ITSupgrade:
Update on the tracking

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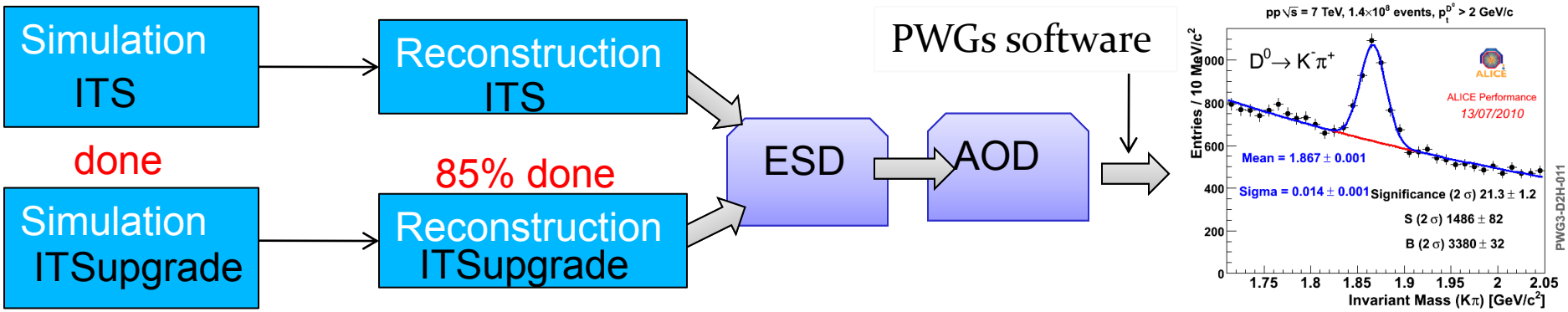
ITSupgrade: simulation and reconstruction



Geometry simulation

Flexibility in the geometrical layout →easy to modify the configuration to optimize the design with respect to:

- **Detector Parameters** (i.e. number, thicknesses and radii of layers) set in the Config.C
  - ➢ **Beam Pipe: need to change beam pipe radius**
    - take off AliPIPE
    - **Implementation of beam pipe 'upgrade' as a beryllium cylinder:** beam pipe parameters set in the Config.C

Status of reconstruction: tracking

Fitting Methods for the ITSupgrade
→ ITS Stand Alone Tracking

✓ Kalman method:

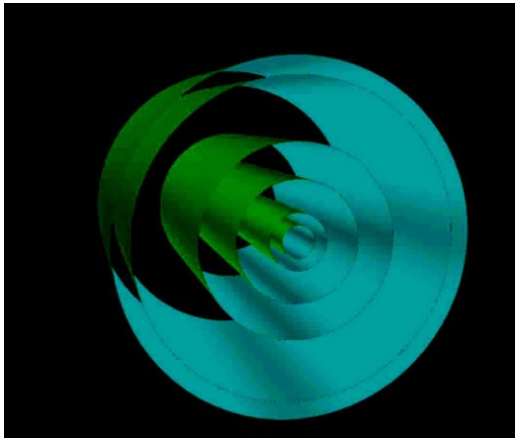
Debug phase: (many thanks to F.Prino)

- Refit Outward and Inward:
  Track Parameters, Covariance matrix, Correction For Material..

Check phase on going

ITS upgrade: validation of tracking with Kalman Filter

	SPD	SDD	SSD
# of layers	2	2	2
radius (cm)	3.9 & 7.6	15 & 24	38 & 43
spatial precision (μm)	rφ = 9-12 μm z = 100 μm	rφ =35 μm z = 25 μm	rφ =20 μm z = 830 μm



✓ same cell segmentation (=>resolution) and radii of the actual SPD, SDD, SSD

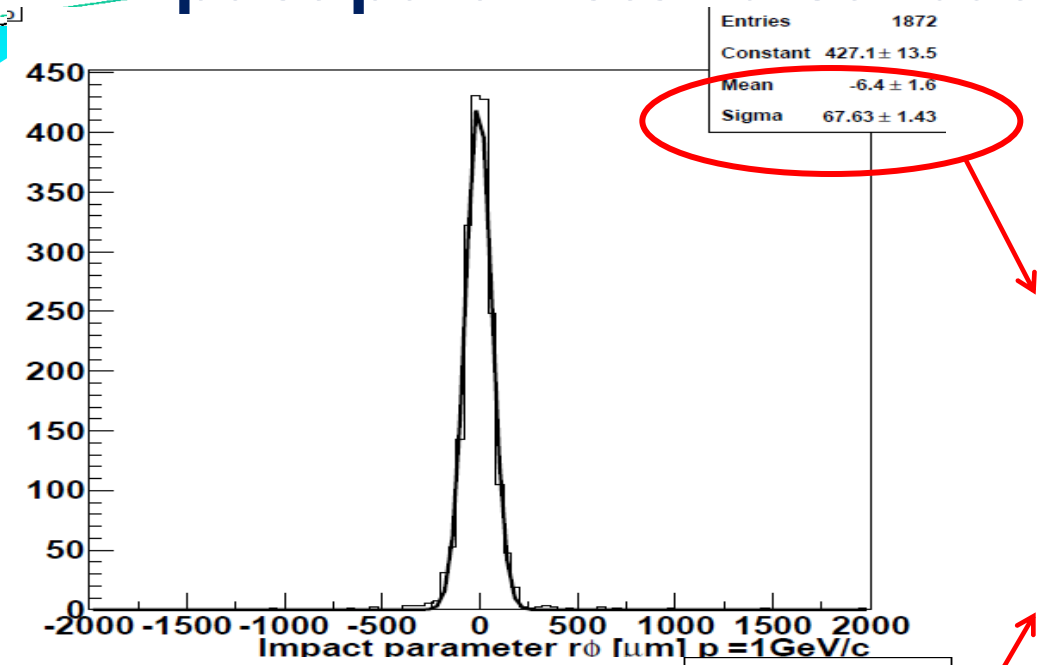
✓ same material budget of the actual ITS (X/X_0 = 8% in tot)

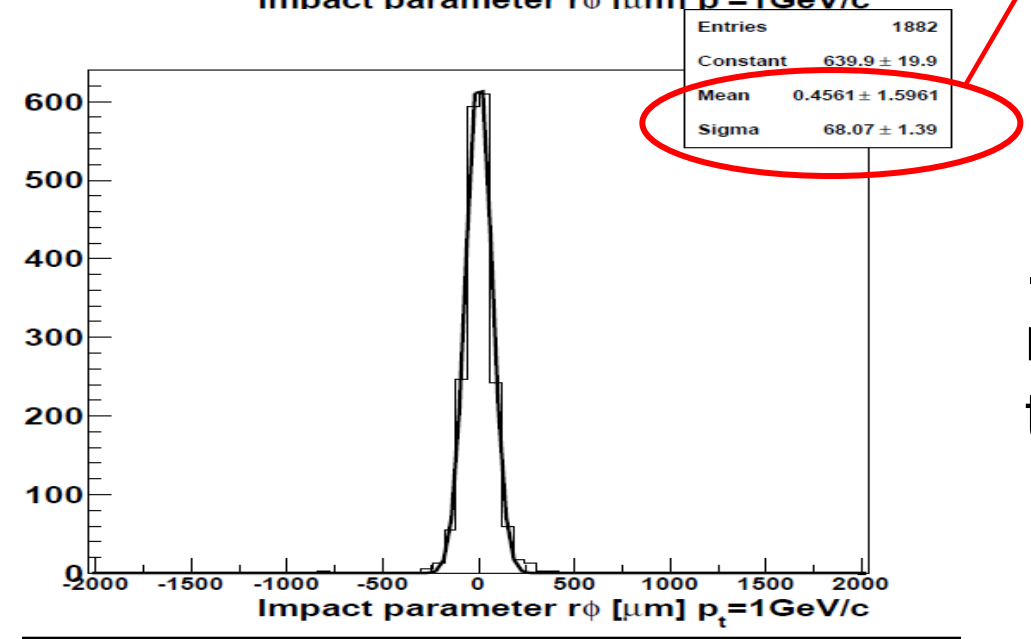
✓Beam Pipe 'upgrade': r = 2.9 cm width= 0.8 mm (Beryllium)

Actual ITS vs ITSupgrade

Factor of merit: Impact parameter resolution and relative momentum resolution

Impact parameter distribution pt =1GeV/c



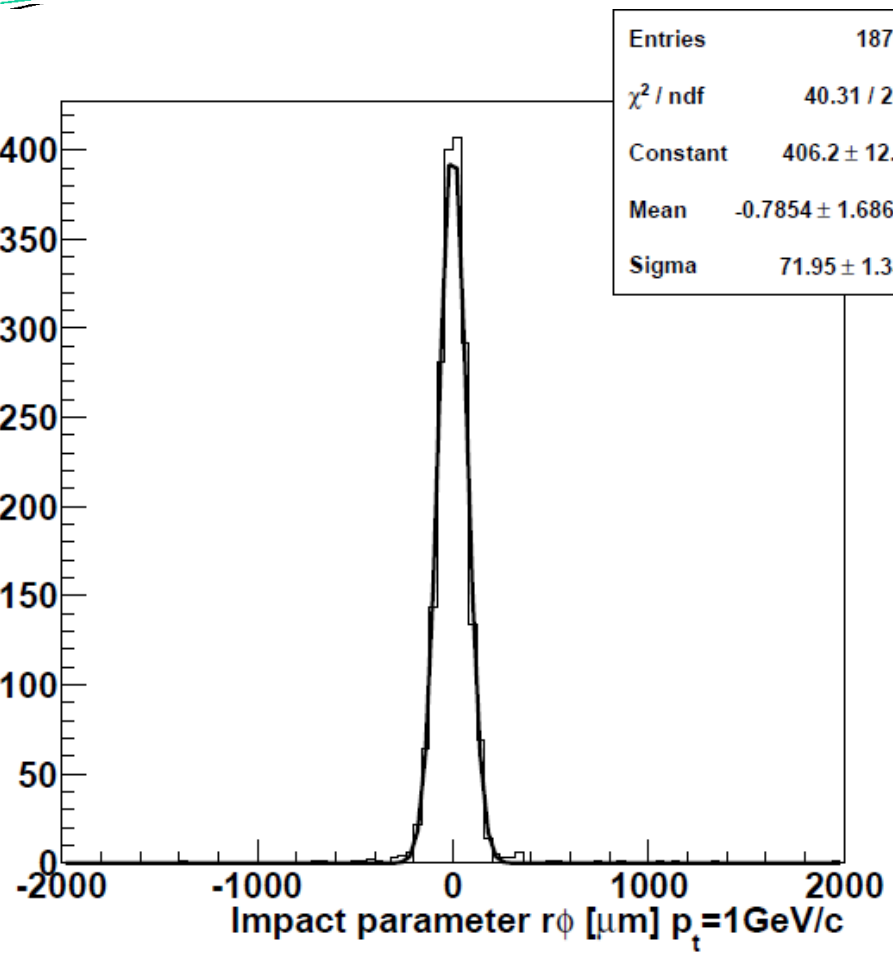


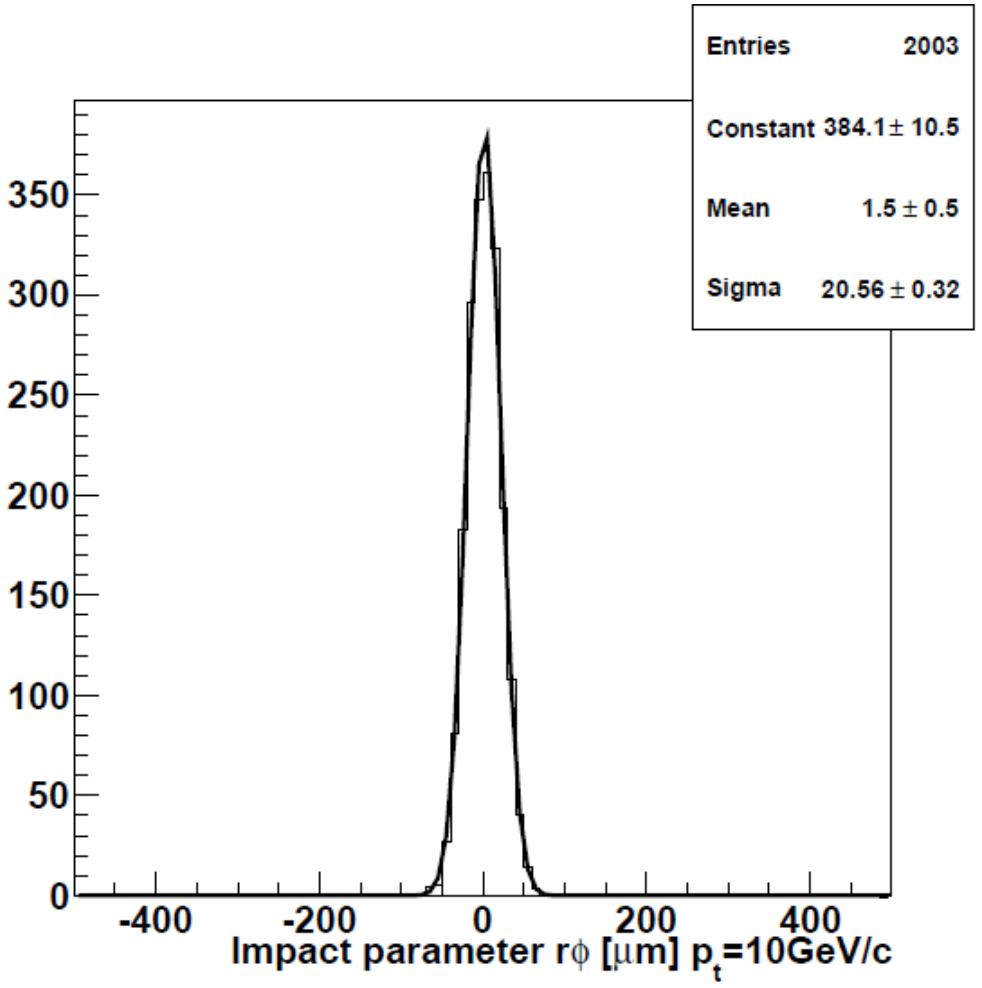
- **AliPIPE off and Beam Pipe upgrade on:**
  not centered distribution:
  shift (-6.4 ± 1.6)μm

- **Without any Beam Pipe:**
  centered distribution
  mean value (-0.4 ± 1.5)μm

.. To be investigated..
no beam pipe-upgrade for the moment → **AliPIPE ON**

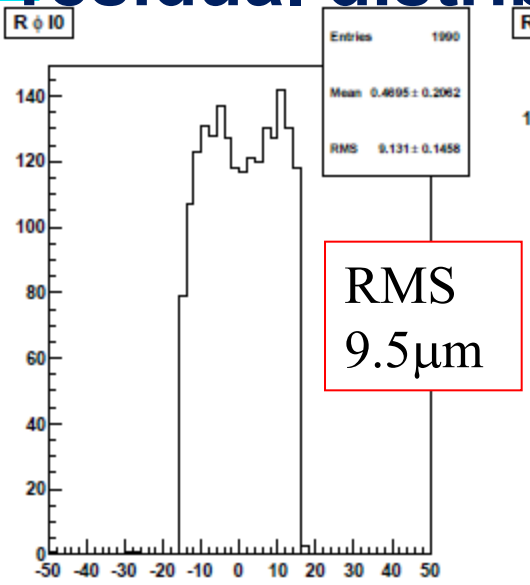
ITSupgrade: Impact parameter distribution

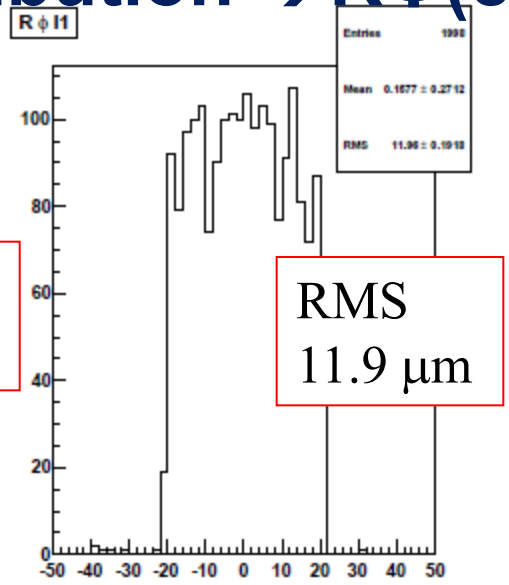


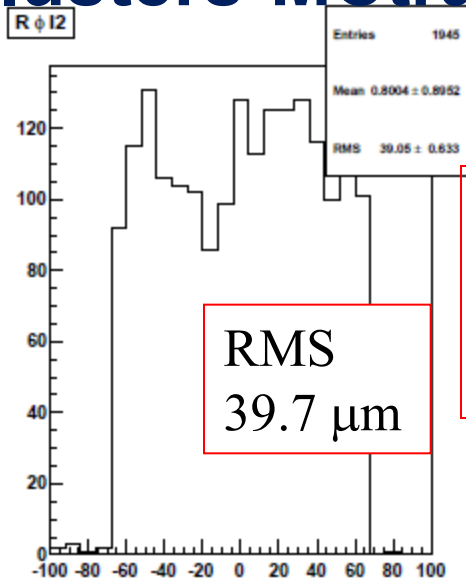


Simulation done with actual beam pipe

Check on the cluster coordinates: residual distribution →RΦ(clusters-MCtrackPosition)

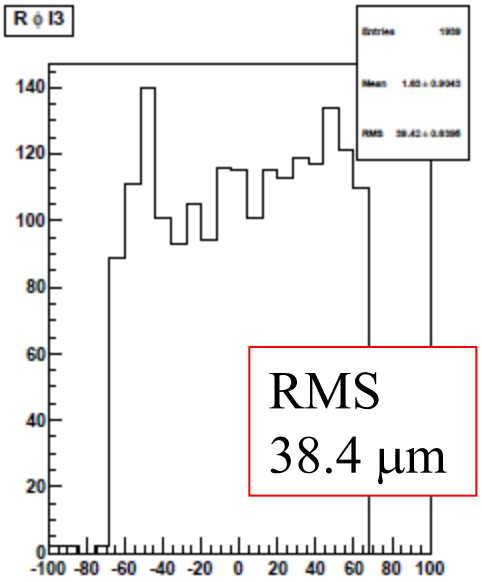


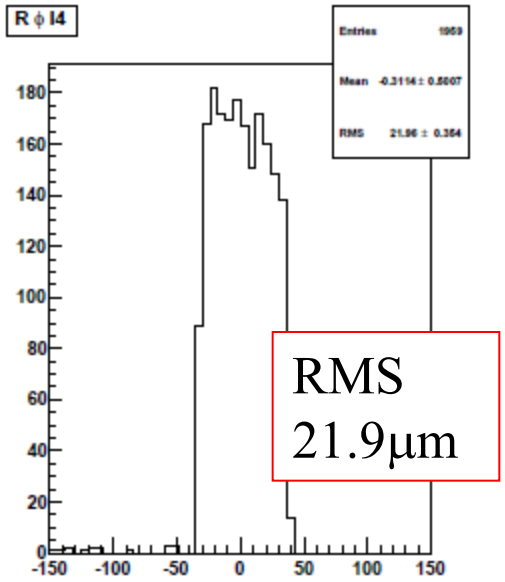


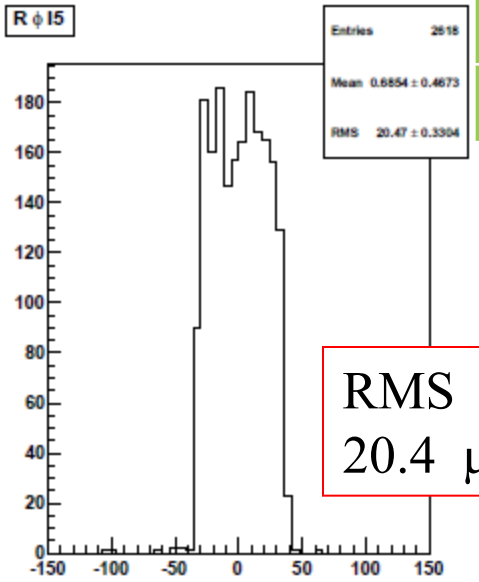


RMS value ~ resolution of each layer

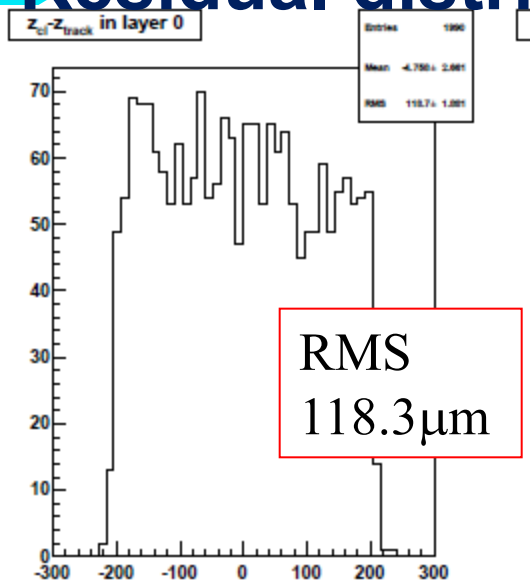
SPDo	9μm
SPD1	12μm
SDD	35μm
SSD	20μm

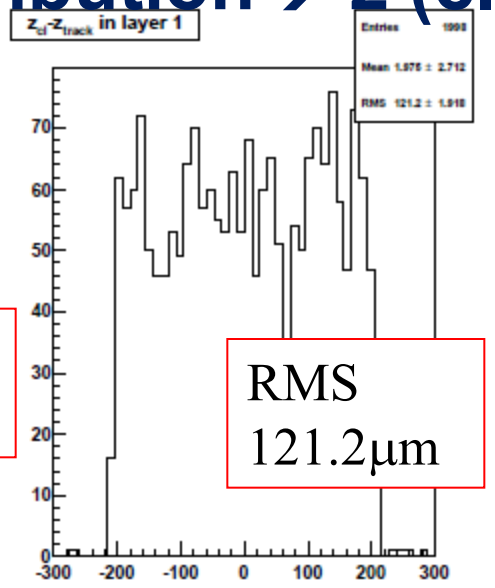


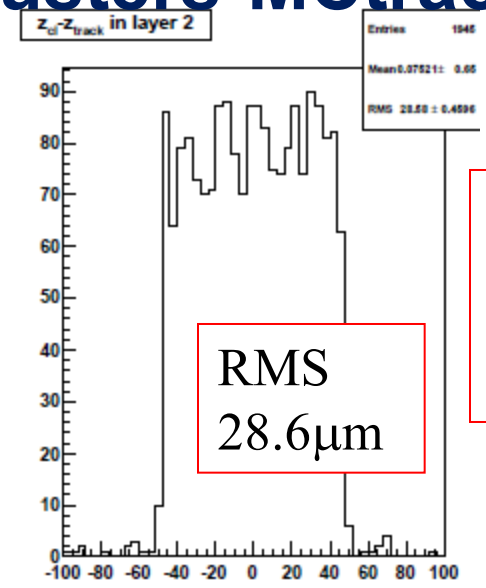


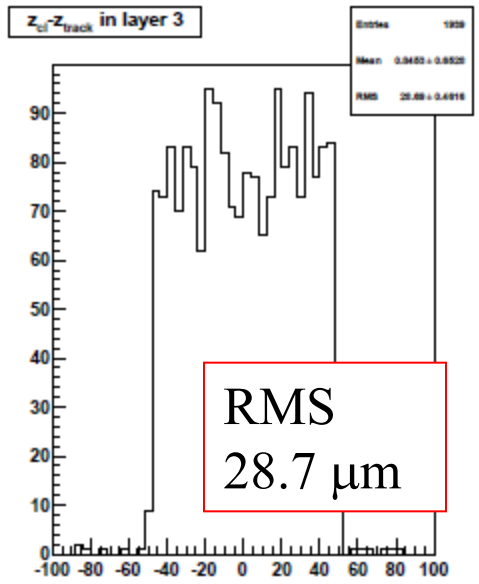


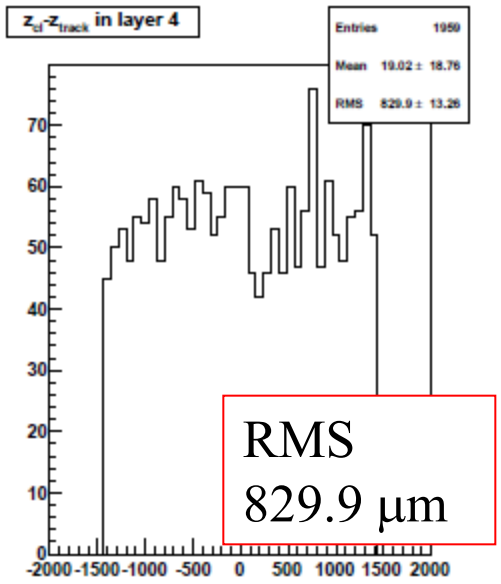
Check on the cluster coordinates: Residual distribution→ z (clusters-MCtrackPosition)

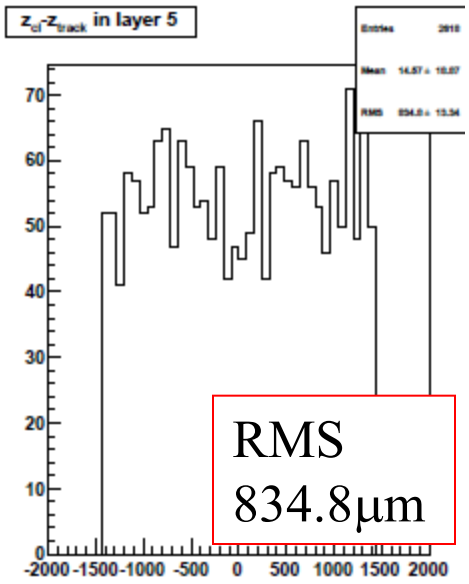










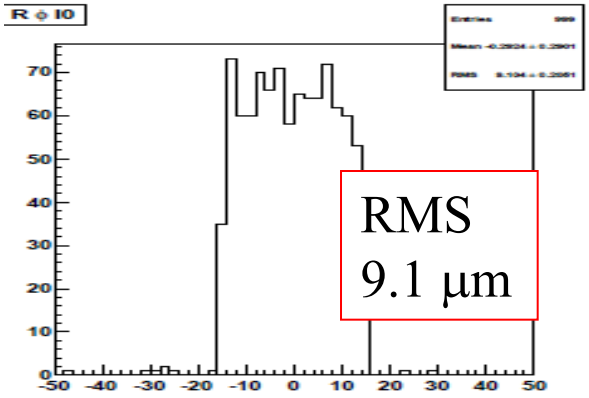


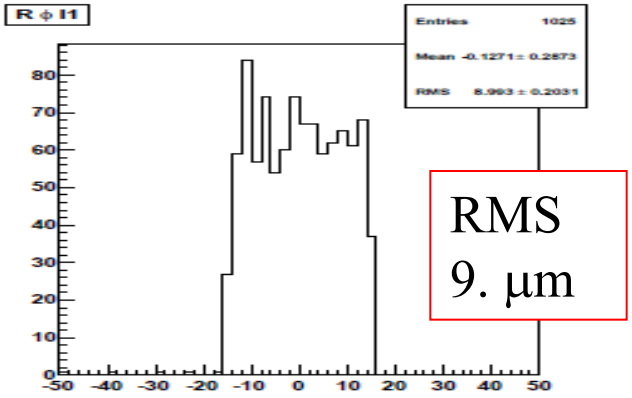
RMS value ~ resolution of each layer

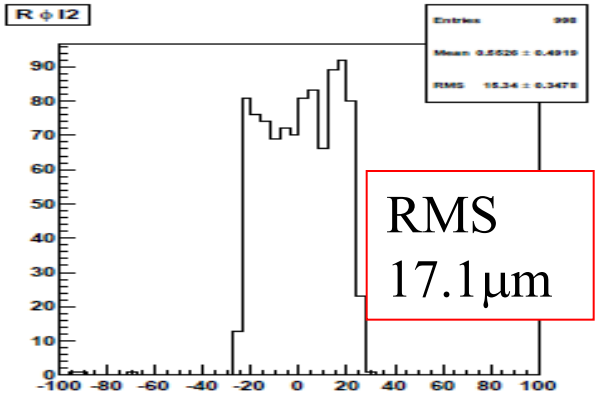
SPD	100μm
SDD	25μm
SSD	830μm

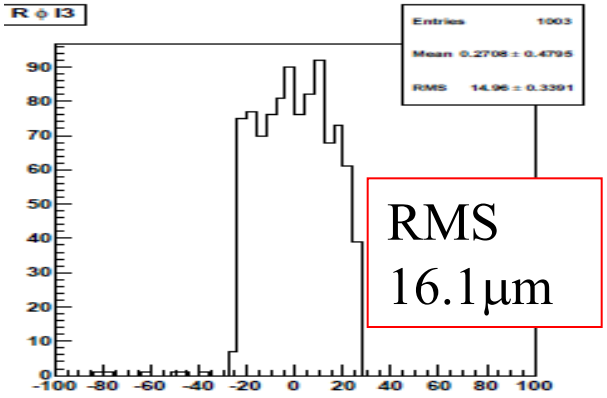
Check on the clusterization:
Residual distribution → different cell segmentation

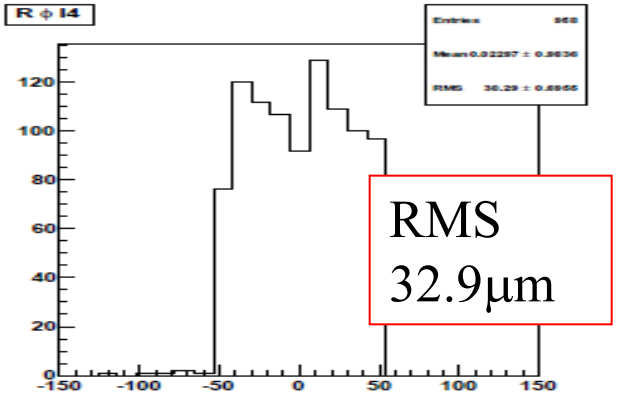
	SPD	SDD	SSD
# of layers	2	2	2
radius (cm)	3.9 & 7.6	15 & 24	38 & 43
spatial precision (μm)	**rφ =9 μm z = 29μm**	**rφ =14μm z = 58μm**	**rφ =29μm z = 87μm**

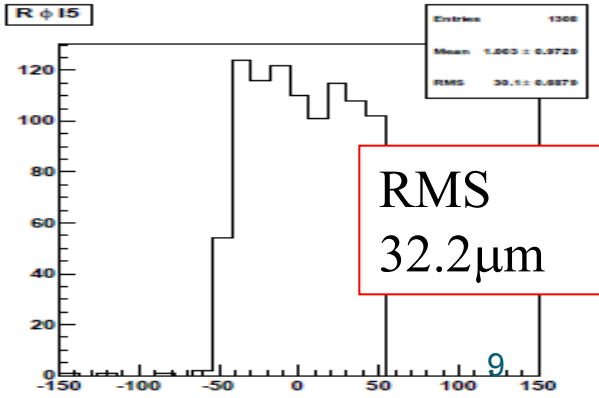








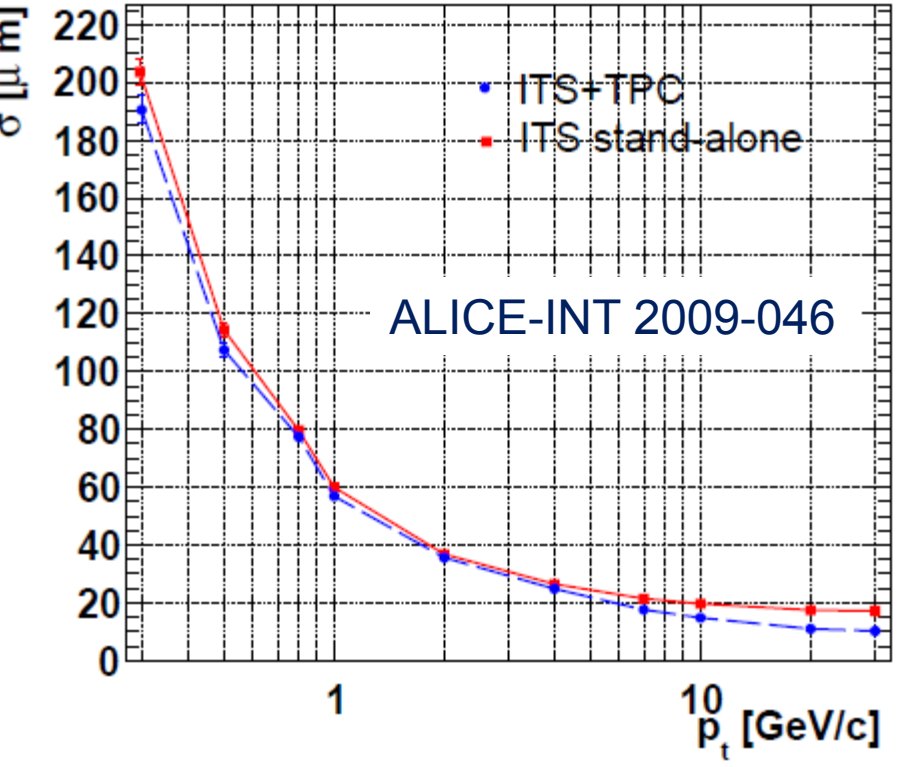




Official ITSstandAlone vs ITSupgrade

Comparison of the rΦ component of the impact parameter resolution

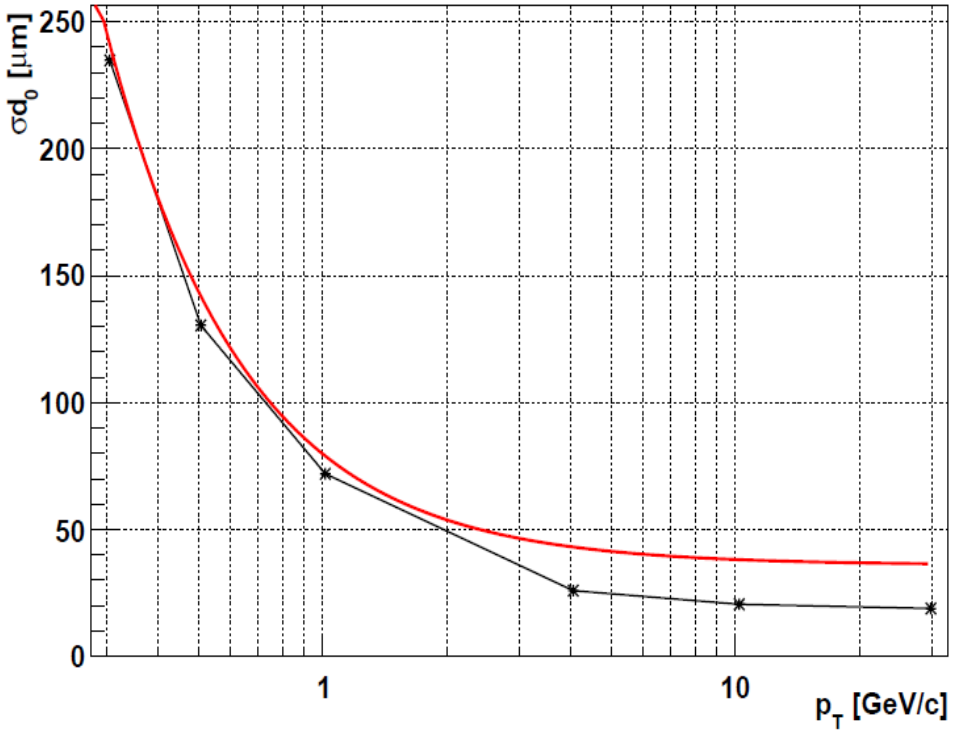
Actual ITS: TPC+ITS vs ITSstandAlone



Blue curve: ITS+TPC tracking

Red curve: ITS stand alone tracking

Actual ITS vs ITSupgrade



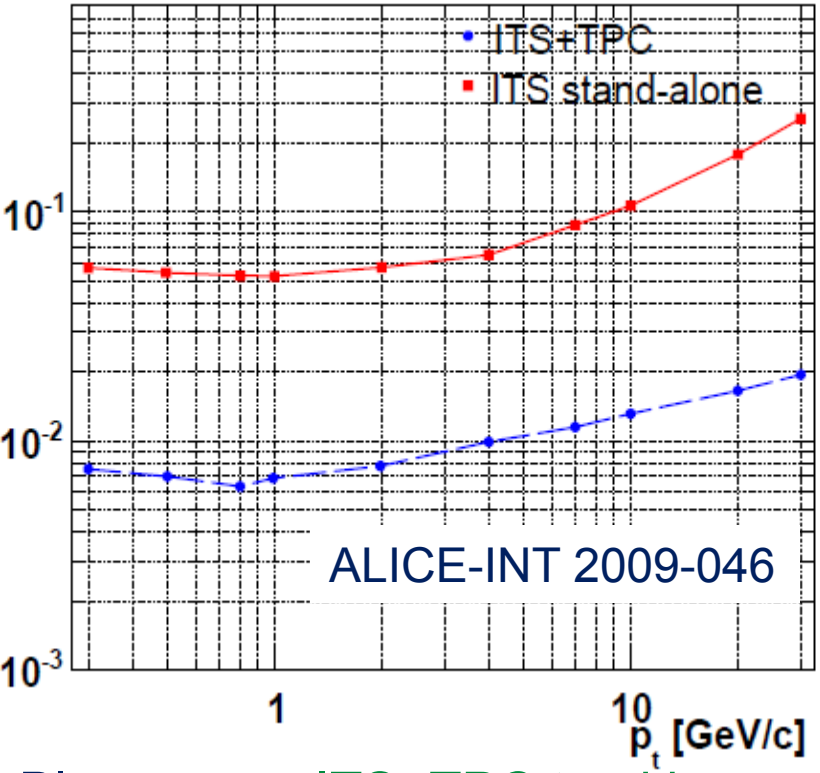
Red curve: actual ITS stand alone

Black curve: upgrade ITS stand alone

Official ITSstandAlone vs ITSupgrade

Comparison of the p_T resolution

Actual ITS: TPC+ITS vs ITSstandAlone



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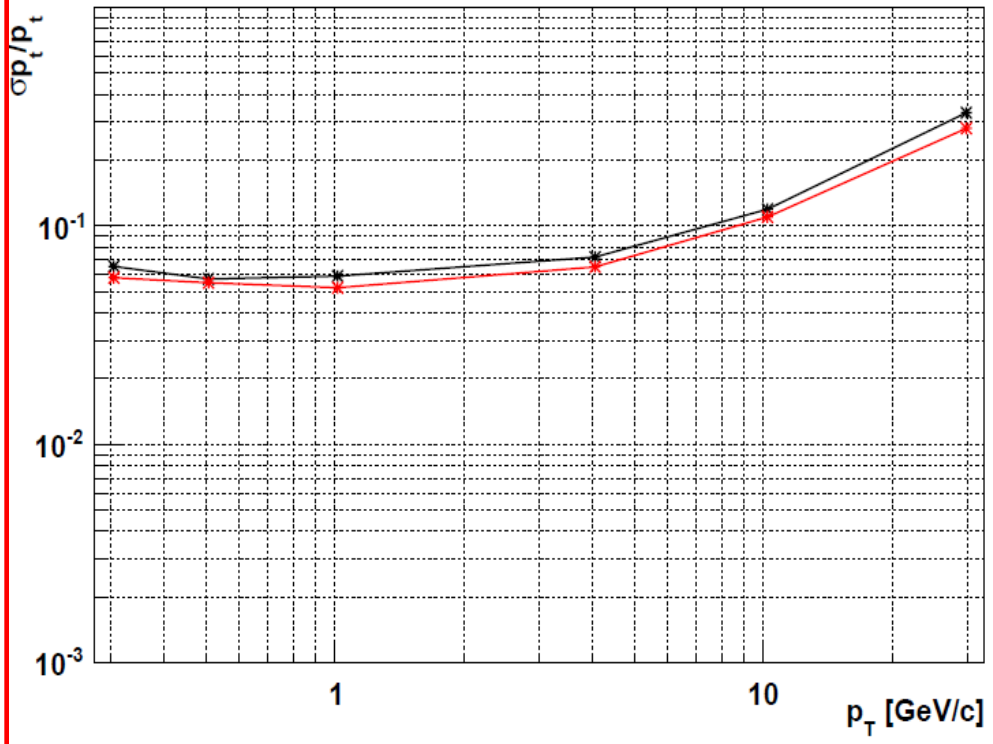
Actual ITS vs ITSupgrade



Red curve: actual ITS stand alone

Black curve: upgrade ITS stand alone

Preliminary Efficiency estimate

- Tracking method efficiency:

  - in a clean environment (one particle per event)
    p_t = 300MeV/c → 82%
    p_t > 1 GeV/c → 100%

  - 100 particles per event:
    50 pions$^+$ + 50 pions$^-$
    p_t = 300MeV/c → 80%
    p_t > 1 GeV/c → 93%

Conclusion

- Debugging and testing the standalone tracking with the Kalman Fit: ..on going

- Make the tracking algorithm flexible for a different number of layers (already done for cell dimension, widths and radii)

- Make performance studies of a physical channel with different layout of ITSupgrade

- ITS upgrade geometry with end-caps not yet possible → to be done after the optimization of the barrel