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Ion crystal transducer for strong coupling between single ions and single photons LUCAS LAMATA, Max-Planck-Institut fuer Quantenoptik, DAVID LEIBRANDT, National Institute of Standards and Technology, ISAAC CHUANG, Center for Ultracold Atoms, Department of Physics, MIT, IGNACIO CIRAC, Max-Planck-Institut fuer Quantenoptik, MIKHAIL LUKIN, ITAMP, Harvard-Smithsonian Center for Astrophysics, and Department of Physics, Harvard University, VLADAN VULETIC, Center for Ultracold Atoms, Department of Physics, MIT, SUSANNE YELIN, ITAMP, Harvard-Smithsonian Center for Astrophysics, and Department of Physics, University of Connecticut — A quantum interface between single photons and single ions in an ion crystal is proposed. The coupling between single photon and single particle is collectively enhanced via a collective internal ion state and a phonon state. Applications for this scheme include single-photon generation, a memory for a quantum repeater, and a deterministic photon-photon or photon-ion entangler.

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