Contribution ID: **3116** Type: **not specified**

P1.1072 Interaction between high-power ICRF waves and drift-wave turbulence in LAPD

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

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.1072.pdf

The Basic Plasma Science Facility (BaPSF) at UCLA is a US national user facility for studies of fundamental processes in magnetized plasmas. The centerpiece of the facility is the Large Plasma Device (LAPD), a 20m long, magnetized linear plasma device [1]. This LAPD has been utilized to study a number of fundamental processes, including: dispersion and damping of kinetic and inertial Alfvén waves, flux ropes and magnetic reconnection, three-wave interactions and parametric instabilities of Alfvén waves, turbulence and transport and interactions of energetic ions and electrons with plasma waves. An experimental campaign on the physics of ICRF waves has recently begun using LAPD.
The LAPD has typical plasma parameters ne ~ 1.0 10^12 - 10^13cm^-3, Te ~ 1 - 10eV and B ~ 1000G. A new high-power (~150 kW) RF system and antenna 0.8 have been developed for excitation of large amplitude fast waves in LAPD. The source runs at a frequency of 1-5 MHz, corresponding to 1 - 10 fci, depending on plasma parameters. Recent work has focused on the structure and scaling of RF sheaths and convection cells near the antenna[2]. In these same experiments, strong low-frequency modulation of coupled fast wave power is observed via direct measurement of the magnetic signals associated with the fast waves in the core plasma. This modulation is well correlated with low-frequency edge density fluctuations associated with drift waves. Suprisingly, the amplitude of the RF modulation and the amplitude of edge density fluctuations in the drift wave frenquency range both grow with increasing RF power, as shown in Fig. 1, suggesting some nonlinear coupling between the edge drift waves and large amplitude fast waves in the core region.

References
[1] W. Gekelman, et al., Rev. Sci. Inst. 87, 025105 (2016).
[2] M. Martin, et al., Phys. Rev. Lett. 119, 205002 (2017).

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Presenter: CARTER, T. (EPS 2019)

Session Classification: Poster P1

Track Classification: MCF