

Predictive Analysis of High Power ICRF Heating in JET

M. Laxåback and JET EFDA Contributors*

EFDA-JET CSU, Culham Science Centre, Abingdon UK; also Association EURATOM-VR, EES, KTH, Stockholm Sweden

**See the Appendix of M.L.Watkins et al., Fusion Energy 2006 (Proc. 21st Int. Conf. Chengdu, 2006) IAEA, (2006)*

One aim of the 2007 JET shutdown is to increase the ICRF power by installing a new, internally matched, two-strap antenna and by adding external conjugate-T matching to two of the four A2 antennas for improved ELM-resilience. The new so-called ITER-like antenna is designed to deliver 7.2MW to the plasma which, together with the A2 antenna improvements, effectively double the power available for ICRF heating. At the resulting power densities the resonant ion power partition, the collisional bulk plasma ion and electron heating fractions and profiles are all affected. Here, coupled wave field and resonant ion distribution function calculations are presented for JET AT scenarios, where low central current densities and associated broad fast ion orbits increase the impact of the power density on the details of the heating. With the increased power more resonant ions are accelerated to higher energies, leading to an increased electron heating fraction and, due to the wider ion orbits, broader heating profiles. The heating asymmetries with directed antenna spectra are enhanced, partly due to the higher power and thereby larger toroidal momentum transfer between wave and ions, and partly due to the reduced pitch-angle scattering of the higher-energy ions. An effect of the higher RF power density is also that a larger fraction of the power is absorbed by D majority ions at their second harmonic resonance, leading to a greater increase in the non-thermal DD fusion yield than would be expected from the increased RF power alone.