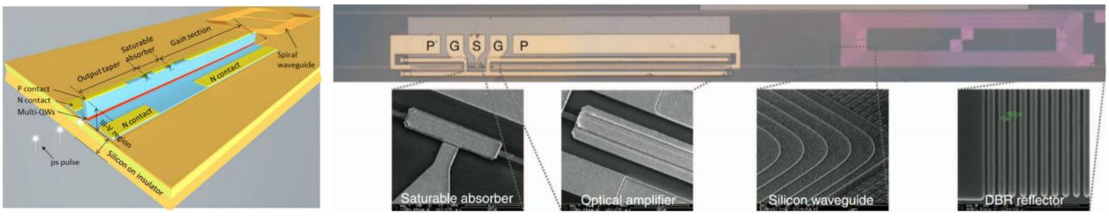
PhD Position on III/V-on-silicon mode-locked lasers

Ghent University – IMEC, Photonics Research Group
Tech Lane Ghent Science Park – Campus A
Technologiepark – Zwijnaarde 15, B-9052 Gent, Belgium

erc
European Research Council
Established by the European Commission



Optical Frequency combs are lasers which produce thousands of equidistant laser lines. The frequency spacing between these lines lies within the radiofrequency band of the electromagnetic spectrum, while the frequency of the laser lines itself lies in the optical part of the electromagnetic spectrum. This provides a link between the RF and the optical domain. They act as “spectral rulers” against which unknown optical frequencies can be measured, and they have had a revolutionary impact on numerous fields ranging from the detection of extra-solar planets to precision metrology, winning its inventors a Nobel Prize in 2005.

Traditionally, these optical frequency combs have been constructed with the help of ultra-short Titanium Sapphire lasers abd fiber lasers. In bulky experimental setups these sources have been used to measure distances with an extreme precision, as a critical tool to make the next generation optical clocks, as a source in attosecond pulse generation experiments, telecom sources for Tbit/s transceivers, ... However, for most of the real-life applications these lasers are not practical, they are too large, too expensive. That is why there has been an enormous interest in the development of on-chip optical frequency combs. Preferably such integrated sources are made using CMOS compatible fabrication processes. Very recently, the Photonics Research Group at Ghent University has shown integrated mode-locked lasers on a silicon chip. These results have been published in Nature Light: Science & Applications and highlighted in Nature Photonics. One can envision to modulate all the individual lasers lines individually with information which would enable efficient on-chip Terabit/s transceivers that would support the next generation telecom networks. Or, one could use the laser lines for doing broadband on-chip gas spectroscopy. Here one can think on making cheap Breathalyzer silicon chips that would analyse your breath for diagnostics. However, at the moment the spectrum of these sources is not broad enough.

Job description:

Building further on the first results obtained at Ghent University a new generation of mode-locked lasers will be developed in this PhD-project. Here we will make use of the fundamental ultra-fast nonlinear response of the waveguides on the silicon chip. Inspired by the ultra-short pulsed fiber mode-locked lasers we will target a new generation of ultra-short pulsed lasers on chips with pulses as short as 100 fs. These short pulsed lasers will have a broad spectrum spanning over more than 30 nm at the telecom wavelength and would allow as a source in next generation terabit/s transceiver or spectroscopic sources. The project will be carried out in the context of the ERC Electric.

Application:

Apply online at http://photonics.intec.ugent.be/contact/vacancies/Application.htm

More information:

Bart.Kuyken@ugent.be
http://www.photonics.intec.ugent.be/

About the Photonics Research Group

The Photonics Research Group (about 85 people) is associated with IMEC, and is part of the Department of Information Technology of Ghent University. The group is headed by Prof. R. Baets and has been active in photonics device research for many years. The other professors in the group are P. Bienstman, W. Bogaerts, B. Kuyken, N. Le Thomas, G. Morthier, G. Roelkens and D. Van Thourhout. The main research directions are silicon nanophotonics, heterogeneous integration, optical communication, photonic (bio)sensors and photonic integrated circuits for biomedical applications in the near-infrared and mid-infrared wavelength range. More in particular, the silicon nanophotonics work focuses on the design and fabrication of SOI-based photonic devices using standard lithographic techniques compatible with CMOS-processing.

The Photonics Research Group has been coordinating the network of excellence ePIXnet and is involved in a number of EU-projects, including the FP7 projects ActPhast, PLAT4M, Cando, and Pocket and the H2020 projects TOPHIT, TeraBoard, PIX4Life, MIRPHAB and Phresco. Furthermore, the group is partner of the Center for Nano- and Biophotonics of Ghent University and the group has been awarded four ERC Independent Researcher Starting Grants, one ERC Consolidator Grant and one ERC Advanced Investigator Grant.