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A generalized Ginzburg-Landau model for nonlinear relaxation oscillation of magnetized plasma boundary with shear flow[1] GUNSU YUN, YOUNGMIN OH, JIEUN LEE, H.J. HWANG, Pohang Univ. Sci Tech. (POSTECH), JAEHYUN LEE, Ulsan National Inst. Sci. Tech. (UNIST), MICHAEL LECONTE, National Fusion Res. Inst. (NFRI), KSTAR TEAM — The boundary of high-temperature plasma confined by a toroidal magnetic field structure often undergoes quasi-periodic relaxation oscillations between high and low energy states. On the KSTAR tokamak, the oscillation cycle consists of a long quasi-steady state characterized by eigenmode-like filamentary modes, an abrupt transition into non-modal filamentary structure [Lee JE, *Sci. Rep.* 7, 45075], and its rapid burst (via magnetic reconnection) leading to the boundary collapse. A phenomenological model including the effects of time-varying perpendicular flow shear, turbulent transport, and external heating has been developed to understand the nonlinear oscillation. The model, which has the form of a generalized complex Ginzburg-Landau equation, shows that the flow shear amplitude and the shear layer width determine the nonlinear oscillation. Numerical solutions revealed that there exists a critical flow shear level below which steady states can exist. This result suggests that the abrupt transition to the non-modal unstable state is due to the flow shear increasing above the critical level. The model predicts that high wavenumber (k) modes can coexist with low-k modes at sufficiently low level of flow shear [Lee J, *Phys. Rev. Lett.* 117, 075001].

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