Abstracts

Design Theory of Up-Converters for Use as Electronically-Tunable Filters (Sep. 1961 [T-MTT])

G.L. Matthaei. "Design Theory of Up-Converters for Use as Electronically-Tunable Filters (Sep. 1961 [T-MTT])." 1961 Transactions on Microwave Theory and Techniques 9.5 (Sep. 1961 [T-MTT]): 425-435.

The up-converters discussed use a single diode, a wide-band impedance matching filter at their signal input, a moderately wide-band impedance matching filter at their pump input, and a narrow-band filter at their sideband output. With a narrow-band filter at the sideband output, the frequency which will be accepted by the amplifier can be controlled by varying the pump frequency. Analysis of the impedance matching problem involved shows that tuning ranges of the order of a half-octave to an octave are possible. Theory is presented for both the lower-sideband and upper-sideband types of tunable up-converters and for the design of the required impedance matching networks. It is shown that, because of the pump input bandwidth required, it will generally be necessary to accept some mismatch at the pump input. But, by use of a properly designed impedance matching filter, the reflection loss can be kept nearly constant across the pump band, and the incident pump power required is not unreasonable. It is seen that properly designed devices of this type using voltage-tunable pump oscillators should have wide tuning range, fast tuning capability a useful amount of gain, no image response, and a low noise figure.

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