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Effects of guide field in driven magnetic reconnection C. Z. CHENG, National Cheng Kung Univ, S. INOUE, National Institutes for Quantum and Radiological Science and Technology, R. HORIUCHI, National Institute for Fusion Science, Y. ONO, X. GUO, University of Tokyo — Decoupling of electron and ion dynamics is the key physical process in the magnetic reconnection layer. It leads to the generation of parallel E-field and in-plane electrostatic E-field, and determines how particles gain energy. For antiparallel magnetic reconnection (zero guide field case), the electron and ion dynamics decoupling is due to meandering particle (unmagnetized) orbits in the field reversal region and particle acceleration by parallel electric field in the separatrix region[1]. The parallel E-field is produced mainly from the driven inductive E-field due to the quadrupole out-of-plane magnetic field generation. The decoupling of electron and ion dynamics causes charge separation which produces the in-plane electrostatic E-field. If the guide field is stronger than the reconnecting magnetic field, both electrons and ions are magnetized in the entire magnetic reconnection domain, and the electron-ion dynamics decoupling process changes from the zero guide field case. Then, the structure of parallel and electrostatic E-fields, and thus how electrons/ions gain energy also changes. We will explain the physical mechanisms of electron-ion dynamics decoupling on the E-field generation, and how electron and ion are heated/accelerated based on the driven reconnection simulation results.

1. C. Z. Cheng et al., Phys. Plasmas 22, 101205 (2015).

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