# Design and Testing of ITER ECH&CD Transmission Line Components*

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ITER Base Line Design requires that the Electron Cyclotron Heating and Current Drive System (ECH&CD) deliver 20 MW of rf power to the ITER plasma. The ECH&CD system consists of twenty-four 1 MW 170 GHz gyrotron systems, Upper and Equatorial launchers, and a low loss Transmission Line (TL) interconnecting the rf sources to the launchers. To achieve the desired power delivery the TL must have a transmission efficiency no less than 90%, when the inherent losses associated with connecting the gyrotron systems to the TL (~3%) and losses in the launchers (~4%) are taken into account. Initial testing on the JAEA Gyrotron Test Stand of ITER relevant TL components, based upon component designs used on other fusion ECH&CD systems, has shown reasonable efficiencies [1], but identified that trapped modes between closely located miter bends, as well as mode conversion at miter bends can lead to excessive heating of the connecting waveguides. GA has designed, built, and will test components to address this issue as well as ITER relevant components that have not been tested at the levels of 1 MW, 170 GHz, for extended pulse lengths. Some of the components that will be tested are ultra low loss miter bends, dc breaks, polarizers, power monitors, bellows, waveguide switches, waveguide cooling clamps, etc. Details of the components and test results will be presented.

1. K. Takahash, et al., "Investigation of Transmission Characteristic in Corrugated Waveguide Transmission Lines for Fusion Application," Proc. 8th IEEE Int. Vacuum Electronics Conf., Kitakyushu, Jpn, 2007.

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