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Plasma Gratings as a Novel Target for Ion Acceleration

Thursday, September 19, 2019 6:00 PM (20 minutes)

With the trend towards higher repetition rate laser systems for applications, there is a demand for new, high repetition rate target solutions. This talk will look at efforts to develop shaped, thin, near-critical density gas targets for radiation pressure driven ion acceleration experiments using the high power, $10.6\mu m$ CO_2 laser at Brookhaven National Laboratory. By suitably shaping a gas target, a ps laser pulse was used to first form a transient plasma grating structure in an underdense density ramp. Subsequently, protons were accelerated from the near-critical density plasma grating elements to multi-MeV energies, with few percent energy spreads with modest $\sim 10^{15}$ Wcm^{-2} laser intensities. The measured proton energies were more than twice that predicted by the hole-boring scaling, $E_i = 4I/n_c c$. Multiple spectral features were observed on a significant fraction of shots. These results will be discussed, along with some future directions.

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