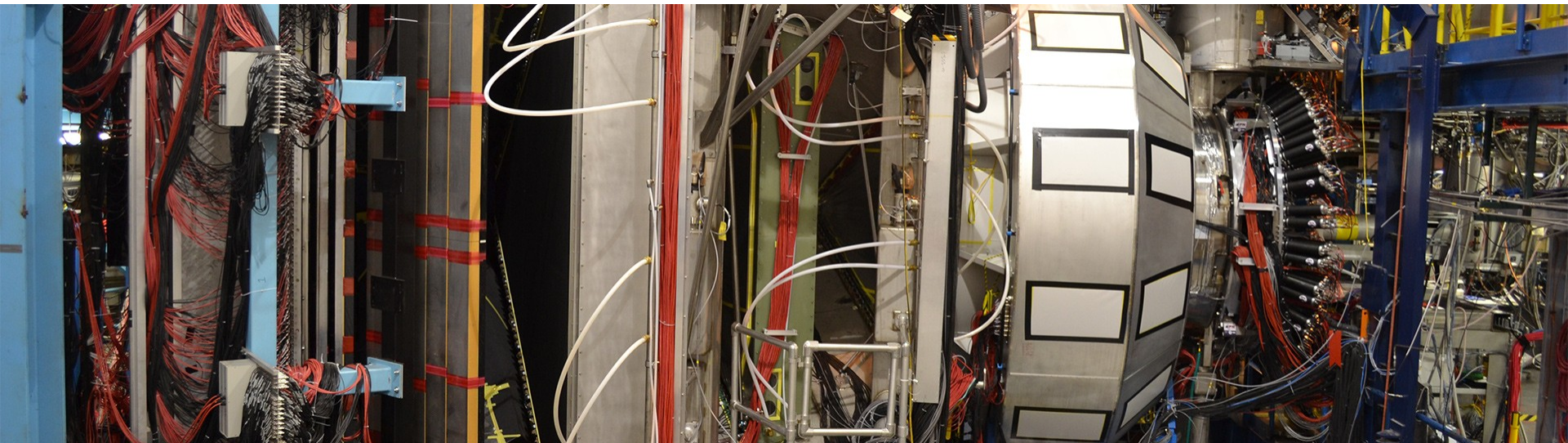


CLAS12 First Experiment



RGA – Status and Plans

Latifa Elouadrhiri

Monday March 5, 2019

Hall B/CLAS12 RG-A Experiments



Proposal	Physics	Spokespersons
E12-06-108	Hard Exclusive Electroproduction of π^0 , η	P. Stoler, K. Joo, <u>V. Kubarovsky</u> , M. Ungaro, C. Weiss
E12-06-108A	Exclusive $N^* \rightarrow KY$ Studies with CLAS12	<u>D.S. Carman</u> , R. Gothe, V. Mokeev
E12-06-108B	Transition Form Factor of the η' Meson with CLAS12	<u>M. Kunkel</u> , D. Lersch
E12-06-112	Proton's Quark Dynamics in SIDIS Pion Production	<u>H. Avakian</u> , K. Joo, Z.E. Meziani, B. Seitz
E12-06-112A	Semi-inclusive Λ Production in Target Fragmentation Region	<u>M. Mirazita</u>
E12-06-112B	Higher Twist Collinear Structure of the Nucleon	S. Pisano, <u>M. Mirazita</u>
E12-06-119	Deeply Virtual Compton Scattering at 11 GeV	<u>F. Sabatie</u> , A. Biselli, H. Egiyan, <u>L. Elouadrhiri</u> , M. Holtrop, D. Ireland, W. Kim
E12-09-003	Excitation of Nucleon Resonances at High Q^2	<u>R. Gothe</u> , V. Burkert, P. Cole, K. Joo, V. Mokeev, P. Stoler
E12-11-005	Hadron Spectroscopy with Forward Tagger	<u>M. Battaglieri</u> , R. De Vita, C. Salgado, S. Stepanyan, D. Watts, D. Weygand
E12-11-005A	Photoproduction of the Very Strangest Baryons	<u>L. Guo</u> , M. Dugger, J. Goetz, E. Pasyuk, I. Strakovsky, D. Watts, N. Zachariou, V. Ziegler
E12-12-001	Timelike Compton Scattering & J/ψ Production in e^+e^-	<u>P. Nadel-Turonski</u> , M. Guidal, T. Horn, R. Paremuzyan, S. Stepanyan
E12-12-001A	J/ψ Photoproduction and Study of LHCb Pentaquarks	<u>S. Stepanyan</u> , M. Battaglieri, A. Celetano, R. De Vita, V. Kubarovsky
E12-12-007	Exclusive ϕ Meson Electroproduction with CLAS12	P. Stoler, C. Weiss, <u>F.X. Girod</u> , M. Guidal, V. Kubarovsky

Experiment Parameters

Duration: **139 PAC days**
80 days high luminosity ($10^{35}\text{cm}^{-2}\text{s}^{-1}$)
39 days low luminosity ($5 \times 10^{33}\text{cm}^{-2}\text{s}^{-1}$)
20 days torus polarity = negative

Energy: **11 GeV**

Target: **LH2**

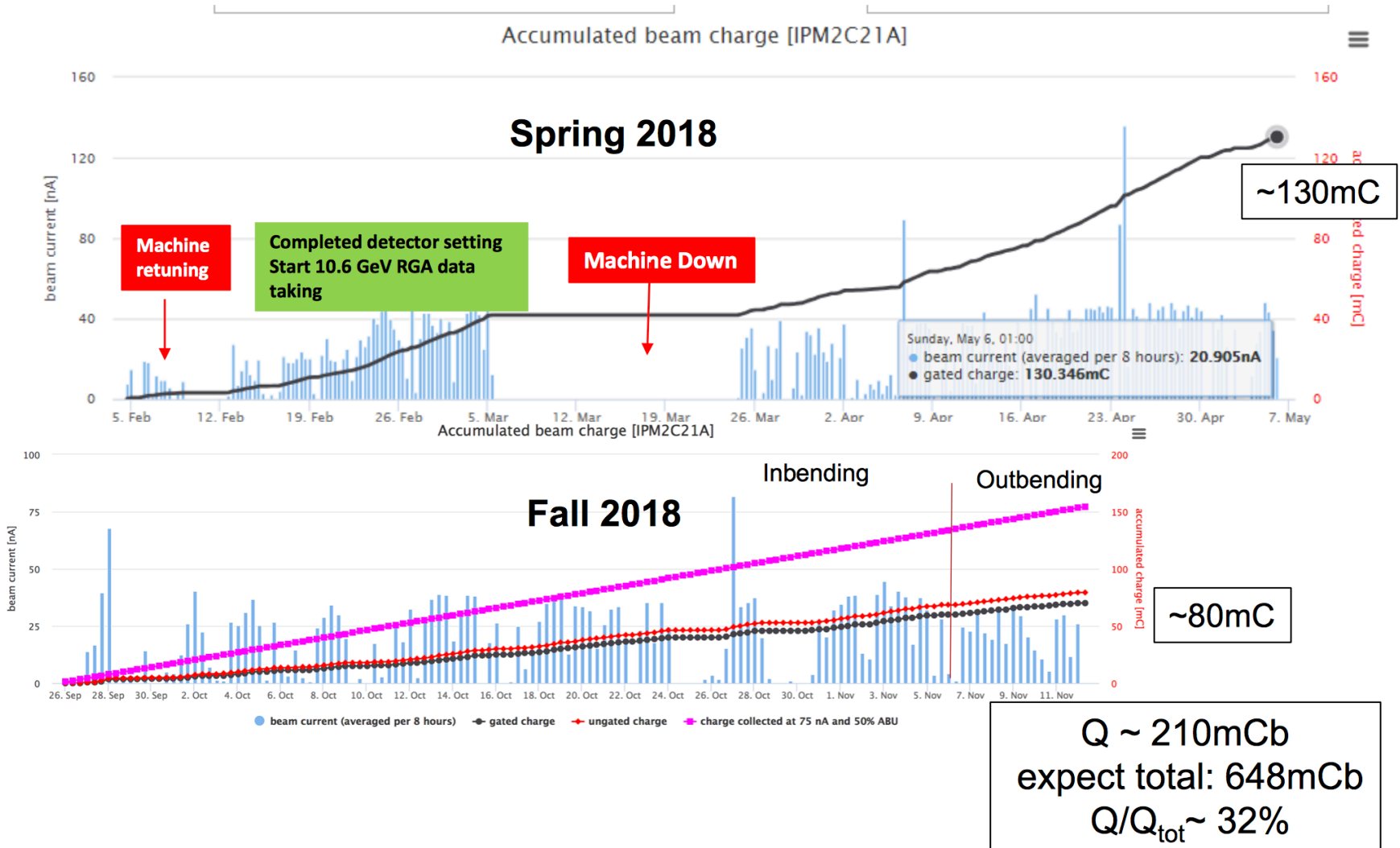
Experiment	parameters
Beam energy	10.6 GeV, electrons polarized
Beam current	2nA (2.5×10^{33}) to 75 nA (1×10^{35})
Torus field and polarity	100% (75% negative particles in-bending & 25% out-bending)
Solenoid field and polarity	100% (nominal)
Trigger(s)	<ol style="list-style-type: none">1. Electron trigger (HTCC/DC/PCAL/EC)2. Electron in FT + 2 hadrons in CLAS123. Muon trigger4. Calibration/Normalization Triggers
Target	5 cm LH2

RG-A- RUN Periods

Schedule	Experiment	Energy (GeV)	Polarization	Days	Total days
CY 2018					
2/5- 5/07	RG-A	6.4 & 10.6	max		
9/26 -10/23	RG-A	10.6	max	28	
10/26 – 11/25	RG-A	10.6	max	31	
11/29 – 12/09	RG-K	7.5	max	11	
12/13 – 12/19	RG-K	6.5	max	7	18
CY 2019					
03/11 – 04/07	RG-A	10.6	max	28	87

- Collected so far about 35% of the data of RGA (65% inbending and 35% outbending)
- Working closely with the RGK Run group

RGA Accumulated Charge



RGAs– FY19 Spring Run Planning

Dates	Run Coordinators
3/19 – 3/27	Dan Carman
3/27 – 4/3	??
4/3 – 4/10	Nick Markov
4/10 – 4/17	??

Need to complete run coordinator list by next meeting

Run plan for FY19 Spring RUN

- Electron trigger and FT trigger similar to the RGB Run, the goal is to run at about 60nA
- Experiment configuration 75% inbending & 25% outbending from total RGA)
(So far we collected 35% outbending and 65% inbending)
- Empty target
- Alignment run
- Random trigger at different beam current for tracking efficiency and trigger efficiency
- Luminosity runs for tracking efficiency
- Anything else?

- **Weekly First experiment meetings**
 - Experiment monitoring
 - Detector calibration/Alignment
 - Data processing
 - Software validation using data and MC simulations
 - High level/Detector efficiency/physics analysis
 - Preparation of 2019 Spring Run
 - High level analysis
 - **Completing Detector Calibration and defining our Path to Publication(s) (Our next Focus)**
- **Documentation can be found**
 - [CLAS12 First Experiment](#)
 - [Hall-B](#)
 - [CLAS12ANA](#)
 - [CLAS12mon](#)

CLAS12mon (<https://clas12mon.jlab.org>)

RG A

RG K

RG B

5005 inf RRR aka Request Run Range

Enable Filter ROW

Search for run number(s): 3000,3005

run	run start time	run end time	beam energy	beam current request	run type	event count	events rate	evio files count
5981	2018-12-18 15:24:40	2018-12-18 17:08:27	6535.36		PROD66_NOFT	78018215	14040.10	619
5980	2018-12-18 13:25:56	2018-12-18 15:00:10	6535.36		PROD66_NOFT	100039700	15627.60	797
5979	2018-12-18 11:14:23	2018-12-18 13:21:12	6535.36		PROD66_NOFT	100059183	4877.50	796
5978	2018-12-18 09:09:50	2018-12-18 11:09:47	6535.36		PROD66_NOFT	100612161	940.33	804
5977	2018-12-18 07:13:27	2018-12-18 09:03:24	6535.36	35nA	PROD66_NOFT	100142199	4324.80	799

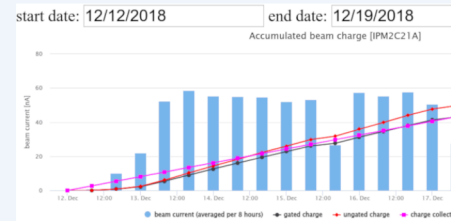
list of runs from RCDB



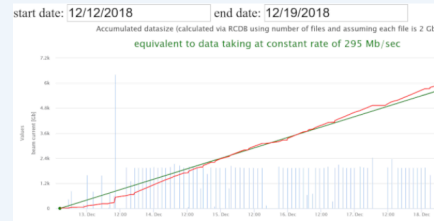
decoding status



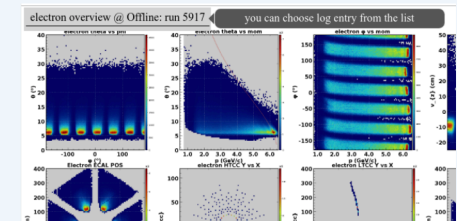
charge per run



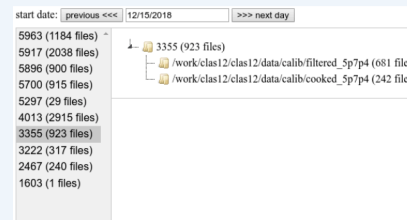
accumulated charge



accumulated data size



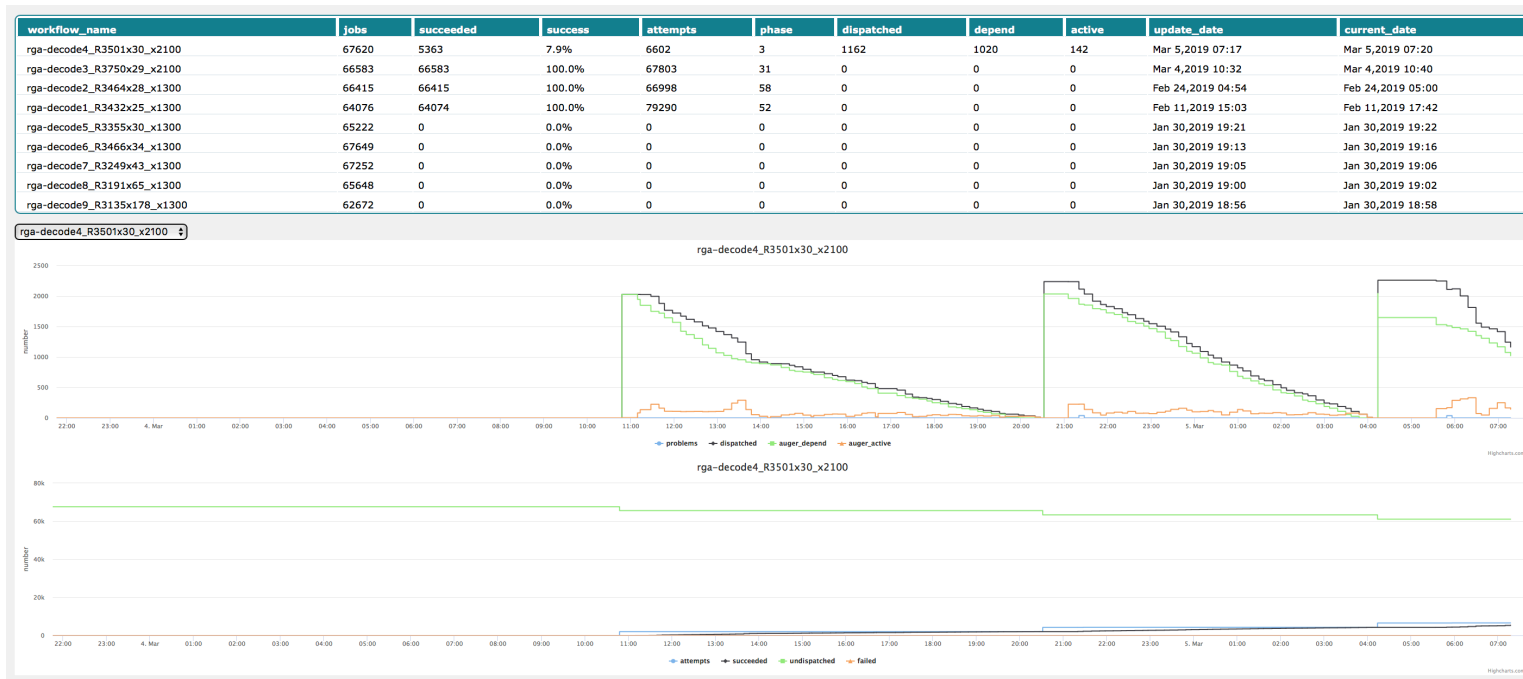
offline plots from logbook



cooked/decoded files

Decoding

- Decoding with HIPO4 in progress for RGA spring run in preparation of Pass1 **~about 34% completed so far- expected to be completed by mid-May**



- Next we will launch decoding of RGK in HIPO4
- For pass0/v1: decoding is being done with HIPO3 for RGA/RGK

RGK/RGK Data Preparation for Pass1 - Status

- **Run selection for RGA/ RGK**
 - First pass completed based on the log book information
 - Runs are grouped by trigger configuration, target and magnetic fields
 - Work is on going based on pass0 and detailed detector performances during the spring/fall runs
 - We will group them also by ranges of luminosity
- **Decoding with HIPO- 4 in progress for RGA spring run (~ 34% completed so far) we will launch RGK next.**
- **Calibration**
 - Initial calibration for RGA Spring 2018 & Fall **completed**. This initial calibration will allow us to study the stability as function of time and decide on when to re-calibrate
- **Monitoring (CLAS12mon) – Very good progress**
 - Monitoring data processing
 - Timeline of major physics and calibration quantities
 - Reorganizing the offline monitoring histograms
 - Adding the missing histograms as needed for monitoring the calibration/detector response needed for Normalization
 - **Making this as part of service in CLARA**

RGK/RGK Data Preparation for Pass1 - Status

- **DC alignment**

- Major progress for the alignment of the Fall runs & **Spring** based on alignment run 5297- **2467**
- **The Fall run looks very good, however there still issues with the alignment of the spring**

- **TORUS field**

- Full map will be used for event reconstruction
- Improvement to the TORUS field calculations

- **CVT alignment**

- Completed on straight tracks validated with straight tracks
- Implementation in the official tracking - reading alignment constants from the data base is in progress
- Then to be validated on the production data

- **FD and CD alignment**

- **Need to develop a strategy, special meeting is being scheduled for next week.**

RGK/RGK – Pass0/V1

Pass0 complete for RGA-Spring, RGK and RGA-Fall

- **All the processed files are located:**

/work/clas12/clas12/data/calib/

- **All the monitoring are under**

/volatile/clas12/rga/pass0/monitoring

- **For timeline use the link below**

<https://clas12mon.jlab.org/rga/timeline/>

Data processing pass0 proposal

- **Pass0-V1 with new software release after EC update**
 - **Check in EC calibration constants to the data base**
 - Proceed with HIPO3 at this stage for data processing (HIPO4 is being completed to deal with data filtering)
 - **Added DC alignment to this pass0 but No CVT alignment yet**
 - **Start PASS0 10 files spring selected run list**
 - Use TOUS field map *Full_torus_r251_phi181_z251_08May2018. dat*
 - **All files will be moved to RGA/Pass0/V1**
 - Produced all monitoring histograms for each run
 - Produce timeline for the defined quantities to check the stability of the calibration
 - Feedback to system experts on the need for additional calibration
 - Document hardware detector performance
 - Post all the information on the RGA Wiki
 - **Process fully selected run at different energies and different configuration serving as benchmark/reference**

RGA - Pass0/V1 Monitoring Tools



<https://clas12mon.jlab.org/rga/timeline>

Benchmark/reference from RGA-Fall

Run #	Number of files
5000 :	2335
5001	1382
5030	904
5038	1239
5046	113
5117	1207

We will launch similarly runs from RGK 7.5 GeV and 6.5 GeV

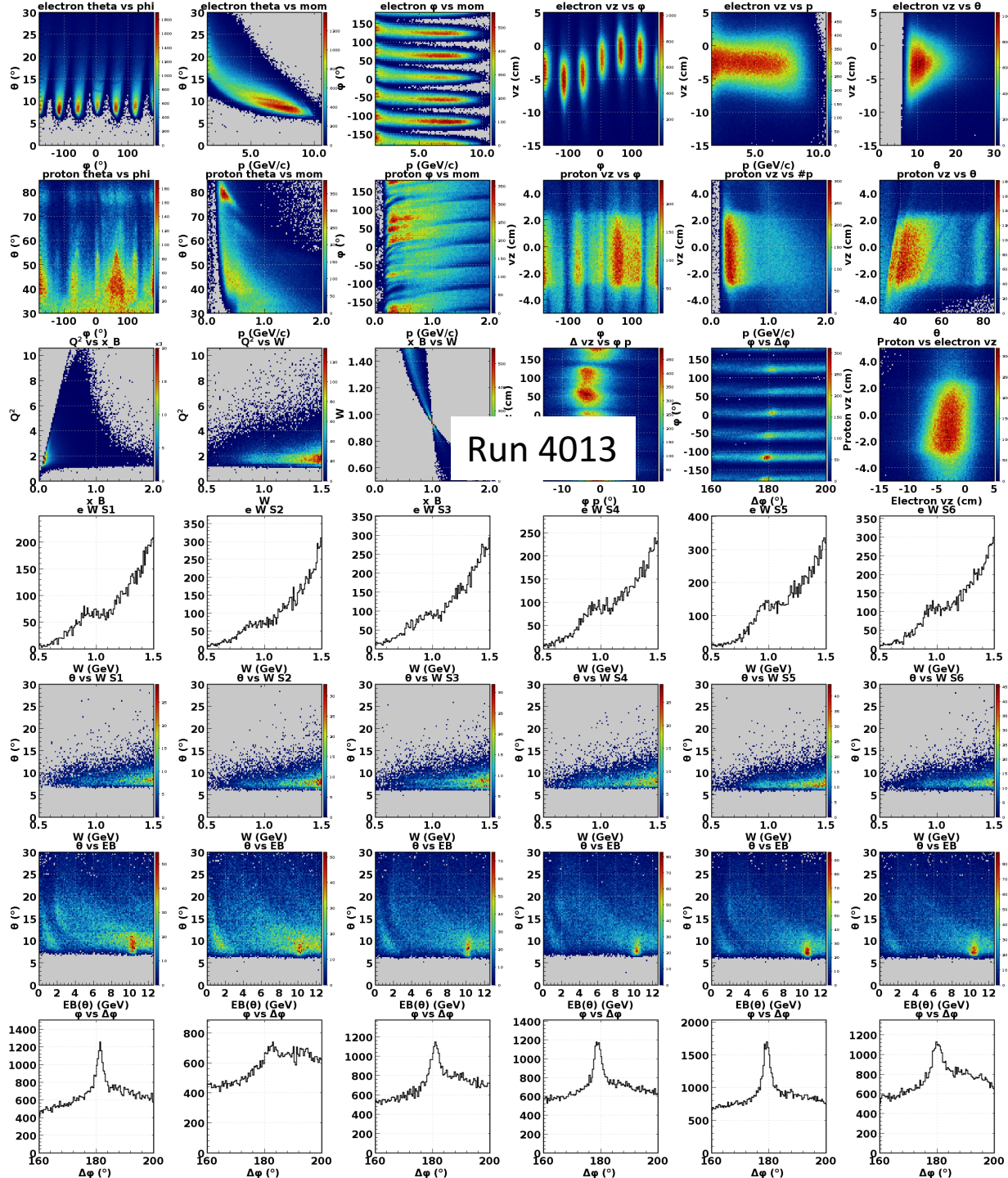
This will enable us:

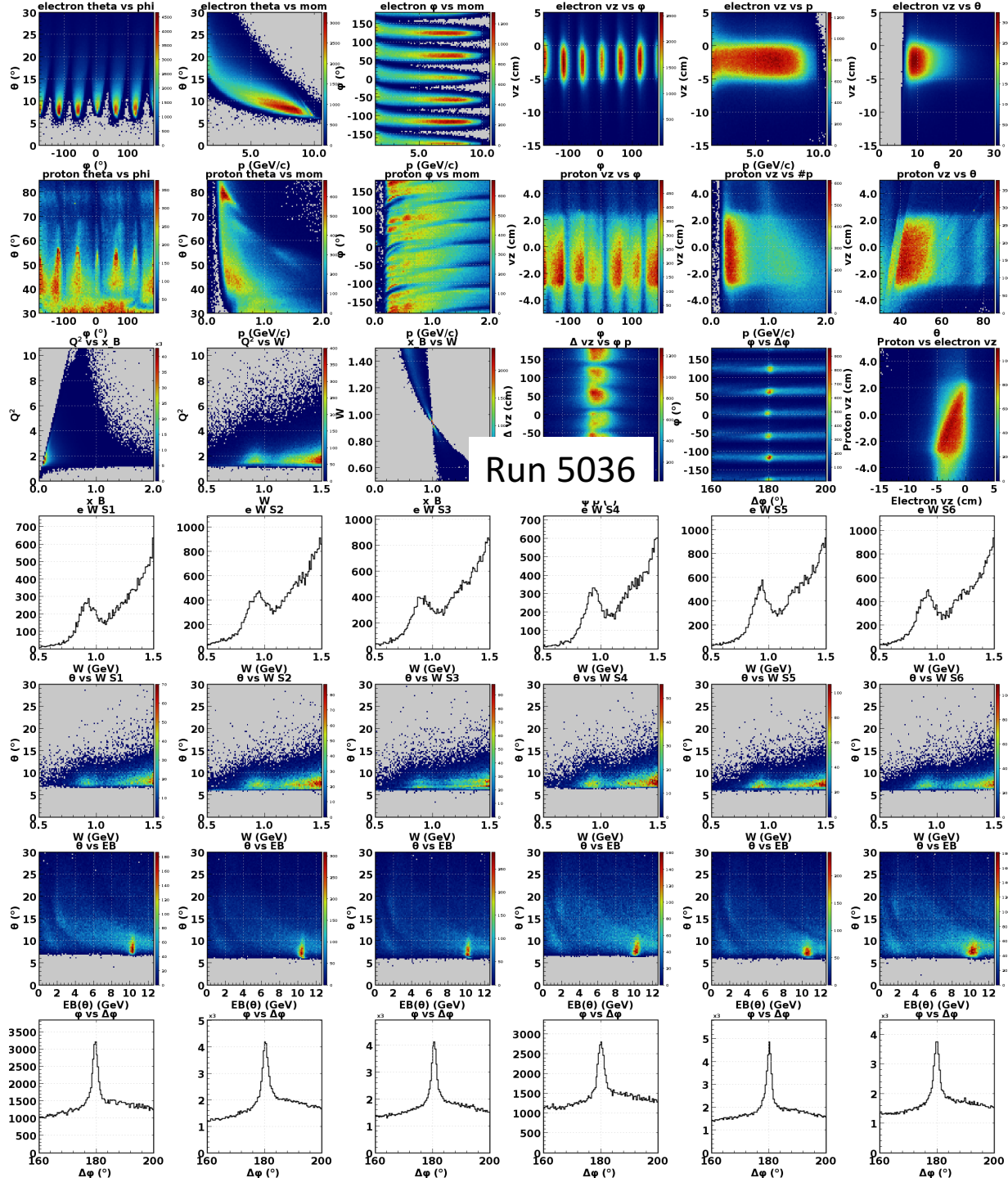
- To validate different version of the software with high statistics
- To start on physics analysis and high level corrections **NOW**

Skims Currently in Place for Analysis Trains

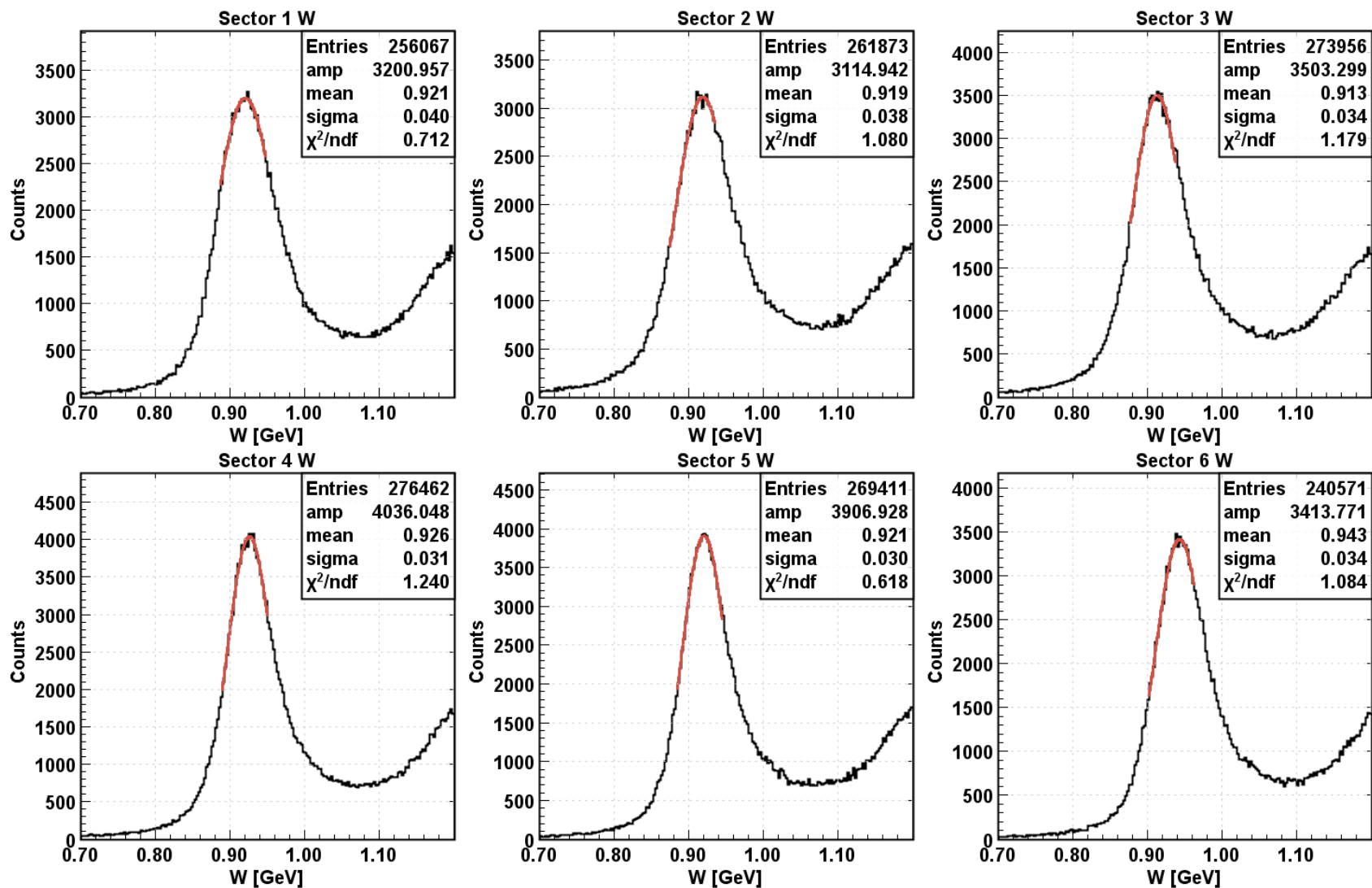
Skim #	Title	Description	Fraction*
Skim 1	$J/\psi/\text{TCS}$	Custom Wagon	0.0052
Skim 2	FT/π^0	$e^- \gamma\gamma$ in FT	0.0078
Skim 3	MesonX/VS	e^- in FT + 2 charged tracks	0.5489
Skim 4	Inclusive	e^- in the Forward Detector	0.3187
Skim 8	$e^- \text{P}$	e^- in FD Proton FD/Central	0.0874
Skim 9	$p\bar{p}$	$p\bar{p}X$	0.0321

Has started on RGA slected runs

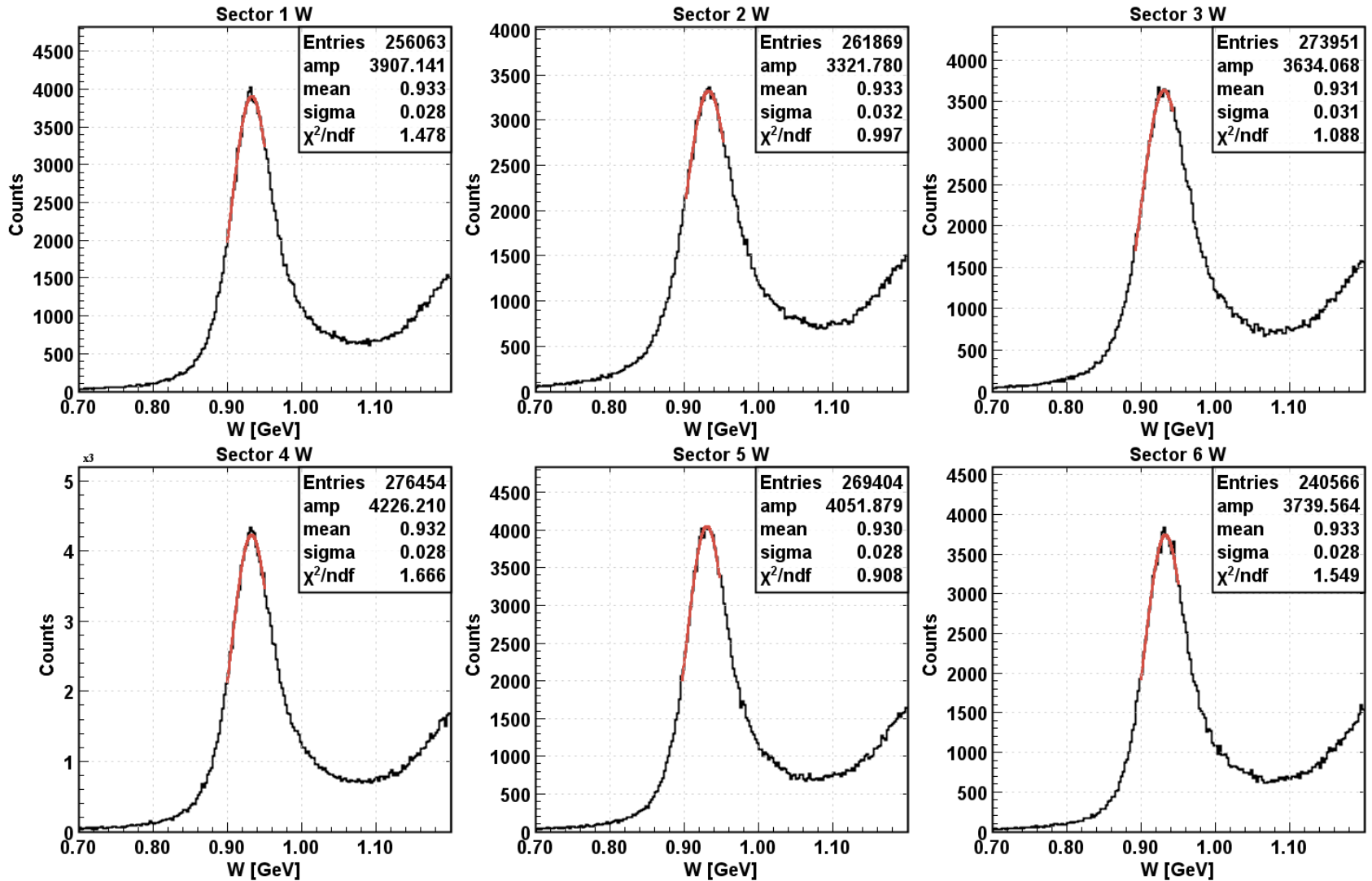




Before Corrections

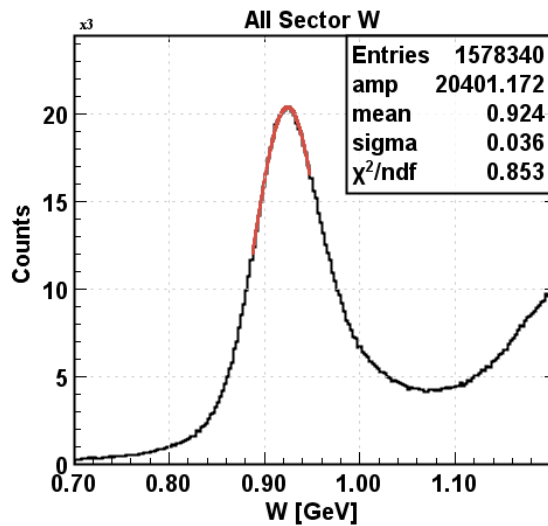


p and θ Corrected Elastic Peak per Sector

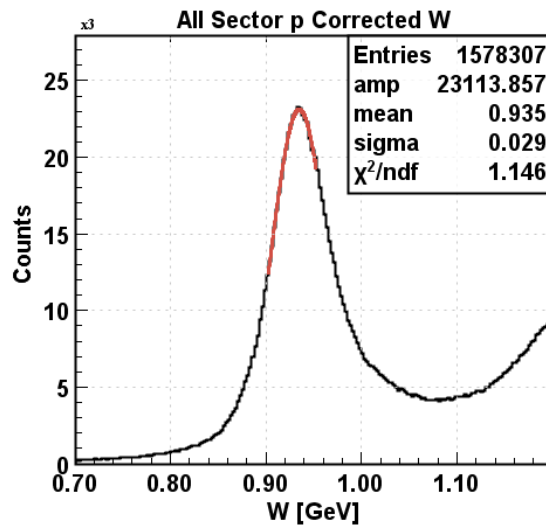


Run # 2383
TorusFieldTest

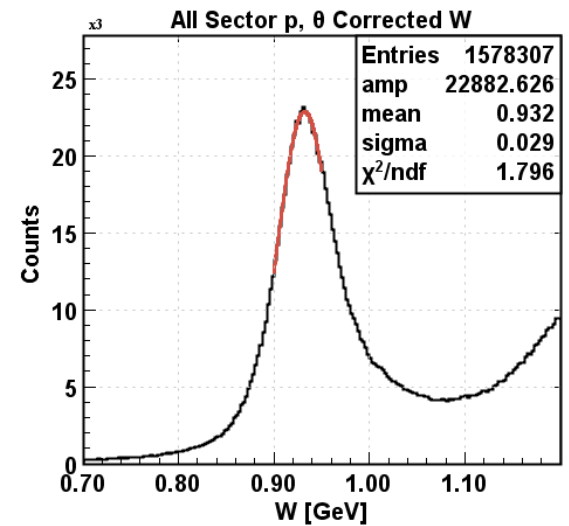
p Corrected Elastic Peak for All Sectors Combined



Before correction



After p correction



After p and θ correction

RGA data preparation for processing status

Tracking efficiency is being studied for both CVT and DC using different methods:

- Normalized charge tracks to electrons
- Merging simulated tracks with Random trigger background taken at different luminosities
- Merging low luminosity run (2nA & 5nA) with random trigger at different luminosities, from production runs & random trigger runs
- **Need also to include studies of normalized reconstructed event to the FC**
- **Need to include tracking efficiencies studies for specific exclusive processes**

(See talks by Stepan and Francesco)

Data processing pass0 V1

- Proceed with HIPO3 at this stage for data processing (HIPO4 is being completed to deal with data filtering)
- Added DC alignment to this pass0 but No CVT alignment yet
- **Processed 10 files RGA-Spring/RGK/RGA-Fall**
- Use TOUS field map *Full_torus_r251_phi181_z251_08May2018. dat*
- *Software Release 5b.7.8*
- **Pass0 completed, all files will be under
/work/clas12/clas12/data/calib/**
- Histograms and timeline for the defined quantities to check the stability of the calibration are completed for 50% of the runs
 - <https://clas12mon.jlab.org/rga/timeline/>
- Feedback to system experts on the need for additional calibration next
- Document hardware detector performance in progress
- **Process fully selected run at different energies and different configuration serving as benchmark/reference: completed for 6 runs from the Fall**

Milestones towards the first physics publication(s)

Tasks	Dates
Complete software tasks critical to PASS1	3/29/2019
Complete CVT alignment including validation	3/29/2019
Complete DC alignment including validation	3/29/2019
Complete Overall CLAS12 alignment (CD/FD)	3/29/2019
Produce release for production Ready for testing	4/4/2019
Readiness Review for Pass1	4/15/2019
Review simulation requirement and set the priorities	5/1/2019
Extensive validation and testing - Leading to final Release	5/3/2019
Final calibration completed for RGA-spring/RGK/RGA-fall	5/3/2019
Official data processing starts	5/3/2019
CLAS12 First Experiment (RGA/RGK) Analysis Review to decide on the DNP presentations	6/5- 6/2019
Abstracts submitted to CLAS PWG for approval	6/20/18
CLAS12 Analysis Review of the results and presentations	9/18-19/2019
DNP Washington DC	10/13-17/2019
Common analysis Note for detector performance	
First Publication(s) submitted for review	12/18/2019

DNP 2019

Fall meeting of the Division of Nuclear Physics of the American Physical Society
OCTOBER xx-xx, 2019 · Arlington (VA) · Crystal Gateway Marriott

TOPICS:

- Nuclear EoS & Implications of GW
- Physics opportunities with EIC
- New data analysis methods
- Structure functions
- Spectroscopy
- Lattice QCD



Local Organizing Committee

N. Benmouna; M. Doring; W. Briscoe(chair); T. Horn;
H. Griesshammer; M. Mai; E. Downie; L. Elouadrhiri; T. Cohen;

www.DNP2019.com

 Jefferson Lab

CLAS12 First Experiment Coordination



Elouadihiri

Experiment coordinator



Pasyuk

Physics Division Liaison (PDL)



Girod



Avakian




Stepanyan



Gothe



Battaglieri

-  **Deep exclusive processes**
E12-06-119, E12-06-108 and E12-12-007
-  **Deep inclusive & SIDIS**
E12-06-112, E12-06-112A and E12-06-112B
-  **Quasi photo-production**
E12-12-001 and E12-12-001A
-  **Nucleon structure**
E12-09-003, E12-06-108A, E12-06-108B
-  **MesonX program**
E12-11-005 and E12-11-005A