High-ρR target design relevant to Fast Ignition

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In the fast ignition scheme, formation of a high dense core plasma is required in implosion process. Because an external magnetic field may help to narrow the divergence angle of electron beam for heating the core, the target is imploded under the strong external magnetic field. In such strong magnetic field, hydrodynamic instability is seeded due to the anisotropic of electron heat conduction. Solid spherical target is one of solutions because it is less sensitive to hydrodynamic instability even in strong magnetic field.

In order to achieve high dense and high ρR compressed fuel core, low isentropic compression is necessary using a tailored pulse as well as the central ignition scheme. Numerical simulations are executed to form a high-dense and high areal-density fuel core using two-dimensional, radiative, magneto-hydrodynamic simulation code, PINOCO [1].

Figure 1 shows magnetic field lines and mass-density contours 400 ps before maximum compression of cryogenic target imploded by 3.6 kJ laser with Gaussian pulse shape. When we design high compressed core with tailored pulse, non-local electron transport [2], laser plasma interaction (LPI) and some other physical models for high intense laser should be considered in the simulations. We will discuss the implementations of these models and its effects to the dynamics in this presentation.

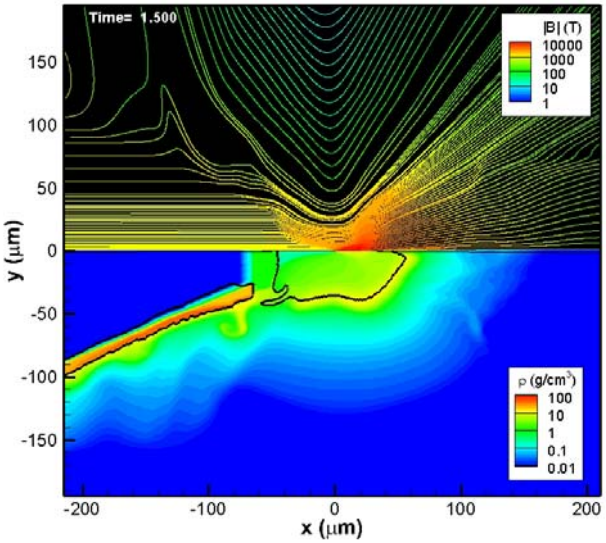

Figure 1: Magnetic-field lines and strength in tesla (upper panel). Mass-density contours (g/cm^3) at 400 ps before maximum compression. Solid black lines indicate material contact surface between CD, DT, and Au (lower panel)

References

[1] H. Nagatomo *et al.*, *Nuclear Fusion* **55**, 093028 (2015)

[2] G.P. Schurtz *et al.*, Physics of Plasmas **7**, 4238 (2000)