Abstracts

Periodic Cylinder Arrays as Transmission Lines

J. Shefer. "Periodic Cylinder Arrays as Transmission Lines." 1963 Transactions on Microwave Theory and Techniques 11.1 (Jan. 1963 [T-MTT]): 55-61.

Periodic structures of conducting cylinders have been used as radiators (Yagi antennas), and, more recently, as slow-wave lines in traveling-wave tubes and masers. In this report it is shown that a nonresonant structure may have interesting capabilities as an open surface-wave transmission line. By means of a relatively simple matching network, efficient excitation of a surface wave on the periodic line is obtained. Response is flat over a 20 per cent frequency range at X band for several combinations of cylinder lengths and spacings. Total insertion losses are less than 3 db and largely independent of length of transmission line. Conducting cylinders are embedded in styrofoam. The effects of bends and twists in the line have also been investigated. It is shown experimentally that a guided wave on this periodic structure can follow a circular path having 1.5lambda radius of curvature with very little loss. The plane of polarization can be rotated 90° by inserting a short twisted section. By terminating the transmission line with short circuits at both ends, a discrete series of transmission maxima is observed. Since these resonant peaks of transmission are of high Q factor, the dispersion characteristic of the line is obtained with very good accuracy. This type of open transmission line may offer advantages over heavy-weight and bulky conventional waveguides for some specialized applications.

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