Contribution ID: **3210** Type: **not specified**

P2.1003 RFX-mod2: a Reversal Field Pinch device with edge transport optimization

Tuesday, 9 July 2019 14:00 (2 hours)

See full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1003.pdf

The edge of magnetically confined plasmas in toroidal configurations is characterized by the presence of various magnetic perturbations (MPs), appearing spontaneously as tearing modes in the Reversed Field Pinch (RFP) [1] or as peeling ballooning modes (ELM) in the tokamak. In the RFX-mod device during high-current discharges (R=2m, a=0.46m, IP>1MA) an almost monochromatic tearing mode (TM) spectrum spontaneously develops: this is the so-called quasisingle helicity (QSH) [2, 3], characterized by the presence of a single mode with helicity m/n, with (m=1, n=7) the poloidal and toroidal mode numbers respectively. However, the presence of secondary modes (m=1,n>7), with amplitudes one order of magnitude smaller than the dominant one, results in a local pattern of constructive interference (phase locking) and in a radial displacement of the plasma edge surface [4]. The intensity of the deformation can be comparable to that of the dominant mode, appearing as a sharp decrease (”hole”) of the connection length to the wall at the locking angle, as shown by simulations with the ORBIT code [5,6]. An upgrade of RFX-mod device, RFX-mod2 [7], will be assembled in the near future. It will be characterized by a copper shell as continuous conductor nearest to the plasma and by a shellplasma proximity reduction from b/a=1.11 to b/a=1.04, likely improving feedback coils action. 3D MHD non-linear visco-resistive simulations show that secondary TM amplitude and the edge deformation due to phase locking will decrease by a factor 2 [8, 9]. Simulations with ORBIT show that in RFX-mod2 the average parallel connection length to the wall is expected to increase by a factor 8 with respect to RFX-mod, with no “hole” at the locking angle [6]. Having virtually cancelled the effect of TMs at r=a with a front end which behaves like an ideal wall, plasma wall interaction in RFX-mod2 could arise only due to the residual error fields at the gaps [8]: these upgrades are expected to lead to an optimized edge transport, with a well-formed SOL and to an improvement of the global plasma performance.
References [1] N. Vianello et al, Nuclear Fusion 53 (2013) 073025 [2] Escande D. et al, PRL 85 (2000) 1662 [3] Lorenzini R. et al, Nature Physics 5 (2009) 570 [4] P. Zanca and D. Terranova Plasma Phys. Control. Fusion 46 (2004) 1115 [5] R.B. White and M.S. Chance, Phys. Fluids 27 (1984) 2455 [6] P. Scarin et al, to be published in Nuclear Fusion (2019) [7] S. Peruzzo et al, Fusion Eng. Des. 136 (2018) 1605 [8] L. Marrelli et al, to be published on Nuclear Fusion (2019) and this conference [9] D. Bonfiglio et al, this conference

Presenter: VERANDA, M. (EPS 2019)

Session Classification: Poster P2

Track Classification: MCF