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**Parametric dependence and inductive control of 3D helical equilibria in the MST RFP** B.E. CHAPMAN, D.J. DEN HARTOG, S.T.A. KUMAR, M. NORNBERG, E. PARKE, J.A. REUSCH, UW-Madison, S. CAPPELLO, P. FRANZ, P. PIOVESAN, M. PUIATTI, M. SPOLAORE, Consorzio RFX, D.L. BROWER, W.X. DING, L. LIN, UCLA — A stellarator-like equilibrium emerges in the core of RFP plasmas when the innermost resonant m = 1 tearing mode grows to large amplitude and the other, secondary m = 1 mode amplitudes are reduced. In MST, the likelihood and duration of these quasi-single-helicity (QSH) spectra increase strongly with Ip, similar to the trend observed in RFX-mod RFP plasmas which also develop a helical equilibrium. However, the Ip at which these spectra emerge in MST is nearly three times smaller than in RFX-mod. But due to additional differences in Te, Zeff, majority ion mass, and density, the two devices share a similar range of Lundquist number, $S > 6 \times 10^5$, an important dimensionless parameter in resistive MHD, suggesting that S may be a predictive parameter for the onset of the helical equilibrium. At the largest S in MST, the amplitude of the dominant mode reaches 8% of the equilibrium field strength. The simultaneous reduction in secondary mode amplitudes leads to an increase in energy confinement time, reaching $> 1$ ms, about 50% larger than lower-S plasmas lacking a QSH spectrum. The secondary modes are reduced even further when the surface parallel electric field is inductively increased. This leads to a central Te $> 1$ keV and an energy confinement time $\sim 3$ ms. There is also a 6 keV/m Te gradient in the core. Supported by USDOE.

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