Abstracts

Gyrotron coaxial cylindrical resonators with corrugated inner conductor: Theory and experiment

J.J. Barroso, R.A. Correa and P. Jose de Castro. "Gyrotron coaxial cylindrical resonators with corrugated inner conductor: Theory and experiment." 1998 Transactions on Microwave Theory and Techniques 46.9 (Sep. 1998 [T-MTT]): 1221-1230.

Gyrotron coaxial resonators with a longitudinally slotted inner cylinder are examined analytically using a surface impedance model, from which expressions for the electromagnetic field, ohmic quality (Q) factor, and characteristic equation of the transverse eigenvalues /spl chi//sub m,p/ are obtained. The major attributes of such resonators are expressed by the dependence of /spl chi//sub m,p/ on the parameter C-defined as the ratio of the outer to inner radii of the coaxial structure. In that connection, the effect of the corrugation parameters on /spl chi//sub m,p/ is particularly investigated on the basis of an expression derived for the slope function d/spl chi//sub m,p,p//dC. It is shown that the /spl chi//sub m,p/(C) curve may either exhibit oscillatory behavior or present a flat portion over a wide range of C depending on the corrugation parameters chosen. The theory is checked against experiment in which resonant frequencies and total Q factors were measured for TE modes operating in the range of 8-16 GHz in a coaxial cavity with 40 slots. Good agreement is found in that the magnitude of the relative error in frequency is less than 0.5%. Corrugated coaxial resonators prove to be relevant to megawatt gyrotrons where highly selective cavities are required to ensure high conversion efficiency.

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