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Synchronously pumped nuclear magnetic oscillator[1] ANNA KORVER, DANIEL THRASHER, MICHAEL BULATOWICZ, THAD WALKER, University of Wisconsin-Madison — We present progress towards a synchronously pumped nuclear magnetic oscillator. Alkali frequency shifts and quadrupole shifts are the dominant systematic effects in dual Xe isotope co-magnetometers. By synchronously pumping the Xe nuclei using spin-exchange with an oscillating Rb polarization, the Rb and Xe spins precess transverse to the longitudinal bias field. This configuration is predicted to be insensitive to first order quadrupole interactions and alkali spin-exchange frequency shifts. A key feature that allows co-precession of the Rb and Xe spins, despite a ~ 1000 fold ratio of their gyromagnetic ratios, is to apply the bias field in the form of a sequence of Rb 2π pulses whose repetition frequency is equal to the Rb Larmor frequency [2]. The 2π pulses result in an effective Rb magnetic moment of zero, while the Xe precession depends only on the time average of the pulsed field amplitude. Polarization modulation of the pumping light at the Xe NMR frequency allows co-precession of the Rb and Xe spins. We will present our preliminary experimental studies of this new approach to NMR of spin-exchange pumped Xe.

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[2]A. Korver, R. Wyllie, B. Lancor, and T. G. Walker, PRL **111**, 043002 (2013).

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