Lower hybrid current drive in experiments for transport barriers at high β_N of JET

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LHCD has been used in JET experiments aimed at producing internal transport barriers (ITBs) in highly triangular plasmas ($\delta \approx 0.4$) at high β_N (up to 3) for steady-state application. The LHCD is a potentially valuable tool for (*i*) modifying the target *q*-profile, which can help avoid deleterious MHD modes and favour the formation of ITBs, and (*ii*) contributing to the non-inductive current drive required to prolong such plasma regimes. The *q*-profile evolution has been simulated during the current ramp-up phase for such a discharge (B_0=2.3T, I_P=1.5 MA) where 2 MW of LHCD has been coupled. The JETTO code was used taking measured plasma profiles and the LHCD was modeled such that the deposition retains the spectral broadening due to parametric instability at the edge, and performs ray tracing and Fokker-Planck analyses in parallel and consistently at each step of the calculation, for each ray [1,2]. The results are in agreement with MSE measurements and indicate the importance of the elevated electron temperature due to LHCD, as well as the driven current. During main heating with 18 MW of NBI and 3 MW of ICRH the bootstrap current also becomes large. JETTO modeling suggests that this can reduce the magnetic shear at large radius, potentially affecting the MHD stability and turbulence behavior in this region. Modelling of the effect of LHCD in this phase of the plasma has allowed the power and antenna spectrum needed to provide non-inductive current drive at large radii to be identified.

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