I-HUB QUANTUM TECHNOLOGY FOUNDATION

IISER PUNE

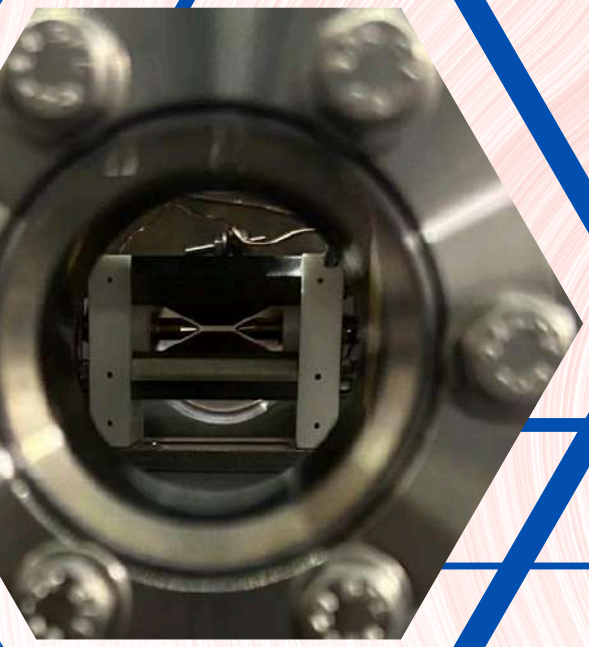
Department of Sciences & Technology Government of India

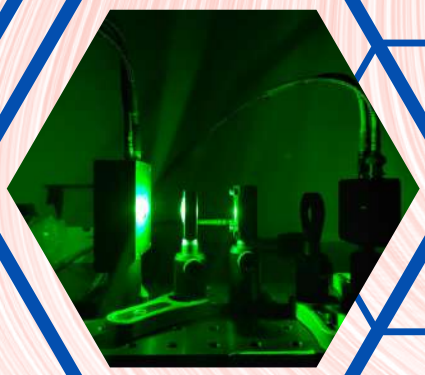
National Mission on Interdisciplinary Cyber-Physical Systems NM-ICPS

I-HUB Quantum Technology Foundation

NEWSLETTER 3.0

Quantum QonnecT





2025
Volume. 3

I-HUB QUANTUM TECHNOLOGY FOUNDATION
IISER PUNE
Quantum QonnecT
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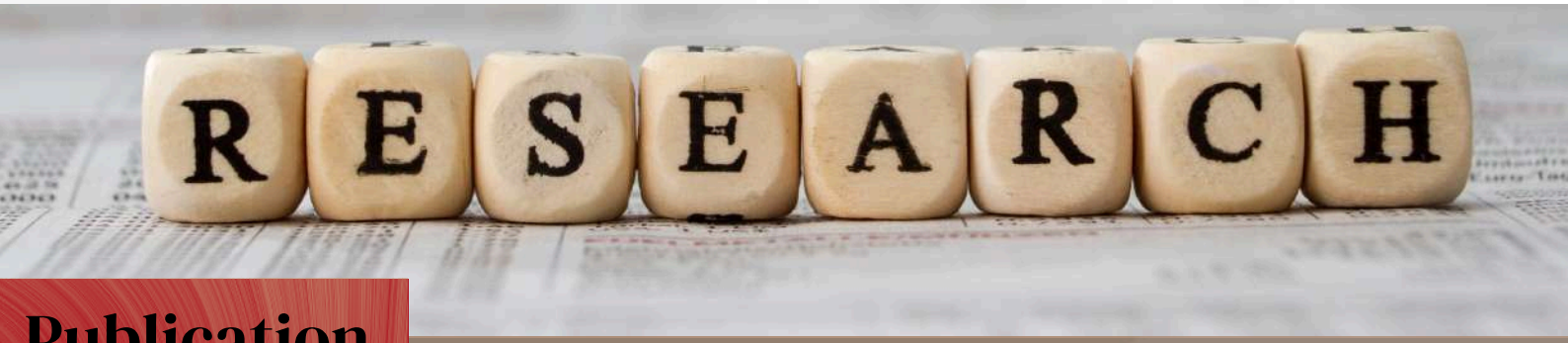
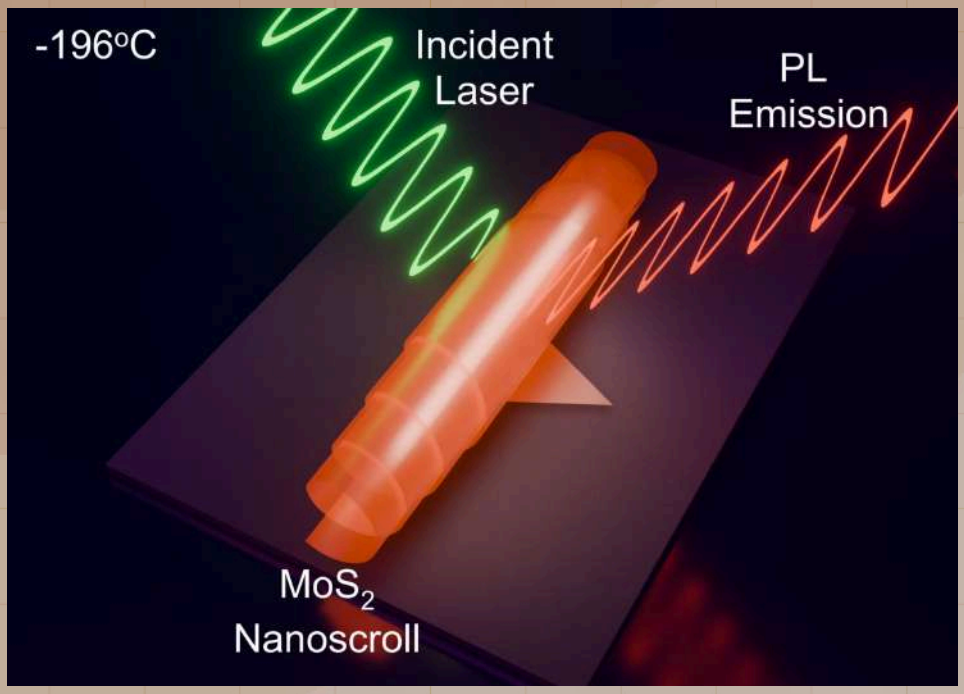


Publication Highlight



ARTICLE LINK

HTTPS://IOPSCIENCE.IOP.ORG/ARTICLE/10.1088/2053-1583/ADE9D8

Bright Breakthrough in 2D Materials

In the global race toward compact, high performance technologies, scientists continue to search for materials with exceptional properties. A recent collaborative breakthrough has put molybdenum disulfide (MoS_2) nanoscrolls in the spotlight as a promising contender. Researchers from the Indian Institute of Science Education and Research (IISER) Pune, the University of Manchester, the Indian Institute of Science (IISc), and Brookhaven National Laboratory, including researchers associated with I-HUB Quantum Technology Foundation, have made a remarkable discovery:

MoS_2 nano scrolls- despite being made of multi-layered 2D sheets, exhibit unusually bright photoluminescence. This finding challenges conventional understanding of 2D material behavior and opens possibilities for the next generation of :

a) Ultra-small electronic components b) Light-based quantum devices c) High-efficiency photodetectors d) Advanced nanoscale sensing systems

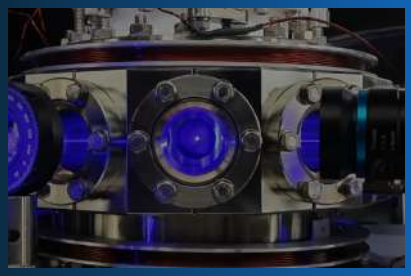
Why This Matters?

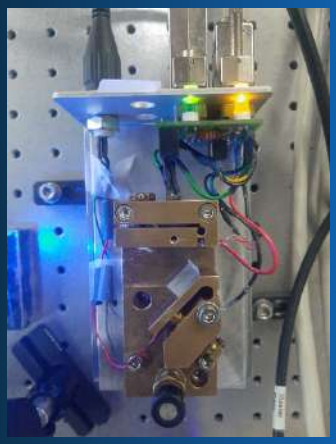
The unexpected bright emission from these nanoscrolls represents a pathway toward quantum-enabled optoelectronics, potentially transforming fields such as communication, computation, and sensing.

We extend special recognition to Prof. Atikur Rahman, I-Hub QTF PI, and his team for their contribution to this impactful publication.

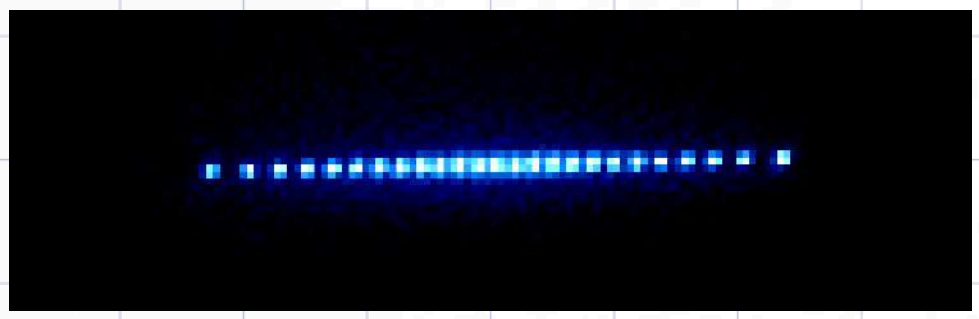
2025 HIGHLIGHT

PROJECT AT I-HUB QTF, IISER PUNE

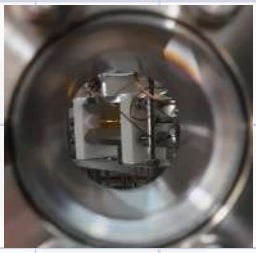




PROF. UMAKANT D RAPOL



LINEAR CRYSTAL OF CALCIUM IONS



ION TRAP

A 20 QUBIT ION TRAP QUANTUM COMPUTER

Quantum computing offers a powerful framework for addressing problems that remain extremely challenging for classical computers. These include quantum simulations for discovering new materials and drugs, developing advanced quantum algorithms, and probing fundamental physical phenomena. For an architecture to function as a practical quantum computer, it must satisfy the well known DiVincenzo criteria scalability, the ability to initialize qubits, long coherence times, universal quantum gates, and accurate measurement.

Among the many experimental platforms explored worldwide, ion traps have emerged as a leading candidate, owing to their exceptionally long coherence times and high fidelities for both single- and multi-qubit operations.

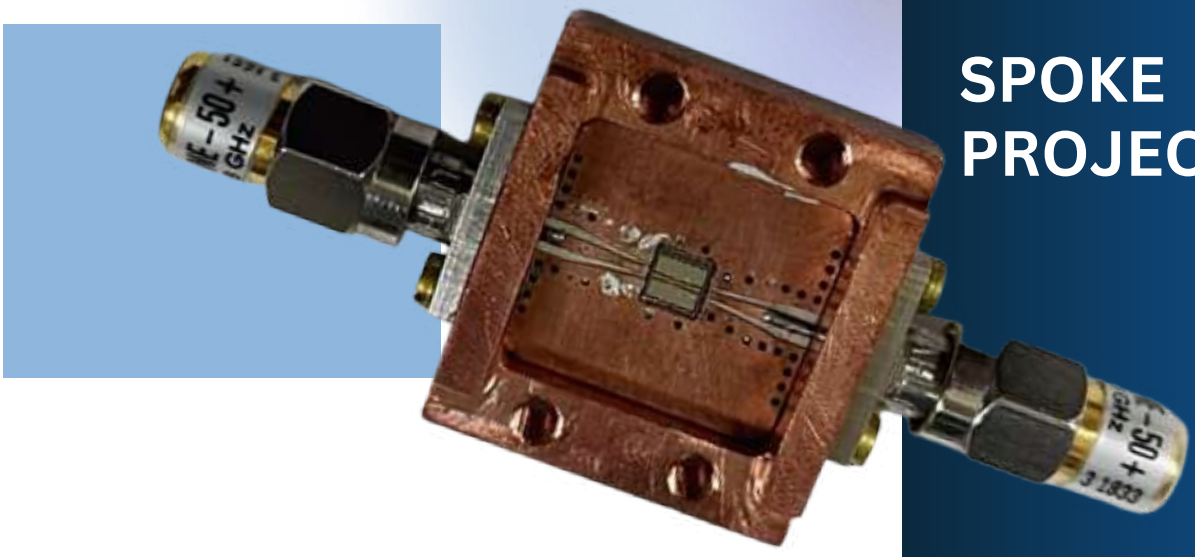
At IISER Pune, the Ion Trap Quantum Computing Project led by Prof. Umakant D. Rapol aims to build a 20-qubit quantum processor using $^{40}Ca^{+}$ ions as qubits. These ions are confined using a carefully designed combination of radio-frequency (RF) and direct current (DC) electric fields inside a precision-engineered blade type ion trap. This architecture creates a region in space where ions can be held in a stable, linear configuration and manipulated with lasers to perform quantum operations.

A central goal of the project is to fabricate and assemble a complete ion trap quantum computing system entirely in-house. The team has achieved several milestones toward this vision. They have successfully demonstrated trapped-ion configuration stable of many days. Various quantum gates are now being implemented and tested in the in-house, which will form a major milestone for ideginous development of trapped ion quantum computing

PROF. RAJAMANI VIJAYARAGHAVAN

2025 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.

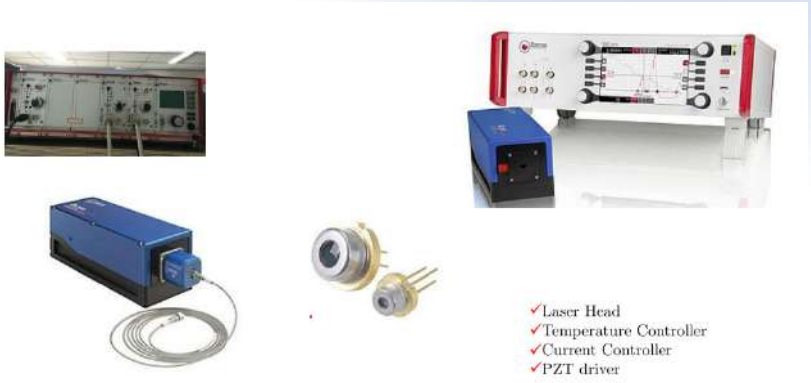
tifr

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.

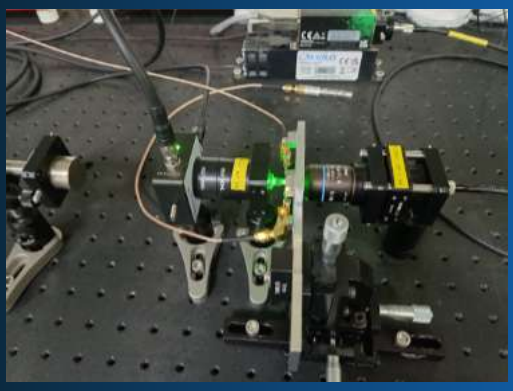
OBJECTIVES OF THE PROJECT ARE:

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

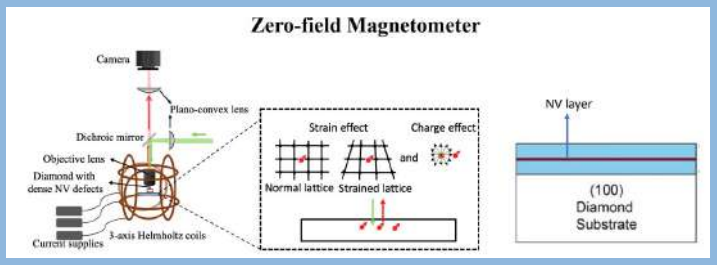
DEVELOPMENT OF HIGH-SENSITIVITY DIAMOND MAGNETOMETRY SETUP

A Compact High-Sensitivity Diamond Magnetometry setup is developed by integrating several precision optical components including plano-convex lenses, optical filters, a high-speed photodiode, and a stable laser source. This advanced setup is designed to achieve highly sensitive magnetic field measurements under ambient conditions. At present, they have successfully demonstrated sub-nanotesla sensitivity, and ongoing efforts aim to further improve the sensitivity down to a few tens of picotesla.



DIAMOND MAGNETOMETER SETUP

To enable accurate and stable detection, the control electronics utilize NI FPGA–based boards for lock-in demodulation and PID stabilization. This implementation facilitates closed-loop frequency tracking, resulting in significantly enhanced measurement stability and a wider dynamic range. As part of continued improvements, they are also working towards miniaturizing the optical sensor head and control electronics, making the entire magnetometry system portable and suitable for wider deployment.



PUBLICATION HIGHLIGHTS

1. SENSING ELECTRIC CURRENTS IN AN A-IGZO TFT-BASED CIRCUIT USING A QUANTUM DIAMOND MICROSCOPE, , HTTPS://ARXIV.ORG/ABS/2506.17742 (TO BE PUBLISHED IN ADVANCED MATERIAL TECHNOLOGIES)

2. MAGNETIC FIELD ORIENTATION DEPENDENCE OF CONTINUOUS-WAVE OPTICALLY DETECTED MAGNETIC RESONANCE WITH NITROGEN-VACANCY ENSEMBLES, HTTPS://ARXIV.ORG/ABS/2504.18478 (UNDER REVIEW)

3. QUANTUM SENSING OF MAGNETIC FIELDS WITH SPINS IN DIAMOND, (INVITED ARTICLE IN QUANTUM VIBES QUARTERLY NEWSLETTER HIGHLIGHTING THE DEVELOPMENTS HAPPENING ACROSS VARIOUS QUANTUM TECHNOLOGIES IN INDIA)

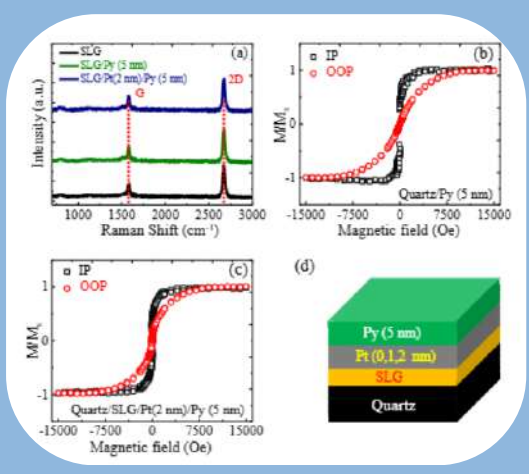
2025 HIGHLIGHT

SPIKE PROJECT

Dr. Rohit Medwal
Assistant Professor
Indian Institute of Technology Kanpur

TUNABLE CHARGE SPIN INTERCONVERSION AT QUANTUM INTERFACE

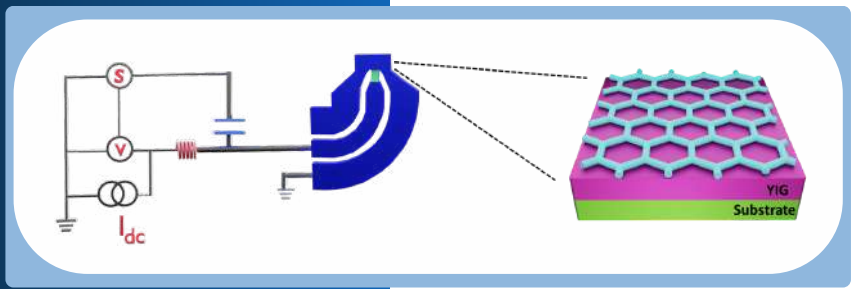
Dr. Rohit Medwal from Indian Institute of Technology Kanpur is working in the area of Quantum Materials and Devices. His project 'Tunable Charge Spin Interconversion at Quantum Interface' is one of the Spike Projects at I-HUB QTF.

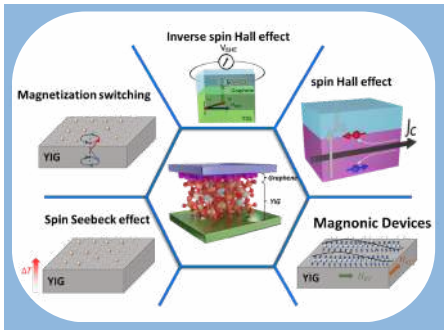


This project pertains to the realization of large spin-dependent splitting at the new quantum hetero-interface of YIG/2D materials. The first set of device prototypes have shown significant promise and is expected to yield spintronic sensors and oscillators in the next 12-18 months.

Notable 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	JNCASR
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	tifr
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	tifr
9.	Dr. Karthik V Raman	Development of cryogen-free cryostat for quantum technologies	tifr
10.	Dr. Rohit Medwal	Tunable Charge Spin Interconversion at Quantum Interface	

Events @ I-HUB QTF

2nd Industry Meet on Quantum Technology Developments and Applications

I-HUB QTF conducted a 2nd Industry Meet with members of Defence Equipment Manufacturers' Association (DEMA) on Quantum Technology Developments and Applications on 22nd August 2024. This workshop was a step forward to the previously conducted IND-eQT Workshop.

2nd Conference on Quantum Technologies using Ultra-Cold Atoms!

The second edition of the Conference on Quantum Technologies using Ultra-Cold Atoms was conducted from 23–25 September, bringing together leading experts, industry researchers, and emerging talent in the quantum field. The event featured thought-provoking talks along with innovative poster presentations by Ph.D. scholars, postdoctoral researchers, and industry professionals, creating a vibrant platform for knowledge exchange and collaboration.

We extend our sincere appreciation to the British Council for partnering with us and contributing to the impactful execution of the conference.

Hands on workshop on being Quantum Ready with NVIDIA

I-Hub Quantum Technology Foundation organized a Hands-on workshop on being Quantum Ready in the NVIDIA AI Summit 2024, held in Mumbai from 23–25 October. This was in continuation of the 'Train the Trainer Workshop' held earlier at Indian Institute of Science Education and Research (IISER), Pune. This is a major step in making India 'Quantum Ready' & driving India's tech landscape.

Introductory Workshop on Quantum Computing, Fergusson College, Pune

I-Hub Quantum Technology Foundation organized a Hands-on workshop on being Quantum Ready in the NVIDIA AI Summit 2024, held in Mumbai from 23–25 October. This was in continuation of the 'Train the Trainer Workshop' held earlier at Indian Institute of Science Education and Research (IISER), Pune. This is a major step in making India 'Quantum Ready' & driving India's tech landscape.

National Science Day at the Indian Institute of Science Education and Research (IISER), Pune

I-HUB QTF participated in the National Science Day at IISER Pune. With 2025 being the Year of 'Quantum Technology', we successfully exhibited three interactive demonstrations (Wave Particle Duality, Bloch Sphere & Quantum Dots), Our exhibit aimed to make foundational quantum concepts more accessible to students, researchers, and visitors from diverse backgrounds.

COLLABORATION-
CHALLENGE TO BE QUANTUM READY

The “Challenge to be Quantum Ready,” an initiative by I-HUB Quantum Technology Foundation, IISER Pune, in partnership with NVIDIA and supported by DST under NM-ICPS and NQM, was launched to empower quantum innovation across startups, industry, and academia. Researchers working in quantum technologies were invited to submit concise proposals describing use-cases that could be explored on an accelerated 36-qubit quantum simulator, with particular interest in hybrid applications spanning Quantum Machine Learning, Healthcare, Computational Chemistry, Optimization, Cryptography, Materials, Error Correction, GQE, and more. Participants gained the opportunity to access NVIDIA’s CUDA-Q enabled GPU infrastructure for accelerated quantum simulations.

The program received strong interest nationwide and 46 applicants were shortlisted for initial access to the simulator. Use cases covered during this initiative were computational chemistry, optimization, cryptography, financial fraud detection, and many more sectors. These impactful use-cases were deployed in a sandbox environment on NVIDIA’s quantum simulation platforms, enabling partners to refine their research and algorithm development. The initiative saw participation from prominent industry leaders such as Accenture, TCS, Mastercard, JP Morgan, and several others. We extend our sincere appreciation to DST, NM-ICPS and NQM for their continued support and guidance. This Challenge to be Quantum Ready initiative was undertaken as our nod to the International Year of Quantum Science and Technology 2025.

Visits @I-HUB QTF

As part of our ongoing efforts to strengthen quantum awareness and capacity building, I-HUB QTF regularly conducts Faculty Development Program (FDP) visits, along with curated visits for industry professionals, students, and academic faculty. These engagements provide participants with exposure to emerging research, cutting-edge infrastructure, and current developments in the rapidly evolving field of Quantum Computing.

Vivekanand Education Society's Institute of Technology (VESIT) to I-HUB QTF as part of their Faculty Development Program (FDP)- 29th March 2025

Southern Command officers visit to I-HUB QTF- 11th April 2025

Nutan College of Engineering and Research (NCER) visit to I-HUB QTF- 25th April, 2025

MGM University, Sambhajinagar (Aurangabad) visit to I-HUB QTF- 8th May 2025

IIT Tirupati Navavishkar I-Hub Foundation visit to I-HUB QTF- 6th June 2025

Dr. D. Y. Patil Institute of Technology, Pune on 27th June 2025 as part of the ongoing AICTE-sponsored ATAL Faculty Development Program (FDP) on Quantum Computing

GH Raisoni College visit at I-HUB QTF- 22nd Sept 2025

DY Patil Institute of Technology, MIT ADT University, and Modern College, Shivajinagar- 29th Sept 2025

Sponsored Events

Young Investigators Meet on Quantum Condensed Matter Theory (YIMQCMT) 2024

YIMQCMT serves as a platform to bring together young theorists from across India, fostering collaboration and discussions in various subfields of Quantum materials. I-HUB QTF was one of the sponsors' for meet which was held on 16th to 18th December 2024

QUANTUM
Seminar Series

How easy (/hard) is it to get good quantum error correcting codes? by Dr. Upendra Kapshikar, Centre for Quantum Technologies, National University of Singapore- 9th Sept 2024

Academic Research on Global Challenges by Prof. T. Venkatesan, Center for Quantum Research and Technology, University of Oklahoma- 15th Nov 2024

Exotic Synchronisation of Time Crystals Outside Symmetric Subspaces by Dr. Sai Vinjanampathy, Indian Institute of Technology- 19th Nov 2024

Exciting Moiré Materials for Quantum Light and Matter by Prof. Ajit Srivastava, Emory University, USA, VAIBHAV Fellow- 08th Dec 2024

Exploring Exchange Bias Through High-Pressure Synthesis of Double Perovskites by Prof. Kazunari Yamaura, Group Leader, Quantum Solid State Materials Group, MANA, NIMS, Tsukuba, Japan- 15th Jan 2025

Advances in Magnetic Hard-Disk Drive Technology by Stephanie Hernandez, Sr. Engineering Director, Seagate Technology- 23rd Jan 2024 27th

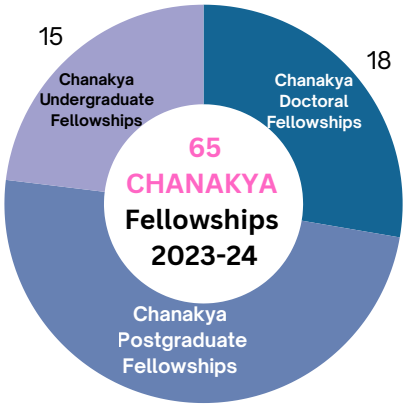
Understanding quantum advantage in machine learning by Prof. Apoorva Patel,Centre for High Energy Physics, Indian Institute of Science, Bangalore- 27th Feb 2025

Materials and Processes for Complex Microsystems on Silicon by Prof. T. Venkatesan, University of Oklahoma, Center for Quantum Research and Technology- 18th Mar 2025

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

@ I-HUB QTF



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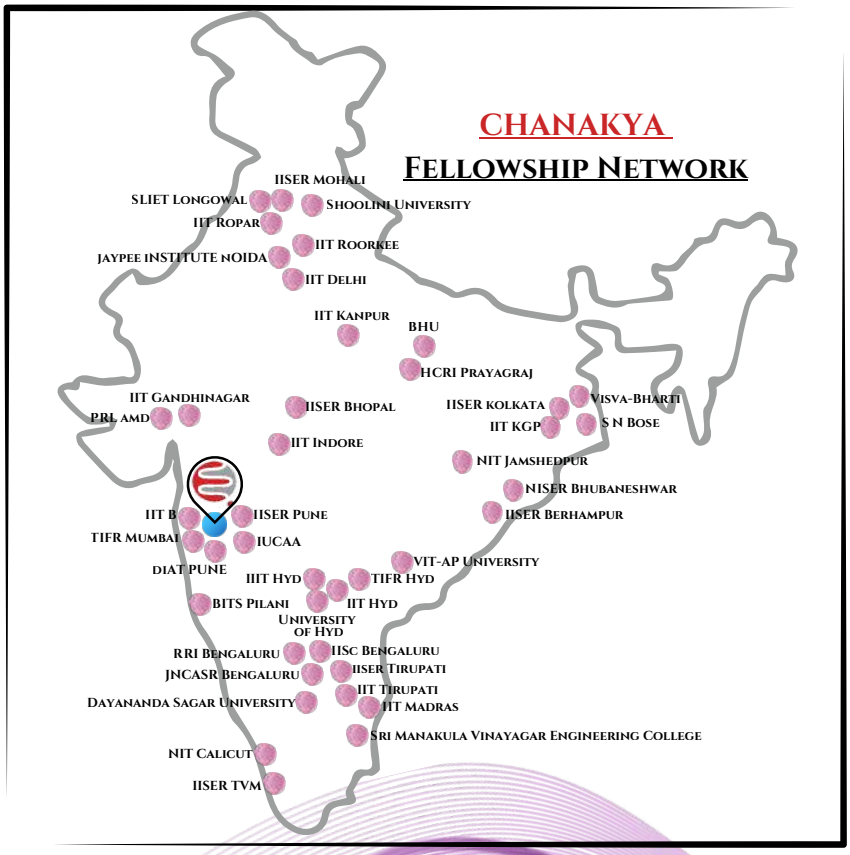

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We are extremely happy to extend our Chanakya Fellowship network to **45 institutes.** Currently, I-HUB QTF is offering fellowships to Undergraduate, Postgraduate, Doctoral and Post Doctoral Fellows, in the areas of Quantum Computing, Quantum Devices, Quantum Materials and Quantum Communication.

Chanakya Undergraduate Fellowships 2024-25

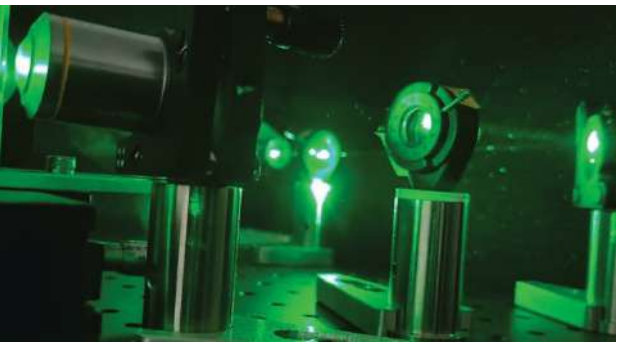
Chanakya fellow	Mentor	Project Title	Institute
Aboli Anil Giri	Nivedita Daimiwal	Development of low-cost spin coater	MKSSS'S Cummins College of Engineering for Women Pune
Siddhi Dahiwale	Nivedita Daimiwal	Development of low-cost spin coater	MKSSS'S Cummins College of Engineering for Women Pune
Aditi Ghorpade	Nivedita Daimiwal	Development of low-cost spin coater	MKSSS'S Cummins College of Engineering for Women Pune
Tania Rai	Atul Joshi	Design and Development of a Programmable Power Supply for Piezoelectric Actuators	MKSSS'S Cummins College of Engineering for Women Pune
Radhika Patwe	Atul Joshi	Design and Development of a Programmable Power Supply for Piezoelectric Actuators	MKSSS'S Cummins College of Engineering for Women Pune
Mrudula Kinkar	Atul Joshi	Design and Development of a Programmable Power Supply for Piezoelectric Actuators	MKSSS'S Cummins College of Engineering for Women Pune
Trivijay Jawale	Sachin Sakhare	Design and Development of High Precision Temperature Controller for Diode Laser	VIIT Pune
Shravani Kulkarni	Meenal Deshmukh	Development of Arbitrary Wave Form Generator for Acousto-optic Deflectors	VIIT Pune
Nisarg Jagad	Meenal Deshmukh	Development of Arbitrary Wave Form Generator for Acousto-optic Deflectors	VIIT Pune
Venu Jangam	Subhadeep De	Identifying suitable designs for compact Optical Resonators through Finite Element Analysis	IUCAA Pune
Sumit Ghosh	Subhadeep De	Development of a Highly Stable Frequency Synthesizer for Precision Quantum Measurements	IUCAA Pune
Aarya Kulkarni	V N More	Age Prediction using Quantum Machine Learning	COEP Technological University, Pune
Aditya Bhalerao	V N More	Magneto-optic devices based on functional oxides encapsulated inside carbon nanotubes	COEP Technological University, Pune
Pranav Gandhi	D V Niture	Understanding of the quantum effects for information storage and processing in DNAs using nanopore sensors with electric current	COEP Technological University, Pune

Startups at I-HUB QTF

QNu Labs

QNu Labs, a Bengaluru based deep-tech startup, is India's pioneer in quantum safe security solutions. They have developed the India's first end-to-end quantum safe heterogeneous network featuring Free-Space QKD (up to 500 km), FIPS-compliant QHSMs, ETSI-compliant QKD controllers, and indigenous single-photon detectors and 10G link encryptors. Their in house team builds patented products across QKD, QRNG, PQC, QVPN, QVerse, and Entropy as a Service. Trusted by the Indian Army, Navy, major corporates, and top research institutions, QNu Labs is reshaping the cryptography landscape with cutting-edge, future-proof quantum security technologies.

PRENISHQ

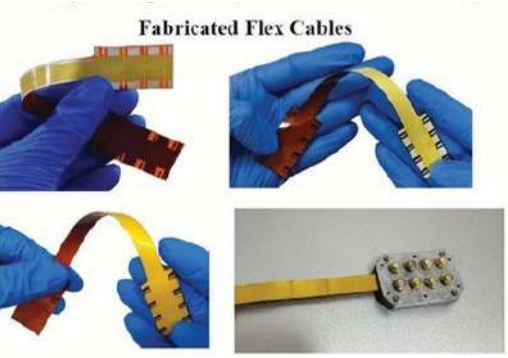


PrenishQ Pvt. Ltd., an IIT Delhi spin-off has developed India's first indigenous high-precision, compact, and tunable diode laser system, marking a major step toward self-reliance in quantum-grade instrumentation. Designed to be robust, affordable, and highly stable, these lasers cover a wide wavelength range and support diverse quantum platforms including atoms, ions, photons, and diamond-based systems. Their precision and reliability make them essential for Raman spectroscopy, optical tweezers, particle analysis, quantum sensing, secure communication, precision metrology, and next generation atomic clocks, significantly strengthening India's photonics and quantum technology ecosystem.

QpiAI India

QpiAI India Pvt. Ltd. is advancing India's quantum ecosystem with its 64-qubit full-stack superconducting quantum computer named Kaveri 64, scalable to 1,000+ qubits and available via cloud-based QCaaS. The company has demonstrated 3D-stacked qubit technology and develops proprietary QpiAI Qubits across both NISQ and fault tolerant architectures. Their transmon qubits use surface-code stabilization, while FTQC qubits employ innovative Q-LDPC error-correcting codes for higher reliability. With a roadmap extending toward CMOS-based spin qubits, QpiAI is building scalable quantum processors engineered for real-world performance.

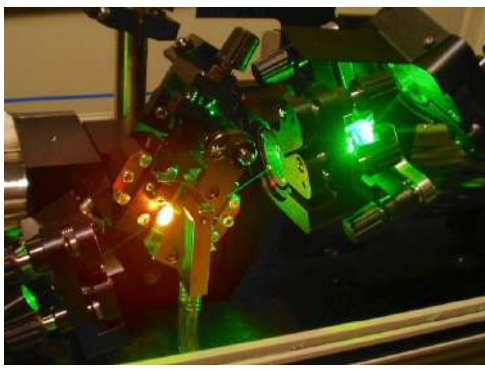
Dimira Technologies



Dimira Technologies Pvt. Ltd., an IIT Bombay–incubated startup, is developing indigenous cryogenic RF cables designed specifically for quantum computers and other advanced cryogenic applications. Their superconducting flexible I/O strips offer ultra-high density signal routing, compatibility with high density shielded connectors, lower thermal load, and significantly reduced cost compared to traditional coaxial assemblies. By adopting printing-based manufacturing, Dimira enables scalable, high volume production at competitive prices. Recognized under the National Quantum Mission, the company is advancing India's capability in critical quantum hardware infrastructure.

QuPrayog

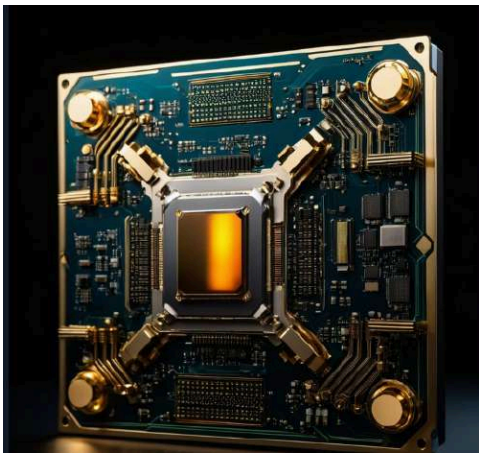
QuPrayog Pvt. Ltd. is developing advanced optical atomic clocks and cutting-edge photonics technologies, including titanium–sapphire lasers and optical frequency combs for ultraprecise measurement and timekeeping. Their Ti:Sapphire lasers provide femtosecond pulses with wide tunability for applications in ultrafast science, imaging, and micro/nanofabrication, while their optical frequency combs support high precision spectroscopy, metrology, and next-generation timing systems. QuPrayog is also working toward a portable optical atomic clock that offers an order-of-magnitude improvement over traditional RF clocks, enabling breakthroughs in navigation, fundamental physics, and precision instrumentation for both research and industry.



Quanastra

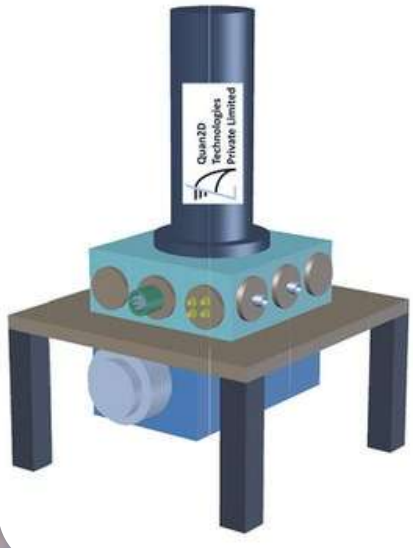
QUANASTRA
QUANTUM INNOVATIONS

Quanastra Pvt. Ltd. is a leading innovator in custom cryogenics and advanced superconducting detectors, delivering high-performance SNSPDs that operate from the deep UV (<200 nm) to the mid-IR (up to 5 μm). The company builds compact, customizable cryogenic systems and plug-and-play single-photon detection solutions that support quantum communication, computing, and imaging. With expertise in thin-film optics, superconducting nanowires, and cryoelectronics, Quanastra provides scalable systems from tabletop units to multi channel rack mounted platforms, tailored to research and industrial needs. Dedicated to advancing quantum and photonics technologies, Quanastra equips scientists and engineers with the precision tools required to push the frontiers of next-generation innovation.



Quan2D Technologes

Quan2D Technologies Pvt. Ltd.



Quan2D Technologies Pvt. Ltd. is advancing India's quantum and nanomaterials ecosystem through the development of indigenously built, cost-effective single-photon detectors and high-efficiency electro-optical sensors. Leveraging patented technologies in nanomaterial synthesis, the company manufactures pristine 2D materials, application specific composites, and smart coatings, while also building specialized instrumentation for industrial-scale production. Their work includes the development of superconducting nanowire single-photon detectors (SNSPDs), which offer exceptional detection efficiency, ultrafast response, extremely low jitter, and negligible dark counts, making them ideal for quantum communication, sensing, astronomy, and advanced optics. With strong expertise in quantum technology and nanotechnology, Quan2D provides customized technical solutions and collaborates with large scale industries to deploy innovative 2D-material based technologies for real world applications.

Shared Facilities

I-Hub Quantum Technology Foundation offers access to shared experimental and computational facilities. These facilities are open to researchers, startups, industry partners, and academic institutions.

Requests for facility usage, software access, and technical support are welcomed from all users. Access is provided subject to availability and relevance.

The shared infrastructure supports research and development in quantum computing, quantum sensing, quantum communication, and quantum materials.

Through this initiative, iHub Quantum aims to enable collaboration, optimize resource utilization, and strengthen India's National Quantum Mission ecosystem.

MENTORSHIP PROGRAM IN COLLABORATION WITH WADHWANI FOUNDATION

I-HUB Quantum Technology Foundation announced the launch of its mentorship program in collaboration with the Wadhwani Foundation, creating a valuable opportunity for early-stage quantum startups to strengthen their business strategy, market positioning, and investor readiness. The program, which has supported over 4,000 startups across India, selected QUPRAYOG, QUANASTRA, QUDYCO, and QUAN2D Technology under its Liftoff Program. Additional startups chosen for the Accelerate Program included QNu Labs, QpiAI, amPICQ Pvt. Ltd., and FORTYTWO Labs.

Through the Wadhwani Accelerate Program, participating startups gained access to leadership development tools, guidance from dedicated venture partners, curated capital connections, global expert insights, market access opportunities, and a strong peer support network.

I-HUB QUANTUM TECHNOLOGY FOUNDATION

Shared Facilities & Services

I-HUB Quantum Technology Foundation continued to expand its Shared Facilities and Services through the Common Facilities Lab. It offers high quality, customizable, and competitively priced technology solutions to its stakeholders. The Electronics Services unit provided PCB design support. This includes impedance controlled, multi-layer boards and PCB based antennas along with PCB manufacturing (up to 2 layers) and full prototyping and system development covering both firmware and software. The Mechanical Services team supports product design and iterative development, CAD modeling and drafting, manufacturing consultation, and end-to-end 3D printing services from design to post-processing. Additionally, the facility offered specialized equipment and two dedicated test benches to support comprehensive testing and development needs.

FDM 3D Printer- BambuLabs P1S Combo with Filament Dryer

Digital Storage Oscilloscope- Keysight EXR404A

SLA 3D Printer- FormLabs Form 4 with Washing and Curing unit

Workstation- HP Z2 G9 Tower

Portable Digital Microscope- Dino-Lite AM8917MZT

USB Oscilloscope- Digilent Analog Discovery Pro 3000

QUANTUM EDUCATION

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.

Website link- http://scicomsoftware.com/

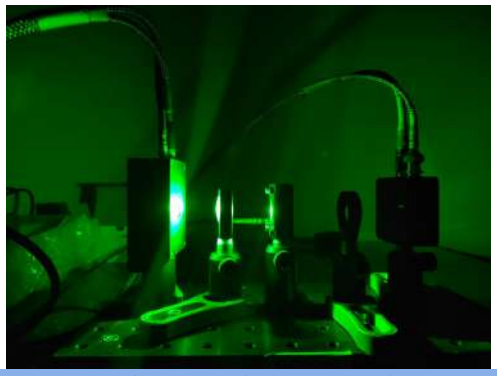
IISER is building a 20-qubit quantum computer using trapped ions arranged in a line or a small 2-D grid. Each ion needs to be hit with a tiny laser beam without disturbing the others. To point the laser to the correct ion very quickly and accurately, the system uses a device called an Acousto-Optic Deflector (AOD), which changes the direction of the laser based on special electronic signals. To generate these signals, I-HUB has created a custom arbitrary waveform generator (AWG). In simple terms, this AWG works like a highly precise "laser steering controller," creating the exact patterns needed to direct the laser to any ion on demand. This helps the quantum computer control each ion reliably and at high speed.

Supported Features of AWG:

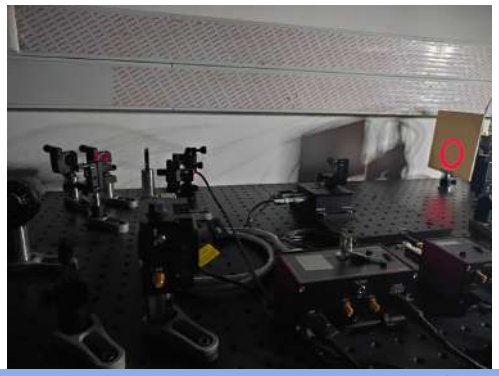
- Pulse Sequence Generation(with 2ns precision)
- Arbitrary Waveform Generation(100MHz bandwidth)
- Rearrangement of Atoms or Ions (Optical Tweezers)
- Ion Addressing (Coherent Manipulation)
- Multitone DDS (20 tones/channel)

QUANTUM EDUCATION

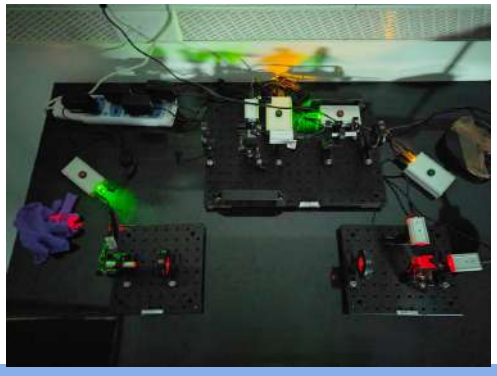
With the launch of the National Quantum Mission, there is a pressing need for a skilled workforce in Quantum Technologies. With this goal in mind, new Masters programme in Quantum Technology was launched in 2024. This two-year programme will equip students with the skills to work in Quantum Technology. The course includes a Quantum Lab which was funded by I-HUB QTF. Various experiments in Nuclear Magnetic Resonance, Quantum cryptography, Quantum Sensisng, Quantum Computing and Quantum Optics are included in the lab course.



Quantum sensing. A highly precise quantum sensor based on Nitrogen-Vacancy defect centers in diamond.



Quantum optics setup for establishing single photon sources, differentiating between classical and non-classical light sources, and testing single-photon interference.



Quantum communication analogy kit. To understand quantum communication through the BB84 protocol, which is provably secure against any eavesdropping.

NMR quantum computer. A table-top NMR quantum computer to test, develop, and prototype small-scale quantum algorithms.

CSR

At I-HUB QTF

QUANTUM INFRASTRUCTURE AND INCUBATOR

The global quantum revolution is gaining momentum, and India is well-positioned to accelerate its progress in Quantum Technologies. While the government continues to build essential infrastructure and launch visionary initiatives, the role of private enterprise remains crucial. Through collaboration, we can create a dedicated quantum technology infrastructure that empowers the Indian scientific community and drives meaningful innovation.

I-HUB Quantum Technology Foundation is committed to strengthening India's quantum ecosystem through a comprehensive suite of initiatives. Its incubation facilities empower quantum-based startups by providing advanced infrastructure and a collaborative innovation space essential for product development. State-of-the-art teaching and outreach labs enrich learning by offering hands-on exposure, nurturing curiosity, and elevating the quality of education and research. The envisioned Quantum Computing Lab aims to democratize access to both physical and cloud-based quantum computers, supporting researchers and contributing to a rapidly expanding global market. Additionally, investments in advanced quantum equipment will ensure that India remains at the forefront of cutting-edge research, enabling present advancements while setting the stage for future breakthroughs.

Women in Quantum

In India, only 14% of STEM professionals are women, trailing behind the global average of 28.4%. Moreover, a mere 15% of physics researchers in India are women, with an even more dismal 10% representation in senior faculty positions.

This gender gap is not just a statistical concern; it is a missed opportunity for innovation and economic growth. Imagine the transformative impact of a diverse quantum workforce on India's GDP – estimated to surge by $770 billion by 2025.

To improve this situation we need your support. Studies reveal that female researchers in India receive far less funding compared to their male counterparts. Even according to our internal figures, the percentage of women who are being hired or getting funded in the Quantum Technology domain stands at around 20%.

We invite you to be the driving force behind our transformative initiative, breaking the quantum ceiling and propelling India into an era where innovation transcends gender barriers.

QWISE Startups (Quantum Women in Scientific Entrepreneurship)

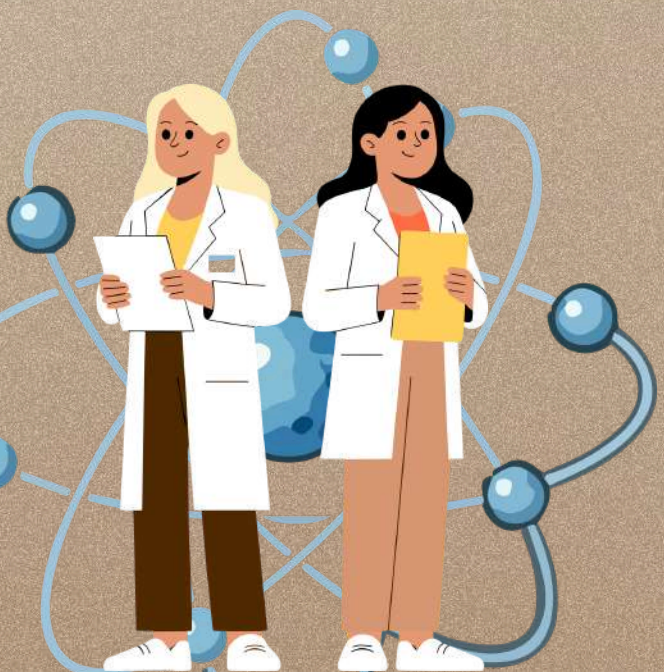
Budding Women Entrepreneurs and Start-ups working in Development of Quantum Technologies

WIDYA-QT Fellowships (Women in Deep-Tech to Yield Advancement in Quantum Technologies)

- Post Doctoral Fellows (2 yrs)
- Quantum Research Fellows (1-2 yrs)

Quantum Project Scientists (1 yr)

Women project scientists conducting research in the Quantum Technology domain.
Age 27-57
Also open for women who have taken career gap.



OUTREACH & TRAINING PROGRAMS

The rapidly expanding field of quantum technology is reaching an exciting inflection point, holding the promise to transform computing, materials science, communication, and a host of emerging domains. However, unlocking this potential requires more than cutting-edge research, it calls for a dedicated ecosystem that cultivates skilled talent, encourages knowledge exchange, and bridges the gap between academia, industry, and aspiring learners. To meet this need, we offer a thoughtfully designed lineup of workshops, seminars, and outreach initiatives that play a vital role in strengthening India's quantum-ready workforce and fostering meaningful collaboration. At I-HUB Quantum Technology Foundation, we run a wide spectrum of programs, from skill building modules and hands-on workshops to large scale outreach events, all aimed at educating, inspiring, and expanding awareness about the transformative world of Quantum Technologies.

Quantum Fellowships

Quantum technology is poised to unlock transformative advances across sectors such as pharmaceuticals, materials science, finance, and artificial intelligence. Realizing this potential, however, depends on empowering the next generation of innovators who will drive these breakthroughs. Fellowships play an essential role in this journey by enabling young researchers to work closely with leading experts, fostering rich collaborations, and encouraging cross-disciplinary exchange that often leads to unexpected scientific progress. With industries projected to gain up to $1.3 trillion in economic value from early quantum computing applications by 2035, the demand for skilled quantum professionals is set to surge. Programs like the Chanakya Fellowship at I-HUB Quantum Technology Foundation are designed to inspire, support, and accelerate the growth of emerging quantum talent, ensuring a strong pipeline of contributors to India's quantum future.

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