

Abstract Submitted
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Beyond mean-field effects in Bloch Oscillations of cold atoms in an optical cavity PRASANNA VENKATESH BALASUBRAMANIAN, DUNCAN O'DELL, McMaster University — In our earlier publication [1] we proposed using Bloch oscillations of cold atoms inside an Fabry-Perot resonator for sensitive measurements of force. The analysis in [1] was performed using a coherent mean-field description for the atoms and the light. In the current work we extend this description substantially by including the effects of fluctuations in both the atomic and light fields. This analysis is used to set realistic limits on the precision to which the force can be measured. We also make contact with the optomechanical description of the combined atom-cavity system which has proved so successful for describing recent pioneering experiments [2].

[1] B. Prasanna Venkatesh et al, Phys. Rev. A 80, 063834 (2009).

[2] S. Gupta et al, Phys. Rev. Lett. 99, 213601 (2007); F.Brennecke et al, Science 322, 235 (2008).

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