



Contribution ID: 622

Type: Poster

## EX/P6-01: Direct Diagnosis and Parametric Dependence of 3D Helical Equilibrium in the MST RFP

Thursday, 11 October 2012 14:00 (4h 45m)

Helical (stellarator-like) equilibria can occur in the core of nominally axisymmetric tokamak and RFP plasmas, including the “snake” in JET [1], planned hybrid-scenario plasmas in ITER [2], and the “single-helical-axis” (SHAx) state in RFX-mod [3]. Here we report for the first time the emergence of the SHAx state in MST, and we report the first direct measurement of the internal magnetic field evolution associated with such a helical equilibrium [4]. Both the probability of the SHAx state’s emergence and its duration increase strongly with  $I_p$  in MST and RFX-mod, but the required  $I_p$  in MST is lower than in RFX-mod. However, due to differences in other plasmas parameters as well, the two devices share a common range of the dimensionless Lundquist number, thus better unifying the results. This state is still not entirely understood [5], but recent theoretical work analogizing the helical structure to a coherent turbulent vortex predicts that the structure’s ability to sustain itself increases as  $I_p^2$  [6].

- [1] A. Weller et al., Phys. Rev. Lett. 59, 2303 (1987).
- [2] W.A. Cooper et al., Plasma Phys. Controlled Fusion 53, 024002 (2011).
- [3] R. Lorenzini et al., Nature Phys. 5, 570 (2009).
- [4] W.F. Bergerson et al., Phys. Rev. Lett. 107, 255001 (2011).
- [5] S. Cappello et al. Nucl. Fusion 51, 103012 (2011).
- [6] J.-H. Kim and P.W. Terry, paper to be submitted.

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**Session Classification:** Poster: P6

**Track Classification:** EXS - Magnetic Confinement Experiments: Stability