FP7 - 224312

HELIOS

pHotonics ELectronics functional Integration on CMOS

D1202 – 2008 GFP conference

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Lead contractor for this deliverable

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Participants: UNITN
Workpackage: WP12

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Abstract: This deliverable details the main data about the 5th international conference on Group IV Photonics, which was held in Sorrento 17-19 september 2008.

Keyword list: silicon photonics, conference

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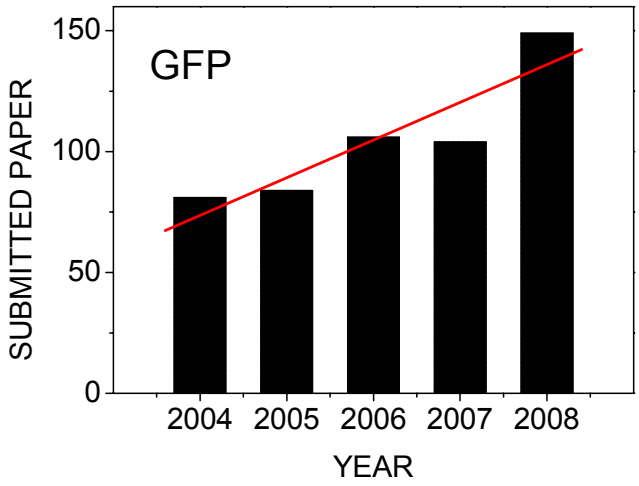
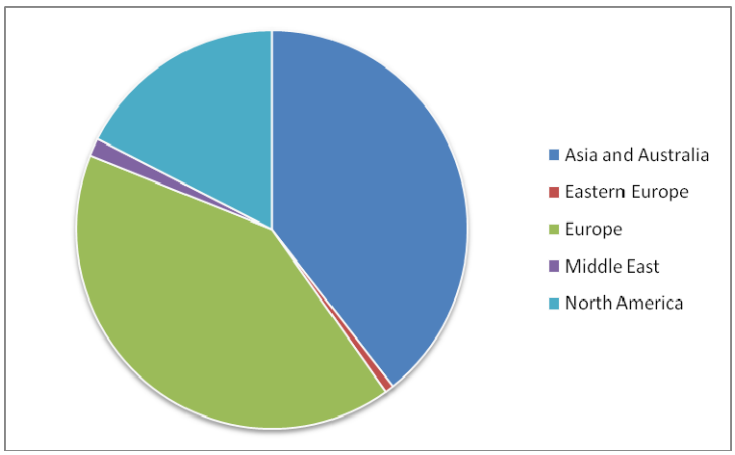
1- Introduction

This D1202 HELIOS project deliverable gives an overview of the 2008 5th IEEE International Conference on Group IV Photonics (http://www.ieee.org/organizations/society/leos/LEOSCONF/GFP2008/index.html) which was organized by L. Pavesi and was intended to be a specific action of the HELIOS consortium towards dissemination.

2- The GFP2008 Conference

The conference had a large participation (149 contributed paper and about 180 attendees). The following figures give the trend of the number of submitted papers and the geographical distribution of the same.





Paper Submissions by Region

Region	Contributed	Invited	Total
		1	1
Asia and Australia	54	3	57
Eastern Europe	1		1
Europe	56	2	58
Middle East	2		2
North America	24	6	30
TOTALS	**137**	**12**	**149**

Helios members were actively participating in the conference both by sitting in the conference committees or by presenting papers.

INTERNATIONAL ADVISORY COMMITTEE

Roel G. Baets, INTEC Department of Information Technology, Belgium
Philippe M. Fauchet, University of Rochester, Rochester, USA
Siegfried Janz, NRC-IMS Institute for Microstructural Sciences, Canada
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Kang L. Wang, University of California - Los Angeles, USA
Koji Yamada, NTT Microsystem Integration Laboratories, Japan
JinZhong Yu, Chinese Academy of Sciences Beijing Institute of Semiconductors, China

PROGRAM COMMITTEE

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Jung Hoon Shin, KAIST, Korea
Kazumi Wada, University of Tokyo, Japan
Dan-Xia Xu, NRC-IMS Institute for Microstructural Sciences, Canada
Koji Yamada, NTT Microsystem Integration Laboratories, Japan

Figure: composition of the international advisory and of the program committee (underlined members of the HELIOS project).

WA1 08.45 - 09.15 (Invited)
Recent Progress in Fast Silicon Modulators, D. Marris-Morini, G. Rasigade, L. Vivien, E. Cassan, S. Laval, *Institut d'Electronique Fondamentale, Orsay, France*, P. Rivallin, P. Lyan and J.-M. Fedeli, *Commissariat à l'Énergie Atomique, Grenoble, France*

WC5 15.45 - 16.00
Electroluminescence from Nanocrystalline-Si/SiO_2 Multilayers with an Electron Injection Barrier, A. Marconi, O. Anopchenko, E. Moser, *University of Trento, Povo, Italy*, M. Wang, *Zhejiang University, Hangzhou, Zhejiang, China*, G. Pucker, *Fondazione Bruno Kessler - Irst, Trento, Italy*, P. Bellutti, *Istituto Trentino di Cultura, Povo, Italy* and L. Pavesi, *University of Trento, Povo, Italy*
The effect of an injection barrier placed on top of a nanocrystalline-Si/SiO_2 multilayered LED is discussed. Direct and alternating current injection schemes and time resolved electroluminescence are reported.

WD5 18.15 - 18.30
Improving Contact Design for Micro-Disc Based Lasers in Integrated Circuits, F. Mandorlo, P. Rojo-Romero, X. Letartre, *École Centrale de Lyon, Ecully, France*, J.-M. Fedeli, *Commissariat à l'Énergie Atomique, Grenoble, France* and P. Viktorovitch, *École Centrale de Lyon, Ecully, France*
For mass production and implementation easiness, electrically driven sources are required, and consequently metal based elements and absorbing medium are necessary. In order to lower lasing thresholds, we propose cost free improvements concerning the contact design and the electrical injection.

WD6 18.30 - 18.45
Vertical Emitting Lasers Based on 2D Photonic Crystal Heterostructure Coupled to Strip Silicon Waveguide, L. Ferrier, O. El Daif, P. Rojo-Romero, X. Letartre, E. Drouard and P. Viktorovitch, *École Centrale de Lyon, Ecully, France*
We study the coupling between a compact vertical emitting lasers based on a 2D photonic crystal heterostructure bonded on a silicon/silica Bragg mirror and a silicon strip waveguide around 1.5microns.

WP3 Optical Add-Drop Multiplexer with FSR Higher than 140 nm using Ring Resonators and Photonic Bandgap Structures, J. Garcia, A. Martinez and J. Marti, *Universidad Politécnica de Valencia, Valencia, Spain*
We propose a novel configuration of OADM where its free spectral range is hugely increased to values higher than 140 nm by combining ring resonators with photonic bandgap structures.

WP11 Vertical Grating Couplers for Silicon Sandwiched Slot Waveguides, J. V. Galan Conejos, J. Blasco Solves, P. Sanchis Kilders, A. M. Abietar, J. Marti, *Universidad Politécnica de Valencia, Valencia, Spain*, J.-M. Fedeli, E. Jordana, P. Gautier and M. Perrin, *Commissariat à l'Énergie Atomique, Grenoble, France*
Grating couplers for efficient vertical coupling between sandwiched slot waveguides and standard single-mode fibers are demonstrated. 20% coupling efficiency is experimentally measured. Higher coupling efficiency is expected for particular designs according to simulation results.

ThA4 09.30 - 09.45
42 GHz Waveguide Germanium-on-Silicon Vertical PIN Photodetector, L. Vivien, D. Marris-Morini, *Institut d'Electronique Fondamentale, Orsay, France*, J. Mangeney, *Université Paris 11, Orsay, France*, P. Crozat, E. Cassan, S. Laval, *Institut d'Electronique Fondamentale, Orsay, France*, J.-M. Fedeli, J.-F. Damlencourt and Y. Lecunff, *Commissariat à l'Énergie Atomique, Grenoble, France*
High speed, high responsivity and reliable CMOS compatible photodetectors are key elements for low cost telecommunications systems at 1.55µm. A 42 GHz germanium on silicon vertical PIN photodetector integrated in SOI waveguide is presented.

ThB3 11.30 - 11.45
Focusing Polarization Diversity Gratings for Silicon-on-Insulator Integrated Circuits, F. van Laere, W. Bogaerts, P. Dumon, G. Roelkens, D. J. Van Thourhout and R. G. Baets, *Ghent University, Gent, Belgium*
We present experimental results for focusing grating couplers for coupling between optical fiber and nanophotonic Silicon-on-Insulator waveguides in polarization diversity configuration. The footprint is reduced by a factor of 8 compared to standard grating couplers.

ThB5 12.00 - 12.15
SOI based 2×2 and 4×4 Waveguide Couplers - Evolution from DPSK to DQPSK, K. Voigt, L. Zimmermann, G. Winzer and K. Petermann, *Technical University Berlin, Berlin, Germany*
We compare 2×2 and 4×4 multi-mode interference (MMI) couplers with respect to performance of D(Q)PSK-demodulators. We shall provide simulation and experimental data of MMI-devices realized in 4µm silicon-on-insulator (SOI) rib waveguide technology.

ThB6 12.15 - 12.30
Er^{3+} Coupled to Si Nanoclusters Rib Waveguides, A. Pitanti, D. Navarro-Urrios, R. Guider, N. Daldosso, *University of Trento, Povo, Italy*, L. Khomenkova, F. Gourbilleau, *École Nationale Supérieure d'Ingénieurs de Caen, Caen, France*, C. J. J. Oton, W. Loh, *University of Southampton, Southampton, UK*, R. Rizk, *École Nationale Supérieure d'Ingénieurs de Caen, Caen, France*, O. Jambois, B. Garrido, *University of Barcelona, Barcelona, Spain* and L. Pavesi, *University of Trento, Povo, Italy*
Er doped nano-Si system has been optimised in terms of photoluminescence intensity and lifetime. Reduction of carrier absorption losses and increasing of the number of Er ions coupled to Si-nc (around 25%)have been achieved.

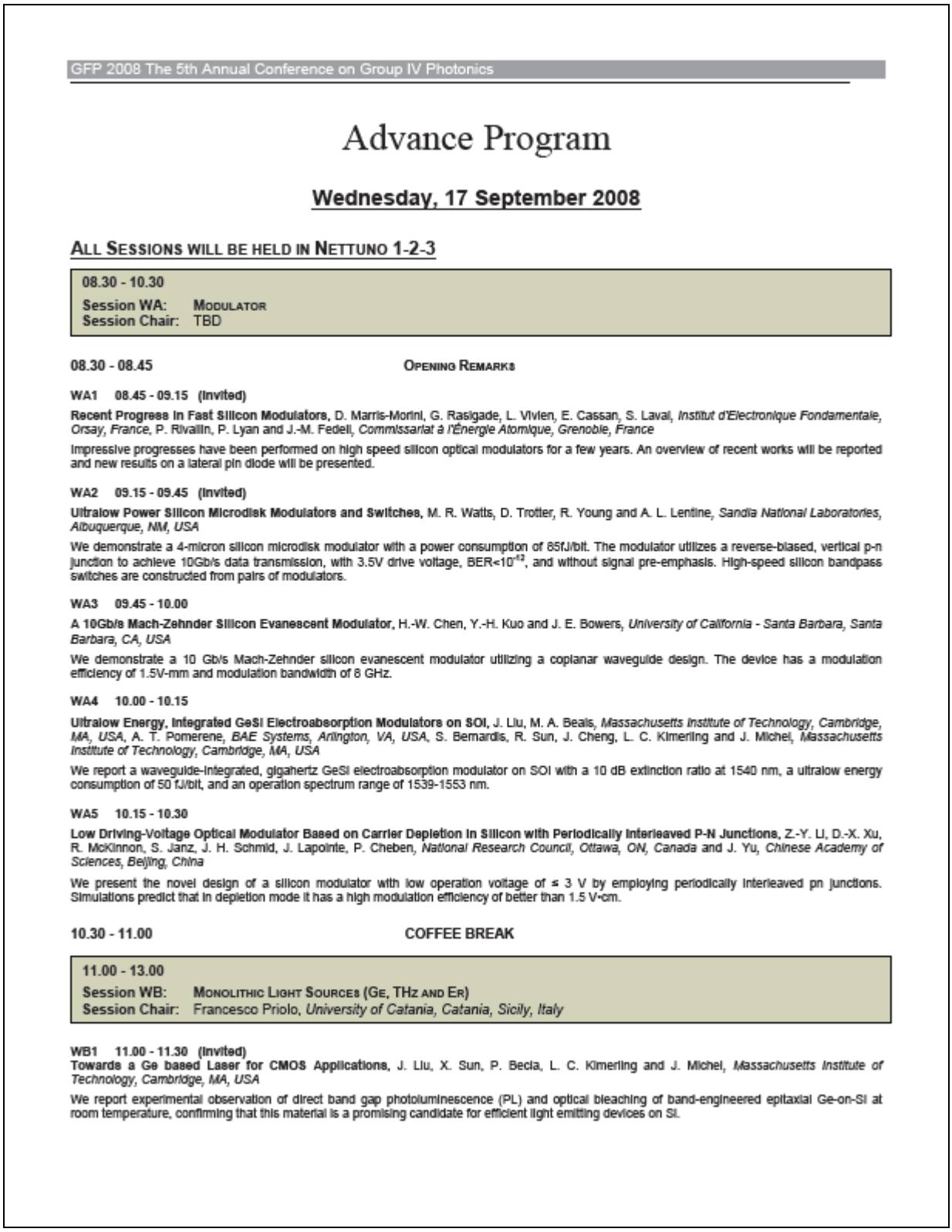
ThB7 12.30 - 12.45
High Quality Coupled Ring Resonators Based on Silicon Clusters Slot Waveguide, Y. Lebour, *University of Barcelona, Barcelona, Spain*, R. Guider, *University of Trento, Trento, Italy*, E. Jordana, J.-M. Fedeli, *Commissariat à l'Énergie Atomique, Grenoble, France*, P. Pellegrino, S. Hernandez, B. Garrido, *University of Barcelona, Barcelona, Spain*, N. Daldosso and L. Pavesi, *University of Trento, Povo, Italy*
High Q factor ring resonators based on Si clusters sandwich slot-waveguide structure have been fabricated by standard DUV lithography. These devices are considered an important step towards the demonstration of an all optical logic gate.

ThP12 Design, Fabrication, and Characterization of an α-Si:H/α-SiCN Multistack Waveguide for Electro Optical Modulation, S. Rao, F. G. Della Corte, *Università "Mediterranea" di Reggio Calabria, Reggio Calabria, Italy*, C. Summonte, *Institute for Microelectronics And Microsystems, Bologna, Italy,* and F. Suriano, *Università "Mediterranea" di Reggio Calabria, Reggio Calabria, Italy*
Electro-optical absorption in α-Si:H/α-SiC_xN_y multilayers has been studied in three different planar multistack waveguides realized by PECVD technology. Light absorption is induced at λ=1.55µm by carrier accumulation through the application of electric field across the multiple insulator/semiconductor device.

ThP28 Modeling Direct Modulation Dynamics in Silicon Nanocrystal Light Emitting Transistors, J. Carreras and B. Garrido, *University of Barcelona, Barcelona, Spain*
We model light modulation from silicon nanocrystal MOSFETs. It is found that an ideal silicon nanocrystal embedded in a defect-free SiO_2 must have an intrinsic absorption cross-section of about 10^{-12} cm^2, which means that there is still a wide margin for electrical injection optimization.
FA4 09.15 - 09.30
Coupled Cavities in One-Dimensional Photonic Crystal Based on Horizontal Slot Waveguide Structure with Si-nc, A. Pitanti, P. Bettotti, E. Rigo, R. Guider, N. Daldosso, *University of Trento, Povo, Italy*, J.-M. Fedeli, *Commissariat à l'Énergie Atomique, Grenoble, France* and L. Pavesi, *University of Trento, Povo, Italy*
One-dimensional photonic crystal structure is used for a slow light effect in a coupled resonators optical horizontal slot waveguide with Si-nc. We report on design, simulations and preliminary optical transmission characterization around 1.55 μm.
FB4 11.45 - 12.00
g-Pack - A Generic Testbed Package for SiliconPhotonics Devices, L. Zimmermann, *Technical University Berlin, Berlin, Germany*, H. Schroeder, T. Tekin, *Fraunhofer-Institut, Berlin, Germany*, W. Bogaerts and P. Dumon, *Ghent University, Gent, Belgium*
g-Pack is a low-frequency packaging approach tobreadboarding of Silicon photonics chips. It provides opticali/o through a fiber array coupled to gratings couplers, andmultiple DC i/o through a pin grid array (PGA) carrier.
FB5 12.00 - 12.15
Silicon Photonics Front-End Integration in High-Speed 0.25μm SiGe BiCMOS, L. Zimmermann, K. Voigt, G. Winzer, *Technical University Berlin, Berlin, Germany*, D. Wolansky, S. Geisler, H. Richter and B. Tillack, *Innovations for High Performance Microelectronics, Frankfurt, Germany*
Modular integration of photonic functionality in the front-end of line of a qualified 0.25 μm SiGe BiCMOS technology is considered. First measurements of electronic & waveguide test structures are presented.

Figure: List of the contributions related to HELIOS activity and presented by HELIOS partners.

Figure: Poster of the conference



GFP 2008 The 5th Annual Conference on Group IV Photonics

Advance Program

Wednesday, 17 September 2008

ALL SESSIONS WILL BE HELD IN NETTUNO 1-2-3

08.30 - 10.30
Session WA: MODULATOR
Session Chair: TBD

08.30 - 08.45 OPENING REMARKS

WA1 08.45 - 09.15 (Invited)

Recent Progress in Fast Silicon Modulators, D. Marris-Morini, G. Rasigade, L. Vivien, E. Cassan, S. Laval, *Institut d'Electronique Fondamentale, Orsay, France,* P. Rivallin, P. Lyan and J.-M. Fedeli, *Commissariat à l'Énergie Atomique, Grenoble, France*

Impressive progresses have been performed on high speed silicon optical modulators for a few years. An overview of recent works will be reported and new results on a lateral pin diode will be presented.

WA2 09.15 - 09.45 (Invited)

Ultralow Power Silicon Microdisk Modulators and Switches, M. R. Watts, D. Trotter, R. Young and A. L. Lentine, *Sandia National Laboratories, Albuquerque, NM, USA*

We demonstrate a 4-micron silicon microdisk modulator with a power consumption of 85fJ/bit. The modulator utilizes a reverse-biased, vertical p-n junction to achieve 10Gb/s data transmission, with 3.5V drive voltage, BER<10^{-12}, and without signal pre-emphasis. High-speed silicon bandpass switches are constructed from pairs of modulators.

WA3 09.45 - 10.00

A 10Gb/s Mach-Zehnder Silicon Evanescent Modulator, H.-W. Chen, Y.-H. Kuo and J. E. Bowers, *University of California - Santa Barbara, Santa Barbara, CA, USA*

We demonstrate a 10 Gb/s Mach-Zehnder silicon evanescent modulator utilizing a coplanar waveguide design. The device has a modulation efficiency of 1.5V-mm and modulation bandwidth of 8 GHz.

WA4 10.00 - 10.15

Ultralow Energy, Integrated GeSi Electroabsorption Modulators on SOI, J. Liu, M. A. Beals, *Massachusetts Institute of Technology, Cambridge, MA, USA,* A. T. Pomerene, *BAE Systems, Arlington, VA, USA,* S. Bernardis, R. Sun, J. Cheng, L. C. Kimerling and J. Michel, *Massachusetts Institute of Technology, Cambridge, MA, USA*

We report a waveguide-integrated, gigahertz GeSi electroabsorption modulator on SOI with a 10 dB extinction ratio at 1540 nm, a ultralow energy consumption of 50 fJ/bit, and an operation spectrum range of 1539-1553 nm.

WA5 10.15 - 10.30

Low Driving-Voltage Optical Modulator Based on Carrier Depletion in Silicon with Periodically Interleaved P-N Junctions, Z.-Y. Li, D.-X. Xu, R. McKinnon, S. Janz, J. H. Schmid, J. Lapointe, P. Cheben, *National Research Council, Ottawa, ON, Canada* and J. Yu, *Chinese Academy of Sciences, Beijing, China*

We present the novel design of a silicon modulator with low operation voltage of ≤ 3 V by employing periodically interleaved pn junctions. Simulations predict that in depletion mode it has a high modulation efficiency of better than 1.5 V-cm.

10.30 - 11.00 COFFEE BREAK

11.00 - 13.00
Session WB: MONOLITHIC LIGHT SOURCES (GE, THZ AND ER)
Session Chair: Francesco Priolo, *University of Catania, Catania, Sicily, Italy*

WB1 11.00 - 11.30 (Invited)
Towards a Ge based Laser for CMOS Applications, J. Liu, X. Sun, P. Becla, L. C. Kimerling and J. Michel, *Massachusetts Institute of Technology, Cambridge, MA, USA*

We report experimental observation of direct band gap photoluminescence (PL) and optical bleaching of band-engineered epitaxial Ge-on-Si at room temperature, confirming that this material is a promising candidate for efficient light emitting devices on Si.

Figure: program of the conference. (The program is a nested adobe file: you can simply click on it to open the file)