

Investigation of ICRF Power in C-Mod SOL*

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Reliable coupling during ion cyclotron range of frequency (ICRF) operation and minimizing impurities associated with ICRF operation are major challenges to ICRF utilization. We have characterized the antenna loading dependence on the scrape off layer (SOL) density profile under a range of conditions. We have also characterized the RF impact on the SOL plasma density profile and turbulence. Typically, the density in the far SOL decreases while the density increases in the SOL where the fast wave is propagating. Using gas puff imaging, we observe a clear modification of SOL turbulence with application of ICRF power. The measured poloidal phase velocity changes sign over a few millimeters in the SOL where the RF wave is propagating and reminiscent of convective cells. ICRF coupling is also affected by arcing in high ICRF power discharges. We have found that seeding with N₂ or Ne eliminates faulting due to arcing and reduces the core high Z impurity content without significant reduction in plasma performance. We have observed melt damage to limiter surfaces that appear to be related to ICRF power. Conditions favoring melting limiter surfaces are discharges with low density and high ICRF power. The energy delivered to the tile is a small fraction of the injected energy (<1%); however, a possible energetic ion mechanism will be presented.

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