

Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Nonclassical millihertz linewidth light source with Rydberg polaritons ZHEXUAN GONG, MICHAEL FOSS-FEIG, Joint Quantum Institute and Joint Center for Quantum Information and Computer Science, NIST/University of Maryland, MINGHUI XU, ANA MARIA REY, MURRAY HOLLAND, JILA, National Institute of Standards and Technology and Department of Physics, University of Colorado, ALEXEY GORSHKOV, Joint Quantum Institute and Joint Center for Quantum Information and Computer Science, NIST/University of Maryland — A superradiant laser could be used to generate light with extremely high spectral purity, with important applications to quantum information and precision measurements. These applications can be further extended when the photon statistics becomes nonclassical. Here we propose a practical way to generate arbitrarily strong nonlinearity in a superradiant laser by introducing a Rydberg gas into the cavity. The output photons can be made perfectly anti-bunched, while inheriting the millihertz linewidth of the lasing atoms. Our method can also be used to generate a photon blockade in various cavity QED setups, and has implications for the simulation of quantum many body physics with photons.

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Date submitted: 30 Jan 2015

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