

Abstract Submitted  
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**New analytic formula for edge bootstrap current**<sup>1</sup> C.S. CHANG, Princeton Plasma Physics Laboratory, S. KOH, Korea Advanced Institute of Science and Technology, J. MENARD, Princeton Plasma Physics Laboratory, H. WEITZNER, New York University, W. CHOE, Korea Advanced Institute of Science and Technology — The edge bootstrap current plays a critical role in the equilibrium and stability of the steep edge pedestal plasma. The pedestal plasma has an unconventional and difficult neoclassical property, as compared with the core plasma. A drift-kinetic particle code XGC0, equipped with a mass-momentum-energy conserving collision operator, is used to study the edge bootstrap current in a realistic diverted magnetic field geometry with a self-consistent radial electric field. When the edge electrons are in the low collisionality banana regime, surprisingly, the present kinetic simulation confirms that the existing analytic expressions (represented by O. Sauter, et. al., Phys. Plasmas 6, 1999) are still valid in this unconventional region, except in a thin radial layer in contact with the magnetic separatrix. However, when the pedestal electrons are in plateau-collisional regime, there is a significant deviation of numerical results from the existing analytic formulas. The deviation occurs in different ways between a conventional aspect ratio tokamak and a tight aspect ratio tokamak. A new analytic fitting formula, as a simple modification to the Sauter formula, is obtained to bring the analytic expression to a better agreement with the edge kinetic simulation results.

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