DRDO Young Scientist Laboratory
Quantum Technology

DYSL QT

About the Lab

Quantum Technology is based on laws of Quantum Mechanics, and works at atomic and sub-atomic level. This technology is expected to revolutionise the field of computing, communication and sensing. With well-established theoretical base, quantum technology is ready to be used for development of secure communication networks, exponentially faster computation and highly accurate and sensitive sensors. Applicability of the quantum technology holds a tremendous importance for military and national security. Taking that into consideration, DRDO would like to be at the forefront of the development of this technology.

DRDO Young Scientist Laboratory for Quantum Technologies (DYSL-QT), Pune has been established to forward the cause of Quantum Computing, Quantum Communication and Quantum Sensing technologies for various applications in India. We intend to herald the country in the current and upcoming domain of quantum technologies and associated technology frontiers.

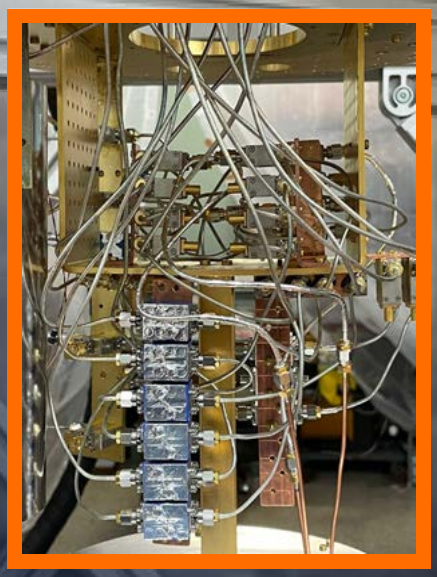
The young scientists of this laboratory are currently doing extensive research and development in the quantum computing systems, quantum random number generators, Quantum communication systems and exploring quantum sensing technologies.

Product / Technology
Achievement

Quantum Random
Number Generator (QRNG)

Random numbers have essential roles in many fields, such as Quantum Communication, cryptography, scientific simulations, lotteries and fundamental science experiments. The generation of genuine randomness is generally considered impossible with only classical means. Harnessing the inherent randomness of Quantum Mechanics can provide true random numbers and thus is the preferred than any other deterministic devices.

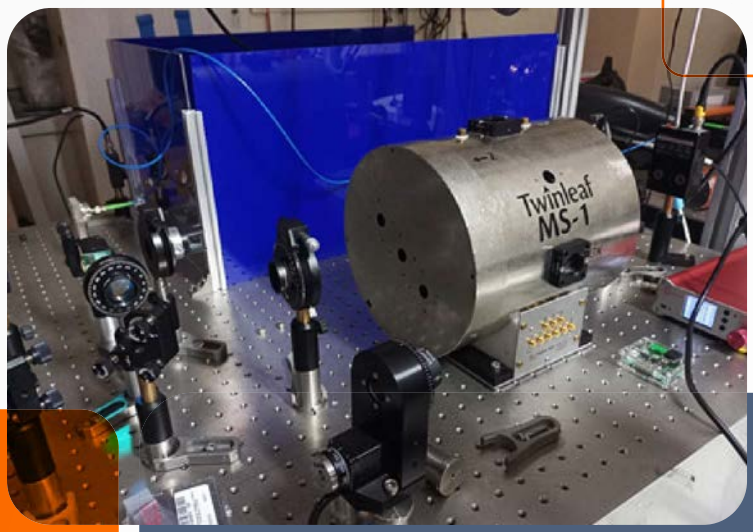
DYSL-QT, DRDO has developed a Quantum Random Number Generator (QRNG) which detects random quantum events and converts those into a stream of binary digits. The Laboratory has developed a fiber-optic branch path based QRNG to ensure compact design and ease of portability.



7-Qubit Superconducting Quantum Computer (SQC):

DYSL-QT is spearheading the development of India's first 7-qubit quantum computer, offering cloud accessibility to all. This groundbreaking technology offers a range of opportunities for organizations and individuals to explore the world of quantum computing and programming. In addition, DYSL-QT is providing open-source control hardware for quantum computers, eliminating the need for extensive electronics and radio frequency interface design. This approach allows researchers to concentrate on advancing their understanding of physics and minimize distractions from electronics and RF technology.

Atomic Magnetometer with femto-Tesla sensitivity



A room temperature vapour of alkali atoms like Rb can be spin polarized by optically pumping them to an electronic state with specific spin using a circularly polarized light to excite the atoms. The atoms evolve in the presence of local magnetic fields and are then probed using resonant light. The probe absorption or polarization rotation is a sensitive measure of the local magnetic field. Optical magnetometers have achieved sensitivities in the sub fT/√ Hz regime using various techniques that involve, high temperature operation, multiple laser beams, amplitude/frequency modulation techniques.

A femto-Tesla magnetometer will find application in areas ranging from geophysical to space exploration. International status Sensing very low magnetic fields is a prerequisite for a wide range of experiments from fundamental physics tests to biomedical detection applications like magneto cardiography.

Super-conducting Quantum Interference Devices (SQUID) have been the popular choice for many of these due to the sensitivity requirements. Recent developments in the field of nonlinear magneto-optic rotation in alkali vapours have made it possible to achieve sensitivities comparable to SQUIDs in atomic systems, with no requirement of cryogenics. Our aim is to develop a Rb vapour based atomic magnetometer for detecting femto-Tesla fields.

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