

Phd Offer at the DIPC in San Sebastián (Spain) Novel quantum phenomena in plasmonic systems

Surface plasmons are optical resonances that can confine light at the nanoscale, leading to efficient coupling with nearby systems and applications in spectroscopy, microscopy or optoelectronics, among many other possibilities. They have thus become one of the key building elements in nanophotonics. Most studies focus on metals as the plasmonic material, and obtain the classical response by solving Maxwell's equation. However, a quantum treatment can be necessary to fully understand the possibilities of novel 2D plasmonic materials such as graphene and topological insulators and to reveal new phenomena, related for example with the coupling between the plasmonic modes and molecules.

The main objective of this theoretical thesis will thus be to use sophisticated quantum treatments, such as Time-Dependent Density Functional Theory (TDDFT) or ab-initio methods, to study new plasmonic materials, new excitations and other novel phenomena. This quantum framework can also be combined with more classical approaches. Many different systems could be studied, with an intriguing possibility being the analysis of a new type of strongly-confined plasmonic acoustic excitations on gold surfaces. Of special interest will be to understand the possibilities of the studied systems for a variety of applications, which may include spectroscopic studies of molecules, nanophotonic devices, quantum information or the modification of the molecular chemical properties.

The work will be theoretical, but the candidate is expected to contribute to collaborations with experimentalists whenever possible. The student is also expected to work closely with other theoreticians on topics closely related to the present work, as for example nanophotonics, ab-initio modeling or quantum information. The candidate should be willing to perform stays of up to several months with our collaborators worldwide if required by the progress of the thesis. A strong background on nanophotonics and on quantum modeling of materials will be particularly valuable.

If you are interested, please contact us before April 15th.

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More information can be found in:

<http://cfm.ehu.es/nanophotonics/>, <http://www.dipc.org/>