Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Kinematics of Bulk Flows Driven by Relativistic Collisionless Magnetic Reconnection[1] KRZYSZTOF NALEWAJKO, DMITRI UZDENSKY, BENOIT CERUTTI, GREGORY WERNER, MITCHELL BEGELMAN, University of Colorado — In several problems of high-energy astrophysics, magnetic reconnection is considered to operate in relativistic collisionless plasmas, where the magnetic energy density dominates even the particle rest energy density, and the magnetization parameter, defined as magnetic-to-plasma enthalpy ratio, exceeds unity. In such a regime, it was proposed that ultra-relativistic bulk plasma outflows, so-called minijets, can be driven along reconnection layers. Here, 2D Particle-in-Cell numerical simulations of relativistic collisionless pair-plasma reconnection for a wide range of magnetization values, in particular for values above unity, are reported. Detailed analysis is presented for bulk flow kinematics and reconnection rate, and their dependence on the magnetization. Basic analytical predictions of the minijets model are tested numerically for the first time. A new effect of fast variation of the bulk velocity field is observed, which could explain rapid gamma-ray variability of cosmic sources such as blazars, gamma-ray bursts, and pulsar wind nebulae.

[1]Supported by DOE and NASA.

Dmitri Uzdensky
University of Colorado

Date submitted: 12 Jul 2013 Electronic form version 1.4