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Quantum interference of single photons from two remote Nitrogen-Vacancy centers in diamond ALEXANDER KUBANEK, ALP SIPAHIGIL, EMRE TOGAN, MICHAEL GOLDMAN, YIWEN CHU, NATHALIE DE LEON, ALEXANDER ZIBROV, MIKHAIL LUKIN, Harvard University — The interference of two identical photons impinging on a beam splitter leads to perfect photon coalescence where both photons leave through the same output port. This fundamental effect, known as Hong-Ou-Mandel (HOM) interference [1], can be used to characterize the properties of quantum emitters with high accuracy. This is a particularly useful tool for quantum emitters embedded in a solid state matrix because their internal properties, unlike those of atoms in free space, can vary substantially from emitter to emitter due to interactions with the environment. Here, we demonstrate HOM interference of photons emitted from two single Nitrogen-Vacancy (NV) centers in diamond that are spatially separated by 2 meters. The frequencies of the photons are controlled by tuning individual optical transitions of associated NVs via a DC electric field. The indistinguishability of the photons paves the way for entanglement generation between remote solid state qubits. [1] C. K. Hong, Z.Y. Ou, and L. Mandel, Phys. Rev. Lett. 59, 2044 (1987).

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