Classification of Low-Mode and High-Mode States with a Pattern-Recognition Algorithm

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Edge operational space diagrams which discriminate well between the Low-mode (L–mode) and High–mode (H–mode) states in the DIII–D tokamak [*J.L. Luxon, R. Anderson, F. Batty, C.B. Baxi, G. Bramson, N.H. Brooks, B. Brown, et al., in Proceedings of the 11th Conference on Plasma Physics and Controlled Fusion Research, 1986 (International Atomic Energy Agency, Vienna, 1987), Vol I, p. 159*] have been obtained with a pattern recognition algorithm. This study used a large database that consists of plasma current I_p, toroidal magnetic field B_T, electron temperature T_e, electron density n_e, electron pressure P_e and the gradients of T_e, n_e and P_e, evaluated at the edge of the plasma in the region where the H–mode transport barrier forms. Identifications of parameters which best discriminate between the L–mode and H–mode states have been performed for a density scan, a current scan and a toroidal field scan. A common feature of the identifications is that ∇T_e emerges by itself or in combination with other measured parameters as one of the identification parameters. A large range of scale lengths $T_e/\nabla T_e$ and low values for $\nabla T_e/I_p$ are found to characterize the L–mode. In contrast the H–mode is characterized by low values of the temperature scale length and a large range of values for $\nabla T_e/I_p$.

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