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P4.2005 Investigation of spontaneous magnetic fields electron and ion emissions in laser-produced plasma in experiments at PALS

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Multi-frame femtosecond polaro-interferometry in combination with measurements of electron and ion emission open great opportunities for detailed studies of laser plasma properties in a wide range of applications from the inertial confinement fusion (ICF) to laboratory astrophysics. We present the 3-frame-complex-interferometry investigation of spontaneous magnetic fields (SMF) produced at planar massive and double-layer Cu targets (massive Cu coated by different thickness layers of plastic) irradiated by the 1st harmonic frequency of the PALS iodine laser with intensity above 10^16 W/cm^2. Along with the SMF parameters, the parameters of electron emission were measured by using the 2D Cu K_alpha x-ray imaging and the multi-channel magnetic electron spectrometer. Moreover, the return target current associated to hot electrons escaping the plasma was measured with the use of a current probe, and the angular distribution of ion emission was measured using a grid system of ion collectors. Obtained information allows defining the current density distributions associated with the flow of electrons in ablative plasma, the energy deposited in SMF, the fast electron energy and their spectrum The combined analysis helps to advance in verification of possible absorption mechanisms of laser radiation, which are assumed responsible for energy transport with participation of fast electrons, an important issue in the SI concept of the ICF. 2D numerical simulations with the ATLANT-HE code and an analytical model that include fast electron generation and transport have been used to support the interpretation of experimental data.

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