

Laser Ion Acceleration for Hadron Therapy

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We discuss using laser plasma as a source of high-energy ions for the purposes of proton therapy. The research in this direction has been conducted in almost all world leading laser science centers. The approach is based on the efficient ion acceleration observed in laboratory, theory and numerical experiments (*in silico*) on the high-power laser interaction with matter. The specific dependence of proton energy losses in biological tissues (the Bragg peak) promotes the solution of the main problem of the irradiation of a malignant tumor with a sufficiently strong and homogeneous dose, ensuring that the irradiation of the surrounding healthy tissues and organs is minimal. Compared to standard accelerators of charged particles used in the present day hadron therapy centers the laser ion acceleration is more advantageous owing to compactness and relatively low cost of laser accelerators and due to possibility to develop the all-optical scheme with transportation and rotation of photon beams instead of high energy ions with magnetic transportation lines and gantries. A usage of tailored targets enables production of high quality ion beams required for hadron therapy.