

Standalone Bertini cascade model

Remove Geant4 dependency from BERT

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A hadronic model (not process) of Geant4

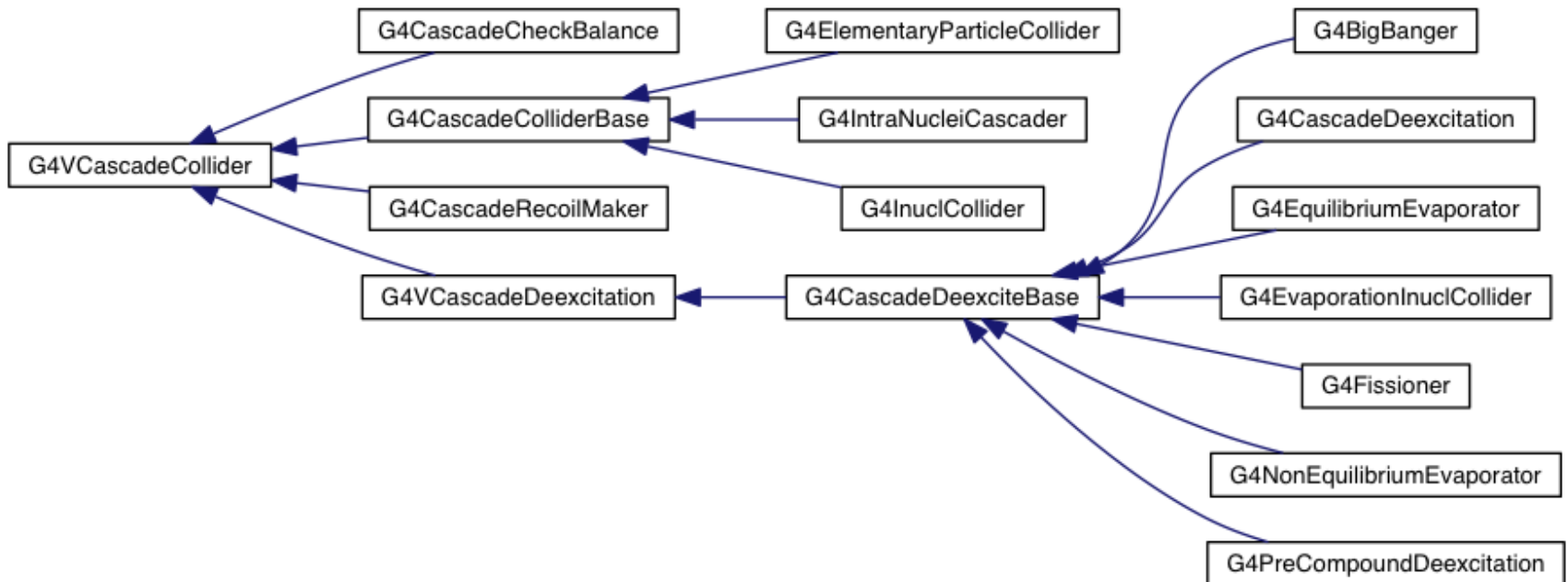
Handling hadronic interaction of proton, neutron, gamma, pion, kaon and hyperons on matter from 0 to 10 GeV

Including cascade, pre-equilibrium (pre-compound) and de-excitation models

`source/processes/hadronic/models/cascade/cascade`

- 131 files are located in include
- 111 files are located in src

An example of Class Hierarchy in BERT



Several assumptions for this separation

Allow dependency to CLHEP

- Vector, Rotation and Random number

Do not worry about multithreading mode

Keep physics capability of BERT as much as possible

Equivalence of result in random number level is desirable

- But not mandatory

External Dependencies in BERT

Geant4

IO

- G4cout,,,

Type

- G4double,,,

Multithreading

- G4Threading,,,

State

- PreInit, Init, Idle,,,,

Exception

- G4Exception

Particle

- G4Proton,, G4ParticleTable,,,

Hadronic framework

- G4HadronicInteraction,,,,

Decay

- For trapped Hyperons

CLHEP

Unit

- PhysicalConstants,
SystemOfUnits

Vector

- 4vector, rotation

Random number

Current status of separation

Running standalone BERT application with CLHEP (Vector, Rotation and Random number) + global (IO, Type, Threading, State, Exception) dependencies.

- -l G4clhep -l G4globman

Dependency to Particle, Hadronic framework and Decay are already excluded

Using GNUmake system of Geant4 for building library and application

- config/*.gmk

Continuously checking result against original

- by regular Geant4 application for thick target validation
- by reaction (model) level calculation

Testing applications

Geant4 application for thick target validation

- Generate Geometry for the validation
- FTFP_BERT is used in the application

Reaction (model) level calculation

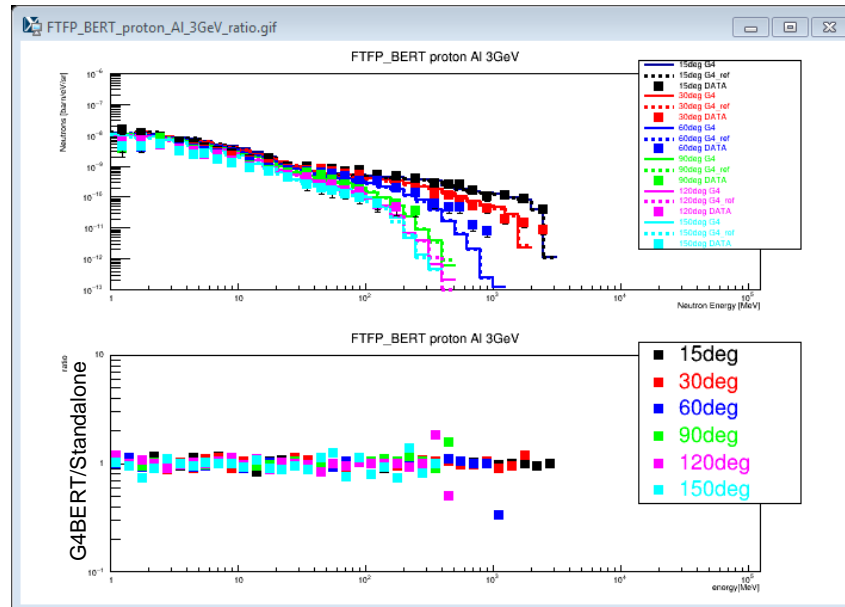
- No geometry generation
- Physics list is not instantiated

In both application, result of standalone BERT (this work) is compared to result of G4BERT

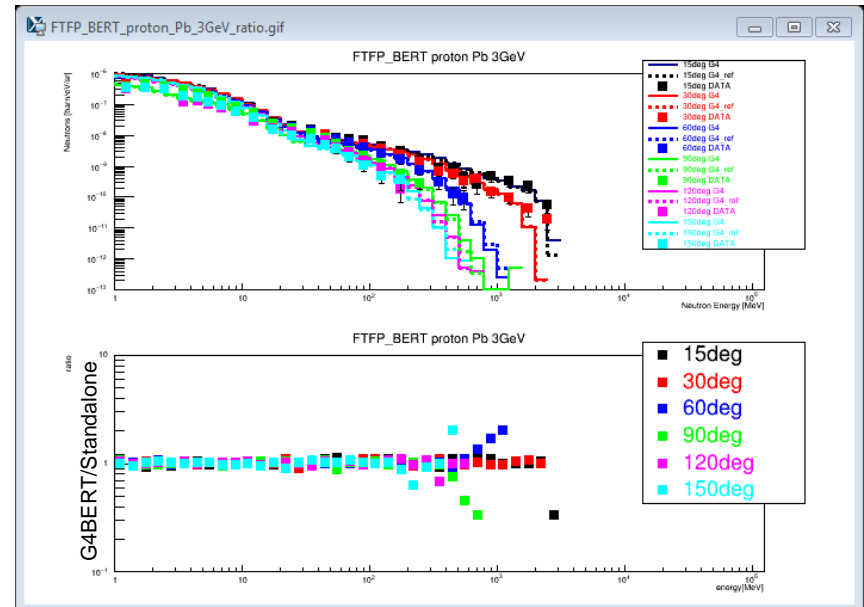
- Target material (nucleus): C (12C), Al (27Al), Fe (56Fe), In (115In) and Pb (208Pb)
- Projectile: proton, neutron, gamma, kaon-, kaon+, lambda, pi-, pi+, sigma-, sigma+, omega- and xi-
- 800MeV, 1.5 GeV and 3GeV

Using standalone version in G4 application for thick target validation

Proton 3GeV on Al



Proton 3GeV on Pb

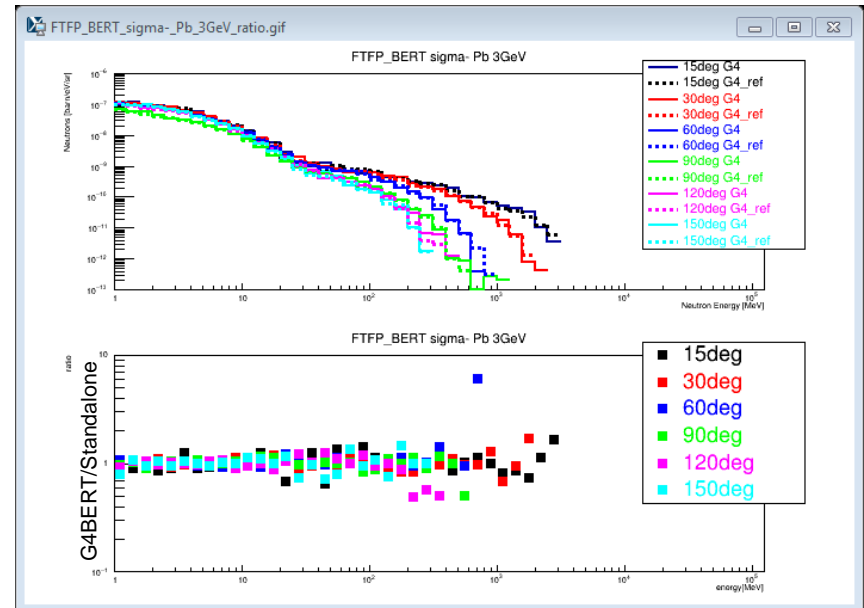
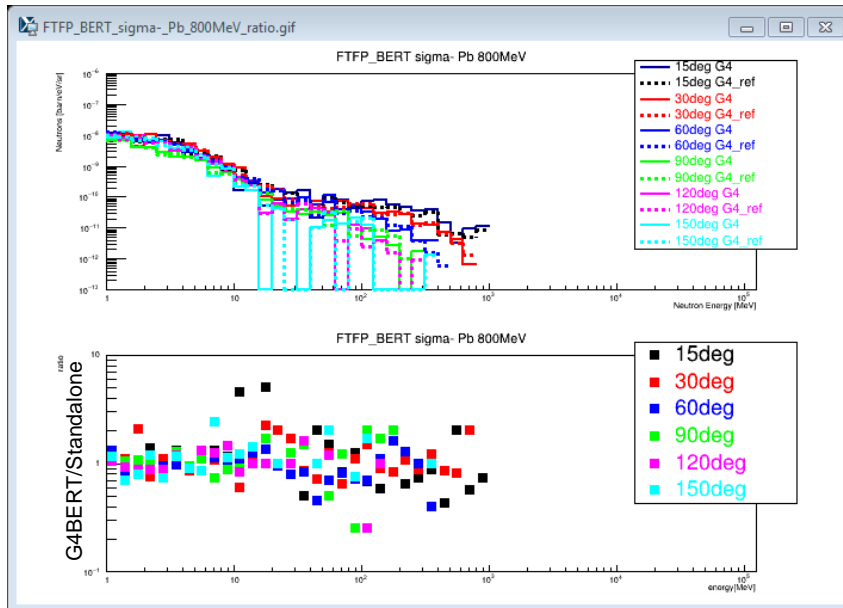


Solid lines Standalone
Dot lines G4BERT
Boxes Data

Using standalone version in G4 application for thick target validation

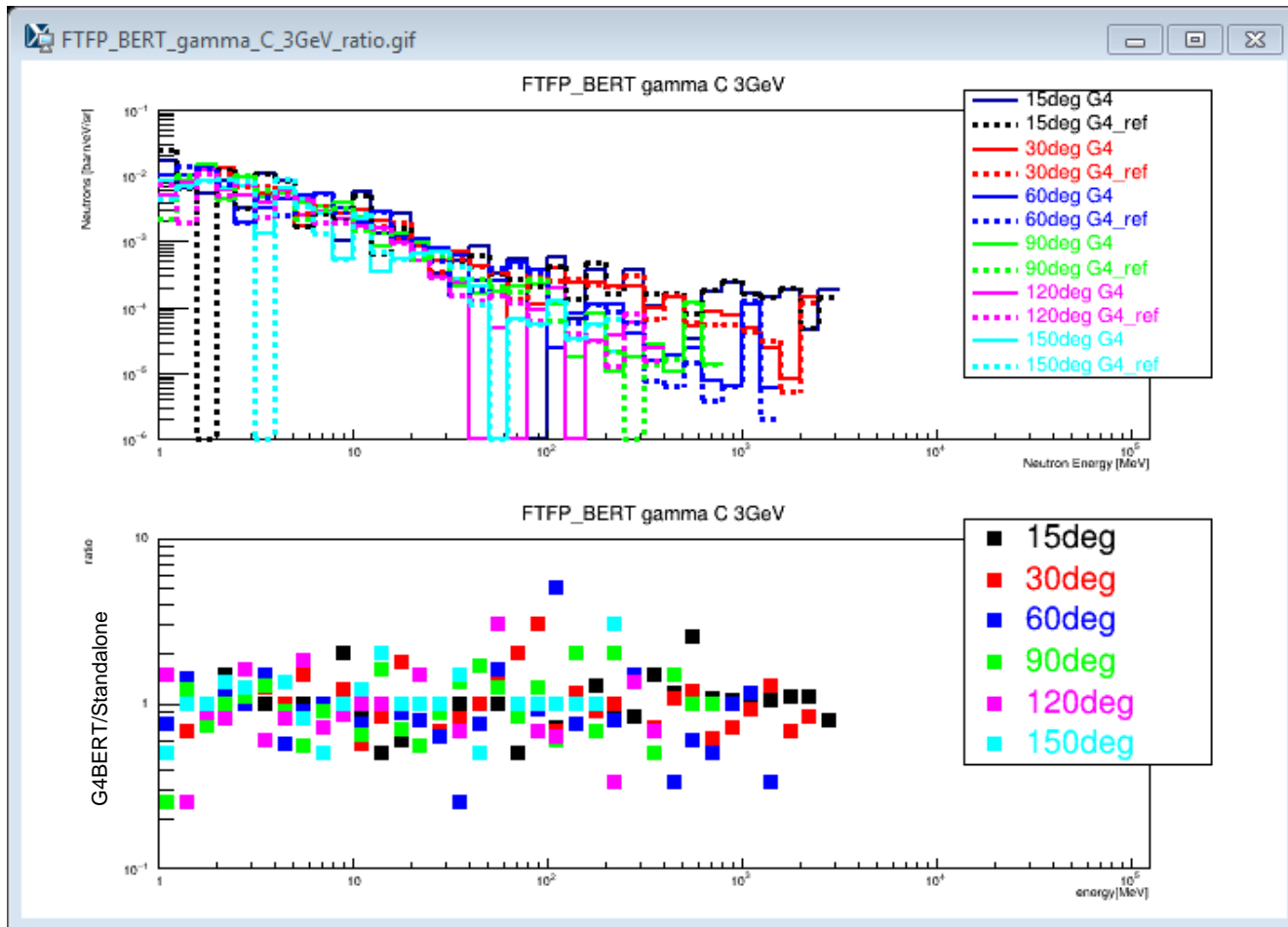
Sigma- 800MeV on Pb

Sigma- 3GeV on Pb



Solid lines Standalone
Dot lines G4BERT

Comparing standalone version in non G4 application (reaction/model level calculation)



Solid lines Standalone
Dot lines G4BERT