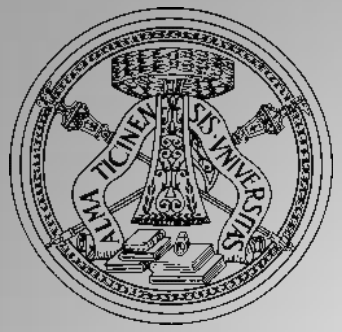


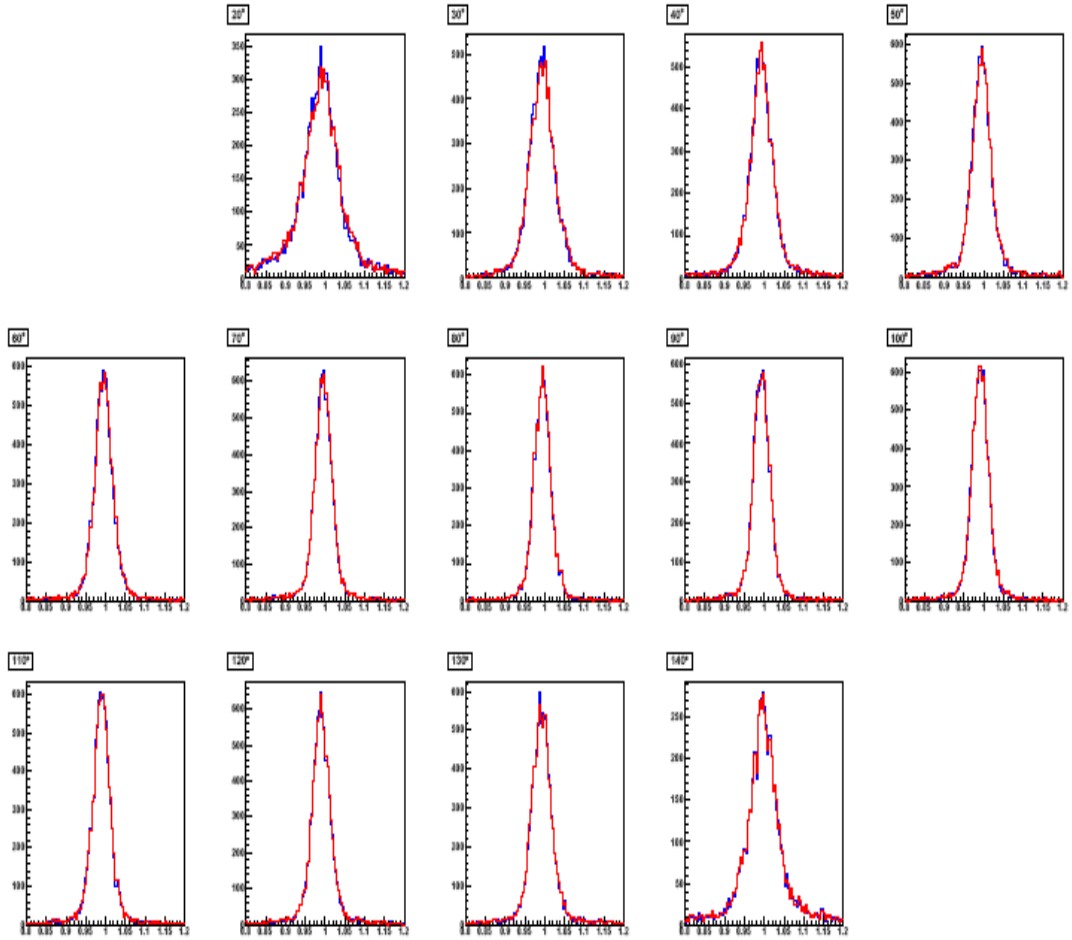
# NEW RESULTS FROM STT SIMULATIONS

Susanna Costanza and Lia Lavezzi
Pavia Group

PANDA Collaboration Meeting at GSI
March 2-6, 2009

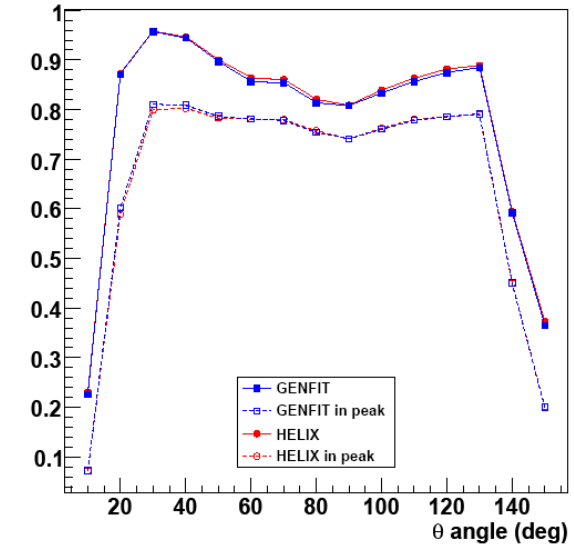
# PROBLEMS IN GENFIT FOR STT + MVD

**Momentum distributions (STT + MVD) @ different θ angles**

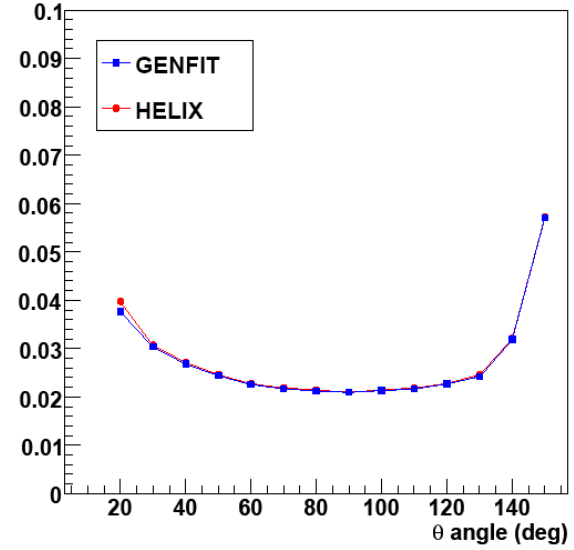



From December presentation (*STT Design Studies*)

**Efficiency (STT + MVD)**




**Momentum Resolution (STT + MVD)**




**STT+MVD in genfit showed no improvements with respect to lhetrack → INVESTIGATION**

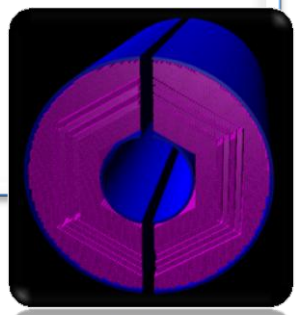
# IMPROVEMENTS IN STT + MVD

## Changes on:

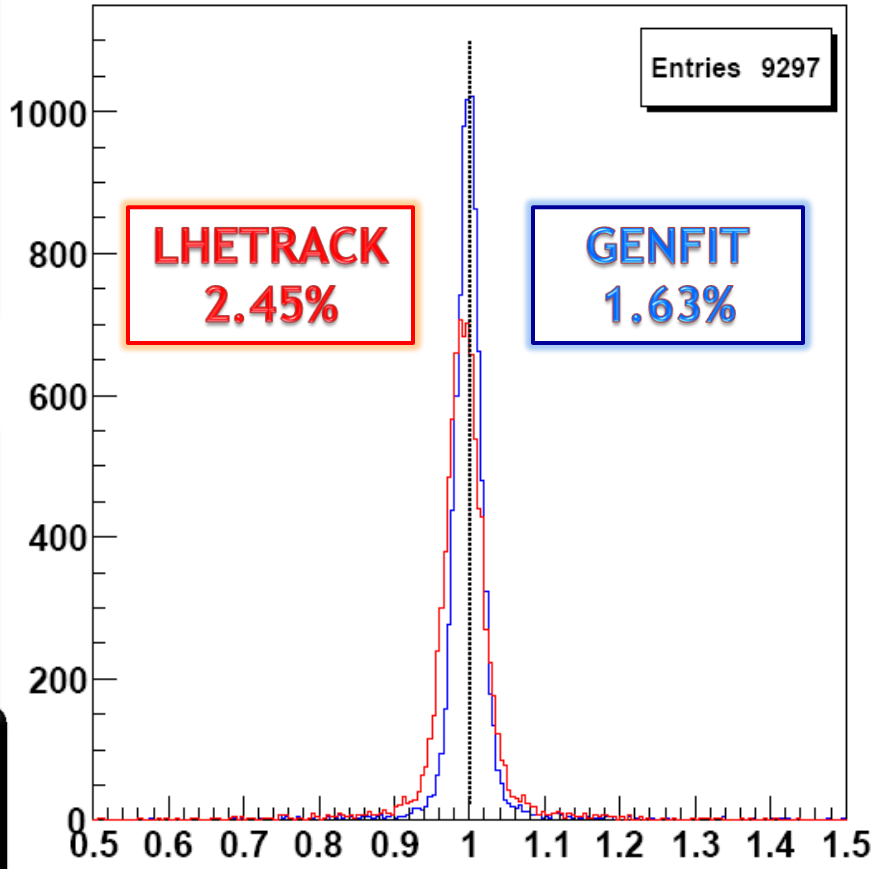
- starting position/mom errors
- MVD and STT measured point coordinates covariances
- Kalman filter planes orientation

## Simulation

- 10000 $\mu^-$ @ 0.3, 1, 5 GeV/c
- $\phi \in [0^\circ, 360^\circ]$
- $\theta \in [20^\circ, 140^\circ]$
- Geometry layout:
  - new geo,
  - STT 150 cm long

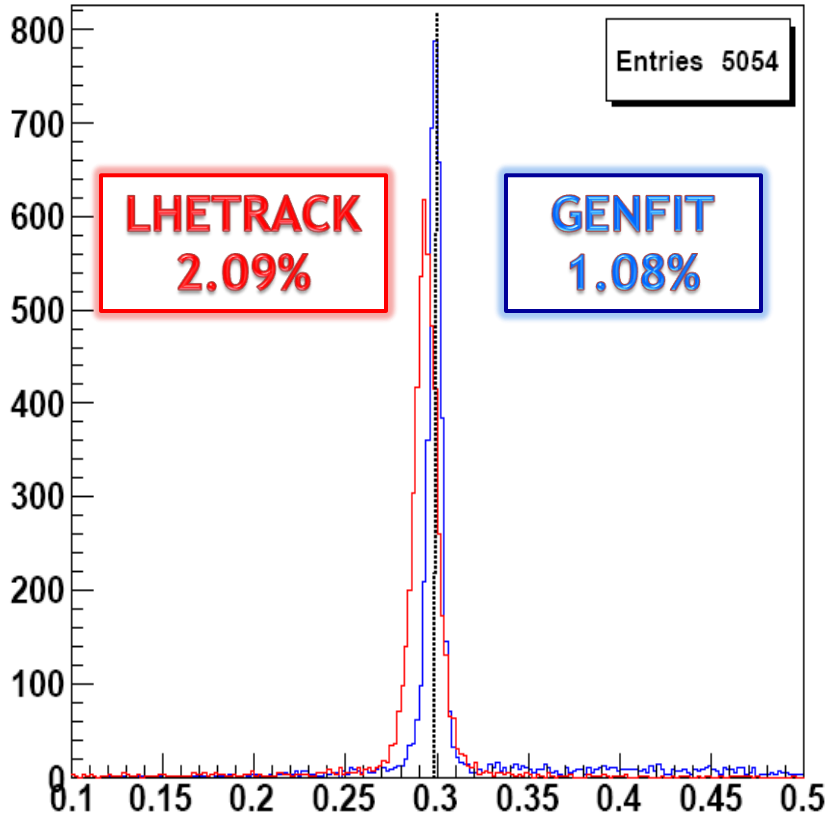


## 1 GeV/c

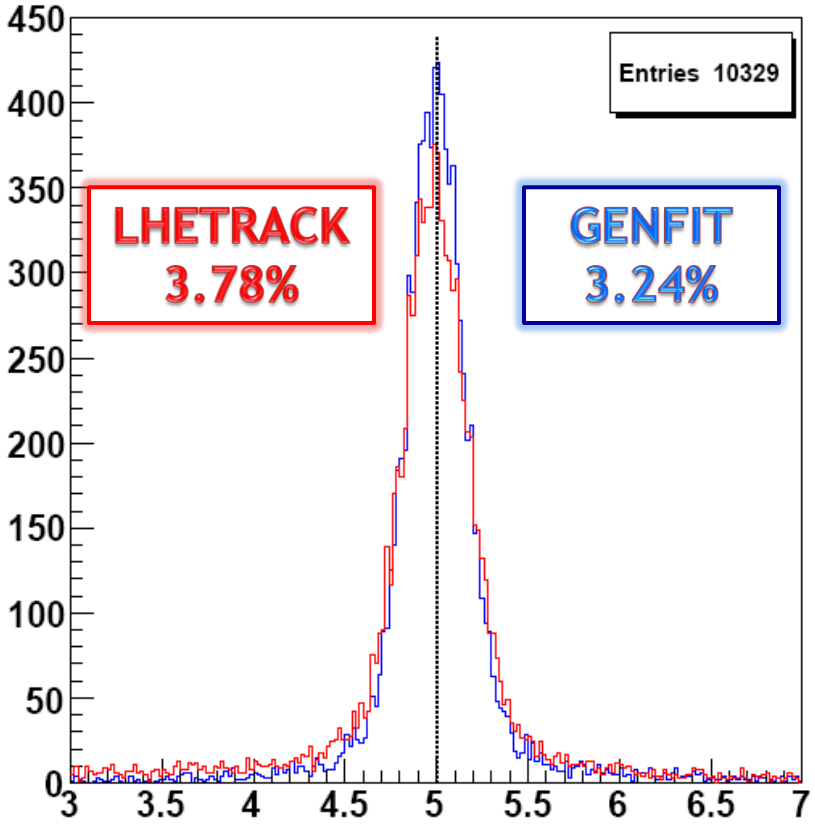


# IMPROVEMENTS IN STT + MVD

300 MeV/c




5 GeV/c



# STT DESIGN STUDIES …"REVISITED"

## Simulation

- 10000 $\mu^-$ @ 1 GeV/c
- $\phi \in [0^\circ, 360^\circ]$
- $\theta$ =
  - $\{20^\circ, 25^\circ, 30^\circ, 35^\circ, 40^\circ\} \pm 2.5^\circ$
  - $\{50^\circ, 80^\circ, 110^\circ, 140^\circ\} \pm 5^\circ$
- Geometry layouts: new geo, 120cm & 150cm

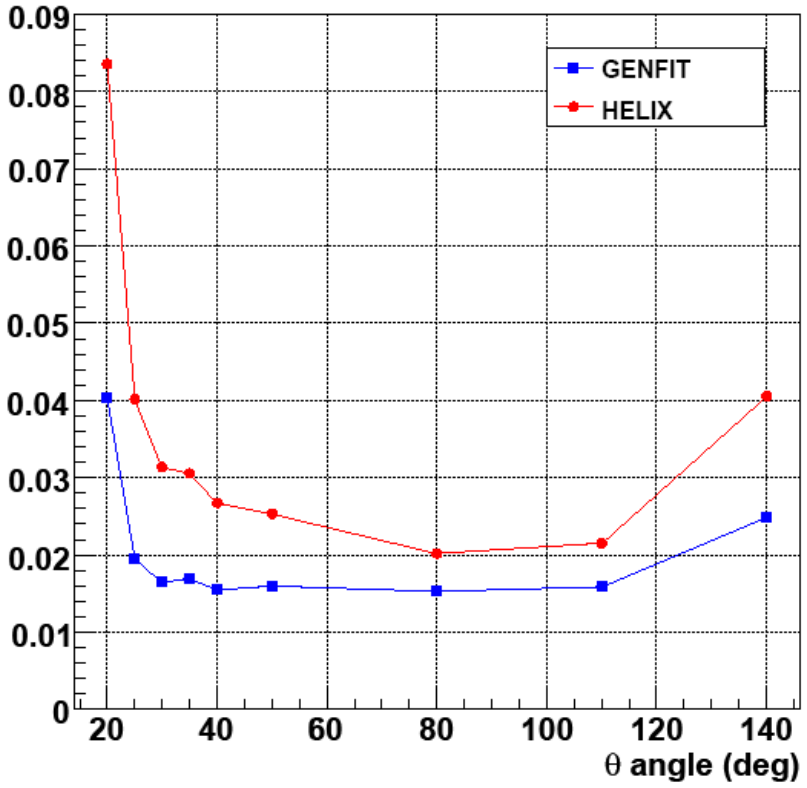
## Studies

- STT + MVD
  - Efficiency
  - Resolution

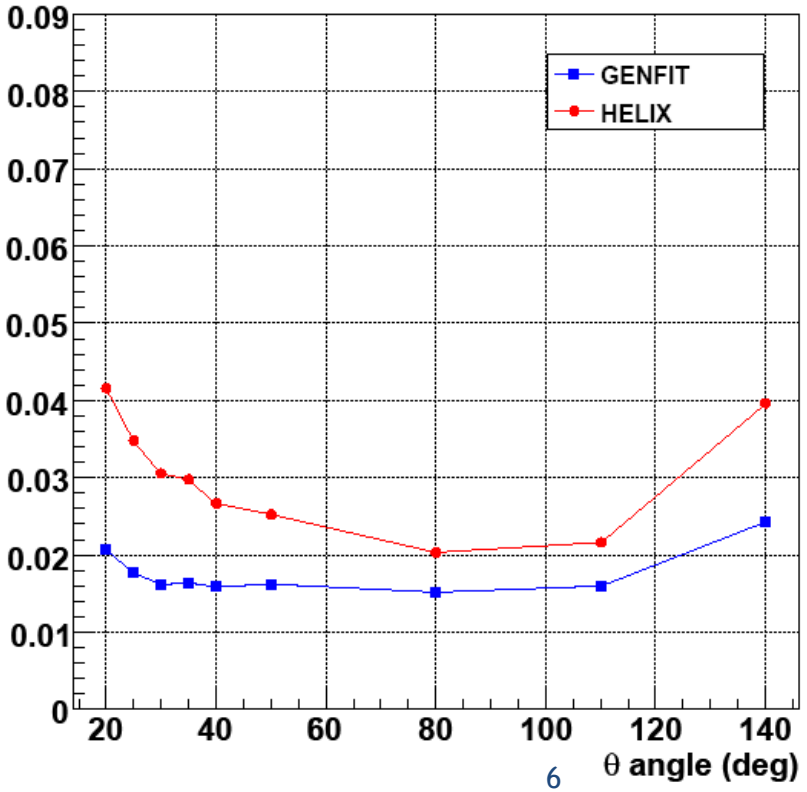
# MOMENTUM RESOLUTION @ DIFFERENT θ ANGLES

10000 $\mu^-$ @ 1 GeV/c, new geometry layout

120 cm



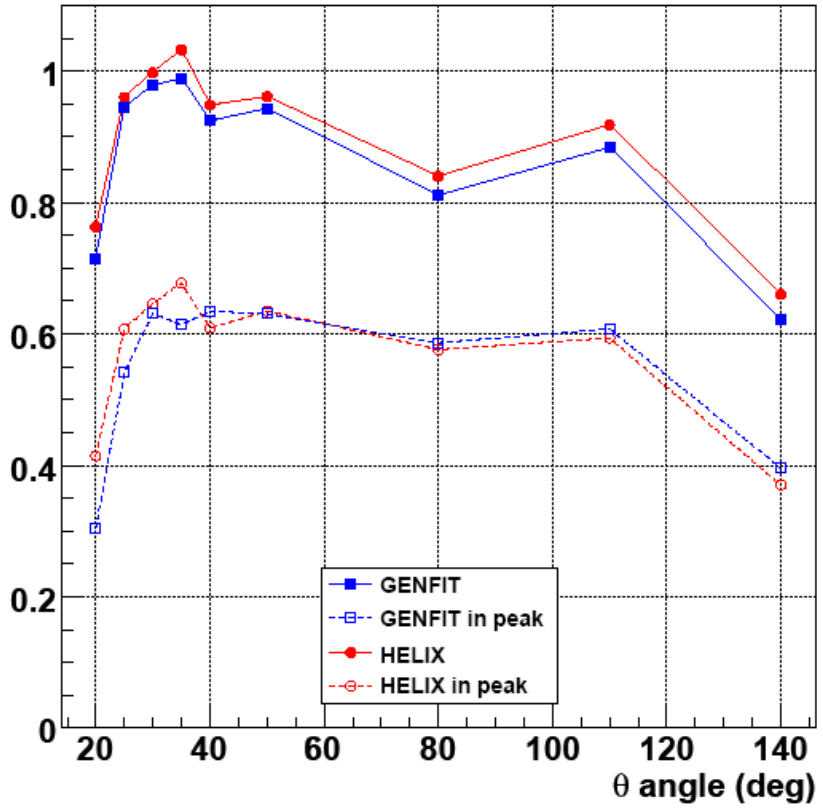

150 cm



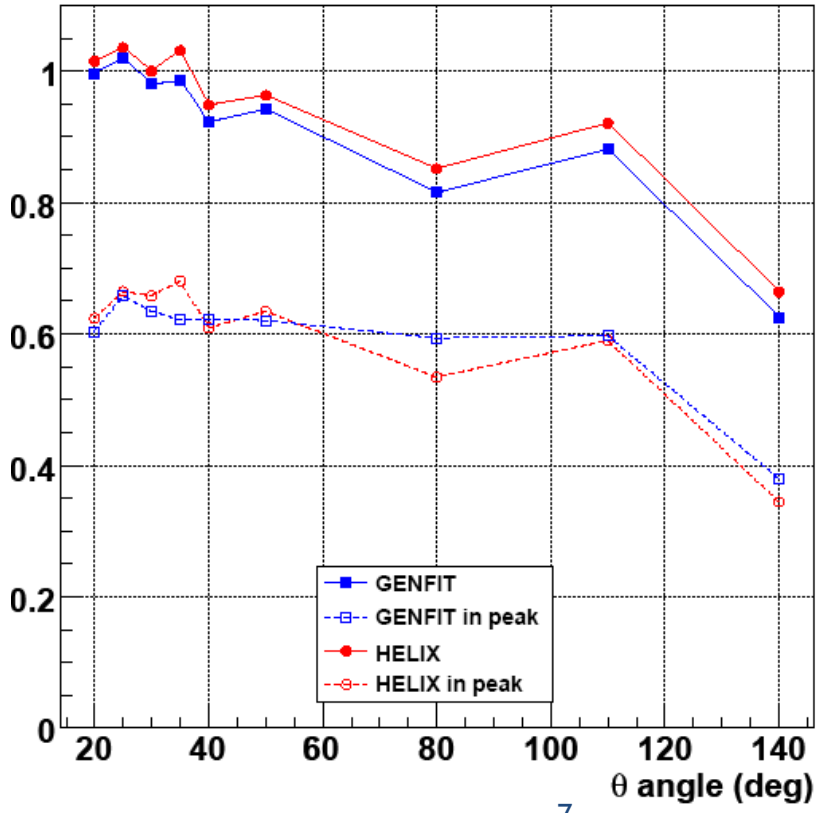
# EFFICIENCY @ DIFFERENT θ ANGLES

10000 $\mu^-$ @ 1 GeV/c, new geometry layout

120 cm



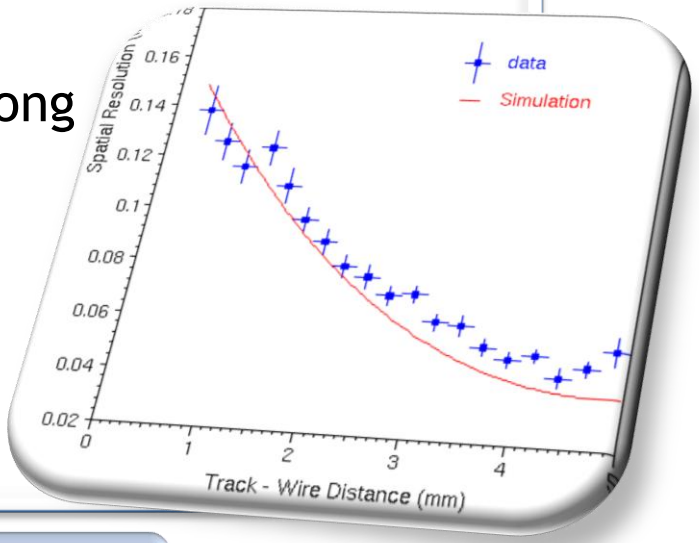

150 cm



# $\sigma_{rdrift}$

## Simulation

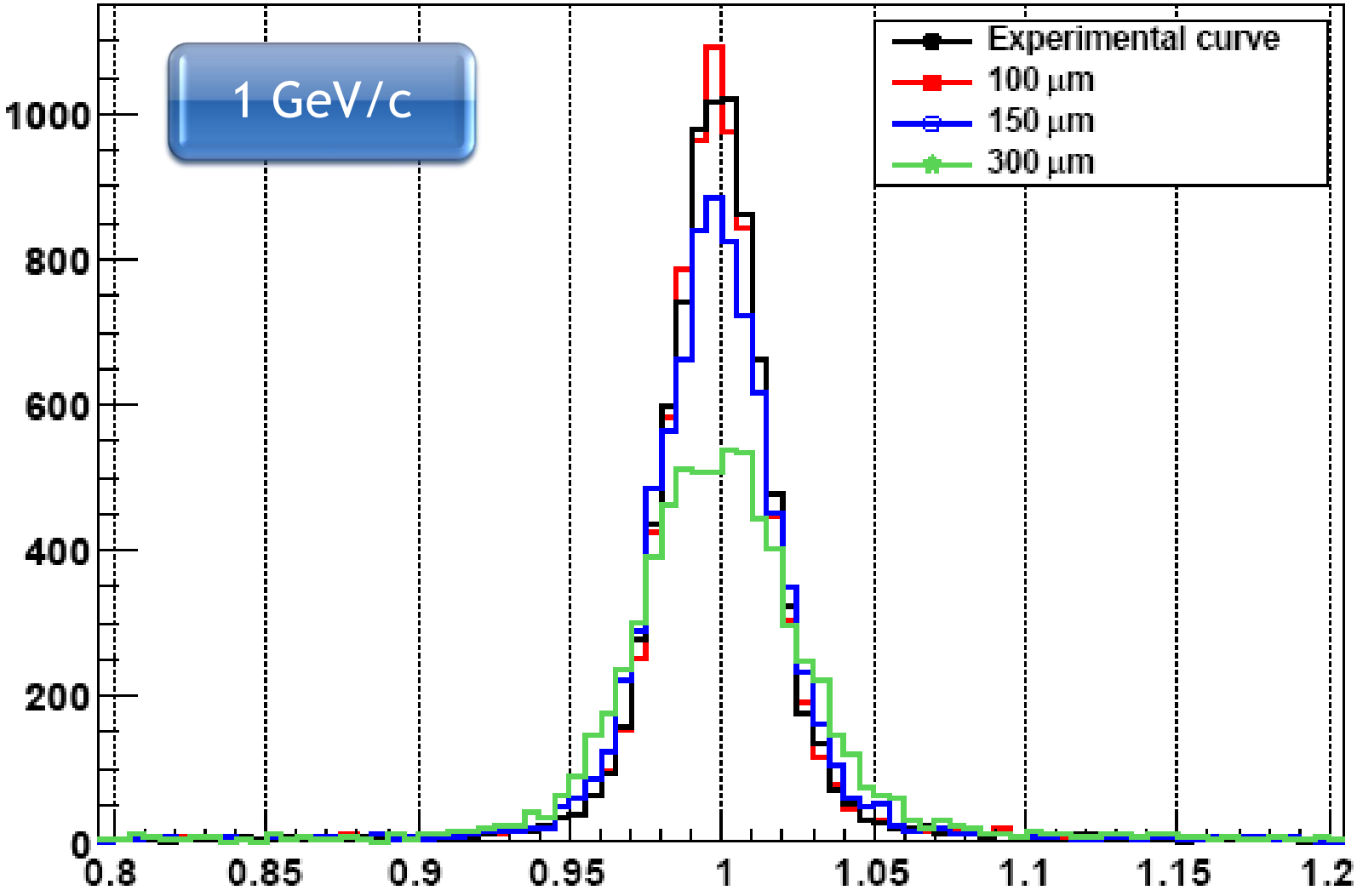
- 10000 $\mu^-$ @ 1 GeV/c
- $\phi \in [0^\circ, 360^\circ]$
- $\theta \in [20^\circ, 140^\circ]$
- Geometry layout:  STT 150 cm long
- drift radius resolution:
  - Juelich experimental curve
  - 100 $\mu$m constant
  - 150 $\mu$m constant
  - 300 $\mu$m constant




## Studies

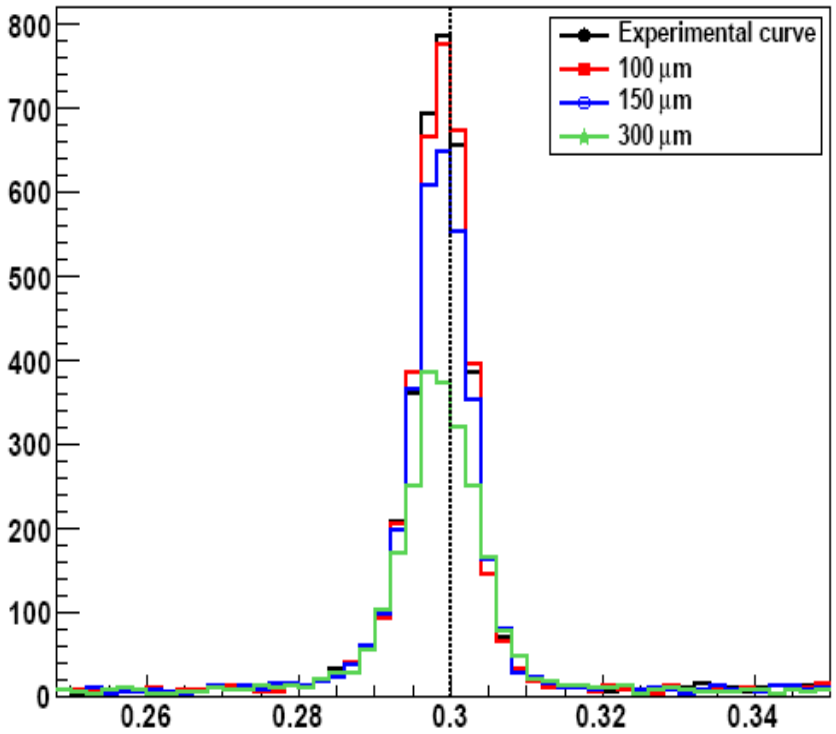
- STT + MVD
  - Efficiency
  - Resolution

# MOMENTUM DISTRIBUTIONS @ DIFFERENT $\sigma_{rdrift}$

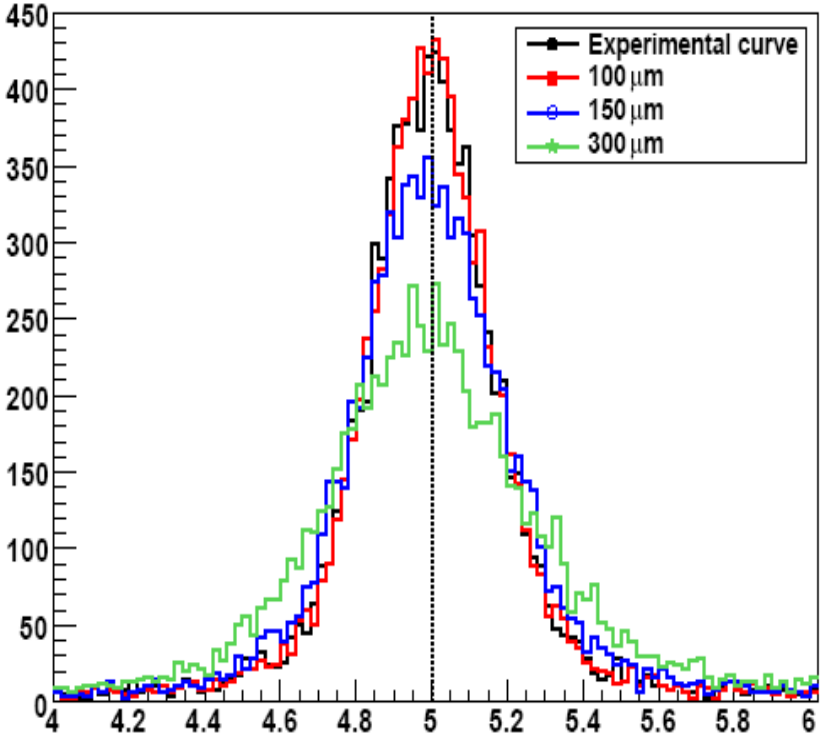


# MOMENTUM DISTRIBUTIONS @ DIFFERENT $\sigma_{rdrift}$

300 MeV/c

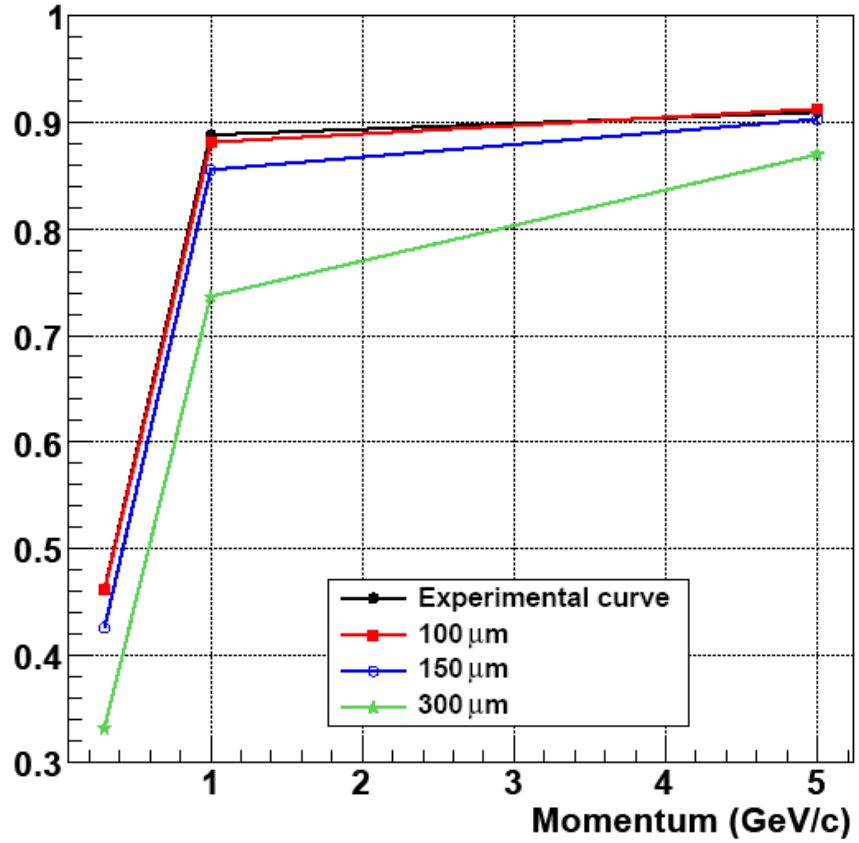



5 GeV/c

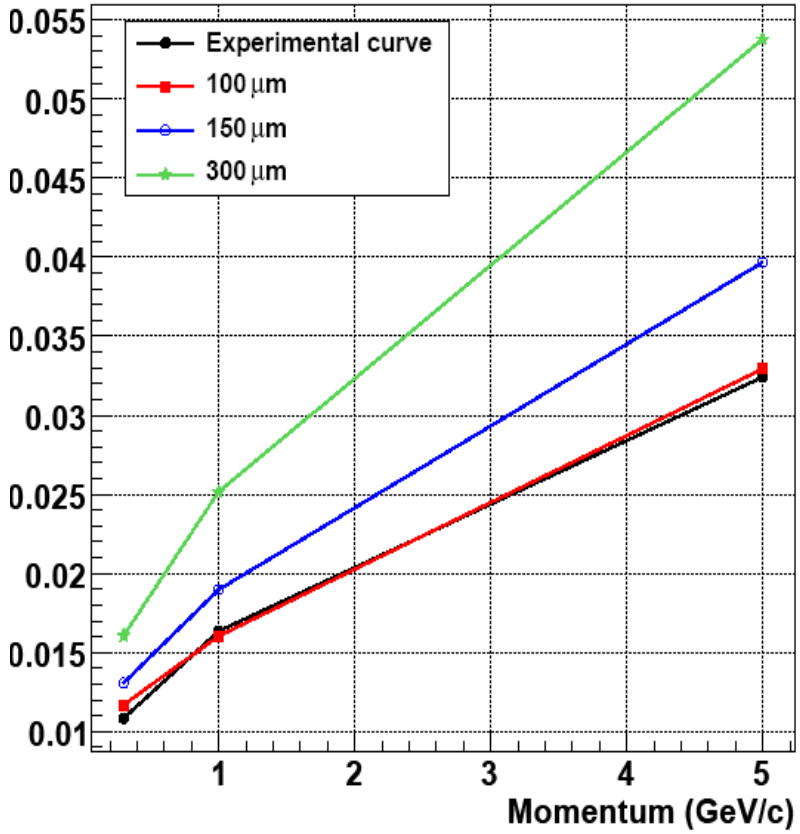


# EFFICIENCY AND MOMENTUM RESOLUTION @ DIFFERENT $\sigma_{rdrift}$

Efficiency

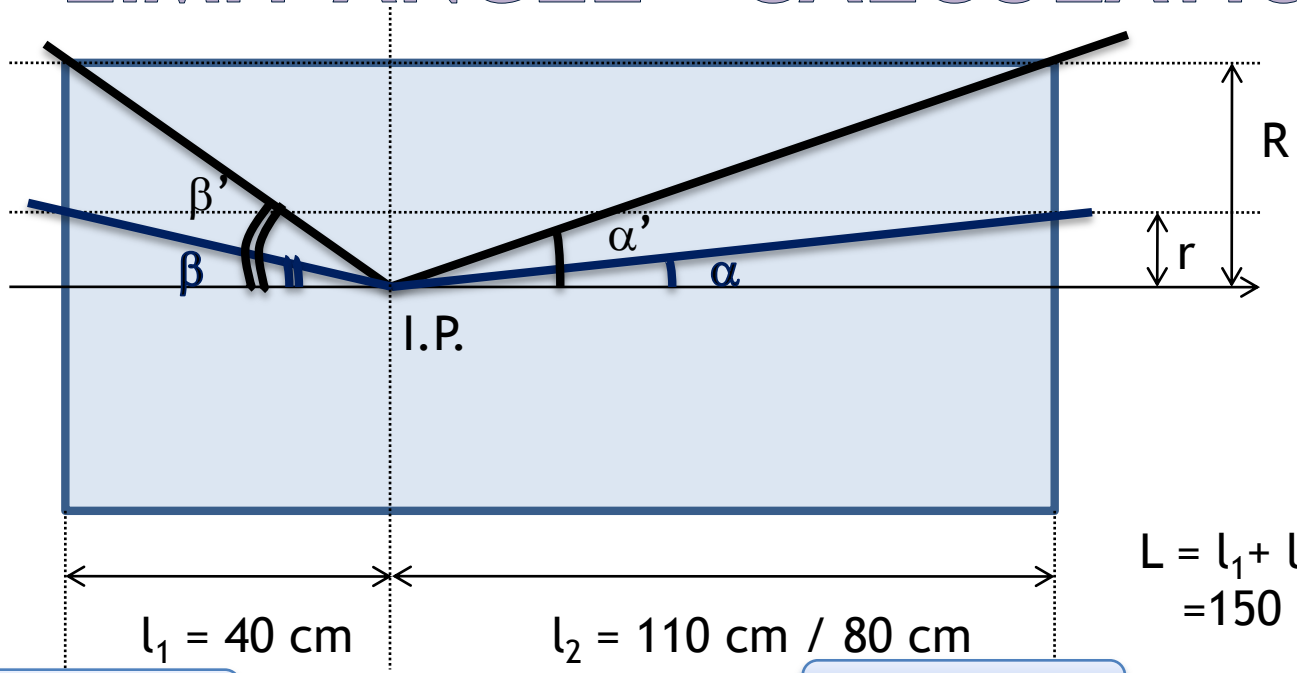



Resolution



# BACKUP SLIDES

# "LIMIT ANGLE" CALCULATION




$L = l_1 + l_2 =$
$= 150\text{ cm} / 120\text{ cm}$

**L = 150 cm**

$$\alpha = \tan^{-1}\frac{r}{l_2} \approx 7.77°$$

$$\beta = \tan^{-1}\frac{r}{l_1} \approx 20.5° \Rightarrow 180° - 20.5° = 159.5°$$

$$\alpha' = \tan^{-1}\frac{R}{l_2} \approx 21°$$

$$\beta' = \tan^{-1}\frac{R}{l_1} \approx 46.4° \Rightarrow 180° - 46.4° = 133.6°$$

**L = 120 cm**

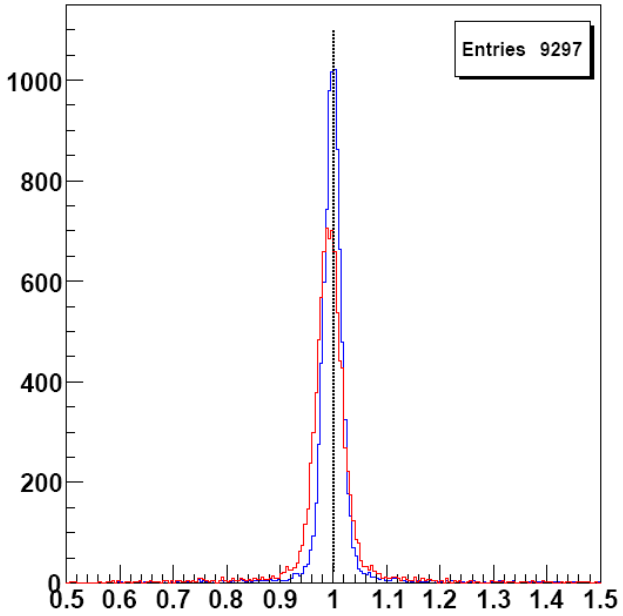
$$\alpha = \tan^{-1}\frac{r}{l_2} \approx 10.62°$$

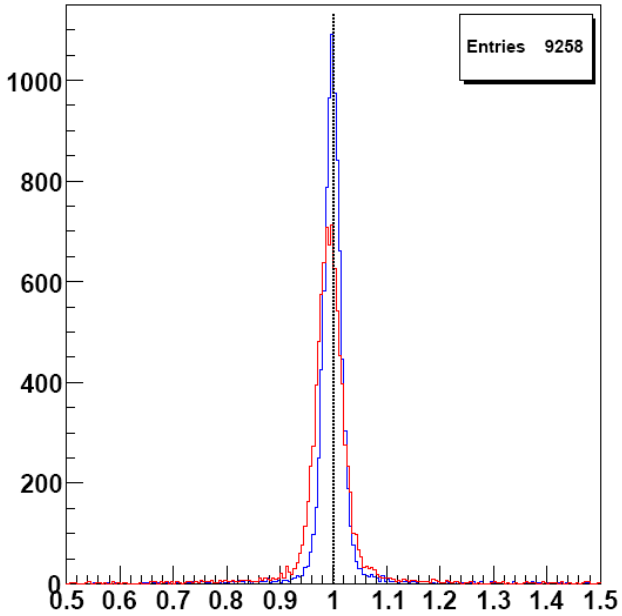
$$\beta = \tan^{-1}\frac{r}{l_1} \approx 20.5° \Rightarrow 180° - 20.5° = 159.5°$$

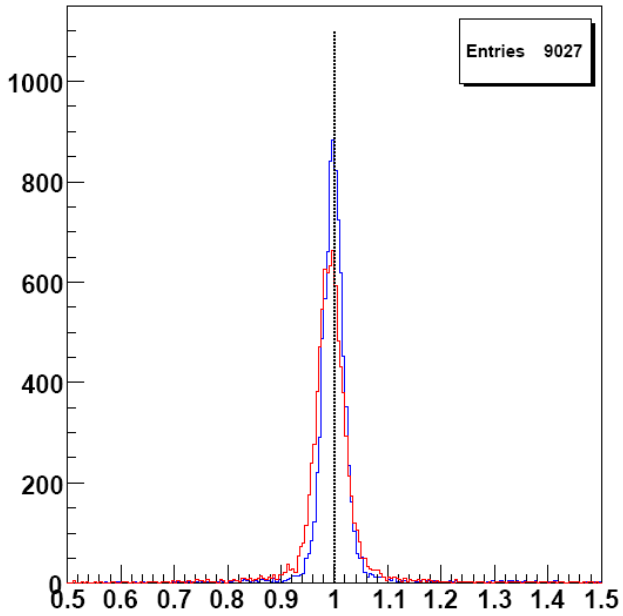
$$\alpha' = \tan^{-1}\frac{R}{l_2} \approx 27.7°$$

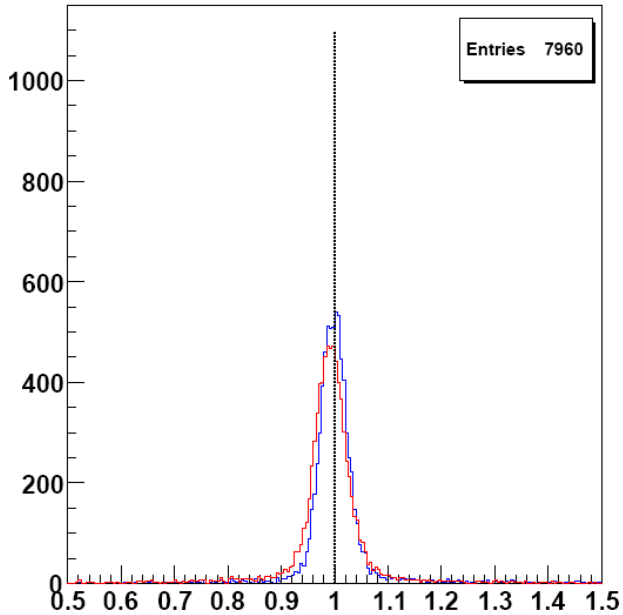
$$\beta = \tan^{-1}\frac{R}{l_1} \approx 46.4° \Rightarrow 180° - 46.4° = 133.6°$$

# MOMENTUM DISTRIBUTIONS @ 1 GEV/C

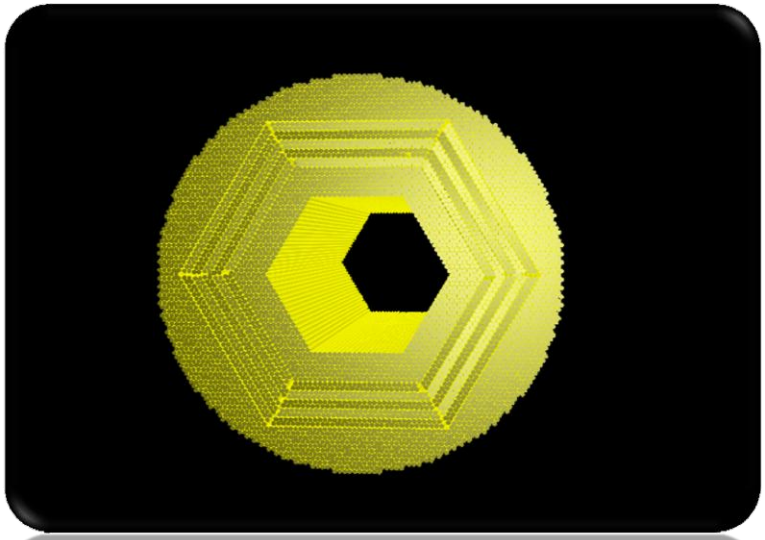


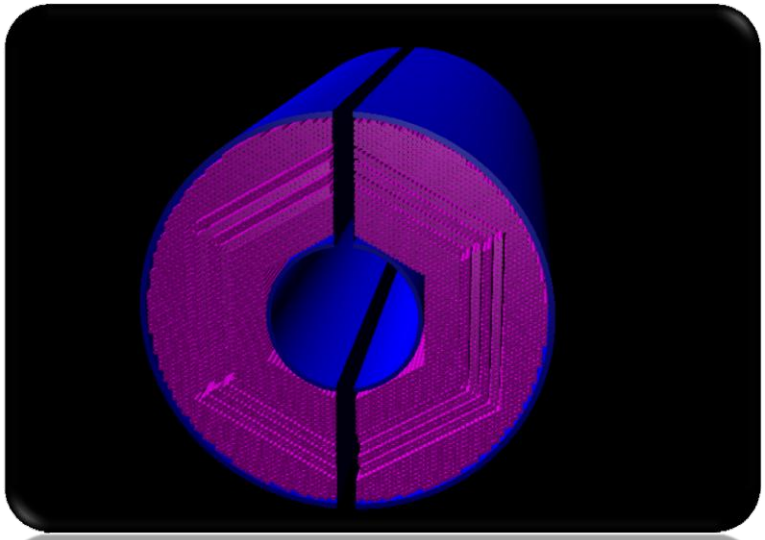



# GEOMETRY LAYOUTS



**Differences:**

- Inner and outer cylinders
- 90° rotation in $\phi$
- target pipe hole
- 4 skewed double layers instead of 5