Abstracts

Coaxial Cavities with Corrugated Inner Conductor for Gyrotrons

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This paper investigates coaxial gyrotron cavities with longitudinal slots on the inner conductor as a means to reduce the number of possible competing modes. In the analytic theory the corrugated surface is treated as a homogeneous impedance surface ("impedance corrugation") to obtain simple formulas for the characteristic equation of the eigenmodes, for the electromagnetic fields and the wall losses. The developed model applies if the number of slots is sufficiently high (cutoff wavelength much larger than the corrugation period). The characteristic equation in terms of the ratio C of the outer wall radius to the inner conductor radius is solved numerically to determine a range of eigenvalues and C where the eigenvalue curves are monotonically decreasing. In such a region a cavity having its inner conductor downtapered (radius decreasing toward the cavity output) can be used to reduce the diffractive quality factors of several modes, leaving the working mode undisturbed and without favoring other modes. In addition the electromagnetic field profiles are investigated, and in particular it is shown that for certain cavity parameters a mode could have its energy concentrated close to the inner conductor. As a check on the validity of the theoretical approximations, simulations with the MAFIA code are carried out. These give good agreement with the results of the analytic equations.

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