Abstracts

Upper cutoff frequency of the bound wave and new leaky wave on the slotline

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Printed-circuit lines exhibit interesting behavior due to leakage of power. We have attempted to work toward a more profound understanding of uniplanar circuit properties when it comprehends planar transmission lines. Our work has focused on the slotline. We realized that the solution of its dispersion equation is multivalued. This enabled us to identify and report a new leaky wave on the slotline. The leaky wave brings down the upper cutoff frequency of the bound wave propagating over the slotline due to overlapping of the bound- and leaky-mode regions. For this case, we present some simple closed-form formulas providing this frequency limit when there is a frequency gap or when simultaneous propagation of the bound and the first or second leaky wave occurs. Propagation of the bound and leaky wave at the same time is a straightforward consequence of the multivalued nature of the solution of the dispersion equation. Evolution of the real and complex improper solutions of the equation in dependence on slotline dimensions demonstrates this clearly. We believe that conclusions drawn for the slotline also hold generally for other printed-circuit lines.

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