

Abstract Submitted
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Clarification of the new XGC0-based bootstrap current formula¹

ROBERT HAGER, CHOONG-SEOCK CHANG, Princeton Plasma Physics Laboratory — Additional proof for the validity of a new bootstrap current formula based on the results of the neoclassical particle-in-cell code XGC0 [Koh et al., Phys. Plasmas **19**, 072505 (2012)] is presented. In the collisional regime in the pedestal region of tight aspect ratio tokamaks, this formula predicts a higher bootstrap current than the popular formula by Sauter [O. Sauter et al., Phys. Plasmas **6**, 2834 (1999)]. Otherwise, bootstrap currents from XGC0 agree approximately to Sauter's formula. Koh et al. argue that collisions in conjunction with the almost toroidal field lines at the high field side of a spherical tokamak enable some of the trapped particles to contribute to the bootstrap current. To corroborate this rationale, corresponding s - α , concentric-circle, and Grad-Shafranov configurations are examined. Since the field line pitch is uniform on a flux surface in s - α configuration, the bootstrap current in s - α geometry is found to agree approximately with Sauter's formula. With the field line pitch variation becoming more pronounced in the concentric-circle and Grad-Shafranov configurations, the current increases continuously to the level predicted by Koh's formula.

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