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Improved Modeling of D1 Optical Pumping of Optically Thick Rb and K-Rb vapors BRIAN LANCOR, ZACK DELAND, THAD WALKER, University of Wisconsin-Madison — The production of hyperpolarized noble gas nuclei using spin exchange optical pumping (SEOP) requires the spin polarization of very optically thick Rb or K-Rb vapors through optical pumping. The efficiency of the optical pumping is the limiting factor in noble gas polarization rates with a given amount of pump laser power. Past modeling of the optical pumping process predicted efficiencies that were far higher ($\sim$10x) than those observed in experiments. By including the recent, precise measurements of the circular dichroism of Rb atoms in the presence of high pressure He and N_2 buffer gases, measurements of the absorption of Rb D1 light by K atoms, and treatments of laser heating and excited state nuclear spin relaxation, we have produced a much more accurate model. This model is a useful tool for the design of SEOP apparatuses. This work was supported by the United States Department of Energy.

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