Integrated simulation system for fuel target implosion in heavy ion fusion

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In inertial fusion, one of crucial issues is a uniform implosion of a DT target fuel to obtain a sufficient fusion energy output. The driver energy deposition non-uniformity should be kept small, less than a few percent. We have been working on a uniform target implosion in heavy ion fusion (HIF) [1]. The heavy ion beams (HIBs) deposit their energy inside of the energy absorber of the HIF target. We also found a preferable HIBs illumination scheme, and found that wobbling HIBs provide a remarkable smoothing effect of the HIBs energy deposition non-uniformity [1].

In order to study the fuel target implosion, ignition and burning, we have developed an integrated target implosion simulation system. Between the initial time and the void closure time, a Lagrange fluid code is developed and used to simulate the target implosion in HIF. After the void closure time, the simulation results at the void closure time in the Lagrange code are transferred to another Euler fluid code to simulate the final phase of the target fuel compression, ignition and burning. All the physical data in the Lagrange code are converted and transferred to those in the Euler code. The Euler code is flexible against the fuel deformation. Figure 1 shows that the integrated implosion system developed in this study. In this paper, we present the details of the integrated simulation system and the recent research results in HIF.

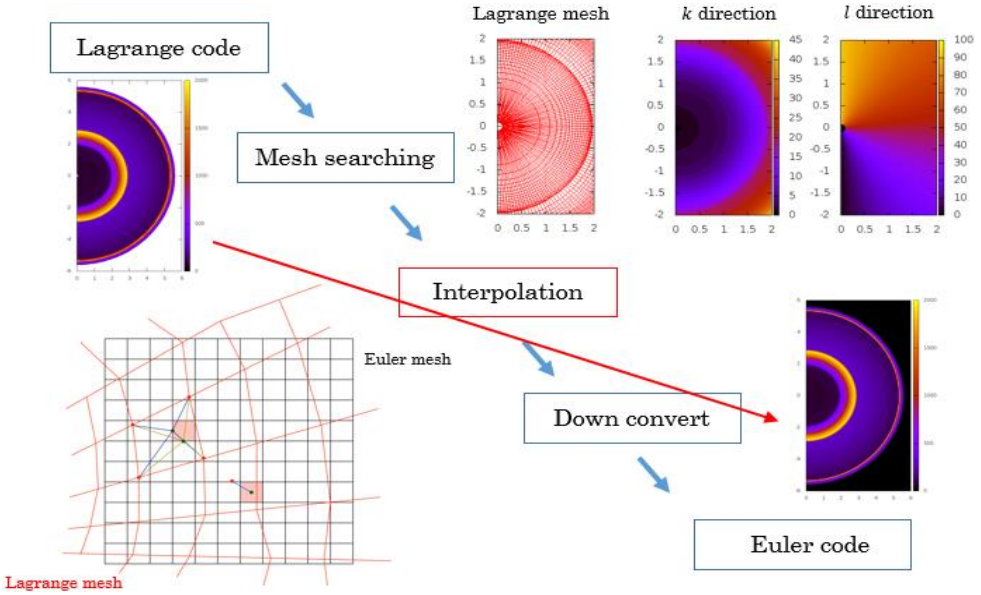

Fig. 1. An integrated implosion simulation system in HIF

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Reference

[1] S. Kawata, et al., Matter and Radiation at Extremes, **1**(2016)89.