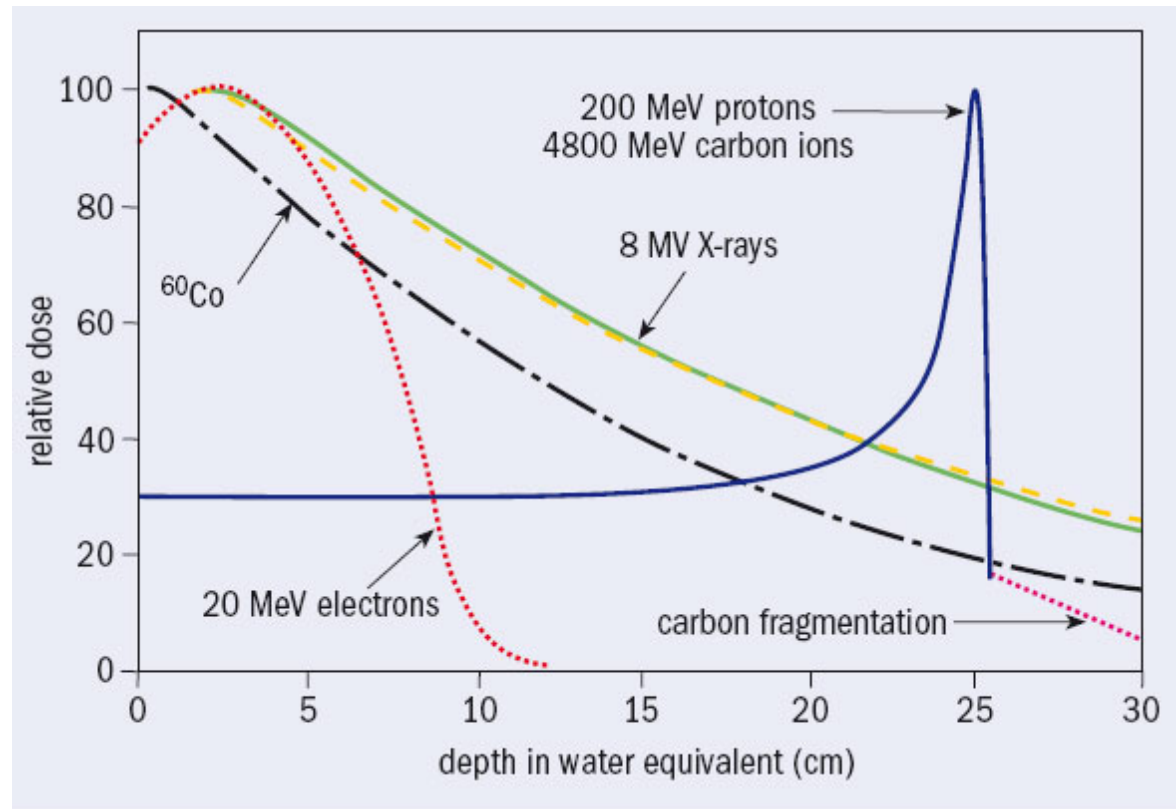


Proton Beam Therapy

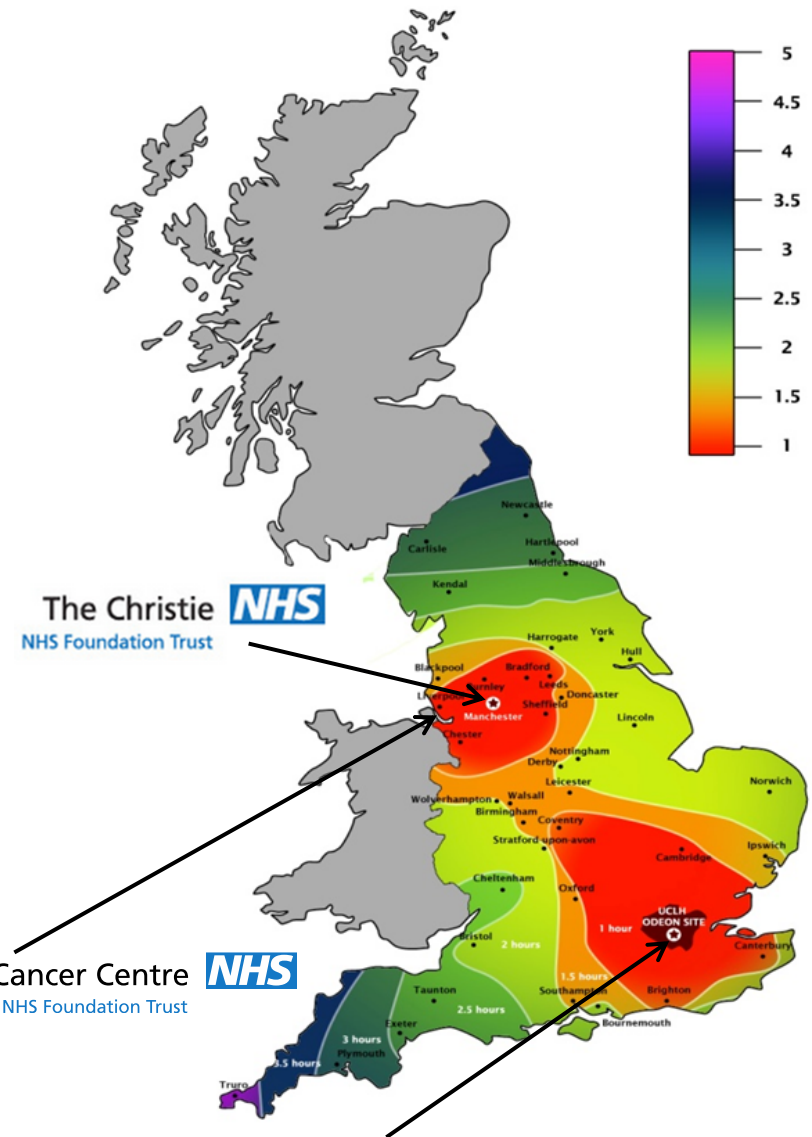
Simon Jolly, Ruben Saakyan,
Raffaella Radogna,
Laurent Kelleter, Matthieu Hentz,
Derek Attree, Saad Shaikh

- Unlike X-rays, charged particles stop!
- Electrons, being lighter, scatter and spread out.
- Protons deposit most dose at the *end* of their path: the *Bragg Peak*.

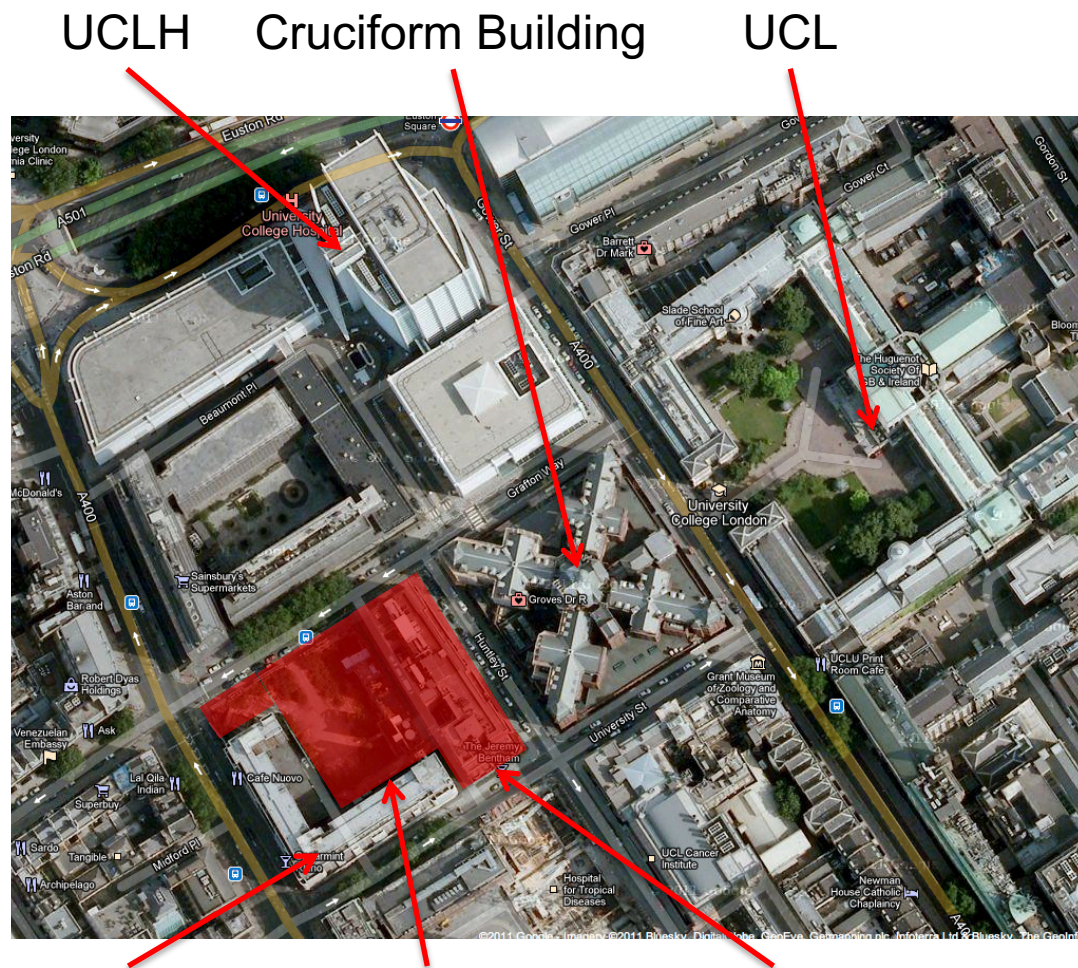


- This property is both the advantage and the disadvantage of proton therapy.
- Protons stop, but you need to know where...

- New national service on two sites:
 - Manchester – 3 treatment rooms
 - London – 4 treatment rooms
- Pencil beam scanning only: 70–245 MeV.
- Full 360° rotating gantries.
- Clatterbridge Cancer Centre (Wirral) treats eye tumours with 60 MeV protons.
- Joint Equipment Procurement.
- Christie started building July 2015:
 - First patient treated December 2018.
- UCLH started building December 2015:
 - First patient to be treated summer 2020.



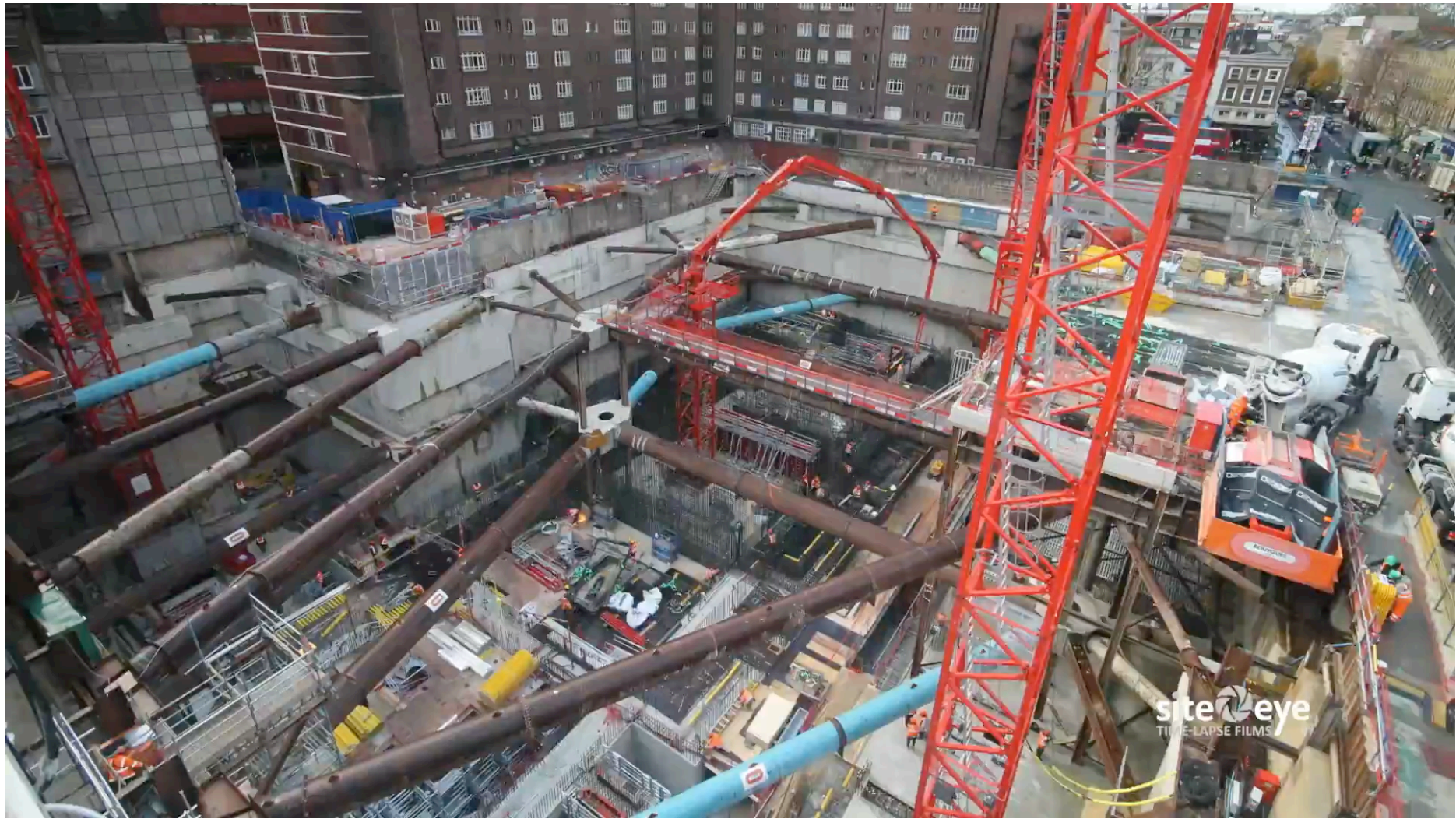
- New facility will be on existing UCLH site, next to Tottenham Court Road.
- Linked to UCLH via walkways to allow easy patient transfer.
- Due to open 2020 (2 years after The Christie).
- Varian cyclotron and 4 360° gantries.



Paramount Court

New proton therapy site

Jeremy Bentham (Deceased)

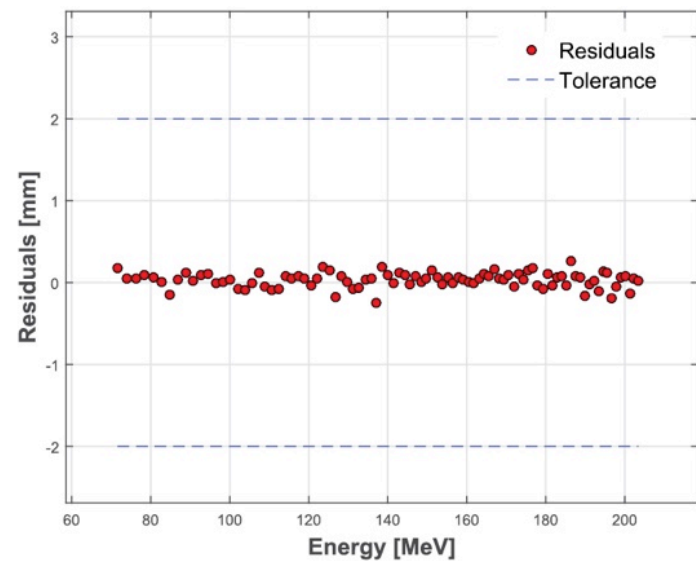
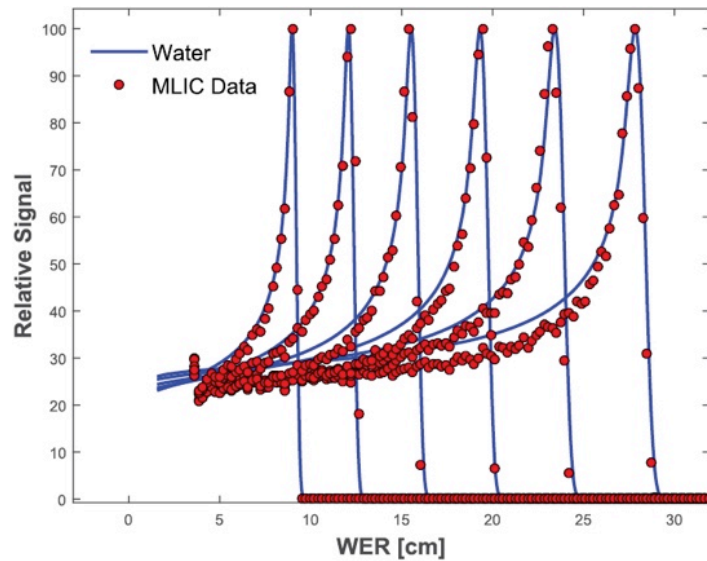


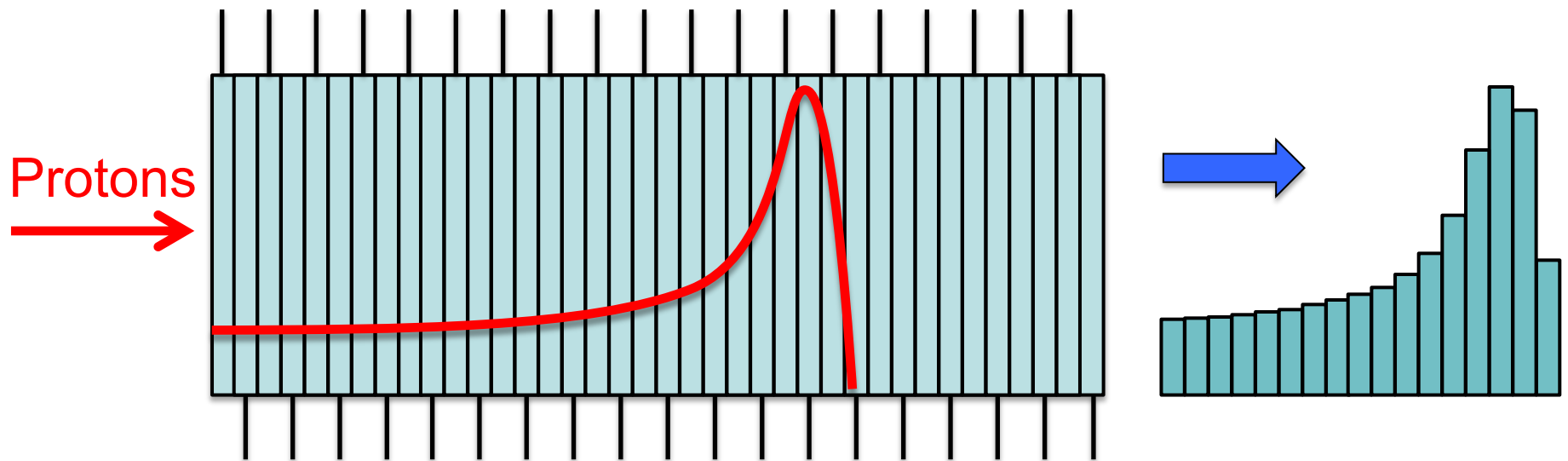
<https://www.uclh.nhs.uk/aboutus/NewDev/NCF/Pages/Blogandupdates.aspx>



<https://www.uclh.nhs.uk/aboutus/NewDev/NCF/Pages/Blogandupdates.aspx>

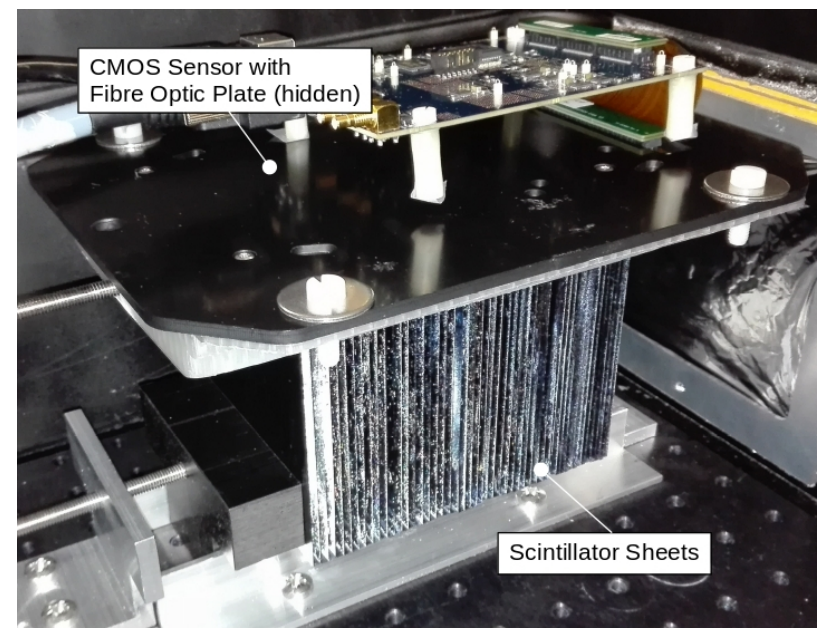
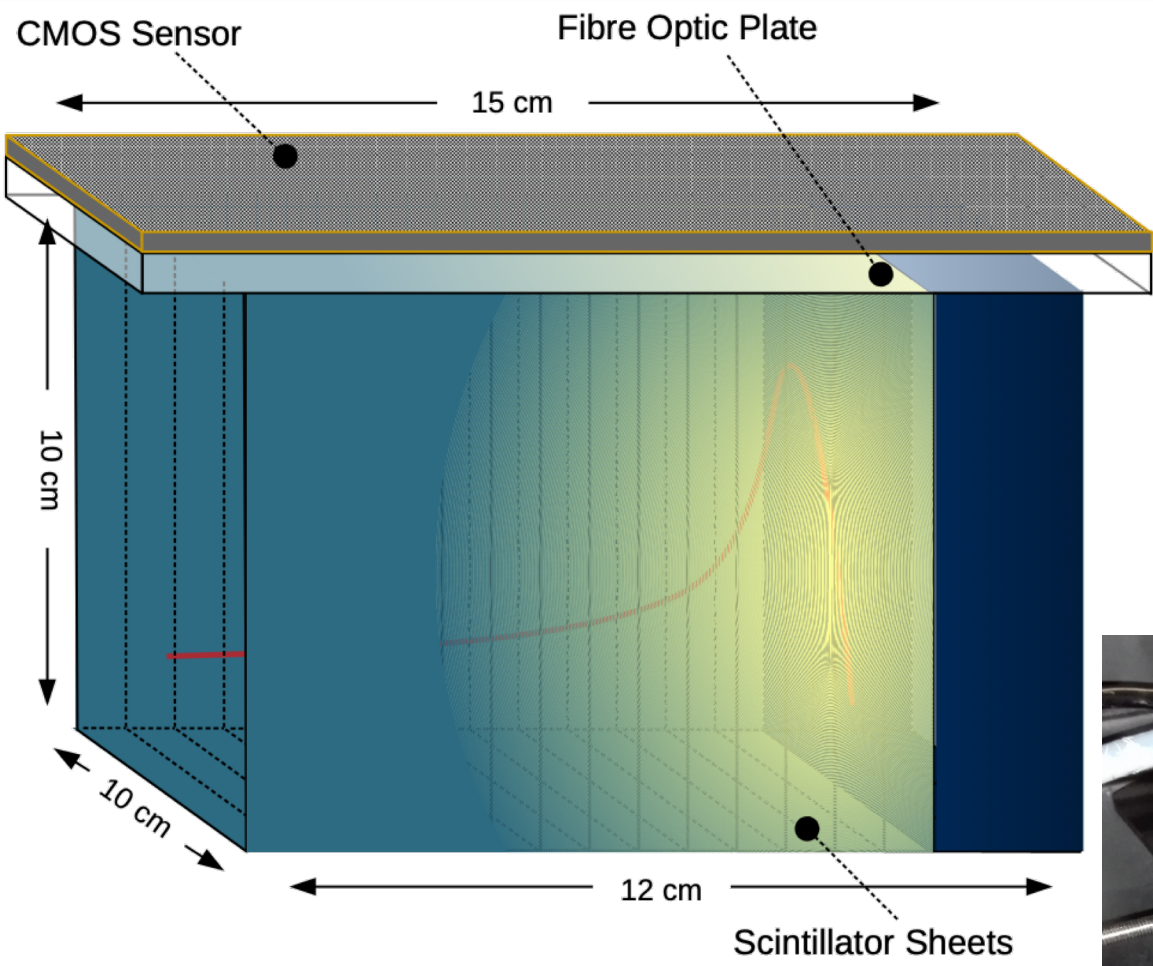
PSI Daily Range QA

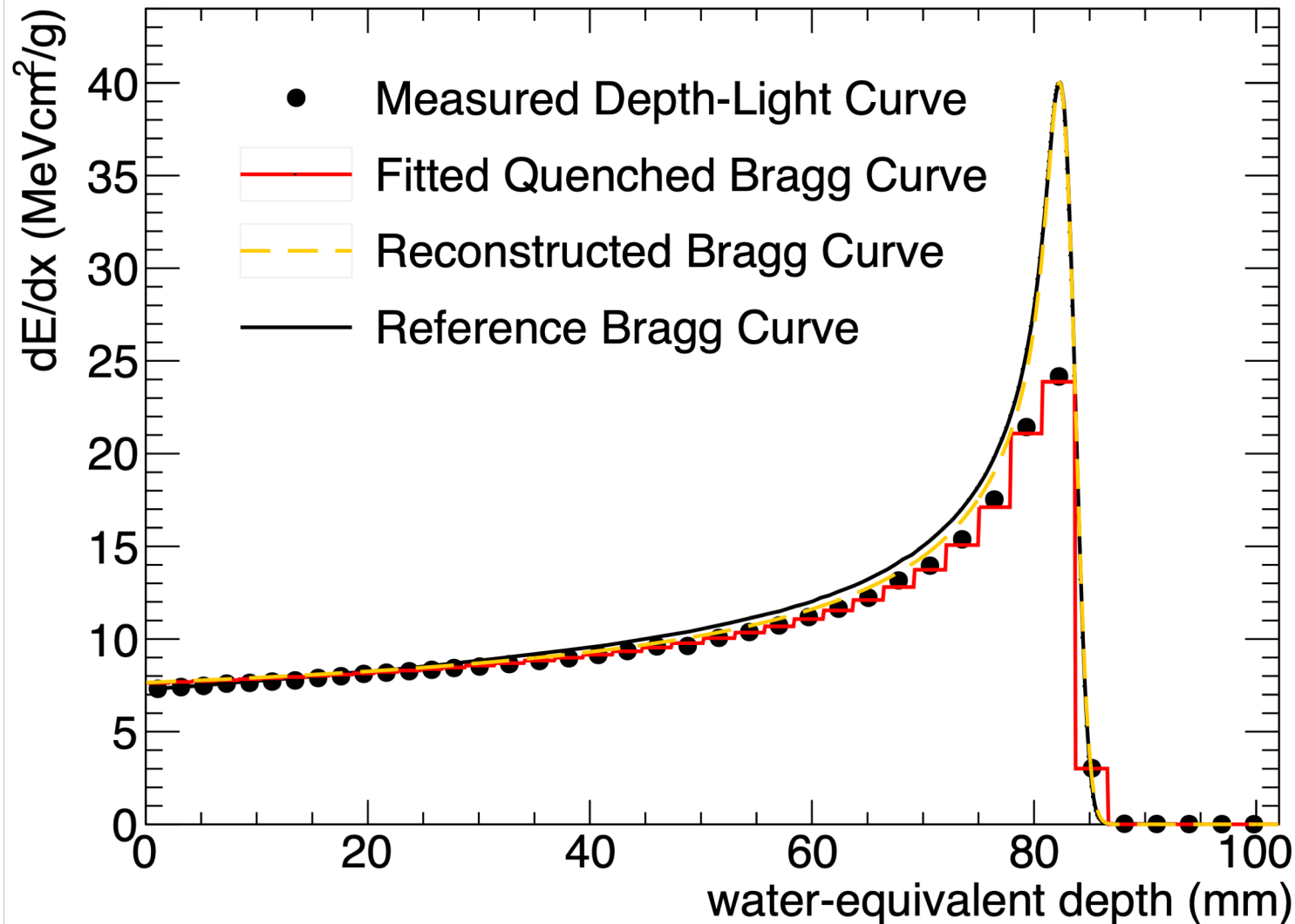




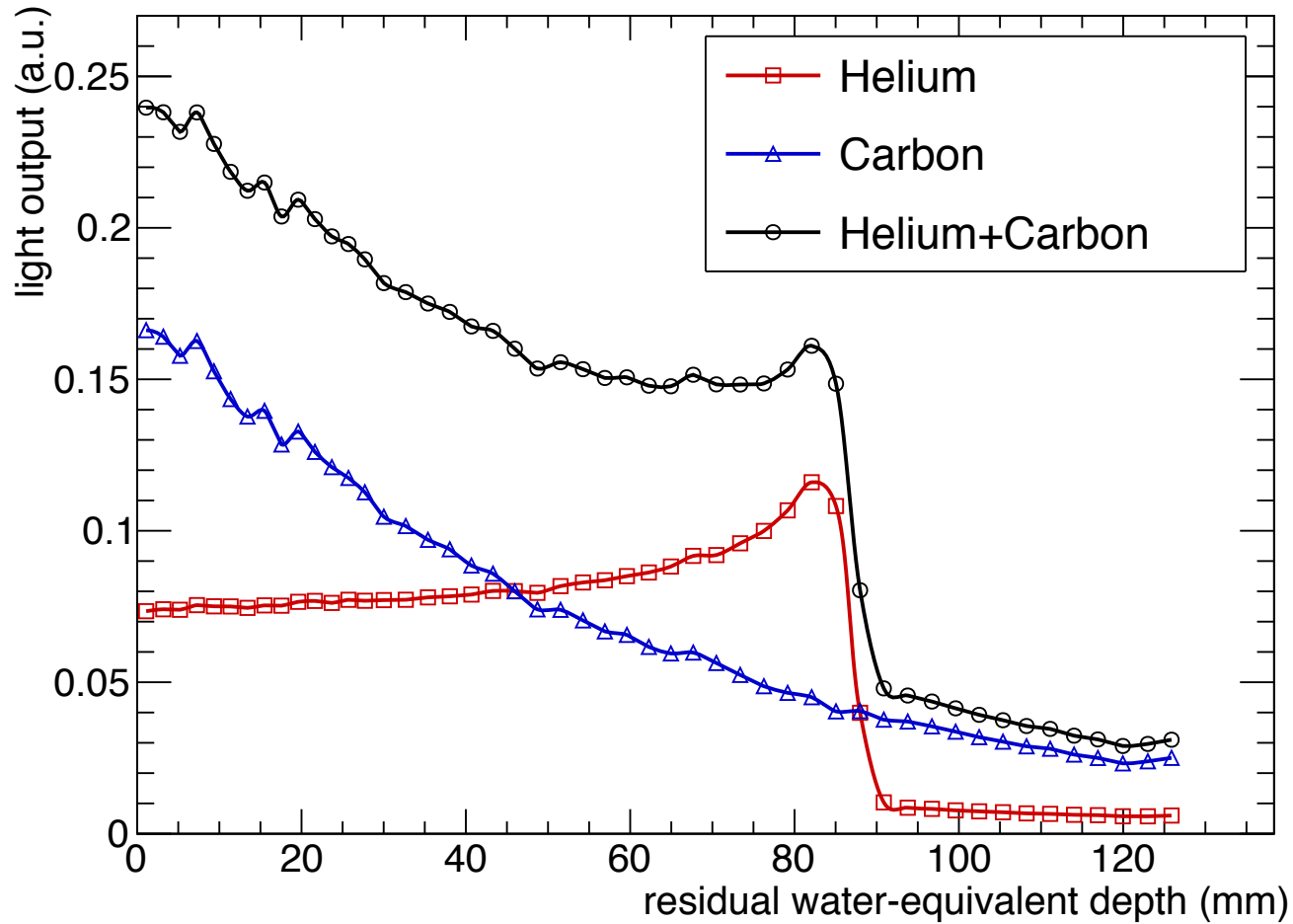
- Segment block into slices and read out light from each slice individually.
- Integrate signal from many protons: very large output from $10^{10}/s$.
- Minimum slice width will depend on manufacture: aiming for < 3 mm.
- Use simple, stable light detection: photodiodes/pixel sensors.
- Resolution set by slice width and variation in scintillator light output.
- Light enough to be nozzle-mounted: measurements from multiple gantry angles.

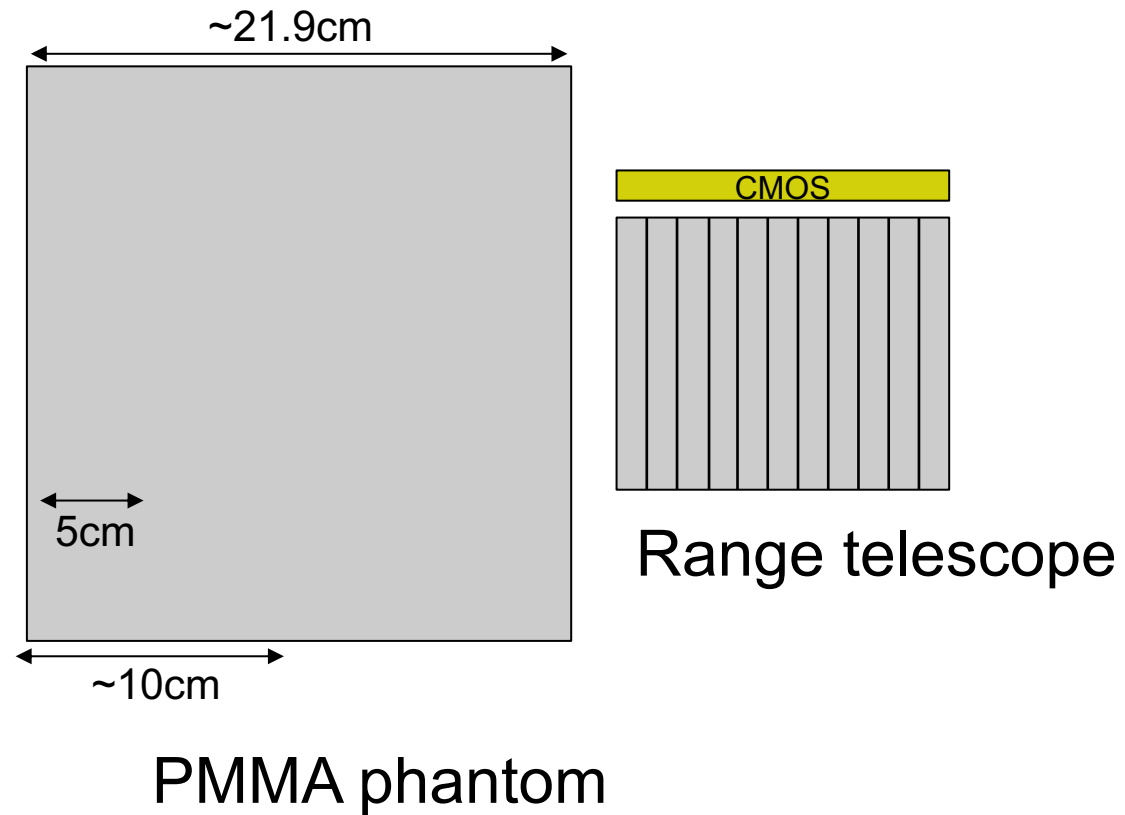
Prototype Detector

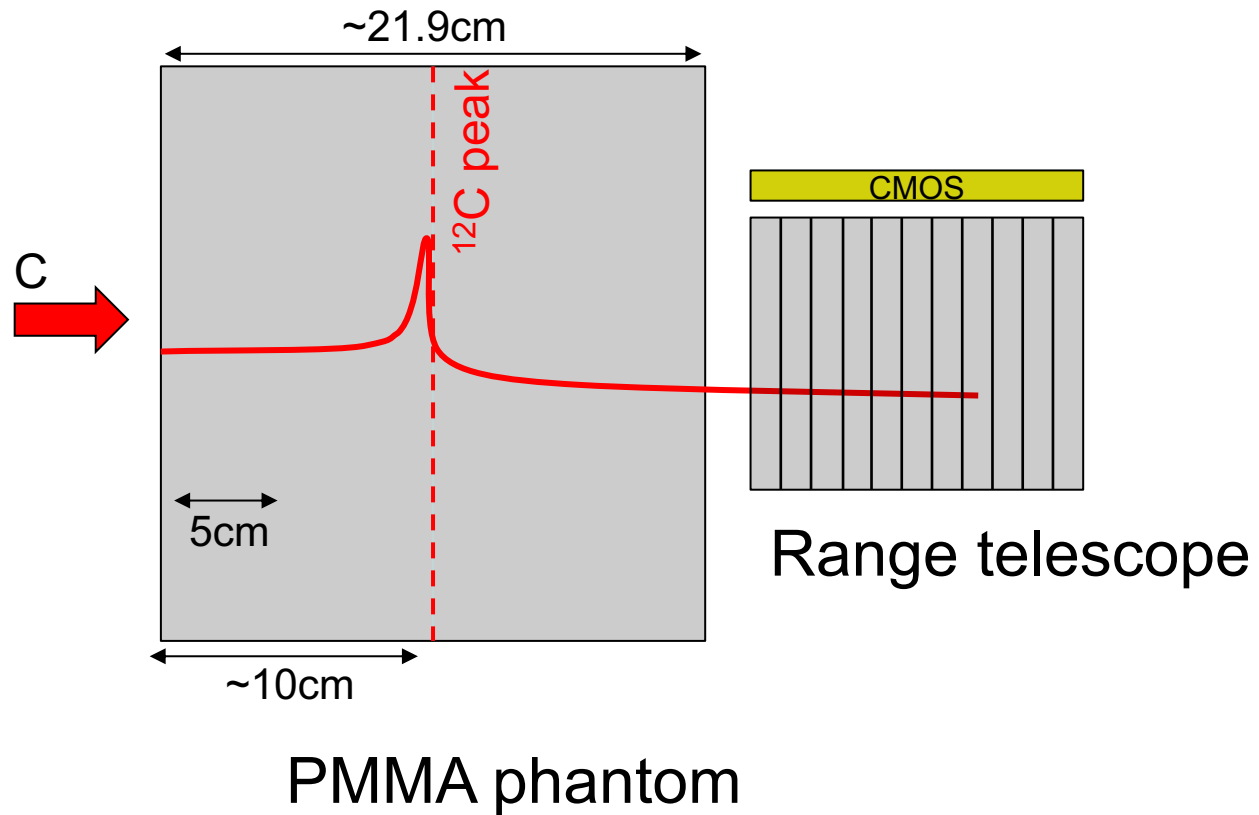


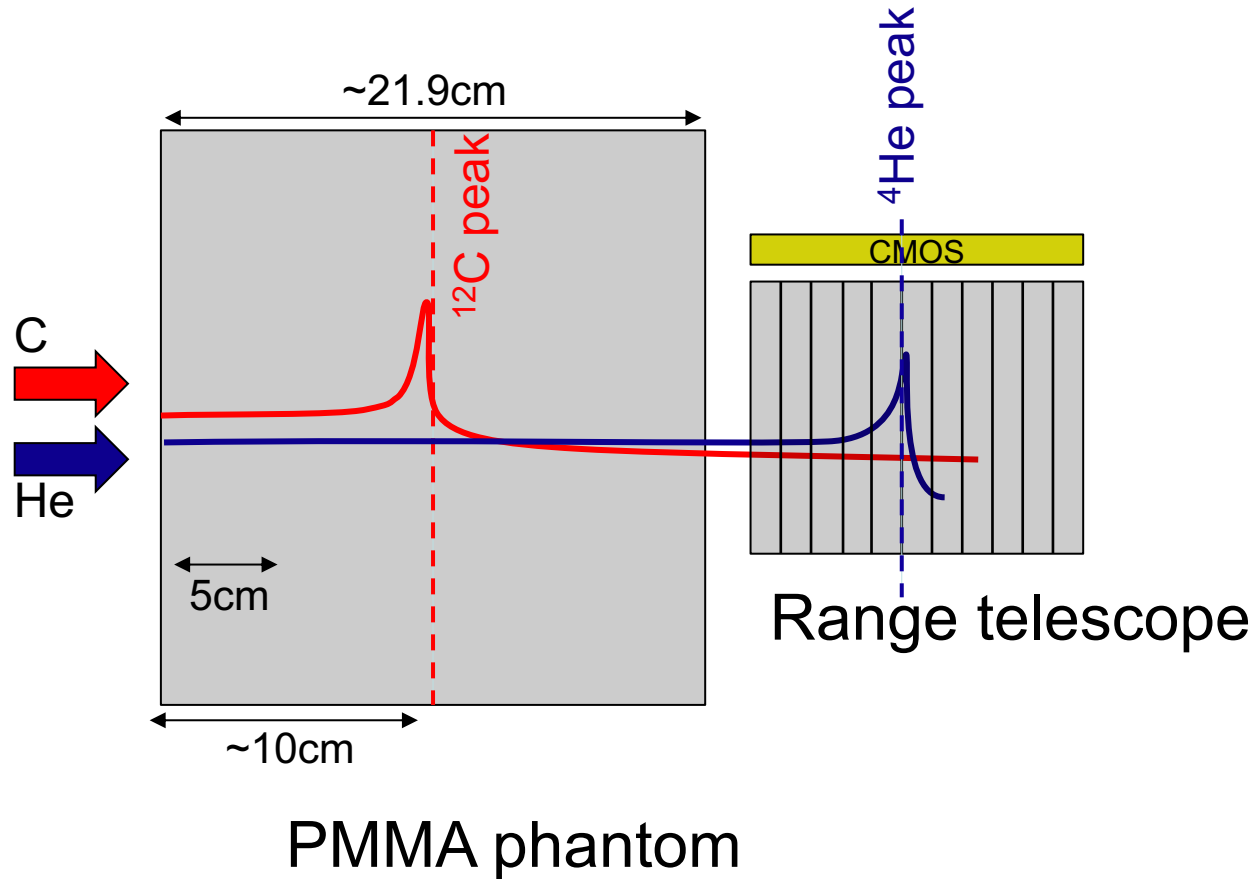


Helium-Carbon Mixing

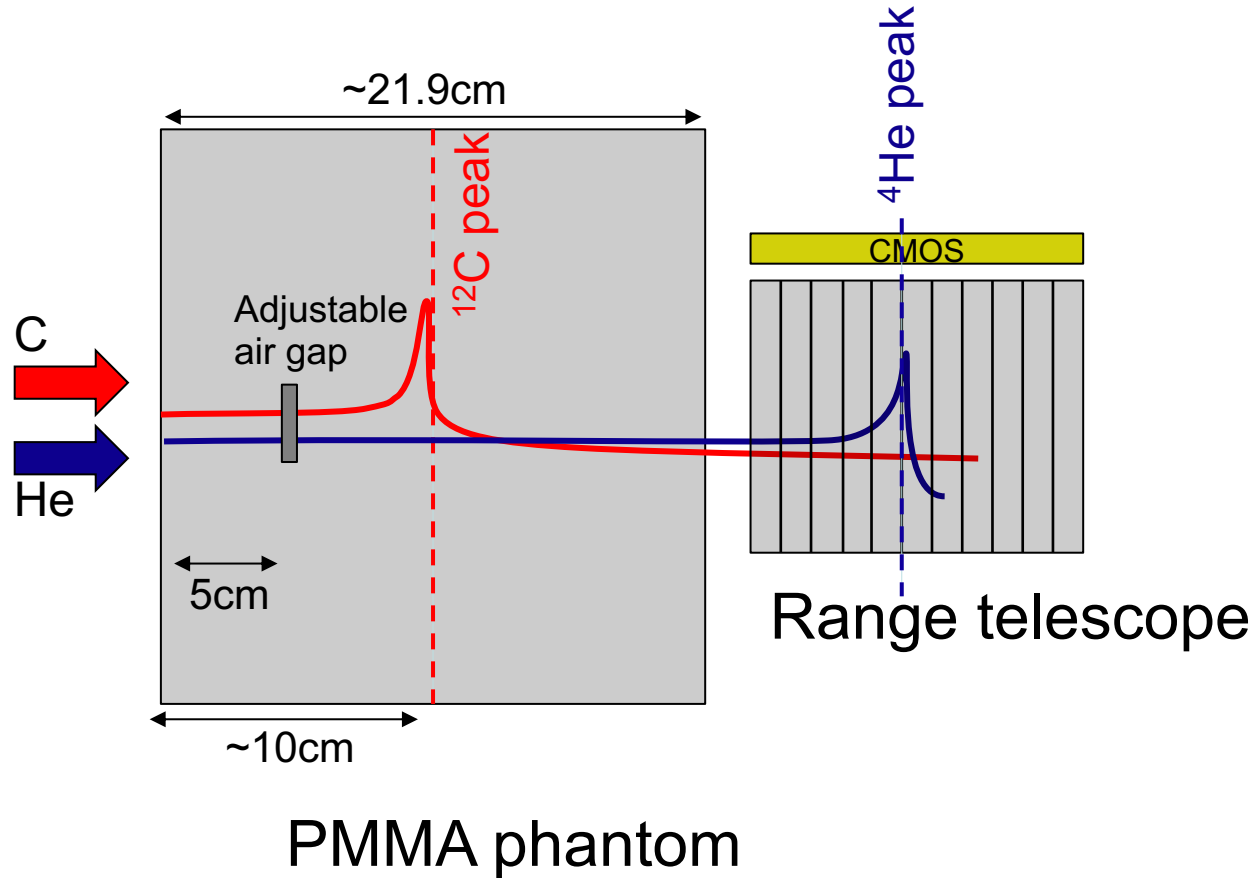


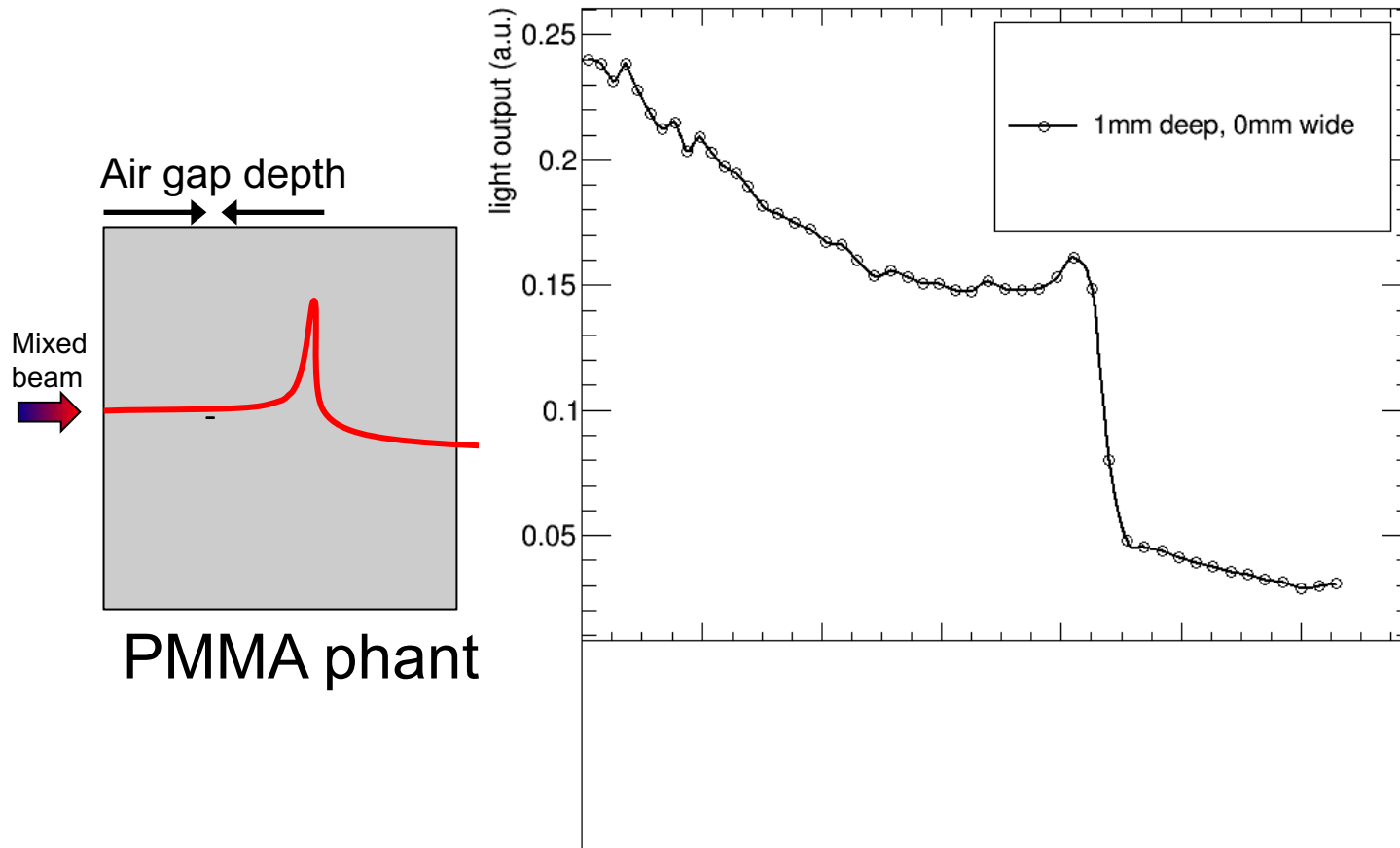




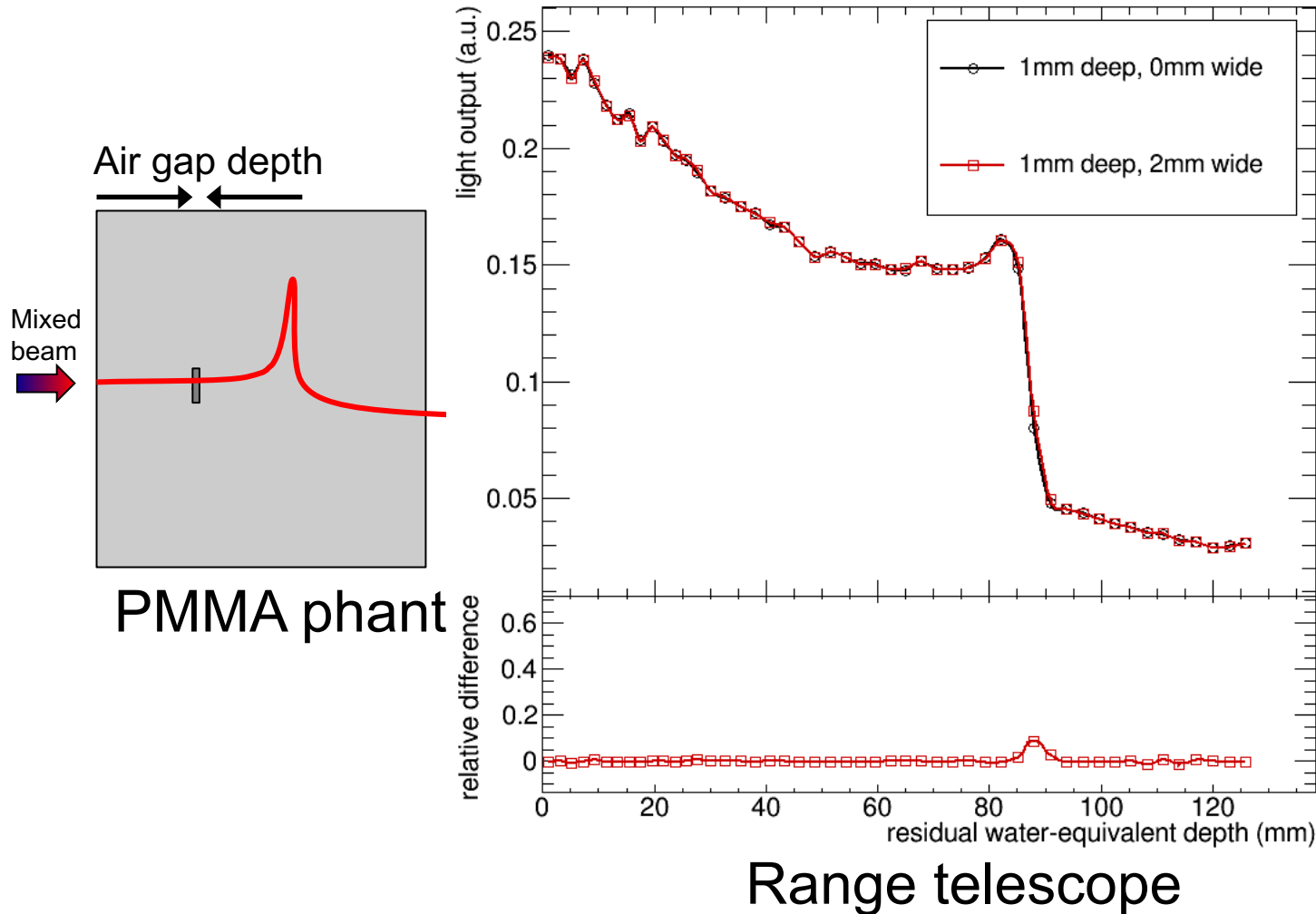


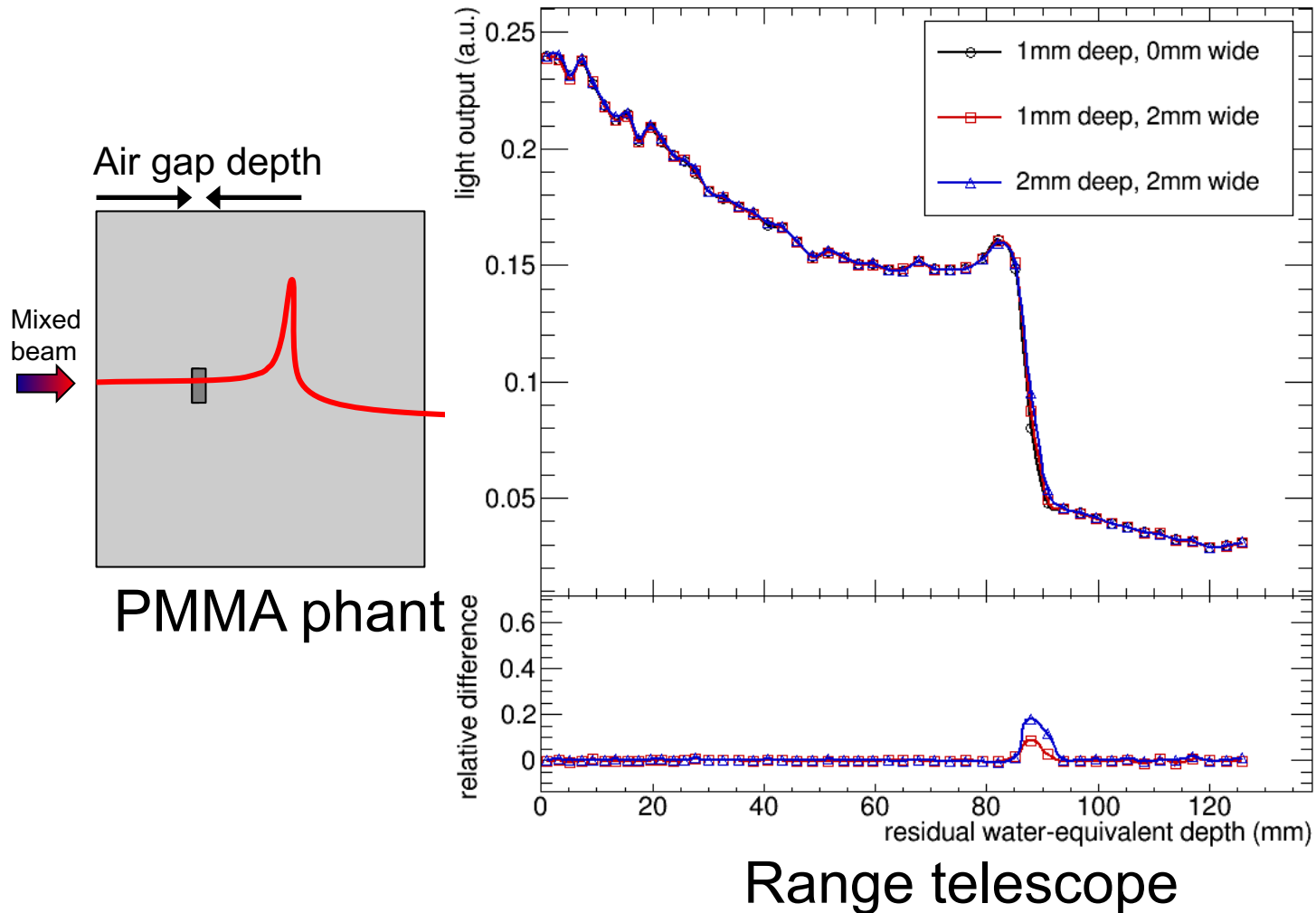
HIT PMMA Phantom Setup

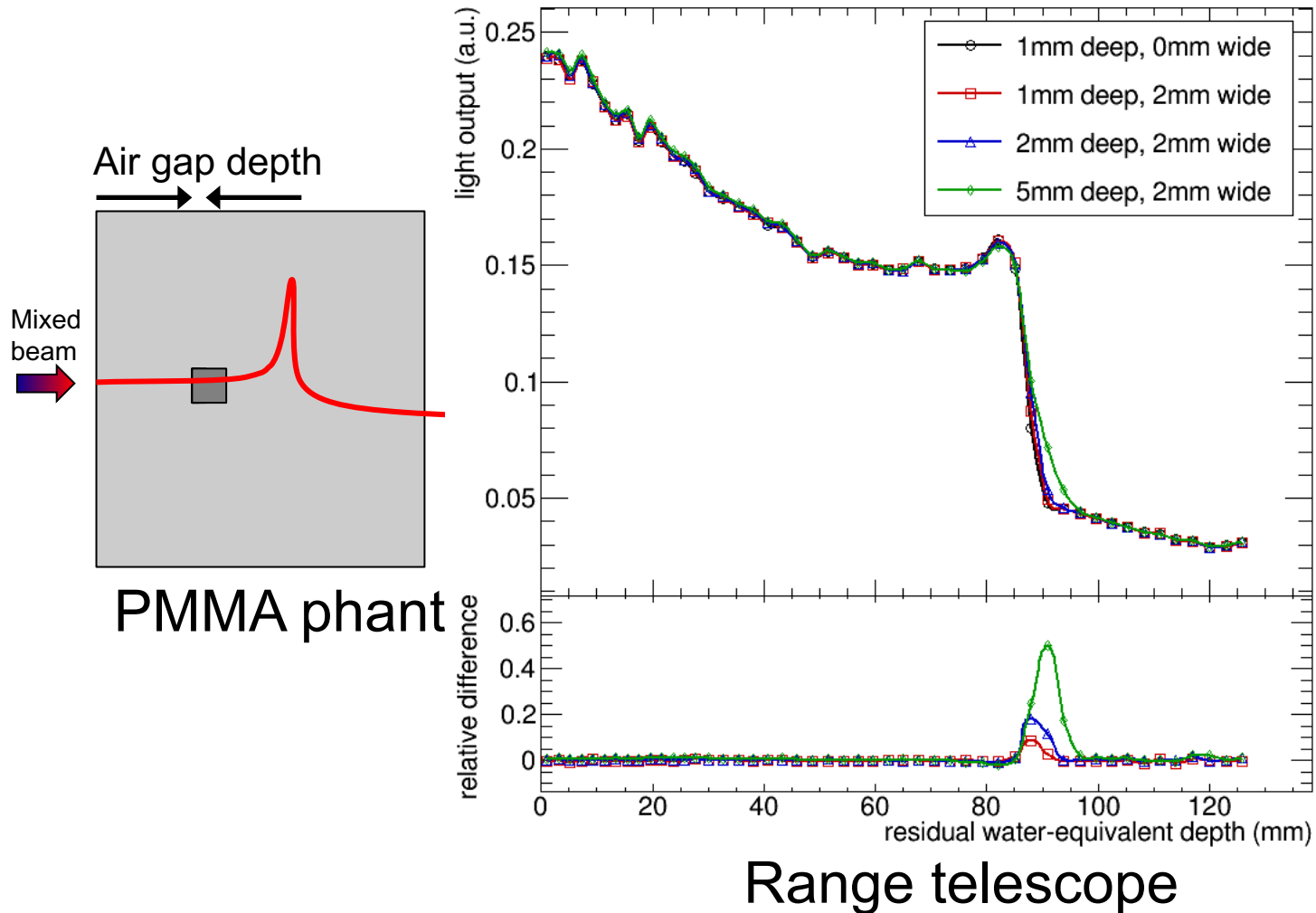


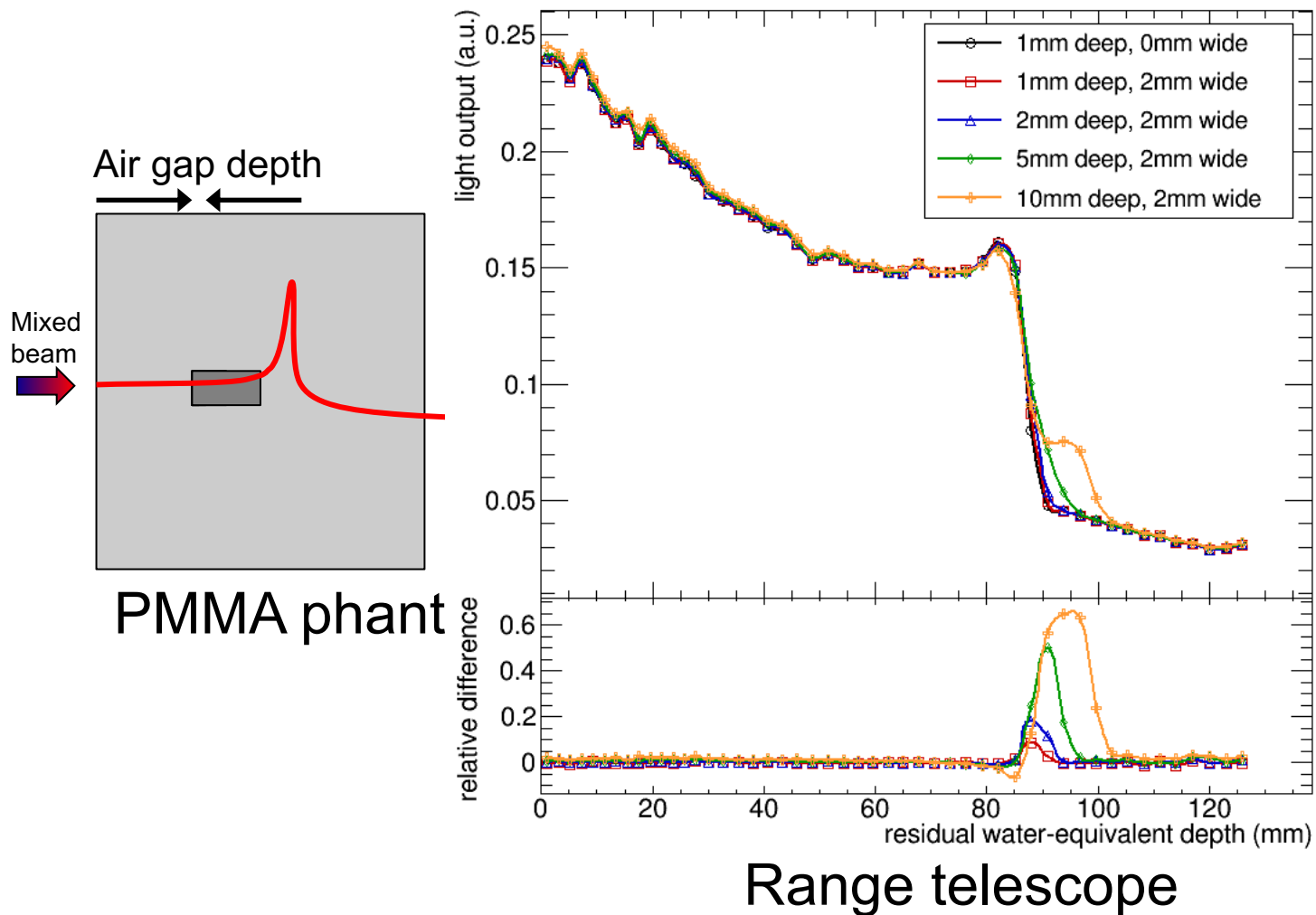


Range telescope









Thank You

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Simon Jolly — Proton Beam Therapy

27/09/19