2-11 D4

HORIZONTAL POLARIZATION BICONICAL HORN ANTENNA EXCITED BY TEll MODE IN CIRCULAR GUIDE

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The horizontal polarization biconical horn antenna excited by the TE11 mode in the circular wave guide is newly proposed at 12 GHZ band.

This antenna is obtained by placing the conducting posts of a considerable number in the radial line and adjusting the distance between parallel conducting plates to $\lambda/2 < d < \lambda$ (d=distance between parallel conducting plate, λ = wave length of free space).

The original structure of the proposed antenna consist of the radial line and the circular wave guide supporting the TEll mode, as shown in Fig. 1.

Since the propagating mode in the radial line is the TM10 mode to Z for $d < \lambda/2$, the electromagnetic wave for the TM10 mode is radiated through the biconical horn with the vertical polarization.

For $\sqrt{2} < d < \lambda$, however, the propagating mode in the radial line are the TM10, TM11 and TE11 modes to Z.

In this case, the electromagnetic waves of TM10 and TM11 modes are radiated through the biconical horn with the vertical polarization and that of TE11 mode is radiated with the horizontal polarization.

If the radial line is excited with the circularly polarized TEll mode in circular wave guide, the original antenna will exhibits an omnidirectional radiation characteristic. Its polarization is the vertical polarization for

 $d < \lambda/2$ and is the circular polarization for $\lambda/2 < d < \lambda$. We, therefore, propose the horizontal polarization biconical horn antenna arranged the conducting posts in the radial line to attenuate the TM modes as shown in Fig. 2.

These posts are arranged in parallel with a common symmetry axis (Z), equally spaced around the circumference of a circle.

Since the TE11 mode in radial line has no component of EZ field, the electromagnetic field of this mode is not influenced by the conducting posts.

The propagating power of the TM mode will be negligibly small in comparison with the propagating power of the TE mode if the number of posts increases.

The nonpropagating modes are excited at the junction between the radial line and the circular wave guide.

In practice, the radial line and the biconical horn should be connected at the location that the amplitudes of the nonpropagating modes are negligible value.

Fig. 3 shows the experimental result of the radiation field pattern in the horizontal plane for the horn without the conducting posts.

Fig. 3a shows the pattern in $\lambda/2 \lambda d = 10$ mm and Fig. 3b shows the pattern in $\lambda/2 \lambda d = 18$ mm.

In Fig. 4 the experimental result of the radiation field pattern in the horizontal plane for the presence of the conduct-

ing post is given.

Fig. 4a shows the pattern for N = 6 and Fig. 4b shows the pattern for N = 12, where N is the number of conducting post. Fig. 5 shows the radiation field pattern using the circular polarizer in both the horizontal and vertical planes of the horizontal polarization.

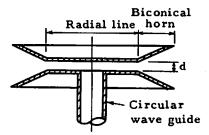


Fig. 1. Geometry of original antenna

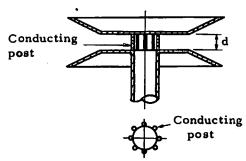


Fig. 2. Geometry of proposed antenna (外2くd(入)

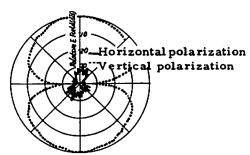


Fig. 3a. Radiation pattern in horizontal plane (d = 10mm, N = 0)

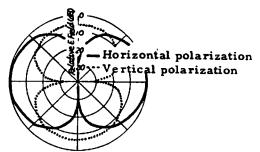


Fig. 3b. Radiation pattern in horizontal plane

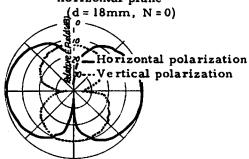


Fig. 4a. Radiation pattern in horizontal plane (d=18mm, N=6)

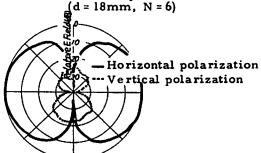


Fig. 4b. Radiation pattern in horizontal plane (d = 18 mm, N = 12)

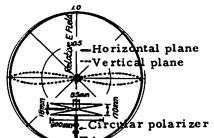


Fig. 5. Radiation pattern using circular polarizer (d = 18mm, N = 12)