

**TITLE: REAL-TIME 3 D SURFACE ANALYSIS DIGITAL HOLOGRAPHIC MICROSCOPE
"DHM" with enhanced axial resolution and extended measurement range**

BACKGROUND:

DHM is based on the property that light interaction with a sample modifies both intensity and phase of the illuminating wave. Any available support for image recording is sensitive only to intensity. Denis Gabor¹ invented in 1948 a way to encode the phase as an intensity variation: the "hologram". Digital Holographic Microscopy (DHM) implements digitally this powerful hologram. With the present power of computers and the developments of digital cameras, holograms can be numerically interpreted within a tenth of second to provide simultaneously: (1) the phase information, which reveals object surfaces with a vertical resolution at the nanometer scale, and (2) intensity images, as obtained by conventional optical microscopes. Both images are defined with a diffraction limited resolution in the transverse plane and are "reconstructed" from the hologram in real time (more than 10 frames per second).

The strength of DHM lies in particular on the use of the so-called off-axis configuration², which enables to capture the whole information by a single image acquisition within a few microseconds.

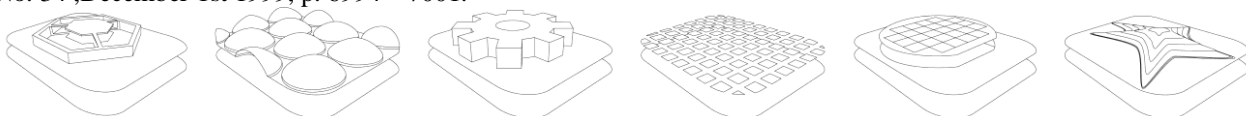
- These important features make out of DHM a unique tool for surface topography measurements which can be used for surface texture analysis
- When combined with stroboscopic application, it becomes now possible to follow up dynamically the characteristics of objects under periodic excitation
- Digital Holographic Microscopes (DHM) enable recording of the whole information necessary to provide 3D phase measurements with a nanometer vertical resolution with a single image acquisition. The use of fast acquisition camera or stroboscopic acquisition mode makes these new systems ideal tools for investigating the topography and dynamical behavior of MEMS and MOEMS.
- The extremely short acquisition time makes DHM systems insensitive to vibrations
- The characteristics of DHM make out of it a unique solution to follow up the whole development cycle of a product, from innovative R&D to quality control in production line, passing through the quantitative optimization of the manufacturing process

The presentation introduces the technology developed and implemented by Lyncée Tec and covers a number material science and research related applications.

Applications examples of DHM metrology at the nanoscale, surface parameters determination, MEMS and MOEMS dynamical response investigation, dynamic characterization of opto electronically and magnetically active samples, micro optics shape and surface specification and including high NA optical components.

¹ Denis Gabor, "A new microscopic principle", Nature, 1948.

² Etienne Cuche, Pierre Marquet, and Christian Depeursinge "Simultaneous amplitude-contrast and quantitative phase-contrast microscopy by numerical reconstruction of Fresnel off-axis holograms", APPLIED OPTICS, Vol. 38, No. 34 ,December 1st 1999, p. 6994 – 7001.



1. COMPANY: LYNCEE TEC SA

Lyncée Tec is fast growing, customer-oriented and market-driven young company.

- After 10 years of technology development and numerous awards for its innovation, the company started to market Digital Holographic Microscopes in 2003.
- The company has installed its offices in the "Parc Scientifique d'Ecublens" (PSE www.parc-scientifique.ch) on the site of the Swiss Federal Institute of Technology of Lausanne (EPFL www.epfl.ch). It offers a unique location in the region of Lake Lemman with numerous specialized sub-contractor manufacturers in the field of micro technologies.
- The proximity of the EPFL is a leading advantage for a high-tech company, since it provides a wide range of know-how and expertise resulting in numerous patents held or licensed to Lyncée Tec.
- A highly qualified multidisciplinary team of more than 20 physicists, biologists and engineers specialized in optics, software, mechanics and micro-technical applications, ensures the skills in terms of advice and technical execution, including development, manufacturing, assembling, quality assurance, sales and support.
- The company has been granted by several industrial awards: "Lausanne Région Entreprendre", CTI start-up Label in 2003, WA De Vigier and Venture in 2004, and Swiss Technology Awards in 2006
- The company has been awarded several patents for its products and technology and is actively offering its products for both material science and life science applications. More than 200 scientific papers were presented and released by users having acquired the product.

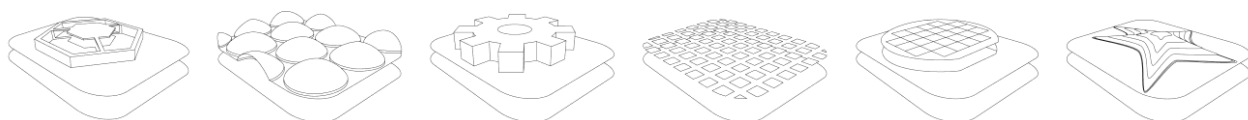
2. AUTHOR

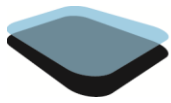
Claude Joris, Swiss citizen, holding Master in Civil Engineering Science and Master in Business Administration and numerous Post Graduation studies from Universities in New York USA / Edinburg UK / Luxembourg / Brussels Belgium and Neuchatel Switzerland.

He lived in 9 different countries and worked in R&D for aircraft engineering design, oil and gas investment projects and oil fields development, management of marketing and sales division of gas measuring system manufacturer, for a lathe machine manufacturers and an high precision tool manufacture prior to Lyncée Tec. He also provided counseling services to 4 start-ups active in QC laser technology, thin films, medical devices and gas measurements. He is co-owner of a patent.

In 2005, he joined Lyncée Tec, brought its worldwide sales & marketing experience and network to market the DHM worldwide and is presently Sales & Marketing Director of Lyncée Tec SA.

He has presented several papers on DHM technology worldwide and has written a chapter on Digital holography technique for the Canadian Society of Microscopy





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PROGRAMME

Presentation

DHM Technology

DHM Specifications and products range

DHM Applications for micro and nanotechnologies:

Solar Cells, Thin Films, Micro Optics, Biomaterial, MEMS devices,
SemiCond, Flat Panel Display, Micro structures

- Topography analysis
- Surface analysis
- Dynamic MEMS characterization
- DHM for QC analysis

