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Dynamics of helical states in MST STEFANO MUNARETTO, University of Wisconsin-Madison, F. AURIEMMA, Consorzio RFX, D. BROWER, The University of California at Los Angeles, B.E. CHAPMAN, D.J. DEN HARTOG, W.X. DING, J. DUFF, University of Wisconsin-Madison, P. FRANZ, Consorzio RFX, J.A. GOETZ, D. HOLLY, L. LIN, K.J. MCCOLLAM, M. MCGARRY, L. MORTON, M.D. NORNBERG, E. PARKE, J.S. SARFF, University of Wisconsin-Madison — The thermal and the magnetic dynamics of quasi-single-helicity (QSH) plasmas evolve independently during the formation and sustainment of the core helical structure. At higher plasma current (and Lundquist number) MST plasmas transition from an axisymmetric multi-helicity state to a QSH state characterized by a strong core helical mode and reduced secondary mode amplitudes. Plasmas in the QSH state tend to wall-lock, often in an orientation that is unfavorable for optimized measurements of the 3D structure using MST's advanced diagnostics. Recently a technique to control the locking position through an applied resonant magnetic perturbation has been developed. Using this technique it is possible to adjust the 3D phase more optimally for specific diagnostics, to study the dynamics of the QSH structure and thermal features. The multi-chord FIR interferometer shows the presence of a density structure for the duration of the QSH state. Measurements of the time evolution of the electron temperature profile using the Thomson Scattering diagnostic reveal that the transition to QSH allows the presence of a 3D thermal structure, but this structure is intermittent. Understanding the mechanism(s) driving these dynamics is the goal of this work. Work supported by the US DOE and NSF.

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