mhd PLASMA activity measurement system version 2020 on the T-11m tokamak [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2021.48.1.045

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Magnetic measurements are the basic diagnostic system of the tokamak, one of the task of which is to register the MHD activity of plasma. Such measurements are performed using magnetic probes, which are single-layer or multi-layer induction coils [1].

The T-11M (“GNC RF TRINITI”) [2] is a round tokamak with the following main parameters: R=70 cm, a=20 cm, Ip=180 kA, BT=1,2 T. Mirnov’s magnetic probes, made and mounted on the T-11M more than 20 years ago, must be replaced due to changes in the characteristics of the frame of these probes. Due to a long stay at high temperatures inside the vacuum vessel, the teflon tube, which is a frame, lost its plasticity and became fragile. When dismounting the magnetic probes in order to check their condition, the tube material crumbled.

A feature of Mirnov’s probes is both their simplicity and efficiency. This article presents the design of new probes of version 2020, the procedure for their calibration, and the results of the calibration.

The MHD probe system has two arrays. The arrays are located in two poloidal sections of the vessel, the angle between which is 8o in toroidal direction. Within the same section, the distance between the probes is the same. In addition, the probes of both arrays are at the same poloidal angles relative to each other. Each series of probes is placed in a thin-walled metal protective tube 0.3 mm thick, repeating the shape of the circular section of the vacuum vessel. Since the protective tubes are open to the atmosphere, the replacement of the old system for measuring MHD plasma activity with a new one is carried out without dismounting the vessel elements of the T-11M tokamak.

The calibration of the magnetic probes was carried out on a calibration stand. The main element of this stand are Helmholtz coils, creating a uniform magnetic field, inside which the reference coil and the calibrated sensor are located. For the convenience of the obtained results of the calibration of magnetic probes storage, a database of MHD diagnostics has been created.

References

1. A.V. Sushkov, A.M. Belov, G.B. Igonkina et al. Design of inductive sensors and data acquisition system for diagnostics of magnetohydrodynamic instabilities on the T-15MD tokamak. Fusion Engineering and Design, 2019, **146**, p.383-387.
2. Unique scientific installations / TRINITI Rosatom. url: <https://www.triniti.ru/services/unikalnye-nauchnye-ustanovki/energokompleks-tsp/>
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/Mu/ru/BE-Balashov.docx) [↑](#footnote-ref-1)