

Packing Fraction

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Method

$$Y_{prod} = Y_{He}^{out} + (1 - p_f)Y_{He}^{in} + p_f Y_N + p_f Y_H$$

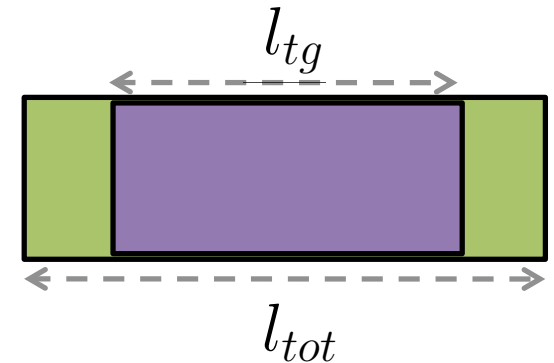
$$Y_{tg} = Y_{prod} - Y_{He}^{out}$$

Yield from materials within the target cell

$$Y_{He}^{out} = \frac{(l_{tot} - l_{tg})}{l_{tot}} Y_{dummy}$$

$$Y_{He}^{in} = \frac{l_{tg}}{l_{tot}} Y_{dummy}$$

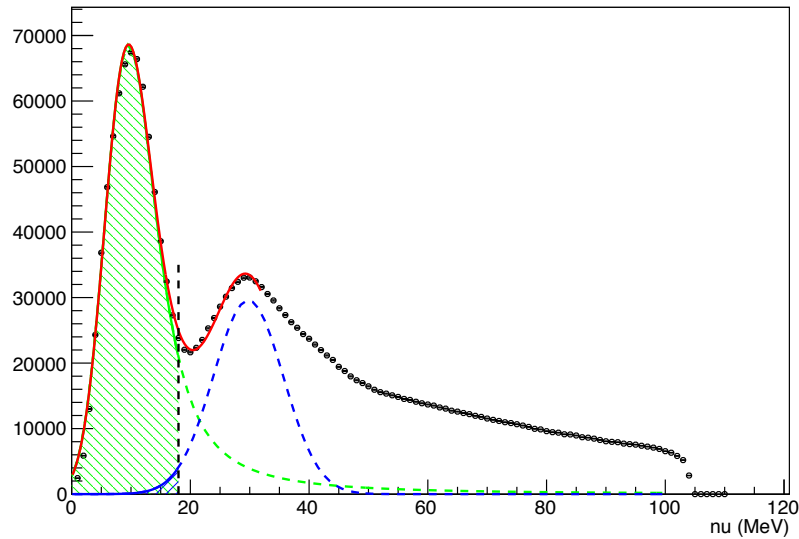
$$(1 - p_f) = \frac{Y_{He}^{in}}{Y_{tg}}$$



Assumes uniform acceptance throughout

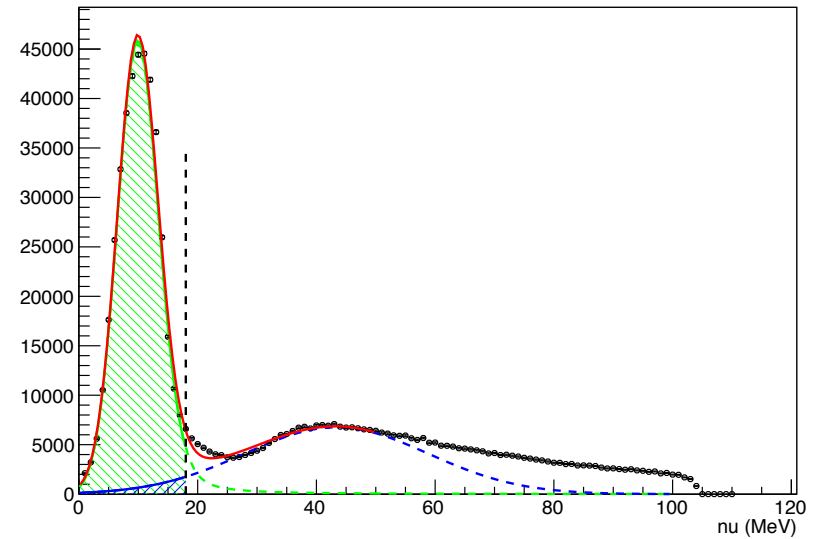
Contamination

Run 3446 (Production)



1.40% Contamination

Run 3448 (Dummy)



3.04% Contamination

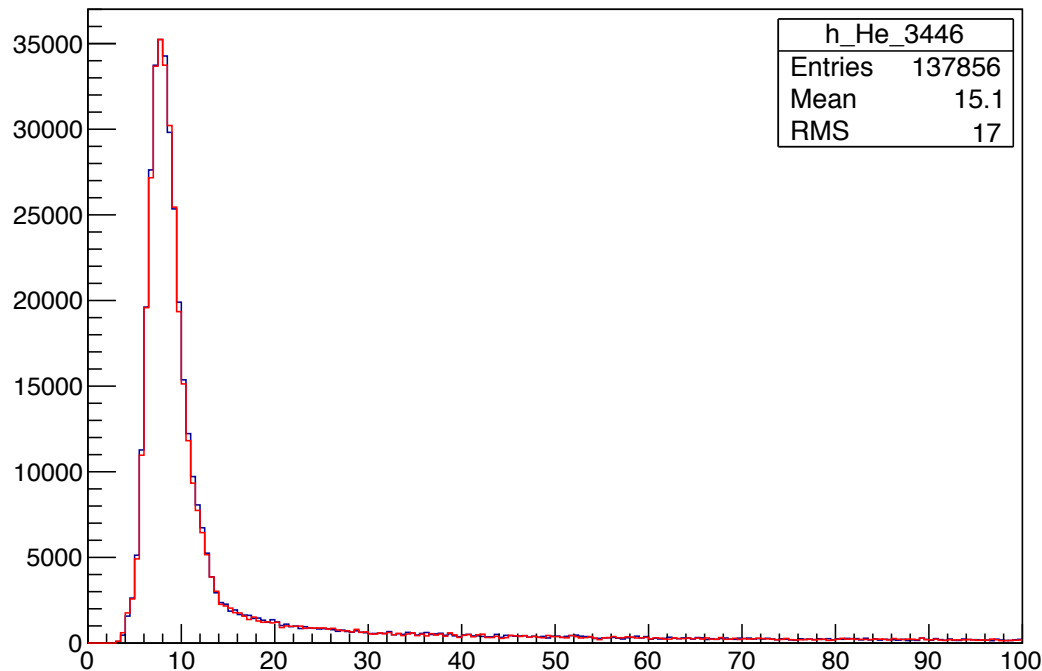
Subtracted off to leave only
elastic contribution

Radiation Length Scaling

Purpose: Scale radiation length in dummy run to helium contribution in production run

Method: Yields generated using g2psim for 2 different radiation lengths. The ratio is used to scale Y_{dummy} rad length to match Y_{prod}

He4 Yields from Simulation



— Radiated model with radiation thickness from dummy run

$$T_A = T_B = 0.00283922$$

— Radiated model with radiation thickness from ammonia cell run (assuming pf = 0.55)

$$T_A = T_B = 0.00164705$$

Radiation Length Scaling

Two Different Methods to Determine the Ratio:

- 1) Use average scaling factor over range of elastic peak
- 2) Apply correction bin by bin
(More on this in next slide)

Using Average:

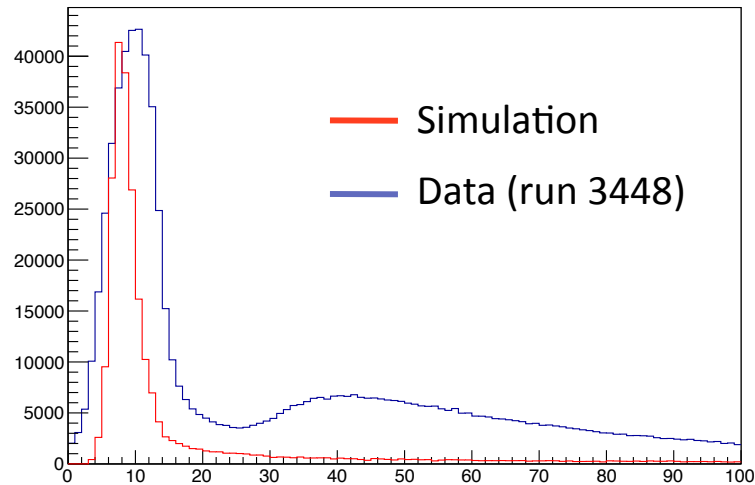
Average scaling factor = 0.9973

pf w/ scaling = 0.553

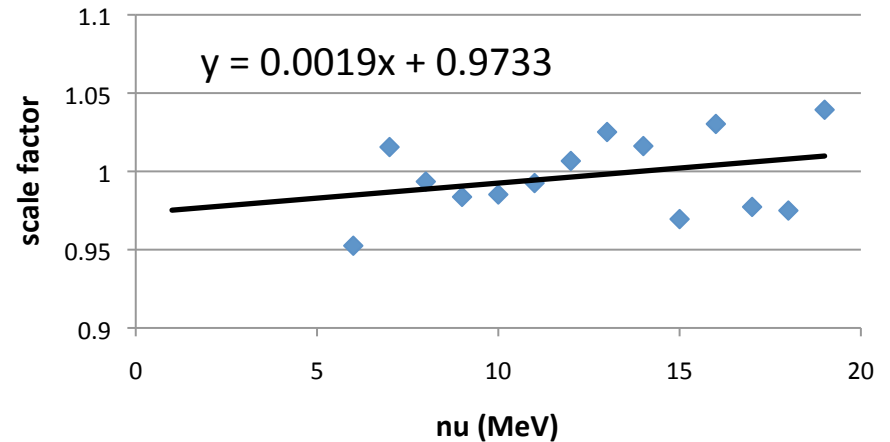
pf w/out scaling = 0.551

Radiation Length Scaling

Applying the Correction bin-by-bin:



Estimating Scale Factor



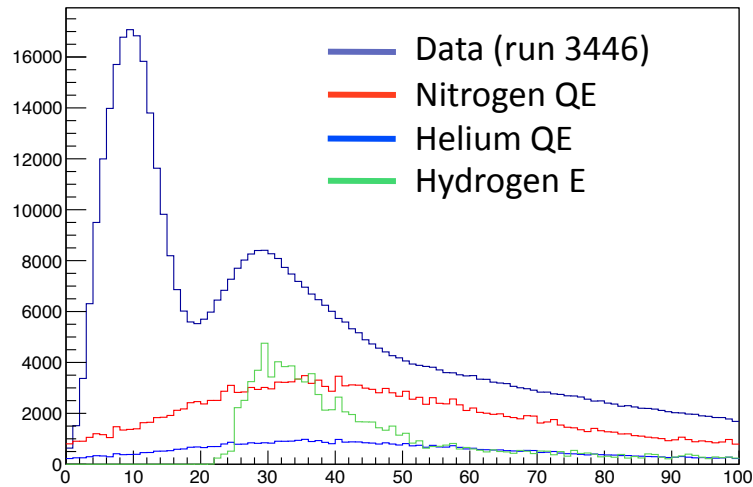
- Simulation doesn't match perfectly with data
- Have to use fit to determine scaling factors at low nu

pf w/ scaling = 0.555

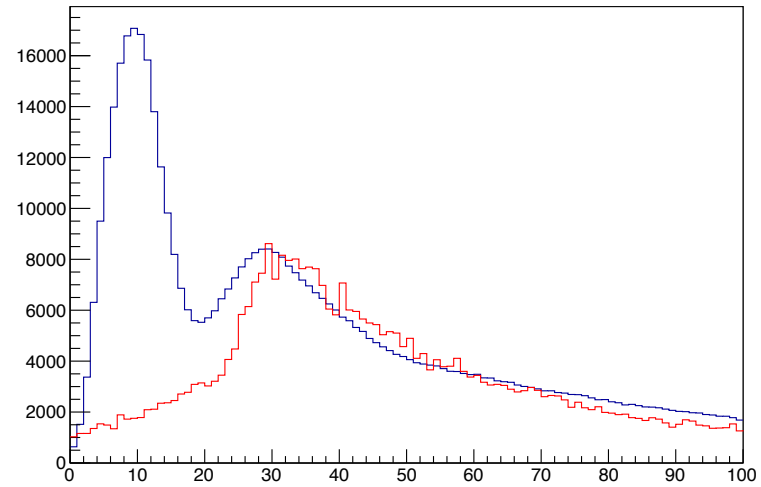
pf w/out scaling = 0.551

Update to Fitting Routine?

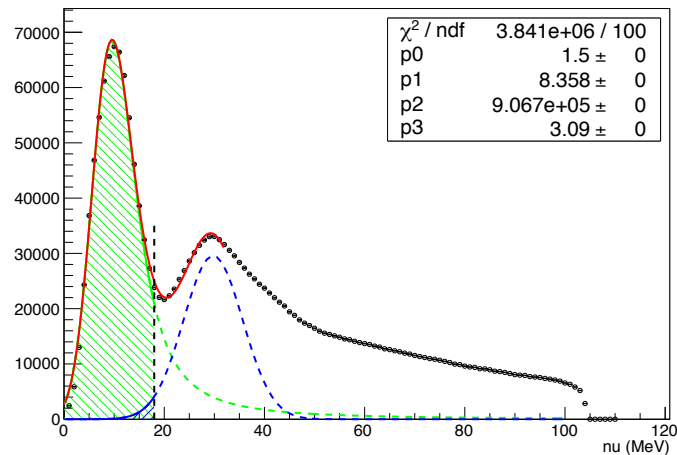
Components



Sum of Components



Fit to Elastic and QE Peaks



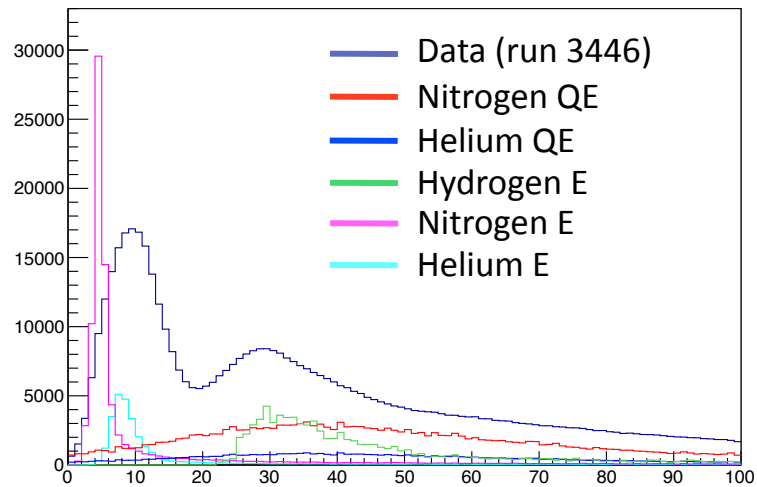
- Currently, approximating “QE” peak as a single Gaussian

- Ideally, fit should account for all components in the peak

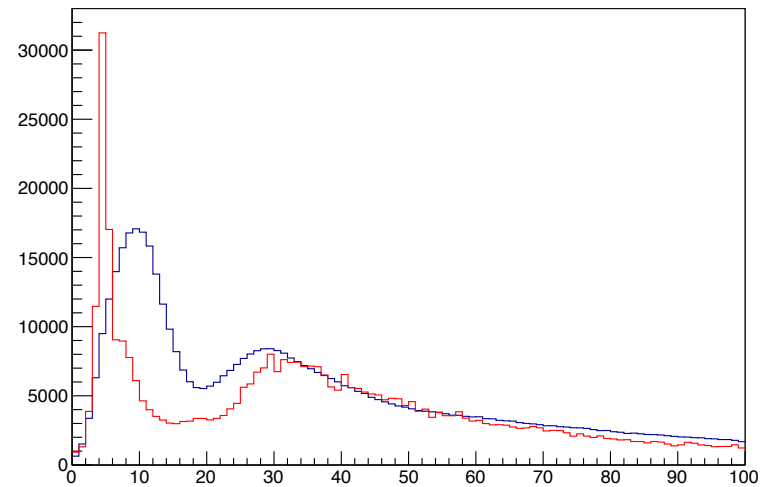
- Requires good matching between data and simulation

Update to Fitting Routine?

Components



Sum of Components



(Including Elastic Components)

Summary

Using Run 3446 (material 8)

w/out scaling: $p_f = 0.551$

w/ scaling (average scale factor): $p_f = 0.553$

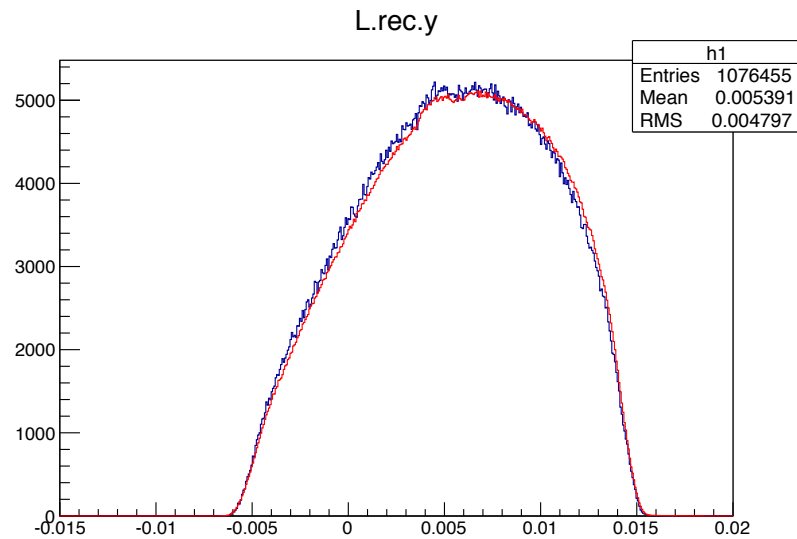
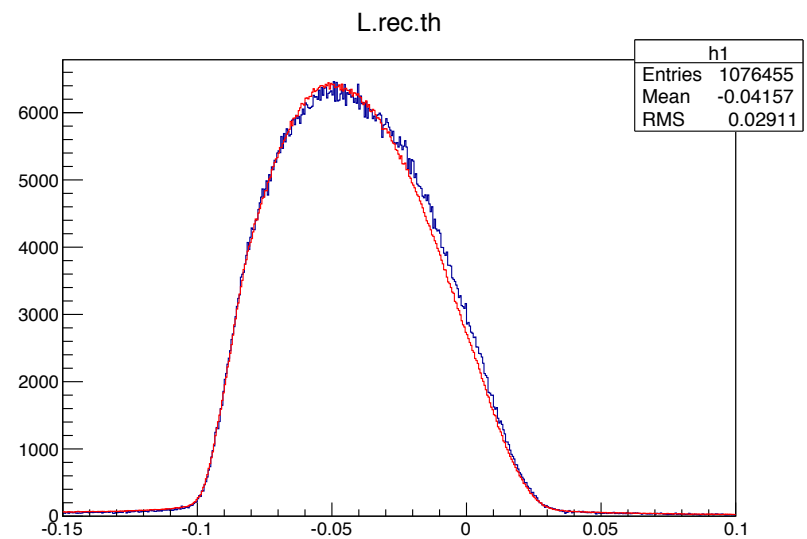
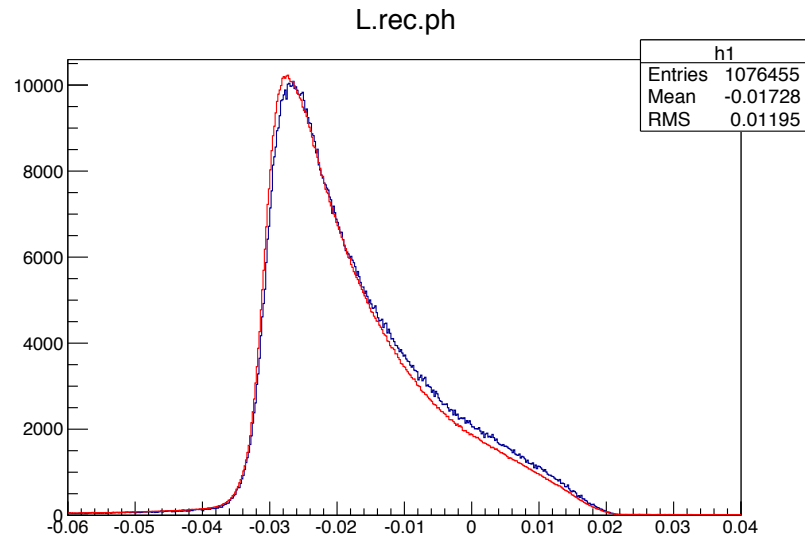
w/ scaling (varying scale factor): $p_f = 0.555$

To Do:

- Update fitting routine
- Include acceptance (when ready)
- Repeat procedure for other target materials/settings
- Suggestions from this meeting?

Backup

Acceptance Variables



— Run 3446 (Production)
— Run 3448 (Dummy)

Recall: Run Selection

2.2 GeV, 2.5T, Elastic

	Run	Tgt x	Tgt y	Tgt theta	Tgt phi
prod.	3446	4.57	3.38	0.0636	0.0042
dummy	3448	4.62	3.30	0.0635	0.0042
empty	3449	5.89	1.69	0.0619	0.0056
packing fraction ↓	3503	2.09	1.05	0.0608	0.0033
	3574	2.00	0.49	0.0601	0.0009
	3727	4.75	2.30	0.0633	0.0049
	3864	0.84	0.69	0.0608	0.0007

- Use “dummy” run in place of “empty” run
- Use production run in place of “packing fraction” run

Yields for Production/Dummy Run

