Abstracts

Multiple-Idler Parametric Amplifiers

R.L. Ernst. "Multiple-Idler Parametric Amplifiers." 1967 Transactions on Microwave Theory and Techniques 15.1 (Jan. 1967 [T-MTT]): 9-22.

The input resistance and noise performance of multiple-idler parametric amplifiers are examined in this paper. General expressions applicable to any given amplifier are derived. Simplifications resulting from a sinusoidal elastance variation permit writing an expression for the input resistance of an amplifier having any given number of idlers by inspection. These expressions are then applied to examine the properties of an amplifier having two idlers. The conditions required for minimum noise performance are derived, and it is found that high pump frequencies and external resistive loading of one idler are required. When the two-idler amplifier is compared to a conventional single-idler amplifier under those conditions which permit operation of the same diode at the same signal and pump frequencies, it is found that an improvement in noise figure results. However, the single idler amplifier pumped at the optimum frequency is capable of better noise performance, because minimum noise conditions cannot be satisfied for the two-idler device at this pump frequency. When below-signal-frequency pumping is utilized in the two-idler amplifier, the reduction in required pump power is substantial, but the noise figure is degraded by a minimum of approximately 3 dB.

❑ Return to main document.