Current injection impacting low frequency waves in a magnetically confined plasma column

S. Vincent[1], V. Désangles[1,2], V. Dolique[1], N. Plihon[1]

[1] *Laboratoire de Physique - ENS de Lyon, CNRS, Lyon, France*

[2] *Département physique - ONERA, Paris, France*

Low frequency waves turbulence developing in magnetized plasma columns are well known to trigger important radial transport, a major issue for fusion devices [1]. We investigate here the impact of direct current injection from the plasma center to the walls on the features of such waves.

Our experimental set-up consists in a cylindrical chamber containing an Argon plasma column of 10 cm diameter of ionization rate 20% and at low pressure ($\sim$ 1 mTorr) generated via a 1 kW RF inductive source. The plasma is confined by a magnetic field ranging from 0.01 T to 0.15 T [2].

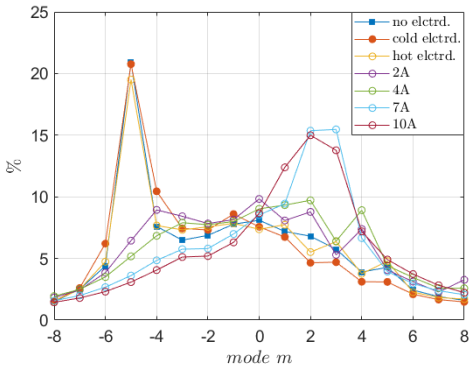

FIGURE 1 – *Impact of an emissive electrode on the m-modes amplitude, as a function of the electrode heating current (i.e. of the emitted current).*

A very fast camera records images of spontaneous radiated light fluctuations in a plane transverse to the plasma column axis, at a 200 kfps rate, showing the presence of azimuthally rotating waves at frequencies of order the kHz. These modes of the form $e^{i(m\theta-\omega t)}$ are extracted by 2D axisymmetric Fourier transform analysis, giving access to their dynamic and their interactions [3]. A tungsten electrode is then inserted at the center of the column, negatively biased with respect to the chamber ground, and heated up to emissive regimes. The electrode emitted current significantly changes the radial profiles of the plasma parameters, and has a dramatic impact on the most instable modes (Figure 1). Finally the impact of this emitted current and of the azimuthal fluctuations on the turbulent radial transport is investigated using an advanced triple probe (following a 5-tips probe design [4]).

Références

[1] W. Horton, *Rev. Mod. Phys.* **71**, 735 (1999)

[2] N. Plihon *et al.*, *Plasma Phys.* **81**, 345810102 (2015)

[3] C. Brandt *et al.*, *Phys. Rev. E* **84**, 056405 (2011)

[4] C. Theiler *et al.*, *Rev. Sci. Instrum.* **82**, 013504 (2011)