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Multi-scenario evaluation and electromagnetic loads on CFETR VV mockup during MD event

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China Fusion Engineering Test Reactor (CFETR), as a new tokamak device to bridge the gap between ITER and DEMO, is developed for further research fusion power plant by China National Integration design Group for Magnetic Confinement Fusion. As a key component to maintain the reliability in run of high-temperature plasma in tokamak, vacuum vessel (VV) has a direct influence on the operation security of the total device. In order to establish the fabrication technology of VV, CFETR vacuum vessel mockup is constructed by Institute of Plasma Physics Chinese Academy of Sciences (ASIPP), its design parameters come from the China Fusion Engineering Test Reactor (CFETR). CFETR magnet system is required to meet the requirement of three scenarios of coil currents, which are used to realize the ITER-like, snowflake and Super-X plasma equilibrium shapes, respectively. In this paper numerical analysis is performed for the electromagnetic loads on CFETR VV mockup corresponding to three different current scenarios shapes during the MD event, respectively. The finite element model for electromagnetic analysis include a 22.5° VV sector and a magnetic system including 2 halves toroidal field (TF) coils, 6 poloidal field (PF) coils, 6 central solenoid (CS) coils, 2 divertor coils (DC) has been built, and a detailed CFETR VV mockup finite element model is established which consists of inner shell, outer shell, reinforcing ribs, ports and magnet coils, etc. The current loads are applied by current density method. The influence of plasma equilibrium configuration on the eddy current and electromagnetic force is also analyzed. The electromagnetic loads on VV during major disruption (MD) will provide a technical support for the future structural design and loads evaluations of CFETR VV.

Eligible for student paper award?

No

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