

Geant4 Hadronic Group Work Plan for 2018

3rd version, 28 February 2018

String models (1/3)

- Finalizing **FTF** model description of NA61/SHINE data on π^- C interactions at 158 and 350 GeV/c
 - V. Uzhinsky
- Tuning of **FTF** parameters for K+P and K+A interactions
 - V. Uzhinsky
- Further tuning and improvement of **QGS**
 - V. Uzhinsky
- Study potential extensions of **QGS** :
 - gamma, electron and neutrino interactions;
 - inclusion of hard processes
 - V. Uzhinsky
- Documentation of **QGS**
 - V. Uzhinsky

String models (2/3)

- Validation of **FTF** for nucleus-nucleus interactions and extension of the validation test-suite for string models (test22) with high-energy nucleus-nucleus data
 - A. Galoyan & V. Uzhinsky
- Tuning and validation of **FTF** model for strange meson and hyperon production in antiproton interactions
 - A. Galoyan
- Study of exp. data on charm particle production in proton and antiproton interactions with protons and nuclei. Implementation of charm particle production in **FTF** model
 - A. Galoyan & V. Uzhinsky
- Further improvements and validation of HIJING for p-Pb and Pb-Pb collisions at LHC
 - K. Abdel-Wagel

String models (3/3)

- Hadronic shower effects of **FTF** and **QGS**
 - A. Ribon
- Code improvements of **FTF** and **QGS**
 - A. Ribon
- Interfacing Fortran EPOS with Geant4
 - T. Pierog & A. Ribon

Intra-nuclear Cascade models (1/2)

- **Bertini (BERT) model**
 - Extension of $\pi^+/\pi^-/\pi^0$ - nucleon 6,7,8,9-body final states to include strange pair production
 - Dennis Wright
 - Maintenance and user-support
 - Dennis Wright & M. Kelsey
 - Code review and eventual re-engineering
 - T. Koi
- **Binary (BIC) model**
 - Maintenance and code review
 - G. Folger

Intra-nuclear Cascade models (2/2)

- **INCL++ model**
 - Completion of strangeness physics in INCL
 - J-C. David & J. Hirtz
 - Upgrades & maintenance
 - J-C. David, J. Hirtz, D. Mancusi, J.L. Rodriguez Sanchez
 - Hypernuclei production in ABLA++
 - J-C David & J.L. Rodriguez Sanchez

Precompound / De-Excitation models

- Complete the new GEM (Generalized Evaporation Model) model
 - V. Ivanchenko
- Modification of FBU (Fermi Break Up) model with addition of gamma transition channels
 - V. Ivanchenko
- Improvement of the parameterisation of the probabilities of evaporation
 - V. Ivanchenko
- Maintenance and improvement of pre-equilibrium and de-excitation models
 - V. Ivanchenko & J. M. Quesada

ParticleHP model

- Maintenance of ParticleHP
 - P. Arce, E. Mendoza & D. Cano Ott, T. Koi, Dennis Wright
- Maintenance and update of the IAEA Geant4 neutron data libraries website (including JEFF-3.3 and ENDF/B-VIII)
 - E. Mendoza & D. Cano Ott
- Maintenance of the Fission Fragment module
 - B. Wendt

LEND model

(Low Energy Neutron Data , General Interaction Data interface)

- Development for neutron- and gamma-induced reactions
 - J. Verbeke
- New version of LEND/GIDI
 - Douglas Wright
- Maintenance and support of physics lists for LEND
 - J. Verbeke & Douglas Wright
- Develop validation tests for G4LENDorBERTModel photo-nuclear model
 - Dennis Wright

NCrystal model

(Model for \sim meV neutron scattering in both poly- and single-crystals)

- Paper to describe the physics of the model in detail
 - X. Cai & T. Kittelmann
- Improved integration of NCrystal in Geant4
 - X. Cai & T. Kittelmann

Radioactive Decay model

- More correct partial K, L1, L2, L3, M1-M5 electron capture probability; implementation of electron capture from N shell
 - L. Desorgher
- Develop Z-dependent tables of electron capture coefficients
 - Dennis Wright
- Maintenance of the RDM & PhotoEvaporation data-sets
 - L. Desorgher
- RDM biasing improvements
 - L. Desorgher & Dennis Wright
- Beta-delayed neutron emission
 - L. Sarmiento
- Extension to Super Heavy Elements (SHE)
 - L. Sarmiento

Elastic models

- R&D hadronic elastic scattering
 - V. Grichine
- Review of hadron elastic models
 - W. Pokorski

Other models

- **Muonic atom**
 - K. Lynch & K. Genser
- **Low-energy, entry-channel models: SMF and BLOB**
 - Semiclassical one-body approaches to solve the Boltzmann-Langevin equation
 - C. Mancini (GeNIALE project)
- **Nuclear Coulomb excitation model**
 - M. Taylor
- **Neutrino interactions:**
 - R&D for neutrino-nucleus final state generator, V. Grichine
 - Inserting neutrino physics in Geant4 framework, V. Grichine

Cross Sections

- New version of G4NEUTRONXS data set
 - V. Ivanchenko
- R&D hadronic cross sections
 - V. Grichine

Validation & Testing

- Composition, monitoring and validation of physics lists for the Intensity Frontier (IF)
- Maintenance, and periodic execution of Test19, Test23, Test47, Test48, Test75
- Hadronic validation with BNL and MIPs data, and with the new high-granularity CMS test-beam
- Physics highlights release page
- Development of the infrastructure for studying sensitivity of MC predictions to the variations of the model parameters
- Possible integration of interfaces of Geant4 hadronic models to be used by GENIE neutrino interaction code
- FNAL Team: K.Genser, R.Hatcher, Sunanda B., H.Wenzel, J.Yarba

Other Validation activities

- Transforming test-beam simulations from the experiments (e.g. ATLAS and CALICE) as Geant4 stand-alone applications useful for hadronic physics validation
 - K. Nikolics & W. Pokorski
- Convert TARC into test15 to be run in nightlies
 - A. Bhattacharyya & A. Howard
- Validation of cascade models with the n_TOF evaluated neutron flux
 - M. Cortes Giraldo
- Validation of low-energy models
 - P. Cirrone & C. Mancini

Hadronic Framework

- Investigate possible simplifications of the hadronic framework
 - Starting with some design ideas recently considered in the context of GeantV physics...
 - A. Ribon *et al.*