Highly-Indistinguishable Single-Photons at 1550 nm from a Two-photon Resonantly Excited Purcell-enhanced Quantum Dot

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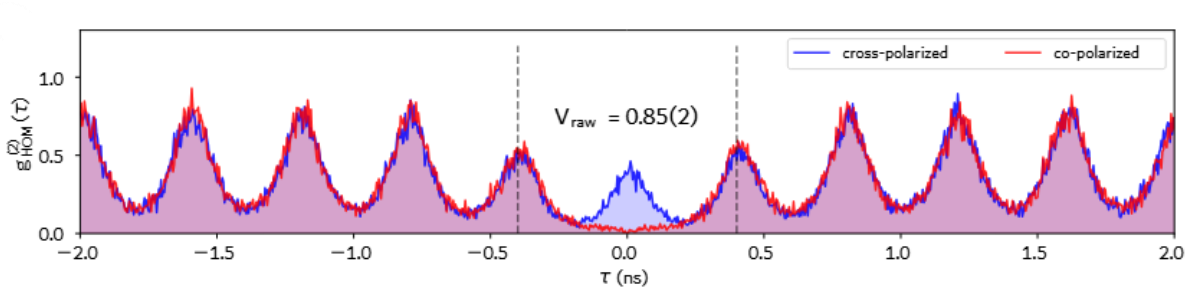
Many photonic quantum technologies rely on sources providing single and indistinguishable photons on demand and at high rates.

Here we present an ultra-fast quantum dot (QD) single-photon source in the telecom C-band, based on InAs/InAlGaAs QD integrated in a circular Bragg grating cavity [1]. We observe record-short biexciton decay times of 68 ps under resonant two-photon-excitation (TPE), which allows us to generate highly indistinguishable single photons at clock rates exceeding 1 GHz. The two-photon interference visibility of photons emitted via the biexciton-exciton transition was measured in a Hong-Ou-Mandel-type experiment to be 90(3)% and 85(2)% at clock rates of 100 MHz and 2.5 GHz, respectively. Implementing stimulated TPE using a bi-chromatic coherent excitation scheme, we show that the photon indistinguishability can be further enhanced for exciton photons.

Our results show promises to advance QD-based implementations of quantum cryptography to unprecedentedly high clock rates at wavelengths suitable for large-scale fiber-optic networks.



[1] R. Behrends et al., Highly-Indistinguishable Single-Photons at 1550 nm from a Two-photon Resonantly Excited Purcell-enhanced Quantum Dot, arXiv:2602.06140 (2026)