Abstract Submitted
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Overview of MST Research J.S. SARFF, Univ. Wisconsin-Madison and Center for Magnetic Self Organization in Laboratory and Astrophysical Plasmas — MST progress in advancing the RFP for (1) fusion plasma confinement with ohmic heating and minimal external magnetization, (2) predictive capability in toroidal confinement physics, and (3) basic plasma physics is summarized. Validation of key plasma models is a program priority. Programmable power supplies (PPS) are being developed to maximize inductive capability. Well-controlled flattops with current as low as 0.02 MA are produced with an existing PPS, and $I_p \leq$0.8 MA is anticipated with a second PPS under construction. The Lundquist number spans S $=10^{(4-9)}$ for 0.02-0.8 MA, allowing nonlinear MHD validation using NIMROD and DEBS at low S to be connected to highest S experiments. The PPS also enables MST tokamak operation for studying transients and runaway electron suppression with RMPs. Gyrokinetic modeling with GENE predicts unstable TEM in improved-confinement plasmas. Fluctuations are measured with TEM properties including a density-gradient threshold larger than for tokamak plasmas. Probe measurements hint that drift waves are also excited via the turbulent cascade in standard RFP plasmas. Turbulent energization of an electron tail occurs during sawtooth reconnection. New diagnostics are being developed to measure the energetic ion profile and transport from EP instabilities with NBI. Supported by US DoE and NSF

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