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P5.1033 Characterization of the scrape-off layer and pedestal conditions at JET using density profile measurements by reflectometry

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The edge electron density at the midplane is a very important interface parameter between core (associated with fusion performance) and divertor plasma (able to control power exhaust). The separatrix density is also essential to assess the pedestal stability and has been observed to be related with the plasma energy confinement, with a significant impact on the Edge Localized Mode (ELM) dynamics. Previous studies indicate that divertor conditions and the separatrix density are correlated influencing even the core plasma confinement (e.g. [1]). Mechanisms such as confinement degradation with gas fuelling, the role of neutrals and the importance of the separatrix density are however not fully understood.
Measurements of the midplane density with high temporal and spatial resolution are therefore instrumental. A reflectometry diagnostic is available at JET that provides density measurements with the required temporal and spatial resolution. A large dataset of measurements is available that enables to estimate physics relevant parameters characterizing the density profile such as pedestal density, pedestal width, separatrix density and scrape-off layer (SOL) width.
In this work, a set of different density profile models are presented as possibilities to expand to the SOL the commonly used modified hyperbolic tangent (mtanh) function. Different SOL models were compared, ranging from simple linear slopes to polynomials and exponentials. A database was established with discharges selected to offer a wide variation of global parameters such as plasma confinement or discharge conditions as impurity seeding, fuelling rate and divertor configuration. Initial results on the correlations between the plasma parameters characterizing the density profile and the selected discharge parameters will be presented. Taking advantage of the high temporal resolution of the reflectometry measurements (down to 15 μs) the evolution along the ELM cycle was also studied. Encouraging results were obtained that allow the determination of the time scales for ELM crash and recovery based on the evolution of parameters such as pedestal and SOL width and separatrix density.

1. M. N. A. Beurskens et al., Plasma Physics and Controlled Fusion 55, 124043, DOI 10.1088/0741-3335/55/12/124043 (2013).

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