Initial Studies for Hall D Beam Tests

Luminosity Group Meeting 26/02/26

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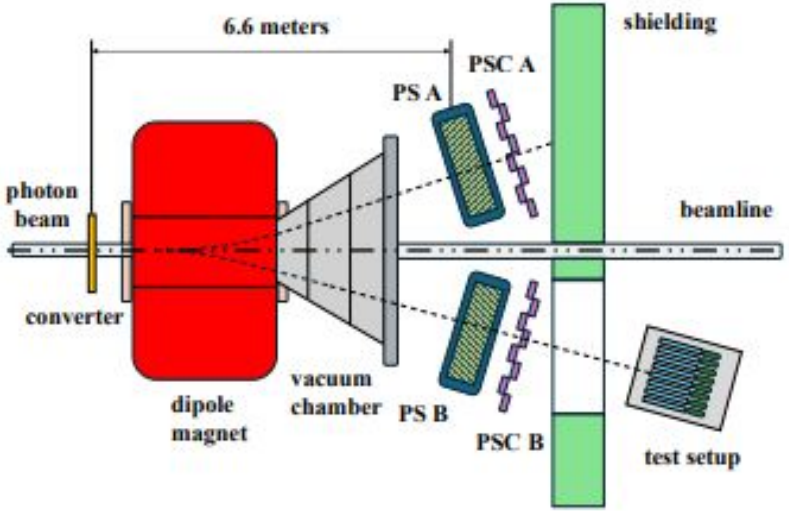
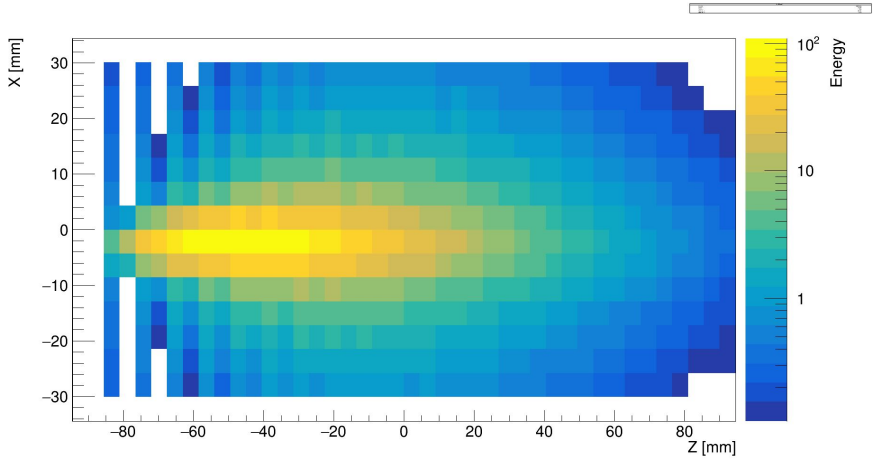
Test Conditions

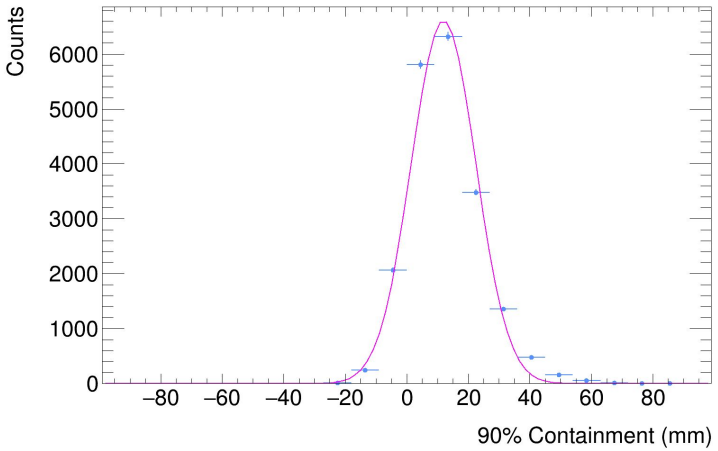
- Proposal to conduct parasitic beam tests at Hall D's pair spectrometer in summer 26.
- Electron energies expected to range from 3 to 6 GeV.
- 50 MHz photon flux expected.



Performance of the Pair Spectrometer in Hall D at Jefferson Lab - https://doi.org/10.48550/arXiv.2601.07587

Simulation Studies



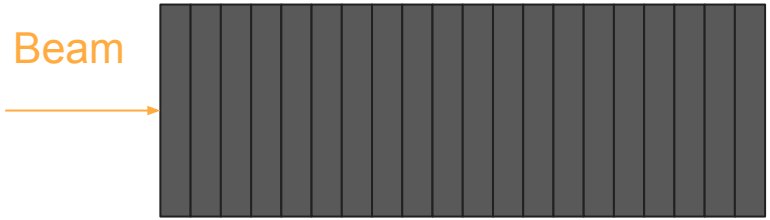


- Mean number of layers to contain 90% of the shower is 12.
- At least 16 would be needed to ensure 90% of the shower is contained in most cases
- Full readout needed in layers 4 - 16 to see the shower development.
- Potential to gate on the second layer as with previous test at Mainz.

Requirements

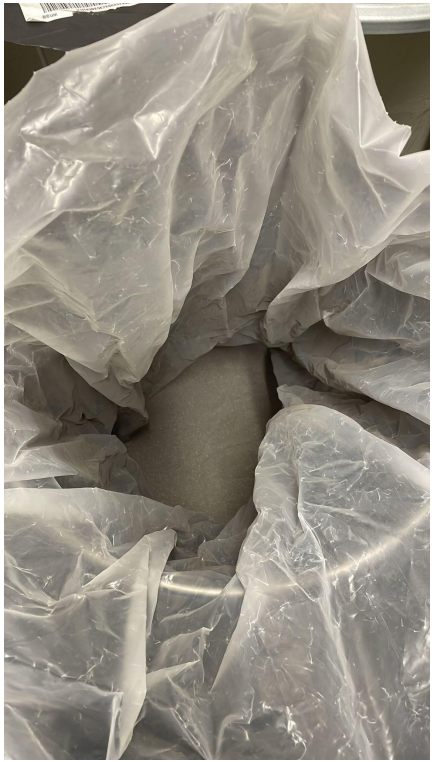
- Ideally 16 to 20 modules would be used to capture the full shower.

- This would require a significant effort in the production of modules as well as from an electronics standpoint.
  - 560 channels to readout
  - 440 SiPMs
  - 10 more SiPM boards
  - Preamp boards



Production

- Currently we have several usable modules at York.
- Work is underway to produce more, ideally 20 modules.
- We have sufficient tungsten and fibre, with the requirement for misc consumables being met by our funding.



Electronics Requirement

- Funding would be needed from JLab to provide the needed electronics.
- York's electronics workshop can mount more SiPMs on boards but we do not have enough of either.
- Preamp boards would have to be produced and tested at York.
- Support from Hall D would be needed for the data acquisition.