Highly indistinguishable on-demand resonance fluorescence photons from a deterministic quantum dot micropillar device with 74% extraction efficiency - DTU Orbit (09/11/2017)

Highly indistinguishable on-demand resonance fluorescence photons from a deterministic quantum dot micropillar device with 74% extraction efficiency

The implementation and engineering of bright and coherent solid state quantum light sources is key for the realization of both on chip and remote quantum networks. Despite tremendous efforts for more than 15 years, the combination of these two key prerequisites in a single, potentially scalable device is a major challenge. Here, we report on the observation of bright single photon emission generated via pulsed, resonance fluorescence conditions from a single quantum dot (QD) deterministically centered in a micropillar cavity device via cryogenic optical lithography. The brightness of the QD fluorescence is greatly enhanced on resonance with the fundamental mode of the pillar, leading to an overall device efficiency of η = (74 ± 4) % for a single photon emission as pure as g (2) (0) = 0.0092 ± 0.0004. The combination of large Purcell enhancement and resonant pumping conditions allows us to observe a two-photon wave packet overlap up to v = (88±3) %.

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