Positron detection system status

Oleksandr Borysov

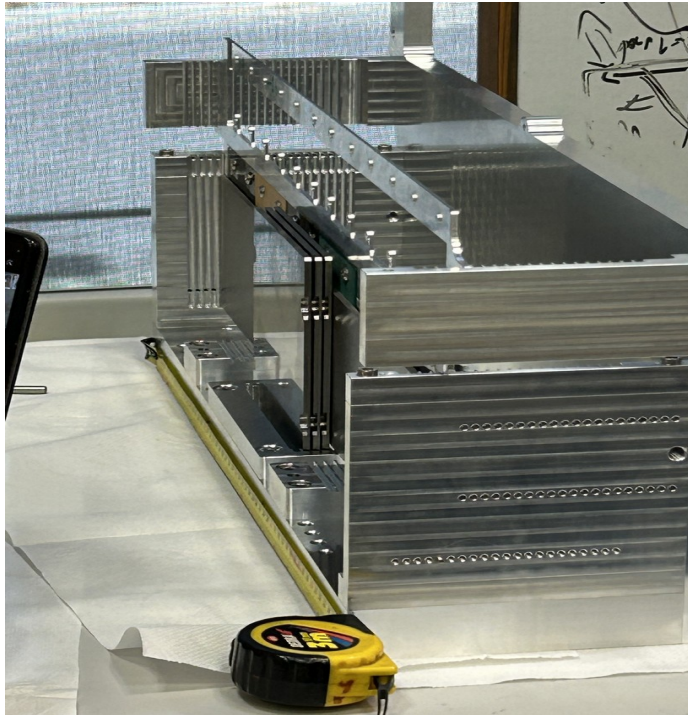
behalf of Positron Detectors group

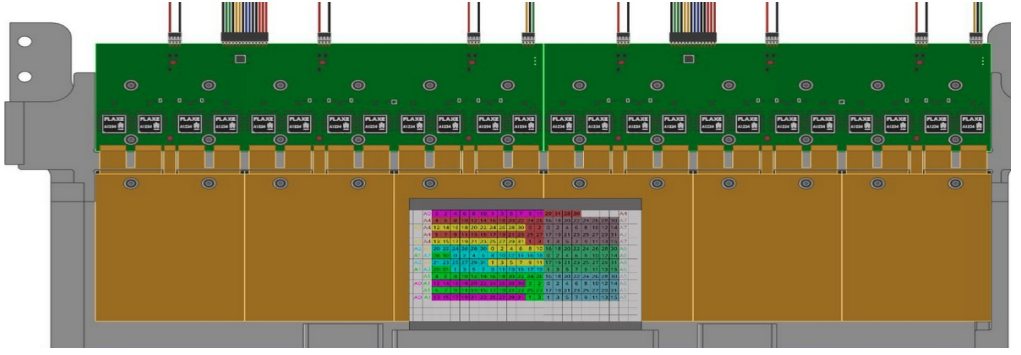
LUXE Steering Board Meeting

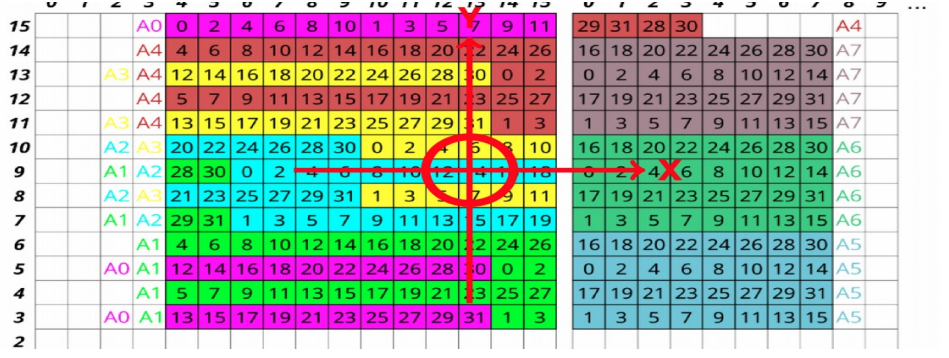
April 30, 2025

Tests of ECALP prototype with 5 GeV electrons

- Dates of beam time slot LUXE ECAL and DRD6 at the DESY II Test Beam Facility TB24: 09-JUN-2025 - 22-JUN-2025
- Use 20 sensors in 10 planes, to scan inactive area between instrumented sensors and angular dependence
- Tungsten plates: 6 LUXE-size available, three ordered, extra (smaller) from previous LumiCal prototype
- Aim at full shower scan by inserting extra tungtsen plates in front of the instrumented part







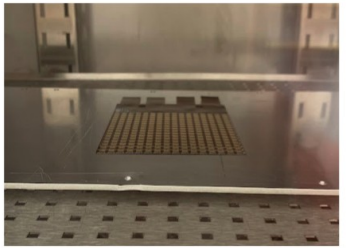
ECAL modules assembly

Inventory – available at IFIC

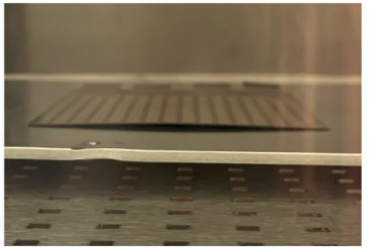
- **Sensors – characterized-**
  - **20 from TAU are in the dry cabinet** **OK**
  - In the process of been cleaned. **- ongoing**
- **Adhesive – OK**
  - Different types of conductive glue + non-conductive
- **CF**
  - ~15 low quality CF (made by ClipCarbono – being used for tests)
  - **20 better quality CF** (made by ClipCarbono but machined by WorkShape (FR) **– OK**

- **Signal Fanouts**
  - **10 FO kaptons with connectors:** **Not OK** (but 20 more are in production by TAU)
  - + 2 in Krakow
  - + 2 used for CF glue tests
  - +5 being used for glueing/curing/deformation studies tests today and tomorrow
- **HV kaptons Fanouts**
  - **15 HV kaptons with connectors:** **Almost OK** (but 20 more are in production by TAU)
  - 5 being used in tests

- Last week tests (CF+real Fanout using siliconne glue)



before curing



During curing

- **This week we are validating the procedure of glueing the CF only at the end**
  - **To avoid deformations in the oven**

Dedicated computing resources

ISS – has a dedicated server for ECAL-LUXE group

Operating system: CentOS Linux

CernVM File System installed (cvmfs)

Access via SSH using Public Key Authentication

~2.8 TB of experimental data (TB2020, TB2021, TB2022) stored on the LUXE server

External users from AGH, IFIC, TAU, UW have an account

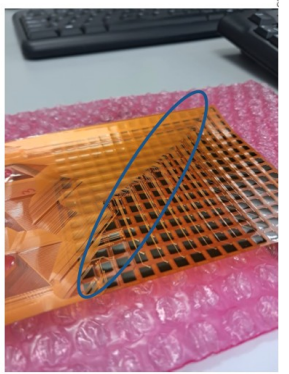
- Geant4, Root and Phython can be access to proceed data

For the upcoming test-beam (**TB2025):**
– **40TB** available for data storage
- data storage capacity up to **65 TB**.

The question is how we will transfer the acquired data to the server???

(real) Material budget

- **CF: 225um +-10um**
- **Siliconne glue:** 100um (+-?)
- **Fanout:** 115-135um
  - depends on the "accumulation" of routing lines
- **Sensor:** 320um
- **HV kapton:** 55-60um
- Total (no conductive glue) = 805-850
- **Total (with two layers of conductive glue) = 905-950um**



Tracker status

Detailed information: https://indico.desy.de/event/47291/contributions/180989/attachments/95021/129661/Noam_DAQatFACETii_LUXE_workshop_29012025.pdf

- 8 staves foreseen for positron tracker at LUXE are in WIS lab.
- 8 readout boards (MOSAIC) are available at WIS. Each stave requires one MOSAIC board for readout.
- A new version of the MOSAIC firmware capable of communicating with TLU has been developed and tested in the lab.
- HV CAEN power supply boards, VME crates for MOSAIC, LDO boards for 8 staves are in the lab.
- The solution equivalent to 1 stave in terms of readout is installed at E320 at SLAC since summer 2024. After two data taking sessions the performance looks good.
- EUDAQ components for reading ALPIDE staves via MOSAIC and data quality monitoring have been developed and are actively used at E320 and in the lab.
- Mechanical support for the stave installation at LUXE has been manufactured.
- Ongoing work on developing a repeater board which would allow usage of longer readout twinax cables. At present the cable length (the distance between staves and MOSAIC board) must be less than 16m. It is not considered as crucial, but could allow to move MOSAIC further away to the place with less radiation, which would a better solution.

Issues: The twinax cables used for the readout in present design are not halogen-free. Halogen-free version of the same type of cables does not exist (did not in 2024).

Consider to test ALPIDE performance in vacuum