

**Temasek Laboratories@NTU
Centre for Optical and Laser Engineering**

**A Seminar on:
Phase Retrieval Techniques for Optical Metrology**

**Speaker:
Dr. Giancarlo Pedrini**



**Venue: Fusion@MAE Seminar Room (Block N3.1-B3c-06)
Date: 12 April, 2013 (Friday)
Time: 10:00am**

Abstract:

Holography is a technique which has proved to be convenient to store and reconstruct the complete amplitude and phase information of a wave front. The popular interest in this technique is due to its unique property to obtain 3D images of an object, but there are other less known but very useful applications which are concerned with: microscopy, deformation measurement, aberration correction, beam shaping, optical testing, data storage, just to mention a few.

The first holograms were recorded on photographic emulsions but already in 1967 Goodman has shown that holograms may be recorded on opto-electronic devices and the physical reconstruction may be replaced by a numerical reconstruction using a computer. This technique which is now called digital holography had an impressive development in the last years this due in particular to the availability of CCD or CMOS sensors with an increased number of pixels and computer resources.

One possible drawback of digital holography is the use of the reference beam which entails additional optical elements and a tedious and sometimes cumbersome process of alignment optimization. Methods which do not use a reference offer a simple experimental setup and are an alternative to digital holography in particular in the case where ultraviolet or X-ray radiation is used.

In the first part of the presentation some applications of digital holography are shown, furthermore, we provide a theoretical framework for analyzing the partial coherence effects. In the second part, phase retrieval techniques which do not use a reference are described.

Biography of Speaker:

Giancarlo Pedrini received his MS degree in physics from the Swiss Federal Institute of Technology (ETH-Zurich) in 1982 and his PhD degree in Optical Sciences from the University of Neuchatel (Switzerland) in 1990. He joined the Institut für Technische Optik at the University of Stuttgart in 1991.

His research areas include: digital holography, vibration analysis, shape measurement, optical testing, measurement of the elastic parameters of biological samples, endoscopy, and phase retrieval.

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