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Alignment of RF Beams to the Waveguide Transmission Lines at DIII-D,* Y.A. Gorelov, J. Lohr, M. Cengher, D. Ponce, *General Atomics* – The DIII-D gyrotron system comprises six 110 GHz gyrotrons and generates ~4.5 MW for plasma experiments. Waveguides are circular, corrugated, evacuated and about 90 m in length. Power injected into the tokamak is reduced to ~3.5 MW by transmission line losses partly owing to misalignments. The Gaussian rf beam of a gyrotron couples with 98% efficiency to the HE_{11} waveguide mode using a single focusing mirror in the matching optics unit (MOU), however the single mirror limits the flexibility of the alignment procedure and mode conversion is quite sensitive to misalignments at the waveguide input, increasing as Θ^2 and Δ^2 for tilt and offset errors, respectively. To improve the alignment, the rf beam was propagated in free space, far from conducting surfaces, after reflection from the MOU mirror. The rf beam position was measured at least at 3 different distances from the mirror for each case. Based on these results, the tilt angle and the offset of the rf beam were calculated and the mirror was readjusted. The process was then repeated until the tilt angle and the offset were minimized.

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