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Numerical studies of startup scenarios in a 1.5 MW, 110 GHz gyrotron operating in short pulses OLEKSANDR SINITSYN, GREGORY NUSINOVICH, THOMAS ANTONSEN, JR., IREAP, University of Maryland, DAVID TAX, RICHARD TEMKIN, PSFC, Massachusetts Institute of Technology, IREAP, UNIVERSITY OF MARYLAND COLLABORATION, PSFC, MASSACHUSETTS INSTITUTE OF TECHNOLOGY COLLABORATION — Megawatt class gyrotrons operate in very high-order modes which form a very dense spectrum. In order to excite the operating mode in the presence of many competitors and drive it to the nominal operating point, careful control of the gyrotron's startup is necessary. Our studies are focused on the startup scenarios of the 110 GHz MIT gyrotron designed for operation at 1.5 MW power level in short pulses. Nominal parameters of the electron beam are: 96 kV, 42 A and orbital-to-axial velocity ratio $\alpha = 1.4$. Previous numerical studies of the startup of this gyrotron had shown that at low voltages (at about 62 kV), first, the high-frequency $TE_{23,6}$ mode was excited and then, at higher voltages (at about 74 kV), it was replaced by the desired $TE_{22,6}$ mode. However, during a series of recent experiments at MIT it was shown that instead of the $TE_{23,6}$ mode a low-frequency $TE_{21,6}$ mode was excited during the voltage rise and persisted up to a voltage of 70 kV. In this work the authors make an attempt to simulate and explain this result with the help of self-consistent time-dependent code MAGY.

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