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3D Numerical Simulation of Kink-Induced Rayleigh-Taylor Instability for Fast Magnetic Reconnection[1] PAKORN WONGWAITAYAKORNKUL, Caltech, HUI LI, Los Alamos National Laboratory, PAUL BELLAN, Caltech — Kink-Induced Rayleigh-Taylor (KI-RT) instability has been observed and proposed as a MHD mechanism to instigate fast magnetic reconnection in the Caltech jet MHD experiment [1]. Experimental observations and preliminary analysis showed that KI-RT occurs more readily for heavy ions and for sufficiently large acceleration [2] and that the disrupted current causes an inductive electric field that accelerates initially 2 eV electrons to sufficiently high energy to produce 6 keV X-rays [3]. However, how plasma parameters govern KI-RT dynamics, the exact requirements for KI-RT to occur, and the process of how KI-RT leads to a magnetic reconnection have not yet been resolved. This work addresses these questions by means of a 3D numerical MHD simulation that uses Chodura resistivity for simulating the localized kinetic enhancement of resistivity when J/ne becomes large. The numerical simulation is consistent with a simplified model for acceleration from kink leading to RT and fast reconnection. The results are compared to experimental and space/solar plasmas. [1] Moser, A. L. and Bellan, P. M., Nature 482, 379 (2012), [2] Zhai, X. and Bellan, P. M., Phys. Plasmas 23, 032121 (2016), [3] Marshall, R. S. and Bellan, P. M., Phys. Plasmas 26, 042102 (2019).

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