

METHODS OF SIGNAL PROCESSING OF MAGNETIC PROBES FOR T-15MD TOKAMAK ^{*)}

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Tokamak T-15MD has a wide range of diagnostic systems, one of which is an array of magnetic probes used both to determine the shape and position of the plasma cord and to detect and study MHD perturbations. The array of probes is located on the inner side of the wall of the vacuum chamber in the poloidal section. Structural features of the installation, such as non-circular cross-section and relatively high toroidal, complicate the processing of magnetic probe data. In this regard, it is necessary to choose a technique that has the least number of restrictions and allows to get the most accurate result.

In this work, we consider a number of methods for processing magnetic diagnostic signals that allow us to obtain information about the structure of MHD disturbances. These include: Fourier series expansion; double Fourier transform; phase matrix method [1]; Hilbert-Huang [2] transform method and singular value decomposition (SVD). These methods are tested on a synthetic signal in order to identify the applicability of the methods and factors that may interfere with their correct operation. Figure 1 shows the results of processing by the above methods of a synthetic signal, which is a composition of two modes at different time frequencies and takes into account the noise of the signal, as well as the Merezhkin transform in the toroidal approximation. It is considered that the signal comes to a circular array of sensors. In addition, the simulation of signals coming to the configuration of the probes corresponding to the one installed on the T-15MD was carried out. Further, real experimental signals are processed in order to confirm the identified limitations and draw a conclusion about the most preferred method for this installation.

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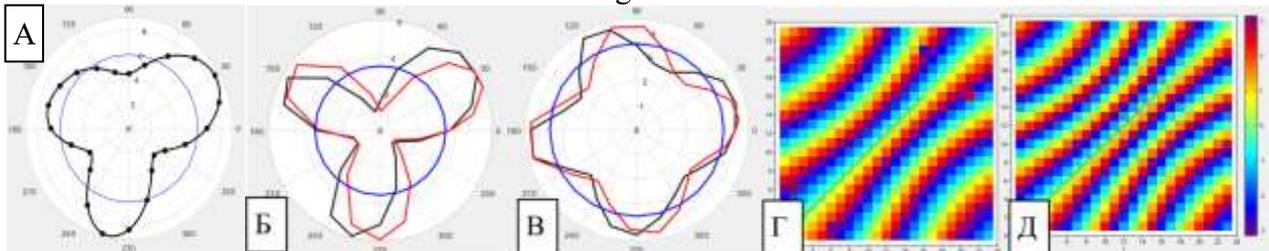


Fig. 1

A - Angular distribution of amplitudes of magnetic probe signals

B, C - Modes $m=3$ and $m=4$ selected by the SVD method (black lines) with subsequent processing by the Hilbert transform (red lines)

D, E - The cross-phase matrixes of the selected modes $m=3$ and $m=4$. The numbers of magnetic probes are located along the axes

References

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^{*)} [abstracts of this report in Russian](#)