



Contribution ID: 569 Contribution code: THU-PO3-206-12

Type: Poster

Thermal Analysis of Toroidal Field Coil of EAST During Plasma Discharges

Thursday 18 November 2021 10:00 (20 minutes)

Abstract-Experimental Advanced Superconducting Tokamak (EAST) is the first fully superconducting tokamak in the world. The superconducting magnets are made of NbTi Cable-In-Conduit Conductor (CICC). The heat load due to plasma discharge rises the temperature of magnet. If the cooling of magnet is not sufficient and the temperature margin of the superconductive cables is not enough, it maybe induce the magnet quenches. In order to safe operation of EAST with higher plasma performance discharge in future, it is important to estimate the operation state of TF magnet. It is found that the outlet temperature rise of TF windings and cases is nearly proportional to plasma current, and the outlet temperature rise of TF windings is not related to the plasma duration, whereas the outlet temperature rise of TF cases seems to increase with plasma duration according to the experimental results.

In order to further study the relationship between the parameters of plasma discharge and the temperature rise of TF windings and cases, the SAITOKPF code is used to analyze the experimental phenomenon.

Index Term- EAST, toroidal field, plasma discharge, temperature margin

Acknowledgments: This work was supported in part by the National Natural Science Foundation of China under Grant No. 51777207.

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Session Classification: THU-PO3-206 Fusion VI: JT-60SA, DTT and Other Devices