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Searching for Sterile Neutrinos and accelerator produced Dark Matter with the Coherent CAPTAIN-Mills

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The MiniBooNE and LSND experiments have shown compelling evidence for sterile neutrinos in short baseline neutrino oscillation experiments. In these experiments, an excess of electron neutrino appearance was observed from a pure muon neutrino beam, and if these data are interpreted as sterile neutrino oscillations, the mass scale is 1 eV2. Analogous muon neutrino disappearance measurements have shown no anomalies, but these experiments have been performed at a different energy scale compared to LSND and MiniBooNE. Coherent CAPTAIN-Mills (CCM) is a new experiment to search for muon neutrino disappearance at the LSND energy scale. CCM will use a 10-ton liquid argon scintillation detector to leverage the enhanced cross section from coherent elastic neutrino-nucleus scattering. CCM will operate at the Lujan Center at LANSCE which is a 100-kW stopped pion source that delivers an 800-MeV proton beam onto a tungsten target at 20 Hz with a pulse width of 275 ns. This fast pulsing is crucial for isolating the monoenergetic muon neutrino in time and reducing neutron backgrounds. Furthermore, new vector portal dark sector models predict beam dump experiments like CCM are sensitive to sub-GeV dark matter production with sensitivities that probe early Universe relic density limits. In this talk, I will describe the current state of sterile neutrino and dark matter theories, describe the CCM detector and sensitivities, and show first results from our successful Fall 2018 commissioning run.