Track Fitting in phase2 (prod2)

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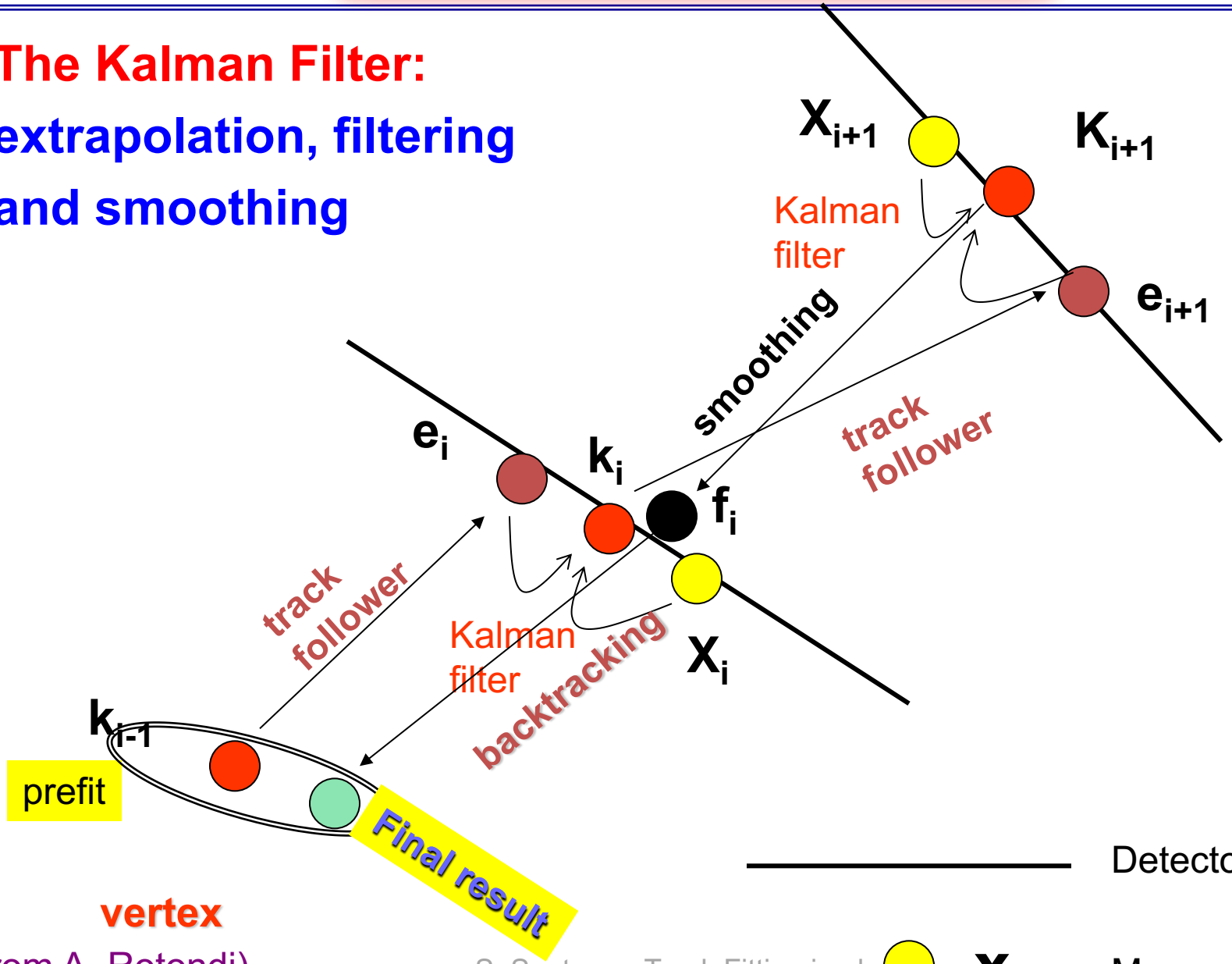
Track Fitting

The Kalman Filter: extrapolation, filtering and smoothing



(from A. Rotondi)

Track Fitting - 2

Pattern Recognition algorithms provide the prefit values

Seed @ the first detector plane

Kalman Filter refit tracks and provides the updated parameters

Helix or Cartesian coordinates @ the perigee
(point of closest approach to Z axis?)

Deterministic Annealing Filter (DAF) removes
hits far from the main trajectory (outliers)

Data and Condidions

Experiment 3

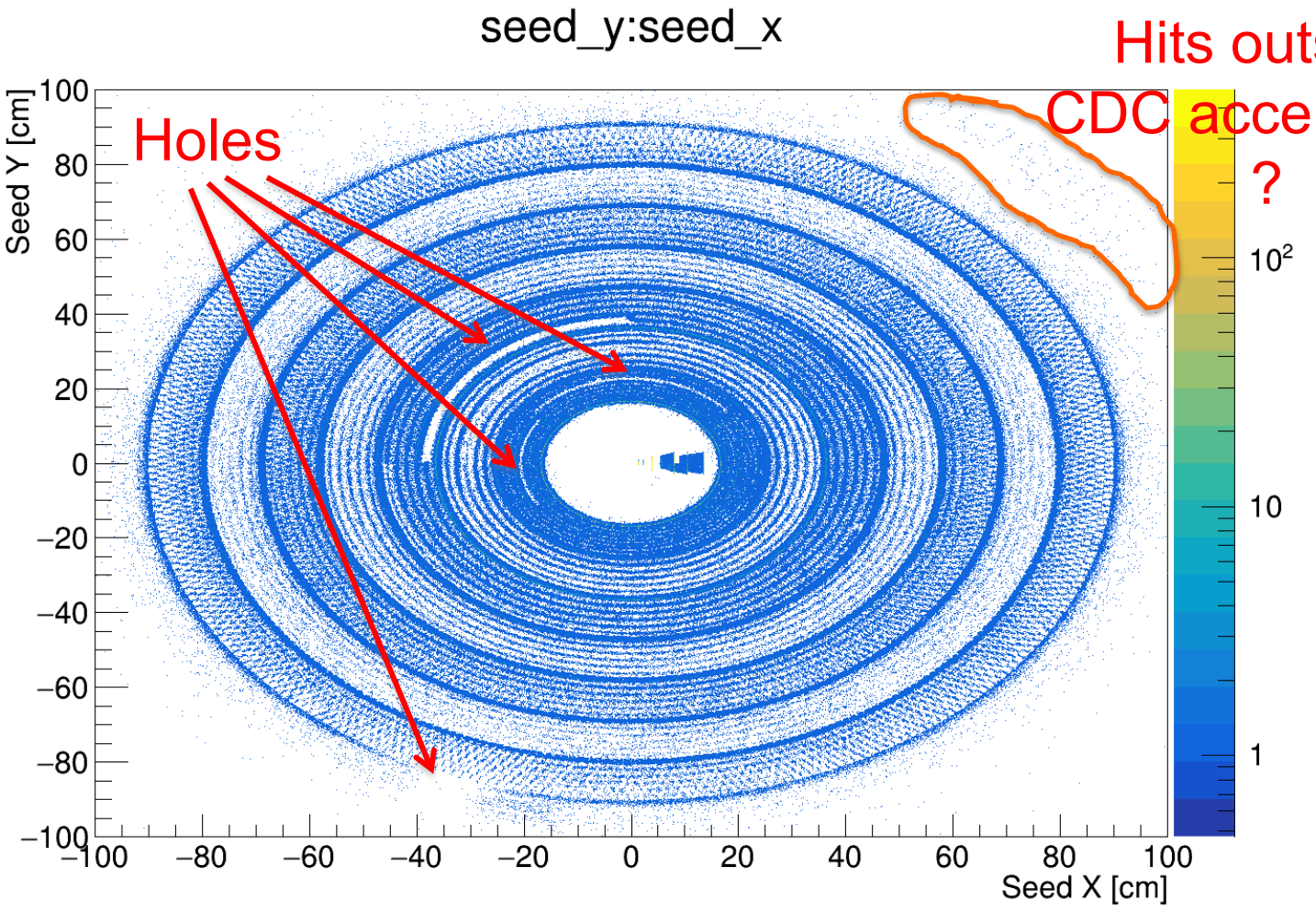
Runs from 112 to 1162

Prod 1 (prod 2 has almost no SVD/PXD hits)

Release 01-02-02

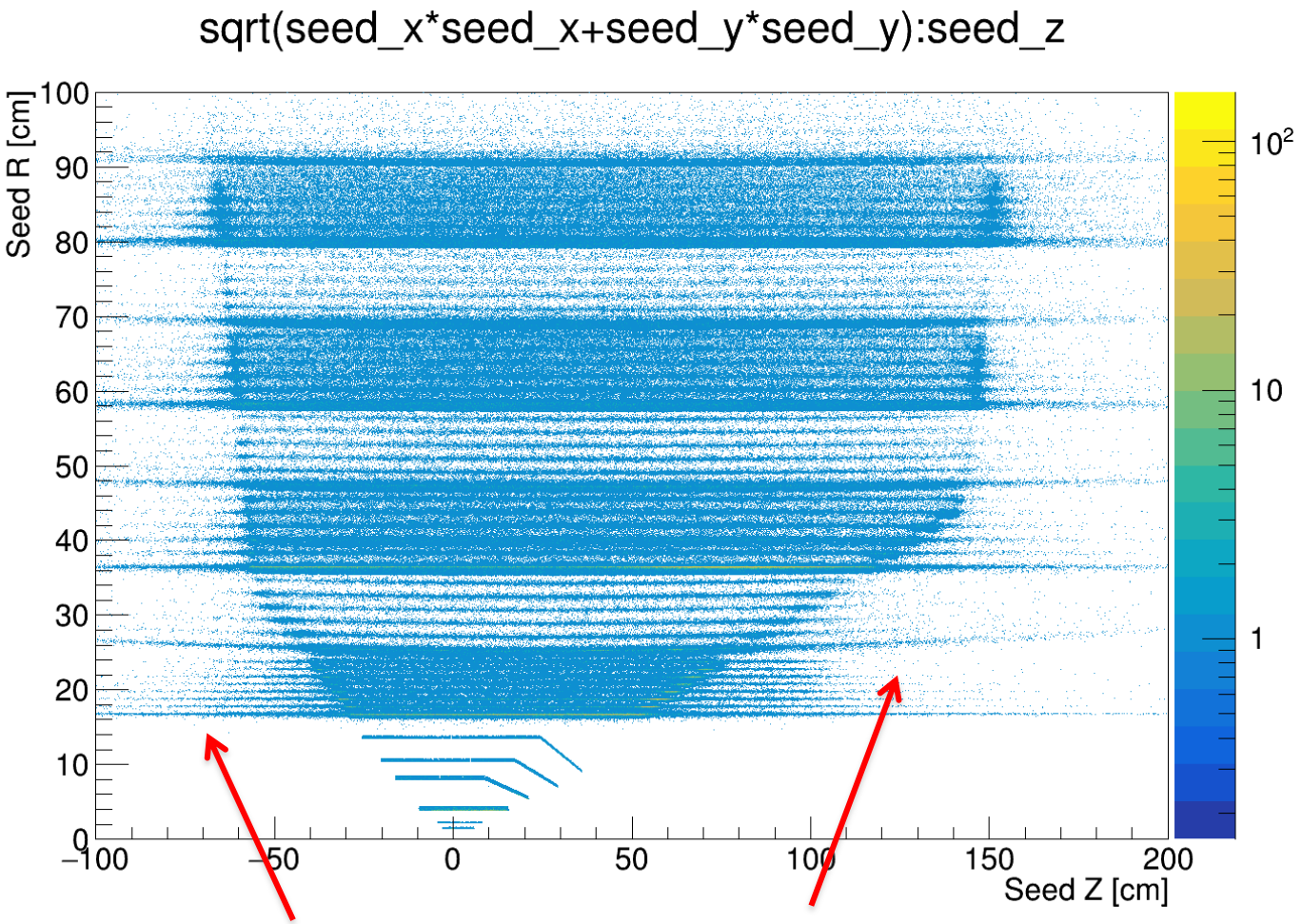
```
use_central_database("GT_gen_data_004.43_gcr2b-reprocessing",
                                                    LogLevel.WARNING)

input_root_files = ['/hsm/belle2/bdata/Data/release-01-02-02/DBxxxxxxxx/
                    prod00000001/e0003/4S/r0*/all/dst/sub00/dst.beam.*.root']
```

Seed position - XY



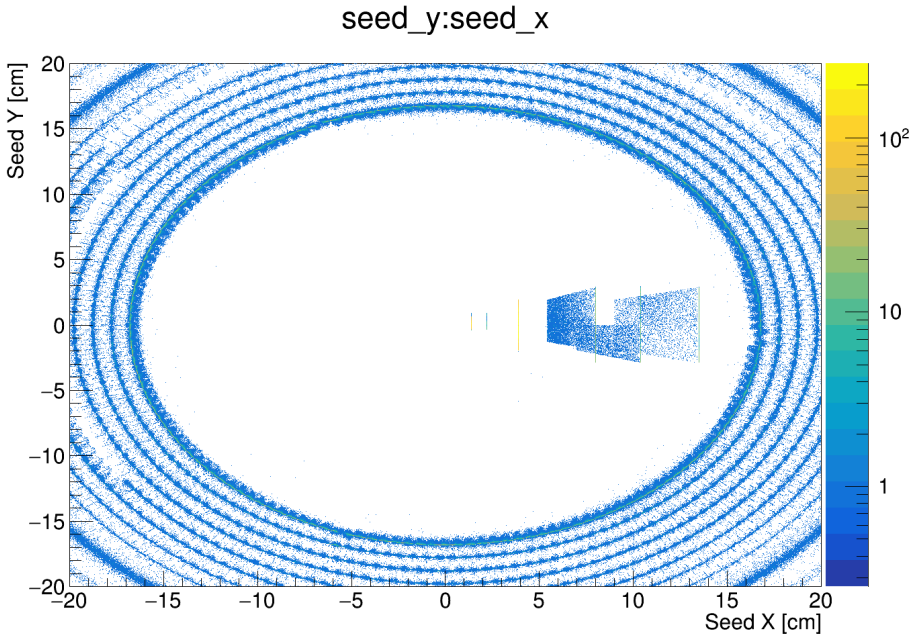
Good CDC Tomography

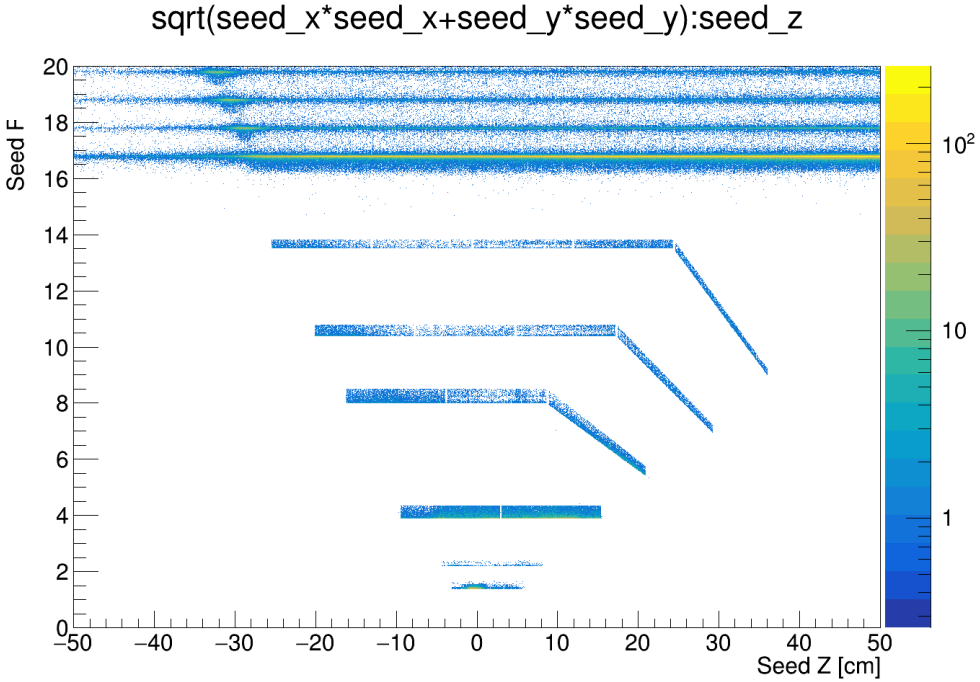
Seed position - RZ



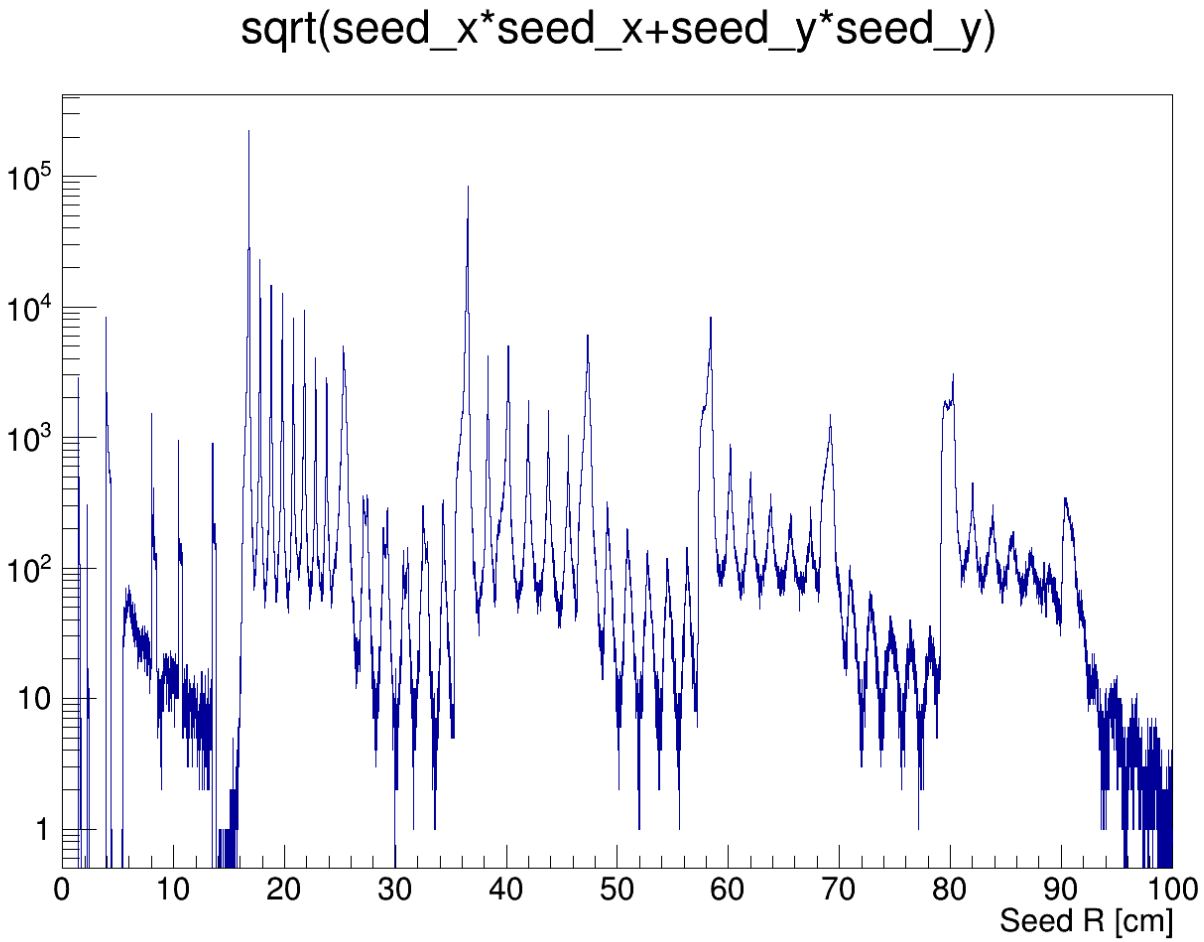
Hits outside CDC acceptance

Seed position Zoom





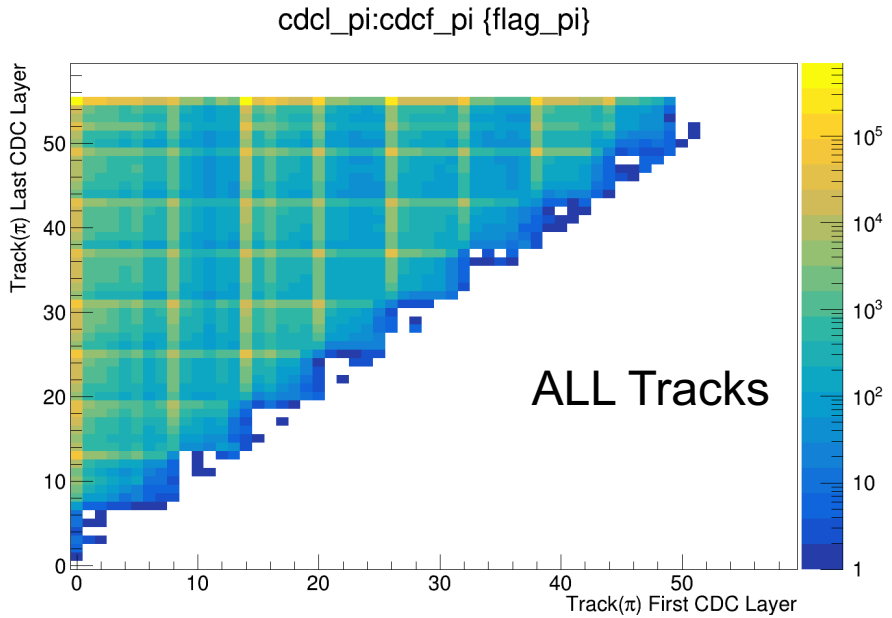
Seed position – R

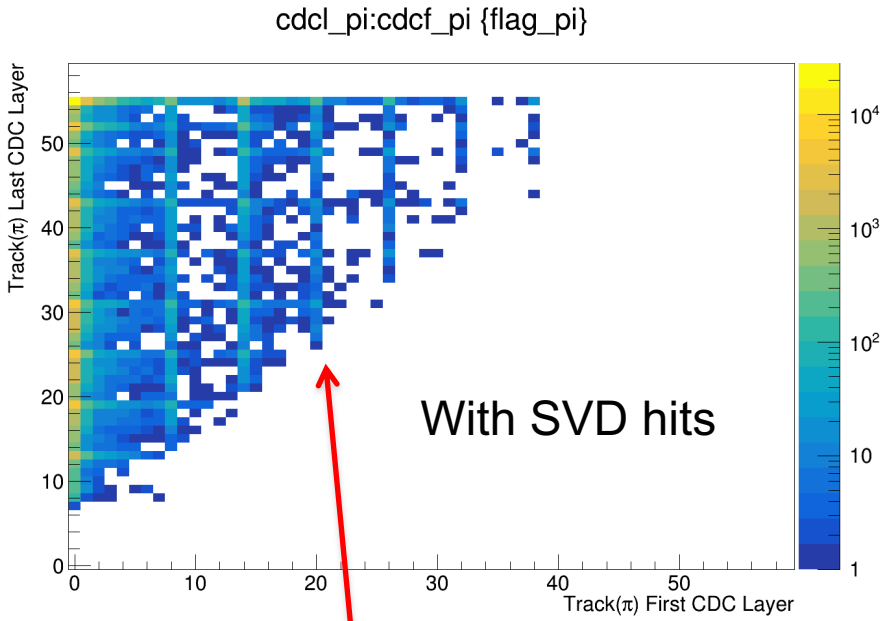


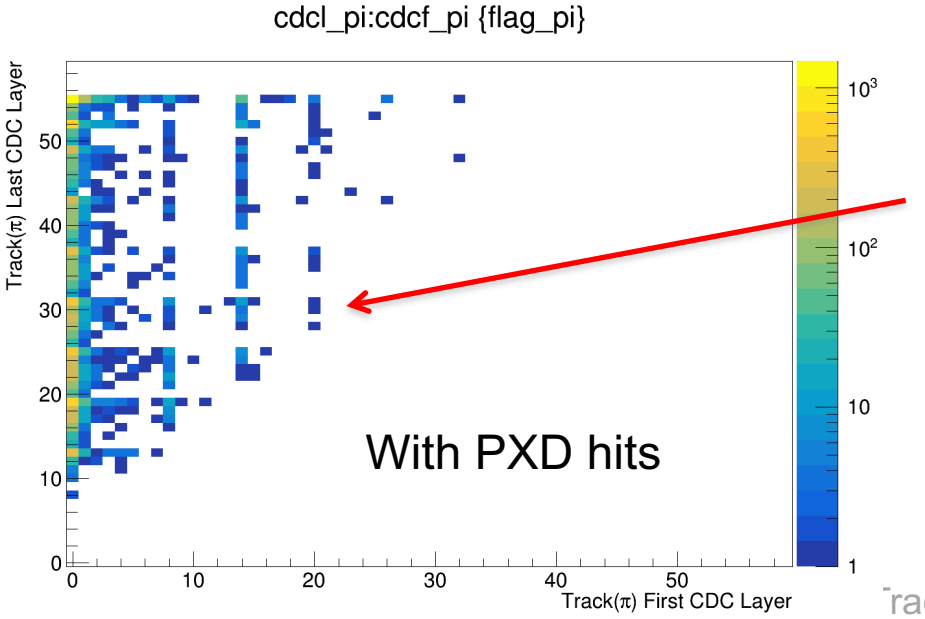
Why a distribution so “flat”?

I would expect to have a lot of events with first hit close to 0, and decreasing in a more or less exponential way

Fitted tracks: CDC first vs last layer

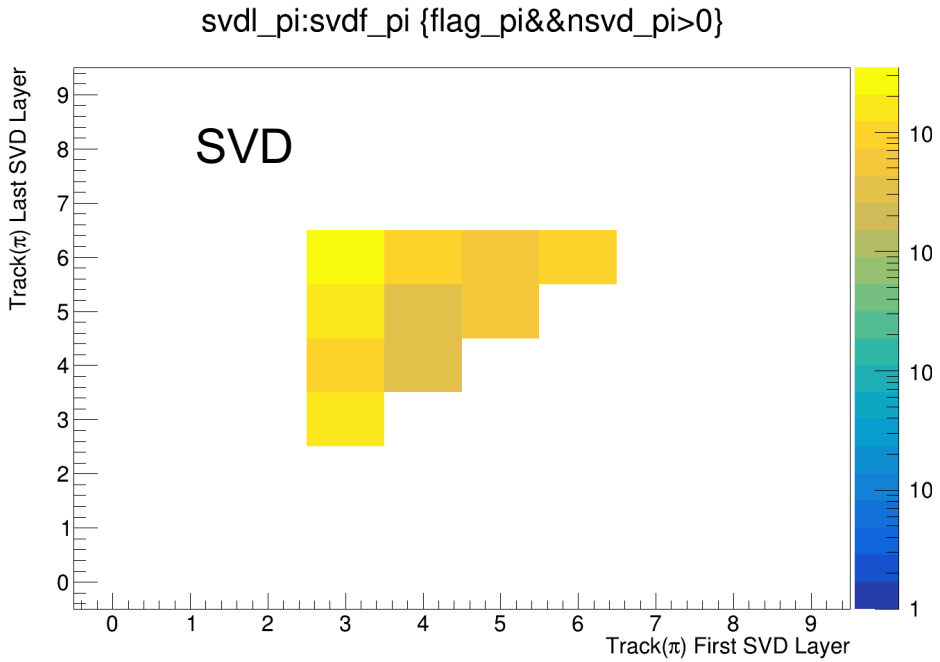


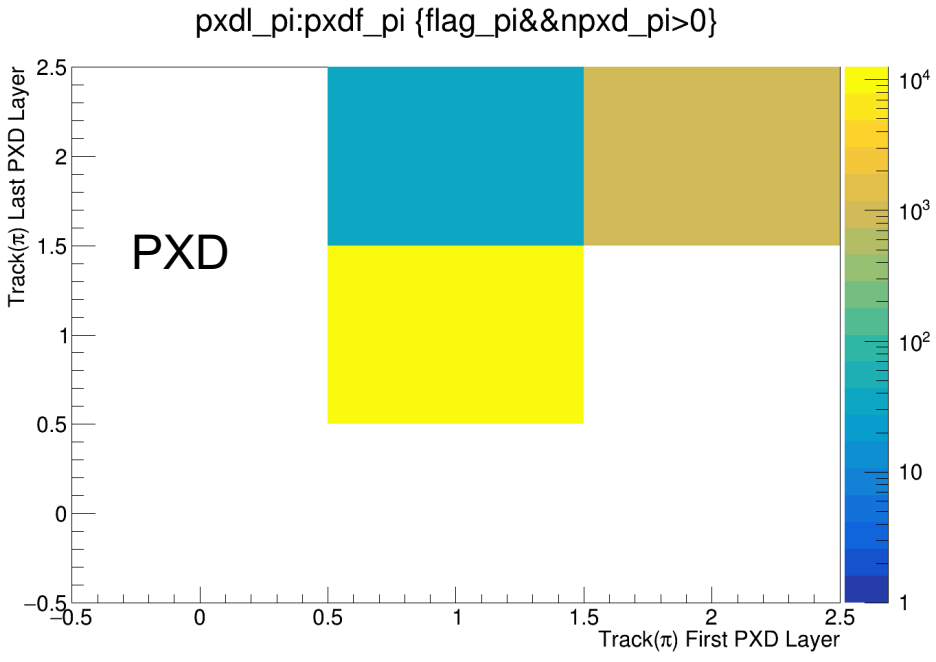




- Why, if the track starts from a VXD hit, the first CDC hit is so far from the inner layer?
- This effect is not correlated to angles

Fitted tracks: VXD first vs last layer



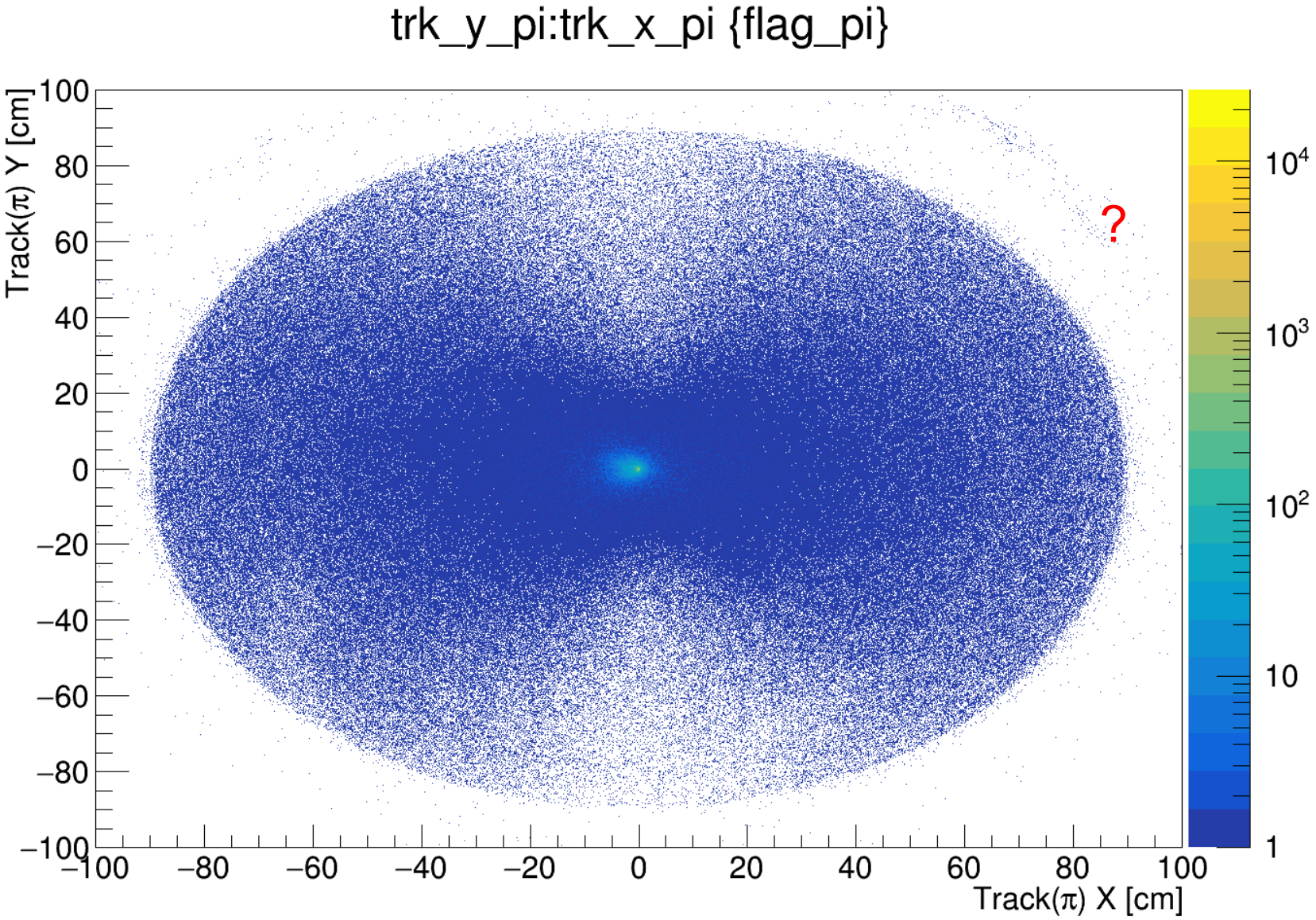


SVD hits are fine

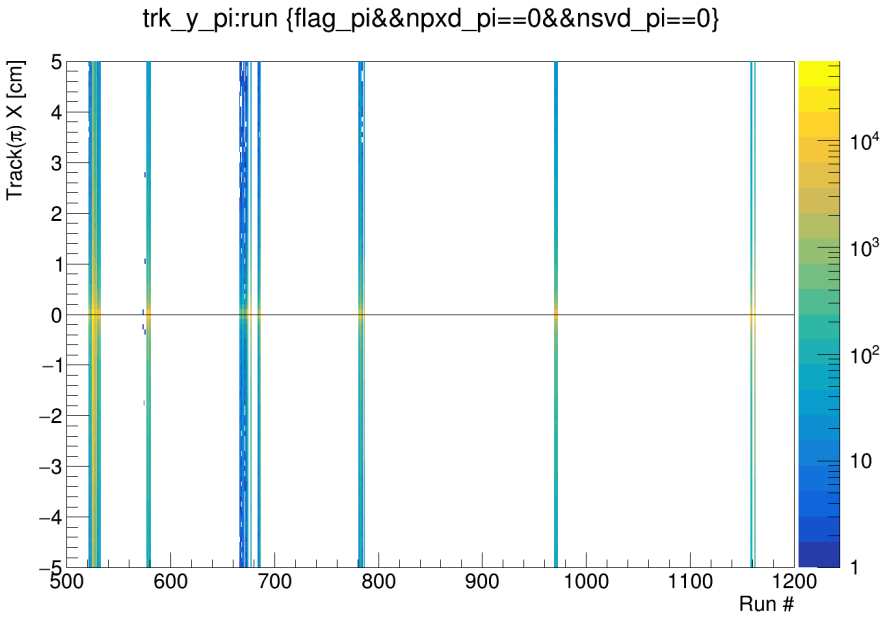
PXD has mostly tracks where only layer 1 is correlated

What happened to PXD layer 2?

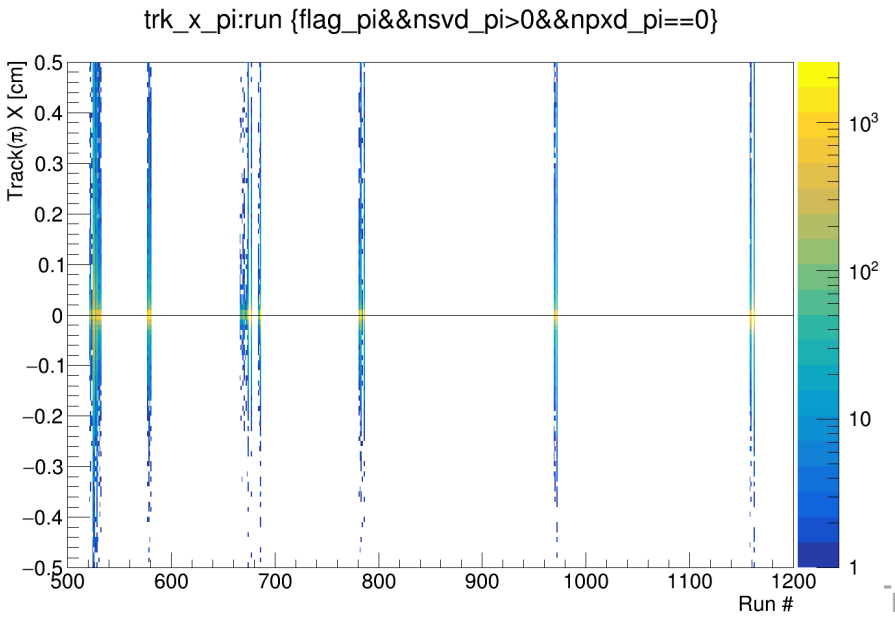
Perigee coordinates from track fit

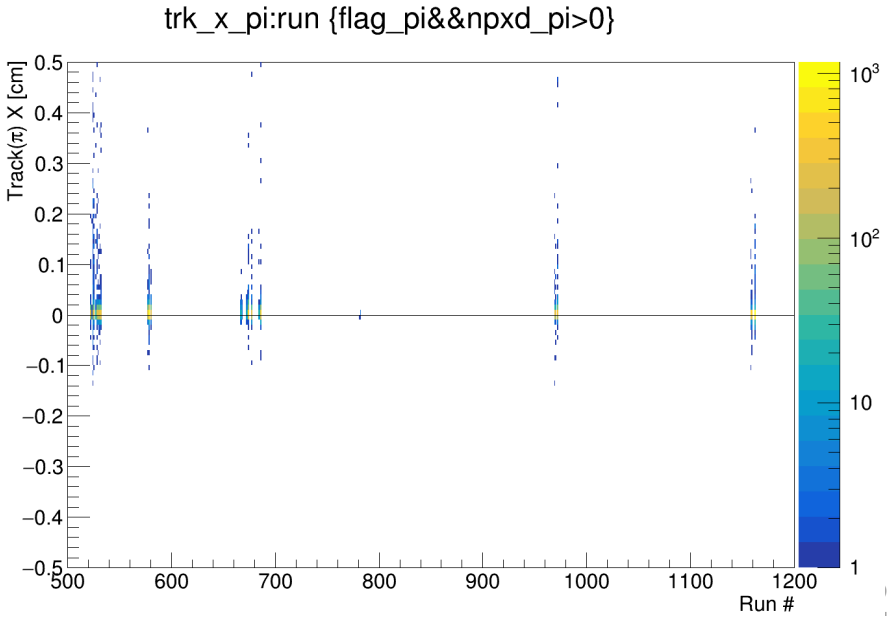


Position from Track Fit (pion) - X

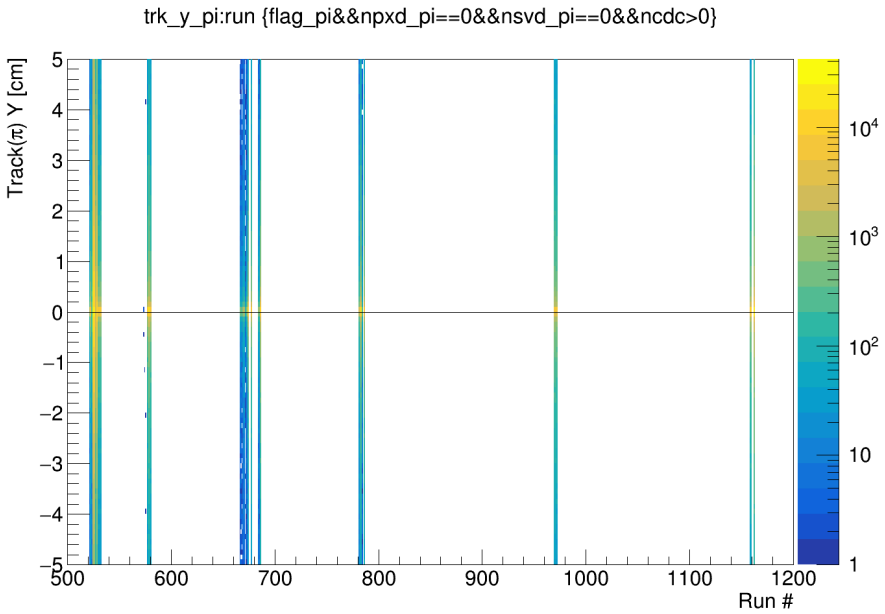


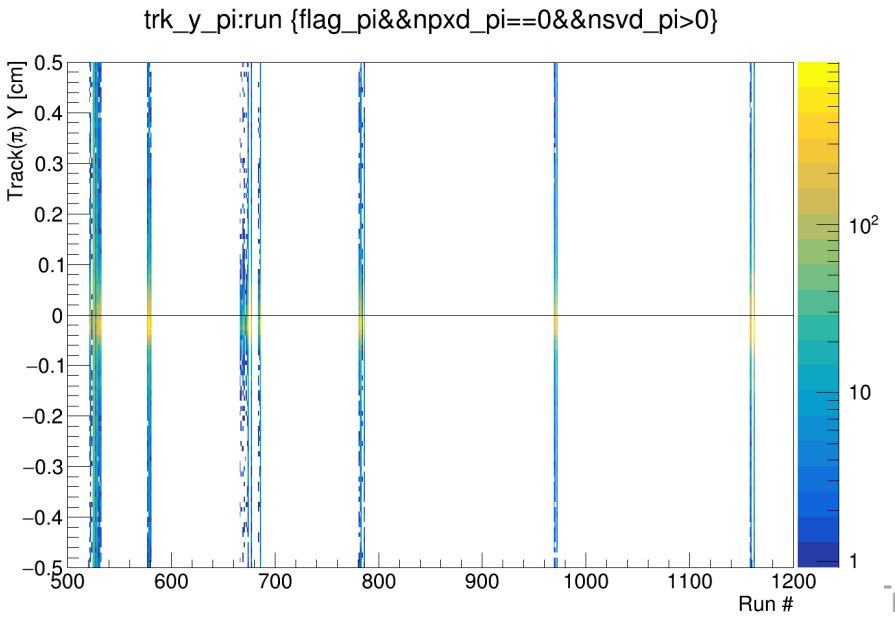
- Position precision very high with PXD hits, worse with only CDC hits
- What's happening vertexing only CDC tracks? (good question)

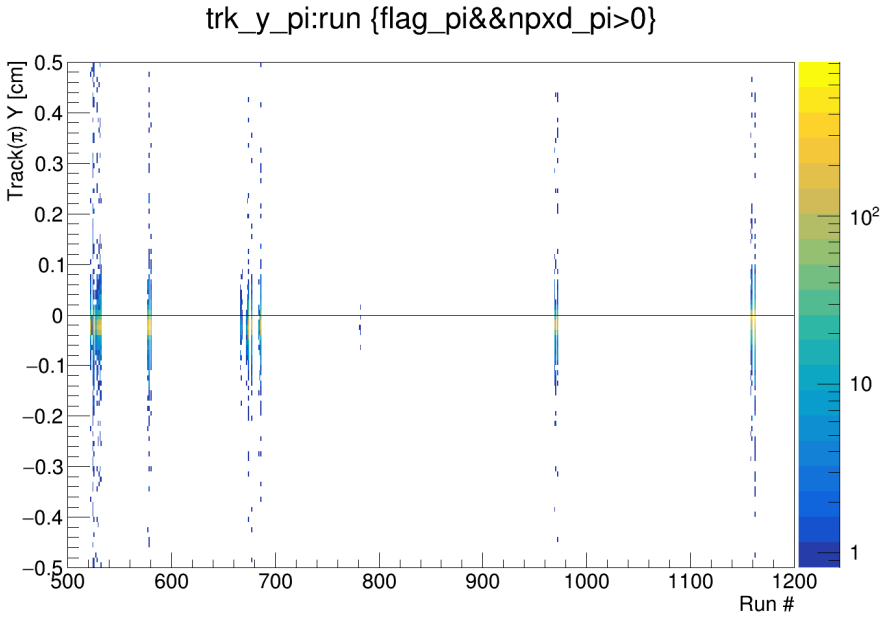




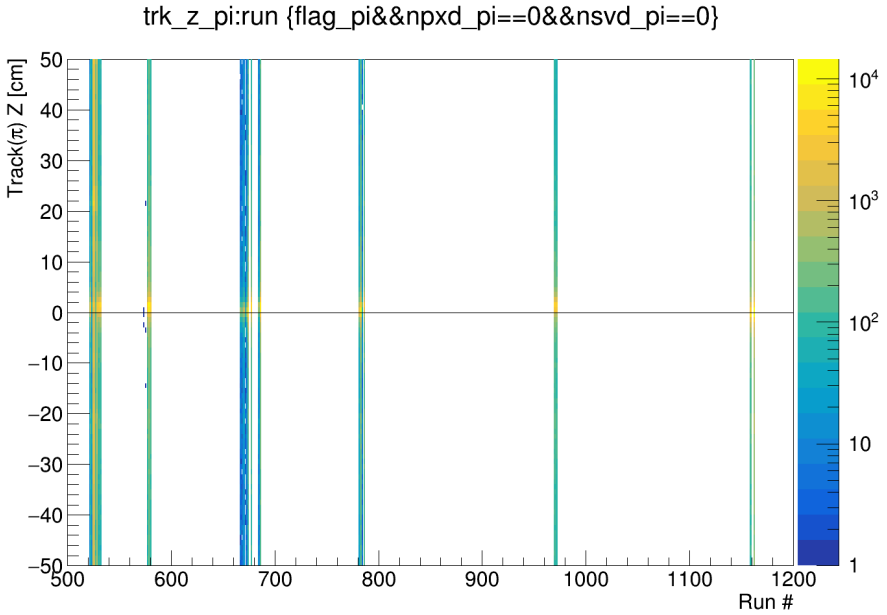
Position from Track Fit (pion) - Y

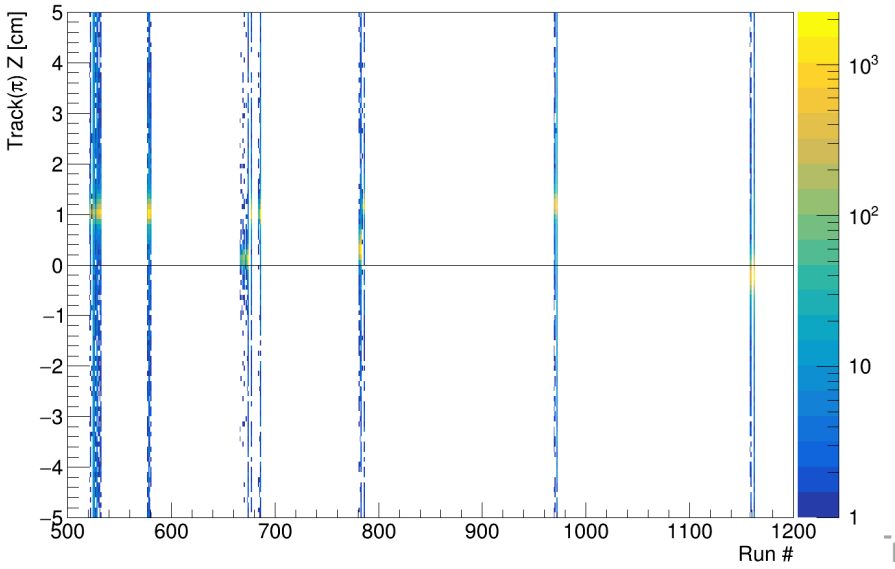


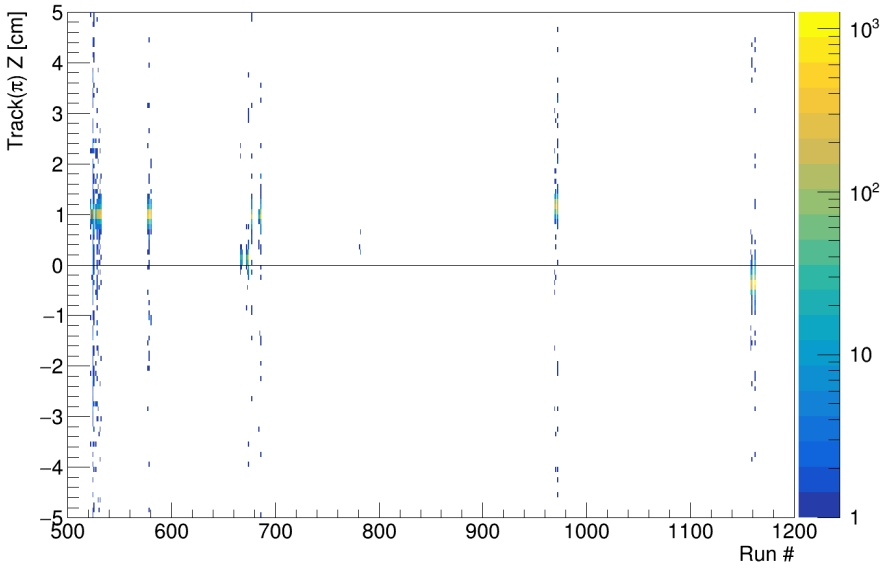




Position from Track Fit (pion) - Z



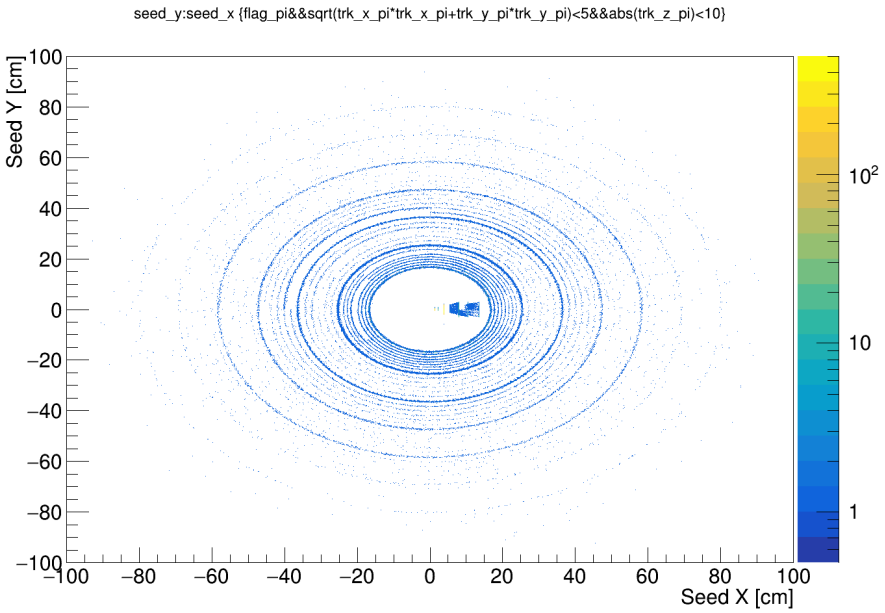


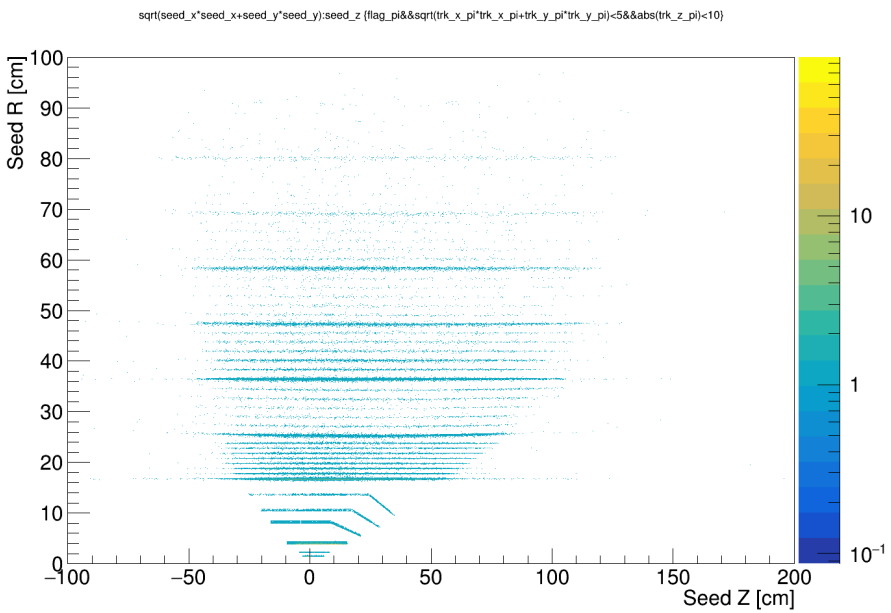


rack

Tracks coming from IP

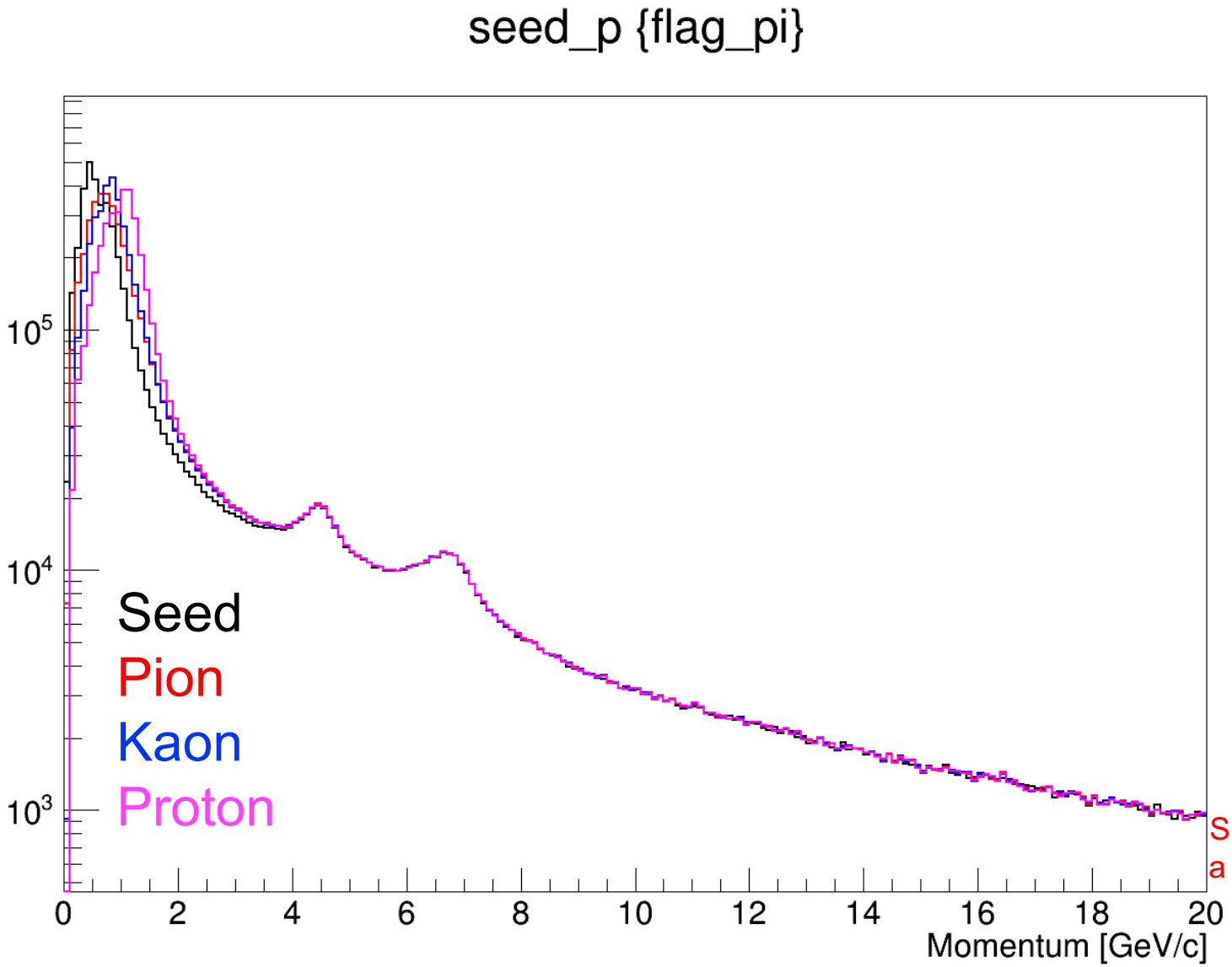
R < 5 cm, |Z| < 10 cm





- Seed values outside acceptance, or very far, coming mainly from non-IP tracks
- Are these real tracks, or fake tracks?

Track Momentum



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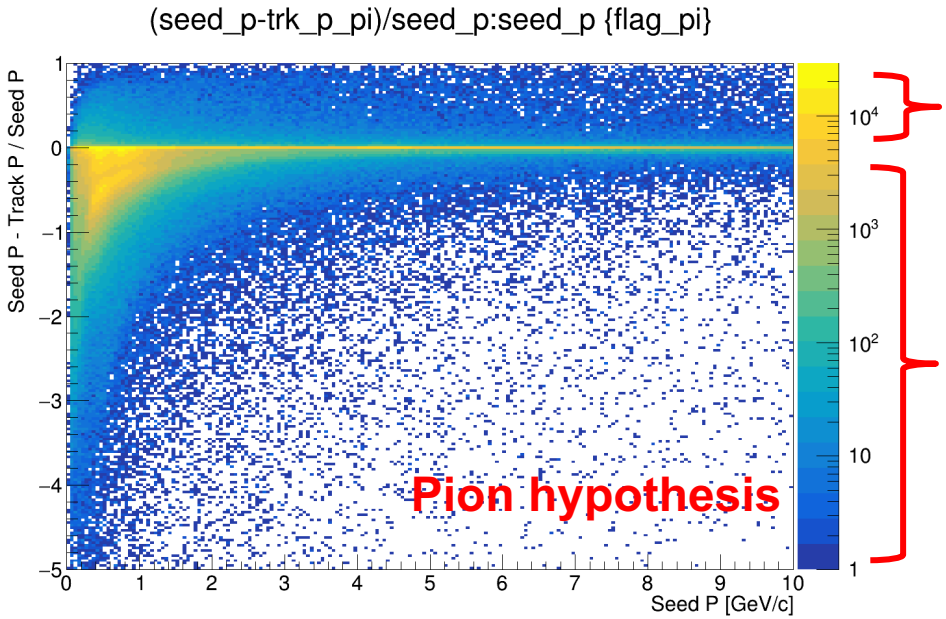
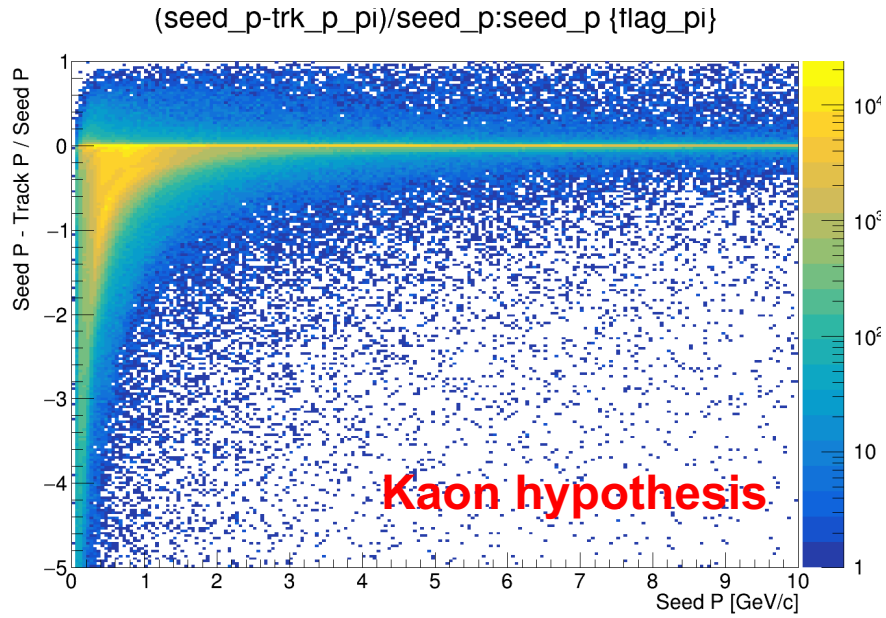
Shall we cut at a maximum p?

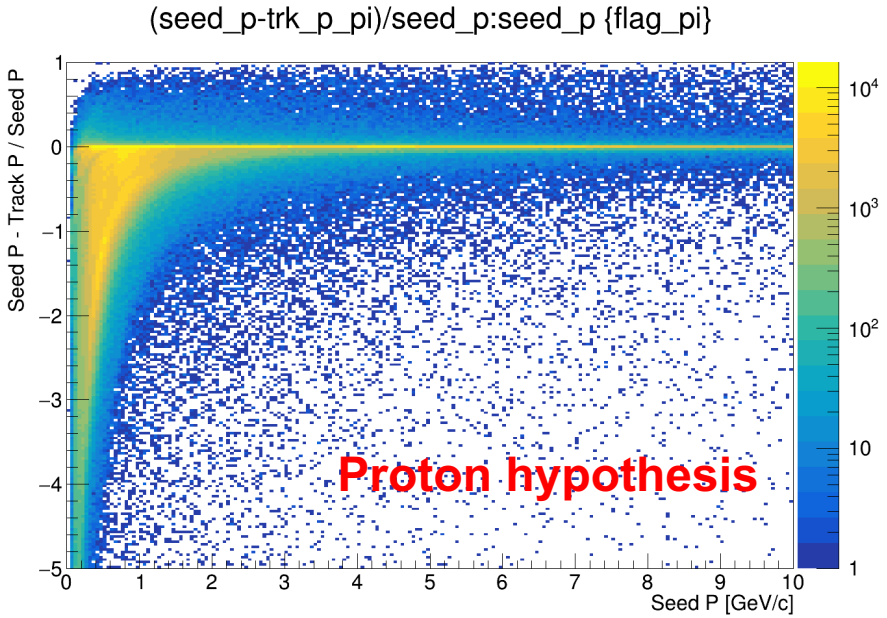
How does track fit change momentum?



Tracks can lose all their energies

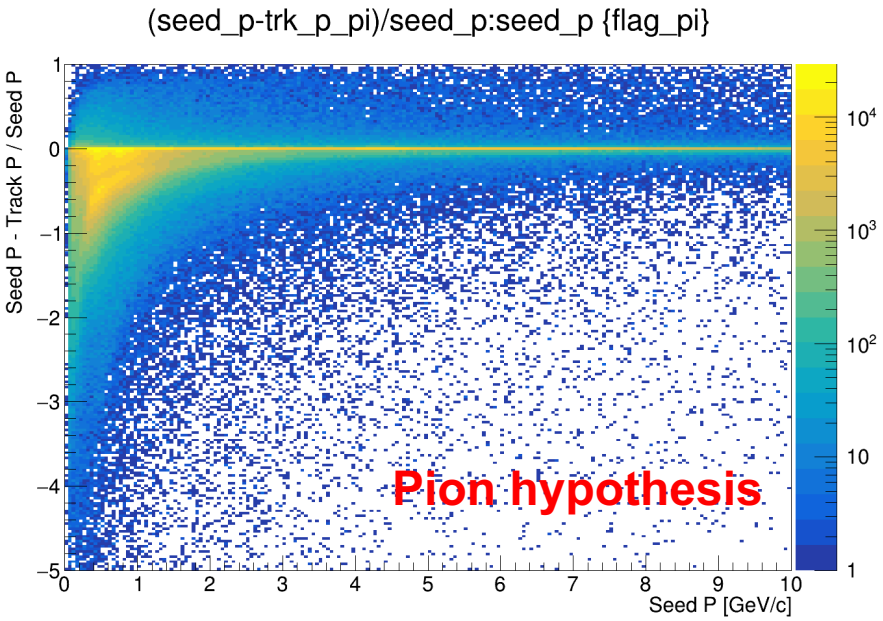
Tracks can gain up to 5 times their seed p



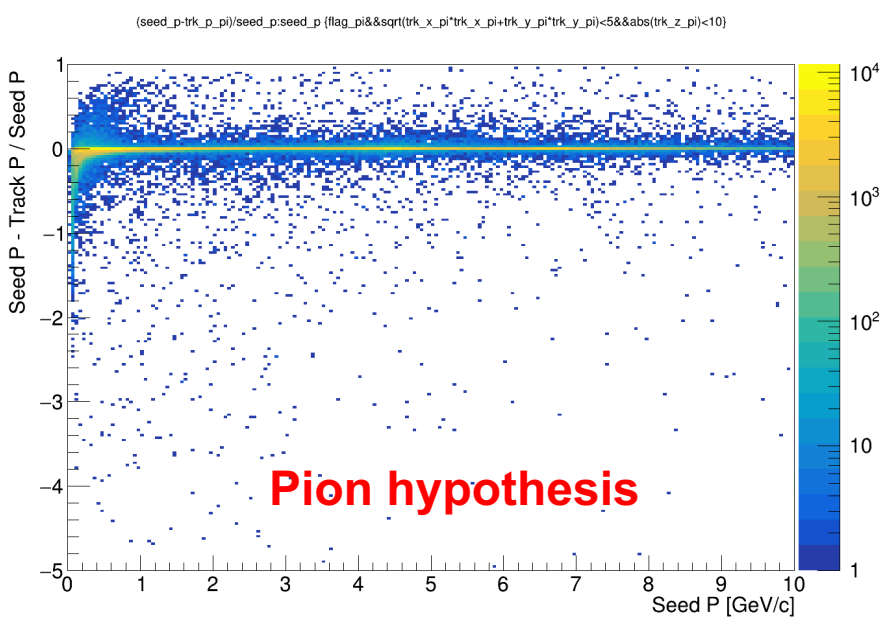


IP and non IP tracks

ALL TRACKS



R < 5 cm, |Z| < 10 cm

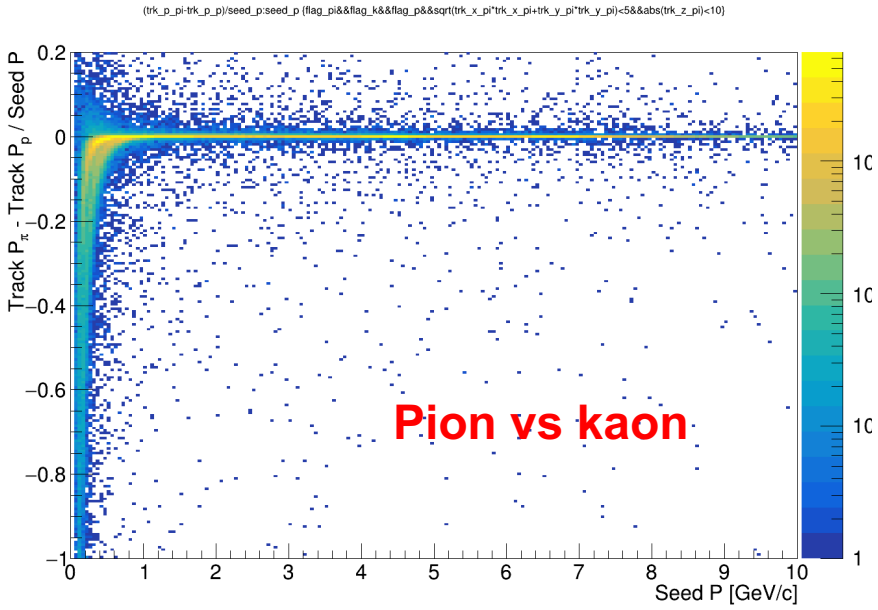


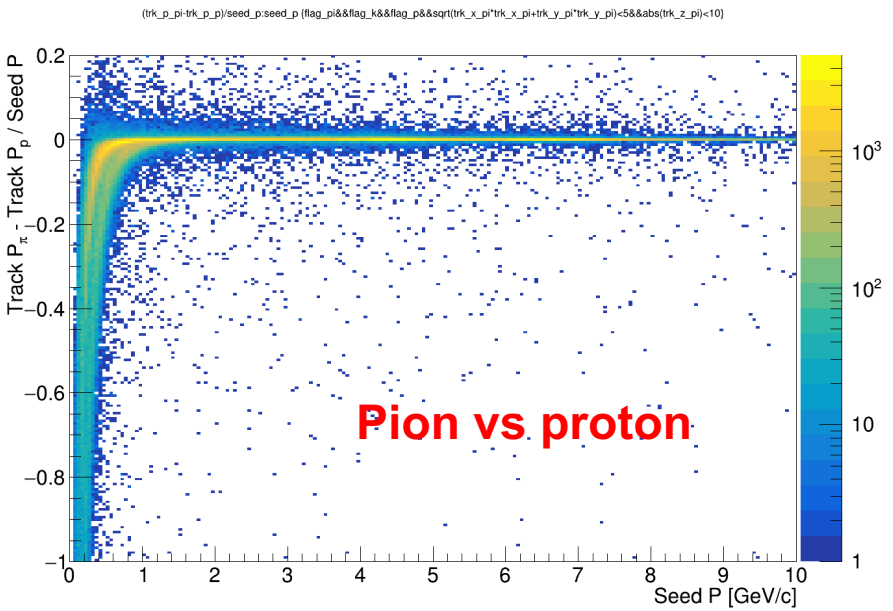
The major changes are present for non IP tracks

With IP requirements the distribution is much clearer

P differences between hypotheses?

R < 5 cm, |Z| < 10 cm



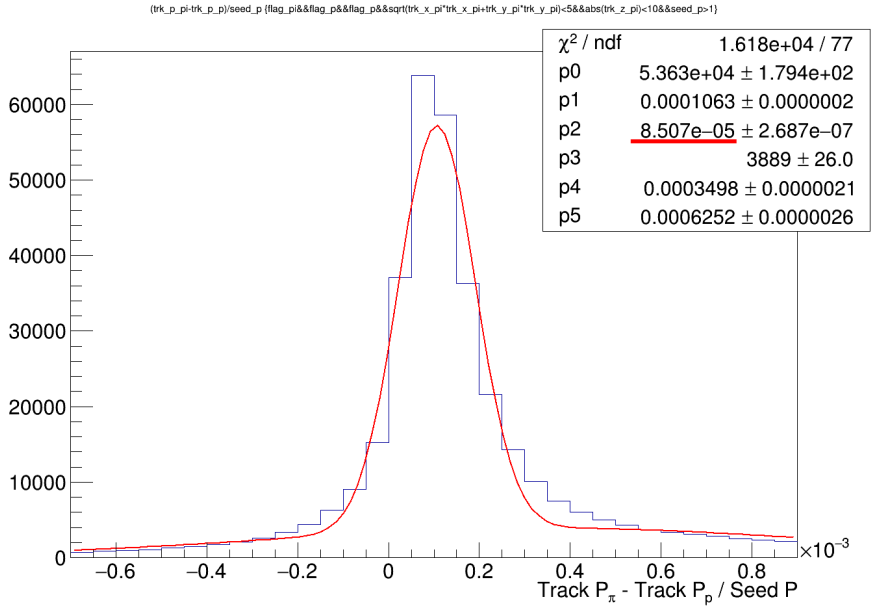


Above 1 GeV/c substantially no differences

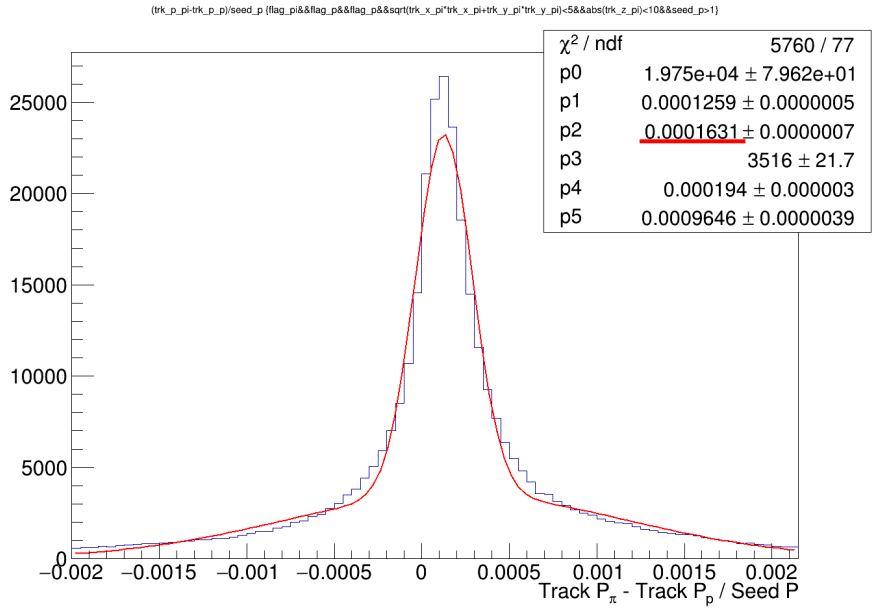
P differences between hypotheses - 2

R < 5 cm, |Z| < 10 cm, P > 1 GeV/c

Pion - kaon

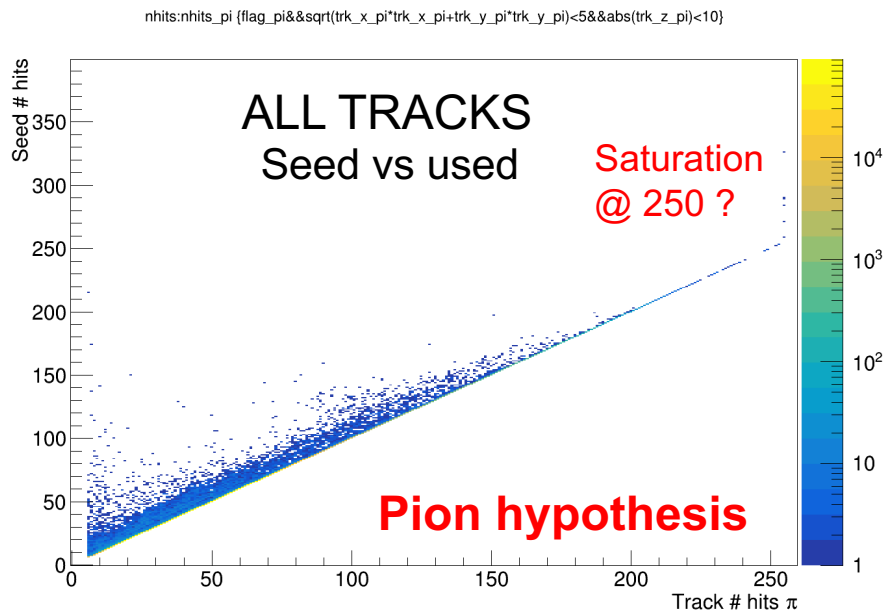


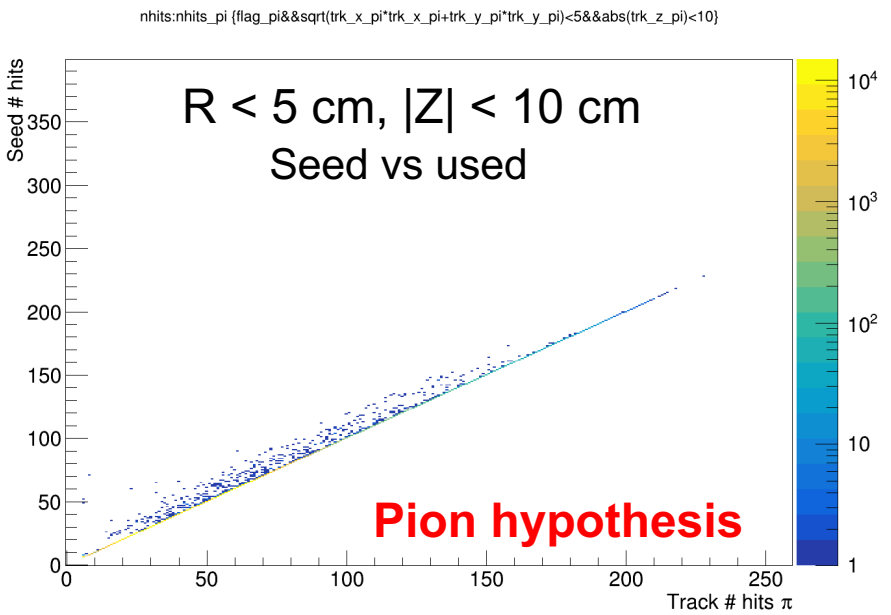
Pion - proton

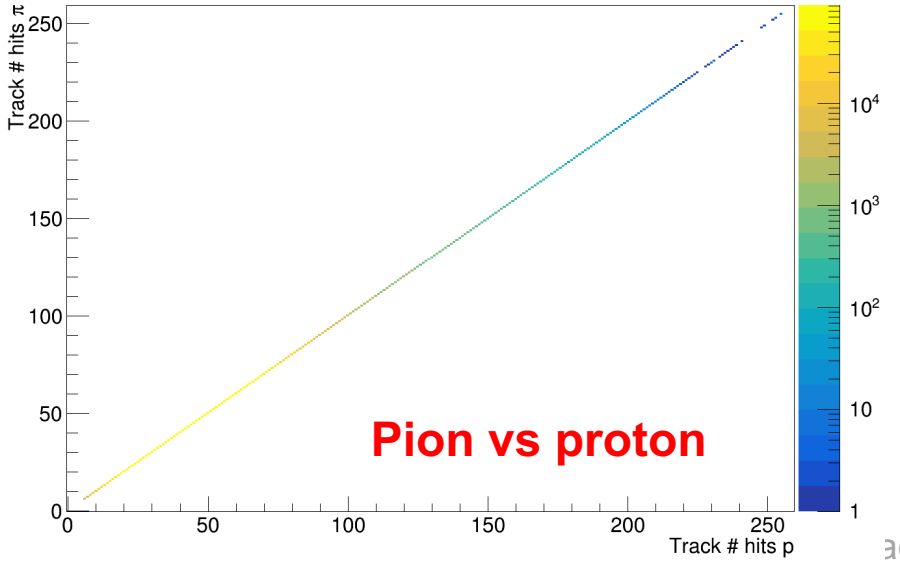


Above 1 GeV/c substantially no differences

What about number of tracking hits?







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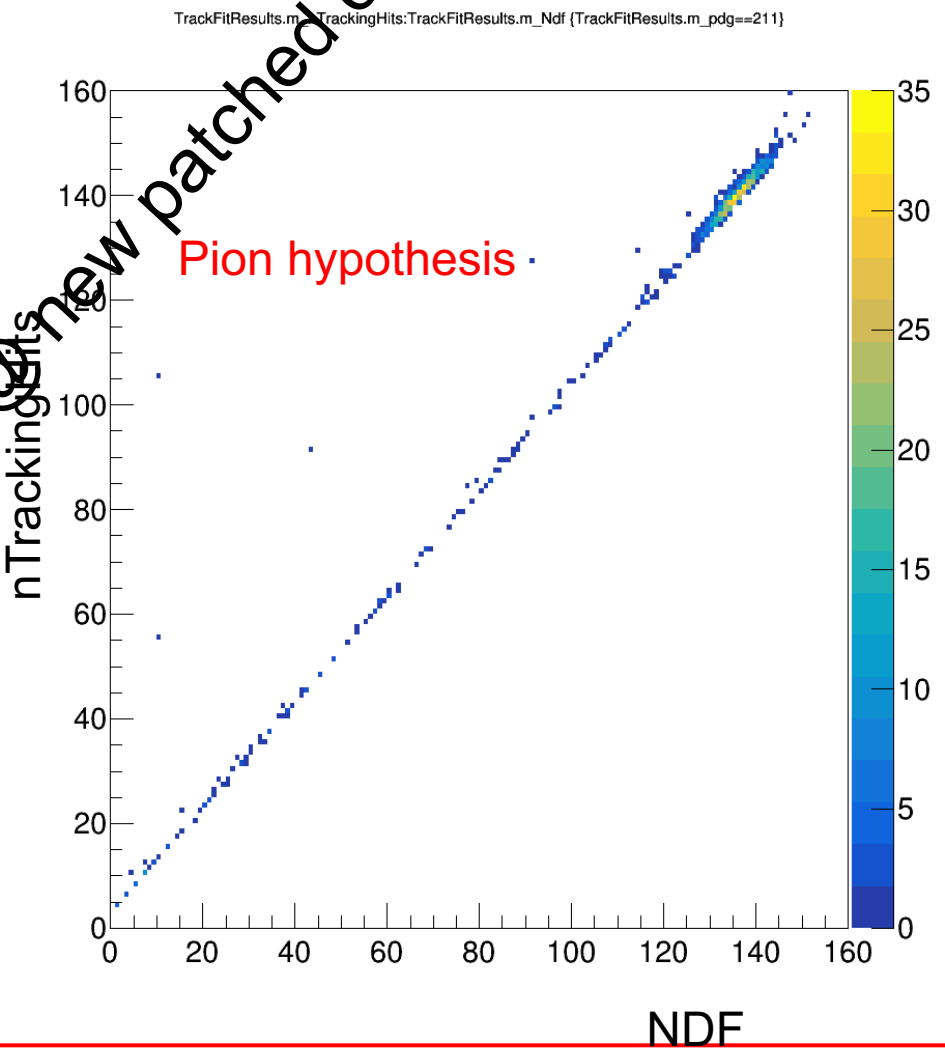
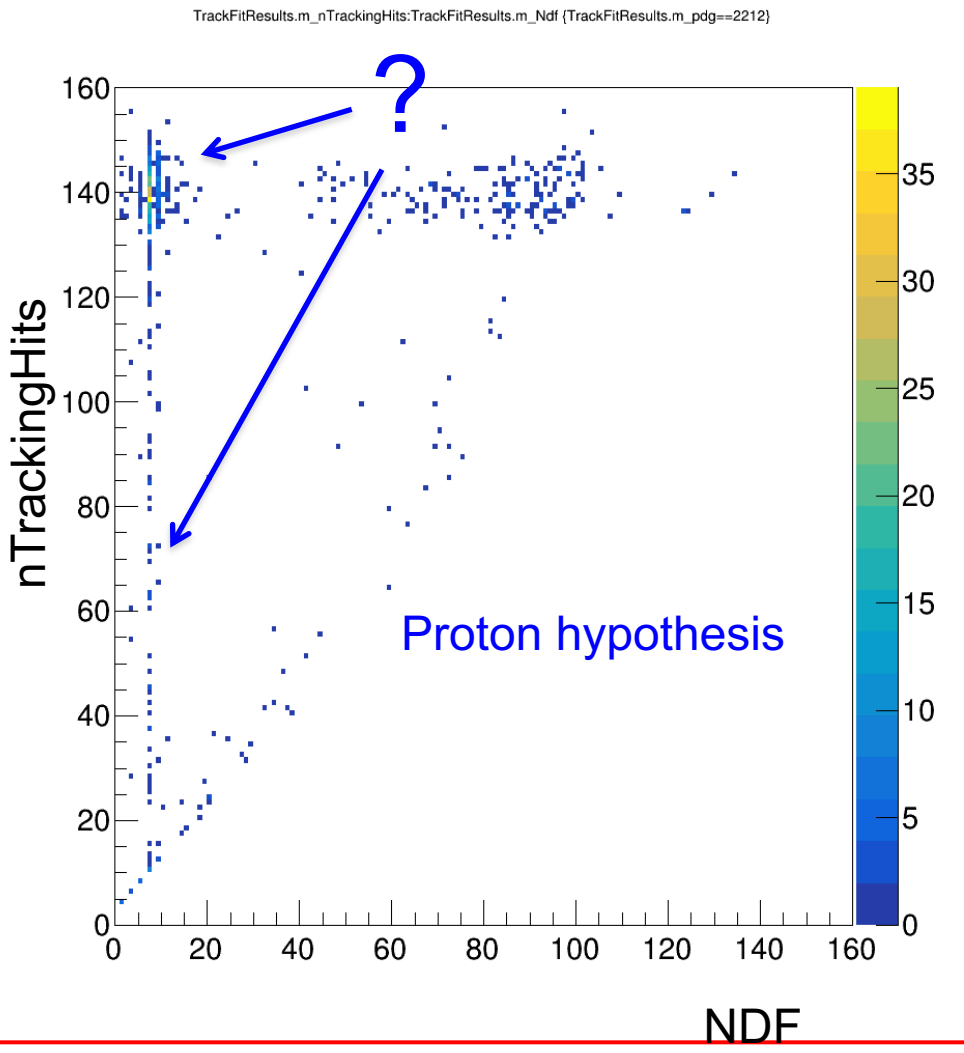
In contradiction to what shown in the past

1000 pions at p_t 0.2 GeV/c, 60°

new patched code





Last December in Pisa

The end

Time for comments, questions, suggestions, whatever