# Towards multi-photon interference with deterministic single-photon emitters in the telecom C-band

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For a long time, photonic quantum technologies in the telecom C-band had to rely on inherently probabilistic single-photon sources based on spontaneous parametric down-conversion. Despite their excellent single-photon properties, their probabilistic nature presents considerable challenges with regard to scalability. It has recently been demonstrated that quantum dot-based platforms are well-suited as deterministic sources of indistinguishable photons in the telecom C-band, with photon properties catching up to their probabilistic counterparts [1, 2].
In this presentation, we demonstrate a deterministic source of indistinguishable single photons in the telecom C-band based on indium arsenide quantum dots in circular Bragg grating resonators [3]. By optimising the optical excitation scheme, we demonstrate two-photon interference visibilities as high as $V_{\mathrm{TPI}} = (91.7 \pm 0.2)\%$ between two consecutively emitted single photons. These developments mark a milestone towards the implementation of near-term photonic quantum technologies with deterministic quantum emitters.
Furthermore, we employ an active demultiplexing scheme to spatially separate multiple consecutively emitted single photons from a single quantum dot. Using the resulting string of spatially separated photons, multi-photon experiments can be performed using compact, fibre-based multiport interferometers. These interference effects form the backbone of many protocols in photonic quantum communication and quantum computation. Our results further consolidate the role of quantum dots as the future workhorse of photonic quantum technologies in the telecom C-band.

## References

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