Kinetic Simulation for EUV spectroscopy on the Degenerated Non-equilibrium Electrons in Dense Aluminum Plasmas

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Ultrafast dynamics of excited electron distribution are important for understanding the formation of dense plasmas created by intense laser pulse. With the ultrashort probe technique, the high harmonic generation driven from ultrashort laser pulse, time-dependent EUV transmission within a few hundred femto-second timescales has been measured. The transmission directly shows electron distribution evolution over 10-eV range near the L-edge (~ 72 eV) of dense aluminum plasmas heated by laser pulses. In this poster, we present a population kinetic simulation model for the strongly excited non-equilibrium Fermi liquid. It includes photo-excitation and collisional de-excitation rates, and is designed in order to analyze the creation of degenerated non-equilibrium electron distributions. The simulation reveals that the stopping power, which essentially affects the de-excitation rate, is a vital factor to reproduce the phenomena that low-energy electrons in Aluminum conduction band are more excited than high-energy electrons, and this result is consistent with the experimental observation.

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