Thomson scattering measurements of the transition layer of collisionless shocks

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Particle acceleration mechanism at the collisionless shocks, which can be seen at various astrophysical phenomena, is most likely the diffusive shock acceleration (DSA), however, the DSA theory has some unsolved problems such as particle injection and generation mechanism of electromagnetic waves to scatter particles. Previous studies of particle acceleration at the collisionless shocks, such as astronomical observations, "in situ" observations in the Earth's magnetosphere, and numerical simulation studies, are insufficient to solve the injection problem. Then, we aim to solve them with laboratory experiments that form the collisionless shocks. Here we use Gekko XII at Institute of Laser Engineering, Osaka University. In December 2017, we performed experiments and succeeded in obtaining data of 33 shots. We put the ambient gas with the pressure of 5 Torr (~670 Pa), Aluminium plane target, which are irradiated by HIPER lasers (wavelength of 1053 nm, pulse width of 1.3 ns, average energy of 700 J/beam). Using the optical self-emission and the collective Thomson scattering measurements, we obtained the time evolution of electron density and electron/ion temperature at the shock transition layer. We present preliminary results of our data analysis.