

Design of 48x32-slot Corporate-feed Plate-laminating Waveguide Antenna with Circular Polarization

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A 48x32-slot corporate-feed plate-laminating waveguide antenna with circular polarization is designed in the 60GHz band. Two modifications are introduced in comparison with the conventional antenna fabricated by diffusion bonding. One is introduced in the feeding circuit and the other is introduced in the radiating element.

Typically in the corporate feed, the number of elements is a power of two and a multistage of T-junctions is used. However, when the number is other than a power of two, a special power divider should be used. For example, a cross junction was introduced at the center of the feeding circuit for a 12x16-slot array antenna (S. Ito et al., IEICE Trans. Commun., 99, 40-47, 2016). This introduction made isolated metal patterns in the feeding circuit, which caused a problem in the diffusion bonding. In the present design, a 3x2-way dividing circuit shown in Fig.1 is adopted in a layer of the feeding circuit to avoid isolated metal patterns. In this circuit, the reflection is below -22dB over 57-66GHz, The 3x2-way division is deviated within 0.3dB in amplitude and 3 degrees in phase in the same band.

A 16x16-slot corporate-feed antenna with circular polarization is connected with each end of the 3x2-way dividing circuit. A hexagonal aperture trimmed two corners at a rectangular one is used for circular polarization. In the conventional antenna, the radiating cavity with this hexagonal cross section caused undesired narrow-banded TM-mode resonance affecting the gain reduction within 57-66GHz (Y. Miura et al., IEICE Trans. Electron., 94, 1618-1625, 2011). The radiating element is redesigned to move this undesired resonance outside the band.

In the 48x32-slot corporate-feed antenna, the overall reflection is below -14.5dB and the axial ratio is less than 3.3dB over 57-66GHz by simulations. The antenna is now under fabrication. In the symposium, the measured results will be shown.

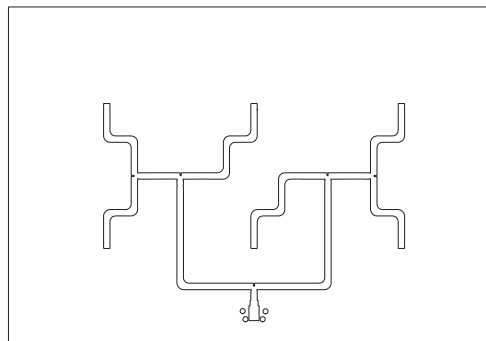


Figure 1. 3x2-way dividing circuit.