

Dynamics of Plasma Density Structures in the THORELLO Device

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The study of turbulence in magnetized plasma and its comprehension represent great interest in the improvement of the plasma confinement. At the edge of magnetic confinement devices, such as tokamaks, stellarators, reversed field pinch, simple magnetized tori (SMT) and linear devices, a large fraction of anomalous particles and energy transport is attributed to the propagation of blobs. These are isolated and intermittent structures, with density and temperature above the surrounding plasma, extending along field lines and radially propagating away from the core.

Basic plasma physics devices, as SMTs, allow to study blobs properties and to overcome fusion device intrinsic difficulties – reduced diagnostics access and not adequate temporal and spatial resolution. The existence of both positive and negative density structures – *blobs* and *voids*, respectively – moving inside the plasma, have been confirmed in previous experiments [1] carried out on the Thorello device.

Plasma coherent structures have been detected by means of the conditional sampling technique [2]. This analysis requires the simultaneous measurements of time series of fluctuating plasma parameters – ion saturation current and floating potential from Langmuir probes – in two positions of the poloidal cross-section. One probe (reference) was fixed at the plasma edge while a second one (scan) was moved throughout the whole cross-section. The first probe provides the triggering condition to detect structures.

The dynamics of the blob/void structures has been studied analyzing the contour plots maps obtained from the conditional sampling analysis. Depending on the applied vertical magnetic field different behaviors can be observed: a blob/void bipolar structure moving as “trapped” in the half cross-section at the low field side following the background \mathbf{ExB} velocity field; the \mathbf{ExB} velocity shear acting as transport barrier decorrelating the void/blob pair splitting the void in two parts; in a different set-up a blob structure moving horizontally with velocities which differ from the background \mathbf{ExB} velocity field. Blobs and voids effects on plasma transport (particle flux) has been analyzed for different scenarios.

[1] Barni R and Riccardi C 2009 *Plasma Physics and Controlled Fusion* **51** 085010

[2] Pécseli H L and Trulsen J 1989 *Physics of Fluids B* **1** 1616