Centre de Nanosciences & de Nanotechnologies

C2N General Seminar

Friday September 24 - 10h00

"Silicon nitride: towards a complete toolbox for nonlinear integrated photonic"

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Link: https://us02web.zoom.us/j/86277738532

Nonlinear optics describes the behaviour of light in a nonlinear medium, exploiting higher orders of the material susceptibility. It allows us to, for example, change the colour of a light beam, change its shape or process light with light. Nonlinear optical phenomena are the basis of many devices used in optical communication systems, optical sensing or material research and enable a wide range of novel applications, and the need for the integration of nonlinear functionalities to the chip scale is evident

It is now well established that silicon nitride offers many advantages for integrated nonlinear photonics. Pushed by recent progress in fabrication, we now have access to very low loss waveguides while maintaining large flexibility in terms of dispersion engineering, both essential for the design of efficient nonlinear systems. As such many nonlinear optical demonstrations, mainly based on 3rd order effects in the telecom band, have been performed. Pushing the applications over the entire accessible spectral range of silicon nitride, from the visible to the middle infrared, as well as offering completely new horizon of applications by inducing effective 2nd-order effects, would provide new and essential elements to the nonlinear integrated photonic toolbox. In this talk I will quickly review our work on systems based on the inherent 3rd order effects, and we then cover how we can leverage all-optical poling to enhance the typically weak 2nd-order nonlinearities of the platform.

Camille-Sophie Brès is an associate professor at EPFL in the institute of Electrical Engineering. She received her bachelor degree with honors in electrical engineering from McGill University, Canada, in 2002. She then moved to the USA where she obtained her PhD in electrical engineering from Princeton University in 2006. After a post-doctoral position at the University of California San Diego she joined EPFL as a tenure track professor and director of the Photonic Systems Laboratory in 2011. Her work focusses on leveraging and enhancing nonlinear processes in optical waveguides for the optimization of all-optical signal processing, light generation and sensing by exploiting dispersion engineering, material properties, and architectural features. She was awarded the early career Women in Photonics Award from the European Optical Society in 2016, as well as ERC starting (2012), Consolidator (2017) and Proof of Concept (2019) grants.