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Simulation of magnetic reconnection in a laboratory setting using a PW-class laser at CoReLS

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Magnetic reconnection is a process where magnetic field energy is rapidly converted into particle energy by rearrangement of field lines. It is known to be one possible candidate which could explain the abrupt ejection of high energy particles in astrophysical environments such as star formation or solar flares. In an earthbound context, e.g. tokamak discharges, magnetic reconnection has also been frequently observed. Numerous *in situ* spacecraft based measurements as well as laboratory experiments, like in tokamak, are performed to investigate the fundamental process of magnetic reconnection, however, the exact physical mechanism still remains uncertain despite the study of longer than a half century. Here, a novel experimental platform to simulate a magnetic reconnection in a laboratory setting using a PW-class laser system (80J, 20fs, 0.1Hz, 800nm,) at the Center for Relativistic Laser Science (CoReLS), Institute for Basic Science, will be presented. A distinct feature of the proposed experiment is the plasma target of near-critical density ($10^{20}cm^{-3}$ ~ 0.1 n_{cr}) instead of a solid metal. Preliminary results of the recently performed experiment, which serves as a preparatory work for future magnetic reconnection experiment, will be shown, especially the magnetic field measurement inside the plasma by means of optical polarimetry diagnostics.