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Towards a low noise system for generating entangled photons in orbital angular momentum NATHANIEL RISTOFF, ANDREW FERDINAND, F. ELOHIM BECERRA, University of New Mexico, Center for Quantum Information and Control — Orbital angular momentum (OAM) of light can be used to increase the information capacity of a communication channel because it allows for multilevel encoding. In quantum communication, multilevel encoding can be used to increase secret key rates in quantum key distribution, while quantum memories based on atomic ensembles can allow for extending communication to long distances. Photon pairs entangled in OAM modes generated from atomic ensembles are readily compatible with atomic quantum memories. We report on the progress towards developing a source of entangled photons in OAM from atomic ensembles with very low levels of noise, that can in principle allow for characterization and control over the OAM spectrum. This source will be based on a cold ensemble of cesium atoms, for which we will employ a variety of techniques to reduce the levels of noise and improve fidelities in the correlation measurements in OAM such as narrow-band frequency filtering and optimized projective measurements with spatial light modulators. This source of entangled photons in OAM will be used for investigations of quantum correlations in high dimensions and entanglement transfer between photons and atoms.

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