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**Progress in High-Field Optical Pumping of Alkali Metal Nuclei**[1]

B. PATTON, K. ISHIKAWA, Y.-Y. JAU, W. HAPPER, Princeton University Physics Department — We present preliminary results of an attempt to polarize alkali metal nuclei via optical pumping in a large (9.4-tesla) magnetic field. NMR measurements of $^{87}$Rb and $^{133}$Cs films in optical cells will be reported. Depopulation pumping of alkalis can easily produce electron polarizations of order unity, as measured during spin-exchange optical pumping of noble gases [1]. At low magnetic fields ($<\sim$1 kG), the strong hyperfine coupling between the alkali electron and nucleus allows angular momentum exchange from one to the other, resulting in nuclear polarization enhancement through optical pumping. In the high magnetic fields required for NMR, however, this interaction is largely decoupled and electron-nuclear spin exchange must rely upon the $\delta A\mathbf{I}\cdot\mathbf{S}$ interaction induced by buffer gas collisions (also called the "Carver rate"). High-field optical pumping experiments may allow for a more precise measurement of this rate, as well as yielding insight into the transfer of angular momentum from the polarized alkali vapor to the bulk alkali metal on the cell walls. The technical challenges of high-resolution NMR of alkali metals at 9.4 tesla will be discussed.

**1**. E. Babcock, I. Nelson, S. Kadlecek, et al., Physical Review Letters **91**, 123003 (2003).

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