Plasmon-exciton coupling: electromagnetic field quantization and emitter description beyond the two-level, point-dipole approximation

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Plasmonic nanostructures enable light-matter interaction strengths well beyond those provided by semiconductor devices. This makes it possible the emergence of polaritonic phenomena at the nanoscale and at a few, or even single, molecule levels. In this seminar, I will explore classical and quantum optical effects behind this strong plasmon-exciton coupling, with particular focus on two different topics. First, I will treat the quantization of the electromagnetic fields in both purely metallic [1] and hybrid metallo-dielectric [2] cavities. Second, I will discuss different configurations in which the strong confinement of plasmonic fields unveils features of quantum emitters not accounted for in a two-level-system and point-dipole approximation. Namely, I will explore the far-field signatures of light-forbidden molecular transitions [3] and the impact of the vibrational degrees of freedom in the plasmonic Purcell effect [4].

REFERENCES

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