Soutenance de thèse

Lundi 10 Juin
14h30, Amphithéâtre - C2N

Multimodal one-dimensional photonic crystal cavities

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Jury Members :

Rapporteur	**Philip Kristensen (Senior Researcher, DTU Fotonik, Technical University of Denmark)**
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Examinatrice	**Delphine Marris-Morini (Professeure, Université Paris-Saclay, C2N)**
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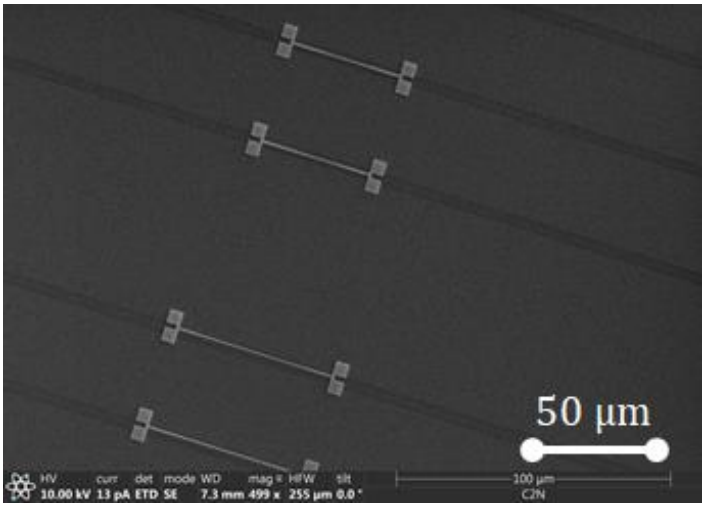
Membre invité	**Stephan Suckow (Head of nanophotonics group at AMO GmbH, Aix-la-Chapelle, Allemagne)**

Abstract :
Integrated photonics research focuses its efforts in developing miniaturised and efficient devices for applications in quantum information, metrology and medicine. In this context, photonic crystal cavities occupy a leading position in the integration of photonic structures owning small footprint and tailorable spectral properties. Special attention in recent years is given to photonic crystal cavities consisting of III-V semiconductor materials, as their nonlinear properties are an asset for further development in complex circuitry of coherent states of light through nonlinear interactions.
In this thesis, we present the design, fabrication and experimental characterisation of one-dimensional photonic crystal cavities integrated on silicon on insulator. First, we detail the design of our cavities which is based on the gentle confinement of the field. We show that our design technique allows the design of multimodal as well as single-mode photonic crystal cavities working at telecom window. The introduced design technique is versatile and easily tailorable to devise cavities of different materials, as InGaP, Si, or InP. Then, we detail the fabrication of III-V photonic structures heterogeneously integrated on silicon on insulator. From the adhesive bonding of the two levels to the final integrated device, fabrication process flow is reported and main challenges encountered commented. Fabrication of silicon-based cavities is also reported. Experimental characterisation of the cavities is conduced by measuring the transmission of the samples. We present how to tailor the spectral properties of the cavities through nanometric variation of their geometrical parameters, and comment on some peculiarities of multimodal coupling.



One-dimensional InGaP photonic crystal cavities integrated on SOI