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P2.1095 Spatiotemporal evolution of turbulent plasma density fluctuations and of their kurtosis value during modulated ECRH at the L-2M stellarator

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Non-local transport and non-Gaussian probability density functions (PDFs) of turbulent fluxes are fundamental physical issues for magnetic confinement fusion that were addressed well in set of works (e.g., review [1] and references therein). Deviation of PDFs from a Gaussian distribution most easily to monitor by calculating the kurtosis value and usually it is preferable to analyze not the original data set but its increments (first order differences) to deal with a stochastically independent data set.
Modulated electron cyclotron resonance heating (ECRH) is a useful tool to study changes in microturbulence characteristics. Such changes can be a result of a variety of nonstationary processes that accompany modulated ECRH. At the L2-M stellarator one form of modulated ECRH is a sequence of microwave (frequency f = 75 GHz for X2-mode ECRH) pulses. The pulse lengths and the lengths of pauses between the pulses can be regulated in a wide range. Heating power P_(ECRH) in the experiments [2, 3] on modulated ECRH was 0.2 MW and 0.4 MW, average electron density n_e was 1.8-2.1 x 10^(19) m^(-3), central electron temperature Te reached 1 keV (at P_(ECRH) = 0.4 MW). Density fluctuations from different plasma regions were measured by multiple collective scattering diagnostics.
In our previous work [3] four characteristic stages of evolution of energy losses during modulated ECRH were noted. The focus of the present work was to investigate thoroughly behavior of kurtosis value during the abovementioned stages. Following common features of density fluctuations measured by all collective scattering diagnostics were observed clearly: deviation of density fluctuations PDFs and PDFs of their increments from a Gaussian distribution has a bursty nature (100 - 200 μs is a typical length of a burst); the deviation of the fluctuations PDFs usually is more pronounced than the deviation of the increments PDFs.

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[1] T.S. Hahm and P.H. Diamond. Journal of the Korean Physical Society, 2018, v.73, pp. 747-792.
[2] G.M. Batanov, M.S. Berezhetskii, V.D. Borzosekov et al. 44th EPS Conference on Plasma Physics, 26 - 30 June 2017, Belfast, Northern Ireland, P2.154.
[3] G.M. Batanov, V.D. Borzosekov, S.E. Grebenshchikov et al. 45th EPS Conference on Plasma Physics, 2 - 6 July 2018, Prague, Czech Republic, P4.1099.

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