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Seminar

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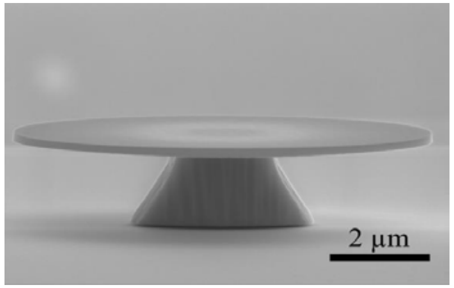
Surface-enhanced optomechanical disk resonators and force sensing



A GaAs disk on AlGaAs pedestal

Optomechanics studies the interaction between light and mechanical motion. In this presentation I will focus on optomechanical experiments carried with miniature disk resonators fabricated out of distinct III-V semiconductors: Gallium Arsenide (GaAs), Aluminium Gallium Arsenide (AlGaAs) and Indium Gallium Phosphide (InGaP). These materials are compliant with optoelectronics functionalities and provide giant optomechanical coupling. In order to boost performances of GaAs resonators, we implemented surface control techniques and obtained a ten-fold reduction of optical dissipation, attaining a Q of six million. On top of GaAs, I will present a comparative investigation of optomechanical interactions in InGaP and AlGaAs disk resonators, and demonstrate their operation as optomechanical oscillators. Finally, we will study optomechanical force sensing experiments with GaAs resonators, analyzing a new sensing principle in light of the phase space trajectory and phase noise of the corresponding oscillators.

[1] L. Ding et al., High frequency GaAs nano-optomechanical disk resonator, Phys. Rev. Lett. 105, 263903 (2010)
[2] B. Guha et. al., Surface-enhanced gallium arsenide photonic resonator with quality factor of 6 × 106,Optica, 4 (2), 218 (2017)
[3] B. Guha et. al., High frequency optomechanical disk resonators in III-V ternary semiconductors, Optics Express, 25 (20) (2017)

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