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Overview of MST Research J.S. SARFF, University of Wisconsin-Madison and Center for Magnetic Self-Organization, 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. New tools and diagnostics are accessing physics barely studied in the RFP. Several diagnostic advances are important for ITER/burning plasma. A 1 MW neutral beam injector operates routinely for fast ion, heating, and transport investigations. Energetic ions are also created spontaneously by tearing mode reconnection, reminiscent of astrophysical plasmas. Classical confinement of impurity ions is measured in reduced-tearing plasmas. Fast ion slowing-down is also classical. Alfven-eigenmode-like activity occurs with NBI, but apparently not TAE. Stellarator-like helical structure appears in the core of high current plasmas, with improved confinement characteristics. FIR interferometry, Thomson scattering, and HIBP diagnostics are beginning to explore microturbulence scales, an opportunity to exploit the RFP's high beta and strong magnetic shear parameter space. A programmable power supply for the toroidal field flexibly explores scenarios from advanced inductive profile control to low current tokamak operation. A 1 MW 5.5 GHz source for electron Bernstein wave injection is nearly complete to investigate heating and current drive in over-dense plasmas. Supported by DOE and NSF.

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