

Abstract Submitted
for the APR20 Meeting of
The American Physical Society

A Neutrino Disappearance Search for Sterile Neutrinos with the CAPTAIN-Mills Detector at the Los Alamos Neutron Science Center
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— MiniBooNE (Mini Booster Neutrino Experiment) and LSND (Liquid Scintillator Neutrino Detector) have shown compelling evidence for sterile neutrinos at $\Delta m^2 \sim 1 \text{ eV}^2$ in short baseline neutrino oscillations experiments. In these experiments, a pure muon neutrino beam is used to search for electron neutrino appearance, i.e. ν_μ disappears in ν_e , but muon neutrino disappearance searches have shown no anomalies. The CAPTAIN-Mills experiment uses a 10-ton liquid argon scintillation detector to leverage the enhanced cross section from coherent elastic neutrino-nucleus scattering (CE ν NS) to measure muon neutrino disappearance at the Lujan Center at the Los Alamos Neutron Science Center. Lujan is a 100-kW stopped pion source that nominally delivers a 290-ns wide, 800-MeV proton beam onto a tungsten target at 20 Hz, but the beam width can be significantly narrowed to 30 ns. Fast pulsing is critical for isolating the monoenergetic muon neutrino from the other neutrino flavors and neutron backgrounds. Description of the CAPTAIN-Mills detector, the Lujan neutrino source, the expected sensitivities for sterile neutrinos will be presented along with the results obtained from the summer 2018 neutrino test run and a December engineering run.

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Date submitted: 11 Jan 2020

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