Pulse operation mode of the inertial electrostatic plasma confinement systems

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The work discusses the operation features of the inertial electrostatic plasma confinement systems (IEC) in the pulsed high voltage mode. Pulse operation mode has advantages in IEC systems, which are associated with high discharge currents that are inaccessible for continuous operating modes. However, the implementation of such operating mode is associated with a number of physical limitations and technical difficulties.

A stand has been developed, consisting of the IEC chamber with a high-voltage pulse transformer and a unit for gas preliminary ionization in the IEC chamber and ions acceleration from a background glow discharge in the chamber. A study of the burning background discharge in the IEC chamber, background discharge current I_{pre} influence on the duration of current and voltage pulses of the main discharge and the delay between them were carried out. The results of the neutron yield measuring in an IEC chamber operating in pulsed mode are presented at a charging voltage up to 105 kV, a discharge current amplitude of several tens of amperes, a preionization current of 8 mA, and a pulse repetition rate from single to 300 Hz. A stable neutron flux with an energy of 2.5 MeV at a level of 10^6 neutrons per second was experimentally obtained.