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CREMLIN PLUS
Connecting Russian and European Measures for Large-scale Research Infrastructures

Task 6: FDIRC Simulation and Prototyping

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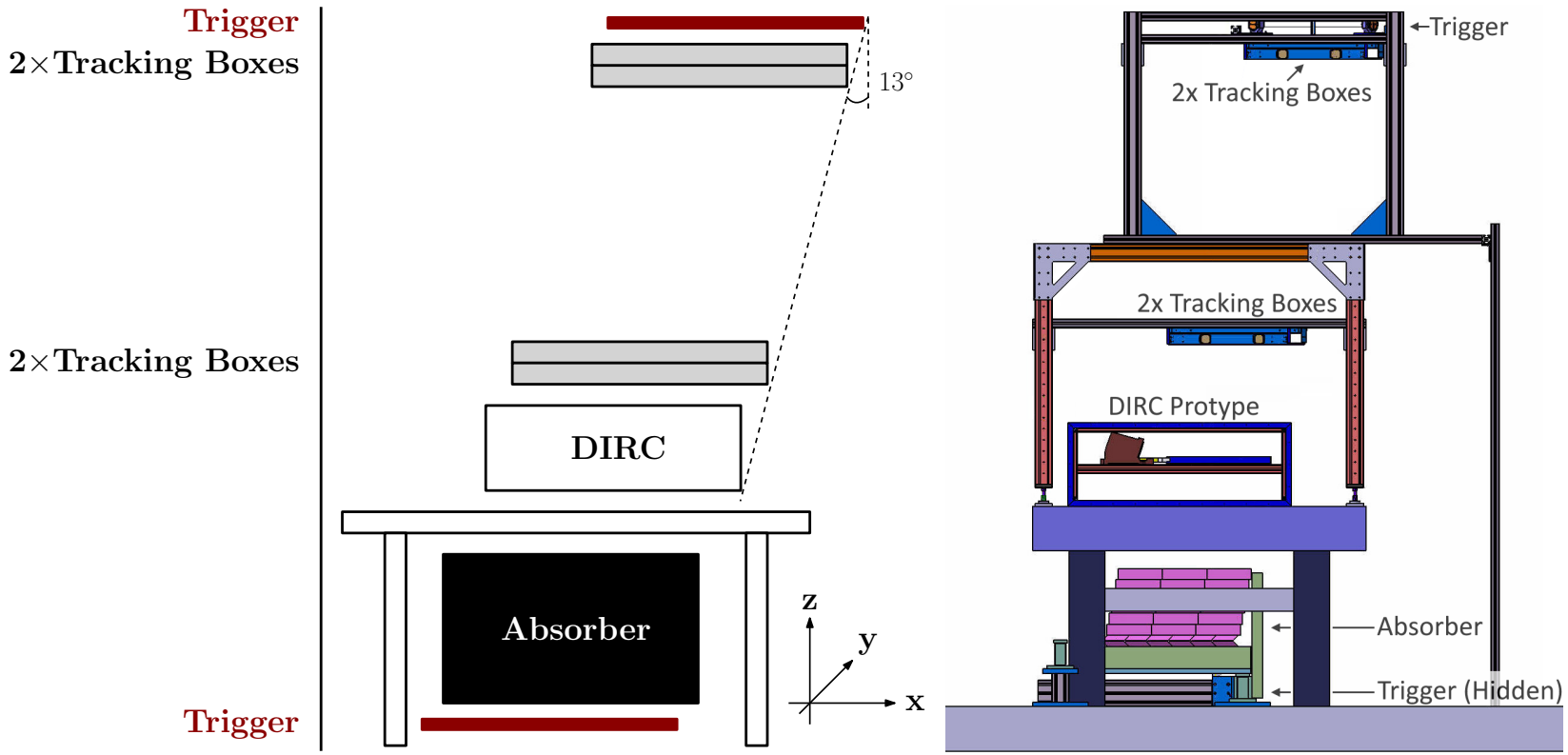
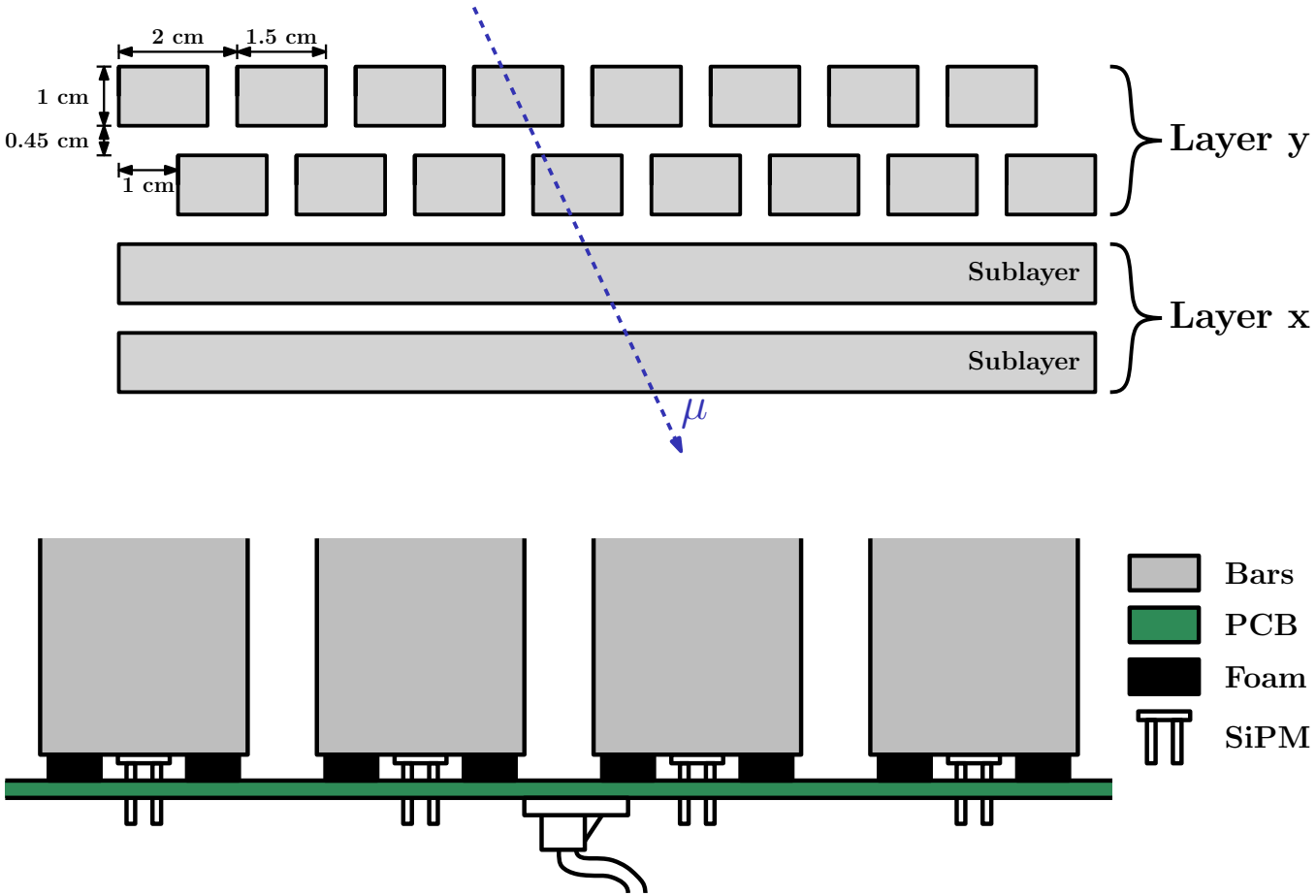
Giessen Cosmics Station

- Giessen Cosmics Station (GCS) for tracking cosmic muons
- 2 tracking stations with 2 scintillator bar boxes
- 2 Trigger plates
- Absorber to filter out low-energetic muons



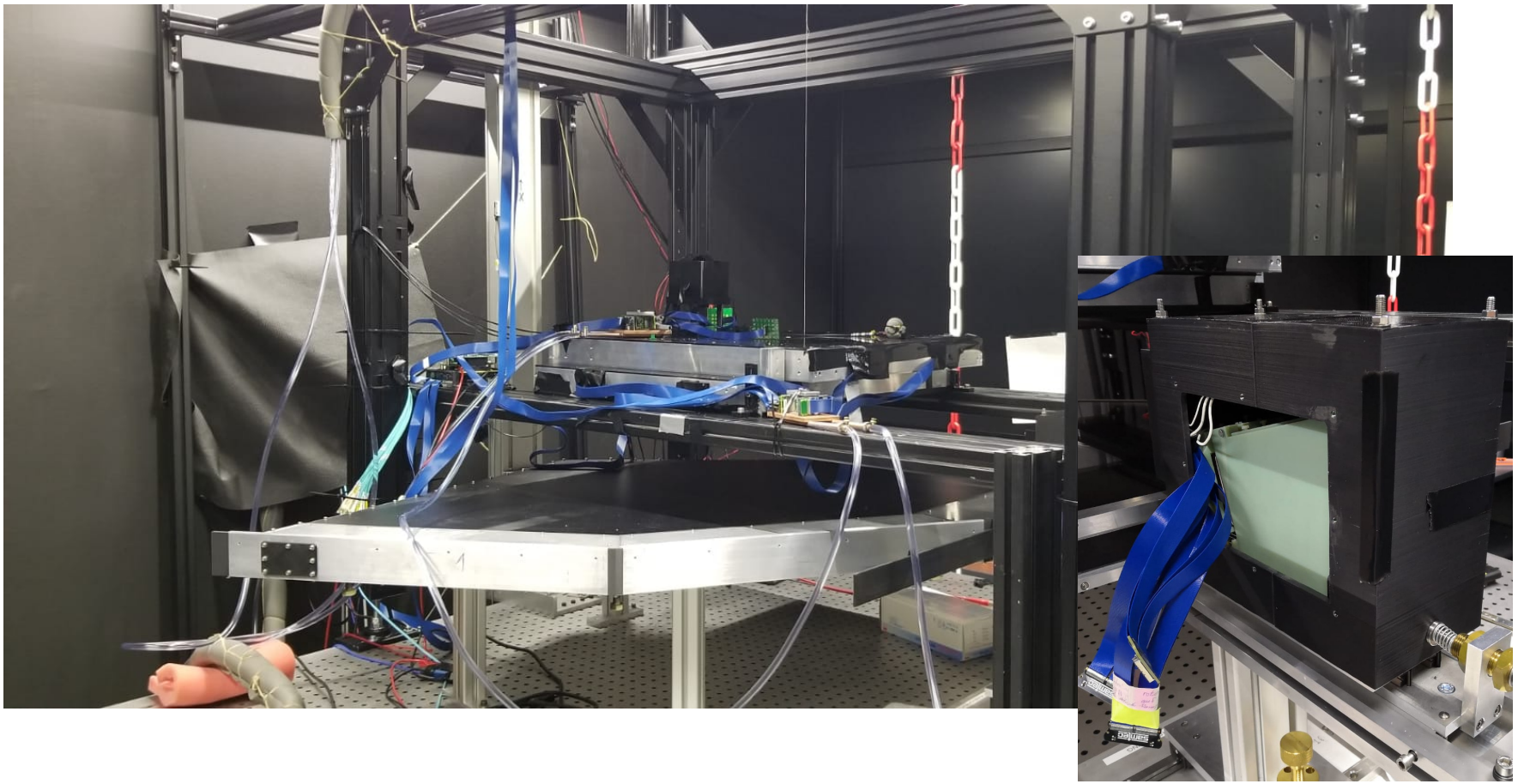
Giessen Cosmics Station

- 2 layers for each coordinate ⇒ increasing resolution
- Readout of scintillator bars with SiPMs



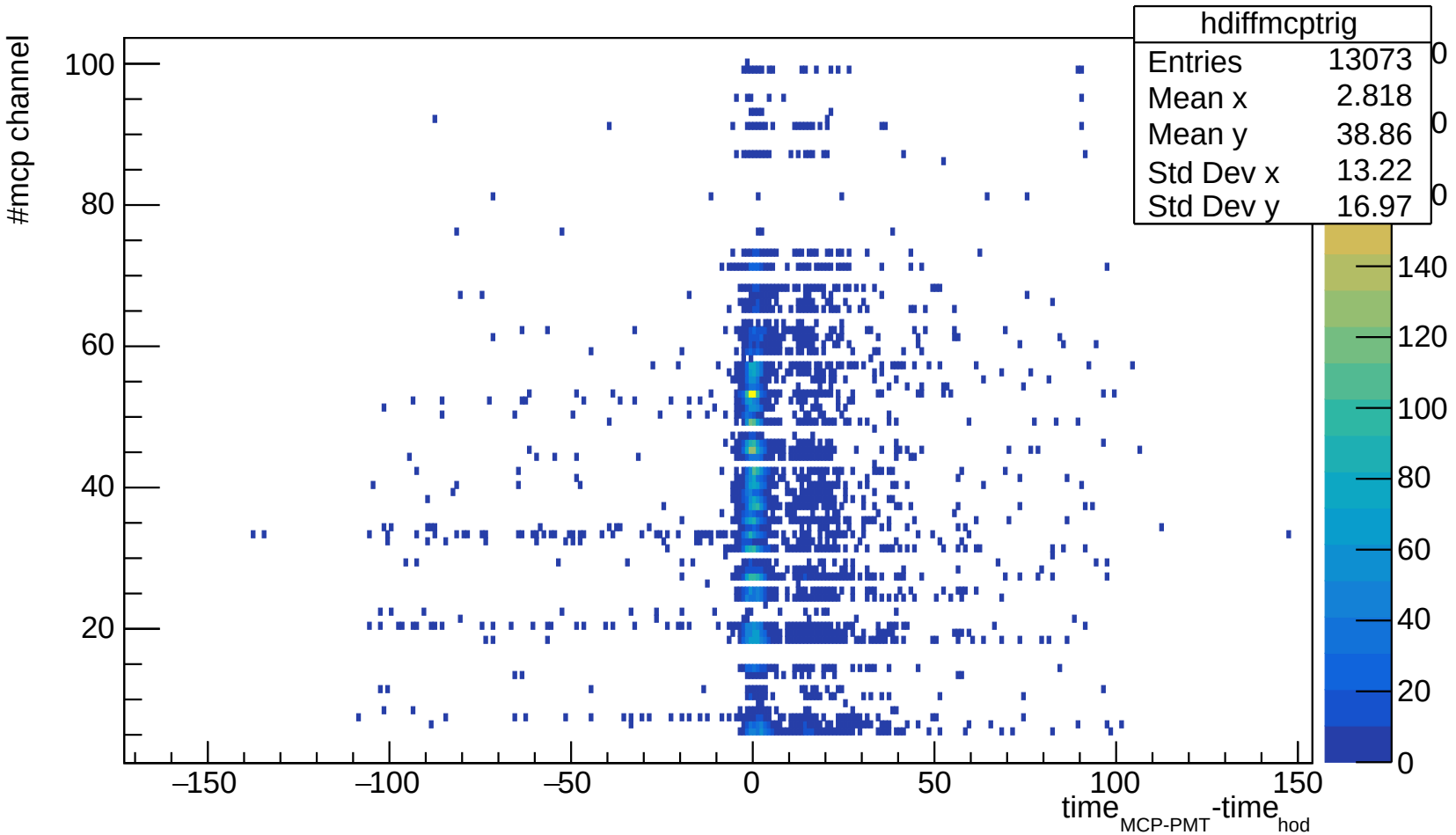
Giessen Cosmics Station

Image of the GCS in the clean room of the JLU
(including DIRC radiator and attached ROM)



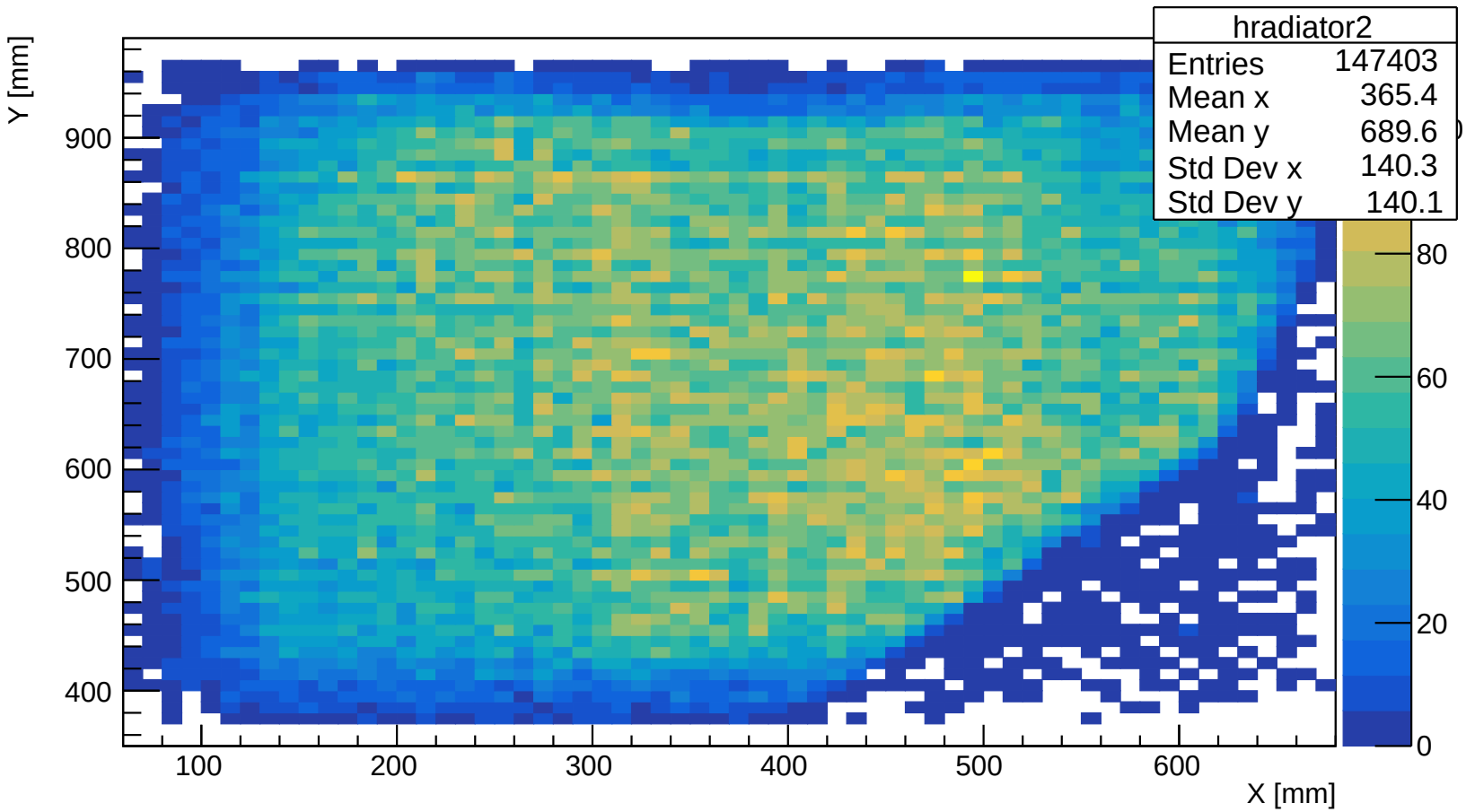
Time Difference

Time difference between MCP-PMT and hodoscope



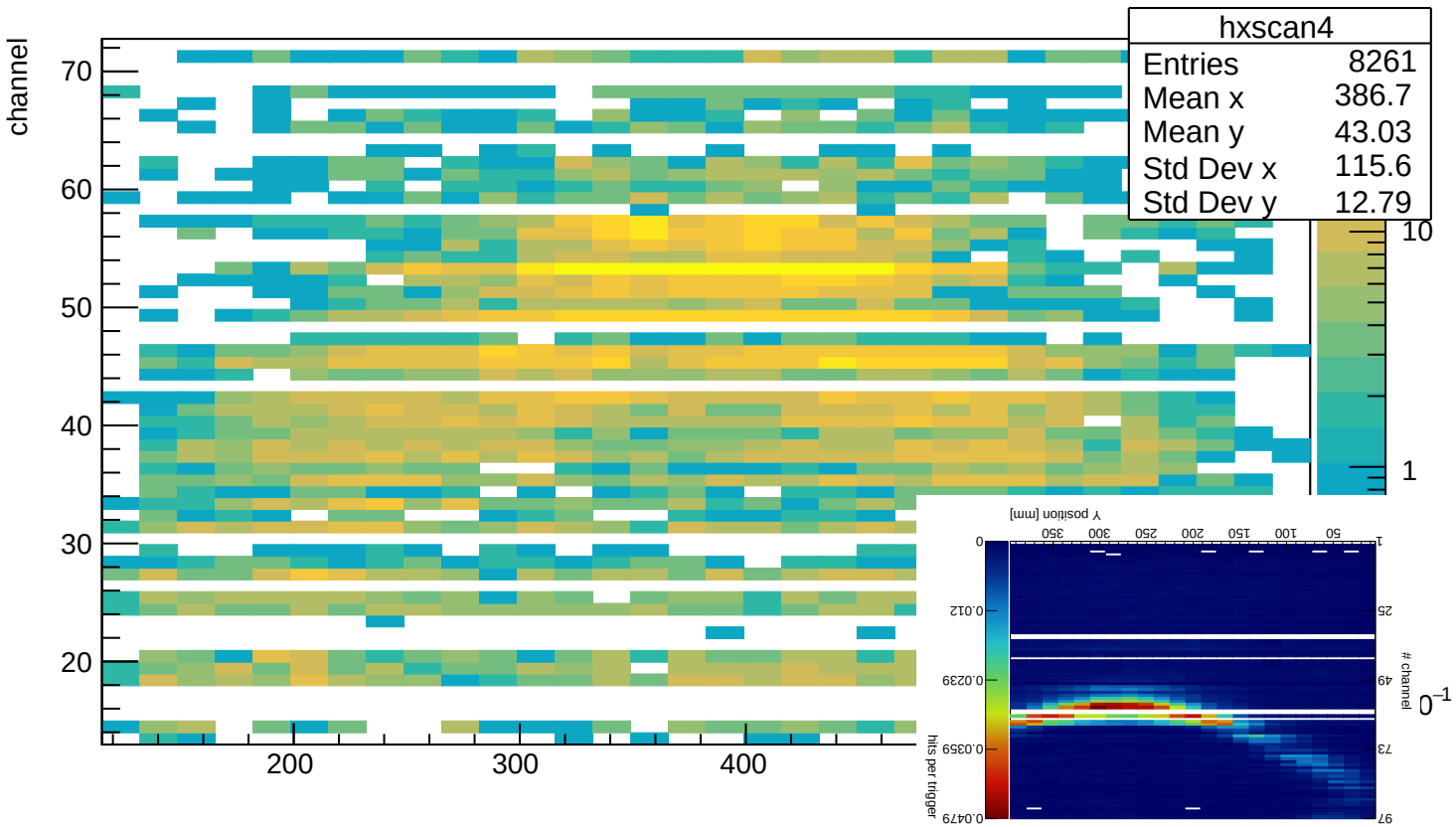
Muon Reconstruction

- Coincidence between MCP-PMT and bar hits
- Projection of radiator plate clearly visible
- 2 PhD students working on simulations and reconstruction



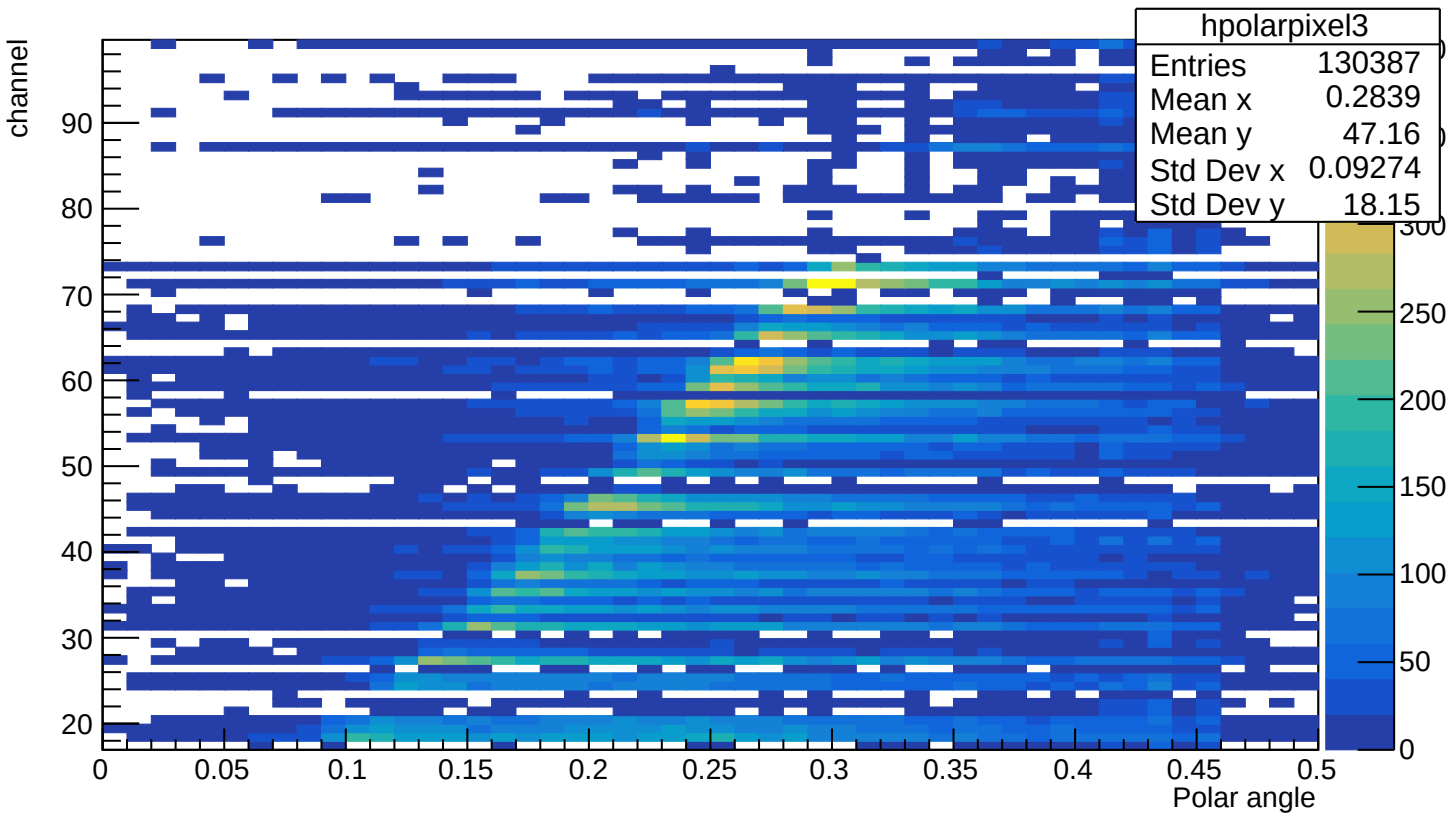
Position Scan

- MCP-PMT hits vs. muon x-position
- Cuts for polar/azimuth angles (similar to testbeam)
- Bottom trigger plate not included until now
- Typical Cherenkov smile (frown) of DIRC detector visible



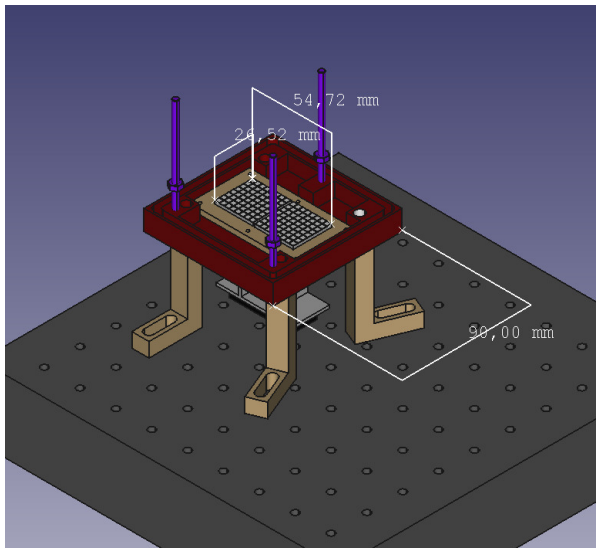
Angle Scan

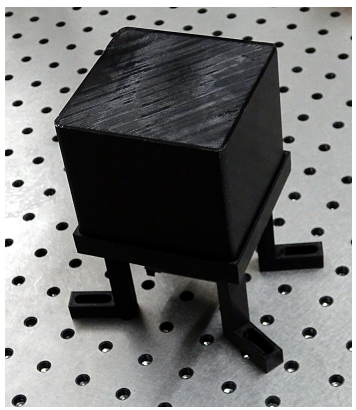
- MCP-PMT channel vs. polar angle (linear dependency)
- Results matching with simulation (more statistics required)
- Additional smearing due to missing bottom trigger

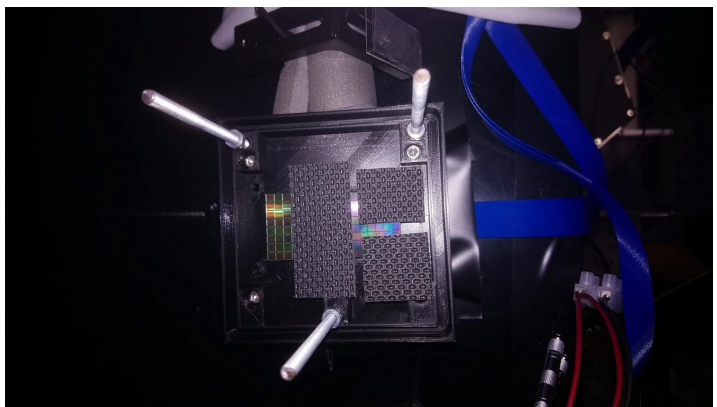


Mini-GCS

- Inserting of Mini-GCS into GCS for testing radiator materials and photon sensors
- Current setup: KETEK and Hamamatsu SiPM matrix

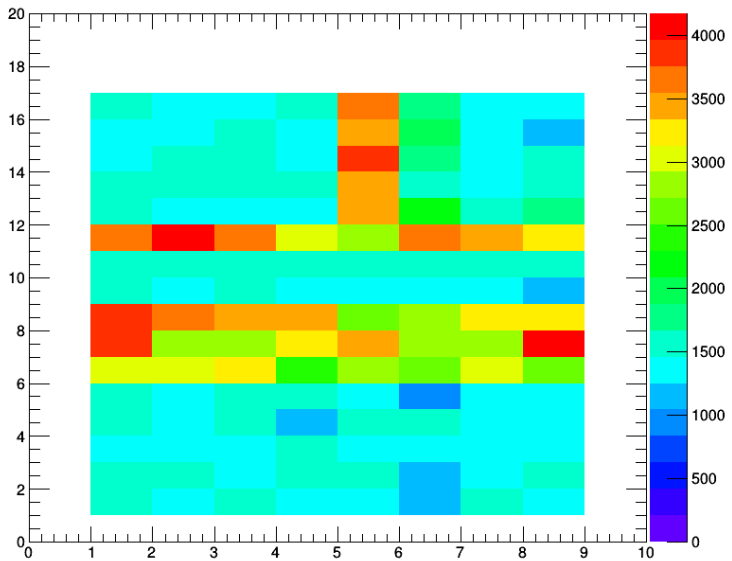


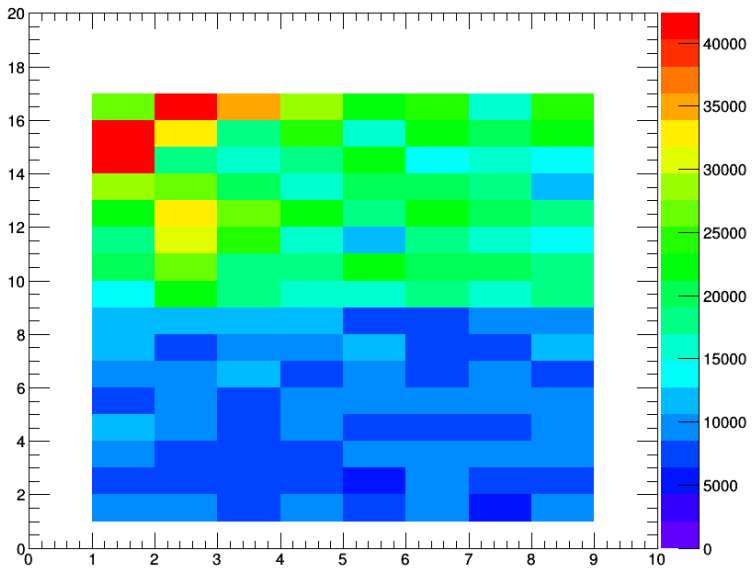




Mini-GCS

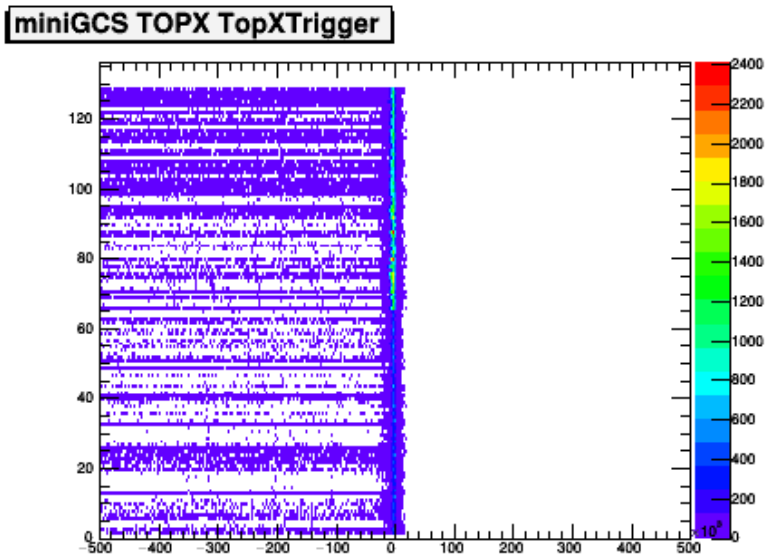
- Currently scintillator in use (multi-photon events)
- Mask can be reproduced $\Rightarrow$ Mapping works well
- New Hamamatu sensor sees more photons
- Better understanding: HV/threshold scan necessary (started)

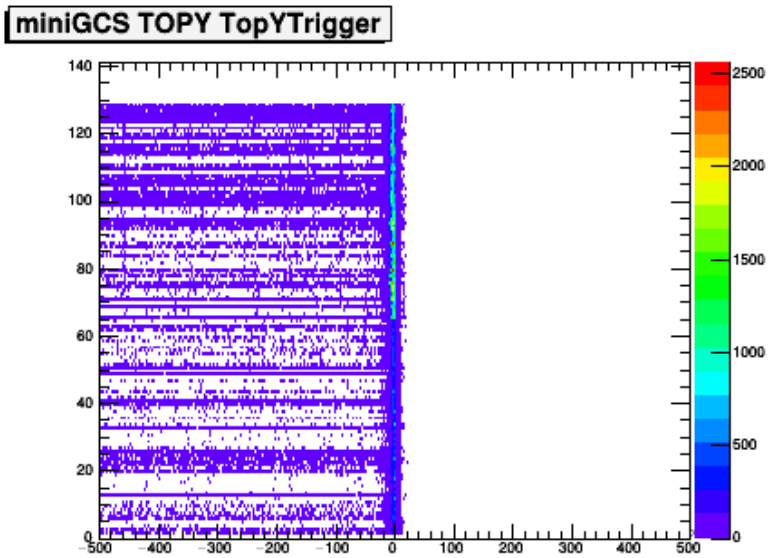


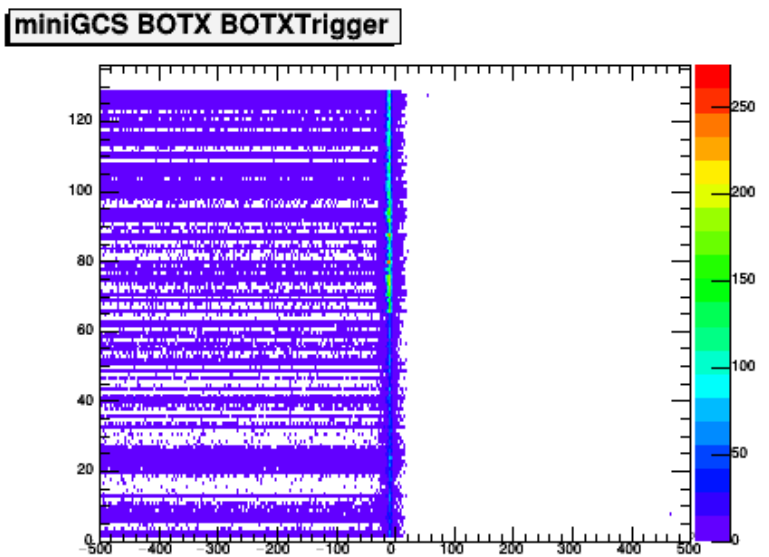


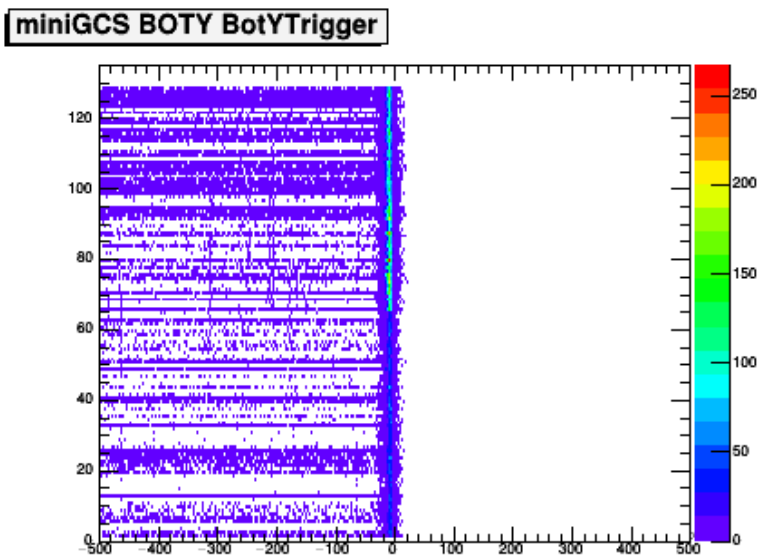
Mini-GCS

Time difference between matrices and all 4 different bar boxes:

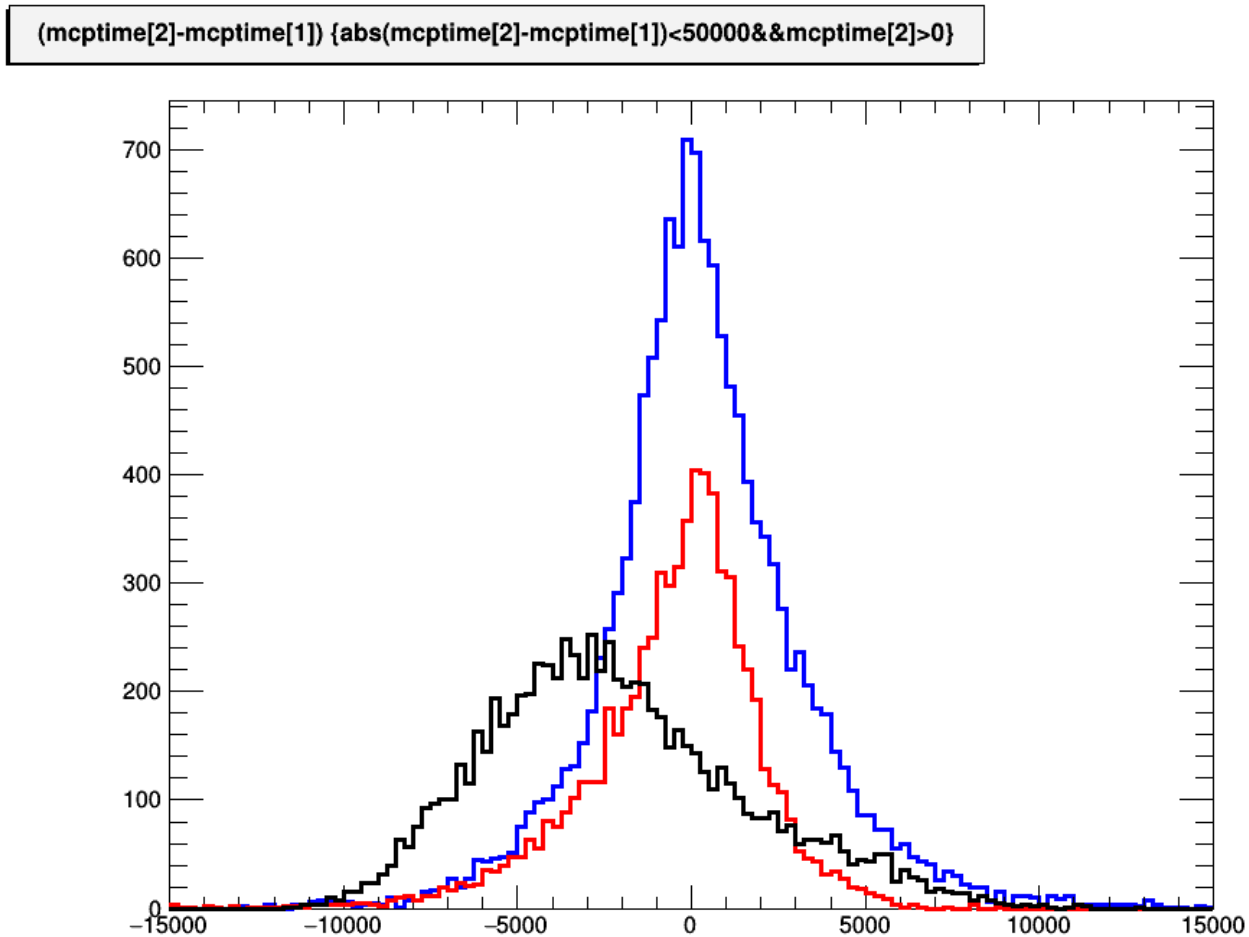






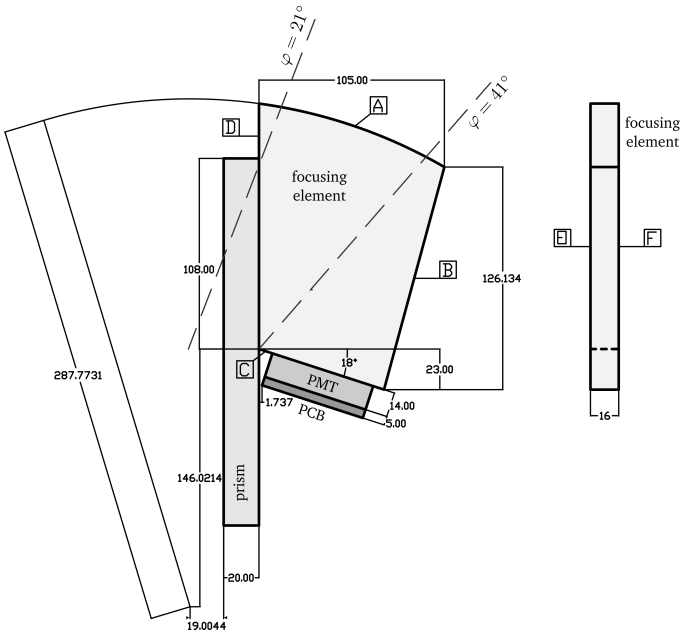


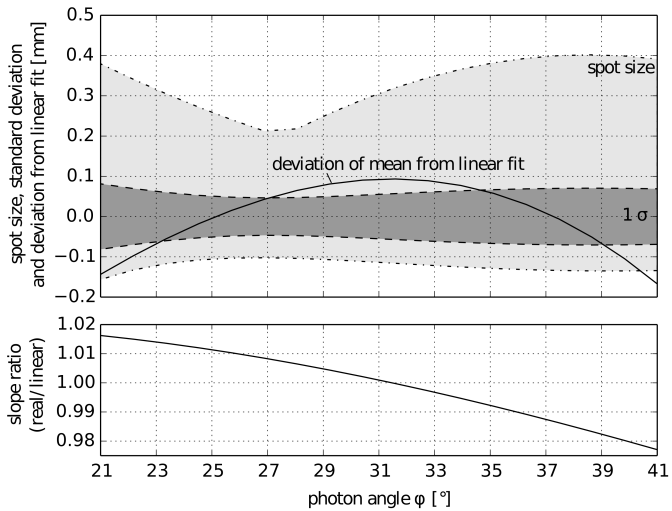
Coincidences between Hamamatsu & KETEK pixels

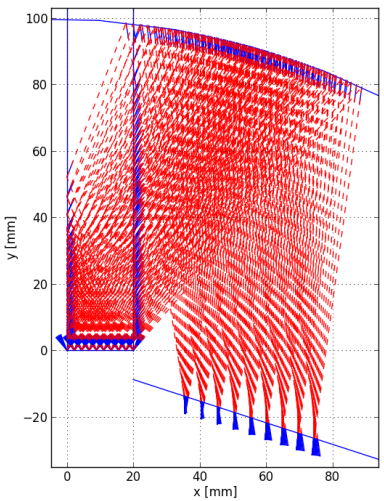


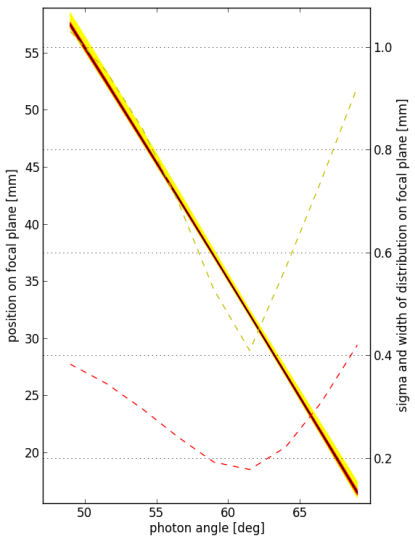
KETEK–KETEK, KETEK–Hamamatsu, Hamamatsu–Hamamatsu

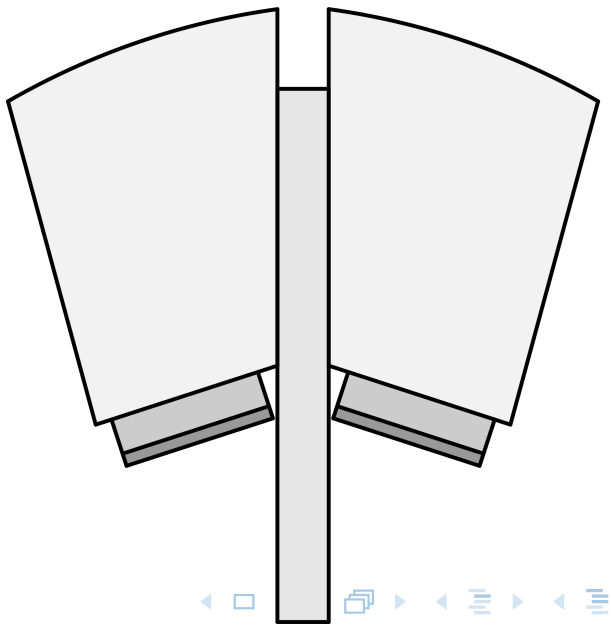
Optics Simulations







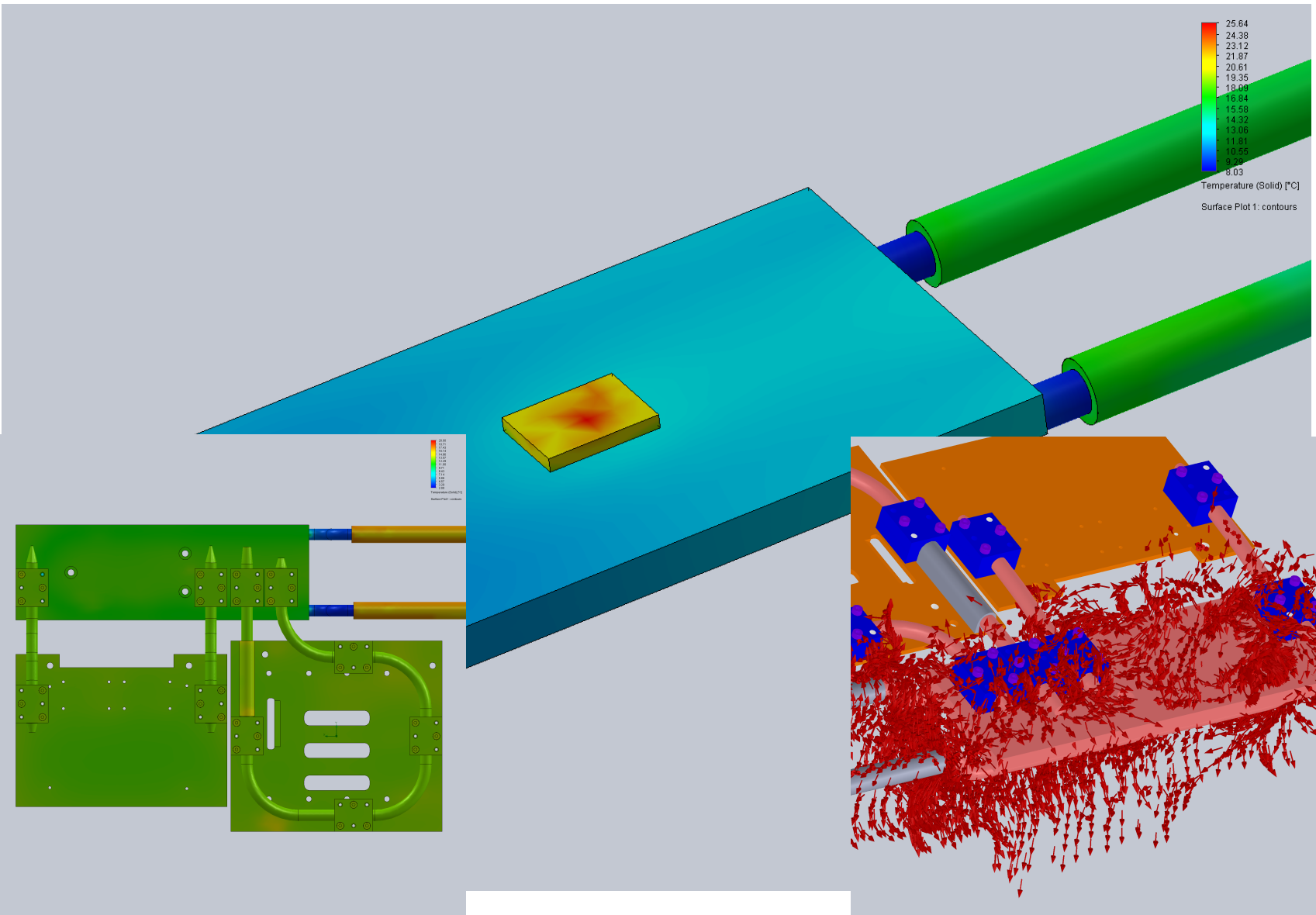




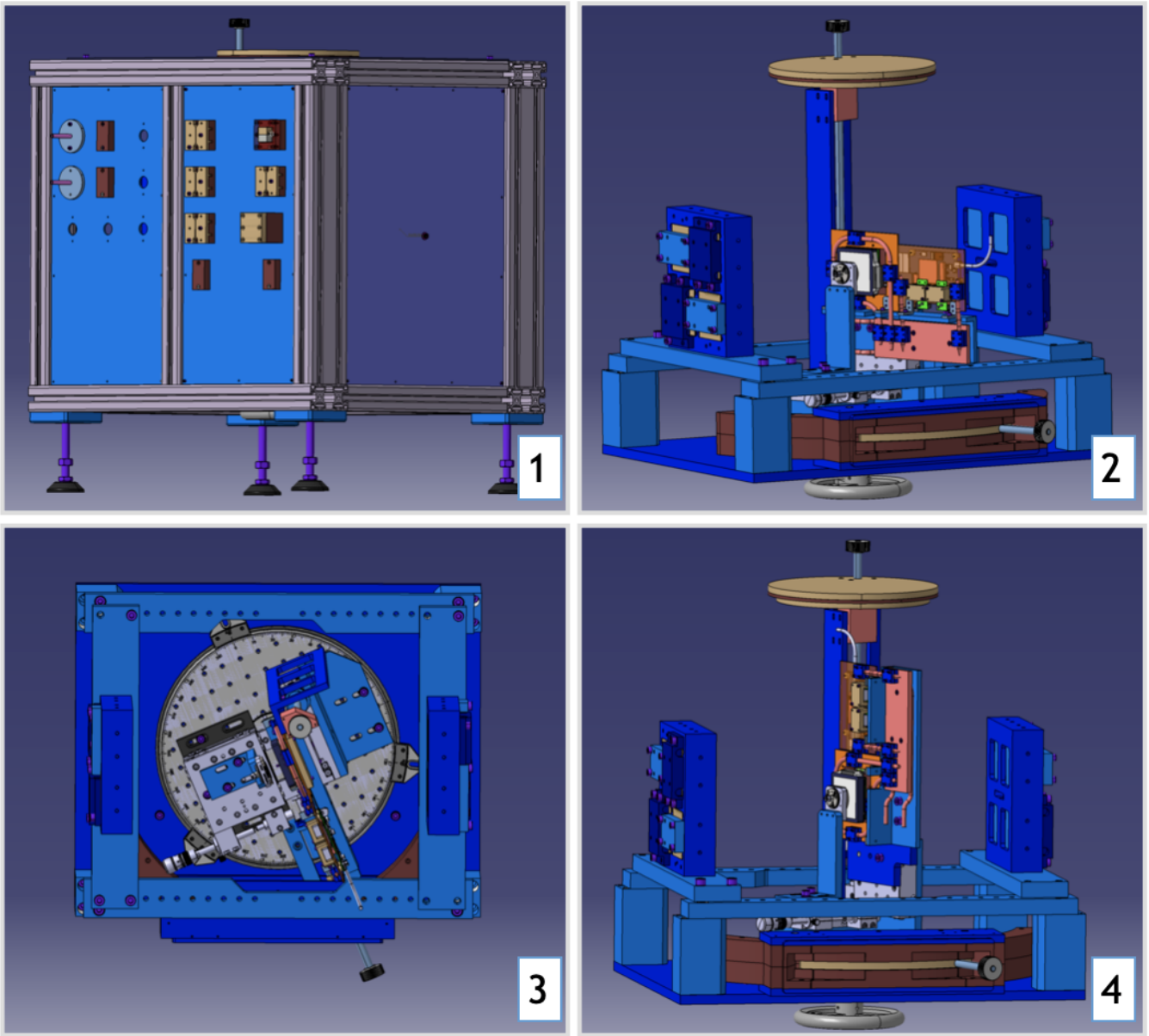
Cooling Prototype

Production of first cooling prototype with pump and heat pipes:

Simulations in SolidWorks:



Sensor Box



Conclusion & Outlook

- the main achievements:
  - Commissioning of GCS and Mini-GCS for prototyping almost finished
- the objectives for the coming year:
  - Optimization of optics
  - Design of cooling system
  - Finalizing detector designs
  - Building first prototypes
- where they seek reinforcement of collaboration with other institutes:
  - Currently no plans
- where they stand with respect to the formal CREMLINplus Milestones and Deliverables:
  - D5.8M24: Status report on R&D work on Particle Identification(PID) system for the SCT detector
  - D5.9M44 Final report on R&D work on Particle Identification(PID) system for the SCT detector
  - 6M42: Prototype for PID system of the SCT Detector (Conference contribution)

Thank you very much!