

P4.1007 Study of the eddy current effect on the magnetic diagnostic on J-TEXT

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See full abstract here

<http://ocs.ciemat.es/EPS2019ABS/pdf/P4.1007.pdf>

The accuracy of measuring Magnetohydrodynamic (MHD) instabilities by inductive loops (formed as Mirnov probes and saddle loops on J-TEXT) is significantly affected by the eddy current, which is determined by the placement of the inductive loops and the material of the conductors nearby. In various frequency ranges, e.g. high frequency for Mirnov probes and quasi-static frequency for locked mode detectors, different compensation methods should be applied.

Mirnov probe measured high frequency magnetic perturbations, induced by eddy currents in the conductors near Mirnov probes, might exist significant phase shift and amplitude decay with respect to that from MHD instabilities. Investigation of the eddy current on the high frequency response of the Mirnov probe is based on a test platform, which is capable of generating uniform AC magnetic field within the frequency range of 1-300 kHz. The eddy current is related to the frequency of the magnetic perturbations, materials of the conductors, thickness of the conductors and distance of the conductors and the probes. Improving the electromagnetic environment around the probes and compensating for experimental measurements through test results both are methods to improve the high frequency measurement capability of the Mirnov probe. While for locked mode detector measured quasi-static radial magnetic field, feature of the related eddy currents is variations of low frequency MHD instabilities and equilibrium field. An analytical model based on lumped eddy current circuits can be established to analyze the mutual inductance between the detectors and equilibrium field, as a result to compensate the eddy current. The array of locked mode detector outside the vacuum has been installed already and an array of locked mode detector inside the vacuum is installed recently on J-TEXT. The impact of eddy current on them will be compared through the coming experiment, which might bring further study of the eddy current on locked mode detectors.

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