

EXPERIMENTAL MEASUREMENTS OF THE ION CYCLOTRON ANTENNAS' COUPLING AND RF CHARACTERISTICS*

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ABSTRACT

Ion cyclotron resonance heating (ICRH) is expected to become the dominant contributor to the supplemental heating needs of plasmas in future toroidal devices. The severity of the environments that will be imposed on the ICRH antennas by the plasma in such devices requires the investigation of different approaches to providing adequate life and reliability in addition to the necessary coupling. This work, which is part of the National Ion Cyclotron Heating Program, addresses these issues.

The rf coupling capabilities and characteristics of various antennas have been measured. The tested antenna configurations include the simple loop antenna operated at resonant lengths as used on Alcator-C, the cavity antenna proposed for Doublet III-D and the resonant double loop, asymmetric resonant double loop, and U-slot antennas.

Models of the voltage, magnetic fields outside the structure, and current have been correlated with the measurements made on these antennas. From these measurements and from typical observations of ICRH coupling in tokamaks, we are studying power and frequency limitations on each antenna and the causes of the limitations. A comparison of the technology, performance, and power limitations of each type of antenna is presented.

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