Axion Dark Matter Searches with AMO techniques WILLIAM
TERRANO, MICHAEL ROMALIS, YUKAI LU, Princeton University — We have
developed a system for measuring nuclear spin energy splittings with unprecedented
stability and sensitivity. Using this we have begun a search for axionic dark mat-
ter across a wide-range of masses, including the particularly interesting "Fuzzy
dark matter scenario. Our system consists of highly polarized Helium 3 and Neon
21, whose precession is monitored by a colocated spin-exchange-relaxation-free Rb-
magnetometer. The Rb magnetometer readout allows very sensitive measurement
of the nuclear-spin magnetization, but also introduces large shifts in their energy
levels. Understanding and controlling these shifts is the main experimental issue in
our system. I will discuss the experimental challenges and our solutions thus far, as
well as showing preliminary results of searching for "Fuzzy dark matter axions with
this system.

William Terrano
Princeton University

Date submitted: 10 Jan 2020   Electronic form version 1.4