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Quantum optics with nanowire quantum dots

Nanowires grown by epitaxial methods enable the fabrication of complex semiconducting heterostructures where the composition, size, position and doping can be controlled with unprecedented freedom. We study the optical properties of single nanowires containing single quantum dots with the aim of interfacing the world of quantum transport and quantum optics. We have demonstrated the operation of a single nanowire light emitting diode. Photocurrent measurements on gated quantum dots are performed to probe the energy levels of a single quantum dot in a nanowire. The polarization properties of nanowire heterostructures will also be discussed and photoluminescence measurements done in different orientations and under magnetic field demonstrate that vertical nanowire devices enable the extraction of any polarization. This enables us to prepare and observe any spin state in our nanowire quantum dot.

We have recently coupled the emission from tunable quantum dots to rubidium vapor and we will discuss the potential advantages of solid state - atomic vapor coupling for the generation of indistinguishable photons from independent quantum dots.



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