Abstract Submitted
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Permanent-magnet helicon discharges at 13 and 27 MHz FRANCIS F. CHEN, UCLA — A small argon helicon discharge 5 cm in diameter and 5 cm long with a permanent-magnet B-field was studied at 13.56 and 27.12 MHz. RF power varied from 200 to 1000W, and pressures from 0.7 to 60 mTorr. The plasma was injected into a large chamber, and the radial density n and temperature T_e profiles were measured at three distances below the source. The results show the inadequacy of existing theories which assume uniform B-fields and long cylinders. The HELIC code[1] used for design showed that 27 MHz should give better antenna coupling than 13 MHz, and that the plasma density should increase linearly with power. When the plasma is immediately ejected from the source, however, the density in the source remains relatively low, and the B-field has to be lowered to match it. With optimized B-field, the plasma conditions are quite different from those in ideal theory. The higher densities at 13 MHz are probably due to the fact that the 13-MHz antenna has three turns instead of one, as required to get an inductance that the matching circuit can handle. At 1000W, $n \approx 0.8 \times 10^{12}$ cm^{-3} was achieved 16.9 cm below the source. At 6.8 cm below the source, the Trivelpiece-Gould density peak can be seen at the edge.

[1]D. Arnush, Phys. Plasmas **7**, 3042 (2000).

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