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ICRH for Mitigation of Core Impurity Accumulation in JET-ILW

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Since 2011 JET has been operating with a full-metal ITER-like wall (ILW), with most of the main chamber plasma facing components made from beryllium (Be) and featuring a bulk tungsten (W) divertor [1,2]. In H-modes with PNBI>15MW of neutral beam injection (NBI), accumulation of heavy impurities (in particular W) has become a concern, since aside from degrading the plasma performance it can - in some cases - lead to radiative collapse of the discharges. One efficient way of avoiding this deleterious central impurity accumulation is to provide a localized heat source to the plasma core, since the resulting peaked temperature profiles have a favourable impact on the transport of the high-Z impurities in this region. The main results concerning the use of ICRH for core impurity mitigation in high power H-mode discharges in JET-ILW will be discussed. It will be shown that the ICRH scenario has to be optimized for core electron heating (low minority concentration, central absorption) and that a minimum RF power (˜4MW) is needed for achieving sufficiently peaked temperature profiles (Te0>5keV) in typical JET H-mode plasmas (ne0=7-9e19/m3) for effective core impurity mitigation to take place. In these conditions, the W concentration profiles as inferred from soft X-ray tomography are hollow, as opposed to the NBI only heated H-modes, which show a strongly peaked W profile in the plasma centre (r/a<0.2). Aside from assisting the high performance H-mode baseline development and from being routinely used to provide a smooth H-L transition for reliable discharge termination, ICRH has also proven to be essential for achieving steady state nitrogen seeded H-mode discharges in JET-ILW [3].

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[1] G. Matthews et al., Phys. Scr. 2011 (2011) 014001
[2] S. Brezinsek et al., Abs. PSI2014, Karazawa, Japan
[3] C. Giroud et al., this conference

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