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Nanoscale source of bright entangled photon pairs

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The on-demand generation of bright entangled photon pairs is highly needed in quantum optics experiments and emerging quantum technologies. However, a quantum light source combining both high fidelity and on-demand bright emission has proven elusive with current leading photon technologies. In this work we present a new bright nanoscale source of strongly entangled photon pairs generated with a quantum dot in a nanowire waveguide. Owing to the shaped nanowire waveguide structure, which serves to direct the quantum dot emission, we detect photon pair rates that are more than two orders of magnitude brighter than a bare quantum dot without photonic nanostructure. The major breakthrough in the nanowire growth to reach entanglement fidelities close to 90% while maintaining high efficiencies will also be discussed. These results will be put in perspective with state-of-the-art entangled photon sources. This is the first bright quantum dot source of entangled photon pairs capable of violating Bell's inequalities, opening up future experiments in quantum optics and developments in quantum communication.

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