H8: DRD6 IDEA DRC (Korean Team)

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On behalf of the Korea Dual-Readout Calorimeter Collaboration (DRD6 IDEA DRC Korea Group)

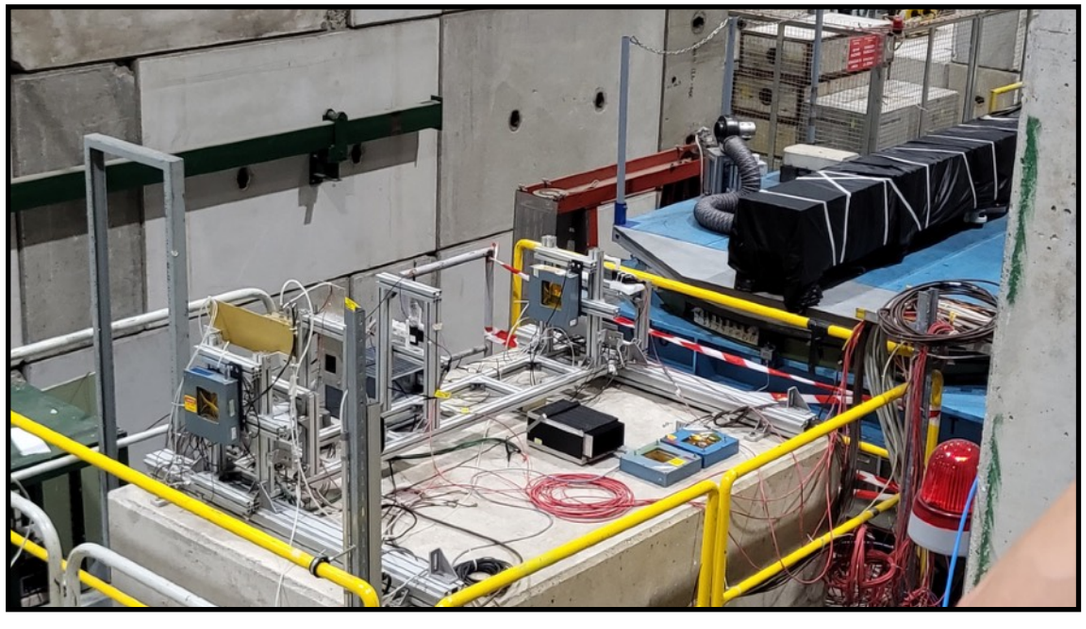
Aug. 1, 2024

Introduction: DRD6 IDEA DRC Korean Team

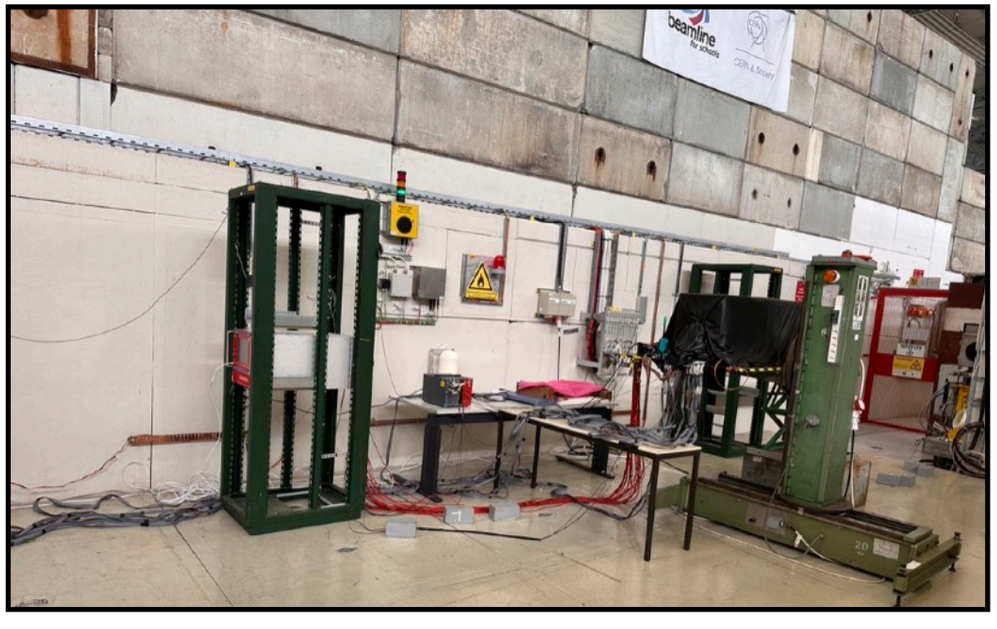
- The **DRD6 IDEA DRC** team aims to research and develop a dual-readout calorimeter for Future colliders (FCC-ee and so on). The DRD6 IDEA DRC team is composed of teams from Korea, Italy, and the USA

- **The DRD6 IDEA DRC Korean Team has been conducting test beams since 2022.** In 2022, they conducted test beams at SPS (H8), and in 2023, they performed test beams at PS (T9)

2022 Aug. Test Beam



2023 Jul. Test Beam



- During the upcoming test period (Week 32 to 35), the Korean team will be a main user during Week 33 and 34, and will share the Week 32 with EU team for various experimental setup tests

Plans of Korea Team

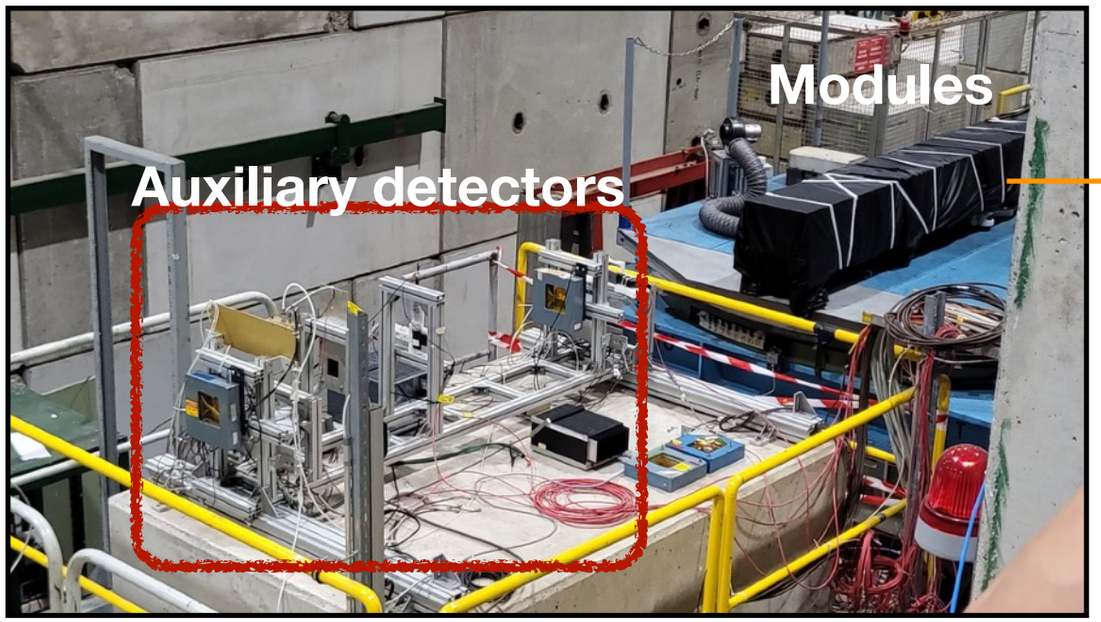
- Weekly plan

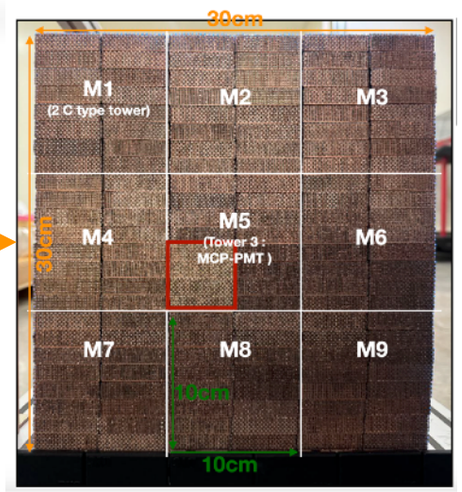
Week	Description	Details
32	Install detector and DAQ system	Install auxiliary detectors(DWC, trigger, Cerenkov counter PS, Neutron counter, tail counter, Moun counter) & DRC modules & setup DAQ system - Test DAQ & modules with parasitic beam
33	Perform main test beam programs	- Calibration & EM performance & Hadronic performance and so on
34	Perform main test beam programs	- Calibration & EM performance & Hadronic performance and so on

Detector Setup for Korean Team

- The DRD6 IDEA DRC Korean team newly built full-size prototype detector

- Our detector modules will be placed on the sapphire table

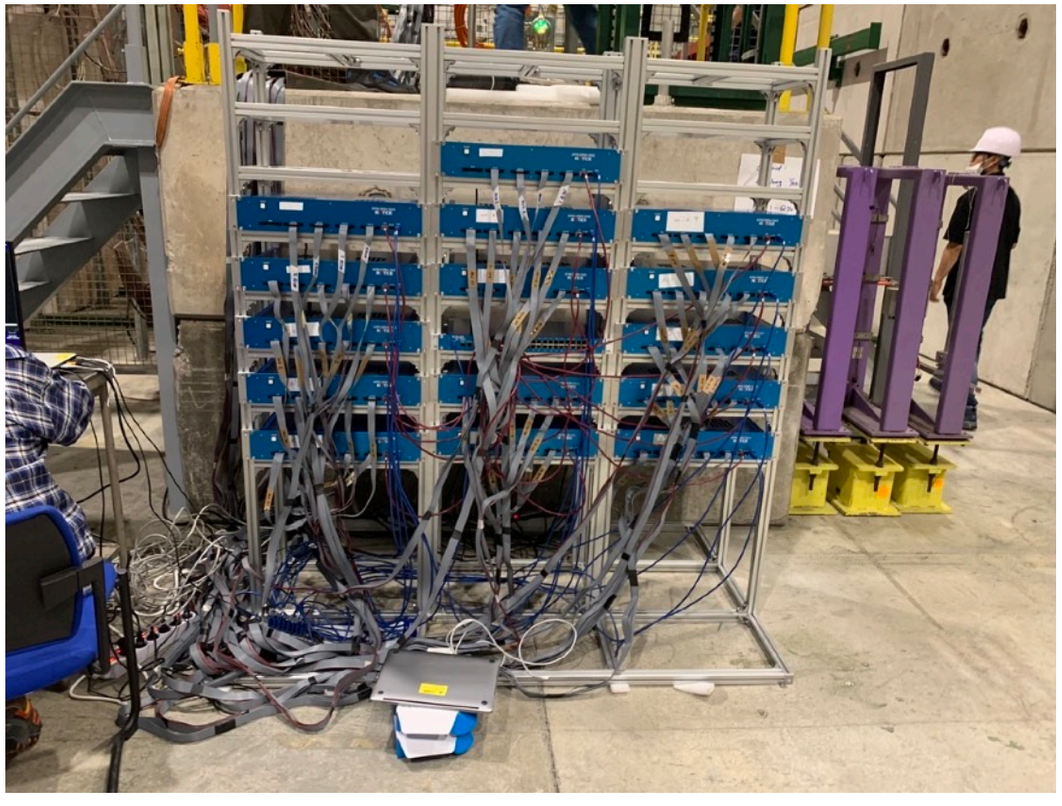




- The DAQ system will be installed behind the concrete block located at the rear of the sapphire table

- The auxiliary detectors (DWC, Triggers, Cerenkov counters, and Preshower detector and so on)will be placed in front of our module

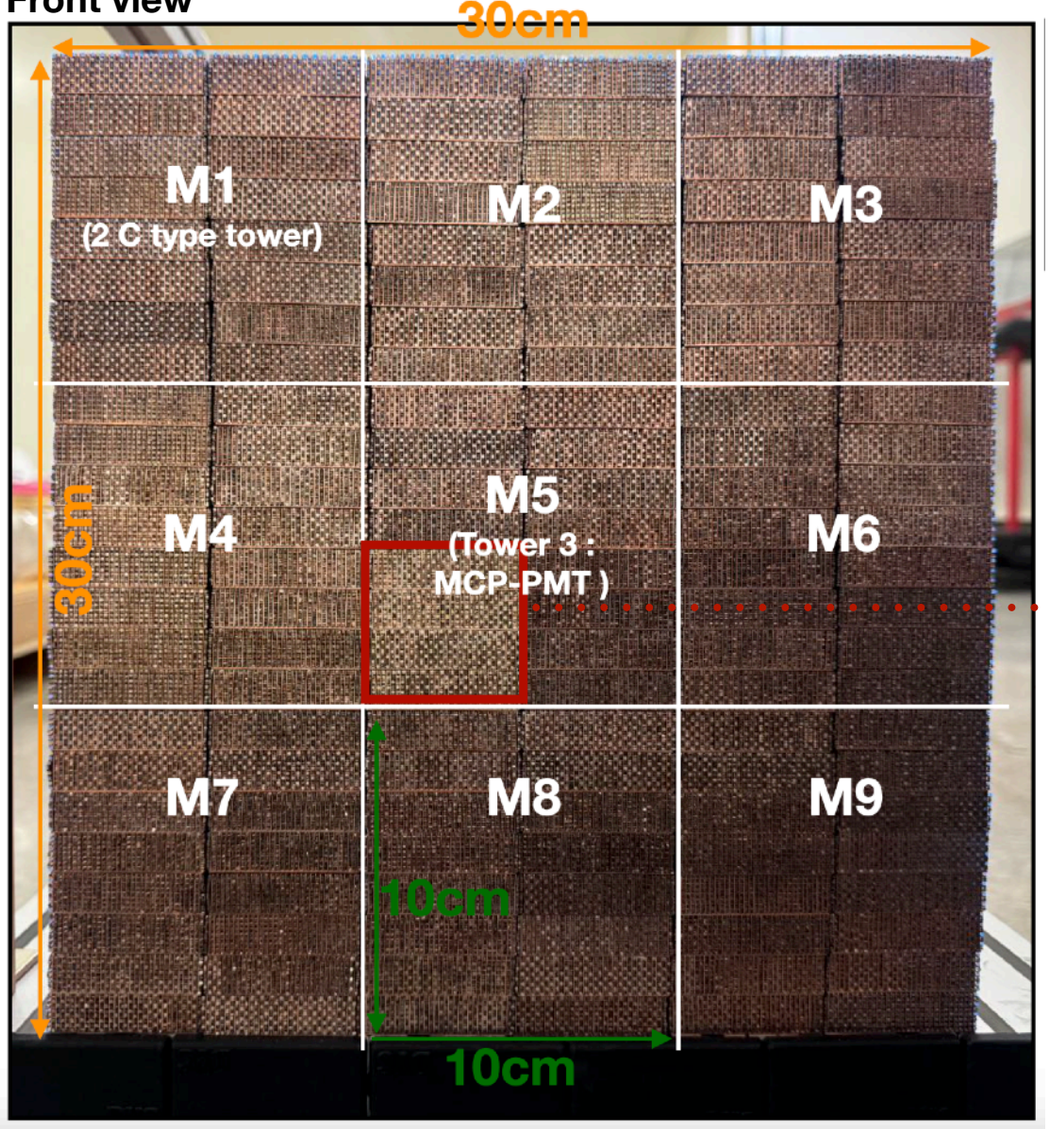
- Beam pipe will be placed in front of auxiliary detectors (Cerenkov counters)



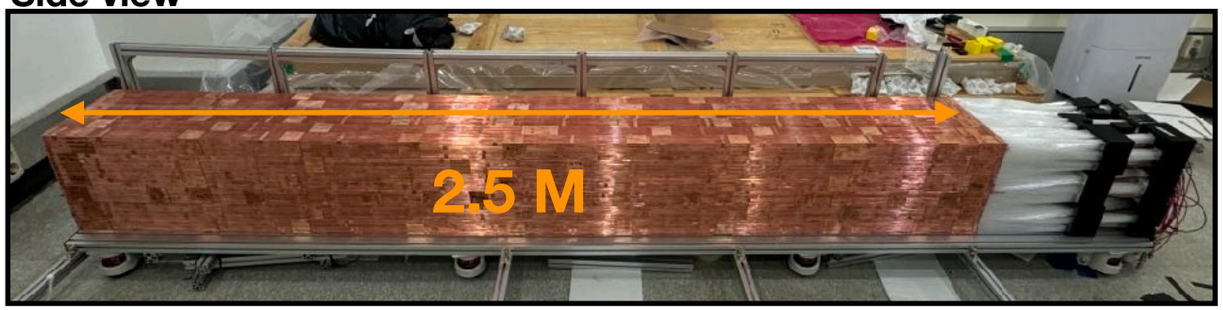
Detector Configuration

- **The DRD6 IDEA DRC Korean team aims to research and develop a dual-readout calorimeter. The dual-readout calorimeter consists of copper and two types of optical fibers**
  - Our detector is composed of 9 modules
  - Dimension: **30 cm X 2.5 M** (10 λ_{int})
  - Weight: **1.2 t**
  - Detector already arrived at CERN (Jul. 9th)

Front view



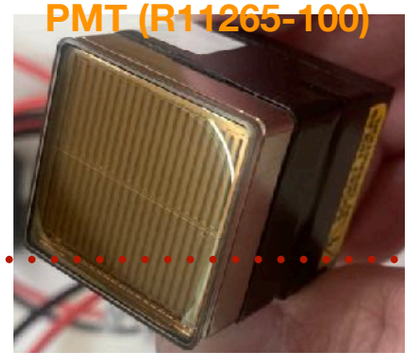
Side view



Readout:

We plan to primarily use PMT (R11265-100), and we will use MCP-PMT (XP85012, XP85112) for M5

PMT (R11265-100)



MCP-PMT (XP85012, XP85112)

Test Beam Programs

- We primarily aim to verify the calibration and the electromagnetic (EM) and hadronic performance of detector. Additionally, we intend to conduct various other programs.

  - Physics programs:
    - Calibration with 20GeV electron beam
    - The EM performance: the energy scan & the uniformity scan
    - The Hadronic performance
      - pions and jets (20 ~ 120 GeV)
      - protons (20 ~120 GeV) without interaction target
  - Additional programs
    - positron resolution measurement & position scan (using MCP-PMT, SiPM)
    - particle identification
    - lateral shower profile measurement
    - light attenuation measurement (pions)
    - Time resolution with the towers that MCP-PMT's and SiPM were equipped
    - 3D shower reconstruction
    - Fiber type test

Requirements

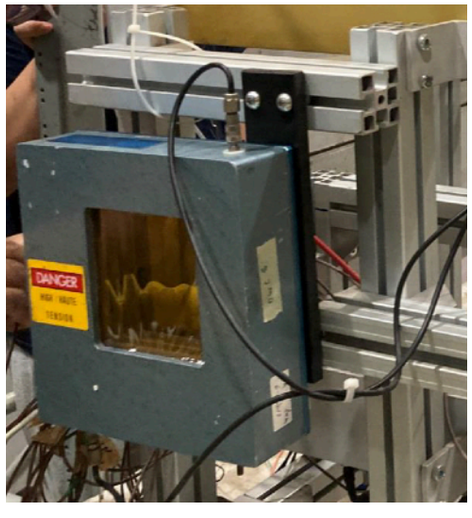
- **Beam requirement:**
  - Electron(positron) beams : 6, 10, 20, 30, 40, 60, 80, 100, 120 GeV
  - Pion beams : 20, 40, 60, 80, 100, 120 GeV
  - Proton beams : 20, 40, 60, 80, 100, 120 GeV

- **Auxiliary detectors:**
  - Two delay wire chambers
  - Cherenkov counters (XCET) :
    - 2 counters (August 7 to 28)
    - Gas: helium gas
    - Analog signals to acquisitive with our DAQ system (experimental area)

Backup

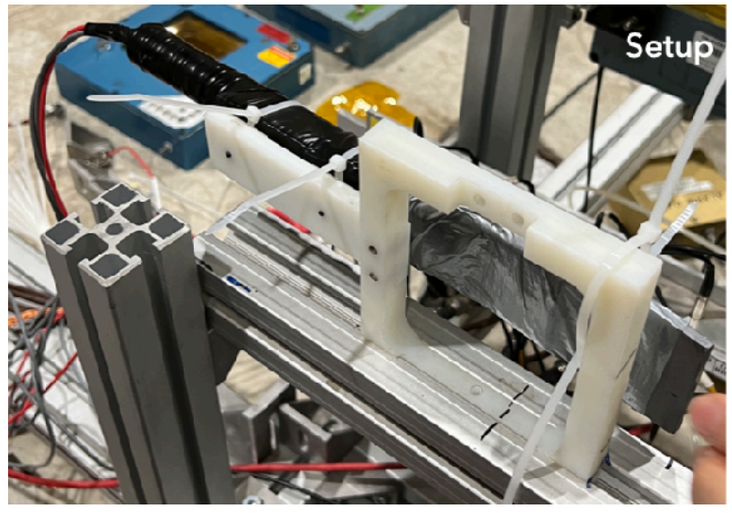
Setup for TB2022

- **Delay wire chamber: x,y position measurement**



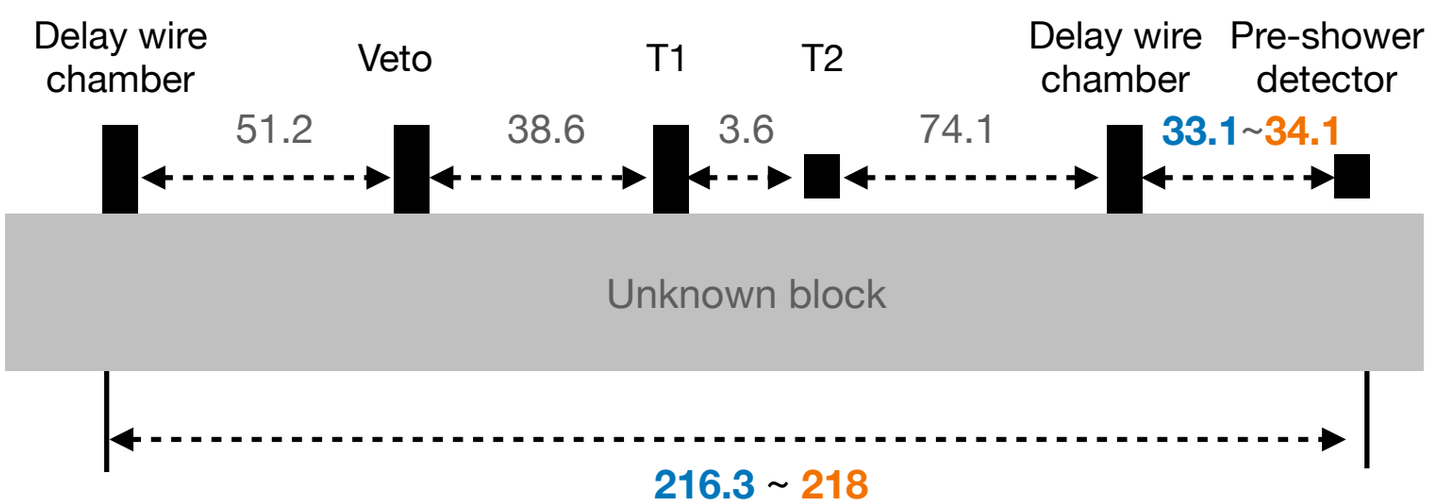
- **T1T2+veto: trigger**

- **Pre-shower detector: for obtaining various types of particles by shower**



Ancillary detectors

Unit: cm



- **Tale catcher: to detect particles that are through the DRC**

- **Muon counter: to detect muon**

Physics Programs

- 36 tower calibration with 20 GeV (or 40 GeV) electrons (0 deg. (rotation angle), 0 deg. (tilting angle))
- The EM performance
  - the energy scan (6, 10, 20, 30, 40, 60, 80, 100, 120 GeV) (1.5 deg., 1.0 deg.)
  - the uniformity scan with 9 points (0 deg., 0 deg.)
- The Hadronic performance (all runs with the interaction target)
  - pions and jets (20, 40, 60, 80, 100, 120 GeV) (0 deg., 0 deg.) and (1.5 deg., 0 deg)
  - protons (20, 40, 60, 80, 100, 120 GeV) without interaction target (0 deg., 0 deg.) and (1.5 deg., 0 deg)
- Additional programs
  - positron resolution measurement with electrons of 10, 20, 40, 60, 80, 100, 120 GeV (0, 0 deg.)
    - the center of the matrix
    - MCP-PMT, SiPM
- position scan (from the center of a tower to another center of a neighbor tower) with electrons
- particle identification (e, mu, pi) - 20, 60, 100, 120 GeV (MCP-PMT, Square PMT, SiPM)
- lateral shower profile measurement with pions (60 GeV)
  - shower axis: the center tower, the upper left or right corner of the matrix
- light attenuation measurement (pions)
- Time resolution with the towers that MCP-PMT’s and SiPM were equipped
- 3D shower reconstruction
- Fiber type test (PMT equalization with LED (must equalize PMT’s with the integrated charge))