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Quantum correlations of light from atoms trapped around an optical nanofiber[1] J.A. GROVER, P. SOLANO, J.E. HOFFMAN, J. LEE, L.A. OROZCO, S.L. ROLSTON, Joint Quantum Institute, Dept. of Physics, UMD and NIST, College Park, MD 20742, USA — We interrogate an ensemble of rubidium atoms trapped around an optical nanofiber (ONF) through the quantum correlations of the light emitted into the ONF mode. Using trapping light at 750 and 1064 nm, we create an optically thick atomic ensemble. The conditional detection, $g^{(2)}(\tau)$, allows for the study of atomic dynamics and of different contributions to the correlation function from single and multiple atoms. The conditional dynamics can not only probe ensemble properties but also provide information about this unique 1D atomic system, opening the opportunity to study many-body physics with long-range interactions. One example is the recent proposal of self-organization into crystalline order of trapped atoms around an ONF [1]. As an atomic ensemble, the guided mode assures high optical depth and good optical coupling of the photons, which may enable protocols that employ states beyond the first Dicke state.

[1] T. Grießer *et al.*, Phys. Rev. Lett. **111**, 055702 (2013); D. E. Chang, *et al.* Phys. Rev. Lett. **110**, 113606 (2013).

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