Abstracts

The Coupled-Cavity Transmission Maser-Analysis

T.R. O'Meara. "The Coupled-Cavity Transmission Maser-Analysis." 1964 Transactions on Microwave Theory and Techniques 12.3 (May 1964 [T-MTT]): 336-348.

This paper discusses an analysis of a maser amplifier structure (developed at Hughes Research Laboratories) consisting of a cascade of iris-coupled pi /2 cavities intermixed with isolators. Starting from the basic media susceptibility, narrow-band equivalent networks and matrix representations are derived for maser and isolator cavities. A rational function approximation to the over-all gain function is thereby derived by matrix methods. From one viewpoint, the over-all amplifier may be regarded as a negative-resistance inverse-feedback amplifier. The key design parameter is shown to be the isolator roundtrip attenuation. Excess isolation yields an overly rounded gain-frequency characteristic, while deficient isolation yields a characteristic with excess ripple or instability in the extreme cases. The feedback effects associated with intermediate "optimum" values of isolation reduce the effective gain per cavity below the normal gain of a single cavity, but in return one obtains a reduced gain sensitivity which may be reduced to a value comparable to or lower than that of the pure traveling-wave maser.

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