Coupling of symmetric and asymmetric modes in a high-power, high-efficiency traveling-wave amplifier

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A three-dimensional model has been developed for the investigation of the coupling of symmetric (TM_{01}) and asymmetric (HEM_{11}) modes in a high-power, high-efficiency traveling-wave amplifier. In the framework of a simplified model it is shown that the coupling between these two modes is determined by a single parameter that depends on the beam characteristics. For a specific set of parameters corresponding to operation at 35 GHz, simulations indicate that an initial HEM_{11} power of 0.5 MW at the input end is sufficient to deflect electrons to the wall. The build-up of this parasitic mode is investigated over many round trips of the wave in the structure and a threshold criterion for self-sustain oscillation is established. Finally a way for suppressing the HEM_{11} mode is analyzed.

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