

DAMOP19-2019-020161

Abstract for an Invited Paper
for the DAMOP19 Meeting of
the American Physical Society

Collective dynamics of atomic ensembles due to long-range optomechanical forces

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In this talk we will present recent theoretical work on cooling and spontaneous spatio-temporal pattern formation of atomic and molecular ensembles in optical resonators, where the key ingredient of the dynamics are the coherent and dissipative long-range optomechanical forces mediated by multiple scattering of the cavity photons. These dynamics reveal the existence of prethermalized states which are expected to be stable over the experimental time scales even in the bad cavity limit. We characterize the properties of these metastable phases in the semiclassical and deep in the quantum regime.