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High Harmonic Fast Wave Heating Studies for L and H Mode NSTX Plasmas J.C. HOSEA, R.E. BELL, B.P. LEBLANC, C.K. PHILLIPS, L. ROQUEMORE, G. TAYLOR, J.R. WILSON, PPPL, R. MAINGI, P.M. RYAN, J. WILGEN, ORNL, K. TRITZ, JHU, AND THE NSTX TEAM — Fast wave research on NSTX is directed toward understanding the coupling of some RF power to edge loss processes. These losses are driven in the vicinity of the antenna as opposed to resulting from multi-pass edge damping. PDI edge losses through ion-electron collisions and direct energetic ion losses appear to be significant, the latter possibly causing clamping of the edge rotation. Deuterium H-mode heating studies reveal that core heating is degraded at lower k_ϕ (- 8 m^{-1} relative to 13 m^{-1}) as for the L-mode case at elevated edge density, consistent with edge wave damping depending on the location of the onset density ($n_{onset} \propto B^* k_{||}^2/\omega$) relative to the position of the antenna. Fast visible camera images clearly indicate that a major fast wave edge loss process is occurring from the plasma scrape off layer (SOL) in the vicinity of the antenna and along the magnetic field lines to the lower outer divertor plate. Large type I ELMs, which are observed at both k_ϕ values, appear after antenna arcs caused by precursor blobs, low level ELMs, or possibly dust. For large ELMs without arcs, the source reflection coefficients rise on a 0.1 ms time scale, suggesting that this rise time might be used to discriminate between ELMs and arcs. Work supported by USDOE Contract No. DE-AC02-09CH11466.

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