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From: K. Long (Director, Centre for the Clinical Application of Particles)

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

1 CCAP student/post-doc Workshop, 6 March 2018

Background

The CCAP is, ab initio, an interdisciplinary collaboration that seeks to develop the techniques and technologies required to address clinical need. The development of a laser-driven particle accelerator system for radiobiological applications is a central part of the Centre's programme. The 'student/post-doc workshop' was proposed and organised by A. Kurup (Physics) to bring together post-docs and graduate students from the Faculty of Medicine and the Department of Physics.

Objectives:

- The principal objective was to give post-docs and students within the CCAP the opportunity to meet each other and to discuss their work in an informal setting; and there-by to
- Identify related or similar topics of study, common issues, and common roadblocks (e.g. in simulation and computing).

Outcomes:

- The principal objective of the meeting was accomplished since the meeting was well attended by personnel from Physics and the Charring Cross Hospital. Three main areas were covered:
 - Laser-plasma particle sources, including software codes used for laser-plasma simulations such as EPOCH, SMILEI and FLASH and the experiments these are used to simulate;
 - The development of the Gabor lens prototype. This lens is proposed to capture and focus particles produced in the Imperial laser-plasma particle source as the front-end of a proof-of-principal laser-driven accelerator system; and
 - Dose-deposition estimation using the Monte Carlo code Fluka and the simulation of clinical linacs using Geant 4.
- Other simulation packages were discussed. PENELOPE, GATE, and TOPAS were agreed on as code packages to be investigated further; and
- It was agreed that EPOCH, SMILEI, and FLASH would be installed on the High Energy Physics group's computing farm to improve computing speed.
- The next meeting is planned for 24th April 2018.

2 Visit to MedAustron and the Medical University of Vienna, 16 April 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 has begun to commission 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:

- Introduce graduate student Hin Tung Lau to the MedAustron accelerator group and agree initial arrangements for Lau's long-term attachment (LTA) to MedAustron;
- Confirm plans laid at the end of January: Lau will contribute to carbon-synchrotron commissioning over the summer and a review meeting will be held in September 2018 when the further collaboration for his PhD will be agreed; and
- Make an initial visit to the Medical University of Vienna to discuss possible topics for collaboration and the possibility of the development of an MCSA ITN application to be submitted in January 2019.

Outcomes:

The meeting was successful on all counts. Lau will begin his LTA in May 2018 and will contribute to the commissioning of the carbon-ion accelerator. Discussions at the Medical University of Vienna led to an outline specification of the content of the ITN programme and several topics for future collaboration.