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Near-Unitary Spin Squeezing in ^{171}Yb in an optical cavity EDWIN EDUARDO PEDROZO PENAFIEL, SIMONE COLOMBO, Massachusetts Institute of Technology, BORIS BRAVERMAN, University of Ottawa, AKIO KAWASAKI, Stanford University, CHI SHU, Harvard University, ZEYANG LI, ENRIQUE MENDEZ, MEGAN YAMOAH, Massachusetts Institute of Technology, LEONARDO SALVI, Universita di Firenze, DAISUKE AKAMATSU, National Metrology Institute of Japan, YANHONG XIAO, Fudan University, VLADAN VULETIC, Massachusetts Institute of Technology — In this work, we experimentally demonstrate the generation of a near-unitary SSS in an ensemble of ^{171}Yb atoms created by a one-axis twisting interaction using cavity feedback squeezing [1]. The near-unitary spin squeezing is engineered between the magnetic sublevels of the ground state of ^{171}Yb using light detuned from the system's resonances [2]. The observed spin noise suppression and metrological gain are limited by the state readout to 9.4(4) dB and 6.5(4) dB, respectively, while the generated states offer a spin noise suppression of 15.9(6) dB and a metrological gain of 12.9(6) dB over the SQL. When limiting the squeezing to 30% of unitarity, we demonstrate an interferometer that improves the averaging time over the SQL by a factor of 3.7(2). This squeezing can be mapped in the future onto an optical transition to improve the performance of an ^{171}Yb state-of-the-art clock. [1] M. H. Schleier-Smith et al. Phys. Rev. A 81, 021804(R) (2010). [2] Y.-L. Zhang et al. Phys. Rev. A 91, 033625 (2015).

Edwin Eduardo Pedrozo Penafiel
Massachusetts Institute of Technology

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