



Hadronic Showers in Geant4 10.7.ref02

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Main Changes in Hadronics vs. 10.7.ref01

No changes in string, intra-nuclear cascades, Precompound and particleHP models

- Cross sections
 - Updated data-set: G4PARTICLEXS-3.1.1
 - Fixed data for He3 and He4 for few light targets
- De-excitation
 - **Changed half-life time threshold for isomer production from 1 μ s to 1 ns**
 - To avoid unphysical missing energy cases reported by NA61/SHINE
 - Likely responsible of few % CPU degradation seen in benchmarks
- Radioactive decay
 - Corrected weight treatment in analogue mode with external biasing
- Hadron elastic constructor
 - Fixed problem in G4HadronHElasticPhysics (used in FTFP_BERT_TRV)

Crashes & Warnings

- No crashes
- No infinite loops
- No new warnings

Reproducibility

- All OK
 - Both usual tests and the new ones for tasking

Pion- showers: FTFP_BERT

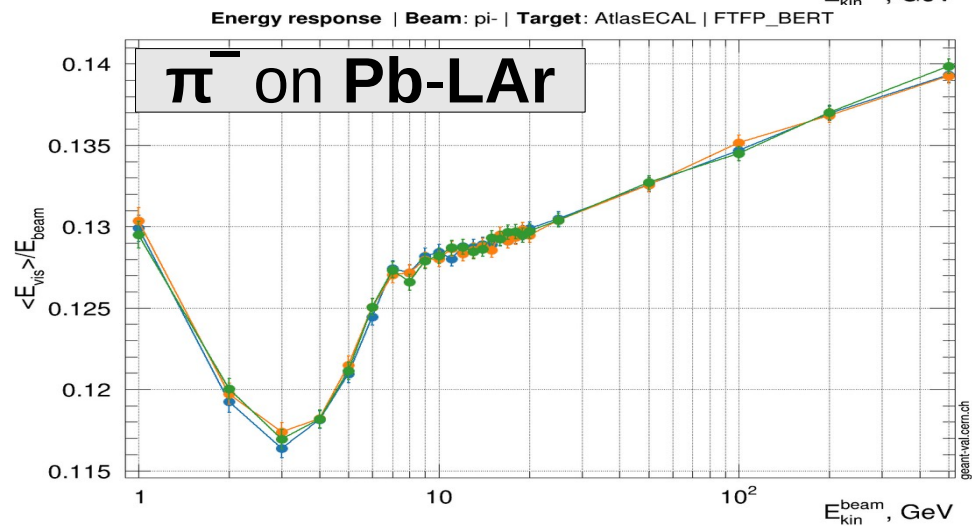
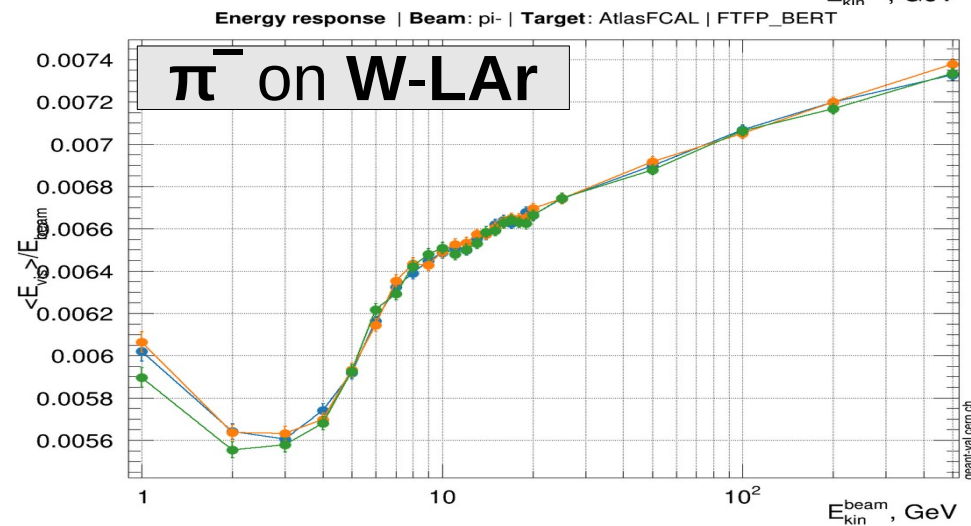
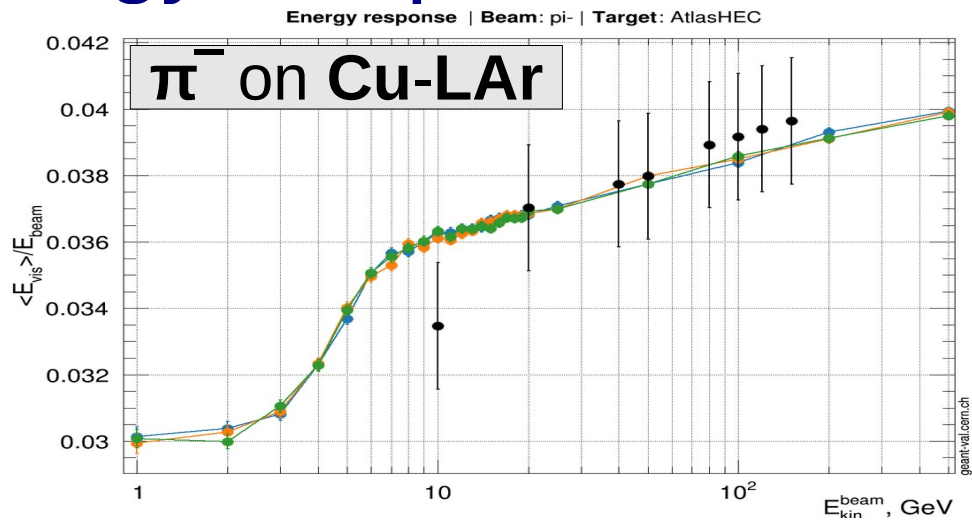
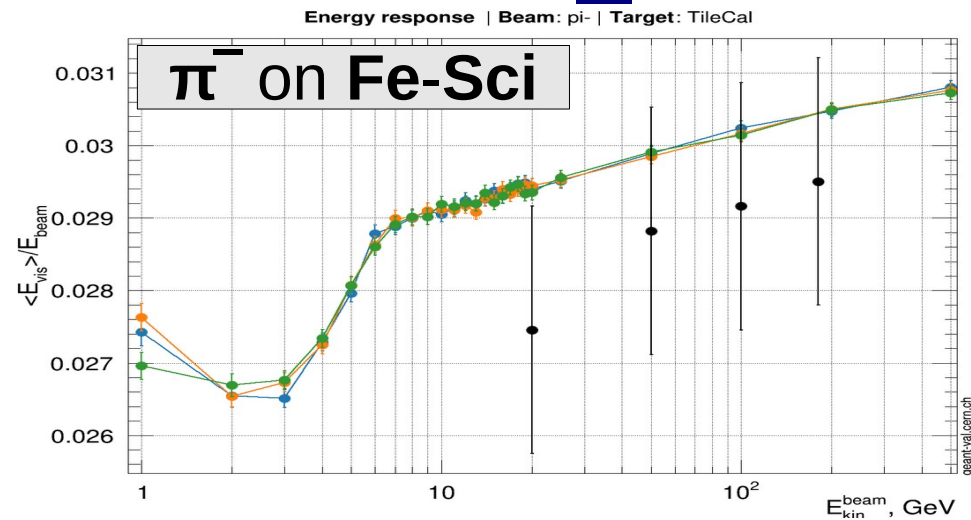
G4 10.7.ref02

G4 10.7.ref01

G4 10.7.p01

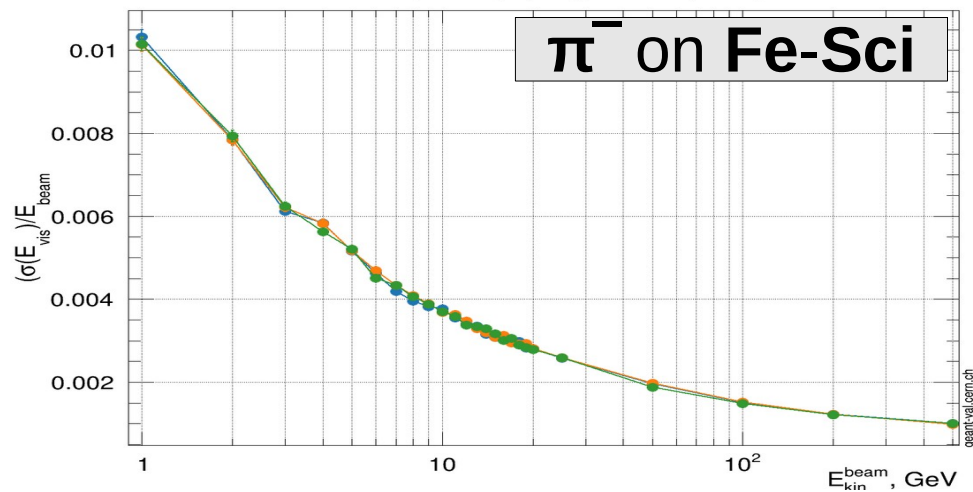
*Note : conventional Birks treatment
(easier and no experimental h/e to fit !)*

FTFP_BERT : Energy Response

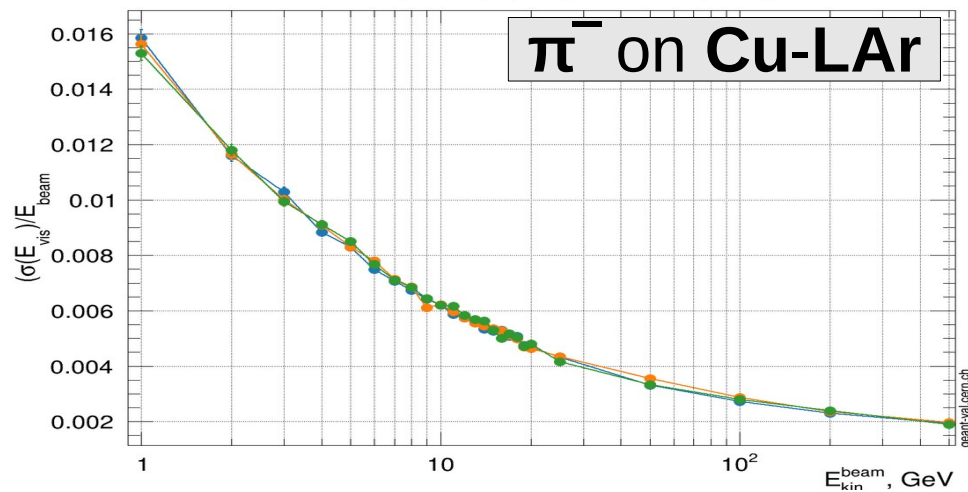


FTFP_BERT : Energy Width

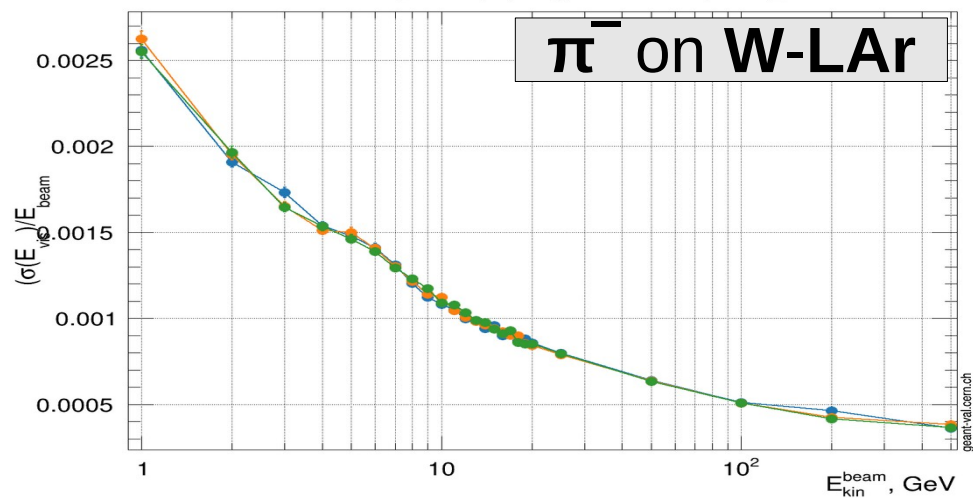
Normalized width | Beam: pi- | Target: TileCal | FTFP_BERT



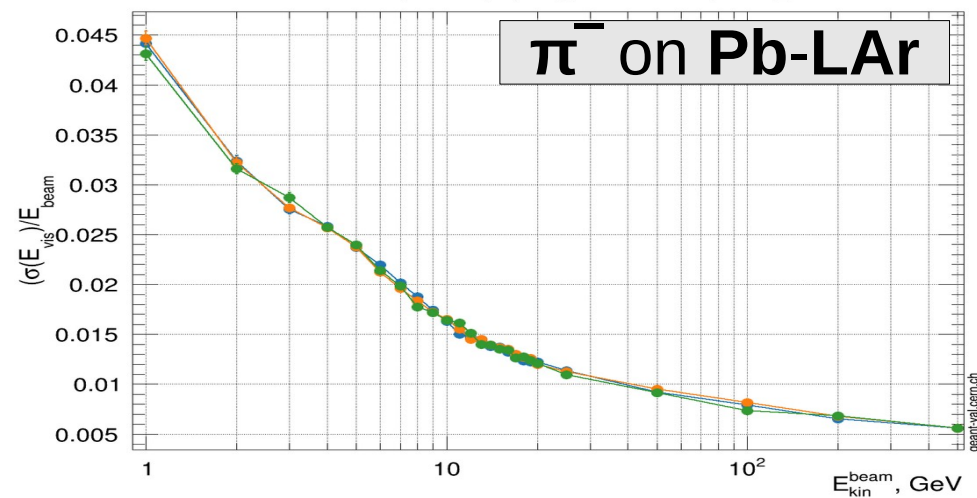
Normalized width | Beam: pi- | Target: AtlasHEC | FTFP_BERT



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



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



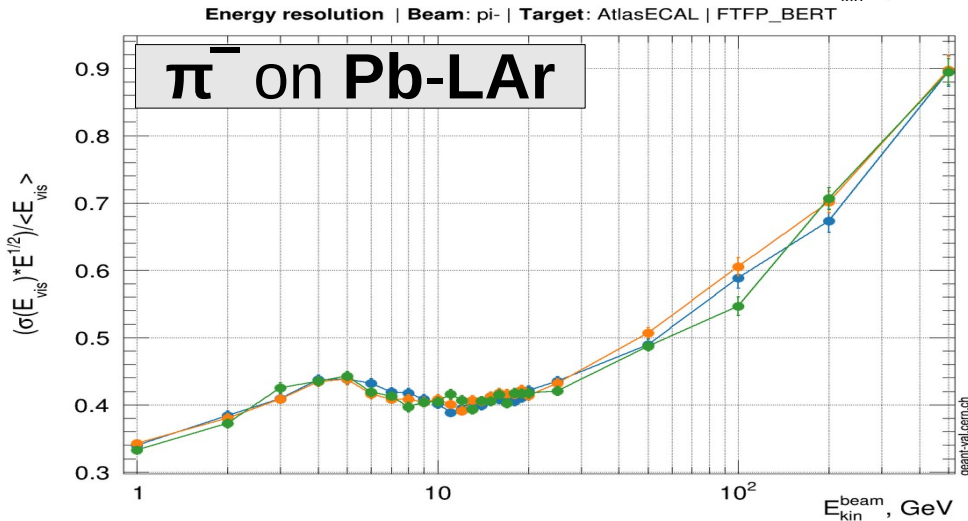
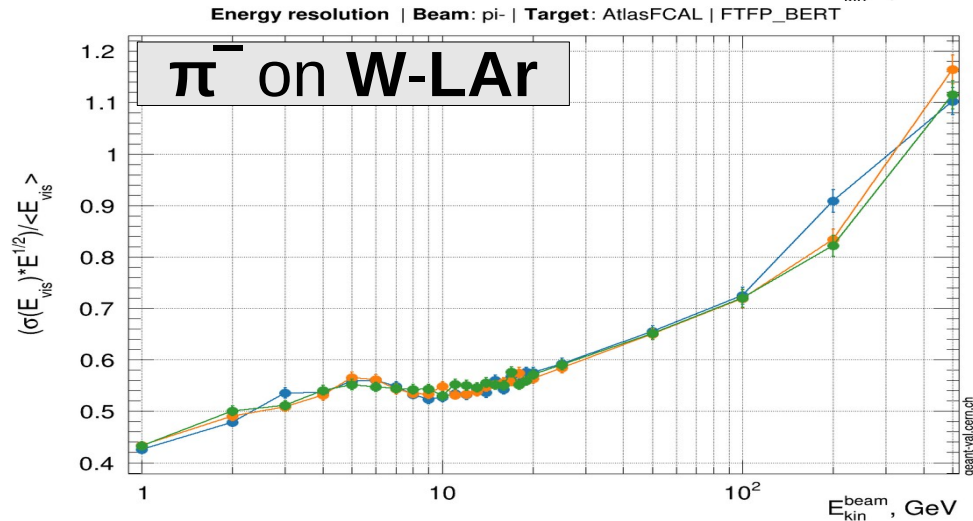
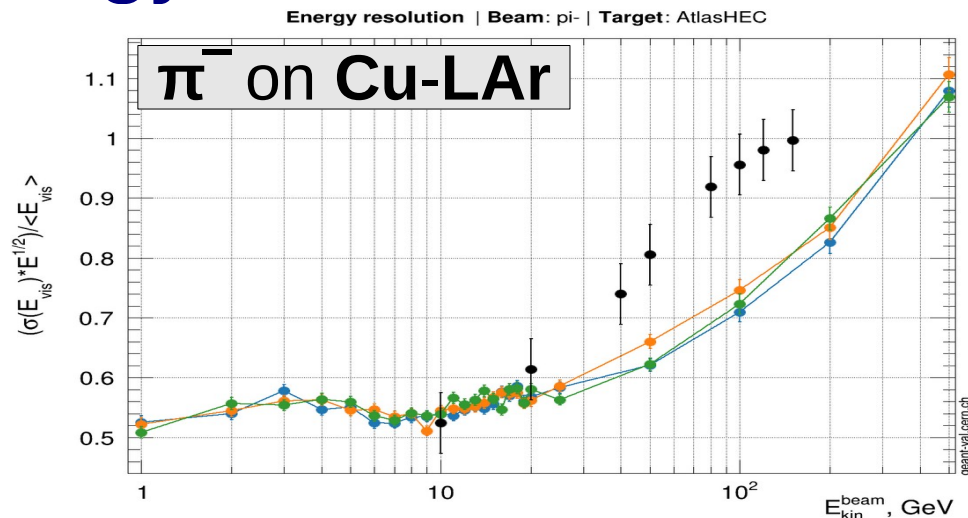
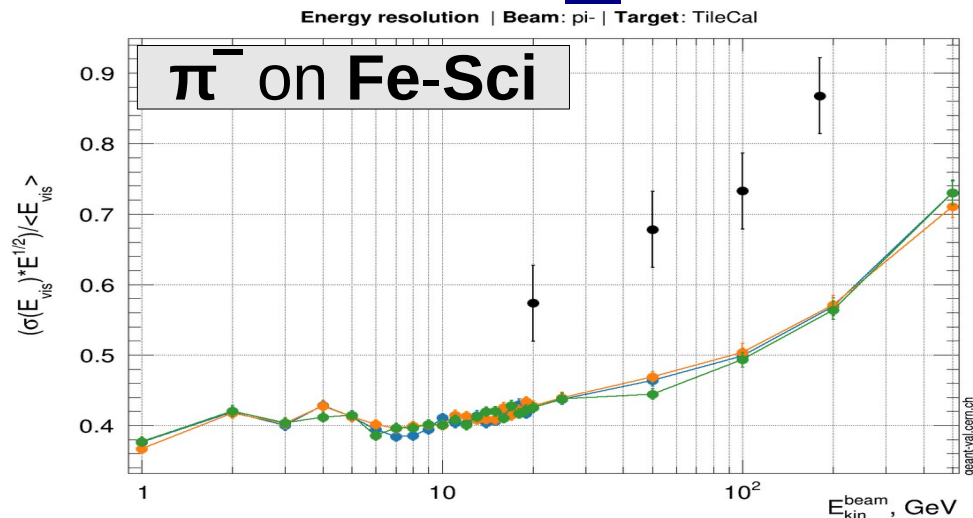
10.7.ref01
10.7.ref02

10.7.p01

10.7.ref01
10.7.ref02

10.7.p01

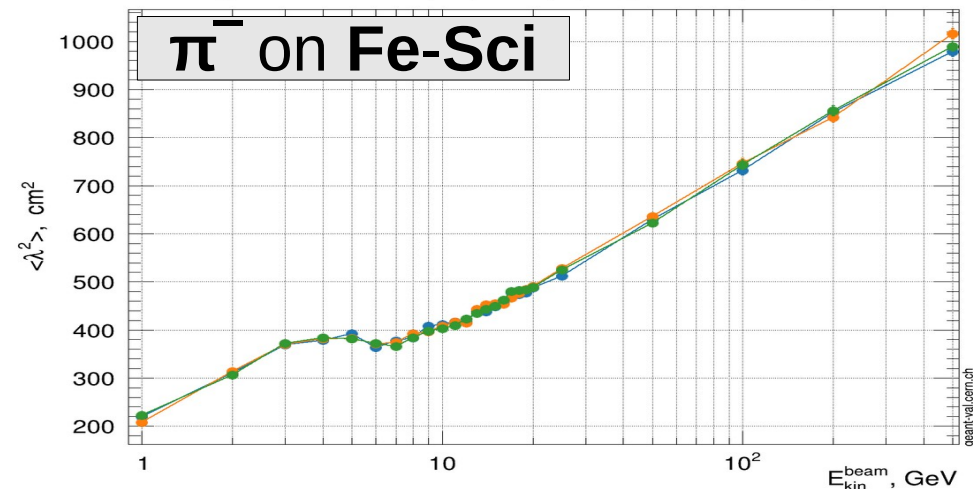
FTFP_BERT : Energy Resolution



FTFP_BERT : Longitudinal Shape

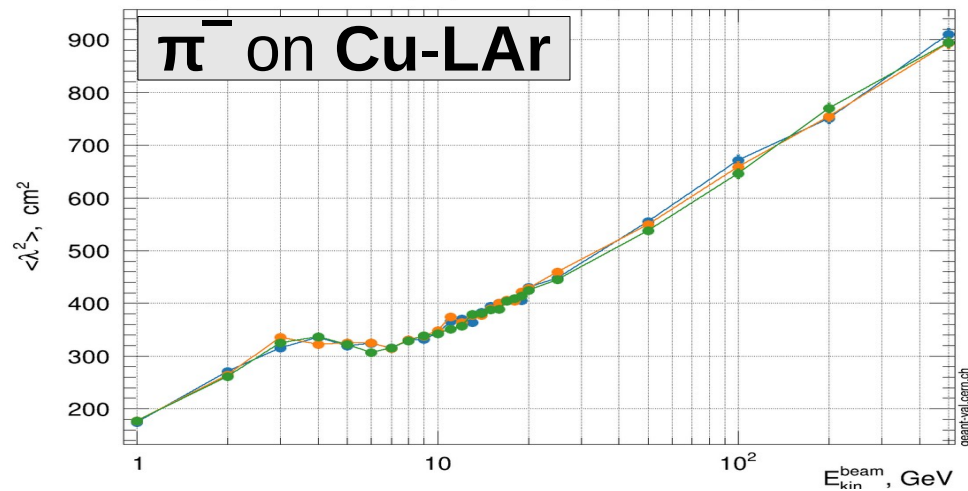
Longitudinal shower shape | Beam: pi- | Target: TileCal | FTFP_BERT

π^- on Fe-Sci



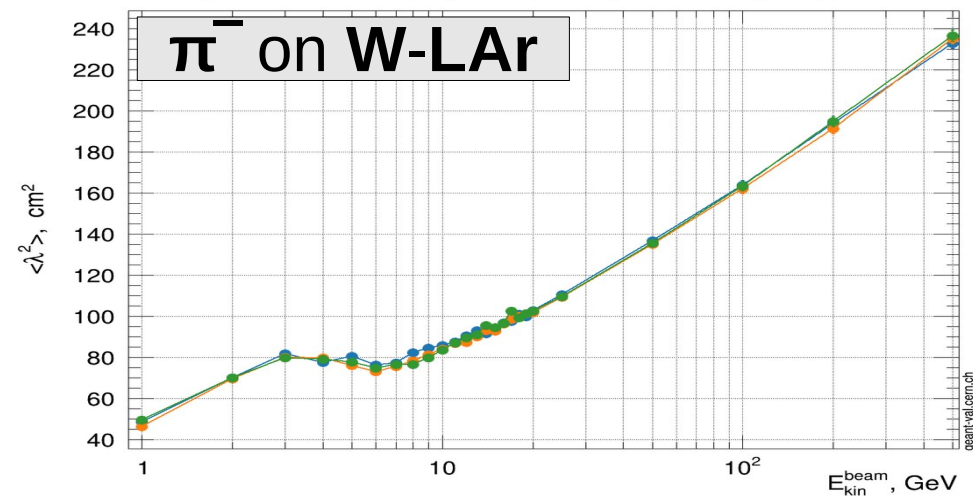
Longitudinal shower shape | Beam: pi- | Target: AtlasHEC | FTFP_BERT

π^- on Cu-LAr



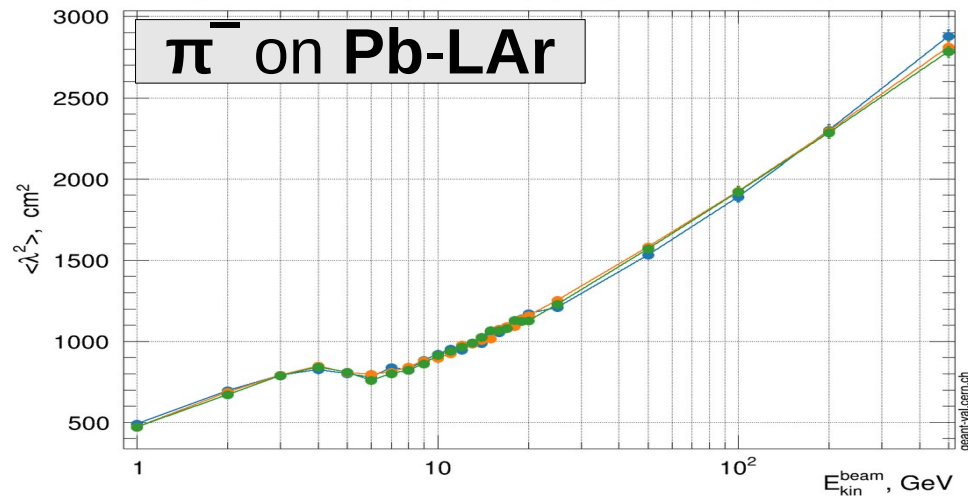
Longitudinal shower shape | Beam: pi- | Target: AtlasFCAL | FTFP_BERT

π^- on W-LAr



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

π^- on Pb-LAr



10.7.ref01
10.7.ref02

10.7.p01

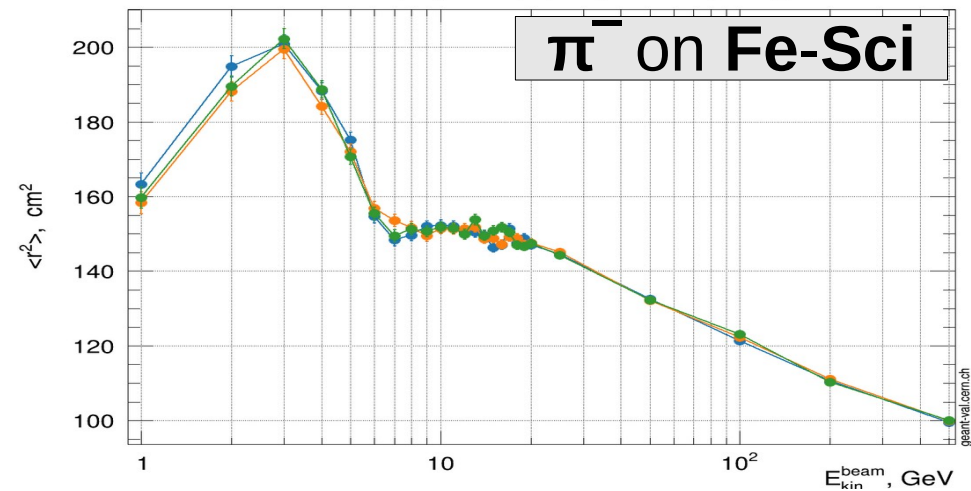
10.7.ref01
10.7.ref02

10.7.p01

FTFP_BERT : Lateral Shape

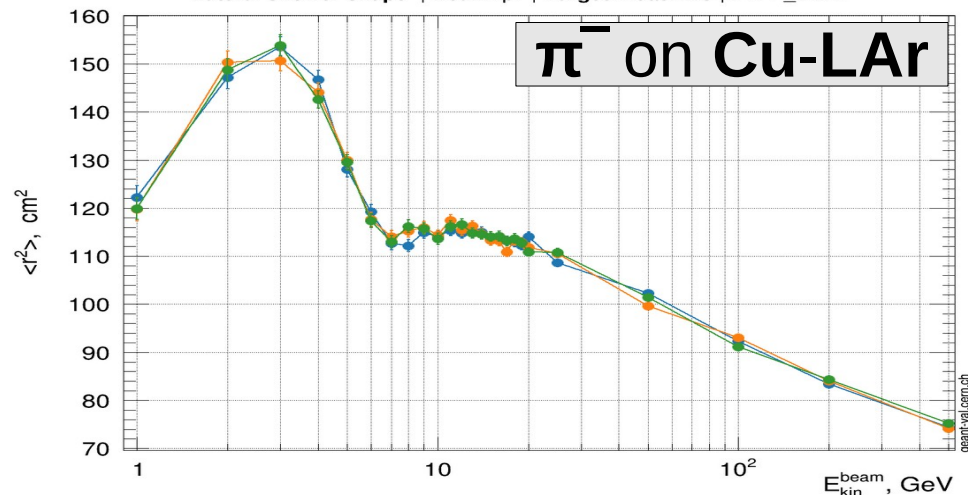
Lateral shower shape | Beam: pi- | Target: TileCal | FTFP_BERT

π^- on Fe-Sci



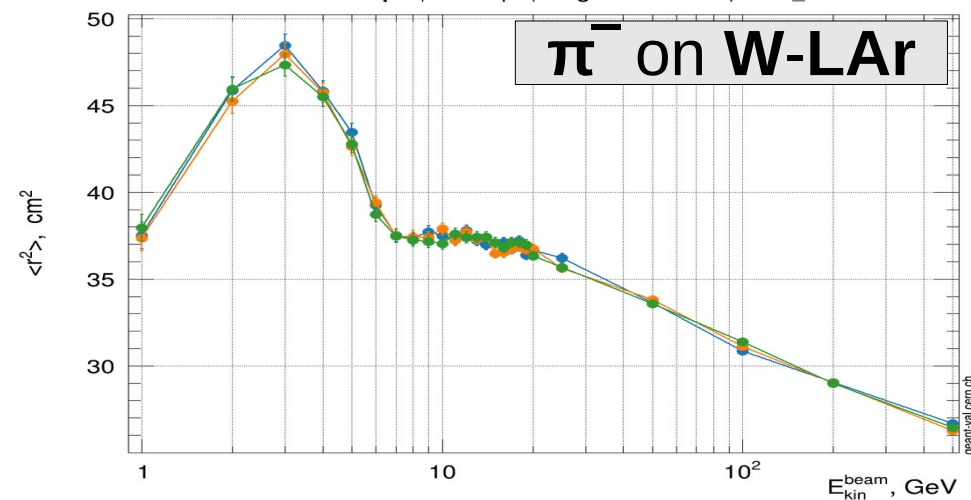
Lateral shower shape | Beam: pi- | Target: AtlasHEC | FTFP_BERT

π^- on Cu-LAr



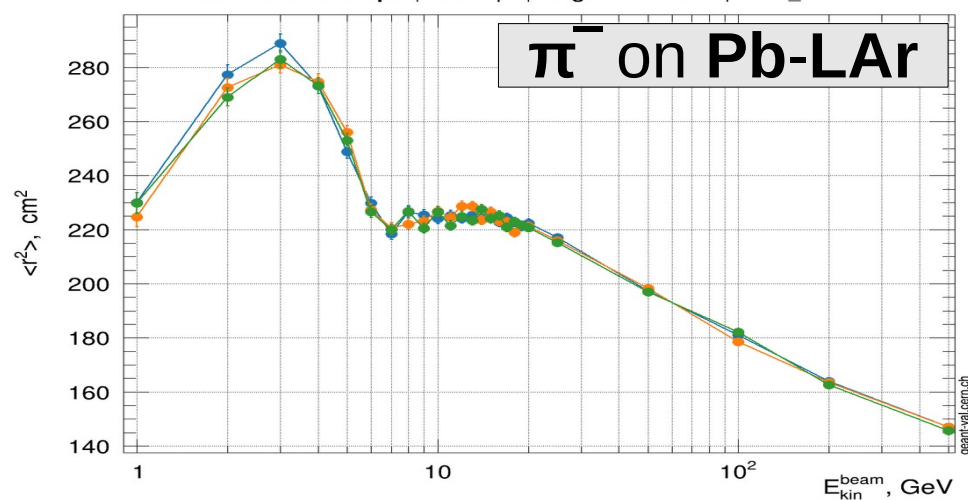
Lateral shower shape | Beam: pi- | Target: AtlasFCAL | FTFP_BERT

π^- on W-LAr



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

π^- on Pb-LAr



Conclusions

- **G4 10.7.ref02**
 - No crashes, infinite loops, or new warnings
 - Reproducibility OK
 - Hadron showers
 - For all physics lists, similar showers for G4 10.7.{p01, ref00, ref01, ref02}