Proton/Ion Bragg Peak Validation

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Introduction

- The verification of Bragg peak simulation was carried out for different proton/ion beams in water phantom
- The special application IION have been developed
- The results were reported in Bordeaux
  - Results indicates number of problems in 7.1

Hadr01

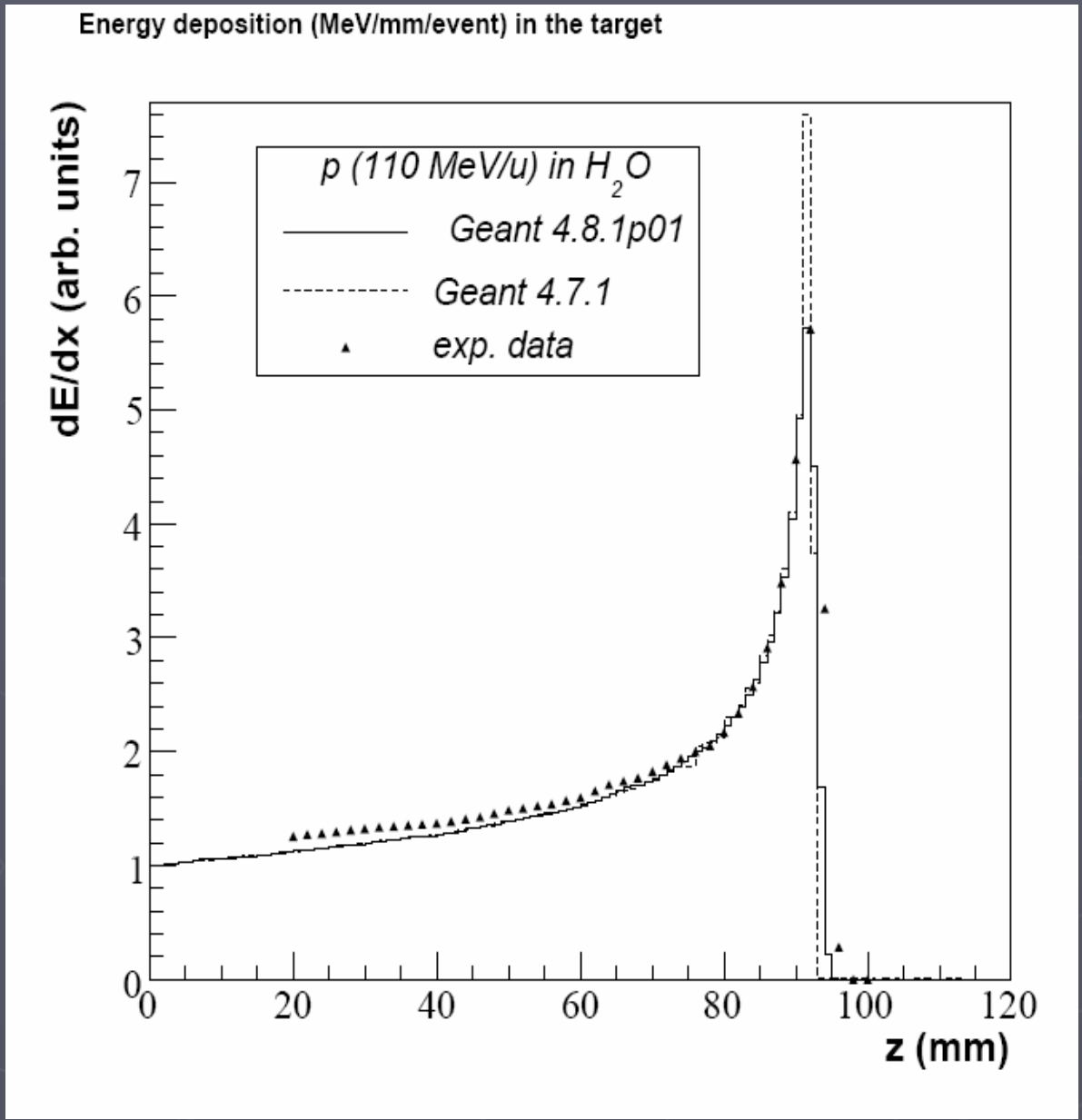
- The IION application was transformed to first extended example Hadr01 and released with G4 8.1
- Hadr01 is used for systematic control on Bragg peak

Simulation Conditions

- QGSP_BIC Physics List
- 0.1 mm cuts
- 30 cm cylindrical water target
- Selected set of beams with data available
  - Proton 110 MeV
  - He4 144.3 MeV/u
  - C12 100 MeV/u

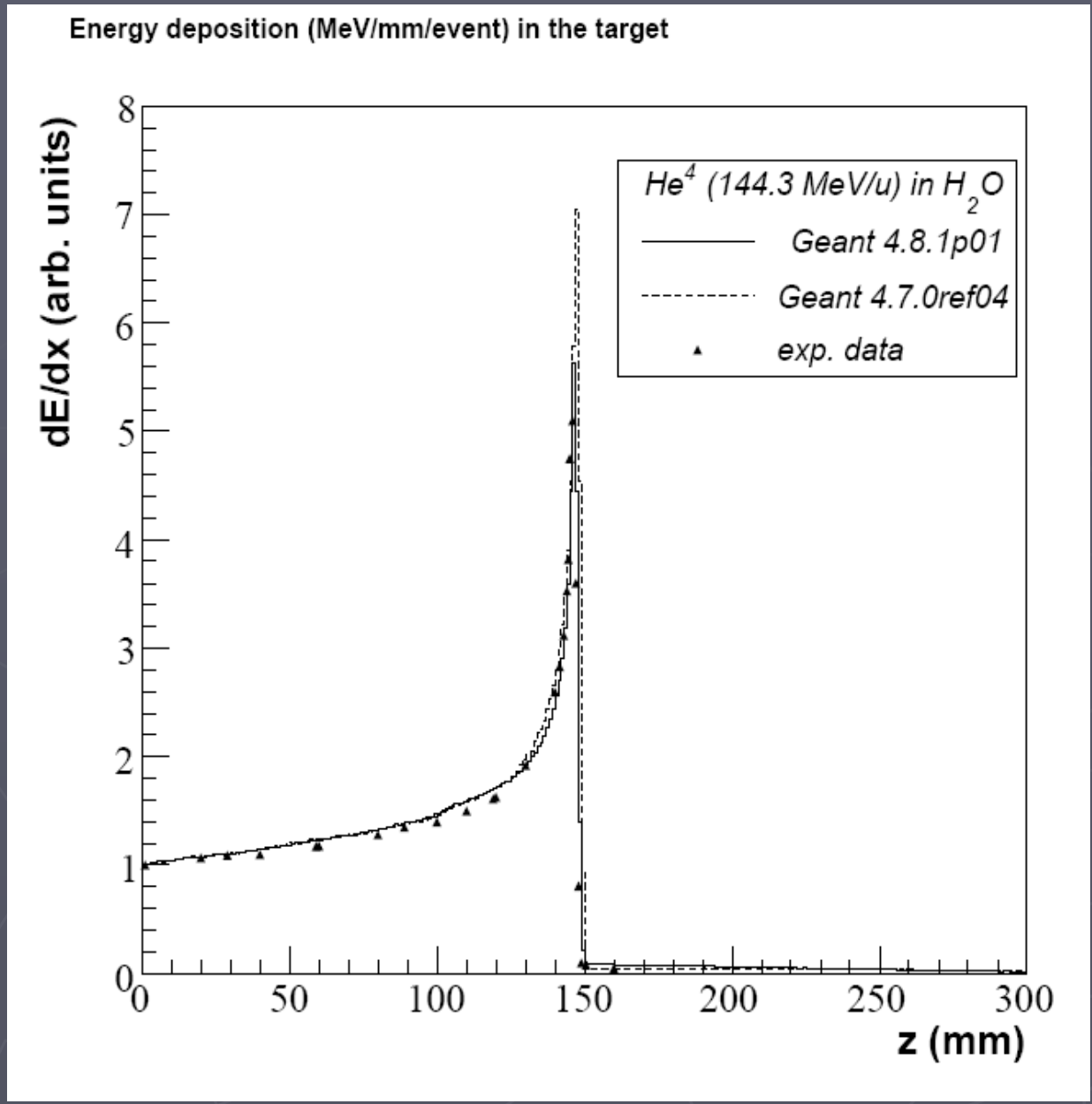
Protons

- Data are shifted for 1 mm
- Bragg peak shape is much more closed to data for 8.1
- Effect of elastic scattering model upgrade and stopping power upgrade

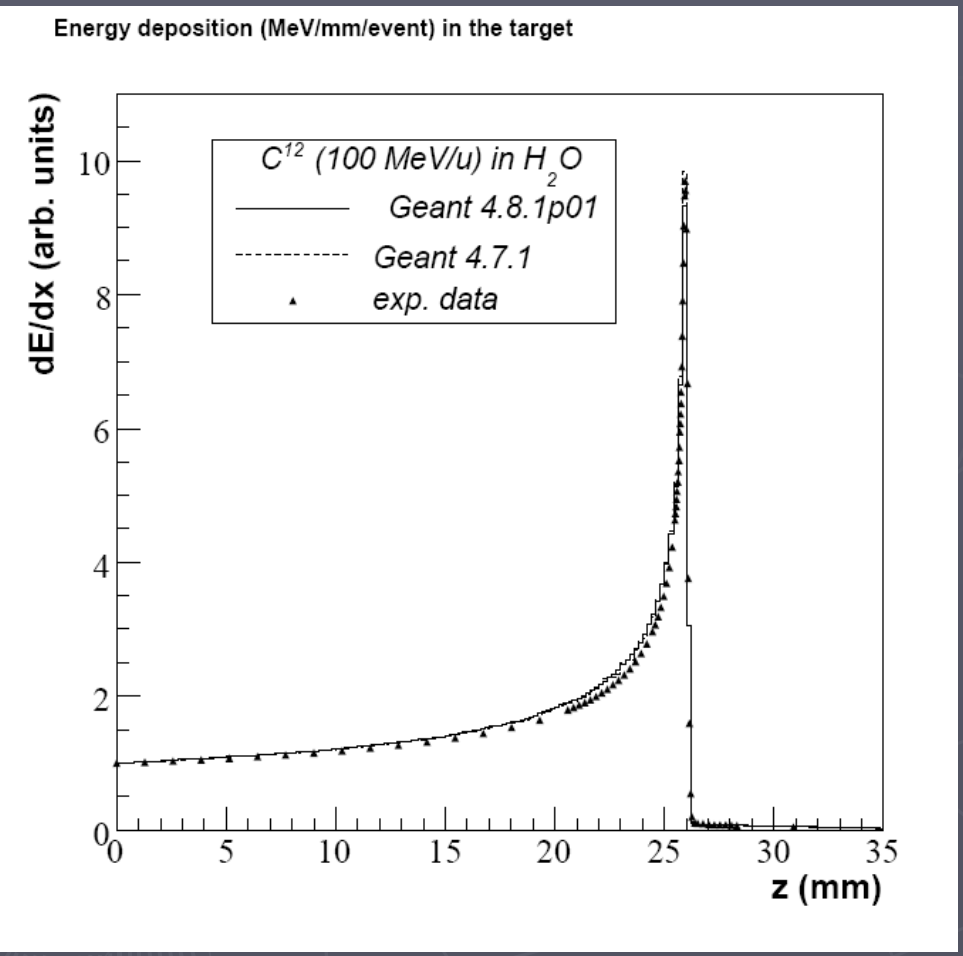


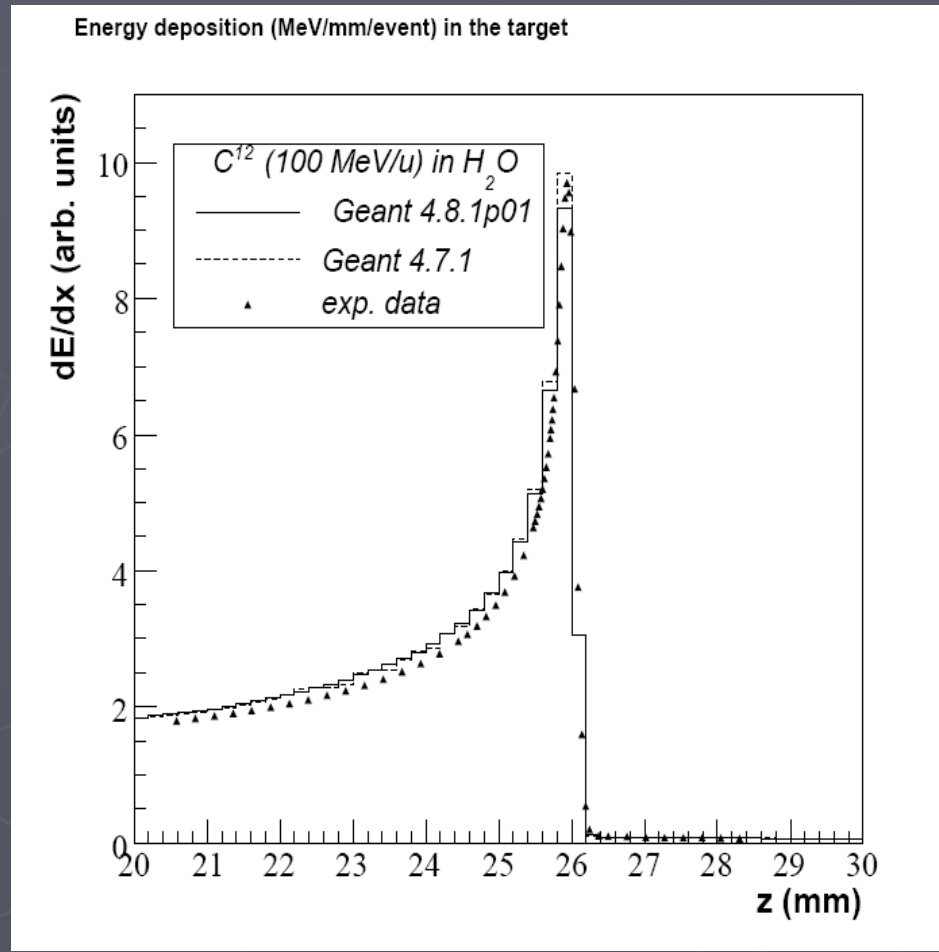
He4

- Data are not shifted
- Bragg peak shape is much more closed to data for 8.1
- Effect of elastic scattering model upgrade and stopping power upgrade



C12 in water (data shifted for 0.2 mm)





Conclusions

- Recent upgrades improve Bragg peak simulation
  - Maximum effect on protons because of elastic scattering upgrade
- Not absolute coincidence simulation/data
  - Systematic should be better understood
- The routine procedure of control on Bragg peak is established
  - Will be move to EM validation suite