Abstracts

RF and IF ports matching circuit synthesis for a simultaneous conjugate-matched mixer using quasi-linear analysis

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A quasi-linear two-port approach between RF and IF ports to design a simultaneous conjugate-matched mixer is presented in this paper. Conventionally, mixer design is treated as a nonlinear three-port device problem. Nonetheless, with the exception of the large-signal local oscillator (LO) that exists at the LO port, the input RF and output IF signals that exist at the RF and IF ports, respectively, are small signals. Consequently, mixers can be approximated as bilateral quasi-linear two-port circuits with a time-variant transfer function between the RF and IF ports, in which the LO port of the mixer is treated as part of the two-port network. With this approximation, it can be shown mathematically that the optimum source and load matching networks required for attaining simultaneous conjugate match at the RF and IF ports are actually time invariant, thus implying that it is possible to synthesize these optimum impedance values. This proposed mixer design technique, together with the equations derived, are verified with block-diagram simulation and experimental measurements of two 2.4-GHz RF/420-MHz IF double-balanced diode mixers.

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