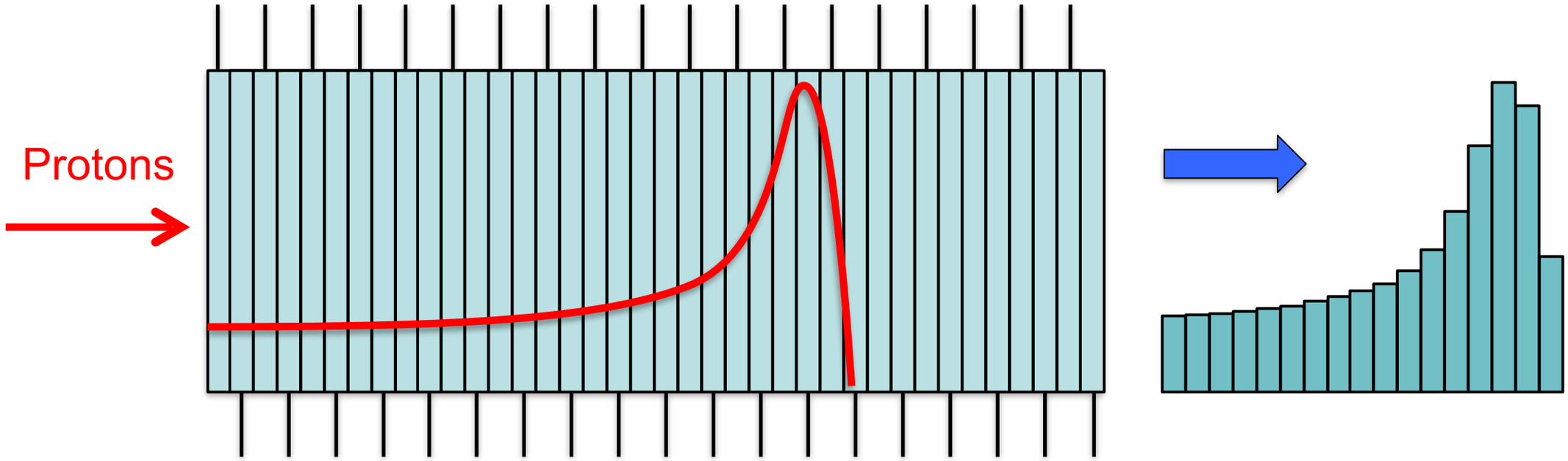
UCL PT QA Range Detector Commercialisation: State of the Art

Proposed QA Range Detector

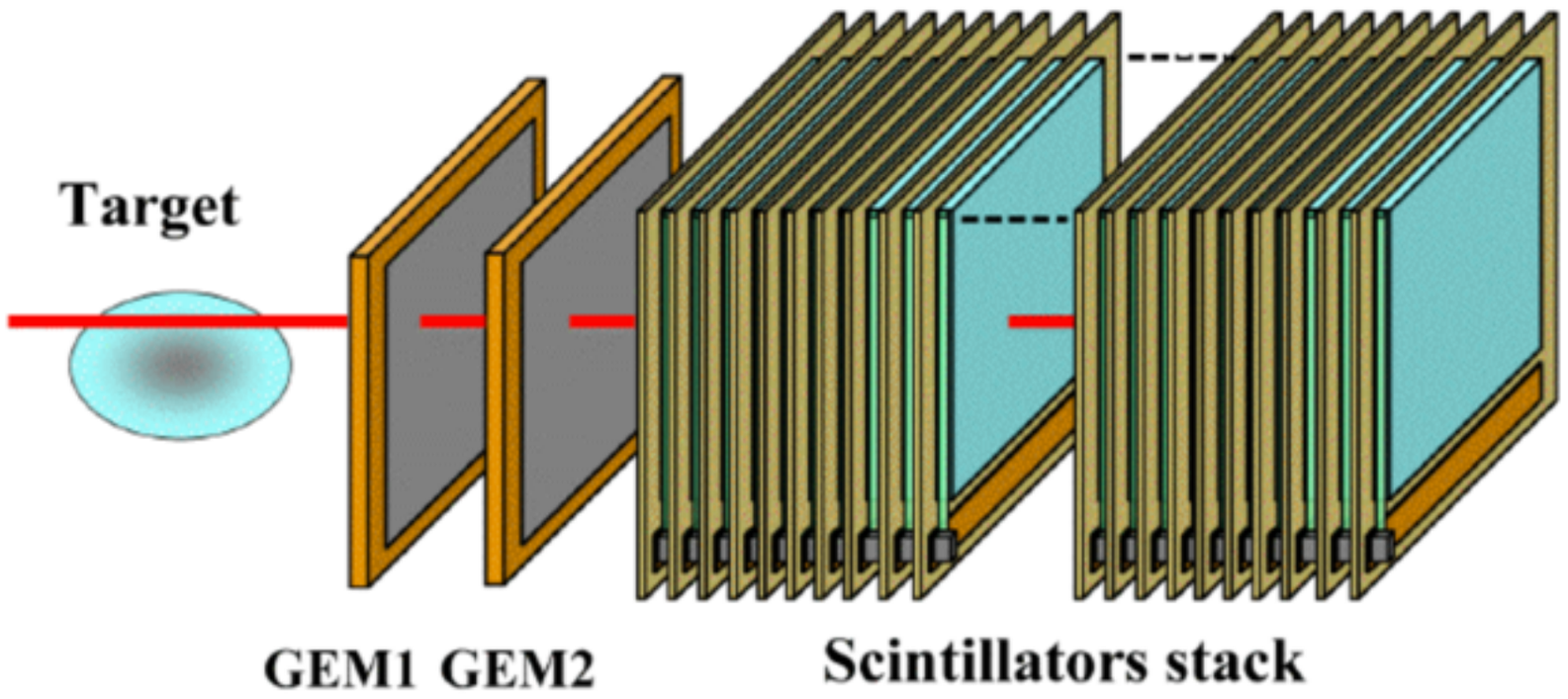


- Segmented Plastic Range Detector:
  - Segment block into slices and read out light from each slice individually.
  - Integrate signal from many protons: intensity for each sheet.
  - Fit quenched Bragg curve to this data.
  - Reconstruct actual Bragg peak and Water Equivalent Path Length (WEPL)

Proton Range Radiography

Range/Energy loss measured by plastic scintillator stack and silicon photomultipliers readout

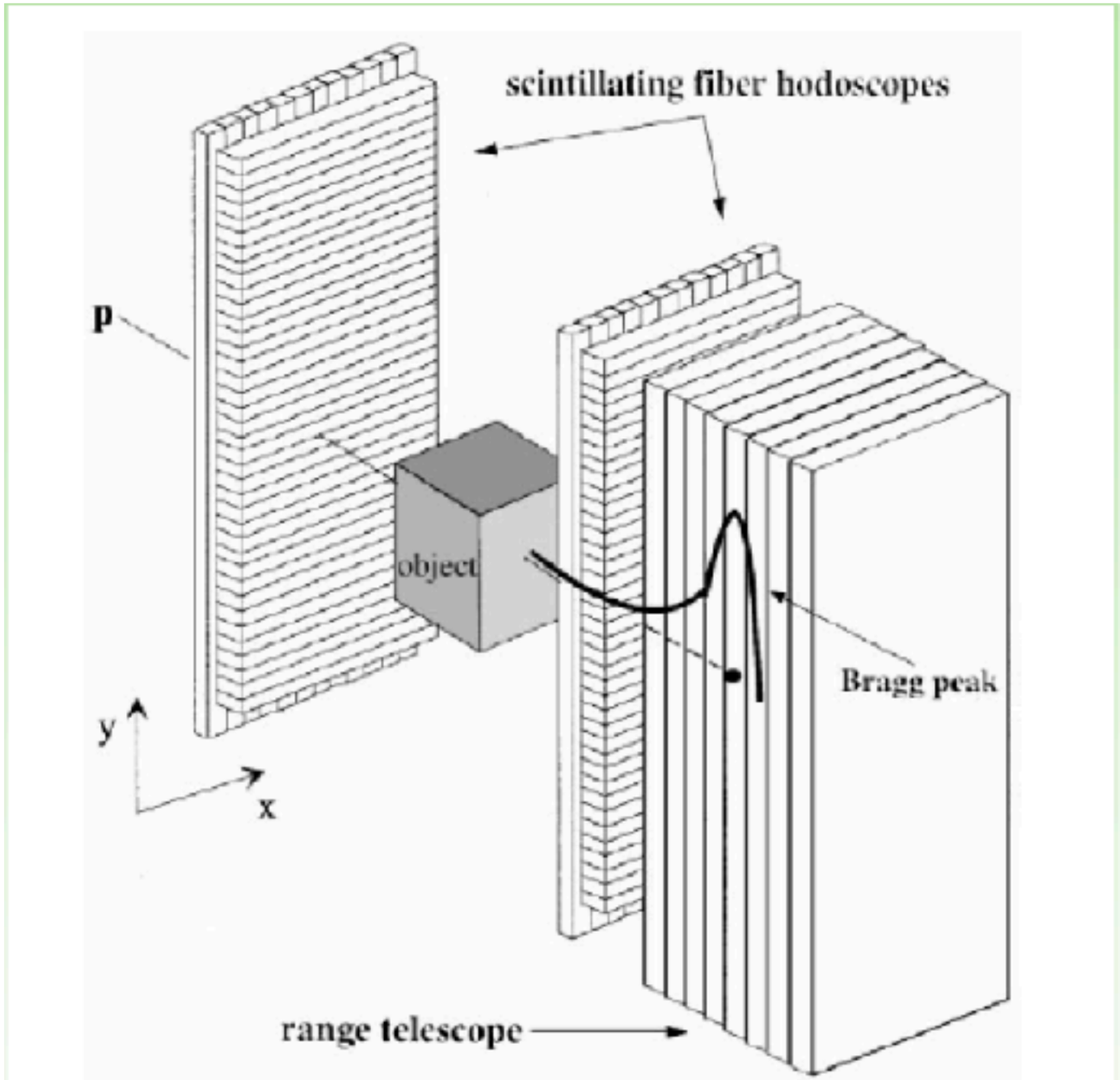
- TERA foundation page: https://project-aqua.web.cern.ch/project-aqua/prr.html
- PhD Thesis: https://ddd.uab.cat/pub/tesis/2014/hdl_10803_133354/daw1de1.pdf
- https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=5402303



Proton Range Radiography

Range/Energy loss measured by plastic scintillator stack

- P. Pemler et al, Nucl Instr. and Meth A432(1999)483



Proton Range Radiography

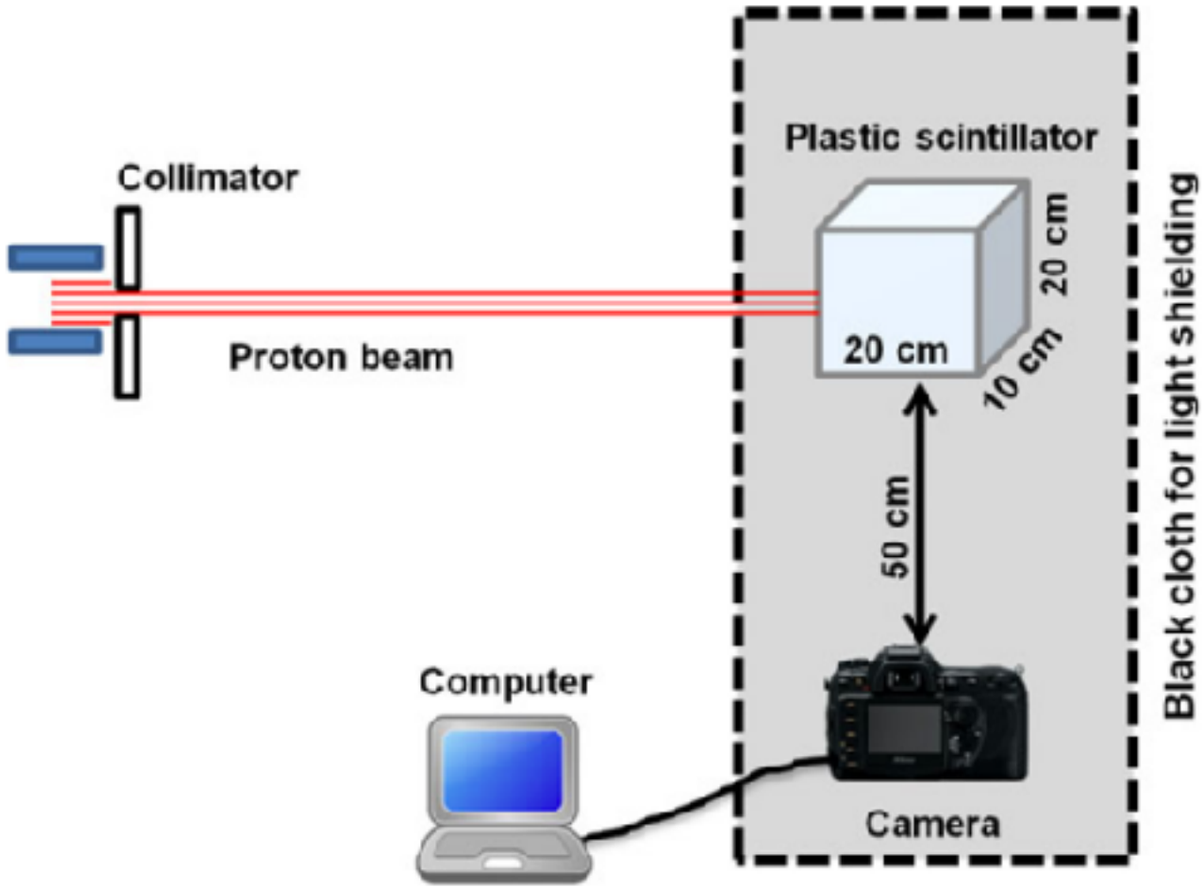
- No quenching correction mentioned
- Single proton measurement
- Different read-out w.r.t. the final proposal for the UCL PT QA Range Detector
- Different principle of operation

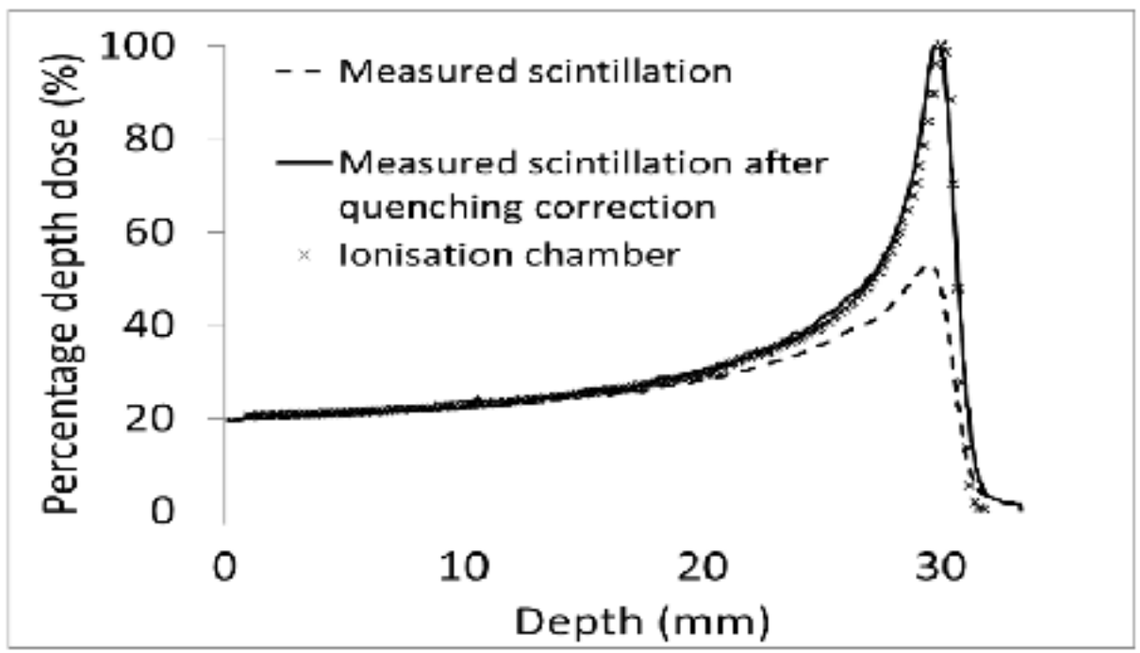
Volumetric scintillation dosimetry

References:

- D. Robertson et al: “Proton beam ruler - a fast proton range measurement tool using a scintillator block and camera” @PTCOG57
- D. Robertson et al: “3D plastic Scintillator detector for a fast verification of ocular proton beam” https://www.thegreenjournal.com/article/S0167-8140(17)30505-4/pdf
- M. Almurayshid et al (UCL authors): “Quality assurance in proton beam therapy using a plastic scintillator and a commercially available digital camera”
  - http://discovery.ucl.ac.uk/1570219/1/Almurayshid_et_al-2017-Journal_of_Applied_Clinical_Medical_Physics.pdf
  - https://smps.org.sa/en/wp-content/uploads/2017/11/Almurayshid_Plastic-Scintillator.pdf

Volumetric scintillation dosimetry





Volumetric scintillation dosimetry

- 3D picture of the beam: complete Bragg peak measured in 3 dimensions and calculate the range from it.
- complex setup
- quenching discussed