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P3.135 Preliminary electromagnetic loads calculation for the divertor of K-DEMO

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The variation of plasma current and magnetic fields generated by superconducting magnet coils causes electromagnetic (EM) loads especially during the abrupt plasma current changes such as major disruption, the vertical displacement event (VDE) of plasma, and the fast discharge. The EM loads are one of the most important external loads for in-vessel components like blanket and divertor modules. The aim of this study is to estimate the EM loads of the K-DEMO divertor module under the major disruption, by using the commercial finite element software, ANSYS Mechanical/Emag. The superconducting magnet system of K-DEMO includes 16 toroidal field (TF) coils, 8 central solenoid (CS) coils, and 12 poloidal field (PF) coils. The magnetic field at the plasma center is about 7.4 T and the peak field is as high as ~16 T. The conceptual model of the K-DEMO divertor module including outboard and inboard targets, dome, and the cassette body with connecting supports was developed. The 22.5° model applying symmetric boundary condition on cutting surfaces was employed to calculate EM loads efficiently. The reduced activation ferritic martensitic (RAFM) steel has been considered as the structural material of in-vessel components. Since RAFM steel is a ferromagnetic material, Maxwell force caused by the magnetization of RAFM steel is also estimated.

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