

Giessen Cosmic Station - Current Measurements

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Online PANDA Meeting

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Overview

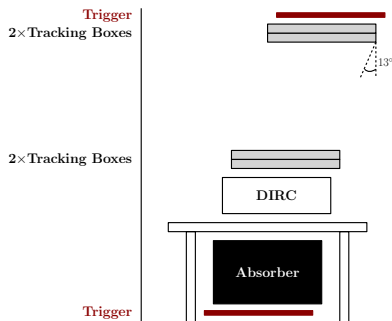
Track Reconstruction

- ▶ Track reconstruction via position measurement in two planes

Components

The test stand consists of

- ▶ Two scintillating plates defining a trigger
- ▶ Four layers of scintillating bars (track reconstruction)
- ▶ About 45 cm of lead in between the trigger plates (energy selection)



Overview

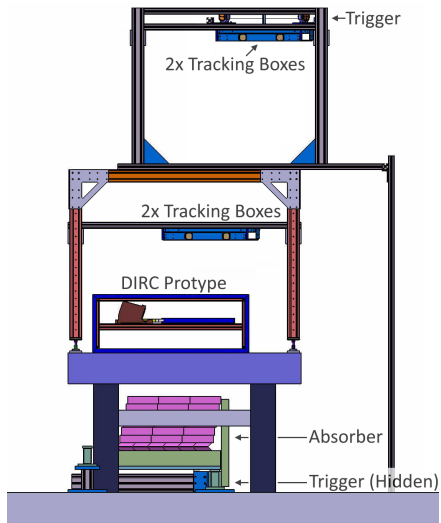
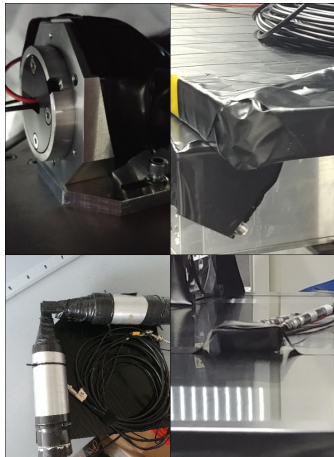


Figure: Annotated CAD drawing of the GCS.

Updated Components

Trigger Plates

- ▶ PMTs in the corners replaced by SiPMs
- ▶ Moved closer to ceiling (due to smaller form factor)



Finger Counters

- ▶ Cross replaced by small scintillating block
- ▶ Readout via two SiPMs

Radiator Plate

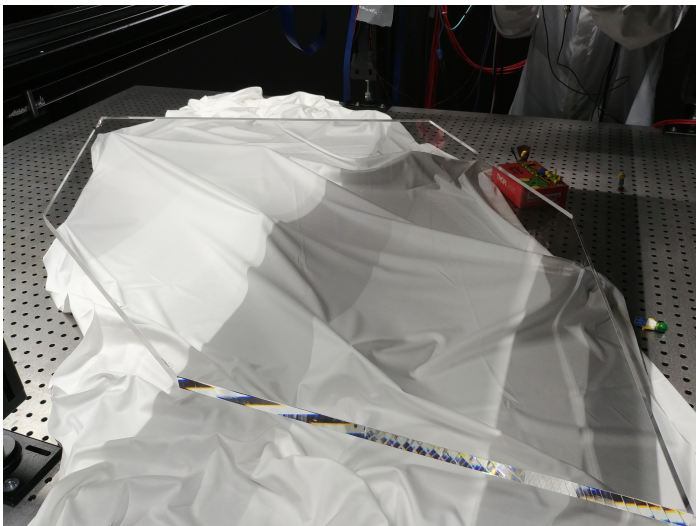


Figure: The new radiator plate inside the clean room.

DISC-DIRC Measurement

Goal of the Measurement

- ▶ Cherenkov Angle Reconstruction and Resolution Estimation with the new Radiator inside GCS

Problem: Light shielding

- ▶ Old prototype box too small
- ▶ Discussed alternatives:
 - ▶ New Rigid Box (Long lead time)
 - ▶ Tent-like construction
 - ▶ No additional shielding (Rely on Cleanroom)
- ▶ Light level checked using human eyes and SiPMs
 - ▶ Cleanroom is dark enough!

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The setup includes ...

- ▶ One MCP coupled to three focusing elements
- ▶ Pulser and laser with diffuser
- ▶ The new radiator plate

Readout

- ▶ All components read out via TOFPET (including GCS)
- ▶ ≈ 460 active channels on 9 ASICs
- ▶ System is running in mixed polarity mode (4 ASICs negative, rest positive)

DISC-DIRC Measurement (Setup)

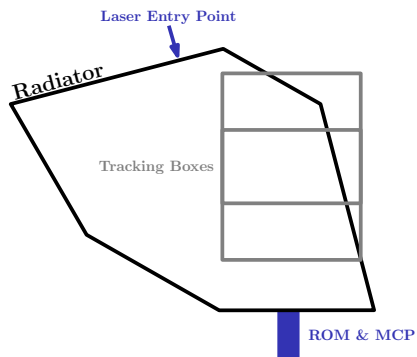


Figure: Schematic drawing of the measurement setup.

DISC-DIRC Measurement (Setup)

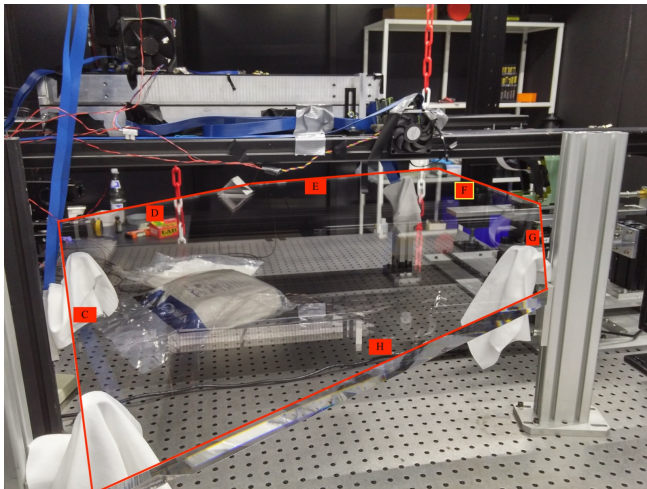


Figure: Positioning of the radiator inside the GCS.

DISC-DIRC Measurement (Setup)

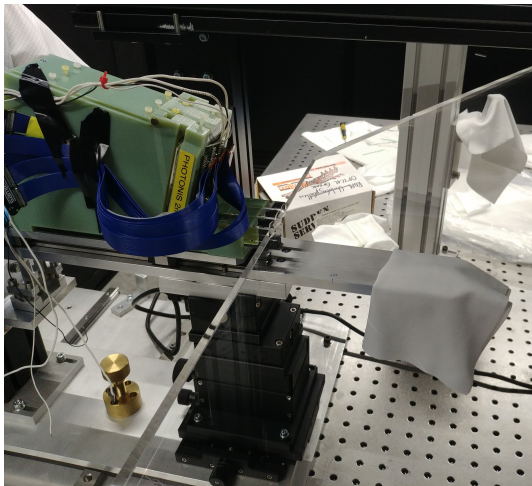


Figure: Readout module and MCP during installation.

DISC-DIRC Measurement (Setup)

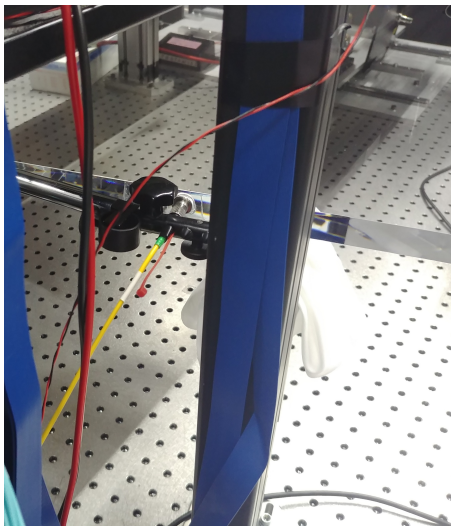


Figure: Positioning of the laser.

List of encountered problems during first weeks of running

- ▶ Light of the neighbouring lab hitting the MCP
 - ▶ Culprit: Cable feedthrough into the cleanroom (solved)
- ▶ Cleanroom temperature control offline (solved)
 - ▶ Slow temperature drift (almost invisible with default dashboard settings)
- ▶ Unstable low voltage power supply (replaced)
- ▶ Maximum disk capacity hit (solved)
- ▶ Degraded timing performance in one of the fronted-modules
- ▶ Some dead channels in the negative polarity ASICs

Tracking Fully Operational

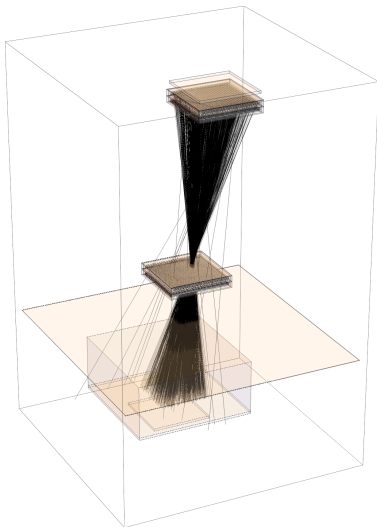


Figure: Reconstructed tracks in coincidence with the finger counter.

Koinzidenz von MCP-Hits and Tracking

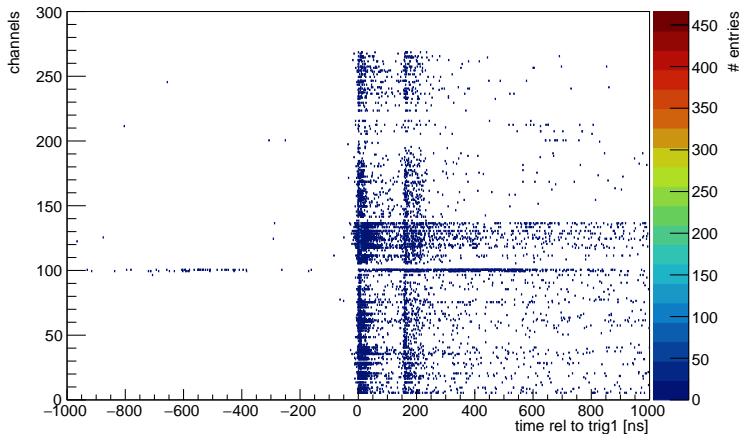
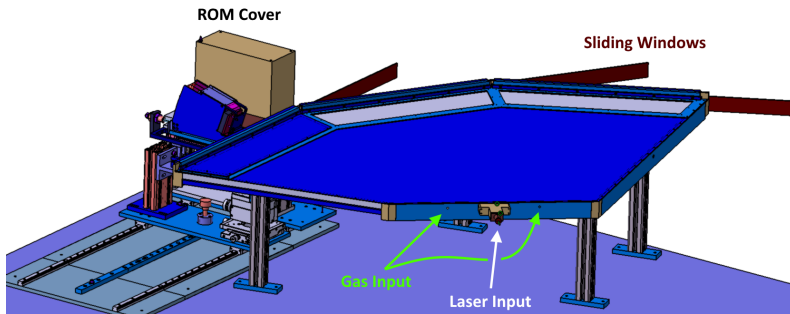


Figure: Time difference between tracking box and MCP.

New Radiator Case

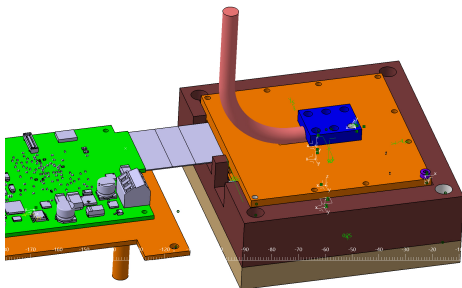
New Radiator Case

- ▶ Expected in the next few weeks
- ▶ ROM-Case larger than final design
- ▶ Soft material (dots/strings) on lid to protect radiator



Cooling of the Readoutboard

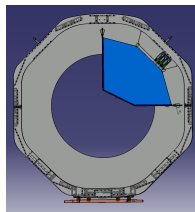
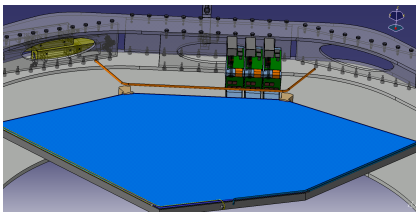
- ▶ First iteration of final Readoutboards expected soon
- ▶ Cooling considerations, planning and design started
- ▶ Currently air flow based cooling used in GCS
 - ▶ Unsuitable for final design
 - ▶ Liquid based cooling instead
 - ▶ Testing device available (CC4150, -20 °C to 200 °C)



Design for Prototype & Phase 1

Prototype in Phase I

- ▶ Inclusion of prototype in PANDA Phase I
- ▶ Number of ROMs strongly dependent on funding
 - ▶ Desired: 16 ROMs
 - ▶ 3 ROMs available from current prototypes
- ▶ Mounting plate and stabilizing cross needs to be built



Thank you!

Reconstruction - Angular Acceptance

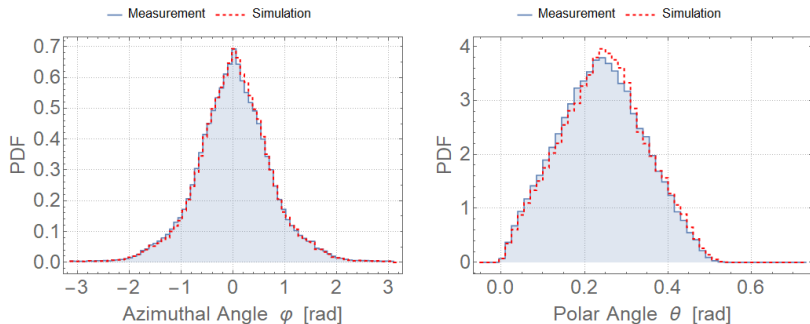


Figure: Angular acceptance without trigger.

Tracking Boxes

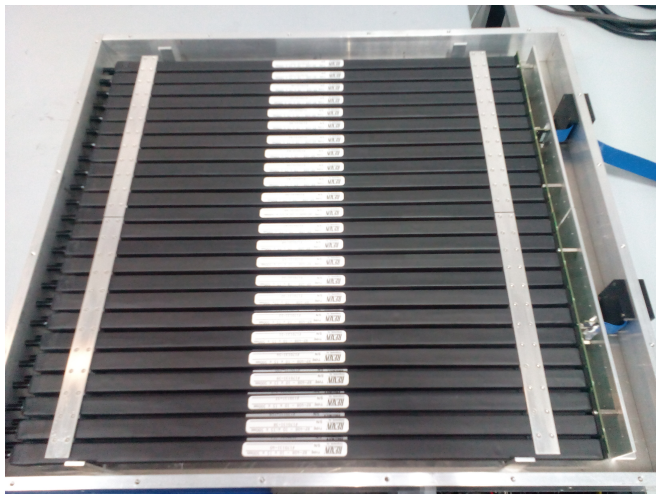
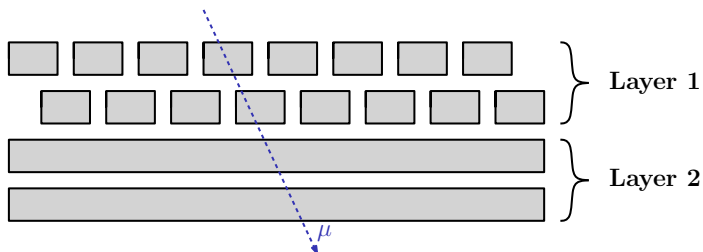


Figure: One of the tracking boxes without lid.

Tracking Boxes

Geometry of the bars

- ▶ 48 bars ($15 \times 10 \times 500$ mm) in two half-layers shifted against each other
- ▶ Second layer rotated by 90° for position resolution along the other axis
- ▶ Every layer in a separate light-proof box



Trigger Plates

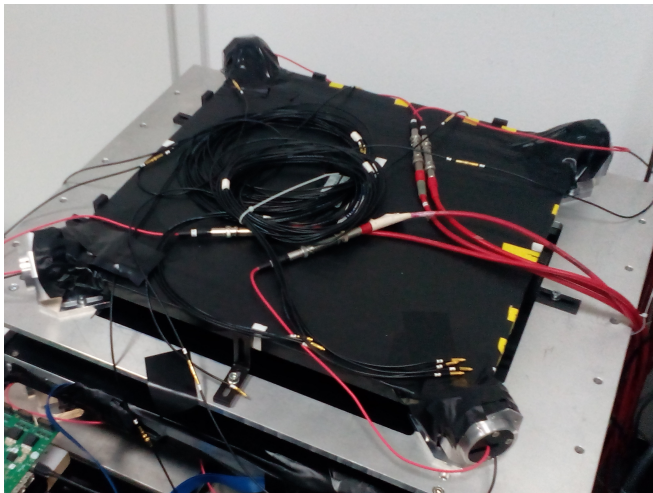


Figure: One of the $50 \times 50 \text{ cm}^2$ trigger plates with PMT-Readout.

Absorber

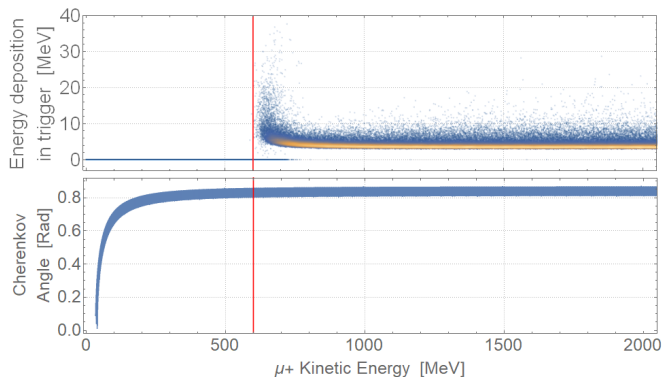


Figure: Energy deposition in the trigger after passing through the lead (top), the Cherenkov angle range (bot) and the estimated threshold (red).

Wavelength cut: $200 \text{ nm} < \lambda < 800 \text{ nm}$ // Energy deposition obtained from Monte Carlo.