Abstracts

Modes in Radial Wave Beam Resonators (Nov. 1965 [T-MTT])

G. Goubau and F. Schwering. "Modes in Radial Wave Beam Resonators (Nov. 1965 [T-MTT])." 1965 Transactions on Microwave Theory and Techniques 13.6 (Nov. 1965 [T-MTT]): 749-755.

Resonant modes in ring shaped resonators formed by a reflector strip bent into a circle are discussed here. These modes are derived by superimposing two radially propagating wave beams, one converging toward the resonator axis, the other one diverging from this axis. The condition for resonance leads to an integral equation whose eigenfunctions describe the field distribution at the reflector strip and whose eigenvalues determine the diffraction loss due to the fraction of energy bypassing the reflector. The approximations made in deriving the radial beam mode system are equivalent to those used for the derivation of the axial beam mode system in a Fabry-Perot resonator. Within the limits of these approximations the kernel of the integral equation for a ring resonator is of the same form as the kernel of the integral equation for a parallel strip resonator. If in the radial case the reflector strip is also curved within the axial planes with a radius of curvature equal to the diameter of the reflector ring, and if the width of the reflector strip is sufficiently large, the axial field distribution of the modes is described by Gauss-Hermite functions. The Q of the ring resonator is determined by the diffraction loss and by reflection loss caused by the finite conductivity of the reflector. Formulas for the corresponding Q-values are derived. A numerical evaluation shows that in the microwave region Q-values of the order of 10/sup 6/ are feasible.

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