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P1.1085 Intermittent plasma fluctuations in the Alcator C-Mod scrape-off layer in L H and I-modes

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Fluctuations in the scrape-off layer of Alcator C-Mod have been investigated by gas puff imaging and mirror Langmuir probe measurements, including L, H and I-mode plasmas. In all cases, the time series from the far scrape-off layer region are dominated by large-amplitude bursts attributed to the radially outwards motion of blob-like filament structures [1]. This results in significant skewness and kurtosis moments and thus strong intermittency of the fluctuations. There is a striking similarity between L- and H-mode plasmas, the latter comprising both quiet/ELM-free H-modes and EDA H-modes [2].
The average burst wave form is well described by a two-sided exponential function, and the time scale is the same for all plasmas investigated [1, 2]. It is shown that both burst amplitudes and the waiting times between them are exponentially distributed. Moreover, there is a universal shape of the frequency power spectrum for all radial positions in the scrape-off layer and for all confinement modes. It is demonstrated that both gas puff imaging and Langmuir probe measurements give the same statistical properties for the fluctuations.
These properties of the fluctuations are shown to be in excellent agreement with predictions of a stochastic model based on a super-position of uncorrelated exponential pulses [1, 2]. This suggests that the power spectrum is determined solely by the exponential pulse shape, while the radial variation of intermittency as quantified by the skewness and kurtosis moments depend on the degree of pulse overlap [1, 2]. A new deconvolution method is applied, demonstrating for the first time that the bursts are uncorrelated and appear in accordance with a homogeneous Poisson process.
Finally, a set of I-mode plasmas are analyzed, showing that in some cases the bursts in the far scrape-off layer appear quasi-periodically and that the blob structures may be associated with geodesic acoustic modes in the edge region.

References
[1] A. Theodorsen et al., Nucl. Fusion 57, 114004 (2017); Phys. Plasmas 25, 122309 (2018)
[2] O.E. Garcia et al., Phys. Plasmas 20 055901 (2013); 25, 056103 (2018)

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