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The scaling of reconnection rate in relativistic collisionless magnetic reconnection YI-HSIN LIU, NASA-GSFC, WILLIAM DAUGHTON, FAN GUO, HUI LI, LANL, MICHAEL HESSE, NASA-GSFC — Relativistic reconnection is suggested to play a crucial role in the energy release and non-thermal particle acceleration in pulsar winds, gamma-ray burst and astrophysical jets from active galactic nuclei or black holes. While there has been significant progress in understanding the particle spectrum generated during reconnection,[1] the scaling of the reconnection in relativistic regimes remains unclear. Several numerical studies suggest that the reconnection rate is only enhanced mildly from ~ 0.1 in the non-relativistic regime up to ~ 0.3 in the strongly relativistic regime, which appears to be consistent with the prediction of Lyubarsky.[2] In this work, first-principle fully kinetic simulations are systematically conducted to explore this issue. In particular, scaling-studies of reconnection rate as function of various parameters, such as the magnetization parameter, upstream pressure and guide field, are performed. Relativistic Ohm's law is analyzed to identify the mechanism of flux-breaking. Theoretical models are derived and compared against the observed scaling.

[1]F. Guo, H. Li, W. Daughton and Y. -H. Liu, submitted to PRL
[2]Y. E. Lyubarsky, Mon. Not. R. Astron. Soc. **358**, 113, 2005

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