Radial electric field profile, pedestal formation and Bx∇B drift direction in WEST

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WEST is a large aspect ratio tokamak (A=5-6) with superconducting coils (magnetic ripple around 2.3% at the plasma edge) and all tungsten plasma-facing components. It possesses symmetric upper and lower divertors and its plasmas are RF heated (using both Lower Hybrid and Ion Cyclotron Resonance Heating systems) with active X-point either on the upper or lower divertor and a Bx∇B drift pointing downwards [1,2]. The profile of the radial electric field is measured by Doppler BackScattering system (DBS) [3] in different magnetic configurations and for various levels of additional power. During some discharges, when the power crossing the separatrix P_{sep} is close to the Martin 2008 scaling [4], the formation of a pedestal is observed. Once the pedestal is formed, the radiation level increases leading to an oscillatory regime. These possible transitions, mainly observed in Lower Single Null configuration (LSN), are characterized by a significant increase of the particle confinement time combined with a radial electric field well getting significantly deeper than for standard L-mode plasmas with lower P_{sep} or higher fraction of radiated power. In other discharges, with similar and even higher injected power, the profile remains less deep and no sign of transition appears. In Upper Single Null configuration (USN), the ExB velocity profile exhibits a less deep well than in LSN during ohmic phases, as expected given the Bx∇B direction. However, with additional power this tendency is reversed and deeper wells form in USN configuration. Interestingly, the discharge with the deepest electric field well exhibits a less pronounced density pedestal than during transitions observed in LSN configuration. In this specific case, the ExB velocity profile exhibits a particular oscillatory behavior.

In this contribution, the shape of the ExB velocity profile measured by DBS is investigated in various magnetic configurations, in presence of various levels of additional power regarding the access to transitions towards improved confinement regimes.

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