

H8 beam time analysis

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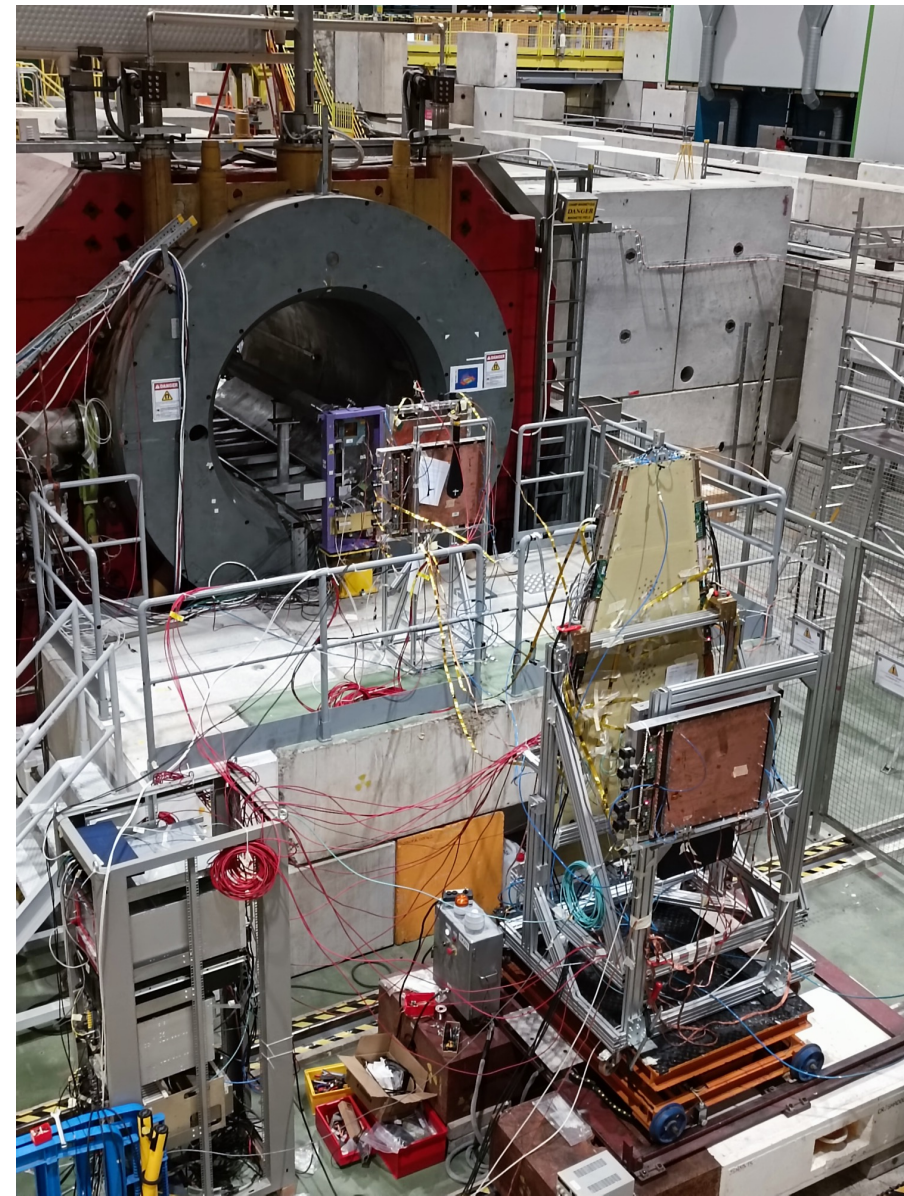
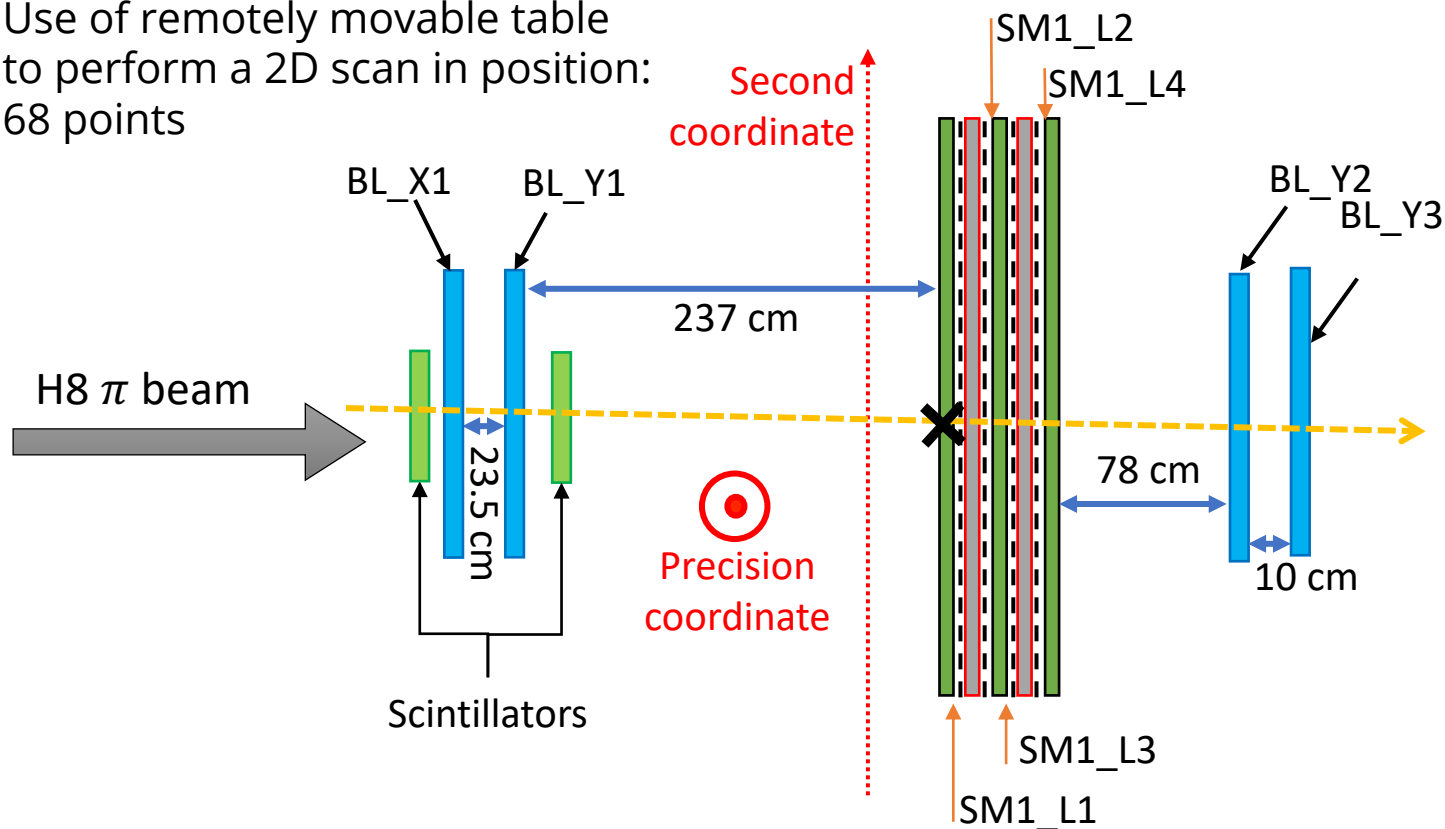


20/06/2024



Introduction

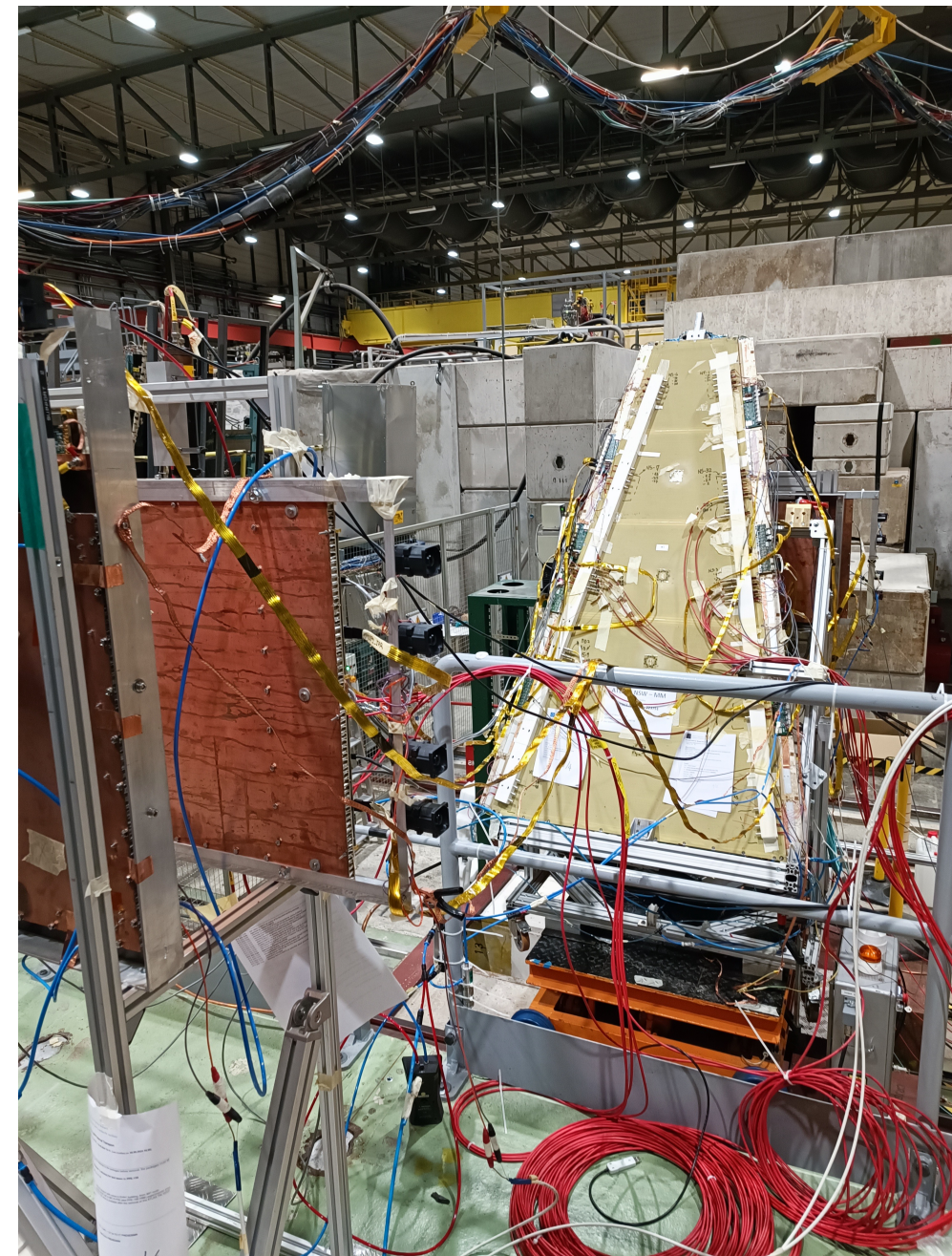
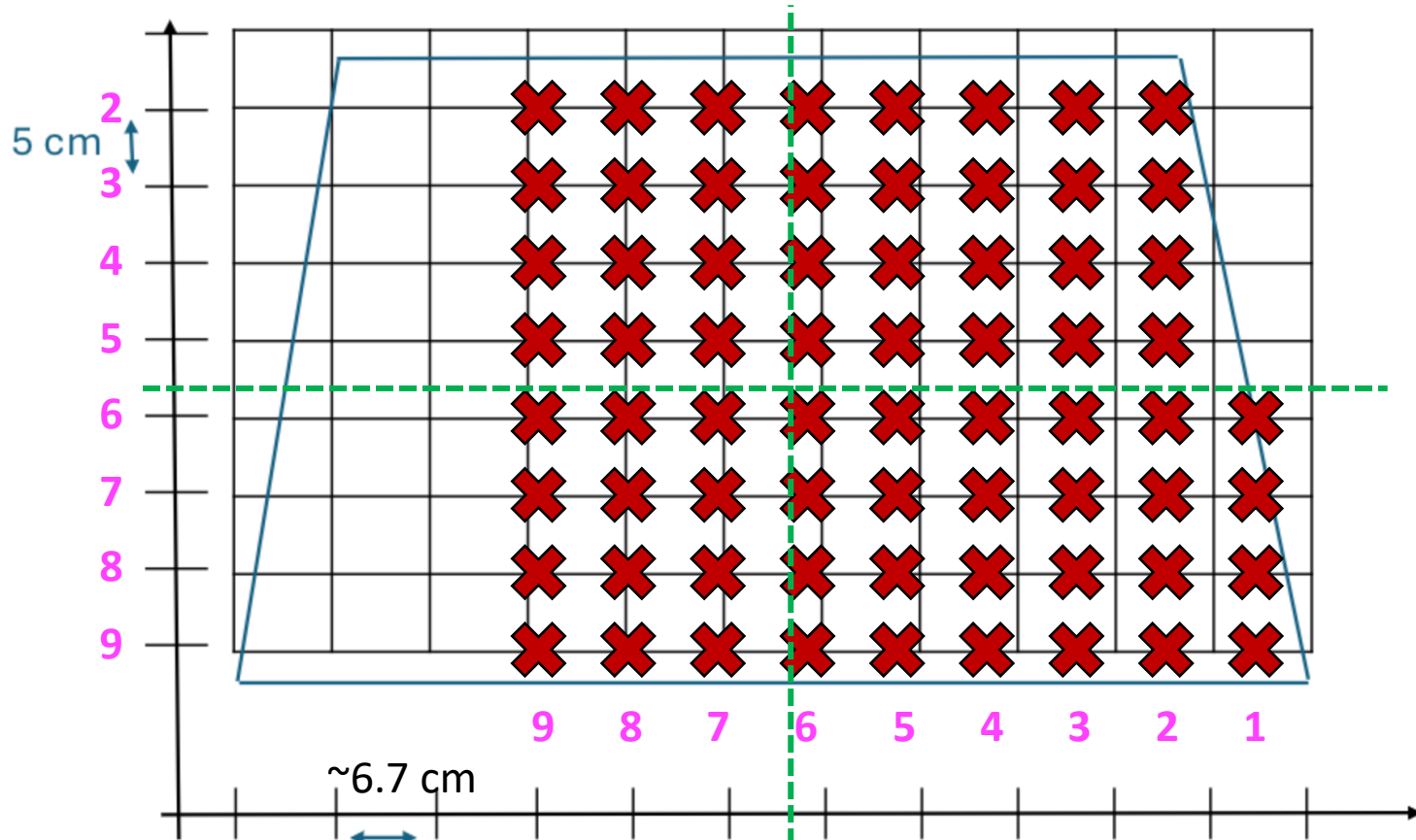
- Setup installed on 5/06/2024 and dismantled on 19/6/2024
- LMU Lauda chiller working fine at 2.5m height
- Several DAQ issues due to new software in use after Alma9 migration
- 2 scintillators, and 4 BL chambers for tracking
- Use of remotely movable table to perform a 2D scan in position: 68 points



Data taking

- 270 runs taken at 29° inclination in 55 positions
- 315 runs taken at 0° inclination in 63 positions
- Angle scan (0°, 10°, 15°, 20°, 24°, 29°) in 2 positions
- 5 voltage points per position: 490 V, 500 V, 510 V, 520 V, 530 V

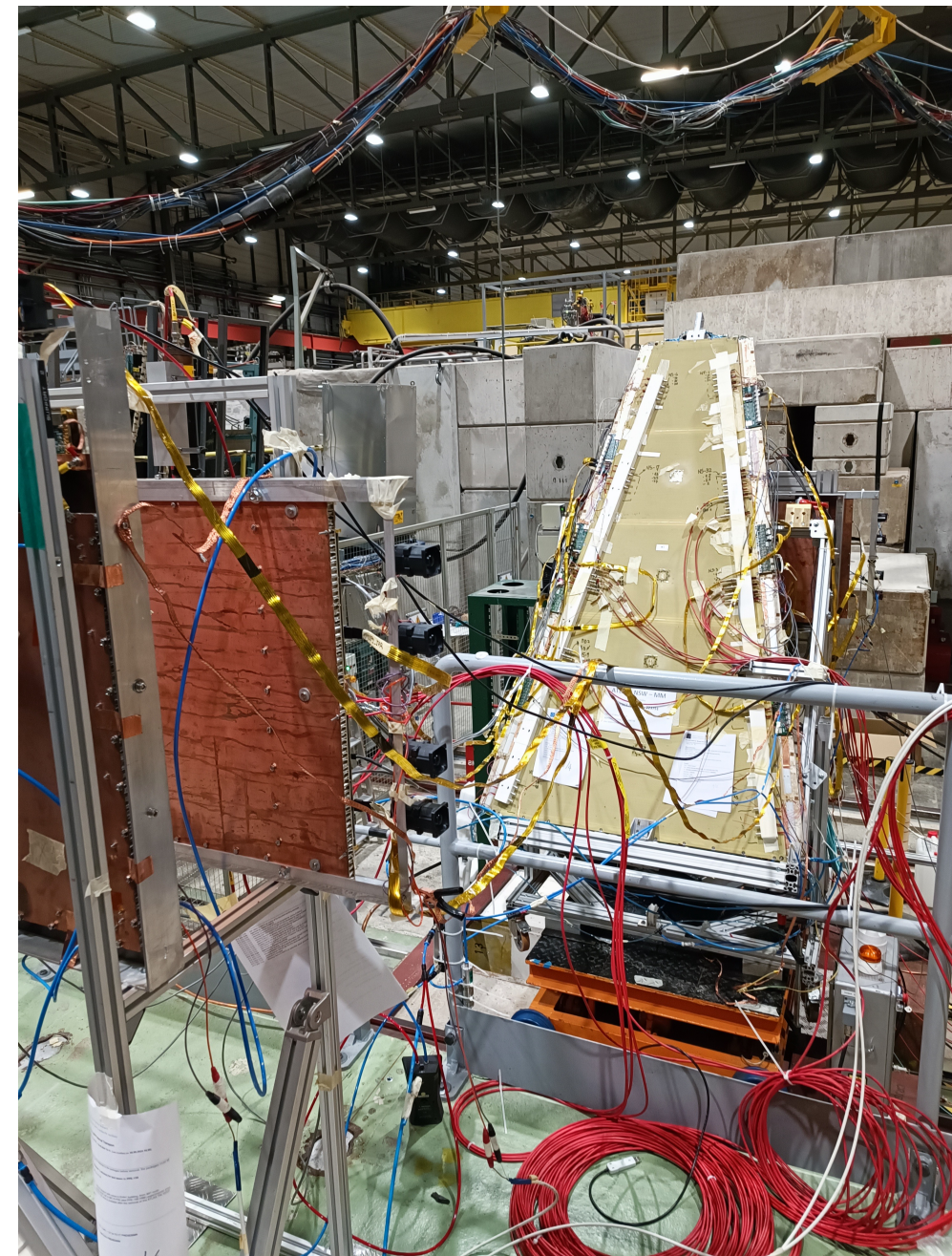
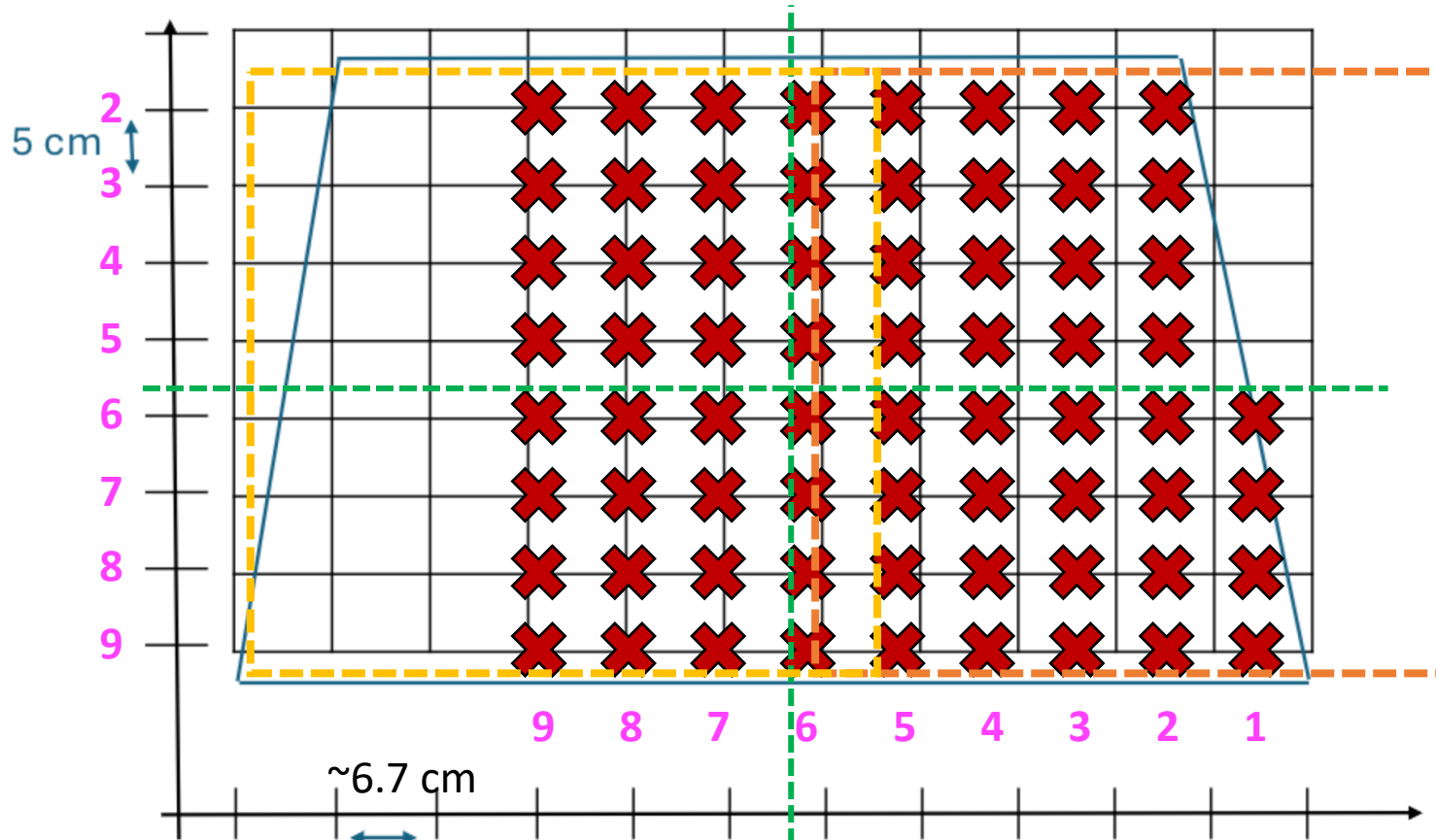
[Runbook link](#)



Data taking

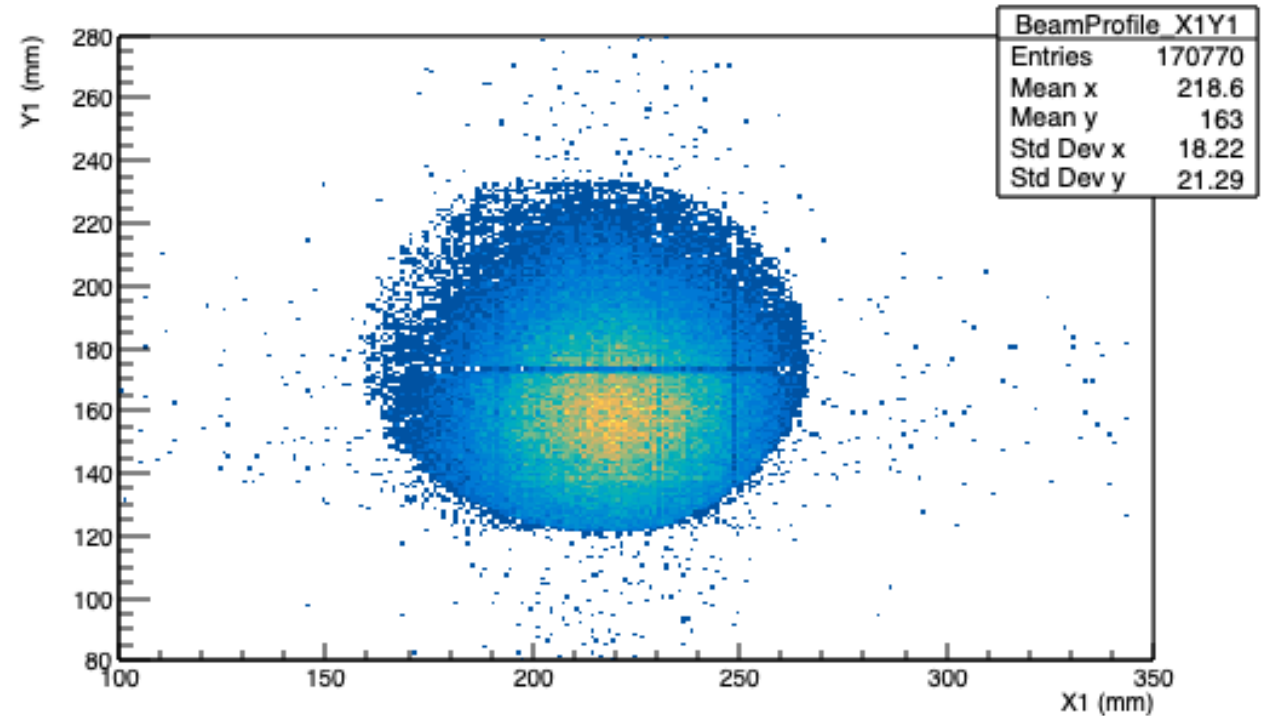
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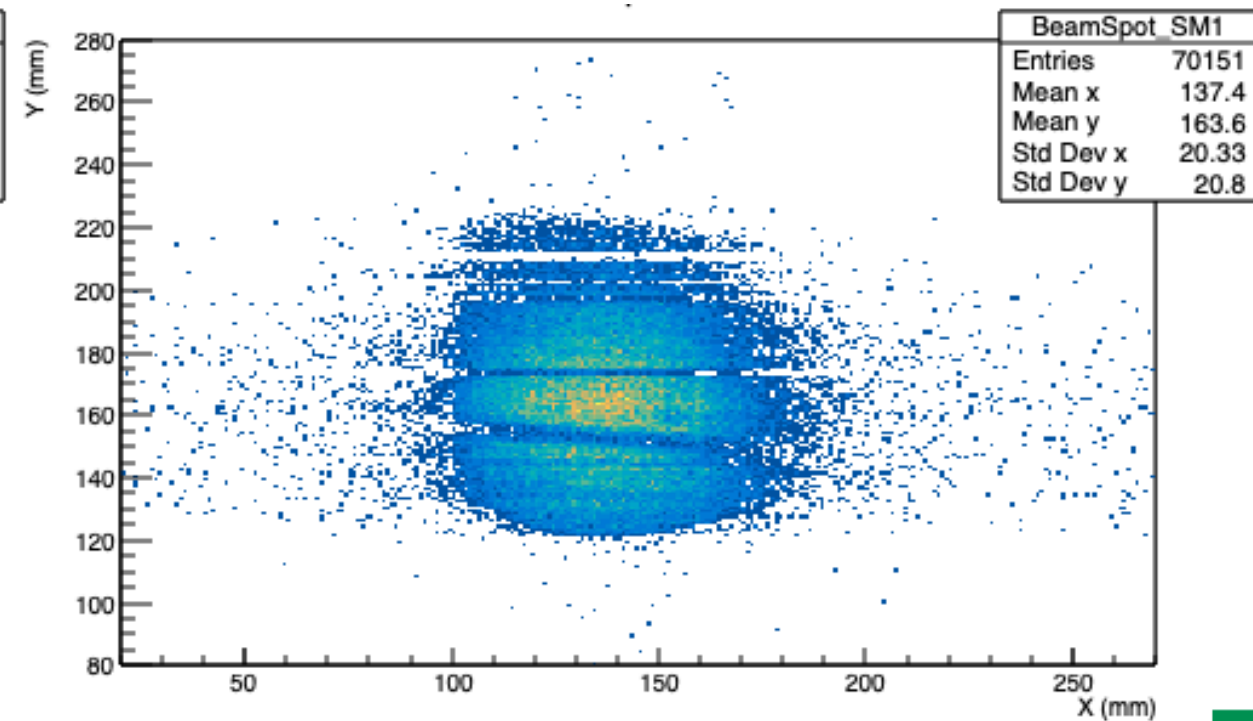
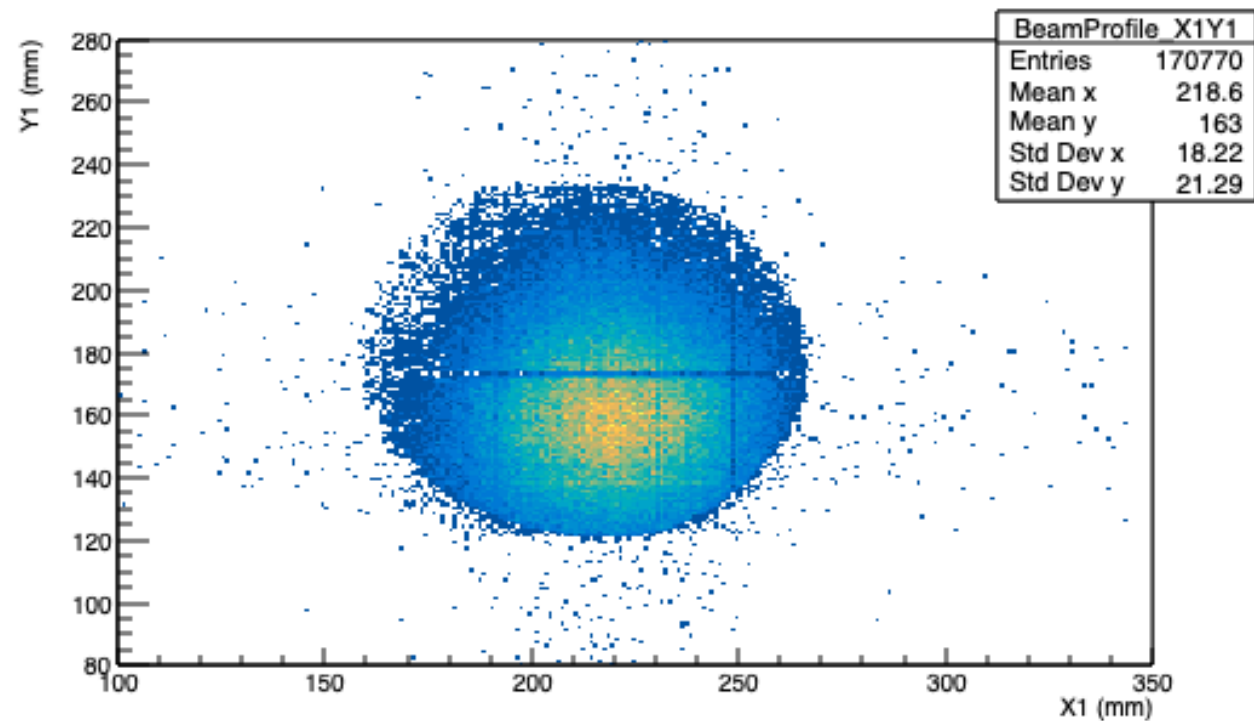
Beam time

- 2D beam spot reconstruction
- 180 GeV pions / protons
- FW: ≈ 10 cm
- FWHM: ≈ 5 cm
- Beam delivered as expected:
 - high intensity pion spills perfect for our data taking
 - $3 - 7 \times 10^5$ particles per spill
 - 1 run per spill
- Many problems with new DAQ and SPS downtime but managed to finish our program in 3 high-efficient data-taking shifts
- 690 runs taken, spanning the surface of 3000 cm^2 of our detector every ~ 5 cm
- Long analysis ongoing due to alignment needed for every position
- Preliminary results are good!
- $\sim 70 \text{ um}$ resolution for 0° tracks, good tracking efficiencies, and uniformity on detector surface



Beam spot

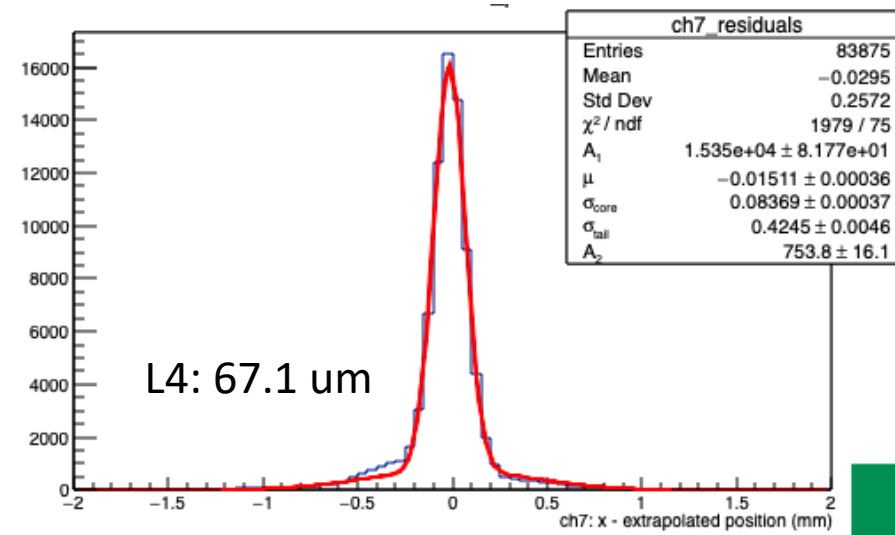
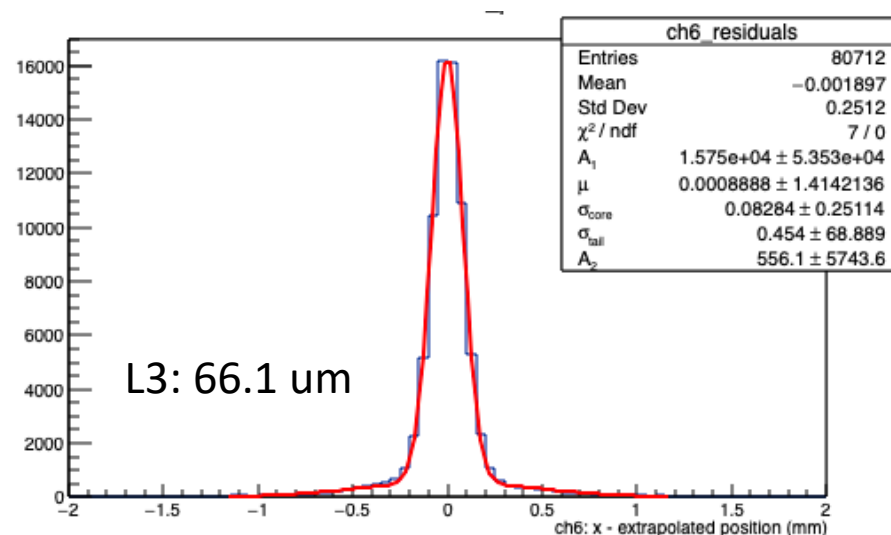
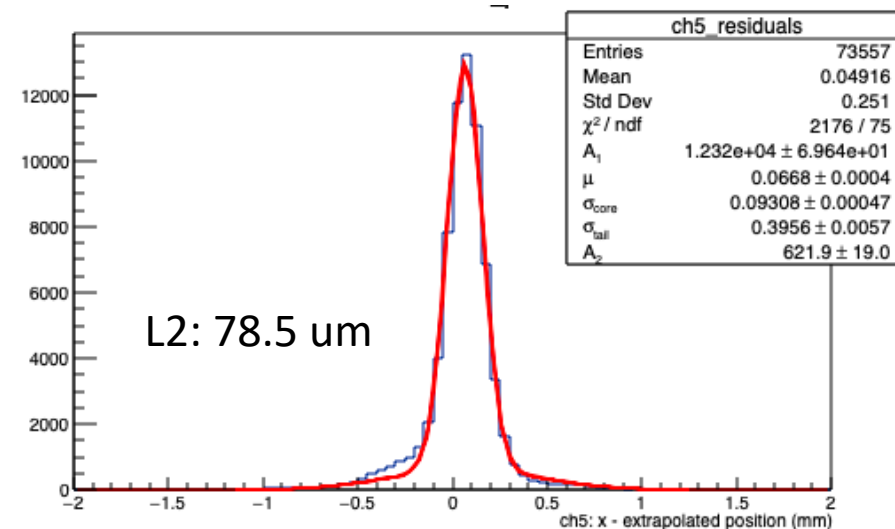
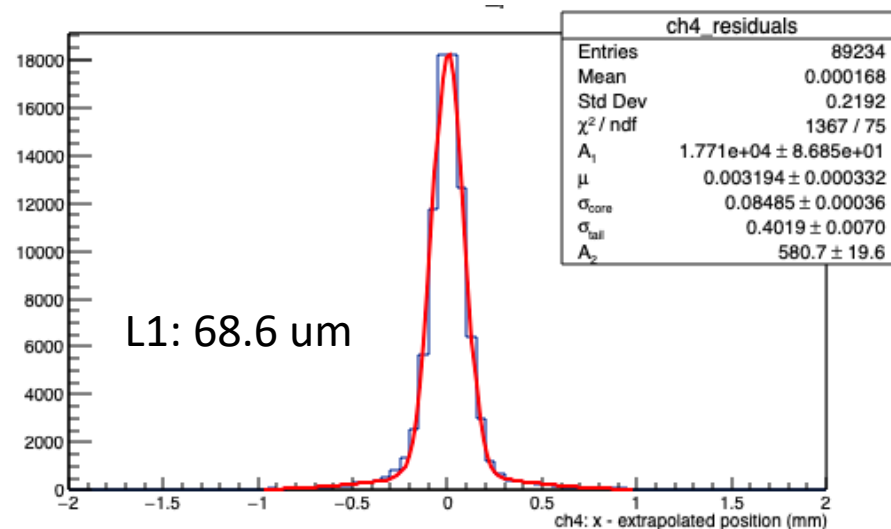
- Beam spot reconstruction:
 - Left: 2D reconstruction using single-clusters in X1 and Y1 reference chambers
 - Right: 2D reconstruction requiring at least 3/4 SM1 layers on track, X coordinate from U and V layer combination (always requested for this measure)



- Some inefficiencies due to dead or noisy strips masked
- Less statistics on the right plot due to tighter requirements on tracking including Y2 and Y3 on-track

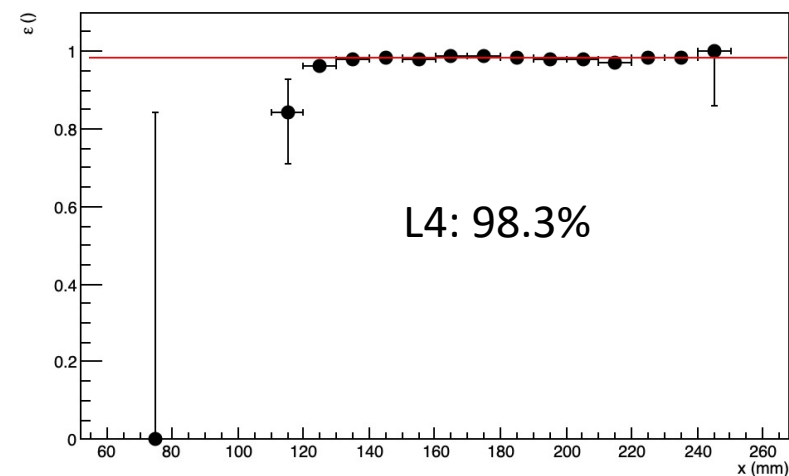
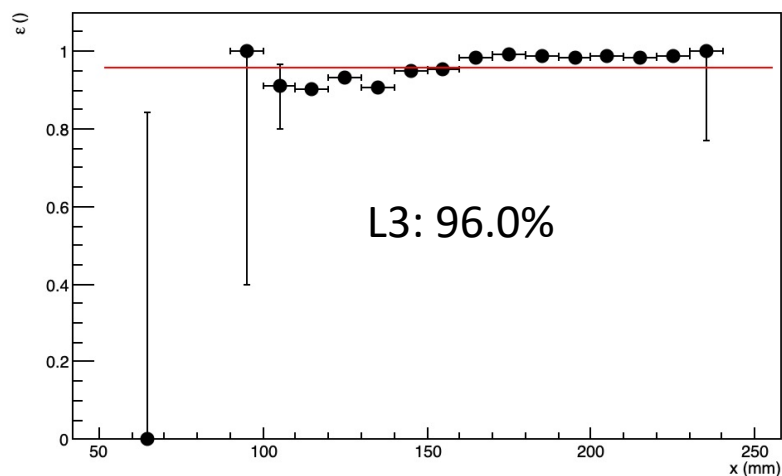
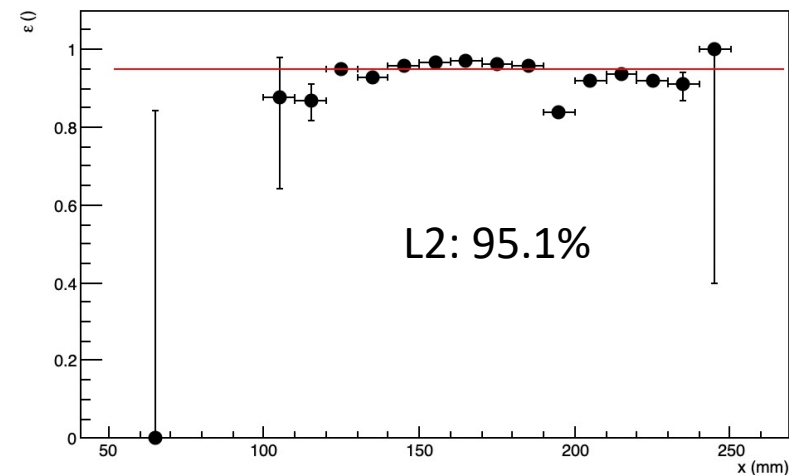
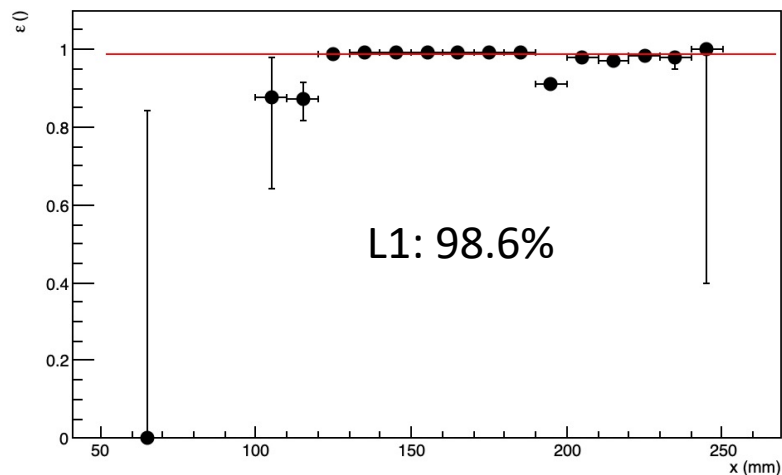
Benchmark point resolutions

- Benchmark run at 0° in position (4,5)
- Very good position resolution around 70 μm for all layers
- Fine-tuned alignment performed for this position
- Need to re-align for all positions to achieve similar results



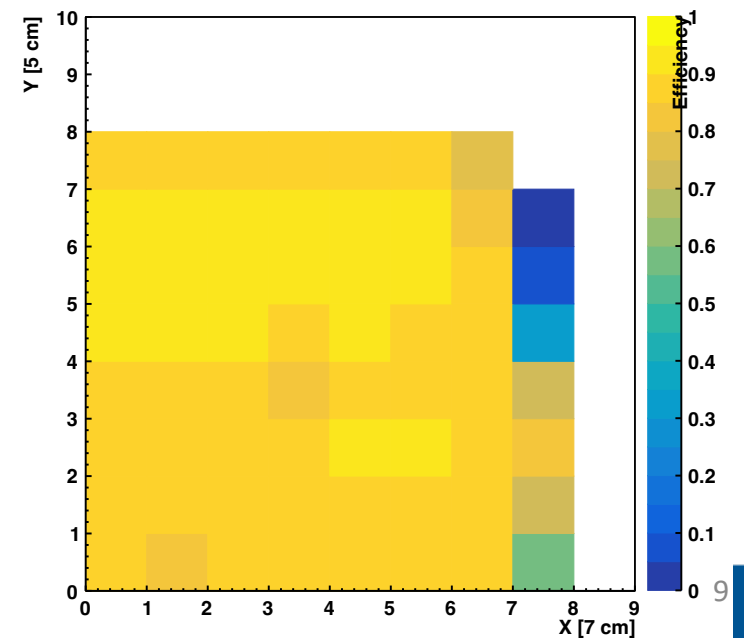
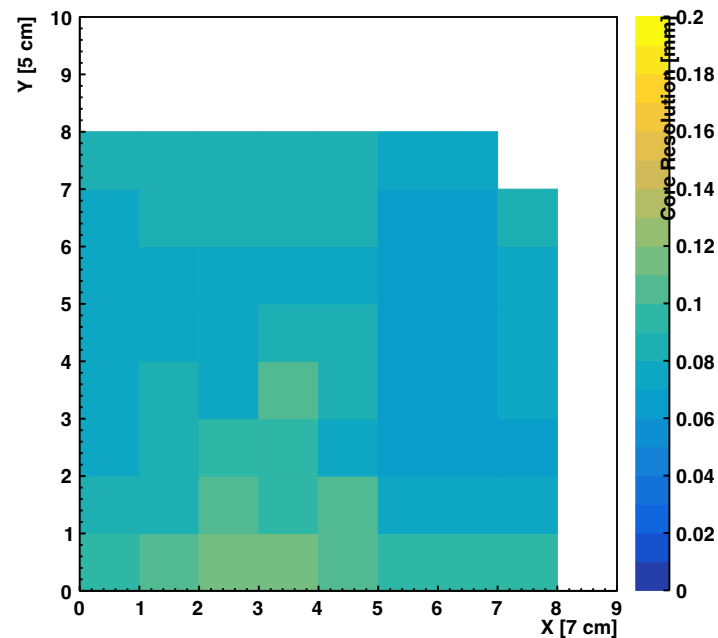
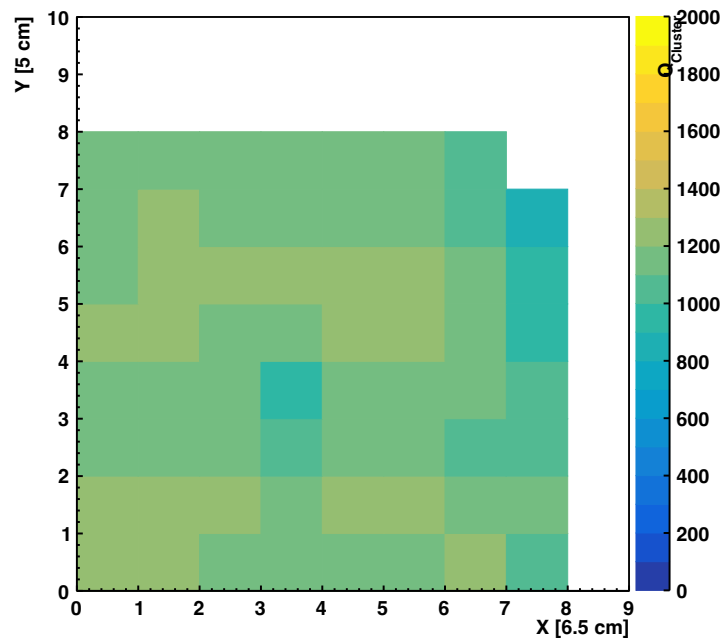
Benchmark point efficiencies

- Benchmark run at 0° in position (4,5)
- Coarse alignment done to perform efficiency measurement
- All 4 SM1 layers efficient with $>95\%$
- Single-strip clusters allowed (as in P1)
- Tuning selection with 2 strip clusters on perpendicular tracks runs..
- Some dead/noisy channels affects efficiency and need to think better how to evaluate it



Fabian's results

- Preliminary analysis, not fine-tuned alignment yet
- Uniformity key parameters on the detector surface
- Cluster charge uniform, visible spot with slightly lower $Q_{cluster}$ where interconnection is located
- Spatial resolutions around 100 μm with coarse alignment
→ achieving 70 μm with fine-tuned alignment in benchmark positions
- Efficiency uniform and good for preliminary result: overall >85% in the active area of the detector (excluding edge points)
→ need to adjust the clustering to avoid losses due to dead electronic channels



Back-up