Abstracts

Leaky-Wave Antennas Using Artificial Dielectrics at Millimeter Wave Frequencies

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A novel approach for the design of leaky-wave antennas using artificial dielectrics at millimeter wave frequencies is discussed. The general radiation characteristics of leaky-wave structures of finite length are presented. The feasibility of frequency scanning and dielectric scanning (changing the direction of the beam by varying the relative permittivity of the electrically controlled liquid artificial dielectric medium) of a leaky-wave antenna using rodded artificial dielectric is investigated theoretically. Calculations shown that the beam angle changes from 20° to 50° off broadside when the frequency is changed from 31.1 to 35.4 GHz or the permittivity of the embedding medium of the artificial dielectric is changed from 1.6 to 2.04. Over a scan range of about 40º the beam width is almost constant. For large scan range the beamwidth of a dielectric-scanned antenna (DSA) is about 15 percent less than the frequency-scanned antenna (FSA). The gain of a DSA greater than the FSA and also has less variation over the scan range. The power efficiency is approximately the same for both the antenna types with worst case efficiency being about 85 percent.

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