

Status of Requirement UR-33: Need of correct pion elastic model for T2K

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thanks to Krzysztof Genser for locating the
people concerned

π^+ H Wrong By Factor 5-10

- **Fixed** in Geant4 10.0
 - verified by Tom Feusels (UBC) for T2K using Geant4 10.2
- 825 MeV/c point in DUET tuning is quite high compared to PDG
 - Repaired Geant4 π^+ P cross section is closer to PDG

pi+ C Cross Section Has Some Deviations

- Geant4 is 20 – 40% high compared to most C data
 - in region of delta resonance (170 MeV)
 - other energies look more or less OK
- Current class G4UPiNuclearCrossSection gets elastic cross section by subtraction of inelastic from total
 - leads to bigger errors than depending on direct measurement of elastic
- Can be fixed
 - Try G4ChipsPionPlusElasticXS, or
 - develop new cross section set based on elastic data

Quasi-elastic Scattering

- As explained at previous meetings QE scattering is not treated separately from all other inelastic processes
 - new processes and models would need to be introduced

Angular Distribution

- For π^+ H, no problems with current model
- For π^+ C, we use sum of two exponentials to sample angle
 - OK on average
 - if detailed distribution important, new elastic scattering model needed

DUET/T2K Feedback

- Question in initial requirement: could DUET/T2K provide feedback to Geant4 elastic and inelastic models?
 - Answer: absolutely

Effort Required to Do Remaining Items

- π^+ C elastic scattering cross section
 - one day to test CHIPS class, one day to put into physics and test
 - if CHIPS not sufficient, new elastic cross section class needed \rightarrow 6 months effort
- More precise angular distribution (< 2 GeV)
 - about 3 months to develop general model
- Quasi-elastic scattering
 - substantial effort (1 year?) to develop cross sections, models