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Theory Experiment

Mode content and transmission measurements on components of the ECH transmission lines on DIII-D,* A. Richenderfer, *Case Western Reserve*, M. Cengher, J. Lohr, C.P. Moeller, *GA* — On the DIII-D ECH system about 25% of the generated rf power is lost in the 90 m long transmission lines, including, typically, 4% at the coupling mirror and 2% intrinsic loss in the straight waveguide sections. The main sources of loss are the ~ 10 miter bends per line, where Ohmic loss contributes about 0.3% per miter and over 1% additional loss per miter comes from mode conversion due to diffraction. The footprint of the rf beam at the miter mirror, hence the diffraction, can be reduced by combining waveguide modes with power ratios and phase differences such that the resultant wall electric field is close to zero. Such modes can be generated in a tapered input arm. The taper design assumes a perfect HE_{11} mode propagating into the miter, but in high power tests, the miter losses actually increased, leading to the hypothesis that the high power beam contained other than a pure HE_{11} mode. Tests of these miters and of their sensitivity to unwanted modes will be presented.

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