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Frequency stability of pulsed superradiant light from the strontium clock transition[1] JUAN A. MUNIZ , MATTHEW A. NORCIA, JULIA CLINE, JOHN ROBINSON, ROSS HUTSON, G. EDWARD MARTI, AKIHISA GOBAN, JUN YE, JAMES THOMPSON, JILA, University of Colorado - Boulder — Superradiant aser light from an ultra-narrow optical transition has been proposed as a next-generation active atomic frequency reference. In this work, we present the first characterization of the spectral properties of superradiant pulses of light emitted from the millihertz linewidth optical clock transition in an ensemble of cold ^{87}Sr atoms trapped inside an optical cavity (Norcia et. al. arXiv:1711.10407). The frequency of the superradiant light is compared to that of a state-of-the-art cavity-stabilized laser and passive strontium optical lattice clock. We characterize the stability and absolute accuracy, as well as demonstrate insensitivity to key environmental perturbations such as fluctuations in the bare optical cavity frequency and magnetic field. The high degree of insensitivity to changes in the cavity length implies that mirror thermal noise will have a negligible impact on the superradiant light frequency, and that the system is a good frequency reference candidate for operation in harsh environments.

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