PROCEEDINGS OF SCIENCE

MiniBooNE Neutrino Cross Section Measurements

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The MiniBooNE experiment has operated at Fermilab since 2002. It has collected 6.46×10^{20} *pot* in neutrino mode and 5.66×10^{20} *pot* in antineutrino mode. This paper presents some of the cross section measurements from this data. The three neutrino-nucleus channels discussed here are important channels for current and future neutrino oscillation experiments.

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1 Speaker

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1. MiniBooNE Cross Section Measurements

The MiniBooNE detector is described elsewhere [1]. This paper presents cross section measurements [2] made with the MiniBooNE detector. The cross sections are important for the understanding of neutrino interactions in neutrino oscillation experiments. Events in MiniBooNE are reconstructed by using a likelihood technique, originally developed for LSND and expanded for MiniBooNE events [3]. The neutrino flux was constrained by measurements of pion production in proton-beryllium interactions by the HARP collaboration [4].

1.1 The Charged Current Quasi Elastic (CCQE) Channel

Figure 1-1 shows the total CCQE cross section as a function of measured neutrino energy. The data is substantially above the independent particle nuclear model (dashed line), The solid line corresponds to fitting and effective axial mass (M_A^{eff}) and minimum Fermi energy scale factor (κ) to the data. The RPA corrections of [5] that include 2-body currents also seem to reproduce the data well. The CCQE events are defined as any CC event that has no observed pion in the final state. There is a substantial single pion background that is be estimated and subtracted from the CCQE sample.

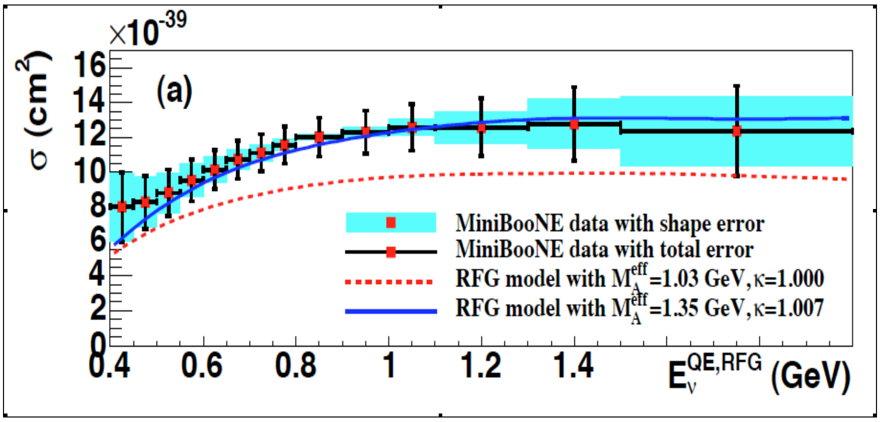

Figure 1-1 The measured CCQE cross section versus neutrino energy. The dashed curve is the standard independent particle model prediction while the red curve shows the prediction when n-particle - n-hole RPA corrections are included.

1.2 The Charged Current Single π^+ and π^0 ($CC\pi^+(\pi^0)$) Channel

Figure 1-2 shows the measured cross sections for single π^+ and π^0 events versus neutrino energy. Those measurements required the development of extended fitting algorithms in order to reconstruct the additional pion in the event.

1.3 The Neutral Current Quasi Elastic (NCE) and Single π0 (NCπ0) Channels

Figure 1-3 shows the flux averaged cross sections for: neutral current quasi elastic versus Q^2; and for neutral current single π^0 events versus π^0 momentum and angle for neutrino mode and antineutrino mode.

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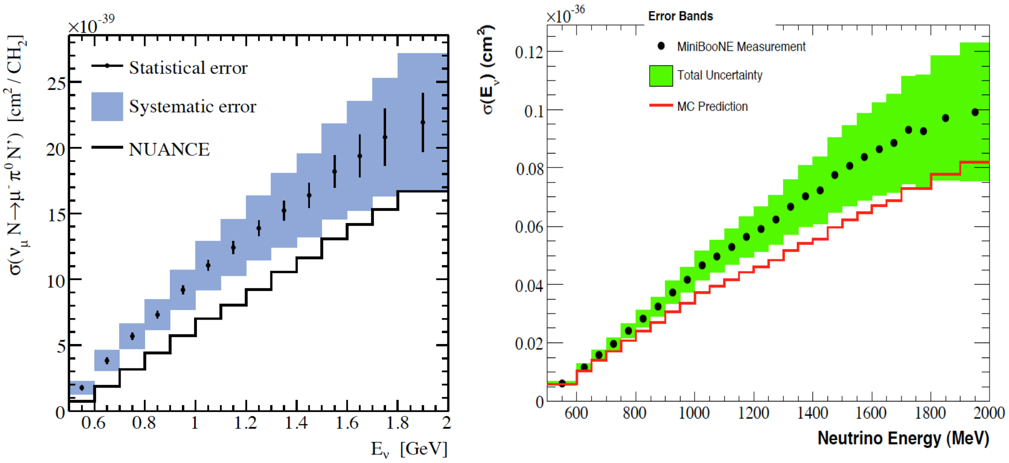

Figure 1-2 The charged current, single π^0 (left) and single π^+ (right) cross sections measured by MiniBooNE are shown. The solid lines are predictions by NUANCE.

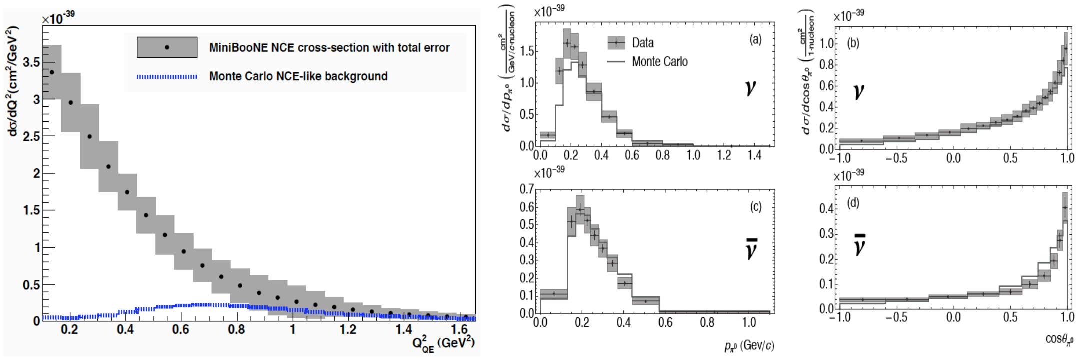

Figure 1-3 The right-hand plot shows the measured cross section for neutral current quasi elastic events versus Q^2, averaged over the MiniBooNE flux. The four panels on the right show the neutral current cross sections for single π^0 production versus π^0 momentum (middle) and π^0 angle (left) for neutrino mode (top) and antineutrino mode (bottom), averaged over the MiniBooNE flux.

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