RF power deposition exploration in NSTX and EAST with visible cameras and Langmuir probes*

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On NSTX the HHFW RF power deposition in the SOL can be large and follows the magnetic field lines from in front of the antenna to an RF heat deposition spiral on the divertor regions [1]. The strong SOL deposition and the spiral formation appear to be properties of the HHFW regime for edge densities above the cutoff density in front of the antenna as simulated with the AORSA RF code [2]. AORSA simulations indicate there is much lower RF deposition in the SOL in the minority ICRF heating regimes of conventional aspect ratio tokamaks [3]. Here, the RF divertor deposition characteristics for NSTX as gleaned from visible cameras and probes are compared to those for EAST. At present levels of coupled power on EAST (up to ~ 700 kW for the gap scan presented here), bands of deposition are observed on the lower divertor outer shelf. The band structure depends on the gap between the antenna and the last closed flux surface, perhaps suggesting RF rectification may play a role in the deposition as on NSTX. Higher RF power operation should permit the RF power deposited on the divertor via the scrape off layer (SOL) to be quantified with IR camera measurements. RF deposition is also indicated on Langmuir probes in the lower outer divertor. Interestingly, the floating potential is pushed more negative for the field lines out in front of the antenna as would be expected for RF rectification with a Maxwellian probe characteristic [4], and more positive for field lines that intercept the antenna/wall. To understand this behavior, probe IV characteristics are needed to establish the electron energy distribution and space potential at the probes. Work continues to quantify RF power deposition in the SOL at increasing levels of applied RF power and its importance for high-power long-pulse RF operation on ITER.

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