Update of *LightIonBraggPeak* test with Li and O data

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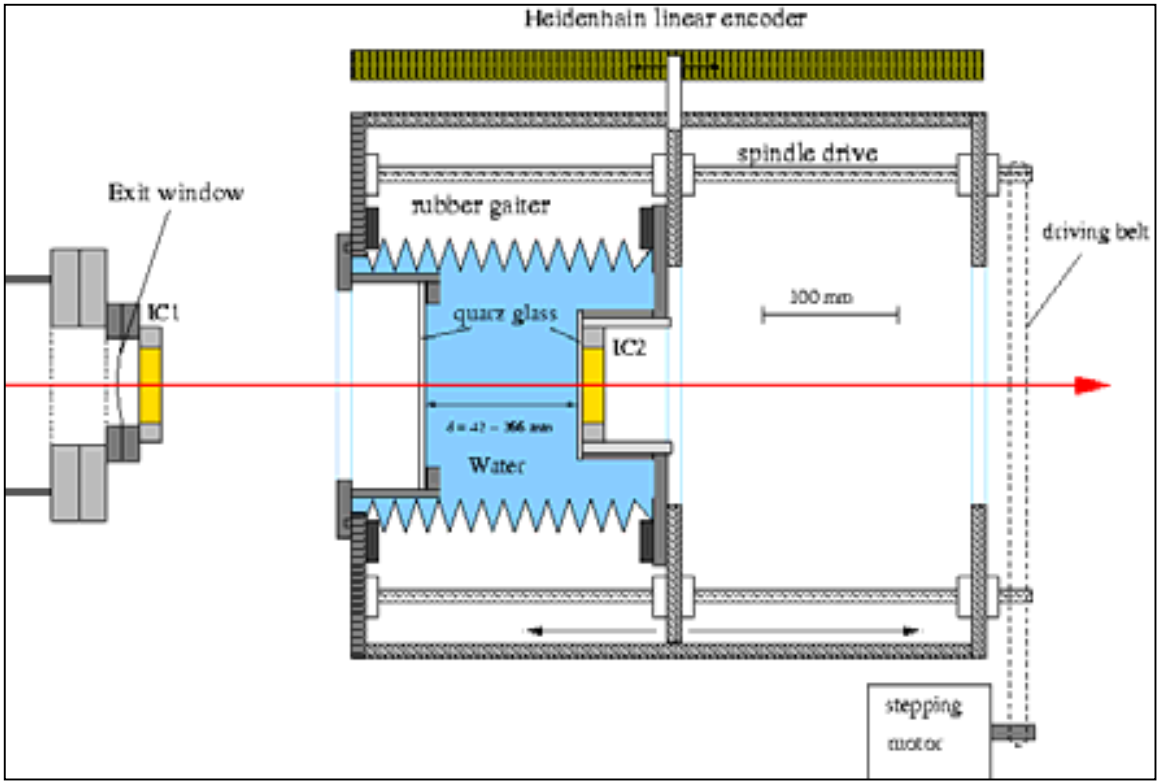
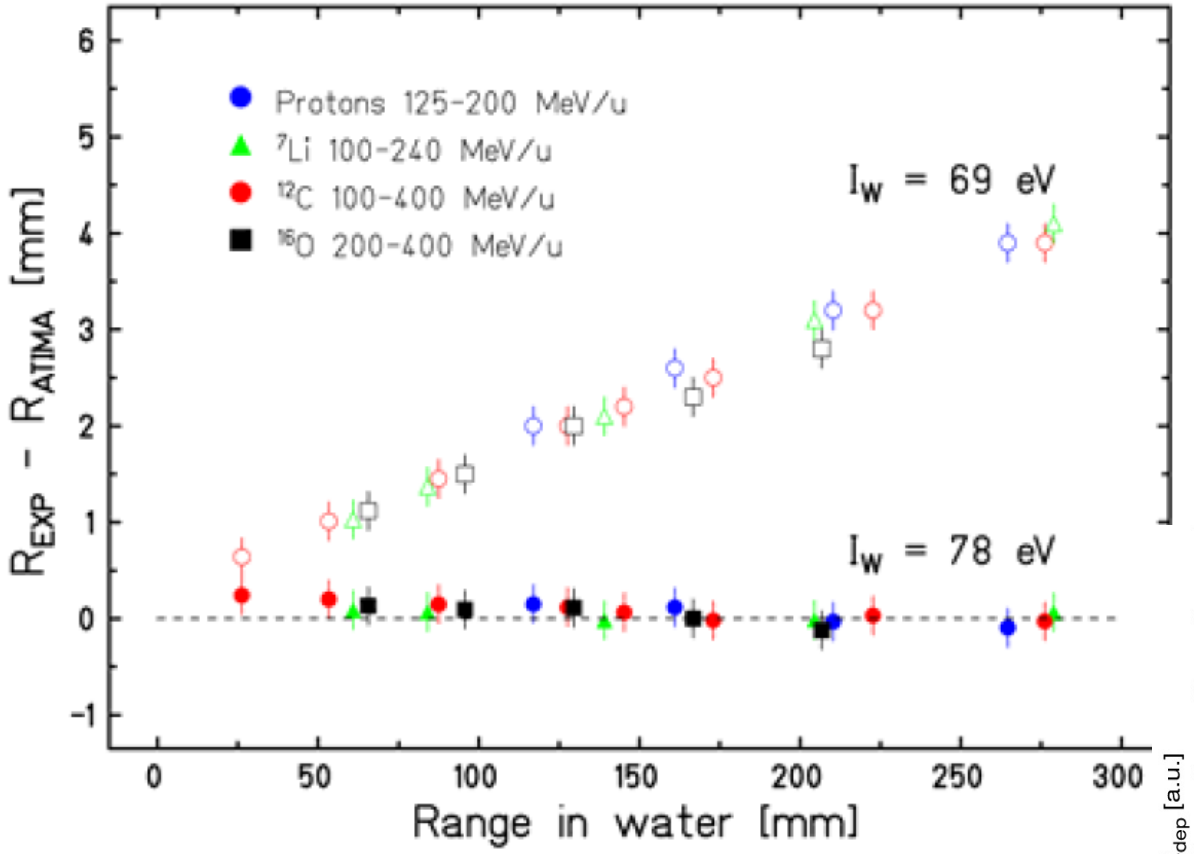
Experimental setup



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

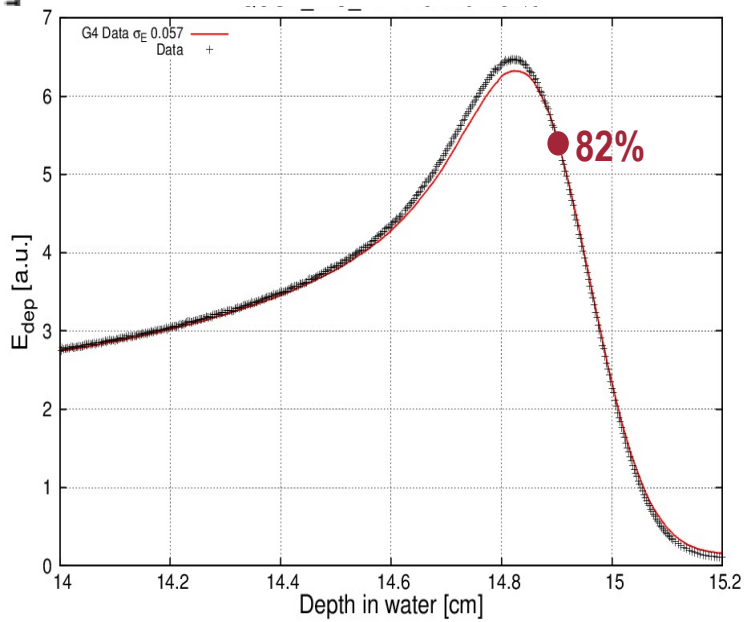
- Relative ionization measurements (IC2/IC1).
- Precise measurement of absolute depth in water.
- Beam angular aperture negligible (defocused at collimator)
- Reported uncertainty of 0.2 mm for the mean range determination, using the 82% distal depth.

Reference data

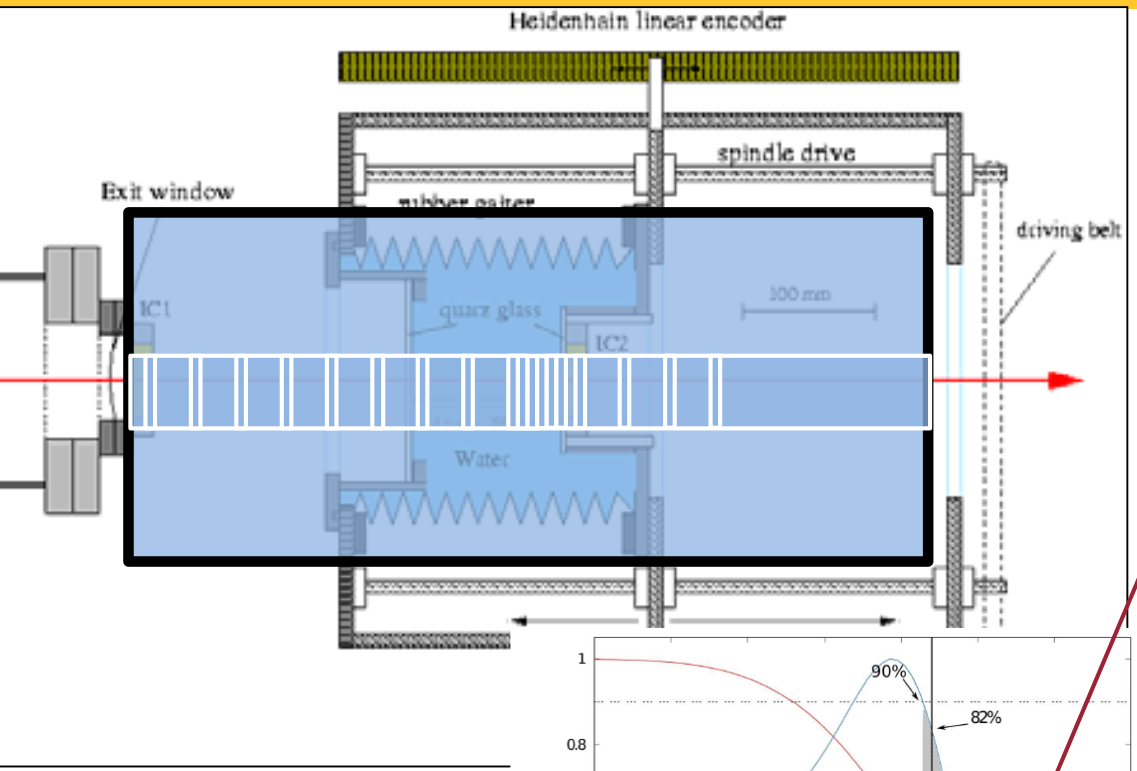


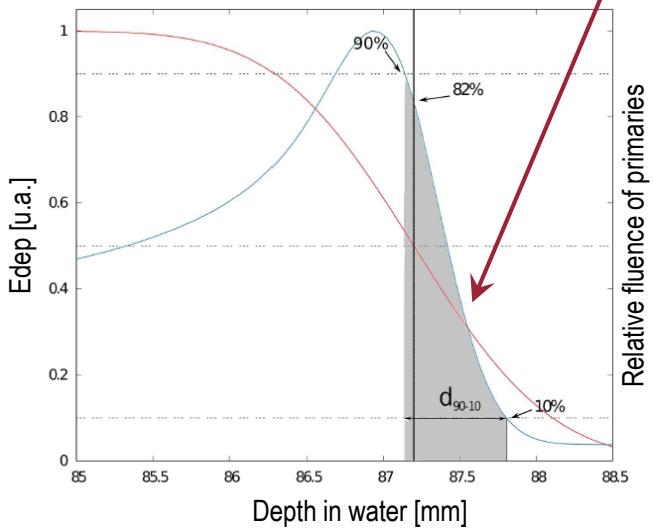
D. Schardt et al., GSI Scientific Report 2007

- "Range" defined as the **depth** where dose is **82%** of máximum, **distal to Bragg peak**



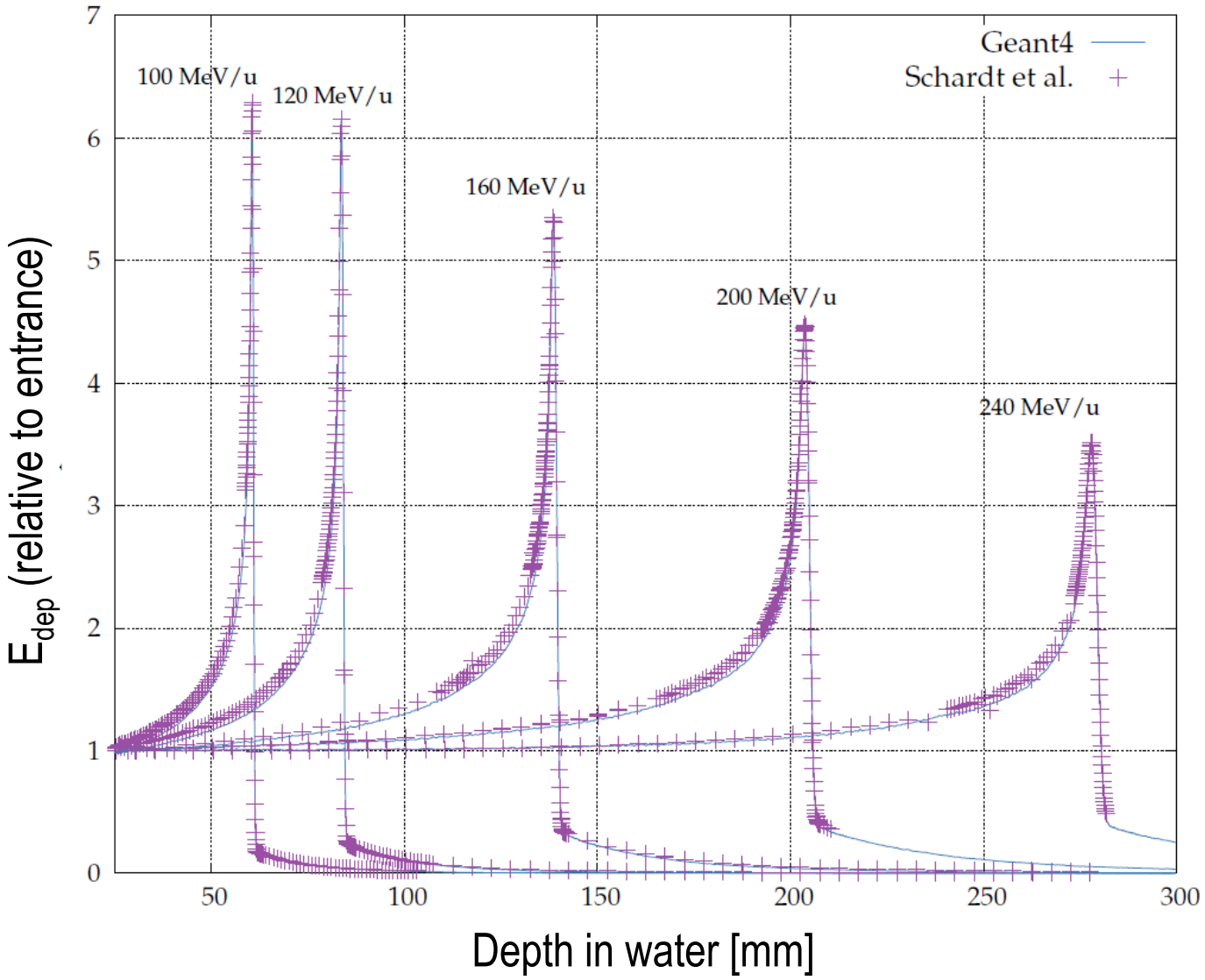
Simulated setup



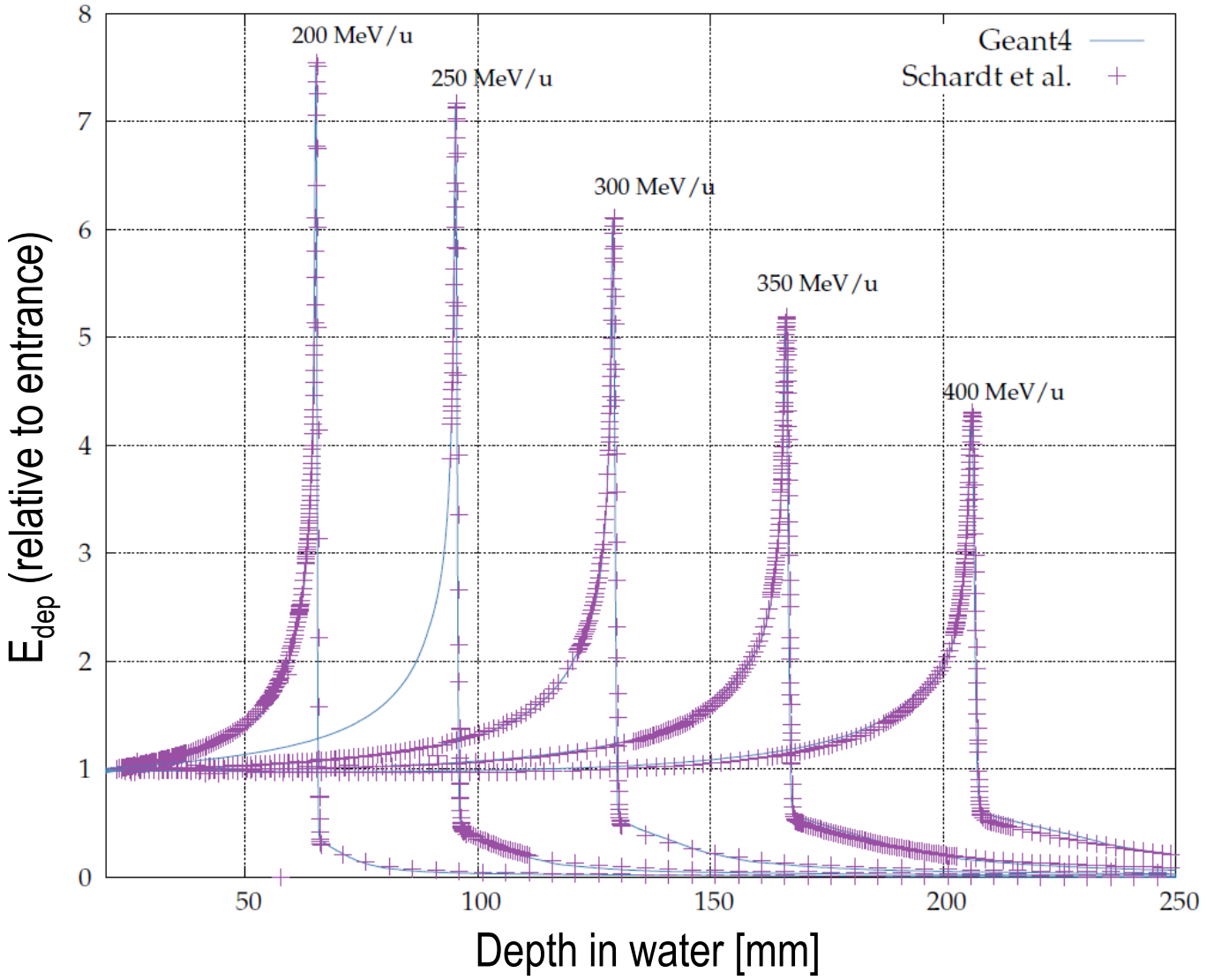


- **G4_WATER** tank.
- Water density corrected according to report (24ºC, **0.997 g/cm^3**).
- Beam energy spread set by matching experimental distal penumbra (**90%-10%**).
- Energy deposition scored in cylindrical voxels along beam axis, with same radius as IC2 (28 mm). Thickness of 50 µm, approx- water equivalent thickness of ICs.
- Pencil beam, no angular divergence.

New Incorporated data – Lithium-7



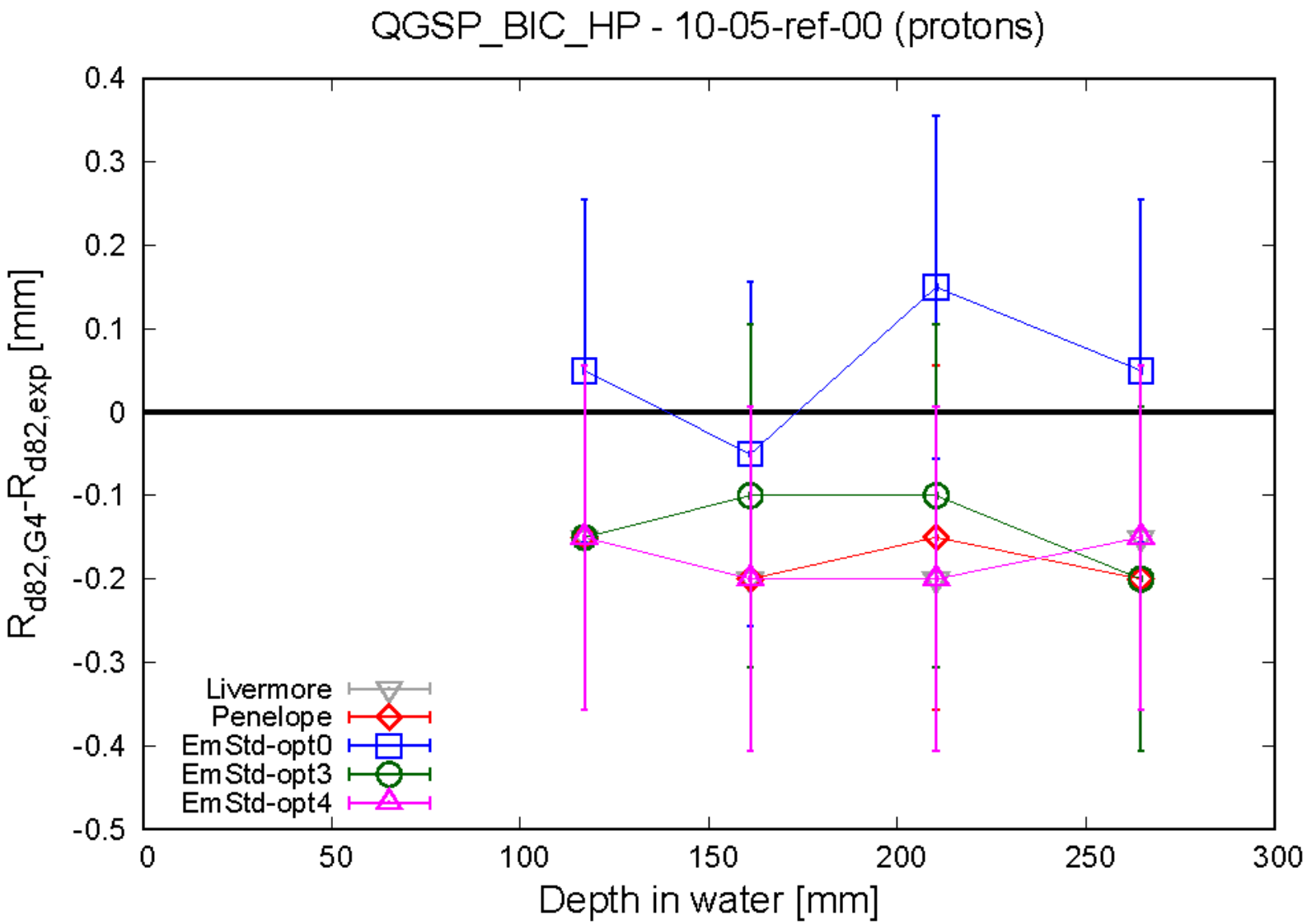
New Incorporated data – Oxygen-16



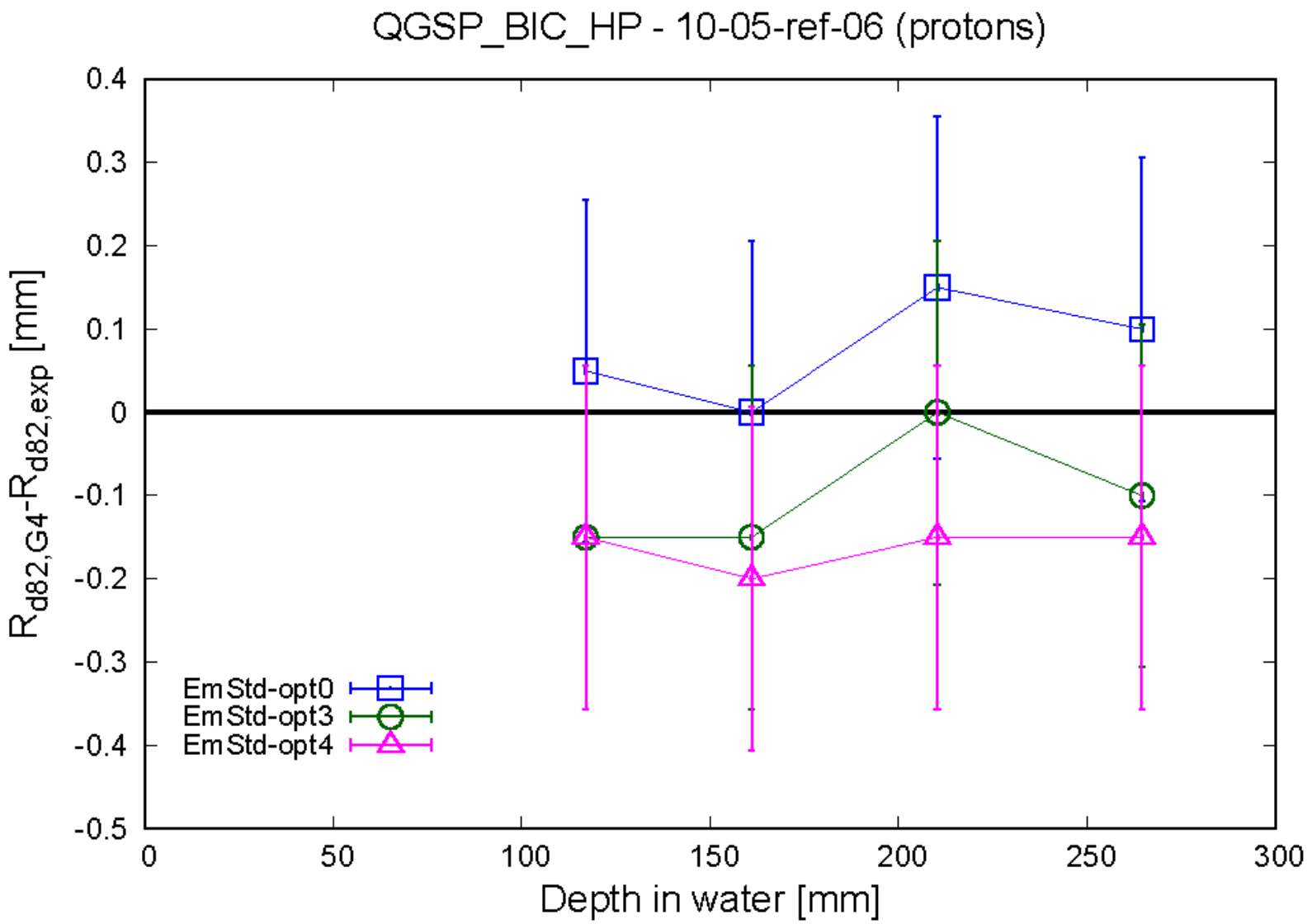
Results

geant4-10-05-ref-00
&
geant4-10-05-ref-06

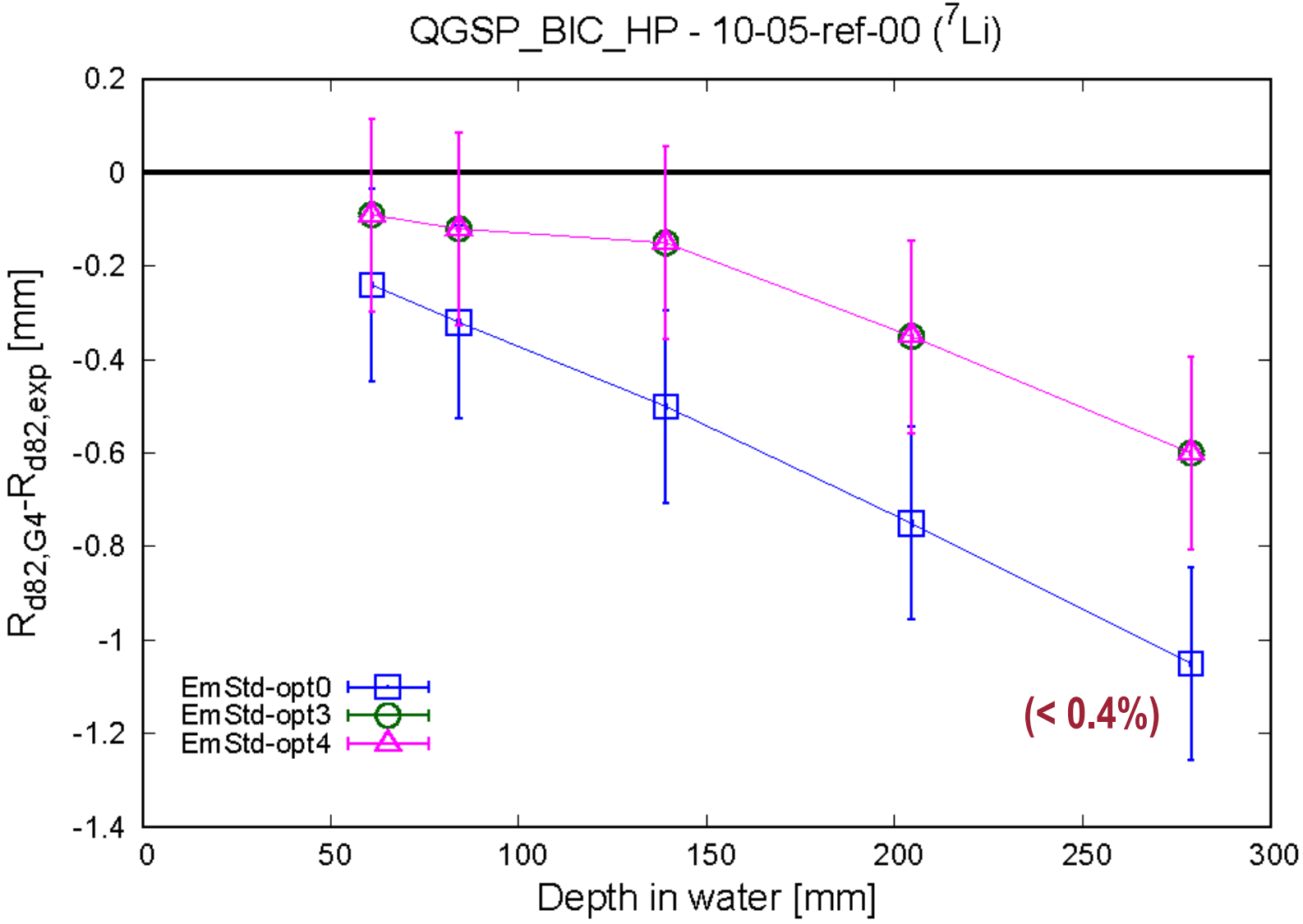
Protons (125-200 MeV)



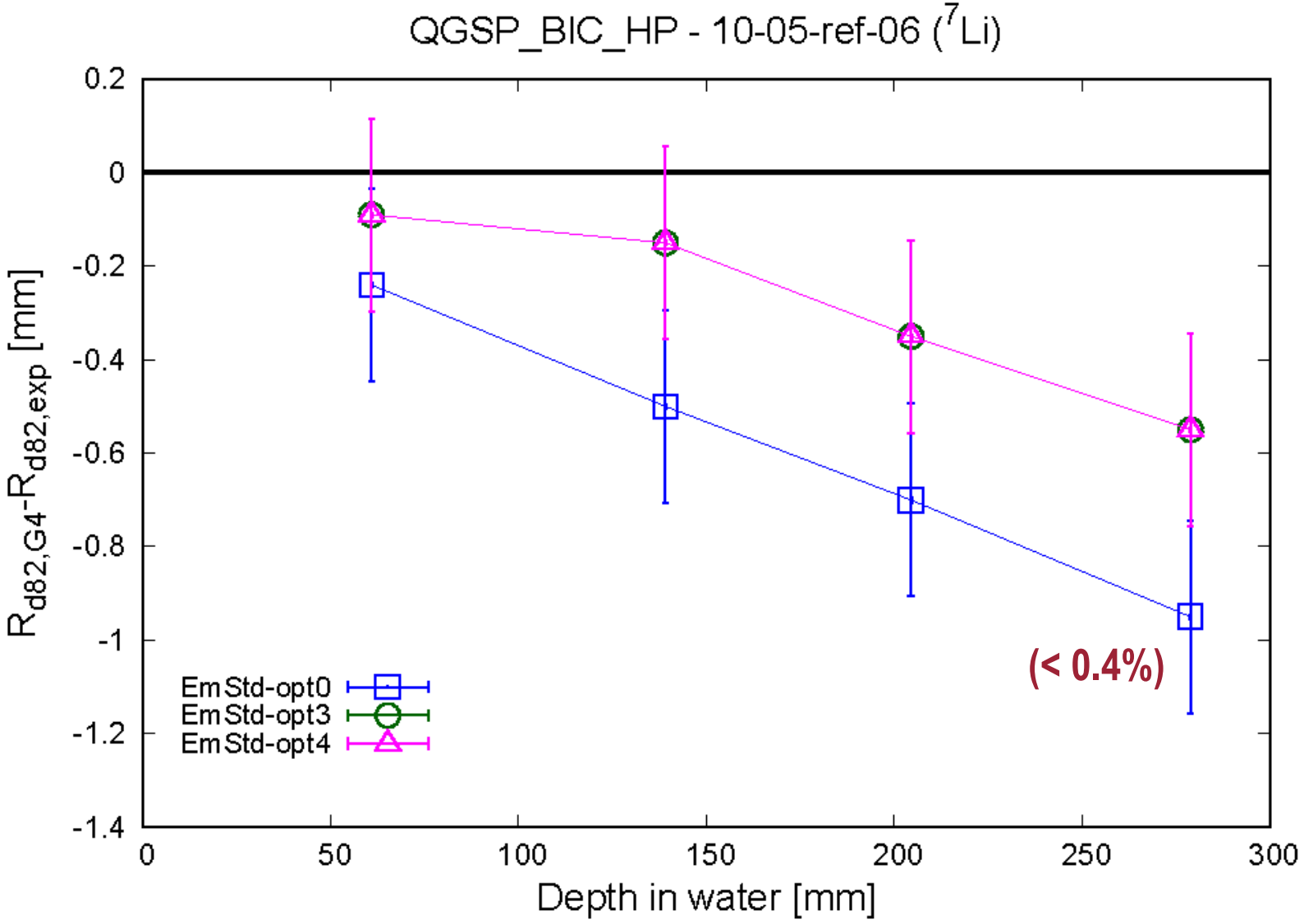
Protons (125-200 MeV/u)



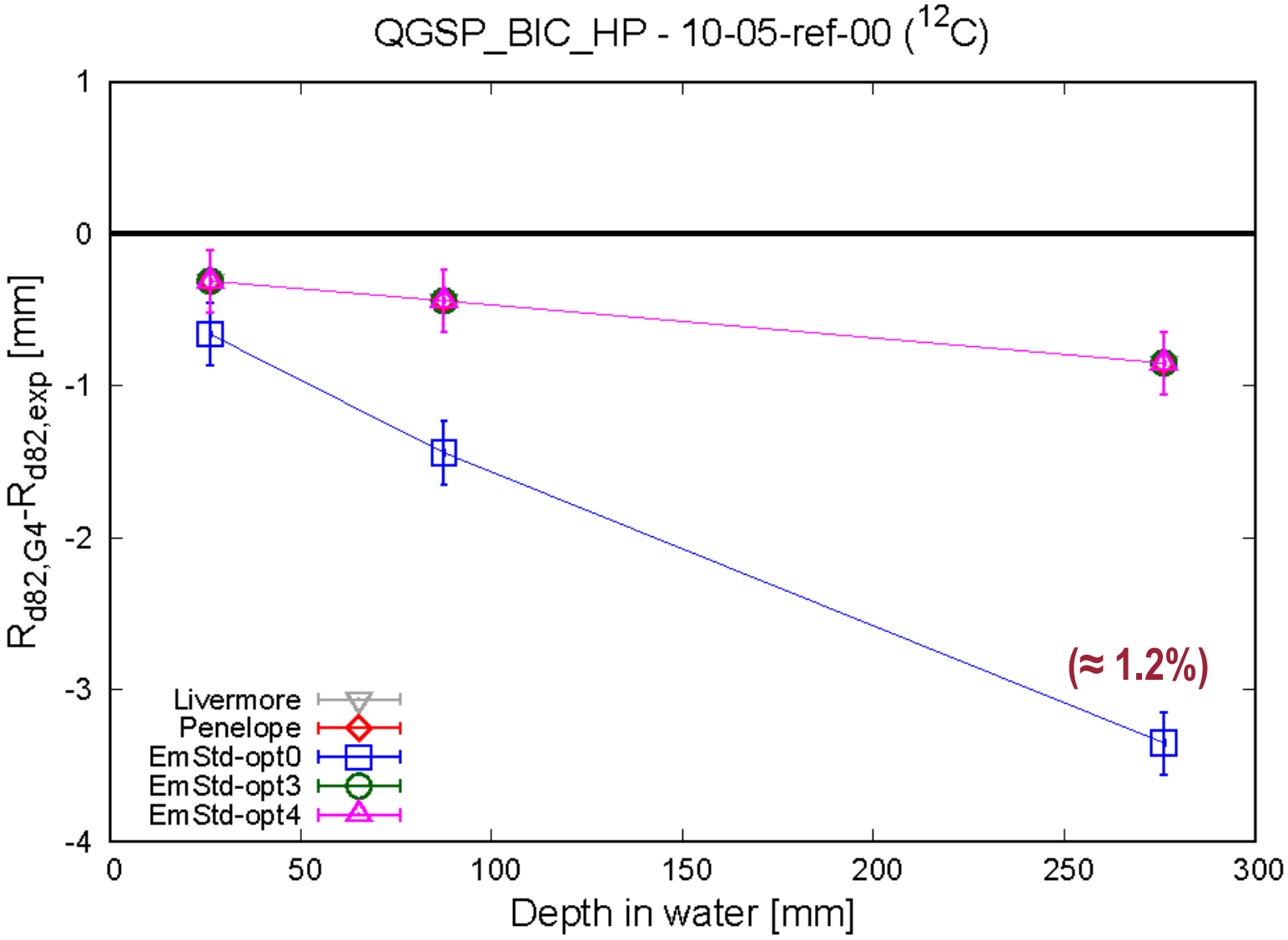
^{7}Li (100-240 MeV/u)



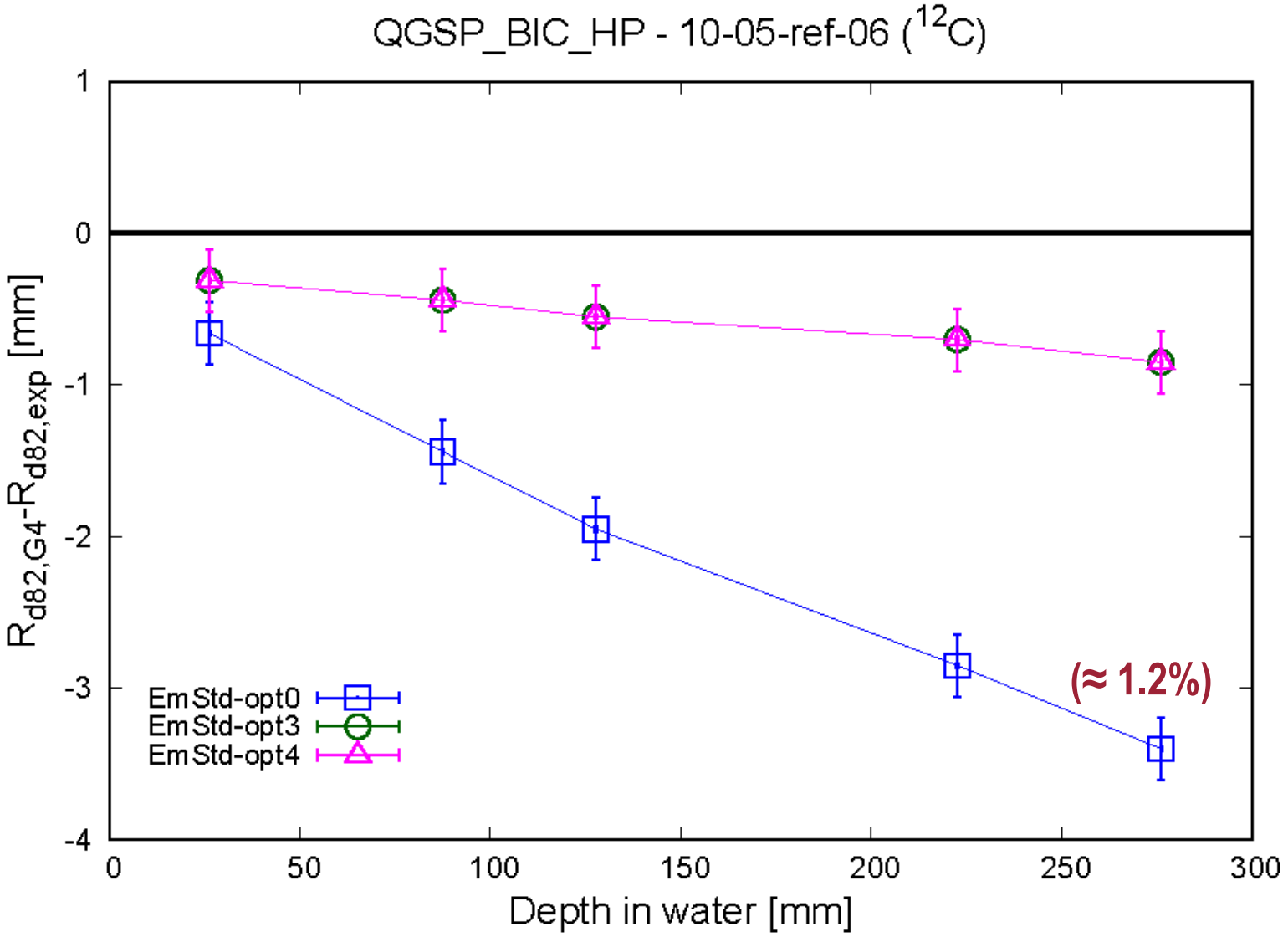
^{7}Li (100-240 MeV/u)



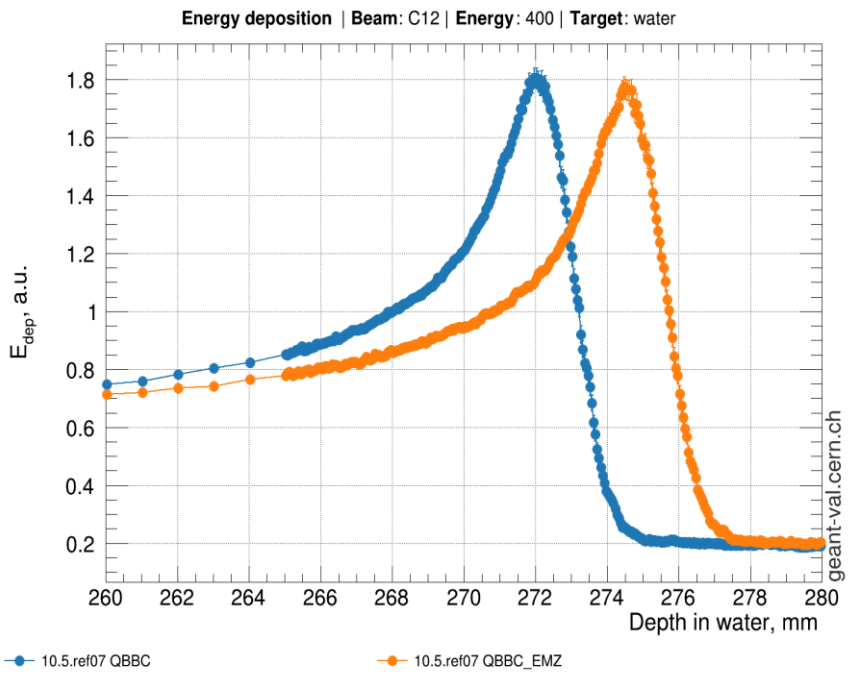
^{12}C (100-400 MeV/u)



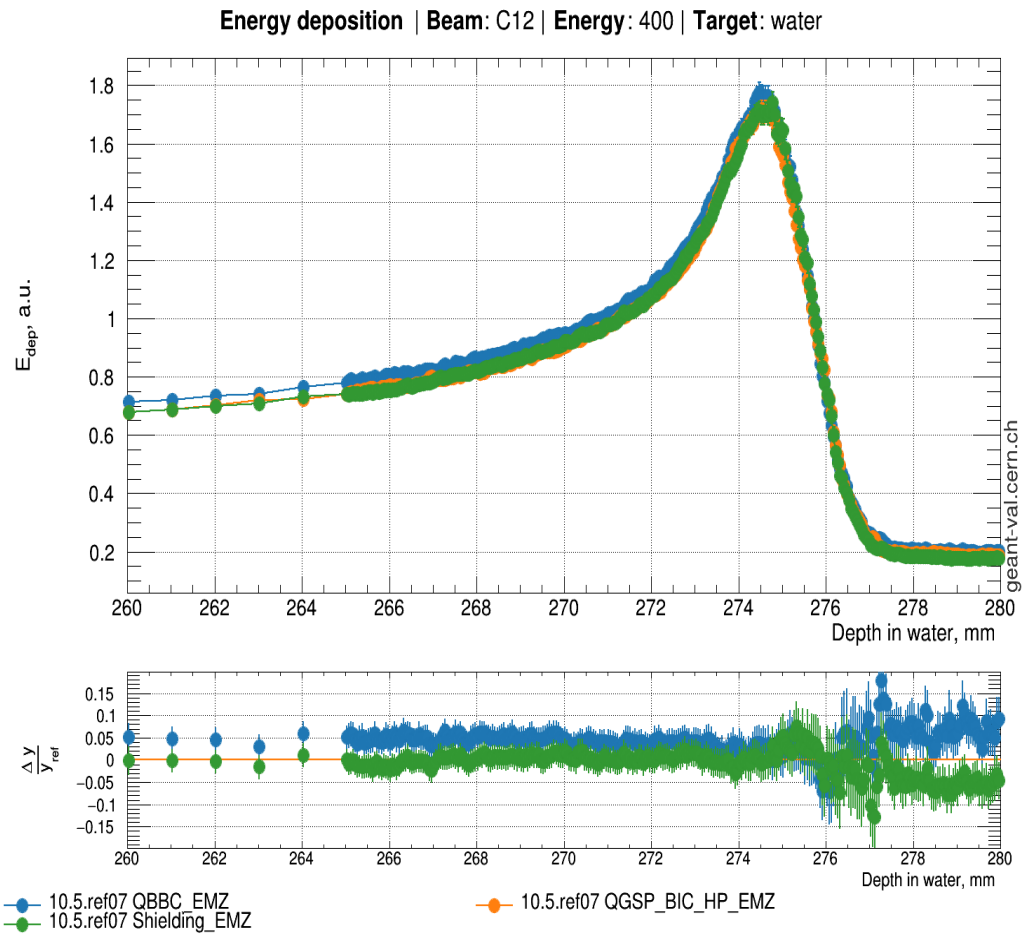
^{12}C (100-400 MeV/u)



^{12}C @ 400 MeV/u (geant4-10-05-ref-07)

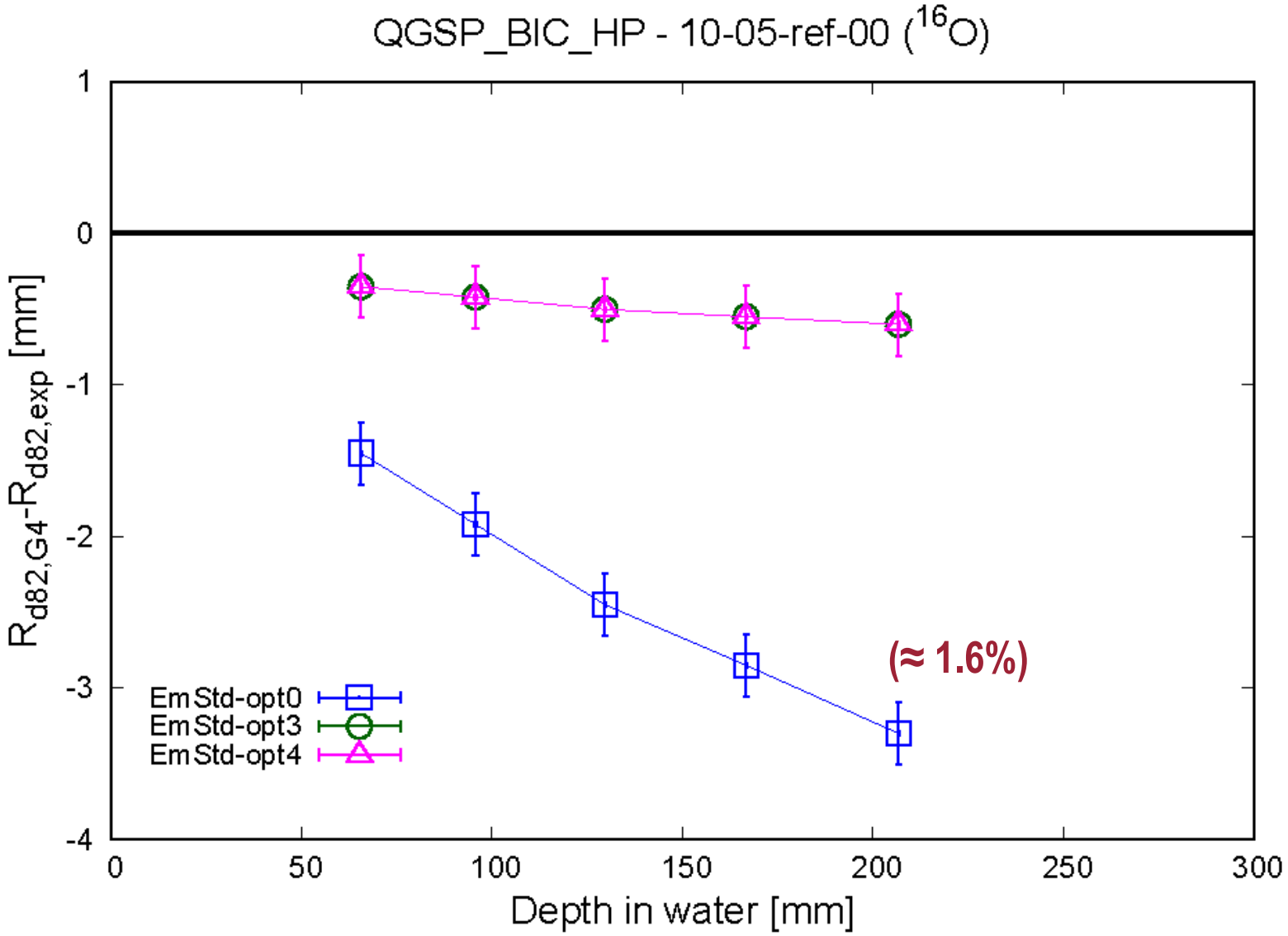


- Same hadronic PL (**QBBC**)
- Illustrative plot **EM-option0** vs **EMZ**

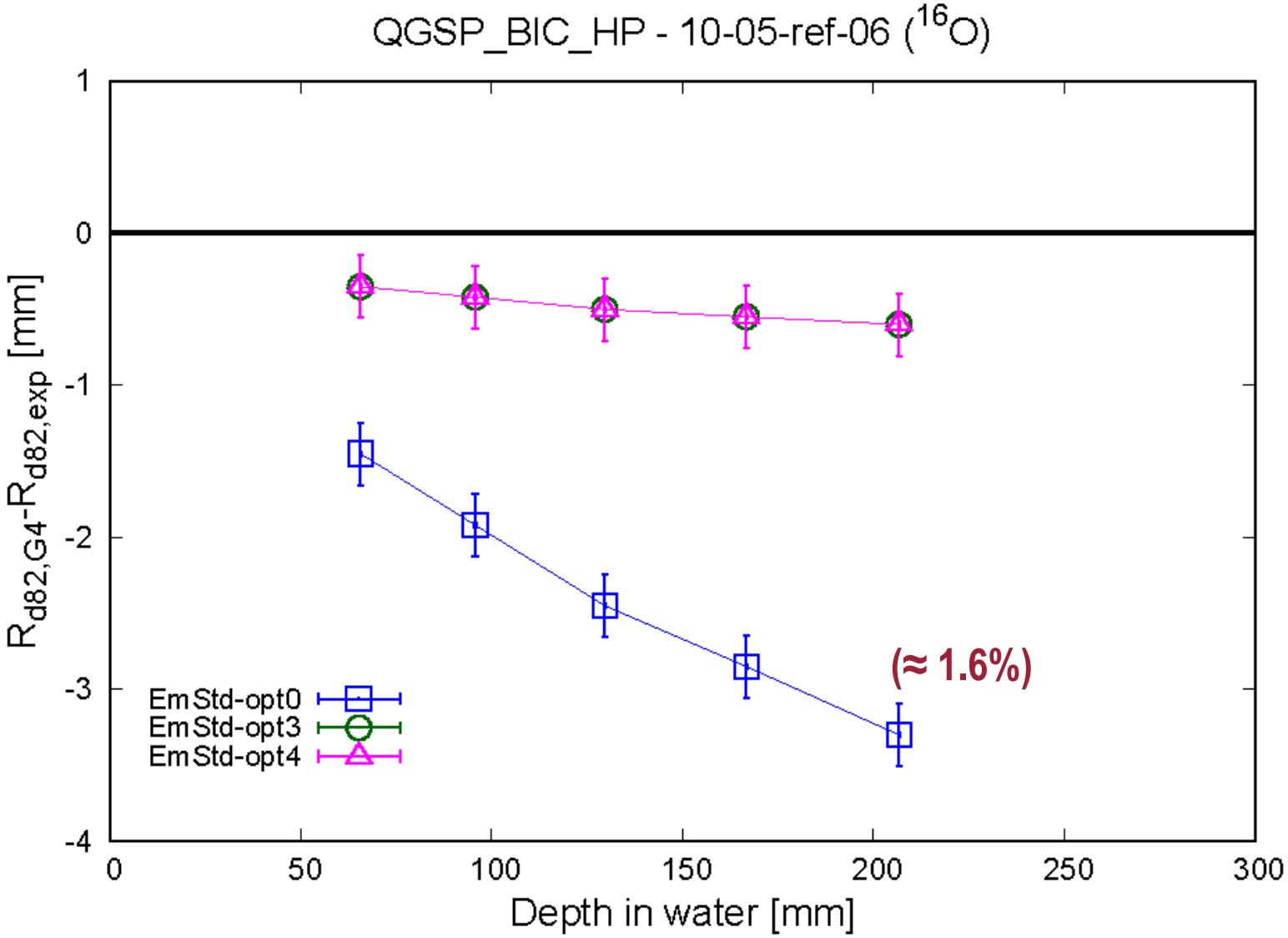


- All using **EMZ**
- **QBBC** vs **Shielding** vs **QGSP_BIC_HP**
- No significant impact on depth of 82% distal

^{16}O (200-400 MeV/u)



^{16}O (200-400 MeV/u)



Conclusions

- ^{7}Li & ^{16}O beam data included in our Bragg curve tests
  - Five different nominal energies, covering up to ~ 25 cm in water
- New ^{12}C ion data @ 250 and 350 MeV/u
- 82% distal depths → stable across reference tags and hadronic PL
- Significant changes in Bragg curve shape with QGSP_BIC_HP & Shielding
- Working on updated code to be included into geant-val