Summary of Session 7A

Julia Yarba, FNAL

21st Geant4 Collaboration Workshop

Sept. 12-16, 2016

Session 7A:
Hadronic Models Development and Validation (II)

CMS calorimetric results		*IVANTCHENKO, Vladimir*
Aula Magna, Ferrara		*16:00 - 16:20*
Update on Radioactive Decay model		*WRIGHT, Dennis*
Aula Magna, Ferrara		*16:20 - 16:40*
Low-energy neutrons in poly- and single-crystals		*CAI, Xiao-Xiao et al.*
Aula Magna, Ferrara		*16:40 - 17:00*
Discussion		*RIBON, Alberto et al.*
Aula Magna, Ferrara		*17:00 - 17:30*

CMS Calorimetric Results
(V.Ivanchenko)

- CMS simulation upgrade for 2017 production:
  - 10.0.p02 + QGSP_FTFP_BERT_EML → 10.2 + "optimal physics lists"
- Many developments in 10.2-series, including in the hadronic physics
- In 2016 CMS has carried out extensive validation in order to determine optimal physics list for the 2017 production
  - Hadronic response changed as compared to 10.0 cycle
- Multiple physics lists were considered
  - Significantly different results from tested physics lists
  - Multiple patches were required/supplied/tested
- Two key aspects affected response to hadronic showers for CMS calorimeters:
  - Configuration of FTF model – CMS private patch is added
    - Improvement as compared vs thin target -> issues in a large-scale simulation
  - Configuration of EM physics – EMM option is added
  - Custom physics list: FTFP_BERT_EMM
- Studies went under time pressure and presented more complications than expected
- CMS suggests that combined calorimeter of CMS type is included in Geant4 validation

Update on Radioactive Decay Model (D.Wright)

- Progress since last year
    - Added decay by neutron emission
    - More precise energy conservation for a number of processes
    - Improved photon evaporation and gamma level handling
    - New databases with floating levels:
        - RadioactiveDecay 5.0
        - PhotonEvaporation 4.0
    - Various types of code improvement and refactoring
- Projects underway
    - Correlation of gamma emission
        - Angular distribution of emitted gamma will depend on previous emissions
    - Beta-delayed neutron and proton emission
    - Discrete levels in nucleus whose energy is poorly known (floating levels)
        - Infrastructure to accommodate required features has been implemented
    - Work on biasing
- Plans for future
    - Continue work on the biasing code
    - Reduce the number of database files
        - Develop binary databases to save time and memory
    - Resolve some floating levels

Low Energy Neutrons in Poly- and Single-Crystals (X.X.Cai)

- Neutron scattering studies enter new era: reactors -> accelerators
  - High rates
  - Higher-energy contamination
  - Complex instrumentation
- NCrystal application
  - Consistent treatment of both low-energy neutrons and other particles
  - Takes advantage of HP and cascade models
- Simulation studies for poly- and single-crystal
- Comparison vs analytical calculations
- Simulated results are compared vs experimental data (if available) and show reasonable agreement overall; differences are understood
- Plans for future:
  - Work on inelastic component
  - Integration with Geant4
    - Coordinated with work on Crystal Concept Extension in Geant4

Discussion

- Largely centered on what of FTF changes to include in release 10.3
  - 10.1 is OK
  - Improvements of 10.2 are in better agreement with thin target data
  - Affect shower development in calorimeters – deviation from data
- Suggestions for 10.3:
  - Revert FTF to its 10.1-like state
  - Fork latest updates as "dev"
  - We even had a "primary" (voting):
    - More people are in favor of this idea than those who explicitly object
    - Even more people did not express any opinion
    - Decision to be taken at the Hadronic group meeting at the end of September