

Electromagnetic and Structural Analysis of EAST Passive Stabilizers Loop

X. Ji, Y.T. Song, S.T. Wu, Z. Wang, G. Shen, L. Cao, Z. Zhou, Y. Peng, X. Peng, C. Wang

Institute of Plasma Physics, Chinese Academy of Sciences

P.O.BOX 1126, Hefei Anhui, China, 230031

jixiang@ipp.ac.cn

The passive stabilizers loop (PSL) is part of the plasma stabilizing system built in the EAST. Its purpose is to provide passive feedback control of the plasma vertical instability on short time scales. To accommodate with the new stage for high performance plasma and enhance the control of vertical stabilization in EAST, the project of PSL has been carried out (Figure 1). [1]

The eddy currents are induced by the vertical displacement events (VDEs) and disruption. The distribution of the eddy currents depend on the structure of the PSL and the formation of the induction. [2] The global model is created and meshed by the ANSYS software. Base on the simulation of plasma VDEs and disruption, the distribution and decay curve of the eddy currents on the PSL are obtained. The stress and the strain caused by the eddy current and the magnetic field are calculated. Moreover, through the structure optimization, the maximum values of the stress and strain on the PSL are decreased.

The halo current is induced by the VDEs. This current often makes the plasma facing components destroyed due to the superheat. Also it will act with circumambient magnet and bring a transient electromagnetic force to make the PSL breakage terrifically under a large dynamic and impact loads. [3] The halo current on the PSL is calculated by the numerical simulation with the free energy method.

In the EAST 2010 spring experiment, the eddy currents on the PSL are measured, as shown in the Figure 2 of shot 15307. As can be seen, the agreement between the simulated and measured eddy currents validate that this analysis method is available in EAST device.

Keywords: Passive stabilizers loop (PSL), Electromagnetic analysis, Structural analysis, VDEs, Disruption

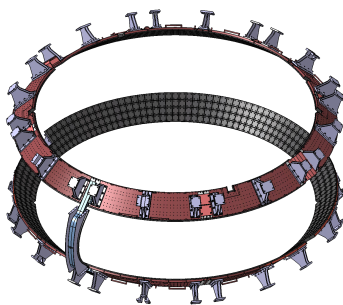


Figure 1: The structure of passive stabilizers loop

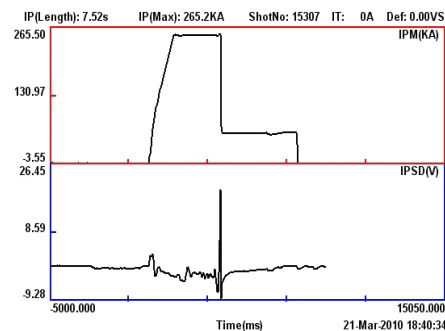


Figure 2: The plasma current and eddy currents in PSL at shot 15307

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