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The design and commissioning of a polarized helium-3 test stand
TIMOTHY NICHOLS, DAMON T. SPAYDE, Hendrix College — Many experiments, such as the neutron electric dipole moment (nEDM) experiment, are interested in achieving high degrees of polarization and long relaxation times in helium-3 in order to complete their measurements. It is possible to add another degree of sensitivity to the aforementioned experiment by using a technique known as spin dressing. In this technique the polarized helium-3 sample is placed into a large uniform magnetic field, known as the holding field. A radio frequency (RF) field is then applied transverse to the holding field altering the effective gyromagnetic ratio and creating the spin dressing effect. In this paper we present the design, construction progress, and calibration results of a test stand using metastability exchange optical pumping to polarize samples of gaseous helium-3. The goal of this test stand is to address the question of what happens to the nuclear polarization and relaxation time of helium-3 when the spin dressing field is not spatially uniform.

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