Karlsruher Institut für Technologie

weekly meeting 2018

FUN WITH PXD RECONSTRUCTION

19.01.2018

Nils Braun | IETP - KIT

1.

DEAD PXD AREAS

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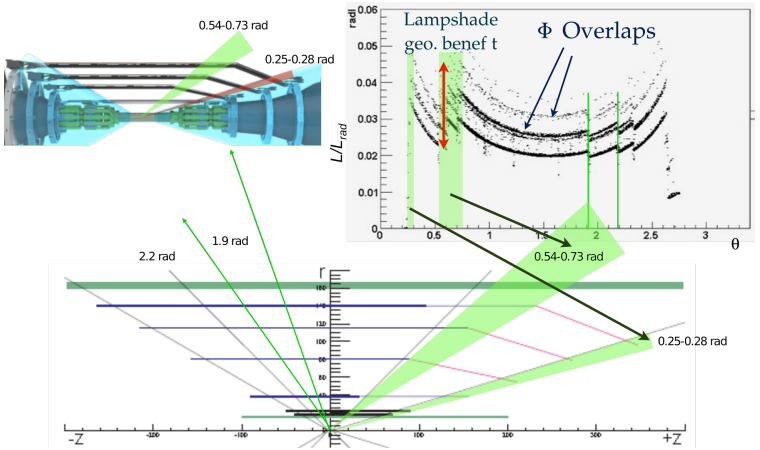
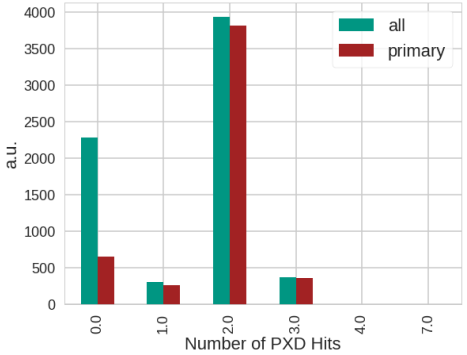
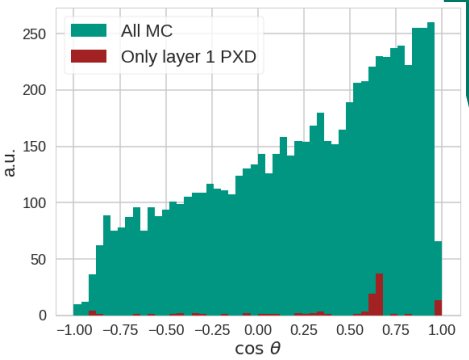


Slide taken from Eugenio.

MC ANALYSIS


all
primary
a.u.
4000
3500
3000
2500
2000
1500
1000
500
0
0.0
1.0
2.0
3.0
4.0
7.0
Number of PXD Hits


All MC
Only layer 1 PXD
a.u.
250
200
150
100
50
0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
cos θ

CURRENT STATUS

- It was reported by Fernando and Vladimir, that there is exactly no track with a PXD hit in layer 1 but not in layer 2.
- This is enforced by a setting in the PXD CKF.
- I will show results based on the new CKF branch (PR #1323), although report was on release 01-00 (but makes no difference).

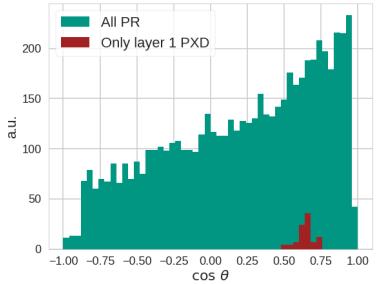
pxd hits	first pxd layer	last pxd layer	pxd hit purity
0	-	-	-
1	2	2	0.7540
2	1	2	0.9885
2	2	2	0.9807
3	1	2	0.9900

A QUICK AND DIRTY FIX

- As the region is very narrow, one can look at those tracks in a special handling.
- I do not allow for empty PXD layer 2 in the first round. In the second round I only look on tracks with $\cos\theta$ between 0.55 and 0.7 and allow for more hit jumping there (if they do not have associated PXD hits already).
- This is very hacky, but does the job.

RESULTS

	before fix	after fix
mc no pxd hits at all	0.1255	0.1170
pxd hit efficiency (prim)	0.8584	0.8665
fake rate	0.0201	0.0203
clone rate	0.0431	0.0431
pxd hit purity	0.9674	0.9594



pxd hits	first	last	pxd hit purity
1	1	1	0.4788
1	2	2	0.7567
2	1	2	0.9886
2	2	2	0.9807
3	1	2	0.9900

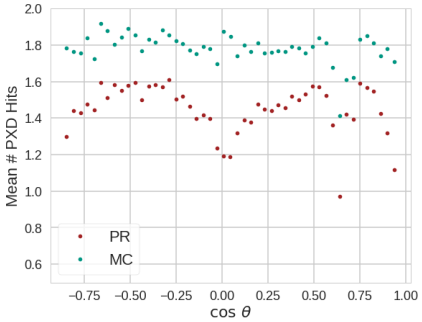
OUTLOOK

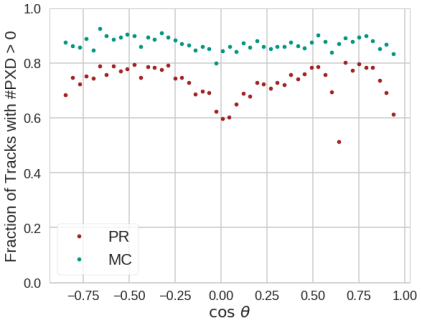
- Current behavior is very strict - but out of a good reason.
- Hotfix is available - but I would rather not push it to master or the release.
- Better handling is possible - but needs time I do not have before B2GM.
- How to proceed?

2.

DIP AT $\cos\theta = 0$

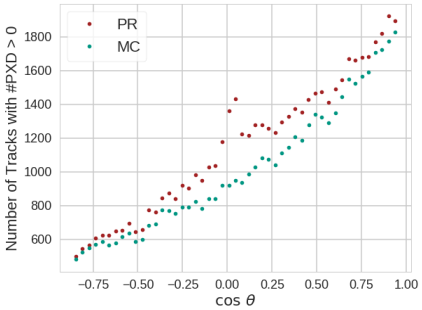
IS OUR PXD TRACKING REALLY SO BAD?

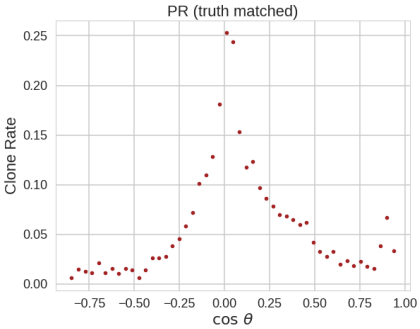




As shown by A. Gaz in the last tracking meeting (and also before), it seems we have a strange dip at $\cos\theta = 0$ in the PXD efficiency.

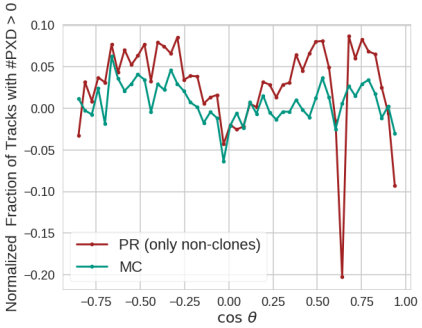
A SECOND ORDER EFFECT

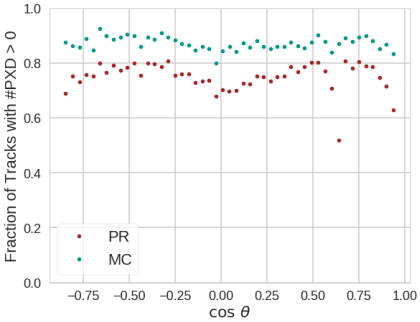




Attention: because of the special geometry at this point, the number of loops is very high for the particles and therefore the clone rate is extraordinary high! This destroys the ”number of PR tracks” plot!

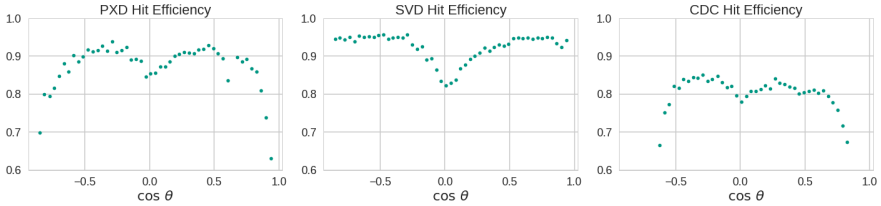
NORMALIZED PLOTS



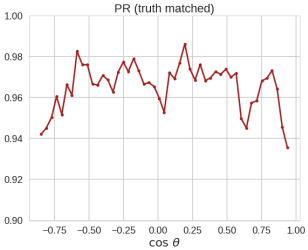


ADDITIONAL THINGS I DISCOVERED

- Caused by the large number of loops, the hit efficiency is also quite low:

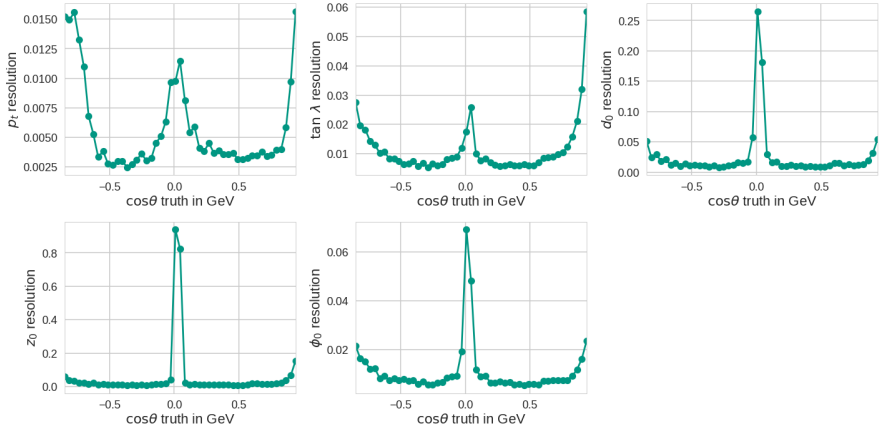


- There seems to be no real effect on hit purity:



ADDITIONAL THINGS I DISCOVERED

- The clones have a large impact on the resolution:



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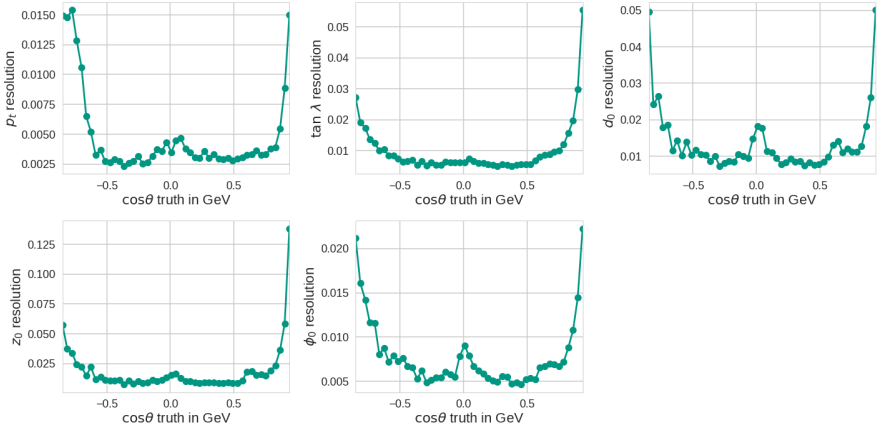

SUMMARY

- The seen issue comes mainly from the fact, that all PR tracks are taken into account - including clones. The clone rate however is very high in this region (a clone detection and resolving algorithm would help here).
- There is a remaining inefficiency even without clones, which is probably a secondary effect, because the ”real” tracks are maybe not the ones with the highest PXD hit efficiency.
- Additionally, the found tracks in this region are ”worse” than the rest in a sense of resolution and hit efficiencies - making the extrapolation more error-prone.