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Superradiance and dynamical instability in an illuminated BEC WILLIAM LUNDEN, JESSE AMATO-GRILL, IVANA DIMITROVA, NIKLAS JEPSEN, WOLFGANG KETTERLE, MIT — An elongated, trapped Bose-Einstein condensate illuminated by an off-resonant laser beam has been used as a platform to observe superradiant Rayleigh scattering for almost two decades. We now consider the case of an elongated BEC illuminated by a pair of non-interfering, off-resonant lasers, and explore the dynamics of the coupled light-matter system in the short-time regime (i.e., times on the order of the inverse of the single-photon recoil frequency). In particular, we look for signatures of a proposed dynamical instability in the coupled system which spontaneously breaks the translational symmetry of both the BEC density and the total light field's intensity profile along the long axis of the trap. We also explore the relative roles of the spontaneous light force and the dipole force in both superradiance and this dynamical instability.

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