Weekly Updates On nu e Meeting

Final POT Normalization

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Absolute Event Rate Calculation

For 20E20 POT

Event Rate	Theoretical	MC ANA Truth(new)	MC Genie
Flux cv-weighted	3156	3104	–
Flux un-weighted	2751	2714	2769±52

Flux files MINERvA Document 8253-v1

last time, total cross-section on slide2 equals to intergral of differetial cross-section on slide10

Cross-section Factors Check-up

Differencial Cross-section(details in back up slides):

$$\frac{d\sigma}{dT} = \frac{2G_\mu^2 m_e}{\pi E_\nu^2}[a^2 E_\nu^2 + b^2 (E_\nu - T)^2 - abm_e T]$$

$G_\mu = 1.16637(1) \times 10^{-5} GeV^{-2}$,

$$m_e = 0.000511 GeV/c^2,\ \hbar = 6.582119 \times 10^{-22} MeV \cdot s$$

$\frac{2G_\mu^2 m_e}{\pi} = 1.5 \times 10^{-41} GeV^{-1} cm^2$ from the reference is a rough approximation

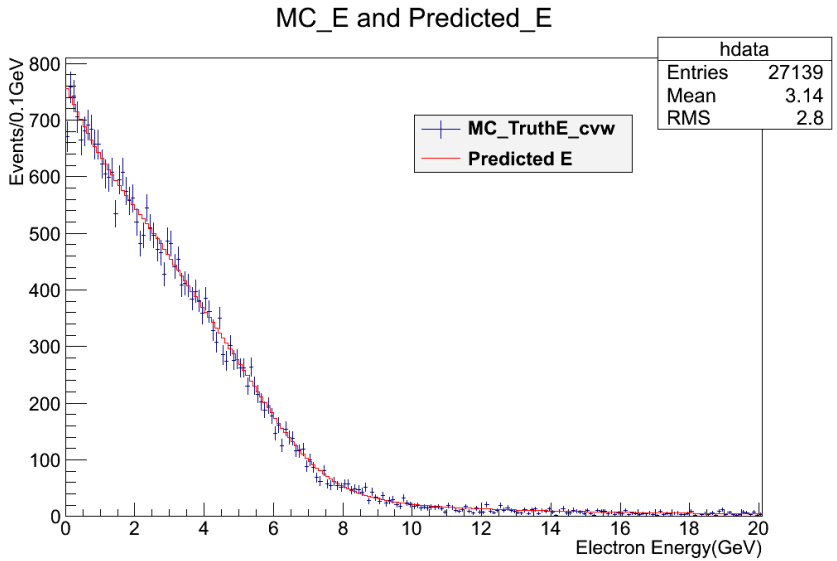
$$\frac{2\times\left(1.16637\times10^{-5} GeV^{-2}\right)^2\times0.511\times10^{-3}\times\left(2.9979\times10^8\times10^4 cm/s\right)^2}{\pi} \times \hbar^2 (GeV^{-1} cm^2)$$

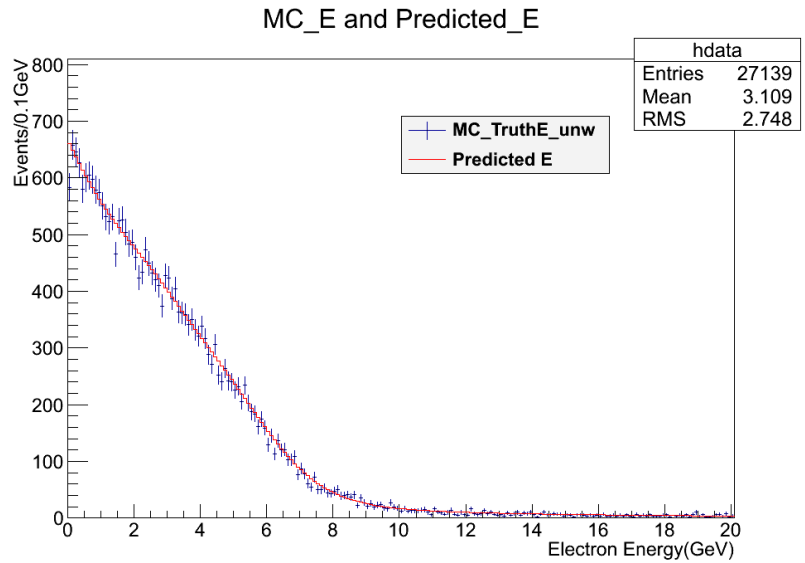
by analyzing the unit, there is a $\hbar^2$ should be multiplied.(where is it from?)

$= 1.72322 \times 10^{-41} GeV^{-1} cm^2$

Electron Spectrum Predictions

using cv-weighted(left) and unweighted(right) flux, POT normalization





CV-weighted flux
$\chi^2 = 1.287$

unweighted flux
$\chi^2 = 1.038$

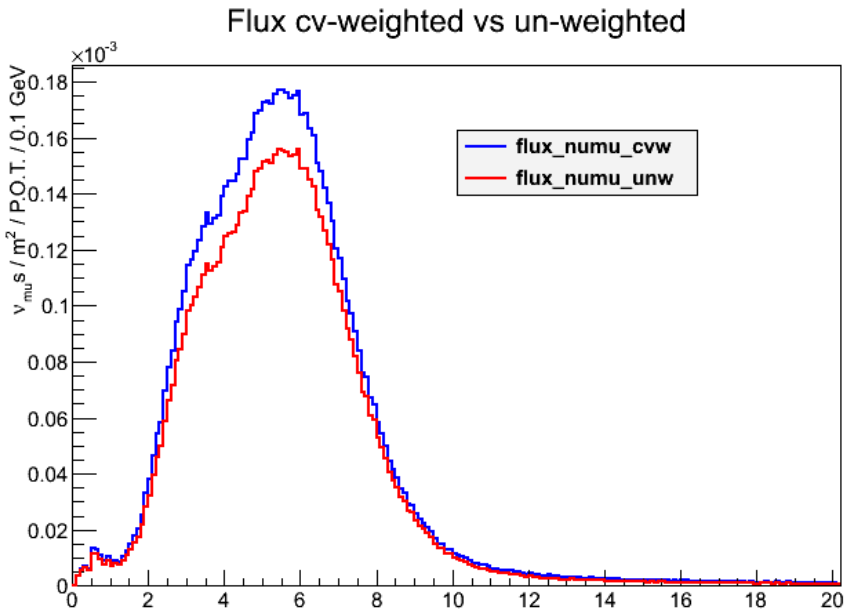
$$\chi^2 = \frac{1}{N}\sum_{i=1}^{N}\frac{(X_i - X_{oi})^2}{X_i}$$

X_i is MC data, X_{oi} is expected Ke histogram, calculate it from 0-12 GeV.

Back Ups

ME Flux Histograms

MINERvA Document 8253-v1



New root files in:
/minerva/data/users/dattam/NUE_EL_mc_v10r5p1/grid/central_value/minerva/
ME; 200e20 POT; NUE_EL;

Electron Spectrum Predictions

arXiv:hep-ph/0603036v1 3Mar 2006

$$\frac{dN(T)}{dT} = Ne \times \int dE_\nu \frac{d\Phi(E_\nu)}{dE_\nu} \frac{d\sigma(T, E_\nu)}{dT}$$

Where

$$Ne = 1.98 \times 10^{30}$$

is the Number of available electrons in fiducial mass

$$\frac{d\sigma}{dT} = \frac{2G_\mu^2 m_e}{\pi E_\nu^2}[a^2 E_\nu^2 + b^2 (E_\nu - T)^2 - abm_e T]$$

$$m_e = 0.000511\, GeV/c^2$$

$s^2 = \sin^2\theta_w \approx 0.23149 \pm 0.00015$ *for* ν_μ, $a = 1/2 - s^2$; $b = -s^2$

$G_\mu = 1.16637(1) \times 10^{-5}\, GeV^{-2}$, and
$\frac{2G_\mu^2 m_e}{\pi} = 1.5 \times 10^{-41}\, GeV^{-1} cm^2$

$$\frac{dN(T)}{dT} = Ne \times \int dE_\nu \frac{d\Phi(E_\nu)}{dE_\nu} \frac{d\sigma(T, E_\nu)}{dT}$$

for the discrete case(per P.O.T):

$\frac{\Delta N}{\Delta T} = Ne \times \sum \Delta E_\nu(GeV) \frac{\Phi_{bin}(/m^2/P.O.T/GeV)}{\Delta E_\nu(GeV)} \times \frac{2G_\mu^2 m_e}{\pi}(GeV^{-1} \times 10^{-4} m^2) \times \frac{1}{E_\nu^2(GeV^2)}[a^2 E_\nu^2 + b^2 (E_\nu - T)^2 - abm_e T](GeV^2)$

For 20E20 POT, Ke and flux histograms, binsize=0.1GeV, bin from 0-1000(0-100 GeV),

$$N_{bin}(/0.1\,GeV) = 20 \times 10^{20}(P.O.T) \times 0.1(GeV) \times \frac{\Delta N}{\Delta T}$$