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Simulating the DIII-D grassy ELM regime with BOUT++[1] B. GUI, T.Y. XIA, ASIPP, X.Q. XU, LLNL, R. NAZIKIAN, PPPL, XI CHEN, R. GROEBNER, GA — In order to develop a steady-state regime for the ITER Phase-II mission, a fully non-inductive hybrid regime with the effective ELM control using weak 3D fields is studied on DIII-D. The 2-fluid modules in BOUT++ are used to study the dynamics of ELMs in this regime, especially for grassy ELMs in DIII-D shot #161414. Linear analysis shows that the grassy ELMs in the hybrid regime occur close to the ideal peeling boundary, which is quite different from the conclusion of high-n ballooning modes on JT60U (Oyama, NF2010). However, the inclusion of the measured edge electric field Er, which can alter the peeling-ballooning (PB) instability boundary (J.G. Chen, PoP2017), predicts wide spectrum PB modes, and all the high-n (n>30) modes can be stabilized by ion diamagnetic effects. Therefore, linear instability of grassy ELMs is driven by ideal peeling modes and low-n ballooning modes due to the boundary changing effects of Er. Nonlinear simulations show that the ELM pressure profile crash at the outer mid-plane is enhanced by Er, but the poloidal extent of the crash is limited to the low-field side and the total energy loss is just ˜1%. Detailed nonlinear simulation results will be reported in this talk.

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