## On the long distance correlation of fluctuations during edge transitions to improved confinement regimes in the TJ-II stellarator

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## Abstract

The long distance coupling between edge density and potential fluctuations has been investigated during transitions to improved confinement regimes in the TJ-II stellarator. Different edge plasma parameters were simultaneously characterized in two different toroidal positions using two similar multi-Langmuir probes installed on fast reciprocating drives.

Results show a long distance correlation between floating potential signals that increases when probes are approximately at the same radial location, whereas there is no correlation between ion saturation current signals. Cross-correlation shows a maximum value when plasma density is close to the threshold for the development of spontaneous edge sheared flows [1], which can be described by a second-order phase transition model [2]. Furthermore, correlation between potential signals increases significantly in plasma regimes with edge biasing induced enhanced confinement.

These findings show the important role of long distance correlations as a first step in the transition to improved confinement regimes and the key role of electric fields to amplify them, providing a critical test for L-H transition mechanisms (e.g. role of ion orbit losses and second order phase transitions based on turbulence driven flows).

[1] M. A. Pedrosa et al., Plasma Physics and Control Fusion (2007)

[2] B.A. Carreras, L. García et al., Phys. Plasmas 13 (2006) 122509