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 $156,500 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)
• 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.
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 STTR 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 Phase I Quantum Collider event for Quantum Information Technologies event (June 16 & 17, 2020 in Brooklyn, 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-qubits, Quantum memory, Quantum Transduction and interfaces, Entanglement distribution, Heterogeneous quantum systems.