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Limits on possible new nucleon monopole-dipole interactions from measurements of the Spin Relaxation Rate of Polarized ^3He Gas
CHANGBO FU, Indiana University, MIKE SNOW, Indiana University, TOM GENTILE, N IST — The possible existence of new interactions of nature with ranges of macroscopic scale and very weak couplings to matter has recently begun to attract more scientific attention. Many experiments search for such weakly-interacting sub-eV Particles (WISPs) [1]. Polarized ^3He gas is an especially clean and convenient system to use to constrain possible new spin dependent interactions involving nucleons. We show that existing measurements of the transverse spin relaxation rate Γ_2 for polarized ^3He gas can be used to set limits on the product $g_s g_p$ of scalar and pseudoscalar couplings for an interaction of “monopole-dipole” form for WISP masses in the μeV to meV range, corresponding to distances from centimeters to microns. We present limits from both a reanalysis of previous measurements of relaxation rate in ^3He spin exchange cells and from data in a test experiment searching for a change in relaxation rate upon the motion of an unpolarized test mass. The outlook for more sensitive measurements using this technique will be discussed. References: [1] J. Jaeckel and A. Ringwald, *Ann. Rev. Nucl. Part. Sci.* **60**, 405 (2010).

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