Modification of transport due to low order rationals of the rotational transform in ECH plasmas of the TJ-II Heliac

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One of the two main research lines in the TJ-II Heliac project consists of exploring features related to the magnetic configuration. Actually, the TJ-II can produce plasmas in a wide range of rotational transform ι values (at very low magnetic shear), mostly above $\iota/2\pi = 3/2$. From past experiments we infer that (i) the magnetic shear correlates locally with transport in the density gradient region [1]; and (ii) above a threshold shear that is compatible with zero within errors, the lowest order rationals are locally coincident with lower electron heat diffusivities [2]. The former experiments were performed in boronized wall. Now, in a first campaign with Lithium wall-conditioning, we have done a new scan on rotational transform moving a non-natural low order rational (7/4) through different radial positions to perform new transport analysis. In these experiments the magnetic shear remains unchanged and very small except in the core region of the plasma. The experimental profiles are constructed from several diagnostics: Electron Cyclotron Emission (T_e), Thomson Scattering (T_e, n_e), reflectometry, interferometry and soft X-ray bolometry (n_e). The results confirm the main observations from our first experiments. In addition, care has been taken to characterize the plasma density profiles so particle transport has been attempted as well. By comparison with the vacuum profiles of the rotational transform, an estimate of the bootstrap current density profile that would explain the results is presented. These results are aimed at understanding the effect of magnetic configuration singularities in the transport propoerties of currentless magnetically confined plasmas. New experiments are planned to study magnetic shear effects.

[1] D. López-Bruna and the TJ-II Team, *Overview of TJ-II experiments*, AIP Conf. Proc., Subseries: Plasma Physics, Vol. 875, 357-362 (2005).
[2] V. I. Vargas *et al.*, Submitted to Nucl. Fusion (2007).