The mass dependence of the collisionless shock generation in counter-streaming plasmas with high-power laser

T. Morita[1], Y. Sakawa[1], Y. Kuramitsu[1], H. Aoki[1], H. Tanji[1], S. Shibata[1], T. Ide[1], N. Ozaki[1], R. Kodama[1], A. Shiroshita[1], T. Sano[1], K. Shigemori[1], T. Norimatsu[1], T. Kato[1], H.Takabe[1], J. Waugh[2], N. Woolsey[2], B. Loupias[3], A. Diziere[4], C. Gregory[4], M. Koenig[4], Y. Zhang[5], X. Liu[5], S. Wang[5], Q. Dong[5], Y. Li[5], J. Zhong[6], J. Zhang[7]

[1]Osaka University, Suita, Osaka, 565-0871, Japan
[2]Department of Physics, University of York, Heslington, YO10 5DD, UK
[3]CEA, DAM, DIF, F-91297 Arpajon, France,
[4]LULI, ´ Ecole Polytechnique, CNRS, CEA, UPMC, Route de Saclay, 91128 Palaiseau, France
[5]Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences Beijing 100190, China
[6]The National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China
[7]Shanghai Jiao Tong University, Shanghai 200240, China

The collisionless shock is one of the most important subjects to study the physics of charged particle acceleration and the origin of cosmic rays. In this report, we present the research of collisionless shock generation using Gekko XII HIPER laser system at Institute of Laser Engineering, Osaka University (352 nm (3ω), 500 ps, ~100 J / beam, ~10^{15} W/cm^2). The collisional effects of the counter-streaming plasmas were investigated using four kinds of materials for our targets. Our target consists of a thin plane or double-plane which was made of CH, C, Al, Cu and Pb. Counter-streaming plasmas were created by laser-produced ablating plasma flows. The plasma flows and generated shocks were diagnosed by interferometry, shadowgraphy to measure the electron density, and by streaked optical pyrometer, gated optical imager, and spectrometer to measure the temperature from the transverse direction to the main laser.