

Preliminary Validation of Proton Beams in Water

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Geant4 EM Meeting

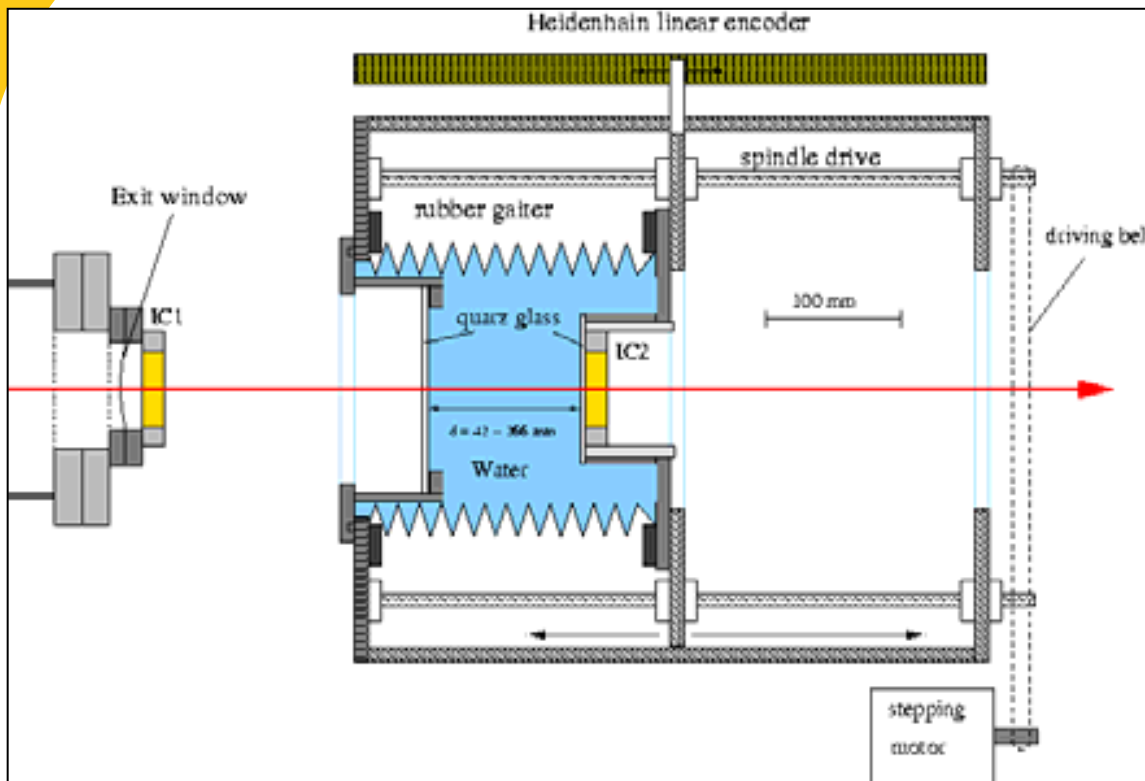
March 9th, 2015



Geant 4

Experimental Setup

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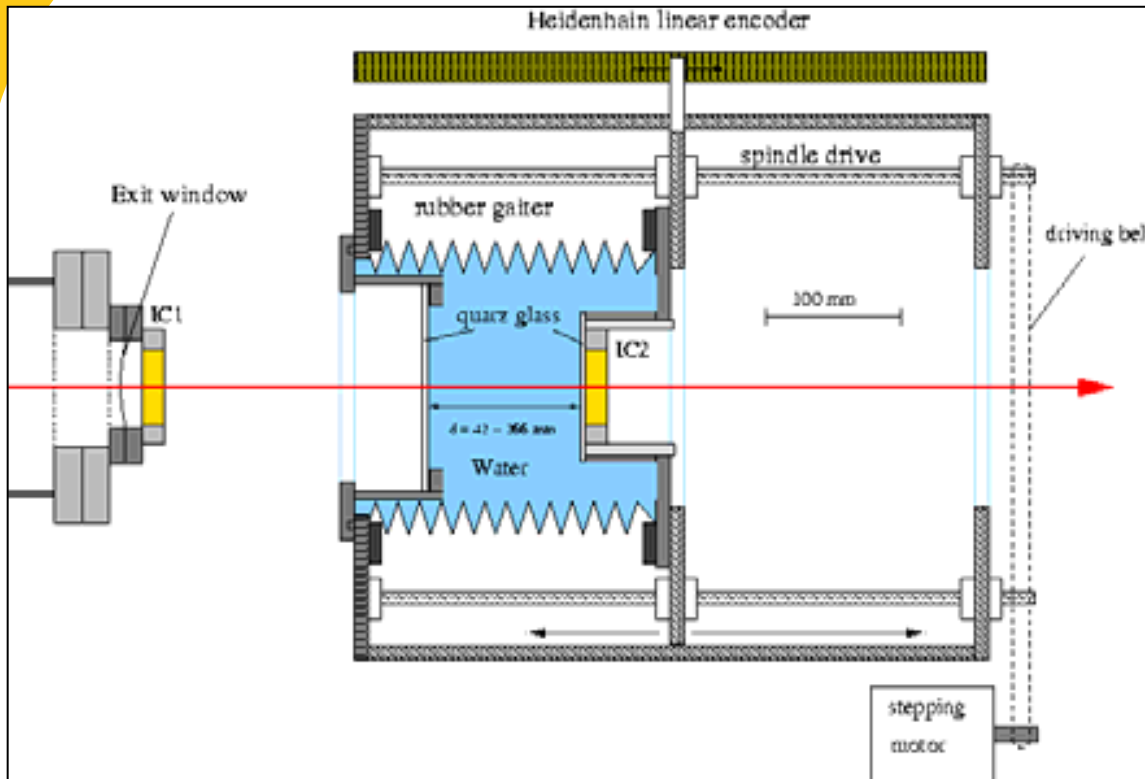


- Relative ionization measurements (IC2/IC1) courtesy of D. Schardt (GSI).
- Precise measurement of absolute depth in water.
- Reported uncertainty of 0.2 mm for the Bragg peak absolute depth.

D. Schardt *et al.*, GSI Scientific Report 2007

Simulated Setup

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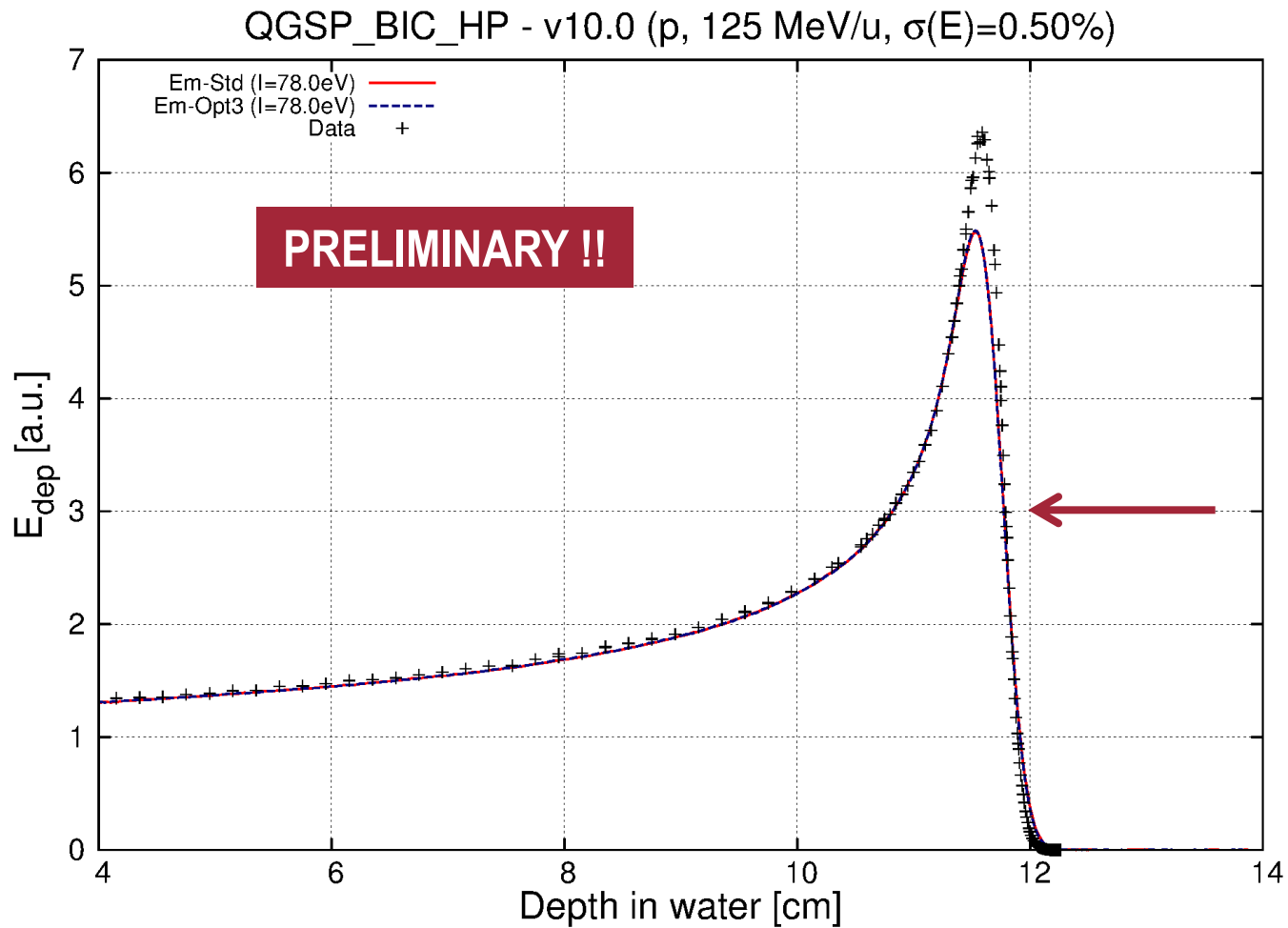
D. Schardt *et al.*, GSI Scientific Report 2007

- Just a water tank (G4_WATER).
- Water density corrected according to report (24°C, 0.997 g/cm³).
- Energy deposition scored in cylindrical voxels along beam axis, with same radius as IC2 (28 mm). Thickness of 50 microns, similar to water equivalent thickness of ICs.
- First-order approximation beam parameters (pencil beam, 0.50% energy spread).

Results (v10.0.2)

4

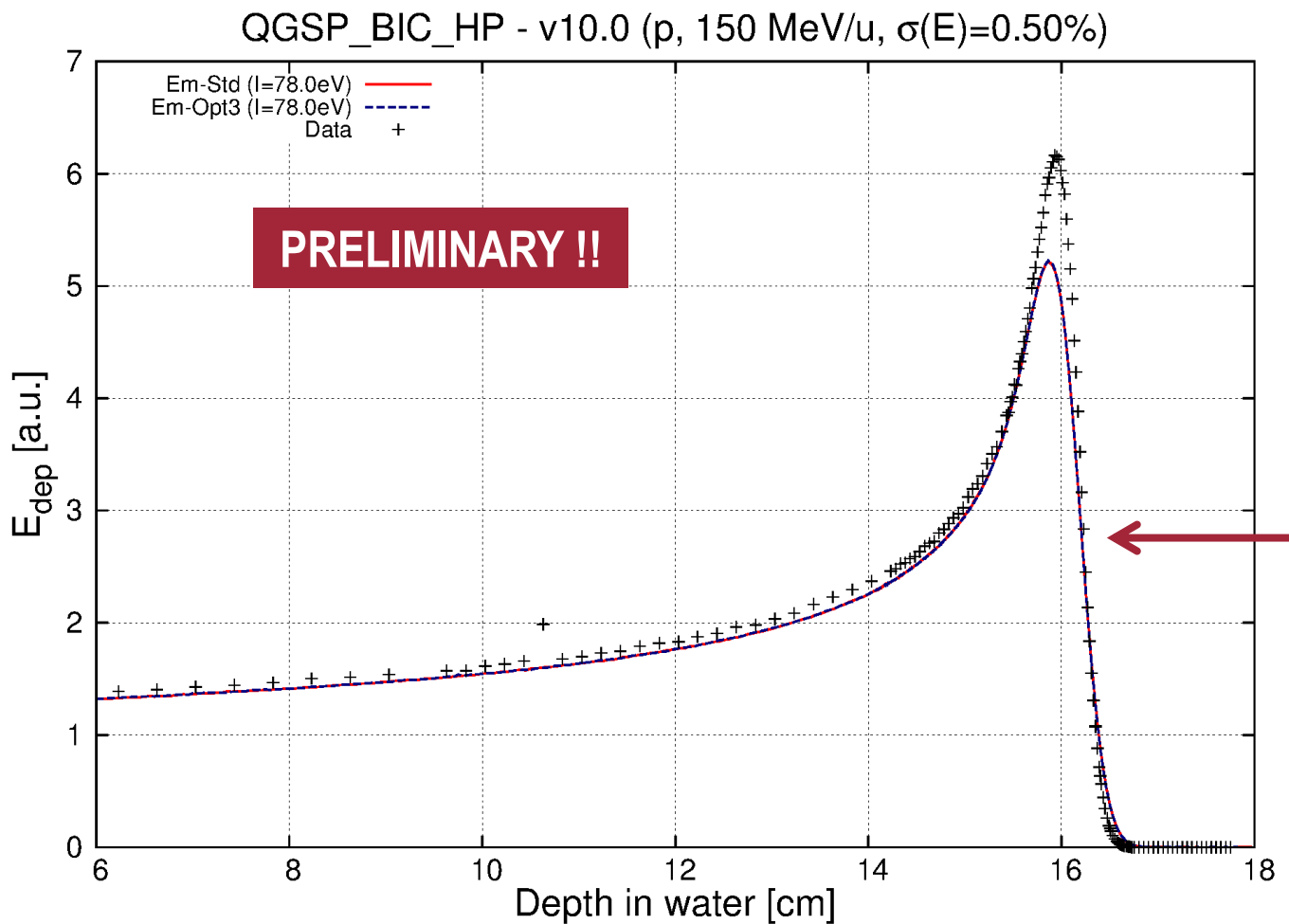
QGSP_BIC_HP – 125 MeV/u



Results (v10.0.2)

5

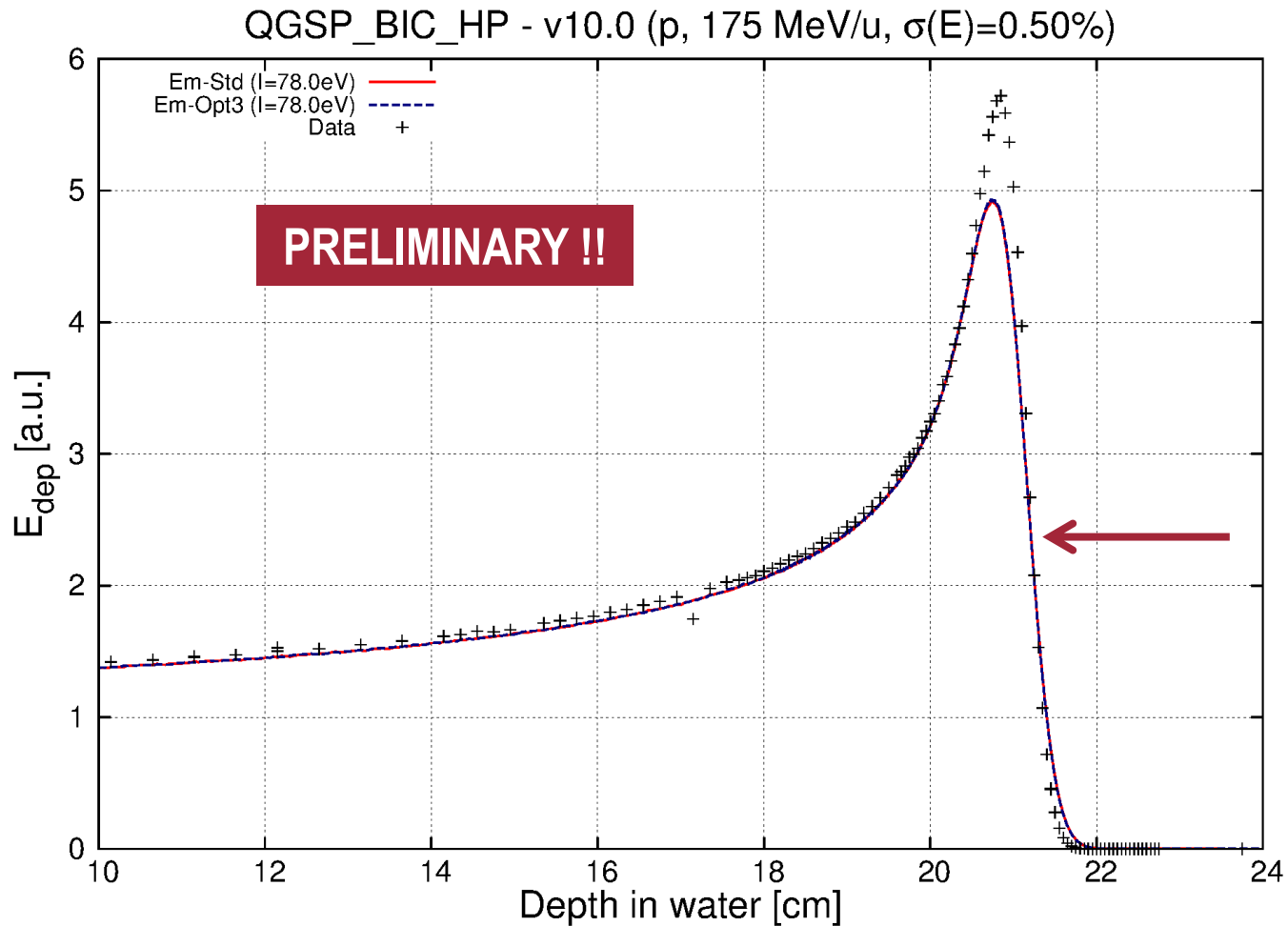
QGSP_BIC_HP – 150 MeV/u



Results (v10.0.2)

6

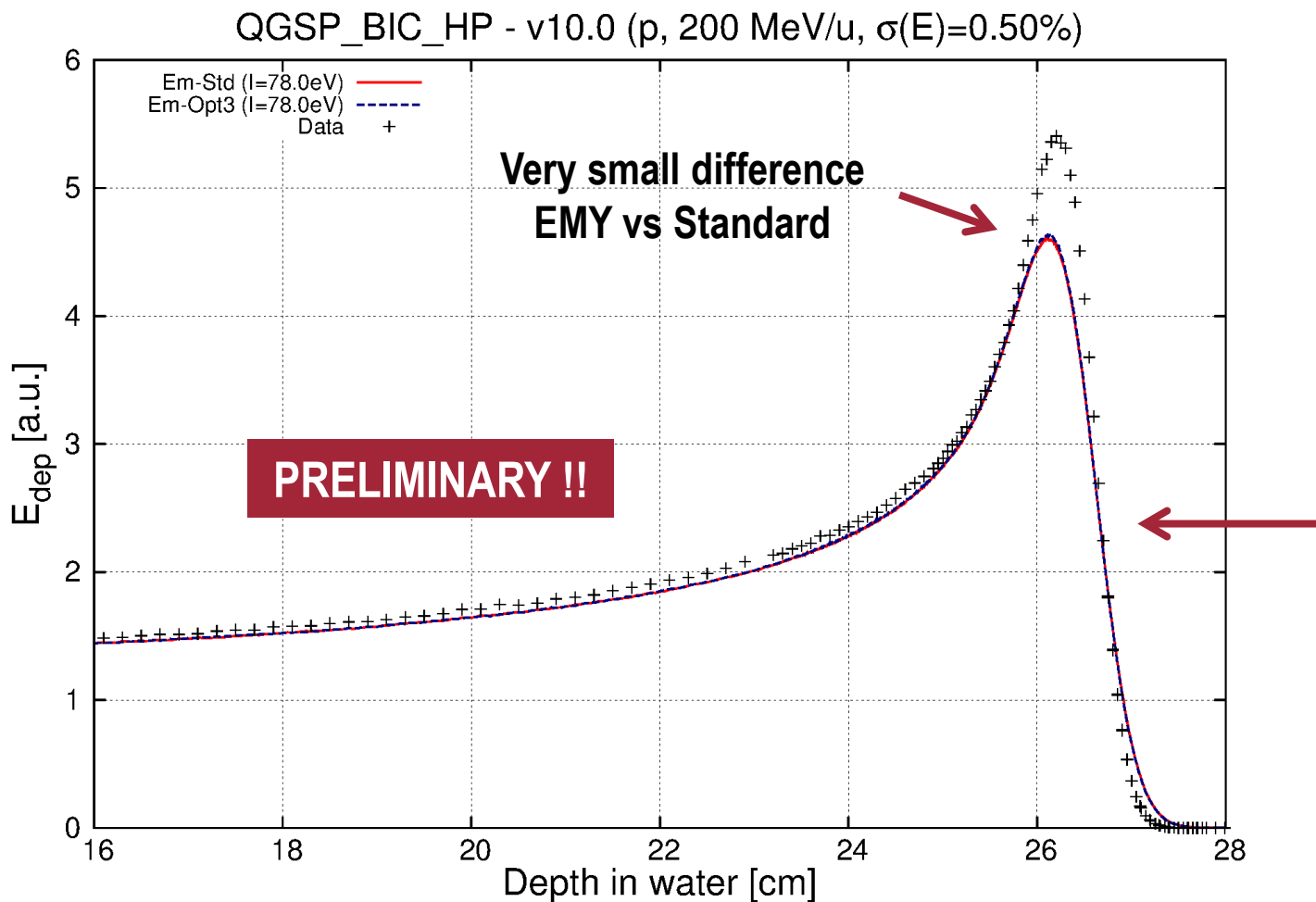
QGSP_BIC_HP – 175 MeV/u



Results (v10.0.2)

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QGSP_BIC_HP – 200 MeV/u



Conclusions & Perspectives

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- Excellent agreement with experimental absolute Bragg peak position in these preliminary comparisons.
 - A better agreement is expected once beam parameters have been fine tuned.
- Opportunity to adjust water I-value with precision < 0.5 eV (?)
- More precise verification of peak-to-plateau ratio pending...

Thanks for your attention