

Status GEM Detectors

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COMPASS/AMBER Technical Board

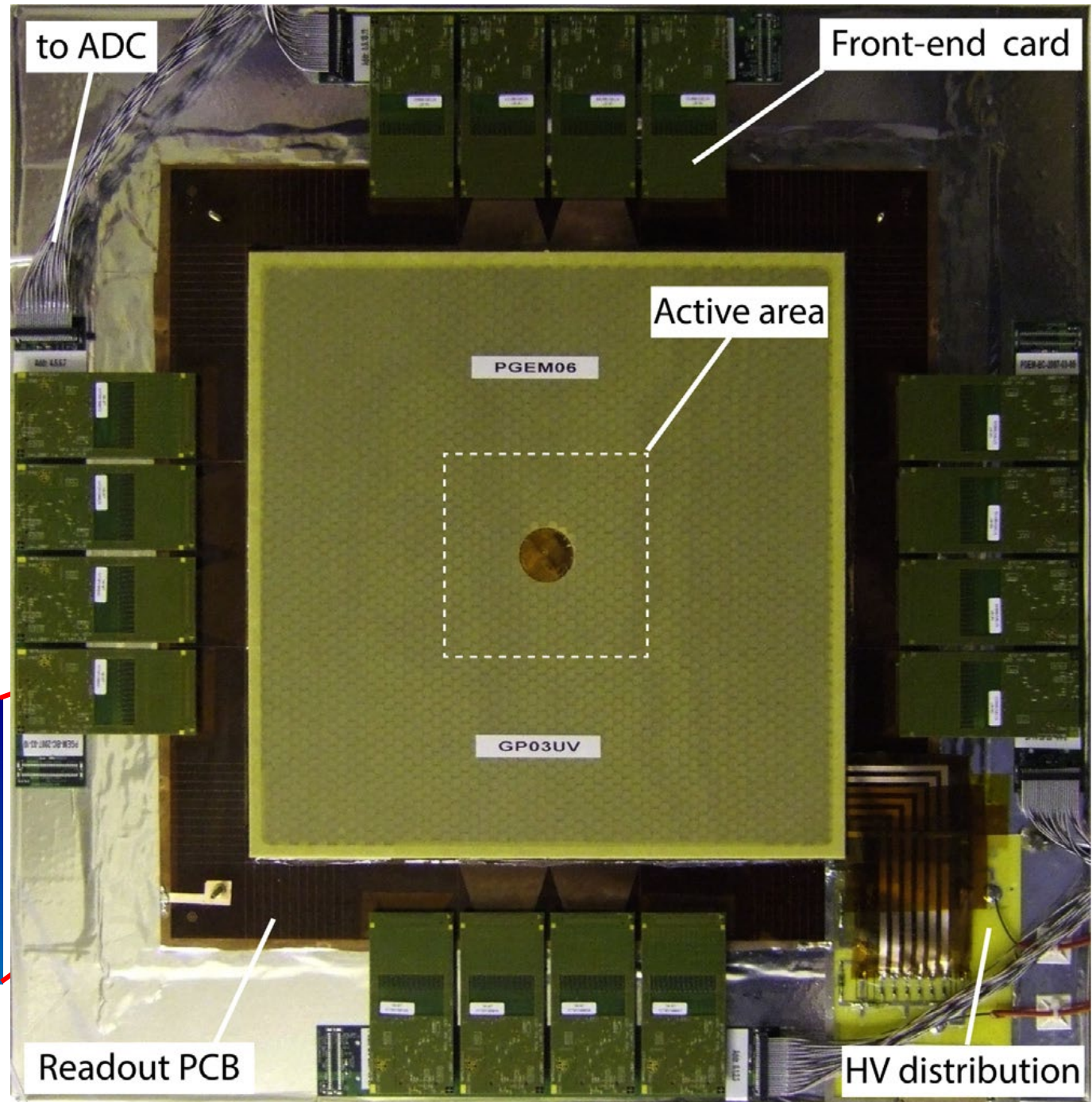
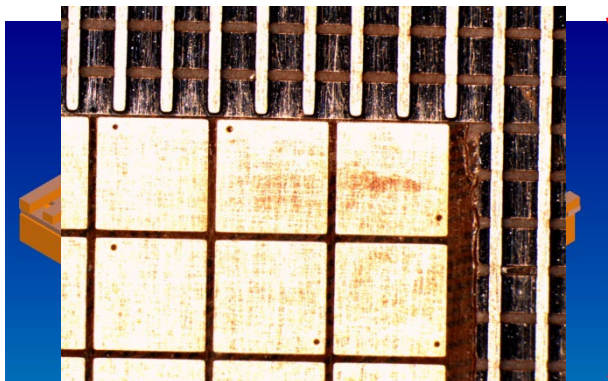
20.09.2022

GEM and PixelGEM system in 2022

- All detectors (GM01-10, GP02/03) switched on 21/22 April 2022 (LV, HV)
- GM02 re-installed to DC5 on 3 May 2022
- Replace GeSiCA for Id 739 (GM08, GM09) by HotGeSiCA on 5 May 2022
- Latency scan performed on 3 June 2022, latencies adjusted
- GP02XY connected to new HotGeSiCA Id 751 for load balancing (together with PMM), other GPs remain on Id 750
- 2 APV chips missing for GM04XY
- low occupancy for GP03XY and GP03UV
- GM11 position used for tests of GT01

PixelGEM

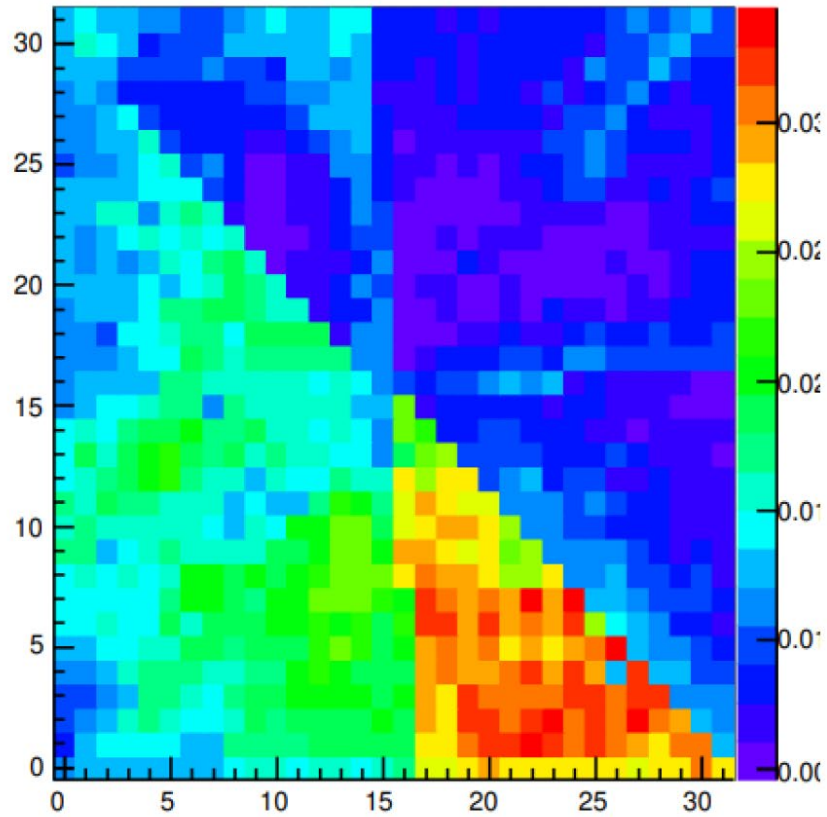
- Pixel + strip readout
- **Center:** 32×32 pixels, 1 mm²
- **Periphery:** 2×512 strips (2D)
- Readout electronics moved away from the beam



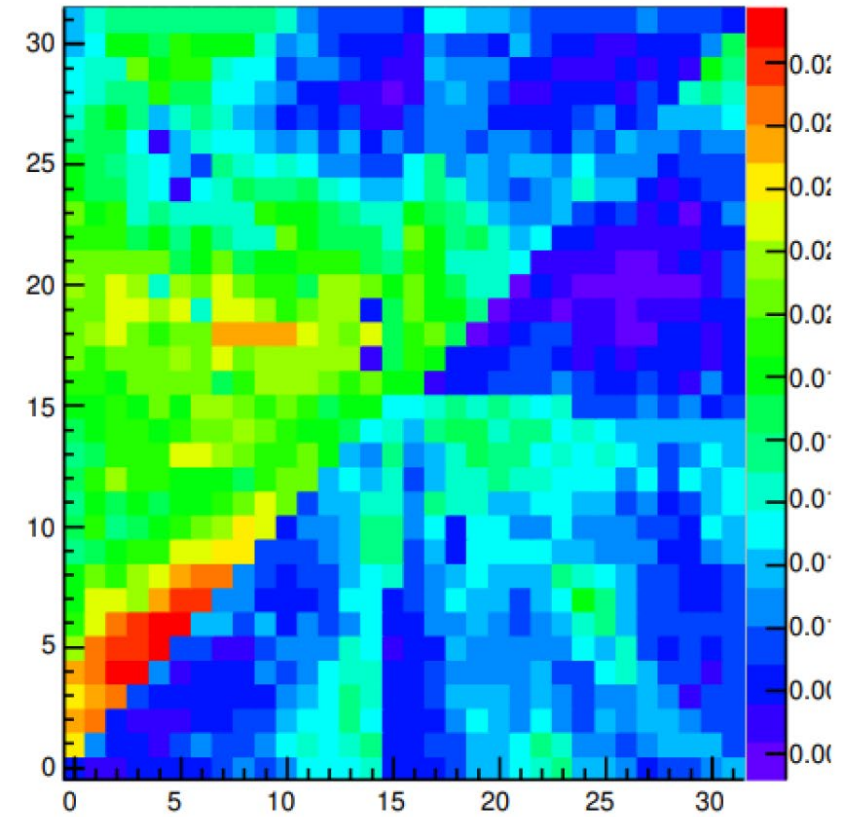
GP03

- occupancies low for half of the detector (here: pixel region)

GP03P2__Occupancy



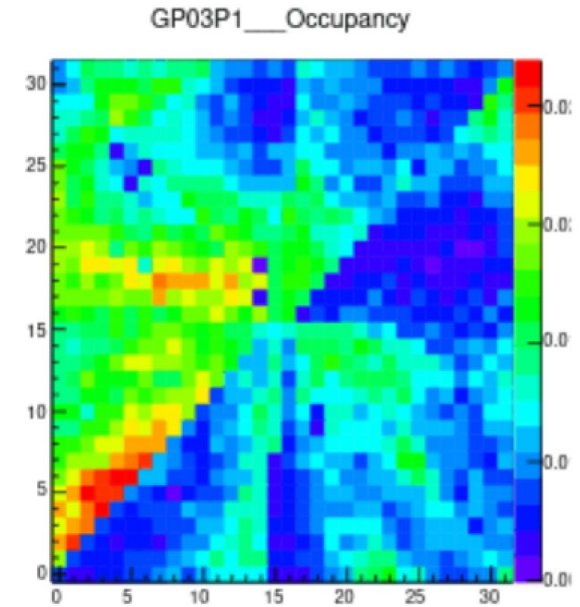
GP03P1__Occupancy



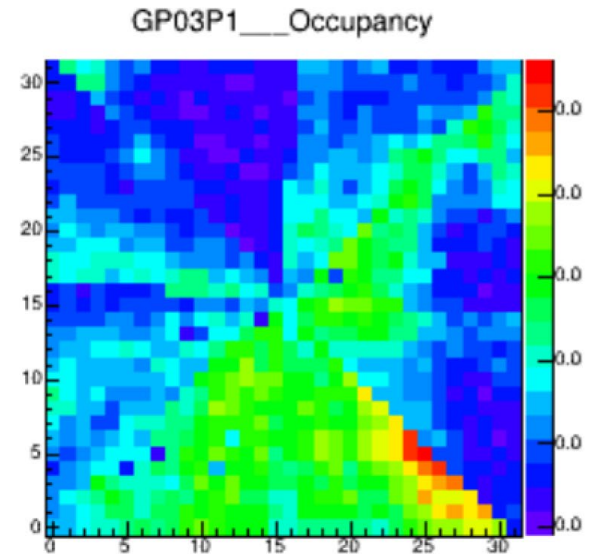
GP03

- occupancies low for half of the detector (here: pixel region)
- changing latency for APV chips \Rightarrow no effect
- swapping cables to ADC \Rightarrow effect moved, i.e. its origin must be located upstream of the ADC card: cables, bus card, APV chips

Before swapping cable, correct mapping



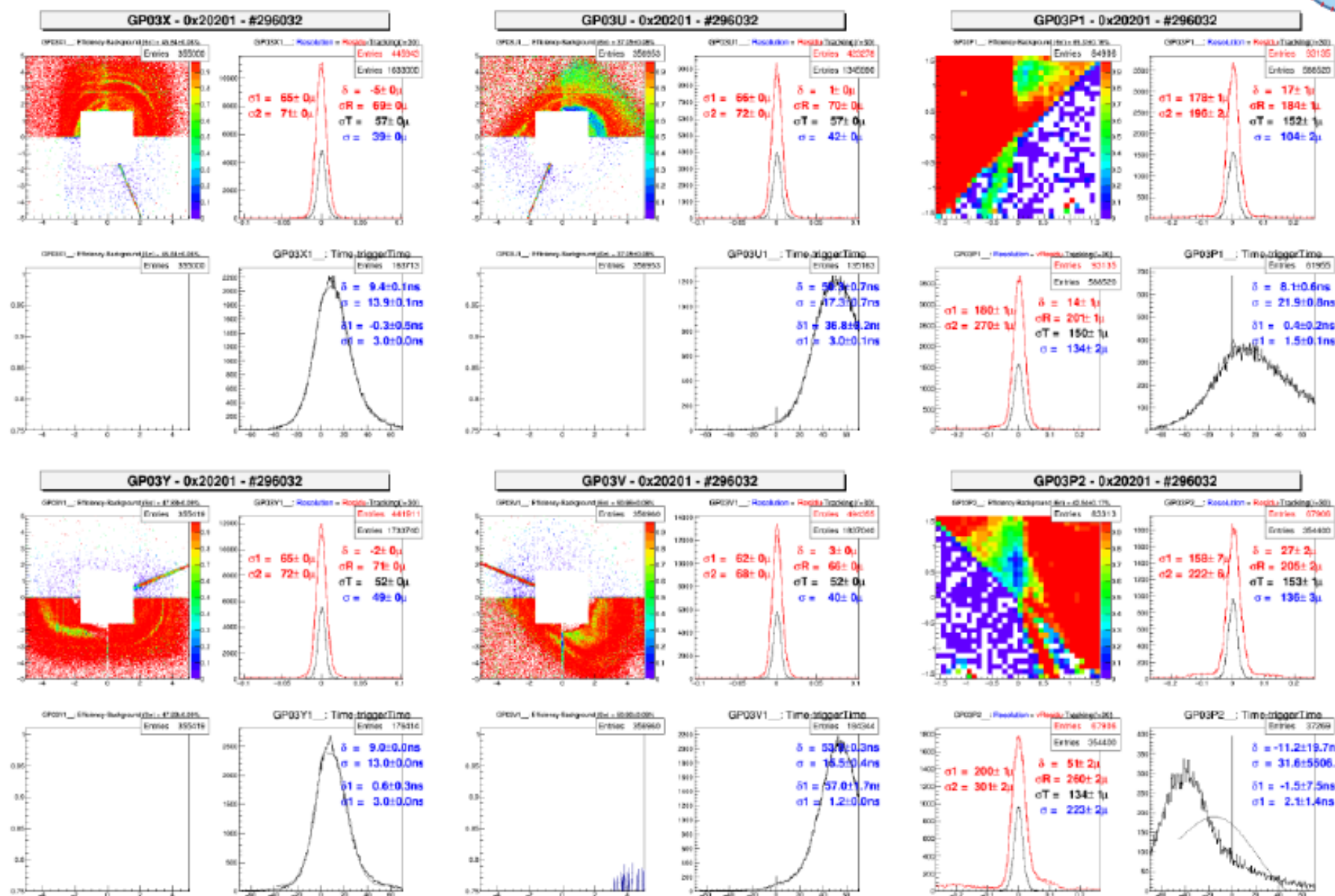
After swapping cables, before correcting mapping



GP03

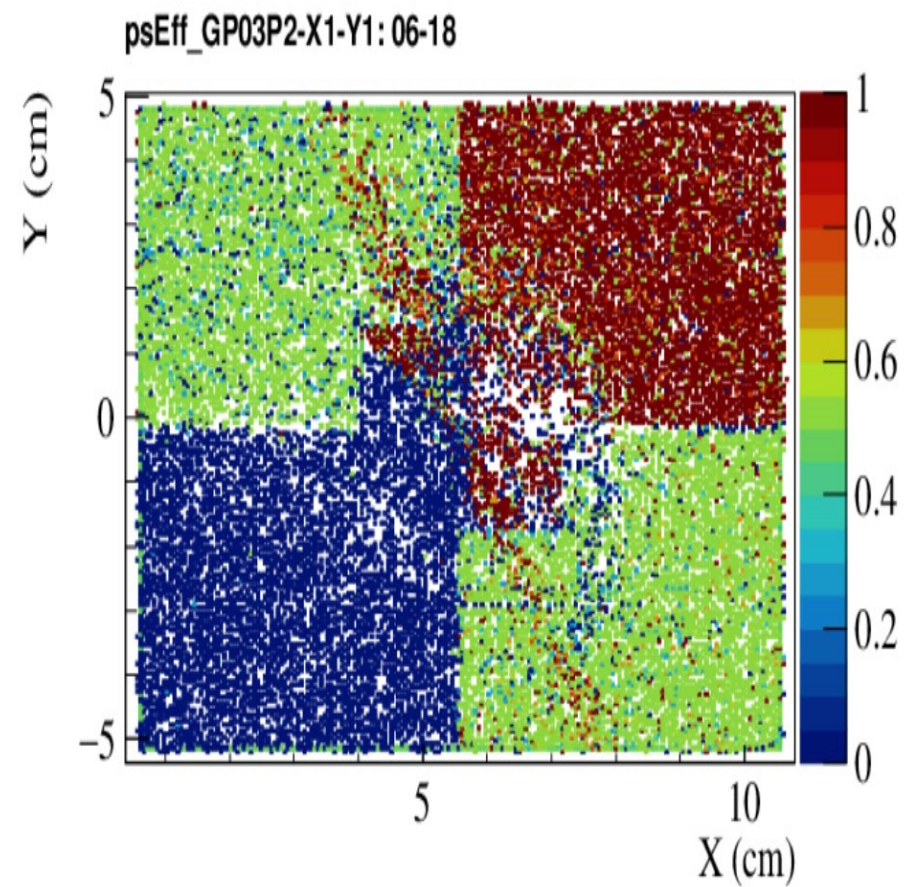
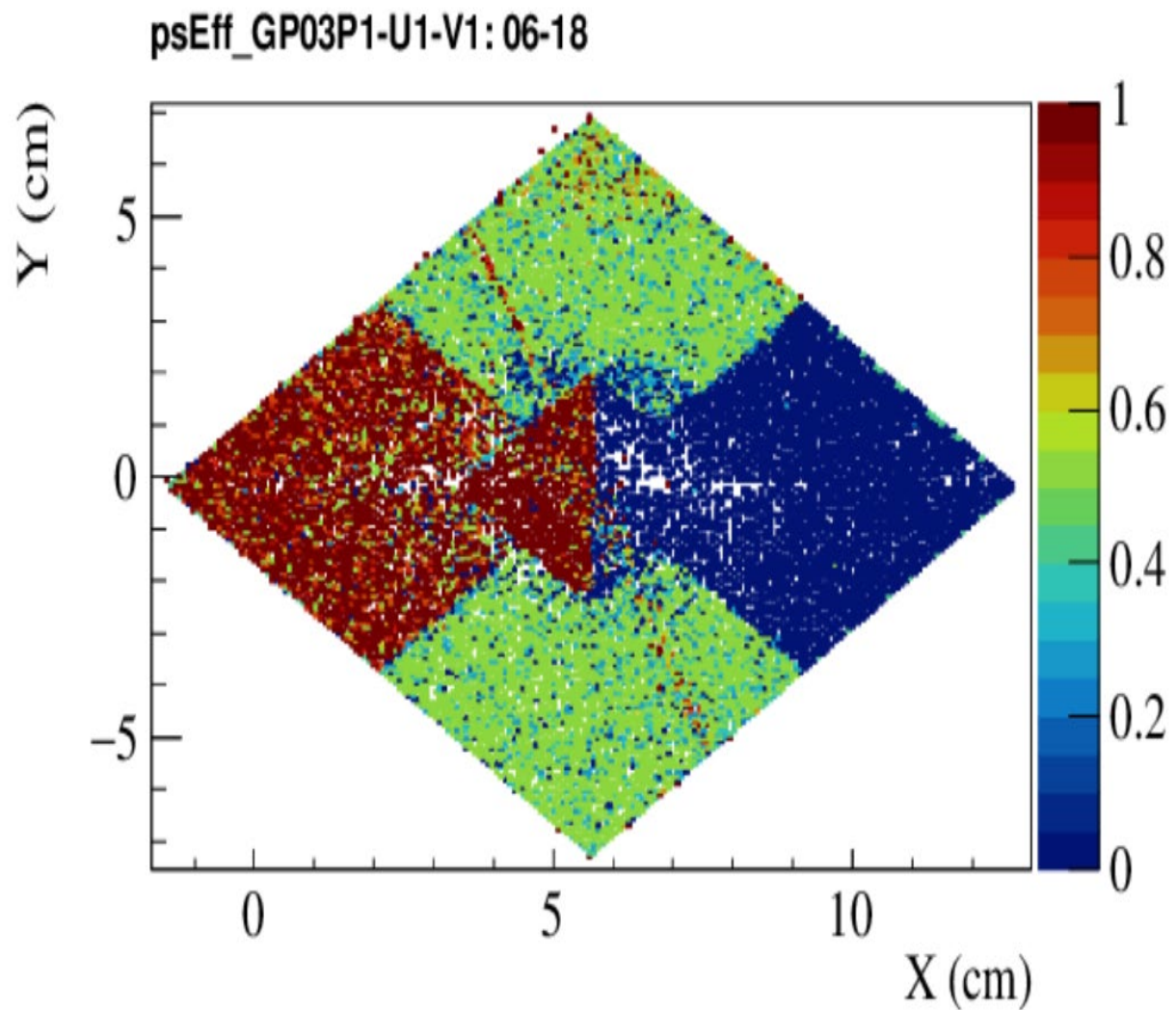
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- efficiencies show similar structure
 - why are low-efficiency regions almost empty?
 - orientation of axes?

GP03



Plane by plane plot of GP03 from Renat.

GP03

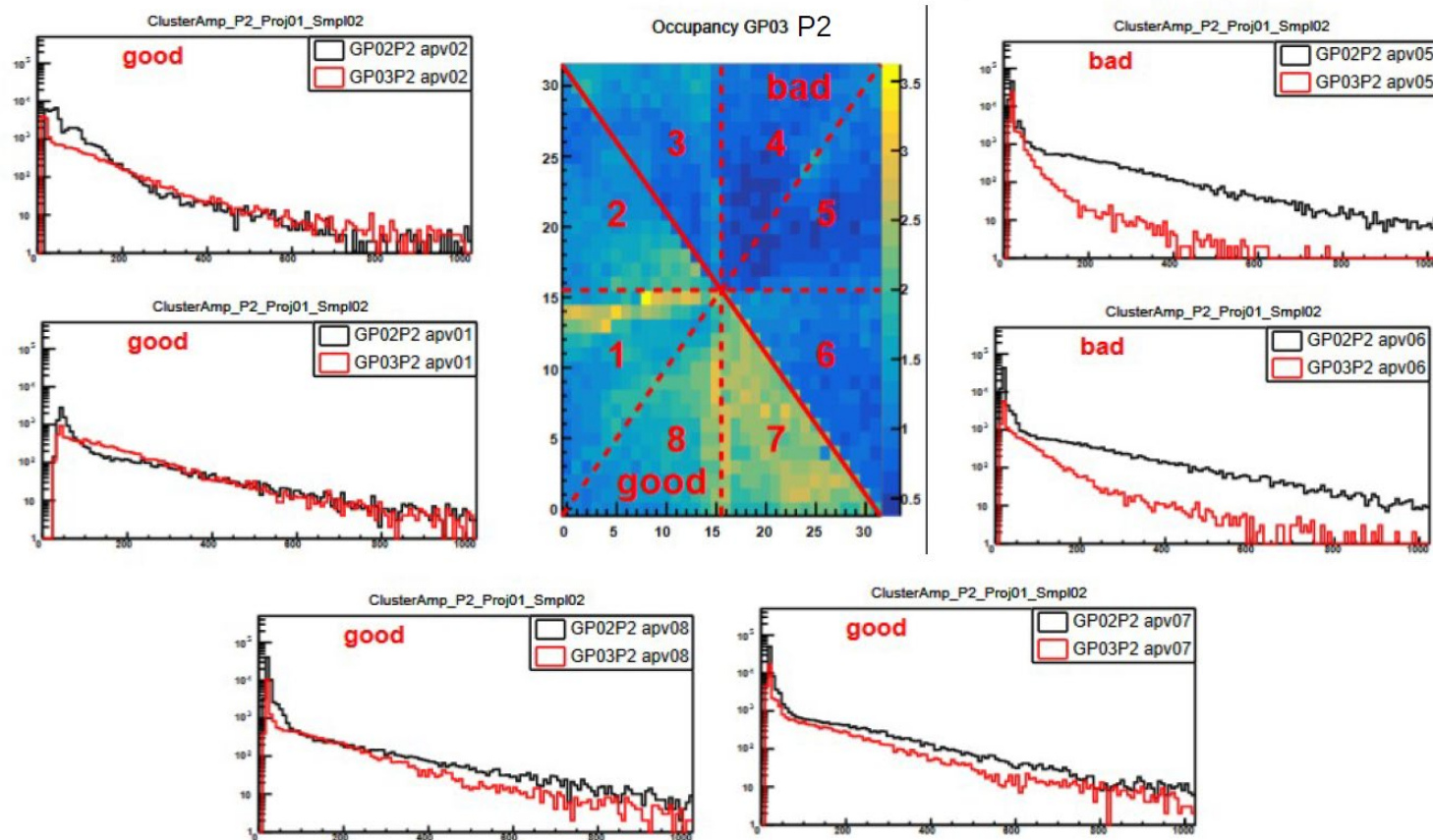
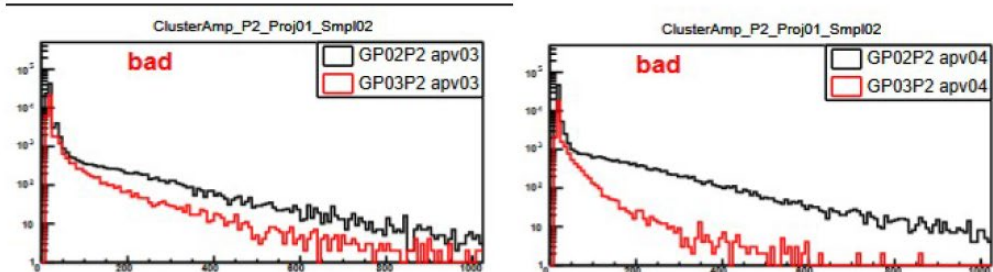


GP03

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 - why are low-efficiency regions almost empty?
 - orientation of axes?
- signal amplitudes lower for low-occupancy regions

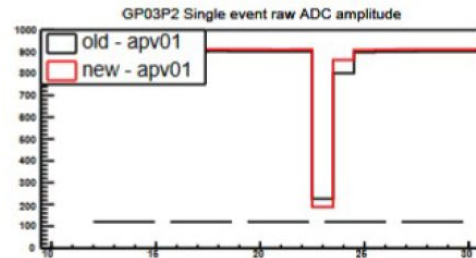
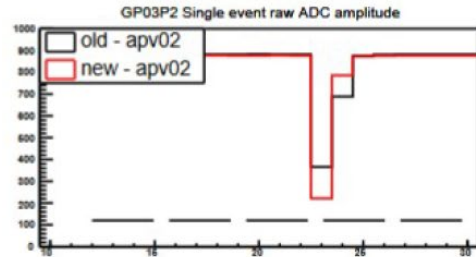
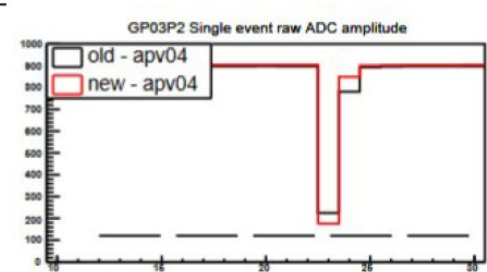
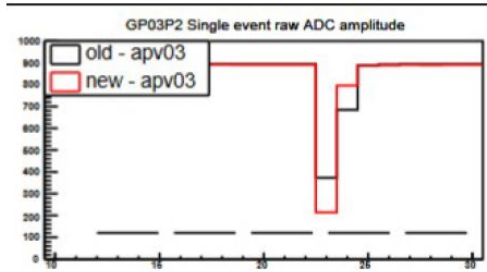
GP03

- amplitudes lower for low-occupancy regions

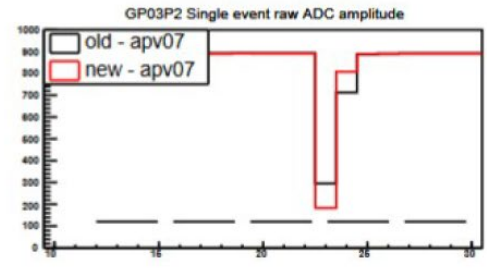
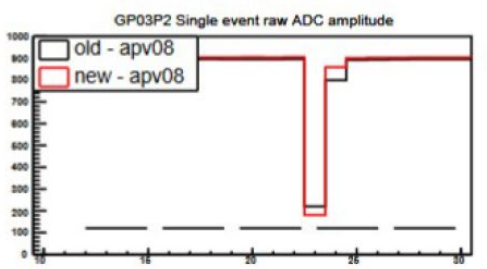
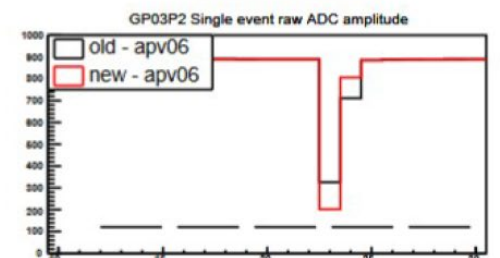
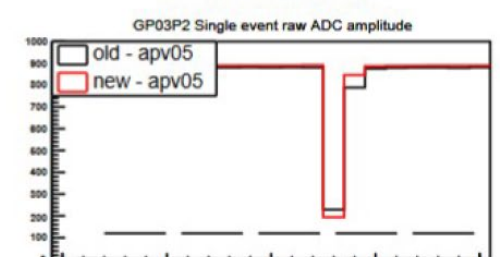
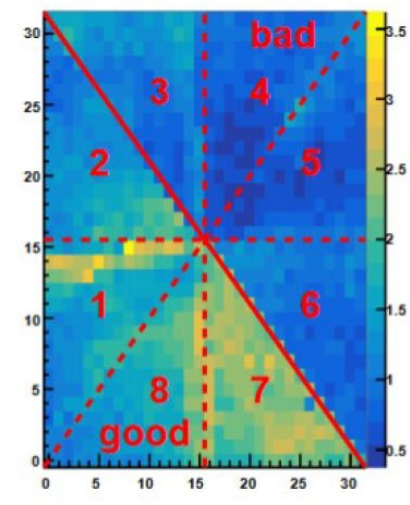


GP03

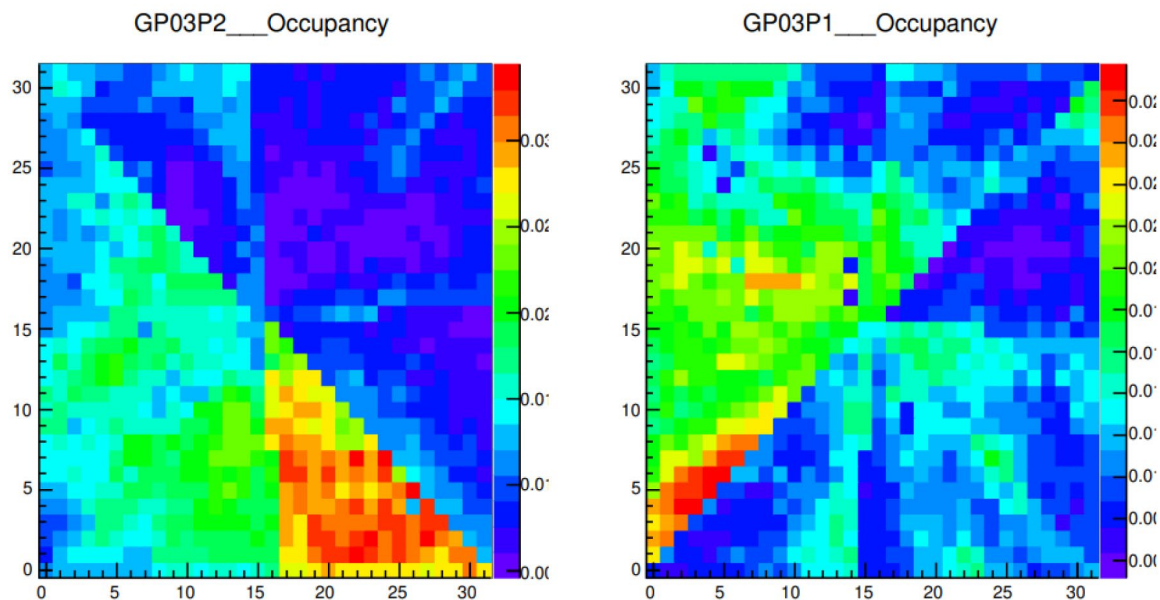
- amplitudes lower for low-occupancy regions
- ADC phase not optimal
- but: no clear correlation with low amplitudes



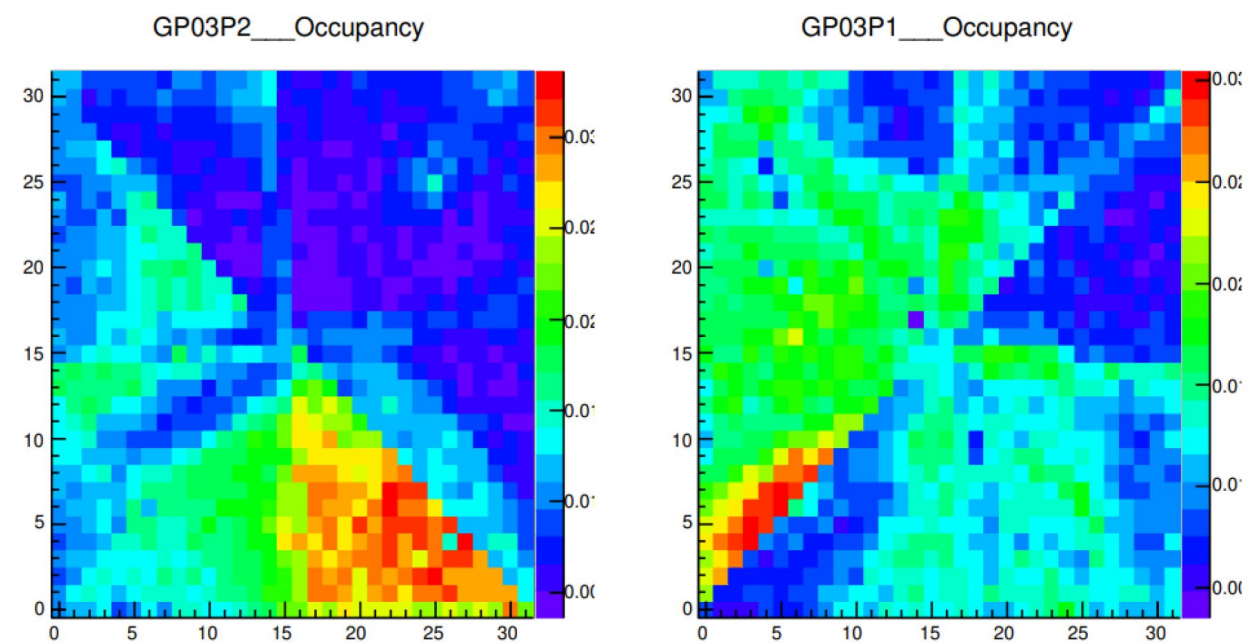
Occupancy GP03 P2



GP03

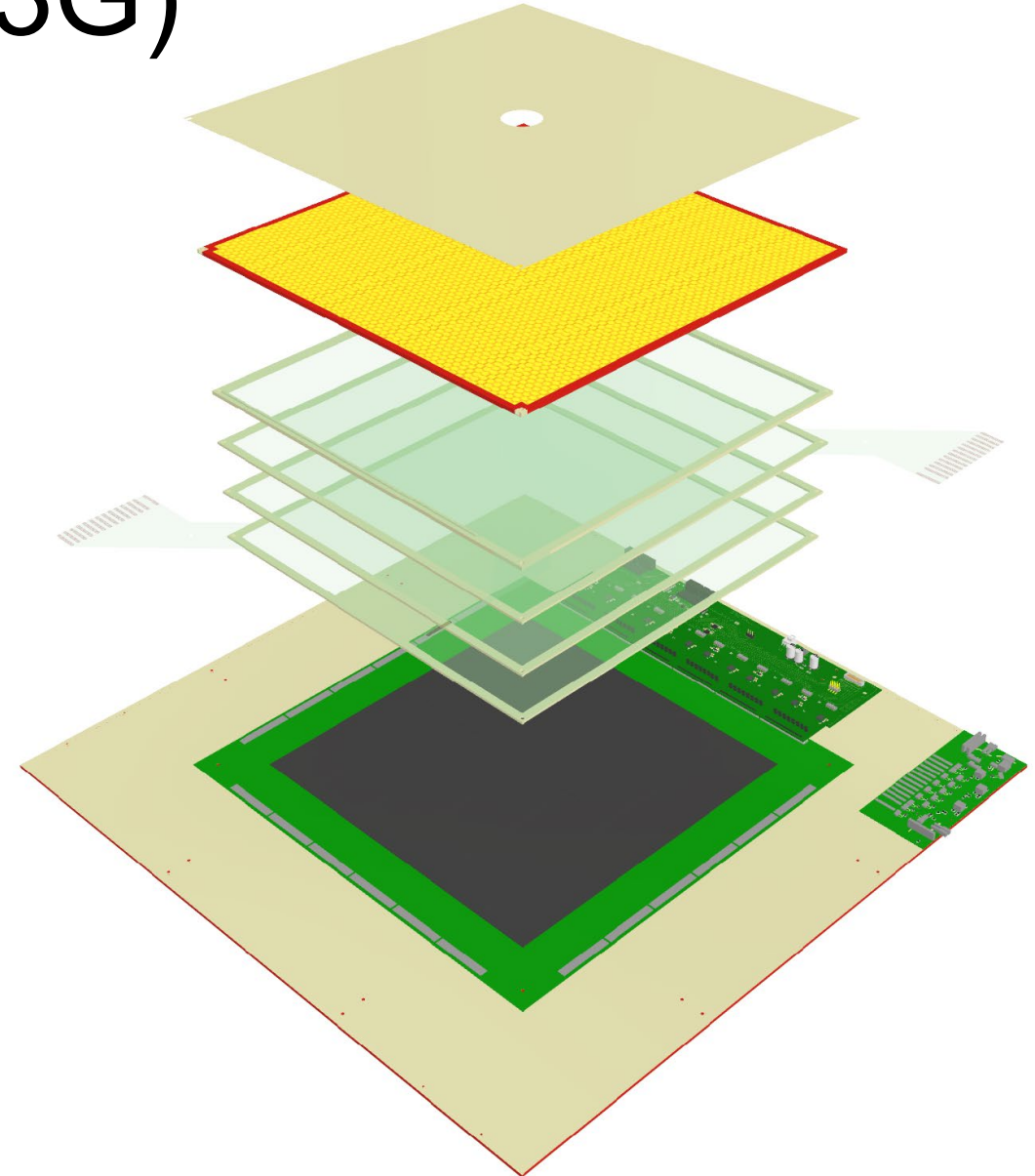
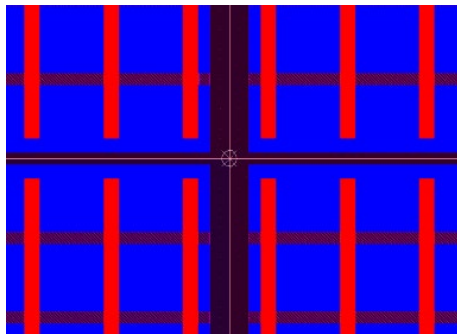


after phase adjustment



COMPASS GEM-3G (CG3G)

- Size of active area: 30.7×30.7 cm²
- Strips divided in center to reduce occupancy
- Triple GEM, foils sectorized on top (13 sectors)
- No spacer grids
- Gas in/out on drift plate, internal distribution



- Stabilized voltage divider: 3 +1 cards
- 6 × 4 front-end cards, 4 supply cards

Status of detector production

	Support plates	Frames	Drift foil	GEM foils	Readout PCB	HV board	Assembly	Calibration	Installation
CG3G01	✓	✓	✓	✓	✓	SVD	✓	✓	Prototype
CG3G02	✓	✓	✓	✓	✓	PVD	✓	✓	
CG3G03	✓	✓	✓	✓	✓	PVD	✓	✓	
CG3G04	✓	✓	✓	✓	✓	PVD	✓	✓	
CG3G05	✓	✓	✓	✓	✓	PVD	✓	✓	

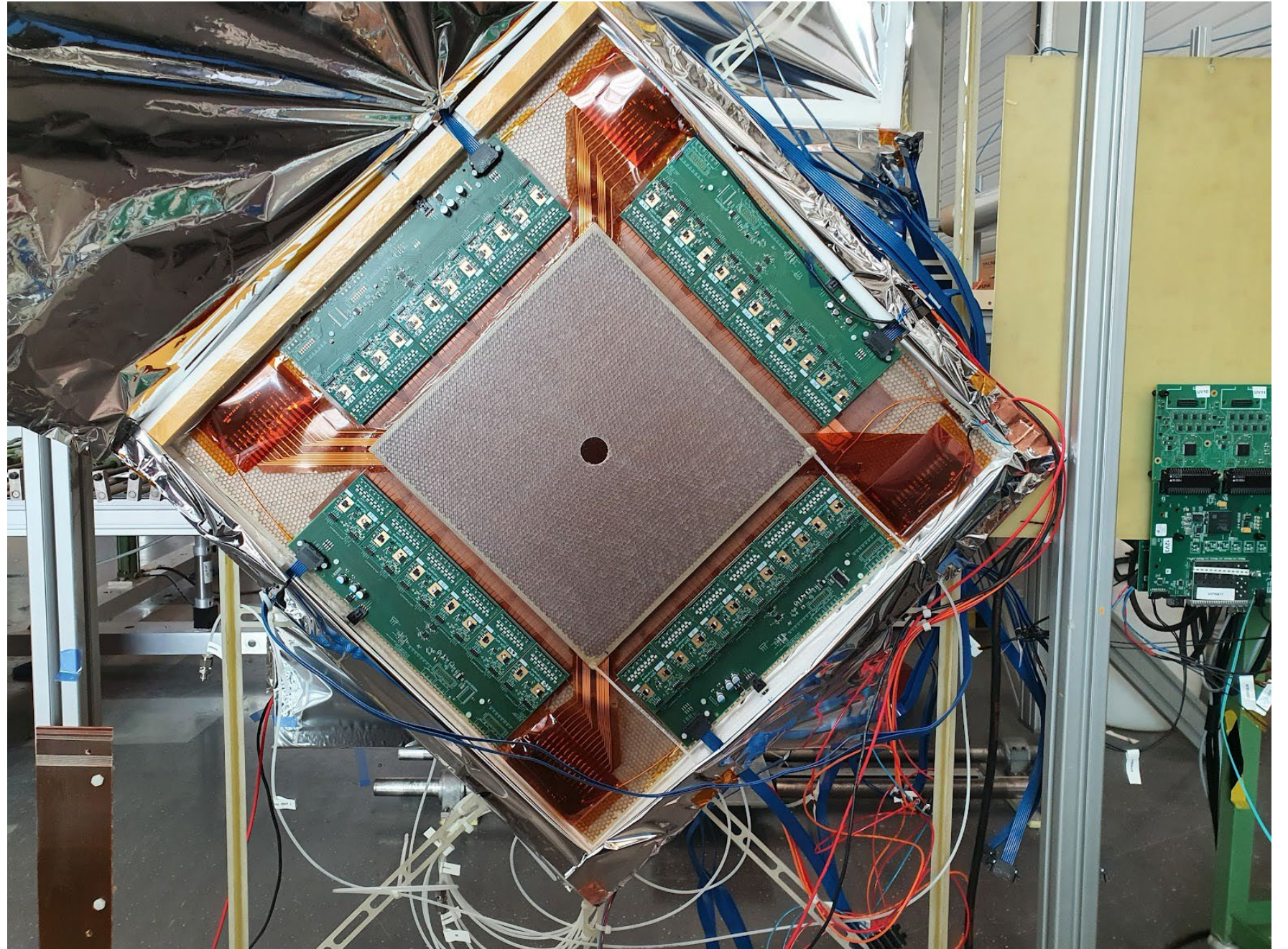
Assembly steps:

- QA: quality assurance
- G1, G2, G3: GEM i framed
- RO: R/O PCB glued
- D: drift foil glued
- S1, S2, S3: stack i glued
- DET: detector assembled
- GAS: gas pipes + tight
- HV: HV board assembled

Positions for 2022: GM04 (?), GM05, downstream of GM09

Installation: September 28

CG3G



Status of CG3G (GT)

- 4 detectors ready and tested (all at CERN, Clean Area)
- shielding, LV, HV cables, etc. ready
- SAMTEC signal cables: delay in delivery, to be delivered to Bonn this week (Wk 38)
- APV FE cards: exchange of capacitors done for 2nd station, cards being tested again at Bonn
- ADC/TDC cards ready (at CERN)
- new detectors set up in Clean Area to debug readout electronics
- problems with LV power supply of 4 bus cards in parallel: voltage drop on power line, change of GND potential, need to power every bus card with a separate channel for the time being
- problems with ADC synchronization between 2 ports: fixed on 18.9.
- can read one ADC card with 12 chips w/o sync. errors: 19.9.
- attempt to read 24 chips with 2 ADCs: still to be debugged
- preliminary plan: installation of 1st station in position downstream SM2 on 28.9.!
- need to prepare infrastructure before
- need to survey detector

Spare Slides

LV Configurations

green: existing
 dark orange: plan for 2021
 light orange: possible future

Generation	p.s. type	GMnnU1	GMnnV1	GMnnX1	GMnnY1
CG1G	APV: CAEN A516	2ch, $\pm 3.5V$, - 0.9A, +0.7A	2ch, $\pm 3.5V$, - 0.9A, +0.7A	2ch, $\pm 3.5V$, - 0.9A, +0.7A	2ch, $\pm 3.5V$, - 0.9A, +0.7A
	APV: NGP804	2ch, $\pm 3.5V$, -1.8A, +1.4A		2ch, $\pm 3.5V$, -1.8A, +1.4A	
	ADC: DN35-5	2ch, $\pm 5V$, +3.2A, -0.6A			
CG2G (PGEM)	APV: DN35-5	2ch, $\pm 3.5V$, -1.8A, +1.4A		2ch, $\pm 3.5V$, -1.8A, +1.4A	
	ADC: DN35-5	3ch, $\pm 5V$, +6A, -3A			
CG3G	APV: NGP804	1ch, +3.3V, 8-12A		1ch, +3.3V, 8-12A	
	ADC: NGP804	1ch, +5V, <6A		1ch, +5V, <6A	
CG4G	VMM (SRS): NGP804	1ch, 1.9-3.5V, 19.2A		1ch, 1.9-3.5V, 19.2A	
	Auxiliary	1ch, 2.9-3.5V, 2.4A		1ch, 2.9-3.5V, 2.4A	

For Center HV switch: 1 ch 12V, no current \Rightarrow find simpler solution