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Toward a Steady-State Superradiant Light Source[1] JOSHUA M. WEINER, JUSTIN G. BOHNET, ZILONG CHEN, JILA, University of Colorado at Boulder, JAMES K. THOMPSON, NIST, JILA, University of Colorado at Boulder
— We report on progress towards a continuous superradiant light source at 795 nm using $\sim 10^6$ ^{87}Rb atoms trapped in a low finesse (F = 710) optical cavity. Such a light source will probe the physics underlying recent proposals for milliHertz linewidth light sources that would revolutionize the precision of optical clocks and enable long baseline interferometry over earth-to-sun distances. In a superradiant light source, the time phase of a spontaneously generated polarization grating acts as the flywheel for phase information, in place of the intracavity light in a conventional laser. The linewidth of the generated light is predicted to fall well below both the Schawlow-Townes limit for conventional lasers and the single particle decoherence rate. Importantly, the frequency of the emitted light is predicted to be highly insensitive to the thermal mirror motion that currently limits the narrowest of lasers.

[1]NIST and NSF Physics Frontier Center

Joshua M. Weiner
JILA, University of Colorado at Boulder

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