

Simultaneous measurements of fluctuations with cold and emissive probes in ISTTOK

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The dynamics of edge and scrape off layer (SOL) transport of heat, particles and specifically momentum is very important for the understanding and control of edge properties in fusion machines. A probe array of four staggered heatable probes and one cylindrical probe on the same poloidal meridian was used in ISTTOK. The heatable probes consisted of 5 mm long loops of 0,2 mm diameter tungsten wires heatable to electron emission. By "cold probe" we mean an unheated loop probe, while in case of an "emissive probe" the loop is heated. The cylindrical probe was biased to ion saturation. The array permits the simultaneous registration of density and poloidal electric field, necessary for the derivation of the radial turbulent flux. The poloidal electric field was simultaneously taken once from the difference between the floating potentials of two staggered cold probes and once of two staggered emissive probes.

First the floating potentials of all four heatable probes were compared with each other when two probes were heated and two not. The cross correlation between the two emissive and the two cold probes show qualitatively the same behaviour although the time lag is nearly doubled for the latter. For the emissive probes, inside the limiter ($r < 85$ mm) at $r \approx 65$ mm the signals are highly correlated ($\gamma \approx 0,9$) which indicates a lower level of turbulence. With increasing radius the correlation decreases and has a minimum at $r \approx 74$ mm ($\gamma \approx 0,7$). This can be associated with a de-correlating shear layer. The radial plasma potential profile shows a change of the radial electric field direction for $r \approx 74$ mm. The radial turbulent flux shows a maximum around $r = 74$ mm also indicating a shear layer at this position. Investigations on intermittent events exhibit clear differences in the potential measured by emissive and cold probes. Intermittent events are more clearly seen and finer structured in the emissive probes suggesting that temperature perturbations associated with blobs cannot be neglected. Thus emissive probes reveal more details of fluctuations in fusion plasmas than cold probes.