

Overview: 2025 Beam Test Plans for EEEMCAL

- ❑ DESY 17 February 2025 (2 weeks):
 - Goal: direct comparison of ASIC and discrete readout chains with IJCLab-Orsay prototype (nominally 3x3mm/15um Hamamatsu SiPM + ASIC readout chain)
- ❑ DESY 24 March 2025 (2 weeks):
 - Goal: direct comparison of PMT and SiPM with MIT prototype; also CRYTUR prototype with proprietary setup
- ❑ JLAB June/July 2025 (checking if earlier, e.g., May may be possible):
 - Opportunity for parasitic test with small beam size allowing for absolute energy resolution measurements with IJCLab-Orsay prototype
- ❑ DESY 9 June 2025 (2 weeks):
 - Contingency. May be superseded by JLab parasitic tests.

For DESY test Douglas will need the names of the participants to officially register them to the test, schedule safety lecture, etc.

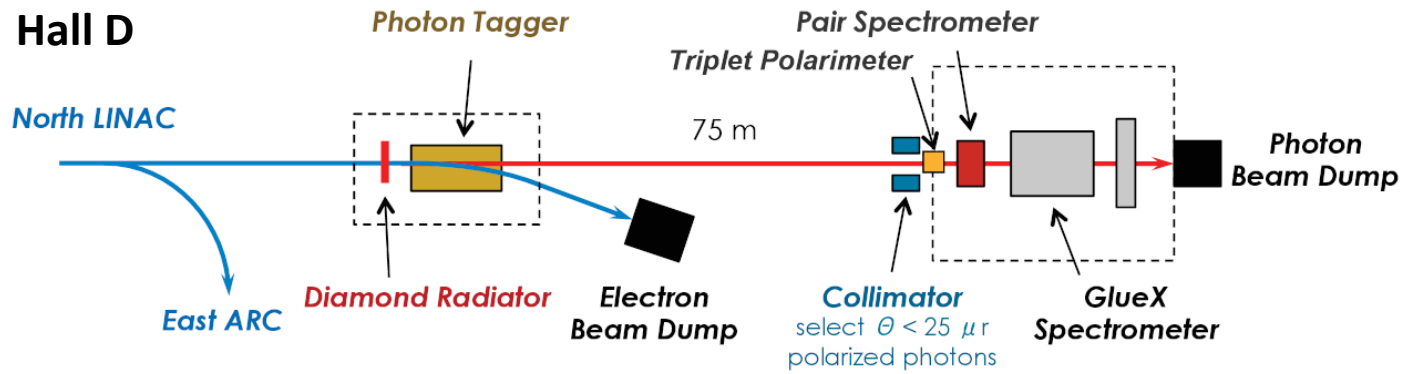
Parasitic Beam Test Opportunities at JLab

Tanja Horn and Yulia Furletova

ePIC TIC Meeting 16 December 2024

Parasitic Beam Test Opportunities at JLab

- ❑ There are parasitic detector beam test opportunities at Jefferson Lab
- ❑ Parasitic here means that the test must follow the schedule of the main experiment including any access constraints, choice of beam energies, and installation space limitations.
- ❑ There are no dedicated test beam slots, which may complicate travel planning. Having someone on site or collaborating with local teams may be beneficial
- ❑ Parasitic beam tests have been carried out successfully in Hall D and the high-luminosity Halls A/C in the past.

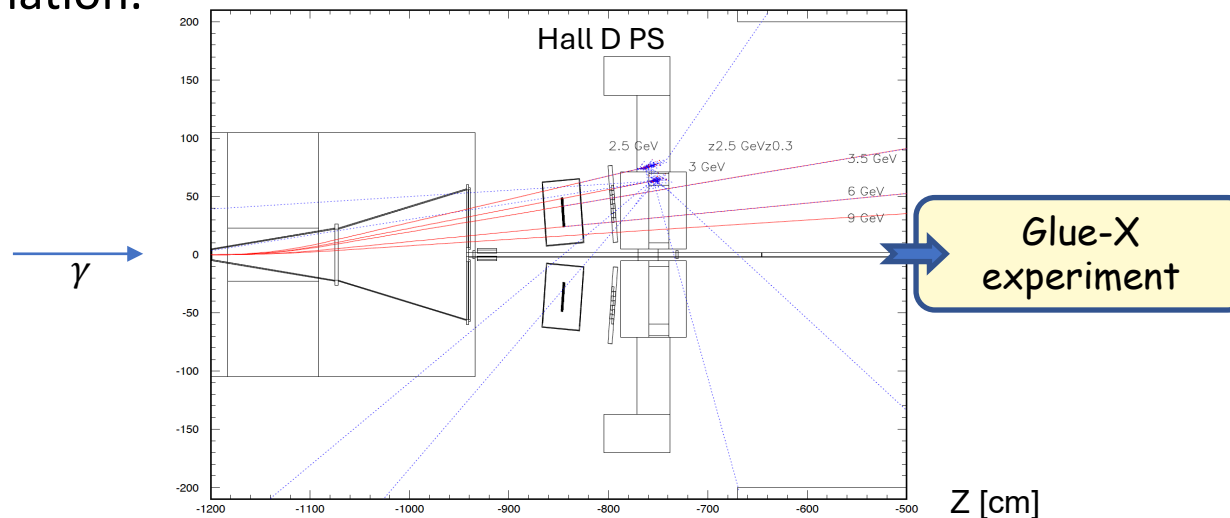
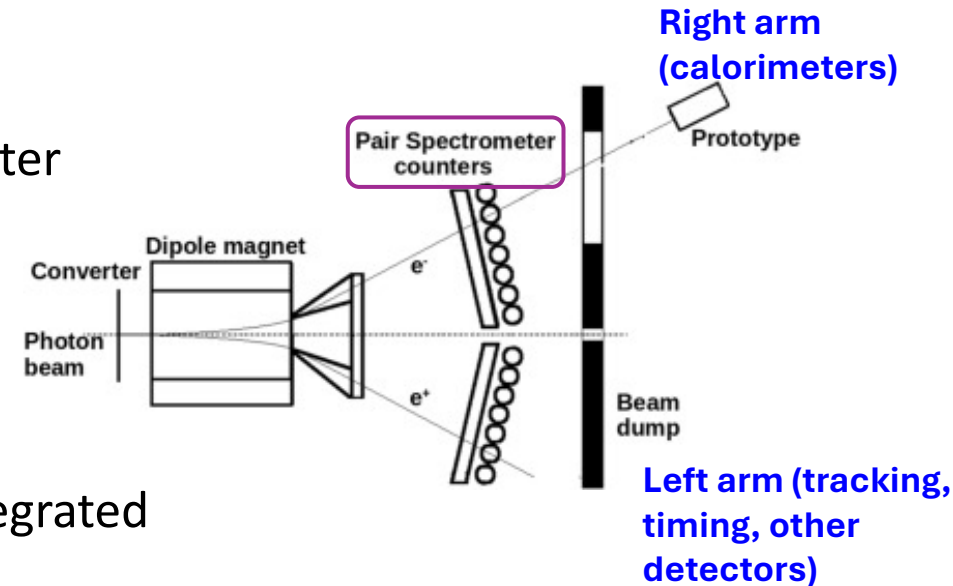


Hall C



Hall D - Overview Parasitic Beam Test Opportunities

- ❑ Hall D features a 12 GeV photon beam
- ❑ Prototype detectors can be installed behind the Pair Spectrometer (available space: ~2m) and make use of the secondary electrons/positrons
- ❑ There are two detector arms (left and right) covering a lepton momentum range depending on the detector location.
- ❑ During stable running conditions prototype readout may be integrated with the GlueX DAQ, which allows for accessing the PS energy information.



Hall D Pair Spectrometer

- ❑ Electrons with 3.5 – 6 GeV of 3.5 GeV/c – 6.0 GeV/c depending on detector location
- ❑ The energy is measured with ~0.5-1.0% resolution
- ❑ Flat beam: in-plane (y -spread ~5mm)
- ❑ 10 kHz rate

Requirements for Parasitic Beam Test Opportunities in Hall D

- ❑ Must have provided information about the beam test, e.g.,
 - overall goal of the test
 - detector description
 - services needed
 - DAQ/trigger plans
 - running conditions
 - what is needed from Hall D
 - what equipment will be brought to Hall D
- ❑ Must have been included in the beam test spreadsheet →
- ❑ Must have presented a technical presentation at the Hall D run coordination meeting
- ❑ Must have obtained the required documentation and training
- ❑ Must have demonstrated functionality of the prototype detector with cosmics or similar

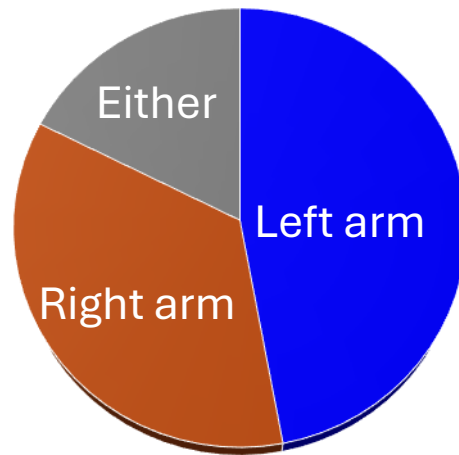
The image shows a detailed spreadsheet with columns for various beam test parameters and services. The columns are color-coded and include headers such as 'Beam Test Opportunities', 'Beam Test Parameters', and 'Beam Test Services'. The data rows contain technical specifications and are organized into several sections, with some cells highlighted in red to draw attention to specific entries.

Constraints 2025 Parasitic Beam Test Opportunities in Hall D

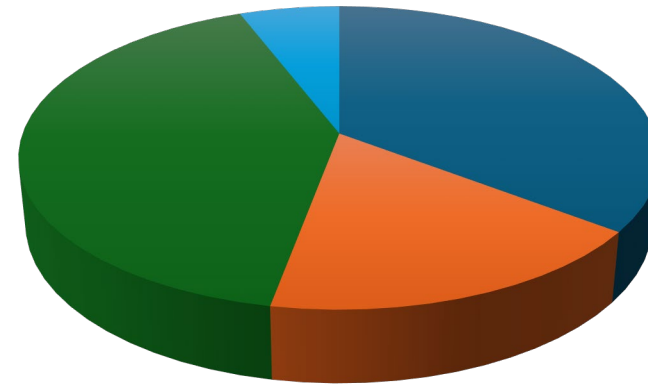
- ❑ Beam is presently expected at the end of January 2025 and run through June/July
- ❑ All beam tests are parasitic and must follow the access schedule of the main experiment
 - During approximately the first month with beam Hall D will be commissioning a new detector for the main experiment, which may result in somewhat unstable conditions, e.g., many accesses to the hall in the first month of beam and possibly more DAQ issues than usual
 - Nominally, one hall access per week is expected when Hall D is in production mode
- ❑ Technical support is very limited, and the needs of the main experiment and Hall D take priority

Status: Parasitic Beam Test Opportunities in Hall D in 2025

- ❑ We are currently planning the parasitic opportunities in Hall D for 2025 spring and summer
- ❑ Presently there are 17 interested groups
 - 6 related to ePIC, 3 EIC Generic R&D, and 8 other topics



■ Left arm ■ Right arm ■ Either arm



■ EPIC ■ EIC Generic R&D ■ MOLLER ■ Other

Parasitic Beam Test Opportunities in Hall D in 2025

- Presently the rough schedule – subject to change – for the test beams is:

Time Frame	Right Arm	Left Arm
February 2025	ZDC HCAL	SVT+AC+LGAD
March 2025	MOLLER	MPGD cylindrical
April 2025	Lumi	MPGD generic
May 2025	Calorimeter with PbGl and PWO	Timepix/Low Q2
June/July 2025	EEEMCAL	MPGD-TRD
June/July 2025	Calorimeter with scintillating glass	MPGD-TRD

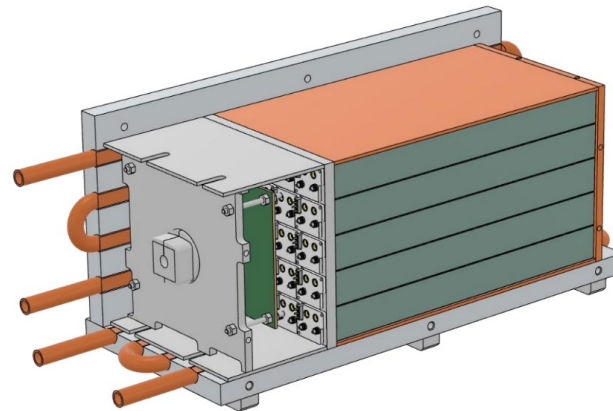
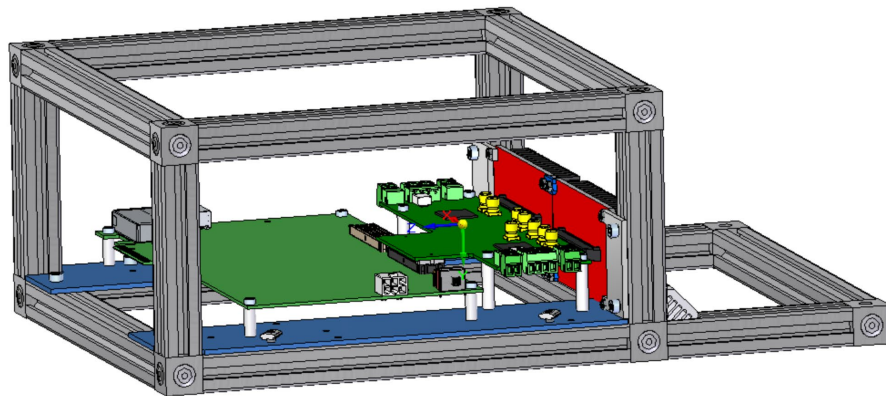
- Tanja and Yulia are doing the coordination between the parasitic test beam group and Hall D
- Anyone interested in possible parasitic opportunities should send email to: Tanja Horn (hornt@cua.edu) and Yulia Furletova (Yulia@jlab.org)

Information about the planned beam tests

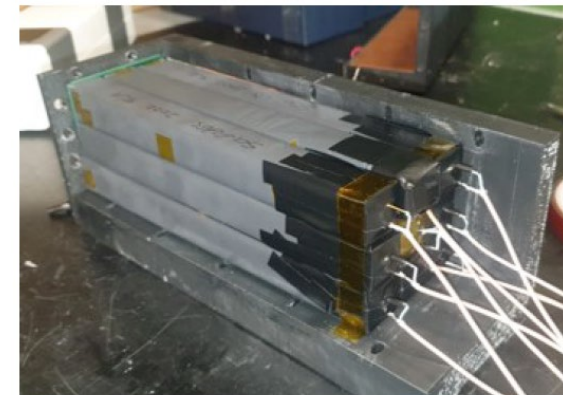
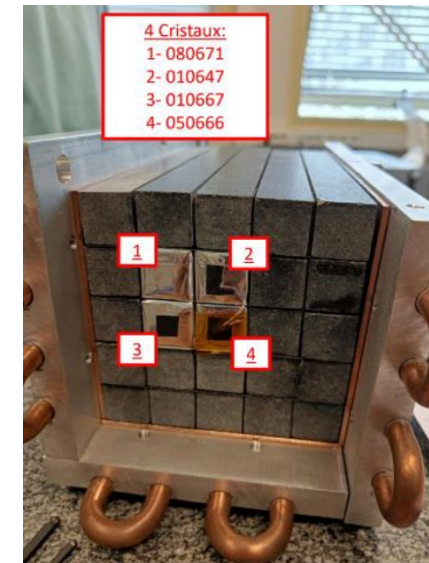
- ❑ **EEEMCAL 1 PWO (AANL, ACU, CUA, IJCLab-Orsay, OU, UKY):** Measure the energy resolution with realistic mechanical structure, e.g., including the carbon structure.

Overall: Investigate stability, linearity, power deposition to:

- 1) test if ASIC gives comparable result with fADC
- 2) determine what is the minimum energy that can be detected with both sets of electronics
- 3) test the impact of mechanical structure on the detector performance.



- ❑ **EEEMCAL 2 SciGlass (AANL, ACU, CUA, INFN-Ge, INFN-Ct):** Measure the energy resolution with a 5x5 detector array and SiPM readout chain



Information about the planned beam tests

❑ AC-LGADs:

Overall goal:

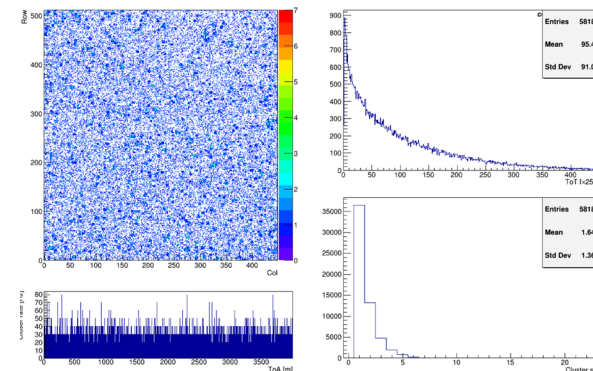
- 1) cccc
- 2) Ccc
- 3) Ccc



❑ Timepix (Glasgow, UK)

Overall goal: Readout DAQ integration, full chain test.

- 1) Streaming test
- 2) Resolution measurements (spatial, angular)
- 3) Timing response

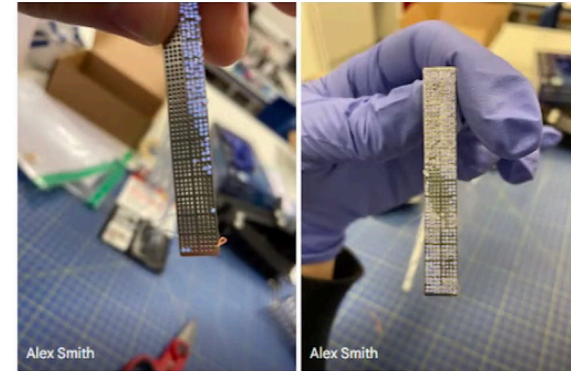
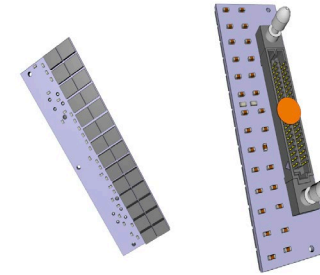
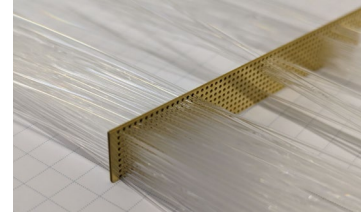


Information about the planned beam tests

❑ Lumi (York, UK)

Overall goal: Measure the energy resolution, test readout chain

- 1) Streaming test
- 2) Energy resolution
- 3) Spatial resolution
- 4) Timing



❑ ZDC-HCAL -SiPM-on-Tile (UCR)

Overall goal(s): measure the EM shower response, check the energy resolution. Important for e/pi separation and compensation.

- 1) Energy resolution
- 2) Angular resolution
- 3) shower profile

