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A new ^3He - ^{129}Xe Co-magnetometer using a Ramsey measurement sequence and Rb-K magnetometer for spin detection¹ AARON KABCENELL, Princeton University, IANNIS KOMINIS, University of Crete, MICHAEL ROMALIS, Princeton University — Noble gas co-magnetometers have been used for many precision measurements, but their sensitivity is still very far from fundamental limits. We are exploring a new approach for operation of a ^3He - ^{129}Xe co-magnetometer that uses a sensitive Rb-K magnetometer as a spin detector. By placing the noble gas atoms inside the magnetometer cell we can increase their magnetic signal using the Fermi-contact interaction, representing a gain of nearly 500 for ^{129}Xe , and achieve nearly quantum-noise limited detection of nuclear spins. In order to take advantage of the long coherence times of ^3He and ^{129}Xe , the precession measurement is based on the Ramsey method of separated oscillatory fields and will be performed in an alkali-metal-free volume. The gas is then transported to the spin detector using techniques developed for remote NMR detection. The sensitivity of this approach is estimated to be on the order of 10^{-13} Hz/day^{1/2}, making it several orders of magnitude more sensitive than the best existing co-magnetometers. We are currently performing tests of the Ramsey measurement method and the sensitivity of the spin detector.

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- Prefer Oral Session
 Prefer Poster Session

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