

Development of a Plasma (Gabor) Lens for LhARA

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The design of the ‘Laser-hybrid Accelerator for Radiobiological Applications’ (LhARA) is based on a series of electron-plasma (Gabor) lenses to capture, focus, and select the energy of the ions produced by a laser-driven source. The short focal lengths required by the reduced footprint of the facility together with the beam optics and the repetition rate of the source impose strict requirements on the density, size, and stability of the plasma in the lenses. The required plasma parameters are compared to those that pertain to the current state-of-the-art traps.

Here, we present a proposed upgrade for an existing electron plasma trap that is limited to ‘single-particle’ ensembles as observed in recent measurements. The development aims to allow the confinement of higher density plasmas in larger volumes with plasma lengths of more than 50 cm and radii of 1 cm or above. Measurements of the transverse rotation of the electrons in the existing trap are described and compared to the results of particle-in-cell simulations. Plans for prospective measurements on the upgraded apparatus will also be presented.