Contribution ID: **3095**   Type: **not specified**

P1.1051 Modelling of non-linear edge harmonic oscillations and the effect of non-axisymmetric magnetic coils

Monday, 8 July 2019 14:00 (2 hours)

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.1051.pdf

Quiescent H-mode (QH-mode) operation is highly desirable relative to the well known Hmode operation because it allows for high energy density in the core as well as potentially improved confinement of energy and particles. A feature of QH-mode is that the Edge Localized Mode (ELM) instabilities are replaced with continuous Edge Harmonic Oscillations (EHO) [1]. Control and reproduction of robust QH-mode regimes could be crucial for future fusion operation. In some cases it may be useful to modify the main characteristics of QH-mode discharges while keeping constant the key elements needed to achieve QH-mode (such as applied torque, edge current density, pedestal pressure, etc.). With that in mind, the effect of global toroidal mode seeding in the vacuum magnetic field on the amplitude of EHO is investigated. Previous numerical simulations have shown that free boundary equilibrium calculations are able to recover non-linear saturated 3D equilibria with edge corrugations associated with EHO in QHmode [2, 3]. Here we use the VMEC free boundary code to do a proof of principle investigation of the coupling between EHO and global toroidal mode seeding. This is done by first producing a QH-mode plasma using the vacuum magnetic field modeled by JET-like toroidal and poloidal field coils. Then, a global toroidal mode n=1,2 is seeded numerically by perturbing the vacuum field using a set of non-axisymmetric external coils associated with the Error Field Correction Coils (EFCC's) in JET and the plasma response is studied. Due to the EFCC's geometry, it is crucial to account for up-down asymmetry in the VMEC code. Spectral decomposition of the 3D plasma displacement with respect to the equivalent 2D axisymmetric equilibrium is performed and compared with linear numerical simulations using the KINX code. A study that effectively isolates the coupling of global n=1,2 toroidal modes with current driven and pressure driven EHO is presented, and the impact of external coils and associated plasma response clearly determined.

References
[1] K. H. Burrell et al., Physics of Plasmas 8, 2153 (2001).
[2] A. Kleiner, submitted for publication to Plasma Phys. Control. Fusion. "Current and pressure gradient trig-
gering and non-linear saturation of edge harmonic oscillations in tokamaks"
[3] D. Brunetti et al., Journal of Plasma Physics, 84 (2), 745840201 (2018).

pppo

Presenter: BUSTOS RAMIREZ, G. (EPS 2019)

Session Classification: Poster P1

Track Classification: MCF