Coupling simulations of high current electron beam (HCEB) transport in the indirect-drive imploded plasma by Sheng Guang II laser facility

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In the numerical simulations of fast ignition in IAPCM (Institute of Applied Physics and Computational Mathematics), we have used the LARED-S radiation hydrodynamics code to conduct the calculations of indirect-drive implosions, the physics of the laser-generated electron source has been studied using PIC code, the electron transport, energy deposition and the formation of hot spot in the imploded bulk plasma has been calculated by hybrid PIC model. The integrated simulations are being developed.

Based on the hybrid scheme proposed by Bell and Davies [1], we developed a PIC (particle-in-cell)-MC (Monte Carlo) code named as EBT2D&3D to model an electron beam transport into the dense matter [2]. The background target is treated as a cold, stationary fluid, the fast electrons are treated as particles and described by a particle-in-cell method. Both self-generated electric and magnetic fields, as well as collisions between fast electrons and the target are considered. The numerical algorithms implemented in the code will be presented in detail.

We will also present the coupling simulations between the radiation hydrodynamics LARED-S and PIC hybrid EBT2D code. The indirect drive implosion is calculated in the conditions of Sheng Guang II Laser Facility, the parameters of imploded plasma are transferred from LARED-S to EBT2D. An assumed electron beam from the scaling law is injected into the imploded plasma, EBT2D is carried out to simulation the electron beam transport in it. The simulation results will be presented and discussed. Furthermore, the effect of a huge magnetic filed generated in the implosion process on the electron transport will be discussed. Some interesting results will be presented.


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