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Compton Scattering from a High Pressure Polarized ^{3}He Target at HIγS and the neutron spin polarizabilities HAIYAN GAO, Duke University and TUNL — The High Intensity Gamma Source (HIγS) at Duke Free Electron Laboratory opens new window to the study of fundamental quantities related to the structure of the nucleon through polarized Compton scattering from a polarized nuclear target. We discuss a future measurement of the spin-dependent asymmetries from Compton scattering of circularly polarized photons from a high-pressure polarized ^{3}He gas target at both the quasielastic and elastic kinematics. The Compton scattered photons and the recoil neutron will be detected in coincidence for the quasielastic scattering process, and only the scattered photons will be detected for the elastic scattering process. This experiment will be carried out at a photon energy between 100 - 140 MeV. In combination with the forward and backward polarizabilities extracted from existing experiments, the new experiment will allow for the first time the extraction of all four neutron spin polarizabilites, and provide crucial tests of predictions based on effective field theories, and dispersion theories. This work is supported by the U.S. Department of Energy (DE-FG02-03ER41231) and by the Duke University.

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