Vertex @ GSI

Vertex Raw Data

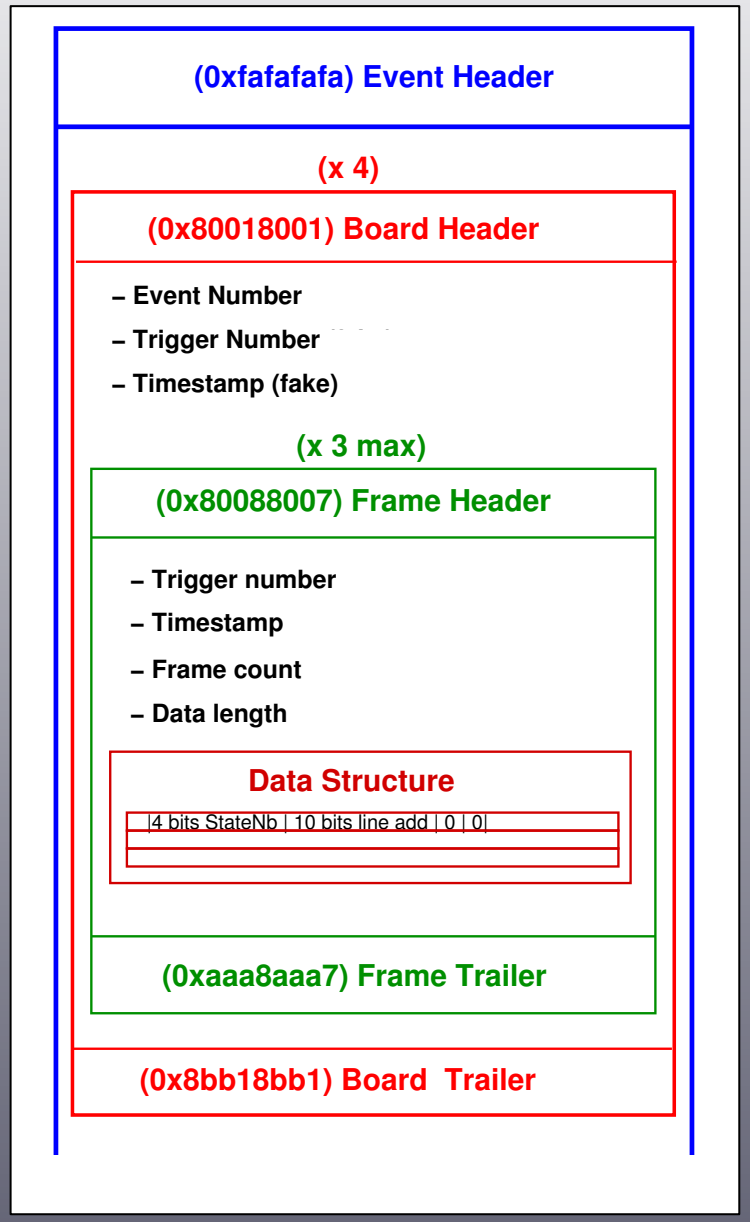
Vertex Standalone files

DAQ files

Conclusions

Vertex Raw Data

- Data Structure:



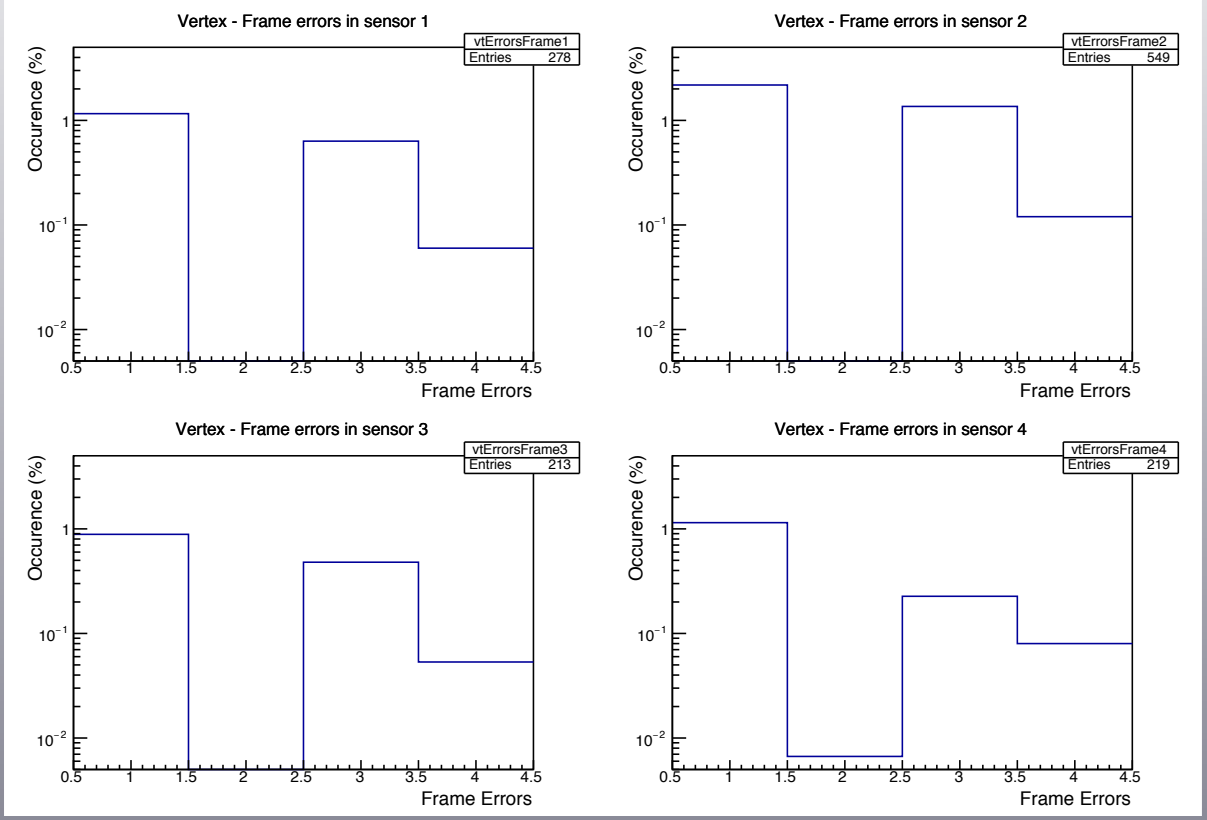
- Event/trigger number synchronized with DAQ
- Frame counter consecutive for each sensor
- Time stamp with inner clock

- Analysed runs:

Run	Date	Time	Duration
2212	19/04/07	18:50:36	626
2242	19/04/08	19:37:21	1425
2251	19/04/09	08:33:29	74

Vertex Standalone (i)

- Raw data errors (run 2251):



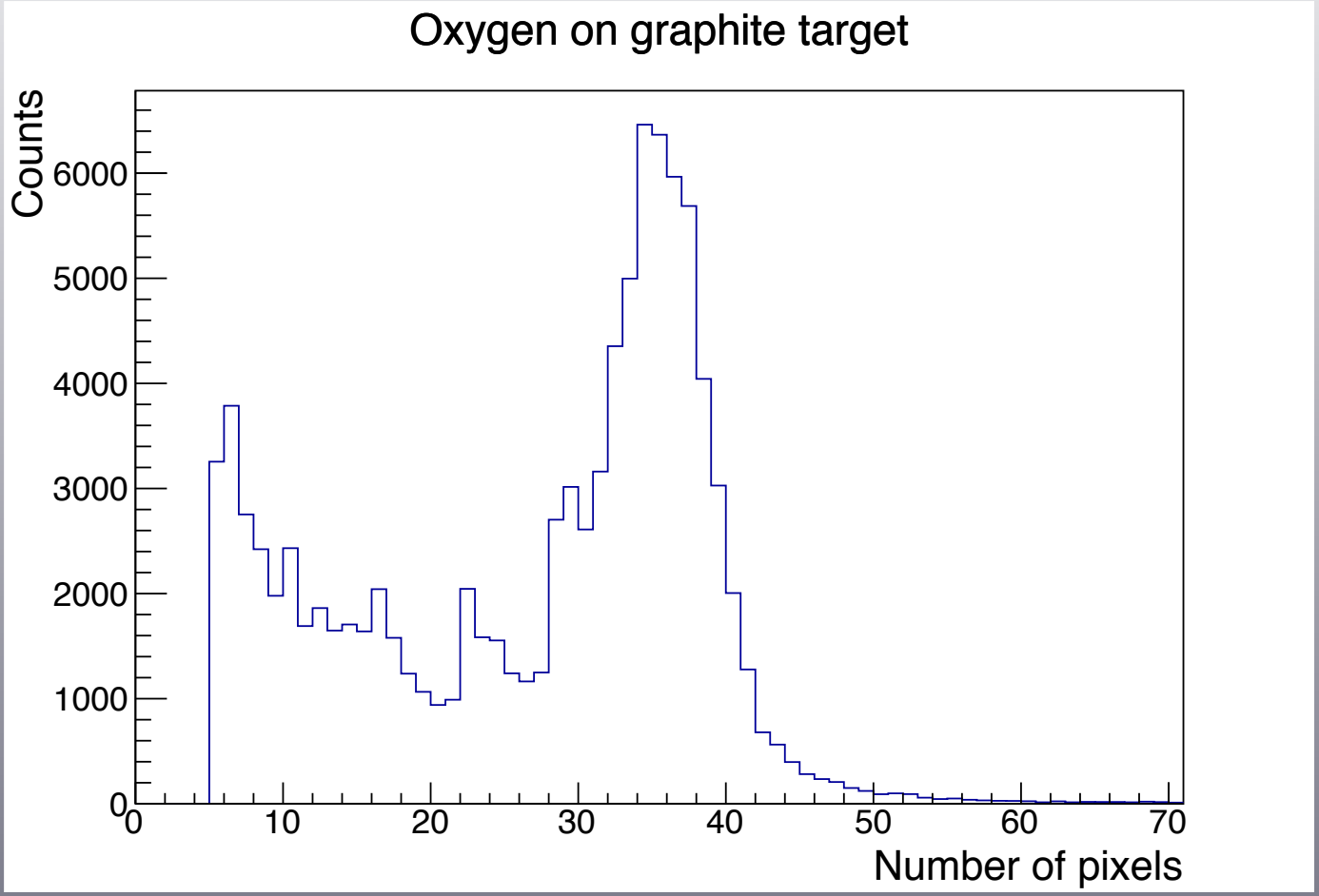
➡ Overall errors < 3%

➡Still investigating

- Noise problems led to corrupted frame structure:
  - wrong or absent frame trailer (err1 and err2)
  - wrong data length (err3)
  - wrong trigger number in frame (err4)

Vertex Standalone (ii)

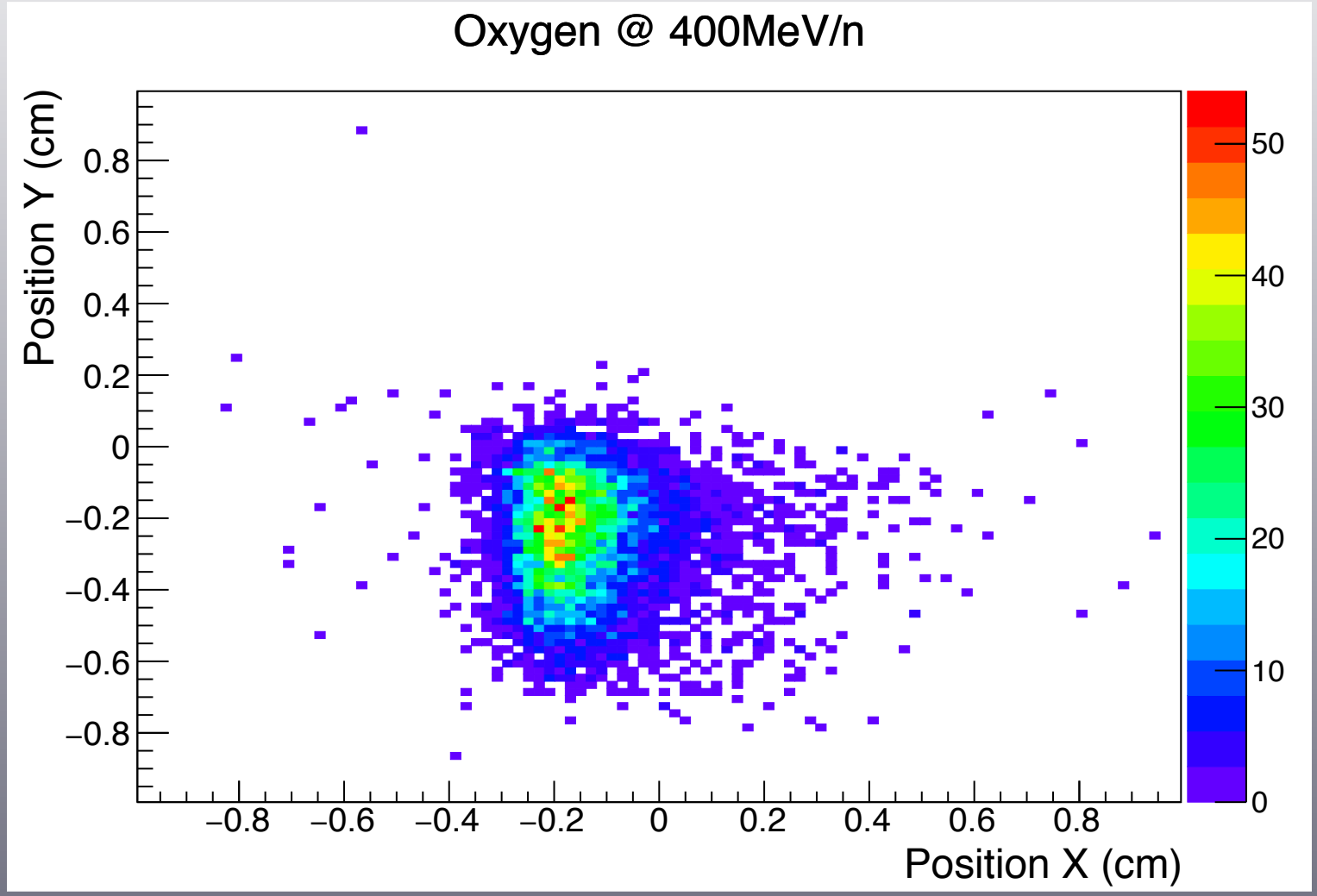
- Cluster size (sensor 2):



- Cut at 5 pixels
- See different cluster size due to fragments

Vertex Standalone (iii)

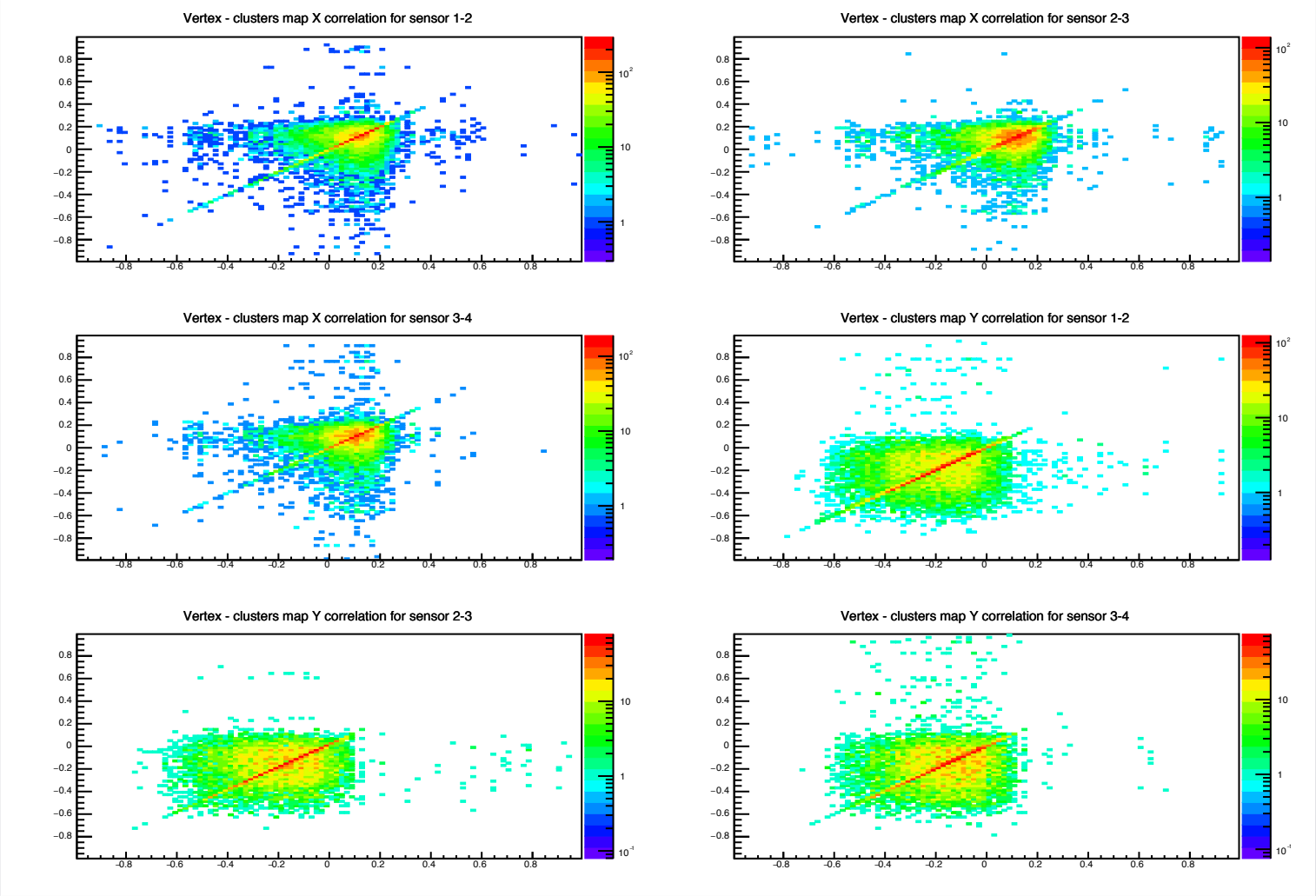
- Beam profile (sensor 4):



- The beam is not gaussian (especially in Y) with tails

Vertex Standalone (iv)

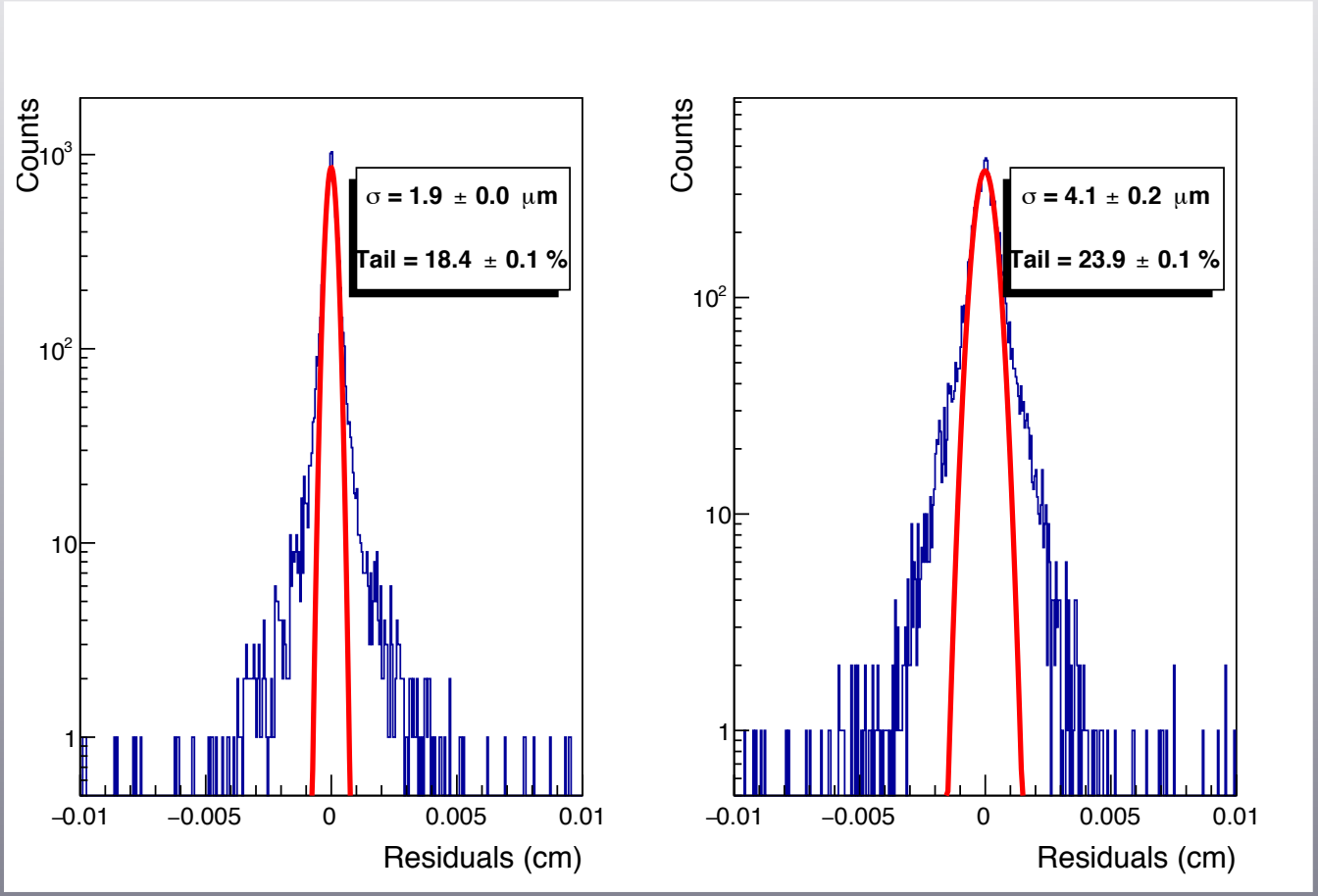
- Correlation plots (pos[n] vs pos[n+1]):



- Clear correlation btw position of a sensor respect to his following

Vertex Standalone (v)

- Alignment:

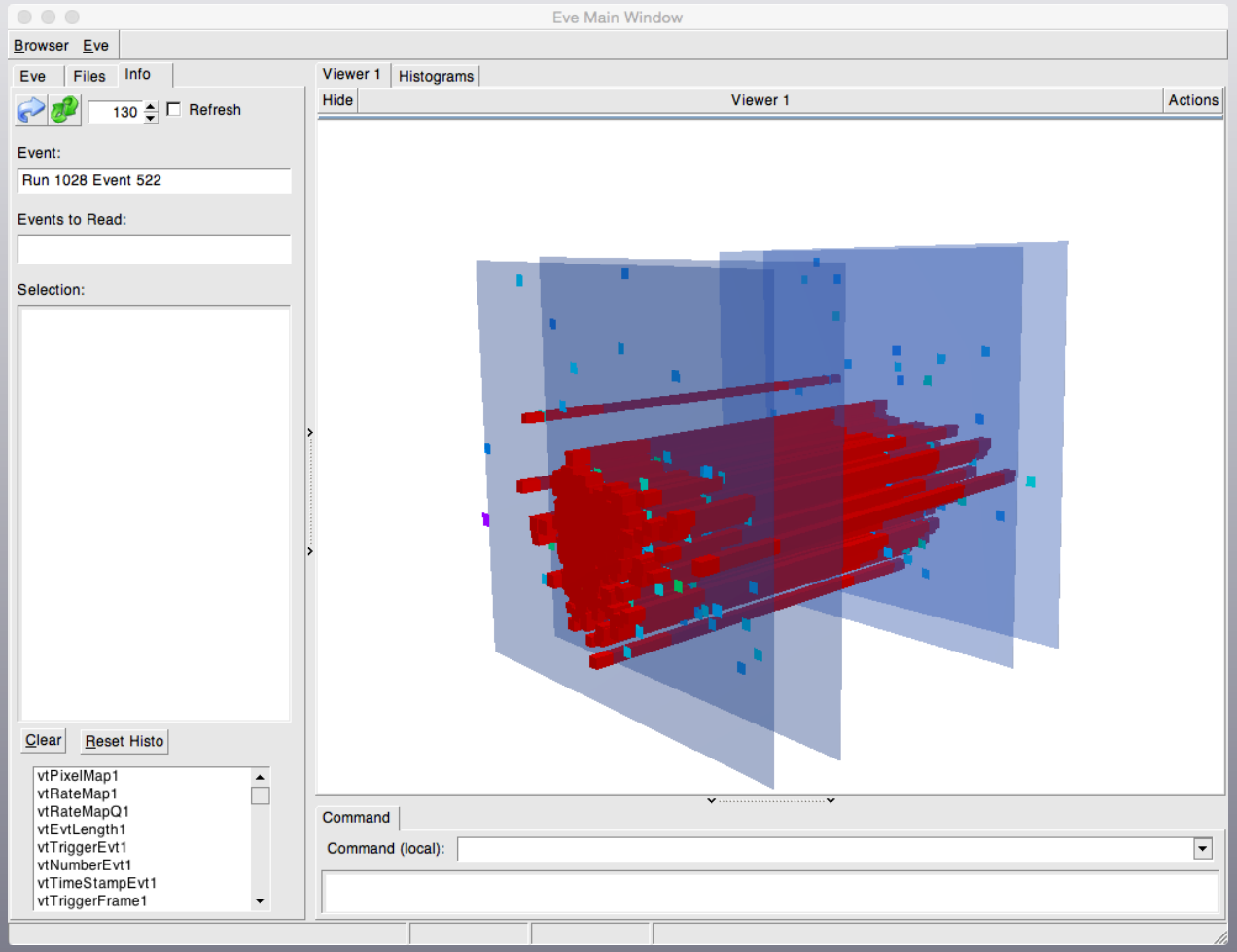


- Low statistics
- Bad shaped beam

➡ Good alignment considering the conditions !

Vertex Standalone (vi)

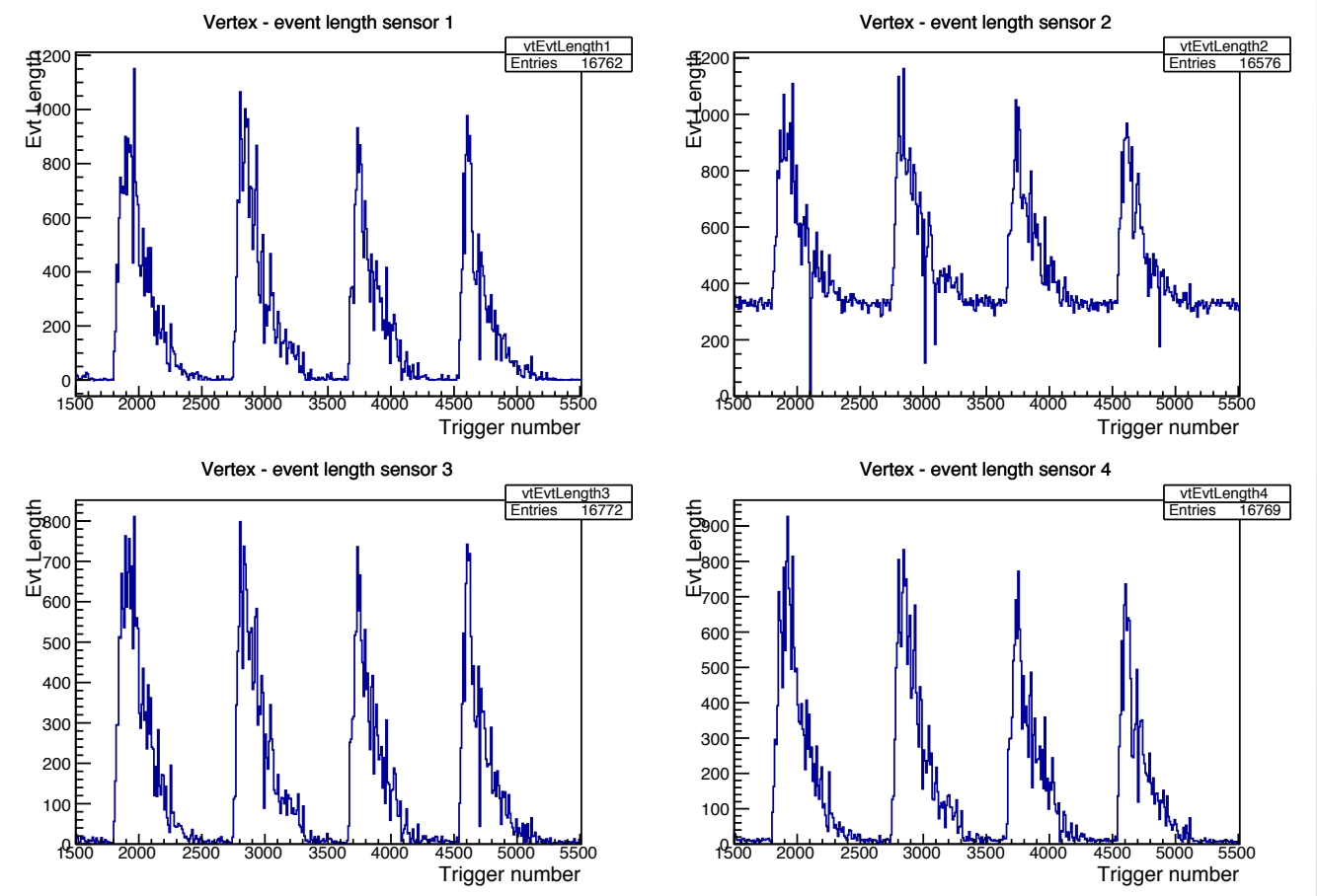
- Event display (cluster size > 5):



- Beam tracks
- Track presence: ~30%, structure intra-spill or trigger ?

Vertex Standalone (vii)

- Event length



- Seems to have trigger with no beam ??

Vertex Standalone (viii)

- **Summary**

Run	Date	Obs	Status
2212	19/04/07	Reset of trigger number in sensors	✗
2242	19/04/08	Jump/reset of trigger number of sensor 1 Sensor 3, sending no data	✗
2251	19/04/09	Reset of all sensors (#62)	✔

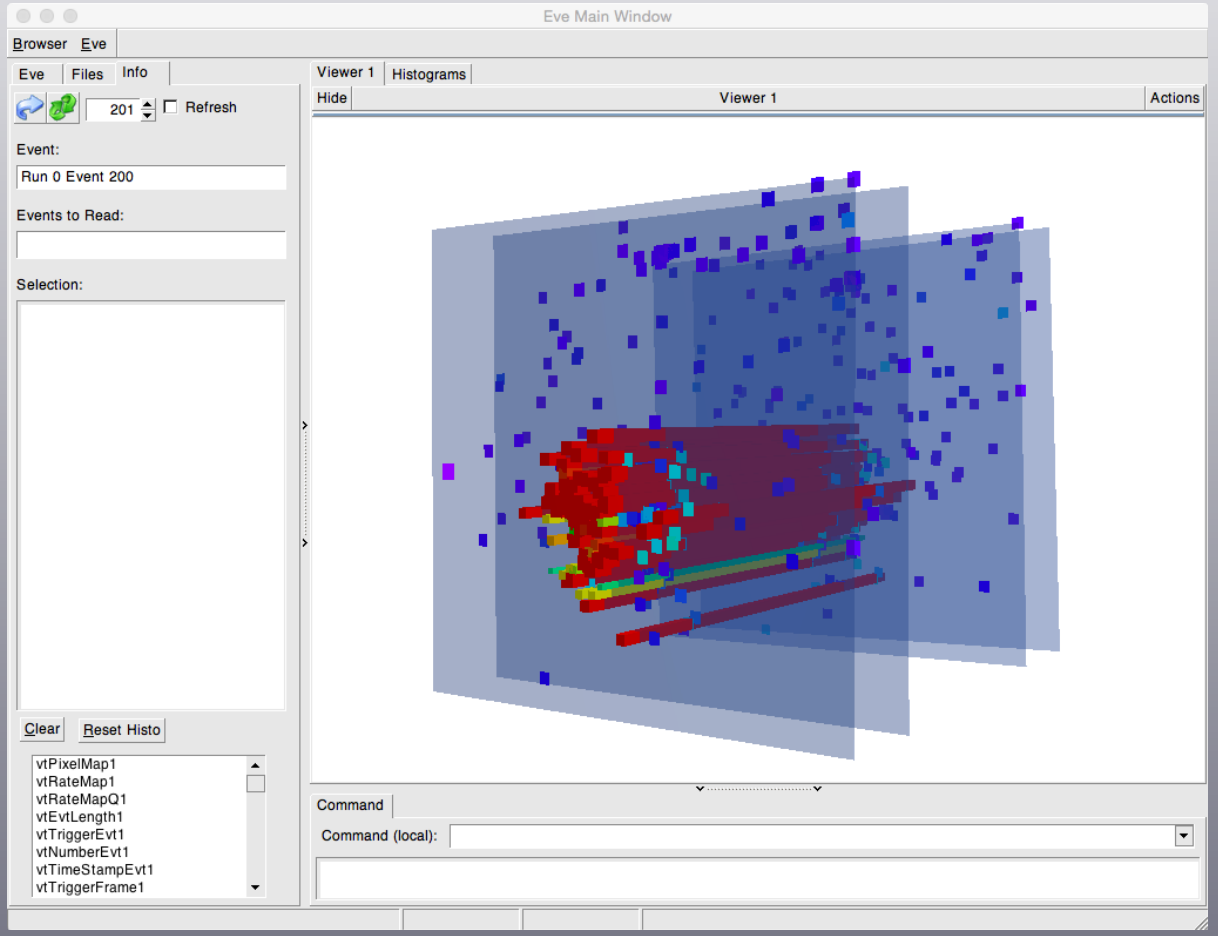
- Still errors in the structure only checking frame errors
- Need further investigation, take time, checking event by event !

➡ Need an online EB to connect to the online monitoring of SHOE (event display)

➡ Cannot take data blindly !

Vertex DAQ file

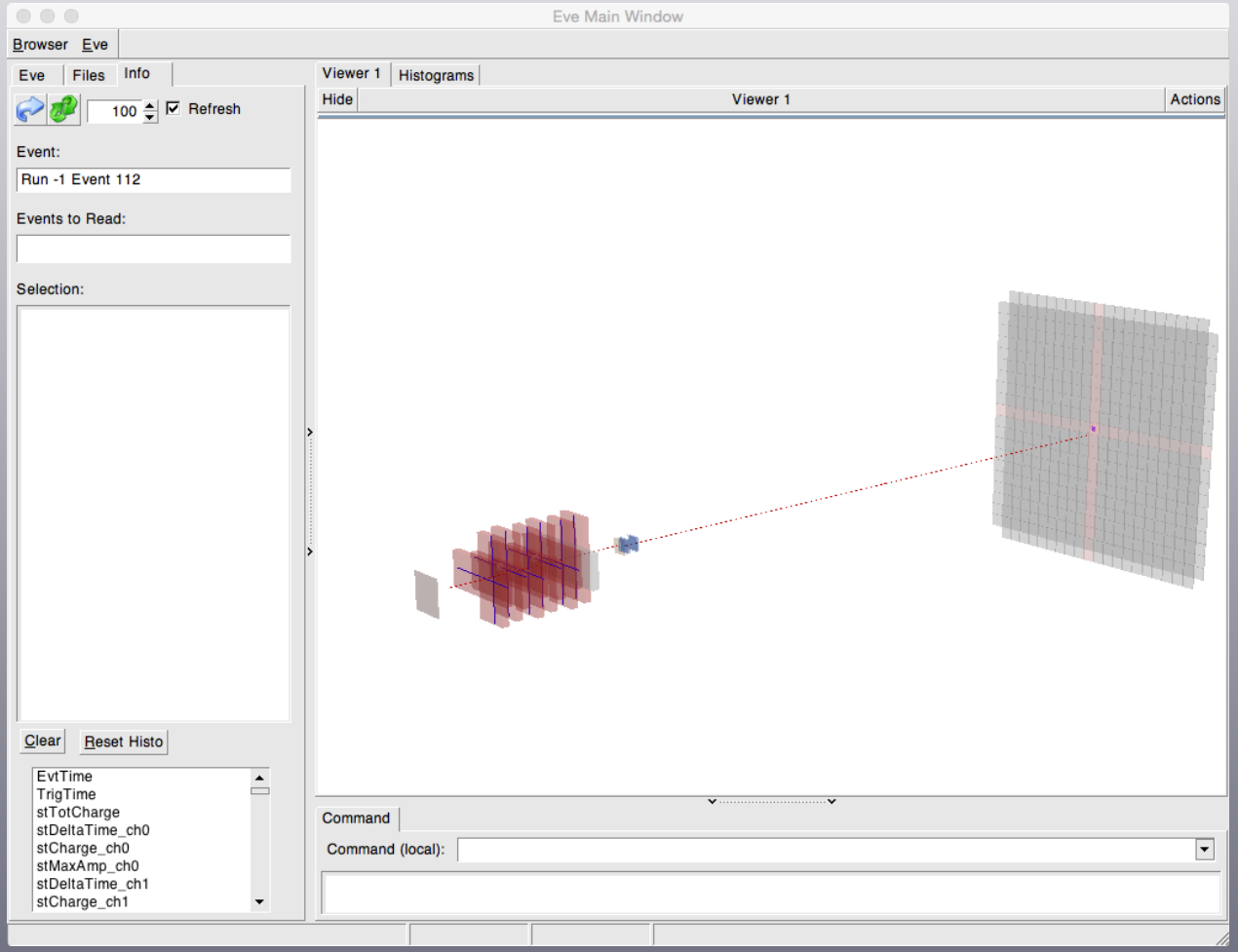
- Event display (cluster size > 5):
  - file: data_built.2251.physics_foot.daq.VTX.1.dat



- Different from standalone file?
- Tracks until ~ 150, no more data ?

GSI DAQ file (i)

- Event display (cluster size > 30):
  - file: data_built.2212.physics_foot.daq.VTX.3.dat



➡ Extremely slow (4 evts/s) ! (for ST or BM)

- Track in BM+VTX+TW

Conclusions

- Interface with DAQ
  - Vertex working with standalone files (cf. run 2251)
  - For DAQ files from event builder ?

    ➡ more investigation is needed, no data in VTX after ~ 100-200 events
- Vertex
  - Cluster for Oxygen and fragments (?)
  - Noisy environment
  - Pb of corrupted data structure maybe related to noise
  - Alignment better than < 5 μm
  - Parameter in GSI/TAVTdetector.map(.cfg)

➡ Need at least > 1 h beam to tune the detector, had < 1/2 h

➡ Fix the broken reset entrance due to a wrong signal delivered by the DAQ

➡ Beam at Frascati testing the VTX setup

Vertex Reconstruction

Efficiency

- Cluster reconstruction: 99.6%
- Track reconstruction:

	Road	Combinatory	Hough
Efficiency	(98.7±0.1)%	(98.9±0.1)%	(99.0±0.1)%
Fake	(1.99±0.01)%	(2.19±0.01)%	(2.86±0.01)%

- Vertex reconstruction:

Efficency	(98.6±0.2)%
Fake	(2.30±0.01)%

➡ If sensors are aligned

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Performance of the reconstruction algorithms of the FIRST experiment pixel sensors vertex detector

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ABSTRACT

Hadrontherapy treatments use charged particles (e.g. protons and carbon ions) to treat tumors. During a therapeutic treatment with carbon ions, the beam undergoes nuclear fragmentation processes giving rise to significant yields of secondary charged particles. An accurate prediction of these production rates is necessary to estimate precisely the dose deposited into the tumours and the surrounding healthy tissues. Nowadays, a limited set of double differential carbon fragmentation cross-section is available.