Contribution ID: **58** Type: **Poster**

STABILITY ANALYSIS OF TJ-II STELLARATOR NBI DRIVEN ALFVÉN EIGENMODES IN ECRH AND ECCD EXPERIMENTS

Wednesday, 4 September 2019 15:15 (15 minutes)

In stellarators, low levels of plasma current induced by neutral beam injection or EC heating may cause non-negligible modifications of the plasma equilibrium and, therefore, of the shear Alfvén waves spectrum. Experiments carried out in the TJ-II stellarator [1] and other helical devices [2, 3] have addressed this issue clearly illustrating this effect.

Numerical analysis of TJ-II (B0=1 T, R=1.5 m, a=0.22 m) experimental results studying the impact of electron cyclotron resonant heating (ECRH) and electron cyclotron current drive (ECCD) on NBI driven Alfvén activity has been performed using the FAR3D code [4]. The code solves the reduced linear resistive MHD equations and the moment equations governing the evolution of the energetic ions density and their parallel velocities, including resonance effects to account for damping/growth of the MHD perturbations. The simulations, aiming at understanding the experimental variations observed in the spectrum of Alfvén Eigenmodes (AEs) measured by magnetic diagnostics and the heavy ion beam probe (HIBP), have been carried out taking into account the equilibrium modified by plasma currents and the fast ion pressure profiles calculated in the different plasma conditions. In principle, FAR3D results allow us to identify the modes with highest growth rate compatible with the variable experimental conditions.

The shots analyzed were obtained with a combination of ECRH/ECCD and hydrogen co-NBI in deuterium plasmas. Furthermore, experiments making use of additional ECRH power allow us to increase plasma temperature with no noticeable variations in plasma density. Changes in electron temperature profile (from 1.6 to 2.0 keV central temperature) are accompanied by an increase in mode frequency (from 240 to 260 kHz), which could be explained by changes in plasma resistivity or in the energetic particle slowing down time. Although the result of the simulations also shows strong variations of the predicted activity, several uncertainties related to the experimental determination of mode number and mode location precludes precise identification of the observed instabilities.

References:
[1] Á. Cappa et al., 45th EPS, P4.1040 (2018)
[2] S. Yamamoto et al, Nucl. Fusion 57, 126065 (2017)
[3] S. Yamamoto et al, 27th IAEA FEC, EX/1-3Ra (2018)
[4] J. Varela et al, Nucl. Fusion 57, 126019 (2017)

Country or International Organization

Spain

Primary authors: CAPPA, Álvaro (Laboratorio Nacional de Fusión CIEMAT); VARELA, Jacobo (National Institute for Fusion Science)

Co-authors: ASCASIBAR, Enrique (CIEMAT); ELISEEV, Leonid (NRC "Kurchatov Institute"); LÓPEZ-BRUNA, Daniel (EsLNF); Dr LINIERS, Macarena (CIEMAT, Madrid, Spain); Dr KHARCHEV, Nickolai (National Research Centre "Kurchatov Institute"); MELNIKOV, Alexander (NRC 'Kurchatov Institute'); MULAS, Sadig (LNF, CIEMAT)

Presenter: CAPPA, Álvaro (Laboratorio Nacional de Fusión CIEMAT)

Session Classification: Poster

Track Classification: Control of Energetic Particle Confinement