Complex photonic networks of light and individual emitters

Riccardo Sapienza
Department of Physics, King's College London, Strand, London WC2R 2LS, United Kingdom.
sapienzalab.org

Single photon emitters coupled to a complex photonic network hold great potential for next generation quantum information at the nanoscale.

I will present our approach to photonic networks based on multiple scattering and how we experimentally couple a set of distributed single emitters with disordered electro-spun dielectric nanofibers [1], percolating plasmonic networks [2], and hybrid antenna-waveguide systems [3]. By measuring individual quantum dots and organic emitters at room temperature we record both real and momentum spectroscopy of the fluorescence and we construct the distribution of the Purcell effect, i.e. the fluorescence modification by local mode density engineering. I will discuss the role of global long-range interactions linked to the network connectivity, degree of percolation and fractality, as well as the local near-field contribution.

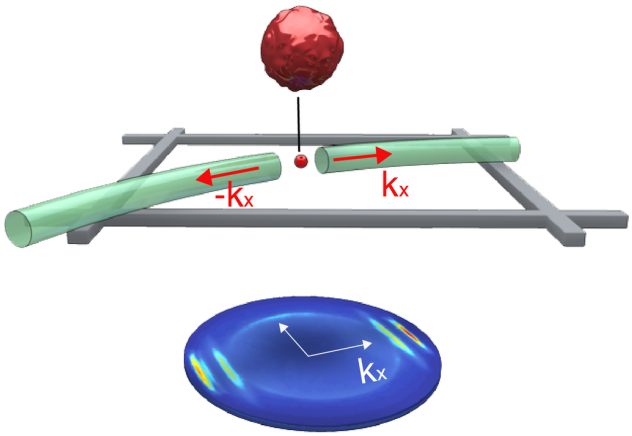

Figure: sketch of the momentum spectroscopy technique for single-emitters in nanowaveguides.

References

[1] Coupling and addressing individual emitters in a nanowaveguide, Michele Gaio, Maria Moffa, Marta Castro-Lopez, Andrea Camposeo, D. Pisignano and R. Sapienza, ArXiv 1508.04276 (2015).
[2] Percolating Plasmonic Networks for Light Emission Control, Michele Gaio, Marta Castro-Lopez, Jan Renger, Niek van Hulst, and Riccardo Sapienza, Faraday Discuss. 178, 237 (2015).
[3] Nanophotonic boost of intermolecular energy transfer, P.M. de Roque, N.F. van Hulst, R. Sapienza, ArXiv 1510.02256 (2015).