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Impact of pedestal plasma density on linear and nonlinear edge-localized mode simulations using BOUT++[1] DEFENG KONG, CASIPP, JIANGUO CHEN, Peking University, XUEQIAO XU, LLNL — The BOUT++ simulations are used to study the linear and nonlinear characteristics of edge-localized mode at different collisionality via a density scan (pressure profiles are kept the same). For a force-balanced electric field Er with no net flow, linear results demonstrate that as the pedestal collisionality decreases, the growth rate of the peeling-ballooning modes decreases for high n but increases for low n ($1 < n < 5$), and the width of the growth rate spectrum becomes narrower and the peak growth shifts to lower n. The increase of low-n mode growth rate is due to the increase of both bootstrap current and Er. By increasing collisionality, nonlinear simulations show that (a) power spectrum becomes broad and flat; (b) the dominant mode changes from n=10 to n=35 . Bispectrum analysis shows that nonlinear mode coupling becomes stronger at high collisionality, especially for the high-n modes with $n \geq 20$, resulting in the lack of dominant filamentary structures and reduced ELM energy loss. The impact of radial electric field Er on peeling and ballooning modes is different. The increase Er significantly enhances the linear growth rate of low-n peeling modes, but only weakly impacts on their nonlinear ELM energy loss; while the increase Er leads to large suppression of nonlinear ballooning fluctuation amplitudes, but only weakly impacts on their linear growth rates.

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