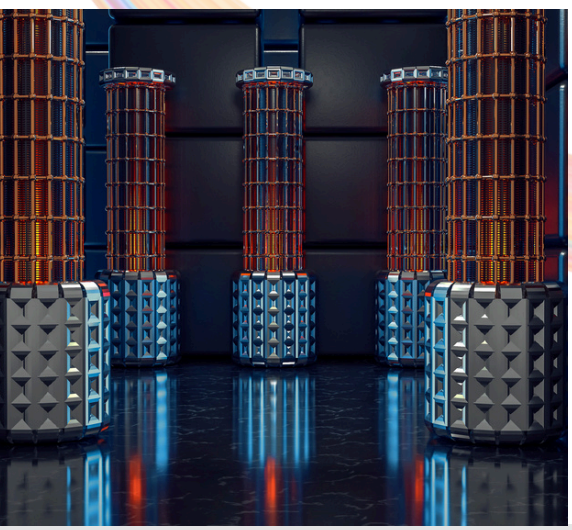
I-HUB QUANTUM TECHNOLOGY FOUNDATION

IISER PUNE

Department of Sciences & Technology Government of India

National Mission on Interdisciplinary Cyber Physical Systems NM-ICPS

QuantumConnecT



I-HUB Quantum Technology Foundation Newsletter 2.0

AUGUST 2024

Volume. 2

VOLUME. 2
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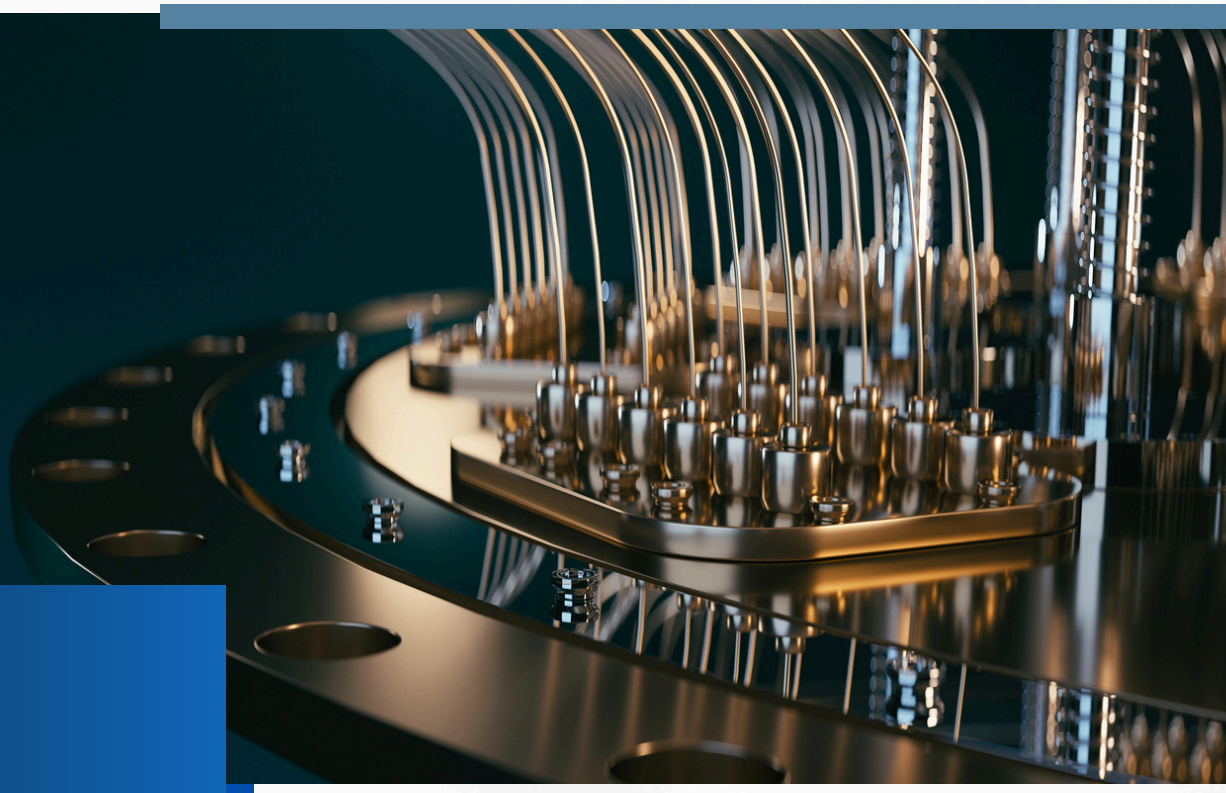
I-HUB QUANTUM TECHNOLOGY FOUNDATION

Quantum QonnecT

IISER PUNE



NEW COURSE LAUNCHED!!

Online Certification course on "Introduction to Quantum Computing"

The I-HUB Quantum Technology Foundation, IISER Pune has recently launched an online certification course on "Introduction to Quantum Computing".

Prof. TS Mahesh
Professor Physics
IISER Pune

Prof. MS Santhanam
Professor Physics & Dean
IRO IISER Pune

Now you can learn Basics of Quantum Computing at your own pace.

1. Freedom to access lectures whenever and wherever you want
2. Registrations can be done throughout the year.

Quantum computers, utilizing quantum mechanics, could surpass classical computers in fields like drug discovery, supply chain optimization, and cryptography. This transformative technology is set to change data processing. This online course by leading researchers provides an extensive introduction to this fast-evolving field, suitable for beginners and tech enthusiasts alike.

About the Course

Quantum computers are expected to harness the exotic properties of quantum mechanics to perform calculations that are beyond the reach of present day classical computers. From drug discovery to optimizing supply chains to cryptography, quantum computing is likely to be the key disruptive technology of our generation, and would fundamentally alter the way we process data. This online certification course, delivered by frontline researchers in the field, offers a broad introduction to this rapidly evolving area. Irrespective of whether you are a curious beginner or a seasoned technology enthusiast, this course is designed to ignite your passion and expand your horizons.

Online Certification course on "Quantum Materials and Devices"

Quantum materials defy the conventional laws of classical physics and exhibit extraordinary properties rooted in quantum mechanics. Research at the frontiers of physics, materials science, and engineering has meant that these exotic materials are now poised to deliver key technological advancements ranging from faster computers to fault-tolerant quantum computing and improved quantum sensors. If you are a curious student, or a professional with a college-level understanding of physical science or engineering, this online certification course is your gateway to understanding quantum materials and their technological applications.

Masters' (MS) Programme in Quantum Technology


Hindustan Times

IISER Pune starts master's programme in quantum tech

By HT Correspondent

Apr 20, 2024 06:22 AM IST

IISER Pune launches a master's program in quantum technology with 20 students, including industry overlap, entrepreneurship, and patenting courses.

With the launch of the National Quantum Mission, there is a pressing need for a skilled workforce in Quantum Technologies. With this goal in mind, new Masters programme in Quantum Technology is launched. This two-year programme will equip students with the skills to work in Quantum Technology. The programme will include significant industry overlap ensuring that a portion of the imparted training has direct industry relevance. The programme will also include courses on Entrepreneurship and Patenting.

The new Master programme in Quantum Technology was officially launched on April 10, 2024, in the presence of Dr. Ajai Chowdhry, Chairman, Mission Governing Body, National Quantum Mission; Prof. Ajay Sood, Principal Scientific Adviser to Govt. of India; the DST Secretary Prof. Abhay Karandikar; and the Director of IISER Pune Prof. Sunil S Bhagwat. Prof. Karandikar announced the launch on Twitter. The programme will commence later this year with around 20 students, to ensure quality personalized training, and then scale up in numbers gradually.

IISER PUNE

Publication Highlight

We're happy to share that the collaborative work involving Dr. Ashish Arora, I-HUB QTF PI and faculty member at IISER Pune, with Rudolf Bratschitsch group from the University of Münster, led by the Luiz Tizei group from Laboratoire de Physique des Solides (LPS)(Paris) has been recently published in the journal Nano Letters (ACS Publications).

This research innovatively engineers excitons' optical line shapes in 2D materials using diverse dielectric atmospheres. This approach shapes narrow optical modes' spectral profiles, offering new potential for nanophotonic device applications.

The work was also covered by The Times of India, Pune Edition, Hindustan Times and Marathi daily Sakal.

Research shows way to make tiny chips for faster computers

SwatiShindeGole
@timesgroup.com

Pune: Indian and German physicists have shown that ultra-thin two-dimensional materials such as tungsten diselenide can rotate the polarization of visible light by several degrees at certain wavelengths under small magnetic fields suitable for use on chips.

The recent study, led by Ashish Arora from Indian Institute of Science Education and Research (IISER) in Pune, and Rudolf Bratschitsch from University of Münster in Germany, was published in the journal Nature Communications.

The discovery has opened pathways towards miniaturised chips for building optical computers expected to be a million times faster than present computers.

Arora said, "One of the problems with conventional optical isolators is that they are quite large, with sizes ranging between several mm and several cm. Researchers have not yet been able to create miniaturized integrated optical systems on a chip that are comparable to everyday silicon-based electronic technologies. Current integrated optical chips consist of only a few hundred elements."

In comparison, a computer processor chip contains many billions of switching elements.

Pic courtesy: IISER

STUDY, A JOINT COLLABORATION

- It has been known for centuries that light exhibits wave-like behaviour in certain situations
- The team's work is a step forward in the development of miniaturised optical isolators
- The work is funded by I-Hub Technology Foundation and SERB of department of technology and ministry of education in India
- It is supported by German Research Foundation and Alexander von Humboldt Foundation in Germany

The new research is a step forward in the development of miniaturized optical isolators. The 2D materials used by the researchers are only a few atomic layers thick, a statement issued by IISER, Pune said.

OPTICAL ISOLATORS

Arora said, "These materials are only one molecule thick, which is a hundred thousand times thinner than a human hair, nothing can go thinner than this. It is surprising that this Faraday rotation is so large."

Explaining the physics, he said, "We used a property of these materials that at certain wavelengths, something known as an exciton, can be created in the material. This excitation rotates the plane of polarization very strongly when the material is placed under a magnetic field."

Bratschitsch said, "In future, 2D materials could become the core of optical isolators and enable on-chip integration for today's optical and future quantum optical computing and communication technologies."

Arora added that performing such sensitive experiments on 2D materials is not easy since the sample areas are very small. "We had to create a new method to measure Faraday rotation which is about 1,000 times faster than the previous technique," he said.

Events @ I-HUB QTF

Train the Trainer Workshop

nasscom ai

The "Train the Trainer" program, a collaboration between I-HUB QTF and NVIDIA, was a two-day workshop aimed at preparing individuals for Quantum Computing. Participants learnt to develop large-scale quantum applications and simulations using NVIDIA CUDA Quantum, designed for Quantum Processing Units (QPUs).

NVIDIA

Workshop on Capacity Building in Quantum Technologies

I-Hub QTF organised a Workshop on Capacity Building in Quantum Technologies at the Indian Institute of Science Education and

Research (IISER), Pune. The event was in collaboration with the Maharashtra Institute of Transformation (MITRA), Dr. Babasaheb Ambedkar Technological University, Lonere and COEP Technological University, Pune

Industry Meet on Quantum Technology Developments and Applications

I-HUB QTF conducted an Industry Meet with members of Defence Equipment Manufacturers' Association (DEMA) on Quantum Technology Developments and Applications on 25th April 2024. This workshop was a step forward to the previously conducted IND-eQT Workshop.

The HUB PI's along with various Industry partners, shared the stage and discussed upon how together they can help each other in bridging the gap between Indian Industry and Scientific Community, understanding their requirements and deliverables.

Emerging Disruptive Technologies & Opportunities in this 2nd Quantum Era

I-HUB QTF, IISER Pune organized an outreach event with Tata Consultancy Services on 20th March 2024 at IISER Pune. Dr. Sourav Chatterjee, Scientist at TCS Research spoke about 'Emerging technologies in this second quantum revolution' and Dr. Anirban M, Quantum Chemist at TCS talked about Quantum-enhanced computation, sensing and

communications. They also talked about the career opportunities in Quantum Technologies.

DATA DYNAMICS SUMMIT

I-HUB QTF supported 'Data Dynamics Summit', a conference focused on data as a central theme along with sessions on Quantum Computing, held at IISER Pune, during 15-16 March 2024. It was aimed at bringing together researchers from diverse fields working data-driven modelling and allied areas.

India International Science Festival (IISF), 2023

I-HUB QTF participated in the India International Science Festival (IISF), 2023 organized at NCR Biotech Science Cluster, Faridabad, Haryana from 17-20 January 2024. We showcased our three innovative products in the New Technologies Show (NATS) in the realm of quantum technologies.

1. Cryogenic superconducting devices and accessories for quantum computing
2. Ultra-low Noise Voltage Pre-Amplifier
3. Ultrasensitive radiation detector

These products will find applications in various industries including quantum technologies and beyond.

Quantum Technologies using Ultracold Atoms

IISER Pune in collaboration with British Council and I-HUB QTF organized a 3-day conference on Quantum Technologies using Ultracold Atoms during 15-17 Nov 2023 .

The conference targeted young researchers, PhD students and post-doctoral fellows across India.

Quantum Technologies: Introduction, Materials and Devices

The physics department of IISER Pune, and I-HUB QTF in collaboration with Purdue Quantum Science and Engineering Institute (PQSEI) organized a 5-day workshop and a conference on 'Quantum Technologies: Introduction, Materials and Devices' during 10-14 July.

INDigenization of Electronics for Quantum Technologies (IND-eQT)

The I-HUB QTF, IISER Pune organized the 1st Workshop on INDigenization of Electronics for Quantum Technologies [IND-eQT]. The workshop brought together the quantum technology network, academia, and industry leaders with a vision to indigenize cutting edge technologies. The workshop was an initiative to spread awareness and sensitize the quantum community about the importance of indigenization and how I-HUB QTF can contribute towards this initiative.

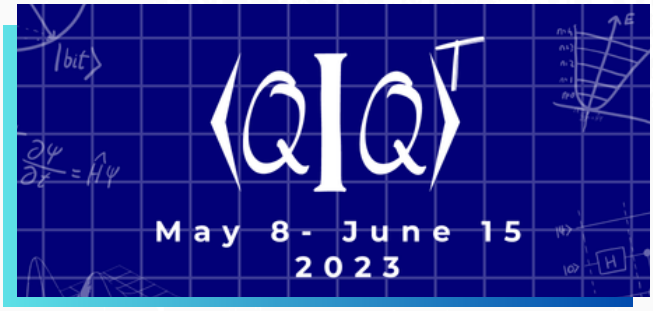
Sponsored Events

Physics of Quantum Matter

I-HUB QTF sponsored the Physics of Quantum Matter School held at NISER Bhubaneshwar. The event comprised of group discussions, insightful lectures, and the opportunity to connect with brilliant minds in the field.

Quantum Information and Quantum Technology

I-HUB QTF sponsored the Internation Conference on Quantum Information and Quantum Technology (QIQT-2023) organized at IISER Kolkata from 8th May to 15th June, and over 2000 students registered for the event.



CFQT2023: Crystals for Quantum Technology

The conference on CFQT2023: Crystals for Quantum Technology Thin Film and Superstructure Chapter was organized at the Institute of Nano Science and Technology, INST Mohali, in association with I-HUB QTF, IISER Pune.

QUANTUM Seminar Series

"Seagate Research and MozaicTM Technology Overview" by Dr. Ed Gage, Vice President Seagate (27.03.2024)

Speaker Affiliations

‘Quantum Communication: A physics experiment or a network paradigm shift?’
by Mr. Inder Monga, ESnet Principal Investigator, QUANT-NET (13.12.2023)

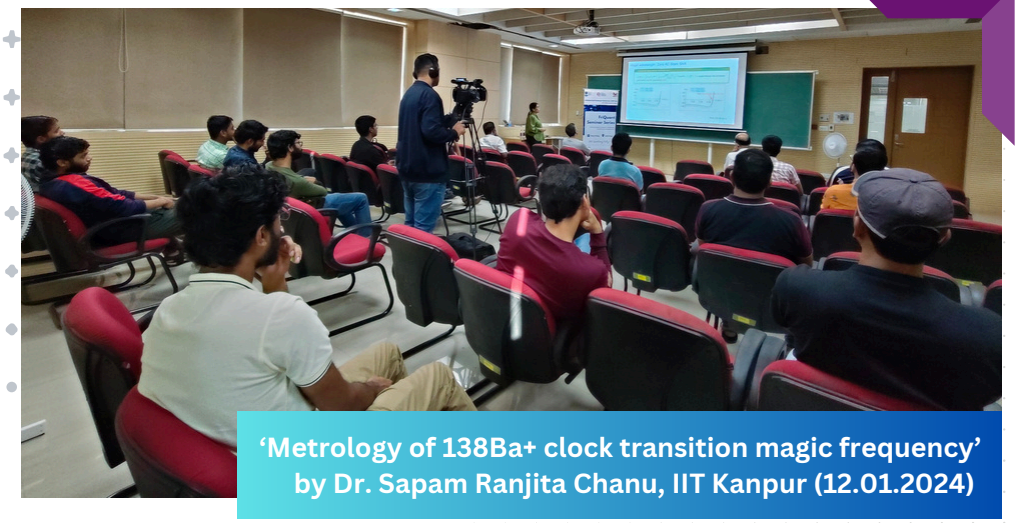
“HAMR: Advances in HDD technology by breaking the superparamagnetic limit”
by Dr. Krishnan Subramanian, Senior Director Seagate (21.11.2023)

‘Ultrafast Spin Manipulation in Ferromagnetic Thin Films and Heterostructures’
by Dr. Anjan Barman, S. N. Bose Kolkata (15.08.2023)

‘Quantum Soliton Collisions’
by Dr. Sebastian Wüster, IISER Bhopal (06.10.2023)

QUANTUM

SEMINAR Photo Gallery



'Metrology of 138Ba+ clock transition magic frequency' by Dr. Sapam Ranjita Chanu, IIT Kanpur (12.01.2024)

'Controlling and probing spins' by, Dr. Rohit Medwal, IIT Kanpur (07.03.2024)

'QuISTechAI: An effort for amalgamation of Science, Technology, & Industry in the quantum domain' by Dr. Abhishek Shukla, QuISTechAI (11.03.2024)

'Processing with Wavelet Transforms – Application to Spin Noise and Pulsed NMR Spectra' by Prof. K.V. Ramanathan, IISc Bangalore (23.02.2024)

IISER PUNE

2023 HIGHLIGHT

PROJECT AT I-HUB QTF, IISER PUNE

PROF. UMAKANT D RAPOL

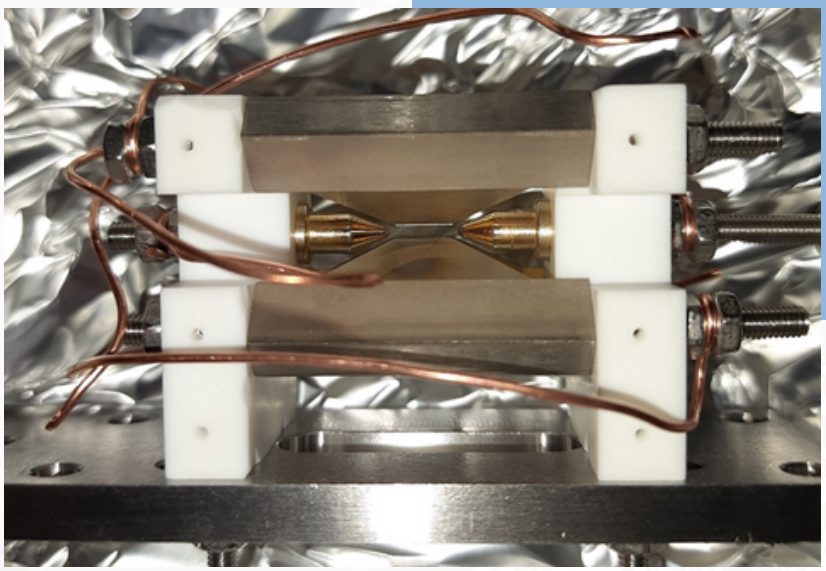
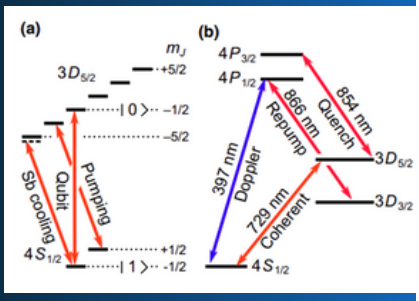


Image of the ion trap

A 20 QUBIT ION TRAP QUANTUM COMPUTER



Quantum computers have started making a steady transition from a purely academic pursuit to applications in industry. Such systems have potential impact in material designing, drug discovery, logistics, finance, security, metrology, etc. We have entered a new era where even though the qubit array size is small (1000s) quantum computers are already much superior to classical computers for tackling specific problems. The global effort is towards increasing the scalability of quantum computers while maintaining their accuracy. One of the leading platforms for performing quantum computation is the ion trap system. This system possesses the best single qubit and two qubit gate fidelities and large coherence times, thus making it a choice of physical qubit realization for several international industry players like Alpine quantum technologies (AQT), ionq, Quantinuum (Honeywell spinoff), quantum factory, oxford ionics, eleqtron. Honeywell and AQT demo things.

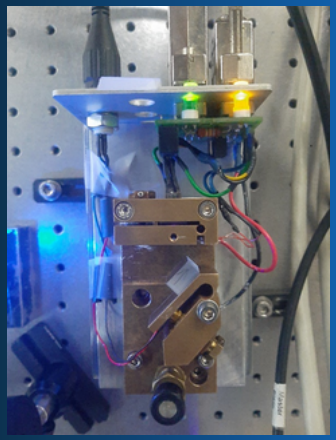


Image of the home-built laser

At IISER-Pune, Prof. Umakant Rapol's team is building a 20-qubit quantum computer based on calcium ion. They have made several strides towards this aim. To realize a qubit array of calcium ions, one first needs to trap the ions and reduce their temperature to several milli Kelvins. This is done by a process known as laser cooling or Doppler cooling. They have successfully shown implementation of this step by imaging the trapped ions using an emccd camera and shown the reduction in their temperature. The ion trap and the lasers were fabricated in-house at IISER-Pune. The team is currently upgrading the vacuum chamber, ion trap and the imaging system for better results. The ultimate aim is to realize an array of 20 laser cooled ions and demonstrate quantum computation on them.

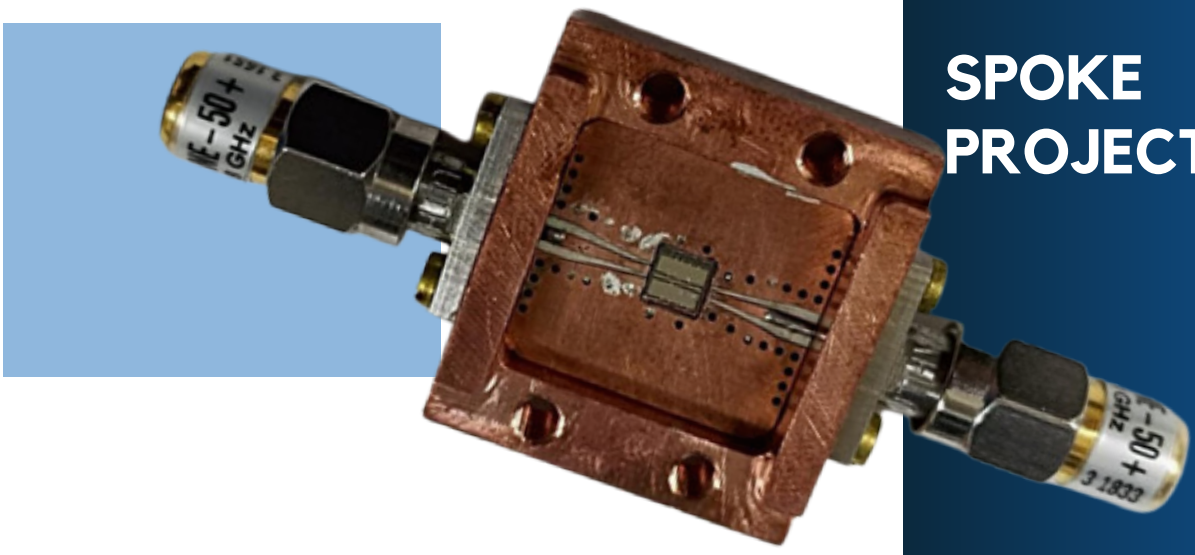
PROJECTS AT I-HUB QTF, IISER PUNE

Sr. No.	I-HUB QTF PI Name	Project Name
1.	Dr. Ashish Arora	Exciton-based quantum optoelectronic technologies
2.	Dr. Ashna Bajpai	Nano-Spintronic Devices based on 1D & 2D Quantum Magnets
3.	Dr. Atikur Rahman	Fabrication of optoelectrical sensor/detector platform using quantum confined systems
4.	Dr. Bijay Agarwalla	Quantum control of open non-equilibrium systems and prescriptions for efficient quantum thermal machines based on Quantum thermodynamic principles
5.	Prof. Mahesh TS	Large Quantum Registers with Nuclear Spin-Systems
6.	Dr. Mukul Kabir	Magnetism and emerging quantum phases in two-dimensional materials
7.	Dr. Rejish Nath	Trapped ion-crystal with Rydberg excitations
8.	Prof. MS Santhanam	Quantum computing : From quantum chaos border to quantum algorithms
9.	Dr. Sreejith GJ	Developing efficient algorithms for strongly interacting quantum many body systems
10.	Prof. Sunil Nair	Development of HTS based DC Squid Sensors Development of Magnon Based Spintronic Devices
11.	Prof. Surjeet Singh	Crystal growth, structural and physical characterization of quantum materials
12.	Prof. Umakant Rapol	Development of 20 qubit ion trap quantum processor Development of a Transportable Atomic Gravimeter

PROF. RAJAMANI VIJAYARAGHAVAN

2023 HIGHLIGHT

SPOKE PROJECT



DEVELOPMENT OF JOSEPHSON PARAMETRIC AMPLIFIERS FOR SUPERCONDUCTING QUBITS BASED QUANTUM PROCESSORS

Josephson Parametric Amplifiers (JPA) are some of the lowest noise microwave frequency amplifiers which are crucial for any superconducting quantum processor as they help in achieving high fidelity measurements in a short amount of time. This makes them an invaluable tool for quantum error correction as well. Making them broadband and high dynamic range will require further research and can be soon turned into a marketable technology with a wide market both in industry and academia. The basic component of a JPA is a non-linear inductor which is implemented using Aluminium Josephson Junctions which can be fabricated using ebeam lithography and double angle metal deposition.

The first batch of these, is expected to hit the markets soon.

OBJECTIVES OF THE PROJECT ARE:

This project plans to develop the following three types of devices:
1. Narrow band JPAs;
2. Impedance engineered broadband JPAs
3. Broadband Travelling Wave Parametric Amplifiers (TWPA)

Dr. Ajay Wasan

DEVELOPMENT OF TUNABLE LASERS AND PORTABLE ATOMIC PLATFORMS FOR QUANTUM INFORMATION PROCESSING AND SENSORS

Trapped atoms in 1D, 2D, or 3D lattices can be used as qubits since they possess all the required features, such as states with long coherence time and the possibility of initialization and readout. Further, this is a very attractive platform for quantum computation due to the scalability, comprehensive manipulations of the qubits, and the possibility of turning off and on the interaction between the atoms on demand.

The project aims at developing these systems locally such that they may be used in high precision laser spectroscopy laboratories in India.

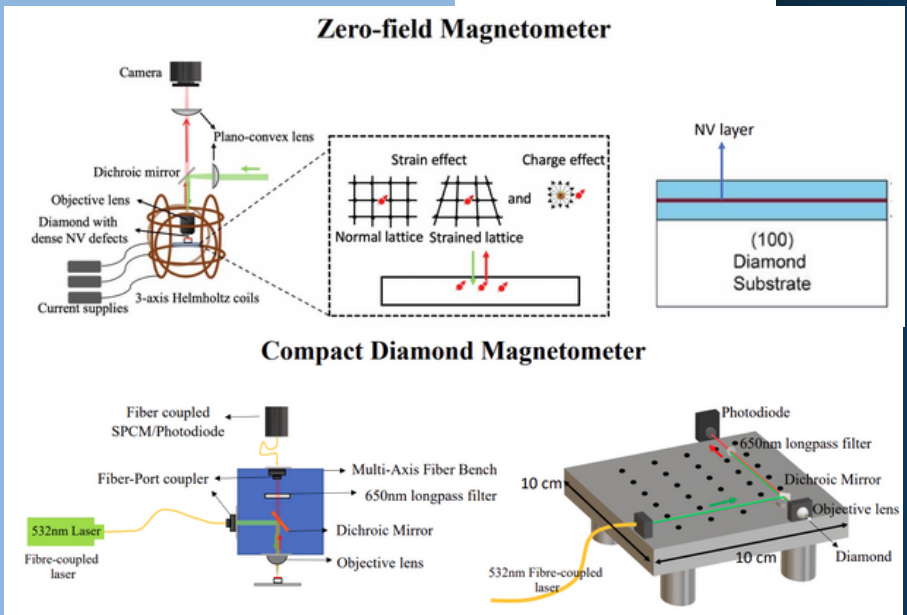
OBJECTIVES OF THE PROJECT ARE:

1. In the first phase, construction of diode laser and tapered amplifier laser systems with electronics.
2. In the second phase, the construction of all other relevant laser systems and the designing and construction of the main vacuum chamber indigenously.
3. In the third phase, designing and constructing of portable atomic platforms for Quantum information processing chamber indigenously.

Dr. Phani Kumar P

DEVELOPMENT OF NITROGEN VACANCY CENTER BASED QUANTUM EGISTER

The significant technological outcome of this project would be the development of a diamond magnetometry setup that can operate at zero magnetic field. NV centers in a diamond magnetometer can be used to perform quantitative, self- calibrated and reproducible measurements of the magnetic field. This NV-diamond magnetometer setup can be further miniaturized and developed into a compact and portable device that would be suitable for widespread use. It is envisioned that this novel quantum tool can be used by other researchers in experimental observation and exploration of magnetic material properties. Leveraging unique NV center properties, combined with diamond nanofabrication and microscopy expertise, this project has the potential to bridge the gap between lab and commercial setting, making novel quantum tools available for microscopy user community.

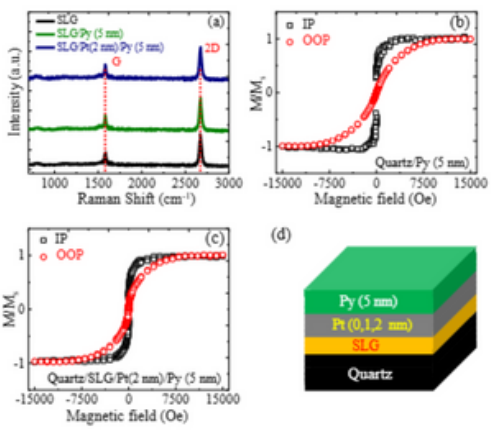


2023 HIGHLIGHT

SPIKE PROJECT

Dr. Rohit Medwal
Assistant Professor
Indian Institute of Technology Kanpur

TUNABLE CHARGE SPIN INTERCONVERSION AT QUANTUM INTERFACE

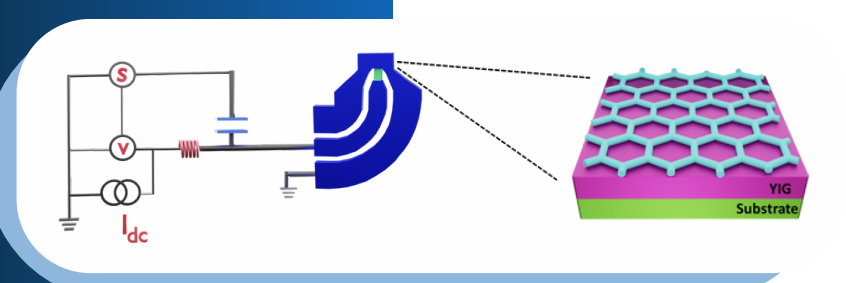


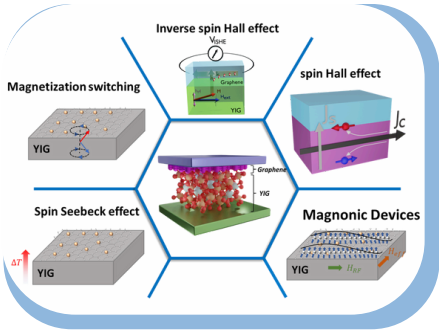
Dr. Rohit Medwal from Indian Institute of Technology Kanpur is working in the area of Quantum Materials and Devices. His project 'Tunable Charge Spin Interconversion at Quantum Interface' is one of the Spike Projects at I-HUB QTF.

This project pertains to the realization of large spin-dependent splitting at the new quantum hetero-interface of YIG/2D materials. The first set of device prototypes have shown significant promise and is expected to yield spintronic sensors and oscillators in the next 12-18 months.

Recent Publications:

1. Ayush K. Gupta, Sourabh Manna, Rajdeep Singh Rawat, and Rohit Medwal. "Magnetization dynamics due to field interplay in external field free spin Hall nano-oscillators" PHYSICAL REVIEW B 109, 134421 (2024)
2. Mahammad Tahir, Subhakanta Das, Mukul Gupta, Rohit Medwal and Soumik Mukhopadhyay. "Enhancement of spin current to charge current conversion in Ferromagnet/Graphene interface" arXiv:2404.16595v2 [cond-mat.mes-hall] 25 May 2024





SPIKE PROJECTS AT I-HUB QTF

Sr. No.	Name of the PI	Project Title	Institute
1.	Dr. Saptarishi Chaudhuri	High precision magnetic field sensors based on spin correlation spectroscopy using thermal and cold atoms	
2.	Prof. Kanishka Biswas	Thermoelectric energy conversion device based on Topological Quantum Materials	
3.	Dr Anirban Bhattacharyya	Growth and characterization of SiGe Quantum Heterostructure Devices by Molecular Beam Epitaxy for Quantum Computing Applications	
4.	Dr. Kausik Majumdar	Development of mid-infrared single photon detector at room temperature	
5.	Dr. Pavan Nukala	Electrocaloric coolers at cryogenic temperatures	
6.	Prof. Mandar M Deshmukh	High-temperature c-axis Josephson junction-based SQUID	
7.	Prof. Harshwardhan Wanare	Frequency double diode laser system at 493nm for barium ion spectroscopy	
8.	Dr. Pranav R. Shirhatti	Develop high performance, cost-effective wavemeters for high resolution atomic and molecular spectroscopy applications	
9.	Dr. Karthik V Raman	Development of cryogen-free cryostat for quantum technologies	
10.	Dr. Rohit Medwal	Tunable Charge Spin Interconversion at Quantum Interface	

2023 HIGHLIGHT

CHANAKYA FELLOWSHIPS

I-HUB QTF is proud to share that one of our Chanakya Post Doctoral Fellows, **Dr. Mir Alimuddin**, working under Dr. Manik Banik, S N Bose Centre for Basic Sciences, got the opportunity to present his work at the 23rd Asian Quantum Information Science Conference (AQIS 2023) Seoul, Korea. His work 'Thermodynamic Signatures of Genuinely Multipartite Entanglement' was selected for a long talk, while the other two 'Advantage of Hardy's Nonlocal Correlation in Reverse Zero-Error Channel Coding' and 'Experimental Verification of Many-Body Entanglement Using Thermodynamic Quantities' were chosen for poster presentation.
We congratulate Dr. Mir Alimuddin and Dr. Manik Banik for the achievement.

Oral presentation:
Thermodynamic Signatures of Genuinely Multipartite Entanglement

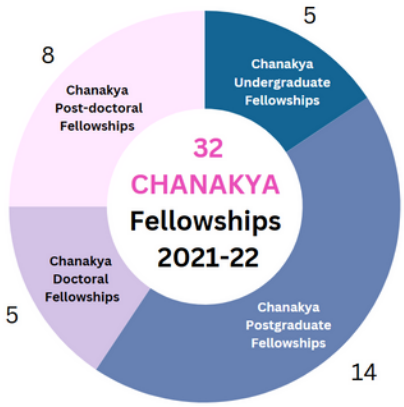
Poster presentation-I:
Advantage of Hardy's Nonlocal Correlation in Reverse Zero-Error Channel Coding

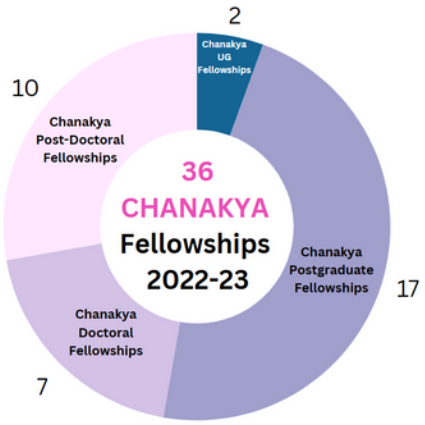
Poster presentation-II:
Experimental Verification of Many-Body Entanglement Using Thermodynamic Quantities

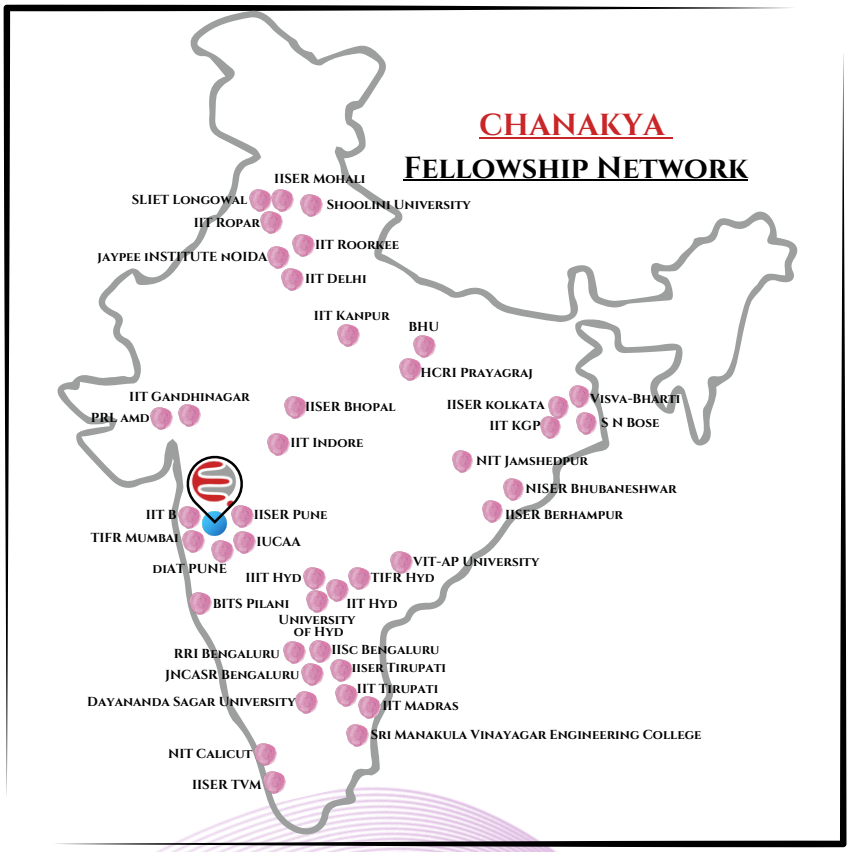
Recent Publications:

- Advantage of Qubit Communication Over The C-bit in Multiple Access Channel; arXiv:2309.17263 (2023) [quant-ph].
- When Mei-Gu Guan's 1960 Postmen get Empowered with Bell's 1964 Nonlocal Correlations, or, Nonlocal Advantage in Vehicle Routing Problem; arXiv:2311.17772 (2023) [quant-ph].
- Optimal quantum teleportation of collaboration; arXiv;2401, 17201 (2024) [quant-ph].
- Quantum Advantage: A Single Qubit's Experimental Edge in Classical Data Storage; arXiv:2403.02659 (2024) [quant-ph].

@ I-HUB QTF







We are extremely happy to extend our Chanakya Fellowship network to **42 institutes.** Currently, I-HUB QTF is offering fellowships to Undergraduate, Postgraduate, Doctoral and Post Doctoral Fellows, in the areas of Quantum Computing, Quantum Devices, Quantum Materials and Quantum Communication.

CHANAKYA Fellowship Network

Chanakya Undergraduate Fellowships 2023-24

Mentor	Chanakya Fellow	Project Title	Institute
Sivarama Krishnan	Aadithya G S	Quantum Random Walks Using OAM of Light	
Kasturi Saha	Advait Risbud	Sensing Biomolecules Based on Quantum Controlled Sensors in Diamond	
Deepasikha Mishra	Ansuman Sahu	Early-stage Alzheimer's Prediction using Quantum Machine Learning	VIT-AP UNIVERSITY
Anirban Saha	Avi Kumar Sharma	Investigating the Boundaries of Quantum Communication: A Study Proposal on PM QKD	Shoolini University
Suresh R	Charumathi K	Space Quantum communication	
Pushpa P V	Kalluru Hitesh	Detection of DNA Mismatch and Cancer cells using Quantum Computing	
Rohit Medwal	Mohd Shaikh Sabir	Magnon-based Quantum Devices for Unconventional Neuromorphic Computing	
Kasturi Saha	Neeraj Prabhu	FPGA-based Bayesian Optimization of NV Centre Experiments	
Vimal Bhatia	Parth Toshniwal	Performance Analysis and Optimization of Terahertz Quantum Key Distribution for 5G/6G and Beyond Communication	
Bhaskaran Muralidharan	Shashwat Chakraborty	High-speed 2D-Xene-based Antiferromagnetic Spintronic Memory	
Kasturi Saha	Siddhant Midha	Digital Quantum Simulation of Floquet Topological Phases	
Deepasikha Mishra	Sreajan Naman	Age Prediction using Quantum Machine Learning	VIT
Ashna Bajpai	Tanmayee Srinivas	Magneto-optic devices based on functional oxides encapsulated inside carbon nanotubes	IISER PUNE
Kuntal Roy	Vedika Vikas Jakate	Understanding of the quantum effects for information storage and processing in DNAs using nanopore sensors with electric current	
Manish Kumar Pandey	Vidhaan Sinha	Quantum Machine Learning for Hyperspectral medical image processing	

Chanakya Postgraduate Fellowships 2023-24

Mentor	Appointed Fellow	Project Title	Institute
Debashis Saha	A.V.N.S.Meghanath	Certifying Quantum Advantage in Direction-Agnostic Multi-Party CommunicationNetworks	IISER THIRUVANANTHAPURAM
Chandan Kumar	Ajay Dhirajlal Bhut	Quantum Capacitance Study in 2D Heterostructure	
Rohit Medwal	Aman Khosla	Artificial Neurons and Synapses through Magnetic Quantum Vortices	
Archak Purkayastha	Apan Dinda	Engineering gain via quantum measurements	IIT Hyderabad
Kuntal Roy	Darsh Khandelwal	Quantum machine learning for enhancing gravitational wave science	
Bhubon Chandra Mech	Deepak B	Design of an 8-bit Quantum-Dot Cellular Automata Reversible Logic CPU	
Bodhaditya Santra	Divyansh Rathore	Construction of Indigenous Cost-effective External Cavity Diode Laser for Advancing Quantum Technologies in India	
Arijit Sharma	Himanshu Miriyala	Development of a transfer cavity-based laser frequency stabilization scheme aided by a wavelength meter	IIT TIRUPATI
Siddhartha Santra	Jigyen Bhavsar	Multiplexed memory-optimised quantum repeater protocol	
Ashok Mohapatra	Kartik Varshney	Development of a Single Photon Source using Spontaneous Four Wave Mixing in Alkali Vapour	NISER
Subhadeep De	M Gautham Upadhyaya M	Designing of a Transportable Ultra-stable Fabry-Perot Cavity	IUCAA
Archak Purkayastha	Mrinmoyee Saha	Dynamics under disordered loss in fermionic chain	IIT Hyderabad

Mentor	Appointed Fellow	Project Title	Institute
Archak Purakaystha	Pitambar Bagui	Engineering Gaussian quantum gain medium	IIT Hyderabad
Alok Kumar Pan	Piyush Saklani	Device-Independent Certification through Quantum Communication Games	IIT Hyderabad
Aravinda S	Priyanuj Rajbongshi	On the Frame Dependency of Quantum Teleportation	IIT TIRUPATI
Sankaranarayanan Selvarajan	Rohit P Thampy	CPT Based Atomic Clock	
Bodhaditya Santra	Sameer Yadav	Development of Indigenous Quantum Technologies through Single Atom Trapping and Imaging	
Siddhartha Santra	Shashank Shekhar	Feasibility domains for quantum key distribution in quantum networks	
Aravinda S	Shivam Sinha	Generalized α-Observational Entropy	IIT TIRUPATI
Kanishka Biswas	Shuva Biswas	Exploring the Role of Lone Pairs on Electronic Structure of Topological Quantum Materials and Its Thermoelectric Properties	JNCASR
Ashok Mohapatra	Swarup Kumar Giri	Quantum limit of light amplification using degenerate four-wave mixing in alkali Vapor	NISER
Anshuman Kumar	Utkarsh	A Monolithic Platform for Strong Coupling of an Single Photon Emitter (SPE) and a Bound State in the Continumm (BIC) in Hexagonal Boron Nitride (hBN)	
Bodhaditya Santra	Vivek Chandra	Development of a low noise driver for narrow linewidth lasers	
Ankur Raina	Anuprita Kulkarni	Cryptographic Applications of Boson Sampling and Chaotic Quantum Systems	

Mentor	Appointed Fellow	Project Title	Institute
B. Prasanna Venkatesh	Md. Asif Zia	Quantum Phases of laser-driven Dipolar Bose-Einstein condensates	
Victor Mukherjee	Mohammed Bilal P S	Optimal charging protocol for quantum many body battery using Reinforcement Learning	
Arijit Sharma	Poorvisha C	Development of a high-resolution diffraction-limited single- ion imaging system.	
Ankur Raina	Pranav Maheshwari	Benchmarking Fault Tolerant Error Correcting Codes	
Ankur Raina	Sanidhya Gupta	Distributed quantum computing with error correction	
Ashna Bajpai	Shashwat Singh Tomar	Calibration of an AC-susceptometer for exploring canted-antiferromagnets for spintronic applications	
Darshan G. Joshi	Shivang Mathur	Hole-doping a topological quantum paramagnet	
Debashish Saha	Subham Das	Self Testing of Quantum States using Entangled Measurements	

QUEST FELLOWSHIPS AT I-HUB QTF

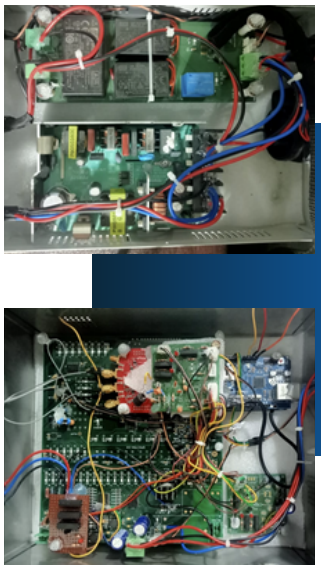
I-HUB QTF has taken forward the QuEST Fellowship program to support research projects covering various areas of quantum technologies.
We have already awarded **18 Doctoral QuEST Fellowships** and now expanding our network with students from institutes all over India.

Mentor	Appointed Fellow	Project Title
Joyee Ghosh	Akanksha Angural	Integrated sources of entangled photons for quantum communications and quantum information applications
Joyee Ghosh	Vikas Kuma ryadav	Integrated sources of entangled photons for quantum communications and quantum information applications
Urbasi Sinha	Mehak Layal	Long distance Quantum Communications: Relay and Repeater Technologies
Kasturi Saha	Ayan Majumdar	Diamond Based Quantum Technologies
Kasturi Saha	Anuj Bathla	Diamond Based Quantum Technologies
Ujjiwal Sen	Swati Chaudhary	Noise analysis and entanglement characterization of quantum information protocols in ion traps, optical lattices, solid-state and magnetic resonance systems
Radhika Vathsan	R Dharmaraj	Geometric aspects of Quantum Correlations in Dynamic
Aditi Sen	Abhishek Mahuri	Quantum Communication Networks Chaneel Capacities and Quantum Cryptography
Anirban Pathak	Satish Kumar	Designing of devices and protocols for quantum hacking random number generation and secure communications
Anil Shaji	Ganeshwar Bhoi	Open systems Non Markovian Dynamics and Not Completele Positive Maps
RP Singh	Vardan Mongia	Free space quantum communications: Road to satellite quantum communications
RP Singh	Tanya Sharma	Free space quantum communications: Road to satellite quantum communications
Chiranjib Mitra	Subhadip Manna	Fabrication and implementation of spin qubit-based quantum gates for quantum information processing in solid state systems
Ajay Wasan	Ishitwa Kumar Das	Quantum computing with trapped Rubidium atoms
Vidya Praveen Bhallamundi	Praveen Hegade	Quantum Information Technologies with Nitrogen Vacancy and Magnetic Resonance

Startups at I-HUB QTF

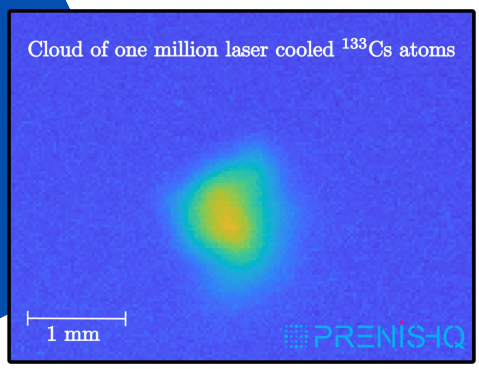
QUDYCO
Light up the Quantum Fuel

Qudyco is developing a software to solve the Schrodinger equation for real-world quantum settings. The software's front end will be a design platform for quantum hardware, while the back end will handle complex computations. This also involves building a robust experimental system to benchmark the software's computational modules. Despite existing repositories for atomic properties, Qudyco's software will be the first to include a solver for design purposes. The company plans to incorporate new, efficient numerical methods to tackle the exponential complexity of problems involving atomic arrays.



Control Box hardware development

PRENISHQ

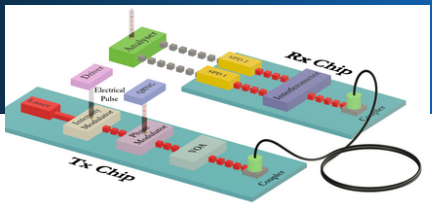


Prenishq is developing a stable laser system for cold atom based quantum technologies which is indispensable for assembling large, defect-free arrays of neutral atoms using programmable optical tweezers. The atoms will be cooled to a few microkelvin using a Magneto Optical Trap (MOT) and further cooled to the quantum ground state using Raman sideband cooling.

Ultracold quantum gases in optical traps are at the forefront of current research and are key to the physical implementation of quantum technologies. The developed laser system can also be used for various other applications.

amPICQ

amPICQ is developing IC-based solutions for Quantum Key Distribution (QKD) to enhance security in the post-Quantum Supremacy era. Current QKD solutions are bulky, expensive, and unreliable. Ampicq aims to improve these issues by developing Photonics Integrated Circuits (PICs) that offer miniaturization, efficiency, reliability, and cost-effectiveness. They will focus on active, phase transformation oriented or 'Differential Phase Shift (DPS) QKD for reliable security. Ampicq plans to develop Transmitter and Receiver Chips in parallel, which will be used in customer's QKD commercial solutions.



Schematic of amPICQ's quantum key distribution solution

Quantum Capacitance Perturbation based Single Photon Detector

AJ Technologies

Single photon detection is essential for quantum imaging, sensing, LiDAR, and environmental monitoring. Current technologies include photomultiplier tubes, avalanche photodiodes, superconducting nanowire detectors, and semiconductor PMTs. However, these methods face issues like dark counts, noise, efficiency limitations, complex designs, and high costs, limiting their applicability in India. There is a need for simpler, cost-effective quantum technologies suitable for room temperature operation. AJ Technologies proposed solution uses quantum capacitance perturbations in micro devices with single/multi-layer 2D materials to create an efficient single photon detection module with tunable wavelength ranges, offering a technologically advanced and cost-effective option for India-centric applications.

SciAMO Research and Instruments Pvt. Ltd.

MagBrainWave Magnetometer Atomic Magnetometry

Neutral atom-based magnetometers have diverse applications in geophysics, navigation, medical imaging (MEG), defense, space exploration, and scientific research. SciAMO is miniaturizing this technology onto a photonic chip and prototyping the integration process, with plans to file a patent. The next step involves creating a cap with an array of these chips to image neural activities in the human brain. This high-sensitivity magnetometer setup will use miniature atomic vapor cells, an optical fiber network for laser power delivery and collection, a linear array photo-detector for detection, and an FPGA for control and analysis, pioneering a new category in biomedical sensing.

Novel Laser Sources for Quantum Applications

BRAHMASENS

BrahmaSens: Lighting the Quantum Future

Fiber lasers offer advantages such as high power, good beam quality, low cost, small footprint, and environmental robustness. Developing low-cost, tunable fiber lasers in the near-IR range is essential. Neodymium-doped fiber emits broadly around 880-930 nm due to the 4F3/2 to 4I9/2 transition, but achieving lasing here is challenging due to competition from the 1060 nm transition. With proper suppression of the 1060 nm lasing, tunable lasers in the 880-930 nm range are feasible. This project aims to demonstrate a high-power, narrow-linewidth, tunable neodymium-doped fiber laser in this range using BrahmaSens's novel optical fibers.

GDQLABS Pvt Ltd

Quantum Magnetometers using Optically Pumped Magnetometers

GDQLABS is an IISER Pune spinoff incubated at I-HUB QTF that aims to dedicate itself for the development of quantum and quantum enabling technologies. They utilize quantum physics, electronics, optics, and vacuum technologies to build real-time hardware, quantum sensors quantum computers and quantum simulators. They are developing Quantum Magnetometers using Optically Pumped Magnetometers, which have applications across industries

INDUSTRY PARTNERS

Transzend Scientific Pvt. Ltd.

Tran-sci is developing affordable and sustainable NMR and MRI technologies, serving various industries and academic institutions. They're also creating new methods for the polymer, rubber, food, and pharmaceutical industries. Additionally, they offer a state-of-the-art NMR training program for young minds. Their collaboration with I-HUB QTF focuses on a Desktop NMR Spectrometer project.

SciCom Software Pvt. Ltd.

SCI-COM provides Engineering Software Services in digital Image Processing, Numerical Analysis, and Scientific Computing. They design Machine Vision Systems, Factory Automation, Control Solutions, and offer Software Testing and Validation Services. Their software serves various industries including Automotive, FMCGs, Industrial goods, Pharmaceutical, Chemical, Defence, Food processing, and Medical. They are collaborating with I-HUB QTF to indigenize Digital Lock-in Amplifier and Direct Digital Synthesize.

Sunay Enterprises

Established in 1996, Sunay Enterprises provides reliable, economical solutions for industrial problems in electronics and computer software. They undertake turnkey projects and cater to specific customer requirements, serving leading industry players across various domains. They have the infrastructure to support the development of software and hardware projects and manufacture tailor-made systems.

GUESTS AT I-HUB QTF

KRS Jamwal, Executive Director of Tata Industries, Abhishek Jain, General Manager Tata Industries Limited and Anil Sharma, Head Corporate Incubation Tata Consultancy Services visited I-HUB QTF, IISER Pune.

As part of the visit, they interacted with the HUB PI's and lab visits were organized showcasing the current work being done in Quantum Technology Development.

As a follow up to the IND-eQT Workshop, senior industry leaders including Vishwas Udpikar, Vivek Aranake, Shirish Deshmukh, Vinaykumar Achwal, Milind Bapat and Deepali Bapat visited I-HUB QTF. A lab visit was organized showcasing the current work being done in Quantum Technology development.

L Venkata Subramaniam and Jaikrishnan Hari from IBM India at I-HUB QTF, IISER Pune. It was great meeting them and discussing future synergistic collaboration possibilities in Quantum Computing Research and its real-world applications.

We hosted 2nd year computer science students and faculty members from Fr. Conceicao Rodrigues Institute of Technology. As part of their visit a sensitization session on Quantum Technologies was conducted.

The session was then followed by a visit to the quantum research labs.

We hosted faculty members from various institutes as part of the program 'ATAL FDP on Quantum Enabled Intelligence'. As part of their visit a sensitization session on Quantum Technologies was conducted. .

The session was followed by a visit to the quantum research labs.

PUBLICATIONS

Sr. No.	Selected Publications
1	"Design of 2.87 GHz Frequency Synthesizer with Programmable Sweep for Diamond Color Defect based CMOS Quantum Sensing Applications" 2022 IEEE international Symposium on Circuites and Systems (ISCAS), Austin, TX, USA, 2022, pp. 3092-3096.
2	"A 2.75 -2 .94 GHz Voltage Controlled Oscilator with Low Gain Variation for Quantum Sensing Applications" 2022 35th International Conference on VLSI Design and 2022 21st International Conference on Embeded Systems (VLSID), Banglore, India, 2022, pp. 186-191.
3	“High resolution spectroscopy of single nitrogen-vacancy defect at zero mgnetic field.”Shashank Kumar, Pralekh Dubey, Sudhan Bhadade, Jemish Naliyapara, Jayita Saha, Phani Peddibhotla, arXiv:2206.14991, arXiv:2206.14991v1
4	"Frequency modulation of Rydberge by radio frequency electromagnetic fields" arXiv:2309.07007 [physics.atom-ph]
5	“Precision bound in periodically modulated continuous quantum thermal machines”,Arpan Das, Shishira Mahunta, Bijay Kumar Agarwalla, Victor Mukherjee, arXiv:2204.14005 [quant-ph]
6	“Silicene an excellent Material for flexible electronics.”, Sahoo, Swastik; Sinha, Abhinaba; Koshi, Namitha Anna; Lee, Seung-Cheol; Bhattacharjee, Satadeep; Muralidharan, Bhaskaran, Journal of Physics D Applied Physics, Swastik Sahoo et al 2022 J. Phys. D: Appl. Phys. 55 425301
7	“Silicene Straintronics, APS March Meeting 2022”, Bulletie of the american Physical society (2022). Bulletin of the American Physical Society, https://meetings.aps.org/Meeting/MAR22/Session/Z72.10
8	“Br I spectral line measurements in the range 2000–6000 cm−1: Part I”, Journal of Quantitative Spectroscopy and Radiative Transfer, Chilukoti Ashoka,*, Himal Bhattb,c, S.R. Vishwakarmab, Arijit Sharmad, M.N. Deoe,* , 1-s2.0-S002240732400027X-main
9	“Hyperfine structure measurements on a forbidden transition of Bi I using Fourier transform spectroscopy.” Journal of Quantitative Spectroscopy and Radiative Transfer, Volume 309, November 2023, 108688, Chilukoti Ashok, Himal Bhatt, S. Harinath Babu, Arijit Sharma, S.R. Vishwakarma, Mohan Babu, M.N. Deo
10	“Generation of out-of-plane polarized spin current in (permalloy, Cu)/EuS interfaces,” Pankhuri Gupta, Niru Chowdhury, Mingran Xu, Prasanta Kumar Muduli, Akash Kumar, Kouta Kondou, Yoshichika Otani, and Pranaba Kishor Muduli, Phys. Rev. B 109, L060405 (Letter) (2024). [Impact factor: 3.908]
11	“Magnetic-Proximity-Induced Efficient Charge-to-Spin Conversion in Large-Area PtSe2/Ni80Fe20 Heterostructures,” Richa Mudgal, Alka Jakhar, Pankhuri Gupta, Ram Singh Yadav, Bubunu Biswal, Pratik Sahu, Himanshu Bangar, Akash Kumar, Niru Chowdhury, Biswarup Satpati, Birabar Ranjit Kumar Nanda, Sashi Satpathy, S Das and Pranaba Kishor Muduli Nano Lett. , 23, 11925 (2023). [Impact factor: 10.8]
12	"Large spin Hall conductivity in epitaxial thin films of kagome antiferromagnet Mn_3Sn at room temperature", H. Bangar, K. I. A. Khan, A. Kumar, N. Chowdhury, P. K. Muduli, and P. K. Muduli, Advanced Quantum Technologies 6, 2200115 (2022). [Impact factor: 5.31]

Sr. No.	Selected Publications
13	“Kagome Magnets: The Emerging Materials for Spintronic Memories." Niru Chowdhury, Kacho Imtiyaz Ali Khan, Himanshu Bangar, Pankhuri Gupta, Ram Singh Yadav, Rekha Agarwal, Akash Kumar, and Pranaba Kishor Muduli. Proc. Nat. Acad. Sci. India Sect A: Phys Sci., 1 (2023). [Impact factor: 1.1]
14	“Emergence of planar topological Hall anisotropy in Bi 2(Se,Te) 3 by the proximity-induced spin-canted state of Heisenberg ferromagnetic insulator EuS”, Dhavala Suri*, Satyaki Sasmal*, Archit Bhardwaj, Juhi Singh, Suman Mundlia, Anshika Mishra, Narayan Mohanta, and Karthik V. Raman, * Equal contributions. arXiv:2107.03596v2 [cond-mat.mes-hall] 23 Sep 2021
15	“Time like correlations and quantum tensor product structure” Phys. Rev. A 106, 062406 (2022).
16	“Thermodynamic Signatures of Genuinely Multipartite Entanglement” Phys. Rev. Lett. 129, 070601 (2022).
17	“Certifying beyond quantumness of locally quantum no-signalling theories through quantum input Bell test” Phys. Rev. A Lett. 106, L040201 (2022).
18	“Exploring superadditivity of coherent information of noisy quantum channels through genetic algorithms”; Phys. Rev. A 106, 012432 (2022).
19	“Composition of Multipartite Quantum Systems: Perspective from Timelike Paradigm” Phys. Rev. Lett. 128, 140401 (2022).
20	“Local quantum state marking” Phys. Rev. A 105, 032407 (2022).
21	“Principle of information causality rationalizes quantum composition” arXiv:2208.13996 [quant-ph].
22	“The battery capacity of energy-storing quantum systems” Phys. Rev. Lett. 131. 030402 (2023).
23	“Advantage of Hardy's Nonlocal Correlation in Reverse Zero-Error Channel Coding” Phys. Rev. A 108. 052430 (2023).
24	“Experimental Verification of Many-Body Entanglement Using Thermodynamics Quantities” Phys. Rev. A 109. L020403 (2024).
25	“Self-testing quantum states via nonmaximal violation in Hardy's test of nonlocality” Phys. Rev. A 105, 052227 (2022).
26	“Classical superdense coding and communication advantage of a single quantum” arXiv:2202.06796 (2021) [quant-ph].
27	“Advantage of Qubit Communication Over The C-bit in Multiple Access Channel” arXiv:2309.17263 (2023) [quant-ph].
28	“When Mei-Gu Guan's 1960 Postmen get Empowered with Bell's 1964 Nonlocal Correlations, or, Nonlocal Advantage in Vehicle Routing Problem” arXiv:2311.17772 (2023) [quant-ph].
29	“Optimal quantum teleportation of collaboration” arXiv;2401, 17201 (2024) [quant-ph].

Sr. No.	Selected Publications
30	“Quantum Advantage: A Single Qubit's Experimental Edge in Classical Data Storage” arXiv:2403.02659 (2024) [quant-ph].
31	“Quantum vs classical: identifying the value of a random variable unambiguously” arXiv:2211.09194 (2022) [quant-ph].
32	“A Cryptography Inspired Model for Non-local Correlations: Decrypting the Enigmas” arXiv:2307.03395 (2023) [quant-ph].
33	“Bipartite polygon models: entanglement classes and their nonlocal behavior” arXiv:2205.05415 (2022) [quant-ph].
34	“Quantum Nonlocality: Multi-copy Resource Inter-convertibility & their Asymptotic Inequivalence” Phys. Rev. Lett. 132, 250205 (2024).
35	“Identifying the value of a random variable unambiguously: Quantum versus classical approaches” Phys. Rev. A 109, 052608 (2024).
36	“Randomness-Free Test of Nonclassicality: A Proof of Concept” Phys. Rev. Lett. 131, 130201 (2023).
37	“Distilling nonlocality in quantum correlations” Phys. Rev. Lett. 130, 220201 (2023).
38	“Self-testing quantum states via nonmaximal violation in Hardy's test of nonlocality” Phys. Rev. A 105, 052227 (2022).
39	“Decoupling nuclear spins via interaction-induced freezing in nitrogen vacancy centers in diamond”, A. Kejriwal*, D. Shishir*, S. Pujari, K. Saha, Quantum Information Processing, 22, 289. *Equal authors
40	"In-situ diameter measurement of optical micro/ nano fiber using scattering loss analysis” 40(17):4122, DOI:10.1364/OL.40.004122, Journal of Optical society of America B.
41	“In situ characterization of optical micro/nano fibers using scattering loss analysis”, J. Appl. Phys. 135, 123101 (2024) DOI:https://doi.org/10.1063/5.0192385.
42	“Fabrication and characterization of optical micro/nanofibers” E. Bashaiah, S. Suman, M. Resmi, B. Das and R. Yalla, arXiv:2405.13627v1 [physics.optics] 22 May 2024
43	“Highly efficient coupling of single photons using a pair of nanostructures” M Resmi, E. Bashaiah, S. Suman and R. Yalla, arXiv:2406.16097
44	“Benchmarking discrete truncated Wigner approximation and restricted Boltzmann neural networks with the exact dynamics of a Rydberg atomic chain,” Vighnesh Naik, Varna Shenoy, Weibin Li, Rejish Nath arXiv:2110.02201
45	"Cracking the Curious Case of the Cascade Protocol” Publication only by Anand Choudhary & Ajay Wasan in IEEE Access, vol. 11, pp. 84709-84733, 2023, doi: 10.1109/ACCESS.2023.3303392.

Sr. No.	Selected Publications
46	"Twin Field QKD with 3-Pulse Differential Phase Encoding." 10.1109/WRAP.2017.8468572
47	“Enhanced spin pumping in heterostructures of coupled ferrimagnetic garnets.” Authors: Anupama Swain, Kshitij Singh Rathore, Pushpendra Gupta, Abhisek Mishra, Yong Heng Lee, Jinho Lim, Axel Hoffmann, Ramanathan Mahendiran & Subhankar Bedanta. Appl. Phys. Lett. 125, 012406 (2024) DOI: https://doi.org/10.1063/5.0201938
48	“Optimized Current Density Reconstruction from Widefield Quantum Diamond Magnetic Field Maps”, S Midha, M Parashar, A Bathla, D. Broadway, J. P. Tettienne, K. Saha, arXiv:2402.17781. (Accepted in Physical Review Applied, June 2024)
49	“Patterns, spin-spin correlations, and competing instabilities in driven quasi-two-dimensional spin-1 Bose-Einstein condensates” Sandra M. Jose , 1 Komal Sah , 1,2 and Rejish Nath 1 1Department of Physics, Indian Institute of Science Education and Research, Pune 411 008, India 2Department of Physics, University of California, Davis, California 95616, USA (Received 21 May 2023; accepted 31 July 2023; published 11 August 2023), PHYSICAL REVIEW A 108, 023308 (2023)
50	“Maximally entangled Rydberg-atom pairs via Landau-Zener sweeps” Dhiya Varghese , Sebastian Wüster,Weibin Li , and Rejish Nath Indian Institute of Science Education and Research, Pune- 411008, India 2Department of Physics, Indian Institute of Science Education and Research, Bhopal, Madhya Pradesh 462066, India 3School of Physics and Astronomy, University of Nottingham, NG7 2R8, United Kingdom (Received 15 February 2023; accepted 30 March 2023; published 10 April 2023), PHYSICAL REVIEW A 107, 043311 (2023)
51	“Droplet arrays in doubly dipolar Bose-Einstein condensates” Ratheejit Ghosh ,Chinmayee Mishra,Luis Santos,and Rejish Nath Department of Physics, IISER Pune, Pune 411 008, India 2Indian Institute of Technology Gandhinagar, Gandhinagar 382 355, India 3Institut für Theoretische Physik, Leibniz Universität Hannover, Appelstrasse 2, DE-30167 Hannover, Germany (Received 3 October 2022; accepted 13 December 2022; published 26 December 2022)PHYSICAL REVIEW A 106, 063318 (2022)
52	“Benchmarking discrete truncated Wigner approximation and neural network quantum states with the exact dynamics in a Rydberg atomic chain” Varna Shenoy3,1, Vighnesh Dattatraya Naik3,1, Weibin Li2 and Rejish Nath1 Published 6 May 2024 • © 2024 IOP Publishing Ltd
53	Nature Commun, “Giant Faraday rotation in atomically thin semiconductors” Benjamin Carey, Nils Kolja Wessling, Paul Steeger, Robert Schmidt, Steffen Michaelis de Vasconcellos, Rudolf Bratschitsch, and Ashish Arora, 2024
54	Nano Letters, “Engineering 2D material exciton lineshape with graphene/h-BN encapsulation” Steffi Y Woo, Fuhui Shao, Ashish Arora, Robert Schneider, Nianjheng Wu, Andrew J Mayne, Ching-Hwa Ho, Mauro Och, Cecilia Mattevi, Antoine Reserbat-Plantey, Alvaro Moreno, Hanan Herzig Sheinfux, Kenji Watanabe, Takashi Taniguchi, Steffen Michaelis de Vasconcellos, Frank HL Koppens, Zhichuan Niu, Odile Stéphan, Mathieu Kociak, F de Abajo, Rudolf Bratschitsch, Andrea Konečná, Luiz HG Tizei. 2024
55	Phys. Rev. B, “Excitonic absorption signatures of twisted bilayer by electron energy-loss spectroscopy” Steffi Y Woo, Alberto Zobelli, Robert Schneider, Ashish Arora, Johann A Preuß, Benjamin J Carey, Steffen Michaelis de Vasconcellos, Maurizia Palummo, Rudolf Bratschitsch, Luiz HG Tizei, 2023\
56	Phys. Rev. Mater, “Substrate influence on transition metal dichalcogenide monolayer exciton absorption linewidth broadening” Fuhui Shao, Steffi Y Woo, Nianjheng Wu, Robert Schneider, Andrew J Mayne, Steffen Michaelis de Vasconcellos, Ashish Arora, Benjamin J Carey, Johann A Preuß, Noémie Bonnet, Cecilia Mattevi, Kenji Watanabe, Takashi Taniguchi, Zhichuan Niu, Rudolf Bratschitsch, Luiz HG Tizei, 2022
57	Small Methods, “High-performance broadband Faraday rotation spectroscopy of 2D materials and thin magnetic films” Benjamin Carey, Nils Kolja Wessling, Paul Steeger, Christoph Klusmann, Robert Schneider, Mario Fix, Robert Schmidt, Manfred Albrecht, Steffen Michaelis de Vasconcellos, Rudolf Bratschitsch, and Ashish Arora, 2022
58	“Observing Algebraic Variety of Lee-Yang Zeros in Inaccessible Systems” Arijit Chatterjee, T. S. Mahesh, Mounir Nisse, and Yen-Kheng Lim, Phys. Rev. A 109, 062601 (2024).

Sr. No.	Selected Publications
59	“Experimental Verification of Many-Body Entanglement Using Thermodynamic Quantities” Jitendra Joshi, Mir Alimuddin, T S Mahesh, and Manik Banik, Phys. Rev. A (Letter) 109, L020403 (2024).
60	“NMR investigations of Dynamical Tunneling in Spin Systems” V. R. Krithika, M. S. Santhanam, and T. S. Mahesh, Phys. Rev. A 108, 032207 (2023).
61	“Long-lived singlet state in oriented phase and its survival across the phase transition into isotropic phase” Vishal Varma and T S Mahesh, Phys. Rev. Appl. 20, 034030 (2023) [Editor Suggested].
62	“Counterdiabatic driving for long-lived singlet state preparation” Abhinav Suresh, Vishal Varma, Priya Batra, and T S Mahesh, J. Chem. Phys. 159, 024202 (2023).
63	“Exceptional hypersurfaces of transfer matrices of finite-range lattice models and their consequences on quantum transport properties” Madhumita Saha, Manas Kulkarni, and Bijay Kumar Agarwalla, Phys. Rev. B 108, 075406 – Published 10 August 2023
64	“Filling an empty lattice by local injection of quantum particles” Akash Trivedi, Sparsh Gupta, Bijay Kumar Agarwalla, Abhishek Dhar, Manas Kulkarni, Anupam Kundu, and Sanjib Sabhapandit, Phys. Rev. A 108, 052204 – Published 2 November 2023
65	“Full statistics of nonequilibrium heat and work for many-body quantum Otto engines and universal bounds: A nonequilibrium Green’s function approach” Sandipan Mohanta and Bijay Kumar Agarwalla, Department of Physics, Indian Institute of Science Education and Research, Pune 411008, India (Received22July 2023; accepted 21 November 2023; published 18 December 2023) PHYSICAL REVIEW E108,064127(2023)
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QWISE Startups (Quantum Women in Scientific Entrepreneurship)
Budding Women Entrepreneurs and Start-ups working in Development of Quantum Technologies

WIDYA-QT Fellowships (Women in Deep-Tech to Yield Advancement in Quantum Technologies)
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The burgeoning field of quantum technology stands at a precipice, brimming with potential to revolutionize computing, materials science, and beyond. Yet, harnessing this potential requires a concerted effort to nurture talent, foster collaboration, and bridge the knowledge gap. This is where our carefully curated suite of workshops, seminars, and conferences plays a pivotal role. We conduct these initiatives to seamlessly connect researchers amongst themselves and with industry representatives, catalyzing the transfer and commercialization of groundbreaking scientific discoveries.

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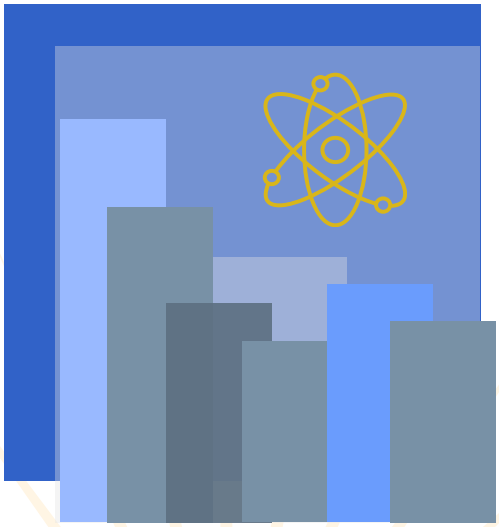
The winds of quantum revolution are stirring, and India is poised to make significant advances in Quantum Technologies. While our government lays the groundwork with insightful projects and essential infrastructure, a vital force remains largely untapped: the power of private enterprise. Our CSR infrastructural projects will be a step towards building a Quantum Technology specific infrastructure to fulfil the needs of the Indian scientific community.



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