Using NiTeV Measurements to Extract νvFe Nuclear Effects and the MINERvA Experiment’s Nuclear Effects Measurement Program

Kuglein-Petti Model of Nuclear Effects

- Global Approach: using data to calculate the consequences of nuclear effects.
- Different effects on nuclear targets, with varying degrees of effect.
- Nuclear effects on charged leptons and neutrinos.
- Comparison of model predictions with experimental data.
- YOUR FIGURE: Kuglein-Petti model predictions for νvFe nuclear effects.

Kuglein-Petti compared to eνFe data

- ννFe: νv[N] + Fe → νν[Fe] + e-
- Comparison of model predictions with experimental data.
- YOUR FIGURE: Kuglein-Petti model predictions compared to experimental data for ννFe.

CTEQ High x Study

- From forward fits to proton data.
- Comparison of model predictions with experimental data.
- YOUR FIGURE: CTEQ high x study results.

NiTeV (νFe) and CHORUS (νFe) ν scattering results compared to reference fit on nuclear structure

- NuTeV and CHORUS data on ν scattering.
- Comparison of model predictions with experimental data.
- YOUR FIGURE: NiTeV and CHORUS ν scattering results compared to reference fit on nuclear structure.

MINERvA Event Rates

- 14.5 Million total CC events in a 4-year run

- YOUR FIGURE: MINERvA event rates.

Conclusions

- NuTeV νvFe scattering seems to see little or no evidence for shadowing.
- Differences in cross sections between νv and νv Fe are small in the region of 0.1 < A < 0.6.
- The Kuglein-Petti corrections for Fe are considerably over-corrected (about a factor of 2) with respect to the reference fit when applied to the NuTeV Fe results.
- Except at very high νv source correction factors differ in both shape and magnitude from charged lepton and K-P correction factors.
- The MINERvA Experiment will accommodate significant mininimum of targets of iron, carbon, and lead.
- The MINERvA Experiment will measure the ratio of F2 and F1 for various combinations of the four targets listed above for Q^2 ≤ 5 GeV^2 and will cover the shadowing region from s = 10^3 to 10^4 to check the hypothesis that the reference length of A is different than 1.