Weekly Updates On nu e Meeting

Predictions for new root files in v10r5p1

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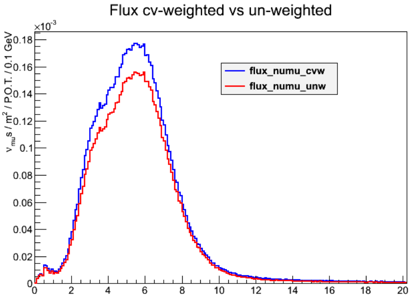
ME Flux Histograms For Theoretical Prediction and Root Files For MC

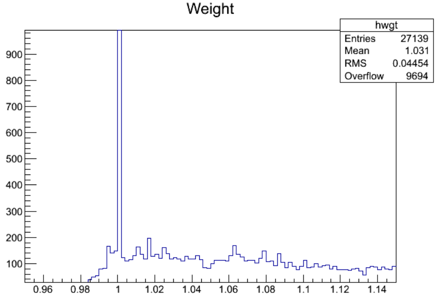
MINERvA Document 8253-v1



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

Weight Variable In ANA EMShower

Weight plot



Absolute Event Rate Calculation

For 20E20 POT

Event Rate	Theoretical	MC ANA	MC Genie
Flux cv-weighted	3056	3072	2769
Flux un-weighted	2667	2685	2769

In Genie, variable wght=1

See MC selections on next page

- MC **ANA** Event Rates are **Integrals** of Histograms histo_cvw and histo_unw for ν_μ, which

chain->Project("histo_cvw","truth_E","wgt(truth_fiducial_evt==1&&mc_incoming==14)")*

chain->Project("histo_unw","truth_E","truth_fiducial_evt==1&&mc_incoming==14")

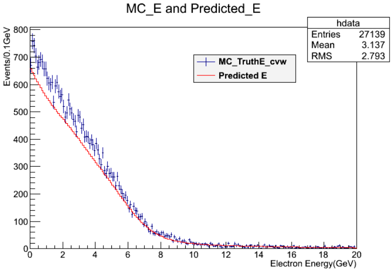
- MC **Genie** Event Rates are **Integrals** of Histograms yEv_cvw and yEv_unw for ν_μ, which

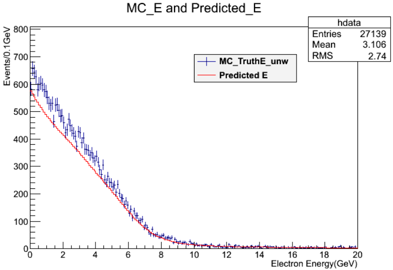
chain->Project("yEv_cvw","y*Ev","wght* (neu==14 && fid_cut)");

chain->Project("yEv_unw","y*Ev","neu==14 && fid_cut");

Electron Spectrum Predictions

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





Back Ups

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

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

$$m_e = 0.000511\, GeV$$

$s^2 = \sin^2\theta_w \approx 0.23149 \pm 0.00015$ *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),

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

code:

```
double dct=0; double T=0;
n1[0]= hFlux_xlo - ( hFlux_binWidth/2.0 );
double ss=0.23149;
double A=0.5-ss;
double B=-ss;
double y=0;
double yStep;

for (int j=1;j<=nFluxbinS;j++) {
n1[j]= n1[j-1] + h_flux->GetBinWidth(j);
//get flux in each Ev bin
FluxbinS[j] = h_flux->GetBinContent(j);
//the y bins # depends on the max Ev (which is n1[j])
yStep=1.0/(n1[j]/yStepSize);
y=0.5*yStep;
for (int i=1;i<(1+(n1[j]/yStepSize));i++)
{
//dct: dsigma/dy
dct=n1[j]*(A*A+B*B*(1-y)*(1-y))-A*B*0.000511*y; T=y*n1[j];
h_elecE->Fill(T,1.98e30*1.5e-
45*(200e20*FluxBinSize*FluxbinS[j]*dct/n1[j])*(h2_binWidth));
y=y+yStep;
}
 }
```