Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

**Superthermal electron energization in magnetic reconnection exhausts**[1] JAN EGEDAL, UW-Madison, WILLIAM DAUGHTON, LANL — Using a kinetic simulation of magnetic reconnection it was recently shown that magnetic-field-aligned electric fields ($E_{\|}$) can be present over large spatial scales in reconnection exhausts [1]. Here we document how the electron confinement provided in part by the structure in $E_{\|}$ allows sustained energization by perpendicular electric fields ($E_{\perp}$). The energization is a consequence of the confined electrons' bounce motion, that includes so-called curvature and gradient-B drifts aligned with the reconnection electric field. The level of energizaition is proportional to the initial particle energy and is therefore enhanced by the initial energy boost of the acceleration potential $e\Phi t = e\int_x^\infty E_{\|} dl$, acquired by electrons entering the region. The mechanism is effective in an extended region of the reconnection exhaust allowing for the generation of super-thermal electrons in reconnection scenarios including only a single x-line. An expression for the phase-space distribution of the super-thermal electrons is derived, providing an accurate match to the kinetic simulation results.

[1] J. Egedal, W. Daughton, and A. Le, Nature Physics, vol. 8, 2012.

[1]Supported by DOE, NSF and NASA

Jan Egedal
UW-Madison

Date submitted: 09 Jul 2014 Electronic form version 1.4