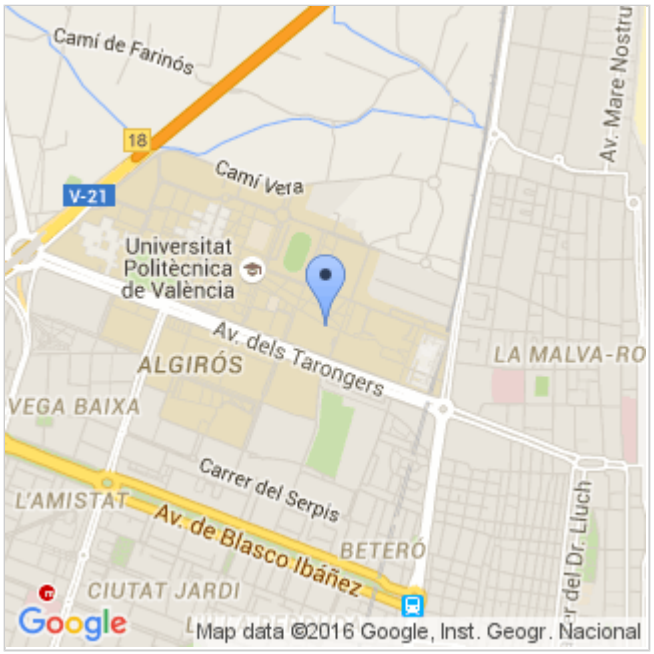
Expression of Interest



Contact Person/Scientist in Charge

- **Name and surname:** Alejandro Martinez
- **Email:** amartinez@ntc.upv.es

Universitat Politècnica de València (UPV)

Department / Institute / Centre

- **Name:** Nanophotonics Technology Center - Universitat Politècnica de València
- **Address:** Campus de Vera; Camino de Vera, s/n; Valencia (46022)
- **Province:** Valencia

Research Area

- Physics (PHY)

Brief description of the institution:

Universitat Politècnica de València (UPV) is the single Spanish Technical University that features in the main University world rankings. It is within the top 5 Spanish Universities with the highest revenue from both public research and knowledge transfer activities, and a national leader in patent license income and start up creation. Constituted in 1971, it comprises nearly 30.000 students, over 2500 academics, and 17 university research centres of excellence.

UPV has a relevant experience in the participation in international research programmes, with over 100 FP7 projects and 40 H2020 projects in the period 2014-2015. UPV researchers are also actively involved all H2020 life program stages, from workprogramme drafting discussions, to project coordination. It is also taking part in several major partnering initiatives (JTIs, PPPs, KICs…).

Brief description of the Centre/Research Group (including URL if applicable):

The Nanophotonics Technology Center (NTC) is a research institute of the Universitat Politècnica de València. NTC's activities are focused on nanophotonics, from basic science to the development of

advances optical devices, systems and networks. NTC has currently 50 members including 10 university professors, 7 postdocs, 11 technicians and 12 PhD students. Our premises (3800 m2 building) include a 500 m2 clean room (class 10-100) for nanofabrication using silicon technology. Several labs are used for characterization of complex nanophotonic devices. Equipment such as FTIR and Raman spectrometry, ellipsometry, tunable CW and pulsed lasers, optical spectrum analyzers or AFM is available in such labs.

NTC is involved in a large number of EU and national projects as well as in research activities with companies and other institutions. NTC's technology-transfer vision has enabled to create three spin-off companies: DAS Photonics (space, aeronautics, and defense), Fibernova (telecom) and Lumensia (biosensors).

In particular, the research group lead by Alejandro Martinez (http://www.ntc.upv.es/english/metamaterials.html) is interested in the study of the properties of new nanophotonics structures, including plasmonics, metamaterials, nanoantennas and optomechanics, and its implementation in silicon photonic chips. The final aim of this group is to use such devices for advanced sensing and optical switching on a silicon chip, amongst other applications.

Project description:

Plasmomechanical devices: boosting cavity optomechanics via surface plasmons

Optical fields provide a very efficient means to transduce and drive mechanical motion at the nanoscale. The interaction between such optical fields and mechanical vibrations cavities constitutes the basics of the field known as cavity optomechanics. So far, optomechanical devices make use of transparent materials that allow high Q cavities, enabling a plethora of new effects such as cavity cooling or phonon lasing. However, this approach has some limitations such as the diffraction-limited size of the cavity or the tight requirements on linewidth and position accuracy of the light sources. Such drawbacks could be alleviated by using surface plasmons. Excitation of plasmonic resonances in metallic nanostructures gives rise to high field concentrations at subwavelength volumes, which should lead to strong forces to drive nanomechanical resonances. The use of metallic nanostructures would allow to break the diffraction limit, achieving footprints well below the wavelength. In addition, the broadband behavior of plasmon resonances would relax the requirements for cavity excitation. Moreover, metallic nanoparticles possess mechanical resonances tunable by choice in the GHz regime, so they could be used as phonon sources.

This project is focused on the control of mechanical resonances of metallic nanostructures using plasmonic resonances and its hybridization with mechanical modes of optomechanical crystals built on silicon membranes. Besides the physical richness that such structures can provide, we foresee applications in sensing, spectroscopy and all-optical modulation.

Applications

The candidate should submit a CV and a letter of motivation before June 10th.