Abstract Submitted
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Restoring photon indistinguishability via pulse and continuous-wave control of solid-state quantum emitters.[1] HERBERT F. FOTSO, Ames Laboratory, ADRIAN E. FEIGUIN, Northeastern University, DAVID D. AWSCHALOM, University of Chicago, VIATCHESLAV V. DOBROVITSKI, Ames Laboratory — Interference of indistinguishable photons is a central element of many protocols for entangling distant qubits in quantum networks. In spite of great progress [1,2,3] in development and applications of solid-state quantum emitters, the entanglement rate remains severely limited. One of the major obstacles is the photon indistinguishability which is greatly reduced by the uncontrollable slow drift of the qubit emission frequency. We investigate several pulse-based and continuous-wave control protocols which suppress the spectral diffusion. We confirm, using both analytics and direct numerical simulations, that these protocols effectively keep the emission at a set target frequency, and explicitly show that the indistinguishability of the emitted photons is restored by the control. We also compare several pulse-based protocols with different pulse timings, and discuss how they affect the emission line and the photon properties. Considering the nitrogen-vacancy centers in diamonds as a convenient example, we demonstrate that both pulse-based and continuous-wave controls can boost the success rate of the long-range entanglement. [1]B. Hensen et al., Nature 526, 682 (2015). [2]B. B. Buckley et al., Science 330, 1212 (2010). [3]W. B. Gao et al., Nature Comm. 4, 2744 (2013).

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