Full reciprocal space analysis of colloidal plasmonic nanostructures

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Periodic arrays of metallic nanoparticles efficiently combine desirable photonic and plasmonic attributes, including strong field enhancement and suppressed radiative losses. Such an interplay between the localized surface plasmon resonances (LSPRs) and their collective diffractive behaviour results in high-quality surface lattice resonances (SLR) [1]. By placing quantum emitters in the vicinity of the periodic structure, one can achieve fluorescent enhancement and directionality of the emission, thereby, enabling tailored light-matter interaction such as plasmon-exciton coupling [2].

In order to optimize the out-coupling of the SLRs to the gain medium, we provide here a comparative investigation of the dispersive behaviour of the periodic 1D and 2D metal nanostructures, fabricated by the means of colloidal self-assembly [3]. To access the quantitative information about wavelength- and angle-dependence of the scattered light, the band structure is mapped through the spectrally resolved Fourier-space imaging (see Figure 1). The energy-momentum measurements are supported by the finite-difference time-domain (FDTD) simulations.

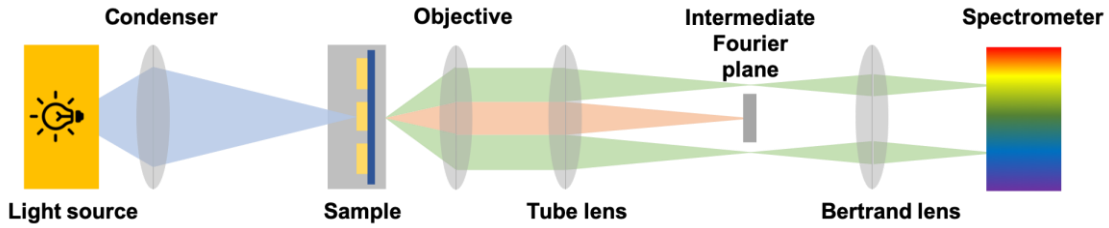

Figure 1. Schematic representation of the back-focal-plane imaging setup.

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