

# The POKER Calorimeter



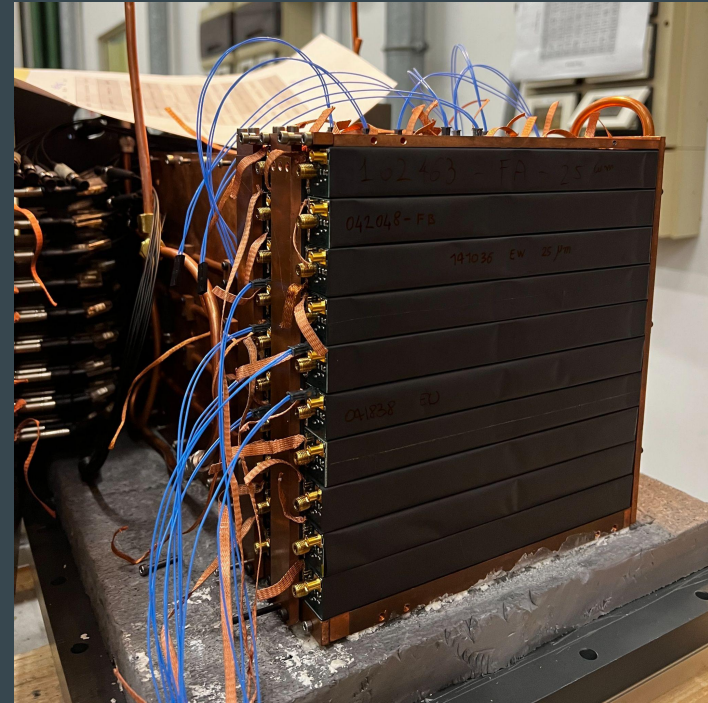
The POKER project search for Light Dark Matter production with a fixed, active target experiment, performing missing-energy measurements with high-energy positron beams.

## The POKER active target (PKR-CAL):

- A new electromagnetic calorimeter
- $\sim 100 \text{ PbWO}_4$  crystals
- SiPM-based readout system

## PKR-CAL features:

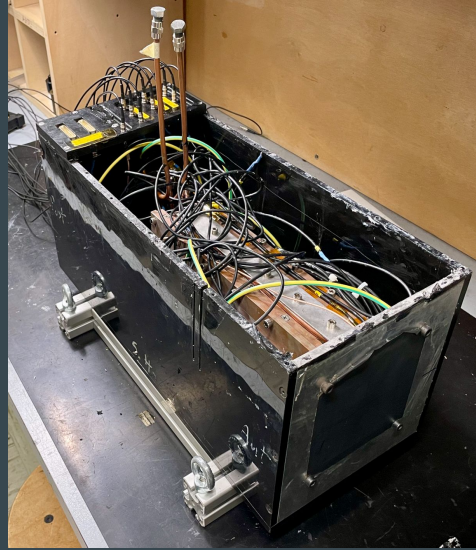
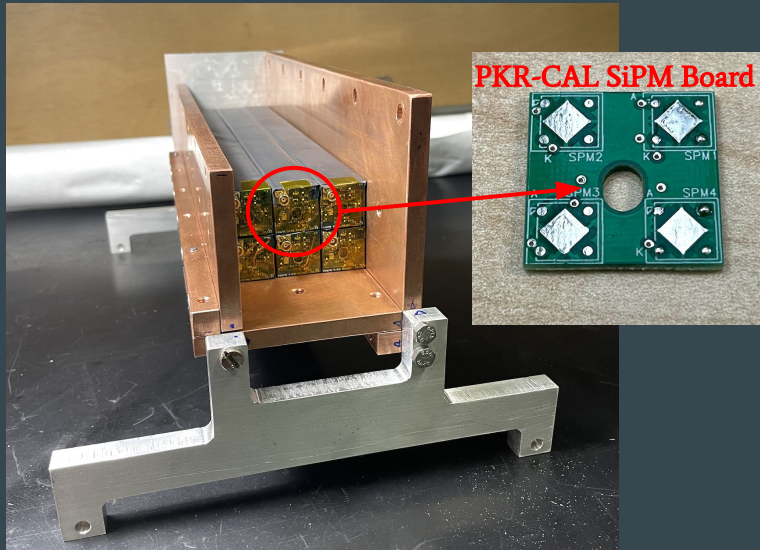
- Full hermeticity: thickness =  $32 X_0$
- Light yield  $\sim 4 \text{ phe}^-/\text{MeV}$
- Linear response in the 100 MeV - 100 GeV range
- Energy resolution:  $\sigma/E < 1\%$ ,  $E \in (10, 100) \text{ GeV}$
- Response time within 40 ns



# The POKERINO Prototype

POKERINO prototype is a small-scale prototype of the PKR-CAL detector

- 3x3 matrix of **PbWO<sub>4</sub> crystals** (CRYTUR Type-II), 2x2x20 cm<sup>3</sup>, intrinsic Light Yield ~ 100  $\gamma$ /MeV
- Each crystal is coupled with a PCB hosting 4 Hamamatsu S14160-6010 **SiPMs** (6×6 mm<sup>2</sup>, 10  $\mu$ m pixel size)
- Wrapped in reflective VM2000 and black Tedlar for light containment
- The matrix is held by a mechanical copper structure, connected to an external cooling system
- The detector is enclosed in a light-tight black box



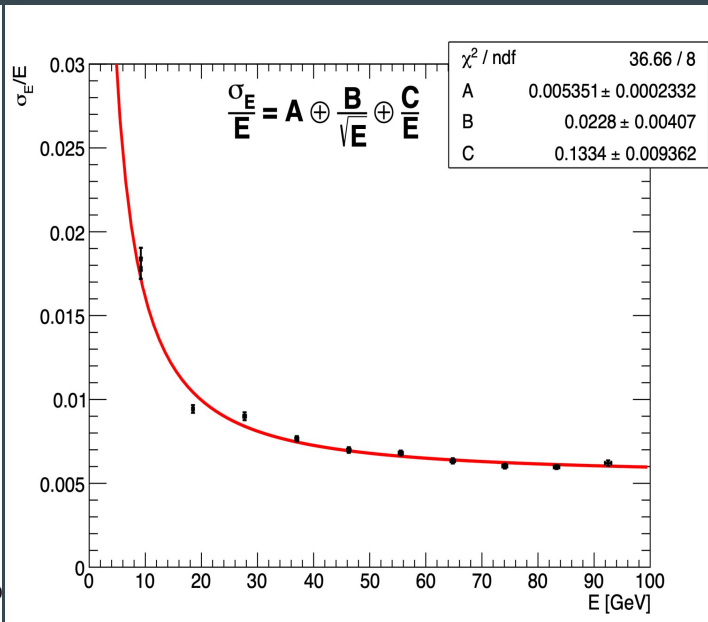
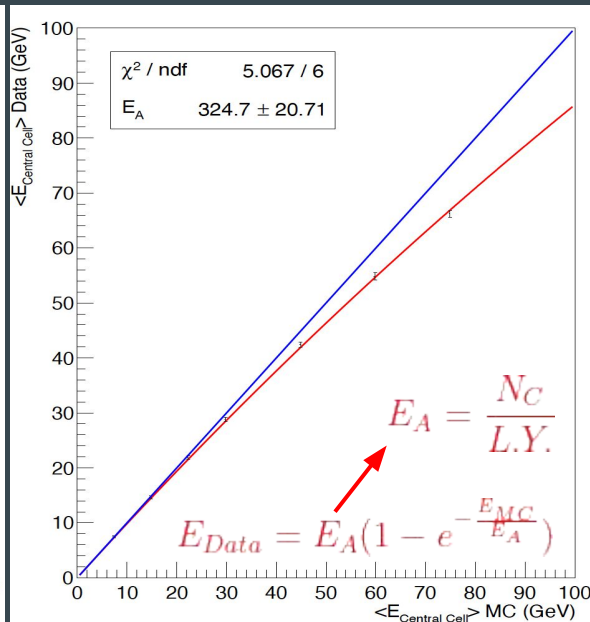
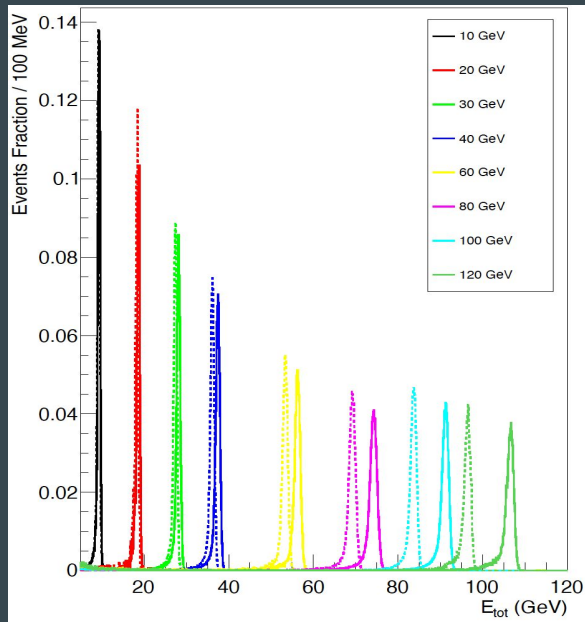
# 2024 Test Beam @CERN-SPS-H6

## Measurements:

- Pre-calibration performed with 180 GeV muons
- Energy scan with  $e^+$  beams from 10 to 120 GeV

## Results:

- SiPM saturation effects measured in experimental conditions: non-linearity is limited and correctable
- Estimated Light Yield:  $\sim 4.5$  phe/MeV, compatible with in-lab tests
- Energy resolution  $\sigma/E < 1\%$ ,  $E \in (10,100)$  GeV, compatible with the expected performance





# PKR-CAL Commissioning & First Tests

Detector assembly was completed in December 2024

- Cosmic rays and laser test were performed in Genova: all channels (except one) are working properly
- Final hardware fixing will be completed in the next month
- The detector will perform the first on-beam measurements this summer

