

Upgrading Giessen Cosmic Station (GCS)

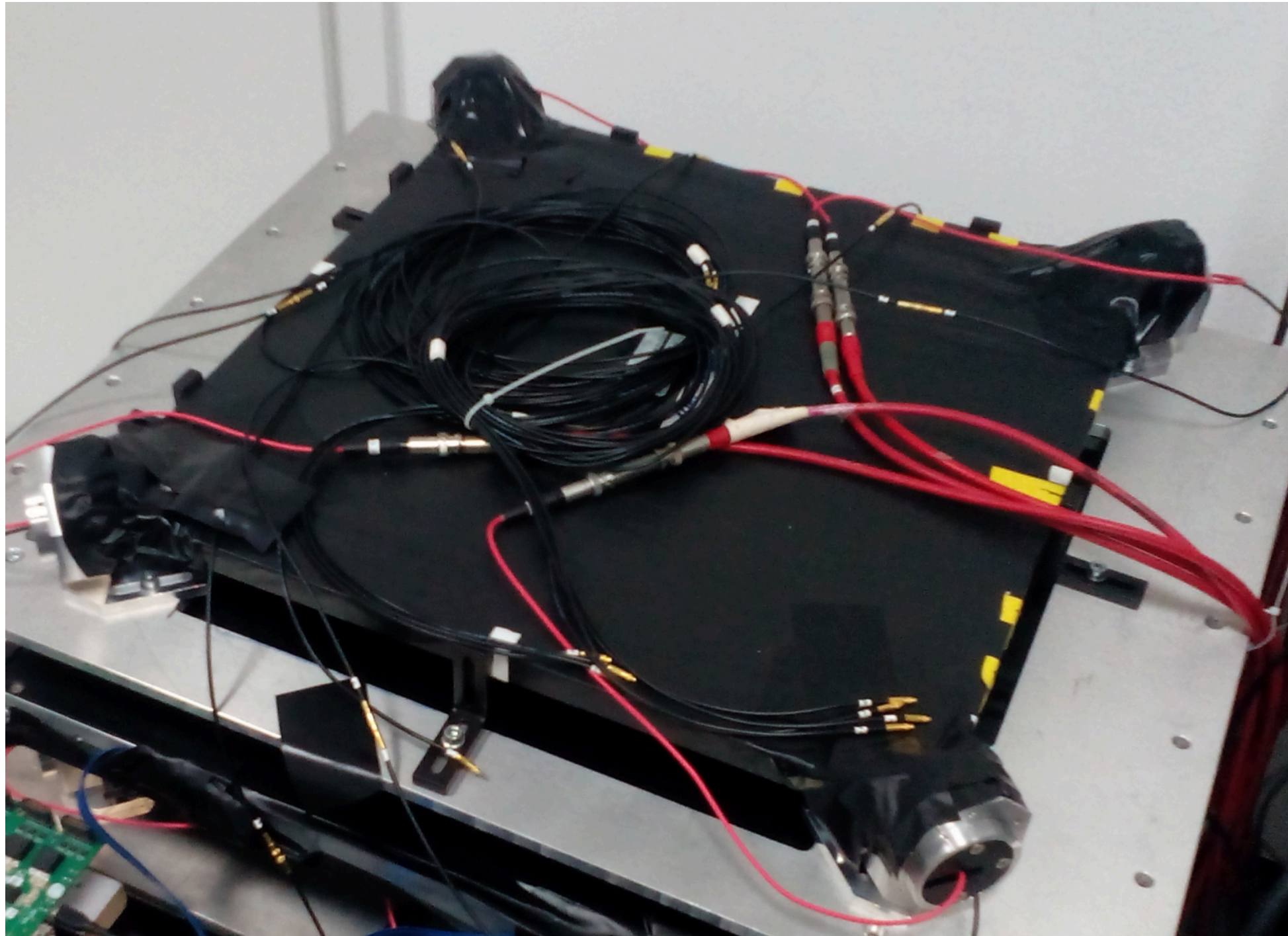
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As an Outline

- Hardware Upgrade
- Software Upgrade Steps
- Running

Photon Detectors for Trigger Plates

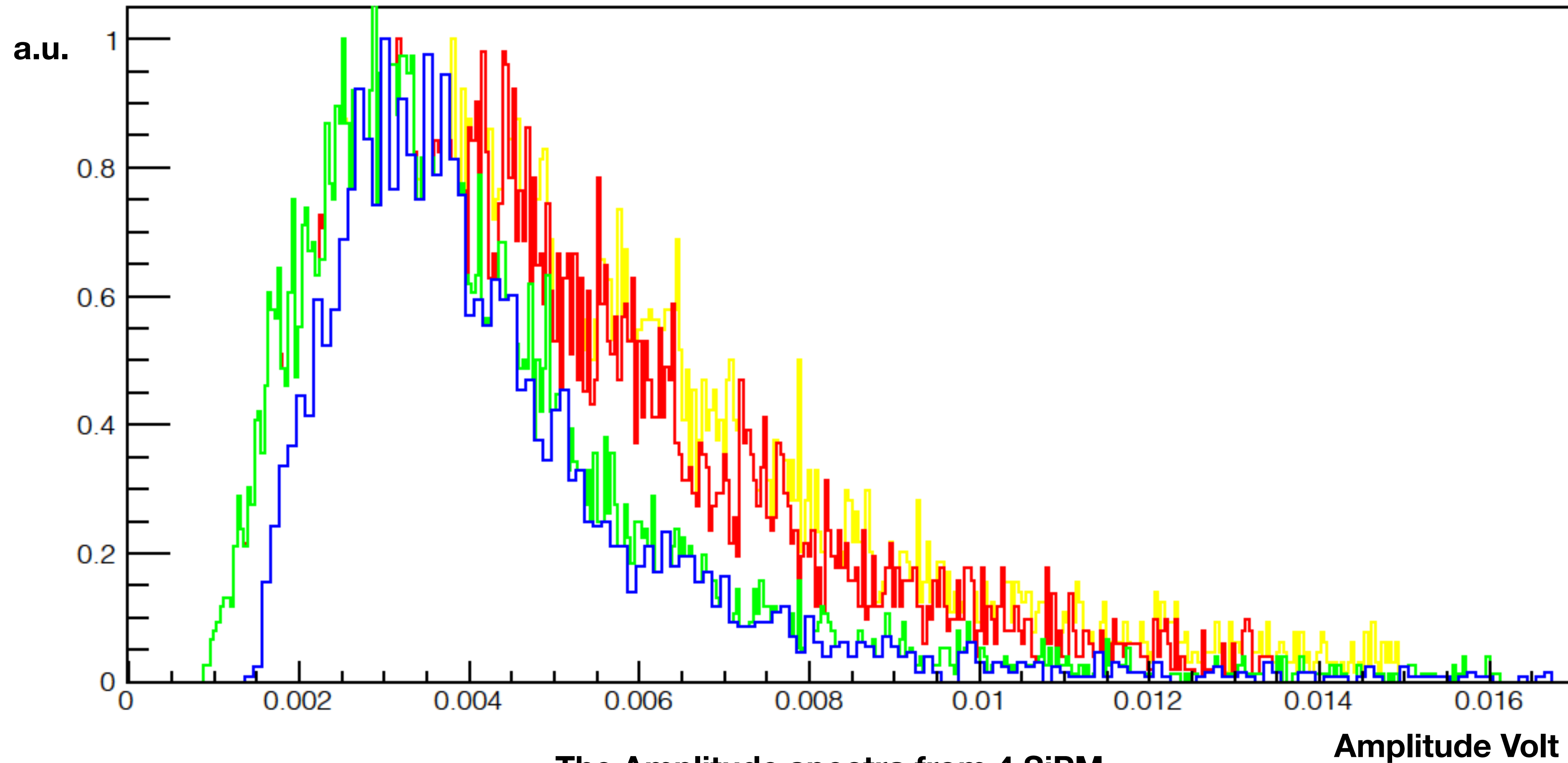


**Hamamatsu PMT's
powered by
CAEN Create/Module circa 1000 Volt
4 Channels per Plate**



**KETEK SiPM's
powered externally circa 30 Volt
1 channel source**

Its Chris work and 50% is done



The Amplitude spectra from 4 SiPM
Placed on each 4 corners of Trigger Plate
The time spectra are in Running part

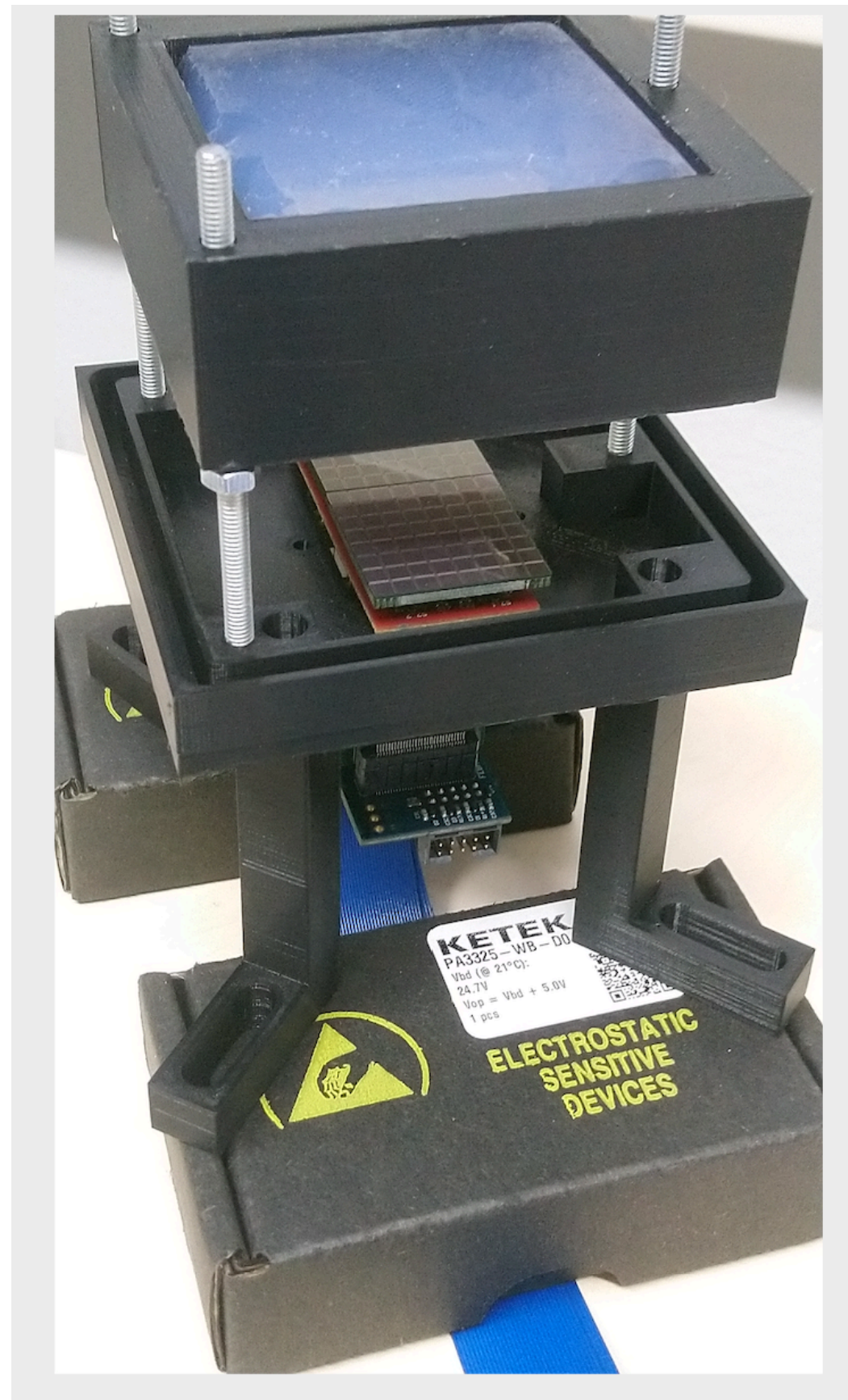
Hardware changes



Apart from Trigger Plates upgrade, we like to upgrade also this small PCB (gets the signals from single detectors then through SAMTEC cable connector feeds TOFPET ASIC)

This will allow us to power single SiPMs and use feedback in online data taking

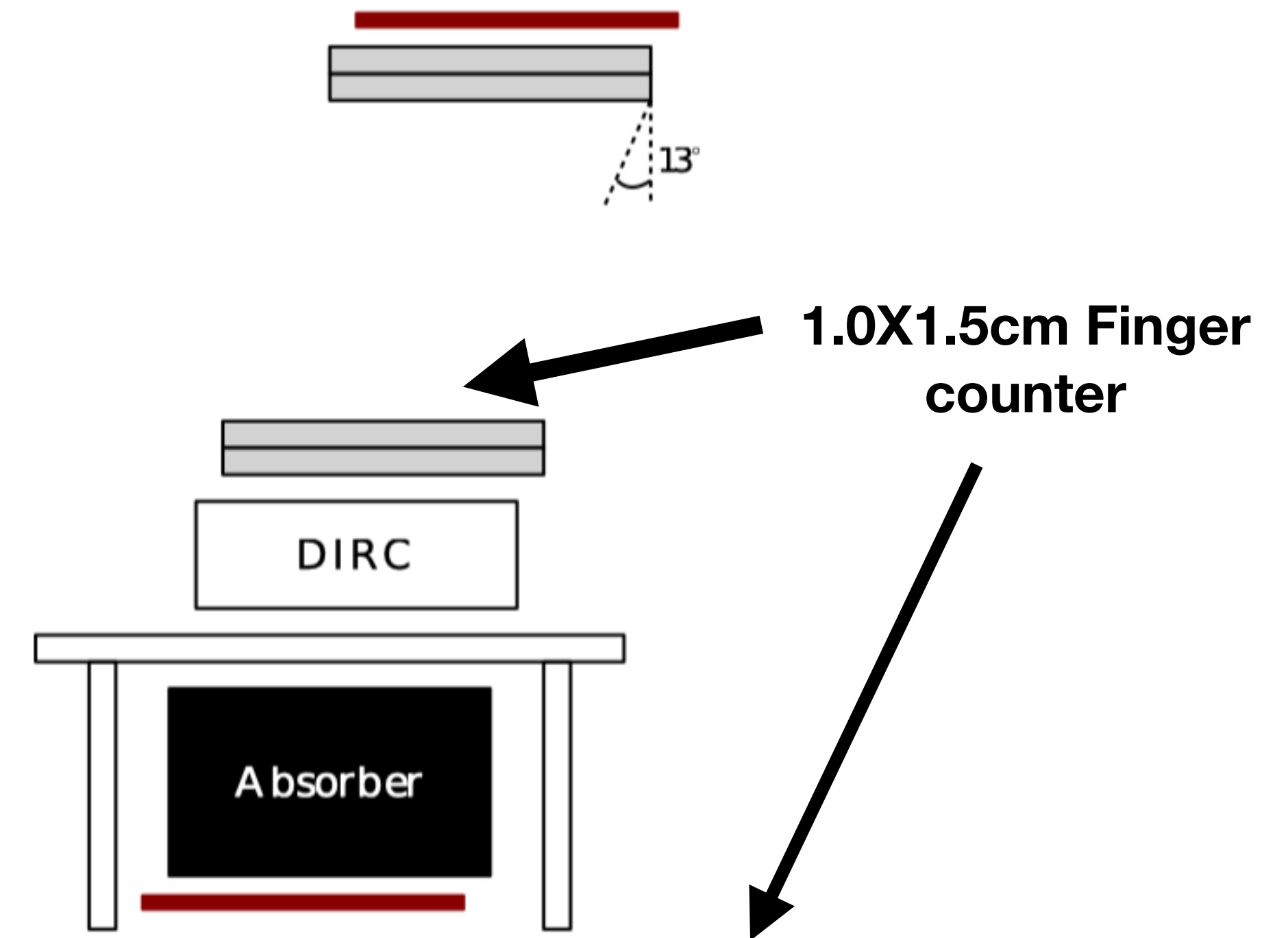
MiniGCS inside GCS



Intention is to check SiPM



Trigger



Will enable better determination of GCS coordinate and angular resolution, see S. Bodenschatz Talk during previous CM meeting

ability to detect Cherenkov photons and see the shape

Will enable also to attack for GCS 2020 Cosmic Prize

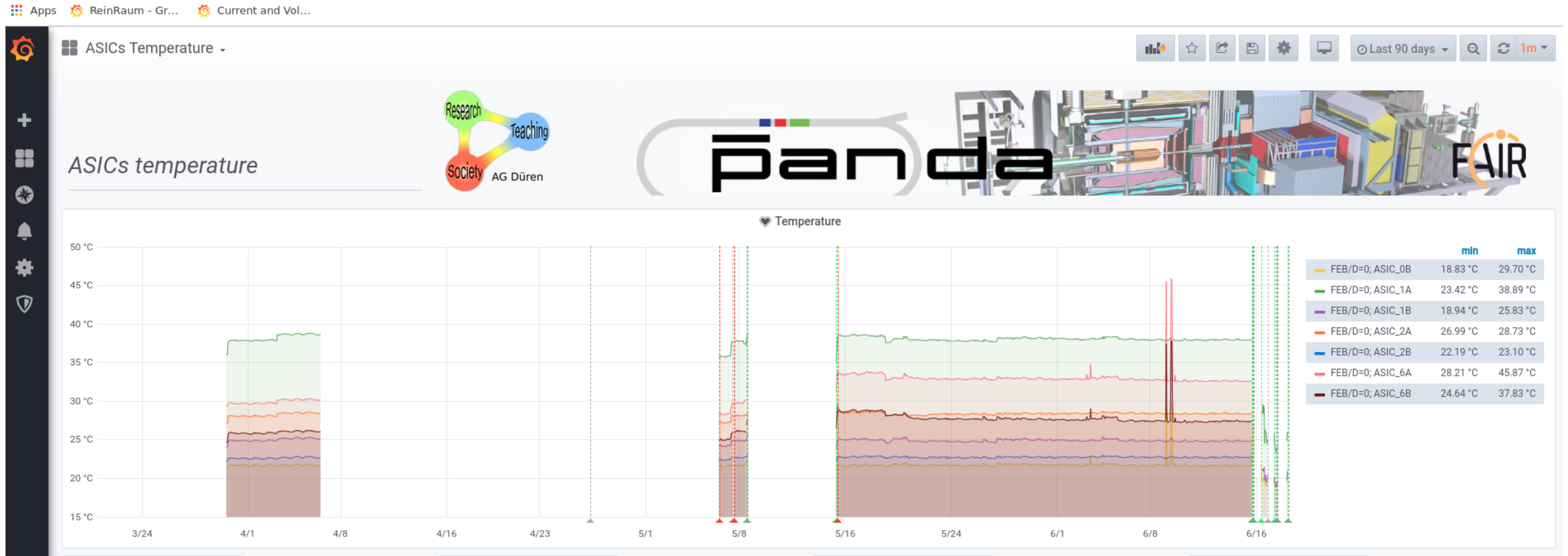
Summary for hardware changes

- 1 trigger plate was rebuild and tested
- Ready for installation (this Wednesday??)
- Rebuild 2nd trigger plate/test/reinstall (in 1 Month?)
- Redesign the new PCB (desired with 16 input and 4 HV(30Volt) output channels) and let produced, then install

Software upgrade steps

- DCS/DB got new host (Thx Marc)
- The DCS database and feeding Clients transferred (Thx J.P. der Lira)
- The new Soft from TOPPET was implemented on our DAQ comp, allowing tests for negative polarity MCP signals (see Ilknur talk for)
- The difficulties to run the system in Covid-19 time from home were bewältigt (was mainly due to JLU computer net step by step recovery due to network hack)
- With new hardware, it will be easy to implement the feedback system allowing changes(HV, thresholds, warning, alarm) after every RUN

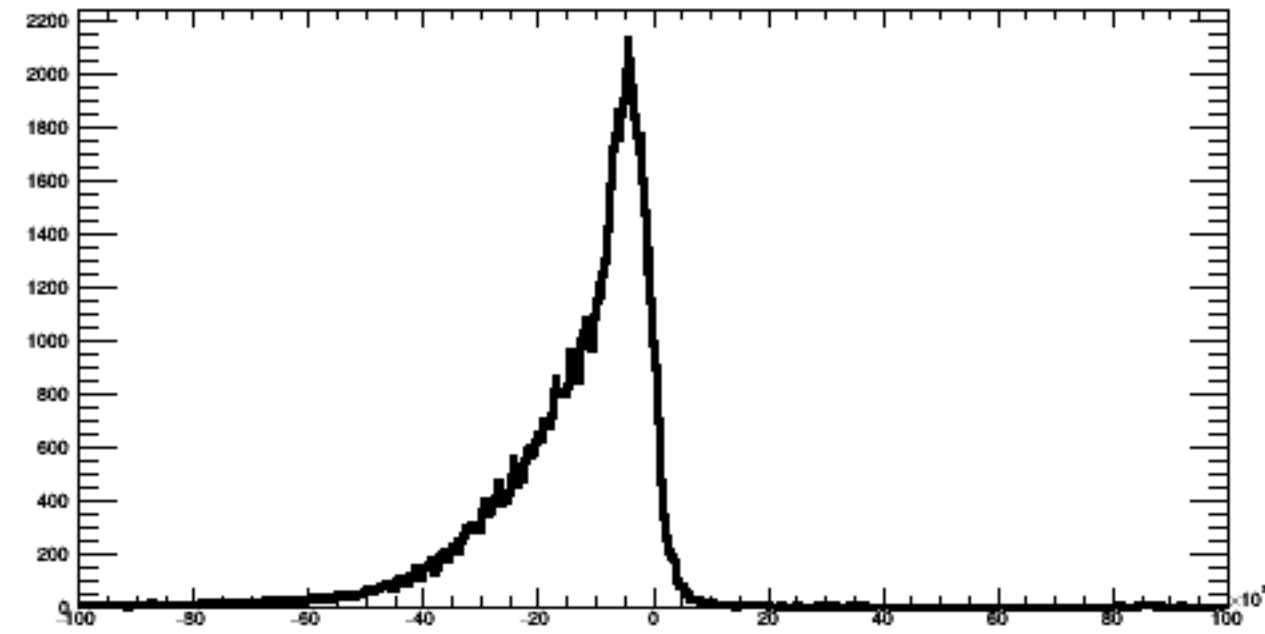
Running, last 90 days



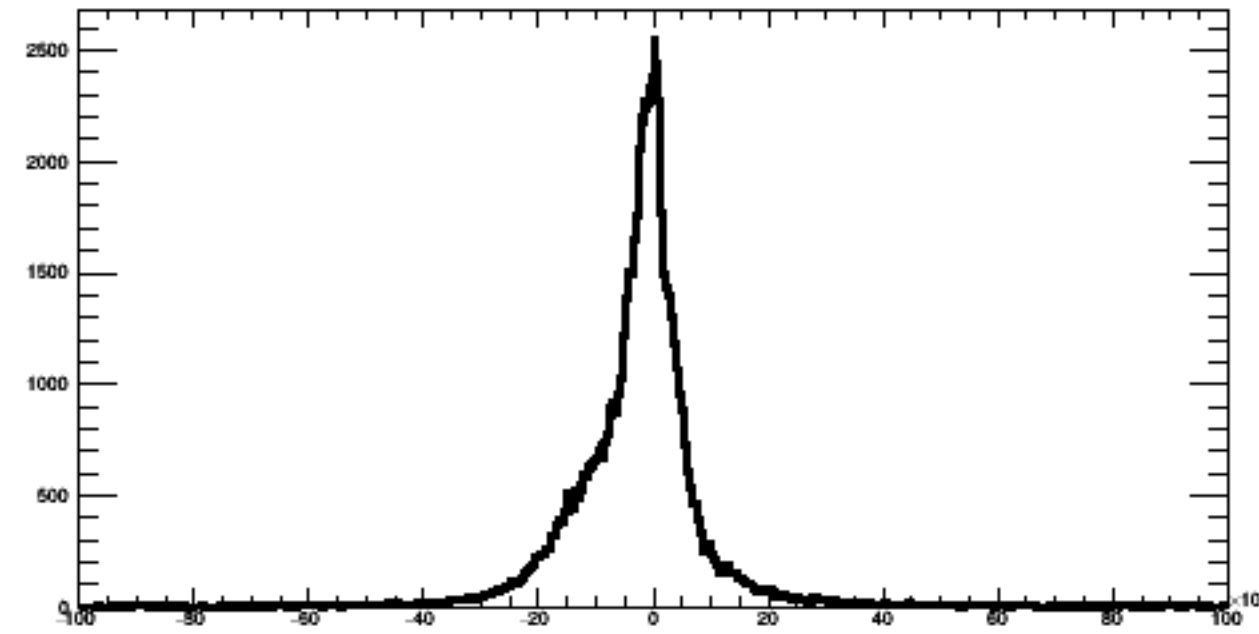
Mini GCS running , 1st Trigger Plate Bau, Test Run, Scope measurements, RUN with new Trigger plate, MCP test with new Soft

Some Results from Running

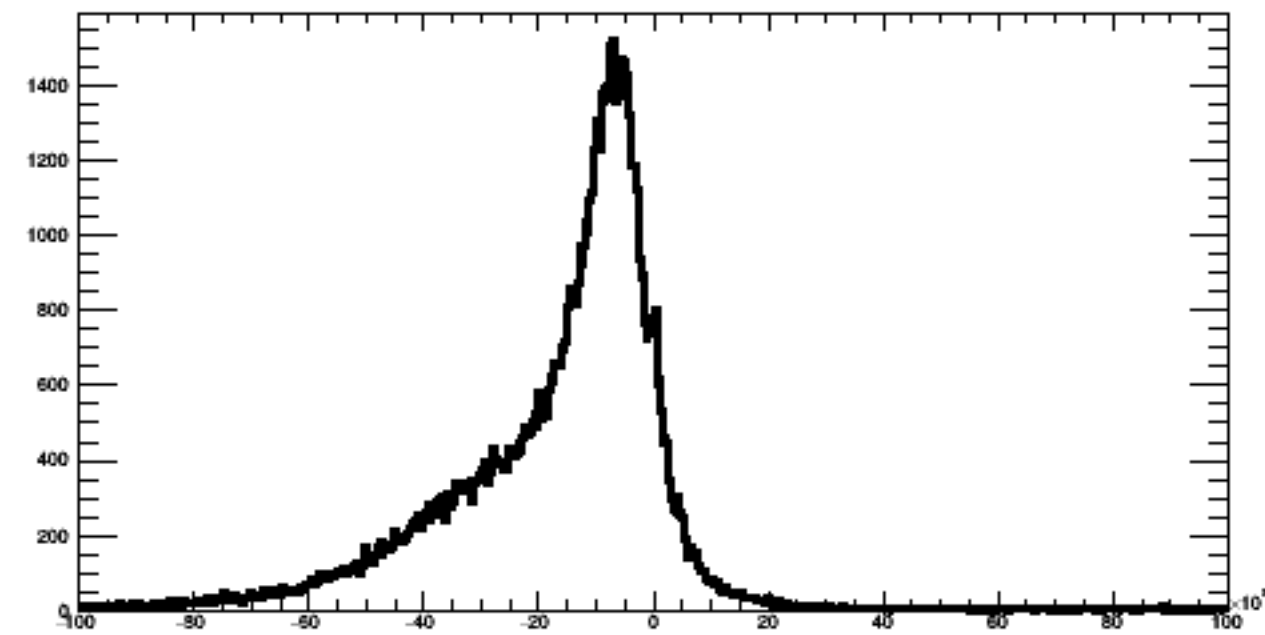
TDIFF_12



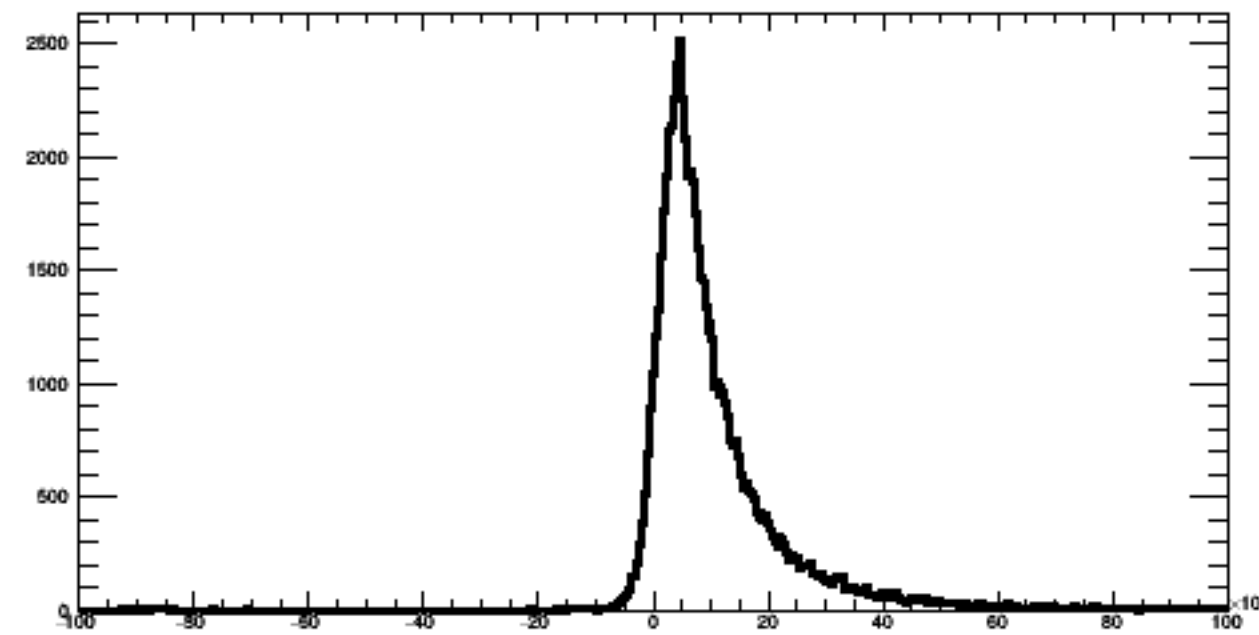
TDIFF_13



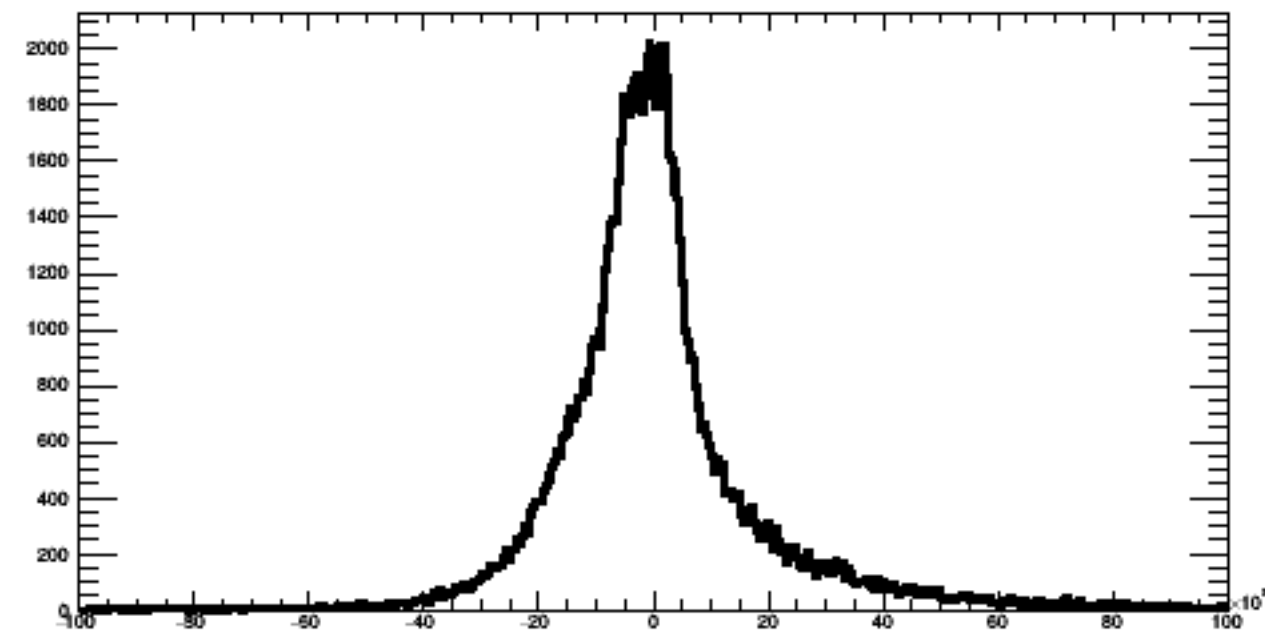
TDIFF_14



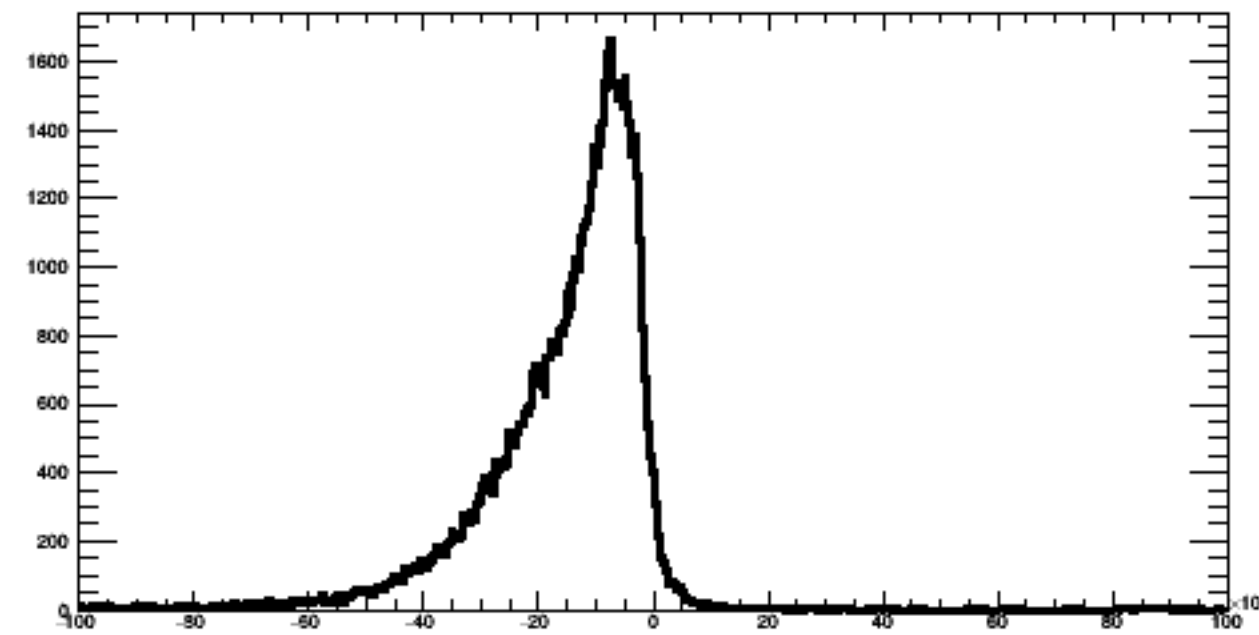
TDIFF_23



TDIFF_24



TDIFF_34



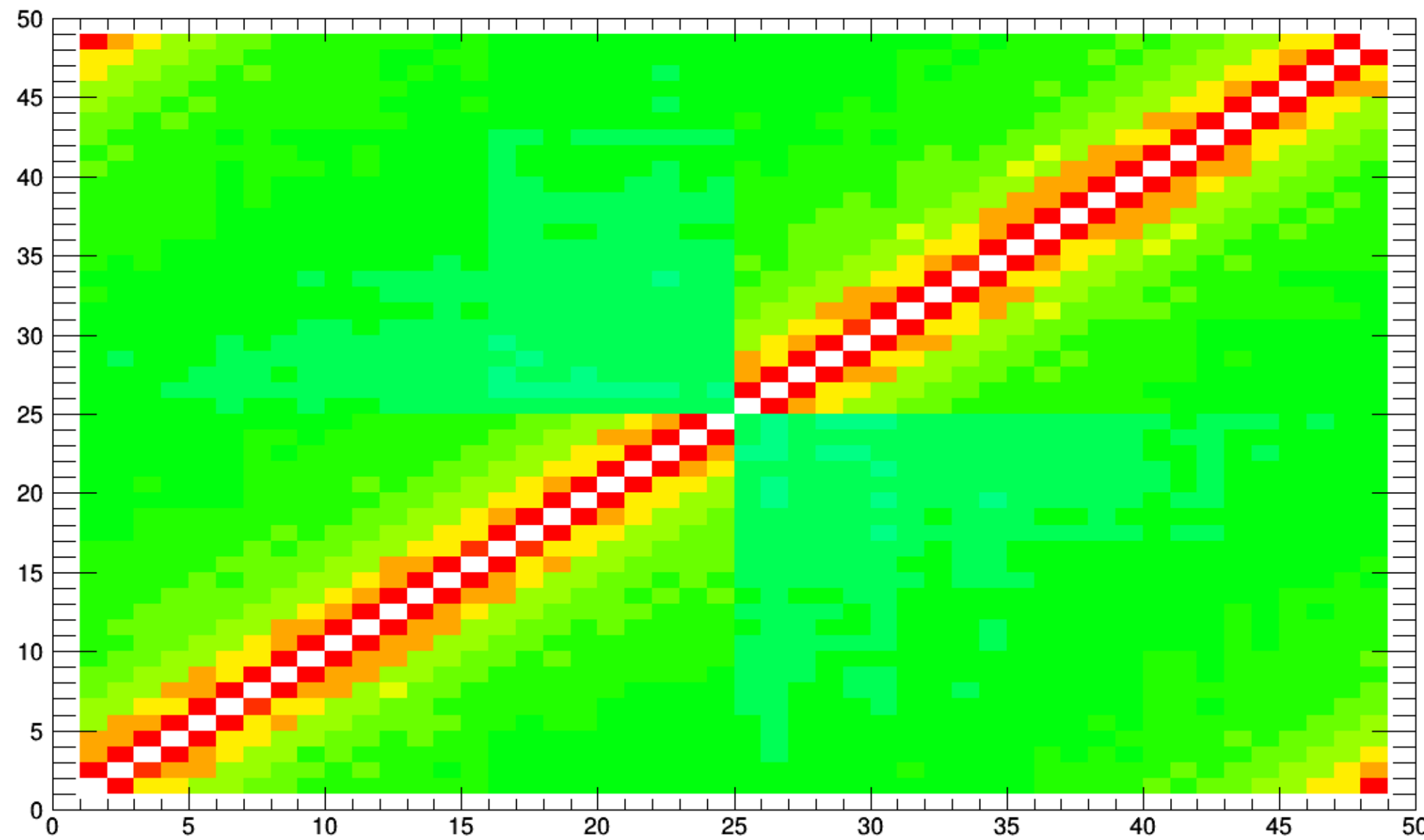
First Chris work:

Coincidences from 4 corners of new Trigger plate:

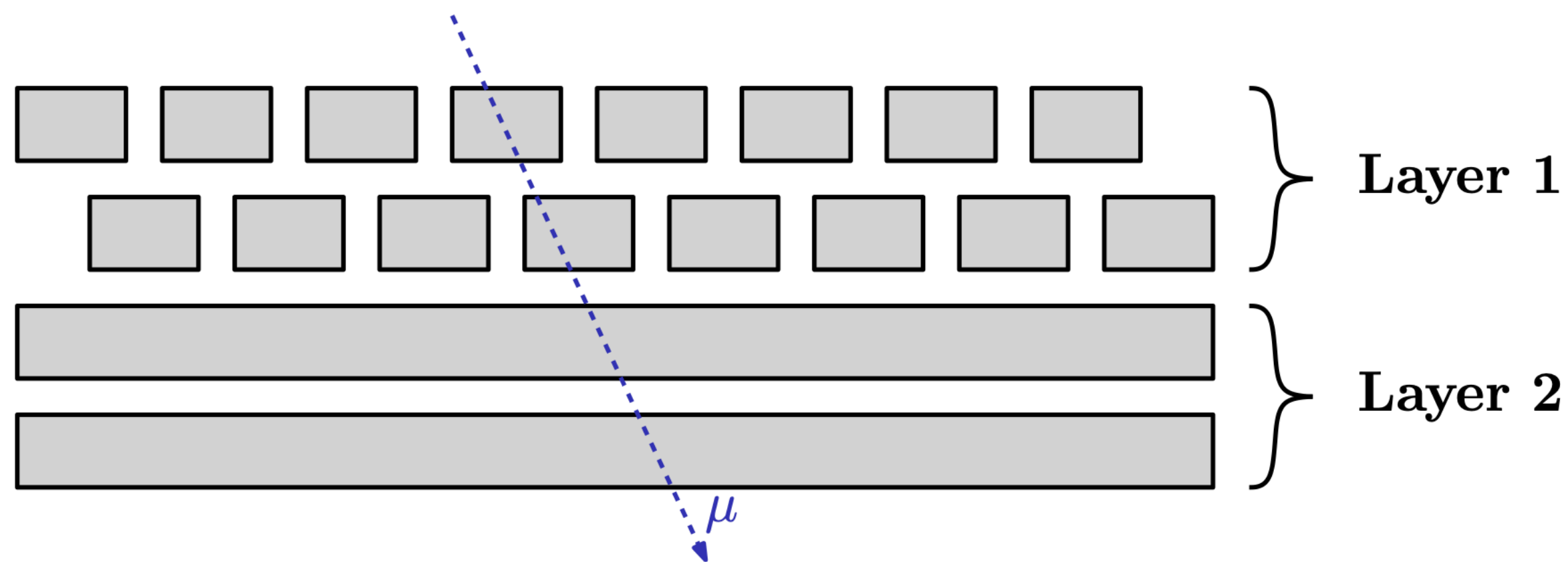
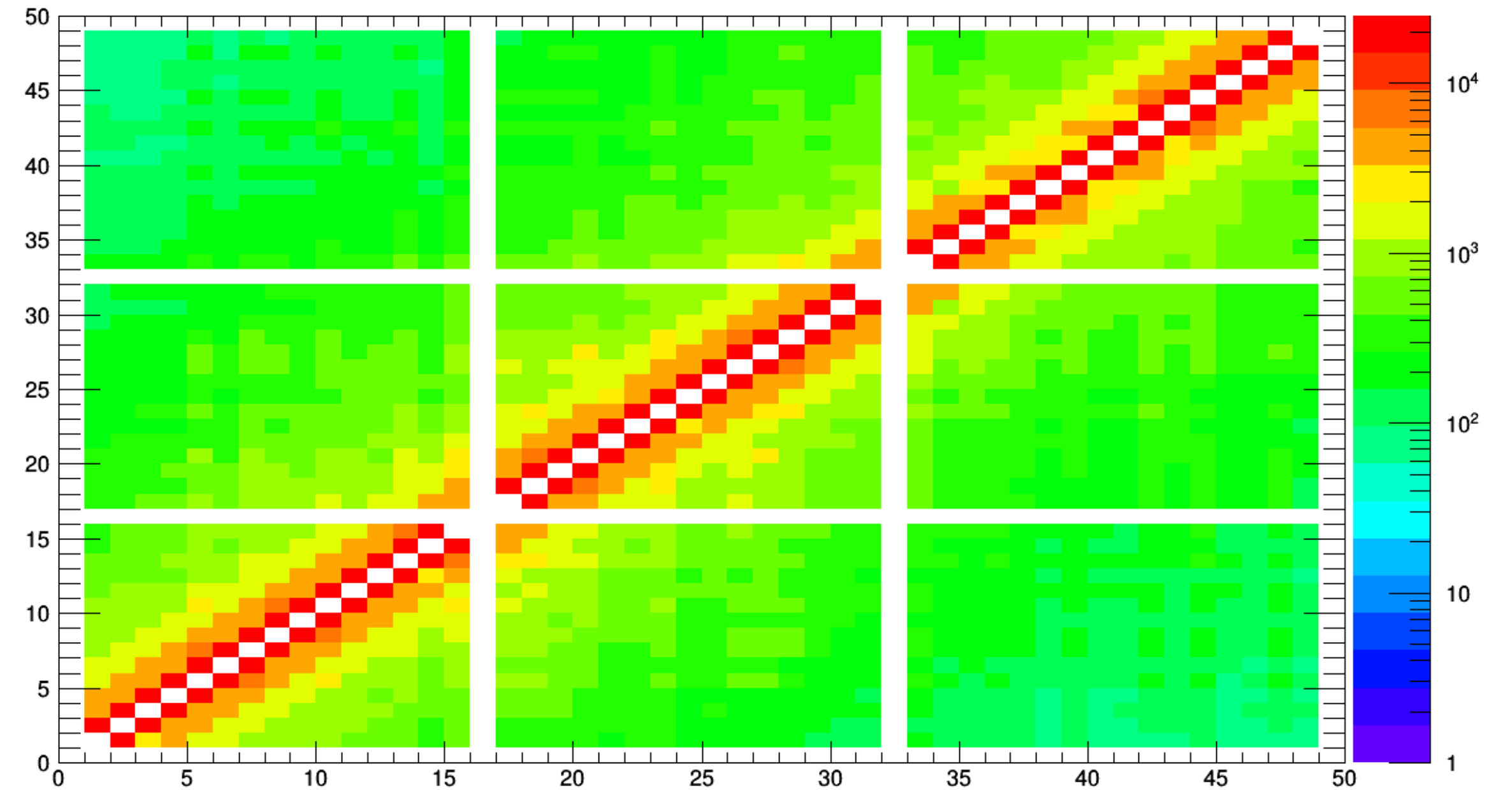
Time differences in ps from every corner

Coincidences between neighbour bars from different Hodoscope Boxes

BOTX BAR BAR Coincidence

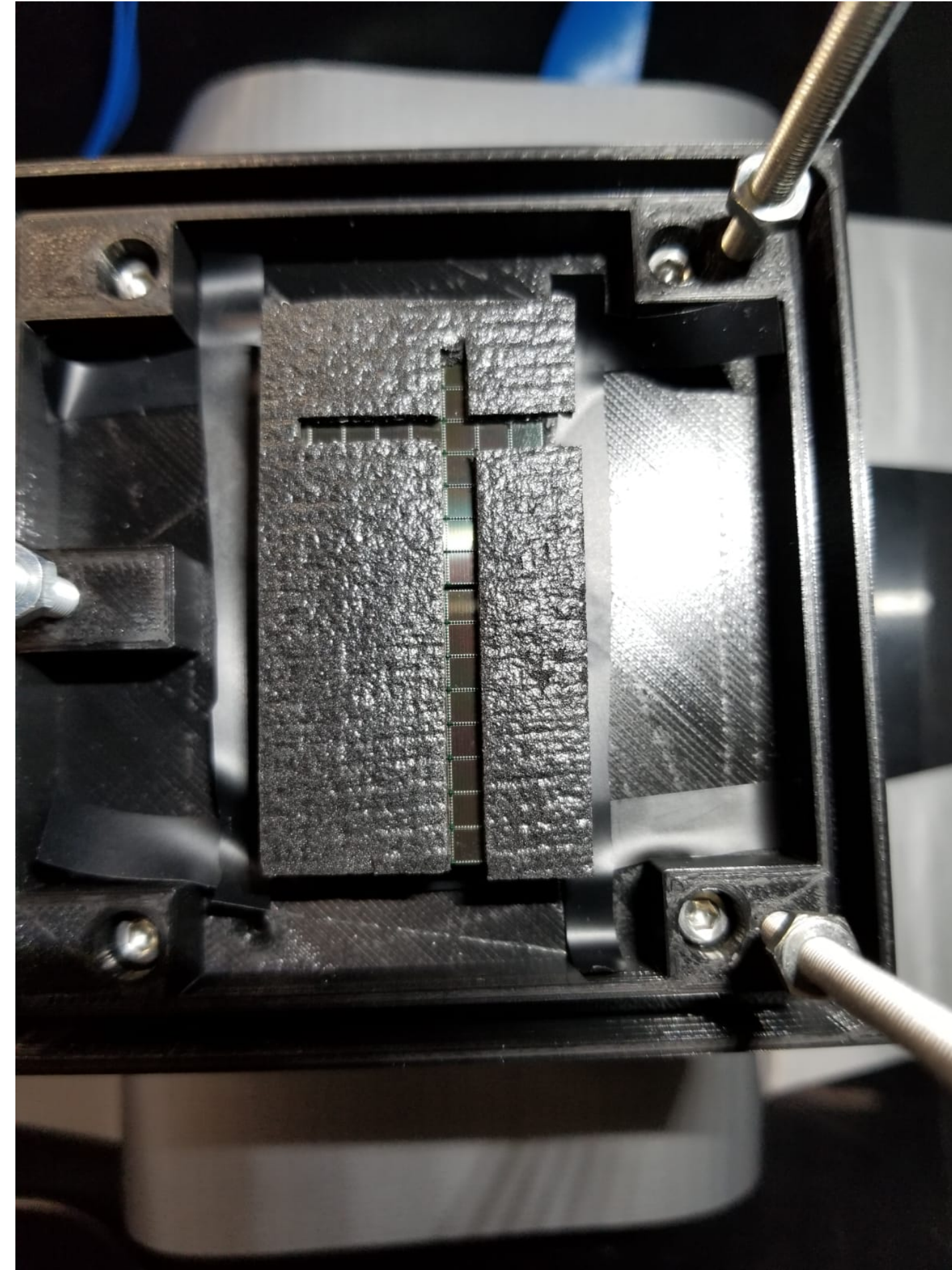
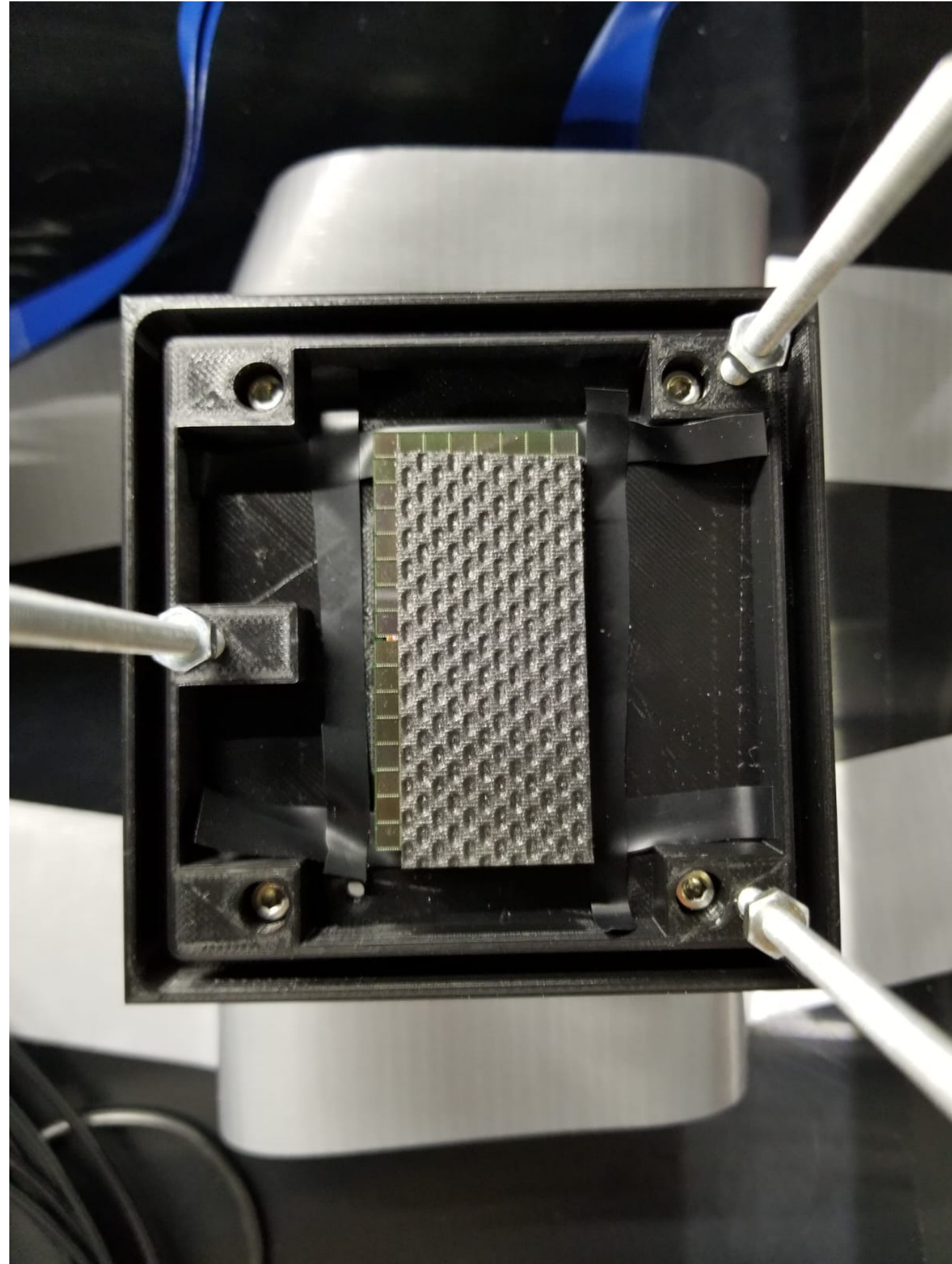


TOPX BAR BAR Coincidence



In Gießen dialect the Boxes called „Simon Boxes“

Mini GCS KETEK SiPMs hidden from radiator light

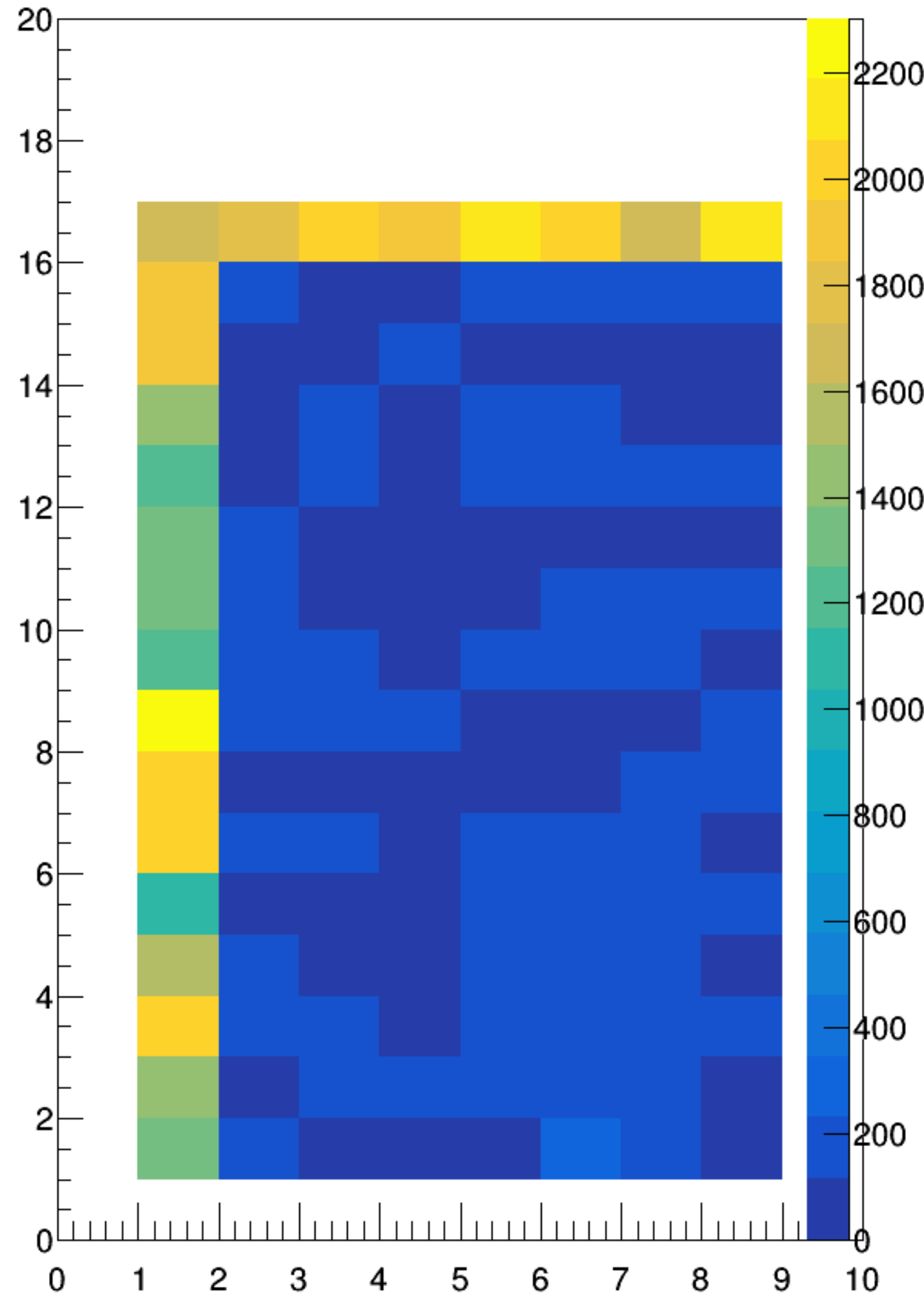


The shaped black foam was put below scintillator
To check the mapping

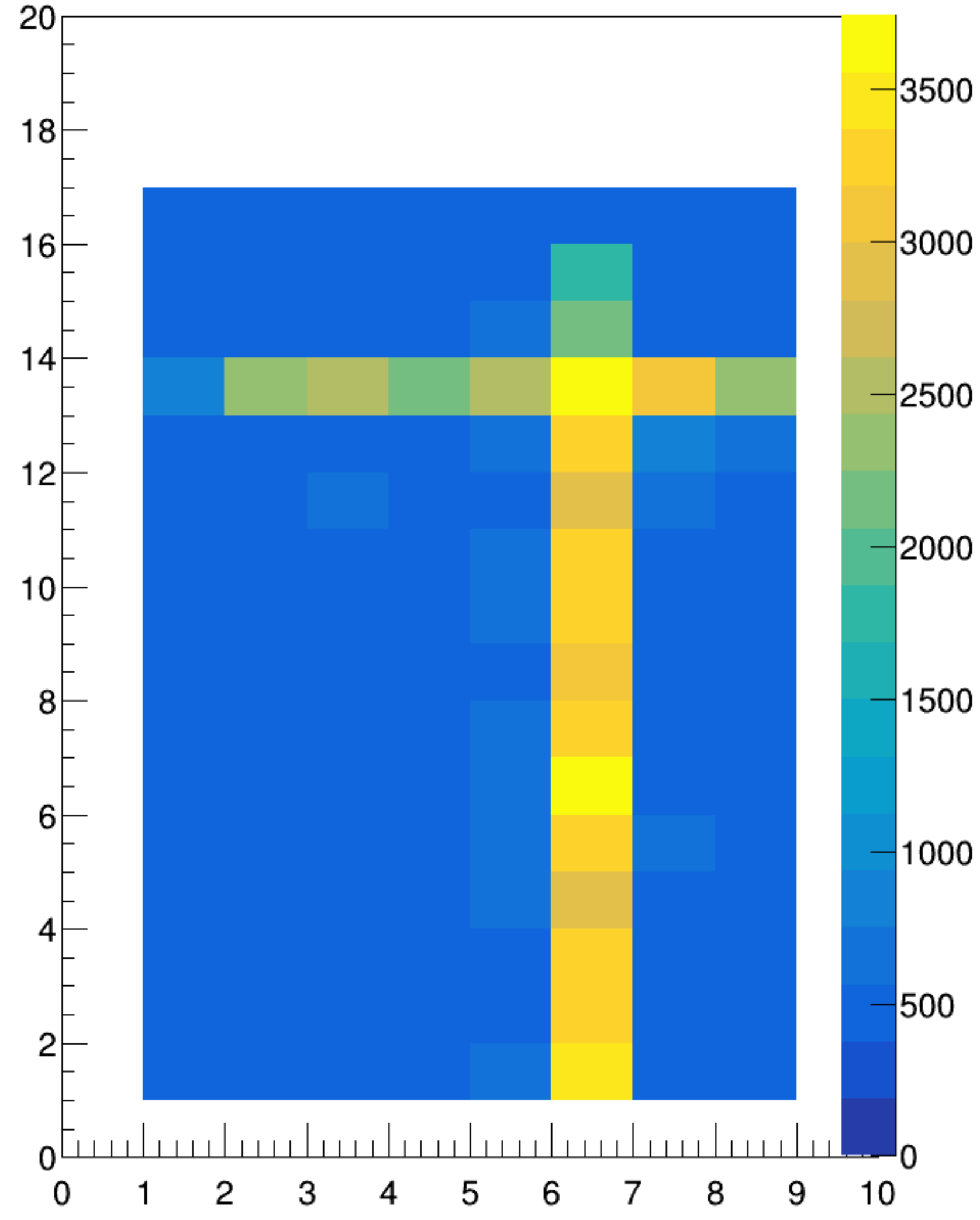
(Thx goes to **Luis Feramacho** too)

Mini GCS KETEK Mapping

AeroMatrix heatmap withTOPX



AeroMatrix heatmap withTOPX



We did many test measurements with:

Empty RUNs (i.e. WO radiator)

RUNs with Scintillator

RUNs with Plexiglass Radiator

RUNs with Aerogel Radiator

(Thx goes to S. Kononov and I. Kuyanov)

**The search for elusive??? Cherenkov cone
Is ongoing....**

as an Outlook

- With improvements in hardware we will get circa 210 channel (all SiPM) good enough (like test beams) GCS which with continuous software updates will be operational from home too!
- The mini GCS and FEL+MCP coupled EDD radiator gives good enough hopes to win the 2020 AGD-GCS prize
- Last but not least: **Bleib Gesund.**