Abstract Submitted
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Superradiant lasing on the millihertz clock transition[1] JULIA CLINE, MATTHEW NORCIA, ROBERT LEWIS-SWAN, JUAN MUNIZ, BIHUI ZHU, JOHN ROBINSON, ROSS HUTSON, AKIHISA GOBAN, G. EDWARD MARTI, JUN YE, ANA REY, JAMES THOMPSON, JILA, Univ of Colorado - Boulder — We demonstrate that superradiant laser light emitted from an ultra-narrow transition can serve as a highly accurate and stable active atomic frequency reference. We present frequency comparisons between superradiant light emitted from the 1 mHz linewidth optical clock transition in ^{87}Sr and a state of the art stable laser system and optical lattice clock [Norcia *et. al.* arXiv:1711.10407]. We characterize the stability and absolute accuracy of the superradiant system and demonstrate insensitivity to key environmental perturbations. Additionally, we present our observations of spin-exchange interactions mediated by the emission and reabsorption of photons inside an optical cavity [Norcia *et. al.* arXiv:1711.03673]. We observe the emergence of a many-body energy gap and signatures of gap protection of the optical coherence against dephasing. Finally, we present future prospects for a continuous superradiant laser.

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