

Radiation-Hydrodynamics code HELIOS-CR: improved models for dense plasma effects and IFE simulations

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HELIOS-CR is a 1-D radiation-magnetohydrodynamics code that is used to simulate the dynamic evolution of plasmas created in high energy density physics (HEDP) experiments [1]. The energy sources include lasers, radiation sources, electric currents (in cylindrical geometry), and particle beams. It has been extensively used for modelling low-yield ICF experiments. We will discuss several model improvements that makes HELIOS more suitable for IFE simulations including accounting for burned fuel, improved fusion cross-sections, more accurate and efficient charged particle transport algorithms, and support for non-monoenergetic particle beam specifications. We will also discuss new models that account for dense plasma effects on atomic structures and their effect on the results of hydrodynamics simulations with inline collisional-radiative atomic kinetics.

References

[1] J.J. MacFarlane, I.E. Golovkin, P.R. Woodruff, HELIOS-CR - a 1-D radiation-magnetohydrodynamics code with inline atomic kinetics modeling, JQSRT, Vol. **99**, Issues 1-3, pp. 381-397 (2006).

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