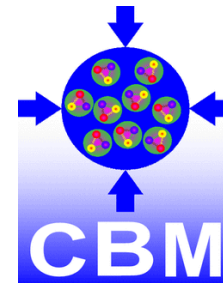


Test beam results of prototypes for the CBM-TRD at DESY and GIF++



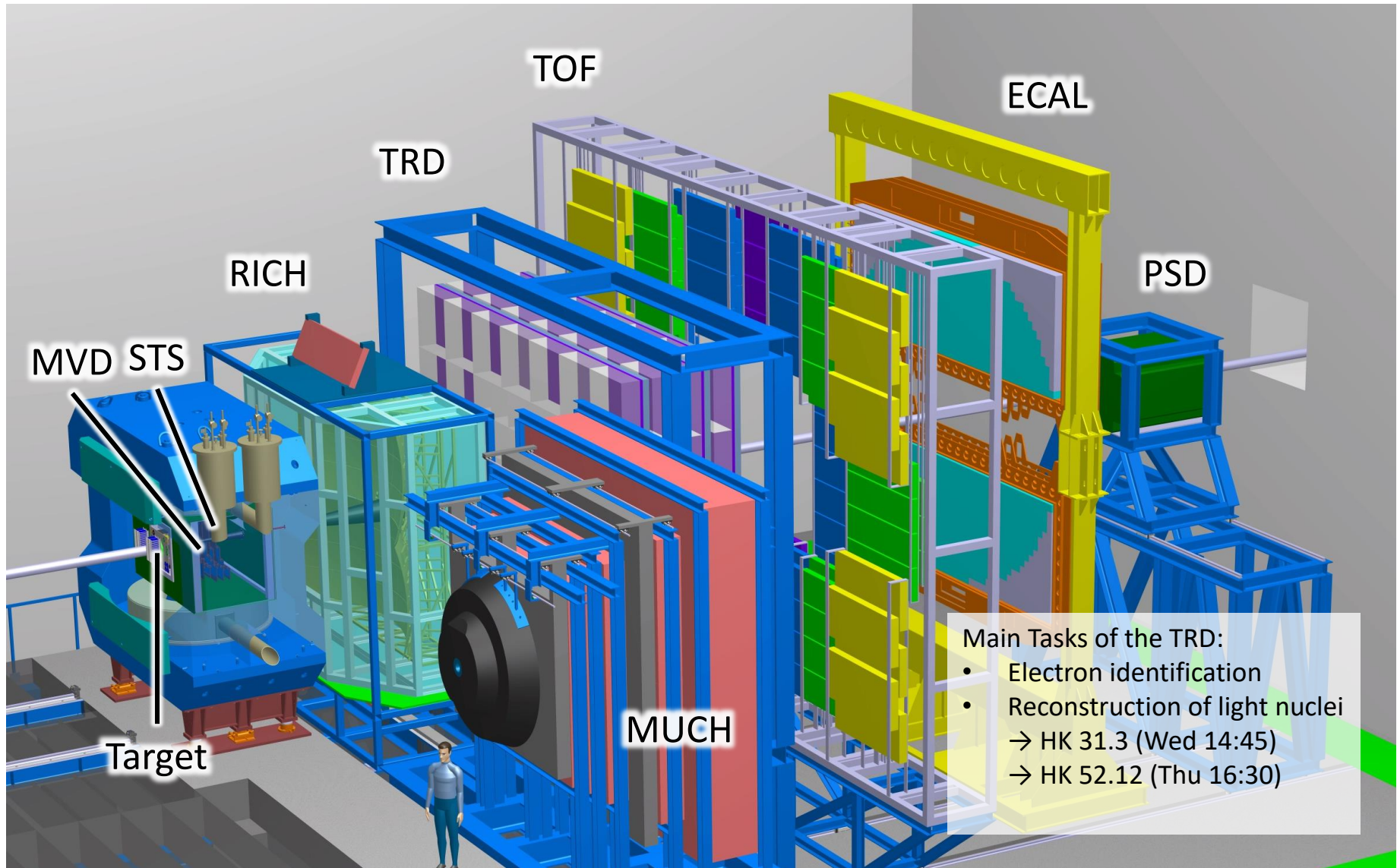
Florian Roether
DPG 26.2.2018



Outline

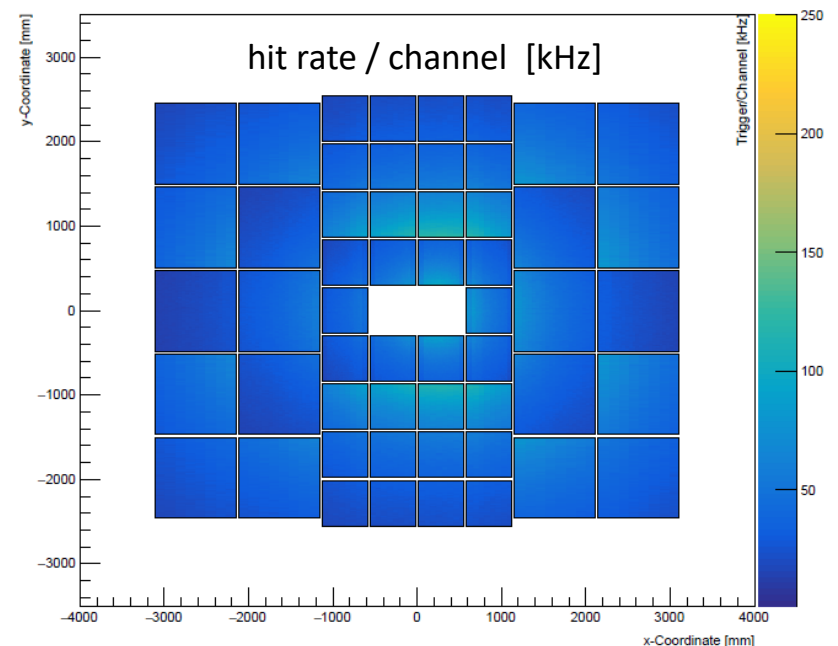
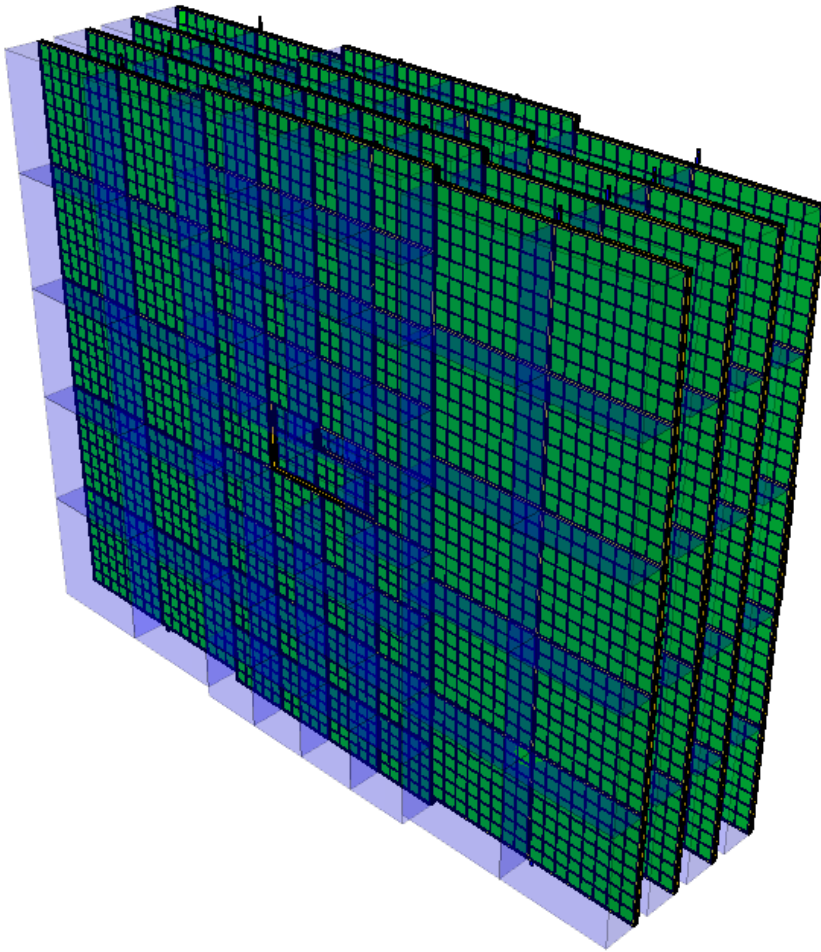
- The TRD at the CBM experiment
- Principle of operation
- DESY beam time
- GIF++ beam time

The Compressed Baryonic Matter Experiment

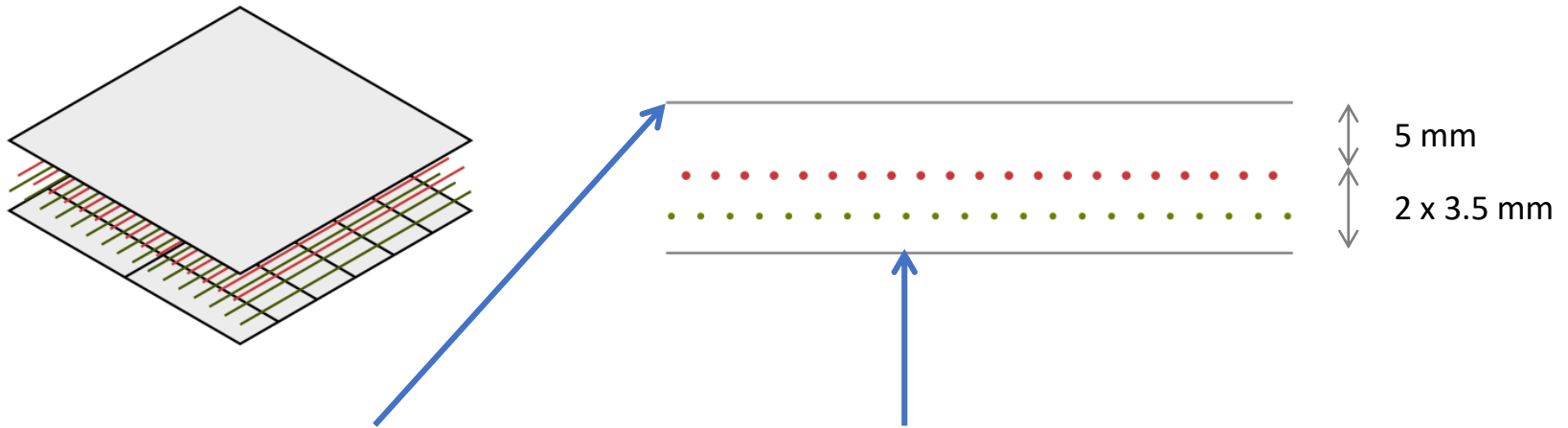


The Transition Radiation Detector

- 54 chambers per detector layer
- Two chamber sizes
- Four different pad granularities
- Signal collection time under $0.3 \mu\text{s}$



Multi Wire Proportional Chamber



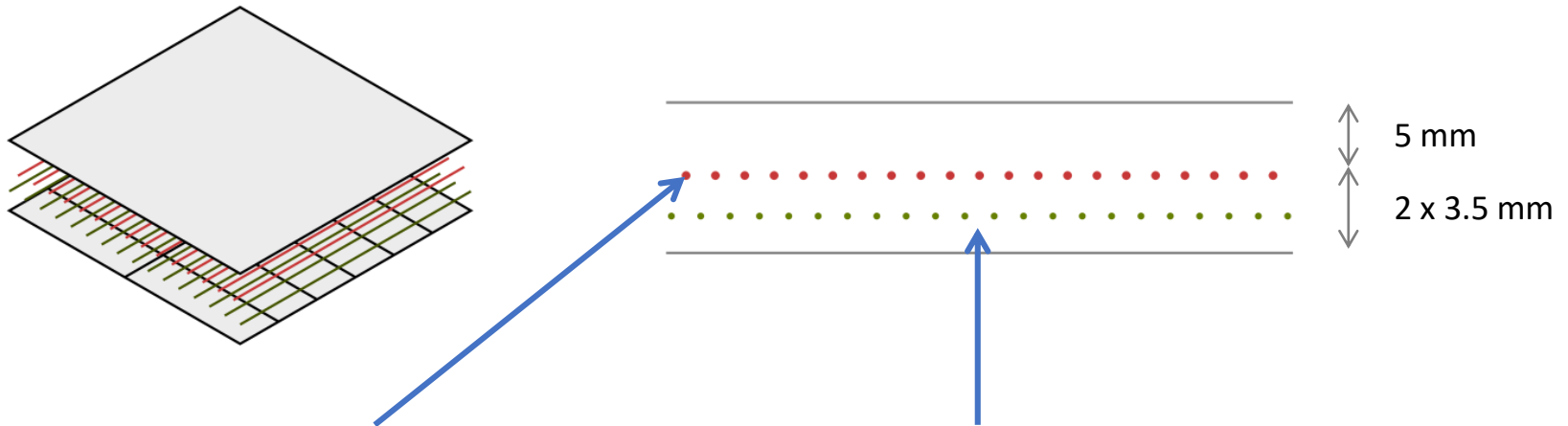
Entrance window:

- 20 μ m Kapton foil
- Aluminized
- Potential: -150 V

Pad plane:

- PCB material (FR4)
- 35 μ m copper plated
- Segmented into pads
- Potential: 0V (ground)

Multi Wire Proportional Chamber



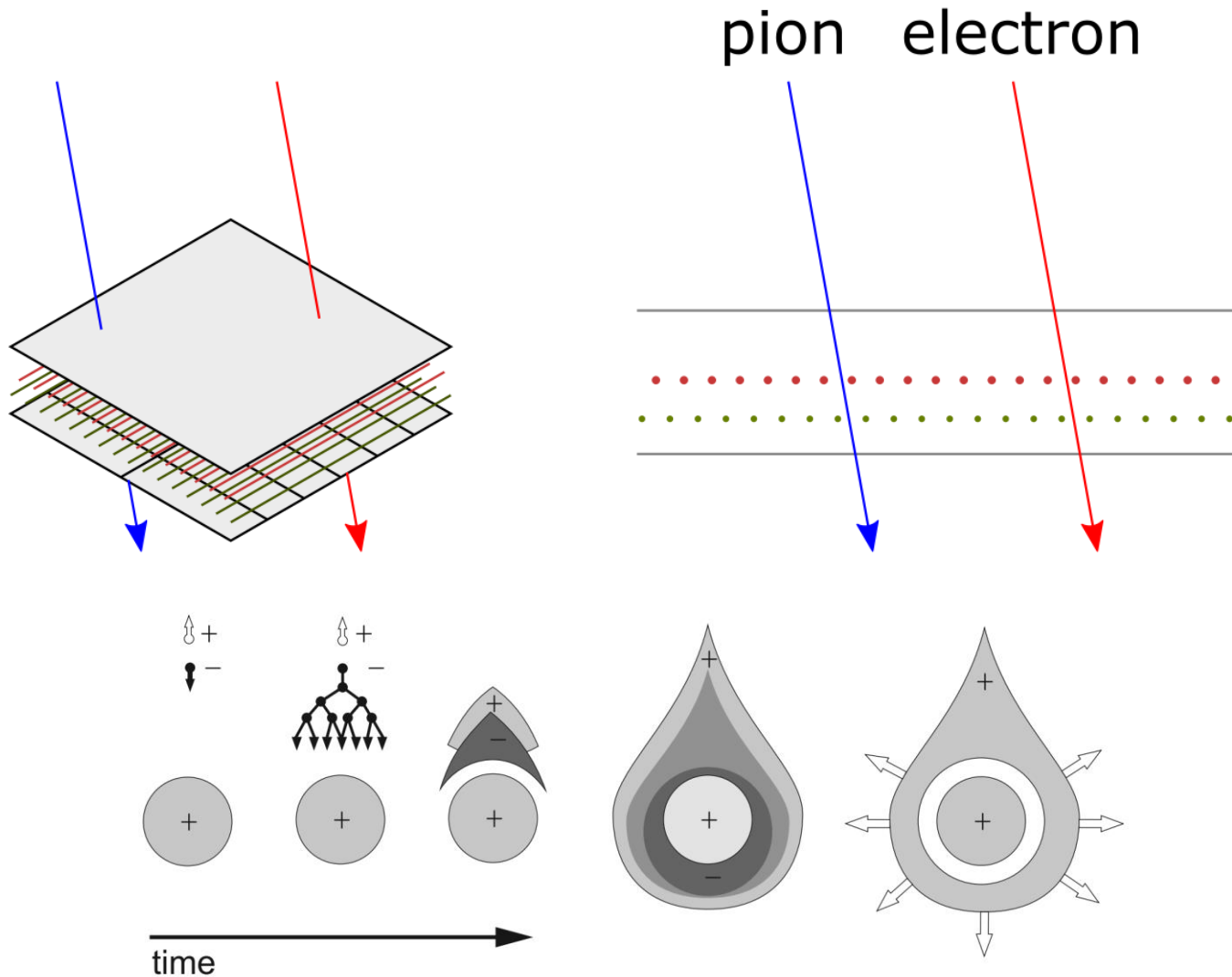
Cathode wire plane:

- Copper-Beryllium wires
- 79 μm diameter
- Potential: 0 V (ground)

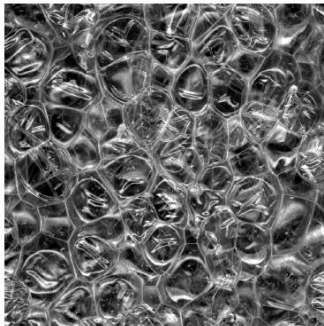
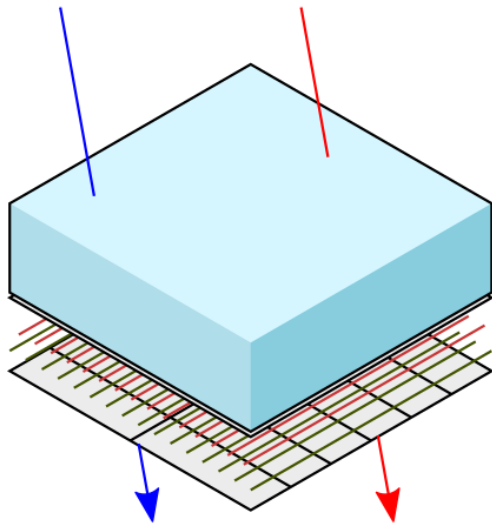
Anode wire plane:

- Gold plated tungsten wires
- 20 μm diameter
- Potential: 1850 V

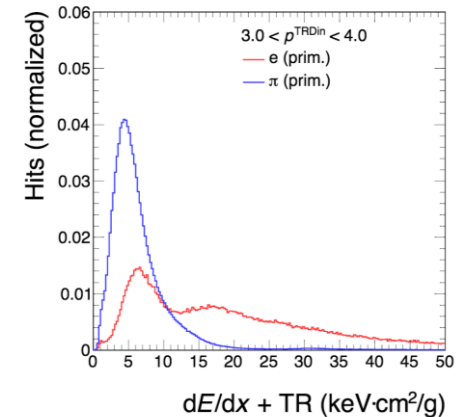
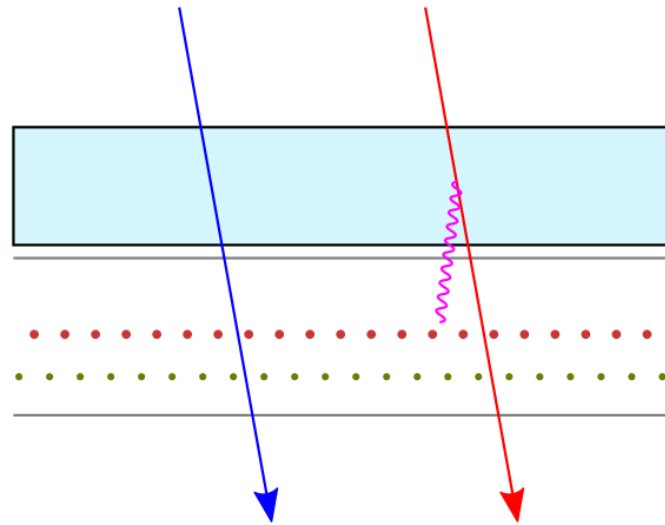
Multi Wire Proportional Chamber



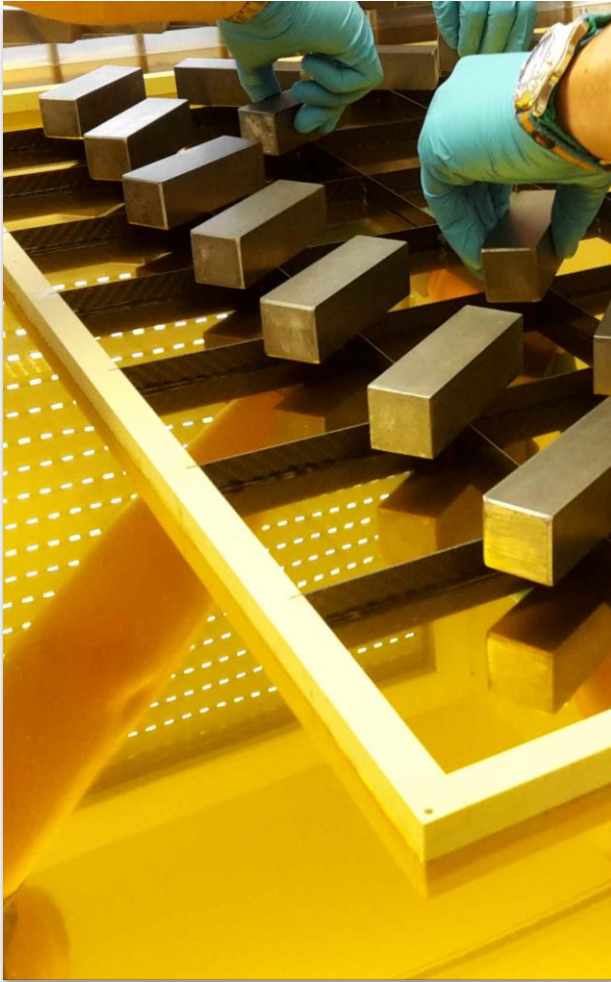
Multi Wire Proportional Chamber



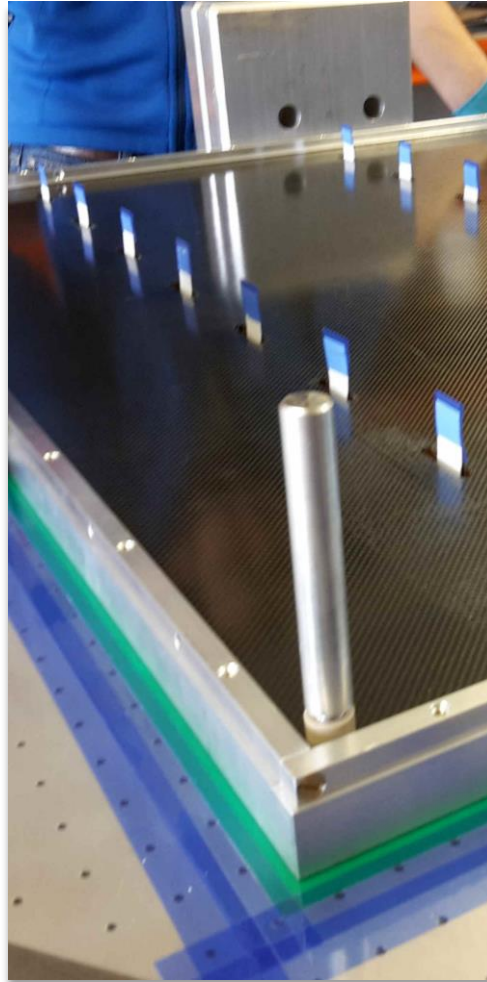
pion electron



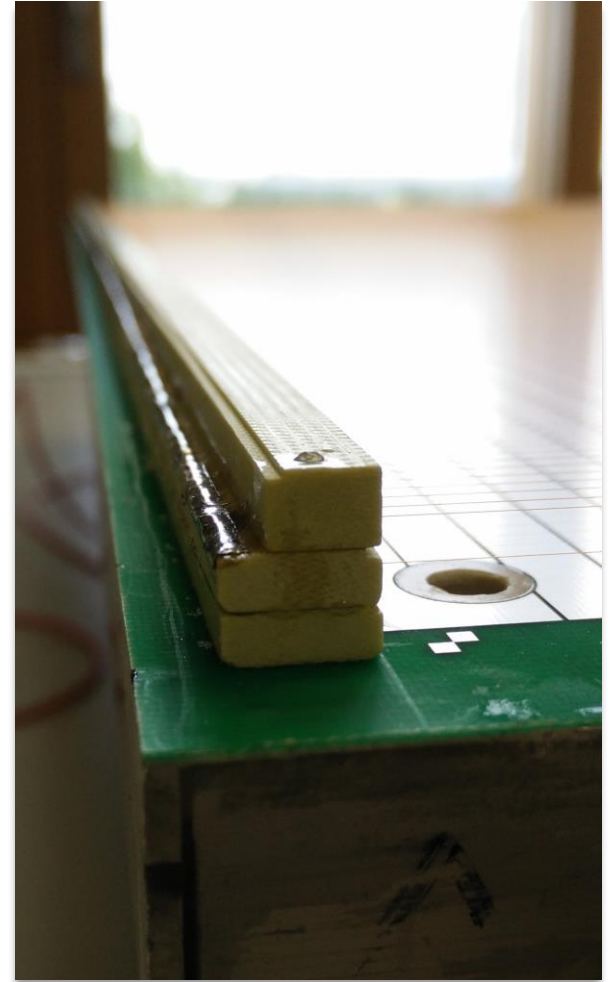
First Large Chamber Prototypes



Entrance window

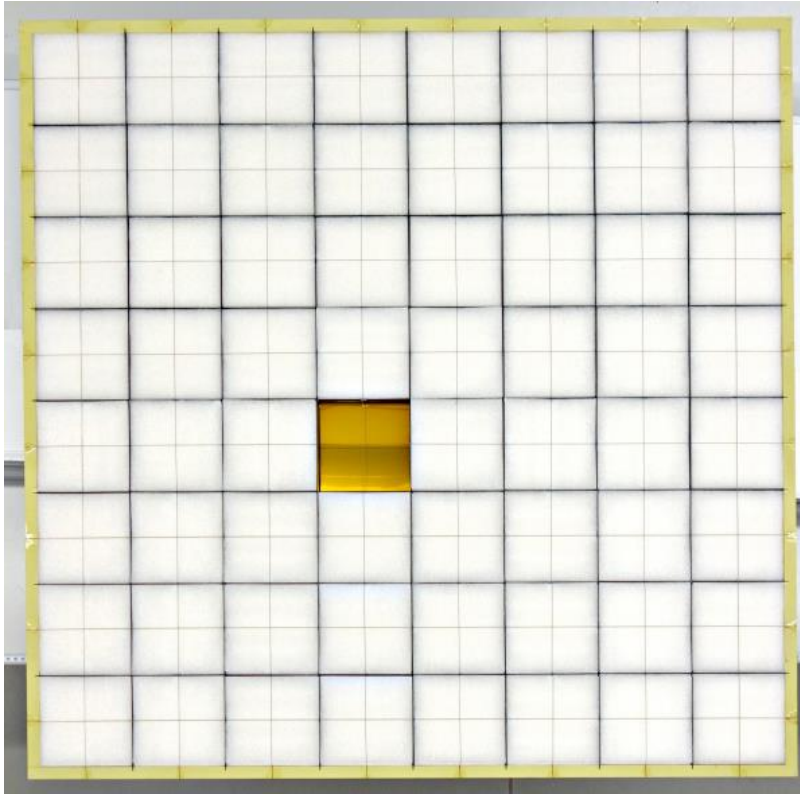


Back panel



Wire ledges with anode- and cathode-wire planes

First Large Radiator Prototypes



Radiator material in between the supporting grid

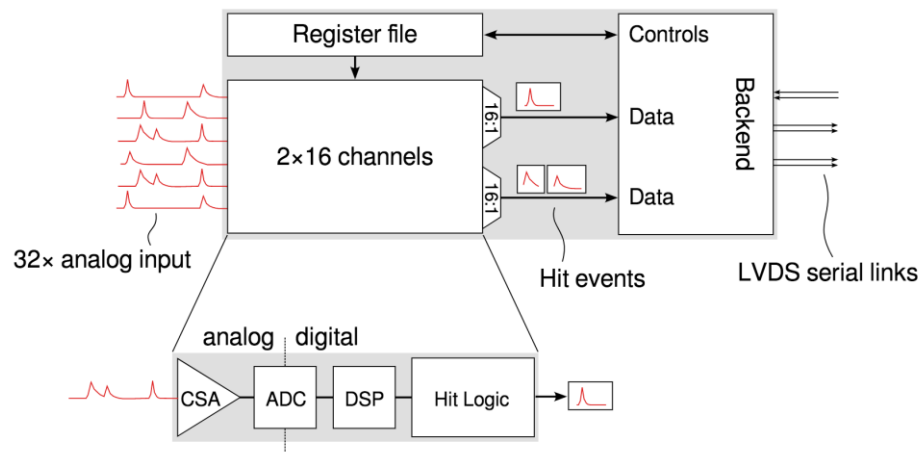


Large radiator prototype

Front End Electronics

SPADIC (Self-triggered **P**ulse **A**mplification and **D**igitization ASIC)

- 32 channels
- 9-bit ADC
- Self-triggered
- Digital shaper

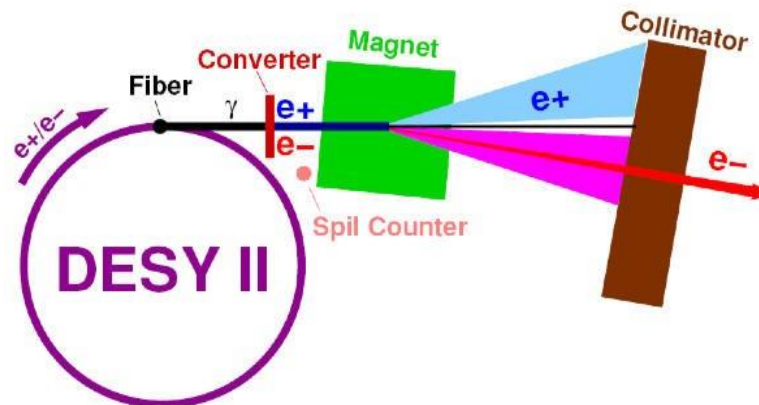


Test Beam At DESY II

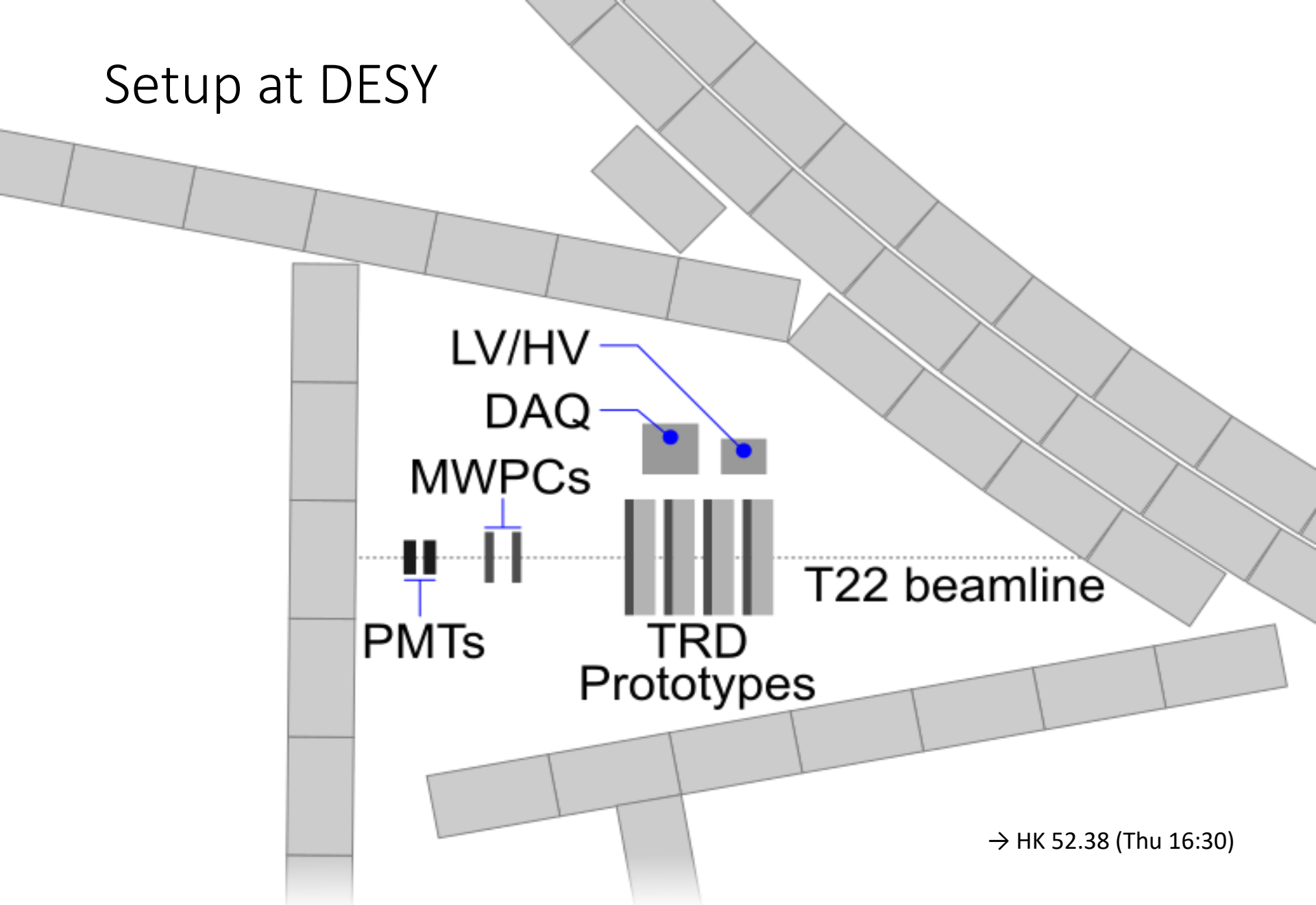
Systematic analysis of detector response

- PID performance
- Electron efficiency
- Position resolution
- Tracking

→ Basis for the optimization of detector simulation software



Setup at DESY



→ HK 52.38 (Thu 16:30)

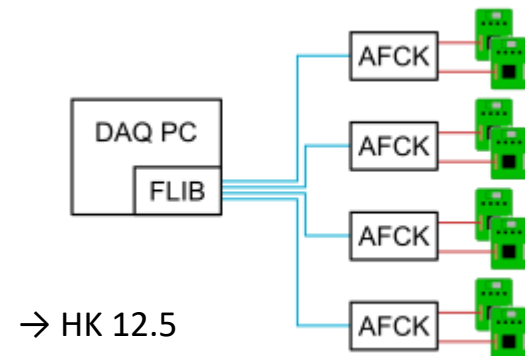
Setup at DESY



Large chamber and radiator prototypes



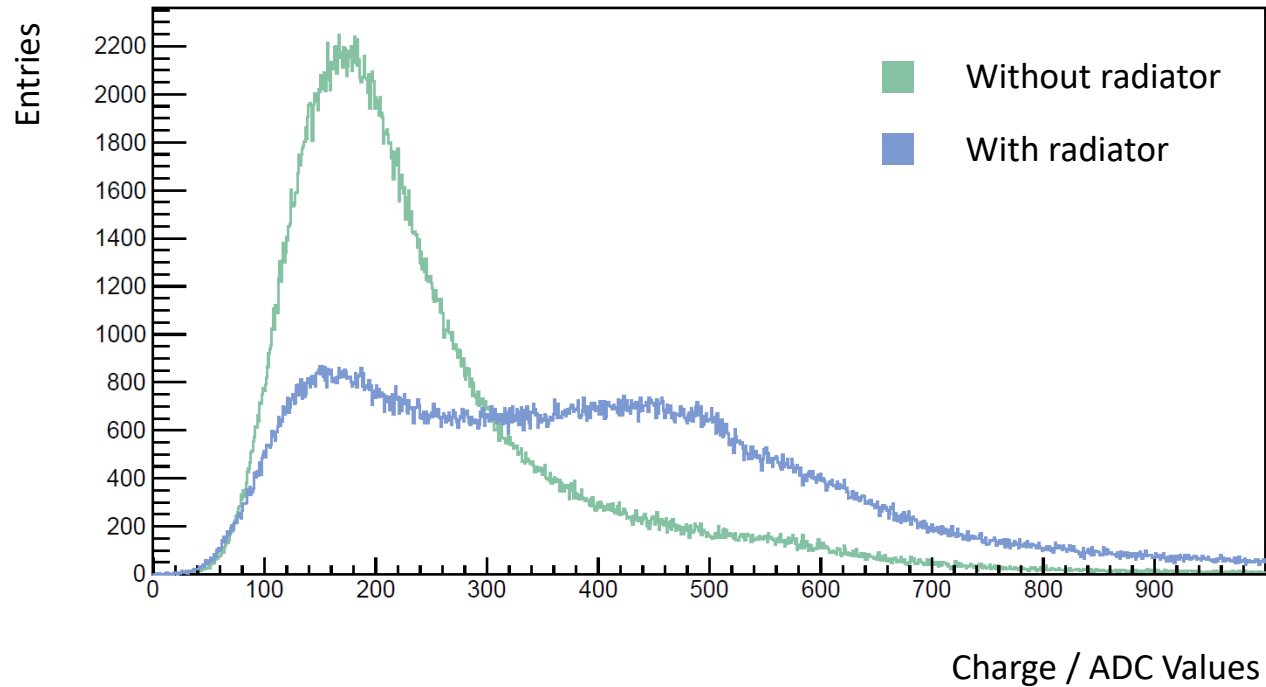
DAQ rack with AFCK boards



DAQ rack with AFCK boards

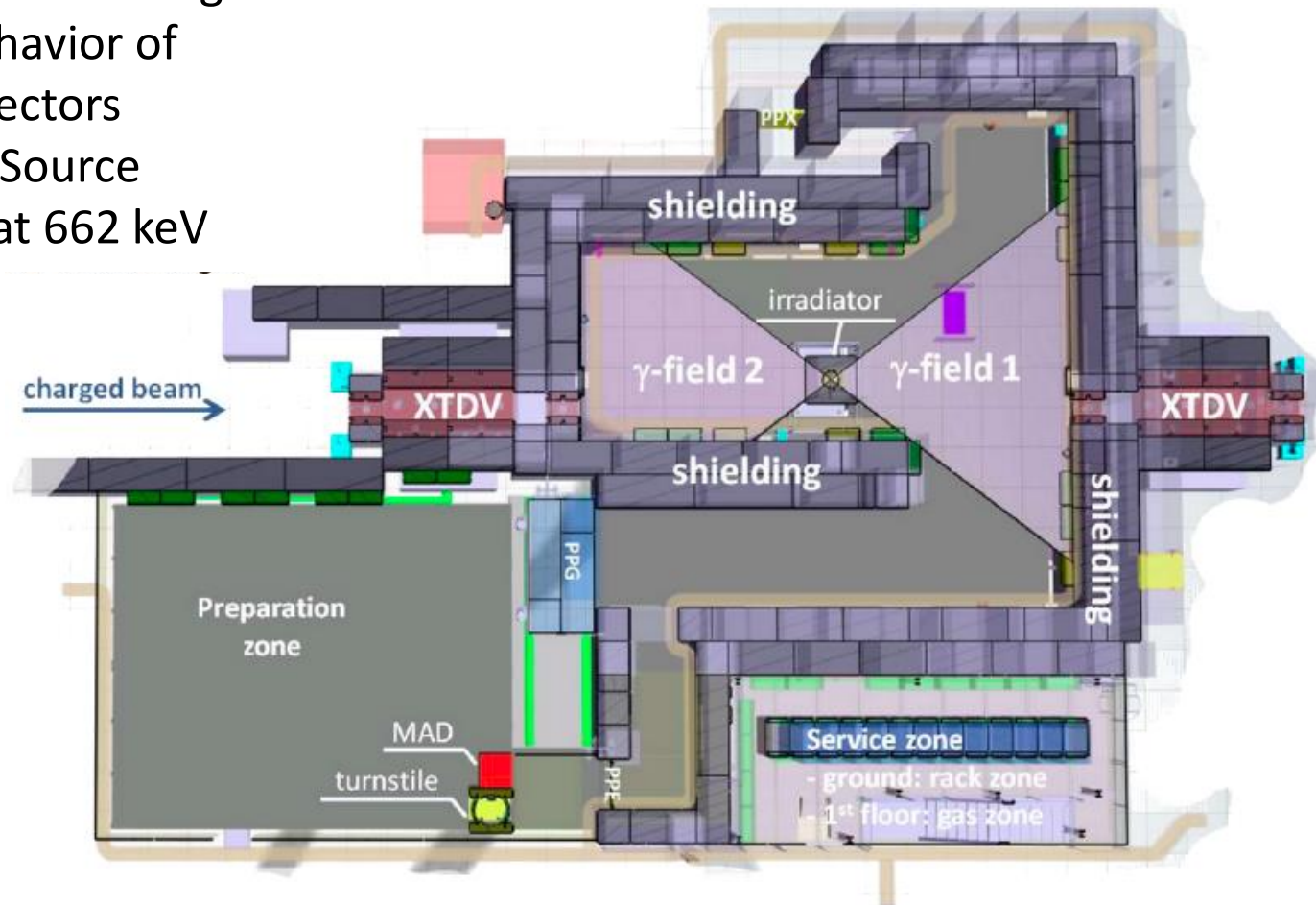
First Results

Spectra of layer 1 (3GeV electron beam)



Testbeam At The Gamma Irradiation Facility

- Dedicated facility for testing the long-term behavior of large particle detectors
- 13.7 TBq Cesium Source
- Main γ emission at 662 keV
- μ -Beam



Setup At GIF++



FEE

Detector prototype

Attenuation filter
and beam optics

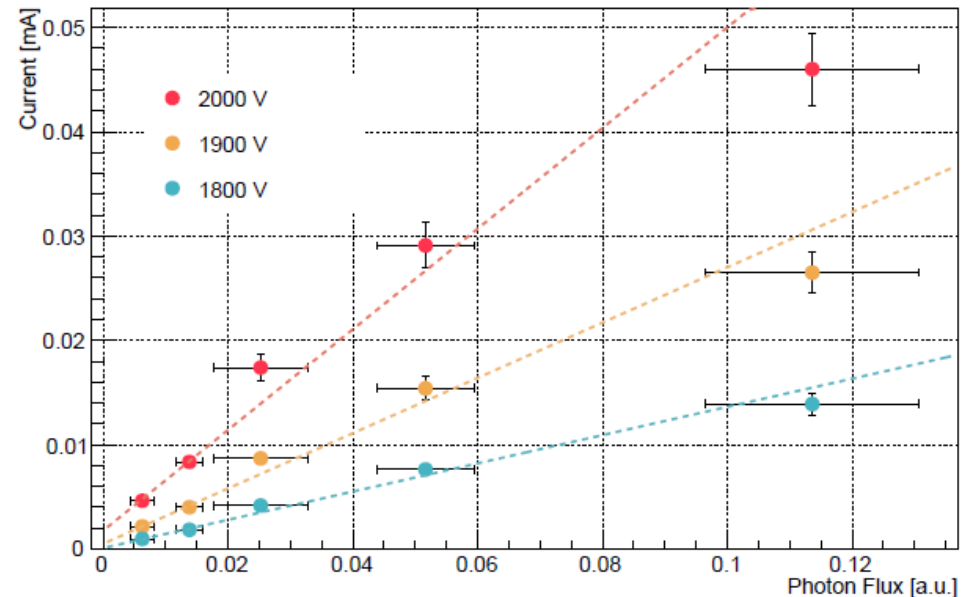
Cesium source

First Results Of The GIF++ Test Beam Campaign

- Stable performance of detector and readout under high load

Still under investigation:

- Influence of the attenuation filters on the γ spectrum
- Simulation of the expected charge deposit in the detector



Summary

- First results of both test beam campaigns look promising
- A lot of work ahead of us
- DESY
 - PID performance
 - Position resolution and tracking
 - Electron efficiency
- GIF++
 - Influence of the filters
 - Simulation of the charge deposit
- Improve the simulations