Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Entropic Lattice Boltzmann Simulations of MHD Turbulence GEORGE VAHALA, Department of Physics, College of William & Mary, Williamsburg, VA 23185, JEFFREY YEPEZ, AFRL, Optical & Supercomputing Site, Kihei, HI 96753, MIN SOE, Department of Mathematics and Physical Sciences, Rogers State University, Claremore, OK 74017, LINDA VAHALA, Department of Electrical & Computer Engineering, Old Dominion University, Norfolk, VA 23529, ARMEN OGANESOV, Department of Physics, College of William & Mary, Williamsburg, VA 23185 — Lattice Boltzmann (LB) codes are ideal to study MHD turbulence since it is a mesoscopic algorithm in a higher dimensional space but whose solution in that space is far simpler to achieve that direct CFD algorithms. In particular, one is no longer hand-cuffed by fast magnetoacoustic waves which are sometimes filtered out by an anelastic approximation. Moreover, these LB simulations can enforce div B = 0 automatically since this arises as the trace of an asymmetric tensor. However the achievable Reynolds and magnetic Reynolds numbers are restricted by numerical instabilities. Here we consider entropic formulations of LB for MHD. For Navier-Stokes turbulence, an entropic scheme has permitted fully resolved simulations on 1600 x 1600 x 1600 spatial grid at a Reynolds number of 25 000.

George Vahala
Department of Physics, College of William & Mary,
Williamsburg, VA 23185

Date submitted: 17 Jul 2012 Electronic form version 1.4