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Radially localized helicon mode and power deposition in a helicon source GUANGYE CHEN, ALEXEY AREFIEV, ROGER BENGTSON, BORIS BREIZMAN, CHARLES LEE, LAXMINARAYAN RAJA, The University of Texas at Austin — Radially localized helicon (RLH) modes [1] arise in a magnetized plasma with a density gradient across the confining magnetic field. The density gradient modifies the dispersion relation of conventional helicon waves, so that the resulting eigenfrequency of an RLH mode is much lower than that of a conventional helicon wave in an elongated plasma under similar conditions. This work presents evidence that RLH waves play a significant role in helicon plasma sources. Plasma density profile was measured in an argon helicon discharge driven by a 1 kW power supply at 13.56 MHz through a half-turn helical antenna. The experimentally measured density profile was then used to calculate the rf field structure. It is found that RLH waves with an azimuthal wave number m=1 form a standing wave structure in the axial direction and that the frequency of the RLH eigenmode is close to the driving frequency of the rf antenna. The calculated resonant power absorption, associated with the RLH eigenmode, accounts for most of the rf power deposited into the plasma in the experiment. The power deposited via TG modes does not exceed 10% of the total power absorption.
[1] B. N. Breizman and A. V. Arefiev, Phys. Rev. Lett. 84, 3863 (2000).

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