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Phase-tuned entangled state generation between distant spin qubits ROBERT STOCKILL, MEGAN STANLEY, LUKAS HUTHMACHER, CLAIRE LE GALL, Cavendish Laboratory, University of Cambridge, JJ Thomson Avenue, Cambridge CB3 0HE, UK, AARON MILLER, Quantum Opus, 42511 Helm St., Plymouth, MI 48170, USA, EDMUND CLARKE, MAXIME HUGUES, EPSRC National Centre for III-V Technologies, University of Sheffield, Sheffield, S1 3JD, UK, CLEMENS MATTHIESEN, METE ATATURE, Cavendish Laboratory, University of Cambridge, JJ Thomson Avenue, Cambridge CB3 0HE, UK — In addition to being one of the most intriguing features of quantum mechanics, distant entanglement provides the unique advantage to networks constructed from coherent, optically connected qubits. Candidates of particular interest for distributed quantum networks are single spins confined to optically-active quantum dots. The strong, coherent optical transitions in these systems provide an ultrafast interface between the ground state spin and well-defined optical modes. We use this interface to distribute entanglement between two electron spins resident in separate quantum dots via the measurement of a single photon [1]. Our minimal heralding scheme and the strength of the optical transitions permits state creation at an 8-kHz rate, the highest reported for nonlocal qubits. We recover a Bell-state fidelity of $61.6 \pm 2.3\%$, determining the non-classicality of the shared state. We demonstrate arbitrary state creation through the phase of our projective measurement. The state distribution reported here establishes spins in optically-active quantum dots as a high-frequency host for controllable nonlocal states. [1] Cabrillo, C. et al., 1999 PRA, 59, 1025-1033

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