

激光 XII 号レーザーを用いた無衝突衝撃波の実験的研究 Experimental study on collisionless shocks with high-power laser system "Gekko-XII"

森田 太智^{1*}; 坂和 洋一¹; 石川 大志¹; 山浦 祐太¹; 佐野 孝好¹; 森高 外征雄¹; 富田 健太郎²; 下田 諒²; 佐藤 裕太²; 松清 修一²; 諫山 翔伍²; 原田 大輔²; 大山 達也²; 藤野 亮佑²; 蔵満 康浩³; 米田 仁紀¹⁰; 長嶺 和慶¹⁰; Koenig Michel⁴; Yurchak Roman⁴; Michaut Claire⁵; Woolsey Nigel⁶; Crowston Robert⁶; Pelka Alexander⁷; Li Yutong⁸; Yuan Dawei⁸; Yin Chuanlei⁸; Zhong Jiayong⁹; Zhang Kai⁹; 高部 英明¹
MORITA, Taichi^{1*}; SAKAWA, Youichi¹; ISHIKAWA, Taishi¹; YAMAURA, Yuta¹; SANO, Takayoshi¹; MORITAKA, Toseo¹; TOMITA, Kentaro²; SHIMODA, Ryo²; SATO, Yuta²; MATSUKIYO, Shuichi²; ISAYAMA, Shogo²; HARADA, Daisuke²; OYAMA, Tatsuya²; FUJINO, Ryosuke²; KURAMITSU, Yasuhiro³; YONEDA, Hiroki¹⁰; NAGAMINE, Kazuyoshi¹⁰; KOENIG, Michel⁴; YURCHAK, Roman⁴; MICHAUT, Claire⁵; WOOLSEY, Nigel⁶; CROWSTON, Robert⁶; PELKA, Alexander⁷; LI, Yutong⁸; YUAN, Dawei⁸; YIN, Chuanlei⁸; ZHONG, Jiayong⁹; ZHANG, Kai⁹; TAKABE, Hideaki¹

¹ 大阪大学レーザーエネルギー学研究センター, ² 九州大学, ³ 国立中央大学, ⁴ LULI, Ecole Polytechnique, ⁵ LUTH, Observatoire de Paris, ⁶ University of York, ⁷ Helmholtz-Zentrum Dresden-Rossendorf, ⁸ Institute of Physics, Chinese Academy of Science, ⁹ National Astronomical Observatory, Chinese Academy of Science, ¹⁰ 電気通信大学レーザー新世代研究センター
¹ Institute of Laser Engineering, Osaka University, ² Kyushu University, ³ National Central University, ⁴ LULI, Ecole Polytechnique, ⁵ LUTH, Observatoire de Paris, ⁶ University of York, ⁷ Helmholtz-Zentrum Dresden-Rossendorf, ⁸ Institute of Physics, Chinese Academy of Science, ⁹ National Astronomical Observatory, Chinese Academy of Science, ¹⁰ Institute for Laser Science, University of Electro-communications

Collisionless shocks play significant roles in particle acceleration, for example, in Earth's bow shock and Supernova remnant shocks. In collisionless shocks, collisions between particles can not account for the formation mechanism and particle-field interactions are essential. Therefore, the shock thickness is much smaller than ion-ion mean free path and a large electromagnetic field exists at the vicinity of the shock. Laboratory experiments with high-power laser systems can be alternative to observations or in-situ measurements by satellites. Collisionless shocks have been produced and investigated in counter-streaming laser-produced plasmas. To investigate collisionless shocks, the measurements of an electric or magnetic field and of fundamental plasma parameters are required. Shocks have been measured by optical diagnostics such as interferometry, shadowgraphy, optical pyrometry, and Thomson scattering to obtain the fundamental plasma parameters: density, temperature, charge state, and flow velocity. We will present recent results from series of our experiments on collisionless shocks with Gekko-XII laser system.

キーワード: 無衝突衝撃波, レーザー, プラズマ, プラズマ計測
Keywords: collisionless shock, laser, plasma, diagnostics