

Conclusions on Geant4 10.6.beta

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Fixed Warnings

- The new warnings that appeared in Cand01, all related to NeutronHP, have been fixed in 10.6.beta

Warning from NeutronHP: could not find proper reaction channel...

Unchanged final states are returned.

G4ParticleChange::CheckIt : the Momentum Change is not unit vector !!

----- EEEE ----- G4Exception-START ----- EEEE -----

neutron E=1.49778 pos=0.433759, -0.431487, -1.25284

**** G4Exception : TRACK003*

issued by : G4ParticleChange::CheckIt : momentum, energy, and/or time was illegal

**** Event Must Be Aborted ****

Particle type : neutron - creator process : pi-Inelastic

Kinetic energy : 1.49778 MeV - Momentum direction : (-0.41426,-0.74931,-0.5166)

Step length : 7.35073 mm - total energy deposit : 0 eV

Pre-step point : (436.804,-425.979,-1249.04) - Physical volume : physiActive (LAr)

- defined by : Transportation - step status : 1

Post-step point : (433.759,-431.487,-1252.84) - Physical volume : physiActive (Lar)

- defined by : neutronInelastic - step status : 4

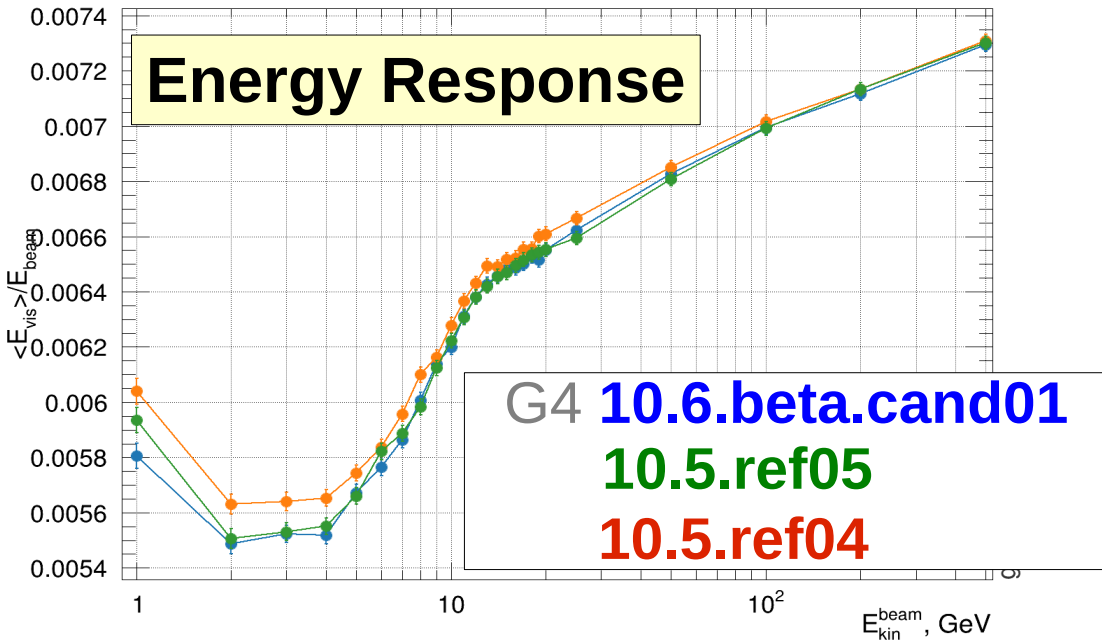
**** Note: Step information might not be properly updated.*

----- EEEE ----- G4Exception-END ----- EEEE -----

FTFP_BERT changes in Tungsten

π^- on W-LAr

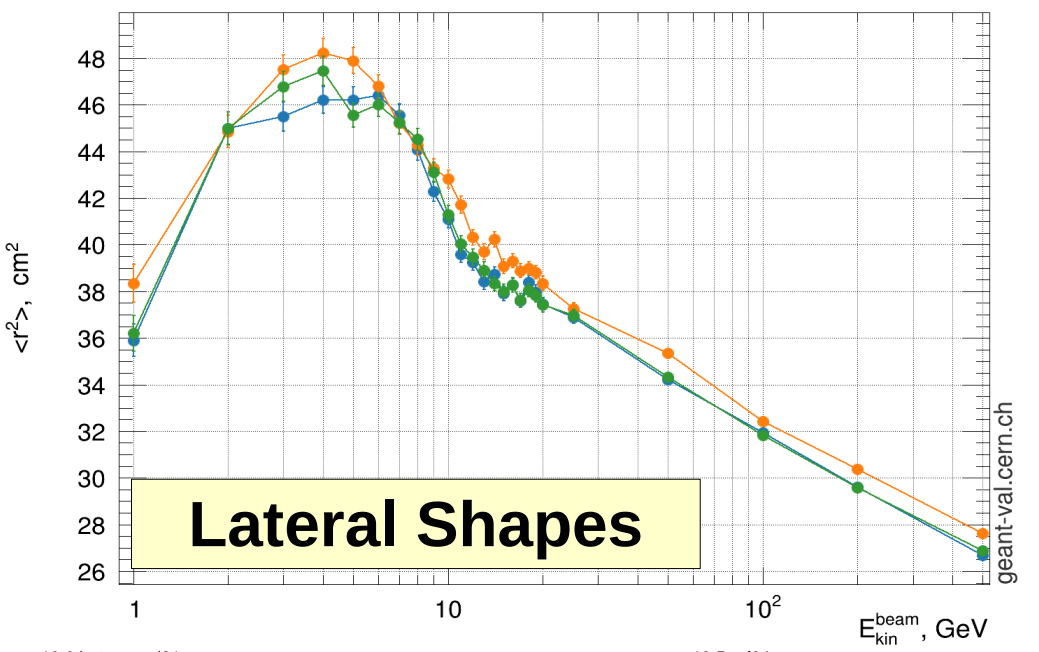
Energy response | Beam: pi- | Target: AtlasFCAL | FTFP_BERT



The changes in energy response and lateral shapes, observed only in Tungsten in Ref05, and present also in 10.6.beta are due to the changes in the **hadronic cross sections**

Note: the changes in Urban multiple scattering, precompound, de-excitation, and even the new dataset G4PARTICLEXS2.0 are not responsible of these changes!

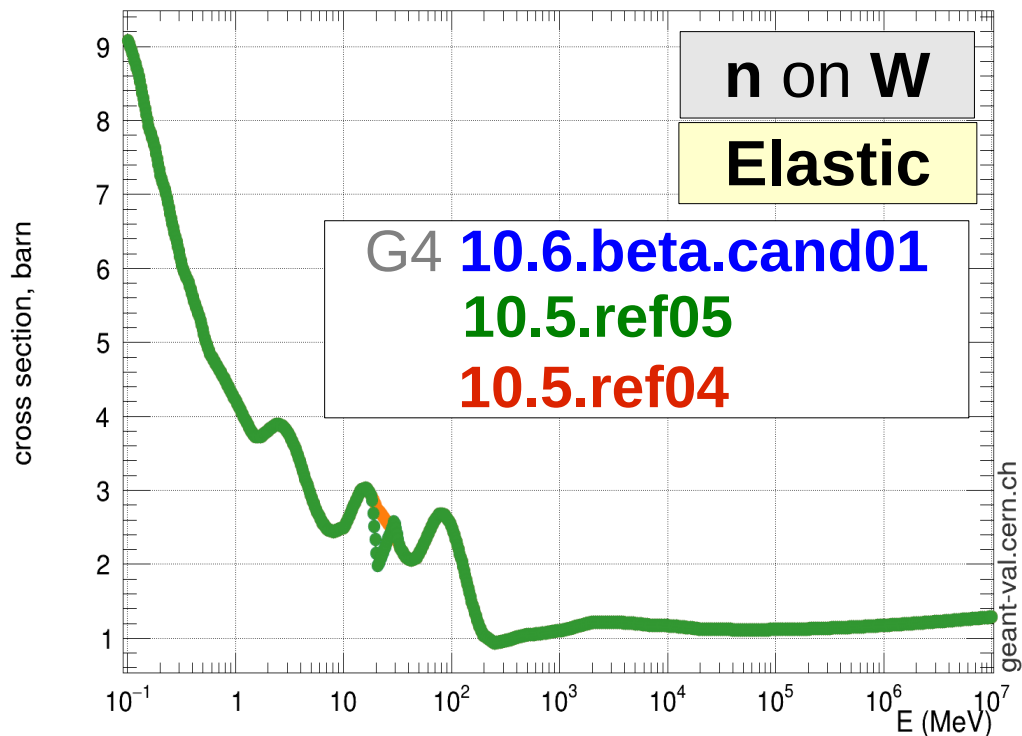
Lateral shower shape | Beam: pi- | Target: AtlasFCAL | FTFP_BERT



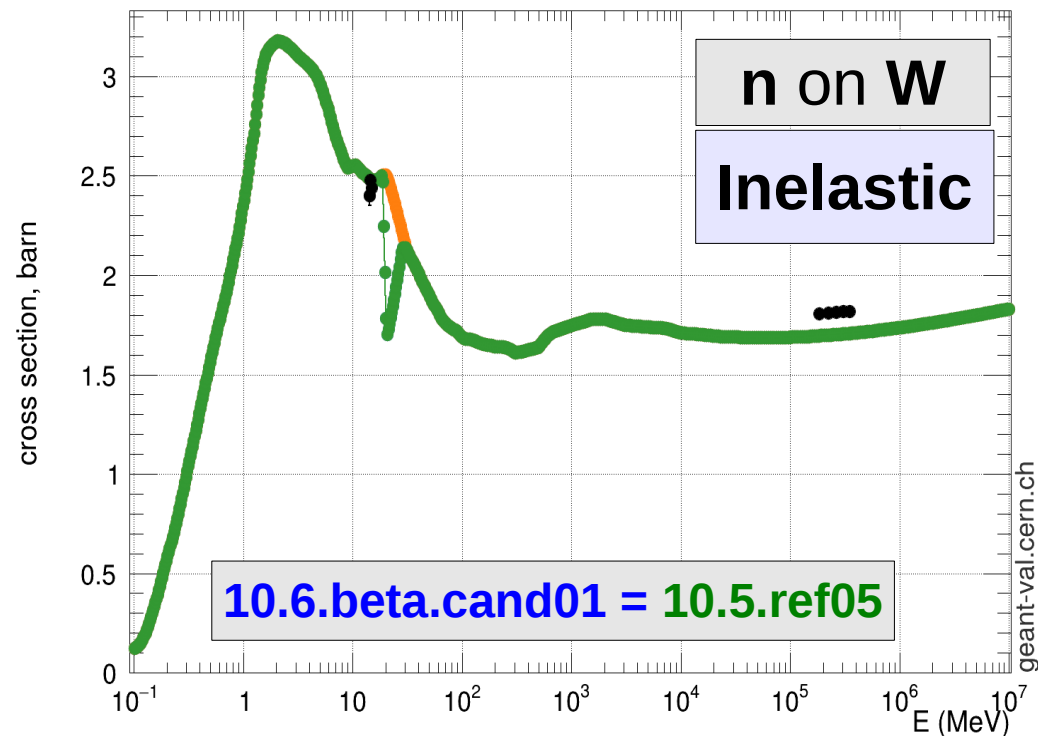
10.6.beta.cand01
10.5.ref05

10.5.ref04

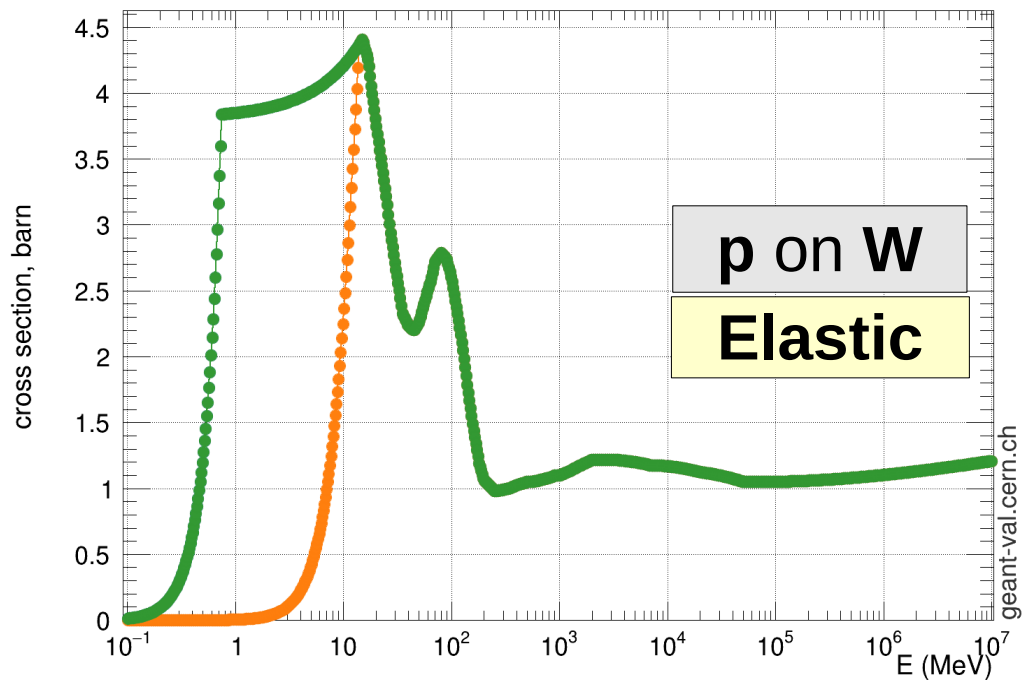
Elastic cross section | Beam: neutron | Target: W | FTFP_BERT



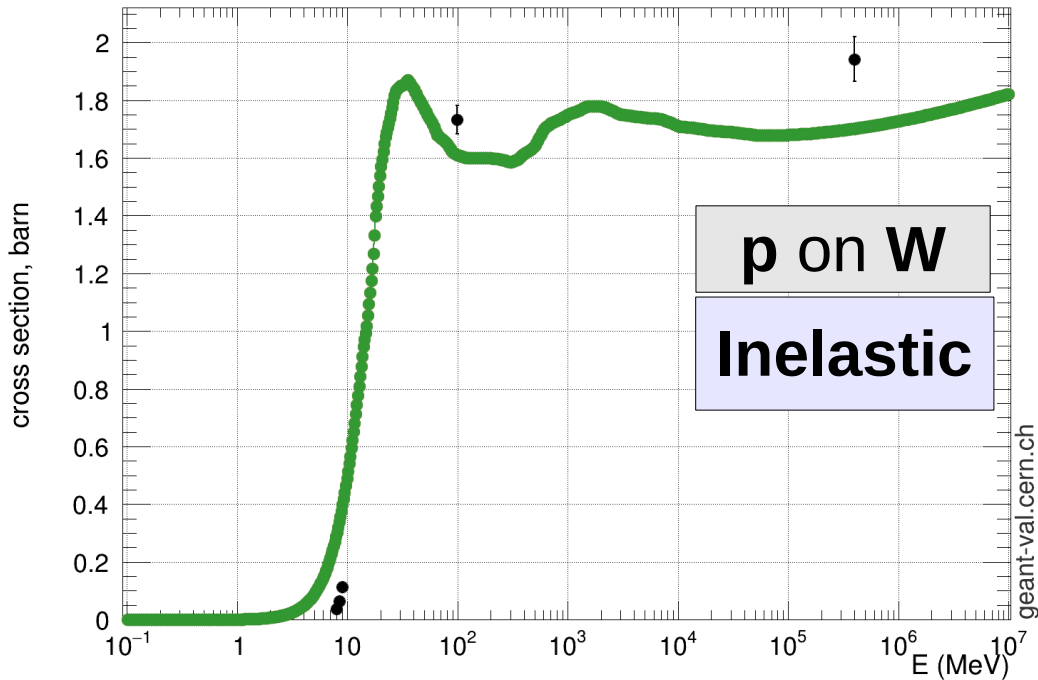
Inelastic cross section | Beam: neutron



Elastic cross section | Beam: proton | Target: W | FTFP_BERT



Inelastic cross section | Beam: proton



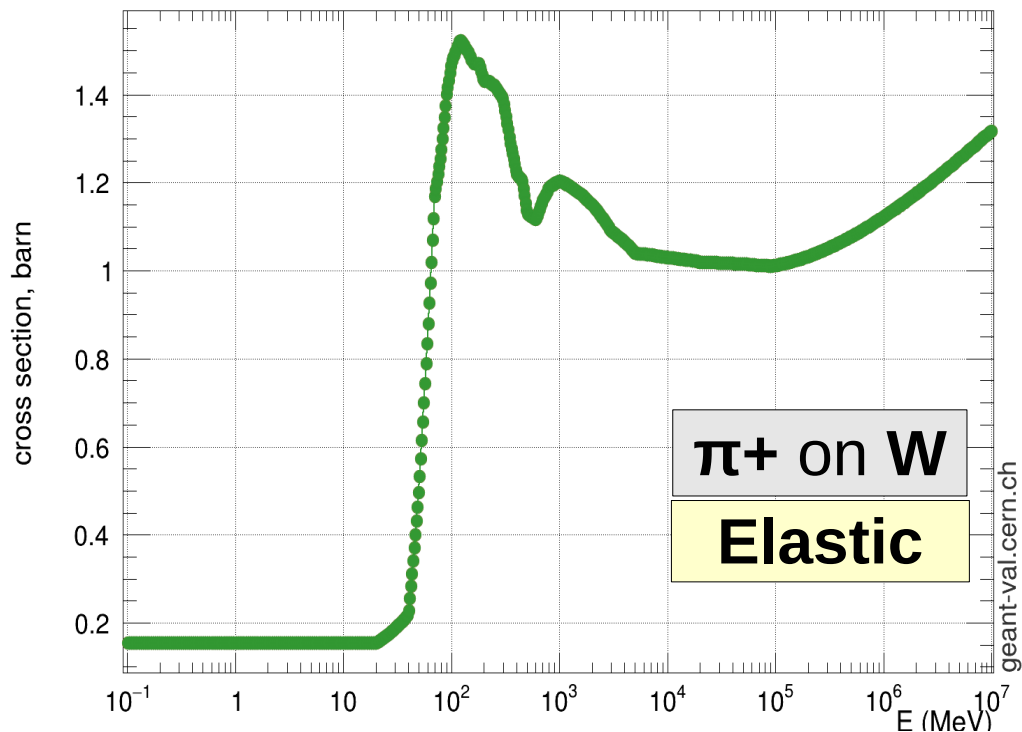
10.6.beta_cand01
10.5.ref05

10.5.ref04

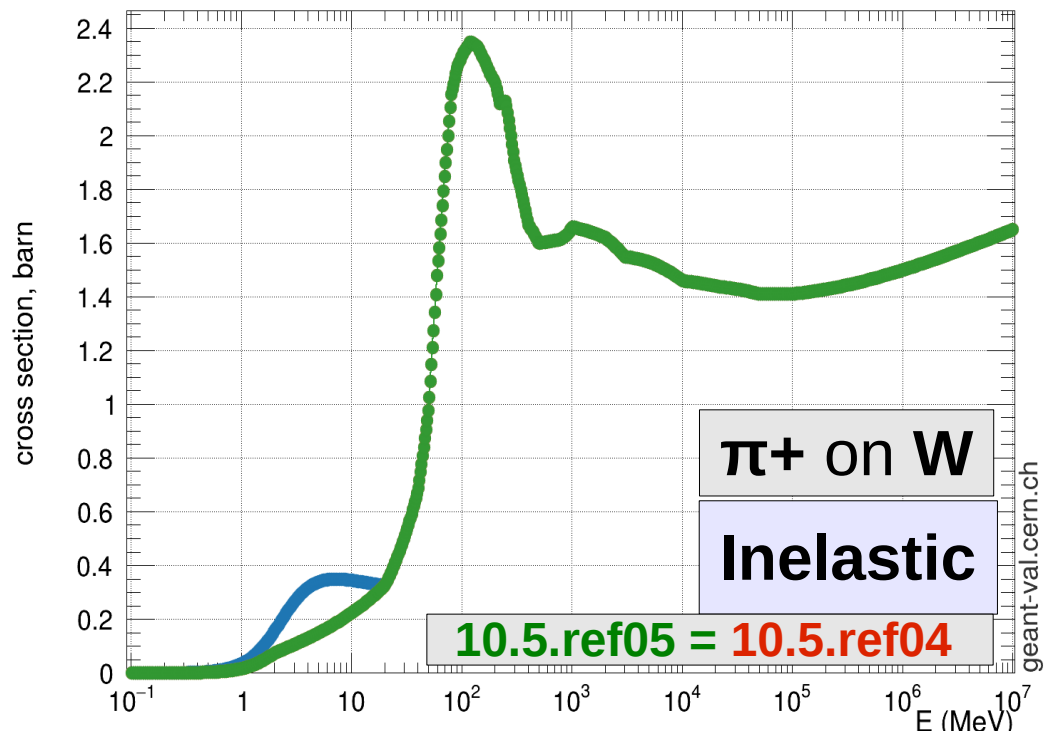
10.6.beta_cand01 W FTFP_BERT
10.5.ref05 W FTFP_BERT

10.5.ref04 W FTFP_BERT
Barashenkov W183.9

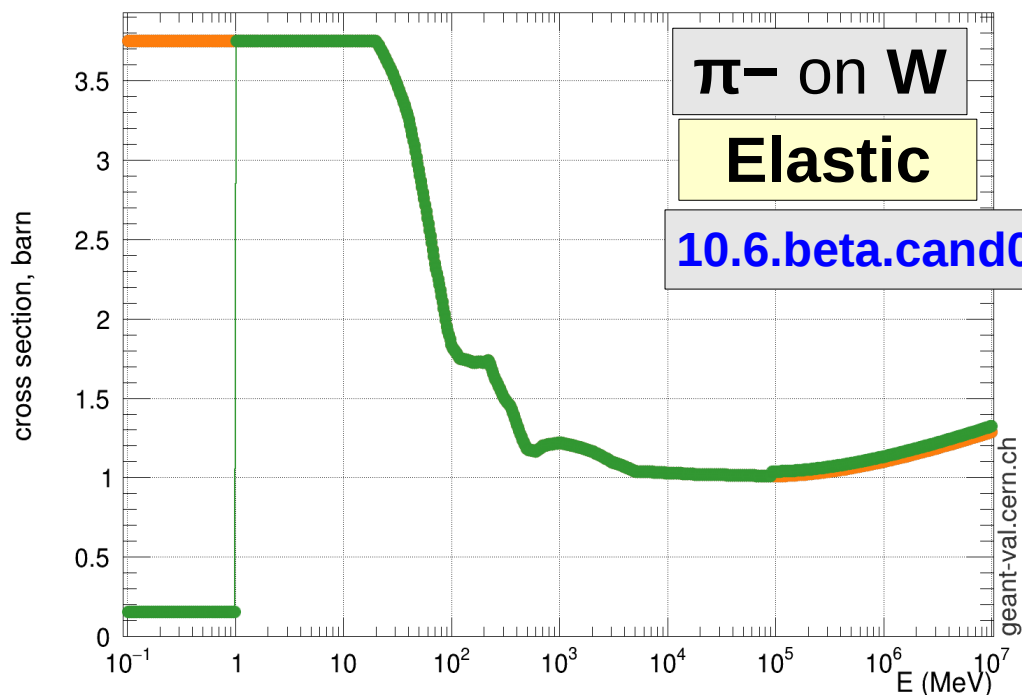
Elastic cross section | Beam: pi+ | Target: W | FTFP_BERT



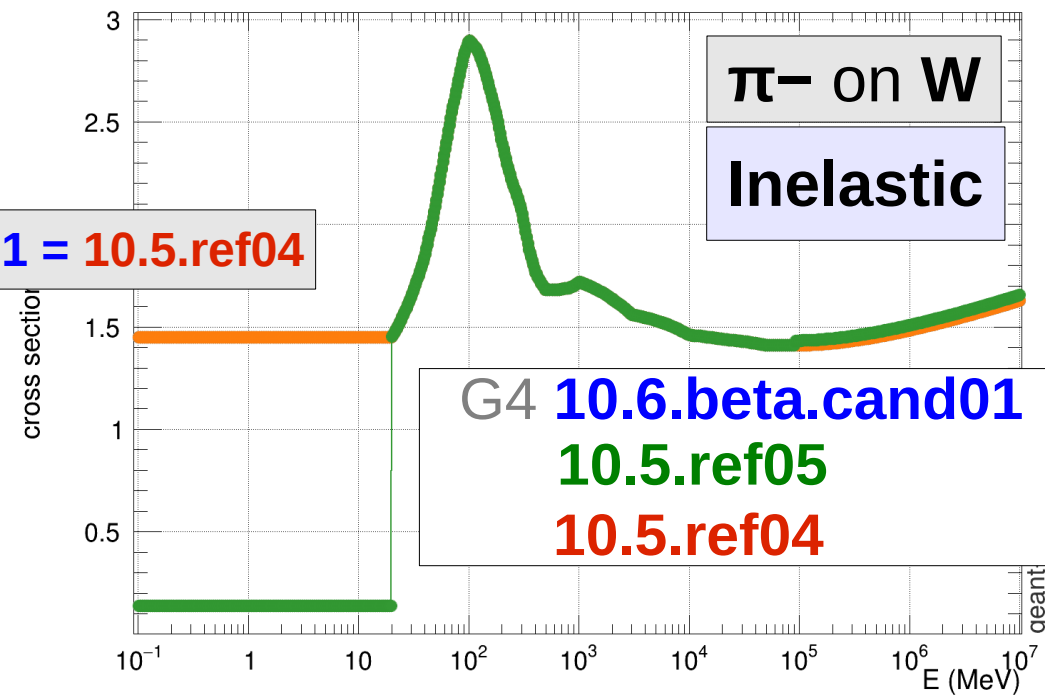
Inelastic cross section | Beam: pi+ | Target: W | FTFP_BERT



Elastic cross section | Beam: pi- | Target: W | FTFP_BERT



Inelastic cross section | Beam: pi- | Target: W | FTFP_BERT



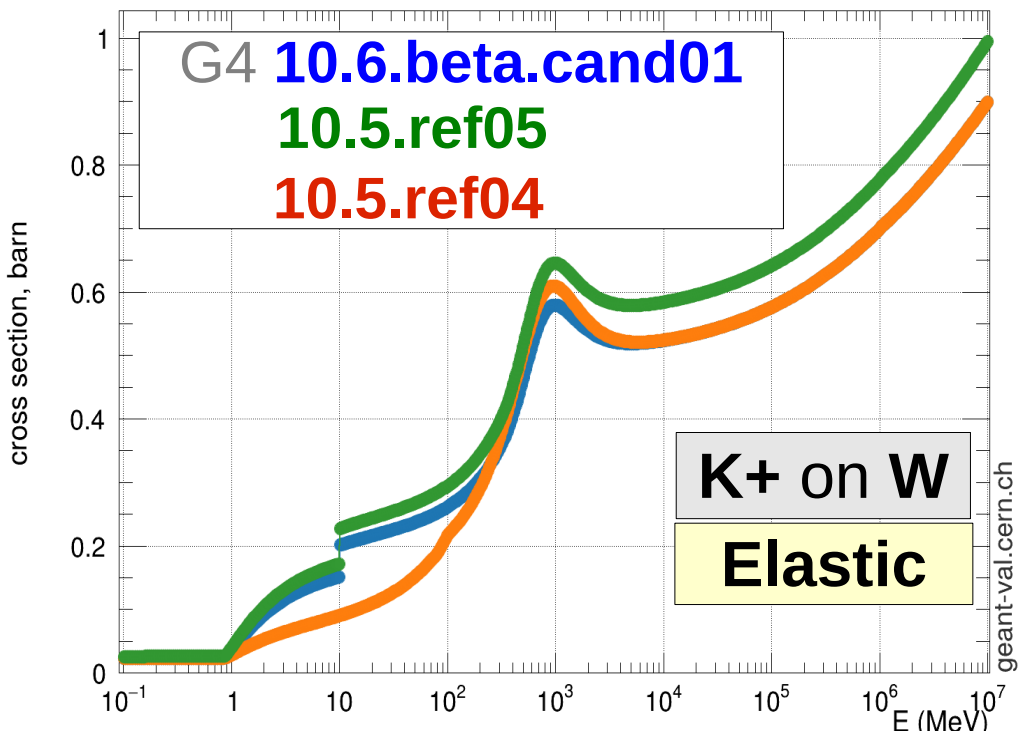
10.6.beta_cand01
10.5.ref05

10.5.ref04

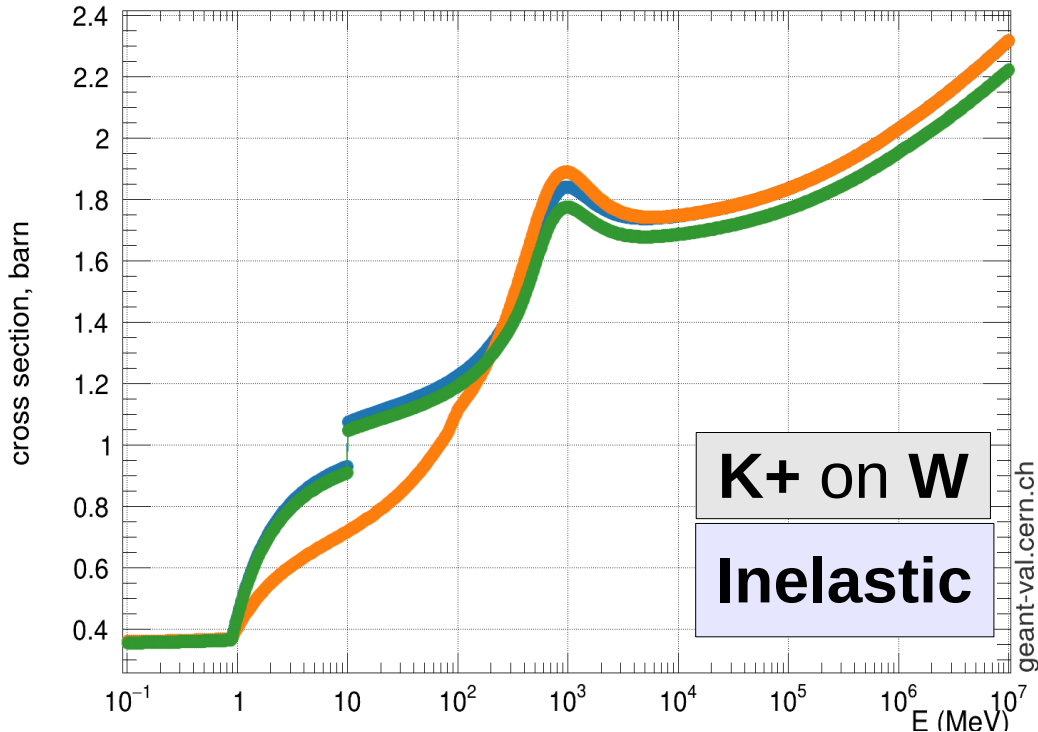
10.6.beta_cand01
10.5.ref05

10.5.ref04

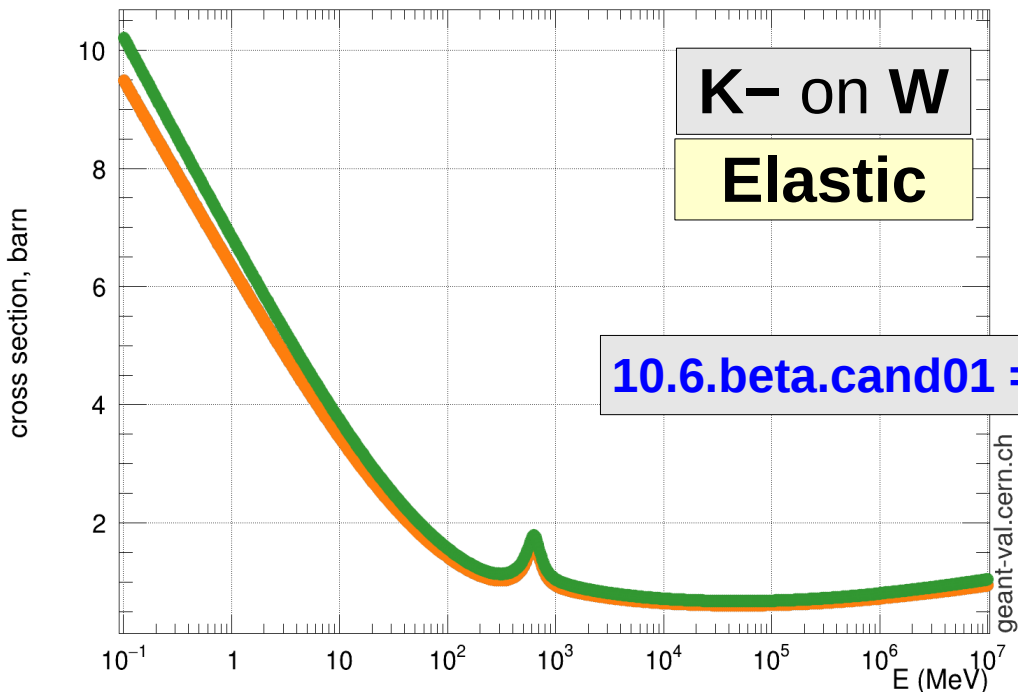
Elastic cross section | Beam: kaon+ | Target: W | FTFP_BERT



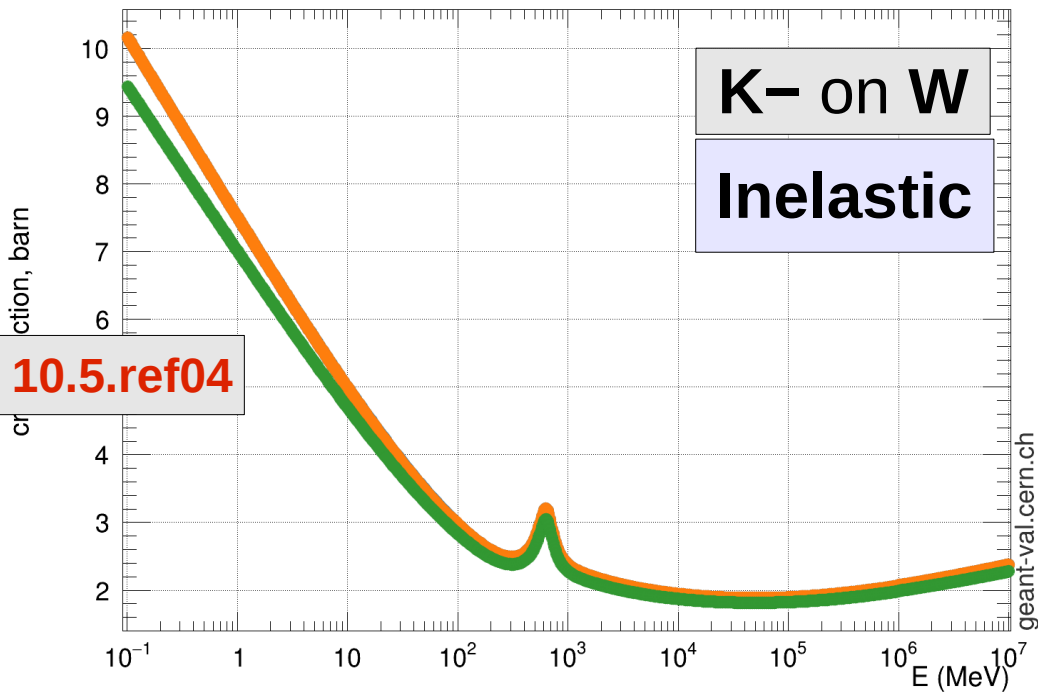
Inelastic cross section | Beam: kaon+ | Target: W | FTFP_BERT



Elastic cross section | Beam: kaon- | Target: W | FTFP_BERT



Inelastic cross section | Beam: kaon- | Target: W | FTFP_BERT



● 10.6.beta.cand01
 ● 10.5.ref05

● 10.5.ref04

● 10.6.beta.cand01
 ● 10.5.ref05

● 10.5.ref04

Conclusions

- **G4 10.6.beta**
 - Fixed new warnings appeared in Cand01
 - Still a few unphysical discontinuities in cross sections (elastic and/or inelastic) to be fixed
 - In particular for π^+ , K^+ and n
 - Changes in the hadronic showers in Tungsten only – with respect to G4 10.5.ref04 – are due to the changes in hadronic cross sections
 - Likely by either the discontinuity in neutron cross sections at **20 MeV** or the changes in the class **G4NeutronCaptureXS**
 - Tungsten has a neutron capture cross section significantly higher than other elements (e.g. Iron, Copper, Lead, etc.)
 - All other possibilities (Urban multiple scattering, precompound, de-excitation, new dataset **G4PARTICLEXS2.0**) have been excluded