Making of an indigenous dry Dilution Refrigerator at IUAC, New Delhi:-

India has embarked on an ambitious mission to harness the infinite computation potential and multifaceted promising technologies of a quantum computer by launching the national program of “National Quantum Mission (NQM)”. To realise the full potential of the program one essential tool required to provide a predictable and stable working environment for the quantum qbits is a dilution refrigerator (DR) going as low as 10mK. In India all groups currently working on exploring various aspects of this technology uses imported dilution refrigerators along with their desired experimental setup. A wet DR was attempted to be indigenously built at VECC, Kolkata which reached a no-load temperature ~50mK.

At IUAC a program has been initiated to make an indigenous dry dilution refrigerator reaching up to 10mK temperature. For realising the goal, we have identified the crucial technological areas which need to be perfected before attempting for making the full refrigerator. Work has been initiated to make prototype components (like gas gap switch, JT impedance, mK temperature sensor,) and we have started getting preliminary test results on their usage at actual working condition. The development of the dry DR technology is crucial for ensuring a stable supply and long-term support (for both technical and manpower) required for success of this mission. The technologies developed during this journey will also aid in attempting many other related critical technologies e.g. mK adsorption cryocooler, PPMS, SNSPD cooling and many more. As a part of national initiative to realise a dry dilution refrigerator 5 prominent institutes of India (IUAC, IITB, IITD, TIFR and IISERM) came together to for making an indigenous DR under “NQM” which is under active consideration.

This talk will highlight the indigenous effort being put in IUAC to realise an indigenous dry DR, the goals set, the component level development plan and its characterisation till date.