



Broad Agency Announcement (BAA)
Integrated Micro Primary
Atomic Clock Technology (IMPACT)

MTO

DARPA-BAA-08-32

April 21, 2008

Table of Contents:

Part I: Overview Information.....	3
Part II: Full Text of Announcement	
Sec. I: Funding Opportunity Description.....	4
Sec. II: Award Information.....	8
Sec. III: Eligibility Information.....	9
1. Eligible Applicants	
2. Cost Sharing and Matching	
Sec. IV: Application and Submission Information.....	10
1. Address to Request Application Package	
2. Content and Form of Application Submission	
3. Submission Dates and Times	
4. Funding Restrictions	
5. Other Submission Requirements	
Sec. V: Application Review Information.....	19
1. Criteria	
2. Review and Selection Process	
Sec. VI: Award Administration Information.....	21
1. Award Notices	
2. Administrative and National Policy Requirements	
3. Reporting Requirements	
Sec. VII: Agency Contacts.....	29
Sec. VIII: Other Information.....	30

Part One: Overview Information

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Microsystems Technology Office (MTO)
- **Funding Opportunity Title** – Integrated Micro Primary Atomic Clock Technology (IMPACT)
- **Announcement Type** – Initial Announcement
- **Funding Opportunity Number** – DARPA-BAA-08-32
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – 12.910 Research and Technology Development
- **Dates**
 - Industry Day: Thursday, May 15, 2008
 - Abstracts Due: 12:00 PM Eastern Time, Thursday, June 5, 2008
 - Proposal Due: 12:00 PM Eastern Time, Wednesday August 6, 2008
- **Anticipated individual awards** – Multiple awards are anticipated.
- **Types of instruments that may be awarded** -- Procurement contract, grant, cooperative agreement or other transaction.
- **Agency contact**
 - Dr. Amit Lal, MTO Program Manager
The BAA Coordinator for this effort can be reached at, fax: 703-248-1933, electronic mail: BAA08-32@darpa.mil
DARPA/MTO
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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 first on the FedBizOpps website, <http://www.fedbizopps.gov/>, and Grants.gov website at <http://www.grants.gov/>. The following information is for those wishing to respond to the BAA.

DARPA is soliciting innovative research proposals in the area of integrated micro primary atomic clock technology. Proposed research should investigate innovative approaches that enable revolutionary advances in science, devices, or systems. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice.

DARPA seeks innovative proposals in developing Integrated Micro Primary Atomic Clock Technology (IMPACT) to ultimately realize a primary atomic clock with drastically reduced size, weight, and power (SWAP) over state-of-the-art primary clocks. Even though the focused goal is to realize a primary atomic clock, it is anticipated that the overall technology developed will push the envelope of chip-scale atomic sensors and atom manipulation for future applications. The deliverable of this program is an integrated, ultra-miniaturized absolute atomic frequency and time standard (i.e. no calibration necessary) that achieves significant reductions in size ($< 5 \text{ cm}^3$) in final package (excluding battery) and power consumption (on the order of 50 mW), while providing frequency accuracy on the order of $\pm 1 \times 10^{-13}$ (Allan deviation at one-hour integration time), and that achieve fundamental stability limits ($\sim 5 \text{ ns}$ per day time loss). The development of a micro primary atomic clock will enable ultra-miniaturized and ultra-low power absolute time and frequency references for applications as nano/pico satellite systems, underwater vehicles, UAVs, sensors, metrology instruments, etc. IMPACT's aim is to leverage Chip-Scale Atomic Clock (CSAC) technology and other atom ensemble manipulation technology in general in developing MEMS/NEMS atom transition manipulation that offer 100-1000X improvements in both stability and accuracy over current CSAC capability with similar size, weight, and power to CSAC.

Background and Description

A more perfect microsystem developed for navigation, time keeping, and communications would include a near-perfect clock with high accuracy and stability. Ability to keep 1-10 ns time accuracy over days to a few microseconds over a year will allow new capabilities for handheld or ground-based sensors, GPS/GPS-denied navigation, and spread spectrum and data-packet communications. Clocks based on atomic transitions have the potential of achieving stability and accuracy limited only by fundamental noise sources such as gravity variations. Continuous evolution in atomic interrogation technology in atom vapor, beams, fountains, and ensembles, in combination

with laser and microwave interrogation development has led to clock stabilities better than one part in 10^{15} . Frequency accuracy has been comparable to stability in many of the clock technologies. However, all of the existing primary clock technologies have size, weight, and power that are not compatible with micro-system integration. The primary time standards with lowest SWAP are the commercially available beam clocks with power consumption of several tens of watts and $>20,000$ cc volume.

The Chip-Scale Atomic Clock has recently demonstrated stability of 10^{-11} @ 1hr with a volume of 1-cc. This revolutionary clock technology utilizes micro-fabricated vapor cells containing cesium and rubidium that have high degree of thermal isolation with micromachined tethers. These cells can be brought to elevated temperatures (85-100°C) for needed Rb or Cs vapor density with a very low power consumption of 5-10mW. With integrated VCSEL interrogation, the physics package of CSAC has been shown to operate at 10-15mW, as compared to several Watts needed in macroscopic physics packages found in commercial atom-vapor based clocks. Although the CSAC aging might be limited by light and buffer gas shifts, among other effects, the CSAC's technology has demonstrated storage and manipulation of micro-stored alkali atoms.

Even as CSAC is useful for many applications requiring 10^{-11} stability, there is a need for clocks that are not only more stable, but also much more accurate such that calibration is unnecessary. Such primary standards, if implemented with CSAC comparable SWAP, will revolutionize timing and communications capabilities for the ever increasing number of DOD platforms that are small, where low size, weight, and power are critical for new component insertion.

While CSAC is a gateway technology to explore primary clock technology, there are several technical approaches that might enable IMPACT. Although some of these technical approaches are described here, DARPA seeks promising far-reaching and novel ideas and approaches that will realize the goals of the IMPACT program. A candidate approach is to use micromachined ion traps. Micromachined ion traps have been shown to trap atoms for high accuracy commensurate with very long interrogation times. MEMS based arrays of ion traps may enable high stability in addition to accuracy. Technical challenges might include identification of ion-trappable atoms that can be optically interrogated, developing new compact optical sources for atom interrogation of ions, and reducing noise in RF interrogation for high signal-to-noise ratio. Another promising approach is MEMS integrated magneto-optical traps that allow interrogation of clouds of atoms at ultra-low temperatures providing both stability and accuracy. Technical challenges for chip-scale implementation will include miniaturization of magneto optical traps and scaling of magnetic field gradients, engineering optical wave front for optimum atom-photon interaction, reducing optical crosstalk in photon detectors, and local oscillator design. Recent efforts in interrogating alkali atoms with optical high Q resonators might provide highly miniature primary standards due to small size of the optical resonator and the few alkali atoms needed, although the readout instrumentation power may be hard to reduce. Similarly, micro- and nanoscale mechanical resonators with resonances commensurate with hyperfine transition frequencies may provide

pathways to directly interrogate and lock onto resonances in alkali atoms that are near the resonator.

Other approaches could use the alkali atom hyperfine absorption spectrum to modify gain of an optical or RF cavity. Alkali vapor in an optical feedback cavity might enable stable alkali-metal transition locked laser with sufficient stability to directly serve as a clock source. Hydrogen MASERS that can meet the 5-cc requirement may be possible by realizing loaded RF cavities or cavities utilizing negative-index of refraction materials. MASERS offer a natural advantage of low noise due to the much lower photon energy noise at the RF frequencies commensurate with the low hyperfine frequencies of hydrogen or other hydrogen-like atoms. Microengineered MASERS might have lower stabilities to smaller cavities, but might improve due to the increase efficiency of excited hydrogen generation.

Another approach to realizing IMPACT goals is the direct miniaturization of an atom beam clock. Here the Stern-Gerlach experimental apparatus could be miniaturized with a much smaller travel distance in a Ramsey interrogation cavity. Micromagnet magnetic fields or optical fields for state selection might enable ultralow-power atomic beam clocks. Challenges will include low power atom beam sources, which could involve engineering the existing CSAC physics package to eject atoms. The lifetime of the clock with the finite number of cesium atoms in the emitting cavity will need to be addressed either by storing sufficient amount of atoms or having atom collectors that can be recycled as emitters later. A challenge to miniature beam clock stability will be the reduced interaction volume in case of RF interrogation or vertical-cavity surface-emitting laser (VCSEL) power and stability in case of optical coherent population trapping (CPT). For atom flux detection, MEMS offers high Q mass detectors that might be suitable to greatly reduced power and size for atom detection compared to hot wire ionization sensors found in traditional atomic beam clocks. However, it may also be possible to realize very sensitive hot-wire atom detectors at microscale due to higher electric fields and temperatures, amplifying the flux of emitted charged particles.

In many of the above-mentioned approaches to interrogate atom ensembles, development of miniature 5-cc packages that can maintain ultra-high vacuum conditions seems necessary. Efforts to realize micro-scale pumping technologies, either by getters or other active pumps at low power would have to be addressed for a full clock.

Table 1: IMPACT Program Milestones

Milestone	SOA	Phase I	Phase II	Phase III
Power (mW) @ RT	30000	160 (physics package)	250 (total clock)	<50 (total clock)
Size (cc)	22500	30 (physics package) – maximum dimension in any direction <10cm	20 (total clock)	5 (total clock)
Atom detector Q*S/N	1.00E+10	1.00E+10	2.00E+10	5.00E+10

Time Loss (ns) @ 1 ms	3.2E-03	3.2E-03	1.6E-03	6.3E-04
Time Loss (ns) @ 1 second	1.0E-01	1.0E-01	5.0E-02	2.0E-02
Time Loss (ns) @ 1 hour	6.0E+00	<60	6.0E+00	1.2E+00
Time Loss (ns) @ 1 day	2.9E+01	<300	2.9E+01	5.2E+00
Time Loss (ns) @ 1 month	1.6E+02	<1600	1.6E+02	3.2+E01
Fractional Frequency Retrace (1-hour turn on, once every day)	1.00E-13	1.70E-11	1.00E-13	1.00E-13

Deliverables and Program Scope

The deliverables of the IMPACT program will be primary atomic clocks with size less than 5-cc and total power less than 50mW. Multidisciplinary teams consisting of micro and nano engineers, atomic physics experts, micro-electronics circuit design experts, and atomic clock producers are anticipated to meet the power and size requirements. To reach the program goals, performers are expected to meet or beat clock metrics as described in Table 1. The timeline for each phase is to be determined by the teams in the proposals. Teams which take less time to deliver metrics in each phase will be preferred, provided the risk in delivering the metrics in the durations is demonstrated to be reasonable.

Phase I: Physics package and clock demonstration: Teams will demonstrate a physics package that consumes less than 160mW of power and takes less than 30-cc of total volume. The physics package Q*SNR has to be greater than 10^{10} to give high confidence that the physical approach chosen to interrogate atom ensemble has a chance of meeting future phase metrics. In this phase, the power and volume metrics relate only to the physics package and not the supporting electronics that will be miniaturized and optimized in future phases. The aim of this phase is to demonstrate that not only is a primary clock possible, but also paths to meet the end of program goal of 5cc and 50mW. The time loss for the clock at time intervals of 1ms, 1s, 1-hr, 1-day, and 1-month are prescribed to indicate that clock performance and not just the frequency variation data is to be measured at the end of phase I. It is expected that performers will relate the prescribed time loss requirements into fractional frequency Allan deviation and phase noise specifications for the local oscillators in the proposals. The time loss will be measured by comparing the time kept with the phase I clock and a macroscale primary source with better accuracy and stability than the IMPACT phase I clock. The performers are expected to determine a reasonable number of tests to indicate success in meeting the time loss metrics. An important metric of fractional frequency retrace accuracy is prescribed to strive towards a primary clock standard. It is anticipated that the mechanisms responsible for retrace drifts will be identified and technical solutions to address these will be developed for phase II and III.

Phase II: Miniaturize physics package and electronics, reducing power, improving accuracy and stability: This phase aims at achieving a miniature primary atomic clock with no off-clock electronics (excluding battery) to within 20-cc volume. The overall power budget for this clock will be 250mW including physics package, local oscillator,

and control electronics power. Efforts in miniaturizing the Phase I physics package while reducing its power are anticipated with aggressive scaling of power consuming elements such as atom flux sources, or optical source power optimization. Electronics integration with board level components is expected to result in the overall size and power specifications. The timing signal output at this stage should be a 1-pps output that can be used to measure the time loss when compared to 1-pps signal from a macro primary atomic clock, and the output phase noise of the frequency source should be measured to calculate time losses for short measurement times less than a second. Testing methodology of the clock to prove that it meets the metrics is expected to be discussed in the proposals.

Phase III: Reduction of size and power while increasing accuracy and stability: Substantial reduction in power and size are anticipated by ASIC or other advanced circuit design and packaging techniques, in combination with further reduction in size and power of the physics package. Approaches that co-integrate electronics and physics package are anticipated to achieve higher degree of miniaturization. The final goal of 50mW, 5-cc primary atomic clock should have a 1-pps output signal that can be compared to the output from a macroscale commercial primary standard for time loss measurement. A plan to deliver a few units to the government should be specified, along with a description of other technology transfer pathways.

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 offerors. 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 offeror. If the proposed effort is inherently divisible and nothing is gained from the aggregation, offerors 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 offerors 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, grant, cooperative agreement, or other transaction depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors.

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. Independent proposals from Government/National laboratories may be subject to applicable direct competition limitations, though certain Federally Funded Research and Development Centers are excepted per P.L. 103-337§ 217 and P.L 105-261 § 3136. Proposers from Government/ National Laboratories must provide documentation to DARPA to establish that they are eligible to propose and have unique capabilities not otherwise available in private industry.

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.

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.) Once the proposals have been received and prior to the start of proposal evaluations, the Government will assess whether any potential conflict of interest exists in regards to the DARPA Program Manager, as well as those individuals chosen to evaluate proposals received under this BAA. The Program Manager is required to review and evaluate all proposals received under this BAA and to manage all selected efforts. The Program Manager for this BAA is a detailee to DARPA under the Intergovernmental Personnel Act (IPA) from Cornell University, and, as such, is highly likely to have a conflict of interest with respect to proposals utilizing that institution as a performer. 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 BAA08-32@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/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)

1. Collaborative Efforts

Collaborative efforts/teaming are encouraged. A website <http://teaming.sysplan.com/impact/> 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. 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 recommendation to propose or not propose and the time and date for submission of a full proposal. DARPA will attempt to review proposal abstracts within thirty (30) calendar days after receipt and will allow proposers at least thirty (30) calendar days after review of their proposal abstracts in order to complete and submit their proposals. Proposal abstracts will be reviewed as they are received. Early submissions of proposal abstracts and full proposals are strongly encouraged because selections may be made at any time during the evaluation process. Regardless of the recommendation, the decision to propose is the responsibility of the proposer. All submitted proposals will be fully reviewed regardless of the disposition of the proposal abstract. Proposers not submitting proposal abstracts are required to submit full proposals at the time and date specified in the BAA 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 and Grants.gov. Full proposals submitted after the due date stated in the BAA or due date otherwise specified by DARPA after review of proposal abstracts may be selected contingent on the availability of funds.

The typical proposal should express a consolidated effort in support of one or more related technical concepts or ideas. Disjointed efforts should not be included into 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.

For Proposers Posting to Grants.Gov:

Offerors may elect to use the Grants.gov APPLY function if the applicant is seeking a grant or cooperative agreement. The APPLY function replaces the proposal submission process that other offerors follow. The APPLY function does not affect the proposal

content or format. The APPLY function is electronic; offerors do not submit paper proposals in addition to the Grants.gov APPLY electronic submission.

For All Proposers:

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 BAA08-32@darpa.mil. DARPA intends to use electronic mail and fax for correspondence regarding BAA 08-32. 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 and any other related information that may subsequently be provided.

For Proposers Submitting proposals through T-FIMS

Proposals sent in response to DARPA-BAA-08-32 must be submitted through T-FIMS. Attached to this BAA is a document entitled “User’s Guide to T-FIMS: DARPA’s BAA Submission System” (see Attachment 1). A thorough read of this section guarantees successful submission to T-FIMS and explains all the necessary steps to submitting proposals through T-FIMS. 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.

For Proposers Submitting to an Electronic Business Application such as the T-FIMS BAA Tool (Not Submitting Hard Copies/CD-ROM):

All proposals submitted electronically by means of an Electronic Business Application Tool or proposal submission web site (not including Grants.gov) 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 BAA08-32@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/>.

2. Proposal Abstract Format

Proposal abstracts are encouraged in advance of full proposals in order to provide potential offerors 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 {15} number of 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. 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.

3. 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. 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 Section I, Volume I shall not exceed {48} number pages. Maximum page lengths for each section are shown in braces { } below. All full proposals must be written in English.

4. Volume I, Technical and Management Proposal

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.

Section II. Summary of Proposal

- A. {2} 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. Include technical justifications establishing how the team plans to meet metrics in Table 1.
- B. {2} Deliverables associated with the proposed research and the 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.
- C. {2} 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 company cost share, if applicable. Milestone measurement, as suggested by Table 1, should enable and support a go/no go decision for the next part of the effort. Additional interim non-critical management and technical milestones are also highly encouraged at a regular interval, especially for phases that are longer than 1-year in duration.
- D. {5} 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.)
- E. {2} General discussion of other research in this area.
- F. {2} 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.

Section III. Detailed Proposal Information

- A. {5} Statement of Work (SOW) - In plain English, clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. The page length for the SOW will be dependant on the amount of the effort. 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, software, etc.) to be provided to the Government in support of the proposed research tasks/activities.

*Note: It is recommended that the SOW should be developed so that each Phase of the program is separately defined. **Do not include any proprietary information in the SOW.***

- B. {3} 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.”
- C. {5} Detailed technical rationale enhancing that of Section II.
- D. {5} Detailed technical approach enhancing and completing that of Section II. Include detailed analysis illustrating how the effort will result in meeting the program milestones as described in Table 1.
- E. {4} Comparison with other ongoing research indicating advantages and disadvantages of the proposed effort.
- F. {2} Discussion of proposer’s previous accomplishments and work in closely related research areas.
- G. {4} Description of the facilities that would be used for the proposed effort. MEMS Exchange (MX) (<http://www.mems-exchange.org>) is a DARPA supported distributed foundry service to enable nationwide micro and nano fabrication. The capability allows proposers with good ideas but without microfabrication expertise or facilities to develop strong proposals. The proposers are strongly encouraged to describe a work and cost plan on how they plan to use MEMS Exchange capabilities. If the team does not plan to use MEMS Exchange, justification of using other facilities should be given.
- H. {3} Detail support enhancing that of Section II, including formal teaming agreements which are required to execute this program.
- I. {2} Cost schedules and milestones (payable and/or technical) for the proposed research, including estimates of cost for each task in each year of the effort delineated by the primes and major subcontractors, total cost, and any company cost share. **Note: Measurable critical technical milestones should occur at the end of every phase.** These technical milestones should enable and support a go/no go decision for the next phase of the effort. Additional interim non-critical management milestones are also highly encouraged at regular intervals. 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. Additionally, proposals should clearly explain the technical

approach(es) that will be employed to meet or exceed each program metric and provide ample justification as to why the approach(es) is/are feasible. **All Table 1 (and additional) metrics should be described in detail so reviewers can assess risks associated with meeting them.**

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.

5. 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*), grant, cooperative agreement, 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 offeror’s cognizant Defense Contract Management Agency (DCMA) administration office (*if known*);
- (14) Name, address, and telephone number of the offeror’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.

Detailed cost breakdown to include: (1) total program cost broken down by major cost items (direct labor, including labor categories; subcontracts; materials; other direct costs, overhead charges, etc.) and further broken down task and phase; (2) major program tasks by fiscal year; (3) an itemization of major subcontracts and equipment purchases; (4) an itemization of any information technology (IT) purchase¹; (5) a summary of projected funding requirements by month; and (6) the source, nature, and amount of any industry cost-sharing; and (7) 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.). The prime contractor is responsible for compiling and providing all subcontractor proposals for the Procuring Contracting Officer (PCO). Subcontractor proposals should include Interdivisional Work Transfer Agreements (ITWA) or similar arrangements. 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. NOTE: for IT and equipment purchases, include a letter stating why the offeror cannot provide the requested resources from its own funding.

Supporting cost and pricing information in sufficient detail to substantiate the summary cost estimates in B. above. Include a description of the method used to estimate costs and supporting documentation. Note: “cost or pricing data” as defined in FAR Subpart 15.4 shall be required if the offeror is seeking a procurement contract award of \$650,000 or greater unless the offeror request an exception from the requirement to submit cost of pricing data. “Cost or pricing data” are not required if the offeror proposes an award instrument other than a procurement contract (e.g., a grant, cooperative agreement, or other transaction.) All proprietary subcontractor proposal documentation, prepared at the same level of detail as that required of the prime, of which cannot be uploaded to TFIMS 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.

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- 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, of 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.”

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 offeror'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. 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 (original and designated number of hard and electronic copies) must be submitted to DARPA/MTO, 3701 Fairfax Drive, Arlington, VA 22203-1714 (Attn.: DARPA-BAA-08-32) on or before 12:00 p.m. (noon) Eastern Time, June, 5, 2008. Proposal abstracts received after this time and date may not be reviewed.

2. Full Proposal Date

The full proposal (original and designated number of hard and electronic copies) must be submitted to DARPA/MTO, 3701 North Fairfax Drive, Arlington, VA 22203-1714 (Attn.: DARPA-BAA-08-32) on or before 12:00 p.m. (noon), Eastern Time, August 6, 2008, 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.

DARPA will post a consolidated Question and Answer response after July 8, 2008, before final full proposals are due. In order to receive a response to your question, submit your question by July 1, 2008 to BAA08-32@darpa.mil.

The full proposal must be submitted via T-FIMS or Grants.gov in time to reach DARPA by August 6, 2008 (initial closing), in order to be considered during the initial evaluation phase; however, DARPA-BAA-08-32 will remain open until 4:00 PM Eastern Time, April 24, 2009. Proposals may be submitted at any time from issuance of this announcement through 4:00 PM Eastern Time, April 24, 2009; however, offerors are

warned that the likelihood of funding is greatly reduced for proposals submitted after the initial closing date deadline.

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

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) Potential Contribution and Relevance to the DARPA Mission; (d) Realism of Proposed Schedule; (e) Proposer's Capabilities and/or Related Experience; (f) Plans and Capability to Accomplish Technology Transition; 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) 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.

(d) 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

(e) 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.

(f) 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.

(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 Selection 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 offeror 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 electronic mail to the Technical POC identified on the proposal coversheet.

B. Administrative and National Policy Requirements

1. Security

The Government anticipates that proposals submitted under this BAA will be unclassified. In the event that a proposer chooses to submit a classified proposal or submit any documentation that may be classified, the following information is applicable.

Security classification guidance on 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 choosing to submit a classified proposal must first receive permission from the Original Classification Authority to use their information in replying to this BAA. Applicable classification guide(s) should be submitted to ensure that the proposal is protected appropriately.

Classified submissions shall be in accordance with the following guidance:

Collateral Classified 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 only be mailed via U.S. Postal Service (USPS) Registered Mail or U.S. Postal Service 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
Reference: BAA 08-32
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 should be hand carried via an authorized, two-person courier team to the DARPA CDR.

Special Access Program (SAP) Information: Contact the DARPA Special Access Program Central Office (SAPCO) 703-526-4052 for further guidance and instructions prior to transmitting SAP information to DARPA. Top Secret SAP, must be transmitted via approved methods for such material. Consult the DoD Overprint to the National Industrial Security Program Operating Manual for further guidance. *Prior to transmitting SAP material*, it is strongly recommended that you coordinate your submission with the DARPA SAPCO.

Sensitive Compartmented Information (SCI) Data: Contact the DARPA Special Security Office (SSO) at 703-812-1994/1984 for the correct SCI courier address and instructions. All SCI should be transmitted through your servicing Special Security Officer (SSO). SCI data must be transmitted through SCI channels only (i.e., approved SCI Facility to SCI facility via secure fax).

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 Offeror's responsibility to clearly define to the Government what is considered proprietary data.

Offerors 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 that the formal request is received at this office within 5 days after unsuccessful notification.

2. Intellectual Property

a. Procurement Contract Proposers

i. 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 source selection 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	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(LIST)	(LIST)	(LIST)

**ii. 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 source selection 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	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(LIST)	(LIST)	(LIST)

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

Proposers responding to this BAA requesting a Grant, Cooperative Agreement, 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 source selection 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.”

c. 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.

d. 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, offerors 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.

3. 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 and contract review meetings at the Program Manager's discretion.

4. 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.

5. 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>

6. Publication Approval

Offerors are advised if they propose grants or cooperative agreements, DARPA may elect to award other award instruments. DARPA will make this election if it determines that the 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. Any award resulting from such a determination will include a requirement for DARPA permission before publishing any information or results on the program.

The following provision will be incorporated into any resultant procurement contract or other transaction:

When submitting material for written approval for open publication as described in subparagraph (a) above, 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.

7. Export Control

Should this project develop beyond fundamental research (basic and applied research ordinarily published and shared broadly within the scientific community) with military or dual-use applications the following 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.

8. 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

The number and types of reports will be specified in the award document, but will include as a minimum quarterly financial and technical 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.

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.

VII. AGENCY CONTACTS

Indicate here if there is a preferred method of communication (email, fax, U.S. Mail, etc).

Administrative, technical or contractual questions should be sent via e-mail to BAA08-32@darpa.mil. If e-mail is not available, fax questions to (703) 248-1933, Attention: BAA 08-32. All requests must include the name, email address, and phone number of a point of contact.

The technical POC for this effort is Dr. Amit Lal
FAX: (703) 248-1933
PHONE: (571) 218-4682
EMAIL: BAA08-32@darpa.mil

VIII. OTHER INFORMATION

DARPA will host an Industry Day Workshop in support of the Innovative Micro Primary Clock Technology (IMPACT) program on May 15, 2008 in the Arlington, VA area. The purpose of this workshop is to provide information on the IMPACT program, promote additional discussion on this topic, address questions from potential proposers, and provide a forum for potential proposers to present their capabilities for teaming opportunities. Interested proposers are not required to attend the Proposer's Day Workshop in order to respond to the Innovative Micro Primary Clock Technology (IMPACT) BAA. Material presented at the workshop, along with answers to selected questions asked during the workshop, will be posted on the DARPA website and will be accessible through <http://www.darpa.mil/mto/solicitations>

DARPA will not provide cost reimbursement for interested proposers in attendance at the Proposer's Day Workshop.

Workshop participants are requested to register no later than May 8, 2008 and will be accepted on a space-availability basis. To receive registration materials, individuals and firms interested in attending the IMPACT Industry Day Workshop should send an email with complete contact information to BAA08-32@darpa.mil, subject line "Industry Day Workshop".

The workshop will be open to members of the public who have registered in advance for the workshop. All foreign nationals, to include permanent residents, must complete and submit a DARPA Form 60 "Foreign National Visit Request" which will be included in the registration materials.

Workshop Point of Contact: Natalie Tedder, BAA08-32@darpa.mil