Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Cavity QED with group II atoms[1] MURRAY J. HOLLAND, DOMINIC MEISER, DAVID TIERI, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA — Traditionally, cavity QED experiments and theory have focused on strong atomic transitions so as to maximize the coupling strength of atoms to cavity photons. Recently novel cavity QED systems using ultra-narrow optical transitions have started to attract attention. In these systems the coupling between atoms and field is much weaker but at the same time the decoherence of the atoms is also much weaker. As a result, non-trivial quantum effects can be studied that are of a different character than in conventional cavity QED systems. For example these systems permit the realization of steady state superradiance and the study of the continuous cross-over from the laser to superradiance, leading to a unification of the theories of these two phenomena. Other avenues of research opened up by these systems are in the areas of ultra-high precision spectroscopy and optical atomic clocks, non-linear optics, and quantum information and simulation.

[1]This work is supported in part by NSF, DOE, and ARO.

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Date submitted: 04 Feb 2011 Electronic form version 1.4