Towards continuous superradiance with a hot atomic beam

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Continuous superradiant lasers have been proposed as next generation optical atomic clocks for precision measurement, metrology, quantum sensing and the exploration of new physics [1].

Superradiance is a collective phenomenon resulting in an enhanced single atom emission rate [2]. A way to provide the required phase synchronization is coupling a cold cloud of atoms to a cavity mode. This technique has been used to demonstrate pulsed superradiance [3-5], however, steady-state operation remains an open challenge.

Here we describe our machine aimed at validating an alternative proposal [6], a rugged superradiant laser operating on the $^1S_0$-$^3P_1$ transition of ^{88}Sr using a hot collimated atomic beam. The elegance of this approach is that a single cooling stage and a low finesse cavity appear sufficient to fulfill the requirements for continuous superradiance. Consequently, our device promises a compact, robust, and simple optical frequency reference.

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