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**Analysis and Measurements of 170 GHz ITER ECH Transmission Line Components**[1] SUDHEER JAWLA, SAMUEL SCHAUB, MICHAEL SHAPIRO, ELIZABETH KOWALSKI, RICHARD TEMKIN, Plasma Science and Fusion Center-MIT, USA, GREGORY HANSON, Oak Ridge National Laboratory, USA — In this paper we discuss two important issues related to the ITER 170 GHz ECH 63.5-mm diameter corrugated waveguide Transmission Lines (TL); 1) calculation of mode conversion losses in the expansion units for the TL, and, 2) determination of mode contents in corrugated waveguides. Expansion units are needed to accommodate expansion and contraction along the TL from the gyrotron to the tokamak. A numerical mode matching code has been developed to estimate power losses due to mode conversion of the operating mode, $HE_{11}$, to higher order modes as a result of the radial discontinuities in a sliding joint. Two designs were evaluated, a simple gap expansion unit and a more complex tapered expansion unit. We also present a novel method for determining the mode content of the linearly polarized (LP) modes of a corrugated waveguide using the method of moments. This method is based on calculating the low order irradiance moments of the measured radiated intensity profiles at several distances from the waveguide aperture. The proposed method is experimentally validated by the data measured from the 63.5-mm diameter corrugated waveguide using the vector network analyzer and a high purity $HE_{11}$ mode generator at 170 GHz built by General Atomics.

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Sudheer Jawla
Massachusetts Inst of Tech-MIT

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