SEMINAIRE ISMO

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Nanooptics of Subnanometric Plasmonic Gaps

Plasmonic nanogaps are formed at the junction of two metallic interfaces providing a great opportunity to explore atomic-scale morphologies and complex photochemical processes by optical means, thanks to the excitation of intense surface plasmonic modes. In recent years, optical spectroscopy of these cavities has proven to be extremely sensitive to atomic-scale features that determine the chemistry and the optoelectronics in the gaps. We exploit different classical and quantum theoretical approaches to address the optics of metallic nanogaps where the separation distances are taken to the extreme, reaching Ångstrom-scale dimensions. A few examples of the potential of plasmonic nanogaps to perform atomically-resolved field-enhanced spectroscopy and microscopy, as well as to address transport properties at optical frequencies will be discussed.

Finally, I will focus on the influence of the morphology of ultra narrow gaps in the plasmonic response. These aspects are crucial to determine the emergence of quantum effects such as tunneling between particles. The atomic scale is a challenging regime in plasmonics, however, it is being progressively achieved experimentally. In this regime, classical theories fail to address the fine details of the optical response, and more sophisticated quantum theories need to be implemented.

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