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Generation, Storage, and Retrieval of Single-Photon Pulses using Electromagnetically Induced Transparency MATTHEW EISAMAN, PHILIP WALTHER, AXEL ANDRE, FLORENT MASSOU, Physics Department, Harvard University, MICHAEL FLEISCHHAUER, Fachbereich Physik, Technische Universitat Kaiserslautern, Germany, ALEXANDER ZIBROV, Physics Department, Harvard University, Harvard-Smithsonian Center for Astrophysics, and P. N. Lebedev Institute of Physics, Moscow, MIKHAIL LUKIN, Physics Department, Harvard University — We demonstrate the use of electromagnetically induced transparency (EIT) for the controllable generation, transmission, and storage of single photons with tunable frequency, timing and bandwidth. We study the interaction of single photons produced in a 'source' ensemble of rubidium-87 atoms at room temperature with another 'target' ensemble. This allows us to simultaneously probe the spectral and quantum statistical properties of narrow-bandwidth single-photon pulses, revealing that their quantum nature is preserved under EIT propagation and storage. We measure the time delay associated with the reduced group velocity of the single-photon pulses and report observations of their storage and retrieval. Finally, we discuss experimental progress towards application of these results to long-distance quantum communication.

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