HHFW Power Deposition in NBI Heated NSTX Plasmas

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A parameter needed for the assessment of the transport properties of auxiliary heated plasmas is the amount of power deposited within the last closed flux surface. In the case of ICRF heating, this factor can be difficult to assess; overestimation of the transport losses can occur, when 100% antenna power is assumed absorbed. Experimental and analytic work is ongoing to ascertain the efficiency of using high-harmonic fast waves (HHFW) to inject auxiliary power into NBI heated NSTX plasmas. Two mechanisms compete for the absorption of the HHFW reaching the main plasma: (1) electron heating via Landau damping and transit-time magnetic pumping; (2) rf acceleration of NBI generated fast ions. As a result of progress in understanding edge effects relevant for wave coupling, significant HHFW power is now routinely deposited within the last closed flux surface. Increases of the plasma stored energy, the electron temperature and the neutron production rate are observed when HHFW power is applied. The power absorption will be investigated by comparing the experimental data with analyses and predictions from the TRANSP/TORIC, GENRAY and CQL3D codes. This work is supported by DOE contract DE-AC02-09CH11466.