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Photon Counting for Bragg Spectroscopy of Quantum Gases JUAN PINO, ROBERT WILD, PHILIP MAKOTYN, DEBORAH JIN, ERIC CORNELL, JILA, Quantum Physics Division, National Institute of Standards and Technology and Department of Physics, University of Colorado — Spectroscopy of low-energy excitations has proved to be an invaluable tool in understanding the many-body physics of ultracold quantum gases. Typically for these measurements, the quantum gas is driven by some field, and the response measured through time-of-flight images of the gas. Often overlooked, however, is the response of the field itself due to its interaction with the gas. We present a method for measuring the response of a light field used to create excitations for Bragg spectroscopy. We describe the techniques used to achieve shot-noise limited detection of this light-field, and also present Bragg spectroscopy of a Bose-Einstein condensate using this novel technique.

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