Abstracts

Modal Circuit Decomposition of Lossy Multiconductor Transmission Lines

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General multi-conductor transmission lines are investigated using modal analysis. This is performed by finding the solution to the telegrapher's equations for general impedance and admittance per unit length matrices Z and Y, respectively, and obtaining the transmission matrix in terms of Z and Y. Hence, the modal circuit is sought, resulting in a cascade of two n-port ideal transformers and n uncoupled transmission lines. A set of necessary and sufficient conditions are established and a construction method is given if the conditions are satisfied. It is shown that the modal circuit will always exist for general homogeneous constant parameters and for the nonhomogeneous case under the quasi-TEM assumption the existence depends on the geometry. The modal circuit is extended for frequency dependent parameters and a set of sufficient conditions are given.

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