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EFFECT OF CONDUCTIVE SCREENS ON THE STABILIZATION OF PLASMA CHANNELS WITH CURRENTS OF HUNDREDS kAmps

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The problem of plasma structure stabilization recently has received considerable attention for low and high temperature plasma applications, in particular in fusion experiments, and in order to cope with the problem different special configurations of current and magnetic systems are developed and deployed. However, the available solutions require construction of complex magnetic fields and consume considerable amounts of energy. With respect to TDI-type thyratrons, which are widely used in recent years in Pulsed Power applications installations, this issue has not been studied thoroughly.

Normally TDI-thyratrons (pseudospark switches) are operated in circuits with grounded grid and, in fact, represent an arc gap, the life of which is mostly determined by erosion of its electrodes. However our experience shows that TDI-thyratrons, operated on the left branch of the Paschen curve, feature certain essentials in the motion of arc channels when switching charge transfer of more than 0.1 C per shot with peak currents exceeding 10 kA. Besides, the way how the switch is connected in the circuit, affects greatly on the service life of the tube.

In a report analyzes the behavior of the discharge in the known switching devices, including ignitrons and vacuum gaps, the influence of their design on the discharge stabilization, which made it possible to determine ways to enhance the reliability of thyratrons.

Based on experimental data, we analyzed the results of the influence of external conductive shield on stabilization of plasma channels in high-power pseudospark switches with reentrant and classic design.

Both no-ferrous and ferrous shields have been tested. The preliminary calculation of the magnetic field distribution is presented. This research is a part of a work on improvement of switching capabilities of thyratrons used for transferring currents up to hundreds kA with switching energy more than 50 kJ.

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