Hadronic Showers in Geant4 **11.2.ref02**

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CERN EP-SFT

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Main Hadronic Changes in G4 11.2.ref02 *vs.* ref01

- *hadronic/cross_sections/*
  - *G4NeutronCaptureXS* : set to 10^-5 eV the lowest energy limit
    - Below this, no computations are performed to avoid numerical problems
  - *G4NeutronInelasticXS* : implemented the **1/v** behavior for the cross section below 10^-5 eV
    - Only in the case that there is no threshold value (below which the cross section is 0.)
- *hadronic/models/particle_hp/*
  - *G4CrossSectionHP* : fixed temperature dependence;
    fixed elastic and capture cross sections for Ar (use only the main natural isotope 40Ar);
    fixed cross sections for rare target atoms (Promethium, Astatine, Radon, Francium)
  - *G4ParticleHPFSFissionFS, G4ParticleHPFissionBaseXS* : technical fixes
- *hadronic/models/radioactive_decay/*
  - *G4BetaPlusDecay, G4BetaMinusDecay* : added extra numerical protection at the level of 1 eV to avoid precision loss and production of neutrino with negative kinetic energy. Fixed sampling algorithm: addressing problem report #2588.

Crashes & Warnings

- No crashes
- No infinite loops
- No new warnings

Reproducibility

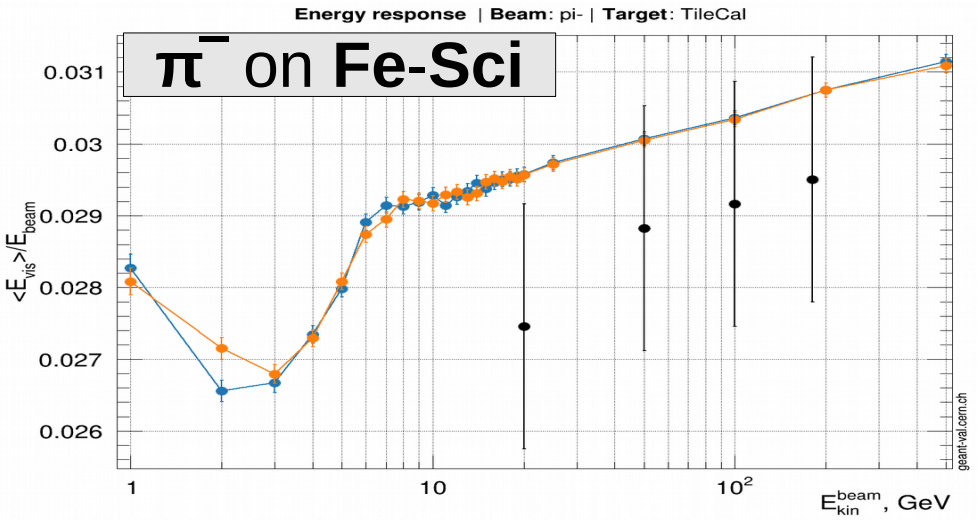
- OK in all cases

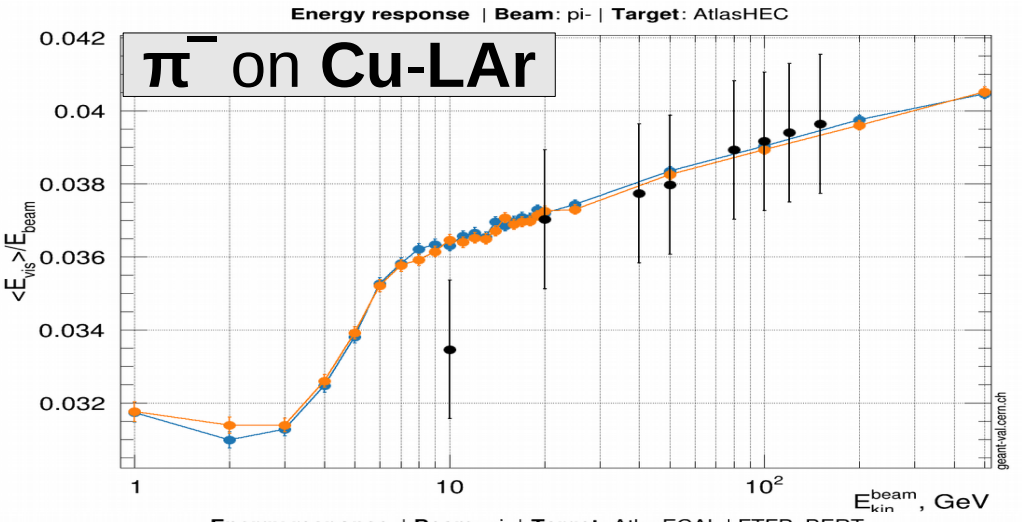
Pion- showers: FTFP_BERT

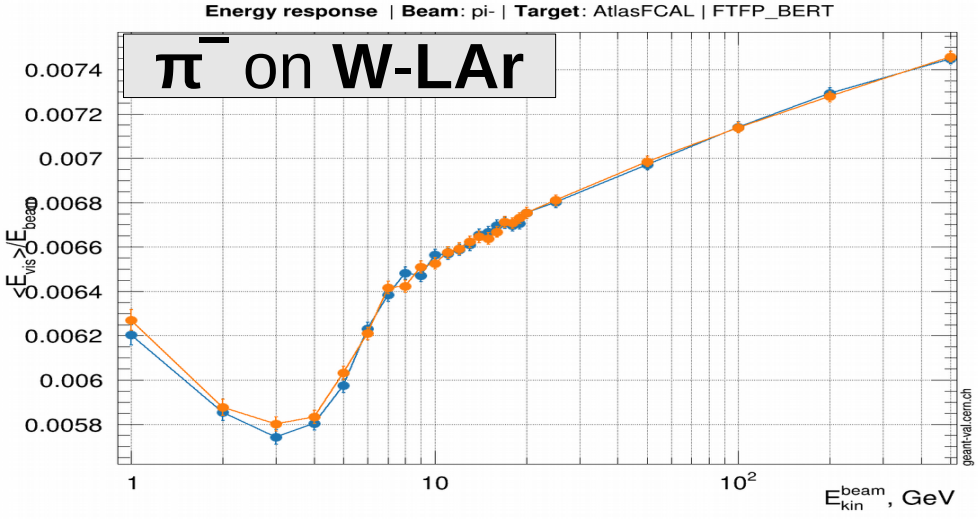
G4 11.2.ref01
G4 11.2.ref02

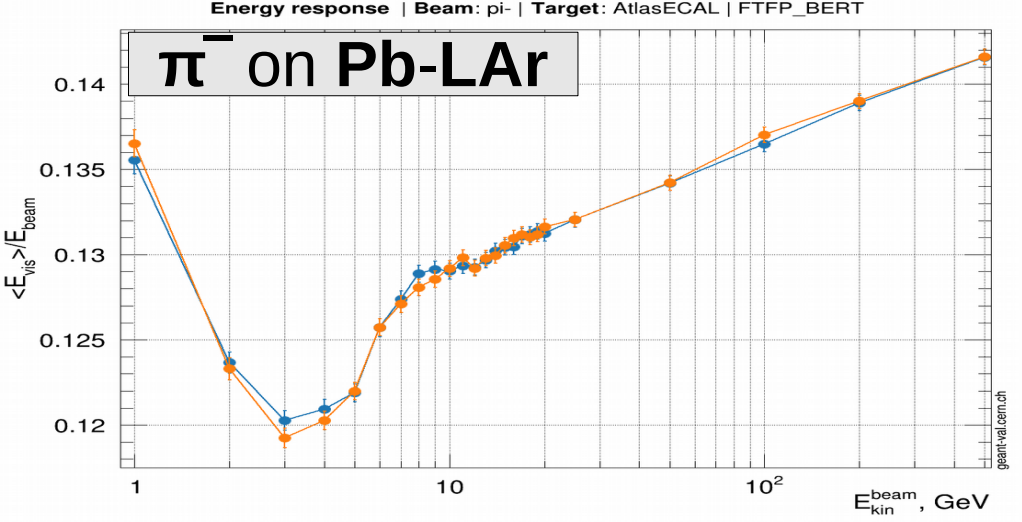
Note : conventional Birks treatment
(easier and no experimental h/e to fit !)

Energy Response

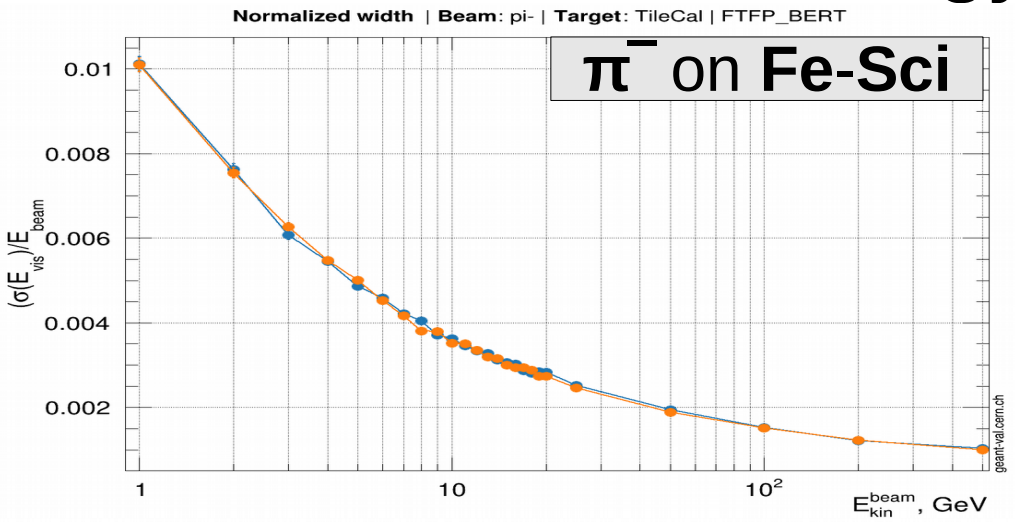


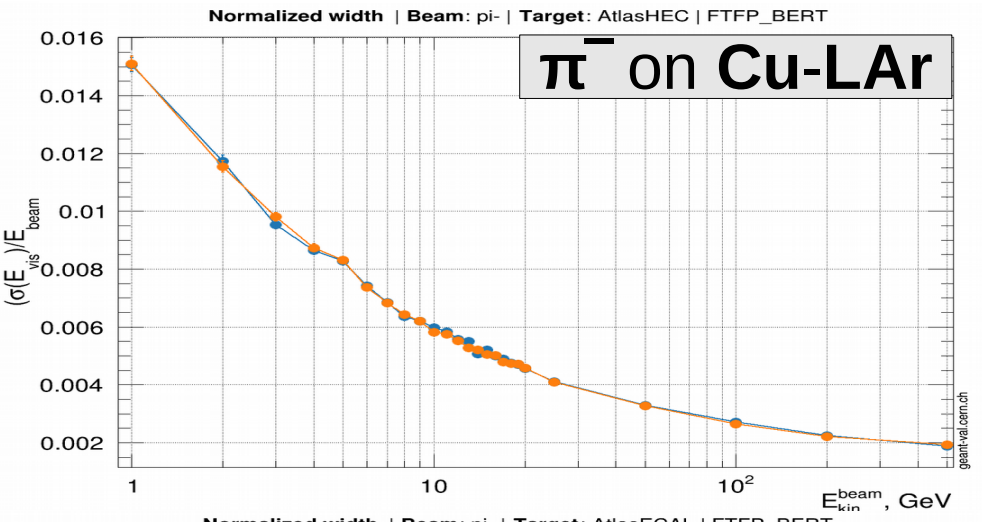


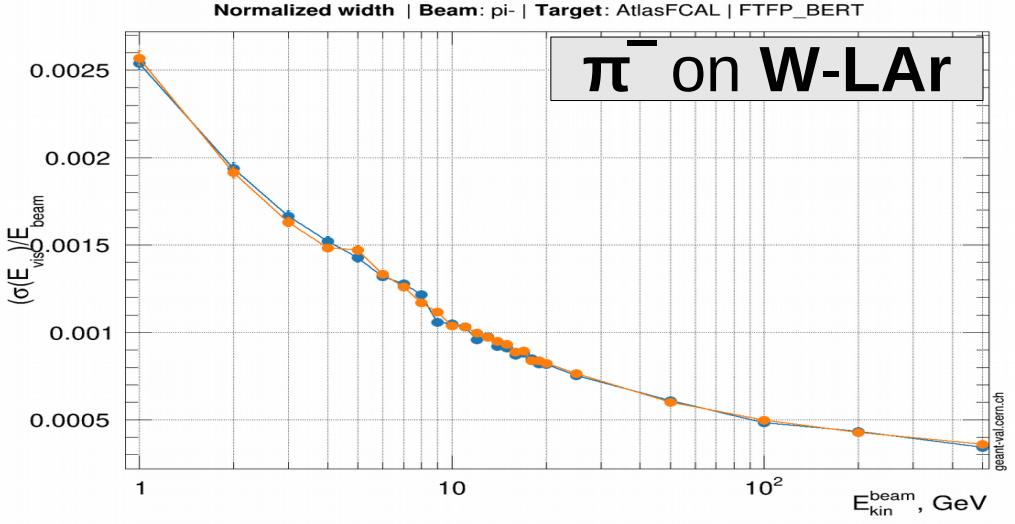


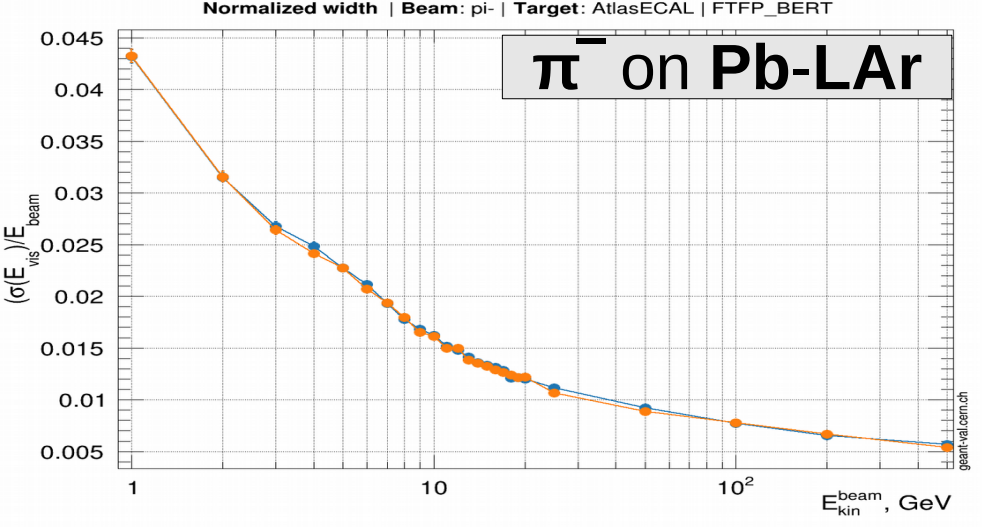


Energy Width

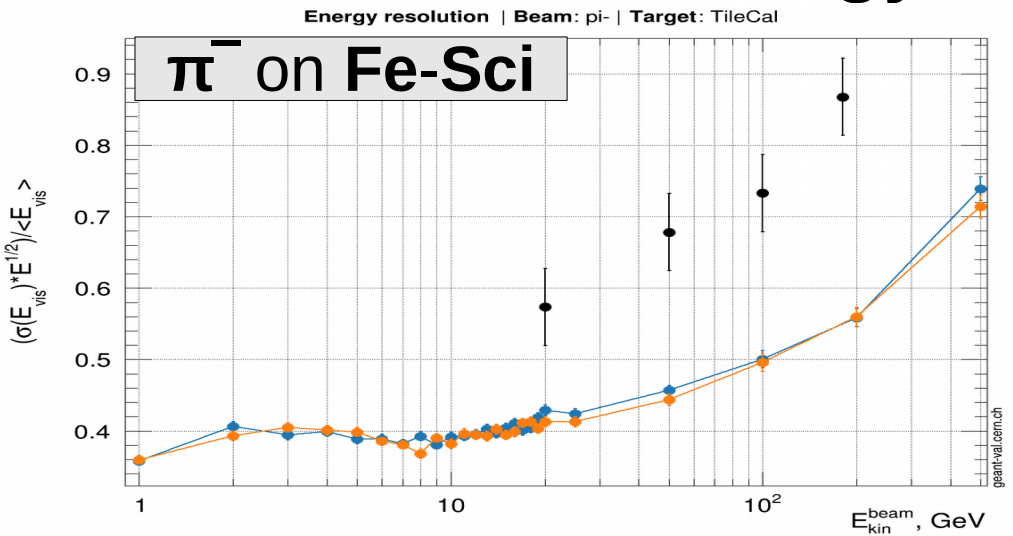


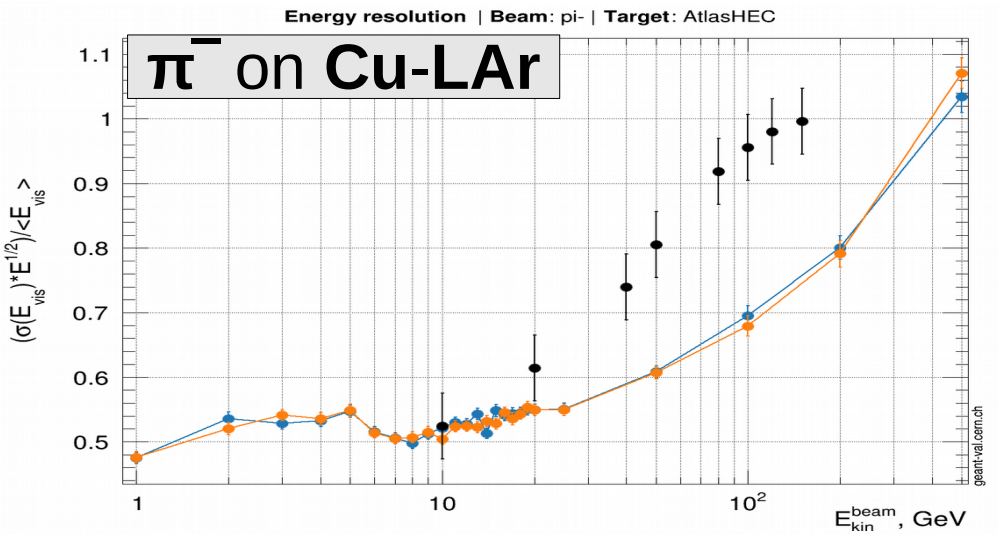


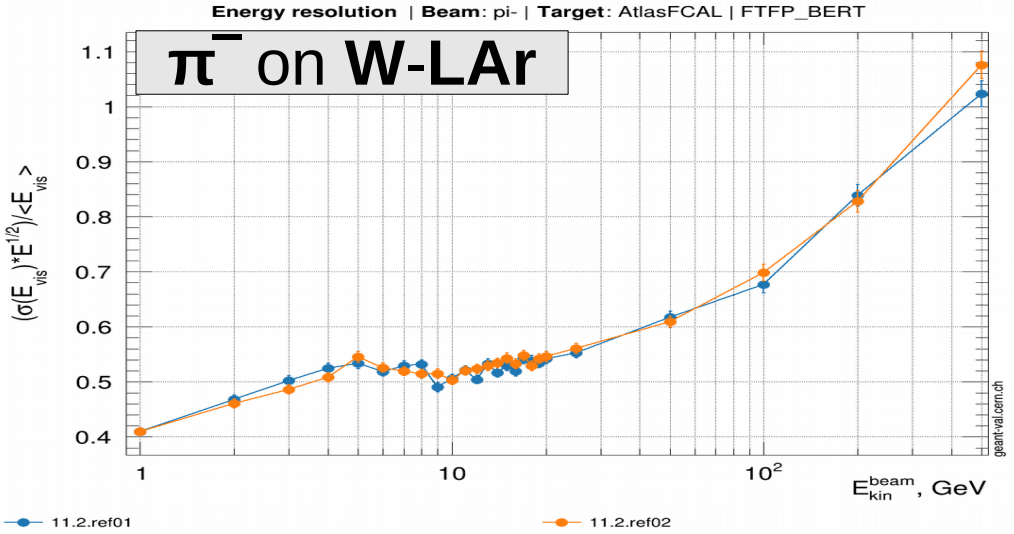


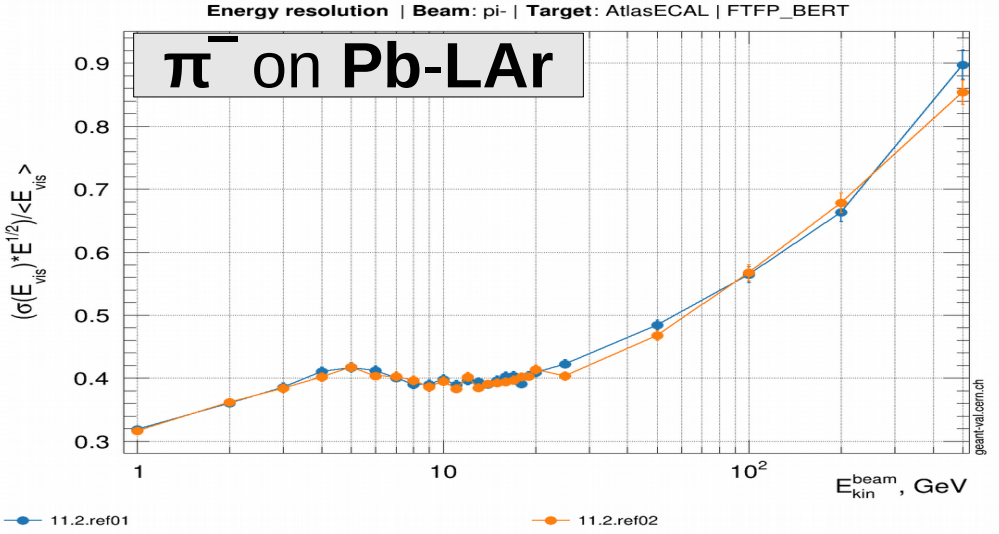


Energy Resolution

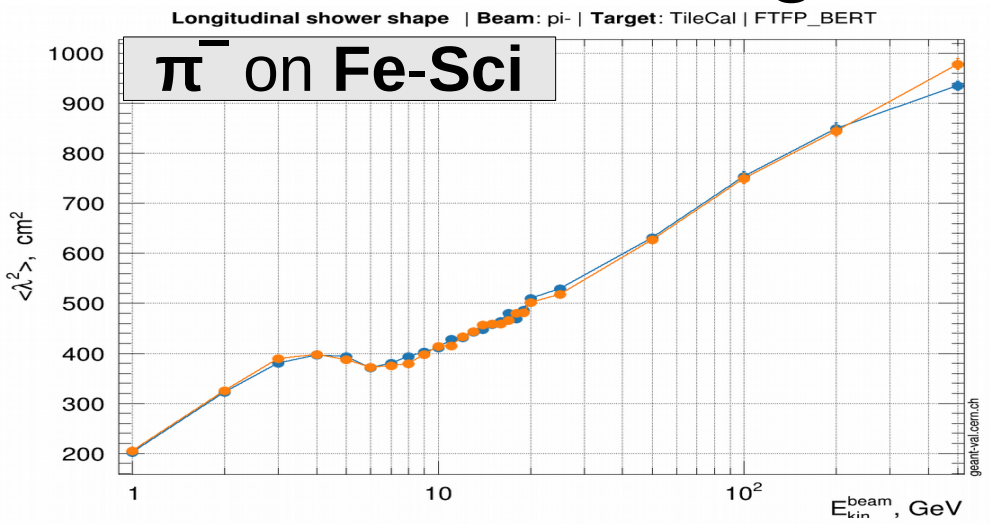


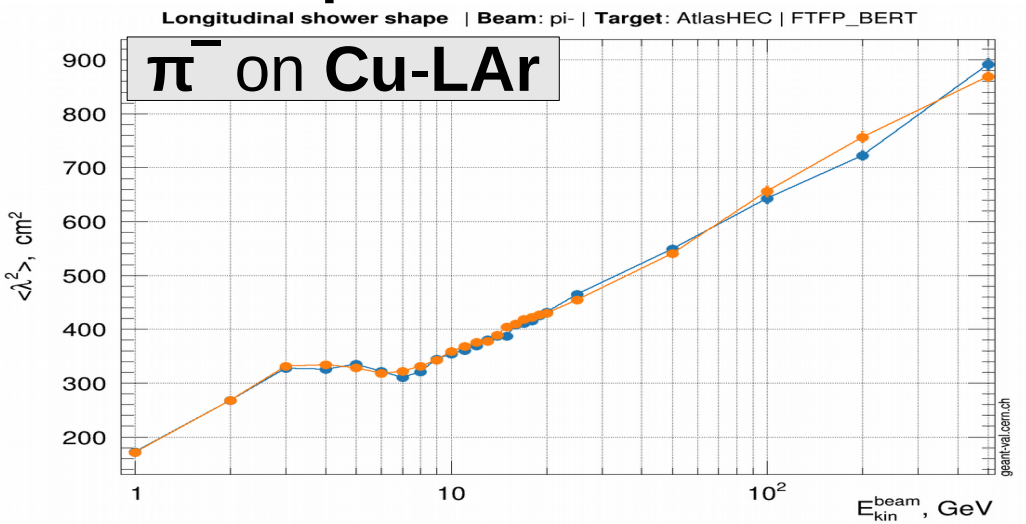


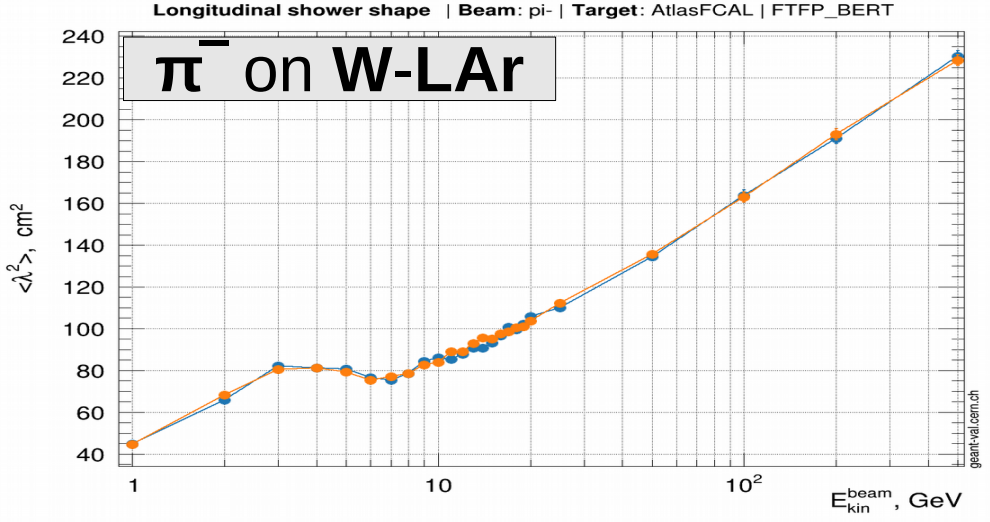


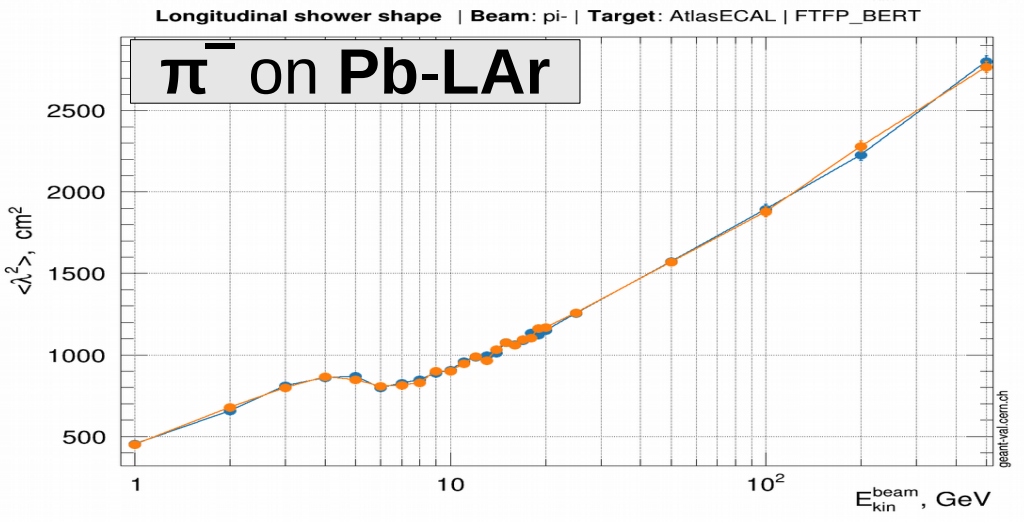


Longitudinal Shape

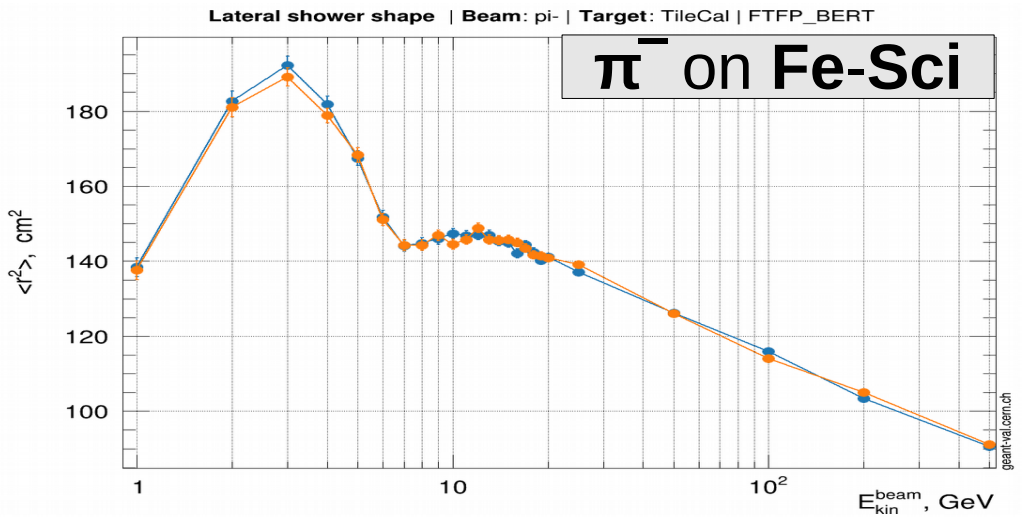


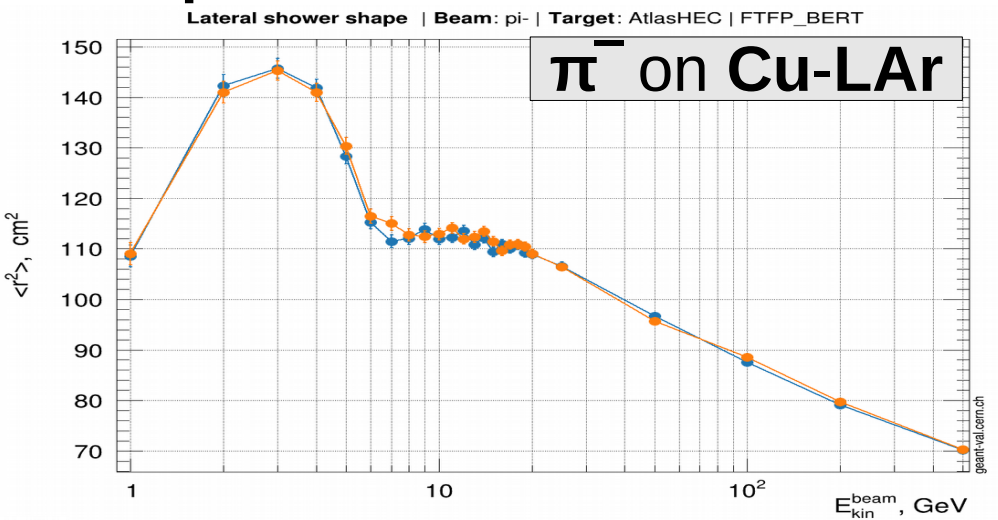


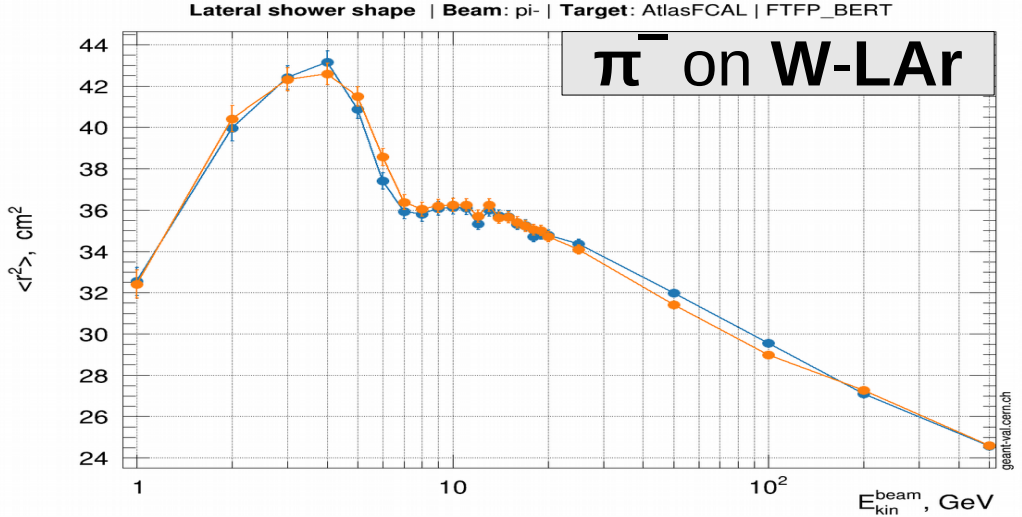


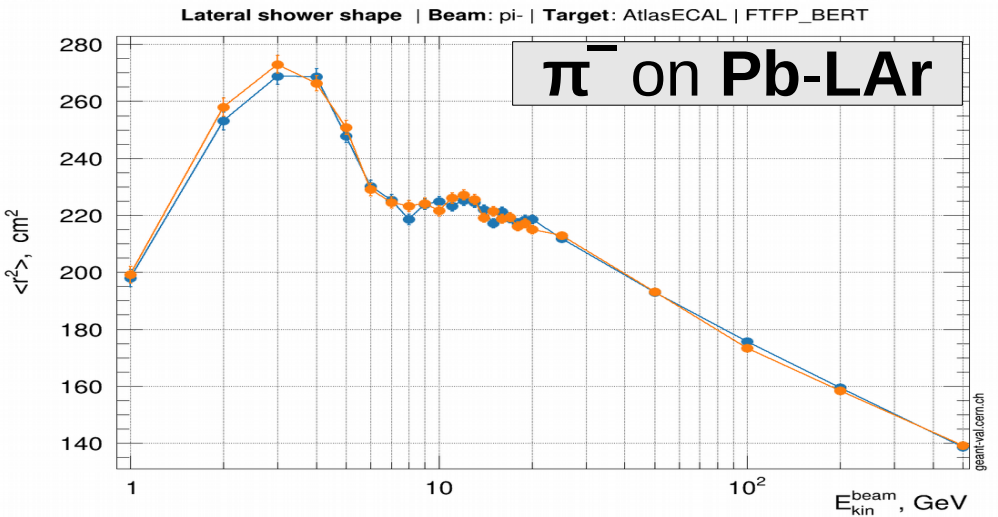


Lateral Shape









Conclusions

- **G4 11.2.ref02**
  - No crashes, no infinite loops, no new warnings
  - Reproducibility fine in all cases
  - Hadron showers similar to those of G4 11.2.ref01, for all physics lists, as expected