Contribution ID: **144** Type: **Poster**

The impact of poloidal flux expansion on JET divertor radiation performance

Tuesday 23 October 2018 08:30 (20 minutes)

For a burning plasma device like ITER, radiative power removal by seeded impurities will be inevitable to avoid divertor damage. Increasing divertor radiation by injecting low-Z impurities such as nitrogen, to reduce scrape-off layer heat flux and to cool the divertor plasma to detachment, is put forward as the primary method to achieve this goal. Here, the possibility of increasing the radiative fraction is assessed by using poloidal magnetic flux expansion. Initial ohmic and nitrogen seeded H-mode High Flux Expansion (HFE) experiments, characterized by the presence of 2-nearby poloidal magnetic field nulls and a contracting geometry near the inner target plate have been recently achieved at JET tokamak In this contribution the physics of the dependence of radiative volume and total radiated power on flux expansion variation at JET, equipped with ITER-like Wall (ILW), will be addressed. EDGE2D-EIRENE simulations have already shown that the divertor heat fluxes can be reduced with N2-injection, qualitatively consistent with experimental observations, by adjusting the impurity injection rate to reproduce the measured divertor radiation. Through EDGE2D-EIRENE code modelling, a detailed analysis of the power balance has been set up to physically investigate the reason of the increase of the radiated power for HFE discharges. An increase of charge exchange losses has been related to an increase of connection length and flux expansion both at X-point at strike points position. Spectroscopy data suggests that there is evidence of a detachment front moving towards the X-point from both the movement of the electron density and the low charge nitrogen charge states as the flux expansion increases. Initial experiments with a second null, on the high field side, forming a configuration with significant distance between the two nulls and a contracting geometry near the target plates have been performed leading to an increase of the main magnetic divertor geometry parameters. In addition, nitrogen seeded H-mode experiments have been set-up showing an increase of the total radiated power of the same factor of the flux expansion increase. Further experiments will be devoted to varying the divertor coils polarities to move the secondary x-point on the low field side region and consequently increase the outer flux expansion both in the x-point and strike point region.

Country or International Organization

Italy

Paper Number

EX/P1-16

Author: Dr VIOLA, BRUNO (ENEA)

Co-authors: Dr MAVIGLIA, Francesco (CREATE); Dr ARTASERSE, Giovanni (ENEA); Mr RUBINO, Giulio (ENEA); Dr CALABRO, Giuseppe (ENEA); Dr MINUCCI, Simone (Universita tuscia)

Presenter: Prof. DE TOMMASI, Gianmaria

Session Classification: P1 Posters