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Effects of magnetic perturbations on magnetic field stochastication during edge pedestal collapse

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Edge localized modes (ELMs) are quasi-periodic relaxation of tokamak pedestal, releasing large heat flux on divertor places. Although ELMs are thought to be triggered by MHD peeling-ballooning instability, the nonlinear relaxation process is not fully understood.
MHD filaments can carry out heat to scrape of layers (SOL) without reconnection [1].
On the contrary, a magnetic topology change due to magnetic reconnection may drive heat and particle out of plasmas. But a reconnection mechanism is not clear in the peeling-ballooning dominated plasmas. Nonlinear generation of tearing-parity fluctuations out of ballooning modes was proposed by Rhee et al. [2] as a candidate for the reconnection mechanism, further leading to stochastic magnetic field regions.

In this work, we investigate how the pedestal collapse scenario is modified in the presence of resonant magnetic perturbations (RMPs), using resistive reduced MHD simulations.
It is found that RMPs tends to inhibit the growth of the primary/secondary tearing fluctuations, indicating possible modification of a pedestal relaxation process.
The growth reduction for the secondary mode correlates with larger pressure and larger magnetic perturbation strength.
The detailed nonlinear analysis will be presented with the evaluation of degree of pedestal energy loss in the presence of magnetic perturbations.

[1] H. Wilson and S. Cowley, Phys. Rev. Lett. 92, 175006 (2004)

[2] Rhee \etal, Nucl. Fusion, 55, 032004 (2015)

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