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P4.1022 Drift waves in a plasma column: POD analysis of high speed imaging

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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 present here analysis from very fast imaging of low frequency waves in a magnetically confined plasma column, as well as concomitant measures of radial transport.
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 (1 mTorr) generated via an electromagnetic induction source of power 1 kW. The plasma is confined by a magnetic field ranging from 0.01 T to 0.15 T [2].
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 images are analysed using a Proper Orthogonal Decomposition technique [3] which is compared to 2D axisymmetric Fourier transform analysis. The POD results exhibit m-modes closely following the eim spatial form of the modes extracted by 2D Fourier transform. The non-linear interactions between these modes is then investigated while increasing the magnetic field (a well known control parameter for drift waves turbulence [4]). Finally the radial transport is measured using an advanced triple probe (following the 5-tips probe design of [5]), and compared to the images analysis of drift waves development.
Références
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