ENSAR2 workshop: GEANT4 in nuclear physics

Wednesday 24 April 2019 - Friday 26 April 2019

Other Institutes

Book of Abstracts

Contents

Nuclear reactions at low and intermediate energies / **35**

Cross-sections of Light Nuclei in the Glauber-Gribov representation

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The Glauber-Gribov approach (corrections for both elastic and inelastic nucleon screening) is considered for the description of light nucleus-nucleus cross-sections. It was found that electromagnetic nucleus radii are result in better description of measurements. The calculations are compared with experimental data for the reaction cross-sections

Nuclear reactions at low and intermediate energies / **23**

Fission Models in Geant4: Status and Plans

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Fission in Geant4 is currently simulated as both a separate process and as a de-excitation model in other inelastic processes. Several different models exist, each with different interfaces and functionalities. This has led to confusion about which models are used and what they do, and to the possibility of users double counting fission by incorrect assignment in physics lists. The inventory of Geant4 fission models will be discussed, highlighting the areas where physics is lacking or not yet addressed, and improvements which need to be made. Potential projects for the future will be presented, including re-organization and redesign of the fission interfaces, expansion of fission databases, physics improvement, validation and documentation.

Detector simulation / **16**

Geant4 Electromagnetic Physics

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The status of the Geant4 electromagnetic physics sub-libraries is presented. Current developments of electromagnetic physics is focused on implementation of next to leading terms of various electromagnetic processes including multiple and single scattering, gamma conversion, positron annihilation. Atomic de-excitation module is use in several electromagnetic models and in radioactive decay. Problems and perspectives of accurate implementation of atomic effects are discussed. The new validation results are presented.

Nuclear reactions at low and intermediate energies / **17**

Geant4 pre-compound model and nuclear de-excitation module

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High and intermediate energy hadronic models should have a sub-model for simulation of nuclear de-excitation processes. In Geant4 there is a general pre-compound model and a general de-excitation module, which are used by many hadronic models. These models were recently modified and improved. Different aspects of these models are discussed and new validation results are presented.

Nuclear structure / **22**

Radioactive Decay in Geant4: Status and Plans

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The Geant4 radioactive decay process, models and databases have undergone many
upgrades during the past several years. These include refactoring the analog and biased decay to allow more efficient sampling, the modularization of the models which implement the various decay modes, physics improvements of the final state particle spectra for many of the decay modes, and the addition of new decay modes. Both the radioactive decay database and the photon de-excitation database have been extended and updated. Each of these topics will be discussed along with plans for future improvements. These improvements include further extensions of radioactive decay to include more decay modes, improved atomic de-excitation and an extensive set of validation plots.

52

Registration

Registration at the CIEMAT main gate.

Nuclear reactions at low and intermediate energies / **15**

The interface of BLOB with GEANT4

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Despite of its large use, the models implemented in Geant4 have shown severe limitations in reproducing the measured secondary yields in ions interaction below 100 MeV/n, in term of production rates, angular and energy distributions.
For this reason, we coupled BLOB (Boltzmann-Langevin One Body), a models dedicated to simulate such interactions, with Geant4 and its de-excitation phase.
BLOB is a semi-classical one-body approaches to solve the Boltzmann-Langevin equation. It includes a treatment of the mean-field propagation, on the basis of an effective interaction. BLOB introduces fluctuations in full phase space through a collision term where nucleon-nucleon correlations are explicitly involved. BLOB has been developed to simulate heavy ion interactions in the Fermi-energy regime.
We will present the preliminary results obtained in calculating double-differential cross sections and angular distributions of the secondary fragments produced in the 12C fragmentation at 62 MeV/n on thin carbon target obtained with this model coupled with Geant4 and its de-excitation phase.

Nuclear reactions at low and intermediate energies / **42**

Transport of low energy neutrons and charged particles in Geant4

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Geant4 allows to use the information available in ENDF-6 format data libraries for the transport of low energy neutrons and charged particles (up to 20 MeV). This is done by the so called G4ParticleHP model (previously G4NeutronHP). We will show the performance of the model, showing its capabilities and limitations. We will also talk about how to use it and about which simulations can be done with this model and which ones can not. Finally, we will propose future developments to improve the performance of the code.

51

Welcome

Welcome to all workshop participants.
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N. Kalantar