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Toward a Differential Measurement of the Electron Neutrino CC1eNp Cross Section in MicroBooNE

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Neutrino oscillation research is at the forefront of new and exciting experimental searches for physics beyond the Standard Model. MicroBooNE, the longest running liquid argon time projection chamber (LArTPC), is the first of several detectors in Fermilabs leading-edge LArTPC program working toward stringent measurements of neutrino oscillation parameters. At energy scales relevant to accelerator-based experiments, charged-current (CC) interactions producing an electron and at least one proton (1eNp) in the final state are a dominant contribution to electron neutrino event rates. To date, no experimental verification of the CC1eNp cross section on argon exists, though such a measurement is crucial for next-generation LArTPCs to reach discovery precision in the appearance channel. While MicroBooNEs primary physics analyses utilize the on-axis Booster Neutrino Beam, a significant neutrino flux is also received from the higher energy, off-axis Neutrinos at the Main Injector (NuMI) beam. The greater e to ratio of the NuMI flux provides a unique opportunity for MicroBooNE to perform world-leading measurements of electron neutrino cross sections. This work presents a selection of NuMI events as progress toward the first differential measurement of CC1eNp interactions in argon, demonstrating our ability to successfully measure and reconstruct electron neutrinos in MicroBooNE.