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Highly-reduced Fine-structure splitting in InAs/InP quantum dots offering efficient on-demand 1.55 μm entangled photon emitter LIXIN HE, University of Science and Technology of China, M. GONG, C-F LI, G-C GUO, University of Science and Technology of China, A. ZUNGER, National Renewable Energy Laboratory — There has been intense recent interest in finding efficient entangled photon sources, including the demonstration of generation of "event-ready" entangled photon pairs via a biexciton cascade process using an (In,Ga)As/GaAs quantum dot(QD). However, a genuine finite energy difference between photons with different polarizations, known as the fine structure splitting (FSS), can destroy the entanglement of the photon pairs. To achieve entanglement from (In,Ga)As/GaAs QD, it was, indeed, necessary to Cherry-pick a sample with extremely small FSS from a large number of samples, or to apply strong in-plane magnetic field. Furthermore, the emission wavelength of (In,Ga)As/GaAs QD (880 - 950 nm) is mismatched with the 1.55 μm needed for communications using the optical fibers. Using theoretical modeling of the fundamental causes of FSS in QDs, we predict that the intrinsic FSS of InAs/InP QDs is an order of magnitude smaller than that of InAs/GaAs dots, and better yet, their excitonic gap matches the 1.55 μm fiber optic wavelength,therefore offer efficient on-demand entangled photon emitters for long distance quantum communication.

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