What is Proton beam therapy?
The aim of any treatment using radiation is to non-invasively deliver a sufficient amount of dose to tumour cells whilst sparing healthy tissue. Contrary to conventional radiotherapy which uses high energy X-rays, Proton therapy instead uses a beam of high energy protons to target and kill cancers. A charged particle beam offers several advantages as protons can be accurately steered towards cancerous cells where they are able to deal more biological damage to target sites.

Why Proton Therapy?
- Protons transfer maximal amounts of energy at a depth (Bragg Peak) which can be specified at the tumour site
- Lower excess dose than conventional x-ray photon radiotherapy
- Sharp fall off means negligible dose after the target area

What is VELO?
VELO is a detector system that is being developed specifically for the CCC proton beam. In order to deliver the protons accurately and safely to each patient for their specific treatment, certain equipment is necessary to verify the process. VELO will be used to measure the properties of the beam and correlate this to the location and amount of radiation being delivered. Essential information about the ongoing quality of the treatment can be learnt as VELO transmits this data during the operation of the beam, unlike typical quality assurance systems which offer results after the irradiation occurs.

Cell & Simulation studies
- Monte Carlo simulations can generate an accurate approximation of processes based on probabilities.
- When considering the effects of radiation and interactions with matter, events are random but their probabilities of occurrence can be calculated.
- Simulations are very useful in predicting and investigating complex interactions and their outcomes reflect real life events.
- These accurate computational projections of outcomes can then be compared with measurements.
- This includes models of beam transport, halo propagation and radiobiological damage and cell response.

References
Clatterbridge Cancer Centre, Wirral, UK
- 62 MeV proton beam
- Passive scanning beam system
- First proton therapy treatment facility in the UK
- Treated 2830 eye cancer patients since 1989

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