Experimental Investigation of RF Sheath Rectification in ICRF and LH Heated Plasmas on Alcator C-Mod*

R. Ochoukov,[1] D.G. Whyte,[1] B. LaBombard,[1] B. Lipschultz,[1] J. Myra,[2] G. Wallace,[1] S. Wukitch,[1] and the Alcator C-Mod Team
[1]*MIT Plasma Science and Fusion Center, Cambridge USA*
[2]*Lodestar Research Corporation, Boulder, Colorado USA*

Radio frequency (RF) rectification of the plasma sheath is being actively studied on C-Mod as a likely mechanism that leads to prohibitively high molybdenum levels in the plasma core of ion cyclotron RF (ICRF) heated discharges. We installed emissive, ion sensitive, Langmuir, and 3D B-dot probes to quantify the plasma potentials (Φ_P) in ICRF and lower hybrid (LH) heated discharges. Two probe sets were mounted on fixed limiter surfaces and one set of probes was mounted on a reciprocating (along the major radius) probe. Initial results showed that RF rectification is strongly dependent on the local plasma density and not on the local RF fields. The RF sheaths had a threshold-like appearance at the local densities of ~10^{15}-10^{16} m^{-3}. Radial probe scans revealed that the RF sheaths peaked in the vicinity of the ICRF limiter surface, agreeing with a recent theory [1]. The highest Φ_P's were observed on magnetic field lines directly mapped to the active ICRF antenna. Measurements in LH heated plasmas showed a strong Φ_P dependence on the parallel index of refraction $n_{//}$ of the launched LH waves: Φ_P is greater at lower $n_{//}$. Little to no dependence was observed on the LH power or the local plasma density.

[1] J.R. Myra and D.A. D'Ippolito, PRL, **101**, 195004 (2008).

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