## Hall D Status

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UGBOD meeting, Jan 2015

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## • Physics with high intensity linearly polarized photon beams

- Experiment *GlueX*: search for exotic hybrid mesons
- Primakoff reactions:
  - Radiative widths of pseudoscalars  $(\eta)$
  - Pion polarizability
- Rare decays of  $\eta$  (conditionally approved)
- Other topics are under discussions

## • Running schedule (tentative for FY16-...)

- 2014 Oct-Dec: commissioning with 10 GeV beam (reduced setup)
- 2015 Apr-May: engineering run at 10 GeV (full setup)
- 2015 Oct-Dec: (accelerator development) 12 GeV
- 2016 Spring: Physics commissioning 12 GeV
- 2016 Fall: GlueX production



## Hall D Complex



Civil Photo July 2011 *Ready Dec 2011* 

Beam/detector

Ready 99.9% by Oct 2014

First beam Oct-Dec 2014



# The Hall D/GlueX collaboration and responsibilities

#### Active responsibilities for Oct-Dec 2014 are marked green

- Jefferson Lab (CDC, FDC, BCAL, beamline, software)
- Carnegie Mellon (CDC, software)
- Indiana University (FCAL, software)
- University of Regina (BCAL)
- Florida State (TOF)
- University of Connecticut (Tagger TAGM, diamonds, MC)
- Catholic University (Tagger TAGH)
- Florida International (Start-Counter)
- Glasgow (polarized beam)
- University of NC, A&T (PS)
- University of NC, Wilmington (PS)

#### 20 institutions, 110 people

- University Santa Maria (Chile) (controls)
- University of Arizona(beamline)
- MIT (Cherenkov, Level-3, software)
- University of Massachusetts (targets, electronics)
- University of Athens (B/FCAL monitoring)
- Yerevan (controls)
- MEPhI Moscow (FDC, BCAL, PS, software)
- ITEP Moscow (calorimetry)
- Northwestern Univ. (calibration)



# Beamline



## Hall D/GlueX Spectrometer and DAQ



Photoproduction  $\gamma p$  15 kHz for a 100 MHz beam Beam 10 MHz/GeV: inclusive trigger 20 kHz  $\Rightarrow$  DAQ  $\Rightarrow$  tape Beam 100 MHz/GeV: inclusive trigger 200 kHz  $\Rightarrow$  DAQ  $\Rightarrow$  L3 farm  $\Rightarrow$  tape



# Commissioning Run: Equipment and Program

## Tagger Hall



#### Collimator Cave



#### Pair Spectrometer - Hall D





## Commissioning Oct-Dec 2014

- · Amorphous radiators only
- Solid target (1cm thick plastic), not LH2
- Solenoid current 1200A (1300A nominal)
- Beam tuning through the collimator
- Verification of the beam alignment in Hall D
- Detector checkout
- Data taking with various triggers

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# Beam Tune

### Beam Parameters

- Beam current 50-200 nA
- Radiator (Al) 0.2-3.10<sup>-4</sup> RL
- Beam energy 10.08 GeV
- Measure the photon spot on the collimator (profiler, act. collimator)
- Steer the electron beam: center the spot on the hole (beam counter, PS)





#### Results

- Radiation levels as expected (no issue)
- Beam tune through collimator: good enough will be improved by fast feedback from active collimator
- Photon beam was found to be well aligned on the target and photon dump

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## Commissioning Program

Starting with the initial calibration/alignment of the detectors, several tasks were done in parallel.

- Trigger tests and tune: FCAL, BCAL, FCAL+BCAL, TOF, ST, PS
- Adjustments: timing, HV, thresholds
- Checkout of the detectors
- FDC alignment (running with no magnetic field)
- Data taking with various triggers

#### Results

- All the detectors and the subsystems are functional
- Detectors' performance as expected. For quantitative results more work on calibration and alignment is needed
- $\sim$  650 M events taken
- DAQ gradual improvements (many issues found and fixed), but still short of the 20 kHz goal (some firmware issues with the FADC-125 MHz)
- 12GeV Key Performance Parameters achieved: approved by DOE



# **Event Display**



## Vertex Reconstruction





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# Matching Tagger Signals





# **Charged Particle PID**





## $\pi^{\circ}$ Reconstruction



- FCAL: initial calibration is off by a factor of 2
- BCAL: initial calibration is off by 15%
- $\pi^{\circ}$  sample will be used for individual channel calibration



- $\pi^+\pi^-$  combinations
- Using the tagger energy the missing mass is reconstructed
- For the nucleon recoil there is a strong ρ signal





# Outlook

## Ongoing Data Analysis

## Calibration

- Timing: existing data are sufficient
- Calorimeters: significant improvement expected, but more data are needed to reach the specs
- Alignment: FDC ongoing, CDC needs more data

### Preparations for the next run

## • Full configuration:

- Liquid Hydrogen target
- Diamond radiator commissioning
- Solenoid: 1300A
- Fixing DAQ issues

## It was a good start. Credit to GlueX collaboration and JLab staff! Thanks to the postdocs and students for doing prompt analysis!

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