

FP7 - 224312
HELIOS
pHotonics ELectronics functional Integration
on CMOS

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Abstract: This document is a 2-page presentation of the project. It will be used for various dissemination activities (ICT conference, European Commission website)

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Executive Summary

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HELIOS**pHotonics ELelectronics functional Integration on CMOS**

Project Number: 224312
Funding Scheme: CP- IP

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Web site**Timeline**

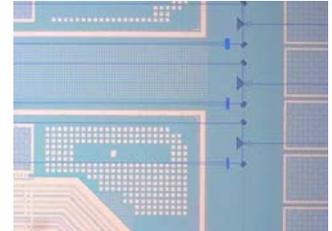
Start Date: 01 May 2008
 End Date: 30 April 2012

Budget

Overall Cost: 12,048,041 €
 Funding: 8,500,000 €

Project Partners

- Commissariat à l'énergie atomique, FR
- Interuniversitair micro-electronica centrum VZW, BE
- Centre national de la recherche scientifique, FR
- Alcatel thales III-V lab, FR
- The University of Surrey, UK
- Consiglio nazionale delle ricerche, IT
- Université Paris-Sud, FR
- Universidad politecnica de Valencia, ES
- Università degli studi di Trento, IT
- Universitat de Barcelona, ES
- 3s photonics SA, FR
- IHP GmbH - innovations for high performance microelectronics / Institut fuer innovative mikroelektronik, DE
- Technische universitaet Berlin, DE
- Thales systemes aeroportes SA, FR
- Das photonics SL, ES
- Austriamicrosystems AG, AT
- Technische universitaet Wien,

Vision & Aim

Photonics is a rapidly growing sector in the global economy. Optical communications, optical storage, imaging, lighting, optical sensors or security are just a few examples. Even if photonics could bring new functionalities to electronic components as low propagation losses, high bandwidth, wavelength multiplexing and immunity to electromagnetic noise, the high cost of photonic components and their assembly is a major obstacle to their deployment in most of application fields. Just like in micro-electronics, many applications can be realized in a much more compact and cost-effective way by integrating the required functionality in a single chip.

So far, the progress in photonic integration technology has been hampered by the large variety in photonic devices and technologies, and the fact that most integration technologies are specific for the applications for which they have been developed. Silicon photonics (or more precisely CMOS Photonics) is a way to tackle the problem by developing a small number of generic integration technologies with a level of functionality that can address a broad range of applications. Such technologies, which should be made accessible via foundries, can address markets that are sufficiently large to pay back the development costs. Moreover, by co-integrating optics and electronics on the same chip, high functionality, high performance and highly integrated devices can be fabricated, while using well mastered microelectronics fabrication process. Another advantage of CMOS photonics is that its success will move the emphasis from the component to the architecture. In other words, industrial and RTD efforts could be focused on new products or new functionalities rather than on the technology level.

Proof of concept or functional demonstrations of major building blocks have been made in previous research projects (laser, modulator, detector, coupling, and link). However, even though the results obtained were considered as a major breakthrough, major efforts are still needed to improve the performance in terms of functionality, bandwidth or power. To go one step further, the European CMOS Photonics community must demonstrate the integration of photonics with electronics and make available an integrated design and fabrication chain with standard and generic processes that could be transferred to foundries.

The aim of the project HELIOS is to combine a photonic layer with a CMOS circuit by different innovative means, using microelectronics fabrication processes.

The objectives of HELIOS are manifold:

- Development of high performance generic building blocks that can be used for a broad range of applications: WDM sources by III-V/Si heterogeneous integration, fast modulators and detectors, passive circuits and packaging
- Building and optimization of the whole "food chain" to fabricate complex functional devices. Photonics/electronics convergence will be addressed at the process level and also at the design level since HELIOS will contribute

AT

- Phoenix BV, NL
- Photline technologies SA, FR

to the development of an adequate design environment

- Demonstrating the power of this proposed “food chain” by realizing several complex photonic IC’s addressing different industrial needs, including a 40Gb/s modulator, a 10x10 Gb/s transceiver, a Photonic QAM-10Gb/s wireless transmission system and a mixed analog and digital transceiver module for multifunction antennas..
- Investigation of more promising but challenging alternative approaches These concepts offer clear advantages in terms of integration on CMOS for the next generation of CMOS Photonics devices
- Road mapping, dissemination and training, to strengthen the European research and industry in this field and to raise awareness of new users about the interest of CMOS Photonics.

HELIOS will make integration technologies accessible for a broad circle of users in a foundry-like, fabless way. In the long term, IC manufacturers will use photonics libraries and IP blocks and integrate them in their circuit design.

HELIOS will gather the major European CMOS Photonics and Electronics players and potential users. It will drive the European RTD in CMOS Photonics and pave the way for industrial development.