LHRS Analysis for d_2^n

Data Modeling Update

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11/10/11

Outline

Tweaking the Model (1)

- Introduce polynomial functions in the QE, Δ, R1, R2 and DIS regions:

$$\begin{aligned}
\sigma_{\text{tot}} &= f_{\text{q.e.}} p_{\text{q.e.}} \sigma_{\text{q.e.}} + f_{\Delta} p_{\Delta} \sigma_{\Delta} + p_{\text{2N}} \sigma_{\text{2N}} + f_{\text{R1}} p_{\text{R1}} \sigma_{\text{R1}} \\
&+ f_{\text{R2}} p_{\text{R2}} \sigma_{\text{R2}} + f_{\text{DIS}} p_{\text{DIS}} \sigma_{\text{DIS}} \\
f_i &= f_i(E_s) \quad \text{or} \quad f_i = f_i(\theta)
\end{aligned}$$

- The form of each polynomial was obtained by fitting the error of the original model (see the 10/27/11 talk) as a function of either E_s or θ, whichever showed a clear trend
- The factor f_i is applied as 1 - the fit

Tweaking the Model (2)

Functional Form of f_i

$$
\begin{aligned}
f_{\text{q.e.}} &= 1 - a_0 - a_1 E_s - a_2 E_s^2 \\
f_{\Delta} &= 1 - a_0 - a_1 E_s - a_2 E_s^2 \\
f_{\text{R1}} &= 1 - a_0 - a_1 \theta - a_2 \theta^2 - a_3 \theta^3 \\
f_{\text{R2}} &= 1 - a_0 - a_1 \theta - a_2 \theta^2 - a_3 \theta^3 \\
f_{\text{DIS}} &= 1 - a_0 - a_1 \theta - a_2 \theta^2
\end{aligned}
$$

Tweaking the Model (3)

Coeffients for the f_i Parameters

Polynomial Coefficients for the QFS Model				
Type	a_0	a_1	a_2	a_3
q.e.	-5.6690	2.2371	-2.1351E-1	–
Δ	-5.6690	2.2371	-2.1351E-1	–
R1	1.0771	-1.2988E-1	4.7559E-3	-5.0074E-5
R2	1.0771	-1.2988E-1	4.7559E-3	-5.0074E-5
DIS	-2.7726E-1	1.4641E-2	-4.0299E-5	–

Tweaking the Model (4)

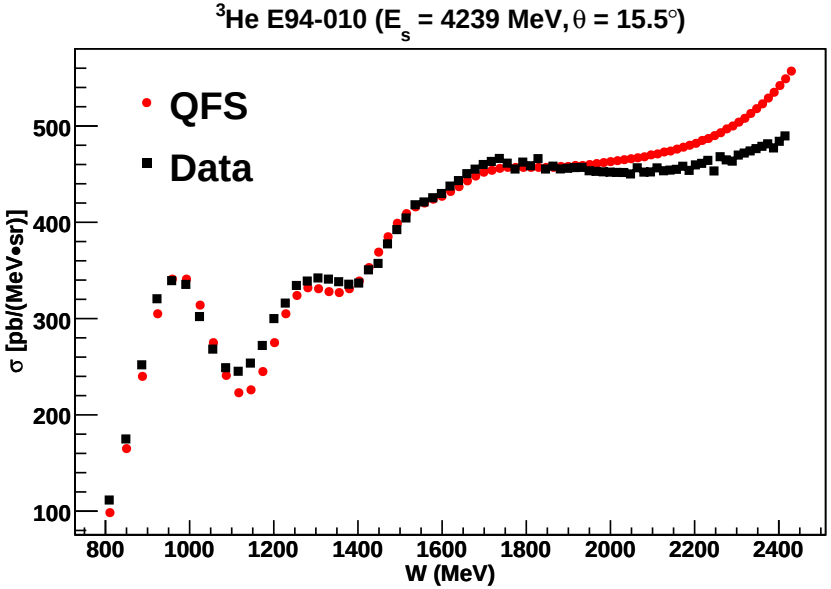
f_i and p_i Parameters

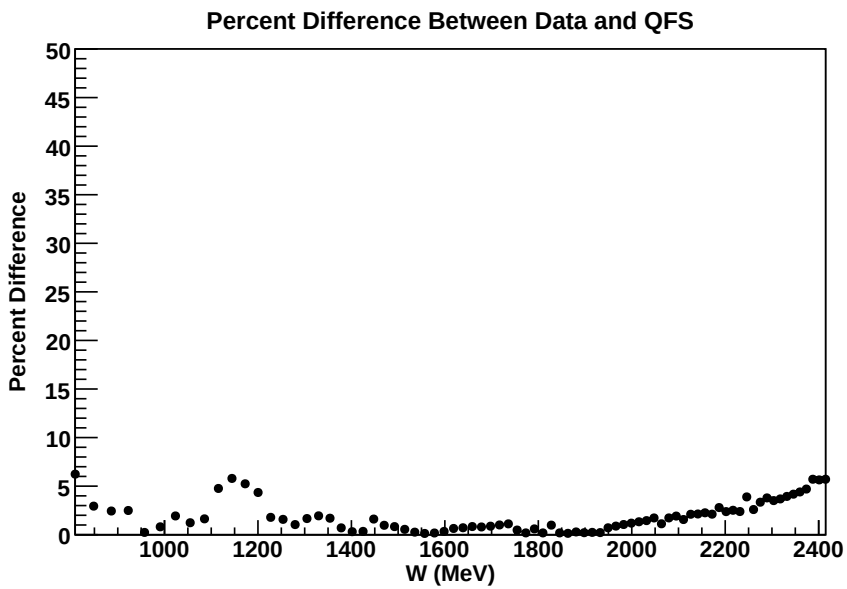
Parameters for the QFS Model						
Exp.	E_s (GeV)	$f_{\text{q.e.}}$	f_Δ	f_{R1}	f_{R2}	f_{DIS}
E94-010	4.239	1.02269	1.02269	0.97990	0.97990	1.08001
E94-010	5.058	0.81604	0.81604	0.97990	0.97990	1.08001
E01-012	4.018	1.12736	1.12736	0.97987	0.97987	0.94217
E01-012	5.009	0.82035	0.82035	0.84984	0.84984	0.85001
E06-014	4.730	0.86436	0.86436	0.69980	0.69980	0.70002
E06-014	5.890	0.89959	0.89959	0.69980	0.69980	0.70002

$$
\begin{aligned}
p_{\text{q.e.}} &= 1.22908 \quad p_\Delta = 1.37812 \\
p_{\text{2N}} &= 0.02726 \quad p_{\text{R1}} = 0.97615 \\
p_{\text{R2}} &= 0.81436 \quad p_{\text{DIS}} = 0.75179
\end{aligned}
$$

Results (1)

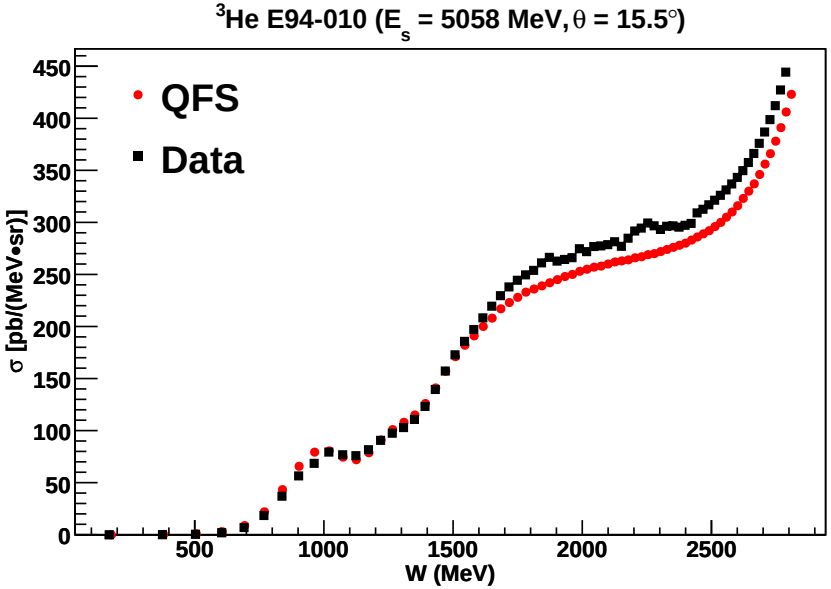
E94-010: $E_s = 4239$ MeV, $\theta = 15.5^\circ$

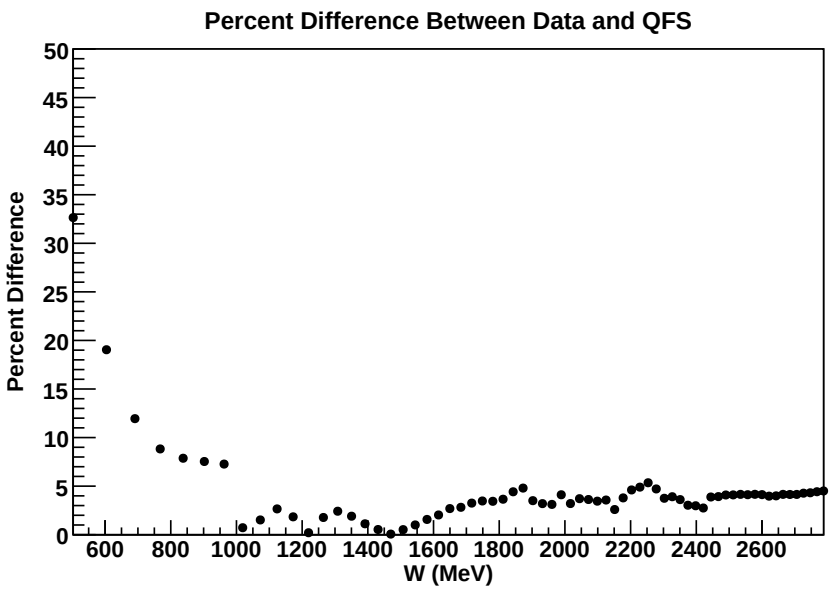




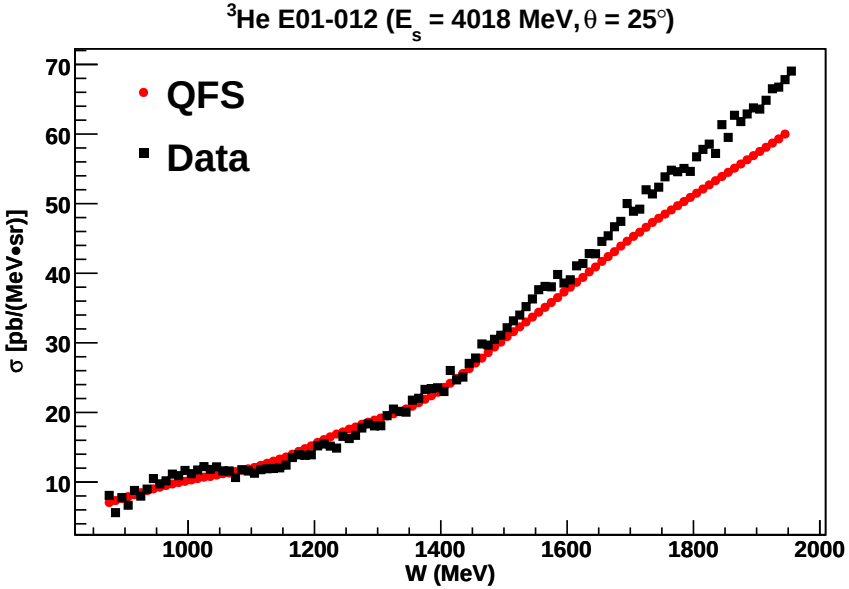
Results (2)

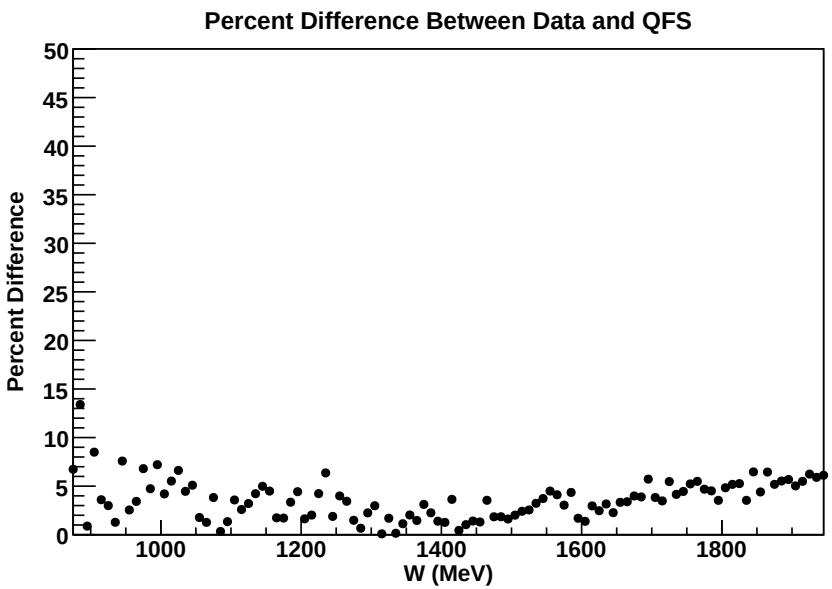
E94-010: $E_s = 5058$ MeV, $\theta = 15.5^\circ$





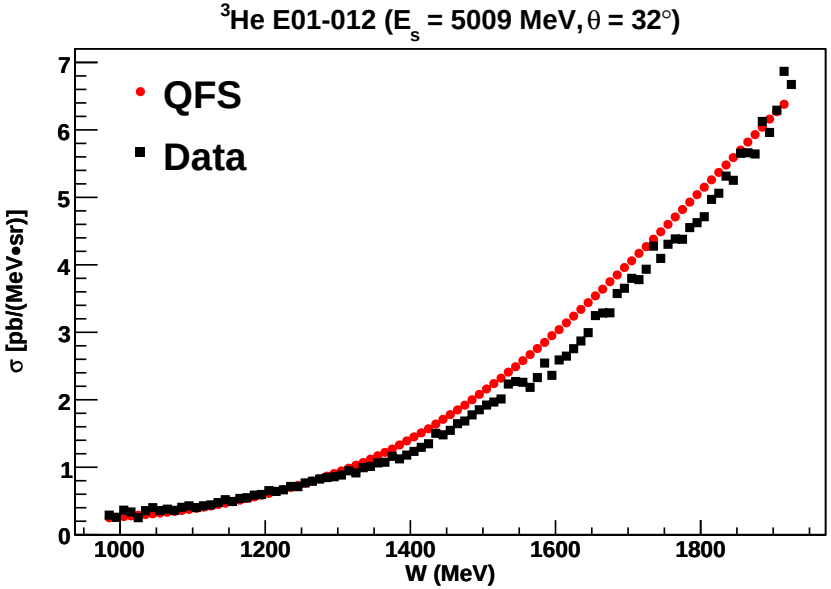
Results (3)
E01-012: $E_s = 4018$ MeV, $\theta = 25^\circ$

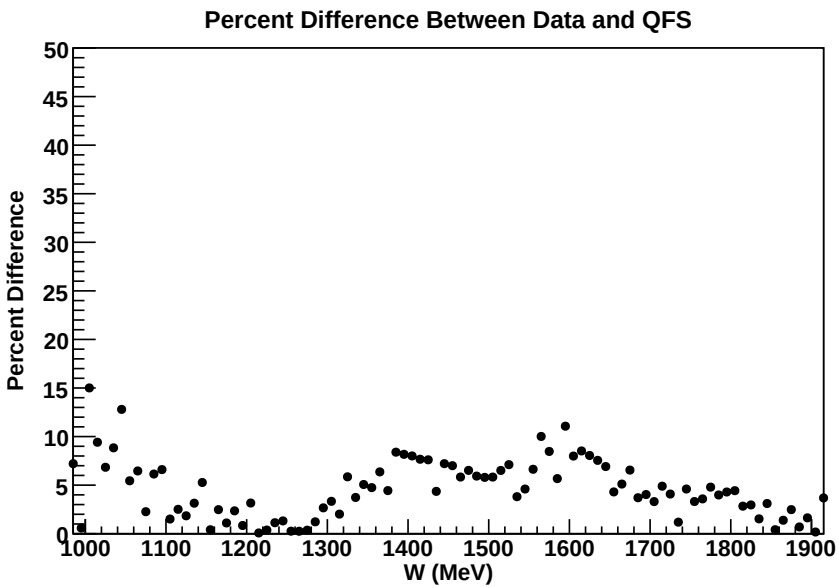




Results (4)

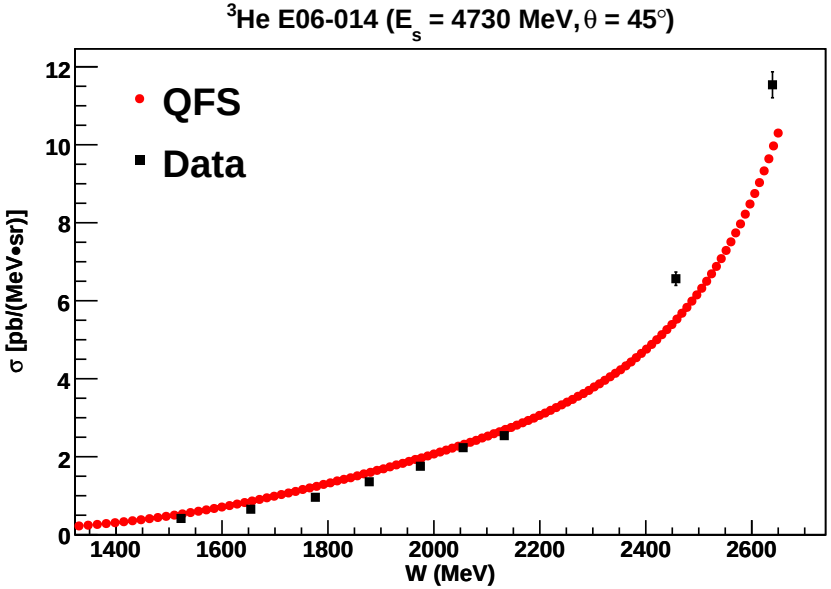
E01-012: $E_s = 5009$ MeV, $\theta = 32^\circ$

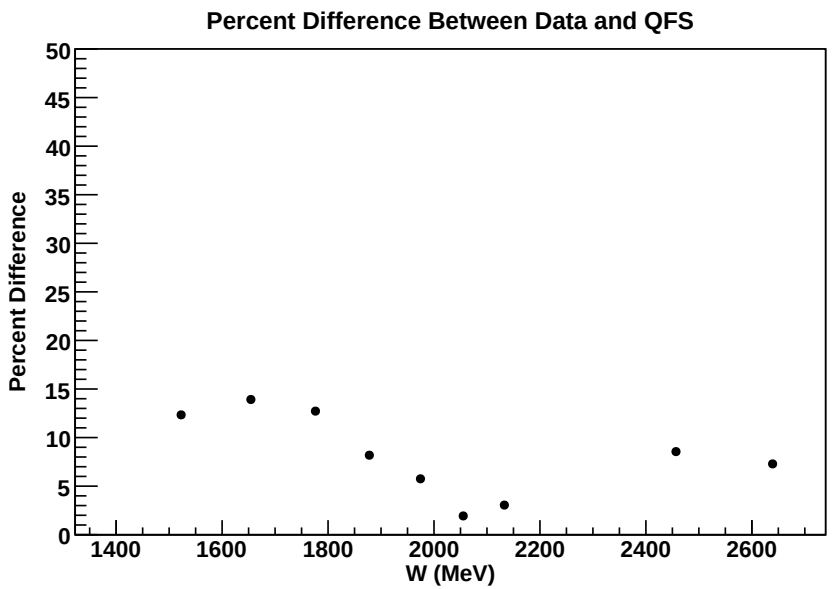




Results (5)

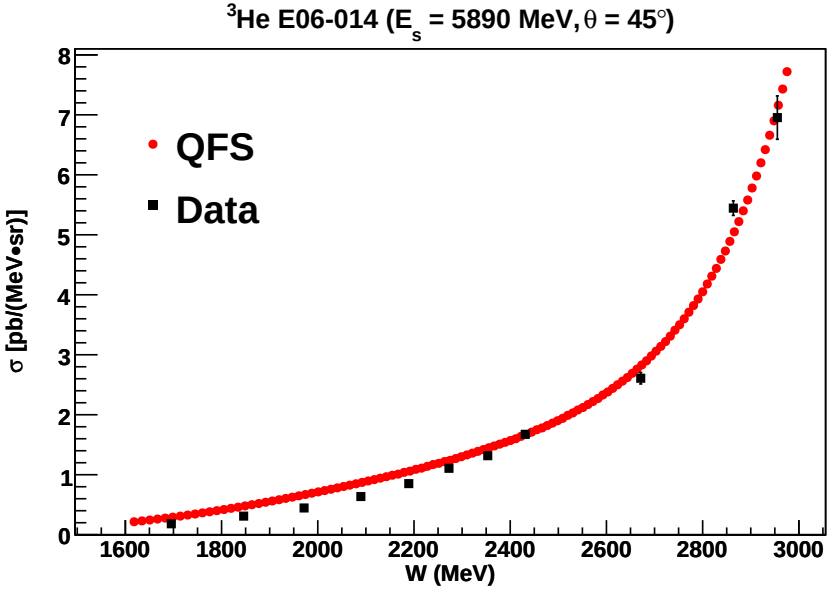
E06-014: $E_s = 4730$ MeV, $\theta = 45^\circ$

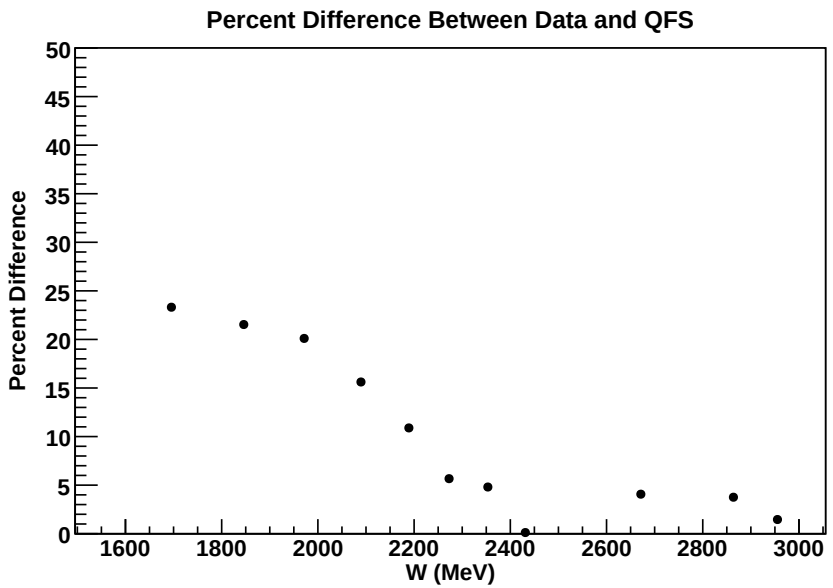




Results (6)

E06-014: $E_s = 5890$ MeV, $\theta = 45^\circ$





Summary

- Data Modeling
  - New parameterization improves the agreement across all data sets
  - Agreement to the 5–10% level for E94-010 and E01-012 and 15–20% for E06-014

What's Next?

- Data Modeling
  - Continue to tweak the model to agree better with the data
- Radiative Corrections
  - Need to figure out the issues in the E_s and E_p integrals in QFS and radcor
- Cross Sections
  - e^+ modeling: Wiser code
  - Systematic errors on LT and VDC