DESIGN OF FOLDED OVERSIZED-WAVEGUIDE PARTITIONED BY METAL PLATE WITH FINITE THICKNESS FOR MILLIMETER-WAVE PLANAR ANTENNA

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Millimeter waves have attracted much attention for the construction of novel wireless systems such as automotive radars and high bit rate wireless communications. Actually, several types of millimeter wave front ends have been developed in many institutes, laboratories, and companies. A high performance millimeter-wave antenna which is compatible with integrated circuits is a key technology for developing such millimeter-wave systems, and several transmission lines such as a microstrip line and a slot line have been used as antenna feeders These printed transmission lines are preferable for application at centimeter frequencies, but they suffer from large transmission loss at millimeter-wave frequencies.

Another candidate for use as antenna feeder is the NRD guide, which consists of dielectric strips inserted in a below cutoff parallel metal plate waveguide and features no radiation at curved sections and discontinuities. Indeed, this NRD guide has been investigated and applied in a radiator for the purpose of antenna applications at 35 GHz.

With this in mind we analyzed a folded oversized-waveguide to construct a compact planar antenna at 60 GHz. This oversized-waveguide, consisting of a double-layered structure, is partitioned by a metal plate with a finite thickness. A planar antenna is located at the upper layer with a height of 1 mm and a two-dimensional parabolic reflector fed by NRD guide radiator and NRD guide integrated circuits are installed in the lower layer with a height of 2.25 mm.

To efficiently introduce a guided mode from the lower layer to the upper layer, a unique matching technique was applied. A small transmission loss less than 0.5 dB and a good return loss larger than 20 dB were successfully performed at an operating frequency of 59 GHz.

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2. B - Fields and Waves

3. (a)

4. C - Contributed Paper

5. No special instructions