



Govt. of India
Ministry of Science & Technology
Department of Science & Technology

Interdisciplinary Cyber Physical Systems (ICPS) Division
Detailed Call For Proposals (CFP) under ICPS programme.
Last date for receipt of proposals through online is 31/12/2017

The Scheme: R&D proposals are invited under **Quantum Information Science and Technology (QuST)** – A Mission Mode Scheme under ICPS programme.

Department of Science and Technology (DST), Government of India has initiated a new directed research programme on “Quantum Information Science and Technology (QuST)”. R&D proposals are invited from researchers who can meet the broad objectives and deliverables.

The present century has witnessed a revolution in harnessing the principles of quantum systems for information processing. The frontier area of Quantum Information Science is truly an interdisciplinary one that is developed by scientists from Physics, Computer Science, Mathematics, and Information Theory as well as Engineers. Some of the important developments were the discovery of quantum computers, fast quantum algorithms, quantum teleportation, super dense coding, remote state preparation, quantum cryptography, and several quantum communication protocols. Quantum Information Science and Technology (QuST) promises to revolutionize the future computation and communication systems which will ultimately have huge impact on the Nation and our society as a whole.

Broad Objectives of QuST:

- Development and demonstration of quantum computers.
- Development and demonstration of quantum communication & cryptography.
- Development of quantum-enhanced and inspired technology.
- Development of advanced mathematical quantum techniques, algorithms and theory of quantum information systems.

Broad Thematic Areas:

- Quantum information technologies with photonic devices.
- Quantum information technologies with solid state, nitrogen vacancy, Magnetic Resonance.
- Quantum information technologies with ion-trap and optical-lattice devices.
- Quantum information technologies with superconducting qubit devices and quantum dot devices.
- Mathematical and Fundamental aspects of quantum computation and quantum information.

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Expected Deliverables:

1. Design of quantum register.
2. 4-qubit quantum computer initially and possibility to scale up no of qubits.
3. Gate implementation and quantum algorithm realization.
4. 4-qubit quantum entangled state.
5. Generation of entangled states between two locations.
6. Multiparty entanglement generation, detection, and quantification.
7. Decoherence effects on entanglement generation, development of methods to overcome the same, and their demonstration.
8. Demonstration of Quantum teleportation, remote state preparation, quantum dense coding.
9. Demonstration of quantum key generation between two locations and its security analysis.

Who can Apply: Academicians, Scientists, Technologists and other practicing researchers from recognised academic, research institutions and registered scientific societies etc.

Approval mechanism: As per standard DST Rules and Regulations.

General Guidelines:

- i) It is a directed research Networked based national level cluster programme working towards above mentioned objectives and clear-cut deliverables.
- ii) Individual proposals received under various thematic domains will be processed as per the Standard Operative Procedure (SOP) of DST like peer review, presentation before Expert Committee etc. will be carried out and a holistic networked programme will be evolved.
- iii) The submitted proposals may undergo a series of changes/modifications as per expert's comments/suggestions before getting into networked programme.
- iv) All proposals are to be submitted on-line at URL – onlinedst.gov.in.
- v) The present call encourages only those projects who are willing to work in consortium based collaborative mode. No isolated individual or independent projects shall be supported under this call. Thus, all received proposals will be processed towards development of a cluster based networked programme through a series of meetings/sessions/Expert Committee's etc.
- vi) Broad thematic research domains are defined. Researchers could submit their proposals under these themes, it includes both theoreticians and experimentalist's. Invariably, each project should connect to thematic domains and as well as to Mission objectives for realizing QuST Mission deliverable.
- vii) The duration of the projects is for 3 years and extendable upto 5 years depending upon technical progress of the project and overall progress of QuST programme. Budget projections are to be made for 3 years only, extension and additional budget requirements will be considered after successful completion and satisfactory progress of projects/ QuST programme as whole.
- viii) Proposals should highlight the core research issues and collaborative research. Under QuST programme, a Centralized Research Facility (CRF) will be created in 2 or 3 locations across the country wherein a common equipment could be made available to all the researchers who are part of this network. Thus, researchers could provide details about equipment they require to achieve their stated project objectives. The CRF's will be equipped with these equipment and facilitates seamless access.

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- ix) Apart from CRF, certain projects may require low end equipment at individual institutes/labs level. Case to case basis these requirements will be analyzed and considered for support.
- x) Being a Mission Mode directed research programme, the timelines, delivery is epitome and binding. Researchers needs to dedicate and those who are willing to spend time and energy in evolving the network, attending series of workshops, meetings, presentations, documentation etc. only should apply.
- xi) The PI's and Co-PIs' research background and expertise in QuST themes needs to be elaborated and corroborated with relevant publications, patents etc. They should also mention how the proposal's fruition connects to the overall objectives and deliverables of the mission.
- xii) **Full C V of the PI/Co-PI & experience in the relevant area must be included in the proposal so that due weightage would be given. Additional sheets could added in the proposal, if required.**
- xiii) Each proposal proposed by PI & Co-PI should mention about the stage of maturity of their relevant labs, at this point in time, so that the expectations of the time required in obtaining results from that lab can be clearly understood.
- xiv) After finalising the list of projects for QuST cluster programme, DST will identify the institutes/PI's where CRF will be created. At this stage no proposals are required for CRF creation. However, all R&D proposals should invariably list/ mention the R&D infrastructure facility they already have and additional infrastructure they require to carry out their research as part of QuST cluster.
- xv) All received proposals will be processed on merit and relevance to mission. There will be a review mechanism which will shortlist proposals. There is an element of competition involved even though the community is working towards certain common goals. Competitive proposals shall be kept confidential and judged by an independent committee. All received/ shortlisted proposal's will not be shared with anyone other than independent committees/ experts. But, being a public funded mission under Grants-In-Aid terms & Conditions, standard GoI guidelines are applicable.
- xvi) For more information, details and info on this programme, visit www.dst.gov.in and for any queries, contact Dr Rajeev Sharma, Scientist-D, ICPS Division, DST, New Delhi Ph:26590310 and e-mail:rajeevsharma@nic.in

Last date for submission: The last date for on-line submission of the proposals is 31/12/2017 and a hard copy/physical copy (only one copy) of the proposal by post should reach to DST within one week from the date of on-line closure. Online system will not accept any proposals after the last date. Only those proposals received both online and hardcopy within the stipulated time will only be considered. **Hard copy proposals by post be addressed to:**

(Dr K R Murali Mohan)
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