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Semiconductor Laser Dynamics For High-Speed Random Signal Generation

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Venue: Room **G6302,** City University of Hong Kong
Reception starts at 4:15pm
(Language: **English**)

Abstract

From a dynamical viewpoint, semiconductor lasers are interesting optoelectronic devices with rich nonlinearities that originate from the intracavity gain. A laser can be perturbed into a range of interesting nonlinear dynamics such as injection-locking, periodic oscillations, quasi-periodic oscillations, and chaos. These dynamics typically span the microwave frequency range, leading to various applications of the lasers as photonic microwave signal sources. This talk will summarize some recent developments in the applications of these nonlinear dynamics as exemplified by the so-called period-one (P1) state and chaotic state. In P1 states, the laser can be applied for radio-over-fiber communication as a photonic microwave oscillation with high frequency-stability, optical controllability, and wide frequency-tunability. In chaotic states, the laser can be applied for random bit generation in cryptography with minimal electronics at bit rates exceeding 0.2 Tbps. Specifically, we developed a scheme employing a fiber Bragg grating (FBG) for a simple and high-quality generation of random bits. Issues related to the entropy associated with the laser dynamics as well as the suppression of undesirable time-delay signatures will also be discussed.

About the Speaker

Nelson Sze-Chun Chan received the B.Eng. degree in electrical and electronic engineering from the University of Hong Kong in 2001, and the M.S. and Ph.D. degrees in electrical engineering from the University of California at Los Angeles (UCLA) in 2004 and 2007, respectively. He is currently an Associate Professor in the Department of Electronic Engineering at the City University of Hong Kong. His research interests include nonlinear dynamics of semiconductor lasers, optical chaos generation, radio-over-fiber, and photonic microwave generation.