Abstracts

On the nature of critical points in leakage regimes of a conductor-backed coplanar strip line

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Leaky dominant mode propagation regimes of a conductor-backed coplanar strip line are rigorously analyzed using the concept of critical or equilibrium points from catastrophe and bifurcation theories, in conjunction with a full-wave integral equation solution. The existence of nondegenerate or Morse critical points (MCPs) and degenerate or fold (turning) critical points (FPs) in coupling and leakage regions are associated with the occurrence of improper real and complex (leaky) solutions. The locations and types of critical points determine the stability and instability of the transmission line system with respect to small changes in geometrical parameters. The dispersion behavior of improper real and complex (leaky) solutions are efficiently reproduced in the local neighborhood of MCPs and FPs using a Taylor series expansion about those points. The qualitative and quantitative dynamic behavior of the transmission line modes can be investigated by examining the evolution of nondegenerate and degenerate points versus some structural parameter, such as strip width. The proposed analysis enables the prediction of bifurcation situations and the existence of improper real and complex solutions and gives a complete description of the system's structural behavior.

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