Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Continued Work on Improving the Precision of Helium Laser Spectroscopy[1] GARNET CAMERON, JONATHAN CUEVAS, ALI KHADEMIAN, DAVID SHINER, Univ of North Texas — Precision measurements of the fine structure of the helium 2P state provide a proving ground for various experimental techniques as well as a test of the bound state quantum electrodynamics of the electron-electron interaction. Additional applications are to nuclear few-body physics and possible input to the fine structure constant determination. In our experimental approach, the first order Doppler shifts in the laser excitation of an atomic beam can be conveniently reduced by laser beam retro-reflection, but at the cost of a standing wave laser interaction. This interaction causes "power" dependent shifts arising from laser cooling effects. The experimental implementation of a straight forward approach that circumvents this effect while maintaining Doppler insensitivity will be discussed. Additional improvements to the atomic beam preparation and optical techniques include a compact, collimated, kG NdFeB magnet assembly optimized with 3-D COMSOL simulation, picomotors, and a 20 ms variable retarder LC. Data collection to further identify sources of uncertainty which limit precision will be examined.

[1]This work was supported by NSF Grant 1404498

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Date submitted: 01 Feb 2020 Electronic form version 1.4