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Optimization of radiation acceleration regime and the target structure in laser plasma interaction GALINA DUDNIKOVA, CHUAN LUI, DENNIS PAPADOPOULOS, ROALD SAGDEEV, University of Maryland, College Park, Maryland, USA, ARI ZIGLER, Hebrew University, Jerusalem, Israel —
Recent work [1,2] indicates that under proper conditions the interaction of ultrashort, high power lasers with thin foils can generate ion beams in the 100-200 MeV energy range with relatively low velocity dispersion. This technology can have major implications to medical ion proton cancer therapy since it can provide a relatively inexpensive table-top alternative to the current used traditional cyclotrons. This paper presents a simulation trade-off study of laser driven generation of quasi-monochromatic ion beams in the thin-foil Radiation Pressure Acceleration (RPA) regime. The radiation pressure accelerates the electron cloud, which in its turn transfers accelerates the ions due to the induced longitudinal charge separation fields. A series of two and three-dimensional PIC simulations are presented with emphasis on stabilizing the target plasma against Raleigh-Taylor and modulational instabilities. Such instabilities are known as the main obstacles in achieving monochromatic beams.

[1] B. Eliasson, C. Lui, et al. New Jour. Phys., 11, 2009.
[2] F. Pegoraro, S.V. Bulanov. Laser Phys., v19, N 2, 2009.

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