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Standard Polarization-Maintaining Fibers as a Source of Polarization-Entangled Photons VIRGINIA LORENZ, BIN FANG, OFFIR COHEN, JAMY MORENO, University of Delaware — Entangled photons are a crucial resource for quantum communication, quantum computation and fundamental tests of quantum mechanics, which often require the distribution or processing of entangled photons through single-mode fiber (SMF) networks. However, coupling into SMFs has been a challenge due to the spatial mode mismatch between the created photons and the guided mode in the SMF. Recently, it was demonstrated that efficient generation of photon-pairs at visible wavelengths is possible using standard, commercially available polarization-maintaining fibers (PMFs), with high coupling efficiency into SMFs. Here we demonstrate the capability of the source to generate polarization-entangled photon-pairs by inserting a PMF source into a Sagnac interferometer. With a total pump power of 10mW of ∼200fs pulses at 715nm and 80MHz, we obtain 350 coincidences/s of photons at 850nm and 620nm. We perform a quantum state tomography to reconstruct the density matrix, yielding, without background subtraction, a tangle of $T = 0.629 \pm 0.022$, a linear entropy of $S = 0.264 \pm 0.014$, and a fidelity with a maximally entangled state of $90.40 \pm 0.56\%$, clearly exhibiting non-classical entanglement. We expect this source to be useful for fiber-based quantum communication protocols.

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