

Applied research

Ultra-Fast Ultra-Low Power Modulators

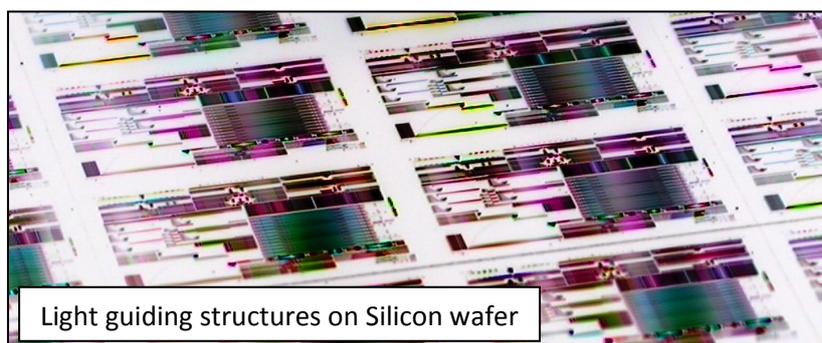
– Fundamental Building Blocks of the Internet of Tomorrow –

Are Envisioned by the Recently Founded European Research Consortium SOFI

With the importance of the internet still growing, the underlying hardware has to keep pace with bandwidth demand and equally important, with power consumption. 7 research teams from 4 countries united in the SOFI consortium are supported by the European Commission in this endeavor. Starting January 2010, the SOFI project will pursue a novel approach to provide an industrially credible alternative technology platform based on the convergence of electronics and optics to **REALIZE HIGHLY INTEGRATED SILICON CHIPS WITH MODULATORS**, taking **ECONOMICAL** and **GREEN** aspects into account.

The silicon based semi-conductor industry is advancing since decades and the use of optical signals over fibers for communication well established. It thus seems self-evident that **uniting optics and electronics on the same chip will result in a leap of performance**. This **convergence is taking place worldwide right now**, relying on Silicon, using CMOS based fabrication technology (standardized, perfected production processes, e.g. cheap mass fabrication). And so is the European project SOFI, which aims at realizing modulators in silicon. Modulators are the key components in communications that allow encoding of information from the electric into the optical domain.

What is new? In the SOFI project the Pockels effect will be used to modulate light. The Pockels effect has already **shown high speed performance in different material systems** (e.g. in lithium niobate). Applying it to Silicon technology is new and will not only allow for **faster, cheaper, much smaller modulators** but also reduce the electronic power to drive such a device, which results in a **much lower energy consumption**. Given the vast amount of energy which is used around the world for telecommunication networks (the telecom sector is said to be responsible for ca. 2% of *global* green house gas emissions), reducing this consumption is one key aspect in saving the climate.



Light guiding structures on Silicon wafer

This 3.5 M€ project entitled *Silicon-Organic hybrid Fabrication platform for Integrated circuits (SOFI)* is funded over 3 years with 2.5M€ from the 7th Framework Programme of the EC (ICT Objective FP7-ICT-2009-4). The coordinator **Prof. Dr. J. Leuthold from the **Institute of Photonics and Quantum Electronics at the Karlsruhe Institute for Technology (KIT)** states: “*We are confident to succeed in making a difference by designing and implementing ultra-fast ultra-low energy consuming modulators for 3 reasons: First, we all know that it is important work and that is a real motivation. Second, this project benefits from years of preparation on the underlying idea. But most importantly, the consortium combines a high level of expertise that is bound to succeed.*”**

The SOFI Consortium consists of research groups from:

- The Karlsruhe Institute of Technology (KIT), **Germany** -- www.ipq.kit.edu
- SELEX Sistemi Integrati, **Italy** -- www.selex-si.com
- IMEC, Interuniversity Microelectronics Centre, **Belgium** -- www.imec.be
- Rainbow Photonic AG, **Switzerland** -- www.rainbowphotonics.com
- GigOptix-Helix AG, **Switzerland** -- www.gigoptix.com
- Research and Education Laboratory in Information Technologies, **Greece** -- www.ait.gr
- The University of Sydney, Centre for Ultrahigh bandwidth Devices for Optical Systems, **Australia** -- www.cudos.org.au

Have a look at our website at **www.sofi-ict.eu**

SOFI - Silicon-Organic hybrid Fabrication platform for Integrated circuits