Longitudinal Groove Loading of a Half-Width Microstrip Leaky-Wave Antenna

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Leaky-wave antennas provide advantages including high directivity, their relative broadband nature and their ability to scan the principle beam with frequency that may be useful for various applications. They can also be designed with different guiding structures. Half-width leaky-wave microstrip antennas have been studied extensively because of the simplicity of feeding them and the ease of fabricating them. They have found applications in communications systems and direction-finding.

Beam control over half-width leaky-wave antennas can be achieved by reactively loading the edge of the microstrip. Various methods have been utilized in implementing such loading including lumped capacitors, varactors, and microstrip stubs. An alternative to these loading methods is proposed here which involves the inclusion of a longitudinal groove next to the shorting wall of the antenna underneath the microstrip and within the substrate. The desired beam-scanning can be achieved by modifying the dimensions of the longitudinal groove. In addition to this, the inclusion of various materials with different dielectric properties inside the groove can be used to implement the scanning of the principle beam.

By adjusting the dielectric constant of the inclusion, the principle beam-angle may be kept constant as the frequency is changed. Alternatively, the beam may be scanned at a fixed frequency. The inclusion of the longitudinal groove is ultimately cheaper than other proposed scanning methods and potentially easier to fabricate.

The performance of the antenna will be demonstrated in the two scenarios mentioned. Simulations showing the impedance and radiation properties of the antenna will be presented. The angular extent of the scanning will be explored. Experimental results with fabricated antennas will also be presented for different scanning scenarios.