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Experimental Research on a 1.5 MW, 110 GHz Gyrotron¹ M.A. SHAPIRO, Y. HIDAKA, E.M. CHOI, I. MASTOVSKY, J.R. SIRIGIRI, D.S. TAX, R.J. TEMKIN, MIT Plasma Science and Fusion Center, J. NEILSON, Calabazas Creek Research, Inc. — We report experimental research on the after cavity interaction (ACI) in a 1.5-MW, 110-GHz gyrotron with an internal mode converter operating in 3 microsecond pulses. Recent experiments with a single-stage depressed collector revealed the effects of the ACI, a second interaction that occurs after the electron beam passes through the intended primary interaction region. The ACI causes re-absorption of the microwave power and broadening of the spent electron beam energy distribution, thus leading to a significant reduction in gyrotron efficiency. The broadening of the spent electron beam energy spectrum, which results in degraded performance of the depressed collector, has been experimentally verified. Ways to minimize the ACI are currently being investigated. Also, a new internal mode converter, consisting of a helically-cut launcher and four smooth curved mirrors, has been designed and fabricated. The cold test shows a good agreement with the theoretical Gaussian beam pattern. This new converter will be hot tested shortly in the gyrotron.

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