Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Controlled Space Physics Experiments using Laboratory Magnetospheres[1] MICHAEL MAUEL, M. DAVIS, D. GARNIER, T.M. ROBERTS, M. WORSTELL, Columbia University, J. KESNER, MIT Plasma Science and Fusion Center — Modern society's reliance on space-based platforms for a variety of economic and geopolitical purposes makes understanding the physics of the magnetosphere and "space weather" one of the most important applications of plasma science. During the past decade, results from the CTX and LDX laboratory magnetospheres and from the RT-1 device at University of Tokyo, we have developed techniques to explore space physics using controlled experiments in laboratory magnetospheres. This presentation briefly reviews observations from the laboratory magnetospheres at Columbia University and MIT, including adiabatic drift-resonant transport, low-frequency MHD turbulence, and the formation of high-beta plasmas with profiles similar to Earth's inner magnetosphere. First principle validation of "whole plasma" space weather models have been completed in relevant magnetic geometry, including the spectrum and dynamics of turbulence successfully modeled with nonlinear bounce-averaged gyrokinetic simulations. Plans to explore Alfvénic dynamics and whistler wave trapping are discussed through the achievement of higher-density plasmas using radio-frequency heating.

[1]Supported by the NSF-DOE Partnership in Plasma Science.

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Date submitted: 11 Jul 2013 Electronic form version 1.4