

Abstract Submitted
for the APR21 Meeting of
The American Physical Society

A Uniform Magnetic Coil for Sterile Neutron Oscillation Searches

ZACH MISTELSKE, University of Kentucky, CHRISTOPHER CRAWFORD TEAM, DAVID BOWLES TEAM — A possible solution to the mystery of dark matter, the neutron lifetime anomaly, and the baryon asymmetry of universe could be neutrons oscillating into sterile mirror neutrons through a dark sector, only interacting with particles of our ordinary (Standard Model) sector through gravity and some potentially exotic interactions. Such oscillations would only occur under specific conditions, such as within a magnetic field, thus compensating the energy level suppression, and thus allowing both neutrons and mirror neutrons achieve identical energy states. These oscillations could be observed by detecting beam losses as neutrons pass through a thick absorber within particular magnetic field configurations. I will describe a magnetic coil made to create the required uniform ~ 10 -G field in any direction for the neutron oscillation, and compact enough to fit within the 1 m long sections of upstream collimators of the ORNL HFIR GP-SANS instrument General Purpose-Small Angle Neutron Scattering beamline at Oak Ridge National Laboratory, where a search is planned. The coil consists of two double-cos(θ) coils and a solenoid covered by a sheet of mu-metal which keeps the inner uniform magnetic fields shielded from any external magnetic fields.

ZACHARY MISTELSKE
University of Kentucky

Date submitted: 08 Jan 2021

Electronic form version 1.4