Divertor plasma and neutral conditions in JET ohmic plasmas in semi-horizontal and vertical divertor plasma configurations

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The divertor plasma configuration in tokamaks affects the distribution of neutrals in the divertor plasma, and thus the divertor plasma conditions and fuelling of the core plasma [1]. In the JET ITER-like wall configuration the plasma conditions at the plates, the neutral pressure in the subdivertor, and the photon emission of deuterium neutrals in the divertor plasma were systematically studied in ohmic plasmas in semi-horizontal and vertical divertor configurations for attached and detached divertor plasma conditions.

Comparing the two divertor plasma configurations, the studies show that the plasma conditions at the high-field and low-field side (HFS and LFS) plates for the total ion current, and the electron temperature and density at the strike points were similar within 20%; however, the subdivertor neutral pressure was 2 to 3 times higher when the LFS strike point was connected to the vertical target. While the density limit was 30% higher for the vertical configuration, the rollover of the ion currents to the HFS and LFS occurred at nearly the same upstream edge density. Without cryopumping, the target currents and densities were found to be higher by approximately 50%, while the pressures were higher by factors of 2 to 3.

Simulations with the fluid edge code EDGE2D/EIRENE predict similar plasma conditions at the LFS target plates for the two divertor plasma configurations, and for detached conditions 2 to 3 times higher neutral fluxes into the divertor plenum when the LFS strike point is on the vertical plate. In addition, the predicted total neutral fuelling of the core plasma is three times lower in the vertical configuration indicating improved neutral compression in the divertor due to increased geometrical closure.

[1] A. Loarte et al., Plasma Physics and Controlled Fusion **43** (2001) R183.

* See the Appendix of F. Romanelli, et al., Proceedings of the 24th IAEA Fusion Energy Conf., San Diego, USA, 2012.