SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
Faculty of Engineering
Website: https://www.eng.nus.edu.sg/ece/

Area: Microelectronic Technologies & Devices

Host: Assoc Prof Aaron Danner

TOPIC	**:**	**Ultrafast mode-locking and high-dimensional entanglement in mesoscale frequency combs**
SPEAKER	**:**	**Chee Wei Wong, Tannas Professor of Engineering** **Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory** **University of California, Los Angeles** **Globalfoundries Visiting Prof with ECE NUS**
DATE	**:**	**8 August 2019, Thursday**
TIME	**:**	**11am to 12pm**
VENUE	**:**	**E5-02-32, Engineering Block E5, Faculty of Engineering, NUS**

ABSTRACT

Recent advances in sub-wavelength nanoscale platforms have afforded the control of light from first principles, with impact to ultrafast sciences, optoelectronics and precision measurements. In this talk I will highlight two examples where emerging micro-scale architectures can make a difference. First, I will describe recent advances in chip-scale Kerr frequency comb oscillators, where we have achieved sub-100-fs pulse mode-locking, one of the shortest pulse Kerr comb to date. Coherent mode-locking is observed in the normal dispersion regime, verified by phase-resolved ultrafast spectroscopy at sub-100-attojoule sensitivities. Soliton mode-locking and crystals, graphene-controlled optical frequency combs, and coherent THz sources will be discussed.

Second, I will describe our studies on quantum entanglement for dense secure communications, based on high-dimensional biphoton frequency combs. Working with time-and frequency-bins, we demonstrate quantum revival of Hong-Ou-Mandel second-order correlation of the qubits. Long postulated by theorists more than a decade ago, we experimentally demonstrate up to 19 dimensions and with visibilities up to 96.5%. The phase-locked high-dimensional qudit state is further witnessed through two non-local stabilized interferometers – in a Franson-type configuration – as a generalized Bell's inequality test of hyperentanglement through multiple degrees-of-freedom. Entanglement revivals of the non-local interference at discrete time-bins are uncovered for the first time, up to 97.8% visibility, as a fundamental resource for dense secure information processing.

BIOGRAPHY

Chee Wei Wong examines precision, quantum, and ultrafast optical measurements in mesoscopic systems. Prof. Wong currently serves as the Tannas Professor of Engineering at the University of California at Los Angeles since 2014 and, prior to that, a tenured faculty member at Columbia University. He is elected a Fellow of multiple societies, and is recipient of NIH Trailblazer Award, DARPA Young Faculty Award, NSF CAREER Award, Google Faculty Award and 3M Faculty Award among others. He received the Doctorate of Science in 2003 and the Masters of Science in 2001, both from the Massachusetts Institute of Technology. From 1996 to 1999, he completed his double degree, B.Sc. with highest distinction and B.A. with highest distinction, both from the University of California at Berkeley.

BIOGRAPHY

His work has appeared in more than 330 journals and conferences, including *Nature*, *Science Advances*, *Physical Review Letters*, *Nature Physics*, *Nature Photonics*, *Nature Communications*, *Nature - Light: Science & Applications* series amongst others. He delivered 110+ plenary and invited talks at universities and industry, published 4 book chapters, and has been awarded 19 patents and 13 provisional patents. He is currently working with 20 research scientists and PhD students, and has supervised 38 research scientists and PhD students, more than half are now in their own professorships including full professors at world-leading institutions. He has sat on 80 PhD thesis committees. In his spare time, he enjoys playing the piano, running and snowboarding.

He is Globalfoundries Visiting Prof with ECE NUS also.

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