S001-30
A 会場 ：11/5　PM1 （13:45-15:30）
14:30〜14:45

#Law　King Fai Farley[1), 安部　勇輝 [1),Morace Alessio[1), 有川　安信 [1), 森田　大樹 [2), 余語　覚文 [1), 尾崎　哲 [3), 千徳　靖彦 [1),Korneev Phillip[4), 藤岡　慎介 [1)
[(1] 阪大レーザー研,[(2] 宇都宮大,[(3] 核融合研,[(4] ロシア国立原子力研究大学

Particle acceleration from semirelativistic magnetic reconnection experiment by petawatt laser

#King Fai Farley Law[1), Yuki Abe[1), Alessio Morace[1), Yasunobu Arikawa[1), Hiroki Morita[2), Akifumi Yogo[1), Tetsuo Ozaki[3), Yasuhiko Sentoku[1), Phillip Korneev[4), Shinsuke Fujioka[1)
[(1]ILE, Osaka U,[(2]Utsunomiya U,[(3]NIFS,[(4]MEPhI, NRNU,

Magnetic reconnection, the process of magnetic field topology rearrangement that results in the conversion of magnetic field energy into kinetic energy of energetic particles, is recently accounted for various phenomena in astronomical plasmas. Examples of such situations include solar phenomena and planetary magnetosphere. In this work, we performed an experimental demonstration of magnetic reconnection under relativistic electron magnetization, where magnetic field energy density is about 100 times of electron rest mass density. This is an intermediate situation between the highly relativistic case in electron-positron pair plasma, in which magnetic reconnection is also accounted for its contribution to gamma-ray flares, and the typical non-relativistic situation mentioned above. In terms of astrophysical settings, this situation shows similarity to plasma in accretion disks of black holes, which also requires an efficient particle acceleration mechanism to fulfill the constraints from recent observations.

In this experiment, the magnetic reconnection plasma was generated by laser-irradiation on the inner surface of a curved target fabricated from a thin metal foil, which produces 2.2 kilo-tesla magnetic field on picosecond time scale. Firstly, we characterized the magnetic field amplitude in the reconnection plasma by proton deflectometry method. After that, we observed a pair of outflow, driven by the reconnection, was accelerated from the irradiated target and particle spectrum in the outflow was measured. A hard ($p = 1.535 \pm 0.015$) power-law non-thermal component was observed in the electron spectrum, which showed consistency with 3-D particle in cell simulation results. Our results reveal the capability of magnetic reconnection as an efficient particle acceleration in semirelativistic magnetized proton-electron plasma.