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A Diagnostic for Electric Field Measurements in the Near/Far-Field Regions of ICRF Antenna E. H. MARTIN, J. B. O. CAUGHMAN, R. C. ISLER, ORNL — The physics mechanisms of wave heating and current drive processes in the bulk hot plasma are generally well identified. However, details of the wave-plasma interaction with a material surface in the cold plasma edge are still not fully understood. The driver behind this interaction is the time-periodic wave electric field and is referred to as the near/far-field depending on the location with respect to the antenna. Various models have been formulated to capture the near/far-field physics but have not been tested experimentally. Thus, a diagnostic capable of measuring the electric field with temporal and 3D-spatial resolution is critical for confidence in the codes used to design next generation ICRF antennas. This research is focused on the development of a laser based spectroscopic technique, Doppler-free saturation spectroscopy (DFSS), and its implementation to study near/far-field physics. Using DFSS the spectra line profile of various electronic transitions are measured and fit to a quantum mechanical model incorporating both magnetic and dynamic electric field operators. The electric field direction and magnitude are extracted from the fit. The experimental setup and planned experiments will be discussed. Additionally, initial measurements of fitted H_δ spectrum under the influence of known electric and magnetic fields will be presented.

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