VVPH
Verification/Validation/Performance for Hadronics Parallel Sessions

Summary of hadronic parallel sessions on Tuesday and Thursday

Aatos, Dennis, Gunter

Session 1 (14:00 Tuesday): Shower Shapes and Specific Tests

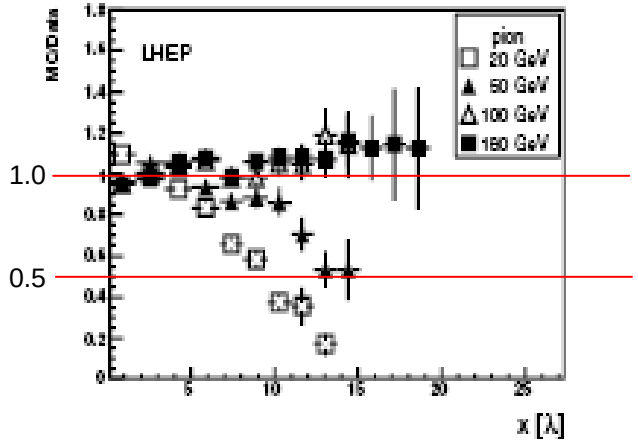
- LHC experiments find hadronic showers are significantly too short using QGS.. physics lists
- Understanding this issue is high priority
- Neutron production by cascade models needs improvement
- Tests:
  - Now five test suites (test19, 29, 30, 35, 39) : in-flight, at-rest, cascade, HARP, hadron elastic
  - benchmarking: multi-layer Faraday cup (G4/data comparison), neutron fluence in water phantom (G4/MCNPX comparison)

Hadronic shower shape - Atlas

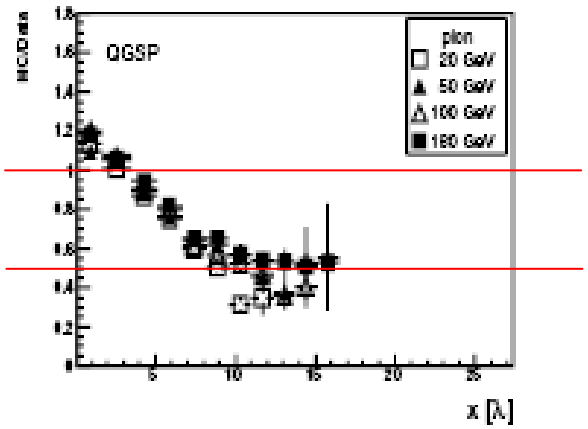
- Atlas TileCal rotated by 90° - M. Simonyan

MC and Data comparison

Good description at high energies.



Showers are too short.



Session 2 (15:10 Tuesday) : Isotope Choice, Combined Cross Sections and Elastic Scattering

- PDG codes for nuclei needed
  - Hisaya will implement
- G4QIsotope unifies different strategies for isotope abundances
  - Can calculate mean cross section
  - examples: G4QElastic, G4QCollision, …
- Isotope choice for user-define abundances
  - In general not implemented – will be for next release
- Nuclear masses:
  - Old-fashioned extrapolation of masses
  - Needs update (decay channels, isomers, hypernuclei)
  - Need to work with particle working group

Session 2 (page 2)

- Combined elastic process was released with 8.1
- It is possible to improve elastic scattering
  - N.Starkov is working now to provide HE model
  - M.Kosov will release improved model
  - Total elastic cross section may be improved
- Combined inelastic and elastic data sets are available with g4 8.1ref03
  - QBBC PhysicsList
  - Hadr01 example
  - Hadr00 example may be created (?)

Session 3 (17:00 Tuesday) : Bertini Speed, Coulomb Barrrier, Hadronic Examples and Benchmarks

- Optimization of Bertini speed by factor of 2.1
  - Replacing some dynamically allocated std::vector with static array-like structures
  - Repeated function calls replaced with std::map and lookup table structures
  - factory design pattern proposed to streamline kaon extension
- Coulomb Barrier not applied in all cases
  - Separation of Bertini submodels (spring 07') will make uniform application of barrier possible

Session 3 (page 2)

- Suggestions made for examples and documentation
  - Add hadronic novice example
  - Add extended hadronic example (Wigmans calorimeter?)
  - Executive summaries for hadronic models
  - Make recommendations for model/physics list use
- G4 still to complete 4 “grand validation” tasks
  - Task2 (NA49: p + C and 158 GeV/c)
  - Task3 (67 GeV thick target)
  - Task4 (PAL: neutrons from electro-production)
  - Task 6 (shower shape in Fe-Scint calorimeter: 10, 20, 50, 100 GeV)

Session 5 (15:30 Thursday) : New Hadronic Models

- Requirements for A-A interactions
  - ~100 MeV/A -> 10s GeV/A essential
  - 10s -> ~100 MeV/A, 100s GeV/A desirable
  - Kinematics of nuclear recoil important
  - See F. Lei's summary in Friday plenary
- Incorporating INCL-ABLA into Geant4
  - INCL4 Fortran available for translation
  - Internal release of C++ wrapper in Nov 06
  - First release of C++ version Apr 07, revision to follow

Session 5 (page 2)

- Proposed developments of CHIPS
  - Simulation of mu-nuclear reactions
  - Improvement of QGSC vs. QGSP
  - CHIPS approach to A-A reactions
    - Calculate cross sections
    - Final state generator: quark and gluon exchange algortithms of nuclear excitation

Hadronic Group Meeting (17:00 Thursday)

- G4NDL
  - Dropped V 0.2
  - Will ask SB, OB to advise on issue of export control for sensitive isotopes
- Review of two-coordinator concept
  - Need stronger leadership on critical problems (such as hadronic showers)
  - Clarify coordinators responsibilties
  - More communication with group
  - Decide for now not to change organization
  - Coordinators should promote clear group mission
  - Improved working atmosphere acknowledged

Hadronic Group Meeting (page 2)

- Shower shape action items
  - Compare with Fluka (Alberto)
    - suppression/enhancement of eta, etaprime,rho
  - Look at diffraction (need more data for comparison, papers for explanation – Dennis will search)
  - Try alternatives to QGS (John)
  - Validate/revise inelastic cross sections (Vladimir G.)
  - Continue revision of elastic (Mikhail, Nikolai, Vladimir I.)
  - Check neutron production/transportation (Alex)
- Acknowledged OB request for Geant4 review
  - Large hadronic component expected
  - Worry about it after December