Edge turbulence in different density regimes in Alcator C-Mod

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Turbulence in the plasma edge and SOL at the outboard midplane of the Alcator C-Mod Tokamak is studied using Gas-Puff-Imaging with a fast camera. The statistical properties of the emissivity fluctuations, as well as the behavior of the blobs, are characterized in different plasma discharges at different normalized density, studying the role played by the plasma edge, in particular the edge turbulence, in the Greenwald limit. It is shown that approaching the Greenwald density limit, there is a change in the edge velocity field measured with the cross correlation technique: the radial velocity increases, while the poloidal velocity inverts its direction of propagation, similar to what was observed in high density discharges of the RFX-mod Reversed Field Pinch device. This implies the existence of a common link between the Greenwald limit and plasma edge dynamics in two rather different configurations.

Moreover, the strong fluctuations, which for standard discharges develop mainly outside the separatrix, extend into the radial region inside the last closed flux surface as the density limit is approached. At the same time, the blobs involve a larger radial region. The link between edge turbulence and the Greenwald limit will be discussed: up to now, while in Tokamaks turbulence seems to play a strong influence on this limit, in RFX-mod no clear connection has been established.