IAEA FEC 2014

Contribution ID: **92** Type: **Poster**

WallDYN Simulations of Global Impurity Migration and Fuel Retention in JET and Extrapolations to ITER

Thursday, October 16, 2014 8:30 AM (4 hours)

The migration of first wall material due to erosion, plasma transport and re-deposition is one of the key challenges in current and future fusion devices. To predict erosion/re-deposition patterns and to understand the underlying principal processes, the global simulation code WallDYN was developed that couples the evolution of the first wall surface composition to plasma impurity transport. To benchmark the WallDYN model, it was applied to the JET ITER-Like Wall experiment (JET-ILW), which mimics the ITER first wall material configuration and is thus an ideal environment to validate the predictive significance of WallDYN calculations for ITER application. WallDYN simulations were performed for L-mode and H-mode plasma scenarios used in global retention studies both during the JET-ILW campaigns and previous JET-Carbon (JET-C) campaigns. The WallDYN calculations show good qualitative agreement with the Be deposition patterns determined from JET-ILW post-campaign wall tile analysis, with no Be layer growth on the W divertor targets but strong Be deposition on the inner divertor baffle and the lower part of the main wall limiters. A comparison of the calculated retention results for C and Be first wall configurations with the experimental results even shows a quantitative agreement when long term outgassing is taken into account. Applying the same model and process physics as for the JET calculations, the impurity migration and resulting fuel species co-deposition in ITER for different wall configurations and background plasmas was calculated. The simulations show that wall configurations including C feature on average a 10 and 100 times higher retention rate than wall configuration only containing Be and W. For C containing configurations only 100 to 700 full 400 sec. ITER discharges would be possible before hitting the 700g T-limit. In contrast for Be and W only configurations, between 3000 and 20000 full 400 second ITER discharges are possible. Independent on the wall material configuration, the different background plasmas result in a factor ˜ 10 variation in co-deposition despite similar total wall fluxes. These strong variations show that a simple wall flux scaling is not enough for predicting retention in ITER for various plasma conditions. Still, for the current ITER material choice (Be wall & W divertor) co-deposition will not limit the ITER operation.

Paper Number

EX/P5-32

Country or International Organisation

Germany

Primary author: Dr SCHMID, Klaus (Max-Planck-Institut für Plasmaphysik)

Co-authors: Dr KRIEGER, Karl (Max-Planck-Institut für Plasmaphysik); Dr BREZINSEK, Sebastijan (Culham Science Center, JET EFDA); LISGO, Steve (ITER Organization)

Presenter: Dr SCHMID, Klaus (Max-Planck-Institut für Plasmaphysik)

Session Classification: Poster 5