Over 330,000 diagnosed with cancer in the UK each year

Nearly two-thirds of patients will receive radiotherapy as part of their treatment

Half of all patients will receive radiotherapy as part of their curative treatment

Most radiotherapy using external beams of high-energy x-rays

New kid on the block - proton beams
Proton beam therapy offer real benefits

- Tumours in the head and neck region
- Tumours near the spine or other critical organs
- Some types of brain tumours
- Some childhood cancers so the risk of second cancers later in life is greatly reduced
- ..... potentially, small cell lung cancer, etc.
- Shorter treatment lengths
- Less side-effects
- Faster recovery

Proton beam therapy status

- 48 operational centres worldwide
- Further ~30 planned
- Over 70,000 patients treated
- UK Government agreed funding of 2 NHS centres
  (UCH, London and Christie’s, Manchester)
**Advantage**
Intense dose in small targeted volume

**Potential Problem**
Intense dose in small healthy volume

**Patient planning**
- Perform x-ray CT
- Translate from diagnostic x-rays to treatment protons
- Prone to errors - 1 - 2 cm in soft tissue, greater in bone

- **Need to see the patient using the “same” protons as used in treatment**

Proton CT – the *Holy Grail* of Radiotherapy
Proton trackers
Radiation-hard technology developed for the Large Hadron Collider at CERN, and employed in discovery of the Higgs Boson.

Range telescope
24 layers of radiation-hardened CMOS imagers.
Same basic technology used in mobile phone cameras, except over 500 times larger and work 20 times faster.

Proton beam

Measure angle of incoming individual protons
Measure angle of outgoing individual protons
Measure residual energy of individual protons

Enough Silicon to make 22,000 iPhone cameras
Collect data at 6 Gigabytes per second - equivalent to 300 HDTV channels
PRaVDA consortium

- University of Lincoln
- University of Birmingham
- University of Liverpool
- University of Surrey
- University of Cape Town
- University of Warwick
- University Hospital Birmingham NHS Foundation Trust
- University Hospital Coventry and Warwickshire NHS Trust
- National Research Foundation (NRF) - iThemba LABS, SA
- United Lincolnshire Hospitals NHS Trust
- The Christie NHS Foundation Trust

- ISDI: Image Sensor Design and Innovation Ltd
- aSpect Systems GmbH
- Elekta AB (Publ)
- Advanced Oncotherapy Plc

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