Contribution ID: **914** Type: **Poster**

The role of the density profile location on pedestal stability in ASDEX Upgrade

Thursday, October 20, 2016 8:30 AM (4 hours)

Scrape-off layer (SOL) properties are controlled by a number of parameters, such as heating power, main ion fuelling, and impurity seeding. The high field side high density (HFSHD) is a region of high density (~10× higher than the separatrix density) localised to the HFS SOL and is observed in both ASDEX Upgrade (AUG) and JET when a gas puff at sufficient heating power is applied. It can be mitigated by either reducing the input power to the main plasma or by radiating this power, via, for example, nitrogen seeding, before it reaches the HFS SOL.

Observations of the density profile and the HFSHD show that the presence of the HFSHD is linked with an outward shift of the density profile. Conversely, when it is mitigated, the profile shifts radially inwards. At the same time, nitrogen seeding has been observed to increase pedestal and global confinement in fuelled discharges on AUG by up to 40%.

Interpretive pedestal modelling is used to validate the peeling-ballooning hypothesis of pedestal limiting ELM behaviour. While this is a valuable tool, it is limited since only final plasma states involving a variety of changes in impurity content, SOL characteristics, and global beta can be analysed. As such, a predictive pedestal tool (iPED) was developed using similar assumptions to the EPED model to vary each parameter independently.

In addition to the standard inputs of predictive pedestal models, an ad-hoc shift of the density profile, based on experimental measurements, is included. An inward shift (of up to 0.01 rho_poloidal) has a dramatic impact on the predicted pedestal stability, increasing it by 30% in a typical AUG scenario and is the dominant factor determining the eventual pedestal top. Increased Z_eff and global beta also contribute to pedestal stabilisation, but have a smaller impact.

To determine the final global plasma state, iPED is combined with the ASTRA transport model. ASTRA and iPED are iterated in a step-wise manner until convergence of the core and pedestal plasmas is reached. This allows the evolution of the global plasma in response to small changes at the separatrix to be modelled, and offers a demonstration of how SOL properties can impact both the pedestal and global confinement.

Paper Number

EX/3-5

Country or International Organization

Germany

Author: Dr DUNNE, Mike (IPP-Garching)

Presenter: Dr DUNNE, Mike (IPP-Garching)

Session Classification: Poster EX/3, EX/4, PPC/1

Track Classification: EXC - Magnetic Confinement Experiments: Confinement