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Present and Future Regimes and Applications of Laser-Plasma Ion Acceleration

Abstract - The acceleration of ions by high intensity laser pulse interaction with solid targets has emerged in recent years as an extremely active area of research. In this talk the state of the art of this field will be briefly reviewed, showing that most of experimental observations reported up to now are successfully explained by the mechanism of Target Normal Sheath Acceleration. However, the ion beam requirements for foreseen applications in fusion, medical, nuclear and particle physics may be met at ultrahigh laser intensities (feasible with the proposed ELI and HiPER facilities) such that ion acceleration occurs in the Radiation Pressure Acceleration (RPA) regime. We discuss recent theoretical results on RPA and how this regime may be already investigated in present-day or next-term experiments with small-scale laser systems.