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P1.1030 Simulation of fast ion loss induced by magnetic islands in the EAST tokamak

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The neoclassical tearing mode (NTM) can result in a large amount of fast ion loss. A correlation between the frequency and the phase of the mode and those of the losses was observed with the diagnosis systems, i.e. the Mirnov coils and the fast ion losses detector (FILD), which explicitly showed that the NTM could lead to fast ion loss [1, 2]. The measurements of the noninductive current by use of neutral beam current drive (NBCD) were reduced significantly in the core region compared with the predictions during NTM, which implied that the NTM could transport fast ions [3, 4]. The fast ion loss induced by magnetic islands has been studied extensively with regard to numerical simulations. There were many codes to use, such as the guiding center drift code ORBIT [5]. The validation of ORBIT for computing the NTM-induced fast ion loss had been confirmed. The results of the simulation well reproduced the observations in the AUG tokamak and the DIII-D tokamak, respectively [6, 7]. In the EAST tokamak, the interaction between NTM and fast ions was observed [8]. Thus, it is interesting to study the beam ion loss due to magnetic islands in the EAST tokamak. In this work, based on ORBIT, we focus on the action of the n = 1, m = 2 mode on fast ions generated by neutral beam injection, where n is the toroidal mode number and m is the poloidal mode number. We scan the q-profile, the strength of toroidal magnetic field, the magnitude and structure as well as rotation of islands to investigate the effects of the NTM on fast ion loss in the EAST tokamak. We demonstrate the mechanisms of the loss due to drift islands, including the convective wave-induced prompt loss and the stochastic loss with the modulation by the magnetic islands.

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