



2021 Fall Meeting of the Division of Nuclear Physics

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Presentation Type: Oral

Sorting Category: 17. Undergraduate Research (CEU, Oral Only)

Abstract Title: Frequency Stabilization of a Diode Laser to the Rubidium D2 Transition

The polarization of dense spin-polarized helium-3 targets can be measured using the Faraday Rotation of alkali metals. Small amounts of the alkali metals Rb and K will be present in the target if the helium-3 nuclei are polarized by spin exchange optical pumping. An external-cavity diode laser emitting frequencies of the D2 transitions of Rb or K will maximize the rotation of linearly polarized light due to the Faraday effect. Small magnetic fields due to the spin-polarized ^3He nuclei can be measured because of this effect, given the laser's frequency remains stable over a long enough time frame. However, diode lasers

Abstract Body: will drift in frequency off the D2 resonance over time. We used a Saturated Absorption method to resolve a Doppler-Free spectrum as a reference for this frequency and optimized the peaks by leveraging polarization changes to overlap the paths of the "probe" and "pump" beams used to measure absorption. Rb⁸⁵ F=3 transition provided a strong error signal optimal for the laser's Top of Fringe locking method. We successfully reduced drift by locking our laser to this transition using lock-in techniques.

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Category Type: Experimental

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