Abstracts

The Transmission of TE/sub 01/ Wave in Helix Waveguides

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Relations are investigated between the transmission characteristics of a helix waveguide and its surface impedance in regions where any simple approximate formulas are not available because of the magnitude of the surface impedance. The numericaf calculations show that, for any given value of the surface impedance and the angular mode index, there exist an infinite number of different modes which are distinguishable from each other by different values of the radial propagation content. Selecting a mode with minimum attenuation for each given surface impedance, we can draw the equiattenuation lines, connecting these points of equal attenuation on the complex surface impedance plane. At some point on the complex surface impedance plane, a maximum value of the minimum attenuation is found. For the TM/sub 0/ mode supported by a helix waveguide 50 mm in diameter, used at a frequency of 50 kmc, this minimax value of the attenuation constant is about 8 neper per meter, and the corresponding value of the surface impedance is about 57.6-j28.8 ohms. The attenuation constants of all the TM/sub 0/ modes corresponding to this optimum value of the surface impedance cannot be smaller than this minimax value. The same kind of calculations are also performed for the two lowest hybrid modes. Physical structures giving the best value of the surface impedance are also suggested.

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