Contribution ID: **83** Type: **Oral**

Detailed charge exchange neutral distribution modelling for the ITER main wall

Tuesday, 28 November 2023 15:45 (30 minutes)

A summary on the numerical assessment of detailed distribution of neutral particles impinging specific diagnostic surfaces in ITER (i.e. mirrors on upper-outer limiter or midplane) was given. Demonstrated are the EIRENE post-processing of ITER SOLPS4.3 simulations including an extension of plasma on an artificial grids up to first wall (c.f. based on previous simulations by A. Khan NME 2019). Some modifications in EIRENE were required to also have both energy and angular distributions were implemented (for the poloidal angle α on a given surface). As a main result it was found that detailed distributions give $2-3$ larger D-on-W physical sputter yields $(,\cos(\alpha))$ compared to standard estimates $(\ )$. The actual factor depends on far-SOL assumptions used for the extension of the grid to the wall, as well on H/L-mode. The $\cos(\alpha)$-dependence gives a factor 2. In H-mode the main contribution comes from the tail of the energy distribution (physical sputtering is suppressed for particle below the threshold 200 eV).

As a next step Ne-on-W calculation should be pursued and compared w.r.t its relevance to D-on-W. Also, refined SOLPS-ITER with wide-grid option should provide a better picture. So far only uncorrelated energy and angular distributions collected and an extension to multi-variate distribution functions possible $=(,\cos(\alpha))$ should be pursued (requiring longer EIRENE run-times for improved statistics and requires large memory). Data compression through MaxEnt regularization techniques are proposed, also to find a better figure-of-merit when mixed (i.e. multi-component) energy and angular distributions are saturated.

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Session Classification: MOD/1 fusion devices