

Popular abstract

Nano Antennas for Enhancement of Nonclassical Light Emission

In the pursuit of pushing the boundaries of technology, scientist and engineers are looking to exploit quantum mechanical effects in the technology of tomorrow. A fundamental building block in this endeavor is the controlled generation of a single quantum of light, namely the photon. Single photons may be generated by spontaneous emission from an isolated quantum emitter, such as a molecule or defect in a diamond. However the emission properties of the isolated quantum emitter are typically not ideal. Issues such as omnidirectional emission, slow photon rate and non-unity quantum yield, being problematic for technological applications. In the presented PhD work, we seek to experimentally improve the spontaneous emission properties of such quantum emitters by incorporating them into metallic nano antennas. The presented work considers gold and silver as potential materials for realizing the metallic nano antennas, while utilizing the nitrogen-vacancy center (NV-center) in diamond for generation of single photons. The nano antenna is assembled around the NV-center by moving metallic nano particles with an atomic force microscope (AFM) or by picking up the nano diamond containing the NV-center, with the AFM, and placing it in the antenna. The spontaneous emission properties of the NV-center are subsequently characterized experimentally in order to evaluate the performance of the various antenna designs.