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Advances in modelling of plasma pedestal behaviour and ELM control in ITER reference plasma scenarios

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The achievement of ITER fusion performance is based upon plasma operational scenarios in which the plasma is in the high confinement regime (H-mode) during the burning phase. The fusion power production level is predicted to strongly depend on the values of the pedestal plasma temperature and density on the inner side of the edge transport barrier (ETB). Similarly, the steep edge density and temperature gradients in the ETB are expected to trigger Edge Localized Modes (ELMs) with large associated transient loads on plasma facing components that can severely reduce their lifetime in ITER.
Although an intensive experimental R&D programme in ITER Members'fusion facilities is presently addressing edge plasma stability issues and ELM control, significant uncertainties remain regarding the empirical extrapolation of the experimental results to ITER. Indeed the edge transport barrier plasma properties of ITER plasmas differ significantly from those in present experiments highlighting the need for a modelling based upon extrapolation of results from present experiments to ITER.
In order to provide a firmer physics base to evaluate the edge plasma properties in ITER H-mode plasmas, the ITER Scientist Fellow Network pedestal group has been created. The group is formed by Fellow modelling experts from the ITER Members'and ITER Organization staff and carries out a coordinated workprogramme together with a wider network of collaborators and addresses a range of issues covering edge MHD stability and transport in ITER plasmas, power, particle and impurity fluxes during ELMs, triggering of ELMs by active schemes such as pellet pacing and vertical oscillations and the application of 3-D fields for ELM control and their effects on edge stability, transport and rotation.
The paper describes the significant progress in many of these areas that has been achieved through the coordinated work of the group.

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