

Measurement of inclusive anti neutrino cross section and ratio to neutrino cross section as a function of muon kinematics

Monday, 8 July 2024 09:45 (10 minutes)

The measurement is that of an inclusive anti neutrino cross section in terms of muon kinematics on the hydrocarbon tracker region of the MINERvA detector. An inclusive measurement in terms of muon kinematics will make for a comparatively easier comparison to model predictions, as such a measurement reduces the need for an accurate prediction of hadronic activity, which is harder to model.

Furthermore, muon kinematics are easier to reconstruct in the detector and a two-dimensional measurement yields a more pointed view of the phase space being explored. Moreover, the measured cross section can be compared to the baseline model broken down by the predicted interaction channel. Some channels dominate in certain parts of phase space and will motivate which aspects of the model require more improvement.

This measurement is extracted in anti-neutrino mode as long-baseline neutrino oscillation experiments rely on a high precision understanding of both neutrino and anti-neutrino nucleus interactions. The neutrino counterpart of this measurement has already been published [1]. Model comparisons are presented for the extracted cross section measurement.

[1] D. Ruterbories et al. (MINERvA), Measurement of inclusive charged-current $\bar{\nu}_\mu$ cross sections as a function of muon kinematics at $\langle E_\nu \rangle \sim 6$ GeV on hydrocarbon, Phys. Rev. D 104, 092007 (2021), arXiv:2106.16210 [hep-ex].

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Session Classification: MINERvA