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Centre for the Clinical Application of Particles; activity report February 2018

1 Visit to MedAustron, 30 January 2018

Background

MedAustron is the Austrian centre for proton and carbon-ion therapy and research. It is a company wholly owned by the Austrian government. The facility includes a proton synchrotron serving three treatment rooms and a fourth 'end-station' dedicated to non-clinical research. MedAustron also acts as a hub for Austrian university groups pursuing research in a variety of fields, including radiobiology.

MedAustron will soon start commissioning a synchrotron for the acceleration of carbon ions and seeks to establish a programme of measurement of the biological effectiveness of carbon-ion beams and a study of the underlying radiobiology. This programme is completely aligned with the CCAP's objectives.

Objectives of visit:

- Establish potential for collaboration on the commissioning and exploitation of the carbon-ion accelerator.

Outcomes:

- The meeting successfully identified a number of topics of mutual interest, including:
 - *Short term:*
 - * Contributions to the commissioning of the carbon-ion synchrotron (starting May 2018);
 - *Medium term:*
 - * Commission synchrotron to deliver 800 MeV protons and exploit the beam to study proton tomography;
 - * Exploitation of the carbon-ion beam to study carbon-ion (micro-)dosimetry and/or carbon-ion radiobiology;
 - * Development of a novel beam-gating interface for clinical use;
 - * Development of novel beam-extraction or beam-delivery systems;
 - * Development of carbon-ion treatment-planning software.
- It was agreed that a Physics PhD student from Imperial would contribute to the carbon-ion-accelerator commissioning. The decision on further research topics to form the basis of the student's thesis would be agreed at a meeting in September 2018.
- The visit included a tour of the radiobiology laboratories established at MedAustron by the Medical University of Vienna. There is clear potential for collaboration here. It was agreed that the post-doc in charge of the radiobiology activity at MedAustron would come to Imperial to deliver a seminar and to discuss further possible areas of collaboration. Follow-up discussions at the Medical University of Vienna will then be arranged.

2 Clinician-led meeting, the Charing Cross Hospital, 5 February 2018

Background

The CCAP is, ab initio, an interdisciplinary collaboration that seeks to develop the techniques and technologies

required to address clinical needs. The 'Clinician-led meeting' was proposed and organised by D. Gujral and M. Williams, consultant oncologists at the Charing Cross Hospital.

The programme included a tour of the CT image acquisition and immobilisation facility, the treatment planning suite and of the new electron-linac X-ray radio-therapy facility that is presently being commissioned. The meeting was well attended and Charing Cross Hospital staff gave generously of their time and expertise.

The meeting concluded with a discussion of initial research directions.

Objectives:

- The principal objective of the meeting was to give the natural scientist members of the CCAP an introduction to the techniques and methodology of radiotherapy in clinical practice and some insight into the constraints on treatment programmes.
- The closing discussion was organised to identify fruitful areas for the collaborative development of the CCAP programme.

Outcomes:

- The primary objective of the meeting was successfully accomplished.
- From the topics raised in the closing discussion, the following were identified as potential topics for future development:
 - Transit dosimetry;
 - Image processing and the simulation of dose-deposition; and
 - High dose-rate electron-beam technology/radiobiology.