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Explosive growth and nonlinear dynamics of the forced magnetic island[1] YASUTOMO ISHII, MASAFUMI AZUMI, Japan Atomic Energy Agency, ANDREI SMOLYAKOV, University of Saskatchewan — The whole process of nonlinear dynamics of magnetic island due to the external perturbation in rotating tokamak plasmas is studied numerically. The island formation is a critical issue severely affecting the performance of the tokamak plasmas. The theoretical work has been done to understand the forced magnetic island suppression by the plasma rotation and to evaluate its threshold value, while less attention has been paid to the subsequent break up process and the long term behavior of the forced island. It was found that the magnetic island grows explosively with changing its structure and the localized plasma current is formed around the X-point. Contrary to the standard magnetic reconnection theory, this localized plasma current causes the enhanced magnetic reconnection in the low resistivity regime. As the result, the long term evolution of the forced magnetic island is dominated by the secondary reconnection as the resistivity becomes small.

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