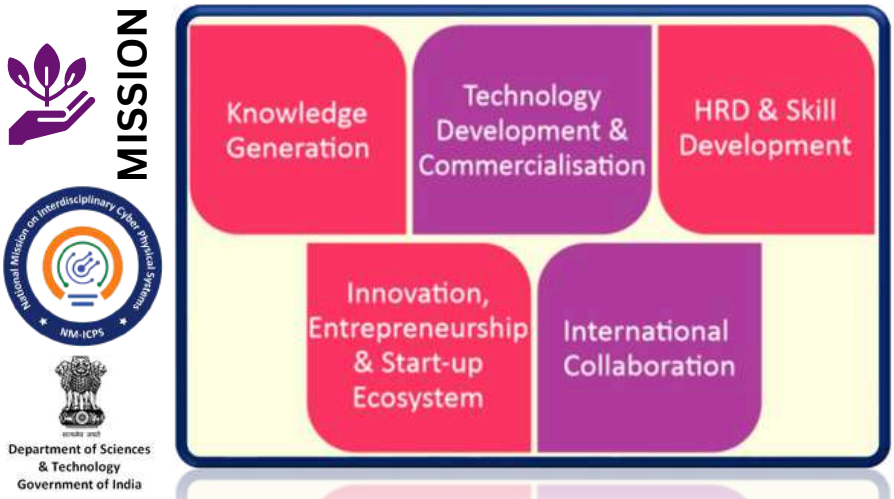
I-HUB Quantum Technology Foundation

The I-HUB Quantum Technology Foundation (I-HUB QTF) is a section-8 company hosted by IISER-Pune and is one of the 25 Technology Innovation Hubs (TIHs) funded by the Department of Science and Technology (DST), Government of India under the National Mission for Interdisciplinary Cyber-Physical Systems (NM-ICPS). It aims to train and develop highly skilled manpower in the area of quantum technologies and translate quantum research into products and services of socio-economic values.

VISION

To strengthen Indian Quantum Economy by achieving leadership in development of Quantum Technologies (QT) and deployment of QT-based applications for a grass-roots level impact !

MISSION



"I am very proud to launch the first edition of our Newsletter 'Quantum Qonnect' dedicated to our country and all the people of the Quantum Community. I look forward to a huge support from all the stakeholders of the Quantum Mission. I would like to thank DST and GoI for providing an excellent opportunity to serve the nation. "

Dr. Sangeeta Maini K M
Chief Executive Officer
I-HUB QTF

The Team

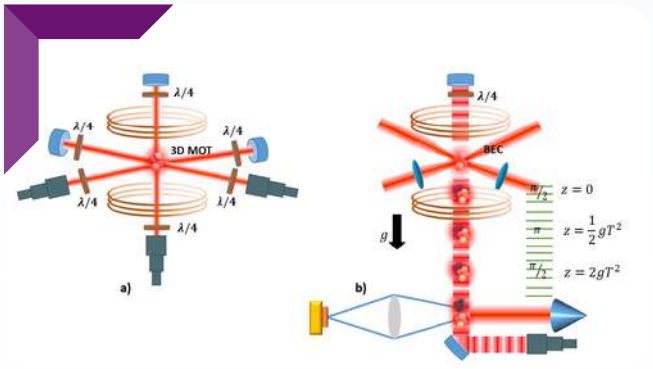
Quantum Experts

- Prof. T S Mahesh
- Dr. Ashna Bajpai
- Dr. Sunil Nair
- Dr. G V Pavan Kumar
- Dr. Rejish Nath
- Prof. M S Santhanam
- Dr. Ashish Arora
- Dr. Atikur Rahman
- Dr. Bijay Agarwalla
- Dr. Mukul Kabir
- Dr. Shreejith G J
- Dr. Surjeet Singh
- Prof. Umakant D Rapol

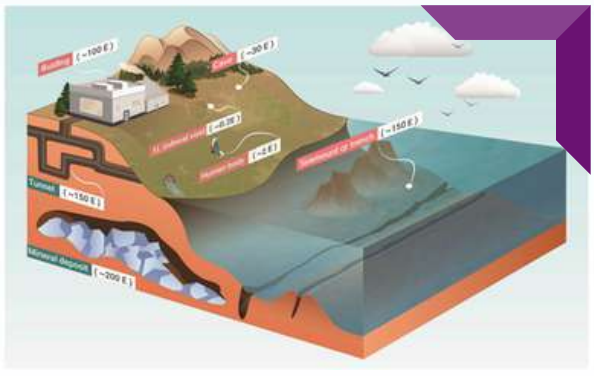
Indigenous Technology Demonstration of Quantum Gravity Sensor or "Gravimeter"

Technology Background: IISER Pune together with I-HUB Quantum Technology Foundation (I-HUB QTF) has demonstrated the technology of Quantum Gravity Sensor or Gravimeter that measures the local gravitational acceleration 'g' using ultracold atoms at temperature ~100 nK. Gravimeter with ultracold atoms is a promising technology which can measure local 'g' up to 9th decimal place. An absolute Gravimeter is emerging to be a useful tool in creating gravity maps of earth, local mineral prospecting, underground hydrological surveys, to detect underground structures such as tunnels, cavities or to detect the hidden machinery such as ammunitions or even nuclear stockpiles and many more. This technology is being translated by Prof. Umakant D Rapol into a transportable product that can be deployed in the field.

The physics of Gravimeter: The Gravimeter is constructed using a Mach-Zehnder interferometer of giant matter waves of ultracold Rubidium atoms in a coherent state – the Bose-Einstein Condensate(BEC). The differential phase shift that is picked up by the falling wave-packets is measured extremely precisely by moving standing waves. The schematic of the interferometer is shown below. Matter waves are split and combined (similar to beam splitters and mirrors in light interferometers) to create the interferometer.



a) Demonstration of atoms loading in a three - dimensional trap
b) Demonstration of atom interferometer with ultra cold atoms for Gravimeter



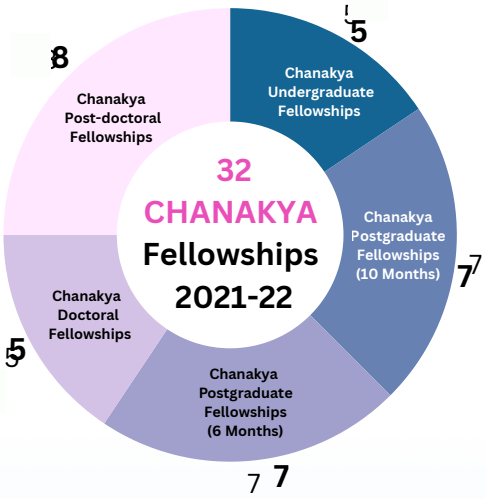
Ref.: Presentation by Richard Lane of Geoscience Australia

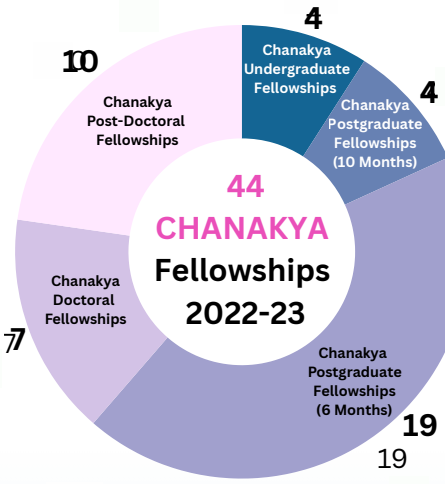
I-HUB QTF

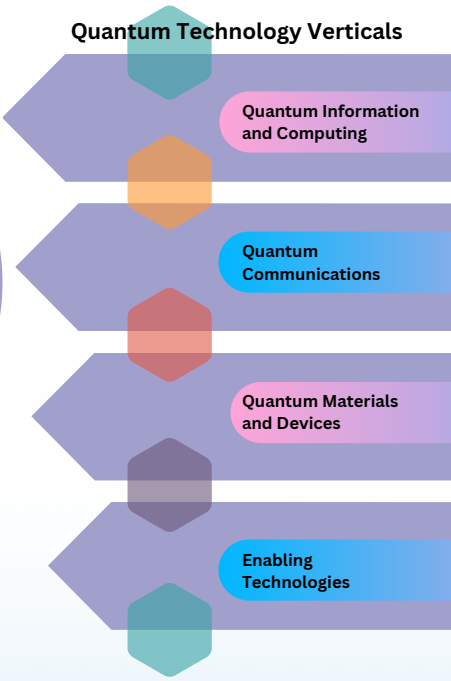
CHANAKYA Fellowships 2021-22

Comprehensive and **H**olistic **A**dvancement of **N**ational **K**nowledge **Y**ield and **A**nalytics

Quantum Skilling







Quantum Incubator @ I-HUB QTF

Startup Incubation

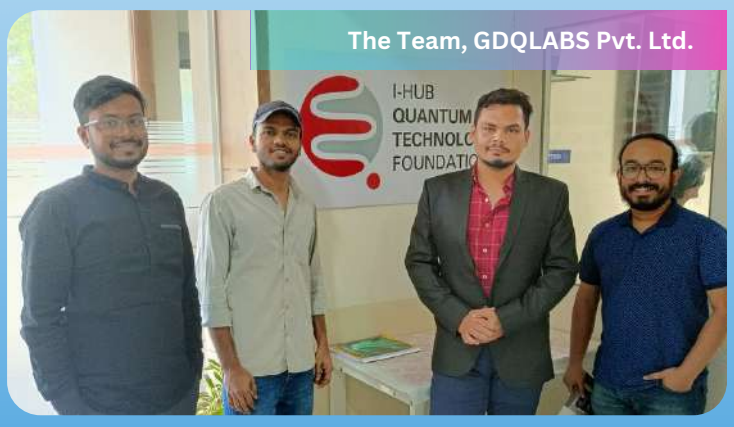
Startup **GDQLABS** Private Limited is on a mission to develop the highly scalable quantum computer based on trapping neutral atoms in an array of optical tweezers.

GDQLABS

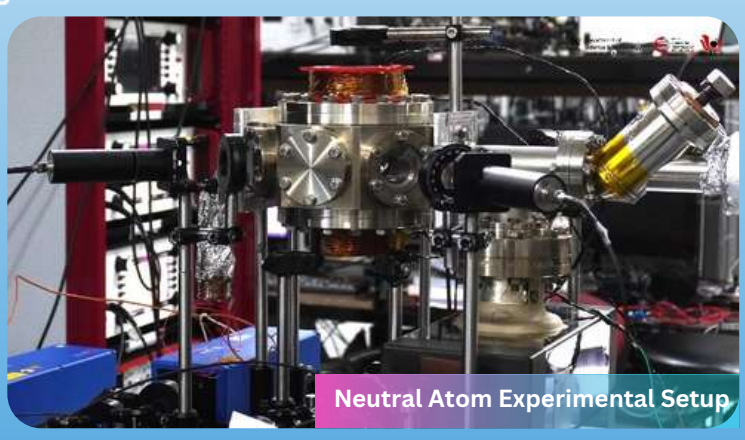
Quantum Technology !

"We will load single neutral atoms in a periodic arrangement of optical tweezers and entangle them to create qubits and unleash their true potential."

- Mr. Pranab Dutta, CEO

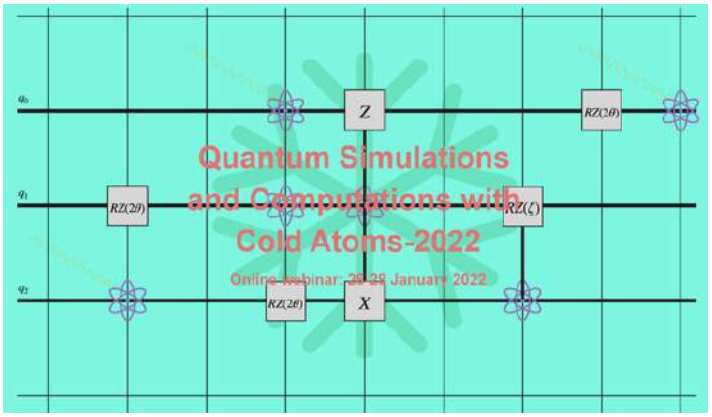


The Team, GDQLABS Pvt. Ltd.



Neutral Atom Experimental Setup

Quantum Simulations and Computation with Cold Atoms



The I-HUB Quantum Technology Foundation, IISER-Pune jointly with the Centre for Quantum Engineering, Research, and Education (TCG CREST), Kolkata organized a three-day Webinar on "Quantum Simulations and Computation with Cold Atoms" from 26th January 2022 to 28th January 2022. The aim was to cover some of the important developments that have taken place in this research area around the world and stimulate discussions for further advancement of the field. Presentations were made by researchers from leading groups in the field, from the USA, France, Japan, South Korea, and India.

QCC 23 & Qu-PRENEUR SUMMIT @ Baba Farid College

The I-HUB QTF supported the 3-day Conference on Quantum Computing and Communications-QCC 23 organized at Baba Farid Group of Institutions, Bathinda, Punjab supported by SERB and Start-up Punjab.

Dr. Sangeeta Maini K M, CEO, I-HUB QTF chaired sessions on Quantum Information and Computing and was one of the key panelist of the 'Qu-Preneur Summit-Future Directions for Quantum Start-ups' along with Dr. Venkata L Subramaniam, IBM, Prof. Panigrahi, IISER-Kolkata, Dr. Manish Gupta, DA-IICT, Mr. Rajesh Narang, Founder, Silicofeller held on 11th February 2023, which discussed future of Quantum Startups and Incubation support for start-ups.

Dr. Sangeeta Maini K M, CEO, I-HUB QTF
@ Qu-PRENEUR SUMMIT

Dr. Sunil Nair, Associate Project Director, I-HUB QTF
@ Qu-PRENEUR SUMMIT

Dr. Maini also interacted with IBM professionals, quantum scientists, algorithm developers, entrepreneurs, stakeholders and personnel related to quantum research and technologies from other academic institutes of the region. Dr. Sunil Nair, Quantum Expert from I-HUB QTF presented his exclusive work on Quantum Technologies.

Indo-Russia Joint Seminar on Quantum Technologies

The Joint Indo – Russia Seminar on Quantum Technologies was a 2-day seminar series organized by I-HUB QTF at IISER-Pune campus on 21-22 August 2022 . The Quantum experts from Russia as well as from all over India were invited for exclusive sessions and seminars in various verticals of Quantum Technologies. All the speakers shared their research and development activities which included Quantum Information and Computing - Ultra cold atom, - Solid State Systems, Quantum Sensing and Metrology, and Quantum Communications.

The I-HUB QTF hosted Indo-Russia Joint Seminar on Quantum Technologies in 2022 that facilitated exchange of state-of-the-art research and technologies developments in quantum areas. An MoU between I-HUB QTF and Russian Quantum Centre (RQC) is underway to facilitate exchange of students, researchers, technologists and start-ups and joint programs in quantum technologies.

Dr. Sangeeta Maini K M, CEO, I-HUB QTF with Dr. Ruslan Yunusov CEO, Russian Quantum Center (RQC) and his team

Prof. Umakant D Rapol, Project Director, I-HUB QTF with Dr. Artem Golovizin, Dr. P N Lebedev Physical Institute of the Russian Academy of Sciences

Dr. Sangeeta Maini K M, CEO, I-HUB QTF with Dr. Ilya Semerikov, Dr. P N Lebedev Physical Institute of the Russian Academy of Sciences & RQC

Talk by Dr. Stanislav Straupe, Sector Head, MSU QT Centre & Russian Quantum Centre on Quantum Computing, Ultra Cold Atoms

Plenary Talks

Talk on Quantum Metrology by Prof. Apoorva Patel, IISc

Talk on Quantum Simulators by Prof. Georgy Shlyapnikov, RQC

DST Centre-State Science Conclave

Ahmedabad 9-11 September 2022

Proud Moment

I-HUB QTF successfully demonstrated India's first portable cold atoms towards development of Neutral Atom based Quantum Computer

सत्यमेव जयते

Department of Science & Technology
GOVERNMENT OF INDIA

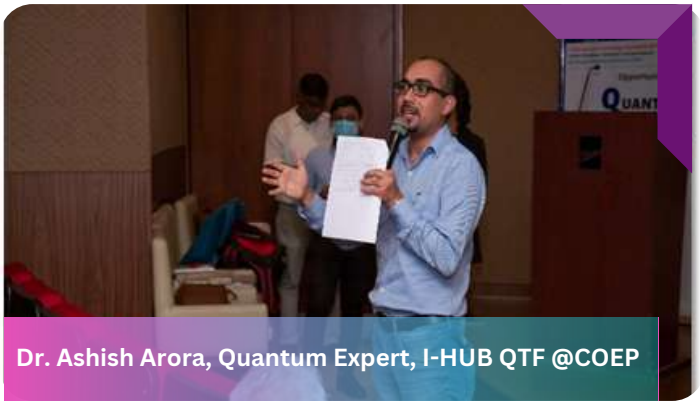
I-HUB QTF @ COEP

I-HUB QUANTUM TECHNOLOGY FOUNDATION

Outreach Program

Participants with I-HUB QTF Team @ COEP

An engaging sensitization program organized by I-HUB Quantum Technology Foundation, IISER Pune at College of Engineering Pune, (COEP). It was a blend of interactive learning in the form of lectures, quiz and much more.



Dr. Ashish Arora, Quantum Expert, I-HUB QTF @COEP

Dr. Ashish Arora, an expert in Quantum Technologies conducted exciting quiz session for the participants. It was very engaging and enriching. Many participants won exclusive I-HUB QTF goodies and souvenirs.

Dr. Sangeeta Maini K M, CEO, I-HUB QTF @COEP

Skilling

Entrepreneurship and Technology Commercialization Program - 2022

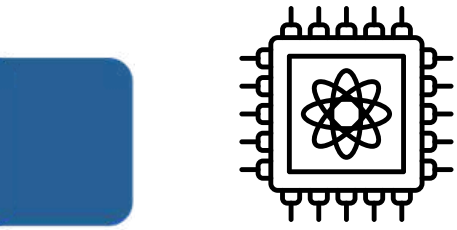
Innovation Entrepreneurship & Start Up Ecosystem

Technology development & commercialization

HRD & Skill development

International Collaboration

Knowledge Generation



Entrepreneurship and Technology Commercialization Program was a 3-day skilling program held on 5-7 September 2022, where in students, research scholars and startups working in advanced technologies were amongst the participants who were trained in various aspects of startup journey and technology commercialization.

ETC Program 2022 participants

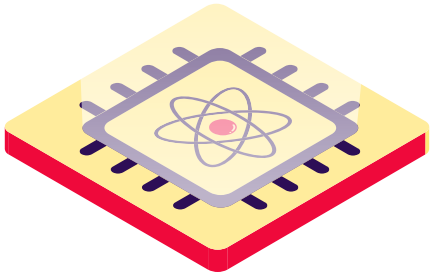
FriQUANT Seminar Series

Updates

*Fri*Quant Seminar launched in 2022, I-HUB QTF, brings informative and engaging seminars covering topics from Quantum Technologies, Innovation and Entrepreneurship.

The Friday Quanta

- Quantum Materials
- Quantum Communications
- Quantum Information & Computing



Speaker Affiliations

Special Friquant Seminar conducted on fascinating works of the Nobel laureates starting from the conceptualization of quantum entanglement to its validation and potential application for the development of quantum information technologies.

FriQUANT Photo Gallery

'Superconductivity at very low carrier density : Bismuth'
by Prof. S Ramakrishnan, IISER Pune

'Quantum Key Distribution from Basics to Satellites'
by Prof. Sushil Mujumdar, TIFR Mumbai

'Quantum Simulations and Precision Measurements with Ultracold Atoms' by Prof. Umakant D Rapol, IISER Pune

Quantum Algorithm Special
by Mr. Anantha Rao, IBM Research Intern

'Quantum for Space'
by, Mr. Jitesh Lalwani, CEO, Artificial Brain

Proud Moment

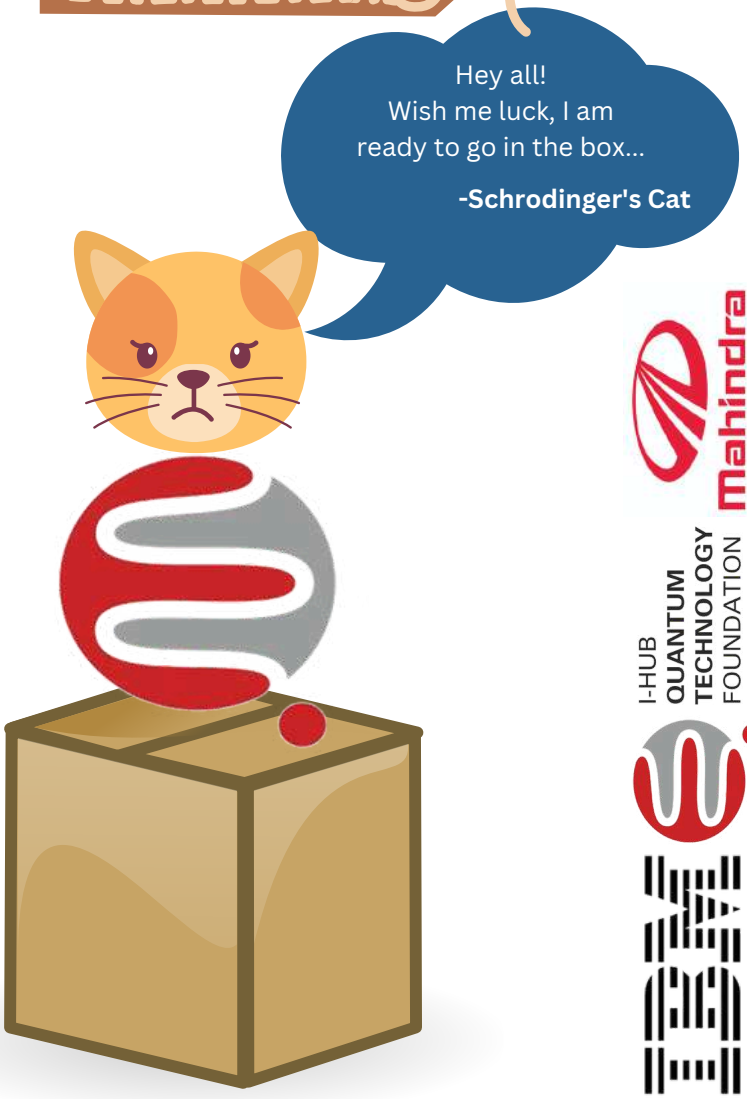
Prof. Umakant D Rapol in discussion with Nobel Laureate Prof. Serge Haroche

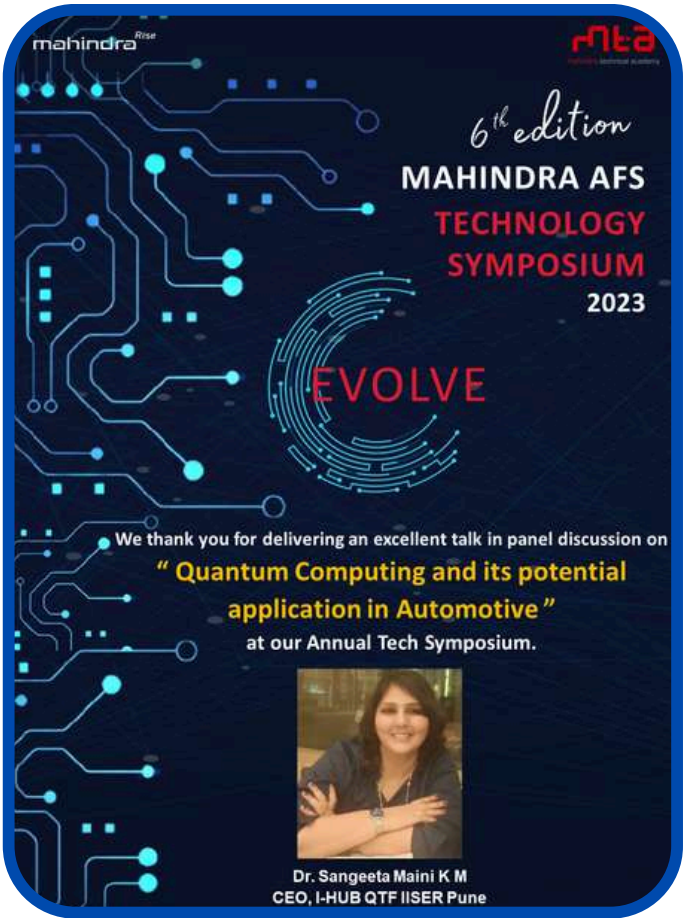
Glad to share that our Project Director at I-HUB QTF, IISER Pune **Prof. Umakant D Rapol**, was one of the key panelists in the discussion with **Nobel Laureate Professor Serge Haroche** at Shiv Nadar Institution of Eminence Delhi-NCR Campus on Feb 13, 2023. They discussed over Indo-French Cooperation Perspectives in Quantum Technologies.

CEO @ Mahindra and Mahindra

Dr. Sangeeta Maini K M, CEO, I-HUB Quantum Technology Foundation and IBM Master, Dr. Venkata L Subramaniam engaged in a panel discussion on "Quantum Computing and its potential applications in Automotive Sector" at the Annual Tech Symposium of Mahindra & Mahindra on 18 February 2023. .

QT Fun Corner





Photonics and Lasers-Academia Industry Meet (PLAIM)

Glad to share that I-HUB Quantum Technology Foundation team gave presentations at the Photonics and Lasers-Academia Industry Meet (PLAIM) Conference held on 7-9 December 2022, organized by IIT Bombay.

I-HUB QTF Team @ PLAIM

Dr. Sangeeta Maini K. M., CEO, I-HUB QTF, presenting @ PLAIM

Prof. Umakant D Rapol, Project Director, I-HUB QTF being honored by Mr. Nihar Ranjan Sahoo, President, Photonics Student Chapter IIT-Bombay

CEO at CoE-QuICST

Dr. Sangeeta Maini K M, CEO, I-HUB QTF, actively participated in a 2-day IIT-Bombay Workshop on Quantum Science and Technology, organized by Centre for Quantum Information Computing Science and Technology CoE-QuICST. I-HUB QTF will diligently support and contribute to IIT-Bombay's Centre of Excellence CoE-QuICST, towards a brighter future of Quantum in India.

Dr. Sangeeta Maini K M, CEO, I-HUB QTF with Prof Arindam Ghosh, IISc Bangalore, Prof. Bhaskaran Muralidharan, IIT-Bombay

Dr. Sangeeta Maini K M, CEO, I-HUB QTF, Prof. Kasturi Saha, IIT-Bombay
Prof. Suddhasatta Mahapatra, IIT-Bombay

QuantumQonnecT Volume 2 *coming up next.....*

- **Workshop on Enabling Technologies**
- **Online Quantum Technology Seminar Series**
- **Expansion of I-HUB QTF Quantum Network**

Stay tuned to know more.....

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