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THE CHINESE UNIVERSITY OF HONG KONG
Department of Information Engineering and
Centre for Advanced Research in Photonics

Seminar

Nonlinear Fiber Optics & Fiber Optical Parametric Amplifiers

by

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Date : 3 March, 2011 (Thur.)
Time : 2:30-3:30pm
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The Chinese University of Hong Kong

Abstract
One of the most promising techniques in fiber optical communication is wavelength division multiplexing (WDM). By fully utilizing the large available low-loss (0.2 – 0.4 dB/km) transmission bandwidth (~300nm), a single fiber can potentially support tens of terabit per second of transmission over thousands of kilometers, to meet the exponentially growing capacity demand. One of the key components for deploying WDM systems is the optical amplifier. However, the conventional erbium-doped fiber amplifier (EDFA) is limited by its bandwidth (~1530 – 1610nm). Thus, alternative types of optical amplifiers are investigated, and the fiber optical parametric amplifier (OPA) is definitely one of the most promising technologies.

A fiber OPA relies on the third-order nonlinear susceptibility $\chi(3)$ of glass: a signal frequency at ωs will be amplified by a strong co-propagating pump at ωp in a fiber through this parametric process. Therefore, OPA may find applications as optical amplifiers in WDM transmission. Another frequency, called idler, will also be generated at $\omega i = 2\omega p - \omega s$. This contains essentially the same modulation information as the input signal, but with an inverted spectrum. This phase-conjugated idler can be used not only for wavelength conversion in WDM networks, but also for mid-span spectral inversion (MSSI) which can combat fiber dispersion, and even some of the detrimental fiber nonlinearities such as self-phase modulation (SPM) or cross-phase modulation (XPM). In order to deploy OPA in MSSI, the idler generated must not be spectrally broadened, which is common in one-pump OPA configuration.

OPAs have sufficient performance to be of interest as amplifiers in optical fiber communication systems. In this presentation, we will start from some basic nonlinear optics and then go through few most recent development such as: (1) simultaneous all-optical inverted and non-inverted wavelength conversion; (2) all-optical wavelength conversion and multicasting; (3) reduction of WDM signal crosstalk in fiber OPA; (4) high-performance OPA with wide-bandwidth and large signal gain.

Biography
Dr. Kenneth Kin-Yip Wong received combined B.E. (1st class honor with medal award) degree in electrical engineering and B. S. degree in physics from the University of Queensland, Brisbane, Australia, in 1997. He received the M.S. degree in 1998 and the Ph.D. degree in 2003, both in electrical engineering at Stanford University. He was a member of the Photonics and Networking Research Laboratory at Stanford University. His research field included DWDM systems, SCM optical systems, fiber nonlinearity, fiber optical parametric amplifiers, and photonic crystal fibers. He is author or coauthor of over 150 journal and conference papers. He worked in Hewlett-Packard Laboratories as research engineer and contributed in projects included parallel optics and VCSEL in 1998-99. He also worked as independent consultant in Innovation CORE (A Sumitomo Electric Company), CA, in 2004.

He was the recipient of OSA New Focus Student Award and IEEE/LEOS Graduate Student Fellowship, both in 2003. He is the reviewer for Optics Letters, JOSA B, Optics Express, IEEE Photonics Technology Letters, IEEE/OSA Journal of Lightwave Technology, IEE Electronics Letters and Optics Communications, etc. Dr. Wong is currently an Associate Professor in the Department of Electrical and Electronic Engineering in the University of Hong Kong, where he won the Best Teacher Award 2005-06 and Outstanding Young Researcher Award 2008-09. He is a senior member of the OSA, IEEE, and IEEE Photonics Society.

**** ALL ARE WELCOME ****

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