

P5.1103 Cylindrical vs toroidal Single Helical states in the low aspect- ratio RELAX device

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See the full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/P5.1103.pdf>

The RELAX device is a low aspect- ratio (with $R/a=2$ where R and a are the major and minor radius of the torus) Reverse Field Pinch (RFP) in which on-axis resonant helical modes with $m=1$ and $n=4$ (m and n being the poloidal and toroidal mode numbers respectively) are observed during the so called Single Helical (SH) states, i.e. states in which the plasma shows (at least in some time windows) an helical saturated dominant perturbation. These states have been predicted by numerical 3D visco-resistive MHD simulations and afterwards detected in almost all RFP's. The SH states can also be studied and characterized, as shown recently, within a cylindrical relaxation theory which assumes as global invariant the plasma volume integrated magnetic helicity weighted over the helical flux of the dominant mode. In this paper we compare the predictions of the cylindrical relaxed states with the solutions that can be obtained by using the VMEC helical equilibrium solver and also with the states obtained by the 3D MHD MIPS code. Both the VMEC and MIPS solutions are fully taking into account the toroidal geometry, so it would be interesting to check to which extent the toroidal effects modify the cylindrically symmetric relaxed states. Furthermore we will check if the global helicity related invariants hypothesized within the cylindrical theory are well reproduced by the time dependent nonlinear simulations.

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