

Status of Frozen-Spin Polarized HD Targets for Spin Experiments*

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The double spin asymmetries from circularly polarized γ beams and longitudinally polarized HD targets have been measured at the LEGS (Laser Electron Gamma Source) facility. The solid HD target has a much smaller dilution factor than other solid target materials and background reactions with unpolarized nucleons are significantly reduced. For these targets, HD gas is isotopically purified by distillation, doped with a small amount of ortho-H₂ and frozen into a mesh of pure aluminum wires which conducts away the heat from the ortho to para conversion of the H₂ impurity. By holding the targets at low temperature and high field (17 mK and 15 Tesla) in a dilution refrigerator for six weeks a frozen-spin state was reached, with equilibrium polarizations for protons and deuterons of 70 and 17%, respectively. Multiple measurements of the relaxation times and multiple transfers of the targets reduced these values so that experimental runs were carried out with polarizations of 30 and 6%, respectively. The relaxation times for protons and deuterons were observed to be 13 and 36 days, respectively, in the beam line cryostat at 1.3 K and a 0.7 Tesla magnetic field. Significantly higher D polarizations are possible by transfer of spin from the proton to the deuteron using an rf forbidden adiabatic fast passage. These results, the present status and future plans will be discussed.

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