MicroBooNE [1] is a Liquid Argon Time Projection Chamber at Fermilab located along the Booster Neutrino Beam Line (E0 = 0.8 GeV).

**INTRODUCTION**

This poster presents MicroBooNE’s first full \( \nu_e \) charged-current inclusive measurement using 1.6 x 10^{20} POT of data (6 months of data).

**SIGNAL TOPOLOGY**

The presence of a neutrino-induced muon with or without other accompanying particles.

**MOTIVATIONS**

- The clear signal definition allows straightforward comparisons to theory models and other experiments.
- The heavy target (argon) makes this measurement sensitive to several nuclear effects.
- Important for MicroBooNE reconstruction and tools development: techniques have been developed for cosmic rejection.
- The final sample can be used as a pre-selection for more exclusive channels.

**EVENT SELECTION**

- Light must be detected in time with the beam spill (flash).
- A PMT-by-PMT matching is run between the flash and exiting tracks: increases the overall acceptance.
- Quality cuts ensure the event is well reconstructed.
- The candidate muon track must have a dQ/dx profile compatible with a minimum ionising muon.
- The reconstructed vertex has to be in the fiducial volume.

**PERFORMANCES**

- The overall efficiency is 55.2%, while the purity is 53.2%.
- Main background is from cosmics in time with the beam: directly measured from beam-off data.
- A cosmic ray tagger has been recently installed: will mitigate this background in future analyses.

**MOMENTUM ESTIMATION**

- Multiple Coulomb Scattering (MCS) is used to estimate the particle momentum: the scattering angle along the track trajectory depends on the initial momentum [2].
- Can be applied to both contained and exiting tracks: increases the overall acceptance.

**TOTAL CROSS SECTION**

The total CC cross section on argon has been measured:

\[
\sigma = \frac{N - B}{\varepsilon \cdot N_{\text{target}} \cdot \Phi \cdot \Delta} \times 10^{-38} \text{cm}^2
\]

The GENIE MC predicted cross section is:

\[
\sigma_{\text{GENIE}} = 0.867 \pm 0.004 \text{(stat.)} \times 10^{-38} \text{cm}^2
\]

- \( N \): Selected and background events
- \( B \): Efficiency (smearred to reco. for differential)
- \( N_{\text{target}} \): Number of target nucleons
- \( \Phi \): Muon-neutrino flux
- \( \Delta \): Bin width of bin (differential only)

This poster presented the first \( \nu_e \) charged-current inclusive measurement from MicroBooNE with full treatment of systematic uncertainties.

**DIFFERENTIAL CROSS SECTION**

The differential cross section is measured as a function of reconstructed kinematics. Detector effects have not been deconvolved.

\[
\frac{d\sigma}{d\cos(\theta_c)} = \frac{N_i - B_i}{\varepsilon_i \cdot N_{\text{target}} \cdot \Phi \cdot \Delta} \times 10^{-38} \text{cm}^2
\]

- \( \varepsilon_i \): Efficiency (smearred to reco. for differential)
- \( \Phi \): Muon-neutrino flux
- \( \Delta \): Bin width of bin (differential only)

**SYSTEMATIC UNCERTAINTIES**

Preliminary systematic uncertainties that affect the total cross section measurement. Detector systems show a conservative estimate.

**TOTAL FIGURE**

The cross section is compared with two sets of models [3]:

- Model Element
- GENIE Default + Emp. MEC
- GENIE Alternative

**SUPPORTING PUBLIC NOTE**

**REFERENCES**