Pre-Pre-Release 9
Tracking Performances

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Tracking Meeting ~ June 9th 2017

Integrated Efficiencies

- Analysed 2k Y(4S) events: common EvtGen generation, different simulation & reconstruction
  - the sector maps used in the reconstruction are trained without PXD Data Reduction
  - only the pion mass hypothesis has been used here

this is the one shown in the plots

	VXDTF	*tracking efficiency*	*efficiency factoring out geom. accept.*	*VXDTF efficiency*
no bkg & no PXD Data Reduction simulation	VXDTF1	**85.1 ± 0.2**	**93.5 ± 0.2**	**87.3 ± 0.2**
	VXDTF2	**86.9 ± 0.2**	**95.5 ± 0.1**	**88.5 ± 0.2**
std bkg & PXD Data Reduction simulation	VXDTF1	**81.9 ± 0.3**	**91.4 ± 0.2**	**84.7 ± 0.2**
	VXDTF2	**84.8 ± 0.2**	**94.6 ± 0.2**	**86.7 ± 0.2**
std bkg + QED & PXD Data Reduction simulation	VXDTF1	**70.6 ± 0.3**	**78.8 ± 0.3**	**73.9 ± 0.3**
	VXDTF2	**job crashed: memory limit reached on batch queue** ℓ		

VXDTF1

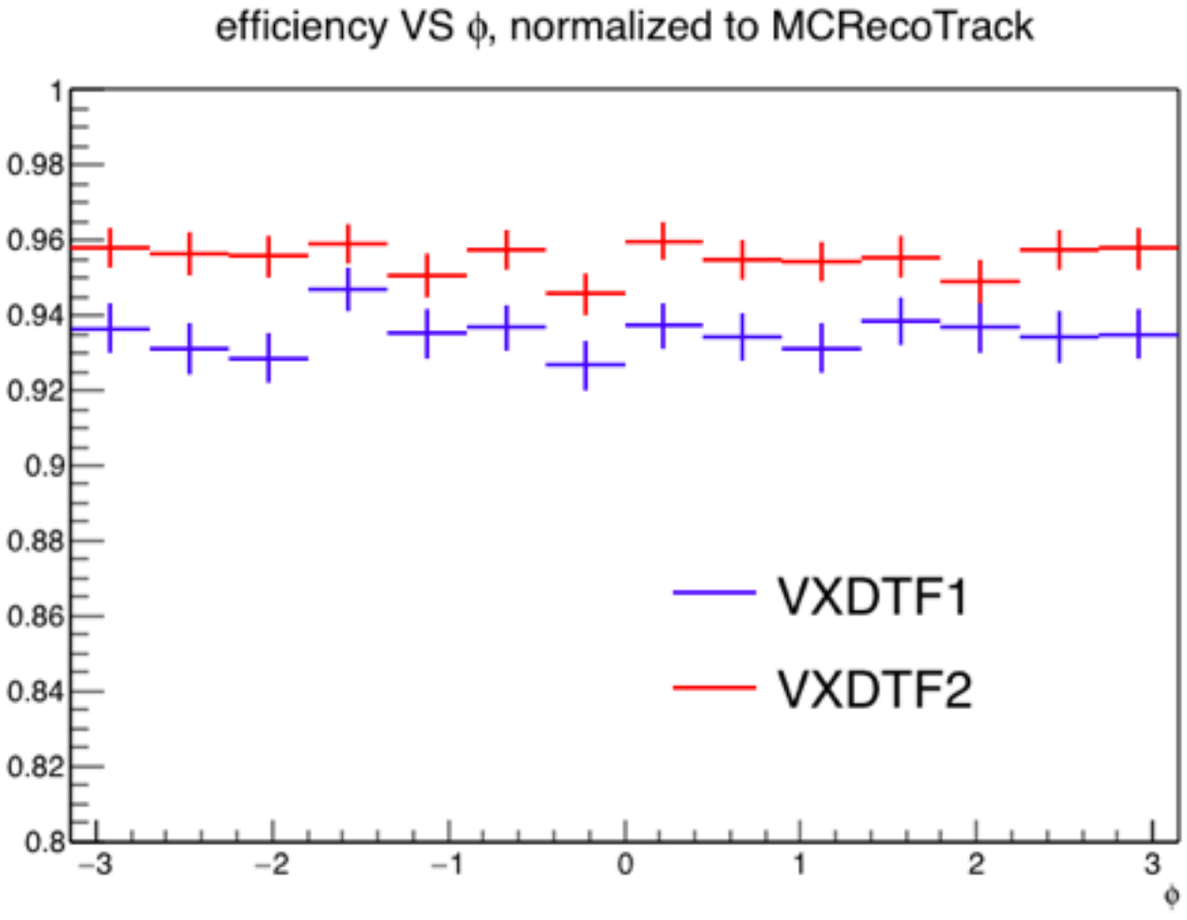
vs

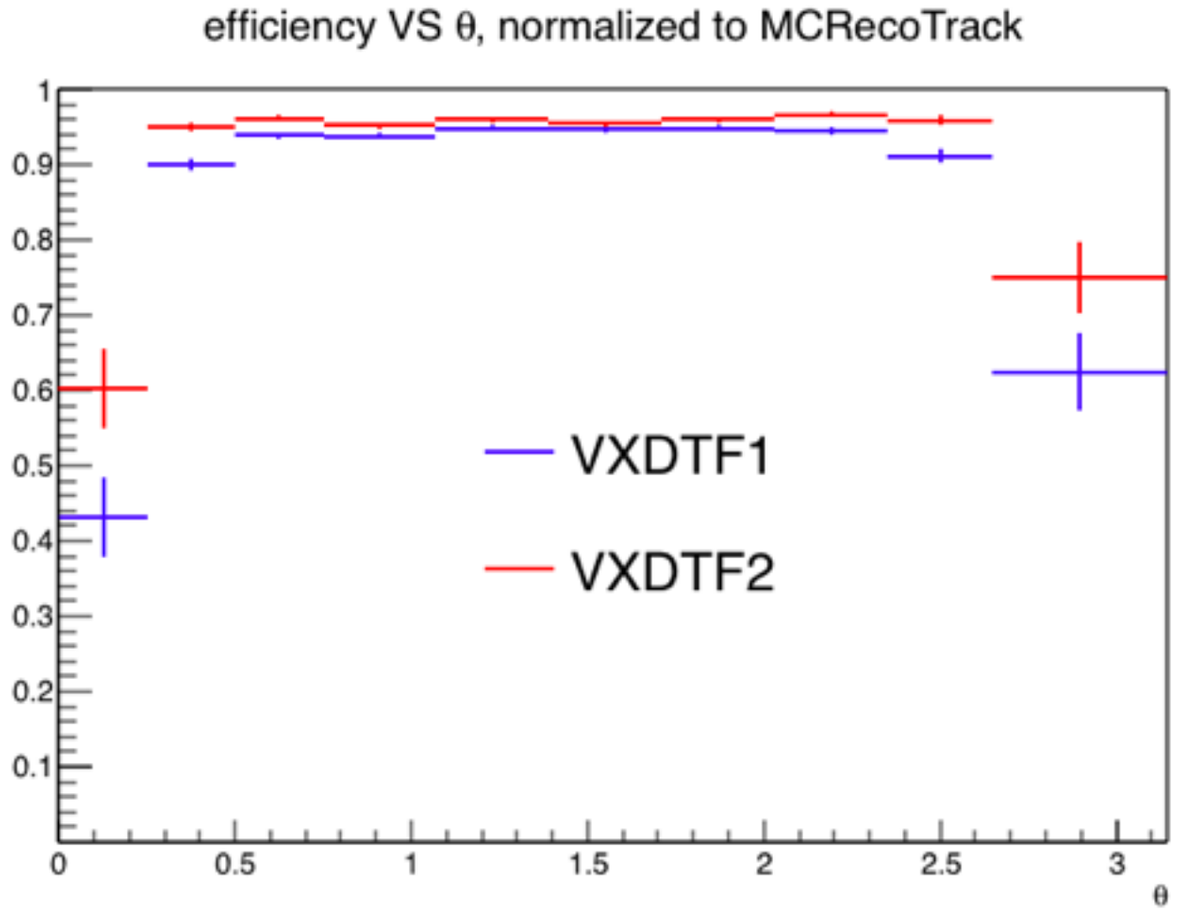
no background &
no PXD Data Reduction simulation

VXDTF2

Efficiency vs Track Direction

no bkg & no PXD Data Reduction simulation

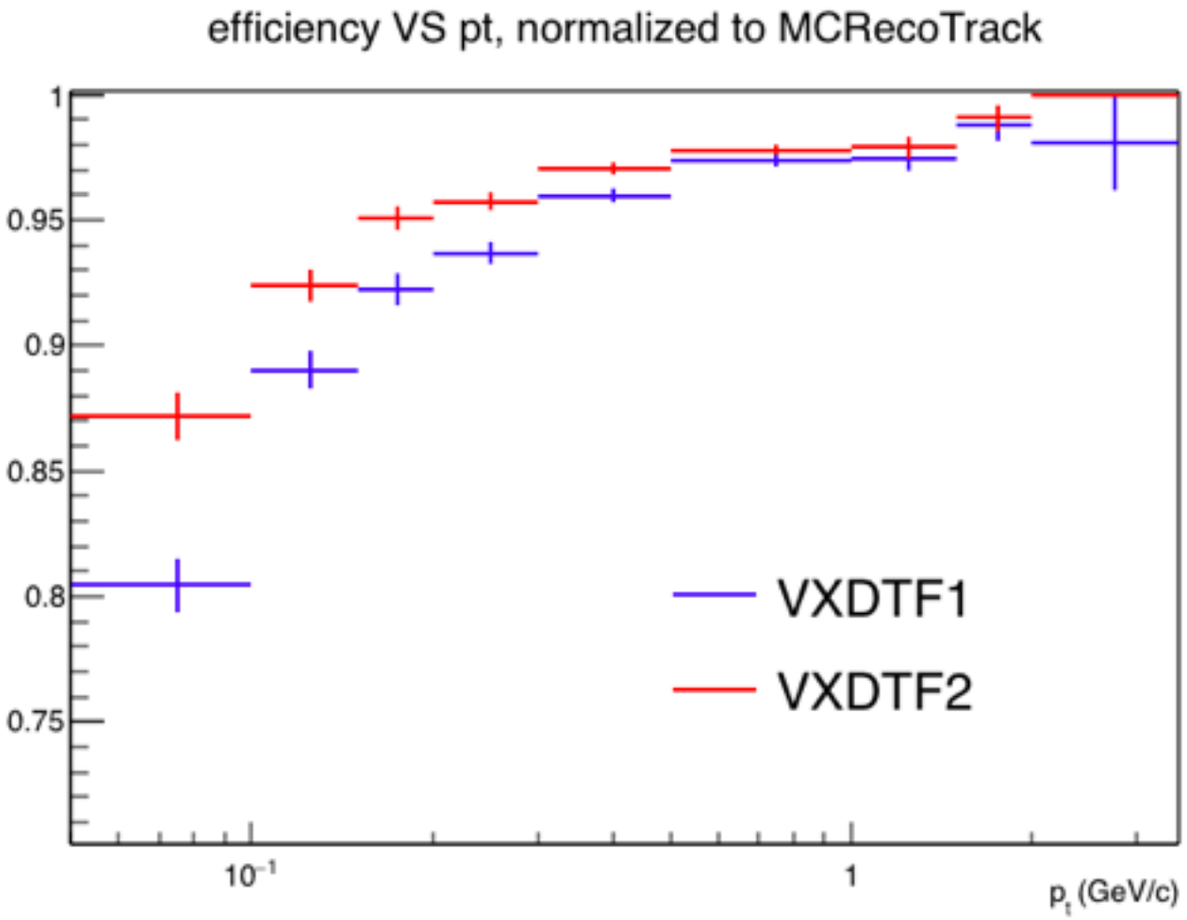


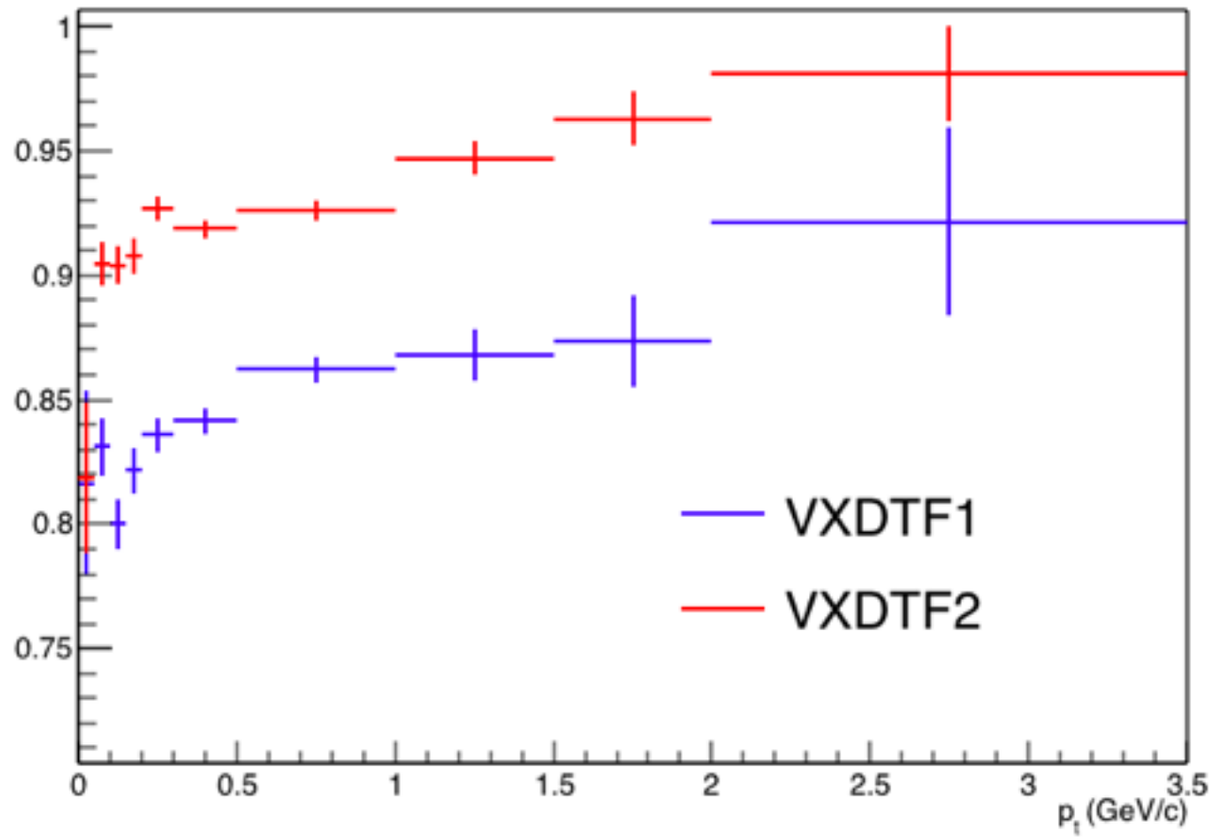


➡ VXDTF2 improves in the forward and backward regions

Efficiency vs p_T

no bkg & no PXD Data Reduction simulation

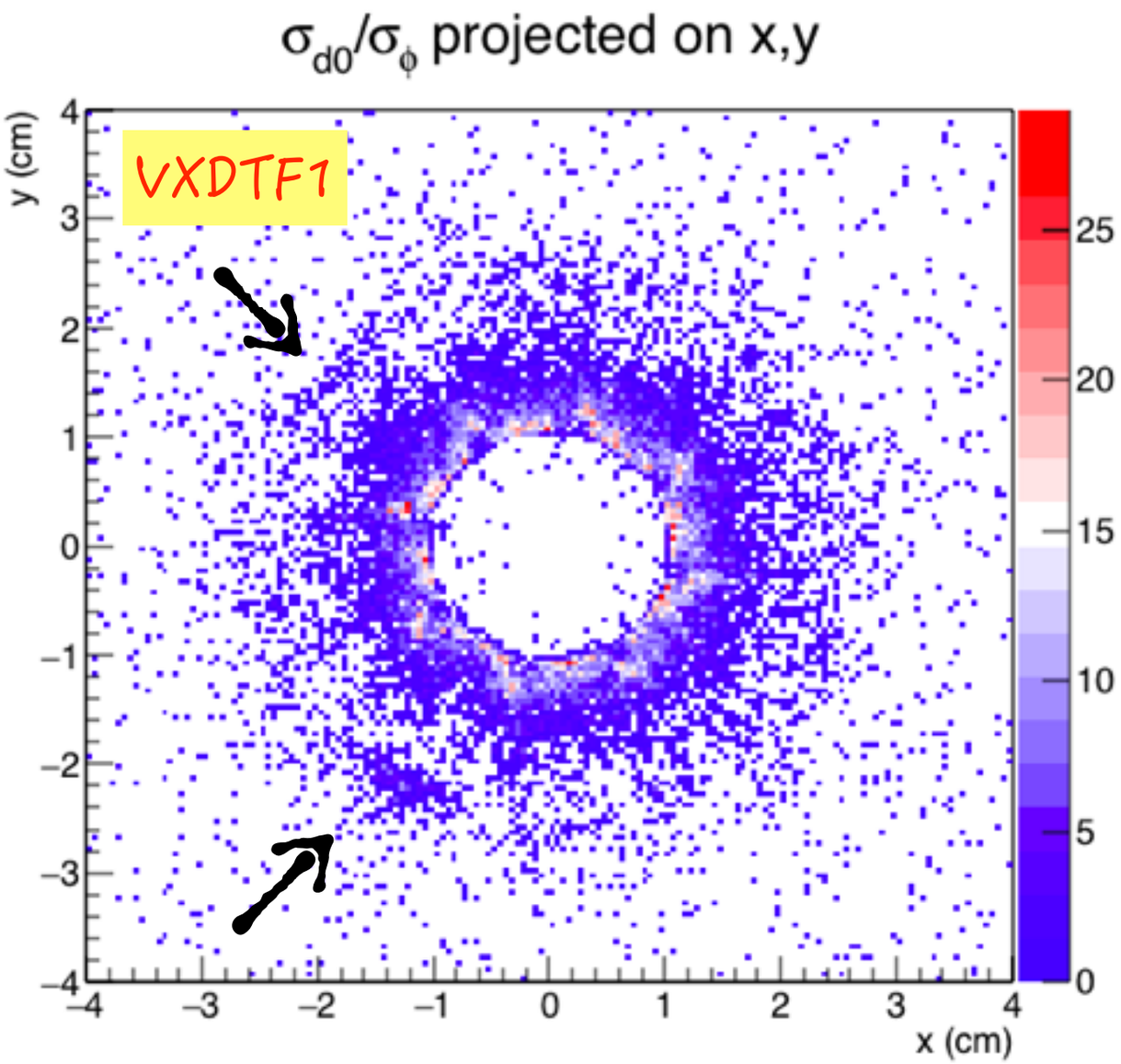


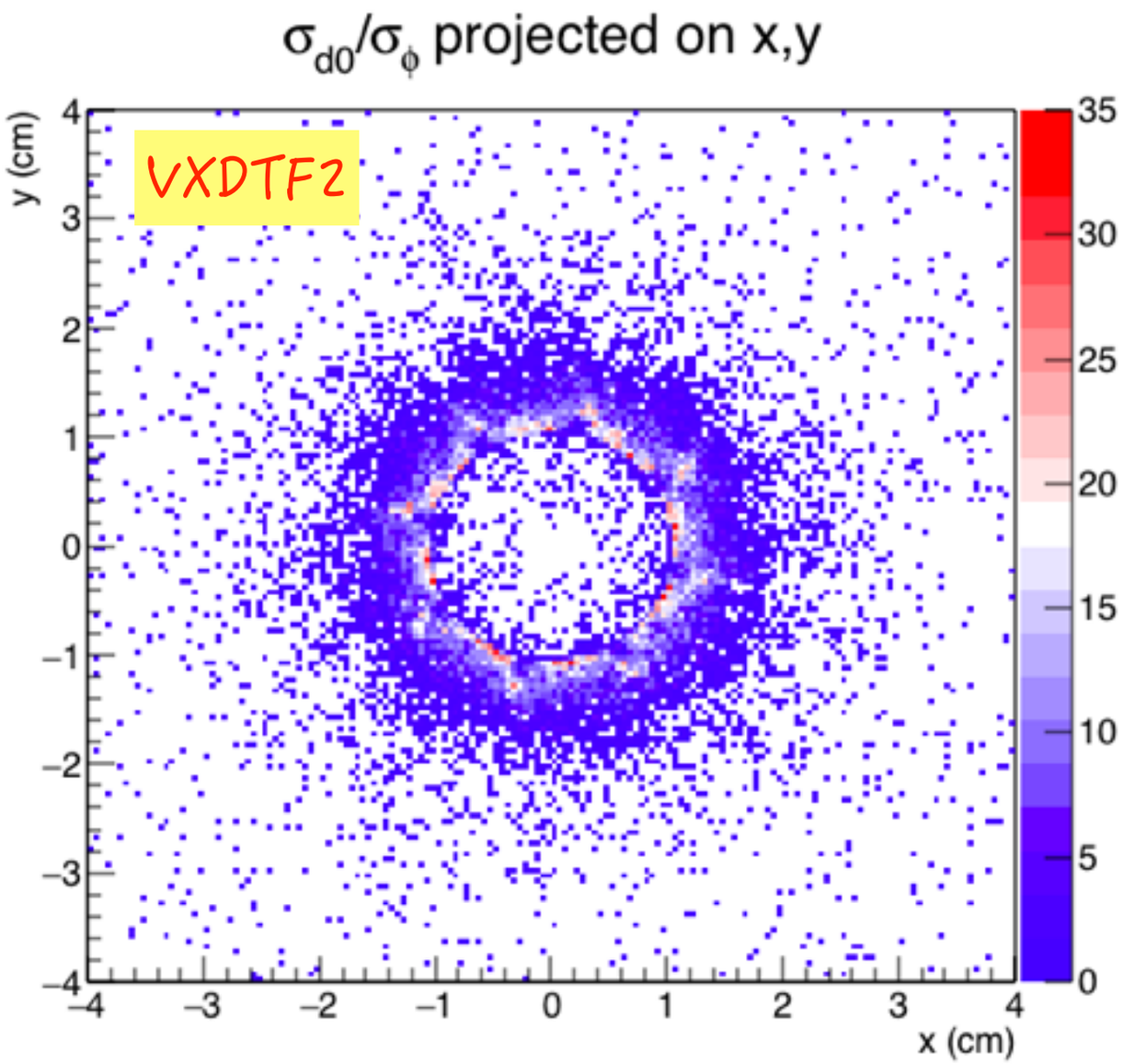


- VXDTF2 improves the performances especially at low p_T, below 200 MeV/c.
- VXDTF2 increases significantly the fraction of tracks with associated PXD hits. Very important for physics!!

Innermost Hit Map

no bkg & no PXD Data Reduction simulation

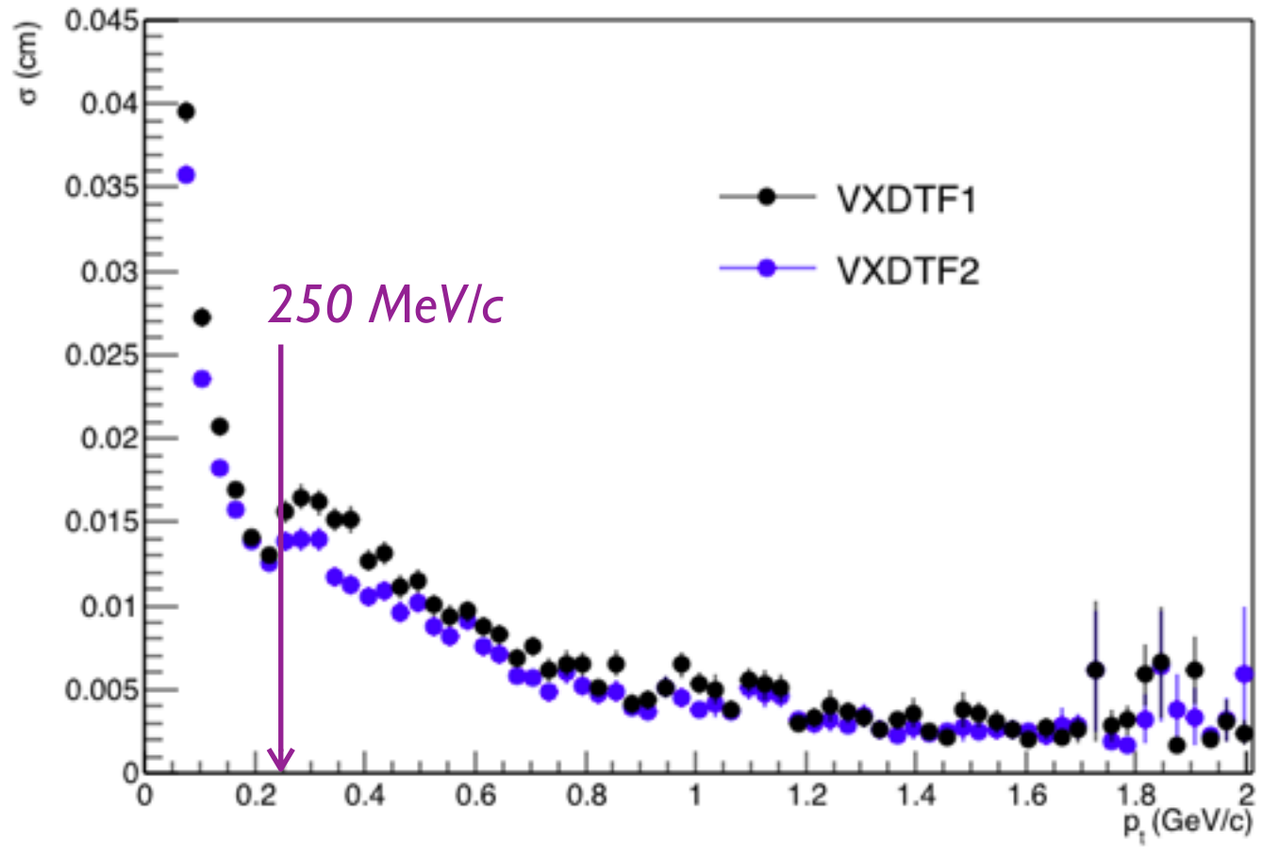


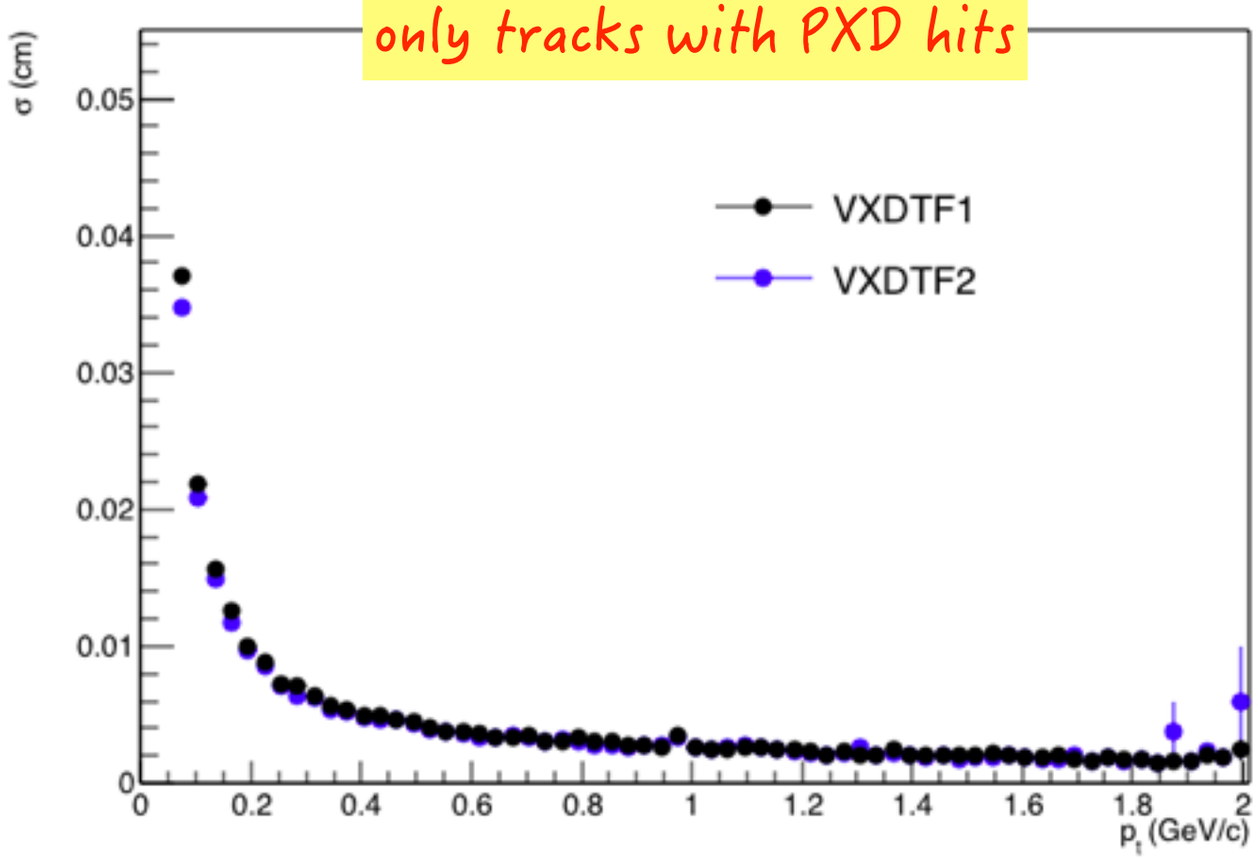


- Structures outside PXD disappears with VXDTF2
- The region inside PXD is more populated with VXDTF2

d_0 Resolution vs p_T

no bkg & no PXD Data Reduction simulation

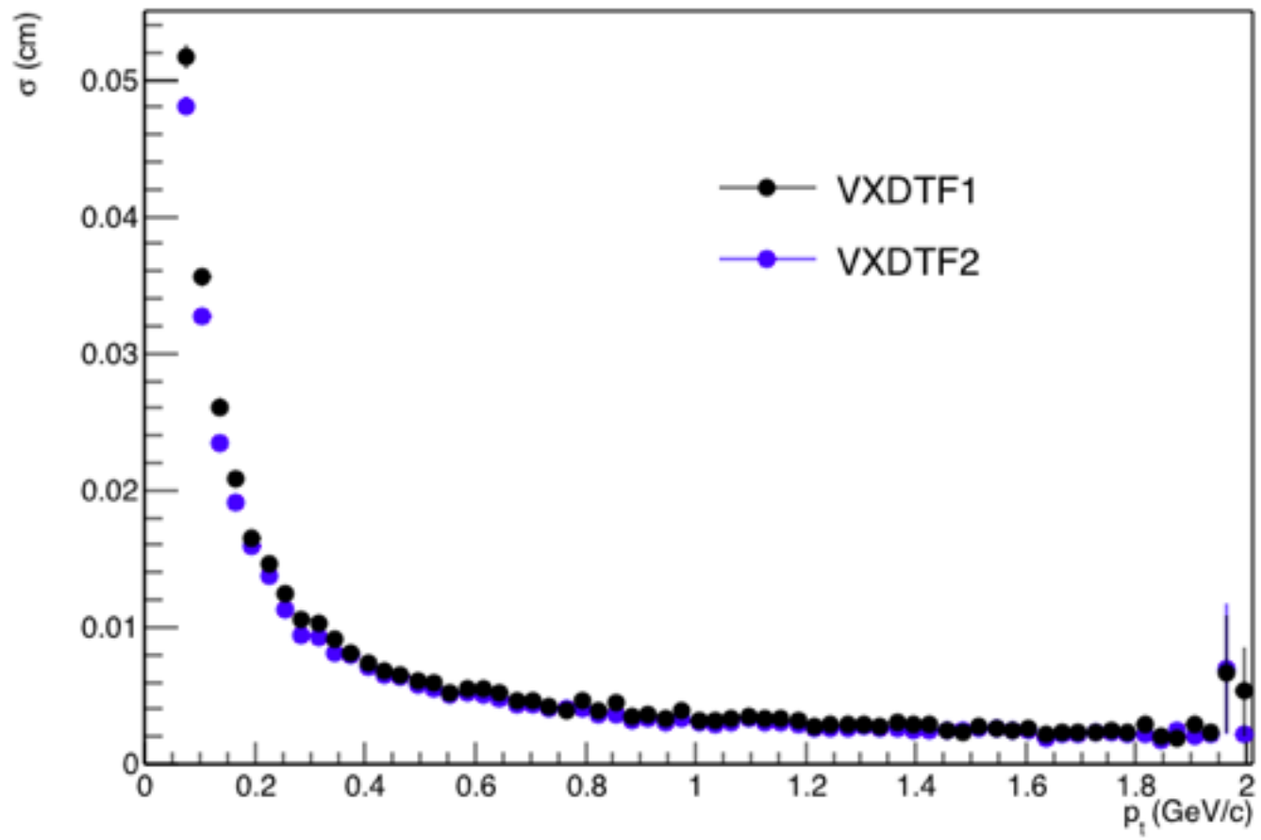




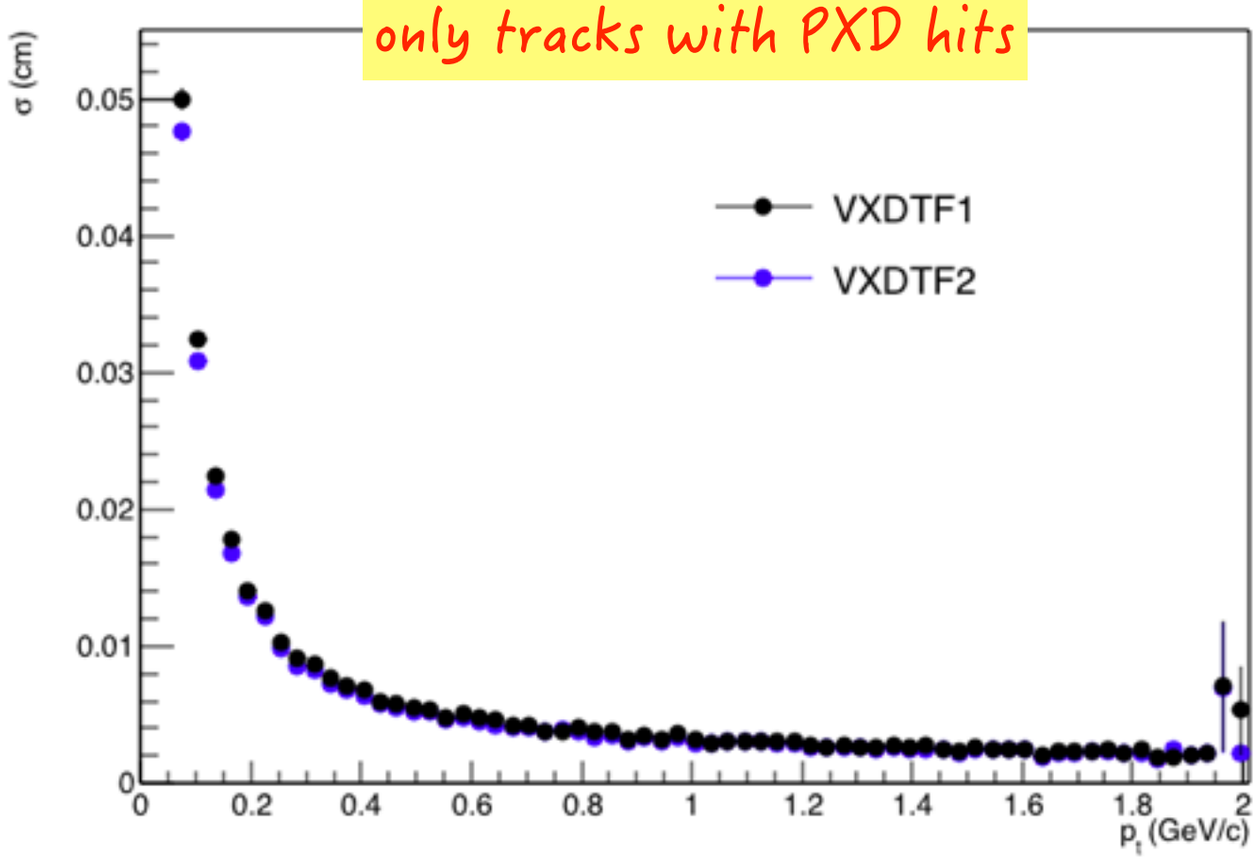
➡ Strange structure around p_T = 300 MeV/c, more evident with VXDTF1, due to Tracks without PXDHit attached → may it be an effect of the different sector maps used for tracks with different momenta?

z_0 Resolution vs p_T

no bkg & no PXD Data Reduction simulation



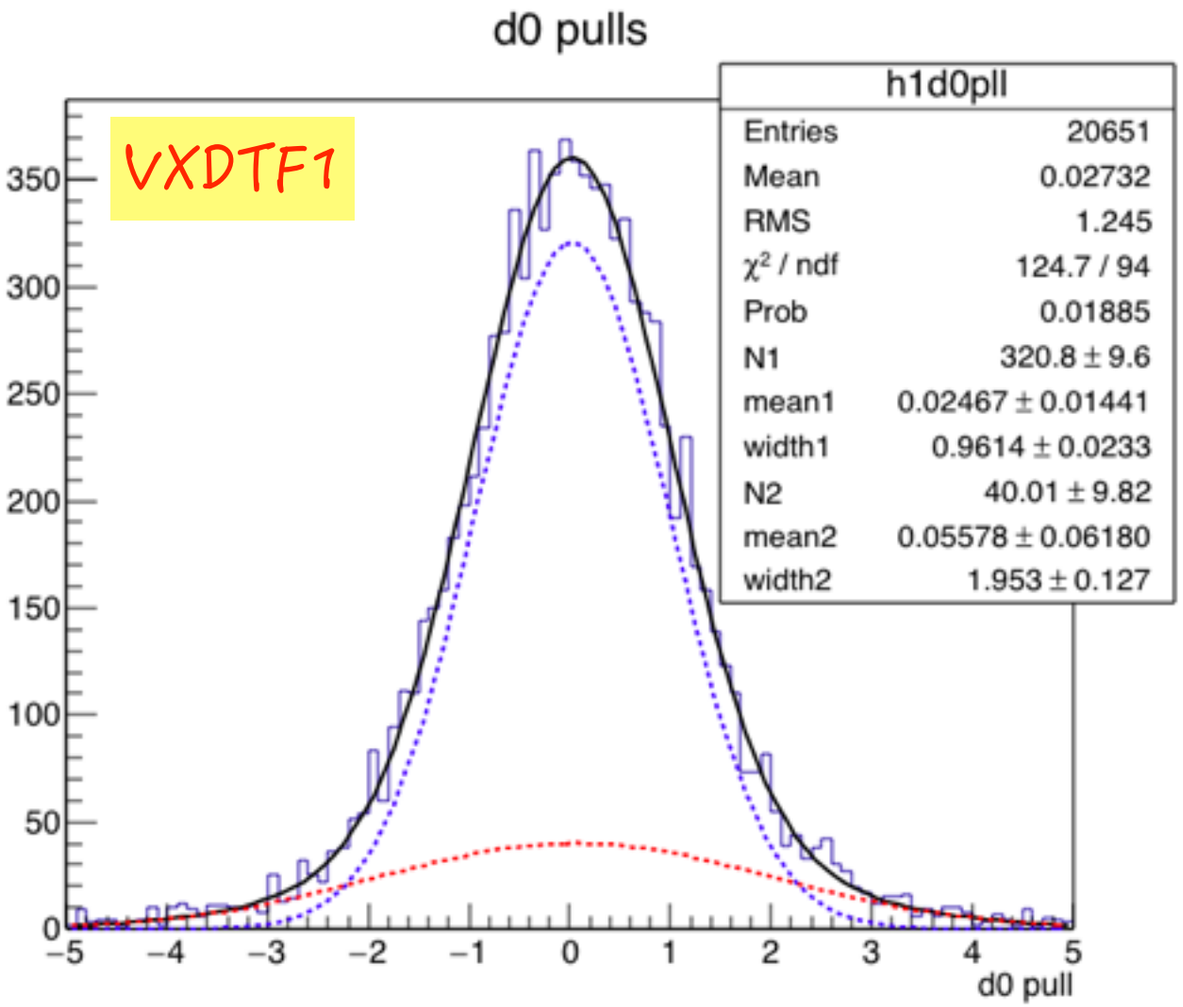
only tracks with PXD hits

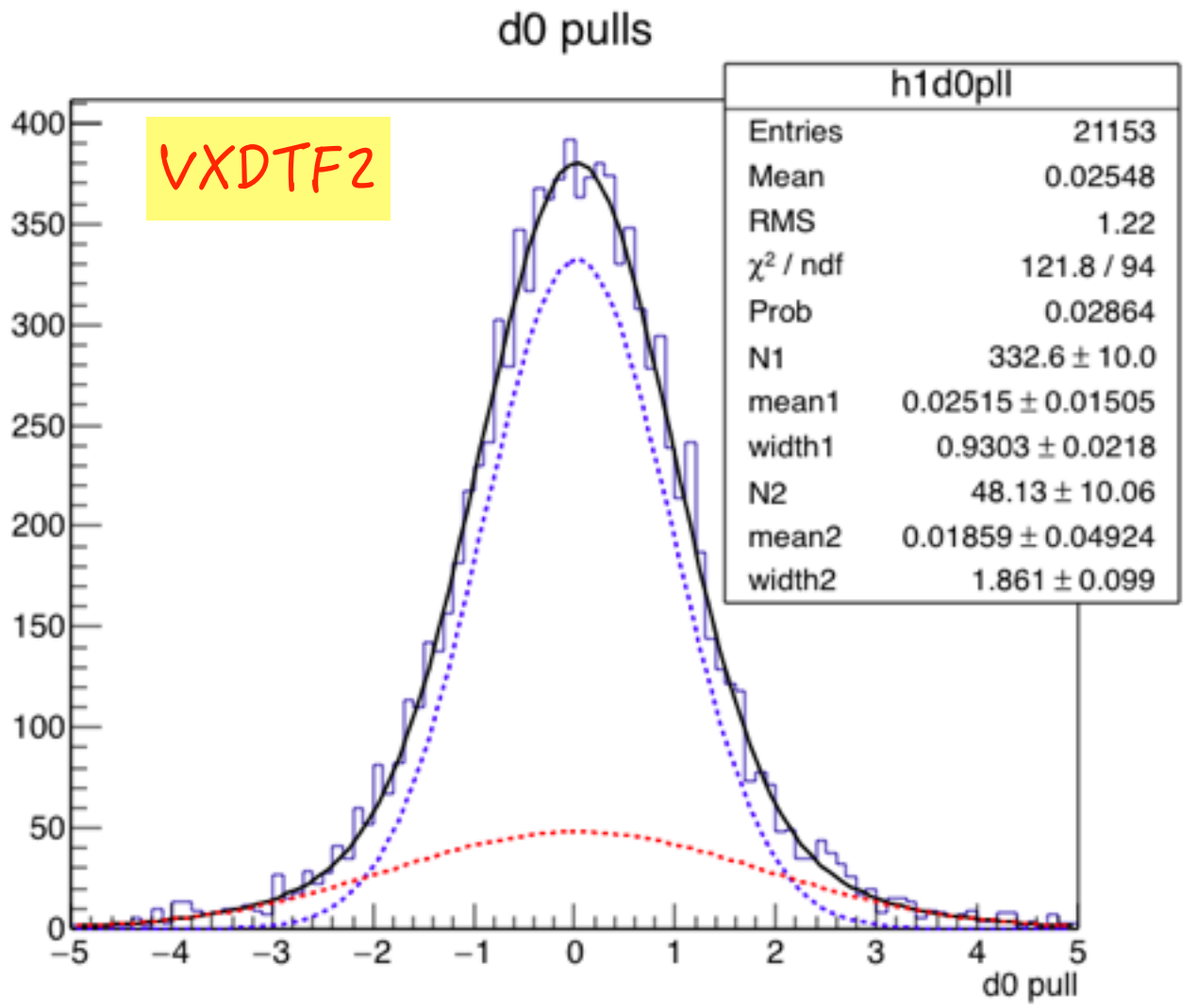


➡ No structure for the longitudinal impact parameter

d_0 Pulls

no bkg & no PXD Data Reduction simulation

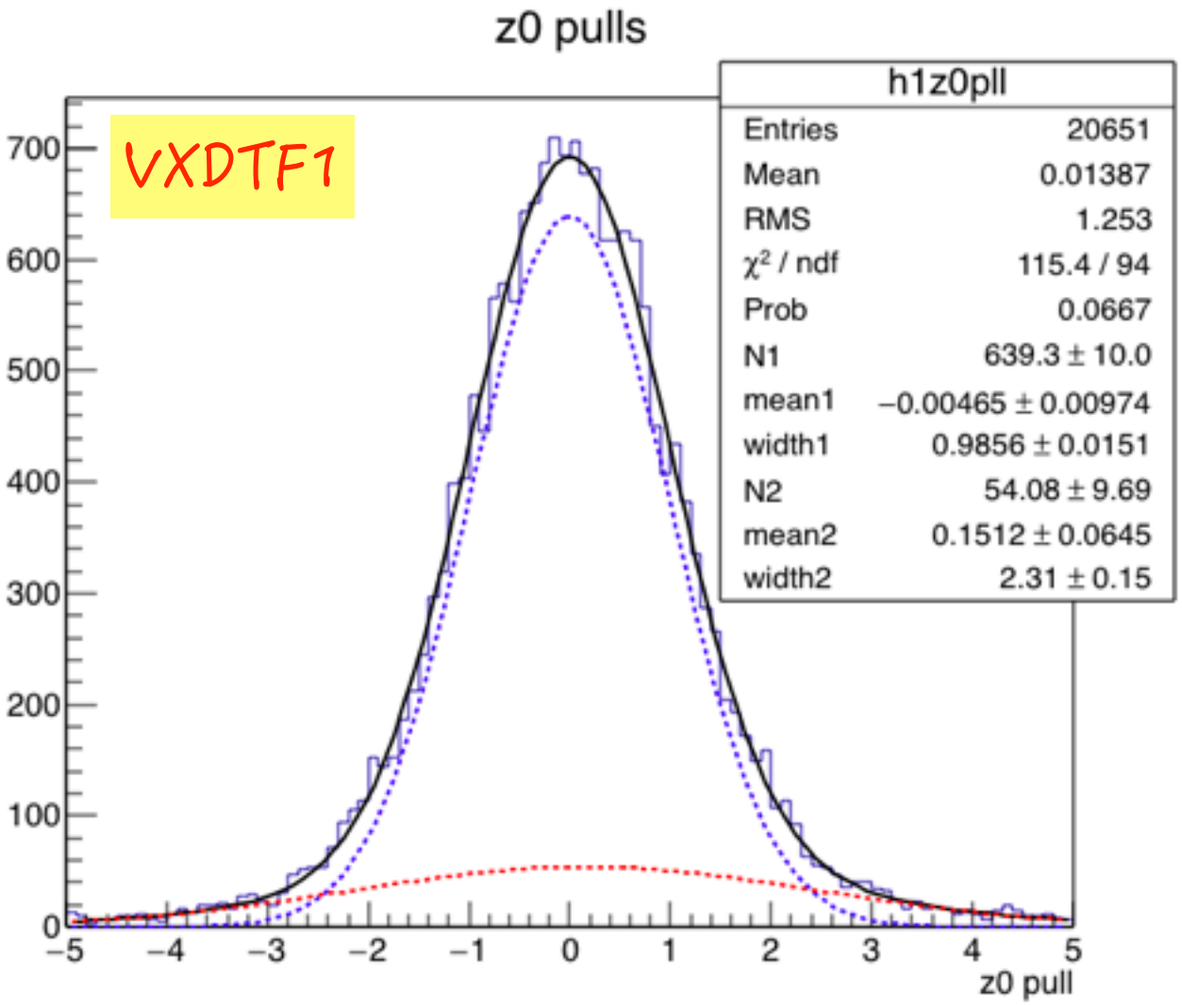


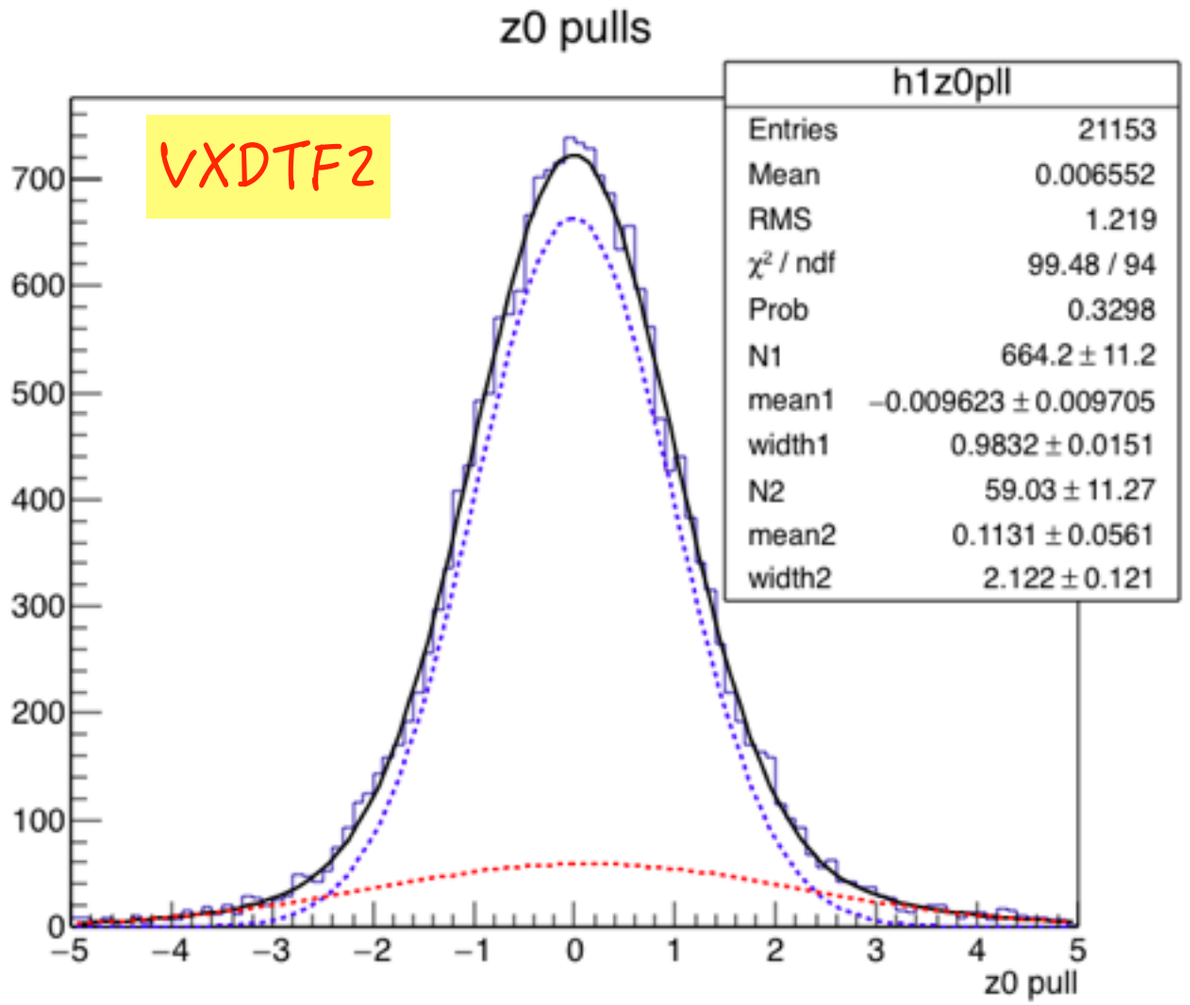


➡ Pulls distribution are very similar between VXDTF1 and VXDTF2

z_0 Pulls

no bkg & no PXD Data Reduction simulation

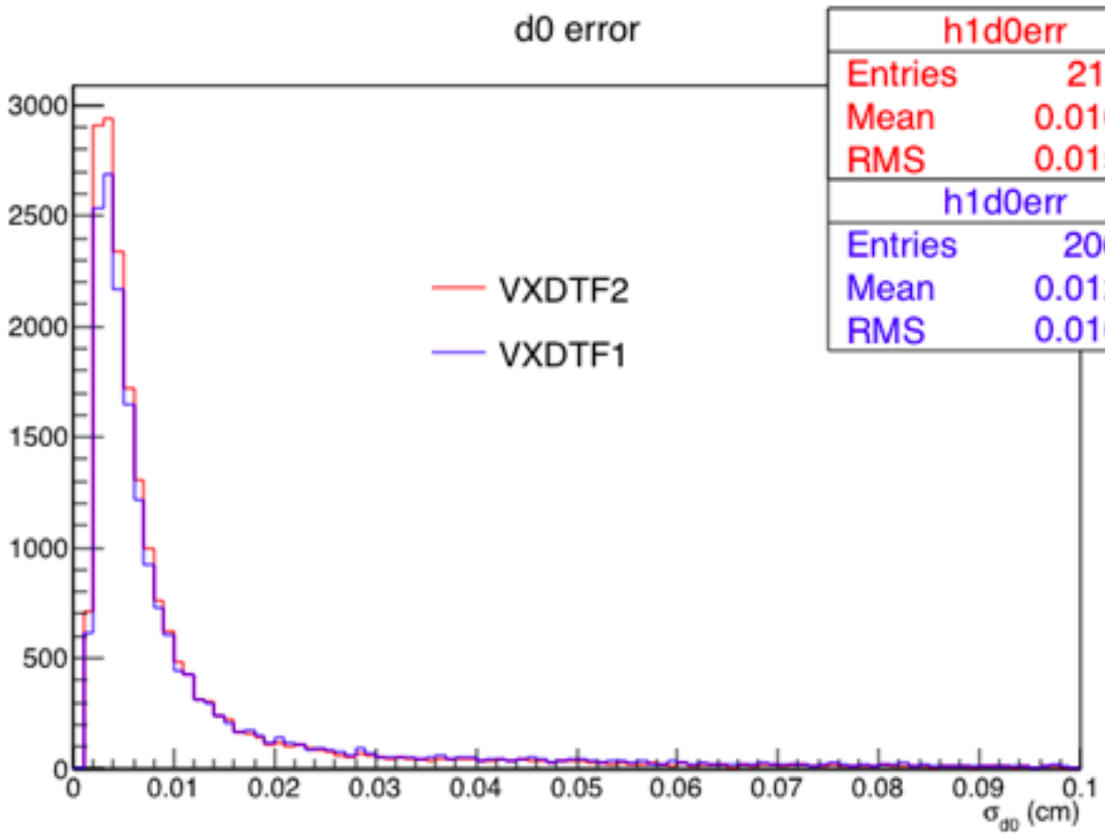


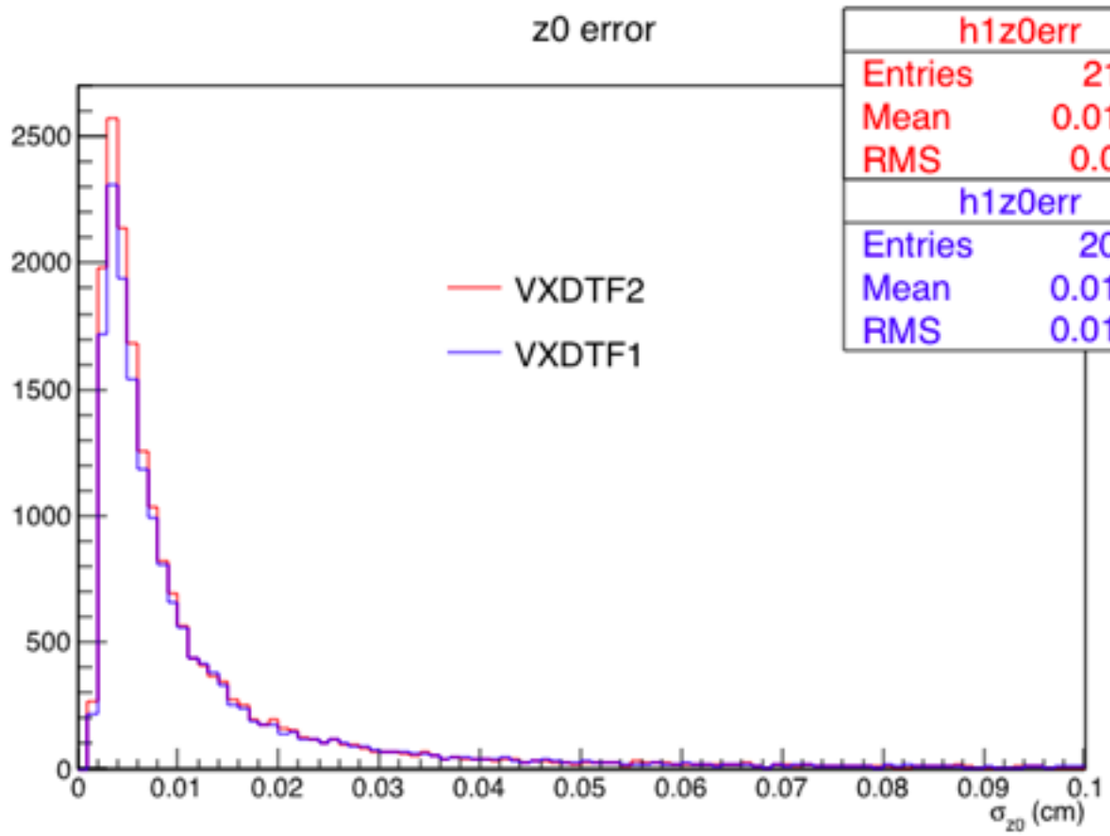


➡ Pulls distribution are very similar between VXDTF1 and VXDTF2

Impact Parameter Errors

no bkg & no PXD Data Reduction simulation





➡ Average estimated error on the impact parameters is ~10% smaller for VXDTF2 and the distribution has a slightly smaller RMS

VXDTF1

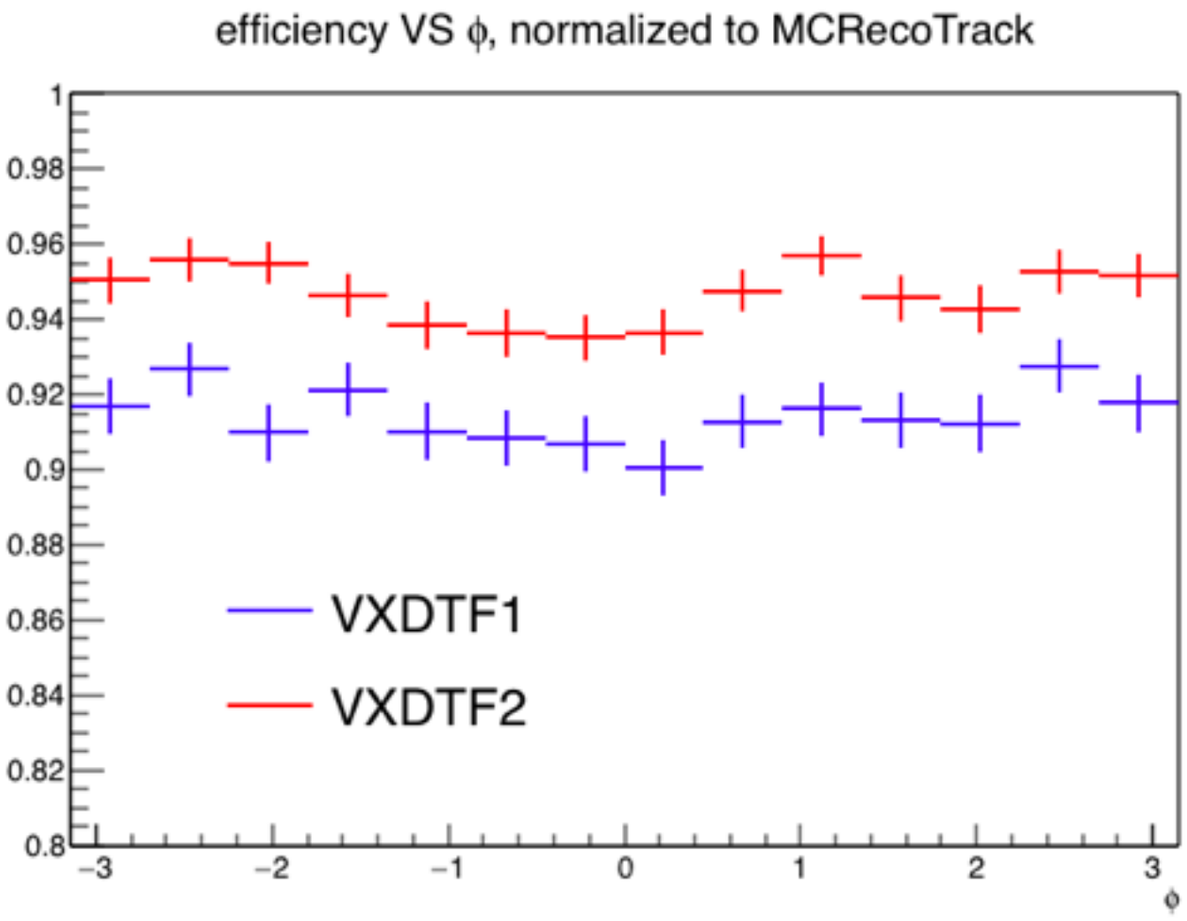
vs

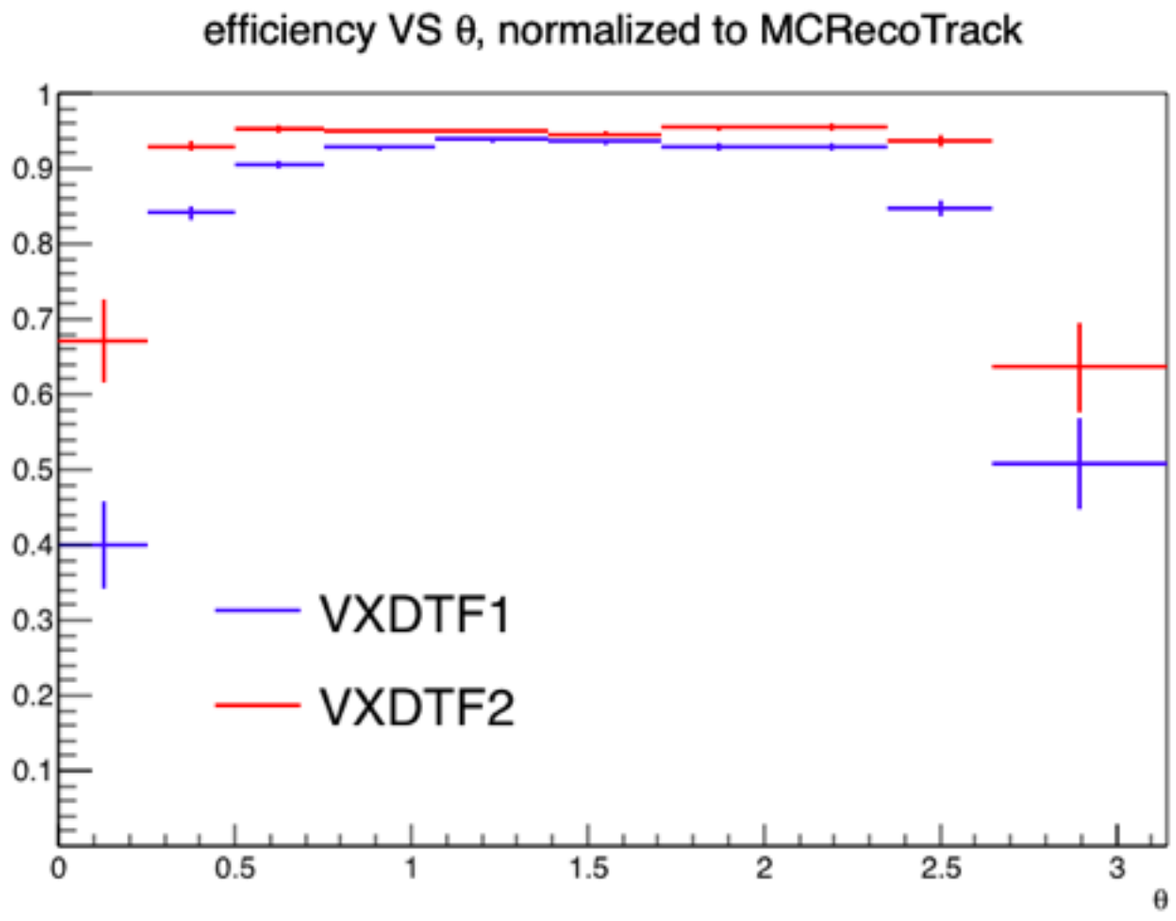
VXDTF2

standard background (no QED) &
PXD Data Reduction simulation

Efficiency vs Track Direction

std bkg & PXD Data Reduction simulation

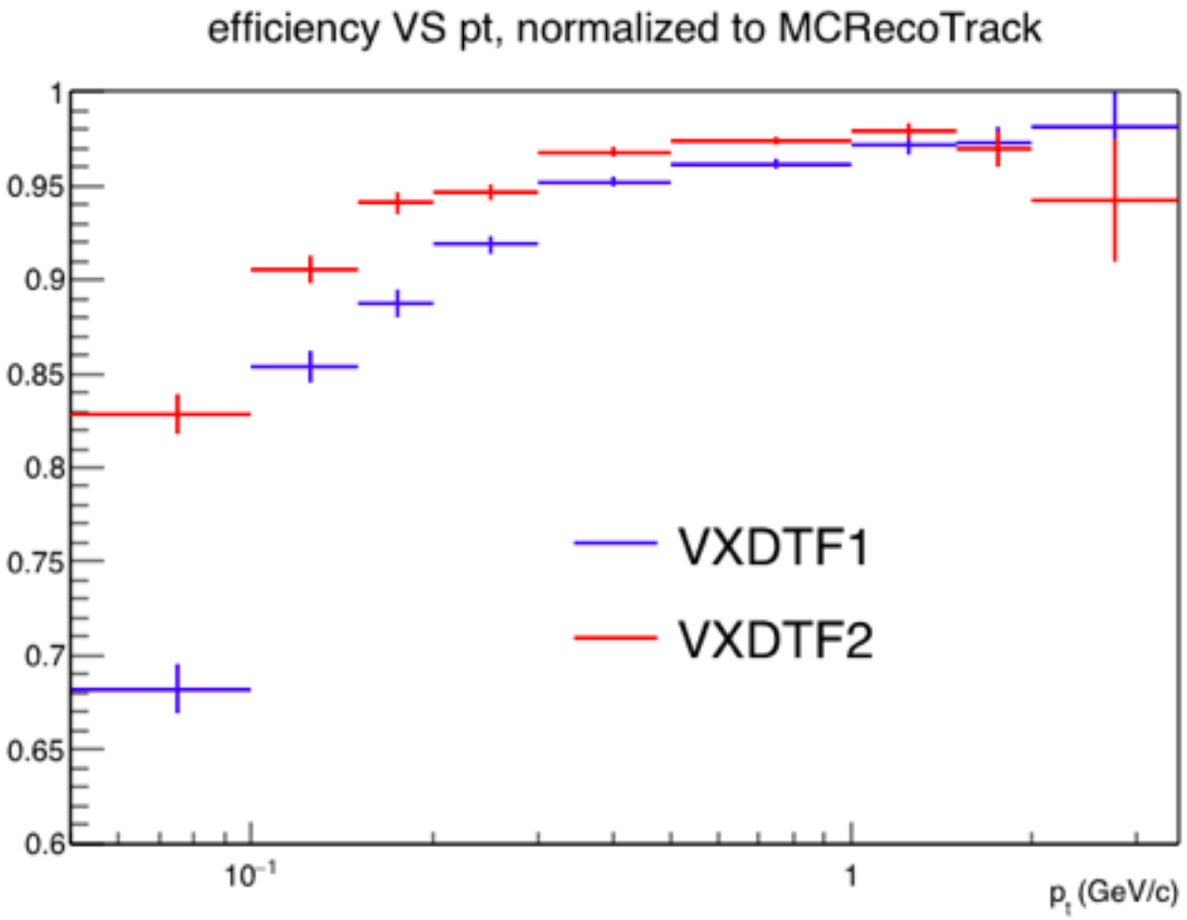


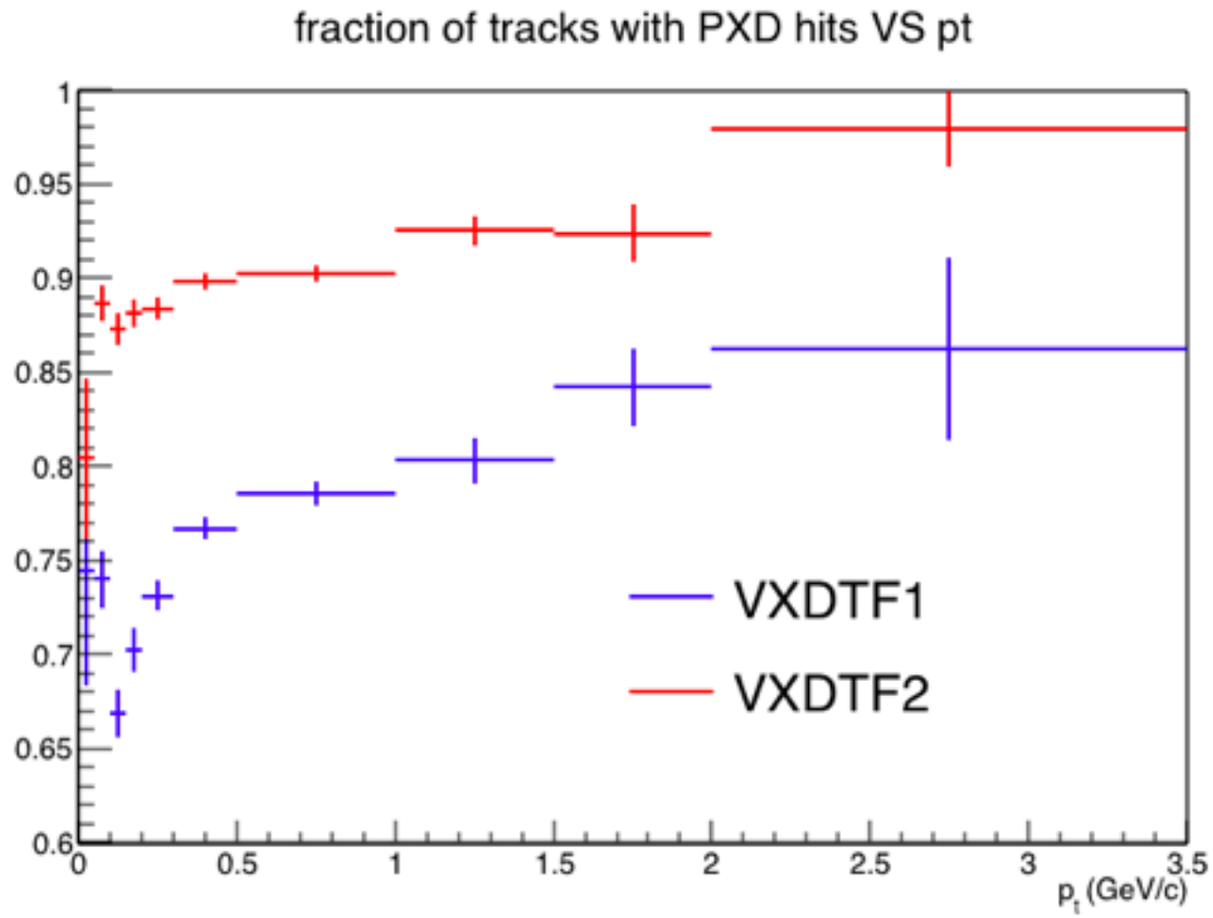


➡ VXDTF2 improves in the forward and backward regions

Efficiency vs p_T

std bkg & PXD Data Reduction simulation

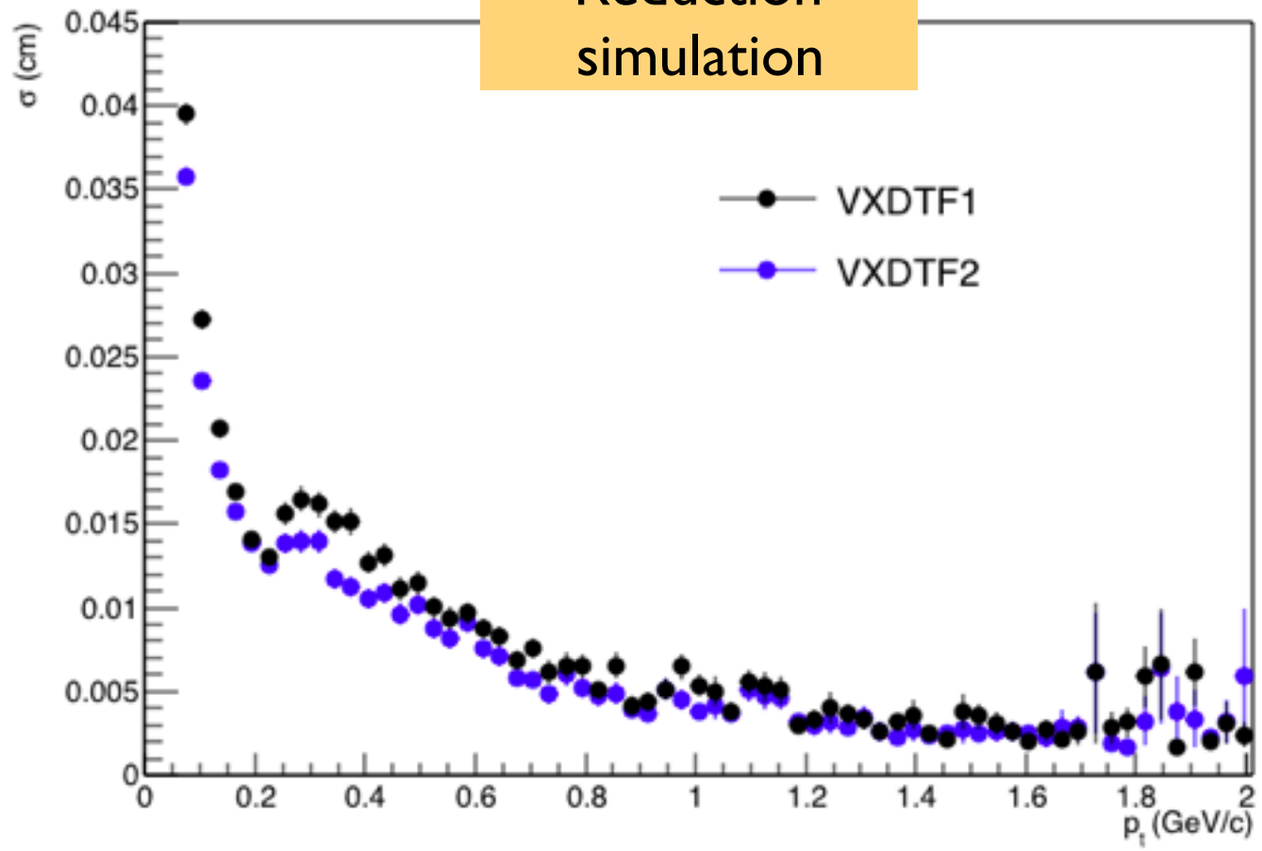




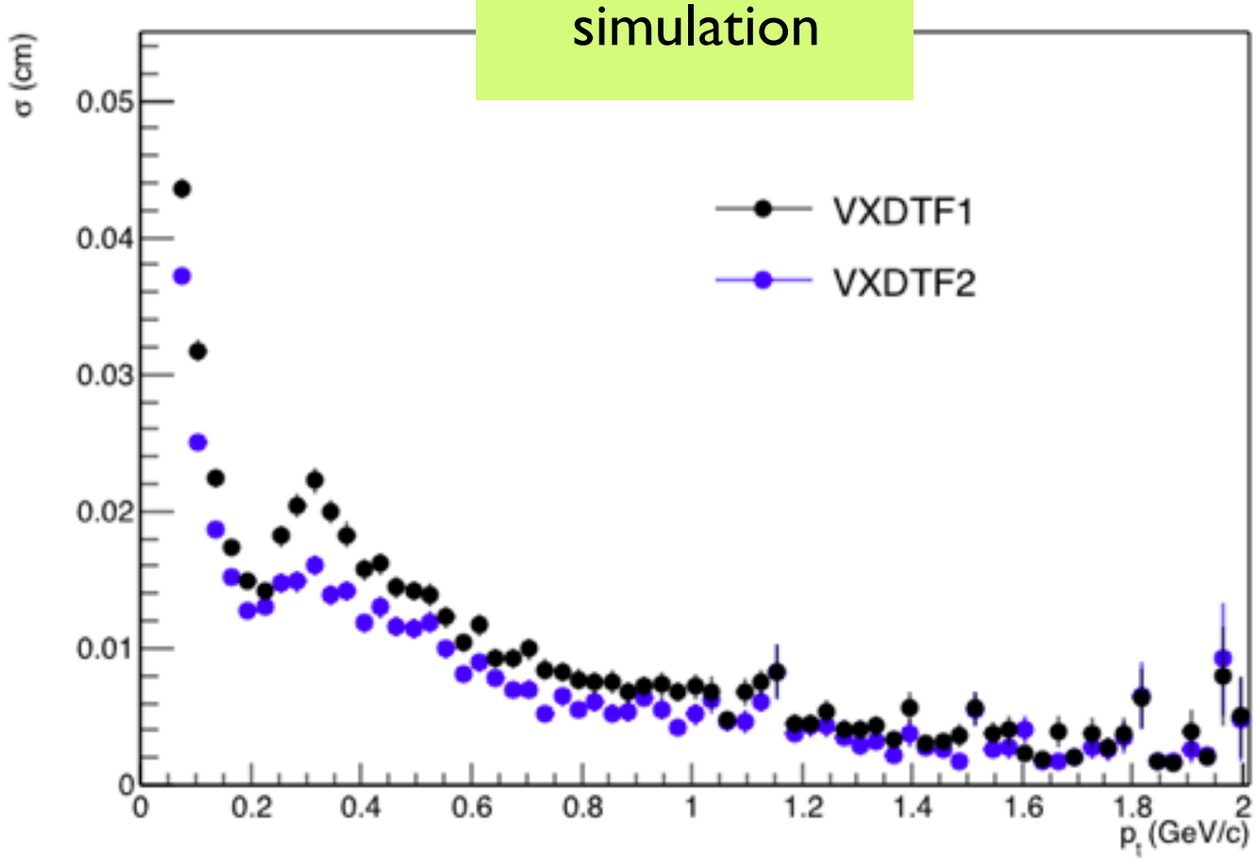
- VXDTF2 improves the performances especially at low p_T, below 200 MeV/c.
- VXDTF2 increases significantly the fraction of tracks with associated PXD hits. Very important for physics!!

d_0 Resolution vs p_T

no bkg & no PXD Data Reduction simulation



std bkg & PXD Data Reduction simulation



➡ Strange structure around p_T = 300 MeV/c, is more evident with background for VXDTF1, it's more ore less the same for VXDTF2 (→ stronger against background)

VXDTF1

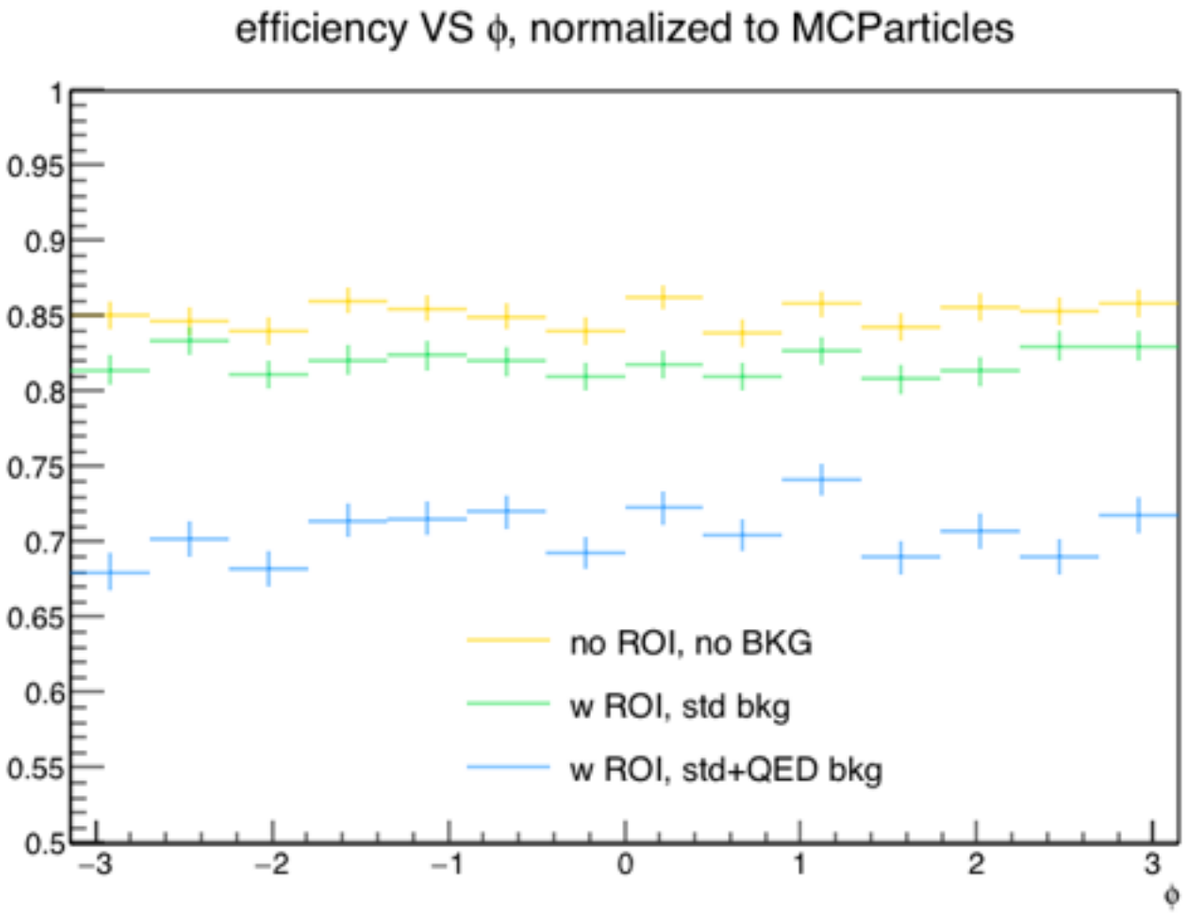
no background
no PXD Data Reduction simulation

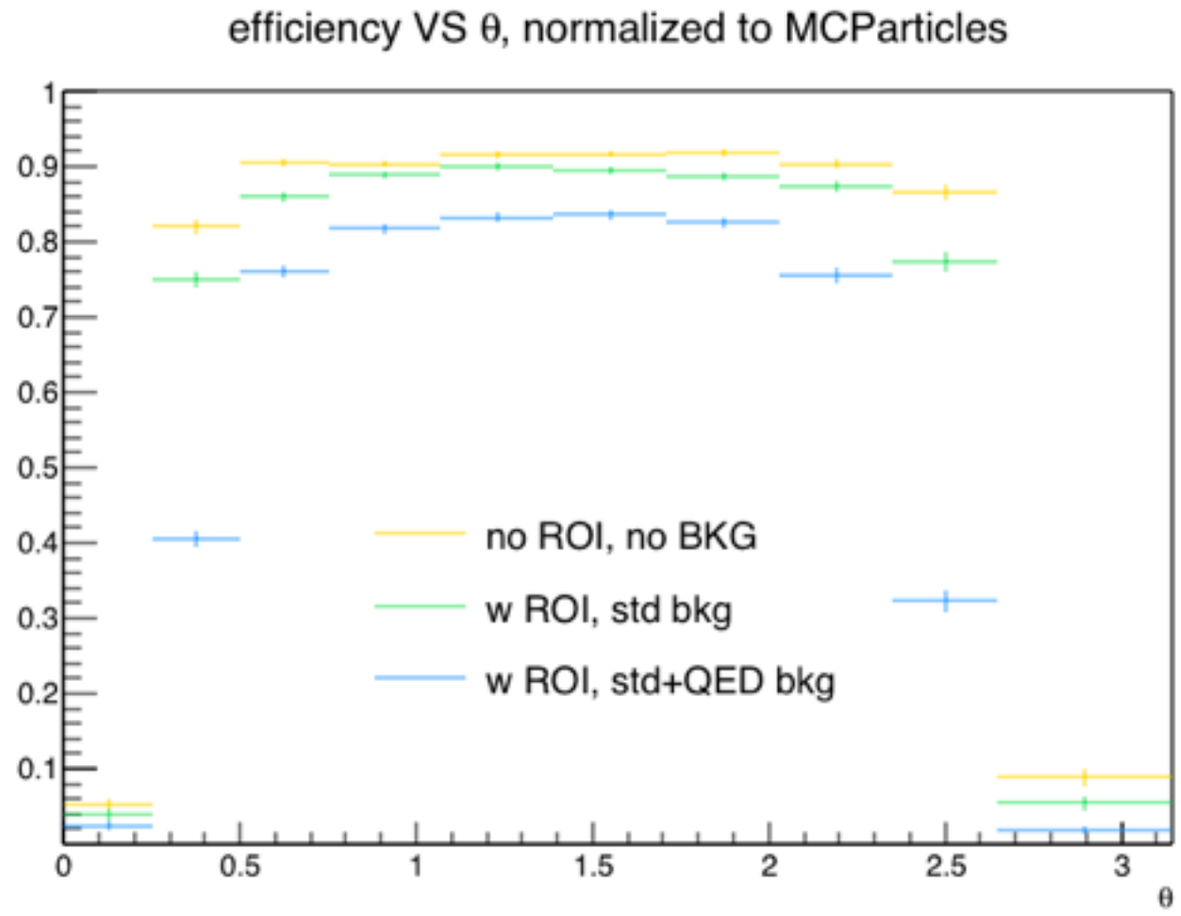
standard background (no QED)
PXD Data Reduction simulation

standard background + QED
PXD Data Reduction simulation

Efficiency vs Track Direction

VXDTF1

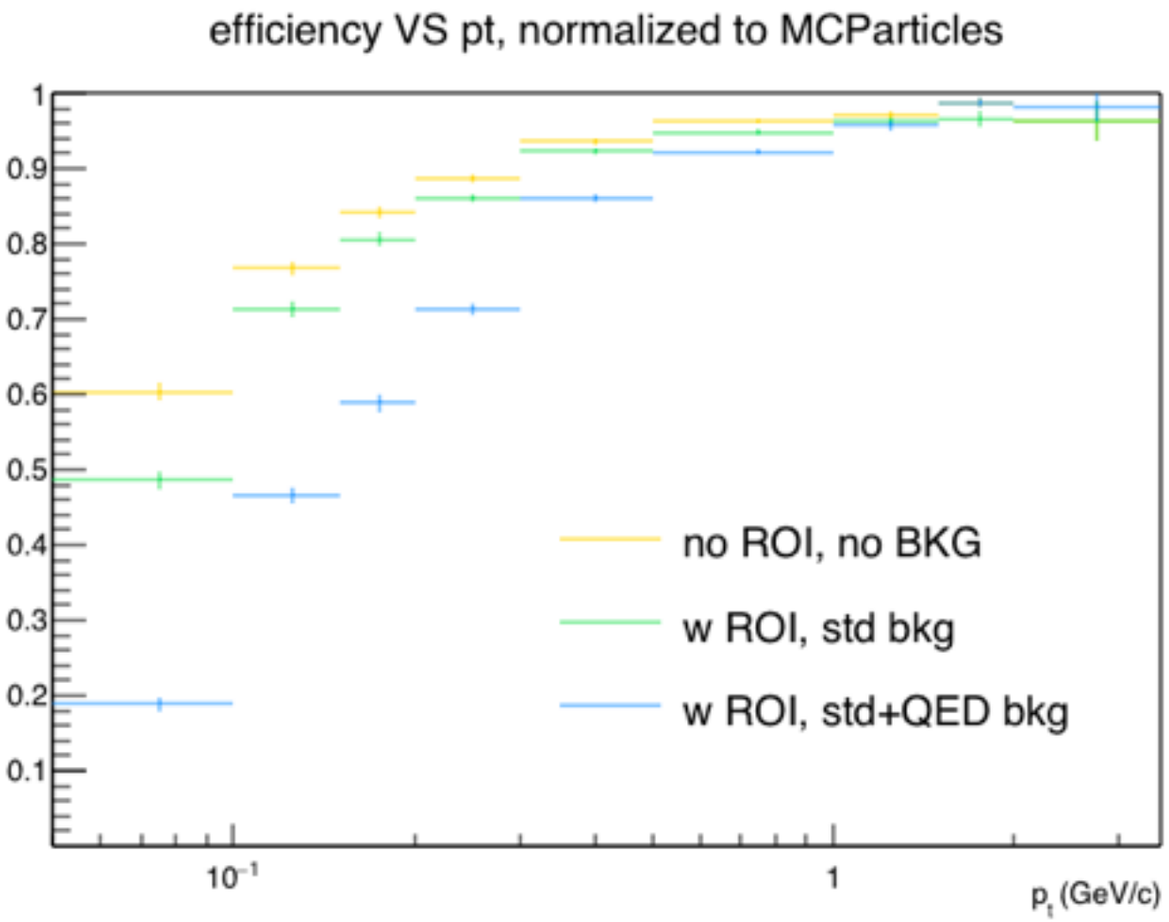


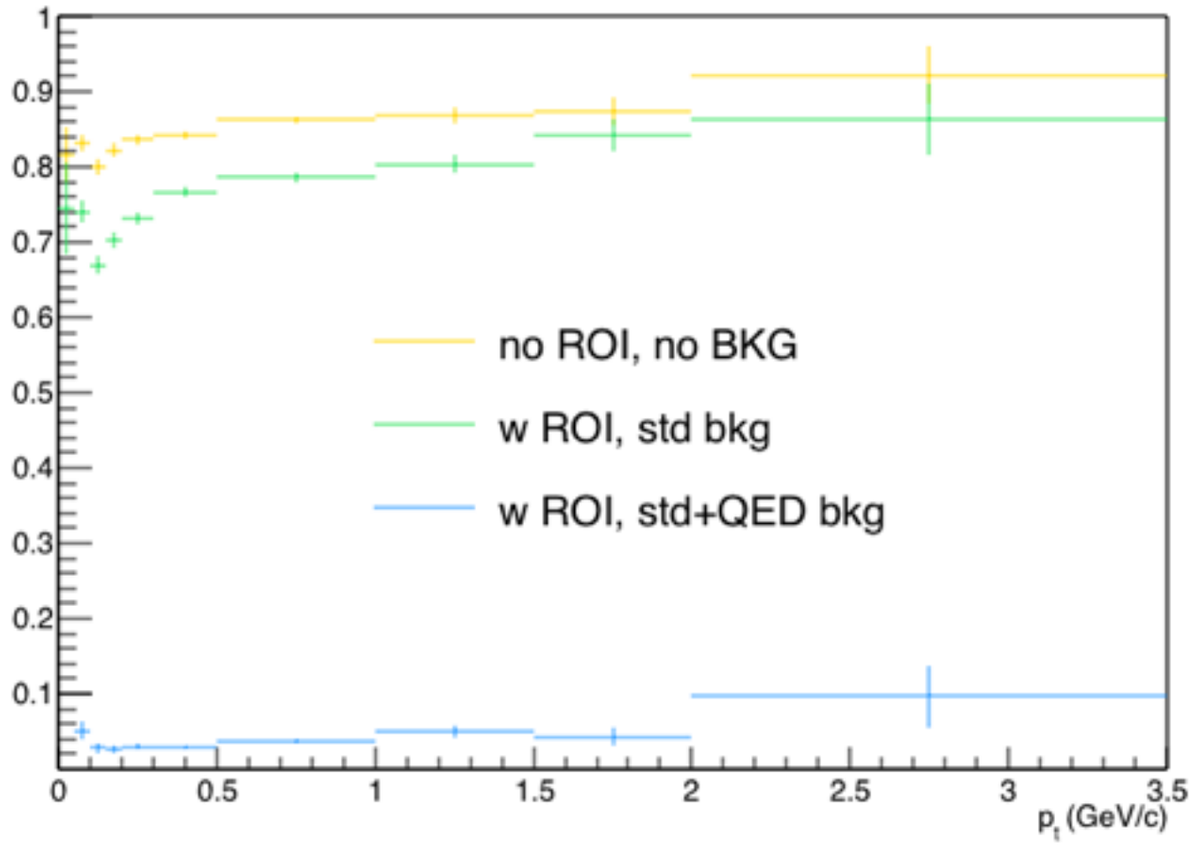


➡ Evident reduction of efficiency as machine background increases, specially with QED background

Efficiency vs p_T

VXDTF1



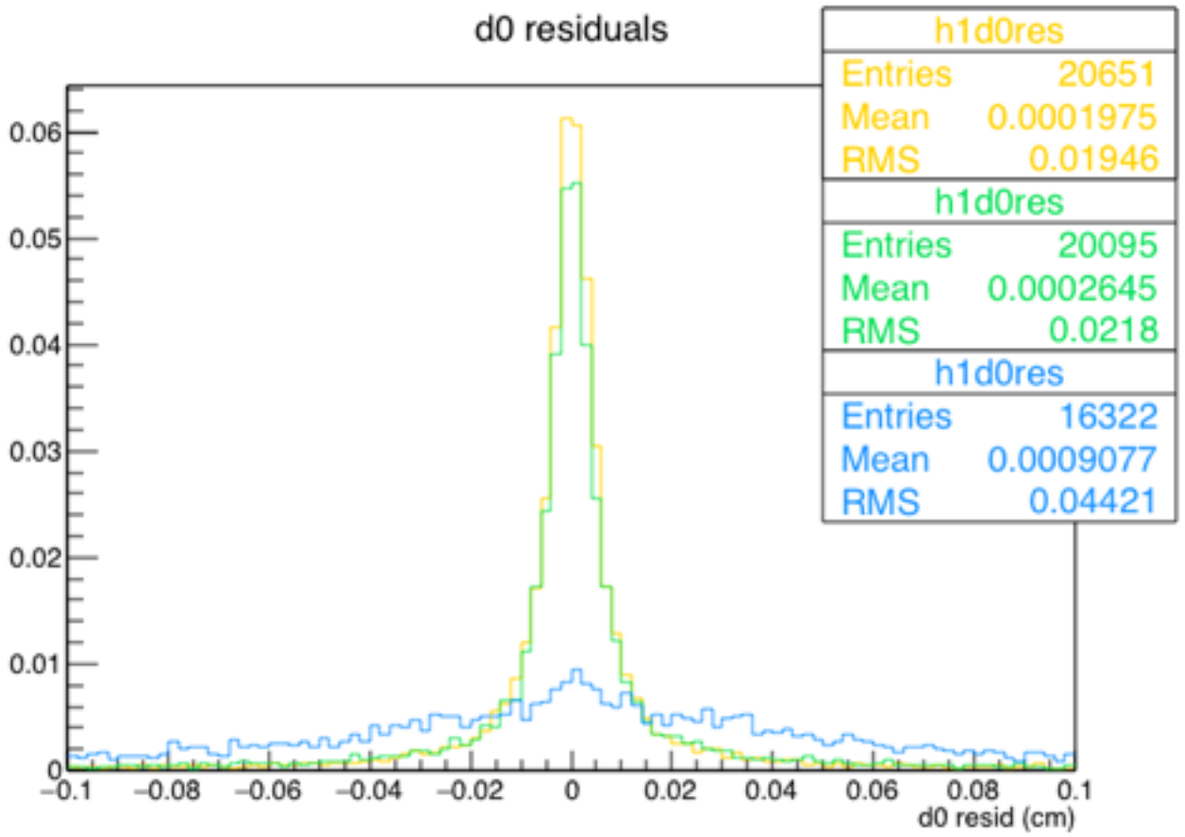


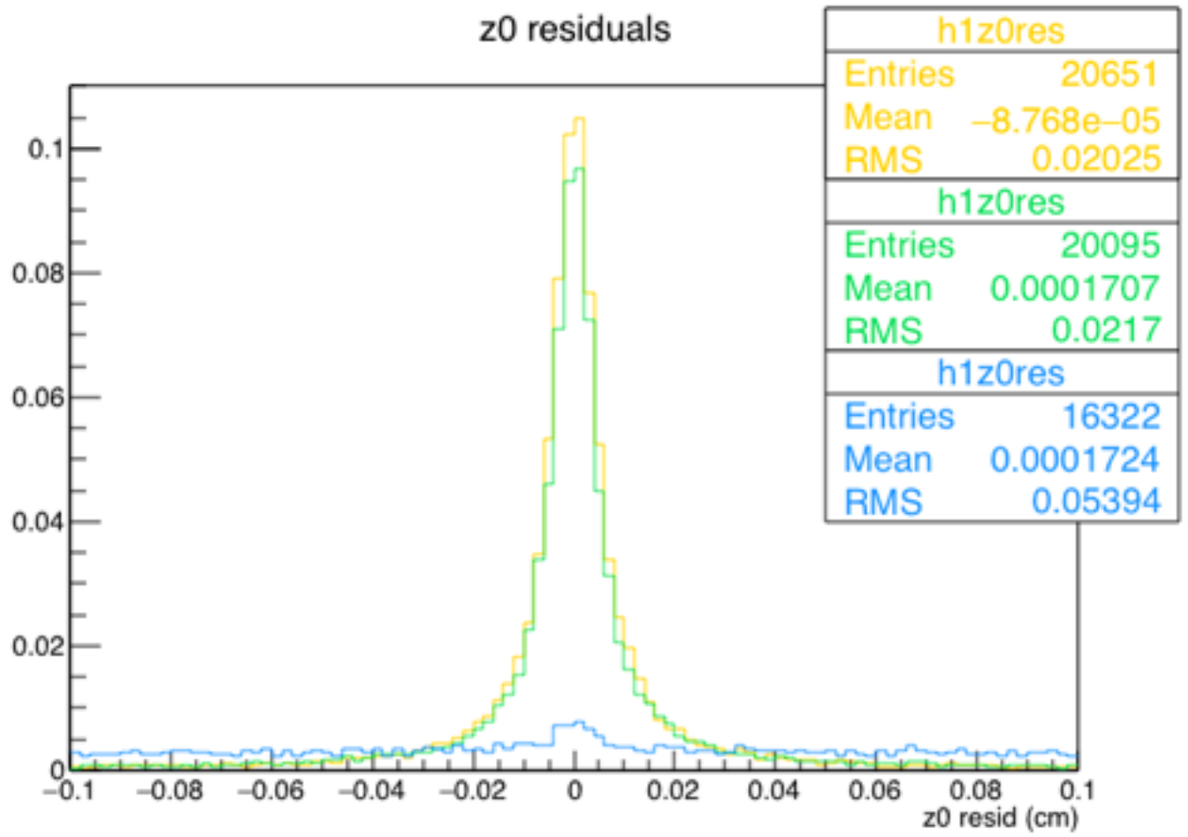
➡ Almost no PXD Hits associated to Tracks when including QED background!!

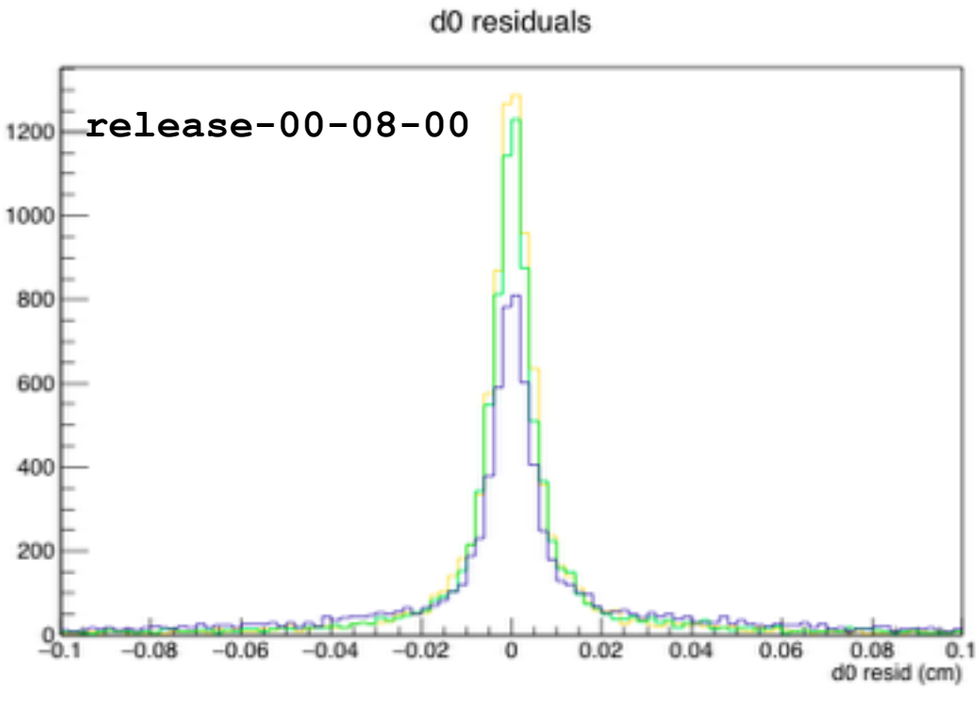
★ this was not the case with release-00-08-00, the average was 55%

Impact Parameters Residuals

VXDTF1







no ROI, no BKG

w ROI, std bkg

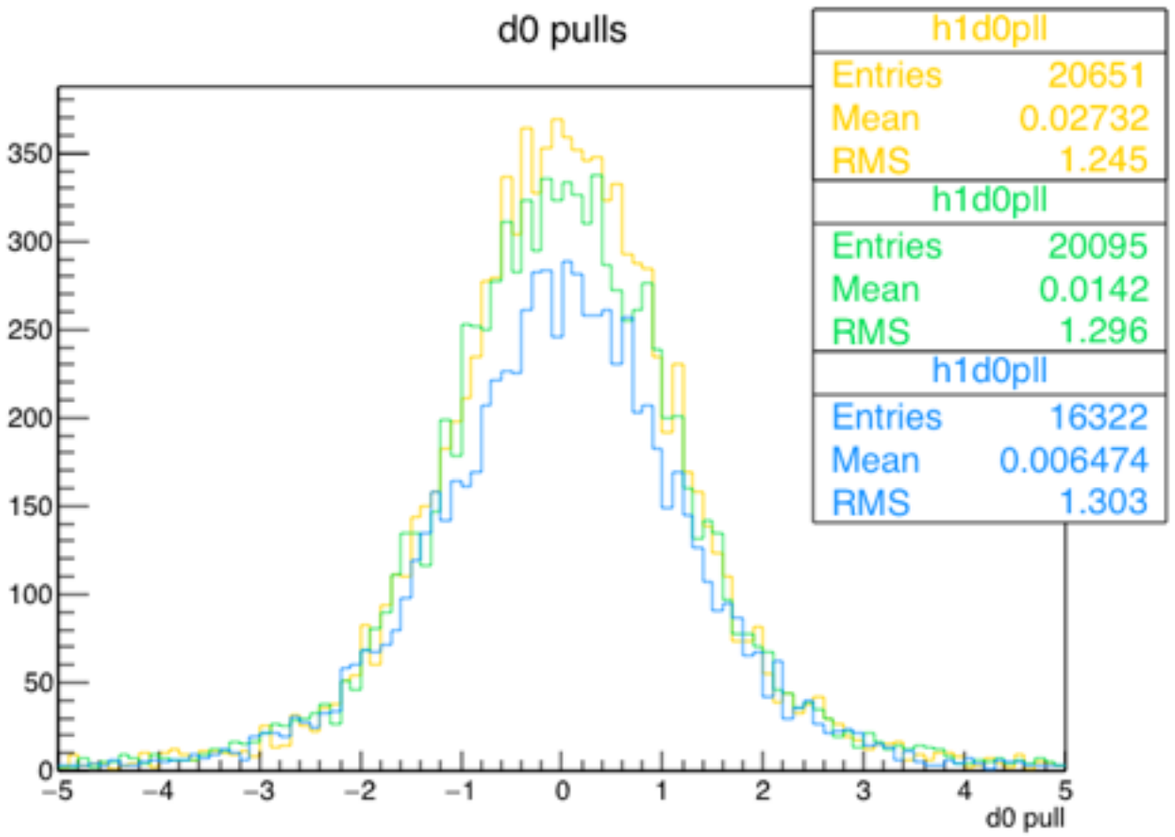
w ROI, std+QED bkg

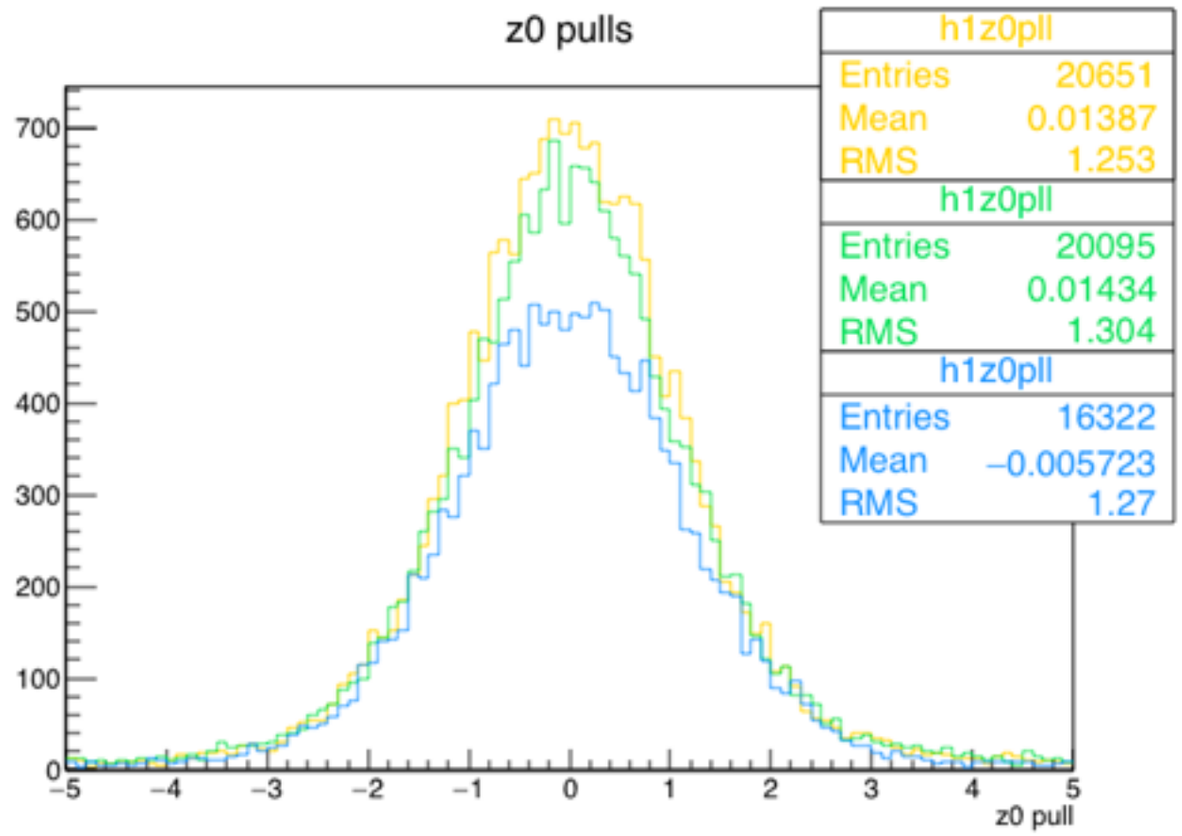
➡ Including QED background almost no track has a PXDHit attached

★ this was not the case with release-00-08-00

Impact Parameters Pulls

VXDTF1

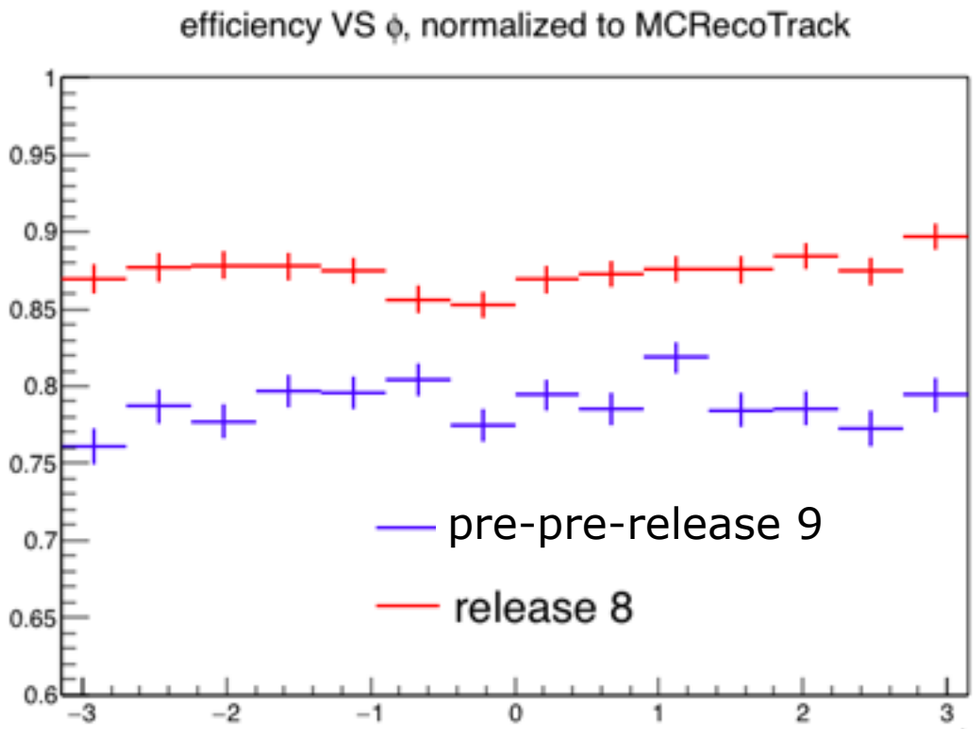


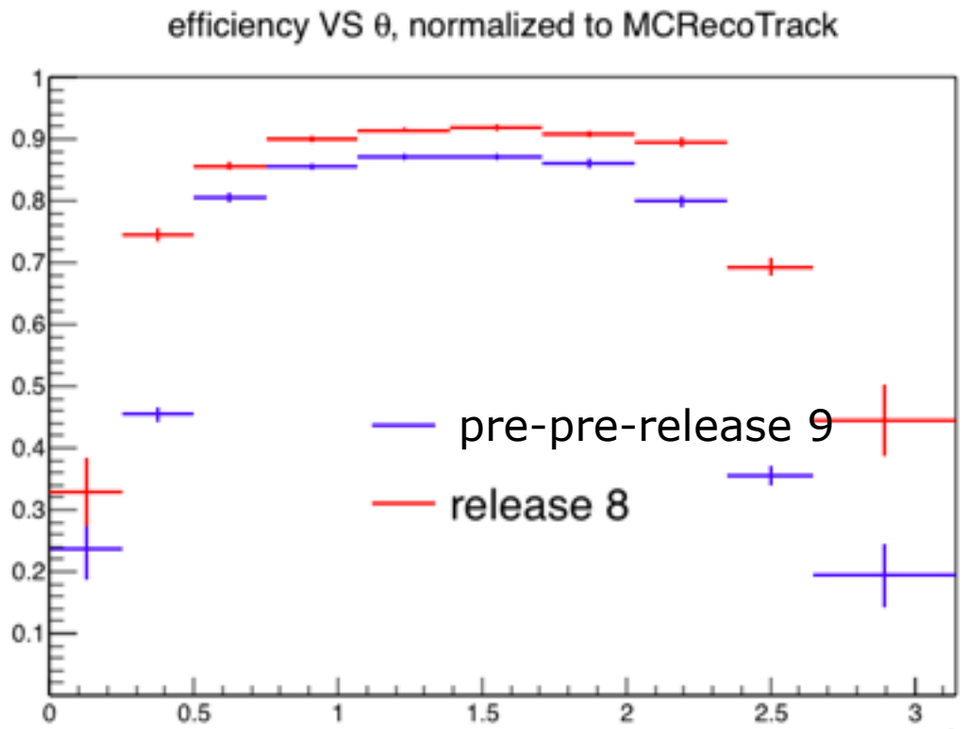


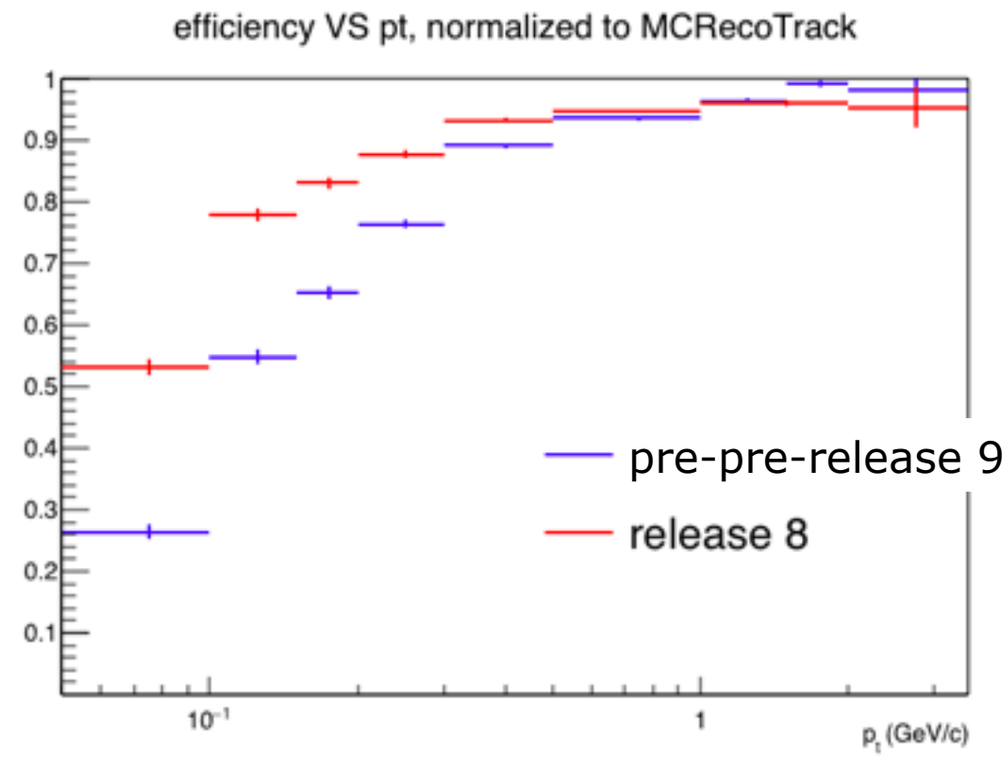
➡ The pulls look fine, even with QED background.

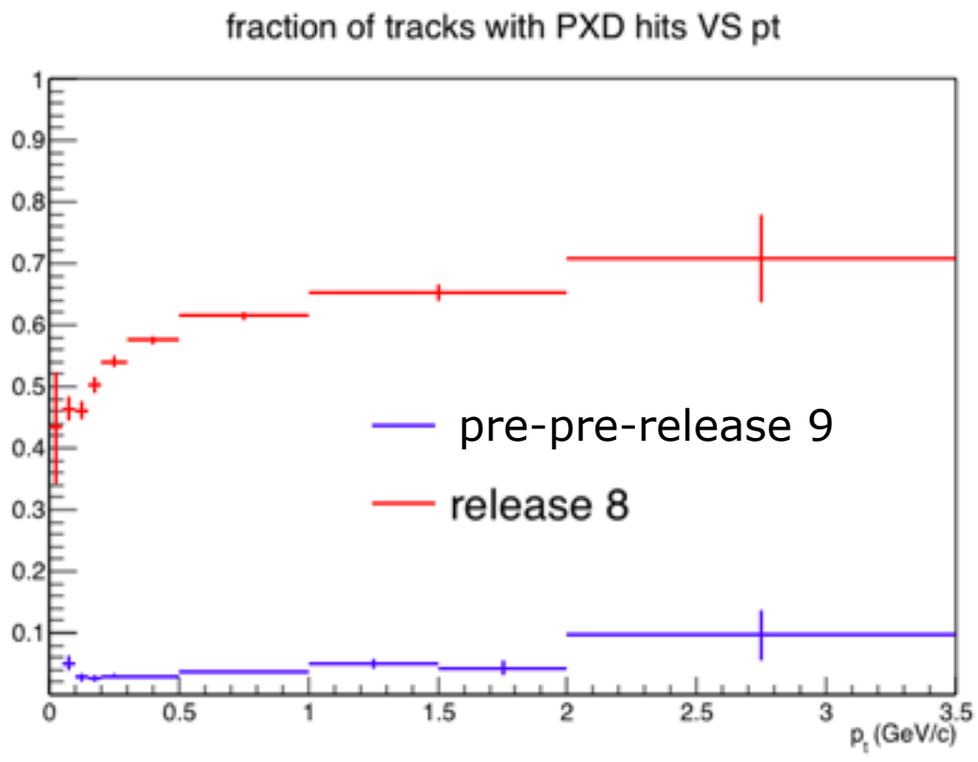
release-00-08-00 vs pre-pre-release 9

std bkg + QED & PXD Data Reduction simulation









Conclusions

- VXDTF2 performances is better than VXDTF1, do we really want the default of release-00-09-00 VXDTF1?
  - from the performances point of view VXDTF2 wins
  - from other points of view, i.e. memory consumption, VXDTF1 is more reliable

- Bump at p_T around 300 MeV/c in the d_0 resolution

- Issue with QED background (in the large time window), not present in release-00-08-00
  - tracking efficiency is degraded (– 10%)
  - fraction of tracks with attached PXD hits is < 10%
  - resolution is degraded (~ twice worse)

Integrated Efficiencies, release-00-08-00

➡ The tracking performance of release-00-08-00 is compatible with the one of the previous release

- only the pion mass hypothesis has been used here although all 5 mass hypotheses are available (only if the track fit has succeeded)

	with ROIs	*tracking efficiency*	*efficiency factoring out geom. accept.*	*V0 efficiency*
no bkg	no	**85.3 ± 0.2**	**93.9 ± 0.2**	**64 ± 2**
	yes	**83.9 ± 0.2**	**93.3 ± 0.2**	**63 ± 2**
std bkg	no	**81.7 ± 0.3**	**89.8 ± 0.2**	**53 ± 2**
	yes	**82.3 ± 0.3**	**92.3 ± 0.2**	**57 ± 2**
std bkg + QED reduced	no	✘	✘	✘
	yes	**80.3 ± 0.3**	**90.1 ± 0.2**	**55 ± 2**
std bkg + QED	no	✘	✘	✘
	yes	**77.8 ± 0.3**	**87.3 ± 0.2**	**51 ± 2**