

Hall D Report

E.Chudakov

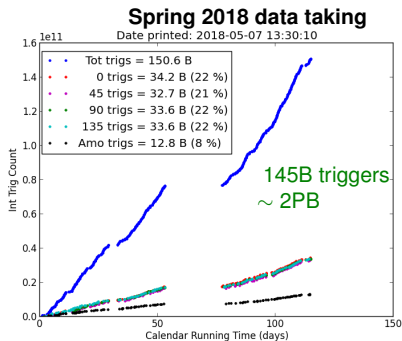
Hall D Group Leader

JLab PAC46, July 2018

Highlights Since July 2017

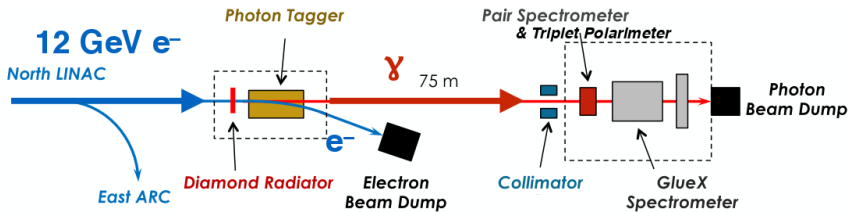
Spring 2018 Run

- Running GlueX-I (E12-06-102)
- 45 PAC days used in spring
- GlueX-I: 78% data collected
27 PAC days left
- Tests for higher intensity GlueX-II

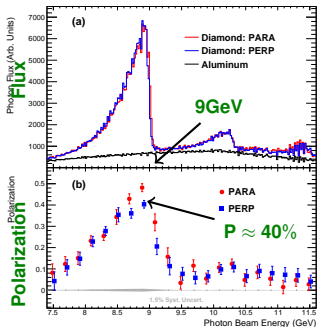


- DIRC for GlueX-II (E12-12-002): scheduled for commissioning in Fall 2018
- CompCal for PrimeX- η (E12-10-011): scheduled for commissioning in Fall 2018
- ERR for GlueX-II passed with recommendations
- Progress in analysis - understanding the efficiencies
DNP Oct 2017 - 14 contributions
- Published: 1 technical paper (BCAL); J/ψ paper in progress

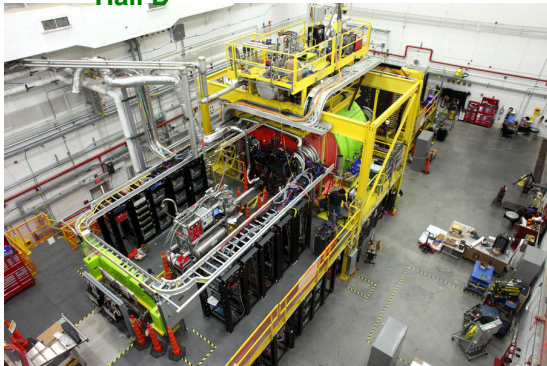
Hall D Apparatus



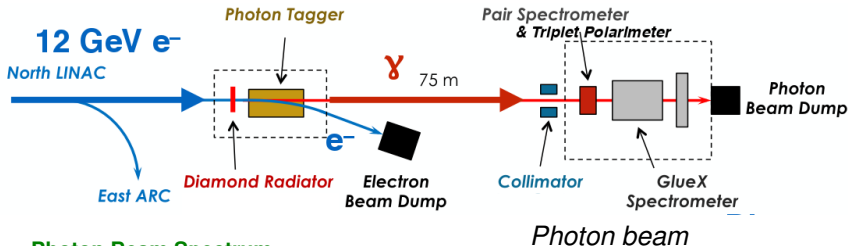
Photon Beam Spectrum



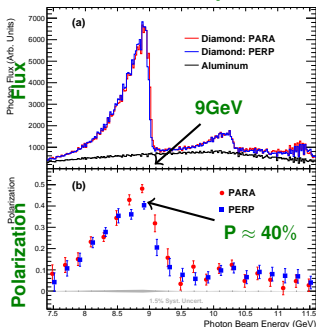
Hall D



Hall D Apparatus



Photon Beam Spectrum



- ▶ Linear polarization
- ▶ Tagging $\sigma E/E \sim 0.1\%$
- ▶ Pair Spectrometer & Triple Polarimeter

Spectrometer

- ▶ Acceptance: $1^\circ < \theta < 120^\circ$
- ▶ Resolutions: h^\pm : $\sigma_p/p \sim 1 - 3\%$
 γ : $\sigma_E/E \sim 6\%/\sqrt{E} + 2\%$
- ▶ Trigger: photoproduction at $E_{BEAM} > 7 \text{ GeV}$
in 2017: 55 kHz (signal + EM background)

The GlueX Collaboration

Arizona State, Athens, Carnegie Mellon, Catholic University, Univ. of Connecticut, Florida International, Florida State, George Washington, Glasgow, GSI, IHEP Beijing, Indiana University, ITEP, Jefferson Lab, U. Mass. Amherst, MIT, MEPhi, Norfolk State, North Carolina A&T, Univ. North Carolina Wilmington, Northwestern, Old Dominion, Santa Maria, Tomsk, University of Regina, W&M, Wuhan, and Yerevan Physics Institute.

Over 120 collaborators from 28 institutions.
20 grad. students (2 PhDs in 2017)

Plans for upgrades and new equipment:

- Capital equipment ($> \$0.5M$):
 - ▶ DIRC (E12-12-002): completion in *FY18*
 - ▶ FCAL upgrade (E12-12-002A): planned for *FY19-FY21*
- Smaller projects ($< \$0.5M$):
 - ▶ DAQ upgrade (E12-12-002A) *FY16-FY18*
 - ▶ CompCal (E12-10-011) *FY18* collaboration with Hall C

Hall D Staff:

- Scientific group: 12 staff scientists and 2 postdocs
- Technical group: 1 mechanical engineer, 1 designer and 6 techs

DIRC progress

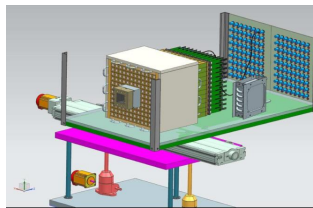
- Complete:
 - All 4 bar boxes delivered
 - 2 bar boxes installed on the frame
 - PMTs being tested
- Schedule for the rest:
 - Optical (water) boxes: Jul 2018
 - PMTs full delivery: by Oct 2018
 - PMT testing: Mar-Dec 2018
 - 50% (1 opt box) ready: Nov 2018
 - 100% ready: Feb 2019



New EM calorimeters

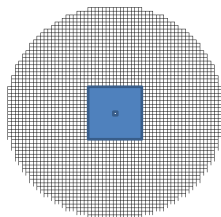
CompCal for PrimeX- η – detecting Compton

- 140 PbWO crystals + PMTs borrowed from Hall C, assembled by the PrimeX team
- Thermostat and moving support – Jlab
- To be ready in Nov 2018



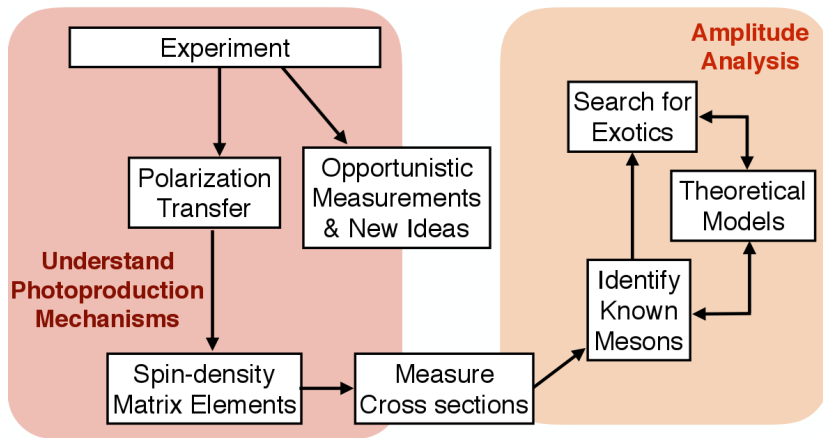
FCAL Upgrade for JEF (and rad. hardness)

- PbWO crystals : $20 \times 20 \text{ mm}^2$ 1000-1600
- External funding application for 1200 channels (*decision Jul-Dec*)
- Full cost $\sim \$3\text{-}5\text{M}$
- Started: conceptual design of the frame



30 cm

GlueX: Analysis Strategy



1. GlueX Experiment and Data Analysis Naomi Jarvis
2. Charged Pion Photoproduction Beam Asymmetries at GlueX - Jonathan Zarling
3. Exclusive η photoproduction and Σ beam asymmetries at GlueX - William McGinley
4. Study of η' photoproduction at the GlueX experiment - Mahmoud Kamel
5. Beam Asymmetry of the $\eta'(958)$ meson through multiple decay channels - Tegan Beattie
6. Survey of Meson Spectroscopy in the 4γ Channel Shuang Han
7. Photoproduction of the $b_1(1235)$ meson in GlueX - Ahmed Foda
8. Search for the exclusive photoproduction of a leptophobic B boson - Cristiano Fanelli
9. Particle identification performance at GlueX - Yunjie Yang
10. The Map to Hadronic Physics from GlueX - Curtis Meyer
11. J/ψ Photoproduction at GlueX - Luke Robison
12. Photoproduction of the Cascade Baryons at GlueX - Ashley Ernst
13. Analysis of ϕ Spin Density Matrix Elements at the GlueX Experiment - Alexander Barnes
14. Photoproduction of Baryon-Antibaryon Pairs at GlueX - Hao Li

GlueX: Progress with Data Analysis

2016-2017 data

~20% of the expected data set
~50 exclusive channels being analyzed
Topics: beam asymmetries, SDM,
cross sections

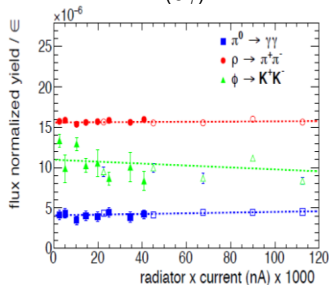
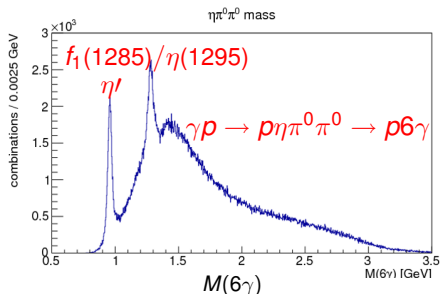
Spring 2018 data

Calibration in progress

Understanding and improving reconstruction efficiency

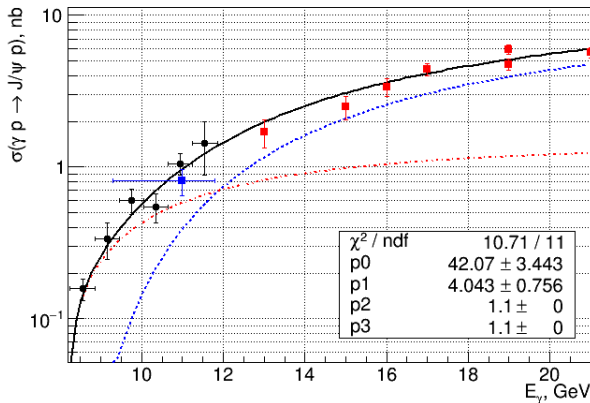
Intensity dependence:

- Accidental hits in CDC
- Improvement in pattern recognition
- Reduction of synchrotron radiation
- MC: adding hits from random triggers describes the intensity dependence



GlueX preliminary: J/ψ cross section

- Data: 2016 + 2017 (not the final version of reconstruction)
- Absolute normalization to Bethe-Heitler cross section at large M_{ee}
- Certain interpretation of the old data (SLAC and Cornell); t-slope energy dependence: model of Strikman et al



Accelerator Schedule for Hall D

Proposal/ experiment	Sta- tus	Title	PAC days	PAC #
E12-06-102	A	Mapping the Spectrum of Light Quark Mesons and Gluonic Excitations with Linearly Polarized Photons	120	30
E12-10-011	A-	A Precision Measurement of the eta Radiative Decay Width via the Primakoff Effect	79	35
E12-13-003	A	An initial study of hadron decays to strange final states with GlueX in Hall D	200	40
E12-13-008	A-	Measuring the Charged Pion Polarizability in the $\gamma\gamma \rightarrow \pi^+\pi^-$ Reaction	25	40
E12-12-002	A	A study of meson and baryon decays to strange final states with GlueX in Hall D	220	42
E12-12-002A	A	Eta Decays with Emphasis on Rare Neutral Modes: The JLab Eta Factory(JEF) Experiment	Grp	45

Accelerator Schedule for Hall D

Established schedule

Proposal/ experiment	Sta- tus	Title	PAC days	PAC #
E12-06-102	A	Mapping Meson early Polarized Photons	90 PAC days: 2017 Spring – 2018 Fall	
E12-10-011	A-	A Precision Measurement of the eta Radiative Primakoff Effect	79	35
E12-13-003	A	An initial study of baryon decays to strange	200	40
E12-13-008	A-	Measuring the Charged Pion Polarizability in the $\gamma\gamma \rightarrow \pi^+\pi^-$ Reaction	25	40
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Accelerator Schedule for Hall D

Established schedule

Intention

Proposal/ experiment	Sta- tus	Title	PAC days	PAC #
E12-06-102	A	Mapping Meson early Polarized Photons	90 PAC days: 2017 Spring – 2018 Fall	
E12-10-011	A-	A Precision Measurement of the eta Radiative Primakoff Effect	79	35
E12-13-003	A	An initial study of baryon decays to strange	2019 Spring – 2019 Fall	
E12-13-008	A-	Measuring the Charged Pion Polarizability in B	25	40
E12-12-002	A	A study of baryon decays to strange final states with GlueX in Hall D	2020 Spring ?	
E12-12-002A	A	Eta Decays with Emphasis on Rare Neutral Modes: The JLab Eta Factory(JEF) Experiment	Grp	45