

# An Update of the Depth-Dose Curve of Antiprotons



Link to this poster

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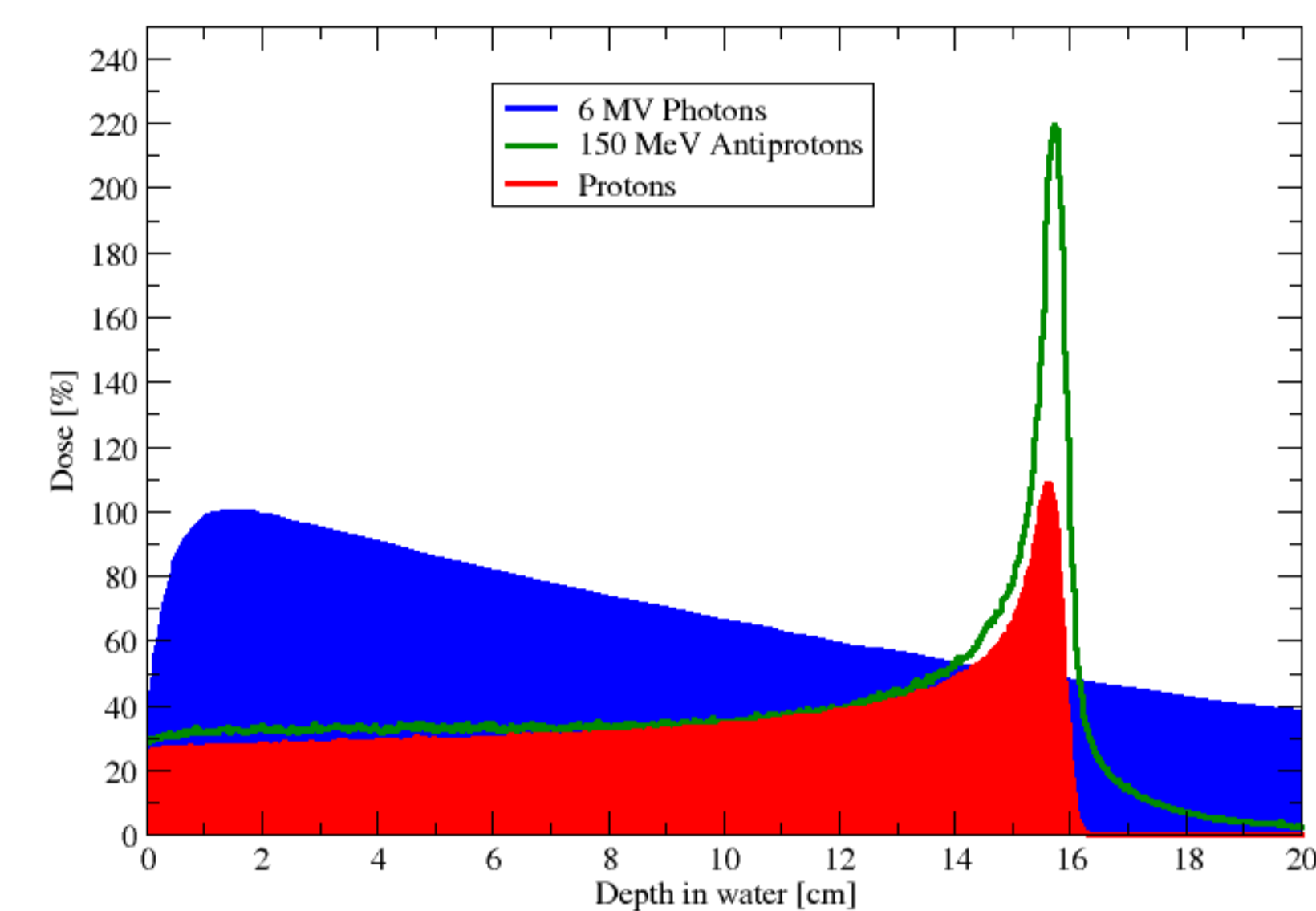
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The CERN AD-4/ACE project purports to **measure** the relative biological effectiveness (**RBE**) of **antiprotons**.

Compared to protons, antiprotons feature:

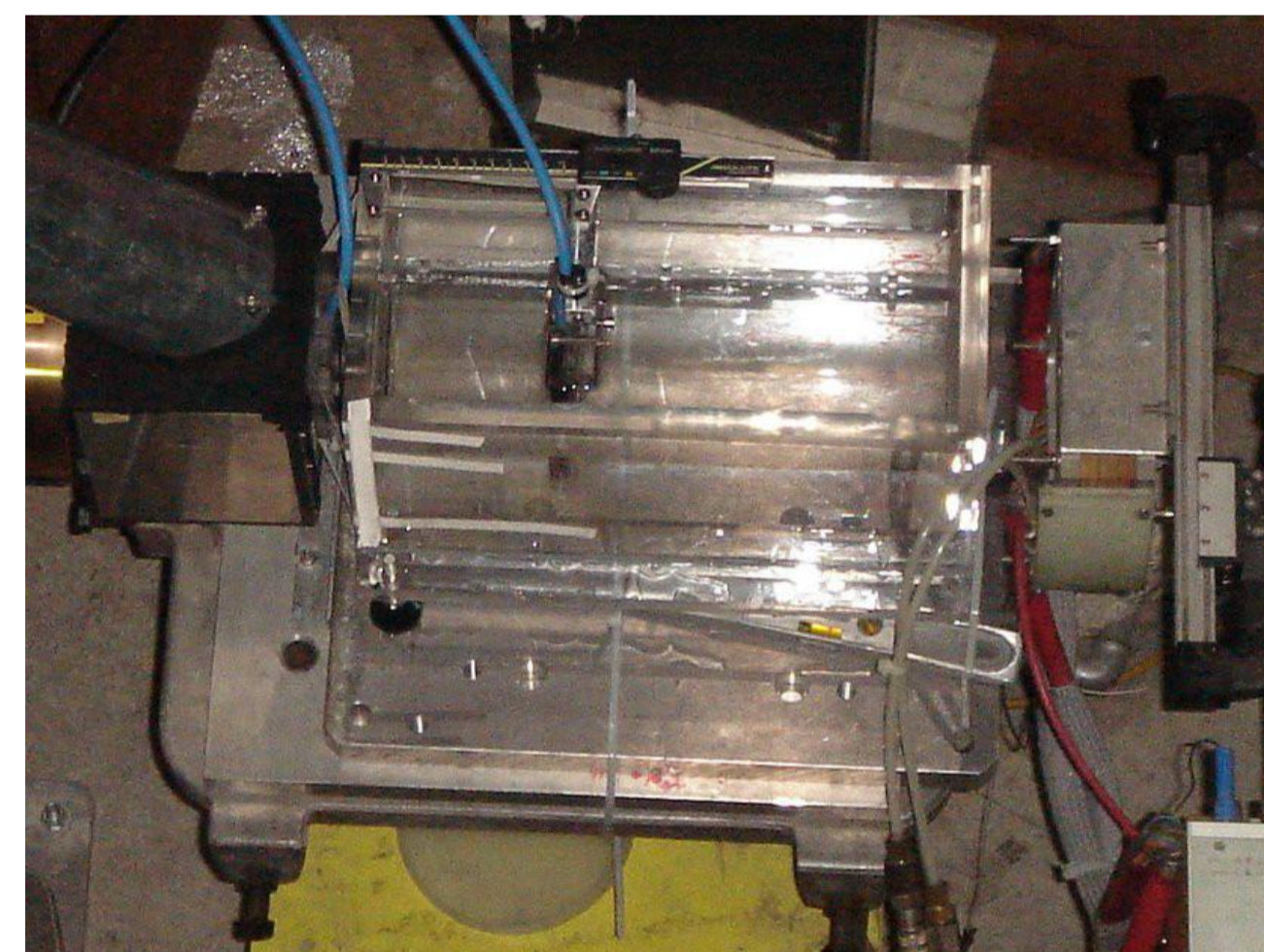
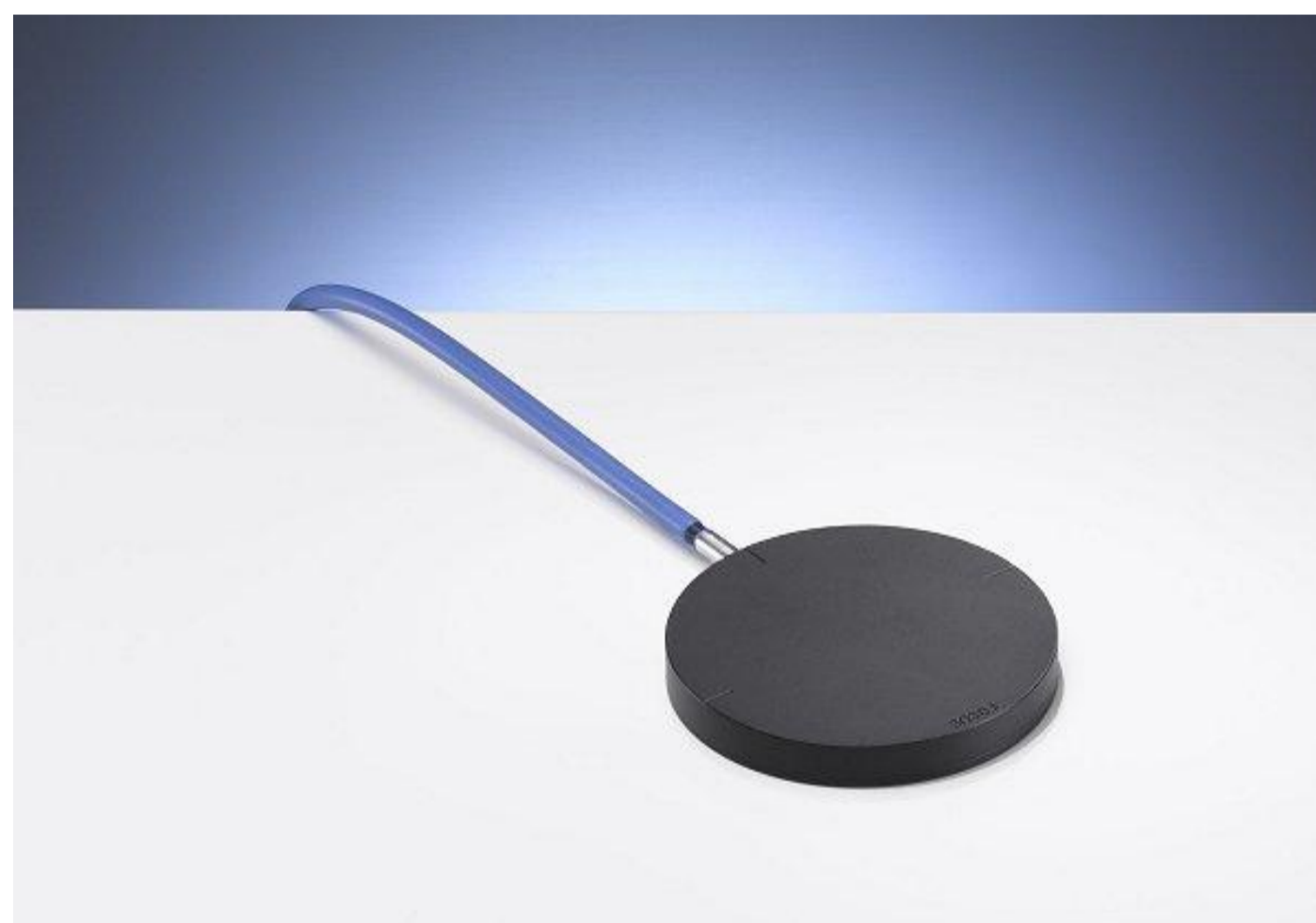
- a **doubling** of the **physical dose** in the Bragg-peak
- a localized **increase of RBE** in the Bragg-peak



We have revisited previously published data (2008) for the antiproton depth-dose curve [1].

In that paper [1]:

- Monte Carlo calculations were done with **SHIELD-HIT**, and compared to the experimental data.
- experimental data were measured with plane parallel **ionization chambers** in a water tank.



**Unfortunately**, in the same paper:

- the dose deposition was plotted **relative**, normalized to a point in the plateau region.
- All simulations were done in **water only** (no ionization chamber simulated).

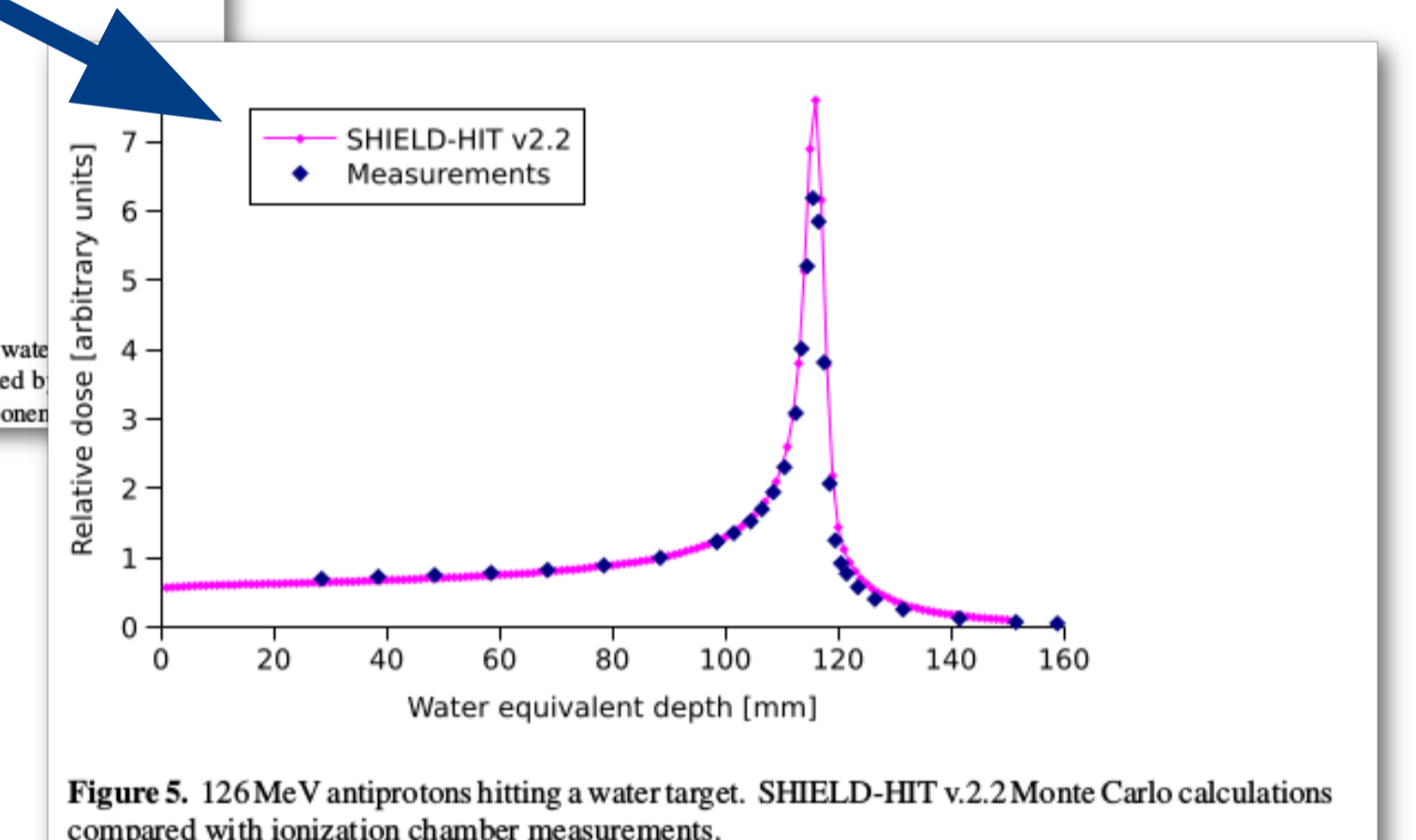
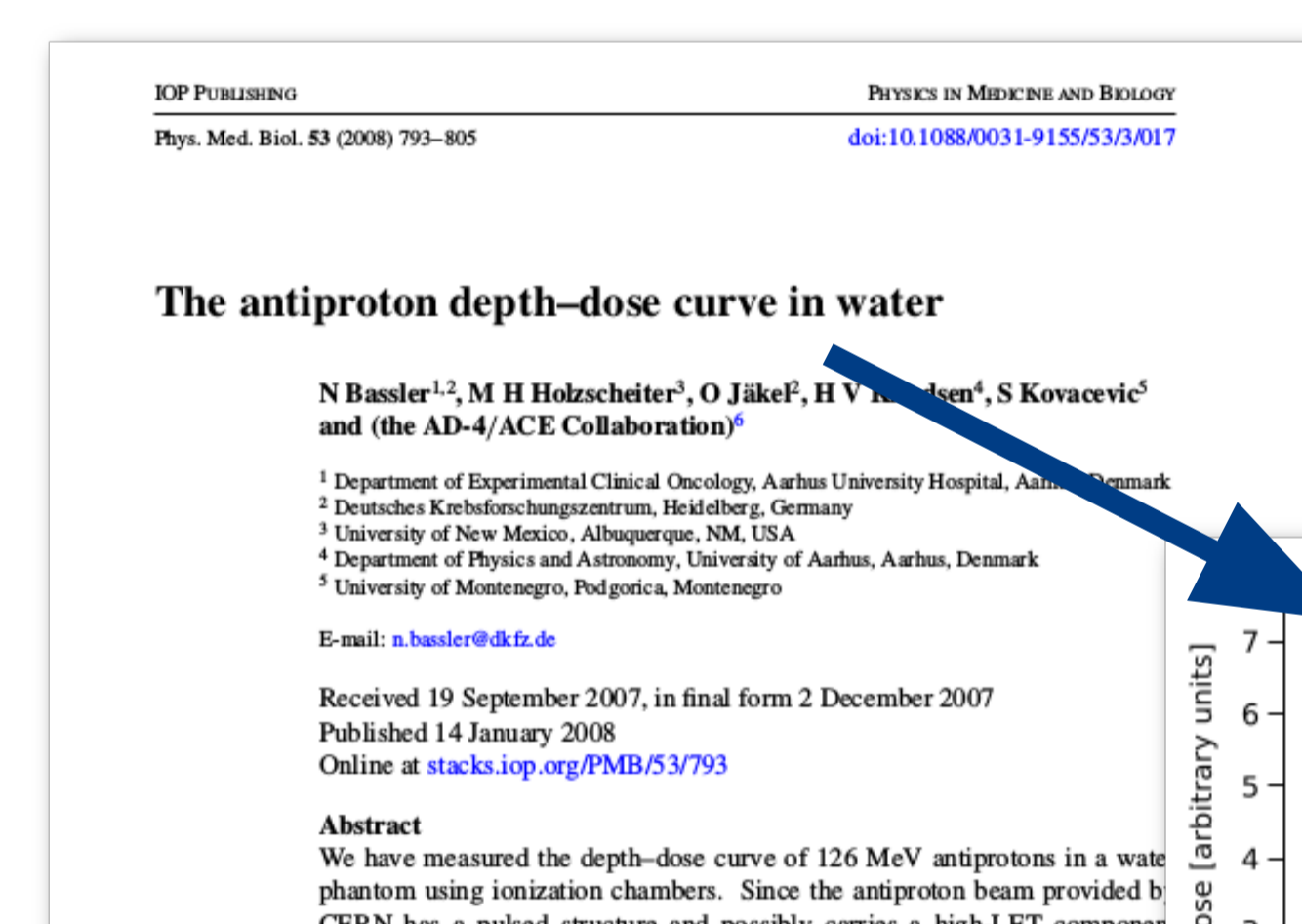


Figure 5. 126 MeV antiprotons hitting a water target. SHIELD-HIT v2.2 Monte Carlo calculations compared with ionization chamber measurements.

**2008 paper:**

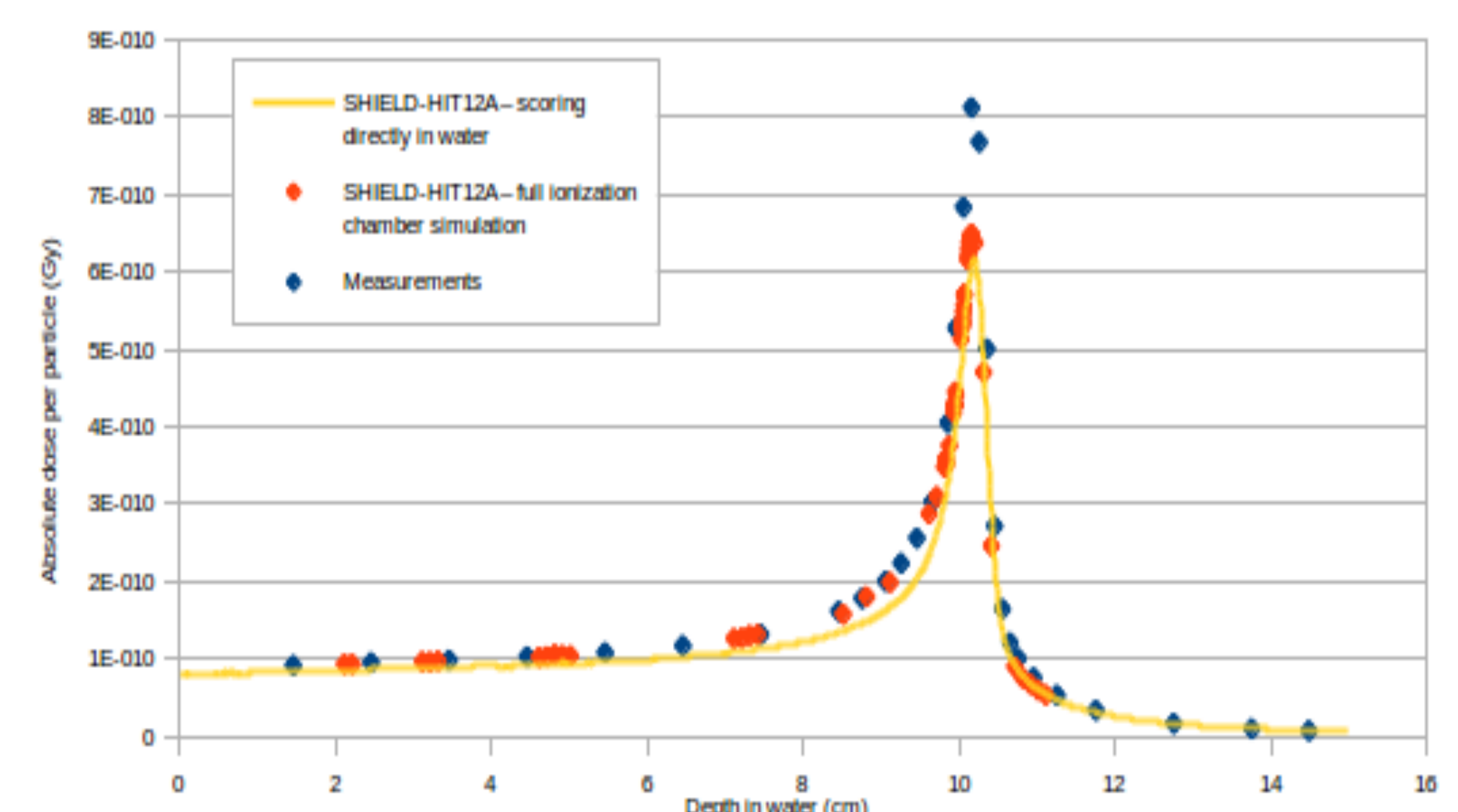
- **Relative data**
- **Poor agreement in peak**

In this revision, we:

- **refine** the experimental data to **absolute** dose per primary particle
- simulate the **exact** ionization chamber **geometry**
- **translate** dose-to-air to **dose-to-water**

We observe that

- **better agreement** between measured data and simulations is obtained using **full simulation** of ionization chamber compared to scoring directly in water, especially in the plateau region and beginning of Bragg peak
- dose in the Bragg peak is still **underestimated**.



## References

[1] Bassler, N., et al., The antiproton depth-dose curve in water, Phys. Med. Biol. 53 (2008), 793.



Link to article