Physics Lists

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Overview

- Status of physics lists

- Improvement of Physics Lists

- Evolution of Physics Lists: new or revise?

- How to validate test Physics Lists ?

- Documentation

- Differences between physics performance

- New application areas and requirements

Status of physics lists

- HEP Production
- Physics List by Application Area
  - advanced examples
- External physics models – and lists ?
  - JQMD, DPMJET, ..

Improvement of Physics Lists

- Mixing models
  - Criteria for transitions between models
    - Brainstorming
    - Critical filtering

- Unified physics modeling
  - New CHIPS physics list
    - Presentation: M Kosov

Criteria for transitions between models

- Brainstorming – collecting suggestions
  - Energy response by particle type
    - Lost energy (neutrinos, nuclear breakup)
    - Energy into neutrons
  - Angular distribution (d2s / dE dW)
    - Mean or quality factor
  - Multiplicity (for calorimeter less important)
  - Conservation of energy/momentum
    - Necessary for energy resolution
    - At what level: GeV ? 100 MeV ? 1 MeV ? 1 keV?
  - Fluctuations of energy going into electromagnetic (gamma, e+/e-)

…

- How to match several quantities?
- Process for mixing
  - By priority or across different ?
  - By eye or minimizing chi^2 ?
- Priority
  - Visible energy, EM
- Recall also coupling between models
  - And choice of de-excitation or reinteraction

Revise or create new Physics Lists?

- Development of new Physics lists (PLs) vs revising existing PLs

- Production physics lists - conservative evolution

- Experimental/development PLs
  - Uses and Proliferation

- Addressing confusion
  - Identifying experimental physics lists (vs production PLs)

Experimental/development PLs

- Needs
  - Created novel versions
    - Different combinations (eg QGSP_FTFP_BERT)
    - Revised thresholds (e.g. FTFP_BERT_TRV)
      - Bertini to FTF/Preco between 6 and 8 GeV
  - Try as candidates for addressing issues
- Benefits
- Challenges and Impact
  - Proliferation: many new physics lists
- Actions?

How to validate / test?

- How to test new Physics Lists
- Existing tests
  - simplified calorimeters
- Identifying a comprehensive suite of validation tests to be run
  - To address key use cases (by application area)
- Improving validation and creating

Documentation

- Status of documentation
  - Efforts since Kobe

- Separation
  - Use cases
    - Requirements, validation
  - Physics list 'engines'
    - Strengths, weaknesses, ..

- How to improve documentation ?
  - Next steps

Differences between PLs

- Understanding & explaining the differences between PL we provide ?
  - Underground (starting point?)
  - Hadron-therapy / medical ?
  - ILC physics list
    - people did not understand it (BERTini up to 13 GeV?)