Contribution ID: **328** Type: **Poster**

TH/P2-21: Progress in the Theoretical Description and the Experimental Characterization of Impurity Transport at ASDEX Upgrade

Tuesday, 9 October 2012 14:00 (4h 45m)

The understanding of impurity transport from the wall to the center of the plasma and the identification of reliable methods to control central impurity accumulation are essential elements toward the achievement of practical fusion energy. A combination of theoretical and experimental research is required to identify the physical mechanisms from the theoretical standpoint, and to validate their impact on the measured impurity density profiles from the experimental side. In this contribution, advances in the theoretical description of turbulent impurity transport, particularly related to the inclusion of rotational effects, are presented. An analytical fluid model, which still captures the main elements of the physics, and linear and nonlinear numerical calculations with the gyrokinetic codes GKW and GS2 are presented and compared. In particular, GKW has the unique feature for a gyrokinetic code of including also centrifugal effects on turbulent transport. The impurity transport mechanisms produced by a radial gradient of the toroidal velocity and by centrifugal effects are singled out in the analytical calculations, and identified in the numerical results. These advances allow, in particular, the consistent prediction of the two dimensional impurity density distribution over the poloidal cross section. This more comprehensive theoretical description is also applied to the modelling of ASDEX Upgrade measurements of impurity density profiles. In neutral beam injection heated H-mode plasmas, central electron cyclotron heating is observed to increase the peaking of both the electron density and the boron density profiles. An inverse correlation is observed between the peaking of the boron density profile and the plasma toroidal rotation, as well as the boron logarithmic temperature gradient. The theoretical explanation of this phenomenology relates the boron response to the reduction of plasma rotation in the presence of central electron heating.

Country or International Organization of Primary Author

Germany

Primary author: Mr ANGIONI, Clemente (Germany)

Co-authors: Prof. PEETERS, A.G. (Faculty of Mathematics, Physics and Informatics, Universitaet Bayreuth, D-95440 Bayreuth, Germany); Dr GEIGER, Benedikt (IPP Garching, Germany); VETH, C. (IPP Garching, Germany); Dr CASSON, F.J. (IPP Garching, Germany); Dr SERTOLI, Marco (IPP Graching, Germany); Dr DUX, R. (IPP Garching, Germany); Dr MCDERMOTT, R.M. (IPP Garching, Germany); Dr CAMENEN, Yann (PIIM, CNRS/Aix-Marseille-Univ., Marseille, France)

Presenter: Mr ANGIONI, Clemente (Germany)

Session Classification: Poster: P2

Track Classification: THC - Magnetic Confinement Theory and Modelling: Confinement