Characterization of Plasma Major Disruption in the Globus-M Spherical Tokamak

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In this presentation we describe the characteristics of the plasma current quench during disruptions in the Globus-M spherical tokamak. The process of current quench is accompanied by the loss of the vertical stability of the plasma column. The plasma boundary during the disruption is reconstructed using the algorithm of movable filaments. In comparison with the International Disruption Database for conventional tokamaks [1] the analysis of the data obtained in the stage of plasma current quench demonstrates a favorable, almost linear dependence of the normalized current quench time t_{CQ}/S on the plasma current density I_p/S before the disruption [2]. The current induced in the vessel also increases linearly with increasing plasma current.

The data on the current quench time and the toroidal current induced in the tokamak vessel are compared for hydrogen and deuterium plasmas. It is shown that the disruption characteristics depend weakly on the ion mass. The main current quench characteristics are compared for different values of the toroidal magnetic field and different values of the plasma safety factor before the disruption.

The distribution of the toroidal current induced in the vessel wall is determined from magnetic measurements, and the electromagnetic loads on the vessel wall during the current quench are calculated [3]. It is shown that the current quench results in the appearance of bending stresses in the vessel domes of near momentless shape.

References:

[1] N. W. Eidietis, S. P. Gerhardt, R. S. Granetz et al, Nucl. Fusion **55**, 063030 (2015).

[2] N. V. Sakharov, V. K. Gusev, A. D. Iblyaminova et al, Plasma Phys. Rep. **43**, 422 (2017).

[3] N. V. Sakharov, V. K. Gusev, A. A. Kavin et al, Plasma Phys. Rep., to be published in 2018.