Abstract Submitted
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Role of edge turbulence and shear flows in density limit on HL-2A tokamak[1] RONGJIE HONG, GEORGE TYNAN, Center for Energy Research, University of California, San Diego, MIN XU, LIN NIE, DONG GUO, RUI KE, TING LONG, YIFANG WU, BODA YUAN, Southwestern Institute of Physics, Chengdu, China — The tokamak density limit has long been suspected as a consequence of the enhanced turbulent transport in edge plasmas. In this study, evolutions of the turbulence and shear flows were investigated at different normalized density $\bar{n}_e/n_G$ in the plasma boundary region of HL-2A tokamak using Langmuir probes. As the density limit was approached, the equilibrium profile of density was flattened in the Scrape-Off Layer (SOL) and steepened inside the separatrix, while the edge cooling was observed from the electron temperature profile. The turbulent cross-field transport also increased substantially with the $\bar{n}_e/n_G$ and the collisionality. In addition, the amplitude of the poloidal phase velocity decreased at higher densities. This destruction of the shear layer was associated with the collapse of the Reynolds stress and thus the reduction in the nonlinear energy transfer from high-frequency fluctuations to low-frequency shear flows. These observations indicate an important role of the edge turbulence and the turbulence-driven shear flow in the underlying physics of tokamak density limit.

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