Current Coverage of Hadronic Validation

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Outline

- Goals and Status
- Detailed Test Status
- Summary of model and cross section coverage
- Work Plan

Overall Validation Goals and Status

- The official validation repository for hadronics is at
  - g4validation.fnal.gov.8080/G4HadronicValidation

- Goals
  - to have all hadronic validation tests here
  - to have all tests re-run at each release
  - develop cross section validation tests

- Status:
  - more than half of all hadronic validation still done outside above repository (other repositories, personal validations, etc.)
  - many tests within the repository are not done regularly, i.e. for each release

Status of Validations In Framework (1)

- simplifiedCalo: simplified calorimeter
  - physics lists FTFP_BERT, QGSP_BERT
  - regular (each release) validation
- test30: low to medium energy
  - Binary, Bertini
  - part of system testing
  - not all test30 cases are in validation framework
  - no entries since release 9.3
- test30iaea: spallation
  - G4Precompound, Binary, Bertini, CHIPS, INCL, QMD, LEP
  - regular (each release) validation

Status of Validations in Framework (2)

- test35: medium energy, comparison to HARP data
  - BERT, Binary, QGS, FTF against HARP data
  - only one reaction entered in validation framework
  - not updated since version 4.0
  - part of system testing
- test45: low energy proton, ion beams stopped in thick targets
  - not yet entered in validation framework
  - part of system testing
- test47: medium energy (1.4 – 15 GeV)
  - Bertini, Binary, CHIPS, FTF
  - regular (each release) validation
  - part of system testing

Status of Validations in Framework (3)

- test48: hadron capture
  - LEP, CHIPS, Bertini, direct implementation processes
  - regular (each release) validation
  - part of system testing

Validations Which Need to be Added to Framework (1)

- test11, test65: neutron transport (HP and LEND)
  - part of system testing
  - need to convert to validation test
- test18: radioactive decay of selected ions
  - part of system testing
  - need to expand and convert to validation test
- test28: Wilson abrasion/ablation
  - part of system testing
  - need to convert to validation test
- test43: high energy up to 320 GeV (QGS, FTF)
  - part of system testing
  - need to convert to validation test

Validations which Need to be Added to Framework (2)

- tests19-23, test29, test39, test49: various CHIPS tests
  - many already part of system testing
  - need to convert at least some to validation tests
- test61: ion-ion (QMD)
  - part of system testing
  - need to convert to validation test
- test69: INCL++
  - part of system testing
  - need to convert to validation test

Summary of Model Coverage

- Good coverage:
  - core models for most of our physics lists are well-covered:
  - Precompound, Binary, Bertini, stopping over almost all their applicable energies
  - FTF well-covered for medium energies, but not ~100-400 GeV range

- Some coverage, but more needed:
  - QGS
  - CHIPS for stopping, de-excitation, gamma-nuclear, lepto-nuclear
  - Binary light ion

Summary of Model Coverage

- Little or no coverage
  - radioactive decay
  - Bertini photo-nuclear, G4MuonVDNuclear, G4ElectroVDNuclear
  - low energy neutrons (HP and LEND)
  - electro-nuclear dissociation, Wilson abrasion, ablation
  - QMD
  - elastic scattering, coherent-elastic
  - anti-particle (FTF, CHIPS)
  - Livermore fission
  - INCL++

Summary of Cross Section Coverage

- Almost none
  - Anton Ivantchenko has made a start
  - system tests available which could be converted to validation tests
  - newer cross section data sets and internal cross sections not tested at all

Work Plan (roughly in order of importance)

- Make FTF and QGS validation tests for the 100 – 400 GeV range, add them to the validation repository and run them for each release
- Nucleon-nucleus and pion-nucleus cross section validation suite
- Make validation suite for INCL++
- Elastic scattering validation suite
- Low energy neutron validation suite
- Photo- and lepto-nuclear validation suite
- QMD validation suite
- Radioactive decay validation suite