

## A-3 (Invited)

### In search for the ideal hybrid silicon laser

R. Baets\*, Y. De Koninck, S. Keyvaninia, S. Stankovic, D. Van Thourhout, G. Roelkens

*Department of Information Technology, Photonics Research Group, Ghent University - IMEC  
Center for Nano- and Biophotonics (NB-Photonics)  
Sint-Pietersnieuwstraat 41 B-9000 Ghent, Belgium*

\* Corresponding author: roel.baetsc@ugent.be

In recent years a lot of progress has been made in the field of hybrid silicon lasers, based on bonded III-V layers on top of a silicon waveguide circuit. A considerable number of concepts have been reported for such lasers, in particular with respect to the type of cavity, the type of light coupling between the silicon layer and the III-V layer and the degree of light confinement in the gain layer. While good performance has been demonstrated for various devices, it is also true to say that in most cases performance is far from ideal. Hence the question arises how to evolve to more ideal hybrid silicon lasers.

While the requirements for an "ideal" laser obviously depend on application, one can argue that the following properties are highly desirable in a broad range of situations, especially when they are power consumption critical :

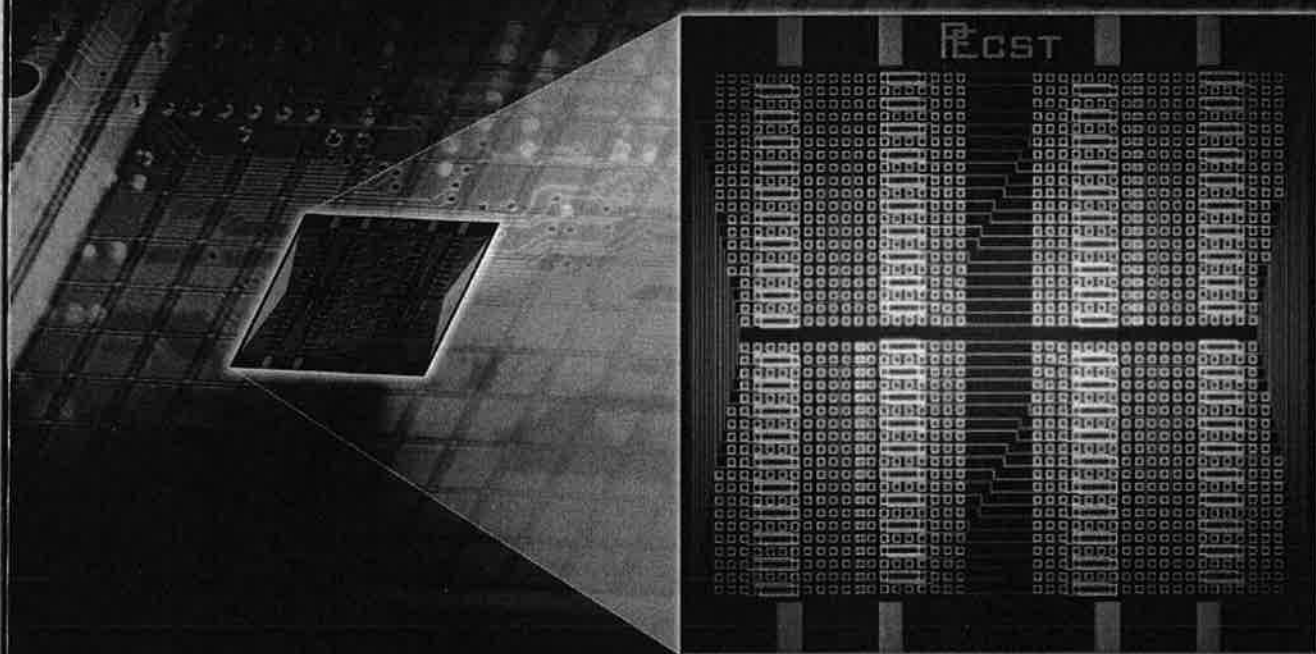
- Good power conversion efficiency
- Low threshold
- Modest power consumption
- Small cavity footprint
- Stable single-mode spectrum (no mode hops)
- Efficient coupling to a single-mode silicon waveguide
- Operation over a wide temperature range
- In some applications: tunability
- High yield / low cost

In this paper we will review the most important hybrid silicon lasers reported so far with respect to these performance criteria and discuss possible options towards a more complete coverage of desired properties.

# ISPEC 2012

The 2nd International Symposium on  
Photonics and Electronics Convergence

— Advanced Nanophotonics and Silicon Device Systems —



## Technical Digest

Date: **December 3-5, 2012**

Venue: **The University of Tokyo, Tokyo, Japan**

December 3-4, 2012 Venue: Ito International Research Center (IIRC), Hongo Campus

December 5, 2012 Venue: Lecture Hall, Graduate School of Mathematical Science Building, Komaba Campus