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Rapid Evolution of the Magnetic Island in the Rotating Plasma

YASUTOMO ISHII, MASAFUMI AZUMI, Japan Atomic Energy Research Institute, ANDREI SMOLYAKOV, University of Saskatchewan — Magnetic island formation at the tearing stable resonant surface by the externally applied magnetic perturbation is investigated for rotating plasmas. When the magnetic island width exceeds the critical value, it grows rapidly with the reduction of the plasma rotation around the resonant surface. These features are consistent with the previous work [1]. The analytical theory show that the critical value depends on both the resistivity and viscosity. Our simulation results, however, show the weak dependence of the critical value on the viscosity. One of the purposes of this study is to investigate this critical value mainly by the MHD simulation in the wide parameter regime. Another purpose of this study is to investigate the whole process of the magnetic island evolution. During the rapid growth phase, the flow potential within the magnetic island changes from the dipole structure to almost the flux function. The change of the flow potential structure is important to the modified Rutherford equation for the neoclassical tearing mode [1]. Hence, we will investigate the detailed process of the magnetic flux and flow potential evolution in the rapid growth phase and the final state.

[1] A.I.Smolyakov et al. PPCF43(2001)1661.

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