7th Asia-Pacific Conference on Plasma Physics, 12-17 Nov, 2023 at Port Messe Nagoya

Shear flows induced by AE / EPM in LHD plasma

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The aim of the study is the analysis of shear flows generation during the saturation phase of AE / EPM in LHD plasma [1]. A set of experiments and nonlinear simulations are performed by the gyro-fluid FAR3d code [2] are performed to investigate the shear flows generated during the bursting phase of the energetic-ion-driven resistivity interchange mode (EIC) [3] and MHD burst [4]. The nonlinear simulations show the generation of shear flows caused by energy transfers from unstable AE / EPM towards the thermal plasma during EIC [5] and MHD bursts [6]. Experiments performed in the 23th and 24th LHD experimental campaigns were dedicated to explore the destabilization of MHD burst and EIC bursting events in discharges with different heating patterns, thermal plasma and magnetic field configurations. The shots 176490 and 179697 show the destabilization of rather MHD and EIC bursts, respectively. Both discharges may indicate the generation of shear flows by AE / EPM uncorrelated with the perturbation induced by the NBI in the plasma. Figure 1 shows the destabilization of a MHD burst between t = 4.0 – 4.3 s in the 176490 discharge (magnetic data spectrometer and Beam Emission Spectroscopy, panels a and b) and the generation of shear flows at R=3.6-3.9 m from t = 4.04 s (radial electric field, poloidal and toroidal plasma velocity measured by charge exchange diagnostic) uncorrelated with the perturbation induced by the perpendicular NBI at t = 4.0 and 4.1 s (dashed horizontal pink lines).

This work was supported by the Comunidad de Madrid under project 2019-T1/AMB-13648, NIFS07KLPH004 and PLADyS', JSPS Core-to-Core Program, A. Advanced Research Networks. The data supporting the findings of this study are available in the LHD experiment data repository at https://doi.org/10.57451/lhd.analyzed-data.

References

[1] K. Ida et al Sci. Rep, 6, 36217 (2016).

[2] J. Varela et al Nucl. Fusion, 57, 046018, (2017).

[3] Du X.D. et al. Nucl. Fusion 56 016002 (2016).

[4] Osakabe M. et al Nucl. Fusion 46 S911 (2006).

[5] J. Varela et al Nucl. Fusion 61 126016 (2021).

[6] J. Varela et al Nucl. Fusion 62 126020 (2022).

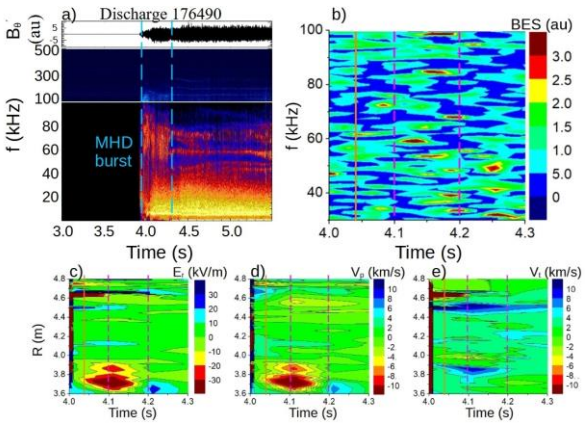

Fig. 1. (a) Perturbation of the poloidal component of the magnetic field and spectrogram of the magnetic data. (b) Beam Emission Spectroscopy data correlated with the plasma MHD activity. (c) Radial electric field, (d) poloidal velocity and (e) toroidal velocity of the plasma measured by the charge exchange diagnostic.