

Keeping Up with Changes to EMI Test

This newsletter is to inform all R&S representatives and interested customers about new developments in CISPR product standards, arising from changes to EMI compliance measurements. The newsletter is published regularly after the annual CISPR meeting and additionally if major changes in CISPR product standards take place. The newsletter is structured by the product standard number and describes for each standard;

- the currently valid edition,
- new amendments,
- potential maintenance items,
- whether the amendments shall be published as a European EN standard,
- Date of mandatory use in the European Economic Area (EEA).

Product Standards in this Issue

[CISPR 11](#)

EMI - industrial, scientific and medical equipment

[CISPR 12](#)

EMI - automotive equipment - protection of off-board receivers

[CISPR 14-1](#)

EMI - household appliances and electric tools

[CISPR 15](#)

EMI - lighting equipment

[CISPR 25](#)

EMI - automotive equipment - protection of on-board receivers

[CISPR 32](#)

EMI - multimedia equipment

[Draft CISPR 36](#)

EMI - automotive equipment - protection of off-board receivers

Which Standard Applies? CISPR Publication Levels

The International Special Committee on Radio Interference (CISPR = "Comité International Spécial des Perturbations Radioélectriques") is a technical committee of the International Electro-technical Commission established in 1933 to protect radio reception from interference. The committee has sub-committees that fulfill both product and basic standardization roles.



The 3 levels of CISPR publications. On the basic level, CISPR 16 defines the measurement apparatus, and how measurements shall be made. How and when changes in CISPR 16 apply to individual product test, is determined by the appropriate product standard.

Basic Standards: **(CISPR sub-committee A)**

The CISPR 16 series, made up of 17 parts. It defines apparatus, methods, uncertainty, and test facilities.

Generic Standards: **(CISPR sub-committee H)**

The IEC 61000-6 series for both emission measurements and immunity testing. The emission series will be restructured. In next edition, Part 6-3 will comprise residential environments only, commercial and light-industrial environments will be moved to the new Part 6-8. Industrial environments will remain in Part 6-4. Sets limits via an interference model

Product Standards: **(CISPR sub-committees B, D, F, I)**

Product and product-family standards for both emission measurements and immunity testing. Provides product-specific requirements, such as operation and arrangement of the EUT, measurement methods, and uncertainty, and permitted deviations for limits.

Major Changes to Product Standards

- The fast FFT-based time-domain scan for EMI receivers such as the R&S®ESW, ESU and ESR is applicable for EMI compliance measurements for CISPR 11, 14-1, 15, 25 and 32. CISPR 12 and 36 will follow in 2020.
- CISPR 11, 14-1 and 15 have updated the references to CISPR 16 needing new requirements for LISNs (attenuation, isolation, phase) and the procedure to evaluate the influence on radiated disturbance measurements of the set-up table material. Also required by CISPR 32.
- The RMS-Average detector as an alternative to quasi-peak and average detector for conducted and radiated disturbance measurements will most probably added in next edition of CISPR 32.
- Measuring radiated disturbance from 30-1000 MHz is mandatory in Europe since 1 May 2012 for testing household appliances and tools according to CISPR 14-1. Or use the disturbance power method for mains powered equipment if the highest internal frequency is under 30 MHz.
- Measuring radiated disturbance from 30 MHz to 300 MHz is mandatory for lighting and similar equipment according to CISPR 15. Alternatively, use the CDN(E) method.
- CISPR 11, 14-1 and 15 need the full treatment of measurement instrumentation uncertainty (MIU) according to CISPR 16-4-2. CISPR 32 will follow in 2019. Requirements to calculate MIU will be incorporated in the next editions of CISPR 12, 25 and 36.
- The linear average detector with meter time constant (CISPR-Average) for radiated disturbance measurements above 1 GHz is now required in CISPR 25 and CISPR 32.
- The new product family standard for multimedia equipment CISPR 32 was updated in March 2015. Measuring radiated disturbance from 30-1000 MHz is applicable in FAR now. CISPR 32 had replaced CISPR 13, CISPR 22, and EN 55103-1 on 5 March 2017.

CISPR 11

Industrial, scientific and medical equipment - disturbance measurements

Product committee CISPR/B: Interference relating to industrial, scientific and medical (ISM) radio-frequency apparatus, to other (heavy) industrial equipment; to overhead power lines; to high voltage equipment and to electric traction.

What's New in the 6th Edition (June 2015)?

- This sixth edition of CISPR 11 cancels and replaces the fifth edition published in 2009 and its Amendment 1 (2010).
- **Induction cooking appliances** are being transferred from CISPR 11 to CISPR 14-1.
- References to the basic standard series CISPR 16 were updated to make the **FFT-based time-domain scan of EMI receivers such as the R&S®ESW, ESU or ESR** applicable for EMI compliance measurements.
- General maintenance had set limits for magnetic field measurements for "small equipment" of Class A Group 2 (e.g. industrial heating or welding equipment) from 150 kHz - 30 MHz at 3 m. Peak limits (CW type) were added for all Group 2 equipment operating above 400 MHz. Relaxed limits in table 12 were deleted.
- **Figures for EUT arrangement and routing of cables including the use of ferrite type common mode absorption devices (CMADs)** are introduced for radiated disturbance measurements on small size equipment (distance 3 m), see Figure below.

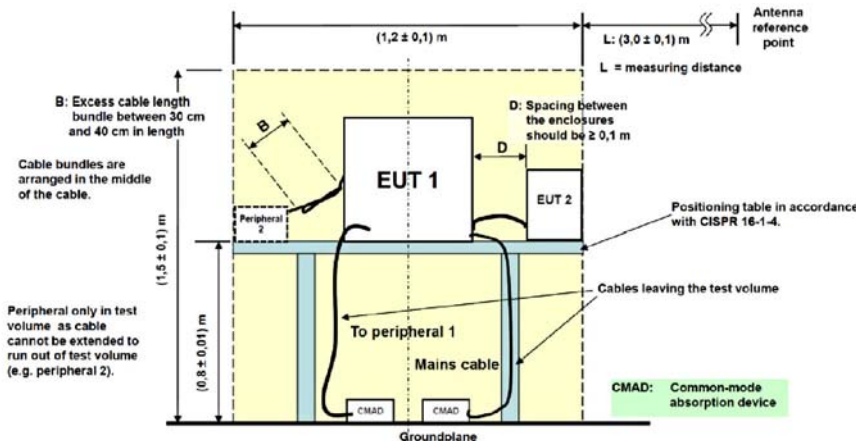
Amplitude Probability Distribution or Log-AV Detector?

A worldwide measurement campaign for APD was conducted to compare results with the established measurement method. The R&S®ESU was one of the approved APD measuring receivers used in Europe, Korea and Japan. **R&S®ESW** and ESR are also suitable for the measurements.



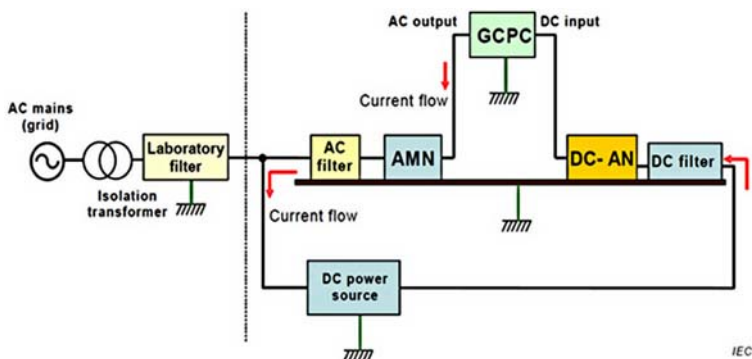
R&S®ESW; the right choice for APD measurements.

- The APD method and associated limits for assessment of fluctuating RF disturbances in the range above 1 GHz were added. The **amplitude probability distribution (APD) measurement function** is applicable as alternative to the established Log-AV detector for radiated disturbance measurements on microwave ovens from 1-18 GHz. The oven under test is operated at its maximum microwave power. The weighted APD measurement is made at the highest peak found by preliminary peak measurements in each frequency band (Band I: 1005 MHz – 2395 MHz, Band II: 2505 MHz – 17995 MHz, outside 5720 MHz – 5880 MHz). Measuring at the preliminary peak and ±10 MHz is sufficient. The three frequencies can be measured in sequence.
- The publication of EN 55011:2016 (sixth edition) was ratified by the European Commission on 15 February 2016. The date of withdrawal of the fifth Edition was set as 15 February 2019; this means the sixth Edition became mandatory on **15 February 2019 in the European Economic Area.**



EUT arrangement and routing of cables including the use of common mode absorption devices (CMADs). Source: CISPR 11:2015

- For radiated disturbance measurements from 1–18 GHz, test sites shall meet the SVSWR criterion (Clause 8, CISPR 16-1-4).
- Requirements for testing **Grid Connected Power Conditioners (GCPC)** were added. The concept of component testing is used for assessing conducted RF disturbance at the DC input power port of GCPC using an artificial network for the DC port (150 Ω DC-AN). The limits apply only to GCPC for use in photovoltaic generating systems. CISPR/A did an estimation of the appropriate **measurement instrumentation uncertainty (MIU)**, for the uncertainty budget (sample calculation) see Amendment 2:2018 to CISPR 16-4-2:2011.



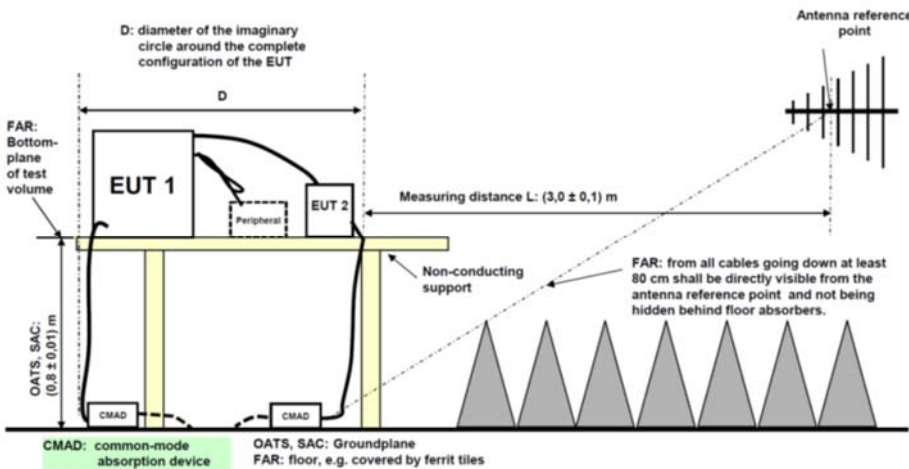
Typical arrangement for measurement of conducted disturbances at LV d.c. power ports with the DC-AN used as termination and decoupling unit to the laboratory d.c. power source). Source: CISPR 11:2015

CISPR 11 — 6th Edition Amendments Industrial, scientific and medical equipment - disturbance measurements

Product committee CISPR/B: Interference relating to industrial, scientific and medical (ISM) radio-frequency apparatus, to other (heavy) industrial equipment; to overhead power lines; to high voltage equipment and to electric traction.

What's New in Amendment 1 to the 6th Edition (June 2015)?

- Fully anechoic room (FAR) according to CISPR 16-1-4 and measurement method according to CISPR 16-2-3 were added for field measurements of frequencies below 1 GHz.
- The method is applicable for small table top equipment equipment ($D_{max} 1,2 m$) measured at a distance of 3 m, see Figure.
- **Amendment 1 was published on 23 June 2016 and date of withdrawal of the European EN 55011:2016/AMD1:2017 was set as 21 April 2020.**



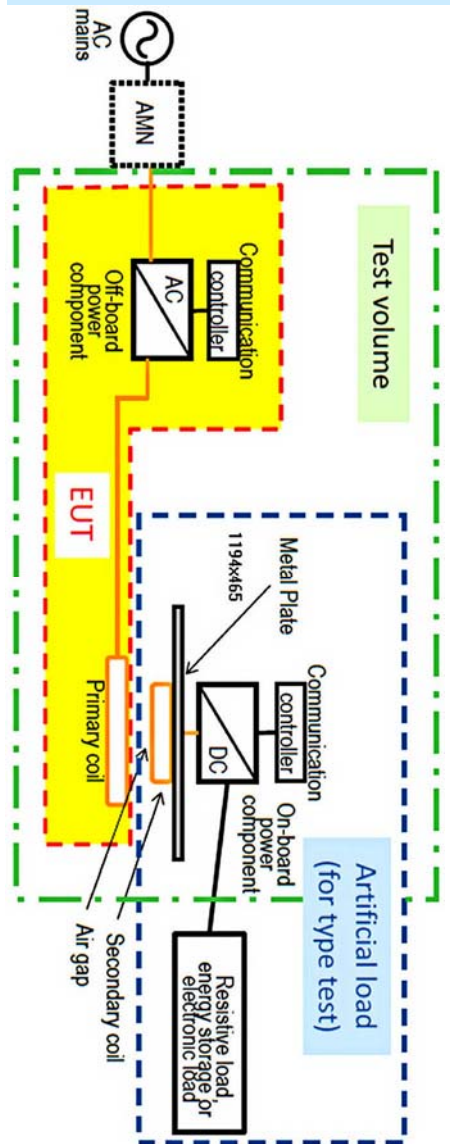
EUT arrangement and routing of cables in FAR including the use of common mode absorption devices (CMADs), Source: AMD1:2016 to CISPR 11:2015.

What's New in Amendment 2 to Edition 6?

- Adds a new definition for **power conversion equipment (PCE)** to cover non-grid power converters, such as d.c. to d.c. converters. Requirements apply only to the following types of equipment:
 - PCE intended for assembly into photovoltaic power generating systems, such as grid connected power converters (GPCCs) **and** d.c. to d.c. converters.
 - GPCCs intended for assembly into energy storage systems.
- For measurements at low voltage d.c. (LV d.c.) power ports of a PCE the following applicability criteria applies:
 - No measurements are required if the cable connected to a LV d.c. power port is less shorter 3 m,
 - For cables longer than 3 m but less than 30 m, the start frequency of the measurement range is limited to $f(MHz) = 60/length$ in meters, e.g. 6 to 30 MHz for a 10 m cable.
 - For a cable of 30 m or longer, the entire frequency range from 150 kHz to 30 MHz has to be measured.
- **Revision of APD measurement method:**
 - Generally, final weighted measurements shall be carried out only when the peak limit was exceeded during the preliminary measurement.
 - Measure in 7 subranges instead of at the frequency of the two highest, as before.
 - The Frequency span of 10 MHz will be increased to 20 MHz, which means measure on 5 final frequencies, (the critical frequency itself, +/- 5 MHz and +/- 10 MHz).
- **Publication of Amendment 2 was on 18 January 2019. The date of withdrawal of the European EN 55011:2016/AMD2:2019 has not been assigned yet.**

What's Coming in Edition 7?

Adds requirements for testing Wireless Power Transfer (WPT) equipment such as off-board charging equipment for electric vehicles. Comprises common mode current measurements in the range 150 kHz to 30 MHz with **current probe such as R&S®EZ-17** and magnetic field measurements in the range 9 kHz to 30 MHz with 60 cm Loop Antenna **such as R&S®HFH2-Z2E** in three orthogonal directions (X,Y,Z), measurement distance 3 m or 10 m (3 m for small EUT). WPT equipment covered by the scope of other CISPR standards will be excluded from the scope of CISPR 11, e.g. wireless tooth brushes are covered by CISPR 14-1.



AC - Conceptual diagram of test setup of WPT power source supply and charging equipment for electric vehicles. Source: Document CISPR/B/710/CD

CISPR 12

Automotive equipment - protection of off-board receivers - disturbance measurements

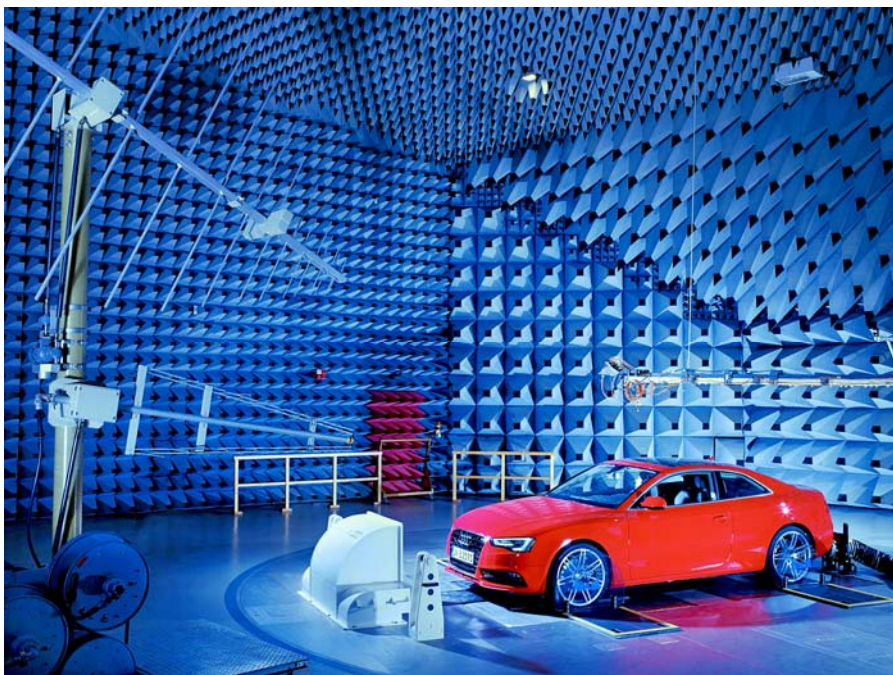
Product committee CISPR/D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices.

What's New in the 6th Edition? (May 2007)

- This sixth edition cancels and replaces the fifth edition published in 2001 and its Amendment 1 (2005).
- It has deleted the determination of narrowband/broadband disturbances. Instead measurements are now performed with both an average detector and a peak or quasi-peak detector. **Both the CISPR-AV detectors with meter time constant, and the linear AV detector are applicable.**
- CISPR 12 was published in Europe as EN 55012:2007, and ratified by the European Commission on 1 September 2007. The date of withdrawal of the 5th edition was set to 1 September 2010, this means the **6th edition became mandatory on 1 September 2010 in the European Economic Area**. It has legal status only for devices equipped with internal combustion engines, e.g. chainsaws, water pumps, snow blowers, air compressors, etc.

Amendment 1 to 6th Edition of CISPR 12 (January 2009)

- Industrial floor cleaning machines (battery and internal combustion powered) covered by IEC 60335-2-72 are added to the scope of CISPR 12 by this amendment. The flowchart in Annex G for checking the applicability has been adopted accordingly. Radio disturbance measurement for such machines are required for the first time.
- In addition the amendment includes an explicit exclusion for floor cleaning machines used in residences, and other household appliances as such equipment is covered by CISPR 14-1.
- The amendment was published in Europe as Amendment 1:2009 to EN 55012:2007, and was ratified by the European Commission on 1 July 2009. The date of withdrawal was set to 1 July 2012, this means **the amendment became mandatory on 1 July 2012 in the European Economic Area**. Again, it has legal status only for devices equipped with internal combustion engines, e.g. chainsaws, water pumps, snow blowers, air compressors, etc.



A vehicle being tested to CISPR 12, for interference to objects outside the vehicle.

What's Coming in Edition 7?

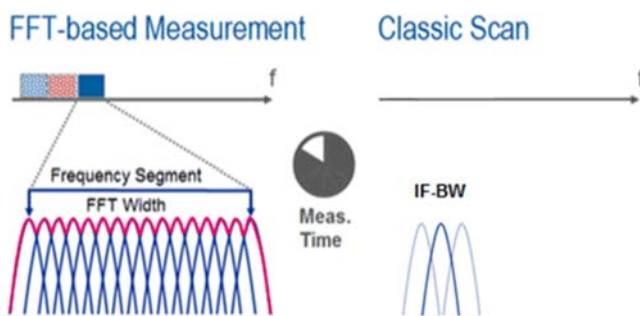
- The references to the basic standard series CISPR 16 will be updated to make the **fast FFT-based time-domain scan of EMI receivers such as the R&S@ESW, ESU or ESR** applicable for EMI compliance measurements.
- For the limits given in CISPR 12, the appropriate average detector is the **CISPR-AV detector** with meter time constant. The alternative pure linear AV detector will be deleted.
- The antenna position for emission measurements on vehicles and other devices will be aligned. Proposed is to define the centre position of the EUT as the reference point if the 3 dB beam of the antenna covers the entire EUT; otherwise multiple antenna positions are necessary.
- Measurements in engine running mode of electric and hybrid vehicles: Constant speed 40 km/h \pm 20%, or top speed if under 40 km/h, without load, on a dynamometer. But speed and load may have significant influence on the emission result.
- **Additional measurements are made in charging mode**, if the charger is a part of the vehicle;
 - Conducted emission (CISPR 14-1) from 150 kHz to 30 MHz,
 - Radiated emission (CISPR 12) from 30 MHz to 1000 MHz.
 - The engine and all other equipment shall be switched off.
- Artificial mains networks for measurements in charging mode:
 - AC power mains lines (no communication); **50 μ H//50 Ω AMN (eg: R&S@ENV216, ENV432, or ENV4200).**
 - DC power mains lines (no communication). Use a 5 μ H//50 Ω DC-charging AN.
 - Symmetric communication lines (eg CAN) use an **asymmetric artificial network (AAN) according to CISPR 16-1-2 (eg: R&S@ENV family)**, between the vehicle and charging station, or any associated equipment.
 - Communication on power lines with AMN/DC-charging-AN and decoupling unit. Use an AAN between PLC modem and power mains if the AMN/AN blocks communication.
 - Communication on control pilot line with special decoupling unit. Use an AAN between Pilot/PLC modem and vehicle. (AAN is to ensure correct communication, not used for the measurements.)
- New normative Annex H will be added on the **consideration of measurement instrumentation uncertainty (MIU)**, uncertainty budget (sample calculation) is given in informative Annex I.
- **Edition 7 failed at the final voting stage. A revised draft is expected in 2019.**

CISPR 14-1 Household appliances and electric tools - disturbance measurements

Product committee CISPR/F: Interference relating to household appliances, tools, lighting equipment and similar apparatus

What's New in the 6th Edition? (January 2016)

- This sixth edition of CISPR 14-1 cancels and replaces the fifth edition published in 2005, its Amendment 1 (2008) and Amendment 2 (2011).
- Description of a general radiated disturbance measurement method to be added. It includes;
 - exemption for battery powered remote controls,
 - introduction of the **fully-anechoic room** (CISPR 16-1-4 and 16-2-3 or IEC 61000-4-22) as alternative for radiated emission testing in a SAC.
 - Specific radiated disturbance measurement methods for air conditioners and for vacuum cleaners including robotic cleaners.
- **Use of ferrite type common mode absorption devices (CMADs)** according to CISPR 16-1-4 is introduced for radiated disturbance measurements.
- **Incorporation of requirements for measuring telecommunication ports based on CISPR 32.**
- Apply voltage probe measurement with a probe **such as R&S@ESH2-Z3** only on load ports of EUTs having associated ports, e.g. electric fence devices.
- **Full implementation of measurement instrumentation uncertainty as in CISPR 16-4-2.**
- Clarification on how to handle household appliances with lighting function, e.g. extractor hoods. Such multifunction equipment shall be measured with the lighting function set to maximum together with the fan in operation. This will avoid double testing, i.e. CISPR 15 need not to be applied.
- Alignment of start frequency for conducted measurements from 148.5 kHz to 150 kHz.
- There is general support **to incorporate the RMS-Average detector** as an alternative to quasi-peak and average detector for conducted and radiated disturbance measurements, but this will be considered as future work to amend Edition 6.
- The publication of EN 55014-1:2017 (sixth Edition) was ratified by the European Commission on 14 September 2016. The date of withdrawal of the fifth Edition was set as 28 April 2020; this means the sixth Edition becomes mandatory on **28 April 2020 in the European Economic Area.**
- References to basic standard series CISPR 16 have been updated to the current edition as of 2016. This incorporates;
 - CISPR 16-1-1 and CISPR 16-2-x to make the **fast FFT-based time-domain scan of EMI receivers such as the R&S@ESW, ESU, and ESR** applicable for EMI compliance measurements.
 - CISPR 16-1-2 on new LISN requirements (phase, isolation, attenuation). R&S@ENV216, ENV432, or ENV4200 (model 04) and from 2006 onwards also ESH2-Z5 and ESH3-Z6 are fulfilling the new requirements whereas old R&S@ESH2-Z5, ESH3-Z5 and ESH3-Z6 don't. Service kits for upgrading old units are available.
 - CISPR 16-1-4 on evaluation procedure for the influence of the set-up table material for radiated disturbance measurements.



FFT-based receivers make measurements several thousand times faster than a conventional stepped frequency scan. For this purpose FFT-based receivers are measuring spectral segments much wider than the resolution bandwidth during the measurement time by parallel calculation at several frequencies.

What's Coming after Edition 6?

- There is general support to extend the **maximum frequency to 6 GHz for radiated disturbance measurements.** However, this extension will be conditional. The highest clock frequency used in the EUT is the criterium for selecting the maximum measurement frequency:
 - 1 GHz if the highest clock frequency is less than 108 MHz,
 - 2 GHz if the highest clock frequency is equal to or larger than 108 MHz but less than 500 MHz,
 - 5 GHz if the highest clock frequency is equal to or larger than 500 MHz but less than 1 GHz,
 - **6 GHz if the highest clock frequency is equal to or larger than 1 GHz.**

Use a fully anechoic room (FAR) or SAC/OATS with RF absorbers on the RGP in accordance with CISPR 16-1-4 and measurement method according to CISPR 16-2-3 for field measurements above 1 GHz. In addition, FAR according to IEC 61000-4-22 is applicable. The highest clock frequency shall be stated in the test report.
- Clarification on click measurements:
 - **FFT-based click analyzers such as the R&S@ESW or ESR** are applicable,
 - Use of 4-channel versus 1-channel analyser,
 - The click rate shall be calculated for each of the four frequencies separately,
 - The upper quartile method shall be applied at each of the four frequencies individually.
Note: Upper Quartile Method defines the number of clicks allowed to exceed the limit.
- **Publication of Amendment 1 is expected in 2020.**



CISPR 15**Lighting equipment - disturbance measurements**

Product committee CISPR/F: Interference relating to household appliances, tools, lighting equipment and similar apparatus

What's New in Edition 9? (May 2018)

This ninth edition of CISPR 15 cancels and replaces the eight edition published in 2013 and its Amendment 1 published in 2015. Date of withdrawal of the European EN 55015:2019 has not been assigned yet.

Full editorial revision and restructuring. That includes introduction of:

- Three basic ports (wired network, local wired and enclosure),
- Term 'module' instead of independent auxiliary,
- More technology-independent approach (number of applications has been reduced significantly).
- **Maximum frequency extended to 1 GHz for radiated disturbance measurements.** Use SAC/OATS or fully anechoic room (FAR) in accordance with CISPR 16-1-4 and measurement method according to CISPR 16-2-3. TEM waveguide in accordance with IEC 61000-4-20 is usable for battery-operated equipment without cables. As an alternative use the conducted CDNE method.
- The CDNE method is restricted in use, only applicable if:
 - **All clock frequencies of the EUT are below or equal to 30 MHz,** statement in test report required!,
 - EUT size less than 3 m x 1 m x 1 m (L x W x H) without wiring.
- The CDNE (Coupling Decoupling Network Emission) has replaced the formerly used CDN (in IEC 61000-4-6) as the latter one is unsuited to radio frequency disturbance measurements from 30 MHz to 300 MHz. **The CDNE comes with an enhanced specification,** e.g. CDNE-M2 or CDNE-M3 with reduced common mode (CM) impedance tolerance and additional parameters for CM phase tolerance and differential mode impedance equal to 100 Ω. A minimum 20 dB for longitudinal conversion loss shall prevent symmetrical voltage influencing measurement results.
- The CDNE limits between 200 MHz and 300 MHz are more stringent than the limits given in CISPR 15 Ed.8 (2013). That incorporates an increasing margin of up to 10 dB at 300 MHz.
- In OATS or SAC **use CDNE for termination of the mains cable** to improve the reproducibility of radiated disturbance measurements.
- Deletion of the insertion-loss requirements and the associated Annex A.
- New conducted disturbance measurement method for GU10 self-ballasted lamp.
- Addition of current probe measurement method and limits for various types of ports (in addition to voltage limits and measurement method).
- For large EUT (> 1,6 m), addition of the magnetic field measurement method using a 60 cm loop antenna **like R&S®HFH2-Z2E** at 3 m distance (method from CISPR 14-1) as alternative to 3 m and 4 m LLAS.



R&S®HM020 with a loop diameter of 2 m. Such LLAS can be used for EUT with a largest dimension of up to 1.6 m.



CISPR 25**Automotive equipment - protection of on-board receivers - disturbance measurements**

Product committee CISPR/D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices

What's New in the 4th Edition? (October 2016)

- This fourth edition cancels and replaces the third edition published in 2008.
- References to the basic standard series CISPR 16 were updated so that the **fast FFT-based time-domain scan of EMI receivers such as the R&S®ESW, ESU, and ESR apply to EMI compliance measurements.**
- The appropriate average detector for measurements above 1 GHz is the **CISPR -AV detector with meter time constant.** Below 1 GHz the pure linear AV detector as alternative was deleted.
- Using the minimum dwell time as defined in Table 2 with a measuring receiver can result in enormous measurement result errors. **Therefore, the minimum dwell time in Table 2 shall be longer than the pulse repetition interval of the disturbance signal.**
- Dielectric material is no longer used between the cable harness and table in the measurement setup for alternators and generators (Fig. 8).
- Requirements for ignoring correction factors for the Artificial Network (AN) such as the R&S®ESH3-Z6 were deleted; applying correction factors for the AN and estimating the associated uncertainty is well known and used in test laboratories. The FM band limits affected have not be revised.
- **New measurements are added for the charging mode of electric and hybrid vehicles, if the charger is part of the vehicle;**
 - Vehicle test by measuring voltage at the internal antenna with impedance matching unit such as **R&S®EZ-12.**
 - The engine and all other equipment shall be switched off.
- Artificial mains networks for measurements in charging mode;
 - AC power mains lines (no communication). Use a 50µH//50 Ω AMN (eg; R&S ENV 216, 432, or 4200).
 - DC power mains lines (no communication). Use a 5µH//50 Ω AN (eg; ESH3-Z6).
 - Symmetric communication lines through **asymmetric artificial network (AAN) according to CISPR 16-1-2** (eg; R&S ENY family) between vehicle and charging station or any associated equipment.
 - Communication on power lines with **AMN/AN and decoupling unit.** Use **AAN** between PLC modem and power mains if the AMN/AN blocks communication
 - Communication on control pilot line with a special decoupling unit. Use AAN between Pilot/PLC modem and vehicle (AAN is to ensure correct communication, **not used for measurements**).
- Test requirements for shielded power supply systems for **high voltages in electric and hybrid vehicles were added;**
 - Conducted disturbance voltage and current measurements. Voltage measurement needs specific 5µH//50 Ohm high voltage artificial network (HV-AN), i.e. adaption for the connection of shielded cables and additional resistor for discharging to <50 V within 60 seconds.
 - Radiated disturbance measurement for components – ALSE method (150 kHz to 2500 MHz).
 - Coupling between high voltage (HV) and low voltage (LV) system by direct S-parameter measurements (coupling attenuation) or based on existing CISPR 25 test set-up (with measurement of voltage, current and electric field).
- A new informative annex on chamber validation was added. It contains two alternative validation methods ("long wire" and "reference site method") to provide flexibility.
- **Edition 4 of CISPR 25 was published on 27 October 2016. In early 2017 corrigendum COR1 was added.**
- CISPR 25:2016 was published in Europe on national level only, e.g. as BS EN 55025:2017 in Great Britain or DIN EN 55025:2018 in Germany. The national standards have been incorporated the corrigendum. **EN 55025 is not listed in the Official Journal of the EU and has no legal status.** Therefore, the car component manufacturer has to apply the specific company standards of the car manufacturer, which are usually based on CISPR 25/EN 55025.

What's Coming in Edition 5?

- **Maximum frequency will be extended beyond 2500 MHz for both component (ALSE method) and vehicle (voltage at internal antenna) testing. This will add new frequency bands up to 6 GHz:**
 - 4G: 2496 to 2690 MHz, 3300 to 3800 MHz and 5150 to 5925 MHz,
 - WiFi: 5150 to 5350 MHz and 5470 to 5725 MHz,
 - C2X (Car-to-X Communication): 5850 to 5925 MHz.
- Adds new GNSS band: 1553 to 1569 MHz to cover BDS (BeiDou Navigation Satellite System, China).
- Revision of measurement methods in charging mode of electric and hybrid vehicles based on charging mode concept as defined in IEC 61851-1 (Mode 1 to 4).
- There is general support to introduce requirements on measurement instrumentation uncertainty.



CISPR 25 covers interference caused by the vehicle to equipment mounted within the vehicle, such as a radio or GPS receiver.

CISPR 32 Multimedia equipment - disturbance measurements

Product committee CISPR/I: Electromagnetic compatibility of information technology equipment, multimedia equipment and receivers

What's in CISPR 32 Edition 1.0?

CISPR 13
Sound and television broadcast receivers -
Radio disturbance characteristics

CISPR 22
Information technology equipment -
Radio disturbance characteristics

EN 55103-1
Audio, video and entertainment lighting
control apparatus for professional use-
Part 1 - Emissions



CISPR 32
Multimedia equipment -
Radio disturbance
characteristics

- The new product family standard for multimedia equipment CISPR 32 was published on 30 January 2012. It has replaced existing CISPR 13, CISPR 22 and EN 55103-1 on 5 March 2017.
- CISPR 32 was published in Europe as EN 55032:2012, and ratified by the European Commission on 5 March 2012. The date of withdrawal of previous standards was set to 5 March 2015, then postponed to 5 March 2017, so **EN 55032 became mandatory on 5 March 2017 in the European Economic Area**. The listing in the Official Journal of the EU was on 25 February 2014.
- Multimedia equipment (MME) is defined as; Information Technology Equipment, Audio equipment, Video equipment, Broadcast receiving equipment, Entertainment lighting control equipment, or combinations.
- Radio transmission in accordance with ITU Radio Regulations is excluded.
- Port concept; measure the disturbance characteristic of each port.
- The measurement instrumentation uncertainty (MIU) shall be considered as specified in CISPR 16-4-2. But MIU need not be taken into account in the determination of compliance. However, it shall be calculated and both the results and the calculated uncertainty shall appear in the test report.
- **Radiated disturbance measurements shall be performed up to 6 GHz** based on a system concept (same as CISPR 22).
- Disturbance power measurement from CISPR 13 is not required any more.
- If there is a choice of test methods, compliance can be shown against any of the test methods using the appropriate limit. In any situation where it is necessary to re-test the equipment to show compliance, the test method originally chosen shall be used to guarantee consistency of the results.
- Compliance can be shown by measuring the EUT operating all functions simultaneously, individually, or any combination thereof.



Conducted EMI test in accordance with CISPR 32 for a television receiver.

What's New in Edition 2?

- For the limits given in CISPR 32 the appropriate average detector is the linear average detector with meter time constant as defined in CISPR 16-1-1; **CISPR-Average Detector**.
- Outdoor units of home satellite receivers are added to the scope (from CISPR 13).
- **Fully anechoic room (FAR)** in accordance with CISPR 16-1-4 and measurement method according to CISPR 16-2-3 for measurements under 1GHz were added.
- Emission-test arrangement for measurements < 1GHz for EUTs with different ways of mounting (floor standing, table-top, wall mounted, handheld) was revised to be measured as table-top even if intended for standing use.
- No need to measure differential voltage emission at each reception channel of broadcast receivers. Use channels that produced highest emission during preview scan.
- **TEM waveguide** in accordance with IEC 61000-4-20 for battery-operated equipment without cables was added (informative Annex).
- **RVC (reverberation chamber)** in accordance with IEC 61000-4-21 for radiated disturbance measurements >1 GHz added (informative Annex).
- Published in Europe as EN 55032:2015, and was ratified by the European Commission on 5 May 2015. The date of withdrawal was set to 5 May 2018; **this means the standard became mandatory on 5 May 2018 in the European Economic Area (EEA)**.

What's Coming after Edition 2?

- **Full implementation of Measurement instrumentation uncertainty (MIU)** as specified in CISPR 16-4-2.
- Measure **power spectrum density (PSD) mask** in accordance with ITU as alternative to measurements with AAN on telecommunication port.
- Add the **RMS-Average detector** as an alternative to quasi-peak and average detector for conducted and radiated disturbance measurements.
- **Terminate cables** leaving the test area in SAC, with VHF-LISN on single phase mains cables. (FAR, DC, three-phase, cables other than mains is still open.)
- Adds requirements for testing multimedia equipment with Wireless Power Transfer (WPT) ports.
- **Clarification on color bar test pattern** referenced in Clause B.2.2 of CISPR 32; in addition to ITU-R BT.1729, new informative Annex J describes color bar image for exercising displays, both 100/0/100/0 and 100/0/75/0 leveling will apply.
- Measurement method and limits > 1 GHz, will require a continuous antenna height scan from 1 to 4 m, tilting of the receive antenna is not required.

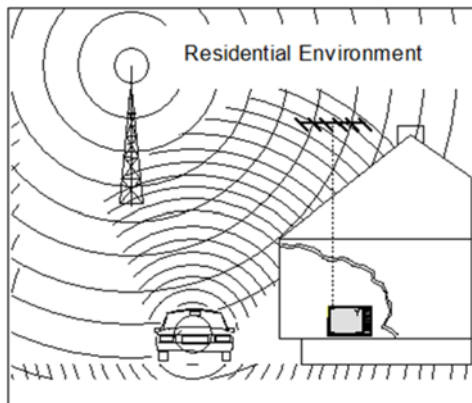
Draft CISPR 36

Automotive equipment - protection of off-board receivers - Radiated disturbance measurements below 30 MHz

Product committee CISPR/D: Electromagnetic disturbances related to electric/ electronic equipment on vehicles and internal combustion engine powered devices

What's in Draft CISPR 36 (Document CISPR/D/455/CD) ?

- The limits and methods of measurement in this draft are designed for the protection of off-board receivers such as TV Broadcast receivers in the frequency range of 150 kHz to 30 MHz when used in the residential environment, see figure. However, it may not provide adequate protection if the receivers are used less than 10 meters from the vehicle.



Source: CISPR/D/439/CDV

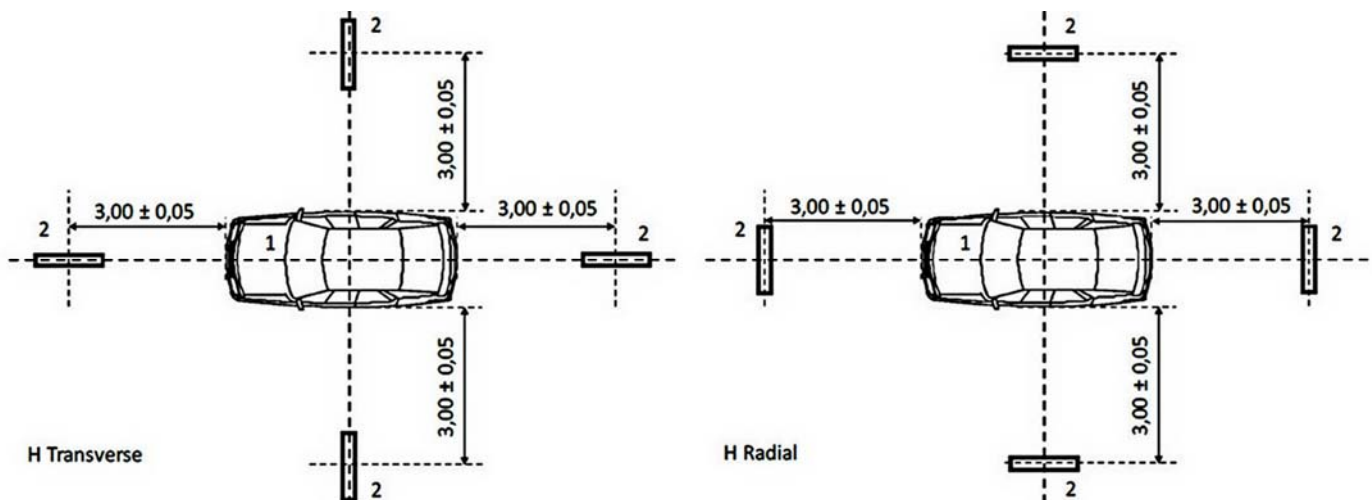
- **Applicable to electric or hybrid electric road vehicles** propelled by an internal traction battery. Measuring conducted electromagnetic disturbances while the vehicle is connected to power mains for charging is not covered in this standard.
- Adds Quasi-peak limits for radiated disturbance measurements (magnetic field) in frequency range 150 kHz to 30 MHz.
- Measurements are performed with 60 cm **Loop Antenna such as R&S®HFH2-Z2E** in Transverse and Radial direction at four positions (see figure), centre of loop is positioned at fixed height of 1,30 m. The measurement distance is 3 m taken from the centre of the loop antenna to the nearest part of the vehicle body.
- **Measurements in electric propulsion motor running mode** of electric and hybrid electric vehicles: Constant speed 40 km/h \pm 20%, or the top speed if less than 40 km/h, without load, on a dynamometer.
- New normative Annex A will be added on the **consideration of measurement instrumentation uncertainty (MIU)**, uncertainty budget (sample calculation) is given in informative Annex B.
- There is general support to add requirements for operation in charging mode (plug-in and WPT), but this will be considered as future work to amend Edition 1.
- Site validation requirements and correlation between Outdoor Test Site (OTS) and absorber lined shielded enclosure (ALSE) measurements are still under consideration. The OTS is similar to an open area test site as specified in CISPR 16-1-4, however a metallic ground plane is not required.
- **First project failed, Publication is now expected in 2020.**

Need More Information?

If you have any questions about measuring to any of the standards covered in this document, do not hesitate to contact the author at Rohde & Schwarz:
Jens Medler
jens.medler@rohde-schwarz.com

Copies of all the standards are available from the International Electrotechnical Commission webstore:

<http://webstore.iec.ch/>



Magnetic field measurement in transverse and radial loop orientation at four positions (Source: CISPR/D/455/CD).