Method to Get Packing Fraction

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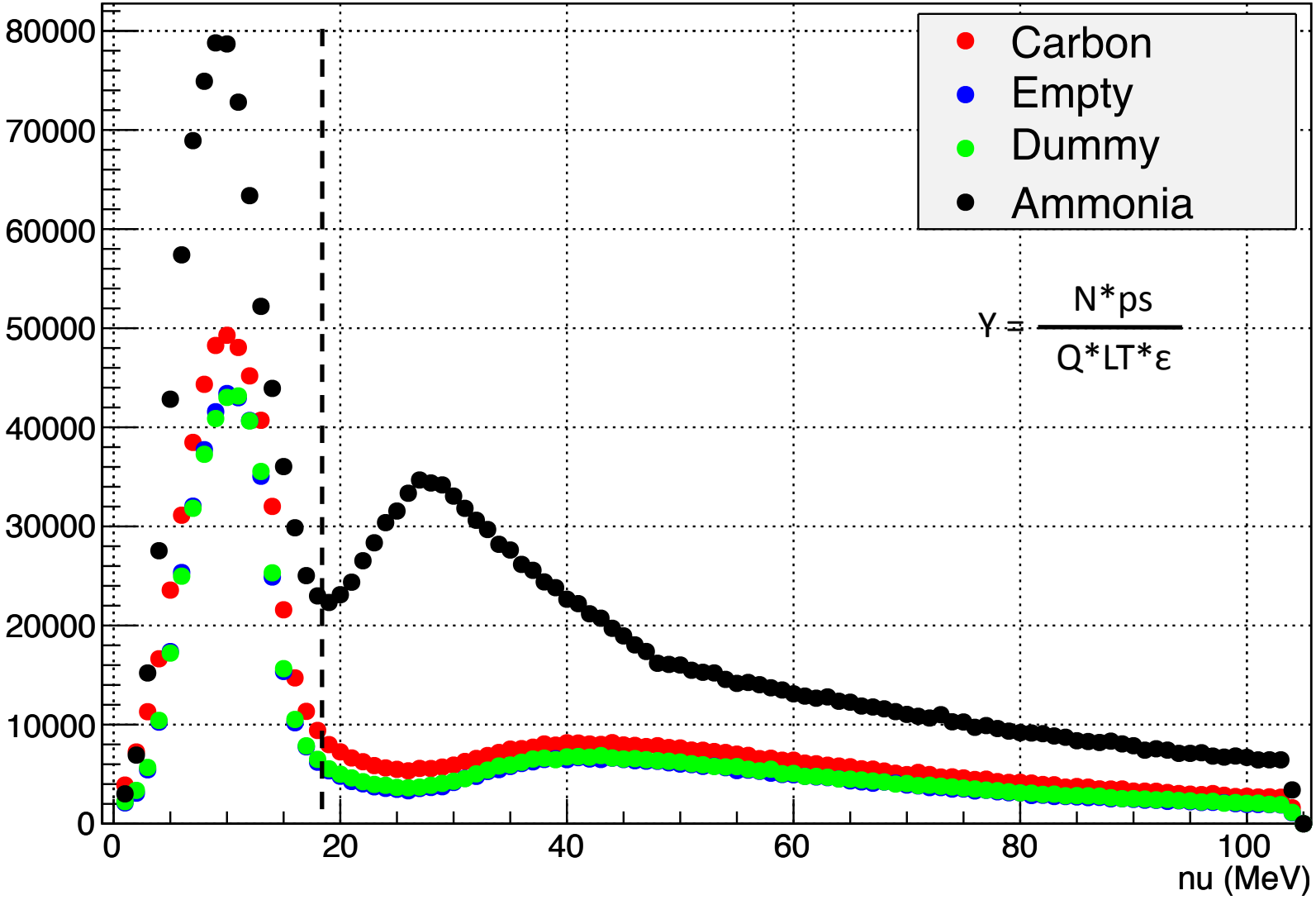
Normalized Yields

2.2 GeV, 2.5T, Transverse



Method

$$Y_{pf} = Y_{^{14}N} + Y_{^4He} + Y_{^{27}Al} + Y_{H_3}$$

Includes contribution from aluminum end cap and NMR coil

$$Y_{carbon} = Y_{^{12}C} + Y'_{^4He}$$

$$Y_{dummy} = Y'_{^4He} + Y_{^{27}Al}$$

$$Y_{empty} = Y'_{^4He}$$

He inside the target cup

$$Y'_{^4He} = Y^{out}_{^4He} + Y^{in}_{^4He}$$

He outside the target cup

Method

$$Y_{pf} = Y_{^{14}N} + Y_{^{4}He} + Y_{^{27}Al} + \cancel{Y_{H_3}}$$

Assume this contribution is small, for now.

$$Y_{pf} = l_{tg}\sigma_N pf + l_{tg}\sigma_{He}(1 - pf) + Y_{He}^{out} + Y_{Al}$$

$$Y_{pf} = l_{tg}pf(\sigma_N - \sigma_{He}) + l_{tg}\sigma_{He} + Y_{He}^{out} + Y_{Al}$$

Can be obtained from Vince's data

Can get relative cross section from empty cell run:

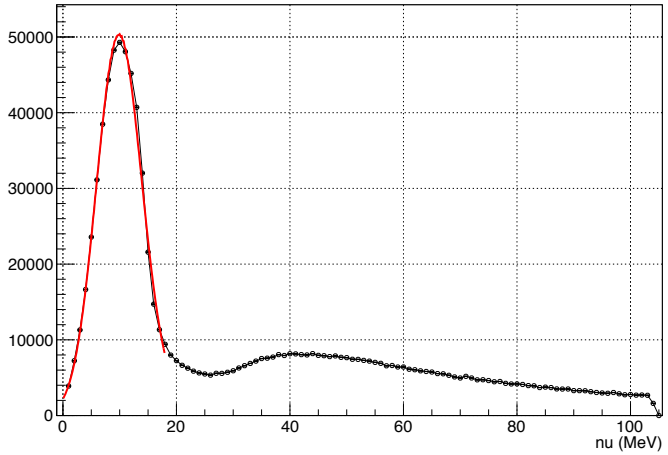
Y_{dummy}

$$Y_{empty} = Y'_{^{4}He} = (l_{tg} + l_{out})\sigma_{He}$$

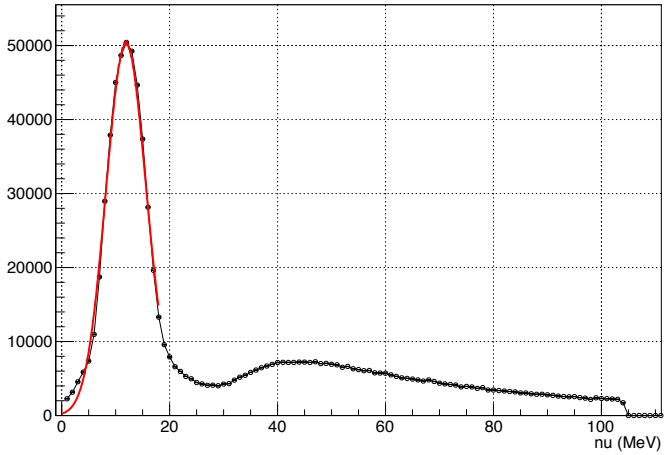
Fits of Dilution Runs

Landau-Gaussian Convolution Fit

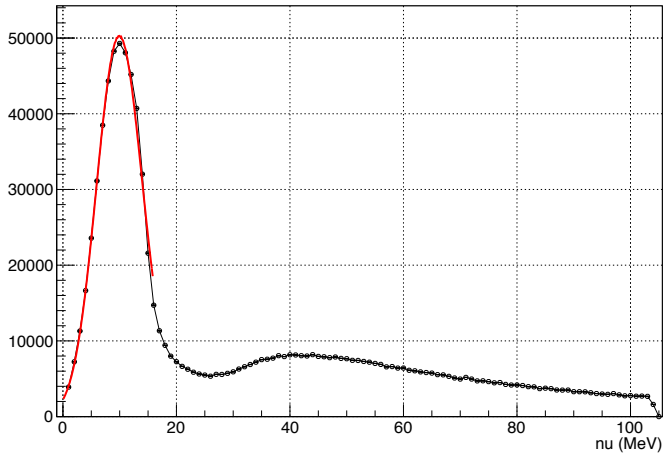
Carbon Run 3447



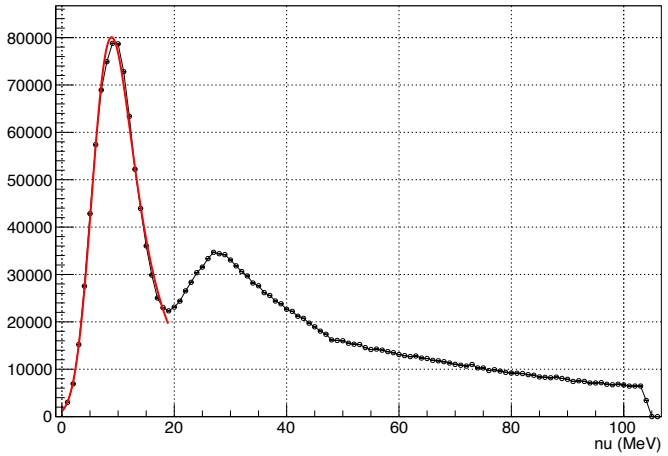
Dummy Run 3448



Dummy Run 3447



Packing Fraction Run 3865



Quick Test

$$Y_{pf} = l_{tg} pf (\sigma_N - \sigma_{He}) + Y_{dummy}$$

Y_{pf} = 1013960

Y_{dummy} = 414573

Y_{empty} = 412556

Y_{carbon} = 532140

ℓ_{tg} = 28.2 mm

ℓ_{out} = 13.8 mm

ℓ_{carbon} = 1.016 mm

$\sigma_{He} = Y_{empty}/(\ell_{tg}+\ell_{out}) = 9822.8$

$\sigma_C = (Y_{carbon} - Y_{empty})/(\ell_{carbon}) = 117700.8$

$\sigma_N = (Y_{pf}/Y_{carbon})*\sigma_C = 224271.6$

pf = 0.10

To Do

- Need to use a better value for σ_N
- Need to include contribution from H_3
  - Either from fit of data or simulation

$$Y_{pf} = Y_{^{14}N} + Y_{^{4}He} + Y_{^{27}Al} + Y_{H_3}$$

- Any suggestions?