



Science and
Technology
Facilities Council

John D Lawson Lecture and Reception

Thursday 08th December 2022

16:00 – Hybrid – Webinar and Live

Professor Ulrich Schramm

Helmholtz-Zentrum, Dresden-Rossendorf

Advancing laser accelerated proton beam performance for dose-controlled irradiation studies and beyond the 100 MeV frontier

The application of laser plasma accelerated proton beams in radiation therapy of cancer has been discussed almost since the first demonstration of plasma accelerators reaching 10s of MeV energies. It was initially motivated by accelerator compactness and cost efficiency, promising a wider spread of advanced therapy methods. Thus, the radiobiology of these intense particle bunches was studied, in particular the exploration of potential dose rate related effects. With the recently reported FLASH effect, a high dose rate effect observed to reduce radiation toxicity in normal tissue, the field has regained significant interest. For the required translation to in-vivo studies laser accelerated proton beams however not only lacked sufficient energy to penetrate the required volume but often stability and reproducibility of beam parameters to ensure the provision of a homogeneous dose distribution in a prescribed way.

This presentation focuses on the recent development at the Petawatt laser DRACO at Helmholtz-Center Dresden-Rossendorf that enabled the first dose controlled systematic irradiation of tumours in mice with laser accelerated protons. Details on acceleration mechanisms and strategies to increase stability and energy at the 60 MeV range will be discussed as well as beam transport by means of a dedicated pulsed solenoid beamline to a secondary target together with online metrology and dosimetry.

In parallel, improved control of interaction parameters together with different types of targets operated close to relativistic induced transparency enabled the exploitation of acceleration mechanisms surpassing target normal sheath acceleration. Here proton energies well beyond 100 MeV could be reached at repetition rate compatible laser parameters.

<https://ukri.zoom.us/j/95732365698>

Coffee & Tea in R22 Coffee Lounge at 15:30

Lecture followed by a reception at 17:00 in the R22 Coffee Lounge– All Welcome