Tracking Performances

outline

- Introduction
- release-00-06-00
- new SVD L3 position
- Conclusions

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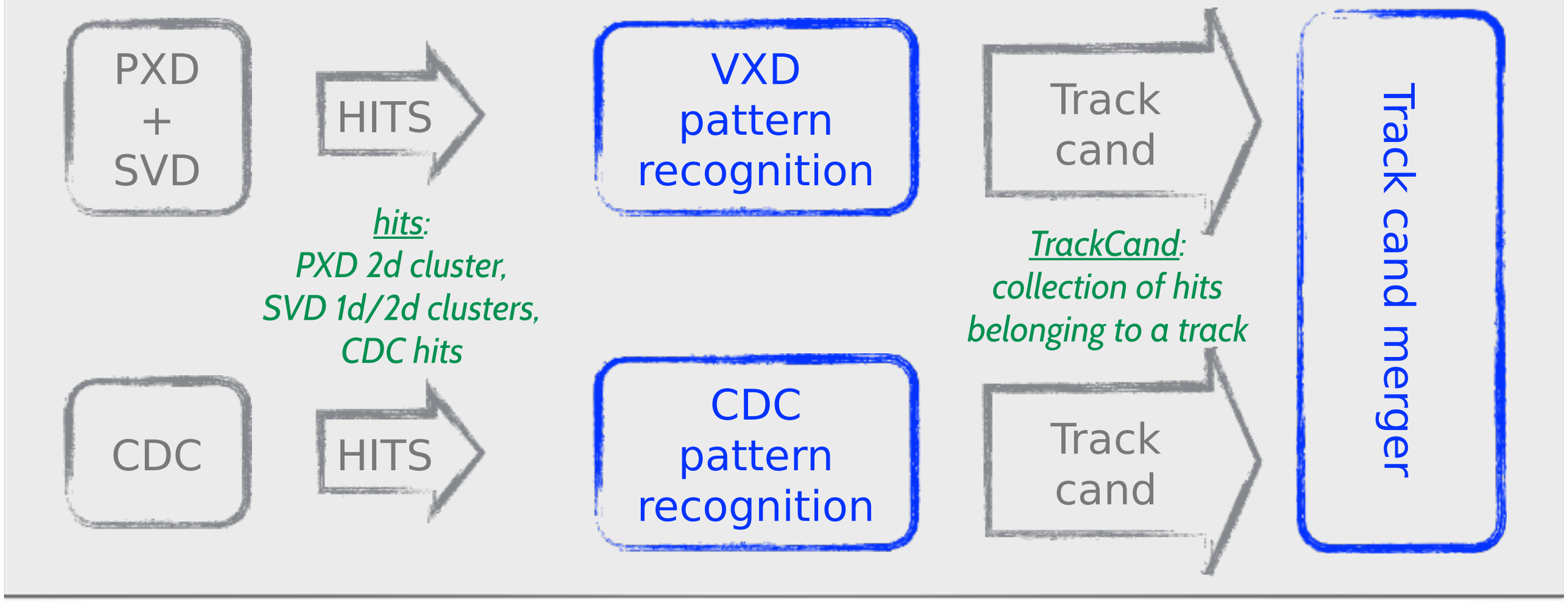
for the Tracking Group

23nd *BelleII* General Meeting ~ February, 3rd 2016

Track Reconstruction (1)

no PXD data reduction
simulation



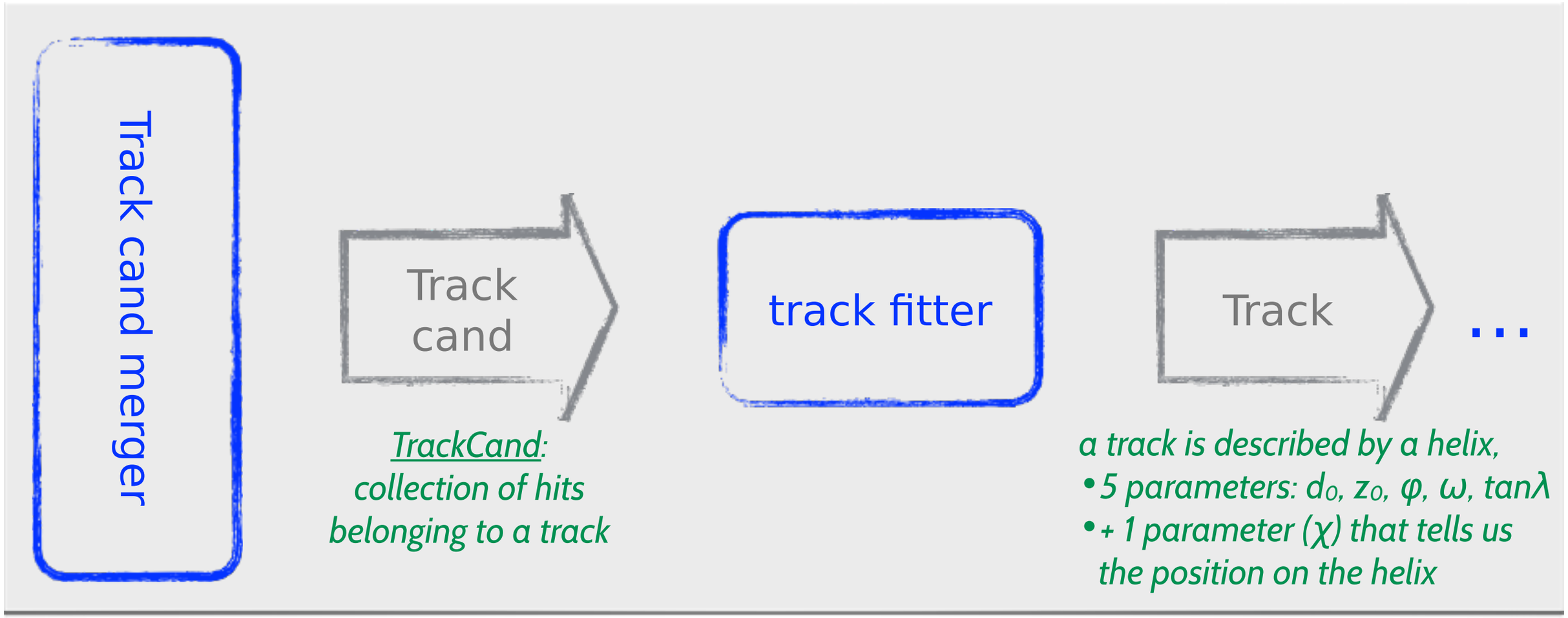
I will show the performances in these two cases

r00-06-00 with new CDC TrackFinder

New geometry based on changed L3 radius

MC-assisted merger

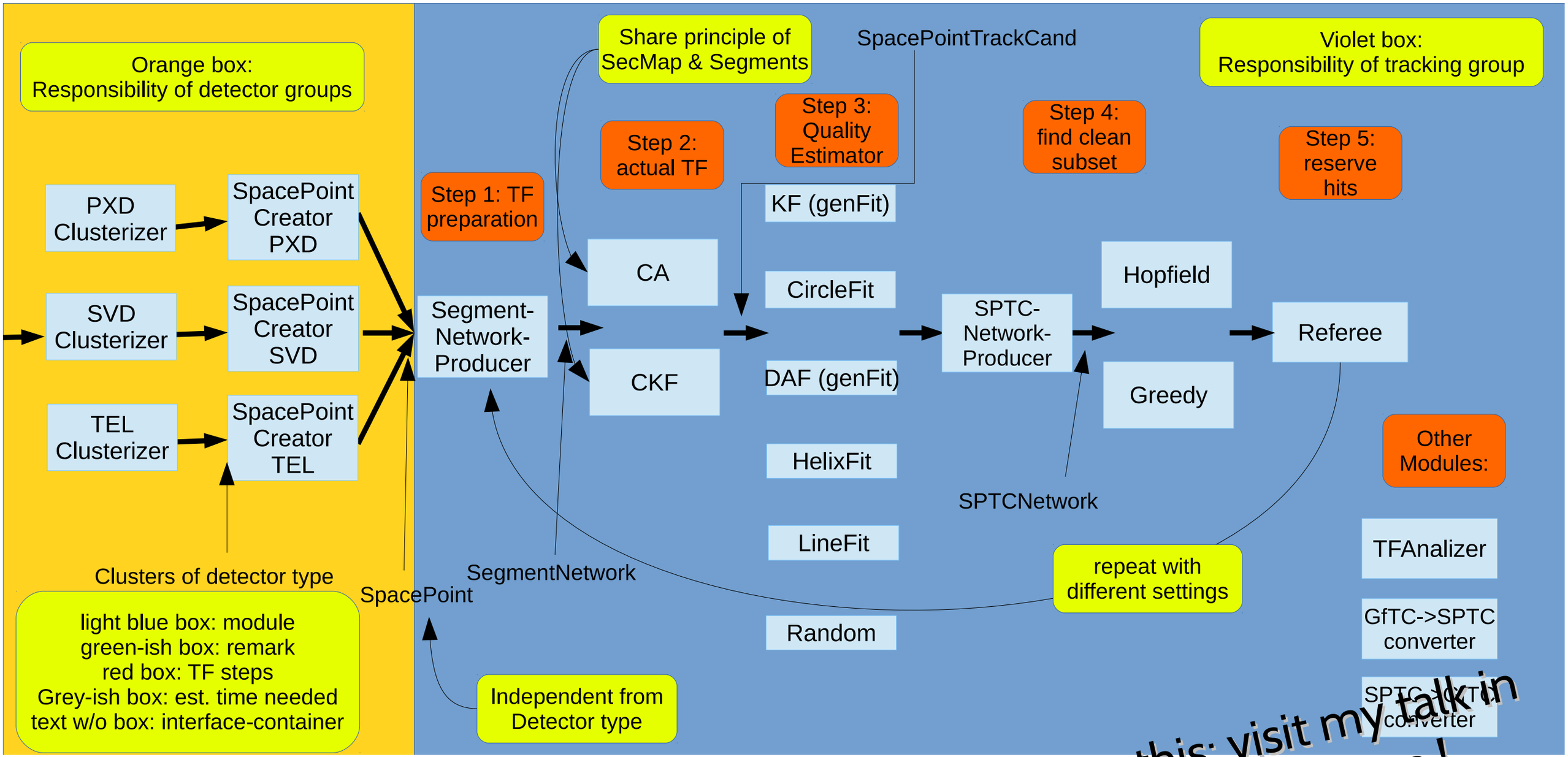
Track Reconstruction (2)



VXD pattern recognition

Track Reconstruction (3) - a glimpse around the corner

Future state of the trackFinderVXD-approach (event-part)

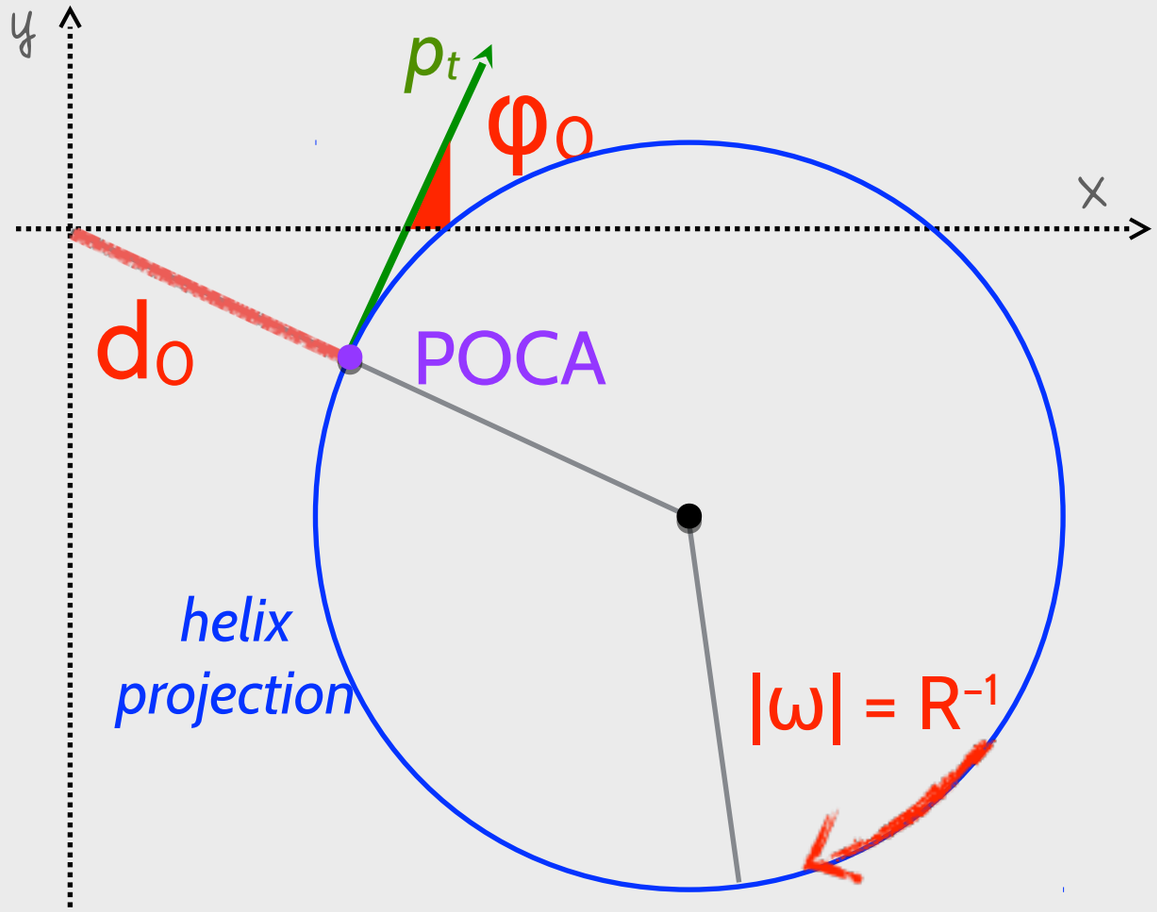


~ main work finished within the next few months ~

More details on this: visit my talk in this hall today @ 5:50 p.m.!

Track Parameterisation

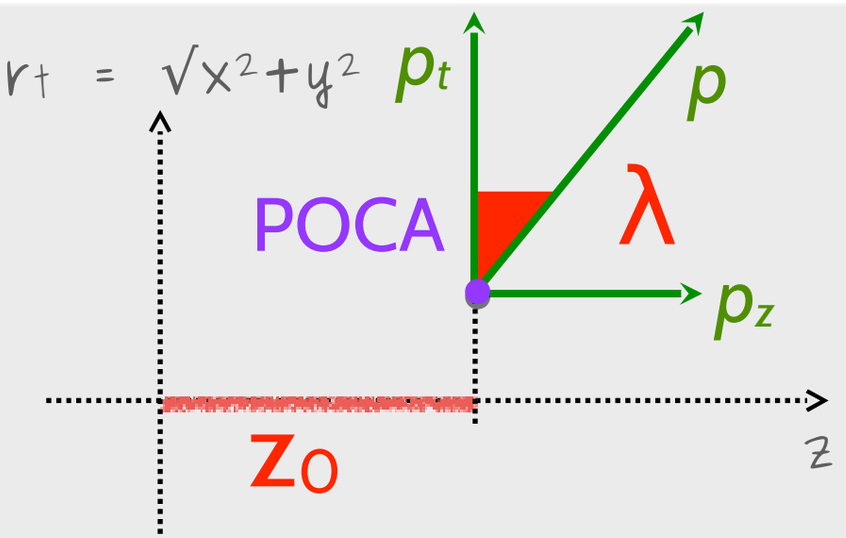
transverse plane



- POCA = Point Of Closest Approach
- d_0 is the 2d signed distance of the POCA from the z axis, the sign depends on the angular momentum of the track (>0 in the fig.)
- φ_0 is the angle between p_t and the x axis at the POCA, $\varphi_0 \in [-\pi,\pi]$
- the sign of ω, the curvature, is the same as the charge of the track (>0 in the fig.)

longitudinal view

- $\tan\lambda$ is the ratio of p_z and p_t, $\lambda \in [-\pi,\pi]$
- z_0 is the signed distance of the POCA from the transverse plane



relase 00-06-00 performances

efficiency & purity + *track quality*

~ latest release available ~

Integrated Efficiency

- this study is based on a sample of 10k Y(4S) generic decays reconstructed with the official standard reconstruction with the addition of the MC information

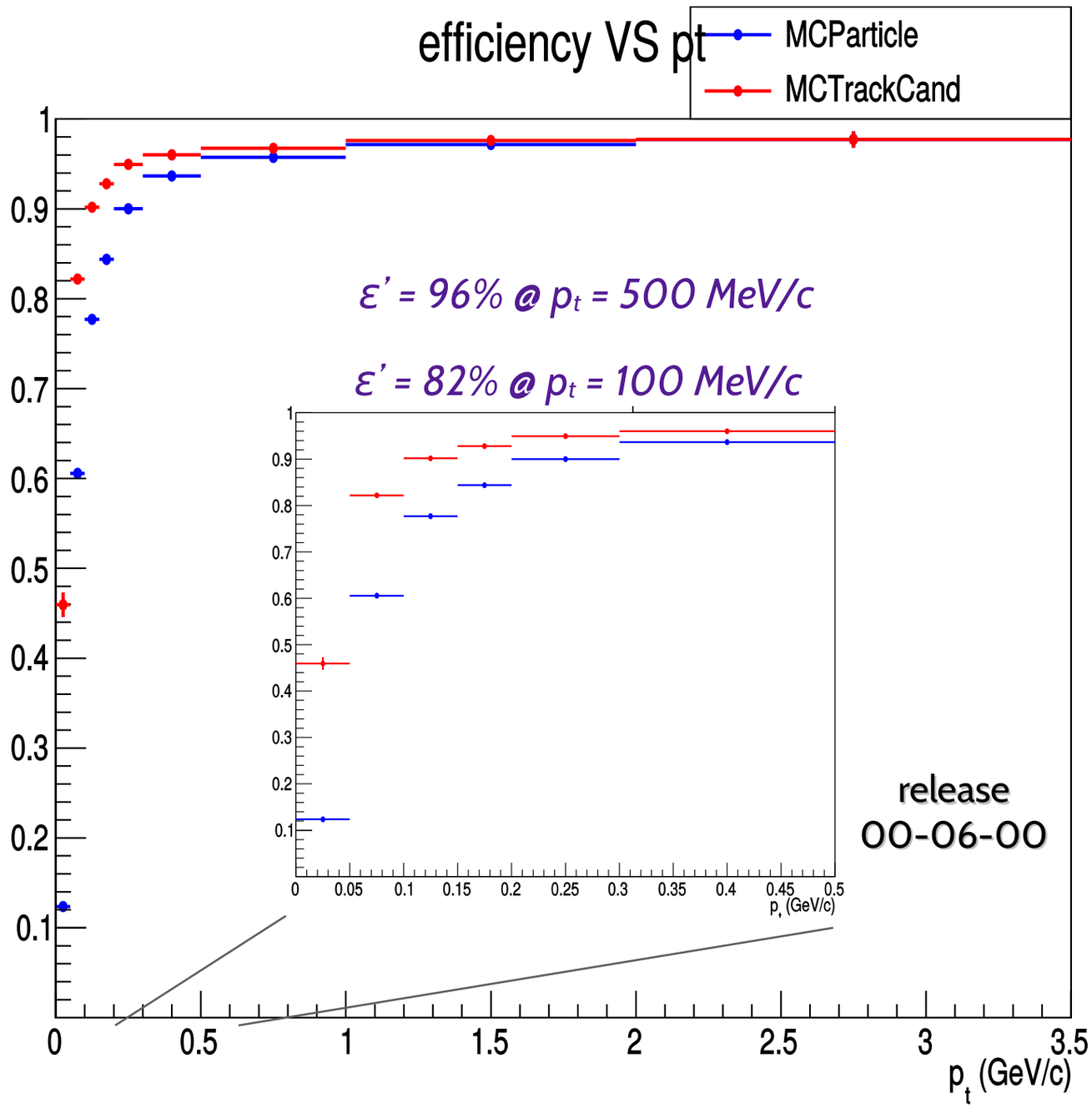
definition	*efficiency (%)*	release 00-05-03	release 00-06-00	revision 24691
$\frac{\#\text{MCParticles with at least one associated Track}}{\#\text{ MCParticles}}$	**physical**	85.6±0.1	85.3±0.1	85.3±0.1
$\frac{\#\text{MCTrackCands with at least one associated Track}}{\#\text{MCTrackCands}}$	**geom. accept. & det. ineff. factored out**	94.0±0.1	93.8±0.1	93.8±0.1
$\frac{\#\text{MCTrackCand with at least one associated TrackCand}}{\#\text{MCTrackCands}}$	**pattern recognition**	96.6±0.1	94.9±0.1	95.0±0.1

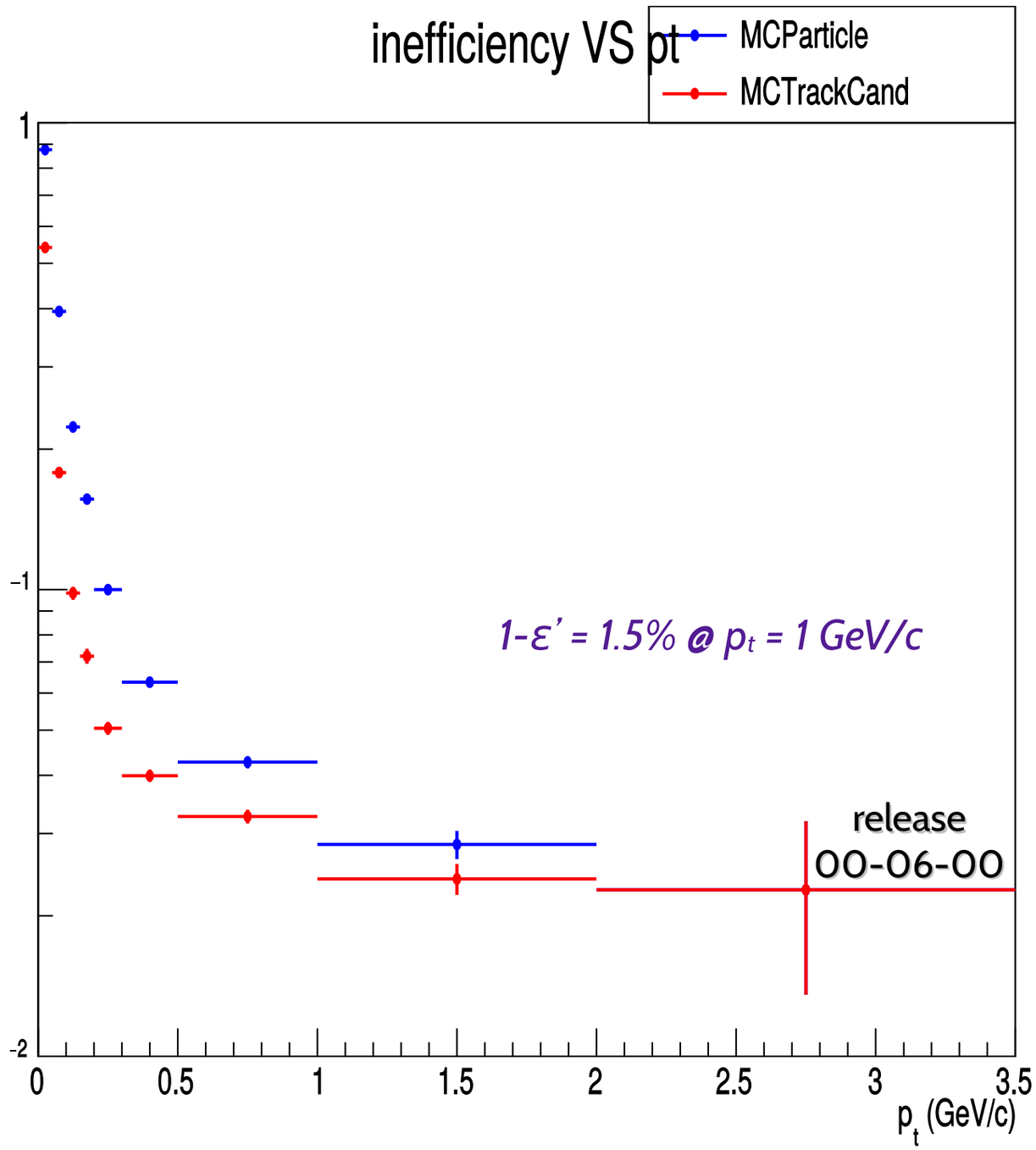
NOTE: MCTrackCand from ideal pattern recognition

- changes since r00-05-03: new CDC tracking (r00-06-00) and new SVD L3-geometry (r24691)
- pattern recognition efficiency is slightly worse compared to r00-05-03
- physical efficiency is compatible with last release

release 00-06-00

Efficiency VS Transverse Momentum

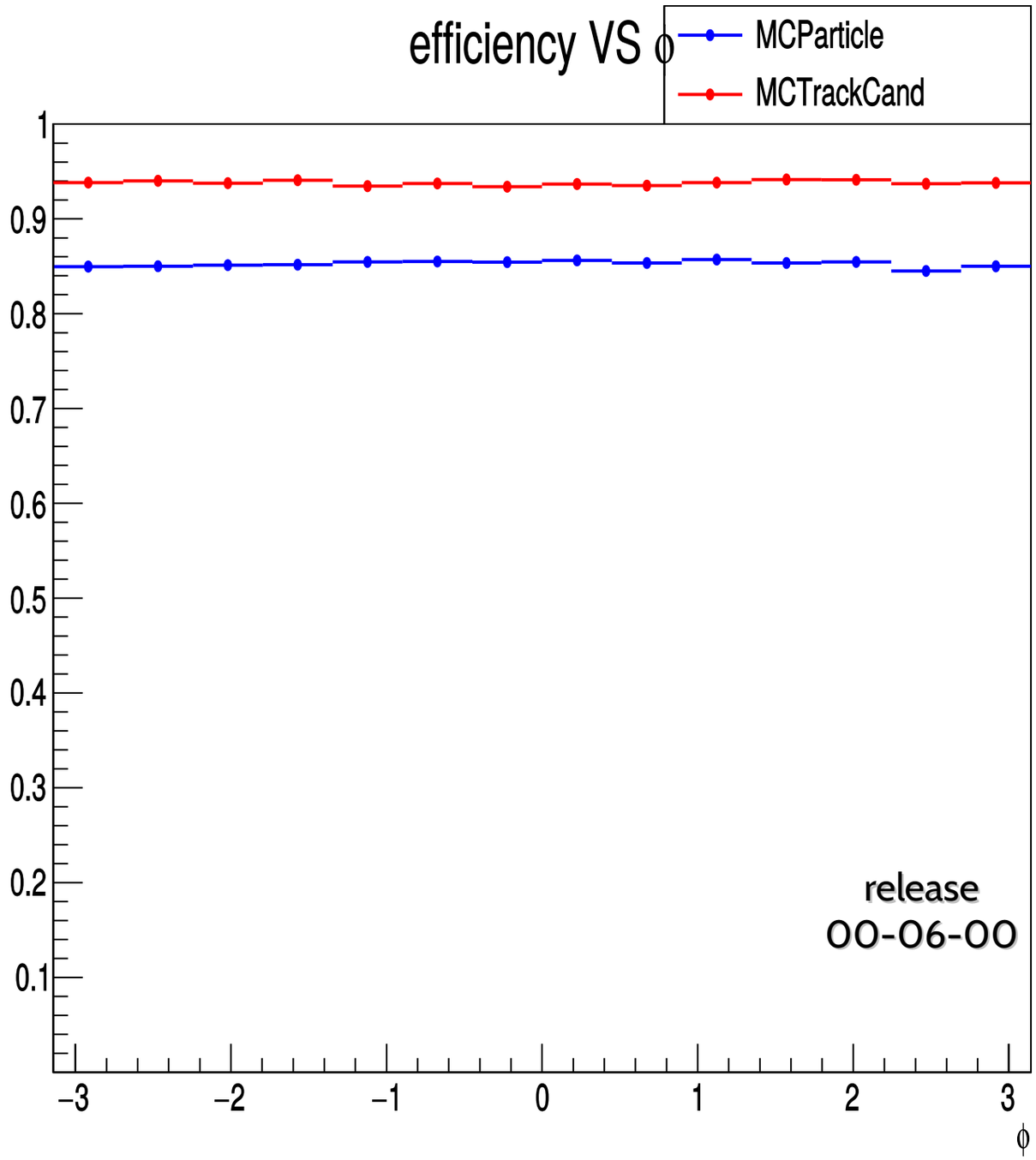


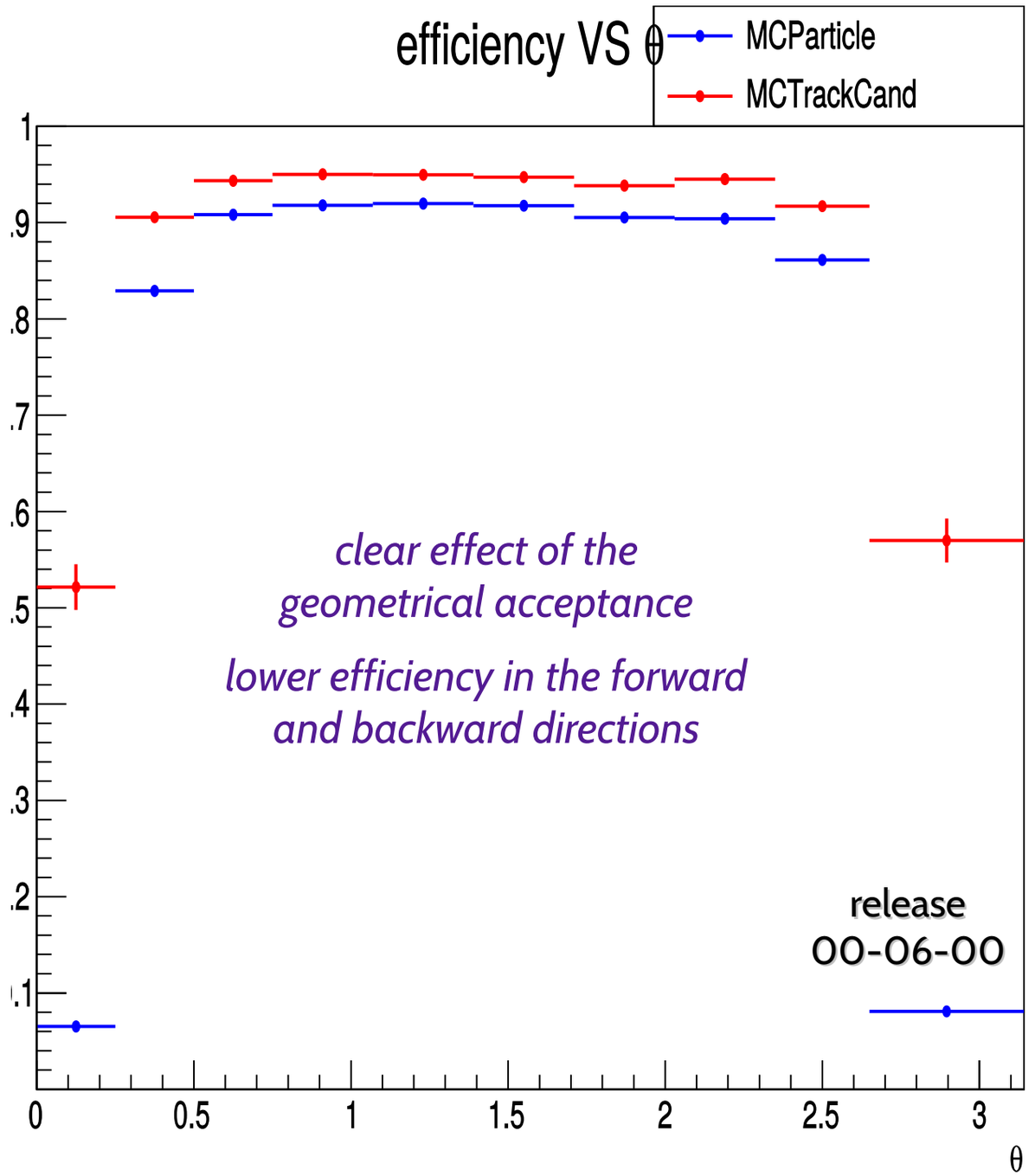


legend:

- physical efficiency
- geometrical acceptance and detector efficiency factored out

Efficiency VS Polar and Azimuthal Angles





legend:

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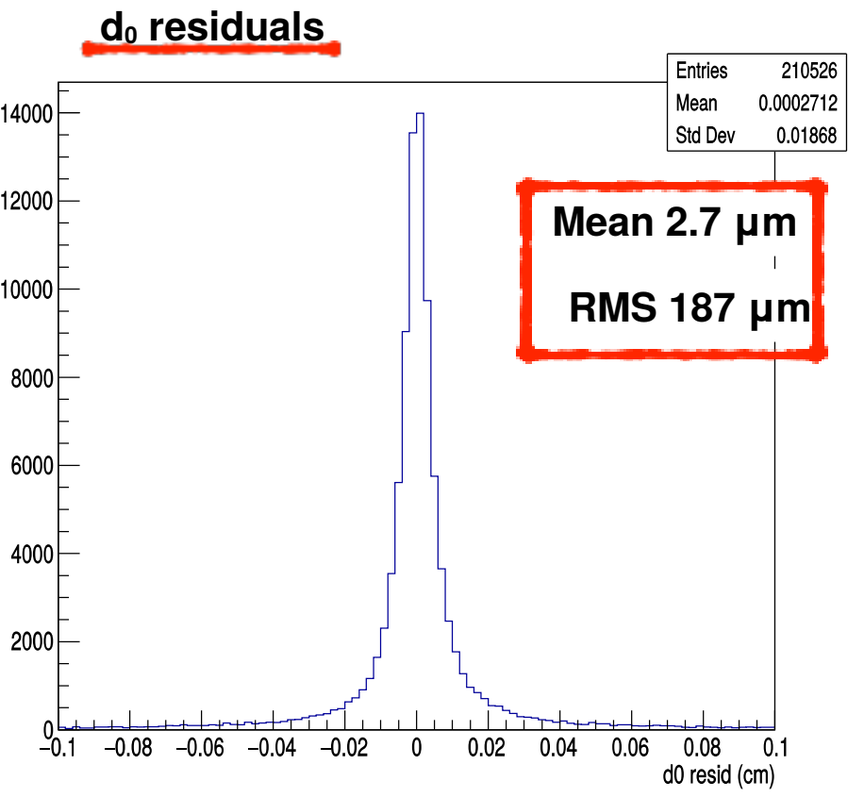
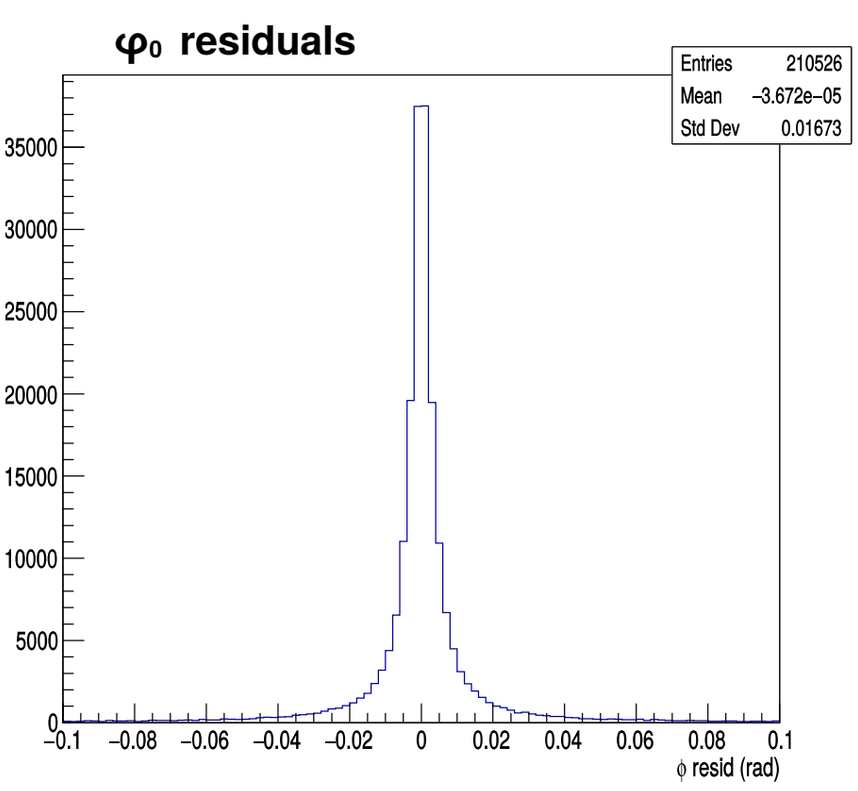
- geometrical acceptance and detector efficiency factored out

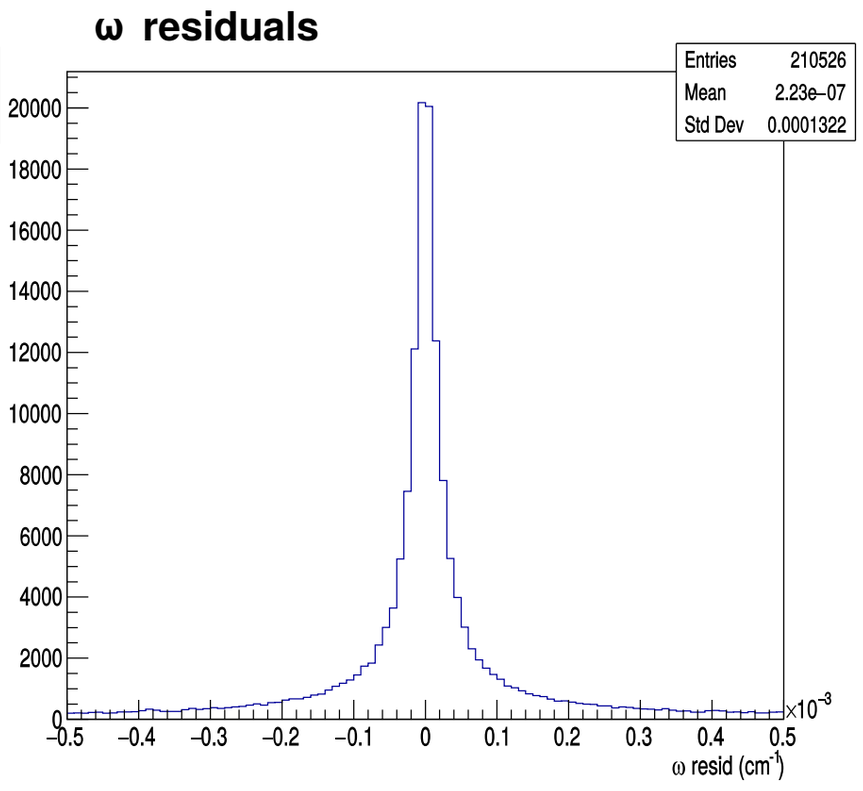
track quality

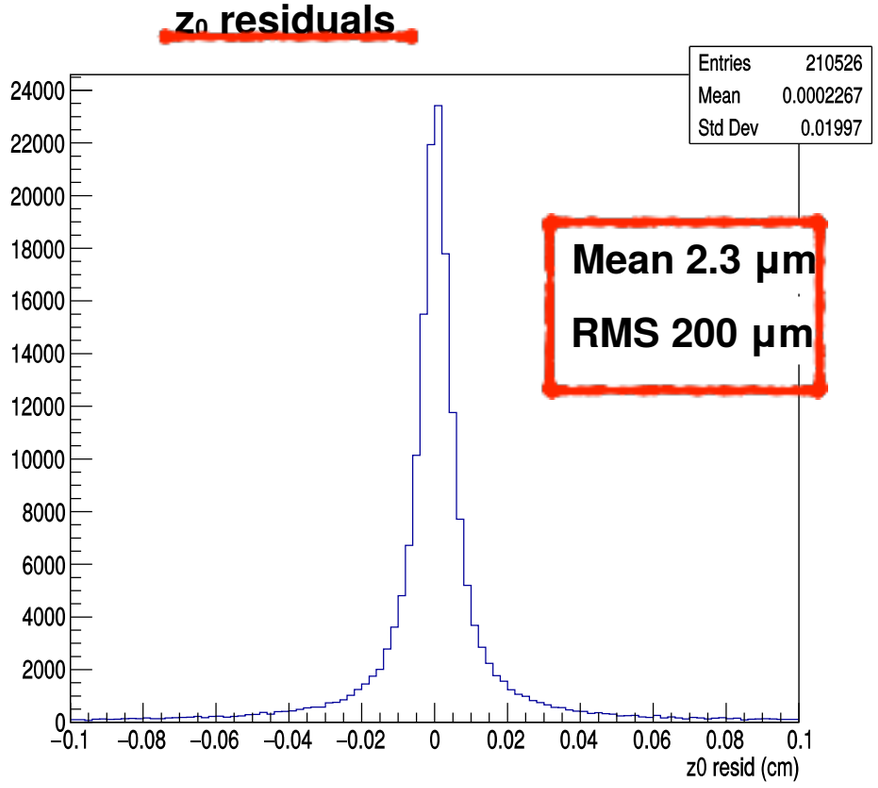
release 00-06-00

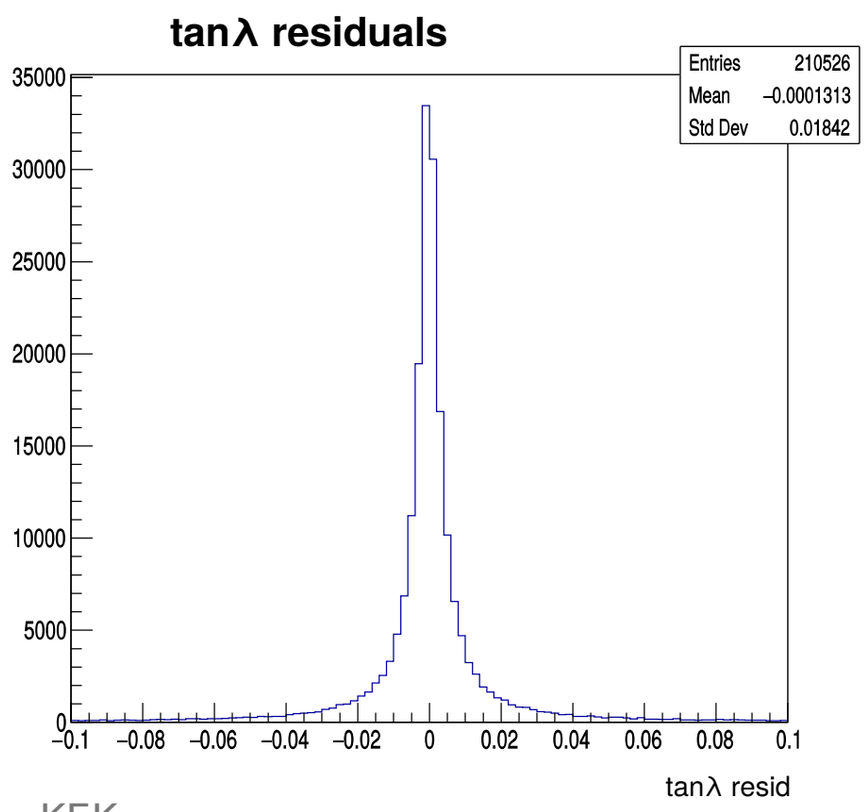
Track Parameters Resolutions (reco–true)







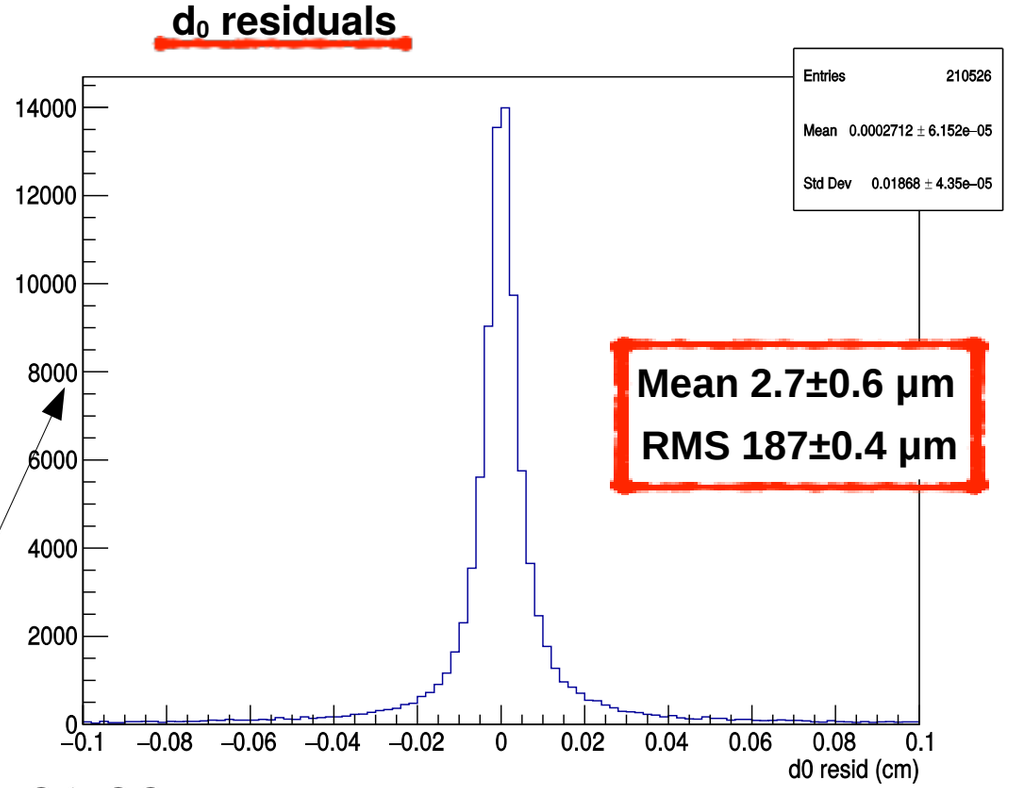


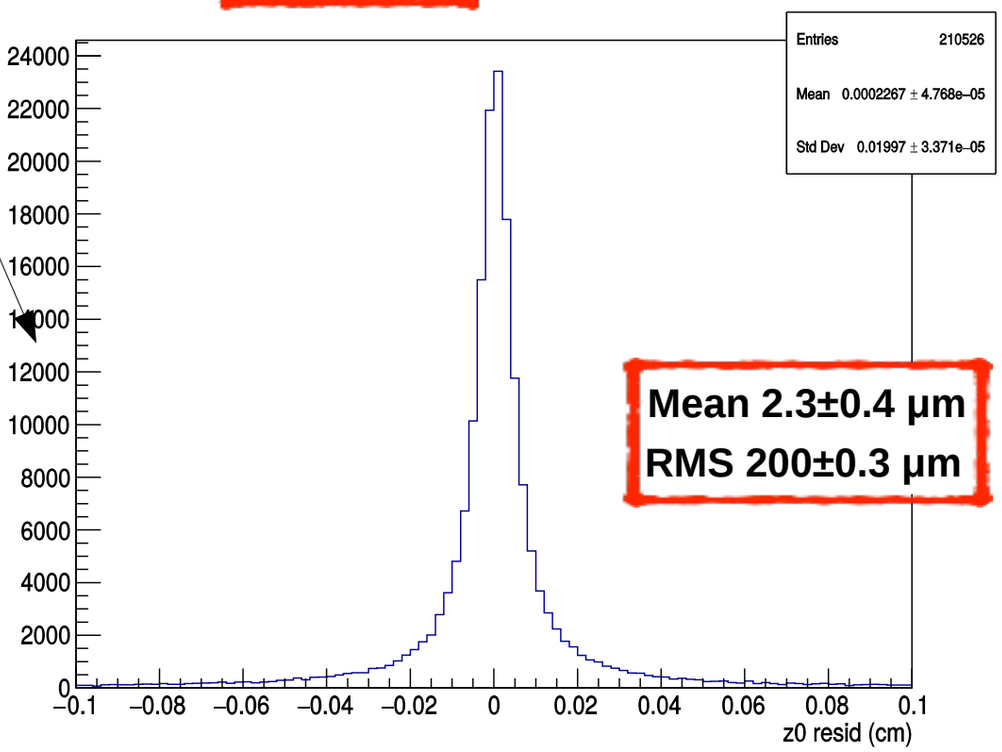


track quality

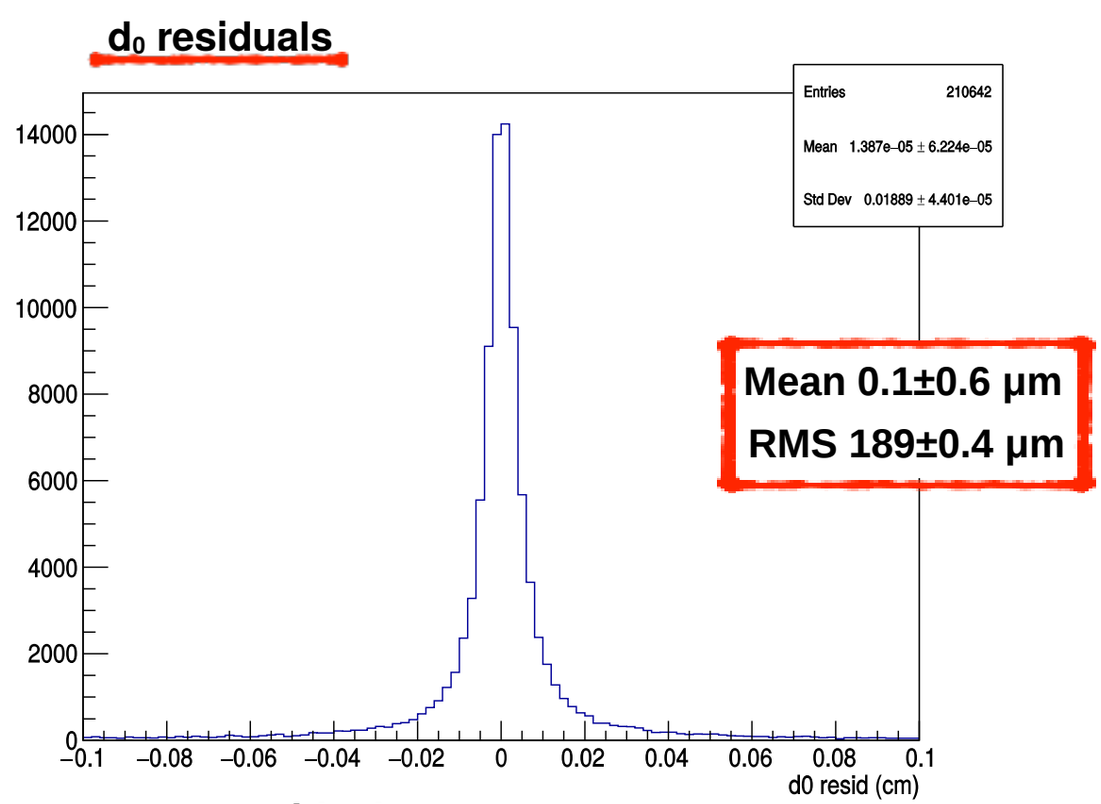
Track Parameters Resolutions (reco–true)

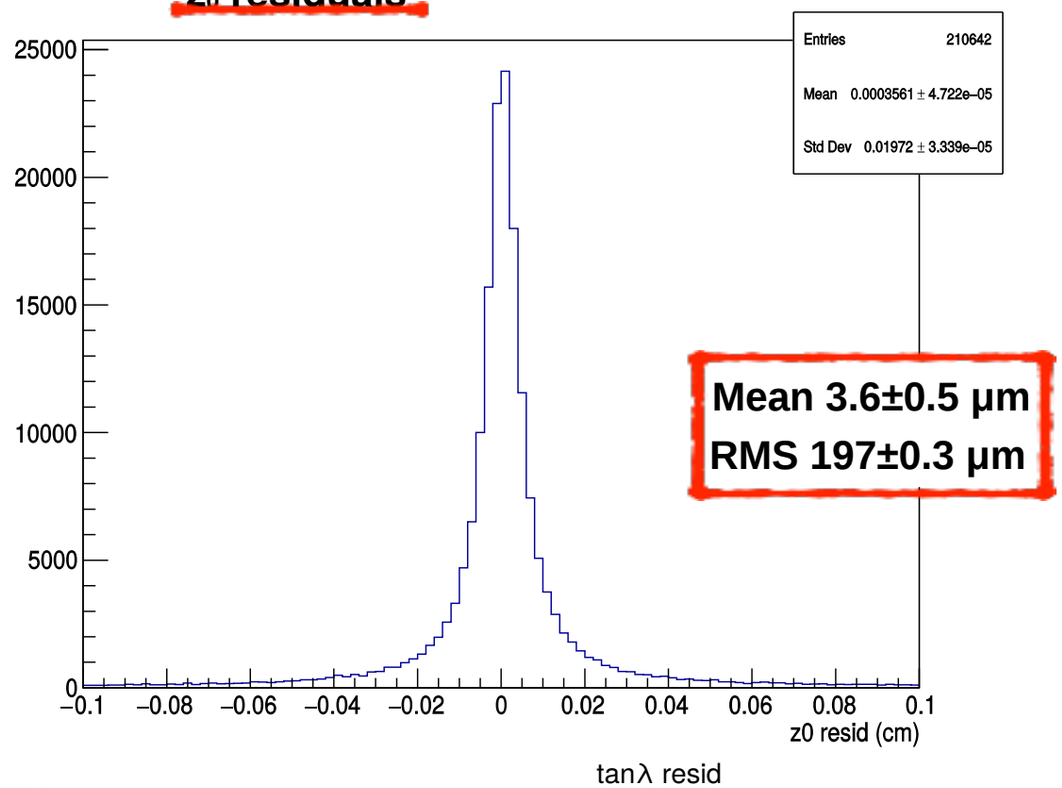
release 00-06-00





r24693



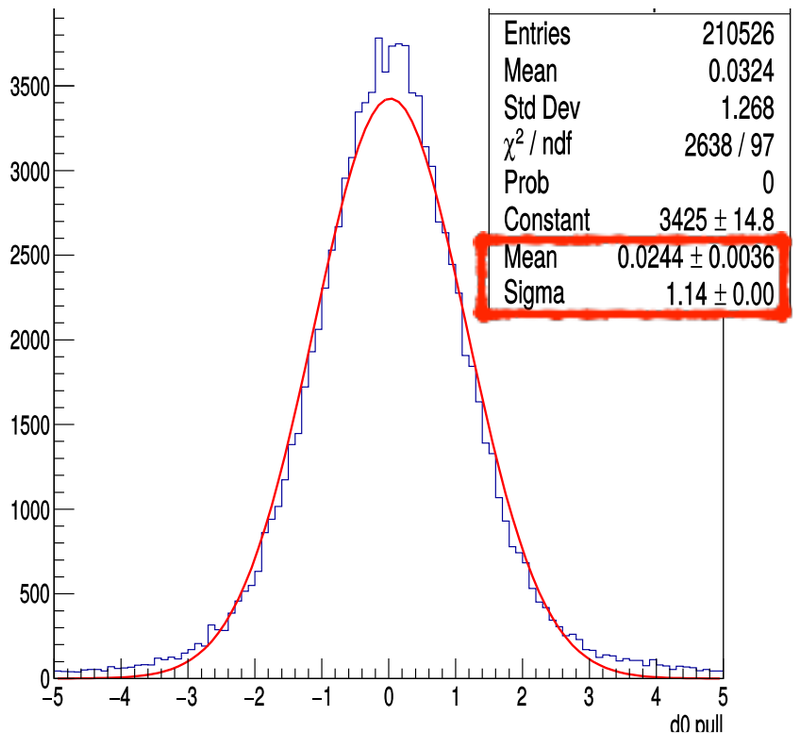


track quality

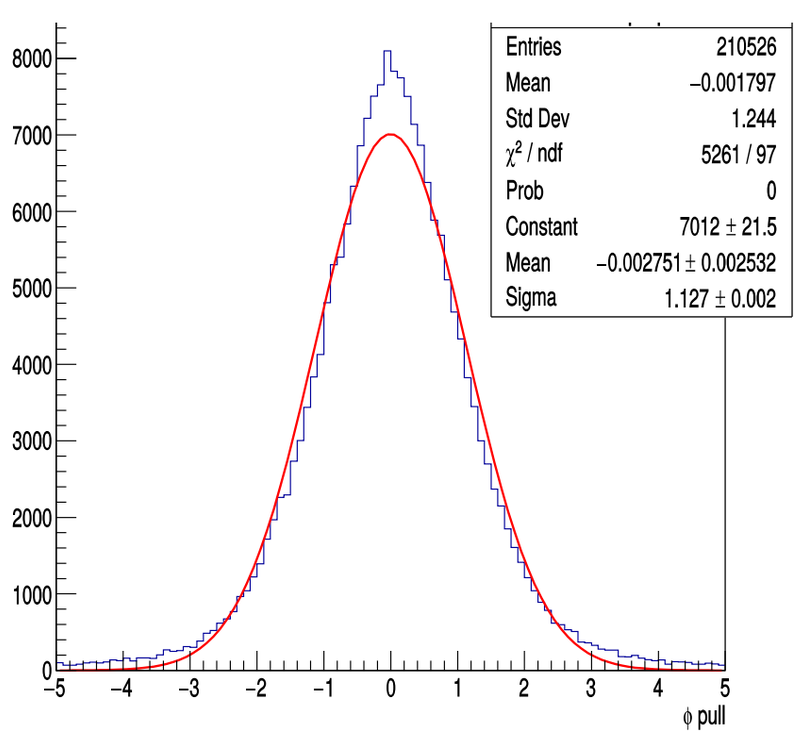
release 00-06-00

Track Parameters Pulls (reco–true)/error

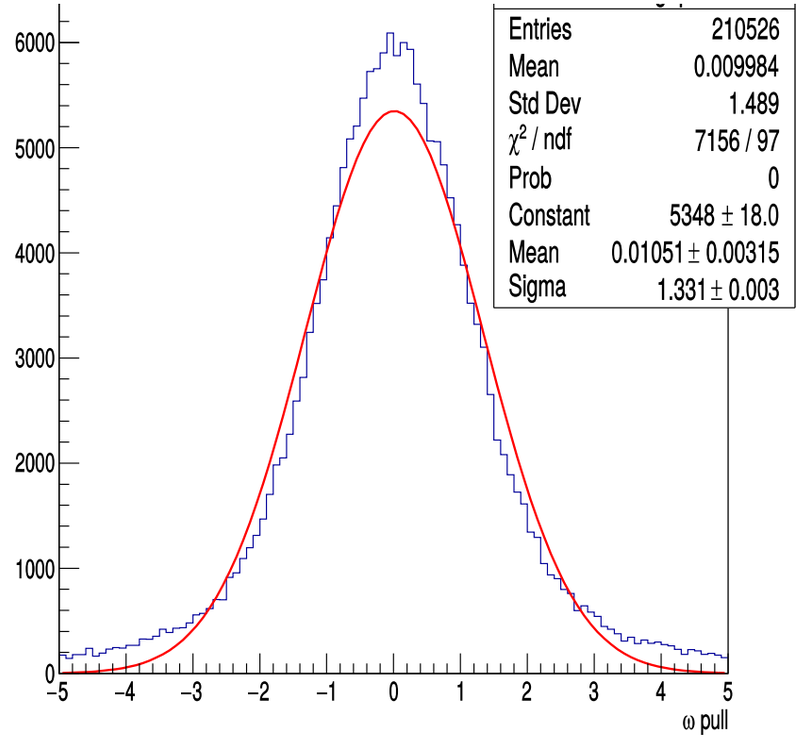
d0 pulls



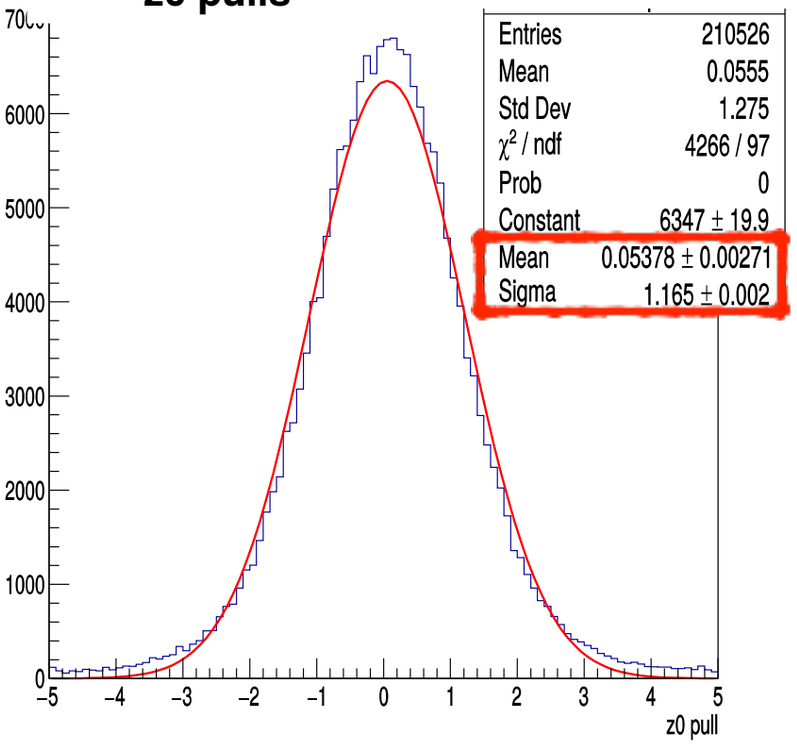
phi pulls



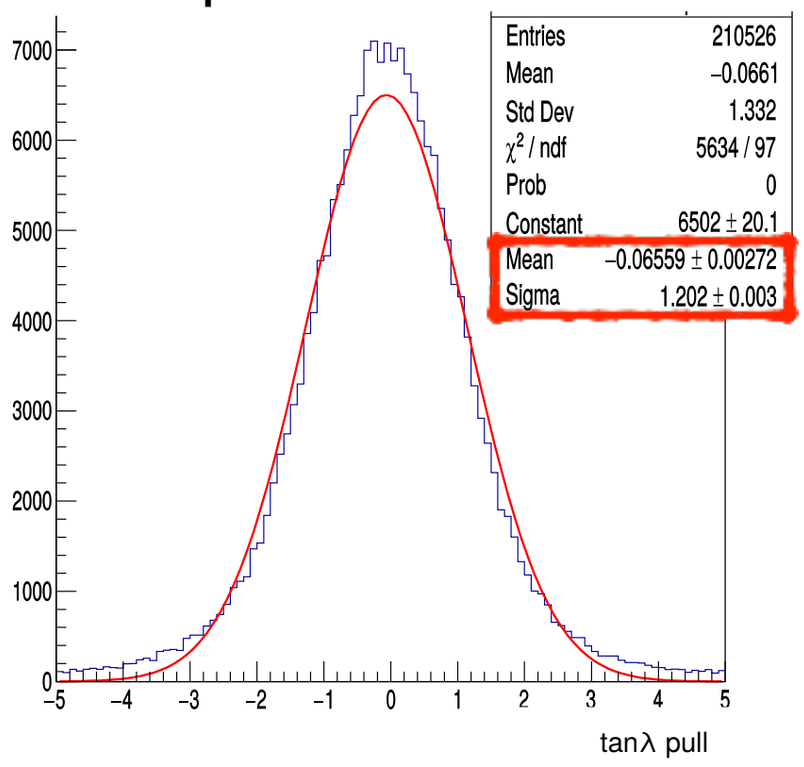
omega pulls



z0 pulls



tanλ pulls

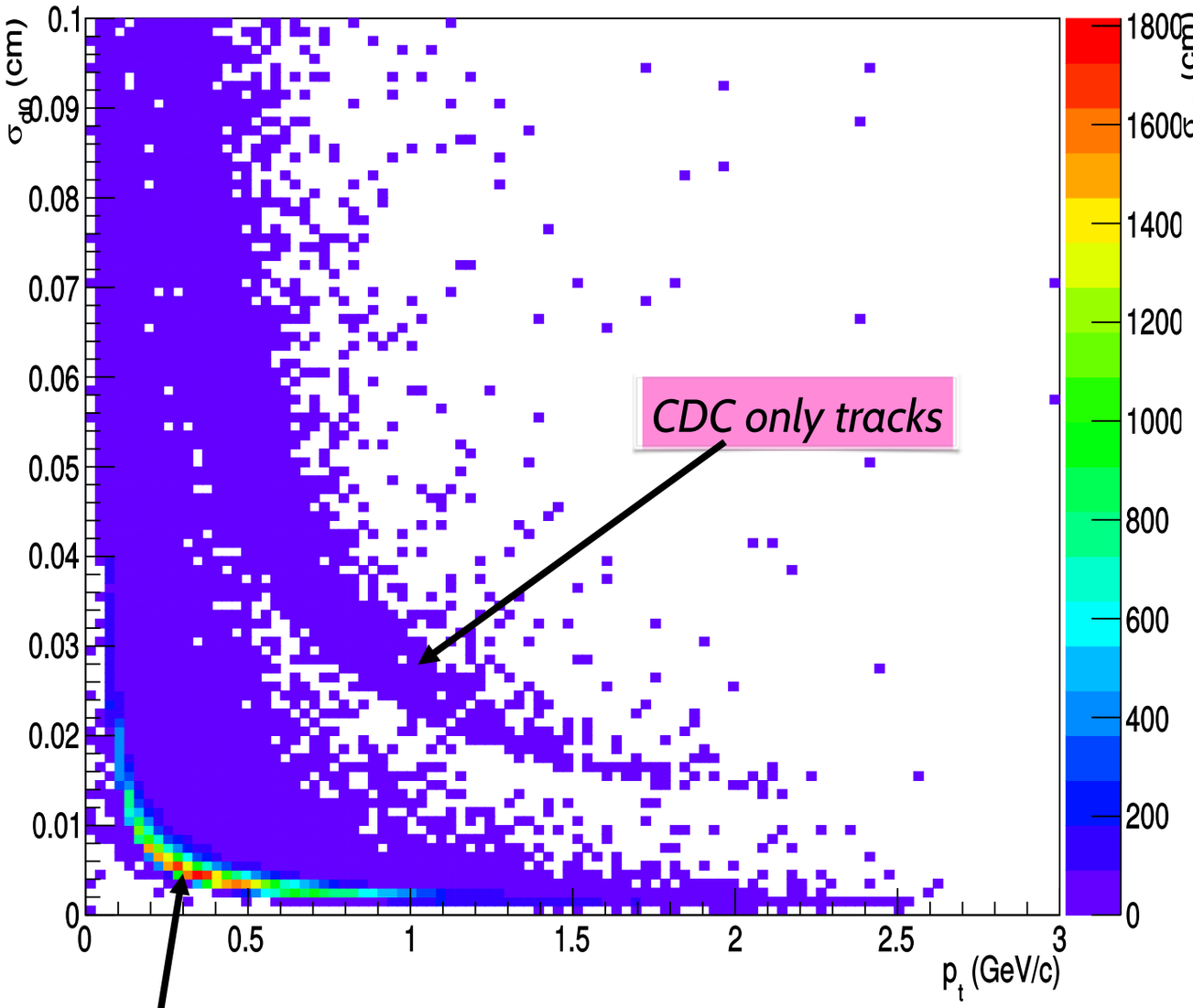


- 33% underestimated errors on ω, 13-20% on the other track parameters
- bias in d0 (2%), z0 (5%), ω(1%) and tanλ (7%)

Impact Parameters Errors VS p_t

σ_{d0} VS p_t

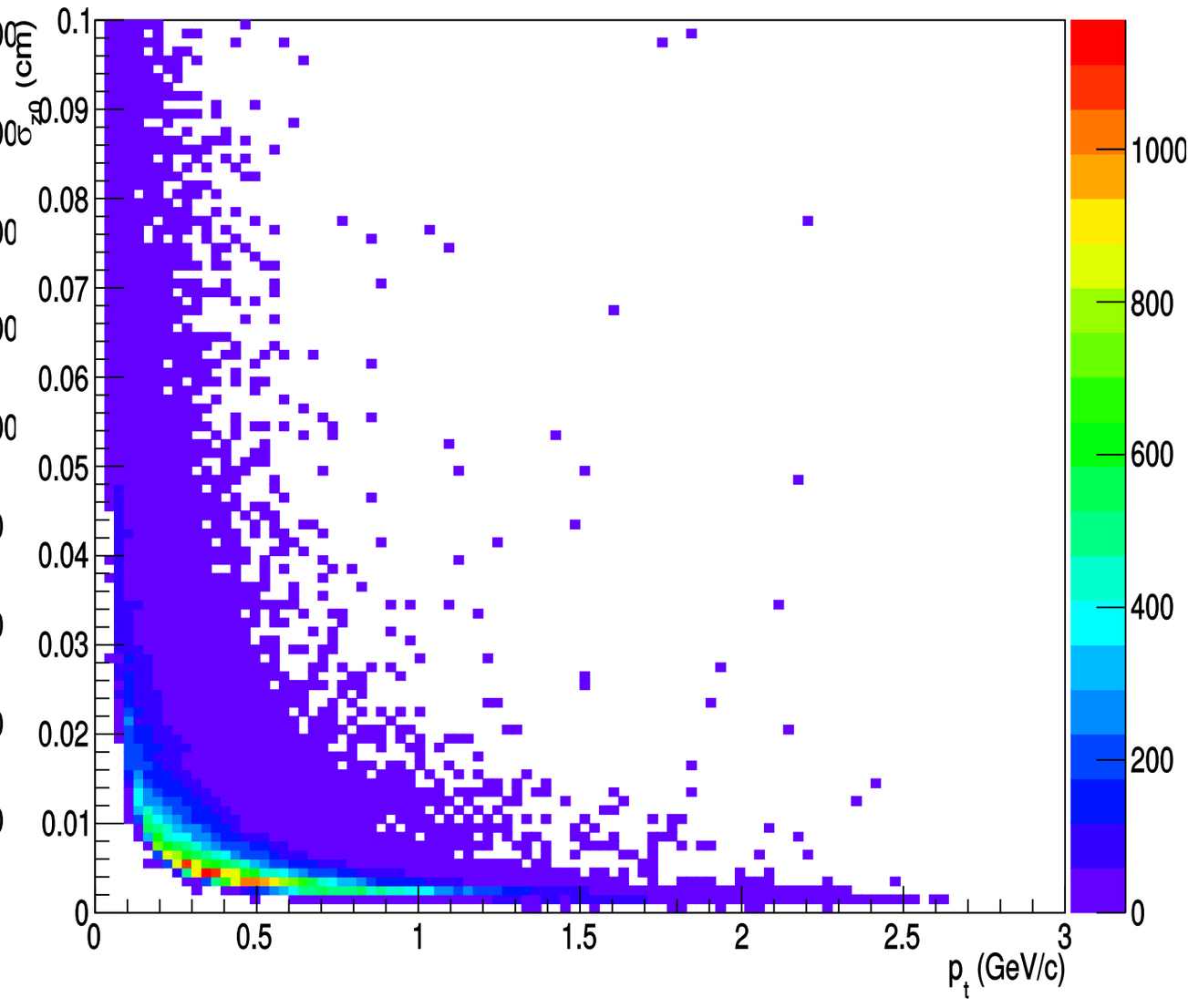
transverse **impact parameter**



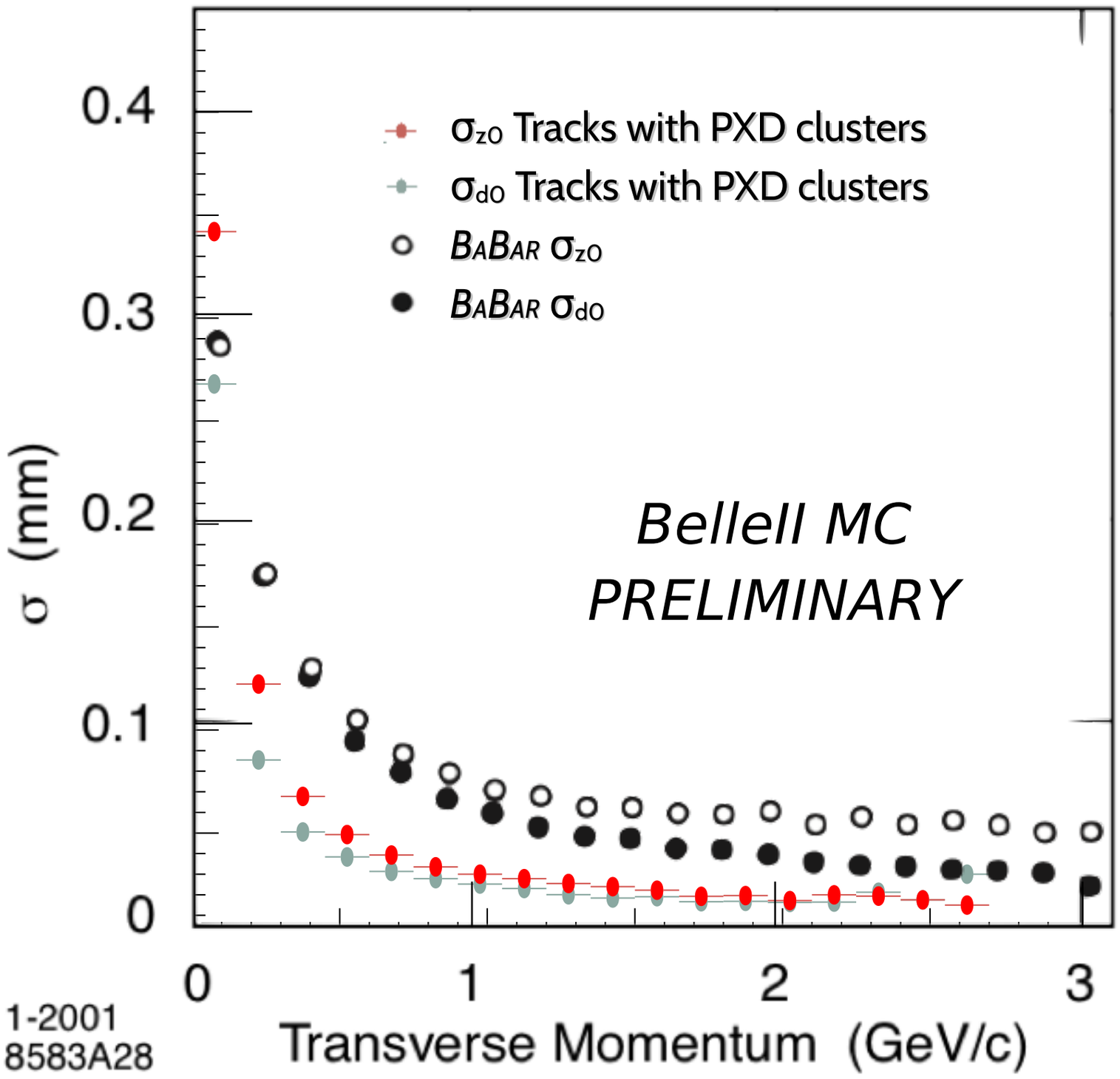
~66% of all tracks

σ_{z0} VS p_t

longitudinal **impact parameter**



Comparison with *BABAR* Tracking



- *Belle II* VXD Tracking performs twice better than *BABAR*, when PXD clusters are attached to the track (**66**% of tracks have PXD cluster attached)

Conclusions

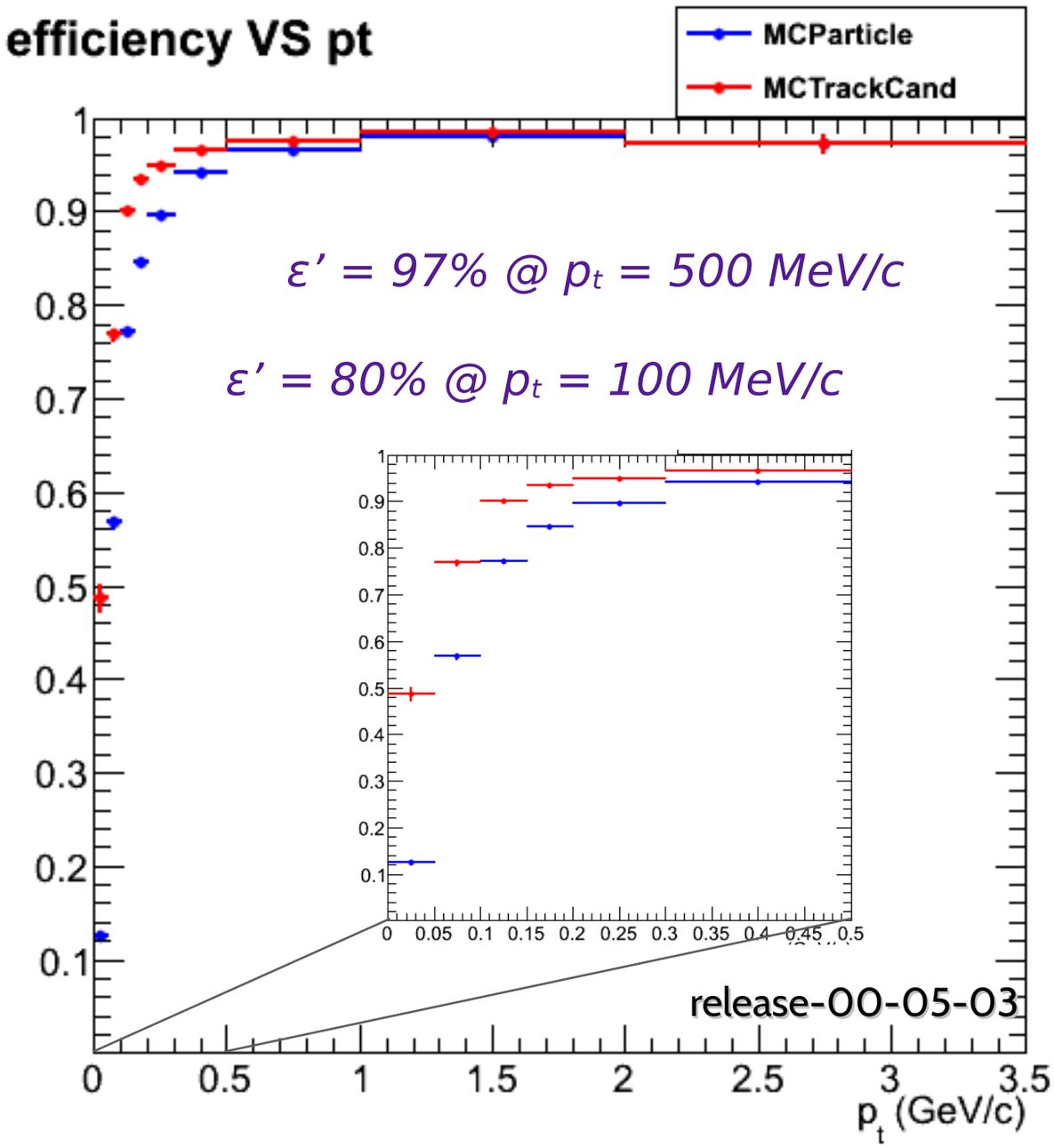
- Performances of Tracking in release-00-06-00 are mostly compatible with previous release
- New SVD L3 position does not have a visible impact on the performance
- An important step in tracking development was made: the new CDC Track Finder replaced Trasan and MC-free combining of TCs
  - the new CDC pattern recognition efficiency is compatible with Trasan
  - problems in fitting CDC track candidates at low p_t which dropped relative efficiency by ~10% are now gone
- A significant drop in number of tracks with PXD Clusters have been observed. A possible cause is the VXDCDCMatcher, which is now MC-free.
- Still a lot to improve (efficiency of using the PXD clusters, bias in the impact parameters, underestimation of the track parameters errors, …)
- Still a number of missing parts in the tracking simulation (PXD data reduction simulation, MC-based track merging, extrapolation toward the CDC and the VXD, …)
- write to tracking@belle2.kek.jp for feedbacks and questions

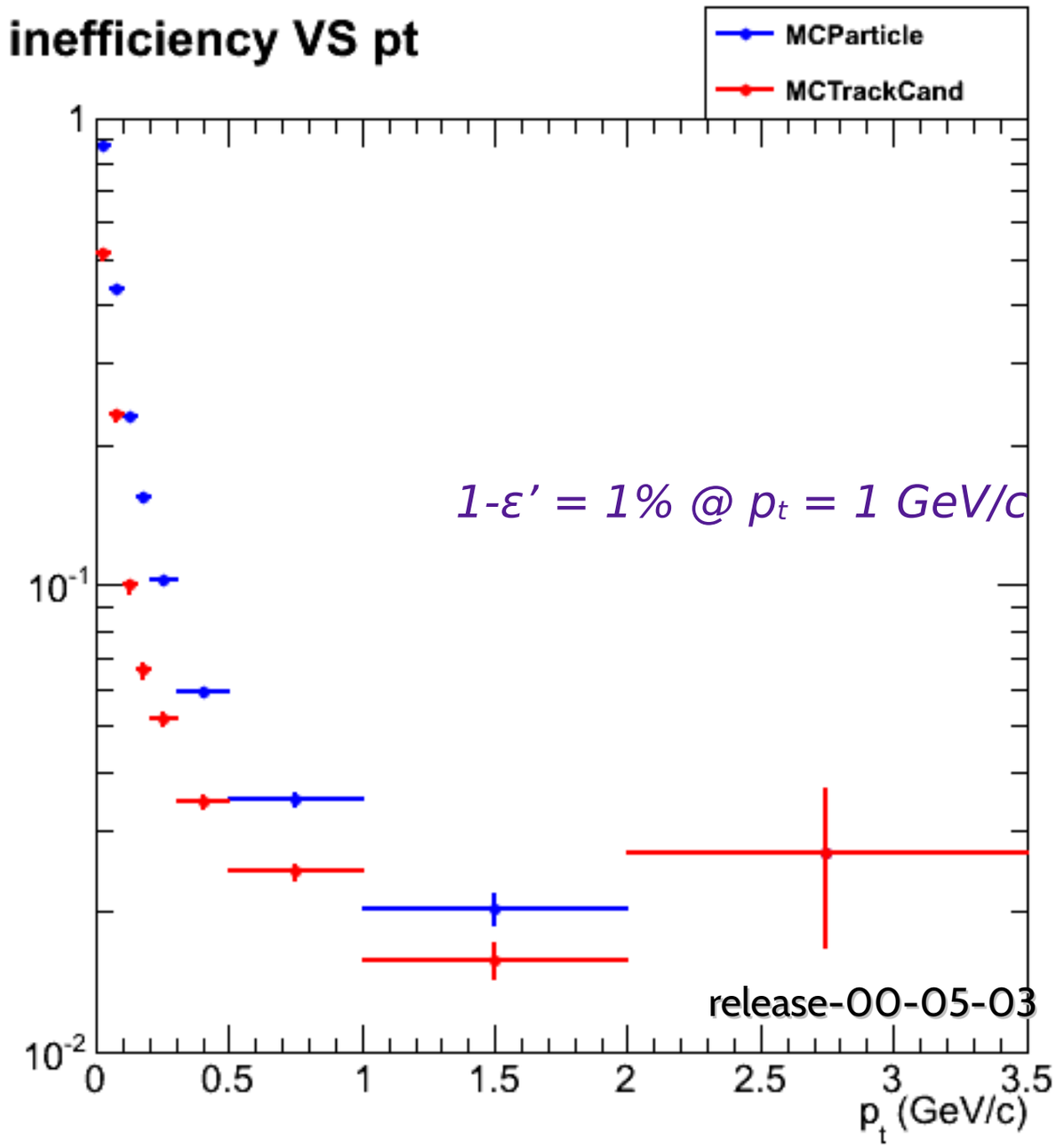
Thank You!

efficiency & purity

BACKUP

Efficiency VS Transverse Momentum

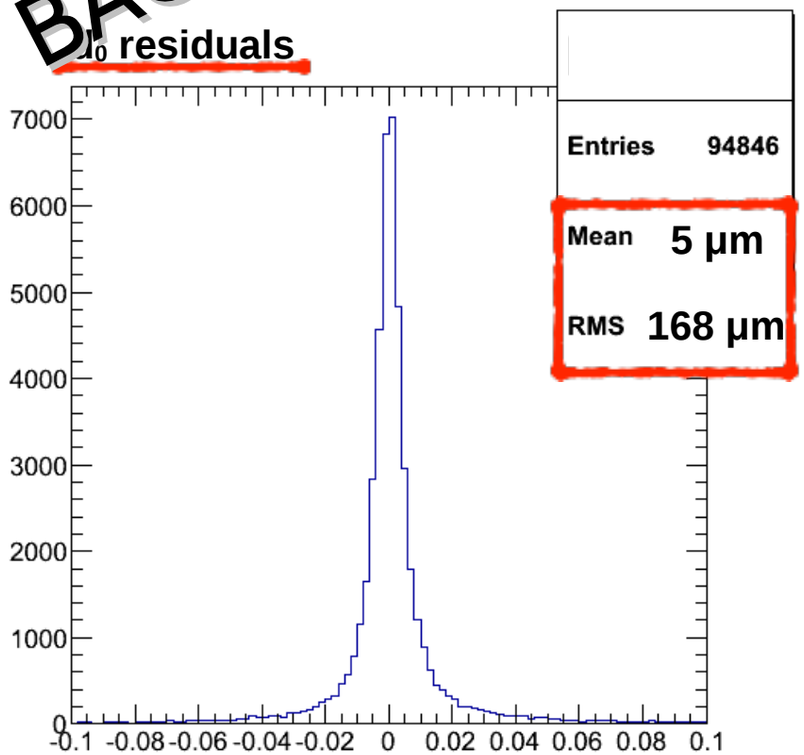
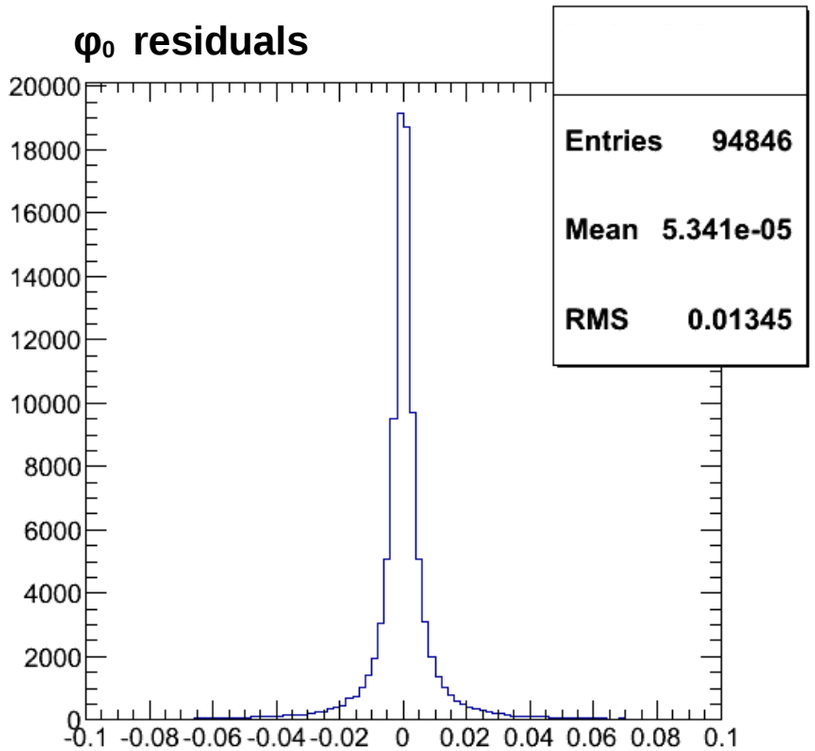
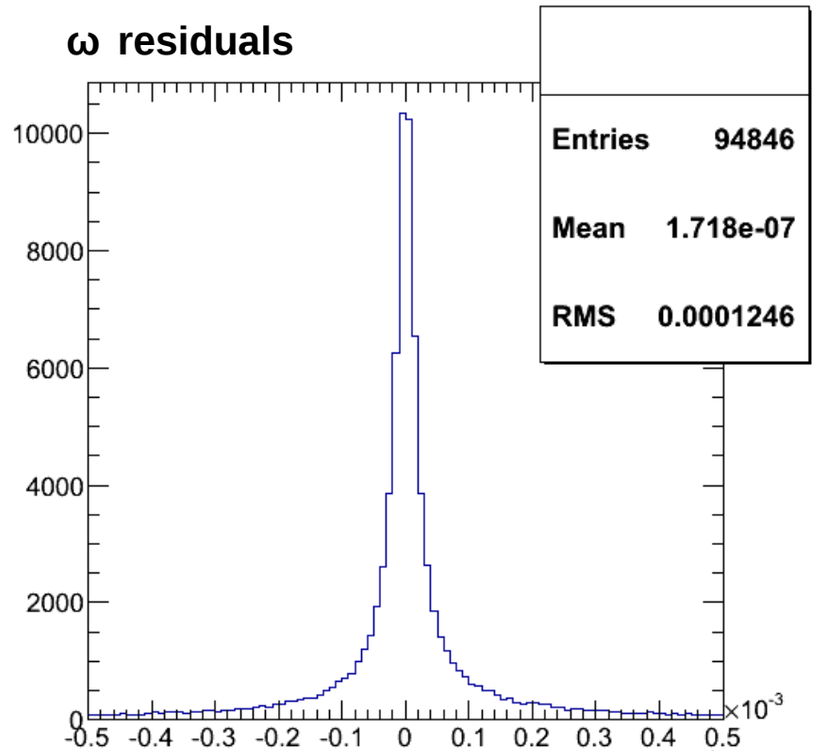
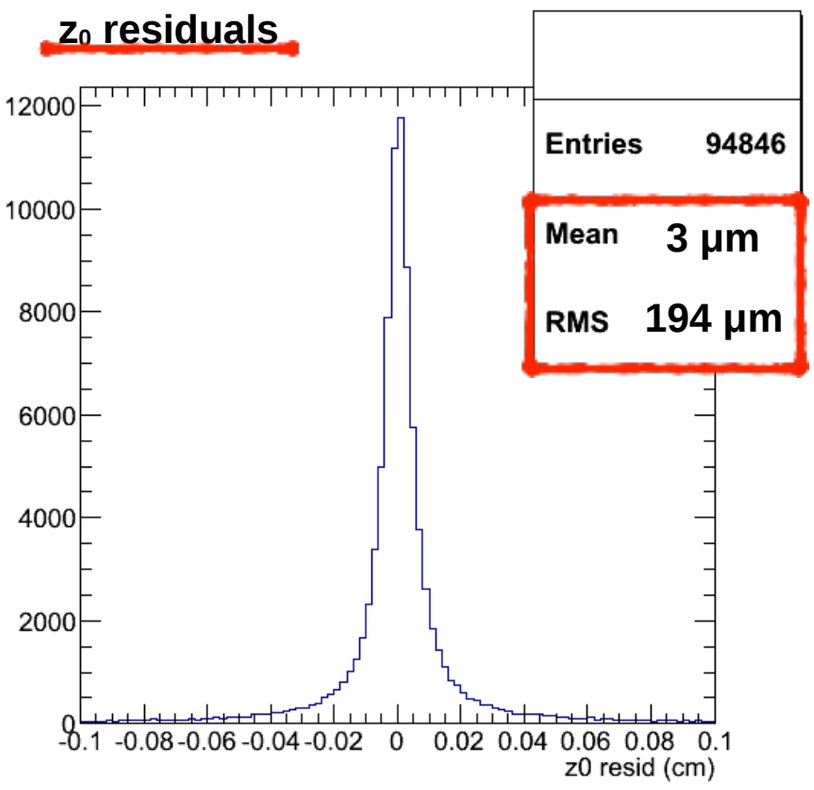
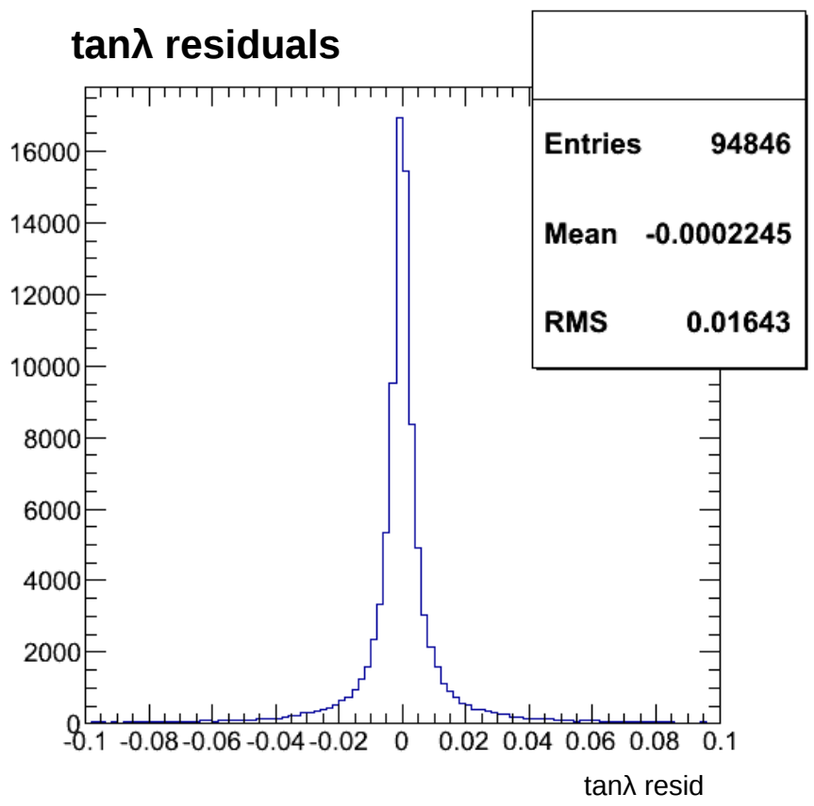




legend:

- physical efficiency
- geometrical acceptance and detector efficiency factored out

track quality

BACKUP

Track Parameters Resolutions (reco–true)