



UNIVERSITÀ
DI TRENTO



Istituto Nazionale
di Fisica Nucleare

TIFPA

Trento
Institute for
Fundamental
Physics and
Applications



PBR activities in Trento

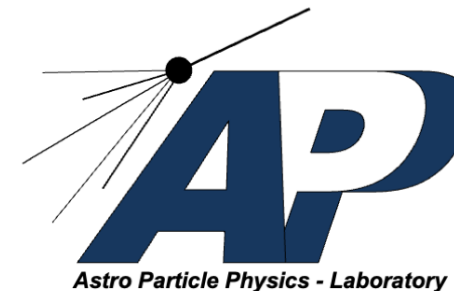
E. Ricci

Ester.ricci@unitn.it

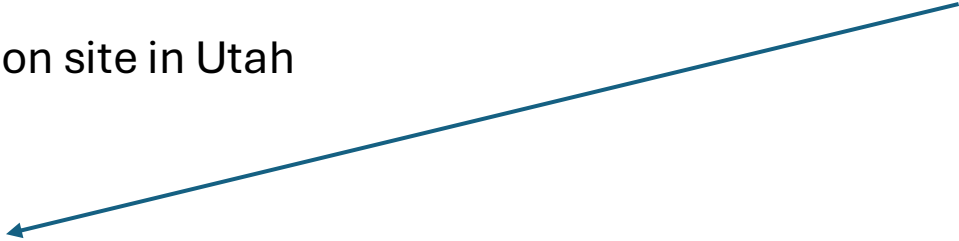
Università di Trento

INFN - TIFPA

Riunione preventivi Commissione II, 1 luglio 2025



SPB_2 activities

- EUSO-SPB2:
 - Data analysis
 - Mini-EUSO
 - mission control
 - ground flashes campaigns
 - analysis
 - EUSO-TA
 - operations on site in Utah
 - analysis,
 - upgrades
 - **PBR**
 - **CC**, FC, γ and X cameras, DAQ&DP, software, simulations
 - INFN-ASI agreements, MoUs
 - During the last months: common participation in the preparation of the response to ESA 2025 M8&F3 calls that resulted in the submission of the M-EUSO proposal
- 
- We are here!

HUGE UNCERTAINTY DUE TO NASA BUDGET CUT
But the collaboration will go on until they eventually stop us

Italian team

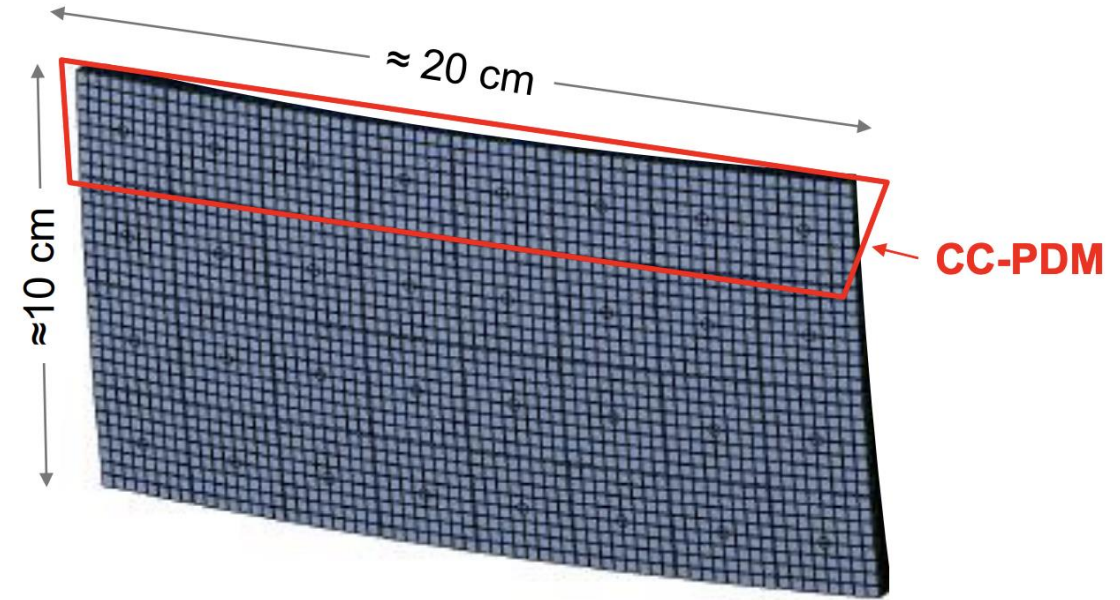
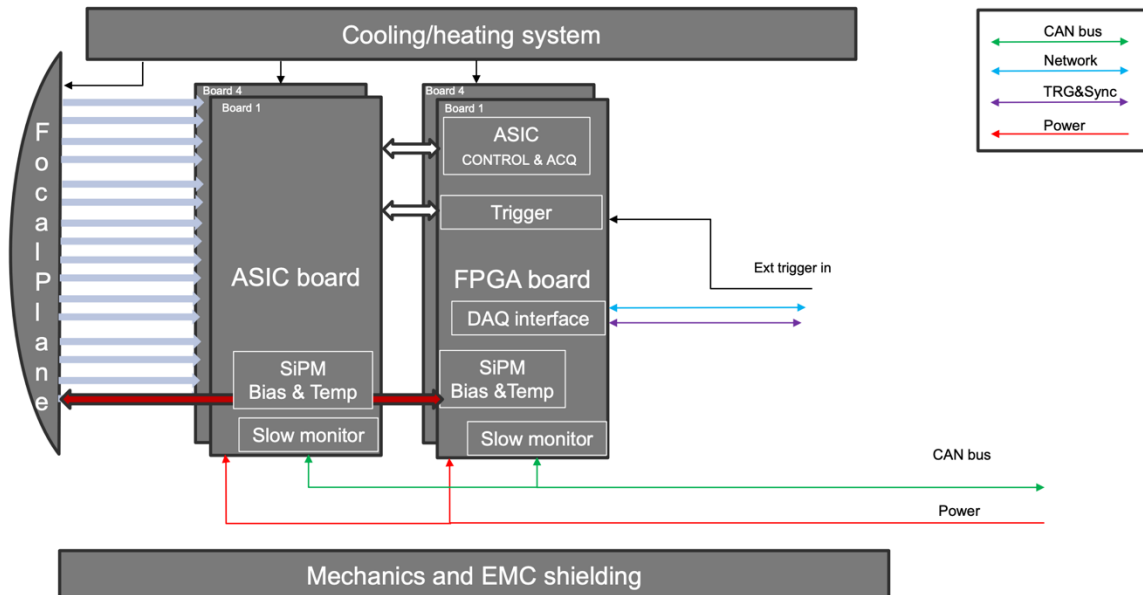
People officially involved in the JEM-EUSO activities for 2024 (SPB2, Mini-EUSO, EUSO TA, PBR, etc):

- 51 → 64 people (30 FTE) + 25% since last year
 - 58 researchers
 - 6 technologists
- 9 Institutions
 - Bari (Resp. F. Cafagna): PBR mechanics and software
 - Catania (R. Caruso): CC modules test and calibration, analysis of SPB2 and Mini-EUSO data
 - Gran Sasso Science Institute (GSSI/LNGS) (A. Di Giovanni): NUSES mission
 - Lecce (V. Scherini): Simulations
 - Napoli (G. Osteria): PBR telescope DAQ and trigger, Cherenkov Camera, simulations, tests
 - Roma Tor Vergata (M. Casolino): Mini-EUSO, EUSO TA, PBR FC DAQ, PBR CC DAQ, PBR X-gamma
 - **Trento** (TIFPA) (E. Ricci): **SiPM bias system for PBR Cherenkov camera**
 - Torino (M. Bertaina): MIZAR ASIC development for PBR, analysis of SPB2 and Mini-EUSO data
 - Trieste (Resp. R. Munini): Simulation of PBR CC

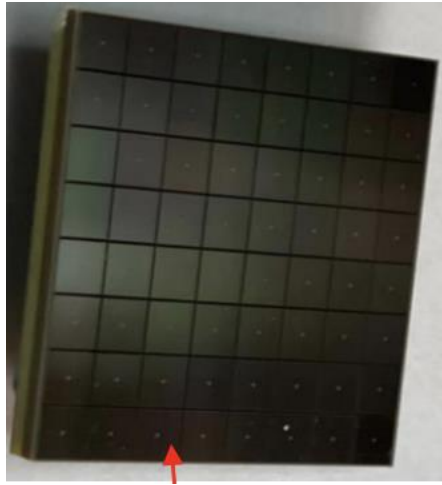
PBR CC overview

Requirements (from simulations):

- Pixel size: 3 x 3 mm²
- Pixel FoV: 0.2°
- Total FoV: 12° x 6° Implementation:
- SiPM arrays:
 - 64 pixels (8 x 8)
 - 4 x 8 = 32 SiPM arrays
 - 2048 pixels
 - **four CC-PDMs** (1x8 SiPM arrays, 512 pixels)

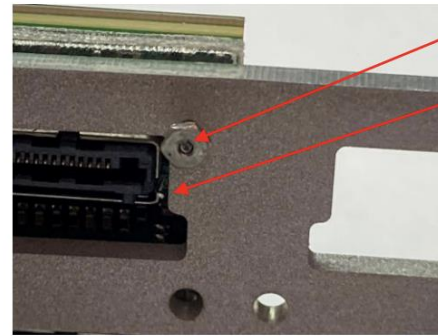


- Each CC-PDM is connected to an ASIC board (two solutions under investigation)
- The ASIC board is connected to an FPGA board
- In the current design the **SiPM bias system is hosted on the FPGA board**
- The desing is not frozen yet

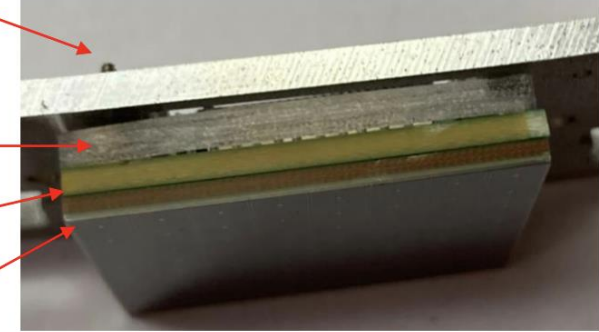


SiPM matrix: Hamamatsu S13361-3050AE-08
Procurement completed.
Assembly of elementary cells ongoing

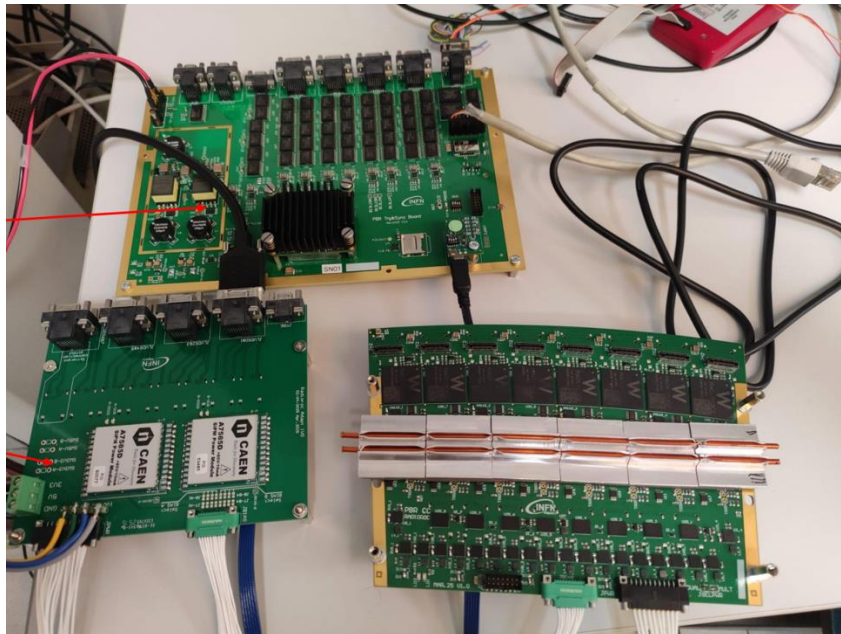
CC status



- M1 screw
- (Samtec) 40 positions LSHM-120-...
- 3D printed spacers
- Custom PCB
- S13361-3050AE-08



40 elementary cells manufactured
30 FM quality



Readout solutions:

- Weeroc Radioroc
 - Board in production
 - More complex, lower performance
 - Off-the-shelf components
- MIZAR ASIC:
 - Developed by INFN-TO.
 - First batch arrived in April
 - Characterisation ongoing
 - No major issues spotted until now!!!

Bias system

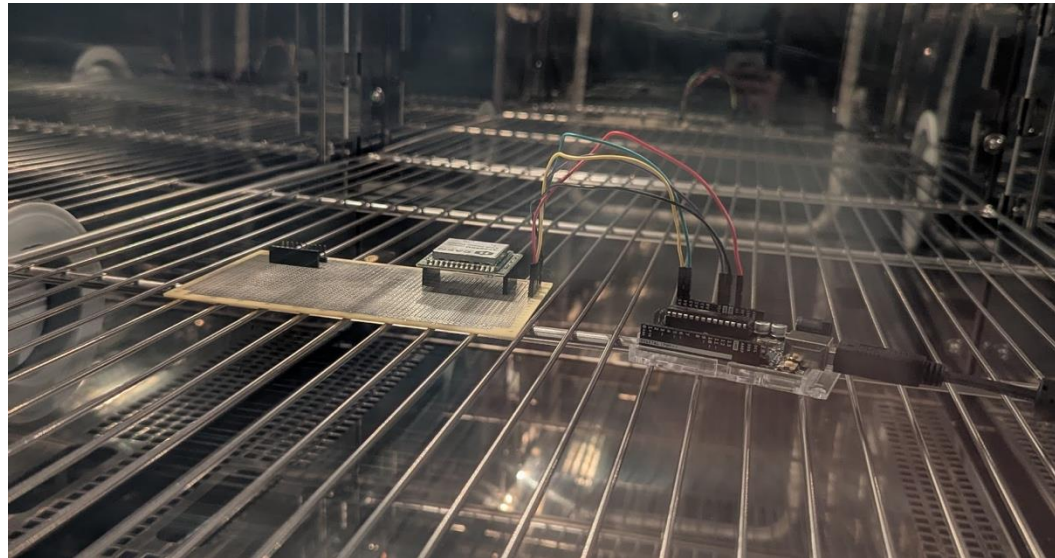
To optimize the performance of the SiPM matrices, each of them should **be powered independently** with a source that can **adapt with the temperature**

- Limited off-the-shelf solutions
- No devices with the required temperature range (-30° to +85°, industrial standard)
- Limited time, a custom solution is currently not viable
- Device selected: **CAEN A7585**
 - Not qualified in temperature
 - Big device (3x3 cm²). The space is limited on the board
- Component under test at TIFPA for temperature qualification (**ongoing**)
- Already integrated on the FPGA board design
- Due to limited space, we decided to use **one power supply for two SiPM matrices**



Ongoing tests

- We are using a version of the **A7585** that can be read using USB port connected to an Arduino
- The setup is inside the climate chamber and thermal cycles are run on the setup
- The test started yesterday (29/6/2025) and are ongoing smoothly for now



People and requests

Under construction, we need to agree how to split the FTEs of people involved in connected projects

Person	Current position	FTE
E. Ricci (Loc. Resp)	RTDa UNITN	0.3
<i>F. Acerbi</i>	<i>FBK</i>	<i>0.3</i>
<i>A. Ficorella</i>	<i>FBK</i>	<i>0.2</i>
<i>A. Gola</i>	<i>FBK</i>	<i>0.2</i>
<i>S. Merzi</i>	<i>FBK</i>	<i>0.3</i>
<i>G. Paternoster</i>	<i>FBK</i>	<i>0.2</i>
TOTALE		1.5

Spesa	Richieste
Missioni (turni integrazione e test in USA, Europa e Italia)	10k
Consumabili (materiale per climate chamber, componenti per test di caratterizzazione materiale spare)	2k
TOTALE	12k

Status spese 2025:
Assegnato: 16 k
Speso: 3k

Le richieste di missione sono calibrate in accordo con la collaborazione in base ai test in cui la sezione è coinvolta.