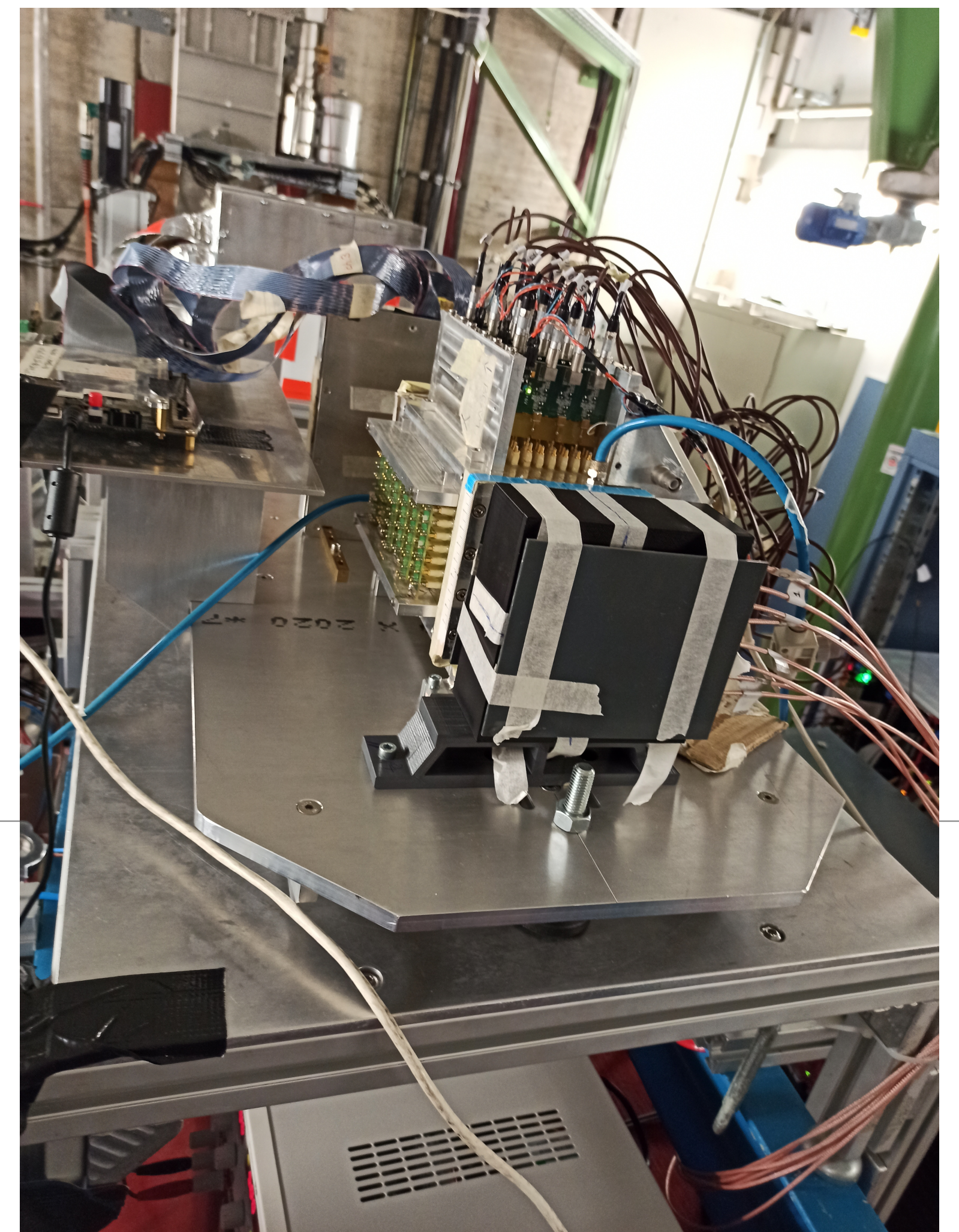
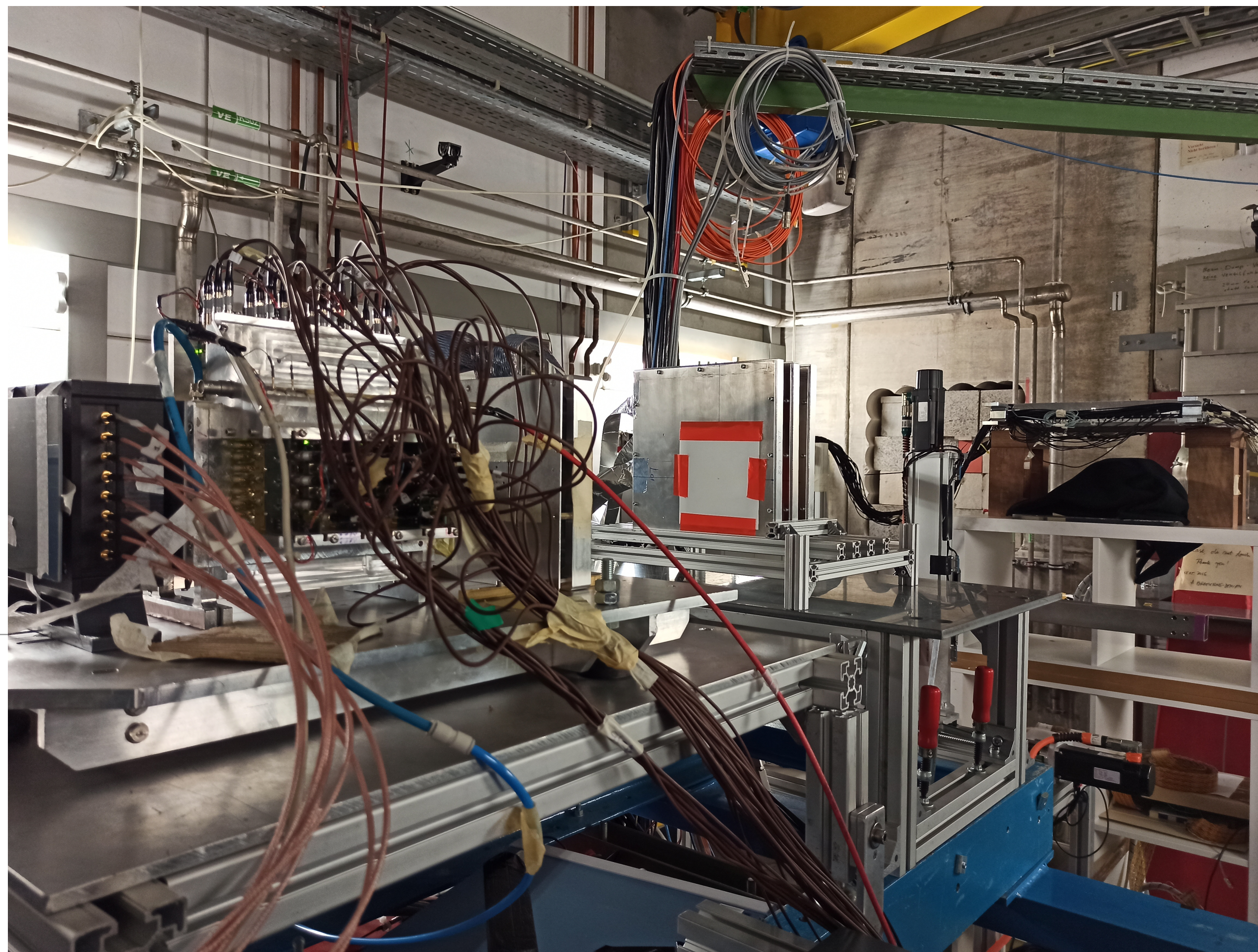
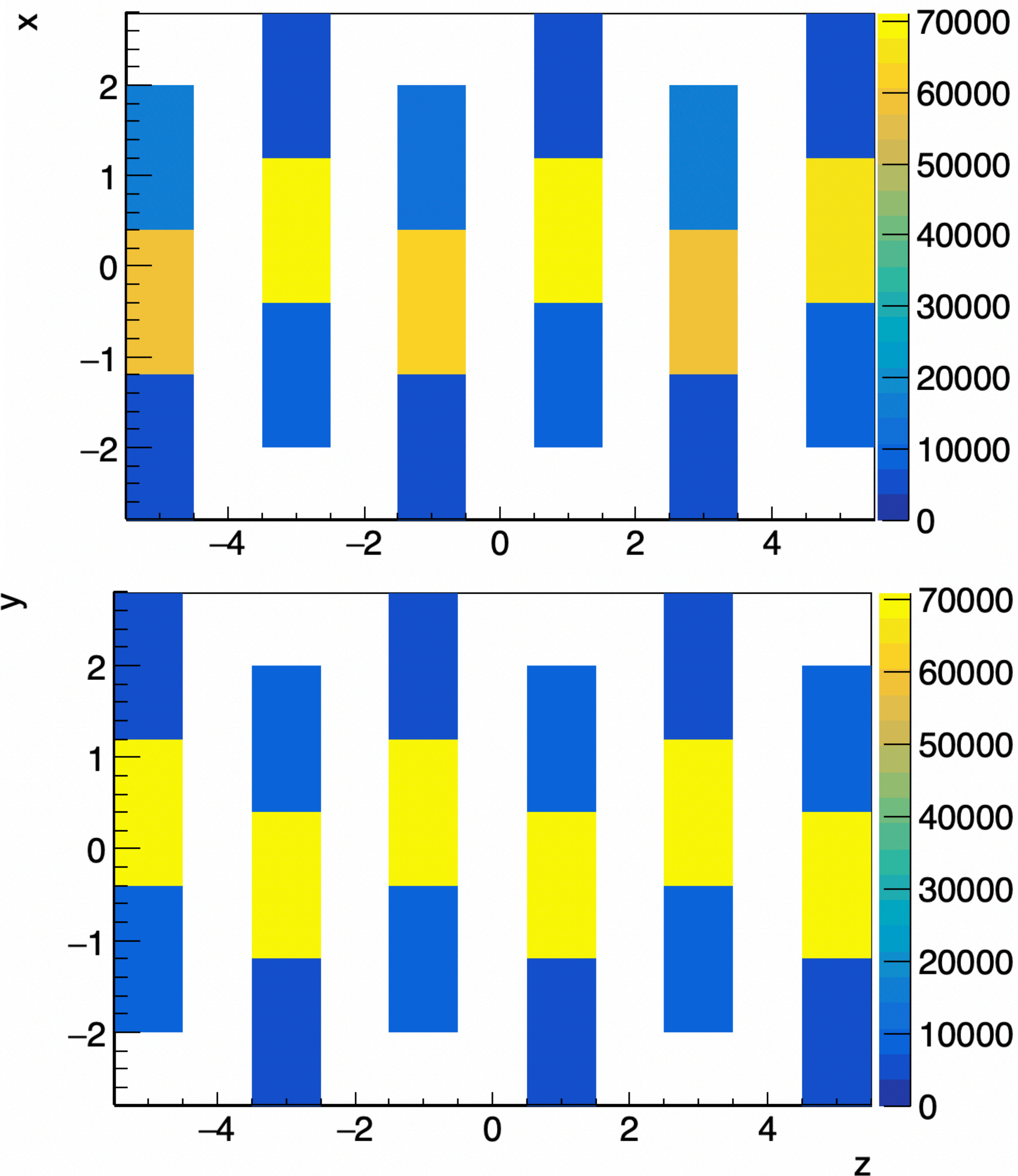




Beam Monitor @ GSI2021: first analysis

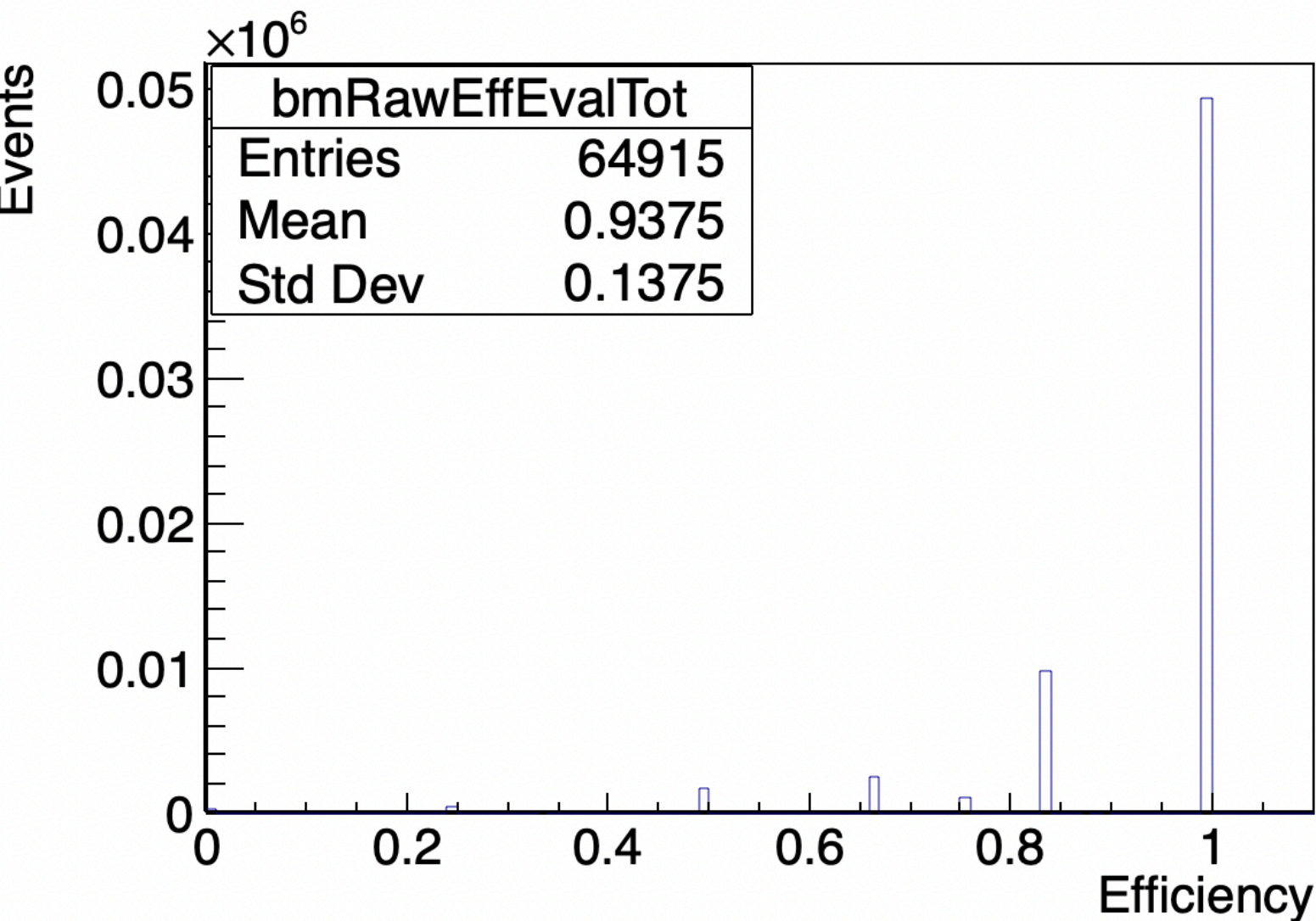
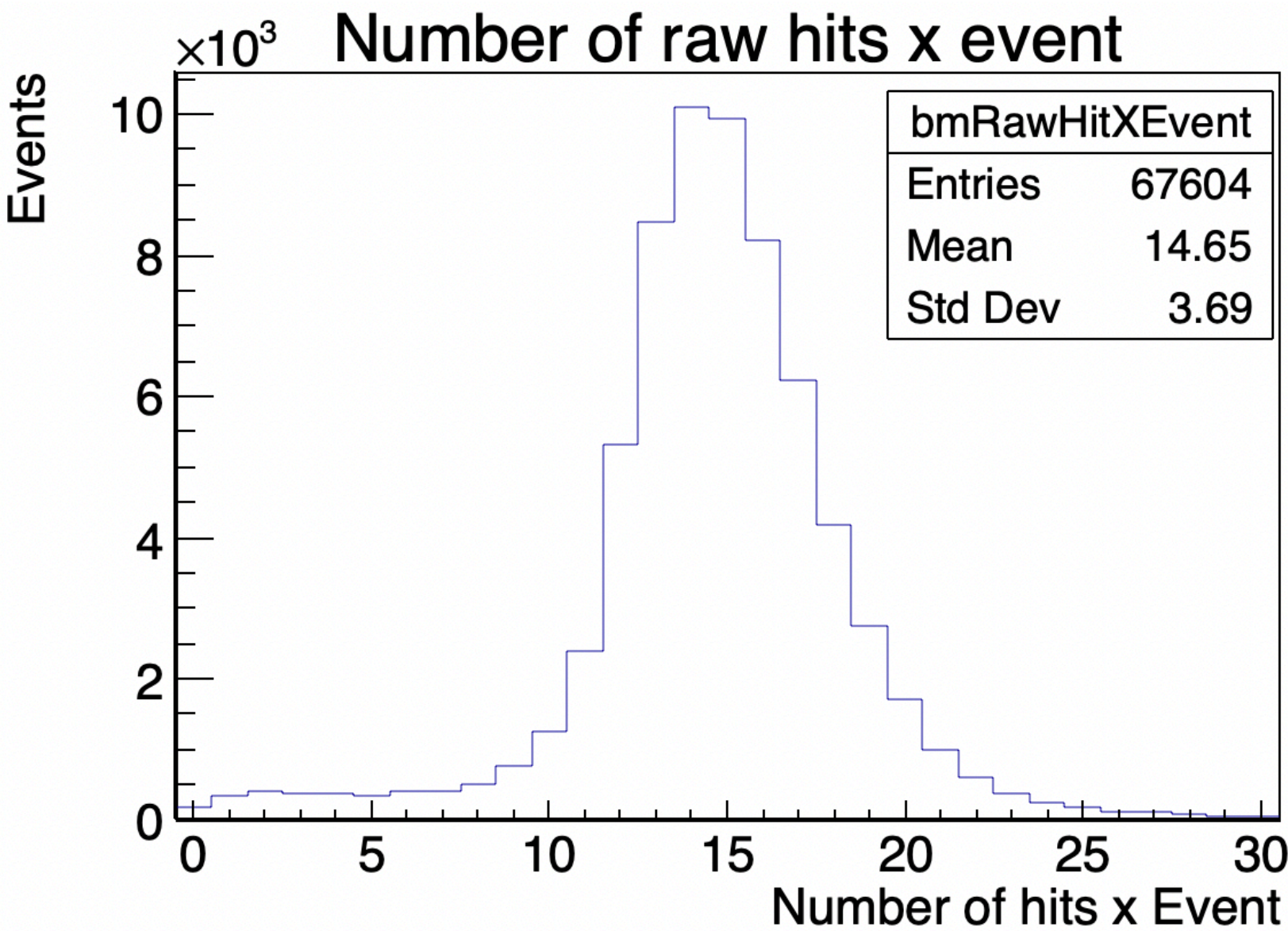
Yunsheng Dong

Data acquisition

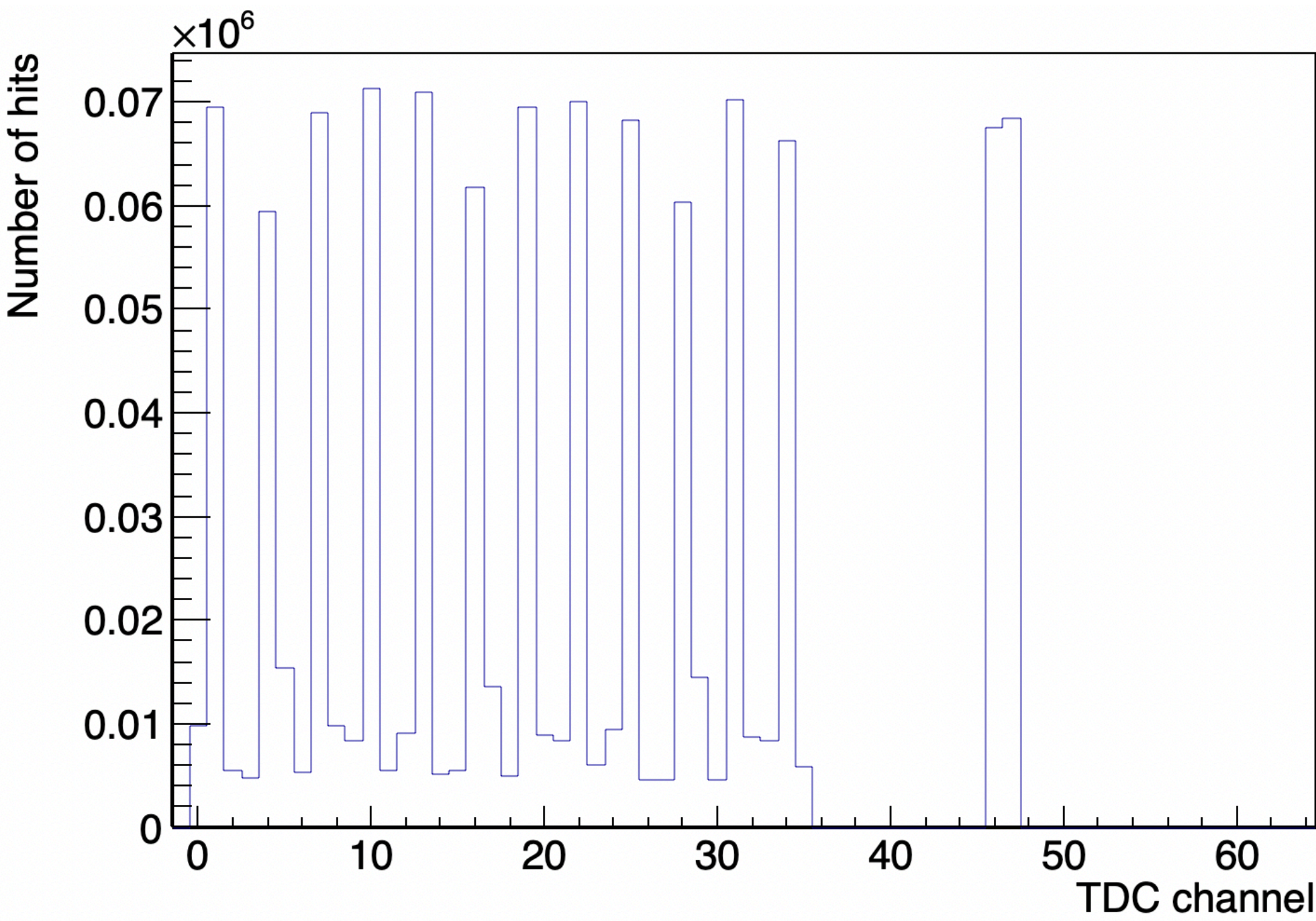


- 200 MeV no VTX (run 4229-4263):
HV=1825 V, signal threshold=75mV
- 400 MeV (run 4271-4315):
HV=1850 V, signal threshold=75mV
- 200 MeV with VTX (run 4320 till end):
HV=1850 V, signal threshold=75mV
- At 200 MeV the BM + SC + VTX table has been shifted along X axis of about 1.2 cm since the beam was not centred in 0
- At 400 MeV the beam was centred and the table was placed along the laser position
- No relevant beam shift on the Y axis

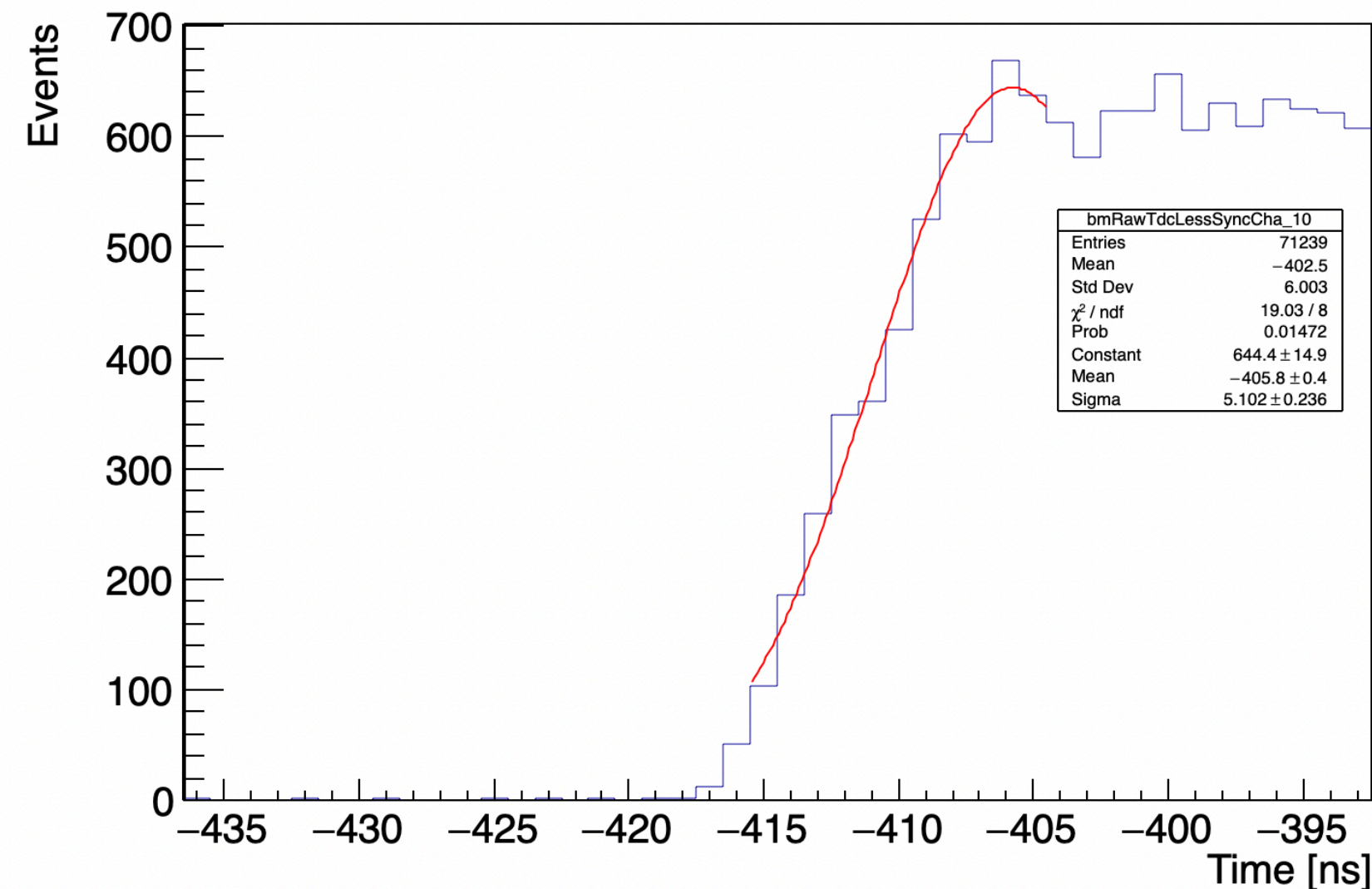
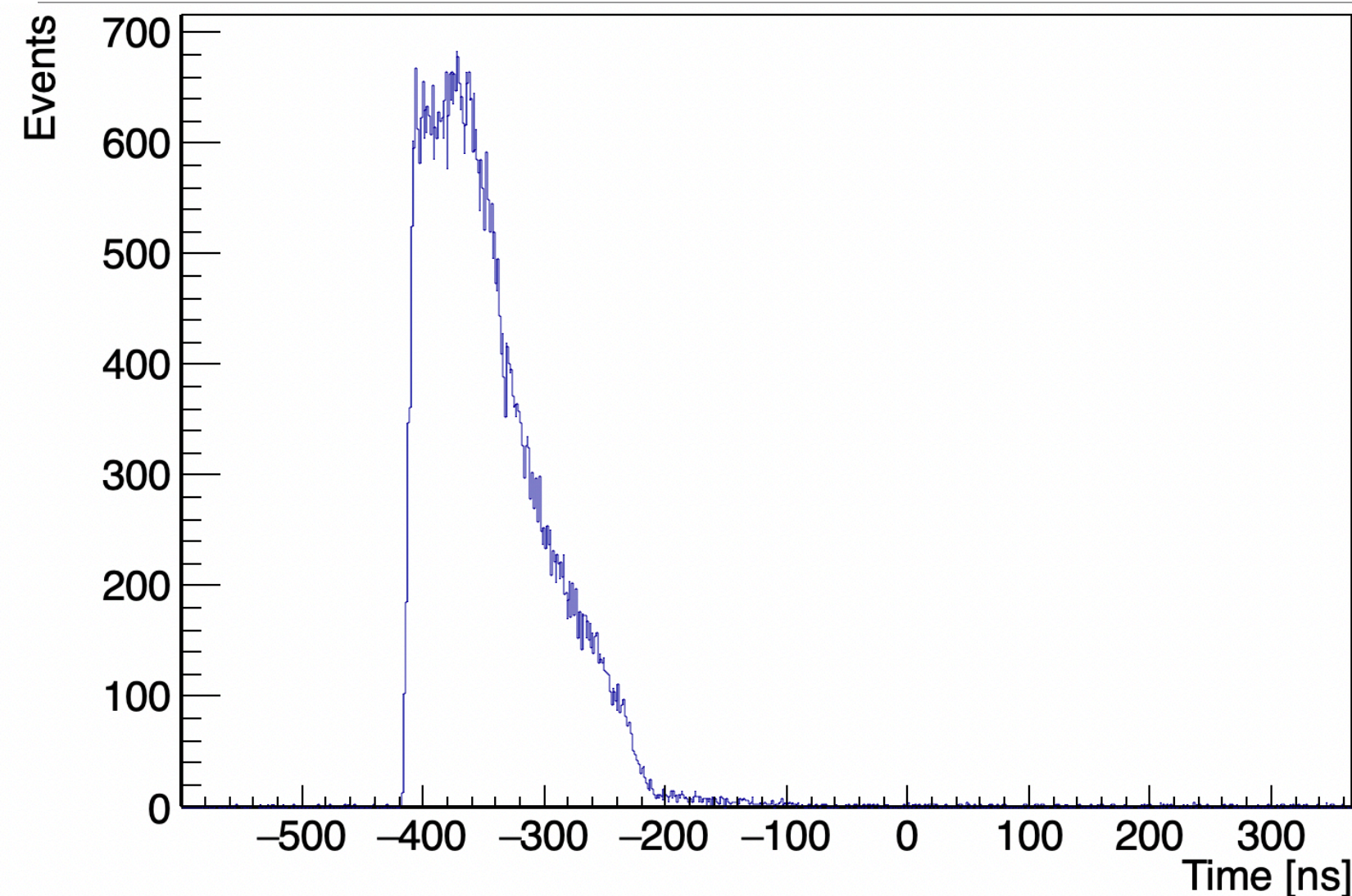
Raw data analysis



- Mean number of hits per event $\sim 15 \pm 1$ hits
- Raw hit detection efficiency ~ 0.9
- No dead or anomalous cells

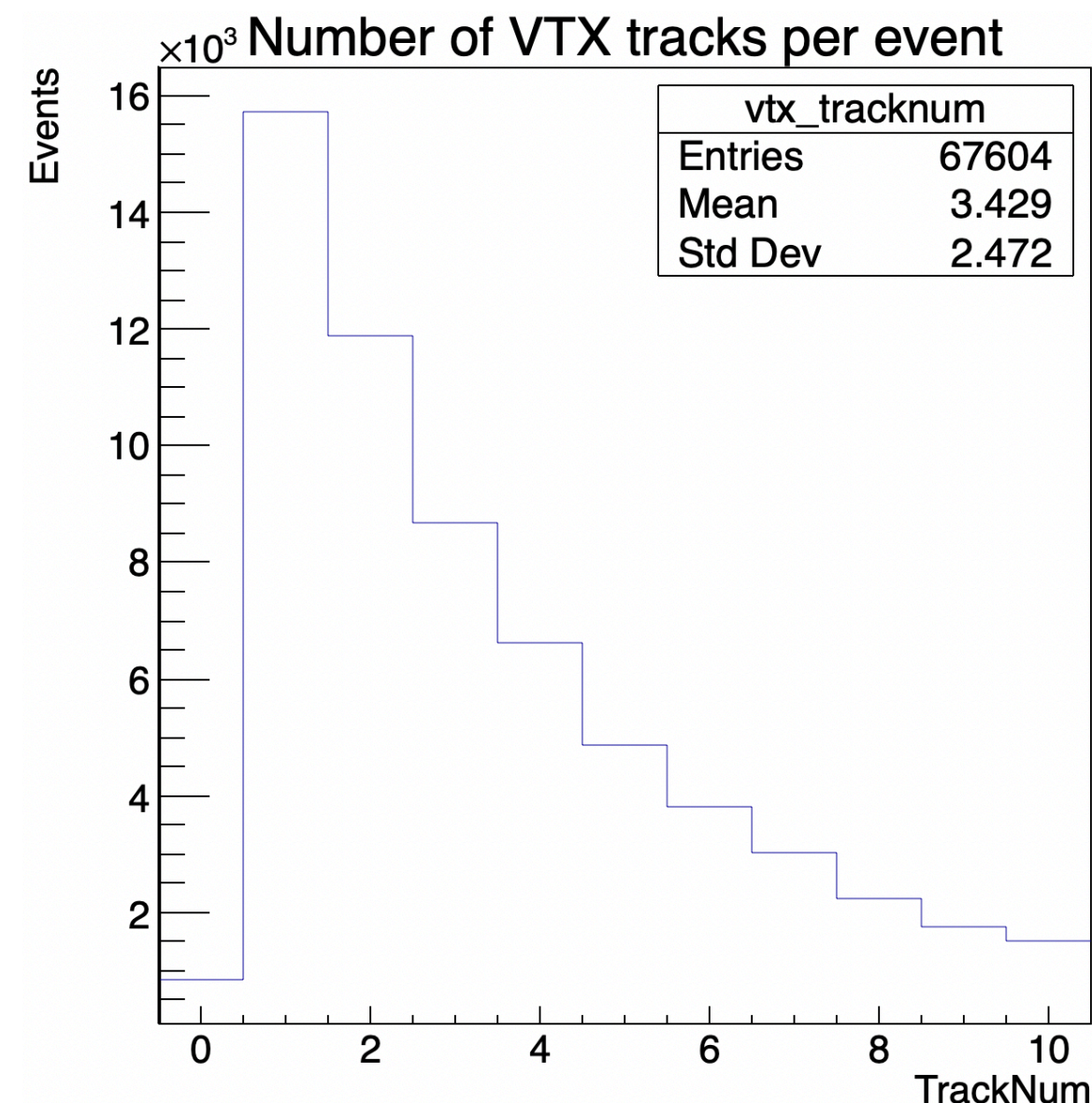
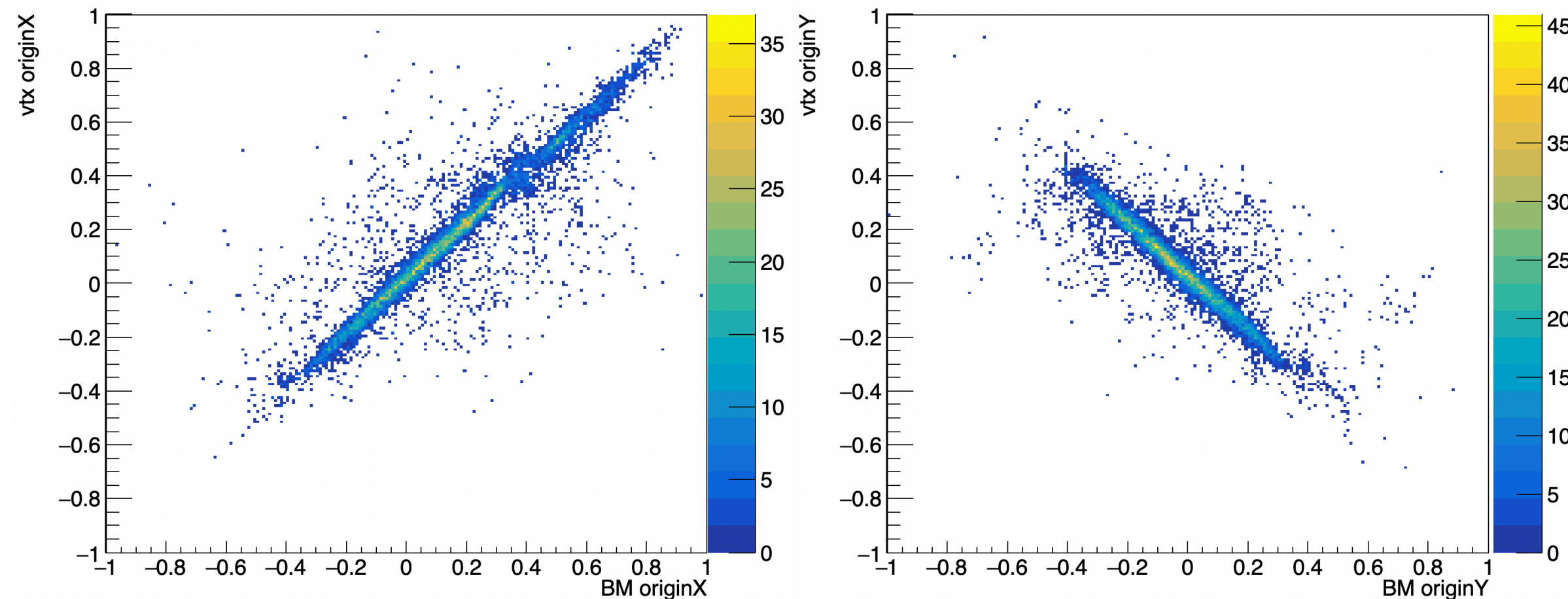


Raw data analysis



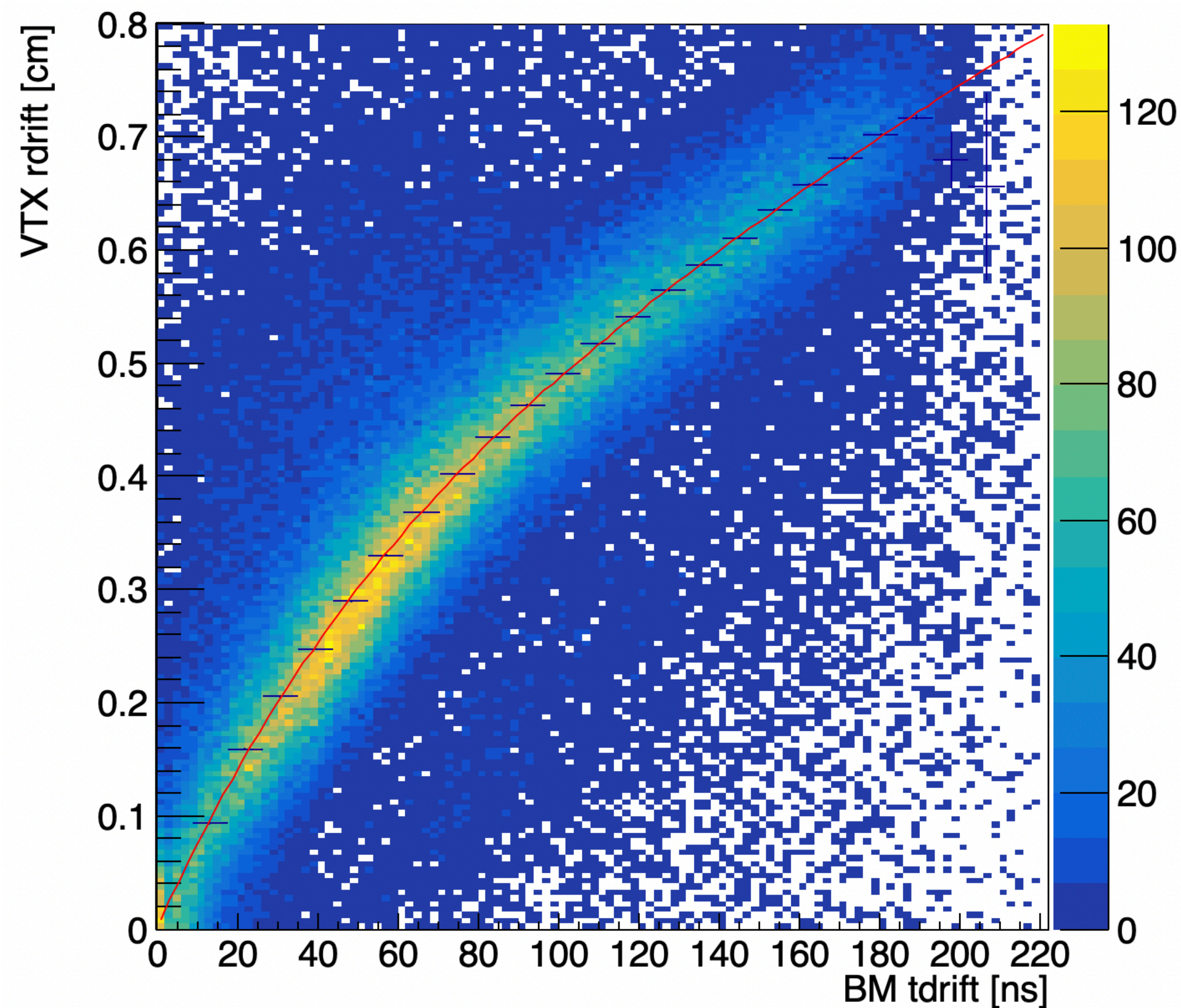
- Total signal length ~ 220 ns
(GSI2020 and GSI2019 signal length was ~ 300 ns)
- **The BM working point has changed with respect to GSI2019 and GSI2020**
(different signal threshold, gas distribution system)
- With the same HV (1850) and signal threshold (20 mV), this time the number of BM hits x event was higher than 30. Checking with the oscilloscope, the threshold has been set to 75 mV
- **Time jitter of ~ 5 ns**
(GSI2019 with FOOT electronic was ~ 20 ns, with BM standalone was ~ 2 ns)

BM-VTX analysis



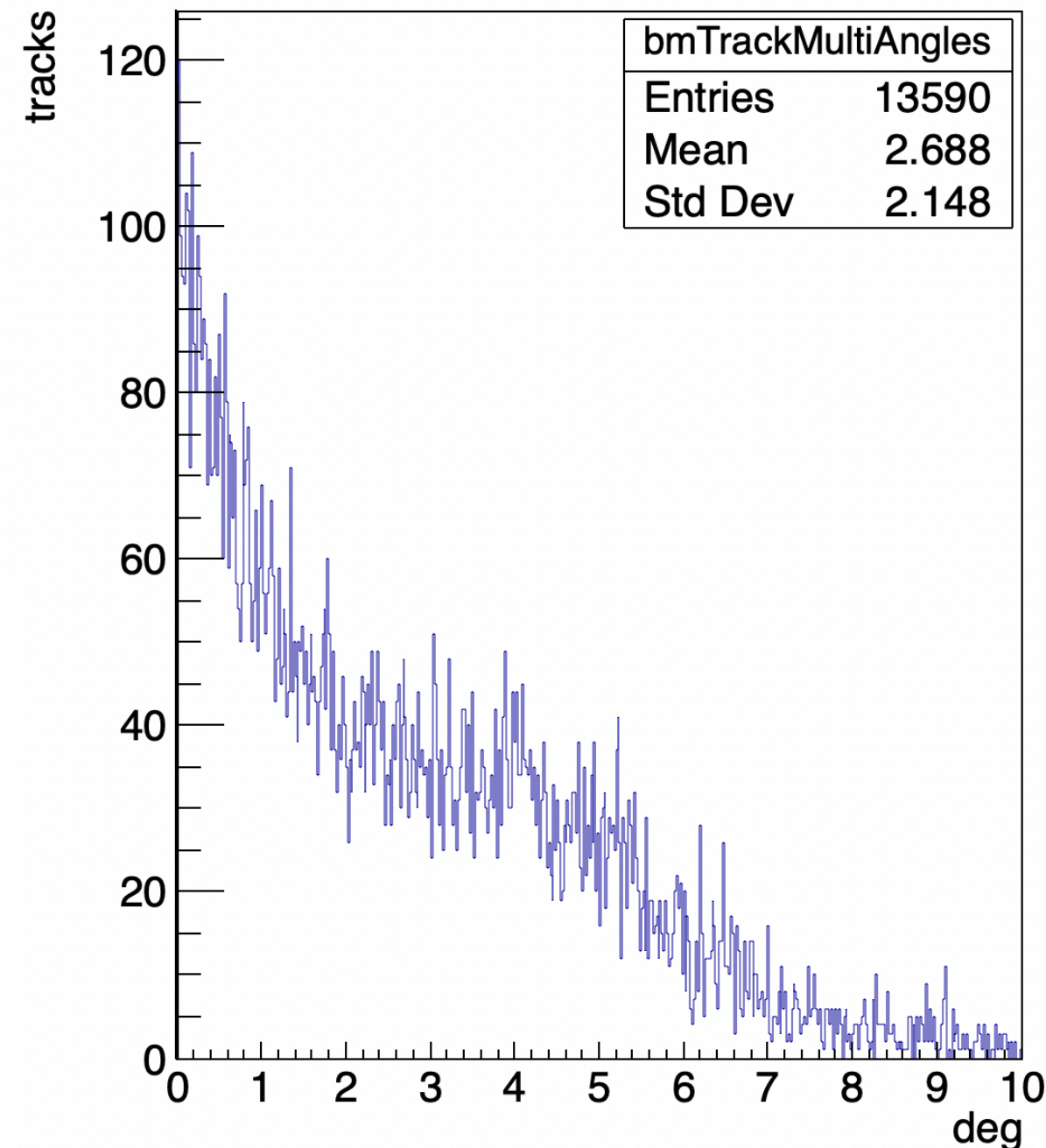
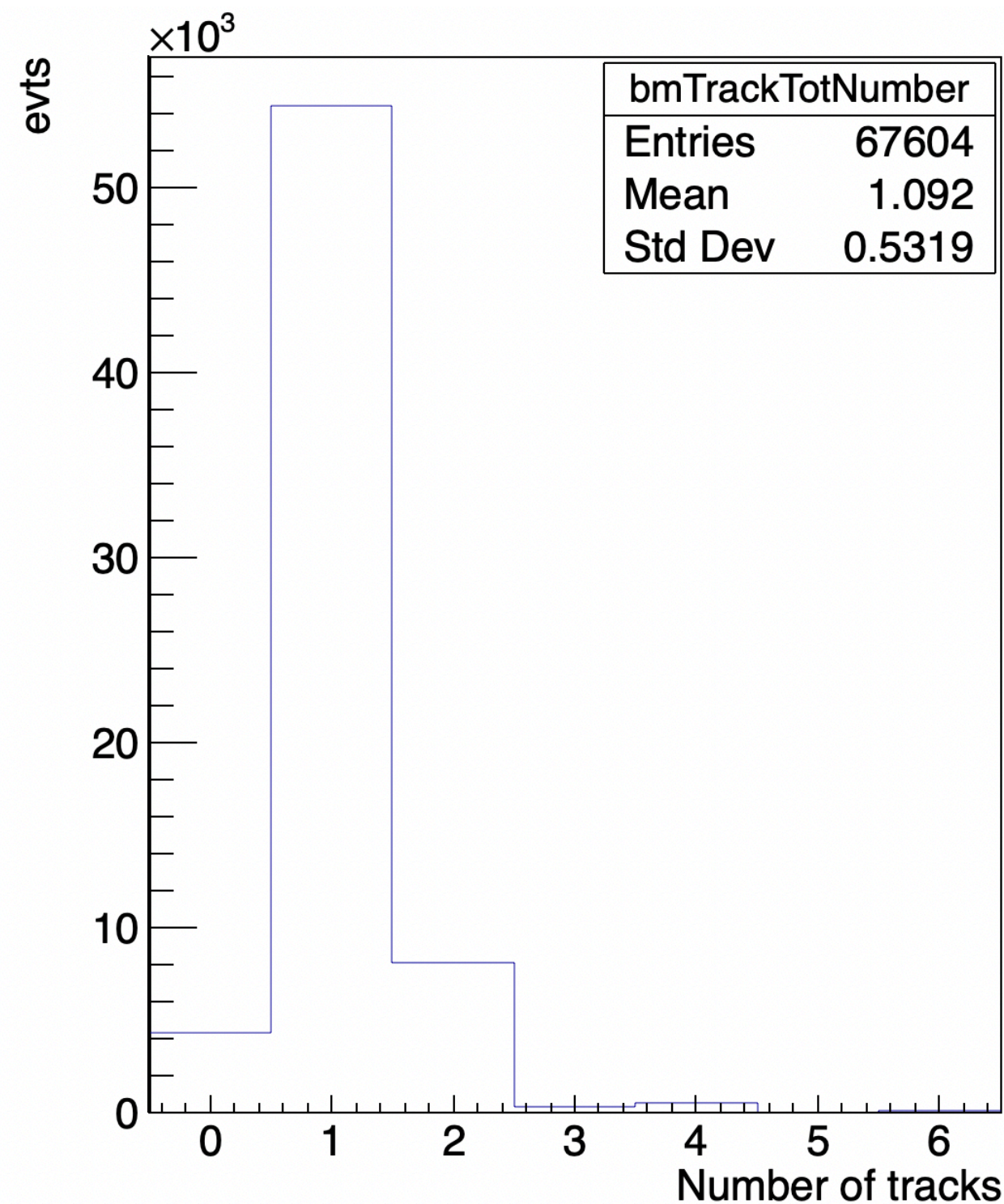
- Run 4287: 400 MeV with VTX and no Target
 - The best run to calibrate the BM
 - The only one analysed up to now
- Clear BM-VTX correlation** on the X axis and anticorrelation on the Y axis, probably due to some geometry convention/mapping etc.
- The correlation is lost at some point
- Somehow, it should be possible to resync the VTX with the other FOOT detectors trigger?
- At the moment the VTX seems to reconstruct too many tracks for a no target run, but it is possible to select the VTX “best” track using the BM track

BM space time relations calibration with VTX



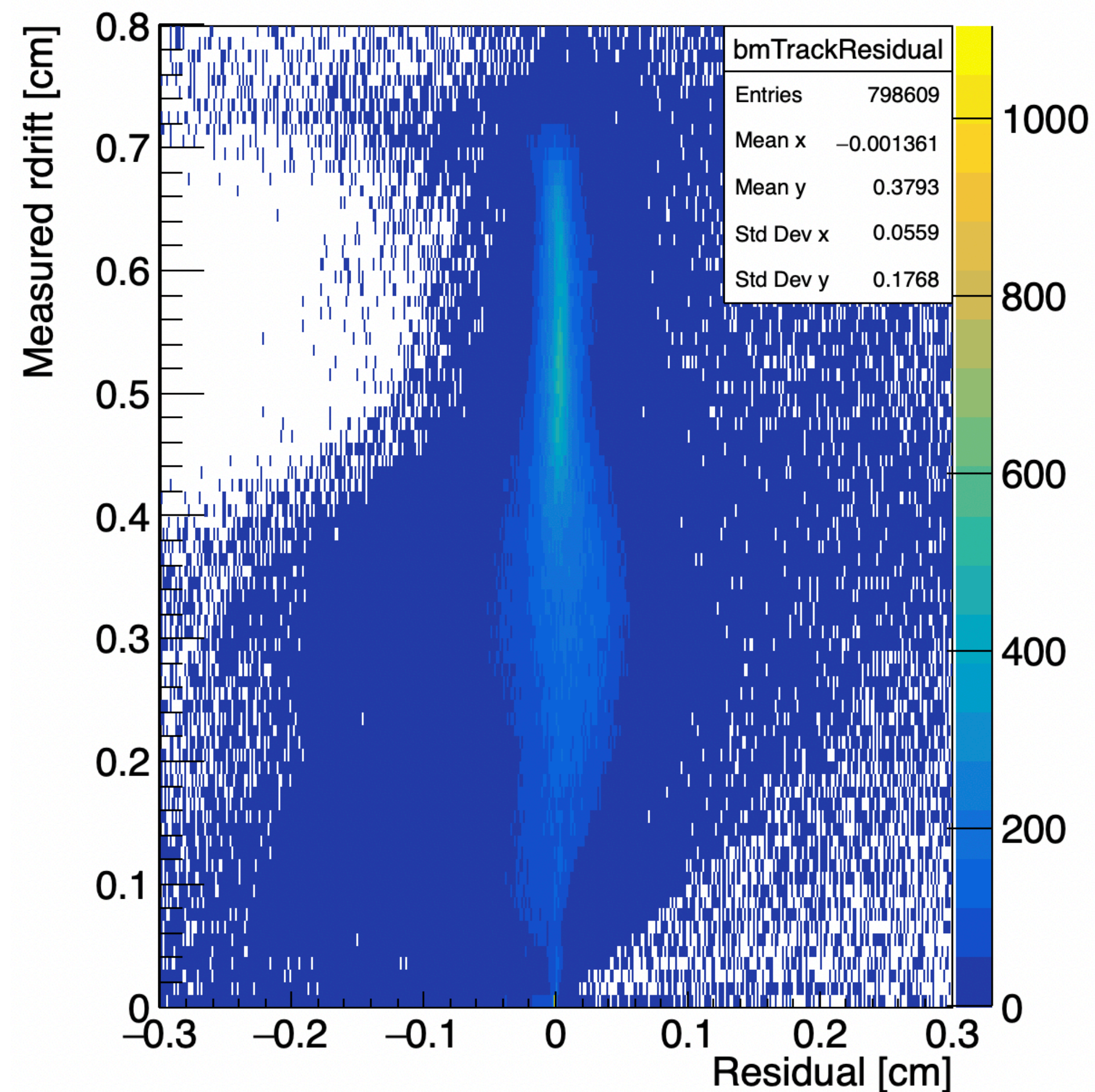
- Given the BM-VTX correlation on the X view tracks, the calibration of the BM space-time relations has been performed with the X view cells
- Iterative procedure:
 - reconstruct BM and VTX tracks
 - align the two detectors with the tracks residual
 - extrapolate the VTX tracks into the BM and combine the VTX drift distances with the BM time hits
- Same procedure adopted to calibrate the BM with the MSD @ Trento in 2019
- **Preliminary results available, but still under study**

Preliminary BM performances

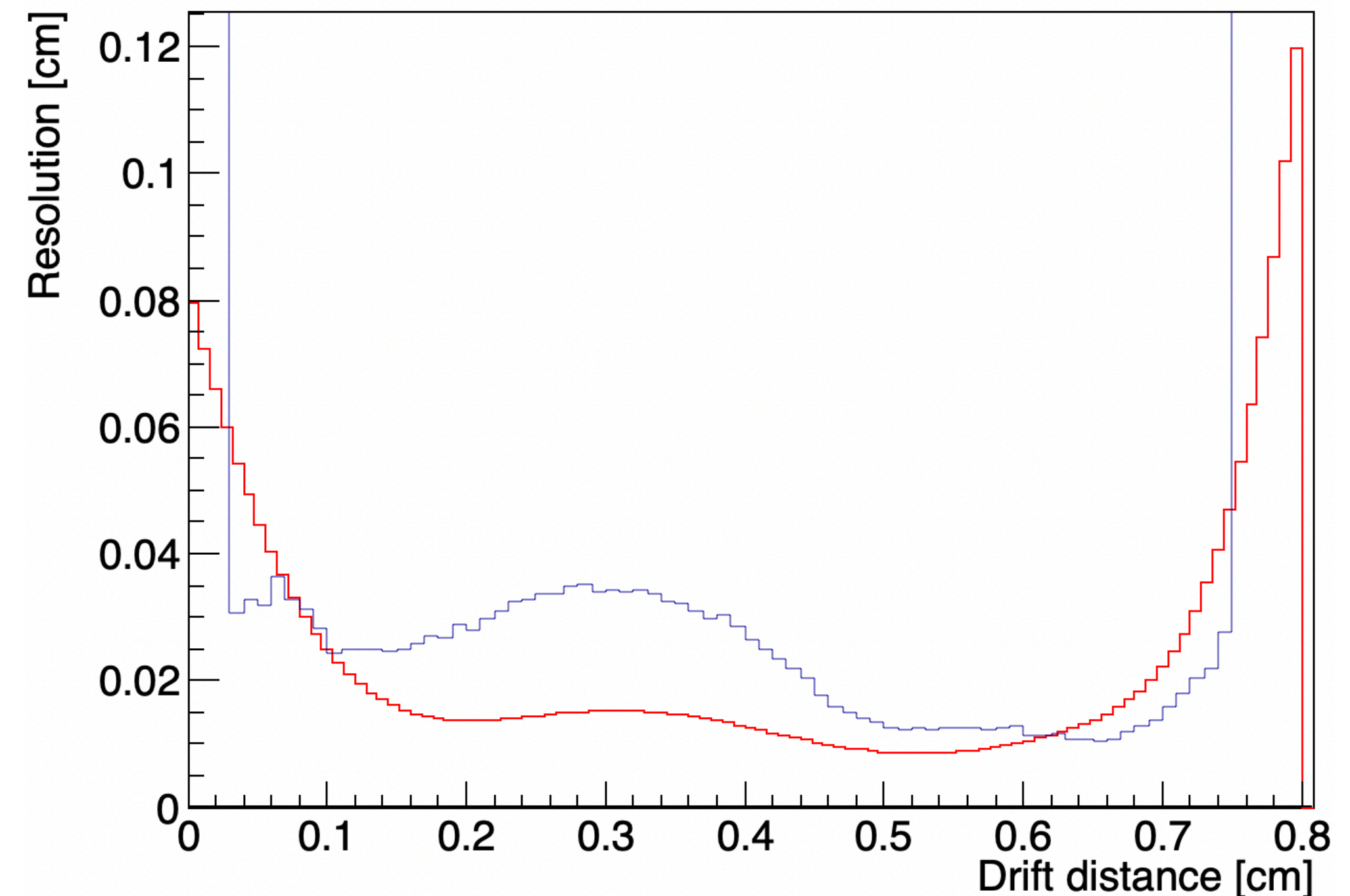


- BM track reconstruction:
 - 6% no BMtrack (4% BM hits < 6)
 - 80% 1 BM track
 - 13% more than 1 BM track
- The track reconstruction parameters are not optimised yet
- With the VTX tracks it should be possible to optimise the reconstruction parameters and study the multitrack events
- Pre-target fragmentation events need to be studied with BM and VTX tracks, and with MC simulations

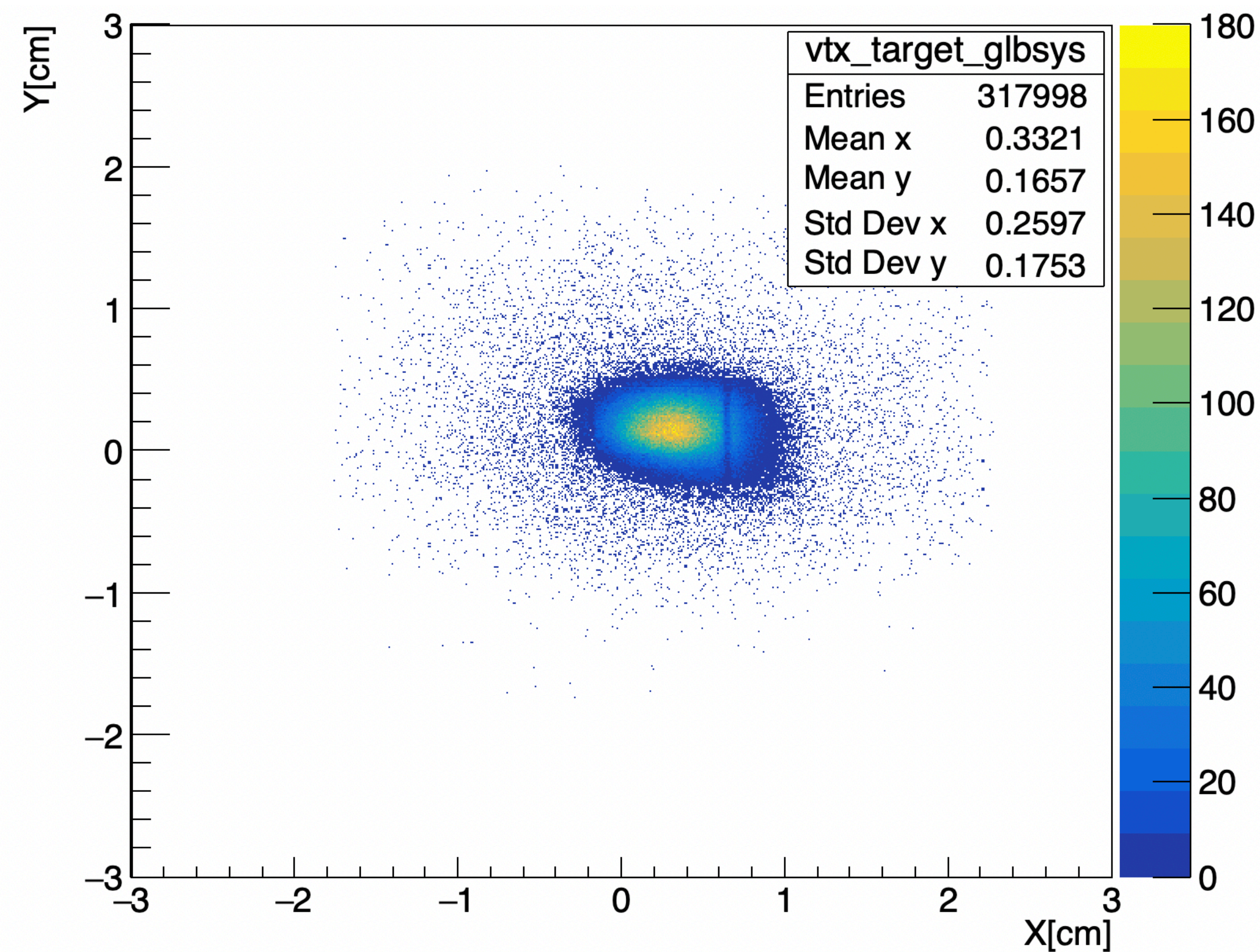
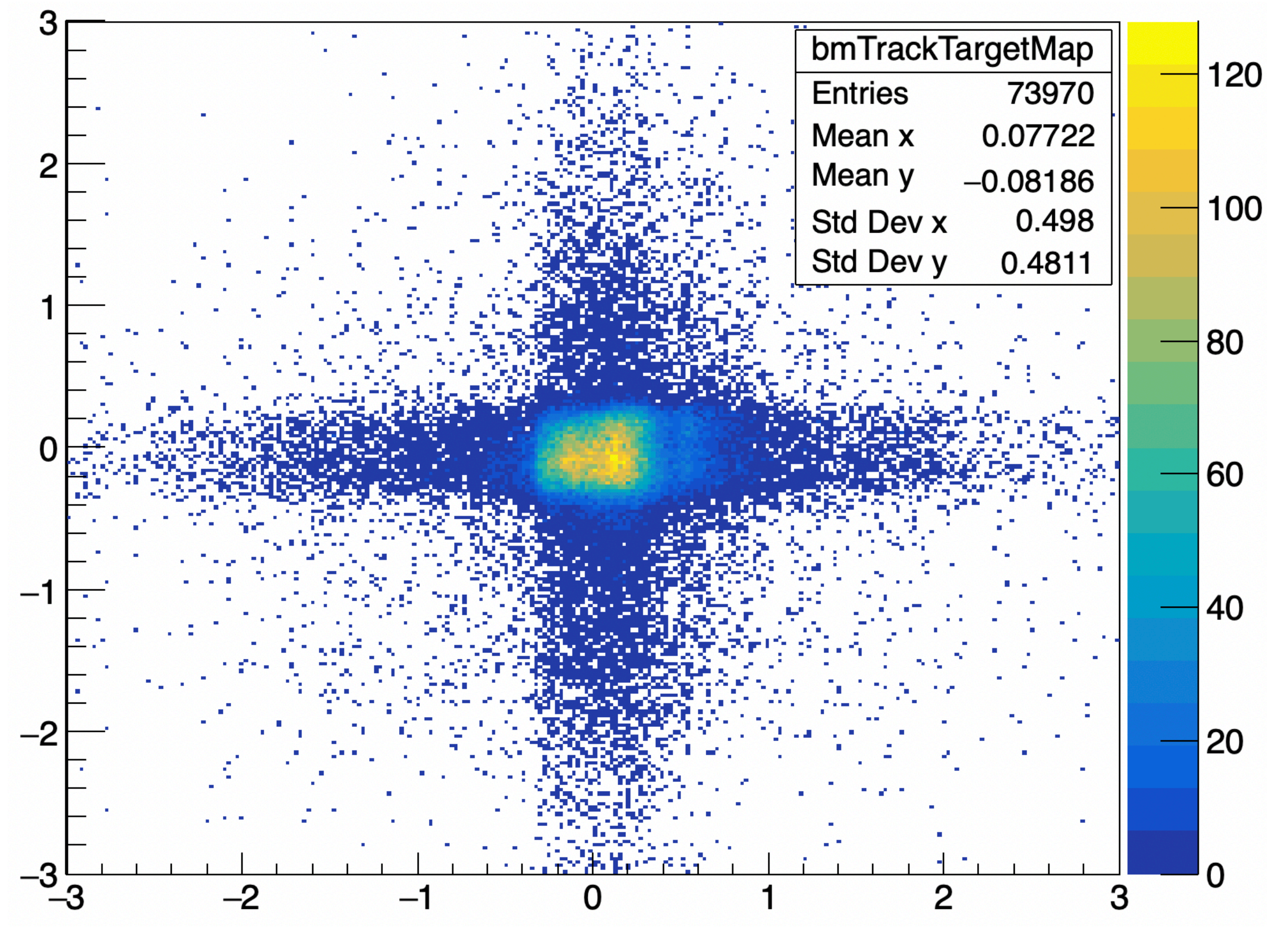
Preliminary BM performances



- With the preliminary space time relations, the BM spatial resolution in the central part of the cell is between 300 and 150 μm , slightly worse than the performances obtained at Trento in 2019 (red)



BM and VTX beam profiles



Conclusions

- The BM has been successfully adopted in the GSI2021 campaign, at the moment no relevant problem/error has been found yet
- With respect to the GSI2020 and GSI2019 campaigns, the detector working point has been changed, probably due to a different gas composition/pressure
- The time jitter of 20 ns experienced in GSI2019 has been reduced to 5 ns
- Clear VTX and BM correlation, at least for the first events (depending on the specific run)
- The BM space time relations can be calibrated with the VTX tracks
- Preliminary results show a track resolution of 150-300 μm in the central part of the BM cell

Future perspectives

- Study the BM-VTX Y axis anticorrelation
- Finalize the BM and VTX alignment and space time relation calibration algorithms
- Finalize the BM performances assessment studies
- Calibrate and study the BM performances also for the 200 MeV runs
- Check the BM multitrack events and study the pre target fragmentation events