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Measurements of electron neutrino interactions at the NOvA near detector

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NOvA is a long-baseline neutrino oscillation experiment designed to measure the $\nu_\mu \rightarrow \nu_e$ and $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ oscillation rates for subsequent extraction of the oscillation parameters of the 3-flavor PMNS model. The NOvA detectors are exposed to Fermilab's NuMI beam, the most powerful accelerator-based neutrino beam in the world. In addition to producing competitive measurements oscillation parameters, the intense neutrino flux from NuMI enables a rich Near Detector (ND) physics program in the range of 1 - 10 GeV of neutrino energy.

The (anti)neutrino flux from NuMI at the Near Detector (ND) is composed of 95%(92%) muon- and 1%(1%) electron-type, respectively, at an average energy of 2 GeV. The NOvA detectors are functionally-identical tracking calorimeters that sit 14 mRad off-axis from the NuMI beam line. Extruded PVC modules filled with liquid scintillator make up the active mass of the detectors, which are composed mostly of CH_2. The detectors' composition and configuration are designed to maximize electron/muon separation capabilities and sensitivity to the leptonic CP-violating phase, δ_{CP}.

NOvA's energy range and heavy nuclear targets offer a unique opportunity to study the nuclear effects of $\nu - A$ interactions with high statistics (anti-)ν_μ and (anti-)ν_e samples. We present three measurements of electron neutrino interaction channels in the NOvA ND: (1) recently published results of the first-ever double-differential charged-current (CC) inclusive electron neutrino cross section featuring a novel signal estimation procedure; (2) the status of a complementary double-differential CC inclusive electron antineutrino cross section with data-driven constraint of ν_e CC background; (3) and the status of a measurement of the elastic neutrino-electron scattering rate with the potential to constrain the flux uncertainties from the NuMI beam.

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