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Anomalous Velocity Distributions Formed by Pick-Up-Like Protons in Magnetic Reconnection[1] SHUNSUKE USAMI, RITOKU HORIUCHI, HIROAKI OHTANI, National Institute for Fusion Science — By means of particle simulations, we investigate ion dynamics responsible for heating during magnetic reconnection in the presence of a guide field. Experiments have reported that ions are heated mainly in the downstream of reconnection, but the mechanism remained unsolved. In Ref. [1], our particle simulations have demonstrated that ring-shaped proton velocity distributions are formed, and protons are effectively heated during magnetic reconnection with a guide field. The proton behaviors are the Pick-Up-Like. Upon entering the downstream across the separatrix, protons behave as nonadiabatic and are energized in the downstream. Recently, our simulations show anomalous shapes of velocity distributions, such as not only a simple ring-shape, but also a horn-shape [2], a circular-arc-shape, and further a multi-structure-shape combing them. We construct a theory accounting for the anomalous structures seen in velocity space. In our presentation, simulation results and the theory will be presented. [1] S. Usami, R. Horiuchi, and H. Ohtani, Phys. Plasmas 24, 092101 (2017). [2] S. Usami, R. Horiuchi, and H. Ohtani, Plasma Fusion Res. in press.

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