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Temperature Fluctuation Measurement in Electron Temperature Gradient (ETG) turbulent plasma of Large Volume Plasma Device (LVPD)

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Electron temperature fluctuations have been measured in core plasma of Large Volume Plasma Device(LVPD) in the background of ETG turbulence using Triple Langmuir Probe (TLP) technique[1]. We have observed that TLP is capable of measuring fluctuations in electron temperature and potential in the times scales of few $\sim \mu sec$ which easily resolve ETG turbulence $(1 - 20kHz)$. Relevance of this diagnostic development for accurate measurement of temperature fluctuations can be gauged from the fact that in the boundary region of magnetically confined fusion plasmas, micro-instabilities of electron scale contributes significantly to plasma transport losses. Past investigations on Electron Temperature Gradient (ETG) driven turbulence suggests that presently ETG is considered as a major source of anomalous plasma transport in fusion devices. Direct measurement of it is difficult there because of its extremely small scale length. In this background, first demonstration of ETG turbulence was made in LVPD and it was made possible by the advent of a large Electron Energy Filter (EEF)[1-2]. Simultaneous measurement of fluctuations in electron temperature (10- 20%), plasma density (5-10%) and potential (0.5- 8%) are carried out by the TLP [3], which agrees well with predicated level of fluctuations for ETG turbulence.

Focus of the present paper will be on the development of TLP diagnostics and its validation for temperature fluctuation measurement. The paper will highlight on features of TLP, especially on development of Boost-Buck concept based floating power supply with floating measurement circuitry. Paper will also discuss on energy flux measurements using TLP for ETG turbulence dominated plasma.

References

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