



*Martedì 27 Maggio 2008
14:30- 15:30
Aula C7 - Facoltà di Ingegneria
Università di Pavia –v. Ferrata 1, Pavia*



Introduzione: Dr. Tiziana Tambosso (IEEE-LEOS Italian Chapter Chair)

Silicon Photonics: Challenges and Future

Prof. Lorenzo Pavesi
Università' di Trento

Abstract – *In this talk challenges and opportunities that silicon photonics is facing are reviewed, underlying the achievements and the still open issues. Finally, the speaker will report on silicon nanophotonics which is the approach pursued to widen the scope of success of silicon photonics.*

The following topic areas will be discussed:

- *state of the art of silicon photonic devices and requirements of industry and markets.*
- *Technology and commercial challenges for the implementation of silicon photonics and photonic integrated circuits in the computing and semiconductor industry.*
- *Advances in silicon device development for photonic circuits and challenges for the on-chip light emission.*
- *Technology, challenges and methodologies for silicon photonics, hybrid solutions and III-V photonic integrated circuits.*
- *The direction of silicon photonics and group IV devices. The technology and the requirements for future needs.*

Sommario della presentazione e biografia del relatore si possono trovare sul sito del LEOS Italian Chapter (<http://www.unipv.it/leos>) nella sezione Events/Lectures.

Silicon Photonics: Challenges and Future

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Abstract – *In this talk I will review the challenges and the opportunities that silicon photonics is facing. I will make the case underlying the achievements and the still open issues. Finally, I will report on silicon nanophotonics which is the approach we are pursuing to widen the scope of success of silicon photonics.*

The communications and computing industries are challenged to enable massive and faster transport of information. Terabit per second is the speed at which data are transferred among multi-core processors. The electrical chip routing challenges in the computer industry have driven the interest for silicon photonics. The idea is to integrate photonic circuits into a standard silicon industry processes. In computing, integrated circuits continue to follow Moore's law. The development of photonics integrated circuits is a solution to the forecasted roadblocks, but key issues remain. Within the communications industry silicon has been utilized as a packaging platform for hybrid integration. But the pushes towards transparent optical network is challenging the use of silicon photonics functionalities.

In this talk I will address this arena. The topic areas which I will discuss are:

- The state of the art of silicon photonic devices and the requirements of the industry and markets.
- The technology and commercial challenges for the implementation of silicon photonics and photonic integrated circuits in the computing and semiconductor industry.
- The advances in silicon device development for photonic circuits and the challenges for the on-chip light emission.
- The technology, challenges and methodologies for silicon photonics, hybrid solutions and III-V photonic integrated circuits.
- The direction of silicon photonics and group IV devices. The technology and the requirements for future needs.

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[1] *Silicon Photonics*, edited by Lorenzo Pavesi and David Lockwood, Topics in Applied Physics vol. 94 (Springer-Verlag, Berlin 2004)

[2] *Optical interconnects: the silicon approach*, edited by Lorenzo Pavesi and Gerard Guillot, Springer series in Optical Sciences vol. 119 (Springer Verlag, Berlin 2006)

[3] Ossicini Stefano, Pavesi Lorenzo, Priolo Francesco *Light Emitting Silicon for Microphotonics*, Springer Tracts in Modern Physics , Vol. 194 [Springer-Verlag, Berlin 2003]

[4] Z. Gaburro, P. Bettotti, N. Dalosso, M. Ghulinyan, D. Navarro-Urrios, M. Melchiorri, F. Riboli, M. Saiani, F. Sbrana, L. Pavesi *Nanostructured Silicon for Photonics - from materials to devices*, Volumes 27-28 of Materials Science Foundations (Trans Tech Publications Ltd, Zuerich 2006)



Lorenzo Pavesi is Professor of Experimental Physics at the University of Trento (Italy). Born the 21st of November 1961, he received his PhD in Physics in 1990 at the Ecole Polytechnique Federale of Lausanne (Switzerland). In 1990 he became Assistant Professor, an Associate Professor in 1999 and Full Professor in 2002 at the University of Trento. He leads the nanoscience laboratory (25 people), teaches several classes at the Science Faculty of the University of Trento, and is dean of the PhD School in Physics. He founded the research activity in semiconductor optoelectronics at the University of Trento and started several laboratories of photonics, growth and advanced treatment of materials. He is in charge of the professional master in NEMS-MEMS, coorganized between University and FBK. He has directed more than 15 PhD students and more than 20 Master thesis students. His research activity concerned the optical properties of semiconductors. During the last years, he concentrated on Silicon based photonics where he looks for the convergence between photonics and electronics by using silicon nanostructures. He is interested in active photonics devices which can be integrated in silicon by using classical waveguides or novel waveguides such as those based on dynamical photonic crystals. His interests encompass also optical sensors or biosensors and solar cells. In silicon photonics, he is one of the worldwide recognized experts, he organized several international conferences, workshops and schools and is a frequently invited speaker. He manages several research projects, both national and international. He advises EC on photonics and is a frequently invited reviewer, monitor or referee for photonics projects by several grant agencies. He is an author or co-author of more than 250 papers, author of several reviews, editor of more than 10 books, author of 2 books and holds six patents. He is in the editorial board of Research Letters in Physics and he was in the editorial board of Journal of Nanoscience and Nanotechnologies, in the directive council of the LENS (Florence), in the Board of Delegates of E-MRS. He holds an H-number of 29 according to the web of science.