

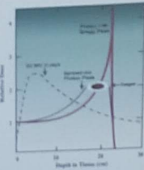
Characterizing Organic Scintillators: Construction of Bragg Peaks for Different Energies Proton Beam Energies



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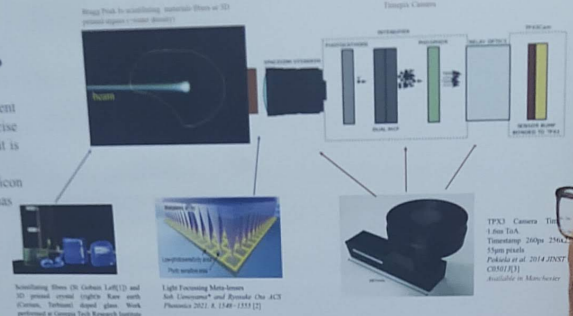
INTRODUCTION

Effective and safe proton therapy for cancer treatment relies on the precise knowledge of the position of the Bragg Peak (BP). Traditional radiation delivers x-rays, or beams of photons, to the tumour or cancer and beyond it. This can damage nearby healthy tissues and can cause significant side effects. By contrast, proton therapy delivers a beam of proton particles that stops at the tumour at the BP, so protons are less damaging to healthy tissue surrounding cancer cells.



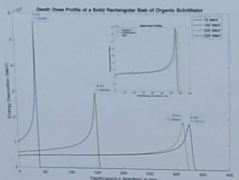
EXPERIMENTAL SETUP

To personalize the treatment for each patient we will use plastic scintillators and a precise camera to detect the Bragg Peak before it is delivered to the tumor. We will also use scintillators and silicon photomultipliers to detect prompt gammas.



GEANT4 SIMULATION

Material	Density (g/cc)	BP Position (mm)
Polystyrene	1.06	325
Polyvinyltoluene	1.023	329
Water	1.0	339

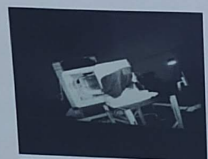


Beam Energy (MeV)	Bragg peak Position (mm)
70	38
150	150
230	315
235	325

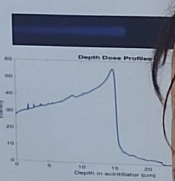
EXPERIMENTAL RESULTS



Photograph of the Beamline facility (research room) at the Christie Proton Therapy Centre, Manchester, United Kingdom.



Ariscam Autofocus Camera	
Sensor	Sony IMX519
Active Pixels	4656 x 3496
Pixel Size	1.22 x 1.22 μm
Sensor Res.	16 MP



Picture of the Bragg Peak in scintillator and plot of the data (MATLAB & ImageJ)



CONCLUSIONS:

we successfully used plastic scintillating materials and a portable camera to detect the Bragg Peak. Further tests were performed to add the measurement of the prompt gamma to further confirm the beam position.

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