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Analysis of Edge Turbulent Transport and Divertor Heat Load for ITER Hybrid Scenario using BOUT + + [1] ZEYU LI, General Atomics, XUEYUN WANG, Peking Univ, XUEGIAO XU, Lawrence Livermore National Laboratory, PHILIP B. SYNDER, General Atomics — BOUT++ six-field two-fluid turbulence code is used to simulate ITER scenarios. The pedestal structures in different scenarios are found to be unstable to different peeling-ballooning instabilities. In linear stage, the most unstable modes are n=15-20, n=40, n=60-80 in steady-state operation (SSO), hybrid and baseline scenarios respectively. In nonlinear stage, the energy loss fractions in the baseline and hybrid scenarios are large (10-20%) while the one in the SSO scenario is dramatically smaller (1%), which are consistent with the features of type-I ELMs and grassy ELMs correspondingly. Broadened by the strong turbulence because of ELMs, the divertor heat flux widths in the three scenarios given by the simulations are 10 times larger than the predictions based on Goldstons drift model, while fit the estimations of the critical ballooning model. The toroidal gap edge melting limit of tungsten monoblocks imposes constrains on ELM energy loss, giving that the ELM energy loss fraction should be smaller than 2.18%, 5.76%, and 10.44% for ITER baseline, hybrid and SSO scenarios, correspondingly. The simulation shows that only the SSO scenarios with grassy ELMs may satisfy the constraint.

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