

Therapeutic ^{12}C Range Benchmarking in Geant4

UOW: Bolst, Guatelli, Rosenfeld

INFN, Catania: Cirrone, Cuttone, Milluzzo, Pandola, Romano, Tramontana



UNIVERSITY OF
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First results: Bragg peak validation

- ▶ **Comparison to Haettner 2013** (Bragg Peak position and fragmentation products)
- ▶ **Testing**
 - EM Physics: Standard Option 3.
 - Alternative Hadronic physics:
 - Binary Ion Cascade
 - QMD
 - QMD + multifrag
 - QMD + multifrag + Fermi Break up
 - QMD + FermiBreak up
 - INCL
 - INCL + multifrag
 - INCL + multifrag+ Fermi Break up
 - INCL + Fermi Break up
- ▶ **Code: Geant4 advanced example hadrontherapy**

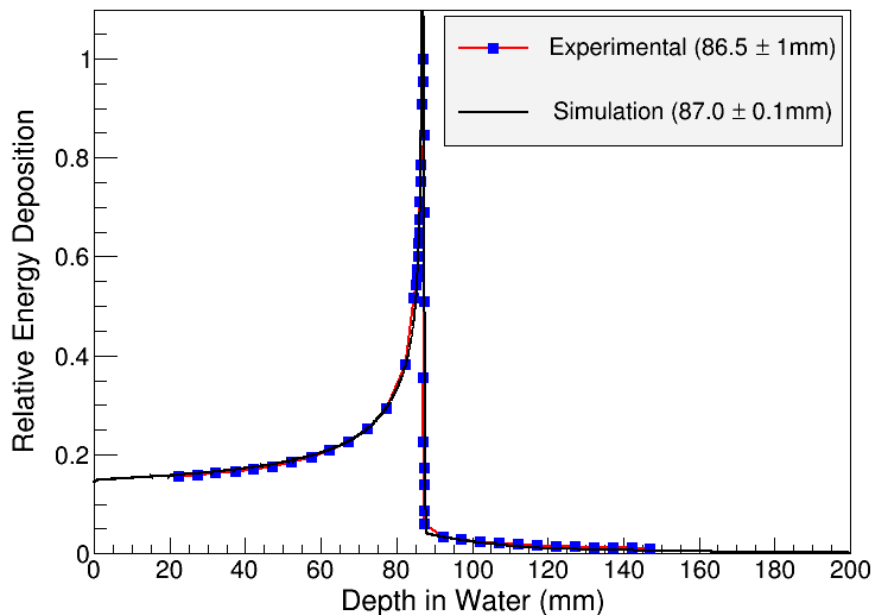
C-12 ion beam



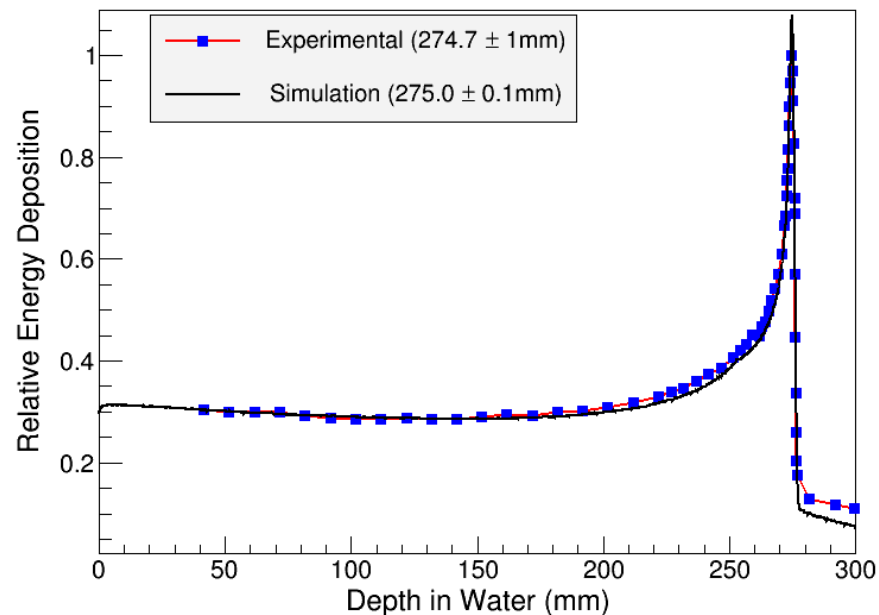
NIST_water
box

Step limit 0.05mm
Cut size 0.1mm

First results



200MeV/u



400MeV/u

Good agreement in position of the Bragg Peak
Next step: statistical analysis

Things to do...

- ▶ Quantitative test (% Difference)
- ▶ Statistical analysis
- ▶ Compare all different hadronic physics approaches
- ▶ It seems there is no documentation explaining how to activate the fragmentation and Fermi Break up which are not the default.

Activity recently started.

PhD student involved: D. Bolst



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