

AIR FORCE
20.A SMALL BUSINESS TECHNOLOGY TRANSFER (STTR)
PROPOSAL PREPARATION INSTRUCTIONS

The Air Force (AF) proposal submission instructions are intended to clarify the Department of Defense (DoD) instructions as they apply to AF specific requirements. **Firms must ensure their proposal meets all requirements of the Broad Agency Announcement currently posted on the DoD website at the time the solicitation closes.**

The AF Program Manager is Mr. David Shahady. The AF SBIR/STTR Program Office can be contacted at afsbirsttr-info@us.af.mil. For general inquiries or problems with the electronic submission, contact the DoD SBIR/STTR Help Desk via email at DoDSBIRSupport@reisystems.com (9:00 a.m. to 5:00 p.m. ET, Monday through Friday). For technical questions about the topics during the pre-announcement period (10 December through 13 January 2020), contact the Topic Authors listed for each topic on the Web site. For information on obtaining answers to your technical questions during the formal announcement period (January 2020 through 12 February 2020), go to <https://sbir.defensebusiness.org>. Your complete proposal **must** be submitted via the submissions site at <https://www.dodsbirsttr.mil/submissions/login> on or before the **8:00 pm ET, 12 February 2020 deadline.**

General information related to the AF Small Business Program can be found at the AF Small Business website, <http://www.airforcesmallbiz.af.mil/>. The site contains information related to contracting opportunities within the AF, as well as business information and upcoming outreach/conference events. Other informative sites include those for the Small Business Administration (SBA), www.sba.gov, and the Procurement Technical Assistance Centers, <http://www.aptacus.us.org>. These centers provide Government contracting assistance and guidance to small businesses, generally at no cost.

(Continued on next page.)

CHART 1: Consolidated STTR Topic Information

Applicable Topics	Phase I					Phase II			
	Technical Volume (Vol 2)	Additional Info (Vol 5)	Award Amount	*Technical Duration	*Final Reporting Period	Technical Volume (Vol 2)	Additional Info (Vol 5)	Technical & Reporting	Initial Award Amount
All AF 20.A Topics	Not to exceed 5 pages	Attach a pitch deck not to exceed 15 slides	Not to exceed \$150,000	6 months	3 months	Not to exceed 15 pages	Attach a pitch deck not to exceed 15 slides	Typically 27 months	Not to exceed \$750,000

*The technical duration and final reporting duration must be added together for the total duration of the project.

PHASE I PROPOSAL SUBMISSION

Read the DoD program announcement at <https://sbir.defensebusiness.org/> for program requirements. When you prepare your proposal, keep in mind that Phase I should address the feasibility of a solution to the topic. For the AF, the contract period of performance for Phase I shall be nine (9) months, and the award shall not exceed \$150,000. We will accept only one Cost Volume per Topic Proposal and it must address the entire nine-month contract period of performance.

The Phase I topic awardees must accomplish the majority of their primary research during the first six months of the contract with the additional three months of effort to be used for generating final reports. Each AF organization may request Phase II proposals prior to the completion of the first six months of the contract based upon an evaluation of the contractor’s technical progress and review by the AF technical point of contact utilizing the criteria in section 8.0 of the DoD announcement. The last three months of the nine-month Phase I contract will provide project continuity for all Phase II awardee (see “Phase II Proposal Submissions” below); no modification to the Phase I contract should be necessary.

Limitations on Length of Proposal

The Phase I Technical Volume has a 5-page-limit (excluding the Cover Sheet, Cost Volume, and Cost Volume Itemized Listing (a-j)). The Technical Volume must be in type no smaller than 10-point on standard 8-1/2" x 11" paper with one (1) inch margins. Only the Technical Volume and any enclosures or attachments count toward the 5-page limit. In the interest of equity, pages in excess of the 5-page limitation will not be considered for review or award. The documents required for upload into Volume 5 using “Other” category do not count towards the 5-page limit.

NOTE: The Fraud, Waste and Abuse Certificate of Training Completion (Volume 6) is required to be completed prior to proposal submission. More information concerning this requirement is provided below under **“PHASE I PROPOSAL SUBMISSION CHECKLIST”**.

Phase I Proposal Format

Proposal Cover Sheet: If your proposal is selected for award, the technical abstract and discussion of anticipated benefits will be publicly released on the Internet. Therefore, DO NOT include proprietary information in these sections.

Technical Volume: The Technical Volume should include all graphics and attachments but should not include the Cover Sheet as it is completed separately. The Phase I proposals shall include a technical volume (uploaded in Volume 2) that shall not exceed 5 pages and a pitch/slide deck not to exceed 15 slides (uploaded in Volume 5). The technical volume and slide deck will be reviewed holistically and there is no set format requirements for the two documents. It is recommended (but not required) that more detailed information is included in the technical volume and higher level information is included in the pitch deck. Most proposals will be printed out on black and white printers so make sure all graphics are distinguishable in black and white. To verify that your proposal has been received, click on the “Check Upload” icon to view your proposal. Typically, your uploaded file will be virus checked and converted to a .pdf document within the hour. However, if your proposal does not appear after an hour, please contact the DoD SBIR/STTR Help Desk via email at DoDSBIRSupport@reisystems.com (9:00 am to 5:00 pm ET Monday through Friday).

Key Personnel: Identify in the Technical Volume all key personnel who will be involved in this project; include information on directly related education, experience, and citizenship. A technical resume of the principal investigator, including a list of publications, if any, must be part of that information. Concise technical resumes for subcontractors and consultants, if any, are also useful. You must identify all U.S. permanent residents to be involved in the project as direct employees, subcontractors, or consultants. You must also identify all non-U.S. citizens expected to be involved in the project as direct employees, subcontractors, or consultants. For all non-U.S. citizens, in addition to technical resumes, please provide countries of origin, the type of visa or work permit under which they are performing and an explanation of their anticipated level of involvement on this project, as appropriate. You may be asked to provide additional information during negotiations in order to verify the foreign citizen’s eligibility to participate on a contract issued as a result of this announcement.

Phase I Work Plan Outline

NOTE: THE AF USES THE WORK PLAN OUTLINE AS THE INITIAL DRAFT OF THE PHASE I STATEMENT OF WORK (SOW). THEREFORE, DO NOT INCLUDE PROPRIETARY INFORMATION IN THE WORK PLAN OUTLINE. TO DO SO WILL NECESSITATE A REQUEST FOR REVISION AND MAY DELAY CONTRACT AWARD.

At the beginning of your proposal work plan section, include an outline of the work plan in the following format:

- 1) Scope: List the major requirements and specifications of the effort.
- 2) Task Outline: Provide a brief outline of the work to be accomplished over the span of the Phase I effort.
- 3) Milestone Schedule
- 4) Deliverables
 - a. Kickoff meeting within 30 days of contract start
 - b. Progress reports)
 - c. Technical review within 6 months
 - d. Final report with SF 298

Cost Volume

Cost Volume information should be provided by completing the on-line Cost Volume and including the Cost Volume Itemized Listing (a-j) specified below. The Cost Volume information must be at a level of detail that would enable Air Force personnel to determine the purpose, necessity and reasonability of each cost element. Provide sufficient information on how funds will be used if the contract is awarded. The on-line Cost Volume and Itemized Cost Volume Information will not count against the 5-page limit. The itemized listing may be placed in the "Explanatory Material" section of the on-line Cost Volume (if enough room) or may be submitted in Volume 5 under the "Other" dropdown option. (Note: Only one file can be uploaded to the DoD Submission Site). Ensure that this file includes your complete Technical Volume and the information below.

a. Special Tooling and Test Equipment and Material: The inclusion of equipment and materials will be carefully reviewed relative to need and appropriateness of the work proposed. The purchase of special tooling and test equipment must, in the opinion of the Contracting Officer, be advantageous to the government and relate directly to the specific effort. They may include such items as innovative instrumentation and/or automatic test equipment.

b. Direct Cost Materials: Justify costs for materials, parts, and supplies with an itemized list containing types, quantities, and price and where appropriate, purposes.

c. Other Direct Costs: This category of costs includes specialized services such as machining or milling, special testing or analysis, costs incurred in obtaining temporary use of specialized equipment. Proposals which include leased hardware, must provide an adequate lease vs. purchase justification or rationale.

d. Direct Labor: Identify key personnel by name if possible or by labor category if specific names are not available. The number of hours, labor overhead and/or fringe benefits and actual hourly rates for each individual are also necessary.

e. Travel: Travel costs must relate to the needs of the project. Break out travel cost by trip, with the number of travelers, airfare, per diem, lodging, etc. The number of trips required, as well as the destination and purpose of each trip should be reflected. Recommend budgeting at least one (1) trip to the Air Force location managing the contract.

f. Cost Sharing: If proposing cost share arrangements, please note each Phase I contract total value may not exceed \$150,000 total, while Phase II contracts shall have an initial Not to Exceed value of \$750,000. Please note cost share contracts or portions of contracts do not allow fee. NOTE: Subcontract arrangements involving provision of Independent Research and Development (IR&D) support are prohibited in accordance with Under Secretary of Defense (USD) memorandum "Contractor Cost Share", dated 16 May 2001, as implemented by SAF/AQ memorandum, same title, dated 11 July 2001.

g. Subcontracts: Involvement of a research institution is required in the project. Involvement of other subcontractors or consultants may also be desired. Describe in detail the tasks to be performed in the Technical Volume and include information in the Cost Volume for the research institution and any other subcontractors/consultants. The proposed total of all consultant fees, facility leases or usage fees, and other subcontract or purchase agreements may not exceed 60 percent of the total contract price or cost, unless otherwise approved in writing by the Contracting Officer. The STTR offeror's involvement must equate to not less than 40 percent of the overall effort and the research institutions must equate to not less than 30 percent.

Support subcontract costs with copies of the subcontract agreements. The supporting agreement documents must adequately describe the work to be performed, i.e., Cost Volume. At a minimum, an offeror must include a Statement of Work (SOW) with a corresponding detailed cost proposal for each planned subcontract.

h. Consultants: Provide a separate agreement letter for each consultant. The letter should briefly state what service or assistance will be provided, the number of hours required, and hourly rate.

i. Any exceptions to the model Phase I purchase order (P.O.) found at <http://www.afsbirsttr.af.mil/Program/Overview/> should be discussed with the Phase I Contracting Officer during negotiations.

NOTE: If no exceptions are taken to an offeror's proposal, the Government may award a contract without discussions (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. Full text for the clauses included in the P.O. may be found at <http://farsite.hill.af.mil>. Please note, the posted P.O. template is for the Small Business Innovation Research (SBIR) Program. While P.O.s for STTR awards are very similar, if selected for award, the contract or P.O. document received by your firm may vary in format/content. If there are questions regarding the award document, contact the Phase I Contracting Officer listed on the selection notification. (See item i under the "Cost Volume" section above) The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary.

j. DD Form 2345: For proposals submitted under export-controlled topics (either International Traffic in Arms (ITAR) or Export Administration Regulations (EAR)), a copy of the certified DD Form 2345, Militarily Critical Technical Data Agreement, or evidence of application submission must be included. The form, instructions, and FAQs may be found at the United States/Canada Joint Certification Program website, <http://www.dla.mil/HQ/InformationOperations/Offers/Products/LogisticsApplications/JCP/DD2345Instructions.aspx>. Approval of the DD Form 2345 will be verified if proposal is chosen for award.

NOTE: Restrictive notices notwithstanding, proposals may be handled for administrative purposes only, by support contractors U.Group, Peerless Technologies, Engineering Network Services, and/or Infinite Management Solutions, LLC. In addition, only Government employees and technical personnel from Federally Funded Research and Development Centers (FFRDCs) MITRE and Aerospace Corporations working under contract to provide technical support to AF Life Cycle Management Center and Space and Missiles Centers may evaluate proposals. All support contractors are bound by appropriate non-disclosure agreements. If you have concerns about any of these contractors, you should contact the AF SBIR/STTR Contracting Officer, Kris Croake at kristina.croake@us.af.mil.

k. The Air Force does not participate in the Discretionary Technical and Business Assistance program. Contractors should not submit proposals that include Discretionary Technical and Business Assistance.

PHASE I PROPOSAL SUBMISSION CHECKLIST

NOTE: If you are not registered in the System for Award Management, <https://www.sam.gov/>, you will not be eligible for an award. Additionally, verify that you are registered to receive contracts (not just grants) and that your address matches between your proposal and SAM.

1) The Air Force Phase I proposal shall be a nine-month effort, and the cost shall not exceed \$150,000. The Special Topic shall be a three-month effort and the cost shall not exceed \$25,000.

2) The Air Force will accept only those proposals submitted electronically via the DoD SBIR Web site (<https://www.dodsbirsttr.mil/submissions/login>).

It is mandatory that the complete proposal submission -- DoD Proposal Cover Sheet, Technical Volume with any appendices, Cost Volume, Itemized Cost Volume Information, and Fraud, Waste and Abuse Certificate of Training Completion -- be submitted electronically through the DoD SBIR website at <https://www.dodsbirsttr.mil/submissions/login>. Each of these documents is to be submitted through the Website.

Please note that the Fraud, Waste and Abuse Training shall be completed prior to submission of your proposal. This is accomplished under Volume 6 of the DoD SBIR Web site (<https://www.dodsbirsttr.mil/submissions/login>). When the training has been completed and certified, the DoD Submission Website will indicate this in the proposal which will complete the Volume 6 requirement. If the training has not been completed, you will receive an error message. Your proposal cannot be submitted until this training has been completed. The Fraud, Waste and Abuse Certificate of Training website can be found under Section 3.6 of the DoD 20.A. STTR BAA Instructions. Your complete proposal **must** be submitted via the submissions site on or before the **8:00 pm ET, 12 February 2020 deadline**. A hardcopy **will not** be accepted.

The AF recommends that you complete your submission early, as computer traffic gets heavy near solicitation close and could slow down the system. **Do not wait until the last minute.** The AF will not be responsible for proposals being denied due to servers being “down” or inaccessible. **Please ensure your e-mail address listed in your proposal is current and accurate. The AF is not responsible for ensuring notifications are received by firms changing mailing address/e-mail address/company points of contact after proposal submission without proper notification to the AF. Changes of this nature that occur after proposal submission or award (if selected) for Phase I and II shall be sent to the Air Force SBIR/STTR site address, afsbirsttr-info@us.af.mil.**

AIR FORCE PROPOSAL EVALUATIONS

The AF will utilize the Phase I proposal evaluation criteria in section 6.0 of the DoD announcement in descending order of importance with technical merit being most important, followed by the qualifications of the principal investigator (and team), and followed by Commercialization Plan.

The AF will utilize Phase II evaluation criteria in section 8.0 of the DoD announcement in descending order of importance with technical merit being most important, followed by the potential for Commercialization Plan, followed by the qualifications of the principal investigator (and team).

The proposer's record of commercializing its prior SBIR and STTR projects will be used as a portion of the Commercialization Plan evaluation. Only firms with four or more Phase II projects that were awarded at least two years prior to a SBIR solicitation will receive a CAI score. If the "Commercialization Achievement Index (CAI)", shown on the first page of the report, is at the 20th percentile or below, the proposer will receive **no more than half** of the evaluation points available under

evaluation criterion (c) in Section 6 of the DoD 19.C STTR instructions. This information supersedes Paragraph 4, Section 5.4e, of the DoD 19.C STTR instructions.

Proposal Status and Feedback

The Principal Investigator (PI) and Corporate Official (CO) indicated on the Proposal Cover Sheet will be notified by e-mail regarding proposal selection or non-selection. Small businesses will receive a notification for each proposal submitted. Please read each notification carefully and note the Proposal Number and Topic Number referenced. **If changes occur to the company mail or email address(es) or company points of contact after proposal submission, the information shall be provided to the AF at afsbirsttr-info@us.af.mil.**

As is consistent with the DoD SBIR/STTR announcement, any feedback requests must be submitted in writing within 30 days after non-selection notification receipt. Written requests for feedback must be submitted via www.afsbirsttr.af.mil through the SBIR system. Feedback requests should include the company name and the telephone number/e-mail address for a primary and alternate point of contact. Include the topic and the proposal number(s). Feedback requests received more than 30 days after non-selection notification receipt will be fulfilled at the Contracting Officers' discretion. Unsuccessful offerors are entitled to no more than one feedback session for each proposal.

IMPORTANT: Proposals submitted to the AF are received and evaluated by different offices within the Air Force and handled on a Topic-by-Topic basis. Each office operates within their own schedule for proposal evaluation and selection. Updates and notification timeframes will vary by office and Topic. If your company is contacted regarding a proposal submission, it is not necessary to contact the AF to inquire about additional submissions. Additional notifications regarding your other submissions will be forthcoming.

We anticipate having all the proposals evaluated and our Phase I contract decisions within approximately three months of proposal receipt. All questions concerning the status of a proposal or debriefing should be directed to the local awarding organization SBIR/STTR Program Manager.

PHASE II PROPOSAL SUBMISSIONS

Phase II is the demonstration of the technology found feasible in Phase I. Only Phase I awardees are eligible to submit a Phase II proposal. All Phase I awardees will be sent a notification with the Phase II proposal submittal date and a link to detailed Phase II proposal preparation instructions. If the mail or email address(es) or firm points of contact have changed since submission of the Phase I proposal, correct information shall be sent to the AF at afsbirsttr-info@us.af.mil. Phase II efforts are typically 27 months in duration (24 months technical performance, with 3 additional months for final reporting) with an initial value not to exceed \$750,000.

NOTE: Phase II awardees should either have or start working towards having a Defense Contract Audit Agency (DCAA) approved accounting system. It is strongly urged an approved accounting system be in place prior to the AF Phase II award timeframe. If you have questions regarding this matter, please discuss with your Phase I Contracting Officer.

All proposals must be submitted electronically at <https://www.dodsbirsttr.mil/submissions/login> by the date indicated in the notification. The technical proposal is **limited to 15 pages unless a different number is specified in the preparation instructions. The Commercialization Report, any advocacy letters, and the additional Cost Volume itemized listing (a-j) will not count against the 15-page limitation and should be**

placed as the last pages of the Topic Proposal file uploaded. The Phase II proposals shall also include a pitch/slide deck not to exceed 15 slides (uploaded in Volume 5). The technical volume and slide deck will be reviewed holistically and there is no set format requirements for the two documents. It is recommended (but not required) that more detailed information is included in the technical volume and higher level information is included in the pitch deck Note: For Phase II applications, only one file can be uploaded to the DoD submission site. Ensure this single file includes your complete Technical Volume and the additional Cost Volume information. The preferred format for submission of proposals is Portable Document Format (.pdf). Graphics must be distinguishable in black and white. Please virus-check your submissions.

AIR FORCE STTR PROGRAM MANAGEMENT IMPROVEMENTS

The Air Force reserves the right to modify the Phase II submission requirements. Should the requirements change, all Phase I awardees will be notified. The Air Force also reserves the right to change any administrative procedures at any time to improve management of the Air Force STTR Program.

AIR FORCE SUBMISSION OF FINAL REPORTS

All Final Reports will be submitted to the awarding AF organization in accordance with the Contract. Companies will not submit Final Reports directly to the Defense Technical Information Center (DTIC).

AIR FORCE STTR 20.A Topic Index

AF20A-T001	Pitch Day for Quantum Enabling Technologies Quantum Timing
AF20A-T002	Pitch Day for Quantum Enabling Technologies Quantum Sensing
AF20A-T003	Pitch Day for Quantum Enabling Technologies Quantum Information Processing and Computing
AF20A-T004	Pitch Day for Quantum Enabling Technologies Quantum Communications and Networking

AIR FORCE STTR 20.A Topic Descriptions

AF20A-T001 TITLE: Pitch Day for Quantum Enabling Technologies Quantum Timing

TECHNOLOGY AREA(S): Information Systems Technology

ACQUISITION PROGRAM: N/A

OBJECTIVE: This is a Pitch Day Topic, please see the above Pitch Day Topic instructions for further details. A Phase I award will be completed over five months with a maximum award of \$156,500K and a Phase II may be awarded for a maximum period of eighteen months and up to \$1.5 million. The objective of this topic is to explore innovative quantum technologies related to Quantum Information Sciences that will not be covered by any other specific STTR topic and thus to explore options for innovative solutions that may fall outside the Air Force's current fields of focus but that may be useful to the development of advanced quantum information systems. This topic will reach companies that can complete a feasibility study and prototype validated concepts in accelerated Phase I and II schedules. This topic is specifically aimed at later stage development rather than earlier stage basic science and research.

DESCRIPTION: The Air Force Research Laboratory is seeking innovative technologies and/or processes which will advance the development of Quantum Enabling Technologies and applications. Specifically, AFRL is interested in advancing and retaining scientific and military dominance in the application of quantum science to USAF needs and interests. Specific topics of interest relating to this Focus Area include, but are not limited to:

Quantum Timing

- Quantum enabling technologies for applications to support low SwaP Atomic clocks
- Rugged, optical atomic clocks for terrestrial or space applications
- Chip-scale/Low-SWaP atomic optical clocks, frequency combs
- Ultra-high precision time dissemination and syncing

PHASE I: Validate the product-market fit between the proposed solution and the proposed topic and define a clear and immediately actionable plan for running a trial with the proposed solution and the proposed AF customer. This feasibility study should directly address:

1. Clearly identify who the prime (and additional) potential AF end user(s) is and articulate how they would use your solution(s) (i.e., the one who is most likely to be an early adopter, first user, and initial transition partner).
2. Deeply explore the problem or benefit area(s), which are to be addressed by the solution(s) - specifically focusing on how this solution will impact the end user of the solution.
3. Define clear objectives and measurable key results for a potential trial of the proposed solution with the identified Air Force end user(s).
4. Clearly identify any additional specific stakeholders beyond the end user(s) who will be critical to the success of any potential trial. This includes, but is not limited to, program offices, contracting offices, finance offices, information security offices and environmental protection offices.
5. Describe the cost and feasibility of integration with current mission-specific products.
6. Describe if and how the demonstration can be used by other DoD or governmental customers.
7. Describe technology related development that is required to successfully field the solution.

The funds obligated on the resulting Phase I STTR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments, laboratory studies, commercial research and interviews. Prototypes may be developed with SBIR funds during Phase I studies to better address the risks and potential payoffs in innovative technologies.

PHASE II: Develop, install, integrate and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study. This demonstration should focus specifically on:

1. Evaluating the proposed solution against the objectives and measurable key results as defined in the Phase I feasibility study.

2. Describing in detail how the solution can be scaled to be adopted widely (i.e. how can it be modified for scale).
3. A clear transition path for the proposed solution that takes into account input from all affected stakeholders including but not limited to: end users, engineering, sustainment, contracting, finance, legal, and cyber security.
4. Specific details about how the solution can integrate with other current and potential future solutions.
5. How the solution can be sustainable (i.e. supportability).
6. Clearly identify other specific DoD or governmental customers who want to use the solution.

PHASE III DUAL USE APPLICATIONS: The Primary goal of STTR is Phase III. The contractor will pursue commercialization of the various technologies developed in Phase II for transitioning expanded mission capability to a broad range of potential government and civilian users and alternate mission applications. Direct access with end users and government customers will be provided with opportunities to receive Phase III awards for providing the government additional research & development, or direct procurement of products and services developed in coordination with the program.

NOTES:

- a. Due to the large amount of expected interest in this topic, we will not be answering individual questions through e-mail, except in rare cases. Instead we will be holding a teleconference to address all questions in an efficient manner. This topic will be updated with the final call-in details as soon as the date is finalized. In the meantime, feel free to use the SITIS Q&A system.
- b. This STTR is not awarding grants, but contracts. When registering in SAM.gov, be sure to select 'YES' to the question 'Do you wish to bid on contracts?' in order to be able to compete for this SBIR topic. If you are only registered to compete for grants, you will be ineligible for this topic.
- c. First payment will be via Government Purchase Card. Therefore, when registering in SAM.gov under Financial Information, be sure to select 'YES' to the question 'Do you accept credit card as a method of payment?'.
- d. We are working to move fast, please double check your CAGE codes and DUNS numbers to be sure they line up, if they are not correct at time of submission, you will be ineligible for this topic. In order to ensure this, please include, in your 15-slide deck, a screenshot from SAM.gov as validation of your correct CAGE code, DUNS number and current business address along with the verification that you are registered to compete for All Contracts.
- e. Companies must be present at the Pitch Day for Quantum Information Technologies event (May, 2020 in NY, NY) and complete their pitch to evaluators in order to receive an award. Further details will be shared in SITIS

REFERENCES:

1. United States Air Force 2030 Science and Technology Strategy: Strengthening USAF Science and Technology for 2030 and Beyond. <https://www.af.mil/Portals/1/documents/2019%20SAF%20story%20attachments/Air%20Force%20Science%20and%20Technology%20Strategy.pdf>
2. National Strategic Overview for Quantum Information Science: Subcommittee on Quantum Information Science under the Committee on Science, National Science and Technology Council (Sep, 2018). <https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Strategic-Overview-for-Quantum-Information-Science.pdf>
3. Quantum Networks for Open Science Workshop Report: Office of Advanced Scientific Computing Research Department of Energy; 25-26Sep2018. <https://info.ornl.gov/sites/publications/Files/Pub124247.pdf>

KEYWORDS: Quantum algorithms, Quantum networking, Quantum computation, Superconducting qubits, Photon-based qubits, Trapped ion qubits, Quantum memory, Quantum Transduction and interfaces, Entanglement distribution, Heterogeneous quantum systems.

AF20A-T002 TITLE: Pitch Day for Quantum Enabling Technologies Quantum Sensing

TECHNOLOGY AREA(S): Information Systems Technology

ACQUISITION PROGRAM: N/A

OBJECTIVE: This is a Pitch Day Topic, please see the above Pitch Day Topic instructions for further details. A Phase I award will be completed over five months with a maximum award of \$156,500K and a Phase II may be awarded for a maximum period of eighteen months and up to \$1.5 million. The objective of this topic is to explore innovative quantum technologies related to Quantum Information Sciences that will not be covered by any other specific STTR topic and thus to explore options for innovative solutions that may fall outside the Air Force's current fields of focus but that may be useful to the development of advanced quantum information systems. This topic will reach companies that can complete a feasibility study and prototype validated concepts in accelerated Phase I and II schedules. This topic is specifically aimed at later stage development rather than earlier stage basic science and research.

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Quantum Sensing

- Quantum enabling technologies for applications to support novel sensing devices
- Optical-mechanical, strain, etc. qubit sensors
- Ultra-sensitive quantum electric, magnetic, and gravitational field sensors
- Quantum sensors for GPS-denied navigation
- Concepts and development of coherent transduction between different qubit technologies
- Distributed/broad-baseline quantum sensor concepts

PHASE I: Validate the product-market fit between the proposed solution and the proposed topic and define a clear and immediately actionable plan for running a trial with the proposed solution and the proposed AF customer. This feasibility study should directly address:

1. Clearly identify who the prime (and additional) potential AF end user(s) is and articulate how they would use your solution(s) (i.e., the one who is most likely to be an early adopter, first user, and initial transition partner).
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4. Specific details about how the solution can integrate with other current and potential future solutions.
5. How the solution can be sustainable (i.e. supportability).
6. Clearly identify other specific DoD or governmental customers who want to use the solution.

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- a. Due to the large amount of expected interest in this topic, we will not be answering individual questions through e-mail, except in rare cases. Instead we will be holding a teleconference to address all questions in an efficient manner. This topic will be updated with the final call-in details as soon as the date is finalized. In the meantime, feel free to use the SITIS Q&A system.
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- d. We are working to move fast, please double check your CAGE codes and DUNS numbers to be sure they line up, if they are not correct at time of submission, you will be ineligible for this topic. In order to ensure this, please include, in your 15-slide deck, a screenshot from SAM.gov as validation of your correct CAGE code, DUNS number and current business address along with the verification that you are registered to compete for All Contracts.
- e. Companies must be present at the Pitch Day for Quantum Information Technologies event (May, 2020 in NY, NY) and complete their pitch to evaluators in order to receive an award. Further details will be shared in SITIS

REFERENCES:

1. United States Air Force 2030 Science and Technology Strategy: Strengthening USAF Science and Technology for 2030 and Beyond. <https://www.af.mil/Portals/1/documents/2019%20SAF%20story%20attachments/Air%20Force%20Science%20and%20Technology%20Strategy.pdf>
2. National Strategic Overview for Quantum Information Science: Subcommittee on Quantum Information Science under the Committee on Science, National Science and Technology Council (Sep, 2018). <https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Strategic-Overview-for-Quantum-Information-Science.pdf>
3. Quantum Networks for Open Science Workshop Report: Office of Advanced Scientific Computing Research Department of Energy; 25-26Sep2018. <https://info.ornl.gov/sites/publications/Files/Pub124247.pdf>

KEYWORDS: Quantum algorithms, Quantum networking, Quantum computation, Superconducting qubits, Photon-based qubits, Trapped ion qubits, Quantum memory, Quantum Transduction and interfaces, Entanglement distribution, Heterogeneous quantum systems.

AF20A-T003 TITLE: Pitch Day for Quantum Enabling Technologies Quantum Information Processing and Computing

TECHNOLOGY AREA(S): Information Systems Technology

ACQUISITION PROGRAM: N/A

OBJECTIVE: This is a Pitch Day Topic, please see the above Pitch Day Topic instructions for further details. A Phase I award will be completed over five to six months with a maximum award of \$156,500K and a Phase II may be awarded for a maximum period of eighteen months and up to \$1.5 million. The objective of this topic is to explore innovative quantum technologies related to Quantum Information Sciences that will not be covered by any other specific STTR topic and thus to explore options for innovative solutions that may fall outside the Air Force's current fields of focus but that may be useful to the development of advanced quantum information systems. This topic will reach companies that can complete a feasibility study and prototype validated concepts in accelerated

Phase I and II schedules. This topic is specifically aimed at later stage development rather than earlier stage basic science and research.

DESCRIPTION: The Air Force Research Laboratory is seeking innovative technologies and/or processes which will advance the development of Quantum Enabling Technologies and applications. Specifically, AFRL is interested in advancing and retaining scientific and military dominance in the application of quantum science to USAF needs and interests. Specific topics of interest relating to this Focus Area include, but are not limited to:

Quantum Information Processing and Computing

- Quantum enabling technologies for applications to support information Processing and Computing; including increase of qubit coherence, gate fidelities, readouts, 3D qubit designs
- Quantum algorithm development for computationally hard problems in optimization, machine learning, neural networks, risk/decision analysis, logistics, computational chemistry, material discovery
- Strategies for performing large computations on limited qubit machines, including, efficient gate and problem decompositions, logical qubit embeddings
- Novel forms of quantum computing implementations, e.g. all optical, hybrid qubit architectures
- PIC-compatible, at-wavelength optical components (e.g. isolators, shutters, modulators, amplifiers)

PHASE I: Validate the product-market fit between the proposed solution and the proposed topic and define a clear and immediately actionable plan for running a trial with the proposed solution and the proposed AF customer. This feasibility study should directly address:

1. Clearly identify who the prime (and additional) potential AF end user(s) is and articulate how they would use your solution(s) (i.e., the one who is most likely to be an early adopter, first user, and initial transition partner).
2. Deeply explore the problem or benefit area(s), which are to be addressed by the solution(s) - specifically focusing on how this solution will impact the end user of the solution.
3. Define clear objectives and measurable key results for a potential trial of the proposed solution with the identified Air Force end user(s).
4. Clearly identify any additional specific stakeholders beyond the end user(s) who will be critical to the success of any potential trial. This includes, but is not limited to, program offices, contracting offices, finance offices, information security offices and environmental protection offices.
5. Describe the cost and feasibility of integration with current mission-specific products.
6. Describe if and how the demonstration can be used by other DoD or governmental customers.
7. Describe technology related development that is required to successfully field the solution.

The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments, laboratory studies, commercial research and interviews. Prototypes may be developed with SBIR funds during Phase I studies to better address the risks and potential payoffs in innovative technologies.

PHASE II: Develop, install, integrate and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study. This demonstration should focus specifically on:

1. Evaluating the proposed solution against the objectives and measurable key results as defined in the Phase I feasibility study.
2. Describing in detail how the solution can be scaled to be adopted widely (i.e. how can it be modified for scale).
3. A clear transition path for the proposed solution that takes into account input from all affected stakeholders including but not limited to: end users, engineering, sustainment, contracting, finance, legal, and cyber security.
4. Specific details about how the solution can integrate with other current and potential future solutions.
5. How the solution can be sustainable (i.e. supportability).
6. Clearly identify other specific DoD or governmental customers who want to use the solution.

PHASE III DUAL USE APPLICATIONS: The Primary goal of STTR is Phase III. The contractor will pursue commercialization of the various technologies developed in Phase II for transitioning expanded mission capability to a broad range of potential government and civilian users and alternate mission applications. Direct access with end users and government customers will be provided with opportunities to receive Phase III awards for providing the

government additional research & development, or direct procurement of products and services developed in coordination with the program.

NOTES:

- a. Due to the large amount of expected interest in this topic, we will not be answering individual questions through e-mail, except in rare cases. Instead we will be holding a teleconference to address all questions in an efficient manner. This topic will be updated with the final call-in details as soon as the date is finalized. In the meantime, feel free to use the SITIS Q&A system.
- b. This STTR is not awarding grants, but contracts. When registering in SAM.gov, be sure to select 'YES' to the question 'Do you wish to bid on contracts?' in order to be able to compete for this SBIR topic. If you are only registered to compete for grants, you will be ineligible for this topic.
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- e. Companies must be present at the Pitch Day for Quantum Information Technologies event (May, 2020 in NY, NY) and complete their pitch to evaluators in order to receive an award. Further details will be shared in SITIS

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2. National Strategic Overview for Quantum Information Science: Subcommittee on Quantum Information Science under the Committee on Science, National Science and Technology Council (Sep, 2018).
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KEYWORDS: Quantum algorithms, Quantum networking, Quantum computation, Superconducting qubits, Photon-based qubits, Trapped ion qubits, Quantum memory, Quantum Transduction and interfaces, Entanglement distribution, Heterogeneous quantum systems.

AF20A-T004

TITLE: Pitch Day for Quantum Enabling Technologies Quantum Communication and Networking

TECHNOLOGY AREA(S): Information Systems Technology

ACQUISITION PROGRAM: N/A

OBJECTIVE: This is a Pitch Day Topic, please see the above Pitch Day Topic instructions for further details. A Phase I award will be completed over five months with a maximum award of \$156,500K and a Phase II may be awarded for a maximum period of eighteen months and up to \$1.5 million. The objective of this topic is to explore innovative quantum technologies related to Quantum Information Sciences that will not be covered by any other specific STTR topic and thus to explore options for innovative solutions that may fall outside the Air Force's current fields of focus but that may be useful to the development of advanced quantum information systems. This topic will reach companies that can complete a feasibility study and prototype validated concepts in accelerated Phase I and II

schedules. This topic is specifically aimed at later stage development rather than earlier stage basic science and research.

DESCRIPTION: The Air Force Research Laboratory is seeking innovative technologies and/or processes which will advance the development of Quantum Enabling Technologies and applications. Specifically, AFRL is interested in advancing and retaining scientific and military dominance in the application of quantum science to USAF needs and interests. Specific topics of interest relating to this Focus Area include, but are not limited to:

Quantum Communication and Networking

- Quantum enabling technologies for applications to support communication and networking
- Entanglement distribution in networks larger than two nodes; protocols and implementations
- Quantum communication and networking beyond (potentially building upon) Quantum Key Distribution (QKD)
- Quantum repeater beyond two nodes
- Concepts and development of coherent transduction between different qubit technologies
- Methods to utilize high dimensional entanglement for networking and communication

PHASE I: Validate the product-market fit between the proposed solution and the proposed topic and define a clear and immediately actionable plan for running a trial with the proposed solution and the proposed AF customer. This feasibility study should directly address:

1. Clearly identify who the prime (and additional) potential AF end user(s) is and articulate how they would use your solution(s) (i.e., the one who is most likely to be an early adopter, first user, and initial transition partner).
2. Deeply explore the problem or benefit area(s), which are to be addressed by the solution(s) - specifically focusing on how this solution will impact the end user of the solution.
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2. National Strategic Overview for Quantum Information Science: Subcommittee on Quantum Information Science under the Committee on Science, National Science and Technology Council (Sep, 2018).
<https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Strategic-Overview-for-Quantum-Information-Science.pdf>
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KEYWORDS: Quantum algorithms, Quantum networking, Quantum computation, Superconducting qubits, Photon-based qubits, Trapped ion qubits, Quantum memory, Quantum Transduction and interfaces, Entanglement distribution, Heterogeneous quantum systems.