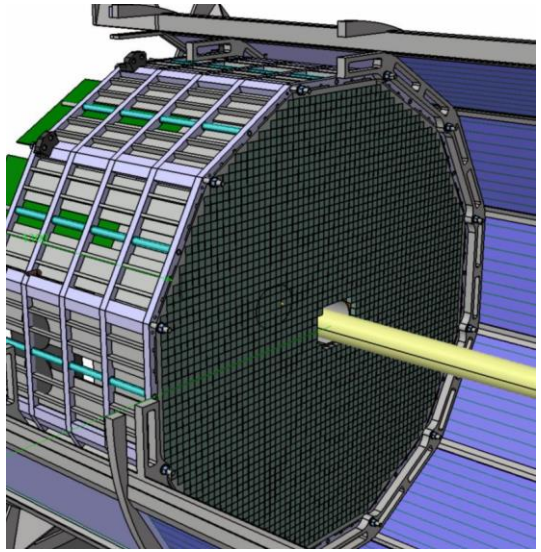
Backward Ecal: needs & plans for monitoring system

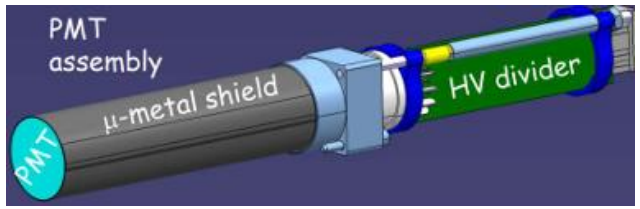


- **Need to monitor:**
  - Radiation damage (crystals, SiPM…)
  - Temperature: PWO light yield varies 2%/°C
- **Current plan:**
  - *Light monitoring* with LEDs from the back of the crystals (with or without fibers)
  - *Temperature sensors* across a selected (but large) number of crystals
- **Calibration** will be done with **physics** (π^0 mass, electron tracks…)
- Monitoring system is only aimed at detecting significant gain variations/drifts

Backward Ecal "prototype": NPS calorimeter

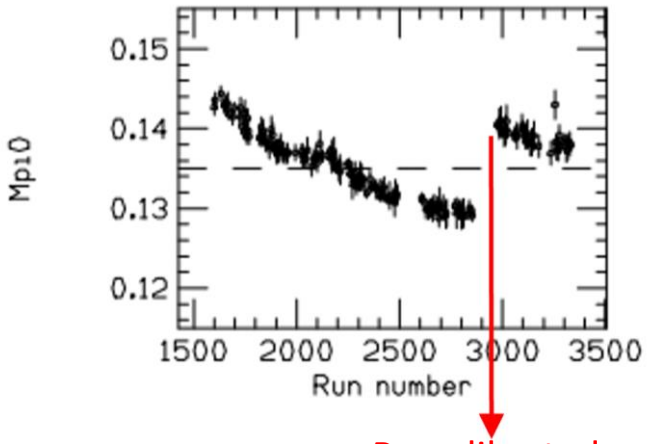
- 1080 PWO crystals
- *PMT readout*
- Currently running at JLab in Hall C

High luminosity: $7.5 \cdot 10^{37}$ cm^2/s

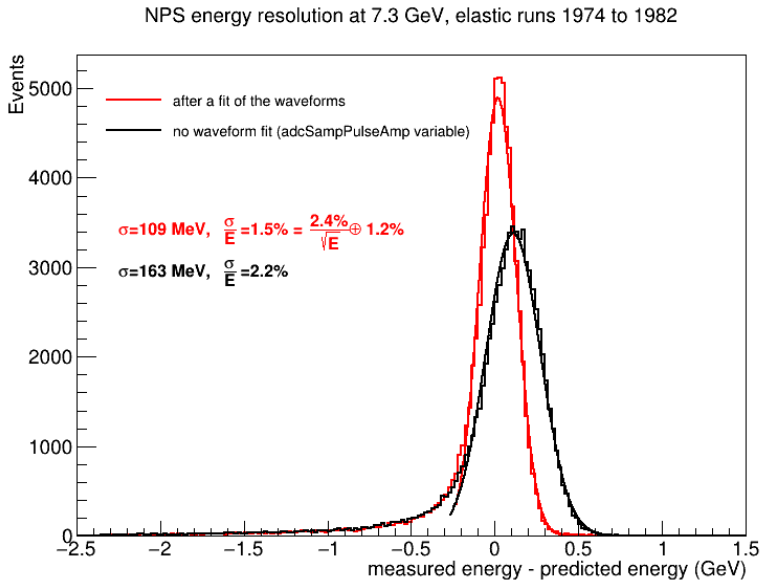


0.5W/channel = 540W total

2 months @ $7.5 \cdot 10^{37}$ cm^2/s

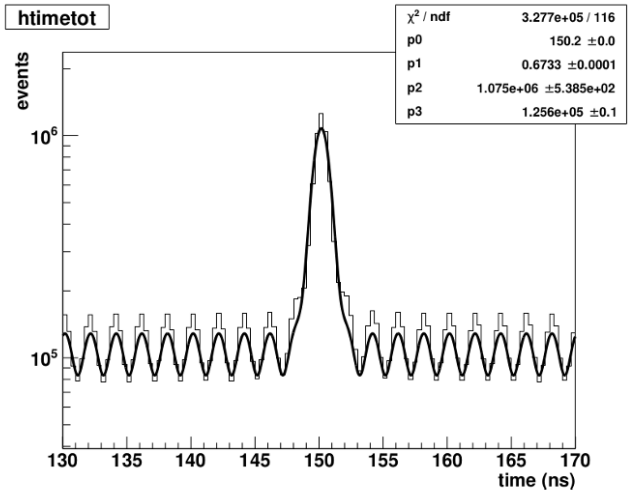


Re-calibrated with higher HV



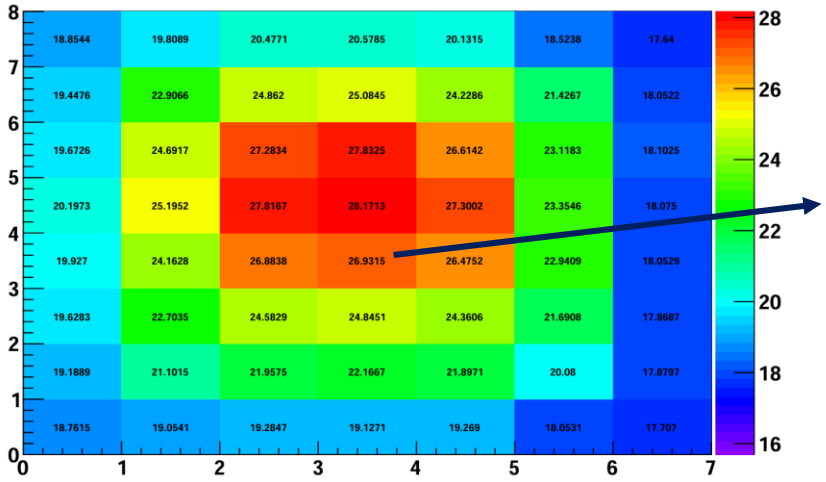
Measured energy resolution (online):

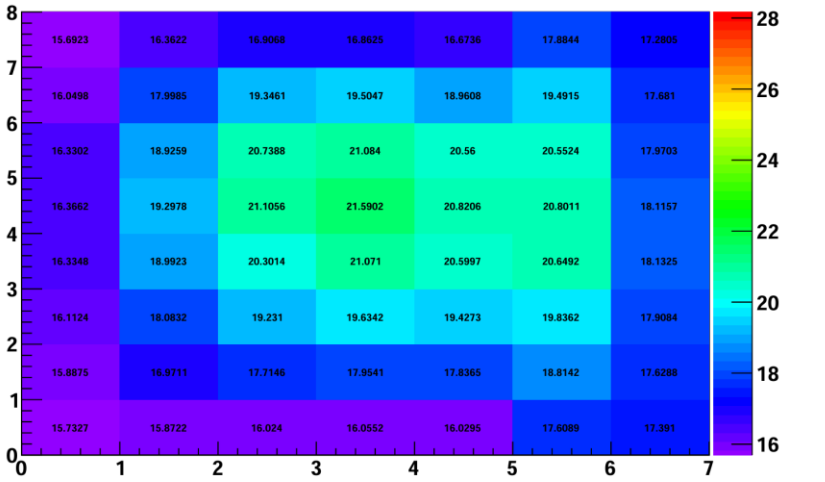
$$\frac{2.4\%}{\sqrt{E}} \oplus 1.2\%$$

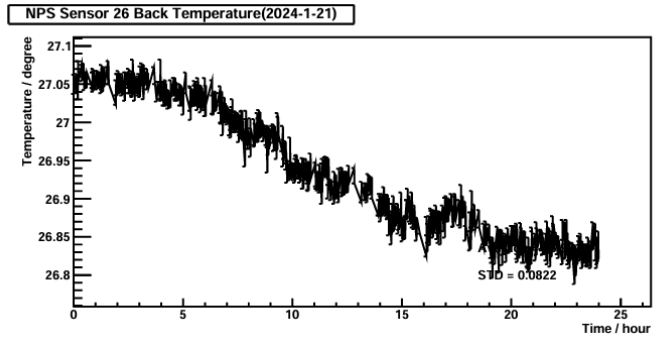


0,67 ns time resolution

NPS experience: temperature stability





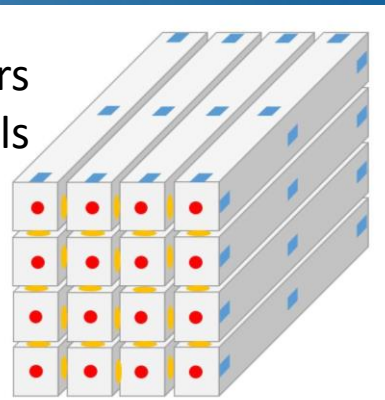


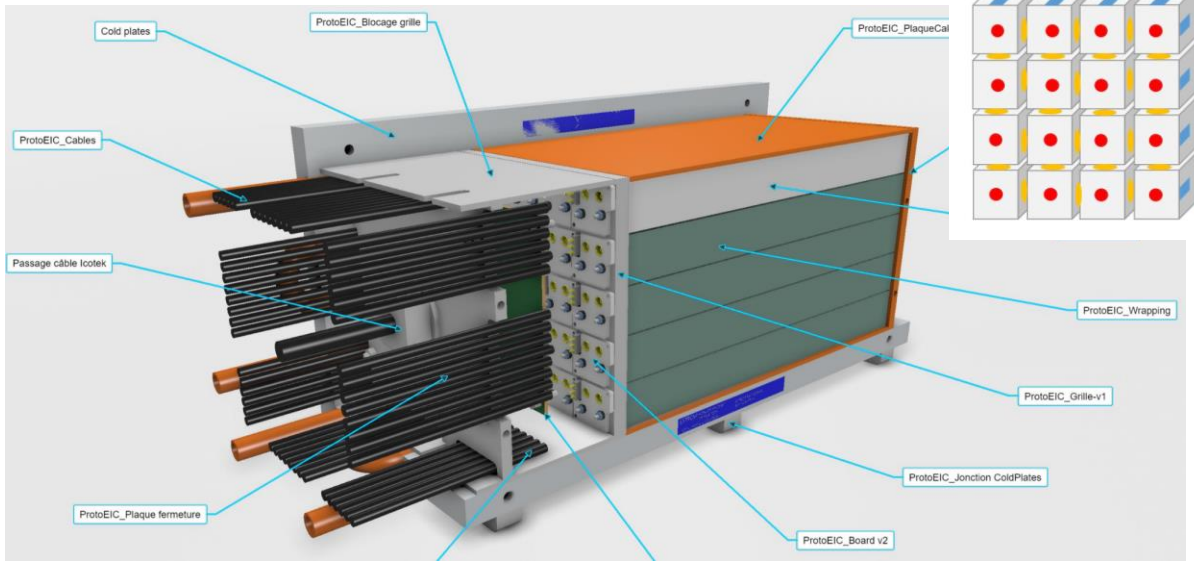
- Good stability achieved: ±0.1°C
- Very slow temperature variations: *O*(days)
- Significant gradient across the surface
- Significant gradient across crystals
- Light yield can be potentially corrected with temperature data

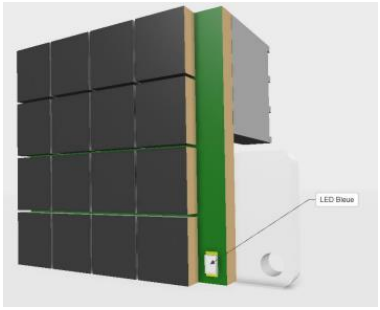
Backward Ecal: 5x5 prototype

Current design of a 5x5 SiPM readout PWO prototype

Thermal sensors along all crystals



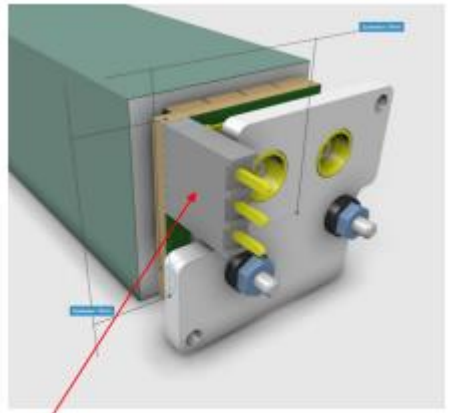




- **Primary goal:**

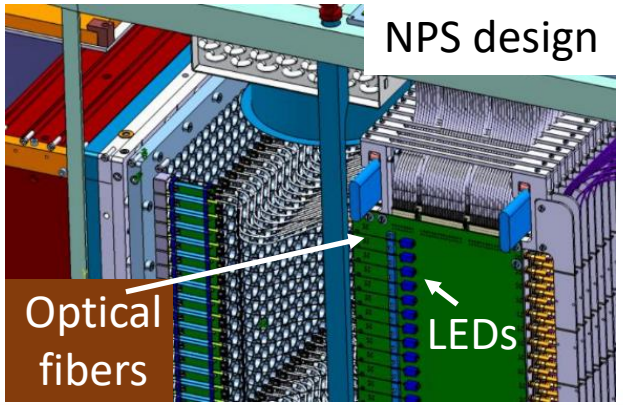
  thermal stability studies

- **Can be fully instrumented** for beam tests:
  - April/May @ CERN
  - Fall'24 @ JLab



Connector for the LED

NPS design



- **Need to test rad hardness of LEDs**
- Alternate solution: deport LED and use fibers to bring the light (solution used in NPS)