Summary of PA-5 (Hadron-2): Validation Suite

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Topics

- **Validation Status Report**
- **Latest Validation Results at Intermediate Energies**
- **Validation Framework – contributions by EM & HAD groups**
- **Related discussions**

Validation Status

- **Models validation:**
  - Well covered, on regular basis,documented (precompound, de-excitation, cascades, partially string models at intermediate energies)
  - In reasonable shape but can be improved (string, ion-ion, low energy neutrons) and better documented
  - Need work (elastic scattering, stopping, radioactive decay, EM dissociation, abrasion/ablation, gamma-and electro-nuclear model)

- **Cross sections validation:**
  - Some sporadic work but no regular efforts so far

3

Validation Status (cont.)

- **Physics lists and shower shape validation**
  - In good shape, on regular basis, presented within LCG
  - Needs to be documented as part of G4 Val efforts
  - Possible extension to "thick target" and "full setup" (also reflected in discussions, see later)

- **Quality of Agreement metrics**
  - List of use cases (<10) in which experts of those cases will assign an estimated agreement with data (chi2, MC/data, etc.)

Latest Validation Results

- **Validation of the reference version:**
  - intermediate energy range

- **Evolution of the models:**
  - **Evolution of Bernini (incl. infrastructure updates)**

    good overall description of data <9 GeV, but for heavy nuclei over-estimates production of proton/neutron in the bck hemisphere

  - **Bertini+PreCompound**

    interesting alternative but needs more work

  - **Evolution of FTF**

    good overall description of data >5 GeV, but has some deficiency

    in predicting inclusive proton and neutron production for heavier targets at energies <5 GeV

Validation Framework – Joint Efforts with EM Group

- **Tools to perform the following:**
  - Parallel processing (for CPU-heavy tests)
  - Merge and Compare
  - Examine, Store (Publish) and Display

- **1st version released at DESY-Zeuthen:**

  http://g4jsp.ifh.de:8080/G4HadronicValidation

- **Presentation on EM validation efforts**
  - Overview of the efforts
  - Joint interests, overlaps with HAD
  - Existing tools, incl. early prototype to port into Val Fwk

6

Comparison of frameworks – from A.Schaelicke

Features	PHP framework	new JSP framework
easy browse results	yes	yes
structure output (e.g. by material)	yes, configurable via XML	planed
interactive comparison	yes, via PyROOT scripts	planed
easy store of additional info	no, but full information in logs	yes, in tags
search page	no	planed
scoring	no	planed
access	CERN afs dir	upload tools (via JSP or directly to DB)

Validation Framework –
Joint Efforts with EM Group (cont.)

- **Near-term plans:**
  - complete porting results and expand the collection
  - add features for interactive overlay/comparison
  - various cleanups in the applications

- **Long-term plans:**
  - Tools for parallel processing

- **Manpower and computing resources**

8

Discussions

- **Open issues in the validation efforts**
  - Quality of accuracy metrics

- **Milestones for the Validation Fwk**
  - Complete port of existing results
  - Expand the collection
  - Start work on productions tools

- **Advertising G4 performance "as a whole"**
  - Extract results from experiments in a "light" way
  - "Approximation" of experimental setup

9

Summary

- **G4 Validation involves a LOT of work**
- **Many efforts on a regular basis and documented**
- **Certain areas still need improvements**
- **It brings many benefits to both the collaboration and the user's community**
- **Lots of work and improvements towards storing results and keeping track of the models and code evolution, advertising to the world; more progress expected in the near future**

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