

Abstract Submitted
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On the limits of spin-exchange optical pumping of ^3He T.R. GENTILE, W.C. CHEN, Q. YE, NIST, T.G. WALKER, Univ. of Wisconsin, E. BABCOCK, Julich Center for Neutron Science at FRM2 — We have obtained improvement in the ^3He polarization achievable by spin-exchange optical pumping (SEOP). These results were primarily obtained in large neutron spin filter cells using diode bar lasers spectrally narrowed with chirped volume holographic gratings. As compared to our past results with lasers narrowed with diffraction gratings, we have observed between 5% and 11% fractional increase in the ^3He polarization P_{He} . We also report a comparable improvement in P_{He} for two small cells, for which we would not have expected an increase from improved laser performance. In particular, prior extensive studies had indicated that the alkali-metal polarization was within 3% of unity in one of these cells. These results have impact on understanding the maximum P_{He} achievable by SEOP, whether the origin of the improvement is from increased alkali-metal polarization or decreased temperature-dependent relaxation. We have observed P_{He} of between 0.80 and 0.85 in several large cells, which marks a new precedent for the polarization achievable by SEOP. Recently we have obtained P_{He} as high as 0.88 with increased laser power. We will discuss these results and tests performed to understand their origin.

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