Packing Fraction

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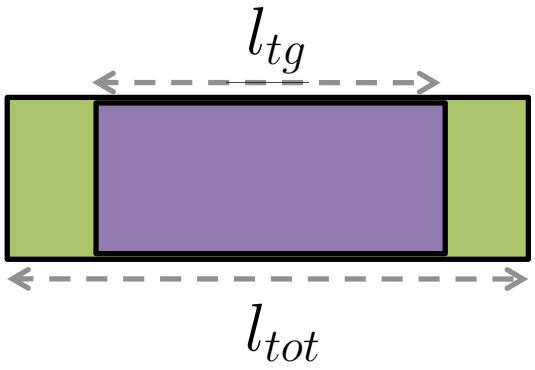
Method

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



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

Yield from materials within the target cell

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

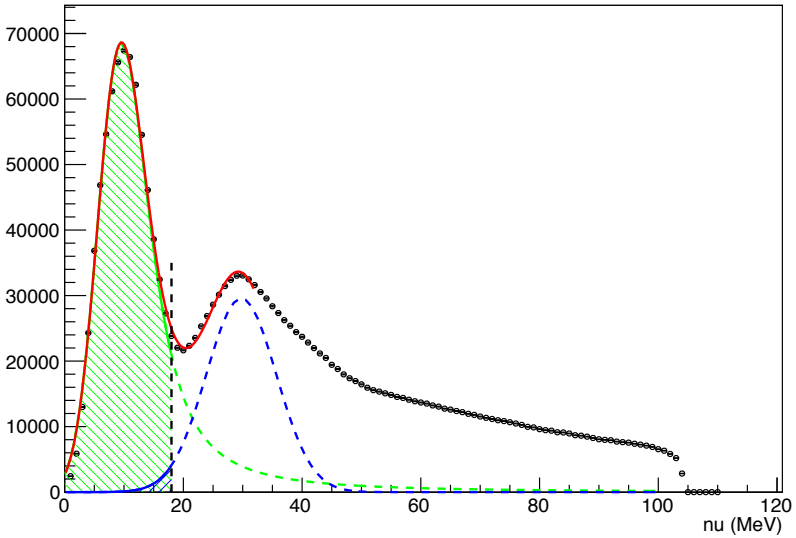
$$Y_{He}^{in} = \frac{l_{tg}}{l_{tot}} Y_{dummy}$$

Assumes uniform acceptance throughout

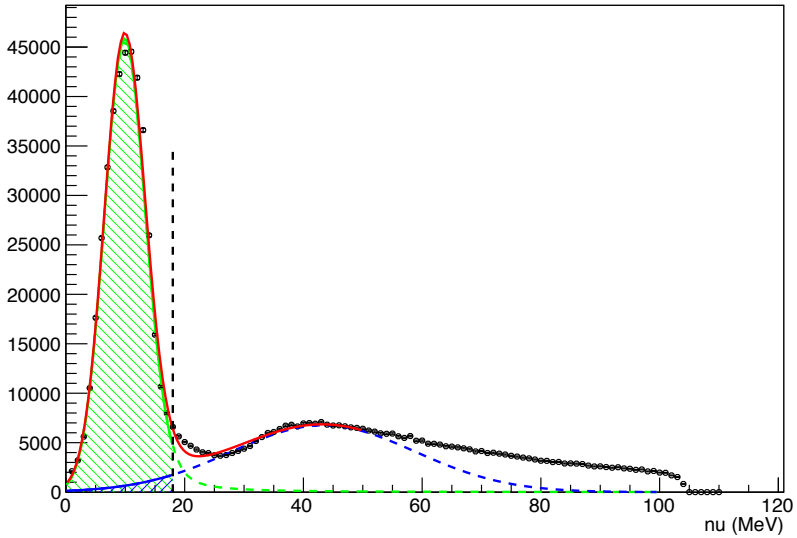
$$(1 - p_f) = \frac{Y_{He}^{in}}{Y_{tg}}$$

Contamination

Run 3446 (Production)



Run 3448 (Dummy)

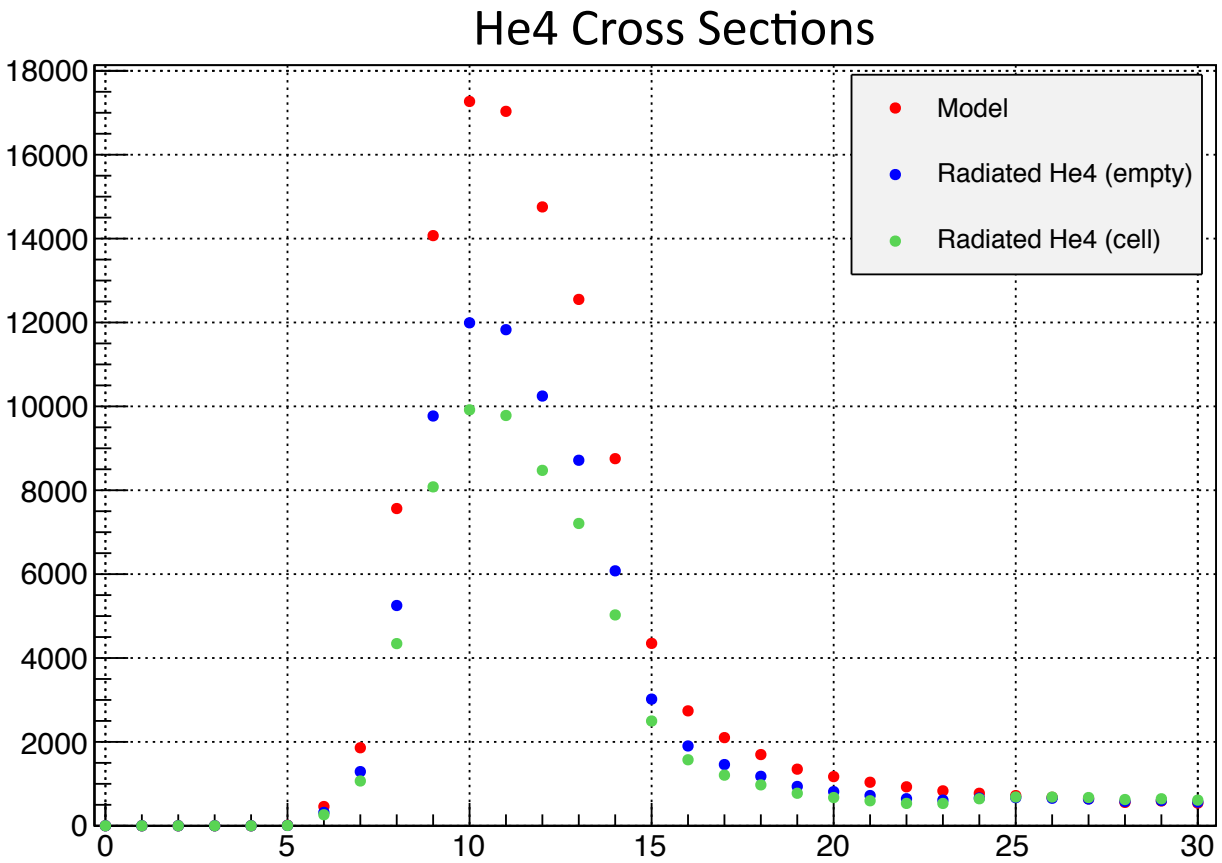


1.40% Contamination

3.04% Contamination

Subtracted off to leave only elastic contribution

Radiation Length Scaling

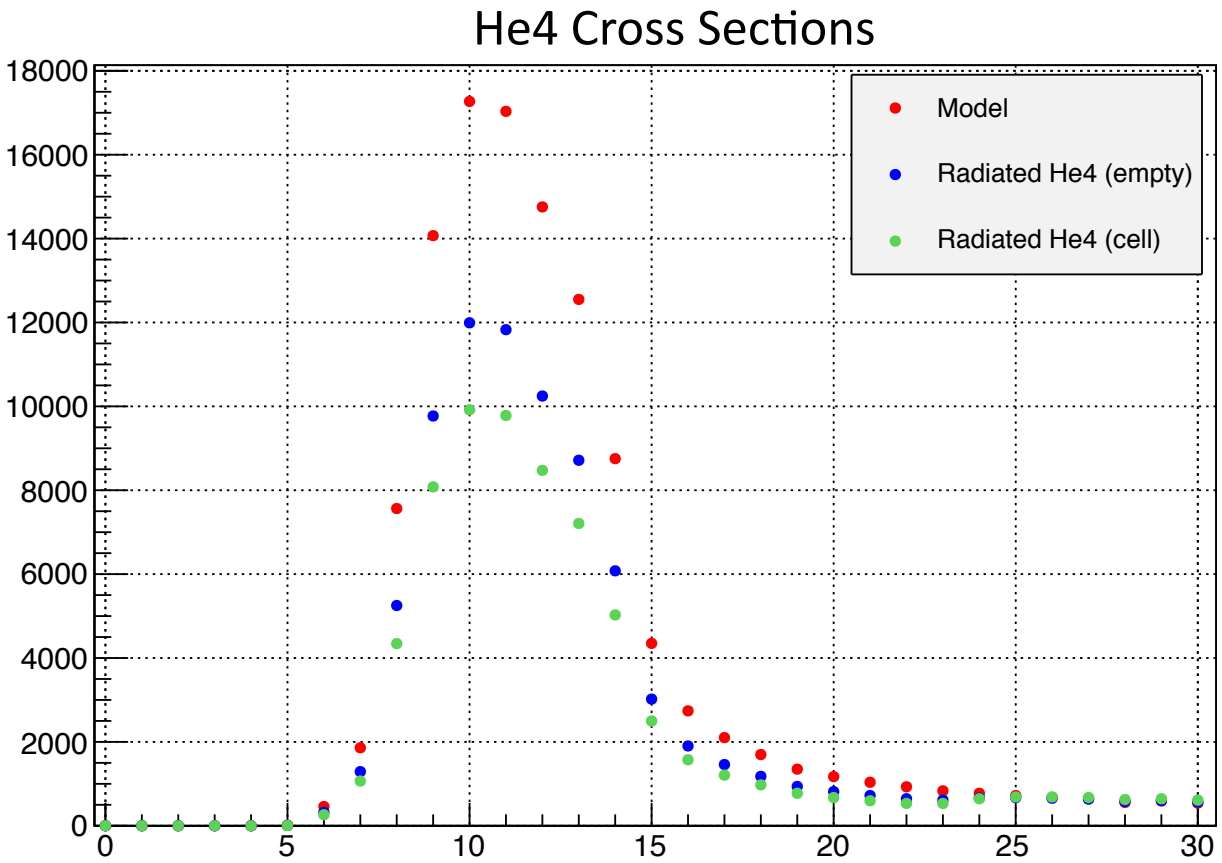


- Elastic He4 Model
- Radiated model with radiation thickness from empty run
- Radiated model with radiation thickness from ammonia cell run

Ratio is used to scale Y_{dummy} rad length to match Y_{prod}

Ratio = 1.209
(seems large...)

Radiation Length Scaling



w/out scaling:

$P_f = 0.551$

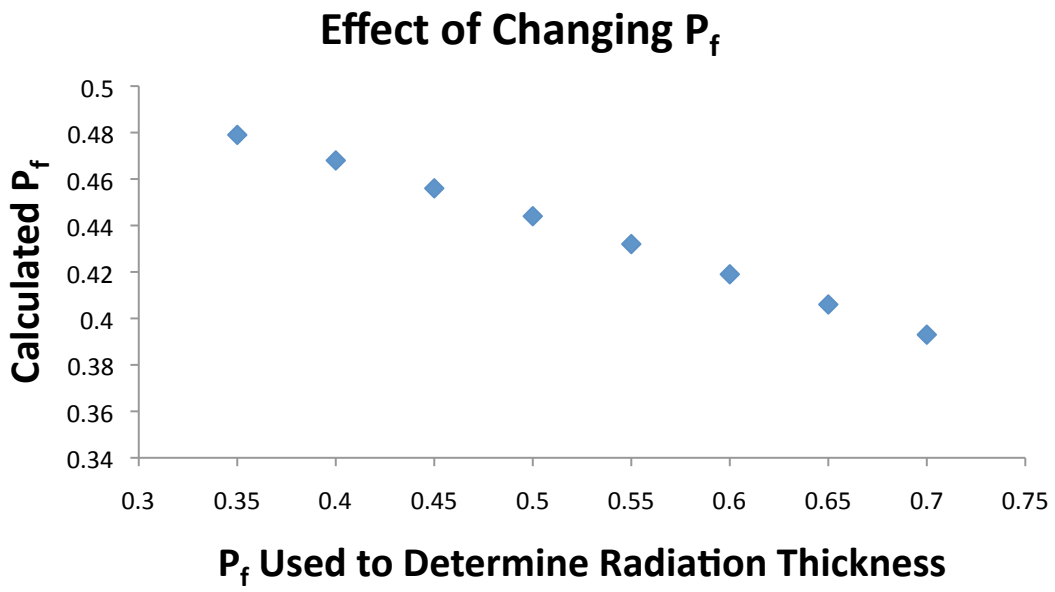
w/ scaling:

$P_f = 0.432$

Ratio = 1.209

Radiation Length Scaling

- Problem with this method:
  - Must assume a value for the packing fraction to determine radiation thickness



Uncertainty

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

Propagation of Uncertainty: $\sigma_{p\_f} = 0.025$

Uncertainty due to difference between fit and sum:

Run 3446: 3.24% difference
Run 3448: 1.88% difference

Total = 0.045

Results

Using Run 3446 (material 8), with Rad Length Scaling

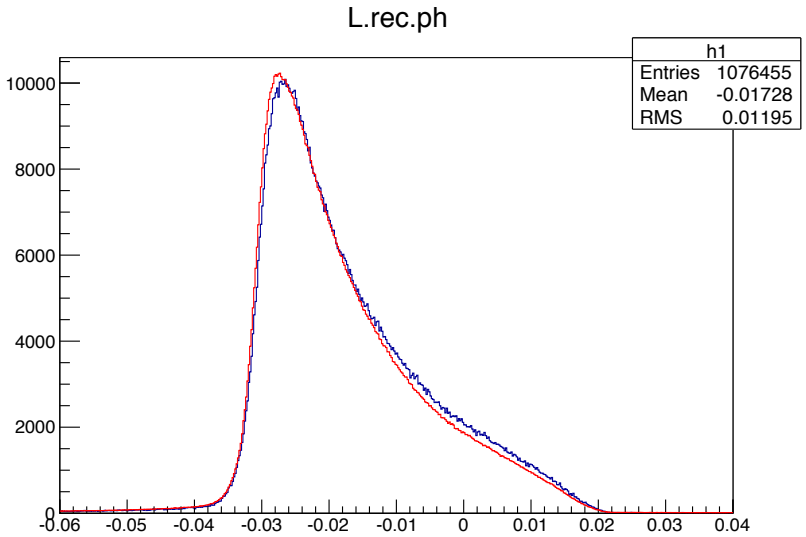
$$p_f = 0.432 \pm 0.045$$

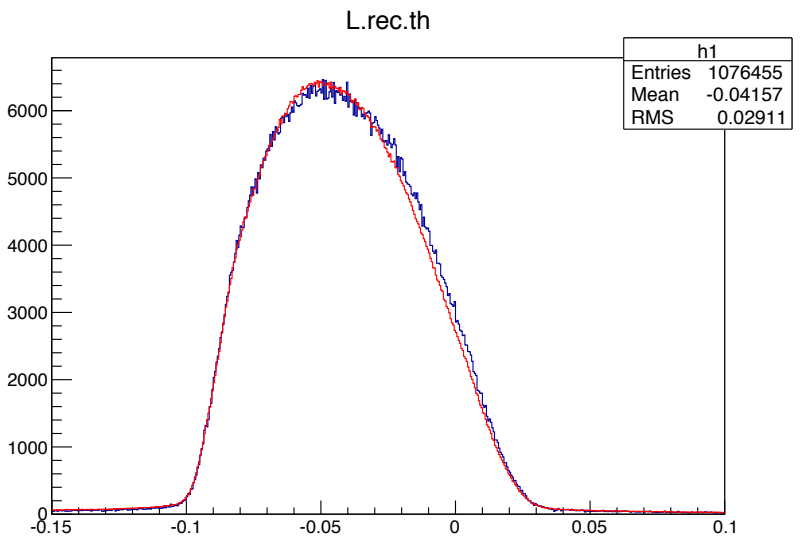
To Do:

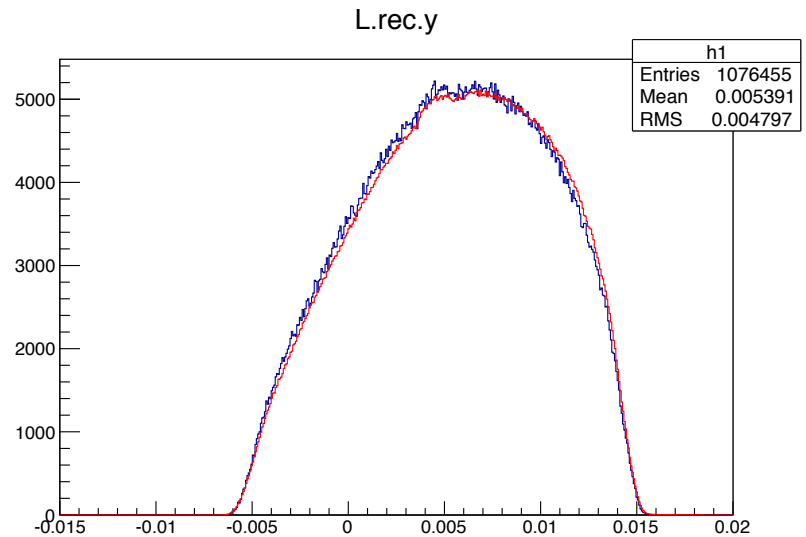
- Radiation length scaling factor too large?
- Include acceptance (when ready)
- Repeat procedure for other target materials/settings
- Suggestions from this meeting?

Backup

Acceptance Variables



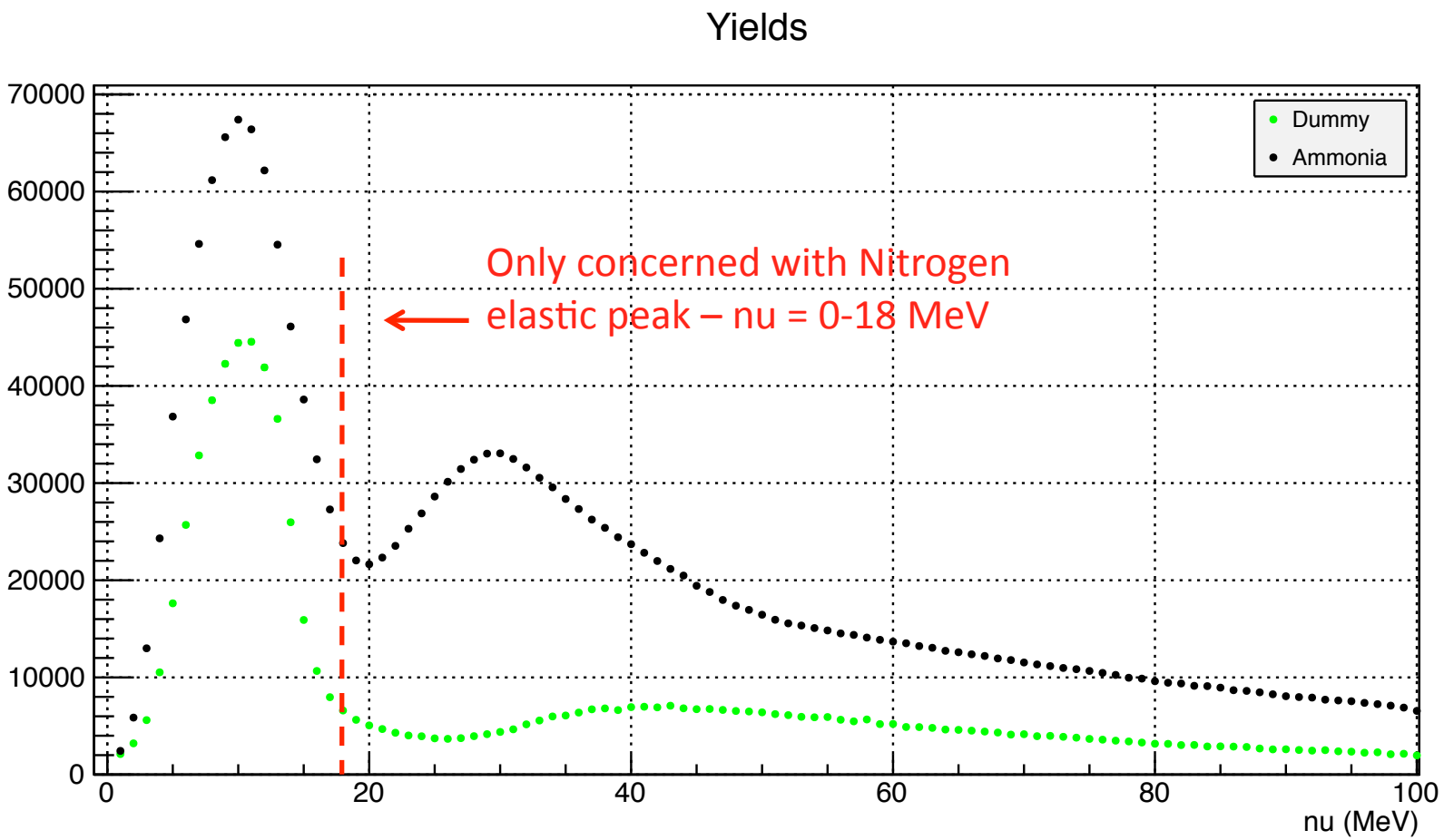




Run 3446 (Production)

Run 3448 (Dummy)

Yields for Production/Dummy Run



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