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Final results of the precision validation of Geant4 models in the pre-equilibrium and nuclear de-excitation phase

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A project is in progress for a systematic, quantitative validation of Geant4 physics models against experimental data.
Due to the complexity of Geant4 physics, the validation of Geant4 hadronic models proceeds according to a bottom-up approach (i.e. from the lower energy range up to higher energies): this approach, which is different from the one adopted in the LCG Simulation Validation Project, allows establishing the accuracy of individual Geant4 models specific to a given energy range on top of already validated models pertinent to a lower energy.
Results are presented concerning the lower energy hadronic interaction phases: the nuclear de-excitation and pre-equilibrium (up to 100 MeV).
All relevant Geant4 electromagnetic and hadronic physics models, and pre-packaged physics configurations distributed by the Geant4 Collaboration (PhysicsLists) have been included in the validation test. The hadronic models for inelastic scattering involve Nuclear De-excitation in two variants (default and GEM), Precompound (with or without Fermi break-up), Bertini and Binary Cascade, and parameterised models. Elastic scattering includes parameterised models and the newly developed Bertini Elastic model. Various prepackaged PhysicsLists are also subject to the same validation process.
The validation is performed against experimental data measured with 2% accuracy. The quantitative comparison of simulated and experimental data distributions exploits a rigorous goodness-of-fit statistical analysis.
The final results from high statistics production on the grid are presented: they compare both the relative accuracy and the execution performance of all the options considered. These results provide guidance to users about the choice of Geant4 electromagnetic and hadronic physics models.

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