Belle Starr and equally sized showers

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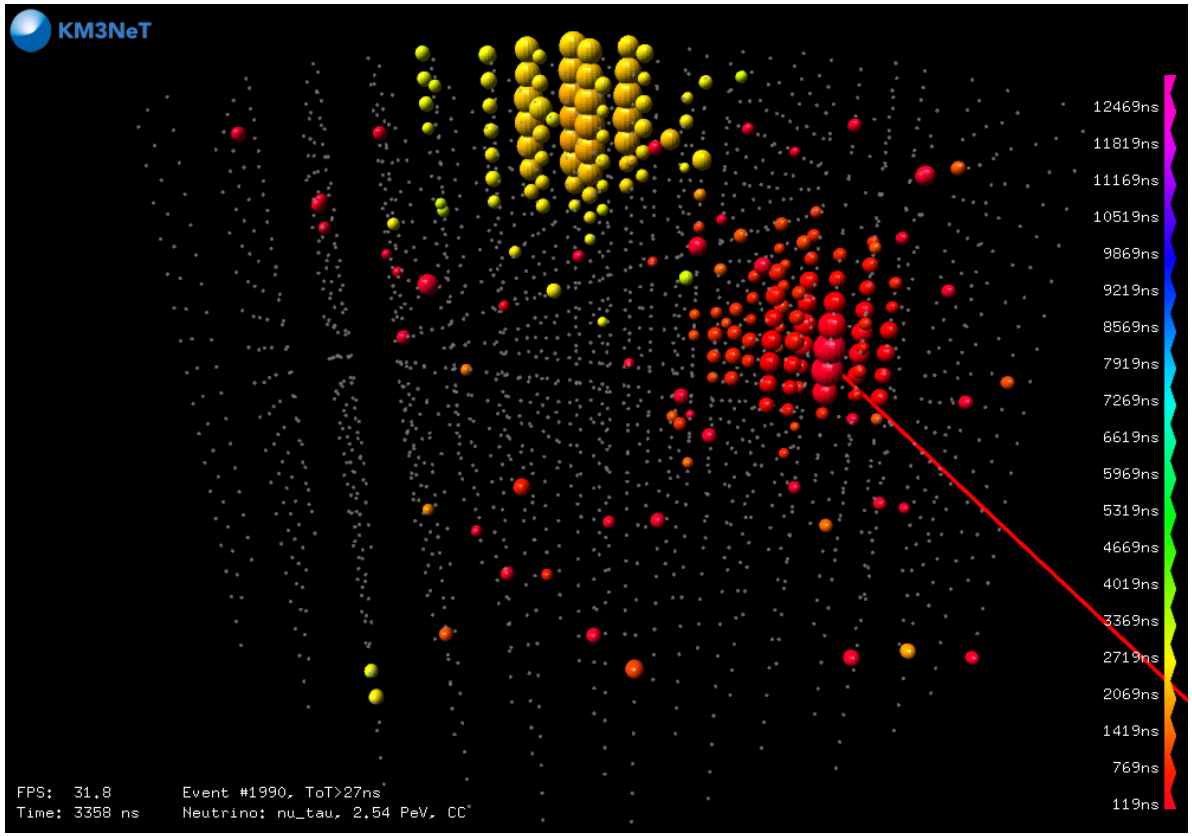
November 18, 2016

The problem

Events with large tua flight length and large showers get reconstructed badly (not at all. . .)



Possible causes

Cause found in position prefit

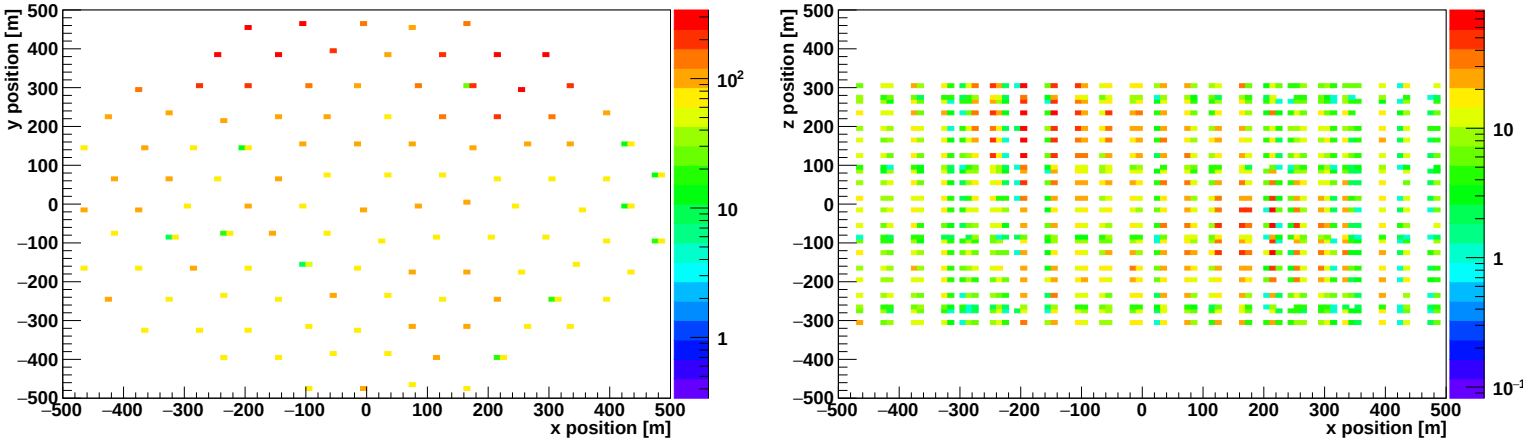
M-Estimator:

$$m = \text{hit}_a \times \sqrt{0.5 + \text{hit}_r^2} \tag{1}$$

- Outliers spoil the event reconstruction?
- Equally sized showers prevent minimum determination?

$\hookrightarrow$ Large tau travel distance prevents hit selection from biasing towards one shower, if showers initially have equal hits they will have equal hits after and therefore fit goes to far away position

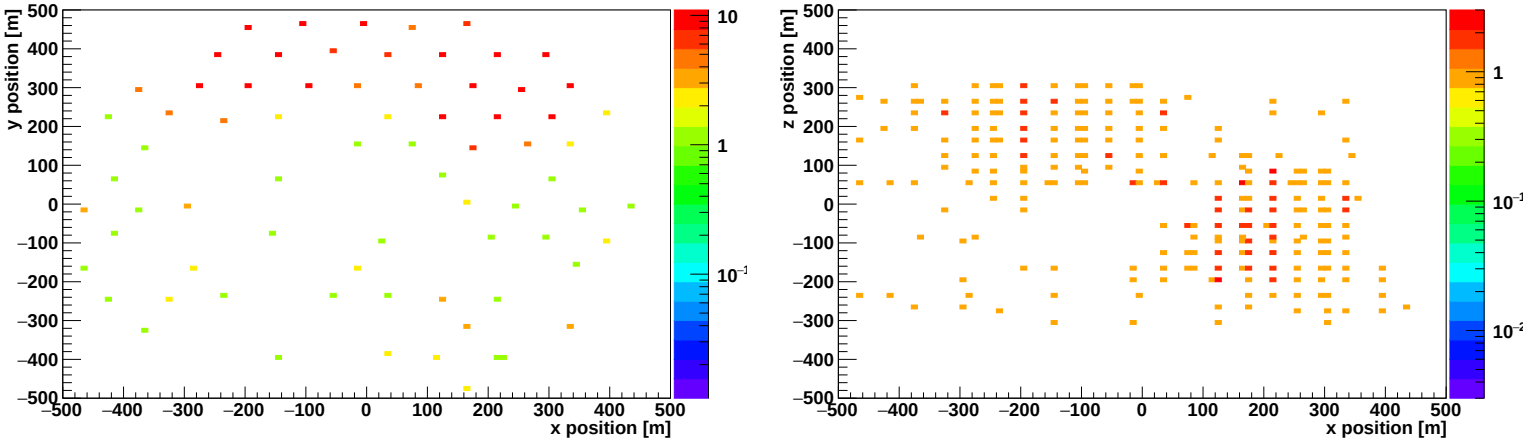
Hit selection for such events



(a) Top view of the detector (b) Side view of the detector

Figure : Initial hit distribution, color is number of hits

Hit selection for such events



(a) Top view of the detector (b) Side view of the detector

Figure : Prefit hitselection hit distribution, color is number of hits

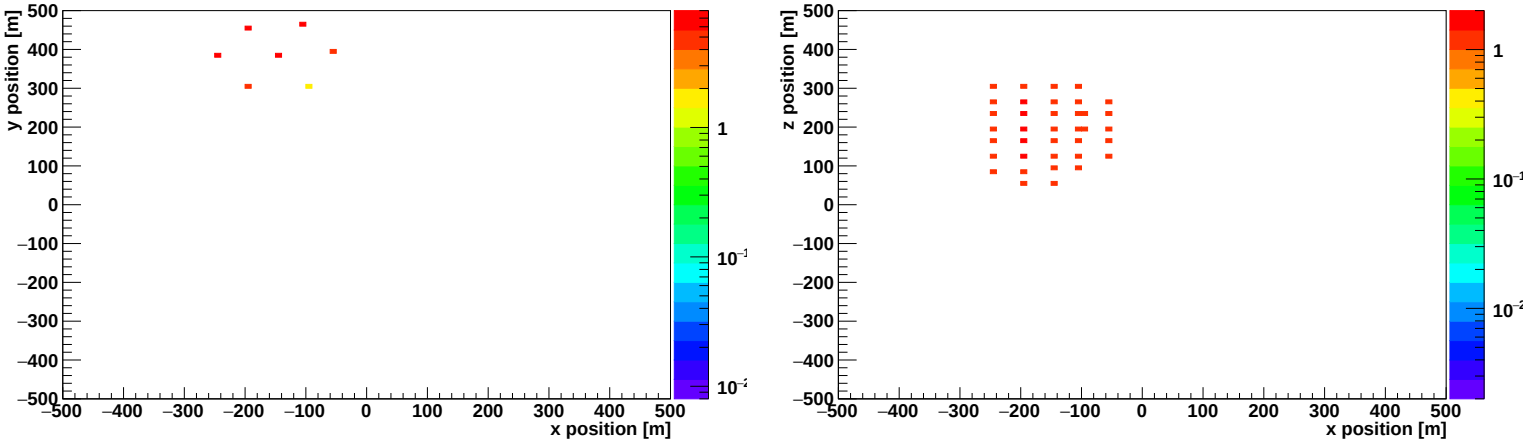
Clustering algorithm

Use clusterize algorithm to pull hit selection towards one of the showers!
Method:

- Find correlation criteria
- Find for each hit the number of hits with which he full fills that criteria
- Find best subset of hits which are correlated (clique algorithm)

Criteria:
Causal relation in time and maximum distance

Hit selection for such events



(a) Top view of the detector (b) Side view of the detector

Figure : Cluster on Prefit hitselection hit distribution, color is number of hits

Reconstruction efficiency

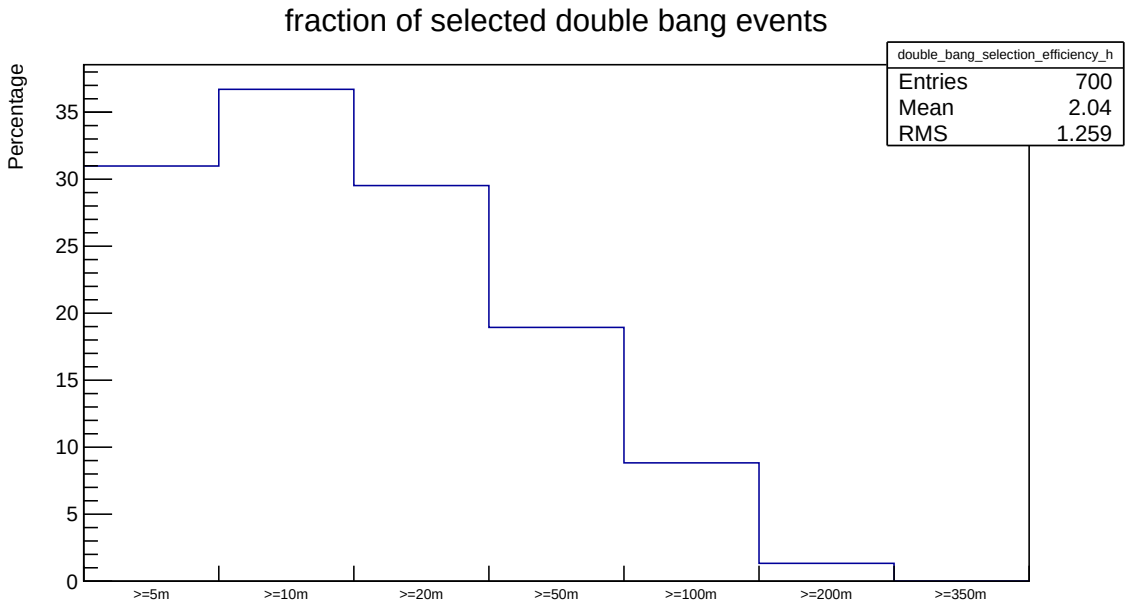


Figure : Reconstruction efficiency rel. to all triggered events old prefit