Centre de Nanosciences et de Nanotechnologies

Soutenance de thèse

The 12 of july 2018

10.00 in the morning

Amphithéâtre rez-de-chaussée C2N site d'Orsay

Fabrice-Roland LAMBERTI

"Opto-phononic confinement in GaAs/AlAs based resonators"

Jury members :

Rapporteur M. Pascal Ruello, laboratoire IMMM, Université du Maine, France
Rapporteur M. Bruno Gayral, Institut Néel, CEA Grenoble, France
Examinatrice Mme. Sarah Benchabane, Femto-ST, France
Examinateur M. Alexey Scherbakov, TU Dortmund
Examinatrice Mme Angela Vasanelli, laboratoire MPQ, Université Paris Diderot
Directeur de thèse M. Paul Voisin, C2N
Encadrant de thèse M. Daniel Lanzillotti Kimura, C2N

Abstract :

Nanophononics is a research field addressing the control and the manipulation of high frequency mechanical vibrations at the nanoscale. Current fabrication techniques enable the realization of nanophononic systems where acoustic phonons interact with confined optical fields, with exciting perspectives for example in the context of high frequency cavity optomechanics.The work carried out in this thesis addresses the conception and the experimental characterization of novel opto-phononic resonators. We will first present a novel confinement method for high frequency mechanical vibrations, based on the adiabatic localization of longitudinal acoustic phonons. We will then present the three-dimensional confinement of light and hypersound in micropillar optomechanical platforms operating at unprecedently high mechanical frequencies (20 GHz). This theoretical study was carried out through finite element simulations and demonstrates the potential of these systems for future high frequency cavity optomechanics experiments. Finally, we will present our experimental work on the measurement of confined high frequency phonons in micropillar systems through Raman scattering spectroscopy. Based on these results I will discuss some future perspectives.

Keywords : Nanophononics, Raman scattering spectroscopy, Optomechanics, superlattices, adiabatic cavity, micropillars.

UMR9001 CNRS-UPSUD
Site d'Orsay : Université Paris -Sud Bât 220 Rue André Ampère 91405 Orsay cedex
Site de Marcoussis : route de Nozay 91460 Marcoussis