Contribution ID: **3543** Type: **not specified**

P5.1002 Modelling multi-modal Resistive Wall Mode feedback control in JT-60SA perspective high beta scenarios

Friday, 12 July 2019 14:00 (2 hours)

See full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P5.1002.pdf

The forthcoming device JT-60SA, under construction in Naka (Japan), is particularly well equipped for studying Advanced Tokamak scenarios with high N and a non-negligible fraction of energetic particles from neutral bean injectors [1][2]. These plasmas are prone to exhibit kink-like ideal MHD instabilities; one or more Resistive Wall Modes (RWM) in particular can be potentially unstable when operating beyond the no-wall pressure limit [3]. While a synergy of wave-particle resonances and active control will play a role in stabilizing RWMs, the present work focuses on the latter. An advanced modelling tool has been developed based on the CarMa code [4][5] which includes a detailed description of the passive stabilizing plate and active coils. As an improvement of previous results, simultaneous stabilization of the most unstable RWMs (n=1,2) is demonstrated, discussing the capabilities and limits of the feedback system. Different configurations of active coils are compared, taking advantage of the flexibility granted by the 18 independent power supplies. A realistic controller for the RWM loop is discussed and implemented in the model, combined with accurate positioning of magnetic sensors on the stabilizing plate and vacuum vessel. The performance of the mode-control algorithm is assessed by analyzing the eigenvalues of the closed-loop system. The development of the time simulation, describing mode dynamics, is also described.

[1] Shirai, H., et al. Nuclear Fusion, 2017, 57.10: 102002.
[2] Giruzzi, G., et al. Nuclear Fusion, 2017, 57.8: 085001.
[3] Bolzonella, T., et al. “Recent studies in support to MHD stability and control on JT-60SA.” 39th EPS Conference on
Plasma Physics and 16th International Congress on Plasma Physics. European Physical Society, 2012.
[4] Portone, A., et al. Plasma Phys. Contr. Fusion, 2008, 50, 085004.
[5] Pigatto, L., et al. “Resistive Wall Mode physics and control challenges in JT-60SA high beta-N scenarios.” 27th IAEA
Fusion Energy Conference. IAEA, 2018.

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Presenter: PIGATTO, L. (EPS 2019)

Session Classification: Poster P5

Track Classification: MCF