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Effect of non-uniform magnetic field on antenna-plasma coupling efficiency in a low magnetic field helicon discharge. SONU YADAV, Institute for plasma research, KSHITISH KUMAR BARADA, Department of Physics and Astronomy, University of California, PRABAK KUMAR CHATTOPADHYAY, Institute for plasma research — The ionization efficiency of helicon plasma discharge is explored by changing the low axial magnetic field gradients near the helicon antenna. The highest plasma density is found for most possible diverging field near the antenna by keeping the other operating parameters unchanged. Measurement of axial wave number together with estimated radial wave number suggests the oblique mode propagation of helicon wave along the resonance cone boundary. Propagation of helicon wave near the resonance cone angle boundary can excite electrostatic fluctuations which subsequently can deposit energy in the plasma. This process has been shown to be responsible for peaking in density in low field helicon discharges, where the helicon wave propagates at an angle with respect to the applied uniform magnetic field. The increased efficiency can be explained on the basis of multiple resonances for multimode excitation by the helicon antenna due to the availability of a broad range of magnetic field values in the near field of the antenna when a diverging magnetic field is applied in the source.

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