Abstracts

The Paradoxical Surface Wave (Crack Wave) in Ferrite-Filled Waveguides

R.R.J. Gagne. "The Paradoxical Surface Wave (Crack Wave) in Ferrite-Filled Waveguides." 1968 Transactions on Microwave Theory and Techniques 16.4 (Apr. 1968 [T-MTT]): 241-250.

Existing theories that relate to propagation in a rectangular waveguide loaded with a transversely magnetized slab of ferrite are reviewed and new points brought out. In the loss-free case, in which the ferrite stab lies against one of the waveguide walls, conflicting results are obtained. If the width of the air gap between the ferrite slab and the waveguide wall is set equal to zero, a single surface wave propagating in one direction only is predicted. This result leads to a thermodynamic paradox. If, however, the air gap is assumed infinitely small but different from zero, two surface wave modes, which transport energy in opposite directions, are predicted. The aim of this paper is to establish whether or not a surface wave exists when there is no air gap for a real structure which is not free of loss. The experimental results show conclusively that the surface wave is present. It is concluded that a mathematical model is required, which assumes losses. If for reasons of simplicity a lossless model is used, then it must be assumed that the width of the air gap is never identical to zero. The structure selected for the experimental work consisted of a rectangular block of ferrite that completely filled the cross section of an X-band waveguide.

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