



# Simple benchmarks
## Final remarks on pion absorption

**Witek Pokorski**

# Outline


- short reminder on the setup
- validation/comparison plots
- conclusion

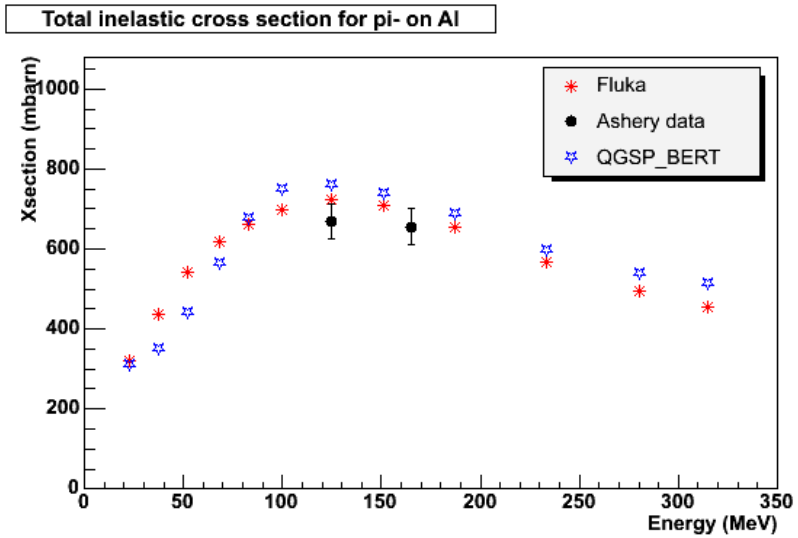


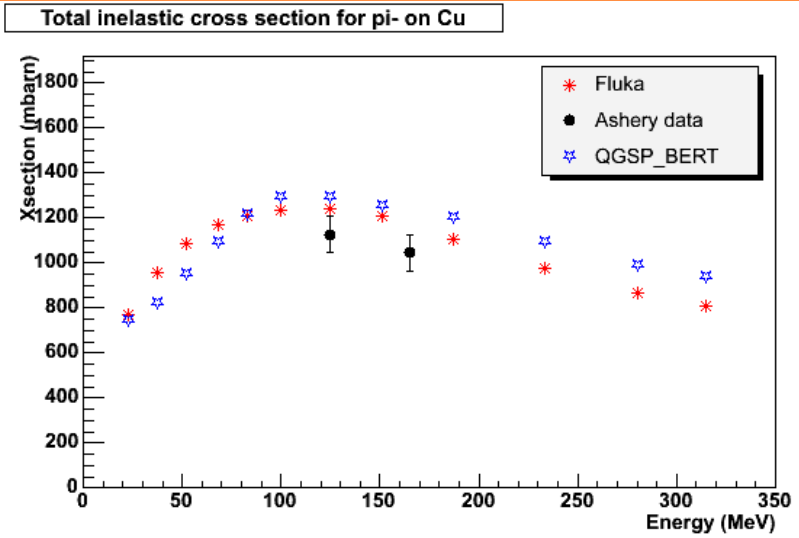
# Pion absorption benchmark

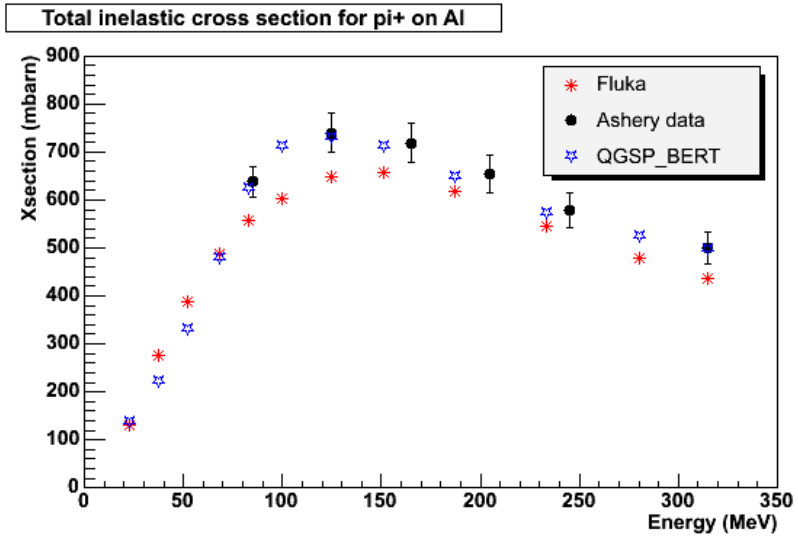

- (see talk given on 3rd of March 2004 at the Physics Validation meeting)
- general idea: thin target (Al,Cu,Au) experiment to study individual pion-nucleus process
- experimental data
  - K. Nakai at al., PRL 44, 1446 (1980)
  - D. Ashery et al, PR C23, 2173 (1991)
- simulation
  - G4 setup initially developed by Isidro Gonzalez (Alice)
    - 'fake' thin target experiment – large block of material, tracking stopped as soon as a process occurs
    - using QGSP_BERT physics list
  - Fluka 'bypass' provided by Alfredo Ferrari
    - using the new parametrisation based on the internal Fluka model

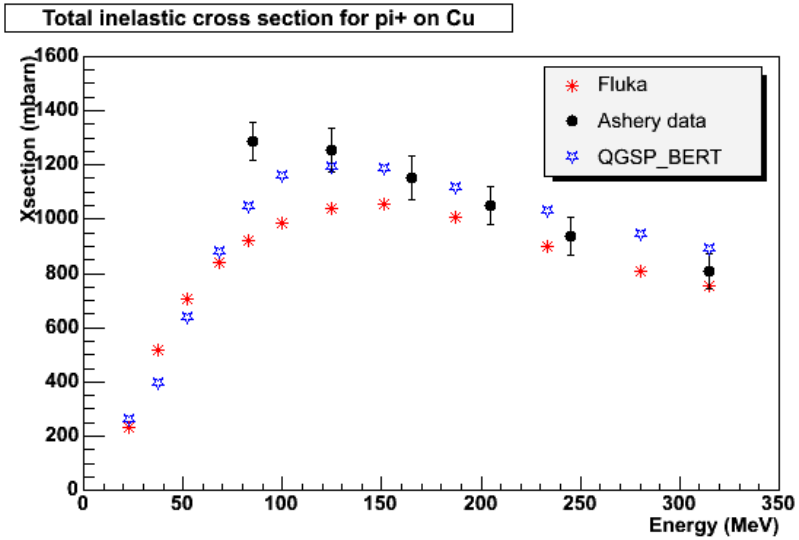


# Total inelastic cross section

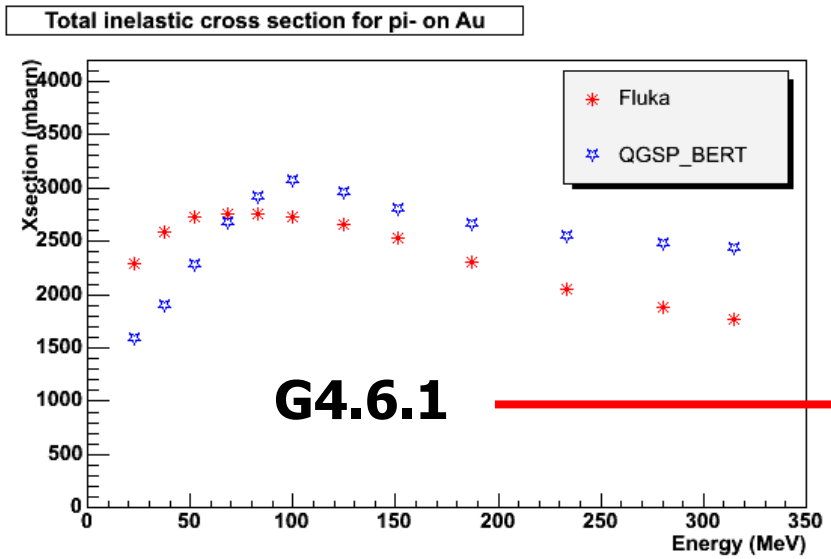


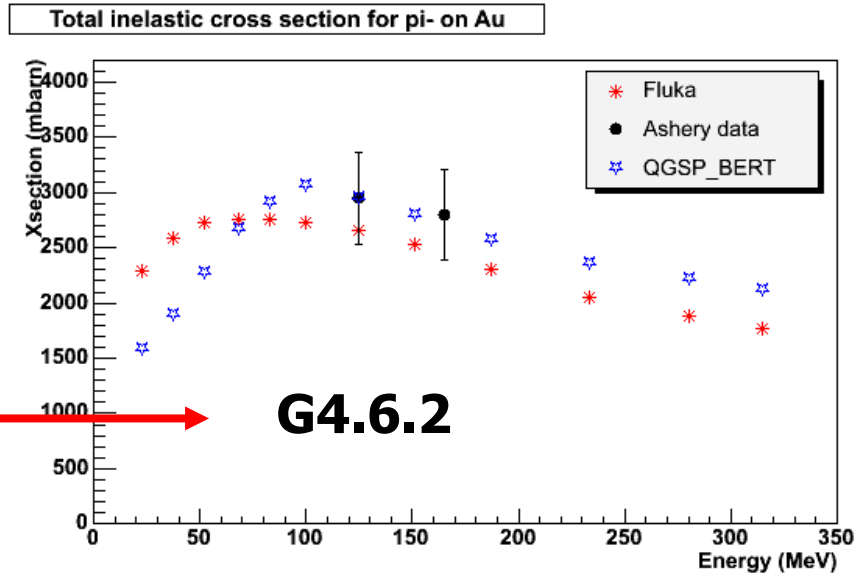



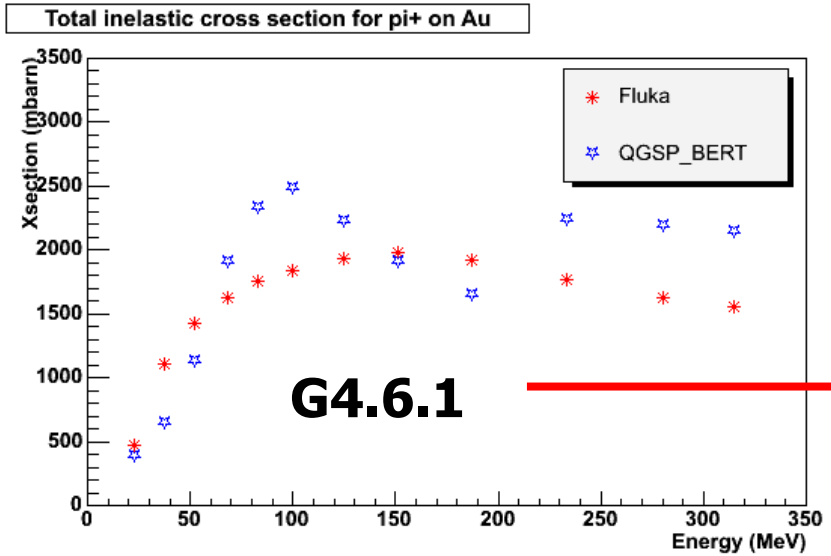



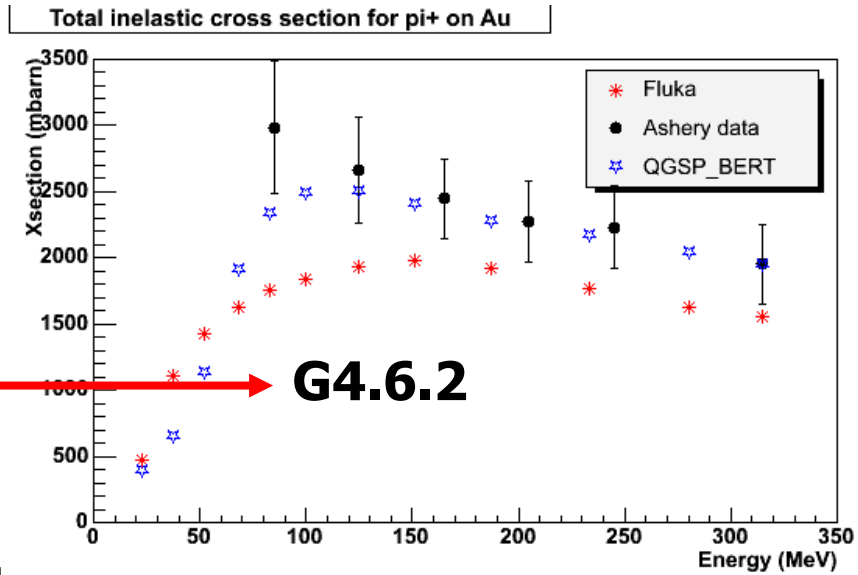



# G4: Au cross section table corrected

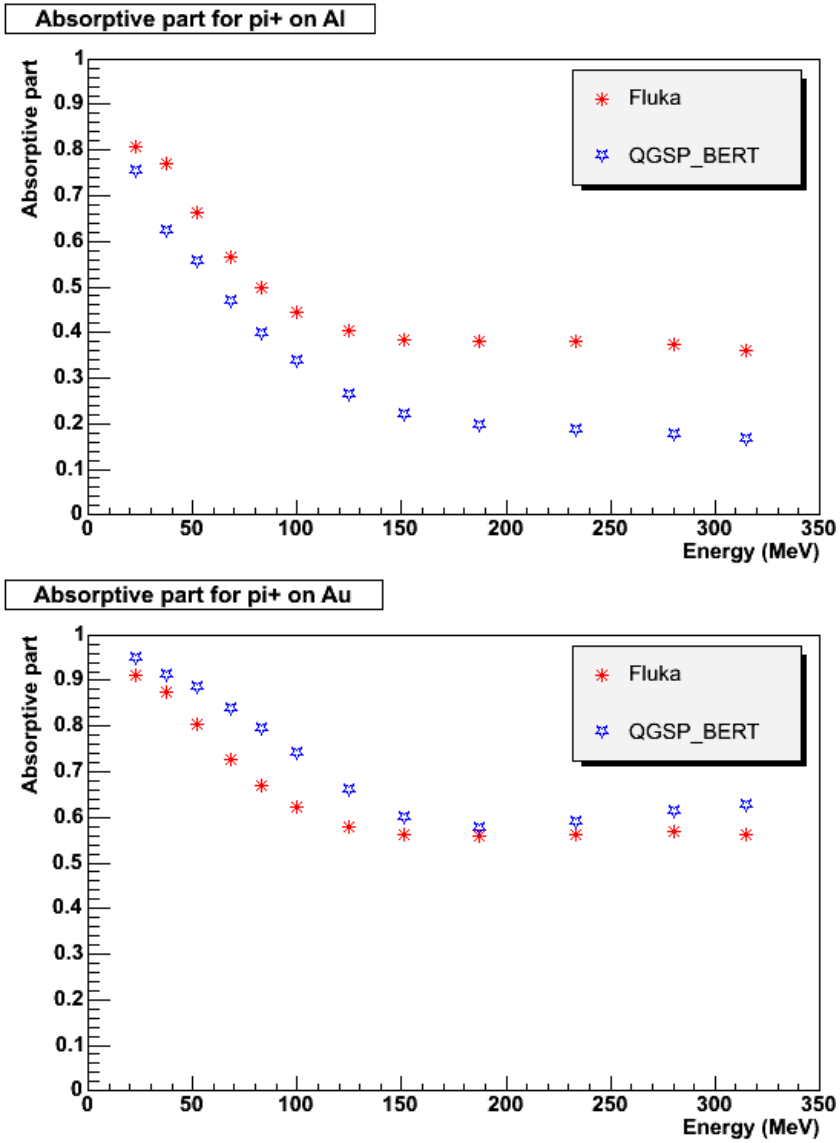


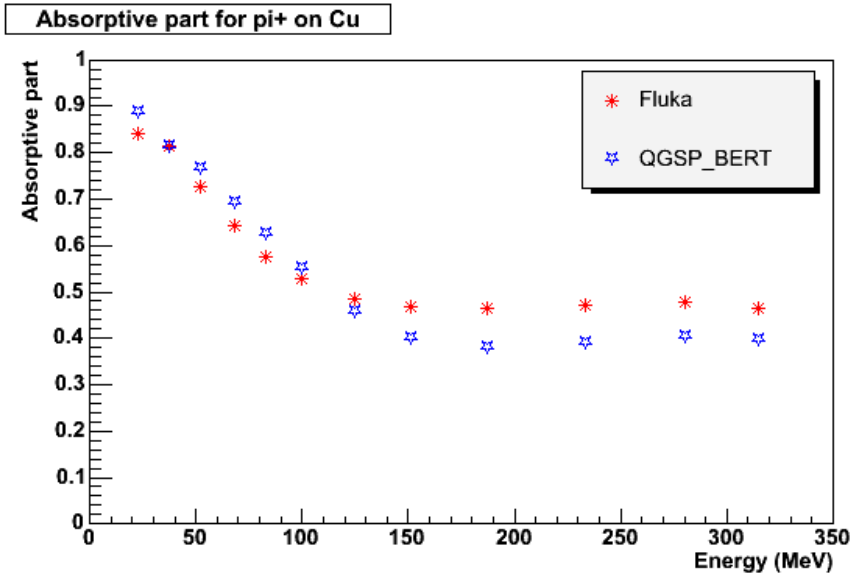



# Absorptive part for pi+



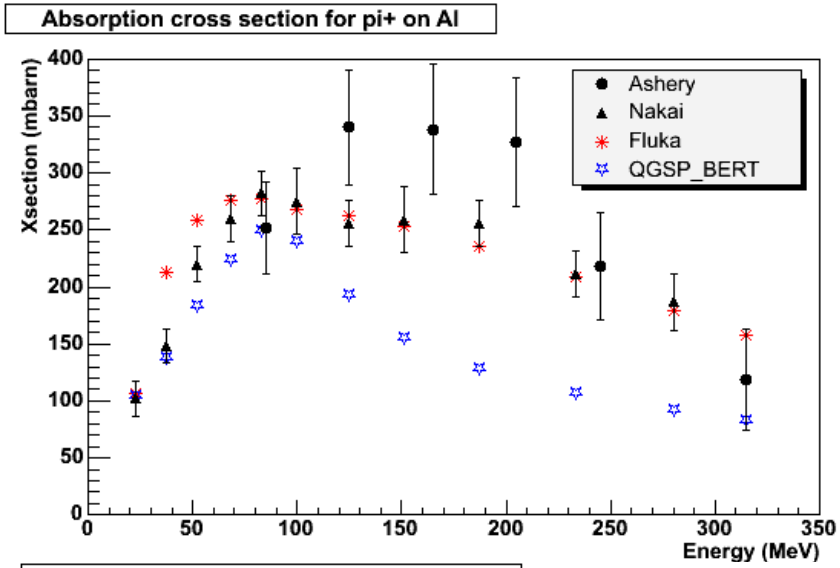



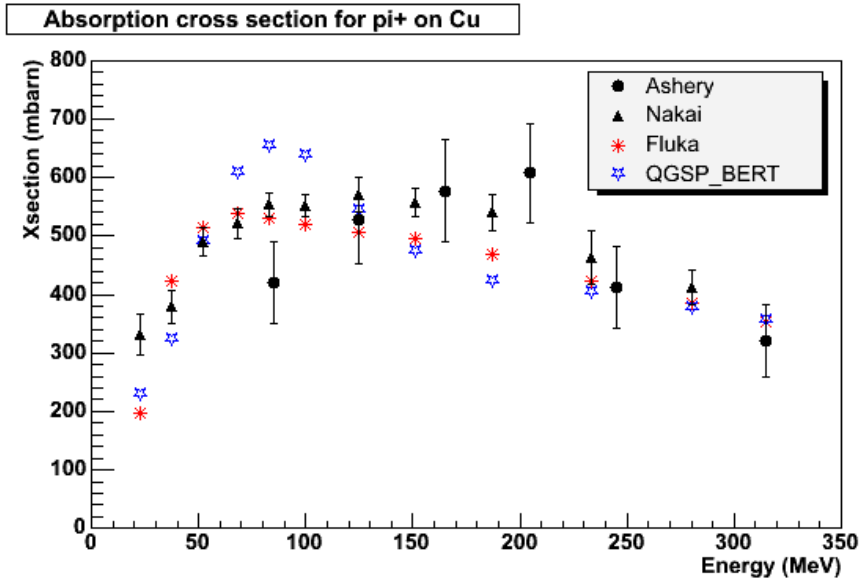


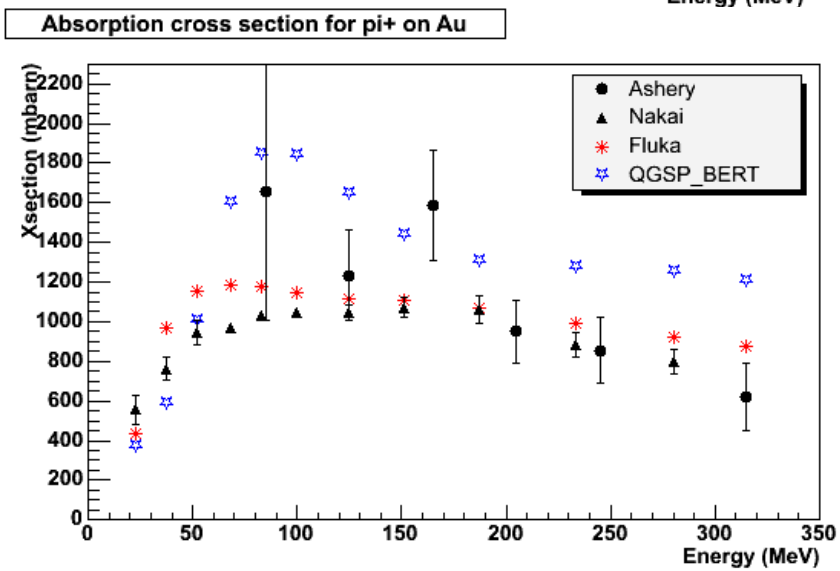


$$\sigma_{absorption} = r\sigma_{total\_inelastic}$$

# Absorption Xsection for pi+

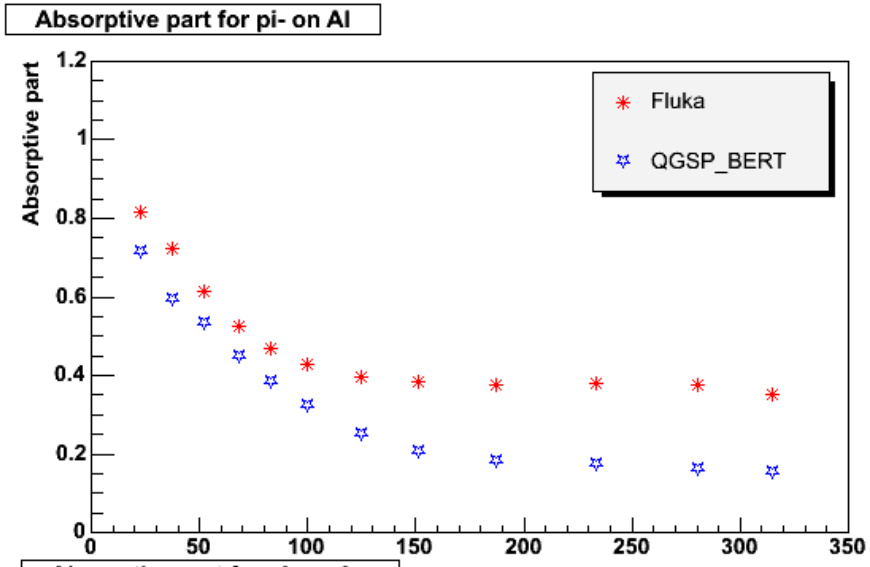


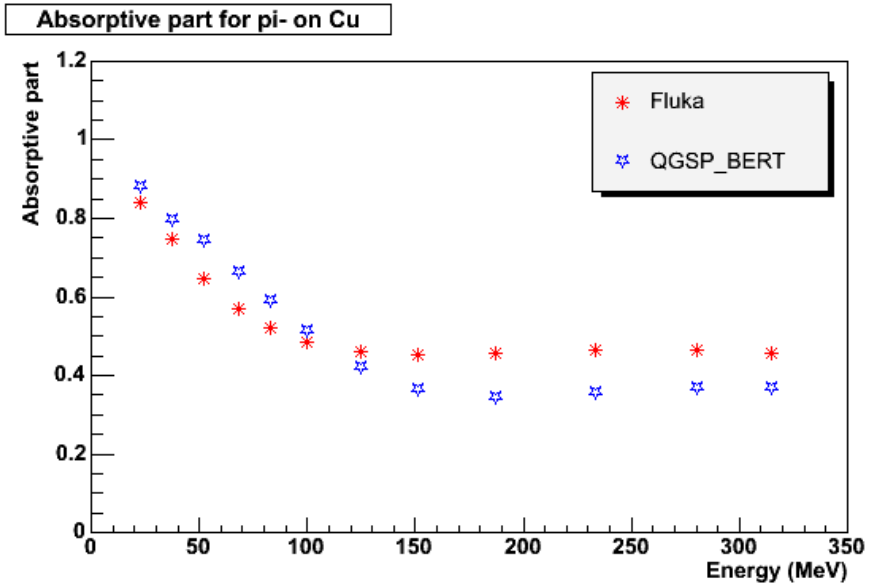



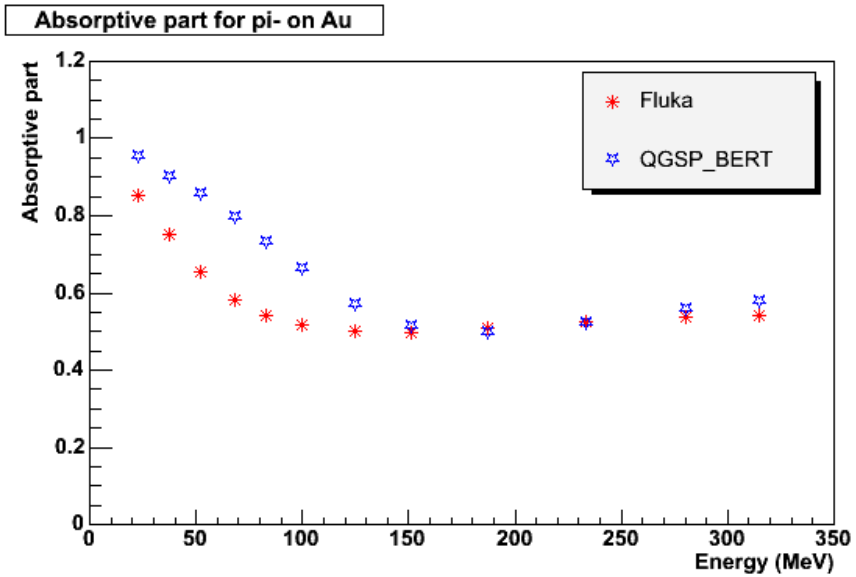




- both G4 and Fluka show reasonable agreement
- in some cases Fluka seems to be a bit better
- difficult to make more conclusions because of big uncertainties in the experimental data

# Absorptive part for pi-

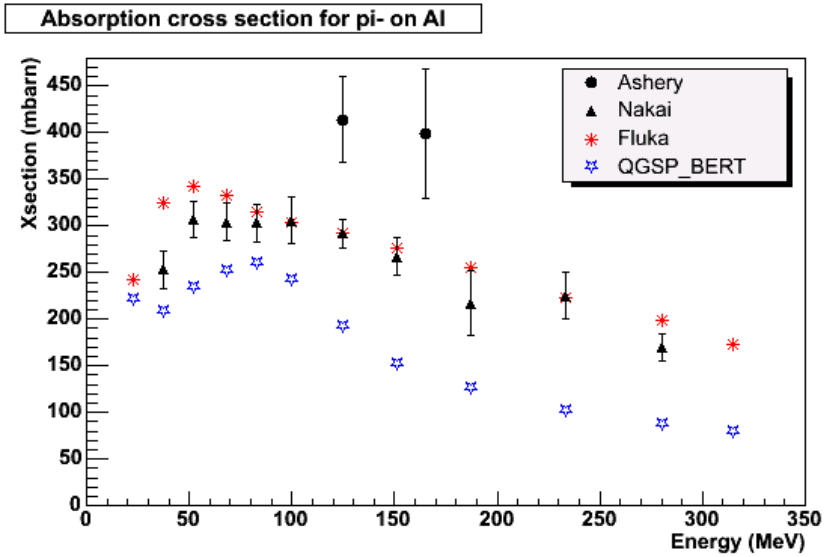


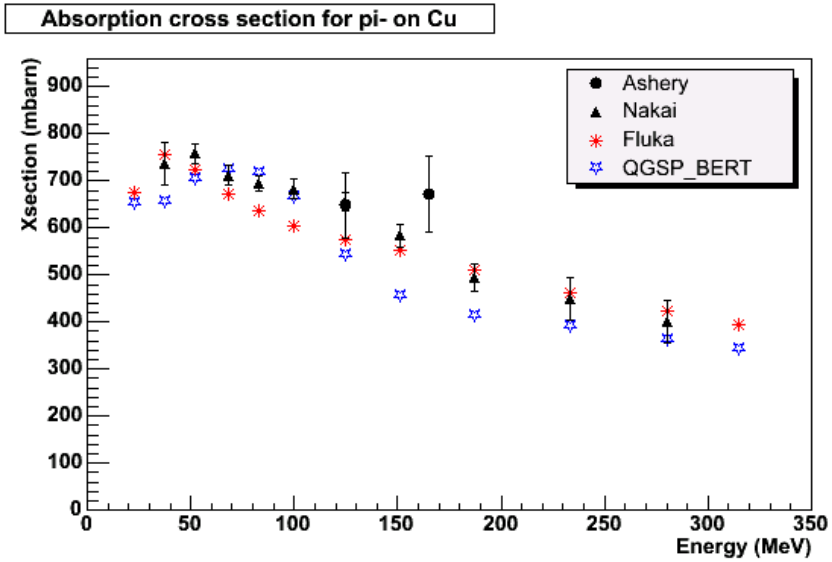



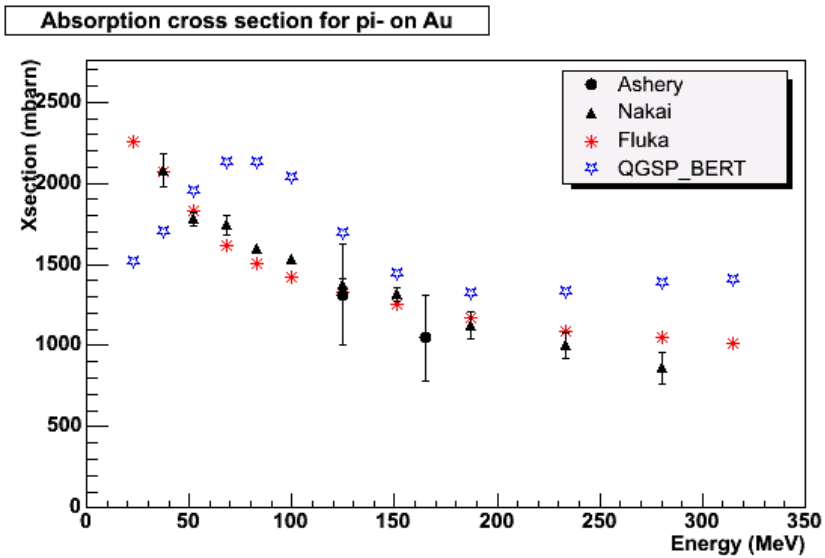




$$\sigma_{absorption} = r\sigma_{total\_inelastic}$$

# Absorption Xsection for pi-

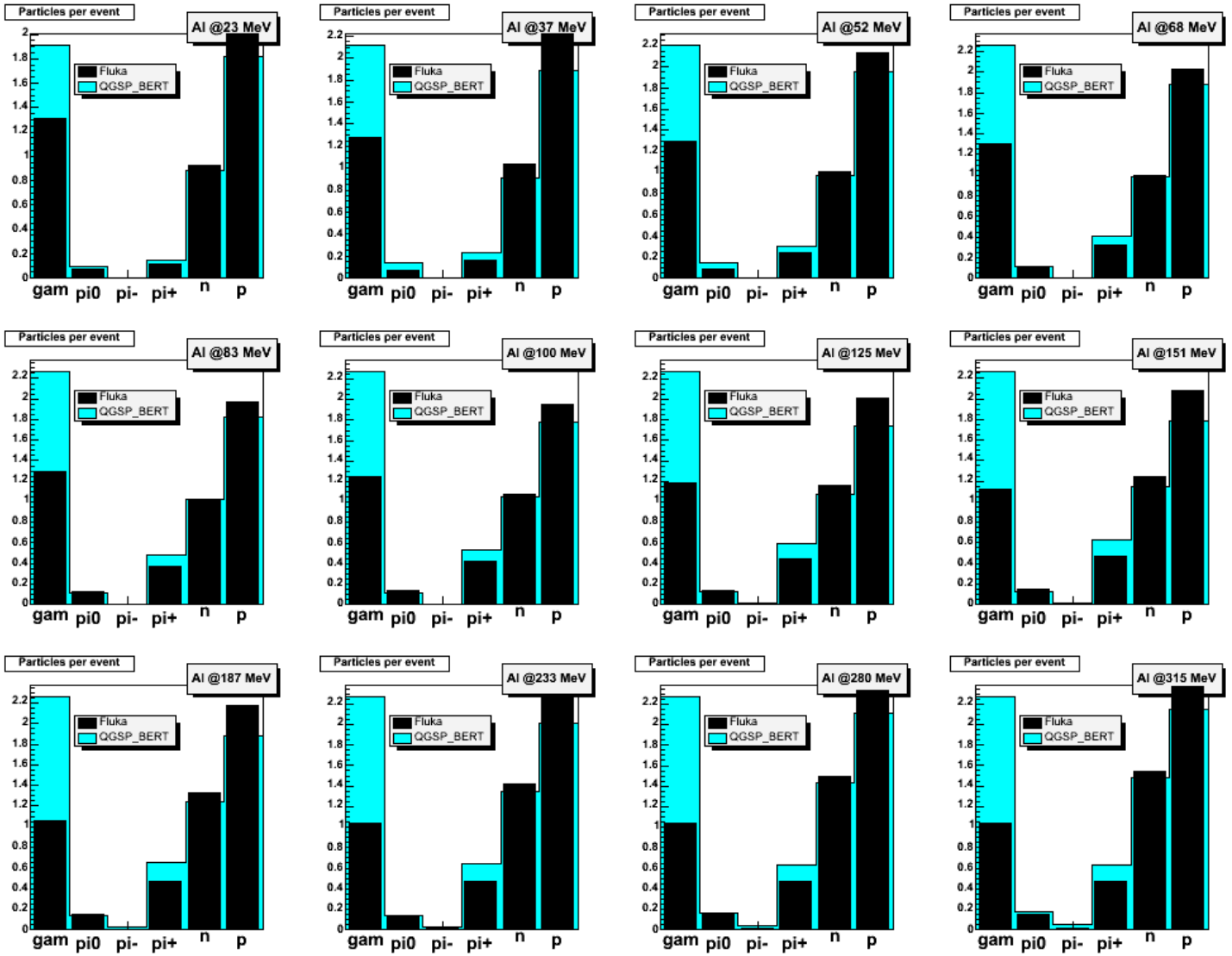


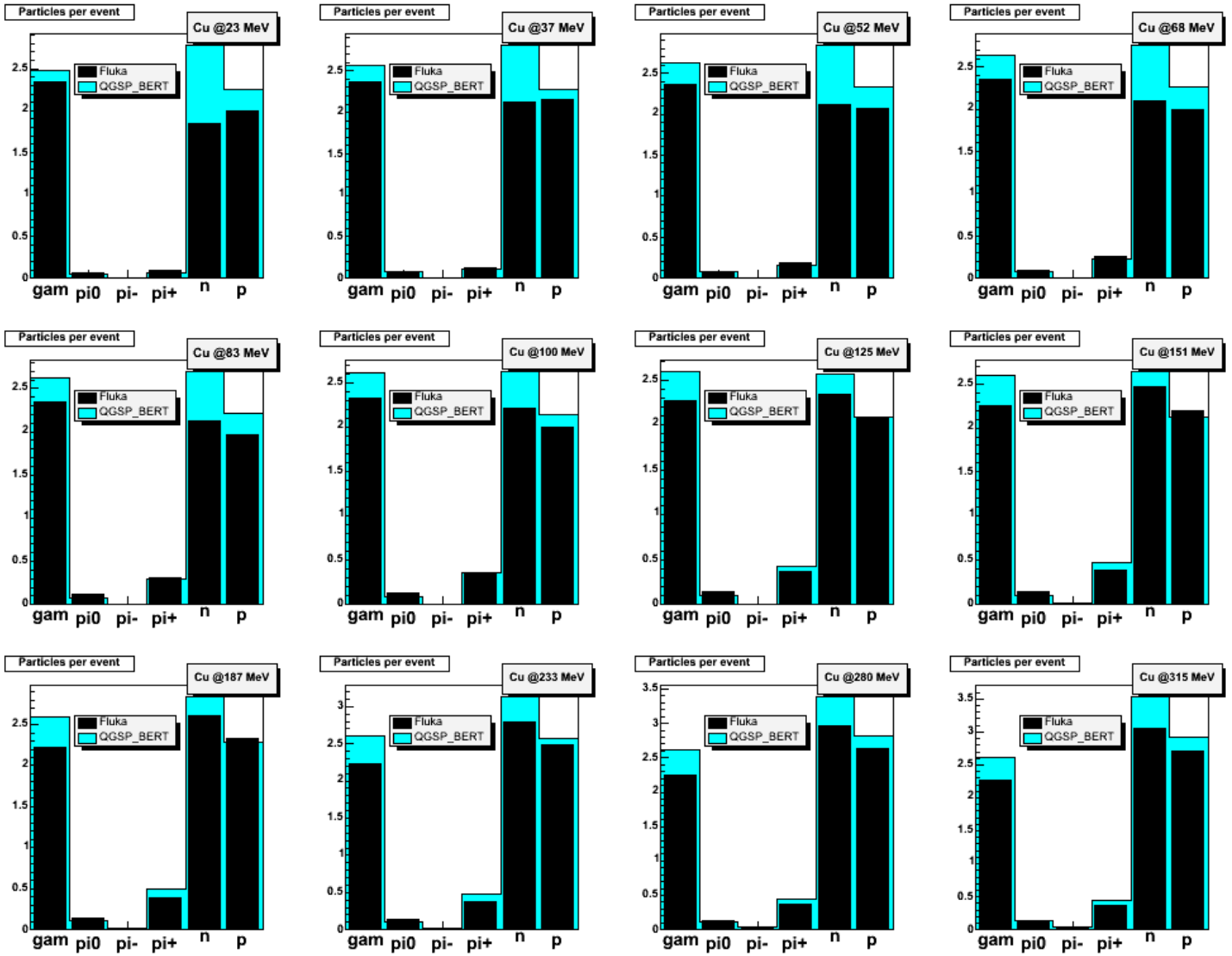




- same remarks as for pi+
- for heavy material (Au) the shape of the QGSP_BERT quite different (?)
- G4: best agreement for 'medium-weight' materials

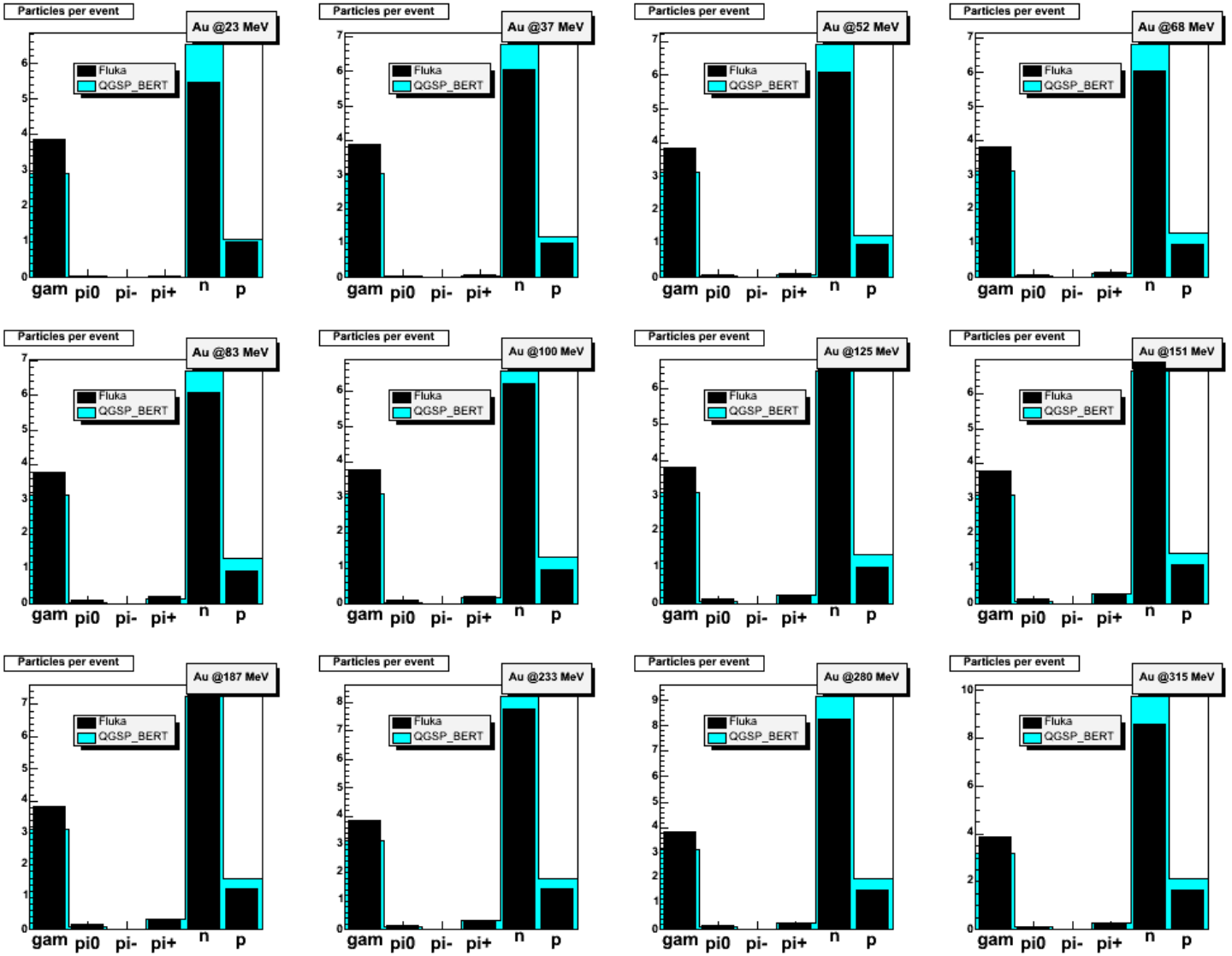
# Particle spectra for pi+ on Al



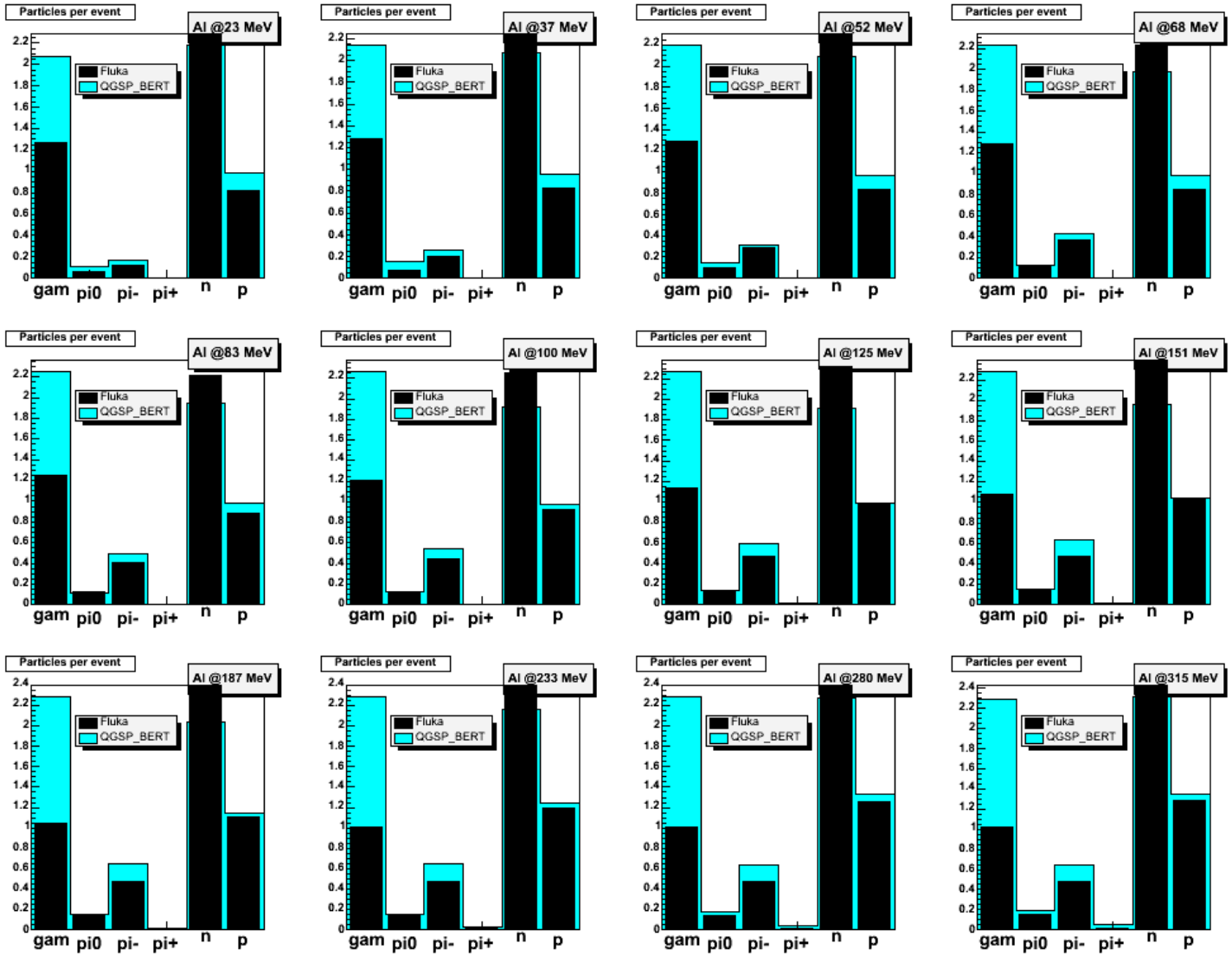
# Particle spectra for pi+ on Cu



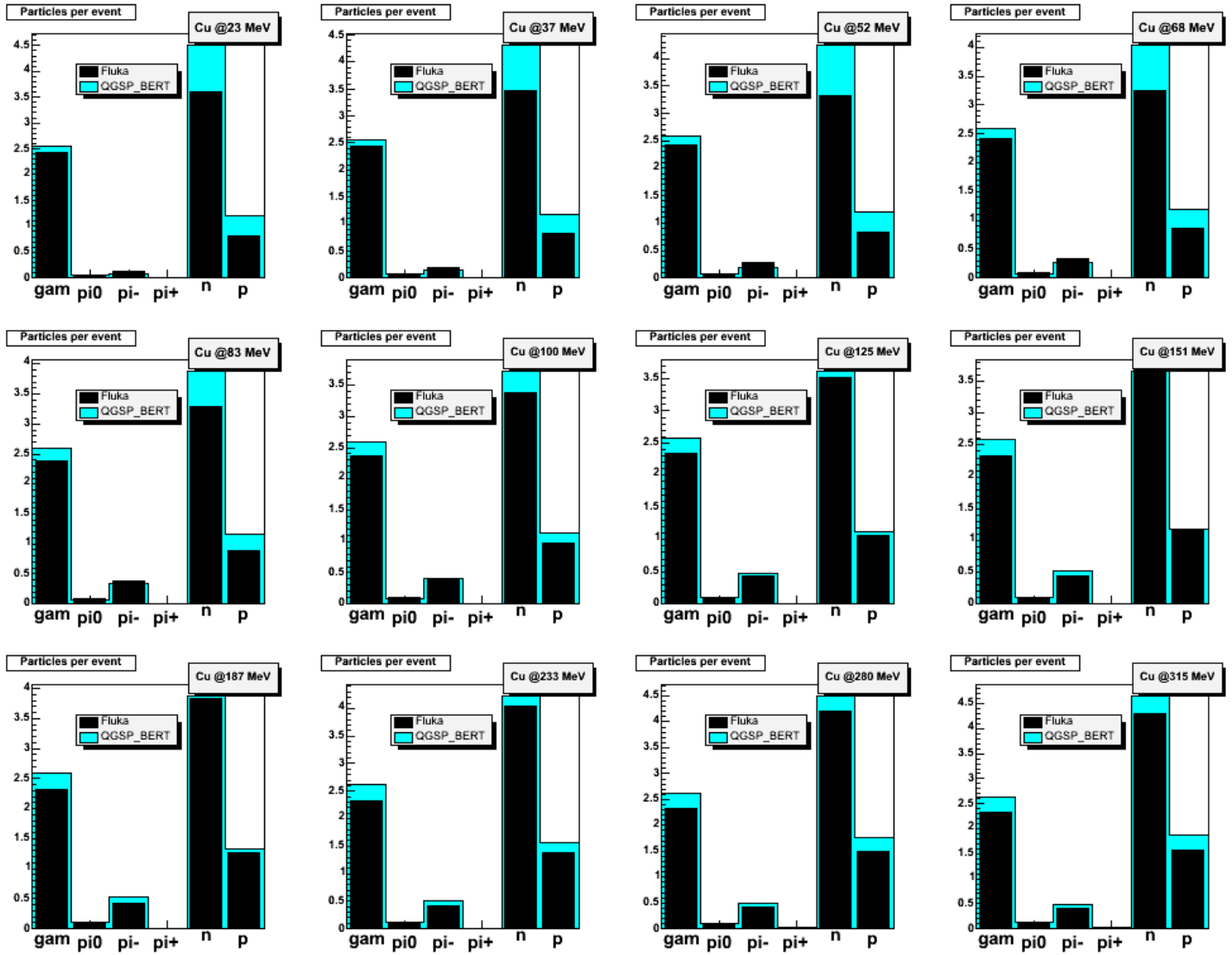
# Particle spectra for pi+ on Au



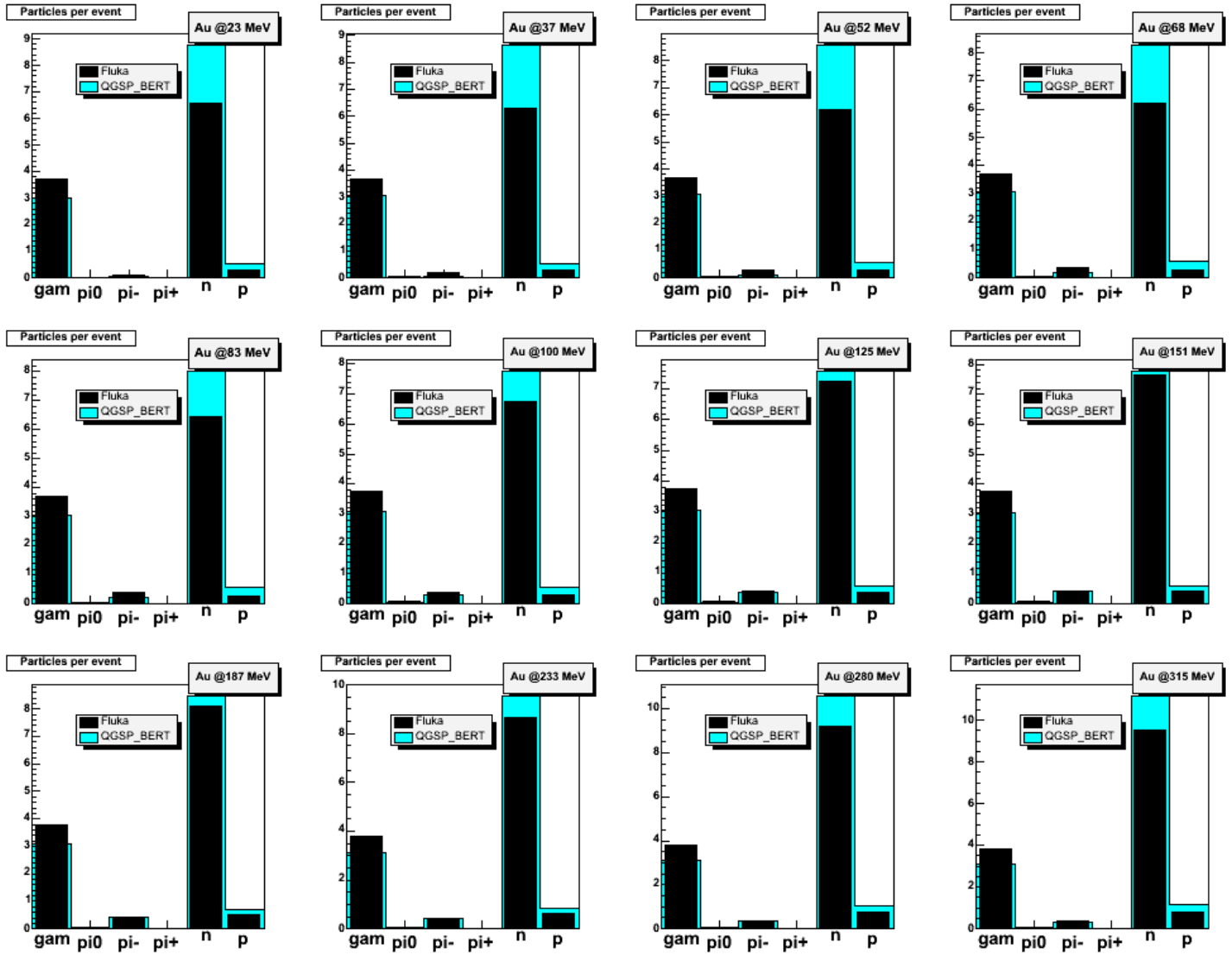
# Particle spectra for pi- on Al



# Particle spectra for pi- on Cu



# Particle spectra for pi- on Au



# Summary

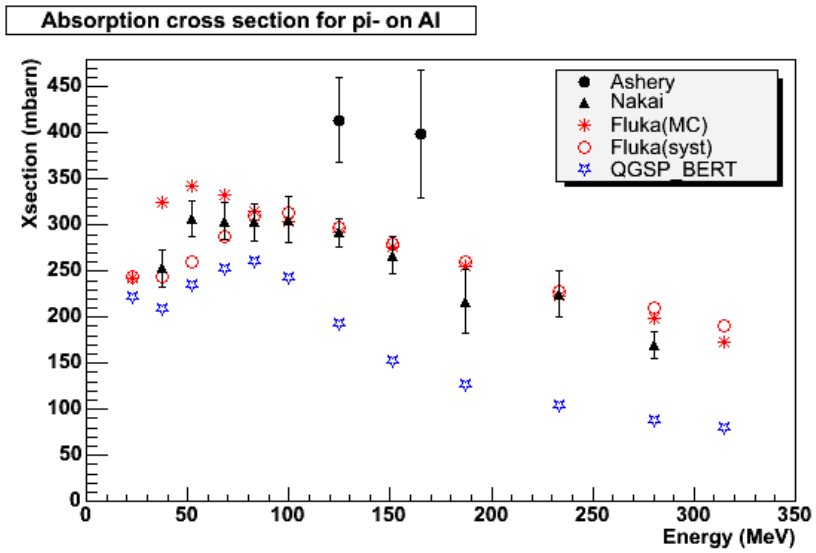

- Both Geant4 and Fluka results show reasonable agreement between simulation and experimental data
- In some cases Fluka seems to be a bit better than G4 with QGSP_BERT, but hard to judge because of big uncertainties in the experimental data
- BUT: how well do we need to reproduce that data????

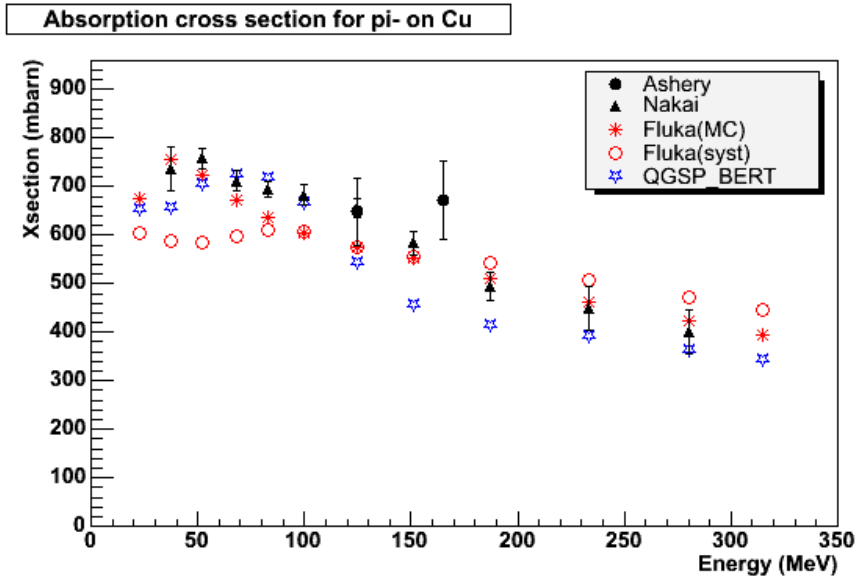
- bug corrected in G4 cross section tables
- additional motivation for Fluka to move to the new parametrisation

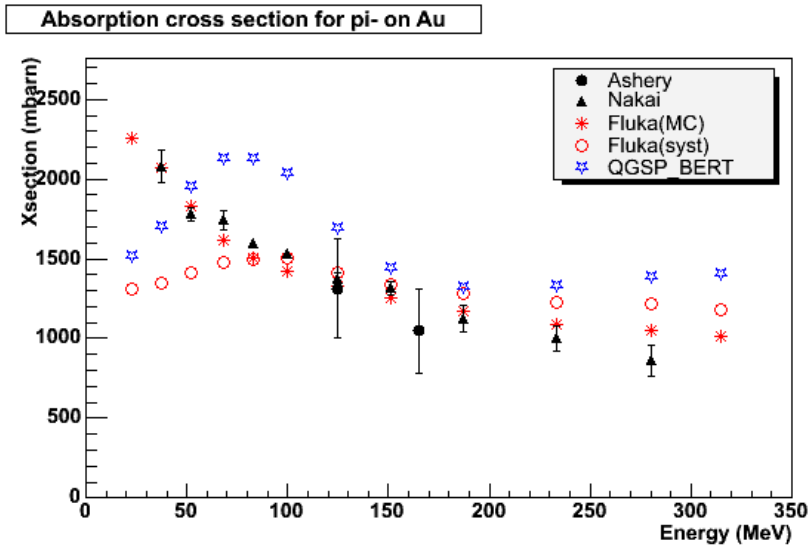
- LCG note on pion absorption benchmark in preparation



# Fluka parametrisations (1/2)



# Fluka parametrisation (2/2)