

First fluctuations measurements in the new confined plasma configuration of the TORPEX device

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TOPIC: Edge - SOL turbulence and transport

The basic plasma physics device TORPEX features some of the main ingredients of the Scrape-Off Layer (SOL) of fusion devices, including gradients of density and magnetic field, as well as magnetic field curvature. A simple magnetized torus configuration (SMT) is produced using a small vertical magnetic field component superimposed to the main toroidal field, resulting in helical open magnetic field lines. A comprehensive study of electrostatic instabilities and turbulence in TORPEX plasmas has been performed in the last years.

A new experimental set-up has been recently implemented on the TORPEX device to produce a poloidal magnetic field and a rotational transform. This set-up is based on an in-vessel toroidal copper wire of 1 cm of radius, suspended in the middle of the vacuum vessel of TORPEX by several horizontal and vertical supports. These supports can also be used to position the current carrying wire at different vertical positions up to the top of the chamber to recover the original SMT configuration. The wire is powered by an external power supply providing a maximum current of 1 kA during a flat-top of about 0.5s. A 0.2s dynamics for the ramp-up and the ramp-down phases is given by the power supply temporal response. The current flowing in the toroidal wire generates a poloidal magnetic field that leads to a rotational transform. In the resulting magnetic field lines configuration the characterization of the plasma turbulence and instabilities can be performed on both the core region of closed flux-surfaces and the SOL region of open field lines. A proper value of the vertical magnetic field is used to precisely define the geometry of closed/open field lines, with the vessel walls acting as a limiter.

An overview of the new experimental set-up will be presented, together with the background plasma parameters and profile. We will discuss the first measurements of plasma fluctuations in the SOL and their spatio-temporal evolution. The more advanced magnetic configurations that are accessible with this new experimental set-up will also be presented.

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