

City University of Hong Kong  
Department of Electronic Engineering &  
IEEE Photonics Society Hong Kong Chapter  
Present a Seminar on

***Self-Mixing Interferometry:  
a Universal Yardstick to Measure Almost Everything***

by

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IEEE Life Fellow, OSA Fellow

Date : 28 January 2011 (Friday)  
Time : 11:00 am – 12:00 nn  
Venue : G6302, 6/F, Green Zone, Academic Building,  
City University of Hong Kong

**Abstract**

In this talk, we start with a theoretical introduction to mutual- and self-coupling phenomena in laser oscillator, and then describe in details the principle of operation of self-mixing interferometer, a new coherent configuration for the measurement of dimensional and kinematic quantities such as: displacement, distance, vibration amplitude, thickness, and angle, and also physical quantities like: coupling factors, line width, alfa-facto index of refraction. In the measurement arrangement, the laser undergoes self-injection at weak level, leading to an amplitude and frequency modulation driven by external optical path length. Then we will describe the developments of a displacement-measuring instrument, first by using the up/down counting of mode hops, then extending the principle of measurement to the case of a diffuse target, reflecting back a field affected by the speckle-pattern statistics. Third, we will report on the successful implementation of two-channel (or, referenced) vibrometer, based on analogue processing of the self-mix signal, in which the speckle-related amplitude errors are removed thanks to a servo-loop concept, and the instrument is capable of true differential operation, on diffuse surface, like a normal optical interferometer operates on legs ending with reflective surfaces. A survey of performances achieved in different design will conclude the talk.

**Biography**



**SILVANO DONATI** (M'75, SM'98, F'03, LF'09) is a full Professor of Optoelectronics at the Department of Electronics, Faculty of Engineering, University of Pavia, Italy, since 1980. He leads the Group of Optoelectronics active on photodetector and noise, electro-optical instrumentation (gyroscopes, interferometry, etc.) and semiconductor devices for chaos and switching applications. He is the credited inventor of self-mixing interferometry and of chaos-shift-keying (CSK) cryptography, the topic covered in his Distinguished Lecture given in 21 LEOS Chapters in two terms, 2007/08 and 2008/09. He is the Author of two books, 'Photodetectors' published by Prentice Hall, 1999, and 'Electro-Optical Instrumentation', published by Prentice Hall, 2004, this last translated in Chinese (Jiao Tong University Press, 2006) and available also in India edition and as an e-book paperback (2008). He also authored or co-authored over 300 papers on peer-reviewed Journals. His seminal ten papers collected 600+ citations. His H factor is 23.

He is the recipient of the AEIT Marconi Award, and 4 more AEI Awards, and 8 Awards from IEEE LEOS. He is Life Fellow of the IEEE, Meritorios Member of AEIT, and Fellow of OSA

~~~~~ All are welcome ~~~~~