Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Low dissipative mechanical resonators based on WSe_2 monolayers
NICOLAS MORELL, ANTOINE RESERBAT-PLANTEY, IOANNIS TSIOUTSIOS, KEVIN SCHADLER, ICFO The Institute of Photonic Sciences, FRANCOIS DUBIN, Institut des NanoSciences de Paris, FRANK KOPPENS, ADRIAN BACHTOLD, ICFO The Institute of Photonic Sciences, QUANTUMNANOMECHANICS TEAM, NANOOPTOELECTRONICS TEAM, NANOSTRUCTURES ET SYSTMES QUANTIQUES TEAM — Atomically thin nano-electromechanical systems (2D-NEMS) combine low mass resonators having resonant frequencies in the MHz-GHz range, wide tunability and low damping. Atomically thin 2D semiconductors, such as transition metal dichalcogenides (TMD), have rich optical properties (direct band gap, spin valley, embedded quantum emitters...), which are linked to their low dimensionality. While optical and electronic properties of WSe_2 have been intensively investigated, there have not been any studies on WSe_2 mechanical resonators. Although TMD NEMs have been fabricated, they have not been measured at cryogenic temperature so far. I will present a new semiconductor 2D-NEMS made of a single layer of WSe_2. We measured mechanical and photoluminescence spectra of WSe_2 suspended drums at cryogenic temperatures. Our results demonstrate an extremely low damping at low temperature with a quality factor Q >47000 at T=3K, which is higher than what can be achieved with graphene NEMs. In addition, we investigated photothermal and optoelectronic effects on the mechanical degree of freedom, revealing the high potential of semiconductor 2D-NEMS for optomechanics experiments.

Nicolas Morell
ICFO The Institute of Photonic Sciences

Date submitted: 06 Nov 2015 Electronic form version 1.4