Identical Single-Photon Sources from Quantum Dot Emitters Coupled to Micropillar Cavities

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Semiconductor quantum dots (QDs) embedded in microcavities are bright and deterministic emitters of indistinguishable single photons [1, 2, 3]. Scaling up quantum photonic technologies requires interfering photons emitted from independent sources, which in turn demands emitters of identical optical properties.

Achieving such reproducibility remains a major technological challenge [4,5] as it requires precise control over device fabrication at the single-emitter level. This includes fine adjustment of the micropillar cavity wavelength, the narrowing of the acceptable spectral range of the targeted QD transitions and reducing the QD density across the wafer to lower the charge induced noise [6].

In this work, we address all these challenges and demonstrate state-of-the-art two-photon interference of (88±1)% between remote quantum-dot micropillar sources, marking a significant step toward scalable solid-state quantum networks [7].

References

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[3] X. Ding *et al.* Nature Photonics vol.19 (2025) p.387
[4] L. Zhai *et al.* Nature Nanotech. vol.17 (2022) p.829
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[6] T. Pollet *et al.* To be submitted.
[7] T. Pollet *et al.* To be submitted.

Figures

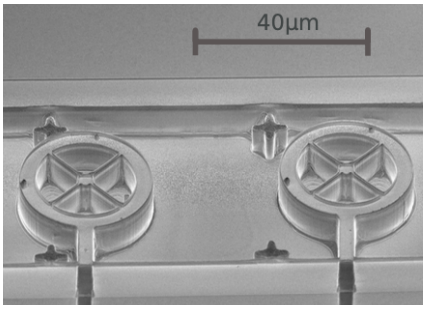

Figure 1: Scanning Electron Microscope image of two micropillar single photon sources.

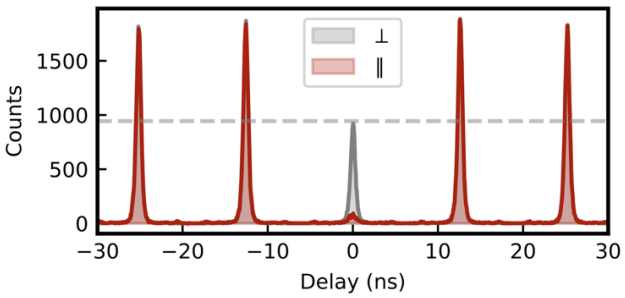

Figure 2: Correlation measurements between two remote sources under phonon assisted excitation using parallel (∥) and orthogonal (⊥) polarisations.