Contribution ID: **233** Type: **Poster**

Impact of Neon Injection on Electron Density Peaking in JET Hybrid Plasmas

Tuesday 23 October 2018 08:30 (20 minutes)

Impact of low-mid Z impurity injection on plasma transport and confinement has been observed and reported in several Tokamak experiments. Understanding particle transport in mixed species plasmas is crucial for reactor relevant conditions where control of DT mixture along with control of He concentration will be necessary. In this paper we present the analysis of experimental electron density profile evolution in JET hybrid scenario discharges with increasing level of Neon seeding. The measured electron flux is compared with fully predictive transport simulations in search for the possible existence of a particle inward pinch proportional to the light impurity concentration as predicted by first principle gyro kinetic simulations.

These seeding experiments, performed for power exhaust mitigation studies, offered the opportunity to study systematically the effect of Neon on density peaking and to compare it with theory predictions. The database includes hybrid discharges at IP = 1.4 MA, BT = 1.9 T, βN = 2.2, additionally heated by 16.5 MW of Neutral Beam Injection power (NBI). A few of the above discharges had a small amount (< 1 MW) of Ion Cyclotron Resonance Heating (ICRH). The current ramp-up, overshooting the plateau value was used to produce a central qo ≈ 1 broad low shear region for better confinement and NTM avoidance. Neon was injected at the start of the NBI heating phase and it was already present during the transition to H-mode: when the central density reached its top value (≈ 4 s later) the Neon contribution to the total number of injected electrons ranged from 5% to 40%. Un-seeded reference discharges were also performed with the same engineering parameters. In the seeded discharges, the core density profile peaking, defined as the ratio between the central (ρ=0.25) and the pedestal density, increases up to npeak/ped ≈ 2 depending on the amount of injected Neon.

Interestingly, in this database, the density peaking did not increased with the average as previously described for un-seeded discharges. Fully predictive transport simulations, carried out with JETTO code proved that the introduction of an inward particle pinch proportional to the effective charge and the ion temperature gradient, as predicted by microturbulence theory, was needed to match the data.

Country or International Organization

Italy

Paper Number

EX/P1-3

Author: Dr FRIGIONE, Domenico (ENEA)

Co-authors: Dr CHALLIS, Clive (Culham Centre for Fusion Energy); Mrs MAZZOTTA, Cristina (ENEA); Dr KOECHL, Florian (Vienna University of Technology, Institute of Atomic and Subatomic Physics); Dr PUCELLA, Gianluca (ENEA); Dr HOBIRK, Joerg (IPP); Dr GRAVES, Jonathan (CRPP-EFPL); FRASSINETTI, Lorenzo (KTH, Royal Institute of Technology); Dr MANTSINEN, Mervi (ICREA - BSC); Dr ROMANELLI, Michele (CCFE)

Presenter: Dr FRIGIONE, Domenico (ENEA)

Session Classification: P1 Posters