

Government of India
Department of Atomic Energy
Indira Gandhi Centre for Atomic Research

Kalpakkam – 603 102.

No.

Dated 11-June-2021

To

Director,
Research and Innovation Centre,
IITM Research Park,
Chennai.

Subject: Joint Research Programme on **“Experimental investigation and development of large size piezoelectric single crystal elements for transducer & actuator applications”** between IGCAR and DRDO

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Dear Sir,

Pursuant to various rounds of discussions between the Officers of Indira Gandhi Centre for Atomic Research, Department of Atomic Energy, Kalpakkam, and Research & Innovation Centre, Defense Research & Development Organization, Chennai, this Centre is interested in taking up Joint Research Programme (JRP) on **“Experimental investigation and development of large size piezoelectric single crystal elements for transducer & actuator applications”** on collaboration basis.

The scope of the research programme and other terms and conditions are as below:

1.0 Scope

1.1. Indira Gandhi Centre for Atomic Research [IGCAR], the second largest establishment of the Department of Atomic Energy, is engaged in a broad based multidisciplinary programme of scientific research and advanced engineering development, directed towards the establishment of the technology of Sodium Cooled Fast Breeder Reactors (FBR), and associated Fuel Cycle Facilities in the country. The mission also includes the development and applications of new and improved materials, techniques, equipment, and systems for FBRs, pursue basic research to achieve breakthrough in Fast Reactor Technology. Materials Science Group (MSG), IGCAR has *state of art* crystal growth facilities and is involved in the growth of strategic materials for detector and sensor applications. The facilities include, travelling heater technique, Czochralski technique, Bridgman technique, novel bottom cooling high temperature solution growth process and associated characterization techniques such as X-ray diffraction, Laue diifraction system for orientation of single crystals, resistivity measurement setups.

1.2. Defence Research & Development Organisation (DRDO) is a premier S&T organization under the Ministry of Defence and deals with all Research and Development activities related to development of systems required for the Services. DRDO has established Research & Innovation Centre (RIC) at IIT Madras Research Park, Chennai to undertake and facilitate multidisciplinary directed basic and applied research in the emerging technologies and in following identified research verticals: Electronics, Micro Electronics and Computational Systems (EMECS), Naval Systems and Naval Technologies (NSNT) and Advanced Vehicle Technologies (AVT).

1.3 This Joint Research Programme (JRP) between MSG, IGCAR, DAE and RIC, DRDO shall devote itself to the conduct of advanced research and implementations in the area of piezoelectric single crystals for the development of next generation underwater transducer applications. However, this may be appended with new areas depending on the interest and availability of related expertise at Materials Science Group, IGCAR.

Specific objectives of this JRP and role of Materials Science Group, IGCAR will be:

- (i) To provide the experimental facilities and expertise to develop piezoelectric single crystals (PZN-PT) as per required dimension.
- (ii) To study the influence of compositional nonlinearities and optimize the required materials properties.
- (iii) To improve materials properties based on feedback received from the user.

2.0 Roles and Responsibilities:

2.1 Responsibilities of RIC, DRDO:

- a) The essential raw materials such as high pure oxide powders, platinum crucible, heater coils and insulation assembly to construct the required high gradient crystal growth furnace are to be provided.
- b) RIC, DRDO will fabricate piezo single crystal based transducer elements and characterize the performance at DRDO Laboratories.
- c) To jointly pursue collaborative research with Materials Science Group, IGCAR on piezoelectric single crystal growth related technology by facilitating short term/ long term exchange of DRDO Scientists/manpower.
- d) To convene regular meetings to monitor the progress and provide feedback to the Materials Science Group, IGCAR.
- e) Also research staffs (JRF/SRF/RA/Project Assistant) from RIC involved in the project to be deputed to IGCAR to assist and get trained in the crystal growth program.

2.2 Responsibilities of Materials Science Group, IGCAR:

- a) Materials Science Group, IGCAR shall provide technical expertise and lab facilities to carry out crystal growth research.
- b) The research staff of Materials Science Group, IGCAR shall be encouraged to work in close collaboration with RIC, DRDO with mutual understanding.
- c) To provide necessary permission for DRDO scientists/personnel to carry out joint experimental work.

2.3 In addition to pursuing research on the above mentioned areas, Materials Science Group, IGCAR shall also carry out following activities:

- a) Conducting Joint Workshops for DRDO scientists and research fellows.
- b) Efforts for harnessing the research results in devices/ products/ technologies with appropriate documentation.
- c) In addition to publications, efforts to be made to patent the outcome of the research.

2.4. Exercise of Executive Powers: Director, IGCAR and Director, RIC are the competent authorities to exercise the administrative powers necessary to implement JRP to full extent. Following executive and/or financial authorization by the Competent Authority as above, the actual action may be taken by such other authorities of IGCAR as is nominated in this on behalf of the Competent Authority.

3.0 Schedule of Implementation

3.1 Management of the Programme: To review and monitor the progress of the project, by Review Committees in which at least 2 Scientist's each from DRDO and IGCAR will be members. They may co-opt/invite such persons who, in their judgment can benefit the deliberations. The Review Committee will review the program and its conduct. It will meet at least once a year and at such other times it may deemed fit. It will administer, monitor and supervise all the R&D related activities coming under the purview of the JRP. The Member Secretaries shall ensure regular convening of the meetings and circulate the agenda and minutes of each of the meetings.

Members from IGCAR

Dr Awadhesh Mani, Head, LTSS, CMPD, MSG
Member Secretary: Dr S. Ganesamoorthy, SO/G

Members from DRDO

Dr V Natarajan, Director, RIC
Member Secretary : Dr E Varadarajan, Scientist F

The work progress will be periodically reviewed by Director MSG and Director, RIC.

4.0 Financial terms and conditions

4.1 The JRP does not foresee any financial commitment except the cost of honouring the financial expenses involved by PARTIES themselves.

4.2 IGCAR will extend its Crystal Growth facility without any charge.

4.3 Parties will manage within their own facilities for the transportation and boarding of the subjects.

4.4 Parties will manage within their own funds organizing meeting/reviews etc.

4.5 Both the parties shall use their own resources for the proposed research work at their respective places. However, if such research work calls for additional expenses that cannot be managed by the project costs or entities on their own, a committee from either of the institute can approve of the additional costs subject to availability of funds.

5.0 Publication and Intellectual Property Right

5.1 Each party will ensure appropriate protection of intellectual property rights generated from cooperation pursuant to JRP, consistent with the respective laws, rules and regulations of India. The parties shall not assign any rights and obligations arising out of the IPRs generated from inventions / activities carried out under the JRP to any third party, without prior written consent of the other party.

5.2. There will be no constraints on the publication of research results which are general in nature except prior approval of PARTIES concerned.

5.3. The intellectual property arising out of the work done at the Materials Science Group, IGCAR shall be the joint property of IGCAR & DRDO and shall be patented in the name of IGCAR & DRDO along with Researchers/ Scientists involved in its proposal and development.

5.4. The ownership of intellectual properties generated by IGCAR & DRDO whether or not legally protected will vest in IGCAR & DRDO.

5.5. No liability clause: DAE/DRDO shall not be responsible for any loss or damage whatsoever, resulting due to implementation of any technology at the premises or due to testing of the same.

5.6. In the interest of national security if it is required both PARTIES will refrain from licensing to particular third parties.

5.7 In order to exchange free flow of ideas among the participating scientists/ faculties there shall be no bar on the number of scientists/ faculties who may participate in the proposal of intellectual property.

5.8 Under no circumstances, restricted or confidential information will be transferred to anyone without prior written consent of both the PARTIES.

6.0 Other General Conditions

6.1 Duration and Termination of JRP: This JRP will operate initially for 3 (Three) years from 1 July 2021 to 30 June 2024. This JRP period can be extended based on the JRP- Review committee recommendation. Thereafter, it will terminate unless renewed. In case, it is found by the two parties that the desired objectives cannot be achieved due to any reason(s) whatsoever, this JRP will be treated as terminated by a mutually agreed procedure without any liability on either of the PARTIES.

6.2 Force Majeure Clause: All parties should not be held responsible for nonfulfillment of their respective obligation under this JRP, due to the exigency of natural causes.

6.3 Resolution of disputes: All disputes regarding interpretation of the contents of this JRP, or its implementation shall be resolved mutually by the Director, IGCAR, and the Director, RIC, DRDO.

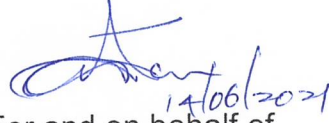
Any disputes remaining shall be resolved in accordance with Government instructions regarding the resolution of disputes between Government departments and autonomous bodies launched by Government.

In case the above terms & conditions of the research programme is acceptable to you, you are kindly requested to sign and return one copy of this for our records.

Yours faithfully,


[Arun Kumar Bhaduri]
Director

For and on behalf of the President of India


For and on behalf of
DRDO
Director RIC, DRDO

Dr. V. NATARAJAN
Director
Research & Innovation Centre,
Govt. of India, Min. of Defence,
DRDO, IITM Research Park,
Taramani, Chennai-600 113.

डॉ. अरुण कुमार भादुड़ी
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