

Abstract Submitted
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A Next Generation Magnetic Reconnection Experiment: Accessing “Reconnection Phase Diagrams” for Space and Astrophysical Relevance H. JI, M. YAMADA, S. PRAGER, PPPL, W. DAUGHTON, V. ROYTER-SHTEYN, LANL — Ongoing dedicated laboratory experiments, such as Magnetic Reconnection Experiment (MRX), have been productive in providing original and valuable data in achieving much needed understanding of fast reconnection and associated processes. However, further critical contributions to astrophysical plasmas are limited by the achievable parameters. In this paper, we discuss results from our ongoing efforts¹ to develop plans for a next-generation reconnection experiment based on MRX. Most recent results from two-dimensional, large-scale numerical simulations suggest the existence of a “reconnection phase diagram”, which illustrates “phase transitions” between different “states” or regimes. They include “collisional MHD without plasmoids regime”, “collisional MHD with plasmoids regime”, “kinetic and MHD hybrid regime”, and “collisionless regime”. The latter three regimes are considered to be relevant to reconnection in solar tachocline, solar corona, and Earth’s magnetosphere. A natural goal for the next generation of reconnection experiments is the ability to access all of these regimes so that phase transitions can be studied in a controlled environment and the results are potentially applicable to astrophysical plasmas. Experimental requirements, aided by numerical simulations, will be discussed in detail.

¹H. Ji et al., APS 51st DPP Annual Meeting (November, 2009), <http://meetings.aps.org/link/BAPS.2009.DPP.TP8.111>

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