

無衝突衝撃波の高強度レーザー実験：マイクロ構造の計測に向けて

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High power laser experiment on collisionless shock: Potential of Thomson scattering measurement

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A collisionless shock often plays some crucial roles in high energy phenomena in space, since it is a sort of an efficient energy converter. At a shock, upstream flow energy is converted into various different types of energies. While a part of it is dissipated as downstream thermal energy, some parts are used to produce high energy non-thermal particles, large amplitude waves, etc. However, detailed mechanisms of the energy conversion have not been well understood.

We have performed the laboratory experiment on collisionless shocks by using high power laser in collaboration with the Institute of Laser Engineering at Osaka university for the past few years. In the experiment expanding target plasma sweeps and compresses a surrounding gas plasma resulting in a discontinuous structure in its density. The density jump at the forward edge of the structure appears to satisfy the theoretical jump condition of a stationary plane shock. In the experiment planned to be performed in this year the local structure of a shock transition region will be measured by using collective Thomson scattering measurement. The potential ability as well as issues of this method to measure the local non-equilibrium plasma is discussed.