First look at BM & VT on GSI2021 data (Run 4306 - MB)



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Hit map at the target center

BM - Position of the tracks at the target center



Run 4306 - BM residuals vs rdrift

Residual vs Rdrift



Pull distributions after fit



Strange dependences (at small and large distances) Not really «normalized pulls»

Matching with VTX tracks



Chisq of VTX tracks



BM-VT match at Z=0



Core resolution of 300 um both in X and in Y; Large non gaussian tails.

Another possible problem;

TVector3 TAGbaseTrack::Intersection(Float_t posZ)
const;

- This assumes that Ztrack=0.0, SlopeZ=1.0 (popular starting conditions)
- Found cases where **Ztrack is different from 0** (no check on the second precondition).
- Similar code found also elsewhere
- Consequences (i.e. physical observables) not searched for

• Some changes committed in the repository

Some solutions

 Vertex chi² evaluated without Z dependence of the tracks (TAGbaseTrack) → once corrected:



- They are actually χ^2/ndf
- Pointing to too large cluster uncertainties ... Factor of $5 \rightarrow$ resscaled

New reco of 4306 (with VT &BM changes)



Both plots do not smell good Maybe I'm too picky!

BM Fit results



Fit converges; the constant term is changed by less than +- 0.1 cm (usually); still some results seem unphysical....

BM track reco

In each view:

- Unassigned hits are loaded in a Legendre plot (q vs m \rightarrow parameters of a track)
- A maximum is searched for; hits around the maximum are assigned to a tracklet
- A chisq fit with minuit is performed on the hits.
- Iterate with unassigned hits.
 If no or few unassigned hits → change view

Tracklets in different view are combined to form tracks



Drift detectors for high # cells



Foot Application - default Legendre plot

Tracks parameters:

- u(x or y) = q + mz
- Each hit will give two curves in the Legendre plot
- Ranges and bins:
- m: -0.001, 0.001, 10 bins
- q(R): -1.5, 1.5 (cm), 15 bins



Problem: for each hit the «curve» can range in q space about $mz + R_{drift}(\sqrt{1 + m^2} - 1)$

 \rightarrow up to 0.01 cm \rightarrow well within the q bin width (0.2 cm) There is no sensitivity to the tracks parameters unless we increase the number of bins in on Q by a large factor

More bins in the Legendre space

Tracks parameters:

- u = q + mz
- Each hit will give two curves in the Legendre plot
- Ranges and bins:
- m: -0.001, 0.001, **32 bins** (10)
- q(R): -1.5, 1.5 (cm), **256 bins** (15)



Comments:

- Just a reasonable first try not optimized!
- Changes in the conversion from bins to values when a flat max is present → better starting values

Results



Comments:

- Less artefacts in the reconstruction ③
- More continuous distributions 🙂
- More far-away tracks ⊗

Hit map at the target center



Residuals and pulls

Residual vs Rdrift



Comments:

- Much more continuous distributions
- It is possible to check both the r-t relation and the assigned uncertainty

Some slices



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Fit on all slices



Matching with VTX tracks



BM-VT match at Z=0



RED: this analysis BLUE: current new SHOE

BM-VT Track opening angle



- Next goals:
- understand better:
 - BM track fitting
 - large Q, large M tracks
 - r-t relation and r errors
 - VT cluster error evaluation
 - VT tracks chisq

Pulls

• After a fit on N measure quantities:

$$p_i = \frac{X_i - X_{fit}}{\sqrt{\sigma_i^2 - \sigma_{fit}^2}}$$

For gaussian quantities and linear systems:

$$\langle p_i \rangle = 0$$
, $\sigma_p = 1$