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Excitation of Modes During the Voltage Rise of a 1.5 MW, 110 GHz Gyrotron[1] DAVID S. TAX, WILLIAM C. GUSS, IVAN MASTOVSKY, MICHAEL A. SHAPIRO, RICHARD J. TEMKIN, MIT, GREGORY S. NUSINOVICH, OLEKSANDR V. SINITSYN, University of Maryland — We report measurement of the modes excited during the voltage rise of a 1.5 MW, 110 GHz pulse gyrotron operating in the $TE_{22,6}$ mode. The gyrotron operates at 96 kV and 40 A with a voltage rise time of less than 1 μs and a flat-top of 2 to 3 μs. Theoretical analysis predicts that competing higher frequency modes are excited during the voltage rise, possibly leading to operation in unwanted modes or the generation of unwanted spurious frequencies. A heterodyne receiver system with 20 ns time resolution was used to measure the frequency as a function of time during the voltage rise. We observed a lower frequency mode, the $TE_{21,6}$ mode near 108 GHz, at voltages up to 70 kV. Data were taken at different values of the magnetic field and operating voltage. The results confirm that low frequency modes are excited during the voltage rise, not high frequency modes. Analysis shows that these modes are backward wave oscillations excited far from cutoff, indicating that they would have a higher order axial field distribution. Additional theoretical research using the code MAGY is underway to explain these latest results.

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