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Conversion Between Telecom and Atomic Photons by Four-Wave Mixing in Warm Rb. JONATHAN KWOLEK, ADAM BLACK, MARK BASHKANSKY, U.S. Naval Research Laboratory, MICHAL PIOTROWICZ, Jacobs — Conversion of atomic-wavelength photons to and from telecom wavelengths is needed for quantum networks and quantum communication that require quantum states to be transferred over large distances. Previously, a conversion between atomic wavelengths and 1.3 μm photons has been demonstrated in an ultra-dense cold atomic ensemble. Here we present a much simpler method of conversion from 1530 nm to 795 nm employing a four-wave mixing (FWM) scheme in a warm vapor cell. Atoms in the warm Rb cell are initially optically pumped to F=2, m_F =2 state to create a dense optical sample for the FWM process by judicious choice of pump and signal polarizations as well as atomic states, detunings and pulse durations. 1530 nm photons are converted to 795 nm in the FWM process with pump beams at 1475 nm and 780 nm, while weak signal beam is at 1530 nm. Converted 795 nm photons are detected by single photon detector. We observe that for longer FWM pulses the conversion efficiency saturates at high Rabi frequencies of pump lasers. By time gating the measurement to the initial 25 ns of the pump pulse, and detuning the pump lasers the conversion reaches 6%. The limiting factors for the conversion are the powers of the pump lasers and population redistribution in the magnetic sublevels of the ground state.

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