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☐ Theory ☒ Experiment

Improved Efficiency of the ECH Transmission Lines on DIII-D,* M. Cengher, J. Lohr, I.A. Gorelov, D. Ponce, C.P. Moeller, GA; M. Shapiro, *MIT* – The transmission in the waveguide lines of the electron cyclotron heating (ECH) system on DIII-D was measured for the six 110 GHz, 1 MW class gyrotrons. After the angular alignment of the rf beam was improved, the measured transmission loss for 4 of the lines was less than -1.1 dB, close to the -1 dB theoretical value. Measurements showed HE_{11} mode content over 85% for all the lines, indicating reduced losses from mode conversion. The higher transmission resulted in an 87 kW increase in the power measured at the DIII-D end of the line for the waveguide system with the best improvement. A newly developed 4-port rf monitor was used together with a directional coupler to measure the HE_{11} , HE_{21} , and TE_{01} mode amplitudes for diagnosis of waveguide performance. The HE_{11} signal was proportional to the transmitted power. The results show that a minimum in the undesired HE_{21} and TE_{01} mode amplitudes corresponds to the best angular alignment. Future plans include reducing the number of miter bends in each line by rerouting the lines and using lower loss miter bends.

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