MODELLING OF HOT DENSE MATTER EXPERIMENTS ON SHORT PULSE LASERS USING BURIED LAYER TARGETS

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We discuss the modelling of short pulse laser hot dense matter experiments on the ORION laser concentrating on the atomic physics and radiative transport required in their analysis. These experiments can reach multiples of solid density at kiloelectronVolt temperatures. In addition to the hot, dense plasma effects which the experiments are designed to interrogate, they present a modelling challenge due to the presence of the laser-plasma interaction, time dependence of the experiment, and the presence of a significant and highly non-Planckian radiation field within the buried layer.

ALICE is an atomic kinetics and atomic physics code designed to model plasmas in these conditions. We will discuss the models used in the code and, through comparison of the predictions of the code to recent experimental results, comment on the implied and required accuracy of the models and particularly the coupling of time dependent atomic kinetics with the radiation field and the dense plasma effects needed to model this regime successfully.

The modelling of the laser-plasma interaction also needs to include atomic physics, kinetics and radiative transport. We will demonstrate the implementation of these in the integrated hydrodynamic and hybrid Particle-in-Cell codes needed to approach a predictive modelling of the experiments.