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Evaluations on reduction of the ITER TFC ripple generated by CN HCCB-TBM

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ABSTRACT

Reduced Activation Ferritic/Martensitic (RAFM) steel has been chosen as structural material for China Helium-Cooled Ceramic Breeder Test Blanket Module (CN HCCB-TBM). The magnetization of RAFM definitely increases the toroidal field perturbation (called TF ripple) in international thermonuclear experimental reactor (ITER). The TF ripple could cause ripple loss of high-energy particles and result in a large localized heat load on the first wall of TBMs. Thus some positive measures to reduce the TF ripple generated by TBMs have been evaluated by finite element models (FEM) in this paper. It has been shown that under the intervention of ferromagnetic inserts (FIs) the TF ripple could be reduced to the acceptable level of ITER (namely, TF ripple $\sim 0.7\%$ at $R = 8.2$ m of plasma edge near the equatorial plane) while fully considering several actual combinations (mass-reduction and recess) of HCCB-TBM and introduction of correction coils.