Abstract submitted to
Flash Radiotherapy and Particle Therapy Conference
Virtual Conference, December 1-3, 2021

The Laser-hybrid Accelerator for Radiobiological Applications (LhARA)

K. Long
On behalf of the LhARA collaboration

Background and Aims

The 'Laser-hybrid Accelerator for Radiobiological Applications', LhARA, is conceived as a novel, uniquely flexible facility dedicated to the study of radiobiology. The technologies that will be demonstrated in LhARA have the potential to allow particle-beam therapy to be delivered in a completely new regime, combining a variety of ion species in a single treatment fraction and exploiting ultra-high dose rates. LhARA will be a hybrid accelerator system in which laser interactions drive the creation of a large flux of protons or light ions that are captured using a plasma lens and formed into a beam. The laser-hybrid approach will allow the exploration of the vast "terra incognita" of the mechanisms by which the biological response is modulated by the physical characteristics of the beam. I will describe outline the state of the art in laser-driven ion acceleration, describe the motivation for LhARA, present the status of its development, and summarise the programme upon which the LhARA collaboration has embarked to drive a step-change in clinical capability.

Methods

The LhARA facility has been simulated using a variety of codes. A prototype of the principal focusing element has been exposed to a beam.

Results

The results of the simulation of the LhARA facility will be presented. The spatial distribution of the beam at the end stations has been estimated and the instantaneous and average dose rates have been calculated.

Conclusions

The LhARA initiative has the potential to deliver the required to deliver automated proton- and ion-beam therapy at FLASH rates in a variety of spatial and spectral configurations.