Validation for LHC experiments

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Current status

- simplified calorimeter
  - ATLAS TileCal, LHCb HAD Fe/Scintilator
  - ATLAS ECal Pb/Ar
  - ATLAS HEC Cu/Ar
  - ATLAS FCal W/Ar
  - CMS ECal Pb/WO4
  - LHCb EM Pb/Scinilator
  - CALICE W/Scintilator
  - ZEUS Pb/Scintlator

Open points

- resolution
- lateral shower shape
- non conservation of important quantities

LHCb request

- validation of thin target
- observables relevant for trackers
  - multiplicity
  - cross sections

What should be done next?

- **Neutron interactions** (even at low-E) are very important to study details of showers
  - Only study so far to show clear effect in lateral shower shape
  - In some cases (time structure) are mandatory to correctly describe data
  - Preliminary results: Doppler broadening not needed (import CPU time saving)
  - **Need dedicated validation of neutrons on scintillators (recoil of H nuclei)**
- **Adding of a cascade backend** to string model (to de-excite nucleus)
  - Hints that can make shower longer (FTF has discrepancy between TileCal and CALICE)
  - Improve agreement with data for resolution
- **A review/tune of π0 production** from FTF could:
  - Reduce visible energy (that is at the moment too high)
  - Increase agreement for resolution

Naive proposal

- We have not yet studied in detail the role of Precompound/deexitation model for HEP experiments
  - But we know it is very important and we need it. I would not be surprised if in the future it will become an “hot” topic
- CALICE data show FTF_BIC is not so bad...
  - And we have thin-target data showing BIC is even the best model in some cases
- A possible future “universal physics list for calorimetry”
  n:HP + BERP + p,n:BIC + FTF+BIC/BERP