

# Grid testing of Geant4 : 10.4.ref07

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

CERN PH/SFT

# Main Changes in Hadronics vs. Ref06

- No changes in: FTF, QGS, BIC, Preco, RadioactiveDecay
- Technical changes in several places
  - Introduced global parameter for the upper energy limit of hadronics (default: 100 TeV), Coverity fixes, compilation warning fixes, etc.
- Bertini
  - Fixed problem of wrong kinematics in the final state
- Cross sections
  - Improved treatment of isotopes
  - Improved computation of kaon cross sections
  - Updated hadron-nucleon cross sections to PDG-2016/2017
  - Deployed faster math functions G4Exp, G4Log, G4Pow
  - Removed Gheisha cross sections whenever better alternatives are available

# Crashes & Warnings

- No crashes
- No infinite loops
- No warnings

## Reproducibility

- Reproducibility OK

Pion- showers: FTFP\_BERT

G4 10.4.ref07

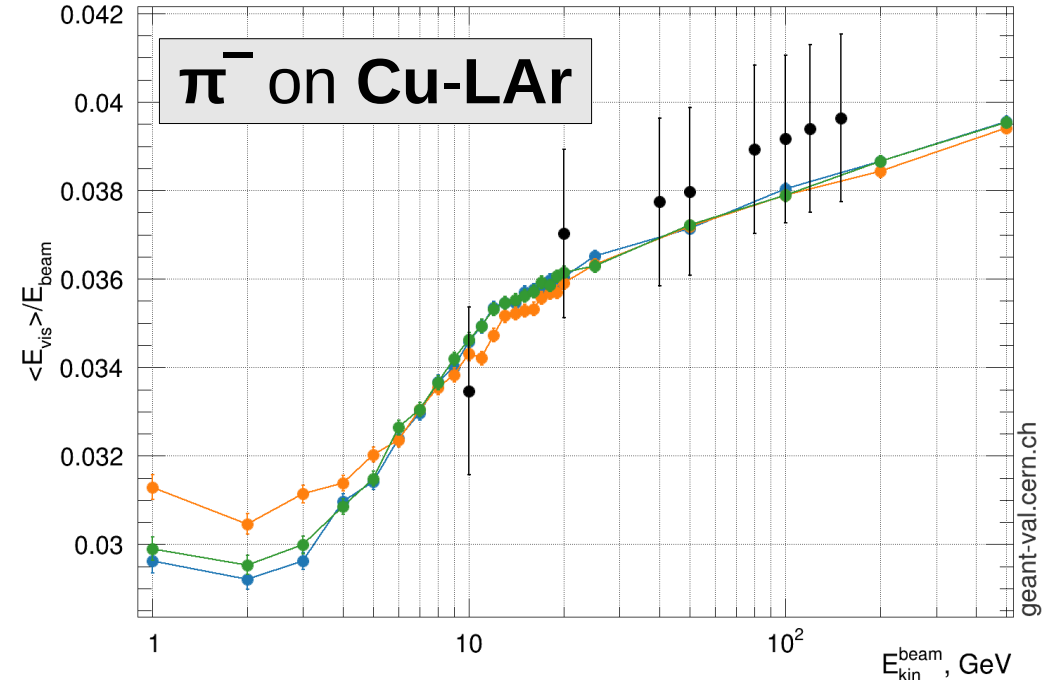
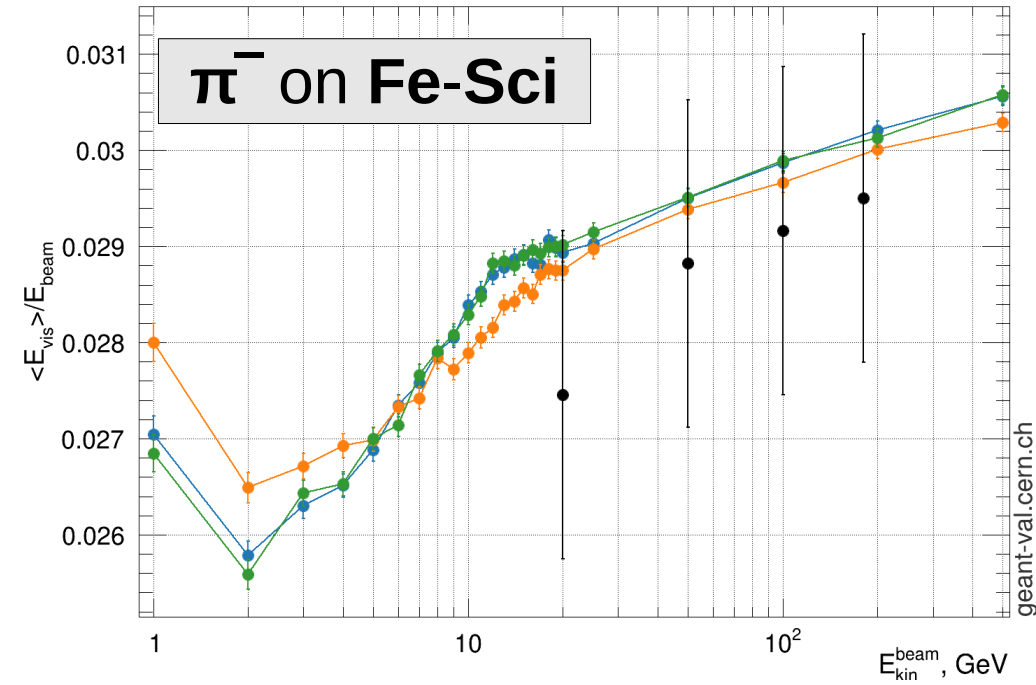
10.4.ref06

10.4.p02

# FTFP\_BERT : Energy Response

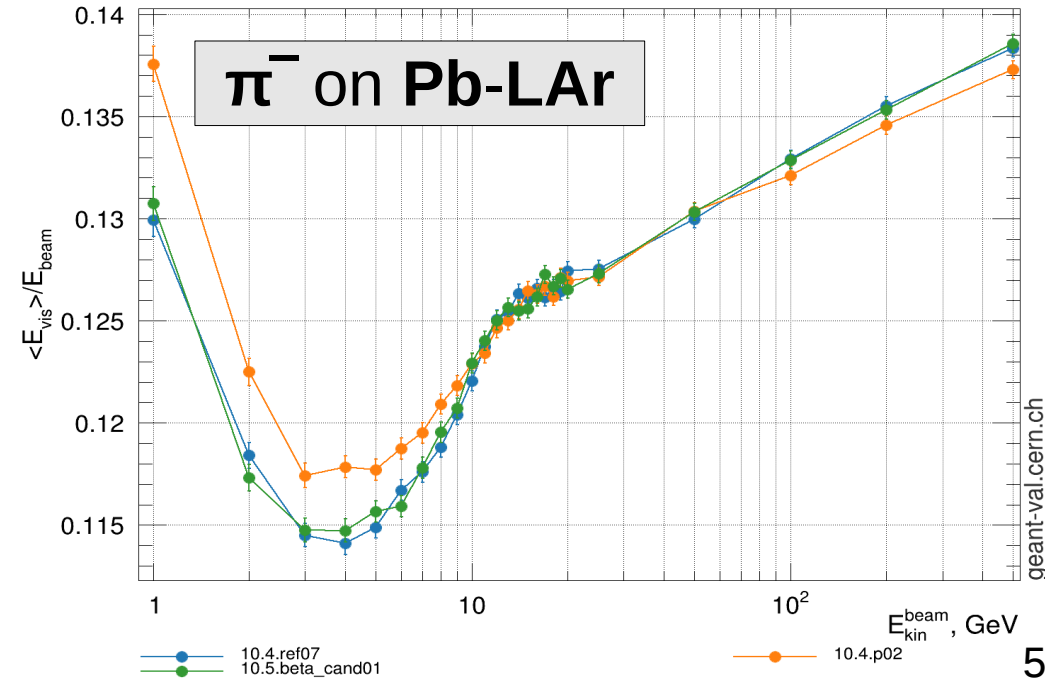
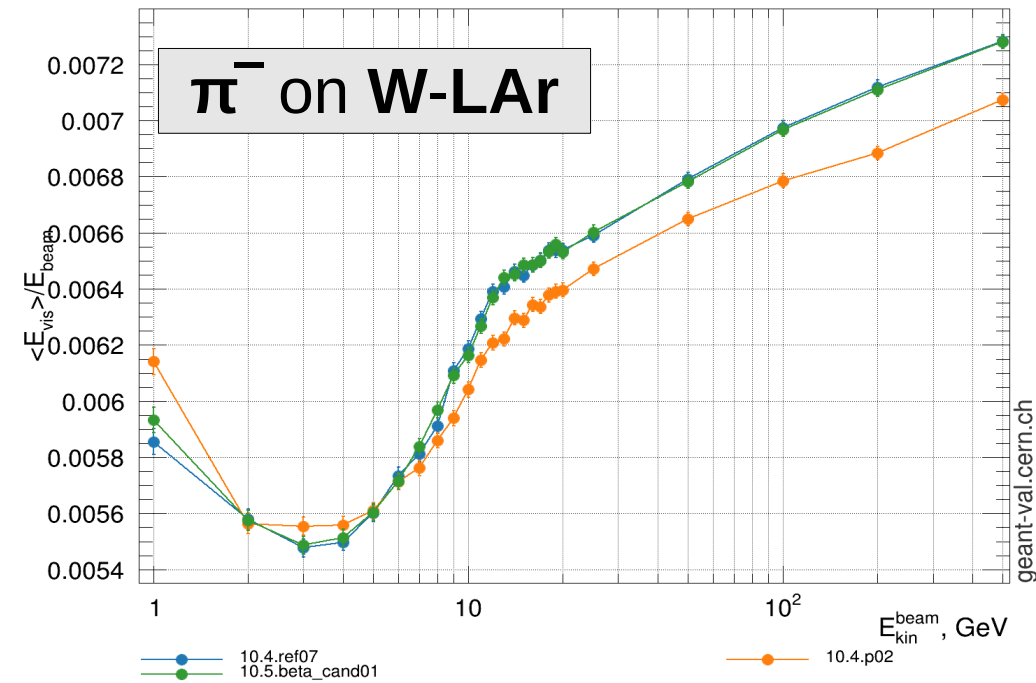
Energy response | Beam: pi- | Target: TileCal

Energy response | Beam: pi- | Target: AtlasHEC



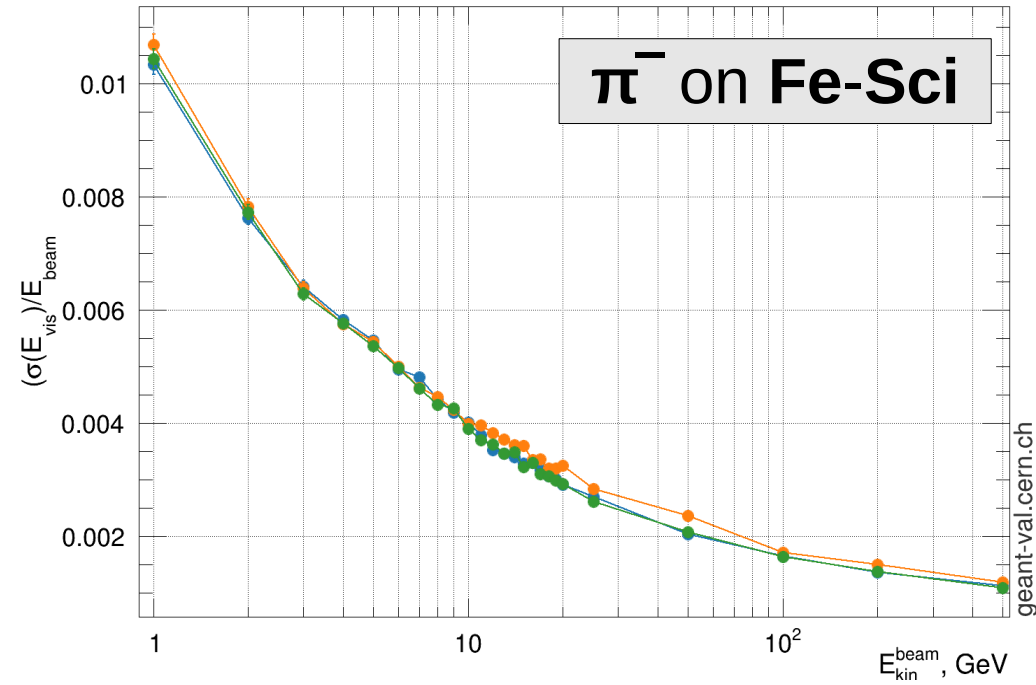
Energy response | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP\_BERT

Energy response | Beam: pi- | Target: AtlasECAL | Physics list: FTFP\_BERT

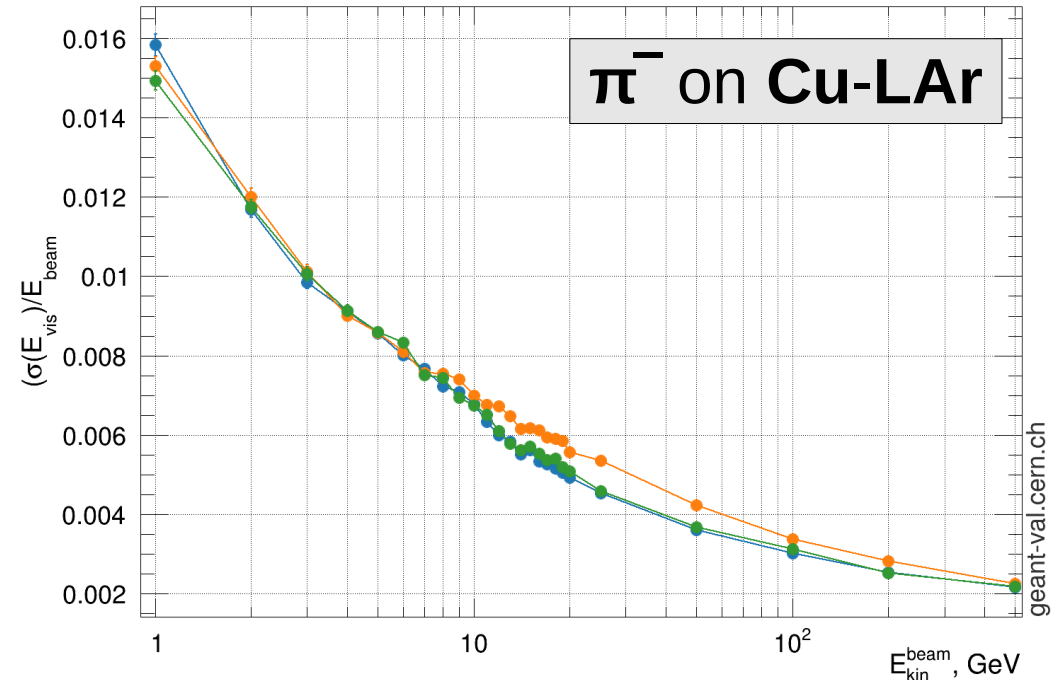


# FTFP\_BERT : Energy Width

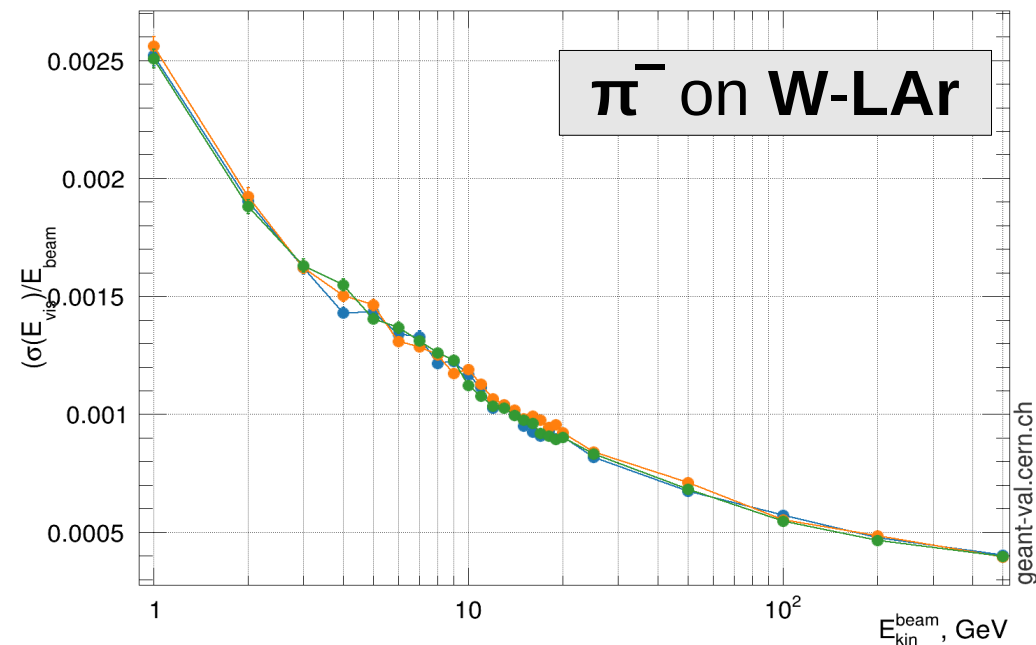
Normalized width | Beam: pi- | Target: TileCal | Physics list: FTFP\_BERT



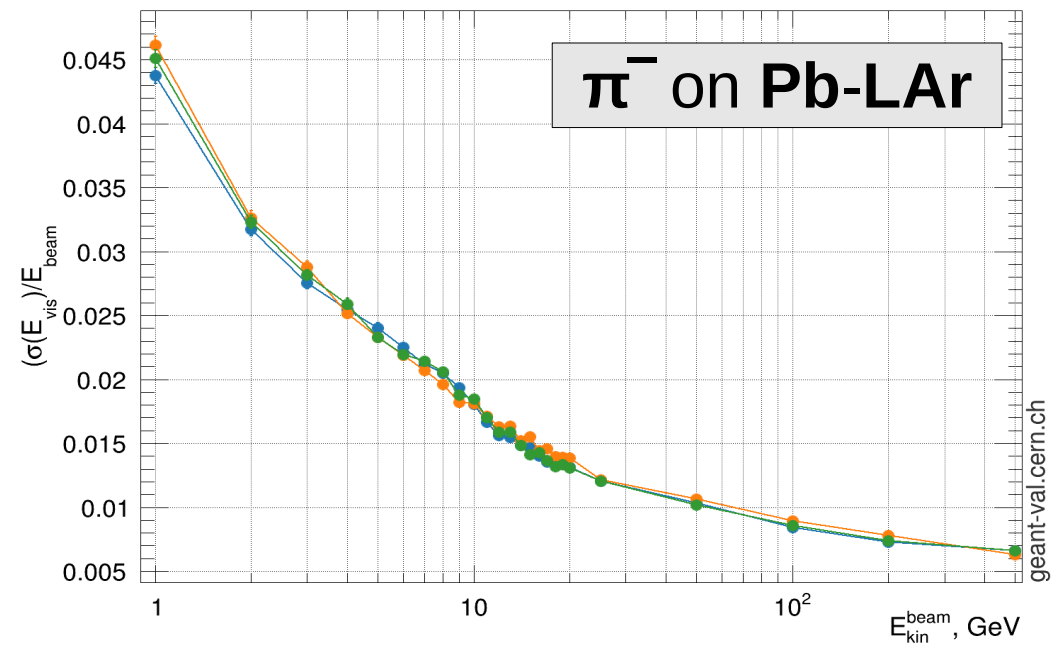
Normalized width | Beam: pi- | Target: AtlasHEC | Physics list: FTFP\_BERT



Normalized width | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP\_BERT



Normalized width | Beam: pi- | Target: AtlasECAL | Physics list: FTFP\_BERT



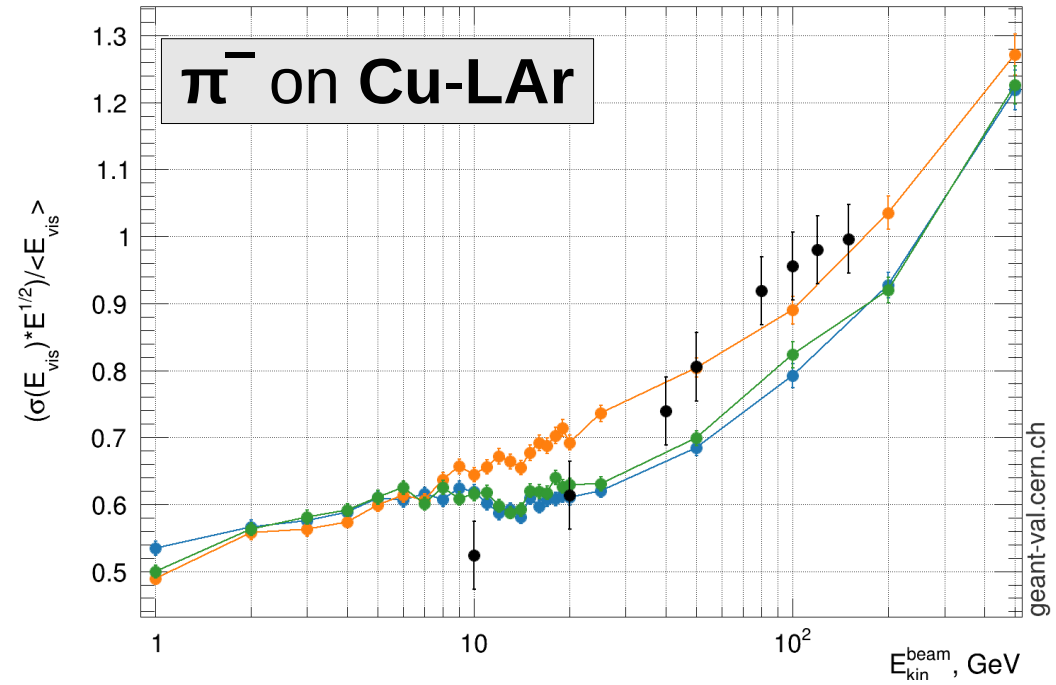
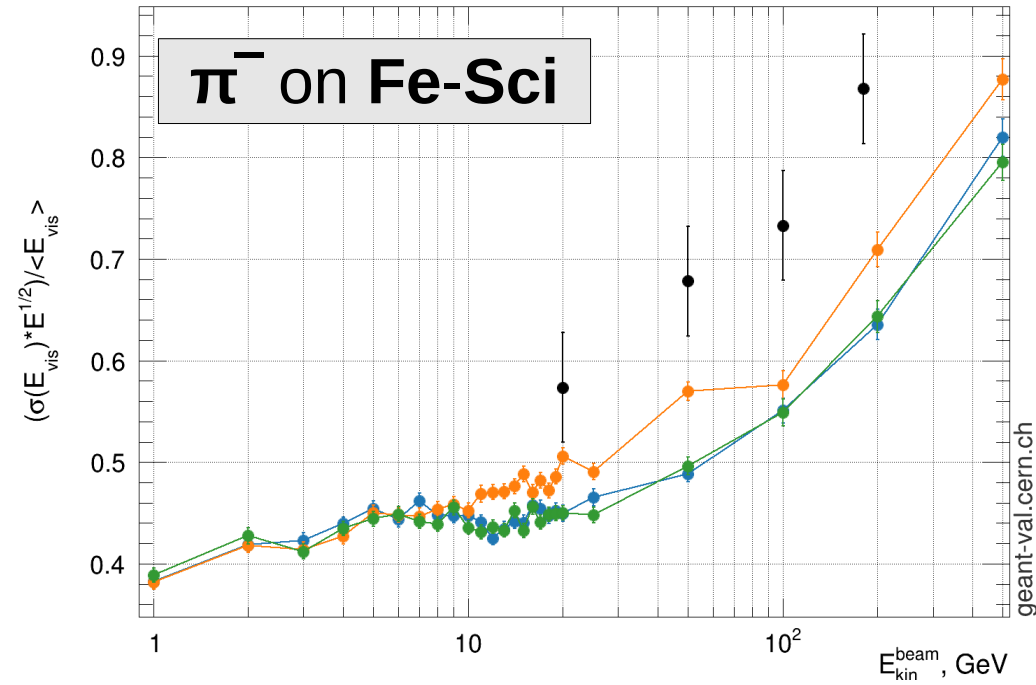
10.4.ref07 (blue), 10.5.beta\_cand01 (green), 10.4.p02 (orange)

10.4.ref07 (blue), 10.5.beta\_cand01 (green), 10.4.p02 (orange)

# FTFP\_BERT : Energy Resolution

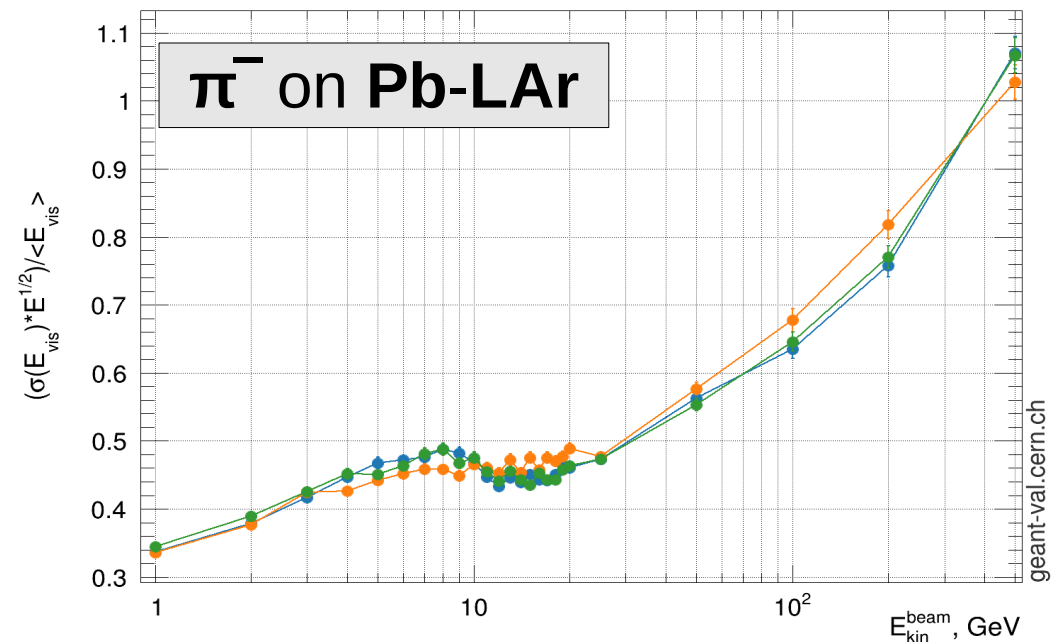
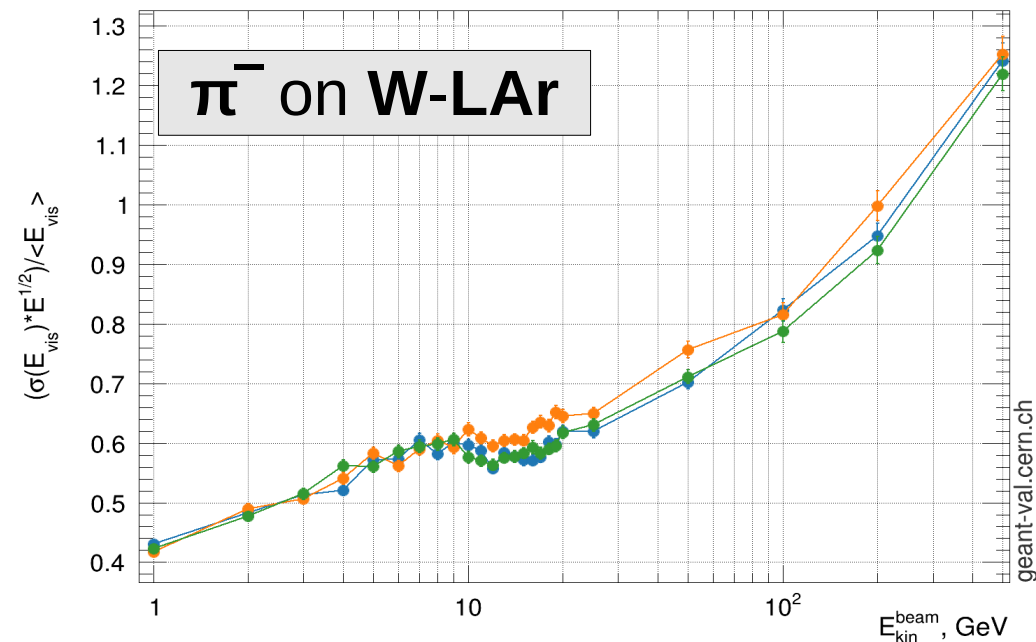
Energy resolution | Beam: pi- | Target: TileCal

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



10.4.ref07  
10.5.beta\_cand01

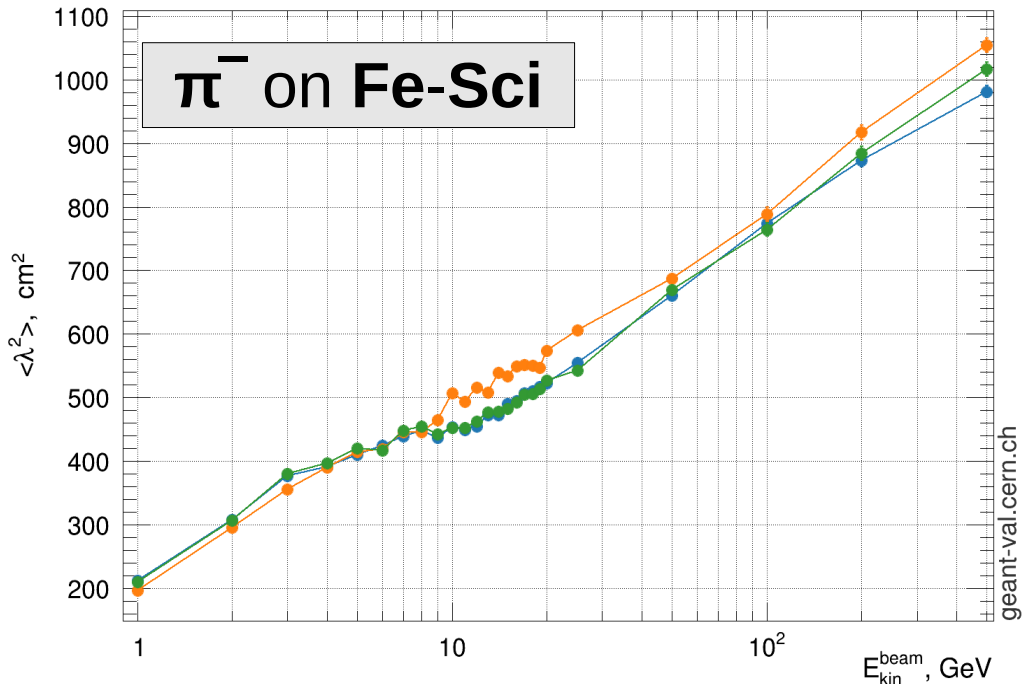
10.4.p02

10.4.ref07  
10.5.beta\_cand01

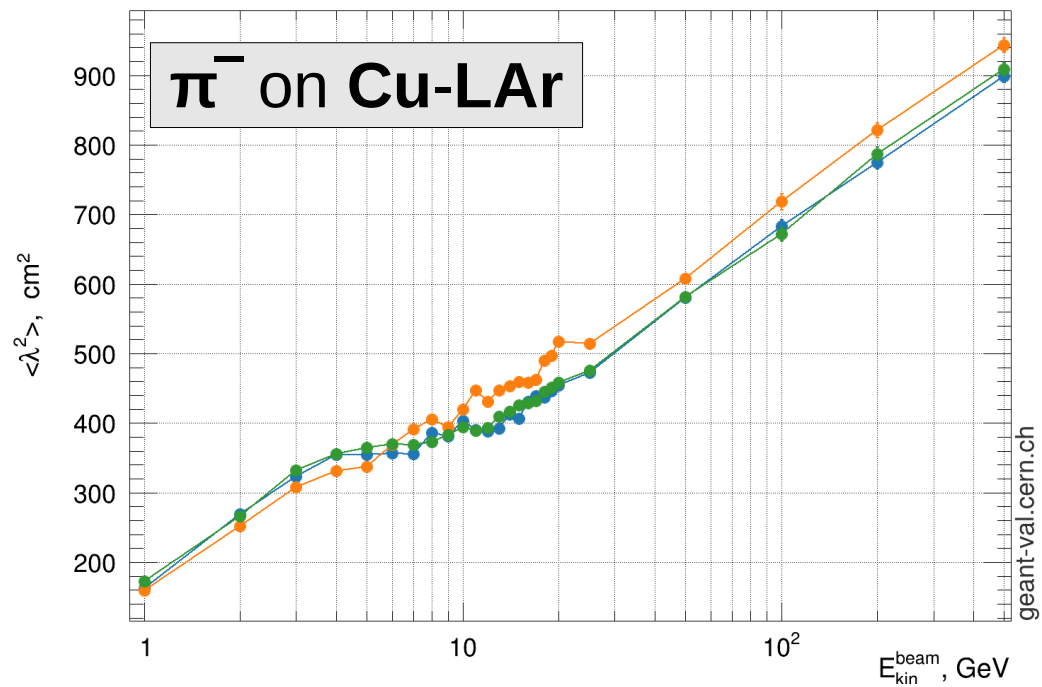
10.4.p02

# FTFP\_BERT : Longitudinal Shape

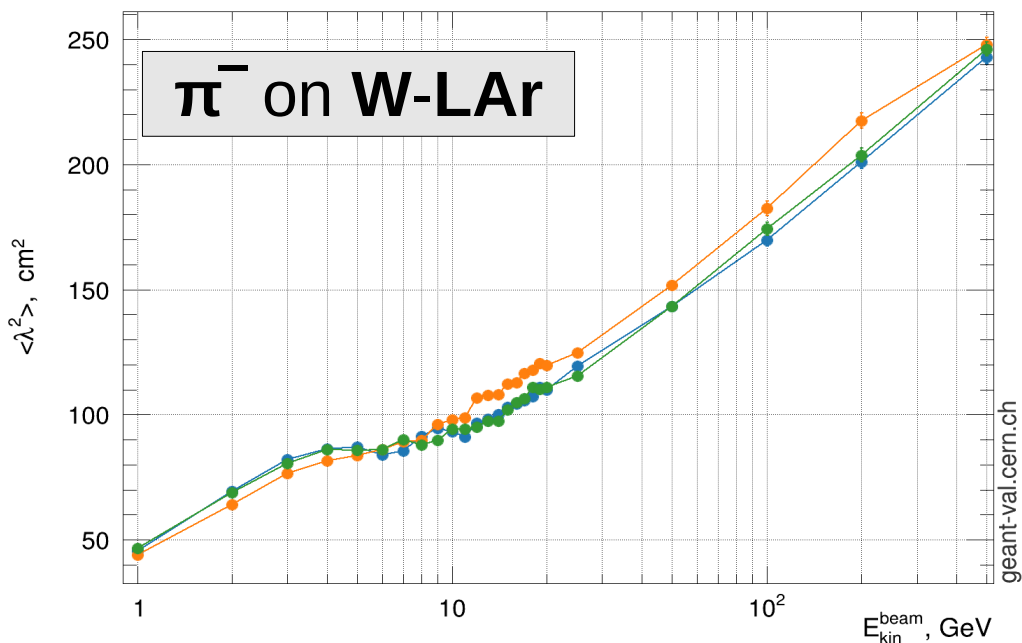
Longitudinal shower shape | Beam: pi- | Target: TileCal | Physics list: FTFP\_BERT



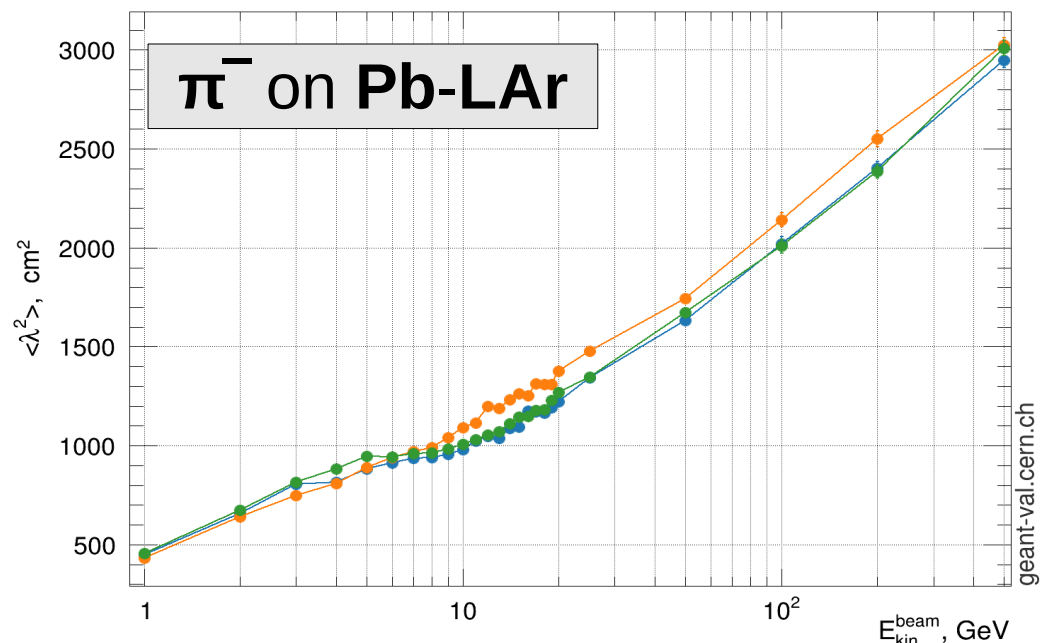
Longitudinal shower shape | Beam: pi- | Target: AtlasHEC | Physics list: FTFP\_BERT



Longitudinal shower shape | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP\_BERT



Longitudinal shower shape | Beam: pi- | Target: AtlasECAL | Physics list: FTFP\_BERT



10.4.ref07  
10.5.beta\_cand01

10.4.p02

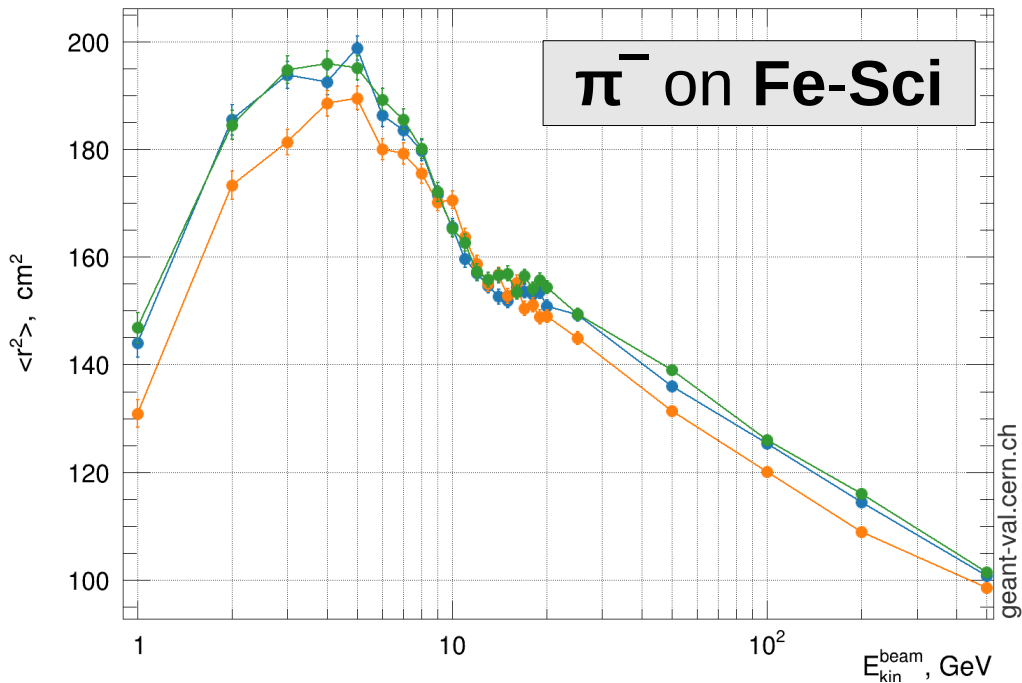
10.4.ref07  
10.5.beta\_cand01

10.4.p02

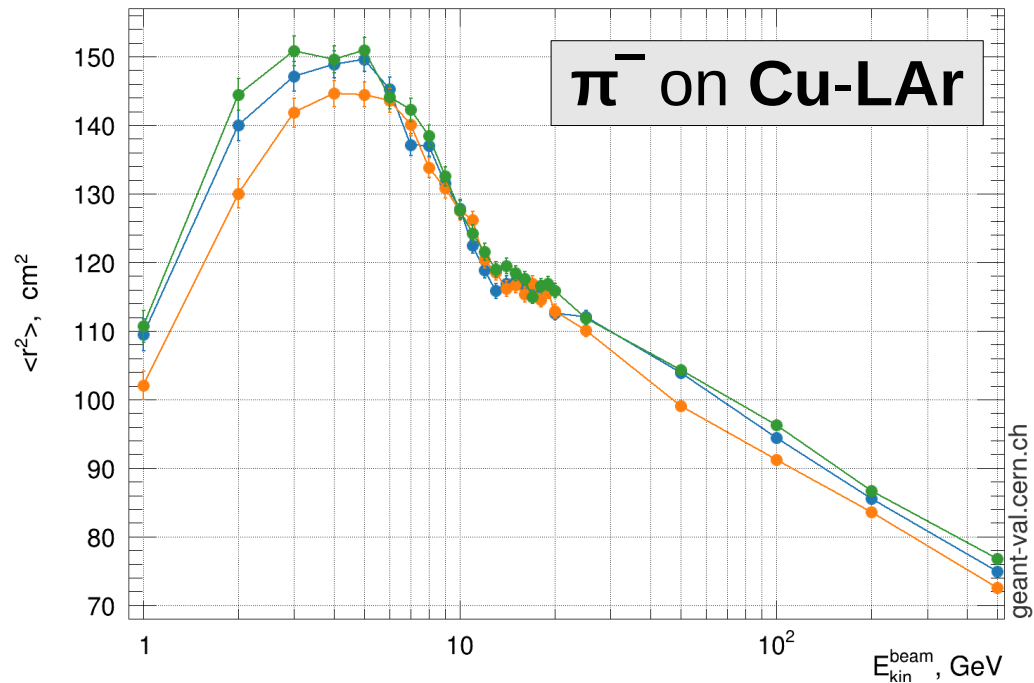


# FTFP\_BERT : Lateral Shape

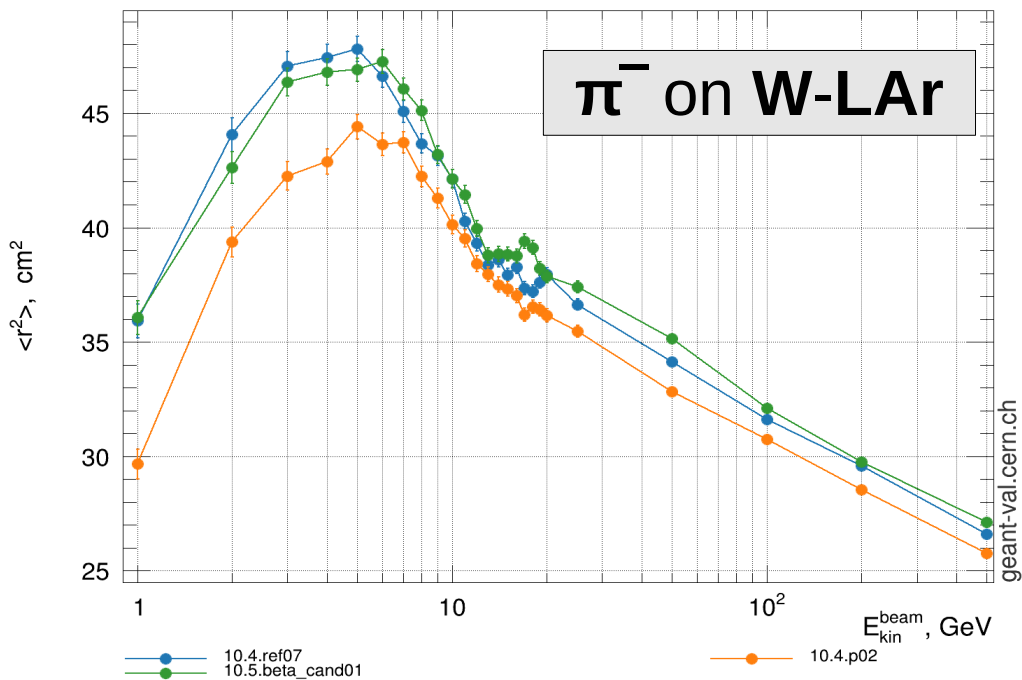
Lateral shower shape | Beam: pi- | Target: TileCal | Physics list: FTFP\_BERT



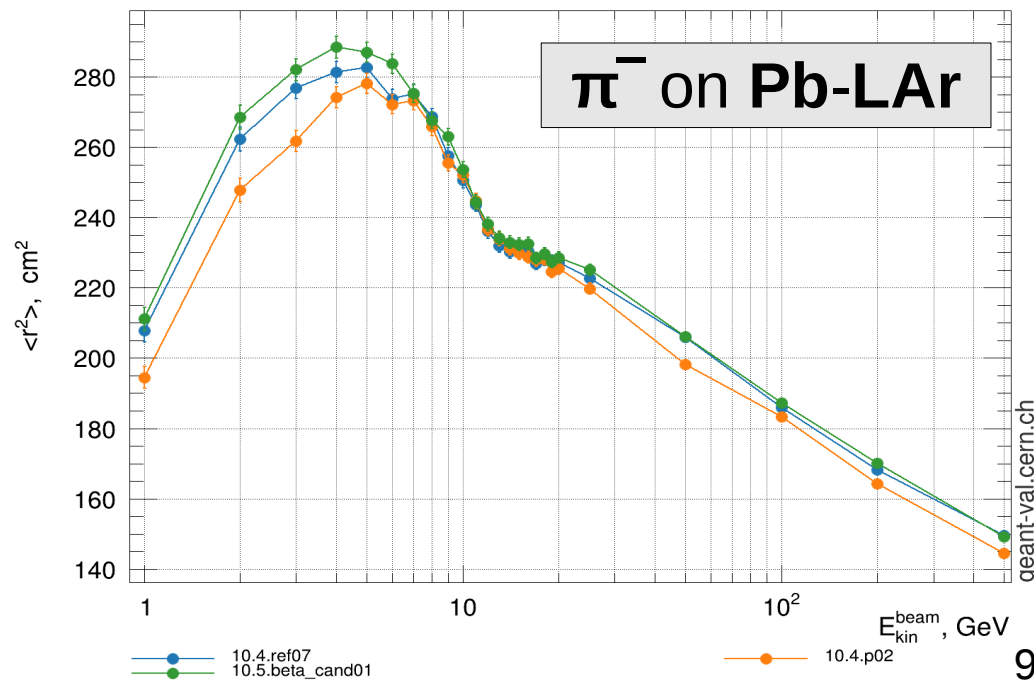
Lateral shower shape | Beam: pi- | Target: AtlasHEC | Physics list: FTFP\_BERT



Lateral shower shape | Beam: pi- | Target: AtlasFCAL | Physics list: FTFP\_BERT



Lateral shower shape | Beam: pi- | Target: AtlasECAL | Physics list: FTFP\_BERT



# Conclusions

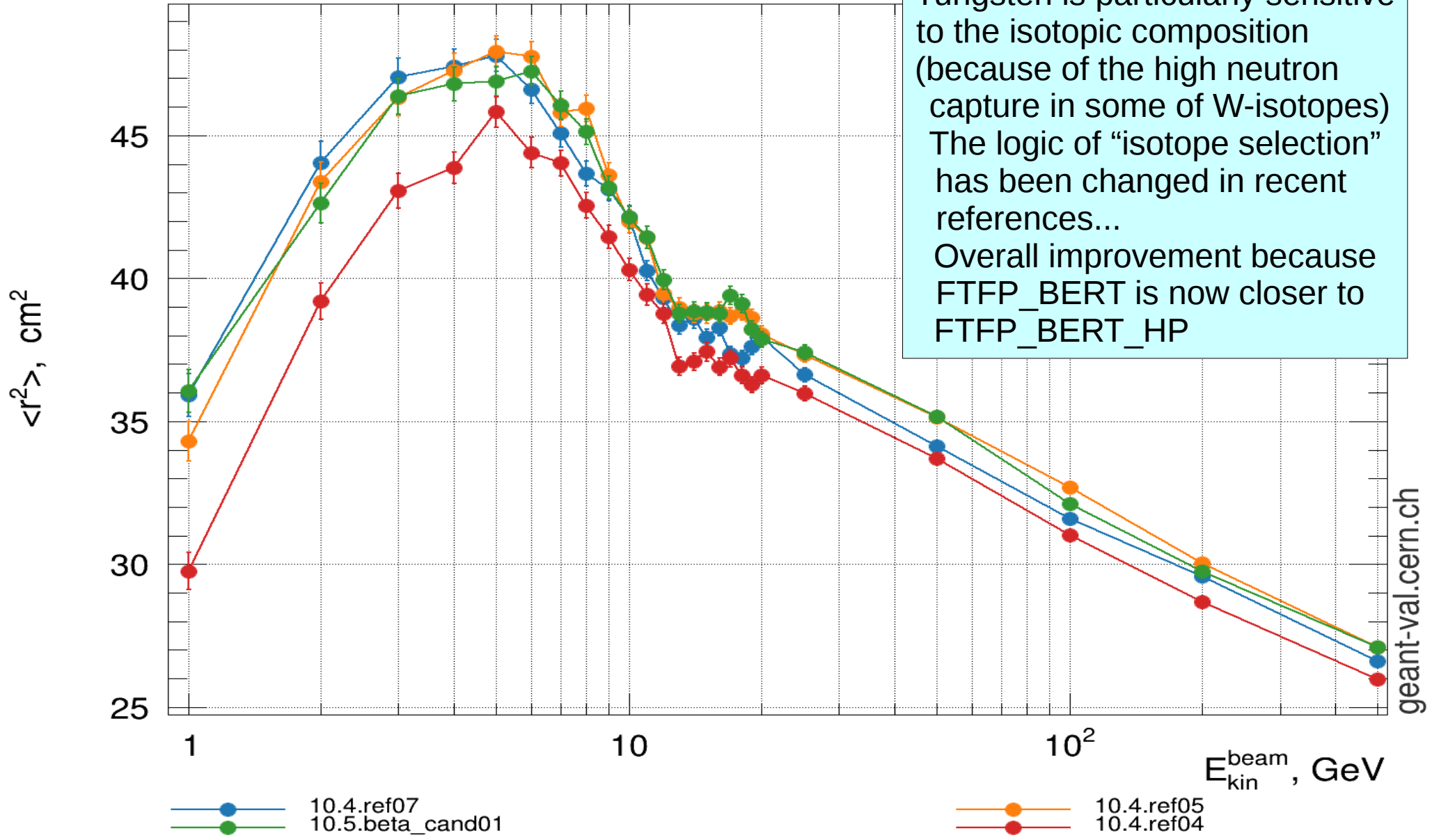
- **G4 10.4.ref07**
  - No crash or infinite loop or warning
  - Reproducibility OK
  - FTF hadronic showers : similar to ref06
    - Small change only in the lateral shape in Tungsten, likely due to the change in the cross-section isotope-treatment (see back-up slides)

Back up

# FTFP\_BERT : Lateral Shape

$\pi^-$  on W-LAr

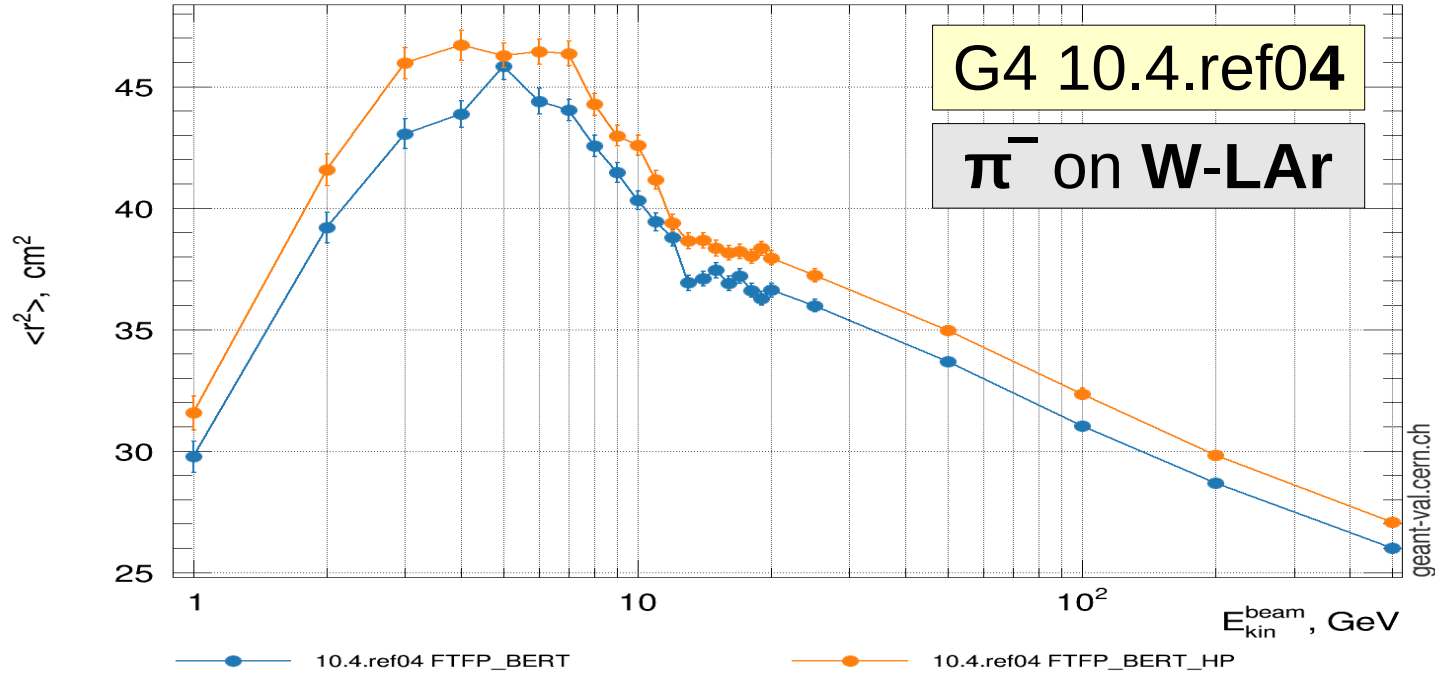
Lateral shower shape | Beam:  $\pi^-$  | Target: AtlasFCAL



geant-val.cern.ch

# Lateral Shape : FTFTP\_BERT vs FTFTP\_BERT\_HP

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



FTFTP\_BERT is closer to FTFTP\_BERT\_HP in Ref05 than in Ref04

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

