17th Kudowa Summer School "Towards Fusion Energy" Kudowa Zdrój, 3 – 7 June, 2024

Radiation Hydrodynamics and Related High Temperature Phenomena

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Abstract

Radiation hydrodynamics is the proper framework for describing the physics of fluids at high temperatures in situations where the fluid is highly collisional and incoherent radiation plays a significant role in the evolution of the hydrodynamic variables. The latter may be due either to the imposition of an intense external source of incoherent radiation (such as a laser-generated incoherent x-ray source) or due to the fact that the fluid itself radiates sufficiently that photons are a key mechanism of energy transport. This talk will describe a variety of the phenomena that may be encountered and the key physics that underpins their development and propagation. Regimes of formation of a variety of types of ionization and radiation waves will be discussed, as will some of the phenomena that can be associated with very strong shock waves, such as radiative precursors and superheating spikes. Following this introduction to some of the physics we shall consider radiation-hydrodynamics simulations from the angle of the prospective or novice user focusing on how to properly determine what type of code should be employed (Lagrangian, Eulerian, ALE, 1-D, 2-D etc) and some guidance on how to set up relevant problems.

References

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