

Silicon Photonics

Dries Van Thourhout

Content:

The course will discuss both fundamentals and applications of silicon photonics. Silicon photonics is rapidly emerging as an attractive platform for realizing cheaper photonic integrated circuits. Silicon Photonics is now already commercially used in datacenters and telecom and new applications in biophotonics, quantum computing, optomechanics, sensing, metrology, spectroscopy are rapidly emerging.

The course will start with explaining the reasons for this interest and the possible advantages of the platform. Next the fundamentals of the waveguide platform and its performance will be discussed (straight and bend waveguides, filters, fiber-chip coupling ...). Subsequently we will also discuss more advanced devices such as detectors, high speed modulators and lasers. In each case we will also touch upon the problems that still need to be resolved and give a comprehensive overview of the current state-of-the-art.

In a second part we will discuss on the integration in a standard CMOS processing environment and on different approaches to integrate silicon photonics circuits with optical circuits. Finally, we give a review of current and future applications, in optical communications, optical interconnect and optical sensing.

The tutorial will contain extensive references for further study and discuss how to get access to the various available platforms.