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LH and ICRH RF electric field measurements using Doppler-free Saturation Spectroscopy E. H. MARTIN, ORNL, A. ZAFAR, NCSU, J. B. O. CAUGHMAN, R. C. ISLER, G. L. BELL, 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 in the cold plasma edge are still not fully understood. To investigate the alluding physics non-perturbative diagnostics are required due to the large energy flux traversing the space associated with the corresponding RF antenna/launcher. A spectroscopic diagnostic, based on Doppler-free saturation spectroscopy, is currently under development at ORNL that will be capable of measuring RF electric fields with high precision (20 V/cm). The RF electric field is determined by systematically fitting a Balmer series spectral line profile obtained via DFSS using a previous validated non-perturbative quantum mechanically model. The spectral line profile is measured using Doppler-free saturation spectroscopy (DFSS). DFSS is a laser-based technique involving two counter-propagating beams, referred to as the pump and probe, which are made to overlap at a single point in space. The frequency of the laser is swept over that associated with the electronic transition of interest and the probe beam absorption intensity is measured. In this presentation an active spectroscopic technique allowing for measurements of the RF electric field driving wave-plasma interactions for lower hybrid (LH) and ion cyclotron resonance heating (ICRH) systems, based on DFSS, will be discussed. Initial measurements of the electric field in the magnetized capacitively coupled RF sheath obtained on a laboratory test stand will be presented.

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