Abstracts

Matrix Representations of Noise Figures and Noise Figure Charts in Terms of Power Wave Variables

K. Hirano and S. Kanema. "Matrix Representations of Noise Figures and Noise Figure Charts in Terms of Power Wave Variables." 1968 Transactions on Microwave Theory and Techniques 16.9 (Sep. 1968 [T-MTT] (Special Issue on Noise)): 692-699.

The noise power, excess exchangeable noise figure, and excess transducer noise figure of a linear active two-port are represented by the power wave scattering transfer matrix. It follows that these noise figures are expressed as ratios of two Hermitian forms, and that their stationary values and the reflection coefficients at the input which yields them are obtained from the eigenvalues and the corresponding eigenvectors of each characteristic matrix. The excess transducer noise figure is considered here only for the case of the load being a resistor. It is proved that the transducer noise figure is equal to the exchangeable noise figure, which includes the contribution of equivalent noise at the input transformed through a two-port from the noise originating in the load. In order to evaluate graphically the change of noise figure of a two-port from its optimum value because of the reflection coefficient at the input, two kinds of noise figure charts are developed: one shows the contours of the constant noise figure normalized by the optimum value, and the other shows the contours of the constant difference between the prescribed noise figure and the optimum value. Their application to a practical problem is demonstrated. The noise figure of a linear active three-port with a passive termination /spl Zeta//sub 3/' at port 3 is expressed by a ratio of two Hermitian forms, and its stationary value and the reflection coefficient /spl Gamma/ /sub 3/ of /spl Zeta//sub 3/' which yields it are obtained. Two noise figure charts are presented by means of which the noise figure of a three-port for a specified /spl Gamma/ /sub 3/ can be evaluated.

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