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Advanced Ion Acceleration Mechanisms

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Abstract: One of the main applications of high power laser facilities is particle acceleration. It is due to the fact that ultrashort laser pulses in plasma are able to generate electromagnetic fields exceeding those typical for the conventional accelerators by many orders of magnitude. Laser ion acceleration is of particular interest due to unique beam properties and its potential application in basic and material science, medicine, industry, etc. There are several possible regimes where different ion acceleration mechanisms may be accessed, depending on target and laser parameters. The most well known of them is Target Normal Sheath Acceleration. However, the quest for more efficient acceleration of ion beams having different spectral features gave rise to several other advanced ion acceleration mechanisms, such as Magnetic Vortex Acceleration and Radiation Pressure Acceleration. Here the basic theoretical concepts for several advanced ion acceleration mechanisms will be presented as well as recent analytical and computer simulation results.

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