PHOLOGIC

Nanophotonic Logic Gates

Project Number: 017158, STREP

Contact
Name : MARTI, Javier
Tel: +34-96-3879768
Fax: +34-96-3877827
Email: jmarti@ntc.upv.es
UNIVERSIDAD POLITECNICA DE VALENCIA
Valencia Nanophotonics Technology Centre
Building IDI-1 PO Box 46022
46022 VALENCIA
SPAIN

Web site
http://www.ist-phologic.org

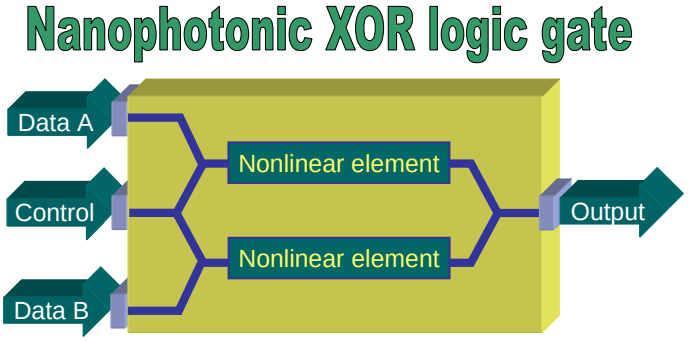
Timeline
Start Date: 2005-06-01
End Date: 2008-05-31

Budget
Overall Cost: 3.58 million euro
Funding: 2.0 million euro

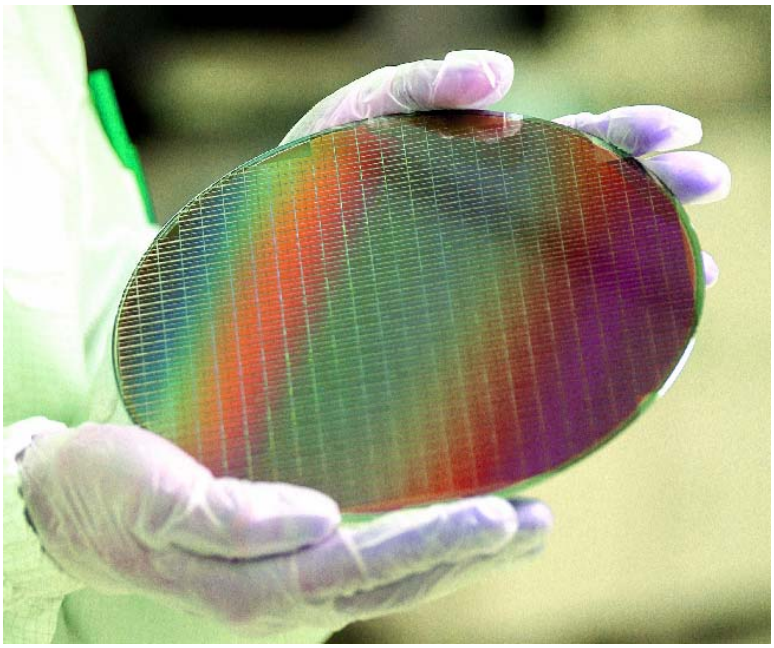
Project Partners

- CONSORZIO CREO - CENTRO RICERCHE ELETTRO OTTICHE ITALY
- COMMISSARIAT A L'ENERGIE ATOMIQUE FRANCE
- MCMASTER UNIVERSITY CANADA
- THE CENTRE FOR INTEGRATED PHOTONICS LIMITED UNITED KINGDOM
- UNIVERSITA DEGLI STUDI DI TRENTO ITALY
- UNIVERSITAT DE BARCELONA SPAIN
- CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS SPAIN

The objective of ***PHOLOGIC*** project is to explore the mass-manufacturing compatibility of nonlinear photonic materials (CdTe and Si nanocrystals) and their associated fabrication processes with CMOS processing lines using a highly scalable photonic logic gate structure as functional validation device. For the sake of benchmarking a third technological approach based on InP planar photonic crystals is also addressed. The CdTe and Si-nc materials show excellent nonlinear features and their fabrication processes can be incorporated in an intermediate step within a CMOS processing line. The full optical characterisation of the materials and the optimisation of their fabrication processes will be carried out in the ***PHOLOGIC*** project, which will suppose a radical long-term innovation beyond current state-of-the-art and a clear innovation aimed at mastering nanophotonics for low cost. As a functional validation device an all-optical logic gate using a nonlinear Mach-Zehnder interferometer structure will be implemented offering key features for mass-manufacturing such as a high scalability and flexibility to implement advanced functional devices. Furthermore, periodic photonic structures will be used to exploit the concept of slow waveguiding reducing thus the size and power requirements of the all-optical logic gate. A monolithic all-optical logic gate on InP based on a buried heterostructure integrating photonic crystals will also be produced for the first time in order to improve the degree of integration and to be used as a benchmarking action with respect to the other two technological approaches (CdTe and Si-nc). The technical assessment among the three proposed technological approaches will be carried by a Consultation Panel formed by several important companies (Si mass-manufacturers, equipment producers and foundries) that will provide evaluation and recommendations in terms of mass-manufacturing, reliability and optical performance.



Scheme of the nanophotonic XOR logic gate to be implemented in PHOLOGIC



PHOLOGIC addresses the inclusion of novel non-linear materials in a CMOS line to achieve mass manufacturing