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FIRST RESULTS OF RADIATION LOSSES DIAGNOSTICS ON T-15MD TOKAMAK *)

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For measurements of the radiation losses (RL) on T-15MD tokamak thermal pyroelectric detectors (characterized by the same sensitivity through all spectral ranges, but rather low signal-to-noise ratio and poor time resolution) [1,2] are used together with semiconductor AXUV (Absolute eXtreme Ultra Violet) photodiodes, which are fast and possess high sensitivity, but exhibit considerable drop of spectral sensitivity in the photon energy range of ~7-100 eV essential for RL in tokamaks. At first plasma campaign on T-15MD two cameras, each equipped with detectors arrays of both types, were installed to observe the plasma in poloidal cross-sections – one from the point in equator plane in the cross-section close to the limiters and the other one from the direction inclined to equator at 55º in the cross-section distant from limiters.

It should be noted that in the regime of gyrotron assisted breakdown and plasma sustainment, which was used during the first plasma campaign, despite application of UHF protective grid, for the pyroelectrics of the equatorial system the stray signal from gyrotron radiation always exceeded one expected from the plasma radiation. Meanwhile, it appears possible to use these detector's signals for tracing the evolution of not absorbed by the plasma part of UHF power. In the same time for the inclined system, where two protective grids were applied, in discharges with significant absorption of UHF radiation by plasma and with high enough level of plasma RL it appears possible to obtain RL profiles from the data of pyroelectrics. For AXUV detectors the influence of UHF radiation on signals appears insignificant.

The dependence of the obtained plasma RL profiles from the discharge regime (with high/ low UHF power absorption), time evolution of the RL profiles and the ratio of RL in cross-sections close and distant from limiters are analyzed in the report. The estimations of total plasma RL from the data of the two types of detectors are presented.

References

[1]. A.G. Alexeev, V.V. Zabrodskiy, D.V. Sarychev, N.A. Solovjev, A.V. Sushkov, Plasma Physics Reports, 2022, Vol. 48, No. 12, pp. 1380–1388.
[2]. V.A. Vershkov, D.V. Sarychev, G.E. Notkin et al., Nucl. Fusion, 2017, 57, 102017.

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