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Ion acceleration by interaction of obliquely incident laser pulses with non-periodic structured target

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Laser irradiation of hydrocarbon targets with varied thickness leads to acceleration of protons by two different mechanisms depending on the laser intensities and target thickness [1-2]. The one involving thicker (~10μm) targets and moderate laser intensities is known as target normal sheath acceleration mechanism. It has recently been reported for the flat targets that there is an enhancement of maximum proton energy if a single normally incident laser pulse is replaced by obliquely incident single laser pulse of similar intensity or is equally divided into two obliquely incident laser pulses [3-5]. Here we perform two-dimensional particle-in-cell (PIC) simulations to study the interaction of one and two oblique laser pulses with a structured target. We investigate the proton energy spectra when the target has a rectangular slot at the front surface and is irradiated with obliquely incident laser pulses. It is observed that the cutoff energy of the accelerated protons is reduced in comparison to the normal incidence case. We also explore the irradiation of targets with triangular as well as semi-circular slots and the reduction of maximum proton energy on using one/two oblique laser pulses seems to be universal for a non-periodic structured targets.

1. A. Macchi, M. Borghesi, M. Passoni, Reviews of Modern Phys. **85** (2013) 751
2. H. Daido, M. Nishiuchi, A. S. Pirozhkov, Reports on Progress In Phys. **75** (2012) 056401
3. L. Yang, Z.G. Deng et al., Physics of Plas. **23**, (2016) 083106
4. J. Ferri, E. Simions et al., Communications Phys. **02**, (2019) 40
5. O. Rahman, Z. M. Sheng, Physics of Plas. **28** (2021) 053106