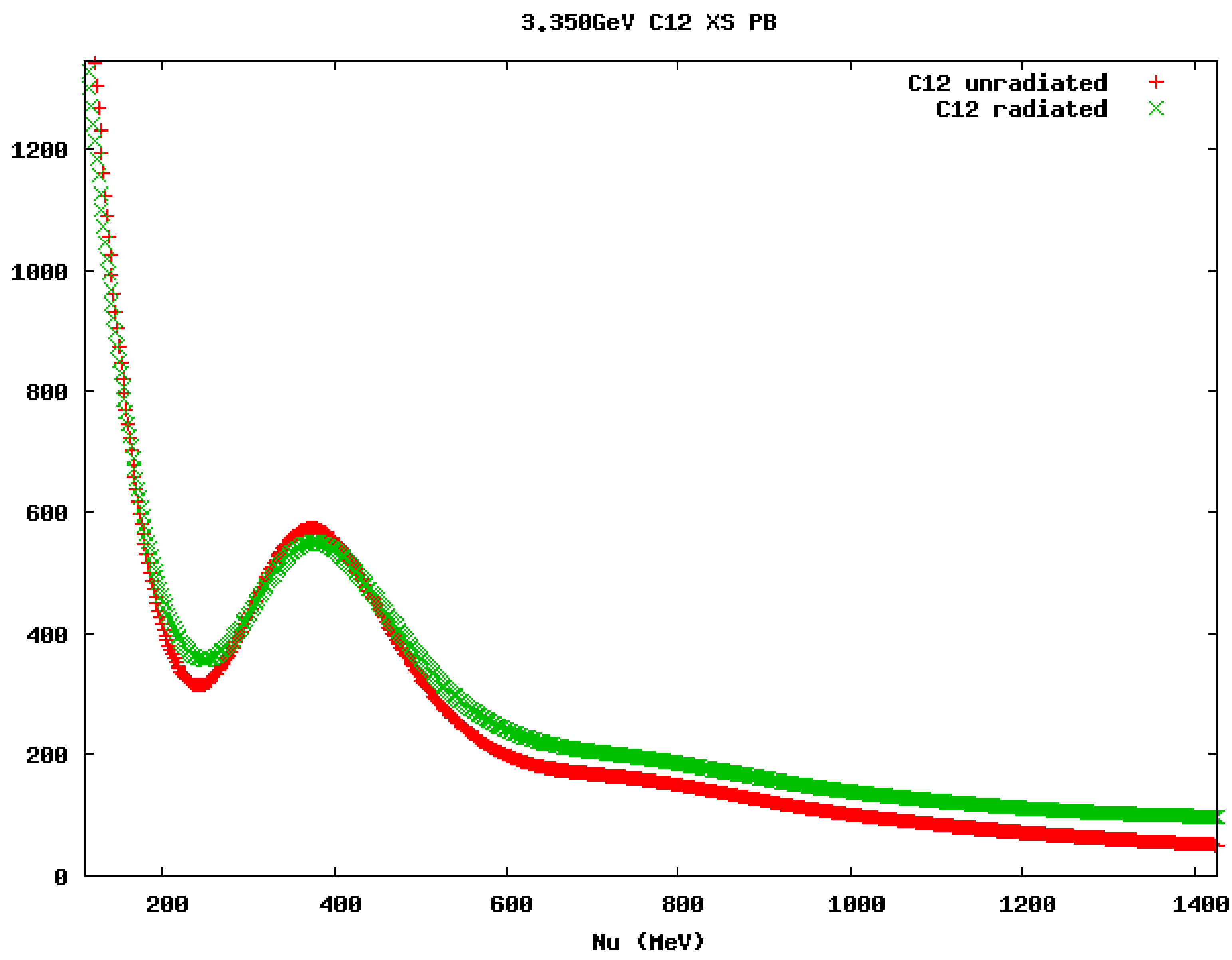
Dilution Update
7/2/14


3.350GeV C12 XS PB
C12 unradiated
C12 radiated
0
200
400
600
800
1000
1200
200
400
600
800
1000
1200
1400
Nu (MeV)

Updated method:

$$N = A \mathscr{L} \sigma t$$

where A = acceptance
$\mathscr{L}$ = luminosity
σ = cross-section
t = time

$$\mathscr{L} = N_A \frac{\rho}{M} \frac{I}{e} z$$

where N = avg. number
ρ = target density
M = target mass
I = incident current
e = electron charge
z = target thickness

So...

$$Y = \frac{N}{Q} = \frac{A \mathscr{L} \sigma t}{Q} = A N_A \frac{\rho}{M} \frac{It}{Qe} z \sigma$$

$$Y = \underline{A} N_A \frac{\rho}{M} \frac{z}{e} \sigma$$

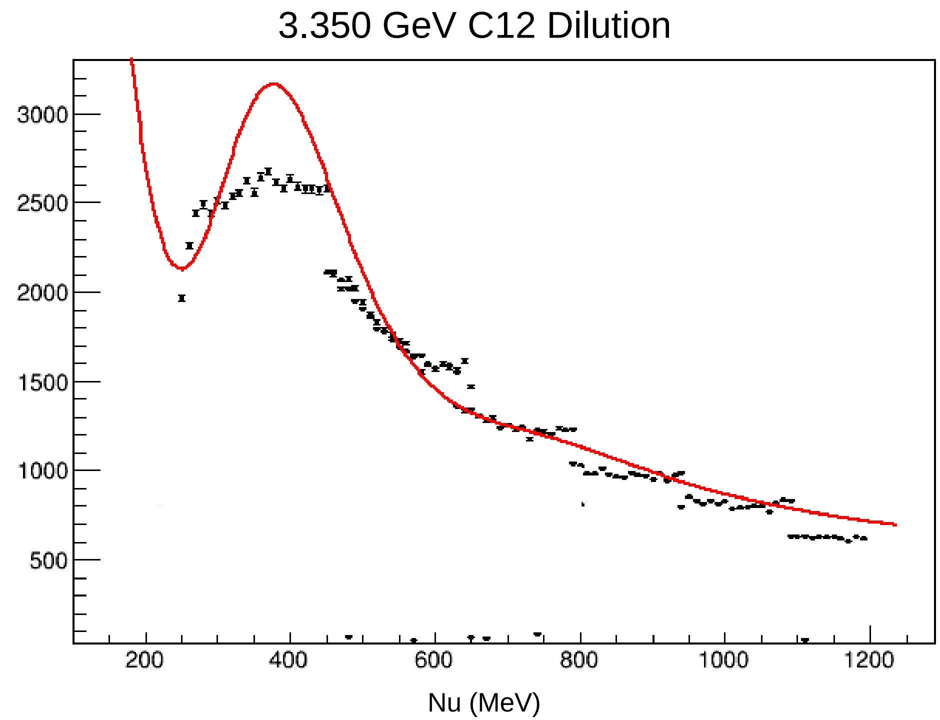
Now when relating the simulated xs to our experimental yield we can estimate a single scaling factor across all materials (acceptance)

- Calculating a carbon yield from dilution runs:

$$Y'_C = Y_{carbon} - \frac{L + L_{out} - L_C}{L + L_{out}} Y_{Empty}$$

- Relating the carbon yield to a cross-section from PB.

$$Y'_C = A N_A \frac{\rho_C}{M_C} \frac{z_C}{e} \sigma_{C_{PB}}$$

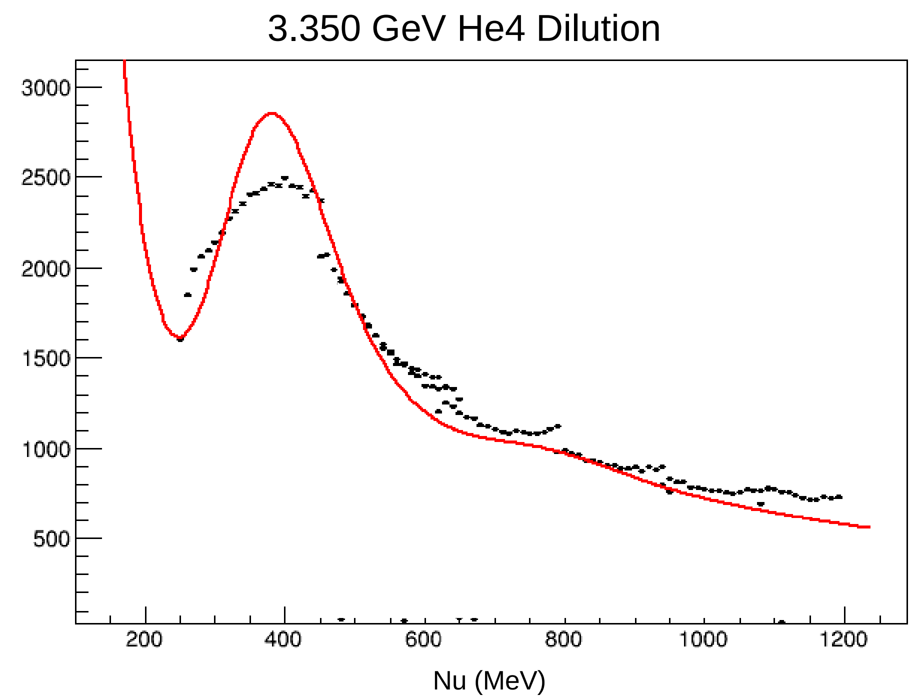


- Calculating a helium yield from dilution runs:

$$Y'_{He} = \frac{1}{L + L_{out}} Y_{Empty}$$

- Relating the helium yield to a cross-section from PB.

$$Y'_{He} = A N_A \frac{\rho_{He}}{M_{He}} \frac{z_{He}}{e} \sigma_{He_{PB}}$$



In both cases A = 2.6×10^{-9}

Now using the acceptance scaling factor we can relate C12 to N14:

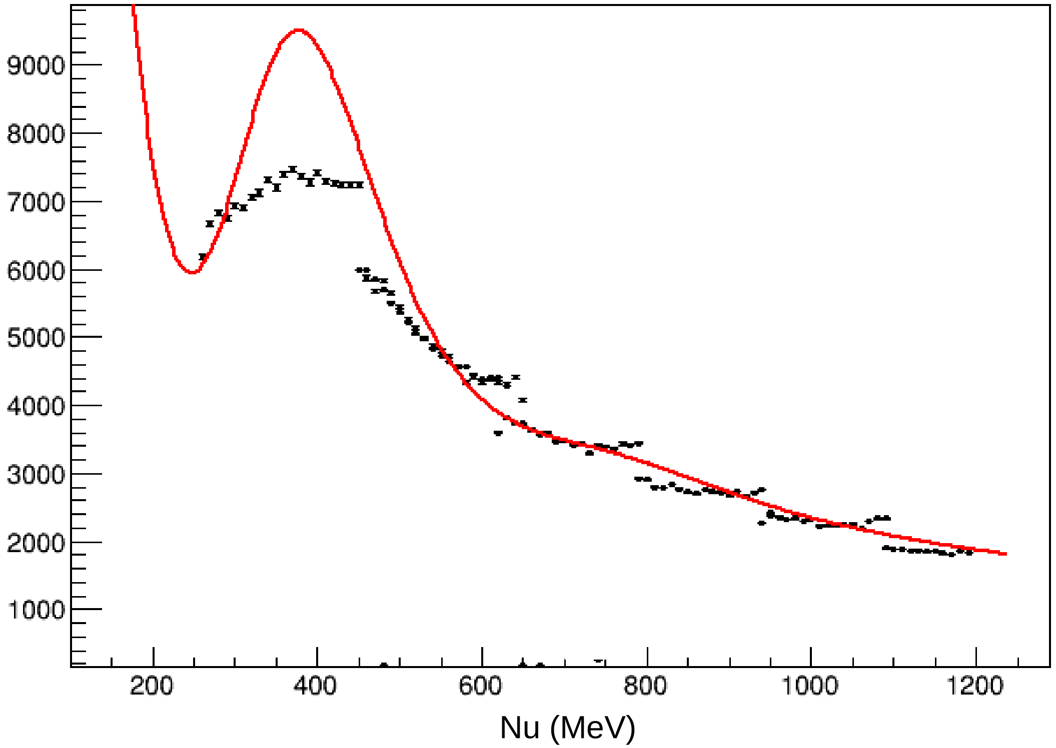
$$Y'_N = \left(1 - \frac{L_N}{L + L_{out}}\right) Y_{Empty} + a\left(\frac{\rho_N L_N M_C}{\rho_C L_C M_N}\right) Y'_C$$

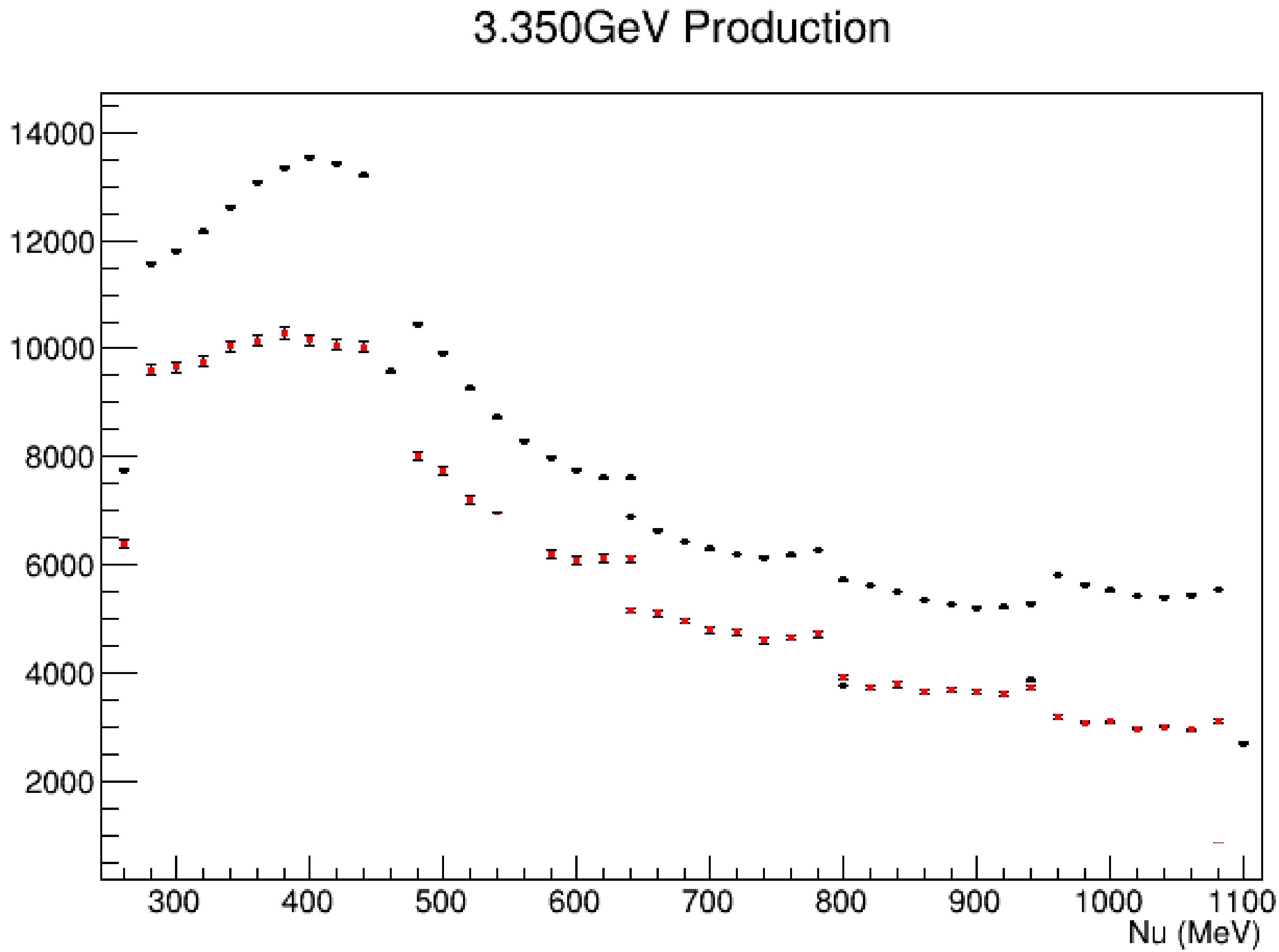
$$Y'_N = \frac{A N_A}{e}\left(\frac{\rho_N Z_N}{M_N}\sigma_{N_{PB}} + \frac{\rho_{He} Z_{He}}{M_{He}}\sigma_{He_{PB}}\right)$$

Using A = $2.6\text{x}10^{-9}$
a= 1.17

(still need to account for an energy dependant scaling factor).

3.350 GeV Nitrogen Dilution




3.350GeV Production
14000
12000
10000
8000
6000
4000
2000
300
400
500
600
700
800
900
1000
1100
Nu (MeV)

3.350 GeV Dilution