T-MUSIC Proposer's Day

William Chappell, Office Director MTO

Briefing prepared for T-MUSIC proposer's day

January 8, 2019









Materials & Integration Thrust



Images: Stanford, MIT



Image: GLOBALFOUNDRIES

CHIPS





Materials & Integration Thrust

In the second



Image: GLOBALFOUNDRIES



CNFET

Image: Stanford, MIT

Image: Stanforst #ET



CNFET

RRAM

Image: DARPA POEM

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited

CHIPS





Materials & Integration Thrust



DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited. Intel

Image: GLOBALFOUNDRIES









www.darpa.mil

Technologies for Mixed-mode Ultra Scaled Integrated Circuits (T-MUSIC)

HR001119S0016 T-MUSIC Proposers Day

T-MUSIC will improve the bandwidth, dynamic range and operational frequencies of RF analog electronics by >10x each, enabling disruptive DoD systems.

Dr. Young-Kai Chen Program Manager Microsystems Technology Office January 8, 2019





T-MUSIC Program Overview



Problem:

Scaling digital CMOS does not support the growth of analog information.



Moore's Law has multiplied digital CMOS with high density and low power ... but hits the performance wall to increase fidelity, sensitivity and bandwidth for next generation mixed-mode electronics.



Transistor Speed And Density In Today's RF Mixed-Mode SoC Technologies





Invigorate On-Shore Foundry Capability



T-MUSIC leverages Moore's Law to scale on-shore mixed-mode semiconductors to THz while integrating advanced digital CMOS.



Remove Analog Performance Bottlenecks



- RF frontends require transistors 10x faster than the operating frequency
- High DC to RF efficiency



 $f_T = 300 \text{ GHz}$





- Fast matched transistors to digitize fast signals
- Low transistor noise enables high resolution and precision

State of the Art

• Resolution: 32 levels (5 effective bits) over 20 GHz @ 64 GSps

T-MUSIC



• Resolution: 256 levels (8 effective bits) over 50GHz @ 100 GSps



T-MUSIC will develop key mixed-mode IP blocks in foundries for HF to 100+GHz operating frequency span with 10x bandwidth, 10x finer resolution and 100x lower oscillator noises.



T-MUSIC Will Multiply DoD Capabilities In Sensing, EW And Communications



T-MUSIC will develop key mixed-mode IP blocks in foundries for HF to 100 GHz operating frequency span with 10x bandwidth, 10x finer resolution and 100x lower oscillator noises.



Commercial Wireless Applications Drive High Volume RF SOCs for mobile units and infrastructures.



DISTRIBUTION A. Approved for public release: distribution unlimited.



T-MUSIC Program Structure (48 Months over three phases 18/18/12)

TA-1: Ultra-broadband Mixed-Mode Foundry Platform (6.3 \$55M)

TA-1A: Ultra-broadband On-Shore Foundry Platform TA-1B: Ultra-broadband Mixed-Mode Building Blocks

TA-2: Research For Advanced THz Devices (6.2 \$15M)



Objective

 Develop on-shore wafer-scale ultra broadband mixed-mode technologies based on digital CMOS foundry platform

Key Metrics and Deliverables

- Analog transistor cut-off frequency ≥ 600 GHz
- Embedded ≤ 22 nm digital CMOS logic

Key Challenges

- Ultra vertical and lateral scaling of both HBT and CMOS for high speed and low noises
- Wafer-scale integration in foundry processes

Key Innovations

- Novel scaled device topologies and materials
- Innovative fabrication processes leveraging digital CMOS foundry platform



* SOI: Silicon-On-Insulator

SoC: System-on-Chip

Establish on-shore semiconductor technology to provide ultra broadband RF mixed-mode SoCs for DoD applications and world-leading commercial suppliers.



Objective

• Innovate critical mixed-mode function blocks via joint device development with on-shore foundries

Key Metrics and Deliverables

- Novel mixed-mode building blocks with 10x bandwidth, 10x resolution and 100x lower noises
- Support Process Design Kits (PDKs) and test cells
- Implement DoD relevant mixed-mode blocks and DoD IP repository for future IC designs

Key Challenges

- Develop mixed-mode PDKs capable of re-using legacy digital CMOS IP library
- Innovative circuit architectures to capitalize advanced devices for >10x performance gain

Key Innovations

- Novel low noise, high resolution analog/digital circuit topologies to maximize system performance
- Optimal combination of HBT and CMOS devices to maximize circuit performance and energy saving

Innovative Mixed-Mode Cells



Precision Ultra Wideband Converters



Metrics:

High resolution converters:

 256 resolution levels (8 effective bits) over 50 GHz bandwidth @ 100GSps sampling rate

Embedded Ultrafast Digital Cells

Metrics:

High speed digital building blocks:

• frequency divider up to 200 GHz input signals

T-MUSIC technology development will develop critical mixed-mode building blocks for shared DoD-wide use.



	T-MUSIC	Phase 1	Phase 2	Phase 3				
Objectives		 Develop > 350GHz transistors Co-integration with CMOS PDK development 	 Develop >400GHz transistor with digital CMOS Yield improvement 	 Develop >600 GHz transistor with ≤ 22nm CMOS Ultra-broadband circuits 				
TA-1	TA-1: Ultra-broadband Mixed-Mode Foundry Platform							
TA-1A Technology	Transistor $f_T/f_{max}^{(a)}$	≥ 350/500 GHz	≥ 400/600 GHz	≥ 600/700 GHz				
	Embedded Digital CMOS ^(b)	≤ 90nm node ≥ 200 mm wafer	≤ 45nm node ≥ 200 mm wafer	≤ 22 nm node ≥ 200 mm wafer				
	PCM Yield Per Wafer (c)	50%	70%	90%				
TA-1B Building Blocks	Demo Circuit #1: <i>PLL</i> ^(d)	Phase Noise @ 30GHz < -90 dBc/Hz @ 100kHz offset < -100 dBc/Hz @ 1MHz offset (Measurement)	Phase Noise @ 30GHz < -90 dBc/Hz @ 100kHz offset < -110 dBc/Hz @ 1MHz offset (Measurement)	Phase Noise @ 30GHz < -100 dBc/Hz @ 100kHz offset < -120 dBc/Hz @ 1MHz offset (Measurement)				
	Demo Circuit #2: <i>ADC</i> ^(d)	Architecture simulation and building block demo (Demo 16ENOB 1GSps ADC)	≥ 256 levels (8 ENOBs) @50 GSps, 25 GHz IBW (Demo: THA ^(d) , ADC)	≥ 256 levels (8 ENOBs) @100GSps, 50 GHz IBW (Measurement)				
	Demo Circuit #3: <i>Frequency Divider</i>	100 GHz (Measurement)	150 GHz (Measurement)	200 GHz (Measurement)				
	Circuit Yield Per Wafer (e)	50% (of divider)	70% (of PLL)	90% (of ADC)				

(a) Proposal must define the test structure for extrinsic f_T and f_{max} to include practical parasitics of the gate and interconnect. f_T and f_{max} will be extracted from >20 GHz measurement

(b) The advanced CMOS node requirement for embedded digital circuits

(c) PCM: foundry-defined Process-Control Monitor (i.e. testers, transistors, 59-stage ring-oscillators)

(d) PLL: Phase-Locked Loop; ENOBs: Effective Number of bits; IBW: Instantaneous Bandwidth; ADC: Analog-to-Digital Converter; THA: Track-and-Hold Amplifier

(e) Within-wafer yield with more than 10 demo circuits per wafer



Novel Highly Scaled Terahertz Transistor Concepts

Ferro-electric MOSFETs

Objective

 Develop next generation THz transistors beyond today's Moore's Law scaling

Key Metrics and Deliverables

- Transistor cut-off frequency ≥ 1,000 GHz
- Fast frequency divider circuit ≥ 400 GHz

Reduced (negative) gate capacitance [University of California, Berkeley] Simulated THz Fe-CMOS FETs Insulator Metal Speed GHz) 1200 1 THz 1000 STI .⊆ **Fransistor** 600 f 400 200 40 60 80 100 120 140 Gate Length (nm) J. P. Duarte et al., "Compact models of negative-capacitance FinFETs: Lumped and distributed charge models," 2016 IEEE International Electron Devices Meeting (IEDM), San Francisco, CA, 2016, pp. 30.5.1-30.5.4

Key Challenges

- Aggressive scaling, new materials and fabrications needed to attain THz performance
- Leveraging highly scaled digital CMOS fabrication infrastructure (e.g. FinFETs)

Key Innovations

- Novel device topologies and new materials
- Convert vertical devices into scalable lateral devices

Lateral SiGe HBT on SOI

Lateral HBT utilizing scaled CMOS-SOI topology [IBM, IEDM 2011; RPI 2015]



S. Raman, *et al.*, "On the Performance of Lateral SiGe Heterojunction Bipolar Transistors With Partially Depleted Base," in IEEE Transactions on Electron Devices, vol. 62, no. 8, pp. 2377-2383, Aug. 2015.

Explore novel silicon-based ultra-fast device topologies for next generation wafer-scale THz SoCs beyond current progressive Moore's Law scaling.



		Phase 1 (18 months)	Phase 2 (18 months)	Phase 3 (12 months)			
	Objectives	 Develop new device structure 	 Scale device and materials 	 Increase integration Level 			
TA-2: Fundamental: Advanced THz RF Mixed-Mode Devices							
	Transistor $f_T/f_{max}^{(a)}$	≥ 600/600 GHz	≥ 800/800 GHz	≥ 1000/1000 GHz			
	Demo Circuit: 1/4 prescaler	≥ 100 GHz	≥ 200 GHz	≥ 400 GHz			

(a) Proposal must define the test structure for extrinsic f_T and f_{max} to include practical parasitics of the transistor and interconnect. f_T and f_{max} will be extracted from >20 GHz measurement



T-MUSIC Program Schedule

DARPA T-MUSIC Program Schedule



TA-1: Ultra-broadband Mixed-Mode Foundry Platform

• TA-1A: Ultra-broadband On-Shore Foundry Platform



TA-1B: Ultra-broadband Mixed-Mode Building Blocks

TA-2: Fundamental: Advanced THz Mixed-Mode Devices





Phase	TA-1				TA-1B		TA-2	
1, 2	TA Foundry T	-1A echnology	T <i>A</i> Found	A-1A Iry MPW	TA- Building	·1B J Blocks	TA THz D	-2 evices
Month	Task	Deliverables	Task	Deliverables	Task	Deliverables	Task	Deliverables
0	Kickoff							
1	NDAs/DKLAs in place							
2	Draft PDK.+1	Draft PDK.+1	PDK.0 ready	PDK.0 Release	<u>Design starts</u>		Draft PDK.+1	Draft PDK.+1
3	PDR: fab plan	PCM, Test cell					PDR: fab plan	PCM, Test cell
4	Short Loops	<u>SL Plan, PDR</u>	MPW PDR		MPW PDR	Simulation	Short Loops	
5								
6			MPW CDR	PCM Test cells	MPW CDR	Layout; Simul.		
7	SL CDR	SL Test Report	MPW Tape-in		MPW Tape-in		SL CDR	SL Test Report
8								
9			MPW start	Report	MPW CDR	<u>Test plan; Doc</u>		
10								
11	SL CDR	SL Test Report			PDK.+1 CDR	Comments	SL CDR	SL Test Report
12								
13								
14			MPW Out		MPW Test start			
15	SL CDR	SL Test Report	PCM Test	PCM Report			SL CDR	SL Test Report
16	SL Complete		MPW CDR	PDK.0 Update	MPW CDR	Test result	SL Complete	
17	PDK.+1 Update	PDK.+1Release				Test report	PDK.+1 Update	PDK.+1Release
18	Phase Review							



DARPA Schedule, milestones and deliverables for Phase 3

Phase	TA-1				TA-1B		TA-2	
3	TA-1A Foundry Technology		TA-1A Foundry MPW		TA-1B Building Blocks		TA-2 THz Devices	
Month	Task	Deliverables	Task	Deliverables	Task	Deliverables	Task	Deliverables
0	Kickoff							
1	Draft PDK.+1	Draft PDK.+1	PDK.0 ready	PDK. Release	<u>Design starts</u>	Simulation	Short Loops	<u>Draft PDK.</u>
2	PDR: fab plan	PCM, Test cell	MPW PDR	PCM Test cells		Layout; Simul.	PDR: fab plan	PCM, Test cell
3	Short Loops	<u>SL Plan, PDR</u>	MPW CDR		MPW CDR			
4			MPW Tape-in		MPW Tape-in			
5			MPW start	Report		<u>Test plan; Doc</u>	SL CDR	SL Test Report
6	SL CDR	SL Test Report	MPW CDR		MPW CDR			
7		CDR			PDK.+1 Review	CDR. Comments		
8								
9	<u>SL Complete</u>	PCM, Test cell					SL Complete	SL Test Report
10	SL Test	SL Test Report	MPW Out	PCM Report	MPW Test start	Test results	PDK. Update	PDK. Release
11	PDK.+1 Update	PDK.+1 Release	PDK.0 Update	PDK. Release	MPW CDR	Test Report	SL CDR	Test Report
12	End of Program Review							



In Order of Importance:

1. Overall Scientific and Technical Merit

2. Potential Contribution and Relevance to the DARPA Mission

- The proposer clearly demonstrates its plans and capabilities to contribute to U.S. national security and U.S. technological capabilities. The evaluation will consider the proposer's plans and capabilities to transition proposed technologies to U.S. national security applications and to U.S. industry. The evaluation may consider the proposer's history of transitioning or plans to transition technologies to foreign governments or to companies that are foreign owned, controlled, or influenced. The evaluation will also consider the proposer's plans and capabilities to assist its employees and agents to be eligible to participate in the U.S. national security environment.
- In addition, the evaluation will take into consideration the proposed technology transition strategy and the extent to which the proposed intellectual property (IP) rights will potentially impact the Government's ability to transition the technology, as applicable.

3. Cost and Schedule Realism

 Specifically for this program, for which simultaneous impacts to the commercial sector and DoD are expected, the level of performer cost share will be considered as a significant element of the Cost Realism evaluation. DARPA recognizes that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies. It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding.



- Please follow the BAA requirements
 - TA-1A, TA-1B, and TA-2 are three stand-alone Technical Areas
 - Submit a proposal to only one Technical Area
 - Abstract is limited to 5-page maximum
 - Technical volume of the proposal is limited to 20-page maximum
- Teaming agreement in proposal between TA-1A and TA1B
 - Associate Contractor Agreement
- Abstracts are strongly encouraged
- Don't be late for your proposals
- Please send technical questions to <u>HR001119S0016@darpa.mil</u>



- Abstract Due Date: January 25, 2019 1 PM EST
- FAQ Submission Deadline: *February 18, 2019*
- Proposal Due Date: *March 12, 2019*
- Estimated period of performance start: *August 2019*

BAA Coordinator: HR001119S0016@darpa.mil



- Read the BAA
 - FedBizOpps
 <u>https://www.fbo.gov/index?s=opportunity&mode=form&id=d9dcb5f58978dd3aea</u>
 <u>11e4d0cb5d1e9e&tab=core&_cview=1</u>
 - Grants.gov <u>https://www.grants.gov/view-opportunity.html?oppId=311773</u>
- Please send questions to the BAA email address:
 - <u>HR001119S0016@darpa.mil</u>
- FAQ Submission Deadline
 - February 18, 2019 1:00 PM EST
- DARPA will post the FAQ on the Opportunities Website
 - Please check frequently at http://www.darpa.mil/work-with-us/opportunities





T-MUSIC HR001119S0016 (ERI Phase II)

Proposers Day

January 8, 2019

Michael Blackstone Contracting Officer DARPA Contracts Management Office



Distribution Statement A. Approved for Public Release; Distribution Unlimited.



Plenty of good information is made available to potential proposers to help clarify program goals/objectives and proposal preparation instructions those things that are stipulated in the BAA

However:

- Only the information/instructions in the BAA counts
- Proposals will only be evaluated in accordance with the instructions provided in the BAA
- Any response provided by the Government in the FAQ that's different than what is provided in the BAA will be made formal by an amendment to the BAA
 - Such responses will make note of an impending BAA amendment

Only a duly authorized Contracting Officer may obligate the Government



BAA allows for a variety of technical solutions and award instrument types

- The BAA defines the problem set, the proposer defines the solution (and SOW)
- Allows for multiple award instrument types:
 - TA-1A and TA-1B: Procurement Contract or Other Transaction (OT) - 6.3 Funding

6.3 Funding Only (Adv. Tech. Dev.) Restricted Research (all tiers)

• TA-2: Procurement Contract, OT, Grant or Cooperative Agreement - - 6.2 Funding

DARPA Scientific Review Process

- Proposals are evaluated on individual merit and relevance as it relates to the stated research goals/objectives rather than against one another (there is no common statement of work)
- Selections will be made to proposers whose proposals are determined to be most advantageous to the Government, all factors considered, including potential contributions to research program and availability of funding
- Government may select for negotiation all, some, or none of the proposals received
- Government may accept proposals in their entirety or select only portions thereof
- Government may elect to establish portions of proposal as options



BAA Process/Timeline

(Notional)

21 days

17 days

- 1. Proposers Day is conducted (7 January 2019)
- 2. BAA is released (4 January 2019)
- 3. Abstracts are due (25 January 2019) للـ (25 January 2019)
- 4. Government abstract responses (~ 11 February 2019)
- 5. Proposals are due/submitted (12 March 2019)
 - BAA closes on 8 April 2019
- 6. Proposals are reviewed for BAA compliance
 - Noncompliant proposals are not reviewed (and cannot be selected)
- 7. Government conducts Scientific Review Process
 - Clarification requests may be sent to various proposers
- 8. Government sends out select/non-select letters (~ 26 April 2019)
 - All proposers who submit a compliant proposal may request an Informal Feedback Session
- 9. Contracts negotiated & awarded (awards by ~ 4 August 2019)

~45 days

100 davs



- All interested/qualified sources may respond subject to the parameters outlined in BAA (such as accepting use of 6.3 funding for TA1-1A & TA-1B)
- Foreign participants/resources may participate to the extent allowed by applicable Security Regulations, Export Control Laws, Non-Disclosure Agreements, etc. (No classified proposals anticipated)
- FFRDCs and Government entities:
 - Are not prohibited by the BAA from proposing
 - Are, however, subject to applicable direct competition limitations
 - Are, however, required to demonstrate eligibility (sponsor letter)
 - > The burden to prove eligibility for all such team members rests with the proposer
 - All elements of a proposal (tech and cost, prime and subs even <u>FFRDC team members</u>) must be included in the prime's submission
- Real and/or Perceived Conflicts of Interest:
 - Identify any conflict/s
 - If any are identified, a mitigation plan must be included



Abstracts are highly encouraged:

- 1. The abstract provides a synopsis (5 pages) of the proposed project
- 2. They minimize unnecessary effort in proposal preparation and review
- 3. They reduce the potential expense of preparing an out of scope proposal

• Submit ONLY to DARPA BAA Website: https://baa.darpa.mil

• Government will reply by letter with one of two possible responses:

- 1. Encourage full proposal, and <u>may</u> provide feedback
- 2. Discourage full proposal, and <u>will</u> provide rationale (<u>may</u> provide feedback)
- DARPA will not communicate further (verbally or in writing)

Regardless of DARPA's response to an abstract, proposers may submit a full proposal

DARPA will review all full proposals submitted without regard to abstract recommendation/feedback



Proposals can address:

- > A proposal can **ONLY** address a single Technical Area
 - TA-1A, TA-1B, or TA-2
- > A proposer can submit proposals to multiple Technical Areas
- > A proposer can be selected for multiple technical areas
- Seeking Contract or OT: Submit ONLY to https://baa.darpa.mil
- Seeking Grant or Cooperative Agreement: Submit ONLY to Grants.gov or Mail (Hard Copy)

TIP 1: Propose to the program (goals, objectives, schedule, deliverables, etc.) the BAA has defined, not to the program you desire.

TIP 2: Stay in your swim lane (TA).



Volume 1: Technical/Management Proposal

- Be mindful of the page limitations
- Be mindful of preparation instructions in the "Funding Opportunity Description"
- Be sure to respond to all of the required "Detailed Proposal Information" items

• E. National Security Impact Statement

This proposal topic is relatively new to MTO BAAs (See Evaluation Criterion #2)

- How the proposed work contributes to U.S. national security and U.S. technological capabilities. The proposer may also summarize previous work that contributed to U.S. national security and U.S. technological capabilities.
- Plans and capabilities to transition technologies developed under this effort to U.S. national security applications and/or to U.S. industry. The proposer may also discuss previous technology transitions to the benefit of U.S. interests.
- Any plans to transition technologies developed under this effort to foreign governments or to companies that are foreign owned, controlled or influenced. The proposer may also discuss previous technology transition to these groups.
- How the proposer will assist its employees and agents performing work under this effort to be eligible to participate in the U.S. national security environment.

• Volume 2: Cost Proposal

- No page limitations
- Be sure to include full subcontract proposals (no ROMs)

Distribution Statement A. Approved for Public Release; Distribution Unlimited.



TA-1A & TA-1B Coordination

Associate Contractor Agreement (ACA)

- TA-1A and TA-1B performers will be required to establish ACAs with each other per BAA and the resulting contract clause – <u>must be in place prior to contract award</u>
- The performers (associate contractors) will have no contractual prime/sub relationship
- Each performer (associate contractor) operates under a separate (Prime) contract
- The ACA sets the basic collaboration relationship ground-rules to ensure both parties agree to work together (share data) to meet the defined project goals and objectives
 - It is common (although not specifically required per the clause) that the ACA also include standard Non-Disclosure Agreement (NDA) type language (data marking, data control, IP ownership, etc.)
- The Government is not a party to the ACA (does not sign it only the performers sign it)
 - Contracting Officer gets a copy for the file as verification purposes only

• NDAs, Design Kit License Agreements, etc.

 Each performer is responsible for putting these in place with the TA-1A foundry/ies for access to PDKs or similar (post award)

Proposal Preparation

- Be sure to include required coordination plan (see BAA page 12)



• If asserting less than Unlimited Rights (e.g., Restrictions):

- Provide and justify basis of assertions using the prescribed format
- Explain how each item will be used to support the proposed research project
- Explain how the Government will be able to reach its program goals (including technology transition)

The above Data Rights Cert includes prime and sub info, as applicable
 Provide even if you are proposing other than a contract (see OT backup slides)

This information is assessed during evaluations (barriers to transition)

• T-MUSIC Specifics:

- TA-1A: Government shall have no less than Limited/Restricted Rights (or similar if an Other Transaction)
- TA-1B: Government shall have no less than Government Purpose Rights (or similar if an Other Transaction)
- TA-2: Government shall have no less than Government Purpose Rights (or similar if an Other Transaction)



Pitfalls That Delay (or prevent) Proposal Review

Failure to submit proposal on time

 There is a small safety net built in for this BAA (rolling submissions after the initial due date through 8 April 2019 – a few weeks). However, it is not a guarantee as funding may be exhausted during the initial round of selections.

> Pls must keep an eye on this if somebody else in your organization is submitting

• Failure to submit using the correct mechanism (noncompliant!)

- DARPA BAA site only (Procurement Contracts & OTs Only)
- Click "Finalize Full Proposal" button or it does not get submitted
 Pls must keep an eye on this if somebody else in your organization is submitting

Failure to submit both proposal volumes (noncompliant!)

- Volume 1, Technical/Management
- Volume 2, Cost

Pages beyond the page limitation (tech prop) – pages will not be reviewed

ROM/s instead of full subcontract cost proposal/s (noncompliant!)

- "I didn't have time to get the subcontract proposal/s" will not change the outcome
 > This is a competition – we won't select what we don't understand



 Prior to Receipt of Proposals (Solicitation Phase): No restrictions, however Gov't (PM/PCO) shall not dictate solutions or transfer technology

Typically handled through the FAQ

 After Receipt of Proposals/Prior to Selections (Scientific Review Phase): Limited to Contracting Officer or BAA Coordinator (with approval) to address clarifications requested by the review team

Proposal cannot be changed in response to clarification requests

- After Selection/Prior to Award (Negotiation Phase): Negotiations are conducted by the Contracting Officer
 - > PM and/or COR typically tasked with finalizing the SOW (with PI)
 - PM and/or COR typically involved in any technical discussions (i.e., partial selection discussions)
 - Pre-award costs will not be reimbursed unless a pre-award cost agreement is negotiated prior to award

Informal Feedback Sessions (Post Selection): May be requested/provided once the selection(s) are made

- If made on a timely basis (~2 wks after letter), all requests will be accepted



Further Info Regarding OTs

- The following slides are provided for new Non-Traditional DoD performers.
 - They will not be presented during the T-MUSIC Proposers Day.
- Additional information is also available on the ERI Webpage (DARPA Website - "Work With Us" / "Electronics Resurgence Initiative").
 - Agreement Template ("ERI TIA Model")
 - Companion Guide
 - Maybe an excerpt of the Page 3/FRANC Proposers Day video where I present the following OT slides
- Additional information is also available on the Contract Management Webpage (DARPA Website - "Work With Us" / "Contract Management").
- I am available to discuss (I will not discuss the BAA itself).



• Technology Investment Agreements (ERI Fits Best Here)

- DoD-created term that encompasses OTs for Research under 10 U.S.C. 2371 and flexible cooperative agreements under 10 U.S.C. 2358
- To engage nonfederal entities in working collaboratively with the Government on basic, applied, or advanced research projects
- These instruments are premised on the resulting technology being dual-use
- Considered an assistance arrangement
- Presently covered in Part 37 of the DoDGARs (Department of Defense Grant and Agreement Regulations)

• OTs for Prototypes (purely military needs)

– Allows DoD to enter into OT agreements to carry out "prototype projects that are directly relevant to enhancing the mission effectiveness of military personnel and the supporting platforms, systems, components, or materials proposed to be acquired or developed by the Department of Defense, or to improvement of platforms, systems, components, or materials in use by the armed forces."

– 10 U.S.C. 2371b

- Considered an acquisition arrangement (supplies or services for the direct benefit or use of the Federal Government)
- DoD has issued an OT for Prototype Guide (Jan 2017) available on the web.



- No matter the type of OT most of the acquisition statutes don't apply, and none of the acquisition regulations apply:
 - Competition in Contracting Act (CICA)
 - Truth in Negotiations Act (Truthful Cost and Pricing)
 - Cost Accounting Standards
 - Contract Disputes Act
 - Procurement Protest Process
 - P.L. 85-804 and indemnification
 - Cost plus a percentage of cost prohibition
 - Buy American Act (in part)
 - Bayh-Dole Act (patents)
 - FAR/DFARS/Agency specific acquisition regulations
 - Termination for Convenience or Default
 - Changes Clause
 - Mandatory flowdowns to subcontractors

• But! Some laws (not considered acquisition regs) still do apply:

- Criminal Laws (false claims/statements)
- Laws of general applicability (Civil Rights Act)
- Laws that would apply to anyone doing business in the U.S. (e.g. environmental laws, import/export control)



• Why use an OT?

- Attractive to contractors looking for elasticity in their agreements
- Attracts companies that would normally avoid DoD business
- Any apparent risk allows parties to change the terms to be more suitable to the party absorbing most of the risk
- Invokes commercial practices, such as negotiating terms and conditions
- Removes rigidity of traditional Government procurement
- Promotes trust and a spirit of cooperation with industry
- OTs involving non-federal (performer) cost share form a partnership between the Government and the Performer (not just the usual Customer-Performer relationship)
- The usual Government procurement safeguards are removed, and risks to the Government increased, which is why the associated statutes involve cost share in most cases.

TIAs = 50/50 share to the maximum extent practicable. Sets the expectation (dual-use), but not a firm requirement – it's negotiable.

≻OT for Prototypes:

>1/3 Performer cost share required (except for small business and non-traditionals)

> The inclusion of cost share does influence the terms and conditions negotiation.



Factors to consider (TIAs)

- The Nature of the Project
 - Does it involve the support or stimulation of research?
 - Is it relevant to integrating the technology into the commercial industrial base?
- The Type of Recipient
 - Is a for-profit performer involved in the research?
 - Will the program be more successful with a team approach or a single performer?
 - These efforts often work well with consortia or teams to facilitate collaboration
 - Single firms are permissible, especially when there will be collaboration between their government and commercial divisions
- The Recipient's Commitment
 - Is there evidence of commitment to incorporate the technology into future products?
 - Are they prepared to cost-share and is the cost-share high quality?
- The Degree of Government Involvement
 - Is the expectation that the Government will be part of the team with insight into progress?
 - Is the recipient or team prepared to self-police and take a leadership role in managing the program?

But keep in mind – OTs can take longer to negotiate than a standard procurement (FAR/DFARS) contract.



• There is a ERI "Model" TIA available on the ERI webpage.

- This "Model" is unique even to DARPA (i.e., IP terms and conditions).
- See also the companion document it helps you get into the Contracting Officer's head.
- If you have little to no experience contracting with the federal government, but really want to be an ERI performer, don't let the unknown (or misinformation) prevent you from submitting a proposal!
 - The Government is not out to steal a performers IP.
 - \checkmark The Performer owns the IP that is created (all award instruments).
 - ✓ The Government seeks only a license to use the IP that is created (Patent and Data Rights).
 - The extent of the Government use rights (data) is negotiable and depends on such factors as program goals and objectives, non-federal (performer) cost share, the nature of each specific data/software deliverable, etc.
 - ✓ Yes the Government typically seeks/prefers Unlimited Rights (no use restrictions at all but,, as noted, it negotiable).
 - ✓ The Performer owns all pre-existing IP.
 - ✓ Any rights the Government has to use pre-existing IP (typically data/software) is negotiable.



• How do we negotiate OTs?

- 1. It starts with the Statement of Work (referred to as a Task Description Document/TDD for OTs.
 - > Well defined tasks that map to the a well defined program plan/schedule (prime and subs)
- 2. It also starts with clearly defined deliverables (data, software, material items).
 - What are they?
 - What is the Government going to do with them once delivered (think program goals and objectives) and how does this relate to data rights for each deliverable?
- 3. Taking the time immediately after selection to ensure each party fully understands the technical goals and objectives, and expectations specific to the proposed/selected project.
 - Work to quickly resolve any misunderstandings and fine-tune the TDD (deliverables).
- 4. Then when the above has been accomplished, we work to <u>fine-tune</u> the agreement terms and conditions to ensure it fits the above.
- 5. Cost is negotiated along the way the extent is at least somewhat related to the amount of non-federal (Performer) cost share involved.
- Negotiation can take as little as 90 days or as long as 180+ days (each OT is unique)