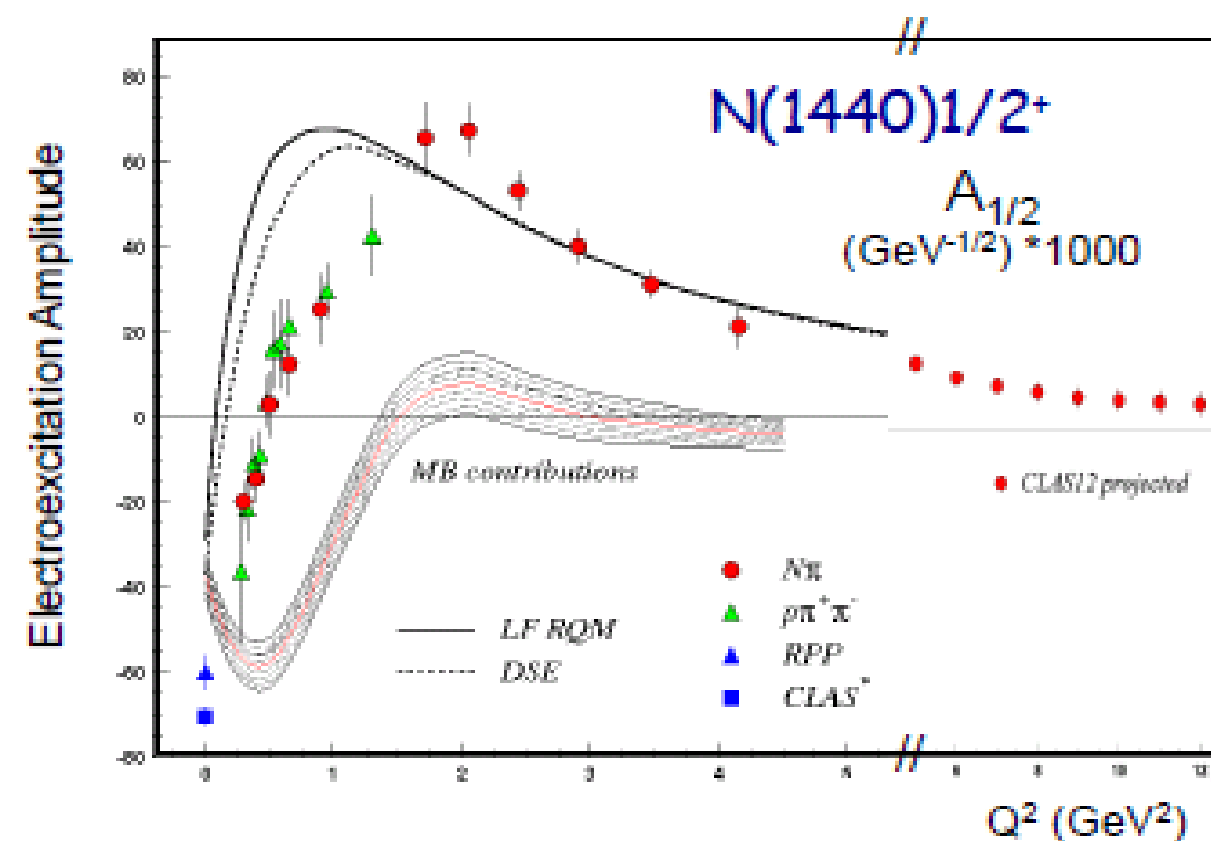
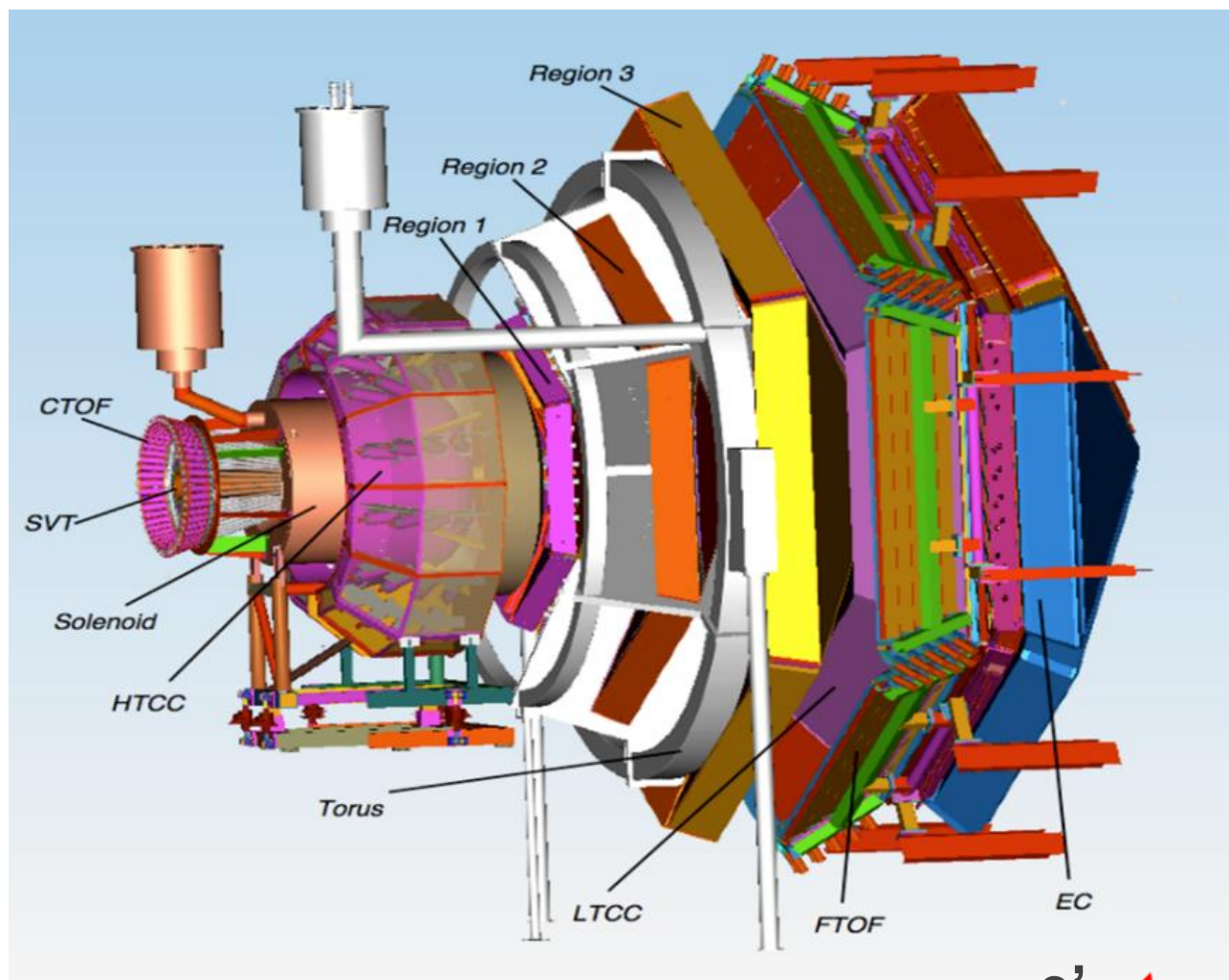
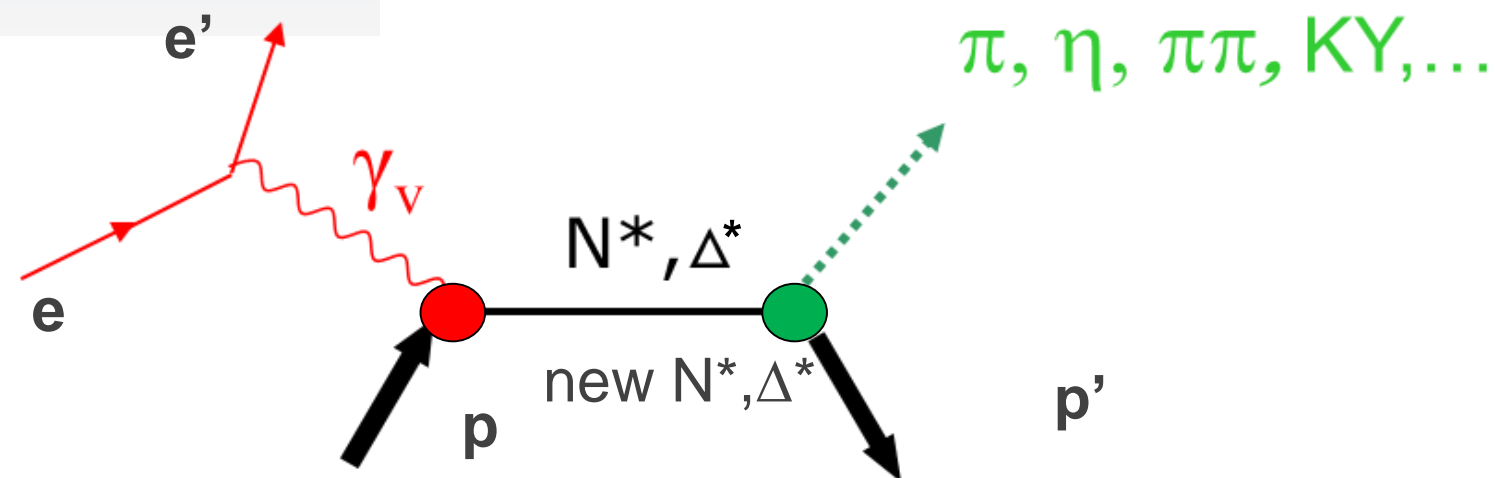


Update of RG-A Hadron Structure Analyses



V.I. Mokeev,
Jefferson Laboratory



CLAS Collaboration Meeting, March 5-8, 2019, Newport News, VA



CLAS12 N* Program at High Q²

E12-09-003

Nucleon Resonance Studies with CLAS12

Gothe, Mokeev, Burkert, Cole, Joo, Stoler

E12-06-108A

KY Electroproduction with CLAS12

Carman, Gothe, Mokeev

- Measure exclusive electroproduction cross sections from an unpolarized proton target with polarized electron beam for $N\pi$, $N\eta$, $N\pi\pi$, KY:

$E_b = 11. \text{ GeV}$, $Q^2 = 3 \rightarrow 12 \text{ GeV}^2$, $W \rightarrow 3.0 \text{ GeV}$ with nearly complete coverage of the final state phase space

- Key Motivation

Study the structure of all prominent N^ states in the mass range up to 2.0 GeV vs. Q^2 up to 12 GeV².*

CLAS12 is the only facility to map-out the N^ quark structure with minimal meson-baryon cloud contributions.*

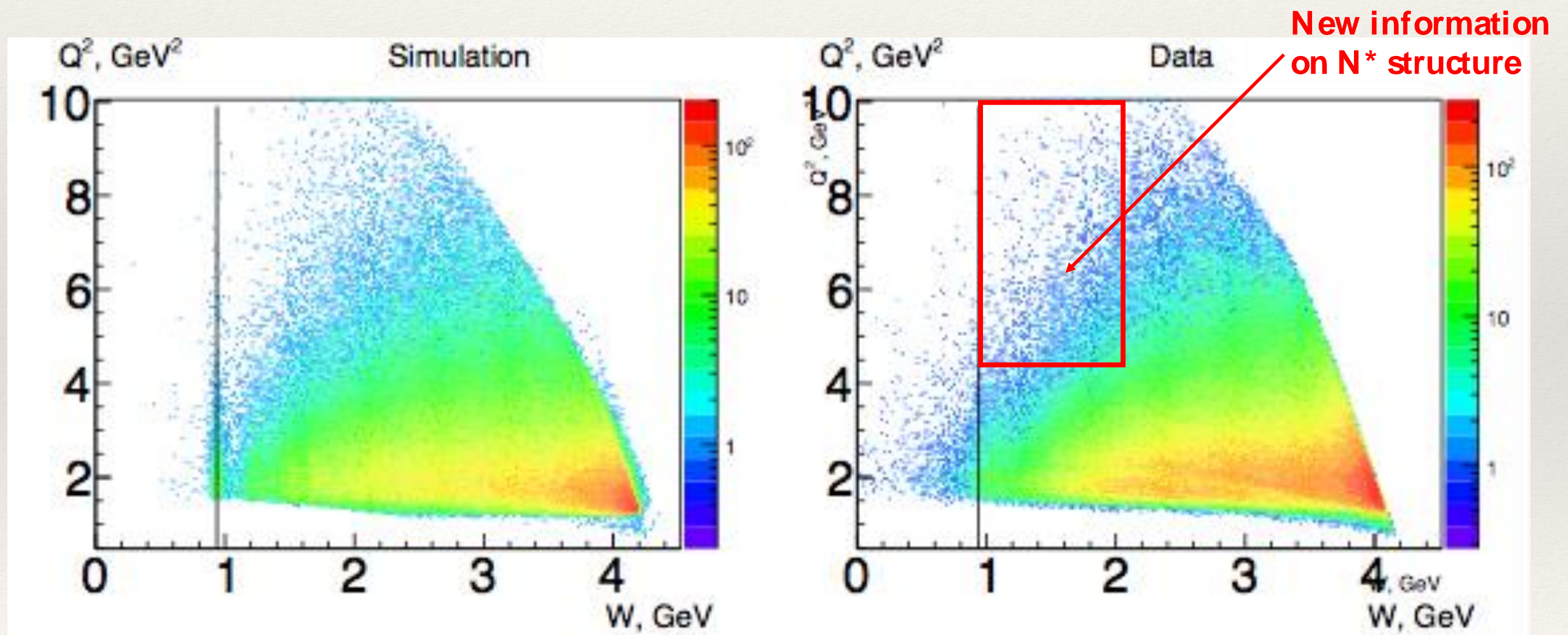
The experiments already started in February 2018!



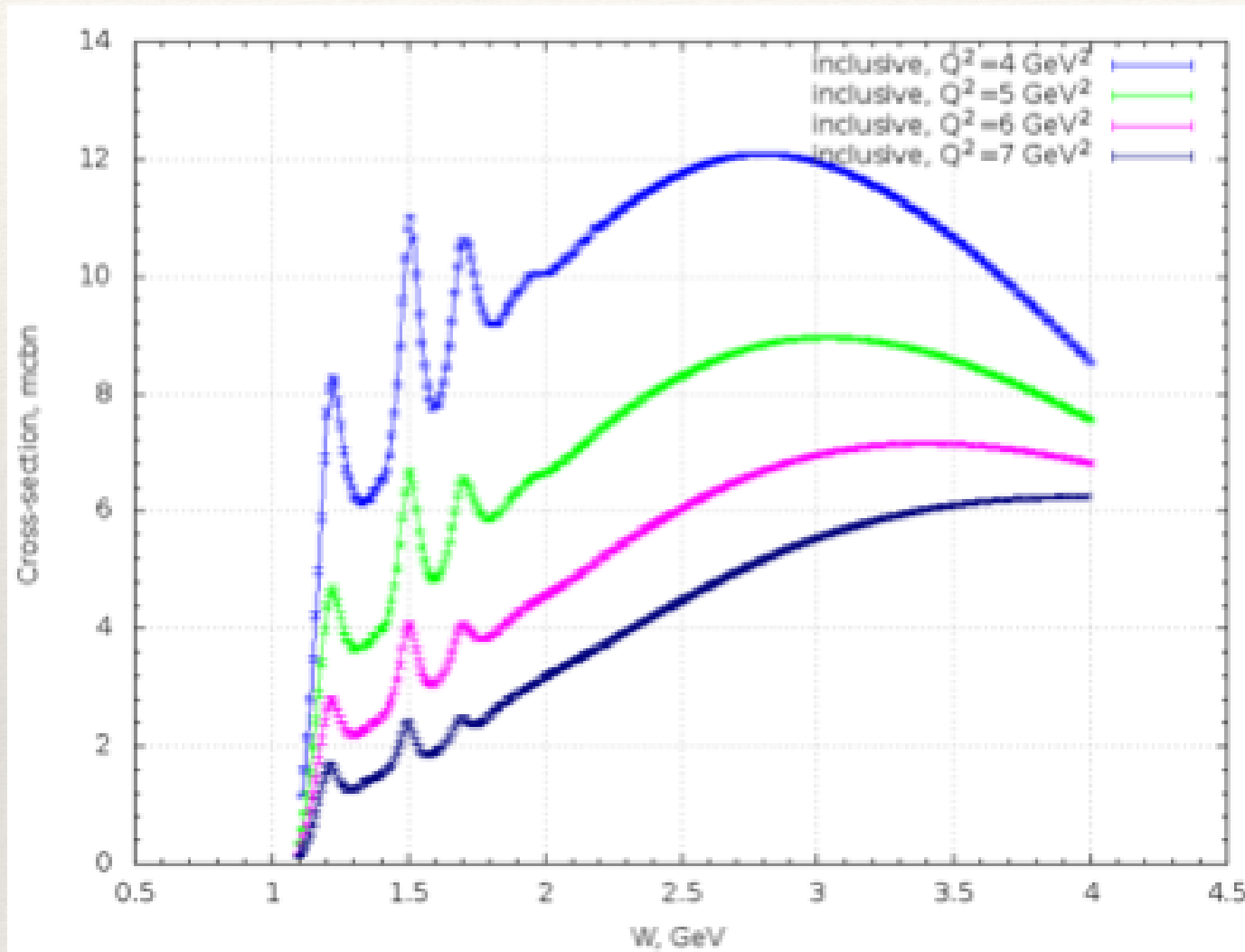
CLAS12 Run 4013 Kinematic Coverage: the MC Simulation and Data Comparison

MC simulation of inclusive e-scattering (elastic peak and radiative effects are included)

Data: Run 4013
 $E_b = 10.6$ GeV
Solenoid -100%
Torus -100%



CLAS and Projected CLAS12 Inclusive Cross Section



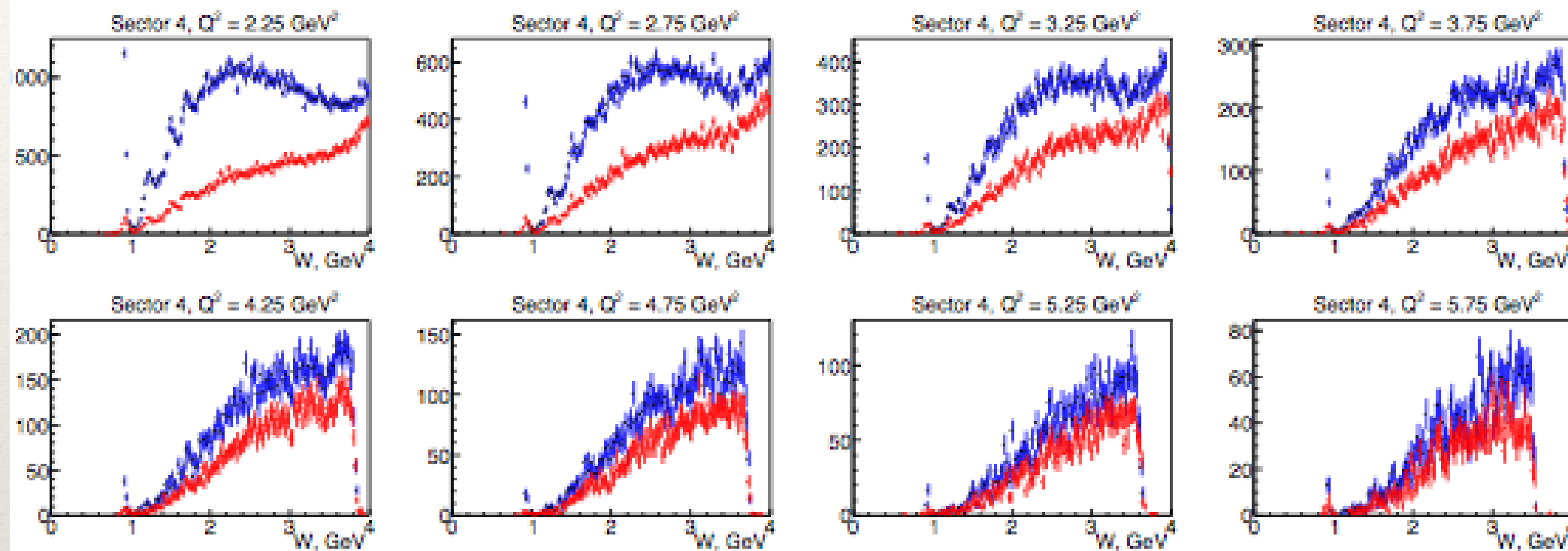
CLAS Data were obtained at $Q^2 < 4.7 \text{ GeV}^2$

Projected CLAS12 results

- Electron beam energy: 10.6 GeV
- Integrated luminosity: $12.8 \cdot 10^{10} \text{ mb}^{-1}$
- Bin sizes: $W = 0.01 \text{ GeV}$ and $Q^2 = 0.1 \text{ GeV}^2$
- Expected statistical accuracy in the range from 0.2% to 2.0%

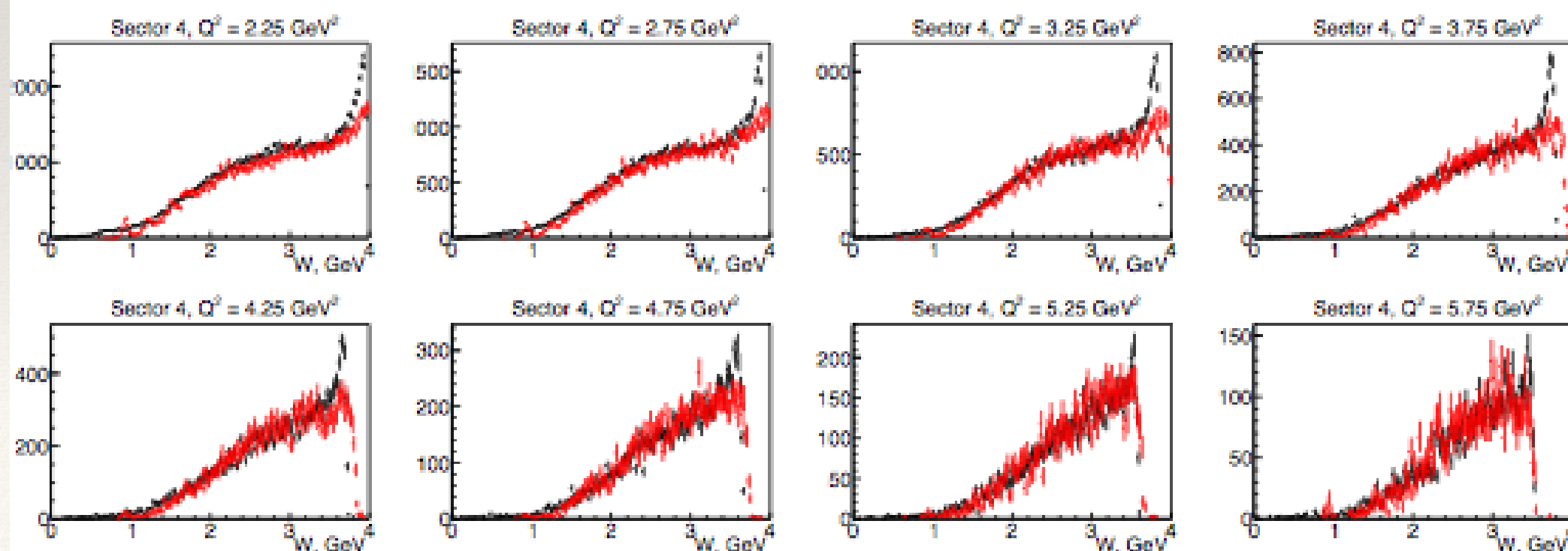
- First precise measurements of inclusive cross section evolution with W and Q^2 in the resonance region (*smallest bin sizes over W , Q^2 ever achieved*)
- Yield valuable insight into quark hadron duality

Evaluation of the Detection Efficiency



Generated and reconstructed inclusive event distributions

Generated
Reconstructed

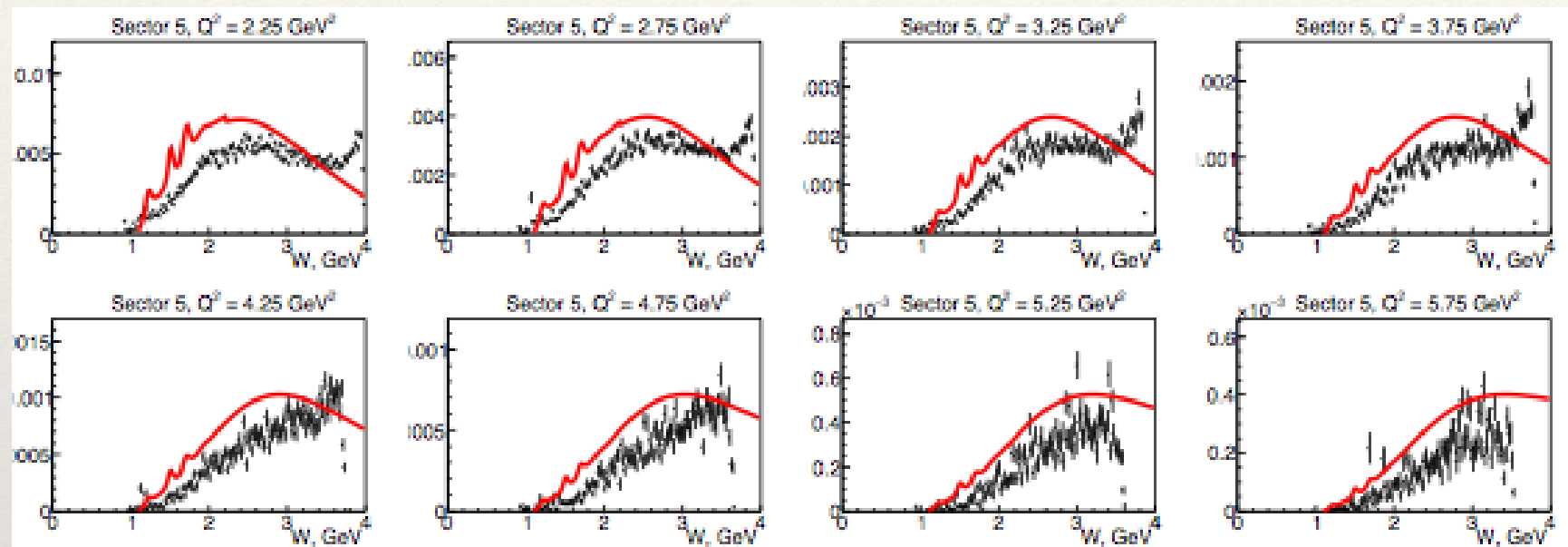


Data and reconstructed event comparison

Data events
Reconstructed events

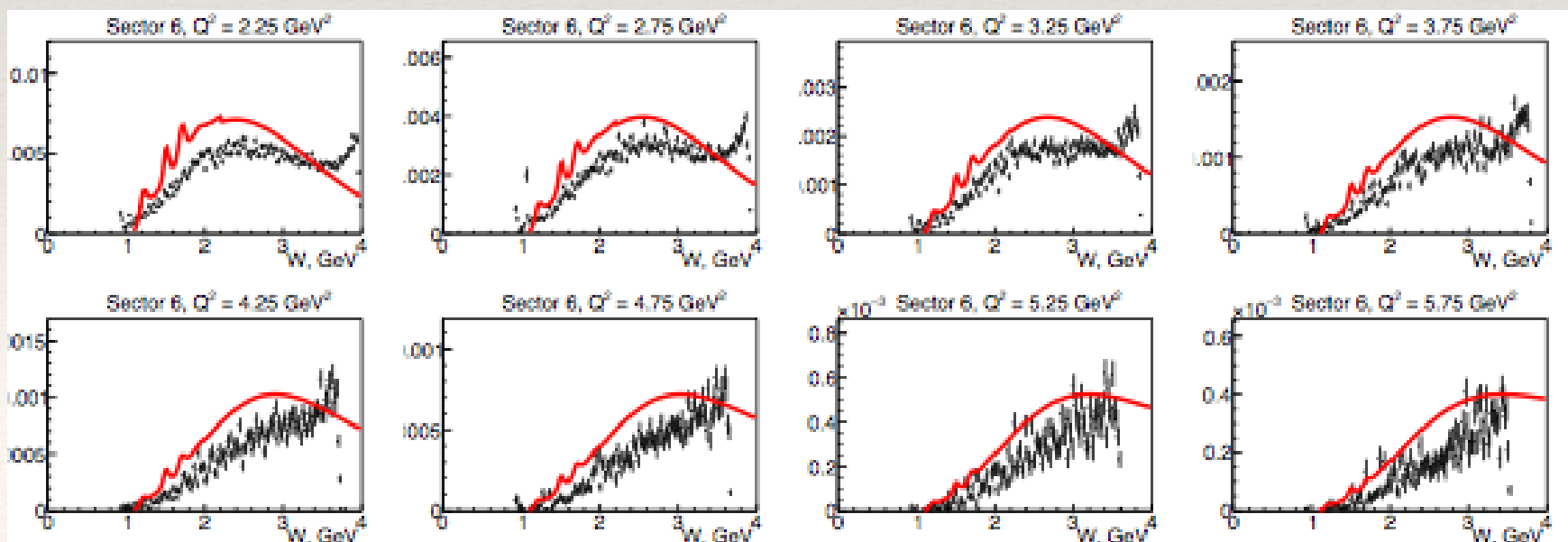
W-Distributions of Inclusive Events Measured with CLAS12 in Comparison with Previous CLAS/World Results

Sector 5



Data event distributions accounting for the detection efficiency and integrated luminosity

Sector 6

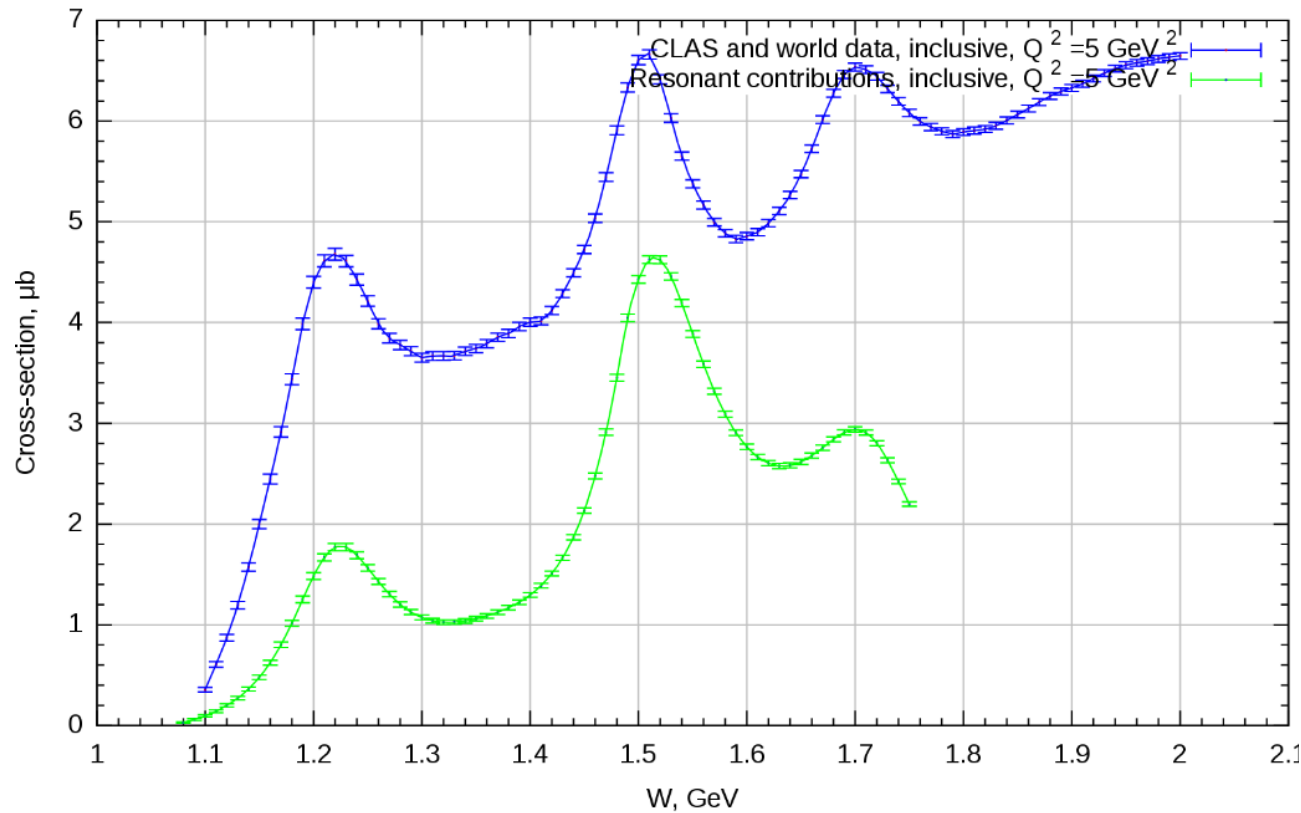


Data

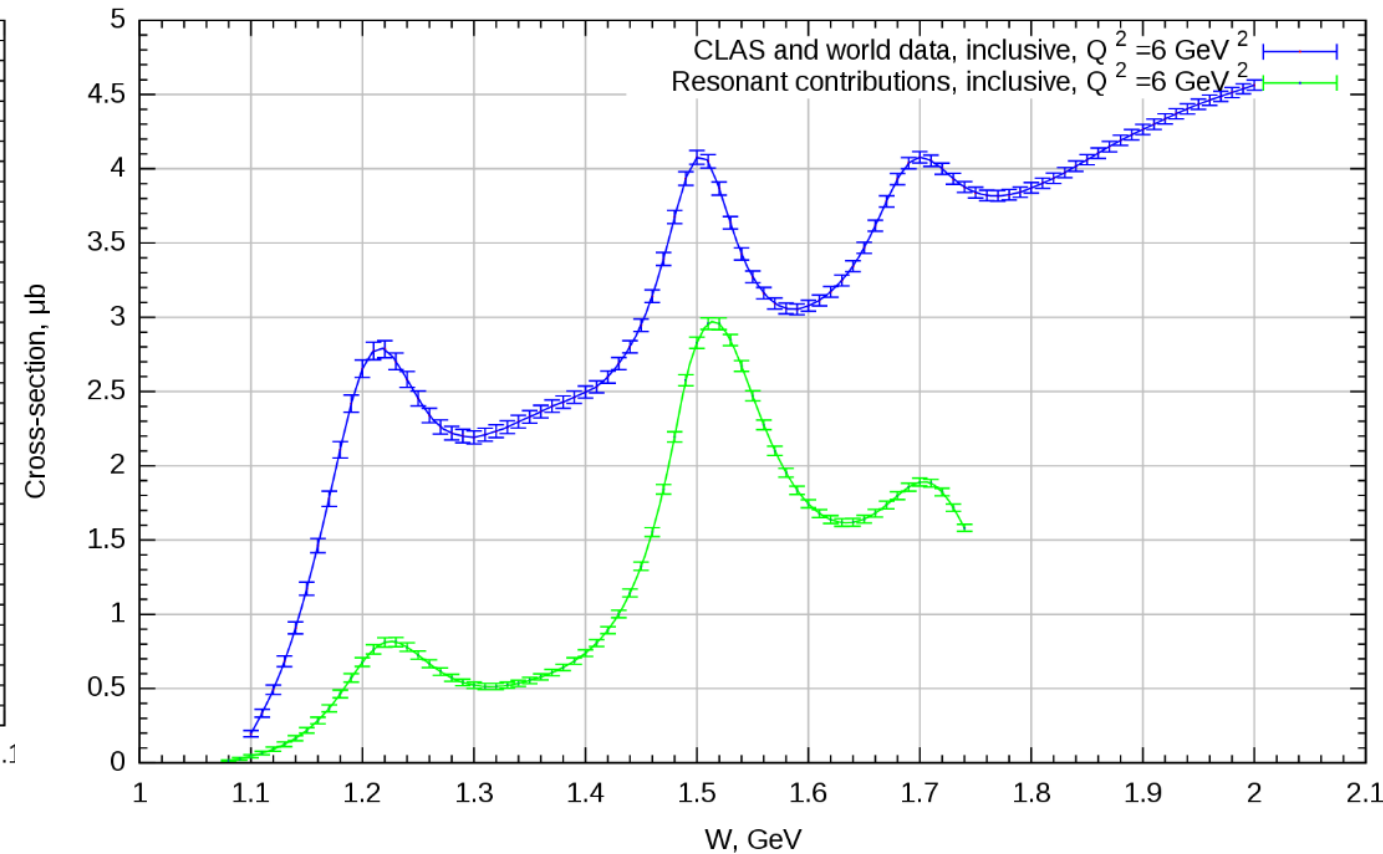
Interpolation/ extrapolation of the CLAS/ world inclusive cross section data from the MSU webpage:
[http:// clas.sinp.msu.ru/ strfun/](http://clas.sinp.msu.ru/strfun/)
(V. Chesnokov, A.Golubenko)

Resonance Contributions to Inclusive Cross Section Data Expected from CLAS12

Joint Hall-B/JPAC Project



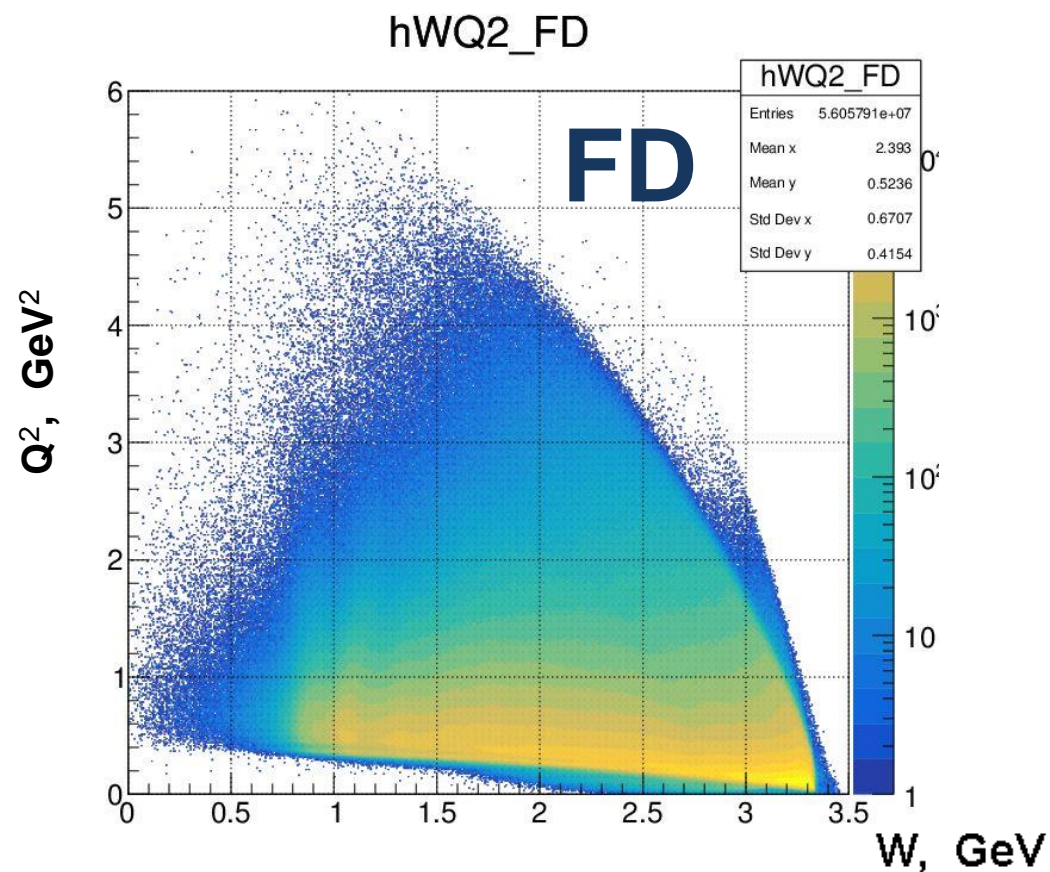
A.N. Hiller Blin, JPAC/Mainz U



- Elucidate nucleon resonance manifestation at photon virtualities up to 7.0 GeV^2
- Provide access to parton distributions for $x_B \rightarrow 1$
- After replacement of the expectations on the virtual photon inclusive cross sections by the CLAS12 data, these physics results will be ready for submission to the journal among the first results from CLAS12

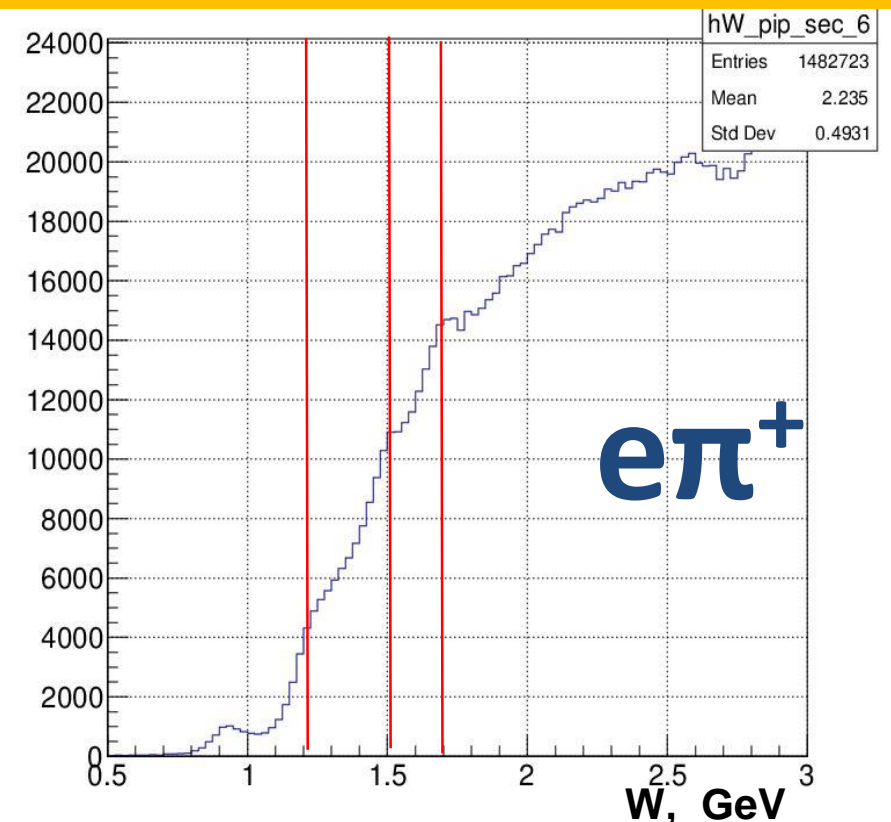
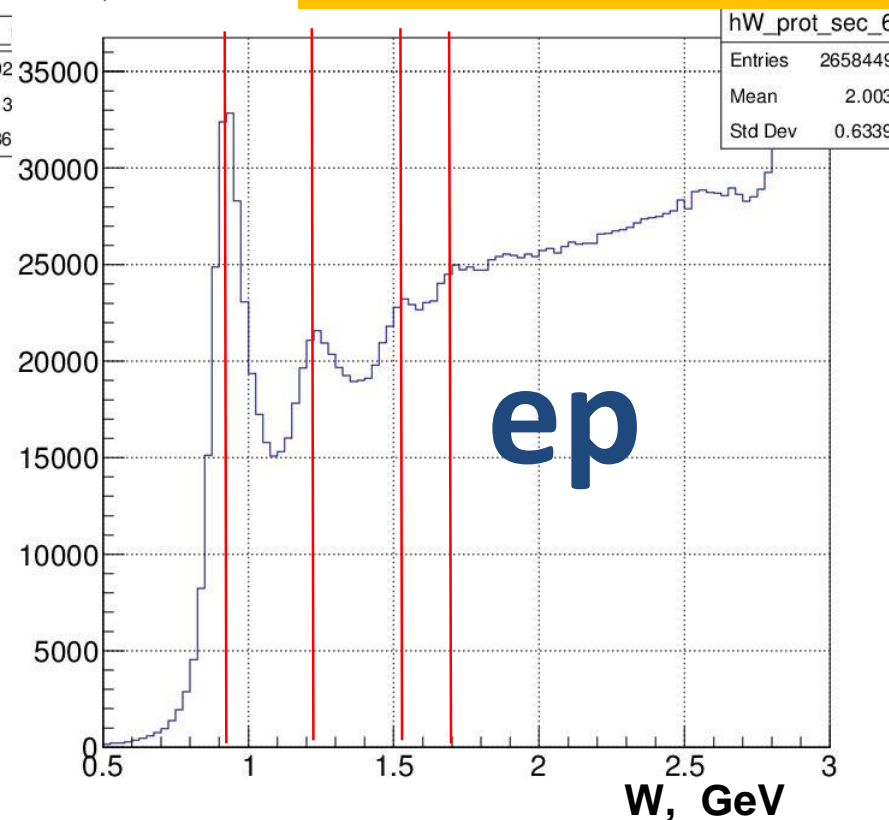
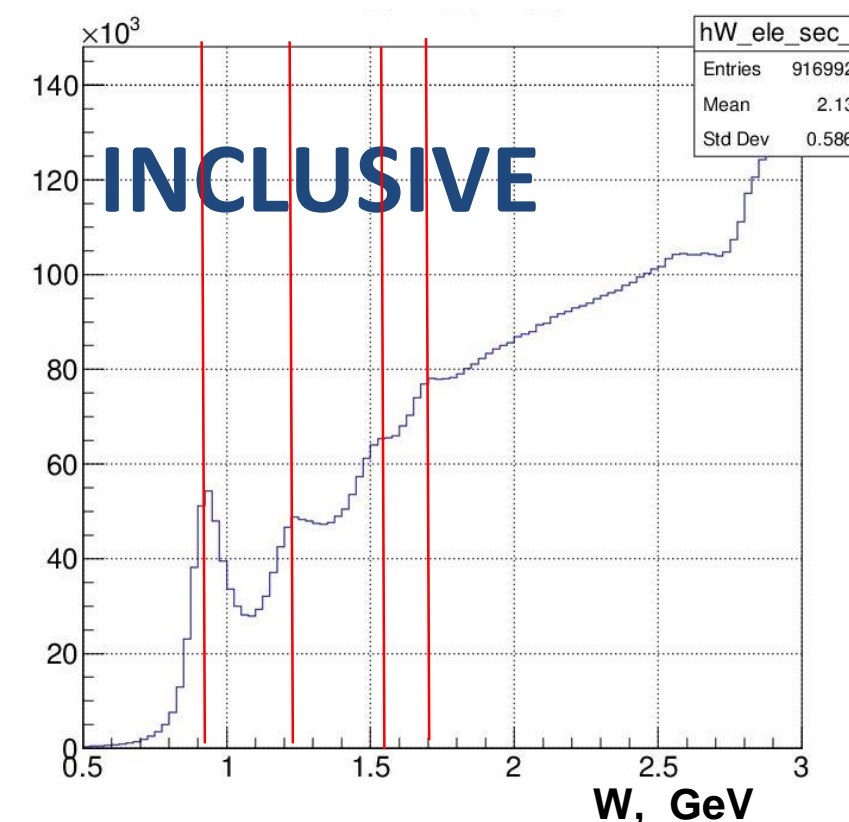
Beam Asymmetry for the π^+n Electroproduction off Protons with CLAS12

V. Klimenko,
Moscow State U.



1. **Cook:** 5b.7.4
2. **Data:** root files: 80% of the run 3842
3. **E=6.4 GeV**
4. **Torus current** = -3766 A
5. **Reaction:** $ep \rightarrow e\pi^+n$

Objective: determine beam asymmetry in the resonance region in exclusive π^+n electroproduction off protons at $W < 2.0$ GeV and $Q^2 < 6.0$ GeV²



Selection of the π^+n Exclusive Events

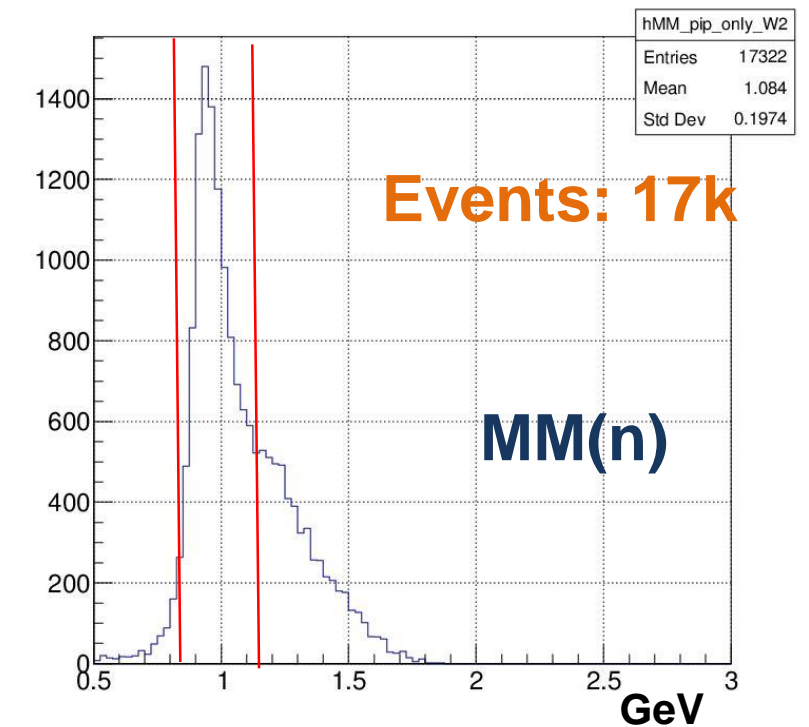
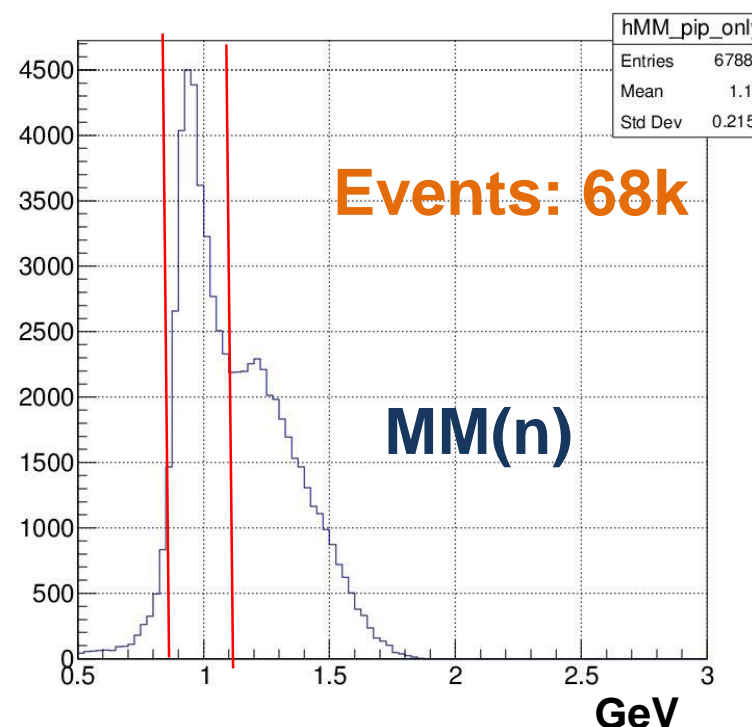
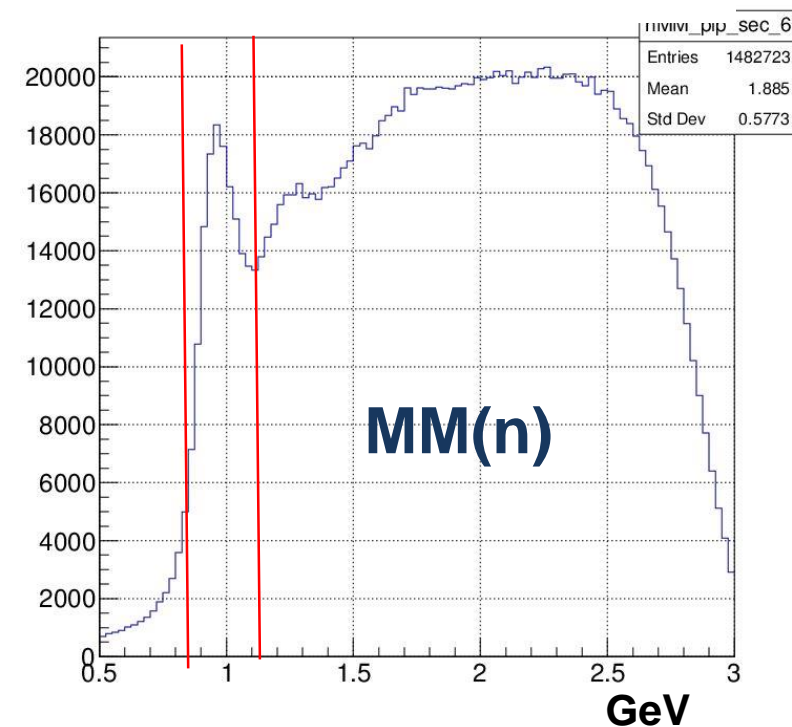
Selection criteria :

1. One and only one pion
2. Track quality check
3. Pions' momentum should be more than 0.2 GeV
4. Pion should be detected by FD

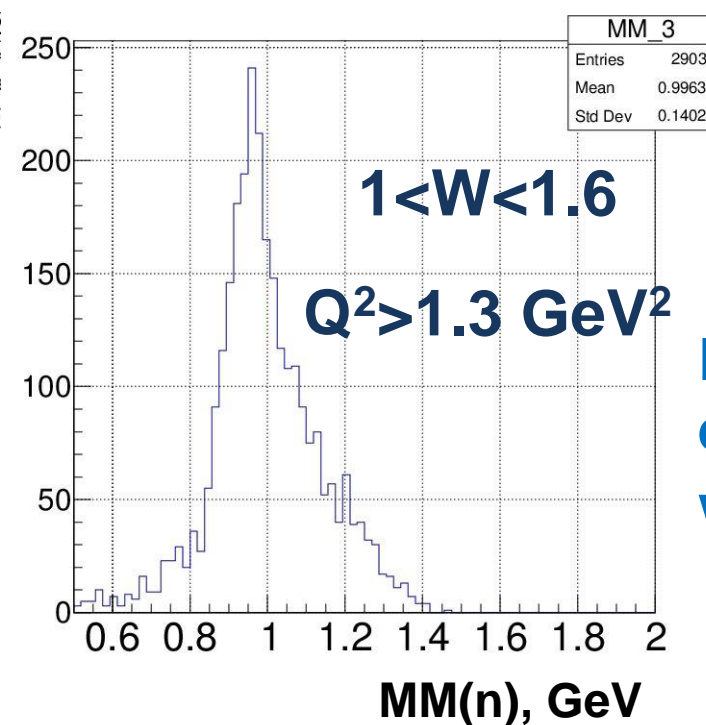
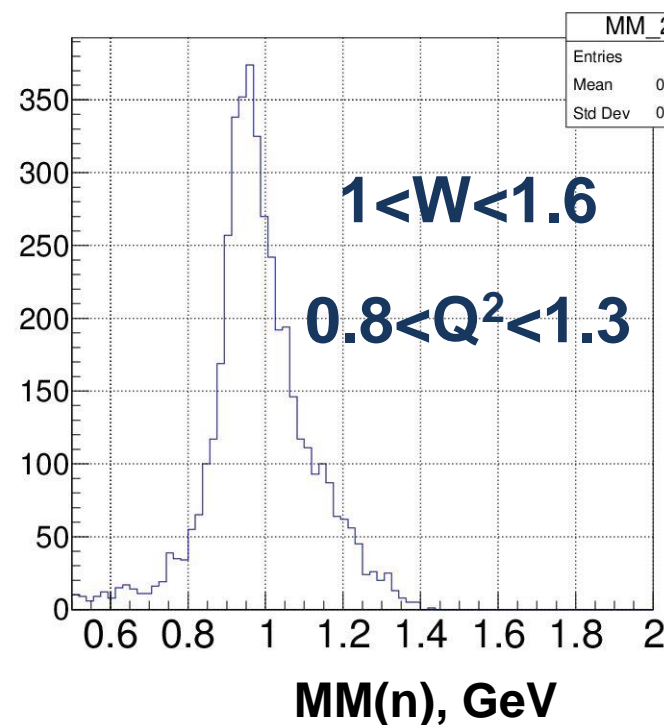
No additional cuts on π^+ :

1. No other charged particles except $e\pi^+$
2. $W < 2$ GeV

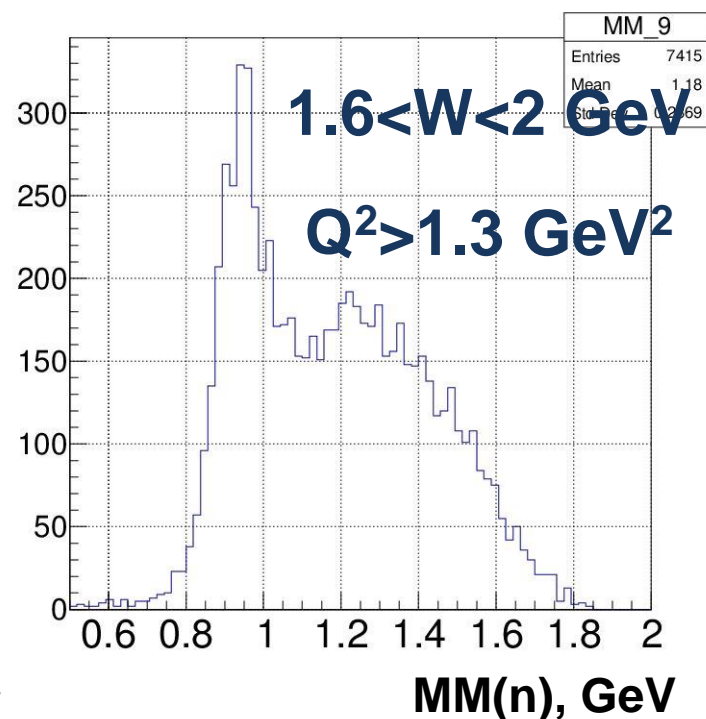
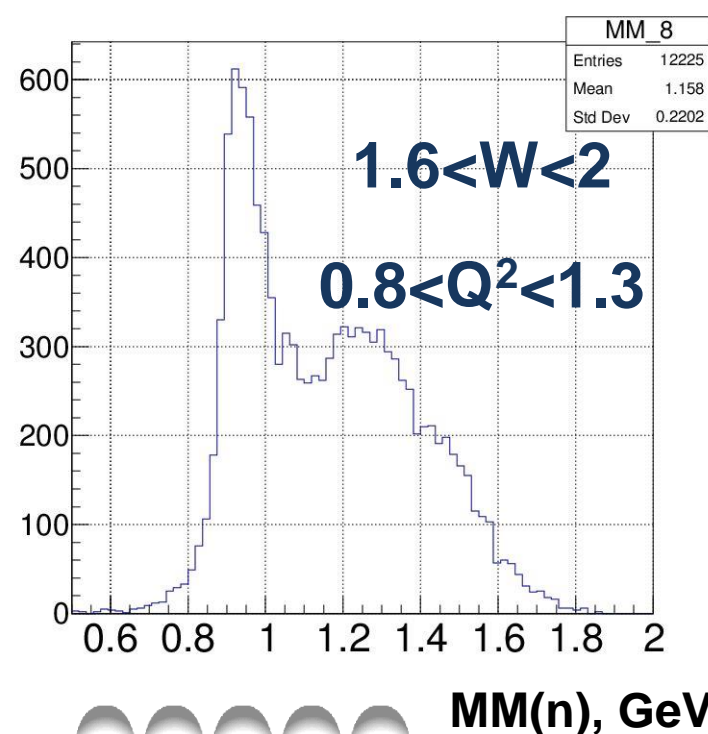
1. No other particles except $e\pi^+$
2. $W < 2$ GeV



Selection of the π^+n Exclusive Events



Prospects for the identification of the π^+n electroproduction off protons events were demonstrated.



Conclusions and Outlook

- Inclusive electron scattering data from CLAS12 has demonstrated the feasibility to study N^* electroexcitations in exclusive meson electroproduction channels of the proposed experiments at still unexplored range of photon virtualities $Q^2 > 5.0 \text{ GeV}^2$.
- Capability to isolate exclusive π^+n electroproduction off proton events from the CLAS12 data was demonstrated.
- Reliable inclusive/exclusive event reconstruction makes straightforward the evaluation of inclusive electron scattering cross section and beam asymmetries in the resonance region. [These results can be the subject of the first publication\(s\) from the RG-A.](#)
- Analyses tools for the phenomenological interpretation of the first CLAS12 data on inclusive electron scattering observables and beam asymmetries for π^+n electroproduction are ready for the experimental data analyses.