

# Longitudinal Data and Moments

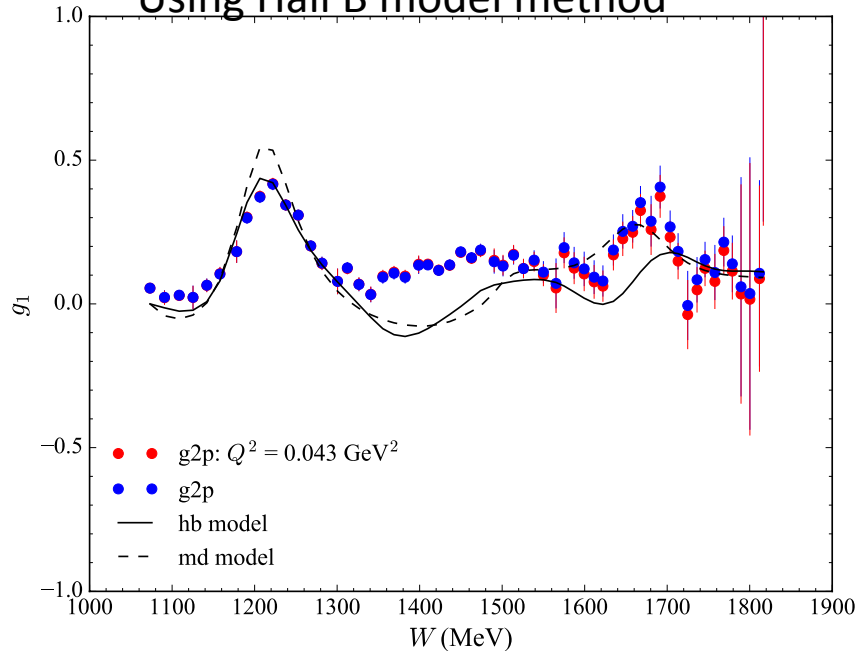
Ryan Zielinski

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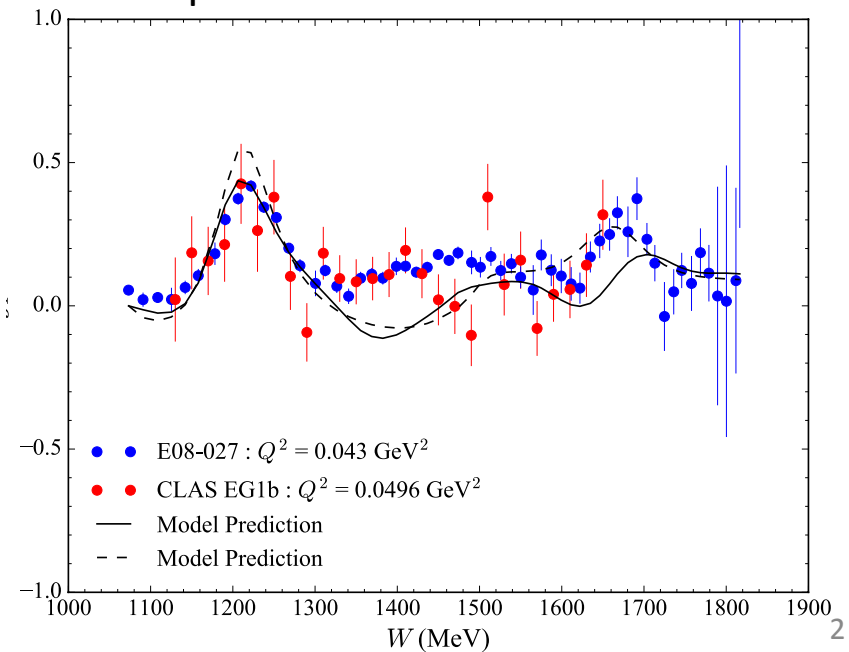
# Overview

- Have Born  $g_1$  data extrapolated to a constant  $Q^2$ 
  - $Q^2 = 0.043 \text{ GeV}^2$
  - Slightly below the min momentum transfer from EG1b
- Also can integrate EG1b data as a check on my process
- Focusing on  $\Gamma_1$  and  $I_A$  (GDH) moments

Extrapolation to constant  $Q^2$   
Using Hall B model method



Comparison between CLAS data and us



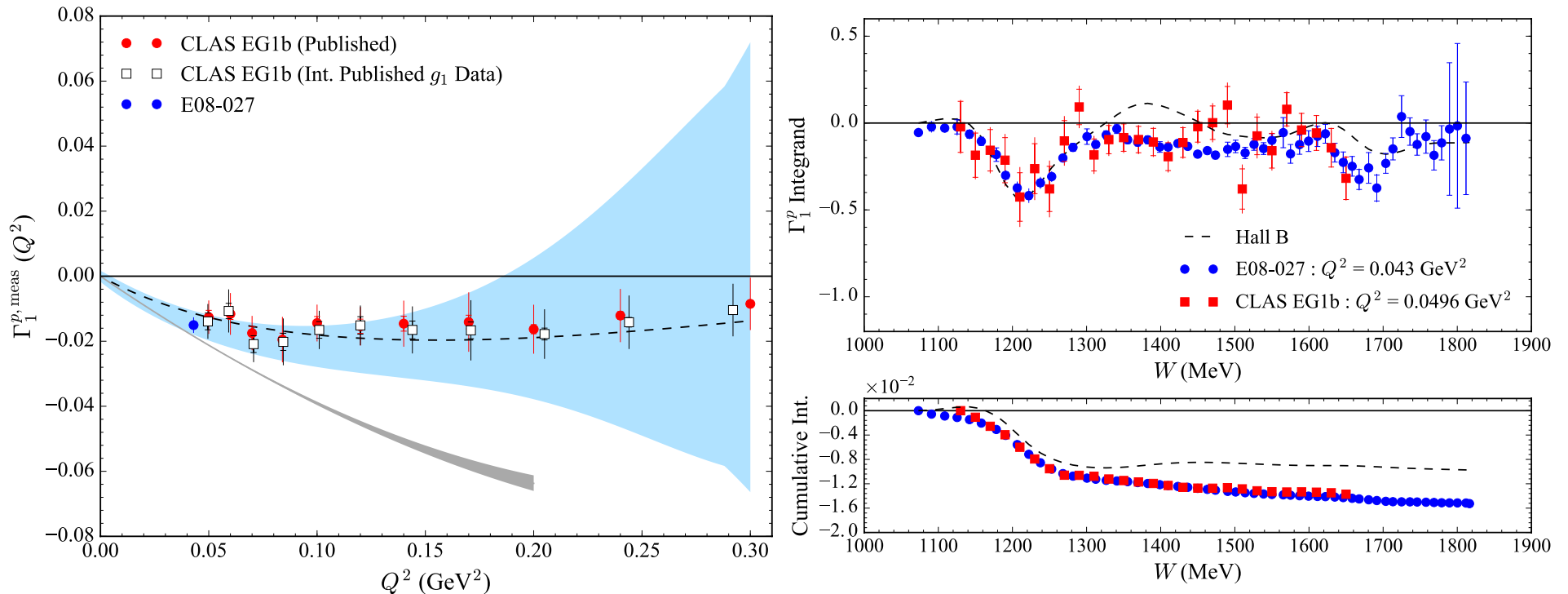
Data taken from CLAS database: <http://clas.sinp.msu.ru/jlab/>

Inner Errors: stat  
Outer Errors: total

# $\Gamma_1$ Moment (Meas.)

$$\Gamma_1(Q^2) = \int_0^{x_{th}} g_1(x, Q^2) dx$$

First test measured part of  $\Gamma_1$  (at g2p kinematics, measured is pretty much all the strength)  
Good agreement between published results and my integration (stat. error bars very similar)  
Assume fully correlated systematics for systematic error on moment



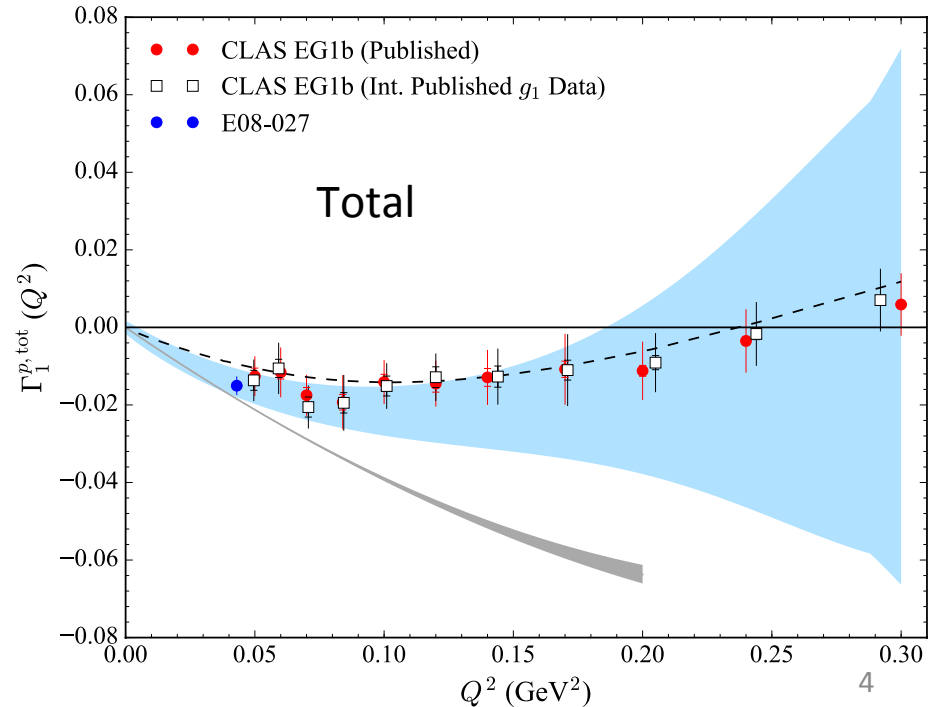
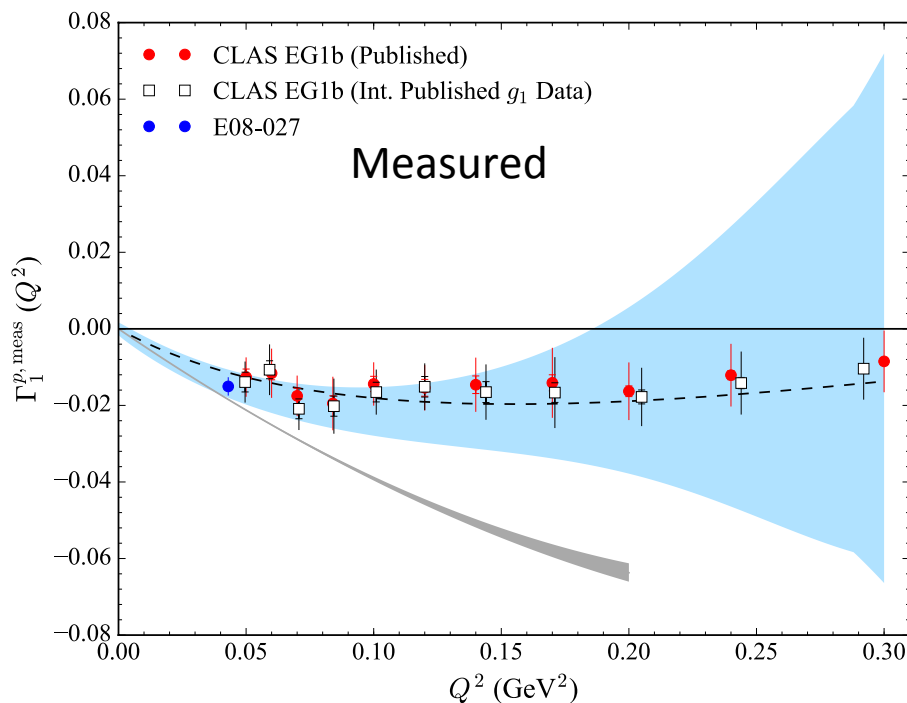
Data taken from CLAS database: <http://clas.sinp.msu.ru/jlab/>

Inner Errors: stat  
Outer Errors: total

# $\Gamma_1$ Moment (Total)

$$\Gamma_1(Q^2) = \int_0^{x_{th}} g_1(x, Q^2) dx$$

First test measured part of  $\Gamma_1$  (at g2p kinematics, measured is pretty much all the strength)  
Good agreement between published results and my integration (stat. error bars very similar)  
Assume fully correlated systematics for systematic error on moment  
Use Hall B model to produce unmeasured parts (agrees with published data)  
Add unmeasured part to systematic for g2p (~2%)



Data taken from CLAS database: <http://clas.sinp.msu.ru/jlab/>

Inner Errors: stat  
Outer Errors: total

# $I_A$ Moment (Total)

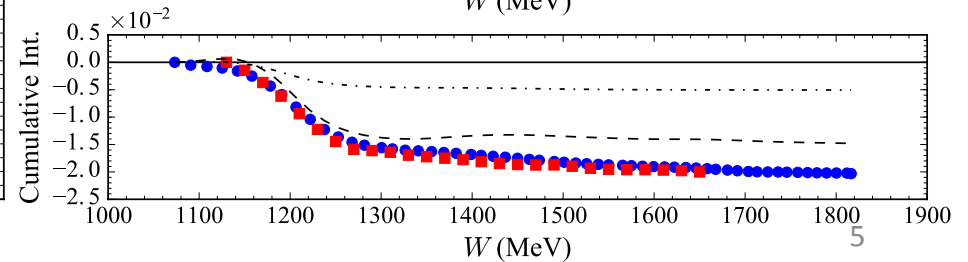
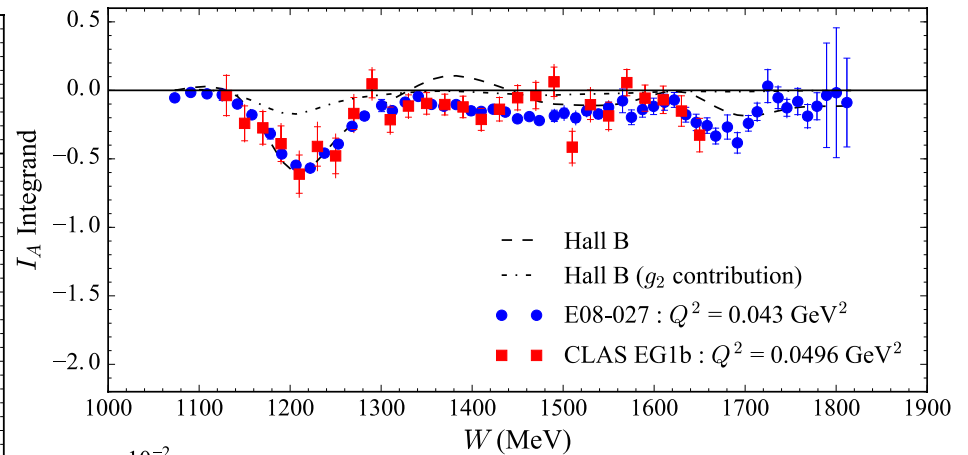
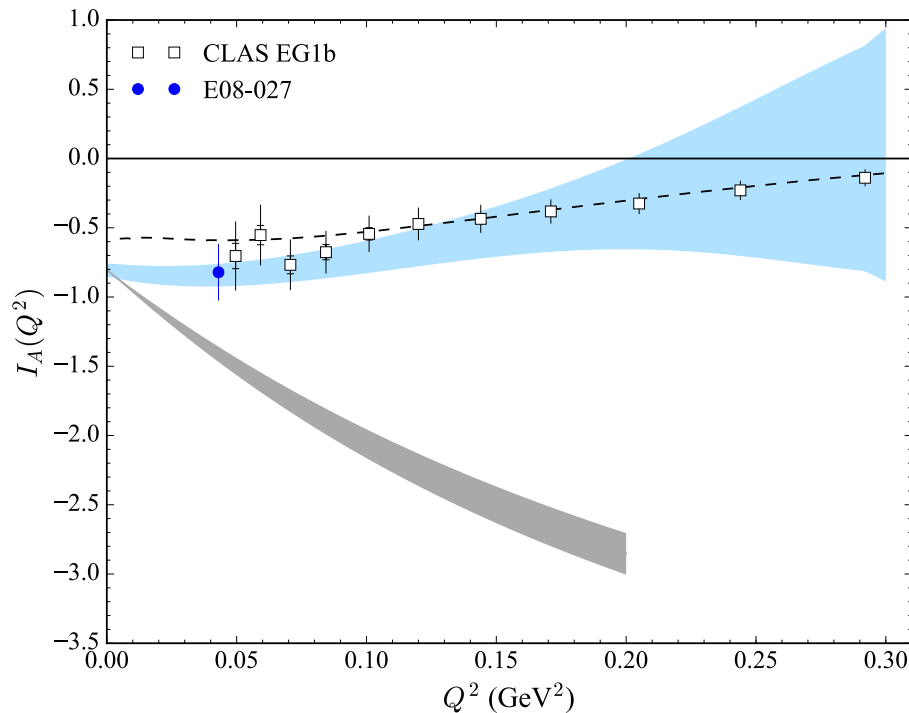
$$I_A(Q^2) = \frac{2M^2}{Q^2} \int_0^{x_{th}} g_1(x, Q^2) - \frac{4M^2 x^2}{Q^2} g_2(x, Q^2) dx$$

Use Hall B model for  $g_2$  and assume 100% uncertainty on that contribution

Assume fully correlated systematics for systematic error on moment

Use Hall B model to produce unmeasured parts

Add unmeasured part to systematic for  $g_2p$  data (~2%)



# Going Forward

- Have confidence in moment calculations (can reproduce published data)
- Also looking into  $g_1$  contribution to hyperfine splitting and higher order moments (i.e.  $\gamma_{0\text{star}}/\text{bar}$ )
- Questions/Comments/Concerns?