Turbulence in L-H transitions on MAST

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As several studies have shown, there exists a critical power threshold P_{LH} beyond which tokamak plasmas transition to a state of reduced turbulence and improved confinement, known as the H mode. There does not yet exist a quantitative model for P_{LH} and attempts at finding an empirical scaling law have not yet produced one which captures all the parameter dependencies. A scoping study on MAST data will be presented which reveals MAST H mode behaviour with density, with different types of transitions and resulting H modes present in different locations of the parameter space.

Some recent studies (e.g. [1, 2]) have shown that L-H transitions occur at a critical energy transfer from turbulence to zonal flows, both in favourable and unfavourable ion ∇B drift configurations [3]. The generality of this result as well as the link between this and divertor configurations will be explored, as separate studies on C-Mod [4] have shown a dependence of P_{LH} on divertor geometry parameters. To test for these concepts and expand on the results, experiments on MAST-U are planned to map out the parameter space of P_{LH} while studying the turbulence dynamics at the edge, making use of the flexible divertor to probe these relationships. In preparation of these experiments, selected MAST transitions have been analysed by employing velocimetry techniques and bispectral methods on 2D beam emission spectroscopy data to investigate wave coupling and spectral energy transfer. These results will be compared to those obtained in [1, 2]. Preliminary results from the experiments on MAST-U will also be presented.

This work was supported by the Engineering and Physical Sciences Research Council grants [EP/L01663X/1] and [EP/T012250/1].

References

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