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The problem of Kelvin-Helmholtz instability on contact boundary of finite width and ICF applications

S. Yu. Gus'kov[1], A. Caruso[2], V. B. Rozanov[1], R.V. Stepanov[1], C. Strangio[2] & N.V. Zmitrenko[3]

1. P.N. Lebedev Physical Institute of Russian Academy of Sciences,
Moscow, Russia
guskov@sci.lebedev.ru

2. ICF Physics and Technology Laboratory of C.R. ENEA,
Frascati, Italy
caruso@frascati.enea.it

3. Institute of Mathematical Modeling of Russian Academy of Sciences,
Moscow, Russia
zmitrenko@imamod.ru

The statement and analysis of non-stationary Kelvin-Helmholtz instability problem is presented under the conditions when the layer of finite thickness moves along the surface of infinite medium. The layer is oriented perpendicularly to the medium surface and width of contact boundary is limited by the layer thickness. The problem has been investigated for the conditions of spherical and cylindrical fast ignition ICF target (Basov (1992)). In this approach during the period of preliminary compression the layer of thermonuclear fuel moves along a surface of channel which is used to deliver the igniting driver energy inside the target. The Kelvin- Helmholtz instability could lead to the mixing of DT-fuel and heavy material of the channel and deteriorate the ignition conditions (Caruso (2003)).

The results of numerical simulations of the phenomenon by 2D hydrodynamics code are presented and discussed. Simulations were carried out at the different types of the initial spectrum of medium boundary perturbations. Several interesting effects of instability evolution have been found. Among them, there are

-non-stationary dynamics of instability evolution;

-the different time of perturbations growth in the layer and in the medium;

-more large age the perturbations in layer in comparison with the perturbations in medium;

-strong influence of layer front edge on the perturbation evolution;

-the intensive vortexes near the both layer edges and spreading of the layer flatness boundaries.

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References

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