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Safety-factor profile dependence of the diamagnetic effect on fusion alpha particle losses in a rippled tokamak MICHINAO BUNNO, YUJI NAKAMURA, Graduate School of Energy Science, Kyoto University, Uji, Kyoto 611-0011, Japan, YASUHIRO SUZUKI, National Institute for Fusion Science, Toki, 509-5292, Japan, KOJI SHINOHARA, GO MATSUNAGA, Japan Atomic Energy Agency, Naka, Ibaraki 311-0193, Japan, KEIJI TANI, Nippon Advanced Technology, Naka, Ibaraki 311-0102, Japan — The finite number of the toroidal field coils (TFCs) breaks the symmetry of tokamak plasmas. The non-axisymmetric field from TFCs is called toroidal field (TF) ripple. Because of TF ripples, energetic ion losses are increased in tokamak plasmas. With increasing the beta value, the plasma changes the magnetic field structures and energetic ion losses. The diamagnetic effect due to the poloidal plasma current is one of the most important finite beta effects. In this study, we clarified how the diamagnetic effect and the fusion alpha particle losses are changed by the safety-factor-profile. Keeping the plasma-pressure profile and the shape of plasma boundary, the MHD equilibrium was solved by the VMEC code for different safety-factor profiles. To investigate the diamagnetic effect, we created the two kinds of field structures: the MHD equilibrium fields with and without the toroidal field due to the plasma current. Trajectories of 10,000 fusion alpha particles were followed in each MHD equilibrium field with different safety-factor profile. By comparing the loss rates, the safety-factor dependence of the diamagnetic effect on the fusion alpha particle losses was clarified in this study.

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