

IARPA and U.S. ARMY RESEARCH OFFICE

BROAD AGENCY ANNOUNCEMENT

W911NF-09-R-0007



Broad Agency Announcement for the
**IARPA Advanced Materials and Fabrication for Coherent
Superconducting Qubits Program**
Within the IARPA Safe and Secure Operations Office

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OVERVIEW INFORMATION

This publication constitutes a Broad Agency Announcement (BAA) and sets forth research topics of interest in the area of experimental and theoretical development of coherent superconducting qubits. This BAA is issued under the provisions of Federal Acquisition Regulation (FAR) 6.102(d) (2) and Department of Defense Grant and Agreement Regulations (DODGARS) 22.315. Awards based on responses to this BAA are considered to be the result of full and open competition.

Advanced Materials and Fabrication for Coherent Superconducting Qubits: The Intelligence Advance Research Projects Activity (IARPA), in partnership with the U.S. Army Research Office (ARO), solicits proposals to: develop fundamental understanding into defects in superconducting qubits; develop means to characterize defects; develop advanced materials, constructions and fabrication methods to eliminate these defects; and subsequently demonstrate substantially extended coherence times in superconducting qubits fabricated from the foregoing developments.

Multiple individual awards – Multiple awards are anticipated for the types of proposals sought.

Types of instruments that may be awarded – R&D contracts and agreements.

Collaborative Efforts – Collaborative/teaming efforts are strongly encouraged.

Federal Agency Name – Intelligence Advanced Research Projects Activity (IARPA), Office of the Director of National Intelligence (ODNI) U.S. Army Research Office, Physics Division, P.O. Box 12211, Research Triangle Park, NC 27709-2211

Issuing Acquisition Office: U.S. Army RDECOM Contracting Center, RTP, P.O. Box 12211, Research Triangle Park, NC 27709-2211

Funding Opportunity Title – **Advanced** Materials and Fabrication for Coherent Superconducting Qubits - IARPA Coherent Superconducting Qubits Program

Announcement Type – **Second announcement**, this announcement is equivalent to the Initial announcement, W911NF-08-R-0011 issued in July 2008.

Funding Opportunity Number – W911NF-09-R-0007

Catalog of Federal Domestic Assistance Numbers (CFDA) – 12.431 – Basic Research

INTRODUCTION

In order to conserve valuable offeror and Government resources and to facilitate determining whether a proposed research idea meets the guidelines described herein, prospective offerors contemplating submission of a white paper or proposal are strongly encouraged to contact the technical point of contact (TPOC). The TPOC is Dr. T.R.Govindan, ARO Physics Division, (919) 549-4236, e-mail: tr.govindan@us.army.mil. The administrative officer is Mr. Ernest Dixon III, Army Contracting Activity, (919) 549-4270.

If an offeror elects to submit a white paper, it must be prepared in accordance with the instructions contained in PART IV. Section B.1. Upon receipt, a white paper will be evaluated and the offeror shall be advised of the evaluation results. Offerors whose white papers receive a favorable evaluation will be contacted and encouraged to prepare a complete proposal in accordance with instructions contained in PART IV Section B.2. The costs of white papers and/or complete proposals in response to this BAA are not considered an allowable direct charge to any award resulting from this BAA or any other award. It may be an allowable expense to the normal bid and proposal indirect costs specified in FAR 31.205-18.

In accordance with federal statutes, regulations, and Department of Defense and Army policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from the Army.

Offerors submitting proposals are cautioned that only a Contracting or Grants Officer may obligate the Government to any agreement involving expenditure of Government funds.

All administrative inquiries regarding this BAA shall be addressed to voice mailbox number 919-549-4375. Technical questions should be referred to the TPOC shown above. When an inquiry is made, please clearly state your name, correct spelling, and telephone number. This BAA is available on the following websites:

<http://www.aro.army.mil/baa>

<http://www.grants.gov>

<http://www.fedbizopps.gov/>.

This BAA is a continuously open announcement valid throughout the period from the date of issuance through 31 July 2009, unless announced otherwise. Amendments to this BAA will be posted to the FedBizOpps web site and published at the above websites when they occur. Interested parties are encouraged to periodically check these websites for updates and amendments.

I. FUNDING OPPORTUNITY DESCRIPTION

Amendments to this BAA will be posted to the FedBizOpps web site when they occur. Interested parties are encouraged to periodically check these websites for updates and amendments. The following information is for those wishing to respond to the BAA.

A. Program Overview

Innovative solutions are sought for the Coherent Superconducting Qubits Program within the Intelligence Advanced Research Projects Activity (IARPA). The Program is envisioned to begin *May 1, 2009 and end by June 1, 2014*. The U.S. Army Research Office (ARO) and IARPA will conduct this BAA in close partnership. This BAA solicits proposals that will lead to substantially extended coherence times in superconducting qubits.

Two Levels of proposals are sought, with particular interest in application to the phase qubit:

Level I proposals will seek to accomplish *all* of the following Program Goals:

(1) fundamental understanding and insights into defects in superconducting qubits that currently limit coherence time and readout contrast; (2) means to characterize, measure and definitively discriminate between these separate defects; and (3) advanced materials, constructions and fabrication methods to eliminate these defects.

Level II proposals will seek to accomplish Level I goals as well as the following additional Program Goal: (4) demonstrate substantially extended coherence times in superconducting qubits fabricated from foregoing developments.

With regard to developing fundamental understanding of superconducting qubit defects, there are several research topics of interest; including but not limited to

1. The origin of defects in “lossy” materials leading to two-level-systems that couple to qubit state transitions; defects whose population for example is reflected by the characteristic “splitting density” observed in readout spectroscopy of the phase qubit.

2. The origin of $1/f$ noise (charge, current and flux noise) and associated electronic mechanisms affecting qubit performance as a function of temperature, but with emphasis on the operating conditions of the qubit. (e.g. for the phase qubit... 25 mK, low power, GHz ...).

3. The role of interface and surface quality attributes including

- a. physical uniformity, smoothness and definition
- b. chemical composition, cleanliness or contamination (stoichiometry, deleterious oxides, impurities...)
- c. morphology (crystallinity, crystal orientation, grain size stability of all of the above (e.g. a junction is considered unstable from which oxygen diffuses into adjacent

layers, resulting in an evolution of stoichiometry and potentially crystallinity and thus electronic properties (e.g. dielectric loss tangent))

4. The effects of coherence length mismatch between dissimilar top and bottom electrodes

5. Novel measurement techniques for isolating decoherence mechanisms and quantifying their relative contribution.

6. Defects that may be intrinsic to specific device architectures such as junction type (SIS, SNS, ScS (constriction or microbridge junctions) or SvS (vacuum junctions)), junction geometry, qubit geometry and layout.

7. The correlation between alternative materials metrics and qubit performance.

8. The role overall qubit size and junction bias current plays, in combination with defects, in enhancing or reducing energy decay and phase coherence in different forms of qubits. For example, ultra small flux and transmon qubits (with ultra-small junctions) have demonstrated better coherence performance (T1 and T2) than larger flux and current-biased phase qubits (with larger junctions).

9. The role defects in junctions plays in contributing to energy loss when incorporated into different configurations of resonant circuits from coplanar waveguides to lumped-element resonators, challenging the notion of “dissipationless” Josephson junctions.

10. New concepts in decoherence mechanisms

Any combination of the above and or additional topics may be included in a proposal. In general, for all topics pursued in developing fundamental understanding of superconducting qubit defects, proposals should focus on:

- a. developing a full understanding of the defect types, the mechanisms by which they occur, the mechanisms by which they affect the qubit, and the qubit performance characteristics they limit (coherence time, contrast, etc.),
- b. the means for definitive characterization and measurement of those defects in the presence of other defects, and subsequently
- c. the most effective means for their elimination.

Note: proposals should also describe test platforms to be used in initial studies of decoherence mechanisms, materials screening and process development. Test platforms such as, but not limited to resonators and antennas should be proposed in appropriate detail, including physically descriptive drawings or photographs and electrical schematics. Details should be given on how the test platform will measure the desired materials properties and how, if possible, the platform can be used to equivalently reveal qubit performance metrics. The correlation between selected materials metrics and qubit performance should be unambiguously supported by a description of theoretical as well as experimental evidence.

With regard to advanced materials and fabrication methods, there are several research topics of interest; including but not limited to

- a. Tunnel junctions of high physical, chemical, morphological, etc... quality and stability, as well as high critical current *and* critical current uniformity
- b. Ultra low-loss dielectrics for insulators and junctions and characterization of detrimental effects of impurities and imperfections therein as a result of the fabrication process
- c. Advanced electrode materials and or passivation layers to minimize 1/f noise from interfaces, electrode surfaces and wiring
- d. Control of contamination from magnetic materials, such as iron
- e. High purity materials for sputtering targets
- f. Innovative qubit designs that may for example
 - 1) minimize or eliminate materials contributing to decoherence (e.g. through vacuum insulators, etc...), or
 - 2) circumvent deleterious mechanisms intrinsic to conventional geometries (e.g. through alternative geometries and or vacuum or normal metal or constriction barriers)
- g. Fabrication techniques providing superior materials and reproducibility
- h. Fabrication quality of electrodes, including the effects of rough edges
- i. Chamber(s) characterization (e.g., temperature, gases, other materials in the chamber) for depositing films and oxidation for fabricating reproducible high quality qubits
- j. New concepts in materials and fabrication techniques or qubit designs

Any combination of the above and or additional topics may be included in a given proposal. In general, for all topics pursued in advanced materials and fabrication methods, proposals should focus on developing materials advances, fabrication techniques, and junction or qubit designs that will substantially eliminate decoherence mechanisms and significantly improve qubit performance.

Neither fundamental understanding of defects nor advanced materials and fabrication should be proposed as independent activities from the other. Rather, all proposals should focus on coupling understanding of decoherence mechanisms to related development of advanced materials and fabrication techniques which minimize or eliminate decoherence mechanisms. Subsequently, Level II proposals should also focus on definitively correlating these advances to measured enhancement of qubit coherence, readout contrast and other vital qubit metrics.

Level II proposals are **not** requested that develop superconducting qubit measurement capability for T_1 , T_2 , readout contrast, or splitting density (for the phase qubit). If the qubit measurement capability is not proven and previously established within the team, it is anticipated that qubit experiments will be subcontracted to groups possessing existing capability. The emphasis of this BAA is not on establishing or advancing qubit measurement capability; rather, it is on development of an understanding of, and the

elimination of, *decoherence mechanisms* in superconducting qubits through advanced materials, processing, characterization and constructions.

Proposals should describe the following in their research plans:

Level I: Proposals at this level should describe an extensive research plan to address a comprehensive set of materials objectives such as provided for the phase qubit in Table I. Proposals at this level are anticipated to

- a. describe an integrated research plan and a cohesive multidisciplinary team to understand decoherence mechanisms, develop and demonstrate advanced materials and fabrication techniques, and conduct systematic characterization
- b. potentially but not necessarily span multiple institutions where research on significant components or where specific expertise is desired, e.g. include subcontracting for specialized expertise such as specific characterization or material fabrication methods, which may not reside at the principal institution and may not be cost-effective to establish in-house
- c. describe control of all experimental parameter space to achieve technical objectives; e.g. to propose all means and equipment necessary to avoid failure to meet technical objectives as a result of materials impurity, poor process control, timely access to equipment/facilities or other complications arising from contamination in or sharing of processing equipment with other research groups.

Level II: Proposals at this level should describe an extensive research plan to address a comprehensive set of materials objectives such as provided for the phase qubit in Table I, as well as all of the qubit objectives such as provided for the phase qubit in Table II. If proposals are not focused on the phase qubit, the minimum technical objectives for qubit measurements will be a 5-fold increase in T_1 and T_2 by year four over the state-of-art today, and a 10-fold increase by year five. In addition, proposals at this level are anticipated to

- a. describe an integrated research plan and a cohesive multidisciplinary team to understand decoherence mechanisms, develop and demonstrate advanced materials and fabrication techniques, conduct systematic characterization, and successfully transition developments into functioning superconducting qubits for measurements
- b. present a clear approach to integrating and optimizing the materials, fabrication and design improvements obtained in the first 4 years to achieve further advanced qubit performance in an optional fifth year
- c. potentially but not necessarily span multiple institutions where research on significant components or where specific expertise is desired, e.g. include subcontracting for specialized expertise such as specific characterization or material fabrication methods, which may not reside at the principal institution and may not be cost-effective to establish in-house
- d. describe control of all experimental parameter space to achieve technical objectives; e.g. to propose all means and equipment necessary to avoid failure to meet technical objectives as a result of materials impurity, poor process control, timely access to

It will also be important that proposals clearly demonstrate performer capabilities including

- e. Fluency with state-of-art theory and experimental characterization of decoherence mechanisms in superconducting qubits.
- f. Materials processing to fully pursue proposed approaches with necessary purity, morphology, film and interface quality, stability, and reproducibility.
- g. For Level II proposals, qubit coherence time measurement at the proposing institution or acquired through other teaming arrangements.

Proposals will be considered having a base period of one year followed by four, consecutive one-year options. Proposals are anticipated to possess the following focus by phase and year

Phase 1 - Years 1-2: a) Establishment of theory enabling experimental discrimination between operative decoherence mechanisms and elucidating a path to their elimination, and b) proof-of-principle demonstration of advanced materials and requisite processing.

Phase 2 - Years 3-4: a) Further development to advance theory of decoherence mechanisms and definitively confirm, discriminate between, and eliminate the same through advanced materials, fabrication and characterization, and b) for Level II proposals to produce a functioning qubit and conduct definitive qubit measurements comprising advances achieved.

Phase 3 - Year 5: a) Optimization of advanced materials, fabrication, and characterization and b) for Level II proposals, optimization of the integration of the forgoing with advanced designs to deliver additional, substantial improvement in coherence.

B. Program Milestones and Metrics

The Government will use the following Program Milestones and Metrics to evaluate the effectiveness of proposed solutions in achieving the stated program objectives, and to determine whether satisfactory progress is being made to warrant continued funding of the program and/or specific performer activity. These metrics are intended to bind the scope of effort, while affording maximum flexibility, creativity, and innovation in proposing solutions to the stated Program Goals.

Of particular interest are proposals whose technical objectives meet or exceed values presented in Tables I and II for the phase qubit. Table I specifies expected objectives for phase qubit materials, and Table II specifies expected objectives for phase qubit performance.

Table I: Example technical objectives for phase qubit materials.*

Objective	Figure of Merit	State-of-art	2011 Year 2 Phase 1	2013 Year 4 Phase 2	2014 Year 5 Phase 3
Substrate	RMS roughness		0.2 nm		
Bottom Electrode	RMS roughness		5 nm	2 nm	<2 nm
	Lattice match (% mismatch with tunnel barrier)		Maintain <0.4% w/ new substrates	Maintain <0.4% w/ new tech	Maintain <0.4% w/ new tech
	Flux noise from surfaces @ 1 Hz	4 $\mu\Phi_0/\sqrt{\text{Hz}}$ on Al	1 $\mu\Phi_0/\sqrt{\text{Hz}}$	0.1 $\mu\Phi_0/\sqrt{\text{Hz}}$	<0.1 $\mu\Phi_0/\sqrt{\text{Hz}}$
	Loss tangent		10^{-4}	10^{-5}	< 10^{-5}
Epi or Amorphous Tunnel Barrier	RMS roughness		5 nm	2 nm	<2 nm
	Pinholes		none		
	Amorphous - Uniformity of Resistance at 300K & I_c at 50mK		<20%	<10%	<5%
	Epitaxial - Uniformity of Resistance at 300K & I_c at 50mK		$\pm 100\%$	< 25%	< 20%
Top Electrode	Lattice match		Maintain <0.4% w/ sub layers	Maintain <0.4% w/ new tech	Maintain <0.4% w/ new tech
Amorphous Insulator	Loss tangent(@ mK, low P, up to 40 GHz	10^{-5} a-Si:H on a-SiO _x sub / Al	10^{-5}	< 10^{-6}	< 10^{-6}
	New materials	a-Si-H	Others...		
	Low roughness	20 nm SiO ₂	10 nm	2 nm	<2 nm
Epi Insulator	New Materials	MgO, Al ₂ O ₃ ...			
Top wiring layer	Flux noise from surfaces @ 1 Hz	4 $\mu\Phi_0/\sqrt{\text{Hz}}$ on Al	1 $\mu\Phi_0/\sqrt{\text{Hz}}$	0.1 $\mu\Phi_0/\sqrt{\text{Hz}}$	<0.1 $\mu\Phi_0/\sqrt{\text{Hz}}$

*This table illustrates the level of detail and degree of advancement expected for materials development. This table is not meant to restrict the scope of proposals.

All proposed materials metrics should correlate strongly to qubit performance metrics. As stated earlier, the correlation between selected materials metrics and qubit performance should be unambiguously supported by a description of theoretical as well as experimental evidence. If proposals are not focused on the phase qubit, then technical objectives for associated materials should be projected at a level of detail and degree of

advancement similar to those in Table I. In general, materials and related advances should be pursued which are projected to lead to no less than an *order of magnitude increase* in corresponding superconducting qubit coherence times.

For Level II proposals, final qubit measurements are expected to demonstrate significant improvements in readout contrast as well as coherence times including T_1 (energy relaxation) and T_2 (dephasing). If proposals are not focused on the phase qubit, objectives should project minimum increases in T_1 and T_2 by 5-fold in year four and by 10-fold in year five, over state-of-art levels today.

Table II: Example technical objectives for phase qubit measurements. **

Figure of Merit	2011	2013	2014
	Year 2 Phase 1 (optional †)	Year 4 Phase 2	Year 5 Phase 3
T_1 and T_2 ‡	2x	5x	10x
Readout Contrast	85%	>90%	>96%
Splitting Density splittings/GHz/ μm^2 @ >10 MHz	0.1	0.01	<0.01

**The milestones given in Table II illustrate the degree of advancement expected for the phase qubit.

† **Note** that in year two for Level II proposals, measurements on qubits fabricated with advances are optional but not required. However, in year four and five, qubit measurements are required comprising materials and construction advancements.

‡ Objectives for T_1 and T_2 are shown as factors of advancement over state-of-the-art at the beginning of the project

C. Program Waypoints

Several Program Waypoints are described below in Table III. The intent of these Waypoints is to assess performer progress toward and likelihood of meeting milestones. Waypoints enable the Program Manager and Program advisors to a) provide more effective guidance and assistance to performers, b) assess justification for continuance and level of funding, and c) assess whether the Program as a whole is on the right path or whether Program-level and/or performer-specific correction is needed to ensure Program success. Offerors should construct their schedule and deliverables consistent with these Waypoints.

Table III. Coherent Superconducting Qubits Program Waypoints

Waypoint Date	Description	Metric	Intent
Summer 2009	1 st Annual Coherent Superconducting Qubit Conference: CSQ 2009	Attendance and Presentation	Cross-fertilization of program performers with global superconducting qubit and advanced materials community; strengthen collaborative relations; gain insight into extant approaches, theory and understanding of decoherence mechanisms; enhance robust, tested and SOA performance
Oct-Nov 2009	Phase 1 Startup Site Visit	Start-up Progress, Staffing, Equipment and Experimental Readiness, Theoretical Progress, Schedule	Funding continuance and level
Summer 2010	CSQ 2010	Attendance and Presentation	Per above for 2009
Oct-Nov 2010	Phase 1 Progress Site Visit	Theoretical and Exptl. Progress, Schedule	Funding continuance and level
April 2011	Phase 1 Milestone Review	Phase 1 Metrics	Phase 2 funding and level
Summer 2011	CSQ 2011	Attendance and Presentation	Per above for 2009
Oct-Nov 2011	Phase 2 Progress Site Visit	Theoretical and Exptl. Progress, Schedule	Funding continuance and level
Summer 2012	CSQ 2012	Attendance and Presentation	Per above for 2009
Oct-Nov 2012	Phase 2 Progress Site Visit	Theoretical and Exptl. Progress, Schedule	Funding continuance and level
April 2013	Phase 2 Milestone Review	Phase 2 Metrics	Phase 3 funding and level
Summer 2013	CSQ 2013	Attendance and Presentation	Per above for 2009
Oct-Nov 2013	Phase 3 Progress Site Visit	Theoretical and Exptl. Progress, Schedule	Funding continuance and level
April 2014	Phase 3 Milestone Review	Phase 3 Metrics	Future IARPA program implications and goals
Summer	CSQ 2014	Attendance and	Per above for 2009, and future

2014		Presentation	IARPA programs and goals
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II. AWARD INFORMATION

The amount of resources available under this BAA for five years of activity will depend on the quality of the proposals received and the availability of funds in the out-years. Multiple awards are anticipated within the two Levels of proposals sought.

If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, the Government reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event the Government desires to award only portions of a proposal, negotiations may be opened with that offeror. 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. The Government reserves the right 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.

Proposals will be considered having a base duration of one year, with four, consecutive one-year options. Critical reviews will take place at Waypoints described in Table III. These will serve to assess demonstrated, quantitative progress relative to stated project objectives. Cancellation or exercise of funding options and levels of funding for continuance will be based in large part upon the results of these reviews.

Awards under this BAA will be made to offerors on the basis of the evaluation criteria listed below (Application Review Information, Sec. V.), and program balance to provide overall value to the Government. Proposals identified for negotiation may result in a contract or grant depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors. The Government reserves the right to negotiate the type of award instrument determined appropriate under the circumstances.

III. ELIGIBILITY INFORMATION

A.1 Eligible Applicants

Research proposals are sought from educational institutions, nonprofit organizations, and public or private organizations. Awards will not be made to individuals.

In accordance with FAR 35.017 (a) (2), other government agencies and Federally Funded Research and Development Centers (FFRDCs) are not eligible to submit proposals under this BAA or participate as team members under proposals submitted by eligible entities.

Historically Black Colleges and Universities (HBCU) [as determined by the Secretary of Education to meet requirements of Title III of the Higher Education Act of 1965, as

amended (20 U.S.C. Sec. 1061)] and Minority Institutions (MI) [as defined by 20 U.S.C. Sec. 1067k(3) and 20 U.S.C. Sec. 2323(a)(1)(C)] are encouraged to participate in the research program, either as the lead research entity or as a member of a team. However, no specific funds are set aside for HBCU/MI participation.

A.2 Procurement Integrity, Standards of Conduct, Ethical Considerations, and Organizational Conflicts of Interest

All Offerors and proposed subcontractors must affirm whether they are providing scientific, engineering, and technical assistance (SETA) or similar support to any IARPA technical office(s) and/or Program Managers through an active contract or subcontract. All affirmations must state which office(s) and/or Program(s) the Offeror 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 must be disclosed. The disclosure shall include a description of the action the Offeror has taken or proposes to take to avoid, neutralize, or mitigate such conflict. Without prior approval or a waiver from the IARPA Director, a Contractor cannot simultaneously be an IARPA SETA as well as an Offeror. Proposals without affirmation shall be withdrawn from further consideration.

If a prospective Offeror believes that any conflict of interest exists or may exist (whether organizational or otherwise), the Offeror should *promptly* raise the issue with both IARPA and ARO by sending Offeror's contact information and a summary of the potential conflict by email to both karl.f.roenigk@ugov.gov and tr.govindan@us.army.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 is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

IV APPLICATION AND SUBMISSION INFORMATION

A. The Application Process

The application process is in three stages as follows:

Stage 1 - Prospective proposers are strongly encouraged to submit white papers prior to the submission of a complete, more detailed proposal. The purpose of white papers is to minimize the labor and cost associated with the production of detailed proposals that have very little chance of being selected for funding. Based on assessment of the white papers, feedback will be provided to the proposers to encourage or discourage them to or from submitting full proposals.

White papers should present the effort in sufficient detail to allow evaluation of the concept's technical merit and its potential contributions of the effort to the IARPA mission. Due to Government budget uncertainties, no specific dollars have been reserved for awards under this BAA.

Stage 2 - Interested offerors are required to submit full proposals. All proposals submitted under the terms and conditions cited in this BAA will be reviewed regardless of the feedback on, or lack of a white paper.

Stage 3. Verify the accuracy of your Dun & Bradstreet (D&B) registration at the D&B website <http://fedgov.dnb.com/webform> before registering with the Central Contractor Registration (CCR) at <http://www.ccr.gov>. Prospective offerors must be registered in CCR prior to award. The CCR obtains Legal Business Name, Doing Business Name (DBA), Physical Address, and Postal Code/ Zip+4 data fields from D&B: If corrections are required, registrants will not be able to enter/modify these fields in CCR; they will be pre-populated using D&B Data Universal Numbering System (DUNS) record data. When D&B confirms the correction has been made, the registrant must then re-visit [ccr.gov](http://www.ccr.gov) and 'accept' D&B's changes. Only at this point will the D&B data be accepted into the CCR record. Allow two (2) business days for D&B to send the modified data to CCR.

B. Format and Content of White papers/Proposals

B.1. White Paper Format and Content:

White papers must be emailed directly to the Technical Point of Contact. Include BAA # W911NF-09-R-0007 WHITE PAPER” in the email subject line. White papers must be submitted in the following format but do not require any special forms:

White papers are *strongly encouraged* prior to submission of a full proposal. White papers should unambiguously and succinctly communicate the value of the proposed approach to meet or exceed the program goals. Additionally, White papers should unambiguously and substantively address the required content detailed below.

i) White papers must be submitted electronically to Dr. T.R. Govindan ARO at email address, tr.govindan@us.army.mil in the following format:

- Single PDF formatted file as an email attachment
- Page Size: 8 ½ x 11 inches
- Margins – 1 inch
- Spacing – single
- Font – No smaller than Times New Roman, 12 point
- Number of Pages – no more than ten (10) single-sided pages. White papers exceeding the page limit may not be evaluated.

ii) White papers will comply with the following content and not exceed 10 pages. All pages shall be numbered consecutively. All sections below shall be included in the page count except as noted:

a) Cover Page including White Paper Title, BAA Number and Title, Date of Submission, Principal Investigator Name, Organization Name, Mailing address, Email address, Phone number(s), (Include Fax if available)

b) Executive Summary: The executive summary should briefly summarize the proposal in less than **two** single spaced pages with Times New Roman 12 pt font. It should unambiguously, succinctly and quantitatively address the following questions in bulleted format:

1. What is the problem or need?
2. What motivates the activity and approach pursued?
3. What are the goals of the proposed activity? Address each goal.
4. What are the specific activities proposed to accomplish the goals?
5. What quantitatively is the state-of-art and the limits of current practice?
6. What's new in the proposed approach that will remove limitations in (4) and improve performance? By how much? On what grounds does the offeror / team base confidence in success?
7. What has the offeror / team achieved previously and how?
8. If successful, what difference will it make quantitatively?
9. To whom will this make a difference and why?
10. How much will it cost to fully complete?
11. How long will it take?
12. What are the key outcome metrics (final results)?

c) Identification and Significance of the Problem and Opportunity: Provide clear detail on points 1 and 3 of the executive summary. Describe the current problem or need. Describe the state-of-art and limits of current practice (quantitatively). Provide any appropriate background material.

d) Innovative Approach: Explain the approach to solving the problem and highlight what is new / innovative in the proposed approach that will remove limitations in current practice and improve performance. Describe quantitatively how much improvement is expected in the various issues to be addressed (detailed technical objectives will be captured in a later section). Explain why these improvements are significant and to whom.

This section is the centerpiece of the White Paper and should succinctly describe the uniqueness and benefits of the proposed approach relative to the current state-of-art approaches. Provide direct comparison to other ongoing research and indicate quantitative advantages *and* disadvantages of the proposed effort, assuming the competing approaches are successful on a similar timeframe. This will require the offeror to project the relative progress of competing approaches.

e) Feasibility of the Approach

Explain on what grounds the offeror / team bases confidence in success. High risk approaches should be grounded on solid scientific principles. Proposals should clearly

provide ample technical and quantitative justification as to why the proposed methods and approaches are feasible.

Describe what the offeror / team has previously achieved and how. Describe the offeror’s accomplishments in closely related areas. Summarize evidence of experience and proficiency, including critical publications and quantitative accomplishments relevant to the proposed work.

f) Technical Objectives

Provide a detailed technical objectives table in the format provided below. Objectives should serve to meet the Program Goals. Add rows and split rows as necessary. Use years appropriate for the performance period of the project, and indicate Phase. While some years may be left out, milestones must be shown for the end of years two, four and five. Avoid excessive text; employ adequate text so that goals and metrics are clearly understandable on their own and in relation to others. Employ footnotes directly below the table for extended descriptions.

The point of this table is to provide a clear, progressive understanding of high level goals, the associated figures of merit that will determine success of reaching those goals, the State-of-Art achieved in the community (possibly by the offeror), what the offeror / team may have already achieved (may be blank), and then how the offeror / team intends to advance those metrics quantitatively by year.

It is difficult to overstate the value of this table. It is critical to the Government’s understanding of how the offeror / team will quantitatively achieve goals as well as measure success. The metrics should be reasonable, but aggressive to significantly advance the state-of-art.

Example White Paper Technical Objectives Table.

Objective	Figure of Merit	State-of-art	Already Achieved	2009	2010	2011	2012
1							
2							
3							
4							

g) Teaming and Key Personnel

Succinctly describe the team, unique capabilities and roles, and highlight key performers in each group or institution. Bios are not necessary at this stage unless for key researchers, and no more than three lines for each should be provided.

h) Facilities/Equipment Available for the Project

Briefly describe the facilities and equipment available and required for the project, including computational and experimental resources.

i) Current and Pending Support

List any proposals submitted or existing funding to do the same or similar work. Provide any details that are important for consideration. A detailed disclosure will be required in the full proposal.

j) Cost Proposal

Prepare a budget and enter the total funds requested each year per the format of the table below. Break down by institution if applicable. The final budget with all necessary details will be submitted with the full proposal.

Example White Paper Cost Table.

	Budget			
	2009	2010	2011	2012
Primary Institution				
Second Institution				
Third Institution				
Total:				

The White Paper page count stops at the end of this section.

k) Definitions: Define all acronyms and symbols in the document. This section falls outside the White Paper page count, not to exceed 1 page.

l) References: Use standard AIP or IEEE formatting. This section falls outside of the White Paper page count, not to exceed 1 page.

B.1.a Disposition Process: After completion of the evaluation, the offeror will be notified in writing of the results.

B.2. Proposal Format and Content.

All full proposals must be submitted electronically through Grants.gov in the format given below. Nonconforming proposals may be rejected without review.

Application Forms – The forms are contained in the Application Package available through the Grants.gov application process. To access these materials, go to <http://www.grants.gov>, select "Apply for Grants", and then select "Download Application Package." Enter the CFDA for Basic Research, 12.431, and the funding opportunity number, **W911NF-09-R-0007**.

NOTE: Compatible versions of Adobe Reader are currently 8.1.1 and 8.1.2. You will be asked to specify your Operating System (examples: Windows, Mac) and Version (examples: XP, Vista, 10.4.9) be sure to specify Adobe Reader Version 8.1.2 to get the compatible version to apply for grants on Grants.gov. Click here to download version 8.1.2 from Adobe Website:
http://www.adobe.com/products/acrobat/readstep2_allversions.htm.

Offerors must complete the mandatory forms and any optional forms (e.g., SF-LLL Disclosure of Lobbying Activities) in accordance with the instructions on the forms and the additional instructions below. The required fields should be completed in accordance

with the “pop-up” instructions on the forms. To activate the instructions, turn on the “Help Mode” (icon with the pointer and question mark at the top of the form). Files that are attached to the forms must be in Adobe Portable Document Form (PDF) unless otherwise specified in this announcement.

The following formatting rules apply for the file attachments:

Paper size when printed – 8.5 x 11 inch paper

Margins – 1 inch

Spacing – single

Font – No smaller than Times New Roman, 12 point

FORM: SF 424 (R&R) (Mandatory) – Complete this form first to populate data in other forms. Authorized Organization Representative (AOR) usernames and passwords serve as “electronic signatures” when your organization submits applications through Grants.gov. By using the SF 424 (R&R), offerors are providing the certification required by 32 CFR Part 28 regarding lobbying as contained in Section VI.2. Use SF 424 R&R. Note: In Block 7, select “Other” and specify whether the type of award selected is a contract or an agreement .

FORM: Research & Related Other Project Information (Mandatory) – Complete questions 1 through 5 and attach files. The files must comply with the following instructions.

1. Project Summary/Abstract (Field 7 on the form) - The project summary/abstract should be a concise description of the proposed research (**200 words or less**). It should also provide recommended proposal reviewer information in the following format:

Project Summary (Field 6): The executive summary should briefly summarize the proposal in **two** single spaced pages with Times New Roman 12 pt font. It should unambiguously, succinctly and quantitatively address *all* of the following questions in bulleted format:

- a. What is the problem or need?
- b. What motivates the activity and approach pursued?
- c. What are the goals of the proposed activity?
- d. What are the specific activities proposed to accomplish the goals? Address each of the goals and whats new in the proposed approach that will remove limitations and improve performance.
- e. By how much and on what grounds does the offeror/team base confidence in success.
- f. How is it done today?
- g. What quantitatively is the state-of-art and limits of the current practice?

- h. What has the offeror / team achieved previously and how?
- i. If successful, what difference will it make quantitatively?
- j. To whom will this make a difference and why?
- k. How much will it cost to fully complete?
- l. How long will it take?
- m. What are the key outcome metrics (final results)?

2. Project Narrative (Field 8)/Technical and Management Portion:

This portion will comply with the following content and not exceed **thirty (30) pages** at Times New Roman, 12 point. Offerors should not feel compelled to use the entire page allotment. All pages should be numbered consecutively. All sections below are included in the page count.

a. Identification and Significance of the Problem and Opportunity: Provide clear detail on points 1 and 3 of the executive summary. Describe the current problem or need. Describe the state-of-art and limits of current practice(quantitatively). Provide any appropriate background material.

b. Innovative Approach: Explain the approach to solving the problem and highlight what is new / innovative in the proposed approach that will remove limitations in current practice and improve performance. Describe quantitatively how much improvement is expected in the various issues to be addressed (detailed technical objectives will be captured in the next section). Explain why these improvements are significant and to whom.

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. Provide direct comparison to other ongoing research and indicate quantitative advantages *and* disadvantages of the proposed effort, assuming the competing approaches are successful on a similar timeframe. This will require the offeror to project the relative progress of competing approaches.

This section requires a detailed description of the technical approach that includes the objectives, scientific relevance, technical approach, and expected significance of the work. The key elements of the proposed work should be clearly identified and related to each other. Proposals should clearly describe, in detail, the technical methods and approaches that will be used to meet or exceed each program milestone.

c. Feasibility of the Approach: Explain on what grounds the offeror / team bases confidence in success. High risk approaches should be grounded on solid scientific principles. Proposals should clearly provide ample technical and quantitative justification as to why the proposed methods and approaches are feasible.

Describe what the offeror / team has previously achieved and how. Describe the offeror's accomplishments in closely related areas. Summarize evidence of

experience and proficiency, including critical publications and quantitative accomplishments relevant to the proposed work.

d. Technical Objectives: State the technical objectives that serve to meet the Program Goals. Break them down into a numbered list. Describe the improvements and innovations sought. Quantify the objectives with figures of merit and compare to the state-of-art. Provide brief statements of how objectives will be accomplished, e.g.:

1. Develop a test fixture capable of...
2. Develop a “specific structure or material” to increase the quality factor of “something” to “some significant metric value.” “This is an order of magnitude improvement over existing results reported by xxx (or over our current results).”
3. Determine
4. Demonstrate
5. Continue on with the other technical objectives

Provide a detailed technical objectives table in the format provided below. Objectives should be consistent with the descriptive list above. Add rows and split rows as necessary. Use years appropriate for the performance period of the project, and indicate Phase. While some years may be left out, milestones must be shown for the end of years two, four and five. Avoid excessive text; employ adequate text so that goals and metrics are clearly understandable on their own and in relation to others. Employ footnotes directly below the table for extended descriptions.

The point of this table is to provide a clear, progressive understanding of high level goals, the associated figures of merit that will determine success of reaching those goals, the State-of-Art achieved in the community (possibly by the offeror), what the offeror / team may have already achieved (may be blank), and then how the offeror / team intends to advance those metrics quantitatively by year.

It is difficult to overstate the value of this table. It is critical to Government’s understanding of how the offeror / team will quantitatively achieve goals as well as measure success. The metrics should be reasonable, but aggressive to significantly advance the state-of-art.

Example Technical Objectives Table

Objective	Figure of Merit	State-of-art	Already Achieved	2009	2010	2011	2012
1							
2							
3							
4							

e. Statement of Work (SOW): Describe specifically the activities to achieve all of the technical goals, as well as technical rationale for the approaches. Break the work down into tasks and sub-tasks as appropriate. For example, the following work breakdown structure is recommended:

Phase 1

Task 1: Make test platform for measuring dielectric loss tangents

Describe what will be done and why. Something like this might be broken into the following sub-tasks.

Task 1.1: Design test platform

Describe the design and the reasoning behind choices.

Task 1.2: Fabricate the test platform

Discuss any specific details of the fabrication process that warrant explanation. If specific materials will be employed then explain why.

Task 2: Next task title

Etc...

The goal of the Statement of Work is to insure the offeror / team thinks through all the tasks in detail, which in turn aids the Government in understanding the progression of all activities, their interdependencies and how they lead to milestones.

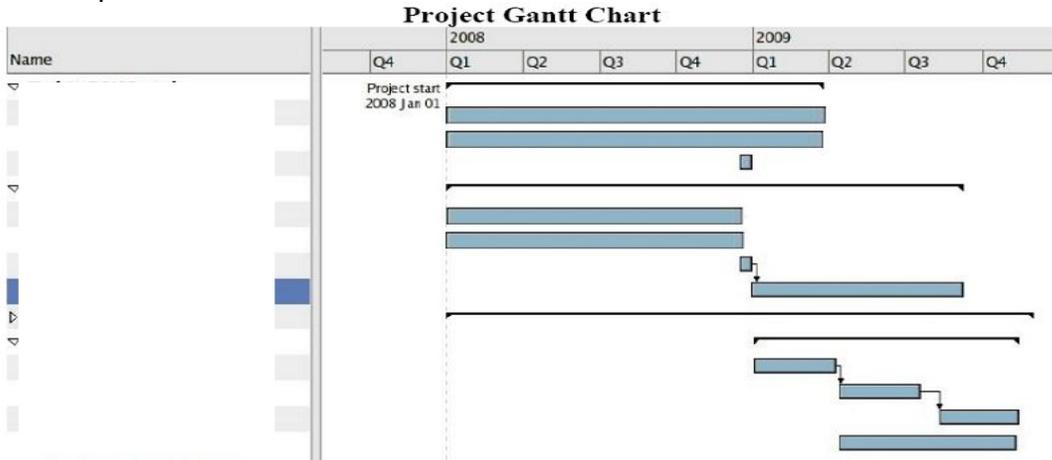
Clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. The SOW must not include proprietary information. For each task/subtask, provide:

1. A general description of the objective (for each defined task/activity).
2. A detailed description of the approach to be taken to accomplish each defined task/activity.
3. Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.).
4. The exit criteria for each task/activity - a product, event or milestone that defines its completion.
5. 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.

At the end, add a Gantt chart to show all the tasks and sub-tasks in the left column and the performance period on the right. Break this down to years and quarters. NOTE: This should be done in MS Project and submitted with the proposal as a separate file as well as pasted into the proposal as an image. The image must be understandable and legible and thus a high level Gantt chart may be required, which subsumes many subtasks into tasks. The technical objectives should be shown as milestones on the Gantt chart.

Example Gantt Chart...



f. Management Plan: Define both the organizations and the individuals within those organizations that make up the team, including expected duties, relevant capabilities and task responsibilities of team members, and expected relationships among members. Expected levels of effort (percentage time or fraction of an FTE) for all key personnel should be clearly noted. A description of the technical, administrative, and business structure of the team and the internal communications plan should be included. Project/function/subcontractor relationships (including formal teaming agreements), Government research interfaces, and planning, scheduling, and control practices should be described. The team leadership structure should be clearly defined.

Succinctly describe any planned subcontracts. Explain the role of all subcontractors and what value they bring to the project. Include how interactions will be handled and detail any deliverables that are expected from/between subcontractors.

g. Intellectual Property Plan: Describe proposed approach to intellectual property rights, together with supporting rationale of why this approach offers the best value to the Government. This section should include a list of technical data, computer software, or computer software documentation associated with this research effort in which the Government will acquire less than unlimited rights.

The page count of the Technical and Management portion stops at the end of this section.

3. Bibliography & References Cited (Field 9) (no page limitations) - Include an appropriate bibliography and list of literature citations. To attach a bibliography, click “Add Attachment.”

4. Facilities and Other Resources (Field 10) (no page limitations) - Describe Facilities available for performing the proposed research and any additional facilities or equipment that the organization proposes to acquire at its own expense. To attach facilities information, click “Add Attachment.”

Equipment (Field 11) (no page limitations) - Provide a rationale for each item of equipment requested in the budget and how this equipment will contribute to the infrastructure building goals of the proposal. To attach equipment information, click “Add Attachment.”

Other Attachments (Field 12) (no page limitations) - Attach ARO Form 52A, Protection of Proprietary Information During Evaluation and After Award/Statement of Disclosure Preference. This form may be accessed at <http://www.aro.army.mil/forms/forms2.htm> under “Forms-Broad Agency /Announcements (BAA)”, completed and saved as an Adobe PDF. To attach ARO Form 52A, click “Add Attachments.”

FORMS: “RESEARCH & RELATED Senior/Key Person Profile” and RESEARCH & RELATED PERSONAL DATA” Personnel Portion: (Not to exceed five pages, *excluding* letters of agreement from subcontractors.) Describe the qualifications of the principal investigator and other key researchers involved in the project, along with the amount of effort to be expended by each person during each year, and include brief biographies for each. For all proposals, one individual should be the designated principal investigator for purposes of technical responsibility and contact.

On a single page, provide a clearly defined organization chart for the program team which includes, as applicable: (1) the programmatic relationship of each 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.

Include letters of agreement from all subcontractors indicating their commitment and ability to perform the requested work. These letters should be signed on the institution’s letterhead. Letters should be no more than a single page each, and should contain no critical technical information related to the proposal. The proposal’s technical content will be judged solely on the material within the Technical Management Portion.

FORM:RESEARCH & RELATED “Senior/Key Person Profile” State of Current and Pending Support Portion: A statement of current and pending support must be included for each investigator listed in the proposal. Use the ARO Current and Pending Support form located at:

<http://www.arl.army.mil/www/default.cfm?Action=29&Page=218#baaforms> to submit this information. This statement requires that each investigator specify all agreements and contracts through which he or she is currently receiving or may potentially receive financial support.

FORM: Disclosure of Lobbying Activities (Standard Form LLL) (Optional): If applicable, this form must be completed. This form is applicable if any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the application for a grant under this BAA.

FORM: Research & Related Budget (Mandatory) – Complete Sections A through J and attach a budget justification in Section K. The budget justification should provide additional data (not included in Sections A through J) by element of cost, sufficient to meet the guidance provided below and ensure meaningful evaluation. The budget justification at Section K should also include the cost sharing or matching plan specified below if applicable.

The budget must include the period-of-performance, a total estimated cost of the project, and the amount and source of project funding (i.e., funds requested from DoD, any funds provided under current grants or contracts with DoD or other federal agencies, and non-federal funds to be provided as cost sharing or matching). The estimated project costs must be shown in total as well as broken down for each year of the program to show the cost elements. Use a separate Research & Related Budget form for each year. The Research & Related Budget-Cumulative Budget form will reflect the total costs. The following additional guidance is provided:

- a. Salary Costs: For all employees/labor categories, indicate the amount of time being charged to the proposed project (e.g., number of months) and show resulting costs based on current or projected salary and fringe benefits.
- b. Equipment: Describe any equipment to be acquired and the basis of cost estimates. Costs should be based on recent quotations from manufacturers or distributors.
- c. Travel: Estimate the required amount of travel and state its relationship to the research. List the proposed destinations and basis of cost estimates.
- d. Meeting Requirements - Awardees should budget accordingly for required meetings and reviews held under this BAA.

Annual Conference(s) - The purpose of the annual conference is to facilitate an open exchange among all Program participants, advisors to the Government, and an extended global audience. Awardees' attendance and presentation at the annual conference is *required*. It is expected that all key personnel will attend the conferences as well as Program Reviews. At the annual conference, awardees

- will present an overview of their work as well as results they consider publishable. The Government believes this open interchange will result in a higher probability of success in achieving the overall program objectives. At annual Program Reviews, awardees will present a comprehensive review of strategy and progress against milestones. Program Reviews will be held at the awardees' locations to allow review of experimental capabilities.
- e. Participant/Trainee Support Costs: Estimate tuition/fees/health insurance for students.
 - f. Other Direct Costs: Itemize and provide the basis for proposed costs for other anticipated direct costs such as communications, transportation, insurance, and rental of equipment other than computer related items. Unusual or expensive items shall be fully explained and justified.
 - g. Materials and Supplies: Estimate costs of materials and supplies. List types of materials needed and costs. Provide basis for cost estimates.
 - h. Publication Costs: Estimate the costs of publishing and reporting research results.
 - i. Consultant Services: State the planned daily consultant fee and travel expenses, the nature of the consulting effort, and the reason consultants are required to complete the effort.
 - j. Subaward Costs: Support the estimate of subaward work by indicating the specific items or portion of the work to be subawarded, type of subaward anticipated, name of subawardee, and a detailed budget for each. For subaward budgets, use the Research & Related Budget form. Under Budget Type, select "Subaward/Consortium." (Subaward cost will be provided with the same amount of detail as that provided by the Prime.)
 - k. Equipment Rental/User Fees: Estimate anticipated direct costs such as rental for computers or other equipment and facility usage fees. Unusual or expensive items should be fully justified.
 - l. Indirect Costs (Overhead, General and Administrative, and Other): Provide the most recent rates, dates of negotiations, the base(s) and period to which the rates apply, and a statement identifying whether the proposed rates are provisional or fixed. If the rates have been negotiated by a Government agency, state when and by which agency. Include a copy of any current indirect rate agreement or provide a URL if this document is available from the Internet.
 - m. Total Direct and Indirect Costs: Give the total costs, year by year, and the cost for the entire proposed grant period.
 - n. Cost Sharing or Matching Plans (if applicable): Construct a table showing the cost sharing or matching share committed to your proposal in the following categories:

Note: To attach the budget justification at Section K, click “Add Attachment.” Additionally, cost breakdowns by task containing the following information will be provided as an attachment at Section K:

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 by task, phase and year from *start date*;
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;
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.).

Failure to provide the requested information or exceed page limits may render the proposal non-responsive, and the proposal may not be evaluated.

Separate attachments, such as institutional brochures or reprints, cannot be considered.

C. Grants.Gov Submission Mechanism (applies to all offerors)

Grants.gov Registration must be accomplished prior to application through this process.

Registration Requirements for Grants.Gov (applies to all offerors)

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.”

There are several one-time actions your organization must complete in order to submit applications through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, register with Grants.gov, and obtain approval for an Authorized Organization Representative (AOR) to submit applications on behalf of the organization). Go to http://www.grants.gov/applicants/get_registered.jsp for further information. Use the Grants.Gov Organization Registration Checklist, which may be accessed at <http://www.grants.gov/assets/OrganizationRegCheck.pdf> to guide you through the process.

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process should be directed to Grants.gov at 1-800-518-4726 or support@grants.gov.

VERY IMPORTANT: In order to view, complete, and submit an application package, you may need to download the appropriate software packages. Go to http://www.grants.gov/applicants/apply_for_grants.jsp for further information.

Apply through the Grants.Gov APPLY portal, <http://www.grants.gov/Apply>. A Grant Application Package is available for download through the Grants.Gov Apply portal under CFDA Number 12.431/Funding Opportunity Number **W911NF-09-R-0007**.

- a. The Application for Federal Assistance form, SF 424 (R&R), must be fully completed. Block 11, “Descriptive Title of Applicant’s Project,” must reference the research being addressed in the effort.
- b. Once the E-Business POC has authorized privileges to the applicant of record (AOR), the AOR will receive an email notification that they have been given authorization. The AOR may then proceed to submit applications to . To find the application on Grants.gov, follow the link <http://www.grants.gov/search/basic.do> and enter the BAA number in the “Search by Funding Opportunity Number:” block. For application instructions, go to <http://www.grants.gov/Apply>. The training demonstration at <http://www.grants.gov/CompleteApplication> will assist AORs in the application process.
- c. You **MUST** open and complete the form entitled Application for Federal Assistance, SF 424 (R&R) first, as this form will automatically populate data fields in other forms. If you encounter any problems, contact customer support at 1-800-518-4726 or at support@grants.gov. If you forget your user name or password, follow the instructions provided in the Credential Provider tutorial. Tutorials may be printed by right-clicking on the tutorial and selecting “Print”.

NOTE: Prospective awardees must complete several steps in order to participate in the Grants.Gov application process. *Starting early is extremely important* as it may take several weeks to complete the processes necessary to submit an application through the Grants.Gov Apply portal.

D. Late Submission and Withdrawal of Proposals

Offerors are responsible for submitting electronic proposals so as to reach Grants.Gov. by the time specified in this BAA for the *initial* or *final* round of funding. If the electronic proposal is received by Grants.Gov after the exact time and date specified for receipt of offers it will be considered "late" and may not be considered for review. Acceptable evidence to establish the time of receipt by Grants.Gov includes documentary evidence of receipt maintained by Grants.Gov.

If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at Grants.gov by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation closing date, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

Proposals may be withdrawn at any time before award by written notice or by email. Notice of withdrawal shall be sent to the Contract Specialist identified in Section VII of this BAA. Withdrawals are effective upon receipt of notice by the Contract Specialist.

V. APPLICATION REVIEW INFORMATION

A. Evaluation Criteria

The criteria to be used to evaluate and select proposals for this program are described below. As no common work statement exists, each proposal will be evaluated on its own merits as well as with regard to its relevance to the program goals; rather than against other proposals for research in the same general area. Evaluation criteria are as follows in descending order of importance:

- 1) Overall scientific and technical merit
- 2) Effectiveness of work plan
- 3) Relevance to IARPA mission and Program Goals
- 4) Relevant experience and expertise
- 5) Cost reasonableness

A.1. Overall Scientific and Technical Merit

Overall scientific and technical merit of the proposal is substantiated, including unique and innovative methods, approaches, and/or concepts. The technical approach is credible, and includes a clear assessment of primary risks and a means to address them. The offeror can expect the selection process to include an assessment of the proposal against the state-of-the-art.

A.2. Effectiveness of Proposed Work Plan

The feasibility and likelihood of the proposed approach for satisfying established program milestones and metrics is explicitly described and clearly substantiated along with risk mitigation strategies for achieving stated milestones and metrics. The proposal

reflects a mature and quantitative understanding of the program milestones and metrics and the statistical confidence with which they may be measured. The offeror may also propose additional milestones and metrics as needed. Any such milestones and metrics are clear and well-defined with a logical connection to enabling offeror decisions and/or Government decisions. The schedule to achieve the milestones is realistic and reasonable.

The role and relationships of prime/subs is clearly delineated with all participants fully documented. Work plans demonstrate the ability to provide full Government visibility into, and interaction with, key technical activities and personnel; and a single point of responsibility for contract performance. Work plans must also demonstrate that key personnel have sufficient time committed to the program to accomplish their described program roles.

The requirement for and the anticipated use or integration of Government Furnished Property (GFP) including all equipment, facilities, information, *etc.* is fully described including dates when such GFP, GFE, GFI or other similar government provided resources will be required.

The offeror's proposed intellectual property and data rights are consistent with the Government's need to be able to communicate program information across Government organizations and to support transition of the program to Intelligence Community users at a reasonable cost.

A.3. Relevance to IARPA Mission and Program Goals

The proposed solution meets the letter and intent of the stated program goals and all elements within the proposal exhibit a comprehensive understanding of the problem. The offeror clearly addresses how the proposed effort will meet and progressively demonstrates the IARPA Coherent Superconducting Qubits program goals.

A.4. Relevant Experience and Expertise

The offeror's capabilities, related experience, facilities, techniques, or unique combination of these which are integral factors for achieving the proposal's objectives; and qualifications, capabilities, and experience of the proposed principal investigator, team leader, and key personnel critical in achieving the proposal objectives, will be evaluated. Time commitments of key personnel must be sufficient for their proposed responsibilities in the effort.

A.5. Cost Reasonableness

The proposed costs are reasonable, realistic, and commensurate with the work proposed. Estimates are "realistic" when they are neither excessive nor insufficient for the effort to be accomplished. The proposal documents all anticipated costs including those of associate, participating organizations. The proposal demonstrates that the offeror has fully analyzed budget requirements and addressed resulting cost risks. All cost-sharing and leveraging opportunities have been explored and identified. Other sponsors who have funded or are funding this offeror for the same or similar efforts are identified.

IARPA recognizes that undue emphasis on cost may motivate offerors to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to achieve a more competitive posture. IARPA 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.

Note to Offerors Regarding the above Evaluation Criteria:

Award(s) will be made to offerors 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 program and the availability of funding for the effort.

OFFERORS ARE CAUTIONED THAT FAILURE TO FOLLOW SUBMITTAL INSTRUCTIONS MAY RESULT IN NEGATIVELY IMPACTING EVALUATION RATINGS AND MAY RESULT IN PROPOSAL REJECTION.

B. Review and Selection Process

It is the policy of IARPA to ensure impartial, equitable, and comprehensive proposal evaluations and to select those sources meeting the Government's technical, policy, and programmatic goals. In order to provide the desired evaluation, qualified Government personnel will conduct reviews and convene panels of experts in the appropriate areas.

The Government intends to use employees of Booz Allen Hamilton, Inc. to assist in administering the evaluation of the proposals as well as to provide expert advice regarding portions of the proposals submitted to the Government. These personnel will have signed and be subject to the terms and conditions of non-disclosure agreements. If an offeror does not send notice of objection to this arrangement, the Government will assume consent to the use of these contractor support personnel in assisting the review of submittal(s) under this BAA. Only Government personnel will make evaluations and award determinations in accordance with this BAA.

Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement.

It is the policy of IARPA 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 ARO and all other copies will be destroyed.

VI. AWARD ADMINISTRATION INFORMATION

A. Award Notices

Notification of selection of proposals will be e-mailed by ARO to successful offerors. Unsuccessful offerors will receive notification of the results of their proposal review.

Offerors whose proposals are recommended for negotiation of award will be contacted by a Contract/Grant Specialist to discuss additional information required for award. This may include representations and certifications, revised budgets or budget explanations, certificate of current cost or pricing data, subcontracting plan for small businesses, and other information as applicable to the proposed award. The award start date will be determined at this time. A contract or grant document signed by the Contracting/Grants Officer is the authorizing award document.

B. Administrative and National Policy Requirements

B.1. Central Contractor Registration (CCR).

Successful offerors must be registered in the DoD CCR database prior to award of any agreement. By submission of an offer resulting from this BAA, the offeror acknowledges the requirement that a prospective contractor/grantee must be registered in the CCR database prior to award, during performance, and through final payment of any agreement resulting from this BAA. The CCR may be accessed at <http://www.ccr.gov>. Assistance with registration is available by phone at 1-888-227-2423.

B.2. Certification Required for Grant Awards.

The certification at Appendix A to 32 CFR Part 28 regarding lobbying is the only certification required at the time of proposal submission for a grant award. The certification is as follows:

“By signing and submitting a proposal that may result in the award of a grant exceeding \$100,000, the prospective awardee is certifying, to the best of his or her knowledge and belief, that:

- a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or

cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

- c. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, and subgrants, and contracts under grants, and loans, or cooperative agreements) and that all sub recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure."

B.3. Certifications Required for Contract Awards

Certifications and representations shall be completed by successful offerors prior to award. Department of Defense FAR Supplement (DFARS) Online Representations and Certifications Application (ORCA) are at website <http://orca.bpn.gov>.

B.4. Export Control

- a. Contractors 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.
- b. 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.
- c. The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.
- d. The Contractor shall be responsible for ensuring that the provisions of this clause (and any required DFARS clause) apply to its subcontractors as applicable or required.

B.5. 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. Each proposal received will be retained at ARO. Proposals will not be returned.

B.6. Intellectual Property

a. Offerors of Contracts

i. Noncommercial Items (Technical Data and Computer Software)

Offerors responding to this BAA requesting a contract to be issued under the FAR 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. Offerors are advised that the Government will use this information during the source selection evaluation process to evaluate the impact of any identified restrictions and may request additional information from the Offeror, as may be necessary, to evaluate the Offeror’s assertions. If no restrictions are intended, then the Offeror 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)

Offerors responding to this BAA requesting a contract to be issued under the FAR 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 offerors 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 Offeror, as may be necessary, to evaluate the Offeror’s assertions. If no restrictions are intended, then the Offeror 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. Offerors of Grants – Noncommercial and Commercial Items (Technical Data and Computer Software)

Offerors responding to this BAA requesting a Grant 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. Offerors may use a format similar to that described in Paragraphs a.i and a.ii 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 Offeror, as may be necessary, to evaluate the Offeror’s assertions. If no restrictions are intended, then the Offeror should state “NONE.”

c. All Offerors – 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 IARPA 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 Offerors – 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 IARPA 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.

C. Reporting Requirements

Additional reports including number and types (e.g., monthly status 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 upon 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.

D. Security

Proposals must not include any information that has been identified as classified national security information under authorities established in Executive Order 12958, Classified National Security Information.

E. Publication Approval

It is anticipated that research funded under this program will be unclassified contracted fundamental research that will not require a pre-publication review.

However, offerors should note that pre-publication approval of certain information may be required if it is determined that its release may result in the disclosure of sensitive intelligence information.