

Broad Agency Announcement
Transmit and Receive Optimized Photonics
(TROPHY)

Microsystems Technology Office

DARPA-BAA-09-07

10/21/2008

Table of Contents:

Part I: Overview Information.....	3
Part II: Full Text of Announcement.....	4
Sec. I: Funding Opportunity Description.....	4
A. Background and Description.....	4
B. Program Objective.....	6
C. Technical Areas of Interest	6
D. Program Organization and Metrics	8
E. Deliverables.....	12
Sec. II: Award Information.....	12
Sec. III: Eligibility Information.....	13
A. Eligible Applicants.....	13
B. Cost Sharing and Matching.....	15
C. Other Eligibility Criteria	15
Sec. IV. Application and Submission Information.....	15
A. Address to Request Application Package	15
B. Content and Form of Application Submission.....	16
1. Security and Proprietary Issues.....	16
2. Abstract and Proposal Information.....	18
3. Proposal Abstract Format	19
4. Full Proposal Format.....	19
5. Volume I, Technical and Management Proposal.....	20
6. Volume II, Cost Proposal.....	23
C. Submission Dates and Times	25
Sec. V. Application Review Information.....	26
A. Evaluation Criteria.....	26
B. Review and Recommendation Process	28
Sec. VI. Award Administration Information.....	29
A. Award Notices	29
B. Administrative and National Policy Requirements.....	29
C. Reporting Requirements	32
D. Electronic Systems.....	33
Sec. VII. Agency Contacts.....	33
Sec. VIII. Other Information.....	33
A. Intellectual Property.....	33
B. Non-Procurement Contract Proposers	35
C. All Proposers – Patents	35
Appendix A.....	37

Part One: Overview Information

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Microsystems Technology Office (MTO)
- **Funding Opportunity Title** – Transmit and Receive Optimized Photonics (TROPHY)
- **Announcement Type** – Initial Broad Agency Announcement (BAA)
- **Funding Opportunity Number** – DARPA-BAA-09-07
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – 12.910 Research and Technology Development
- **Dates**
 - Proposal Abstract Due Date- November 20, 2008
 - Proposal Due Date- January 20, 2009
- **Concise description of the funding opportunity** - DARPA is soliciting innovative research proposals for developing novel fiber optic links for RF antenna transmit and receive applications through selective mode-specific optimization of electro-optic transducers and photoreceivers. Proposed program (TROPHY, Transmit & Receive Optimized Photonics) research should investigate innovative approaches that enable revolutionary advances in fiber optic links and the associated components. The resulting links should operate broadband with high linearity (output third-order intercept ~ 65 dBm) and high RF output powers (~ 5 W) for transmit mode configurations, and with very high linearity (Spur-Free Dynamic Range ~ 132 dB.Hz^{2/3}) and low noise (noise figure ~ 3 dB) for receive mode configurations. Of particular interest is achieving these goals without compromising the wall plug efficiency. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.
- **Anticipated individual awards** – Multiple awards are anticipated.
- **Types of instruments that may be awarded** -- Procurement contract or other transaction agreement (e.g., Technology Investment Agreement).
- **Agency contact**
 - Dr. Ronald Esman
DARPA/MTO
ATTN: DARPA-BAA-09-07
3701 North Fairfax Drive
Arlington, VA 22203-1714
PHONE (571) 218-4691

The BAA Coordinator for this effort can be reached at, fax: (703) 696-2206, electronic mail: BAA09-07@darpa.mil

Part Two: Full Text of Announcement

I. FUNDING OPPORTUNITY DESCRIPTION

The Defense Advanced Research Projects Agency often selects its research efforts through the Broad Agency Announcement (BAA) process. The BAA will appear on the FedBizOpps website, <http://www.fedbizopps.gov/>. The following information is for those wishing to respond to the BAA.

DARPA is soliciting innovative research proposals for developing novel fiber optic links for RF antenna transmit and receive applications through selective mode-specific optimization of electro-optic transducers and photoreceivers. Proposed program (Transmit & Receive Optimized Photonics or TROPHY) research should investigate innovative approaches that enable revolutionary advances in fiber optic links and the associated components. The resulting links should operate broadband with high linearity (output third-order intercept ~ 65 dBm) and high RF output powers (~ 5 W) for transmit mode configurations, and with very high linearity (Spur-Free Dynamic Range ~ 132 dB.Hz^{2/3}) and low noise (noise figure ~ 3 dB) for receive mode configurations. Of particular interest is achieving these goals without compromising the wall plug efficiency. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

A. Background and Description

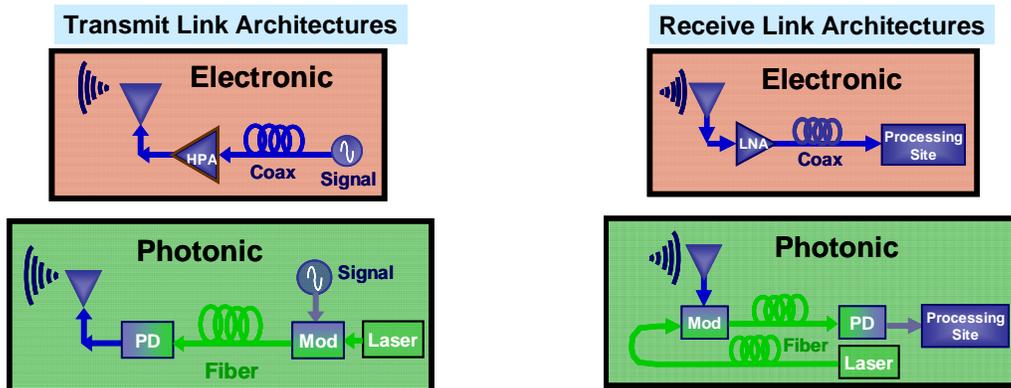


Figure 1. Electronic & Photonic Transmit & Receive Link Architectures

In military applications, conventional antenna systems are typically designed to operate in either transmit or receive mode, and are typically fed electronically with a coaxial cable from the processing station. Such electronic feeds entail high loss, are heavy, and significantly degrade the size, weight and power (SWAP) efficiencies of the link. Photonic technologies on the other hand are very attractive for application in antenna systems due to their low loss, lightweight flexible cabling, immunity to electromagnetic interference, broad bandwidth, and overall ability to remote antennas over distances not possible with conventional electronic approaches. Illustrated in Figure 1 are architectures

for electronic and photonic transmit and receive links. Photonically remoting the antenna aperture significantly alleviates the power burden at the aperture because a majority of the power hungry components can now be located at an in-board processing station. Furthermore, in shipboard and avionic applications the coaxial (metallic) cable runs from the antenna aperture to the processing station can range from tens of feet up to a thousand feet and typically there are many such coaxial cable runs on board any given ship or aircraft. There is a significant size, weight, and power (SWAP) reduction and redistribution potential when these coaxial cables are replaced with the significantly more efficient photonic links. Such migration is already occurring in the case of digital buses employed in shipboard and avionic networking applications. RF systems on the other hand are still heavily dependent on conventional high-speed electronic technologies and are therefore constrained by the performance, prime power, and distance limitations of the coaxial cable. TROPHY will seek to change this paradigm by developing cutting-edge electro-optic (EO) transducers and photoreceivers for photonic distribution of RF signals to and from the antenna.

Antenna systems performance in transmit or receive mode is conventionally optimized with different components for very different performance goals. Similarly, different operational mode configurations place different demands on fiber optic links:

On the transmit side, the photonic link must deliver a significant amount (~ several watts) of RF power to the radiator without compromising the output third order intercept point (OIP3) or overall efficiency.

On the receive side, the photonic link must perform with extreme sensitivity to low power signals without compromising the spur free dynamic range (SFDR) or overall efficiency of the link.

Through TROPHY, DARPA is seeking revolutionary ideas that would enable photonic transport of RF signals to and from the aperture in the 0.1 to 20 GHz frequency span and rival, indeed outperform their electronic counterparts. Of particular interest to TROPHY are the following: linear, high-efficiency, EO transducers (e.g., EO intensity modulators, EO phase modulators, electro-absorption modulators, etc., on any suitable materials platform such as Lithium Niobate, InP, Polymers, etc.), high-power photoreceivers with a large OIP3, and integrated link techniques, as needed, that allow for the remote photonic delivery of RF signals over distances of at least 10 meters and eventually spanning several thousand feet without compromising the linearity and efficiency of the link. In the future, we envision that compact packages of such devices will directly interface with many antenna aperture needs including phased array antennas. Such critical component technologies would eventually enable the following:

1. Truly broadband (~ 0.1 to 20 GHz) antenna systems without compromising the aperture linearity and radiated power
2. A common photonic conduit for RF signal processing allowing for cross platform integration and further capacity increases through wavelength division multiplexing (WDM)

3. A factor of 10 to 100 reduction in system SWAP
4. Immunity to electromagnetic interference
5. The ability to process antenna signals in the photonic domain and perform such critical functions as large time-bandwidth RF delays, RF filtering, and high resolution analog-to-digital conversion at very high speeds

Despite the potential advantages of photonic technologies over electronics, there has been little progress in deploying RF photonics in antenna systems. The primary barriers to the introduction of photonics in antenna systems have been the linearity, power delivery capability, and prime power efficiency of EO transducers and photoreceivers. Despite, the fundamentally different needs for transmit and receive applications, EO transducers and photoreceivers for application in RF photonic links have not been selectively optimized for a specific application viz., transmit or receive. TROPHY will attempt to circumvent these barriers by developing selectively optimized EO transducers and photoreceivers for transmit and receive applications. In a nutshell, TROPHY is aimed at significantly outperforming electronic counterparts and at rendering photonic technologies overwhelmingly practical for application in antenna systems.

B. Program Objective

The objective of TROPHY is to develop the critical photonic component technologies necessary to realize high-fidelity transmit and receive fiber optical links in the 0.1 to 20 GHz frequency span. In the future, we envision monolithic integration of arrays of such components to transport and process RF signals including feeds to phased array antennas. In this context, proposers are urged to be cognizant of the size constraints of the end application and factor it into the approach and preliminary designs. Some background information comparing nominal state-of-the-art electronic and photonic technologies are presented below for both transmit and receive links. Included are the plots of TROPHY's target metrics. Accomplishment of TROPHY goals will be validated through the demonstration of specific Program Metrics (detailed in "Deliverables" below).

C. Technical Areas of Interest

For the following, EO transducers refer generally to RF-input to modulated optical-output devices. Photoreceivers refer to single and multiple integrated devices converting optical input(s) to RF output. Photonic links refer to RF input to RF output transport utilizing optical fiber and any optical modulation format, including coherent techniques. The telecommunications C-Band (1525-1560 nm) is the preferred wavelength of operation where other optical components are readily available. Operation outside of this band will be considered but should be well justified.

DARPA seeks innovative proposals in the following two Technical Areas of Interest. **A single proposal may address one or both Technical Areas of Interest, in a comprehensive manner. Proposals only addressing select aspects of a Technical Area of Interest, viz., proposals that only address electro-optical transducers or photoreceivers will be deemed not responsive. Proposers wishing to address both**

Technical Areas of Interest may do so in a single proposal.

Technical Area I: Transmit Optimized Photonic Links: This area will develop and demonstrate photonic component technologies nominally operating in the 1550 nm band, for transmit applications, operating in the 0.1 to 20 GHz frequency range. Here, the frequency range may be broken up into 5 sub-bands with each band occupying an instantaneous bandwidth of 4 GHz. Thus, 2, 6, 10, 14 and 18 GHz are the center frequencies of the different sub-bands. The specific components that will be developed include EO transducers and photoreceivers.

1. ***Transmit optimized EO transducers:*** The proposer will use innovative ideas to design and demonstrate EO transducers with sufficient performance to meet the TROPHY transmit link metrics. Performers are required to demonstrate transmit link performance over a minimum distance of 10 meters with a TROPHY EO transducer-photoreceiver link. Thus, teaming between EO transducer and photoreceiver developers is encouraged.
2. ***Transmit optimized photoreceivers:*** The proposer will use innovative ideas to design and demonstrate photoreceivers with sufficient performance to meet the TROPHY transmit link metrics. Performers are required to demonstrate transmit link performance over a minimum distance of 10 meters with a TROPHY photoreceiver-EO transducer pair. Thus, teaming between photoreceiver and EO transducer developers is encouraged.

Technical Area II: Receive Optimized Photonic Links: This area will develop and demonstrate photonic component technologies operating in the 1550 nm band, for receive applications, operating in the 0.1 to 20 GHz frequency range. Here, the frequency range may be broken up into 5 sub-bands with each band occupying an instantaneous bandwidth of 4 GHz. Thus, 2, 6, 10, 14 and 18 GHz are the center frequencies of the different sub-bands. The specific components that will be developed include EO transducers and photoreceivers.

1. ***Receive optimized EO transducers:*** The proposer will use innovative ideas to design and demonstrate EO transducers with sufficient performance to meet the TROPHY receive requirements. Performers are required to demonstrate receive link performance over a minimum distance of 10 meters with a TROPHY EO transducer-photoreceiver link. Thus, teaming between EO transducer and photoreceiver developers is encouraged.
2. ***Receive optimized photoreceivers:*** The proposer will use innovative ideas to design and demonstrate photoreceivers with sufficient performance to meet the TROPHY receive link requirements. Performers are required to demonstrate receive link performance over a minimum distance of 10 meters with a TROPHY photoreceiver-EO transducer pair. Since balanced detection is contemplated to facilitate cancellation of the laser's relative intensity noise (RIN), the chosen photoreceiver architecture must be capable of allowing for

such noise cancellation. Thus teaming between photoreceiver and EO transducer developers is encouraged.

D. Program Organization and Metrics

The program will be conducted in two Phases, each having definite, measurable metrics, the most critical of which are designated as Go/No-Go (GNG) Metrics. These metrics are explained below and are depicted pictorially in accompanying plots. The GNG metrics are further delineated numerically in Tables 1 and 2 in Appendix A.

Programmatically, the principal differences between the Phases for the Transmit case are the increased RF transmit power and the enhanced linearity through increased output third-order intercept point (OIP3) and output second-order intercept point (OIP2). For the Receive case, the principal differences between Phases are the two-tone SFDR, Minimum detectable signal (MDS) for a signal-to-noise ratio of 7 dB, and the receive figure of merit (RFOM). The metrics for both the Transmit and Receive cases refer to continuous wave (CW) operation. The key deliverables are described in Section E below.

Transmit Optimized Photonic Links

For transmit applications, a comparison of the DC power efficiency of state-of-the-art (SOA) photonics (brown curve) with electronics (red curve) is shown in the plot in Figure 2. This comparison is based on the following assumptions:

- Instantaneous 3 dB bandwidth (**4 GHz**)
- Frequency range (**0.1-20 GHz**)
- RF output power (**5W**)
- Remoting length (**10 meters**)

The photonics SOA and electronics plots are estimates based on commercial-off-the-shelf (COTS) photonic components and RF amplifiers, respectively. Also shown are curves for the GNG efficiency metrics for TROPHY in Phases I (blue curve) and II (green curve), respectively. The target efficiency metrics will be explained in greater detail in section D (Program Organization and Metrics). As shown, SOA photonics falls well short of electronics in terms of the afforded efficiency. The low efficiency of SOA photonics is likely attributable to the wide bandwidth (DC to 20 GHz) of SOA photonic components. TROPHY will seek to bridge the efficiency gap by developing components optimized for operation in a specific 4 GHz bands in the 0.1 to 20 GHz frequency span. Furthermore, the output RF power for SOA photonic links is < 0.5 W limited primarily by photoreceiver saturation. TROPHY will seek to increase the output RF power to 5 W and 15W in Phase 1 and 2, respectively.

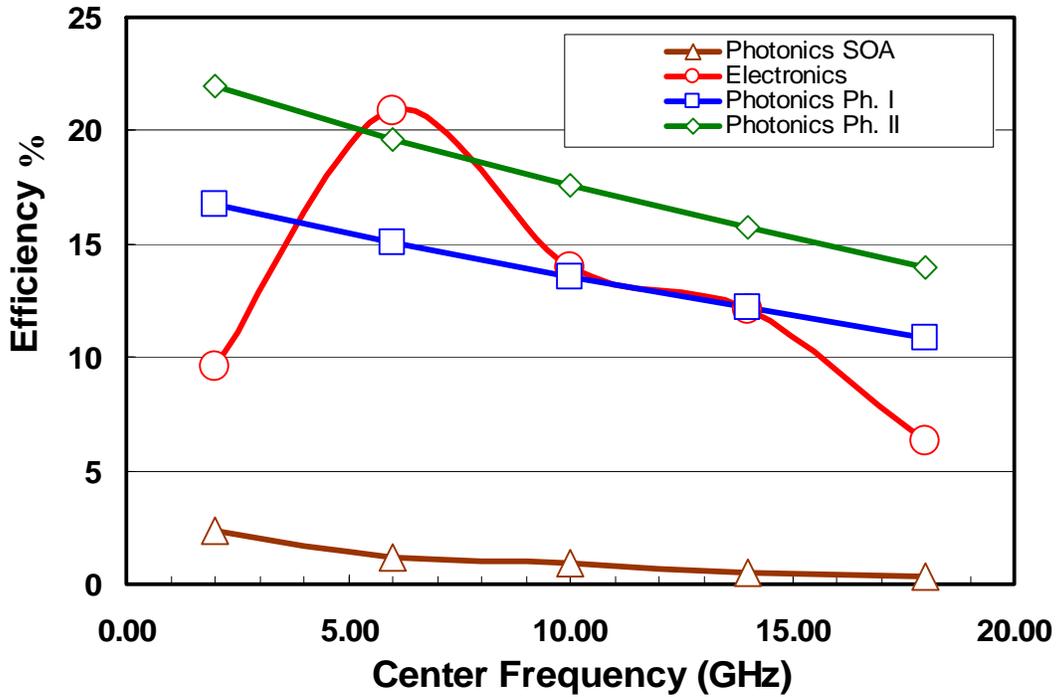


Figure 2. Transmit Link GNG Metrics as compared with SOA DC power efficiency (A 12% laser/fiber amplifier DC power efficiency was assumed in the photonics cases)

Another transmit link parameter that warrants comparison is the ratio of OIP3 to DC power. This is shown below in Figure 3.

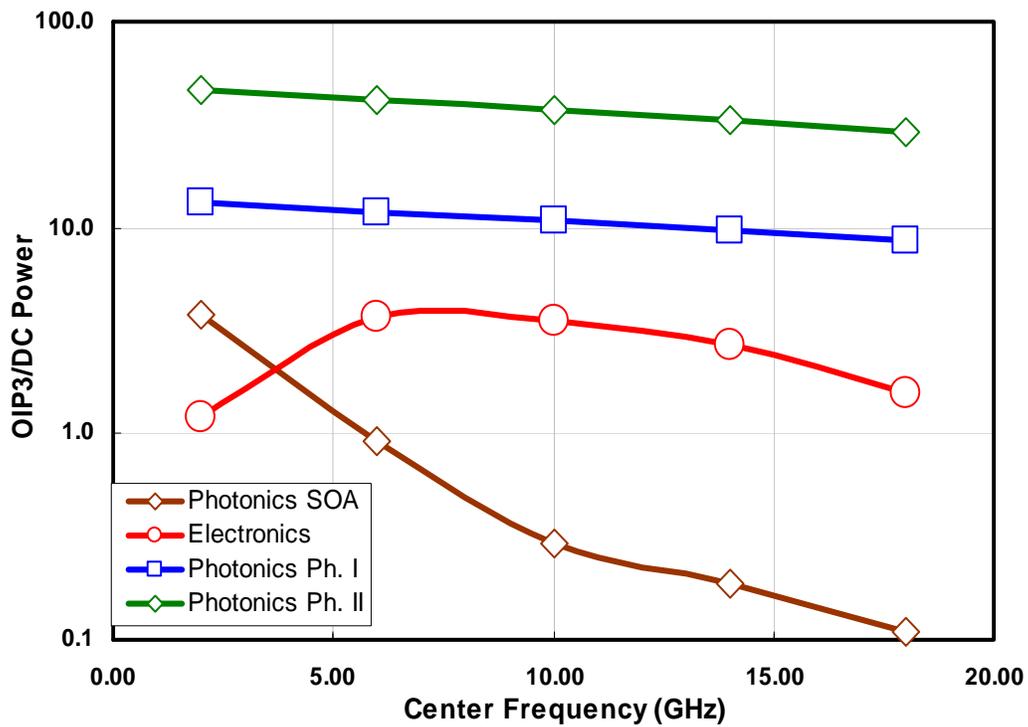


Figure 3. Transmit Link GNG Metrics as compared with SOA for OIP3/DC power

Again, photonics falls well short of electronics especially at higher frequencies. This is attributable to the low OIP3 of photonics (~ 25 to 19 dBm in the 0.1 to 20 GHz span) vs. electronics (~ 48 to 51 dBm for 5 W output power). As with Figure 2, TROPHY targets are also shown. Overall, TROPHY program objectives would be to more than bridge the gap between photonics and electronics for transmit applications.

Receive Optimized Photonic Links

For receive links, in addition to OIP3, SFDR and NF become important considerations. Shown in Figures 4 and 5 are plots of SFDR, and minimum detectable signal for signal-to-noise ratio (SNR) of 7 dB, respectively. This comparison is based on the following assumptions:

- Instantaneous bandwidth (4 GHz)
- Frequency range (0.1-20 GHz)
- Output signal-to-noise ratio (7 dB)
- Remoting length (10 meters)

As shown in both Figures 4 & 5, significant strides needs to be made with respect to photonic technologies to achieve the level of performance required in antenna systems.

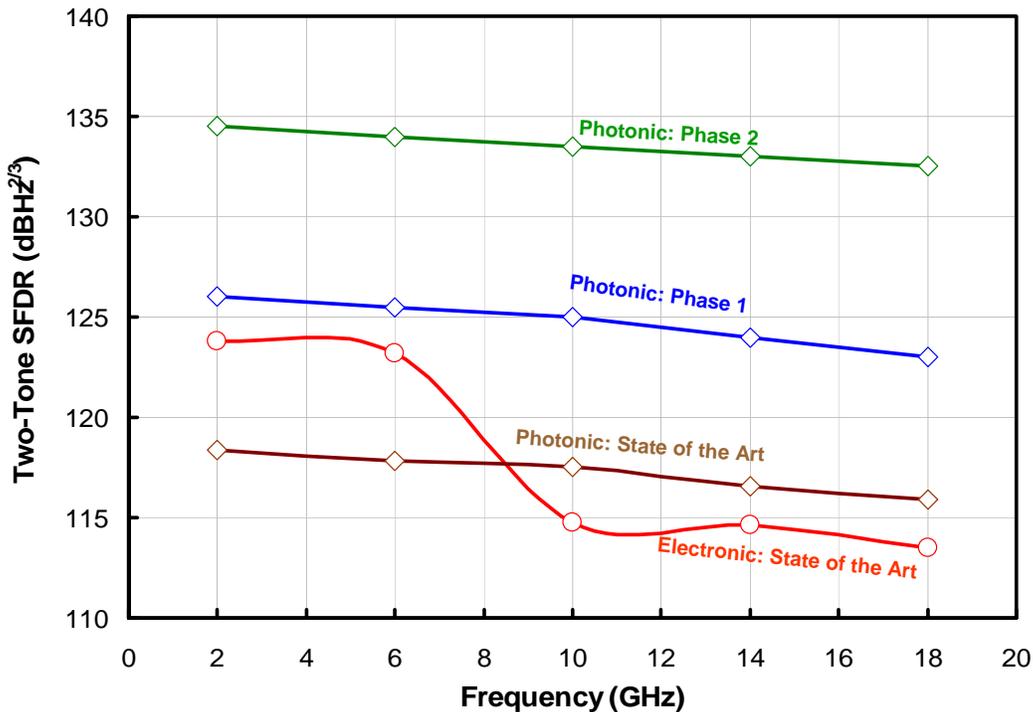


Figure 4. Receive Link GNG metrics compared to SOA for two-tone SDFR

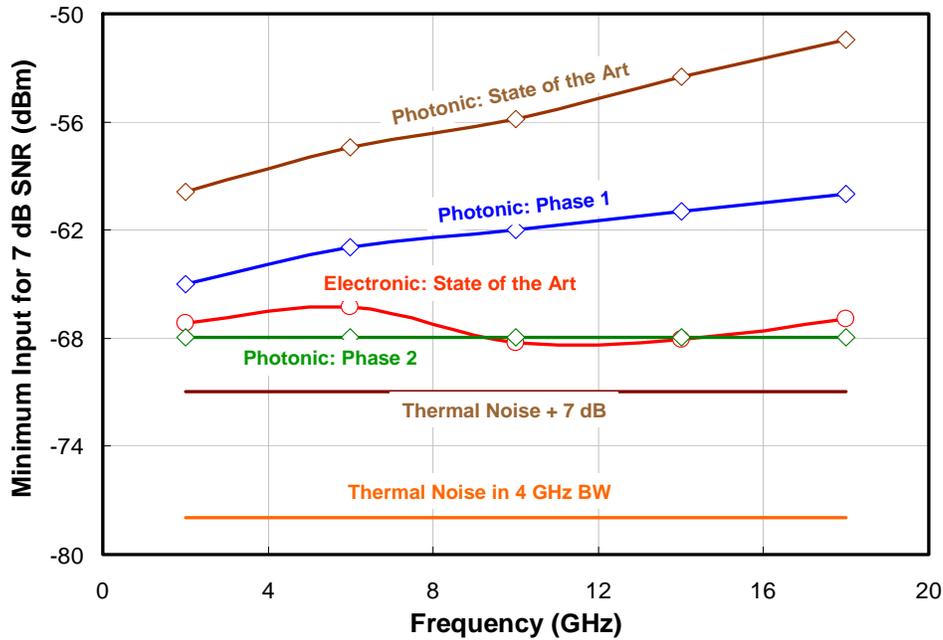


Figure 5. Receive Link GNG metrics compared to SOA for Minimum Input Signal for 7 dB SNR in a 4 GHz bandwidth

A further objective of TROPHY is to ensure that in attaining RF performance the DC power efficiency of the device is not compromised. In this context, a receive figure of merit (RFOM) can be defined as follows:

$$RFOM = \frac{1000 \times OIP3}{NF \times DC \text{ Power}}$$

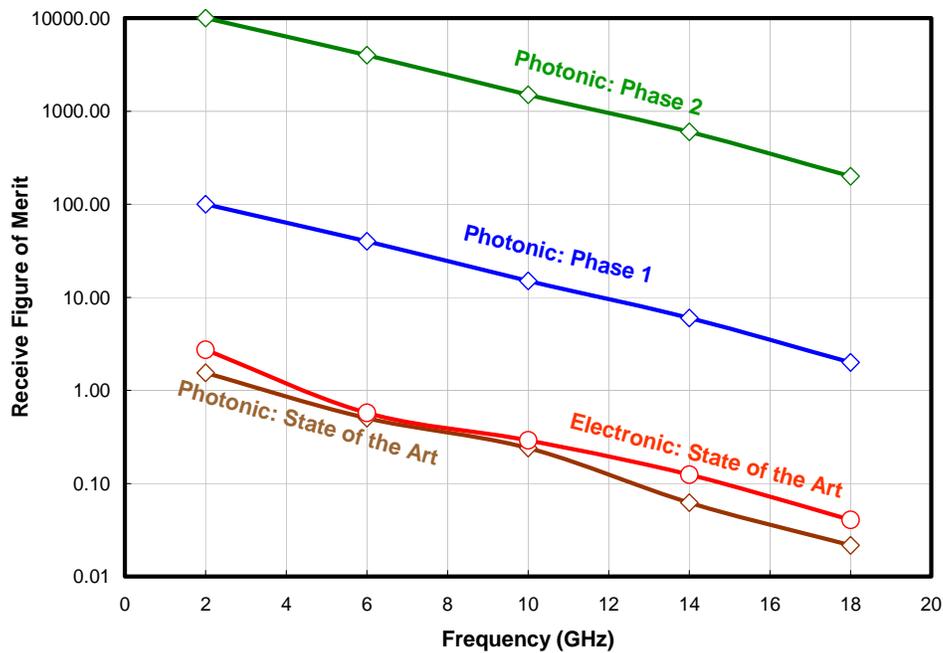


Figure 6. Receive Link GNG metrics compared to SOW for RFOM

From Figure 6 it is clear that TROPHY will seek to develop components for receive links with significantly enhanced linearity and performance without compromising the DC power efficiency.

Each Phase will culminate in specified demonstration(s), which will serve to validate that the goals of that Phase have been achieved and that the performer has met the GNG metrics. Proposers should describe, in detail, within their proposal how they plan to evaluate their technologies to verify that GNG metrics have been met. Performers are expected to meet or exceed **all** GNG metrics for the respective phases shown in Figures 2 through 6 above (or Tables 1 or 2 in Appendix A) by the conclusion of each Phase. Proposers may, at their option, propose more ambitious values for any of the GNG metrics than those indicated in Figures 2 through 6. In general, proposals committing to the most aggressive GNG metrics in each Phase will be preferred, provided that the risk in delivering the stated metrics, as described in the proposal, is considered reasonable by the reviewers.

E. Deliverables

The primary deliverables for each Phase of the TROPHY program will be experimental demonstrations of the performance metrics outlined in Tables 1, 2, or both. The proposal should clearly discuss how the target performance metrics would be achieved, and how each metric would be measured experimentally. Additionally, corresponding to each technical area, a packaged photonic link (optical sources, optical amplifiers, EO transducers and photoreceivers) must be delivered. Minimally, packaging refers to transportable devices with standard interfaces (e.g., telecommunications grade fiber, SMA compatible RF connectors, etc.).

II. AWARD INFORMATION

Multiple awards are anticipated. The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation, and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if the Source Selection Authority later determines them to be necessary. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. If the proposed effort is inherently divisible and nothing is gained from the aggregation, proposers should consider submitting it as multiple independent efforts. The Government reserves the right to fund proposals in phases with options for continued work at the end of one or more of the phases.

Awards under this BAA will be made to proposers on the basis of the evaluation criteria listed below (see section labeled “Application Review Information”, Sec. V.), and program balance to provide overall value to the Government. Proposals identified for negotiation may result in a procurement contract, or other transaction depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors.

As of the date of publication of this BAA, DARPA expects that program goals for this BAA **cannot** be met by proposers intending to perform 'fundamental research,' i.e., basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization the results of which ordinarily are restricted for proprietary or national security reasons. Notwithstanding this statement of expectation, DARPA is not prohibited from considering and selecting research proposals that, regardless of the category of research proposed, still meet the BAA criteria for submissions. In all cases, the contracting officer shall have sole discretion to select award instrument type and to negotiate all instrument provisions with selectees. In all cases, the proposers need to state how they will handle sensitive information (e.g., for official use only, ITAR restricted, EAR restricted, or classified) if the need arises.

Any procurement contract resulting from this BAA will likely include Government DFARS clause 252.204-7008 “Requirements for Contracts Involving Export Controlled Items.” Any Other Transaction agreement resulting from this BAA will likely include a clause similar to DFARS clause 252.204-7008.

III. ELIGIBILITY INFORMATION

A. Eligible Applicants

All responsible sources capable of satisfying the Government's needs may submit a proposal that shall be considered by DARPA. Historically Black Colleges and Universities (HBCUs), Small Businesses, Small Disadvantaged Businesses and Minority Institutions (MIs) are encouraged to submit proposals and join others in submitting proposals; however, no portion of this announcement will be set aside for these organizations' participation due to the impracticality of reserving discrete or severable areas of this research for exclusive competition among these entities.

Federally Funded Research and Development Centers (FFRDCs) and Government entities (Government/National laboratories, military or educational institutions, etc.) are subject to applicable direct competition limitations and cannot propose to this BAA in any capacity, unless they can clearly demonstrate the work is not otherwise available from the private sector AND they also provide written documentation citing the specific statutory authority (as well as, where relevant, contractual authority) establishing their eligibility to propose to government solicitations. At the present time, DARPA does not

consider 15 U.S.C. 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C. 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the Proposer.

Foreign participants and/or individuals may participate to the extent that such participants comply with any necessary Non-Disclosure Agreements, Security Regulations, Export Control Laws, and other governing statutes applicable under the circumstances. Initial plans for compliance should be included within the proposal.

Applicants considering classified submissions (or requiring access to classified information during the life-cycle of the program) shall ensure all industrial, personnel, and information system processing security requirements are in place and at the appropriate level (e.g., Facility Clearance (FCL), Personnel Security Clearance (PCL), certification and accreditation (C&A)) and any Foreign Ownership Control and Influence (FOCI) issues are mitigated prior to such submission or access. Additional information on these subjects can be found at: www.dss.mil.

1. Procurement Integrity, Standards of Conduct, Ethical Considerations, and Organizational Conflicts of Interest

Current federal employees are prohibited from participating in particular matters involving conflicting financial, employment, and representational interests (18 USC 203, 205, and 208.). The DARPA Program Manager for this BAA is Dr. Ronald Esman. As of the date of first publication of the BAA, the Government has not identified any potential conflicts of interest involving this program manager. Once the proposals have been received, and prior to the start of proposal evaluations, the Government will assess potential conflicts of interest and will promptly notify the proposer if any appear to exist. (Please note the Government assessment does NOT affect, offset, or mitigate the proposer's own duty to give full notice and planned mitigation for all potential organizational conflicts, as discussed below.) The Program Manager is required to review and evaluate all proposals received under this BAA and to manage all selected efforts. Proposers should carefully consider the composition of their performer team before submitting a proposal to this BAA.

All Proposers and proposed subcontractors must affirm whether they are providing scientific, engineering, and technical assistance (SETA) or similar support to any DARPA technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the Proposer supports and identify the prime contract numbers. Affirmations shall be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure shall include a description of the action the Proposer has taken or proposes to take to avoid, neutralize, or mitigate such conflict. In accordance with FAR 9.503 and without prior approval or a waiver from the DARPA Director, a

Contractor cannot simultaneously be a SETA and Performer. Proposals that fail to fully disclose potential conflicts of interests and/or do not have plans to mitigate this conflict will be returned without technical evaluation and withdrawn from further consideration for award.

If a prospective Proposer believes that any conflict of interest exists or may exist (whether organizational or otherwise), the Proposer should promptly raise the issue with DARPA by sending Proposer's contact information and a summary of the potential conflict by email to the mailbox address for this BAA at BAA09-07@darpa.mil, before time and effort are expended in preparing a proposal and mitigation plan. If, in the sole opinion of the Government after full consideration of the circumstances, any conflict situation cannot be effectively mitigated, the proposal may be returned without technical evaluation and withdrawn from further consideration for award under this BAA.

B. Cost Sharing and Matching

Cost sharing is not required for this particular program; however, cost sharing will be carefully considered where there is an applicable statutory condition relating to the selected funding instrument (e.g., for any Other Transactions under the authority of 10 U.S.C. § 2371). Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

C. Other Eligibility Criteria (optional) – Collaborative Efforts

Collaborative efforts/teaming are encouraged. A website (www.davincinetbook.com/teams) has been established to facilitate formation of teaming arrangements between interested parties. Specific content, communications, networking, and team formation are the sole responsibility of the participants. Neither DARPA nor the Department of Defense (DoD) endorses the destination web site or the information and organizations contained therein, nor does DARPA or the DoD exercise any responsibility at the destination. This website is provided consistent with the stated purpose of this BAA.

IV. APPLICATION AND SUBMISSION INFORMATION

A. Address to Request Application Package

This solicitation contains all information required to submit a proposal. No additional forms, kits, or other materials are needed. This notice constitutes the total BAA. No additional information is available, nor will a formal Request for Proposal (RFP) or additional solicitation regarding this announcement be issued. Requests for same will be disregarded.

B. Content and Form of Application Submission

1. Security and Proprietary Issues

NOTE: If proposals are classified, the proposals must indicate the classification level of not only the proposal itself, but also the anticipated award document classification level.

The Government anticipates proposals submitted under this BAA will be unclassified. However, if a proposal is submitted as “Classified National Security Information” as defined by Executive Order 12958 as amended, then the information must be marked and protected as though classified at the appropriate classification level and then submitted to DARPA for a final classification determination.

Proposers choosing to submit a classified proposal from other classified sources must first receive permission from the respective Original Classification Authority in order to use their information in replying to this BAA. Applicable classification guide(s) should also be submitted to ensure the proposal is protected at the appropriate classification level.

Classified submissions shall be appropriately and conspicuously marked with the proposed classification level and declassification date. Submissions requiring DARPA to make a final classification determination shall be marked as follows:

CLASSIFICATION DETERMINATION PENDING. Protect as though classified (insert the recommended classification level: (e.g., Top Secret, Secret or Confidential)

Classified submissions shall be in accordance with the following guidance:

Confidential and Secret Collateral Information: Use classification and marking guidance provided by previously issued security classification guides, the Information Security Regulation (DoD 5200.1-R), and the National Industrial Security Program Operating Manual (DoD 5220.22-M) when marking and transmitting information previously classified by another Original Classification Authority. Classified information at the Confidential and Secret level may be mailed via appropriate U.S. Postal Service methods (e.g., (USPS) Registered Mail or USPS Express Mail). All classified information will be enclosed in opaque inner and outer covers and double wrapped. The inner envelope shall be sealed and plainly marked with the assigned classification and addresses of both sender and addressee. The inner envelope shall be address to:

Defense Advanced Research Projects Agency
ATTN: (Microsystems Technology Office/MTO)
Reference: DARPA-BAA-09-07
3701 North Fairfax Drive

Arlington, VA 22203-1714

The outer envelope shall be sealed with no identification as to the classification of its contents and addressed to:

Defense Advanced Research Projects Agency
Security & Intelligence Directorate, Attn: CDR
3701 North Fairfax Drive
Arlington, VA 22203-1714

All Top Secret materials: Top Secret information should be hand carried by an appropriately cleared and authorized courier to the DARPA CDR. Prior to traveling, the courier shall contact the DARPA CDR at 571 218-4842 to coordinate arrival and delivery.

Special Access Program (SAP) Information: SAP information must be transmitted via approved methods. Prior to transmitting SAP information, contact the DARPA SAPCO at 703-526-4052 for instructions.

Sensitive Compartmented Information (SCI): SCI must be transmitted via approved methods. Prior to transmitting SCI, contact the DARPA Special Security Office (SSO) at 703-248-7213 for instructions.

Proprietary Data: All proposals containing proprietary data should have the cover page and each page containing proprietary data clearly marked as containing proprietary data. It is the Proposer's responsibility to clearly define to the Government what is considered proprietary data.

Security classification guidance via a DD Form 254 will not be provided at this time since DARPA is soliciting ideas only. After reviewing the incoming proposals, if a determination is made that the award instrument may result in access to classified information a DD Form 254 will be issued and attached as part of the award.

Proposers must have existing and in-place prior to execution of an award, approved capabilities (personnel and facilities) to perform research and development at the classification level they propose. It is the policy of DARPA to treat all proposals as competitive information, and to disclose their contents only for the purpose of evaluation. Proposals will not be returned. The original of each proposal received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided the formal request is received at this office within 5 days after unsuccessful notification.

2. Abstract and Proposal Information

Proposers who choose to use abstracts are strongly encouraged to submit a proposal abstract in advance of a full proposal. This procedure is intended to minimize unnecessary effort in proposal preparation and review. The time and date for submission of proposal abstracts is specified in Section C below. DARPA will acknowledge receipt of the submission and assign a control number that should be used in all further correspondence regarding the proposal abstract.

DARPA will respond to proposal abstracts with a statement as to whether DARPA is interested in the idea. DARPA will attempt to reply to proposal abstracts within thirty (30) calendar days of receipt. Proposal abstracts will be reviewed in the order they are received. Early submissions of proposal abstracts and full proposals are strongly encouraged because selections may be made at any time during the period of solicitation. Regardless of DARPA's response to a proposal abstract, proposers may submit a full proposal. DARPA will review all full proposals submitted using the published evaluation criteria and without regard to any comments resulting from the review of a proposal abstract.

Proposers are required to submit full proposals by the time and date specified in the BAA in order to be considered during the initial round of selections. DARPA may evaluate proposals received after this date for a period up to one year from date of posting on FedBizOpps. Selection remains contingent on availability of funds.

A single proposal may address one or both Technical Areas of Interest, in a comprehensive manner. Proposals only addressing select aspects of a Technical Area of Interest, viz., proposals that only address electro-optical transducers or photoreceivers will be deemed not responsive. Proposers wishing to address both Technical Areas of Interest may do so in a single proposal.

Restrictive notices notwithstanding, proposals may be handled, for administrative purposes only, by a support contractor. This support contractor is prohibited from competition in DARPA technical research and is bound by appropriate nondisclosure requirements. Proposals and proposed abstracts may not be submitted by fax or e-mail; any so sent will be disregarded.

Proposals not meeting the format described in the BAA may not be reviewed.

All administrative correspondence and questions on this solicitation, including requests for information on how to submit a proposal abstract or full proposal to this BAA, should be directed to BAA09-07@darpa.mil. DARPA intends to use electronic mail for correspondence regarding DARPA-BAA-09-07. Proposals and proposal abstracts may not be submitted by fax or e-mail; any so sent will be disregarded. DARPA encourages use of the Internet for retrieving the BAA, amendments to the BAA, and any other related information that may subsequently be provided: <http://www.darpa.mil/baa/#eto>. Please continue to monitor the BAA site for possible amendments throughout the BAA process.

Proposals sent in response to DARPA-BAA-09-07 must be submitted through DARPA's Technical-Financial Information Management System (T-FIMS). See <https://www.tfims.darpa.mil/baa/> for more information on how to request an account, upload proposals, and use the T-FIMS tool. Because proposers using T-FIMS may encounter heavy traffic on the web server, and T-FIMS requires a registration and certificate installation for all proposers, proposers should not wait until the day the proposal is due to create an account in T-FIMS and submit the proposal. All proposers using T-FIMS must also encrypt the proposal, as per the instructions below.

All proposals submitted electronically by means of an Electronic Business Application Tool or proposal submission web site must be encrypted using Winzip or PKZip with 256-bit AES encryption. Only one zipped/encrypted file will be accepted per proposal and proposals not zipped/encrypted will be rejected by DARPA. An encryption password form must be completed and emailed to BAA09-07@darpa.mil at the time of proposal submission. See <https://www.tfims.darpa.mil/baa/> for the encryption password form.

Note the word "PASSWORD" must appear in the subject line of the above email and there are minimum security requirements for establishing the encryption password. Failure to provide the encryption password may result in the proposal not being evaluated. For further information and instructions on how to zip and encrypt proposal files, see <https://www.tfims.darpa.mil/baa/>.

3. Proposal Abstract Format

Proposal abstracts are encouraged in advance of full proposals in order to provide potential proposers with a rapid response to minimize unnecessary effort. Proposal abstracts should follow the same general format as described for Volume I under PROPOSAL FORMAT (see below), but include ONLY Sections I and II. The cover sheet should be clearly marked "PROPOSAL ABSTRACT" and the total length should not exceed 10 pages, excluding cover page and official transmittal letter. All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. Proposals using font smaller than 12 point may not be reviewed. Smaller font may be used for figures, tables and charts. The page limitation for proposal abstracts includes all figures, tables, and charts. No formal transmittal letter is required. All proposal abstracts must be written in English.

4. Full Proposal Format

All full proposals must be in the format given below. Nonconforming proposals may be rejected without review. Proposals shall consist of two volumes. All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. Proposals using text with less than 12 point font may not be evaluated. Smaller font may be used for figures, tables and charts. The page limitation for full proposals includes all figures, tables, and charts. Volume I, Technical and Management Proposal, may include an attached bibliography of relevant technical papers or research notes (published and

unpublished) which document the technical ideas and approach upon which the proposal is based. Copies of not more than three (3) relevant papers can be included with the submission. The bibliography and attached papers are not included in the page counts given below. The submission of other supporting materials along with the proposals is strongly discouraged and will not be considered for review. Except for the attached bibliography and optional papers in Section I, Volume I shall not exceed 64 numbered pages. Maximum page lengths for each section are shown in braces { } below. All full proposals must be written in English.

5. Volume I, Technical and Management Proposal

{2} Section I. Administrative

A. Cover sheet to include:

- (1) BAA number
- (2) Technical area
- (3) Lead Organization Submitting proposal
- (4) Type of business, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "OTHER SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL", OR "OTHER NONPROFIT"
- (5) Contractor's reference number (if any)
- (6) Other team members (if applicable) and type of business for each
- (7) Proposal title
- (8) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available)
- (9) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available), total funds requested from DARPA, and the amount of cost share (if any) and
- (10) Date proposal was submitted.

B. Official transmittal letter.

{9} Section II. Summary of Proposal

- A. Innovative claims for the proposed research. This section is the centerpiece of the proposal and should succinctly describe the uniqueness and benefits of the proposed approach relative to the current state-of-art alternate approaches.
- B. Cost, schedule and, if applicable, payable milestones for the proposed research, including estimates of cost for each task in each year of the effort delineated by the prime and major subcontractors, total cost and, if applicable, company cost share. **Note: All program GNG metrics should be described/discussed in detail so reviewers can assess risks associated with meeting them. Measurable critical milestones should occur at the end of every phase.** These payable milestones should enable and support a go/no go decision for the next part of the effort. Do not include proprietary information with the milestones. Additional

interim non-critical management milestones are also highly encouraged at a regular interval.

- C. Technical rationale, technical approach, and constructive plan for accomplishment of technical goals in support of innovative claims and deliverable production. (In the full proposal, this section should be supplemented by a more detailed plan in Section III.)
- D. General discussion of other research in this area and how the above goals and milestones compare to what is already been demonstrated.
- E. A clearly defined organization chart for the program team which includes, as applicable: (1) the programmatic relationship of team member; (2) the unique capabilities of team members; (3) the task of responsibilities of team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person during each year.
- F. Deliverables associated with the proposed research including such items as reports, demonstrations, test plans, and test articles. Include plans and capability to accomplish technology transition and commercialization. Include in this section all proprietary claims to the results, prototypes, intellectual property, or systems supporting and/or necessary for the use of the research, results, and/or prototype. If there are not proprietary claims, this should be stated.

Note: When completing Proposal Section III parts A-H below, keep in mind the evaluation criteria explained in BAA Section V, p. 27, below.

{51} Section III. Detailed Proposal Information

- A. {15} *Technical Rationale and Approach.* Detailed technical rationale and approach enhancing that of Section II. A concise section outlining the scientific and technical challenges, unique approaches, and potential anticipated technical solutions to the challenges that will be addressed. This section should demonstrate that the proposer has a clear understanding of the state-of-the-art; and should provide sufficient technical details so as to permit complete evaluation of the feasibility of the idea. Additionally, comparison with other ongoing research shall be provided indicating advantages and disadvantages of the proposed effort.
- B. {8} *Program Plan & Risk Assessment.* Detailed program plan and risk assessment enhancing that of Section II. A narrative explaining the explicit timelines, milestone achievements, and quantitative program GNG metrics by which progress toward the goals can be evaluated. The proposed period of performance of the overall program, and each program phase, should be clearly stated. The narrative plan should include a specific test plan detailing how all program GNG metrics will be accurately measured. All program GNG metrics must be associated with demonstrable, quantitative measures of performance, and should be summarized in a single table. Proposals should clearly explain the technical approach(es) that will be employed to meet or exceed each program GNG metric and provide ample justification as to why the approach(es) is/are feasible. This section should also identify major technical risk elements specific to the proposed approach, estimate the risk magnitude for each such element, and describe specific plans to mitigate risk. **All program GNG metrics should be**

- described/discussed in detail so reviewers can assess risks associated with meeting them. Measurable critical milestones should occur at the end of every phase.** These critical technical milestones should enable and support a go/no go decision for the next part of the effort. Additional interim non-critical technical milestones are also highly encouraged at regular intervals.
- C. {7} *Statement of Work (SOW)* - In plain English, clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. The SOW **must not** include proprietary information. The SOW **must** be developed so that each phase of the program is separately defined. The SOW **must** include, for each phase, a table defining the program GNG metrics to be achieved. For each task/subtask, provide:
- A general description of the objective (for each defined task/activity);
 - A detailed description of the approach to be taken to accomplish each defined task/activity);
 - Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
 - The exit criteria for each task/activity - a product, event or milestone that defines its completion.
 - Define all deliverables (reporting, data, reports, hardware, software, etc.) to be provided to the Government in support of the proposed research tasks/activities.
- D. {4} *Teaming and Management Plan.* A clearly defined organization chart for the program team which includes the programmatic relationship and a summary of each member's roles and responsibilities. Additionally, a narrative discussing (1) the proposers teaming strategy/rationale; (2) the specific roles and responsibilities of the team members; (3) the unique capabilities of the team members; (4) the proposers team management approach; and (5) the proposers approach/process regarding handling sensitive information (e.g., for official use only, ITAR restricted, EAR restricted, or classified), if the need arises.
- E. {5} *Capabilities.* A section describing relevant prior work, the background, qualifications and relevant experience of team member organizations (prime and sub) and key individuals to be assigned to the program, and the facilities and equipment to be utilized. Please do not attach supporting material (CDs, movies, etc.) to the proposal, except as noted in Section IV below.
- F. {4} *Technology Transition & Business Plan.* A description of the results, products, transferable technology, and expected technology transfer path enhancing that of Section II. B. See also VI (B)(2) "Intellectual Property."
- G. {4} *Cost schedules and Payable Milestones,* if proposed, for the proposed research including estimates of cost for each task in each phase and year of the effort delineated by the primes and major subcontractors, total cost, and any company cost share. Payable milestones (descriptions, exit criteria, etc.), if proposed, must not include proprietary information. Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.
- H. {6} *Slide Summary.* PowerPoint-type slide (i.e., landscape formatted for presentation) that succinctly highlights the major aspects of the proposal. The

summary should include a Pentachart (see PowerPoint Attachment 1), problem being solved, approach being pursued, technical challenges within the approach and their proposed solutions, and all program metrics (including proposer defined metrics, if applicable).

Section IV. Additional Information

A brief bibliography of relevant technical papers and research notes (published and unpublished) which document the technical ideas upon which the proposal is based. Copies of not more than three (3) relevant papers can be included in the submission.

6. Volume II, Cost Proposal – {No Page Limit}

Cover sheet to include:

- (1) BAA number;
- (2) Technical area;
- (3) Lead Organization Submitting proposal;
- (4) Type of business, selected among the following categories: “LARGE BUSINESS”, “SMALL DISADVANTAGED BUSINESS”, “OTHER SMALL BUSINESS”, “HBCU”, “MI”, “OTHER EDUCATIONAL”, OR “OTHER NONPROFIT”;
- (5) Contractor’s reference number (if any);
- (6) Other team members (if applicable) and type of business for each;
- (7) Proposal title;
- (8) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available);
- (9) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), and electronic mail (if available);
- (10) Award instrument requested: cost-plus-fixed-fee (CPFF), cost-award—no fee, cost sharing contract – no fee, or other type of procurement contract (*specify*), or other transaction;
- (11) Place(s) and period(s) of performance;
- (12) Total proposed cost separated by basic award and option(s) (if any);
- (13) Name, address, and telephone number of the proposer’s cognizant Defense Contract Management Agency (DCMA) administration office (*if known*);
- (14) Name, address, and telephone number of the proposer’s cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*);
- (15) Date proposal was prepared;
- (16) DUNS number;
- (17) TIN number; and
- (18) Cage Code;
- (19) Subcontractor Information; and
- (20) Proposal validity period.

The proposers cost volume shall provide cost and pricing information, or other than cost or pricing information if the total price is under \$650,000, in sufficient detail to substantiate the program price proposed (e.g., realism and reasonableness). In doing so, the proposer shall provide a detailed cost breakdown by phase, task and month. The breakdown shall include, at a minimum, the following major cost items: direct labor (labor categories and labor hours per category); subcontracts (by subcontractor); material/equipment; other direct costs (travel, computer usage fee's, etc.), and indirect charges (rates and factors such as Overhead, G&A, Fringe Benefits, etc.). Proposers are encouraged to provide the aforementioned cost breakdown as an editable MS Excel spreadsheet with tabs (material, travel, ODC's) provided as necessary. Additionally, the proposer shall provide (1) a summary of total program costs by phase and task, (2) an itemization of major subcontracts, (3) a priced Bill-of-Materials (BOM) clearly identifying, for each item proposed, the source of the unit price (i.e., vendor quote, engineering estimate, etc.) and the type of property (i.e., material, equipment, special test equipment, plant equipment, information technology (IT)¹, etc.); (4) the source, nature, and amount of any industry cost-sharing; and (5) identification of pricing assumptions of which may require incorporation into the resulting award instrument (e.g., use of Government Furnished Property/Facilities/Information, access to Government Subject Matter Expert/s, etc.). Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.

The proposer shall provide a detailed description of the methods used to estimate costs, to include, at a minimum: 1) substantiation of all rates and factors, and 2) labor and material estimates supported by a narrative basis-of-estimate (BOE) providing sufficient detail to substantiate cost estimates. The prime contractor is responsible for compiling and providing, as part of its proposal submission to the Government, subcontractor proposals prepared at the same level of detail as that required of the prime. Subcontractor proposals include Interdivisional Work Transfer Agreements (ITWA) or similar arrangements. If seeking a procurement contract, the prime contractor shall provide a cost reasonableness analysis of proposed subcontractor prices. Such analysis shall indicate the extent to

-
- ¹ IT is defined as “any equipment, or interconnected system(s) or subsystem(s) of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the agency. (a) For purposes of this definition, equipment is used by an agency if the equipment is used by the agency directly or is used by a contractor under a contract with the agency which – (1) Requires the use of such equipment; or (2) Requires the use, to a significant extent, or such equipment in the performance of a service or the furnishing of a product. (b) The term “information technology” includes computers, ancillary, software, firmware and similar procedures, services (including support services), and related resources. (c) The term “information technology” does not include – (1) Any equipment that is acquired by a contractor incidental to a contract; or (2) Any equipment that contains imbedded information technology that is used as an integral part of the product, but the principal function of which is not the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. For example, HVAC (heating, ventilation, and air conditioning) equipment such as thermostats or temperature control devices, and medical equipment where information technology is integral to its operation, are not information technology.”
 -

which the prime contractor has negotiated subcontract prices. All proprietary subcontractor proposal documentation which cannot be uploaded to TFIMS as part of the proposers submission, shall be made immediately available to the Government, upon request, under separate cover (i.e., mail, electronic/email, etc.), either by the Proposer or by the subcontractor organization – this does not relieve the proposer from the requirement to include, as part of their TFIMS submission, subcontract proposals that do not include proprietary pricing information (rates, factors, etc.).

If seeking a procurement contract and items of Contractor Acquired Property are proposed, exclusive of material, the proposer shall clearly demonstrate that the inclusion of such items as Government Property is in keeping with the requirements of FAR Part 45.102. For IT purchases, all proposers shall include a letter stating why the proposer cannot provide the requested resources from its own funding.

NOTE: “cost or pricing data” as defined in FAR Subpart 15.4 shall be required if the proposer is seeking a procurement contract award of \$650,000 or greater unless the proposer requests an exception from the requirement to submit cost or pricing data. “Cost or pricing data” are not required if the proposer proposes an award instrument other than a procurement contract (e.g., a Technology Investment Agreement or 845 Other Transaction Agreement for Prototypes).

All proposers requesting an 845 Other Transaction Agreement for Prototypes (OTA) must include a detailed list of payment milestones. Each such payment milestone must include the following: milestone description, exit criteria, due date, milestone payment amount (to include, if cost share is proposed, contractor and government share amounts). It is noted that, at a minimum, such payable milestones should relate directly to accomplishment of program technical go/no-go criteria as defined in the BAA and/or the proposer’s proposal. Agreement type, fixed price or expenditure based, will be subject to negotiation by the Agreements Officer; however, it is noted that the Government prefers use of fixed price payable milestones to the maximum extent possible. Do not include proprietary data. If the proposer requests award of an 845 OTA as a nontraditional defense contractor, as so defined in the OSD guide entitled “Other Transactions (OT) Guide For Prototype Projects” dtd January 2001 (as amended)(http://www.dau.mil/pubs/Online_Pubs.asp), information must be included in the cost proposal to support the claim. Additionally, if the proposer plans requests award of an 845 OTA, without the required one-third (1/3) cost share, information must be included in the cost proposal supporting that there is at least one non-traditional defense contractor participating to a significant extent in the proposed prototype project.

C. Submission Dates and Times

1. Proposal Abstract Date

The proposal abstract must be submitted to DARPA/MTO through T-FIMS on or before 4:00 p.m., local time (Arlington, VA), November 20,2008. Proposal abstracts received after this time and date may not be reviewed.

2. Full Proposal Date

The full proposal must be submitted to DARPA/MTO through T-FIMS on or before 4:00 p.m., local time (Arlington, VA), January 20, 2009 in order to be considered during the initial round of selections; however, proposals received after this deadline may be received and evaluated up to one year from date of posting on FedBizOpps. Full proposals submitted after the due date specified in the BAA or due date otherwise specified by DARPA after review of proposal abstracts may be selected contingent upon the availability of funds. Proposers are warned that the likelihood of funding is greatly reduced for proposals submitted after the initial closing date deadline.

DARPA will continue to post a consolidated Question and Answer document on <http://www.darpa.mil/baa/#eto> through January 6, 2009. In order to receive a response to question(s), it is highly recommended that your question(s) be submitted by no later than December 30, 2008 to BAA09-07@darpa.mil.

DARPA will acknowledge receipt of complete submissions via email and assign control numbers that should be used in all further correspondence regarding proposals.

Failure to comply with the submission procedures may result in the submission not being evaluated.

D. Intergovernmental Review (if applicable)

Not Applicable

E. Funding Restrictions

Not Applicable

F. Other Submission Requirements

Not Applicable

V. APPLICATION REVIEW INFORMATION

A. Evaluation Criteria

Evaluation of proposals will be accomplished through a scientific/technical review of each proposal using the following criteria, in order of descending importance: (a) Ability to meet Program Go/No-Go Metrics; (b) Overall Scientific and Technical Merit; (c) Plans and Capability to Accomplish Technology Transition; (d) Proposer's Capabilities and/or Related Experience; (e) Potential Contribution and Relevance to the DARPA Mission; (f) Realism of Proposed Schedule; and (g) Cost Realism. Proposals will not be evaluated

against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons. The following are descriptions of the above listed criteria:

(a) Ability to meet program Go/No-Go Metrics

The feasibility and likelihood of the proposed approach for satisfying the program go/no-go metrics are explicitly described and clearly substantiated. The proposal reflects a mature and quantitative understanding of the program go/no-go metrics, the statistical confidence with which they may be measured, and their relationship to the concept of operations that will result from successful performance in the program.

(b) Overall Scientific and Technical Merit

The proposed technical approach is feasible, achievable, complete and supported by a proposed technical team that has the expertise and experience to accomplish the proposed tasks. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final product that achieves the goal can be expected as a result of award. The proposal identifies major technical risks and planned mitigation efforts are clearly defined and feasible.

(c) Plans and Capability to Accomplish Technology Transition

The capability to transition the technology to the research, industrial, and operational military communities in such a way as to enhance U.S. defense, and the extent to which intellectual property rights limitations creates a barrier to technology transition.

(d) Proposer's Capabilities and/or Related Experience

The proposer's prior experience in similar efforts must clearly demonstrate an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule. The proposed team has the expertise to manage the cost and schedule. Similar efforts completed/ongoing by the proposer in this area are fully described including identification of other Government sponsors.

(e) Potential Contribution and Relevance to the DARPA Mission

The potential contributions of the proposed effort with relevance to the national technology base will be evaluated. Specifically, DARPA's mission is to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their military use.

(f) Realism of Proposed Schedule

The proposer's abilities to aggressively pursue performance metrics in the shortest timeframe and to accurately account for that timeframe will be evaluated, as well as proposer's ability to understand, identify, and mitigate any potential risk in schedule.

(g) Cost Realism

The objective of this criterion is to establish that the proposed costs are realistic for the technical and management approach offered, as well as to determine the proposer's practical understanding of the effort. This will be principally measured by cost per labor-hour and number of labor-hours proposed. The evaluation criterion recognize 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. Cost reduction approaches that will be received favorably include innovative management concepts that maximize direct funding for technology and limit diversion of funds into overhead.

After selection and before award the contracting officer will negotiate cost/price reasonableness.

Award(s) will be made to proposers whose proposals are determined to be the most advantageous to the Government, all factors considered, including the potential contributions of the proposed work to the overall research program and the availability of funding for the effort. Award(s) may be made to any proposer(s) whose proposal(s) is determined selectable regardless of its overall rating.

NOTE: PROPOSERS ARE CAUTIONED THAT EVALUATION RATINGS MAY BE LOWERED AND/OR PROPOSALS REJECTED IF SUBMITTAL INSTRUCTIONS ARE NOT FOLLOWED.

B. Review and Recommendation Process

It is the policy of DARPA to ensure impartial, equitable, comprehensive proposal evaluations and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals. Pursuant to FAR 35.016, the primary basis for selecting proposals for acceptance shall be technical, importance to agency programs, and fund availability. In order to provide the desired evaluation, qualified Government personnel will conduct reviews and (if necessary) convene panels of experts in the appropriate areas.

Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons. For evaluation purposes, a proposal is the document described in "Proposal Information", Section IV.B. Other supporting or background materials submitted with the proposal will be considered for the reviewer's convenience only and not considered as part of the proposal.

Restrictive notices notwithstanding, proposals may be handled for administrative purposes by support contractors. These support contractors are prohibited from competition in DARPA technical research and are bound by appropriate non-disclosure requirements.

Subject to the restrictions set forth in FAR 37.203(d), input on technical aspects of the proposals may be solicited by DARPA from non-Government consultants /experts who are strictly bound by the appropriate non-disclosure requirements.

It is the policy of DARPA to treat all proposals as competitive information and to disclose their contents only for the purpose of evaluation. No proposals will be returned. Upon completion of the source selection process, the original of each proposal received will be retained at DARPA and all other copies will be destroyed.

VI. AWARD ADMINISTRATION INFORMATION

A. Award Notices

As soon as the evaluation of a proposal is complete, the proposer will be notified that 1) the proposal has been selected for funding pending contract negotiations, or 2) the proposal has not been selected. These official notifications will be sent via U.S. mail and electronic mail to the Technical POC identified on the proposal coversheet.

B. Administrative and National Policy Requirements

1. Meeting and Travel Requirements

There will be a program kickoff meeting and all key participants are required to attend. Performers should also anticipate periodic site visits at the Program Manager's discretion.

2. Human Use

All research involving human subjects, to include use of human biological specimens and human data, selected for funding must comply with the federal regulations for human subject protection. Further, research involving human subjects that is conducted or supported by the DoD must comply with 32 CFR 219, *Protection of Human Subjects* (<http://www.dtic.mil/biosys/downloads/32cfr219.pdf>), and DoD Directive 3216.02, *Protection of Human Subjects and Adherence to Ethical Standards in DoD-Supported Research* (<http://www.dtic.mil/whs/directives/corres/html2/d32162x.htm>).

Institutions awarded funding for research involving human subjects must provide documentation of a current Assurance of Compliance with Federal regulations for human subject protection, for example a Department of Health and Human Services, Office of Human Research Protection Federal Wide Assurance (<http://www.hhs.gov/ohrp>). All institutions engaged in human subject research, to include subcontractors, must also have a valid Assurance. In addition, personnel involved in human subjects research must provide documentation of completing appropriate training for the protection of human subjects.

For all proposed research that will involve human subjects in the first year or phase of the project, the institution must provide evidence of or a plan for review by an Institutional Review Board (IRB) upon final proposal submission to DARPA. The IRB conducting the review must be the IRB identified on the institution's Assurance. The protocol, separate from the proposal, must include a detailed description of the research plan, study population, risks and benefits of study participation, recruitment and consent process, data collection, and data analysis. Consult the designated IRB for guidance on writing the protocol. The informed consent document must comply with federal regulations (32 CFR 219.116). A valid Assurance along with evidence of appropriate training all investigators should all accompany the protocol for review by the IRB.

In addition to a local IRB approval, a headquarters-level human subjects regulatory review and approval is required for all research conducted or supported by the DoD. The Army, Navy, or Air Force office responsible for managing the award can provide guidance and information about their component's headquarters-level review process. Note that confirmation of a current Assurance and appropriate human subjects protection training is required before headquarters-level approval can be issued.

The amount of time required to complete the IRB review/approval process may vary depending on the complexity of the research and/or the level of risk to study participants. Ample time should be allotted to complete the approval process. The IRB approval process can last between one to three months, followed by a DoD review that could last between three to six months. No DoD/DARPA funding can be used towards human subjects research until ALL approvals are granted.

3. Animal Use

Any Recipient performing research, experimentation, or testing involving the use of animals shall comply with the rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Act of 1966, as amended, (7 U.S.C. 2131-2159); (ii) the guidelines described in National Institutes of Health Publication No. 86-23, "Guide for the Care and Use of Laboratory Animals"; (iii) DoD Directive 3216.01, "Use of Laboratory Animals in DoD Program."

For submissions containing animal use, proposals should briefly describe plans for Institutional Animal Care and Use Committee (IACUC) review and approval. Animal studies in the program will be expected to comply with the PHS Policy on Humane Care and Use of Laboratory Animals, available at <http://grants.nih.gov/grants/olaw/olaw.htm>.

All Recipients must receive approval by a DoD certified veterinarian, in addition to an IACUC approval. No animal studies may be conducted using DoD/DARPA funding until the USAMRMC Animal Care and Use Review Office (ACURO) or other appropriate DoD veterinary office(s) grant approval. As a part of this secondary review process, the Recipient will be required to complete and submit an ACURO Animal Use Appendix, which may be found at <https://mrmc.amedd.army.mil/AnimalAppendix.asp>

4. Publication Approval

It is anticipated that the performance of research resulting from the BAA will not be fundamental research. More specifically, DARPA anticipates research resulting from the proposed program will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Proposers are therefore advised, if they propose grants or cooperative agreements, DARPA will likely elect to award other award instruments. Any award resulting from such a determination will include a requirement for written DARPA permission before publishing any information or results on the program.

The following provision will be incorporated into any resultant non-fundamental research procurement contract or other transaction:

There shall be no dissemination or publication, except within and between the Contractor and any subcontractors, of information developed under this contract or contained in the reports to be furnished pursuant to this contract without prior written approval of the DARPA Technical Information Officer (DARPA/TIO). All technical reports will be given proper review by appropriate authority to determine which Distribution Statement is to be applied prior to the initial distribution of these reports by the Contractor. Papers resulting from unclassified contracted fundamental research are exempt from prepublication controls and this review requirement, pursuant to DoD Instruction 5230.27 dated October 6, 1987.

When submitting material for written approval for open publication, the Contractor/Awardee must submit a request for public release to the DARPA TIO and include the following information: 1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx. 30 words), number of pages (or minutes of video) and document type (briefing, report, abstract, article, or paper); 2) Event Information: event type (conference, principle investigator meeting, article or paper), event date, desired date for DARPA's approval; 3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and 4) Contractor/Awardee's Information: POC name, e-mail and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests can be sent either via e-mail to tio@darpa.mil or via 3701 North Fairfax Drive, Arlington VA 22203-1714, telephone (571) 218-4235. Refer to www.darpa.mil/tio for information about DARPA's public release process.

5. Export Control

For all resulting research efforts that are beyond fundamental research (basic and applied research ordinarily published and shared broadly within the scientific community) with military or dual-use applications, the following shall apply:

(1) The Contractor shall comply with all U. S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of (including deemed exports) hardware, technical data, and software, or for the provision of technical assistance.

(2) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at any Government installation (whether in or outside the United States), where the foreign person will have access to export-controlled technologies, including technical data or software.

(3) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.

(4) The Contractor shall be responsible for ensuring that the provisions of this clause apply to its subcontractors.

Any contract or agreement resulting from this BAA will likely include the clause noted above and/or Government DFARS clause 252.204-7008 "Requirements for Contracts Involving Export Controlled Items." Any Other Transaction agreement resulting from this BAA will likely include a clause similar to DFARS clause 252.204-7008.

6. Subcontracting

Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. 637(d)), it is the policy of the Government to enable small business and small disadvantaged business concerns to be considered fairly as subcontractors to contractors performing work or rendering services as prime contractors or subcontractors under Government contracts, and to assure that prime contractors and subcontractors carry out this policy. Each proposer who submits a contract proposal and includes subcontractors is required to submit a subcontracting plan in accordance with FAR 19.702(a) (1) and (2) should do so with their proposal. The plan format is outlined in FAR 19.704.

C. Reporting Requirements

The number and types of reports will be specified in the award document, but will include, as a minimum, **monthly** financial status reports. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed on before award. Reports and briefing material will also be required as appropriate to document progress in accomplishing program metrics. A Final Report that summarizes the project and tasks will be required at the conclusion of the performance period for the award, notwithstanding the fact that the research may be continued under a follow-on vehicle.

D. Electronic Systems

1. Central Contractor Registration (CCR)

Selected proposers not already registered in the Central Contractor Registry (CCR) will be required to register in CCR prior to any award under this BAA. Information on CCR registration is available at <http://www.ccr.gov>.

2. Representations and Certifications

In accordance with FAR 4.1201, prospective proposers shall complete electronic annual representations and certifications at <http://orca.bpn.gov>.

3. Wide Area Work Flow (WAWF)

Unless using another approved electronic invoicing system, performers will be required to submit invoices for payment directly via the Internet/WAWF at <http://wawf.eb.mil>. Registration to WAWF will be required prior to any award under this BAA.

4. i-Edison

The award document for each proposal selected and funding will contain a mandatory requirement for patent reports and notifications to be submitted electronically through i-Edison (<http://s-edison.info.nih.gov/iEdison>).

VII. AGENCY CONTACTS

Administrative, technical or contractual questions should be sent via e-mail to BAA09-07@darpa.mil. All requests must include the name, email address, and phone number of a point of contact.

The technical POC for this effort is:
Dr. Ronald Esman
DARPA/MTO
ATTN: DARPA-BAA-09-07
3701 North Fairfax Drive
Arlington, VA 22203-1714
PHONE : 571-218-4691
EMAIL : BAA09-07@darpa.mil

VIII. OTHER INFORMATION

A. Intellectual Property

1. Procurement Contract Proposers

a. Noncommercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS shall identify all noncommercial technical data and noncommercial computer software that it plans to generate, develop, and/or deliver under any proposed award instrument in which the Government will acquire less than unlimited rights, and to assert specific restrictions on those deliverables. Proposers shall follow the format under DFARS 252.227-7017 for this stated purpose. In the event that proposers do not submit the list, the Government will assume that it automatically has “unlimited rights” to all noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, unless it is substantiated that development of the noncommercial technical data and noncommercial computer software occurred with mixed funding. If mixed funding is anticipated in the development of noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, then proposers should identify the data and software in question, as subject to Government Purpose Rights (GPR). In accordance with DFARS 252.227-7013 Rights in Technical Data - Noncommercial Items, and DFARS 252.227-7014 Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, the Government will automatically assume that any such GPR restriction is limited to a period of five (5) years in accordance with the applicable DFARS clauses, at which time the Government will acquire “unlimited rights” unless the parties agree otherwise. Proposers are admonished that the Government will use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer, as may be necessary, to evaluate the proposer’s assertions. If no restrictions are intended, then the proposer should state “NONE.”

A sample list for complying with this request is as follows:

NONCOMMERCIAL				
Technical Data Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(NARRATIVE)	(LIST)	(LIST)	(LIST)

b. Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS shall identify all commercial technical data and commercial computer software that may be embedded in any noncommercial deliverables contemplated under the research effort, along with any applicable restrictions on the Government’s use of such commercial technical data and/or commercial computer software. In the event that proposers do not submit the list, the Government will assume that there are no restrictions on the Government’s use of such commercial items. The Government may use the list

during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer, as may be necessary, to evaluate the proposer’s assertions. If no restrictions are intended, then the proposer should state “NONE.”

A sample list for complying with this request is as follows:

COMMERCIAL				
Technical Data Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(NARRATIVE)	(LIST)	(LIST)	(LIST)

2. Non-Procurement Contract Proposers – Noncommercial and Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a Technology Investment Agreement, or Other Transaction for Prototype shall follow the applicable rules and regulations governing these various award instruments, but in all cases should appropriately identify any potential restrictions on the Government’s use of any Intellectual Property contemplated under those award instruments in question. This includes both Noncommercial Items and Commercial Items. Although not required, proposers may use a format similar to that described in Paragraphs 1.a and 1.b above. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions, and may request additional information from the proposer, as may be necessary, to evaluate the proposer’s assertions. If no restrictions are intended, then the proposer should state “NONE.”

3. All Proposers – Patents

Include documentation proving your ownership of or possession of appropriate licensing rights to all patented inventions (or inventions for which a patent application has been filed) that will be utilized under your proposal for the DARPA program. If a patent application has been filed for an invention that your proposal utilizes, but the application has not yet been made publicly available and contains proprietary information, you may provide only the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and a summary of the patent title, together with either: 1) a representation that you own the invention, or 2) proof of possession of appropriate licensing rights in the invention.

4. All Proposers – Intellectual Property Representations

Provide a good faith representation that you either own or possess appropriate licensing rights to all other intellectual property that will be utilized under your proposal for the DARPA program. Additionally, proposers shall provide a short summary for each item

asserted with less than unlimited rights that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research.

APPENDIX A.

Tx Link Metrics (10 m Link)		This Program	
		Φ1	Φ2
RF Transmit Power (W)		5	15
Instantaneous 3 dB Bandwidth, IBW (GHz)		4	4
Center Frequency Range (GHz)		2 - 18	2 - 18
OIP3 (dBm)		56	65
OIP2 (dBm) (measured out-of-band)		70	80
Total DC Power (W)*	2 GHz	30	75
	6 GHz	33	82
	10 GHz	37	91
	14 GHz	41	99
	18 GHz	46	110

Table 1: GNG Metrics for the TX case
(*Assumes 12% Laser/Fiber Amplifier Efficiency)

Rx Link Metrics (10 m Link)		This Program	
		Φ1	Φ2
Instantaneous 3 dB Bandwidth, IBW (GHz)		4	4
Center Frequency Range (GHz)		2 - 18	2 - 18
OIP2 (dBm) (measured out-of-band)		+75	+85
2 GHz	Two-Tone SFDR (dBHz ^{2/3})	126	134.5
	Minimum Detectable Signal for 7 dB SNR (dBm/4 GHz)	-65	-68
	Receive Figure of Merit	100	10000
6 GHz	Two-Tone SFDR (dBHz ^{2/3})	125.5	134
	Minimum Detectable Signal for 7 dB SNR (dBm/4 GHz)	-63	-68
	Receive Figure of Merit	40	4000
10 GHz	Two-Tone SFDR (dBHz ^{2/3})	125	133.5
	Minimum Detectable Signal for 7 dB SNR (dBm/4 GHz)	-62	-68
	Receive Figure of Merit	15	1500
14 GHz	Two-Tone SFDR (dBHz ^{2/3})	124	133
	Minimum Detectable Signal for 7 dB SNR (dBm/4 GHz)	-61	-68
	Receive Figure of Merit	6	600
18 GHz	Two-Tone SFDR (dBHz ^{2/3})	123	132.5
	Minimum Detectable Signal for 7 dB SNR (dBm/4 GHz)	-60	-68
	Receive Figure of Merit	2	200

Table 2: GNG Metrics for the RX case