ASSESSMENT OF THE ITER DWELL PUMP-DOWN

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During the "dwell" period between ITER plasma current pulses the pressure in the plasma chamber has to be pumped down to the mPa level to allow for an orderly pre-fill and breakdown to initiate the subsequent plasma current pulse. The shortest reference evacuation time corresponds to the dwell between successive ITER 400 s burn pulses, each dwell being 1400 s long. The dwell evacuation is dominated by the out-gassing from the plasma-facing components, the majority of which are armoured with beryllium (~700 m^2), with a minority in CFC on the lower divertor vertical targets (~50 m^2). During plasma discharges, impinging deuterons and tritons load the implantation layer of the armour to near-saturation conditions. From previous experimental measurements and theoretical studies, it is known that the out-gassing rate decays from an initial value that depends on the armour material and temperature, and the energy and implantation time of the incident particles, according to a power law in elapsed time (t^{-n}), the exponent n being ~0.7. During the subsequent dwell evacuation, the implanted atoms are desorbed and constitute the main load on the primary torus cryo-sorption pumps, particularly during the latter stage of evacuation when the pressure is low.

The results of parametric studies are reported to assess various factors that may affect the out-gassing rate (e.g., mixing of material, effect of temperature). These latter results delineate the domain in which the terminal pressure is acceptable, and indicate the amount of additional pumping that will be provided by the neutral beam cryo-sorption pumps in order to attain the required dwell terminal pressure under the most adverse, but realistic, out-gassing characteristics.