

Grid testing of Geant4 : **10.5.beta**

G. Folger, D. Konstantinov, G. Latyshev,
W. Pokorski, A. Ribon

CERN PH/SFT

Main Changes in Hadronics vs. Ref05

- No changes in: QGS, BERT, BIC, Precompound, De-excitation
- FTF
 - Fixed non-flat $\cos(\theta)$ and φ distributions for \bar{p} annihilation at rest
 - Code improvements – without changes to the physics
- Hadronic cross sections
 - Better handling of isotope-wise cross sections when available
- Management
 - Technical fix to `G4HadronicProcess::PostStepDoIt`

Crashes & Warnings

- No crashes
- No infinite loops
- 1 warning

HAD_FANCY3DNUCLEUS_001

issued by : G4Fancy3DNucleus::ChooseFermiMomenta():

difficulty finding proton momentum, set it to (0,0,0)

**** This is just a warning message. ****

- Warning introduced in G4 10.4.ref01 which can happen from time to time, nothing to worry about if it happens rarely

Reproducibility

- Reproducibility OK

Pion- showers: FTFP_BERT

G4 10.5.beta

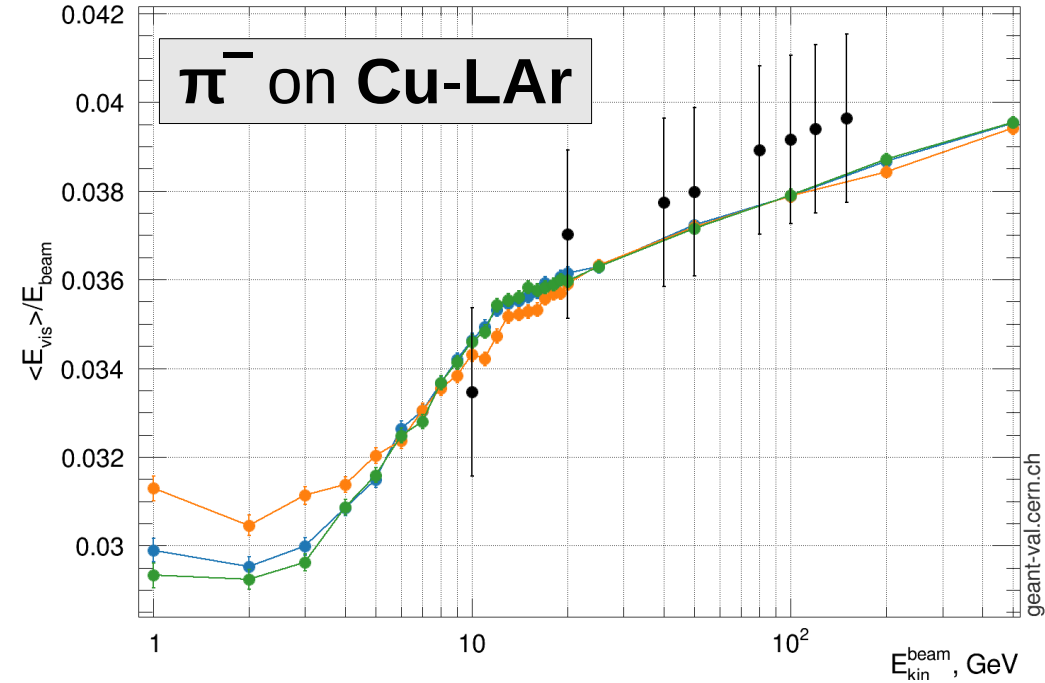
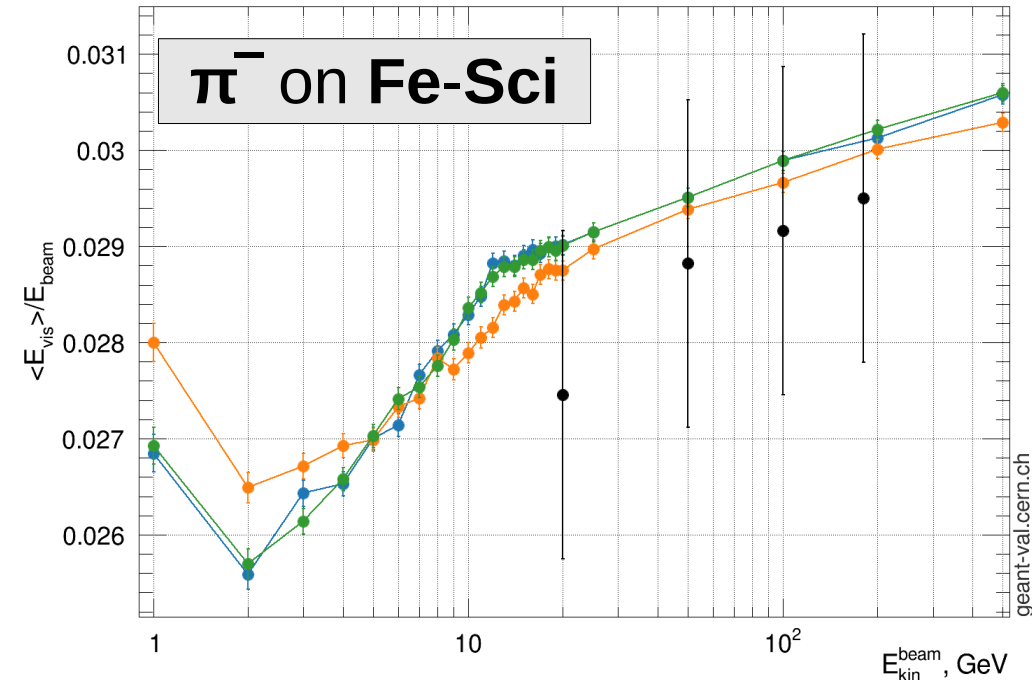
10.4.ref05

10.4.p02

FTFP_BERT : Energy Response

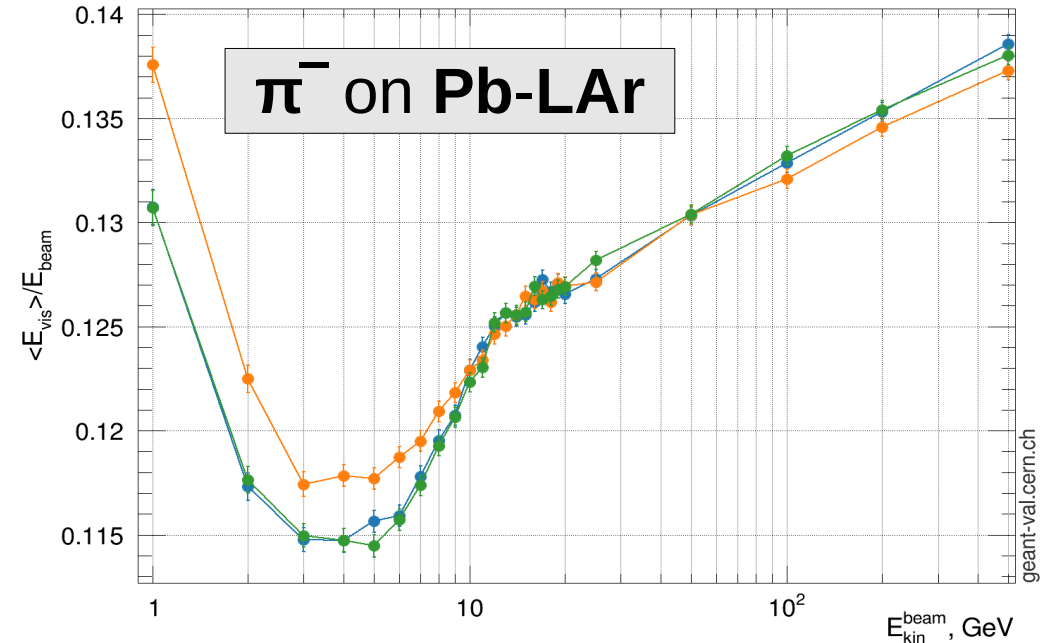
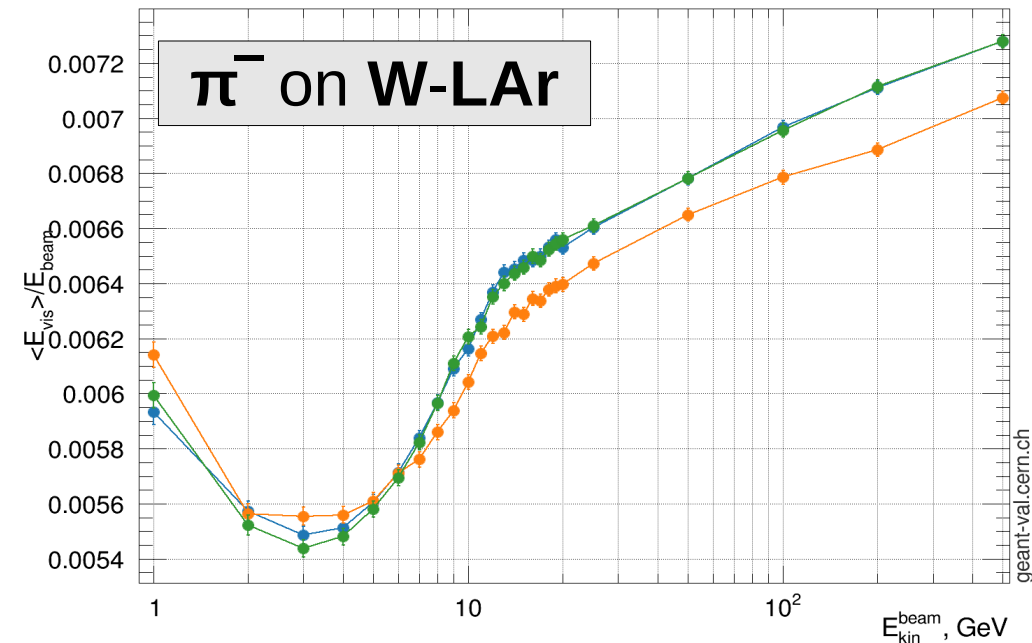
Energy response | Beam: pi- | Target: TileCal

Energy response | Beam: pi- | Target: AtlasHEC



Energy response | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP_BERT

Energy response | Beam: pi- | Target: AtlasECAL | Physics list: FTFP_BERT

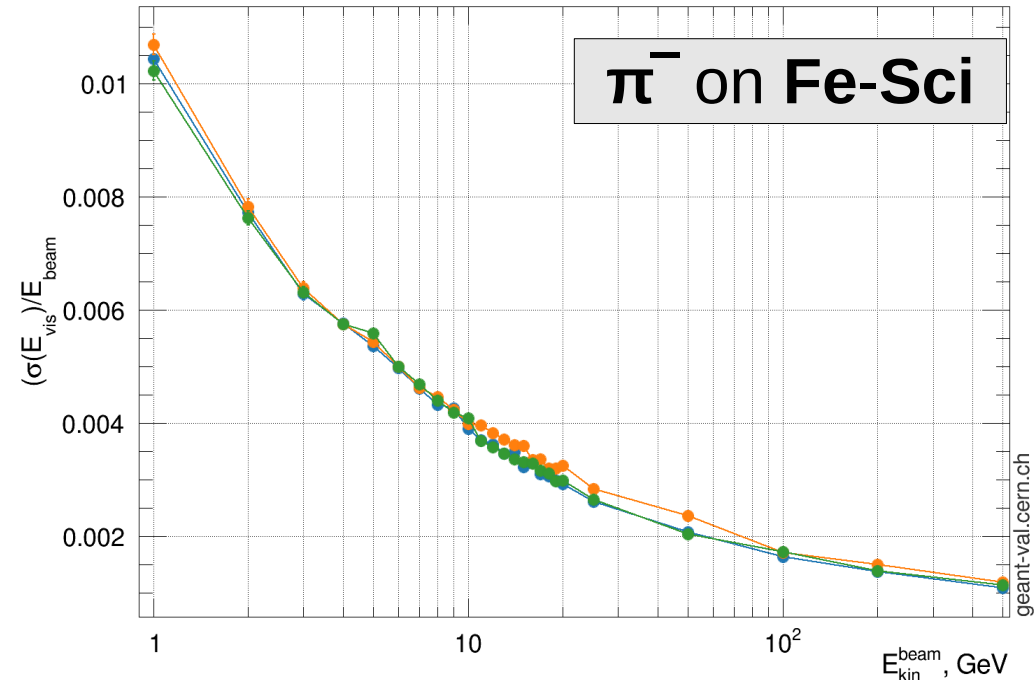


10.5.beta_cand01 (blue line with dots)
 10.4.ref05 (green line with dots)
 10.4.p02 (orange line with dots)

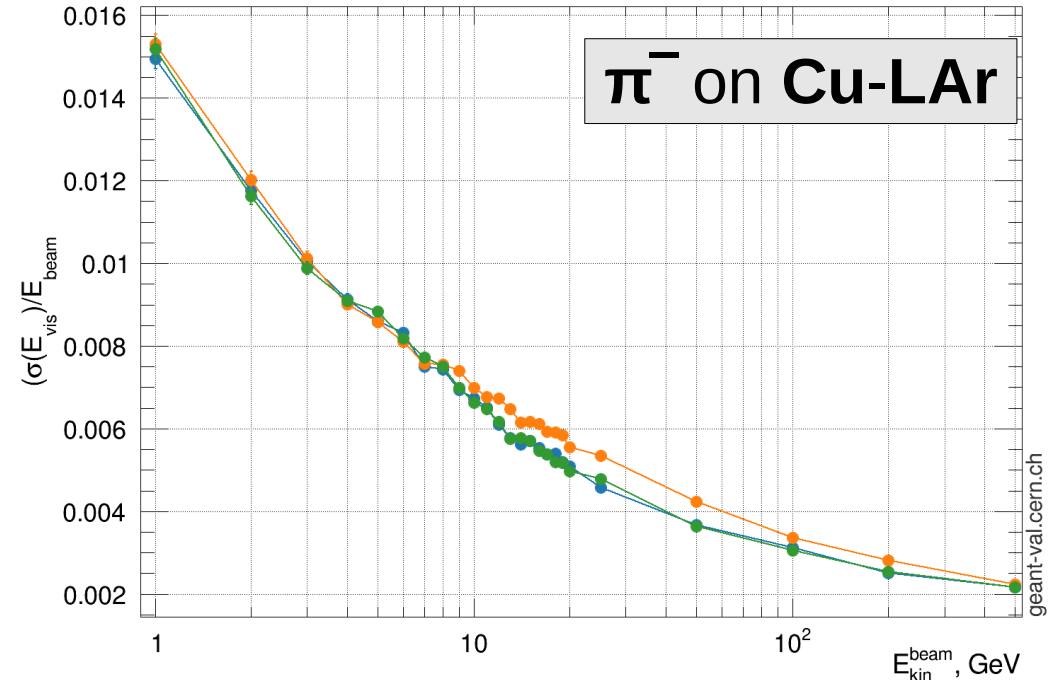
10.5.beta_cand01 (blue line with dots)
 10.4.ref05 (green line with dots)
 10.4.p02 (orange line with dots)

FTFP_BERT : Energy Width

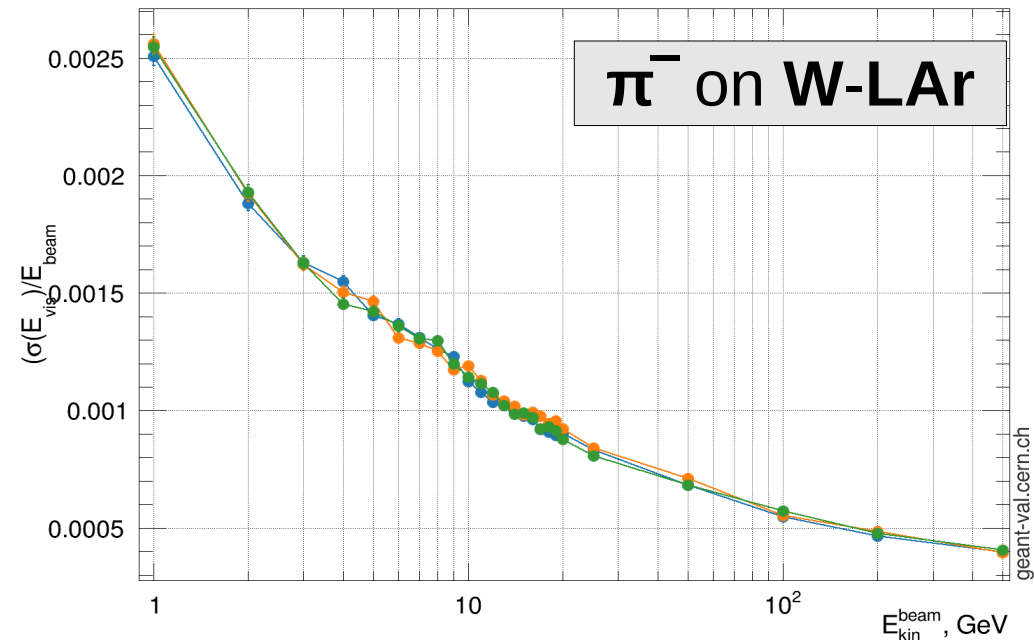
Normalized width | Beam: pi- | Target: TileCal | Physics list: FTFP_BERT



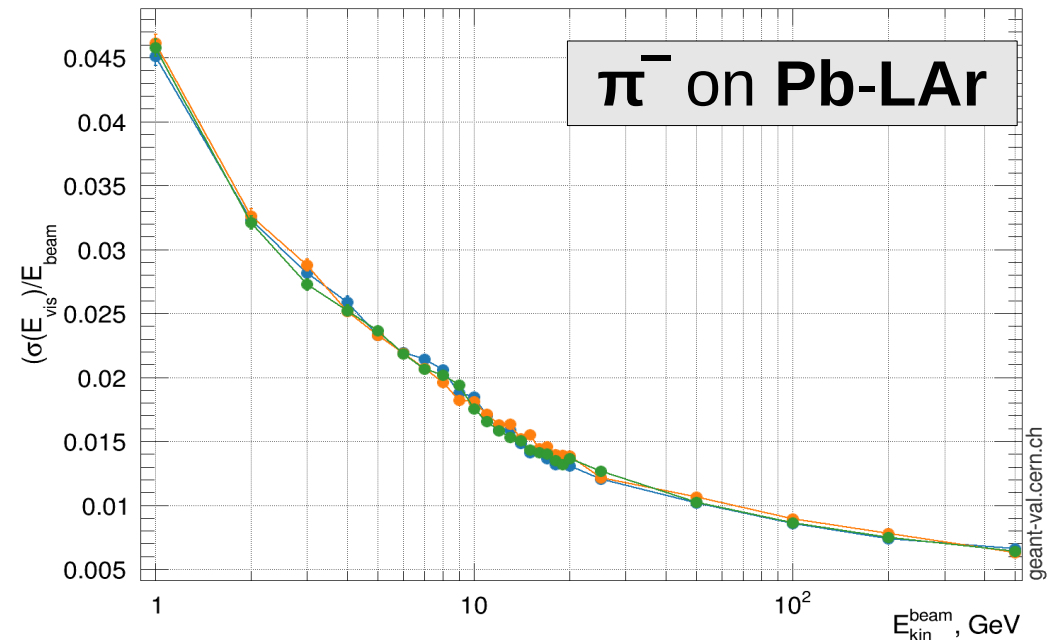
Normalized width | Beam: pi- | Target: AtlasHEC | Physics list: FTFP_BERT



Normalized width | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP_BERT



Normalized width | Beam: pi- | Target: AtlasECAL | Physics list: FTFP_BERT



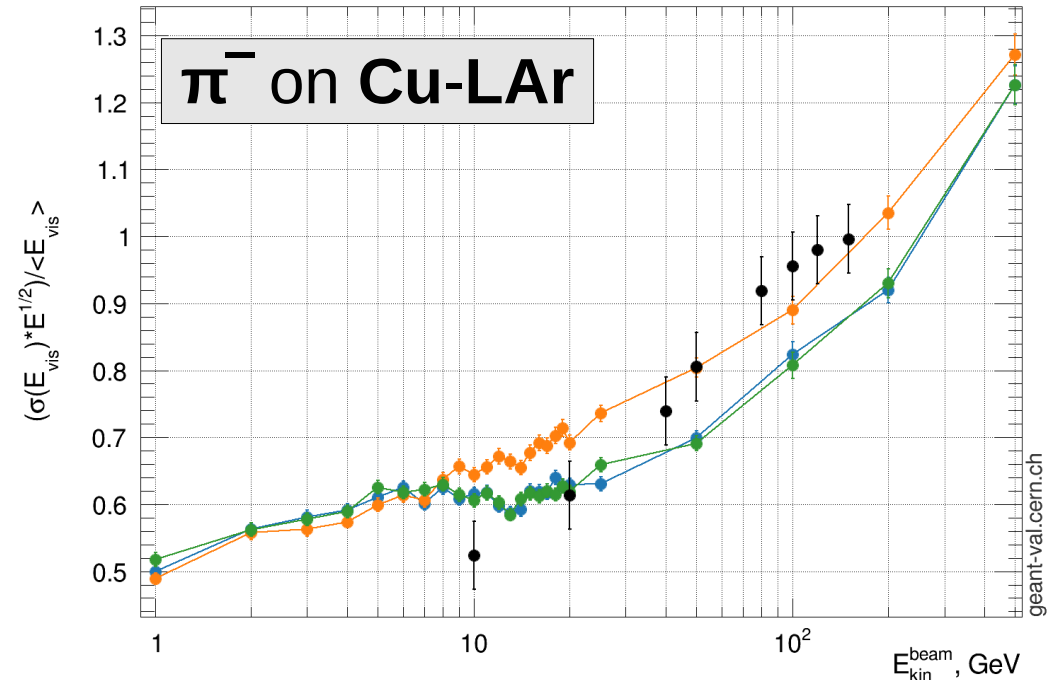
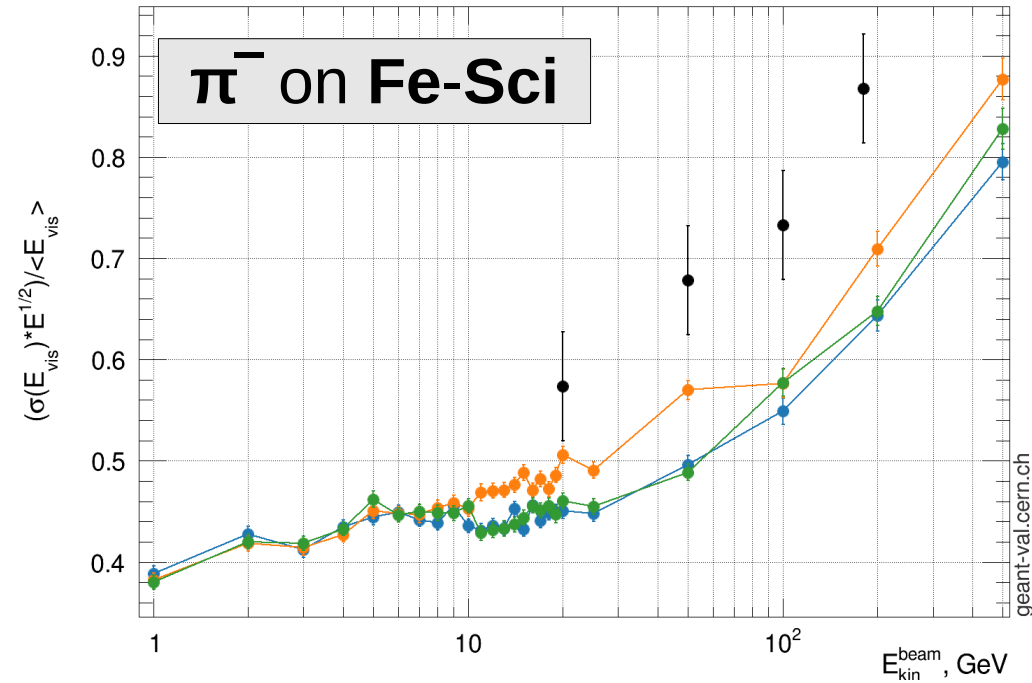
10.5.beta_cand01 (blue), 10.4.ref05 (green), 10.4.p02 (orange)

10.5.beta_cand01 (blue), 10.4.ref05 (green), 10.4.p02 (orange)

FTFP_BERT : Energy Resolution

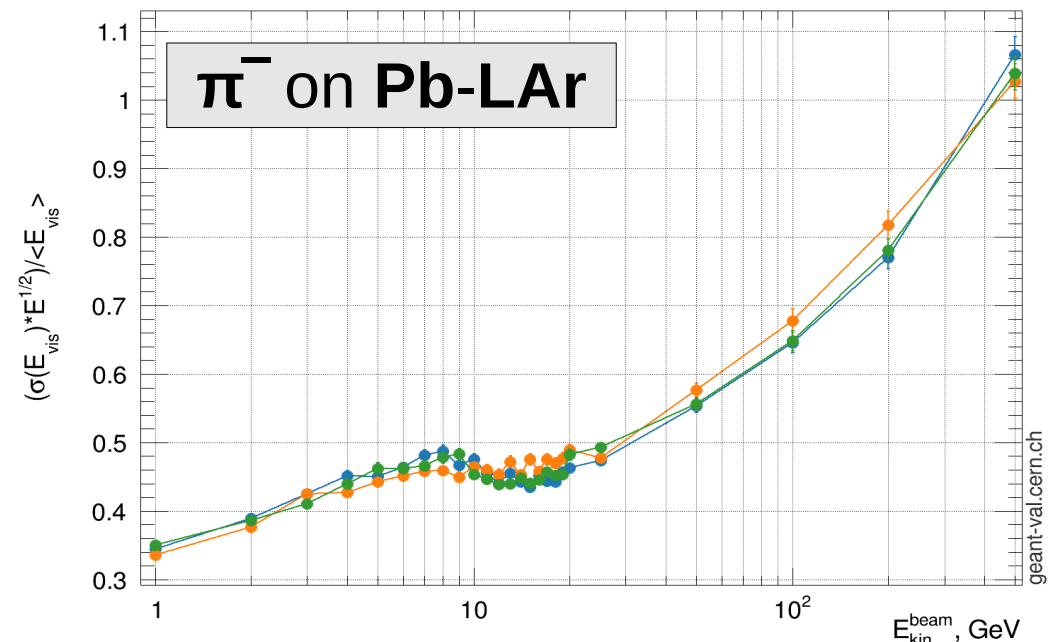
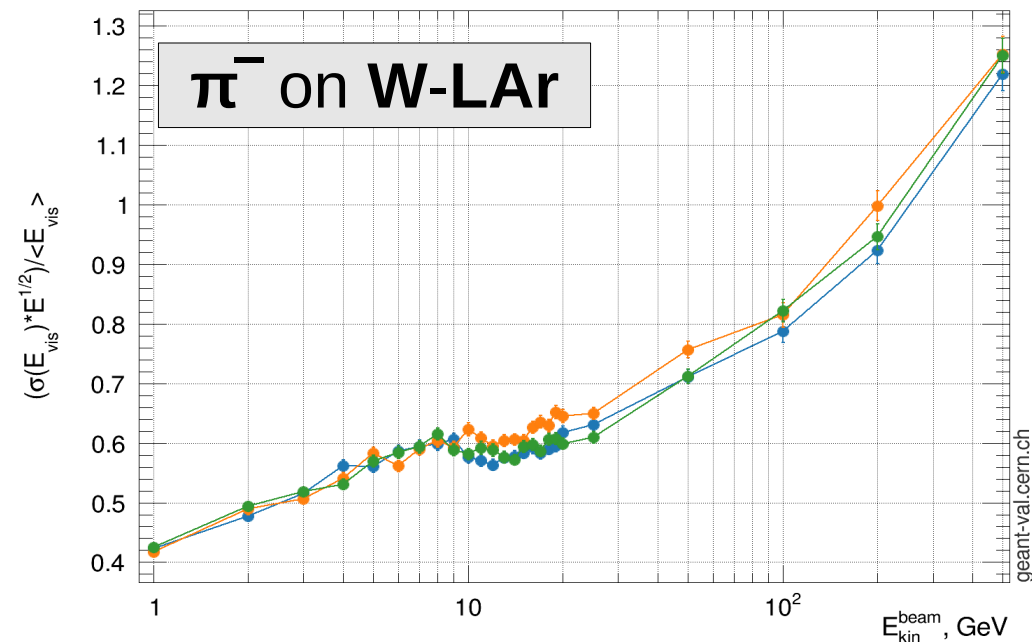
Energy resolution | Beam: pi- | Target: TileCal

Energy resolution | Beam: pi- | Target: AtlasHEC



Energy resolution | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP_BERT

Energy resolution | Beam: pi- | Target: AtlasECAL | Physics list: FTFP_BERT

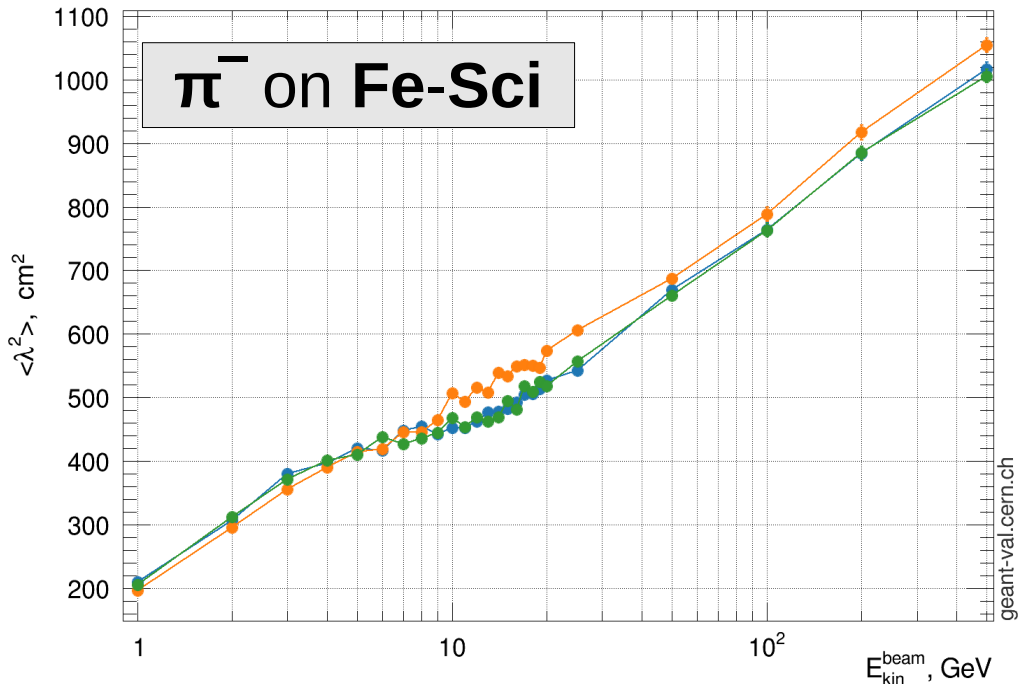


10.5.beta_cand01 (blue), 10.4.ref05 (green), 10.4.p02 (orange)

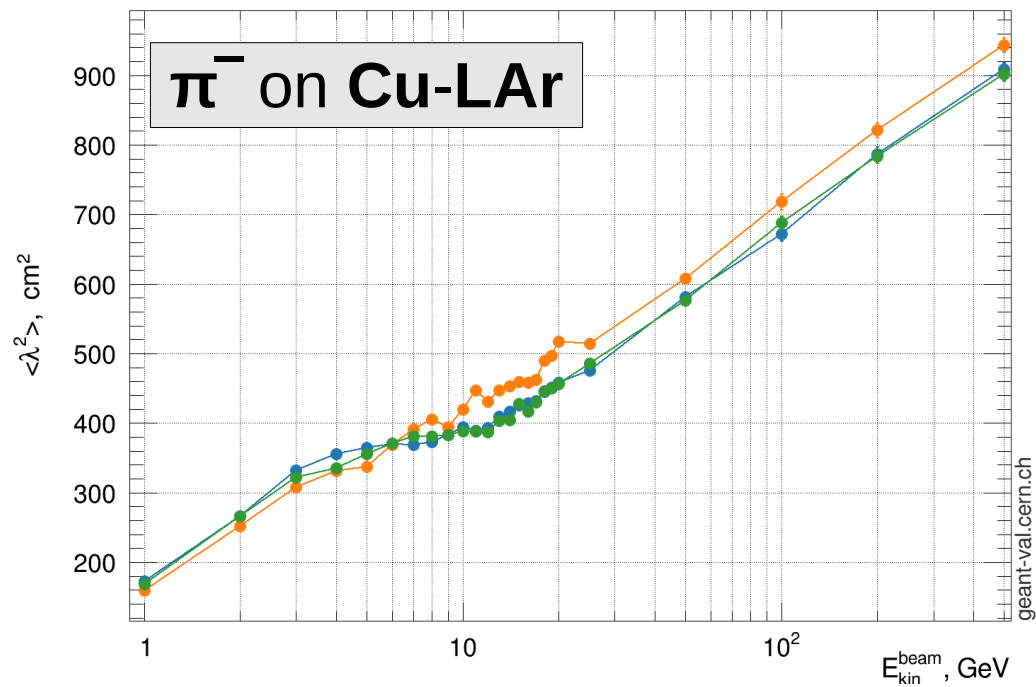
10.5.beta_cand01 (blue), 10.4.ref05 (green), 10.4.p02 (orange)

FTFP_BERT : Longitudinal Shape

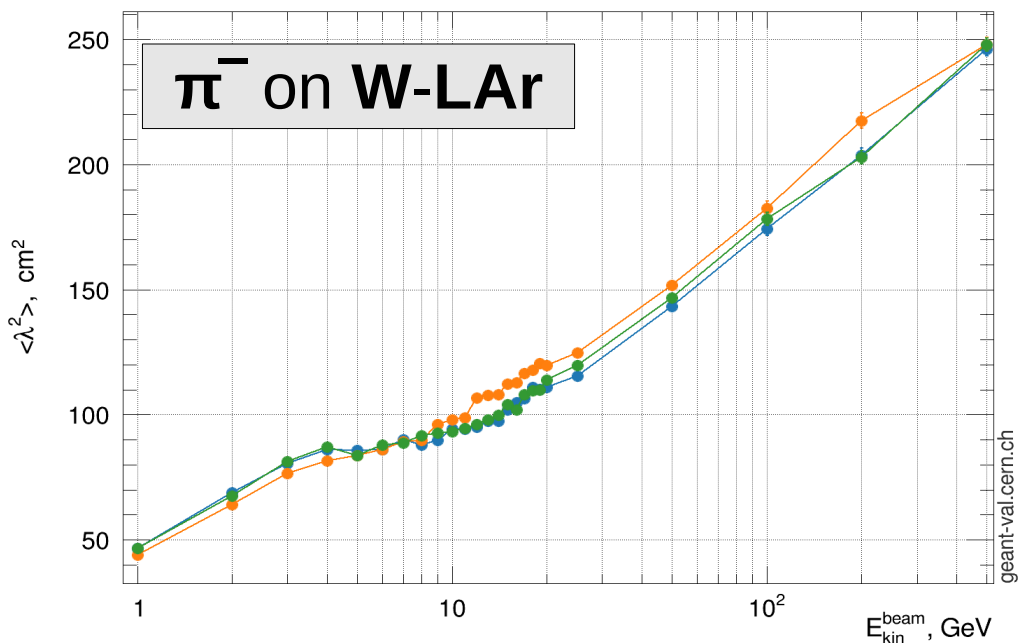
Longitudinal shower shape | Beam: pi- | Target: TileCal | Physics list: FTFP_BERT



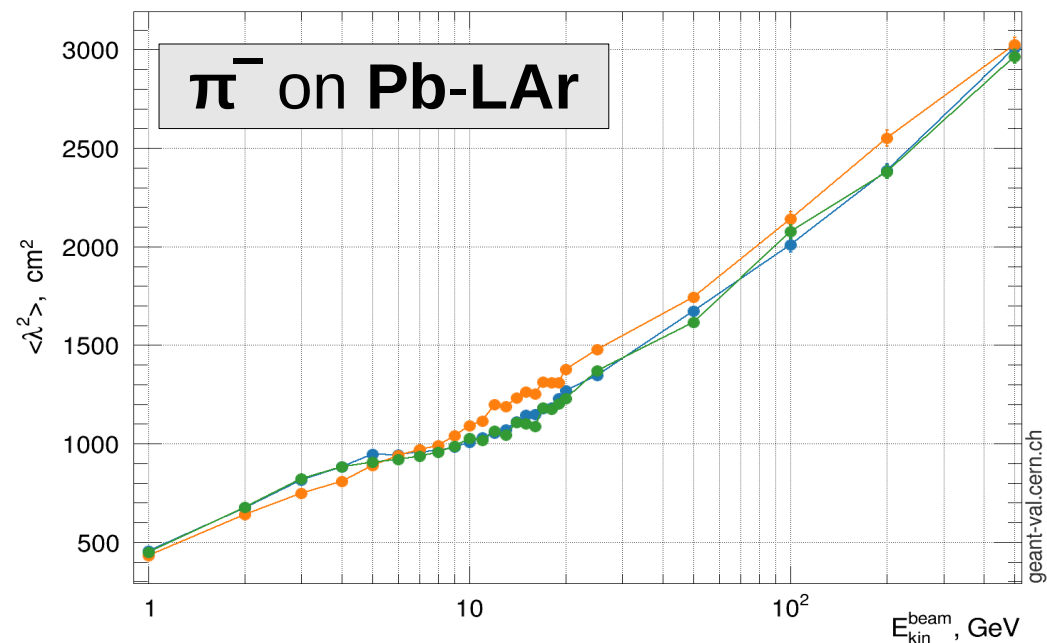
Longitudinal shower shape | Beam: pi- | Target: AtlasHEC | Physics list: FTFP_BERT



Longitudinal shower shape | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP_BERT



Longitudinal shower shape | Beam: pi- | Target: AtlasECAL | Physics list: FTFP_BERT

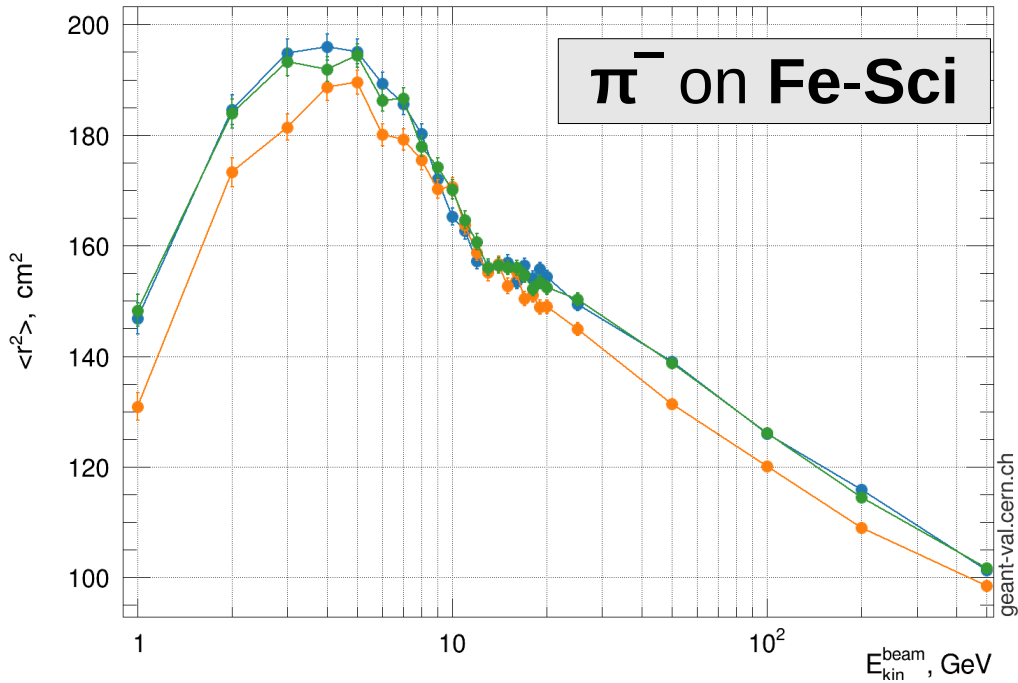


10.5.beta_cand01 (blue circle) 10.4.ref05 (green circle) 10.4.p02 (orange circle)

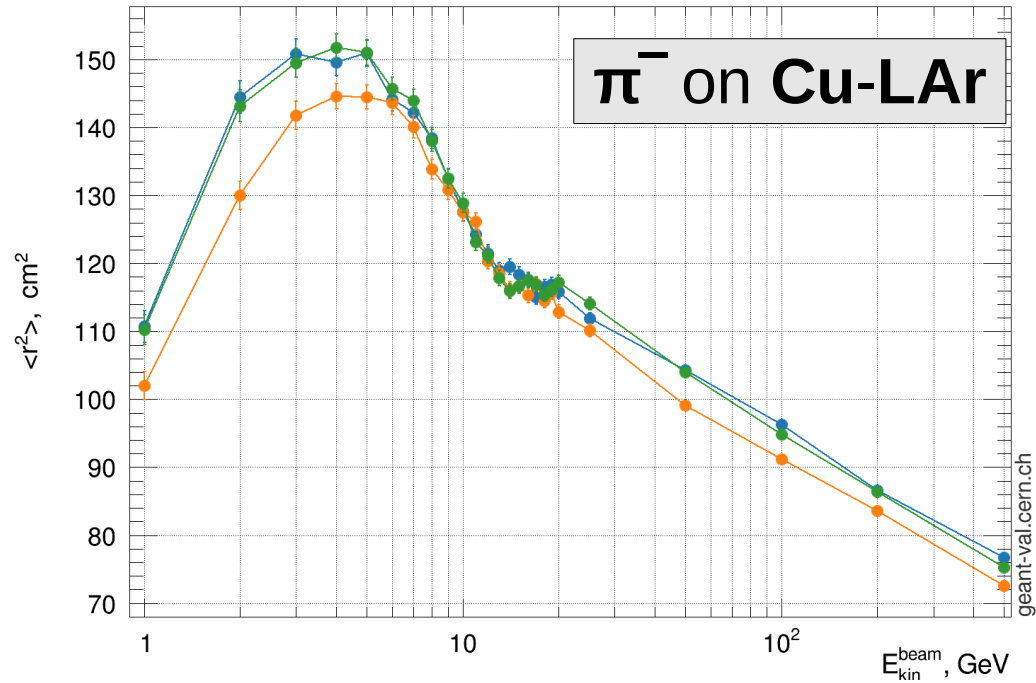
10.5.beta_cand01 (blue circle) 10.4.ref05 (green circle) 10.4.p02 (orange circle)

FTFP_BERT : Lateral Shape

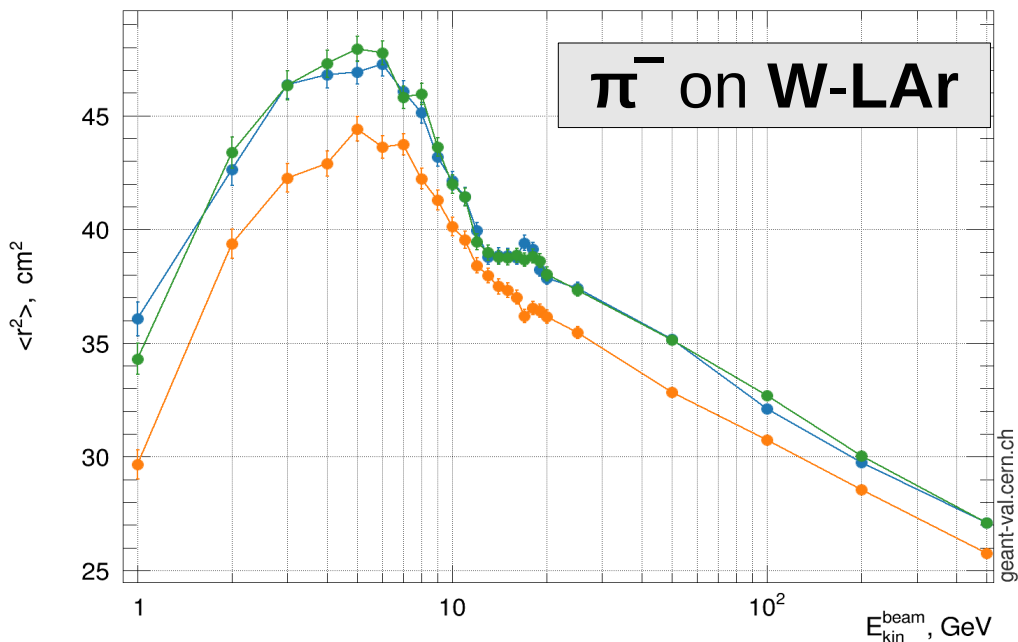
Lateral shower shape | Beam: pi- | Target: TileCal | Physics list: FTFP_BERT



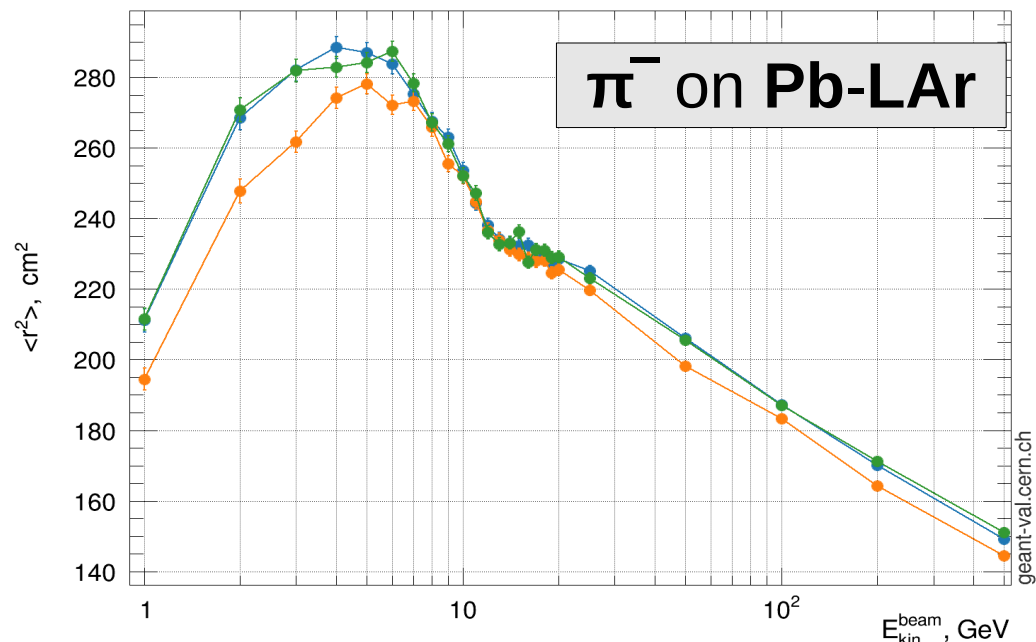
Lateral shower shape | Beam: pi- | Target: AtlasHEC | Physics list: FTFP_BERT



Lateral shower shape | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP_BERT



Lateral shower shape | Beam: pi- | Target: AtlasECAL | Physics list: FTFP_BERT



10.5.beta_cand01 (blue circle)
10.4.ref05 (green circle)
10.4.p02 (orange circle)

10.5.beta_cand01 (blue circle)
10.4.ref05 (green circle)
10.4.p02 (orange circle)

Conclusions

- **G4 10.5.beta**
 - No crash or infinite loop
 - 1 warning (ok: harmless)
 - Reproducibility OK
 - FTF hadronic showers as in Ref05

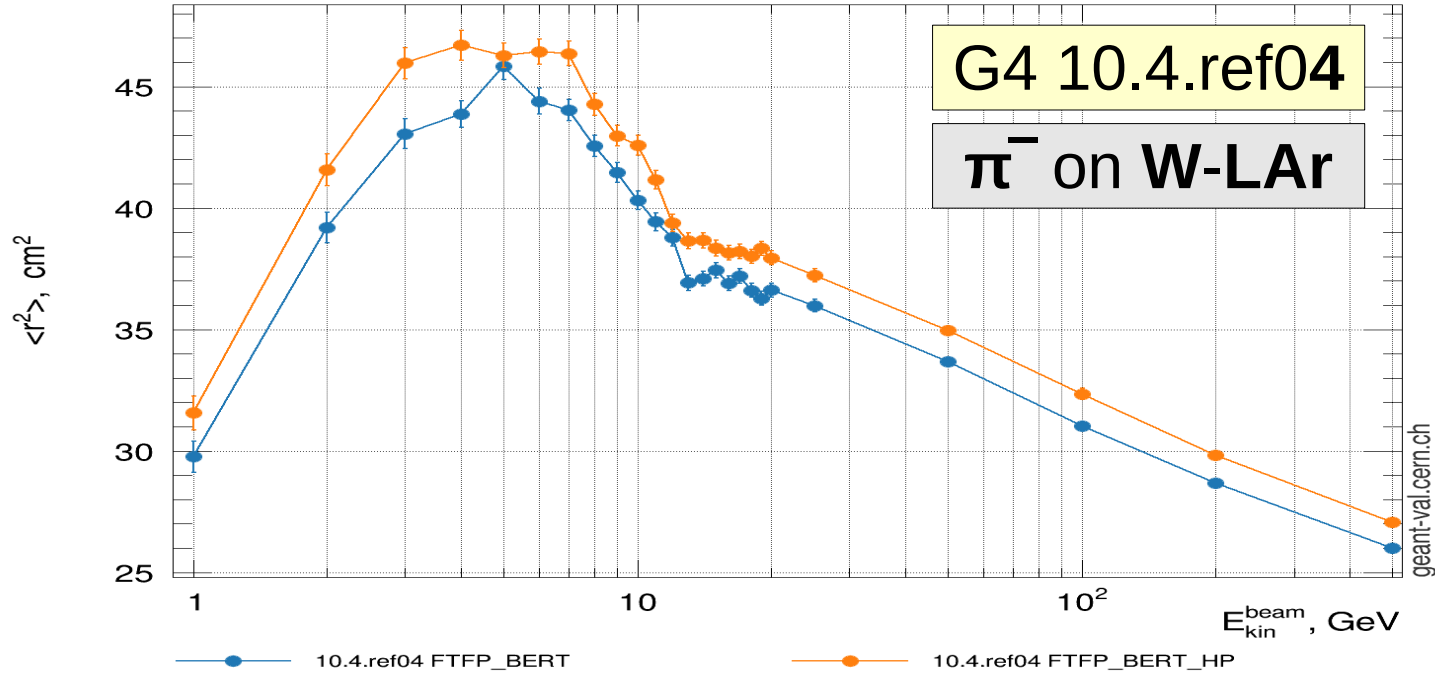
Backup Slides

Pion- showers :
Lateral shapes on W-LAr
G4 10.4.ref04 , ref05

FTFP_BERT vs. **FTFP_BERT_HP**

Lateral Shape : FTFP_BERT vs FTFP_BERT_HP

Lateral shower shape | Beam: pi- | Target: AtlasFCAL



FTFP_BERT is closer to FTFP_BERT_HP in Ref05 than in Ref04

Lateral shower shape | Beam: pi- | Target: AtlasFCAL

