Numerical modeling of radiation physics in kinetic plasmas [I][1]

YASUHIKO SENTOKU, IOANA PARASCHIV, RYAN ROYLE, RISHI PANDIT, ROBERTO MANCINI, Department of Physics, University of Nevada, Reno — High energy density plasmas created by ultraintense short laser light emit intense x-rays via atomic processes. There is no simulation code available to study the critical details of X-ray emission/absorption and the plasma formation with femtosecond temporal resolution. Since the plasmas are created in less than 1 ps, thermalization or equilibrium cannot be assumed so that we must treat the plasma kinetically. We have developed a novel simulation tool based on the collisional particle-in-cell (PIC) code, PICLS, in which we now solve the X-ray transport and photoionization self-consistently with the plasma dynamics. This talk introduces the idea of the numerical model of the radiation trasport and also introduces several applications such as Bremsstrahlung, K-α emission, and XFEL-matter interaction, of which details are presented in the following talks.

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