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Title:Nonlinear dynamics of planar gyrotrons with transverse diffraction coupling of radiation
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Abstract:We propose that the planar geometry of the interaction space and transverse (relative to the direction of translatory motion of electrons) power extraction be used for increasing the integrated radiation power of short-wavelength gyrotrons. The advantage of such a scheme over the traditional cylindrical geometry of gyrotrons is the possibility to ensure coherence of radiation for a large superdimensionality factor due to diffraction mechanism of mode selection in the open transverse coordinate and locking of radiation from various fractions of the ribbon-shaped polyhelical electron beam by transverse energy fluxes. Simulation of the non-linear dynamics of a planar gyrotron demonstrates the possibility of attaining the output power of hundreds of kilowatts at frequencies of up to 1 THz. A further increase in the output power to the megawatt level can be attained by using resonators with a nonuniform profile, for which the gap between the plates increases from the center to the periphery. Such a configuration is analogous to unstable optical resonators used in some powerful lasers.
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