LHRS Analysis for d_2^n

QFS Modeling of Data

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Outline

Description

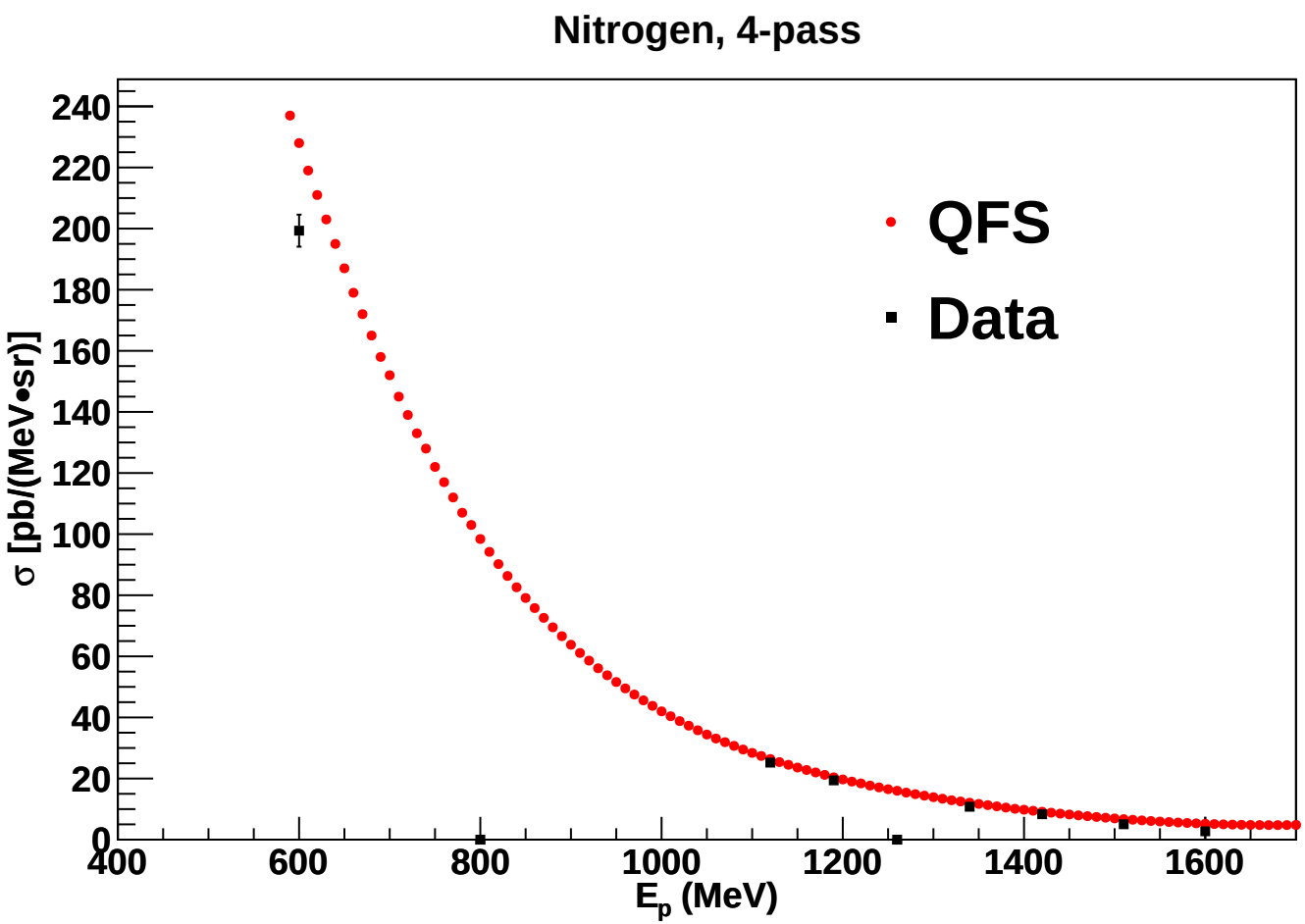
- To model our experimental data, we fit it using the QFS program
- Contributing processes in QFS:
  1. Quasi-elastic
  2. Delta resonance
  3. W = 1500, 1700 MeV resonances
  4. The ‘dip’ region
  5. DIS
- We (arbitrarily) weight each process by some multiplicative factor(s) so that QFS accurately describes both the 4- and 5-pass data

QFS Modeling of Nitrogen Data (1)
The Fit Parameters

- In the following, E_s, E_p, Q^2 and ν have been converted to GeV when used as multiplicative factors
- $\sigma_{\mathrm{qe}} \rightarrow \frac{E_s}{4}\frac{E_s}{1.178}\sigma_{\mathrm{qe}}$
- $\sigma_{\Delta} \rightarrow \left(2+\frac{3}{4}E_p\right)\sigma_{\Delta}$
- $\sigma_{1500} \rightarrow \sigma_{1500}$
- $\sigma_{1700} \rightarrow \frac{Q^2}{2}\frac{E_s}{\nu}\sigma_{1700}$
- $\sigma_{\mathrm{2N}} \rightarrow \frac{1}{5}E_p\left(1+\frac{E_s}{\nu}\right)\sigma_{\mathrm{2N}}$
- $\sigma_{\mathrm{DIS}} \rightarrow \frac{1}{\sin(\theta/2)}\frac{1}{16.5}\frac{E_s}{E_p}\sigma_{\mathrm{DIS}}$

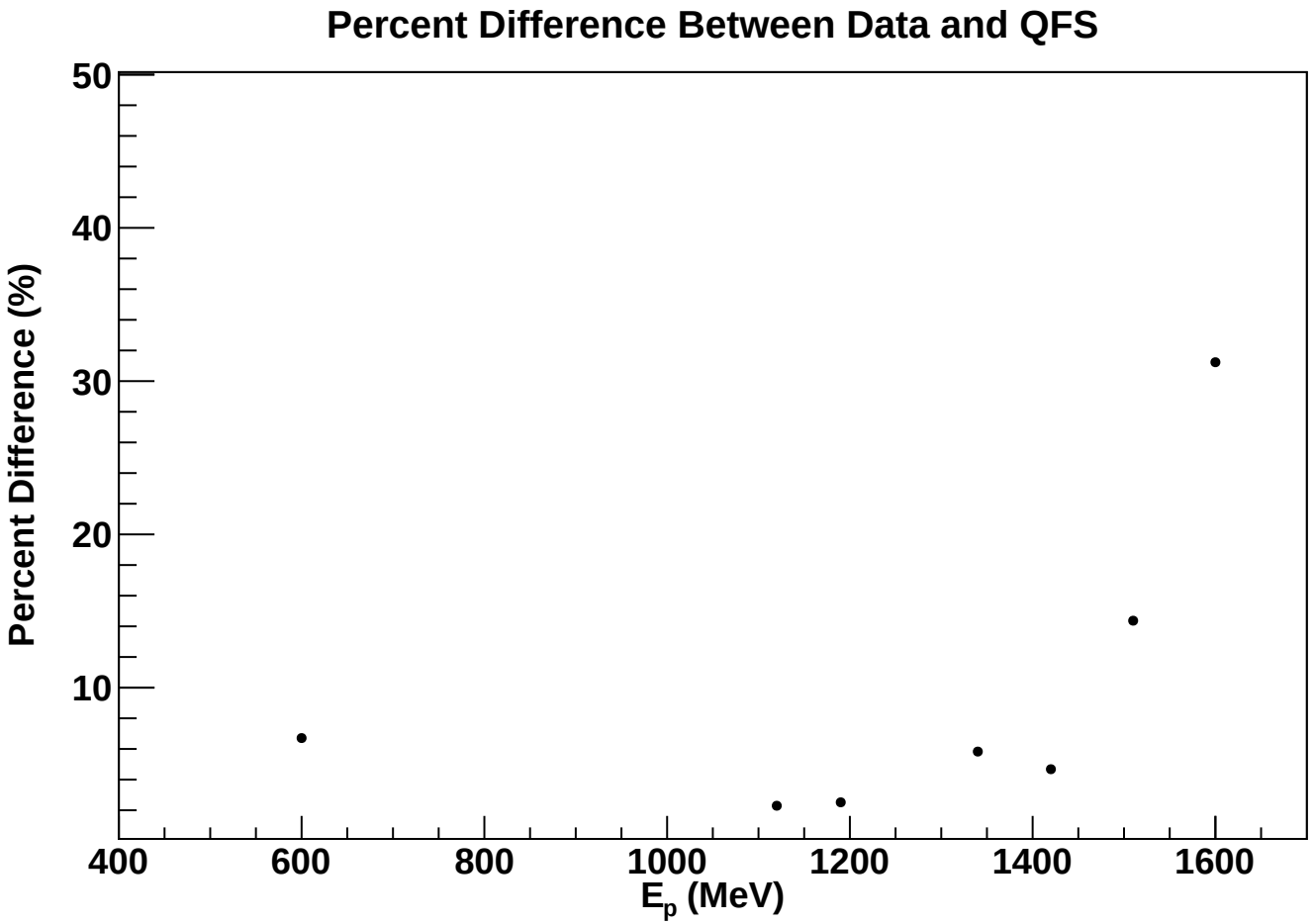
QFS Modeling of Nitrogen Data (2)

E_s = 4730 MeV



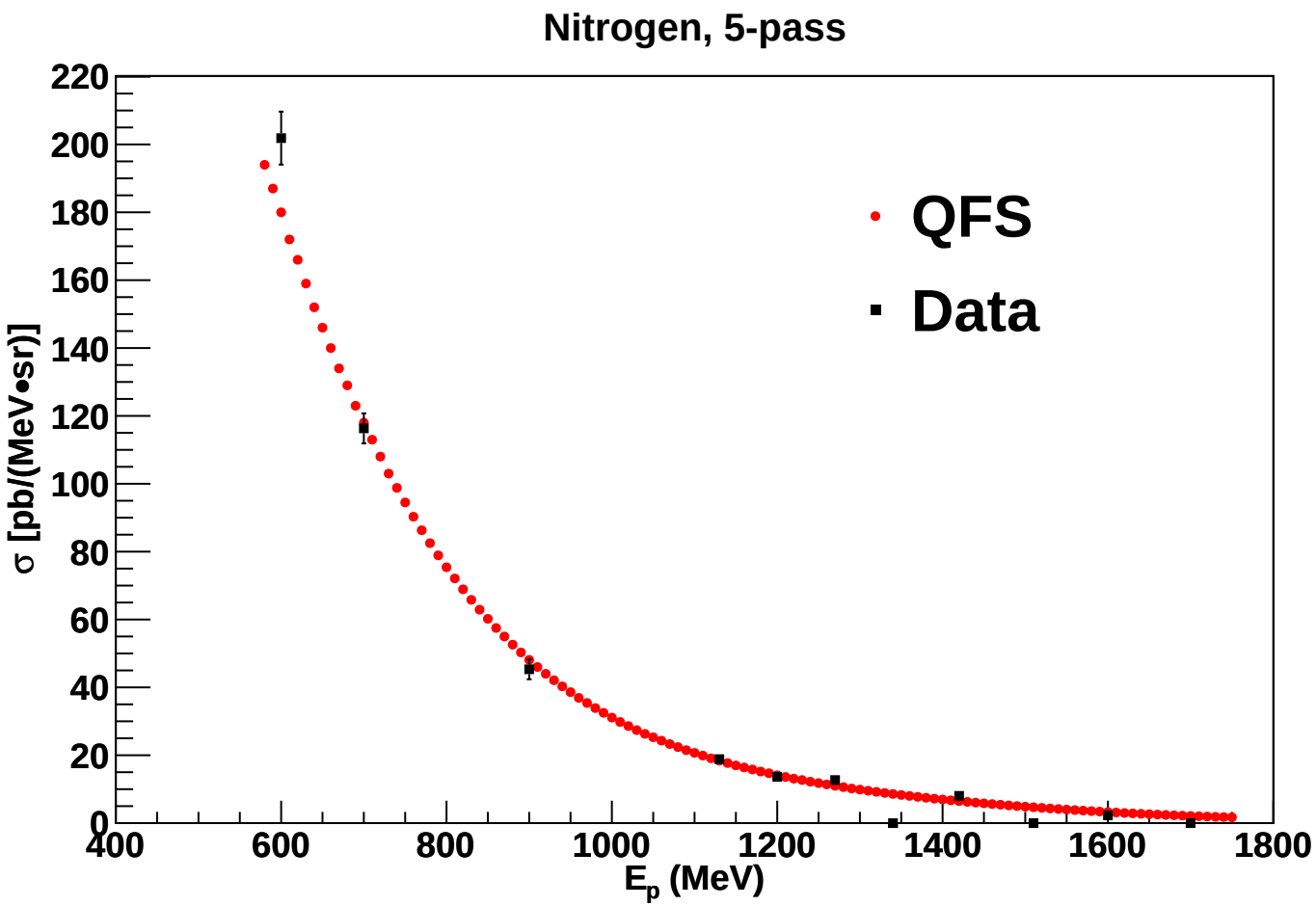
QFS Modeling of Nitrogen Data (3)

E_s = 4730 MeV



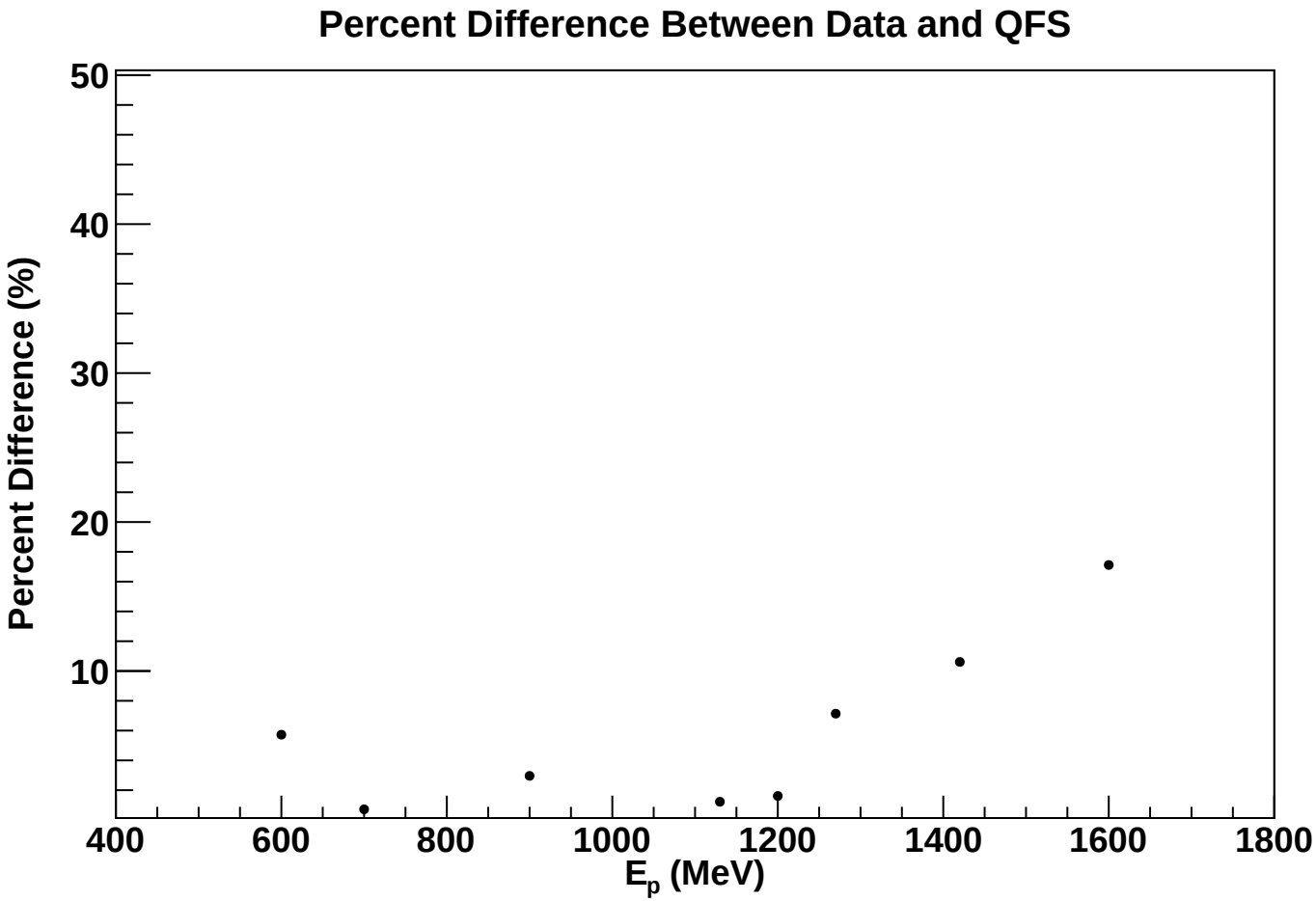
QFS Modeling of Nitrogen Data (4)

E_s = 5890 MeV



QFS Modeling of Nitrogen Data (5)

E_s = 5890 MeV



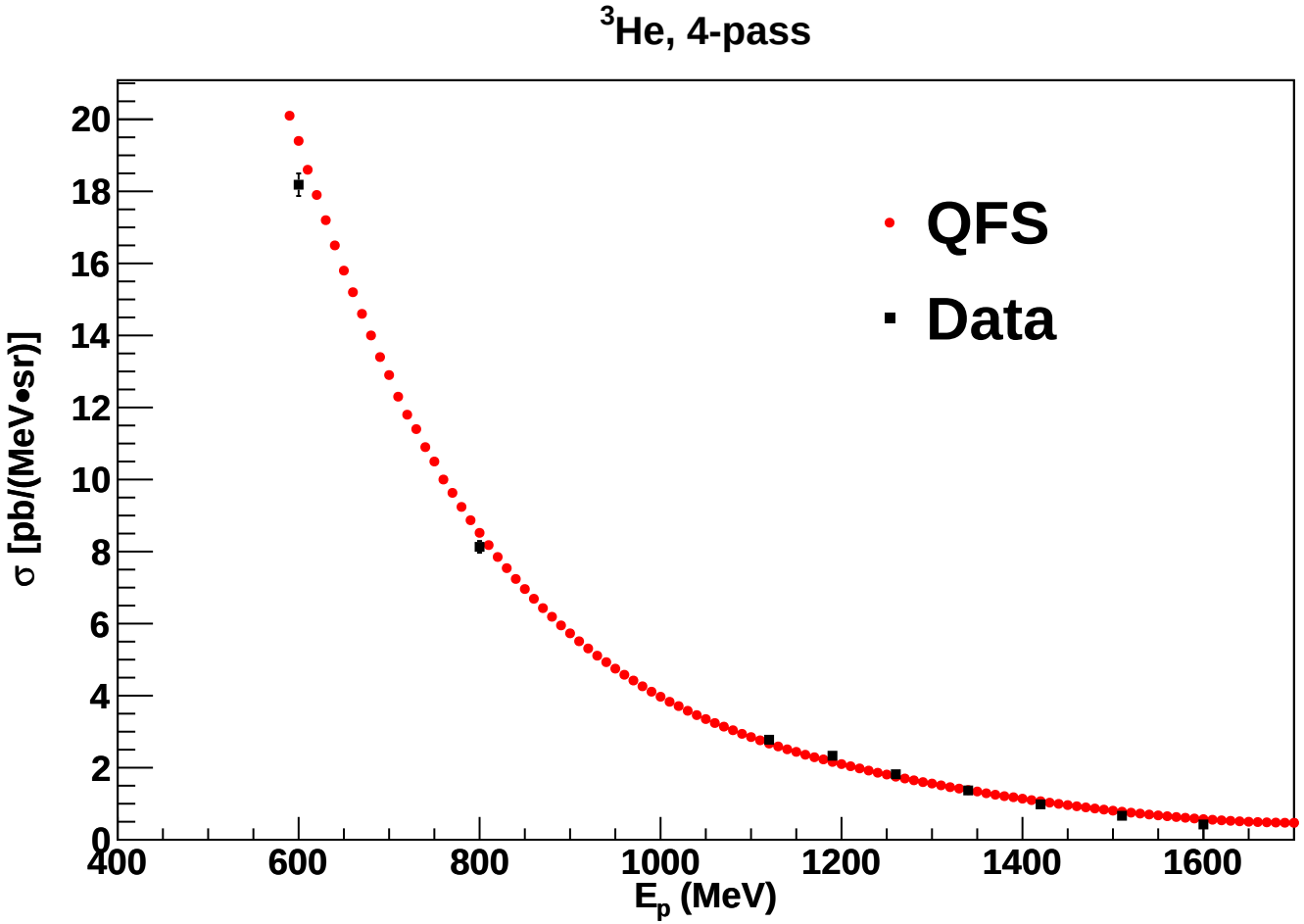
QFS Modeling of ^{3}He Data (1)

The Fit Parameters

- In the following, E_s, E_p, Q^2 and ν have been converted to GeV when used as multiplicative factors
- $\sigma_{\rm qe} \rightarrow \frac{E_s}{\nu}\frac{E_s}{4}\sigma_{\rm qe}$
- $\sigma_{\Delta} \rightarrow \frac{1}{\nu}\left(10^{-3}E + E_p\right)\sigma_{\Delta}$
- $\sigma_{1500} \rightarrow \frac{4}{E_s}\sigma_{1500}$
- $\sigma_{1700} \rightarrow \frac{Q^2}{10}\sigma_{1700}$
- $\sigma_{\rm 2N} \rightarrow \frac{9}{10}E_p\left(1 + \frac{E_s}{\nu}\right)\sigma_{\rm 2N}$
- $\sigma_{\rm DIS} \rightarrow \frac{3}{5\sin(\theta/2)}\frac{1}{4.73}\sigma_{\rm DIS}$

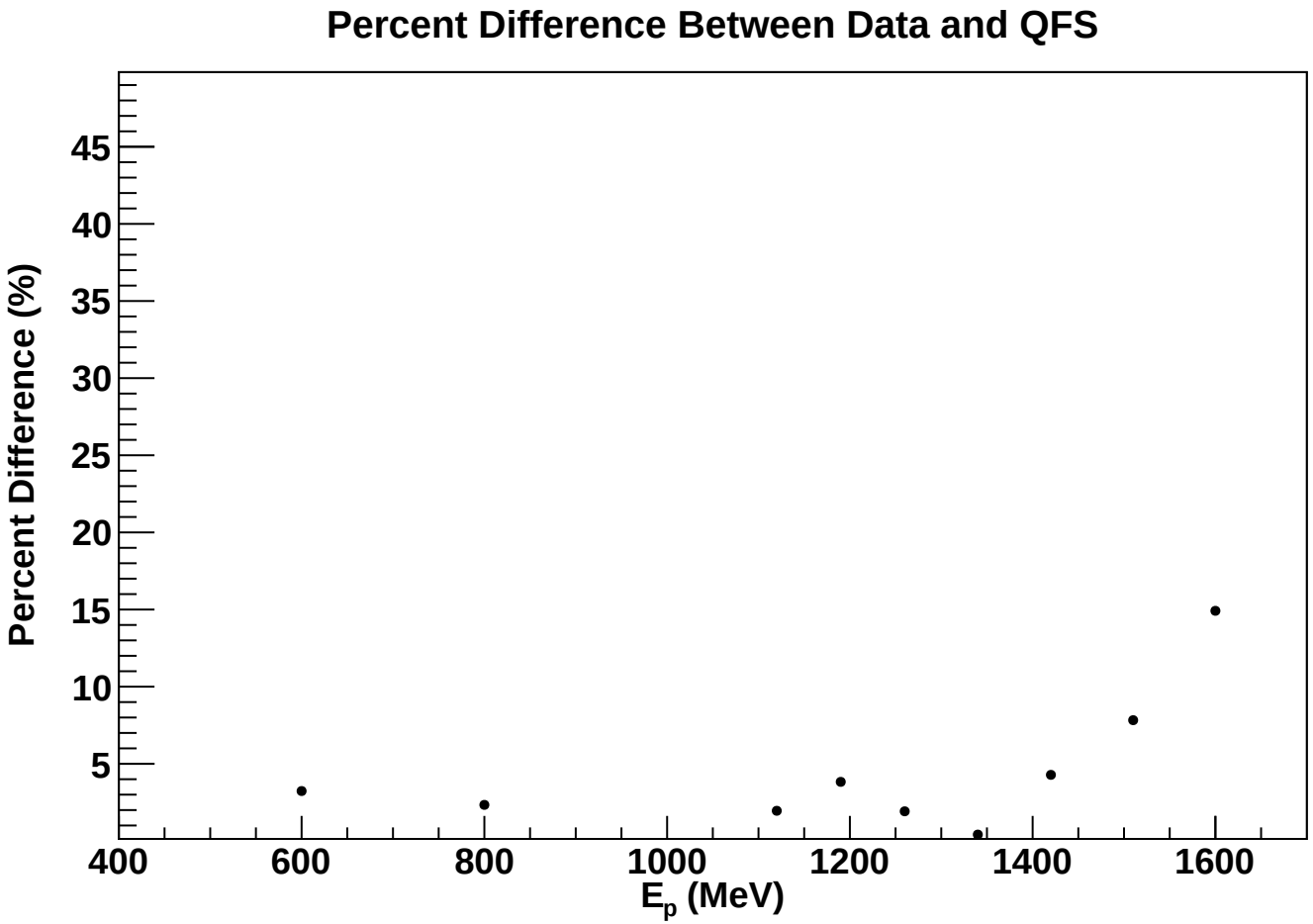
QFS Modeling of ^{3}He Data (2)

E_s = 4730 MeV



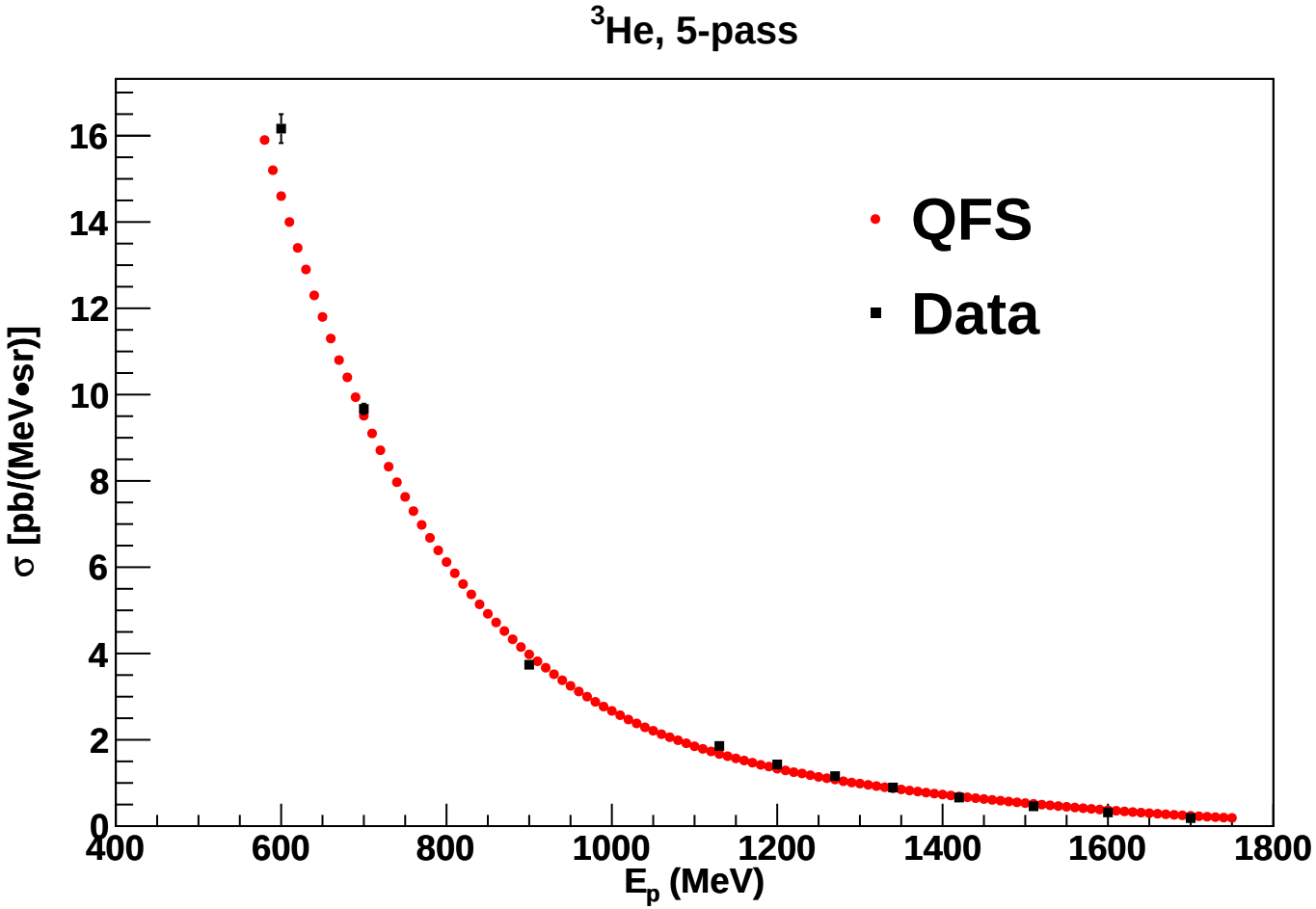
QFS Modeling of ^{3}He Data (3)

E_s = 4730 MeV



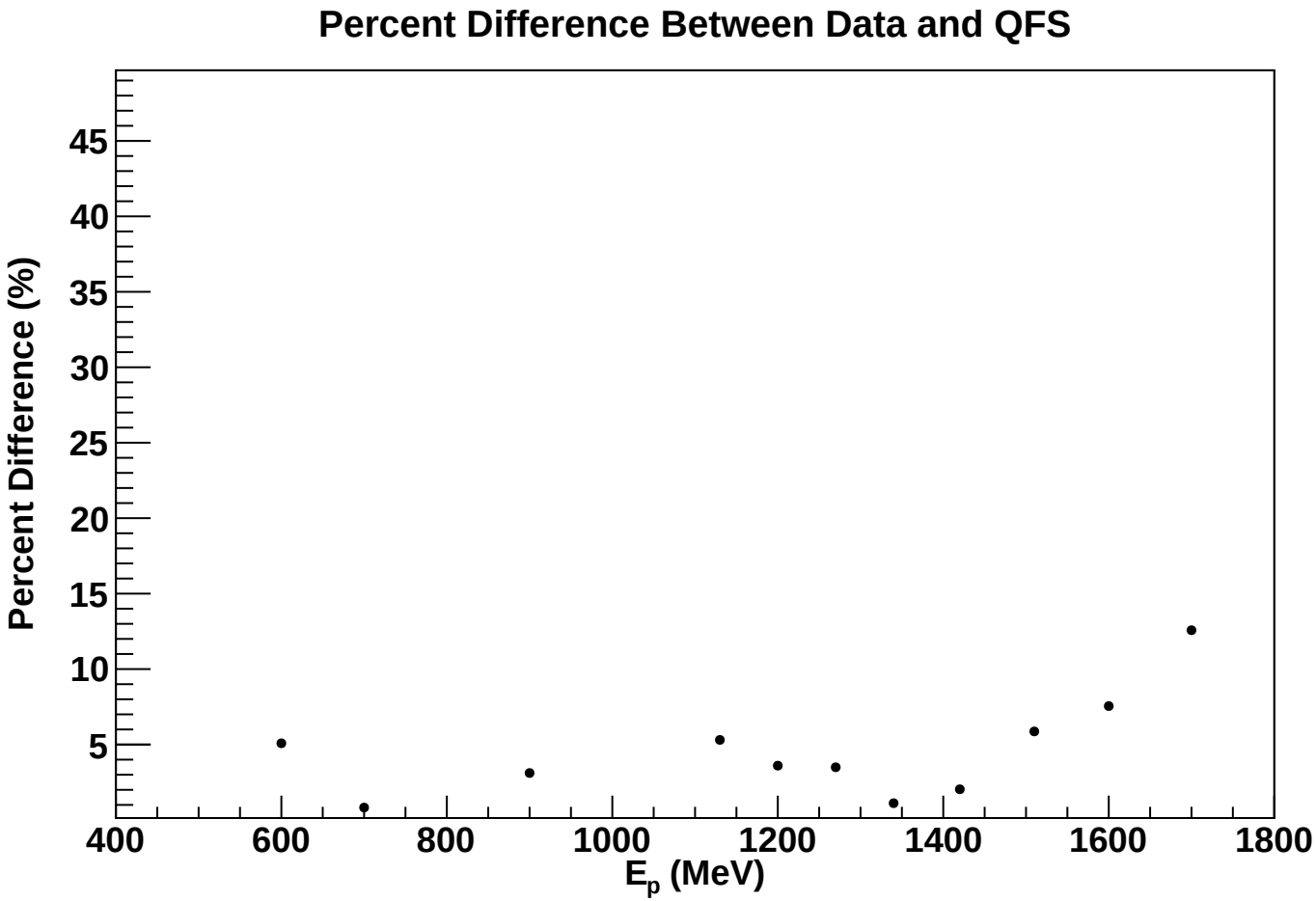
QFS Modeling of ^{3}He Data (4)

E_s = 5890 MeV



QFS Modeling of ^{3}He Data (5)

E_s = 5890 MeV



Summary

- QFS models do a decent job fitting the data:
  - Nitrogen: Better than $\sim$6% for most data points
  - ^{3}He: Better than $\sim$5% for most data points
- The model doesn't do as well at high E_p values: 10–30%

What's Next?

- Radiative Corrections:
  - Get radcor working at our kinematics
- Cross Sections:
  - Double-check nitrogen dilutions (using QFS fit)
  - Finite acceptance correction
  - Loose ends on systematic errors (LT, VDC and Q)