GRAiNITA Muon Test Bench Status (GMTBS)

25/01/24
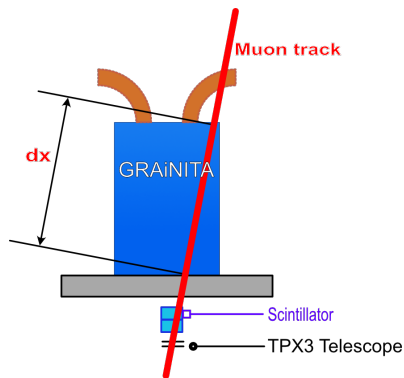
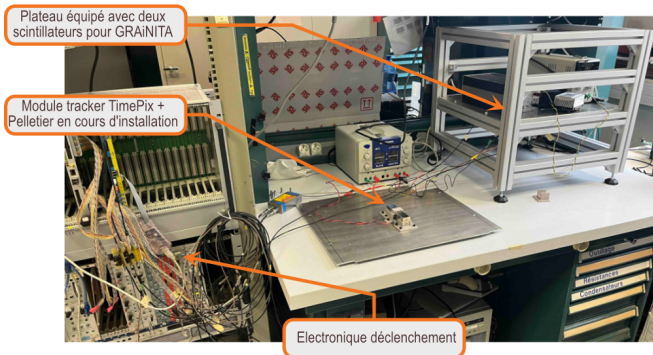# Reminder : architecture

Timepix

- ▶ Track reconstruction
- ▶ Few ns resolution/20 s frame (PC time)

Scintillators

- ▶ Accurate time stamp
- ▶ 15.6 ns resolution/start of the detector (PC time)

Construction status

Plateau équipé avec deux scintillateurs pour GRAiNITA

Module tracker TimePix + Pelletier en cours d'installation
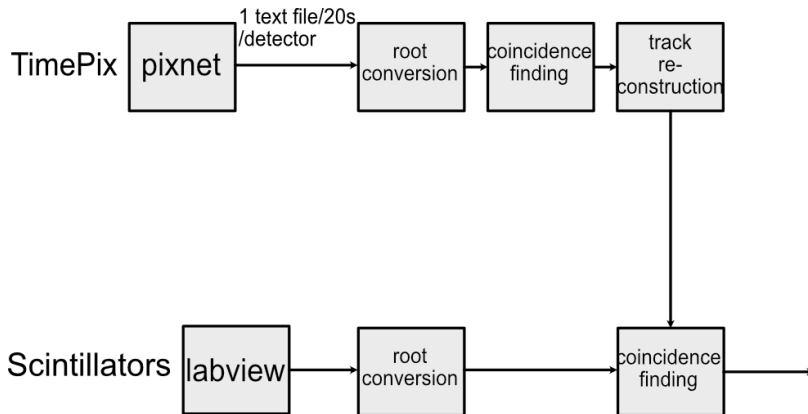
Electronique déclenchement

Done

- ▶ structure
- ▶ Reading and cooling of timepix
- ▶ Reading of the scintillators
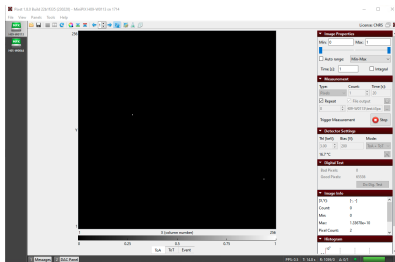- ▶ Data acquisition of the timepix and the scintillators

Ongoing

- ▶ Black box
- ▶ Installation of Grainita and its readout

Acquision chain

Acquision software

▶ Pixet, delivered by the Advacam company

▶ ASM board home made software (labview)

▶ Issue : De-synchronisation between the two Timepix seems to happen when the load on the acquisition PC HD increase

▶ So far, the same PC control both. Will likely change in the future.

Acquision software

- Data acquisition test : 47 hours of data, a large part is not usable (desynchro)
- 780466 pixels hits
- 49599 pixels in a 350 ns coincidence windows
- 1775 muons candidate
- 824 muons candidates for the scintillators

Todo :

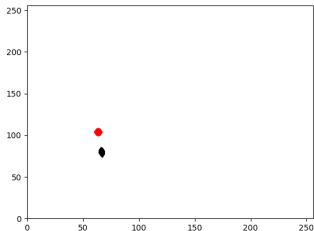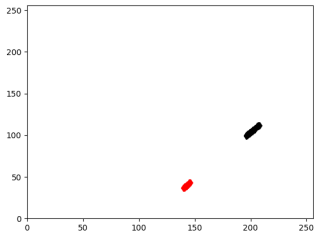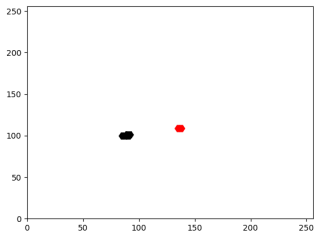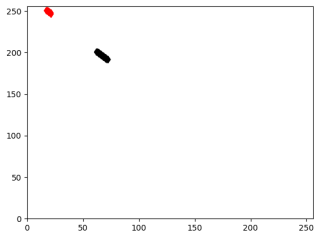- Track based reconstruction can bring a significant improvement to remove backgrounds candidates.
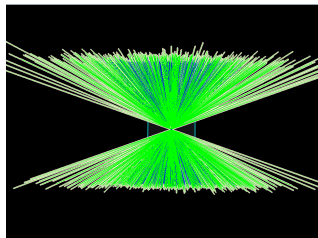
All tracks
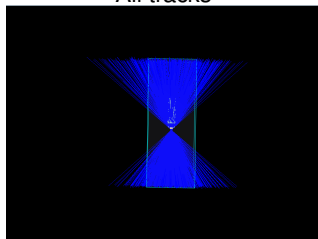
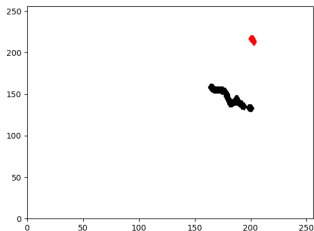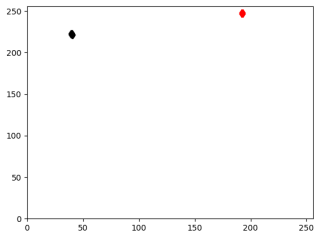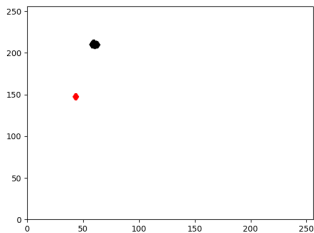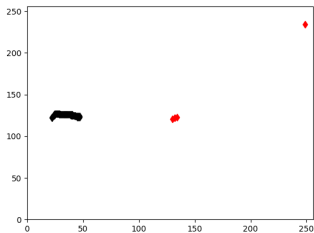Only the one crossing the scintillators

Examples 1/2

Data taking has started with the TimePix detector, exemple of Muons :

Examples 2/2

Data taking has started with the TimePix detector, example of random
coincidence (15% of the events):

Scintillators/Timepix coincidence

- ▶ Each timepix candidate is tested against the scintillators candidates
- ▶ Rate of scintillator candidate : 4 muons/min
- ▶ Rate of timepix candidate :
- ▶ PC time used as a reference :
  - ▶ ASM internal counter/PC time : 1 s resolution
  - ▶ Difference between the PC time of the two timepix
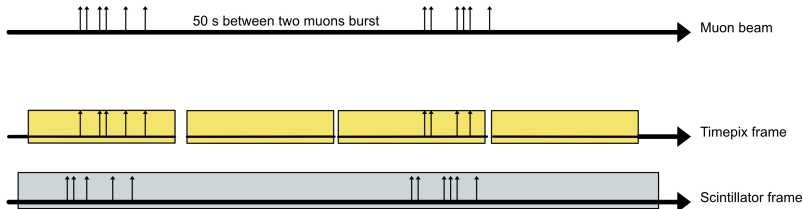- ▶ Studies ongoing

dt {coinc==1&&muonType>10}

htemp	
Entries	745
Mean	−1.033
Std Dev	1.108
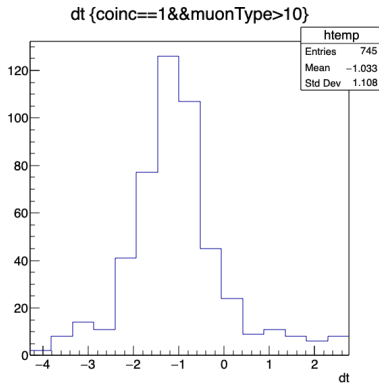
Time difference between the scintillators candidates and the muon candidate

Muon beam time alignment : Position of the problem

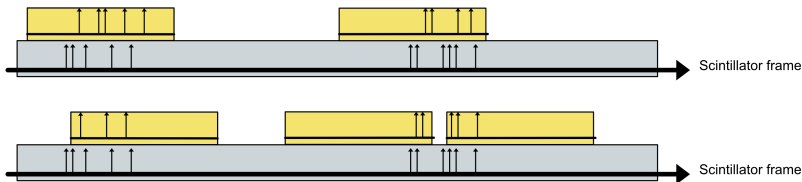Word of caution : We are only starting to think about this subject

- ▶ Timepix produce 20 s files
- ▶ 1s time stamps are not enough to recover the incoming muons
- ▶ Time difference between frames are not known a priori
- → Use the cosmic test bench to quantify that

Muon beam time alignment : One possibility

Step 1 :

▶ Use the 1 s time stamp to perform a rough alignment of the 20 s frame

Step 2 :

▶ Find the best delay value which minimize the time difference between all the muons