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Mitigating impact of rectified RF sheath potential on the ELMs[1]

BIN GUI, Institute of Plasma Physics Chinese Academy of Sciences, XUEQIAO XU, Lawerence Livermore National Lab, TIANYANG XIA, Institute of Plasma Physics Chinese Academy of Sciences — Here we report on the BOUT++ simulation results for the mitigating impact of rectified RF sheath potential on the peeling-ballooning modes. The limiter and the RF wave antenna are placed at the outer middle plane in the scrape-off-layer (SOL) in shift-circle geometry. The external shear flow is induced by the limiter and the RF wave. Besides this, the sheath boundary conditions are imposed on the perturbed potential and parallel current. From the three-field simulations [1], it is found that the energy loss is suppressed by the external shear flow in the nonlinear phase. The external shear flow due to the RF wave leads to a broad turbulence spectrum. The wider spectrum leads to a weaker turbulence transport and results in a smaller energy loss. The perturbed electric potential and the parallel current near the sheath region are also suppressed locally due to the sheath boundary condition. Based on this work, this effect of limiter will also be applied in six-field which includes more physics effects [2]. The effect of sheath boundary conditions on the thermal conductivities and heat flux will be studied.

[1] Xu, et al., Nucl. Fusion, 2011.
[2] Xia, et al., Nucl. Fusion, 2013.

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