P4.030 An accelerator-produced, sub-GeV dark matter search with the MiniBooNE neutrino detector

R Cooper
New Mexico State University, USA

on behalf of MiniBooNE collaboration

There is overwhelming astrophysical and cosmological evidence for the existence of dark matter. For more than two decades, significant experimental work has been done to search for non-gravitational interactions of dark matter in deep underground detectors. The signal for these searches is low-energy nuclear recoils, but these searches lose sensitivity if the WIMP mass is below 1 GeV. There are ample theoretical motivations to search for dark matter masses below 1 GeV though. One model proposes that low-mass dark matter is part of a dark sector that couples to the Standard Model via a sub-GeV vector portal particle. The MiniBooNE dark matter experiment is searching for accelerator-produced, low-mass dark matter at the Fermilab Booster Neutrino Beamline with the MiniBooNE neutrino detector. To enhance possible low-mass dark matter production and to suppress neutrino backgrounds, an 8.9 GeV proton beam is diverted off target to hit a steel beamstop at the end of the pion decay drift region. The accelerator-produced dark matter are boosted to higher energies and elastically scatter on the mineral oil target (CH₂) in the MiniBooNE detector. The boosted dark matter will deposit up to a few-hundred MeV of energy on the target nucleons or electrons and will be reconstructed with high efficiency in the 800-ton target volume. MiniBooNE has completed its experimental run with 1.86 \times 10^{20} protons-on-target and analysis is underway. In this poster, I will discuss low-mass, vector-mediated WIMP dark matter models, describe the MiniBooNE detector and the beam-off-target experiment, and summarize the expected sensitivity from the final analysis.