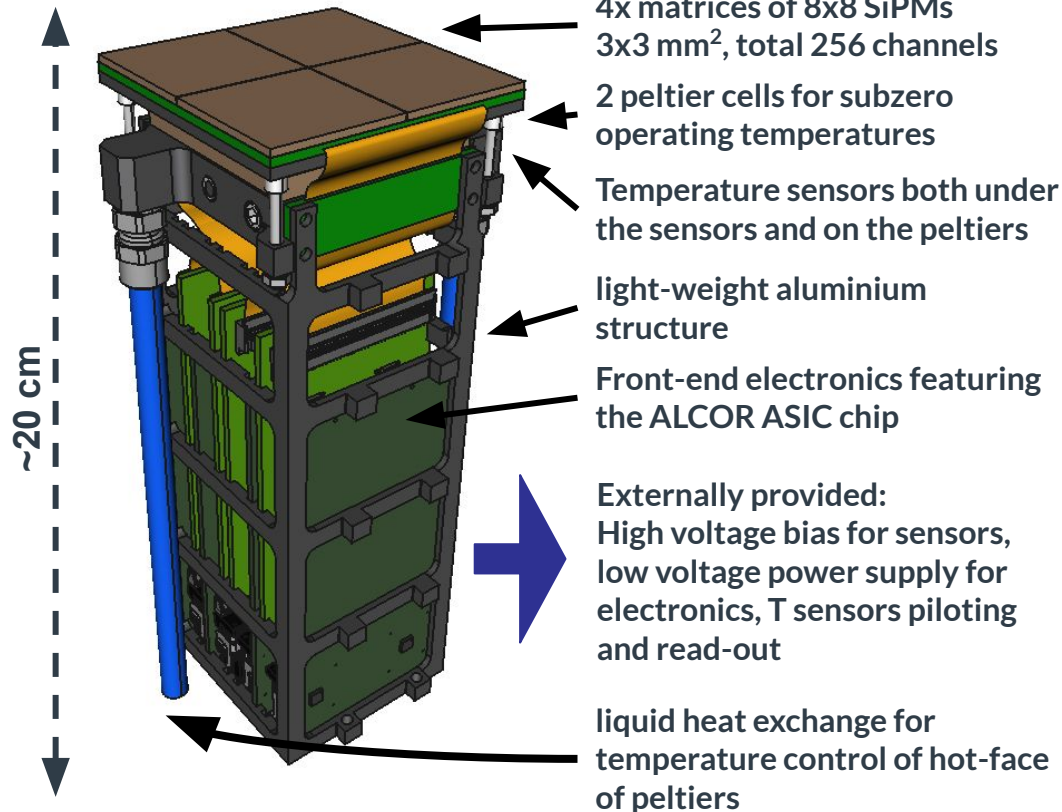


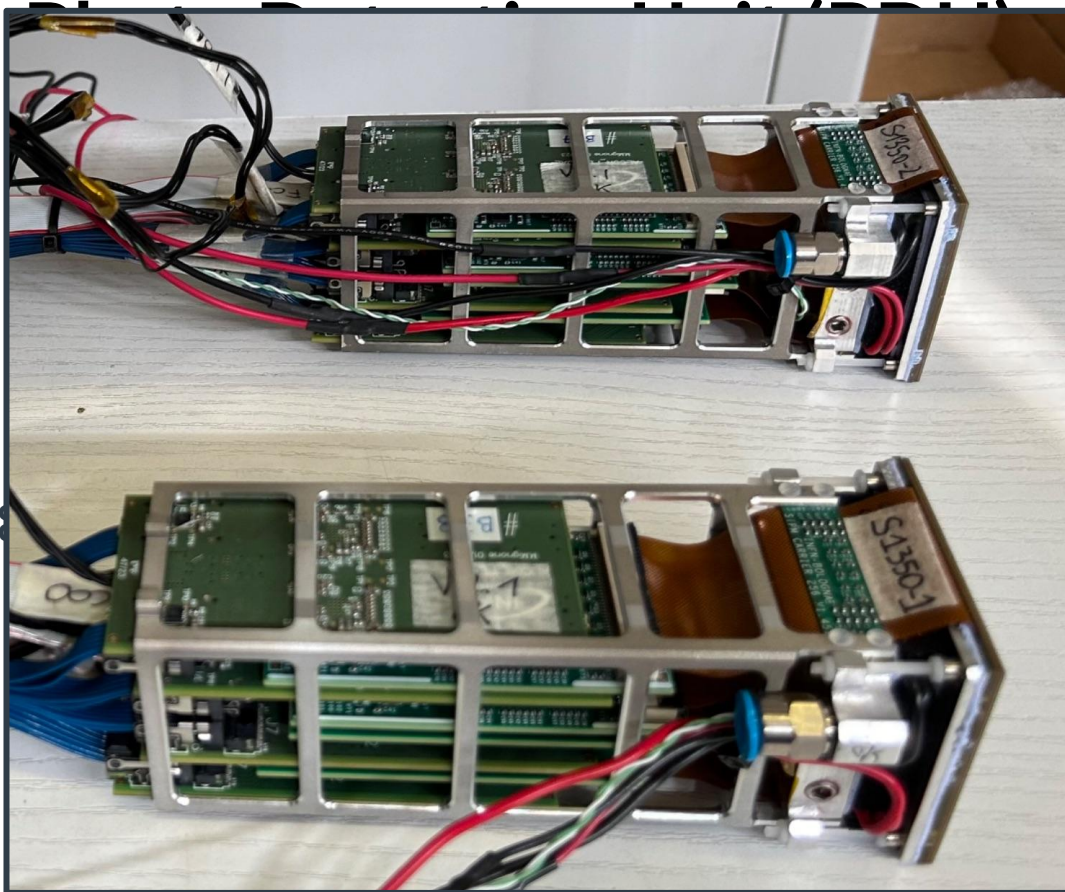
# dRICH test beam: results

Nicola Rubini (1)

(1) INFN Bologna  
28 June 2024

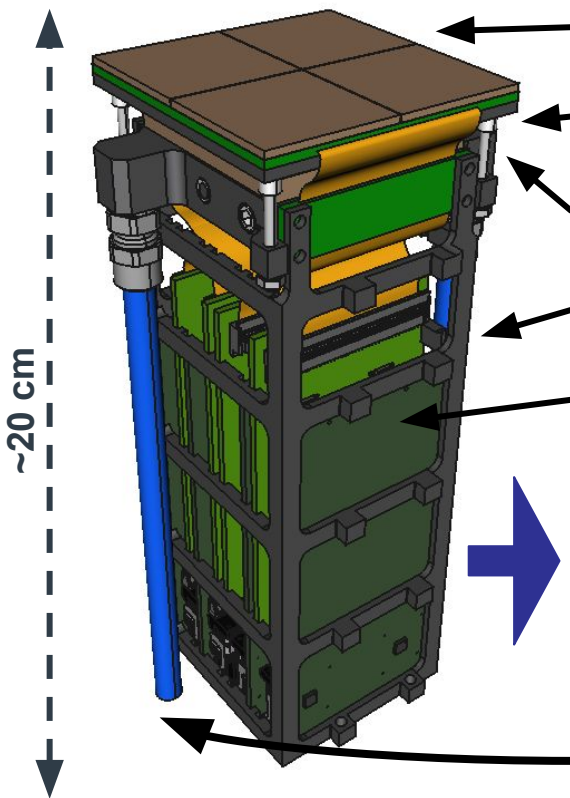
# Photo Detection Unit (PDU)





operatore

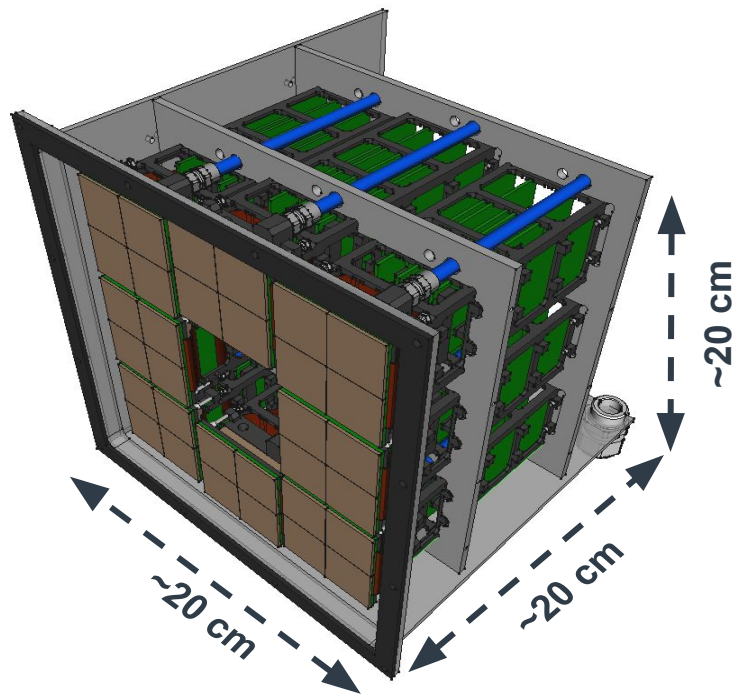
# Photo Detection Unit (PDU)



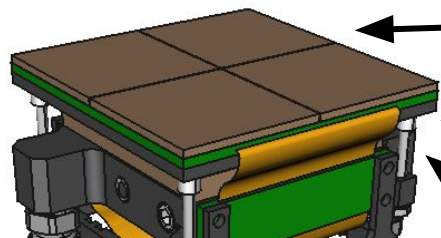
- 4x matrices of 8x8 SiPMs  
3x3 mm<sup>2</sup>, total 256 channels
- 2 peltier cells for subzero operating temperatures
- Temperature sensors both under the sensors and on the peltiers
- light-weight aluminium structure
- Front-end electronics featuring the ALCOR ASIC chip
- Externally provided:  
High voltage bias for sensors,  
low voltage power supply for electronics, T sensors piloting and read-out
- liquid heat exchange for temperature control of hot-face of peltiers

# Prototype

Compact solution for a ~18 cm<sup>2</sup> of active area, reading 2048 channels



# Photo Detection Unit (PDU)

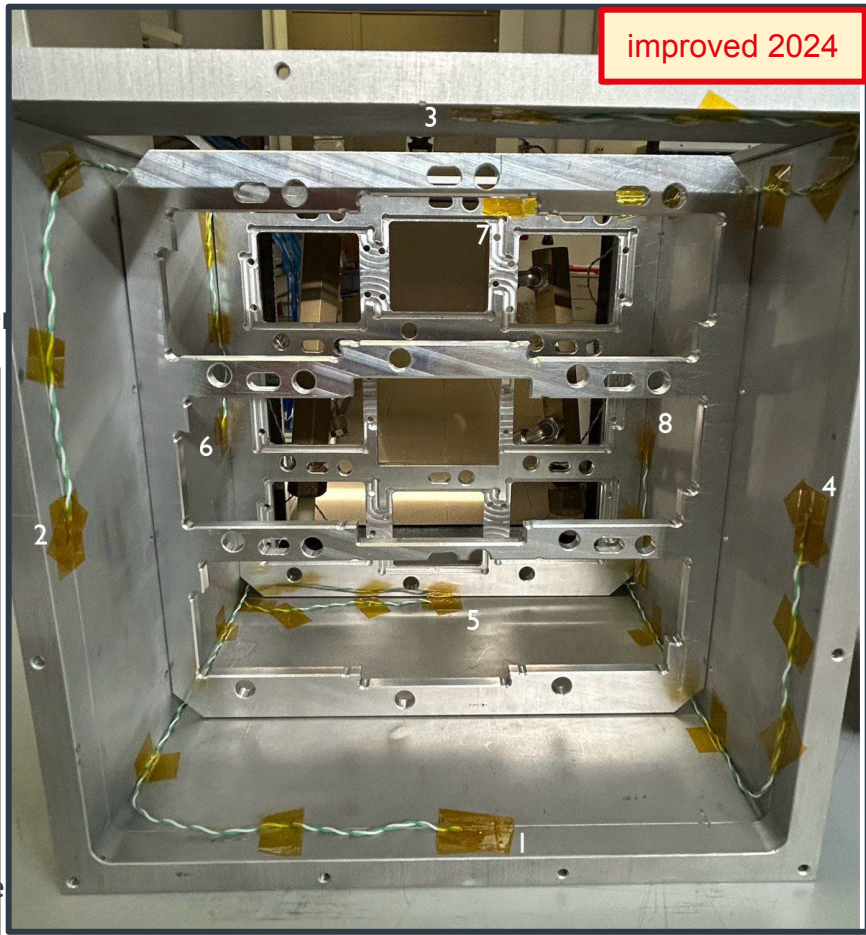


4x matrices of 8x8 SiPMs  
 3x3 mm<sup>2</sup>, total 256 channels

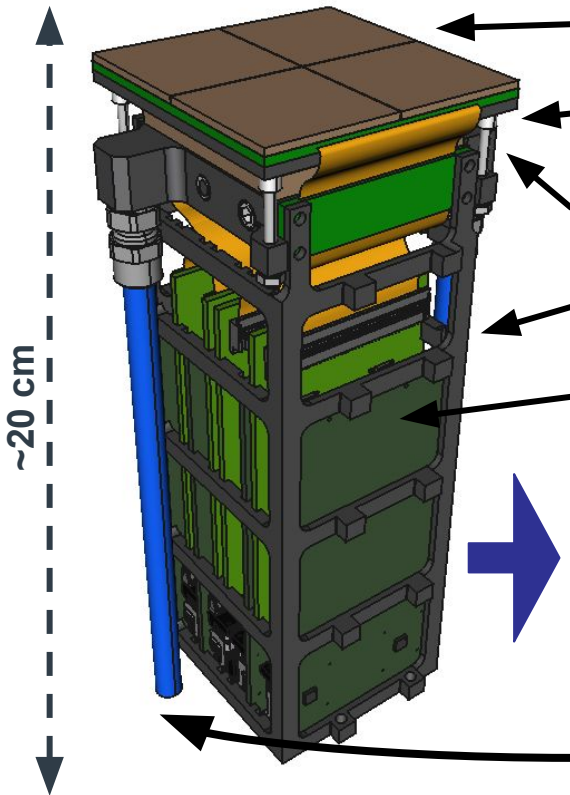
2 peltier cells for subzero  
 operating temperatures

Temperature sensors both under  
 the sensors and on the peltiers

improved 2024



# Photo Detection Unit (PDU)



4x matrices of 8x8 SiPMs  
3x3 mm<sup>2</sup>, total 256 channels

2 peltier cells for subzero  
operating temperatures

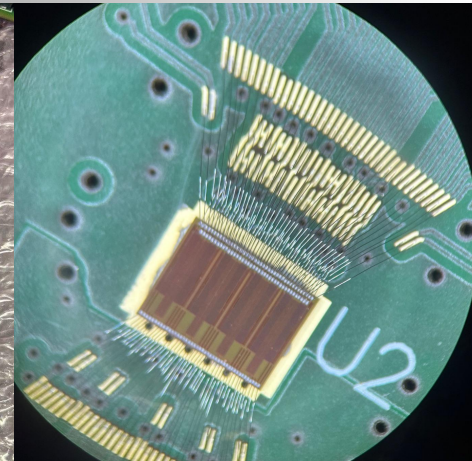
Temperature sensors both under  
the sensors and on the peltiers

light-weight aluminium  
structure

Front-end electronics featuring  
the **ALCOR ASIC** chip

Externally provided:  
High voltage bias for sensors,  
low voltage power supply for  
electronics, T sensors piloting  
and read-out

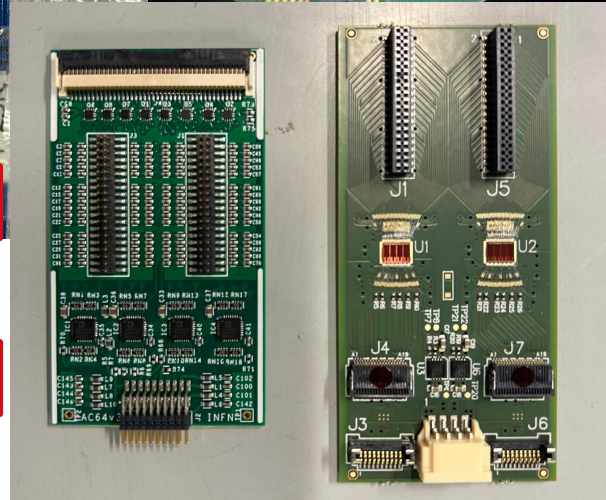
liquid heat exchange for  
temperature control of hot-face  
of peltiers



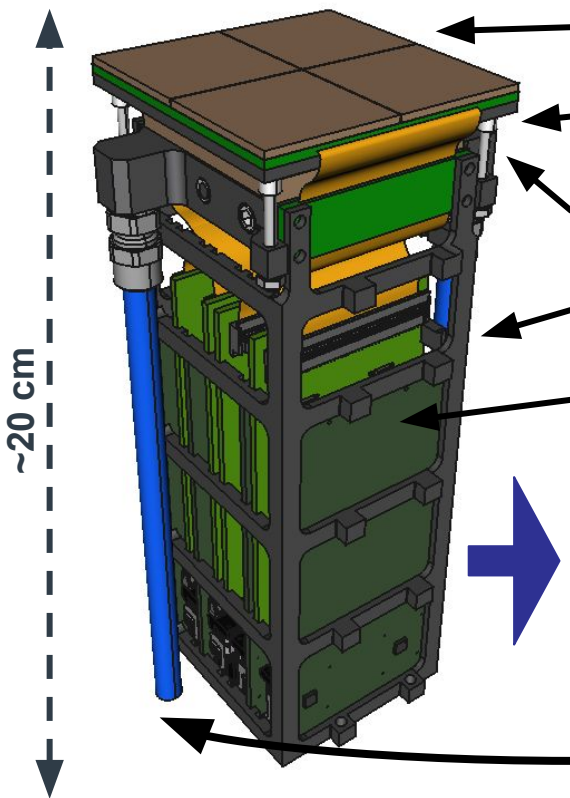
improved 2024

we installed  
ALCOR v2.1

studied in 2023

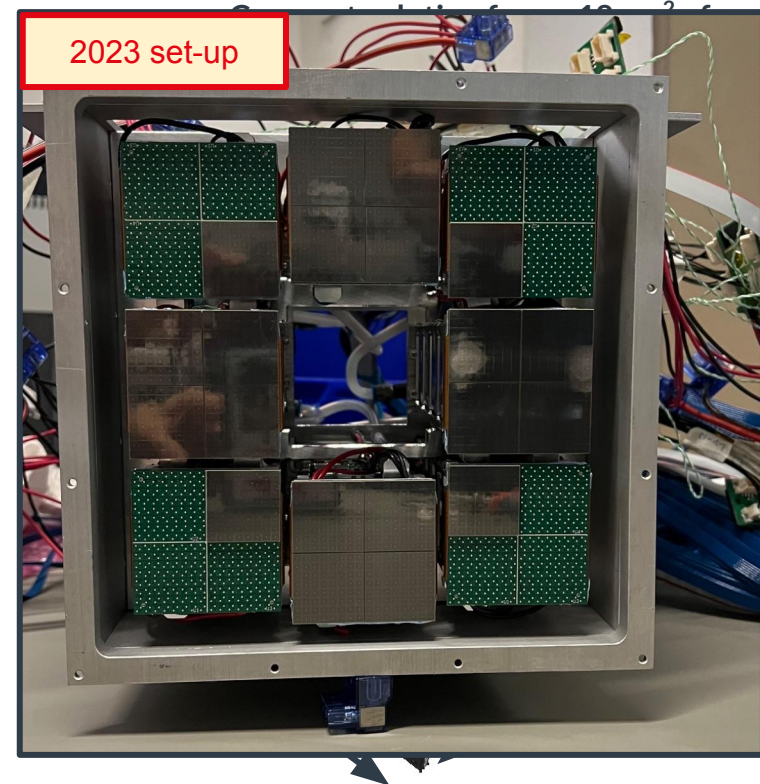


# Photo Detection Unit (PDU)



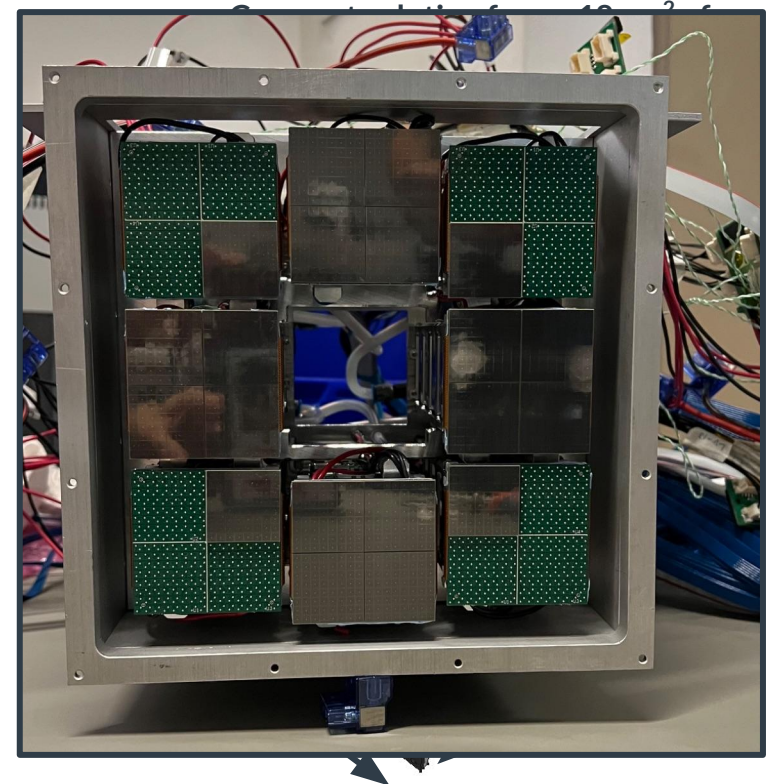
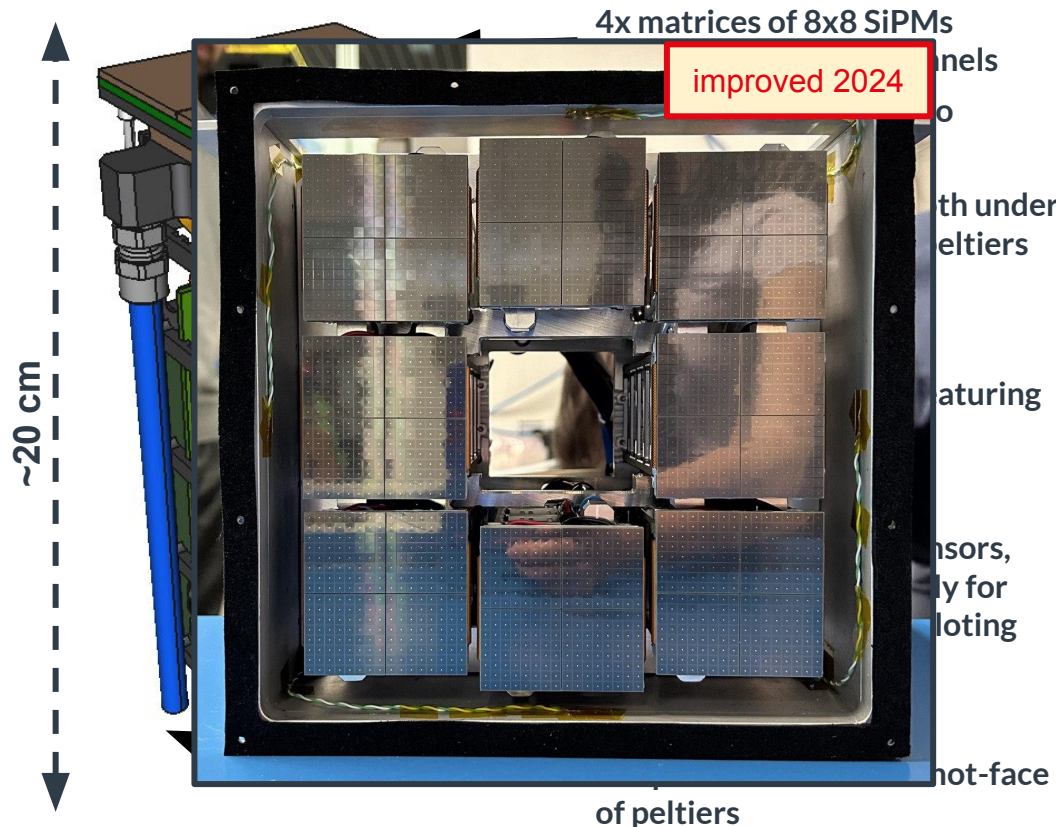
- 4x matrices of 8x8 SiPMs  
 3x3 mm<sup>2</sup>, total 256 channels
- 2 peltier cells for subzero operating temperatures
- Temperature sensors both under the sensors and on the peltiers
- light-weight aluminium structure
- Front-end electronics featuring the ALCOR ASIC chip
- Externally provided:  
 High voltage bias for sensors,  
 low voltage power supply for electronics, T sensors piloting and read-out
- liquid heat exchange for temperature control of hot-face of peltiers

# Prototype



# Photo Detection Unit (PDU)

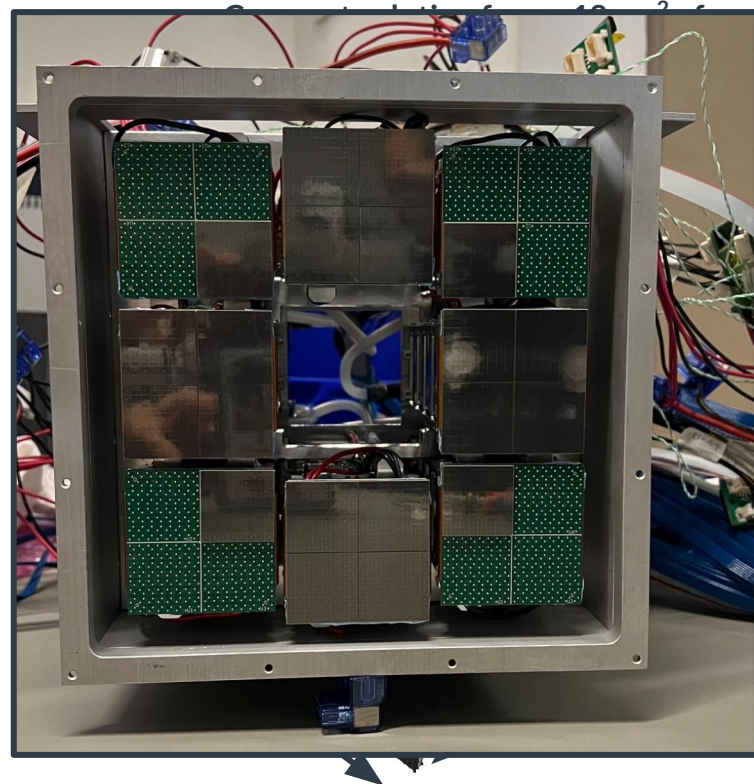
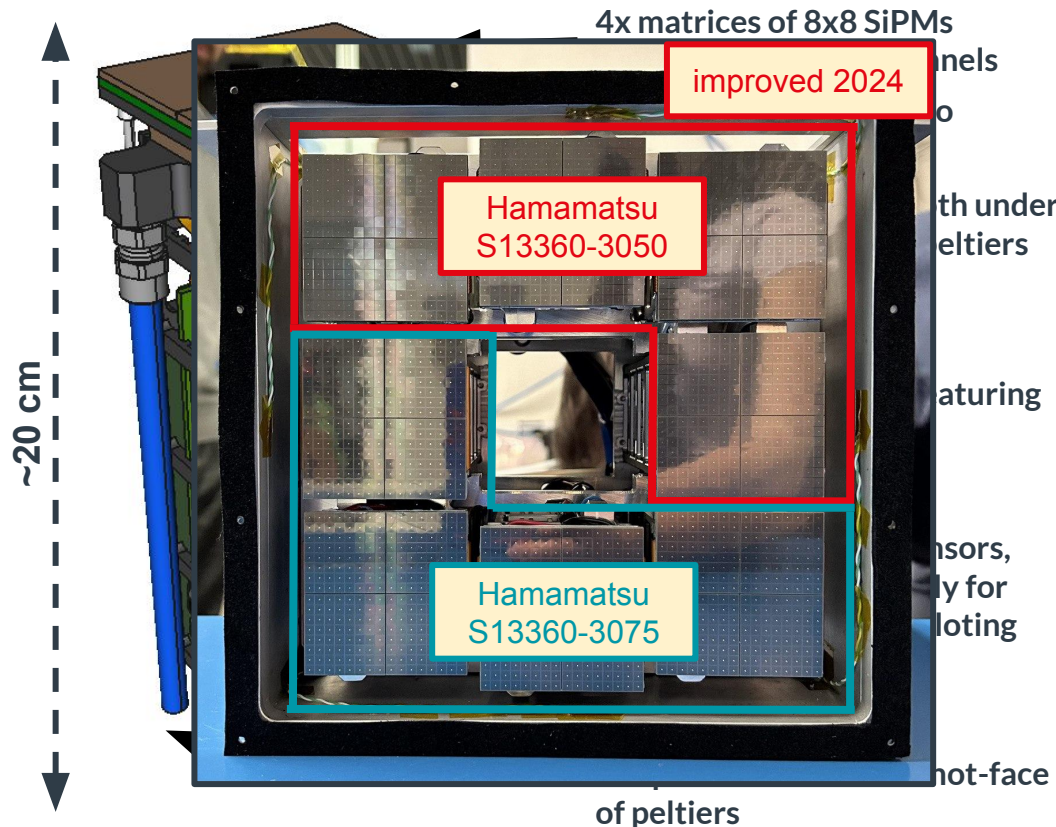
# Prototype





# Photo Detection Unit (PDU)

# Prototype



# Disclaimer

2023:

focus on detector, electronics, sensors  
 same beam, different detector configurations

2024:

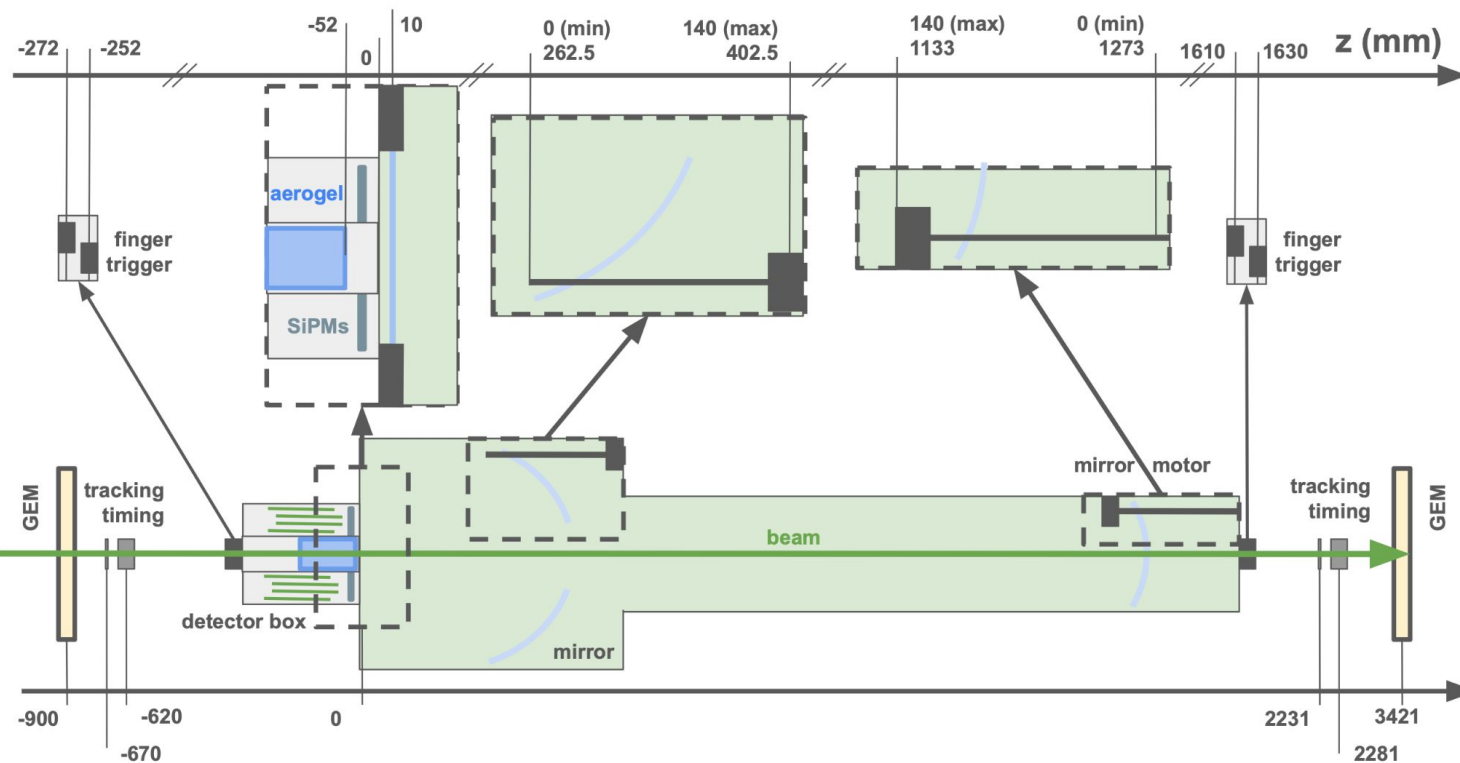
focus on light, radiators, sensors  
same detector configuration, different beam



**Still preliminary!**



# Experimental set-up



# Experimental set-up

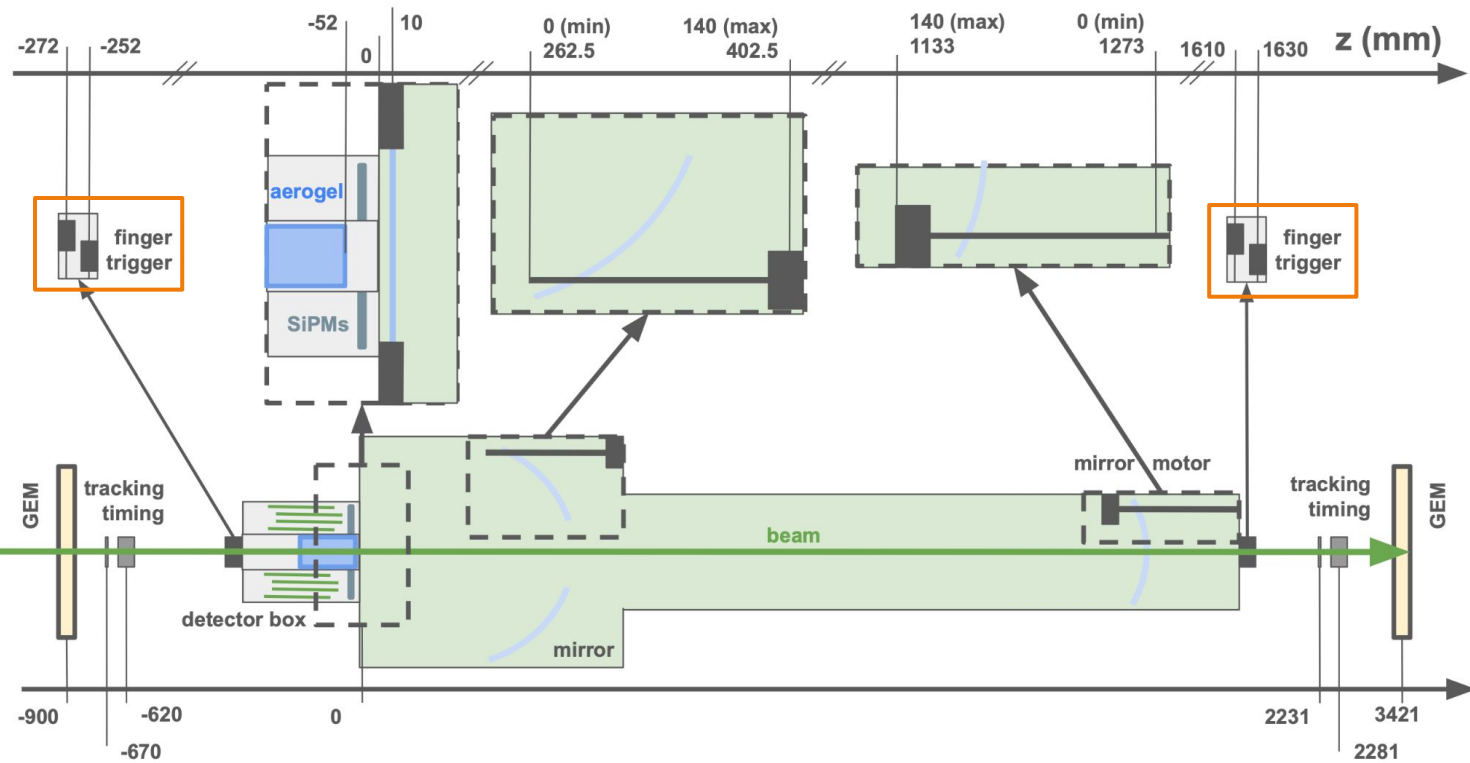
-52 | 10      0 (min)      140 (max)      140 (max)      0 (min)      z (mm)



# Experimental set-up

**SAME**

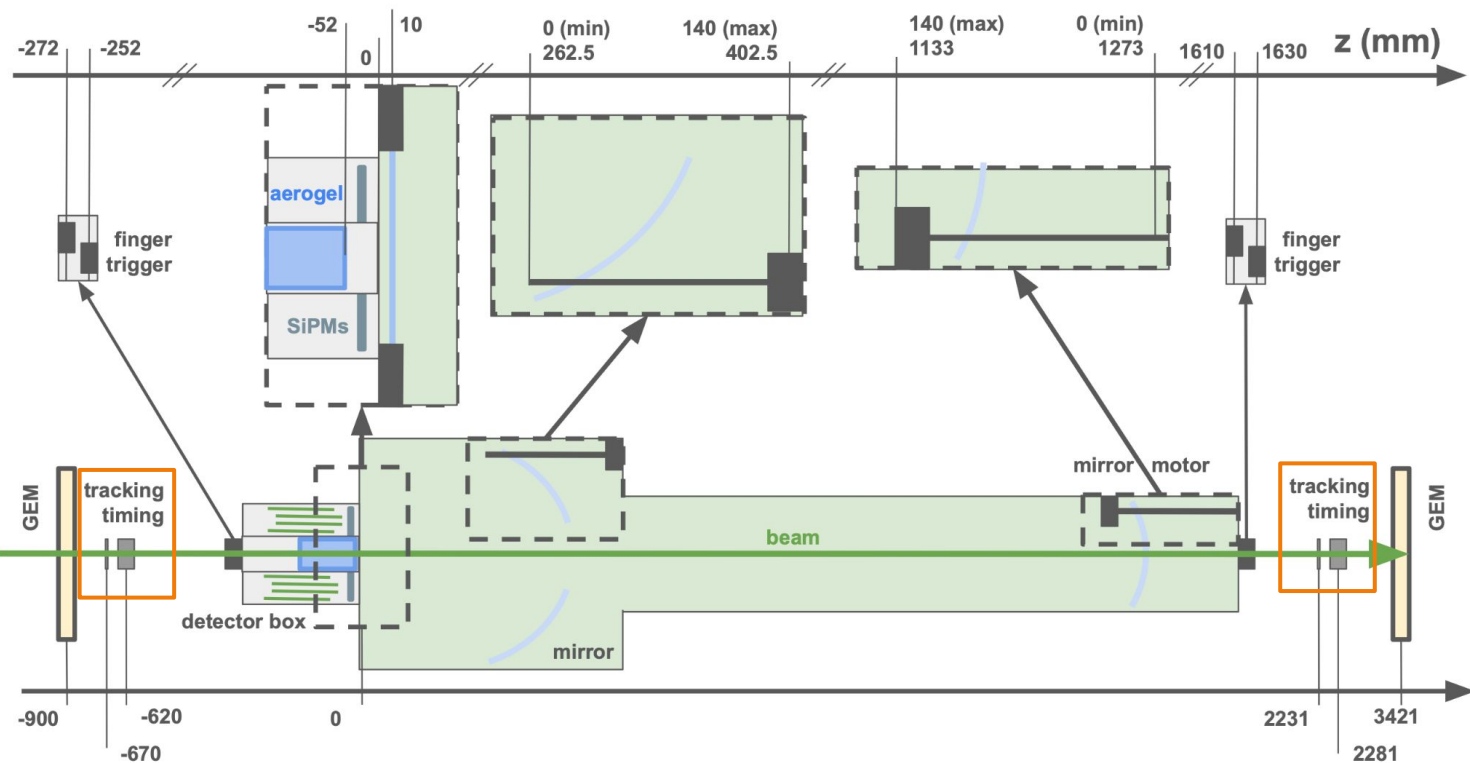
The main trigger was a finger scintillator positioned up- and down-stream



# Experimental set-up

**NEW**

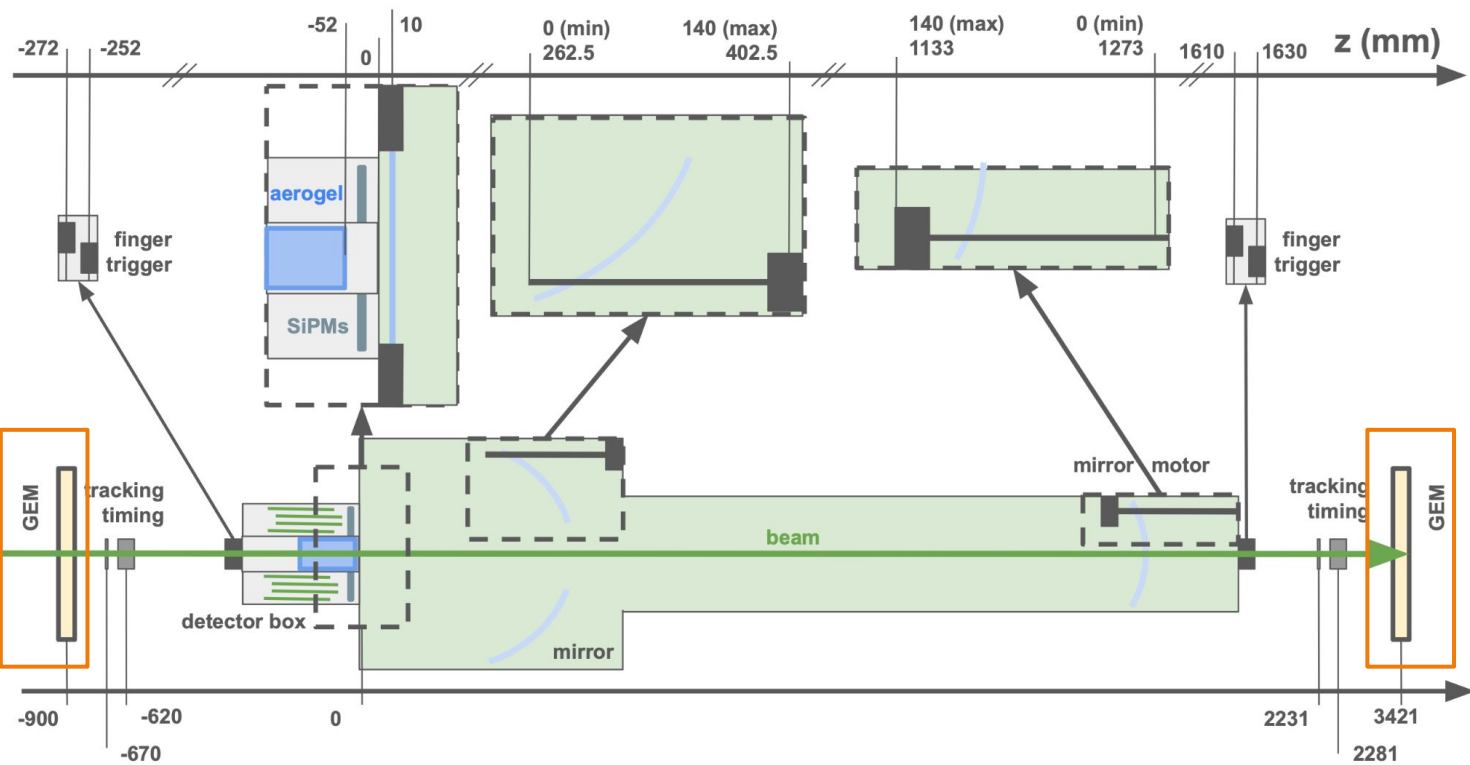
we installed a new timing and tracking system based on SiPM w/ ALCOR readout



# Experimental set-up

**NEW**

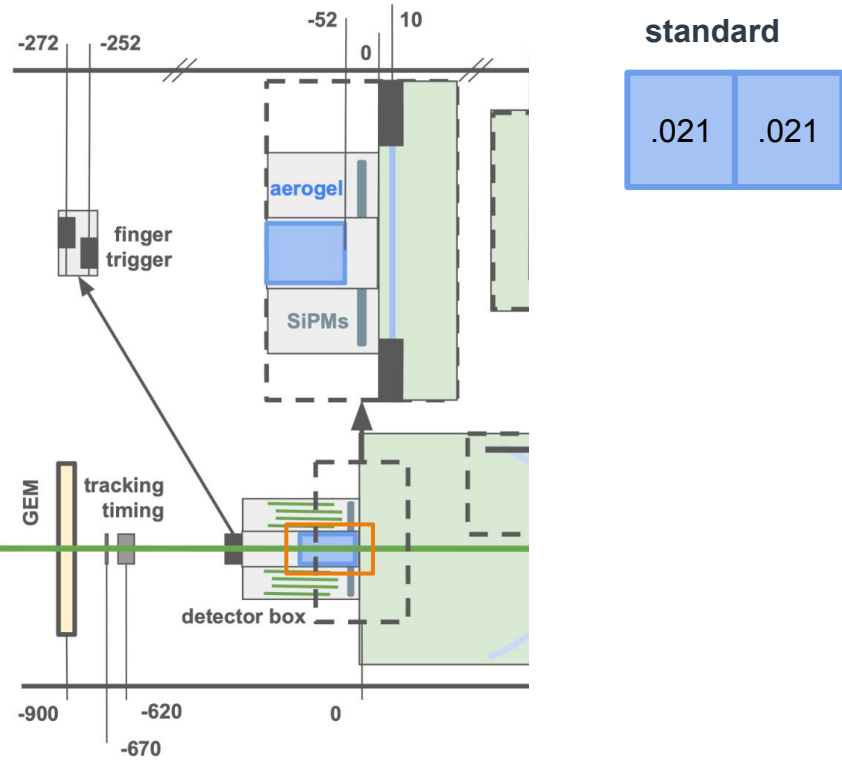
we now have a portion of the runs where the GEM information is available



# Experimental set-up: aerogel

**NEW**

We worked on the aerogel radiator

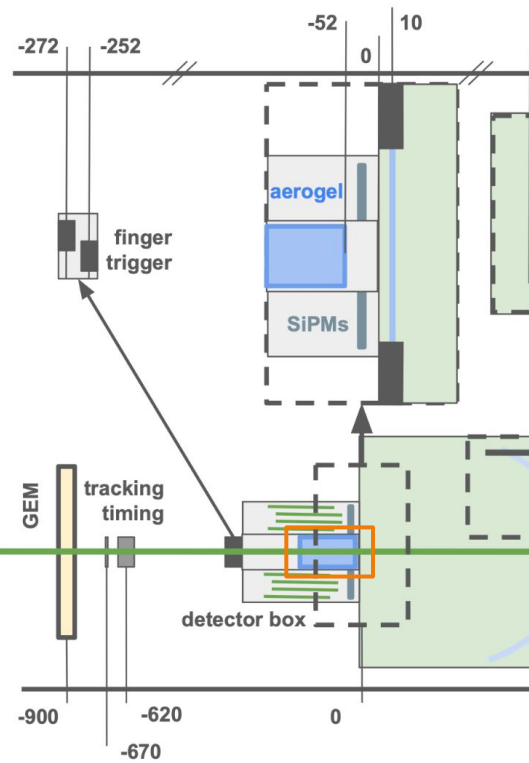




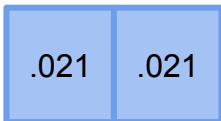
# Experimental set-up: aerogel

**NEW**

We worked on the aerogel radiator:  
 - different number of tiles



standard



background

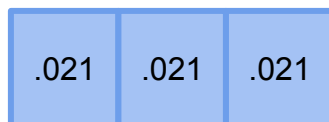


background analysis!

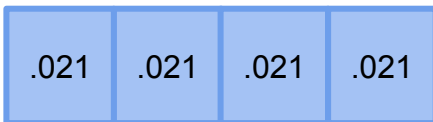
single



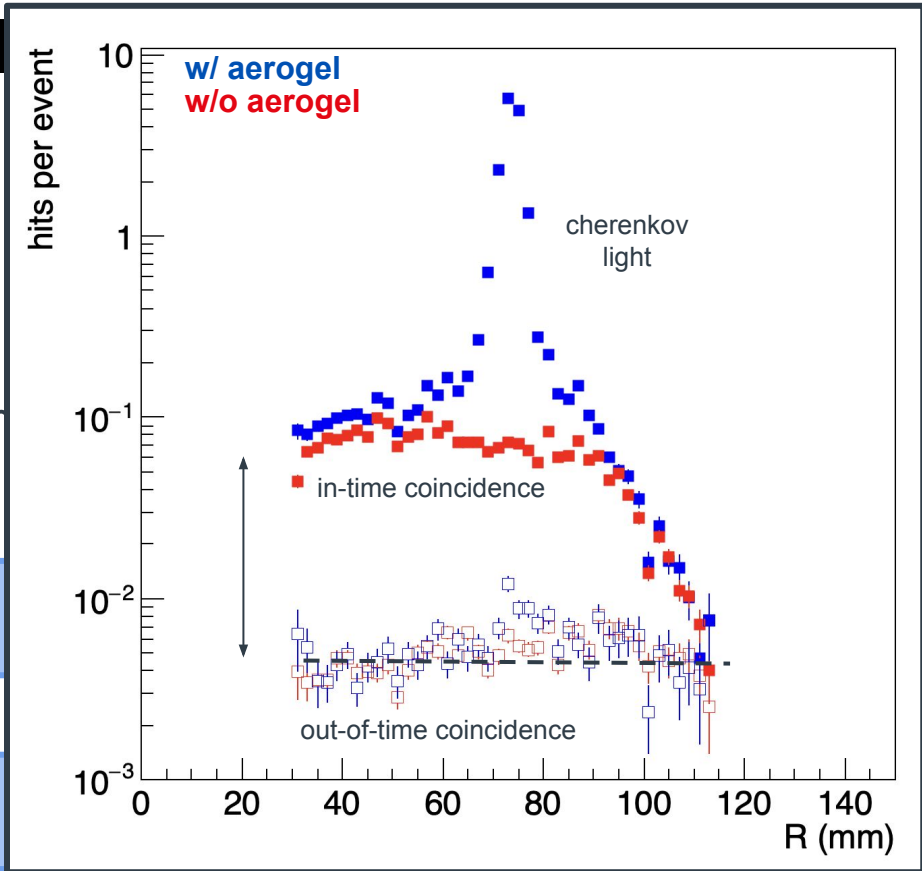
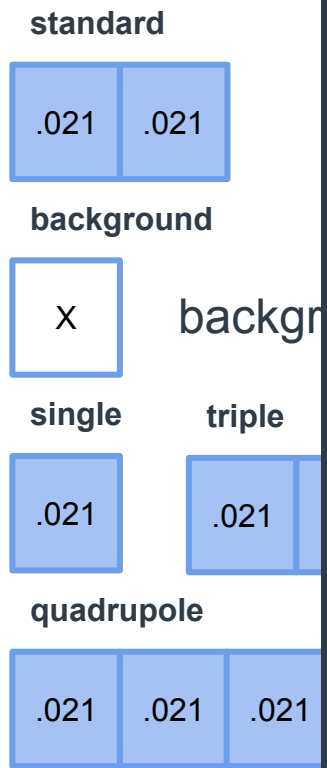
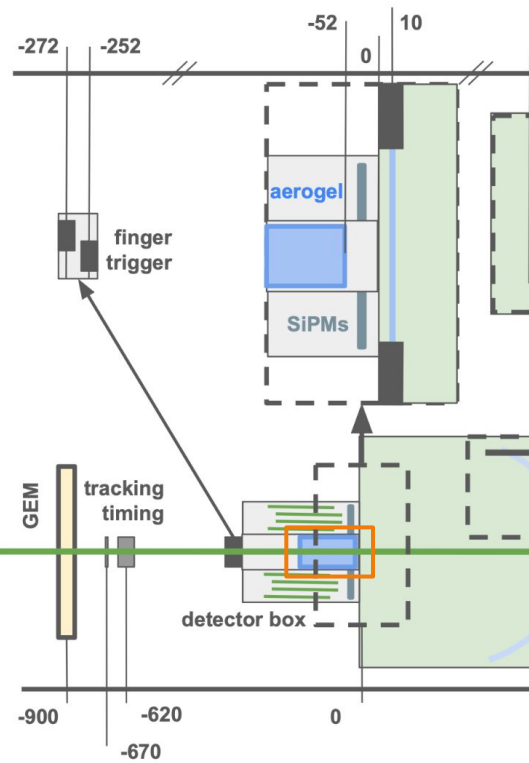
triple



quadrupole



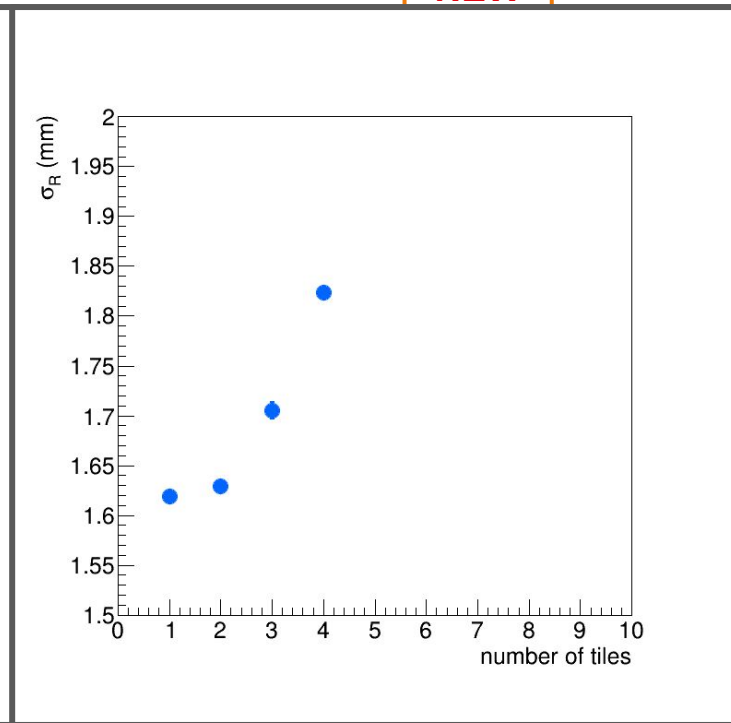
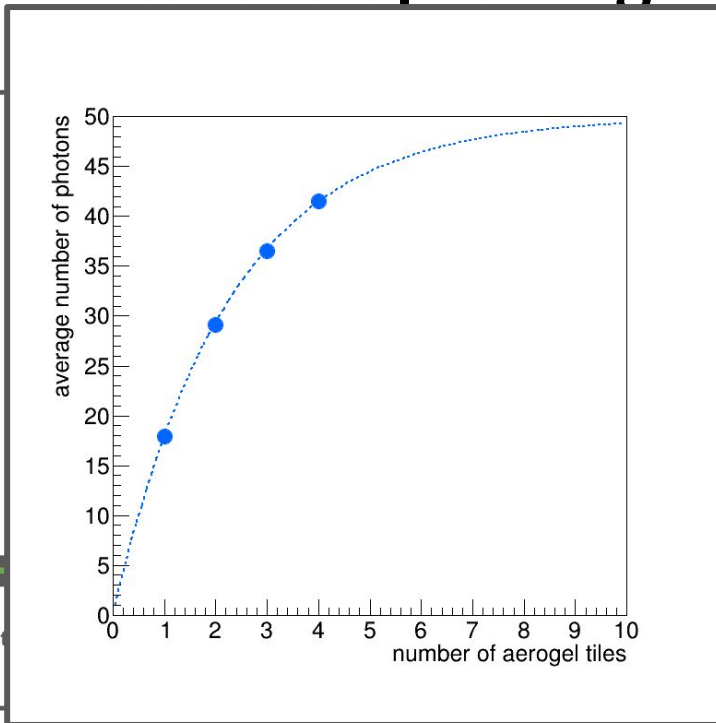
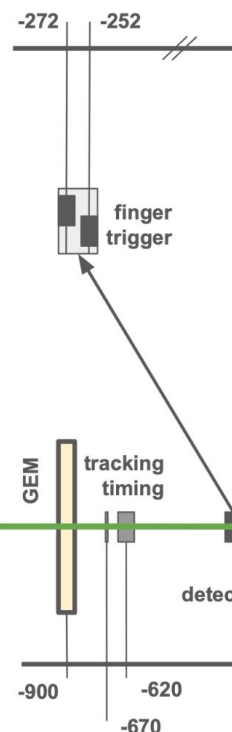
# Experimental set-up: aerogel



# Experimental set-up: aerogel

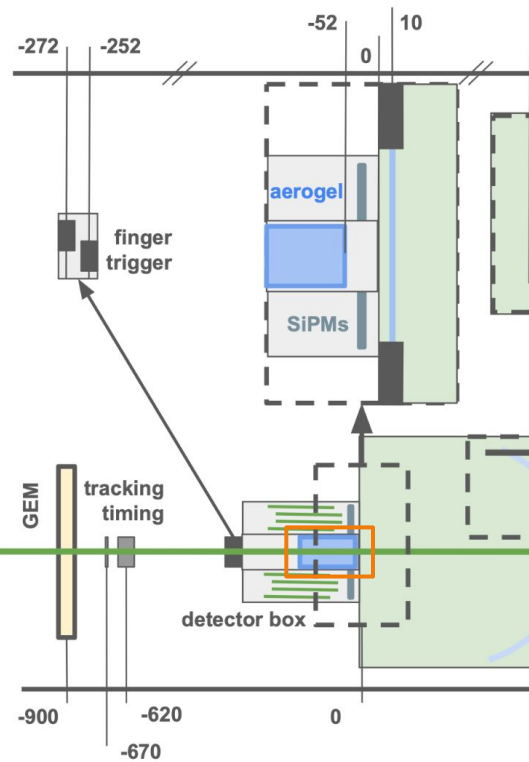
**NEW**

the  
 r:  
 umber

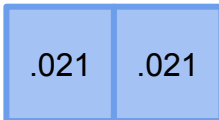


.021 .021 .021 .021

# Experimental set-up: aerogel



standard



background

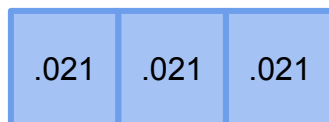


background analysis

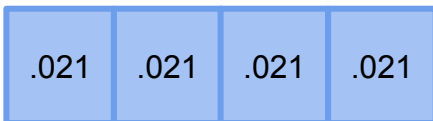
single



triple



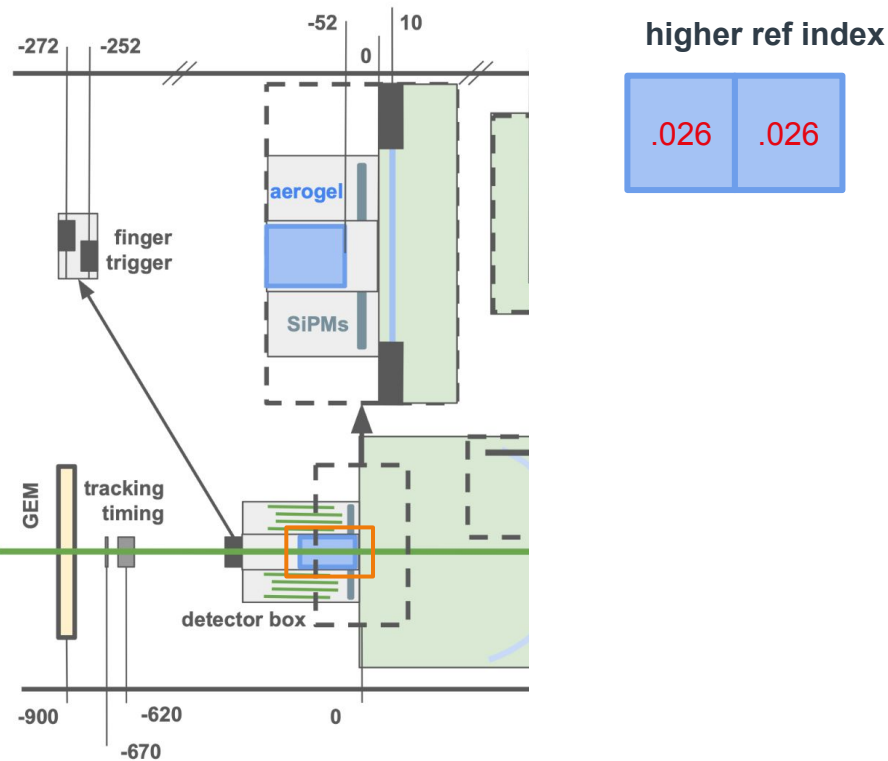
quadrupole



# Experimental set-up: aerogel

**NEW**

- We worked on the aerogel radiator:
- different number of tiles
  - different ref index

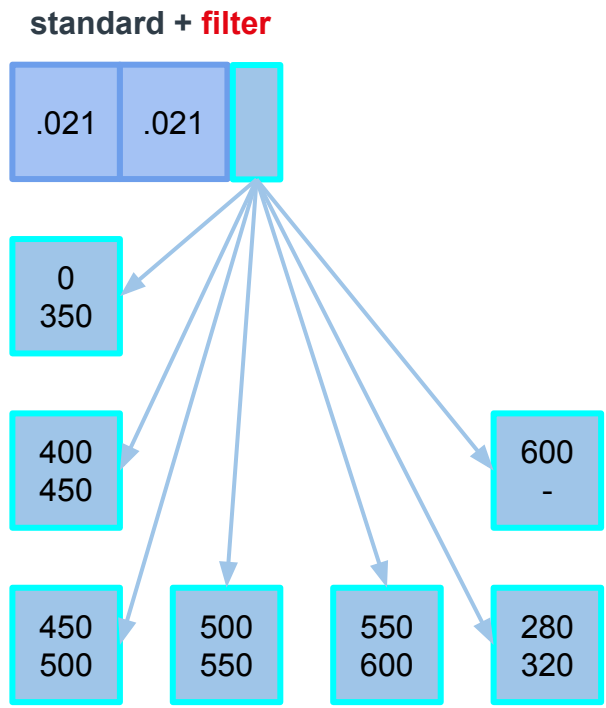
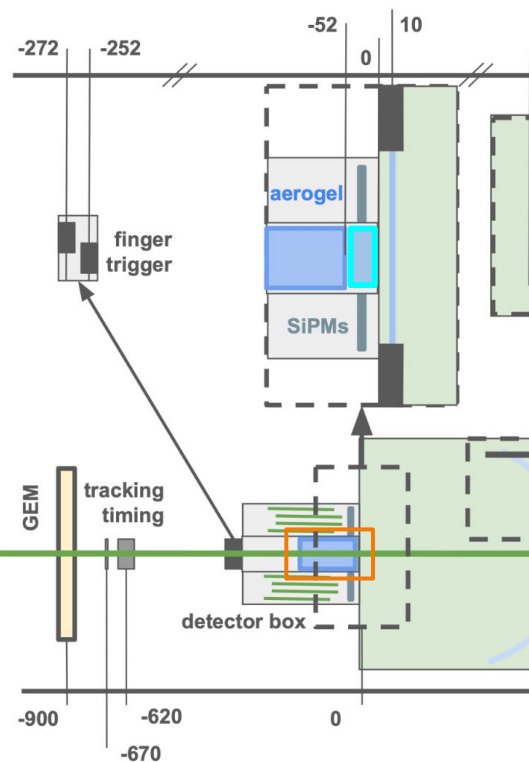


# Experimental set-up: aerogel

**NEW**

We worked on the aerogel radiator:

- different number of tiles
- different ref index
- different filters for wavelength (nm)

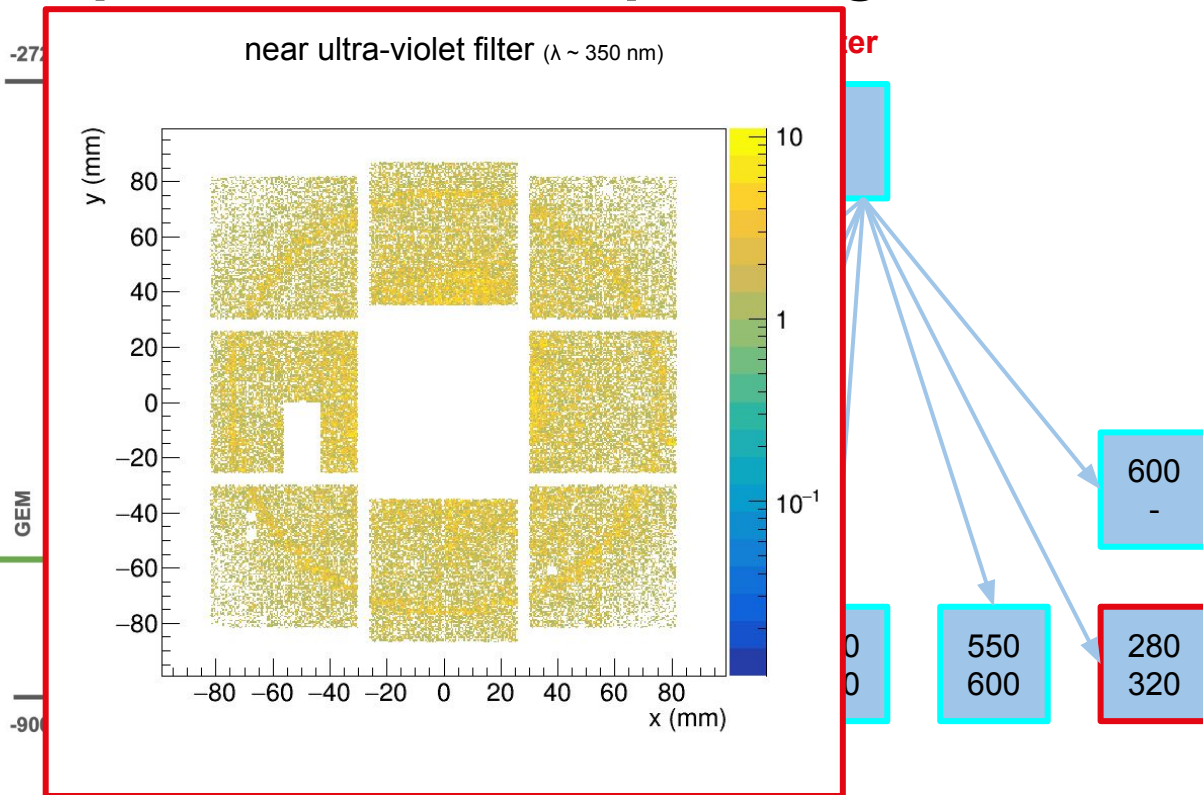


# Experimental set-up: aerogel

**NEW**

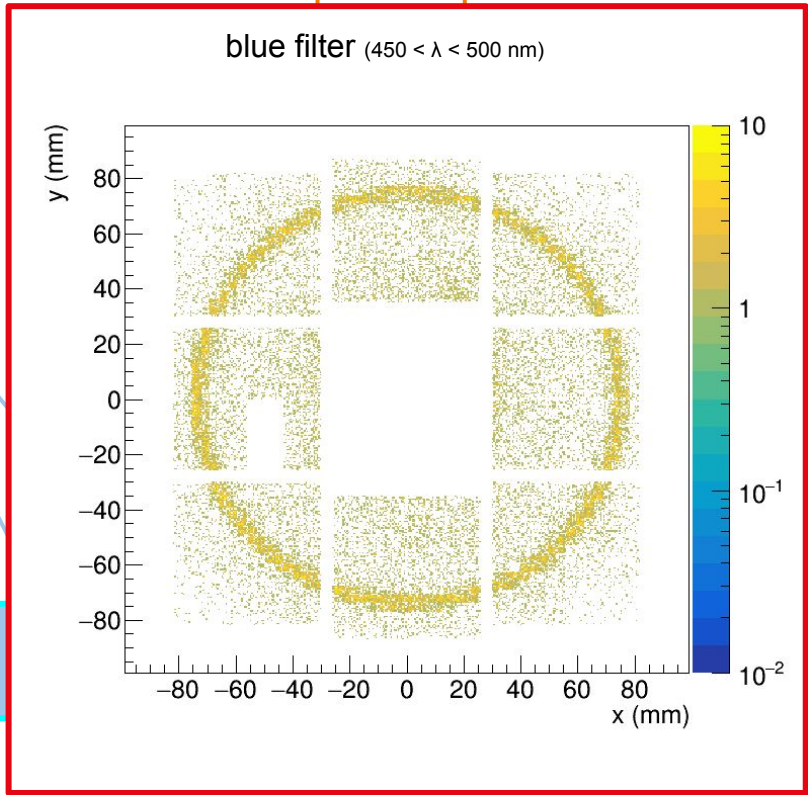
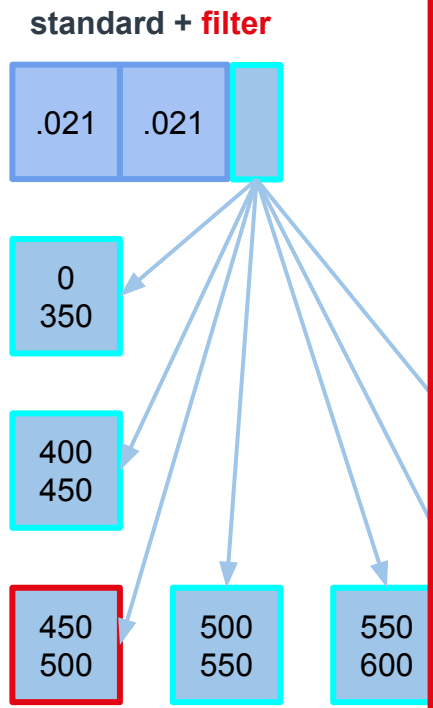
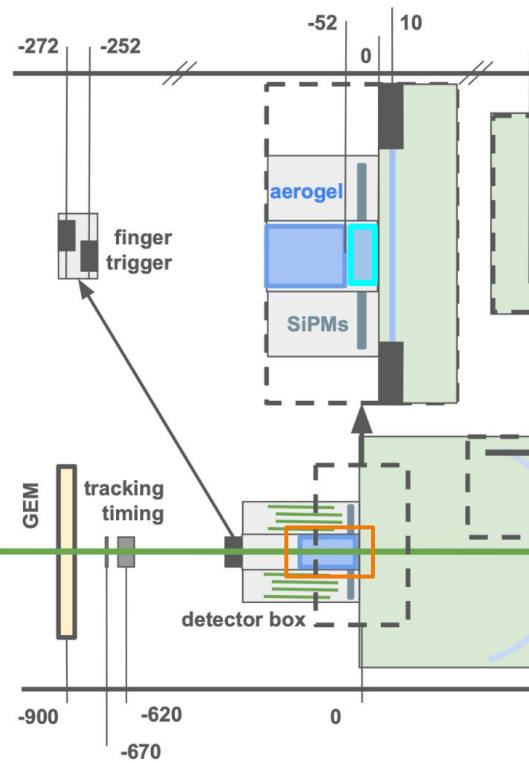
We worked on the aerogel radiator:

- different number of tiles
- different ref index
- different filters for wavelength (nm)



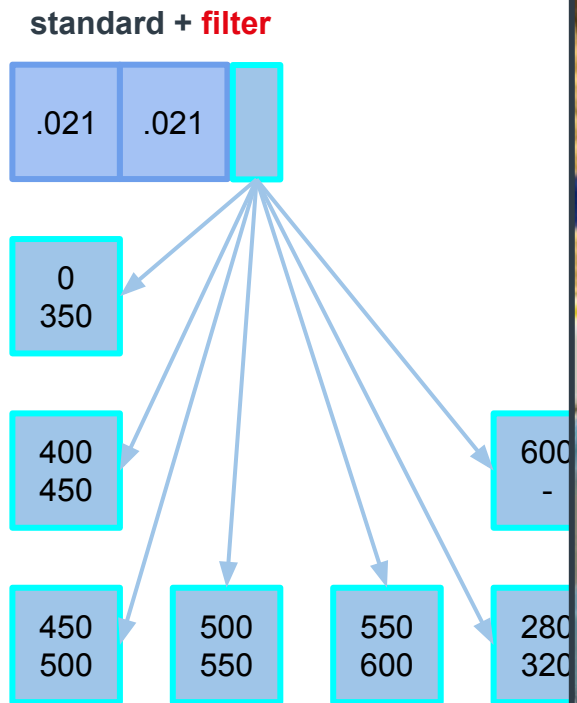
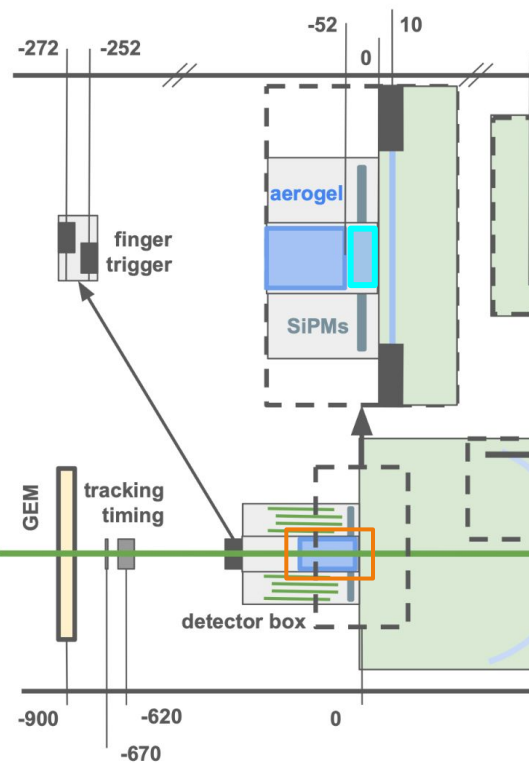
# Experimental set-up: aerogel

**NEW**

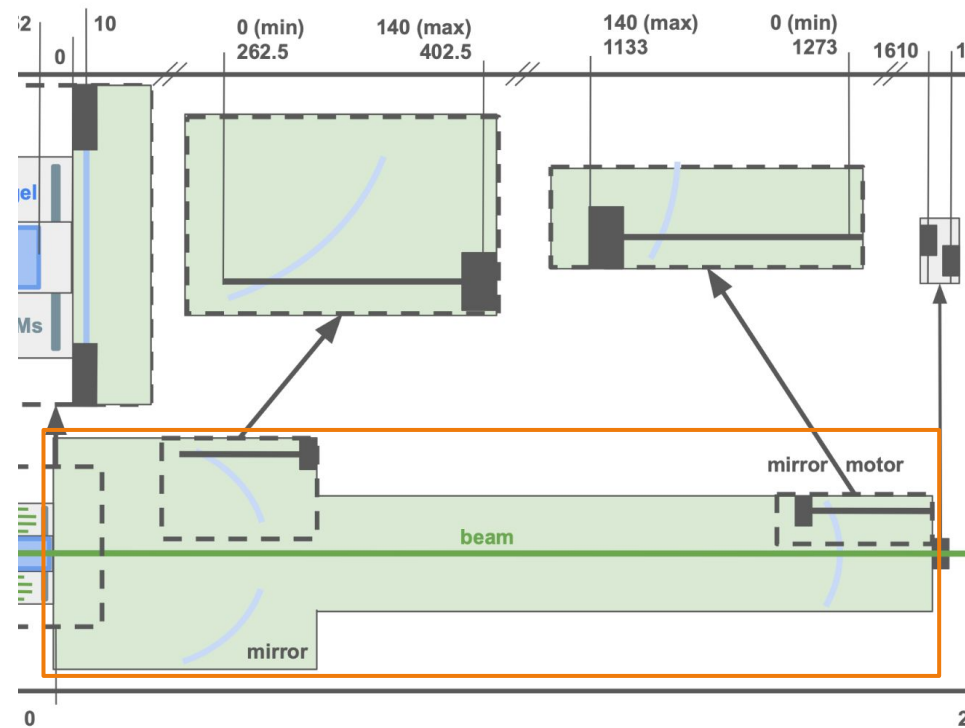




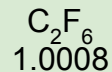
# Experimental set-up: aerogel



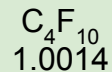
# Experimental set-up



standard



new gas

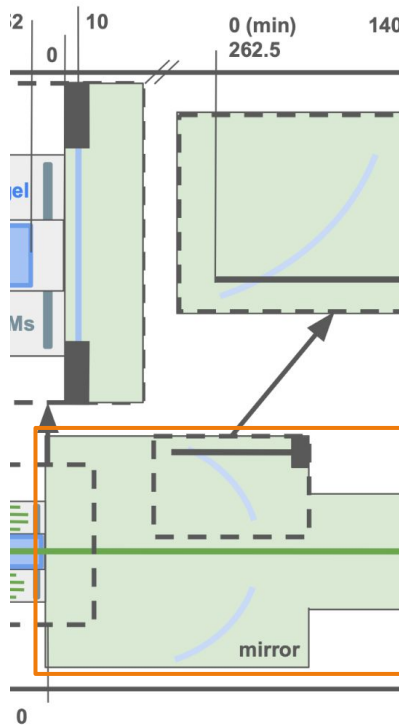


**NEW**

We worked on the gas radiator

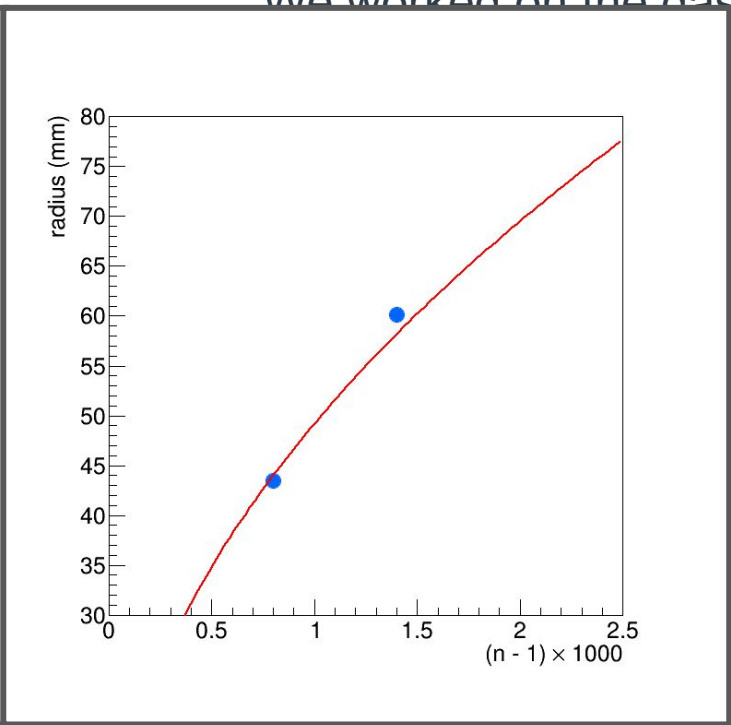
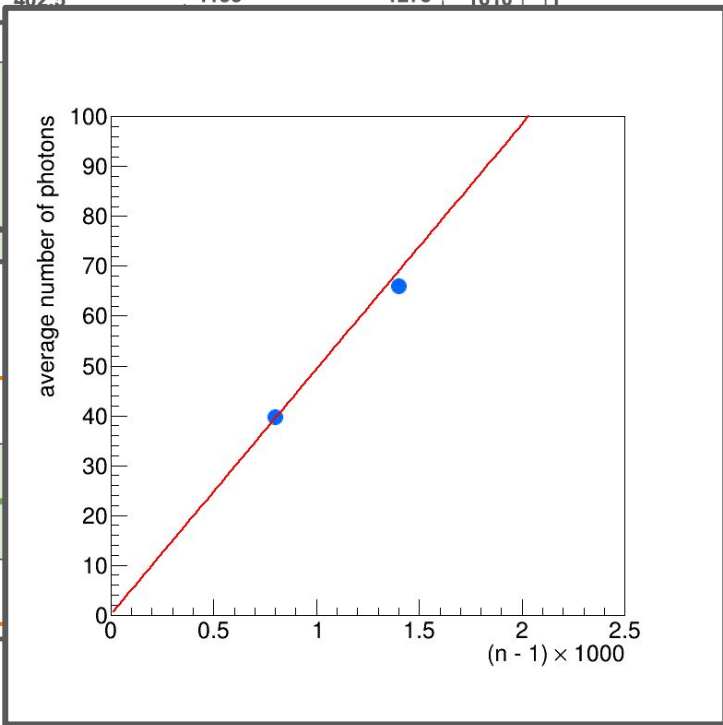
# Experimental set-up

**NEW**



standard

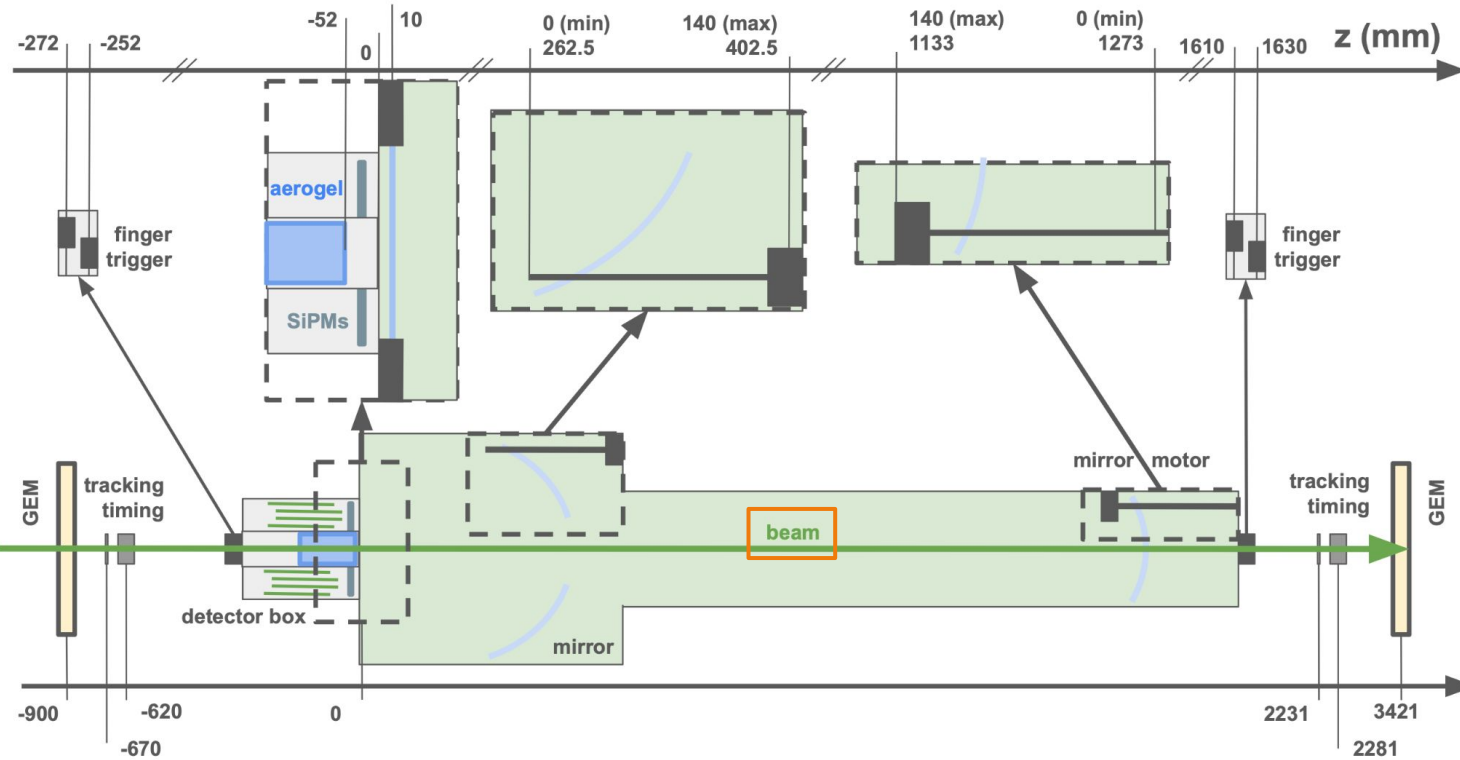
We worked on the gas



# Experimental set-up

**NEW**

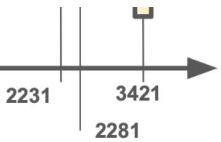
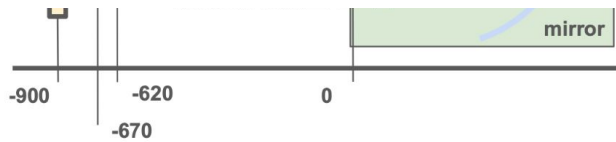
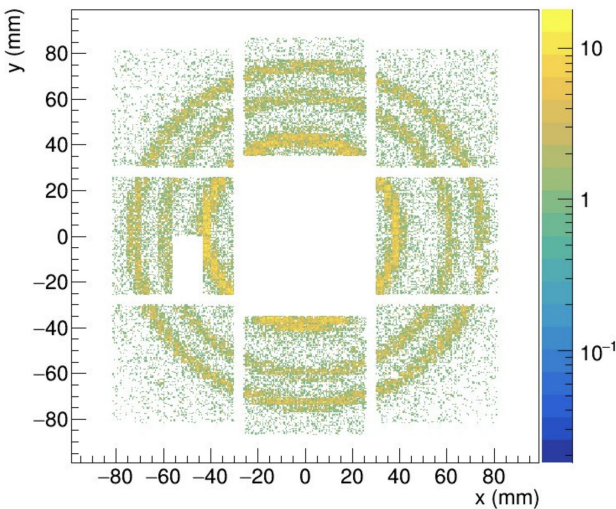
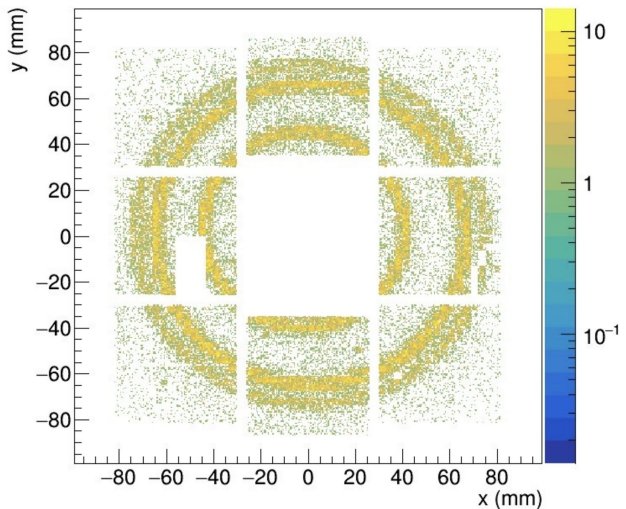
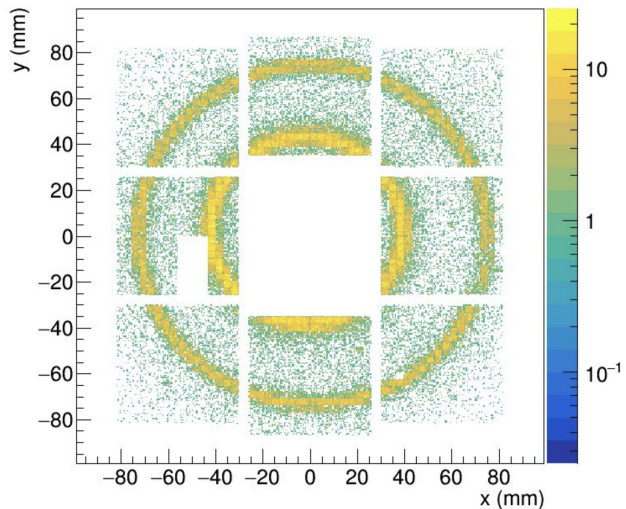
This year we were main users and we could control beam parameters i.e. momenta scans



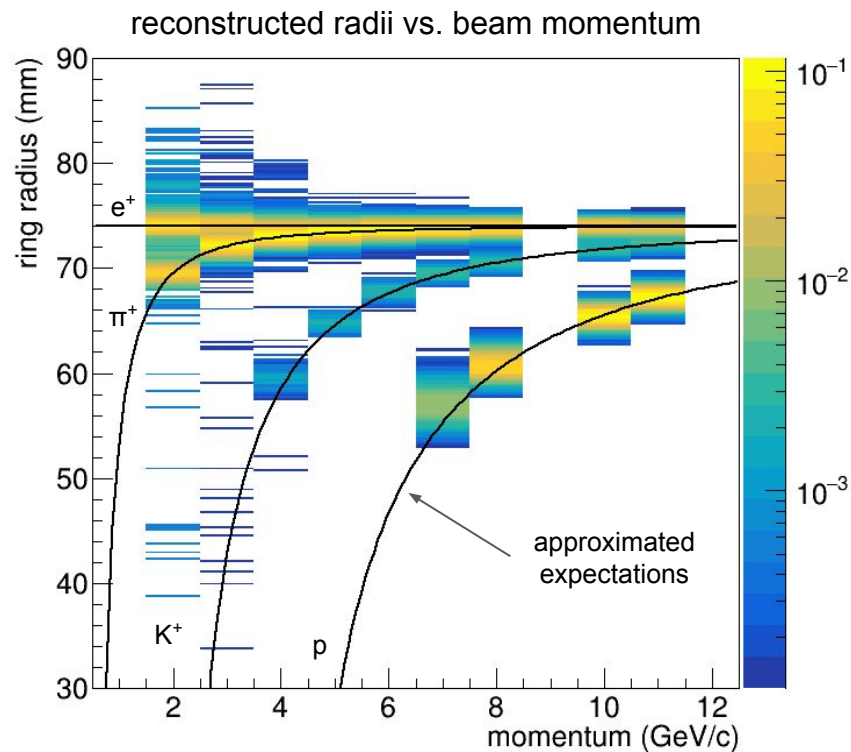
# Experimental set-up

**NEW**

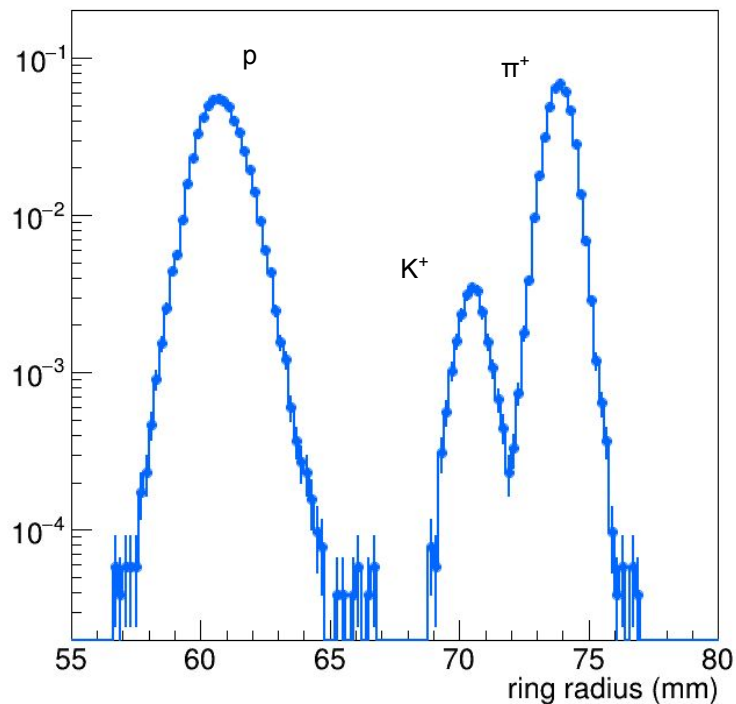
-272 | -252 | -52 | 10 | 0 (min) 262.5 | 140 (max) 402.5 | 140 (max) 1133 | 0 (min) 1273 | 1610 | 1630 z (mm) This year we



# Momentum scan

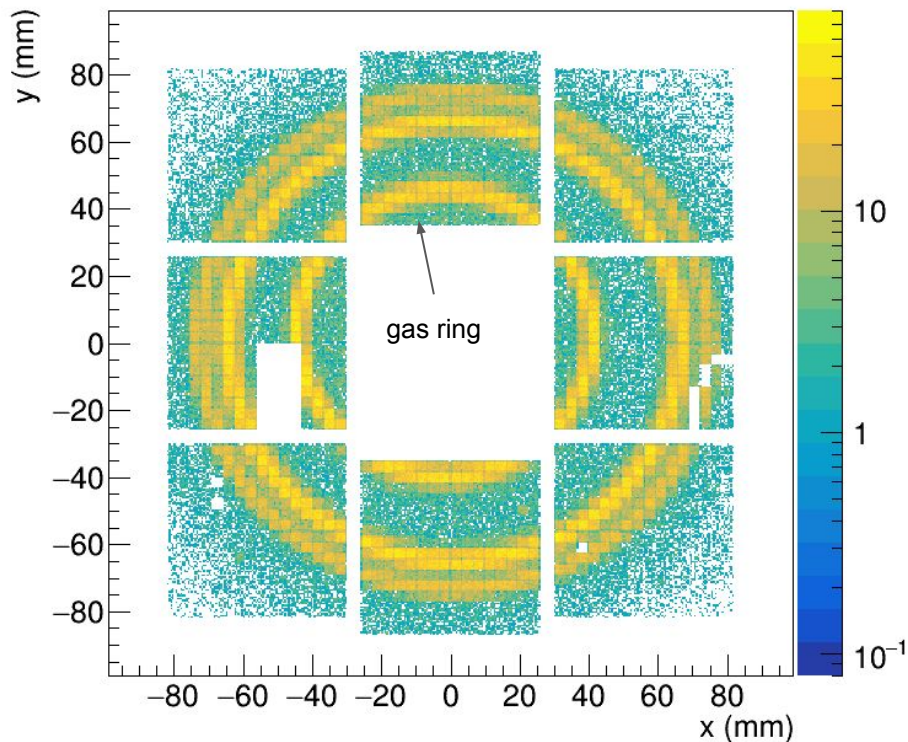


reconstructed radii at 8 GeV/c beam momentum

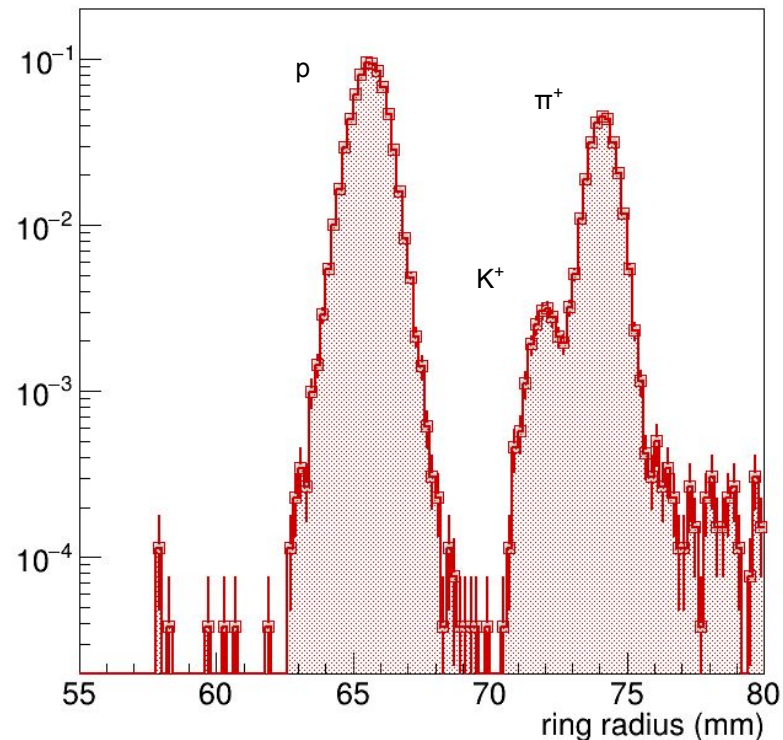


# PID w/ Gas & Aerogel

10 GeV/c positive beam with no selection applied

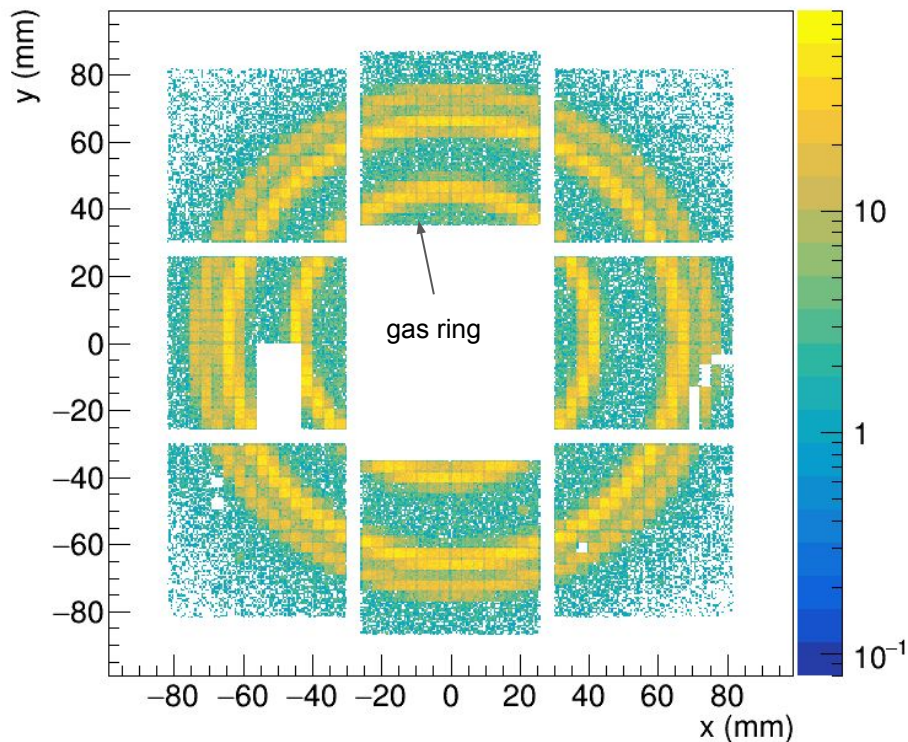


reconstructed radii at 10 GeV/c with no selection applied

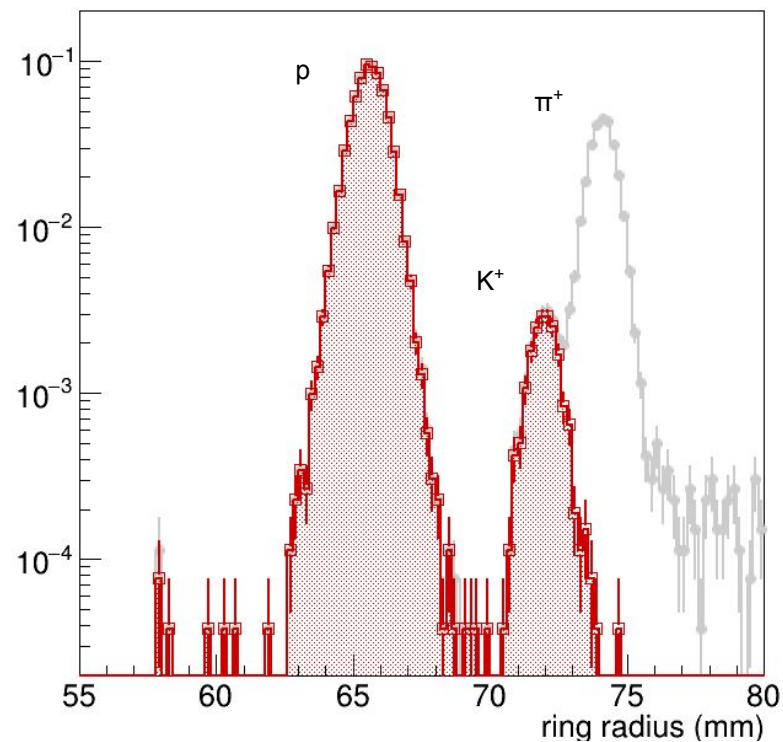


# PID w/ Gas & Aerogel

10 GeV/c positive beam with no selection applied



reconstructed radii at 10 GeV/c with no selection applied





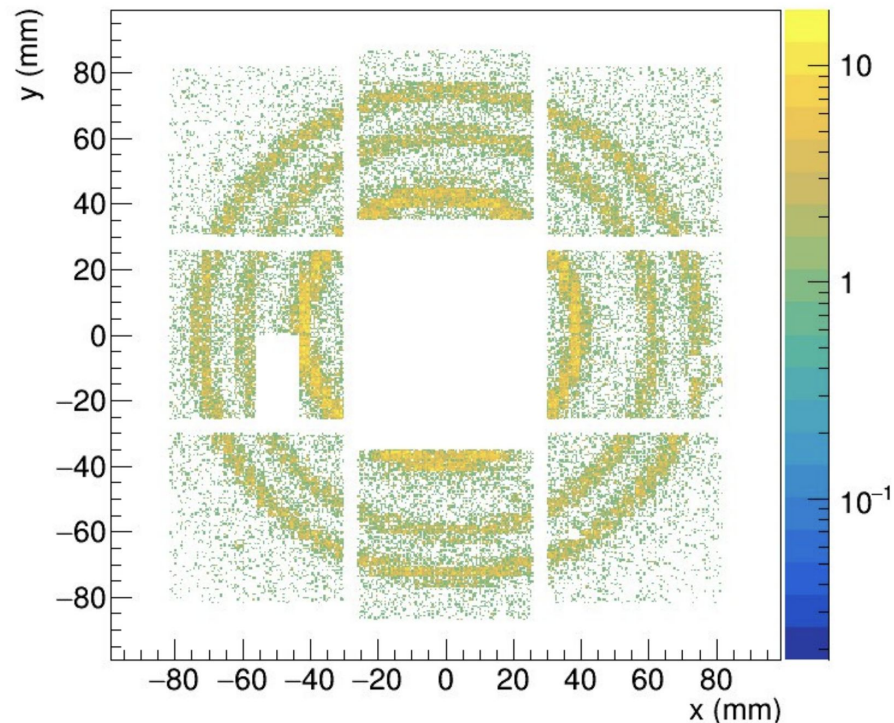
# Conclusions

The beam tests of October 2023 and May/June 2024 were very successful.

We are moving forward in the electronics, sensors and light characterisation for a deeper understanding of the detector.

A LOT of data has been taken, if you wish to help there is plenty of room to join the data analysis task force

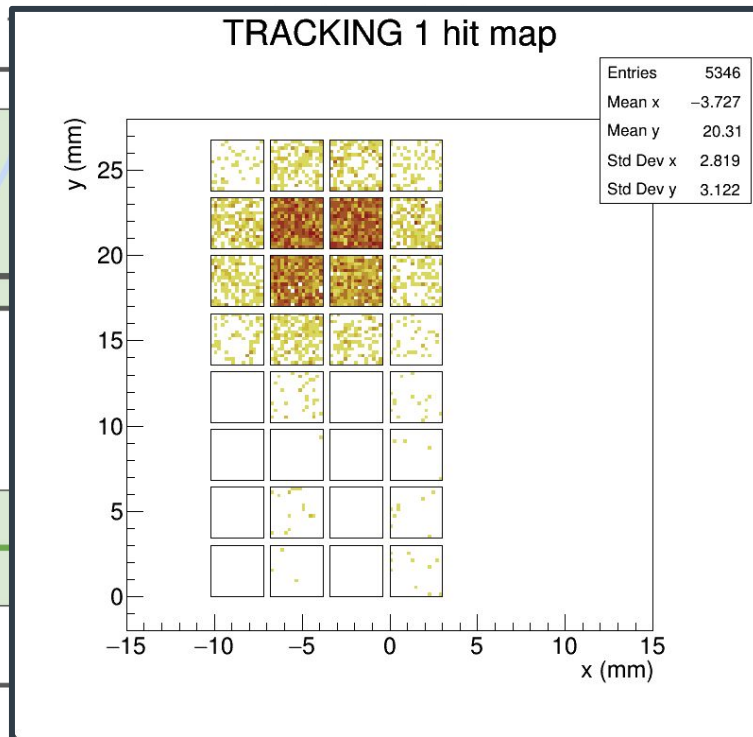
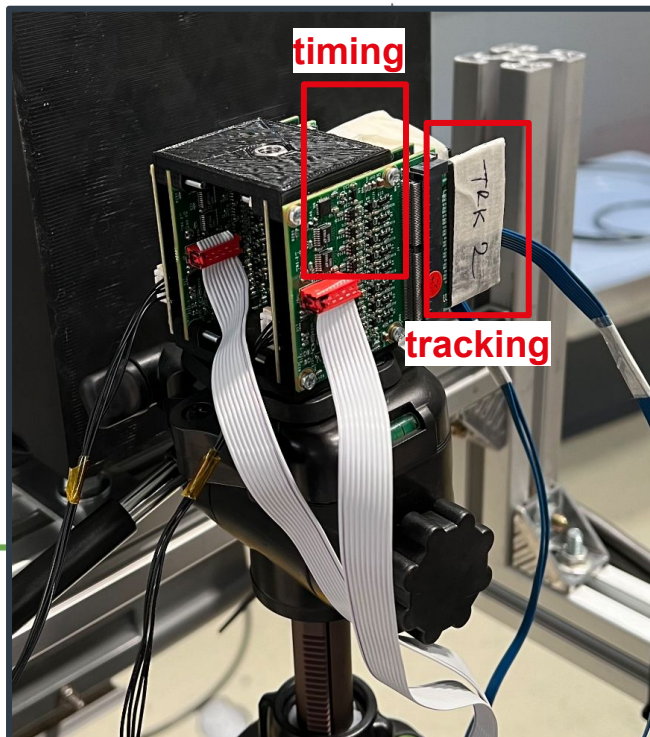
Thank you to everyone that helped in the beam test!



**Thank you!**  
**Any questions?**

# Back-up

# Experimental set-up



**NEW**

we installed a new timing and tracking system based on SiPM w/ ALCOR readout