Update on BM @ CNAO2022 (first shift)

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BM working point

BM - Position of the tracks at the target center
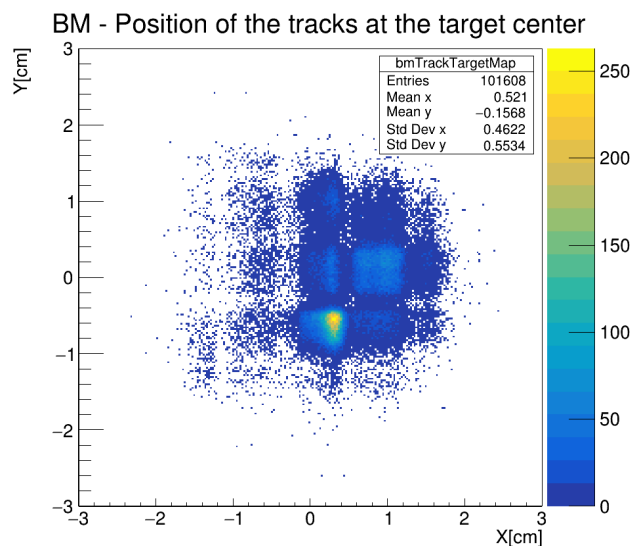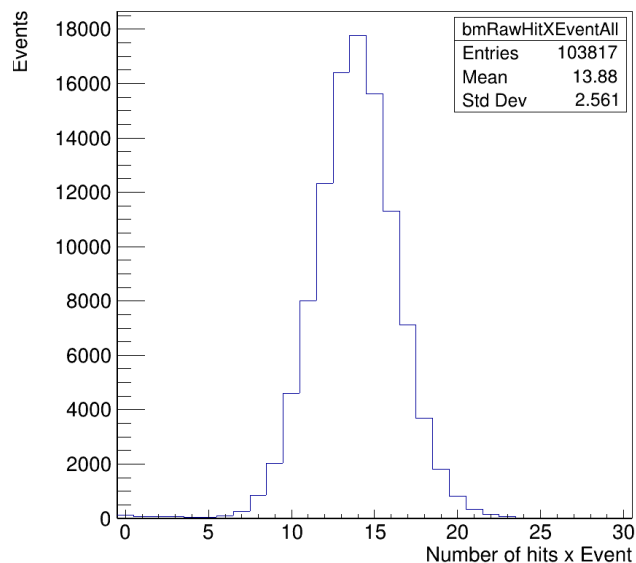
- For a given particle energy we performed a scan in HV and signal thresholds in order to find the best working point for the BM

- Best condition for 12C:
  300 MeV/u: HV=1750, Threshold=10 mV
  115 MeV/u: HV=1700, Threshold=10 mV

- For protons @ 226MeV: HV=2075, Th=10mV (not analysed yet)

- **We need to tune the detector settings and position for each beam particle/energy (few kevents, 10-30 min)**

- **Is it possible to refresh the Gnam plots without stop and restart the run? This could save time in the tuning of detectors and beam parameters**

- 12C @ 115 MeV/u: "perfect" condition run 5326:
  -Mean BM hits ~ 14
  -Raw hit detection efficiency ~ 0.82
  -Mean number of BM tracks per event~0.98
  -BM parameters NOT OPTIMIZED

BM hits vs rate

### 12C @ 115 MeV/u

Beam Rate vs Number of BM hits
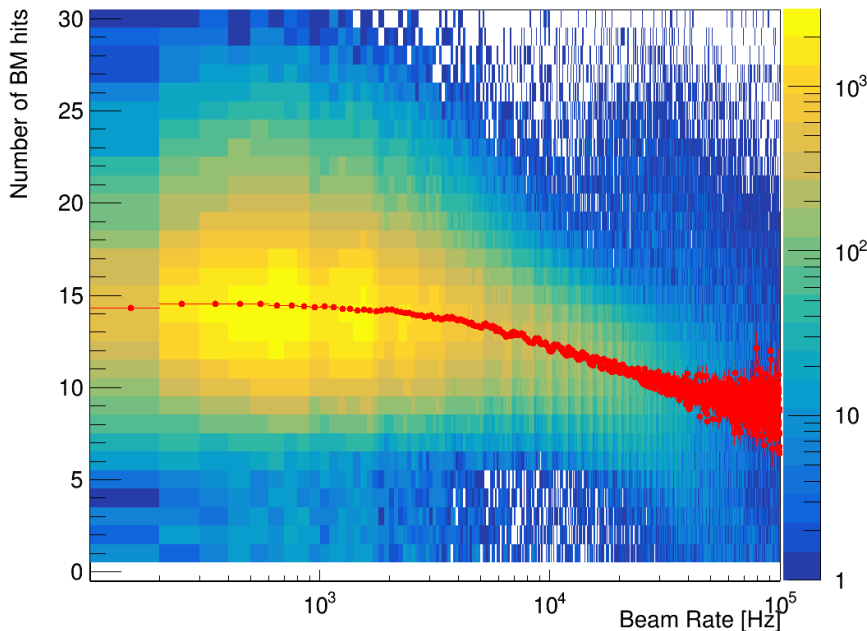
Drop of BM efficiency @ HIT and GSI2021 probably due to a too high setting of the signal thresholds (20 mV) that required an increase of the HV setting.
No inefficiency @ GSI2019 (10 mV)

A high rate of incident particles can increase the current on the sense wires, decreasing the effective electric field (The BM sense wires are connected to HV by a 50 MOhm protection resistor) and, then, decreasing the detector efficiency

- High beam rate → low effective electric field → low signal amplitude (checked with the oscilloscope) → low detector efficiency

- Mean signal amplitude, current and voltage drop:
  -"Perfect" condition: 30 mV; 0.3 µA → ~1 V
  -50-100 kHz: 20 mV; 2.25 µA → ~10V
  -500 kHz: 7-8 mV; 10µA→ 42V

- Inefficiency effect starts at about 10 kHz and it becomes relevant at 100 kHz

- At FOOT rates (<1kHz) the BM shouldn't have inefficiency issues

- At higher rate, the use of low threshold can mitigate the inefficiencies (we tried 5 mV), but there are other effects

BM and VTX

vtx originY / BM originY

vtx originX / BM originX
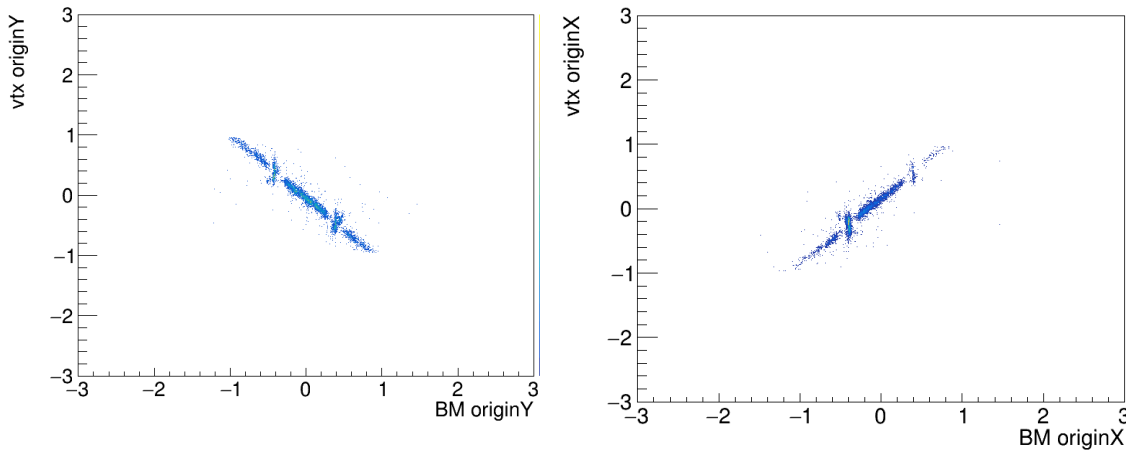
- Correlation between BM and VTX on the Y axis

- Anticorrelation on the X axis (probably some mapping files to be fixed in VTX or BM?)

- Need to check with MSD (not done yet)

- Need to check the sync on long runs (not done yet)
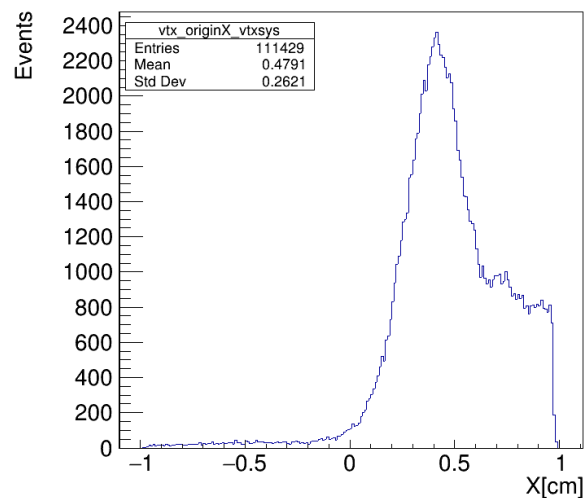
- The beam is not perfectly Gaussian

Vertex - Beam Profile
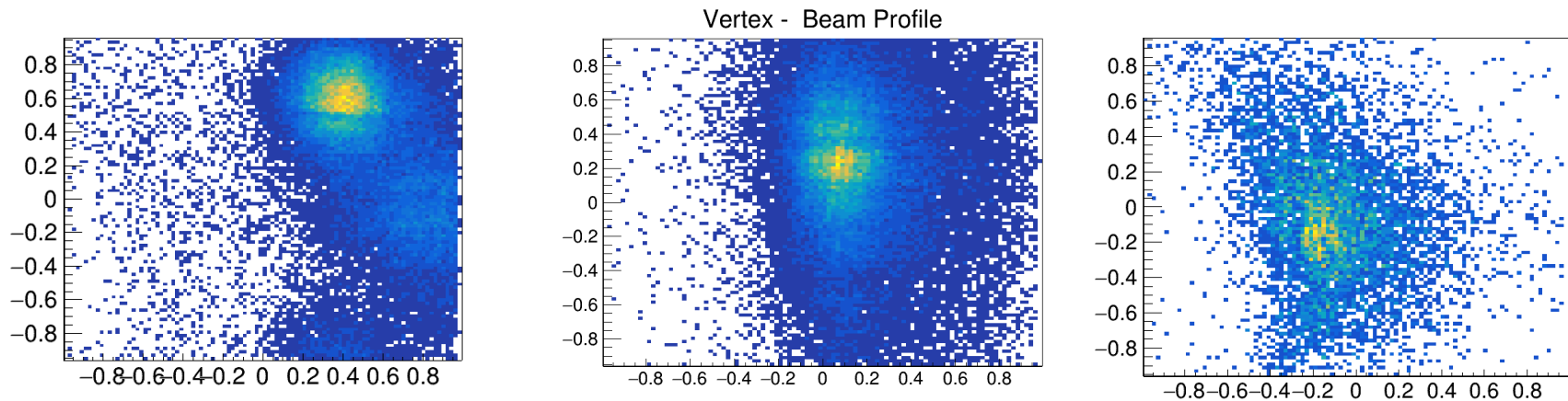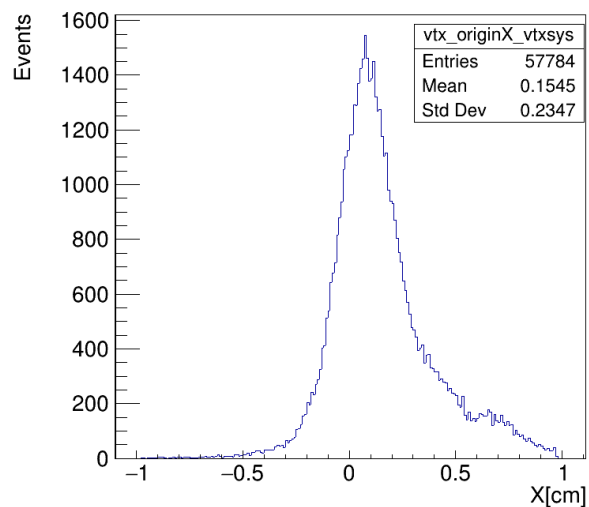

12C @ 115 MEV/u;

200 MeV/u;

300 MeV/u

VTX beam profile

12C @ 115 MEV/u (run5326);   200 MeV/u (run5341);   300 MeV/u (run5309)