

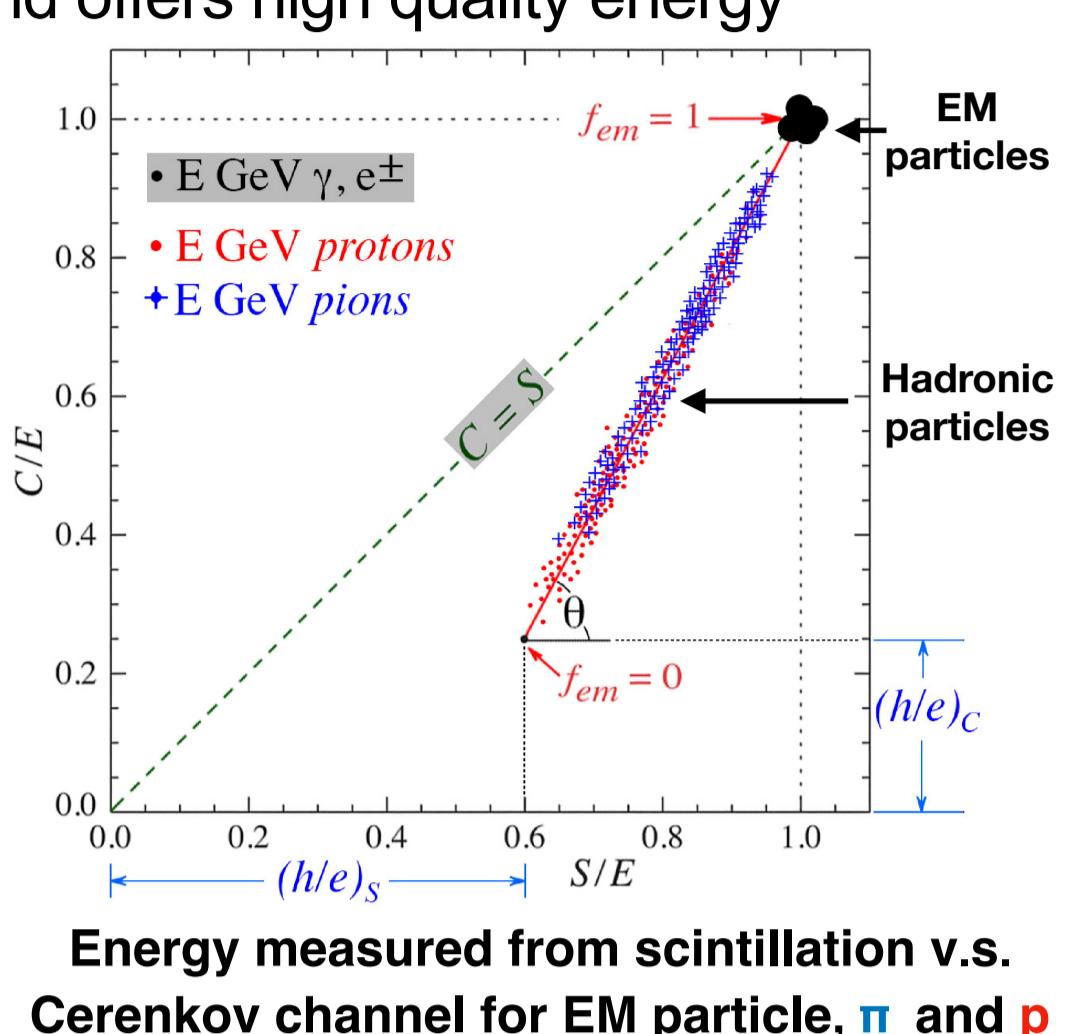
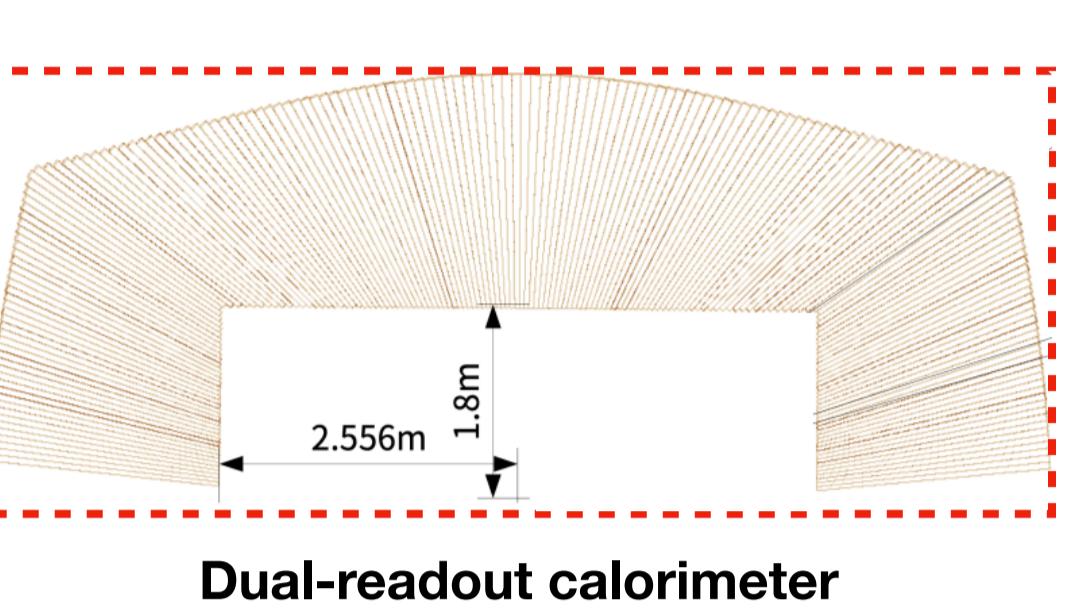
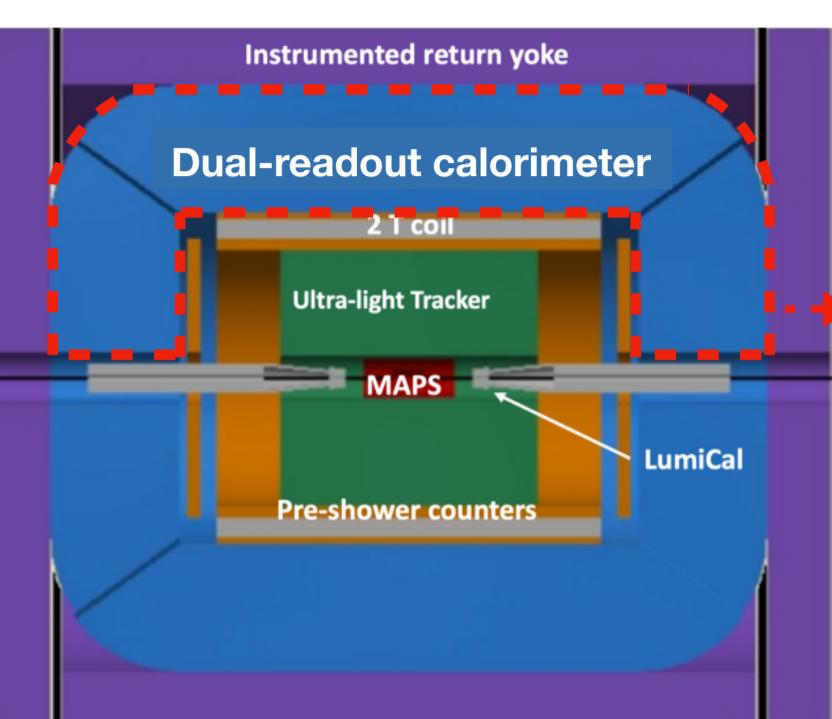
DQM and data handling procedure of first dual-readout calorimeter test beam experiment at CERN for future e+e- colliders

Sungwon Kim (Yonsei University) on behalf of the Korea Dual-Readout Calorimeter team



Dual-readout Calorimeter

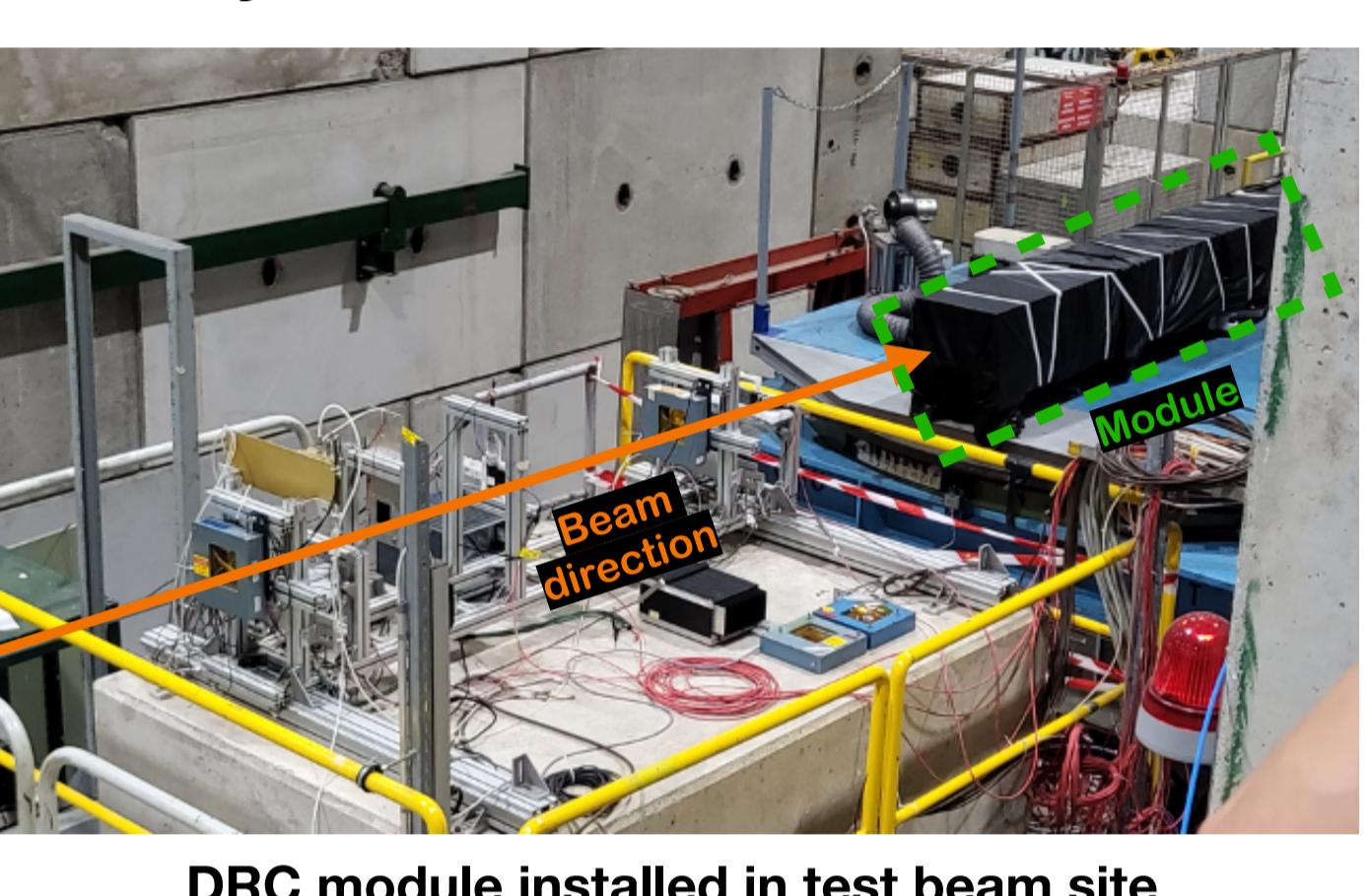
- Dual-Readout calorimeter is included in IDEA detector design, which has been proposed in both conceptual design reports of CEPC and FCC-ee
- Fluctuation of EM fraction (f_{em}) makes it difficult to measure energy of hadronic shower
- Using Cerenkov and Scintillation fibers, DRC can measure f_{em} and offers high quality energy measurement for both EM particles and hadrons



The IDEA detector

DRC Test beam at CERN

- Korea DRC team made 2 DRC modules and had test beam at CERN north area this Aug.
- DRC module located in north area H8 site with auxiliary detectors

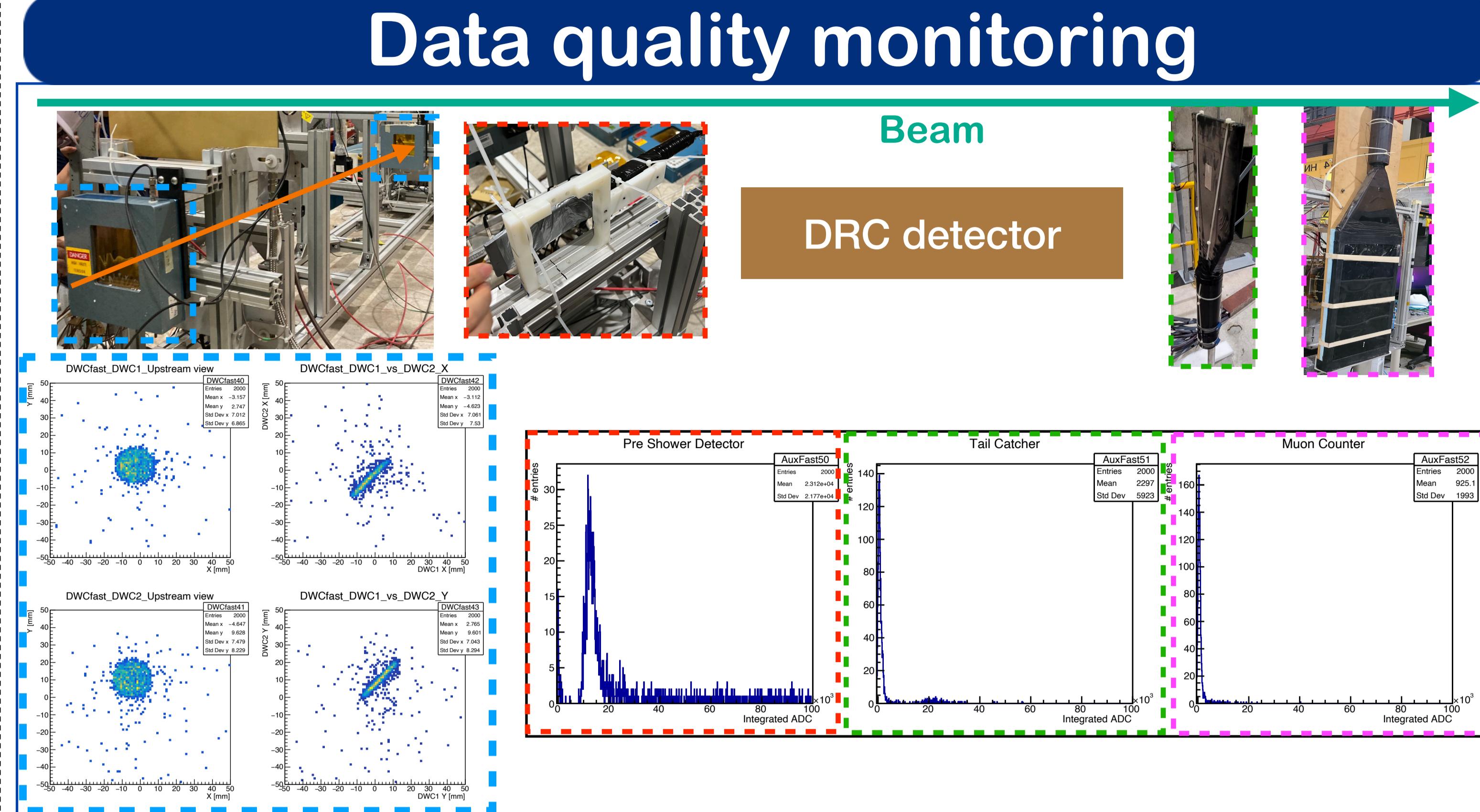
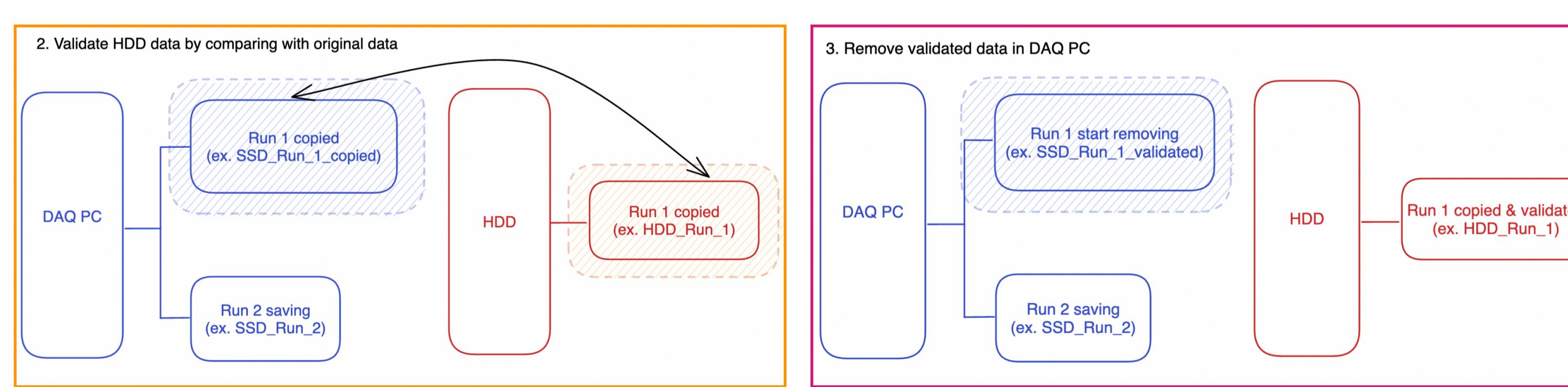
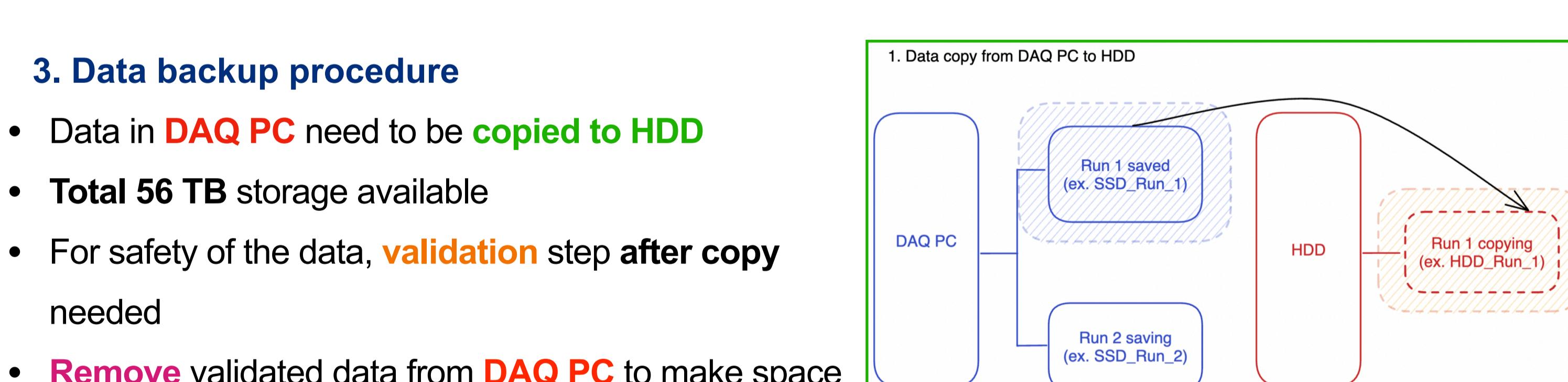
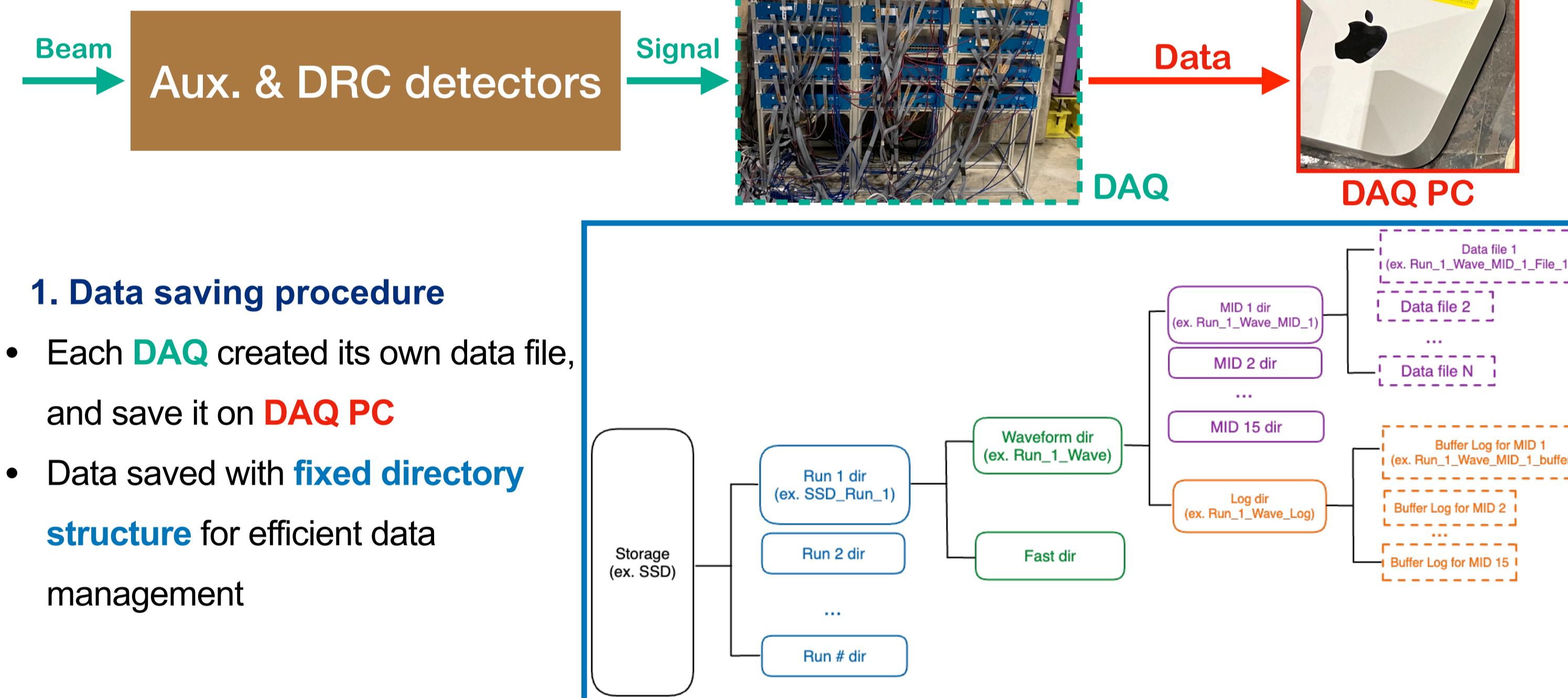


CERN north area

2 DRC modules

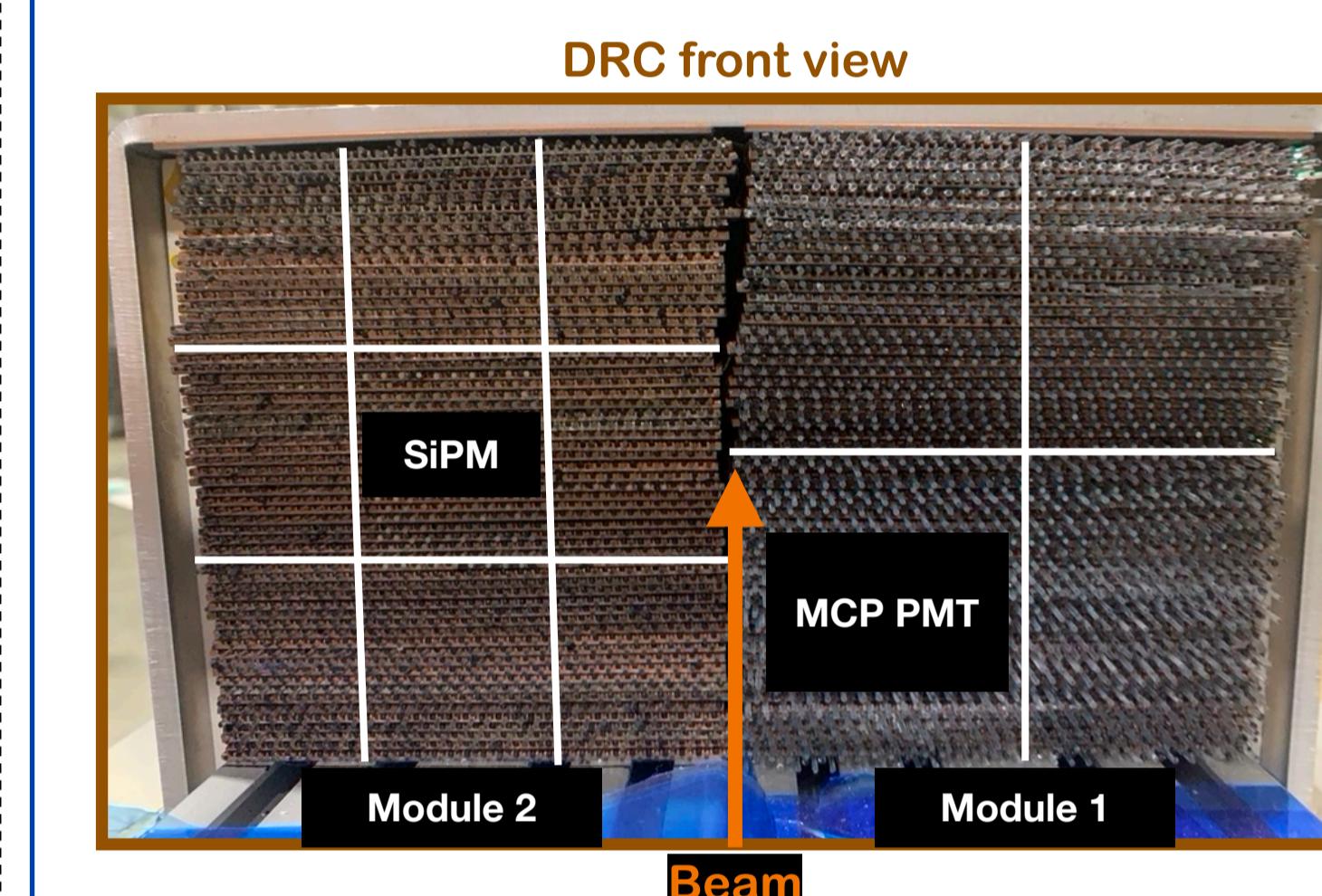
DRC module installed in test beam site

Data management during TB



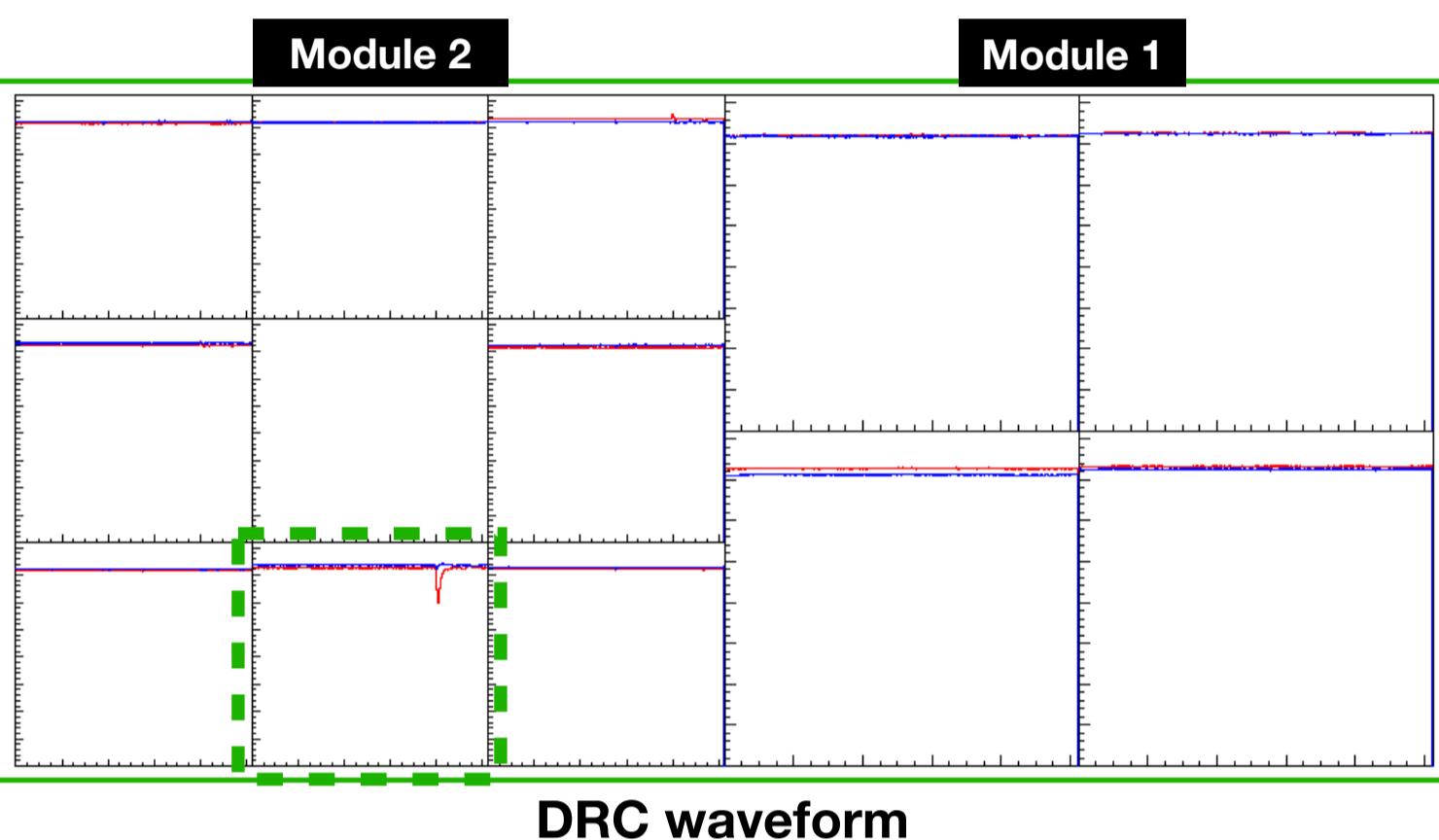
1. Delay wire chamber

- 2D histogram of **DWC response**
- To monitor the **beam position setup**
- Make **2D plot with timing information**



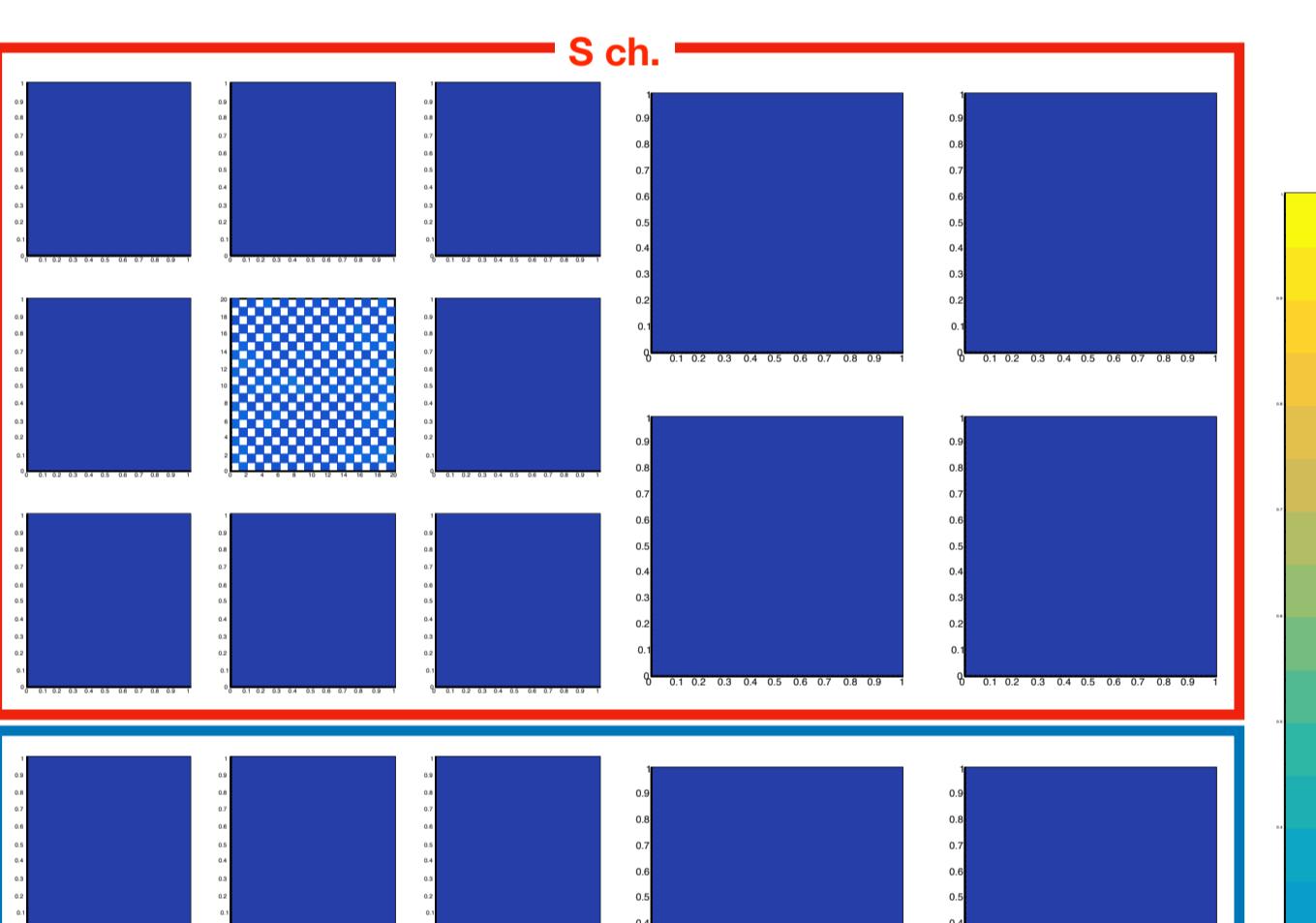
2. Pre-shower, Tail catcher, Muon counter

- Response of **Pre-shower**, **Tail catcher**, **Muon counter**
- To monitor the **beam setup, quality**
- Make **histogram with Integrated ADC of each detector**



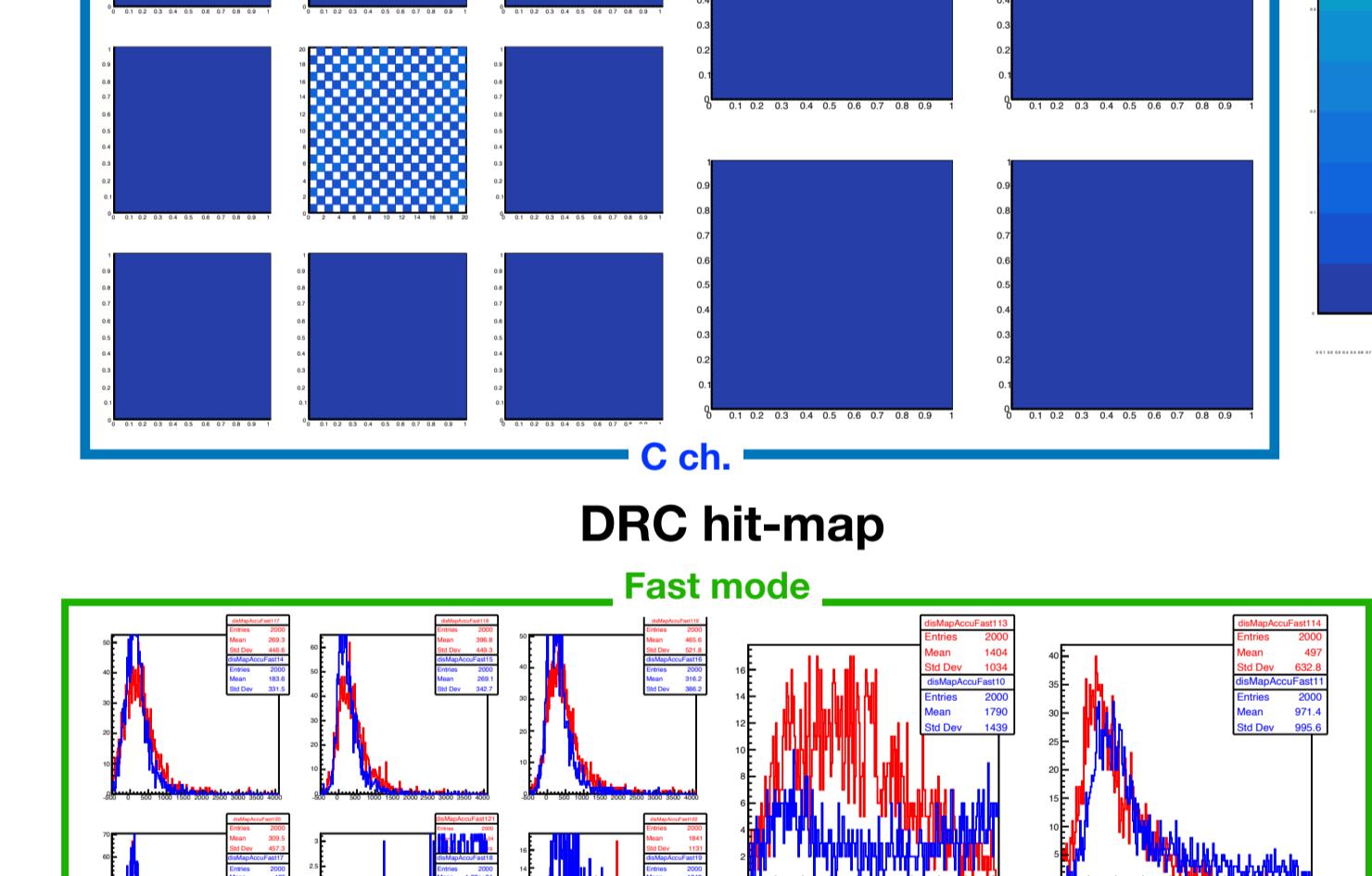
3. DRC module structure

- 2 **DRC** modules separated into various **towers**
- 400 ch **SiPM** at **Module 2**, **MCP-PMT** at **Module 1**
- Generic **PMTs** at all other towers



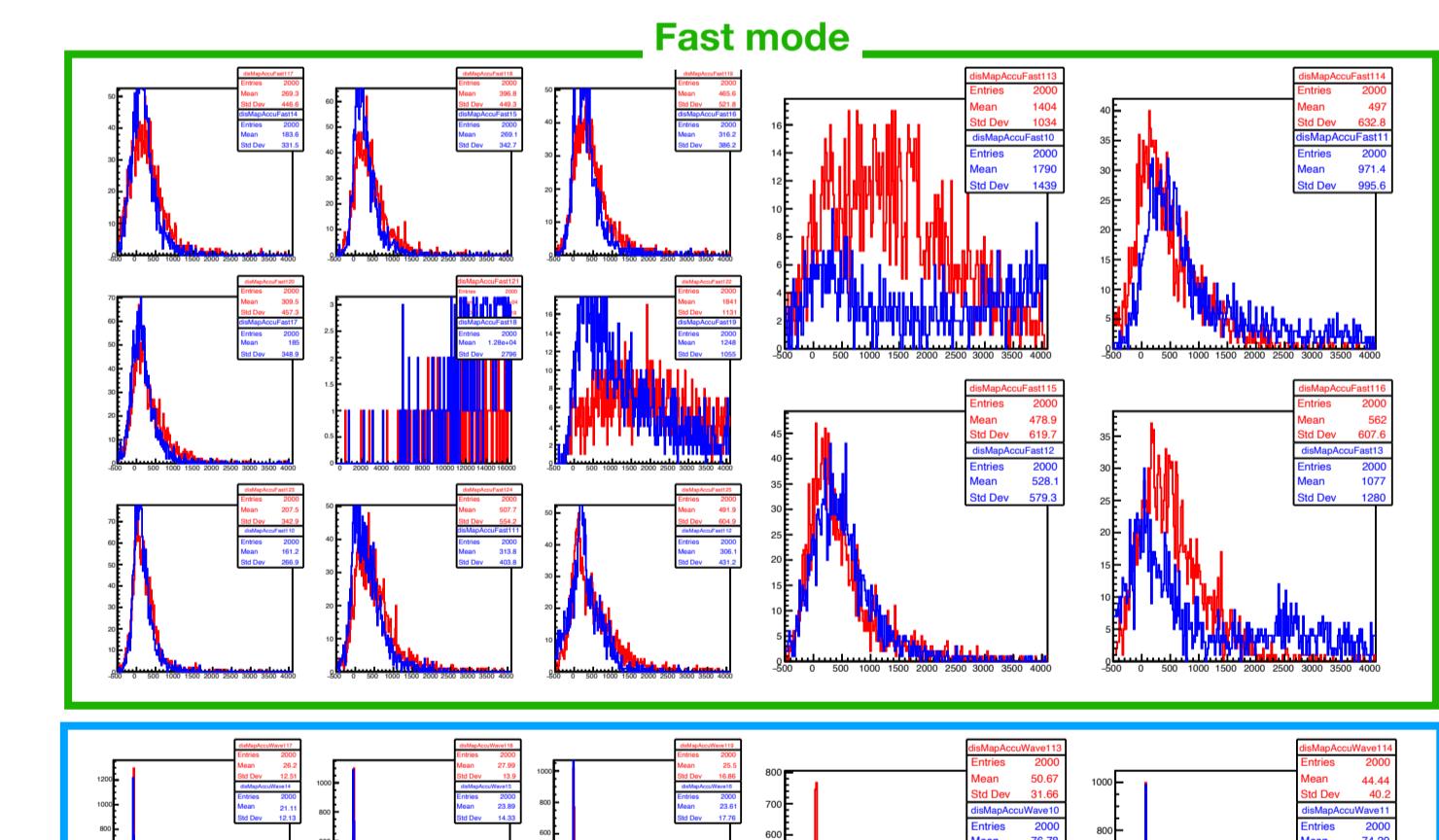
4. DRC module waveform plot

- DRC** module response in **waveform** (single evt.)
- To monitor the **raw response** from each **readout**
- Make **graph with voltage vs time** (both ADC) of **DRC** using **waveform data**



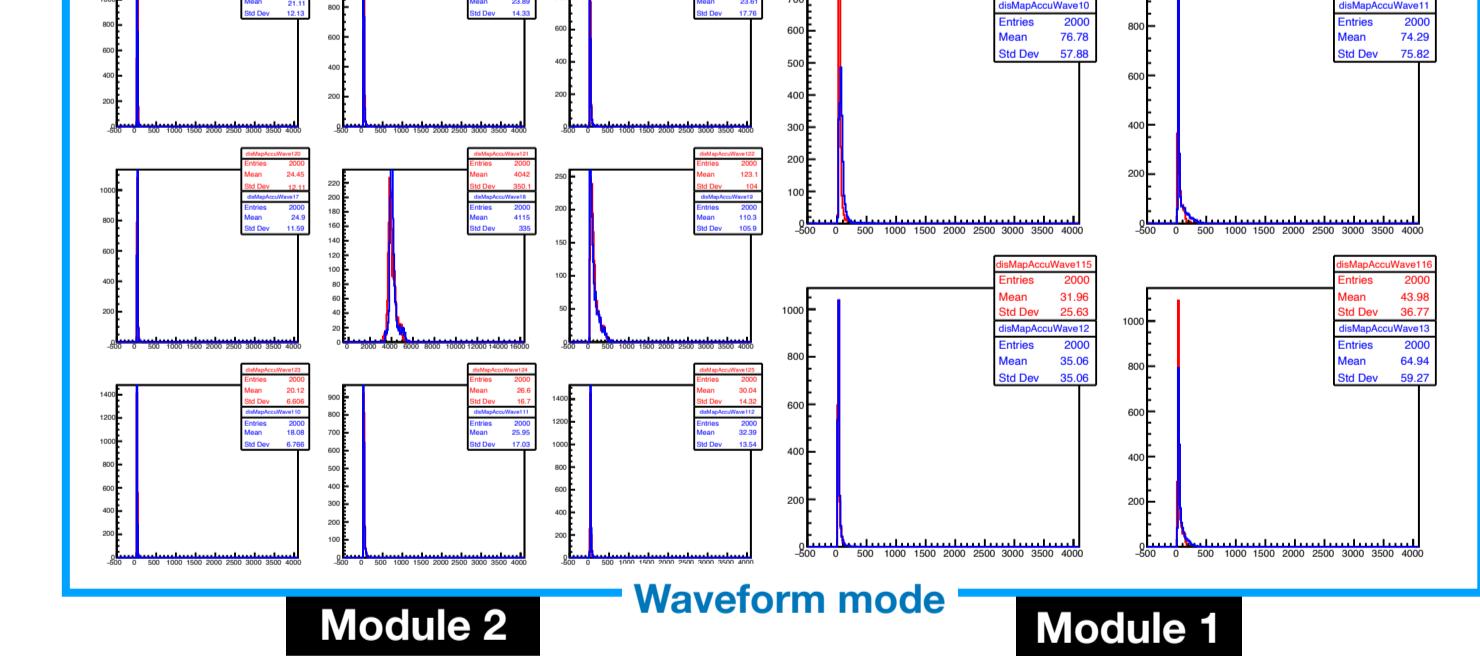
5. DRC module hit-map

- DRC** module response in **2D hit-map**
- Scintillation & Cerenkov** ch. drawn separately
- To monitor the overall **module response** with **position**
- Make **2D histogram with integrated ADC of DRC**



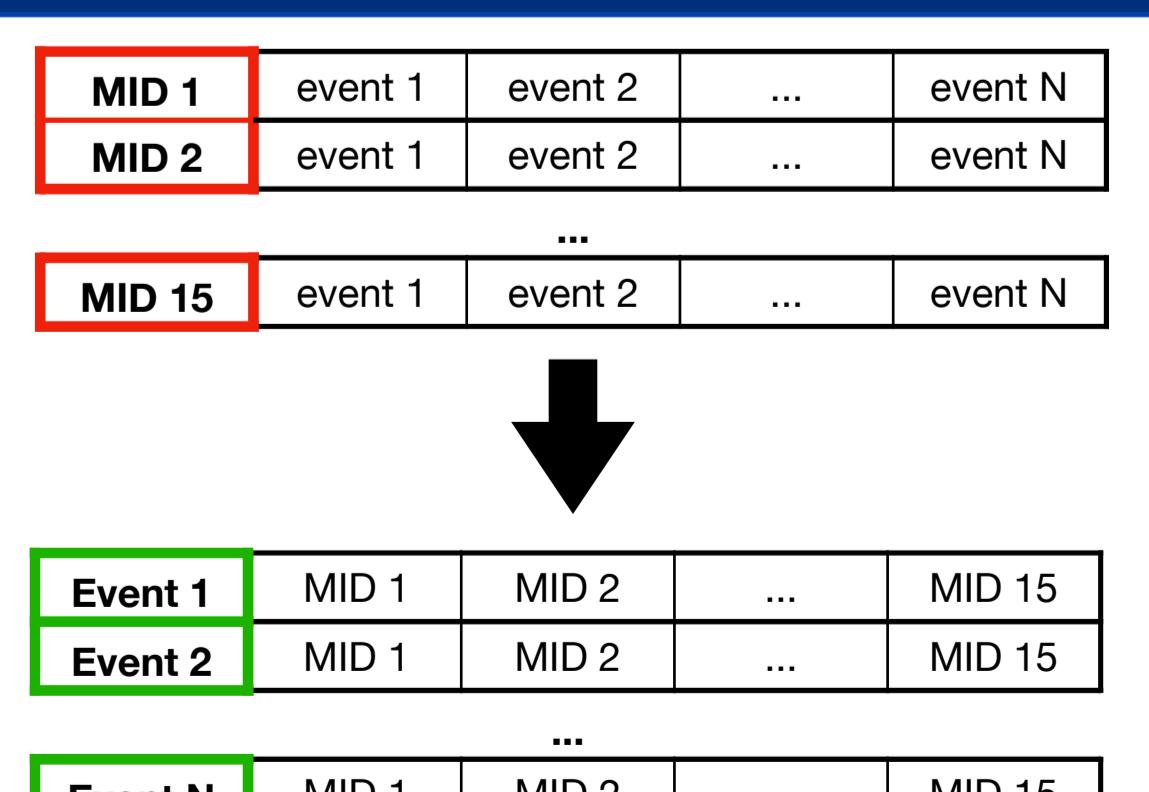
6. DRC module ADC histogram

- DRC** module response in **ADC distribution**
- To monitor the **accurate module response** of both **C & S ch.**
- Make **histogram with ADC response of DRC** using both **Fast mode & waveform mode** data



Ntupleizing the TB data

- The raw data stored in **DAQ module-wise**
- Need to ntuple the data in **event-wise format**
- Developed dedicated **ntupler** & ntupleized the TB data
- TB ntuples** are used for **test beam data analysis**



Summary

- Korea dual-readout calorimeter team built 2 DRC modules and had **test beam** at CERN
- During test beam, proceeded **data management** and **data quality monitoring**
- For safety of the data, **backup** and **data validation** taken regularly
- To check overall test beam setup, **data quality monitoring** was conducted
- Ntupleizing** TB data for data analysis also done after the test beam