Status of FTKSim:
Linear fit constants

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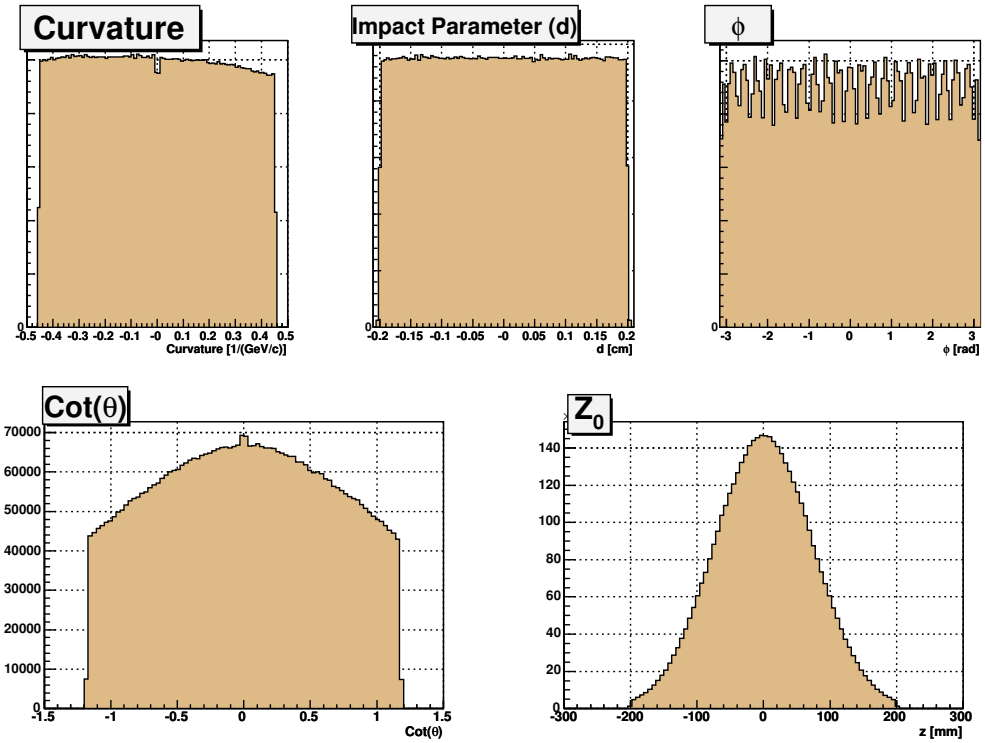
We have completed the training using data from the new Monte Carlo production of μ^+ and μ^- with these characteristics:

- Uniform distribution in inverse transverse energy $(0 \div 1 GeV^{-1})$
- Uniform distribution $0.0 \div 0.2cm$ of impact parameter.
- Uniform distribution in ϕ, $-\pi \div \pi$
- Uniform distribution in $\eta \in [-1, 1]$.
- Gaussian in z_0 with $\mu = 0$, $\sigma = 20mm$.

The training was made with a complete *3D recostruction* (curvature, impact parameter, ϕ, $\cot(\theta)$, z_0) with **3D sectorization** and **2D sectorization**.

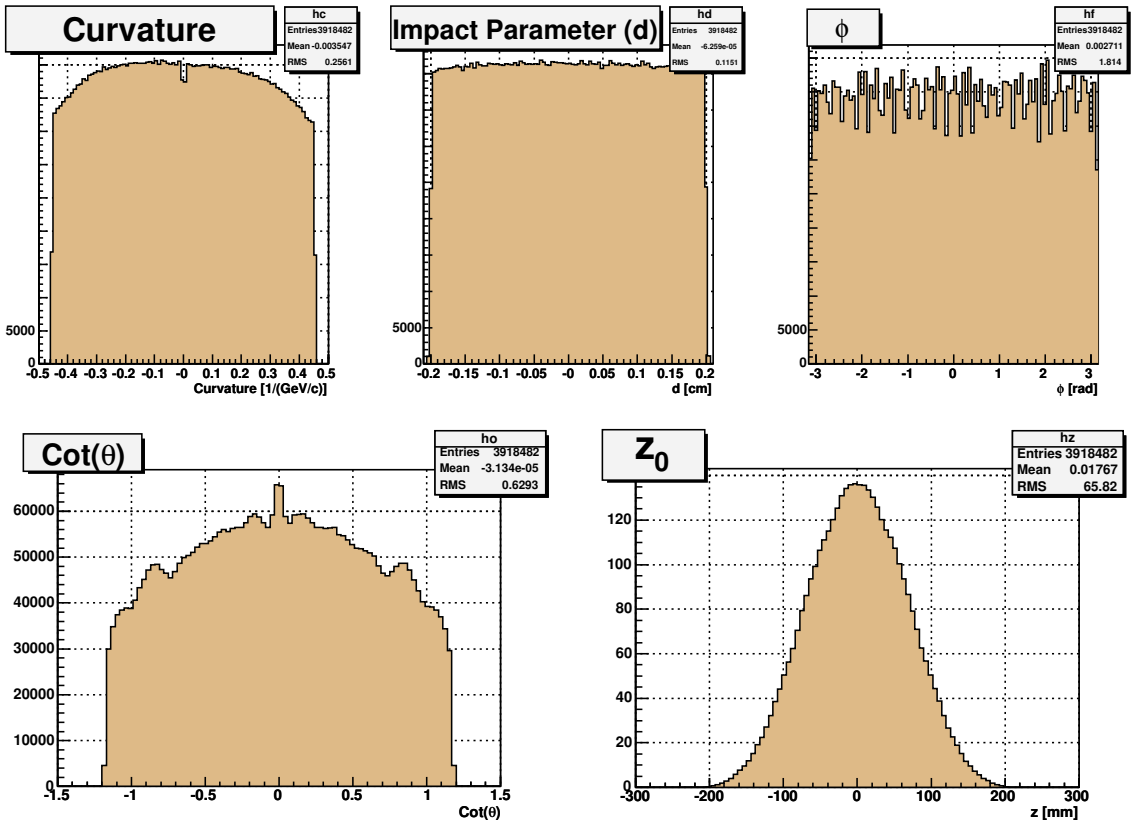
2D Sectorization, parameters population

2D Sectorization has efficiency in all parameters, same inefficiencies for positive curvatures and for some values of ϕ angle.



3D Sectorization, parameters population

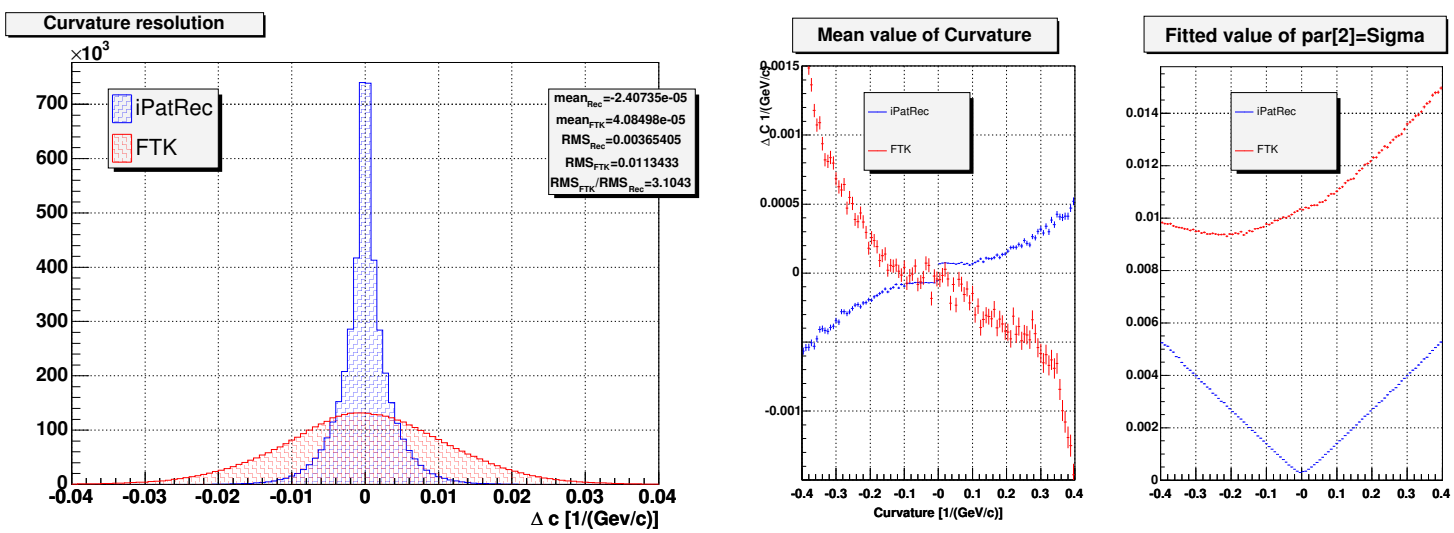
Some inefficiencies similar to 2D sectorization.



2D Sectorizaion, Curvature

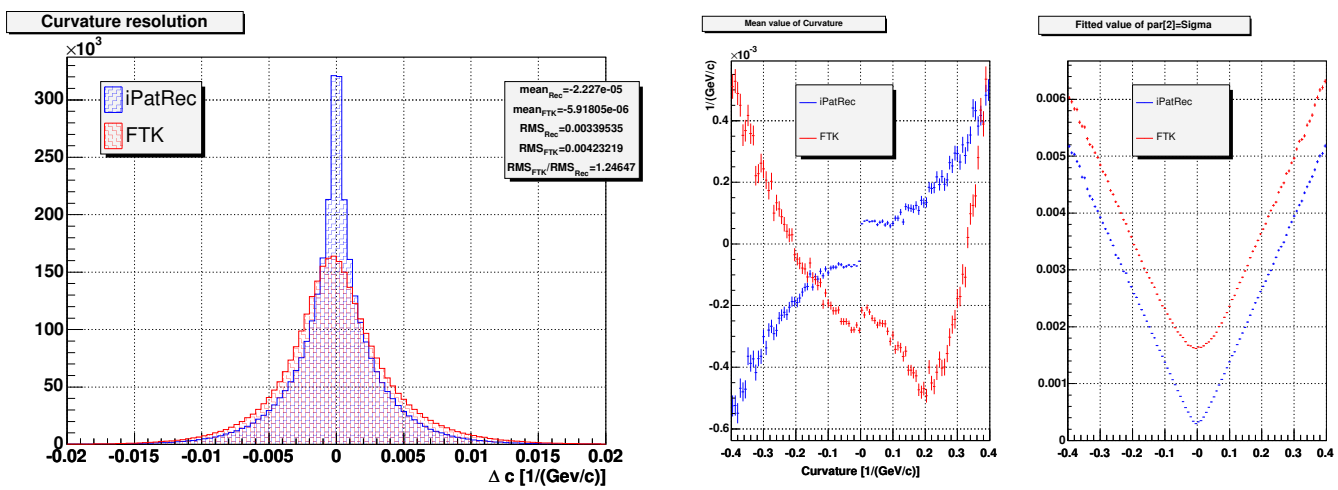
Curvature recostructions of FTK has worse resolution than off-line.

The plots on the right shows the mean value and the gaussian σ of the differences from real curvatures' value and FTK or IPatRec. FTK shows a great non linearity effects.



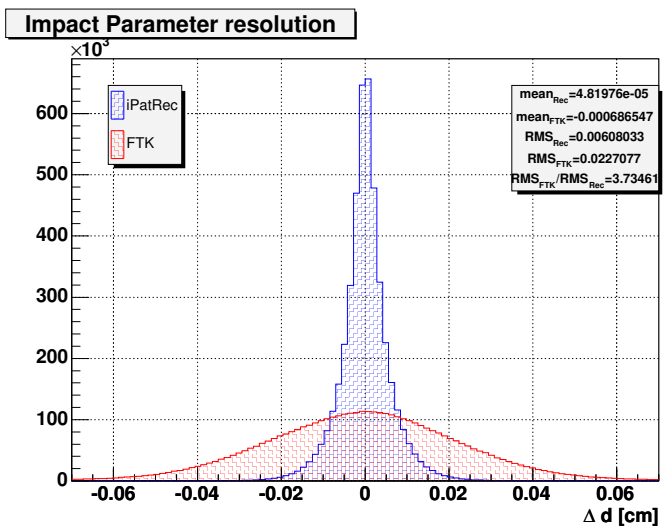
3D Sectorization, Curvature

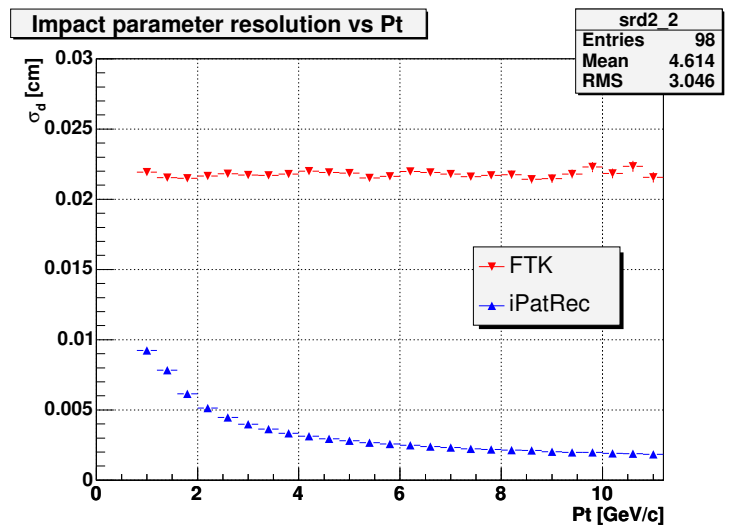
Curvature has a residual non linearity effects on resolution:



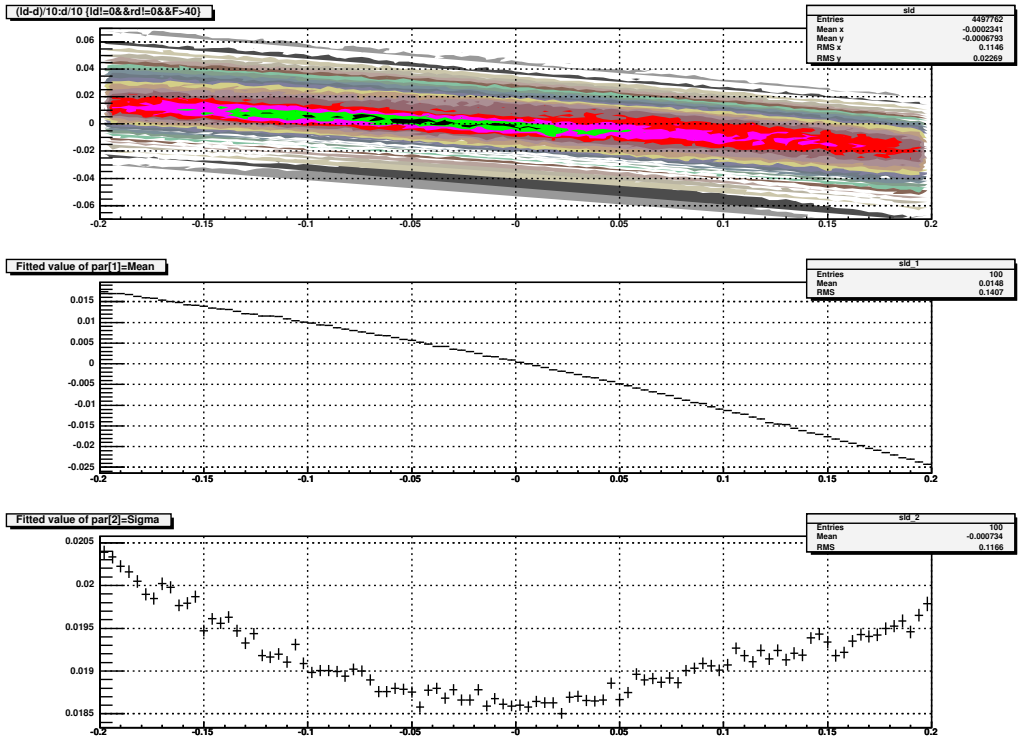
2D Sectorization, Impact parameter

Impact parameter recostruction is worse than iPatRec for all $P_\perp$ values, with a value of $230\mu m$.





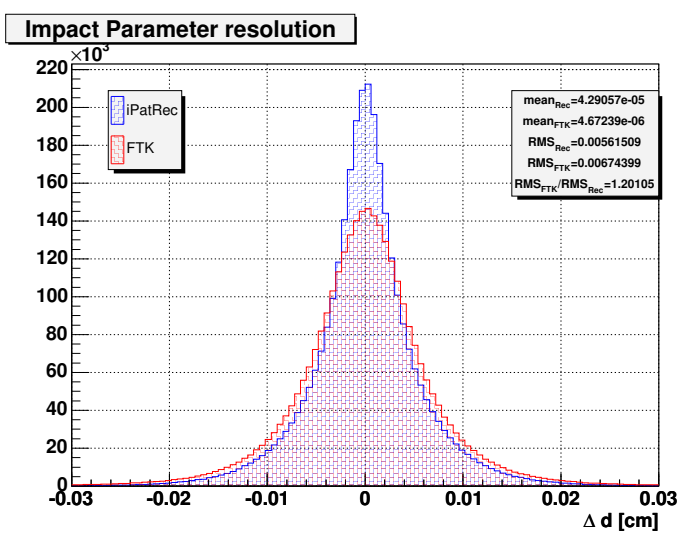
There is a great non linearity on Impact parameter recostruction:

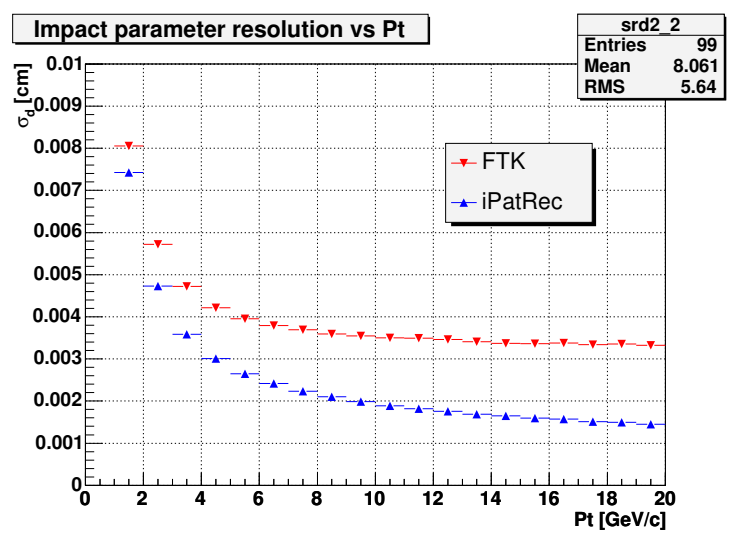


3D Sectorization, Impact Parameter

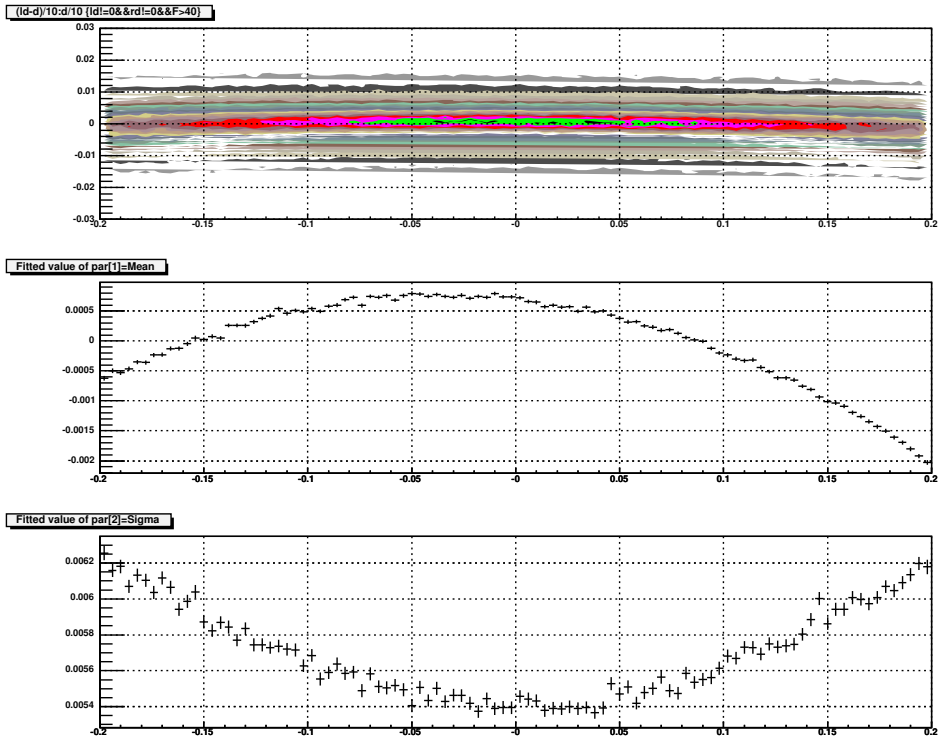
Impact Parameter recostruction has a great impovement respects 2D sectorization.

The resolution as function of $P_\perp$ has an asymptotic value of $30\mu m$ (iPatRec has an asymptotic value of $\sim 13\mu m$).



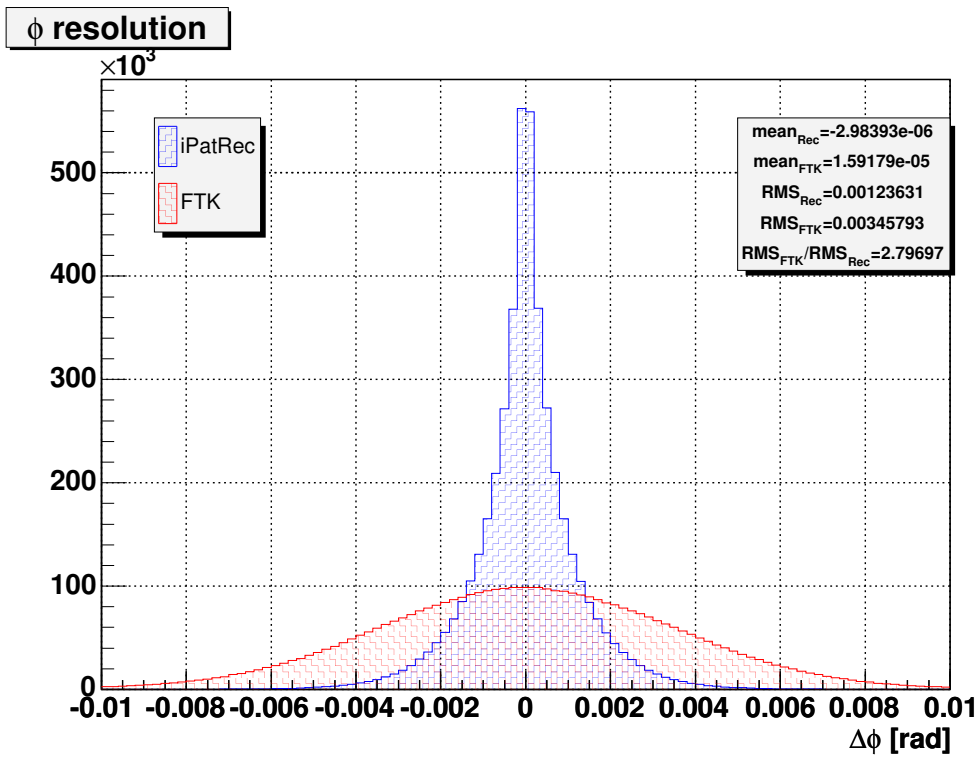


Remanin same non-linearity effect.



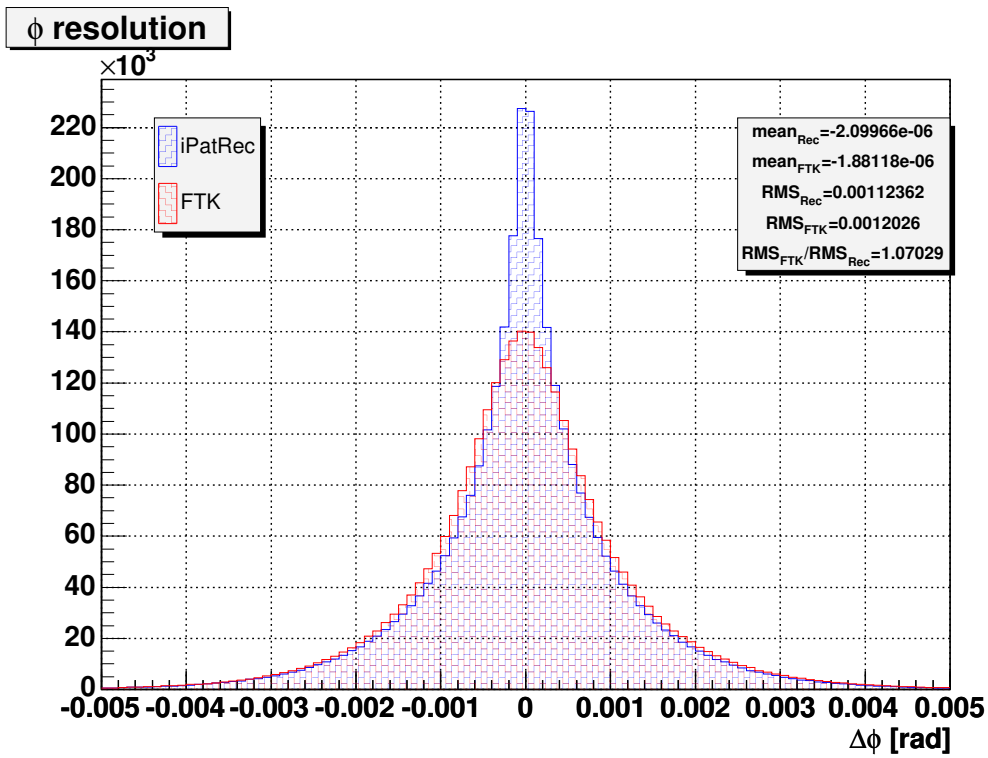
2D Sectorization, ϕ

ϕ resolution worse than offline.



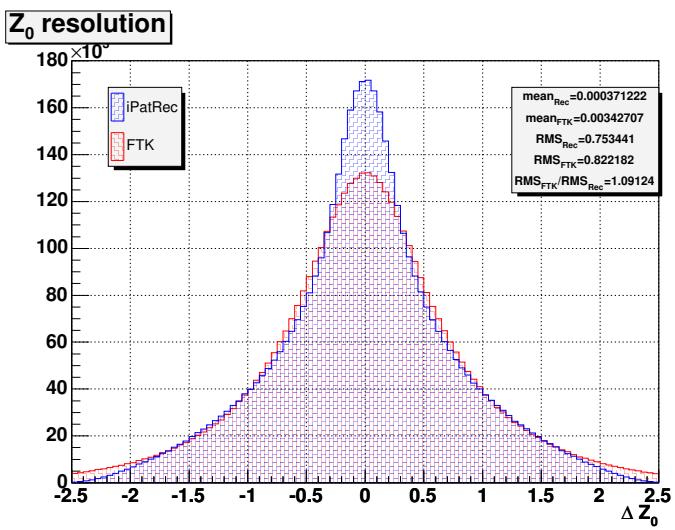
3D Sectorization, ϕ

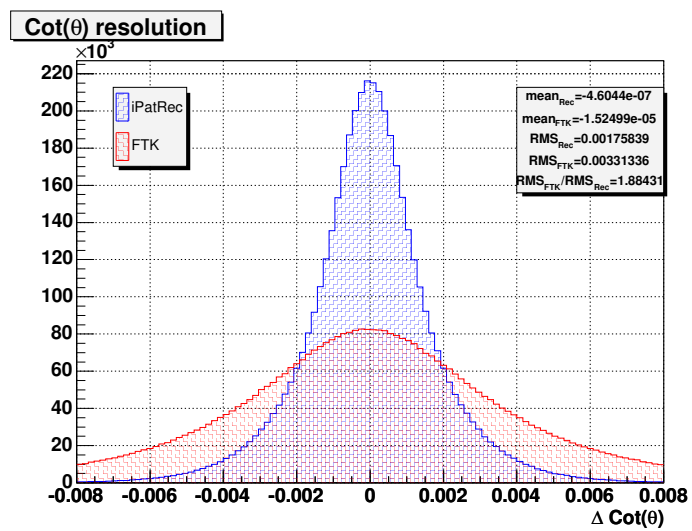
ϕ angle is correctly reconstructed by FTK.



2D Sectorization, $\cot(\theta)$ and z_0

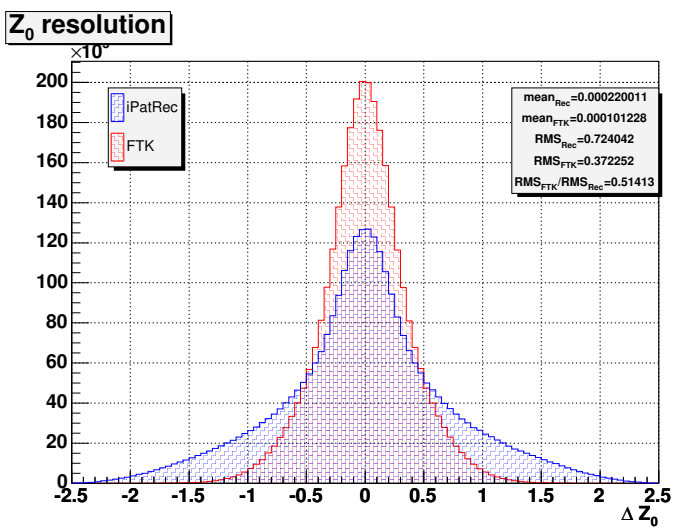
z_0 and $\cot(\theta)$ are reconstuted worse than ATLAS off-line, but these values can be sufficient for the trigger's purposes.

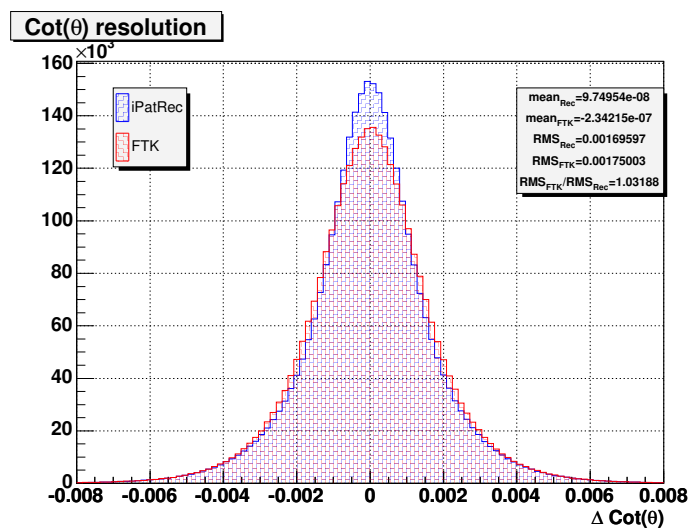




3D Sectorization, $\cot(\theta)$ and z_0

$\cot(\theta)$ and z_0 are well reconstructed with 3D Sectorization:





2D Sectorization vs 3D Sectorization

$\frac{\mathbf{RMS_{ftk}}}{\mathbf{RMS_{rec}}}$	**2D**	**3D**
Curv.	3.1	1.2
Impact Par.	3.7	1.2
ϕ	2.8	1.1
$\cot(\theta)$	1.9	1.0
z_0	1.1	0.5

	2D	**3D**
num. secs	~ 1000	~ 300000
MB gcon	2	700
RAM occ.	$< 1MB$	$\sim 200MB$

Conclusions

- Need other studies to try to remove not linearity effects, expecially for 2D sectorization.
- The new training show that the geometry of the ATLAS Inner Detector could suggest a 3D Sectorization (expecially for Impact Parameters).
- Use of 2D Sectorization constants is trivial, 3D Sectorization requires a large memory (but still feasible).

Next step: use geometrical constants to test resolution on real events reconstruction.