

Abstract Submitted  
for the DPP12 Meeting of  
The American Physical Society

**Overview of MST Research**<sup>1</sup> J.S. SARFF, Univ. Wisconsin-Madison and Center for Magnetic Self Organization (CMSO), MST TEAM & COLLABORATION — MST progress in advancing the RFP for (1) fusion plasma confinement with minimal external magnetization, (2) toroidal confinement physics, and (3) basic plasma physics is summarized. Stellarator-like helical equilibria (QSH) appear spontaneously at high current. The Lundquist number appears a key parameter, unifying QSH onset versus current in both MST and RFX-Mod. Equilibrium modeling for the 3D state is corroborated by several diagnostics, including new 2-color SXR tomography. A 1 MW neutral beam injector stimulates beam-driven instabilities for the first time in the RFP. The observed modes are nonlinearly coupled, causing redistribution of the fast ions. Interestingly, beam-generated ions are accelerated to higher energy during sawtooth events, likely related to non-collisional ion heating. The tearing mode relaxation process is a rich story where single-fluid MHD appears to capture the sawtooth period dynamics, but extended MHD is needed to explain coupled momentum and dynamo processes. A kinetic momentum stress associated with magnetic turbulence has also been discovered. Theoretical analysis of micro-instability indicates micro-tearing will be dominant at high beta. MST diagnostics will assess such instabilities in high-performance plasmas with large Te gradients.

<sup>1</sup>Supported by DoE and NSF.

John Sarff  
University of Wisconsin-Madison

Date submitted: 20 Jul 2012

Electronic form version 1.4