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Observation of helicon wave with m=0 antenna in a weakly magnetized inductively coupled plasma source BERT ELLINGBOE, NISHANT SIRSE, RACHEL MOLONEY, JOHN MCCARTHY, Dublin City University, Ireland — Bounded whistler wave, called "helicon wave," is known to produce high-density plasmas and has been exploited as a high density plasma source for many applications, including electric propulsion for spacecraft. In a helicon plasma source, an antenna wrapped around the magnetized plasma column launches a low frequency wave, $\omega_{\mathrm{ce}}/2 > \omega_{\mathrm{helicon}} > \omega_{\mathrm{ce}}/100$, in the plasma which is responsible for maintaining high density plasma. Several antenna designs have been proposed in order to match efficiently the wave modes. In our experiment, helicon wave mode is observed using an m=0 antenna. A floating B dot probe, compensated to the capacitively coupled E field, is employed to measure axial-wave-field-profiles (z, r, and θ components) in the plasma at multiple radial positions as a function of rf power and pressure. The B_θ component of the rf-field is observed to be unaffected as the wave propagates in the axial direction. Power coupling between the antenna and the plasma column is identified and agrees with the E, H, and wave coupling regimes previously seen in M=1 antenna systems. That is, the B_z component of the rf-field is observed at low plasma density as the B_z component from the antenna penetrates the plasma. The B_z component becomes very small at medium density due to shielding at the centre of the plasma column; however, with increasing density, a sudden "jump" occurs in the B_z component above which a standing wave under the antenna with a propagating wave away from the antenna are observed.

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