



IDEA Cluster Counting beamtest 2024



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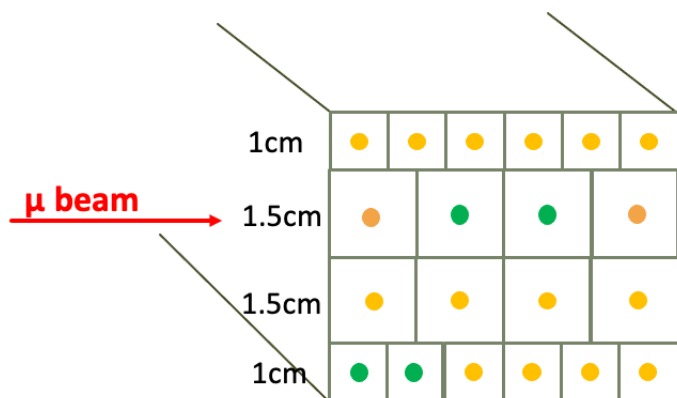


on behalf of the IDEA CC community

PS & SPS User meeting, March 6, 2024

Beam test setup at H8/CERN in 2024

- 20 tubes with wires (20 μm diameter, tungsten gold-coated) and different cell size.
- 1 16-channel DRS
- 1 4-channel DRS
- custom PCBs for the 3 trigger scintillators
- two external hard disk to store the data collected
- Mixture of gases through the CERN gas rack



- Data to be collected at different percentages of helium and isobutane: 90-10. , 85-15, 80-20.
- Data to be collected with muon beam between 1 and 12 GeV momentum ; configuration with 10 GeV loaded

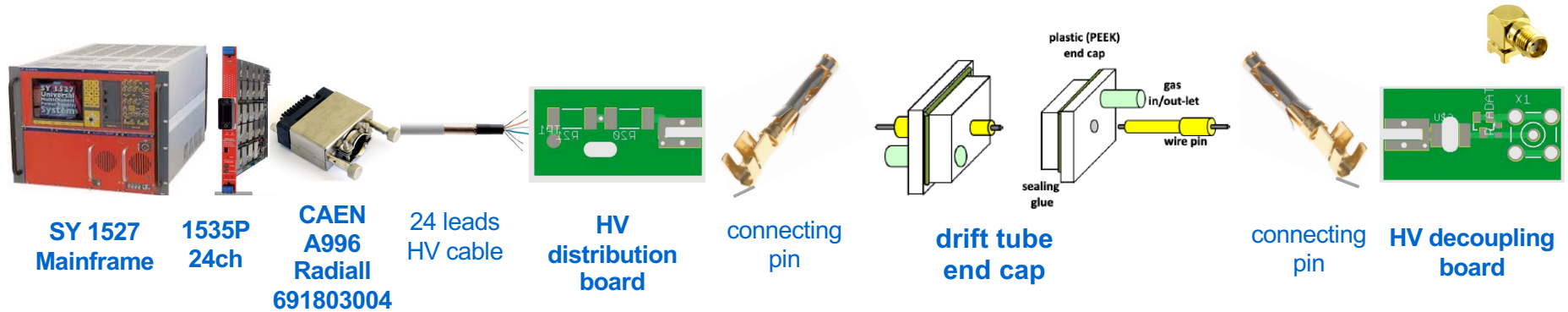


NEW CONNECTION SCHEME

- Connect the 3 trigger scintillators to a 4-channels DRS
- Propagate the trigger signal to the other channels of the 4-channel DRS and to a 16-channel DRS, where the tube are connected.

Setup similar to what we had for testbeam in 2023

Beam test at H8/CERN in 2021: components



Trigger scintillator



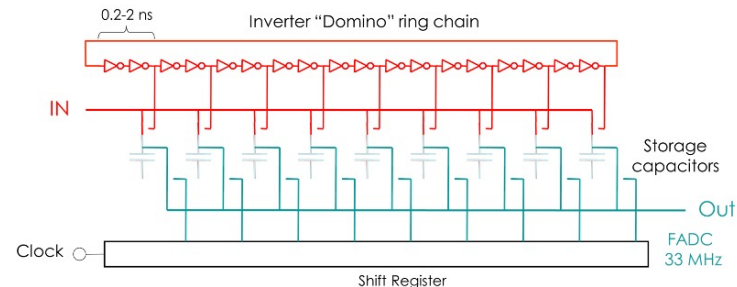
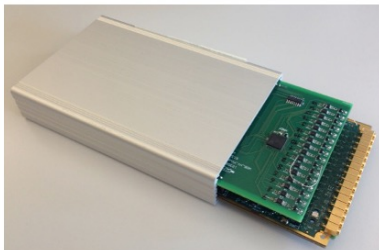
Three scintillator tiles (12 cm x 4 cm), placed upstream and downstream of the drift tubes pack, instrumented with SiPM.

The gas system at CERN:

- sets the needed gas mixture
- checks the gas pressure at the entrance (1 bar)

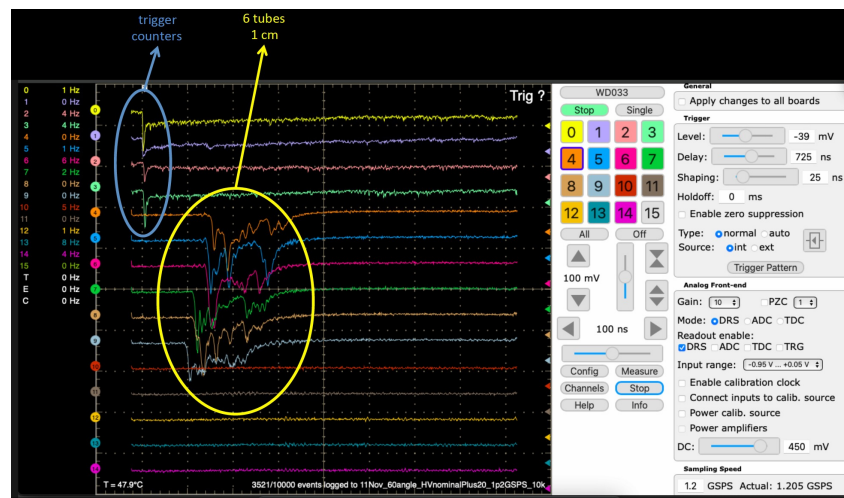
Beam test at H8/CERN in 2021: DAQ

16 channels data acquisition board designed and used by the MEG2 experiment at PSI ($\mu \rightarrow e + \gamma$)



- **Analog switched capacitor array:** analog memory with a depth of 1024 sampling cells, perform a “sliding window” sampling.
- **500MSPS ↔ 5GSPS sampling speed** with 11.5 bit signal-noise ratio
 - 8 analog channels + 1 clock-dedicated channel for sub 50ps time alignment
- Pile-up rejection $O(\sim 10 \text{ ns})$
- Time measurement $O(10 \text{ ps})$
- Charge measurement $O(0.1\%)$

Details at: “Application of the DRS chip for fast waveform digitizing, Stefan Ritt, Roberto Dinapoli, Ueli Hartmann”, *Nuclear Instruments and Methods in Physics Research A* 623 (2010) 486–488



Beam test at T10/East Area: configurations

Data to be collected for different configurations:

- 90%He-10%iC₄H₁₀
- 80%He-20%iC₄H₁₀
- HV nominal (+10,+20,+30,-10,-20,-30)
- Angle 0°, 30°, 45°, 60°

WDB interface is similar to the interface of an oscilloscope with 16 channels:

