Indistinguishability of coherent photons from from telecom-wavelength quantum dots

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The ability of two photons to interfere lies at the heart of many photonic quantum networking concepts [1] and requires that the photons are indistinguishable with sufficient coherence times to resolve the interference signals. Semiconductor quantum dots, typically emitting around 900 nm, are promising candidates for such quantum light sources, with bright and coherent single photon sources recently demonstrated [2]. Recently, efforts have been made to push emission wavelengths into the telecom bands to harness the vastly superior transmission of such photons in optical fibres for quantum network applications [3,4]. Here, we investigate the limits of coherence and indistinguishability for InAs/InP quantum dots with direct emission into the telecom C-band. We use coherence time measurements to investigate how close to the Fourier limit emission from this system can be pushed. Based on the coherent emission, we use Hong–Ou–Mandel interferometry to study the indistinguishability of the emitted photons. A sketch of our setup is shown in Fig. 1 (a), and Fig. 1 (b) shows the obtained interference visibility, which reaches 98.6±1.6% after post-selection and correction for detector resolution [4]. Our results highlight the potential of our system for the development of future quantum networking applications.

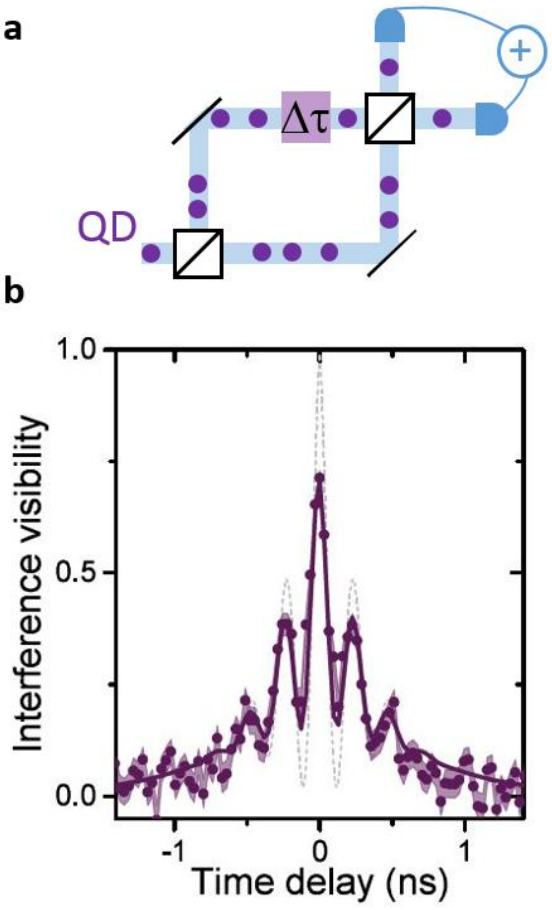

Figure 1: Indistinguishability measurement for telecom wavelength photons. (a) Hong-Ou-Mandel interferometer setup and (b) measured interference visibility from an InAs/InP quantum dot.

References

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