Joint CQSE & NCTS Online Seminar

2021
Oct. 15, Friday

TIME Oct. 15, 2021, 2:30~3:30pm
TITLE Integrated Photonic Quantum Chip Technology for Computing
SPEAKER Prof. Yen-Hung Chen
Dept. of Optics and Photonics, National Central University
PLACE Rm104, Chin-Pao Yang Lecture Hall,
CCMS & New Physics Building, NTU

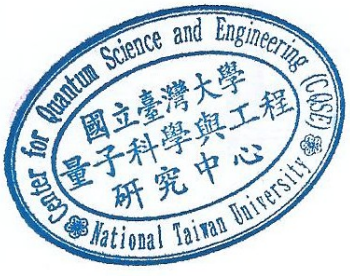
Abstract:

Quantum photonics has progressed rapidly and becomes a rising technology for realizing many quantum devices and systems advantageous for, e.g., sensing, communications, information processing, and computing applications. Compared to the mature development in information and communication technology with classical bits, through quantum superposition and quantum entanglement, quantum computers have provided a huge quantum parallelism, resulting in solving problems in an ultra-fast speed beyond the computation power of today's supercomputers. An important example is the most recent demonstrated quantum computational advantage using photons in performing the Boson sampling with the machine "*Jiuzhang*". A quantum bit (qubit) is the basic unit of quantum information used in quantum computing, playing a role like a classical binary bit in conventional computers but endowed with a super property by nature that allows the unit to be in a coherent superposition of the associated two (quantum) states simultaneously. In contrast to various qubits such as those from ion-trap and superconducting technologies, optical or photonic qubits are featured by many unique advantages, including workable at room temperature, compatible with CMOS, fiber-optic, and integrated-optic technologies, free from vacuum and magnetic systems, and scalable using such as multiplexing technology. These important features have led to abundant industrial and academic developments in integrated photonic quantum science and technology and have clearly manifested that photonic qubits are becoming a favorable and promising solution for quantum computing.

In this study, we integrate our expertise on the technologies of photonic qubits (single photon, heralded single photon, and squeezed light), silicon/$LiNbO_3$ photonics, single-photon detectors, leading-edge diode pump lasers, and quantum codes to realize scalable silicon-based quantum chips with the ability to perform fault-tolerant quantum computation at room temperature. In this talk, I will focus on our recent demonstration of Taiwan's first integrated quantum photonic chip realized with a highly integrated heralded single-photon source and a 2 qubits CNOT gate designed for the future measurement-based computing.

Biography Brief:

Dr. Yen-Hung Chen is currently a professor with the Department of Optics and Photonics, National Central University, Taiwan. His research interests are in the area of nonlinear optics, integrated waveguide laser and photonic devices, integrated quantum photonic sources and circuits/devices, integrated microchip solid-state lasers, and quasi-phase-matching technology.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