Abstract Submitted
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Single-photon nonlinearities in the propagation of focused beams through dense atomic clouds[1] YIDAN WANG, Joint Quantum Institute; University of Maryland, College Park, ALEXEY GORSHKOV, MICHAEL GULLANS, Joint Quantum Institute; Joint Center for Quantum Information and Computer Science — We theoretically study single-photon nonlinearities realized when a highly focused Gaussian beam passes through a dense atomic cloud. In this system, strong dipole-dipole interactions arise between closely spaced atoms and significantly affect light propagation. We find that the highly focused Gaussian beam can be treated as an effective one-dimensional waveguide, which simplifies the calculation of photon transmission and correlation functions. The formalism we develop is also applicable to the case where additional atom-atom interactions, such as interactions between Rydberg atoms, are involved.

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