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Axial cavity for helicon waves in a nonuniform plasma ALEXEY AREFIEV, BORIS BREIZMAN, MIKHAIL PEKKER, Institute for Fusion Studies, Univ. of Texas at Austin — Plasma nonuniformity has a strong effect on the structure of helicon modes. In particular, a density gradient across the magnetic field supports a surface-type wave, localized in the strong gradient area [1]. This so-called radially-localized helicon mode has recently been observed experimentally in an axisymmetric plasma column [2]. The experimental results indicate that the plasma forms a cavity for the mode along the field lines, as the wave transit time along the column is much shorter than the wave damping time. In this work, we investigate the phenomenon of axial wave trapping analytically and numerically. We have shown that 1) a sharp drop in plasma density along the field lines causes a nearly complete reflection of the radially-localized helicon mode; 2) the reflection is accompanied by the excitation of a conventional whistler. Since the axial wavelength of the excited whistler is much greater than that of the radially-localized wave, only a small portion of the energy is transferred to the whistler. We have used these analytical results to validate our rf-field solver, which is designed to study waves in an axisymmetric plasma column. The solver will ultimately be used for self-consistent modeling of helicon plasma sources [3]. [1] B.N. Breizman and A.V. Arefiev, Phys. Rev. Lett. 84, 3863 (2000). [2] M.I. Panevsky and R.D. Bengtson, Phys. Plasmas 9, 4196 (2004). [3] A.V. Arefiev and B.N. Breizman, Phys. Plasmas 11, 2942 (2004).

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