

Bragg Peak validation: G4Med *LightlonBraggPeak* test

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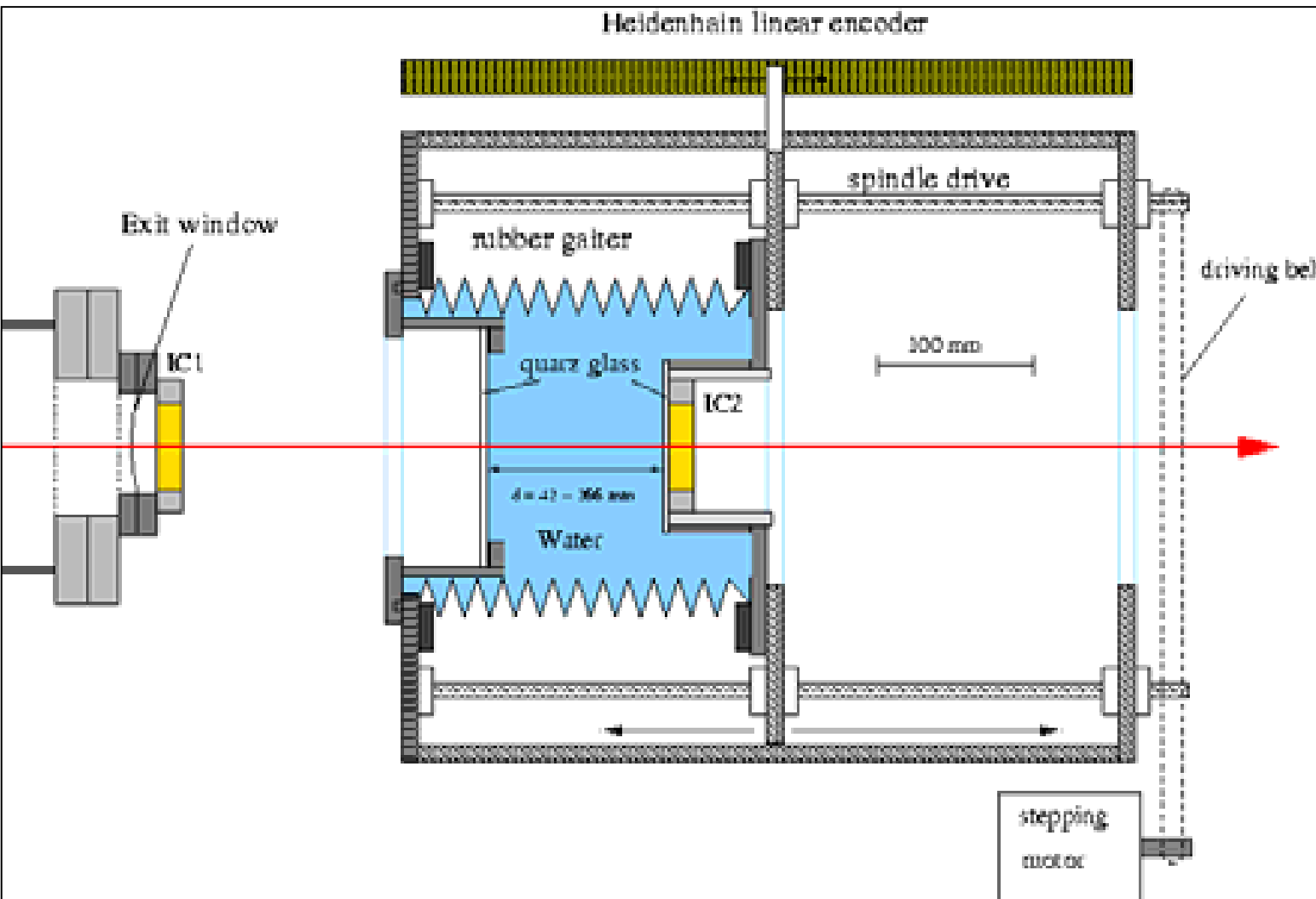
28th Geant4 Collaboration Meeting

Hokkaido University
Sapporo (Japan), September 27, 2023.



Experimental setup

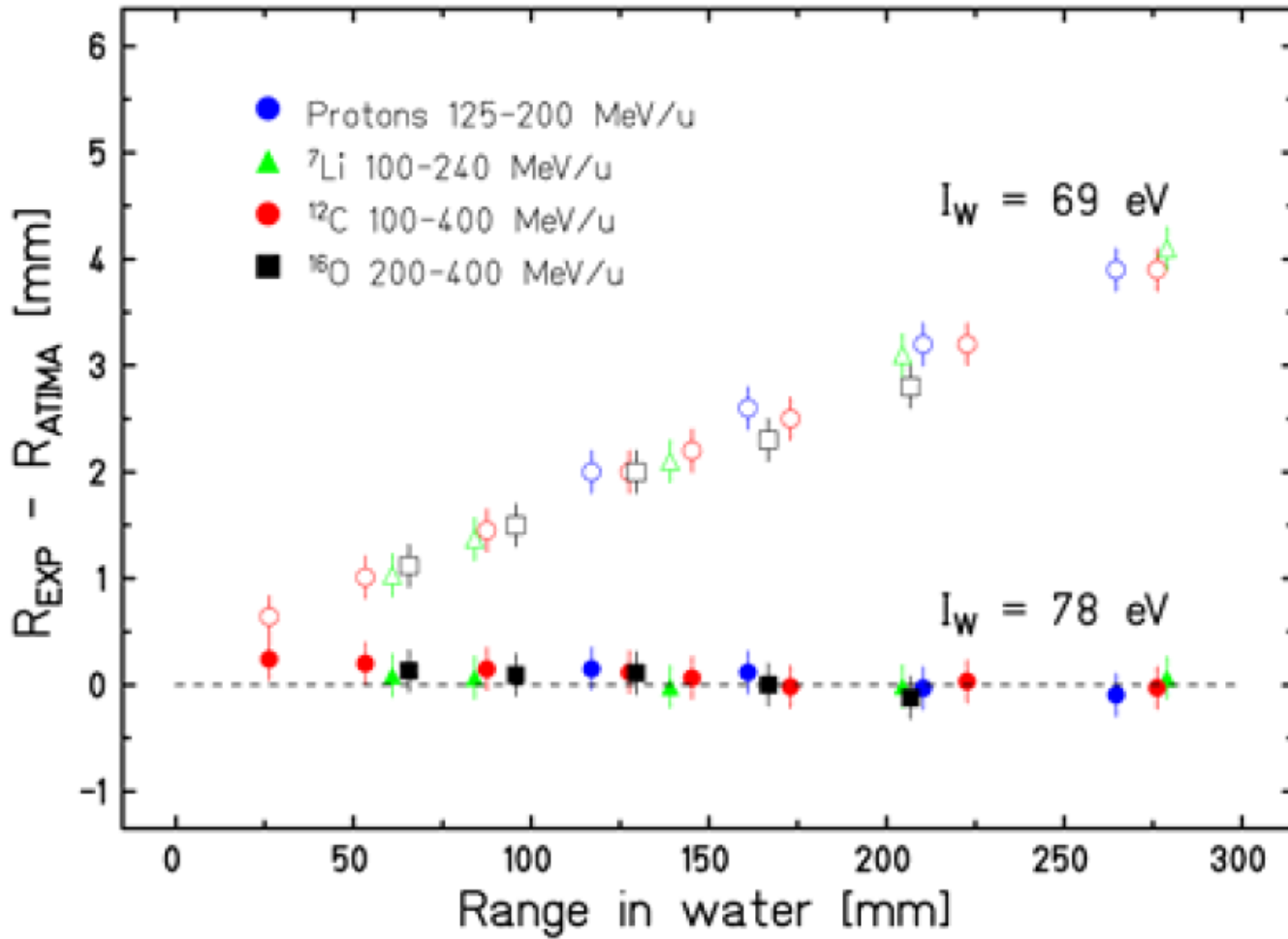
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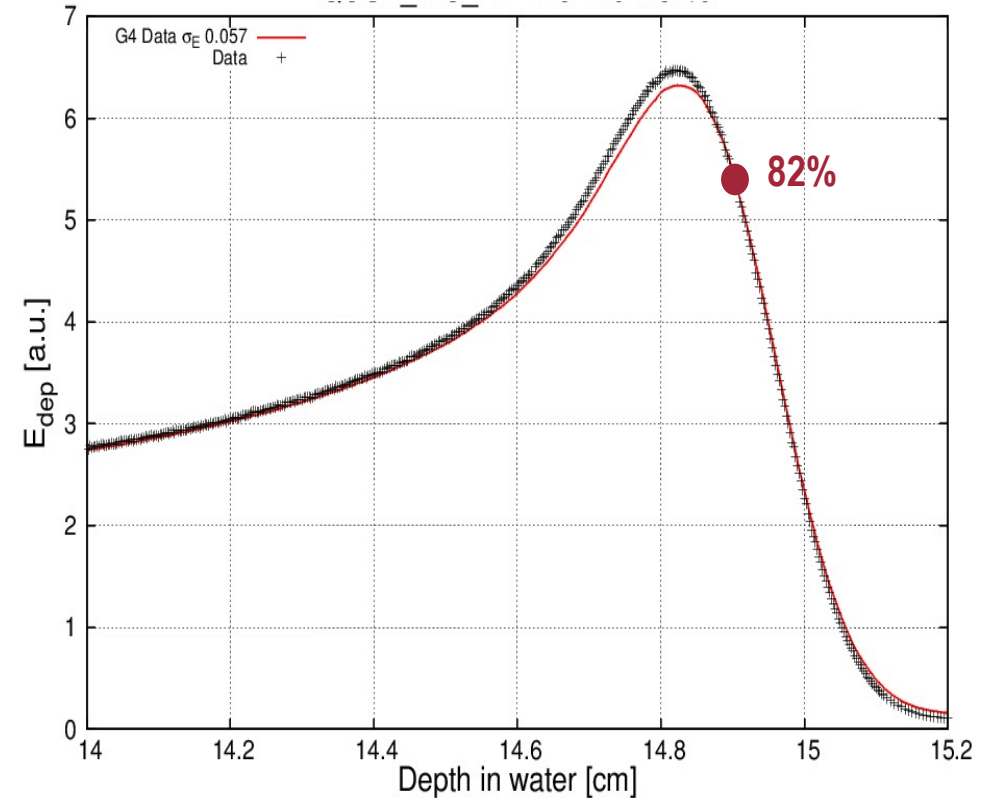
D. Schardt *et al.*, GSI Scientific Report 2007

- 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

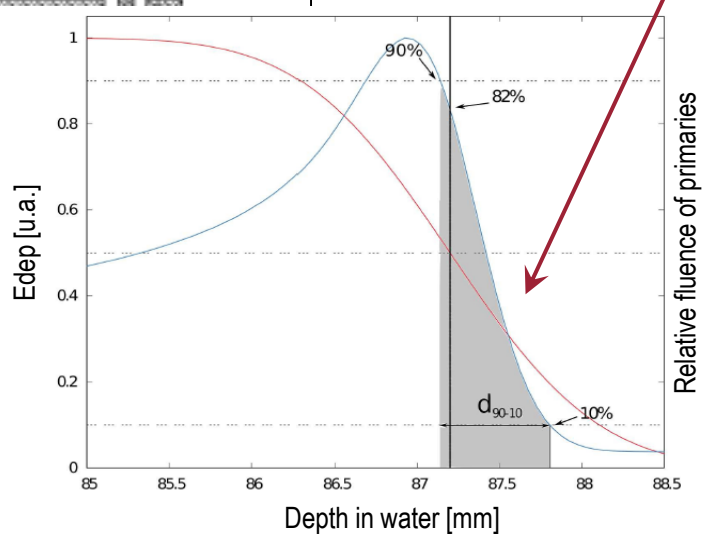
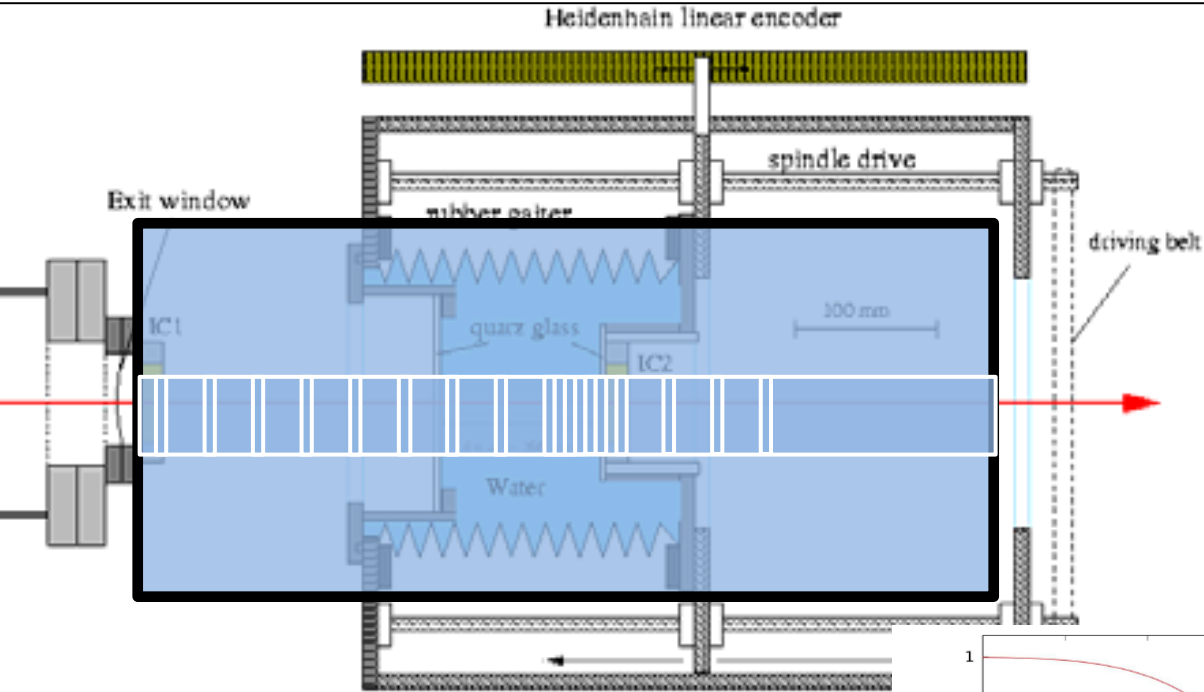


“Range” defined as the **depth** where dose is **82%** of maximum, **distal to Bragg peak**



D. Schardt et al., GSI Scientific Report 2007

Setup geometry model

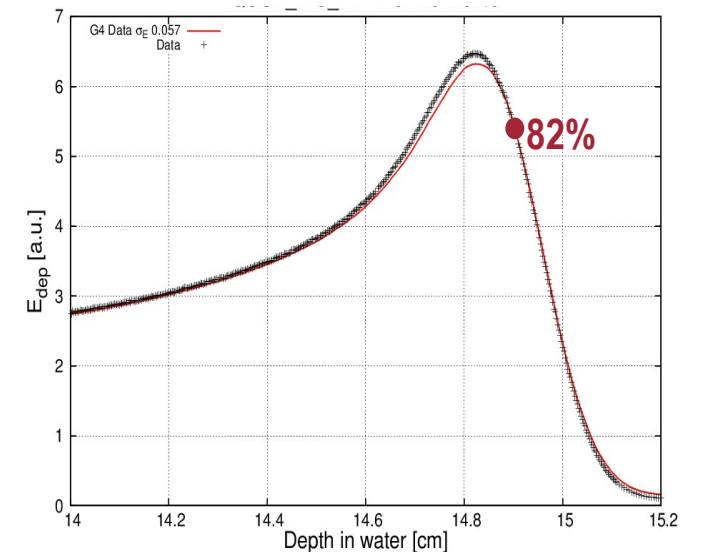


- **G4_WATER** tank.
- **Water density corrected** according to report (24°C, **0.997 g/cm³**).
- **Beam energy spread** set by matching experimental distal penumbra (**90%-10%**).
- Energy deposition scored in cylindrical voxels along beam axis, with same radius as IC2 (28 mm). Thickness of 50 μm – approx water equivalent thickness of ICs.
- Pencil beam, no angular divergence.

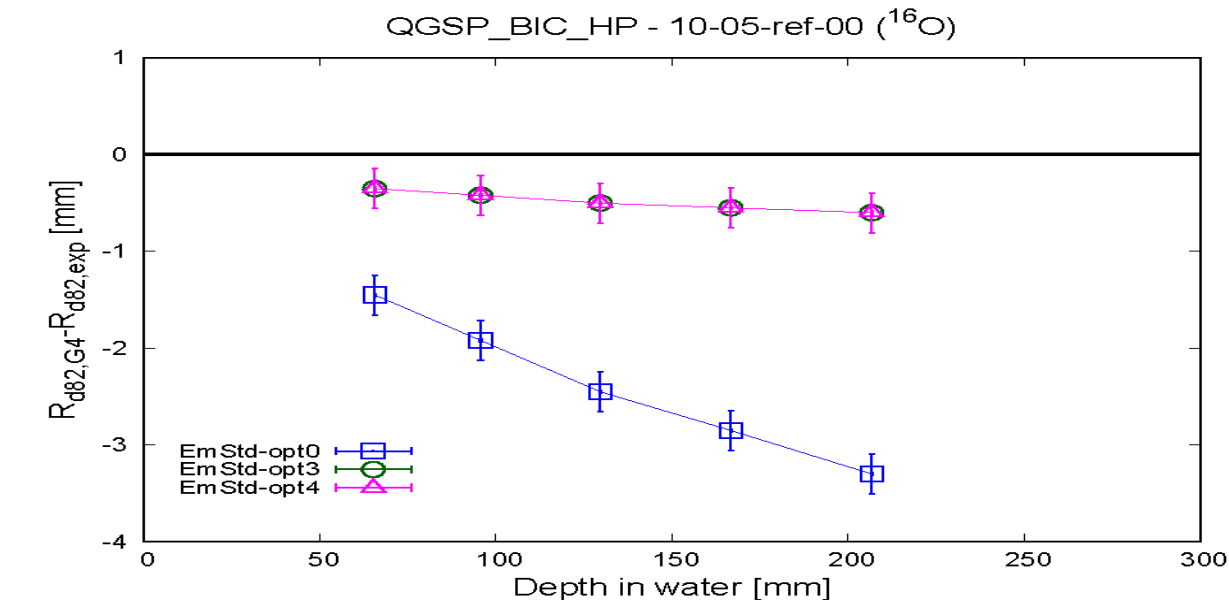
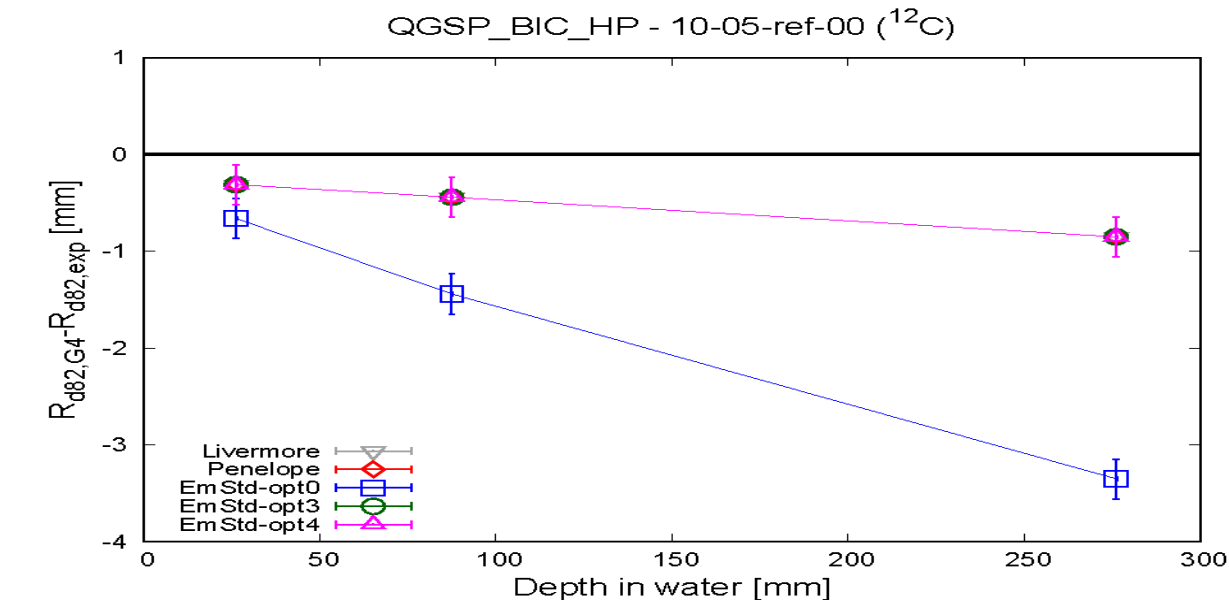
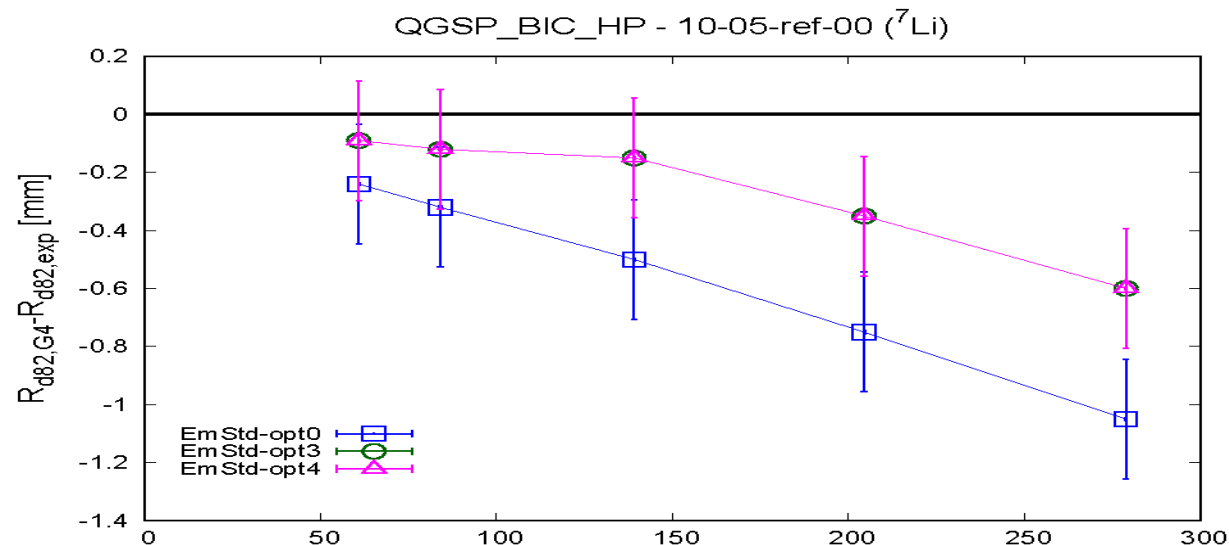
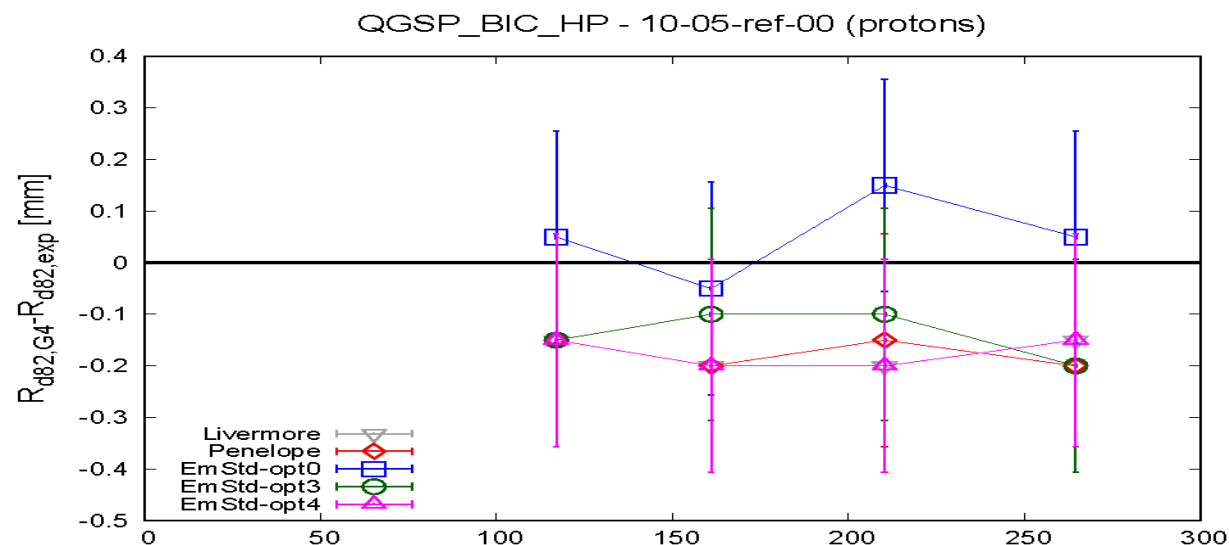
Results – Differences in distal R_{82}

11-01-ref-08
VS
the past

R_{82} : **Depth** where dose is **82%** of maximum, **distal to Bragg peak**

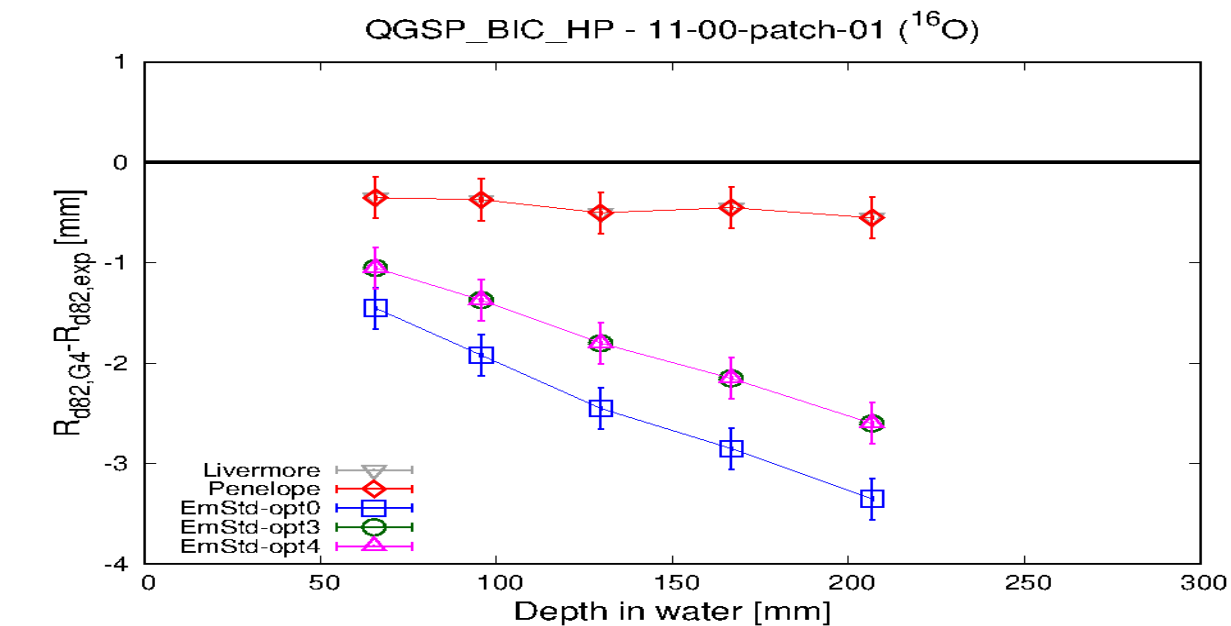
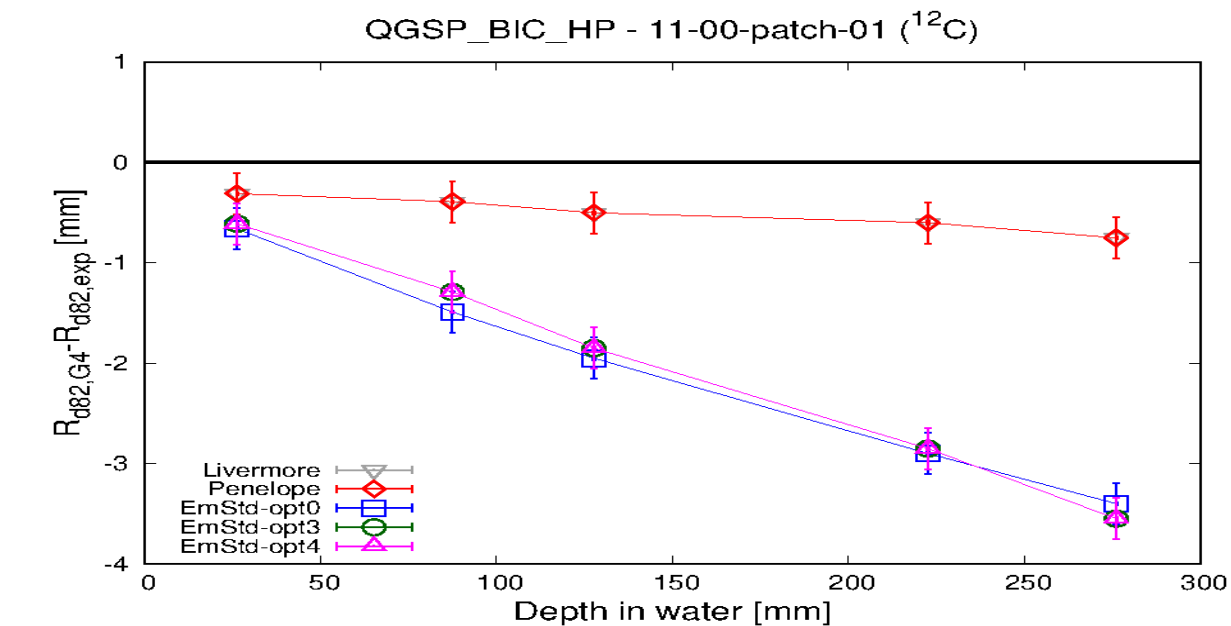
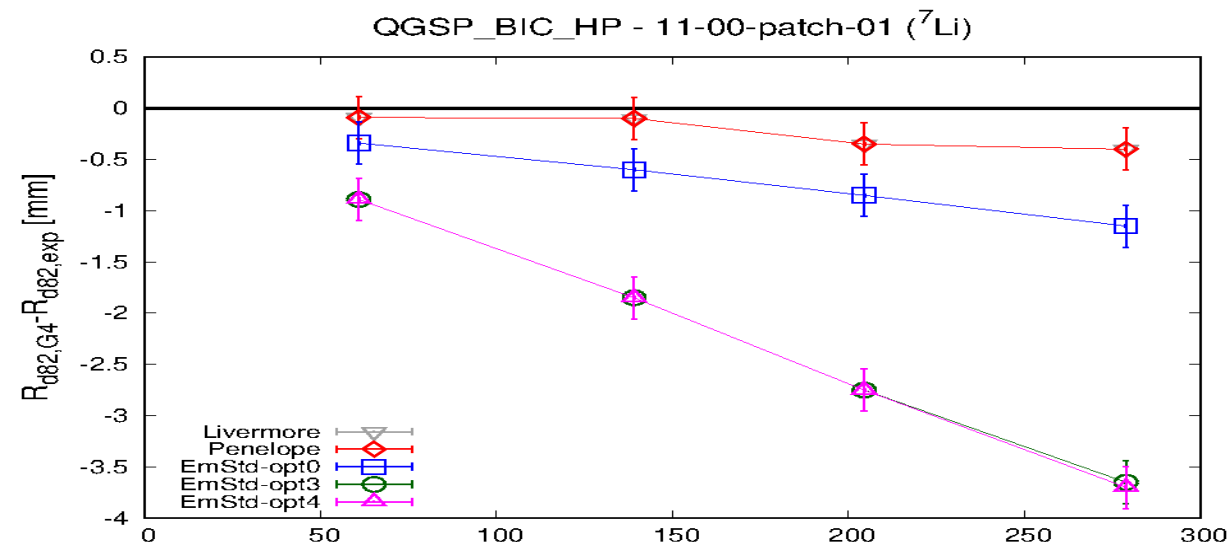
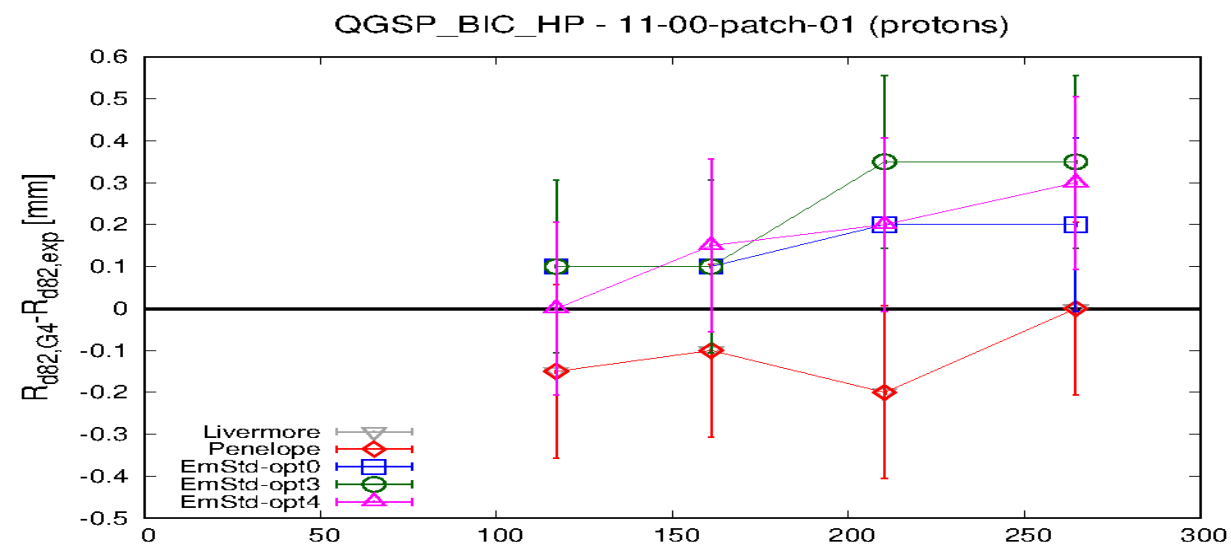


10-05-ref-00



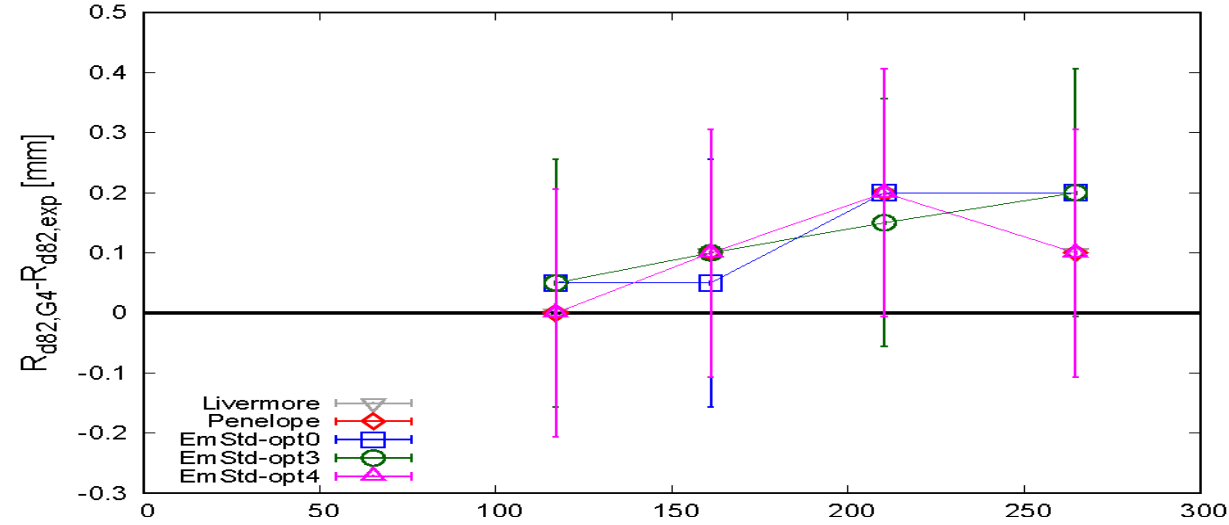
11-00-patch-01

7

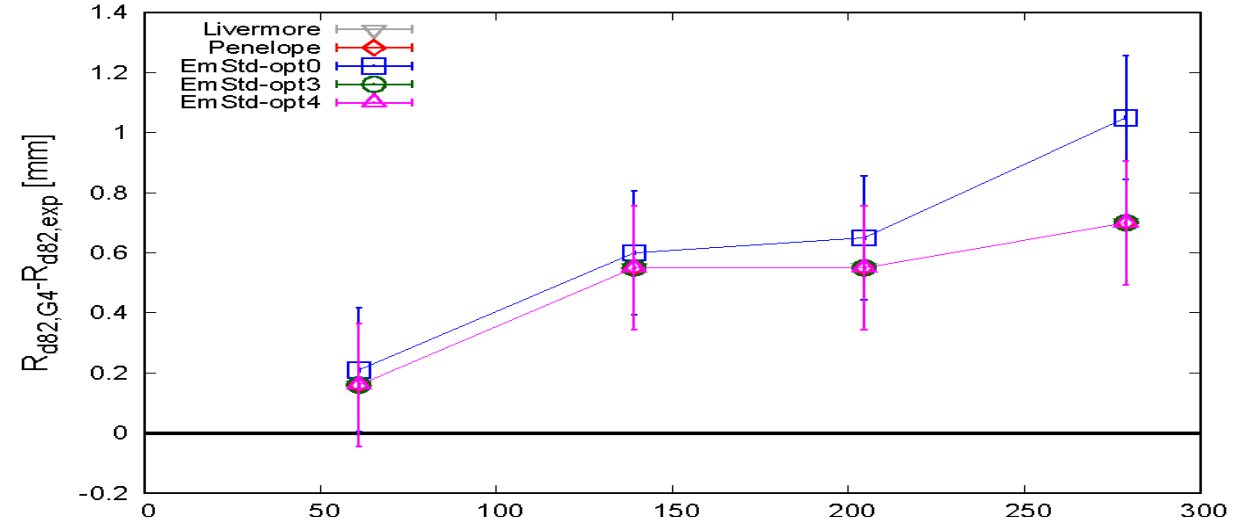


11-01-ref-08

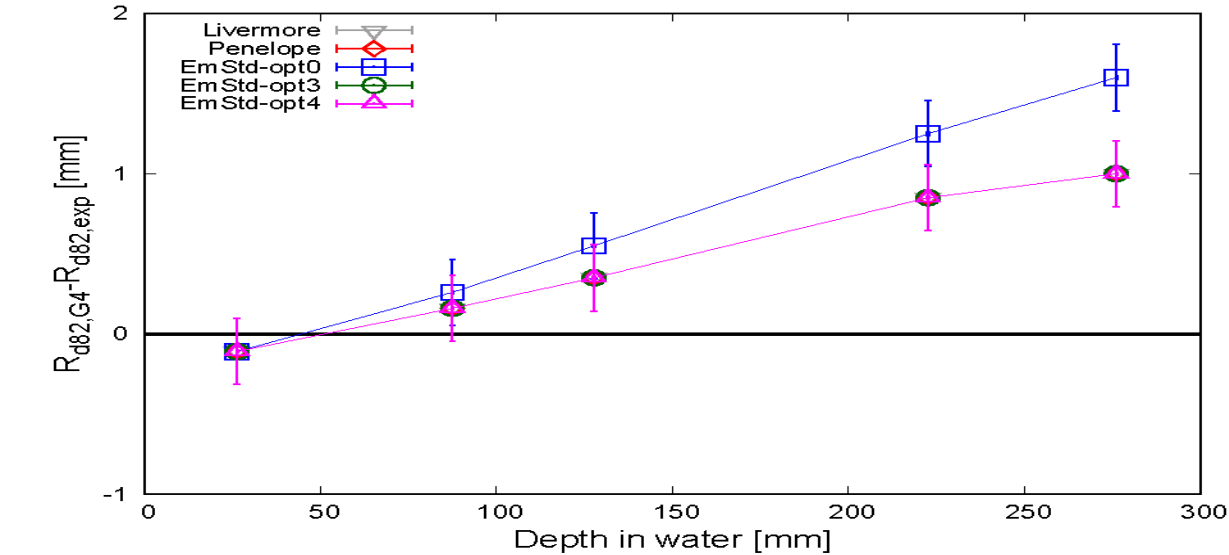
QGSP_BIC_HP - 11-01-ref-08 (protons)



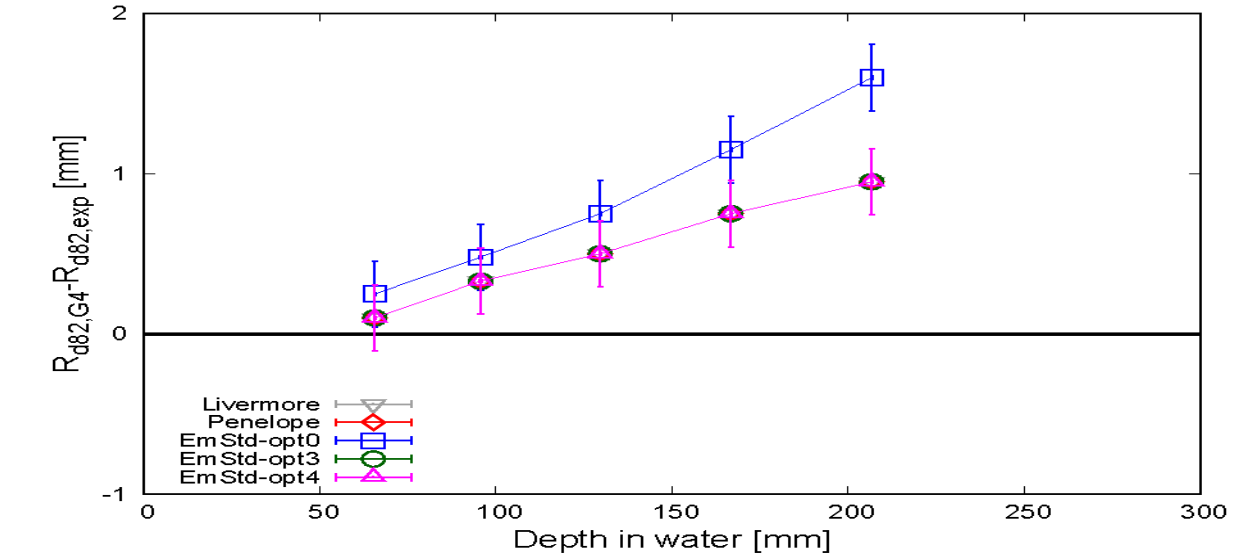
QGSP_BIC_HP - 11-01-ref-08 (⁷Li)

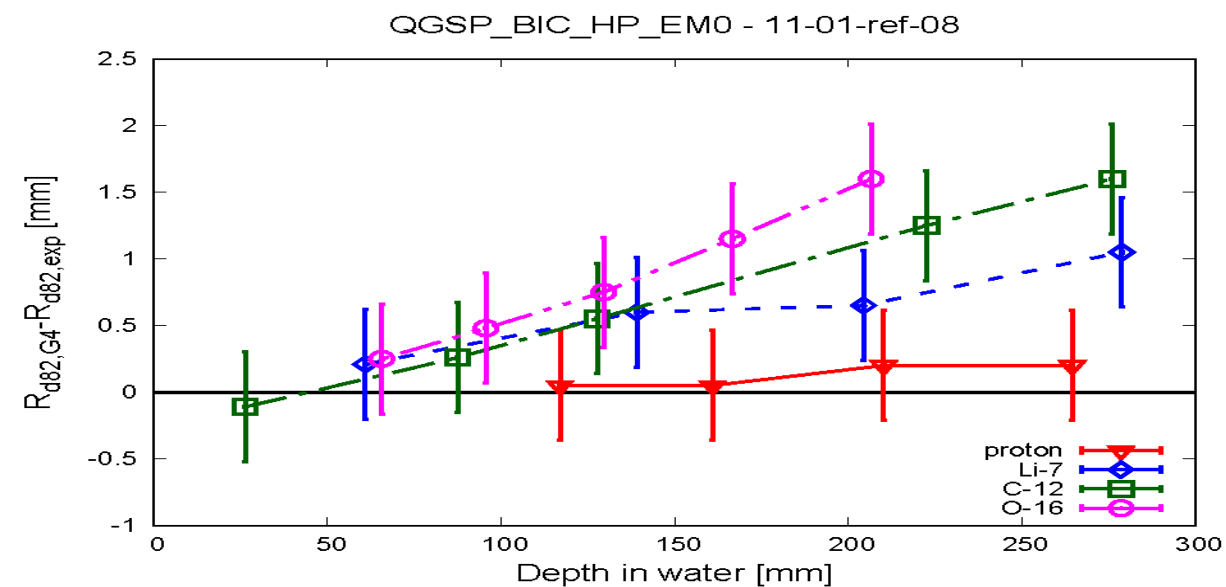
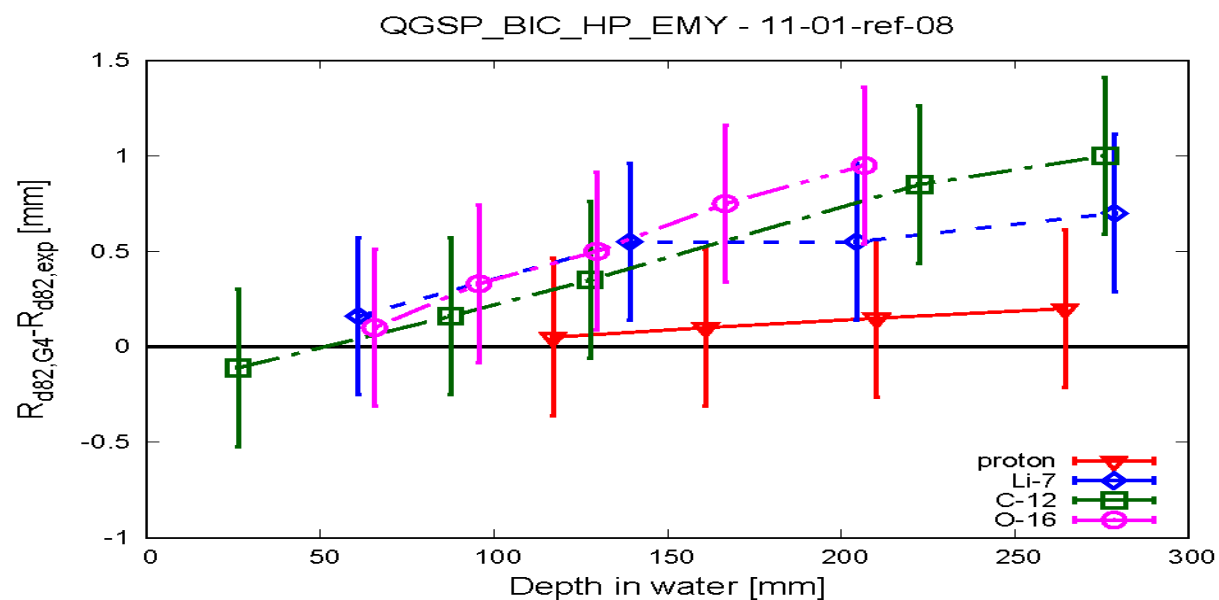
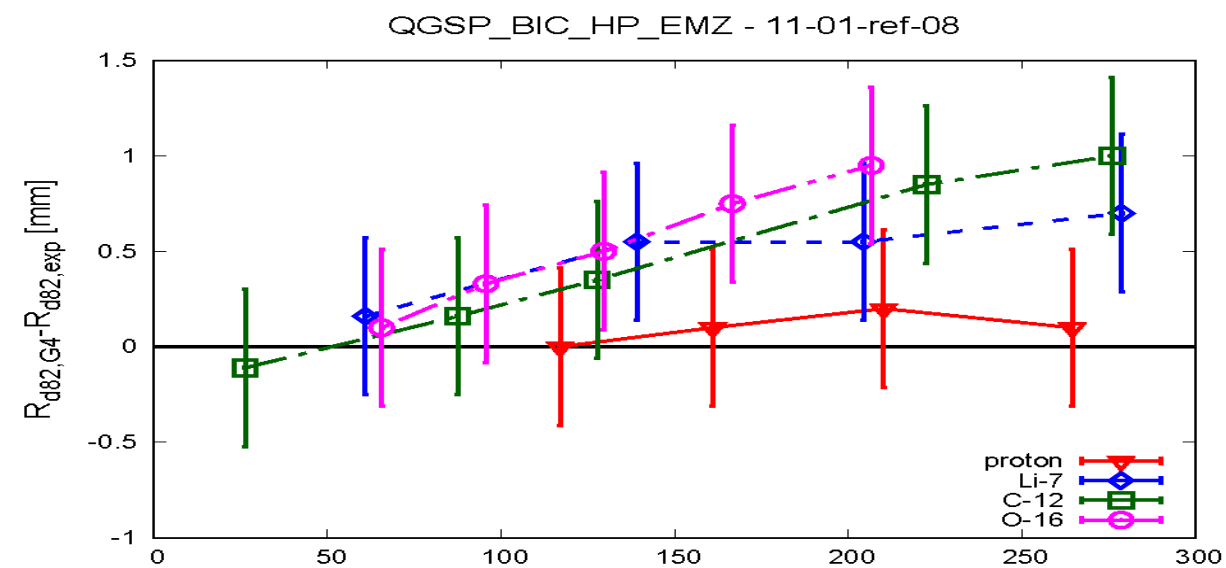


QGSP_BIC_HP - 11-01-ref-08 (¹²C)



QGSP_BIC_HP - 11-01-ref-08 (¹⁶O)





Please watch y-scales!



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