

State of California
AIR RESOURCES BOARD

**CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES
FOR 2004 AND SUBSEQUENT MODEL
HEAVY-DUTY DIESEL ENGINES AND VEHICLES**

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NOTE: This document is incorporated by reference in section 1956.8(b), title 13, California Code of Regulations (“CCR”) and also incorporates by reference various sections of Title 40, Part 86 of the Code of Federal Regulations, with some modifications. It contains the majority of the requirements necessary for certification of heavy-duty diesel engines for sale in California, in addition to containing the exhaust emissions standards and test procedures for these diesel engines.¹ The section numbering conventions for this document are set forth in subparagraph 4 on page 6. Reference is also made in this document to other California-specific requirements that are necessary to complete an application for certification. These other documents are designed to be used in conjunction with this document. They include:

1. “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles,” (incorporated by reference in section 1976, title 13, CCR);
2. Warranty requirements (sections 2035, et seq., title 13, CCR);
3. Warranty requirements (sections 2036, et seq., title 13, CCR);
4. OBD II (section 1968, et seq., title 13, CCR, as applicable);
5. HD OBD (sections 1971, et seq., title 13, CCR, as applicable);
6. “California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels through 2014,” (incorporated by reference in section 2317, title 13, CCR); and
7. “California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years,” (incorporated by reference in (section 2317, title 13, CCR).

¹ The requirements for diesel engines used in complete vehicles up to 14,000 pounds GVW are contained in the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” (incorporated by reference in §1961(d), title 13, CCR) and the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” (incorporated by reference in section 1961.2, title 13, CCR).

Table of Contents

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES 1

I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS. 1

1.	General Applicability. [§86.xxx-1]	1
2.	Definitions. [§86.xxx-2]	4
3.	Abbreviations. [§86.xxx-3]	11
4.	Section numbering; construction. [§86.084-4]. October 25, 2016. [No change.]	12
5.	General Standards; increase in emissions; unsafe conditions. [§86.090-5]	12
6.	Hearings on certification. [§86.078-6] October 25, 2016.	12
7.	Maintenance of records; submittal of information; right of entry. [§86.000-7]	12
8.	Emission standards for light-duty vehicles. [§86.xxx-8] [n/a]	13
9.	Emission standards for light-duty trucks. [§86.xxx-9] [n/a]	13
10.	Emission standards for Otto-cycle heavy-duty engines and vehicles. [§86.xxx-10]	13
11.	Emission standards for diesel heavy-duty engines and vehicles. [§86.xxx-11]	13
12.	Alternative certification procedures. [§86.080-12]. April 17, 1980.	28
13.	Alternative durability program. [§86.xxx-13] April 17, 1980. [n/a; light-duty only.]	29
14.	Small-volume manufacturers certification procedures. [§86.xxx-14] April 6, 1994.	29
15.	NOx plus NMHC and particulate averaging, trading, and banking for heavy-duty engines [§86.xxx-15].	30
16.	Prohibition of defeat devices. [§86.004-16] July 13, 2005. [No change.]	43
17.	On-board diagnostics for engines used in applications less than or equal to 14,000 pounds GVWR. [§86.007-17]	43
18.	On-board diagnostics for engines used in applications greater than 14,000 pounds GVWR. [§86.010-18]	43
19.	§86.xxx-19. [Reserved.]	43
20.	Incomplete vehicles, classification. [§86.085-20] April 28, 2014. [No change.]	43
21.	Application for certification. [§86.xxx-21]	43
22.	Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and Selective Enforcement Audit, adequacy of limits, and physically adjustable ranges. [§86.094-22] April 30, 2010. [No change.]	46
23.	Required data. [§86.xxx-23]	46
24.	Test vehicles and engines. [§86.xxx-24]	47
25.	Maintenance. [§86.xxx-25]	47
26.	Mileage and service accumulation; emission measurements. [§86.004-26]. April 28, 2014.	53
27.	Special test procedures. [§86.090-27] April 11, 1989. [No change.]	67
28.	Compliance with emission standards. [§86.xxx-28] January 18, 2001.	67
29.	Testing by the Administrator. [§86.091-29]. April 28, 2014.	67
30.	Certification. [§86.xxx-30]	68
31.	Separate certification. [§86.079-31] September 8, 1977. [No change.]	70
32.	Addition of a vehicle or engine after certification. [§86.079-32] September 8, 1977. [No change.]	70
33.	Changes to a vehicle or engine covered by certification. [§86.079-33] September 8, 1977. [No change.]	70
34.	Alternative procedure for notification of additions and changes. [§86.082-34] November 2, 1982. [No change.]	70
35.	Labeling. [§86.xxx-35].	70
36.	Submission of vehicle identification numbers. [§86.079-36] [n/a]	75

37.	Production vehicles and engines. [§86.085-37] October 25, 2016. [No change.]	75
38.	Maintenance instructions. [§86.xxx-38]	75
39.	Submission of maintenance instructions. [§86.079-39] September 8, 1977. [No change.]	76
40.	Heavy-duty engine rebuilding practices. [§86.xxx-40]	76
II.	Test Procedures.....	77
Subpart I - Emission Regulations for New Diesel-Fueled Heavy-Duty Engines; Smoke Exhaust		
Test Procedure.....		
86.884-1	General Applicability. September 21, 1994.	77
86.884-2	Definitions. November 16, 1983.	77
86.884-3	Abbreviations. November 16, 1983.	77
86.884-4	Section numbering. September 21, 1994.	77
86.884-5	Test Procedures. April 11, 1989.	77
86.884-6	Fuel specifications. April 11, 1989.	77
86.884-7	Dynamometer operation cycle for smoke emission tests. September 5, 1997.	77
86.884-8	Dynamometer and engine equipment. July 13, 2005.	77
86.884-9	Smoke measurement system. September 5, 1997.	77
86.884-10	Information. July 13, 2005.	77
86.884-11	Instrument checks. December 10, 1984.	77
86.884-12	Test run. July 13, 2005.	77
86.884-13	Data analysis. September 5, 1997.	77
86.884-14	Calculations. January 15, 2004.	77
Subpart N - Exhaust Test Procedures for Heavy-duty Engines.....		
86.1301	Scope; applicability. October 25, 2016.	77
86.1302-84	Definitions. November 16, 1983.	77
86.1303-84	Abbreviations. November 16, 1983.	77
86.1304	Section numbering; construction. July 13, 2005.	77
86.1305	Introduction; structure of subpart. August 8, 2014.	77
86.1333	Transient test cycle generation. April 28, 2014.	77
86.1360	Supplemental emission test; test cycle and procedures. April 28, 2014.	79
86.1362	Steady-state testing with a ramped-modal cycle. March 10, 2021 (Pre-publication).	85
86.1363-2007	Steady-state testing with a discrete-mode cycle. June 30, 2008.	87
86.1370	Not-To-Exceed. October 25, 2016.	87
86.1372	Measuring smoke emissions within the NTE zone. April 28, 2014.	98
Subpart S – General Compliance Provisions for Control of Air Pollution From New and In-Use Light-Duty Vehicles, Light-Duty Trucks, and Complete Otto-Cycle Heavy-Duty Vehicles.....		
86.1863-07	Optional chassis certification for diesel vehicles. September 15, 2011.	99
Subpart T - Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines.....		
86.1901	What testing requirements apply to my engines that have gone into service? November 8, 2010.	100
86.1905	How does this program work? November 8, 2010.	100
86.1908	How must I select and screen my in-use engines? June 14, 2005.	100
86.1910	How must I prepare and test my in-use engines? October 25, 2016.	100
86.1912	How do I determine whether an engine meets the vehicle-pass criteria? October 25, 2016.	102
86.1917	How does in-use testing under this subpart relate to the emission-related warranty in Section 207(a)(1) of the Clean Air Act? June 14, 2005.	104
86.1920	What in-use testing information must I report to ARB? October 25, 2016.	104
86.1925	What records must I keep? November 8, 2010.	108
86.1930	What special provisions apply from 2005 through 2009? November 8, 2010.	109

Appendix I to Part 86 - Urban Dynamometer Schedules.....	109
Appendix I to Subpart T – Sample Graphical Summary of NTE Emission Results.....	244
PART 1036 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HEAVY-DUTY HIGHWAY ENGINES.....	245
Subpart A – Overview and Applicability.....	245
1036.1 Does this part apply for my engines? March 10, 2021 (Pre-publication).	245
1036.2 Who is responsible for compliance? October 25, 2016.	245
1036.5 Which engines are excluded from this part’s requirements? October 25, 2016.	245
1036.10 How is this part organized? October 25, 2016.	245
1036.15 Do any other regulation parts apply to me? October 25, 2016.	246
1036.30 Submission of information. October 25, 2016.	246
Subpart B – Emission Standards and Related Requirements.....	246
1036.100 Overview of exhaust emission standards. October 25, 2016.	246
1036.108 Greenhouse gas emission standards. October 25, 2016.	246
1036.115 Other requirements. October 25, 2016.	247
1036.130 Installation instructions for vehicle manufacturers. October 25, 2016.	247
1036.135 Labeling. October 25, 2016.	247
1036.140 Primary intended service class and engine cycle. October 25, 2016.	247
1036.150 Interim provisions. October 25, 2016.	247
Subpart C – Certifying Engine Families.....	248
1036.205 What must I include in my application? October 25, 2016.	248
1036.210 Preliminary approval before certification. October 25, 2016.	249
1036.225 Amending my application for certification. March 10, 2021 (Pre-publication).	249
1036.230 Selecting engine families. March 10, 2021 (Pre-publication).	249
1036.235 Testing requirements for certification. May 12, 2020.	250
1036.241 Demonstrating compliance with greenhouse gas emission standards. October 25, 2016.	250
1036.250 Reporting and recordkeeping for certification. October 25, 2016.	250
1036.255 What decisions may ARB make regarding my certificate of conformity? March 10, 2021 (Pre-publication).	250
Subpart D – Testing Production Engines and Hybrid Powertrains.....	250
1036.301 Measurements related to GEM inputs in a selective enforcement audit. March 10, 2021 (Pre-publication).	250
Subpart E – In-use Testing.....	250
1036.401 In-use testing. October 25, 2016.	250
Subpart F – Test Procedures.....	251
1036.501 How do I run a valid emission test? March 10, 2021 (Pre-publication).	251
1036.503 Engine data and information for vehicle certification. March 10, 2021 (Pre-publication).	252
1036.505 Supplemental emission test. March 10, 2021 (Pre-publication).	253
1036.510 Transient Testing Procedures. March 10, 2021 (Pre-publication).	253
1036.525 Hybrid engines. March 10, 2021 (Pre-publication).	253
1036.527 Powertrain system rated power determination. March 10, 2021 (Pre-publication).	253
1036.530 Calculating greenhouse gas emission rates. March 10, 2021 (Pre-publication).	253
1036.535 Determining steady-state engine fuel maps and fuel consumption at idle. March 10, 2021 (Pre-publication).	253
1036.540 Determining cycle-average engine fuel maps. March 10, 2021 (Pre-publication).	253
1036.543 Carbon balance error verification. March 10, 2021 (Pre-publication).	253

Subpart G – Special Compliance Provisions	253
1036.601 What compliance provisions apply? October 25, 2016.	253
1036.605 GHG exemption for engines used in specialty vehicles. October 25, 2016.	254
1036.610 Off-cycle technology credits and adjustments for reducing greenhouse gas emissions. October 25, 2016.	254
1036.615 Engines with Rankine cycle waste heat recovery and hybrid powertrains. October 25, 2016.	254
1036.620 Alternate CO ₂ standards based on model year 2011 compression-ignition engines. March 10, 2021 (Pre-publication).	254
1036.625 In-use compliance with family emission limits (FELs). October 25, 2016.	254
1036.630 Certification of engine GHG emissions for powertrain testing. October 25, 2016.	254
Subpart H – Averaging, Banking, and Trading for Certification	254
1036.701 General provisions. October 25, 2016.	254
1036.710 Averaging. October 25, 2016.	254
1036.715 Banking. October 25, 2016.	254
1036.720 Trading. October 25, 2016.	254
1036.725 What must I include in my application for certification? October 25, 2016.	254
1036.730 ABT reports. October 25, 2016.	254
1036.735 Recordkeeping. October 25, 2016.	255
1036.740 Restrictions for using emission credits. October 25, 2016.	255
1036.745 End-of-year CO ₂ credit deficits. October 25, 2016.	255
1036.750 What can happen if I do not comply with the provisions of this subpart? October 25, 2016.	255
1036.755 Information provided to the Department of Transportation. [n/a]	255
Subpart I – Definitions and Other Reference Information	255
1036.801 Definitions. March 10, 2021 (Pre-publication).	255
1036.805 Symbols, acronyms, and abbreviations. June 30, 2017.	256
1036.810 Incorporation by reference. March 10, 2021 (Pre-publication).	256
1036.815 Confidential information. October 25, 2016.	256
1036.820 Requesting a hearing. October 25, 2016.	256
1036.825 Reporting and recordkeeping requirements. October 25, 2016.	256
Appendix I to Part 1036 - Summary of Previous Emission Standards. March 10, 2021 (Pre-publication).	257
Appendix II to Part 1036 – Transient Duty Cycles. March 10, 2021 (Pre-publication).	257
Appendix III to Part 1036 – Default Engine Fuel Maps for 40 CFR §1036.540. March 10, 2021 (Pre-publication).	257
Appendix to Subpart F, section 1036.501 – Low-load cycle for optionally certified diesel hybrid powertrain families.	257
PART 1065 – ENGINE-TESTING PROCEDURES.....	436
Subpart A – Applicability and General Provisions	436
1065.1 Applicability. April 28, 2014.	436
1065.2 Submitting information to ARB under this part. April 28, 2014.	436
1065.5 Overview of this part 1065 and its relationship to the standard-setting part. October 30, 2009.	436
1065.10 Other procedures. October 25, 2016.	436
1065.12 Approval of alternate procedures. April 28, 2014.	436
1065.15 Overview of procedures for laboratory and field testing. October 25, 2016.	436
1065.20 Units of measure and overview of calculations. April 28, 2014.	436
1065.25 Recordkeeping. April 28, 2014.	436
Subpart B – Equipment Specifications	436

1065.101	Overview. June 30, 2008.	436
1065.110	Work inputs and outputs, accessory work, and operator demand. June 30, 2008.	436
1065.120	Fuel properties and fuel temperature and pressure. June 30, 2008.	436
1065.122	Engine cooling and lubrication. June 30, 2008.	436
1065.125	Engine intake air. September 15, 2011.	436
1065.127	Exhaust gas recirculation. July 13, 2005.	437
1065.130	Engine exhaust. March 10, 2021 (Pre-publication).	437
1065.140	Dilution for gaseous and PM constituents. March 10, 2021 (Pre-publication).	437
1065.145	Gaseous and PM probes, transfer lines, and sampling system components. March 10, 2021 (Pre-publication).	437
1065.150	Continuous sampling. July 13, 2005.	437
1065.170	Batch sampling for gaseous and PM constituents. March 10, 2021 (Pre-publication).	437
1065.190	PM-stabilization and weighing environments for gravimetric analysis. September 15, 2011.	437
1065.195	PM-stabilization environment for in-situ analyzers. June 30, 2008.	437
Subpart C – Measurement Instruments		437
1065.201	Overview and general provisions. April 28, 2014.	437
1065.202	Data updating, recording, and control. October 25, 2016.	437
1065.205	Performance specifications for measurement instruments. March 10, 2021 (Pre-publication).	437
1065.210	Work input and output sensors. April 28, 2014.	437
1065.215	Pressure transducers, temperature sensors, and dewpoint sensors. June 30, 2008.	437
1065.220	Fuel flow meter. March 10, 2021 (Pre-publication).	437
1065.225	Intake-air flow meter. March 10, 2021 (Pre-publication).	437
1065.230	Raw exhaust flow meter. April 28, 2014.	437
1065.240	Dilution air and diluted exhaust flow meters. April 28, 2014.	437
1065.245	Sample flow meter for batch sampling. July 13, 2005.	437
1065.247	Diesel exhaust fluid flow rate. March 10, 2021 (Pre-publication).	437
1065.248	Gas divider. July 13, 2005.	437
1065.250	Nondispersive infra-red analyzer. April 28, 2014.	437
1065.260	Flame ionization detector. October 25, 2016.	437
1065.265	Nonmethane cutter. September 15, 2011.	438
1065.266	Fourier transform infrared analyzer. October 25, 2016.	438
1065.267	Gas chromatograph with a flame ionization detector. October 25, 2016.	438
1065.269	Photoacoustic analyzer for ethanol and methanol. April 28, 2014.	438
1065.270	Chemiluminescent detector. April 28, 2014.	438
1065.272	Nondispersive ultraviolet analyzer. April 28, 2014.	438
1065.275	N ₂ O measurement devices. March 10, 2021 (Pre-publication).	438
1065.280	Paramagnetic and magnetopneumatic O ₂ detection analyzers. March 10, 2021 (Pre-publication).	438
1065.284	Zirconia (ZrO ₂) analyzer. April 28, 2014.	438
1065.290	PM gravimetric balance. November 8, 2010.	438
1065.295	PM inertial balance for field-testing analysis. April 28, 2014.	438
Subpart D – Calibrations and Verifications		438
1065.301	Overview and general provisions. July 13, 2005.	439
1065.303	Summary of required calibration and verifications. March 10, 2021 (Pre-publication).	439
1065.305	Verifications for accuracy, repeatability, and noise. April 28, 2014.	439
1065.307	Linearity verification. March 10, 2021 (Pre-publication).	439
1065.308	Continuous gas analyzer system-response and updating-recording verification– for gas analyzers not continuously compensated for other gas species. April 28, 2014.	439
1065.309	Continuous gas analyzer system-response and updating-recording verification – for gas analyzers continuously compensated for other gas species. March 10, 2021 (Pre-publication).	439
1065.310	Torque calibration. April 28, 2014.	439

1065.315	Pressure, temperature, and dewpoint calibration. April 28, 2014.	439
1065.320	Fuel-flow calibration. July 13, 2005.	439
1065.325	Intake-flow calibration. July 13, 2005.	439
1065.330	Exhaust-flow calibration. July 13, 2005.	439
1065.340	Diluted exhaust flow (CVS) calibration. October 25, 2016.	439
1065.341	CVS, PFD, and batch sampler verification (propane check). October 25, 2016.	439
1065.342	Sample dryer verification. March 10, 2021 (Pre-publication).	439
1065.345	Vacuum-side leak verification. October 25, 2016.	439
1065.350	H ₂ O interference verification for CO ₂ NDIR analyzers. March 10, 2021 (Pre-publication).	439
1065.355	H ₂ O and CO ₂ interference verification for CO NDIR analyzers. March 10, 2021 (Pre-publication).	439
1065.360	FID optimization and verification. October 25, 2016.	439
1065.362	Non-stoichiometric raw exhaust FID O ₂ interference verification. April 28, 2014.	440
1065.365	Nonmethane cutter penetration fractions. March 10, 2021 (Pre-publication).	440
1065.366	Interference verification for FTIR analyzers. October 25, 2016.	440
1065.369	H ₂ O, CO, and CO ₂ interference verification for photoacoustic alcohol analyzers. April 28, 2014.	440
1065.370	CLD CO ₂ and H ₂ O quench verification. March 10, 2021 (Pre-publication).	440
1065.372	NDUV analyzer HC and H ₂ O interference verification. September 15, 2011.	440
1065.375	Interference verification for N ₂ O analyzers. March 10, 2021 (Pre-publication).	440
1065.376	Chiller NO ₂ penetration. April 28, 2014.	440
1065.378	NO ₂ -to-NO converter conversion verification. September 15, 2011.	440
1065.390	PM balance verifications and weighing process verification. October 25, 2016.	440
1065.395	Inertial PM balance verifications. July 13, 2005.	440
Subpart E – Engine Selection, Preparation, and Maintenance.....		440
1065.401	Test engine selection. July 13, 2005.	440
1065.405	Test engine preparation and maintenance. April 28, 2014.	440
1065.410	Maintenance limits for stabilized test engines. March 10, 2021 (Pre-publication).	440
1065.415	Durability demonstration. June 30, 2008.	440
Subpart F – Performing an Emission Test in the Laboratory.....		440
1065.501	Overview. April 28, 2014.	441
1065.510	Engine mapping. March 10, 2021 (Pre-publication).	441
1065.512	Duty cycle generation. March 10, 2021 (Pre-publication).	441
1065.514	Cycle-validation criteria for operation over specified duty cycles. March 10, 2021 (Pre-publication).	441
1065.516	Sample system decontamination and preconditioning. April 28, 2014.	441
1065.518	Engine preconditioning. April 28, 2014.	441
1065.520	Pre-test verification procedures and pre-test data collection. April 28, 2014.	443
1065.525	Engine starting, restarting, and shutdown. September 15, 2011.	443
1065.526	Repeating void modes or test intervals. April 28, 2014.	443
1065.530	Emission test sequence. March 10, 2021 (Pre-publication).	443
1065.545	Verification of proportional flow control for batch sampling. March 10, 2021 (Pre-publication).	443
1065.546	Verification of minimum dilution ratio for PM batch sampling. October 25, 2016.	443
1065.550	Gas analyzer range verification, and drift verification. April 28, 2014.	443
1065.590	PM sampling media (e.g., filters) preconditioning and tare weighing. October 25, 2016.	443
1065.595	PM sample post-conditioning and total weighing. June 30, 2008.	443
Subpart G – Calculations and Data Requirements.....		443
1065.601	Overview. April 28, 2014.	443
1065.602	Statistics. March 10, 2021 (Pre-publication).	443
1065.610	Duty cycle generation. March 10, 2021 (Pre-publication).	443

1065.630	Local acceleration of gravity. April 28, 2014.	443
1065.640	Flow meter calibration calculations. March 10, 2021 (Pre-publication).	443
1065.642	SSV, CFV, and PDP molar flow rate calculations. March 10, 2021 (Pre-publication).	443
1065.644	Vacuum-decay leak rate. April 28, 2014.	443
1065.645	Amount of water in an ideal gas. October 25, 2016.	443
1065.650	Emission calculations. October 25, 2016.	443
1065.655	Chemical balances of fuel, intake air, and exhaust. October 25, 2016.	443
1065.659	Removed water correction. April 28, 2014.	443
1065.660	THC, NMHC, and CH ₄ determination. October 25, 2016.	443
1065.665	THCE and NMHCE determination. March 10, 2021 (Pre-publication).	444
1065.667	Dilution air background emission correction. March 10, 2021 (Pre-publication).	444
1065.670	NOx intake-air humidity and temperature corrections. September 15, 2011.	444
1065.672	Drift correction. April 30, 2010.	444
1065.675	CLD quench verification calculations. March 10, 2021 (Pre-publication).	444
§1065.680	Adjusting emission levels to account for infrequently regenerating aftertreatment devices. October 25, 2016.	444
1065.690	Buoyancy correction for PM sample media. October 25, 2016.	444
1065.695	Data requirements. March 10, 2021 (Pre-publication).	444
Subpart H – Engine Fluids, Test Fuels, Analytical Gases and Other Calibration Standards.....		444
1065.701	General requirements for test fuels. April 28, 2014March 10, 2021 (Pre-publication)	444
1065.703	Distillate diesel fuel. April 28, 2014.	447
1065.705	Residual and intermediate residual fuel. April 28, 2014. [No change.]	448
1065.710	Gasoline. February 19, 2015. [n/a]	448
1065.715	Natural gas. April 28, 2014.	448
1065.720	Liquefied petroleum gas. April 28, 2014.	449
1065.725	High-level ethanol-gasoline blends. April 28, 2014.	449
1065.735	Diesel exhaust fluid. October 25, 2016.	452
1065.740	Lubricants. July 13, 2005.	452
1065.745	Coolants. July 13, 2005.	452
1065.750	Analytical gases. October 25, 2016.	452
1065.790	Mass standards. March 10, 2021 (Pre-publication).	452
Subpart I –Testing with Oxygenated Fuels		452
1065.801	Applicability. July 13, 2005.	452
1065.805	Sampling system. April 28, 2014.	452
1065.845	Response factor determination. June 30, 2014.	452
1065.850	Calculations. April 28, 2014.	452
Subpart J- Field Testing and Portable Emission Measurement Systems.....		452
1065.901	Applicability. June 30, 2008.	452
1065.905	General provisions. April 28, 2014.	452
1065.910	PEMS auxiliary equipment for field testing. March 10, 2021 (Pre-publication).	452
1065.915	PEMS instruments. April 28, 2014.	452
1065.920	PEMS calibrations and verifications. April 28, 2014.	452
1065.925	PEMS preparation for field testing. September 15, 2011.	452
1065.930	Engine starting, restarting, and shutdown. July 13, 2005.	452
1065.935	Emission test sequence for field testing. June 30, 2008.	452
1065.940	Emission calculations. November 8, 2010.	453
Subpart K – Definitions and Other Reference Information.....		453
1065.1001	Definitions. October 25, 2016	453
1065.1005	Symbols, abbreviations, acronyms, and units of measure. October 25, 2016.	453
1065.1010	Incorporation by reference. October 25, 2016.	454
Subpart L – Methods for Unregulated and Special Pollutants.....		454

1065.1101	Applicability. April 28, 2014.	454
1065.1103	General provisions for SVOC measurement. April 28, 2014.	454
1065.1105	Sampling system design. October 25, 2016.	454
1065.1107	Sample media and sample system preparation; sample system assembly. October 25, 2016.	454
1065.1109	Post-test sampler disassembly and sample extraction. October 25, 2016.	454
1065.1111	Sample analysis. April 28, 2014.	454

PART 1068 – GENERAL COMPLIANCE PROVISIONS FOR HIGHWAY, STATIONARY, AND NONROAD PROGRAMS..... 455

Subpart A – Applicability and Miscellaneous Provisions..... 455

1068.1	Does this part apply to me? October 25, 2016.	455
1068.5	How must manufacturers apply good engineering judgement? October 8, 2008.	455
1068.20	May ARB enter my facilities for inspections? October 25, 2016.	455
1068.30	Definitions. October 25, 2016.	455
1068.35	Symbols, acronyms, and abbreviations. October 8, 2008.	456
1068.45	General labeling provisions. October 25, 2016.	456

Subpart E – Selective Enforcement Auditing..... 457

1068.401	What is a selective enforcement audit? October 25, 2016.	457
1068.405	What is in a test order? October 25, 2016.	457
1068.410	How must I select and prepare my engines/equipment? April 30, 2010.	457
1068.415	How do I test my engines/equipment? October 25, 2016.	457
1068.420	How do I know when my engine family fails an SEA? October 25, 2016.	457
1068.425	What happens if one of my production-line engines/equipment exceeds the emission standards? October 25, 2016.	457
1068.430	What happens if a family fails an SEA? October 25, 2016.	457
1068.435	May I sell engines/equipment from a family with a suspended certificate of conformity? October 8, 2008.	457
1068.440	How do I ask ARB to reinstate my suspended certificate? April 30, 2010.	457
1068.445	When may ARB revoke my certificate under this subpart and how may I sell these engines/equipment again? October 8, 2008.	457
1068.450	What records must I send to ARB? October 25, 2016.	457
1068.455	What records must I keep? October 8, 2008.	457

**CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES
FOR 2004 AND SUBSEQUENT MODEL
HEAVY-DUTY DIESEL ENGINES AND VEHICLES**

The following provisions of Subparts A, I, N, S, and T, Part 86, of Subparts A through I, Part 1036, of Subparts A through L, Part 1065, and of Subparts A and E, Part 1068, Title 40, Code of Federal Regulations, as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the applicable section listed below, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty diesel engines and vehicles, are adopted and incorporated herein by this reference as the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," except as altered or replaced by the provisions set forth below.

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS.

§86.1 Incorporation by reference. October 25, 2016.

Subpart A - General Provisions for Heavy-Duty Engines and Heavy-Duty Vehicles.

1. General Applicability. [§86.xxx-1]

A. Federal Provisions.

1. **§86.001-1** October 6, 2000.

1.1 Subparagraph (a) [No change.]

1.2 Subparagraph (b) *Optional Applicability*. [No change.]

1.3 Subparagraphs (c) and (d) Reserved

1.4 Amend subparagraph (e) as follows: *Small volume manufacturers*.

Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line (including all vehicles and engines imported under the provisions of 40 CFR §§85.1505 and 85.1509 of this chapter) are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year production shall be based on projected California sales. To certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Executive Officer's approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.092-14(b) before the Executive Officer's approval will be granted.

The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.098-14.

1.5 Subparagraph (f) *Optional procedures for determining exhaust opacity.* [No change.]

2. **§86.005-1** October 6, 2000

2.1 Subparagraph (a) [No change.]

2.2 Subparagraph (b) *Optional Applicability.* [No change.]

2.3 Subparagraph (c) [n/a; Otto-cycle]

2.4 Subparagraph (d) Reserved

2.5 Amend subparagraph (e) as follows: *Small volume manufacturers.*

Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line (including all vehicles and engines imported under the provisions of 40 CFR §§85.1505 and 85.1509 of this chapter) are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year production shall be based on projected California sales. To certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Executive Officer's approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.092-14(b) before the Executive Officer's approval will be granted. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.098-14.

2.6 Subparagraph (f) *Optional procedures for determining exhaust opacity.* [No change.]

3. **§86.016-1** October 25, 2016.

3.1 Subparagraph (a) *Applicability.* Amend as follows:

3.1.1 Subparagraph (1). [No change.]

3.1.2 Subparagraphs (2) and (3). Delete and replace with the following: A manufacturer must certify any complete heavy-duty vehicle of 14,000 pounds gross vehicle weight rating or less and any 2020 and subsequent model incomplete heavy-duty vehicle of 10,000 pounds gross vehicle weight rating or less in accordance with the medium-duty vehicle provisions contained in the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," incorporated by reference in section 1961.2, title 13, CCR, as applicable. Heavy-duty engine or vehicle provisions of subpart A do not apply to such a vehicle.

3.1.3 Subparagraph (4). Delete and replace with the following: The provisions of this subparagraph are contained the "California Evaporative

Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.”

3.1.4 Subparagraph (5). Delete and replace with the following: All heavy-duty engines and vehicles are subject to the on-board diagnostic system requirements in section 1968 et seq., title 13, CCR, as applicable.

3.2 Subparagraph (b) *Relationship to subpart S of this part*. [No change.]

3.3 Subparagraph (c) *Greenhouse gas emission standards*. Delete and replace with the following: See 40 CFR parts 1036 and 1037 for greenhouse gas emission standards that apply for heavy-duty engines and vehicles, as modified by these test procedures.

3.4 Subparagraph (d) *Non-petroleum fueled vehicles*. Delete and replace with the following: The standards and requirements of this part apply to non-petroleum fueled motor vehicles, as described in subsection B. of this section.

3.5 Amend subparagraph (e) as follows: *Small volume manufacturers*. Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, and heavy-duty engines in its product line (including all vehicles and engines imported under the provisions of 40 CFR §§85.1505 and 85.1509) are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year production shall be based on projected California sales. To certify its product line under these optional procedures, the small volume manufacturer must first obtain the Executive Officer’s approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.094-14(b) before the Executive Officer’s approval will be granted. The small volume manufacturer’s heavy-duty engine certification procedures are described in 40 CFR §86.098-14.

3.6 Subparagraph (f) *Optional procedures for determining exhaust opacity*. [No change.]

3.7 Subparagraph (g). [n/a; clean alternative fuel conversions]

3.8 Subparagraph (h). *Turbine engines*. [No change.]

B. California provisions.

1. These regulations shall be applicable to all heavy-duty diesel methanol-fueled, ethanol-fueled, natural-gas-fueled and liquefied-petroleum gas-fueled dedicated, dual-fuel and multi-fuel engines (and vehicles) including those engines derived from existing diesel engines. For any engine that is not a distinctly diesel engine nor derived from such, the Executive Officer shall determine whether the engine shall be subject to these regulations or alternatively to the heavy-duty Otto-cycle engine regulations, in consideration of the relative similarity of the engine’s torque-speed characteristics and vehicle applications with those of diesel and Otto-cycle engines. Reference to dual fuel vehicles or engines shall also mean bi-fuel vehicles or engines. References to methanol shall also mean ethanol. For guidance

on classifying 2021 and subsequent model heavy heavy-duty Otto-cycle engines, used in vehicles which normally exceed 33,000 pounds GVWR, based on primary intended service class, see 40 CFR §1036.140.

2. References in the federal regulations to light-duty vehicles and light-duty trucks do not apply. References to heavy-duty Otto-cycle engines or vehicles do not apply.

3. Any reference to vehicle or engine sales or vehicle or engine production volume throughout the United States shall mean vehicle or engine sales or vehicle or engine volume in California. References to small volume manufacturers shall mean California small volume manufacturer as defined in section I.1.A., above.

4. Regulations concerning U.S. EPA hearings, U.S. EPA inspections, specific language on the Certificate of Conformity, non-conformance penalties, evaporative emission, high-altitude vehicles and testing, alternative useful life, and Certification Short Test shall not be applicable to these procedures, except where specifically noted. The regulations pertaining to evaporative emissions are contained in “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles,” as incorporated in title 13, CCR §1976. All heavy-duty methanol- and gaseous-fueled vehicles shall comply with the evaporative requirements in title 13, CCR, §1976.

2. Definitions. [§86.xxx-2]

A. Federal Provisions.

1. **§86.004-2** October 25, 2016. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

1.1 Introductory text and definitions “*Ambulance*” through “*U.S.-directed production.*” [No change.]

1.2 Amend “*Useful Life*” definition as follows:

1.2.1 Subparagraphs (1) through (3). [n/a]

1.2.2 Delete and replace subparagraph (4) as follows:

(4) For a diesel HDE family:

(i) For light heavy-duty engines:

(A) For 2004 through 2026 model-year light heavy-duty diesel engines, excluding 2024 through 2026 model-year engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 10 years or 110,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year light heavy-duty diesel engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 12 years or 190,000 miles, whichever first occurs.

(C) For 2031 and subsequent model-year light heavy-duty diesel engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 15 years or 270,000 miles, whichever first occurs.

(D) For 2024 and subsequent model diesel engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 15 years or 150,000 miles, whichever first occurs.

(ii) For medium heavy-duty engines:

(A) For 2004 through 2026 model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 10 years or 185,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 11 years or 270,000 miles, whichever first occurs.

(C) For 2031 and subsequent model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 12 years or 350,000 miles, whichever first occurs.

(iii) For heavy heavy-duty engines:

(A) For 2004 through 2026 model-year heavy heavy-duty diesel engines, 2004 through 2026 model-year heavy-duty diesel urban buses, 2004 through 2026 model-year heavy-duty diesel engines to be used in urban buses, and 2004 through 2026 model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 10 years or 435,000 miles, or 22,000 hours, whichever first occurs, except as provided in paragraphs (4)(iii)(A)(1) and (4)(iii)(A)(2).

(1) The useful life limit of 22,000 hours in paragraph (4)(iii)(A) of this definition is effective as a limit to the useful life only when an accurate hours meter is provided by the manufacturer with the engine and only when such hours meter can reasonably be expected to operate properly over the useful life of the engine.

(2) For an individual engine, if the useful life hours limit of 22,000 hours is reached before the engine reaches 10 years or 100,000 miles, the useful life shall become 10 years or 100,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year heavy heavy-duty diesel engines, 2027 through 2030 model-year heavy-duty diesel urban buses, 2027 through 2030 model-year heavy-duty diesel engines to be used in urban buses, and 2027 through 2030 model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 11 years or 600,000 miles, or 30,000 hours, whichever first occurs, except as provided in paragraphs (4)(iii)(B)(1) and (4)(iii)(B)(2).

(1) The useful life limit of 30,000 hours in paragraph (4)(iii)(B) of this definition is effective as a limit to the useful life only if the manufacturer equips the engine with an hours meter that accurately records and reports the hours that the engine is operated throughout its useful life. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the useful life period, such as on a vehicle equipped with stop-start technology.

(2) For an individual engine, if the useful life hours limit of 30,000 hours is reached before the engine reaches 11 years or 450,000 miles, the useful life shall become 11 years or 450,000 miles, whichever first occurs.

(C) For 2031 and subsequent model-year heavy heavy-duty diesel engines, 2031 and subsequent model-year heavy-duty diesel urban buses, 2031 and subsequent model-year heavy-duty diesel engines to be used in urban buses, and 2031 and subsequent model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons, a period of use of 12 years or 800,000 miles, or 40,000 hours, whichever first occurs, except as provided in paragraphs (4)(iii)(C)(1) and (4)(iii)(C)(2).

(1) The useful life limit of 40,000 hours in paragraph (4)(iii)(C) of this definition is effective as a limit to the useful life only if the manufacturer equips the engine with an hours meter that accurately

records and reports the hours that the engine is operated throughout its useful life. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the useful life period, such as on a vehicle equipped with stop-start technology.

(2) For an individual engine, if the useful life hours limit of 40,000 hours is reached before the engine reaches 12 years or 600,000 miles, the useful life shall become 12 years or 600,000 miles, whichever first occurs.

1.2.3 Subparagraph (5). [No change.]

1.2.4 Add Subparagraph (6) as follows:

(6) For 2022 and subsequent model year diesel hybrid powertrain families optionally certified pursuant to title 13, CCR §1956.8:

(i) For 2022 through 2023 model year diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the useful life periods and model year implementation schedules for light heavy-duty diesel engines in subparagraph (4)(i)(A) of this section, and for 2024 and subsequent model year diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the useful life periods and model year implementation schedules for diesel engines in subparagraph (4)(i)(D) of this section, shall apply to the diesel hybrid powertrains.

(ii) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 14,001 to 19,500 pounds, the useful life periods and model year implementation schedules for light heavy-duty diesel engines in subparagraph (4)(i) of this section shall apply to the diesel hybrid powertrains.

(iii) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 19,501 to 33,000 pounds, the useful life periods and model year implementation schedules for medium heavy-duty engines in subparagraph (4)(ii) of this section shall apply to the diesel hybrid powertrains.

(iv) For diesel hybrid powertrains primarily used in vehicles with a GVWR greater than 33,000 pounds, the useful life periods and model year implementation schedules for heavy heavy-duty diesel engines in subparagraph (4)(iii) of this section shall apply to the diesel hybrid powertrains.

1.3 Delete and replace “Warranty period” definition as follows:

Warranty period [For guidance see title 13, CCR, §2036].

2. **§86.010-2** April 30, 2010. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

3. **§86.012-2** September 15, 2011. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

3.1 Amend paragraph as follows: The definitions of 40 CFR §86.010-2 continue to apply to model year 2010 and later model year engines and vehicles. The definitions listed in this section apply beginning with model year 2012. “GHG Urban Bus” means a passenger-carrying vehicle with a load capacity of fifteen or more passengers and intended primarily for intracity operation, i.e., within the confines of a city or greater metropolitan area. GHG urban bus operation is characterized by short rides and frequent stops. To facilitate this type of operation, more than one set of quick-operating entrance and exit doors would normally be installed. Since fares are usually paid in cash or tokens, rather than purchased in advance in the form of tickets, GHG urban buses would normally have equipment installed for collection of fares. GHG urban buses are also typically characterized by the absence of equipment and facilities for long distance travel, e.g., rest rooms, large luggage compartments, and facilities for stowing carry-on luggage.

B. California Provisions.

“**Administrator**” means the Executive Officer of the Air Resources Board.

“**Automatic active regeneration**” is an approved AECD that is active during normal operation of the vehicle for the purpose of restoring emissions aftertreatment component efficiency by raising exhaust temperature to manufacturer-specific targets and activating other controls as approved by the Executive Officer. The regeneration is triggered automatically by the ECM without operator or service request based on the conditions of operation, design limits, and other approved parameters specified in AECD description, and is indicated by the ECM as “active” while the event is in progress. Common examples include DPF regeneration to oxidize accumulated soot, and actions to recover SCR efficiency due to, for example, accumulation of DEF deposits.

“**ARB**” means Air Resources Board or the Executive Officer of the Air Resources Board.

“**Break-in period**” means the service accumulation period before an engine and aftertreatment system is stabilized for emissions-data testing.

“**California sales volume**” means the number of new California certified engines, vehicles or powertrains sold to an ultimate purchaser in the State of California in a given model year.

“**Certificate of Conformity**” means “Executive Order” certifying vehicles for sale in California.

“**Certification**” means certification as defined in Section 39018 of the Health and Safety Code.

"Class 3" means a vehicle with a GVWR that is above 10,000 pounds but at or below 14,000 pounds.

"Class 4" means a vehicle with a GVWR that is above 14,000 pounds but at or below 16,000 pounds.

"Class 5" means a vehicle with a GVWR that is above 16,000 pounds but at or below 19,500 pounds.

"Class 6" means a vehicle with a GVWR that is above 19,500 pounds but at or below 26,000 pounds.

"Class 7" means a vehicle with a GVWR that is above 26,000 pounds but at or below 33,000 pounds.

"Class 8" means a vehicle with a GVWR that is above 33,000 pounds.

"Conformity Factor" means a multiplier to the emission standards used for in-use compliance testing with PEMS.

"Designated Compliance Officer" means the Executive Officer of the Air Resources Board or his or her delegate.

"EPA" shall also mean Air Resources Board or Executive Officer of the Air Resources Board

"EPA Enforcement Officer" means the Executive Officer or his or her delegate.

"Family certification level or FCL" means the family certification level as described in section 1036.801 of these test procedures.

"Field fix" means a modification, removal or replacement of an emission-related component by a manufacturer or dealer, or revision by a manufacturer for implementation by dealers to specifications or maintenance practices for emission-related components on engines that have left the assembly line.

"Greenhouse gas Emissions Model (GEM)" means the Greenhouse gas Emissions Model (GEM) Phase 2, Version 3.5.1, November 2020; incorporated by reference in 40 CFR §1037.810 (c)(2), and for powertrain testing specified in 40 CFR § 1037.550(a) means GEM's MATLAB/Simulink Hardware-in-Loop model, version 3.8, December 2020 ("GEM HIL model"), last amended March 10, 2021 (Pre-publication), which is incorporated by reference herein.

"Heavy-Duty Transient Federal Test Procedure or FTP cycle" means the test procedure specified in 40 CFR §86.007-11(a)(2), as amended October 25, 2016.

"Intermediate useful life" means the period of use of 435,000 miles or 8 years, whichever first occurs, applicable for the intermediate emission standards for oxides of nitrogen for 2027 and subsequent model year heavy heavy-duty diesel engines.

"Intermediate useful life NOx standard" means the emissions standards for oxides of nitrogen applicable to the intermediate useful life for 2027 and subsequent model year heavy heavy-duty-diesel engines.

"In-use threshold" means the value of the emission standards multiplied by a conformity factor for the respective in-use bins: idle, low load, and medium/high load.

"Legacy engine family" means an engine family certified under the provisions of title 13, CCR, Section 1956.8(a)(2)(C)3.

"Low-hour" means the emission test point after the break-in period.

“Low-load cycle (LLC)” means the supplemental emission test procedure with the low-load cycle according to section I.11.B.8 of these test procedures.

“Manual active regeneration” is an approved AECD that is active only while the vehicle is stationary for the purpose of restoring emissions aftertreatment component efficiency by raising exhaust temperature to manufacturer-specific targets and activating other controls as approved by the Executive Officer. The regeneration is triggered either by operator request (e.g., dash switch) in response to an ECM message, or by service request (e.g., dash switch or service tool), and is indicated by the ECM as “active” while the event is in progress.

“Measurement allowance” means accuracy margin.

“Medium-duty engine” means a heavy-duty engine that is used to propel a medium-duty vehicle.

“Medium-duty vehicle” means 2004 through 2006 model year heavy-duty low-emission vehicle, ultra-low-emission vehicle, super-ultra-low-emission vehicle or zero-emission vehicle certified to the standards in title 13, CCR, section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2004 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

“NTE standard” means NTE emission limit.

“Optional Low NOx Engine” means a 2015 or subsequent model heavy-duty diesel engine certified to the optional low NOx emission standards in subparagraph I.11.B.7.

“Optionally certified hybrid powertrain or hybrid powertrain or heavy-duty hybrid powertrain” means a group of components that includes an engine, electric motor-generator system, rechargeable energy storage system other than a conventional battery system or conventional flywheel, battery management system, including charge controller and thermal management systems and associated power electronics. Transmissions, final drives and drive shafts may be included as powertrain components if specified by the hybrid powertrain manufacturer. Supplemental electrical batteries and hydraulic accumulators are examples of hybrid energy storage systems. Note other examples of systems that qualify as hybrid engines or powertrains are systems that recover kinetic energy and use it to power an electric heater in the aftertreatment.

“Optionally certified diesel hybrid powertrain or diesel hybrid powertrain or heavy-duty diesel hybrid powertrain” means a hybrid powertrain that uses a diesel engine.

“Portable emission measurement system (PEMS)” means a measurement system consisting of portable equipment that can be used to generate brake-specific emission measurements during field testing or laboratory testing.

“Ramped Modal Cycle (RMC)” means the engine test cycle as defined in section 86.1362 of these test procedures. For 2024 and subsequent model years, certifying heavy-duty engine manufacturers have the option of using either the engine test cycle in 86.1362 or 1036.505 of these test procedures for demonstrating compliance with the applicable RMC criteria pollutant emissions standards.

“Running change” means a change to a vehicle/engine or addition of a model which occurs after certification but during vehicle/engine production.

“Telematics” means any wireless technology that transmits engine or vehicle operational parameters.

“Test Procedure” means all aspects of engine testing including but not limited to the test cycle, preconditioning procedures, equipment specifications, calibrations, calculations and other protocols and specifications needed to measure emissions.

“Vehicle family” has the same definition as “vehicle family” in 40 CFR §1037.801, last amended on March 10, 2021 (Pre-publication), which is incorporated by reference herein.

“Vehicle-FTP” means the vehicle FTP cycle as defined in Appendix II to part 1036 paragraph (c) of these test procedures.

“Vehicle-LLC” means the vehicle low-load cycle as defined in Appendix to Subpart F, section 1036.501 of these test procedures.

“Vehicle-RMC” means the powertrain test cycle as defined in section 86.1362 of these test procedures. For 2024 and subsequent model years, certifying diesel hybrid powertrain manufacturers have the option of using either the powertrain test cycle in 1036.505 or 86.1362 of these test procedures for demonstrating compliance with the applicable Vehicle-RMC criteria pollutant emissions standards.

“Warranty period” [For guidance see title 13, CCR, §2036]

“Zero-emission vehicle” means an on-road vehicle with a drivetrain that produces zero exhaust emission of any criteria pollutant (or precursor pollutant) or greenhouse gas under any possible operational modes or conditions.

3. Abbreviations. [§86.xxx-3]

A. Federal Provisions.

1. **§86.000-3 Abbreviations.** October 22, 1996. [All federal abbreviations apply, except as otherwise noted below. Abbreviations specific to other requirements are contained in separate documents.]

B. California Provisions.

“3B-MAW” means 3-Binned Moving Average Window as described in section 86.1370.B of these test procedures

“55-cruise” means the 55 mi/hr highway cruise cycle as described in 40 CFR §1037.510(a)(3), last amended on March 10, 2021 (Pre-publication), which is incorporated by reference herein.

“65-cruise” means the 65 mi/hr highway cruise cycle as described in 40 CFR §1037.510(a)(3), last amended on March 10, 2021 (Pre-publication), which is incorporated by reference herein.

“B-MAW” means Binned Moving Average Window as described in section 86.1370.B of these test procedures

“CA-ABT” means California averaging, banking and trading program as described in Section I.15.B.3 of these test procedures

“CCR” means “California Code of Regulations

“EAS” means the combination of the engine, aftertreatment system

and electronic control unit combined together

“HDTT” means Heavy-Duty Transient Test Cycle as described in Appendix I 40 CFR §1037 and §1037.510(a)(3), last amended on March 10, 2021 (Pre-publication), which is incorporated by reference herein

“LEV” means low-emission vehicle

“MDV” means medium-duty vehicle

“OBD” means on-board diagnostics

“ULEV” means ultra-low-emission vehicle

“SULEV” means super-ultra-low-emission vehicle

4. Section numbering; construction. [§86.084-4]. October 25, 2016. [No change.]

The section numbering convention employed in these test procedures, in order of priority, is I.1.A.1.1. in order to distinguish California procedures and requirements from those of the U.S. EPA. References in these test procedures to specific sections of the Code of Federal Regulations maintain the same numbering system employed in the Code of Federal Regulations. California-only requirements are set forth in a separate subsection. In the beginning of each section the general notation §86.xxx-# is used when there is more than one applicable section (or when no versions of the section are being incorporated) to indicate the section being discussed without regard to model year. The years of applicability (denoted generically “xxx”) are added as applicable in the pertinent subsections.

In cases where the entire CFR section is incorporated by reference with no modifications, the notation “[No change.]” is used. In cases where the federal requirements are modified by California requirements, the notation “Amend (or delete) subparagraph () as follows:” is used. If the federal requirement is not applicable, the notation “[n/a]” is used. In cases where there are California only requirements, the additional California requirements are noted in a separate subsection with the numbering convention set forth above.

If a CFR section for a specific model year is set forth in this document, and that CFR section references previous CFR sections, then all previously referenced CFR sections are deemed incorporated into this document unless otherwise noted.

5. General Standards; increase in emissions; unsafe conditions. [§86.090-5] November 12, 1996. [No change.]

6. Hearings on certification. [§86.078-6] October 25, 2016.

Amend the paragraph as follows: If a manufacturer's request for a hearing is approved, ARB will follow the hearing procedures specified in accordance with title 17, CCR, §60055.1, et seq., with respect to such issue.

7. Maintenance of records; submittal of information; right of entry. [§86.000-7] April 27, 2018. [No change.]

8. Emission standards for light-duty vehicles. [§86.xxx-8] [n/a]
9. Emission standards for light-duty trucks. [§86.xxx-9] [n/a]
10. Emission standards for Otto-cycle heavy-duty engines and vehicles. [§86.xxx-10] [n/a]
11. Emission standards for diesel heavy-duty engines and vehicles. [§86.xxx-11]
 - A. Federal provisions.**
 - 1. §86.004-11 Emission standards for 2004 and later model year diesel heavy-duty engines and vehicles.** April 28, 2014.
 - 1.1 Amend subparagraph (a) as follows:
 - 1.1.1 Amend subparagraph (a)(1) Exhaust emissions from new 2004 through 2006 model year diesel HDEs, other than diesel-fueled, dual fuel and bi-fuel urban buses, shall not exceed the following:
 - 1.1.2 Subparagraphs (a)(1)(i) through (a)(iii)(C) [No change.]
 - 1.1.3 Amend subparagraph (a)(2) as follows: The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(2) of appendix I to this part, and measured and calculated in accordance with the procedures set forth in subpart N of this part as amended in part II of these test procedures, except as noted in §86.098-28(c)(2) or superseding sections.
 - 1.2. Subparagraph (b). [No change.]
 - 1.3. Subparagraph (c). [No change.]
 - 1.4 Amend subparagraph (d) as follows: Every manufacturer of new motor vehicle engines subject to the standards prescribed in title 13, CCR, §1956.8 (a), §1956.8 (h), and this section shall, prior to taking any of the actions prohibited by California Health & Safety Code section 43211 or as specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in subpart I or N as amended by these test procedures to ascertain that such test engines meet the requirements of paragraphs (a), (b), (c), and (d) of this section.
 - 1.5 Subparagraph (e). [No change.]
 - 2. §86.007-11 Emission standards and supplemental requirements for 2007 and later model year diesel heavy-duty engines and vehicles.** October 25, 2016.
 - 2.1 Add the following sentence to the introductory paragraph: Except as otherwise noted, references in this subsection to heavy-duty engines or HDEs shall include medium-duty engines as defined in Section I.2.B of these test procedures.
 - 2.2 Amend subparagraph (a)(1) as follows: Exhaust emissions from new 2007 through 2023 model year diesel HDEs including engines used in urban buses shall not exceed the following. Exhaust emissions from new 2024 and

later model year HDEs including engines used in urban buses are specified in subparagraph I.11.B, below.

2.2.1 Subparagraphs (a)(1)(i) through (a)(1)(ii)(A). [No change.]

2.2.2 Amend subparagraph (a)(1)(ii)(B) as follows: Nonmethane-hydrocarbon (NMHC) for engines fueled with natural gas or liquefied petroleum gas: 0.14 grams per brake horsepower-hour (0.052 grams per megajoule).

2.2.3 Subparagraph (a)(1)(ii)(C) through (a)(iv). [No change.]

2.2.4 Amend subparagraph (a)(2) as follows: The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(2) of appendix I to this part, and measured and calculated in accordance with the procedures set forth in subpart N of this part as amended in part II of these test procedures, except as noted in 40 CFR §86.007-23(c)(2) or superseding sections.

2.2.5 Delete subparagraph (a)(3). [For guidance see 40 CFR, Subpart N, §86.1360-2007 of these test procedures].

2.2.6 Delete subparagraph (a)(4)(i) through (a)(4)(vi). [For guidance see 40 CFR, Subpart N, §86.1370-2007 of these test procedures]

2.3 Subparagraphs (b)(1)(i) through (b)(1)(iii). [No change.]

2.3.1 Delete subparagraph (b)(1)(iv). [For guidance see 40 CFR, Subpart N, §86.1370-2007 of these test procedures]

2.3.2 Subparagraphs (b)(2)(i). [No change.]

2.3.3 Delete subparagraph (b)(2)(ii). [For guidance see 40 CFR, Subpart N, §86.1370-2007 of these test procedures]

2.3.4 Subparagraph (b)(3) and (b)(4). [No change.]

2.4 Subparagraph (c). [No change.]

2.5 Amend subparagraph (d) as follows: Every manufacturer of new motor vehicle engines subject to the standards prescribed in title 13, CCR, §1956.8 (a), §1956.8 (h), and this section shall, prior to taking any of the actions prohibited by California Health & Safety Code section 43211 or as specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in subpart I or N as amended in part II of these test procedures to ascertain that such test engines meet the requirements of paragraphs (a), (b), (c), and (d) of this section.

2.6 Subparagraphs (e) through (i). [No change.]

2.7 Amend subparagraph (j) as follows: Engines installed in new glider vehicles are subject to the standards specified in 40 CFR 1037.635 as modified by the California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles, as amended on December 19, 2018.

B. California provisions.

1. Urban Bus Standards.

1.1 The exhaust emissions from new 2004 through 2006 model year heavy-duty engines (other than diesel-fueled, dual-fuel and bi-fuel heavy-duty engines) used in urban buses shall not exceed the standards set forth in 40 CFR §86.004-11(a)(1), above.

1.2 The exhaust emissions, as measured under transient operating conditions, from 2004 through 2006 model year diesel-fueled, dual-fuel and bi-fuel heavy-duty engines used in urban buses shall not exceed:

**2004 – 2006 Heavy-Duty Diesel-Fuel, Dual Fuel, and Bi-Fuel Urban Bus
Engine Exhaust Emission Standards*
(grams per brake horsepower-hour or g/bhp-hr)**

NOx¹	NMHC or NMHCE	CO³	PM²	HCHO⁴
0.5 (0.2 g/megajoule)	0.05 (0.02 g/megajoule)	5.0 (1.9 g/megajoule); [7.0 (2.6 g/megajoule)]	0.01 (0.004 g/megajoule)	0.01 (0.004 g/megajoule)

¹ Oxides of Nitrogen (NOx). This standard is for certification testing and selective enforcement audit testing. As an option, manufacturers may choose to meet the NOx standard with a base engine that is certified to the standards in §86.004-11(a)(1), (October 6, 2000), equipped with an aftertreatment system that reduces NOx to 0.5 g/bhp-hr and PM to 0.01 g/bhp-hr. The NMHC, CO, and formaldehyde standards above shall still apply. Manufacturers shall be responsible for full certification, durability, testing, and warranty and other requirements for the base engine. For the aftertreatment system, manufacturers shall not be subject to the certification durability requirements, or in-use recall and enforcement provisions, but are subject to warranty provisions for functionality.

² Particulates. This standard is for certification testing, selective enforcement audit testing, and in-use testing. As an option, manufacturers may choose to meet the PM standard with an aftertreatment system that reduces PM to 0.01 g/bhp-hr. Manufacturers shall be responsible for full certification, durability, testing, and warranty and other requirements for the base engine. For the aftertreatment system, manufacturers shall not be subject to the certification durability requirements, or in-use recall and enforcement provisions, but are subject to warranty provisions for functionality.

³ Carbon monoxide. The 5.0 g/bhp-hr (1.9 grams per megajoule) standard is for certification testing and selective enforcement audit testing, and the 7.0 g/bhp-hr (2.6 grams per megajoule) standard is for in-use testing.

⁴ Formaldehyde. This standard is for certification testing, selective enforcement audit testing and in-use testing.

2. Optional HDE and Urban Bus Standards. A manufacturer may elect to certify 2004 through 2006 model year heavy-duty diesel engines greater than 14,000 pounds gross vehicle weight rating and heavy-duty engines used in urban buses [excluding diesel-fuel, dual-fuel and bi-fuel heavy-duty diesel engines used in urban bus engines] to the following standards, as measured under transient operating conditions. Engines certified to these standards are not eligible to participate in NOx, NOx plus NMHC, or particulate ABT programs.

OPTIONAL STANDARDS
Heavy-Duty Diesel Engines >14,000 lbs. GVW
(excluding diesel-fueled, dual fuel, and bi-fuel Urban Buses)
(grams per brake-horsepower-hour or g/bhp-hr)

Model Year	NOx plus NMHC (or NMHCE)*	CO	PM
2004–2006*	0.3 to 1.8, inclusive; (in 0.3 g/bhp-hr increments)	15.5	0.01; 0.02; or 0.03

* NOx plus NMHC are measured as the arithmetic sum of the NOx plus NMHC exhaust component certification values.

3. **Formaldehyde Standards.** Formaldehyde exhaust emissions from new 2004 through 2006 model methanol-fueled diesel engines, shall not exceed 0.05 g/bhp-hr.

4. **Requirements for Dual- and Bi-Fuel Engines.** For the 2004 through 2006 model years, an engine family whose design allows engine operation in either of two distinct alternative fueling modes, where each fueling mode is characterized by use of one fuel or a combination of two fuels and significantly different emission levels under each mode, may certify to a different NOx plus NMHC (depending on model year) standard for each fueling mode, provided it meets the following requirements:

- (1) The NOx plus NMHC certification standard used for certification under the higher emitting fueling mode must be the standard contained in paragraph 11.A.1 above as appropriate.
- (2) The NOx plus NMHC certification standard used for certification under the lower emitting fueling mode must be one of the reduced-emission standards contained in paragraph 11.B.2 above, as appropriate.
- (3) The engine family is not used to participate in any manufacturer's averaging, banking or trading program.
- (4) The engine family meets all other applicable emission standards in each fueling mode.
- (5) The higher emitting fueling mode must be intended only for fail-safe vehicle operation in the case of a malfunction or inadvertent fuel depletion which precludes normal operation in the lower emitting fueling mode. Evidence of such design intent would be a significantly reduced horsepower versus engine speed curve when operating in the higher emitting fueling mode as compared to the curve while operating in the lower emitting fueling mode.
- (6) All applicable exhaust emission testing, data submission, and certification application requirements must be met separately for each of the two fueling modes of operation, but should be submitted for ARB approval in a single package.

5. **Standards for Heavy-Duty Engines .**

5.1 **Requirements Specific to Heavy-Duty Engines Used in Medium-Duty Vehicles 8,501 to 10,000 pounds GVW.** For the 2004 through

2019 model years, a manufacturer of heavy-duty engines used in medium-duty vehicles 8,501 to 10,000 pounds GVW may choose to comply with the following standards as an alternative to the primary emission standards and test procedures specified in title 13, CCR, §1961 or §1961.2, as applicable. A manufacturer that chooses to comply with these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in title 13, CCR, §2139(c). For the 2020 and subsequent model years, a manufacturer of heavy-duty engines used in medium-duty vehicles 8,501 to 10,000 pounds GVW must comply with the primary emission standards and test procedures specified in title 13, CCR, §1961.2.

5.2 Requirements Specific to Heavy-Duty Engines Used in Medium-Duty Vehicles 10,001 to 14,000 pounds GVW. For the 2004 and subsequent model years, a manufacturer of heavy-duty engines used in medium-duty vehicles 10,001 to 14,000 pounds GVW may choose to comply with the following standards as an alternative to the primary emission standards and test procedures specified in title 13, CCR, §1961 or §1961.2, as applicable. A manufacturer that chooses to comply with these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in title 13, CCR, §2139(c).

5.3 Exhaust Emission Standards for Heavy-Duty Engines.

5.3.1 The exhaust emissions from new 2004 through 2019 model heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 8,501 to 10,000 pounds GVW and 2004 through 2023 model heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 10,001 to 14,000 pounds GVW shall not exceed:

**Exhaust Emission Standards for 2004 through 2006 Model
Medium-Duty ULEVs and SULEVs
(g/bhp-hr)**

Vehicle Emission Category	NOx + NMHC	CO	PM	HCHO
ULEV ¹ Option A	2.5 (with a 0.5 cap on NMHC)	14.4	0.10	0.050
ULEV ¹ ; Option B	2.4	14.4	0.10	0.050

**Exhaust Emission Standards for 2007 through 2019 Model
Medium-Duty ULEVs and SULEVs 8,501-10,000 lbs. GVW and 2007 Through 2023
Model Medium-Duty ULEVs and SULEVs
10,001-14,000 lbs. GVW
(g/bhp-hr)**

Vehicle Emission Category	NOx	NMHC or NMHCE	CO	PM	HCHO
ULEV ¹	0.20	0.14	15.5	0.01	0.050
SULEV ¹	0.10	0.07	7.7	0.005	0.025

¹ Emissions averaging may be used to meet these standards using the requirements for participation averaging, banking and trading programs, as set forth in Section I.15 of these test procedures.

5.3.2 The exhaust emissions from new 2024 and subsequent model diesel engines used in medium-duty vehicles 10,001 to 14,000 pounds GVWR shall not exceed:

**Exhaust Emission Standards for 2024 through 2026 Model
Diesel Engines Used in Medium-Duty Vehicles 10,001-14,000 lbs. GVWR
(g/bhp-hr)^A**

Test Procedure	NOx	NMHC	CO	PM	HCHO
FTP cycle	0.050	0.14	15.5	0.005	0.050
RMC cycle	0.050	0.14	15.5	0.005	0.050
Low-load cycle	0.200	0.14	15.5	0.005	0.050

Exhaust Emission Standards for 2027 and Subsequent Model Diesel Engines Used in Medium-Duty Vehicles 10,001-14,000 lbs. GVWR (g/bhp-hr)^A

Test Procedure	NOx	NMHC	CO	PM	HCHO
FTP cycle	0.020	0.14	15.5	0.005	0.050
RMC cycle	0.020	0.14	15.5	0.005	0.050
Low-load cycle	0.050	0.14	15.5	0.005	0.050

^A A manufacturer of diesel engines used in medium-duty vehicles may choose to comply with these standards as an alternative to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13 CCR. An engine certified for use in a medium-duty vehicle shall not be used in a heavy-duty vehicle over 14,000 pounds GVWR.

5.3.3 Except as provided in subparagraph 5.3.4 below, the exhaust emissions from new 2024 and subsequent model light-heavy duty engines used in vehicles 14,001 to 19,500 pounds GVWR, medium heavy-duty engines, and heavy heavy-duty engines, including urban bus engines, shall not exceed:

Exhaust Emission Standards for 2024 through 2026 Model Diesel Light Heavy-Duty Engines, Medium Heavy-Duty Engines, and Heavy Heavy-Duty Engines (g/bhp-hr)

Test Procedure	NOx	NMHC	CO	PM
FTP cycle	0.050	0.14	15.5	0.005
RMC cycle	0.050	0.14	15.5	0.005
Low-load cycle	0.200	0.14	15.5	0.005

Exhaust Emission Standards for 2027 and Subsequent Model Diesel Light Heavy-Duty Engines and Medium Heavy-Duty Engines (g/bhp-hr)

Test Procedure	NOx	NMHC	CO	PM
FTP cycle	0.020	0.14	15.5	0.005
RMC cycle	0.020	0.14	15.5	0.005
Low-load cycle	0.050	0.14	15.5	0.005

**Exhaust Emission Standards for 2027 through 2030 Model Diesel
Heavy Heavy-Duty Engines
(g/bhp-hr)**

Test Procedure	Intermediate Useful Life NOx	NOx	NMHC	CO	PM
FTP cycle	0.020	0.035	0.14	15.5	0.005
RMC cycle	0.020	0.035	0.14	15.5	0.005
Low-load cycle	0.050	0.090	0.14	15.5	0.005

**Exhaust Emission Standards for 2031 and Subsequent Model Diesel
Heavy Heavy-Duty Engines
(g/bhp-hr)**

Test Procedure	Intermediate Useful Life NOx	NOx	NMHC	CO	PM
FTP cycle	0.020	0.040	0.14	15.5	0.005
RMC cycle	0.020	0.040	0.14	15.5	0.005
Low-load cycle	0.050	0.100	0.14	15.5	0.005

5.3.4. 2024 through 2026 model year engines rated at or above 525 bhp maximum power as defined in 40 CFR §1065.510.

5.3.4.1. In lieu of compliance with the requirements specified in subparagraph 5.3.3 above, a manufacturer may elect to certify a heavy-duty engine family or families rated at or above 525 bhp by

(a) submitting the federal engine family certification approval (e.g., federal certificate of conformity) for the applicable engine family and complying with all federal requirements for heavy-duty engines,

(b) demonstrating compliance with the Heavy-Duty Diesel Engine Idling Requirements for that model year as provided in subparagraph 13 CCR section 1956.8(a)(6), and

(c) providing emission warranty requirements for that model year as specified in 13 CCR section 2036.

5.3.4.2. A manufacturer is only eligible to utilize this option if it meets the criteria identified in subparagraphs (a) through (d), below.

a. The manufacturer must have certified and sold heavy-duty diesel engines rated at or above 525 bhp maximum power in California for either the 2018 or 2019 model year.

b. The maximum number of heavy-duty diesel engines covered by engine families certified under this provision that a manufacturer may sell in California in each applicable model year under this provision must not exceed 1.10 times that manufacturer's 2018 or 2019 model year California

sales volume of engines rated at or above 525 bhp, whichever is greater.

c. A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or December 1, 2023, whichever is later;

d. The manufacturer must submit to the Executive Officer all data that it submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements specified in 40 CFR §§ 86.007-15, 86.007-21, and 86.007-23. In addition, the manufacturer must submit California-specific data requirements that are necessary to complete an application for certification including data and label requirements as specified in subparagraphs 21.B.4, 35.B.4, and 35.B.7.

5.3.5 For 2024 and 2025 model year heavy-duty diesel engine families rated below 525 bhp maximum power as defined in 40 CFR §1065.510, a manufacturer may elect to certify a heavy-duty diesel engine family or families with $0.100 < \text{FTP NO}_x \text{ FEL} \leq 0.20 \text{ g/bhp-hr}$, and $0.005 < \text{FTP PM FEL} \leq 0.01 \text{ g/bhp-hr}$ if it meets the criteria set forth below in subparagraphs 5.3.5.1 and 5.3.5.2 below:

5.3.5.1 The engine family meets the applicable regulatory requirements specified in title 13, CCR, Section 1956.8 and these test procedures with the following allowances:

(a) The low-load cycle emission standards in subparagraph I.11.B.5.3.3 of these test procedures would not be applicable,

(b) In lieu of meeting the requirements specified in subparagraph §86.1370.B.6. of these test procedures, the engine family must comply with the requirements for a 2023 model year engine family, as set forth in subparagraphs §86.1370.A through §86.1370.B.5 of these test procedures.

(c) In lieu of meeting the requirements specified in subparagraph I.26.B of these test procedures, the engine family must comply with the requirements for a 2023 model year engine family, as set forth in subparagraph I.26.A of these test procedures.

(d) Comply with the heavy-duty OBD requirements specified in title 13, CCR, Sections 1971.1 and 1971.5. applicable to a 2023 model year engine family.

5.3.5.2. A manufacturer is only eligible to utilize this option if it meets all criteria identified in subparagraphs (a) through (f) below.

(a) The manufacturer must certify the engine family subject to the averaging, trading and banking provisions in subparagraph I.15.B.3. of

these test procedures.

(b) The maximum family emission limit for the engine family must not exceed the specified values in subparagraph I.15.B.3.(i) of these test procedures.

(c) The manufacturer must offset its model year NOx and PM deficit balance generated by legacy engines by using credits from the heavy-duty zero-emission averaging set described in subparagraph I.15.B.3.(j) of these test procedures.

(1) If a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available, or are only available for a cost exceeding \$4,000 (for enough NOx or PM credits to offset one medium heavy-duty legacy engine), the manufacturer may submit a plan for Executive Officer approval to use credits from the same averaging set described in subparagraph I.15.B.3.(a) of these test procedures to offset any remaining model year deficit balance generated by legacy engines. The plan must include information describing the manufacturer's attempts to purchase heavy-duty zero-emission NOx or PM credits from all manufacturers who have certified heavy-duty zero-emission vehicles or powertrains with CARB and that the manufacturer was denied a fair market offer to purchase such credits (i.e., such credits were only available at a cost exceeding \$4,000 for enough NOx or PM credits to offset one medium heavy-duty legacy engine). The Executive Officer will base his or her determination upon the information included in the plan and the exercise of good engineering judgment that the information substantiates that sufficient heavy-duty zero-emission NOx or PM credits were not available or were only available at a cost exceeding \$4,000 (for enough NOx or PM credits to offset one medium heavy-duty legacy engine).

(2) If credits from the same averaging set described in subparagraph I.15.B.3.(a) of these test procedures are not available, the manufacturer may carryover the NOx or PM deficit balance generated by legacy engines until the end of the 2026 model year, provided the manufacturer offsets the remaining legacy engine generated deficit balance times 1.25 with credits from the heavy-duty zero-emission averaging set or the same averaging set described in subparagraph I.15.B.3.(a) of these test procedures by the end of the 2026 model year. In other words, if the deficit carried over is 1 Mg, the manufacturer would need to offset the deficit with 1.25 Mg.

(3) If at the end of the 2026 model year, a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available for the manufacturer to offset the remaining legacy engine generated

deficit balance times 1.25, the manufacturer must do all the following for the remaining NOx or PM balance:

(i) Provide documentation to the Executive Officer substantiating that the manufacturer has attempted to purchase heavy-duty NOx or PM credits from all manufacturers with such credits and was denied a fair market offer: i.e. exceeding \$4,000 for enough NOx or PM credits to offset one medium heavy-duty legacy engine.

(ii) Submit a plan for Executive Officer approval for projects targeted at California disadvantaged communities and that are sufficient to offset the excess emissions within 5 years. The plan must include project descriptions and budgets and a demonstration that the projects will achieve reductions required. The Executive Officer will base his or her determination upon the documentation provided by the manufacturer and the exercise of good engineering judgment that the plan would benefit disadvantaged communities, and would fully offset the excess emissions due to the credit deficit balance within 5 years. The manufacturer may submit contingency plans to be assessed and approved on the same standard as set forth in this subsection.

(iii) At the end of the 5-year period, the manufacturer must submit information documenting that the excess emissions have been offset. Failure to do so means that legacy engines would be subject to the provisions of §86.004-15.A.(b)(5) of these test procedures.

(d) For each certifying heavy-duty diesel engine manufacturer, the total California sales volume of legacy engines certified under this provision may not exceed 45 percent of the manufacturer's total actual California sales of heavy-duty diesels engines for 2024 model year, and 25 percent of the manufacturer's total actual California sales of heavy-duty diesels engines for 2025 model year.

(e) NOx and PM deficits generated by legacy engines are subject to the provisions of §86.004-15.A.(b)(5) of these test procedures.

(f) In order to certify legacy engines in a particular model year, a manufacturer must also certify one or more heavy-duty diesel engine families subject to the standards in title 13, CCR, Section 1956.8(a)(2)(C)1 in the same model year.

5.4 Optional Standards for Complete and Incomplete Heavy-Duty Vehicles up to the 2023 Model Year. Manufacturers may request to group

complete and incomplete 2023 and earlier model year heavy-duty vehicles into the same test group as vehicles certifying to the LEV III exhaust emission standards and test procedures specified in title 13, CCR, §1961.2, so long as those complete and incomplete heavy-duty diesel vehicles meet the most stringent LEV III standards to which any vehicle within that test group certifies.

6. Heavy-Duty Diesel Engine Idling Requirements. Except as provided in subparagraph I.11.B.6.2, the requirements in this subparagraph apply to 2008 through 2023 model diesel engines used in heavy-duty vehicles over 14,000 pounds GVWR, and 2024 and subsequent model diesel engines used in medium-duty vehicles from 10,001 to 14,000 pounds GVWR or heavy-duty vehicles over 14,000 pounds GVWR. Manufacturers may meet the requirements of this subparagraph by either demonstrating compliance with the Engine Shutdown System requirements of subparagraph 6.1, below or the optional NOx Idling Emission Standard specified in subparagraph 6.3, below.

6.1 Engine Shutdown System. The requirements in this subsection apply to engine manufacturers and original equipment manufacturers, as applicable, that are responsible for the design and control of engine and/or vehicle idle controls.

6.1.1 Requirements. Except as provided in subsections 11.B.6.2 and 3, all new 2008 and subsequent model year heavy-duty diesel engines shall be equipped with an engine shutdown system that automatically shuts down the engine after 300 seconds of continuous idling operation once the vehicle is stopped, the transmission is set to “neutral” or “park,” and the parking brake is engaged. If the parking brake is not engaged, then the engine shutdown system shall shut down the engine after 900 seconds of continuous idling operation once the vehicle is stopped and the transmission is set to “neutral” or “park.” The engine shutdown system must be tamper-resistant and non-programmable. A warning signal, such as a light or sound indicator inside the vehicle cabin, may be used to alert the driver 30 seconds prior to engine shutdown. The engine shutdown system must be capable of allowing the driver to reset the engine shutdown system timer by momentarily changing the position of the accelerator, brake, or clutch pedal, or other mechanism within 30 seconds prior to engine shutdown. Once reset, the engine shutdown system shall restart the engine shutdown sequence described in this paragraph above, and shall continue to do so until the engine shuts down or the vehicle is driven.

6.1.2 Engine Shutdown System Override. The engine shutdown system may be overridden, to allow the engine to run continuously at idle, only under the following conditions:

(1) If the engine is operating in power take-off (PTO) mode. The PTO system shall have a switch or a setting that can be switched “on” to override the engine shutdown system and will reset to the “off” position when the vehicle’s engine is turned off or when the PTO equipment is

turned off. Subject to advance Executive Officer approval, other methods for detecting or activating PTO operation may be allowed; or,

(2) if the vehicle's engine coolant temperature is below 60°F. The engine shutdown system shall automatically be activated once the coolant temperature reaches 60°F or above. The engine coolant temperature shall be measured with the engine's existing engine coolant temperature sensor used for engine protection, if so equipped. Other methods of measuring engine coolant temperature may be allowed, subject to advance Executive Officer approval.

(3) if an exhaust emission control device is regenerating, and keeping the engine running is necessary to prevent aftertreatment or engine damage, the engine shutdown system may be overridden for the duration necessary to complete the regeneration process up to a maximum of 30 minutes. Determination of what constitutes the need for regeneration will be based on data provided by the manufacturer at time of certification. Regeneration events that may require longer than 30 minutes of engine idling to complete shall require advance Executive Officer approval. At the end of the regeneration process, the engine shutdown system shall automatically be enabled to restart the engine shutdown sequence described in subparagraph 11.B.6.1.1. above. A vehicle that uses a regeneration strategy under engine idling operating conditions shall be equipped with a dashboard indicator light that, when illuminated, indicates that the exhaust emission control device is regenerating. Other methods of indicating that the exhaust emission control device is regenerating may be used with advance Executive Officer approval.

(4) if servicing or maintenance of the engine requires extended idling operation. The engine's electronic control module may be set to temporarily deactivate the engine shutdown system for up to a maximum of 60 minutes. The deactivation of the engine shutdown system shall only be performed with the use of a diagnostic scan tool. At the end of the set deactivation period, the engine's electronic control module shall reset to restart the engine shutdown system sequence described in subparagraph 11.B.6.1.1 above.

6.2 Exempt Vehicles.

6.2.1 2008 through 2023 model heavy-duty diesel engines to be used in buses as defined in California Vehicle Code §§ 233, 612 and 642, school buses as defined in California Vehicle Code § 545, recreational vehicles as defined in Health and Safety Code 18010, medium duty vehicles as defined in § 1900(b)(13) of title 13, California Code of Regulations (CCR), military tactical vehicles as defined in §1905 of title 13, CCR, authorized emergency vehicles as defined in California Vehicle Code § 165, armored cars, as defined in California Vehicle Code § 115, and workover rigs, as defined in § 2449 of title 13, CCR are exempted from these requirements.

6.2.2 2024 and subsequent model heavy-duty engines to be used in military tactical vehicles as defined in §1905 of title 13, CCR, and authorized emergency vehicles as defined in California Vehicle Code § 165 are exempted from these requirements.

6.3 Optional NOx Idling Emission Standard.

6.3.1 Emission Standards

6.3.1.1 In lieu of the engine shutdown system requirements specified in subsection 11.B.6.1 above, an engine manufacturer may elect to certify its new 2008 through 2023 model year heavy-duty diesel engines and 2024 through 2026 model heavy-duty diesel engines subject to the provisions specified in subparagraph 11.B.5.3.4 and 2024 through 2025 model year heavy-duty diesel engines subject to the provisions specified in subparagraph 11.B.5.3.5 above, to an optional NOx idling emission standard of 30 grams per hour.

6.3.1.2 Except as provided in subparagraph 6.3.1.1. above, in lieu of the engine shutdown system requirements specified in subparagraph 11.B.6.1 above, an engine manufacturer may elect to certify its new 2024 and subsequent model year heavy-duty diesel engines to the following optional NOx idling emission standards. The optional NOx idling emissions shall not exceed:

Optional NOx Idling Emission Standards for 2024 and Subsequent Model Diesel Engines used in Medium-Duty Vehicles 10,001 to 14,000 Pounds GVWR and Heavy-Duty Vehicles with GVWR Greater than 14,000 Pounds (grams per hour)

Model Year	Oxides of Nitrogen
2024 – 2026	10
2027 and subsequent	5

6.3.2 Compliance Determination:

6.3.2.1 Compliance with these optional standards will be determined based on testing conducted pursuant to the supplemental NOx idling test cycle and procedures specified in section 86.1360-2007.B.4 below. The manufacturer may request an alternative test procedure if the technology used cannot be demonstrated using the procedures in section 86.1360-2007.B.4, subject to advance approval of the Executive Officer.

6.3.2.2 Manufacturers certifying to the optional NOx idling standards must not increase emissions of CO, PM, or NMHC, determined by comparing results from the supplemental NOx idling test cycle and procedures specified in section 86.1360-2007.B.4 below, to emission

results from the idle mode of the supplemental steady state test cycle or emission results from idle portions of the transient test cycle for heavy duty diesel engines, respectively specified in sections 86.1360-2007 and 86.1327-98. With advance Executive Officer approval, a manufacturer may use other methods of ensuring that emissions of CO, PM, and NMHC are not adversely affected in meeting the optional NOx requirement. Also, manufacturers shall state in their application for certification that meeting the optional NOx idling requirement will not adversely affect the associated emissions of CO, PM and NMHC.

6.3.2.3 An engine manufacturer certifying its engine to the optional NOx idling emission standard must also produce a vehicle label, as defined in subsection 35.B.4, below.

6.4 **Optional Alternatives to Main Engine Idling.** All new 2008 and subsequent model year heavy duty diesel engines may also be equipped with idling emission reduction devices that comply with the compliance requirements specified in title 13, CCR section 2485(c)(3).

7. Optional Low NOx Emission Standards for Heavy Duty Engines for 2015 and Subsequent Model Year.

7.1 For 2015 through 2021 model heavy-duty engines used in vehicles over 14,000 pounds GVWR, manufacturers may elect to certify heavy duty engines to the following optional low NOx emission standards in lieu of the primary NOx emissions standard of 0.20 g/bhp-hr.

**Optional Low NOx Exhaust Emission Standards for
2015 through 2021 Model Year
(grams per brake-horsepower-hour or g/bhp-hr)**

	NOx	NMHC or NMHCE	CO	PM
Optional Low NOx 0.10	0.10	0.14	15.5	0.01
Optional Low NOx 0.05	0.05	0.14	15.5	0.01
Optional Low NOx 0.02	0.02	0.14	15.5	0.01

7.2 For 2022 and subsequent model light heavy-duty engines, medium-heavy-duty engines, and heavy heavy-duty engines, manufacturers may elect to certify their engines to the following optional low NOx emission standards in lieu of the primary NOx emissions standard applicable for that model year. Engine families that are certified to the optional low NOx emission standards are not eligible for generating any NOx credits in the federal or California ABT programs.

Optional Low NOx Exhaust Emission Standards for 2022 and Subsequent Model Heavy Heavy-Duty Engines, Medium-Heavy Duty Engines, and Light Heavy-Duty Engines (g/bhp-hr)

Model Year	Test Procedure	NOx	NMHC	CO	PM
2022 – 2023	FTP and RMC	0.10, 0.05, 0.02, or 0.01	0.14	15.5	0.01
2024 - 2026	FTP and RMC/ LLC	0.020 / 0.080 or 0.010 / 0.040	0.14	15.5	0.005
2027 and Subsequent	FTP and RMC/ LLC	0.010 / 0.025	0.14	15.5	0.005

8. Low-Load Cycle Standard for Heavy Duty Engines for 2024 and Subsequent Model Years.

Exhaust emissions from 2024 and subsequent model engines used in medium-duty vehicles 10,001 – 14,000 pounds GVWR, light heavy-duty engines, medium heavy-duty engines, and heavy-heavy duty engines over the test cycle specified in Appendix I to Part 86 subparagraph B.1 of these test procedures shall not exceed the emission standards in sections I.11.B.5.3 and I.11.B.7.2 of these test procedures and shall be measured and calculated in accordance with the procedures set forth in subpart N of this part.

9. Exhaust Emission Standards for 2022 and Subsequent Model Diesel Hybrid Powertrains Used In Hybrid Vehicles Over 14,000 pounds GVWR, or Used in Incomplete Vehicles from 10,001 to 14,000 Pounds GVWR.

For 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, the exhaust emissions and model year implementation schedules in this section for diesel heavy-duty engines used in vehicles over 14,000 pounds GVWR shall apply to the diesel hybrid powertrains.

For 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, used in incomplete vehicles from 10,001 to 14,000 pounds GVWR, the exhaust emission standards and model year implementation schedules applicable to the diesel engines used in incomplete vehicles from 10,001 to 14,000 pounds GVWR shall apply to the diesel hybrid powertrains in such vehicles.

12. Alternative certification procedures. [§86.080-12]. April 17, 1980.

A. Federal provisions. [No change].

B. California provisions.

1.1 Subparagraphs (a)(1) through (a)(4) [No change].

1.2 Add subparagraph (a)(5) as follows:

(a)(5) **Optional Powertrain Certification Test Procedure for Diesel Hybrid Powertrains for 2022 and Subsequent Model Year.** Manufacturers may elect to optionally certify diesel hybrid powertrains to applicable on-road heavy-duty diesel engine GHG emission standards and criteria pollutants emission standards pursuant to title 13, CCR, section 1956.8, using the powertrain test procedure pursuant to 40 CFR part 1036, subpart F and 40 CFR §1037.550, as amended March 10, 2021 (Pre-publication), which is incorporated by reference herein. A diesel hybrid powertrain certified under this optional powertrain certification test procedure shall be subject to all applicable emission standards, for on-road heavy-duty diesel engines for any given model year. Except as otherwise noted, a diesel hybrid powertrain optionally certified pursuant to this section shall comply with all requirements applicable to on-road heavy-duty engines of this part, other referenced parts of the CFR, and title 13, CCR, section 1956.8, understanding “engine” to mean “diesel hybrid powertrain” and “engine family” to mean “diesel hybrid powertrain family”, including requirements for on-board diagnostic system as specified in title 13, CCR, sections 1968.2 and 1971.1 et seq, useful life as specified in section I.2.A of these test procedures, emissions warranty as specified in title 13, CCR section 2036, and durability demonstration as specified in section I.26 of these test procedures, and title 13, CCR, section 1956.8, as applicable.

13. Alternative durability program. [§86.xxx-13] April 17, 1980. [n/a; light-duty only.]

14. Small-volume manufacturers certification procedures. [§86.xxx-14] April 6, 1994.

A. Federal provisions. [A small volume manufacturer shall mean a California small volume manufacturer as defined in 40 CFR §86.001-1 (e), as modified above. Any reference to 10,000 units shall mean 4,500 units in California based on the average number of units sold for the three previous consecutive model years defined in 40 CFR §86.001-1 (e), as modified in Section I.1.A, above.]

1. **§86.094-14** October 25, 2016. Amend as follows:

1.1 Subparagraphs (a) through (c)(1) [No change.]

1.2 Amend subparagraph (c)(2) as follows: Delete the last sentence, “However, the manufacturer is not required to submit the information to the Administrator unless the Administrator requests it.”

1.3 Subparagraphs (c)(3) through (c)(3)(ii) [No change.]

1.4 Amend subparagraph (c)(3)(ii)(A) as follows: Manufacturers with aggregated sales of less than 301 motor vehicles and motor vehicles engines per year may use assigned deterioration factors that the Executive Officer determines and prescribes based on design specifications or sufficient control over design specifications, development data, in-house testing procedures, and in-use experience. [The remainder of the paragraph is the same.]

- 1.5 Subparagraphs (c)(3)(ii)(B) through (c)(7)(i) [No change.]
 - 1.6 Add the following sentence to subparagraph (c)(7)(ii): All running changes that do not adversely affect emissions or the emission control system durability shall be deemed approved unless disapproved by the Executive Officer within 30 days of the implementation of the running change.
 - 1.7 Subparagraph (c)(8) [No change.]
2. **§86.096-14** March 24, 1993. [No change; pertains to evaporative requirements.]
3. **§86.098-14** April 6, 1994. [No change; pertains to evaporative requirements.]
15. NO_x plus NMHC and particulate averaging, trading, and banking for heavy-duty engines [§86.xxx-15].
- A. Federal provisions.**
 - 1. **§86.004-15** October 6, 2000. Amend as follows:
 - 1.1 Add the following sentence to subparagraph (a)(1): Except as otherwise noted, references in this subsection to engines, heavy-duty engines, or HDEs shall include medium-duty engines.
 - 1.2 Subparagraphs (a)(2) through (b)(1)(ii)(A) [No change.]
 - 1.3 Subparagraph (b)(1)(ii)(B). Add the following sentence: In the case of medium-duty engines the FEL is subject to the same upper limit as required for heavy-duty engines.
 - 1.4 Subparagraphs (b)(1)(iii) through (b)(1)(iv)(B). [No change.]
 - 1.5 Subparagraph (b)(1)(iv)(C). Add the following sentence: Credits generated before the year 2004 to be used to certify engines in the combined light heavy-duty and medium-duty averaging set, as described in paragraphs (d)(2)(i) and (e)(2), in the year 2004 and later, must have been generated through the sale of engines in California.
 - 1.6 Subparagraph (b)(2)(i). [No change.]
 - 1.7 Subparagraph (b)(2)(ii) Amend as follows: (ii) The source of the credits to be used to comply with the emission standard if the FEL exceeds the standard, or where credits will be applied if the FEL is less than the emission standard. In cases where credits are being obtained, each engine family involved must state specifically the source (manufacturer/engine family) of the credits being used, including the year of generation of the credits being used and whether the credits were generated from engines sold in California or from 49-state engines. In cases where credits are being generated/supplied, each engine family involved must state specifically the designated use (manufacturer/engine family or reserved) of the credits involved. All such reports shall include all credits involved in averaging, trading or banking.
 - 1.8 Subparagraphs (b)(3) through (c)(1)(ii). [No change.]
 - 1.9 Subparagraph (c)(1)(iii). Add the following sentence: For medium-duty engines certified in the 2004 and 2005 model years, an additional adjustment to the Std value described in this subparagraph (c)(1)(iii), allowing for

certification using Federal certification fuel may be made on an individual engine family basis as determined by the ARB Executive Officer upon application by the engine manufacturer.

1.10 Subparagraphs (c)(2) through (d)(1). [No change.]

1.11 Subparagraph (d)(2). Amend as follows: For NOx plus NMHC credits from diesel-cycle heavy-duty engines:

(i) Heavy heavy-duty engines and medium heavy-duty engines, as defined in §86.004-2, each constitute an averaging set. Light heavy-duty engines, as defined in §86.004-2, for use in vehicles of more than 14,000 pounds gross vehicle weight rating and medium-duty engines, combined constitute an averaging set. Averaging and trading among all diesel-cycle engine families within the same averaging set is allowed.

(ii) Engines intended for use in urban buses constitute a separate averaging set from all other heavy-duty engines. Averaging and trading between diesel cycle bus engine families within the same averaging set is allowed.

1.12 Subparagraphs (e) and (e)(1). [No change.]

1.13 Subparagraph (e)(2) Amend as follows: (e)(2)

(i) For heavy-duty engines, exclusive of urban bus engines, heavy heavy-duty engines and medium heavy-duty engines, as defined in §86.004-2, each constitute an averaging set. Light heavy-duty engines, as defined in §86.004-2, for use in vehicles of more than 14,000 pounds gross vehicle weight rating and medium-duty engines, combined constitute an averaging set. Averaging and trading between diesel-cycle engine families within the same averaging set is allowed.

1.14 Subparagraphs (e)(3) through (f)(3)(ii). [No change.]

1.15 Subparagraph (f)(3)(iii) Add the following sentences: Banked credits generated before the 2004 model year to be applied toward the certification of engines in the combined light heavy-duty and medium-duty averaging set, as described in paragraphs (d)(2)(i) and (e)(2) above, must have been generated through the sale of eligible engines within California. Credits generated before the 2004 model year from engines sold outside of California may not be used to certify light heavy-duty or medium-duty engines for sale in California. Manufacturers subject to the consent decree shall bank and use credits as allowed in their respective consent decrees.²

1.16 Subparagraphs (g) through (i). [No change.]

1.17 Subparagraph (j) Credit apportionment. Delete; replace with: At the manufacturer's option, marketable emission reduction credits for NOx plus NMHC, for use in emission reduction credit programs other than ABT, may be

² Seven of the largest heavy-duty diesel engine manufacturers will be implementing measures to reduce emissions beginning October 1, 2002, to meet the requirements of the Heavy-Duty Diesel Engines Settlement Agreements reached with the ARB. The Heavy-Duty Diesel Engine Settlements were agreements reached in response to lawsuits brought by the United States Environmental Protection Agency and violations alleged by the ARB pertaining to excess in-use emissions caused by the use of defeat devices and unacceptable algorithms. Navistar signed its Settlement Agreement on October 22, 1998. Cummins, Detroit Diesel Corporation, Caterpillar, Volvo, Mack and Renault signed their Settlement Agreements on December 15, 1998.

generated based upon engine certification to the optional reduced-emission NOx plus NMHC certification standards of section I.11.B.2 of these test procedures except that medium-duty engines certified under title 13, CCR, §1956.8(h) for use in vehicles of more than 8,500 pounds through 14,000 pounds gross vehicle weight rating may not be used as the basis for generating marketable emission reduction credits. Use of any marketable emission reduction credits generated must meet the requirements of the individual emission reduction credit program where the credits will be applied.

(1) For those engine sales used to generate ABT credits, the manufacturer shall report engine sales in the category "ABT-only credits." For those engine sales certified to generate marketable emission reduction credits for NOx, the manufacturer shall report engine sales in the category "non-manufacturer-owned credits."

(i) For engine sales reported as "ABT-only credits," the credits generated must be used solely in the ABT program described in this section.

(ii) The engine manufacturer may declare a portion of engine sales "non-manufacturer-owned credits" and any marketable NOx credits generated based upon such sales would belong to the engine purchaser. For ABT, the manufacturer may not generate any credits for the engine sales reported as "non-manufacturer-owned credits."

(2) Only manufacturer-owned credits resulting from engine sales reported as "ABT-only credits" shall be used in the averaging, trading, and banking provisions described in this section.

(3) Credits shall not be double-counted. Credits used in the ABT program may not be provided to an engine purchaser for use in another program.

(4) Manufacturers shall determine and state the number of engines sold as "ABT-only credits" and "non-manufacturer-owned credits" in the end-of-model year reports required under §86.001-23.

1.18 Subparagraphs (k) and (l). [No change.]

2. **§86.007-15.** January 18, 2001. Amend as follows:

2.1 Introductory paragraph; subparagraphs (a) through (m)(9). [No change.]

2.2 Amend subparagraph (m)(9)(i) through (iv) as follows:

(i) Manufacturers certifying a split diesel engine family to both the pre-2007 (phased-out) and post-2007 (phased-in) emission standards with equally sized subfamilies may exclude the engines within that split family from end-of-year NOx (or NOx+NMHC) ABT calculations, provided that neither subfamily generates credits for use by other engine families, or uses banked credits, or uses averaging credits from other engine families. All of the engines in that split family must be excluded from the phase-in calculations of Sec. 86.007-11(g)(1) (both from the number of engines complying with the standards being phased-in and from the total number of U.S.-directed production engines.)

(ii) [n/a; Otto-cycle]

(iii) [No change.]

(iv) Notwithstanding the provisions of paragraph (m)(9)(iii) of this section, for split families, the NOx FEL shall be used to determine applicability of the provisions of §86.1360-2007 B.1.2 and B.1.3. and Sec.1370-2007 A.1.4.1(iii) and A.1.4.1(iv), as modified by these test procedures.

2.3 Subparagraph (m)(10). [No change.]

B. California provisions

1. For medium-duty diesel-cycle engines certified under title 13, CCR §1956.8(h):

(a) Credits may be generated by an alternative mechanism proposed by the engine manufacturer and approved by the Executive Officer of the ARB. The alternative credit-generating mechanism shall not include any attribute expressly prohibited under the federal ABT program, such as cross-class or cross-fuel trading.

(b) Manufacturers must annually submit a proposed plan for generating credits to the Executive Officer of the ARB and have it approved prior to sale of engines of that model year in California.

2. A manufacturer may not include an engine family certified to the optional NOx emissions standards in the ABT programs for NOx but may include it for particulates.

3. *California-only averaging, banking, and trading (CA-ABT) program for 2022 and subsequent model years* - For 2022 and subsequent model year California certified medium-duty engine families, heavy-duty engine families and optionally certified diesel hybrid powertrain families, manufacturers may begin participating in the California NOx and particulate averaging, banking and trading program to show compliance with the full useful life emission standards in Section I.11 of these test procedures. For 2024 and subsequent model years, all manufacturers that certify products in California must enroll in the CA-ABT program. Heavy-duty zero-emission powertrain families can participate in the CA-ABT program subject to the provisions of subparagraph I.15.B.3.(j) of these test procedures. All CA-ABT calculations must be performed using the California sales volume.

(a) The CA-ABT program only includes the following four averaging sets. Medium-duty vehicles that are chassis certified under title 13, CCR, section 1961.2 are not eligible to participate in the CA-ABT program.

(1) The light heavy-duty diesel averaging set only includes:

(i) Medium-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (h)(2) and (b),

(ii) Light heavy-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (a) and (b), and

(iii) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used primarily in class 4 and 5 vehicles with diesel engines.

(iv) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used in incomplete vehicles from 10,001 to 14,000 pounds GVWR.

(2) The medium heavy-duty diesel averaging set only includes:

(i) Medium heavy-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (a) and (b), and

(ii) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used primarily in class 6 and 7 vehicles with diesel engines.

(3) The heavy heavy-duty diesel averaging set only includes:

(i) Heavy heavy-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (a) and (b), and

(ii) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used primarily in class 8 vehicles with diesel engines.

(4) The heavy-duty zero-emission averaging set described in subparagraph B.3.(j) of this section.

(b) Transfer of credits between any averaging sets is prohibited with the following exception: credits from the heavy-duty zero-emission averaging set can be transferred into any other averaging set such as the light heavy-duty diesel, medium heavy-duty diesel, or heavy heavy-duty diesel averaging set only to cover deficits generated by any certified engine families.

(c) The averaging set for engines used in urban buses will be determined based on the primary intended service class of the engine used in the urban bus.

(d) Existing federal-ABT program credits generated during 2009 and previous model years cannot be transferred into or used in the CA-ABT program.

(e) As provided in this section, a portion of existing banked credits in the federal-ABT program that were generated from the 2010 through 2021 model years can be transferred into the CA-ABT program for each averaging set during the 2022 model year, subject to the provisions in subparagraph B.3.(f) of this section. Manufacturers cannot otherwise transfer any other existing banked

credits in the federal-ABT program to the CA-ABT program. Manufacturers that do not begin enrollment in the CA-ABT program in 2022 model year may not transfer any federal-ABT credits into the CA-ABT program.

(f) For each averaging set specified in subparagraph B.3.(a) of this section, calculate the maximum allowance for the transfer of federal-ABT credits to the CA-ABT program using the following equation:

$$\left(\begin{array}{c} \text{Maximum allowable credit} \\ \text{transfer to CA - ABT bank} \\ \text{in 2022 model year for} \\ \text{each heavy - duty diesel averaging set} \end{array} \right) = CR \times \left(\sum_{i=t_1}^{t_2} (CA)_i \right) \div \left(\sum_{i=t_1}^{t_2} (National)_i \right)$$

where:

t_1 = 2019 model year.

t_2 = 2021 model year.

CA_i = California sales volume of engines within the corresponding averaging set in model year i .

$National_i$ = the number of engines produced for U.S. sales within the corresponding averaging set in model year i .

CR = banked federal credits (in Mg) for the corresponding averaging set generated in the 2010 to 2021 model year period.

(g) For determining credit availability or credit needs for engine families or optionally certified diesel hybrid powertrain families in the CA-ABT program:

$$Emission\ Credits = \left(Std - FTP\ FEL \times \frac{MYUL}{AUL} \right) \times CF \times AUL \times Sales \times 10^{-6}$$

where:

Emission credits are calculated for each individual engine family or optionally certified diesel hybrid powertrain family in Megagrams (Mg).

Std = the current model year FTP cycle NO_x or particulate emission standard in grams per brake horsepower hour. For example, the current model year FTP cycle NO_x emission standard for a 2025 model year engine family is 0.050 g/bhp-hr,

FTP FEL = the FTP cycle NO_x or particulate family emission limit for the engine family or optionally certified diesel hybrid powertrain family in grams per brake horsepower hour,

CF = the transient cycle conversion factor (in bhp-hr/mile) is the total (integrated) cycle brake horsepower-hour for the applicable engine family during the FTP cycle divided by 6.5 miles (or Vehicle-FTP cycle for optionally certified diesel hybrid powertrain family divided by 6.8 miles),

AUL = applicable useful life for the engine family or optionally certified diesel hybrid powertrain family in miles as defined in Section I.2.A of these test procedures. For example, the AUL for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements is 800,000 miles,

MYUL = current model year useful life requirement for the engine family or optionally certified diesel hybrid powertrain family in miles as defined in Section I.2.A of these test procedures. For example, the MYUL for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements is 600,000 miles,

Sales = California sales volume for the engine family or optionally certified diesel hybrid powertrain family during the model year. Projected model year sales are used for initial certification estimates. Actual sales numbers are used for end-of-year compliance determination.

(h) Credit life. CA-ABT credits may be used only for five model years after the year in which they are generated. For example, credits generated in model year 2024 may be used to demonstrate compliance with emission standards only through model year 2029.

(i) Family Emission Limits (FELs) - The CA-ABT program for medium-duty and heavy-duty diesel engines and optionally certified diesel hybrid powertrain families has separate FELs for each of the following certification emissions test cycles: FTP, RMC and LLC for engine families (Vehicle-FTP, Vehicle-RMC and Vehicle-LLC cycles for optionally certified diesel hybrid powertrain families). The relationships between the respective FELs for these cycles and the maximum allowable FELs are as follows:

(1) FTP FELs – These FELs apply to the FTP cycle for engine families (Vehicle-FTP cycle for optionally certified diesel hybrid powertrain families) NO_x and particulate matter emissions, and are selected by the manufacturer for each engine family or optionally certified diesel hybrid powertrain family. These FELs are used in the CA-ABT calculations as shown in subparagraph B.3.(g) of this section. Maximum FEL values (caps) for the FTP (Vehicle-FTP) cycle are as follows:

(A) For 2023 and previous model years, the maximum NOx and particulate matter FELs are specified in Section I.11 of these test procedures.

(B) For 2024 through 2025 model years, the maximum FTP NOx FEL value is 0.20 g/bhp-hr for engines certified under title 13, CCR, Section 1956.8(a)(2)(C)3. For all other 2024 through 2025 model year engines, the maximum FTP NOx FEL value is 0.100 g/bhp-hr.

(C) For 2026 model year, the maximum FTP NOx FEL value is 0.100 g/bhp-hr.

(D) For 2027 and subsequent model year light heavy-duty and medium heavy-duty diesel engines, the maximum FTP NOx FEL value is 0.050 g/bhp-hr.

(E) For 2027 through 2030 model year heavy heavy-duty diesel engines, the maximum FTP NOx FEL value is 0.065 g/bhp-hr.

(F) For 2031 and subsequent model year heavy heavy-duty diesel engines, the maximum FTP NOx FEL value is 0.070 g/bhp-hr.

(G) For 2024 and subsequent model years, the maximum FTP particulate matter FEL value is 0.010 g/bhp-hr.

(2) RMC FELs – These FELs apply to the RMC cycle for engine families (Vehicle-RMC for optionally certified diesel hybrid powertrain families) NOx and particulate emissions and have the same numerical value as the FTP cycle FELs for both NOx and particulate matter. Manufacturers cannot choose a different FEL value for the RMC cycle.

(3) LLC FELs – These FELs apply to the LLC cycle for engine families (Vehicle-LLC for optionally certified diesel hybrid powertrain families) NOx and particulate emissions and have the following values:

(A) For 2024 and subsequent model years, the LLC NOx FEL shall be determined as follows:

$$LLC\ NOx\ FEL = factor \times FTP\ NOx\ FEL$$

where:

LLC NOx FEL = calculated value of the LLC NOx FEL for engine families (optionally certified diesel hybrid powertrain families).

factor = “4” for 2024 through 2026 model years, subject to the following restriction: the maximum LLC NOx FEL value shall not exceed 0.300 g/bhp-hr.

“2.5” for 2027 and subsequent model years.

FTP NOx FEL = NOx FEL assigned by the manufacturer for the FTP cycle for engine families (Vehicle-FTP cycle for optionally certified diesel hybrid powertrain families).

Manufacturers can only use the calculated LLC NOx FEL value for each engine family or optionally certified diesel hybrid powertrain family. If a manufacturer needs a higher LLC NOx FEL value, they must increase the FTP NOx FEL value for the engine family (optionally certified diesel hybrid powertrain family) and then recalculate the corresponding LLC NOx FEL value.

(B) For 2024 and subsequent model years, the maximum LLC particulate matter FEL value is 0.010 g/bhp-hr. The LLC particulate matter FEL must have the same value as the FTP particulate matter FEL,

(4) In lieu of compliance with the intermediate useful life NOx emission standards for 2027 and subsequent model year heavy heavy-duty engines, NOx family emission limits applicable at intermediate useful life (FEL_{IUL}) may be used for the FTP, RMC, and LLC duty cycles, where FEL_{IUL} values are assigned for all three cycles. The FEL_{IUL} may not be used to participate in any ABT program.

For the FTP and RMC duty cycles, the assigned FEL_{IUL} is determined by the following formulas:

$$FTP\ NOx\ FEL_{IUL} = 0.020 + (FTP\ NOx\ FEL_{FUL} - FTP\ NOx\ emission\ standard)$$

$$RMC\ NOx\ FEL_{IUL} = FTP\ NOx\ FEL_{IUL}$$

where:

FTP NOx FEL_{IUL} = the FTP NOx family emission limit of the heavy heavy-duty engine at intermediate useful life in g/bhp-hr, where its minimum value is 0.005 g/bhp-hr.

FTP NOx FEL_{FUL} = the FTP NOx family emission limit of the heavy

heavy-duty engine at full useful life in g/bhp-hr.

FTP NO_x emission standard = the applicable NO_x emission standard at full useful life for the FTP or RMC duty cycles.

RMC NO_x FEL_{IUL} = RMC NO_x family emission limit at intermediate useful life in g/bhp-hr.

For the LLC duty cycle, the FEL_{IUL} is determined by multiplying the FTP FEL_{IUL} by a factor of 2.5.

For example, if a manufacturer chooses a FTP FEL_{FUL} of 0.050 g/bhp-hr for a 2027 model year heavy heavy-duty engine family, then the assigned FEL_{IUL} values would be:

$$\text{FTP NO}_x \text{ FEL}_{IUL} = 0.020 + (0.050 - 0.035) = 0.035 \text{ g/bhp-hr}$$

$$\text{RMC NO}_x \text{ FEL}_{IUL} = 0.035 \text{ g/bhp-hr}$$

$$\text{LLC NO}_x \text{ FEL}_{IUL} = 0.035 * 2.5 = 0.088 \text{ g/bhp-hr}$$

(j) Heavy-duty zero-emission averaging set - Zero-emission powertrain families with models used in class 4 through 8 vehicles are eligible to generate NO_x and PM credits in the heavy-duty zero-emission averaging set under the CA-ABT program. Zero-emission powertrain models used in class 3 or lower class vehicles are not eligible for participation in the CA-ABT program.

(1) Credit Life. Zero-emission NO_x and PM credits can be banked for use in future model years, only up through model year 2026. For example, credits generated in model year 2024 may be used to demonstrate compliance with emission standards only through model year 2026.

(2) Zero-emission NO_x and PM credits for each applicable zero-emission powertrain model within a powertrain family shall be calculated using the following equation:

$$\text{Zero emission Credits} = \text{Std} \times \text{ECF} \times \text{UL} \times \text{Sales} \times 10^{-6}$$

where:

Zero-emission credits are calculated for each zero-emission powertrain model within the powertrain family in Mg,

Std = the applicable FTP cycle NO_x or PM emission standard in grams per brake horsepower hour for the corresponding model year as specified in Section I.11 of these test procedures. For zero-

emission powertrain models used in class 4 and 5 zero-emission vehicle families, use the FTP cycle NO_x or PM emission standard applicable to light heavy-duty diesel engines. For zero-emission powertrain models used in class 6 and 7 zero-emission vehicle families, use the FTP cycle NO_x or PM emission standard applicable to medium heavy-duty diesel engines. For zero-emission powertrain models used in class 8 zero-emission vehicle families, use the FTP cycle NO_x or PM emission standard applicable to heavy heavy-duty diesel engines,

ECF = the transient cycle conversion factor (in bhp-hr/mile) is the total (integrated) cycle brake horsepower-hour for the applicable zero-emission powertrain model during the Vehicle-FTP cycle divided by 6.8 miles,

UL = applicable useful life for the vehicle family in which the powertrain model would be installed. UL is in miles as defined in 40 CFR §1037.105 last amended on October 25, 2016, and 40 CFR §1037.106 last amended on March 10, 2021 (Pre-publication), which is incorporated by reference herein.

Sales = California sales volume for the zero-emission powertrain model sold within the given powertrain family during the model year. Projected model year sales are used for initial certification. Actual sales numbers are used for end-of-year compliance determination.

(3) The heavy-duty zero-emission averaging set provisions and credits are only available for 2022 through 2026 model years. Any banked zero-emission credits would no longer be available in the CA-ABT program for 2027 and subsequent model years.

(4) In order to participate in the CA-ABT program, the heavy-duty zero-emission powertrain must meet the following requirements:

(A) For 2022 through 2023 model years, the heavy-duty zero-emission powertrain family must be used in a heavy-duty zero-emission vehicle certified under title 17, CCR, section 95663.

(B) For 2024 through 2026 model years, the heavy-duty zero-emission powertrain family must be certified under title 13, CCR, section 1956.8(a)(8).

(k) CA-ABT reporting –A manufacturer must submit end-of-year reports for each engine family, optionally certified diesel hybrid powertrain family, and zero-

emission powertrain family participating in the CA-ABT program, as described in subparagraphs B.3.(a) through B.3.(j) of this section.

(1) The end-of-year reports shall be submitted within 180 days of the end of the model year to: Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave., Riverside, CA 92507.

(2) These reports shall indicate the engine family name or optionally certified diesel hybrid powertrain family name or zero-emission powertrain family name and model names, the averaging set, the California sales volume, all of the parameters and corresponding values required to calculate credits as given in the applicable CA-ABT section, the resulting type and number of credits generated/required. Manufacturers shall also submit how and where credit surpluses were dispersed (or are to be banked) and how and through what means credit deficits were met. Copies of contracts related to credit trading must also be included or supplied by the broker if applicable. The report shall also include a calculation of credit balances to show that net mass emissions balances are within those allowed by the emission standards (equal to or greater than a zero credit balance).

(3) Errors discovered by ARB or the manufacturer in the end-of-year report, including changes in the production counts, may be corrected up to 90 days subsequent to submission of the end-of-year report. Errors discovered by ARB after 90 days shall be corrected if credits are reduced. Errors in the manufacturer's favor will not be corrected if discovered after the 90 day correction period allowed.

(4) Failure by a manufacturer participating in the CA-ABT programs to submit the end-of-year report (as applicable) in the specified time for all zero-emission powertrains, engines or optionally certified diesel hybrid powertrains that are part of an averaging set shall constitute a violation of title 13, CCR, section 1956.8 for each such powertrain and engine.

4. Early compliance credit multipliers for 2022 through 2030 model year engine families and optionally certified diesel hybrid powertrains - Manufacturers that produce and certify engines and optionally certified hybrid powertrains that comply with future model year requirements in title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 on a voluntary basis will be eligible for early compliance credit multipliers subject to the following limitations:

(a) Early compliance credit multipliers will only be available for 2022 through 2030 model year California certified engine families and optionally certified diesel hybrid powertrains.

(b) Early compliance eligibility criteria for engine families and optionally certified diesel hybrid powertrains – An eligible engine family or optionally certified diesel hybrid powertrain must meet all the applicable numeric emissions standards and requirements of the regulations as set forth in title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 for the specified model years, as specified in subparagraphs B.4.(d) and B.4.(e) below. For example, to get a 1.5 multiplier, an eligible 2025 model year light heavy-duty engine family must certify to at or below an FTP NOx FEL of 0.020 g/bhp-hr and an FTP PM FEL of 0.005 g/bhp-hr, and demonstrate compliance with the 2027 model year useful life, durability, warranty, in-use testing requirements, on-board diagnostics (OBD) requirements, etc. in order to participate in the program.

(c) Credits for engine families and optionally certified diesel hybrid powertrains that are eligible for early compliance credit multipliers shall be calculated, adjusted, and banked as follows:

$$\text{adjusted credits} = \text{emission credits} \times \text{ECCM}$$

where:

adjusted credits = Amount of credits that can be banked in the CA-ABT program (in Mg).

emission credits = Amount of credits calculated for each eligible engine family or optionally certified diesel hybrid powertrain as shown in subparagraph B.3.(g) of this section (in Mg).

ECCM = Early compliance credit multiplier as described in subparagraph B.4.(d) of this section.

(d) Early compliance credit multipliers shall be determined as shown below:

Engine (optionally certified diesel hybrid powertrain) Family Model Year	Complying with the Regulations for Model Years*	Early Compliance Credit Multiplier
2022 – 2023	2024 – 2026	1.5
2022 – 2023	2027 - 2030	2.0
2022 – 2023	2031 and subsequent	2.5
2024 – 2026	2027 - 2030	1.5
2024 – 2026	2031 and subsequent	2.0
2027 – 2030	2031 and subsequent	1.5

* Compliance with model year regulations means compliance with the requirements of title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 for the specified model years.

(e) Credits generated from zero-emission powertrain families are not eligible for early compliance credit multipliers.

16. Prohibition of defeat devices. [§86.004-16] July 13, 2005. [No change.]

17. On-board diagnostics for engines used in applications less than or equal to 14,000 pounds GVWR. [§86.007-17]
[Delete replace with: All heavy-duty diesel cycle engines used in vehicles up to 14,000 pounds GVW must have an on-board diagnostic system as required in title 13, CCR §1968 et seq, as applicable.]

18. On-board diagnostics for engines used in applications greater than 14,000 pounds GVWR. [§86.010-18]
[Delete replace with: All heavy-duty diesel cycle engines used in vehicles greater than 14,000 pounds GVWR must have an on-board diagnostic system as required in title 13, CCR §1971.1 et seq, as applicable.]

19. §86.xxx-19. [Reserved.]

20. Incomplete vehicles, classification. [§86.085-20] April 28, 2014. [No change.]

21. Application for certification. [§86.xxx-21]

A. Federal provisions.

1. **§86.004-21** April 28, 2014. Amend as follows:
 - 1.1 Subparagraphs (a) through (l). [No change.]
 - 1.2 Delete subparagraph (m).

1.2 Subparagraph (n). [No change.]

2. **§86.007-21** April 28, 2014. Amend as follows:

2.1 Subparagraphs (a) through (l). [No change.]

2.2 Delete subparagraph (m).

2.3 Subparagraph (n). [No change.]

2.4 Amend subparagraph (o) as follows: For 2005 and subsequent model year diesel heavy-duty engines, the manufacturer must provide the following additional information pertaining to the supplemental steady-state test conducted under § 86.1360-2007:

2.4.1 Subparagraph (o)(1). [No change.]

2.4.2 Amend subparagraph (o)(2) as follows: For engines subject to the MAEL (see §86.1360-2007B.1), brake specific gaseous emission data for each of the 12 non-idle test points (identified under §86.1360-2007(b)(1)) and the 3 selected test points (identified under §86.1360-2007(b)(2));

2.4.3 Amend subparagraph (o)(3) as follows: For engines subject to the MAEL (see §86.1360-2007B.1), concentrations and mass flow rates of all regulated gaseous emissions plus carbon dioxide;

2.4.4 Subparagraph (o)(4) and (o)(5). [No change.]

2.4.5 Amend subparagraph (o)(6) as follows: For engines subject to the MAEL (see §86.1360-2007B.1), a statement that the engines will comply with the weighted average emissions cap and interpolated values comply with the emission testing caps specified in §86.1360-2007B.1 for the useful life of the engine. The manufacturer also must maintain records at the manufacturer's facility which contain a detailed description of all test data, engineering analyses, and other information which provides the basis for this statement, where such information exists. The manufacturer must provide such information to the Executive Officer upon request.

2.4.6 Subparagraph (o)(7). [Reserve.]

2.5 Amend subparagraph (p) as follows:

2.5.1. (1) The manufacturer must provide a statement in the application for certification that the diesel heavy-duty engine for which certification is being requested will comply with the applicable Not-To-Exceed Limits specified in §86.1370-2007 A.1.4 when operated under all conditions which may reasonably be expected to be encountered in normal vehicle operation and use. The manufacturer also must maintain records at the manufacturer's facility which contain all test data, engineering analyses, and other information which provides the basis for this statement, where such information exists. The manufacturer must provide such information to the Executive Officer upon request.

2.5.2. Subparagraph (p)(2). [No change.]

2.5.3. Amend subparagraph (p)(3) as follows: For each engine model and/or horsepower rating within an engine family for which a manufacturer is applying for a NTE deficiency(ies) under the provisions of §86.1370-2007B.3, the manufacturer's application for an NTE deficiency(ies) must include a complete description of the deficiency, including but not limited to: the specific description of the deficiency; what pollutant the deficiency is being applied for, all

engineering efforts the manufacturer has made to overcome the deficiency, what specific operating conditions the deficiency is being requested for (i.e., temperature ranges, humidity ranges, altitude ranges, etc.), a full description of the auxiliary emission control device(s) which will be used to maintain emissions to the lowest practical level; and what the lowest practical emission level will be.

2.6 Subparagraph (q). [No change.]

B. California provisions.

1. For 2004 and subsequent model year medium-duty ultra-low-emission and super-ultra-low emission vehicles and engines not powered exclusively by diesel fuel, the manufacturer shall submit projected California sales and fuel economy data two years prior to certification.

2. Heavy-Duty Diesel Engine Idling Requirements.

2.1 For 2008 and subsequent model year heavy-duty diesel engines, the manufacturer must provide a statement in the application for certification that the heavy-duty diesel engine for which certification is being requested will comply with the automatic engine shutdown requirements to control idle emissions as specified in subsection 11.B.6.1. If the heavy-duty diesel engine for which certification is being requested is explicitly designed for exempt vehicles, per the provisions in 11.B.6.2, then the manufacturer must also provide a statement in its application for certification so stating.

2.2 A manufacturer that elects to certify engines to the optional NOx idling emission standard, specified in subsection 11.B.6.3, must provide in the application for certification information pertaining to the NOx idling emission certification test conducted under 86.1360-2007.B.4, below, including emissions data for total particulate matter, non-methane hydrocarbons or total hydrocarbons, oxides of nitrogen, carbon monoxide, and carbon dioxide in grams per hour, the test load in brake-horsepower, and engine test speeds in revolutions per minute for both mode 1 and mode 2 testing. With advance Executive Officer approval, a manufacturer may use an alternative procedure to show compliance with the optional NOx idling emission standard. Regardless of the procedure used, the manufacturer shall also provide the appropriate labels to be affixed to the vehicle on which the engine is going to be installed as required in subsection 35.B.4, below. The manufacturer must maintain records at the manufacturer's facility that contain all test data, engineering analyses, and other information which provide the basis for the compliance statement, where such information exists. The manufacturer must provide such information to the Executive Officer within 30 days upon request.

2.3 If the heavy-duty diesel engine for which certification is being requested incorporates any of the alternative idle emission control strategies contained in title 13, CCR, section 2485(c)(3), then the manufacturer must provide in its application for certification a description of the alternative strategy or technology including the type, brand name, model identification number, and where applicable emissions data and power rating. In addition, the manufacturer must also provide the appropriate labels to be affixed to the outside of the vehicle as required in subsections 35.B.4. If the alternative technology is a fuel-fired

heater, then the manufacturer must provide with the application for certification the information required under subsection H.4.4, Part I of the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” incorporated by reference in title 13, CCR, section 1961, or the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” incorporated by reference in title 13, CCR, section 1961.2, as applicable.

22. Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and Selective Enforcement Audit, adequacy of limits, and physically adjustable ranges. [§86.094-22] April 30, 2010. [No change.]

23. Required data. [§86.xxx-23]

A. Federal Provisions.

1. **§86.098-23.** April 28, 2014.

1.1 Subparagraphs (a) through (b)(1)(i) [No change.]

1.2 Add the following sentence to subparagraph (b)(1)(ii): The data derived from testing to determine the exhaust emission deterioration factors shall be submitted to the Executive Officer for review.

1.2.1 For 2023 and previous model years, if the durability test method is accepted by EPA, it shall also be accepted by ARB, subject to the following condition. If, after certification for the first model year in which the method is used, the Executive Officer determines that a manufacturer's durability test procedures do not conform with good engineering practices, the Executive Officer may require changes to that manufacturer's durability test procedures for subsequent model years. The manufacturer's revised durability test procedures shall be submitted to the Executive Officer for review and approval.

1.2.2 For 2024 and subsequent model years, the durability test method must follow the provisions in section I.26.B of these test procedures.

1.3 Subparagraphs (b)(2) through (h)(2) [No change.]

1.4 Amend subparagraph (h)(3) as follows:

(h)(3)(i) These reports shall be submitted within 90 days of the end of the model year to: Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave, Riverside, CA 92507.

1.5 Subparagraphs (h)(3)(ii) through (m) [No change.]

2. **§86.001-23.** April 28, 2014. [No change, except that the amendments indicated for §86.098-23 above still apply.]

3. **§86.007-23.** April 28, 2014. [No change, except that the amendments indicated for §86.098-23 above still apply.]

24. Test vehicles and engines. [§86.xxx-24]

A. Federal Provisions.

1. **§86.001-24.** October 22, 1996. [No change except that the reference in subparagraph (e)(2) to 10,000 light-duty vehicles, light-duty trucks, heavy-duty vehicles and heavy-duty engines shall mean 4,500 units based on the average number of vehicles or engines sold for the three previous consecutive model years for which a manufacturer seeks certification in California.]

2. **§86.096-24.** April 28, 2014.

2.1 Subparagraphs (a) through (b)(3)(ii) [No change.]

2.2 Amend subparagraph (b)(3)(iii) by adding the following sentence to the end of the subparagraph:

For 2024 and subsequent model years, the Executive Officer will also consider the aftertreatment conversion efficiency.

2.3 Subparagraphs (b)(3)(iv) through (f) [No change.]

25. Maintenance. [§86.xxx-25]

A. Federal provisions.

1. **§86.004-25.** October 25, 2016.

1.1 Amend Subparagraph (a)(1) as follows:

Applicability. This section applies to light-duty vehicles, light-duty trucks, optionally certified diesel hybrid powertrains, and HDEs.

1.2 Subparagraphs (a)(2) through (b)(3)(v)(H). [No change.]

1.3 Add the following title (plus spacing) to the beginning of subparagraph (b)(4):

(4) Minimum Maintenance Intervals for Diesel-Cycle Heavy-Duty Engines:

1.4 Delete and replace subparagraph (b)(4)(i) as follows:

(i) For 2021 and earlier model-year diesel-cycle heavy-duty engine families, for 2022 and subsequent model-year diesel-cycle heavy-duty engine families that are certified for use in vehicles with a GVWR less than or equal to 14,000 pounds, and for 2022 through 2026 model year diesel-cycle heavy-duty engine families used in vehicles with a GVWR greater than 14,000 pounds that are certified for use in hybrid vehicles exclusively (except diesel hybrid powertrain optionally certified pursuant to title 13, CCR, section 1956.8), that are certified for use in dual fuel vehicles, or that are not certified on only diesel fuel, the adjustment, cleaning, repair, or replacement of the items listed in paragraphs (b)(4)(i) (A)-(D) of this section shall initially not

occur before 50,000 miles (or 1,500 hours) of use and thereafter not more frequently than at intervals of 50,000-miles (or 1,500-hours).

For 2022 and subsequent model-year diesel hybrid powertrain families optionally certified for use in hybrid vehicles pursuant to title 13, CCR section 1956.8, for 2022 through 2026 model-year diesel-cycle heavy-duty engine families certified for use in vehicles with a GVWR greater than 14,000 pounds on only diesel fuel, including engine families certified for concurrent use in both dedicated internal-combustion vehicles and hybrid vehicles, and for 2027 and subsequent model-year diesel-cycle heavy-duty engine families certified for use in vehicles with a GVWR greater than 14,000 pounds on diesel or alternative fuels, including engine families certified for use in hybrid vehicles exclusively or concurrently with dedicated internal-combustion vehicles:

- *Adjustment or cleaning frequency.* The frequency of manufacturer scheduled adjustment or cleaning for the items listed in paragraphs (b)(4)(i) (A)-(D) shall be limited by the same minimum maintenance intervals as for 2021 or earlier model-year diesel-cycle heavy-duty engine families as stated in this paragraph (b)(4)(i).
 - *Repair or replacement frequency.* The frequency of manufacturer scheduled repair or replacement for the emission-related components and systems listed in paragraph (b)(4)(vi) shall be limited by the minimum maintenance intervals stated therein. These maintenance intervals do not apply to parts identified in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR. The maintenance provisions for the GHG-related parts in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR, are specified in 1037.125 of that same section.
- (A) Exhaust gas recirculation system related filters and coolers.
 - (B) Crankcase ventilation valves and filters.
 - (C) Fuel injector tips (cleaning only).
 - (D) DEF filters.

1.5 Subparagraph (b)(4)(ii). [No change.]

1.6 Delete and replace subparagraph (b)(4)(iii) as follows:

(iii) For 2021 and earlier model-year diesel-cycle heavy-duty engine families exclusively, for 2022 and subsequent model-year diesel-cycle heavy-duty engine families that are certified for use in vehicles with a GVWR less than or equal to 14,000 pounds, and for 2022 through 2026 model year diesel-cycle heavy-duty engine families used in vehicles with a GVWR greater than 14,000 pounds that are certified for use in hybrid vehicles exclusively (except diesel hybrid powertrain families optionally certified pursuant to title 13, CCR, section 1956.8), that are certified for use in dual fuel vehicles, or that are not certified on only diesel fuel, the adjustment, cleaning, repair, or

replacement of the items listed in paragraphs (b)(4)(iii) (A)-(G) of this section shall initially not occur before 100,000 miles (or 3,000 hours) of use and thereafter not more frequently than at intervals of at least 100,000-miles (or 3,000-hours) for light heavy-duty diesel engines, or, thereafter at intervals of at least 150,000 miles (or 4,500 hours) for medium and heavy heavy-duty diesel engine families.

For 2022 and subsequent model-year diesel hybrid powertrain families optionally certified for use in hybrid vehicles pursuant to title 13, CCR, section 1956.8, for 2022 through 2026 model-year diesel-cycle heavy-duty engine families certified for use in vehicles with a GVWR greater than 14,000 pounds on only diesel fuel, including engine families certified for concurrent use in both dedicated internal-combustion vehicles and hybrid vehicles, and for 2027 and subsequent model-year diesel-cycle heavy-duty engine families certified for use in vehicles with a GVWR greater than 14,000 pounds on diesel or alternative fuels, including engine families certified for use in hybrid vehicles exclusively or concurrently with dedicated internal-combustion vehicles:

- *Adjustment or cleaning frequency.* The frequency of manufacturer scheduled adjustment or cleaning for the items listed in paragraphs (b)(4)(iii) (A)-(G) shall be limited by the same minimum maintenance intervals as for 2021 or earlier model-year diesel-cycle heavy-duty engine families as stated in this paragraph (b)(4)(iii).
 - *Repair or replacement frequency.* The frequency of manufacturer scheduled repair or replacement for the emission-related components and systems listed in paragraph (b)(4)(vi) shall be limited by the minimum maintenance intervals stated therein. These maintenance intervals do not apply to parts identified in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR. The maintenance provisions for the GHG-related parts in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR, are specified in 1037.125 of that same section.
- (A) Fuel injectors.
 - (B) Turbocharger.
 - (C) Electronic engine control unit and its associated sensors and actuators.
 - (D) Particulate trap or trap oxidizer systems including related components (adjustment and cleaning only for filter element, scheduled replacement of the filter element is not allowed during the useful life).
 - (E) Exhaust gas recirculation system (including all related control valves, and tubing) except as otherwise provided in paragraph (b)(4)(i)(A) of this section.
 - (F) Catalytic converter (adjustment and cleaning only for catalyst beds, scheduled replacement of the bed is not allowed during the useful life).

(G) Any other add-on emissions-related component (i.e., a component whose sole or primary purpose is to reduce emissions or whose failure will significantly degrade emissions control and whose function is not integral to the design and performance of the engine.)

1.7 Subparagraphs (b)(4)(iv) through (b)(4)(v). [No change.]

1.8 Add new subparagraph (b)(4)(vi) as follows:

(vi) For 2022 and subsequent model-year diesel hybrid powertrain families optionally certified for use in hybrid vehicles pursuant to title 13, CCR section 1956.8, (see §86.004-25 (b)(4)(vii) for guidance), for 2022 through 2026 model-year diesel-cycle heavy-duty engine families certified for use in vehicles with a GVWR greater than 14,000 pounds on only diesel fuel, including engine families certified for concurrent use in both dedicated internal-combustion vehicles and hybrid vehicles, and for 2027 and subsequent model-year diesel-cycle heavy-duty engine families certified for use in vehicles with a GVWR greater than 14,000 pounds on diesel or alternative fuels, including engine families certified for use in hybrid vehicles exclusively or concurrently with dedicated internal-combustion vehicles, repair and replacement for the criteria pollutant emission-related components and systems listed below shall not occur before the first occurrence of a maintenance interval specified in the following table, and thereafter not more frequently than at least that same interval. Manufacturers may not schedule maintenance based on any other metric (e.g., hours of operation, calendar years, months, etc.) except as specifically provided in the table below:

Component or System	Minimum Repair / Replacement Interval		
	Light Heavy-Duty Diesel Engine 14,000 lbs. < GVWR ≤ 19,500 lbs.	Medium Heavy-Duty Diesel Engine 19,500 lbs. < GVWR ≤ 33,000 lbs.	Heavy Heavy-Duty Diesel Engine GVWR > 33,000 lbs.
Exhaust Gas Recirculation (EGR) System (valves & cooler - not including hoses)	Not Replaceable ^{1,2}	Not Replaceable ^{1,2}	Not Replaceable ^{1,2}
Exhaust Gas Recirculation (EGR) System (other than valves & cooler)	110,000 miles, or 3 years	185,000 miles	435,000 miles
Crankcase Ventilation System	50,000 miles	60,000 miles, or 2,000 hours, or 1 year	60,000 miles, or 2,000 hours, or 1 year
Diesel Exhaust Fluid (DEF) Filter	110,000 miles, or 2 years	125,000 miles, or 3,000 hours, or 10 years	125,000 miles, or 3,000 hours
Fuel Injectors	110,000 miles	185,000 miles	435,000 miles
Turbochargers	Not Replaceable ^{1,2}	Not Replaceable ^{1,2}	Not Replaceable ^{1,2}
Electronic Control Unit, Sensors, and Actuators	100,000 miles, or 3,000 hours	150,000 miles, or 4,500 hours	150,000 miles, or 4,500 hours, or 5 years
Diesel Particulate Filter System (element only)	Not Replaceable ¹	Not Replaceable ¹	Not Replaceable ¹
Diesel Particulate Filter System (other than element)	110,000 miles	185,000 miles, or 3 years	435,000 miles, or 3 years
Catalytic Converter (bed only)	Not Replaceable ¹	Not Replaceable ¹	Not Replaceable ¹
Catalytic Converter (other than catalyst bed)	110,000 miles	185,000 miles	435,000 miles
Any other add-on or new technology emission-related component or system whose primary purpose is to reduce emissions or whose failure will significantly degrade emissions control	110,000 miles, or 3,300 hours ³	185,000 miles, or 5,550 hours ³	435,000 miles, or 13,050 hours ³

1. For components or systems designated in the table as "Not Replaceable," manufacturers shall not schedule any repair / replacement maintenance intervals throughout the applicable useful life of the heavy-duty diesel engine, defined in § 86.004-2 of the California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles, last amended April 18, 2019, except as noted in section § 86.004-25 (i).
2. Sensors and actuators are included only if they are integral to these assemblies and cannot be repaired without removing or replacing the assembly. Otherwise sensors and actuators are subject to the maintenance intervals specified in the table for Electronic Control Units, Sensors, and Actuators.
3. Manufacturers may request more frequent repair / replacement maintenance intervals for add-on or new technology emission-related components provided that the manufacturer demonstrates to the Executive Officer's satisfaction that such intervals are technologically necessary and appropriate.

1.9 Add new subparagraph (b)(4)(vii) as follows:

(vii) For 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, the maintenance requirements shall be as specified in this section, as applicable,

understanding “engine” to mean “optionally certified diesel hybrid powertrain” and “engine family” to mean “optionally certified diesel hybrid powertrain family,” and shall be further as specified below:

(A) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 14,001 to 19,500 pounds, the requirements for light heavy-duty diesel engines of this section shall apply to the hybrid powertrains.

(B) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 19,501 to 33,000 pounds, the requirements for medium heavy-duty diesel engines of this section shall apply to the hybrid powertrains.

(C) For diesel hybrid powertrains primarily used in vehicles with a GVWR greater than 33,000 pounds, the requirements for heavy heavy-duty diesel engines of this section shall apply to the hybrid powertrains.

(D) For diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the requirements for diesel-cycle heavy-duty engine families that are certified for use in vehicles with a GVWR less than or equal to 14,000 pounds, as set forth in subparagraphs (b)(4)(i) and (b)(4)(iii) of this section shall apply to the hybrid powertrains.

1.10 Subparagraphs (b)(5) through (b)(6)(ii)(F). [No change.]

1.11 Add the following phrase to the last sentence of subparagraph (b)(6)(iii): ... or California Vehicle Code §27156, et seq.

1.12 Subparagraph (b)(7)(i). [No change.]

1.13 Add the following paragraph to subparagraph (b)(7)(ii):

The Executive Officer may approve a request for new scheduled maintenance for:

(A) Beginning with the 2024 model year certification applications (with full carryover to model years 2025 and 2026);

(B) Beginning with the 2027 model year certification applications (with full carryover to model years 2028, 2029, and 2030);

(C) Beginning with the 2031 model year certification applications (with full carryover to model year 2032).

The Executive Officer shall base his or her approval on a determination, derived from good engineering judgment, that a manufacturer has submitted detailed evidence supporting the need for the maintenance requested, and supporting data or other substantiation for the recommended maintenance category and for the interval suggested for emission-related maintenance. This provision does not apply to the components or systems designated as “Not Replaceable,” as

specified in § 86.004-25 (b)(4)(vi) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles,” as last amended September 9, 2021.

1.14 Add the following sentence to subparagraph (b)(7)(iii): The Executive Officer may also provide the manufacturer a hearing in accordance with title 17, CCR, §60055.1, et seq., with respect to such issue.

1.15 Paragraphs (c) through (h). [No change.]

1.16 Delete and replace paragraph (i) as follows:

(i) Notwithstanding the provisions of paragraphs (b)(4) and (6) of this section, manufacturers may schedule replacement or repair of particulate trap elements (or trap oxidizer elements), catalytic converter beds (including NOx adsorber, diesel oxidation catalyst, and selective catalyst reduction beds), turbochargers, and exhaust gas recirculation systems provided that the manufacturer demonstrates to the Executive Officer's satisfaction that the repair or replacement will be performed according to the schedule and the manufacturer pays for the repair or replacement.

26. Mileage and service accumulation; emission measurements. [§86.004-26]. April 28, 2014.

A. Federal Provisions. [No Change]

B. California Provisions.

1. The following provisions are applicable to 2024 and subsequent model year medium-duty and heavy-duty diesel engines. These provisions also apply to optionally certified diesel hybrid powertrains, where “engine” also means “optionally certified diesel hybrid powertrain”, “engine dynamometer” also mean “powertrain dynamometer”, “FTP, RMC, LLC” also mean “Vehicle-FTP, Vehicle-RMC, Vehicle-LLC, respectively”, and “engine family” also means “optionally certified diesel hybrid powertrain family”.

1.1 The durability service accumulation method used by a manufacturer must be designed to effectively predict the deterioration of emissions in actual use over the full useful life of the candidate in-use engines and must cover the breadth of the manufacturer’s product line that will be covered by the durability procedure.

1.1.1 For 2024 through 2026 model year engine families, a manufacturer must demonstrate engine and emission-related component durability, and calculate deterioration factors for each engine family using the following procedures. The service accumulation hours (excluding the time required for engine cooldown periods) must adhere to the specifications in subparagraphs B.1.1.1.1 through B.1.1.1.4 of this section. Manufacturers must additionally meet the requirements in subparagraphs B.1.1.1.5 through B.1.1.1.7 of this section:

1.1.1.1 Medium-duty diesel engines – 3,400 hours of service accumulation on an engine dynamometer equivalent to 150,000 miles of

useful life.

1.1.1.2 Light heavy-duty diesel engines, excluding medium-duty diesel engines – 2,500 hours of service accumulation on an engine dynamometer equivalent to 110,000 miles of useful life.

1.1.1.3 Medium heavy-duty diesel engines – Manufacturers must choose from one of the following service accumulation options below:

1.1.1.3.1 Option 1: 4,200 hours of service accumulation on an engine dynamometer equivalent to 185,000 miles of useful life; or

1.1.1.3.2 Option 2: 2,100 hours of service accumulation on an engine dynamometer, followed by accelerated aftertreatment aging for $\frac{1}{2}$ of useful life, as shown in Figure CA26-1 below. In order to use this option, manufacturers must submit in-use emission data reports as described in subparagraph B.1.1.3 of this section for 50% or more of the medium heavy-duty diesel engines used in vehicles sold originally in California each and every year for three consecutive model years.

For example, a manufacturer certifies three engine families A27, B27 and C27 in model year 2024, two engine families A28, B28 in model year 2025, and one engine family A29 in model year 2026. Subsequently, the manufacturer submits in-use emissions reports, as described in subparagraph B.1.1.3 of this section, for 52% of vehicles using A27, 53% of vehicles using B27, 54% of vehicles using C27 in each of the calendar years 2024 through 2026. The manufacturer also submits in-use emissions reports for 60% of vehicles using A28, 52% of vehicles using B28 in each of the calendar years 2025 and 2026. The manufacturer also submits in-use emissions reports for 58% of vehicles using A29 in 2026 calendar year. Because the manufacturer in the example submitted data for more than 50% of all its engines that have been certified using the durability data for three consecutive model years, the manufacturer would be eligible to use this durability demonstration option.

1.1.1.4 Heavy heavy-duty diesel engines – Manufacturers must choose from one of the following service accumulation options below:

1.1.1.4.1 Option 1: 9,800 hours of service accumulation on an engine dynamometer equivalent to 435,000 miles of useful life, or

1.1.1.4.2 Option 2: 4,900 hours of service accumulation on an engine dynamometer, followed by accelerated aftertreatment aging for $\frac{1}{2}$ of useful life, as shown in Figure CA26-1 below. This alternative durability demonstration program reduces the total hours of durability demonstration by allowing manufacturers to use accelerated aftertreatment aging for

50% of the useful life. In order to use this option, manufacturers must submit in-use emission data reports for heavy heavy-duty diesel engines for each and every year for three consecutive model years as described in subparagraph B.1.1.3 of this section.

1.1.1.4.3 Option 3: 3,000 hours of service accumulation on an engine dynamometer, followed by accelerated aftertreatment aging for 69% of useful life, as shown in Figure CA26-1 below. In order to use this option, manufacturers must submit in-use emission data reports as described in subparagraph B.1.1.3 of this section for 50% or more of the heavy heavy-duty diesel engines used in vehicles sold originally in California each and every year for three consecutive model years.

1.1.1.4.4, Option 4: For 2024 and 2025 model year heavy heavy-duty diesel engines only, the durability service accumulation may be accomplished in one process and on one EAS over two model years (2024 and 2025) as described below:

1.1.1.4.4.1. Perform accelerated aftertreatment aging for 69% of useful life followed by an additional service accumulation of EAS on engine dynamometer for 1,500 hours;

1.1.1.4.4.2. Use all emissions test data and perform a linear regression method to calculate the deterioration factor at full useful life for the 2024 model year engine family certification.

1.1.1.4.4.3. Continue to perform an additional 1,500 hours service accumulation on engine dynamometer for the 2025 model year certification;

1.1.1.4.4.4. Calculate the deterioration factor using the procedure specified in subparagraph B.1.3 of this section.

1.1.1.4.4.5 For 2025 model year, manufacturers must use the deterioration factor with the largest value as calculated in subparagraphs B.1.1.1.4.4.2 and B.1.1.1.4.4.4 of this section.

1.1.1.4.4.6 In order to use this option, manufacturers must submit in-use emission data reports as described in subparagraph B.1.1.3 of this section for 50% or more of the heavy heavy-duty diesel engines used in vehicles sold originally in California each and every year for three consecutive model years.

1.1.1.4.4.7 The sequence of engine dynamometer aging, accelerated aftertreatment aging, and the required emissions test points for this option are shown in Figure CA 26-2.

"X" = Total required engine dynamometer aging hours
 "Y" = Total accelerated aftertreatment aging hours
 Ash Cleaning must be performed at equally spaced equivalent mileage intervals

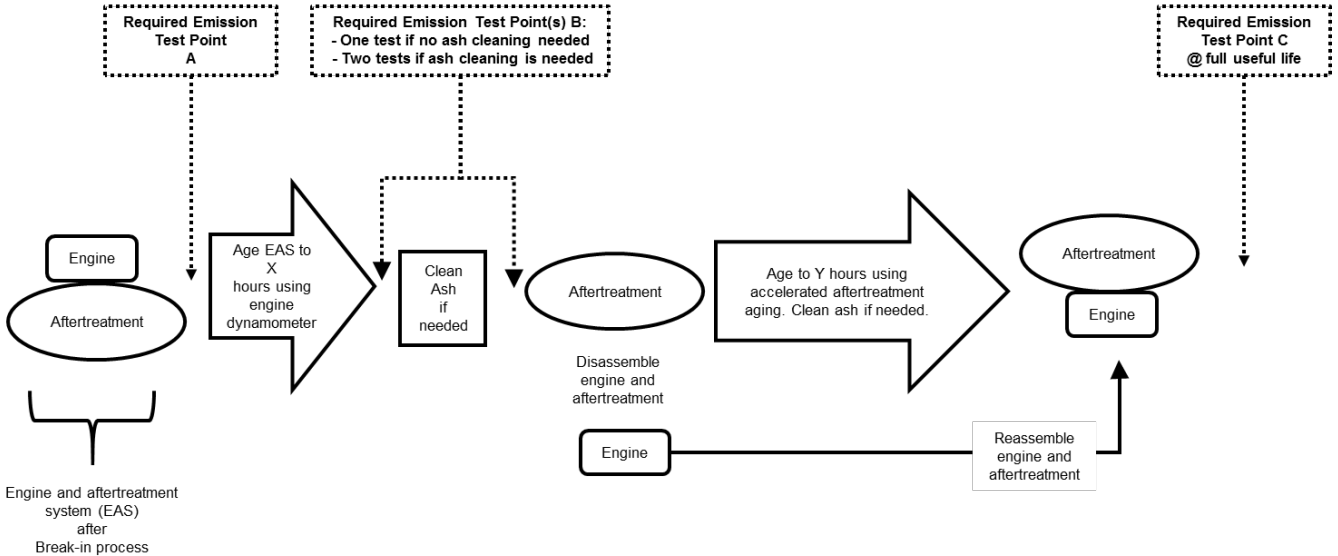


Figure CA26-1: Alternative Durability Demonstration Using Accelerated Aftertreatment Aging

"X" is the number of accelerated aging hours representing 69% of useful life
 "Y" is 1,500 hours of engine dynamometer aging
 Ash Cleaning must be performed at equally spaced equivalent mileage intervals

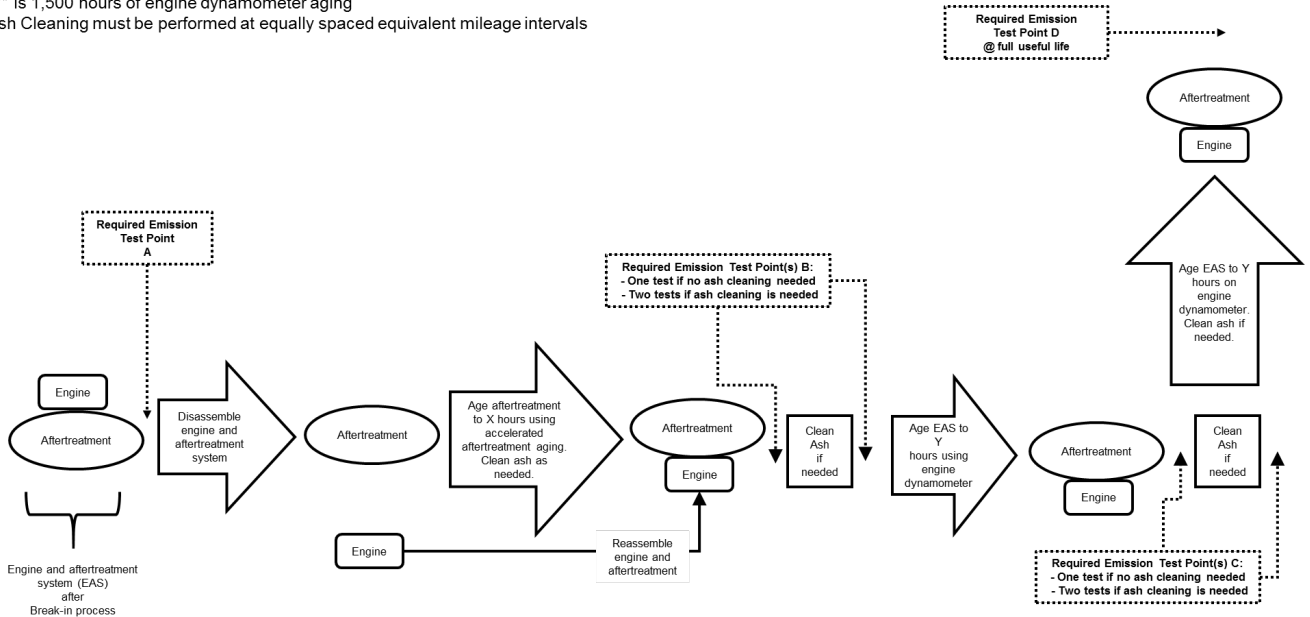


Figure CA26-2: Two-Year Durability Demonstration Using Accelerated Aftertreatment Aging (Heavy Heavy-Duty Engines)

1.1.1.5 Engine dynamometer service accumulation cycle shall be

limited to one of the two cycle options below, based on the requirements of subparagraph B.1.1.1.6 of this section, for establishing durability data.

1.1.1.5.1 Cycle-1 – A combination of the FTP, RMC, LLC and extended idle periods as specified in Figure CA26-3.

1.1.1.5.2 Cycle-2 – A combination of HDTT, 55-cruise, 65-cruise, LLC and extended idle periods as specified in Figure CA26-4. The manufacturer must consider all possible greenhouse gas vehicle subcategories as defined in 40 CFR §1037.230, last amended March 10, 2021 (Pre-publication), which is incorporated by reference herein. For each engine family, the manufacturer must choose the vehicle subcategory and vehicle configuration that yields the highest load factor using the GEM model. Manufacturers may use a 20-second ramp-up or ramp-down period in between the HDTT, 55-cruise and 65-cruise cycles. Engine manufacturers that do not have access to vehicle configuration parameters for the applicable engine family, may use vehicle design parameters used in the GEM model from previous model year engine families in the same primary intended service class and applications.

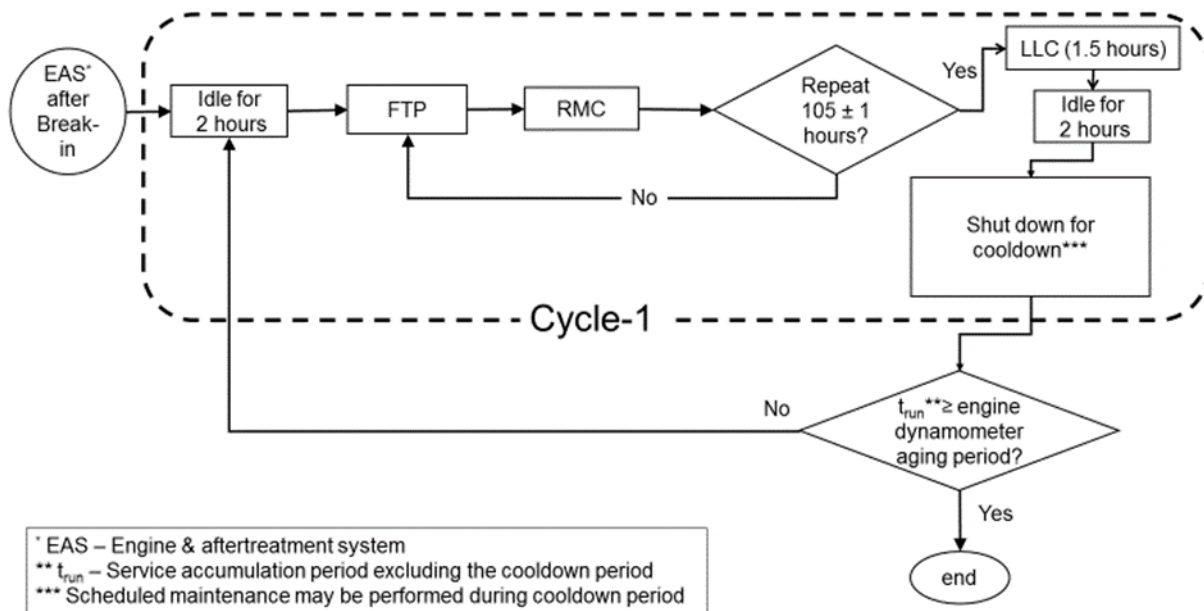


Figure CA26-3: Cycle-1 Service Accumulation Cycle

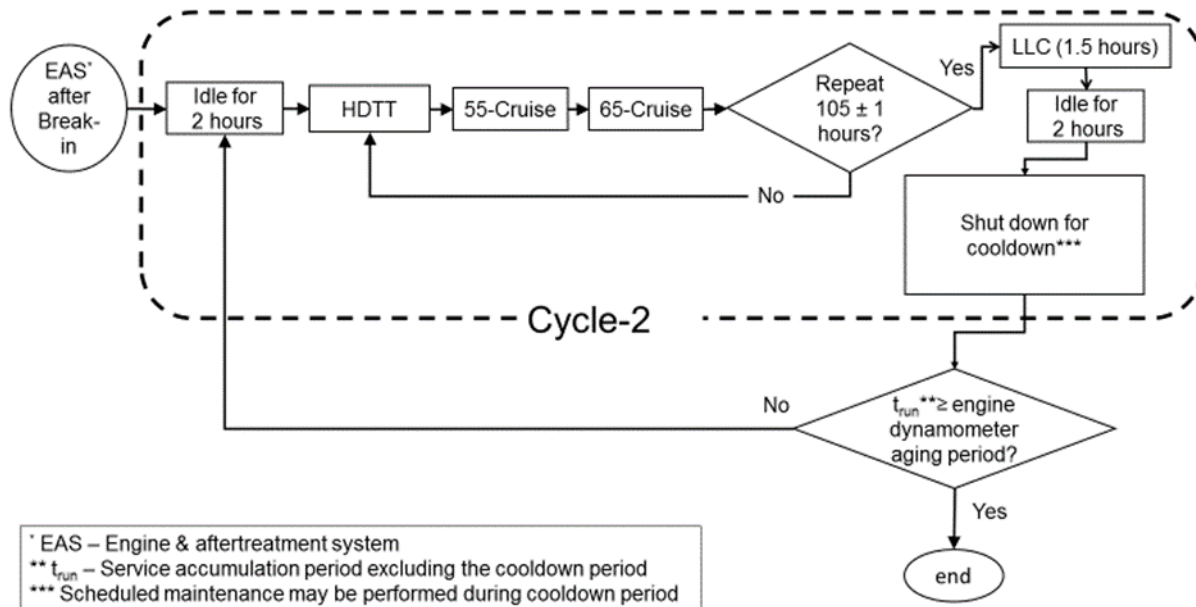


Figure CA26-4: Cycle-2 Service Accumulation Cycle

1.1.1.5.3 Load factor is defined as:

$$Load\ Factor = \frac{\int_0^D P_i \cdot dt}{P_{max} \cdot D}$$

where:

- P_i = Instantaneous engine power (hp)
- D = Total duration of the cycle (seconds)
- P_{max} = Maximum engine power rating (hp)
- T = time (seconds)

1.1.1.6 For each engine family, manufacturers must calculate the load factor for Cycle-1 and Cycle-2 and use the cycle with the highest calculated load factor.

1.1.1.7 Manufacturers may use the forced cooldown provisions in Section 1065.530(a)(1) of these test procedures for the cooldown period.

1.1.2 For 2027 and subsequent model year engine families, manufacturers shall develop a durability demonstration program using a combination of dynamometer aging, accelerated aftertreatment aging and in-use emissions reporting using the provisions in subparagraph B.1.1.3 of this section and good engineering judgement. Manufacturers must additionally meet the requirements in subparagraphs B.1.1.1.5 through B.1.1.1.7 of this section. For

light heavy-duty and medium heavy-duty engines, the sequence of the aging process and the required emission test points are shown in Figure CA26-1. For heavy heavy-duty engines, the sequence of the aging process and the required emission test points are shown in Figure CA26-5. The following schedules establish minimum required service accumulation for each primary intended service class:

"X" is the total required engine dynamometer aging hours
 "Y" is determined so that Y+X hours represent 435,000 miles
 "Z" is determined so that X+Y+Z hours represent full useful life
 Ash Cleaning must be performed at equally spaced equivalent mileage intervals

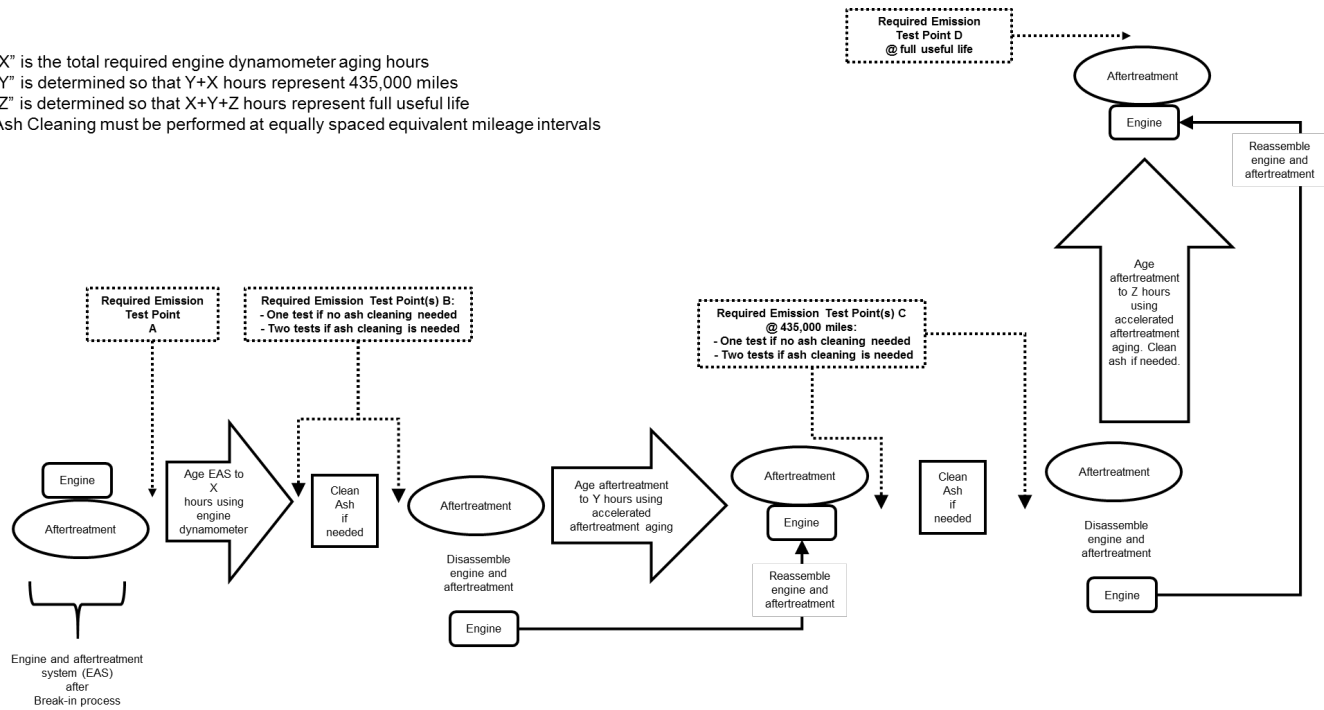


Figure CA26-5: Alternative Durability Demonstration Using Accelerated Aftertreatment Aging for 2027 and Subsequent Model Year Heavy Heavy-Duty Engines

1.1.2.1 For 2027 through 2030 model years:

1.1.2.1.1 Medium-duty diesel engines – 3,400 hours (100% of useful life) aging on engine dynamometer. Medium-duty diesel families are not subject to in-use emissions reporting.

1.1.2.1.2 Light heavy-duty diesel engines, excluding medium-duty diesel engines - Minimum 3,000 hours (69% of useful life) aging on engine dynamometer, with the remaining 31% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.1.3 Medium heavy-duty diesel engines – Minimum 4,200 hours (69% of useful life) aging on engine dynamometer, with the remaining 31% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.1.4 Heavy heavy-duty diesel engines – Minimum 4,900 hours (36% of useful life) aging on engine dynamometer, with the remaining 64% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.1.5 Manufacturers that collect and submit in-use emissions data from 50% or more of the engines used in vehicles sold originally in California for three consecutive model years can use a reduced service accumulation schedule in the subsequent model year. In order to be eligible, manufacturers must meet the 50% threshold for all certified engine families in each and every of the three previous model years. A manufacturer that does not submit in-use emissions data from 50% or more of its engines used in vehicles sold originally in California for three consecutive model years shall not be eligible to use the reduced service accumulation schedule in subsequent model year.

For example, a manufacturer certifies three engine families A27, B27 and C27 in model year 2027, two engine families A28, B28 in model year 2028, and one engine family A29 in model year 2029. Subsequently, the manufacturer submits in-use emissions reports, as described in subparagraph B.1.1.3 of this section, for 52% of vehicles using A27, 53% of vehicles using B27, 54% of vehicles using C27 in each of the calendar years 2027 through 2029. The manufacturer also submits in-use emissions reports for 60% of vehicles using A28, 52% of vehicles using B28 in each of the calendar years 2028 and 2029. The manufacturer also submits in-use emissions reports for 58% of vehicles using A29 in 2029 calendar year. Because the manufacturer in the example submitted data for more than 50% of all its engines that have been certified using the durability data for three consecutive model years, the manufacturer would then be eligible for using reduced service accumulation schedules as shown below for 2030 model year engine families.

1.1.2.1.5.1 Light heavy-duty diesel engines, excluding medium-duty diesel engines - Minimum 2,500 hours (58% of useful life) aging on engine dynamometer, with the remaining 42% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.1.5.2 Medium heavy-duty diesel engines – Minimum 3,500 hours (57% of useful life) aging on engine dynamometer, with the remaining 43% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.1.5.3 Heavy heavy-duty diesel engines – Minimum 3,750 hours (28% of useful life) aging on engine dynamometer, with the

remaining 72% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.2 For 2031 and subsequent model years:

1.1.2.2.1 Medium-duty diesel engines – 3,400 hours (100% of useful life) aging on engine dynamometer. Medium-duty diesel families are not subject to in-use emissions reporting.

1.1.2.2.2 Light heavy-duty diesel engines, excluding medium-duty diesel engines – Minimum 3,180 hours (52% of useful life) aging on engine dynamometer, with the remaining 48% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.2.3 Medium heavy-duty diesel engines – Minimum 4,200 hours (53% of useful life) aging on engine dynamometer, with the remaining 47% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.2.4 Heavy heavy-duty diesel engines – Minimum 4,900 hours (27% of useful life) aging on engine dynamometer, with the remaining 73% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.2.5 Manufacturers that collect and submit in-use emissions data from 50% or more of the engines used in vehicles sold originally in California for five consecutive model years can use a reduced service accumulation schedule in the subsequent model years. In order to be eligible, manufacturers must meet the 50% threshold for all certified engine families in each and every of the five previous model years. A manufacturer that does not submit in-use emissions data from 50% or more of its engines used in vehicles sold originally in California for five consecutive model years shall not be eligible to use the reduced service accumulation schedule in subsequent model year.

For example, a manufacturer certifies three engine families A31, B31 and C31 in model year 2031, two engine families A32, B32 in model year 2032, one engine family A33 in model year 2033, two engine families A34, B34 in model year 2034, and one engine family A35 in model year 2035. Subsequently, the manufacturer submits in-use emissions reports, as described in subparagraph B.1.1.3 of this section, for 52% of vehicles using A31, 53% of vehicles using B31, 54% of vehicles using C31 in each of the calendar years 2031 through 2035. The manufacturer also submits in-use emissions reports for 60% of vehicles using A32, 52% of vehicles using B32 in each of the calendar years 2032 through 2035. The

manufacturer also submits in-use emissions reports for 58% of vehicles using A33 in each of the calendar years 2033 through 2035. The manufacturer also submits in-use emissions reports for 70% of vehicles using A34 and B34 in each of the calendar years 2034 and 2035. The manufacturer also submits in-use emissions reports for 75% of vehicles using A35 in calendar year 2035. Because the manufacturer in the example submitted data for more than 50% of all its engines that have been certified using the durability data for five consecutive model years, the manufacturer in the example would then be eligible for using reduced service accumulation schedules as shown below for 2036 model year engine families.

1.1.2.2.5.1 Light heavy-duty diesel engines, excluding medium-duty diesel engines - Minimum 2,500 hours (41% of useful life) aging on engine dynamometer, with the remaining 59% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.2.5.2 Medium heavy-duty diesel engines – Minimum 3,500 hours (44% of useful life) aging on engine dynamometer, with the remaining 56% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.2.2.5.3 Heavy heavy-duty diesel engines – Minimum 3,750 hours (21% of useful life) aging on engine dynamometer, with the remaining 79% of useful life consisting of accelerated aftertreatment aging, engine dynamometer aging, or any combination of the two.

1.1.3 In-use emissions reporting for California certified, heavy-duty engines (with SCR systems) to the Executive Officer must adhere to the following requirements:

1.1.3.1 In-use emissions reporting can be used by:

1.1.3.1.1 2024 and subsequent model year medium heavy-duty diesel and heavy heavy-duty diesel engines, and

1.1.3.1.2 2027 and subsequent model year light heavy-duty diesel engines.

1.1.3.2 Manufacturers must submit a separate report for each California certified engine family.

1.1.3.3 The initial report must be electronically submitted to: Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave., Riverside, CA 92507 by December 31 of the

applicable engine family model year. For example, the initial report for a 2024 model year engine family must be submitted by December 31, 2024.

1.1.3.4 Subsequent annual reports must be electronically submitted to ARB by December 31 of the subsequent model years. For example, the subsequent reports for a 2024 model year engine family must be submitted by December 31, 2025, 2026 and so forth.

1.1.3.5 For each vehicle/engine, data must be recorded at least one time per calendar year. Also, for each annual vehicle/engine data recording throughout its useful life, the interval between valid annual data recordings must be at least six months. For example, a vehicle/engine sampled at August 1, 2025 would require another sample after February 1, 2026.

1.1.3.6 In-use emissions reporting is not required for engines that have passed their applicable useful life period. The percentage of California sales calculations should exclude engines that have passed their applicable useful life period.

1.1.3.7 In-use emissions reports for each vehicle/engine shall at least contain the following information:

- (A) Engine family name,
- (B) Vehicle family name,
- (C) California sales volume of vehicles for each engine family,
- (D) Engine model name,
- (E) Rated engine model power (hp),
- (F) Vehicle identification number (VIN),
- (G) Engine serial number,
- (H) Odometer reading (miles),
- (I) Engine run time/hour-meter reading (hours),
- (J) Date when all data was recorded,
- (K) All tracking parameters identified in title 13, CCR, section 1971.1(h)(5),

(L) In lieu of parameters in subparagraph B.1.1.3.7.K of this section, manufacturers may submit another set of parameters that identify the in-use emissions characteristics of each vehicle/engine. The format and content of these parameters must be determined based on good engineering judgement and is subject to ARB approval.

1.1.3.8 For each engine family, manufacturers must submit all in-use vehicle/engine emissions data collected by the manufacturer in the reporting year, and at a minimum collect and report data on 20% of vehicles (using the same engine family) that were originally sold in the California market. If the manufacturer fails to report data for at least 20% of vehicles sold in California, using the same engine family for three consecutive model years in the 2024

through 2030 model year period, or for five consecutive model years in 2031 and subsequent model years, the manufacturer cannot use accelerated aftertreatment aging for the subsequent model years engine families. For any engine family that initially fails to meet the minimum percentage, the manufacturer may submit all in-use vehicle/engine emissions data it collected for that family on a nationwide basis, in order to meet the minimum percentage defined by those originally sold in the California market.

1.1.3.9 In-use emission reports must include data from vocational and, if applicable, tractor vehicles as defined in 40 CFR §1037.801 last amended March 10, 2021 (Pre-publication), which is incorporated by reference herein.

1.1.3.10 Manufacturers that certify engines with ARB under title 13, CCR, section 1956.8 must submit in-use emissions reports as described in subparagraph B.1.1.3 of this section. Vehicle manufacturers that certify vehicles under title 17, CCR, section 95663 shall not take any actions that will impair or prevent certifying engine manufacturers from complying with this requirement, including, without limitation, prohibiting installation or disabling any hardware or software associated with the telematics systems installed on an engine by the certifying engine manufacturer that is described in the engine application for certification, unless they have obtained authorization from the certifying engine manufacturer. Alternatively, a vehicle manufacturer must provide the certifying engine manufacturer with all of the data needed to comply. No other person shall disconnect, modify, or alter any engine or vehicle telematics systems unless prior authorization has been obtained from the corresponding certifying engine or vehicle manufacturer.

1.2 For 2024 and subsequent model year medium-duty and heavy-duty engines (with SCR systems), the break-in period for emission-data and durability-data engines shall adhere to the following guidelines:

1.2.1 The manufacturer shall demonstrate through periodic emissions testing (at least three emissions tests with evenly spaced intervals of 60 hours of service accumulation) using the FTP, RMC and LLC cycles, the number of hours at which the engine and aftertreatment system combination is stabilized for emissions testing. The manufacturer shall maintain, and provide the emissions test data to the Executive Officer at the time of certification. In lieu of emissions testing, the manufacturer may elect to accumulate 300 hours of service on each engine and aftertreatment system combination to demonstrate stabilized emission levels.

1.3 For 2024 and subsequent model year engine families using accelerated aftertreatment aging for a portion of the applicable useful life, exhaust emission deterioration factors shall be determined by calculating additive or multiplicative deterioration factors using a linear regression model which includes results for emission test points A, B, C and D (and any intermediate emissions test points if

applicable) as shown in Figures CA26-1, CA26-2, or CA26-5 for each pollutant.

1.4 Sawtooth and other nonlinear deterioration patterns. For 2024 and subsequent model year engine families, the deterioration factor calculations assume that the highest useful life emissions occur either at the end of useful life or at the low-hour test point. The provisions of this subparagraph apply where good engineering judgement indicates that the highest emissions over the useful life will occur between these two points. For example, emissions may increase with service accumulation until a certain maintenance step is performed, then return to the low-hour emission levels and begin increasing again. Base deterioration factors for engines with such emission patterns on the difference between (or ratio of) the point at which the highest emissions occur and the low-hour test point. Note that this applies for maintenance-related deterioration only where we allow such critical emission-related maintenance.

1.5 Manufacturers that use accelerated aftertreatment aging for demonstrating durability must comply with the following requirements.

1.5.1 Perform emissions tests using the applicable certification (FTP, RMC and LLC) cycles to calculate deterioration factors. The emissions test intervals are shown in Figures CA26-1, CA26-2 or CA26-5 as applicable.

1.5.2. Submit periodic in-use emissions reports for each applicable engine family that uses an SCR system to the Executive Officer. In-use emissions reporting shall follow the procedures described in subparagraph B.1.1.3 of this section.

1.5.3 Use good engineering judgement in accounting for thermal and chemical degradation of the aftertreatment system in proposing an accelerated aftertreatment process.

1.5.4 Accelerated aftertreatment aging must be equivalent to the same service accumulation cycles that are specified in subparagraph B.1.1.1.5 of this section.

2. The following provisions apply to optionally certified diesel hybrid powertrains, where “engine” also means “optionally certified diesel hybrid powertrain”, “engine dynamometer” also mean “powertrain dynamometer”, “FTP, RMC, LLC” also mean “Vehicle-FTP, Vehicle-RMC, Vehicle-LLC, respectively”, and “engine family” also means “optionally certified diesel hybrid powertrain family”.

2.1 For 2022 and subsequent model year optionally certified diesel hybrid powertrain families optionally certified pursuant to title 13, CCR, section 1956.8, a manufacturer must demonstrate engine and emission-related component durability, including hybrid-related components as defined pursuant to section 1036.801.B of

these test procedures, such as electric motor-generator system, rechargeable energy storage system, battery management system, including charge controller and thermal management systems and associated power electronics, and calculate deterioration factors for each optionally certified diesel hybrid powertrain family in accordance with the procedures in section I.26 of these test procedures.

2.2 For optionally certified diesel hybrid powertrain families used in incomplete vehicles from 10,001 to 14,000 pounds GVWR, the durability demonstration and model year implementation schedules are identical to the durability demonstration and model year implementation schedules specified for the class of diesel engines used in such powertrains in this section.

2.3 For optionally certified diesel hybrid powertrain families primarily used in class 4 and 5 vehicles, the durability demonstration and model year implementation schedules for light heavy-duty diesel engines in this section shall apply to the diesel hybrid powertrains.

2.4 For optionally certified diesel hybrid powertrain families primarily used in class 6 and 7 vehicles, the durability demonstration and model year implementation schedules for medium heavy-duty diesel engines in this section shall apply to the diesel hybrid powertrains.

2.5 For optionally certified diesel hybrid powertrain families primarily used in class 8 vehicles, the durability demonstration and model year implementation schedules for heavy heavy-duty diesel engines in this section shall apply to the diesel hybrid powertrains.

2.6 For optionally certified diesel hybrid powertrain families using certified on-road medium-duty diesel engines or heavy-duty diesel engines that have demonstrated engine and emission-related durability pursuant to section I.26 of these test procedures, a manufacturer must provide documentation, including, but not limited to, test data, engineering analysis, to demonstrate to the satisfaction of the Executive Officer that engine and emission-related durability for the certified diesel engine will be similar or substantially similar when integrated in a hybrid powertrain. In addition, a manufacturer must demonstrate durability for hybrid-related components pursuant to paragraph B.2 of this section.

2.7 For MY2024-2026 optionally certified diesel hybrid powertrain families using on-road heavy-duty engines other than California-certified on-road heavy-duty diesel engines, a manufacturer must demonstrate engine and emission-related component durability pursuant to one of the options described in section I.26.B.1.1.1. of these test procedures. In addition, a manufacturer must demonstrate durability for hybrid-related components pursuant to paragraph B.2.1 of this section. For optionally certified diesel hybrid powertrain families using engines other than California-certified on-road medium-duty diesel engines or heavy-duty diesel engines, a manufacturer must demonstrate engine and emission-related component

durability, including hybrid-related components pursuant to section I.26 of these test procedures.

27. Special test procedures. [§86.090-27] April 11, 1989. [No change.]

28. Compliance with emission standards. [§86.xxx-28] January 18, 2001.

A. Federal provisions.

1. **§86.004-28.** October 25, 2016. Amend as follows:

1.1 Subparagraphs (a) through (c)(4)(i) [No change.]

1.2 Amend subparagraph (c)(4)(ii) as follows: [No change, except that diesel-cycle smoke testing shall only apply to petroleum-fueled diesel-cycle engines.]

1.3. Subparagraph (c)(4)(iii)(A) [n/a; Otto-cycle engines.]

1.4 Subparagraph (c)(4)(iii)(B): [No change, except that the exhaust emission results for formaldehyde exhaust emission results for methanol-fueled engines and vehicles, ultra-low emission vehicles and super-ultra-low emission vehicles shall also be adjusted by the appropriate deterioration factor (through addition or multiplication as the case may be.)

1.5 Amend subparagraph (c)(4)(iii)(B)(3) as follows: For petroleum-fueled diesel cycle HDEs only: [No change to remainder of paragraph.]

1.6 Subparagraphs (c)(iv) through (i). [No change.]

B. California provisions.

1. **Deterioration factor for exhaust emissions.**

1.1 **Additive deterioration factor.** Except as specified in paragraph B.1.2 of this section, use an additive deterioration factor for exhaust emissions. An additive deterioration factor for a pollutant is the difference between exhaust emissions at the end of the useful life and exhaust emissions at the low-hour test point. In these cases, adjust the official emission results for each tested engine at the selected test point by adding the factor to the measured emissions. If the factor is less than zero, use zero. Additive deterioration factors must be specified to one more decimal place than the applicable standard.

1.2 **Multiplicative deterioration factor.** Use a multiplicative deterioration factor if good engineering judgment calls for the deterioration factor for a pollutant to be the ratio of exhaust emissions at the end of the useful life to exhaust emissions at the low-hour test point. For example, if you use aftertreatment technology that controls emissions of a pollutant proportionally to engine-out emissions, it is often appropriate to use a multiplicative deterioration factor. Adjust the official emission results for each tested engine at the selected test point by multiplying the measured emissions by the deterioration factor. If the factor is less than one, use one. A multiplicative deterioration factor may not be appropriate in cases where testing variability is significantly greater than engine-to-engine variability. Multiplicative deterioration factors must be specified to one more significant figure than the applicable standard.

29. Testing by the Administrator. [§86.091-29]. April 28, 2014. [No change.]

30. Certification. [§86.xxx-30]

A. Federal provisions

1. **§86.004-30.** April 28, 2014. Amend as follows:

- 1.1 Subparagraphs (a) through (a)(2). [No change.]
- 1.2 Add the following sentence to subparagraph (a)(3)(i). For heavy-duty engines certified under the provisions of section I.11.B.4 of these test procedures two certificates will be issued, one for each fueling mode. [No change to remainder of paragraph.]
- 1.3 Subparagraphs (a)(3)(ii) through (b)(2). [No change.]
- 1.4 Subparagraph (b)(3). Add the following sentence: If, after a review of the request and supporting data, the Executive Officer finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with title 17, CCR, §60040, et seq., with respect to such issue.
- 1.5 Subparagraph (b)(4). [No change.]
- 1.6 Subparagraph (b)(4)(i). Add the following phrase at the beginning of the paragraph: Request a hearing under title 17, CCR, §60040, et seq.; or...
- 1.7 Subparagraph (b)(4)(ii) through (b)(5). No change.
- 1.8 Subparagraph (b)(5)(i). Add the following phrase at the beginning of the paragraph: Request a hearing under title 17, CCR, §60040, et seq.; or...
- 1.9 Subparagraph (b)(5)(ii) through (c)(5). [No change.]
- 1.10 Subparagraph (c)(5)(i). Add the following phrase at the beginning of the paragraph: Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with title 17, CCR, §60040, et seq. hereof; and ...
- 1.11 Subparagraph (c)(5)(ii). [No change.]
- 1.12 Subparagraph (c)(6). Add the following sentence: The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Executive Officer under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with title 17, CCR, §60040, et seq. If the Executive Officer finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.
- 1.13 Subparagraphs (d) through (e). [No change.]
- 1.14 Delete subparagraph (f) and replace with the following: All medium- duty diesel cycle engines used in vehicles up to 14,000 pounds GVW must have an on-board diagnostic system as required in title 13, CCR §1968 et seq, as applicable.

2. **§86.007-30.** April 28, 2014. Amend as follows:

- 2.1 Subparagraphs (a) through (a)(2). [No change.]
- 2.2 Add the following sentence to subparagraph (a)(3)(i). For heavy- duty engines certified under the provisions of section I.11.B.4 of these test procedures two certificates will be issued, one for each fueling mode. [No

change to remainder of paragraph.]

2.3 Subparagraphs (a)(3)(ii) through (b)(2). [No change.]

2.4 Subparagraph (b)(3). Add the following sentence: If, after a review of the request and supporting data, the Executive Officer finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with title 17, CCR, §60040, et seq., with respect to such issue.

2.5 Subparagraph (b)(4). [No change.]

2.6 Subparagraph (b)(4)(i). Add the following phrase at the beginning of the paragraph: Request a hearing under title 17, CCR, §60040, et seq.; or...

2.7 Subparagraph (b)(4)(ii) through (b)(5). [No change.]

2.8 Subparagraph (b)(5)(i). Add the following phrase at the beginning of the paragraph: Request a hearing under title 17, CCR, §60040, et seq.; or...

2.9 Subparagraph (b)(5)(ii) through (c)(5). [No change.]

2.10 Subparagraph (c)(5)(i). Add the following phrase at the beginning of the paragraph: Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with title 17, CCR, §60040, et seq. hereof; and ...

2.11 Subparagraph (c)(5)(ii). [No change.]

2.12 Subparagraph (c)(6). Add the following sentence: The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Executive Officer under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with title 17, CCR, §60040, et seq. If the Executive Officer finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

2.13 Subparagraphs (d) through (e). [No change.]

2.14 Delete subparagraph (f) and replace with the following: All medium- duty diesel cycle engines used in vehicles up to 14,000 pounds GVW must have an on-board diagnostic system as required in title 13, CCR §1968 et seq, as applicable.

B. California Provisions

1. If a 2024 or subsequent model year engine family or test group does not comply with the in-use test requirements in title 13, CCR, sections 2111-2140, and Part II, Subpart T of this test procedure, warranty reporting requirements in title 13, CCR, sections 2141-2149, or is equipped with an emission control component that exceeds the thresholds specified in title 13, CCR, section 2143, and the component was not redesigned, recalibrated, or manufactured in a different manner to address component features identified to result in exceedance of the thresholds in title 13, CCR, section 2143 for the model year for which an application is requested, a manufacturer cannot request a carryover or carry across application based on data from that engine family or test group. If the emission control component has been

identified as causing an engine family or test group to exceed the thresholds specified in title 13, CCR, section 2143 has not been redesigned, recalibrated, or manufactured in a different manner to address component features identified to result in exceedance of such thresholds for the model year for which the application is requested, a manufacturer may only use carryover or carry across data if the manufacturer extends the warranty coverage for that emission control component to the full useful life of the engine family or test group.

31. Separate certification. [§86.079-31] September 8, 1977. [No change.]
32. Addition of a vehicle or engine after certification. [§86.079-32] September 8, 1977. [No change.]
33. Changes to a vehicle or engine covered by certification. [§86.079-33] September 8, 1977. [No change.]
34. Alternative procedure for notification of additions and changes. [§86.082-34] November 2, 1982. [No change.]
35. Labeling. [§86.xxx-35].
 - A. Federal Provisions.**
 1. **86.095-35** October 25, 2016.
 - 1.1 Add the following sentence to the introductory paragraph: The labeling requirements of this section shall apply to all new motor vehicle engines certified according to the provisions of California Health and Safety Code Section 43100.
 - 1.2 Subparagraphs (a)(1) through (a)(3)(iii)(G). [No change.]
 - 1.3 Amend subparagraph (a)(3)(iii)(H) as follows:
 - 1.3.1 An unconditional statement of compliance with the appropriate model year California regulations; for example, “This engine conforms to California regulations applicable to XXXX model year new heavy-duty diesel engines.” It may also state that the engine conforms to any applicable federal or Canadian emission standards for new heavy-duty diesel engines.
 - 1.3.2 For 2004 through 2006 model year heavy heavy-duty diesel-fueled, dual-fuel, and bi-fuel engines to be used in urban buses that are certified to the optional reduced emission standards and are sold to any transit agency exempted under paragraphs (c)(8) and (d)(7), title 13, CCR, §1956.2 from the requirements of paragraphs (c)(5) and (d)(4), title 13, CCR §1956.2.

“This engine conforms to California regulations applicable to XXXX model year new urban bus or heavy-duty diesel engines and is certified to a NO_x plus NMHC optional reduced-emission standards of XXX g/bhp-hr (for optional reduced-emission standards specify between 0.3 and 1.8, inclusive, at 0.3 b/bhp-hr increments, and a particulate matter standards of 0.01 g/bhp-hr).”

1.3.3 For all other 2004 through 2006 model year heavy-duty diesel cycle engines, including those used in urban buses, that are certified to the optional reduced-emission standards, the label shall contain the following statement:

“This engine conforms to California regulations applicable to XXXX model year new (specify urban bus or heavy-duty diesel) engines and is certified to a NO_x plus NMHC optional reduced-emission standards of XXX g/bhp-hr (for optional reduced-emission standards specify between 0.3 and 1.8, inclusive, at 0.3 g/bhp-hr increments, and a particulate matter standard of 0.03 g/bhp-hr, 0.02 g/bhp-hr, or 0.01 g/bhp-hr).”

1.4 Subparagraphs (a)(3)(iii)(I) through (i). [No change.]

B. California provisions.

1. For 2004 and later model year heavy-duty diesel engines certified under the requirements of title 13, CCR, §1956.8(a)(3), the statement of compliance requirements of this subsection shall be repeated for each of the two fueling modes of operation. Appended to the statement for the lower emitting fueling mode of operation shall be the following sentence:

“This certification is valid only while operating on ____ (indicate the fuel or fuel combination under which this mode of operation was certified) fuel. Operation using any other fueling mode will result in significant increases in exhaust emissions and significantly reduce engine performance.”

2. Manufacturers may elect to use a supplemental label in addition to the original label if there is not sufficient space to include all the required information. The supplemental label must conform to all specifications as the original label. In the case that a supplemental label is used, the original label shall be numbered “1 of 2” and the supplemental label shall be numbered “2 of 2.”

3. Statements shall not be used on labels placed on engines that, in fact, do not comply with all applicable California regulations.

4. Vehicle Labels for Heavy-Duty Diesel Engine Idling Requirements.
For each 2008 and subsequent model year heavy-duty diesel engine certified to the optional NO_x idling emission standard pursuant to paragraph 11.B.6.3 or equipped with a certified/verified auxiliary power system (APS) pursuant to title 13, CCR, section 2485(c)(3)(A), a single label shall be produced and affixed, as applicable, on each vehicle equipped with such heavy-duty diesel engine.

4.1 The labeling requirements for engine manufacturers, aftermarket APS manufacturers and installers, and original equipment manufacturers are as follows:

4.1.1 Engine manufacturers. The engine manufacturer that has certified an engine to the optional NO_x idling emission standard pursuant to

paragraph 11.B.6.3, or certified/verified an APS pursuant to title 13, CCR, section 2485(c)(3)(A), shall produce the appropriate label for each new engine or APS pursuant to paragraph 35.B.4.2, below. The label shall be affixed on the outside of the vehicle pursuant to paragraph 35.B.4.3 by the original equipment manufacturer.

4.1.2 Aftermarket APS manufacturers and installers. An aftermarket APS manufacturer that has certified/verified an APS pursuant to title 13, CCR, section 2485(c)(3)(A), shall produce the appropriate label for each APS system pursuant to paragraph 35.B.4.2, below. The label shall be affixed on the outside of the vehicle pursuant to paragraph 35.B.4.3 by the party that is responsible for installing the APS on the vehicle.

4.1.3 Original equipment manufacturer. An original equipment manufacturer that has certified an engine to the optional NOx idling emission standard pursuant to paragraph 11.B.6.3, or certified/verified an APS pursuant to title 13, CCR, section 2485(c)(3)(A), shall produce and affix the appropriate label on the outside of the vehicle pursuant to paragraphs 35.B.4.2 or 35.B.4.3, whichever is applicable.

4.2 **Label Format.** Figure 1 shows a facsimile of the label format for an engine certified to the optional NOx idling emission standard pursuant to paragraph 11.B.6.3. Figure 2 shows a facsimile of the label format for an engine in a certified/verified APS pursuant to title 13, CCR, section 2485(c)(3)(A). The engine manufacturer, APS manufacturer or original equipment manufacturer, whichever is applicable, that produces and affixes the label on the vehicle must ensure that the label has the following characteristics:



Figure 1



Figure 2

- 4.2.1 Oval shape.
- 4.2.2 Dimensions of no less than 6 inches wide by 4 inches high.
- 4.2.3 The color of the outer and inner ellipses shall be dark blue and the stars in red. The background of the label shall be light blue in color. The

size of the stars shall be equal to the size of the characters as specified in paragraph 35.B.4.2.4 below.

4.2.4 A vehicle equipped with an engine that is certified pursuant to paragraph 11.B.6.3 shall have a label with the word “CERTIFIED,” and below it the phrase “CLEAN IDLE,” as shown in Figure 1. A vehicle equipped with an APS certified/verified pursuant to title 13, CCR, section 2485(c)(3)(A) shall have a label with the word “VERIFIED,” and below it the phrase “CLEAN APS,” as shown in Figure 2. The label information shall be written in the English language with sans serif font, black in color, and in upper case letters. The size of the font shall be at least 7/16 inch (or 32 points) and the spacing of the fonts must be such that the longest phrase (for example, “CLEAN IDLE”) extends from the left edge to the right edge of the inner edge of the inner ellipse, without touching the edges. The label information shall be centrally aligned, both vertically and horizontally.

4.2.5 A hologram as shown in Figure 3 shall be embedded within the proposed label. The hologram must cover the entire label. The hologram shall have the phrase “Clean Skies” repeatedly written from edge to edge of the label boundaries and each phrase shall be separated by a circular bullet. The position of the circular bullet in each line shall be exactly above the space between the words “Clean” and “Skies” of the line below. The color of the font shall be orange. The font size shall be less than or equal to a quarter of the font size of the phrase “CLEAN IDLE” or “CLEAN APS” as specified in subsection 35.B.4.2.4, above. The hologram shall have the map of the State of California, in orange color, overlaid over the text and positioned in the center of the label as shown in Figure 3, below.



4.3 Label Location and Attachment Requirements

4.3.1 The appropriate label shall be permanently affixed to the exterior on the driver’s side of the hood, in an area within one foot by one foot from the top and front edges of the hood. If such an attachment is not feasible, the label may be attached at a different location subject to advance approval by the Executive Officer.

4.3.2 Each label must be affixed in such a manner that it can not be removed without destroying or defacing the label. The label must not be

affixed to any vehicle component that can easily be detached from the vehicle.

4.3.3 The label and any adhesives used must be designed to withstand, for a period of 10 years, typical environmental conditions. Typical environmental conditions include, but are not limited to, exposure to extreme heat or cold, moisture, engine fuels, lubricants and coolants.

4.4 The party that certifies/verifies the engine pursuant to paragraph 11.B.6.3 or the APS pursuant to title 13, CCR, section 2485(c)(3)(A) shall be the ultimate party responsible for ensuring that the labels are correctly produced. Samples of labels produced pursuant to this subsection must be submitted to the Executive Officer with the applicable certification or verification application.

4.5 Labels on vehicles may also be applied by original equipment manufacturers, distributors, or dealers. However, the party that certified the engine or the APS and produced the labels remains the ultimate party responsible for ensuring that the labels are correctly administered. If the labels are administered by the original equipment manufacturer, dealer, or distributor, the producer of the label shall include its name and a serial number on the label. The location of the producer's name and serial number on the label shall be written in the lower part of the label, in the space vertically centered between the label wording and the inner ellipses, and the font must contrast the label background. The serial numbers of the labels administered must be recorded by the original equipment manufacturer, distributor, or dealer and reported to the party responsible for producing the labels. This information shall be maintained by the party responsible for producing the labels for a period of 10 years, and shall be made available to the Executive Officer upon request.

4.6 A heavy-duty diesel engine that has been certified pursuant to subsection 11.B.6.3 shall not be modified or altered unless said modification or alteration has been approved by the Executive Officer pursuant to title 13 CCR sections 2220 through 2225.

4.7 An idling emission reduction device or system that has been certified/verified pursuant to title 13, CCR, section 2485(c)(3)(A) shall not be modified or altered unless said modification or alteration has been approved by the Executive Officer pursuant to title 13 CCR sections 2470 through 2476.

5. For 2015 and subsequent model year heavy-duty and medium-duty diesel cycle engines certified to the Optional Low NOx Engine emission standards in subparagraph A.11.B.7., the label shall contain the following statement: "This engine conforms to California regulations applicable to XXXX model year heavy-duty diesel engines and is certified to the Optional Low NOx Engine emission standard of XXX g/bhp-hr."

6. For 2022 and subsequent model year heavy-duty diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, the label shall contain the following statement: "This diesel hybrid powertrain family conforms

to California regulations applicable to XXXX model year hybrid powertrains and is intended for use primarily in Class Y vehicles.”

7. For 2024 through 2026 model year heavy-duty diesel engines rated at or above 525 bhp maximum power and certified to the provisions specified in 13 CCR section 1956.8(a)(2)(C)2, the label must contain the following statement: “This engine conforms to the 525 horsepower and above exemption specified in 13 CCR 1956.8(a)(2)(C)2 applicable to XXXX model year”.

8. For 2024 through 2025 model year heavy-duty diesel engines certified to the provisions specified in 13 CCR section 1956.8(a)(2)(C)3, the label must contain the following statement: “This legacy engine is certified under the provisions of 13 CCR 1956.8(a)(2)(C)3 applicable to XXXX model year”.

36. Submission of vehicle identification numbers. [§86.079-36] [n/a]

37. Production vehicles and engines. [§86.085-37] October 25, 2016. [No change.]

38. Maintenance instructions. [§86.xxx-38]

A. Federal provisions

1. §86.004-38 April 28, 2014.

1.1 Subparagraphs (a) through (f). [No change.]

1.2 Amend subparagraph (g)(1) as follows: (g) Emission control diagnostic service information:

(1) Manufacturers shall furnish or cause to be furnished to any person engaged in the repairing or servicing of motor vehicles or motor vehicle engines, or the Administrator upon request, any and all information needed to make use of the on-board diagnostic system and such other information, including instructions for making emission-related diagnosis and repairs, including, but not limited to, service manuals, technical service bulletins, recall service information, data stream information, bi-directional control information, and training information, unless such information is protected by section 208(c) of the Act or California Government Code Section 6250, as a trade secret. No such information may be withheld under section 208(c) of the Act or California Government Code Section 6250 if that information is provided (directly or indirectly) by the manufacturer to franchised dealers or other persons engaged in the repair, diagnosing, or servicing of motor vehicles or motor vehicle engines.

1.3 Subparagraphs (g)(2) through (i). [No change.]

2. §86.010-38 April 28, 2014.

2.1 Subparagraphs (a) through (a). [No change.]

2.2 Insert subparagraph (a)(3) as follows:

The maintenance instructions shall not prohibit the use of commercially available diesel and biofuel blends that meet California’s fuel

specifications in title 4, CCR, section 4148 for 2024 and subsequent model year engines.

2.3 Subparagraph (b) through (f). [No change.]

2.4 Subparagraph (g). Delete; replace with: Manufacturers of heavy-duty diesel engines used in vehicles weighing 14,000 pounds GVW and less must comply with the motor vehicle service information requirements set forth in title 13, CCR §1969.

2.5 Subparagraph (h). [No change.]

2.6 Amend subparagraph (i) as follows: Through model year 2013, for each new diesel-fueled engine subject to the standards prescribed in title 13, CCR §1956.8(a), §1956.8(h), and Sec. 86.007-11, as applicable, the manufacturer shall furnish or cause to be furnished to the ultimate purchaser a statement that "This engine must be operated only with ultra low sulfur diesel fuel (that is, diesel fuel meeting ARB specifications for highway diesel fuel, including a 15 ppm sulfur cap)."

2.7 Subparagraph (j). Delete; replace with: Manufacturers of heavy-duty diesel engines used in vehicles over 14,000 pounds GVW must comply with the motor vehicle service information requirements set forth in title 13, CCR §1969.

39. Submission of maintenance instructions. [§86.079-39] September 8, 1977. [No change.]

40. Heavy-duty engine rebuilding practices. [§86.xxx-40]

A. Federal Provisions.

1. **§86.004-40** January 18, 2001.

1.1 Add the following sentence to the introductory paragraph: Any deviation from the provisions contained in this section is also a prohibited act under California Vehicle Code section 27156, et seq.

1.2 Subparagraphs (a) through (e). [No change.]

II. Test Procedures

Subpart I - Emission Regulations for New Diesel-Fueled Heavy-Duty Engines; Smoke Exhaust Test Procedure

86.884-1 General Applicability. September 21, 1994.

The provisions of this subpart are applicable to new petroleum-fueled diesel heavy-duty engines beginning with the 1984 model year.

The provisions of this subpart are not applicable to new heavy-duty diesel gaseous-fuel engines and those gaseous-fuel engines derived from diesel engines, except dual-fuel and multi-fuel engines which use petroleum fuel.

86.884-2 Definitions. November 16, 1983.

86.884-3 Abbreviations. November 16, 1983.

86.884-4 Section numbering. September 21, 1994.

86.884-5 Test Procedures. April 11, 1989.

86.884-6 Fuel specifications. April 11, 1989.

86.884-7 Dynamometer operation cycle for smoke emission tests. September 5, 1997.

86.884-8 Dynamometer and engine equipment. July 13, 2005.

86.884-9 Smoke measurement system. September 5, 1997.

86.884-10 Information. July 13, 2005.

86.884-11 Instrument checks. December 10, 1984.

86.884-12 Test run. July 13, 2005.

86.884-13 Data analysis. September 5, 1997.

86.884-14 Calculations. January 15, 2004.

Subpart N - Exhaust Test Procedures for Heavy-duty Engines

86.1301 Scope; applicability. October 25, 2016.

86.1302-84 Definitions. November 16, 1983.

86.1303-84 Abbreviations. November 16, 1983.

86.1304 Section numbering; construction. July 13, 2005.

86.1305 Introduction; structure of subpart. August 8, 2014.

86.1333 Transient test cycle generation. April 28, 2014.

A. Federal Provisions. [No change.]

B. California Provisions.

1. *Accessory loads for the low-load cycle* - For 2024 and subsequent model year medium-duty and heavy-duty diesel engines, the accessory loads for the low-load cycle were derived from the GEM model:

1.1 Manufacturers have the option to add an accessory load to any idle

portion of the low-load cycle. The maximum accessory load allowed is dependent on the primary intended service class of the engine, and may not exceed the following values:

Primary Intended Service Class	Accessory load (kW)
Medium-duty or Light heavy-duty	1.5
Medium heavy-duty	2.5
Heavy heavy-duty	3.5

1.2 Continuous idle segments within the low-load cycle that exceed 200 seconds duration are to be run at conditions simulating neutral or park on the transmission.

2. For 2024 and subsequent model year medium-duty and heavy-duty diesel engines, the low-load cycle RPM and torque values are normalized (expressed as a percentage of maximum) in these listings.

2.1 To unnormalize RPM, use the following equation:

$$Actual\ RPM = \frac{\%RPM \times (Max\ Test\ Speed - Curb\ Idle\ Speed)}{100} + Curb\ Idle\ Speed$$

where:

Max Test Speed = the maximum test speed as calculated in Section 1065 of these test procedures.

2.2 Torque is normalized to the maximum torque at the RPM listed with it. Therefore, to unnormalize the torque values in the cycle, the maximum torque curve for the engine in question must be used. The generation of the maximum torque curve is described in Section 1065 of these test procedures.

2.3 Example of the unnormalization procedure. Unnormalize the following test point, given Maximum Test speed = 3800 RPM and Curb Idle Speed = 600 RPM.

Percent RPM = 43

Percent Torque = 82

2.3.1 Calculate actual RPM:

$$\text{Actual RPM} = \frac{43 \times (3,800 - 600)}{100} + 600 = 1,976 \text{ RPM}$$

2.3.2 Determine actual torque: Determine the maximum observed torque at 1,976 RPM from the maximum torque curve. Then multiply this value (e.g., 358 ft-lbs) by 82%. This results in an actual torque of 294 ft-lbs.

86.1360 Supplemental emission test; test cycle and procedures. April 28, 2014.

A. Federal provisions

1. Introductory paragraph. [No change.]
2. Amend subparagraph (a) as follows: Applicability. This section applies to 2005 and subsequent model year heavy duty diesel engines.
3. Amend subparagraph (b) as follows:

3.2. Subparagraph (b)(2): [No change.]

4. Subparagraph (c). [No change.]
5. Subparagraph (d). Determining the control area. [No change.]
6. Subparagraph (e). [Reserve.]
7. Amend subparagraph (f) as follows: Maximum allowable emission limits.

(1) For gaseous emissions, the 12 non-idle test point results and the four-point linear interpolation procedure specified in paragraph (g) of this section for intermediate conditions, shall define Maximum Allowable Emission Limits for purposes of paragraph B.1 of this section except as modified under paragraph (f)(3) of this section. [No change to remainder of paragraph.]

Maximum Allowable Emission Limits

Sample - For Illustration Only

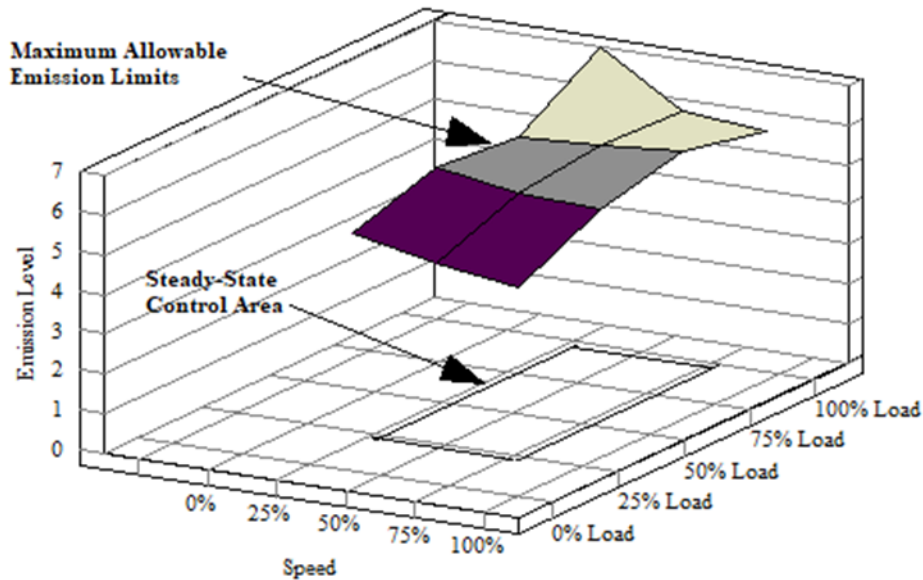


Figure 1

(2) If the weighted average emissions, calculated according to paragraph (e)(6) of this section, for any gaseous pollutant is equal to or lower than required by paragraph B.1 of this section, each of the 13 test values for that pollutant shall first be multiplied by the ratio of the applicable emission standard (under paragraph B.1 of this section) to the weighted average emissions value, and then by 1.10 for interpolation allowance, before determining the Maximum Allowable Emission Limits under paragraph (g)(2) of this section.

(3) [No change.]

8. Subparagraph (g) Calculating intermediate test points. [No change.]

B. California provisions

1. Emission testing caps and procedures for the 2005 and 2006 model years.

1.1 Testing to determine whether an engine meets the applicable emission limits when measured over the supplemental emission test is performed according to section 86.1363-2007. The weighted average exhaust emissions, as determined according to 86.1363-2007(g), for each regulated pollutant shall not exceed 1.0 times the applicable emission standards specified in Part I.11 of these test procedures or FELs specified in §86.007-11(a)(1).

1.2 For engines not having a NO_x FEL less than 1.5 g/bhp-hr, gaseous

exhaust emissions shall not exceed the steady-state interpolated values determined by the Maximum Allowable Emission Limits (for the corresponding speed and load), as determined under subparagraph (g) of this section, when the engine is operated in the steady-state control area defined under subparagraph (d) of this section, during steady-state engine operation.

1.3 For engines with a NO_x FEL less than 1.5 g/bhp-hr, the Maximum Allowable Emission Limit requirements, as determined under Sec. 86.1360-2007(f), do not apply.

1.4 The emission caps specified in this section shall be rounded to the same number of significant figures as the applicable standards in Part I.11 of these test procedures using ASTM E29-93a.

2. In-Use Compliance for 2005 and subsequent model year engines.

The procedures for in-use voluntary and influenced recall for heavy-duty diesel engines under this section are described in title 13, CCR §§2111 through 2140, except as modified by this paragraph for 2005 and 2006 model year engines. In evaluating the scope of the affected population for the purposes of this section, there shall be a rebuttable presumption that the affected population is the engine family to which the tested engines belong. No engine may be used to establish the existence of an emissions exceedance if the engine or vehicle in which it was installed was subject to abuse or improper maintenance or operation, or if the engine was improperly installed, and such acts or omissions caused the exceedance.

2.1 For the purposes of this section, an exceedance of the emission testing caps occurs when the average emissions of the test vehicles or engines, pursuant to title 13, CCR §2139, for any pollutant exceed the emission threshold. For the purposes of this section, emission threshold is defined as:

(i) for a test using vehicle test equipment (e.g., an over-the-road mobile monitoring device such as "ROVER", or a chassis dynamometer), the applicable maximum NO_x emissions limit plus the greater of 0.5 g/bhp-hr or one standard deviation of the data set established pursuant to paragraph B.2.2 of this section; or

(ii) for a test using an engine dynamometer, the applicable maximum NO_x emissions limit plus 0.5 g/bhp-hr.

2.2 Where an engine dynamometer or vehicle test shows an apparent exceedance of the emissions threshold, the party conducting the original test shall repeat such test under the same conditions at least nine times. The mean of the tests shall be used for the averaging of the test vehicle emissions in determining compliance.

2.3 If the average emissions of the test vehicles exceed the emissions threshold, the Executive Officer shall notify the manufacturer in writing of the test results. The manufacturer has the option to submit an influenced recall plan in accordance with title 13, CCR §§ 2113 through 2121 within 45 days or to proceed with performing the engineering analysis and/or conducting further testing in accordance with paragraphs B.2.4 and/or B.2.5 of this section. Upon the completion of testing conducted in paragraph(s) B.2.4 and/or B.2.5 if the test results indicate that the average emissions of the test vehicles exceeds the

emissions threshold, the Executive Officer shall notify the manufacturer in writing of the test results and upon receipt of the notification, the manufacturer shall have 45 days to submit an influenced recall plan in accordance with title 13, CCR §§ 2113 through 2121.

2.4 If the testing conducted under paragraph B.2.1 and title 13, CCR § 2139 was performed using vehicle test equipment, then the engine manufacturer may elect to conduct additional tests of that engine using an engine dynamometer, provided that all environmental and engine operating conditions present during vehicle testing under paragraph B.2.1 and title 13, CCR § 2139 can be reproduced or corrected consistent with paragraph B.2.6 of this section. If the engine manufacturer elects to conduct such additional engine dynamometer tests, it shall provide ARB with at least three business days notice prior to commencement of such testing. If based on such additional tests the engine exceeds the emission threshold, the engine manufacturer may conduct further testing in accordance with paragraph B.2.5 of this section and/or perform an engineering analysis to determine the percentage of the affected population that exceeds the emissions threshold and the emission levels of the exceeding engines. However, the manufacturer may not determine the percentage of the affected population or the emission levels solely on the basis of an engineering analysis unless it demonstrates to the Executive Officer's satisfaction that such analysis alone is sufficient under the circumstances.

2.5 Within 60 days of receiving notice of an exceedance under paragraph B.2.3 of this section, the manufacturer may commence testing of not less than ten additional in-service engines. The manufacturer may conduct these tests using vehicle testing equipment, or using an engine dynamometer, at the manufacturer's option.

2.6 The testing of additional engines under paragraphs B.2.4 and B.2.5 of this section shall be conducted under conditions that are no less stringent than the initial test in terms of those parameters that may affect the result, and, at the manufacturer's option, may be limited to those emission limits and conditions for which apparent exceedances have been identified. Such parameters typically, but not necessarily, include relevant ambient conditions, operating conditions, service history, and age of the vehicle. Prior to conducting any testing, the manufacturer shall submit a test plan to ARB for its review and approval. Within 30 days following ARB's proposed modifications, the manufacturer shall incorporate the proposed modifications and implement the test plan as approved. Special conditioning of test engines shall not be permitted. Where the manufacturer elects to conduct the additional testing utilizing an engine dynamometer, it shall reproduce relevant engine operating and environmental conditions associated with the initial exceedance, provided, however, that correction factors may be used to reproduce temperature, humidity or altitude conditions that cannot be simulated in the laboratory. Regardless of the testing equipment utilized, the test results shall be adjusted to reflect documented test systems error and/or variability in accordance with good engineering practices.

3. Exemptions.

3.1 The requirements set forth in this section do not apply to “ultra-small volume manufacturers” for model years 2005 and 2006. For the purposes of this section, an “ultra-small volume manufacturer” means any manufacturer with California sales less than or equal to 300 new passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, and heavy-duty engines per model year based on the average number of vehicles and engines sold by the manufacturer in the previous three consecutive model years.

3.2 The requirements set forth in this section do not apply to “urban buses”, as defined in title 13, CCR §1956.2, for model years 2005 and 2006.

4. **Determination of NOx Idling Emissions.** The requirements set forth in this subparagraph apply to 2008 and subsequent model year heavy-duty diesel engines certifying to the optional NOx idling emission standard specified in subsection 11.B.6.3, above. To determine whether an engine meets the optional NOx idling emission standard, emissions shall be measured by testing the engine on an engine dynamometer as described below.

4.1 **Test Cycle.** The following 2 mode duty cycle shall be performed on a dynamometer on the test engine:

Mode	Engine Speed (rpm)	Time in mode (seconds)	Engine Load
1	Manufacturer Recommended Curb idle	1800	See subparagraph 4.1.1 below
2	1100	1800	See subparagraph 4.1.2 below

4.1.1 For mode 1, the dynamometer load or torque applied shall be based on the vehicle power requirements during curb idle operation. The engine manufacturer shall determine the curb idle speed and the appropriate test load for the test engine. The load shall include curb idle power requirements needed for operating engine accessories, such as the engine cooling fan, alternator, coolant pump, air compressor, engine oil and fuel pumps and any other engine accessory operated during curb idle of the engine. The load for mode 1 may not include power requirements for operating the air conditioning compressor or for operating on-board accessories, such as a microwave, refrigerator, television, computer, etc., that the vehicle operator may use during rest periods.

4.1.2 For mode 2, the dynamometer load or torque applied shall be based on the vehicle power requirements during idle speed operations of 1100 revolutions per minute (rpm). The engine manufacturer shall determine the appropriate test load for the test engine. The load shall include high engine idle speed power requirements needed for operating engine

accessories, such as the engine cooling fan, alternator, coolant pump, air compressor, engine oil and fuel pumps, air conditioning compressor set at maximum capacity, and any other engine accessory operated during the idle operation of the engine. The total test load shall be equal to the test load so determined plus an additional load of 2 kilowatts to take into account the power needs for operating on-board accessories such as a television, refrigerator, microwave, computer, etc.

4.2 Test Requirements.

4.2.1 **Pre-conditioning.** Prior to measuring emissions, bring the engine to a warm condition as follows:

(a) If the idling test follows directly after testing over the Federal Test Procedure or the supplemental emission tests, consider the engine warm. Bring down the engine to the manufacturer recommended curb idle speed, apply the appropriate load as determined in subparagraph 4.1.1, and start measuring emissions after 10 minutes and only after achieving temperature stability. Temperature stability may be determined as the point at which the engine coolant temperature is within 2% of its mean value for at least 2 minutes.

(b) If the engine is cold, warm-up the engine by operating it at any speed above peak-torque speed and between 65 to 85% of maximum mapped power until the engine coolant's temperature is within 2% of its mean value for at least 2 minutes or until the engine thermostat controls engine temperature.

4.2.2 **Test Sequence.** Following engine warm-up as described in subparagraph 4.2.1, the test shall be performed first for mode 1. Bring down the engine to the curb idle speed, apply the appropriate load as determined in subparagraph 4.1.1, and start measuring emissions after 10 minutes and only after achieving temperature stability. Temperature stability may be determined as the point at which the engine coolant temperature is within 2% of its mean value for at least 2 minutes. Upon completion of mode 1 testing, the engine speed shall be ramped up to 1100 rpm. Once the engine starts operating at 1100 rpm, apply the appropriate load as determined in subparagraph 4.1.2, and start measuring emissions after 10 minutes and only after achieving temperature stability. Temperature stability may be determined as the point at which the engine coolant temperature is within 2% of its mean value for at least 2 minutes. The engine shall be operated for the prescribed time in each mode. The specified test speed shall be held to within ± 50 rpm and the specified torque shall be held to within ± 2 percent of the maximum torque at the test speed.

4.2.3 **Calculations.** For each test mode, calculate the modal average mass emissions level for each regulated pollutant, in grams per hour, the modal average power, in brake horsepower and the modal average speed, in rpm. For compliance, the calculated average NOx emissions of each mode shall not exceed the optional NOx idling emission standard of 30 grams per hour specified in subsection 11.B.6.3 above.

A. Federal provisions.

1. Subparagraph (a) [No change.]
2. Subparagraph (b). Amend subparagraph (b) by replacing the table with the following table:

Engine Testing

Hybrid Powertrain Testing – Road Grade Coefficients⁴

RMC mode	Time in mode (seconds)	Engine speed ^{1,2}	Torque (percent) ^{2,3}	Vehicle speed (mph) ⁴	a	b	c	d	e	f	g	h	CO ₂ weighting (percent) ⁵
1a Steady-state	170	Warm idle	0	Warm Idle	0	0	0	0	0	0	0	0	6
1b Transition	20	Linear Transition	Linear Transition	Linear Transition	-1.898E-08	-5.895E-07	3.780E-05	4.706E-03	6.550E-04	-2.679E-02	-1.027E+00	1.542E+01	
2a Steady-state	173	A	100	V _{refA}	-1.235E-08	-5.506E-07	3.954E-05	1.248E-03	5.287E-04	-3.117E-02	-3.263E-01	1.627E+01	9
2b Transition	20	Linear Transition	Linear Transition	Linear Transition	-1.640E-09	-4.899E-07	2.493E-05	5.702E-04	4.768E-04	-2.389E-02	-2.712E-01	1.206E+01	
3a Steady-state	219	B	50	V _{refB}	8.337E-09	-4.758E-07	1.291E-05	2.874E-04	4.528E-04	-1.803E-02	-1.830E-01	8.808E+00	10
3b Transition	20	B	Linear Transition	V _{refB}	4.263E-09	-5.102E-07	2.010E-05	3.703E-04	4.852E-04	-2.242E-02	-2.068E-01	1.074E+01	
4a Steady-state	217	B	75	V _{refB}	1.686E-10	-5.226E-07	2.579E-05	5.521E-04	5.005E-04	-2.561E-02	-2.393E-01	1.285E+01	10
4b Transition	20	Linear Transition	Linear Transition	Linear Transition	6.556E-10	-4.971E-07	2.226E-05	5.293E-04	4.629E-04	-2.185E-02	-1.819E-01	1.086E+01	
5a Steady-state	103	A	50	V _{refA}	3.833E-09	-4.343E-07	1.369E-05	4.755E-04	4.146E-04	-1.605E-02	-1.899E-01	8.200E+00	12
5b Transition	20	A	Linear Transition	V _{refA}	-7.526E-11	-4.680E-07	2.035E-05	7.214E-04	4.478E-04	-2.012E-02	-2.306E-01	1.043E+01	
6a Steady-state	100	A	75	V _{refA}	-4.195E-09	-4.855E-07	2.624E-05	8.345E-04	4.669E-04	-2.338E-02	-2.547E-01	1.215E+01	12
6b Transition	20	A	Linear Transition	V _{refA}	3.185E-09	-4.545E-07	1.549E-05	6.220E-04	4.308E-04	-1.724E-02	-2.093E-01	8.906E+00	

7a Steady-state	103	A	25	V_{refA}	1.202E-08	-3.766E-07	6.943E-07	1.107E-04	3.579E-04	-8.468E-03	-1.243E-01	4.195E+00	12
7b Transition	20	Linear Transition	Linear Transition	Linear Transition	1.481E-09	-5.004E-07	2.151E-05	6.028E-04	4.765E-04	-2.197E-02	-2.669E-01	1.109E+01	
8a Steady-state	194	B	100	V_{refB}	-8.171E-09	-5.682E-07	3.880E-05	8.171E-04	5.462E-04	-3.315E-02	-2.957E-01	1.689E+01	9
8b Transition	20	B	Linear Transition	V_{refB}	3.527E-09	-5.294E-07	2.221E-05	4.955E-04	4.976E-04	-2.363E-02	-2.253E-01	1.156E+01	
9a Steady-state	218	B	25	V_{refB}	1.665E-08	-4.288E-07	-1.393E-07	2.170E-05	4.062E-04	-1.045E-02	-1.266E-01	4.762E+00	9
9b Transition	20	Linear Transition	Linear Transition	Linear Transition	7.236E-09	-5.497E-07	1.998E-05	1.381E-04	5.110E-04	-2.333E-02	-2.154E-01	1.024E+01	
10a Steady-state	171	C	100	V_{refC}	-7.509E-10	-5.928E-07	3.454E-05	5.067E-04	5.670E-04	-3.353E-02	-2.648E-01	1.649E+01	2
10b Transition	20	C	Linear Transition	V_{refC}	1.064E-08	-5.343E-07	1.678E-05	2.591E-04	5.101E-04	-2.331E-02	-2.017E-01	1.119E+01	
11a Steady-state	102	C	25	V_{refC}	2.235E-08	-4.756E-07	-2.078E-06	-6.006E-05	4.509E-04	-1.213E-02	-1.261E-01	5.090E+00	1
11b Transition	20	C	Linear Transition	V_{refC}	1.550E-08	-5.417E-07	1.114E-05	8.438E-05	5.051E-04	-2.005E-02	-1.679E-01	8.734E+00	
12a Steady-state	100	C	75	V_{refC}	7.160E-09	-5.569E-07	2.234E-05	3.107E-04	5.301E-04	-2.644E-02	-2.177E-01	1.266E+01	1
12b Transition	20	C	Linear Transition	V_{refC}	9.906E-09	-5.292E-07	1.694E-05	2.460E-04	5.058E-04	-2.304E-02	-1.990E-01	1.103E+01	
13a Steady-state	102	C	50	V_{refC}	1.471E-08	-5.118E-07	9.881E-06	1.002E-04	4.864E-04	-1.904E-02	-1.678E-01	8.738E+00	1
13b Transition	20	Linear Transition	Linear Transition	Linear Transition	-1.482E-09	-1.992E-06	6.475E-05	-1.393E-02	1.229E-03	-3.967E-02	1.135E+00	-7.267E+00	
14 Steady-state	168	Warm idle	0	Warm idle	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6

¹Engine speed terms are defined in part 1065 of these test procedures.

²Advance from one mode to the next within a 20 second transition phase. During the transition phase, command a linear progression from the settings of the current mode to the settings of the next mode.

³The percent torque is relative to maximum torque at the commanded engine speed.

⁴See section 1036.505 of these test procedures for a description of powertrain testing with the ramped-modal cycle, including the equation that uses the road-grade coefficients.

⁵Use the specified weighting factors to calculate composite emission results for CO₂ as specified in section 1036.501 of these test procedures.

86.1363-2007 Steady-state testing with a discrete-mode cycle. June 30, 2008.
(Deleted on April 28, 2014, by U.S. EPA, but this section remains unchanged in these test procedure since they were applicable to 2004 through 2009 model year heavy-duty engines.)

86.1370 Not-To-Exceed. October 25, 2016.

A. Federal provisions.

1. Amend subparagraph (a) as follows: General. The purpose of this test procedure is to measure in-use emissions of 2005 through 2023 model year heavy-duty diesel engines while operating within a broad range of speed and load points (the Not-To-Exceed Control Area) and under conditions which can reasonably be expected to be encountered in normal vehicle operation and use. For testing in-use emissions of 2024 and subsequent model year engines, use the method outlined in 86.1370.B.6. of these test procedures. Emission results from this test procedure are to be compared to the Not-To-Exceed Limits specified in paragraph (d)(1) of this section. The Not-To-Exceed Limits specified in paragraph (d)(1) of this section do not apply for engine starting conditions. Tests conducted using the procedures specified in this subpart are considered valid Not-to-Exceed tests (Note: duty cycles and limits on ambient conditions do not apply for Not-To-Exceed tests).

2. Amend subparagraph (b) as follows:

2.1 Introductory paragraph, subparagraphs (b)(1) through (b)(4): [No change.]

2.2 Amend subparagraph (b)(5) as follows: For particulate matter only from 2005 and 2006 model year engines, speed and load points determined by one of the following methods, whichever is applicable, shall be excluded from the Not-To-Exceed Control Area. B and C engine speeds shall be determined according to the provisions of § 86.1360-2007(c): [No change to remainder of paragraph.]

2.3 Amend subparagraphs (b)(6) and (b)(7) as follows: [These requirements will apply for 2007 through 2023 model year engines.]

3. Subparagraph (c) [No change.]

4. Amend subparagraph (d) as follows: Not-to-exceed control area caps.

4.1 Amend subparagraph (d)(1) as follows: Add the following introductory sentence to subparagraph (d)(1): When operated within the Not-To-Exceed Control Area defined in paragraph (b) of this section, diesel engine emissions shall not exceed the applicable Not-To-Exceed Limits specified below when averaged over any time period greater than or equal to 30 seconds, except where a longer minimum averaging period is required by paragraph (d)(2) of this section.

(i)The emission caps specified in this section shall be rounded to the

same number of significant figures as the applicable standards in Part I.11 of these test procedures using ASTM E29-93a.

(ii) For 2005 and 2006 model year engines, when operated within the Not-To-Exceed Control Area defined in paragraph (b) of this section, diesel engine brake-specific exhaust emissions in grams/bhp-hr (as determined under paragraphs (b) and (c) of this section), for each regulated pollutant, shall not exceed 1.25 times the applicable emission standards specified in Part I.11 of these test procedures during engine and vehicle operation specified in paragraph (e)(1) of this section, except as noted in paragraph (e)(2) of this section, when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

(iii) For 2007 through 2023 model year engines having a NO_x FEL less than 1.50 g/bhp-hr, the brake-specific exhaust NMHC or NO_x emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the NTE test procedures, shall not exceed 1.5 times the applicable NMHC or NO_x emission standards or FELs specified in Part I.11 of these test procedures, during engine and vehicle operation specified in subdivisions (b), (e), (f), and B.1 of this section when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

(iv) For 2007 through 2023 model year engines not having a NO_x FEL less than 1.50 g/bhp-hr, the brake-specific NO_x and NMHC exhaust emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.25 times the applicable emission standards or FELs specified in Part I.11 of these test procedures during engine and vehicle operation specified in paragraphs (b), (e), (f), and (g) of this section when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

(v) For 2007 through 2023 model year engines, the brake-specific exhaust PM emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.5 times the applicable PM emission standards or FEL (for FELs above the standard only) specified in Part I.11 of these test procedures, during engine and vehicle operation specified in paragraphs (b), (e), (f), and B.1 of this section when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

4.2 Subparagraph (d)(2) [No change.]

4.3 Add the following subparagraph (d)(3): For 2005 through 2023 model year heavy-duty engines, operation within the Not-to-Exceed Control Area (defined in paragraph (b) of this section) must also comply with the following:

(i) A filter smoke number of 1.0 under steady-state operation, or the following alternate opacity limits:

(A) A 30 second transient test average opacity limit of 4% for a 5

- inch path; and
(B) A 10 second steady state test average opacity limit of 4% for a 5 inch path.

(ii) The limits set forth in paragraph (d)(3)(i) of this section refer to exhaust smoke emissions generated under the conditions set forth in paragraphs (b) and (e) of this section and calculated in accordance with the procedures set forth in §86.1372-2007.

5. Amend subparagraph (e) as follows: Ambient corrections.

5.1 Introductory paragraph: [No change.]

5.2 Subparagraph (e)(1) For engines operating within the ambient conditions specified in paragraph B.1.1 of this section. [No change to remainder of paragraph.]

5.3 Amend subparagraph (e)(2) as follows: For engines operating within the ambient conditions specified in paragraph B.1.2 of this section; [No change to remainder of section.]

6. Subparagraphs (f) through (j). [No change.]

B. California provisions.

1. Ambient operating regions. For each engine family, the not-to-exceed emission limits must apply during one of the following two ambient operating regions;

1.1 The not-to-exceed emission limits apply for all altitudes less than or equal to 5,500 feet above sea-level, during all ambient conditions (temperature and humidity). Temperature and humidity ranges for which correction factors are allowed are specified in paragraph (e) of this section; or

1.2 The not-to-exceed emission limits apply at all altitudes less than or equal to 5,500 feet above sea-level, for temperatures less than or equal to the temperature determined by the following equation at the specified altitude;

$$T = -0.00254 \times A + 100$$

Where:

T = ambient air temperature in degrees Fahrenheit

A = altitude in feet above sea-level (A is negative for altitudes below sea-level)

Temperature and humidity ranges for which correction factors are allowed are specified in section (e).

2. In-Use Compliance. The procedures for in-use voluntary and influenced recall for heavy-duty diesel engines under this section are described in title 13, CCR §§ 2111 through 2140, except as modified by this paragraph for 2005 and 2006 model year engines. In evaluating the scope of the affected population for the purposes of this section, there shall be a rebuttable presumption that the affected population is the engine family to which the tested engines belong. No engine may be used to establish the existence of an emissions exceedance if the engine or vehicle in which it was installed was subject to abuse or improper maintenance or

operation, or if the engine was improperly installed, and such acts or omissions caused the exceedance.

2.1 For the purposes of this an exceedance of the emission testing caps occurs when the average emissions of the test vehicles or engines, pursuant to title 13, CCR § 2139, for any pollutant exceed the emission threshold. For the purposes of this section, emission threshold is defined as:

(i) for a test using vehicle test equipment (e.g., an over-the-road mobile monitoring device such as "ROVER", or a chassis dynamometer), the applicable maximum NO_x emissions limit plus the greater of 0.5 g/bhp-hr or one standard deviation of the data set established pursuant to paragraph B.2(2) of this section; or

(ii) for a test using an engine dynamometer, the applicable maximum NO_x emissions limit plus 0.5 g/bhp-hr.

2.2 Where an engine dynamometer or vehicle test shows an apparent exceedance of the emissions threshold, the party conducting the original test shall repeat such test under the same conditions at least nine times. The mean of the tests shall be used for the averaging of the test vehicle emissions in determining compliance.

2.3 If the average emissions of the test vehicles exceed the emissions threshold, the Executive Officer shall notify the manufacturer in writing of the test results. The manufacturer has the option to submit an influenced recall plan in accordance with title 13, CCR §§ 2113 through 2121 within 45 days or to proceed with performing the engineering analysis and/or conducting further testing in accordance with paragraphs B.2.4 and/or B.2.5 of this section. Upon the completion of testing conducted in paragraph(s) B.2.2 and/or B.2.5, if the test results indicate that the average emissions of the test vehicles exceeds the emissions threshold, the Executive Officer shall notify the manufacturer in writing of the test results and upon receipt of the notification, the manufacturer shall have 45 days to submit an influenced recall plan in accordance with title 13, CCR §§ 2113 through 2121.

2.4 If the testing conducted under paragraph B.2.1 and title 13, CCR § 2139 was performed using vehicle test equipment, then the engine manufacturer may elect to conduct additional tests of that engine using an engine dynamometer, provided that all environmental and engine operating conditions present during vehicle testing under paragraph B.2.1 and title 13, CCR § 2139 can be reproduced or corrected consistent with paragraph B.2.6 of this section. If the engine manufacturer elects to conduct such additional engine dynamometer tests, it shall provide ARB with at least three business days' notice prior to commencement of such testing. If based on such additional tests the engine exceeds the emission threshold, the engine manufacturer may conduct further testing in accordance with paragraph B.2.5 of this section and/or perform an engineering analysis to determine the percentage of the affected population that exceeds the emissions threshold and the emission levels of the exceeding engines. However, the manufacturer may not determine the percentage of the affected population or the emission levels solely on the basis of an engineering

analysis unless it demonstrates to the Executive Officer's satisfaction that such analysis alone is sufficient under the circumstances.

2.5 Within 60 days of receiving notice of an exceedance under paragraph B.2.3 of this section, the manufacturer may commence testing of not less than ten additional in-service engines. The manufacturer may conduct these tests using vehicle testing equipment, or using an engine dynamometer, at the manufacturer's option.

2.6 The testing of additional engines under paragraphs B.2.4 and B.2.5 of this section shall be conducted under conditions that are no less stringent than the initial test in terms of those parameters that may affect the result, and, at the manufacturer's option, may be limited to those emission limits and conditions for which apparent exceedances have been identified. Such parameters typically, but not necessarily, include relevant ambient conditions, operating conditions, service history, and age of the vehicle. Prior to conducting any testing, the manufacturer shall submit a test plan to ARB for its review and approval. Within 30 days following ARB's proposed modifications, if any, the manufacturer shall incorporate the proposed modifications and implement the test plan as approved. Special conditioning of test engines shall not be permitted. Where the manufacturer elects to conduct the additional testing utilizing an engine dynamometer, it shall reproduce relevant engine operating and environmental conditions associated with the initial exceedance, provided, however, that correction factors may be used to reproduce temperature, humidity or altitude conditions that cannot be simulated in the laboratory. Regardless of the testing equipment utilized, the test results shall be adjusted to reflect documented test systems error and/or variability in accordance with good engineering practices.

3. Deficiencies for NTE requirements.

3.1 For model years 2005 through 2009, upon application by the manufacturer, the Executive Officer may accept a HDDE as compliant with the NTE requirements even though specific requirements are not fully met. Such compliances without meeting specific requirements, or deficiencies, will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: technical feasibility of the given hardware and lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers. Deficiencies will be approved on a engine model and/or horsepower rating basis within an engine family, and each approval is applicable for a single model year. A manufacturer's application must include a description of the auxiliary emission control device(s) which will be used to maintain emissions to the lowest practical level, considering the deficiency being requested, if applicable. An application for a deficiency must be made during the certification process; no deficiency will be granted to retroactively cover engines already certified.

3.2 Unmet requirements should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Executive Officer. The NTE deficiency should only be seen as an allowance

for minor deviations from the NTE requirements. The NTE deficiency provisions allow a manufacturer to apply for relief from the NTE emission requirements under limited conditions. ARB expects that manufacturers should have the necessary functioning emission control hardware in place to comply with the NTE.

3.3 For model years 2010 through 2013, the Executive Officer may allow up to three deficiencies per engine family. The provisions of §86.007-11 (a)(4)(iv)(A) and §86.007-11 (B) apply for deficiencies allowed by §86.007-11 (a)(4)(iv)(C). In determining whether to allow the additional deficiencies, the Executive Officer may consider any relevant factors, including the factors identified in §86.007-11 (a)(4)(iv)(A). If additional deficiencies are approved, the Executive Officer may set any additional conditions that he/she determines to be appropriate.

4. Exemptions.

4.1 The requirements set forth in this section do not apply to “ultra-small volume manufacturers” for model years 2005 and 2006. For the purposes of this section, an “ultra-small volume manufacturer” means any manufacturer with California sales less than or equal to 300 new passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, and heavy-duty engines per model year based on the average number of vehicles and engines sold by the manufacturer in the previous three consecutive model years.

4.2 The requirements set forth in this section do not apply to “urban buses”, as defined in title 13, CCR, § 1956.2, for model years 2005 and 2006.

5. Submission of NTE deficiencies and limited testing region information. Manufacturers are not required to provide engine information exclusively related to in-use testing as part of initial certification. However, upon request from ARB, the manufacturers must provide the information which clearly identifies parameters defining all NTE deficiencies described under subparagraph B.3. of this section and parameters defining all NTE limited testing regions described under 86.1370-07(b)(6) and (7) that are requested. When requested, deficiencies and limited testing regions must be reported for all engine families and power ratings in English with sufficient detail for us to determine if a particular deficiency or limited testing region will be encountered in the emission test data from the portable emission-sampling equipment and field-testing procedures referenced in Part 1065, subpart J of these test procedures as applicable. Such information is to be provided within 60 days of the request from ARB.

6. Test Procedures for Three Binned Moving Average Window (3B-MAW) Method for diesel engines.

For 2024 and subsequent model year engines, the 3B-MAW method described in this paragraph 6 applies to the manufacturer-run program described in Part 86 Subpart T of these test procedures – Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines and the CARB Heavy Duty In-Use Compliance Testing.

A test with the 3B-MAW consists of one shift-day. To complete a shift-day's worth of testing, start sampling at the beginning of a shift and continue sampling for the whole shift, subject to the calibration requirements of PEMS. A shift-day is the period of a normal workday for an individual employee. A shift-day must begin with a cold start, where the engine coolant is equal to or less than 86 deg. F (30 deg. C). The engine may be shut down and keyed on during the shift-day, but the PEMS must remain active and recording throughout the shift-day.

If a manufacturer believes that conditions may be infeasible to meet the cold start requirements (for example, due to ambient temperatures that are too high), the manufacturer may request approval from the Executive Officer to begin the shift-day without a cold start, as part of the test plan approval process in 86.1920.B.3.2.

6.1 Moving Average Window principle: Mass emissions for the pollutants (NMHC, CO, NO_x, and PM) shall be evaluated using a moving average window method, based on a reference time of 300 seconds. Mass emissions are not calculated for the complete shift-day, but for subsets equal to 300 seconds in length, and referred to as "windows". Windows will overlap each other with a time increment, Δt , equal to the data sampling rate of 1 second. Start of windows begins every valid second in the data set.

6.2 Exclusions. Only valid data, as described in this section, shall be considered in calculating window duration, work, CO₂ mass, and criteria emissions of the averaging window. If the window encounters invalid data, skip the invalid data, and include seconds of valid data to compensate at the end of the window to a total window of 300 seconds of valid data. For windows using the exclusions in 6.2.1 through 6.2.8, if the invalid data is continuous for a consecutive period greater than 600 seconds, the window ends and a new window would need to be generated once valid data is encountered again. In cases where invalid data is in excess of 600 seconds, a detailed explanation of the cause of invalid data conditions must be documented in the reporting requirements of 86.1920 of these test procedures. Data collected during any of the following conditions shall be considered invalid data and shall be excluded from compliance determination:

6.2.1 Zero drift check or conditioning of the PEMS instrumentation

6.2.2 Atmospheric pressure less than 82.5 kPa

6.2.3 Ambient air temperature less than 19 deg. F (-7 deg. C)

6.2.4 Altitudes greater than 5,500 feet above sea-level; or

6.2.5 For altitudes less than or equal to 5,500 feet above sea level, temperatures greater than the temperature determined by the following

equation at the specified altitude shall be considered invalid data:

$$T_{invalid} > -0.00254 \times h + 100$$

Where:

$T_{invalid}$ is the ambient air temperature threshold where above this temperature the data is considered invalid at a specific altitude, in degrees Fahrenheit

h is the altitude above sea-level, in feet (h is negative for altitudes below sea-level)

6.2.6 For 2024 through 2026 model year engines, engine coolant temperature is less than 158 deg. F (70 deg. C) and engine coolant temperature is not stabilized within ± 3.6 deg. F (± 2 deg. C) over a period of five minutes

6.2.7 Vehicle operation during indicated manual active regeneration and automatic active regeneration

6.2.8 Vehicle operation where the engine is shut-off or keyed off while the engine rpm is equivalent to zero

6.3 Valid tests.

Retesting must be conducted if a test is determined to be invalid. A valid test is determined by meeting all of the following conditions:

6.3.1 Test start: emissions sampling (NMHC, CO, NOx, PM and CO₂), exhaust flowrate parameters, and sampling of relevant OBD parameters, and ambient temperature and humidity shall commence prior to starting the engine. The coolant temperature shall not exceed 86 deg. F (30 deg. C) at the beginning of the test. If the ambient temperature and the coolant temperature exceeds 86 deg. F (30 deg. C) at the start of the test, the test is void and testing shall be rescheduled. If a manufacturer believes that conditions may be infeasible to meet the cold start requirements (for example, due to ambient temperatures that are too high), the manufacturer may request approval from the Executive Officer to begin the shift-day without a cold start as part of the test plan approval process in 86.1920.B.3.2.

6.3.2 Each bin will be required to have a minimum of 2,400 valid windows. If the 2,400 valid windows in any bin is not achieved, continue testing additional days as necessary to achieve the minimum window requirements for each bin. If testing on the first or subsequent shift-day fulfills the valid window requirements for the low load and the medium/high load bins, but does not fulfill the valid window requirements of the idle bin, then the manufacturer may instruct the fleet to idle the test engine at the end of the

shift day for a minimum of forty minutes and a maximum of sixty minutes to satisfy the valid window requirement of the idle bin.

6.3.3 For 2024 through 2026 model year engines only, the average engine power over the test must be equal to or greater than 10% of the engine's peak power for a valid test. In the event of an invalid test, the manufacturer shall retest the vehicle additional days until a valid test is achieved.

6.4 Percent engine load:

The percent engine load of a window will be used to bin the data in section 6.5 Window Binning. Window percent engine load is calculated by dividing average CO₂ emission rate [g CO₂/hour] during the 300 second window by the product of the engine's FTP CO₂ family certification level (FCL) value and the maximum power output of the engine defined in section 1065.510 of these test procedures.

$$\text{Percent Engine Load}_{\text{window}} = \frac{3,600 \text{ sec/hr}}{\text{FCL} \times \text{HP}_{\text{max}}} \times \frac{\sum_{t=1}^{300} (\dot{m}_{\text{CO}_2} \times \Delta t)}{300 \text{ sec}}$$

Where,

*Percent Engine Load*_{window} is the percent engine load calculated with the average CO₂ emission rate and the FCL

*m*_{CO₂} mass emission rate of CO₂ [g CO₂/sec]

FCL is the family certification level on the FTP cycle [g CO₂/bhp-hr]

HP_{max} is the maximum rated engine horsepower [bhp]

Δ*t* is equal to the data sampling rate [1 second]

6.5 Window Binning.

Windows are categorized into one of three bins: idle, low load, and medium/high load, as determined by percent engine load over 300 seconds of operation.

6.5.1 Idle bin

The window's percent engine load is less than or equal to 6%

6.5.2 Low-load bin

The window's percent engine load is greater than 6% and less than or equal to 20%.

6.5.3 Medium-/high-load bin

The window's percent engine load is greater than 20%

6.6 Emissions testing evaluation and vehicle pass criteria

Sum-over-Sum (SOS) Evaluation:

To determine in-use compliance, the Bin emissions for each criteria

pollutant (NMHC, CO, NOx, and PM) shall be calculated for each of the three bins (idle, low, medium/high). For the low-load and medium/high-load bins, SOS emissions are calculated for each pollutant using the equation:

$$e_{sos\ a,b} = \frac{\sum_{k=1}^{n_b} \sum_{t=1}^{300} (\dot{m}_a \times \Delta t)}{\sum_{k=1}^{n_b} \sum_{t=1}^{300} (\dot{m}_{CO_2} \times \Delta t)} \times FCL$$

Where:

$e_{sos\ a,b}$ is the SOS emissions [g/bhp-hr] of a pollutant in a bin, where subscript “a” is the pollutant (NMHC, CO, NOx, and PM) and “b” refers to the low-load bin or medium/high-load bin

\dot{m}_a is the mass emission rate of pollutant a [g/sec]

\dot{m}_{CO_2} is the mass emission rate of CO₂ emitted [g/sec]

n_b is the number of windows in a bin

Δt is equal to the data sampling rate [1 second]

FCL is the family certification level on the FTP cycle [g CO₂/bhp-hr]

For idle bin emissions, the SOS emissions are calculated using the following equation:

$$e_{sos\ a,idle} = \frac{\sum_{k=1}^{n_{idle}} \sum_{t=1}^{300} (\dot{m}_a \times \Delta t)}{\sum_{k=1}^{n_{idle}} \sum_{t=1}^{300} (\Delta t)} \times \frac{3,600sec}{1hr}$$

Where:

$e_{sos\ a,idle}$ is the SOS emission for pollutant, a, in the idle bin [g/hr]

\dot{m}_a is the mass emission rate of pollutant a [g/sec]

n_{idle} is the number of windows in the idle bin

Δt is equal to the data sampling rate [1 second]

Since NOx is the only pollutant with an idle standard, pollutant “a”, in this equation represents only NOx emissions.

The engine pass criteria is determined by comparing each bin’s SOS criteria emission for each of the three bins to the In-Use thresholds in the table below. The engine passes the test if the SOS emissions are less than the defined threshold for each and every bin and for each and every pollutant. The engine fails the test if any pollutant in any bin’s SOS emissions exceeds the applicable threshold.

Table of Bin Structure Definitions, Applicable Standards, and In-Use thresholds

Bin	Percent Engine Load	The SOS Emissions In-use Threshold
Idle	$Percent\ Engine\ Load_{window} \leq 6\%$	$e_{SOS\ a,Idle} \leq CF^B \times Idle\ standard^A$
Low	$6\% < Percent\ Engine\ Load_{window} \leq 20\%$	$e_{SOS\ a,Low} \leq CF^B \times LLC\ standard^A$
Medium/High	$20\% < Percent\ Engine\ Load_{window}$	$e_{SOS\ a,MedHigh} \leq CF^B \times FTP/RMC\ standard^A$

^A The applicable standards can be found in title 13, CCR, § 1956.8

^B For 2024 through 2029 model year engines, the conformity factor, CF, is equal to 2.0. For 2030 and subsequent model year engines, the conformity factor, CF, is equal to 1.5.

7. In-Use Compliance Testing for Idling Emissions:

Except for engines certified in accordance with the provisions specified in 13 CCR section 1956.8(a)(2)(C)2, for 2024 and subsequent model year heavy-duty diesel engines used in medium duty vehicles 10,001 – 14,000 pounds GVWR and heavy-duty vehicles over 14,000 pounds GVWR that are optionally certified to the idling NOx emission standards specified in subparagraph I.11.B.6, above, the Executive Officer may conduct in-use compliance emissions testing to determine whether the engine complies with the idling NOx emission standard to which the engine is certified. The Executive Officer may follow the following procedure specified in this subparagraph 7 to determine compliance:

7.1 In-use compliance emission testing may be conducted using chassis dynamometer in the laboratory or using an on-board PEMS.

7.2 The engine may be tested to warm engine coolant conditions. If the engine is cold, emissions measurements will begin when either of the following conditions are met:

7.2.1 the engine coolant temperature has reached 70°C or 158°F for the first time since engine start, or

7.2.2 after the coolant temperature is stabilized within +/- 2°C over a period of 5 minutes, whichever occurs first.

7.3 The vehicle will be tested with properly functioning engine and vehicle accessories such as engine cooling fan, alternator, coolant pump, air compressor, engine oil and fuel pumps and any other accessory needed for a normal operation of the vehicle at idle speed. Additionally, the cab air conditioning system may be set to maximum heating or cooling during the test.

7.4 Emissions will be measured for a minimum of 30 minutes at an engine idle speed equal to the curb idle speed set by the manufacturer or any other elevated idle speed up to 1100 revolutions per minute.

7.5 For compliance, the calculated average NOx emissions from the test shall not exceed the optional NOx idling emission standard applicable for the engine model year specified in section I.11.B.6.

86.1372 Measuring smoke emissions within the NTE zone. April 28, 2014.

This section contains the measurement techniques to be used for determining compliance with the filter smoke limit or opacity limits in §86.1370-2007 (d)(3)(i).
[No change to remainder of section.]

Subpart S – General Compliance Provisions for Control of Air Pollution From New and In-Use Light-Duty Vehicles, Light-Duty Trucks, and Complete Otto-Cycle Heavy-Duty Vehicles.

86.1863-07 Optional chassis certification for diesel vehicles. September 15, 2011.

1. Amend subparagraph (a) as follows: For the 2004 through 2014 model years, a manufacturer may optionally certify heavy-duty diesel vehicles weighing 14,000 pounds GVWR or less to the emission standards specified in title 13, CCR, §1961. Such vehicles must meet all applicable requirements of the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” as incorporated by reference in title 13, CCR, §1961(d). For the 2015 through 2019 model years, a manufacturer may optionally certify heavy-duty diesel vehicles weighing 8,500 to 10,000 pounds GVWR or less to the emission standards specified in title 13, CCR, §1961 or §1961.2, as applicable. Such vehicles must meet all applicable requirements of the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” incorporated by reference in section 1961.2, title 13, CCR. For the 2015 and subsequent model years, a manufacturer may optionally certify heavy-duty diesel vehicles weighing 10,001 to 14,000 pounds GVWR or less to the emission standards specified in title 13, CCR, §1961.2. Such vehicles must meet all applicable requirements of the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” incorporated by reference in section 1961.2, title 13, CCR. For the 2020 and subsequent model years, heavy-duty diesel vehicles 8,501 to 10,000 pounds GVW must certify to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR.

2. Amend subparagraph (b) as follows: Diesel vehicles optionally certified under this section are subject to the OBD requirements of title 13, CCR, §1968.2.

3. Subparagraphs (c) to (g). [No change.]

4. Subparagraphs (h) and (i). [No change.]

Subpart T - Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines.

86.1901 What testing requirements apply to my engines that have gone into service? November 8, 2010.

86.1905 How does this program work? November 8, 2010.

1. Subparagraphs (a) through (f). [No change.]
2. Amend subparagraph (g) as follows: For any communication related to this subpart, contact the to the In-Use Programs Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave, Riverside, CA 92507.

86.1908 How must I select and screen my in-use engines? June 14, 2005.

1. Amend subparagraph (a) as follows:

1.1 Subparagraph (a)(1) through (a)(5). [No change.]

1.2 Amend subparagraph (a)(6) as follows: The engines have not been misfueled. The use of commercially available diesel and biofuel blends that meets California's fuel specifications in title 4, CCR, section 4148, will not be considered misfueled for 2024 and subsequent model year engines.

1.3 Subparagraphs (a)(7) through (a)(8). [No change.]

1.4 Amend subparagraph (a)(9) as follows: The vehicles have not exceeded the applicable useful life, in miles or years as defined in title 13, CCR, section 2112; you may otherwise not exclude engines from testing based on their age or mileage.

1.5 Subparagraph (a)(10). [No change.]

2. Subparagraph (b) through (d). [No change.]

86.1910 How must I prepare and test my in-use engines? October 25, 2016.

A. Federal Provisions

1. Subparagraphs (a) through (b). [No change.]

2. Amend subparagraph (c) as follows:

2.1 Subparagraph (c)(1). [No change.]

2.2 Amend subparagraph (c)(2) as follows:

(i) For 2005 through 2023 model year engines, you may use any biodiesel fuel blend that is either expressly allowed or not otherwise indicated as an unacceptable fuel in the vehicle's owner or operator manual or in the engine manufacturer's published fuel recommendations.

(ii) For 2024 and subsequent model year engines, you may use any commercially available biodiesel fuel blend.

2.3 Amend subparagraph (c)(3) as follows:

(i) For 2005 through 2023 model year engines, you may drain a prospective test vehicle's fuel tank(s) and refill the tank(s) with diesel fuel conforming to ASTM D 975 specifications described in paragraph (c)(1) of this section.

(ii) For 2024 and subsequent model year engines, you may drain a prospective test vehicle's fuel tank(s) and refill the tank(s) with diesel fuel conforming to ASTM D 975 specifications or commercially available biodiesel described in paragraph (c)(1) or (c)(2)(ii) of this section.

2.4 Subparagraphs (c)(4) through (c)(6). [No change.]

3. Subparagraph (d). [No change.]

4. Amend subparagraph (e) as follows: For Phase 1 testing, for 2007 through 2023 model year engines, you must test the engine under conditions reasonably expected to be encountered during normal vehicle operation and use consistent with the general NTE requirements in section 86.1370.A.1 of these test procedures. For 2024 and subsequent model year engines, for Phase 1 testing you must test the engine under conditions reasonably expected to be encountered and use consistent with 3B-MAW requirements described in sections 86.1370.B.6, 86.1910, and 86.1912 of these test procedures. For the purpose of this subpart, normal operation and use would generally include consideration of the vehicle's normal routes and loads (including auxiliary loads such as air conditioning in the cab), normal ambient conditions, and the normal driver.

5. Subparagraphs (f). [No change.]

6. Amend subparagraph (g) as follows:

(g) Once an engine is set up for testing, test the engine for at least one shift-day.

For 2005 to 2023 model year engines, to complete a shift-day's worth of testing, start sampling at the beginning of the shift and continue sampling for the whole shift, subject to the calibration requirements of the portable emissions measurements systems. For 2024 and subsequent model year engines, to complete a shift-day's worth of testing, start sampling before starting the engine at the beginning of a shift and continue sampling for the whole shift, subject to the calibration requirements of the portable emissions measurement systems. A shift-day is the period of a normal workday for an individual employee. For 2005 to 2023 model year engines, if the first shift-day of testing does not involve at least 3 hours of accumulated non-ide operation, repeat the testing for second shift-day and report the results from both days of testing. If the second shift-day of testing also does not result in at least 3 hours of accumulated non-ide operation, you may choose whether or not to continue testing with that vehicle. For 2024 and subsequent model year engines, if the first shift-day of testing does not achieve 2,400 valid windows for each bin, repeat the testing for an additional shift-day until the valid window requirements per bin are achieved.

(i) For 2005 to 2023 model year engines, if after two shift-days you discontinue testing before accumulating 3 hours of non-idle operation on

either day, evaluate the valid NTE samples from both days of testing as described in 86.1912 and include the data in reporting and record keeping requirements specified in 86.1920 and 1925. Count the engine toward meeting your testing requirements under this subpart and use the data for deciding whether additional engines must be tested under the applicable Phase 1 or Phase 2 test plan.

If testing on the first or subsequent shift-day fulfills the valid window requirements for the low load and the medium/high load bins, but does not fulfill the valid window requirements of the idle bin, then the manufacturer may instruct the fleet to idle the test engine at the end of the shift day for a minimum of forty minutes and a maximum of sixty minutes to satisfy the valid window requirement of the idle bin.

7. Subparagraph (h). [No change.]

8. Amend subparagraph (i) as follows:

(i) For 2005 through 2023 model year engines, you may count a vehicle as meeting the vehicle-pass criteria described in § 86.1912 if a shift day of testing or two-shift days of testing (with the requisite non-idle/idle operation time as in paragraph (g) of this section), or if the extended testing you elected under paragraph (h) of this section does not generate a single valid NTE sampling event, as described in § 86.1912(b). Count the vehicle towards meeting your testing requirements under this subpart.

9. Subparagraph (j). [No change.]

86.1912 How do I determine whether an engine meets the vehicle-pass criteria? October 25, 2016.

A. Federal Provisions [No change.]

B. California Provisions

1. For 2024 and subsequent model year engines, use the methods in section 86.1370.B.6 of these test procedures to determine whether an engine meets the vehicle-pass criteria.

86.1915 What are the requirements for Phase 1 and Phase 2 testing? June 14, 2005.

A. Federal Provisions

1. Introductory paragraph through (a). [No change.]

2. Amend subparagraph (a)(1) as follows: Start by measuring emissions from five engines using the procedures described in 40 CFR part 1065, subpart J. If all five engines comply fully with the vehicle-pass criteria in section 86.1912 of these test procedures for all pollutants, you may stop testing. This completes your testing

requirements under this subpart for the applicable calendar year for that engine family.

3. Subparagraph (a)(2). [No change.]

4. Amend subparagraph (a)(3) as follows: If your testing results under paragraphs (a)(1) and (a)(2) of this section do not satisfy the criteria for completing your testing requirements under those paragraphs for all pollutants, that is, two or more engines do not satisfy the criteria, test four additional engines so you have tested a total of ten engines, unless based on the initial results you declare that the engine family is in non-compliance.

5. Subparagraph (a)(4) to (b)(3). [No change.]

6. Amend subparagraph (b)(4): For 2023 and earlier model years only, you may under any circumstances elect to conduct Phase 2 testing following the completion of Phase 1 testing. All the provisions of paragraph (c) of this section apply to Phase 2 testing.

7. Subparagraph (c), [No change]

B. California Provisions

1. For 2024 and subsequent model year engines, the provisions for Phase 2 testing will no longer be applicable. If an engine family is found to be in non-compliance as a result of Phase 1 testing under this section, you must notify the CARB Executive Officer within 15 days of the failure with the intent to submit a recall plan. The recall plan must be submitted within 45 days of notifying the CARB Executive Officer.

2. For 2024 and subsequent model year engines, use the 3B-MAW methods in 86.1370.B.6 of these test procedures, instead of the methods in section 86.1912.A of these test procedures, to determine compliance with the requirements of this section.

3. For 2024 and subsequent model year engines, the engine family is deemed to be noncompliant if the Phase 1 testing meets any of the following criteria:

3.1 The sum-over-sum emissions of the same pollutant and same bin exceed the in-use threshold (86.1370.B.6) for three or more tests.

3.2 Any of the average SOS values exceed the applicable in-use emission threshold defined in (86.1370.B.6.) The average SOS value is calculated from the arithmetic mean of 10 vehicles from Phase 1 testing for each of pollutants (NMHC, CO, NOx, and PM) and for each of the bins (idle, low, med./high).

4. For 2024 and subsequent model year engines, if your testing results under paragraphs 86.1915.A(a)(1) and (a)(2) of this section do not satisfy the criteria for completing your testing requirements under those paragraphs for all pollutants, test

four additional engines so you have tested a total of ten engines, or you may concede the engine family is in non-compliance based on the initial results.

5. For 2024 and subsequent model year engines, Phase 1 testing is considered complete if any of the following conditions are met:

5.1 A total of five valid engines were tested and analyzed with the methods in section 86.1370.B.6.6. and all five engines completely fulfilled the engine pass criteria.

5.2 A total of six valid engines were tested and analyzed with the methods in section 86.1370.B.6.6. and five of the six engines completely fulfilled the engine pass criteria.

5.3 A total of 10 valid engines were tested and analyzed with the methods in 86.1370.B.6 and the arithmetic mean of the 10 engine's sum-over-sum values in §86.1370.B.6.6. are less than the in-use thresholds for each bin and pollutant.

5.4 The engine manufacturer declares the engine family is in noncompliance and begins discussions with the Executive Officer for corrective action.

86.1917 How does in-use testing under this subpart relate to the emission-related warranty in Section 207(a)(1) of the Clean Air Act? June 14, 2005.

1. Amend subparagraph (a) as follows: An exceedance of the NTE found through the in-use testing program under this subpart is not by itself sufficient to show a breach of warranty under title 13, CCR, section 2036. [No change to remainder of paragraph.]

2. Amend subparagraph (b) as follows: To the extent that in-use NTE testing does not reveal such a material deficiency at the time of sale in the design or manufacture of an engine compared with the certified engine, or a defect in the materials and workmanship of a component or part, test results showing an exceedance of the NTE by itself would not show a breach of warranty under title 13, CCR, section 2036.

86.1920 What in-use testing information must I report to ARB? October 25, 2016.

A. Federal Provisions

1. Amend subparagraph (a) as follows: Send us electronic reports using an approved information format to the In-Use Programs Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave, Riverside, CA 92507. If you want to use a different format, send us a written request with justification.

2. Subparagraphs (b)(1) to (b)(4)(vi). [No change.]

3. Amend subparagraph (b)(4)(vii) as follows:

Ambient temperature, dewpoint, and atmospheric pressure at the start and finish of each valid NTE event for model year 2005 to 2023 engines. For 2024 and subsequent model year engines, ambient temperature, dewpoint, and atmospheric pressure at the start and finish of each valid window.

4. Amend subparagraph (b)(4)(viii) as follows:
 - (i) For 2005 to 2023 model year engines, the number of valid NTE events (see 86.1912(b) of these test procedures).
 - (ii) For 2024 and subsequent model year engines, the total number of windows and the number of windows per bin.
5. Amend subparagraph (b)(4)(ix) as follows:

For 2005 to 2023 model year engines, average emissions of each pollutant over each valid NTE event. Describe the method you used to determine NMHC as specified in 40 CFR part 1065, subpart J. See appendix I of this subpart for an example of graphically summarizing NTE emission results. For 2024 and subsequent model year engines, conduct analysis as described in Binned Moving Average Windows in 86.1370.B.6 of these test procedures.
6. Subparagraph (b)(4)(x). [No change.]
7. Amend subparagraph (b)(4)(xi) as follows:

For 2005 to 2023 model year engines, vehicle-pass ratios (see § 86.1912(e)).
8. Subparagraph (b)(4)(xii). [No change.]
9. Amend subparagraph (b)(5) as follows:

For each engine family, identify the applicable requirements as follows:

 - (i) The applicable in-use thresholds. For 2005 to 2023 model year engines identify the NTE threshold in 86.1912 subparagraph a of these test procedures. For 2024 and subsequent model year engines identify the in-use thresholds for the 3B-MAW in 86.1370.B.6.6 of these test procedures.
 - (ii) Vehicle and engine information needed to identify the limited testing regions under §86.1370-2007(b)(6) and (7) for 2005 to 2023 model year engines.
 - (iii) Vehicle and engine information needed to identify any approved NTE deficiencies under §86.007-11(a)(4)(iv) for 2005 to 2023 model year engines.
10. Subparagraphs (b)(6) to (c). [No Change]
11. Amend subparagraph (d) as follows: Send us an electronic notification at hd-inuse@arb.ca.gov describing any voluntary vehicle/engine emission evaluation test you intend to conduct ... [No change to remainder of paragraph.]
12. Amend subparagraph (e) as follows: Send us an electronic notification at hd-inuse@arb.ca.gov within 15 days after your initial review of the test data for a selected engine family indicates that three engines in Phase 1 testing have failed to comply with the vehicle-pass criteria. [No change to remainder of paragraph.]
13. Subparagraphs (f) and (g). [No change.]

B. California Provisions

1. For 2024 and subsequent model year engines, the manufacturer shall collect at a minimum the following data stream values (if the engine is so-equipped) at 1 second intervals (i.e., 1 Hertz) and submit the data in a comma separated value file for each test.
 1. engine speed
 2. actual engine torque
 3. reference engine maximum torque
 4. engine coolant temperature
 5. engine oil temperature

6. fuel rate
7. modeled exhaust flow
8. intake air/manifold temperature
9. air flow rate (from mass air flow sensor)
10. fuel injection timing
11. EGR mass flow rate
12. commanded EGR valve duty cycle/position
13. actual EGR valve duty cycle/position
14. EGR error between actual and commanded
15. boost pressure
16. commanded/target boost pressure
17. PM filter inlet temperature
18. PM filter outlet temperature
19. exhaust gas temperature sensor output
20. variable geometry turbo position
21. corrected NOx sensor output
22. DEF dosing mode
23. stability of NOx sensor reading
24. engine friction – percent torque
25. commanded DEF dosing
26. DEF usage for current driving cycle
27. DEF dosing rate
28. charge air cooler outlet temperature
29. SCR intake temperature
30. SCR outlet temperature
31. modeled actual ammonia storage level on SCR
32. target ammonia storage level on SCR
33. NOx mass emission rate – engine out
34. NOx mass emission rate – tailpipe
35. Vehicle speed
36. Engine run time
37. Hydrocarbon doser flow rate

2. For 2024 and subsequent model year in-use testing, the manufacturer shall additionally collect an OBD scan (i.e., snapshot of data) of all data stream parameters, all service mode data, and all tracked data (i.e., all data required in title 13, CCR sections 1971.1(h)(4) and (h)(5)) at the beginning of the shift day, at any key-off events, and the end of each shift day during testing.

3. HDIUT Test Plan Approval

For 2024 and subsequent model year engines, the manufacturer must send test plans for pre-approval by CARB's Executive Officer a minimum of 30 calendar days prior to testing for each vehicle tested, and must notify CARB's Executive Officer if a subsequent shift day is necessary as described in section 86.1910 (g) of this document.

Test plans, notifications, and communications related to this subsection must be sent to: Executive Officer, California Air Resources Board, 1001 I Street, Sacramento, CA 95814 or hd-inuse@arb.ca.gov

3.1 Test plans must include but are not limited to the following vehicle, engine, OBD/MIL, maintenance, and PEMS system information outlined in the table:

<p>Vehicle Information Manufacturer Model Model year Vehicle identification number (VIN) Vehicle/fleet vocation Percent of operation at highway speeds Percent of operation on surface streets Percent of operation idling Trailer type if applicable Mileage</p>
<p>Engine Information Engine family Engine model number Displacement Power rating Model year Engine serial number</p>
<p>OBD/Malfunction Indicator Light (MIL) History of OBD/MIL illuminating events History of owner actions for OBD/MIL illumination OBD/MIL codes experienced after accepting for in-use testing</p>
<p>Test Day Expected date Expected test time Expected duration Test number Number of shift days Location Route Expected weather</p>
<p>PEMS Make Model Certification</p>

Some parameters may not be known exactly at the time of the test plan submission, especially in the Test Day category items. The manufacturer may use forecasted information as necessary and indicate when a parameter is forecasted.

3.2 The manufacturer must identify weather or logistical circumstances making the cold start requirements infeasible for the particular test. If a manufacturer believes that conditions may be infeasible to meet the cold start requirements (for example, due to ambient temperatures that are too high or fleet procedures), the manufacturer may request approval from the Executive Officer to begin the shift-day without a cold start. The Executive Officer will approve said request if he or she determines that the identified circumstances will not allow the manufacturer to meet the cold start test requirements. In assessing the request, the Executive Officer will reply on information provided by the manufacturer and his or her engineering judgment.

3.3 The manufacturer is required to electronically submit the test plans, a contact email and phone number a minimum of 30 calendar days prior to scheduled testing to hd-inuse@arb.ca.gov. CARB's Executive Officer will have 14 calendar days after test plan submission by the manufacturer to review and provide comments. CARB's Executive Officer will approve a submitted test plan if he or she determines the submitted test plan will enable the manufacturer to collect a sufficient number of the data stream values specified in sections 86.1920.B.1 and B.2 of these procedures, fulfills the guidelines for testing in 86.1910 needed to determine if an engine meets the vehicle pass criterion in 86.1912.B of these procedures. In making that determination, CARB's Executive Officer will consider the information provided by the manufacturer and his or her engineering judgment.

If there are no comments by CARB's Executive Officer within the allotted review time, then the manufacturer may proceed with testing the vehicle.

86.1925 What records must I keep? November 8, 2010.

A. Federal Provisions

1. Paragraph (a). [No change.]

2. Amend subparagraph (b) as follows: Keep the following paper or electronic records of your in-use testing for five years after you complete all testing required for an engine family:

(1) Keep a copy of reports described in section 86.1920 of these test procedures.

(2) Keep any additional records, including forms you create, related to any of the following:

(i) The procurement and vehicle-selection process described in section 86.1908 of these test procedures, including the vehicle owner's name, address, phone number and e-mail address.

(ii) Pre test maintenance and adjustments to the engine performed under section 86.1910 of these test procedures.

(iii) Test results for all void, incomplete, and voluntary testing described in

section 86.1920 of these test procedures

(iv) Evaluations to determine why a vehicle failed the vehicle pass criteria described in sections 86.1912 or 86.1370.B of these test procedures.

3. Subparagraph b(3). [No Change.]

86.1930 What special provisions apply from 2005 through 2009? November 8, 2010.

Appendix I to Part 86 - Urban Dynamometer Schedules.

A. Federal Provisions. October 25, 2016.

1. Subparagraphs (a) through (f)(1). [n/a]
2. Subparagraph (f)(2) EPA Engine Dynamometer Schedule for Heavy-Duty Diesel Engines. [No change.]
3. Subparagraphs (f)(3) through (h). [n/a]

B. California Provisions

1. For 2024 and subsequent model year medium-duty and heavy-duty diesel engines, the low-load cycle Engine Dynamometer Schedule is shown below. These second-by-second listings represent torque and RPM maneuvers characteristic of heavy-duty engines. Procedures for unnormalizing the torque and speed values are provided in Section 86.1333.B.2 of these test procedures.

Engine testing

Record (seconds)	Normalized revolutions per minute (percent)	Normalized torque (percent)
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0

17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0
27	0	0
28	0	0
29	0	0
30	0	0
31	0	0
32	0	0
33	0	0
34	0	0
35	0	0
36	0	0
37	0	0
38	0	0
39	0	0
40	0	0
41	0	0
42	0	0
43	0	0
44	0	0
45	0	0
46	0	0
47	0	0
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50	0	0
51	0	0
52	0	0
53	0	0
54	0	0
55	0	0
56	0	0
57	0	0

58	0	0
59	0	0
60	0	0
61	0	0
62	0	0
63	0	0
64	0	0
65	0	0
66	0	0
67	0	0
68	0	0
69	0	0
70	3	5
71	7	10
72	15.1	16.5
73	28.3	10.4
74	46	11.1
75	66.5	12.3
76	37.6	1
77	54.6	20.7
78	76.6	15.9
79	47.9	2
80	64.7	36.4
81	77.4	29.6
82	28.2	2.9
83	48.4	54.9
84	72.1	17.7
85	82.5	10.7
86	60.2	1.1
87	64.4	(a)
88	67.8	(a)
89	62.7	12
90	47	28.9
91	52.3	(a)
92	54.5	(a)
93	54.7	(a)
94	53.6	(a)
95	50.4	(a)
96	46	(a)
97	44.1	(a)
98	42.5	(a)

99	42.4	(a)
100	43	(a)
101	42.5	(a)
102	41.4	(a)
103	41.6	(a)
104	42.1	(a)
105	41.4	(a)
106	40.6	(a)
107	38.2	(a)
108	35.4	0.8
109	34	2.8
110	33	4.5
111	32.3	5.3
112	31.5	0
113	28.9	(a)
114	28.8	(a)
115	24.9	(a)
116	19.1	(a)
117	29.8	(a)
118	20.6	(a)
119	14.7	(a)
120	19.7	16.8
121	21.8	(a)
122	15.2	(a)
123	24.8	10.6
124	20.5	9.5
125	19.7	15.6
126	8.5	(a)
127	0	0
128	0.5	5.4
129	0	0
130	0.5	5.7
131	1.7	9.8
132	6.7	14.6
133	6.5	12
134	6.5	9.8
135	6.6	8.6
136	6	8.1
137	4.5	7.3
138	3.4	8.2
139	8	17

140	17.4	8
141	28.3	6.2
142	35.4	9.6
143	51	9.7
144	62	10.6
145	32.4	1
146	58.1	24.4
147	89.1	27.9
148	32.4	3
149	38.6	17.1
150	48.9	19.8
151	61.4	18.7
152	70.7	14.8
153	45.7	0.8
154	49	20.7
155	57.5	23.4
156	66.7	22.1
157	48.7	5.8
158	44.5	14.3
159	45	6.9
160	44.3	1.5
161	46.4	19.2
162	48.3	6.9
163	48.2	5.8
164	47.6	5.8
165	46.6	4
166	45.1	3.6
167	44	2.9
168	42.4	3.4
169	41.7	1
170	37.9	(^a)
171	32.7	(^a)
172	20.8	(^a)
173	18.8	13.7
174	16.3	3.5
175	14.1	5.3
176	6.7	1.3
177	0.1	5.9
178	0	0
179	0	0
180	0	0

181	0	0
182	1.2	6.3
183	2	9.9
184	5.1	12
185	4.6	8.7
186	0	0
187	0	0
188	0	0
189	0	0
190	0	0
191	0	0
192	0	0
193	0	0
194	0	0
195	0	0
196	0	0
197	0	0
198	0	0
199	0	0
200	0	0
201	0	0
202	0	0
203	0	0
204	0	0
205	0	0
206	0	0
207	1.1	9.2
208	5.9	22
209	6.7	24.1
210	7	18.6
211	14.8	11.2
212	24.9	10.8
213	37.7	8.2
214	50.4	7.7
215	62.3	8.3
216	30.7	4.7
217	34.2	19.4
218	52.4	12.2
219	63.4	7.7
220	46.8	0.5
221	41.8	2.7

222	38.8	3.8
223	36.3	4.7
224	36.1	3.5
225	35.4	1.6
226	34.9	(a)
227	29.9	(a)
228	24.6	(a)
229	17.9	(a)
230	17.3	16.4
231	22	(a)
232	14.1	(a)
233	5.4	1.4
234	0.1	5.8
235	0	0
236	0	0
237	0	0
238	0	0
239	0	0
240	0	0
241	0	0
242	0	0
243	0	0
244	0	0
245	0	0
246	0	0
247	0	0
248	0	0
249	0	0
250	1	5.3
251	1.1	9.9
252	3.4	9.1
253	1.1	7.6
254	2.8	9.5
255	7.7	11.8
256	11.9	14.4
257	19.1	14.4
258	34.6	10.2
259	48	9.5
260	57.2	10.1
261	52	12.7
262	40.4	23.7

263	69.3	13.6
264	58.9	7.7
265	59.1	17.7
266	67.1	6.2
267	43.5	2.9
268	35.8	(^a)
269	24.1	(^a)
270	14	12.1
271	18.6	9.1
272	0	0
273	0	0
274	0	0
275	0	0
276	0	0
277	0	0
278	0	0
279	0	0
280	0	0
281	0	0
282	0	0
283	0	0
284	0	0
285	0	0
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287	0	0
288	0	0
289	0	0
290	0	0
291	0	0
292	0	0
293	0	0
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296	0	0
297	0	0
298	0	0
299	0	0
300	0	0
301	0	0
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303	0	0

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307	0	0
308	0	0
309	0	0
310	0	0
311	0	0
312	0	0
313	0	0
314	0	0
315	0.9	9
316	7.2	32.1
317	8.2	21.3
318	19.5	20.4
319	35.5	11
320	54.3	10.6
321	59.1	13.7
322	28	5.9
323	35	17.6
324	50.2	9.8
325	62.3	5.7
326	52.2	3.7
327	47.5	(^a)
328	43.5	(^a)
329	39.8	3.7
330	44.2	7.2
331	54.1	7.2
332	60.4	10.3
333	70.3	13.2
334	41.7	2.3
335	57.1	18.5
336	74.6	21.3
337	60.4	9.2
338	56	33.9
339	72.4	35.4
340	86.3	23.8
341	37	0.5
342	38.1	32.8
343	44.6	28.9
344	49.2	17.2

345	50.2	0.1
346	48.5	(a)
347	46.7	(a)
348	43.9	(a)
349	41.2	(a)
350	38	(a)
351	34	(a)
352	28.8	(a)
353	21.2	(a)
354	31.1	5.3
355	18.6	(a)
356	13	(a)
357	23.6	12.3
358	14.2	(a)
359	14.2	5.5
360	19.1	12.4
361	0	0
362	0.1	5.6
363	0	0
364	0	0
365	0	0
366	0	0
367	0	0
368	0	0
369	0	0
370	0	0
371	0	0
372	0	0
373	0	0
374	0	0
375	0	0
376	0	0
377	0	0
378	0	0
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383	0	0
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387	0	0
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391	0	0
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393	0	0
394	0	0
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414	0	0
415	0	0
416	0	0
417	0	0
418	0	0
419	0	0
420	0	0
421	0	0
422	0.6	9.9
423	5	14
424	5.1	12.1
425	1.7	7.9
426	0.1	5.8

427	0	0
428	0	0
429	0	0
430	0	0
431	0	0
432	0	0
433	0	0
434	0	0
435	0	0
436	4.4	15.4
437	6	20.4
438	6	14.1
439	6	10.3
440	4.4	8.7
441	2.5	9.1
442	7.5	15.1
443	12	13.2
444	24.5	12.2
445	45.3	9.5
446	68.4	11.4
447	45.7	1.5
448	72.7	23
449	64.8	9.8
450	66.2	29.8
451	86.5	23.4
452	36.8	2.3
453	43.3	21.8
454	51.4	24.5
455	58.2	21.2
456	60.8	16.9
457	34.8	0.7
458	34.4	31.3
459	36.8	2.8
460	36	(^a)
461	35.9	(^a)
462	31.1	(^a)
463	25	5.7
464	24.2	0.4
465	22.1	3.9
466	22.4	30.1
467	28.8	20.2

468	30.6	1.6
469	27.9	(a)
470	21.3	(a)
471	13.9	(a)
472	25.3	11.7
473	17.8	(a)
474	12.1	1.4
475	24.1	(a)
476	16.4	(a)
477	21.6	16.5
478	26.4	(a)
479	16.2	(a)
480	24.6	10.5
481	8.2	1.1
482	0	0
483	0	0
484	0	0
485	0	0
486	0	0
487	0	0
488	0	0
489	0	0
490	0	0
491	0	0
492	0	0
493	0	0
494	0	0
495	0	0
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499	0	0
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501	0	0
502	0	0
503	0	0
504	0	0
505	0	0
506	0	0
507	0	0
508	0	0

509	0	0
510	0	0
511	0	0
512	7.5	45.3
513	6.5	32.7
514	7.6	23.8
515	12.7	8.8
516	18.8	14.4
517	30.4	12.7
518	44	10.6
519	53.2	8.3
520	57.7	10
521	48.5	11.5
522	33.7	25.7
523	49.9	16
524	68.1	20.4
525	50.4	5.3
526	51.1	21.9
527	65	22.8
528	78.1	19.5
529	46.8	2.9
530	51.1	19.3
531	59.7	26.7
532	68.8	23.9
533	45	0.5
534	46.8	44.3
535	55.7	25
536	58.9	11.6
537	45.1	8.5
538	35.7	39.3
539	43.2	34.4
540	46.2	16.8
541	46.7	9.6
542	45.6	(^a)
543	42.7	(^a)
544	38.4	(^a)
545	33.4	(^a)
546	28	(^a)
547	23.9	(^a)
548	18.9	(^a)
549	12.9	8.6

550	15.4	(^a)
551	25.2	8.4
552	11.1	2.8
553	15.6	6.4
554	0.3	13.3
555	3.8	31.8
556	16.6	25.5
557	25.4	25.7
558	48.8	26.5
559	77.9	30.8
560	55.5	3.1
561	61	36.7
562	78.8	26.1
563	65.7	26
564	31.5	17.9
565	43.2	45.2
566	48.7	15.9
567	49.3	10.9
568	50.1	12.6
569	56.6	37.8
570	61.9	18.7
571	64.6	12.8
572	37.2	2.8
573	44.1	64.1
574	53.1	39.7
575	56.8	23.5
576	59.2	24.4
577	43.3	7.9
578	35.4	41.4
579	37.7	21.3
580	37.9	17.9
581	38.4	17.3
582	38.8	13.3
583	37.4	10.8
584	36.6	11.5
585	34.8	6.5
586	33	(^a)
587	29.9	(^a)
588	24	(^a)
589	29.3	13.3
590	20.2	(^a)

591	17	14.9
592	15.4	8.8
593	2.5	1.3
594	0.1	5.7
595	0	0
596	0	0
597	0	0
598	0	0
599	6.4	30.8
600	6.8	38.6
601	6.7	31.6
602	12.7	18.1
603	25.1	8.8
604	31.3	14
605	48.5	8.2
606	57.3	7.4
607	49.5	15
608	16.2	6.7
609	29.3	45.7
610	69.5	40.4
611	70.3	25.8
612	35.7	13.9
613	38	4.9
614	37.8	4.4
615	37.5	4.3
616	37.3	4.3
617	37	4.4
618	36.7	4.4
619	36.5	4.5
620	36.9	12.3
621	44.6	20.6
622	51.4	10.4
623	53.7	(^a)
624	53.5	(^a)
625	54.2	16.7
626	62.2	18.4
627	65.7	8.9
628	43.8	(^a)
629	42.4	1.5
630	41.8	4.6
631	41.6	5.1

632	41.4	5.1
633	41.3	5.2
634	41.2	5.2
635	41.1	5.2
636	41	5.2
637	41	5.3
638	40.9	5.3
639	40.8	5.3
640	40.7	5.3
641	42.1	13.3
642	45.4	13.6
643	50.5	9.9
644	53.2	5.7
645	54.6	(^a)
646	53.9	0.3
647	53.3	4.7
648	53.1	5.3
649	53.1	5.4
650	53	5.4
651	53	5.4
652	52.9	5.4
653	52.9	5.4
654	52.9	5.4
655	52.8	5.4
656	52.8	5.4
657	52.8	5.4
658	52.8	5.4
659	52.7	5.4
660	55.2	16.3
661	58.7	16.1
662	54	10.8
663	38.1	35.5
664	44.3	23.7
665	46.3	1.7
666	46.4	(^a)
667	45.8	7.8
668	50.4	34.7
669	54.7	15.2
670	57.6	(^a)
671	54.1	(^a)
672	52.1	(^a)

673	52	(^a)
674	51.3	5.7
675	51.3	6.8
676	51.6	11.2
677	54.2	11.5
678	54.7	16.5
679	54.4	22.6
680	55.3	8.6
681	55.8	1.3
682	55.5	4.3
683	55.3	6.3
684	55.3	6.5
685	55.3	6.5
686	55.3	6.5
687	55.3	6.5
688	55.2	4.8
689	54.4	2.7
690	55.2	(^a)
691	54.2	13.3
692	54.1	11.8
693	54.7	5.3
694	55.4	(^a)
695	54.9	1.9
696	54.5	6.2
697	54.5	7.2
698	54.5	6.3
699	54	(^a)
700	54.8	(^a)
701	54.1	(^a)
702	53.2	6.7
703	53.5	5.8
704	53	(^a)
705	50.9	8.6
706	50.7	11.7
707	51.1	7.8
708	51.2	6.6
709	51.2	6.5
710	51.2	6.5
711	51.2	6.5
712	51.3	6.5
713	51.3	6.5

714	51.3	6.5
715	51.3	6.5
716	51.3	6.5
717	51.3	6.5
718	51.3	6.5
719	51.3	6.5
720	51.3	6.5
721	51.3	6.5
722	51.3	6.5
723	51.3	6.5
724	51.3	6.5
725	51.3	6.5
726	51.3	6.5
727	51.3	6.5
728	51.3	6.5
729	51.3	6.5
730	51.3	6.5
731	51.3	6.5
732	51.3	6.5
733	51.3	6.5
734	51.4	10.5
735	53.1	11.2
736	52.9	5.3
737	53.8	2.9
738	55.5	(^a)
739	55.1	2
740	55.7	6.8
741	55.9	5.3
742	54.1	18
743	53.9	14.8
744	55	9.5
745	55.4	1.9
746	55.7	8.4
747	57.4	(^a)
748	56.7	(^a)
749	32.2	(^a)
750	30.2	25.4
751	28.9	43.8
752	29.6	37.9
753	30.5	13.4
754	30.6	(^a)

755	29.2	(a)
756	28.7	(a)
757	28.2	(a)
758	27.7	8.5
759	27.5	(a)
760	24.9	(a)
761	23.1	(a)
762	21	8.9
763	34.4	(a)
764	30.1	(a)
765	22.8	(a)
766	13.2	(a)
767	17.9	7.1
768	21.7	10.3
769	15.3	(a)
770	0.9	(a)
771	0.1	5.6
772	0	0
773	0	0
774	0	0
775	0	0
776	0	0
777	0	0
778	0	0
779	0	0
780	0	0
781	0	0
782	0	0
783	0	0
784	0	0
785	0	0
786	0	0
787	0	0
788	0	0
789	0	0
790	0	0
791	0	0
792	0	0
793	0	0
794	0	0
795	0	0

796	0	0
797	0	0
798	0	0
799	0	0
800	0	0
801	0	0
802	0	0
803	0	0
804	0	0
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806	0	0
807	0	0
808	0	0
809	0	0
810	0	0
811	7.7	34.4
812	16.2	15.7
813	37.9	5.1
814	51.4	10.8
815	71.1	18.9
816	49.8	(^a)
817	65.6	18.1
818	43.5	4.8
819	47.4	35.6
820	73	32.8
821	76.2	29
822	33.1	6.8
823	44.9	51
824	60.1	44.1
825	67	22.5
826	72.5	28.6
827	46	2.8
828	51	60.5
829	63	33.5
830	65.5	25.2
831	57.8	12.7
832	40.4	36
833	43.6	24.7
834	44.1	21.8
835	45	10.9
836	44.3	(^a)

837	42	(a)
838	38.5	(a)
839	35.3	(a)
840	31.3	(a)
841	24.9	(a)
842	29.1	12.7
843	20.4	(a)
844	14.7	12.9
845	14.7	(a)
846	17.2	6.5
847	16.7	12.3
848	0	0
849	0	0
850	12.9	(a)
851	13.4	3
852	0	0
853	0	0
854	0	0
855	0	0
856	0	0
857	0	0
858	0	0
859	0	0
860	0	0
861	0	0
862	0	0
863	0	0
864	0	0
865	0	0
866	0	0
867	0	0
868	0	0
869	0	0
870	3	5
871	7	10
872	58.6	22.6
873	84.8	19.9
874	46.7	3.3
875	51.2	10.4
876	56.5	10.6
877	70.3	14.4

878	53.2	10.4
879	50.4	34.3
880	81.5	54.8
881	91.3	5.4
882	63.6	10.3
883	57.9	37.8
884	80.1	61.2
885	89.5	24
886	60.8	7.4
887	57.2	41.9
888	65.4	8.4
889	65.6	5.5
890	35.9	0.3
891	35.4	31.2
892	37.3	19
893	40.5	38
894	46.4	56.4
895	52.5	39.6
896	54.6	7.8
897	53.3	(^a)
898	51.2	(^a)
899	49.3	(^a)
900	47.4	(^a)
901	46	6.4
902	45.9	7.6
903	46.4	18.3
904	48.1	23.5
905	50	22.5
906	50.5	8.6
907	48.9	(^a)
908	48.2	11
909	47.5	3.6
910	48.3	14.9
911	48.7	13
912	47.8	(^a)
913	47.8	14.5
914	48.3	10.1
915	48.3	6.4
916	48.2	7
917	48.3	12.5
918	48.1	6.6

919	48.2	12.1
920	49.2	17.9
921	50.7	11.7
922	49.4	(a)
923	47.2	(a)
924	44.8	(a)
925	42.1	(a)
926	39.1	(a)
927	36.2	(a)
928	33.5	(a)
929	29.8	(a)
930	25.1	(a)
931	20.4	(a)
932	23.8	13.5
933	29.8	1.8
934	15.6	(a)
935	19.4	14.3
936	16.1	(a)
937	16.3	13.1
938	17.8	11.5
939	8.6	1.8
940	0	0
941	0	0
942	0	0
943	1	5
944	5	8.7
945	5.4	7.6
946	0	0
947	0	0
948	0	0
949	0	0
950	0	0
951	0	0
952	0	0
953	5.4	16.3
954	7.2	26
955	27.1	23
956	64.4	18
957	44.8	3.7
958	60.6	28.7
959	92.5	23.9

960	53	1.3
961	85.2	41.6
962	56.3	0.4
963	67.8	48.8
964	101.7	55.3
965	31.9	2.4
966	37.3	57.2
967	54.7	82.5
968	64.3	12.2
969	65.1	8.7
970	36.8	1
971	35.5	20.2
972	36.9	14.6
973	38.2	14.8
974	38.9	8
975	39	7.7
976	37.5	(^a)
977	35.6	(^a)
978	33.1	(^a)
979	30	(^a)
980	26.2	(^a)
981	21.9	(^a)
982	18.1	(^a)
983	40.7	16.1
984	36	(^a)
985	33.7	(^a)
986	32	(^a)
987	29.3	(^a)
988	27	(^a)
989	24.6	(^a)
990	21.8	(^a)
991	18.2	(^a)
992	9.9	6.7
993	16	2.1
994	13.4	4
995	11.3	5.7
996	0	0
997	0.3	3.9
998	0.2	3.5
999	0	0
1000	0	0

1001	0	0
1002	0	0
1003	0	0
1004	0	0
1005	0	0
1006	0	0
1007	0	0
1008	0	0
1009	0	0
1010	0	0
1011	0	0
1012	0	0
1013	0	0
1014	0	0
1015	0	0
1016	0	0
1017	1	7.6
1018	7.8	34.2
1019	27.5	19.7
1020	67.8	18.4
1021	39.9	5.8
1022	39.1	27.8
1023	90.5	36.7
1024	55.7	1.3
1025	81.4	46.8
1026	56.6	2.7
1027	62.2	36.5
1028	81	44.1
1029	64.2	11
1030	56.2	37.2
1031	77.1	77.9
1032	103.6	47.7
1033	56.1	2.9
1034	65	62.1
1035	72.1	27.2
1036	75	19.5
1037	42.6	1.6
1038	43.4	47.9
1039	47.3	26.8
1040	49	21.4
1041	50.5	23.2

1042	51.9	20.3
1043	53.2	19.4
1044	54.1	14.5
1045	54	6.5
1046	54.9	26.4
1047	58	38
1048	60.7	25.2
1049	32.4	(^a)
1050	29.8	7.6
1051	28.4	(^a)
1052	26.2	(^a)
1053	25.2	14.1
1054	26.9	47.6
1055	30.5	70.4
1056	32.1	12.2
1057	32.6	26.7
1058	34.5	44
1059	36.5	34.5
1060	37.7	26.5
1061	38.6	23.3
1062	39.3	20.6
1063	39.6	19.9
1064	40.1	23.2
1065	40.7	25.2
1066	41.6	27.3
1067	42.4	23.5
1068	42.9	22.5
1069	43.2	15.8
1070	43.1	15.6
1071	43.2	17.1
1072	43.2	13.8
1073	43.2	14.7
1074	43	22.7
1075	43.8	24.6
1076	44.2	13.7
1077	44	6.9
1078	42.9	(^a)
1079	41.4	2.9
1080	41	14
1081	41.1	17.7
1082	41.7	15

1083	42.4	19.8
1084	43.5	17.4
1085	44	10.8
1086	44.3	10
1087	44.5	6.5
1088	44.1	0.4
1089	43.4	1.2
1090	43.2	7.3
1091	43.1	4.7
1092	42.8	4.7
1093	42.6	5.8
1094	42.6	9.8
1095	42.9	13.4
1096	43.4	19
1097	44.2	15
1098	44.6	11.5
1099	44.8	5.5
1100	44.1	(^a)
1101	43.1	(^a)
1102	42.8	10.3
1103	43	0.7
1104	42	(^a)
1105	41.3	(^a)
1106	40.7	(^a)
1107	40	1.3
1108	39.6	6.1
1109	39.4	2.4
1110	38.8	(^a)
1111	38.1	0.1
1112	37.4	(^a)
1113	36.1	(^a)
1114	35	(^a)
1115	34	(^a)
1116	32.7	(^a)
1117	31	(^a)
1118	29.8	0.8
1119	30	8.2
1120	29.8	1.2
1121	29.1	(^a)
1122	28	(^a)
1123	26.8	(^a)

1124	25.7	(a)
1125	24	(a)
1126	22.3	(a)
1127	21.1	(a)
1128	21	21.6
1129	22.6	36.9
1130	24.9	37.1
1131	26.9	30.8
1132	28.5	29.6
1133	29.8	23.4
1134	30.7	21.9
1135	31.8	20.3
1136	32.2	(a)
1137	30.6	(a)
1138	27.7	(a)
1139	24.8	(a)
1140	22.1	(a)
1141	20.1	(a)
1142	18.5	(a)
1143	21.2	11.1
1144	36.3	(a)
1145	33.4	(a)
1146	30.7	(a)
1147	27.9	(a)
1148	24.4	(a)
1149	21.2	(a)
1150	17.9	(a)
1151	38.8	9.1
1152	20.3	(a)
1153	15.9	12.7
1154	12.6	(a)
1155	0	0
1156	0	0
1157	0	0
1158	0	0
1159	0	0
1160	0	0
1161	0	0
1162	0	0
1163	0	0
1164	0	0

1165	2	7.7
1166	8.3	40.4
1167	34.3	17.6
1168	65.7	16.8
1169	35.6	5.8
1170	13.2	5.7
1171	0	0
1172	0	0
1173	57.3	38.8
1174	59.1	9.7
1175	63.4	29.7
1176	76	29.9
1177	24	4.9
1178	42.7	53.3
1179	81.2	36.8
1180	85.8	(^a)
1181	50.4	(^a)
1182	45.6	9.1
1183	57.4	46.7
1184	77.6	53.7
1185	89.2	19.2
1186	69.4	15.3
1187	56.2	36.1
1188	67.1	29.4
1189	72.5	36.6
1190	45.1	5.9
1191	41.1	43.2
1192	48.2	57.4
1193	53.6	36.3
1194	56.9	28.7
1195	58.6	15.2
1196	34	4.8
1197	28.5	(^a)
1198	28.6	16.6
1199	28.3	2.3
1200	29	25.8
1201	29.5	20.8
1202	30.3	31.8
1203	31.7	29.4
1204	32.7	26.6
1205	33.8	20.6

1206	34.1	14.2
1207	34.3	8.5
1208	34.2	7.6
1209	34.2	15.7
1210	34.9	17
1211	35.2	14.2
1212	35.2	13.2
1213	35.2	7.2
1214	34.9	(a)
1215	33.8	(a)
1216	31.6	(a)
1217	29.2	(a)
1218	26.7	(a)
1219	24.4	(a)
1220	22.1	(a)
1221	20	(a)
1222	17.8	(a)
1223	36.2	16.7
1224	36.2	(a)
1225	32.5	(a)
1226	28.3	(a)
1227	22.2	(a)
1228	25.2	13.9
1229	25.8	2
1230	14.1	(a)
1231	10.6	7.4
1232	20.8	0.2
1233	12.3	(a)
1234	10.5	3.1
1235	12.8	9.3
1236	29.4	3.1
1237	37.4	23.4
1238	53.5	32.7
1239	77.8	51.3
1240	80.8	31
1241	29.1	2.8
1242	38.6	63.7
1243	56.9	37.5
1244	58.8	(a)
1245	55.1	(a)
1246	51.3	(a)

1247	47.4	(a)
1248	43.4	(a)
1249	38.5	(a)
1250	30.4	(a)
1251	19.7	(a)
1252	11.8	(a)
1253	29.1	16.9
1254	29.1	4.3
1255	34.4	24.4
1256	46.4	34.7
1257	61.2	45.4
1258	79.1	53.2
1259	95.4	38.8
1260	54.9	2.5
1261	56.1	5.8
1262	55.1	0.8
1263	53.7	0.4
1264	52.2	0.1
1265	51.4	4.3
1266	48.8	(a)
1267	44.2	(a)
1268	35.3	(a)
1269	23.4	(a)
1270	11.3	(a)
1271	24.3	5.9
1272	10.1	(a)
1273	20	1.1
1274	17.9	11.7
1275	6.3	0.7
1276	9.6	23.3
1277	33.1	16.3
1278	58.7	18.9
1279	87.6	26.5
1280	48.5	1.8
1281	74.4	41.3
1282	64.1	12.5
1283	57.1	34.6
1284	91	78.4
1285	38.6	8.5
1286	32.8	40
1287	47	74.3

1288	64.2	53.9
1289	70.4	21.4
1290	71.9	7.4
1291	39.8	2.4
1292	39.6	32
1293	42.7	24
1294	44.6	20.6
1295	47.3	31.6
1296	49.9	22.2
1297	50.7	9.1
1298	50.1	0.8
1299	49.4	4.5
1300	48	(^a)
1301	46.9	1.9
1302	45.9	0
1303	44.2	(^a)
1304	42.2	(^a)
1305	39.1	(^a)
1306	33.2	(^a)
1307	25.5	(^a)
1308	16	3.5
1309	27.1	(^a)
1310	8.7	(^a)
1311	11.4	5.9
1312	13.8	6.7
1313	14.3	(^a)
1314	30	14.9
1315	27.8	0.3
1316	41.8	16.8
1317	68.8	20.7
1318	65.3	16.6
1319	50.9	30.1
1320	71.4	14.2
1321	65.7	16.8
1322	41.5	12.7
1323	45.3	9
1324	47	(^a)
1325	41.1	(^a)
1326	34.1	(^a)
1327	23.5	(^a)
1328	8.1	1.2

1329	19.1	9.4
1330	0	0
1331	0.9	7.7
1332	0.7	3.4
1333	0	0
1334	7.5	17.5
1335	22.4	12
1336	36	10.8
1337	48.2	6.5
1338	48	0.2
1339	39.2	(^a)
1340	27.4	(^a)
1341	15.9	(^a)
1342	2	0.2
1343	0.1	3.8
1344	0	0
1345	0	0
1346	0	0
1347	0	0
1348	0	0
1349	0	0
1350	0	0
1351	0	0
1352	1.1	6.8
1353	6.1	21.6
1354	6.4	18.5
1355	17.4	10.1
1356	30.9	7.8
1357	44.5	8.4
1358	61.1	10.5
1359	35.1	0.4
1360	52.5	23.7
1361	83.5	20.9
1362	50.3	0.8
1363	68	37.5
1364	85.5	25.2
1365	52.7	8.2
1366	73.4	39.6
1367	89.5	27.4
1368	53	6
1369	63.6	11.9

1370	65.6	12.2
1371	37.4	1
1372	38.7	40
1373	45.5	24.5
1374	49	17.2
1375	51.4	13.6
1376	52.5	7.2
1377	51.4	(^a)
1378	48.9	(^a)
1379	45.8	(^a)
1380	42.4	(^a)
1381	38.5	(^a)
1382	38.6	11.6
1383	39.9	6.5
1384	39.3	2
1385	37.9	(^a)
1386	35.1	(^a)
1387	32.2	(^a)
1388	27.3	(^a)
1389	18.7	(^a)
1390	10.4	8.1
1391	14.8	4.6
1392	13.2	3.6
1393	13.6	8.9
1394	0	0
1395	0	0
1396	0.5	9.5
1397	5.4	7.1
1398	8.2	9
1399	21.2	10.3
1400	43.7	13.1
1401	68.2	16.2
1402	35.2	2
1403	67.5	31.5
1404	78.2	22.2
1405	54	18.5
1406	89.3	35.3
1407	54.6	0.9
1408	64.4	29.5
1409	77.2	23.7
1410	49	2.1

1411	52.1	40.4
1412	63.3	18.4
1413	62.3	(a)
1414	29.7	(a)
1415	24.2	(a)
1416	18.8	(a)
1417	14.1	(a)
1418	10.5	(a)
1419	11.3	25.6
1420	14.9	15.2
1421	12.8	(a)
1422	25	9.3
1423	18.6	9.1
1424	24.5	24.4
1425	32.7	24.2
1426	41.1	24.4
1427	50	26
1428	58.6	18.7
1429	64	25.5
1430	37.7	1.4
1431	38.4	30.5
1432	39.3	(a)
1433	36.4	(a)
1434	33.4	(a)
1435	29.7	(a)
1436	25.8	(a)
1437	21.3	(a)
1438	17.5	(a)
1439	15.1	1.2
1440	14.3	2.3
1441	12.6	(a)
1442	9.9	(a)
1443	27.4	13.6
1444	23	(a)
1445	20.8	3.5
1446	20.5	5.3
1447	18.5	(a)
1448	11.9	(a)
1449	22.4	6.1
1450	10	8.7
1451	6.7	0.6

1452	0	0
1453	0	0
1454	0	0
1455	0	0
1456	0	0
1457	0	0
1458	0	0
1459	0	0
1460	0	0
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1464	0	0
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1466	0	0
1467	0	0
1468	0	0
1469	0	0
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1471	0	0
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1500	0	0
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1502	0	0
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1510	0	0
1511	0	0
1512	0	0
1513	0	0
1514	0	0
1515	0	0
1516	0	0
1517	0	0
1518	0	0
1519	5.1	15
1520	7	25.8
1521	18.1	9.5
1522	28.4	7.1
1523	44.9	9.8
1524	57.8	6.7
1525	33.6	4.5
1526	37.9	12.1
1527	48.5	6.2
1528	49.9	1.3
1529	42.5	(^a)
1530	30.4	(^a)
1531	18.7	(^a)
1532	4	0.9
1533	0.1	3.9

1534	0	0
1535	0	0
1536	0	0
1537	0	0
1538	0	0
1539	0	0
1540	0	0
1541	0	0
1542	0	0
1543	0	0
1544	0	0
1545	0	0
1546	0	0
1547	0	0
1548	0	0
1549	0	0
1550	0	0
1551	0	0
1552	0	0
1553	0	0
1554	0	0
1555	0	0
1556	0	0
1557	0	0
1558	0	0
1559	0	0
1560	0	0
1561	3	5
1562	7	10
1563	4.7	8.1
1564	2	6.4
1565	6.2	11.6
1566	8.6	8.9
1567	20.7	5.2
1568	28	1.9
1569	25.6	(a)
1570	14.9	(a)
1571	0	0
1572	0	0
1573	1.2	6.5
1574	6.8	23.2

1575	16.6	14.1
1576	52.5	14.5
1577	76.9	22.6
1578	52.1	12.3
1579	94.5	27.6
1580	56.4	1
1581	66	5.3
1582	49.2	6.7
1583	31.3	(a)
1584	22.1	(a)
1585	12.1	(a)
1586	27.3	8.2
1587	16	(a)
1588	17.4	10.5
1589	33.7	15.4
1590	43.6	(a)
1591	37.7	(a)
1592	34.8	6.5
1593	60.7	30.4
1594	90.6	21.4
1595	54.9	(a)
1596	48.4	(a)
1597	56.5	19.6
1598	72	21.8
1599	85.8	26.9
1600	32.2	2.2
1601	42.2	31.8
1602	46.5	1.9
1603	57.8	21.7
1604	37.1	4.8
1605	36.7	(a)
1606	32.8	(a)
1607	27.8	(a)
1608	22.8	(a)
1609	16.5	(a)
1610	10.3	7.6
1611	12.8	6.4
1612	30.4	11.4
1613	12.4	(a)
1614	0	0
1615	1.1	1.4

1616	43.1	4.2
1617	54.9	6.5
1618	74.6	17.4
1619	52.3	1.4
1620	67.1	23.5
1621	79.1	1.9
1622	46.4	(^a)
1623	39	(^a)
1624	28.8	(^a)
1625	16.6	(^a)
1626	20.1	14.2
1627	15.4	(^a)
1628	17.1	10.6
1629	40.8	26.5
1630	69.8	18.3
1631	85.7	13.1
1632	51.9	1.7
1633	72.1	42.7
1634	84.4	29.2
1635	35.6	(^a)
1636	40.5	30.3
1637	52.7	44.5
1638	65.4	19.1
1639	67.1	(^a)
1640	34	(^a)
1641	31.3	(^a)
1642	29.3	(^a)
1643	25.4	(^a)
1644	19.9	(^a)
1645	23	5.7
1646	8.9	5.7
1647	12.4	7.5
1648	16.5	2.7
1649	25	10.8
1650	16.3	4.1
1651	41.5	28.9
1652	82.3	43.6
1653	56.9	0.2
1654	70.1	45.2
1655	72.7	29.1
1656	36.9	16.9

1657	42.7	(a)
1658	41.3	(a)
1659	37.7	(a)
1660	34.5	(a)
1661	27	(a)
1662	15	(a)
1663	11.6	0.1
1664	10	(a)
1665	15.6	9.8
1666	0	0
1667	0	0
1668	0	0
1669	0	0
1670	0	0
1671	0	0
1672	0	0
1673	0	0
1674	0	0
1675	0	0
1676	0	0
1677	0	0
1678	0	0
1679	1.4	7.2
1680	6.6	22.6
1681	16.2	15.4
1682	59.1	19.5
1683	67.4	17.1
1684	62.3	17.7
1685	77.8	11.5
1686	41.8	(a)
1687	35.9	(a)
1688	39.3	0.2
1689	34.3	(a)
1690	9.5	3.5
1691	0	0
1692	0	0
1693	0	0
1694	0.5	6.5
1695	3.6	6.9
1696	5.4	9.3
1697	5.5	6.2

1698	3.1	3.5
1699	0	0
1700	0	0
1701	0	0
1702	3.1	7.4
1703	6.8	20.3
1704	24.6	12.8
1705	64.5	18.2
1706	53.8	7.7
1707	66.6	27.9
1708	72.2	18.5
1709	63.5	31.1
1710	94.7	29.7
1711	55.9	2.1
1712	82.9	60.8
1713	39.6	4.9
1714	38.7	4.2
1715	37.4	(^a)
1716	32.9	(^a)
1717	27.7	(^a)
1718	23.1	(^a)
1719	17.1	(^a)
1720	9.1	6.4
1721	10.6	3
1722	37.5	15.4
1723	73.5	38.4
1724	87.7	20.1
1725	56.6	5.6
1726	85.3	41.3
1727	41.9	7.1
1728	40.7	38.8
1729	51.4	13
1730	51.6	(^a)
1731	33.9	(^a)
1732	34	(^a)
1733	35	1.8
1734	35.6	(^a)
1735	33.9	(^a)
1736	30.3	(^a)
1737	25.8	(^a)
1738	21	(^a)

1739	16.3	(a)
1740	11.5	(a)
1741	18.5	5.5
1742	12.4	8.2
1743	24.2	7.3
1744	17	6.9
1745	21.2	11.5
1746	52.4	26
1747	89.6	29.8
1748	57.8	11.2
1749	97.7	41.2
1750	55.9	(a)
1751	80.7	31.1
1752	71.6	28.9
1753	37	17
1754	41.1	7.7
1755	44.3	7.3
1756	46.7	(a)
1757	30.6	(a)
1758	24.8	(a)
1759	21.2	(a)
1760	21.2	4.1
1761	23.4	2.4
1762	23.4	(a)
1763	19.7	(a)
1764	13.8	(a)
1765	12.6	9.7
1766	12.5	(a)
1767	15.5	10.3
1768	12.4	(a)
1769	23.1	7.5
1770	20.1	7.4
1771	17.8	5.9
1772	0	0
1773	0.3	4.2
1774	4.6	13.8
1775	30.1	18.8
1776	65.5	20.4
1777	82.3	18
1778	49	(a)
1779	42.4	(a)

1780	34.8	(a)
1781	29.4	(a)
1782	25.5	(a)
1783	22.5	(a)
1784	18.6	(a)
1785	13.6	(a)
1786	12	9.3
1787	41.9	(a)
1788	35.6	(a)
1789	37.1	2
1790	39.1	0.7
1791	41.4	2
1792	42.3	(a)
1793	39	(a)
1794	36.5	0.4
1795	40.6	4.2
1796	49.4	4.5
1797	55	1
1798	53	(a)
1799	48.6	(a)
1800	49.8	3.9
1801	60.1	4.3
1802	59.2	12.8
1803	35.1	(a)
1804	29.4	(a)
1805	23.2	(a)
1806	13.8	(a)
1807	20.3	7.8
1808	0	0
1809	0	0
1810	0	0
1811	7.1	19.8
1812	19.5	10.8
1813	43.5	8.5
1814	61.5	5.7
1815	39.7	5.8
1816	33.9	(a)
1817	33	1.1
1818	37.8	3.2
1819	36.2	(a)
1820	36.4	2.4

1821	44	5.4
1822	49	0.9
1823	52.2	2.6
1824	55.4	1.1
1825	58.4	2.2
1826	66.4	9.6
1827	37.6	1.9
1828	37.6	(^a)
1829	39.3	1.9
1830	42.6	2.4
1831	44.4	0.2
1832	45.7	0.9
1833	48	1
1834	45	(^a)
1835	38.7	(^a)
1836	32.8	(^a)
1837	25.6	(^a)
1838	4.9	0.8
1839	0.1	3.9
1840	0	0
1841	0	0
1842	0	0
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1852	0	0
1853	1	6.7
1854	6.8	21.9
1855	17.1	11.1
1856	35	5.6
1857	35.7	(^a)
1858	21.8	(^a)
1859	0	0
1860	0	0
1861	0	0

1862	0	0
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1865	0	0
1866	2.5	6.8
1867	5.6	12.3
1868	4.4	4.8
1869	0	0
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1871	0	0
1872	1.6	6.5
1873	5.1	9.6
1874	3.4	5.8
1875	0	0
1876	0	0
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1879	1.3	6.6
1880	4.8	7.7
1881	0.8	5.4
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2135	0	0
2136	51.7	18.5
2137	10.6	6.5
2138	0	0
2139	18.6	7.7
2140	6.2	0.7
2141	0	0
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2161	0	0
2162	0	0
2163	0	0
2164	0	0
2165	0	0
2166	0	0
2167	0	0
2168	7.1	34.5
2169	10.6	19.6
2170	29.3	11.2
2171	41.5	3.5
2172	37	(a)
2173	22.1	(a)
2174	2.6	0.5
2175	0.1	2.5
2176	8.3	41.2
2177	27	19.8
2178	48.7	11.1
2179	61.9	9.8
2180	30.5	2.3
2181	25.4	(a)
2182	5.8	0.5
2183	0	0
2184	0	0
2185	0	0
2186	0	0
2187	0	0
2188	0	0
2189	0	0

2190	0	0
2191	0	0
2192	0	0
2193	0.9	7.1
2194	8.1	40.6
2195	27.4	18.8
2196	46.8	10
2197	54.8	2
2198	54.2	1.2
2199	50.7	2.7
2200	50.4	4.4
2201	53.4	4
2202	56.1	3.1
2203	34.8	6.4
2204	31.5	2.3
2205	32.1	2.4
2206	31.4	2.7
2207	31.4	2.4
2208	32.5	2.3
2209	31.8	1.5
2210	29.8	(^a)
2211	21.4	(^a)
2212	8.8	0.5
2213	0	0
2214	0	0
2215	0	0
2216	0	0
2217	0	0
2218	0	0
2219	0	0
2220	0	0
2221	0	0
2222	0	0
2223	3.6	10.8
2224	6.7	25.7
2225	14.1	13.6
2226	27.4	8
2227	44	10.3
2228	59	7.6
2229	33.4	1.8
2230	39.5	11.1

2231	47.5	4.3
2232	43.9	(a)
2233	33.7	(a)
2234	21.6	(a)
2235	10.3	(a)
2236	0	0
2237	0	0
2238	0	0
2239	0	0
2240	0	0
2241	0	0
2242	0	0
2243	0	0
2244	0	0
2245	0	0
2246	0	0
2247	0	0
2248	0	0
2249	0	0
2250	0	0
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2252	0	0
2253	0	0
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2255	0	0
2256	0	0
2257	0	0
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2296	0	0
2297	0	0
2298	0	0
2299	2.1	7.2
2300	8.7	49.6
2301	51.5	35.1
2302	68.4	21.2
2303	72.7	25.8
2304	57.9	7.7
2305	58.4	36.2
2306	106.4	37.8
2307	32.6	2.2
2308	42.1	98.8
2309	64.9	21
2310	65	0.2
2311	36.2	(^a)
2312	29.8	(^a)

2313	25.8	(a)
2314	22.5	(a)
2315	19.3	(a)
2316	17	(a)
2317	15.4	4.1
2318	14.4	1.5
2319	12.9	(a)
2320	11.6	8.8
2321	24.3	1.8
2322	18.2	(a)
2323	14.3	(a)
2324	9.9	(a)
2325	10.9	3
2326	5.6	0.7
2327	0	0
2328	3.4	7
2329	6.3	10.9
2330	6.2	3.5
2331	0	0
2332	0	0
2333	8.7	36.1
2334	47.4	34.5
2335	74.6	30.1
2336	38.3	1.3
2337	88.1	38
2338	50.5	0.8
2339	68.9	46.4
2340	69.6	16.4
2341	55.1	35.9
2342	83.9	29.4
2343	87.2	12.3
2344	58.8	6.3
2345	59.1	52.5
2346	85.8	67.1
2347	67.4	11.5
2348	56.8	47.6
2349	69.9	76.1
2350	86.8	76.3
2351	49.1	0.6
2352	45.4	64.4
2353	51.4	80.2

2354	60.2	89.5
2355	69.5	87.4
2356	77.8	85.8
2357	48.5	7.2
2358	40.2	50.8
2359	42	78.2
2360	45.9	91.3
2361	50.4	95.9
2362	50.7	6.9
2363	48.4	11.9
2364	49.2	(a)
2365	45.8	(a)
2366	44.2	(a)
2367	41.5	(a)
2368	38.7	(a)
2369	36.4	(a)
2370	34.2	(a)
2371	33.2	(a)
2372	31.5	(a)
2373	30.4	(a)
2374	29.3	13.2
2375	28.7	(a)
2376	23.6	(a)
2377	16.8	3.9
2378	36	(a)
2379	36.6	(a)
2380	32.9	(a)
2381	26.9	(a)
2382	26.4	(a)
2383	25.6	(a)
2384	18.1	(a)
2385	33	5.8
2386	19.4	(a)
2387	9.8	4.3
2388	20.7	1.1
2389	18.7	(a)
2390	13.9	(a)
2391	12.8	(a)
2392	14.2	(a)
2393	16.4	4.2

2394	21.4	9.2
2395	23.7	4.3
2396	24.9	5.7
2397	27.2	6.4
2398	29.1	10.6
2399	34.4	19.3
2400	44.5	25.5
2401	55.9	22
2402	58	4.2
2403	50.3	14.9
2404	31.4	31.9
2405	38.9	18.9
2406	39.4	(a)
2407	36.4	(a)
2408	31.3	(a)
2409	24.5	(a)
2410	18.6	(a)
2411	14.9	(a)
2412	8.9	(a)
2413	33	6
2414	36.4	28.9
2415	45.1	24.4
2416	50.9	12.1
2417	54.2	6.3
2418	53.3	(a)
2419	52.5	3.6
2420	53.9	6.8
2421	54.2	7.5
2422	53	6
2423	54.2	7.9
2424	57.8	8.1
2425	61.4	14
2426	34.1	1
2427	38.7	56.4
2428	57.6	68.8
2429	68.9	33.9
2430	79.9	55.8
2431	72.1	21.5
2432	51.1	43.7
2433	59.3	80.6
2434	71.3	82

2435	78.4	27.2
2436	45.9	2.1
2437	46.3	70.5
2438	52.4	83.4
2439	59.1	50.7
2440	59.6	21.4
2441	61.4	19
2442	30.4	2.9
2443	31	36.2
2444	31.7	30.6
2445	32.1	13
2446	32.1	22
2447	31.8	(a)
2448	31.2	17.8
2449	30.8	(a)
2450	29.5	(a)
2451	28.4	(a)
2452	28.4	28.8
2453	29.1	23.2
2454	29.8	21.1
2455	30.6	19.6
2456	31.6	15
2457	32.4	7.4
2458	33.4	7.3
2459	34.2	(a)
2460	35	(a)
2461	35.8	(a)
2462	36	(a)
2463	35.9	(a)
2464	35.6	(a)
2465	34.9	(a)
2466	34	(a)
2467	33.3	16.5
2468	33.2	14.2
2469	33.6	38.9
2470	34.4	47.8
2471	34.9	38.6
2472	34.8	40.6
2473	34.7	45.1
2474	34.3	38.1
2475	34.4	60.8

2476	33.6	(^a)
2477	30.3	1
2478	28.4	(^a)
2479	26.7	11.3
2480	26.4	37.8
2481	27.2	60.2
2482	30	78.9
2483	32	65.3
2484	33.1	11.8
2485	33.4	25.9
2486	34.1	31
2487	34.2	0.5
2488	34.9	47.5
2489	36.9	39.9
2490	38.1	44.3
2491	40.2	62.9
2492	42.4	52.1
2493	42.9	4.8
2494	42.5	12.5
2495	42.5	17
2496	42.7	28
2497	42.8	15
2498	42.9	17.8
2499	43	21.5
2500	43.2	20
2501	43.5	24.6
2502	44.2	31.9
2503	44.1	4.6
2504	44	24.5
2505	44	8.7
2506	43.4	4.4
2507	43.1	14
2508	42.6	4.2
2509	41.7	(^a)
2510	41.2	13.6
2511	40.8	6.5
2512	40.7	20.3
2513	39.8	(^a)
2514	39	14.7
2515	39.3	24.9
2516	38.9	(^a)

2517	38.5	15.5
2518	38	(a)
2519	37.3	7
2520	36.4	(a)
2521	35.3	(a)
2522	34.1	(a)
2523	32.8	(a)
2524	30.7	(a)
2525	28.9	(a)
2526	27.8	(a)
2527	26.7	(a)
2528	26.4	20
2529	26.8	24.1
2530	27.1	15.6
2531	27.6	29.9
2532	28.3	31.9
2533	28.6	14.2
2534	29.3	37.8
2535	30.6	43.6
2536	31.9	34.4
2537	31.6	0.9
2538	32.1	38.6
2539	32.6	0.8
2540	32	(a)
2541	32	20
2542	32.1	2.5
2543	31.3	(a)
2544	30.3	(a)
2545	29.5	(a)
2546	27.9	(a)
2547	26.1	(a)
2548	24.8	(a)
2549	23.1	39.1
2550	22.3	56.9
2551	24.3	68.3
2552	25.9	40.5
2553	26.8	24.7
2554	27.5	38.9
2555	28.3	44.5
2556	29	26
2557	29.3	28.1

2558	29.8	33.5
2559	30.4	16.3
2560	30.5	17.6
2561	30.4	9.3
2562	30	1
2563	29.1	(^a)
2564	28.4	11.9
2565	28.1	(^a)
2566	28.1	30.8
2567	29.1	37.6
2568	30.3	40.6
2569	31.5	24.7
2570	32.4	37.8
2571	33.7	44.2
2572	35.1	37.5
2573	36.2	38.5
2574	36.2	(^a)
2575	36.2	31
2576	36.8	24.9
2577	37.4	26.1
2578	37.8	25.3
2579	38	15.1
2580	38.1	20.9
2581	38.2	18.4
2582	37.7	(^a)
2583	37.7	29.6
2584	38.4	21.6
2585	38.7	19.5
2586	39.2	28.1
2587	39.8	27.4
2588	40.2	21.7
2589	40.4	21.5
2590	40.9	32.8
2591	41.7	44.7
2592	41.5	(^a)
2593	41	29.5
2594	40.4	12.9
2595	39.7	22.7
2596	39.3	22.7
2597	38.8	21.6
2598	38.5	34.9

2599	38.4	21.9
2600	38.6	31.5
2601	39.1	10.7
2602	39	9.8
2603	38.9	4.6
2604	40	37.2
2605	40.2	(^a)
2606	41	41.4
2607	42.9	36
2608	42.5	(^a)
2609	41.2	(^a)
2610	40.9	23.2
2611	40.9	8.6
2612	40.4	7.5
2613	40.2	13.8
2614	40.4	23.4
2615	40.9	31.8
2616	41.1	21.4
2617	41.8	39
2618	43.1	38.6
2619	43.1	5.1
2620	43.6	42.2
2621	44.9	40.6
2622	44.2	(^a)
2623	42.8	(^a)
2624	42.2	29.3
2625	41.8	13.5
2626	41.4	30.6
2627	41.2	15.3
2628	40.8	26.4
2629	40.3	21.9
2630	40.2	30.7
2631	40.2	28.1
2632	40	26.8
2633	40.2	36
2634	40.4	30.7
2635	40.7	38.9
2636	41.2	36.4
2637	41.5	36.5
2638	41.8	35.6
2639	42	35.8

2640	41.6	13.2
2641	41	22.6
2642	41.2	36.5
2643	41.4	29.7
2644	41.5	21.1
2645	41.4	21.8
2646	41.5	20.2
2647	41.6	24
2648	41.7	21.9
2649	41.9	25.3
2650	41	(^a)
2651	40.9	36.6
2652	41.2	14.7
2653	41.5	32.6
2654	41.8	21.5
2655	41.8	24.1
2656	42	26.5
2657	42	16.9
2658	41.6	18.7
2659	41.6	33.4
2660	42	42.5
2661	43.5	72
2662	45.9	51.3
2663	45.4	(^a)
2664	46.1	46.3
2665	47.1	(^a)
2666	46.7	9.4
2667	45.7	(^a)
2668	44.4	0.1
2669	43.2	(^a)
2670	42.5	5.9
2671	42.6	7
2672	42.8	8.9
2673	43.2	(^a)
2674	43.4	(^a)
2675	43.7	(^a)
2676	44.2	(^a)
2677	43.3	(^a)
2678	42	(^a)
2679	40.9	(^a)
2680	41	(^a)

2681	40.5	(a)
2682	39	(a)
2683	37.6	(a)
2684	36	(a)
2685	33.2	(a)
2686	32.2	(a)
2687	29.5	(a)
2688	27.2	(a)
2689	24.5	(a)
2690	21.5	(a)
2691	17.9	(a)
2692	37.6	9.6
2693	24.4	(a)
2694	19.8	(a)
2695	16.8	15.6
2696	38.2	4.6
2697	35.3	53.2
2698	34.8	(a)
2699	28	(a)
2700	18.9	(a)
2701	40.1	12.9
2702	28.6	(a)
2703	16.4	(a)
2704	10.4	(a)
2705	33.4	9.5
2706	28.5	3.5
2707	29.1	14.7
2708	36.1	19.7
2709	43.7	21.1
2710	51.1	14.7
2711	55.9	21.4
2712	66.5	34.1
2713	68.3	19.9
2714	40.6	23.4
2715	53.5	75.5
2716	63.9	17.2
2717	64.5	11.6
2718	36.4	2.4
2719	34.5	50
2720	39.1	24
2721	41.7	26.3

2722	43.6	20.8
2723	45.5	28.8
2724	47.5	27.2
2725	47.6	20.8
2726	48.4	30.2
2727	48.3	20.1
2728	50.2	(a)
2729	49.6	(a)
2730	46.6	(a)
2731	44.7	(a)
2732	43.1	(a)
2733	41.2	(a)
2734	40.1	1.5
2735	39.5	(a)
2736	37.2	(a)
2737	34.7	(a)
2738	29.9	(a)
2739	21.9	(a)
2740	27.2	14.2
2741	29.7	0.3
2742	24.4	(a)
2743	10.1	(a)
2744	10.4	(a)
2745	16.1	11.8
2746	16.5	9.6
2747	0	0
2748	0	0
2749	0	0
2750	0	0
2751	0	0
2752	0	0
2753	0	0
2754	0	0
2755	5.6	23
2756	19.9	33.9
2757	74.4	32.9
2758	60.9	1
2759	97.8	33.1
2760	55.9	2.2
2761	89.4	50.7
2762	54.9	1.2

2763	71.2	57.1
2764	90.9	17.2
2765	55.2	0.8
2766	75	77.5
2767	85.3	20.8
2768	52.8	13.4
2769	65.9	80.7
2770	85.7	74.1
2771	53.9	0.2
2772	55.1	62.4
2773	65.1	77
2774	77.2	83
2775	51.1	6.5
2776	46.7	52.1
2777	51.7	78.3
2778	58.5	62.4
2779	60.8	33.9
2780	62	48.1
2781	65.4	41.7
2782	67.2	23.3
2783	68.2	10.3
2784	36.5	3.2
2785	36	7.7
2786	36	27.9
2787	36.5	14.5
2788	35.9	(a)
2789	34.7	(a)
2790	33.3	(a)
2791	32	(a)
2792	30.6	(a)
2793	29.2	(a)
2794	29.2	39.4
2795	30	(a)
2796	30	36.7
2797	32.3	24.1
2798	33.2	37.9
2799	33.8	53.5
2800	35.7	53.5
2801	36.9	29
2802	37.2	26.9
2803	37.8	1.8

2804	37.4	17.4
2805	37.4	9.8
2806	37.6	16.8
2807	38.5	36.7
2808	38.8	0.3
2809	39.5	(^a)
2810	40.2	(^a)
2811	41.3	38.9
2812	42	59.2
2813	42.8	83.1
2814	44.5	93.3
2815	45.6	19.9
2816	46.3	40.8
2817	45.6	(^a)
2818	43.7	(^a)
2819	42.4	10.3
2820	41.8	20
2821	41.6	36.9
2822	41	30.8
2823	38.3	(^a)
2824	35.1	(^a)
2825	32.5	5
2826	31.5	(^a)
2827	29.4	(^a)
2828	27.3	17.8
2829	26	(^a)
2830	24.1	(^a)
2831	21.2	2.8
2832	18.8	18.7
2833	17.5	(^a)
2834	37.4	20.4
2835	36.9	(^a)
2836	31.3	(^a)
2837	25.4	(^a)
2838	22.2	(^a)
2839	20.2	(^a)
2840	17.8	(^a)
2841	39.4	19.9
2842	30.1	(^a)
2843	23.8	(^a)
2844	18	0.7

2845	40.1	10.2
2846	30.6	20.8
2847	26.2	(a)
2848	22.5	(a)
2849	20.6	(a)
2850	18.4	(a)
2851	17.5	(a)
2852	19	(a)
2853	21.8	3.9
2854	28.5	24.2
2855	36.5	10
2856	44.9	26
2857	56.8	27.8
2858	61.9	(a)
2859	55.5	13.5
2860	38.2	(a)
2861	40.9	(a)
2862	43.5	(a)
2863	44.3	(a)
2864	41.6	(a)
2865	39.5	(a)
2866	37.3	(a)
2867	37	(a)
2868	37.4	(a)
2869	37.7	(a)
2870	38.8	(a)
2871	39	(a)
2872	38.5	(a)
2873	38.5	(a)
2874	38.7	(a)
2875	38.6	(a)
2876	41	7.9
2877	41.1	(a)
2878	42.5	18.9
2879	46.9	37.1
2880	54	59.6
2881	59.1	32.2
2882	64.1	48.6
2883	71.8	61.2
2884	88.5	48.4

2885	46.5	2.9
2886	47.6	80.3
2887	53.5	84.4
2888	60.7	91.2
2889	68	89.5
2890	83.8	30
2891	38.8	3.1
2892	40.5	84.5
2893	43.8	87.5
2894	47.6	94.8
2895	51.6	97.2
2896	55.2	89.3
2897	57.4	71.7
2898	59.1	71.9
2899	61	85.6
2900	62.4	77.7
2901	63.3	66.2
2902	63.7	57.5
2903	64.8	12.5
2904	36.2	0.2
2905	36.1	40.1
2906	36.4	53.8
2907	37.2	62.7
2908	38.3	67.1
2909	39.6	51.8
2910	40.1	54.1
2911	40.1	34.6
2912	39.8	40.2
2913	40.8	56.1
2914	40.3	37.3
2915	40.6	45.8
2916	40.6	(^a)
2917	40	11.8
2918	40.1	18.5
2919	39.2	25.2
2920	38.8	40.6
2921	39	38.4
2922	39	40
2923	38.6	71.7
2924	38.9	89.2
2925	40.1	18.1

2926	40.5	(a)
2927	40.5	(a)
2928	40.1	(a)
2929	38.6	(a)
2930	36.9	(a)
2931	35.6	(a)
2932	34.3	(a)
2933	33.2	(a)
2934	32.4	7.6
2935	32.2	(a)
2936	31.3	30.2
2937	31.9	21.1
2938	31.2	8.6
2939	31.2	34.6
2940	31.4	5.8
2941	30.6	(a)
2942	29.8	(a)
2943	29.4	37.9
2944	30.2	66.9
2945	30.9	44.1
2946	31.1	35.5
2947	31.1	9.2
2948	30.4	20.2
2949	30.5	38.2
2950	31	51.1
2951	32.1	79.8
2952	32.8	30.1
2953	32.1	0.1
2954	31.2	(a)
2955	30.1	(a)
2956	29	(a)
2957	28.1	0.8
2958	28	19.9
2959	27.8	22
2960	27.4	(a)
2961	26.2	(a)
2962	25.3	(a)
2963	24.7	14.5
2964	24.4	34.1
2965	24.6	47.9
2966	25	59.8

2967	25	57.9
2968	24.6	66.1
2969	24	22.9
2970	21.8	40
2971	21.7	68.7
2972	22.8	(^a)
2973	21.1	(^a)
2974	18.3	(^a)
2975	20.6	10.1
2976	40.2	3.7
2977	39.6	62.7
2978	41.5	38.1
2979	41.8	11.7
2980	41.6	(^a)
2981	39.9	(^a)
2982	38.9	(^a)
2983	38.2	12.5
2984	37.8	27
2985	38.3	25.4
2986	39	21
2987	39.9	17.6
2988	40.7	36.7
2989	41.1	47.3
2990	40.5	34.5
2991	40.6	3.8
2992	40.2	(^a)
2993	40	(^a)
2994	40.4	18.4
2995	41.7	30.6
2996	42.6	27.8
2997	43.4	18.8
2998	43.2	15.5
2999	43.5	21.1
3000	43.9	16.5
3001	44.1	11
3002	43.6	0.9
3003	42.8	2.5
3004	42.4	31.4
3005	43.2	48.8
3006	44.3	39.9
3007	44.9	41.2

3008	45.2	46.6
3009	45.7	53.4
3010	46.7	44.3
3011	47.4	40.7
3012	47.7	21.3
3013	46.5	10.7
3014	45.9	14
3015	45.5	12.2
3016	45.4	9.7
3017	45	8.3
3018	44.3	37.6
3019	43.8	63.1
3020	44.9	85.9
3021	48.1	94.1
3022	51	50.2
3023	52.9	22.7
3024	53.3	0.9
3025	52.8	3.9
3026	52.1	(^a)
3027	51.5	(^a)
3028	50.8	(^a)
3029	49.9	(^a)
3030	48.4	20.6
3031	47.7	33.2
3032	48.2	1.7
3033	48.7	(^a)
3034	47.7	(^a)
3035	45.6	38.3
3036	45.8	49.5
3037	47	(^a)
3038	47.1	6.7
3039	46.7	12.3
3040	46.4	20.6
3041	46.6	32.4
3042	47.3	11.8
3043	46.3	(^a)
3044	44.9	(^a)
3045	43.6	15.7
3046	44	29.1
3047	44.4	17.1
3048	44.8	23

3049	44.9	21.9
3050	45.1	21.5
3051	44.8	36.8
3052	44.8	40
3053	45.4	8.4
3054	44.5	22.7
3055	44	43
3056	45.2	16.5
3057	45.5	(a)
3058	45	4
3059	47	12.5
3060	45.8	(a)
3061	45.6	(a)
3062	45.2	(a)
3063	44.2	(a)
3064	42.6	(a)
3065	41.2	(a)
3066	39.6	(a)
3067	37.3	(a)
3068	35.6	(a)
3069	34.6	(a)
3070	33.4	(a)
3071	31.9	(a)
3072	29.8	(a)
3073	28.2	2.7
3074	28.7	25
3075	28	(a)
3076	27.2	(a)
3077	24.8	(a)
3078	21.8	(a)
3079	19.5	(a)
3080	17.4	(a)
3081	41.9	19.2
3082	38	(a)
3083	35.2	(a)
3084	31.2	(a)
3085	27.6	3
3086	29.3	42.9
3087	29.7	38.8
3088	27	(a)

3089	25.1	(a)
3090	20	(a)
3091	34.3	15.3
3092	25.8	(a)
3093	22.1	(a)
3094	20.7	(a)
3095	19	(a)
3096	34	17.2
3097	26.1	1.2
3098	11.7	7.9
3099	14.6	7.5
3100	2.1	0.3
3101	0.1	2.1
3102	0	0
3103	0	0
3104	0	0
3105	0	0
3106	0	0
3107	0	0
3108	0	0
3109	0	0
3110	0	0
3111	0	0
3112	0	0
3113	0	0
3114	0	0
3115	0	0
3116	0	0
3117	0	0
3118	0	0
3119	0	0
3120	0	0
3121	0	0
3122	0	0
3123	0	0
3124	0	0
3125	0.6	10.4
3126	7.6	32.5
3127	14.8	14.4
3128	33.9	8.5
3129	57.6	11.5

3130	66.3	12.2
3131	71.7	30.5
3132	44.1	5.8
3133	53.4	37.5
3134	106.1	78.9
3135	43.8	1.9
3136	60	59.6
3137	90.4	70.2
3138	62.1	1.8
3139	71.3	61.6
3140	85.2	26.5
3141	54.6	20.2
3142	64.1	71.4
3143	76.1	46.3
3144	51.8	0.8
3145	50.9	(^a)
3146	51.3	(^a)
3147	51.6	(^a)
3148	51.9	(^a)
3149	51.9	(^a)
3150	51.4	(^a)
3151	50.2	(^a)
3152	48.6	(^a)
3153	47.3	(^a)
3154	47.1	(^a)
3155	47.9	4.9
3156	49.6	14
3157	52.5	26
3158	54.8	14.1
3159	56.1	5.8
3160	57	3.4
3161	57.9	5.5
3162	58	7.5
3163	34.6	(^a)
3164	34.3	(^a)
3165	34.2	20.5
3166	34.8	25.1
3167	35.3	24.8
3168	36.1	30.5
3169	37.2	32.4
3170	38.1	28.6

3171	38.8	25.7
3172	39.5	26.4
3173	40.2	27
3174	40.9	23.3
3175	41.2	21.8
3176	42	32.6
3177	43.4	41.2
3178	46.2	74.3
3179	50.5	90.2
3180	53.9	41.2
3181	54.1	13.4
3182	53.5	(a)
3183	51.9	(a)
3184	50.3	(a)
3185	48.4	(a)
3186	47	(a)
3187	46	(a)
3188	44.6	(a)
3189	42.5	(a)
3190	38.1	(a)
3191	35.1	(a)
3192	33	(a)
3193	31.5	(a)
3194	30.8	11.8
3195	30.8	15.6
3196	30.6	(a)
3197	28	(a)
3198	21.4	(a)
3199	33.8	6
3200	20.7	(a)
3201	32	8.3
3202	24	(a)
3203	19.9	(a)
3204	40.2	16.1
3205	43.3	26
3206	49.5	24.1
3207	52.6	16.2
3208	56.1	16.8
3209	57.4	1.5
3210	54.3	(a)
3211	51	(a)

3212	47.8	(a)
3213	44.7	(a)
3214	41	(a)
3215	37.3	(a)
3216	31.4	(a)
3217	20.8	(a)
3218	34.5	10.9
3219	29	(a)
3220	22.3	(a)
3221	13.8	(a)
3222	21.9	6.8
3223	16.8	6.7
3224	18.1	12.5
3225	19.5	9.6
3226	20.9	10.3
3227	21.1	4.8
3228	16.2	(a)
3229	19.6	9.3
3230	13.5	1.1
3231	18.2	(a)
3232	13.9	6.2
3233	20.5	14.6
3234	33.4	9.2
3235	43.5	8
3236	54.4	8.7
3237	66.2	9.2
3238	43.1	1
3239	54	16.4
3240	69.3	13.6
3241	65.5	13.2
3242	50	26.4
3243	62.2	8.9
3244	60.4	4.5
3245	33.7	(a)
3246	27.5	(a)
3247	16.4	(a)
3248	23.9	6.8
3249	13.5	(a)
3250	21.9	1
3251	15.2	8.3
3252	24.2	16.5

3253	35.3	10.4
3254	41.6	5.6
3255	39.6	(a)
3256	37.9	3.5
3257	40.2	5.7
3258	43.8	5.7
3259	47	5.1
3260	51.7	7.4
3261	60.2	10.7
3262	69.7	10
3263	45	0.1
3264	37	(a)
3265	29.3	(a)
3266	20.4	(a)
3267	12.8	(a)
3268	30.2	4.2
3269	45.6	23.4
3270	66.8	15.6
3271	77.2	13.6
3272	48.2	2.2
3273	41.3	(a)
3274	33.5	(a)
3275	26	(a)
3276	18.7	(a)
3277	12.2	0.2
3278	20.9	(a)
3279	12.8	6.5
3280	0	0
3281	0	0
3282	0	0
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3551	0	0
3552	0	0
3553	0	0
3554	0	0
3555	0	0
3556	0	0
3557	0.6	11.9
3558	6.5	28.8
3559	7.2	27
3560	15.7	15
3561	34.4	12.3
3562	64.6	16.7
3563	50.3	4.6
3564	65.3	30.7
3565	47.8	14.2
3566	38.7	32.5
3567	84.4	74.8
3568	42.8	4.5
3569	44	39.1
3570	45.5	(^a)
3571	39.2	(^a)
3572	30.6	(^a)
3573	13.5	0.7
3574	14.7	7.9
3575	1.2	(^a)
3576	0.1	5.8
3577	4.1	10.8
3578	6.8	10.2
3579	5.3	4.6
3580	0.9	5.4

3581	0.3	10.6
3582	6.1	12.3
3583	14.3	15.2
3584	27.3	8.3
3585	33.1	3.6
3586	31.1	2.5
3587	33.3	5.1
3588	40.7	5.2
3589	43.5	2.3
3590	38.6	1.8
3591	44.8	6.7
3592	57.6	8.2
3593	49.5	10.2
3594	44.3	16.7
3595	73.3	20.3
3596	46.1	13
3597	38.4	32.8
3598	75	46
3599	48.3	13.8
3600	36.9	36.6
3601	59.4	72.6
3602	82.2	57.1
3603	59.9	2.7
3604	60.4	43.6
3605	59.8	(^a)
3606	47.9	(^a)
3607	35.5	(^a)
3608	26.5	(^a)
3609	21.3	(^a)
3610	33	7.2
3611	11.3	(^a)
3612	19.5	12.5
3613	13.9	(^a)
3614	0	0
3615	0	0
3616	0	0
3617	0	0
3618	0	0
3619	0	0
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3629	0	0
3630	0	0
3631	0	0
3632	1.1	7.1
3633	4.3	13.6
3634	6.3	22.9
3635	6.6	17
3636	6.4	9.9
3637	7.9	9.9
3638	15.2	14
3639	31.5	9.6
3640	46.2	8.1
3641	68.3	14.2
3642	44.3	1.2
3643	75.6	38.8
3644	46	8.5
3645	45	33.7
3646	89.9	66.8
3647	40.7	0.4
3648	46	48
3649	72.2	82.4
3650	75.6	17.4
3651	58.3	36
3652	71.6	75
3653	83.1	25.7
3654	51.8	20.3
3655	59.3	70.8
3656	70.7	80.1
3657	76.9	26.6
3658	49.2	2.5
3659	49.7	15.4
3660	49.1	(^a)
3661	47.5	(^a)
3662	46.3	(^a)

3663	44	(a)
3664	39.4	(a)
3665	33.2	(a)
3666	28.7	(a)
3667	23.1	(a)
3668	33.7	13.1
3669	30.5	(a)
3670	24.9	(a)
3671	28.2	13.5
3672	22.4	4.6
3673	16.2	2.1
3674	16.5	5.1
3675	14	7.2
3676	13.5	5.4
3677	0	0
3678	0	0
3679	0	0
3680	0	0
3681	0	0
3682	6	24.4
3683	7.7	33.4
3684	25.5	15.4
3685	50.1	13
3686	77	16.7
3687	45.5	1.1
3688	96	52.9
3689	34.5	2.6
3690	59.4	53.3
3691	89.5	33.2
3692	39.2	2
3693	56.1	63.8
3694	83.3	70
3695	59.2	0.3
3696	61.6	50.6
3697	77.6	83.9
3698	57.3	6
3699	53.5	43.8
3700	62.9	79.6
3701	75	95.3
3702	53.6	4.6
3703	50.6	46.1

3704	56.4	79.9
3705	64	93.9
3706	69.6	37.6
3707	70.6	21.5
3708	68	11.4
3709	43	12.2
3710	44.5	29.6
3711	44.4	10.1
3712	44	7
3713	43.1	2
3714	42.3	1.1
3715	41.2	(a)
3716	40	(a)
3717	38.7	(a)
3718	37.5	(a)
3719	36	(a)
3720	34.9	(a)
3721	32.8	(a)
3722	29.5	(a)
3723	25.9	(a)
3724	22.6	(a)
3725	19.9	(a)
3726	37	7.2
3727	32.7	(a)
3728	25.5	(a)
3729	19.6	4.9
3730	31.1	(a)
3731	25.9	(a)
3732	22.1	(a)
3733	36.9	12.8
3734	23.5	(a)
3735	30.2	6.8
3736	15.8	(a)
3737	22.3	3.5
3738	19.3	15.3
3739	15.8	9.3
3740	16.9	8.5
3741	0	0
3742	0	0
3743	0	0
3744	1.7	9.1

3745	7.1	31.5
3746	10.3	21.5
3747	43	17.4
3748	89.3	31.2
3749	52.3	1.8
3750	101.6	65.3
3751	38	1.8
3752	65.1	55.2
3753	78.5	29.8
3754	40.6	15.2
3755	60.4	67.5
3756	90	70.2
3757	60.3	2.3
3758	66.9	60.6
3759	79.2	30
3760	51.3	1.2
3761	53.4	47.7
3762	55.7	8.4
3763	55.4	(^a)
3764	54.3	1.4
3765	53.9	4.1
3766	54.1	9.3
3767	55.6	18.5
3768	59.3	36.6
3769	63.8	30.1
3770	66.4	18.2
3771	43.1	0.4
3772	43	51.1
3773	49.6	81
3774	55.1	49
3775	58.9	44.6
3776	62.5	46.7
3777	64.9	25.7
3778	65.7	13.7
3779	41.7	0.4
3780	40.5	31.8
3781	41.2	21
3782	41.2	7.1
3783	41.2	11.4
3784	41.6	20.9
3785	42.2	21.1

3786	42.8	19.8
3787	43.8	30.5
3788	44.4	17.7
3789	45.2	27.6
3790	45.7	16.6
3791	46.7	31.9
3792	47.7	27.1
3793	49.1	37.5
3794	50.8	40.8
3795	52.7	45.9
3796	54.7	44.6
3797	56.7	46.3
3798	58.9	52.6
3799	60.1	16.2
3800	58	(a)
3801	34.9	(a)
3802	32.8	3.8
3803	32.2	(a)
3804	31.2	(a)
3805	29.8	(a)
3806	28.7	(a)
3807	27.3	(a)
3808	25.7	(a)
3809	24.9	(a)
3810	23.7	(a)
3811	22.7	(a)
3812	21.9	(a)
3813	20.7	(a)
3814	19.4	(a)
3815	38.2	1.1
3816	38.1	22.8
3817	39.7	39.3
3818	41.4	29.7
3819	41.8	14.7
3820	41.9	12.7
3821	42.2	21.3
3822	43.4	31.2
3823	44.2	21
3824	44.7	18.6
3825	45.1	17.6
3826	45.4	16.8

3827	45.9	18.5
3828	46	13
3829	46	14.4
3830	46.4	10.9
3831	45.5	(a)
3832	44.4	(a)
3833	42.8	(a)
3834	41.1	(a)
3835	39.2	(a)
3836	38.1	(a)
3837	37.9	10.9
3838	37.9	12.9
3839	38.3	17.9
3840	38.7	8.5
3841	37.6	(a)
3842	37.6	14.5
3843	37.5	8.5
3844	37.4	7.6
3845	36.9	5.2
3846	36.9	13.2
3847	37.2	13.9
3848	37	6.9
3849	36.8	2.4
3850	35.8	(a)
3851	35.2	3.1
3852	34.6	2.3
3853	34.4	10.4
3854	34.5	10.5
3855	34.3	6.5
3856	34	4.6
3857	33.5	6
3858	33.8	20.3
3859	34.7	28.4
3860	35.8	31.3
3861	37.2	29.8
3862	37.8	18.2
3863	38.1	14.9
3864	38.4	11.4
3865	37.6	(a)
3866	37.1	1.7
3867	36.2	(a)

3868	35.2	(a)
3869	34.4	(a)
3870	34.1	10.8
3871	34.3	14.3
3872	34.5	13.3
3873	34.6	12.7
3874	34.7	12.1
3875	34.9	19.8
3876	36.2	30.9
3877	36.6	15.7
3878	37.1	13.5
3879	36.2	(a)
3880	33.1	(a)
3881	29	(a)
3882	24.8	(a)
3883	21.1	(a)
3884	38.5	15.7
3885	35.8	(a)
3886	33.7	(a)
3887	30.7	(a)
3888	27.3	(a)
3889	26.6	13.3
3890	27.9	30.6
3891	30.7	41.6
3892	32.5	15.8
3893	31.9	(a)
3894	21.8	(a)
3895	25.6	4.2
3896	26.8	3.8
3897	20.2	2.5
3898	14.3	2.8
3899	11.3	6.7
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3917	0	0
3918	0	0
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3920	7	10
3921	6.7	32.8
3922	6.3	35
3923	5.8	25.2
3924	6.1	10.4
3925	0	0
3926	0.1	5.8
3927	0	0
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3929	0	0
3930	1.3	9.6
3931	6.3	36.6
3932	6.5	48.5
3933	5.9	38.4
3934	9.7	20.5
3935	17.5	14.9
3936	22.2	9
3937	22.6	4.6
3938	17.2	3.2
3939	10.7	(^a)
3940	0	0
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4071	5.2	20.5
4072	5	20.8

4073	5.4	23.1
4074	5.1	18.1
4075	4.3	8.7
4076	0	0
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4078	0.8	6.4
4079	5.3	18.7
4080	4.8	19.6
4081	5.5	29.5
4082	6	38.2
4083	4.3	14.8
4084	4.3	8.7
4085	0.1	7.5
4086	0.1	5.9
4087	0.7	5.8
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4117	2.8	9.3
4118	2.3	9
4119	0.8	9.8
4120	1.4	9.6
4121	4.6	14
4122	4.5	13.1
4123	4.8	16
4124	5.1	18.8
4125	6	31.2
4126	7.1	52.5
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4130	32.1	12.2
4131	42	7.6
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4134	33.8	14.3
4135	21.5	25
4136	24.7	9.1
4137	25.5	4.5
4138	28.7	9.9
4139	34.4	10.7
4140	40.5	4.7
4141	42.8	3.3
4142	43.4	0
4143	39.5	(^a)
4144	34.1	(^a)
4145	22	(^a)
4146	0	0
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4149	1.1	10.1
4150	7.2	38.5
4151	6.5	34.3
4152	6.2	18
4153	13.3	18.5
4154	21.3	13.1

4155	25.8	8.2
4156	27.2	6.2
4157	29.8	3
4158	29.7	3.6
4159	31.4	4.4
4160	31	5.6
4161	29.2	4.6
4162	27	5.2
4163	24	7.4
4164	22.2	8.8
4165	21.8	9
4166	23.2	8.6
4167	23.3	8.9
4168	21.2	6.4
4169	18.2	3.9
4170	13.7	7.6
4171	10.5	10.9
4172	9.9	7.9
4173	5.2	0.5
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4177	2.7	10
4178	5.1	19.6
4179	6.8	47.4
4180	6.2	45.8
4181	5.9	29.5
4182	10.2	15.6
4183	12.9	13.2
4184	13.8	17.7
4185	18.1	7.9
4186	17.3	3.6
4187	13.9	2.4
4188	12.6	0.6
4189	10.6	(^a)
4190	8.1	4.3
4191	0	0
4192	0	0
4193	0	0
4194	0.8	8.7
4195	6.5	25

4196	6.3	28.5
4197	5.7	19.5
4198	5.4	10.8
4199	5.7	10.2
4200	6.6	16.4
4201	6.9	13.9
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4207	0.4	5.8
4208	0.7	10
4209	0.5	9.9
4210	0.1	5.9
4211	0	0
4212	0.6	8.4
4213	4.5	13.9
4214	4.9	19.7
4215	4.9	23.1
4216	4.7	22
4217	4.7	20.2
4218	4.4	15.3
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4220	1.3	9.9
4221	5.6	16.9
4222	5.3	14.9
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4877	6.3	42.9
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4880	5.8	26.2
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4883	12.1	12.2
4884	16.8	15.6
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4886	39.2	15.2
4887	55.7	15.4
4888	43.9	13.3
4889	36.9	23.2
4890	48	11.8
4891	55.2	13.7
4892	64.8	10.6

4893	33.1	0.7
4894	34.1	6.1
4895	32.1	(^a)
4896	27.4	(^a)
4897	18.5	(^a)
4898	6.8	0.8
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4945	0	0
4946	0	0
4947	0	0
4948	0	0
4949	0	0
4950	0	0
4951	0	0
4952	0	0
4953	0	0
4954	0	0
4955	0	0
4956	0	0
4957	0	0
4958	0	0
4959	0	0
4960	0	0
4961	0	0
4962	0	0
4963	0	0
4964	0	0
4965	0	0
4966	0	0
4967	0	0
4968	0	0
4969	0	0
4970	0	0
4971	0	0
4972	0	0
4973	0	0
4974	0	0

4975	0	0
4976	0	0
4977	0	0
4978	0	0
4979	0	0
4980	0	0
4981	0	0
4982	0	0
4983	0	0
4984	0	0
4985	0	0
4986	0	0
4987	0	0
4988	0	0
4989	0	0
4990	0	0
4991	0	0
4992	0	0
4993	0	0
4994	0	0
4995	0	0
4996	0	0
4997	0	0
4998	0	0
4999	0	0
5000	0	0
5001	0	0
5002	0	0
5003	0	0
5004	0	0
5005	0	0
5006	0	0
5007	0	0
5008	0	0
5009	0	0
5010	0	0
5011	0	0
5012	0	0
5013	0	0
5014	0	0
5015	0	0

5016	0	0
5017	0	0
5018	0	0
5019	0	0
5020	0	0
5021	0	0
5022	0	0
5023	0	0
5024	0	0
5025	0	0
5026	0	0
5027	0	0
5028	0	0
5029	0	0
5030	0	0
5031	0	0
5032	0	0
5033	0	0
5034	0	0
5035	0	0
5036	0	0
5037	0	0
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5039	0	0
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5046	0	0
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5048	0	0
5049	0	0
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5051	0	0
5052	0	0
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5054	0	0
5055	0	0
5056	0	0

5057	0	0
5058	0	0
5059	0	0
5060	0	0
5061	0	0
5062	0	0
5063	0	0
5064	0	0
5065	0	0
5066	0	0
5067	0	0
5068	0	0
5069	0	0
5070	0	0
5071	0	0
5072	0	0
5073	0	0
5074	0	0
5075	0	0
5076	0	0
5077	0	0
5078	0	0
5079	0	0
5080	0	0
5081	0	0
5082	0	0
5083	0	0
5084	0	0
5085	0	0
5086	0	0
5087	0	0
5088	0	0
5089	0	0
5090	0	0
5091	0	0
5092	0	0
5093	0	0
5094	0	0
5095	0	0
5096	0	0
5097	0	0

5098	0	0
5099	0	0
5100	0	0
5101	0	0
5102	0	0
5103	0	0
5104	0	0
5105	0	0
5106	0	0
5107	0	0
5108	0	0
5109	0	0
5110	0	0
5111	0	0
5112	0	0
5113	0	0
5114	0	0
5115	0	0
5116	0	0
5117	0	0
5118	0	0
5119	0	0
5120	0	0
5121	1	7.5
5122	0	0
5123	0	0
5124	1.2	6.9
5125	5.9	28.2
5126	6	37.9
5127	5.7	36.4
5128	6.4	40.8
5129	7	44.4
5130	17.5	30.8
5131	33	16.5
5132	43.5	15.8
5133	54.5	11.2
5134	45.5	16.1
5135	23.1	31.7
5136	32.4	17.3
5137	40.6	6.3
5138	47.3	(^a)

5139	50.3	(a)
5140	51	(a)
5141	48.1	(a)
5142	44.8	(a)
5143	40.4	(a)
5144	37.8	(a)
5145	36.4	(a)
5146	36.8	3.3
5147	41.2	2.4
5148	44.7	3.9
5149	50.1	5.6
5150	57.9	2.6
5151	57.9	12.3
5152	24.4	(a)
5153	16.9	1
5154	10.7	0.7
5155	28.2	16.1
5156	5.3	1
5157	0.1	6
5158	0	0
5159	0	0
5160	0.4	5.8
5161	1.4	9.5
5162	6.2	28.4
5163	6.8	41
5164	5.7	34.4
5165	5.4	23.3
5166	5.9	22.2
5167	6.1	21.1
5168	6.2	19.5
5169	6.4	20.2
5170	6.9	29.3
5171	6	18.2
5172	6.7	26.6
5173	5.8	13.1
5174	7	10.2
5175	7.4	9.2
5176	7.5	9
5177	7.5	8.8
5178	7.5	8.8
5179	8.7	16.8

5180	20.1	20.7
5181	33.4	16
5182	49.7	13.4
5183	57.2	6.8
5184	26.8	1
5185	21.1	24.2
5186	25.4	14
5187	26.1	11.9
5188	28	7.4
5189	28.5	6
5190	28.5	5.7
5191	28.4	5.6
5192	28.2	5.6
5193	28.1	5.6
5194	27.9	5.7
5195	29.5	14.7
5196	40.8	21.2
5197	56.3	21.8
5198	68.3	13.8
5199	33.3	2.8
5200	42.1	40.5
5201	59.3	19.7
5202	67.3	9.5
5203	38.3	0.5
5204	42.7	37
5205	49.4	19.3
5206	56.8	10.7
5207	63.5	24.7
5208	42.4	13.5
5209	25.9	51.3
5210	30.8	72.4
5211	38.7	13.4
5212	38	(a)
5213	31.1	(a)
5214	18.8	(a)
5215	9.7	17.8
5216	2.1	0.2
5217	0.1	5.8
5218	0	0
5219	0	0
5220	0	0

5221	0	0
5222	0	0
5223	0	0
5224	0	0
5225	0	0
5226	0	0
5227	0	0
5228	0	0
5229	0	0
5230	0	0
5231	0	0
5232	0	0
5233	0	0
5234	0	0
5235	0	0
5236	0	0
5237	0	0
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5240	0	0
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5242	0	0
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5244	0	0
5245	0	0
5246	0	0
5247	0	0
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5255	0	0
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5257	0	0
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5260	0	0
5261	0	0

5262	0	0
5263	0	0
5264	0	0
5265	0	0
5266	0	0
5267	0	0
5268	0	0
5269	0	0
5270	0	0
5271	0	0
5272	0	0
5273	0	0
5274	0	0
5275	0	0
5276	0	0
5277	0	0
5278	0	0
5279	0	0
5280	0	0
5281	0	0
5282	0	0
5283	0.8	9.8
5284	6.6	37.6
5285	6.5	41.8
5286	5.7	27.5
5287	5.4	14.6
5288	4.3	4.8
5289	0	0
5290	0	0
5291	0	0
5292	1.8	9.6
5293	7.7	54.2
5294	7.2	74
5295	26.2	44
5296	56.6	26.2
5297	41.1	15.5
5298	15.7	3.7
5299	25.6	54.8
5300	58.4	41.3
5301	79.3	27.1
5302	45	0.8

5303	52.4	49
5304	84.7	84.8
5305	85.6	30.4
5306	47.3	2.8
5307	52.6	65.9
5308	67.5	87.5
5309	85.6	57.5
5310	92.5	52
5311	67.3	17.9
5312	50.8	39.2
5313	54.7	74.5
5314	61.2	90.7
5315	70.6	97
5316	82.2	95.2
5317	90.7	33.2
5318	53	2.5
5319	58.2	62
5320	64.7	43.3
5321	68.1	53.2
5322	70.3	80.1
5323	73.6	35
5324	74.1	26.3
5325	43.6	7.6
5326	37.1	12.3
5327	35.9	8.2
5328	34.1	(^a)
5329	30.2	(^a)
5330	23.3	(^a)
5331	14.2	(^a)
5332	30.7	1.7
5333	19.7	(^a)
5334	15.1	12.6
5335	43.1	5.7
5336	39.2	(^a)
5337	35.7	(^a)
5338	30.1	(^a)
5339	24.4	(^a)
5340	21.6	(^a)
5341	21.3	(^a)
5342	20.1	4.4
5343	20.1	10

5344	20.4	6.1
5345	19.1	(^a)
5346	16	(^a)
5347	12.8	(^a)
5348	9.4	(^a)
5349	8.4	(^a)
5350	8.2	(^a)
5351	32.6	20.1
5352	27.9	(^a)
5353	26.6	20.9
5354	30.9	32
5355	33.2	21.5
5356	32.4	2.7
5357	34.7	19.6
5358	46.7	35.6
5359	61.8	44.7
5360	74.1	43.8
5361	79.1	27.1
5362	40	3
5363	38.7	58.8
5364	47	81.8
5365	59.3	92.7
5366	72.4	96.5
5367	80.9	50.4
5368	85.8	58
5369	47.8	0.5
5370	47.6	52.3
5371	52.8	81.7
5372	59.2	93.4
5373	65.5	98.3
5374	72.3	98.2
5375	75.3	21.6
5376	76.1	42.7
5377	40	1.5
5378	38.4	58.3
5379	40.8	83.1
5380	43.6	92.9
5381	46.7	96.7
5382	50.1	98.4
5383	53	99.3
5384	56.2	99

5385	59.9	58.3
5386	61.8	38.7
5387	62.9	41
5388	30.9	1.4
5389	29.2	64.2
5390	29.7	86
5391	30.5	93.5
5392	31.4	60
5393	31.8	34.9
5394	31.6	45.6
5395	31.8	45.8
5396	31.8	(a)
5397	30.6	(a)
5398	29.4	4.1
5399	28.4	(a)
5400	27.6	(a)
5401	26.6	4.6
5402	26	(a)
5403	25	14.2
5404	24.4	8.2
5405	24.1	(a)
5406	23.2	(a)
5407	22.5	(a)
5408	21.8	(a)
5409	20.6	9.5
5410	19.6	4.5
5411	18.7	(a)
5412	18	(a)
5413	16.5	(a)
5414	17.2	13.8
5415	40.8	2.2
5416	36.4	(a)
5417	34.8	(a)
5418	33.5	(a)
5419	31.7	(a)
5420	27.1	(a)
5421	20	(a)
5422	26.2	22.1
5423	25.5	7.2
5424	33.7	15.3
5425	15.9	(a)

5426	10.8	(^a)
5427	9.4	6.8
5428	11	45
5429	15.6	61.7
5430	20.1	44.6
5431	23.1	47
5432	27	43
5433	31.6	43.2
5434	36.1	33
5435	38.7	21
5436	41.9	36.1
5437	47.2	48.6
5438	55.4	69.9
5439	65.4	71.9
5440	72.7	55
5441	76.7	33.4
5442	41.3	1.5
5443	39.1	49.6
5444	44	79.4
5445	50.2	58
5446	53.4	43.9
5447	56.3	52.2
5448	60.4	67.4
5449	64.7	61.3
5450	68	51.4
5451	70.9	50.6
5452	41	6.3
5453	36.5	46.3
5454	38	57.7
5455	39.9	59.5
5456	41.9	65.2
5457	44.4	77.2
5458	46.9	69.5
5459	48.7	48.9
5460	49.9	38.1
5461	50.3	19.6
5462	49.5	(^a)
5463	48.2	(^a)
5464	46.6	(^a)
5465	45.3	(^a)
5466	43.5	(^a)

5467	40.3	(a)
5468	35.8	(a)
5469	32.1	(a)
5470	28.4	(a)
5471	22.8	(a)
5472	14.5	6.3
5473	22.7	(a)
5474	27.5	8.8
5475	6.4	3.7
5476	20.7	(a)
5477	13.7	(a)
5478	9.9	(a)
5479	0	0
5480	0	0
5481	0	0
5482	0	0
5483	0.7	5.9
5484	36.3	46.1
5485	34.1	(a)
5486	26.5	(a)
5487	20.6	2.3
5488	16	(a)
5489	10.2	(a)
5490	0	0
5491	0	0
5492	0	0
5493	0	0
5494	0	0
5495	0	0
5496	0	0
5497	0	0
5498	0	0
5499	0	0
5500	0	0
5501	0	0
5502	0	0
5503	0	0
5504	0	0
5505	0	0

(a) Closed throttle motoring

Appendix I to Subpart T – Sample Graphical Summary of NTE Emission Results

PART 1036 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HEAVY-DUTY HIGHWAY ENGINES

Subpart A – Overview and Applicability

1036.1 Does this part apply for my engines? March 10, 2021 (Pre-publication).

1. Amend subparagraph (a) as follows: Except as specified in 40 CFR §1036.5, the provisions of this part apply for engines that will be installed in heavy-duty vehicles (including glider vehicles) above 14,000 pounds GVWR for propulsion, 2022 and subsequent model year diesel hybrid powertrains optionally certifying to criteria pollutants emission standards pursuant to title 13, CCR, 1956.8 that will be installed in incomplete vehicles from 10,001 to 14,000 pounds GVWR, and 2022 and subsequent model year diesel hybrid powertrains optionally certifying to criteria pollutants emission standards pursuant to title 13, CCR, 1956.8 that will be installed in heavy-duty vehicles above 14,000 pounds GVWR. These provisions also apply for engines that will be installed in 2019 and earlier model year incomplete heavy-duty vehicles from 8,501 to 10,000 pounds GVWR and in incomplete heavy-duty vehicles from 10,001 to 14,000 pounds GVWR, unless the engine is installed in a vehicle that is covered by an Executive Order under 40 CFR part 86, subpart S.

2. Amend subparagraph (b) as follows: This part does not apply with respect to exhaust emission standards for HC, CO, NO_x, or PM except as follows:

(1) The provisions of §1036.601 apply.

(2) 40 CFR parts 85 and 86 may specify that certain provisions apply.

(3) The provisions of §1036.501(h)(1) apply.

(4) Diesel hybrid powertrain optionally certifying to criteria pollutants emission standards pursuant to title 13, CCR, 1956.8 apply.

3. Delete subparagraph (c).

4. Subparagraph (d). [No change.]

1036.2 Who is responsible for compliance? October 25, 2016.

1036.5 Which engines are excluded from this part's requirements? October 25, 2016.

1. Subparagraph (a). [No change.]

2. Amend subparagraph (b) as follows: Engines installed in heavy-duty vehicles that do not provide motive power are nonroad engines, except for diesel engines installed in a hybrid powertrain optionally certifying to criteria pollutants emission standards pursuant to title 13, CCR 1956.8 regardless whether the engine provides motive power or not. The provisions of this part therefore do not apply to these engines. See 40 CFR parts 1039, 1048, or 1054 for other requirements that apply for these auxiliary engines. See 40 CFR part 1037 for requirements that may apply for vehicles using these engines, such as the evaporative emission requirements of 40 CFR 1037.103.

3. Subparagraphs (c) through (e). [No change.]

1036.10 How is this part organized? October 25, 2016.

1036.15 Do any other regulation parts apply to me? October 25, 2016.

1036.30 Submission of information. October 25, 2016.

1. Amend subparagraph as follows: Send all reports and requests for approval to the ARB Designated Compliance Officer, as follows: Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave., Riverside, CA 92507.

Subpart B – Emission Standards and Related Requirements

1036.100 Overview of exhaust emission standards. October 25, 2016.

1036.108 Greenhouse gas emission standards. October 25, 2016.

1. Add the following section to the introductory paragraph: Optional Compliance Via the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program. For the 2014 through 2020 model years, a manufacturer may elect to demonstrate compliance with this section, 40 CFR §1036.108, for all of its applicable heavy-duty engines by demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program, if it meets the criteria identified below.

(1) A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or December 1, 2014, whichever is later;

(2) The manufacturer must submit to ARB all data that it submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §1036.205, §1036.250, and §1036.730, for demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program and the U.S. Environmental Protection Agency determination of compliance. With the exception of the 2014 model year, all such data must be submitted within 30 days of receipt of the U.S. Environmental Protection Agency Certificate of Conformity or of the date of submission to the U.S. Environmental Protection Agency, whichever is later, for each model year that a manufacturer selects compliance with this option;

(3) The manufacturer must provide to the Executive Officer separate numbers for each engine family of heavy-duty engines produced and delivered for sale in California each model year and all values used in calculating positive or negative emission credits in 40 CFR §1036.730.

2. Subparagraphs (a) through (a)(1)(i). [No change.]

3. Add the following language to subparagraph (a)(1)(ii): As an option, 2017 through 2027 model year heavy-duty diesel engines, except in all cases engines used in medium-duty vehicles, may be certified to the Optional Low-CO₂ Emission Standards. The CO₂ emissions from engines certified to the Optional Low-CO₂ Emission Standards may not exceed the following standards:

**Optional Low-CO₂ Emission Standards for
2017 through 2027 Model Year Heavy-Duty Diesel Engines
(grams per horsepower-hour or g/hp-hr)**

<i>Light heavy-duty – vocational</i>	<i>Medium heavy-duty – vocational</i>	<i>Heavy heavy-duty – vocational</i>	<i>Medium heavy-duty – tractor</i>	<i>Heavy heavy-duty – tractor</i>
490	474	446	409	387

Engines certified to the Optional Low-CO₂ Emission Standards must also comply with the applicable CH₄ and N₂O emission standards set forth in subparagraphs (a)(2) and (a)(3), respectively. In addition, engines certified to these Optional Low-CO₂ Emission Standards and participating in the Innovative Technology Regulation set forth in §§2208 and 2208.1 of title 13, CCR are not eligible to participate in the averaging, banking, and trading program, or to generate credits for certification.

4. Subparagraphs (a)(2) through (f). [No change.]

1036.115 Other requirements. October 25, 2016.

1036.130 Installation instructions for vehicle manufacturers. October 25, 2016.

1. Subparagraphs (a) through (b)(1). [No change.]

2. Delete and replace subparagraph (b)(2), as follows: State “Failing to follow these instructions when installing a certified engine, or an optionally certified diesel hybrid powertrain, in a heavy-duty motor vehicle violates federal and state law, subject to fines or other penalties as described in the Clean Air Act and California Health and Safety Code.”

3. Subparagraphs (b)(3) through (d). [No change.]

1036.135 Labeling. October 25, 2016.

1. Amend the introductory paragraph as follows: Beginning January 1, 2015, label your engines, or optionally certified diesel hybrid powertrains, as described in 40 CFR §86.007-35(a)(3), as modified by these test procedures, with the following additional information:

2. Subparagraph (b) through (d). [No change.]

1036.140 Primary intended service class and engine cycle. October 25, 2016.

1. Amend the introductory paragraph as follows: You must identify a single primary intended service class for each compression-ignition engine family, or for each optionally certified diesel hybrid powertrain family, that best describes vehicles for which you design and market the engine, or the optionally certified diesel hybrid powertrain, as follows:

2. Subparagraphs (a) through (c). [No change.]

1036.150 Interim provisions. October 25, 2016.

1. Amend subparagraph (a) as follows: *Credit provisions for 2013 model year compliance*. The provisions of this paragraph (a) apply to 2013 model year heavy-duty diesel engines that have generated early credits with U.S. Environmental

Protection Agency. For each 2013 model year heavy-duty diesel engine that is certified to the greenhouse gas standards of 40 CFR Part 1036, an equal amount of credit as given by the U.S. Environmental Protection Agency will be granted in the California ABT Program. The manufacturer must notify ARB of its intent to use this provision before submitting its application and must submit to ARB all data that the manufacturer submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §§1036.205, 1036.250, and 1036.730.

2. Subparagraphs (a)(1) through (p). [No change.]

Subpart C – Certifying Engine Families

1036.205 What must I include in my application? October 25, 2016.

1. Amend the introductory paragraph as follows: This Subpart C also applies to optionally certifying diesel hybrid powertrain families. Submit an application for certification as described in 40 CFR 86.007–21, with the following additional information:

2. Amend subparagraph (a) as follows: Describe the engine family's, or optionally certified diesel hybrid powertrain family's, specifications and other basic parameters of the engine's or optionally certified diesel hybrid powertrain's, design and emission controls with respect to compliance with the requirements of this part. Describe in detail all system components for controlling greenhouse gas emissions, and criteria pollutants emissions for diesel hybrid powertrains optionally certified pursuant to title 13, CCR 1956.8, including all auxiliary emission control devices (AECDs) and all fuel system components you will install on any production or test engine, or optionally certified diesel hybrid powertrain. Identify the part number of each component you describe. For this paragraph (a), treat as separate AECDs any devices that modulate or activate differently from each other.

3. Subparagraph (b). [No change.]

4. Amend subparagraph (c) as follows: Include the emission-related installation instructions you will provide if someone else installs your engines, or optionally certified diesel hybrid powertrains, in their vehicles (see §1036.130).

5. Subparagraphs (d) through (e). [No change.]

6. Amend subparagraph (f) as follows: Identify the engine family's, or powertrain family's, deterioration factors and describe how you developed them (see §1036.241). Present any test data you used for this.

7. Amend subparagraph (g)(1) as follows: Present exhaust emission data for CO₂, CH₄, and N₂O on an emission-data engine to show that your engines meet the applicable emission standards we specify in §1036.108, or, for optionally certified diesel hybrid powertrains, present exhaust emission data for criteria pollutants on an emission-data diesel hybrid powertrain to show that your optionally certified diesel hybrid powertrains meet the applicable emission standards pursuant to title 13, CCR 1956.8. Show emission figures before and after applying deterioration factors for each engine. In addition to the composite results, show individual measurements for cold-start testing and hot-start testing over the transient test cycle

8. Amend subparagraph (h) as follows: State whether your certification is limited for certain engines, or optionally certified diesel hybrid powertrains. For example, if you certify heavy heavy-duty engines to the CO₂ standards using only transient testing, the engines may be installed only in vocational vehicles.

9. Amend subparagraph (i) as follows: Unconditionally certify that all the engines in the engine family, or all the diesel hybrid powertrains in the optionally certified diesel hybrid powertrain family, are built as described and comply with the requirements of this part, other referenced parts of the CFR, and title 13, CCR, section 1956.8. Note that 40 CFR §1036.235 specifies which engines to test to show that engines in the entire family comply with the requirements of this part.

10. Subparagraphs (j) through (n). [No change.]

1036.210 Preliminary approval before certification. October 25, 2016.

1. Amend the introductory paragraph as follows: If you send us information before you finish the application, we may review it and make any appropriate determinations, especially for questions related to engine family definitions or optionally certified diesel hybrid powertrain family definitions, auxiliary emission control devices, adjustable parameters, deterioration factors, testing for service accumulation, and maintenance. Decisions made under this section are considered to be preliminary approval, subject to final review and approval. We will generally not reverse a decision where we have given you preliminary approval, unless we find new information supporting a different decision. If you request preliminary approval related to the upcoming model year or the model year after that, we will make best-efforts to make the appropriate determinations as soon as practicable. We will generally not provide preliminary approval related to a future model year more than two years ahead of time.

1036.225 Amending my application for certification. March 10, 2021 (Pre-publication).

1. Amend the introductory paragraph as follows: Before we issue you a certificate of conformity, you may amend your application to include new or modified engine configurations, subject to the provisions of this section. After we have issued your certificate of conformity, but before the end of the model year, you may send us an amended application requesting that we include new or modified engine configurations within the scope of the certificate, subject to the provisions of this section. You must amend your application if any changes occur with respect to any information that is included or should be included in your application. The requirements of this section also apply to optionally certified diesel hybrid powertrains, as appropriate, understanding “engine” to mean “optionally certified diesel hybrid powertrain” and “engine family” to mean “optionally certified diesel hybrid powertrain family”.

2. Subparagraphs (a) through (g). [No change.]

1036.230 Selecting engine families. March 10, 2021 (Pre-publication).

1. Amend the introductory paragraph as follows: See 40 CFR 86.001–24 for instructions on how to divide your product line into families of engines that are expected to have similar emission characteristics throughout the useful life, or see

40 CFR 1037.231 for instructions on how to divide your product line into families of optionally certified diesel hybrid powertrains that are expected to have similar emission characteristics throughout the useful life. You must certify your engines to the standards of §1036.108 using the same engine families you use for criteria pollutants under 40 CFR part 86. The requirements of this section also apply to optionally certified diesel hybrid powertrains, as appropriate, understanding “engine” to mean “optionally certified diesel hybrid powertrain” and “engine family” to mean “optionally certified diesel hybrid powertrain family”. The following provisions also apply:

2. Subparagraphs (a) through (f). [No change.]

1036.235 Testing requirements for certification. May 12, 2020.

1. Amend the introductory paragraph as follows: This section describes the emission testing you must perform to show compliance with the greenhouse gas emission standards in §1036.108. This section also describes the emission testing you must perform for diesel hybrid powertrain optionally certifying to the criteria pollutants emission standards pursuant to title 13, CCR 1956.8, understanding “engine” to mean “optionally certified diesel hybrid powertrain” and “engine family” to mean “optionally certified diesel hybrid powertrain family”, and comply with the requirements of this part, other referenced parts of the CFR, and title 13, CCR, section 1956.8.

2. Subparagraphs (a) through (f). [No change.]

1036.241 Demonstrating compliance with greenhouse gas emission standards. October 25, 2016.

1036.250 Reporting and recordkeeping for certification. October 25, 2016.

1036.255 What decisions may ARB make regarding my certificate of conformity? March 10, 2021 (Pre-publication).

Subpart D – Testing Production Engines and Hybrid Powertrains

1036.301 Measurements related to GEM inputs in a selective enforcement audit. March 10, 2021 (Pre-publication).

Subpart E – In-use Testing

1036.401 In-use testing. October 25, 2016.

1. Amend this paragraph as follows: We may perform in-use testing of any engine family subject to the standards of this part, consistent with the provisions of §1036.235, or any optionally certified diesel hybrid powertrain family subject to the standards of this part, other referenced parts of the CFR, and title 13, CCR, section 1956.8, consistent with the provisions of §1036.235. Note that this provision does not affect your obligation to test your in-use engines, or optionally certified diesel hybrid powertrains, as described in 40 CFR part 86, subpart T.

Subpart F – Test Procedures

1036.501 How do I run a valid emission test? March 10, 2021 (Pre-publication).

1. Amend subparagraph (a) as follows: Use the equipment and procedures specified in this subpart and 40 CFR 86.1305 to determine whether engines meet the emission standards in § 1036.108, or for optionally certified diesel hybrid powertrains, the emission standards in title 13, CCR, § 1956.8.
2. Subparagraphs (b) through (g). [No change.]
3. Amend subparagraph (h) as follows: The following additional provisions apply for testing to demonstrate compliance with the emission standards in § 1036.108 for model year 2021 and later engines, or title 13, CCR, § 1956.8 for model year 2022 and later optionally certified diesel hybrid powertrains:
 4. Subparagraphs (h)(1) through (h)(2). [No change.]
 5. Amend subparagraph (h)(3) as follows: Measure CO₂, CH₄, and N₂O emissions, or for diesel hybrid powertrains optionally certifying pursuant to title 13, CCR, § 1956.8, measure criteria pollutants emissions, over the transient cycle specified in either section 86.1333 or § 1036.510 or appendix II to part 1036 of these test procedures.
 6. Subparagraph (h)(4). [No change.]
 7. Add new subparagraph (h)(5) as follows: For diesel hybrid powertrains optionally certifying pursuant to title 13, CCR, § 1956.8, measure or calculate emissions of criteria pollutants to demonstrate compliance with the standards of this part, other referenced parts of the CFR, including 40 CFR part 86, subpart A, and title 13, CCR, § 1956.8.
 8. Add new subparagraph (h)(6) as follows: For diesel hybrid powertrains optionally certifying pursuant to title 13, CCR, § 1956.8, measure emissions of criteria pollutants to demonstrate compliance with the standards of this part by testing the hybrid powertrain on a dynamometer with the following low-load testing procedures to determine whether it meets the low-load emission standards.

The following provisions are applicable to 2024 and subsequent model year optionally certified diesel hybrid powertrain families:

(a) Measure emissions by testing the diesel hybrid powertrain optionally certified to criteria pollutants emission standards pursuant to title 13, CCR, section 1956.8, on a dynamometer with the Vehicle-LLC described in Appendix to Subpart F, section 1036.501 of these test procedures, to determine whether it meets the low-load cycle emission standards in section I.11.B of these test procedures.

(b) For optionally certified diesel hybrid powertrain testing, follow instructions in section 1036.505 (b)(2) of these test procedures to carry out the test except replace $P_{\text{contrated}}$ with P_{rated} , the peak rated power determined in section 1036.527 of these test procedures and keep the transmission in drive for all idle segments after the initial idle segment.

(c) Precondition the optionally certified diesel hybrid powertrain by running two hot-start Vehicle-FTP cycles. Shut down the diesel hybrid powertrain, and complete a 20 minute soak period. Immediately after completing the soak period, start the Vehicle-LLC. Start sampling emissions immediately after you start the diesel hybrid powertrain and continue sampling until the duty cycle is complete. Calculate the total emission mass of each constituent, m , and the total work, W , over each test interval according to section 1065.650 of these test procedures.

(d) Calculate cycle statistics and compare with the established criteria as specified in section 1065.514 of these test procedures for engines and 40 CFR 1037.550, last amended March 10, 2021 (Pre-publication), incorporated by reference herein for diesel hybrid powertrains to confirm that the test is valid.

(e) *Accessory loads for the Vehicle-LLC* – Apply the curb idle transmission torque, CITT, according to section 1037.550(f)(2) of these test procedures. The following optional accessory loads were derived from the GEM model:

1. Manufacturers have the option to add an accessory load to any idle portion of the Vehicle-LLC. The maximum accessory load allowed is dependent on the vehicle class, and may not exceed the following values:

Vehicle Class	Accessory load (kW)
4 and 5	1.5
6 and 7	2.5
8	3.5

2. Continuous idle segments (vehicle speed = 0) within the Vehicle-LLC that exceed 200 seconds duration are to be run at conditions simulating neutral or park on the transmission.

1036.503 Engine data and information for vehicle certification. March 10, 2021 (Pre-publication).

1. Amend the introductory paragraph as follows: You must give vehicle manufacturers information as follows so they can certify model year 2021 and later vehicles, or for 2022 and subsequent model year optionally certified diesel hybrid powertrains, understanding “engine” to mean “optionally certified diesel hybrid powertrain” and “engine family” to mean “optionally certified diesel hybrid powertrain family”, as applicable:

2. Subparagraphs (a) through (d). [No change.]

1036.505 Supplemental emission test. March 10, 2021 (Pre-publication).

1. Amend subparagraph (a) as follows: Starting in model year 2021, you must measure CO₂ emissions using the SET duty cycle in 86.1362 of these test procedures as described in 1036.501 of these test procedures, or using the SET duty cycle in this section. For 2024 and subsequent model years, you may measure criteria pollutant emissions using either the cycle in 86.1362 of these test procedures or the duty cycle specified in this section.

2. Subparagraphs (b)(1) through (b)(2)(vii). [No change.]

3. Amend subparagraph (b)(2)(ix) as follows: If you are certifying an optionally certified diesel hybrid powertrain system without the transmission, use a default transmission efficiency of 0.95. If you certify with this configuration, you must use 40 CFR 1037.550(a)(3)(ii) to create the vehicle model along with its default transmission shift strategy. Use the transmission parameters defined in Table 1 of § 1036.540 to determine transmission type and gear ratio. For Light and Medium HDVs, use the Light and Medium HDV parameters for the FTP, LLC, and SET. For Tractors and Heavy HDVs, use the Tractor and Heavy HDV transient cycle parameters for the FTP and LLC and the Tractor and Heavy HDV highway cruise cycle parameters for the SET.

4. Subparagraphs (b)(ix) through (c). [No change.]

1036.510 Transient Testing Procedures. March 10, 2021 (Pre-publication).

1036.525 Hybrid engines. March 10, 2021 (Pre-publication).

1036.527 Powertrain system rated power determination. March 10, 2021 (Pre-publication).

1036.530 Calculating greenhouse gas emission rates. March 10, 2021 (Pre-publication).

1036.535 Determining steady-state engine fuel maps and fuel consumption at idle. March 10, 2021 (Pre-publication).

1036.540 Determining cycle-average engine fuel maps. March 10, 2021 (Pre-publication).

1036.543 Carbon balance error verification. March 10, 2021 (Pre-publication).

Subpart G – Special Compliance Provisions

1036.601 What compliance provisions apply? October 25, 2016.

1. Subparagraphs (a) through (a)(2). [No change.]

2. Amend subparagraph (a)(3) as follows: The warranty-related prohibitions in title 13, CCR, sections 2035, 2036, 2037, 2039, 2040, 2041, and 2042, apply to manufacturers of new heavy-duty highway engines, and optionally certified diesel hybrid powertrains, in addition to the prohibitions described in 40 CFR 1068.101(b)(6).

3. Subparagraphs (a)(4) through (d). [No change.]

1036.605 GHG exemption for engines used in specialty vehicles. October 25, 2016.

1036.610 Off-cycle technology credits and adjustments for reducing greenhouse gas emissions. October 25, 2016.

1. Subparagraphs (a) through (c). [No change.]

2. Amend subparagraph (d) as follows: We may seek public comment on your request. However, we will generally not seek public comment on credits/adjustments based on A to B engine dynamometer testing, chassis testing, or in-use testing.

3. Subparagraph (e). [No change.]

1036.615 Engines with Rankine cycle waste heat recovery and hybrid powertrains. October 25, 2016.

1036.620 Alternate CO₂ standards based on model year 2011 compression-ignition engines. March 10, 2021 (Pre-publication).

1036.625 In-use compliance with family emission limits (FELs). October 25, 2016.

1036.630 Certification of engine GHG emissions for powertrain testing. October 25, 2016.

Subpart H – Averaging, Banking, and Trading for Certification

1036.701 General provisions. October 25, 2016.

1. Add the following language to subparagraph (a): Engines certified to the Optional Low-CO₂ Emission Standards pursuant to 40 CFR §1036.108, as amended September 15, 2011, which is hereby incorporated herein, as modified by these test procedures, and participating in the Innovative Technology Regulation set forth in §§2208 and 2208.1 of title 13, CCR may not generate credits or participate in the averaging, banking, and trading provisions of this subpart.

2. Subparagraphs (b) through (j). [No change.]

1036.705 Generating and calculating emission credits. March 10, 2021 (Pre-publication).

1036.710 Averaging. October 25, 2016.

1036.715 Banking. October 25, 2016.

1036.720 Trading. October 25, 2016.

1036.725 What must I include in my application for certification? October 25, 2016.

1036.730 ABT reports. October 25, 2016.

1036.735 Recordkeeping. October 25, 2016.

1036.740 Restrictions for using emission credits. October 25, 2016.

1036.745 End-of-year CO2 credit deficits. October 25, 2016.

1036.750 What can happen if I do not comply with the provisions of this subpart?
October 25, 2016.

1036.755 Information provided to the Department of Transportation. [n/a]

Subpart I – Definitions and Other Reference Information

1036.801 Definitions. March 10, 2021 (Pre-publication).

A. Federal Provisions. [All federal definitions apply, except as otherwise noted below.]

B. California Provisions.

“2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program” means the national program that applies to new 2014 through 2020 model medium- and heavy-duty engines and vehicles to control greenhouse gas emissions, as adopted by the U.S. Environmental Protection Agency (76 Fed. Reg. 57106 (September 15, 2011)), and as subsequently amended on June 17, 2013, as incorporated in and amended by these test procedures.

“Certificate of Conformity” means an Executive Order certifying engines, or optionally certified diesel hybrid powertrain, for sale in California.

“Certification” means relating to the process of obtaining an Executive Order for an engine family, or optionally certified diesel hybrid powertrain family, that complies with the emission standards and requirements in this part.

“Designated Compliance Officer” means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.

“Designated Enforcement Officer” means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.

“EPA” shall also mean Air Resources Board or Executive Officer of the Air Resources Board.

“Hybrid powertrain” means a hybrid system that includes energy storage features other than a conventional battery system or conventional flywheel, diesel engine, electric motor-generator system, battery management system, including thermal management systems and associated power electronics. Supplemental electrical batteries and hydraulic accumulators are examples of hybrid energy storage systems. Note other examples of systems that qualify as hybrid engines or powertrains are systems that recover kinetic energy and use it to power an electric heater in the aftertreatment. Note that certain provisions in this part treat hybrid engines and powertrains intended for vehicles that include regenerative braking different than those intended for vehicles that do not include regenerative braking.

“Hybrid vehicle” means a vehicle that includes energy storage features other than a conventional battery system or conventional flywheel in addition to an internal combustion engine or other engine using consumable chemical fuel, including a vehicle installed with a diesel hybrid powertrain optionally certified to the criteria pollutant emission standards pursuant to title 13, CCR 1956.8. Supplemental electrical batteries and hydraulic accumulators are examples of hybrid energy storage systems. Note other examples of systems that qualify as hybrid engines or powertrains are systems that recover kinetic energy and use it to power an electric heater in the aftertreatment. Note that certain provisions in this part treat hybrid vehicles that include regenerative braking different than those that do not include regenerative braking.

“Manufacturer” means any person who manufactures or assembles an engine, optionally certified diesel hybrid powertrain, vehicle, or piece of equipment for sale in California or otherwise introduces a new engine into commerce in California. This includes importers who import engines, optionally certified diesel hybrid powertrains, or vehicles for resale.

“U.S. Environmental Protection Agency” means the United States Environmental Protection Agency.

“We (us, our)” means the Executive Officer and any authorized representatives.

1036.805 Symbols, acronyms, and abbreviations. June 30, 2017.

A. Federal Provisions. [No change.]

B. California Provisions.

ARB means Air Resources Board.

1036.810 Incorporation by reference. March 10, 2021 (Pre-publication).

1036.815 Confidential information. October 25, 2016.

A. Federal Provisions. [No change.]

B. California Provisions. The provisions of title 17, CCR section 91000 through 91022 apply for information you consider confidential. Note that according to section 91011, emissions data shall not be identified as confidential.

1036.820 Requesting a hearing. October 25, 2016.

1. Delete subparagraph (a) and replace as follows: You may request a hearing under certain circumstances, as described elsewhere in this part.

2. Subparagraph (b). [No change.]

3. Amend subparagraph (c) as follows: If we agree to hold a hearing, we will use the procedures specified in 17 CCR sections 60055.1 through 60055.43.

1036.825 Reporting and recordkeeping requirements. October 25, 2016.

1. Subparagraphs (a) through (d). [No change.]

2. Delete subparagraph (e).

Appendix I to Part 1036 - Summary of Previous Emission Standards. March 10, 2021 (Pre-publication).

Appendix II to Part 1036 – Transient Duty Cycles. March 10, 2021 (Pre-publication).

Appendix III to Part 1036 – Default Engine Fuel Maps for 40 CFR §1036.540. March 10, 2021 (Pre-publication).

Appendix to Subpart F, section 1036.501 – Low-load cycle for optionally certified diesel hybrid powertrain families.

B. California Provisions

1. The low-load cycle for optionally certified diesel hybrid powertrain families (Vehicle-LLC) involves a schedule of vehicle speeds and road grade. Determine road grade at each point based on the peak rated power of the powertrain system, P_{rated} , determined in section 1036.527 of these test procedures and road grade coefficients using the following equation: $Road\ Grade = a.(P_{rated})^2 + b.P_{rated} + c$

Road Grade Coefficients

Record (seconds)	Vehicle Speed (mph)	<i>a</i>	<i>b</i>	<i>c</i>
1	0.00	0	0	0
2	0.00	-4.44E-06	-1.10E-03	-8.08E-02
3	0.00	-6.66E-06	-1.65E-03	-1.21E-01
4	0.00	-6.66E-06	-1.65E-03	-1.21E-01
5	0.00	-6.66E-06	-1.65E-03	-1.21E-01
6	0.00	-6.66E-06	-1.65E-03	-1.21E-01
7	0.00	-6.66E-06	-1.65E-03	-1.21E-01
8	0.00	-6.66E-06	-1.65E-03	-1.21E-01
9	0.00	-6.66E-06	-1.65E-03	-1.21E-01
10	0.00	-6.66E-06	-1.65E-03	-1.21E-01
11	0.00	-6.66E-06	-1.65E-03	-1.21E-01

12	0.00	-6.66E-06	-1.65E-03	-1.21E-01
13	0.00	-6.66E-06	-1.65E-03	-1.21E-01
14	0.00	-6.66E-06	-1.65E-03	-1.21E-01
15	0.00	-6.66E-06	-1.65E-03	-1.21E-01
16	0.00	-6.66E-06	-1.65E-03	-1.21E-01
17	0.00	-6.66E-06	-1.65E-03	-1.21E-01
18	0.00	-6.66E-06	-1.65E-03	-1.21E-01
19	0.00	-6.66E-06	-1.65E-03	-1.21E-01
20	0.00	-6.66E-06	-1.65E-03	-1.21E-01
21	0.00	-6.66E-06	-1.65E-03	-1.21E-01
22	0.00	-6.66E-06	-1.65E-03	-1.21E-01
23	0.00	-6.66E-06	-1.65E-03	-1.21E-01
24	0.00	-6.66E-06	-1.65E-03	-1.21E-01
25	0.00	-6.66E-06	-1.65E-03	-1.21E-01
26	0.00	-6.66E-06	-1.65E-03	-1.21E-01
27	0.00	-6.66E-06	-1.65E-03	-1.21E-01
28	0.00	-6.66E-06	-1.65E-03	-1.21E-01
29	0.00	-6.66E-06	-1.65E-03	-1.21E-01
30	0.00	-6.66E-06	-1.65E-03	-1.21E-01
31	0.00	-6.66E-06	-1.65E-03	-1.21E-01
32	0.00	-6.66E-06	-1.65E-03	-1.21E-01
33	0.00	-6.66E-06	-1.65E-03	-1.21E-01
34	0.00	-6.66E-06	-1.65E-03	-1.21E-01
35	0.00	-6.66E-06	-1.65E-03	-1.21E-01
36	0.00	-6.66E-06	-1.65E-03	-1.21E-01
37	0.00	-6.66E-06	-1.65E-03	-1.21E-01
38	0.00	-6.66E-06	-1.65E-03	-1.21E-01
39	0.00	-6.66E-06	-1.65E-03	-1.21E-01
40	0.00	-6.66E-06	-1.65E-03	-1.21E-01
41	0.00	-6.66E-06	-1.65E-03	-1.21E-01
42	0.00	-6.66E-06	-1.65E-03	-1.21E-01

43	0.00	-6.66E-06	-1.65E-03	-1.21E-01
44	0.00	-6.66E-06	-1.65E-03	-1.21E-01
45	0.00	-6.66E-06	-1.65E-03	-1.21E-01
46	0.00	-6.66E-06	-1.65E-03	-1.21E-01
47	0.00	-6.66E-06	-1.65E-03	-1.21E-01
48	0.00	-6.66E-06	-1.65E-03	-1.21E-01
49	0.00	-6.66E-06	-1.65E-03	-1.21E-01
50	0.00	-6.66E-06	-1.65E-03	-1.21E-01
51	0.00	-6.66E-06	-1.65E-03	-1.21E-01
52	0.00	-6.66E-06	-1.65E-03	-1.21E-01
53	0.00	-6.66E-06	-1.65E-03	-1.21E-01
54	0.00	-6.66E-06	-1.65E-03	-1.21E-01
55	0.00	-6.66E-06	-1.65E-03	-1.21E-01
56	0.00	-6.66E-06	-1.65E-03	-1.21E-01
57	0.00	-6.66E-06	-1.65E-03	-1.21E-01
58	0.00	-6.66E-06	-1.65E-03	-1.21E-01
59	0.00	-6.66E-06	-1.65E-03	-1.21E-01
60	0.00	-6.66E-06	-1.65E-03	-1.21E-01
61	0.00	-6.66E-06	-1.65E-03	-1.21E-01
62	0.00	-6.66E-06	-1.65E-03	-1.21E-01
63	0.00	-6.66E-06	-1.65E-03	-1.21E-01
64	0.00	-6.66E-06	-1.65E-03	-1.21E-01
65	0.00	-6.66E-06	-1.65E-03	-1.21E-01
66	0.00	-6.66E-06	-1.65E-03	-1.21E-01
67	0.00	-6.66E-06	-1.65E-03	-1.21E-01
68	0.00	-6.66E-06	-1.65E-03	-1.21E-01
69	0.00	-6.66E-06	-1.65E-03	-1.21E-01
70	0.00	-6.66E-06	-1.65E-03	-1.21E-01
71	0.00	-6.66E-06	-1.65E-03	-1.21E-01
72	2.81	-6.66E-06	-1.65E-03	-1.21E-01
73	3.37	-6.66E-06	-1.65E-03	-1.21E-01

74	4.13	-6.66E-06	-1.65E-03	-1.21E-01
75	5.01	-6.66E-06	-1.65E-03	-1.21E-01
76	4.76	-6.66E-06	-1.65E-03	-1.21E-01
77	5.82	-6.66E-06	-1.65E-03	-1.21E-01
78	7.07	-6.66E-06	-1.65E-03	-1.21E-01
79	6.80	-6.66E-06	-1.65E-03	-1.21E-01
80	8.13	-6.66E-06	-1.65E-03	-1.21E-01
81	9.59	-6.66E-06	-1.65E-03	-1.21E-01
82	9.12	-6.66E-06	-1.65E-03	-1.21E-01
83	11.38	-6.66E-06	-1.65E-03	-1.21E-01
84	14.20	-6.66E-06	-1.65E-03	-1.21E-01
85	15.43	-6.66E-06	-1.65E-03	-1.21E-01
86	16.13	-6.66E-06	-1.65E-03	-1.21E-01
87	16.88	-6.66E-06	-1.65E-03	-1.21E-01
88	17.38	-6.66E-06	-1.65E-03	-1.21E-01
89	17.72	-6.66E-06	-1.65E-03	-1.21E-01
90	18.17	-6.66E-06	-1.65E-03	-1.21E-01
91	19.23	-6.66E-06	-1.65E-03	-1.21E-01
92	19.66	-6.66E-06	-1.65E-03	-1.21E-01
93	19.70	-6.66E-06	-1.65E-03	-1.21E-01
94	19.49	-6.66E-06	-1.65E-03	-1.21E-01
95	18.89	-6.66E-06	-1.65E-03	-1.21E-01
96	18.06	-6.66E-06	-1.65E-03	-1.21E-01
97	17.69	-6.66E-06	-1.65E-03	-1.21E-01
98	17.39	-6.66E-06	-1.65E-03	-1.21E-01
99	17.38	-6.66E-06	-1.65E-03	-1.21E-01
100	17.50	-6.66E-06	-1.65E-03	-1.21E-01
101	17.39	-6.66E-06	-1.65E-03	-1.21E-01
102	17.19	-6.66E-06	-1.65E-03	-1.21E-01
103	17.21	-6.66E-06	-1.65E-03	-1.21E-01
104	17.31	-2.22E-06	-5.50E-04	-4.04E-02

105	17.18	2.22E-06	5.50E-04	4.04E-02
106	17.06	6.66E-06	1.65E-03	1.21E-01
107	16.57	6.66E-06	1.65E-03	1.21E-01
108	16.04	6.66E-06	1.65E-03	1.21E-01
109	15.78	6.66E-06	1.65E-03	1.21E-01
110	15.59	6.66E-06	1.65E-03	1.21E-01
111	15.45	6.66E-06	1.65E-03	1.21E-01
112	15.31	6.66E-06	1.65E-03	1.21E-01
113	14.85	6.66E-06	1.65E-03	1.21E-01
114	14.84	6.66E-06	1.65E-03	1.21E-01
115	14.10	6.66E-06	1.65E-03	1.21E-01
116	13.06	6.66E-06	1.65E-03	1.21E-01
117	11.80	6.66E-06	1.65E-03	1.21E-01
118	10.43	6.66E-06	1.65E-03	1.21E-01
119	9.55	6.66E-06	1.65E-03	1.21E-01
120	9.10	6.66E-06	1.65E-03	1.21E-01
121	8.39	6.66E-06	1.65E-03	1.21E-01
122	7.62	6.66E-06	1.65E-03	1.21E-01
123	6.59	6.66E-06	1.65E-03	1.21E-01
124	5.05	6.66E-06	1.65E-03	1.21E-01
125	4.15	6.66E-06	1.65E-03	1.21E-01
126	3.29	6.66E-06	1.65E-03	1.21E-01
127	2.77	6.66E-06	1.65E-03	1.21E-01
128	2.69	6.66E-06	1.65E-03	1.21E-01
129	2.45	6.66E-06	1.65E-03	1.21E-01
130	2.08	6.66E-06	1.65E-03	1.21E-01
131	1.69	6.66E-06	1.65E-03	1.21E-01
132	1.64	2.22E-06	5.50E-04	4.04E-02
133	1.83	-2.22E-06	-5.50E-04	-4.04E-02
134	2.02	-6.66E-06	-1.65E-03	-1.21E-01
135	2.14	-6.66E-06	-1.65E-03	-1.21E-01

136	2.21	-6.66E-06	-1.65E-03	-1.21E-01
137	2.21	-6.66E-06	-1.65E-03	-1.21E-01
138	2.22	-6.66E-06	-1.65E-03	-1.21E-01
139	2.44	-6.66E-06	-1.65E-03	-1.21E-01
140	2.91	-6.66E-06	-1.65E-03	-1.21E-01
141	3.38	-6.66E-06	-1.65E-03	-1.21E-01
142	3.68	-6.66E-06	-1.65E-03	-1.21E-01
143	4.35	-6.66E-06	-1.65E-03	-1.21E-01
144	4.82	-6.66E-06	-1.65E-03	-1.21E-01
145	4.49	-6.66E-06	-1.65E-03	-1.21E-01
146	6.01	-6.66E-06	-1.65E-03	-1.21E-01
147	7.71	-6.66E-06	-1.65E-03	-1.21E-01
148	7.32	-6.66E-06	-1.65E-03	-1.21E-01
149	8.08	-6.66E-06	-1.65E-03	-1.21E-01
150	9.02	-6.66E-06	-1.65E-03	-1.21E-01
151	10.16	-6.66E-06	-1.65E-03	-1.21E-01
152	11.03	-6.66E-06	-1.65E-03	-1.21E-01
153	10.91	-6.66E-06	-1.65E-03	-1.21E-01
154	11.51	-6.66E-06	-1.65E-03	-1.21E-01
155	12.49	-6.66E-06	-1.65E-03	-1.21E-01
156	13.56	-6.66E-06	-1.65E-03	-1.21E-01
157	13.80	-6.66E-06	-1.65E-03	-1.21E-01
158	13.91	-6.66E-06	-1.65E-03	-1.21E-01
159	14.01	-6.66E-06	-1.65E-03	-1.21E-01
160	13.91	-6.66E-06	-1.65E-03	-1.21E-01
161	14.19	-6.66E-06	-1.65E-03	-1.21E-01
162	14.49	-2.22E-06	-5.50E-04	-4.04E-02
163	14.47	2.22E-06	5.50E-04	4.04E-02
164	14.38	6.66E-06	1.65E-03	1.21E-01
165	14.24	6.66E-06	1.65E-03	1.21E-01
166	14.03	6.66E-06	1.65E-03	1.21E-01

167	13.87	6.66E-06	1.65E-03	1.21E-01
168	13.63	6.66E-06	1.65E-03	1.21E-01
169	13.52	6.66E-06	1.65E-03	1.21E-01
170	12.97	6.66E-06	1.65E-03	1.21E-01
171	12.23	6.66E-06	1.65E-03	1.21E-01
172	10.49	6.66E-06	1.65E-03	1.21E-01
173	8.00	6.66E-06	1.65E-03	1.21E-01
174	5.87	6.66E-06	1.65E-03	1.21E-01
175	4.27	6.66E-06	1.65E-03	1.21E-01
176	2.95	6.66E-06	1.65E-03	1.21E-01
177	1.76	6.66E-06	1.65E-03	1.21E-01
178	0.96	2.22E-06	5.50E-04	4.04E-02
179	0.00	-2.22E-06	-5.50E-04	-4.04E-02
180	0.00	-6.66E-06	-1.65E-03	-1.21E-01
181	0.00	-6.66E-06	-1.65E-03	-1.21E-01
182	0.00	-6.66E-06	-1.65E-03	-1.21E-01
183	0.14	-6.66E-06	-1.65E-03	-1.21E-01
184	0.51	-6.66E-06	-1.65E-03	-1.21E-01
185	0.72	-6.66E-06	-1.65E-03	-1.21E-01
186	0.84	-6.66E-06	-1.65E-03	-1.21E-01
187	0.93	-6.66E-06	-1.65E-03	-1.21E-01
188	0.71	-6.66E-06	-1.65E-03	-1.21E-01
189	0.00	-6.66E-06	-1.65E-03	-1.21E-01
190	0.00	-6.66E-06	-1.65E-03	-1.21E-01
191	0.00	-6.66E-06	-1.65E-03	-1.21E-01
192	0.00	-6.66E-06	-1.65E-03	-1.21E-01
193	0.00	-6.66E-06	-1.65E-03	-1.21E-01
194	0.00	-6.66E-06	-1.65E-03	-1.21E-01
195	0.00	-6.66E-06	-1.65E-03	-1.21E-01
196	0.00	-6.66E-06	-1.65E-03	-1.21E-01
197	0.00	-6.66E-06	-1.65E-03	-1.21E-01

198	0.00	-6.66E-06	-1.65E-03	-1.21E-01
199	0.00	-6.66E-06	-1.65E-03	-1.21E-01
200	0.00	-7.61E-07	-4.94E-03	1.23E+00
201	0.00	5.14E-06	-8.24E-03	2.59E+00
202	0.00	1.10E-05	-1.15E-02	3.94E+00
203	0.00	1.10E-05	-1.15E-02	3.94E+00
204	0.00	1.10E-05	-1.15E-02	3.94E+00
205	0.00	1.10E-05	-1.15E-02	3.94E+00
206	0.00	1.10E-05	-1.15E-02	3.94E+00
207	0.02	1.10E-05	-1.15E-02	3.94E+00
208	0.55	1.10E-05	-1.15E-02	3.94E+00
209	1.47	1.10E-05	-1.15E-02	3.94E+00
210	2.39	1.10E-05	-1.15E-02	3.94E+00
211	2.79	1.10E-05	-1.15E-02	3.94E+00
212	3.23	1.10E-05	-1.15E-02	3.94E+00
213	3.78	1.10E-05	-1.15E-02	3.94E+00
214	4.33	1.10E-05	-1.15E-02	3.94E+00
215	4.84	1.10E-05	-1.15E-02	3.94E+00
216	4.37	1.10E-05	-1.15E-02	3.94E+00
217	4.69	1.10E-05	-1.15E-02	3.94E+00
218	5.72	1.10E-05	-1.15E-02	3.94E+00
219	6.35	3.68E-06	-3.84E-03	1.31E+00
220	6.78	-3.68E-06	3.84E-03	-1.31E+00
221	6.57	-1.10E-05	1.15E-02	-3.94E+00
222	6.35	-1.10E-05	1.15E-02	-3.94E+00
223	6.17	-1.10E-05	1.15E-02	-3.94E+00
224	6.16	-1.10E-05	1.15E-02	-3.94E+00
225	6.11	-1.10E-05	1.15E-02	-3.94E+00
226	6.08	-1.10E-05	1.15E-02	-3.94E+00
227	5.72	-1.10E-05	1.15E-02	-3.94E+00
228	5.34	-1.10E-05	1.15E-02	-3.94E+00

229	4.87	-1.10E-05	1.15E-02	-3.94E+00
230	4.41	-1.10E-05	1.15E-02	-3.94E+00
231	4.05	-1.10E-05	1.15E-02	-3.94E+00
232	3.60	-1.10E-05	1.15E-02	-3.94E+00
233	3.26	-1.10E-05	1.15E-02	-3.94E+00
234	2.63	-1.10E-05	1.15E-02	-3.94E+00
235	2.18	-1.10E-05	1.15E-02	-3.94E+00
236	1.93	-1.10E-05	1.15E-02	-3.94E+00
237	1.60	-1.10E-05	1.15E-02	-3.94E+00
238	1.23	-3.68E-06	3.84E-03	-1.31E+00
239	0.00	3.68E-06	-3.84E-03	1.31E+00
240	0.00	1.10E-05	-1.15E-02	3.94E+00
241	0.00	1.10E-05	-1.15E-02	3.94E+00
242	0.00	1.10E-05	-1.15E-02	3.94E+00
243	0.00	1.10E-05	-1.15E-02	3.94E+00
244	0.00	1.10E-05	-1.15E-02	3.94E+00
245	0.00	1.10E-05	-1.15E-02	3.94E+00
246	0.00	1.10E-05	-1.15E-02	3.94E+00
247	0.00	1.10E-05	-1.15E-02	3.94E+00
248	0.00	1.10E-05	-1.15E-02	3.94E+00
249	0.00	1.10E-05	-1.15E-02	3.94E+00
250	0.19	1.10E-05	-1.15E-02	3.94E+00
251	0.83	1.10E-05	-1.15E-02	3.94E+00
252	1.57	1.10E-05	-1.15E-02	3.94E+00
253	2.11	1.10E-05	-1.15E-02	3.94E+00
254	2.28	1.10E-05	-1.15E-02	3.94E+00
255	2.49	1.10E-05	-1.15E-02	3.94E+00
256	2.66	1.10E-05	-1.15E-02	3.94E+00
257	2.98	1.10E-05	-1.15E-02	3.94E+00
258	3.64	1.10E-05	-1.15E-02	3.94E+00
259	4.22	1.10E-05	-1.15E-02	3.94E+00

260	4.62	1.10E-05	-1.15E-02	3.94E+00
261	4.84	1.10E-05	-1.15E-02	3.94E+00
262	5.03	1.10E-05	-1.15E-02	3.94E+00
263	6.67	1.10E-05	-1.15E-02	3.94E+00
264	7.26	1.10E-05	-1.15E-02	3.94E+00
265	7.77	1.10E-05	-1.15E-02	3.94E+00
266	8.37	3.68E-06	-3.84E-03	1.31E+00
267	8.25	-3.68E-06	3.84E-03	-1.31E+00
268	7.87	-1.10E-05	1.15E-02	-3.94E+00
269	6.82	-1.10E-05	1.15E-02	-3.94E+00
270	5.29	-1.10E-05	1.15E-02	-3.94E+00
271	3.71	-1.10E-05	1.15E-02	-3.94E+00
272	2.81	-1.10E-05	1.15E-02	-3.94E+00
273	2.43	-1.10E-05	1.15E-02	-3.94E+00
274	1.88	-1.10E-05	1.15E-02	-3.94E+00
275	1.27	-1.10E-05	1.15E-02	-3.94E+00
276	0.00	-1.10E-05	1.15E-02	-3.94E+00
277	0.00	-1.10E-05	1.15E-02	-3.94E+00
278	0.00	-1.10E-05	1.15E-02	-3.94E+00
279	0.00	-1.10E-05	1.15E-02	-3.94E+00
280	0.00	-1.10E-05	1.15E-02	-3.94E+00
281	0.00	-1.10E-05	1.15E-02	-3.94E+00
282	0.00	-1.10E-05	1.15E-02	-3.94E+00
283	0.00	-1.10E-05	1.15E-02	-3.94E+00
284	0.00	-1.10E-05	1.15E-02	-3.94E+00
285	0.00	-1.10E-05	1.15E-02	-3.94E+00
286	0.00	-1.10E-05	1.15E-02	-3.94E+00
287	0.00	-1.10E-05	1.15E-02	-3.94E+00
288	0.00	-1.10E-05	1.15E-02	-3.94E+00
289	0.00	-1.10E-05	1.15E-02	-3.94E+00
290	0.00	-1.10E-05	1.15E-02	-3.94E+00

291	0.00	-1.10E-05	1.15E-02	-3.94E+00
292	0.00	-1.10E-05	1.15E-02	-3.94E+00
293	0.00	-1.10E-05	1.15E-02	-3.94E+00
294	0.00	-1.10E-05	1.15E-02	-3.94E+00
295	0.00	-1.10E-05	1.15E-02	-3.94E+00
296	0.00	-1.10E-05	1.15E-02	-3.94E+00
297	0.00	-1.10E-05	1.15E-02	-3.94E+00
298	0.00	-1.10E-05	1.15E-02	-3.94E+00
299	0.00	-1.10E-05	1.15E-02	-3.94E+00
300	0.00	-5.06E-06	5.25E-03	-2.46E+00
301	0.00	9.20E-07	-1.03E-03	-9.84E-01
302	0.00	6.90E-06	-7.30E-03	4.93E-01
303	0.00	6.90E-06	-7.30E-03	4.93E-01
304	0.00	6.90E-06	-7.30E-03	4.93E-01
305	0.00	6.90E-06	-7.30E-03	4.93E-01
306	0.00	6.90E-06	-7.30E-03	4.93E-01
307	0.00	6.90E-06	-7.30E-03	4.93E-01
308	0.00	6.90E-06	-7.30E-03	4.93E-01
309	0.00	6.90E-06	-7.30E-03	4.93E-01
310	0.00	6.90E-06	-7.30E-03	4.93E-01
311	0.00	6.90E-06	-7.30E-03	4.93E-01
312	0.00	6.90E-06	-7.30E-03	4.93E-01
313	0.00	6.90E-06	-7.30E-03	4.93E-01
314	0.00	6.90E-06	-7.30E-03	4.93E-01
315	0.08	6.90E-06	-7.30E-03	4.93E-01
316	0.90	6.90E-06	-7.30E-03	4.93E-01
317	2.50	6.90E-06	-7.30E-03	4.93E-01
318	2.98	6.90E-06	-7.30E-03	4.93E-01
319	3.68	6.90E-06	-7.30E-03	4.93E-01
320	4.49	6.90E-06	-7.30E-03	4.93E-01
321	4.93	6.90E-06	-7.30E-03	4.93E-01

322	4.13	6.90E-06	-7.30E-03	4.93E-01
323	4.75	6.90E-06	-7.30E-03	4.93E-01
324	5.61	6.90E-06	-7.30E-03	4.93E-01
325	6.29	6.90E-06	-7.30E-03	4.93E-01
326	6.99	6.90E-06	-7.30E-03	4.93E-01
327	6.98	6.90E-06	-7.30E-03	4.93E-01
328	6.70	6.90E-06	-7.30E-03	4.93E-01
329	6.42	6.90E-06	-7.30E-03	4.93E-01
330	6.73	6.90E-06	-7.30E-03	4.93E-01
331	7.44	6.90E-06	-7.30E-03	4.93E-01
332	7.88	6.90E-06	-7.30E-03	4.93E-01
333	8.52	6.90E-06	-7.30E-03	4.93E-01
334	8.39	6.90E-06	-7.30E-03	4.93E-01
335	9.77	6.90E-06	-7.30E-03	4.93E-01
336	11.37	6.90E-06	-7.30E-03	4.93E-01
337	11.80	6.90E-06	-7.30E-03	4.93E-01
338	12.30	6.90E-06	-7.30E-03	4.93E-01
339	14.20	6.90E-06	-7.30E-03	4.93E-01
340	15.85	6.90E-06	-7.30E-03	4.93E-01
341	15.94	6.90E-06	-7.30E-03	4.93E-01
342	16.50	6.90E-06	-7.30E-03	4.93E-01
343	17.72	6.90E-06	-7.30E-03	4.93E-01
344	18.61	6.90E-06	-7.30E-03	4.93E-01
345	18.82	2.30E-06	-2.43E-03	1.64E-01
346	18.52	-2.30E-06	2.43E-03	-1.64E-01
347	18.17	-6.90E-06	7.30E-03	-4.93E-01
348	17.66	-6.90E-06	7.30E-03	-4.93E-01
349	17.15	-6.90E-06	7.30E-03	-4.93E-01
350	16.55	-6.90E-06	7.30E-03	-4.93E-01
351	15.80	-6.90E-06	7.30E-03	-4.93E-01
352	14.83	-6.90E-06	7.30E-03	-4.93E-01

353	13.42	-6.90E-06	7.30E-03	-4.93E-01
354	11.61	-6.90E-06	7.30E-03	-4.93E-01
355	10.13	-6.90E-06	7.30E-03	-4.93E-01
356	9.29	-6.90E-06	7.30E-03	-4.93E-01
357	8.60	-6.90E-06	7.30E-03	-4.93E-01
358	7.51	-6.90E-06	7.30E-03	-4.93E-01
359	5.49	-6.90E-06	7.30E-03	-4.93E-01
360	3.82	-6.90E-06	7.30E-03	-4.93E-01
361	2.45	-6.90E-06	7.30E-03	-4.93E-01
362	1.45	-6.90E-06	7.30E-03	-4.93E-01
363	0.72	-6.90E-06	7.30E-03	-4.93E-01
364	0.00	-6.90E-06	7.30E-03	-4.93E-01
365	0.00	-6.90E-06	7.30E-03	-4.93E-01
366	0.00	-6.90E-06	7.30E-03	-4.93E-01
367	0.00	-6.90E-06	7.30E-03	-4.93E-01
368	0.00	-6.90E-06	7.30E-03	-4.93E-01
369	0.00	-6.90E-06	7.30E-03	-4.93E-01
370	0.00	-6.90E-06	7.30E-03	-4.93E-01
371	0.00	-6.90E-06	7.30E-03	-4.93E-01
372	0.00	-6.90E-06	7.30E-03	-4.93E-01
373	0.00	-6.90E-06	7.30E-03	-4.93E-01
374	0.00	-6.90E-06	7.30E-03	-4.93E-01
375	0.00	-6.90E-06	7.30E-03	-4.93E-01
376	0.00	-6.90E-06	7.30E-03	-4.93E-01
377	0.00	-6.90E-06	7.30E-03	-4.93E-01
378	0.00	-6.90E-06	7.30E-03	-4.93E-01
379	0.00	-6.90E-06	7.30E-03	-4.93E-01
380	0.00	-6.90E-06	7.30E-03	-4.93E-01
381	0.00	-6.90E-06	7.30E-03	-4.93E-01
382	0.00	-6.90E-06	7.30E-03	-4.93E-01
383	0.00	-6.90E-06	7.30E-03	-4.93E-01

384	0.00	-6.90E-06	7.30E-03	-4.93E-01
385	0.00	-6.90E-06	7.30E-03	-4.93E-01
386	0.00	-6.90E-06	7.30E-03	-4.93E-01
387	0.00	-6.90E-06	7.30E-03	-4.93E-01
388	0.00	-6.90E-06	7.30E-03	-4.93E-01
389	0.00	-6.90E-06	7.30E-03	-4.93E-01
390	0.00	-6.90E-06	7.30E-03	-4.93E-01
391	0.00	-6.90E-06	7.30E-03	-4.93E-01
392	0.00	-6.90E-06	7.30E-03	-4.93E-01
393	0.00	-6.90E-06	7.30E-03	-4.93E-01
394	0.00	-6.90E-06	7.30E-03	-4.93E-01
395	0.00	-6.90E-06	7.30E-03	-4.93E-01
396	0.00	-6.90E-06	7.30E-03	-4.93E-01
397	0.00	-6.90E-06	7.30E-03	-4.93E-01
398	0.00	-6.90E-06	7.30E-03	-4.93E-01
399	0.00	-6.90E-06	7.30E-03	-4.93E-01
400	0.00	-2.72E-06	2.69E-03	2.99E-01
401	0.00	1.45E-06	-1.93E-03	1.09E+00
402	0.00	5.62E-06	-6.54E-03	1.88E+00
403	0.00	5.62E-06	-6.54E-03	1.88E+00
404	0.00	5.62E-06	-6.54E-03	1.88E+00
405	0.00	5.62E-06	-6.54E-03	1.88E+00
406	0.00	5.62E-06	-6.54E-03	1.88E+00
407	0.00	5.62E-06	-6.54E-03	1.88E+00
408	0.00	5.62E-06	-6.54E-03	1.88E+00
409	0.00	5.62E-06	-6.54E-03	1.88E+00
410	0.00	5.62E-06	-6.54E-03	1.88E+00
411	0.00	5.62E-06	-6.54E-03	1.88E+00
412	0.00	5.62E-06	-6.54E-03	1.88E+00
413	0.00	5.62E-06	-6.54E-03	1.88E+00
414	0.00	5.62E-06	-6.54E-03	1.88E+00

415	0.00	5.62E-06	-6.54E-03	1.88E+00
416	0.00	5.62E-06	-6.54E-03	1.88E+00
417	0.00	5.62E-06	-6.54E-03	1.88E+00
418	0.00	5.62E-06	-6.54E-03	1.88E+00
419	0.00	5.62E-06	-6.54E-03	1.88E+00
420	0.00	5.62E-06	-6.54E-03	1.88E+00
421	0.00	5.62E-06	-6.54E-03	1.88E+00
422	0.03	5.62E-06	-6.54E-03	1.88E+00
423	0.21	5.62E-06	-6.54E-03	1.88E+00
424	0.57	5.62E-06	-6.54E-03	1.88E+00
425	0.71	5.62E-06	-6.54E-03	1.88E+00
426	0.60	5.62E-06	-6.54E-03	1.88E+00
427	0.00	5.62E-06	-6.54E-03	1.88E+00
428	0.00	5.62E-06	-6.54E-03	1.88E+00
429	0.00	5.62E-06	-6.54E-03	1.88E+00
430	0.00	5.62E-06	-6.54E-03	1.88E+00
431	0.00	5.62E-06	-6.54E-03	1.88E+00
432	0.00	5.62E-06	-6.54E-03	1.88E+00
433	0.00	5.62E-06	-6.54E-03	1.88E+00
434	0.00	5.62E-06	-6.54E-03	1.88E+00
435	0.00	5.62E-06	-6.54E-03	1.88E+00
436	0.06	5.62E-06	-6.54E-03	1.88E+00
437	0.92	5.62E-06	-6.54E-03	1.88E+00
438	1.52	5.62E-06	-6.54E-03	1.88E+00
439	1.84	5.62E-06	-6.54E-03	1.88E+00
440	2.03	5.62E-06	-6.54E-03	1.88E+00
441	2.09	5.62E-06	-6.54E-03	1.88E+00
442	2.24	5.62E-06	-6.54E-03	1.88E+00
443	2.68	5.62E-06	-6.54E-03	1.88E+00
444	3.21	5.62E-06	-6.54E-03	1.88E+00
445	4.10	5.62E-06	-6.54E-03	1.88E+00

446	5.09	5.62E-06	-6.54E-03	1.88E+00
447	5.35	5.62E-06	-6.54E-03	1.88E+00
448	6.84	5.62E-06	-6.54E-03	1.88E+00
449	7.54	5.62E-06	-6.54E-03	1.88E+00
450	8.25	5.62E-06	-6.54E-03	1.88E+00
451	9.88	5.62E-06	-6.54E-03	1.88E+00
452	10.12	5.62E-06	-6.54E-03	1.88E+00
453	10.84	5.62E-06	-6.54E-03	1.88E+00
454	11.78	5.62E-06	-6.54E-03	1.88E+00
455	12.58	5.62E-06	-6.54E-03	1.88E+00
456	12.90	5.62E-06	-6.54E-03	1.88E+00
457	12.15	5.62E-06	-6.54E-03	1.88E+00
458	12.41	5.62E-06	-6.54E-03	1.88E+00
459	12.80	5.62E-06	-6.54E-03	1.88E+00
460	12.70	5.62E-06	-6.54E-03	1.88E+00
461	12.70	5.62E-06	-6.54E-03	1.88E+00
462	11.97	5.62E-06	-6.54E-03	1.88E+00
463	11.05	5.62E-06	-6.54E-03	1.88E+00
464	10.94	5.62E-06	-6.54E-03	1.88E+00
465	10.64	5.62E-06	-6.54E-03	1.88E+00
466	10.65	5.62E-06	-6.54E-03	1.88E+00
467	11.59	1.87E-06	-2.18E-03	6.28E-01
468	11.89	-1.87E-06	2.18E-03	-6.28E-01
469	11.51	-5.62E-06	6.54E-03	-1.88E+00
470	10.54	-5.62E-06	6.54E-03	-1.88E+00
471	9.43	-5.62E-06	6.54E-03	-1.88E+00
472	8.58	-5.62E-06	6.54E-03	-1.88E+00
473	7.92	-5.62E-06	6.54E-03	-1.88E+00
474	7.29	-5.62E-06	6.54E-03	-1.88E+00
475	6.80	-5.62E-06	6.54E-03	-1.88E+00
476	6.09	-5.62E-06	6.54E-03	-1.88E+00

477	5.65	-5.62E-06	6.54E-03	-1.88E+00
478	5.48	-5.62E-06	6.54E-03	-1.88E+00
479	4.74	-5.62E-06	6.54E-03	-1.88E+00
480	4.03	-5.62E-06	6.54E-03	-1.88E+00
481	3.27	-5.62E-06	6.54E-03	-1.88E+00
482	2.33	-5.62E-06	6.54E-03	-1.88E+00
483	1.15	-5.62E-06	6.54E-03	-1.88E+00
484	0.43	-5.62E-06	6.54E-03	-1.88E+00
485	0.00	-5.62E-06	6.54E-03	-1.88E+00
486	0.00	-5.62E-06	6.54E-03	-1.88E+00
487	0.00	-5.62E-06	6.54E-03	-1.88E+00
488	0.00	-5.62E-06	6.54E-03	-1.88E+00
489	0.00	-5.62E-06	6.54E-03	-1.88E+00
490	0.00	-5.62E-06	6.54E-03	-1.88E+00
491	0.00	-5.62E-06	6.54E-03	-1.88E+00
492	0.00	-5.62E-06	6.54E-03	-1.88E+00
493	0.00	-5.62E-06	6.54E-03	-1.88E+00
494	0.00	-5.62E-06	6.54E-03	-1.88E+00
495	0.00	-5.62E-06	6.54E-03	-1.88E+00
496	0.00	-5.62E-06	6.54E-03	-1.88E+00
497	0.00	-5.62E-06	6.54E-03	-1.88E+00
498	0.00	-5.62E-06	6.54E-03	-1.88E+00
499	0.00	-5.62E-06	6.54E-03	-1.88E+00
500	0.00	-1.43E-06	1.95E-03	-4.33E-01
501	0.00	2.77E-06	-2.65E-03	1.02E+00
502	0.00	6.97E-06	-7.24E-03	2.47E+00
503	0.00	6.97E-06	-7.24E-03	2.47E+00
504	0.00	6.97E-06	-7.24E-03	2.47E+00
505	0.00	6.97E-06	-7.24E-03	2.47E+00
506	0.00	6.97E-06	-7.24E-03	2.47E+00
507	0.00	6.97E-06	-7.24E-03	2.47E+00

508	0.00	6.97E-06	-7.24E-03	2.47E+00
509	0.00	6.97E-06	-7.24E-03	2.47E+00
510	0.00	6.97E-06	-7.24E-03	2.47E+00
511	0.00	6.97E-06	-7.24E-03	2.47E+00
512	0.58	6.97E-06	-7.24E-03	2.47E+00
513	1.80	6.97E-06	-7.24E-03	2.47E+00
514	2.49	6.97E-06	-7.24E-03	2.47E+00
515	2.71	6.97E-06	-7.24E-03	2.47E+00
516	2.96	6.97E-06	-7.24E-03	2.47E+00
517	3.47	6.97E-06	-7.24E-03	2.47E+00
518	4.05	6.97E-06	-7.24E-03	2.47E+00
519	4.46	6.97E-06	-7.24E-03	2.47E+00
520	4.65	6.97E-06	-7.24E-03	2.47E+00
521	4.82	6.97E-06	-7.24E-03	2.47E+00
522	4.68	6.97E-06	-7.24E-03	2.47E+00
523	5.59	6.97E-06	-7.24E-03	2.47E+00
524	6.60	6.97E-06	-7.24E-03	2.47E+00
525	6.85	6.97E-06	-7.24E-03	2.47E+00
526	7.21	6.97E-06	-7.24E-03	2.47E+00
527	8.20	6.97E-06	-7.24E-03	2.47E+00
528	9.02	6.97E-06	-7.24E-03	2.47E+00
529	8.85	6.97E-06	-7.24E-03	2.47E+00
530	9.24	6.97E-06	-7.24E-03	2.47E+00
531	10.02	6.97E-06	-7.24E-03	2.47E+00
532	10.86	6.97E-06	-7.24E-03	2.47E+00
533	10.83	6.97E-06	-7.24E-03	2.47E+00
534	11.24	6.97E-06	-7.24E-03	2.47E+00
535	12.30	6.97E-06	-7.24E-03	2.47E+00
536	12.68	6.97E-06	-7.24E-03	2.47E+00
537	12.61	6.97E-06	-7.24E-03	2.47E+00
538	12.60	6.97E-06	-7.24E-03	2.47E+00

539	13.71	6.97E-06	-7.24E-03	2.47E+00
540	14.18	2.32E-06	-2.41E-03	8.22E-01
541	14.25	-2.32E-06	2.41E-03	-8.22E-01
542	14.11	-6.97E-06	7.24E-03	-2.47E+00
543	13.67	-6.97E-06	7.24E-03	-2.47E+00
544	13.05	-6.97E-06	7.24E-03	-2.47E+00
545	12.30	-6.97E-06	7.24E-03	-2.47E+00
546	11.51	-6.97E-06	7.24E-03	-2.47E+00
547	10.90	-6.97E-06	7.24E-03	-2.47E+00
548	10.18	-6.97E-06	7.24E-03	-2.47E+00
549	8.96	-6.97E-06	7.24E-03	-2.47E+00
550	7.54	-6.97E-06	7.24E-03	-2.47E+00
551	6.62	-6.97E-06	7.24E-03	-2.47E+00
552	5.48	-6.97E-06	7.24E-03	-2.47E+00
553	3.51	-6.97E-06	7.24E-03	-2.47E+00
554	2.71	-2.32E-06	2.41E-03	-8.22E-01
555	3.01	2.32E-06	-2.41E-03	8.22E-01
556	3.73	6.97E-06	-7.24E-03	2.47E+00
557	4.22	6.97E-06	-7.24E-03	2.47E+00
558	5.52	6.97E-06	-7.24E-03	2.47E+00
559	7.14	6.97E-06	-7.24E-03	2.47E+00
560	7.32	6.97E-06	-7.24E-03	2.47E+00
561	7.90	6.97E-06	-7.24E-03	2.47E+00
562	9.19	6.97E-06	-7.24E-03	2.47E+00
563	9.75	6.97E-06	-7.24E-03	2.47E+00
564	9.49	6.97E-06	-7.24E-03	2.47E+00
565	10.82	6.97E-06	-7.24E-03	2.47E+00
566	11.50	6.97E-06	-7.24E-03	2.47E+00
567	11.58	6.97E-06	-7.24E-03	2.47E+00
568	11.66	6.97E-06	-7.24E-03	2.47E+00
569	12.39	6.97E-06	-7.24E-03	2.47E+00

570	13.03	6.97E-06	-7.24E-03	2.47E+00
571	13.17	6.97E-06	-7.24E-03	2.47E+00
572	12.85	6.97E-06	-7.24E-03	2.47E+00
573	13.82	6.97E-06	-7.24E-03	2.47E+00
574	15.16	6.97E-06	-7.24E-03	2.47E+00
575	15.73	6.97E-06	-7.24E-03	2.47E+00
576	16.07	6.97E-06	-7.24E-03	2.47E+00
577	16.09	6.97E-06	-7.24E-03	2.47E+00
578	16.02	6.97E-06	-7.24E-03	2.47E+00
579	16.47	6.97E-06	-7.24E-03	2.47E+00
580	16.49	6.97E-06	-7.24E-03	2.47E+00
581	16.59	2.32E-06	-2.41E-03	8.22E-01
582	16.67	-2.32E-06	2.41E-03	-8.22E-01
583	16.41	-6.97E-06	7.24E-03	-2.47E+00
584	16.27	-6.97E-06	7.24E-03	-2.47E+00
585	15.92	-6.97E-06	7.24E-03	-2.47E+00
586	15.59	-6.97E-06	7.24E-03	-2.47E+00
587	15.04	-6.97E-06	7.24E-03	-2.47E+00
588	13.92	-6.97E-06	7.24E-03	-2.47E+00
589	12.46	-6.97E-06	7.24E-03	-2.47E+00
590	10.39	-6.97E-06	7.24E-03	-2.47E+00
591	8.45	-6.97E-06	7.24E-03	-2.47E+00
592	5.03	-6.97E-06	7.24E-03	-2.47E+00
593	2.58	-6.97E-06	7.24E-03	-2.47E+00
594	1.52	-6.97E-06	7.24E-03	-2.47E+00
595	1.09	-6.97E-06	7.24E-03	-2.47E+00
596	0.71	-2.32E-06	2.41E-03	-8.22E-01
597	0.00	2.32E-06	-2.41E-03	8.22E-01
598	0.00	6.97E-06	-7.24E-03	2.47E+00
599	0.13	6.97E-06	-7.24E-03	2.47E+00
600	1.14	6.97E-06	-7.24E-03	2.47E+00

601	2.17	6.97E-06	-7.24E-03	2.47E+00
602	2.71	6.97E-06	-7.24E-03	2.47E+00
603	3.25	6.97E-06	-7.24E-03	2.47E+00
604	3.51	6.97E-06	-7.24E-03	2.47E+00
605	4.25	6.97E-06	-7.24E-03	2.47E+00
606	4.63	6.97E-06	-7.24E-03	2.47E+00
607	4.48	6.97E-06	-7.24E-03	2.47E+00
608	3.48	6.97E-06	-7.24E-03	2.47E+00
609	4.42	6.97E-06	-7.24E-03	2.47E+00
610	6.66	6.97E-06	-7.24E-03	2.47E+00
611	7.73	6.97E-06	-7.24E-03	2.47E+00
612	7.84	6.97E-06	-7.24E-03	2.47E+00
613	8.05	6.97E-06	-7.24E-03	2.47E+00
614	8.04	6.97E-06	-7.24E-03	2.47E+00
615	8.01	6.97E-06	-7.24E-03	2.47E+00
616	7.99	6.97E-06	-7.24E-03	2.47E+00
617	7.96	6.97E-06	-7.24E-03	2.47E+00
618	7.94	6.97E-06	-7.24E-03	2.47E+00
619	7.92	6.97E-06	-7.24E-03	2.47E+00
620	7.95	6.97E-06	-7.24E-03	2.47E+00
621	8.65	6.97E-06	-7.24E-03	2.47E+00
622	9.28	6.97E-06	-7.24E-03	2.47E+00
623	9.49	6.97E-06	-7.24E-03	2.47E+00
624	9.48	6.97E-06	-7.24E-03	2.47E+00
625	9.52	6.97E-06	-7.24E-03	2.47E+00
626	10.26	6.97E-06	-7.24E-03	2.47E+00
627	10.78	6.97E-06	-7.24E-03	2.47E+00
628	10.94	6.97E-06	-7.24E-03	2.47E+00
629	10.77	6.97E-06	-7.24E-03	2.47E+00
630	10.70	6.97E-06	-7.24E-03	2.47E+00
631	10.67	6.97E-06	-7.24E-03	2.47E+00

632	10.66	6.97E-06	-7.24E-03	2.47E+00
633	10.65	6.97E-06	-7.24E-03	2.47E+00
634	10.63	6.97E-06	-7.24E-03	2.47E+00
635	10.62	6.97E-06	-7.24E-03	2.47E+00
636	10.61	6.97E-06	-7.24E-03	2.47E+00
637	10.60	6.97E-06	-7.24E-03	2.47E+00
638	10.59	6.97E-06	-7.24E-03	2.47E+00
639	10.59	6.97E-06	-7.24E-03	2.47E+00
640	10.58	6.97E-06	-7.24E-03	2.47E+00
641	10.73	6.97E-06	-7.24E-03	2.47E+00
642	11.11	6.97E-06	-7.24E-03	2.47E+00
643	11.71	6.97E-06	-7.24E-03	2.47E+00
644	12.03	6.97E-06	-7.24E-03	2.47E+00
645	12.20	6.97E-06	-7.24E-03	2.47E+00
646	12.12	6.97E-06	-7.24E-03	2.47E+00
647	12.04	6.97E-06	-7.24E-03	2.47E+00
648	12.02	6.97E-06	-7.24E-03	2.47E+00
649	12.02	4.84E-06	-5.15E-03	1.74E+00
650	12.01	2.70E-06	-3.05E-03	1.01E+00
651	12.01	5.63E-07	-9.50E-04	2.85E-01
652	12.00	5.63E-07	-9.50E-04	2.85E-01
653	12.00	5.63E-07	-9.50E-04	2.85E-01
654	11.99	5.63E-07	-9.50E-04	2.85E-01
655	11.99	5.63E-07	-9.50E-04	2.85E-01
656	11.98	5.63E-07	-9.50E-04	2.85E-01
657	11.98	5.63E-07	-9.50E-04	2.85E-01
658	11.98	5.63E-07	-9.50E-04	2.85E-01
659	11.98	5.63E-07	-9.50E-04	2.85E-01
660	12.25	5.63E-07	-9.50E-04	2.85E-01
661	12.66	5.63E-07	-9.50E-04	2.85E-01
662	12.89	5.63E-07	-9.50E-04	2.85E-01

663	12.97	5.63E-07	-9.50E-04	2.85E-01
664	13.88	5.63E-07	-9.50E-04	2.85E-01
665	14.19	5.63E-07	-9.50E-04	2.85E-01
666	14.22	5.63E-07	-9.50E-04	2.85E-01
667	14.11	5.63E-07	-9.50E-04	2.85E-01
668	14.78	5.63E-07	-9.50E-04	2.85E-01
669	15.43	5.63E-07	-9.50E-04	2.85E-01
670	15.88	5.63E-07	-9.50E-04	2.85E-01
671	15.37	5.63E-07	-9.50E-04	2.85E-01
672	15.06	5.63E-07	-9.50E-04	2.85E-01
673	15.04	5.63E-07	-9.50E-04	2.85E-01
674	14.94	5.63E-07	-9.50E-04	2.85E-01
675	14.93	5.63E-07	-9.50E-04	2.85E-01
676	14.97	5.63E-07	-9.50E-04	2.85E-01
677	15.36	5.63E-07	-9.50E-04	2.85E-01
678	15.43	5.63E-07	-9.50E-04	2.85E-01
679	15.38	5.63E-07	-9.50E-04	2.85E-01
680	15.52	5.63E-07	-9.50E-04	2.85E-01
681	15.60	5.63E-07	-9.50E-04	2.85E-01
682	15.56	5.63E-07	-9.50E-04	2.85E-01
683	15.53	5.63E-07	-9.50E-04	2.85E-01
684	15.52	5.63E-07	-9.50E-04	2.85E-01
685	15.52	5.63E-07	-9.50E-04	2.85E-01
686	15.52	5.63E-07	-9.50E-04	2.85E-01
687	15.52	5.63E-07	-9.50E-04	2.85E-01
688	15.51	5.63E-07	-9.50E-04	2.85E-01
689	15.39	5.63E-07	-9.50E-04	2.85E-01
690	15.52	5.63E-07	-9.50E-04	2.85E-01
691	15.36	5.63E-07	-9.50E-04	2.85E-01
692	15.34	5.63E-07	-9.50E-04	2.85E-01
693	15.43	5.63E-07	-9.50E-04	2.85E-01

694	15.54	5.63E-07	-9.50E-04	2.85E-01
695	15.46	5.63E-07	-9.50E-04	2.85E-01
696	15.41	5.63E-07	-9.50E-04	2.85E-01
697	15.41	5.63E-07	-9.50E-04	2.85E-01
698	15.41	5.63E-07	-9.50E-04	2.85E-01
699	15.33	4.09E-07	-8.22E-04	3.50E-01
700	15.47	2.54E-07	-6.94E-04	4.14E-01
701	15.36	9.97E-08	-5.66E-04	4.78E-01
702	15.21	9.97E-08	-5.66E-04	4.78E-01
703	15.26	9.97E-08	-5.66E-04	4.78E-01
704	15.19	9.97E-08	-5.66E-04	4.78E-01
705	14.88	9.97E-08	-5.66E-04	4.78E-01
706	14.84	9.97E-08	-5.66E-04	4.78E-01
707	14.90	9.97E-08	-5.66E-04	4.78E-01
708	14.92	9.97E-08	-5.66E-04	4.78E-01
709	14.92	9.97E-08	-5.66E-04	4.78E-01
710	14.92	9.97E-08	-5.66E-04	4.78E-01
711	14.92	9.97E-08	-5.66E-04	4.78E-01
712	14.92	9.97E-08	-5.66E-04	4.78E-01
713	14.93	9.97E-08	-5.66E-04	4.78E-01
714	14.93	9.97E-08	-5.66E-04	4.78E-01
715	14.93	9.97E-08	-5.66E-04	4.78E-01
716	14.93	9.97E-08	-5.66E-04	4.78E-01
717	14.93	9.97E-08	-5.66E-04	4.78E-01
718	14.93	9.97E-08	-5.66E-04	4.78E-01
719	14.93	9.97E-08	-5.66E-04	4.78E-01
720	14.93	9.97E-08	-5.66E-04	4.78E-01
721	14.93	9.97E-08	-5.66E-04	4.78E-01
722	14.93	9.97E-08	-5.66E-04	4.78E-01
723	14.93	9.97E-08	-5.66E-04	4.78E-01
724	14.93	9.97E-08	-5.66E-04	4.78E-01

725	14.93	9.97E-08	-5.66E-04	4.78E-01
726	14.93	9.97E-08	-5.66E-04	4.78E-01
727	14.93	9.97E-08	-5.66E-04	4.78E-01
728	14.94	9.97E-08	-5.66E-04	4.78E-01
729	14.94	9.97E-08	-5.66E-04	4.78E-01
730	14.94	9.97E-08	-5.66E-04	4.78E-01
731	14.94	9.97E-08	-5.66E-04	4.78E-01
732	14.94	9.97E-08	-5.66E-04	4.78E-01
733	14.94	9.97E-08	-5.66E-04	4.78E-01
734	14.95	9.97E-08	-5.66E-04	4.78E-01
735	15.20	9.97E-08	-5.66E-04	4.78E-01
736	15.18	9.97E-08	-5.66E-04	4.78E-01
737	15.30	9.97E-08	-5.66E-04	4.78E-01
738	15.56	9.97E-08	-5.66E-04	4.78E-01
739	15.50	9.97E-08	-5.66E-04	4.78E-01
740	15.58	9.97E-08	-5.66E-04	4.78E-01
741	15.61	9.97E-08	-5.66E-04	4.78E-01
742	15.33	9.97E-08	-5.66E-04	4.78E-01
743	15.30	9.97E-08	-5.66E-04	4.78E-01
744	15.48	9.97E-08	-5.66E-04	4.78E-01
745	15.54	9.97E-08	-5.66E-04	4.78E-01
746	15.58	9.97E-08	-5.66E-04	4.78E-01
747	15.85	9.97E-08	-5.66E-04	4.78E-01
748	15.77	9.97E-08	-5.66E-04	4.78E-01
749	15.36	9.97E-08	-5.66E-04	4.78E-01
750	15.05	9.97E-08	-5.66E-04	4.78E-01
751	14.80	9.97E-08	-5.66E-04	4.78E-01
752	14.93	9.97E-08	-5.66E-04	4.78E-01
753	15.11	3.32E-08	-1.89E-04	1.59E-01
754	15.14	-3.32E-08	1.89E-04	-1.59E-01
755	14.88	-9.97E-08	5.66E-04	-4.78E-01

756	14.79	-9.97E-08	5.66E-04	-4.78E-01
757	14.69	-9.97E-08	5.66E-04	-4.78E-01
758	14.60	-9.97E-08	5.66E-04	-4.78E-01
759	14.55	-9.97E-08	5.66E-04	-4.78E-01
760	14.09	-9.97E-08	5.66E-04	-4.78E-01
761	13.76	-9.97E-08	5.66E-04	-4.78E-01
762	12.81	-9.97E-08	5.66E-04	-4.78E-01
763	12.32	-9.97E-08	5.66E-04	-4.78E-01
764	11.83	-9.97E-08	5.66E-04	-4.78E-01
765	10.76	-9.97E-08	5.66E-04	-4.78E-01
766	9.35	-9.97E-08	5.66E-04	-4.78E-01
767	7.87	-9.97E-08	5.66E-04	-4.78E-01
768	6.32	-9.97E-08	5.66E-04	-4.78E-01
769	4.47	-9.97E-08	5.66E-04	-4.78E-01
770	2.49	-9.97E-08	5.66E-04	-4.78E-01
771	1.67	-9.97E-08	5.66E-04	-4.78E-01
772	1.55	-9.97E-08	5.66E-04	-4.78E-01
773	1.46	-9.97E-08	5.66E-04	-4.78E-01
774	0.71	-9.97E-08	5.66E-04	-4.78E-01
775	0.00	-9.97E-08	5.66E-04	-4.78E-01
776	0.00	-9.97E-08	5.66E-04	-4.78E-01
777	0.00	-9.97E-08	5.66E-04	-4.78E-01
778	0.00	-9.97E-08	5.66E-04	-4.78E-01
779	0.00	-9.97E-08	5.66E-04	-4.78E-01
780	0.00	-9.97E-08	5.66E-04	-4.78E-01
781	0.00	-9.97E-08	5.66E-04	-4.78E-01
782	0.00	-9.97E-08	5.66E-04	-4.78E-01
783	0.00	-9.97E-08	5.66E-04	-4.78E-01
784	0.00	-9.97E-08	5.66E-04	-4.78E-01
785	0.00	-9.97E-08	5.66E-04	-4.78E-01
786	0.00	-9.97E-08	5.66E-04	-4.78E-01

787	0.00	-9.97E-08	5.66E-04	-4.78E-01
788	0.00	-9.97E-08	5.66E-04	-4.78E-01
789	0.00	-9.97E-08	5.66E-04	-4.78E-01
790	0.00	-9.97E-08	5.66E-04	-4.78E-01
791	0.00	-9.97E-08	5.66E-04	-4.78E-01
792	0.00	-9.97E-08	5.66E-04	-4.78E-01
793	0.00	-9.97E-08	5.66E-04	-4.78E-01
794	0.00	-9.97E-08	5.66E-04	-4.78E-01
795	0.00	-9.97E-08	5.66E-04	-4.78E-01
796	0.00	-9.97E-08	5.66E-04	-4.78E-01
797	0.00	-9.97E-08	5.66E-04	-4.78E-01
798	0.00	-9.97E-08	5.66E-04	-4.78E-01
799	0.00	-9.97E-08	5.66E-04	-4.78E-01
800	0.00	3.52E-06	-3.25E-03	6.82E-01
801	0.00	7.14E-06	-7.07E-03	1.84E+00
802	0.00	1.08E-05	-1.09E-02	3.00E+00
803	0.00	1.08E-05	-1.09E-02	3.00E+00
804	0.00	1.08E-05	-1.09E-02	3.00E+00
805	0.00	1.08E-05	-1.09E-02	3.00E+00
806	0.00	1.08E-05	-1.09E-02	3.00E+00
807	0.00	1.08E-05	-1.09E-02	3.00E+00
808	0.00	1.08E-05	-1.09E-02	3.00E+00
809	0.00	1.08E-05	-1.09E-02	3.00E+00
810	0.00	1.08E-05	-1.09E-02	3.00E+00
811	1.28	1.08E-05	-1.09E-02	3.00E+00
812	2.87	1.08E-05	-1.09E-02	3.00E+00
813	3.79	1.08E-05	-1.09E-02	3.00E+00
814	4.37	1.08E-05	-1.09E-02	3.00E+00
815	5.19	1.08E-05	-1.09E-02	3.00E+00
816	5.60	1.08E-05	-1.09E-02	3.00E+00
817	6.47	1.08E-05	-1.09E-02	3.00E+00

818	6.40	1.08E-05	-1.09E-02	3.00E+00
819	6.93	1.08E-05	-1.09E-02	3.00E+00
820	8.77	1.08E-05	-1.09E-02	3.00E+00
821	9.82	1.08E-05	-1.09E-02	3.00E+00
822	9.69	1.08E-05	-1.09E-02	3.00E+00
823	11.02	1.08E-05	-1.09E-02	3.00E+00
824	12.80	1.08E-05	-1.09E-02	3.00E+00
825	13.62	1.08E-05	-1.09E-02	3.00E+00
826	14.25	1.08E-05	-1.09E-02	3.00E+00
827	13.95	1.08E-05	-1.09E-02	3.00E+00
828	14.84	1.08E-05	-1.09E-02	3.00E+00
829	16.62	1.08E-05	-1.09E-02	3.00E+00
830	17.00	1.08E-05	-1.09E-02	3.00E+00
831	17.13	1.08E-05	-1.09E-02	3.00E+00
832	16.96	1.08E-05	-1.09E-02	3.00E+00
833	17.56	1.08E-05	-1.09E-02	3.00E+00
834	17.66	3.59E-06	-3.63E-03	1.00E+00
835	17.84	-3.59E-06	3.63E-03	-1.00E+00
836	17.72	-1.08E-05	1.09E-02	-3.00E+00
837	17.29	-1.08E-05	1.09E-02	-3.00E+00
838	16.63	-1.08E-05	1.09E-02	-3.00E+00
839	16.03	-1.08E-05	1.09E-02	-3.00E+00
840	15.29	-1.08E-05	1.09E-02	-3.00E+00
841	14.10	-1.08E-05	1.09E-02	-3.00E+00
842	12.28	-1.08E-05	1.09E-02	-3.00E+00
843	10.41	-1.08E-05	1.09E-02	-3.00E+00
844	8.82	-1.08E-05	1.09E-02	-3.00E+00
845	7.57	-1.08E-05	1.09E-02	-3.00E+00
846	5.93	-1.08E-05	1.09E-02	-3.00E+00
847	3.77	-1.08E-05	1.09E-02	-3.00E+00
848	1.51	-1.08E-05	1.09E-02	-3.00E+00

849	0.00	-1.08E-05	1.09E-02	-3.00E+00
850	0.00	-1.08E-05	1.09E-02	-3.00E+00
851	0.00	-1.08E-05	1.09E-02	-3.00E+00
852	0.00	-1.08E-05	1.09E-02	-3.00E+00
853	0.00	-1.08E-05	1.09E-02	-3.00E+00
854	0.00	-1.08E-05	1.09E-02	-3.00E+00
855	0.00	-1.08E-05	1.09E-02	-3.00E+00
856	0.00	-1.08E-05	1.09E-02	-3.00E+00
857	0.00	-1.08E-05	1.09E-02	-3.00E+00
858	0.00	-1.08E-05	1.09E-02	-3.00E+00
859	0.00	-1.08E-05	1.09E-02	-3.00E+00
860	0.00	-1.08E-05	1.09E-02	-3.00E+00
861	0.00	-1.08E-05	1.09E-02	-3.00E+00
862	0.00	-1.08E-05	1.09E-02	-3.00E+00
863	0.00	-1.08E-05	1.09E-02	-3.00E+00
864	0.00	-1.08E-05	1.09E-02	-3.00E+00
865	0.00	-3.20E-06	3.17E-03	-1.70E+00
866	0.00	4.37E-06	-4.55E-03	-3.93E-01
867	0.00	1.19E-05	-1.23E-02	9.11E-01
868	0.00	1.19E-05	-1.23E-02	9.11E-01
869	0.00	1.19E-05	-1.23E-02	9.11E-01
870	0.00	1.19E-05	-1.23E-02	9.11E-01
871	0.00	1.19E-05	-1.23E-02	9.11E-01
872	5.59	1.19E-05	-1.23E-02	9.11E-01
873	6.92	1.19E-05	-1.23E-02	9.11E-01
874	6.66	1.19E-05	-1.23E-02	9.11E-01
875	7.09	1.19E-05	-1.23E-02	9.11E-01
876	7.46	1.19E-05	-1.23E-02	9.11E-01
877	8.40	1.19E-05	-1.23E-02	9.11E-01
878	8.87	1.19E-05	-1.23E-02	9.11E-01
879	9.51	9.98E-06	-1.04E-02	9.26E-01

880	12.38	8.02E-06	-8.59E-03	9.42E-01
881	13.39	6.07E-06	-6.76E-03	9.58E-01
882	13.29	6.07E-06	-6.76E-03	9.58E-01
883	13.65	6.07E-06	-6.76E-03	9.58E-01
884	16.38	6.07E-06	-6.76E-03	9.58E-01
885	17.62	6.07E-06	-6.76E-03	9.58E-01
886	17.91	6.07E-06	-6.76E-03	9.58E-01
887	18.28	6.07E-06	-6.76E-03	9.58E-01
888	19.71	6.07E-06	-6.76E-03	9.58E-01
889	19.75	5.71E-06	-6.39E-03	4.77E-01
890	19.56	5.36E-06	-6.03E-03	-3.99E-03
891	19.87	5.00E-06	-5.66E-03	-4.85E-01
892	20.32	5.00E-06	-5.66E-03	-4.85E-01
893	21.01	5.00E-06	-5.66E-03	-4.85E-01
894	22.32	5.00E-06	-5.66E-03	-4.85E-01
895	23.74	5.00E-06	-5.66E-03	-4.85E-01
896	24.26	5.00E-06	-5.66E-03	-4.85E-01
897	23.98	5.00E-06	-5.66E-03	-4.85E-01
898	23.51	5.00E-06	-5.66E-03	-4.85E-01
899	23.08	3.15E-06	-3.81E-03	-3.54E-01
900	22.66	1.30E-06	-1.95E-03	-2.22E-01
901	22.31	-5.46E-07	-9.93E-05	-9.10E-02
902	22.29	-5.46E-07	-9.93E-05	-9.10E-02
903	22.38	-5.46E-07	-9.93E-05	-9.10E-02
904	22.76	-5.46E-07	-9.93E-05	-9.10E-02
905	23.20	-5.46E-07	-9.93E-05	-9.10E-02
906	23.34	-5.46E-07	-9.93E-05	-9.10E-02
907	23.00	-5.46E-07	-9.93E-05	-9.10E-02
908	22.80	-5.46E-07	-9.93E-05	-9.10E-02
909	22.66	9.61E-07	-1.66E-03	1.85E-01
910	22.82	2.47E-06	-3.21E-03	4.62E-01

911	22.92	3.98E-06	-4.77E-03	7.38E-01
912	22.74	3.98E-06	-4.77E-03	7.38E-01
913	22.71	3.98E-06	-4.77E-03	7.38E-01
914	22.83	3.98E-06	-4.77E-03	7.38E-01
915	22.84	3.98E-06	-4.77E-03	7.38E-01
916	22.80	3.98E-06	-4.77E-03	7.38E-01
917	22.83	3.98E-06	-4.77E-03	7.38E-01
918	22.79	3.98E-06	-4.77E-03	7.38E-01
919	22.79	3.98E-06	-4.77E-03	7.38E-01
920	23.02	1.33E-06	-1.59E-03	2.46E-01
921	23.36	-1.33E-06	1.59E-03	-2.46E-01
922	23.10	-3.98E-06	4.77E-03	-7.38E-01
923	22.62	-3.98E-06	4.77E-03	-7.38E-01
924	22.06	-3.98E-06	4.77E-03	-7.38E-01
925	21.45	-3.98E-06	4.77E-03	-7.38E-01
926	20.76	-3.98E-06	4.77E-03	-7.38E-01
927	20.11	-3.98E-06	4.77E-03	-7.38E-01
928	19.48	-3.98E-06	4.77E-03	-7.38E-01
929	18.65	-3.98E-06	4.77E-03	-7.38E-01
930	17.59	-3.98E-06	4.77E-03	-7.38E-01
931	16.52	-3.98E-06	4.77E-03	-7.38E-01
932	15.18	-3.98E-06	4.77E-03	-7.38E-01
933	13.26	-3.98E-06	4.77E-03	-7.38E-01
934	11.39	-3.98E-06	4.77E-03	-7.38E-01
935	9.71	-3.98E-06	4.77E-03	-7.38E-01
936	8.52	-3.98E-06	4.77E-03	-7.38E-01
937	6.98	-3.98E-06	4.77E-03	-7.38E-01
938	4.90	-3.98E-06	4.77E-03	-7.38E-01
939	2.92	-3.98E-06	4.77E-03	-7.38E-01
940	2.39	-3.98E-06	4.77E-03	-7.38E-01
941	2.44	-3.98E-06	4.77E-03	-7.38E-01

942	2.37	-3.98E-06	4.77E-03	-7.38E-01
943	1.67	-3.98E-06	4.77E-03	-7.38E-01
944	1.17	-3.98E-06	4.77E-03	-7.38E-01
945	1.34	-3.98E-06	4.77E-03	-7.38E-01
946	1.28	-3.98E-06	4.77E-03	-7.38E-01
947	0.56	-1.33E-06	1.59E-03	-2.46E-01
948	0.00	1.33E-06	-1.59E-03	2.46E-01
949	0.00	3.98E-06	-4.77E-03	7.38E-01
950	0.00	3.98E-06	-4.77E-03	7.38E-01
951	0.00	3.98E-06	-4.77E-03	7.38E-01
952	0.00	3.98E-06	-4.77E-03	7.38E-01
953	0.27	3.98E-06	-4.77E-03	7.38E-01
954	1.40	3.98E-06	-4.77E-03	7.38E-01
955	2.96	3.98E-06	-4.77E-03	7.38E-01
956	4.35	3.98E-06	-4.77E-03	7.38E-01
957	4.75	3.98E-06	-4.77E-03	7.38E-01
958	5.67	3.98E-06	-4.77E-03	7.38E-01
959	7.29	3.98E-06	-4.77E-03	7.38E-01
960	7.23	3.98E-06	-4.77E-03	7.38E-01
961	9.37	3.98E-06	-4.77E-03	7.38E-01
962	9.93	3.98E-06	-4.77E-03	7.38E-01
963	11.11	3.98E-06	-4.77E-03	7.38E-01
964	13.96	3.98E-06	-4.77E-03	7.38E-01
965	13.82	3.98E-06	-4.77E-03	7.38E-01
966	14.93	3.98E-06	-4.77E-03	7.38E-01
967	17.81	3.98E-06	-4.77E-03	7.38E-01
968	19.53	3.98E-06	-4.77E-03	7.38E-01
969	19.67	3.46E-06	-4.20E-03	7.13E-01
970	19.70	2.95E-06	-3.63E-03	6.88E-01
971	19.90	2.43E-06	-3.06E-03	6.63E-01
972	20.24	2.43E-06	-3.06E-03	6.63E-01

973	20.52	2.43E-06	-3.06E-03	6.63E-01
974	20.69	8.11E-07	-1.02E-03	2.21E-01
975	20.71	-8.11E-07	1.02E-03	-2.21E-01
976	20.39	-2.43E-06	3.06E-03	-6.63E-01
977	19.96	-2.43E-06	3.06E-03	-6.63E-01
978	19.40	-2.43E-06	3.06E-03	-6.63E-01
979	18.69	-2.43E-06	3.06E-03	-6.63E-01
980	17.83	-2.43E-06	3.06E-03	-6.63E-01
981	16.87	-2.43E-06	3.06E-03	-6.63E-01
982	15.98	-2.43E-06	3.06E-03	-6.63E-01
983	15.23	-2.43E-06	3.06E-03	-6.63E-01
984	14.81	-2.43E-06	3.06E-03	-6.63E-01
985	14.41	-2.43E-06	3.06E-03	-6.63E-01
986	14.12	-2.43E-06	3.06E-03	-6.63E-01
987	13.67	-2.43E-06	3.06E-03	-6.63E-01
988	13.29	-2.43E-06	3.06E-03	-6.63E-01
989	12.89	-2.43E-06	3.06E-03	-6.63E-01
990	12.41	-2.43E-06	3.06E-03	-6.63E-01
991	11.82	-2.43E-06	3.06E-03	-6.63E-01
992	9.97	-2.43E-06	3.06E-03	-6.63E-01
993	8.02	-2.43E-06	3.06E-03	-6.63E-01
994	5.89	-2.43E-06	3.06E-03	-6.63E-01
995	3.93	-2.43E-06	3.06E-03	-6.63E-01
996	2.50	-2.43E-06	3.06E-03	-6.63E-01
997	2.18	-2.43E-06	3.06E-03	-6.63E-01
998	1.91	-2.43E-06	3.06E-03	-6.63E-01
999	2.01	-2.43E-06	3.06E-03	-6.63E-01
1000	2.13	-2.43E-06	3.06E-03	-6.63E-01
1001	2.04	-2.43E-06	3.06E-03	-6.63E-01
1002	0.61	-2.43E-06	3.06E-03	-6.63E-01
1003	0.00	-2.43E-06	3.06E-03	-6.63E-01

1004	0.00	-2.43E-06	3.06E-03	-6.63E-01
1005	0.00	-2.43E-06	3.06E-03	-6.63E-01
1006	0.00	-2.43E-06	3.06E-03	-6.63E-01
1007	0.00	-2.43E-06	3.06E-03	-6.63E-01
1008	0.00	-2.43E-06	3.06E-03	-6.63E-01
1009	0.00	-2.43E-06	3.06E-03	-6.63E-01
1010	0.00	-2.43E-06	3.06E-03	-6.63E-01
1011	0.00	-2.43E-06	3.06E-03	-6.63E-01
1012	0.00	-2.43E-06	3.06E-03	-6.63E-01
1013	0.00	-2.43E-06	3.06E-03	-6.63E-01
1014	0.00	-2.43E-06	3.06E-03	-6.63E-01
1015	0.00	-1.41E-06	1.62E-03	-4.82E-01
1016	0.00	-3.87E-07	1.85E-04	-3.00E-01
1017	0.01	6.35E-07	-1.25E-03	-1.19E-01
1018	0.94	6.35E-07	-1.25E-03	-1.19E-01
1019	2.99	6.35E-07	-1.25E-03	-1.19E-01
1020	4.47	6.35E-07	-1.25E-03	-1.19E-01
1021	4.45	6.35E-07	-1.25E-03	-1.19E-01
1022	4.59	6.35E-07	-1.25E-03	-1.19E-01
1023	7.17	6.35E-07	-1.25E-03	-1.19E-01
1024	7.32	6.35E-07	-1.25E-03	-1.19E-01
1025	9.10	6.35E-07	-1.25E-03	-1.19E-01
1026	9.86	6.35E-07	-1.25E-03	-1.19E-01
1027	10.61	6.35E-07	-1.25E-03	-1.19E-01
1028	12.35	6.35E-07	-1.25E-03	-1.19E-01
1029	13.32	6.35E-07	-1.25E-03	-1.19E-01
1030	13.44	6.35E-07	-1.25E-03	-1.19E-01
1031	15.98	6.35E-07	-1.25E-03	-1.19E-01
1032	18.47	6.35E-07	-1.25E-03	-1.19E-01
1033	18.16	6.35E-07	-1.25E-03	-1.19E-01
1034	19.55	6.35E-07	-1.25E-03	-1.19E-01

1035	20.81	6.35E-07	-1.25E-03	-1.19E-01
1036	21.31	6.35E-07	-1.25E-03	-1.19E-01
1037	21.12	6.35E-07	-1.25E-03	-1.19E-01
1038	21.65	6.35E-07	-1.25E-03	-1.19E-01
1039	22.58	6.35E-07	-1.25E-03	-1.19E-01
1040	22.98	6.35E-07	-1.25E-03	-1.19E-01
1041	23.32	6.35E-07	-1.25E-03	-1.19E-01
1042	23.63	6.35E-07	-1.25E-03	-1.19E-01
1043	23.92	6.35E-07	-1.25E-03	-1.19E-01
1044	24.14	6.35E-07	-1.25E-03	-1.19E-01
1045	24.13	6.35E-07	-1.25E-03	-1.19E-01
1046	24.30	6.35E-07	-1.25E-03	-1.19E-01
1047	24.99	6.35E-07	-1.25E-03	-1.19E-01
1048	25.63	6.35E-07	-1.25E-03	-1.19E-01
1049	25.39	6.35E-07	-1.25E-03	-1.19E-01
1050	25.07	6.35E-07	-1.25E-03	-1.19E-01
1051	24.66	6.35E-07	-1.25E-03	-1.19E-01
1052	24.00	6.35E-07	-1.25E-03	-1.19E-01
1053	23.64	6.35E-07	-1.25E-03	-1.19E-01
1054	24.13	6.35E-07	-1.25E-03	-1.19E-01
1055	25.20	6.35E-07	-1.25E-03	-1.19E-01
1056	25.77	6.35E-07	-1.25E-03	-1.19E-01
1057	25.90	6.35E-07	-1.25E-03	-1.19E-01
1058	26.46	6.35E-07	-1.25E-03	-1.19E-01
1059	27.06	6.35E-07	-1.25E-03	-1.19E-01
1060	27.46	6.35E-07	-1.25E-03	-1.19E-01
1061	27.72	6.35E-07	-1.25E-03	-1.19E-01
1062	27.95	6.35E-07	-1.25E-03	-1.19E-01
1063	28.03	6.35E-07	-1.25E-03	-1.19E-01
1064	28.20	6.35E-07	-1.25E-03	-1.19E-01
1065	28.38	6.35E-07	-1.25E-03	-1.19E-01

1066	28.65	6.35E-07	-1.25E-03	-1.19E-01
1067	28.91	6.35E-07	-1.25E-03	-1.19E-01
1068	29.05	6.35E-07	-1.25E-03	-1.19E-01
1069	29.15	6.35E-07	-1.25E-03	-1.19E-01
1070	29.13	6.35E-07	-1.25E-03	-1.19E-01
1071	29.17	6.35E-07	-1.25E-03	-1.19E-01
1072	29.17	6.35E-07	-1.25E-03	-1.19E-01
1073	29.15	6.35E-07	-1.25E-03	-1.19E-01
1074	29.09	6.35E-07	-1.25E-03	-1.19E-01
1075	29.31	6.35E-07	-1.25E-03	-1.19E-01
1076	29.46	6.35E-07	-1.25E-03	-1.19E-01
1077	29.40	6.35E-07	-1.25E-03	-1.19E-01
1078	29.08	6.35E-07	-1.25E-03	-1.19E-01
1079	28.62	6.35E-07	-1.25E-03	-1.19E-01
1080	28.49	6.35E-07	-1.25E-03	-1.19E-01
1081	28.50	6.35E-07	-1.25E-03	-1.19E-01
1082	28.69	6.35E-07	-1.25E-03	-1.19E-01
1083	28.91	6.35E-07	-1.25E-03	-1.19E-01
1084	29.24	6.35E-07	-1.25E-03	-1.19E-01
1085	29.41	6.35E-07	-1.25E-03	-1.19E-01
1086	29.51	6.35E-07	-1.25E-03	-1.19E-01
1087	29.55	6.35E-07	-1.25E-03	-1.19E-01
1088	29.46	6.35E-07	-1.25E-03	-1.19E-01
1089	29.24	6.35E-07	-1.25E-03	-1.19E-01
1090	29.17	6.35E-07	-1.25E-03	-1.19E-01
1091	29.14	6.35E-07	-1.25E-03	-1.19E-01
1092	29.04	6.35E-07	-1.25E-03	-1.19E-01
1093	28.98	6.35E-07	-1.25E-03	-1.19E-01
1094	28.98	6.35E-07	-1.25E-03	-1.19E-01
1095	29.07	6.35E-07	-1.25E-03	-1.19E-01
1096	29.22	6.35E-07	-1.25E-03	-1.19E-01

1097	29.47	6.35E-07	-1.25E-03	-1.19E-01
1098	29.60	6.35E-07	-1.25E-03	-1.19E-01
1099	29.66	3.90E-07	-1.02E-03	-3.48E-01
1100	29.47	1.44E-07	-7.91E-04	-5.77E-01
1101	29.15	-1.02E-07	-5.61E-04	-8.06E-01
1102	29.04	-1.02E-07	-5.61E-04	-8.06E-01
1103	29.11	-1.02E-07	-5.61E-04	-8.06E-01
1104	28.82	-1.02E-07	-5.61E-04	-8.06E-01
1105	28.60	-1.02E-07	-5.61E-04	-8.06E-01
1106	28.41	-1.02E-07	-5.61E-04	-8.06E-01
1107	28.19	-1.02E-07	-5.61E-04	-8.06E-01
1108	28.07	-1.02E-07	-5.61E-04	-8.06E-01
1109	28.01	-1.02E-07	-5.61E-04	-8.06E-01
1110	27.84	-1.02E-07	-5.61E-04	-8.06E-01
1111	27.62	-1.02E-07	-5.61E-04	-8.06E-01
1112	27.40	-1.02E-07	-5.61E-04	-8.06E-01
1113	27.01	-1.02E-07	-5.61E-04	-8.06E-01
1114	26.68	-1.02E-07	-5.61E-04	-8.06E-01
1115	26.36	-1.02E-07	-5.61E-04	-8.06E-01
1116	25.98	-1.02E-07	-5.61E-04	-8.06E-01
1117	25.47	-1.02E-07	-5.61E-04	-8.06E-01
1118	25.06	-1.02E-07	-5.61E-04	-8.06E-01
1119	25.12	-1.02E-07	-5.61E-04	-8.06E-01
1120	25.07	-1.02E-07	-5.61E-04	-8.06E-01
1121	24.86	-1.02E-07	-5.61E-04	-8.06E-01
1122	24.51	-1.02E-07	-5.61E-04	-8.06E-01
1123	24.15	-1.02E-07	-5.61E-04	-8.06E-01
1124	23.82	-1.02E-07	-5.61E-04	-8.06E-01
1125	23.30	-1.02E-07	-5.61E-04	-8.06E-01
1126	22.79	-1.02E-07	-5.61E-04	-8.06E-01
1127	22.40	-1.02E-07	-5.61E-04	-8.06E-01

1128	22.35	-1.02E-07	-5.61E-04	-8.06E-01
1129	22.82	-1.02E-07	-5.61E-04	-8.06E-01
1130	23.52	-1.02E-07	-5.61E-04	-8.06E-01
1131	24.15	-1.02E-07	-5.61E-04	-8.06E-01
1132	24.65	-1.02E-07	-5.61E-04	-8.06E-01
1133	25.04	-1.02E-07	-5.61E-04	-8.06E-01
1134	25.31	-1.02E-07	-5.61E-04	-8.06E-01
1135	25.65	-3.39E-08	-1.87E-04	-2.69E-01
1136	25.81	3.39E-08	1.87E-04	2.69E-01
1137	25.35	1.02E-07	5.61E-04	8.06E-01
1138	24.45	1.02E-07	5.61E-04	8.06E-01
1139	23.57	1.02E-07	5.61E-04	8.06E-01
1140	22.73	1.02E-07	5.61E-04	8.06E-01
1141	22.10	1.02E-07	5.61E-04	8.06E-01
1142	21.62	1.02E-07	5.61E-04	8.06E-01
1143	20.87	1.02E-07	5.61E-04	8.06E-01
1144	20.13	1.02E-07	5.61E-04	8.06E-01
1145	19.46	1.02E-07	5.61E-04	8.06E-01
1146	18.86	1.02E-07	5.61E-04	8.06E-01
1147	18.21	1.02E-07	5.61E-04	8.06E-01
1148	17.42	1.02E-07	5.61E-04	8.06E-01
1149	16.68	1.02E-07	5.61E-04	8.06E-01
1150	15.94	1.02E-07	5.61E-04	8.06E-01
1151	14.61	1.02E-07	5.61E-04	8.06E-01
1152	12.22	1.02E-07	5.61E-04	8.06E-01
1153	8.78	1.02E-07	5.61E-04	8.06E-01
1154	4.16	1.02E-07	5.61E-04	8.06E-01
1155	1.53	3.39E-08	1.87E-04	2.69E-01
1156	0.05	-3.39E-08	-1.87E-04	-2.69E-01
1157	0.00	-1.02E-07	-5.61E-04	-8.06E-01
1158	0.00	-1.02E-07	-5.61E-04	-8.06E-01

1159	0.00	-1.02E-07	-5.61E-04	-8.06E-01
1160	0.00	-1.02E-07	-5.61E-04	-8.06E-01
1161	0.00	-1.02E-07	-5.61E-04	-8.06E-01
1162	0.00	-1.02E-07	-5.61E-04	-8.06E-01
1163	0.00	-1.02E-07	-5.61E-04	-8.06E-01
1164	0.00	1.96E-06	-2.70E-03	-3.88E-01
1165	0.00	4.02E-06	-4.85E-03	3.01E-02
1166	1.67	6.08E-06	-6.99E-03	4.48E-01
1167	3.22	6.08E-06	-6.99E-03	4.48E-01
1168	4.40	6.08E-06	-6.99E-03	4.48E-01
1169	4.25	6.08E-06	-6.99E-03	4.48E-01
1170	3.19	6.08E-06	-6.99E-03	4.48E-01
1171	2.29	6.08E-06	-6.99E-03	4.48E-01
1172	1.95	6.08E-06	-6.99E-03	4.48E-01
1173	4.02	6.08E-06	-6.99E-03	4.48E-01
1174	5.22	6.08E-06	-6.99E-03	4.48E-01
1175	5.81	6.08E-06	-6.99E-03	4.48E-01
1176	7.71	6.08E-06	-6.99E-03	4.48E-01
1177	6.89	6.08E-06	-6.99E-03	4.48E-01
1178	8.77	6.08E-06	-6.99E-03	4.48E-01
1179	12.38	6.08E-06	-6.99E-03	4.48E-01
1180	12.88	6.08E-06	-6.99E-03	4.48E-01
1181	12.56	6.08E-06	-6.99E-03	4.48E-01
1182	12.17	6.08E-06	-6.99E-03	4.48E-01
1183	13.58	6.08E-06	-6.99E-03	4.48E-01
1184	16.08	6.08E-06	-6.99E-03	4.48E-01
1185	17.59	6.08E-06	-6.99E-03	4.48E-01
1186	17.81	6.08E-06	-6.99E-03	4.48E-01
1187	18.12	6.08E-06	-6.99E-03	4.48E-01
1188	19.97	6.08E-06	-6.99E-03	4.48E-01
1189	20.86	6.08E-06	-6.99E-03	4.48E-01

1190	20.96	6.08E-06	-6.99E-03	4.48E-01
1191	21.15	6.08E-06	-6.99E-03	4.48E-01
1192	22.74	6.08E-06	-6.99E-03	4.48E-01
1193	24.00	6.08E-06	-6.99E-03	4.48E-01
1194	24.76	6.08E-06	-6.99E-03	4.48E-01
1195	25.16	6.08E-06	-6.99E-03	4.48E-01
1196	25.14	6.08E-06	-6.99E-03	4.48E-01
1197	24.67	6.08E-06	-6.99E-03	4.48E-01
1198	24.68	6.08E-06	-6.99E-03	4.48E-01
1199	24.60	5.42E-06	-6.52E-03	4.64E-01
1200	24.79	4.75E-06	-6.06E-03	4.80E-01
1201	24.95	4.08E-06	-5.59E-03	4.96E-01
1202	25.18	4.08E-06	-5.59E-03	4.96E-01
1203	25.61	4.08E-06	-5.59E-03	4.96E-01
1204	25.94	4.08E-06	-5.59E-03	4.96E-01
1205	26.27	4.08E-06	-5.59E-03	4.96E-01
1206	26.38	4.08E-06	-5.59E-03	4.96E-01
1207	26.45	4.08E-06	-5.59E-03	4.96E-01
1208	26.41	4.08E-06	-5.59E-03	4.96E-01
1209	26.41	4.08E-06	-5.59E-03	4.96E-01
1210	26.60	4.08E-06	-5.59E-03	4.96E-01
1211	26.70	4.08E-06	-5.59E-03	4.96E-01
1212	26.71	4.08E-06	-5.59E-03	4.96E-01
1213	26.72	1.36E-06	-1.86E-03	1.65E-01
1214	26.63	-1.36E-06	1.86E-03	-1.65E-01
1215	26.32	-4.08E-06	5.59E-03	-4.96E-01
1216	25.65	-4.08E-06	5.59E-03	-4.96E-01
1217	24.90	-4.08E-06	5.59E-03	-4.96E-01
1218	24.15	-4.08E-06	5.59E-03	-4.96E-01
1219	23.44	-4.08E-06	5.59E-03	-4.96E-01
1220	22.74	-4.08E-06	5.59E-03	-4.96E-01

1221	22.08	-4.08E-06	5.59E-03	-4.96E-01
1222	21.41	-4.08E-06	5.59E-03	-4.96E-01
1223	20.77	-4.08E-06	5.59E-03	-4.96E-01
1224	20.12	-4.08E-06	5.59E-03	-4.96E-01
1225	19.27	-4.08E-06	5.59E-03	-4.96E-01
1226	18.31	-4.08E-06	5.59E-03	-4.96E-01
1227	16.95	-4.08E-06	5.59E-03	-4.96E-01
1228	14.91	-4.08E-06	5.59E-03	-4.96E-01
1229	12.71	-4.08E-06	5.59E-03	-4.96E-01
1230	11.12	-4.08E-06	5.59E-03	-4.96E-01
1231	10.12	-4.08E-06	5.59E-03	-4.96E-01
1232	8.74	-4.08E-06	5.59E-03	-4.96E-01
1233	8.03	-4.08E-06	5.59E-03	-4.96E-01
1234	7.80	-4.08E-06	5.59E-03	-4.96E-01
1235	7.68	-4.08E-06	5.59E-03	-4.96E-01
1236	7.48	-1.36E-06	1.86E-03	-1.65E-01
1237	8.32	1.36E-06	-1.86E-03	1.65E-01
1238	9.80	4.08E-06	-5.59E-03	4.96E-01
1239	12.04	4.08E-06	-5.59E-03	4.96E-01
1240	13.87	4.08E-06	-5.59E-03	4.96E-01
1241	13.62	4.08E-06	-5.59E-03	4.96E-01
1242	15.13	4.08E-06	-5.59E-03	4.96E-01
1243	18.23	1.36E-06	-1.86E-03	1.65E-01
1244	18.64	-1.36E-06	1.86E-03	-1.65E-01
1245	18.02	-4.08E-06	5.59E-03	-4.96E-01
1246	17.37	-4.08E-06	5.59E-03	-4.96E-01
1247	16.72	-4.08E-06	5.59E-03	-4.96E-01
1248	16.04	-4.08E-06	5.59E-03	-4.96E-01
1249	15.23	-4.08E-06	5.59E-03	-4.96E-01
1250	13.89	-4.08E-06	5.59E-03	-4.96E-01
1251	12.09	-4.08E-06	5.59E-03	-4.96E-01

1252	10.75	-4.08E-06	5.59E-03	-4.96E-01
1253	10.16	-1.36E-06	1.86E-03	-1.65E-01
1254	10.12	1.36E-06	-1.86E-03	1.65E-01
1255	10.75	4.08E-06	-5.59E-03	4.96E-01
1256	12.22	4.08E-06	-5.59E-03	4.96E-01
1257	14.05	4.08E-06	-5.59E-03	4.96E-01
1258	16.28	4.08E-06	-5.59E-03	4.96E-01
1259	17.96	4.08E-06	-5.59E-03	4.96E-01
1260	17.77	4.08E-06	-5.59E-03	4.96E-01
1261	18.16	4.08E-06	-5.59E-03	4.96E-01
1262	18.00	4.08E-06	-5.59E-03	4.96E-01
1263	17.76	4.08E-06	-5.59E-03	4.96E-01
1264	17.51	1.36E-06	-1.86E-03	1.65E-01
1265	17.38	-1.36E-06	1.86E-03	-1.65E-01
1266	16.94	-4.08E-06	5.59E-03	-4.96E-01
1267	16.20	-4.08E-06	5.59E-03	-4.96E-01
1268	14.72	-4.08E-06	5.59E-03	-4.96E-01
1269	12.72	-4.08E-06	5.59E-03	-4.96E-01
1270	10.68	-4.08E-06	5.59E-03	-4.96E-01
1271	9.21	-4.08E-06	5.59E-03	-4.96E-01
1272	7.77	-4.08E-06	5.59E-03	-4.96E-01
1273	6.54	-4.08E-06	5.59E-03	-4.96E-01
1274	4.66	-4.08E-06	5.59E-03	-4.96E-01
1275	2.80	-1.36E-06	1.86E-03	-1.65E-01
1276	3.12	1.36E-06	-1.86E-03	1.65E-01
1277	4.31	4.08E-06	-5.59E-03	4.96E-01
1278	5.60	4.08E-06	-5.59E-03	4.96E-01
1279	6.99	4.08E-06	-5.59E-03	4.96E-01
1280	6.84	4.08E-06	-5.59E-03	4.96E-01
1281	8.63	4.08E-06	-5.59E-03	4.96E-01
1282	9.83	4.08E-06	-5.59E-03	4.96E-01

1283	10.14	4.08E-06	-5.59E-03	4.96E-01
1284	13.22	4.08E-06	-5.59E-03	4.96E-01
1285	13.95	4.08E-06	-5.59E-03	4.96E-01
1286	14.20	4.08E-06	-5.59E-03	4.96E-01
1287	16.52	4.08E-06	-5.59E-03	4.96E-01
1288	19.43	4.08E-06	-5.59E-03	4.96E-01
1289	20.55	4.08E-06	-5.59E-03	4.96E-01
1290	20.81	4.08E-06	-5.59E-03	4.96E-01
1291	20.61	4.08E-06	-5.59E-03	4.96E-01
1292	20.81	4.08E-06	-5.59E-03	4.96E-01
1293	21.53	4.08E-06	-5.59E-03	4.96E-01
1294	21.98	4.08E-06	-5.59E-03	4.96E-01
1295	22.58	4.08E-06	-5.59E-03	4.96E-01
1296	23.18	4.08E-06	-5.59E-03	4.96E-01
1297	23.38	4.08E-06	-5.59E-03	4.96E-01
1298	23.25	4.08E-06	-5.59E-03	4.96E-01
1299	23.08	4.08E-06	-5.59E-03	4.96E-01
1300	22.79	1.36E-06	-1.86E-03	1.65E-01
1301	22.53	-1.36E-06	1.86E-03	-1.65E-01
1302	22.29	-4.08E-06	5.59E-03	-4.96E-01
1303	21.93	-4.08E-06	5.59E-03	-4.96E-01
1304	21.47	-4.08E-06	5.59E-03	-4.96E-01
1305	20.77	-4.08E-06	5.59E-03	-4.96E-01
1306	19.46	-4.08E-06	5.59E-03	-4.96E-01
1307	17.72	-4.08E-06	5.59E-03	-4.96E-01
1308	15.24	-4.08E-06	5.59E-03	-4.96E-01
1309	12.80	-4.08E-06	5.59E-03	-4.96E-01
1310	10.27	-4.08E-06	5.59E-03	-4.96E-01
1311	7.19	-4.08E-06	5.59E-03	-4.96E-01
1312	5.46	-4.08E-06	5.59E-03	-4.96E-01
1313	4.52	-4.08E-06	5.59E-03	-4.96E-01

1314	4.17	-1.36E-06	1.86E-03	-1.65E-01
1315	4.06	1.36E-06	-1.86E-03	1.65E-01
1316	4.74	4.08E-06	-5.59E-03	4.96E-01
1317	6.11	4.08E-06	-5.59E-03	4.96E-01
1318	6.88	4.08E-06	-5.59E-03	4.96E-01
1319	7.04	4.08E-06	-5.59E-03	4.96E-01
1320	8.48	4.08E-06	-5.59E-03	4.96E-01
1321	8.79	4.08E-06	-5.59E-03	4.96E-01
1322	8.72	4.08E-06	-5.59E-03	4.96E-01
1323	9.08	1.36E-06	-1.86E-03	1.65E-01
1324	9.26	-1.36E-06	1.86E-03	-1.65E-01
1325	8.71	-4.08E-06	5.59E-03	-4.96E-01
1326	8.06	-4.08E-06	5.59E-03	-4.96E-01
1327	7.08	-4.08E-06	5.59E-03	-4.96E-01
1328	5.51	-4.08E-06	5.59E-03	-4.96E-01
1329	3.49	-4.08E-06	5.59E-03	-4.96E-01
1330	2.56	-4.08E-06	5.59E-03	-4.96E-01
1331	2.34	-1.36E-06	1.86E-03	-1.65E-01
1332	2.54	1.36E-06	-1.86E-03	1.65E-01
1333	2.45	4.08E-06	-5.59E-03	4.96E-01
1334	3.02	4.08E-06	-5.59E-03	4.96E-01
1335	3.77	4.08E-06	-5.59E-03	4.96E-01
1336	4.46	4.08E-06	-5.59E-03	4.96E-01
1337	5.09	1.36E-06	-1.86E-03	1.65E-01
1338	5.09	-1.36E-06	1.86E-03	-1.65E-01
1339	4.65	-4.08E-06	5.59E-03	-4.96E-01
1340	4.05	-4.08E-06	5.59E-03	-4.96E-01
1341	3.47	-4.08E-06	5.59E-03	-4.96E-01
1342	2.89	-4.08E-06	5.59E-03	-4.96E-01
1343	1.88	-4.08E-06	5.59E-03	-4.96E-01
1344	1.24	-4.08E-06	5.59E-03	-4.96E-01

1345	0.00	-4.08E-06	5.59E-03	-4.96E-01
1346	0.00	-4.08E-06	5.59E-03	-4.96E-01
1347	0.00	-4.08E-06	5.59E-03	-4.96E-01
1348	0.00	-4.08E-06	5.59E-03	-4.96E-01
1349	0.00	-4.08E-06	5.59E-03	-4.96E-01
1350	0.00	2.87E-07	7.17E-04	1.23E-01
1351	0.00	4.66E-06	-4.16E-03	7.42E-01
1352	0.02	9.03E-06	-9.03E-03	1.36E+00
1353	0.65	9.03E-06	-9.03E-03	1.36E+00
1354	1.96	9.03E-06	-9.03E-03	1.36E+00
1355	2.61	9.03E-06	-9.03E-03	1.36E+00
1356	3.11	9.03E-06	-9.03E-03	1.36E+00
1357	3.62	9.03E-06	-9.03E-03	1.36E+00
1358	4.24	9.03E-06	-9.03E-03	1.36E+00
1359	4.33	9.03E-06	-9.03E-03	1.36E+00
1360	5.27	9.03E-06	-9.03E-03	1.36E+00
1361	6.86	9.03E-06	-9.03E-03	1.36E+00
1362	6.89	9.03E-06	-9.03E-03	1.36E+00
1363	8.20	9.03E-06	-9.03E-03	1.36E+00
1364	9.89	9.03E-06	-9.03E-03	1.36E+00
1365	9.77	9.03E-06	-9.03E-03	1.36E+00
1366	11.65	9.03E-06	-9.03E-03	1.36E+00
1367	13.24	9.03E-06	-9.03E-03	1.36E+00
1368	13.10	9.03E-06	-9.03E-03	1.36E+00
1369	14.41	9.03E-06	-9.03E-03	1.36E+00
1370	14.66	7.30E-06	-7.44E-03	1.06E+00
1371	14.67	5.56E-06	-5.85E-03	7.53E-01
1372	15.20	3.83E-06	-4.26E-03	4.50E-01
1373	16.35	3.83E-06	-4.26E-03	4.50E-01
1374	16.95	3.83E-06	-4.26E-03	4.50E-01
1375	17.35	3.83E-06	-4.26E-03	4.50E-01

1376	17.56	3.83E-06	-4.26E-03	4.50E-01
1377	17.38	3.83E-06	-4.26E-03	4.50E-01
1378	16.97	3.83E-06	-4.26E-03	4.50E-01
1379	16.44	3.83E-06	-4.26E-03	4.50E-01
1380	15.89	3.83E-06	-4.26E-03	4.50E-01
1381	15.23	3.83E-06	-4.26E-03	4.50E-01
1382	15.22	3.83E-06	-4.26E-03	4.50E-01
1383	15.45	1.28E-06	-1.42E-03	1.50E-01
1384	15.34	-1.28E-06	1.42E-03	-1.50E-01
1385	15.12	-3.83E-06	4.26E-03	-4.50E-01
1386	14.65	-3.83E-06	4.26E-03	-4.50E-01
1387	14.16	-3.83E-06	4.26E-03	-4.50E-01
1388	13.36	-3.83E-06	4.26E-03	-4.50E-01
1389	11.92	-3.83E-06	4.26E-03	-4.50E-01
1390	9.91	-3.83E-06	4.26E-03	-4.50E-01
1391	7.88	-3.83E-06	4.26E-03	-4.50E-01
1392	5.88	-3.83E-06	4.26E-03	-4.50E-01
1393	3.69	-3.83E-06	4.26E-03	-4.50E-01
1394	2.44	-5.77E-06	6.21E-03	-9.83E-01
1395	2.26	-7.72E-06	8.17E-03	-1.52E+00
1396	2.01	-3.22E-06	3.38E-03	-6.83E-01
1397	1.94	3.22E-06	-3.38E-03	6.83E-01
1398	2.27	9.66E-06	-1.01E-02	2.05E+00
1399	2.74	9.66E-06	-1.01E-02	2.05E+00
1400	3.58	9.66E-06	-1.01E-02	2.05E+00
1401	4.51	9.66E-06	-1.01E-02	2.05E+00
1402	4.36	9.66E-06	-1.01E-02	2.05E+00
1403	6.02	9.66E-06	-1.01E-02	2.05E+00
1404	7.27	9.66E-06	-1.01E-02	2.05E+00
1405	7.27	9.66E-06	-1.01E-02	2.05E+00
1406	9.67	9.66E-06	-1.01E-02	2.05E+00

1407	9.76	9.66E-06	-1.01E-02	2.05E+00
1408	10.83	9.66E-06	-1.01E-02	2.05E+00
1409	12.04	9.66E-06	-1.01E-02	2.05E+00
1410	12.27	9.66E-06	-1.01E-02	2.05E+00
1411	12.93	9.66E-06	-1.01E-02	2.05E+00
1412	14.36	9.66E-06	-1.01E-02	2.05E+00
1413	14.27	9.66E-06	-1.01E-02	2.05E+00
1414	13.64	9.66E-06	-1.01E-02	2.05E+00
1415	12.82	9.66E-06	-1.01E-02	2.05E+00
1416	11.92	9.66E-06	-1.01E-02	2.05E+00
1417	11.12	9.66E-06	-1.01E-02	2.05E+00
1418	10.50	8.53E-06	-9.27E-03	1.71E+00
1419	10.63	7.40E-06	-8.41E-03	1.38E+00
1420	11.24	6.27E-06	-7.55E-03	1.04E+00
1421	10.90	6.27E-06	-7.55E-03	1.04E+00
1422	9.25	6.27E-06	-7.55E-03	1.04E+00
1423	8.81	6.27E-06	-7.55E-03	1.04E+00
1424	9.52	6.27E-06	-7.55E-03	1.04E+00
1425	10.54	6.27E-06	-7.55E-03	1.04E+00
1426	11.59	6.27E-06	-7.55E-03	1.04E+00
1427	12.69	6.27E-06	-7.55E-03	1.04E+00
1428	13.77	6.27E-06	-7.55E-03	1.04E+00
1429	14.44	6.27E-06	-7.55E-03	1.04E+00
1430	14.67	6.27E-06	-7.55E-03	1.04E+00
1431	15.15	2.09E-06	-2.52E-03	3.48E-01
1432	15.34	-2.09E-06	2.52E-03	-3.48E-01
1433	14.87	-6.27E-06	7.55E-03	-1.04E+00
1434	14.36	-6.27E-06	7.55E-03	-1.04E+00
1435	13.74	-6.27E-06	7.55E-03	-1.04E+00
1436	13.08	-6.27E-06	7.55E-03	-1.04E+00
1437	12.34	-6.27E-06	7.55E-03	-1.04E+00

1438	11.69	-6.27E-06	7.55E-03	-1.04E+00
1439	11.28	-6.27E-06	7.55E-03	-1.04E+00
1440	11.14	-6.27E-06	7.55E-03	-1.04E+00
1441	10.86	-6.27E-06	7.55E-03	-1.04E+00
1442	10.42	-6.27E-06	7.55E-03	-1.04E+00
1443	9.89	-6.27E-06	7.55E-03	-1.04E+00
1444	9.37	-6.27E-06	7.55E-03	-1.04E+00
1445	9.09	-6.27E-06	7.55E-03	-1.04E+00
1446	9.05	-6.27E-06	7.55E-03	-1.04E+00
1447	8.80	-6.27E-06	7.55E-03	-1.04E+00
1448	8.00	-6.27E-06	7.55E-03	-1.04E+00
1449	6.71	-6.27E-06	7.55E-03	-1.04E+00
1450	5.21	-6.27E-06	7.55E-03	-1.04E+00
1451	2.72	-6.27E-06	7.55E-03	-1.04E+00
1452	0.95	-6.27E-06	7.55E-03	-1.04E+00
1453	0.00	-6.27E-06	7.55E-03	-1.04E+00
1454	0.00	-6.27E-06	7.55E-03	-1.04E+00
1455	0.00	-1.59E-06	2.19E-03	-8.04E-01
1456	0.00	3.08E-06	-3.17E-03	-5.64E-01
1457	0.00	7.76E-06	-8.53E-03	-3.24E-01
1458	0.00	7.76E-06	-8.53E-03	-3.24E-01
1459	0.00	7.76E-06	-8.53E-03	-3.24E-01
1460	0.00	7.76E-06	-8.53E-03	-3.24E-01
1461	0.00	7.76E-06	-8.53E-03	-3.24E-01
1462	0.00	7.76E-06	-8.53E-03	-3.24E-01
1463	0.00	7.76E-06	-8.53E-03	-3.24E-01
1464	0.00	7.76E-06	-8.53E-03	-3.24E-01
1465	0.00	7.76E-06	-8.53E-03	-3.24E-01
1466	0.00	7.76E-06	-8.53E-03	-3.24E-01
1467	0.00	7.76E-06	-8.53E-03	-3.24E-01
1468	0.00	7.76E-06	-8.53E-03	-3.24E-01

1469	0.00	7.76E-06	-8.53E-03	-3.24E-01
1470	0.00	7.76E-06	-8.53E-03	-3.24E-01
1471	0.00	7.76E-06	-8.53E-03	-3.24E-01
1472	0.00	7.76E-06	-8.53E-03	-3.24E-01
1473	0.00	7.76E-06	-8.53E-03	-3.24E-01
1474	0.00	7.76E-06	-8.53E-03	-3.24E-01
1475	0.00	7.76E-06	-8.53E-03	-3.24E-01
1476	0.00	7.76E-06	-8.53E-03	-3.24E-01
1477	0.00	7.76E-06	-8.53E-03	-3.24E-01
1478	0.00	7.76E-06	-8.53E-03	-3.24E-01
1479	0.00	7.76E-06	-8.53E-03	-3.24E-01
1480	0.00	7.76E-06	-8.53E-03	-3.24E-01
1481	0.00	7.76E-06	-8.53E-03	-3.24E-01
1482	0.00	7.76E-06	-8.53E-03	-3.24E-01
1483	0.00	7.76E-06	-8.53E-03	-3.24E-01
1484	0.00	7.76E-06	-8.53E-03	-3.24E-01
1485	0.00	7.76E-06	-8.53E-03	-3.24E-01
1486	0.00	7.76E-06	-8.53E-03	-3.24E-01
1487	0.00	7.76E-06	-8.53E-03	-3.24E-01
1488	0.00	7.76E-06	-8.53E-03	-3.24E-01
1489	0.00	7.76E-06	-8.53E-03	-3.24E-01
1490	0.00	7.76E-06	-8.53E-03	-3.24E-01
1491	0.00	7.76E-06	-8.53E-03	-3.24E-01
1492	0.00	7.76E-06	-8.53E-03	-3.24E-01
1493	0.00	7.76E-06	-8.53E-03	-3.24E-01
1494	0.00	7.76E-06	-8.53E-03	-3.24E-01
1495	0.00	7.76E-06	-8.53E-03	-3.24E-01
1496	0.00	7.76E-06	-8.53E-03	-3.24E-01
1497	0.00	7.76E-06	-8.53E-03	-3.24E-01
1498	0.00	7.76E-06	-8.53E-03	-3.24E-01
1499	0.00	7.76E-06	-8.53E-03	-3.24E-01

1500	0.00	7.76E-06	-8.53E-03	-3.24E-01
1501	0.00	7.76E-06	-8.53E-03	-3.24E-01
1502	0.00	7.76E-06	-8.53E-03	-3.24E-01
1503	0.00	7.76E-06	-8.53E-03	-3.24E-01
1504	0.00	7.76E-06	-8.53E-03	-3.24E-01
1505	0.00	7.76E-06	-8.53E-03	-3.24E-01
1506	0.00	7.76E-06	-8.53E-03	-3.24E-01
1507	0.00	7.76E-06	-8.53E-03	-3.24E-01
1508	0.00	7.76E-06	-8.53E-03	-3.24E-01
1509	0.00	7.76E-06	-8.53E-03	-3.24E-01
1510	0.00	7.76E-06	-8.53E-03	-3.24E-01
1511	0.00	7.76E-06	-8.53E-03	-3.24E-01
1512	0.00	7.76E-06	-8.53E-03	-3.24E-01
1513	0.00	7.76E-06	-8.53E-03	-3.24E-01
1514	0.00	7.76E-06	-8.53E-03	-3.24E-01
1515	0.00	7.76E-06	-8.53E-03	-3.24E-01
1516	0.00	7.76E-06	-8.53E-03	-3.24E-01
1517	0.00	7.76E-06	-8.53E-03	-3.24E-01
1518	0.00	7.76E-06	-8.53E-03	-3.24E-01
1519	0.14	7.76E-06	-8.53E-03	-3.24E-01
1520	1.71	7.76E-06	-8.53E-03	-3.24E-01
1521	2.64	7.76E-06	-8.53E-03	-3.24E-01
1522	3.02	7.76E-06	-8.53E-03	-3.24E-01
1523	3.64	7.76E-06	-8.53E-03	-3.24E-01
1524	4.13	7.76E-06	-8.53E-03	-3.24E-01
1525	4.18	7.76E-06	-8.53E-03	-3.24E-01
1526	4.56	7.76E-06	-8.53E-03	-3.24E-01
1527	5.11	2.59E-06	-2.84E-03	-1.08E-01
1528	5.19	-2.59E-06	2.84E-03	1.08E-01
1529	4.82	-7.76E-06	8.53E-03	3.24E-01
1530	4.20	-7.76E-06	8.53E-03	3.24E-01

1531	3.61	-7.76E-06	8.53E-03	3.24E-01
1532	2.85	-7.76E-06	8.53E-03	3.24E-01
1533	1.94	-7.76E-06	8.53E-03	3.24E-01
1534	1.16	-2.59E-06	2.84E-03	1.08E-01
1535	0.00	2.59E-06	-2.84E-03	-1.08E-01
1536	0.00	7.76E-06	-8.53E-03	-3.24E-01
1537	0.00	7.76E-06	-8.53E-03	-3.24E-01
1538	0.00	7.76E-06	-8.53E-03	-3.24E-01
1539	0.00	7.76E-06	-8.53E-03	-3.24E-01
1540	0.00	7.76E-06	-8.53E-03	-3.24E-01
1541	0.00	7.76E-06	-8.53E-03	-3.24E-01
1542	0.00	7.76E-06	-8.53E-03	-3.24E-01
1543	0.00	7.76E-06	-8.53E-03	-3.24E-01
1544	0.00	7.76E-06	-8.53E-03	-3.24E-01
1545	0.00	7.76E-06	-8.53E-03	-3.24E-01
1546	0.00	7.76E-06	-8.53E-03	-3.24E-01
1547	0.00	7.76E-06	-8.53E-03	-3.24E-01
1548	0.00	7.76E-06	-8.53E-03	-3.24E-01
1549	0.00	7.76E-06	-8.53E-03	-3.24E-01
1550	0.00	7.76E-06	-8.53E-03	-3.24E-01
1551	0.00	7.76E-06	-8.53E-03	-3.24E-01
1552	0.00	7.76E-06	-8.53E-03	-3.24E-01
1553	0.00	7.76E-06	-8.53E-03	-3.24E-01
1554	0.00	7.76E-06	-8.53E-03	-3.24E-01
1555	0.00	7.76E-06	-8.53E-03	-3.24E-01
1556	0.00	7.76E-06	-8.53E-03	-3.24E-01
1557	0.00	7.76E-06	-8.53E-03	-3.24E-01
1558	0.00	7.76E-06	-8.53E-03	-3.24E-01
1559	0.00	7.76E-06	-8.53E-03	-3.24E-01
1560	0.00	7.76E-06	-8.53E-03	-3.24E-01
1561	0.00	7.76E-06	-8.53E-03	-3.24E-01

1562	0.00	7.76E-06	-8.53E-03	-3.24E-01
1563	0.62	7.76E-06	-8.53E-03	-3.24E-01
1564	1.04	7.76E-06	-8.53E-03	-3.24E-01
1565	1.54	7.76E-06	-8.53E-03	-3.24E-01
1566	2.49	7.76E-06	-8.53E-03	-3.24E-01
1567	2.98	7.76E-06	-8.53E-03	-3.24E-01
1568	3.28	2.59E-06	-2.84E-03	-1.08E-01
1569	3.19	-2.59E-06	2.84E-03	1.08E-01
1570	2.75	-7.76E-06	8.53E-03	3.24E-01
1571	1.30	-2.59E-06	2.84E-03	1.08E-01
1572	0.00	2.59E-06	-2.84E-03	-1.08E-01
1573	0.05	7.76E-06	-8.53E-03	-3.24E-01
1574	1.12	7.76E-06	-8.53E-03	-3.24E-01
1575	2.81	7.76E-06	-8.53E-03	-3.24E-01
1576	4.24	7.76E-06	-8.53E-03	-3.24E-01
1577	5.60	7.76E-06	-8.53E-03	-3.24E-01
1578	5.96	7.76E-06	-8.53E-03	-3.24E-01
1579	8.32	7.76E-06	-8.53E-03	-3.24E-01
1580	8.63	7.76E-06	-8.53E-03	-3.24E-01
1581	9.37	2.59E-06	-2.84E-03	-1.08E-01
1582	9.62	-2.59E-06	2.84E-03	1.08E-01
1583	9.11	-7.76E-06	8.53E-03	3.24E-01
1584	8.11	-7.76E-06	8.53E-03	3.24E-01
1585	7.01	-7.76E-06	8.53E-03	3.24E-01
1586	6.04	-7.76E-06	8.53E-03	3.24E-01
1587	5.42	-2.59E-06	2.84E-03	1.08E-01
1588	5.50	2.59E-06	-2.84E-03	-1.08E-01
1589	6.79	7.76E-06	-8.53E-03	-3.24E-01
1590	7.61	7.76E-06	-8.53E-03	-3.24E-01
1591	7.15	7.76E-06	-8.53E-03	-3.24E-01
1592	6.89	7.76E-06	-8.53E-03	-3.24E-01

1593	8.88	7.76E-06	-8.53E-03	-3.24E-01
1594	11.28	7.76E-06	-8.53E-03	-3.24E-01
1595	11.48	7.76E-06	-8.53E-03	-3.24E-01
1596	10.97	7.76E-06	-8.53E-03	-3.24E-01
1597	11.78	7.76E-06	-8.53E-03	-3.24E-01
1598	13.47	7.76E-06	-8.53E-03	-3.24E-01
1599	14.92	7.76E-06	-8.53E-03	-3.24E-01
1600	15.21	7.76E-06	-8.53E-03	-3.24E-01
1601	17.04	7.76E-06	-8.53E-03	-3.24E-01
1602	17.89	7.76E-06	-8.53E-03	-3.24E-01
1603	19.09	2.59E-06	-2.84E-03	-1.08E-01
1604	19.38	-2.59E-06	2.84E-03	1.08E-01
1605	19.31	-7.76E-06	8.53E-03	3.24E-01
1606	18.50	-7.76E-06	8.53E-03	3.24E-01
1607	17.40	-7.76E-06	8.53E-03	3.24E-01
1608	16.33	-7.76E-06	8.53E-03	3.24E-01
1609	14.97	-7.76E-06	8.53E-03	3.24E-01
1610	12.74	-7.76E-06	8.53E-03	3.24E-01
1611	10.27	-7.76E-06	8.53E-03	3.24E-01
1612	8.67	-7.76E-06	8.53E-03	3.24E-01
1613	7.07	-7.99E-06	8.66E-03	1.24E+00
1614	4.45	-8.22E-06	8.79E-03	2.15E+00
1615	3.71	-2.82E-06	2.97E-03	1.02E+00
1616	5.47	2.82E-06	-2.97E-03	-1.02E+00
1617	6.15	8.46E-06	-8.92E-03	-3.06E+00
1618	7.24	8.46E-06	-8.92E-03	-3.06E+00
1619	8.08	8.46E-06	-8.92E-03	-3.06E+00
1620	9.41	8.46E-06	-8.92E-03	-3.06E+00
1621	10.43	2.82E-06	-2.97E-03	-1.02E+00
1622	10.52	-2.82E-06	2.97E-03	1.02E+00
1623	9.95	-8.46E-06	8.92E-03	3.06E+00

1624	8.85	-8.46E-06	8.92E-03	3.06E+00
1625	7.52	-8.46E-06	8.92E-03	3.06E+00
1626	6.17	-8.46E-06	8.92E-03	3.06E+00
1627	5.37	-2.82E-06	2.97E-03	1.02E+00
1628	5.48	2.82E-06	-2.97E-03	-1.02E+00
1629	7.31	8.46E-06	-8.92E-03	-3.06E+00
1630	9.64	8.46E-06	-8.92E-03	-3.06E+00
1631	10.91	8.46E-06	-8.92E-03	-3.06E+00
1632	11.25	8.46E-06	-8.92E-03	-3.06E+00
1633	13.42	8.46E-06	-8.92E-03	-3.06E+00
1634	15.77	8.46E-06	-8.92E-03	-3.06E+00
1635	15.91	8.46E-06	-8.92E-03	-3.06E+00
1636	16.74	8.46E-06	-8.92E-03	-3.06E+00
1637	18.91	8.46E-06	-8.92E-03	-3.06E+00
1638	21.27	2.82E-06	-2.97E-03	-1.02E+00
1639	21.64	-2.82E-06	2.97E-03	1.02E+00
1640	21.56	-8.46E-06	8.92E-03	3.06E+00
1641	21.28	-8.46E-06	8.92E-03	3.06E+00
1642	20.80	-8.46E-06	8.92E-03	3.06E+00
1643	19.83	-8.46E-06	8.92E-03	3.06E+00
1644	18.43	-8.46E-06	8.92E-03	3.06E+00
1645	16.06	-8.46E-06	8.92E-03	3.06E+00
1646	12.52	-8.46E-06	8.92E-03	3.06E+00
1647	8.98	-8.46E-06	8.92E-03	3.06E+00
1648	7.22	-8.46E-06	8.92E-03	3.06E+00
1649	5.92	-8.46E-06	8.92E-03	3.06E+00
1650	5.43	-2.82E-06	2.97E-03	1.02E+00
1651	7.37	2.82E-06	-2.97E-03	-1.02E+00
1652	10.55	8.46E-06	-8.92E-03	-3.06E+00
1653	11.67	8.46E-06	-8.92E-03	-3.06E+00
1654	13.20	8.46E-06	-8.92E-03	-3.06E+00

1655	15.78	8.46E-06	-8.92E-03	-3.06E+00
1656	16.11	8.46E-06	-8.92E-03	-3.06E+00
1657	17.21	2.82E-06	-2.97E-03	-1.02E+00
1658	16.96	-2.82E-06	2.97E-03	1.02E+00
1659	16.32	-8.46E-06	8.92E-03	3.06E+00
1660	15.73	-8.46E-06	8.92E-03	3.06E+00
1661	14.42	-8.46E-06	8.92E-03	3.06E+00
1662	12.23	-8.46E-06	8.92E-03	3.06E+00
1663	9.56	-8.46E-06	8.92E-03	3.06E+00
1664	6.48	-8.46E-06	8.92E-03	3.06E+00
1665	3.70	-8.46E-06	8.92E-03	3.06E+00
1666	0.19	-8.46E-06	8.92E-03	3.06E+00
1667	0.00	-8.46E-06	8.92E-03	3.06E+00
1668	0.00	1.19E-06	-1.81E-04	2.22E+00
1669	0.00	1.08E-05	-9.28E-03	1.38E+00
1670	0.00	2.05E-05	-1.84E-02	5.38E-01
1671	0.00	2.05E-05	-1.84E-02	5.38E-01
1672	0.00	2.05E-05	-1.84E-02	5.38E-01
1673	0.00	2.05E-05	-1.84E-02	5.38E-01
1674	0.00	2.05E-05	-1.84E-02	5.38E-01
1675	0.00	2.05E-05	-1.84E-02	5.38E-01
1676	0.00	2.05E-05	-1.84E-02	5.38E-01
1677	0.00	2.05E-05	-1.84E-02	5.38E-01
1678	0.00	2.05E-05	-1.84E-02	5.38E-01
1679	0.05	2.05E-05	-1.84E-02	5.38E-01
1680	0.85	2.05E-05	-1.84E-02	5.38E-01
1681	2.80	2.05E-05	-1.84E-02	5.38E-01
1682	4.49	2.05E-05	-1.84E-02	5.38E-01
1683	5.91	2.05E-05	-1.84E-02	5.38E-01
1684	6.54	2.05E-05	-1.84E-02	5.38E-01
1685	7.55	2.05E-05	-1.84E-02	5.38E-01

1686	7.48	2.05E-05	-1.84E-02	5.38E-01
1687	7.00	2.05E-05	-1.84E-02	5.38E-01
1688	7.27	6.83E-06	-6.12E-03	1.79E-01
1689	6.89	-6.83E-06	6.12E-03	-1.79E-01
1690	4.95	-6.83E-06	6.12E-03	-1.79E-01
1691	0.00	6.83E-06	-6.12E-03	1.79E-01
1692	0.00	2.05E-05	-1.84E-02	5.38E-01
1693	0.00	2.05E-05	-1.84E-02	5.38E-01
1694	0.15	2.05E-05	-1.84E-02	5.38E-01
1695	0.57	2.05E-05	-1.84E-02	5.38E-01
1696	1.14	2.05E-05	-1.84E-02	5.38E-01
1697	1.71	2.05E-05	-1.84E-02	5.38E-01
1698	2.03	2.05E-05	-1.84E-02	5.38E-01
1699	2.12	2.05E-05	-1.84E-02	5.38E-01
1700	1.59	2.05E-05	-1.84E-02	5.38E-01
1701	0.00	2.05E-05	-1.84E-02	5.38E-01
1702	0.27	2.05E-05	-1.84E-02	5.38E-01
1703	1.79	2.05E-05	-1.84E-02	5.38E-01
1704	3.14	2.05E-05	-1.84E-02	5.38E-01
1705	4.72	2.05E-05	-1.84E-02	5.38E-01
1706	5.69	2.05E-05	-1.84E-02	5.38E-01
1707	6.75	2.05E-05	-1.84E-02	5.38E-01
1708	8.42	2.05E-05	-1.84E-02	5.38E-01
1709	9.10	2.05E-05	-1.84E-02	5.38E-01
1710	11.46	2.05E-05	-1.84E-02	5.38E-01
1711	11.77	2.05E-05	-1.84E-02	5.38E-01
1712	14.55	2.05E-05	-1.84E-02	5.38E-01
1713	15.87	6.83E-06	-6.12E-03	1.79E-01
1714	16.46	-6.83E-06	6.12E-03	-1.79E-01
1715	16.26	-2.05E-05	1.84E-02	-5.38E-01
1716	15.47	-2.05E-05	1.84E-02	-5.38E-01

1717	14.51	-2.05E-05	1.84E-02	-5.38E-01
1718	13.67	-2.05E-05	1.84E-02	-5.38E-01
1719	12.60	-2.05E-05	1.84E-02	-5.38E-01
1720	10.03	-1.89E-05	1.69E-02	4.28E-01
1721	6.37	-6.83E-06	6.12E-03	-1.79E-01
1722	7.09	5.25E-06	-4.60E-03	-7.86E-01
1723	9.87	1.57E-05	-1.38E-02	-2.36E+00
1724	11.51	1.57E-05	-1.38E-02	-2.36E+00
1725	11.83	1.57E-05	-1.38E-02	-2.36E+00
1726	14.87	1.57E-05	-1.38E-02	-2.36E+00
1727	15.88	1.57E-05	-1.38E-02	-2.36E+00
1728	16.75	1.57E-05	-1.38E-02	-2.36E+00
1729	18.75	1.57E-05	-1.38E-02	-2.36E+00
1730	18.83	1.57E-05	-1.38E-02	-2.36E+00
1731	18.78	1.57E-05	-1.38E-02	-2.36E+00
1732	18.71	1.57E-05	-1.38E-02	-2.36E+00
1733	18.92	1.57E-05	-1.38E-02	-2.36E+00
1734	19.07	5.25E-06	-4.60E-03	-7.86E-01
1735	18.71	-5.25E-06	4.60E-03	7.86E-01
1736	17.95	-1.57E-05	1.38E-02	2.36E+00
1737	16.97	-1.57E-05	1.38E-02	2.36E+00
1738	15.93	-1.57E-05	1.38E-02	2.36E+00
1739	14.90	-1.57E-05	1.38E-02	2.36E+00
1740	13.86	-1.57E-05	1.38E-02	2.36E+00
1741	12.45	-1.72E-05	1.52E-02	1.43E+00
1742	10.28	-1.87E-05	1.66E-02	4.98E-01
1743	7.92	-2.02E-05	1.80E-02	-4.32E-01
1744	5.23	-2.02E-05	1.80E-02	-4.32E-01
1745	4.36	-6.73E-06	6.00E-03	-1.44E-01
1746	5.94	6.73E-06	-6.00E-03	1.44E-01
1747	8.35	2.02E-05	-1.80E-02	4.32E-01

1748	8.70	2.02E-05	-1.80E-02	4.32E-01
1749	11.46	2.02E-05	-1.80E-02	4.32E-01
1750	11.77	2.02E-05	-1.80E-02	4.32E-01
1751	14.39	2.02E-05	-1.80E-02	4.32E-01
1752	15.80	2.02E-05	-1.80E-02	4.32E-01
1753	16.13	2.02E-05	-1.80E-02	4.32E-01
1754	16.88	2.02E-05	-1.80E-02	4.32E-01
1755	17.47	2.02E-05	-1.80E-02	4.32E-01
1756	17.93	2.02E-05	-1.80E-02	4.32E-01
1757	17.61	2.02E-05	-1.80E-02	4.32E-01
1758	16.74	2.02E-05	-1.80E-02	4.32E-01
1759	15.93	2.02E-05	-1.80E-02	4.32E-01
1760	15.91	2.02E-05	-1.80E-02	4.32E-01
1761	16.39	6.73E-06	-6.00E-03	1.44E-01
1762	16.42	-6.73E-06	6.00E-03	-1.44E-01
1763	15.63	-2.02E-05	1.80E-02	-4.32E-01
1764	14.36	-2.02E-05	1.80E-02	-4.32E-01
1765	12.98	-2.02E-05	1.80E-02	-4.32E-01
1766	11.75	-2.02E-05	1.80E-02	-4.32E-01
1767	10.96	-2.02E-05	1.80E-02	-4.32E-01
1768	9.99	-2.02E-05	1.80E-02	-4.32E-01
1769	7.76	-2.02E-05	1.80E-02	-4.32E-01
1770	5.51	-2.02E-05	1.80E-02	-4.32E-01
1771	3.84	-6.73E-06	6.00E-03	-1.44E-01
1772	2.83	-3.98E-06	4.12E-04	-8.90E-02
1773	2.60	-1.23E-06	-5.18E-03	-3.41E-02
1774	3.25	-1.19E-05	1.24E-03	-2.67E-01
1775	4.69	-1.19E-05	1.24E-03	-2.67E-01
1776	6.71	-1.19E-05	1.24E-03	-2.67E-01
1777	8.02	-1.19E-05	1.24E-03	-2.67E-01
1778	8.05	-1.19E-05	1.24E-03	-2.67E-01

1779	7.53	-1.19E-05	1.24E-03	-2.67E-01
1780	6.92	-1.19E-05	1.24E-03	-2.67E-01
1781	6.48	-1.19E-05	1.24E-03	-2.67E-01
1782	6.17	-1.19E-05	1.24E-03	-2.67E-01
1783	5.93	-1.19E-05	1.24E-03	-2.67E-01
1784	5.63	-1.19E-05	1.24E-03	-2.67E-01
1785	5.22	-1.19E-05	1.24E-03	-2.67E-01
1786	4.97	-1.19E-05	1.24E-03	-2.67E-01
1787	5.43	-1.19E-05	1.24E-03	-2.67E-01
1788	5.06	-1.19E-05	1.24E-03	-2.67E-01
1789	5.14	-1.19E-05	1.24E-03	-2.67E-01
1790	5.25	-1.19E-05	1.24E-03	-2.67E-01
1791	5.38	-1.19E-05	1.24E-03	-2.67E-01
1792	5.44	-1.19E-05	1.24E-03	-2.67E-01
1793	5.26	-1.19E-05	1.24E-03	-2.67E-01
1794	5.11	-1.19E-05	1.24E-03	-2.67E-01
1795	5.33	-1.19E-05	1.24E-03	-2.67E-01
1796	5.84	-1.19E-05	1.24E-03	-2.67E-01
1797	6.17	-1.19E-05	1.24E-03	-2.67E-01
1798	6.06	-1.19E-05	1.24E-03	-2.67E-01
1799	5.81	-1.19E-05	1.24E-03	-2.67E-01
1800	5.86	-1.19E-05	1.24E-03	-2.67E-01
1801	6.45	-1.19E-05	1.24E-03	-2.67E-01
1802	6.72	-3.98E-06	4.12E-04	-8.90E-02
1803	6.94	3.98E-06	-4.12E-04	8.90E-02
1804	6.49	1.19E-05	-1.24E-03	2.67E-01
1805	5.99	1.19E-05	-1.24E-03	2.67E-01
1806	5.25	1.19E-05	-1.24E-03	2.67E-01
1807	3.96	1.19E-05	-1.24E-03	2.67E-01
1808	3.07	1.19E-05	-1.24E-03	2.67E-01
1809	2.21	1.19E-05	-1.24E-03	2.67E-01

1810	0.78	3.98E-06	-4.12E-04	8.90E-02
1811	1.71	-3.98E-06	4.12E-04	-8.90E-02
1812	2.93	-1.19E-05	1.24E-03	-2.67E-01
1813	3.89	-1.19E-05	1.24E-03	-2.67E-01
1814	4.64	-1.19E-05	1.24E-03	-2.67E-01
1815	4.99	-1.19E-05	1.24E-03	-2.67E-01
1816	4.96	-1.19E-05	1.24E-03	-2.67E-01
1817	4.90	-1.19E-05	1.24E-03	-2.67E-01
1818	5.17	-1.19E-05	1.24E-03	-2.67E-01
1819	5.10	-1.19E-05	1.24E-03	-2.67E-01
1820	5.09	-1.19E-05	1.24E-03	-2.67E-01
1821	5.52	-1.19E-05	1.24E-03	-2.67E-01
1822	5.82	-1.19E-05	1.24E-03	-2.67E-01
1823	6.01	-1.19E-05	1.24E-03	-2.67E-01
1824	6.19	-1.19E-05	1.24E-03	-2.67E-01
1825	6.36	-1.19E-05	1.24E-03	-2.67E-01
1826	6.81	-1.19E-05	1.24E-03	-2.67E-01
1827	7.12	-1.19E-05	1.24E-03	-2.67E-01
1828	7.13	-1.19E-05	1.24E-03	-2.67E-01
1829	7.26	-1.19E-05	1.24E-03	-2.67E-01
1830	7.52	-1.19E-05	1.24E-03	-2.67E-01
1831	7.67	-1.19E-05	1.24E-03	-2.67E-01
1832	7.77	-1.19E-05	1.24E-03	-2.67E-01
1833	7.96	-3.98E-06	4.12E-04	-8.90E-02
1834	7.73	3.98E-06	-4.12E-04	8.90E-02
1835	7.23	1.19E-05	-1.24E-03	2.67E-01
1836	6.76	1.19E-05	-1.24E-03	2.67E-01
1837	6.20	1.19E-05	-1.24E-03	2.67E-01
1838	4.18	3.98E-06	-4.12E-04	8.90E-02
1839	0.00	-3.98E-06	4.12E-04	-8.90E-02
1840	0.00	-1.19E-05	1.24E-03	-2.67E-01

1841	0.00	-1.19E-05	1.24E-03	-2.67E-01
1842	0.00	-1.19E-05	1.24E-03	-2.67E-01
1843	0.00	-1.19E-05	1.24E-03	-2.67E-01
1844	0.00	-1.19E-05	1.24E-03	-2.67E-01
1845	0.00	-1.19E-05	1.24E-03	-2.67E-01
1846	0.00	-1.19E-05	1.24E-03	-2.67E-01
1847	0.00	-1.19E-05	1.24E-03	-2.67E-01
1848	0.00	-1.19E-05	1.24E-03	-2.67E-01
1849	0.00	-1.19E-05	1.24E-03	-2.67E-01
1850	0.00	-1.19E-05	1.24E-03	-2.67E-01
1851	0.00	-1.19E-05	1.24E-03	-2.67E-01
1852	0.00	-1.19E-05	1.24E-03	-2.67E-01
1853	0.15	-1.19E-05	1.24E-03	-2.67E-01
1854	1.30	-1.19E-05	1.24E-03	-2.67E-01
1855	2.83	-1.19E-05	1.24E-03	-2.67E-01
1856	3.56	-1.19E-05	1.24E-03	-2.67E-01
1857	3.61	-1.19E-05	1.24E-03	-2.67E-01
1858	3.05	-1.19E-05	1.24E-03	-2.67E-01
1859	1.16	-1.19E-05	1.24E-03	-2.67E-01
1860	0.00	-1.19E-05	1.24E-03	-2.67E-01
1861	0.00	-1.19E-05	1.24E-03	-2.67E-01
1862	0.00	-1.19E-05	1.24E-03	-2.67E-01
1863	0.00	-1.19E-05	1.24E-03	-2.67E-01
1864	0.00	-1.19E-05	1.24E-03	-2.67E-01
1865	0.00	-1.19E-05	1.24E-03	-2.67E-01
1866	0.17	-1.19E-05	1.24E-03	-2.67E-01
1867	1.42	-1.19E-05	1.24E-03	-2.67E-01
1868	1.97	-1.19E-05	1.24E-03	-2.67E-01
1869	1.94	-1.19E-05	1.24E-03	-2.67E-01
1870	0.16	-1.19E-05	1.24E-03	-2.67E-01
1871	0.00	-1.19E-05	1.24E-03	-2.67E-01

1872	0.17	-1.19E-05	1.24E-03	-2.67E-01
1873	1.08	-1.19E-05	1.24E-03	-2.67E-01
1874	1.54	-1.19E-05	1.24E-03	-2.67E-01
1875	1.56	-1.19E-05	1.24E-03	-2.67E-01
1876	0.00	-1.19E-05	1.24E-03	-2.67E-01
1877	0.00	-1.19E-05	1.24E-03	-2.67E-01
1878	0.00	-1.19E-05	1.24E-03	-2.67E-01
1879	0.18	-1.19E-05	1.24E-03	-2.67E-01
1880	0.88	-1.19E-05	1.24E-03	-2.67E-01
1881	1.29	-1.19E-05	1.24E-03	-2.67E-01
1882	1.67	-1.19E-05	1.24E-03	-2.67E-01
1883	2.01	-1.19E-05	1.24E-03	-2.67E-01
1884	2.09	-1.19E-05	1.24E-03	-2.67E-01
1885	2.14	-1.19E-05	1.24E-03	-2.67E-01
1886	2.12	-1.19E-05	1.24E-03	-2.67E-01
1887	1.90	-1.19E-05	1.24E-03	-2.67E-01
1888	0.40	-1.19E-05	1.24E-03	-2.67E-01
1889	0.00	-1.19E-05	1.24E-03	-2.67E-01
1890	0.00	-1.19E-05	1.24E-03	-2.67E-01
1891	0.00	-1.19E-05	1.24E-03	-2.67E-01
1892	0.00	-1.19E-05	1.24E-03	-2.67E-01
1893	0.00	-1.19E-05	1.24E-03	-2.67E-01
1894	0.00	-1.19E-05	1.24E-03	-2.67E-01
1895	0.00	-1.19E-05	1.24E-03	-2.67E-01
1896	0.00	-1.19E-05	1.24E-03	-2.67E-01
1897	0.00	-1.19E-05	1.24E-03	-2.67E-01
1898	0.00	-1.19E-05	1.24E-03	-2.67E-01
1899	0.00	-1.19E-05	1.24E-03	-2.67E-01
1900	0.00	-7.98E-06	-5.26E-04	6.35E-01
1901	0.00	-4.03E-06	-2.29E-03	1.54E+00
1902	0.00	-7.34E-08	-4.05E-03	2.44E+00

1903	0.00	-7.34E-08	-4.05E-03	2.44E+00
1904	0.00	-7.34E-08	-4.05E-03	2.44E+00
1905	0.00	-7.34E-08	-4.05E-03	2.44E+00
1906	0.00	-7.34E-08	-4.05E-03	2.44E+00
1907	0.00	-7.34E-08	-4.05E-03	2.44E+00
1908	0.00	-7.34E-08	-4.05E-03	2.44E+00
1909	0.00	-7.34E-08	-4.05E-03	2.44E+00
1910	0.00	-7.34E-08	-4.05E-03	2.44E+00
1911	0.00	-7.34E-08	-4.05E-03	2.44E+00
1912	0.00	-7.34E-08	-4.05E-03	2.44E+00
1913	0.00	-7.34E-08	-4.05E-03	2.44E+00
1914	0.00	-7.34E-08	-4.05E-03	2.44E+00
1915	0.00	-7.34E-08	-4.05E-03	2.44E+00
1916	0.00	-7.34E-08	-4.05E-03	2.44E+00
1917	0.00	-7.34E-08	-4.05E-03	2.44E+00
1918	0.00	-7.34E-08	-4.05E-03	2.44E+00
1919	0.00	-7.34E-08	-4.05E-03	2.44E+00
1920	0.00	-7.34E-08	-4.05E-03	2.44E+00
1921	0.00	-7.34E-08	-4.05E-03	2.44E+00
1922	0.00	-7.34E-08	-4.05E-03	2.44E+00
1923	0.00	-7.34E-08	-4.05E-03	2.44E+00
1924	0.00	-7.34E-08	-4.05E-03	2.44E+00
1925	0.00	-7.34E-08	-4.05E-03	2.44E+00
1926	0.00	-7.34E-08	-4.05E-03	2.44E+00
1927	0.00	-7.34E-08	-4.05E-03	2.44E+00
1928	0.00	-7.34E-08	-4.05E-03	2.44E+00
1929	0.00	-7.34E-08	-4.05E-03	2.44E+00
1930	0.00	-7.34E-08	-4.05E-03	2.44E+00
1931	0.00	-7.34E-08	-4.05E-03	2.44E+00
1932	0.00	-7.34E-08	-4.05E-03	2.44E+00
1933	0.00	-7.34E-08	-4.05E-03	2.44E+00

1934	0.00	-7.34E-08	-4.05E-03	2.44E+00
1935	0.00	-7.34E-08	-4.05E-03	2.44E+00
1936	0.00	-7.34E-08	-4.05E-03	2.44E+00
1937	0.00	-7.34E-08	-4.05E-03	2.44E+00
1938	0.00	-7.34E-08	-4.05E-03	2.44E+00
1939	0.00	-7.34E-08	-4.05E-03	2.44E+00
1940	0.00	-7.34E-08	-4.05E-03	2.44E+00
1941	0.00	-7.34E-08	-4.05E-03	2.44E+00
1942	0.00	-7.34E-08	-4.05E-03	2.44E+00
1943	0.00	-7.34E-08	-4.05E-03	2.44E+00
1944	0.00	-7.34E-08	-4.05E-03	2.44E+00
1945	0.00	-7.34E-08	-4.05E-03	2.44E+00
1946	0.00	-7.34E-08	-4.05E-03	2.44E+00
1947	0.00	-7.34E-08	-4.05E-03	2.44E+00
1948	0.00	-7.34E-08	-4.05E-03	2.44E+00
1949	0.00	-7.34E-08	-4.05E-03	2.44E+00
1950	0.00	-7.34E-08	-4.05E-03	2.44E+00
1951	0.00	-7.34E-08	-4.05E-03	2.44E+00
1952	0.00	-7.34E-08	-4.05E-03	2.44E+00
1953	0.00	-7.34E-08	-4.05E-03	2.44E+00
1954	0.00	-7.34E-08	-4.05E-03	2.44E+00
1955	0.00	-7.34E-08	-4.05E-03	2.44E+00
1956	0.00	-7.34E-08	-4.05E-03	2.44E+00
1957	0.00	-7.34E-08	-4.05E-03	2.44E+00
1958	0.00	-7.34E-08	-4.05E-03	2.44E+00
1959	0.00	-7.34E-08	-4.05E-03	2.44E+00
1960	0.00	-7.34E-08	-4.05E-03	2.44E+00
1961	0.00	-7.34E-08	-4.05E-03	2.44E+00
1962	0.00	-7.34E-08	-4.05E-03	2.44E+00
1963	0.00	-7.34E-08	-4.05E-03	2.44E+00
1964	0.00	-7.34E-08	-4.05E-03	2.44E+00

1965	0.00	-7.34E-08	-4.05E-03	2.44E+00
1966	0.00	-7.34E-08	-4.05E-03	2.44E+00
1967	0.00	-7.34E-08	-4.05E-03	2.44E+00
1968	0.00	-7.34E-08	-4.05E-03	2.44E+00
1969	0.00	-7.34E-08	-4.05E-03	2.44E+00
1970	0.00	-7.34E-08	-4.05E-03	2.44E+00
1971	0.00	-7.34E-08	-4.05E-03	2.44E+00
1972	0.00	-7.34E-08	-4.05E-03	2.44E+00
1973	0.00	-7.34E-08	-4.05E-03	2.44E+00
1974	0.00	-7.34E-08	-4.05E-03	2.44E+00
1975	0.00	-7.34E-08	-4.05E-03	2.44E+00
1976	0.00	-7.34E-08	-4.05E-03	2.44E+00
1977	0.00	-7.34E-08	-4.05E-03	2.44E+00
1978	0.00	-7.34E-08	-4.05E-03	2.44E+00
1979	0.00	-7.34E-08	-4.05E-03	2.44E+00
1980	0.00	-7.34E-08	-4.05E-03	2.44E+00
1981	0.00	-7.34E-08	-4.05E-03	2.44E+00
1982	0.00	-7.34E-08	-4.05E-03	2.44E+00
1983	0.00	-7.34E-08	-4.05E-03	2.44E+00
1984	0.00	-7.34E-08	-4.05E-03	2.44E+00
1985	0.00	-7.34E-08	-4.05E-03	2.44E+00
1986	0.00	-7.34E-08	-4.05E-03	2.44E+00
1987	0.00	-7.34E-08	-4.05E-03	2.44E+00
1988	0.00	-7.34E-08	-4.05E-03	2.44E+00
1989	0.00	-7.34E-08	-4.05E-03	2.44E+00
1990	0.00	-7.34E-08	-4.05E-03	2.44E+00
1991	0.00	-7.34E-08	-4.05E-03	2.44E+00
1992	0.00	-7.34E-08	-4.05E-03	2.44E+00
1993	0.00	-7.34E-08	-4.05E-03	2.44E+00
1994	0.00	-7.34E-08	-4.05E-03	2.44E+00
1995	0.00	-7.34E-08	-4.05E-03	2.44E+00

1996	0.00	-7.34E-08	-4.05E-03	2.44E+00
1997	0.00	-7.34E-08	-4.05E-03	2.44E+00
1998	0.00	-7.34E-08	-4.05E-03	2.44E+00
1999	0.00	-7.34E-08	-4.05E-03	2.44E+00
2000	0.00	-7.34E-08	-4.05E-03	2.44E+00
2001	0.00	-7.34E-08	-4.05E-03	2.44E+00
2002	0.00	-7.34E-08	-4.05E-03	2.44E+00
2003	0.00	-7.34E-08	-4.05E-03	2.44E+00
2004	0.00	-7.34E-08	-4.05E-03	2.44E+00
2005	0.00	-7.34E-08	-4.05E-03	2.44E+00
2006	0.00	-7.34E-08	-4.05E-03	2.44E+00
2007	0.00	-7.34E-08	-4.05E-03	2.44E+00
2008	0.00	-7.34E-08	-4.05E-03	2.44E+00
2009	0.00	-7.34E-08	-4.05E-03	2.44E+00
2010	0.00	-7.34E-08	-4.05E-03	2.44E+00
2011	0.00	-7.34E-08	-4.05E-03	2.44E+00
2012	0.00	-7.34E-08	-4.05E-03	2.44E+00
2013	0.00	-7.34E-08	-4.05E-03	2.44E+00
2014	0.00	-7.34E-08	-4.05E-03	2.44E+00
2015	0.00	-7.34E-08	-4.05E-03	2.44E+00
2016	0.00	-7.34E-08	-4.05E-03	2.44E+00
2017	0.00	-7.34E-08	-4.05E-03	2.44E+00
2018	0.00	-7.34E-08	-4.05E-03	2.44E+00
2019	0.00	-7.34E-08	-4.05E-03	2.44E+00
2020	0.00	-7.34E-08	-4.05E-03	2.44E+00
2021	0.00	-7.34E-08	-4.05E-03	2.44E+00
2022	0.00	-7.34E-08	-4.05E-03	2.44E+00
2023	0.00	-7.34E-08	-4.05E-03	2.44E+00
2024	0.00	-7.34E-08	-4.05E-03	2.44E+00
2025	0.00	-7.34E-08	-4.05E-03	2.44E+00
2026	0.00	-7.34E-08	-4.05E-03	2.44E+00

2027	0.00	-7.34E-08	-4.05E-03	2.44E+00
2028	0.00	-7.34E-08	-4.05E-03	2.44E+00
2029	0.00	-7.34E-08	-4.05E-03	2.44E+00
2030	0.00	-7.34E-08	-4.05E-03	2.44E+00
2031	0.00	-7.34E-08	-4.05E-03	2.44E+00
2032	0.00	-7.34E-08	-4.05E-03	2.44E+00
2033	0.00	-7.34E-08	-4.05E-03	2.44E+00
2034	0.00	-7.34E-08	-4.05E-03	2.44E+00
2035	0.00	-7.34E-08	-4.05E-03	2.44E+00
2036	0.00	-7.34E-08	-4.05E-03	2.44E+00
2037	0.00	-7.34E-08	-4.05E-03	2.44E+00
2038	0.00	-7.34E-08	-4.05E-03	2.44E+00
2039	0.00	-7.34E-08	-4.05E-03	2.44E+00
2040	0.00	-7.34E-08	-4.05E-03	2.44E+00
2041	0.00	-7.34E-08	-4.05E-03	2.44E+00
2042	0.00	-7.34E-08	-4.05E-03	2.44E+00
2043	0.00	-7.34E-08	-4.05E-03	2.44E+00
2044	0.00	-7.34E-08	-4.05E-03	2.44E+00
2045	0.00	-7.34E-08	-4.05E-03	2.44E+00
2046	0.00	-7.34E-08	-4.05E-03	2.44E+00
2047	0.00	-7.34E-08	-4.05E-03	2.44E+00
2048	0.00	-7.34E-08	-4.05E-03	2.44E+00
2049	0.00	-7.34E-08	-4.05E-03	2.44E+00
2050	0.00	-7.34E-08	-4.05E-03	2.44E+00
2051	0.00	-7.34E-08	-4.05E-03	2.44E+00
2052	0.00	-7.34E-08	-4.05E-03	2.44E+00
2053	0.00	-7.34E-08	-4.05E-03	2.44E+00
2054	0.00	-7.34E-08	-4.05E-03	2.44E+00
2055	0.00	-7.34E-08	-4.05E-03	2.44E+00
2056	0.00	-7.34E-08	-4.05E-03	2.44E+00
2057	0.00	-7.34E-08	-4.05E-03	2.44E+00

2058	0.00	-7.34E-08	-4.05E-03	2.44E+00
2059	0.00	-7.34E-08	-4.05E-03	2.44E+00
2060	0.00	-7.34E-08	-4.05E-03	2.44E+00
2061	0.00	-7.34E-08	-4.05E-03	2.44E+00
2062	0.00	-7.34E-08	-4.05E-03	2.44E+00
2063	0.00	-7.34E-08	-4.05E-03	2.44E+00
2064	0.00	-7.34E-08	-4.05E-03	2.44E+00
2065	0.00	-7.34E-08	-4.05E-03	2.44E+00
2066	0.00	-7.34E-08	-4.05E-03	2.44E+00
2067	0.00	-7.34E-08	-4.05E-03	2.44E+00
2068	0.00	-7.34E-08	-4.05E-03	2.44E+00
2069	0.00	-7.34E-08	-4.05E-03	2.44E+00
2070	0.00	-7.34E-08	-4.05E-03	2.44E+00
2071	0.00	-7.34E-08	-4.05E-03	2.44E+00
2072	0.00	-7.34E-08	-4.05E-03	2.44E+00
2073	0.00	-7.34E-08	-4.05E-03	2.44E+00
2074	0.00	-7.34E-08	-4.05E-03	2.44E+00
2075	0.00	-7.34E-08	-4.05E-03	2.44E+00
2076	0.00	-7.34E-08	-4.05E-03	2.44E+00
2077	0.00	-7.34E-08	-4.05E-03	2.44E+00
2078	0.00	-7.34E-08	-4.05E-03	2.44E+00
2079	0.00	-7.34E-08	-4.05E-03	2.44E+00
2080	0.00	-7.34E-08	-4.05E-03	2.44E+00
2081	0.00	-7.34E-08	-4.05E-03	2.44E+00
2082	0.00	-7.34E-08	-4.05E-03	2.44E+00
2083	0.00	-7.34E-08	-4.05E-03	2.44E+00
2084	0.00	-7.34E-08	-4.05E-03	2.44E+00
2085	0.00	-7.34E-08	-4.05E-03	2.44E+00
2086	0.00	-7.34E-08	-4.05E-03	2.44E+00
2087	0.00	-7.34E-08	-4.05E-03	2.44E+00
2088	0.00	-7.34E-08	-4.05E-03	2.44E+00

2089	0.00	-7.34E-08	-4.05E-03	2.44E+00
2090	0.00	-7.34E-08	-4.05E-03	2.44E+00
2091	0.00	-7.34E-08	-4.05E-03	2.44E+00
2092	0.00	-7.34E-08	-4.05E-03	2.44E+00
2093	0.00	-7.34E-08	-4.05E-03	2.44E+00
2094	0.00	-7.34E-08	-4.05E-03	2.44E+00
2095	0.00	-7.34E-08	-4.05E-03	2.44E+00
2096	0.00	-7.34E-08	-4.05E-03	2.44E+00
2097	0.00	-7.34E-08	-4.05E-03	2.44E+00
2098	0.00	-7.34E-08	-4.05E-03	2.44E+00
2099	0.00	-7.34E-08	-4.05E-03	2.44E+00
2100	0.00	-7.34E-08	-4.05E-03	2.44E+00
2101	0.00	-7.34E-08	-4.05E-03	2.44E+00
2102	0.00	-7.34E-08	-4.05E-03	2.44E+00
2103	0.00	-7.34E-08	-4.05E-03	2.44E+00
2104	0.00	-7.34E-08	-4.05E-03	2.44E+00
2105	0.00	-7.34E-08	-4.05E-03	2.44E+00
2106	0.00	-7.34E-08	-4.05E-03	2.44E+00
2107	0.00	-7.34E-08	-4.05E-03	2.44E+00
2108	0.00	-7.34E-08	-4.05E-03	2.44E+00
2109	0.00	-7.34E-08	-4.05E-03	2.44E+00
2110	0.00	-7.34E-08	-4.05E-03	2.44E+00
2111	0.00	-7.34E-08	-4.05E-03	2.44E+00
2112	0.00	-7.34E-08	-4.05E-03	2.44E+00
2113	0.00	-7.34E-08	-4.05E-03	2.44E+00
2114	0.00	-7.34E-08	-4.05E-03	2.44E+00
2115	0.00	-7.34E-08	-4.05E-03	2.44E+00
2116	0.00	-7.34E-08	-4.05E-03	2.44E+00
2117	0.00	-7.34E-08	-4.05E-03	2.44E+00
2118	0.00	-7.34E-08	-4.05E-03	2.44E+00
2119	0.00	-7.34E-08	-4.05E-03	2.44E+00

2120	0.00	-7.34E-08	-4.05E-03	2.44E+00
2121	0.00	-7.34E-08	-4.05E-03	2.44E+00
2122	0.00	-7.34E-08	-4.05E-03	2.44E+00
2123	0.00	-7.34E-08	-4.05E-03	2.44E+00
2124	0.00	-7.34E-08	-4.05E-03	2.44E+00
2125	0.00	-7.34E-08	-4.05E-03	2.44E+00
2126	0.00	-7.34E-08	-4.05E-03	2.44E+00
2127	0.00	-7.34E-08	-4.05E-03	2.44E+00
2128	0.00	-7.34E-08	-4.05E-03	2.44E+00
2129	0.00	-7.34E-08	-4.05E-03	2.44E+00
2130	0.00	-7.34E-08	-4.05E-03	2.44E+00
2131	0.00	-7.34E-08	-4.05E-03	2.44E+00
2132	0.00	-7.34E-08	-4.05E-03	2.44E+00
2133	0.00	-7.34E-08	-4.05E-03	2.44E+00
2134	0.00	-7.34E-08	-4.05E-03	2.44E+00
2135	0.00	-7.34E-08	-4.05E-03	2.44E+00
2136	4.10	-7.34E-08	-4.05E-03	2.44E+00
2137	3.04	-7.34E-08	-4.05E-03	2.44E+00
2138	2.62	-7.34E-08	-4.05E-03	2.44E+00
2139	3.59	-7.34E-08	-4.05E-03	2.44E+00
2140	2.95	-7.34E-08	-4.05E-03	2.44E+00
2141	0.00	-7.34E-08	-4.05E-03	2.44E+00
2142	0.00	-7.34E-08	-4.05E-03	2.44E+00
2143	0.00	-7.34E-08	-4.05E-03	2.44E+00
2144	0.00	-7.34E-08	-4.05E-03	2.44E+00
2145	0.00	-7.34E-08	-4.05E-03	2.44E+00
2146	0.00	-7.34E-08	-4.05E-03	2.44E+00
2147	0.00	-7.34E-08	-4.05E-03	2.44E+00
2148	0.00	-7.34E-08	-4.05E-03	2.44E+00
2149	0.00	-7.34E-08	-4.05E-03	2.44E+00
2150	0.00	-7.34E-08	-4.05E-03	2.44E+00

2151	0.00	-7.34E-08	-4.05E-03	2.44E+00
2152	0.00	-7.34E-08	-4.05E-03	2.44E+00
2153	0.00	-7.34E-08	-4.05E-03	2.44E+00
2154	0.00	-7.34E-08	-4.05E-03	2.44E+00
2155	0.00	-7.34E-08	-4.05E-03	2.44E+00
2156	0.00	-7.34E-08	-4.05E-03	2.44E+00
2157	0.00	-7.34E-08	-4.05E-03	2.44E+00
2158	0.00	-7.34E-08	-4.05E-03	2.44E+00
2159	0.00	-7.34E-08	-4.05E-03	2.44E+00
2160	0.00	-7.34E-08	-4.05E-03	2.44E+00
2161	0.00	-7.34E-08	-4.05E-03	2.44E+00
2162	0.00	-7.34E-08	-4.05E-03	2.44E+00
2163	0.00	-7.34E-08	-4.05E-03	2.44E+00
2164	0.00	-7.34E-08	-4.05E-03	2.44E+00
2165	0.00	-7.34E-08	-4.05E-03	2.44E+00
2166	0.00	-7.34E-08	-4.05E-03	2.44E+00
2167	0.00	-7.34E-08	-4.05E-03	2.44E+00
2168	0.61	-7.34E-08	-4.05E-03	2.44E+00
2169	2.34	-7.34E-08	-4.05E-03	2.44E+00
2170	3.07	-7.34E-08	-4.05E-03	2.44E+00
2171	3.52	-7.34E-08	-4.05E-03	2.44E+00
2172	3.36	-7.34E-08	-4.05E-03	2.44E+00
2173	2.80	-7.34E-08	-4.05E-03	2.44E+00
2174	1.82	-7.34E-08	-4.05E-03	2.44E+00
2175	0.00	-7.34E-08	-4.05E-03	2.44E+00
2176	1.26	-7.34E-08	-4.05E-03	2.44E+00
2177	2.97	-7.34E-08	-4.05E-03	2.44E+00
2178	3.78	-7.34E-08	-4.05E-03	2.44E+00
2179	4.28	-7.34E-08	-4.05E-03	2.44E+00
2180	4.11	-7.34E-08	-4.05E-03	2.44E+00
2181	3.95	-7.34E-08	-4.05E-03	2.44E+00

2182	2.82	-7.34E-08	-4.05E-03	2.44E+00
2183	0.00	-7.34E-08	-4.05E-03	2.44E+00
2184	0.00	-7.34E-08	-4.05E-03	2.44E+00
2185	0.00	-7.34E-08	-4.05E-03	2.44E+00
2186	0.00	-7.34E-08	-4.05E-03	2.44E+00
2187	0.00	-7.34E-08	-4.05E-03	2.44E+00
2188	0.00	-7.34E-08	-4.05E-03	2.44E+00
2189	0.00	-7.34E-08	-4.05E-03	2.44E+00
2190	0.00	-7.34E-08	-4.05E-03	2.44E+00
2191	0.00	-7.34E-08	-4.05E-03	2.44E+00
2192	0.00	-7.34E-08	-4.05E-03	2.44E+00
2193	0.05	-7.34E-08	-4.05E-03	2.44E+00
2194	1.58	-7.34E-08	-4.05E-03	2.44E+00
2195	2.99	-7.34E-08	-4.05E-03	2.44E+00
2196	3.71	-7.34E-08	-4.05E-03	2.44E+00
2197	4.02	-7.34E-08	-4.05E-03	2.44E+00
2198	4.01	-7.34E-08	-4.05E-03	2.44E+00
2199	3.87	-7.34E-08	-4.05E-03	2.44E+00
2200	3.85	-7.34E-08	-4.05E-03	2.44E+00
2201	3.97	-7.34E-08	-4.05E-03	2.44E+00
2202	4.07	-7.34E-08	-4.05E-03	2.44E+00
2203	4.13	-7.34E-08	-4.05E-03	2.44E+00
2204	4.25	-7.34E-08	-4.05E-03	2.44E+00
2205	4.28	-7.34E-08	-4.05E-03	2.44E+00
2206	4.24	-7.34E-08	-4.05E-03	2.44E+00
2207	4.25	-7.34E-08	-4.05E-03	2.44E+00
2208	4.30	-7.34E-08	-4.05E-03	2.44E+00
2209	4.27	-7.34E-08	-4.05E-03	2.44E+00
2210	4.17	-7.34E-08	-4.05E-03	2.44E+00
2211	3.74	-7.34E-08	-4.05E-03	2.44E+00
2212	3.11	-7.34E-08	-4.05E-03	2.44E+00

2213	0.00	-7.34E-08	-4.05E-03	2.44E+00
2214	0.00	-7.34E-08	-4.05E-03	2.44E+00
2215	0.00	-7.34E-08	-4.05E-03	2.44E+00
2216	0.00	-7.34E-08	-4.05E-03	2.44E+00
2217	0.00	-7.34E-08	-4.05E-03	2.44E+00
2218	0.00	-7.34E-08	-4.05E-03	2.44E+00
2219	0.00	-7.34E-08	-4.05E-03	2.44E+00
2220	0.00	-7.34E-08	-4.05E-03	2.44E+00
2221	0.00	-7.34E-08	-4.05E-03	2.44E+00
2222	0.00	-7.34E-08	-4.05E-03	2.44E+00
2223	0.05	-7.34E-08	-4.05E-03	2.44E+00
2224	1.52	-7.34E-08	-4.05E-03	2.44E+00
2225	2.48	-7.34E-08	-4.05E-03	2.44E+00
2226	3.00	-7.34E-08	-4.05E-03	2.44E+00
2227	3.60	-7.34E-08	-4.05E-03	2.44E+00
2228	4.17	-7.34E-08	-4.05E-03	2.44E+00
2229	4.22	-7.34E-08	-4.05E-03	2.44E+00
2230	4.64	-7.34E-08	-4.05E-03	2.44E+00
2231	5.06	-7.34E-08	-4.05E-03	2.44E+00
2232	4.89	-7.34E-08	-4.05E-03	2.44E+00
2233	4.37	-7.34E-08	-4.05E-03	2.44E+00
2234	3.76	-7.34E-08	-4.05E-03	2.44E+00
2235	3.18	-7.34E-08	-4.05E-03	2.44E+00
2236	2.52	-7.34E-08	-4.05E-03	2.44E+00
2237	0.23	-7.34E-08	-4.05E-03	2.44E+00
2238	0.00	-7.34E-08	-4.05E-03	2.44E+00
2239	0.00	-7.34E-08	-4.05E-03	2.44E+00
2240	0.00	2.71E-06	-6.12E-03	2.09E+00
2241	0.00	5.49E-06	-8.18E-03	1.74E+00
2242	0.00	8.27E-06	-1.02E-02	1.39E+00
2243	0.00	8.27E-06	-1.02E-02	1.39E+00

2244	0.00	8.27E-06	-1.02E-02	1.39E+00
2245	0.00	8.27E-06	-1.02E-02	1.39E+00
2246	0.00	8.27E-06	-1.02E-02	1.39E+00
2247	0.00	8.27E-06	-1.02E-02	1.39E+00
2248	0.00	8.27E-06	-1.02E-02	1.39E+00
2249	0.00	8.27E-06	-1.02E-02	1.39E+00
2250	0.00	8.27E-06	-1.02E-02	1.39E+00
2251	0.00	8.27E-06	-1.02E-02	1.39E+00
2252	0.00	8.27E-06	-1.02E-02	1.39E+00
2253	0.00	8.27E-06	-1.02E-02	1.39E+00
2254	0.00	8.27E-06	-1.02E-02	1.39E+00
2255	0.00	8.27E-06	-1.02E-02	1.39E+00
2256	0.00	8.27E-06	-1.02E-02	1.39E+00
2257	0.00	8.27E-06	-1.02E-02	1.39E+00
2258	0.00	8.27E-06	-1.02E-02	1.39E+00
2259	0.00	8.27E-06	-1.02E-02	1.39E+00
2260	0.00	8.27E-06	-1.02E-02	1.39E+00
2261	0.00	8.27E-06	-1.02E-02	1.39E+00
2262	0.00	8.27E-06	-1.02E-02	1.39E+00
2263	0.00	8.27E-06	-1.02E-02	1.39E+00
2264	0.00	8.27E-06	-1.02E-02	1.39E+00
2265	0.00	8.27E-06	-1.02E-02	1.39E+00
2266	0.00	8.27E-06	-1.02E-02	1.39E+00
2267	0.00	8.27E-06	-1.02E-02	1.39E+00
2268	0.00	8.27E-06	-1.02E-02	1.39E+00
2269	0.00	8.27E-06	-1.02E-02	1.39E+00
2270	0.00	8.27E-06	-1.02E-02	1.39E+00
2271	0.00	8.27E-06	-1.02E-02	1.39E+00
2272	0.00	8.27E-06	-1.02E-02	1.39E+00
2273	0.00	8.27E-06	-1.02E-02	1.39E+00
2274	0.00	8.27E-06	-1.02E-02	1.39E+00

2275	0.00	8.27E-06	-1.02E-02	1.39E+00
2276	0.00	8.27E-06	-1.02E-02	1.39E+00
2277	0.00	8.27E-06	-1.02E-02	1.39E+00
2278	0.00	8.27E-06	-1.02E-02	1.39E+00
2279	0.00	8.27E-06	-1.02E-02	1.39E+00
2280	0.00	8.27E-06	-1.02E-02	1.39E+00
2281	0.00	8.27E-06	-1.02E-02	1.39E+00
2282	0.00	8.27E-06	-1.02E-02	1.39E+00
2283	0.00	8.27E-06	-1.02E-02	1.39E+00
2284	0.00	8.27E-06	-1.02E-02	1.39E+00
2285	0.00	8.27E-06	-1.02E-02	1.39E+00
2286	0.00	8.27E-06	-1.02E-02	1.39E+00
2287	0.00	8.27E-06	-1.02E-02	1.39E+00
2288	0.00	8.27E-06	-1.02E-02	1.39E+00
2289	0.00	8.27E-06	-1.02E-02	1.39E+00
2290	0.00	8.27E-06	-1.02E-02	1.39E+00
2291	0.00	8.27E-06	-1.02E-02	1.39E+00
2292	0.00	8.27E-06	-1.02E-02	1.39E+00
2293	0.00	8.27E-06	-1.02E-02	1.39E+00
2294	0.00	8.27E-06	-1.02E-02	1.39E+00
2295	0.00	8.27E-06	-1.02E-02	1.39E+00
2296	0.00	8.27E-06	-1.02E-02	1.39E+00
2297	0.00	8.27E-06	-1.02E-02	1.39E+00
2298	0.00	8.27E-06	-1.02E-02	1.39E+00
2299	0.00	8.27E-06	-1.02E-02	1.39E+00
2300	1.87	8.27E-06	-1.02E-02	1.39E+00
2301	3.84	8.27E-06	-1.02E-02	1.39E+00
2302	5.23	8.27E-06	-1.02E-02	1.39E+00
2303	6.27	8.27E-06	-1.02E-02	1.39E+00
2304	7.16	8.27E-06	-1.02E-02	1.39E+00
2305	7.53	8.27E-06	-1.02E-02	1.39E+00

2306	10.53	8.27E-06	-1.02E-02	1.39E+00
2307	10.28	8.27E-06	-1.02E-02	1.39E+00
2308	11.65	8.27E-06	-1.02E-02	1.39E+00
2309	14.54	2.76E-06	-3.42E-03	4.63E-01
2310	14.61	-2.76E-06	3.42E-03	-4.63E-01
2311	14.29	-8.27E-06	1.02E-02	-1.39E+00
2312	13.76	-8.27E-06	1.02E-02	-1.39E+00
2313	13.08	-8.27E-06	1.02E-02	-1.39E+00
2314	12.52	-8.27E-06	1.02E-02	-1.39E+00
2315	11.99	-8.27E-06	1.02E-02	-1.39E+00
2316	11.60	-8.27E-06	1.02E-02	-1.39E+00
2317	11.32	-8.27E-06	1.02E-02	-1.39E+00
2318	11.15	-8.27E-06	1.02E-02	-1.39E+00
2319	10.92	-8.27E-06	1.02E-02	-1.39E+00
2320	10.12	-8.27E-06	1.02E-02	-1.39E+00
2321	9.30	-8.27E-06	1.02E-02	-1.39E+00
2322	8.77	-8.27E-06	1.02E-02	-1.39E+00
2323	8.28	-8.27E-06	1.02E-02	-1.39E+00
2324	7.75	-8.27E-06	1.02E-02	-1.39E+00
2325	5.41	-8.27E-06	1.02E-02	-1.39E+00
2326	2.62	-8.27E-06	1.02E-02	-1.39E+00
2327	1.42	-8.27E-06	1.02E-02	-1.39E+00
2328	1.30	-2.76E-06	3.42E-03	-4.63E-01
2329	2.04	2.76E-06	-3.42E-03	4.63E-01
2330	2.17	8.27E-06	-1.02E-02	1.39E+00
2331	1.97	8.27E-06	-1.02E-02	1.39E+00
2332	1.16	8.27E-06	-1.02E-02	1.39E+00
2333	1.99	8.27E-06	-1.02E-02	1.39E+00
2334	3.70	8.27E-06	-1.02E-02	1.39E+00
2335	4.78	8.27E-06	-1.02E-02	1.39E+00
2336	4.59	8.27E-06	-1.02E-02	1.39E+00

2337	7.02	8.27E-06	-1.02E-02	1.39E+00
2338	6.88	8.27E-06	-1.02E-02	1.39E+00
2339	8.24	8.27E-06	-1.02E-02	1.39E+00
2340	9.80	8.27E-06	-1.02E-02	1.39E+00
2341	9.94	8.27E-06	-1.02E-02	1.39E+00
2342	12.63	8.27E-06	-1.02E-02	1.39E+00
2343	12.98	8.27E-06	-1.02E-02	1.39E+00
2344	13.30	8.27E-06	-1.02E-02	1.39E+00
2345	13.78	8.27E-06	-1.02E-02	1.39E+00
2346	17.03	8.27E-06	-1.02E-02	1.39E+00
2347	18.36	8.27E-06	-1.02E-02	1.39E+00
2348	18.22	8.27E-06	-1.02E-02	1.39E+00
2349	20.33	8.27E-06	-1.02E-02	1.39E+00
2350	23.14	8.27E-06	-1.02E-02	1.39E+00
2351	22.57	8.27E-06	-1.02E-02	1.39E+00
2352	22.10	8.27E-06	-1.02E-02	1.39E+00
2353	23.40	8.27E-06	-1.02E-02	1.39E+00
2354	25.38	8.27E-06	-1.02E-02	1.39E+00
2355	27.48	8.27E-06	-1.02E-02	1.39E+00
2356	29.37	8.27E-06	-1.02E-02	1.39E+00
2357	29.12	8.27E-06	-1.02E-02	1.39E+00
2358	28.20	8.27E-06	-1.02E-02	1.39E+00
2359	28.70	8.27E-06	-1.02E-02	1.39E+00
2360	29.84	8.27E-06	-1.02E-02	1.39E+00
2361	31.20	8.27E-06	-1.02E-02	1.39E+00
2362	31.45	8.27E-06	-1.02E-02	1.39E+00
2363	30.76	2.76E-06	-3.42E-03	4.63E-01
2364	31.06	-2.76E-06	3.42E-03	-4.63E-01
2365	30.05	-8.27E-06	1.02E-02	-1.39E+00
2366	29.49	-8.27E-06	1.02E-02	-1.39E+00
2367	28.71	-8.27E-06	1.02E-02	-1.39E+00

2368	27.84	-8.27E-06	1.02E-02	-1.39E+00
2369	27.13	-8.27E-06	1.02E-02	-1.39E+00
2370	26.47	-8.27E-06	1.02E-02	-1.39E+00
2371	26.15	-8.27E-06	1.02E-02	-1.39E+00
2372	25.61	-8.27E-06	1.02E-02	-1.39E+00
2373	25.27	-8.27E-06	1.02E-02	-1.39E+00
2374	24.91	-8.27E-06	1.02E-02	-1.39E+00
2375	24.76	-8.27E-06	1.02E-02	-1.39E+00
2376	23.24	-8.27E-06	1.02E-02	-1.39E+00
2377	20.73	-8.27E-06	1.02E-02	-1.39E+00
2378	20.06	-8.27E-06	1.02E-02	-1.39E+00
2379	20.21	-8.27E-06	1.02E-02	-1.39E+00
2380	19.43	-8.27E-06	1.02E-02	-1.39E+00
2381	18.01	-8.27E-06	1.02E-02	-1.39E+00
2382	17.88	-8.27E-06	1.02E-02	-1.39E+00
2383	17.73	-8.27E-06	1.02E-02	-1.39E+00
2384	16.06	-8.27E-06	1.02E-02	-1.39E+00
2385	13.87	-8.27E-06	1.02E-02	-1.39E+00
2386	12.07	-8.27E-06	1.02E-02	-1.39E+00
2387	10.05	-8.27E-06	1.02E-02	-1.39E+00
2388	8.91	-8.27E-06	1.02E-02	-1.39E+00
2389	8.83	-8.27E-06	1.02E-02	-1.39E+00
2390	8.25	-8.27E-06	1.02E-02	-1.39E+00
2391	8.10	-2.76E-06	3.42E-03	-4.63E-01
2392	8.27	2.76E-06	-3.42E-03	4.63E-01
2393	8.54	8.27E-06	-1.02E-02	1.39E+00
2394	9.15	8.27E-06	-1.02E-02	1.39E+00
2395	9.45	8.27E-06	-1.02E-02	1.39E+00
2396	9.59	8.27E-06	-1.02E-02	1.39E+00
2397	9.87	8.27E-06	-1.02E-02	1.39E+00
2398	10.11	8.27E-06	-1.02E-02	1.39E+00

2399	10.75	8.27E-06	-1.02E-02	1.39E+00
2400	12.00	8.27E-06	-1.02E-02	1.39E+00
2401	13.43	8.27E-06	-1.02E-02	1.39E+00
2402	13.72	8.27E-06	-1.02E-02	1.39E+00
2403	13.98	8.27E-06	-1.02E-02	1.39E+00
2404	13.97	8.27E-06	-1.02E-02	1.39E+00
2405	15.25	8.27E-06	-1.02E-02	1.39E+00
2406	15.36	8.27E-06	-1.02E-02	1.39E+00
2407	14.87	8.27E-06	-1.02E-02	1.39E+00
2408	14.03	8.27E-06	-1.02E-02	1.39E+00
2409	12.87	8.27E-06	-1.02E-02	1.39E+00
2410	11.89	8.27E-06	-1.02E-02	1.39E+00
2411	11.27	8.27E-06	-1.02E-02	1.39E+00
2412	10.30	8.27E-06	-1.02E-02	1.39E+00
2413	10.60	8.27E-06	-1.02E-02	1.39E+00
2414	11.01	8.27E-06	-1.02E-02	1.39E+00
2415	12.08	8.27E-06	-1.02E-02	1.39E+00
2416	12.82	8.27E-06	-1.02E-02	1.39E+00
2417	13.24	8.27E-06	-1.02E-02	1.39E+00
2418	13.14	8.27E-06	-1.02E-02	1.39E+00
2419	13.04	8.27E-06	-1.02E-02	1.39E+00
2420	13.20	8.27E-06	-1.02E-02	1.39E+00
2421	13.24	8.27E-06	-1.02E-02	1.39E+00
2422	13.10	8.27E-06	-1.02E-02	1.39E+00
2423	13.24	8.27E-06	-1.02E-02	1.39E+00
2424	13.69	8.27E-06	-1.02E-02	1.39E+00
2425	14.12	8.27E-06	-1.02E-02	1.39E+00
2426	14.14	8.27E-06	-1.02E-02	1.39E+00
2427	15.16	8.27E-06	-1.02E-02	1.39E+00
2428	18.28	8.27E-06	-1.02E-02	1.39E+00
2429	20.25	4.87E-06	-6.43E-03	5.91E-01

2430	22.05	1.46E-06	-2.60E-03	-2.08E-01
2431	23.50	-1.94E-06	1.22E-03	-1.01E+00
2432	23.43	-1.94E-06	1.22E-03	-1.01E+00
2433	25.21	-1.94E-06	1.22E-03	-1.01E+00
2434	27.90	-1.94E-06	1.22E-03	-1.01E+00
2435	29.63	-1.94E-06	1.22E-03	-1.01E+00
2436	29.48	-1.94E-06	1.22E-03	-1.01E+00
2437	30.04	-1.94E-06	1.22E-03	-1.01E+00
2438	31.83	-1.94E-06	1.22E-03	-1.01E+00
2439	33.94	-1.94E-06	1.22E-03	-1.01E+00
2440	34.17	-1.94E-06	1.22E-03	-1.01E+00
2441	34.46	-1.94E-06	1.22E-03	-1.01E+00
2442	34.15	-1.94E-06	1.22E-03	-1.01E+00
2443	34.54	-1.94E-06	1.22E-03	-1.01E+00
2444	34.83	-1.94E-06	1.22E-03	-1.01E+00
2445	35.02	-1.94E-06	1.22E-03	-1.01E+00
2446	35.01	-1.94E-06	1.22E-03	-1.01E+00
2447	34.93	-1.94E-06	1.22E-03	-1.01E+00
2448	34.65	-1.94E-06	1.22E-03	-1.01E+00
2449	34.52	-1.94E-06	1.22E-03	-1.01E+00
2450	34.00	-1.94E-06	1.22E-03	-1.01E+00
2451	33.51	-1.94E-06	1.22E-03	-1.01E+00
2452	33.47	-1.94E-06	1.22E-03	-1.01E+00
2453	33.77	-1.94E-06	1.22E-03	-1.01E+00
2454	34.07	-1.94E-06	1.22E-03	-1.01E+00
2455	34.40	-1.94E-06	1.22E-03	-1.01E+00
2456	34.81	-1.94E-06	1.22E-03	-1.01E+00
2457	35.19	-1.94E-06	1.22E-03	-1.01E+00
2458	35.58	-1.94E-06	1.22E-03	-1.01E+00
2459	35.94	-1.94E-06	1.22E-03	-1.01E+00
2460	36.27	-1.94E-06	1.22E-03	-1.01E+00

2461	36.60	-1.94E-06	1.22E-03	-1.01E+00
2462	36.71	-1.94E-06	1.22E-03	-1.01E+00
2463	36.64	-1.94E-06	1.22E-03	-1.01E+00
2464	36.51	-1.94E-06	1.22E-03	-1.01E+00
2465	36.22	-1.94E-06	1.22E-03	-1.01E+00
2466	35.87	-1.94E-06	1.22E-03	-1.01E+00
2467	35.54	-1.94E-06	1.22E-03	-1.01E+00
2468	35.51	-1.94E-06	1.22E-03	-1.01E+00
2469	35.62	-1.94E-06	1.22E-03	-1.01E+00
2470	35.94	-1.94E-06	1.22E-03	-1.01E+00
2471	36.15	-1.94E-06	1.22E-03	-1.01E+00
2472	36.09	-1.94E-06	1.22E-03	-1.01E+00
2473	36.06	-1.94E-06	1.22E-03	-1.01E+00
2474	35.92	-1.94E-06	1.22E-03	-1.01E+00
2475	35.92	-1.94E-06	1.22E-03	-1.01E+00
2476	35.70	-1.94E-06	1.22E-03	-1.01E+00
2477	34.29	-1.94E-06	1.22E-03	-1.01E+00
2478	33.50	-1.94E-06	1.22E-03	-1.01E+00
2479	32.79	-1.94E-06	1.22E-03	-1.01E+00
2480	32.61	-1.94E-06	1.22E-03	-1.01E+00
2481	32.93	-1.94E-06	1.22E-03	-1.01E+00
2482	34.07	-1.94E-06	1.22E-03	-1.01E+00
2483	34.93	-1.94E-06	1.22E-03	-1.01E+00
2484	35.46	-1.94E-06	1.22E-03	-1.01E+00
2485	35.55	-1.94E-06	1.22E-03	-1.01E+00
2486	35.85	-1.94E-06	1.22E-03	-1.01E+00
2487	35.92	-1.94E-06	1.22E-03	-1.01E+00
2488	36.13	-1.94E-06	1.22E-03	-1.01E+00
2489	37.00	-1.94E-06	1.22E-03	-1.01E+00
2490	37.50	-1.94E-06	1.22E-03	-1.01E+00
2491	38.31	-1.94E-06	1.22E-03	-1.01E+00

2492	39.28	-1.94E-06	1.22E-03	-1.01E+00
2493	39.54	-1.94E-06	1.22E-03	-1.01E+00
2494	39.37	-1.94E-06	1.22E-03	-1.01E+00
2495	39.34	-1.94E-06	1.22E-03	-1.01E+00
2496	39.43	-1.94E-06	1.22E-03	-1.01E+00
2497	39.51	-1.94E-06	1.22E-03	-1.01E+00
2498	39.52	-1.94E-06	1.22E-03	-1.01E+00
2499	39.58	-1.94E-06	1.22E-03	-1.01E+00
2500	39.64	-1.94E-06	1.22E-03	-1.01E+00
2501	39.76	-1.94E-06	1.22E-03	-1.01E+00
2502	40.03	-1.94E-06	1.22E-03	-1.01E+00
2503	40.04	-1.94E-06	1.22E-03	-1.01E+00
2504	39.98	-1.94E-06	1.22E-03	-1.01E+00
2505	39.99	-1.94E-06	1.22E-03	-1.01E+00
2506	39.75	-1.94E-06	1.22E-03	-1.01E+00
2507	39.60	-1.94E-06	1.22E-03	-1.01E+00
2508	39.44	-1.94E-06	1.22E-03	-1.01E+00
2509	39.06	-1.94E-06	1.22E-03	-1.01E+00
2510	38.82	-1.94E-06	1.22E-03	-1.01E+00
2511	38.69	-1.94E-06	1.22E-03	-1.01E+00
2512	38.62	-1.94E-06	1.22E-03	-1.01E+00
2513	38.30	-1.94E-06	1.22E-03	-1.01E+00
2514	37.92	-1.94E-06	1.22E-03	-1.01E+00
2515	38.00	-1.94E-06	1.22E-03	-1.01E+00
2516	37.88	-1.94E-06	1.22E-03	-1.01E+00
2517	37.69	-1.94E-06	1.22E-03	-1.01E+00
2518	37.49	-1.94E-06	1.22E-03	-1.01E+00
2519	37.22	-1.94E-06	1.22E-03	-1.01E+00
2520	36.84	-1.94E-06	1.22E-03	-1.01E+00
2521	36.40	-1.94E-06	1.22E-03	-1.01E+00
2522	35.89	-1.94E-06	1.22E-03	-1.01E+00

2523	35.34	-1.94E-06	1.22E-03	-1.01E+00
2524	34.50	-1.94E-06	1.22E-03	-1.01E+00
2525	33.74	-1.94E-06	1.22E-03	-1.01E+00
2526	33.25	-1.94E-06	1.22E-03	-1.01E+00
2527	32.80	-1.94E-06	1.22E-03	-1.01E+00
2528	32.65	-1.94E-06	1.22E-03	-1.01E+00
2529	32.81	-1.94E-06	1.22E-03	-1.01E+00
2530	32.95	-1.94E-06	1.22E-03	-1.01E+00
2531	33.13	-1.94E-06	1.22E-03	-1.01E+00
2532	33.43	-1.94E-06	1.22E-03	-1.01E+00
2533	33.58	-1.94E-06	1.22E-03	-1.01E+00
2534	33.83	-1.94E-06	1.22E-03	-1.01E+00
2535	34.37	-1.94E-06	1.22E-03	-1.01E+00
2536	34.91	-1.94E-06	1.22E-03	-1.01E+00
2537	34.86	-1.94E-06	1.22E-03	-1.01E+00
2538	35.01	-1.94E-06	1.22E-03	-1.01E+00
2539	35.28	-1.94E-06	1.22E-03	-1.01E+00
2540	35.02	-1.94E-06	1.22E-03	-1.01E+00
2541	34.99	-1.94E-06	1.22E-03	-1.01E+00
2542	35.07	-1.94E-06	1.22E-03	-1.01E+00
2543	34.72	-1.94E-06	1.22E-03	-1.01E+00
2544	34.31	-1.94E-06	1.22E-03	-1.01E+00
2545	34.06	-1.94E-06	1.22E-03	-1.01E+00
2546	33.40	-1.94E-06	1.22E-03	-1.01E+00
2547	32.59	-1.94E-06	1.22E-03	-1.01E+00
2548	32.04	-1.94E-06	1.22E-03	-1.01E+00
2549	31.24	-1.94E-06	1.22E-03	-1.01E+00
2550	30.88	-1.94E-06	1.22E-03	-1.01E+00
2551	31.70	-1.94E-06	1.22E-03	-1.01E+00
2552	32.40	-1.94E-06	1.22E-03	-1.01E+00
2553	32.80	-1.94E-06	1.22E-03	-1.01E+00

2554	33.07	-1.94E-06	1.22E-03	-1.01E+00
2555	33.40	-1.94E-06	1.22E-03	-1.01E+00
2556	33.71	-1.94E-06	1.22E-03	-1.01E+00
2557	33.83	-1.94E-06	1.22E-03	-1.01E+00
2558	34.06	-1.94E-06	1.22E-03	-1.01E+00
2559	34.31	-1.94E-06	1.22E-03	-1.01E+00
2560	34.34	-1.94E-06	1.22E-03	-1.01E+00
2561	34.35	-1.94E-06	1.22E-03	-1.01E+00
2562	34.16	-1.94E-06	1.22E-03	-1.01E+00
2563	33.82	-1.94E-06	1.22E-03	-1.01E+00
2564	33.48	-1.94E-06	1.22E-03	-1.01E+00
2565	33.38	-1.94E-06	1.22E-03	-1.01E+00
2566	33.33	-1.94E-06	1.22E-03	-1.01E+00
2567	33.75	-1.94E-06	1.22E-03	-1.01E+00
2568	34.26	-1.94E-06	1.22E-03	-1.01E+00
2569	34.77	-1.94E-06	1.22E-03	-1.01E+00
2570	35.11	-1.94E-06	1.22E-03	-1.01E+00
2571	35.64	-1.94E-06	1.22E-03	-1.01E+00
2572	36.23	-1.94E-06	1.22E-03	-1.01E+00
2573	36.71	-1.94E-06	1.22E-03	-1.01E+00
2574	36.77	-1.94E-06	1.22E-03	-1.01E+00
2575	36.71	-1.94E-06	1.22E-03	-1.01E+00
2576	36.96	-1.94E-06	1.22E-03	-1.01E+00
2577	37.21	-1.94E-06	1.22E-03	-1.01E+00
2578	37.40	-1.94E-06	1.22E-03	-1.01E+00
2579	37.48	-1.94E-06	1.22E-03	-1.01E+00
2580	37.51	-1.94E-06	1.22E-03	-1.01E+00
2581	37.57	-1.94E-06	1.22E-03	-1.01E+00
2582	37.38	-1.94E-06	1.22E-03	-1.01E+00
2583	37.34	-1.94E-06	1.22E-03	-1.01E+00
2584	37.63	-1.94E-06	1.22E-03	-1.01E+00

2585	37.75	-1.94E-06	1.22E-03	-1.01E+00
2586	37.96	-1.94E-06	1.22E-03	-1.01E+00
2587	38.21	-1.94E-06	1.22E-03	-1.01E+00
2588	38.41	-1.94E-06	1.22E-03	-1.01E+00
2589	38.49	-1.94E-06	1.22E-03	-1.01E+00
2590	38.67	-1.94E-06	1.22E-03	-1.01E+00
2591	39.00	-1.94E-06	1.22E-03	-1.01E+00
2592	38.97	-1.94E-06	1.22E-03	-1.01E+00
2593	38.69	-1.94E-06	1.22E-03	-1.01E+00
2594	38.48	-1.94E-06	1.22E-03	-1.01E+00
2595	38.18	-1.94E-06	1.22E-03	-1.01E+00
2596	38.00	-1.94E-06	1.22E-03	-1.01E+00
2597	37.81	-1.94E-06	1.22E-03	-1.01E+00
2598	37.67	-1.94E-06	1.22E-03	-1.01E+00
2599	37.65	-2.27E-06	1.52E-03	-9.08E-01
2600	37.73	-2.60E-06	1.82E-03	-8.09E-01
2601	37.96	-2.93E-06	2.11E-03	-7.10E-01
2602	37.89	-2.93E-06	2.11E-03	-7.10E-01
2603	37.88	-2.93E-06	2.11E-03	-7.10E-01
2604	38.27	-2.93E-06	2.11E-03	-7.10E-01
2605	38.45	-2.93E-06	2.11E-03	-7.10E-01
2606	38.69	-2.93E-06	2.11E-03	-7.10E-01
2607	39.48	-2.93E-06	2.11E-03	-7.10E-01
2608	39.39	-2.93E-06	2.11E-03	-7.10E-01
2609	38.87	-2.93E-06	2.11E-03	-7.10E-01
2610	38.70	-2.93E-06	2.11E-03	-7.10E-01
2611	38.71	-2.93E-06	2.11E-03	-7.10E-01
2612	38.49	-2.93E-06	2.11E-03	-7.10E-01
2613	38.42	-2.93E-06	2.11E-03	-7.10E-01
2614	38.48	-2.93E-06	2.11E-03	-7.10E-01
2615	38.66	-2.93E-06	2.11E-03	-7.10E-01

2616	38.77	-2.93E-06	2.11E-03	-7.10E-01
2617	39.02	-2.93E-06	2.11E-03	-7.10E-01
2618	39.59	-2.93E-06	2.11E-03	-7.10E-01
2619	39.63	-2.93E-06	2.11E-03	-7.10E-01
2620	39.79	-2.93E-06	2.11E-03	-7.10E-01
2621	40.32	-2.93E-06	2.11E-03	-7.10E-01
2622	40.10	-2.93E-06	2.11E-03	-7.10E-01
2623	39.52	-2.93E-06	2.11E-03	-7.10E-01
2624	39.23	-2.93E-06	2.11E-03	-7.10E-01
2625	39.06	-2.93E-06	2.11E-03	-7.10E-01
2626	38.86	-2.93E-06	2.11E-03	-7.10E-01
2627	38.80	-2.93E-06	2.11E-03	-7.10E-01
2628	38.62	-2.93E-06	2.11E-03	-7.10E-01
2629	38.44	-2.93E-06	2.11E-03	-7.10E-01
2630	38.39	-2.93E-06	2.11E-03	-7.10E-01
2631	38.40	-2.93E-06	2.11E-03	-7.10E-01
2632	38.32	-2.93E-06	2.11E-03	-7.10E-01
2633	38.39	-2.93E-06	2.11E-03	-7.10E-01
2634	38.46	-2.93E-06	2.11E-03	-7.10E-01
2635	38.59	-2.93E-06	2.11E-03	-7.10E-01
2636	38.79	-2.93E-06	2.11E-03	-7.10E-01
2637	38.93	-2.93E-06	2.11E-03	-7.10E-01
2638	39.02	-2.93E-06	2.11E-03	-7.10E-01
2639	39.10	-2.93E-06	2.11E-03	-7.10E-01
2640	38.99	-2.93E-06	2.11E-03	-7.10E-01
2641	38.73	-2.93E-06	2.11E-03	-7.10E-01
2642	38.78	-2.93E-06	2.11E-03	-7.10E-01
2643	38.88	-2.93E-06	2.11E-03	-7.10E-01
2644	38.93	-2.93E-06	2.11E-03	-7.10E-01
2645	38.91	-2.93E-06	2.11E-03	-7.10E-01
2646	38.93	-2.93E-06	2.11E-03	-7.10E-01

2647	38.96	-2.93E-06	2.11E-03	-7.10E-01
2648	39.03	-2.93E-06	2.11E-03	-7.10E-01
2649	39.08	-2.93E-06	2.11E-03	-7.10E-01
2650	38.79	-2.93E-06	2.11E-03	-7.10E-01
2651	38.67	-2.93E-06	2.11E-03	-7.10E-01
2652	38.83	-2.93E-06	2.11E-03	-7.10E-01
2653	38.90	-2.93E-06	2.11E-03	-7.10E-01
2654	39.05	-2.93E-06	2.11E-03	-7.10E-01
2655	39.07	-2.93E-06	2.11E-03	-7.10E-01
2656	39.14	-2.93E-06	2.11E-03	-7.10E-01
2657	39.15	-2.93E-06	2.11E-03	-7.10E-01
2658	38.98	-2.93E-06	2.11E-03	-7.10E-01
2659	38.94	-2.93E-06	2.11E-03	-7.10E-01
2660	39.10	-2.93E-06	2.11E-03	-7.10E-01
2661	39.66	-2.93E-06	2.11E-03	-7.10E-01
2662	40.71	-2.93E-06	2.11E-03	-7.10E-01
2663	40.61	-2.93E-06	2.11E-03	-7.10E-01
2664	40.80	-2.93E-06	2.11E-03	-7.10E-01
2665	41.32	-2.93E-06	2.11E-03	-7.10E-01
2666	41.12	-2.93E-06	2.11E-03	-7.10E-01
2667	40.75	-2.93E-06	2.11E-03	-7.10E-01
2668	40.20	-2.93E-06	2.11E-03	-7.10E-01
2669	39.70	-2.93E-06	2.11E-03	-7.10E-01
2670	39.39	-2.93E-06	2.11E-03	-7.10E-01
2671	39.41	-2.93E-06	2.11E-03	-7.10E-01
2672	39.52	-2.93E-06	2.11E-03	-7.10E-01
2673	39.69	-2.93E-06	2.11E-03	-7.10E-01
2674	39.79	-2.93E-06	2.11E-03	-7.10E-01
2675	39.91	-2.93E-06	2.11E-03	-7.10E-01
2676	40.11	-2.93E-06	2.11E-03	-7.10E-01
2677	39.81	-2.93E-06	2.11E-03	-7.10E-01

2678	39.25	-2.93E-06	2.11E-03	-7.10E-01
2679	38.78	-2.93E-06	2.11E-03	-7.10E-01
2680	38.78	-9.77E-07	7.05E-04	-2.37E-01
2681	38.60	9.77E-07	-7.05E-04	2.37E-01
2682	37.99	2.93E-06	-2.11E-03	7.10E-01
2683	37.38	2.93E-06	-2.11E-03	7.10E-01
2684	36.67	2.93E-06	-2.11E-03	7.10E-01
2685	35.53	2.93E-06	-2.11E-03	7.10E-01
2686	35.18	2.93E-06	-2.11E-03	7.10E-01
2687	34.02	2.93E-06	-2.11E-03	7.10E-01
2688	33.01	2.93E-06	-2.11E-03	7.10E-01
2689	31.93	2.93E-06	-2.11E-03	7.10E-01
2690	30.65	2.93E-06	-2.11E-03	7.10E-01
2691	29.19	2.93E-06	-2.11E-03	7.10E-01
2692	26.34	2.93E-06	-2.11E-03	7.10E-01
2693	23.48	2.93E-06	-2.11E-03	7.10E-01
2694	22.01	2.93E-06	-2.11E-03	7.10E-01
2695	21.07	2.93E-06	-2.11E-03	7.10E-01
2696	20.05	2.93E-06	-2.11E-03	7.10E-01
2697	19.82	2.93E-06	-2.11E-03	7.10E-01
2698	19.79	2.93E-06	-2.11E-03	7.10E-01
2699	18.28	2.93E-06	-2.11E-03	7.10E-01
2700	16.18	2.93E-06	-2.11E-03	7.10E-01
2701	14.96	2.93E-06	-2.11E-03	7.10E-01
2702	13.59	2.93E-06	-2.11E-03	7.10E-01
2703	11.53	2.93E-06	-2.11E-03	7.10E-01
2704	10.49	2.93E-06	-2.11E-03	7.10E-01
2705	10.27	2.93E-06	-2.11E-03	7.10E-01
2706	10.04	2.93E-06	-2.11E-03	7.10E-01
2707	10.11	9.77E-07	-7.05E-04	2.37E-01
2708	10.96	-9.77E-07	7.05E-04	-2.37E-01

2709	11.91	-2.93E-06	2.11E-03	-7.10E-01
2710	12.85	-2.93E-06	2.11E-03	-7.10E-01
2711	13.43	-2.93E-06	2.11E-03	-7.10E-01
2712	14.71	-2.93E-06	2.11E-03	-7.10E-01
2713	15.86	-2.93E-06	2.11E-03	-7.10E-01
2714	15.53	-2.93E-06	2.11E-03	-7.10E-01
2715	17.60	-2.93E-06	2.11E-03	-7.10E-01
2716	19.45	-2.93E-06	2.11E-03	-7.10E-01
2717	19.56	-2.93E-06	2.11E-03	-7.10E-01
2718	19.47	-2.93E-06	2.11E-03	-7.10E-01
2719	19.64	-2.93E-06	2.11E-03	-7.10E-01
2720	20.72	-2.93E-06	2.11E-03	-7.10E-01
2721	21.30	-2.93E-06	2.11E-03	-7.10E-01
2722	21.75	-2.93E-06	2.11E-03	-7.10E-01
2723	22.16	-2.93E-06	2.11E-03	-7.10E-01
2724	22.62	-2.93E-06	2.11E-03	-7.10E-01
2725	22.65	-2.93E-06	2.11E-03	-7.10E-01
2726	22.80	-2.93E-06	2.11E-03	-7.10E-01
2727	22.80	-2.93E-06	2.11E-03	-7.10E-01
2728	23.30	-9.77E-07	7.05E-04	-2.37E-01
2729	23.19	9.77E-07	-7.05E-04	2.37E-01
2730	22.46	2.93E-06	-2.11E-03	7.10E-01
2731	22.04	2.93E-06	-2.11E-03	7.10E-01
2732	21.67	2.93E-06	-2.11E-03	7.10E-01
2733	21.23	2.93E-06	-2.11E-03	7.10E-01
2734	20.97	2.93E-06	-2.11E-03	7.10E-01
2735	20.86	2.93E-06	-2.11E-03	7.10E-01
2736	20.33	2.93E-06	-2.11E-03	7.10E-01
2737	19.77	2.93E-06	-2.11E-03	7.10E-01
2738	18.71	2.93E-06	-2.11E-03	7.10E-01
2739	16.90	2.93E-06	-2.11E-03	7.10E-01

2740	14.92	2.93E-06	-2.11E-03	7.10E-01
2741	13.71	2.93E-06	-2.11E-03	7.10E-01
2742	12.88	2.93E-06	-2.11E-03	7.10E-01
2743	10.50	2.93E-06	-2.11E-03	7.10E-01
2744	7.51	2.93E-06	-2.11E-03	7.10E-01
2745	5.02	2.93E-06	-2.11E-03	7.10E-01
2746	3.25	2.93E-06	-2.11E-03	7.10E-01
2747	0.16	2.93E-06	-2.11E-03	7.10E-01
2748	0.00	2.93E-06	-2.11E-03	7.10E-01
2749	0.00	2.93E-06	-2.11E-03	7.10E-01
2750	0.00	2.54E-06	-2.53E-03	-2.96E-02
2751	0.00	2.14E-06	-2.94E-03	-7.69E-01
2752	0.00	1.75E-06	-3.35E-03	-1.51E+00
2753	0.00	1.75E-06	-3.35E-03	-1.51E+00
2754	0.00	1.75E-06	-3.35E-03	-1.51E+00
2755	0.10	1.75E-06	-3.35E-03	-1.51E+00
2756	2.70	1.75E-06	-3.35E-03	-1.51E+00
2757	4.69	1.75E-06	-3.35E-03	-1.51E+00
2758	5.72	1.75E-06	-3.35E-03	-1.51E+00
2759	7.34	1.75E-06	-3.35E-03	-1.51E+00
2760	7.40	1.75E-06	-3.35E-03	-1.51E+00
2761	9.63	1.75E-06	-3.35E-03	-1.51E+00
2762	9.81	1.75E-06	-3.35E-03	-1.51E+00
2763	11.41	1.75E-06	-3.35E-03	-1.51E+00
2764	13.40	1.75E-06	-3.35E-03	-1.51E+00
2765	13.38	1.75E-06	-3.35E-03	-1.51E+00
2766	15.71	1.75E-06	-3.35E-03	-1.51E+00
2767	17.87	1.75E-06	-3.35E-03	-1.51E+00
2768	17.59	1.75E-06	-3.35E-03	-1.51E+00
2769	19.67	1.75E-06	-3.35E-03	-1.51E+00
2770	22.96	1.75E-06	-3.35E-03	-1.51E+00

2771	23.66	1.75E-06	-3.35E-03	-1.51E+00
2772	24.30	1.75E-06	-3.35E-03	-1.51E+00
2773	26.52	1.75E-06	-3.35E-03	-1.51E+00
2774	29.24	1.75E-06	-3.35E-03	-1.51E+00
2775	29.99	1.75E-06	-3.35E-03	-1.51E+00
2776	30.18	1.75E-06	-3.35E-03	-1.51E+00
2777	31.64	1.75E-06	-3.35E-03	-1.51E+00
2778	33.74	1.75E-06	-3.35E-03	-1.51E+00
2779	34.51	1.75E-06	-3.35E-03	-1.51E+00
2780	34.83	1.75E-06	-3.35E-03	-1.51E+00
2781	35.89	1.75E-06	-3.35E-03	-1.51E+00
2782	36.47	1.75E-06	-3.35E-03	-1.51E+00
2783	37.00	1.75E-06	-3.35E-03	-1.51E+00
2784	36.85	1.75E-06	-3.35E-03	-1.51E+00
2785	36.65	1.75E-06	-3.35E-03	-1.51E+00
2786	36.64	1.75E-06	-3.35E-03	-1.51E+00
2787	36.86	1.75E-06	-3.35E-03	-1.51E+00
2788	36.65	1.75E-06	-3.35E-03	-1.51E+00
2789	36.16	1.75E-06	-3.35E-03	-1.51E+00
2790	35.59	1.75E-06	-3.35E-03	-1.51E+00
2791	35.04	1.75E-06	-3.35E-03	-1.51E+00
2792	34.44	1.75E-06	-3.35E-03	-1.51E+00
2793	33.86	1.75E-06	-3.35E-03	-1.51E+00
2794	33.79	1.75E-06	-3.35E-03	-1.51E+00
2795	34.16	1.75E-06	-3.35E-03	-1.51E+00
2796	34.11	1.75E-06	-3.35E-03	-1.51E+00
2797	35.11	1.75E-06	-3.35E-03	-1.51E+00
2798	35.48	1.75E-06	-3.35E-03	-1.51E+00
2799	35.68	1.75E-06	-3.35E-03	-1.51E+00
2800	36.45	1.75E-06	-3.35E-03	-1.51E+00
2801	37.02	1.75E-06	-3.35E-03	-1.51E+00

2802	37.15	1.75E-06	-3.35E-03	-1.51E+00
2803	37.44	1.75E-06	-3.35E-03	-1.51E+00
2804	37.26	1.75E-06	-3.35E-03	-1.51E+00
2805	37.26	1.75E-06	-3.35E-03	-1.51E+00
2806	37.30	1.75E-06	-3.35E-03	-1.51E+00
2807	37.66	1.75E-06	-3.35E-03	-1.51E+00
2808	37.86	1.75E-06	-3.35E-03	-1.51E+00
2809	38.15	1.75E-06	-3.35E-03	-1.51E+00
2810	38.46	1.75E-06	-3.35E-03	-1.51E+00
2811	38.82	1.75E-06	-3.35E-03	-1.51E+00
2812	39.10	1.75E-06	-3.35E-03	-1.51E+00
2813	39.38	1.75E-06	-3.35E-03	-1.51E+00
2814	40.07	1.75E-06	-3.35E-03	-1.51E+00
2815	40.66	1.75E-06	-3.35E-03	-1.51E+00
2816	40.90	5.83E-07	-1.12E-03	-5.03E-01
2817	40.73	-5.83E-07	1.12E-03	5.03E-01
2818	39.89	-1.75E-06	3.35E-03	1.51E+00
2819	39.34	-1.75E-06	3.35E-03	1.51E+00
2820	39.06	-1.75E-06	3.35E-03	1.51E+00
2821	38.94	-1.75E-06	3.35E-03	1.51E+00
2822	38.71	-1.75E-06	3.35E-03	1.51E+00
2823	37.68	-1.75E-06	3.35E-03	1.51E+00
2824	36.31	-1.75E-06	3.35E-03	1.51E+00
2825	35.22	-1.75E-06	3.35E-03	1.51E+00
2826	34.89	-1.75E-06	3.35E-03	1.51E+00
2827	34.01	-1.75E-06	3.35E-03	1.51E+00
2828	33.02	-1.75E-06	3.35E-03	1.51E+00
2829	32.53	-1.75E-06	3.35E-03	1.51E+00
2830	31.76	-1.75E-06	3.35E-03	1.51E+00
2831	30.51	-1.75E-06	3.35E-03	1.51E+00
2832	29.51	-1.75E-06	3.35E-03	1.51E+00

2833	28.98	-1.75E-06	3.35E-03	1.51E+00
2834	28.34	-1.75E-06	3.35E-03	1.51E+00
2835	27.30	-1.75E-06	3.35E-03	1.51E+00
2836	25.61	-1.75E-06	3.35E-03	1.51E+00
2837	23.80	-1.75E-06	3.35E-03	1.51E+00
2838	22.77	-1.75E-06	3.35E-03	1.51E+00
2839	22.13	-1.75E-06	3.35E-03	1.51E+00
2840	21.41	-1.75E-06	3.35E-03	1.51E+00
2841	20.54	-1.75E-06	3.35E-03	1.51E+00
2842	18.82	-1.75E-06	3.35E-03	1.51E+00
2843	17.32	-1.75E-06	3.35E-03	1.51E+00
2844	15.96	-1.75E-06	3.35E-03	1.51E+00
2845	14.79	-1.75E-06	3.35E-03	1.51E+00
2846	13.86	-1.75E-06	3.35E-03	1.51E+00
2847	13.15	-1.75E-06	3.35E-03	1.51E+00
2848	12.52	-1.75E-06	3.35E-03	1.51E+00
2849	12.22	-1.75E-06	3.35E-03	1.51E+00
2850	11.84	-1.75E-06	3.35E-03	1.51E+00
2851	11.70	-5.83E-07	1.12E-03	5.03E-01
2852	11.94	5.83E-07	-1.12E-03	-5.03E-01
2853	12.39	1.75E-06	-3.35E-03	-1.51E+00
2854	13.50	1.75E-06	-3.35E-03	-1.51E+00
2855	14.85	1.75E-06	-3.35E-03	-1.51E+00
2856	16.24	1.75E-06	-3.35E-03	-1.51E+00
2857	18.22	1.75E-06	-3.35E-03	-1.51E+00
2858	19.16	1.75E-06	-3.35E-03	-1.51E+00
2859	19.76	1.75E-06	-3.35E-03	-1.51E+00
2860	20.55	1.75E-06	-3.35E-03	-1.51E+00
2861	21.17	1.75E-06	-3.35E-03	-1.51E+00
2862	21.76	1.75E-06	-3.35E-03	-1.51E+00
2863	21.97	1.75E-06	-3.35E-03	-1.51E+00

2864	21.39	1.75E-06	-3.35E-03	-1.51E+00
2865	20.87	1.75E-06	-3.35E-03	-1.51E+00
2866	20.39	1.75E-06	-3.35E-03	-1.51E+00
2867	20.29	1.75E-06	-3.35E-03	-1.51E+00
2868	20.38	1.75E-06	-3.35E-03	-1.51E+00
2869	20.44	1.75E-06	-3.35E-03	-1.51E+00
2870	20.69	1.75E-06	-3.35E-03	-1.51E+00
2871	20.75	1.75E-06	-3.35E-03	-1.51E+00
2872	20.63	1.75E-06	-3.35E-03	-1.51E+00
2873	20.63	1.75E-06	-3.35E-03	-1.51E+00
2874	20.68	1.75E-06	-3.35E-03	-1.51E+00
2875	20.64	1.75E-06	-3.35E-03	-1.51E+00
2876	21.18	1.75E-06	-3.35E-03	-1.51E+00
2877	21.21	1.75E-06	-3.35E-03	-1.51E+00
2878	21.50	1.75E-06	-3.35E-03	-1.51E+00
2879	22.46	1.75E-06	-3.35E-03	-1.51E+00
2880	24.02	1.75E-06	-3.35E-03	-1.51E+00
2881	25.23	1.75E-06	-3.35E-03	-1.51E+00
2882	26.34	1.75E-06	-3.35E-03	-1.51E+00
2883	28.08	1.75E-06	-3.35E-03	-1.51E+00
2884	30.11	1.75E-06	-3.35E-03	-1.51E+00
2885	29.80	1.75E-06	-3.35E-03	-1.51E+00
2886	30.43	1.75E-06	-3.35E-03	-1.51E+00
2887	32.18	1.75E-06	-3.35E-03	-1.51E+00
2888	34.35	1.75E-06	-3.35E-03	-1.51E+00
2889	36.57	1.75E-06	-3.35E-03	-1.51E+00
2890	38.17	1.75E-06	-3.35E-03	-1.51E+00
2891	37.86	1.75E-06	-3.35E-03	-1.51E+00
2892	38.45	1.75E-06	-3.35E-03	-1.51E+00
2893	39.76	1.75E-06	-3.35E-03	-1.51E+00
2894	41.36	1.75E-06	-3.35E-03	-1.51E+00

2895	43.02	1.75E-06	-3.35E-03	-1.51E+00
2896	44.53	1.75E-06	-3.35E-03	-1.51E+00
2897	45.47	1.75E-06	-3.35E-03	-1.51E+00
2898	46.16	1.75E-06	-3.35E-03	-1.51E+00
2899	46.91	8.19E-08	-1.40E-03	-1.64E+00
2900	47.54	-1.59E-06	5.53E-04	-1.77E+00
2901	47.94	-3.25E-06	2.51E-03	-1.90E+00
2902	48.09	-3.25E-06	2.51E-03	-1.90E+00
2903	48.73	-3.25E-06	2.51E-03	-1.90E+00
2904	48.99	-3.25E-06	2.51E-03	-1.90E+00
2905	48.91	-3.25E-06	2.51E-03	-1.90E+00
2906	49.02	-3.25E-06	2.51E-03	-1.90E+00
2907	49.47	-3.25E-06	2.51E-03	-1.90E+00
2908	50.10	-3.25E-06	2.51E-03	-1.90E+00
2909	50.82	-3.25E-06	2.51E-03	-1.90E+00
2910	51.10	-3.25E-06	2.51E-03	-1.90E+00
2911	51.13	-3.25E-06	2.51E-03	-1.90E+00
2912	50.97	-3.25E-06	2.51E-03	-1.90E+00
2913	51.48	-3.25E-06	2.51E-03	-1.90E+00
2914	51.21	-3.25E-06	2.51E-03	-1.90E+00
2915	51.36	-3.25E-06	2.51E-03	-1.90E+00
2916	51.48	-3.25E-06	2.51E-03	-1.90E+00
2917	51.14	-3.25E-06	2.51E-03	-1.90E+00
2918	51.14	-3.25E-06	2.51E-03	-1.90E+00
2919	50.64	-3.25E-06	2.51E-03	-1.90E+00
2920	50.38	-3.25E-06	2.51E-03	-1.90E+00
2921	50.51	-3.25E-06	2.51E-03	-1.90E+00
2922	50.51	-3.25E-06	2.51E-03	-1.90E+00
2923	50.25	-3.25E-06	2.51E-03	-1.90E+00
2924	50.38	-3.25E-06	2.51E-03	-1.90E+00
2925	51.16	-3.25E-06	2.51E-03	-1.90E+00

2926	51.42	-3.25E-06	2.51E-03	-1.90E+00
2927	51.41	-1.08E-06	8.36E-04	-6.34E-01
2928	51.21	1.08E-06	-8.36E-04	6.34E-01
2929	50.40	3.25E-06	-2.51E-03	1.90E+00
2930	49.47	3.25E-06	-2.51E-03	1.90E+00
2931	48.70	3.25E-06	-2.51E-03	1.90E+00
2932	47.98	3.25E-06	-2.51E-03	1.90E+00
2933	47.36	3.25E-06	-2.51E-03	1.90E+00
2934	46.88	3.25E-06	-2.51E-03	1.90E+00
2935	46.79	3.25E-06	-2.51E-03	1.90E+00
2936	46.25	3.25E-06	-2.51E-03	1.90E+00
2937	46.58	3.25E-06	-2.51E-03	1.90E+00
2938	46.21	3.25E-06	-2.51E-03	1.90E+00
2939	46.21	3.25E-06	-2.51E-03	1.90E+00
2940	46.34	3.25E-06	-2.51E-03	1.90E+00
2941	45.91	3.25E-06	-2.51E-03	1.90E+00
2942	45.44	3.25E-06	-2.51E-03	1.90E+00
2943	45.20	3.25E-06	-2.51E-03	1.90E+00
2944	45.56	3.25E-06	-2.51E-03	1.90E+00
2945	46.01	3.25E-06	-2.51E-03	1.90E+00
2946	46.15	3.25E-06	-2.51E-03	1.90E+00
2947	46.18	3.25E-06	-2.51E-03	1.90E+00
2948	45.75	3.25E-06	-2.51E-03	1.90E+00
2949	45.80	3.25E-06	-2.51E-03	1.90E+00
2950	46.04	3.25E-06	-2.51E-03	1.90E+00
2951	46.63	3.25E-06	-2.51E-03	1.90E+00
2952	47.10	3.25E-06	-2.51E-03	1.90E+00
2953	46.76	3.25E-06	-2.51E-03	1.90E+00
2954	46.22	3.25E-06	-2.51E-03	1.90E+00
2955	45.66	3.25E-06	-2.51E-03	1.90E+00
2956	45.04	3.25E-06	-2.51E-03	1.90E+00

2957	44.54	3.25E-06	-2.51E-03	1.90E+00
2958	44.41	3.25E-06	-2.51E-03	1.90E+00
2959	44.32	3.25E-06	-2.51E-03	1.90E+00
2960	44.13	3.25E-06	-2.51E-03	1.90E+00
2961	43.49	3.25E-06	-2.51E-03	1.90E+00
2962	42.96	3.25E-06	-2.51E-03	1.90E+00
2963	42.59	3.25E-06	-2.51E-03	1.90E+00
2964	42.43	3.25E-06	-2.51E-03	1.90E+00
2965	42.52	3.25E-06	-2.51E-03	1.90E+00
2966	42.69	3.25E-06	-2.51E-03	1.90E+00
2967	42.70	3.25E-06	-2.51E-03	1.90E+00
2968	42.51	3.25E-06	-2.51E-03	1.90E+00
2969	42.22	3.25E-06	-2.51E-03	1.90E+00
2970	40.99	3.25E-06	-2.51E-03	1.90E+00
2971	40.87	3.25E-06	-2.51E-03	1.90E+00
2972	41.60	3.25E-06	-2.51E-03	1.90E+00
2973	40.72	3.25E-06	-2.51E-03	1.90E+00
2974	39.16	3.25E-06	-2.51E-03	1.90E+00
2975	38.09	3.25E-06	-2.51E-03	1.90E+00
2976	37.79	1.08E-06	-8.36E-04	6.34E-01
2977	38.10	-1.08E-06	8.36E-04	-6.34E-01
2978	38.92	-3.25E-06	2.51E-03	-1.90E+00
2979	39.06	-3.25E-06	2.51E-03	-1.90E+00
2980	39.05	-3.25E-06	2.51E-03	-1.90E+00
2981	38.34	-3.25E-06	2.51E-03	-1.90E+00
2982	37.88	-3.25E-06	2.51E-03	-1.90E+00
2983	37.58	-3.25E-06	2.51E-03	-1.90E+00
2984	37.40	-3.25E-06	2.51E-03	-1.90E+00
2985	37.61	-3.25E-06	2.51E-03	-1.90E+00
2986	37.90	-3.25E-06	2.51E-03	-1.90E+00
2987	38.29	-3.25E-06	2.51E-03	-1.90E+00

2988	38.56	-3.25E-06	2.51E-03	-1.90E+00
2989	38.74	-3.25E-06	2.51E-03	-1.90E+00
2990	38.49	-3.25E-06	2.51E-03	-1.90E+00
2991	38.57	-3.25E-06	2.51E-03	-1.90E+00
2992	38.45	-3.25E-06	2.51E-03	-1.90E+00
2993	38.35	-3.25E-06	2.51E-03	-1.90E+00
2994	38.48	-3.25E-06	2.51E-03	-1.90E+00
2995	39.00	-3.25E-06	2.51E-03	-1.90E+00
2996	39.37	-3.25E-06	2.51E-03	-1.90E+00
2997	39.73	-3.25E-06	2.51E-03	-1.90E+00
2998	39.66	-3.25E-06	2.51E-03	-1.90E+00
2999	39.77	-2.59E-06	1.70E-03	-2.14E+00
3000	39.95	-1.94E-06	8.87E-04	-2.39E+00
3001	40.03	-1.28E-06	7.77E-05	-2.63E+00
3002	39.83	-1.28E-06	7.77E-05	-2.63E+00
3003	39.49	-1.28E-06	7.77E-05	-2.63E+00
3004	39.29	-1.28E-06	7.77E-05	-2.63E+00
3005	39.59	-1.28E-06	7.77E-05	-2.63E+00
3006	40.05	-1.28E-06	7.77E-05	-2.63E+00
3007	40.32	-1.28E-06	7.77E-05	-2.63E+00
3008	40.41	-1.28E-06	7.77E-05	-2.63E+00
3009	40.64	-1.28E-06	7.77E-05	-2.63E+00
3010	41.06	-1.28E-06	7.77E-05	-2.63E+00
3011	41.36	-1.28E-06	7.77E-05	-2.63E+00
3012	41.53	-1.28E-06	7.77E-05	-2.63E+00
3013	41.02	-1.28E-06	7.77E-05	-2.63E+00
3014	40.80	-1.28E-06	7.77E-05	-2.63E+00
3015	40.60	-1.28E-06	7.77E-05	-2.63E+00
3016	40.58	-1.28E-06	7.77E-05	-2.63E+00
3017	40.44	-1.28E-06	7.77E-05	-2.63E+00
3018	40.07	-1.28E-06	7.77E-05	-2.63E+00

3019	39.82	-1.28E-06	7.77E-05	-2.63E+00
3020	40.24	-1.28E-06	7.77E-05	-2.63E+00
3021	41.54	-1.28E-06	7.77E-05	-2.63E+00
3022	42.86	-1.28E-06	7.77E-05	-2.63E+00
3023	43.67	-1.28E-06	7.77E-05	-2.63E+00
3024	43.88	-1.28E-06	7.77E-05	-2.63E+00
3025	43.67	-1.28E-06	7.77E-05	-2.63E+00
3026	43.41	-1.28E-06	7.77E-05	-2.63E+00
3027	43.16	-1.28E-06	7.77E-05	-2.63E+00
3028	42.87	-1.28E-06	7.77E-05	-2.63E+00
3029	42.46	-1.28E-06	7.77E-05	-2.63E+00
3030	41.79	-1.28E-06	7.77E-05	-2.63E+00
3031	41.51	-1.28E-06	7.77E-05	-2.63E+00
3032	41.75	-1.28E-06	7.77E-05	-2.63E+00
3033	42.04	-1.28E-06	7.77E-05	-2.63E+00
3034	41.58	-1.28E-06	7.77E-05	-2.63E+00
3035	40.62	-1.28E-06	7.77E-05	-2.63E+00
3036	40.69	-1.28E-06	7.77E-05	-2.63E+00
3037	41.29	-1.28E-06	7.77E-05	-2.63E+00
3038	41.29	-1.28E-06	7.77E-05	-2.63E+00
3039	41.12	-1.28E-06	7.77E-05	-2.63E+00
3040	41.00	-1.28E-06	7.77E-05	-2.63E+00
3041	41.02	-1.28E-06	7.77E-05	-2.63E+00
3042	41.35	-1.28E-06	7.77E-05	-2.63E+00
3043	41.00	-1.28E-06	7.77E-05	-2.63E+00
3044	40.40	-1.28E-06	7.77E-05	-2.63E+00
3045	39.84	-1.28E-06	7.77E-05	-2.63E+00
3046	39.95	-1.28E-06	7.77E-05	-2.63E+00
3047	40.17	-1.28E-06	7.77E-05	-2.63E+00
3048	40.30	-1.28E-06	7.77E-05	-2.63E+00
3049	40.35	-1.28E-06	7.77E-05	-2.63E+00

3050	40.44	-1.28E-06	7.77E-05	-2.63E+00
3051	40.28	-1.28E-06	7.77E-05	-2.63E+00
3052	40.30	-1.28E-06	7.77E-05	-2.63E+00
3053	40.57	-1.28E-06	7.77E-05	-2.63E+00
3054	40.19	-1.28E-06	7.77E-05	-2.63E+00
3055	39.92	-1.28E-06	7.77E-05	-2.63E+00
3056	40.49	-1.28E-06	7.77E-05	-2.63E+00
3057	40.62	-1.28E-06	7.77E-05	-2.63E+00
3058	40.43	-4.26E-07	2.59E-05	-8.76E-01
3059	41.25	4.26E-07	-2.59E-05	8.76E-01
3060	40.83	1.28E-06	-7.77E-05	2.63E+00
3061	40.73	1.28E-06	-7.77E-05	2.63E+00
3062	40.57	1.28E-06	-7.77E-05	2.63E+00
3063	40.13	1.28E-06	-7.77E-05	2.63E+00
3064	39.45	1.28E-06	-7.77E-05	2.63E+00
3065	38.89	1.28E-06	-7.77E-05	2.63E+00
3066	38.22	1.28E-06	-7.77E-05	2.63E+00
3067	37.22	1.28E-06	-7.77E-05	2.63E+00
3068	36.54	1.28E-06	-7.77E-05	2.63E+00
3069	36.12	1.28E-06	-7.77E-05	2.63E+00
3070	35.64	1.28E-06	-7.77E-05	2.63E+00
3071	34.99	1.28E-06	-7.77E-05	2.63E+00
3072	34.12	1.28E-06	-7.77E-05	2.63E+00
3073	33.44	1.28E-06	-7.77E-05	2.63E+00
3074	33.59	1.28E-06	-7.77E-05	2.63E+00
3075	33.37	1.28E-06	-7.77E-05	2.63E+00
3076	33.07	1.28E-06	-7.77E-05	2.63E+00
3077	32.09	1.28E-06	-7.77E-05	2.63E+00
3078	30.80	1.28E-06	-7.77E-05	2.63E+00
3079	29.84	1.28E-06	-7.77E-05	2.63E+00
3080	28.97	1.28E-06	-7.77E-05	2.63E+00

3081	28.16	1.28E-06	-7.77E-05	2.63E+00
3082	27.61	1.28E-06	-7.77E-05	2.63E+00
3083	26.78	1.28E-06	-7.77E-05	2.63E+00
3084	25.54	1.28E-06	-7.77E-05	2.63E+00
3085	24.41	1.28E-06	-7.77E-05	2.63E+00
3086	24.87	1.28E-06	-7.77E-05	2.63E+00
3087	24.99	1.28E-06	-7.77E-05	2.63E+00
3088	24.23	1.28E-06	-7.77E-05	2.63E+00
3089	23.70	1.28E-06	-7.77E-05	2.63E+00
3090	22.18	1.28E-06	-7.77E-05	2.63E+00
3091	19.98	1.28E-06	-7.77E-05	2.63E+00
3092	17.80	1.28E-06	-7.77E-05	2.63E+00
3093	16.90	1.28E-06	-7.77E-05	2.63E+00
3094	16.57	1.28E-06	-7.77E-05	2.63E+00
3095	16.19	1.28E-06	-7.77E-05	2.63E+00
3096	15.05	1.28E-06	-7.77E-05	2.63E+00
3097	13.21	1.28E-06	-7.77E-05	2.63E+00
3098	8.67	1.28E-06	-7.77E-05	2.63E+00
3099	4.71	1.28E-06	-7.77E-05	2.63E+00
3100	2.23	1.28E-06	-7.77E-05	2.63E+00
3101	0.64	4.26E-07	-2.59E-05	8.76E-01
3102	0.00	-4.26E-07	2.59E-05	-8.76E-01
3103	0.00	-1.28E-06	7.77E-05	-2.63E+00
3104	0.00	-1.28E-06	7.77E-05	-2.63E+00
3105	0.00	-1.28E-06	7.77E-05	-2.63E+00
3106	0.00	-1.28E-06	7.77E-05	-2.63E+00
3107	0.00	-1.28E-06	7.77E-05	-2.63E+00
3108	0.00	-1.28E-06	7.77E-05	-2.63E+00
3109	0.00	-1.28E-06	7.77E-05	-2.63E+00
3110	0.00	-1.28E-06	7.77E-05	-2.63E+00
3111	0.00	-1.28E-06	7.77E-05	-2.63E+00

3112	0.00	-1.28E-06	7.77E-05	-2.63E+00
3113	0.00	-1.28E-06	7.77E-05	-2.63E+00
3114	0.00	-1.28E-06	7.77E-05	-2.63E+00
3115	0.00	-1.28E-06	7.77E-05	-2.63E+00
3116	0.00	-1.28E-06	7.77E-05	-2.63E+00
3117	0.00	-1.28E-06	7.77E-05	-2.63E+00
3118	0.00	-1.28E-06	7.77E-05	-2.63E+00
3119	0.00	-1.28E-06	7.77E-05	-2.63E+00
3120	0.00	-1.28E-06	7.77E-05	-2.63E+00
3121	0.00	-1.28E-06	7.77E-05	-2.63E+00
3122	0.00	-1.28E-06	7.77E-05	-2.63E+00
3123	0.00	-1.28E-06	7.77E-05	-2.63E+00
3124	0.00	-1.28E-06	7.77E-05	-2.63E+00
3125	0.19	-1.28E-06	7.77E-05	-2.63E+00
3126	1.28	-1.28E-06	7.77E-05	-2.63E+00
3127	2.80	-1.28E-06	7.77E-05	-2.63E+00
3128	3.61	-1.28E-06	7.77E-05	-2.63E+00
3129	4.62	-1.28E-06	7.77E-05	-2.63E+00
3130	5.82	-1.28E-06	7.77E-05	-2.63E+00
3131	6.74	-1.28E-06	7.77E-05	-2.63E+00
3132	8.12	-1.28E-06	7.77E-05	-2.63E+00
3133	9.38	-1.28E-06	7.77E-05	-2.63E+00
3134	13.44	-1.28E-06	7.77E-05	-2.63E+00
3135	13.77	-1.28E-06	7.77E-05	-2.63E+00
3136	16.09	-1.28E-06	7.77E-05	-2.63E+00
3137	20.49	-1.28E-06	7.77E-05	-2.63E+00
3138	20.87	-1.28E-06	7.77E-05	-2.63E+00
3139	22.66	-1.28E-06	7.77E-05	-2.63E+00
3140	25.16	-1.28E-06	7.77E-05	-2.63E+00
3141	25.48	-1.28E-06	7.77E-05	-2.63E+00
3142	27.67	-1.28E-06	7.77E-05	-2.63E+00

3143	30.66	-1.28E-06	7.77E-05	-2.63E+00
3144	31.12	-1.28E-06	7.77E-05	-2.63E+00
3145	31.40	-1.28E-06	7.77E-05	-2.63E+00
3146	31.52	-1.28E-06	7.77E-05	-2.63E+00
3147	31.64	-1.28E-06	7.77E-05	-2.63E+00
3148	31.73	-1.28E-06	7.77E-05	-2.63E+00
3149	31.71	-1.28E-06	7.77E-05	-2.63E+00
3150	31.58	-1.28E-06	7.77E-05	-2.63E+00
3151	31.23	-1.28E-06	7.77E-05	-2.63E+00
3152	30.73	-1.28E-06	7.77E-05	-2.63E+00
3153	30.31	-1.28E-06	7.77E-05	-2.63E+00
3154	30.21	-1.28E-06	7.77E-05	-2.63E+00
3155	30.46	-1.28E-06	7.77E-05	-2.63E+00
3156	30.96	-1.28E-06	7.77E-05	-2.63E+00
3157	31.86	-1.28E-06	7.77E-05	-2.63E+00
3158	32.60	-1.28E-06	7.77E-05	-2.63E+00
3159	33.02	-1.28E-06	7.77E-05	-2.63E+00
3160	33.28	-1.28E-06	7.77E-05	-2.63E+00
3161	33.58	-1.28E-06	7.77E-05	-2.63E+00
3162	33.87	-1.28E-06	7.77E-05	-2.63E+00
3163	33.80	-1.28E-06	7.77E-05	-2.63E+00
3164	33.67	-1.28E-06	7.77E-05	-2.63E+00
3165	33.61	-1.28E-06	7.77E-05	-2.63E+00
3166	33.83	-1.28E-06	7.77E-05	-2.63E+00
3167	34.04	-1.28E-06	7.77E-05	-2.63E+00
3168	34.35	-1.28E-06	7.77E-05	-2.63E+00
3169	34.78	-3.25E-07	-6.69E-04	-2.39E+00
3170	35.16	6.29E-07	-1.42E-03	-2.16E+00
3171	35.44	1.58E-06	-2.16E-03	-1.92E+00
3172	35.70	1.58E-06	-2.16E-03	-1.92E+00
3173	36.00	1.58E-06	-2.16E-03	-1.92E+00

3174	36.27	1.58E-06	-2.16E-03	-1.92E+00
3175	36.40	1.58E-06	-2.16E-03	-1.92E+00
3176	36.67	1.58E-06	-2.16E-03	-1.92E+00
3177	37.21	1.58E-06	-2.16E-03	-1.92E+00
3178	38.28	1.58E-06	-2.16E-03	-1.92E+00
3179	39.97	1.58E-06	-2.16E-03	-1.92E+00
3180	41.42	1.58E-06	-2.16E-03	-1.92E+00
3181	41.56	5.28E-07	-7.21E-04	-6.40E-01
3182	41.33	-5.28E-07	7.21E-04	6.40E-01
3183	40.73	-1.58E-06	2.16E-03	1.92E+00
3184	40.08	-1.58E-06	2.16E-03	1.92E+00
3185	39.34	-1.58E-06	2.16E-03	1.92E+00
3186	38.76	-1.58E-06	2.16E-03	1.92E+00
3187	38.35	-1.58E-06	2.16E-03	1.92E+00
3188	37.79	-1.58E-06	2.16E-03	1.92E+00
3189	37.03	-1.58E-06	2.16E-03	1.92E+00
3190	35.29	-1.58E-06	2.16E-03	1.92E+00
3191	34.03	-1.58E-06	2.16E-03	1.92E+00
3192	33.20	-1.58E-06	2.16E-03	1.92E+00
3193	32.55	-1.58E-06	2.16E-03	1.92E+00
3194	32.27	-1.58E-06	2.16E-03	1.92E+00
3195	32.24	-1.58E-06	2.16E-03	1.92E+00
3196	32.19	-1.58E-06	2.16E-03	1.92E+00
3197	31.26	-1.58E-06	2.16E-03	1.92E+00
3198	28.69	-1.58E-06	2.16E-03	1.92E+00
3199	25.33	-1.58E-06	2.16E-03	1.92E+00
3200	22.12	-1.58E-06	2.16E-03	1.92E+00
3201	19.64	-1.58E-06	2.16E-03	1.92E+00
3202	18.09	-1.58E-06	2.16E-03	1.92E+00
3203	17.06	-1.58E-06	2.16E-03	1.92E+00
3204	16.91	-1.58E-06	2.16E-03	1.92E+00

3205	17.48	-1.58E-06	2.16E-03	1.92E+00
3206	18.65	-1.58E-06	2.16E-03	1.92E+00
3207	19.24	-1.58E-06	2.16E-03	1.92E+00
3208	19.91	-1.58E-06	2.16E-03	1.92E+00
3209	20.18	-1.58E-06	2.16E-03	1.92E+00
3210	19.61	-1.58E-06	2.16E-03	1.92E+00
3211	19.00	-1.58E-06	2.16E-03	1.92E+00
3212	18.39	-1.58E-06	2.16E-03	1.92E+00
3213	17.80	-1.58E-06	2.16E-03	1.92E+00
3214	17.12	-1.58E-06	2.16E-03	1.92E+00
3215	16.42	-1.58E-06	2.16E-03	1.92E+00
3216	15.33	-1.58E-06	2.16E-03	1.92E+00
3217	13.35	-1.58E-06	2.16E-03	1.92E+00
3218	12.30	-1.58E-06	2.16E-03	1.92E+00
3219	11.67	-1.58E-06	2.16E-03	1.92E+00
3220	10.68	-1.58E-06	2.16E-03	1.92E+00
3221	9.44	-1.58E-06	2.16E-03	1.92E+00
3222	8.17	-1.58E-06	2.16E-03	1.92E+00
3223	7.79	-1.58E-06	2.16E-03	1.92E+00
3224	7.93	-1.58E-06	2.16E-03	1.92E+00
3225	8.10	-1.58E-06	2.16E-03	1.92E+00
3226	8.26	-1.58E-06	2.16E-03	1.92E+00
3227	8.29	-1.58E-06	2.16E-03	1.92E+00
3228	7.74	-1.58E-06	2.16E-03	1.92E+00
3229	6.10	-1.58E-06	2.16E-03	1.92E+00
3230	4.38	-1.58E-06	2.16E-03	1.92E+00
3231	3.83	-1.58E-06	2.16E-03	1.92E+00
3232	3.59	-5.28E-07	7.21E-04	6.40E-01
3233	3.94	5.28E-07	-7.21E-04	-6.40E-01
3234	4.66	1.58E-06	-2.16E-03	-1.92E+00
3235	5.23	1.58E-06	-2.16E-03	-1.92E+00

3236	5.84	1.58E-06	-2.16E-03	-1.92E+00
3237	6.50	1.58E-06	-2.16E-03	-1.92E+00
3238	6.49	1.58E-06	-2.16E-03	-1.92E+00
3239	7.41	1.58E-06	-2.16E-03	-1.92E+00
3240	8.51	1.58E-06	-2.16E-03	-1.92E+00
3241	8.99	1.58E-06	-2.16E-03	-1.92E+00
3242	9.10	1.58E-06	-2.16E-03	-1.92E+00
3243	10.26	1.58E-06	-2.16E-03	-1.92E+00
3244	10.20	1.58E-06	-2.16E-03	-1.92E+00
3245	9.78	1.58E-06	-2.16E-03	-1.92E+00
3246	9.05	1.58E-06	-2.16E-03	-1.92E+00
3247	7.78	1.58E-06	-2.16E-03	-1.92E+00
3248	6.52	1.58E-06	-2.16E-03	-1.92E+00
3249	5.82	2.10E-06	-3.68E-03	-1.98E+00
3250	4.99	2.62E-06	-5.20E-03	-2.05E+00
3251	4.66	3.13E-06	-6.72E-03	-2.11E+00
3252	5.29	3.13E-06	-6.72E-03	-2.11E+00
3253	6.09	3.13E-06	-6.72E-03	-2.11E+00
3254	6.54	3.13E-06	-6.72E-03	-2.11E+00
3255	6.42	3.13E-06	-6.72E-03	-2.11E+00
3256	6.29	3.13E-06	-6.72E-03	-2.11E+00
3257	6.44	3.13E-06	-6.72E-03	-2.11E+00
3258	6.70	3.13E-06	-6.72E-03	-2.11E+00
3259	6.93	3.13E-06	-6.72E-03	-2.11E+00
3260	7.26	3.13E-06	-6.72E-03	-2.11E+00
3261	7.86	3.13E-06	-6.72E-03	-2.11E+00
3262	8.54	3.13E-06	-6.72E-03	-2.11E+00
3263	8.49	3.13E-06	-6.72E-03	-2.11E+00
3264	7.97	3.13E-06	-6.72E-03	-2.11E+00
3265	7.28	3.13E-06	-6.72E-03	-2.11E+00
3266	6.47	3.13E-06	-6.72E-03	-2.11E+00

3267	5.76	3.13E-06	-6.72E-03	-2.11E+00
3268	5.62	3.13E-06	-6.72E-03	-2.11E+00
3269	6.79	3.13E-06	-6.72E-03	-2.11E+00
3270	8.32	1.04E-06	-2.24E-03	-7.03E-01
3271	9.08	-1.04E-06	2.24E-03	7.03E-01
3272	8.94	-3.13E-06	6.72E-03	2.11E+00
3273	8.38	-3.13E-06	6.72E-03	2.11E+00
3274	7.66	-3.13E-06	6.72E-03	2.11E+00
3275	6.97	-3.13E-06	6.72E-03	2.11E+00
3276	6.30	-3.13E-06	6.72E-03	2.11E+00
3277	5.74	-3.13E-06	6.72E-03	2.11E+00
3278	4.92	-3.13E-06	6.72E-03	2.11E+00
3279	3.34	-3.13E-06	6.72E-03	2.11E+00
3280	0.54	-1.04E-06	2.24E-03	7.03E-01
3281	0.00	1.04E-06	-2.24E-03	-7.03E-01
3282	0.00	3.13E-06	-6.72E-03	-2.11E+00
3283	0.00	3.13E-06	-6.72E-03	-2.11E+00
3284	0.00	3.13E-06	-6.72E-03	-2.11E+00
3285	0.00	3.13E-06	-6.72E-03	-2.11E+00
3286	0.00	3.13E-06	-6.72E-03	-2.11E+00
3287	0.00	3.13E-06	-6.72E-03	-2.11E+00
3288	0.00	3.13E-06	-6.72E-03	-2.11E+00
3289	0.00	3.13E-06	-6.72E-03	-2.11E+00
3290	0.00	3.13E-06	-6.72E-03	-2.11E+00
3291	0.00	3.13E-06	-6.72E-03	-2.11E+00
3292	0.00	3.13E-06	-6.72E-03	-2.11E+00
3293	0.00	3.13E-06	-6.72E-03	-2.11E+00
3294	0.00	3.13E-06	-6.72E-03	-2.11E+00
3295	0.00	3.13E-06	-6.72E-03	-2.11E+00
3296	0.00	3.13E-06	-6.72E-03	-2.11E+00
3297	0.00	3.13E-06	-6.72E-03	-2.11E+00

3298	0.00	3.13E-06	-6.72E-03	-2.11E+00
3299	0.00	3.13E-06	-6.72E-03	-2.11E+00
3300	0.00	3.13E-06	-6.72E-03	-2.11E+00
3301	0.00	3.13E-06	-6.72E-03	-2.11E+00
3302	0.00	3.13E-06	-6.72E-03	-2.11E+00
3303	0.00	3.13E-06	-6.72E-03	-2.11E+00
3304	0.00	3.13E-06	-6.72E-03	-2.11E+00
3305	0.00	3.13E-06	-6.72E-03	-2.11E+00
3306	0.00	3.13E-06	-6.72E-03	-2.11E+00
3307	0.00	3.13E-06	-6.72E-03	-2.11E+00
3308	0.00	3.13E-06	-6.72E-03	-2.11E+00
3309	0.00	3.13E-06	-6.72E-03	-2.11E+00
3310	0.00	3.13E-06	-6.72E-03	-2.11E+00
3311	0.00	3.13E-06	-6.72E-03	-2.11E+00
3312	0.00	3.13E-06	-6.72E-03	-2.11E+00
3313	0.00	3.13E-06	-6.72E-03	-2.11E+00
3314	0.00	3.13E-06	-6.72E-03	-2.11E+00
3315	0.00	3.13E-06	-6.72E-03	-2.11E+00
3316	0.00	3.13E-06	-6.72E-03	-2.11E+00
3317	0.00	3.13E-06	-6.72E-03	-2.11E+00
3318	0.00	3.13E-06	-6.72E-03	-2.11E+00
3319	0.00	3.13E-06	-6.72E-03	-2.11E+00
3320	0.00	3.13E-06	-6.72E-03	-2.11E+00
3321	0.00	3.13E-06	-6.72E-03	-2.11E+00
3322	0.00	3.13E-06	-6.72E-03	-2.11E+00
3323	0.00	3.13E-06	-6.72E-03	-2.11E+00
3324	0.00	3.13E-06	-6.72E-03	-2.11E+00
3325	0.00	3.13E-06	-6.72E-03	-2.11E+00
3326	0.00	3.13E-06	-6.72E-03	-2.11E+00
3327	0.00	3.13E-06	-6.72E-03	-2.11E+00
3328	0.00	3.13E-06	-6.72E-03	-2.11E+00

3329	0.00	3.13E-06	-6.72E-03	-2.11E+00
3330	0.00	3.13E-06	-6.72E-03	-2.11E+00
3331	0.00	3.13E-06	-6.72E-03	-2.11E+00
3332	0.00	3.13E-06	-6.72E-03	-2.11E+00
3333	0.00	3.13E-06	-6.72E-03	-2.11E+00
3334	0.00	3.13E-06	-6.72E-03	-2.11E+00
3335	0.00	3.13E-06	-6.72E-03	-2.11E+00
3336	0.00	3.13E-06	-6.72E-03	-2.11E+00
3337	0.00	3.13E-06	-6.72E-03	-2.11E+00
3338	0.00	3.13E-06	-6.72E-03	-2.11E+00
3339	0.00	3.13E-06	-6.72E-03	-2.11E+00
3340	0.00	3.13E-06	-6.72E-03	-2.11E+00
3341	0.00	3.13E-06	-6.72E-03	-2.11E+00
3342	0.00	3.13E-06	-6.72E-03	-2.11E+00
3343	0.00	3.13E-06	-6.72E-03	-2.11E+00
3344	0.00	3.13E-06	-6.72E-03	-2.11E+00
3345	0.00	3.13E-06	-6.72E-03	-2.11E+00
3346	0.00	3.13E-06	-6.72E-03	-2.11E+00
3347	0.00	3.13E-06	-6.72E-03	-2.11E+00
3348	0.00	3.13E-06	-6.72E-03	-2.11E+00
3349	0.00	3.13E-06	-6.72E-03	-2.11E+00
3350	0.00	3.13E-06	-6.72E-03	-2.11E+00
3351	0.00	3.13E-06	-6.72E-03	-2.11E+00
3352	0.00	3.13E-06	-6.72E-03	-2.11E+00
3353	0.00	3.13E-06	-6.72E-03	-2.11E+00
3354	0.00	3.13E-06	-6.72E-03	-2.11E+00
3355	0.00	3.13E-06	-6.72E-03	-2.11E+00
3356	0.00	3.13E-06	-6.72E-03	-2.11E+00
3357	0.00	3.13E-06	-6.72E-03	-2.11E+00
3358	0.00	3.13E-06	-6.72E-03	-2.11E+00
3359	0.00	3.13E-06	-6.72E-03	-2.11E+00

3360	0.00	3.13E-06	-6.72E-03	-2.11E+00
3361	0.00	3.13E-06	-6.72E-03	-2.11E+00
3362	0.00	3.13E-06	-6.72E-03	-2.11E+00
3363	0.00	3.13E-06	-6.72E-03	-2.11E+00
3364	0.00	3.13E-06	-6.72E-03	-2.11E+00
3365	0.00	3.13E-06	-6.72E-03	-2.11E+00
3366	0.00	3.13E-06	-6.72E-03	-2.11E+00
3367	0.00	3.13E-06	-6.72E-03	-2.11E+00
3368	0.00	3.13E-06	-6.72E-03	-2.11E+00
3369	0.00	3.13E-06	-6.72E-03	-2.11E+00
3370	0.00	3.13E-06	-6.72E-03	-2.11E+00
3371	0.00	3.13E-06	-6.72E-03	-2.11E+00
3372	0.00	3.13E-06	-6.72E-03	-2.11E+00
3373	0.00	3.13E-06	-6.72E-03	-2.11E+00
3374	0.00	3.13E-06	-6.72E-03	-2.11E+00
3375	0.00	3.13E-06	-6.72E-03	-2.11E+00
3376	0.00	3.13E-06	-6.72E-03	-2.11E+00
3377	0.00	3.13E-06	-6.72E-03	-2.11E+00
3378	0.00	3.13E-06	-6.72E-03	-2.11E+00
3379	0.00	3.13E-06	-6.72E-03	-2.11E+00
3380	0.00	3.13E-06	-6.72E-03	-2.11E+00
3381	0.00	3.13E-06	-6.72E-03	-2.11E+00
3382	0.00	3.13E-06	-6.72E-03	-2.11E+00
3383	0.00	3.13E-06	-6.72E-03	-2.11E+00
3384	0.00	3.13E-06	-6.72E-03	-2.11E+00
3385	0.00	3.13E-06	-6.72E-03	-2.11E+00
3386	0.00	3.13E-06	-6.72E-03	-2.11E+00
3387	0.00	3.13E-06	-6.72E-03	-2.11E+00
3388	0.00	3.13E-06	-6.72E-03	-2.11E+00
3389	0.00	3.13E-06	-6.72E-03	-2.11E+00
3390	0.00	3.13E-06	-6.72E-03	-2.11E+00

3391	0.00	3.13E-06	-6.72E-03	-2.11E+00
3392	0.00	3.13E-06	-6.72E-03	-2.11E+00
3393	0.00	3.13E-06	-6.72E-03	-2.11E+00
3394	0.00	3.13E-06	-6.72E-03	-2.11E+00
3395	0.00	3.13E-06	-6.72E-03	-2.11E+00
3396	0.00	3.13E-06	-6.72E-03	-2.11E+00
3397	0.00	3.13E-06	-6.72E-03	-2.11E+00
3398	0.00	3.13E-06	-6.72E-03	-2.11E+00
3399	0.00	3.13E-06	-6.72E-03	-2.11E+00
3400	0.00	3.13E-06	-6.72E-03	-2.11E+00
3401	0.00	3.13E-06	-6.72E-03	-2.11E+00
3402	0.00	3.13E-06	-6.72E-03	-2.11E+00
3403	0.00	3.13E-06	-6.72E-03	-2.11E+00
3404	0.00	3.13E-06	-6.72E-03	-2.11E+00
3405	0.00	3.13E-06	-6.72E-03	-2.11E+00
3406	0.00	3.13E-06	-6.72E-03	-2.11E+00
3407	0.00	3.13E-06	-6.72E-03	-2.11E+00
3408	0.00	3.13E-06	-6.72E-03	-2.11E+00
3409	0.00	3.13E-06	-6.72E-03	-2.11E+00
3410	0.00	3.13E-06	-6.72E-03	-2.11E+00
3411	0.00	3.13E-06	-6.72E-03	-2.11E+00
3412	0.00	3.13E-06	-6.72E-03	-2.11E+00
3413	0.00	3.13E-06	-6.72E-03	-2.11E+00
3414	0.00	3.13E-06	-6.72E-03	-2.11E+00
3415	0.00	3.13E-06	-6.72E-03	-2.11E+00
3416	0.00	3.13E-06	-6.72E-03	-2.11E+00
3417	0.00	3.13E-06	-6.72E-03	-2.11E+00
3418	0.00	3.13E-06	-6.72E-03	-2.11E+00
3419	0.00	3.13E-06	-6.72E-03	-2.11E+00
3420	0.00	3.13E-06	-6.72E-03	-2.11E+00
3421	0.00	3.13E-06	-6.72E-03	-2.11E+00

3422	0.00	3.13E-06	-6.72E-03	-2.11E+00
3423	0.00	3.13E-06	-6.72E-03	-2.11E+00
3424	0.00	3.13E-06	-6.72E-03	-2.11E+00
3425	0.00	3.13E-06	-6.72E-03	-2.11E+00
3426	0.00	3.13E-06	-6.72E-03	-2.11E+00
3427	0.00	3.13E-06	-6.72E-03	-2.11E+00
3428	0.00	3.13E-06	-6.72E-03	-2.11E+00
3429	0.00	3.13E-06	-6.72E-03	-2.11E+00
3430	0.00	3.13E-06	-6.72E-03	-2.11E+00
3431	0.00	3.13E-06	-6.72E-03	-2.11E+00
3432	0.00	3.13E-06	-6.72E-03	-2.11E+00
3433	0.00	3.13E-06	-6.72E-03	-2.11E+00
3434	0.00	3.13E-06	-6.72E-03	-2.11E+00
3435	0.00	3.13E-06	-6.72E-03	-2.11E+00
3436	0.00	3.13E-06	-6.72E-03	-2.11E+00
3437	0.00	3.13E-06	-6.72E-03	-2.11E+00
3438	0.00	3.13E-06	-6.72E-03	-2.11E+00
3439	0.00	3.13E-06	-6.72E-03	-2.11E+00
3440	0.00	3.13E-06	-6.72E-03	-2.11E+00
3441	0.00	3.13E-06	-6.72E-03	-2.11E+00
3442	0.00	3.13E-06	-6.72E-03	-2.11E+00
3443	0.00	3.13E-06	-6.72E-03	-2.11E+00
3444	0.00	3.13E-06	-6.72E-03	-2.11E+00
3445	0.00	3.13E-06	-6.72E-03	-2.11E+00
3446	0.00	3.13E-06	-6.72E-03	-2.11E+00
3447	0.00	3.13E-06	-6.72E-03	-2.11E+00
3448	0.00	3.13E-06	-6.72E-03	-2.11E+00
3449	0.00	3.13E-06	-6.72E-03	-2.11E+00
3450	0.00	3.13E-06	-6.72E-03	-2.11E+00
3451	0.00	3.13E-06	-6.72E-03	-2.11E+00
3452	0.00	3.13E-06	-6.72E-03	-2.11E+00

3453	0.00	3.13E-06	-6.72E-03	-2.11E+00
3454	0.00	3.13E-06	-6.72E-03	-2.11E+00
3455	0.00	3.13E-06	-6.72E-03	-2.11E+00
3456	0.00	3.13E-06	-6.72E-03	-2.11E+00
3457	0.00	3.13E-06	-6.72E-03	-2.11E+00
3458	0.00	3.13E-06	-6.72E-03	-2.11E+00
3459	0.00	3.13E-06	-6.72E-03	-2.11E+00
3460	0.00	3.13E-06	-6.72E-03	-2.11E+00
3461	0.00	3.13E-06	-6.72E-03	-2.11E+00
3462	0.00	3.13E-06	-6.72E-03	-2.11E+00
3463	0.00	3.13E-06	-6.72E-03	-2.11E+00
3464	0.00	3.13E-06	-6.72E-03	-2.11E+00
3465	0.00	3.13E-06	-6.72E-03	-2.11E+00
3466	0.00	3.13E-06	-6.72E-03	-2.11E+00
3467	0.00	3.13E-06	-6.72E-03	-2.11E+00
3468	0.00	3.13E-06	-6.72E-03	-2.11E+00
3469	0.00	3.13E-06	-6.72E-03	-2.11E+00
3470	0.00	3.13E-06	-6.72E-03	-2.11E+00
3471	0.00	3.13E-06	-6.72E-03	-2.11E+00
3472	0.00	3.13E-06	-6.72E-03	-2.11E+00
3473	0.00	3.13E-06	-6.72E-03	-2.11E+00
3474	0.00	3.13E-06	-6.72E-03	-2.11E+00
3475	0.00	3.13E-06	-6.72E-03	-2.11E+00
3476	0.00	3.13E-06	-6.72E-03	-2.11E+00
3477	0.00	3.13E-06	-6.72E-03	-2.11E+00
3478	0.00	3.13E-06	-6.72E-03	-2.11E+00
3479	0.00	3.13E-06	-6.72E-03	-2.11E+00
3480	0.00	3.13E-06	-6.72E-03	-2.11E+00
3481	0.00	3.13E-06	-6.72E-03	-2.11E+00
3482	0.00	3.13E-06	-6.72E-03	-2.11E+00
3483	0.00	3.13E-06	-6.72E-03	-2.11E+00

3484	0.00	3.13E-06	-6.72E-03	-2.11E+00
3485	0.00	3.13E-06	-6.72E-03	-2.11E+00
3486	0.00	3.13E-06	-6.72E-03	-2.11E+00
3487	0.00	3.13E-06	-6.72E-03	-2.11E+00
3488	0.00	3.13E-06	-6.72E-03	-2.11E+00
3489	0.00	3.13E-06	-6.72E-03	-2.11E+00
3490	0.00	3.13E-06	-6.72E-03	-2.11E+00
3491	0.00	3.13E-06	-6.72E-03	-2.11E+00
3492	0.00	3.13E-06	-6.72E-03	-2.11E+00
3493	0.00	3.13E-06	-6.72E-03	-2.11E+00
3494	0.00	3.13E-06	-6.72E-03	-2.11E+00
3495	0.00	3.13E-06	-6.72E-03	-2.11E+00
3496	0.00	3.13E-06	-6.72E-03	-2.11E+00
3497	0.00	3.13E-06	-6.72E-03	-2.11E+00
3498	0.00	3.13E-06	-6.72E-03	-2.11E+00
3499	0.00	3.13E-06	-6.72E-03	-2.11E+00
3500	0.00	3.13E-06	-6.72E-03	-2.11E+00
3501	0.00	3.13E-06	-6.72E-03	-2.11E+00
3502	0.00	3.13E-06	-6.72E-03	-2.11E+00
3503	0.00	3.13E-06	-6.72E-03	-2.11E+00
3504	0.00	3.13E-06	-6.72E-03	-2.11E+00
3505	0.00	3.13E-06	-6.72E-03	-2.11E+00
3506	0.00	3.13E-06	-6.72E-03	-2.11E+00
3507	0.00	3.13E-06	-6.72E-03	-2.11E+00
3508	0.00	3.13E-06	-6.72E-03	-2.11E+00
3509	0.00	3.13E-06	-6.72E-03	-2.11E+00
3510	0.00	3.13E-06	-6.72E-03	-2.11E+00
3511	0.00	3.13E-06	-6.72E-03	-2.11E+00
3512	0.00	3.13E-06	-6.72E-03	-2.11E+00
3513	0.00	3.13E-06	-6.72E-03	-2.11E+00
3514	0.00	3.13E-06	-6.72E-03	-2.11E+00

3515	0.00	3.13E-06	-6.72E-03	-2.11E+00
3516	0.00	3.13E-06	-6.72E-03	-2.11E+00
3517	0.00	3.13E-06	-6.72E-03	-2.11E+00
3518	0.00	3.13E-06	-6.72E-03	-2.11E+00
3519	0.00	3.13E-06	-6.72E-03	-2.11E+00
3520	0.00	3.13E-06	-6.72E-03	-2.11E+00
3521	0.00	3.13E-06	-6.72E-03	-2.11E+00
3522	0.00	3.13E-06	-6.72E-03	-2.11E+00
3523	0.00	3.13E-06	-6.72E-03	-2.11E+00
3524	0.00	3.13E-06	-6.72E-03	-2.11E+00
3525	0.00	3.13E-06	-6.72E-03	-2.11E+00
3526	0.00	3.13E-06	-6.72E-03	-2.11E+00
3527	0.00	3.13E-06	-6.72E-03	-2.11E+00
3528	0.00	3.13E-06	-6.72E-03	-2.11E+00
3529	0.00	3.13E-06	-6.72E-03	-2.11E+00
3530	0.00	3.13E-06	-6.72E-03	-2.11E+00
3531	0.00	3.13E-06	-6.72E-03	-2.11E+00
3532	0.00	3.13E-06	-6.72E-03	-2.11E+00
3533	0.00	3.13E-06	-6.72E-03	-2.11E+00
3534	0.00	3.13E-06	-6.72E-03	-2.11E+00
3535	0.00	3.13E-06	-6.72E-03	-2.11E+00
3536	0.00	3.13E-06	-6.72E-03	-2.11E+00
3537	0.00	3.13E-06	-6.72E-03	-2.11E+00
3538	0.00	3.13E-06	-6.72E-03	-2.11E+00
3539	0.00	3.13E-06	-6.72E-03	-2.11E+00
3540	0.00	3.13E-06	-6.72E-03	-2.11E+00
3541	0.00	3.13E-06	-6.72E-03	-2.11E+00
3542	0.00	3.13E-06	-6.72E-03	-2.11E+00
3543	0.00	3.13E-06	-6.72E-03	-2.11E+00
3544	0.00	3.13E-06	-6.72E-03	-2.11E+00
3545	0.00	3.13E-06	-6.72E-03	-2.11E+00

3546	0.00	3.13E-06	-6.72E-03	-2.11E+00
3547	0.00	3.13E-06	-6.72E-03	-2.11E+00
3548	0.00	3.13E-06	-6.72E-03	-2.11E+00
3549	0.00	3.13E-06	-6.72E-03	-2.11E+00
3550	0.00	3.13E-06	-6.72E-03	-2.11E+00
3551	0.00	3.13E-06	-6.72E-03	-2.11E+00
3552	0.00	3.13E-06	-6.72E-03	-2.11E+00
3553	0.00	3.13E-06	-6.72E-03	-2.11E+00
3554	0.00	3.13E-06	-6.72E-03	-2.11E+00
3555	0.00	3.13E-06	-6.72E-03	-2.11E+00
3556	0.00	3.13E-06	-6.72E-03	-2.11E+00
3557	0.00	3.13E-06	-6.72E-03	-2.11E+00
3558	0.49	3.13E-06	-6.72E-03	-2.11E+00
3559	2.00	3.13E-06	-6.72E-03	-2.11E+00
3560	2.83	3.13E-06	-6.72E-03	-2.11E+00
3561	3.62	3.13E-06	-6.72E-03	-2.11E+00
3562	4.91	3.13E-06	-6.72E-03	-2.11E+00
3563	5.41	3.13E-06	-6.72E-03	-2.11E+00
3564	6.38	3.13E-06	-6.72E-03	-2.11E+00
3565	7.69	3.13E-06	-6.72E-03	-2.11E+00
3566	8.06	3.13E-06	-6.72E-03	-2.11E+00
3567	12.12	3.13E-06	-6.72E-03	-2.11E+00
3568	13.12	3.13E-06	-6.72E-03	-2.11E+00
3569	13.79	1.04E-06	-2.24E-03	-7.03E-01
3570	14.11	-1.04E-06	2.24E-03	7.03E-01
3571	13.18	-3.13E-06	6.72E-03	2.11E+00
3572	11.93	-3.13E-06	6.72E-03	2.11E+00
3573	9.43	-3.13E-06	6.72E-03	2.11E+00
3574	5.10	-3.13E-06	6.72E-03	2.11E+00
3575	2.51	-3.13E-06	6.72E-03	2.11E+00
3576	1.80	-1.04E-06	2.24E-03	7.03E-01

3577	1.74	1.04E-06	-2.24E-03	-7.03E-01
3578	2.16	3.13E-06	-6.72E-03	-2.11E+00
3579	2.17	3.13E-06	-6.72E-03	-2.11E+00
3580	2.00	3.13E-06	-6.72E-03	-2.11E+00
3581	2.03	3.13E-06	-6.72E-03	-2.11E+00
3582	2.12	3.13E-06	-6.72E-03	-2.11E+00
3583	2.77	3.13E-06	-6.72E-03	-2.11E+00
3584	3.33	3.13E-06	-6.72E-03	-2.11E+00
3585	3.59	3.13E-06	-6.72E-03	-2.11E+00
3586	3.51	3.13E-06	-6.72E-03	-2.11E+00
3587	3.59	3.13E-06	-6.72E-03	-2.11E+00
3588	3.92	3.13E-06	-6.72E-03	-2.11E+00
3589	4.04	3.13E-06	-6.72E-03	-2.11E+00
3590	3.83	3.13E-06	-6.72E-03	-2.11E+00
3591	4.09	3.13E-06	-6.72E-03	-2.11E+00
3592	4.63	3.13E-06	-6.72E-03	-2.11E+00
3593	4.96	3.13E-06	-6.72E-03	-2.11E+00
3594	5.26	3.13E-06	-6.72E-03	-2.11E+00
3595	6.86	3.13E-06	-6.72E-03	-2.11E+00
3596	7.63	3.13E-06	-6.72E-03	-2.11E+00
3597	8.03	3.13E-06	-6.72E-03	-2.11E+00
3598	11.34	3.13E-06	-6.72E-03	-2.11E+00
3599	12.50	3.13E-06	-6.72E-03	-2.11E+00
3600	12.76	3.13E-06	-6.72E-03	-2.11E+00
3601	15.98	3.13E-06	-6.72E-03	-2.11E+00
3602	19.37	3.13E-06	-6.72E-03	-2.11E+00
3603	20.08	3.13E-06	-6.72E-03	-2.11E+00
3604	20.65	1.04E-06	-2.24E-03	-7.03E-01
3605	20.68	-1.04E-06	2.24E-03	7.03E-01
3606	18.48	-3.13E-06	6.72E-03	2.11E+00
3607	16.12	-3.13E-06	6.72E-03	2.11E+00

3608	14.40	-3.13E-06	6.72E-03	2.11E+00
3609	13.41	-3.13E-06	6.72E-03	2.11E+00
3610	11.79	-3.13E-06	6.72E-03	2.11E+00
3611	9.06	-3.13E-06	6.72E-03	2.11E+00
3612	6.43	-3.13E-06	6.72E-03	2.11E+00
3613	4.35	-3.13E-06	6.72E-03	2.11E+00
3614	2.11	-1.04E-06	2.24E-03	7.03E-01
3615	0.00	1.04E-06	-2.24E-03	-7.03E-01
3616	0.00	3.13E-06	-6.72E-03	-2.11E+00
3617	0.00	3.13E-06	-6.72E-03	-2.11E+00
3618	0.00	3.13E-06	-6.72E-03	-2.11E+00
3619	0.00	3.13E-06	-6.72E-03	-2.11E+00
3620	0.00	3.13E-06	-6.72E-03	-2.11E+00
3621	0.00	3.13E-06	-6.72E-03	-2.11E+00
3622	0.00	3.13E-06	-6.72E-03	-2.11E+00
3623	0.00	3.13E-06	-6.72E-03	-2.11E+00
3624	0.00	3.13E-06	-6.72E-03	-2.11E+00
3625	0.00	3.13E-06	-6.72E-03	-2.11E+00
3626	0.00	3.13E-06	-6.72E-03	-2.11E+00
3627	0.00	3.13E-06	-6.72E-03	-2.11E+00
3628	0.00	3.13E-06	-6.72E-03	-2.11E+00
3629	0.00	3.13E-06	-6.72E-03	-2.11E+00
3630	0.00	3.13E-06	-6.72E-03	-2.11E+00
3631	0.00	3.13E-06	-6.72E-03	-2.11E+00
3632	0.00	3.13E-06	-6.72E-03	-2.11E+00
3633	0.11	3.13E-06	-6.72E-03	-2.11E+00
3634	1.02	3.13E-06	-6.72E-03	-2.11E+00
3635	1.96	3.13E-06	-6.72E-03	-2.11E+00
3636	2.33	3.13E-06	-6.72E-03	-2.11E+00
3637	2.50	3.13E-06	-6.72E-03	-2.11E+00
3638	2.81	3.13E-06	-6.72E-03	-2.11E+00

3639	3.51	3.13E-06	-6.72E-03	-2.11E+00
3640	4.14	3.13E-06	-6.72E-03	-2.11E+00
3641	5.08	3.13E-06	-6.72E-03	-2.11E+00
3642	5.14	3.13E-06	-6.72E-03	-2.11E+00
3643	6.93	3.13E-06	-6.72E-03	-2.11E+00
3644	8.06	3.13E-06	-6.72E-03	-2.11E+00
3645	8.63	3.13E-06	-6.72E-03	-2.11E+00
3646	12.65	3.13E-06	-6.72E-03	-2.11E+00
3647	13.06	3.13E-06	-6.72E-03	-2.11E+00
3648	14.07	3.13E-06	-6.72E-03	-2.11E+00
3649	17.83	3.13E-06	-6.72E-03	-2.11E+00
3650	20.25	3.13E-06	-6.72E-03	-2.11E+00
3651	20.28	3.13E-06	-6.72E-03	-2.11E+00
3652	22.69	3.13E-06	-6.72E-03	-2.11E+00
3653	24.95	3.13E-06	-6.72E-03	-2.11E+00
3654	24.78	3.13E-06	-6.72E-03	-2.11E+00
3655	26.50	3.13E-06	-6.72E-03	-2.11E+00
3656	29.27	3.13E-06	-6.72E-03	-2.11E+00
3657	30.86	3.13E-06	-6.72E-03	-2.11E+00
3658	30.59	3.13E-06	-6.72E-03	-2.11E+00
3659	31.00	1.04E-06	-2.24E-03	-7.03E-01
3660	30.85	-1.04E-06	2.24E-03	7.03E-01
3661	30.33	-3.13E-06	6.72E-03	2.11E+00
3662	29.98	-3.13E-06	6.72E-03	2.11E+00
3663	29.28	-3.13E-06	6.72E-03	2.11E+00
3664	27.92	-3.13E-06	6.72E-03	2.11E+00
3665	25.96	-3.13E-06	6.72E-03	2.11E+00
3666	24.56	-3.13E-06	6.72E-03	2.11E+00
3667	22.85	-3.13E-06	6.72E-03	2.11E+00
3668	20.96	-3.13E-06	6.72E-03	2.11E+00
3669	19.67	-3.13E-06	6.72E-03	2.11E+00

3670	18.32	-3.13E-06	6.72E-03	2.11E+00
3671	15.79	-3.13E-06	6.72E-03	2.11E+00
3672	12.51	-3.13E-06	6.72E-03	2.11E+00
3673	9.73	-3.13E-06	6.72E-03	2.11E+00
3674	7.50	-3.13E-06	6.72E-03	2.11E+00
3675	5.34	-3.13E-06	6.72E-03	2.11E+00
3676	3.39	-3.13E-06	6.72E-03	2.11E+00
3677	2.14	-3.13E-06	6.72E-03	2.11E+00
3678	0.73	-1.04E-06	2.24E-03	7.03E-01
3679	0.00	1.04E-06	-2.24E-03	-7.03E-01
3680	0.00	3.13E-06	-6.72E-03	-2.11E+00
3681	0.00	3.13E-06	-6.72E-03	-2.11E+00
3682	0.26	3.13E-06	-6.72E-03	-2.11E+00
3683	2.05	3.13E-06	-6.72E-03	-2.11E+00
3684	3.24	3.13E-06	-6.72E-03	-2.11E+00
3685	4.30	3.13E-06	-6.72E-03	-2.11E+00
3686	5.45	3.13E-06	-6.72E-03	-2.11E+00
3687	5.36	3.13E-06	-6.72E-03	-2.11E+00
3688	7.76	3.13E-06	-6.72E-03	-2.11E+00
3689	7.59	3.13E-06	-6.72E-03	-2.11E+00
3690	9.89	3.13E-06	-6.72E-03	-2.11E+00
3691	13.30	3.13E-06	-6.72E-03	-2.11E+00
3692	13.14	3.13E-06	-6.72E-03	-2.11E+00
3693	15.50	3.13E-06	-6.72E-03	-2.11E+00
3694	19.50	3.13E-06	-6.72E-03	-2.11E+00
3695	20.13	3.13E-06	-6.72E-03	-2.11E+00
3696	20.86	3.13E-06	-6.72E-03	-2.11E+00
3697	23.79	3.13E-06	-6.72E-03	-2.11E+00
3698	24.88	3.13E-06	-6.72E-03	-2.11E+00
3699	25.16	3.13E-06	-6.72E-03	-2.11E+00
3700	27.36	3.13E-06	-6.72E-03	-2.11E+00

3701	30.28	3.13E-06	-6.72E-03	-2.11E+00
3702	31.05	3.13E-06	-6.72E-03	-2.11E+00
3703	31.23	3.13E-06	-6.72E-03	-2.11E+00
3704	32.96	3.13E-06	-6.72E-03	-2.11E+00
3705	35.29	3.13E-06	-6.72E-03	-2.11E+00
3706	37.14	3.13E-06	-6.72E-03	-2.11E+00
3707	37.50	3.13E-06	-6.72E-03	-2.11E+00
3708	37.47	3.13E-06	-6.72E-03	-2.11E+00
3709	37.14	3.13E-06	-6.72E-03	-2.11E+00
3710	37.67	3.13E-06	-6.72E-03	-2.11E+00
3711	37.68	1.04E-06	-2.24E-03	-7.03E-01
3712	37.52	-1.04E-06	2.24E-03	7.03E-01
3713	37.20	-3.13E-06	6.72E-03	2.11E+00
3714	36.88	-3.13E-06	6.72E-03	2.11E+00
3715	36.45	-3.13E-06	6.72E-03	2.11E+00
3716	35.98	-3.13E-06	6.72E-03	2.11E+00
3717	35.45	-3.13E-06	6.72E-03	2.11E+00
3718	34.98	-3.13E-06	6.72E-03	2.11E+00
3719	34.35	-3.13E-06	6.72E-03	2.11E+00
3720	33.94	-3.13E-06	6.72E-03	2.11E+00
3721	33.13	-3.13E-06	6.72E-03	2.11E+00
3722	31.83	-3.13E-06	6.72E-03	2.11E+00
3723	30.38	-3.13E-06	6.72E-03	2.11E+00
3724	29.06	-3.13E-06	6.72E-03	2.11E+00
3725	27.94	-3.13E-06	6.72E-03	2.11E+00
3726	27.13	-3.13E-06	6.72E-03	2.11E+00
3727	25.82	-3.13E-06	6.72E-03	2.11E+00
3728	23.60	-3.13E-06	6.72E-03	2.11E+00
3729	21.48	-3.13E-06	6.72E-03	2.11E+00
3730	19.84	-3.13E-06	6.72E-03	2.11E+00
3731	18.54	-3.13E-06	6.72E-03	2.11E+00

3732	17.61	-3.13E-06	6.72E-03	2.11E+00
3733	16.17	-3.13E-06	6.72E-03	2.11E+00
3734	13.88	-3.13E-06	6.72E-03	2.11E+00
3735	11.44	-3.13E-06	6.72E-03	2.11E+00
3736	9.74	-3.13E-06	6.72E-03	2.11E+00
3737	8.06	-3.13E-06	6.72E-03	2.11E+00
3738	6.77	-3.13E-06	6.72E-03	2.11E+00
3739	5.41	-3.13E-06	6.72E-03	2.11E+00
3740	4.04	-3.13E-06	6.72E-03	2.11E+00
3741	2.53	-3.13E-06	6.72E-03	2.11E+00
3742	1.29	-1.04E-06	2.24E-03	7.03E-01
3743	0.00	1.04E-06	-2.24E-03	-7.03E-01
3744	0.06	3.13E-06	-6.72E-03	-2.11E+00
3745	1.17	3.13E-06	-6.72E-03	-2.11E+00
3746	2.59	3.13E-06	-6.72E-03	-2.11E+00
3747	3.98	3.13E-06	-6.72E-03	-2.11E+00
3748	5.76	3.13E-06	-6.72E-03	-2.11E+00
3749	5.74	3.13E-06	-6.72E-03	-2.11E+00
3750	8.02	3.13E-06	-6.72E-03	-2.11E+00
3751	7.95	3.13E-06	-6.72E-03	-2.11E+00
3752	10.40	3.13E-06	-6.72E-03	-2.11E+00
3753	13.35	3.13E-06	-6.72E-03	-2.11E+00
3754	13.34	3.13E-06	-6.72E-03	-2.11E+00
3755	16.13	3.13E-06	-6.72E-03	-2.11E+00
3756	20.44	3.13E-06	-6.72E-03	-2.11E+00
3757	20.42	3.13E-06	-6.72E-03	-2.11E+00
3758	21.82	3.13E-06	-6.72E-03	-2.11E+00
3759	24.21	3.13E-06	-6.72E-03	-2.11E+00
3760	24.25	3.13E-06	-6.72E-03	-2.11E+00
3761	25.13	3.13E-06	-6.72E-03	-2.11E+00
3762	25.76	3.13E-06	-6.72E-03	-2.11E+00

3763	25.70	3.13E-06	-6.72E-03	-2.11E+00
3764	25.43	3.13E-06	-6.72E-03	-2.11E+00
3765	25.33	3.13E-06	-6.72E-03	-2.11E+00
3766	25.38	3.13E-06	-6.72E-03	-2.11E+00
3767	25.71	3.13E-06	-6.72E-03	-2.11E+00
3768	26.57	3.13E-06	-6.72E-03	-2.11E+00
3769	27.69	3.13E-06	-6.72E-03	-2.11E+00
3770	28.36	3.13E-06	-6.72E-03	-2.11E+00
3771	28.38	3.13E-06	-6.72E-03	-2.11E+00
3772	28.85	3.13E-06	-6.72E-03	-2.11E+00
3773	30.82	3.13E-06	-6.72E-03	-2.11E+00
3774	32.62	-4.06E-06	-1.60E-03	-2.20E+00
3775	33.79	-1.13E-05	3.53E-03	-2.29E+00
3776	34.91	-1.84E-05	8.65E-03	-2.39E+00
3777	35.71	-1.84E-05	8.65E-03	-2.39E+00
3778	35.98	-1.84E-05	8.65E-03	-2.39E+00
3779	35.85	-1.84E-05	8.65E-03	-2.39E+00
3780	36.07	-1.84E-05	8.65E-03	-2.39E+00
3781	36.40	-1.84E-05	8.65E-03	-2.39E+00
3782	36.43	-1.84E-05	8.65E-03	-2.39E+00
3783	36.39	-1.84E-05	8.65E-03	-2.39E+00
3784	36.54	-1.84E-05	8.65E-03	-2.39E+00
3785	36.79	-1.84E-05	8.65E-03	-2.39E+00
3786	37.01	-1.84E-05	8.65E-03	-2.39E+00
3787	37.40	-1.84E-05	8.65E-03	-2.39E+00
3788	37.66	-1.84E-05	8.65E-03	-2.39E+00
3789	37.98	-1.84E-05	8.65E-03	-2.39E+00
3790	38.18	-1.84E-05	8.65E-03	-2.39E+00
3791	38.56	-1.84E-05	8.65E-03	-2.39E+00
3792	38.96	-1.84E-05	8.65E-03	-2.39E+00
3793	39.52	-1.84E-05	8.65E-03	-2.39E+00

3794	40.19	-1.84E-05	8.65E-03	-2.39E+00
3795	40.94	-1.84E-05	8.65E-03	-2.39E+00
3796	41.75	-1.84E-05	8.65E-03	-2.39E+00
3797	42.52	-1.84E-05	8.65E-03	-2.39E+00
3798	43.37	-1.84E-05	8.65E-03	-2.39E+00
3799	43.95	-1.84E-05	8.65E-03	-2.39E+00
3800	43.21	-1.84E-05	8.65E-03	-2.39E+00
3801	42.38	-1.84E-05	8.65E-03	-2.39E+00
3802	41.99	-1.84E-05	8.65E-03	-2.39E+00
3803	41.69	-1.84E-05	8.65E-03	-2.39E+00
3804	41.20	-1.84E-05	8.65E-03	-2.39E+00
3805	40.53	-1.84E-05	8.65E-03	-2.39E+00
3806	39.92	-1.84E-05	8.65E-03	-2.39E+00
3807	39.26	-1.84E-05	8.65E-03	-2.39E+00
3808	38.45	-1.84E-05	8.65E-03	-2.39E+00
3809	37.98	-1.84E-05	8.65E-03	-2.39E+00
3810	37.42	-1.84E-05	8.65E-03	-2.39E+00
3811	36.90	-1.84E-05	8.65E-03	-2.39E+00
3812	36.47	-1.84E-05	8.65E-03	-2.39E+00
3813	35.88	-1.84E-05	8.65E-03	-2.39E+00
3814	35.48	-1.84E-05	8.65E-03	-2.39E+00
3815	35.24	-1.84E-05	8.65E-03	-2.39E+00
3816	35.17	-1.84E-05	8.65E-03	-2.39E+00
3817	35.76	-1.84E-05	8.65E-03	-2.39E+00
3818	36.44	-1.84E-05	8.65E-03	-2.39E+00
3819	36.66	-1.34E-05	6.65E-03	-2.03E+00
3820	36.69	-8.40E-06	4.64E-03	-1.67E+00
3821	36.77	-3.39E-06	2.64E-03	-1.31E+00
3822	37.26	-3.39E-06	2.64E-03	-1.31E+00
3823	37.60	-3.39E-06	2.64E-03	-1.31E+00
3824	37.79	-3.39E-06	2.64E-03	-1.31E+00

3825	37.96	-3.39E-06	2.64E-03	-1.31E+00
3826	38.06	-3.39E-06	2.64E-03	-1.31E+00
3827	38.25	-3.39E-06	2.64E-03	-1.31E+00
3828	38.32	-3.39E-06	2.64E-03	-1.31E+00
3829	38.34	-3.39E-06	2.64E-03	-1.31E+00
3830	38.46	-3.39E-06	2.64E-03	-1.31E+00
3831	38.15	-3.39E-06	2.64E-03	-1.31E+00
3832	37.72	-3.39E-06	2.64E-03	-1.31E+00
3833	37.09	-3.39E-06	2.64E-03	-1.31E+00
3834	36.43	-3.39E-06	2.64E-03	-1.31E+00
3835	35.67	-3.39E-06	2.64E-03	-1.31E+00
3836	35.20	-3.39E-06	2.64E-03	-1.31E+00
3837	35.10	-3.39E-06	2.64E-03	-1.31E+00
3838	35.10	-3.39E-06	2.64E-03	-1.31E+00
3839	35.22	-3.39E-06	2.64E-03	-1.31E+00
3840	35.40	-3.39E-06	2.64E-03	-1.31E+00
3841	35.02	-3.39E-06	2.64E-03	-1.31E+00
3842	34.96	-3.39E-06	2.64E-03	-1.31E+00
3843	34.93	-3.39E-06	2.64E-03	-1.31E+00
3844	34.89	-3.39E-06	2.64E-03	-1.31E+00
3845	34.72	-3.39E-06	2.64E-03	-1.31E+00
3846	34.69	-3.39E-06	2.64E-03	-1.31E+00
3847	34.80	-3.39E-06	2.64E-03	-1.31E+00
3848	34.76	-3.39E-06	2.64E-03	-1.31E+00
3849	34.65	-3.39E-06	2.64E-03	-1.31E+00
3850	34.28	-3.39E-06	2.64E-03	-1.31E+00
3851	34.02	-3.39E-06	2.64E-03	-1.31E+00
3852	33.78	-3.39E-06	2.64E-03	-1.31E+00
3853	33.70	-3.39E-06	2.64E-03	-1.31E+00
3854	33.72	-3.39E-06	2.64E-03	-1.31E+00
3855	33.65	-3.39E-06	2.64E-03	-1.31E+00

3856	33.53	-3.39E-06	2.64E-03	-1.31E+00
3857	33.35	-3.39E-06	2.64E-03	-1.31E+00
3858	33.43	-3.39E-06	2.64E-03	-1.31E+00
3859	33.78	-3.39E-06	2.64E-03	-1.31E+00
3860	34.24	-3.39E-06	2.64E-03	-1.31E+00
3861	34.76	-3.39E-06	2.64E-03	-1.31E+00
3862	35.05	-3.39E-06	2.64E-03	-1.31E+00
3863	35.16	-3.39E-06	2.64E-03	-1.31E+00
3864	35.28	-3.39E-06	2.64E-03	-1.31E+00
3865	35.01	-3.39E-06	2.64E-03	-1.31E+00
3866	34.79	-3.39E-06	2.64E-03	-1.31E+00
3867	34.42	-3.39E-06	2.64E-03	-1.31E+00
3868	34.04	-3.39E-06	2.64E-03	-1.31E+00
3869	33.70	-3.39E-06	2.64E-03	-1.31E+00
3870	33.59	-3.39E-06	2.64E-03	-1.31E+00
3871	33.65	-3.39E-06	2.64E-03	-1.31E+00
3872	33.72	-3.39E-06	2.64E-03	-1.31E+00
3873	33.78	-3.39E-06	2.64E-03	-1.31E+00
3874	33.80	-3.39E-06	2.64E-03	-1.31E+00
3875	33.89	-3.39E-06	2.64E-03	-1.31E+00
3876	34.36	-3.39E-06	2.64E-03	-1.31E+00
3877	34.57	-3.39E-06	2.64E-03	-1.31E+00
3878	34.77	-1.13E-06	8.80E-04	-4.36E-01
3879	34.44	1.13E-06	-8.80E-04	4.36E-01
3880	33.26	3.39E-06	-2.64E-03	1.31E+00
3881	31.65	3.39E-06	-2.64E-03	1.31E+00
3882	29.97	3.39E-06	-2.64E-03	1.31E+00
3883	28.47	3.39E-06	-2.64E-03	1.31E+00
3884	27.48	3.39E-06	-2.64E-03	1.31E+00
3885	26.74	3.39E-06	-2.64E-03	1.31E+00
3886	26.07	3.39E-06	-2.64E-03	1.31E+00

3887	25.15	3.39E-06	-2.64E-03	1.31E+00
3888	24.10	3.39E-06	-2.64E-03	1.31E+00
3889	23.83	3.39E-06	-2.64E-03	1.31E+00
3890	24.20	3.39E-06	-2.64E-03	1.31E+00
3891	25.07	3.39E-06	-2.64E-03	1.31E+00
3892	25.66	3.39E-06	-2.64E-03	1.31E+00
3893	25.51	3.39E-06	-2.64E-03	1.31E+00
3894	22.52	3.39E-06	-2.64E-03	1.31E+00
3895	17.98	3.39E-06	-2.64E-03	1.31E+00
3896	14.07	3.39E-06	-2.64E-03	1.31E+00
3897	10.09	3.39E-06	-2.64E-03	1.31E+00
3898	5.72	3.39E-06	-2.64E-03	1.31E+00
3899	3.24	3.39E-06	-2.64E-03	1.31E+00
3900	0.61	3.39E-06	-2.64E-03	1.31E+00
3901	0.00	3.39E-06	-2.64E-03	1.31E+00
3902	0.00	3.39E-06	-2.64E-03	1.31E+00
3903	0.00	3.39E-06	-2.64E-03	1.31E+00
3904	0.00	3.39E-06	-2.64E-03	1.31E+00
3905	0.00	3.39E-06	-2.64E-03	1.31E+00
3906	0.00	3.39E-06	-2.64E-03	1.31E+00
3907	0.00	6.56E-06	-6.28E-03	3.32E+00
3908	0.00	9.73E-06	-9.93E-03	5.33E+00
3909	0.00	1.29E-05	-1.36E-02	7.35E+00
3910	0.00	1.29E-05	-1.36E-02	7.35E+00
3911	0.00	1.29E-05	-1.36E-02	7.35E+00
3912	0.00	1.29E-05	-1.36E-02	7.35E+00
3913	0.00	1.29E-05	-1.36E-02	7.35E+00
3914	0.00	1.29E-05	-1.36E-02	7.35E+00
3915	0.00	1.29E-05	-1.36E-02	7.35E+00
3916	0.00	1.29E-05	-1.36E-02	7.35E+00
3917	0.00	1.29E-05	-1.36E-02	7.35E+00

3918	0.00	1.29E-05	-1.36E-02	7.35E+00
3919	0.00	1.29E-05	-1.36E-02	7.35E+00
3920	0.00	1.29E-05	-1.36E-02	7.35E+00
3921	0.66	1.29E-05	-1.36E-02	7.35E+00
3922	1.59	1.29E-05	-1.36E-02	7.35E+00
3923	2.33	1.29E-05	-1.36E-02	7.35E+00
3924	2.69	1.29E-05	-1.36E-02	7.35E+00
3925	2.52	1.29E-05	-1.36E-02	7.35E+00
3926	1.77	1.29E-05	-1.36E-02	7.35E+00
3927	0.66	1.29E-05	-1.36E-02	7.35E+00
3928	0.00	1.29E-05	-1.36E-02	7.35E+00
3929	0.00	1.29E-05	-1.36E-02	7.35E+00
3930	0.00	1.29E-05	-1.36E-02	7.35E+00
3931	0.32	1.29E-05	-1.36E-02	7.35E+00
3932	1.27	1.29E-05	-1.36E-02	7.35E+00
3933	2.24	1.29E-05	-1.36E-02	7.35E+00
3934	2.84	1.29E-05	-1.36E-02	7.35E+00
3935	3.17	1.29E-05	-1.36E-02	7.35E+00
3936	3.37	1.29E-05	-1.36E-02	7.35E+00
3937	3.39	1.29E-05	-1.36E-02	7.35E+00
3938	3.16	1.29E-05	-1.36E-02	7.35E+00
3939	2.89	1.29E-05	-1.36E-02	7.35E+00
3940	2.72	1.29E-05	-1.36E-02	7.35E+00
3941	2.11	1.29E-05	-1.36E-02	7.35E+00
3942	1.33	1.29E-05	-1.36E-02	7.35E+00
3943	0.85	1.29E-05	-1.36E-02	7.35E+00
3944	0.42	1.29E-05	-1.36E-02	7.35E+00
3945	0.00	1.29E-05	-1.36E-02	7.35E+00
3946	0.00	1.29E-05	-1.36E-02	7.35E+00
3947	0.00	1.29E-05	-1.36E-02	7.35E+00
3948	0.00	1.29E-05	-1.36E-02	7.35E+00

3949	0.00	1.29E-05	-1.36E-02	7.35E+00
3950	0.00	1.29E-05	-1.36E-02	7.35E+00
3951	0.00	1.29E-05	-1.36E-02	7.35E+00
3952	0.00	1.29E-05	-1.36E-02	7.35E+00
3953	0.00	1.29E-05	-1.36E-02	7.35E+00
3954	0.00	1.29E-05	-1.36E-02	7.35E+00
3955	0.00	1.29E-05	-1.36E-02	7.35E+00
3956	0.00	1.29E-05	-1.36E-02	7.35E+00
3957	0.00	1.29E-05	-1.36E-02	7.35E+00
3958	0.00	1.29E-05	-1.36E-02	7.35E+00
3959	0.00	1.29E-05	-1.36E-02	7.35E+00
3960	0.00	1.29E-05	-1.36E-02	7.35E+00
3961	0.00	1.29E-05	-1.36E-02	7.35E+00
3962	0.00	1.29E-05	-1.36E-02	7.35E+00
3963	0.00	1.29E-05	-1.36E-02	7.35E+00
3964	0.00	1.29E-05	-1.36E-02	7.35E+00
3965	0.00	1.29E-05	-1.36E-02	7.35E+00
3966	0.00	1.29E-05	-1.36E-02	7.35E+00
3967	0.00	1.29E-05	-1.36E-02	7.35E+00
3968	0.00	1.29E-05	-1.36E-02	7.35E+00
3969	0.00	1.29E-05	-1.36E-02	7.35E+00
3970	0.00	1.29E-05	-1.36E-02	7.35E+00
3971	0.00	1.29E-05	-1.36E-02	7.35E+00
3972	0.00	1.29E-05	-1.36E-02	7.35E+00
3973	0.00	1.29E-05	-1.36E-02	7.35E+00
3974	0.00	1.29E-05	-1.36E-02	7.35E+00
3975	0.00	1.29E-05	-1.36E-02	7.35E+00
3976	0.00	1.29E-05	-1.36E-02	7.35E+00
3977	0.00	1.29E-05	-1.36E-02	7.35E+00
3978	0.00	1.29E-05	-1.36E-02	7.35E+00
3979	0.00	1.29E-05	-1.36E-02	7.35E+00

3980	0.00	1.29E-05	-1.36E-02	7.35E+00
3981	0.00	1.29E-05	-1.36E-02	7.35E+00
3982	0.00	1.29E-05	-1.36E-02	7.35E+00
3983	0.00	1.29E-05	-1.36E-02	7.35E+00
3984	0.00	1.29E-05	-1.36E-02	7.35E+00
3985	0.00	1.29E-05	-1.36E-02	7.35E+00
3986	0.00	1.29E-05	-1.36E-02	7.35E+00
3987	0.00	1.29E-05	-1.36E-02	7.35E+00
3988	0.00	1.29E-05	-1.36E-02	7.35E+00
3989	0.00	1.29E-05	-1.36E-02	7.35E+00
3990	0.00	1.29E-05	-1.36E-02	7.35E+00
3991	0.00	1.29E-05	-1.36E-02	7.35E+00
3992	0.00	1.29E-05	-1.36E-02	7.35E+00
3993	0.00	1.29E-05	-1.36E-02	7.35E+00
3994	0.00	1.29E-05	-1.36E-02	7.35E+00
3995	0.00	1.29E-05	-1.36E-02	7.35E+00
3996	0.00	1.29E-05	-1.36E-02	7.35E+00
3997	0.00	1.29E-05	-1.36E-02	7.35E+00
3998	0.00	1.29E-05	-1.36E-02	7.35E+00
3999	0.00	1.29E-05	-1.36E-02	7.35E+00
4000	0.00	1.29E-05	-1.36E-02	7.35E+00
4001	0.00	1.29E-05	-1.36E-02	7.35E+00
4002	0.00	1.29E-05	-1.36E-02	7.35E+00
4003	0.00	1.29E-05	-1.36E-02	7.35E+00
4004	0.00	1.29E-05	-1.36E-02	7.35E+00
4005	0.00	1.29E-05	-1.36E-02	7.35E+00
4006	0.00	1.29E-05	-1.36E-02	7.35E+00
4007	0.00	1.29E-05	-1.36E-02	7.35E+00
4008	0.00	1.29E-05	-1.36E-02	7.35E+00
4009	0.00	1.29E-05	-1.36E-02	7.35E+00
4010	0.00	1.29E-05	-1.36E-02	7.35E+00

4011	0.00	1.29E-05	-1.36E-02	7.35E+00
4012	0.00	1.29E-05	-1.36E-02	7.35E+00
4013	0.00	1.29E-05	-1.36E-02	7.35E+00
4014	0.00	1.29E-05	-1.36E-02	7.35E+00
4015	0.00	1.29E-05	-1.36E-02	7.35E+00
4016	0.00	1.29E-05	-1.36E-02	7.35E+00
4017	0.00	1.29E-05	-1.36E-02	7.35E+00
4018	0.00	1.29E-05	-1.36E-02	7.35E+00
4019	0.00	1.29E-05	-1.36E-02	7.35E+00
4020	0.00	1.29E-05	-1.36E-02	7.35E+00
4021	0.00	1.29E-05	-1.36E-02	7.35E+00
4022	0.00	1.29E-05	-1.36E-02	7.35E+00
4023	0.00	1.29E-05	-1.36E-02	7.35E+00
4024	0.00	1.29E-05	-1.36E-02	7.35E+00
4025	0.00	1.29E-05	-1.36E-02	7.35E+00
4026	0.00	1.29E-05	-1.36E-02	7.35E+00
4027	0.00	1.29E-05	-1.36E-02	7.35E+00
4028	0.00	1.29E-05	-1.36E-02	7.35E+00
4029	0.00	1.29E-05	-1.36E-02	7.35E+00
4030	0.00	1.29E-05	-1.36E-02	7.35E+00
4031	0.00	1.29E-05	-1.36E-02	7.35E+00
4032	0.00	1.29E-05	-1.36E-02	7.35E+00
4033	0.00	1.29E-05	-1.36E-02	7.35E+00
4034	0.00	1.29E-05	-1.36E-02	7.35E+00
4035	0.00	1.29E-05	-1.36E-02	7.35E+00
4036	0.00	1.29E-05	-1.36E-02	7.35E+00
4037	0.00	1.29E-05	-1.36E-02	7.35E+00
4038	0.00	1.29E-05	-1.36E-02	7.35E+00
4039	0.00	1.29E-05	-1.36E-02	7.35E+00
4040	0.00	1.29E-05	-1.36E-02	7.35E+00
4041	0.00	1.29E-05	-1.36E-02	7.35E+00

4042	0.00	1.29E-05	-1.36E-02	7.35E+00
4043	0.00	1.29E-05	-1.36E-02	7.35E+00
4044	0.00	1.29E-05	-1.36E-02	7.35E+00
4045	0.00	1.29E-05	-1.36E-02	7.35E+00
4046	0.00	1.29E-05	-1.36E-02	7.35E+00
4047	0.00	1.29E-05	-1.36E-02	7.35E+00
4048	0.00	1.29E-05	-1.36E-02	7.35E+00
4049	0.00	1.29E-05	-1.36E-02	7.35E+00
4050	0.00	1.29E-05	-1.36E-02	7.35E+00
4051	0.00	1.29E-05	-1.36E-02	7.35E+00
4052	0.00	1.29E-05	-1.36E-02	7.35E+00
4053	0.00	1.29E-05	-1.36E-02	7.35E+00
4054	0.00	1.29E-05	-1.36E-02	7.35E+00
4055	0.00	1.29E-05	-1.36E-02	7.35E+00
4056	0.00	1.29E-05	-1.36E-02	7.35E+00
4057	0.00	1.29E-05	-1.36E-02	7.35E+00
4058	0.00	1.29E-05	-1.36E-02	7.35E+00
4059	0.00	1.29E-05	-1.36E-02	7.35E+00
4060	0.00	1.29E-05	-1.36E-02	7.35E+00
4061	0.00	1.29E-05	-1.36E-02	7.35E+00
4062	0.00	1.29E-05	-1.36E-02	7.35E+00
4063	0.00	1.29E-05	-1.36E-02	7.35E+00
4064	0.00	1.29E-05	-1.36E-02	7.35E+00
4065	0.00	1.29E-05	-1.36E-02	7.35E+00
4066	0.00	1.29E-05	-1.36E-02	7.35E+00
4067	0.00	1.29E-05	-1.36E-02	7.35E+00
4068	0.00	1.29E-05	-1.36E-02	7.35E+00
4069	0.00	1.29E-05	-1.36E-02	7.35E+00
4070	0.00	1.29E-05	-1.36E-02	7.35E+00
4071	0.02	1.29E-05	-1.36E-02	7.35E+00
4072	0.43	1.29E-05	-1.36E-02	7.35E+00

4073	0.80	1.29E-05	-1.36E-02	7.35E+00
4074	1.22	1.29E-05	-1.36E-02	7.35E+00
4075	1.37	1.29E-05	-1.36E-02	7.35E+00
4076	1.34	1.29E-05	-1.36E-02	7.35E+00
4077	1.03	1.29E-05	-1.36E-02	7.35E+00
4078	0.65	1.29E-05	-1.36E-02	7.35E+00
4079	0.30	1.29E-05	-1.36E-02	7.35E+00
4080	0.26	1.29E-05	-1.36E-02	7.35E+00
4081	0.31	1.29E-05	-1.36E-02	7.35E+00
4082	0.92	1.29E-05	-1.36E-02	7.35E+00
4083	1.84	1.29E-05	-1.36E-02	7.35E+00
4084	1.92	1.29E-05	-1.36E-02	7.35E+00
4085	2.03	1.29E-05	-1.36E-02	7.35E+00
4086	2.46	1.29E-05	-1.36E-02	7.35E+00
4087	2.47	1.29E-05	-1.36E-02	7.35E+00
4088	2.68	1.29E-05	-1.36E-02	7.35E+00
4089	2.30	1.29E-05	-1.36E-02	7.35E+00
4090	1.20	1.29E-05	-1.36E-02	7.35E+00
4091	0.41	1.29E-05	-1.36E-02	7.35E+00
4092	0.00	1.29E-05	-1.36E-02	7.35E+00
4093	0.00	1.29E-05	-1.36E-02	7.35E+00
4094	0.00	1.29E-05	-1.36E-02	7.35E+00
4095	0.00	1.29E-05	-1.36E-02	7.35E+00
4096	0.00	1.29E-05	-1.36E-02	7.35E+00
4097	0.00	1.29E-05	-1.36E-02	7.35E+00
4098	0.00	1.29E-05	-1.36E-02	7.35E+00
4099	0.00	1.29E-05	-1.36E-02	7.35E+00
4100	0.00	1.17E-05	-1.23E-02	6.55E+00
4101	0.00	1.06E-05	-1.10E-02	5.75E+00
4102	0.00	9.39E-06	-9.75E-03	4.96E+00
4103	0.00	9.39E-06	-9.75E-03	4.96E+00

4104	0.00	9.39E-06	-9.75E-03	4.96E+00
4105	0.00	9.39E-06	-9.75E-03	4.96E+00
4106	0.00	9.39E-06	-9.75E-03	4.96E+00
4107	0.00	9.39E-06	-9.75E-03	4.96E+00
4108	0.00	9.39E-06	-9.75E-03	4.96E+00
4109	0.00	9.39E-06	-9.75E-03	4.96E+00
4110	0.00	9.39E-06	-9.75E-03	4.96E+00
4111	0.00	9.39E-06	-9.75E-03	4.96E+00
4112	0.00	9.39E-06	-9.75E-03	4.96E+00
4113	0.00	9.39E-06	-9.75E-03	4.96E+00
4114	0.00	9.39E-06	-9.75E-03	4.96E+00
4115	0.00	9.39E-06	-9.75E-03	4.96E+00
4116	0.00	9.39E-06	-9.75E-03	4.96E+00
4117	0.00	9.39E-06	-9.75E-03	4.96E+00
4118	0.00	9.39E-06	-9.75E-03	4.96E+00
4119	0.00	9.39E-06	-9.75E-03	4.96E+00
4120	0.00	9.39E-06	-9.75E-03	4.96E+00
4121	0.05	9.39E-06	-9.75E-03	4.96E+00
4122	0.20	9.39E-06	-9.75E-03	4.96E+00
4123	0.38	9.39E-06	-9.75E-03	4.96E+00
4124	0.54	9.39E-06	-9.75E-03	4.96E+00
4125	0.73	9.39E-06	-9.75E-03	4.96E+00
4126	1.23	9.39E-06	-9.75E-03	4.96E+00
4127	2.10	9.39E-06	-9.75E-03	4.96E+00
4128	2.83	9.39E-06	-9.75E-03	4.96E+00
4129	3.31	9.39E-06	-9.75E-03	4.96E+00
4130	3.78	9.39E-06	-9.75E-03	4.96E+00
4131	4.19	9.39E-06	-9.75E-03	4.96E+00
4132	4.44	9.39E-06	-9.75E-03	4.96E+00
4133	4.77	9.39E-06	-9.75E-03	4.96E+00
4134	4.64	9.39E-06	-9.75E-03	4.96E+00

4135	4.56	9.39E-06	-9.75E-03	4.96E+00
4136	4.75	9.39E-06	-9.75E-03	4.96E+00
4137	4.80	9.39E-06	-9.75E-03	4.96E+00
4138	4.98	9.39E-06	-9.75E-03	4.96E+00
4139	5.31	9.39E-06	-9.75E-03	4.96E+00
4140	5.66	9.39E-06	-9.75E-03	4.96E+00
4141	5.79	9.39E-06	-9.75E-03	4.96E+00
4142	5.83	9.39E-06	-9.75E-03	4.96E+00
4143	5.61	9.39E-06	-9.75E-03	4.96E+00
4144	5.30	9.39E-06	-9.75E-03	4.96E+00
4145	4.62	9.39E-06	-9.75E-03	4.96E+00
4146	2.84	9.39E-06	-9.75E-03	4.96E+00
4147	1.03	9.39E-06	-9.75E-03	4.96E+00
4148	0.44	9.39E-06	-9.75E-03	4.96E+00
4149	0.44	9.39E-06	-9.75E-03	4.96E+00
4150	1.04	9.39E-06	-9.75E-03	4.96E+00
4151	2.07	9.39E-06	-9.75E-03	4.96E+00
4152	2.69	9.39E-06	-9.75E-03	4.96E+00
4153	2.99	9.39E-06	-9.75E-03	4.96E+00
4154	3.32	9.39E-06	-9.75E-03	4.96E+00
4155	3.52	9.39E-06	-9.75E-03	4.96E+00
4156	3.57	9.39E-06	-9.75E-03	4.96E+00
4157	3.69	9.39E-06	-9.75E-03	4.96E+00
4158	3.68	9.39E-06	-9.75E-03	4.96E+00
4159	3.75	9.39E-06	-9.75E-03	4.96E+00
4160	3.73	9.39E-06	-9.75E-03	4.96E+00
4161	3.66	9.39E-06	-9.75E-03	4.96E+00
4162	3.57	9.39E-06	-9.75E-03	4.96E+00
4163	3.44	9.39E-06	-9.75E-03	4.96E+00
4164	3.37	9.39E-06	-9.75E-03	4.96E+00
4165	3.35	9.39E-06	-9.75E-03	4.96E+00

4166	3.41	9.39E-06	-9.75E-03	4.96E+00
4167	3.41	9.39E-06	-9.75E-03	4.96E+00
4168	3.33	9.39E-06	-9.75E-03	4.96E+00
4169	3.20	9.39E-06	-9.75E-03	4.96E+00
4170	3.01	9.39E-06	-9.75E-03	4.96E+00
4171	2.88	9.39E-06	-9.75E-03	4.96E+00
4172	2.85	9.39E-06	-9.75E-03	4.96E+00
4173	2.66	9.39E-06	-9.75E-03	4.96E+00
4174	2.19	9.39E-06	-9.75E-03	4.96E+00
4175	1.22	9.39E-06	-9.75E-03	4.96E+00
4176	0.53	9.39E-06	-9.75E-03	4.96E+00
4177	0.26	9.39E-06	-9.75E-03	4.96E+00
4178	0.04	9.39E-06	-9.75E-03	4.96E+00
4179	0.82	9.39E-06	-9.75E-03	4.96E+00
4180	1.96	9.39E-06	-9.75E-03	4.96E+00
4181	2.65	9.39E-06	-9.75E-03	4.96E+00
4182	2.86	9.39E-06	-9.75E-03	4.96E+00
4183	2.98	9.39E-06	-9.75E-03	4.96E+00
4184	3.01	9.39E-06	-9.75E-03	4.96E+00
4185	3.20	9.39E-06	-9.75E-03	4.96E+00
4186	3.16	9.39E-06	-9.75E-03	4.96E+00
4187	3.02	9.39E-06	-9.75E-03	4.96E+00
4188	2.97	9.39E-06	-9.75E-03	4.96E+00
4189	2.89	9.39E-06	-9.75E-03	4.96E+00
4190	2.77	9.39E-06	-9.75E-03	4.96E+00
4191	2.48	9.39E-06	-9.75E-03	4.96E+00
4192	1.81	9.39E-06	-9.75E-03	4.96E+00
4193	1.27	9.39E-06	-9.75E-03	4.96E+00
4194	1.01	9.39E-06	-9.75E-03	4.96E+00
4195	0.93	9.39E-06	-9.75E-03	4.96E+00
4196	1.41	9.39E-06	-9.75E-03	4.96E+00

4197	2.00	9.39E-06	-9.75E-03	4.96E+00
4198	2.30	9.39E-06	-9.75E-03	4.96E+00
4199	2.32	9.39E-06	-9.75E-03	4.96E+00
4200	2.40	9.39E-06	-9.75E-03	4.96E+00
4201	2.69	9.39E-06	-9.75E-03	4.96E+00
4202	2.58	9.39E-06	-9.75E-03	4.96E+00
4203	2.18	9.39E-06	-9.75E-03	4.96E+00
4204	1.79	9.39E-06	-9.75E-03	4.96E+00
4205	1.59	9.39E-06	-9.75E-03	4.96E+00
4206	1.44	9.39E-06	-9.75E-03	4.96E+00
4207	1.29	9.39E-06	-9.75E-03	4.96E+00
4208	1.24	9.39E-06	-9.75E-03	4.96E+00
4209	1.21	9.39E-06	-9.75E-03	4.96E+00
4210	1.01	9.39E-06	-9.75E-03	4.96E+00
4211	0.45	9.39E-06	-9.75E-03	4.96E+00
4212	0.07	9.39E-06	-9.75E-03	4.96E+00
4213	0.00	9.39E-06	-9.75E-03	4.96E+00
4214	0.06	9.39E-06	-9.75E-03	4.96E+00
4215	0.24	9.39E-06	-9.75E-03	4.96E+00
4216	0.44	9.39E-06	-9.75E-03	4.96E+00
4217	0.64	9.39E-06	-9.75E-03	4.96E+00
4218	0.78	9.39E-06	-9.75E-03	4.96E+00
4219	0.74	9.39E-06	-9.75E-03	4.96E+00
4220	0.72	9.39E-06	-9.75E-03	4.96E+00
4221	0.81	9.39E-06	-9.75E-03	4.96E+00
4222	1.05	9.39E-06	-9.75E-03	4.96E+00
4223	1.06	9.39E-06	-9.75E-03	4.96E+00
4224	1.04	9.39E-06	-9.75E-03	4.96E+00
4225	0.99	9.39E-06	-9.75E-03	4.96E+00
4226	0.88	9.39E-06	-9.75E-03	4.96E+00
4227	1.12	9.39E-06	-9.75E-03	4.96E+00

4228	1.03	9.39E-06	-9.75E-03	4.96E+00
4229	0.55	9.39E-06	-9.75E-03	4.96E+00
4230	0.01	9.39E-06	-9.75E-03	4.96E+00
4231	0.00	9.39E-06	-9.75E-03	4.96E+00
4232	0.00	9.39E-06	-9.75E-03	4.96E+00
4233	0.00	9.39E-06	-9.75E-03	4.96E+00
4234	0.00	9.39E-06	-9.75E-03	4.96E+00
4235	0.00	9.39E-06	-9.75E-03	4.96E+00
4236	0.00	9.39E-06	-9.75E-03	4.96E+00
4237	0.00	9.39E-06	-9.75E-03	4.96E+00
4238	0.00	9.39E-06	-9.75E-03	4.96E+00
4239	0.00	9.39E-06	-9.75E-03	4.96E+00
4240	0.00	9.39E-06	-9.75E-03	4.96E+00
4241	0.00	9.39E-06	-9.75E-03	4.96E+00
4242	0.00	9.39E-06	-9.75E-03	4.96E+00
4243	0.00	9.39E-06	-9.75E-03	4.96E+00
4244	0.00	9.39E-06	-9.75E-03	4.96E+00
4245	0.00	9.39E-06	-9.75E-03	4.96E+00
4246	0.00	9.39E-06	-9.75E-03	4.96E+00
4247	0.00	9.39E-06	-9.75E-03	4.96E+00
4248	0.00	9.39E-06	-9.75E-03	4.96E+00
4249	0.00	9.39E-06	-9.75E-03	4.96E+00
4250	0.00	9.57E-06	-9.95E-03	4.82E+00
4251	0.00	9.75E-06	-1.01E-02	4.68E+00
4252	0.00	9.92E-06	-1.03E-02	4.55E+00
4253	0.00	9.92E-06	-1.03E-02	4.55E+00
4254	0.00	9.92E-06	-1.03E-02	4.55E+00
4255	0.00	9.92E-06	-1.03E-02	4.55E+00
4256	0.00	9.92E-06	-1.03E-02	4.55E+00
4257	0.00	9.92E-06	-1.03E-02	4.55E+00
4258	0.00	9.92E-06	-1.03E-02	4.55E+00

4259	0.00	9.92E-06	-1.03E-02	4.55E+00
4260	0.00	9.92E-06	-1.03E-02	4.55E+00
4261	0.00	9.92E-06	-1.03E-02	4.55E+00
4262	0.00	9.92E-06	-1.03E-02	4.55E+00
4263	0.00	9.92E-06	-1.03E-02	4.55E+00
4264	0.00	9.92E-06	-1.03E-02	4.55E+00
4265	0.00	9.92E-06	-1.03E-02	4.55E+00
4266	0.00	9.92E-06	-1.03E-02	4.55E+00
4267	0.00	9.92E-06	-1.03E-02	4.55E+00
4268	0.00	9.92E-06	-1.03E-02	4.55E+00
4269	0.00	9.92E-06	-1.03E-02	4.55E+00
4270	0.00	9.92E-06	-1.03E-02	4.55E+00
4271	0.00	9.92E-06	-1.03E-02	4.55E+00
4272	0.00	9.92E-06	-1.03E-02	4.55E+00
4273	0.00	9.92E-06	-1.03E-02	4.55E+00
4274	0.00	9.92E-06	-1.03E-02	4.55E+00
4275	0.00	9.92E-06	-1.03E-02	4.55E+00
4276	0.00	9.92E-06	-1.03E-02	4.55E+00
4277	0.00	9.92E-06	-1.03E-02	4.55E+00
4278	0.00	9.92E-06	-1.03E-02	4.55E+00
4279	0.00	9.92E-06	-1.03E-02	4.55E+00
4280	0.00	9.92E-06	-1.03E-02	4.55E+00
4281	0.00	9.92E-06	-1.03E-02	4.55E+00
4282	0.00	9.92E-06	-1.03E-02	4.55E+00
4283	0.00	9.92E-06	-1.03E-02	4.55E+00
4284	0.00	9.92E-06	-1.03E-02	4.55E+00
4285	0.00	9.92E-06	-1.03E-02	4.55E+00
4286	0.00	9.92E-06	-1.03E-02	4.55E+00
4287	0.00	9.92E-06	-1.03E-02	4.55E+00
4288	0.00	9.92E-06	-1.03E-02	4.55E+00
4289	0.00	9.92E-06	-1.03E-02	4.55E+00

4290	0.00	9.92E-06	-1.03E-02	4.55E+00
4291	0.00	9.92E-06	-1.03E-02	4.55E+00
4292	0.00	9.92E-06	-1.03E-02	4.55E+00
4293	0.00	9.92E-06	-1.03E-02	4.55E+00
4294	0.00	9.92E-06	-1.03E-02	4.55E+00
4295	0.00	9.92E-06	-1.03E-02	4.55E+00
4296	0.00	9.92E-06	-1.03E-02	4.55E+00
4297	0.00	9.92E-06	-1.03E-02	4.55E+00
4298	0.00	9.92E-06	-1.03E-02	4.55E+00
4299	0.00	9.92E-06	-1.03E-02	4.55E+00
4300	0.00	9.92E-06	-1.03E-02	4.55E+00
4301	0.00	9.92E-06	-1.03E-02	4.55E+00
4302	0.00	9.92E-06	-1.03E-02	4.55E+00
4303	0.00	9.92E-06	-1.03E-02	4.55E+00
4304	0.00	9.92E-06	-1.03E-02	4.55E+00
4305	0.00	9.92E-06	-1.03E-02	4.55E+00
4306	0.00	9.92E-06	-1.03E-02	4.55E+00
4307	0.00	9.92E-06	-1.03E-02	4.55E+00
4308	0.00	9.92E-06	-1.03E-02	4.55E+00
4309	0.00	9.92E-06	-1.03E-02	4.55E+00
4310	0.00	9.92E-06	-1.03E-02	4.55E+00
4311	0.00	9.92E-06	-1.03E-02	4.55E+00
4312	0.00	9.92E-06	-1.03E-02	4.55E+00
4313	0.00	9.92E-06	-1.03E-02	4.55E+00
4314	0.00	9.92E-06	-1.03E-02	4.55E+00
4315	0.00	9.92E-06	-1.03E-02	4.55E+00
4316	0.00	9.92E-06	-1.03E-02	4.55E+00
4317	0.00	9.92E-06	-1.03E-02	4.55E+00
4318	0.00	9.92E-06	-1.03E-02	4.55E+00
4319	0.00	9.92E-06	-1.03E-02	4.55E+00
4320	0.00	9.92E-06	-1.03E-02	4.55E+00

4321	0.00	9.92E-06	-1.03E-02	4.55E+00
4322	0.00	9.92E-06	-1.03E-02	4.55E+00
4323	0.00	9.92E-06	-1.03E-02	4.55E+00
4324	0.00	9.92E-06	-1.03E-02	4.55E+00
4325	0.00	9.92E-06	-1.03E-02	4.55E+00
4326	0.00	9.92E-06	-1.03E-02	4.55E+00
4327	0.00	9.92E-06	-1.03E-02	4.55E+00
4328	0.00	9.92E-06	-1.03E-02	4.55E+00
4329	0.00	9.92E-06	-1.03E-02	4.55E+00
4330	0.00	9.92E-06	-1.03E-02	4.55E+00
4331	0.00	9.92E-06	-1.03E-02	4.55E+00
4332	0.00	9.92E-06	-1.03E-02	4.55E+00
4333	0.00	9.92E-06	-1.03E-02	4.55E+00
4334	0.00	9.92E-06	-1.03E-02	4.55E+00
4335	0.00	9.92E-06	-1.03E-02	4.55E+00
4336	0.00	9.92E-06	-1.03E-02	4.55E+00
4337	0.00	9.92E-06	-1.03E-02	4.55E+00
4338	0.00	9.92E-06	-1.03E-02	4.55E+00
4339	0.00	9.92E-06	-1.03E-02	4.55E+00
4340	0.00	9.92E-06	-1.03E-02	4.55E+00
4341	0.00	9.92E-06	-1.03E-02	4.55E+00
4342	0.00	9.92E-06	-1.03E-02	4.55E+00
4343	0.00	9.92E-06	-1.03E-02	4.55E+00
4344	0.00	9.92E-06	-1.03E-02	4.55E+00
4345	0.00	9.92E-06	-1.03E-02	4.55E+00
4346	0.00	9.92E-06	-1.03E-02	4.55E+00
4347	0.00	9.92E-06	-1.03E-02	4.55E+00
4348	0.00	9.92E-06	-1.03E-02	4.55E+00
4349	0.00	9.92E-06	-1.03E-02	4.55E+00
4350	0.00	9.92E-06	-1.03E-02	4.55E+00
4351	0.00	9.92E-06	-1.03E-02	4.55E+00

4352	0.00	9.92E-06	-1.03E-02	4.55E+00
4353	0.00	9.92E-06	-1.03E-02	4.55E+00
4354	0.00	9.92E-06	-1.03E-02	4.55E+00
4355	0.00	9.92E-06	-1.03E-02	4.55E+00
4356	0.00	9.92E-06	-1.03E-02	4.55E+00
4357	0.00	9.92E-06	-1.03E-02	4.55E+00
4358	0.00	9.92E-06	-1.03E-02	4.55E+00
4359	0.00	9.92E-06	-1.03E-02	4.55E+00
4360	0.00	9.92E-06	-1.03E-02	4.55E+00
4361	0.00	9.92E-06	-1.03E-02	4.55E+00
4362	0.00	9.92E-06	-1.03E-02	4.55E+00
4363	0.00	9.92E-06	-1.03E-02	4.55E+00
4364	0.00	9.92E-06	-1.03E-02	4.55E+00
4365	0.00	9.92E-06	-1.03E-02	4.55E+00
4366	0.00	9.92E-06	-1.03E-02	4.55E+00
4367	0.00	9.92E-06	-1.03E-02	4.55E+00
4368	0.00	9.92E-06	-1.03E-02	4.55E+00
4369	0.00	9.92E-06	-1.03E-02	4.55E+00
4370	0.00	9.92E-06	-1.03E-02	4.55E+00
4371	0.00	9.92E-06	-1.03E-02	4.55E+00
4372	0.00	9.92E-06	-1.03E-02	4.55E+00
4373	0.00	9.92E-06	-1.03E-02	4.55E+00
4374	0.00	9.92E-06	-1.03E-02	4.55E+00
4375	0.00	9.92E-06	-1.03E-02	4.55E+00
4376	0.00	9.92E-06	-1.03E-02	4.55E+00
4377	0.00	9.92E-06	-1.03E-02	4.55E+00
4378	0.00	9.92E-06	-1.03E-02	4.55E+00
4379	0.00	9.92E-06	-1.03E-02	4.55E+00
4380	0.00	9.92E-06	-1.03E-02	4.55E+00
4381	0.00	9.92E-06	-1.03E-02	4.55E+00
4382	0.00	9.92E-06	-1.03E-02	4.55E+00

4383	0.00	9.92E-06	-1.03E-02	4.55E+00
4384	0.00	9.92E-06	-1.03E-02	4.55E+00
4385	0.00	9.92E-06	-1.03E-02	4.55E+00
4386	0.00	9.92E-06	-1.03E-02	4.55E+00
4387	0.00	9.92E-06	-1.03E-02	4.55E+00
4388	0.00	9.92E-06	-1.03E-02	4.55E+00
4389	0.00	9.92E-06	-1.03E-02	4.55E+00
4390	0.00	9.92E-06	-1.03E-02	4.55E+00
4391	0.00	9.92E-06	-1.03E-02	4.55E+00
4392	0.00	9.92E-06	-1.03E-02	4.55E+00
4393	0.00	9.92E-06	-1.03E-02	4.55E+00
4394	0.00	9.92E-06	-1.03E-02	4.55E+00
4395	0.00	9.92E-06	-1.03E-02	4.55E+00
4396	0.00	9.92E-06	-1.03E-02	4.55E+00
4397	0.00	9.92E-06	-1.03E-02	4.55E+00
4398	0.00	9.92E-06	-1.03E-02	4.55E+00
4399	0.00	9.92E-06	-1.03E-02	4.55E+00
4400	0.00	9.92E-06	-1.03E-02	4.55E+00
4401	0.00	9.92E-06	-1.03E-02	4.55E+00
4402	0.00	9.92E-06	-1.03E-02	4.55E+00
4403	0.00	9.92E-06	-1.03E-02	4.55E+00
4404	0.00	9.92E-06	-1.03E-02	4.55E+00
4405	0.00	9.92E-06	-1.03E-02	4.55E+00
4406	0.00	9.92E-06	-1.03E-02	4.55E+00
4407	0.00	9.92E-06	-1.03E-02	4.55E+00
4408	0.00	9.92E-06	-1.03E-02	4.55E+00
4409	0.00	9.92E-06	-1.03E-02	4.55E+00
4410	0.00	9.92E-06	-1.03E-02	4.55E+00
4411	0.00	9.92E-06	-1.03E-02	4.55E+00
4412	0.00	9.92E-06	-1.03E-02	4.55E+00
4413	0.00	9.92E-06	-1.03E-02	4.55E+00

4414	0.00	9.92E-06	-1.03E-02	4.55E+00
4415	0.00	9.92E-06	-1.03E-02	4.55E+00
4416	0.00	9.92E-06	-1.03E-02	4.55E+00
4417	0.00	9.92E-06	-1.03E-02	4.55E+00
4418	0.00	9.92E-06	-1.03E-02	4.55E+00
4419	0.00	9.92E-06	-1.03E-02	4.55E+00
4420	0.00	9.92E-06	-1.03E-02	4.55E+00
4421	0.00	9.92E-06	-1.03E-02	4.55E+00
4422	0.00	9.92E-06	-1.03E-02	4.55E+00
4423	0.00	9.92E-06	-1.03E-02	4.55E+00
4424	0.00	9.92E-06	-1.03E-02	4.55E+00
4425	0.00	9.92E-06	-1.03E-02	4.55E+00
4426	0.00	9.92E-06	-1.03E-02	4.55E+00
4427	0.00	9.92E-06	-1.03E-02	4.55E+00
4428	0.00	9.92E-06	-1.03E-02	4.55E+00
4429	0.00	9.92E-06	-1.03E-02	4.55E+00
4430	0.00	9.92E-06	-1.03E-02	4.55E+00
4431	0.00	9.92E-06	-1.03E-02	4.55E+00
4432	0.00	9.92E-06	-1.03E-02	4.55E+00
4433	0.00	9.92E-06	-1.03E-02	4.55E+00
4434	0.00	9.92E-06	-1.03E-02	4.55E+00
4435	0.00	9.92E-06	-1.03E-02	4.55E+00
4436	0.00	9.92E-06	-1.03E-02	4.55E+00
4437	0.00	9.92E-06	-1.03E-02	4.55E+00
4438	0.00	9.92E-06	-1.03E-02	4.55E+00
4439	0.00	9.92E-06	-1.03E-02	4.55E+00
4440	0.00	9.92E-06	-1.03E-02	4.55E+00
4441	0.00	9.92E-06	-1.03E-02	4.55E+00
4442	0.00	9.92E-06	-1.03E-02	4.55E+00
4443	0.00	9.92E-06	-1.03E-02	4.55E+00
4444	0.00	9.92E-06	-1.03E-02	4.55E+00

4445	0.00	9.92E-06	-1.03E-02	4.55E+00
4446	0.00	9.92E-06	-1.03E-02	4.55E+00
4447	0.00	9.92E-06	-1.03E-02	4.55E+00
4448	0.00	9.92E-06	-1.03E-02	4.55E+00
4449	0.00	9.92E-06	-1.03E-02	4.55E+00
4450	0.00	9.92E-06	-1.03E-02	4.55E+00
4451	0.00	9.92E-06	-1.03E-02	4.55E+00
4452	0.00	9.92E-06	-1.03E-02	4.55E+00
4453	0.00	9.92E-06	-1.03E-02	4.55E+00
4454	0.00	9.92E-06	-1.03E-02	4.55E+00
4455	0.00	9.92E-06	-1.03E-02	4.55E+00
4456	0.00	9.92E-06	-1.03E-02	4.55E+00
4457	0.00	9.92E-06	-1.03E-02	4.55E+00
4458	0.00	9.92E-06	-1.03E-02	4.55E+00
4459	0.00	9.92E-06	-1.03E-02	4.55E+00
4460	0.00	9.92E-06	-1.03E-02	4.55E+00
4461	0.00	9.92E-06	-1.03E-02	4.55E+00
4462	0.00	9.92E-06	-1.03E-02	4.55E+00
4463	0.00	9.92E-06	-1.03E-02	4.55E+00
4464	0.00	9.92E-06	-1.03E-02	4.55E+00
4465	0.00	9.92E-06	-1.03E-02	4.55E+00
4466	0.00	9.92E-06	-1.03E-02	4.55E+00
4467	0.00	9.92E-06	-1.03E-02	4.55E+00
4468	0.00	9.92E-06	-1.03E-02	4.55E+00
4469	0.00	9.92E-06	-1.03E-02	4.55E+00
4470	0.00	9.92E-06	-1.03E-02	4.55E+00
4471	0.00	9.92E-06	-1.03E-02	4.55E+00
4472	0.00	9.92E-06	-1.03E-02	4.55E+00
4473	0.00	9.92E-06	-1.03E-02	4.55E+00
4474	0.00	9.92E-06	-1.03E-02	4.55E+00
4475	0.00	9.92E-06	-1.03E-02	4.55E+00

4476	0.00	9.92E-06	-1.03E-02	4.55E+00
4477	0.00	9.92E-06	-1.03E-02	4.55E+00
4478	0.00	9.92E-06	-1.03E-02	4.55E+00
4479	0.00	9.92E-06	-1.03E-02	4.55E+00
4480	0.00	9.92E-06	-1.03E-02	4.55E+00
4481	0.00	9.92E-06	-1.03E-02	4.55E+00
4482	0.00	9.92E-06	-1.03E-02	4.55E+00
4483	0.00	9.92E-06	-1.03E-02	4.55E+00
4484	0.00	9.92E-06	-1.03E-02	4.55E+00
4485	0.00	9.92E-06	-1.03E-02	4.55E+00
4486	0.00	9.92E-06	-1.03E-02	4.55E+00
4487	0.00	9.92E-06	-1.03E-02	4.55E+00
4488	0.00	9.92E-06	-1.03E-02	4.55E+00
4489	0.00	9.92E-06	-1.03E-02	4.55E+00
4490	0.00	9.92E-06	-1.03E-02	4.55E+00
4491	0.00	9.92E-06	-1.03E-02	4.55E+00
4492	0.00	9.92E-06	-1.03E-02	4.55E+00
4493	0.00	9.92E-06	-1.03E-02	4.55E+00
4494	0.00	9.92E-06	-1.03E-02	4.55E+00
4495	0.00	9.92E-06	-1.03E-02	4.55E+00
4496	0.00	9.92E-06	-1.03E-02	4.55E+00
4497	0.00	9.92E-06	-1.03E-02	4.55E+00
4498	0.00	9.92E-06	-1.03E-02	4.55E+00
4499	0.00	9.92E-06	-1.03E-02	4.55E+00
4500	0.00	9.92E-06	-1.03E-02	4.55E+00
4501	0.00	9.92E-06	-1.03E-02	4.55E+00
4502	0.00	9.92E-06	-1.03E-02	4.55E+00
4503	0.00	9.92E-06	-1.03E-02	4.55E+00
4504	0.00	9.92E-06	-1.03E-02	4.55E+00
4505	0.00	9.92E-06	-1.03E-02	4.55E+00
4506	0.00	9.92E-06	-1.03E-02	4.55E+00

4507	0.00	9.92E-06	-1.03E-02	4.55E+00
4508	0.00	9.92E-06	-1.03E-02	4.55E+00
4509	0.00	9.92E-06	-1.03E-02	4.55E+00
4510	0.00	9.92E-06	-1.03E-02	4.55E+00
4511	0.00	9.92E-06	-1.03E-02	4.55E+00
4512	0.00	9.92E-06	-1.03E-02	4.55E+00
4513	0.00	9.92E-06	-1.03E-02	4.55E+00
4514	0.00	9.92E-06	-1.03E-02	4.55E+00
4515	0.00	9.92E-06	-1.03E-02	4.55E+00
4516	0.00	9.92E-06	-1.03E-02	4.55E+00
4517	0.00	9.92E-06	-1.03E-02	4.55E+00
4518	0.00	9.92E-06	-1.03E-02	4.55E+00
4519	0.00	9.92E-06	-1.03E-02	4.55E+00
4520	0.00	9.92E-06	-1.03E-02	4.55E+00
4521	0.00	9.92E-06	-1.03E-02	4.55E+00
4522	0.00	9.92E-06	-1.03E-02	4.55E+00
4523	0.00	9.92E-06	-1.03E-02	4.55E+00
4524	0.00	9.92E-06	-1.03E-02	4.55E+00
4525	0.00	9.92E-06	-1.03E-02	4.55E+00
4526	0.00	9.92E-06	-1.03E-02	4.55E+00
4527	0.00	9.92E-06	-1.03E-02	4.55E+00
4528	0.00	9.92E-06	-1.03E-02	4.55E+00
4529	0.00	9.92E-06	-1.03E-02	4.55E+00
4530	0.00	9.92E-06	-1.03E-02	4.55E+00
4531	0.00	9.92E-06	-1.03E-02	4.55E+00
4532	0.00	9.92E-06	-1.03E-02	4.55E+00
4533	0.00	9.92E-06	-1.03E-02	4.55E+00
4534	0.00	9.92E-06	-1.03E-02	4.55E+00
4535	0.00	9.92E-06	-1.03E-02	4.55E+00
4536	0.00	9.92E-06	-1.03E-02	4.55E+00
4537	0.00	9.92E-06	-1.03E-02	4.55E+00

4538	0.00	9.92E-06	-1.03E-02	4.55E+00
4539	0.00	9.92E-06	-1.03E-02	4.55E+00
4540	0.00	9.92E-06	-1.03E-02	4.55E+00
4541	0.00	9.92E-06	-1.03E-02	4.55E+00
4542	0.00	9.92E-06	-1.03E-02	4.55E+00
4543	0.00	9.92E-06	-1.03E-02	4.55E+00
4544	0.00	9.92E-06	-1.03E-02	4.55E+00
4545	0.00	9.92E-06	-1.03E-02	4.55E+00
4546	0.00	9.92E-06	-1.03E-02	4.55E+00
4547	0.00	9.92E-06	-1.03E-02	4.55E+00
4548	0.00	9.92E-06	-1.03E-02	4.55E+00
4549	0.00	9.92E-06	-1.03E-02	4.55E+00
4550	0.00	9.92E-06	-1.03E-02	4.55E+00
4551	0.00	9.92E-06	-1.03E-02	4.55E+00
4552	0.00	9.92E-06	-1.03E-02	4.55E+00
4553	0.00	9.92E-06	-1.03E-02	4.55E+00
4554	0.00	9.92E-06	-1.03E-02	4.55E+00
4555	0.00	9.92E-06	-1.03E-02	4.55E+00
4556	0.00	9.92E-06	-1.03E-02	4.55E+00
4557	0.00	9.92E-06	-1.03E-02	4.55E+00
4558	0.00	9.92E-06	-1.03E-02	4.55E+00
4559	0.00	9.92E-06	-1.03E-02	4.55E+00
4560	0.00	9.92E-06	-1.03E-02	4.55E+00
4561	0.00	9.92E-06	-1.03E-02	4.55E+00
4562	0.00	9.92E-06	-1.03E-02	4.55E+00
4563	0.00	9.92E-06	-1.03E-02	4.55E+00
4564	0.00	9.92E-06	-1.03E-02	4.55E+00
4565	0.00	9.92E-06	-1.03E-02	4.55E+00
4566	0.00	9.92E-06	-1.03E-02	4.55E+00
4567	0.00	9.92E-06	-1.03E-02	4.55E+00
4568	0.00	9.92E-06	-1.03E-02	4.55E+00

4569	0.00	9.92E-06	-1.03E-02	4.55E+00
4570	0.00	9.92E-06	-1.03E-02	4.55E+00
4571	0.00	9.92E-06	-1.03E-02	4.55E+00
4572	0.00	9.92E-06	-1.03E-02	4.55E+00
4573	0.00	9.92E-06	-1.03E-02	4.55E+00
4574	0.00	9.92E-06	-1.03E-02	4.55E+00
4575	0.00	9.92E-06	-1.03E-02	4.55E+00
4576	0.00	9.92E-06	-1.03E-02	4.55E+00
4577	0.00	9.92E-06	-1.03E-02	4.55E+00
4578	0.00	9.92E-06	-1.03E-02	4.55E+00
4579	0.00	9.92E-06	-1.03E-02	4.55E+00
4580	0.00	9.92E-06	-1.03E-02	4.55E+00
4581	0.00	9.92E-06	-1.03E-02	4.55E+00
4582	0.00	9.92E-06	-1.03E-02	4.55E+00
4583	0.00	9.92E-06	-1.03E-02	4.55E+00
4584	0.00	9.92E-06	-1.03E-02	4.55E+00
4585	0.00	9.92E-06	-1.03E-02	4.55E+00
4586	0.00	9.92E-06	-1.03E-02	4.55E+00
4587	0.00	9.92E-06	-1.03E-02	4.55E+00
4588	0.00	9.92E-06	-1.03E-02	4.55E+00
4589	0.00	9.92E-06	-1.03E-02	4.55E+00
4590	0.00	9.92E-06	-1.03E-02	4.55E+00
4591	0.00	9.92E-06	-1.03E-02	4.55E+00
4592	0.00	9.92E-06	-1.03E-02	4.55E+00
4593	0.00	9.92E-06	-1.03E-02	4.55E+00
4594	0.00	9.92E-06	-1.03E-02	4.55E+00
4595	0.00	9.92E-06	-1.03E-02	4.55E+00
4596	0.00	9.92E-06	-1.03E-02	4.55E+00
4597	0.00	9.92E-06	-1.03E-02	4.55E+00
4598	0.00	9.92E-06	-1.03E-02	4.55E+00
4599	0.00	9.92E-06	-1.03E-02	4.55E+00

4600	0.00	9.92E-06	-1.03E-02	4.55E+00
4601	0.00	9.92E-06	-1.03E-02	4.55E+00
4602	0.00	9.92E-06	-1.03E-02	4.55E+00
4603	0.00	9.92E-06	-1.03E-02	4.55E+00
4604	0.00	9.92E-06	-1.03E-02	4.55E+00
4605	0.00	9.92E-06	-1.03E-02	4.55E+00
4606	0.00	9.92E-06	-1.03E-02	4.55E+00
4607	0.00	9.92E-06	-1.03E-02	4.55E+00
4608	0.00	9.92E-06	-1.03E-02	4.55E+00
4609	0.00	9.92E-06	-1.03E-02	4.55E+00
4610	0.00	9.92E-06	-1.03E-02	4.55E+00
4611	0.00	9.92E-06	-1.03E-02	4.55E+00
4612	0.00	9.92E-06	-1.03E-02	4.55E+00
4613	0.00	9.92E-06	-1.03E-02	4.55E+00
4614	0.00	9.92E-06	-1.03E-02	4.55E+00
4615	0.00	9.92E-06	-1.03E-02	4.55E+00
4616	0.00	9.92E-06	-1.03E-02	4.55E+00
4617	0.00	9.92E-06	-1.03E-02	4.55E+00
4618	0.00	9.92E-06	-1.03E-02	4.55E+00
4619	0.00	9.92E-06	-1.03E-02	4.55E+00
4620	0.00	9.92E-06	-1.03E-02	4.55E+00
4621	0.00	9.92E-06	-1.03E-02	4.55E+00
4622	0.00	9.92E-06	-1.03E-02	4.55E+00
4623	0.00	9.92E-06	-1.03E-02	4.55E+00
4624	0.00	9.92E-06	-1.03E-02	4.55E+00
4625	0.00	9.92E-06	-1.03E-02	4.55E+00
4626	0.00	9.92E-06	-1.03E-02	4.55E+00
4627	0.00	9.92E-06	-1.03E-02	4.55E+00
4628	0.00	9.92E-06	-1.03E-02	4.55E+00
4629	0.00	9.92E-06	-1.03E-02	4.55E+00
4630	0.00	9.92E-06	-1.03E-02	4.55E+00

4631	0.00	9.92E-06	-1.03E-02	4.55E+00
4632	0.00	9.92E-06	-1.03E-02	4.55E+00
4633	0.00	9.92E-06	-1.03E-02	4.55E+00
4634	0.00	9.92E-06	-1.03E-02	4.55E+00
4635	0.00	9.92E-06	-1.03E-02	4.55E+00
4636	0.00	9.92E-06	-1.03E-02	4.55E+00
4637	0.00	9.92E-06	-1.03E-02	4.55E+00
4638	0.00	9.92E-06	-1.03E-02	4.55E+00
4639	0.00	9.92E-06	-1.03E-02	4.55E+00
4640	0.00	9.92E-06	-1.03E-02	4.55E+00
4641	0.00	9.92E-06	-1.03E-02	4.55E+00
4642	0.00	9.92E-06	-1.03E-02	4.55E+00
4643	0.00	9.92E-06	-1.03E-02	4.55E+00
4644	0.00	9.92E-06	-1.03E-02	4.55E+00
4645	0.00	9.92E-06	-1.03E-02	4.55E+00
4646	0.00	9.92E-06	-1.03E-02	4.55E+00
4647	0.00	9.92E-06	-1.03E-02	4.55E+00
4648	0.00	9.92E-06	-1.03E-02	4.55E+00
4649	0.00	9.92E-06	-1.03E-02	4.55E+00
4650	0.00	9.92E-06	-1.03E-02	4.55E+00
4651	0.00	9.92E-06	-1.03E-02	4.55E+00
4652	0.00	9.92E-06	-1.03E-02	4.55E+00
4653	0.00	9.92E-06	-1.03E-02	4.55E+00
4654	0.00	9.92E-06	-1.03E-02	4.55E+00
4655	0.00	9.92E-06	-1.03E-02	4.55E+00
4656	0.00	9.92E-06	-1.03E-02	4.55E+00
4657	0.00	9.92E-06	-1.03E-02	4.55E+00
4658	0.00	9.92E-06	-1.03E-02	4.55E+00
4659	0.00	9.92E-06	-1.03E-02	4.55E+00
4660	0.00	9.92E-06	-1.03E-02	4.55E+00
4661	0.00	9.92E-06	-1.03E-02	4.55E+00

4662	0.00	9.92E-06	-1.03E-02	4.55E+00
4663	0.00	9.92E-06	-1.03E-02	4.55E+00
4664	0.00	9.92E-06	-1.03E-02	4.55E+00
4665	0.00	9.92E-06	-1.03E-02	4.55E+00
4666	0.00	9.92E-06	-1.03E-02	4.55E+00
4667	0.00	9.92E-06	-1.03E-02	4.55E+00
4668	0.00	9.92E-06	-1.03E-02	4.55E+00
4669	0.00	9.92E-06	-1.03E-02	4.55E+00
4670	0.00	9.92E-06	-1.03E-02	4.55E+00
4671	0.00	9.92E-06	-1.03E-02	4.55E+00
4672	0.00	9.92E-06	-1.03E-02	4.55E+00
4673	0.00	9.92E-06	-1.03E-02	4.55E+00
4674	0.00	9.92E-06	-1.03E-02	4.55E+00
4675	0.00	9.92E-06	-1.03E-02	4.55E+00
4676	0.00	9.92E-06	-1.03E-02	4.55E+00
4677	0.00	9.92E-06	-1.03E-02	4.55E+00
4678	0.00	9.92E-06	-1.03E-02	4.55E+00
4679	0.00	9.92E-06	-1.03E-02	4.55E+00
4680	0.00	9.92E-06	-1.03E-02	4.55E+00
4681	0.00	9.92E-06	-1.03E-02	4.55E+00
4682	0.00	9.92E-06	-1.03E-02	4.55E+00
4683	0.00	9.92E-06	-1.03E-02	4.55E+00
4684	0.00	9.92E-06	-1.03E-02	4.55E+00
4685	0.00	9.92E-06	-1.03E-02	4.55E+00
4686	0.00	9.92E-06	-1.03E-02	4.55E+00
4687	0.00	9.92E-06	-1.03E-02	4.55E+00
4688	0.00	9.92E-06	-1.03E-02	4.55E+00
4689	0.00	9.92E-06	-1.03E-02	4.55E+00
4690	0.00	9.92E-06	-1.03E-02	4.55E+00
4691	0.00	9.92E-06	-1.03E-02	4.55E+00
4692	0.00	9.92E-06	-1.03E-02	4.55E+00

4693	0.00	9.92E-06	-1.03E-02	4.55E+00
4694	0.00	9.92E-06	-1.03E-02	4.55E+00
4695	0.00	9.92E-06	-1.03E-02	4.55E+00
4696	0.00	9.92E-06	-1.03E-02	4.55E+00
4697	0.00	9.92E-06	-1.03E-02	4.55E+00
4698	0.00	9.92E-06	-1.03E-02	4.55E+00
4699	0.00	9.92E-06	-1.03E-02	4.55E+00
4700	0.00	9.92E-06	-1.03E-02	4.55E+00
4701	0.00	9.92E-06	-1.03E-02	4.55E+00
4702	0.00	9.92E-06	-1.03E-02	4.55E+00
4703	0.00	9.92E-06	-1.03E-02	4.55E+00
4704	0.00	9.92E-06	-1.03E-02	4.55E+00
4705	0.00	9.92E-06	-1.03E-02	4.55E+00
4706	0.00	9.92E-06	-1.03E-02	4.55E+00
4707	0.00	9.92E-06	-1.03E-02	4.55E+00
4708	0.00	9.92E-06	-1.03E-02	4.55E+00
4709	0.00	9.92E-06	-1.03E-02	4.55E+00
4710	0.00	9.92E-06	-1.03E-02	4.55E+00
4711	0.00	9.92E-06	-1.03E-02	4.55E+00
4712	0.00	9.92E-06	-1.03E-02	4.55E+00
4713	0.00	9.92E-06	-1.03E-02	4.55E+00
4714	0.00	9.92E-06	-1.03E-02	4.55E+00
4715	0.00	9.92E-06	-1.03E-02	4.55E+00
4716	0.00	9.92E-06	-1.03E-02	4.55E+00
4717	0.00	9.92E-06	-1.03E-02	4.55E+00
4718	0.00	9.92E-06	-1.03E-02	4.55E+00
4719	0.00	9.92E-06	-1.03E-02	4.55E+00
4720	0.00	9.92E-06	-1.03E-02	4.55E+00
4721	0.00	9.92E-06	-1.03E-02	4.55E+00
4722	0.00	9.92E-06	-1.03E-02	4.55E+00
4723	0.00	9.92E-06	-1.03E-02	4.55E+00

4724	0.00	9.92E-06	-1.03E-02	4.55E+00
4725	0.00	9.92E-06	-1.03E-02	4.55E+00
4726	0.00	9.92E-06	-1.03E-02	4.55E+00
4727	0.00	9.92E-06	-1.03E-02	4.55E+00
4728	0.00	9.92E-06	-1.03E-02	4.55E+00
4729	0.00	9.92E-06	-1.03E-02	4.55E+00
4730	0.00	9.92E-06	-1.03E-02	4.55E+00
4731	0.00	9.92E-06	-1.03E-02	4.55E+00
4732	0.00	9.92E-06	-1.03E-02	4.55E+00
4733	0.00	9.92E-06	-1.03E-02	4.55E+00
4734	0.00	9.92E-06	-1.03E-02	4.55E+00
4735	0.00	9.92E-06	-1.03E-02	4.55E+00
4736	0.00	9.92E-06	-1.03E-02	4.55E+00
4737	0.00	9.92E-06	-1.03E-02	4.55E+00
4738	0.00	9.92E-06	-1.03E-02	4.55E+00
4739	0.00	9.92E-06	-1.03E-02	4.55E+00
4740	0.00	9.92E-06	-1.03E-02	4.55E+00
4741	0.00	9.92E-06	-1.03E-02	4.55E+00
4742	0.00	9.92E-06	-1.03E-02	4.55E+00
4743	0.00	9.92E-06	-1.03E-02	4.55E+00
4744	0.00	9.92E-06	-1.03E-02	4.55E+00
4745	0.00	9.92E-06	-1.03E-02	4.55E+00
4746	0.00	9.92E-06	-1.03E-02	4.55E+00
4747	0.00	9.92E-06	-1.03E-02	4.55E+00
4748	0.00	9.92E-06	-1.03E-02	4.55E+00
4749	0.00	9.92E-06	-1.03E-02	4.55E+00
4750	0.00	9.92E-06	-1.03E-02	4.55E+00
4751	0.00	9.92E-06	-1.03E-02	4.55E+00
4752	0.00	9.92E-06	-1.03E-02	4.55E+00
4753	0.00	9.92E-06	-1.03E-02	4.55E+00
4754	0.00	9.92E-06	-1.03E-02	4.55E+00

4755	0.00	9.92E-06	-1.03E-02	4.55E+00
4756	0.00	9.92E-06	-1.03E-02	4.55E+00
4757	0.00	9.92E-06	-1.03E-02	4.55E+00
4758	0.00	9.92E-06	-1.03E-02	4.55E+00
4759	0.00	9.92E-06	-1.03E-02	4.55E+00
4760	0.00	9.92E-06	-1.03E-02	4.55E+00
4761	0.00	9.92E-06	-1.03E-02	4.55E+00
4762	0.00	9.92E-06	-1.03E-02	4.55E+00
4763	0.00	9.92E-06	-1.03E-02	4.55E+00
4764	0.00	9.92E-06	-1.03E-02	4.55E+00
4765	0.00	9.92E-06	-1.03E-02	4.55E+00
4766	0.00	9.92E-06	-1.03E-02	4.55E+00
4767	0.00	9.92E-06	-1.03E-02	4.55E+00
4768	0.00	9.92E-06	-1.03E-02	4.55E+00
4769	0.00	9.92E-06	-1.03E-02	4.55E+00
4770	0.00	9.92E-06	-1.03E-02	4.55E+00
4771	0.00	9.92E-06	-1.03E-02	4.55E+00
4772	0.00	9.92E-06	-1.03E-02	4.55E+00
4773	0.00	9.92E-06	-1.03E-02	4.55E+00
4774	0.00	9.92E-06	-1.03E-02	4.55E+00
4775	0.00	9.92E-06	-1.03E-02	4.55E+00
4776	0.00	9.92E-06	-1.03E-02	4.55E+00
4777	0.00	9.92E-06	-1.03E-02	4.55E+00
4778	0.00	9.92E-06	-1.03E-02	4.55E+00
4779	0.00	9.92E-06	-1.03E-02	4.55E+00
4780	0.00	9.92E-06	-1.03E-02	4.55E+00
4781	0.00	9.92E-06	-1.03E-02	4.55E+00
4782	0.00	9.92E-06	-1.03E-02	4.55E+00
4783	0.00	9.92E-06	-1.03E-02	4.55E+00
4784	0.00	9.92E-06	-1.03E-02	4.55E+00
4785	0.00	9.92E-06	-1.03E-02	4.55E+00

4786	0.00	9.92E-06	-1.03E-02	4.55E+00
4787	0.00	9.92E-06	-1.03E-02	4.55E+00
4788	0.00	9.92E-06	-1.03E-02	4.55E+00
4789	0.00	9.92E-06	-1.03E-02	4.55E+00
4790	0.00	9.92E-06	-1.03E-02	4.55E+00
4791	0.00	9.92E-06	-1.03E-02	4.55E+00
4792	0.00	9.92E-06	-1.03E-02	4.55E+00
4793	0.00	9.92E-06	-1.03E-02	4.55E+00
4794	0.00	9.92E-06	-1.03E-02	4.55E+00
4795	0.00	9.92E-06	-1.03E-02	4.55E+00
4796	0.00	9.92E-06	-1.03E-02	4.55E+00
4797	0.00	9.92E-06	-1.03E-02	4.55E+00
4798	0.00	9.92E-06	-1.03E-02	4.55E+00
4799	0.00	9.92E-06	-1.03E-02	4.55E+00
4800	0.00	9.92E-06	-1.03E-02	4.55E+00
4801	0.00	9.92E-06	-1.03E-02	4.55E+00
4802	0.00	9.92E-06	-1.03E-02	4.55E+00
4803	0.00	9.92E-06	-1.03E-02	4.55E+00
4804	0.00	9.92E-06	-1.03E-02	4.55E+00
4805	0.00	9.92E-06	-1.03E-02	4.55E+00
4806	0.00	9.92E-06	-1.03E-02	4.55E+00
4807	0.00	9.92E-06	-1.03E-02	4.55E+00
4808	0.00	9.92E-06	-1.03E-02	4.55E+00
4809	0.00	9.92E-06	-1.03E-02	4.55E+00
4810	0.00	9.92E-06	-1.03E-02	4.55E+00
4811	0.00	9.92E-06	-1.03E-02	4.55E+00
4812	0.00	9.92E-06	-1.03E-02	4.55E+00
4813	0.00	9.92E-06	-1.03E-02	4.55E+00
4814	0.00	9.92E-06	-1.03E-02	4.55E+00
4815	0.00	9.92E-06	-1.03E-02	4.55E+00
4816	0.00	9.92E-06	-1.03E-02	4.55E+00

4817	0.00	9.92E-06	-1.03E-02	4.55E+00
4818	0.00	9.92E-06	-1.03E-02	4.55E+00
4819	0.00	9.92E-06	-1.03E-02	4.55E+00
4820	0.00	9.92E-06	-1.03E-02	4.55E+00
4821	0.00	9.92E-06	-1.03E-02	4.55E+00
4822	0.00	9.92E-06	-1.03E-02	4.55E+00
4823	0.00	9.92E-06	-1.03E-02	4.55E+00
4824	0.00	9.92E-06	-1.03E-02	4.55E+00
4825	0.00	9.92E-06	-1.03E-02	4.55E+00
4826	0.00	9.92E-06	-1.03E-02	4.55E+00
4827	0.00	9.92E-06	-1.03E-02	4.55E+00
4828	0.00	9.92E-06	-1.03E-02	4.55E+00
4829	0.00	9.92E-06	-1.03E-02	4.55E+00
4830	0.00	9.92E-06	-1.03E-02	4.55E+00
4831	0.00	9.92E-06	-1.03E-02	4.55E+00
4832	0.00	9.92E-06	-1.03E-02	4.55E+00
4833	0.00	9.92E-06	-1.03E-02	4.55E+00
4834	0.00	9.92E-06	-1.03E-02	4.55E+00
4835	0.00	9.92E-06	-1.03E-02	4.55E+00
4836	0.00	9.92E-06	-1.03E-02	4.55E+00
4837	0.00	9.92E-06	-1.03E-02	4.55E+00
4838	0.00	9.92E-06	-1.03E-02	4.55E+00
4839	0.00	9.92E-06	-1.03E-02	4.55E+00
4840	0.00	9.92E-06	-1.03E-02	4.55E+00
4841	0.00	9.92E-06	-1.03E-02	4.55E+00
4842	0.00	9.92E-06	-1.03E-02	4.55E+00
4843	0.00	9.92E-06	-1.03E-02	4.55E+00
4844	0.00	9.92E-06	-1.03E-02	4.55E+00
4845	0.00	9.92E-06	-1.03E-02	4.55E+00
4846	0.00	9.92E-06	-1.03E-02	4.55E+00
4847	0.00	9.92E-06	-1.03E-02	4.55E+00

4848	0.00	9.92E-06	-1.03E-02	4.55E+00
4849	0.00	9.92E-06	-1.03E-02	4.55E+00
4850	0.00	9.92E-06	-1.03E-02	4.55E+00
4851	0.00	9.92E-06	-1.03E-02	4.55E+00
4852	0.00	9.92E-06	-1.03E-02	4.55E+00
4853	0.00	9.92E-06	-1.03E-02	4.55E+00
4854	0.00	9.92E-06	-1.03E-02	4.55E+00
4855	0.00	9.92E-06	-1.03E-02	4.55E+00
4856	0.00	9.92E-06	-1.03E-02	4.55E+00
4857	0.00	9.92E-06	-1.03E-02	4.55E+00
4858	0.00	9.92E-06	-1.03E-02	4.55E+00
4859	0.00	9.92E-06	-1.03E-02	4.55E+00
4860	0.00	9.92E-06	-1.03E-02	4.55E+00
4861	0.00	9.92E-06	-1.03E-02	4.55E+00
4862	0.00	9.92E-06	-1.03E-02	4.55E+00
4863	0.00	9.92E-06	-1.03E-02	4.55E+00
4864	0.00	9.92E-06	-1.03E-02	4.55E+00
4865	0.00	9.92E-06	-1.03E-02	4.55E+00
4866	0.00	9.92E-06	-1.03E-02	4.55E+00
4867	0.00	9.92E-06	-1.03E-02	4.55E+00
4868	0.00	9.92E-06	-1.03E-02	4.55E+00
4869	0.00	9.92E-06	-1.03E-02	4.55E+00
4870	0.00	9.92E-06	-1.03E-02	4.55E+00
4871	0.00	9.92E-06	-1.03E-02	4.55E+00
4872	0.00	9.92E-06	-1.03E-02	4.55E+00
4873	0.00	9.92E-06	-1.03E-02	4.55E+00
4874	0.00	9.92E-06	-1.03E-02	4.55E+00
4875	0.00	9.92E-06	-1.03E-02	4.55E+00
4876	0.00	9.92E-06	-1.03E-02	4.55E+00
4877	0.40	9.92E-06	-1.03E-02	4.55E+00
4878	1.15	9.92E-06	-1.03E-02	4.55E+00

4879	1.82	9.92E-06	-1.03E-02	4.55E+00
4880	2.12	9.92E-06	-1.03E-02	4.55E+00
4881	2.56	9.92E-06	-1.03E-02	4.55E+00
4882	2.83	9.92E-06	-1.03E-02	4.55E+00
4883	2.94	9.92E-06	-1.03E-02	4.55E+00
4884	3.14	9.92E-06	-1.03E-02	4.55E+00
4885	3.52	9.92E-06	-1.03E-02	4.55E+00
4886	4.07	9.92E-06	-1.03E-02	4.55E+00
4887	4.76	9.92E-06	-1.03E-02	4.55E+00
4888	5.16	9.92E-06	-1.03E-02	4.55E+00
4889	5.44	9.92E-06	-1.03E-02	4.55E+00
4890	6.08	9.92E-06	-1.03E-02	4.55E+00
4891	6.49	9.92E-06	-1.03E-02	4.55E+00
4892	7.04	9.92E-06	-1.03E-02	4.55E+00
4893	7.06	9.92E-06	-1.03E-02	4.55E+00
4894	7.30	9.92E-06	-1.03E-02	4.55E+00
4895	7.15	9.92E-06	-1.03E-02	4.55E+00
4896	6.79	9.92E-06	-1.03E-02	4.55E+00
4897	6.08	9.92E-06	-1.03E-02	4.55E+00
4898	5.20	9.92E-06	-1.03E-02	4.55E+00
4899	4.00	9.92E-06	-1.03E-02	4.55E+00
4900	2.69	9.92E-06	-1.03E-02	4.55E+00
4901	1.30	9.92E-06	-1.03E-02	4.55E+00
4902	0.37	9.92E-06	-1.03E-02	4.55E+00
4903	0.00	9.92E-06	-1.03E-02	4.55E+00
4904	0.00	9.92E-06	-1.03E-02	4.55E+00
4905	0.00	9.92E-06	-1.03E-02	4.55E+00
4906	0.00	9.92E-06	-1.03E-02	4.55E+00
4907	0.00	9.92E-06	-1.03E-02	4.55E+00
4908	0.00	9.92E-06	-1.03E-02	4.55E+00
4909	0.00	9.92E-06	-1.03E-02	4.55E+00

4910	0.00	9.92E-06	-1.03E-02	4.55E+00
4911	0.00	9.92E-06	-1.03E-02	4.55E+00
4912	0.00	9.92E-06	-1.03E-02	4.55E+00
4913	0.00	9.92E-06	-1.03E-02	4.55E+00
4914	0.00	9.92E-06	-1.03E-02	4.55E+00
4915	0.00	9.92E-06	-1.03E-02	4.55E+00
4916	0.00	9.92E-06	-1.03E-02	4.55E+00
4917	0.00	9.92E-06	-1.03E-02	4.55E+00
4918	0.00	9.92E-06	-1.03E-02	4.55E+00
4919	0.00	9.92E-06	-1.03E-02	4.55E+00
4920	0.00	9.40E-06	-9.78E-03	4.27E+00
4921	0.00	8.88E-06	-9.20E-03	3.99E+00
4922	0.00	8.35E-06	-8.63E-03	3.71E+00
4923	0.00	8.35E-06	-8.63E-03	3.71E+00
4924	0.00	8.35E-06	-8.63E-03	3.71E+00
4925	0.00	8.35E-06	-8.63E-03	3.71E+00
4926	0.00	8.35E-06	-8.63E-03	3.71E+00
4927	0.00	8.35E-06	-8.63E-03	3.71E+00
4928	0.00	8.35E-06	-8.63E-03	3.71E+00
4929	0.00	8.35E-06	-8.63E-03	3.71E+00
4930	0.00	8.35E-06	-8.63E-03	3.71E+00
4931	0.00	8.35E-06	-8.63E-03	3.71E+00
4932	0.00	8.35E-06	-8.63E-03	3.71E+00
4933	0.00	8.35E-06	-8.63E-03	3.71E+00
4934	0.00	8.35E-06	-8.63E-03	3.71E+00
4935	0.00	8.35E-06	-8.63E-03	3.71E+00
4936	0.00	8.35E-06	-8.63E-03	3.71E+00
4937	0.00	8.35E-06	-8.63E-03	3.71E+00
4938	0.00	8.35E-06	-8.63E-03	3.71E+00
4939	0.00	8.35E-06	-8.63E-03	3.71E+00
4940	0.00	8.35E-06	-8.63E-03	3.71E+00

4941	0.00	8.35E-06	-8.63E-03	3.71E+00
4942	0.00	8.35E-06	-8.63E-03	3.71E+00
4943	0.00	8.35E-06	-8.63E-03	3.71E+00
4944	0.00	8.35E-06	-8.63E-03	3.71E+00
4945	0.00	8.35E-06	-8.63E-03	3.71E+00
4946	0.00	8.35E-06	-8.63E-03	3.71E+00
4947	0.00	8.35E-06	-8.63E-03	3.71E+00
4948	0.00	8.35E-06	-8.63E-03	3.71E+00
4949	0.00	8.35E-06	-8.63E-03	3.71E+00
4950	0.00	8.35E-06	-8.63E-03	3.71E+00
4951	0.00	8.35E-06	-8.63E-03	3.71E+00
4952	0.00	8.35E-06	-8.63E-03	3.71E+00
4953	0.00	8.35E-06	-8.63E-03	3.71E+00
4954	0.00	8.35E-06	-8.63E-03	3.71E+00
4955	0.00	8.35E-06	-8.63E-03	3.71E+00
4956	0.00	8.35E-06	-8.63E-03	3.71E+00
4957	0.00	8.35E-06	-8.63E-03	3.71E+00
4958	0.00	8.35E-06	-8.63E-03	3.71E+00
4959	0.00	8.35E-06	-8.63E-03	3.71E+00
4960	0.00	8.35E-06	-8.63E-03	3.71E+00
4961	0.00	8.35E-06	-8.63E-03	3.71E+00
4962	0.00	8.35E-06	-8.63E-03	3.71E+00
4963	0.00	8.35E-06	-8.63E-03	3.71E+00
4964	0.00	8.35E-06	-8.63E-03	3.71E+00
4965	0.00	8.35E-06	-8.63E-03	3.71E+00
4966	0.00	8.35E-06	-8.63E-03	3.71E+00
4967	0.00	8.35E-06	-8.63E-03	3.71E+00
4968	0.00	8.35E-06	-8.63E-03	3.71E+00
4969	0.00	8.35E-06	-8.63E-03	3.71E+00
4970	0.00	8.35E-06	-8.63E-03	3.71E+00
4971	0.00	8.35E-06	-8.63E-03	3.71E+00

4972	0.00	8.35E-06	-8.63E-03	3.71E+00
4973	0.00	8.35E-06	-8.63E-03	3.71E+00
4974	0.00	8.35E-06	-8.63E-03	3.71E+00
4975	0.00	8.35E-06	-8.63E-03	3.71E+00
4976	0.00	8.35E-06	-8.63E-03	3.71E+00
4977	0.00	8.35E-06	-8.63E-03	3.71E+00
4978	0.00	8.35E-06	-8.63E-03	3.71E+00
4979	0.00	8.35E-06	-8.63E-03	3.71E+00
4980	0.00	8.35E-06	-8.63E-03	3.71E+00
4981	0.00	8.35E-06	-8.63E-03	3.71E+00
4982	0.00	8.35E-06	-8.63E-03	3.71E+00
4983	0.00	8.35E-06	-8.63E-03	3.71E+00
4984	0.00	8.35E-06	-8.63E-03	3.71E+00
4985	0.00	8.35E-06	-8.63E-03	3.71E+00
4986	0.00	8.35E-06	-8.63E-03	3.71E+00
4987	0.00	8.35E-06	-8.63E-03	3.71E+00
4988	0.00	8.35E-06	-8.63E-03	3.71E+00
4989	0.00	8.35E-06	-8.63E-03	3.71E+00
4990	0.00	8.35E-06	-8.63E-03	3.71E+00
4991	0.00	8.35E-06	-8.63E-03	3.71E+00
4992	0.00	8.35E-06	-8.63E-03	3.71E+00
4993	0.00	8.35E-06	-8.63E-03	3.71E+00
4994	0.00	8.35E-06	-8.63E-03	3.71E+00
4995	0.00	8.35E-06	-8.63E-03	3.71E+00
4996	0.00	8.35E-06	-8.63E-03	3.71E+00
4997	0.00	8.35E-06	-8.63E-03	3.71E+00
4998	0.00	8.35E-06	-8.63E-03	3.71E+00
4999	0.00	8.35E-06	-8.63E-03	3.71E+00
5000	0.00	8.35E-06	-8.63E-03	3.71E+00
5001	0.00	8.35E-06	-8.63E-03	3.71E+00
5002	0.00	8.35E-06	-8.63E-03	3.71E+00

5003	0.00	8.35E-06	-8.63E-03	3.71E+00
5004	0.00	8.35E-06	-8.63E-03	3.71E+00
5005	0.00	8.35E-06	-8.63E-03	3.71E+00
5006	0.00	8.35E-06	-8.63E-03	3.71E+00
5007	0.00	8.35E-06	-8.63E-03	3.71E+00
5008	0.00	8.35E-06	-8.63E-03	3.71E+00
5009	0.00	8.35E-06	-8.63E-03	3.71E+00
5010	0.00	8.35E-06	-8.63E-03	3.71E+00
5011	0.00	8.35E-06	-8.63E-03	3.71E+00
5012	0.00	8.35E-06	-8.63E-03	3.71E+00
5013	0.00	8.35E-06	-8.63E-03	3.71E+00
5014	0.00	8.35E-06	-8.63E-03	3.71E+00
5015	0.00	8.35E-06	-8.63E-03	3.71E+00
5016	0.00	8.35E-06	-8.63E-03	3.71E+00
5017	0.00	8.35E-06	-8.63E-03	3.71E+00
5018	0.00	8.35E-06	-8.63E-03	3.71E+00
5019	0.00	8.35E-06	-8.63E-03	3.71E+00
5020	0.00	8.35E-06	-8.63E-03	3.71E+00
5021	0.00	8.35E-06	-8.63E-03	3.71E+00
5022	0.00	8.35E-06	-8.63E-03	3.71E+00
5023	0.00	8.35E-06	-8.63E-03	3.71E+00
5024	0.00	8.35E-06	-8.63E-03	3.71E+00
5025	0.00	8.35E-06	-8.63E-03	3.71E+00
5026	0.00	8.35E-06	-8.63E-03	3.71E+00
5027	0.00	8.35E-06	-8.63E-03	3.71E+00
5028	0.00	8.35E-06	-8.63E-03	3.71E+00
5029	0.00	8.35E-06	-8.63E-03	3.71E+00
5030	0.00	8.35E-06	-8.63E-03	3.71E+00
5031	0.00	8.35E-06	-8.63E-03	3.71E+00
5032	0.00	8.35E-06	-8.63E-03	3.71E+00
5033	0.00	8.35E-06	-8.63E-03	3.71E+00

5034	0.00	8.35E-06	-8.63E-03	3.71E+00
5035	0.00	8.35E-06	-8.63E-03	3.71E+00
5036	0.00	8.35E-06	-8.63E-03	3.71E+00
5037	0.00	8.35E-06	-8.63E-03	3.71E+00
5038	0.00	8.35E-06	-8.63E-03	3.71E+00
5039	0.00	8.35E-06	-8.63E-03	3.71E+00
5040	0.00	8.35E-06	-8.63E-03	3.71E+00
5041	0.00	8.35E-06	-8.63E-03	3.71E+00
5042	0.00	8.35E-06	-8.63E-03	3.71E+00
5043	0.00	8.35E-06	-8.63E-03	3.71E+00
5044	0.00	8.35E-06	-8.63E-03	3.71E+00
5045	0.00	8.35E-06	-8.63E-03	3.71E+00
5046	0.00	8.35E-06	-8.63E-03	3.71E+00
5047	0.00	8.35E-06	-8.63E-03	3.71E+00
5048	0.00	8.35E-06	-8.63E-03	3.71E+00
5049	0.00	8.35E-06	-8.63E-03	3.71E+00
5050	0.00	8.35E-06	-8.63E-03	3.71E+00
5051	0.00	8.35E-06	-8.63E-03	3.71E+00
5052	0.00	8.35E-06	-8.63E-03	3.71E+00
5053	0.00	8.35E-06	-8.63E-03	3.71E+00
5054	0.00	8.35E-06	-8.63E-03	3.71E+00
5055	0.00	8.35E-06	-8.63E-03	3.71E+00
5056	0.00	8.35E-06	-8.63E-03	3.71E+00
5057	0.00	8.35E-06	-8.63E-03	3.71E+00
5058	0.00	8.35E-06	-8.63E-03	3.71E+00
5059	0.00	8.35E-06	-8.63E-03	3.71E+00
5060	0.00	8.35E-06	-8.63E-03	3.71E+00
5061	0.00	8.35E-06	-8.63E-03	3.71E+00
5062	0.00	8.35E-06	-8.63E-03	3.71E+00
5063	0.00	8.35E-06	-8.63E-03	3.71E+00
5064	0.00	8.35E-06	-8.63E-03	3.71E+00

5065	0.00	8.35E-06	-8.63E-03	3.71E+00
5066	0.00	8.35E-06	-8.63E-03	3.71E+00
5067	0.00	8.35E-06	-8.63E-03	3.71E+00
5068	0.00	8.35E-06	-8.63E-03	3.71E+00
5069	0.00	8.35E-06	-8.63E-03	3.71E+00
5070	0.00	8.35E-06	-8.63E-03	3.71E+00
5071	0.00	8.35E-06	-8.63E-03	3.71E+00
5072	0.00	8.35E-06	-8.63E-03	3.71E+00
5073	0.00	8.35E-06	-8.63E-03	3.71E+00
5074	0.00	8.35E-06	-8.63E-03	3.71E+00
5075	0.00	8.35E-06	-8.63E-03	3.71E+00
5076	0.00	8.35E-06	-8.63E-03	3.71E+00
5077	0.00	8.35E-06	-8.63E-03	3.71E+00
5078	0.00	8.35E-06	-8.63E-03	3.71E+00
5079	0.00	8.35E-06	-8.63E-03	3.71E+00
5080	0.00	8.35E-06	-8.63E-03	3.71E+00
5081	0.00	8.35E-06	-8.63E-03	3.71E+00
5082	0.00	8.35E-06	-8.63E-03	3.71E+00
5083	0.00	8.35E-06	-8.63E-03	3.71E+00
5084	0.00	8.35E-06	-8.63E-03	3.71E+00
5085	0.00	8.35E-06	-8.63E-03	3.71E+00
5086	0.00	8.35E-06	-8.63E-03	3.71E+00
5087	0.00	8.35E-06	-8.63E-03	3.71E+00
5088	0.00	8.35E-06	-8.63E-03	3.71E+00
5089	0.00	8.35E-06	-8.63E-03	3.71E+00
5090	0.00	8.35E-06	-8.63E-03	3.71E+00
5091	0.00	8.35E-06	-8.63E-03	3.71E+00
5092	0.00	8.35E-06	-8.63E-03	3.71E+00
5093	0.00	8.35E-06	-8.63E-03	3.71E+00
5094	0.00	8.35E-06	-8.63E-03	3.71E+00
5095	0.00	8.35E-06	-8.63E-03	3.71E+00

5096	0.00	8.35E-06	-8.63E-03	3.71E+00
5097	0.00	8.35E-06	-8.63E-03	3.71E+00
5098	0.00	8.35E-06	-8.63E-03	3.71E+00
5099	0.00	8.35E-06	-8.63E-03	3.71E+00
5100	0.00	8.35E-06	-8.63E-03	3.71E+00
5101	0.00	8.35E-06	-8.63E-03	3.71E+00
5102	0.00	8.35E-06	-8.63E-03	3.71E+00
5103	0.00	8.35E-06	-8.63E-03	3.71E+00
5104	0.00	8.35E-06	-8.63E-03	3.71E+00
5105	0.00	8.35E-06	-8.63E-03	3.71E+00
5106	0.00	8.35E-06	-8.63E-03	3.71E+00
5107	0.00	8.35E-06	-8.63E-03	3.71E+00
5108	0.00	8.35E-06	-8.63E-03	3.71E+00
5109	0.00	8.35E-06	-8.63E-03	3.71E+00
5110	0.00	8.35E-06	-8.63E-03	3.71E+00
5111	0.00	8.35E-06	-8.63E-03	3.71E+00
5112	0.00	8.35E-06	-8.63E-03	3.71E+00
5113	0.00	8.35E-06	-8.63E-03	3.71E+00
5114	0.00	8.35E-06	-8.63E-03	3.71E+00
5115	0.00	8.35E-06	-8.63E-03	3.71E+00
5116	0.00	8.35E-06	-8.63E-03	3.71E+00
5117	0.00	8.35E-06	-8.63E-03	3.71E+00
5118	0.00	8.35E-06	-8.63E-03	3.71E+00
5119	0.00	8.35E-06	-8.63E-03	3.71E+00
5120	0.00	8.35E-06	-8.63E-03	3.71E+00
5121	0.00	8.35E-06	-8.63E-03	3.71E+00
5122	0.00	8.35E-06	-8.63E-03	3.71E+00
5123	0.00	8.35E-06	-8.63E-03	3.71E+00
5124	0.00	8.35E-06	-8.63E-03	3.71E+00
5125	0.07	8.35E-06	-8.63E-03	3.71E+00
5126	0.65	8.35E-06	-8.63E-03	3.71E+00

5127	1.29	8.35E-06	-8.63E-03	3.71E+00
5128	1.88	8.35E-06	-8.63E-03	3.71E+00
5129	2.48	8.35E-06	-8.63E-03	3.71E+00
5130	3.16	8.35E-06	-8.63E-03	3.71E+00
5131	3.81	8.35E-06	-8.63E-03	3.71E+00
5132	4.25	8.35E-06	-8.63E-03	3.71E+00
5133	4.71	8.35E-06	-8.63E-03	3.71E+00
5134	4.87	8.35E-06	-8.63E-03	3.71E+00
5135	4.65	8.35E-06	-8.63E-03	3.71E+00
5136	5.19	8.35E-06	-8.63E-03	3.71E+00
5137	5.66	8.35E-06	-8.63E-03	3.71E+00
5138	6.05	8.35E-06	-8.63E-03	3.71E+00
5139	6.22	8.35E-06	-8.63E-03	3.71E+00
5140	6.26	8.35E-06	-8.63E-03	3.71E+00
5141	6.10	8.35E-06	-8.63E-03	3.71E+00
5142	5.91	8.35E-06	-8.63E-03	3.71E+00
5143	5.66	8.35E-06	-8.63E-03	3.71E+00
5144	5.51	8.35E-06	-8.63E-03	3.71E+00
5145	5.42	8.35E-06	-8.63E-03	3.71E+00
5146	5.44	8.35E-06	-8.63E-03	3.71E+00
5147	5.70	8.35E-06	-8.63E-03	3.71E+00
5148	5.90	8.35E-06	-8.63E-03	3.71E+00
5149	6.21	8.35E-06	-8.63E-03	3.71E+00
5150	6.65	2.78E-06	-2.88E-03	1.24E+00
5151	6.84	-2.78E-06	2.88E-03	-1.24E+00
5152	6.54	-8.35E-06	8.63E-03	-3.71E+00
5153	5.94	-8.35E-06	8.63E-03	-3.71E+00
5154	5.45	-8.35E-06	8.63E-03	-3.71E+00
5155	4.74	-8.35E-06	8.63E-03	-3.71E+00
5156	3.66	-8.35E-06	8.63E-03	-3.71E+00
5157	2.44	-8.35E-06	8.63E-03	-3.71E+00

5158	1.55	-8.35E-06	8.63E-03	-3.71E+00
5159	1.16	-8.35E-06	8.63E-03	-3.71E+00
5160	0.82	-8.35E-06	8.63E-03	-3.71E+00
5161	0.52	-2.56E-06	2.66E-03	-1.37E+00
5162	0.59	3.24E-06	-3.31E-03	9.69E-01
5163	1.18	9.03E-06	-9.28E-03	3.31E+00
5164	2.06	9.03E-06	-9.28E-03	3.31E+00
5165	2.30	9.03E-06	-9.28E-03	3.31E+00
5166	2.34	9.03E-06	-9.28E-03	3.31E+00
5167	2.39	9.03E-06	-9.28E-03	3.31E+00
5168	2.45	9.03E-06	-9.28E-03	3.31E+00
5169	2.42	9.03E-06	-9.28E-03	3.31E+00
5170	2.28	9.03E-06	-9.28E-03	3.31E+00
5171	2.49	9.03E-06	-9.28E-03	3.31E+00
5172	2.37	9.03E-06	-9.28E-03	3.31E+00
5173	2.67	9.03E-06	-9.28E-03	3.31E+00
5174	2.73	9.03E-06	-9.28E-03	3.31E+00
5175	2.75	9.03E-06	-9.28E-03	3.31E+00
5176	2.75	9.03E-06	-9.28E-03	3.31E+00
5177	2.75	9.03E-06	-9.28E-03	3.31E+00
5178	2.75	9.03E-06	-9.28E-03	3.31E+00
5179	2.80	9.03E-06	-9.28E-03	3.31E+00
5180	3.27	9.03E-06	-9.28E-03	3.31E+00
5181	3.83	9.03E-06	-9.28E-03	3.31E+00
5182	4.51	9.03E-06	-9.28E-03	3.31E+00
5183	4.83	9.03E-06	-9.28E-03	3.31E+00
5184	4.73	9.03E-06	-9.28E-03	3.31E+00
5185	4.54	9.03E-06	-9.28E-03	3.31E+00
5186	4.79	9.03E-06	-9.28E-03	3.31E+00
5187	4.83	9.03E-06	-9.28E-03	3.31E+00
5188	4.94	9.03E-06	-9.28E-03	3.31E+00

5189	4.97	9.03E-06	-9.28E-03	3.31E+00
5190	4.97	9.03E-06	-9.28E-03	3.31E+00
5191	4.96	9.03E-06	-9.28E-03	3.31E+00
5192	4.95	9.03E-06	-9.28E-03	3.31E+00
5193	4.95	9.03E-06	-9.28E-03	3.31E+00
5194	4.94	9.03E-06	-9.28E-03	3.31E+00
5195	5.02	9.03E-06	-9.28E-03	3.31E+00
5196	5.66	9.03E-06	-9.28E-03	3.31E+00
5197	6.54	9.03E-06	-9.28E-03	3.31E+00
5198	7.24	9.03E-06	-9.28E-03	3.31E+00
5199	7.05	9.03E-06	-9.28E-03	3.31E+00
5200	7.90	9.03E-06	-9.28E-03	3.31E+00
5201	9.27	9.03E-06	-9.28E-03	3.31E+00
5202	9.92	9.03E-06	-9.28E-03	3.31E+00
5203	10.23	9.03E-06	-9.28E-03	3.31E+00
5204	10.89	9.03E-06	-9.28E-03	3.31E+00
5205	11.64	9.03E-06	-9.28E-03	3.31E+00
5206	12.44	9.03E-06	-9.28E-03	3.31E+00
5207	13.15	9.03E-06	-9.28E-03	3.31E+00
5208	13.24	9.03E-06	-9.28E-03	3.31E+00
5209	12.47	9.03E-06	-9.28E-03	3.31E+00
5210	13.18	9.03E-06	-9.28E-03	3.31E+00
5211	14.38	3.01E-06	-3.09E-03	1.10E+00
5212	14.30	-3.01E-06	3.09E-03	-1.10E+00
5213	13.30	-9.03E-06	9.28E-03	-3.31E+00
5214	11.48	-9.03E-06	9.28E-03	-3.31E+00
5215	9.06	-9.03E-06	9.28E-03	-3.31E+00
5216	6.13	-9.03E-06	9.28E-03	-3.31E+00
5217	3.32	-9.03E-06	9.28E-03	-3.31E+00
5218	1.29	-9.03E-06	9.28E-03	-3.31E+00
5219	0.34	-9.03E-06	9.28E-03	-3.31E+00

5220	0.00	-9.03E-06	9.28E-03	-3.31E+00
5221	0.00	-9.03E-06	9.28E-03	-3.31E+00
5222	0.00	-9.03E-06	9.28E-03	-3.31E+00
5223	0.00	-9.03E-06	9.28E-03	-3.31E+00
5224	0.00	-9.03E-06	9.28E-03	-3.31E+00
5225	0.00	-9.03E-06	9.28E-03	-3.31E+00
5226	0.00	-9.03E-06	9.28E-03	-3.31E+00
5227	0.00	-9.03E-06	9.28E-03	-3.31E+00
5228	0.00	-9.03E-06	9.28E-03	-3.31E+00
5229	0.00	-9.03E-06	9.28E-03	-3.31E+00
5230	0.00	-9.03E-06	9.28E-03	-3.31E+00
5231	0.00	-9.03E-06	9.28E-03	-3.31E+00
5232	0.00	-9.03E-06	9.28E-03	-3.31E+00
5233	0.00	-9.03E-06	9.28E-03	-3.31E+00
5234	0.00	-9.03E-06	9.28E-03	-3.31E+00
5235	0.00	-9.03E-06	9.28E-03	-3.31E+00
5236	0.00	-9.03E-06	9.28E-03	-3.31E+00
5237	0.00	-9.03E-06	9.28E-03	-3.31E+00
5238	0.00	-9.03E-06	9.28E-03	-3.31E+00
5239	0.00	-9.03E-06	9.28E-03	-3.31E+00
5240	0.00	-9.03E-06	9.28E-03	-3.31E+00
5241	0.00	-9.03E-06	9.28E-03	-3.31E+00
5242	0.00	-9.03E-06	9.28E-03	-3.31E+00
5243	0.00	-9.03E-06	9.28E-03	-3.31E+00
5244	0.00	-9.03E-06	9.28E-03	-3.31E+00
5245	0.00	-9.03E-06	9.28E-03	-3.31E+00
5246	0.00	-9.03E-06	9.28E-03	-3.31E+00
5247	0.00	-9.03E-06	9.28E-03	-3.31E+00
5248	0.00	-9.03E-06	9.28E-03	-3.31E+00
5249	0.00	-9.03E-06	9.28E-03	-3.31E+00
5250	0.00	-7.32E-07	8.21E-04	-3.59E-01

5251	0.00	7.56E-06	-7.63E-03	2.59E+00
5252	0.00	1.59E-05	-1.61E-02	5.54E+00
5253	0.00	1.59E-05	-1.61E-02	5.54E+00
5254	0.00	1.59E-05	-1.61E-02	5.54E+00
5255	0.00	1.59E-05	-1.61E-02	5.54E+00
5256	0.00	1.59E-05	-1.61E-02	5.54E+00
5257	0.00	1.59E-05	-1.61E-02	5.54E+00
5258	0.00	1.59E-05	-1.61E-02	5.54E+00
5259	0.00	1.59E-05	-1.61E-02	5.54E+00
5260	0.00	1.59E-05	-1.61E-02	5.54E+00
5261	0.00	1.59E-05	-1.61E-02	5.54E+00
5262	0.00	1.59E-05	-1.61E-02	5.54E+00
5263	0.00	1.59E-05	-1.61E-02	5.54E+00
5264	0.00	1.59E-05	-1.61E-02	5.54E+00
5265	0.00	1.59E-05	-1.61E-02	5.54E+00
5266	0.00	1.59E-05	-1.61E-02	5.54E+00
5267	0.00	1.59E-05	-1.61E-02	5.54E+00
5268	0.00	1.59E-05	-1.61E-02	5.54E+00
5269	0.00	1.59E-05	-1.61E-02	5.54E+00
5270	0.00	1.59E-05	-1.61E-02	5.54E+00
5271	0.00	1.59E-05	-1.61E-02	5.54E+00
5272	0.00	1.59E-05	-1.61E-02	5.54E+00
5273	0.00	1.59E-05	-1.61E-02	5.54E+00
5274	0.00	1.59E-05	-1.61E-02	5.54E+00
5275	0.00	1.59E-05	-1.61E-02	5.54E+00
5276	0.00	1.59E-05	-1.61E-02	5.54E+00
5277	0.00	1.59E-05	-1.61E-02	5.54E+00
5278	0.00	1.59E-05	-1.61E-02	5.54E+00
5279	0.00	1.59E-05	-1.61E-02	5.54E+00
5280	0.00	1.59E-05	-1.61E-02	5.54E+00
5281	0.00	1.59E-05	-1.61E-02	5.54E+00

5282	0.00	1.59E-05	-1.61E-02	5.54E+00
5283	0.00	1.59E-05	-1.61E-02	5.54E+00
5284	0.49	1.59E-05	-1.61E-02	5.54E+00
5285	1.56	1.59E-05	-1.61E-02	5.54E+00
5286	2.36	1.59E-05	-1.61E-02	5.54E+00
5287	2.62	1.59E-05	-1.61E-02	5.54E+00
5288	2.35	1.59E-05	-1.61E-02	5.54E+00
5289	1.80	1.59E-05	-1.61E-02	5.54E+00
5290	0.99	1.59E-05	-1.61E-02	5.54E+00
5291	0.20	1.59E-05	-1.61E-02	5.54E+00
5292	0.00	1.59E-05	-1.61E-02	5.54E+00
5293	0.41	1.59E-05	-1.61E-02	5.54E+00
5294	2.08	1.59E-05	-1.61E-02	5.54E+00
5295	3.52	1.59E-05	-1.61E-02	5.54E+00
5296	4.78	1.59E-05	-1.61E-02	5.54E+00
5297	4.95	1.59E-05	-1.61E-02	5.54E+00
5298	4.03	1.59E-05	-1.61E-02	5.54E+00
5299	4.78	1.59E-05	-1.61E-02	5.54E+00
5300	6.65	1.59E-05	-1.61E-02	5.54E+00
5301	7.86	1.59E-05	-1.61E-02	5.54E+00
5302	7.98	1.59E-05	-1.61E-02	5.54E+00
5303	8.70	1.59E-05	-1.61E-02	5.54E+00
5304	11.22	1.59E-05	-1.61E-02	5.54E+00
5305	12.14	1.59E-05	-1.61E-02	5.54E+00
5306	11.42	1.59E-05	-1.61E-02	5.54E+00
5307	11.95	1.59E-05	-1.61E-02	5.54E+00
5308	13.53	1.59E-05	-1.61E-02	5.54E+00
5309	15.51	1.59E-05	-1.61E-02	5.54E+00
5310	16.26	1.59E-05	-1.61E-02	5.54E+00
5311	16.50	1.59E-05	-1.61E-02	5.54E+00
5312	16.16	1.59E-05	-1.61E-02	5.54E+00

5313	16.70	1.59E-05	-1.61E-02	5.54E+00
5314	17.65	1.59E-05	-1.61E-02	5.54E+00
5315	19.03	1.59E-05	-1.61E-02	5.54E+00
5316	20.76	1.59E-05	-1.61E-02	5.54E+00
5317	22.06	1.59E-05	-1.61E-02	5.54E+00
5318	22.66	1.59E-05	-1.61E-02	5.54E+00
5319	23.82	1.59E-05	-1.61E-02	5.54E+00
5320	25.15	1.59E-05	-1.61E-02	5.54E+00
5321	25.84	1.59E-05	-1.61E-02	5.54E+00
5322	26.27	1.59E-05	-1.61E-02	5.54E+00
5323	26.99	1.59E-05	-1.61E-02	5.54E+00
5324	27.09	1.59E-05	-1.61E-02	5.54E+00
5325	26.91	5.29E-06	-5.36E-03	1.85E+00
5326	26.76	-5.29E-06	5.36E-03	-1.85E+00
5327	26.42	-1.59E-05	1.61E-02	-5.54E+00
5328	25.95	-1.59E-05	1.61E-02	-5.54E+00
5329	24.87	-1.59E-05	1.61E-02	-5.54E+00
5330	23.00	-1.59E-05	1.61E-02	-5.54E+00
5331	20.44	-1.59E-05	1.61E-02	-5.54E+00
5332	17.84	-1.59E-05	1.61E-02	-5.54E+00
5333	16.00	-1.59E-05	1.61E-02	-5.54E+00
5334	15.03	-1.59E-05	1.61E-02	-5.54E+00
5335	14.64	-1.59E-05	1.61E-02	-5.54E+00
5336	14.48	-1.59E-05	1.61E-02	-5.54E+00
5337	13.98	-1.59E-05	1.61E-02	-5.54E+00
5338	13.14	-1.59E-05	1.61E-02	-5.54E+00
5339	12.28	-1.59E-05	1.61E-02	-5.54E+00
5340	11.86	-1.59E-05	1.61E-02	-5.54E+00
5341	11.81	-1.59E-05	1.61E-02	-5.54E+00
5342	11.62	-1.59E-05	1.61E-02	-5.54E+00
5343	11.63	-1.59E-05	1.61E-02	-5.54E+00

5344	11.67	-1.59E-05	1.61E-02	-5.54E+00
5345	11.48	-1.59E-05	1.61E-02	-5.54E+00
5346	11.03	-1.59E-05	1.61E-02	-5.54E+00
5347	10.54	-1.59E-05	1.61E-02	-5.54E+00
5348	10.04	-1.59E-05	1.61E-02	-5.54E+00
5349	9.90	-1.59E-05	1.61E-02	-5.54E+00
5350	9.88	-1.59E-05	1.61E-02	-5.54E+00
5351	9.63	-1.59E-05	1.61E-02	-5.54E+00
5352	9.33	-5.29E-06	5.36E-03	-1.85E+00
5353	9.18	5.29E-06	-5.36E-03	1.85E+00
5354	9.63	1.33E-05	-1.36E-02	4.57E+00
5355	9.89	1.07E-05	-1.10E-02	3.60E+00
5356	9.81	8.05E-06	-8.51E-03	2.62E+00
5357	10.04	8.05E-06	-8.51E-03	2.62E+00
5358	11.32	8.05E-06	-8.51E-03	2.62E+00
5359	12.95	8.05E-06	-8.51E-03	2.62E+00
5360	14.28	8.05E-06	-8.51E-03	2.62E+00
5361	14.83	8.05E-06	-8.51E-03	2.62E+00
5362	14.23	8.05E-06	-8.51E-03	2.62E+00
5363	14.35	8.05E-06	-8.51E-03	2.62E+00
5364	15.55	8.05E-06	-8.51E-03	2.62E+00
5365	17.36	8.05E-06	-8.51E-03	2.62E+00
5366	19.31	8.05E-06	-8.51E-03	2.62E+00
5367	20.61	8.05E-06	-8.51E-03	2.62E+00
5368	21.33	8.05E-06	-8.51E-03	2.62E+00
5369	21.32	8.05E-06	-8.51E-03	2.62E+00
5370	21.65	8.05E-06	-8.51E-03	2.62E+00
5371	22.70	8.05E-06	-8.51E-03	2.62E+00
5372	23.99	8.05E-06	-8.51E-03	2.62E+00
5373	25.28	8.05E-06	-8.51E-03	2.62E+00
5374	26.67	8.05E-06	-8.51E-03	2.62E+00

5375	27.34	8.05E-06	-8.51E-03	2.62E+00
5376	27.48	8.05E-06	-8.51E-03	2.62E+00
5377	27.03	8.05E-06	-8.51E-03	2.62E+00
5378	27.10	8.05E-06	-8.51E-03	2.62E+00
5379	27.75	8.05E-06	-8.51E-03	2.62E+00
5380	28.53	8.05E-06	-8.51E-03	2.62E+00
5381	29.39	8.05E-06	-8.51E-03	2.62E+00
5382	30.32	8.05E-06	-8.51E-03	2.62E+00
5383	31.15	8.05E-06	-8.51E-03	2.62E+00
5384	32.05	8.05E-06	-8.51E-03	2.62E+00
5385	33.11	8.05E-06	-8.51E-03	2.62E+00
5386	33.66	8.05E-06	-8.51E-03	2.62E+00
5387	33.96	8.05E-06	-8.51E-03	2.62E+00
5388	33.81	8.05E-06	-8.51E-03	2.62E+00
5389	33.85	8.05E-06	-8.51E-03	2.62E+00
5390	34.03	8.05E-06	-8.51E-03	2.62E+00
5391	34.31	8.05E-06	-8.51E-03	2.62E+00
5392	34.70	8.05E-06	-8.51E-03	2.62E+00
5393	34.87	8.05E-06	-8.51E-03	2.62E+00
5394	34.79	8.05E-06	-8.51E-03	2.62E+00
5395	34.84	2.68E-06	-2.84E-03	8.74E-01
5396	34.87	-2.68E-06	2.84E-03	-8.74E-01
5397	34.44	-8.05E-06	8.51E-03	-2.62E+00
5398	33.94	-8.05E-06	8.51E-03	-2.62E+00
5399	33.58	-8.05E-06	8.51E-03	-2.62E+00
5400	33.26	-8.05E-06	8.51E-03	-2.62E+00
5401	32.87	-8.05E-06	8.51E-03	-2.62E+00
5402	32.63	-8.05E-06	8.51E-03	-2.62E+00
5403	32.25	-8.05E-06	8.51E-03	-2.62E+00
5404	32.02	-8.05E-06	8.51E-03	-2.62E+00
5405	31.93	-8.05E-06	8.51E-03	-2.62E+00

5406	31.57	-8.05E-06	8.51E-03	-2.62E+00
5407	31.29	-8.05E-06	8.51E-03	-2.62E+00
5408	31.00	-8.05E-06	8.51E-03	-2.62E+00
5409	30.56	-8.05E-06	8.51E-03	-2.62E+00
5410	30.16	-8.05E-06	8.51E-03	-2.62E+00
5411	29.82	-8.05E-06	8.51E-03	-2.62E+00
5412	29.56	-8.05E-06	8.51E-03	-2.62E+00
5413	28.96	-8.05E-06	8.51E-03	-2.62E+00
5414	28.19	-8.05E-06	8.51E-03	-2.62E+00
5415	27.26	-8.05E-06	8.51E-03	-2.62E+00
5416	26.59	-8.05E-06	8.51E-03	-2.62E+00
5417	26.13	-8.05E-06	8.51E-03	-2.62E+00
5418	25.76	-8.05E-06	8.51E-03	-2.62E+00
5419	25.29	-8.05E-06	8.51E-03	-2.62E+00
5420	24.01	-8.05E-06	8.51E-03	-2.62E+00
5421	22.03	-8.05E-06	8.51E-03	-2.62E+00
5422	19.60	-8.05E-06	8.51E-03	-2.62E+00
5423	16.50	-8.05E-06	8.51E-03	-2.62E+00
5424	13.16	-8.05E-06	8.51E-03	-2.62E+00
5425	11.03	-8.05E-06	8.51E-03	-2.62E+00
5426	10.25	-8.05E-06	8.51E-03	-2.62E+00
5427	10.04	-2.68E-06	2.84E-03	-8.74E-01
5428	10.27	2.68E-06	-2.84E-03	8.74E-01
5429	10.94	8.05E-06	-8.51E-03	2.62E+00
5430	11.62	8.05E-06	-8.51E-03	2.62E+00
5431	12.06	8.05E-06	-8.51E-03	2.62E+00
5432	12.63	8.05E-06	-8.51E-03	2.62E+00
5433	13.30	8.05E-06	-8.51E-03	2.62E+00
5434	13.98	8.05E-06	-8.51E-03	2.62E+00
5435	14.38	8.05E-06	-8.51E-03	2.62E+00
5436	14.84	8.05E-06	-8.51E-03	2.62E+00

5437	15.61	8.05E-06	-8.51E-03	2.62E+00
5438	16.80	8.05E-06	-8.51E-03	2.62E+00
5439	18.29	8.05E-06	-8.51E-03	2.62E+00
5440	19.38	8.05E-06	-8.51E-03	2.62E+00
5441	19.99	8.05E-06	-8.51E-03	2.62E+00
5442	19.89	8.05E-06	-8.51E-03	2.62E+00
5443	19.93	8.05E-06	-8.51E-03	2.62E+00
5444	20.89	8.05E-06	-8.51E-03	2.62E+00
5445	22.17	8.05E-06	-8.51E-03	2.62E+00
5446	22.85	8.05E-06	-8.51E-03	2.62E+00
5447	23.42	8.05E-06	-8.51E-03	2.62E+00
5448	24.25	8.05E-06	-8.51E-03	2.62E+00
5449	25.14	8.05E-06	-8.51E-03	2.62E+00
5450	25.83	8.05E-06	-8.51E-03	2.62E+00
5451	26.43	8.05E-06	-8.51E-03	2.62E+00
5452	26.52	8.05E-06	-8.51E-03	2.62E+00
5453	26.57	8.05E-06	-8.51E-03	2.62E+00
5454	26.99	8.05E-06	-8.51E-03	2.62E+00
5455	27.50	8.05E-06	-8.51E-03	2.62E+00
5456	28.08	8.05E-06	-8.51E-03	2.62E+00
5457	28.75	8.05E-06	-8.51E-03	2.62E+00
5458	29.45	8.05E-06	-8.51E-03	2.62E+00
5459	29.97	8.05E-06	-8.51E-03	2.62E+00
5460	30.32	8.05E-06	-8.51E-03	2.62E+00
5461	30.44	8.05E-06	-8.51E-03	2.62E+00
5462	30.26	8.05E-06	-8.51E-03	2.62E+00
5463	29.88	2.68E-06	-2.84E-03	8.74E-01
5464	29.44	-2.68E-06	2.84E-03	-8.74E-01
5465	29.07	-8.05E-06	8.51E-03	-2.62E+00
5466	28.59	-8.05E-06	8.51E-03	-2.62E+00
5467	27.71	-8.05E-06	8.51E-03	-2.62E+00

5468	26.44	-8.05E-06	8.51E-03	-2.62E+00
5469	25.39	-8.05E-06	8.51E-03	-2.62E+00
5470	24.37	-8.05E-06	8.51E-03	-2.62E+00
5471	22.82	-8.05E-06	8.51E-03	-2.62E+00
5472	20.10	-8.05E-06	8.51E-03	-2.62E+00
5473	16.17	-8.05E-06	8.51E-03	-2.62E+00
5474	12.18	-8.05E-06	8.51E-03	-2.62E+00
5475	9.50	-8.05E-06	8.51E-03	-2.62E+00
5476	8.26	-8.05E-06	8.51E-03	-2.62E+00
5477	7.79	-8.05E-06	8.51E-03	-2.62E+00
5478	7.38	-8.05E-06	8.51E-03	-2.62E+00
5479	6.77	-8.05E-06	8.51E-03	-2.62E+00
5480	6.11	-8.05E-06	8.51E-03	-2.62E+00
5481	5.44	-8.05E-06	8.51E-03	-2.62E+00
5482	5.21	-8.05E-06	8.51E-03	-2.62E+00
5483	5.25	-8.05E-06	8.51E-03	-2.62E+00
5484	5.77	-8.05E-06	8.51E-03	-2.62E+00
5485	5.30	-8.05E-06	8.51E-03	-2.62E+00
5486	4.86	-8.05E-06	8.51E-03	-2.62E+00
5487	4.52	-8.05E-06	8.51E-03	-2.62E+00
5488	4.26	-8.05E-06	8.51E-03	-2.62E+00
5489	3.93	-8.05E-06	8.51E-03	-2.62E+00
5490	3.43	-8.05E-06	8.51E-03	-2.62E+00
5491	3.00	-8.05E-06	8.51E-03	-2.62E+00
5492	3.03	-8.05E-06	8.51E-03	-2.62E+00
5493	2.99	-8.05E-06	8.51E-03	-2.62E+00
5494	2.61	-8.05E-06	8.51E-03	-2.62E+00
5495	2.22	-8.05E-06	8.51E-03	-2.62E+00
5496	1.85	-8.05E-06	8.51E-03	-2.62E+00
5497	1.69	-8.05E-06	8.51E-03	-2.62E+00
5498	1.59	-8.05E-06	8.51E-03	-2.62E+00

5499	1.57	-8.05E-06	8.51E-03	-2.62E+00
5500	1.59	-8.05E-06	8.51E-03	-2.62E+00
5501	1.45	-8.05E-06	8.51E-03	-2.62E+00
5502	1.09	-8.05E-06	8.51E-03	-2.62E+00
5503	0.62	-8.05E-06	8.51E-03	-2.62E+00
5504	0.27	-8.05E-06	8.51E-03	-2.62E+00
5505	0.00	-8.05E-06	8.51E-03	-2.62E+00

PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions

- 1065.1 Applicability. April 28, 2014.
1. Amend subparagraph (a) as follows:
 - 1.1. Introductory paragraph. [No change.]
 - 1.2. Subparagraphs (a)(1). [n/a]
 - 1.3. Amend subparagraph (a)(2) as follows: Model year 2010 and later heavy-duty highway engines we regulate under title 13, CCR, §1956.8. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 86, subpart N, according to §1065.10, as modified by these test procedures.
 - 1.4. Subparagraphs (a)(3) through (a)(8). [n/a]
 2. Subparagraph (b). [n/a]
 3. Subparagraph (c) through (h). [No change.]
- 1065.2 Submitting information to ARB under this part. April 28, 2014.
1. Subparagraphs (a) through (d). [No change.]
 2. Amend subparagraph (e) as follows: See title 17, CCR, section 91011 for provisions related to confidential information. Note that according to this section, emission data shall not be identified as confidential.
 3. Subparagraph (f). [No change.]
- 1065.5 Overview of this part 1065 and its relationship to the standard-setting part. October 30, 2009.
- 1065.10 Other procedures. October 25, 2016.
- 1065.12 Approval of alternate procedures. April 28, 2014.
- 1065.15 Overview of procedures for laboratory and field testing. October 25, 2016.
1. Subparagraphs (a) through (a)(2)(ii). [No change.]
 2. Delete subparagraph (a)(2)(iii).
 3. Subparagraphs (a)(2)(iv) through (f). [No change.]
- 1065.20 Units of measure and overview of calculations. April 28, 2014.
- 1065.25 Recordkeeping. April 28, 2014.

Subpart B – Equipment Specifications

- 1065.101 Overview. June 30, 2008.
- 1065.110 Work inputs and outputs, accessory work, and operator demand. June 30, 2008.
- 1065.120 Fuel properties and fuel temperature and pressure. June 30, 2008.
- 1065.122 Engine cooling and lubrication. June 30, 2008.
- 1065.125 Engine intake air. September 15, 2011.

- 1065.127 Exhaust gas recirculation. July 13, 2005.
- 1065.130 Engine exhaust. March 10, 2021 (Pre-publication).
- 1065.140 Dilution for gaseous and PM constituents. March 10, 2021 (Pre-publication).
- 1065.145 Gaseous and PM probes, transfer lines, and sampling system components. March 10, 2021 (Pre-publication).
- 1065.150 Continuous sampling. July 13, 2005.
- 1065.170 Batch sampling for gaseous and PM constituents. March 10, 2021 (Pre-publication).
- 1065.190 PM-stabilization and weighing environments for gravimetric analysis. September 15, 2011.
- 1065.195 PM-stabilization environment for in-situ analyzers. June 30, 2008.

Subpart C – Measurement Instruments

- 1065.201 Overview and general provisions. April 28, 2014.
- 1065.202 Data updating, recording, and control. October 25, 2016.
- 1065.205 Performance specifications for measurement instruments. March 10, 2021 (Pre-publication).

Measurement of Engine Parameters and Ambient Conditions

- 1065.210 Work input and output sensors. April 28, 2014.
- 1065.215 Pressure transducers, temperature sensors, and dewpoint sensors. June 30, 2008.

Flow-Related Measurements

- 1065.220 Fuel flow meter. March 10, 2021 (Pre-publication).
- 1065.225 Intake-air flow meter. March 10, 2021 (Pre-publication).
- 1065.230 Raw exhaust flow meter. April 28, 2014.
- 1065.240 Dilution air and diluted exhaust flow meters. April 28, 2014.
- 1065.245 Sample flow meter for batch sampling. July 13, 2005.
- 1065.247 Diesel exhaust fluid flow rate. March 10, 2021 (Pre-publication).
- 1065.248 Gas divider. July 13, 2005.

CO and CO₂ Measurements

- 1065.250 Nondispersive infra-red analyzer. April 28, 2014.

Hydrocarbon Measurements

- 1065.260 Flame ionization detector. October 25, 2016.
 1. Subparagraphs (a) through (e). [No change.]
 2. Delete subparagraph (f).
 3. Subparagraph (g). [No change.]

- 1065.265 Nonmethane cutter. September 15, 2011.
- 1065.266 Fourier transform infrared analyzer. October 25, 2016.
1. Amend subparagraph (a) as follows: Application. For engines that run only on natural gas, you may use a Fourier transform infrared (FTIR) analyzer to measure nonmethane hydrocarbon (NMHC) for continuous sampling. You may use an FTIR analyzer with any gaseous-fueled engine, including dual-fuel engines, to measure CH₄, for either batch or continuous sampling (for subtraction from THC).
 2. Subparagraph (b). [No change.]
 3. Amend subparagraph (c) as follows: Hydrocarbon species for NMHC additive determination. To determine NMHC, measure ethane in addition to those same hydrocarbon species. Determine NMHC as described in 40 CFR §1065.660(b)(4).
 4. Amend subparagraph (d) as follows: NMHC CH₄ determination from subtraction of CH₄ from THC. Determine CH₄ as described in 40 CFR §1065.660(d)(2). Determine NMHC from subtraction of CH₄ from THC as described in 40 CFR §1065.660(b)(3). Determine CH₄ as described in 40 CFR §1065.660(d)(2).
 5. Subparagraph (e). [No change.]
- 1065.267 Gas chromatograph with a flame ionization detector. October 25, 2016.
- 1065.269 Photoacoustic analyzer for ethanol and methanol. April 28, 2014.

NO_x Measurements

- 1065.270 Chemiluminescent detector. April 28, 2014.
- 1065.272 Nondispersive ultraviolet analyzer. April 28, 2014.
- 1065.275 N₂O measurement devices. March 10, 2021 (Pre-publication).

O₂ Measurements

- 1065.280 Paramagnetic and magnetopneumatic O₂ detection analyzers. March 10, 2021 (Pre-publication).

Air-to Fuel Ratio Measurements

- 1065.284 Zirconia (ZrO₂) analyzer. April 28, 2014.

PM Measurements

- 1065.290 PM gravimetric balance. November 8, 2010.
- 1065.295 PM inertial balance for field-testing analysis. April 28, 2014.

Subpart D – Calibrations and Verifications

- 1065.301 Overview and general provisions. July 13, 2005.
- 1065.303 Summary of required calibration and verifications. March 10, 2021 (Pre-publication).
- 1065.305 Verifications for accuracy, repeatability, and noise. April 28, 2014.
- 1065.307 Linearity verification. March 10, 2021 (Pre-publication).
- 1065.308 Continuous gas analyzer system-response and updating-recording verification– for gas analyzers not continuously compensated for other gas species. April 28, 2014.
- 1065.309 Continuous gas analyzer system-response and updating-recording verification – for gas analyzers continuously compensated for other gas species. March 10, 2021 (Pre-publication).

Measurement of Engine Parameters and Ambient Conditions

- 1065.310 Torque calibration. April 28, 2014.
- 1065.315 Pressure, temperature, and dewpoint calibration. April 28, 2014.

Flow-Related Measurements

- 1065.320 Fuel-flow calibration. July 13, 2005.
- 1065.325 Intake-flow calibration. July 13, 2005.
- 1065.330 Exhaust-flow calibration. July 13, 2005.
- 1065.340 Diluted exhaust flow (CVS) calibration. October 25, 2016.
- 1065.341 CVS, PFD, and batch sampler verification (propane check). October 25, 2016.
- 1065.342 Sample dryer verification. March 10, 2021 (Pre-publication).
- 1065.345 Vacuum-side leak verification. October 25, 2016.

CO and CO₂ Measurements

- 1065.350 H₂O interference verification for CO₂ NDIR analyzers. March 10, 2021 (Pre-publication).
- 1065.355 H₂O and CO₂ interference verification for CO NDIR analyzers. March 10, 2021 (Pre-publication).

Hydrocarbon Measurements

- 1065.360 FID optimization and verification. October 25, 2016.
 1. Subparagraphs (a) through (a)(2). [No change.]
 2. Delete subparagraph (a)(3).
 3. Subparagraphs (b) through (d). [No change.]
 4. Delete subparagraph (f).

1065.362 Non-stoichiometric raw exhaust FID O₂ interference verification. April 28, 2014.

1065.365 Nonmethane cutter penetration fractions. March 10, 2021 (Pre-publication).

1065.366 Interference verification for FTIR analyzers. October 25, 2016.

1. Amend subparagraph (a) as follows: Scope and frequency. If you measure CH₄ or NMHC using an FTIR analyzer, verify the amount of interference after initial analyzer installation and after major maintenance.

2. Subparagraph (b). [No change.]

3. Amend subparagraph (c) as follows: System requirements. An FTIR analyzer must have combined interference that is within $\pm 2\%$ of the flow-weighted mean concentration of CH₄ or NMHC expected at the standard, though we strongly recommend a lower interference that is within $\pm 1\%$.

4. Subparagraph (d). [No change.]

1065.369 H₂O, CO, and CO₂ interference verification for photoacoustic alcohol analyzers. April 28, 2014.

NO_x Measurements

1065.370 CLD CO₂ and H₂O quench verification. March 10, 2021 (Pre-publication).

1065.372 NDUV analyzer HC and H₂O interference verification. September 15, 2011.

1065.375 Interference verification for N₂O analyzers. March 10, 2021 (Pre-publication).

1065.376 Chiller NO₂ penetration. April 28, 2014.

1065.378 NO₂-to-NO converter conversion verification. September 15, 2011.

PM Measurements

1065.390 PM balance verifications and weighing process verification. October 25, 2016.

1065.395 Inertial PM balance verifications. July 13, 2005.

Subpart E – Engine Selection, Preparation, and Maintenance

1065.401 Test engine selection. July 13, 2005.

1065.405 Test engine preparation and maintenance. April 28, 2014.

1065.410 Maintenance limits for stabilized test engines. March 10, 2021 (Pre-publication).

1065.415 Durability demonstration. June 30, 2008.

Subpart F – Performing an Emission Test in the Laboratory

- 1065.501 Overview. April 28, 2014.
- 1065.510 Engine mapping. March 10, 2021 (Pre-publication).
- 1065.512 Duty cycle generation. March 10, 2021 (Pre-publication).
- 1065.514 Cycle-validation criteria for operation over specified duty cycles. March 10, 2021 (Pre-publication).

A. Federal Provisions

- 1. Introductory paragraph [No change.]
- 2. Subparagraph (a) through (f)(3). [No change.]
- 3. Add new subparagraph (f)4) as follows:
 - (4) For variable-speed gaseous-fueled engines with a single-point fuel injection system, apply all of the following statistical criteria to validate the low-load cycle in Appendix I to Part 86 subparagraph B.1 of these test procedures:

Parameter	Speed	Torque	Power
Slope, a_1	$0.950 \leq a_1 \leq 1.030$	$0.800 \leq a_1 \leq 1.030$	$0.800 \leq a_1 \leq 1.030$
Absolute value of intercept, $ a_0 $	$\leq 10\%$ of warm idle	$\leq 2\%$ of maximum mapped torque	$\leq 2\%$ of maximum mapped power
Standard error of estimate, SEE	$\leq 5\%$ of maximum test speed	$\leq 10\%$ of maximum mapped torque	$\leq 10\%$ of maximum mapped power
Coefficient of determination, r^2	≥ 0.970	≥ 0.650	≥ 0.650

- 1065.516 Sample system decontamination and preconditioning. April 28, 2014.
- 1065.518 Engine preconditioning. April 28, 2014.

A. Federal Provisions. [No change.]

B California Provisions.

1. This paragraph specifies the engine preconditioning procedures for different types of duty cycles. For 2024 and subsequent model years, you must identify the amount of preconditioning before starting to precondition. You must run the predefined amount of preconditioning. You may measure emissions during preconditioning. You may not abort an emission test sequence based on emissions measured during preconditioning. For confirmatory testing, you may request Executive Officer approval for us to run more than two preconditioning cycles; the Executive Officer shall approve this upon determining that the extra preconditioning cycles are limited to the minimum technically necessary to meet the intent of this section, for example, to restore ammonia in the SCR catalyst due to the effect of DPF regeneration on NH₃ storage in the SCR catalyst; that emissions during the operation from the end of the regeneration through the end of the requested extra preconditioning cycles are fully accounted for in the measurement and calculation of emission factors EF_L and EF_H as specified in section 1065.680 of these test procedures; and that the request for extra preconditioning cycles was made prior to the engine family being certified. Perform preconditioning as follows, noting that the

specific cycles for preconditioning are the same ones that apply for emission testing:

2. For 2024 and subsequent model year medium-duty and heavy-duty diesel engine families, preconditioning sequences for the engine and aftertreatment must be designed such that emissions measured during the test are representative of emissions during normal operation and use. A preconditioning sequence that activates or enhances AECs that bias or otherwise produce unrepresentative emission results during a test may not be approved. Engines are required to be compliant with the emission standards after preconditioning and up to the point the next regeneration event is triggered, regardless of the level of soot loading on the particulate filter, and regardless of operation prior to preconditioning (e.g., particulate filter regeneration, extended non-regeneration cycles, back-to-back cycles without key off). Additionally, emissions performance should not deteriorate, degrade, or decrease upon successive repeats of the certification cycle. The emissions control system should not use different control targets upon successive repeats of the certification cycle given the same or similar test conditions. For example, the emission level from the first Hot FTP following the Cold FTP should be consistent with any emission level from a Hot FTP that was conducted as part of a series of back-to-back Hot FTP cycles up to the point the next regeneration is triggered.

3. Engine preconditioning for the Low-Load Cycle – For 2024 and subsequent model years, in addition to the requirements in paragraphs B.1 and B.2 of this section, use the following procedures to precondition the engine and aftertreatment system prior to emission testing:

3.1 Precondition the engine by running one or two hot-start FTP cycles as identified in paragraph A.2 of Appendix I to Part 86 of these test procedures.

3.2 Shut down the engine after completion of preconditioning cycle(s) per requirements of paragraphs B.1 and B.2 of this section and allow 20 minutes to elapse.

3.3 Perform emission testing using the cycle specified in paragraph B.1 of Appendix I to Part 86 of these test procedures.

- 1065.520 Pre-test verification procedures and pre-test data collection. April 28, 2014.
- 1065.525 Engine starting, restarting, and shutdown. September 15, 2011.
- 1065.526 Repeating void modes or test intervals. April 28, 2014.
- 1065.530 Emission test sequence. March 10, 2021 (Pre-publication).
- 1065.545 Verification of proportional flow control for batch sampling. March 10, 2021 (Pre-publication).
- 1065.546 Verification of minimum dilution ratio for PM batch sampling. October 25, 2016.
- 1065.550 Gas analyzer range verification, and drift verification. April 28, 2014.
- 1065.590 PM sampling media (e.g., filters) preconditioning and tare weighing. October 25, 2016.
- 1065.595 PM sample post-conditioning and total weighing. June 30, 2008.

Subpart G – Calculations and Data Requirements

- 1065.601 Overview. April 28, 2014.
- 1065.602 Statistics. March 10, 2021 (Pre-publication).
- 1065.610 Duty cycle generation. March 10, 2021 (Pre-publication).
- 1065.630 Local acceleration of gravity. April 28, 2014.
- 1065.640 Flow meter calibration calculations. March 10, 2021 (Pre-publication).
- 1065.642 SSV, CFV, and PDP molar flow rate calculations. March 10, 2021 (Pre-publication).
- 1065.644 Vacuum-decay leak rate. April 28, 2014.
- 1065.645 Amount of water in an ideal gas. October 25, 2016.
- 1065.650 Emission calculations. October 25, 2016.
1. Subparagraphs (a) through (c)(5). [No change.]
 2. Delete subparagraph (c)(6).
 3. Subparagraphs (d) through (h). [No change.]
- 1065.655 Chemical balances of fuel, intake air, and exhaust. October 25, 2016.
- 1065.659 Removed water correction. April 28, 2014.
- 1065.660 THC, NMHC, and CH₄ determination. October 25, 2016.
1. Subparagraphs (a) through (a)(2). [No change.]
 2. Delete subparagraph (a)(3).
 3. Subparagraphs (a)(4) through (b). [No change.]
 4. Delete subparagraph (c).
 5. Subparagraph (d). [No change.]
 6. Delete subparagraph (e).

- 1065.665 THCE and NMHCE determination. March 10, 2021 (Pre-publication).
- 1065.667 Dilution air background emission correction. March 10, 2021 (Pre-publication).
- 1065.670 NOx intake-air humidity and temperature corrections. September 15, 2011.
- 1065.672 Drift correction. April 30, 2010.
- 1065.675 CLD quench verification calculations. March 10, 2021 (Pre-publication).
- §1065.680 Adjusting emission levels to account for infrequently regenerating aftertreatment devices. October 25, 2016.

A. Federal Provisions. [No change.]

B. California Provisions

1. For 2024 and subsequent model years, for manufacturers using extra preconditioning cycles, measurement and calculation of regeneration emissions (EF_H) shall be done such that all emissions from the start of the regeneration event to the start of the emission test cycle are included. For the Low-Load Cycle, manufacturers shall propose a calculation for regeneration emissions (EF_H). Executive Officer approval shall be based on the manufacturer's use of good engineering judgment and the representativeness of the proposed IRAF calculations.

- 1065.690 Buoyancy correction for PM sample media. October 25, 2016.
- 1065.695 Data requirements. March 10, 2021 (Pre-publication).

Subpart H – Engine Fluids, Test Fuels, Analytical Gases and Other Calibration Standards

- 1065.701 General requirements for test fuels. March 10, 2021 (Pre-publication).

A. Federal provisions.

- 1. Subparagraph (a). [No change.]
- 2. Amend subparagraph (b) as follows: *Fuels meeting alternative specifications*. We may allow you to use a different test fuel if you show us and we find that using it does not affect your ability to comply with all applicable emission standards using commercially available fuels.
- 3. Subparagraph (c). [No change.]
- 4. Amend subparagraph (d) as follows: *Fuel specifications*.
 - 4.1 Subparagraph (1). [No change.]
 - 4.2 Subparagraph (2). The fuel parameters specified in this subpart depend on measurement procedures that are incorporated by reference
- 5. Subparagraph (e). [No change.]
- 6. Subparagraph (f). [No change.]

B. California provisions.

1. Methanol Fuel.

1.1 Exhaust emission test fuel. For diesel alcohol vehicles and hybrid electric vehicles which use diesel alcohol engines, methanol or ethanol fuel used for exhaust and evaporative emission testing shall meet the specifications set forth in title 13, CCR, section 2292.1 (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol) as modified by the following:

Specification	Limit
M-100 Fuel Methanol	
Methanol	98.0 ± 0.5 vol. percent
Ethanol	1.0 vol. Percent (max.)
Petroleum fuel meeting the specifications of 40 CFR §1065.703	1.0 ± 0.1 vol. percent
E-100 Fuel Ethanol	
Ethanol	98.0 ± 0.5 vol. percent
Methanol	1.0 vol. Percent (max.)
Petroleum fuel meeting the specifications of 40 CFR §1065.703	1.0 ± 0.1 vol. percent

1.2 **Mileage accumulation fuel.** For diesel alcohol vehicles and hybrid electric vehicles which use diesel alcohol engines, methanol or ethanol fuel used for service accumulation shall meet the applicable specifications set forth in title 13, CCR, section 2292.1 (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol).

1.3 The specification range of the fuels to be used under this section 1 shall be reported in accordance with §86.094-21.

1.4 Fuel additives and ignition improvers intended for use in alcohol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

2. Mixtures Of Petroleum and Alcohol Fuels for Flexible Fuel Vehicles.

2.1 **Exhaust emission test fuel for emission-data and durability-data vehicles.** For diesel alcohol vehicles and hybrid electric vehicles which use diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in title 13, CCR, section 2292.2 (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following:

Specification	Limit
M-85 Fuel Methanol	
Petroleum fuel meeting the specifications of 40 CFR §1065.703	13-16 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.
E-85 Fuel Ethanol	
Petroleum fuel meeting the specifications of 40 CFR §1065.703	15-21 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.

2.2 Mileage accumulation fuel. For flexible fuel diesel alcohol vehicles and hybrid electric vehicles that use diesel alcohol engines, petroleum fuel shall meet the applicable specifications in §86.1313-98(a) or (b), as modified by these test procedures, and methanol or ethanol fuel shall meet the applicable specifications set forth in title 13, CCR, section 2292.2 (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specification for E-85 Fuel Ethanol). Mileage accumulation procedures shall be subject to the requirements set forth in §§ 86.004-26 and 86.1831-01(a) and (b) and are subject to the prior approval of the Executive Officer. A manufacturer shall consider expected customer fuel usage as well as emission deterioration when developing its durability demonstration.

2.3 Evaporative emission test fuel for emission-data and durability data vehicles. For diesel alcohol vehicles and hybrid electric vehicles, which use diesel alcohol engines, a blend of methanol or ethanol fuel used for evaporative emission testing shall meet the applicable specifications set forth in title 13, CCR, section 2292.2 (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) and gasoline meeting the specifications of 86.1313-94 (a)(1), as modified by these test procedures, such that the final blend is composed of either 35 volume percent methanol (1.0 volume percent of total blend) for methanol-fueled vehicles or 10 volume percent ethanol (1.0 volume percent of total blend) for ethanol-fueled vehicles. Alternative alcohol-gasoline blends may be used in place of M35 or E10 if demonstrated to result in equivalent or higher evaporative emissions, subject to prior approval of the Executive Officer.

2.4 The specification range of the fuels to be used in this section 2 shall be reported in accordance with §86.094-21.

2.5 Fuel additives and ignition improvers intended for use in alcohol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

3. Identification of New Clean Fuels to be Used in Certification Testing.

Any person may petition the state board to establish by regulation certification testing specifications for a new clean fuel for which specifications for the new clean fuel are not specifically set forth in part 1065, subpart H as amended herein. Prior to adopting such specifications, the state board shall consider the relative cost-effectiveness of use of the fuel in reducing emissions compared to the use of other fuels. Whenever the state board adopts specifications for a new clean fuel for certification testing, it shall also establish by regulation specifications for the fuel as it is sold commercially to the public.

(a) If the proposed new clean fuel may be used to fuel existing motor vehicles, the state board shall not establish certification specifications for the fuel unless the petitioner has demonstrated that:

(1) Use of the new clean fuel in such existing motor vehicles would not increase emissions of NMHC, NO_x, and CO, and the potential risk associated with toxic air contaminants, as determined pursuant to the procedures set forth in the "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels through 2014" or the "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years," which are incorporated by reference in title 13, CCR, §2317, as applicable. In the case of fuel-flexible vehicles or dual-fuel vehicles that were not certified on the new clean fuel but are capable of being operated on it, exhaust and evaporative emissions from the use of the new clean fuel shall not increase compared to exhaust and evaporative emissions from the use of gasoline that complies with Title 13, Division 3, Chapter 5, Article 1, California Code of Regulations.

(2) Use of the new clean fuel in such existing motor vehicles would not result in increased deterioration of the vehicle and would not void the warranties of any such vehicles.

(b) Whenever the state board designates a new clean fuel pursuant to this section, the state board shall also establish by regulation required specifications for the new clean fuel sold commercially in California.

1065.703 Distillate diesel fuel. April 28, 2014.

1. Subparagraph (a) [No change.]

2. Delete subparagraph (b) and replace with the following:

(b)(1) Use the ultra low sulfur grade test fuel as specified in Table 1 of §1065.703.

(b)(2) Diesel test fuel having the specifications listed below in the table may be used in exhaust emission testing as an option to the specifications in Table 1 of §1065.703. If a manufacturer elects to use this option, the Executive Officer shall conduct exhaust emission testing with diesel fuel having the specifications listed below.

Diesel Fuel Specification	Limit	Test Method ^a
Natural Cetane Number	47-55	D613-86
Distillation Range, °F		Title 13 CCR, §2282(g)(3)

IBP	340-420	
10% point	400-490	
50% point	470-560	
90% point	550-610	
EP	580-660	
API Gravity, degrees	33-39	D287-82
Total Sulfur, ppm	7-15	Title 13 CCR, §2282(g)(3)
Nitrogen Content, ppmw	100-500	Title 13 CCR, §2282(g)(3)
Total Aromatic Hydrocarbons, vol. %	8-12	Title 13 CCR, §2282(g)(3)
Polycyclic Aromatic Hydrocarbons, wt. % (max.)	1.4	Title 13 CCR, §2282(g)(3)
Flashpoint, °F (max)	130	D 93-80
Viscosity @ 40°C, centistokes	2.0-4.1	D 445-83

^a ASTM specifications unless otherwise noted. A reference to a subsection of title 13, CCR, §2282 means the test method identified in that subsection for the particular property. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results of the specified method.

3. Subparagraph (c) [No change.]

1065.705 Residual and intermediate residual fuel. April 28, 2014. [No change.]

1065.710 Gasoline. February 19, 2015. [n/a]

1065.715 Natural gas. April 28, 2014.

1. Delete subparagraph (a) and replace with the following:

(a)(1) **Exhaust emission test fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use natural gas, fuel used for exhaust and evaporative emission testing shall meet the specifications listed in title 13, CCR, section 2292.5 (Specifications for Compressed Natural Gas) as modified by the following:

Specification	Limit
Compressed Natural Gas Certification Test Fuel	
Methane	90.0 ± 1.0 mole percent
Ethane	4.0 ± 0.5 mole percent
C ₃ and higher hydrocarbon content	2.0 ± 0.3 mole percent
Oxygen	0.5 mole percent maximum
Inert gases (CO ₂ + N ₂)	3.5 ± 0.5 vol. percent

(a)(2) **Mileage accumulation fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use natural gas, fuel used for service accumulation shall meet the specifications listed in title 13, CCR, section 2292.5 (Specifications for Compressed Natural Gas).

(a)(3) The specification range of the fuels to be used in this section (a) shall be reported in accordance with §86.094-21.

2. Subparagraphs (b) through (d) [No change.]

1065.720 Liquefied petroleum gas. April 28, 2014.

1. Delete subparagraph (a) and replace with the following:

(a)(1) **Evaporative and exhaust emission test fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use liquefied petroleum gas, fuel used for exhaust and evaporative emission testing shall meet the specifications listed in title 13, CCR, section 2292.6 (Specifications for Liquefied Petroleum Gas) as modified by the following:

Specification	Limit
Liquefied Petroleum Gas Certification Test Fuel	
Propane	93.5 ± 1.0 volume percent
Propene	3.8 ± 0.5 volume percent
Butane and heavier components	1.9 ± 0.3 volume percent

(a)(2) Mileage accumulation fuel. For dedicated, dual-fueled or hybrid electric vehicles which use liquefied petroleum gas, fuel used for service accumulation shall meet the specifications listed in title 13, CCR, section 2292.6 (Specifications for Liquefied Petroleum Gas).

(a)(3) The specification range of the fuels to be used in this section (a) shall be measured in accordance with ASTM D2163-91 and reported in accordance with §86.094-21.

2. Subparagraph (b) through (d) [No change.]

1065.725 High-level ethanol-gasoline blends. April 28, 2014.

A. Federal provisions. [No change.]

B. California provisions.

1. California Alcohol Certification Fuel Specifications.

1.1 **Emission test fuel.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust and evaporative emission testing shall meet the specifications set forth in section 2292.1, title 13, CCR, (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol) as modified by the following:

Specification	Limit
M-100 Fuel Methanol	
Methanol	98.0 ± 0.5 vol. percent
Ethanol	1.0 vol. percent max.

Petroleum fuel meeting the specifications of §1065.710 as modified in subparagraph 2(b)(1).	1.0 ± 0.1 vol. percent
E-100 Fuel Ethanol	
Ethanol	98.0 ± 0.5 vol. percent
Methanol	1.0 vol. percent max.
Petroleum fuel meeting the specifications of §1065.710 as modified in subparagraph 2(b)(1).	1.0 ± 0.1 vol. percent

1.2 **Mileage accumulation fuel.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for service accumulation shall meet the applicable specifications set forth in section 2292.1, title 13, CCR, (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol).

1.3 Fuel additives and ignition improvers intended for use in alcohol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

2 California Certification Fuel Specifications – Mixtures of Petroleum and Alcohol Fuels for Flexible Fuel Vehicles.

2.1 **Exhaust emission test fuel for emission-data and durability-data vehicles.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following. E-85 that meets the specifications in §1065.725 may be used in exhaust and evaporative emission testing as an option to the E-85 Fuel Ethanol specifications in this subparagraph. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications listed below, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications listed below. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725.

Specification	Limit
M-85 Fuel Methanol	
Petroleum fuel meeting the specifications of §1065.710 as modified in subparagraph 2(b)(1).	13-16 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.
E-85 Fuel Ethanol	
Petroleum fuel meeting the specifications of §1065.710 as modified in subparagraph 2(b)(1).	15-21 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.

2.2 Mileage accumulation fuel. For flexible fuel Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles that use Otto-cycle or diesel alcohol engines, petroleum fuel shall meet the applicable specifications in §1065.710, as modified in §1065.710 subparagraph 2, above, and methanol or ethanol fuel shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specification for E-85 Fuel Ethanol). Mileage accumulation procedures shall be subject to the requirements set forth in 40 CFR §86.004-26 and §86.1831-01(a) and (b) and are subject to the prior approval of the Executive Officer. A manufacturer shall consider expected customer fuel usage as well as emissions deterioration when developing its durability demonstration.

2.3 Evaporative emission test fuel for emission-data and durability-data vehicles. For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, a blend of methanol or ethanol fuel used for evaporative emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) and gasoline meeting the specifications of §1065.710, as modified in §1065.710 subparagraph 2, above, such that the final blend is composed of either 35 volume percent methanol (± 1.0 volume percent of total blend) for methanol-fueled vehicles or 10 volume percent ethanol (± 1.0 volume percent of total blend) for ethanol-fueled vehicles. Alternative alcohol-gasoline blends may be used in place of M35 or E10 if demonstrated to result in equivalent or higher evaporative emissions, subject to prior approval of the Executive Officer.

2.4 Additive requirements. Fuel additives and ignition improvers intended for use in alcohol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

- 1065.735 Diesel exhaust fluid. October 25, 2016.
- 1065.740 Lubricants. July 13, 2005.
- 1065.745 Coolants. July 13, 2005.
- 1065.750 Analytical gases. October 25, 2016.
- 1065.790 Mass standards. March 10, 2021 (Pre-publication).

Subpart I –Testing with Oxygenated Fuels

- 1065.801 Applicability. July 13, 2005.
- 1065.805 Sampling system. April 28, 2014.
- 1065.845 Response factor determination. June 30, 2014.
- 1065.850 Calculations. April 28, 2014.

Subpart J- Field Testing and Portable Emission Measurement Systems

- 1065.901 Applicability. June 30, 2008.
- 1065.905 General provisions. April 28, 2014.
- 1065.910 PEMS auxiliary equipment for field testing. March 10, 2021 (Pre-publication).
- 1065.915 PEMS instruments. April 28, 2014.
- 1065.920 PEMS calibrations and verifications. April 28, 2014.
- 1065.925 PEMS preparation for field testing. September 15, 2011.
- 1065.930 Engine starting, restarting, and shutdown. July 13, 2005.
- 1065.935 Emission test sequence for field testing. June 30, 2008.

A. Federal Provisions. [No change.]

B. California Provisions

1. For 2024 and subsequent model year engines, take the following steps after in-use emission sampling is complete for test intervals that do not meet the range criteria in §1065.550.

1.1 For any test intervals, “3B-MAW” described in 86.1370.B.6 of this document, that do not meet the range criteria in §1065.550, use good engineering judgment to determine emission values of data collected during the test interval and over the range, and include the determined emission values for SOS Evaluation described in 86.1370.B.6 of this document. For example, twice the range can be used to estimate emission values of such data collected during the test interval and over the range. When 5% or more of test intervals during the test do not meet the range criteria in §1065.550 for a criteria pollutant, the test engine is deemed to be noncompliant for the engine family for the criteria pollutant unless you demonstrate compliance with the applicable emission standards.

2. For 2024 and subsequent model year engines, only for NO, NO₂, and NO_x, do not apply the drift validation criteria in §1065.550(b)(3)(i) or (b)(4), only if the drift value is equal to or within +/-2.5 ppm criteria. If the zero drift check is equal to or within +/- 2.5 ppm, the data is valid and drift correction may be used. If the zero drift check is greater than +/- 2.5 ppm, data is invalidated and drift correction may not be used. In addition, for any windows of the 3B-MAW method containing any drift invalidated data described in this paragraph, these windows are also invalidated. For valid NO, NO₂, and NO_x data, subject to use drift readings within +/- 2.5 ppm for drift correction, the corrected values calculated from the drift correction equation, Eq. 1065-672-1, must be used for SOS emission calculations described in section 86.1370.B.6.6.

1065.940 Emission calculations. November 8, 2010.

Subpart K – Definitions and Other Reference Information

1065.1001 Definitions. October 25, 2016

A. Federal Provisions. [No change.]

B. California Provisions

1. Amend the definition of “Designated Compliance Officer” as follows:
Designated Compliance Officer means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
2. Amend the definition of “Hydrocarbon” as follows: *Hydrocarbon (HC)* means THC, THCE, NMHC, NMOG, or NMHCE, as applicable. Hydrocarbon generally means the hydrocarbon group on which the emission standards are based for each type of fuel and engine.
3. Delete the definition of “Nonmethane nonethane hydrocarbon (NMNEHC).”
4. Amend the definition of “Test interval” as follows: For 2024 and subsequent model year engines, *Test Interval* means a duration of time over which you determine brake-specific emissions. For example, the standard-setting part may specify a complete laboratory duty cycle as a cold-start test interval, plus a hot-start test interval. As another example, a standard-setting part may specify a field-test interval, such as a “3B-MAW” described in 86.1370.B.6 of this document. In cases where multiple test intervals occur over a duty cycle, the standard-setting part may specify additional calculations that weight and combine results to arrive at composite values for comparison against the applicable standards.

1065.1005 Symbols, abbreviations, acronyms, and units of measure. October 25, 2016.

A. Federal Provisions. [No change.]

B. California Provisions.

ARB means Air Resources Board.

1065.1010 Incorporation by reference. October 25, 2016.

Subpart L – Methods for Unregulated and Special Pollutants

1065.1101 Applicability. April 28, 2014.

Semi-Volatile Organic Compounds

1065.1103 General provisions for SVOC measurement. April 28, 2014.

1065.1105 Sampling system design. October 25, 2016.

1065.1107 Sample media and sample system preparation; sample system assembly. October 25, 2016.

1065.1109 Post-test sampler disassembly and sample extraction. October 25, 2016.

1065.1111 Sample analysis. April 28, 2014.

PART 1068 – GENERAL COMPLIANCE PROVISIONS FOR HIGHWAY, STATIONARY, AND NONROAD PROGRAMS

Subpart A – Applicability and Miscellaneous Provisions

1068.1 Does this part apply to me? October 25, 2016.

1. Subparagraph (a) to (a)(1). [No change.]
2. Amend (a)(2) as follows: This part 1068 applies to heavy-duty motor vehicles and motor vehicle engines used in such vehicles, that are subject to the emission standards in title 13, CCR, section 1956.8.
3. Delete subparagraphs (a)(3) through (d).

1068.5 How must manufacturers apply good engineering judgement? October 8, 2008.

1. Subparagraph (a) through (d). [No change.]
2. Delete subparagraph (e).

1068.20 May ARB enter my facilities for inspections? October 25, 2016.

1. Delete subparagraph (a) and replace with: We may inspect your testing, manufacturing processes, storage facilities (including port facilities for imported engines and equipment or other relevant facilities), or records, as authorized by the California Health and Safety Code (Division 25.5 and Part 5, Division 26), to enforce the provisions of this chapter. Inspectors will have authorizing credentials and will usually limit inspections to normal operating hours.
2. Subparagraph (b). [No change.]
3. Delete subparagraph (c) and replace with: Any ARB Enforcement Officer must be furnished by those in charge of a facility being inspected with such reasonable assistance as may be necessary to discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to the ARB irrespective of whether or not the applicant controls the facility.
4. Delete subparagraph (d) and replace with: The duty to admit or cause to be admitted any ARB Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and foreign engine and vehicle manufacturers and facilities. The ARB will not attempt to make any inspections that it has been informed that local law forbids. However, if local law makes it impossible to insure the accuracy of data generated at a facility, no informed judgment that an engine or vehicle is certifiable or is covered by an Executive Order can properly be based on the data. It is the responsibility of the engine manufacturer or vehicle manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

1068.30 Definitions. October 25, 2016.

A. Federal Provisions. [All federal definitions apply, except as otherwise noted below.]

Date of manufacture: Delete and replace with:

Date of manufacture means one of the following:

(1) For engines, the date on which the crankshaft is installed in an engine block, with the following exception:

(i) Manufacturers may assign a date of manufacture at a point in the assembly process later than the date otherwise specified under this definition. For example, a manufacturer may use the build date printed on the label or stamped on the engine as the date of manufacture.

Engine: Delete

B. California Provisions.

“Administrator” means the Executive Officer of the Air Resources Board, or a designee of the Executive Officer.

“Certificate of Conformity” means an Executive Order certifying engines for sale in California.

“Certification” means relating to the process of obtaining an Executive Order for an engine family that complies with the emission standards and requirements in this part.

“Designated Compliance Officer” means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.

“EPA” shall also mean Air Resources Board or Executive Officer of the Air Resources Board.

“Standard-setting part” means the articles of the California Code of Regulations that define emission standards for a particular engine.

“United States” in reference to vehicle or engine sales or vehicle or engine introduced into commerce means the vehicle or engine sales or vehicle or engine introduced into commerce in California.

“We (us, our)” means the Executive Officer and any authorized representatives.

1068.35 Symbols, acronyms, and abbreviations. October 8, 2008.

A. Federal Provisions. [No change.]

B. California Provisions.

ARB means Air Resources Board.

1068.45 General labeling provisions. October 25, 2016.

Subpart E – Selective Enforcement Auditing

- 1068.401 What is a selective enforcement audit? October 25, 2016.
- 1068.405 What is in a test order? October 25, 2016.
- 1068.410 How must I select and prepare my engines/equipment? April 30, 2010.
- 1068.415 How do I test my engines/equipment? October 25, 2016.
- 1068.420 How do I know when my engine family fails an SEA? October 25, 2016.
- 1068.425 What happens if one of my production-line engines/equipment exceeds the emission standards? October 25, 2016.
- 1068.430 What happens if a family fails an SEA? October 25, 2016.
- 1068.435 May I sell engines/equipment from a family with a suspended certificate of conformity? October 8, 2008.
- 1068.440 How do I ask ARB to reinstate my suspended certificate? April 30, 2010.
- 1068.445 When may ARB revoke my certificate under this subpart and how may I sell these engines/equipment again? October 8, 2008.
- 1068.450 What records must I send to ARB? October 25, 2016.
- 1068.455 What records must I keep? October 8, 2008.