Radiation pattern measurement of a dielectric cuboid antenna in quasi-millimeter wave band

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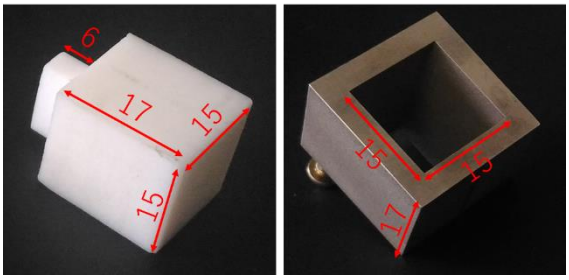
Introduction

In recent years, the development of large capacity wireless communication technology using millimeter wave and terahertz wave has been remarkable. Especially for antennas, it is preferable to have a higher directivity and a higher gain. In this paper, we propose a dielectric cuboid antenna. For the proof-of-concept, we measured the radiation pattern of the dielectric cuboid antenna in the 24 GHz band and compeered it with that of a horn antenna with the same dimension.

Measurement

Figure 1 (a) and (b) show the dielectric cuboid antenna and horn antenna, respectively. The dielectric cuboid antenna is made of Teflon ($\varepsilon = 2.1$) and has a protrusion for insertion and fixation in the WR - 42 waveguide. The length from the end surface of the waveguide to the antenna aperture is 17 mm. The antenna aperture size is 15 mm x 15 mm. We measured the near field pattern of the antennas based on the nonpolarimetric electrooptic frequency down conversion technique [1] and calculated the radiation pattern based on the Fourier transform.

Figure 2 shows the normalized radiation patterns of the H plane. The -3dB beam width of the horn antenna is 58.4 ° whereas that of the dielectric cuboid antenna is 39.4 °. We confirmed that the directivity of the dielectric cuboid antenna is higher than that of the horn antenna.



(a) Dielectric cuboid antenna. **(b)** Horn antenna.

Fig. 1. Dimensions of the antennas.

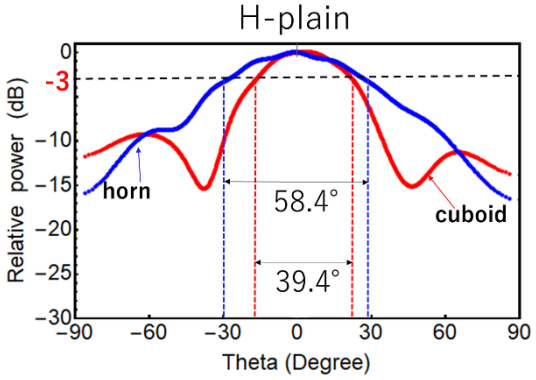


Fig. 2. Radiation pattern of the antennas in H plane

Reference

[1] S. Hisatake et al., Scientific Reports, 7, 9203 (2017).