ON THE COMBINING SCHEMESFOR MAGNETO-INERTIAL FUSIONSYSTEMS WITH HYBRID DRIVERS*

Sergei V. Ryzhkov,Victor V. KuzenovandPavel A. Frolko
Bauman Moscow State Technical University,2-nd Baumanskaya Street, 5,1
Moscow, 105005Russian Federation

Innovative schemes of compression and heating of targets in the concept of magneto-inertial fusion (MIF) are proposed. "Standard" MIF version assumed target plasma and magnetic flux compression by high-speed plasma jets (plasma liner)[1] or/and quasisymmetric laser-driven implosion of magnetized target[2]. The maximum value of magnetic field in the "standard" version can be obtained in the target volume.

It has been proposed to use combined scheme to implode magnetized target plasma[3]. Increase in fusion gain and uniform compression by using a hybrid driver system may be achieved. Such a hybrid system consists of:
1) the system of target irradiation involves the lasers or hohlraum or plasma accelerators;
2) the "dynamic" system to compress the initial seed magnetic flux directed along the geometric axis of symmetry. In this case, the magnetic system is located outside the target area. The magnetic system such as *Z*-pinch or Θ-pinch, asymmetric *Z*-pinch or other self-contracting discharges, e.g. exploding wires, allows confining the charged particles in both transverse and longitudinal directions with respect to the magnetic induction vector. Thus, it is a powerful source of the magnetic field (as magnetic flux increases with time)and broadband *X*-ray emission.

In contrast to "standard" MIF, the maximum value of the magnetic field is arranged outside of the target, because the magnetic field penetrates the target due to the relatively slow process of diffusion. This leads to an increase in the plasma confinement time, an additional (due to eddy currents) heating plasma target, and stabilizing its borders.

1. S. C. Hsu, T. J. Awe, S. Brockington, A. Case, J. T. Cassibry, G.Kagan, S. J. Messer, M. Stanic, X. Tang, D. R. Welchand F. D. Witherspoon, “Spherically Imploding Plasma Liners as a Standoff Driver for Magneto-Inertial Fusion”, IEEE Trans. on Plasma Science **40**, 1287(2012).
2. P. Y. Chang, G. Fiksel, M. Hohenberger, J. P. Knauer, R. Betti, F.J. Marshall, D. D. Meyerhofer, F. H. Seguinand R. D. Petrasso, “Fusion Yield Enhancement in Magnetized Laser-Driven Implosions”,Phys. Rev. Lett. **107**, 035006 (2011).
3. S.V. Ryzhkov, V. V. Kuzenovand P.A. Frolko, “Innovative Concept of the Compression and Heating of the Plasma Targets in the Scheme for Magneto-Inertial Fusion”, 25thIAEA Fusion Energy Conference,13-25 October 2014, PD/P6-1.

* Work supported by the Ministry of Education and Science of the Russian Federation (MES RF Project №13.79.2014/K)