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Microwave heating of over-dense plasmas in the TJ-K stellarator ALF KÖHN, GREGOR BIRKENMEIER, HENDRIK HÖHNLE, EBERHARD HOLZHAUER, WALTER KASPAREK, MIRKO RAMISCH, ULRICH STROTH, Institut fuer Plasmaforschung, Universitaet Stuttgart — In the stellarator TJ-K, over-dense plasmas are generated by means of microwaves at 2.45 GHz and 8.25 GHz. The plasma is characterized by densities $\leq 10^{18}$ m^{-3} and electron temperatures ≤ 20 eV. At the given plasma parameters, absorption of the O or X-waves at the fundamental cyclotron resonance is only possible through the Bernstein wave, which can be generated due to an O-X-B or X-B mode conversion process. Furthermore, absorption is possible at the upper-hybrid resonance or, if a R-wave is generated after multiple reflections between cut-off layer and wall, at the cyclotron resonance. In order to sort out the importance of the different heating mechanisms, experimental studies have been carried out in a wide parameter range. Power-modulation experiments with Langmuir-probe arrays and wave-field measurements are used to detect the local power-deposition profile. Dominant absorption is found at the upper-hybrid resonance. In order to optimise the O-X-B mode-conversion efficiency, a novel array antenna has been developed. Thus the angle between the microwave beam and the flux surfaces can be modified by tuning the microwave frequency. First experiments with this antenna will be presented. The experimental results are compared with simulations from a full-wave code.

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