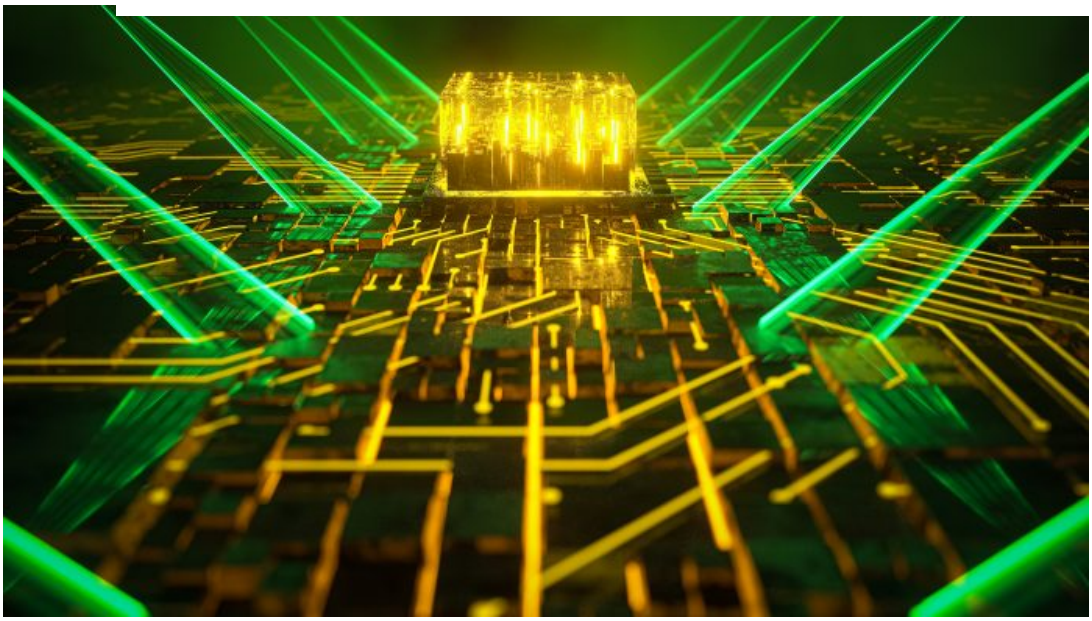

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NTU Singapore has officially launched the Quantum Science and Engineering Centre to facilitate the development of quantum-based chip technologies.

Nanyang Technological University, Singapore (**NTU Singapore**) has now unveiled the Quantum Science and Engineering Centre (QSec). The objective of the centre is to enable the development of devices and technologies powered by quantum science, such as quantum-based chip technologies.

The centre is the first of its kind in Singapore and will carry out research on developing and building quantum chips utilising semiconductor fabrication technologies. These chips are the cornerstone of quantum devices like quantum chip processors, networks, and sensors. They hold crucial functions in many a range of areas, including quantum computing, communication, cryptography, cybersecurity, and sensor technology.

Developing quantum technologies

Education said: "Qu investme remains started c competit translate the technology into real-world applications. We look forward to the Quantum Science and Engineering Centre's (QSec) contributions to Singapore's efforts in advancing quantum technologies, especially in the development of quantum computing chips and quantum communications."

NTU President Professor Subra Suresh added: "The Quantum Science and Engineering Centre (QSec) aims to conduct groundbreaking research in several areas: quantum key distribution chips, quantum computation, quantum and classical neural network, cluster state computation and quantum sensing. NTU's focus in these areas is part of our strategy to be a key enabler in the development of quantum science technologies to support Singapore's efforts in quantum engineering for the benefit of industry and society."

International collaboration in quantum technology

Centre co-director Professor Liu Ai Qun from NTU's School of Electrical and Electronic Engineering said: "The Quantum Science and Engineering Centre (QSec) aims to not only take up a key role in supporting the local quantum industry, but to also build up strong international collaboration in quantum technologies which will benefit Singapore."

Fellow centre co-director Dr Kwek Leong Chuan, a principal investigator at the Centre for Quantum Technologies (CQT) hosted at the National University of Singapore, concluded: "The Centre hopes to enhance Singapore's impact on quantum science, engineering, and technologies by leveraging on our capability in chip-based devices. We are also hoping to train and enthuse more engineers and secondary school students in this emerging direction."

Light-based quantum chips

One of QSec's core research interests is the creation of a quantum computing chip capable of undertaking quantum calculations by utilising an integrated

photonic wafer.

Quantum computati compute

either ones or zeros. In contrast, quantum processors use quantum bits, or qubits, which can occur in quantum states where they represent both one and zero at the same time. This enables qubits to encode far more information than binary bits.

Secure communications

Another area of interest at the centre is securing communications with quantum cryptology. As cyberattacks become more complex and hacking tools become more powerful, quantum cryptography presents an alternative to safeguard information from future **cyber-attacks** and unforeseen technological advances.

The most prominent application of quantum cryptography so far developed is quantum key distribution (QKD), a method that permits two remote users — who are embedded in an untrusted network such as the Internet — to exchange secret keys in the presence of an attacker who may own unlimited computing resources.

By taking advantage of the sensitivity of quantum signals, QKD chips can identify when an attacker tries to spy on communication. The secret keys, which are communicated as a series of quantum signals, become disturbed and will scatter if an attacker intercepts them, making them ineffective.

QSec researchers have been able to develop a quantum communication chip small enough to fit into everyday devices such as laptops or smartphones, which could lead to highly secure, encrypted communication.