

Amplification of AFOSR BAA - FA9550-19-S-0003

AFOSR – NRF/IITP Korea Quantum Information Science and Technologies

2021-2024

The US Air Force Office of Scientific Research (AFOSR) / Asian Office of Aerospace Research & Development (AOARD) and the National Research Foundation of Korea (NRF) / the Institute of Information & communications Technology Planning & Evaluation (IITP) announce the solicitation for a three-year program that is co-funded by the AFOSR/AOARD and the NRF/ IITP.

History:

NRF/IITP have had a long 11-year relationship with the USAF and sister services for supporting basic scientific research efforts. In order to continue to provide opportunities for scientists and engineers in both countries to collaborate in these emerging technology areas and to leverage their intellectual resources, AFOSR and NRF/IITP are collaborating on a program in Quantum Information Science and Technologies.

Eligibility:

This is an open call with open competition, so welcome all applications. Applications must have a minimum of two co-PIs for each team; one from a US institution and one from a Korean institution. More specifically, a team will consist of a principal investigator (PI) from the US with his/her counterpart from Korea are invited to submit a joint proposal indicating what could be accomplished with their existing collaboration with three years of funding. Only one application per team; thus identical proposal narratives should be submitted to both AFOSR and NRF/IITP.

In order to identify the range of potential interest, each team will be asked to submit a white paper with a technical narrative of no more than 3 pages. White papers should describe the proposed effort to be undertaken. Based on the evaluation of these white papers, the finalist teams will be invited to submit full proposals.

The proposals will be reviewed by both NRF/IITP and AFOSR. It is expected that basic-research efforts funded under this program will publish their results in the open literature, and would foster greater scientific collaboration between the US and Korea.

Collaborative Funding Opportunity:

The proposed work is expected to utilize non-classical physical resources to develop beyond-classical capabilities in imaging, sensing and precision measurements, information processing and transfer, or simulation and discovery of complex materials. Research topics of interest in this program include the following broad areas: quantum communications and networks, quantum repeaters, quantum information processing, and quantum computing/simulation; and fundamental studies in support of this research area, such as fundamental investigations of the creation, manipulation, and characterization of entanglement, highly entangled states, dissipation

engineering, quantum control techniques, new types of qubit development, and coherent state transfer between different types of qubits.

Additional research concentrations areas of this program include the understanding and predictive design of new materials whose atomic and molecular structure, bonds, and defects can facilitate superb quantum behavior (i.e. coherence, entanglement, spin dynamics, etc.); study of effects from influences such as elastic properties, vibrations, surfaces, and interfaces on the desired quantum (non-classical) behavior of the material; and exploitation of materials properties and phenomenon to mitigate sources of decoherence and enhance material performance in quantum information applications.

More specific scientific focus areas under this collaboration are:

- Integrated photonics for quantum technologies
- Hybrid quantum systems for quantum information science
- Single photon sources for quantum information applications
- Solid-state qubits
- Quantum material synthesis for quantum information applications
- Quantum simulator
- Quantum algorithms

The NRF and IITP will support projects under this BAA Amplification, thus the Korean team must choose either the NRF or IITP to submit the proposal. Each are supporting basic research in quantum information science and technologies; however, the NRF is focused in the area of quantum computing, while IITP is focused in the area of quantum sensors and communication.

Korean Institute	NRF	IITP
Focus Area	Quantum Computing	Quantum Sensors /Communication

Selection will be based upon (1) the technical merits of the proposed research and development, (2) potential relationship of the proposed research and development to Department of Defense missions, and (3) the unique synergy enabled by the US-Korean collaboration.

The proposals will be reviewed by both US AFOSR and the NRF/IITP. It is expected that efforts funded under this program will foster greater scientific collaboration between the US and Korea. Specific areas of interest can be also found in the AFOSR Broad Agency Announcement (BAA-AFOSR-FA9550-19-S-0003) at <https://www.grants.gov/web/grants/view-opportunity.html?oppId=314753>

Funding Level:

All funding is estimated and based on budget availability of both the US and Korean governments. We anticipate Three Years of funding - AFOSR will fund about seven US PI's at \$100,000 per year and NRF/IITP will fund their corresponding Korean PI's a minimum of 100,000,000 KRW per year for each grant.

Year 1 (2021-2022) – minimum 100 million KRW for the Korean PI, US \$100,000 for the US PI
Year 2 (2022-2023) – minimum 100 million KRW for the Korean PI, US \$100,000 for the US PI
Year 3 (2023-2024) – minimum 100 million KRW for the Korean PI, US \$100,000 for the US PI

The specific dates each team will be funded will vary due to the different funding cycles.

Application Process, Timeline, and Submission Information

The proposal submission process is in two stages. Prospective awardees are encouraged to submit a white paper to minimize the labor and cost associated with the production of detailed full proposals that have very little chance of being selected for funding.

White Paper Phase: Each team consisting of a US PI and Korean PI will be asked to submit a joint white paper with a technical narrative of no more than 3 pages. The white papers should include research highlights (problem, method of investigation, uniqueness of approach, potential relevance to Department of Defense missions), and the following two items as appendices (not counted against page count): biographic information on US and Korean research team members, and simple budget. White papers should be submitted via email to the AFOSR Point of Contact (POC) and following website of the NRF/IITP by *10 March 2021, 18:00 Korean Standard Time*.

NRF POC: NRF e-R&D system, <https://ernd.nrf.re.kr/>

AFOSR POC: Dr. Christopher Vergien, christopher.vergien@us.af.mil

IITP POC: IITP EZOne system, <https://ezone.iitp.kr/>

All submitted white papers will be reviewed independently by AFOSR and NRF/IITP representatives. Up to 10 mutually agreed teams will be invited to submit full proposals. Based on the evaluation of these proposals up to 7 teams will be funded. The selection of the research teams qualified to submit full proposals will be announced by *14 April 2021*.

Full Proposal Phase: Each application must be from a team as aforementioned. Full proposal will include a narrative of no more than 8-10 pages to compete for the final selection. The proposals should include research highlights such as the problem, method of investigation, uniqueness or novelty of approach, synergy value of the specific US/Korean team, coordination plan, personnel exchanges, and relevance to Department of Defense missions with the following items as appendices: CV's for both PIs, and a joint budget summary. More information can be found in the [AFOSR Broad Agency Announcement \(FA9550-19-S-0003\)](#). In addition, each team member may need to submit supplemental documents, forms, and budget justification required by the US/Korea funding agency for which the team member will be seeking funding. Identical Joint Proposal narratives and appendices with all funding-agency specific associated supplemental documents should be submitted to both the following websites of NRF/IITP and AFOSR by *13 May 2021, 18:00 Korean Standard Time*.

NRF POC: Through the NRF e-R&D system, <https://ernd.nrf.re.kr/>

AFOSR POC: Dr. Christopher Vergien, christopher.vergien@us.af.mil

IITP POC: Through the IITP EZOne system, <https://ezone.iitp.kr/>

Korean PIs: Submit applications, to include white papers, in accordance with the NRF/IITP call and domestic regulations. NRF/IITP operates the online system and applicants should log in to

submit their proposals using this online system. After evaluation of the white papers, candidates for full grant application will be notified to submit a full proposal. The candidates should submit their full proposals through the online system in a similar way as they submit white papers.

Questions regarding submission of proposals may be sent to:

NRF – Dr. Sinai Kim: snkim@nrf.re.kr

IITP – Dr. Junho Choi: juno@iitp.kr

US PIs: Please see Part II for the template. Submit white papers to christopher.vergien@us.af.mil and the full proposals through the funding opportunity [FA9550-19-S-0003](https://www.grants.gov/web/grants/view-opportunity.html?oppId=314753) (<https://www.grants.gov/web/grants/view-opportunity.html?oppId=314753>). Please use the AOARD international package. In box 4b of the SF424 enter “Vergien, Chris” to direct your submission to the correct office. Once submitted, please e-mail both the full grant application package with the Grants.gov ID number to christopher.vergien@us.af.mil

The evaluation of full proposals will be made by AFOSR and NRF/IITP representatives. The announcement for the awards will be made by June 2021. Applicants funded by the U.S. Air Force Office of Scientific Research (AFOSR), are subject to the terms and conditions described in the current AFOSR Broad Agency Announcement. Evaluation criteria and review are subject to the terms and conditions described in the current AFOSR Broad Agency Announcement.

Timeline:

11 January 2021 – Publish call for white papers

10 March 2021 – White papers are due (obligation of 30 days)

14 April 2021 – Down select 10 white papers for full proposal and notify applicants

13 May 2021 – Full proposals are due

18 June 2021 – Publish results of selection

The following items should be discussed between the Korean PI's institution and the US PI's institution:

1. Intellectual property issues
2. Personnel exchanges (faculty and students) to promote collaborative research.

Addressing these issues well in advance will expedite the grant process and minimize delays in starting the research collaboration.

Joint Reporting:

When awarded, the Korean and US PI's shall submit joint annual and final reports to AFOSR and NRF/IITP as required in the grant paperwork. In addition, mandatory annual program reviews will be held, and both PI's are expected to attend the review and to make a joint oral presentations.

US-Korea Quantum Science and Technology Program 2021

Preliminary Proposal

Part I.

1. Project Information

		For NRF/IITP Staff use only (Registered No.)	
1.1 Project Title	(in English) (in Korean)		
1.2 Main Research Area		1.3 Sub-research Field	
1.4 Research Duration	From 2021 to 2024 (3 Year)		

2. Applicant Information

Korean Principal Investigator (KPI)		US Principal Investigator (USPI)	
Full Name (age)		Full Name (age)	
Nationality		Nationality	
Affiliation (Department)		Affiliation (Department)	
Position		Position	
Telephone		Telephone	
Fax		Fax	
E-mail		E-mail	
Address		Address	

3. Budget Description

Requested budget by KPI (in Korean Won)		Requested budget by USPI (in US Dollars)	
2021	(Won)	2021	\$

4. Number of Participants

	PI	Researcher				Assistant/Staff	Total
		Prof.	Post-Doc.	Ph .D. Course	Master Course		
Korean Lab.							
US Lab.							

5. Authentication and Commitment

Declaration: I am hereby aware that this proposal is submitted for consideration of AFOSR and NRF/IITP program. I will faithfully observe and conduct research in accordance with National Research and Development Management Regulations.			
Signature of the Korean Principal Investigator (KPI):			
name	signature	date:	
Signature of the US Principal Investigator (USPI):			
name	signature	date:	
Signature of the representative from the host organization (Korean side only):			
Name	position	signature	date :

Part II. Contents of Preliminary Proposal (White Paper)

[Limited to 3 pages maximum, but CVs of both PIs may be added as Part III.]

Sample or Guide FORMAT of AOARD Proposal/White Paper

Proposal/White papers should relate the current state-of-the-art, how the proposed effort would advance it, length of time, and the approximate cost.

Page length 3 pages

Title Page

- Proposal Title:
- Principle Investigator:
- Key Researcher(s) involved in the Proposed Project
- Affiliation of each Researcher(s)
- Proposed Period-of-Performance
- Proposed Total Cost

Abstract [300 words or less, to be publically posted on US Government searchable database]

- A concise (not to exceed 300 words) abstract that describes the research objective, technical approaches, anticipated outcome and impact of the specific research.

Introduction

- Any background information concerning the proposed research- put the proposed idea in perspective to work in the same area and historical development of field.
- Define motivation for the research, and ensure that the technical merit is clear.
- State-of-the-art of the field and Significance and innovation (i.e., why you are doing this research, what is the significance and innovative)

Statement of Objectives

- You should use active verbs when you prepare the statement of objectives, e.g., “conduct” research in a subject area, “investigate” a problem, “determine” to test a hypothesis.

Approach or Research Effort

- Please explain the proposed research plan and how it will be accomplished – explain any unique approach aspects.
- Please include a plan of work.
- Detail any proposed collaboration.
- Briefly describe the importance to the research of any requested travel or equipment.

Pay-off

- Please explain what the research advances proposed is or potential long-term benefits of the proposed research.
- Detail any predictive performance measures with comparison to other competitive methods.

Facilities

- Please describe the facilities available for performing the proposed research, and any additional facilities or equipment the organization proposes to acquire at its own expense for the work

Funding Summary

- Approximate funding level needed year by year. [Should match request in the (a) Budget Justification and (b) SF424 Budget]

AOARD FUNDING REQUESTED	AMOUNT in USD
• Year 1	• \$
• Year 2	• \$
• Year 3	• \$
TOTAL	

- **[Optional] Leveraged Funding.** If the AOARD grant is supporting only a part of a larger effort, it helps us if we understand the context. Please estimate cost-shared funding from other sources that are supporting the project described in the provided narrative. Please describe this as an unofficial estimate of the costs that the AOARD would have had to pay if the entire project described in the above narrative was supported by the AOARD.

Estimated amount from different organizations. Need organization and amount in USD. Only need labour categories from AOARD funding elements.

FUNDING SOURCES	AMOUNT
•	• \$
•	• \$
TOTAL	