

Horizontally Polarized Omni-Directional Antennas

Haruo KAWAKAMI^{1*}, Gentei SATO¹ and Toshikazu HORI²

¹Antenna Giken Corp., ²Fukui University

kawakami@antenna-giken.co.jp

1. Introduction

The effectiveness in using polarized wave diversity antennas for mobile communication base station is reported. For example, collinear array antennas of the vertically polarized wave omnidirectionality are mainly utilized in the base station in PHS. Since the diameter increases generally, for this, the antenna, which obtains the omnidirectionality in the horizontally polarized wave, is disadvantageous in respect of weight, wind pressure load. Though the horizontally polarized wave antenna of the thin diameter is reported, it is reported, because horizontally polarized wave omnidirectionality antenna of the diameter that it was the simple structure and is thin was developed in this paper.

2. Antenna construction

There is Bruce antenna ⁽¹⁾, which radiates the linear polarizations at the narrow antenna width. Fig.1 construction plan omnidirectionality antenna horizontally polarized wave horizontal pattern. Fig. 2 is the figure, which shows integration structure in the antenna and a part of feed.

In Fig. 2, a part of feed is the copper foil substrate (2.6 dielectric constants,

1.6mm thickness), and antenna elements of 1 constitute the conductor (copper or brass) on the copper foil substrate multistage. The shape of antenna element of 1 constituted the shape (an edge is meander line of the 1/4 wavelength) called the blues antenna for the C type. It was constituted for the 6 square shapes, since to curvedly bend radiating element part of 1 is difficult in the processing, and it made it tabular for the efficiency upgrading. Antenna elements of 1, which face through the taper balun each other, are connected in order to arrange a part of feed 12 from the coaxial line, as it is shown in Fig.2, and in order to become an opposite phase. It is being distributed so that the excitation phase may become a coordinate phase in the tournament type for the multistage composition. The center frequency is made to be 1907MHz, and the detailed design of the omnidirectionality antenna in horizontally polarized wave horizontal pattern is described. The current fed electricity in each center in order to bend in the semicircular state, as this is shown in Fig.1, and by two placing antenna element of 1, in order to cancel like the arrow in the opposite phase. 0.25

and distance between circular arcs are made to be 0.25 λ , and by doing the fine tuning of interval g of arm of 4, the omni directionality in horizontal pattern of the horizontally polarized wave is obtained the length of semicircle arc of antenna elements of 1. The following are being attempted by putting same foil substrate of 11 composed of the feed line like Fig. 2 on the basis of this composition actually in the center, and laminating antenna elements of 1: radiation resistance and improvement on the band. The overall length of antenna element is 58mm(0.369 λ), and the overall width is 24mm(0.153 λ), and radomes of 4 uses made of FRP of 29mm outer diameter and 1mm thickness. They are one step, two steps, and overall length in each case is 205mm, 365mm and 560mm 4 stage.

3. Experiment result and consideration

Characteristics of the return loss are shown in Fig.3. It is possible that this antenna minutely adjusts the resonant frequency in length and thickness of arm part of Fig.1, and -14dB(VSWR=1.5) or less was obtained at 1.895 ~ 1.918GHz. The directionality in the horizontal pattern is shown in Fig. 4. Omni directionality characteristics were obtained in the deviation within 1dB. This time actual gain was about 2dBi. It was that it arranged this antenna perpendicularly and multistage and

carries out the parallel feed, and the vertical pattern was shown in Fig. 5. Still, the antenna of the actual gain of about 5dBi in 2 stages and about 7dBi in the 4 stages was obtained the gain of the each stair. The cheap and light omni directionality antenna in horizontally polarized wave horizontal pattern was examined, and the fundamental designed value as the deviation got characteristics of the desire within about 1dB was obtained.

4. Conclusion

By constituting the antenna element of the shape, which is simple on a sheet of substrate, the omni directionality antenna in horizontally polarized wave horizontal pattern can be realized at the thin diameter.

The high-gain antenna equipment is obtained by arranging the antenna element multistage. Application to the wireless LAN equipment that is especially cheap target more and more change and be light and antenna element shape for the high gain and simplification of the feed line can expect PHS antenna of the 1.9 GHz band. Radiation element shape and simplification of the feed line are future problems.

Reference:

[1] J. D. Kraus, "ANTENNAS (Second Edition)", McGraw-Hill, N.Y.p.509, 1988.

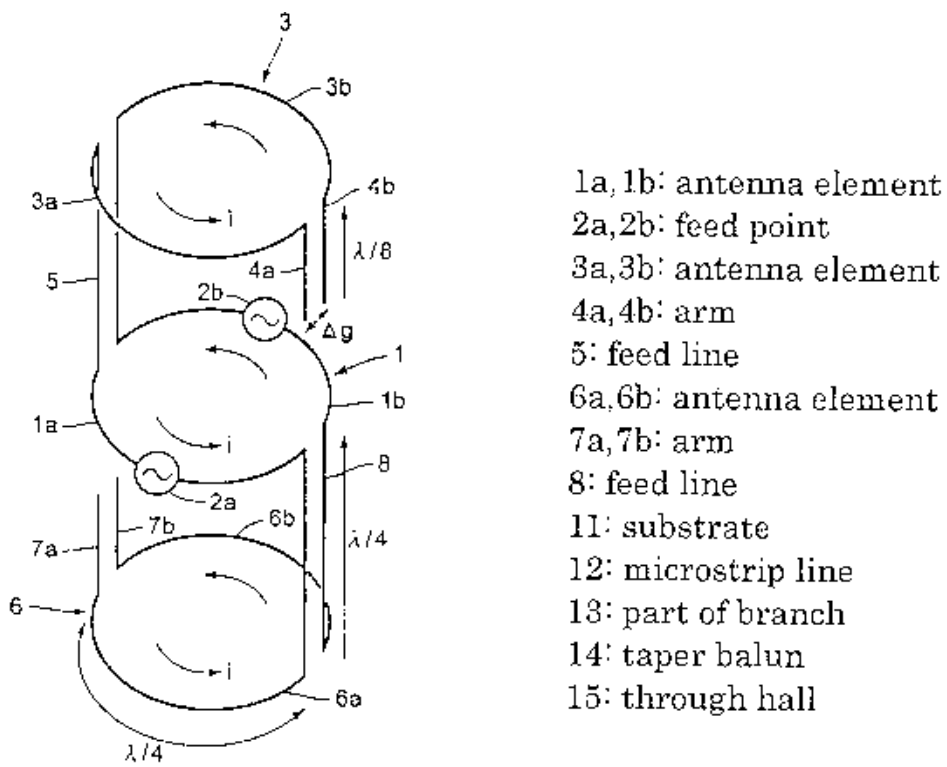


Fig.1 Antenna structure

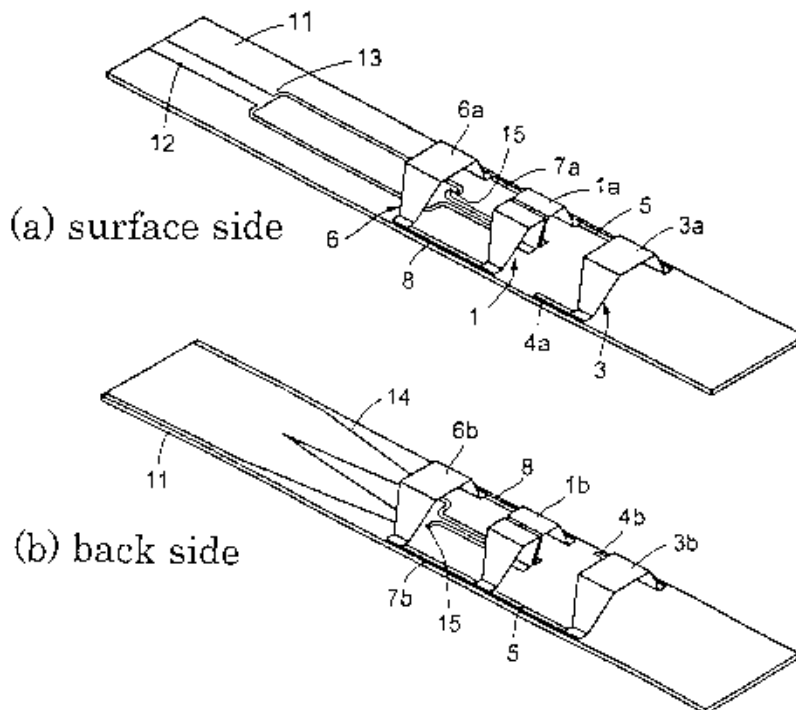


Fig.2 Integration structure in the antenna and a part of feed line

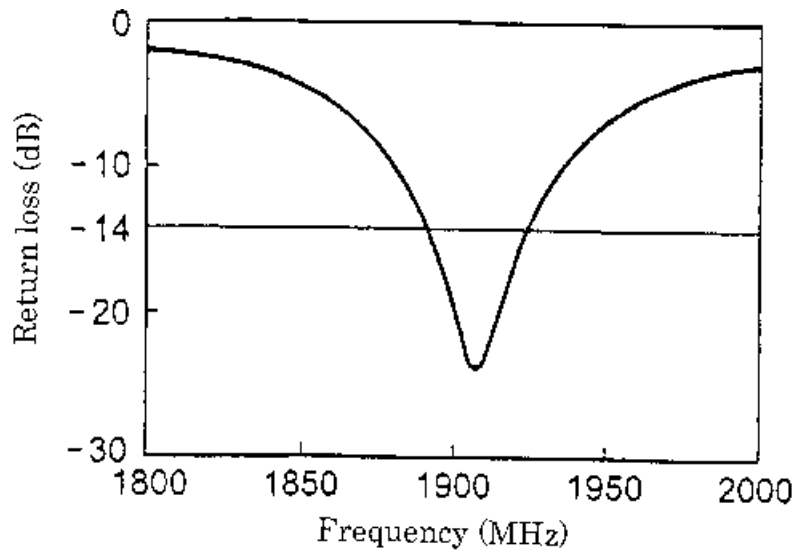


Fig.3 Characteristics of the return loss

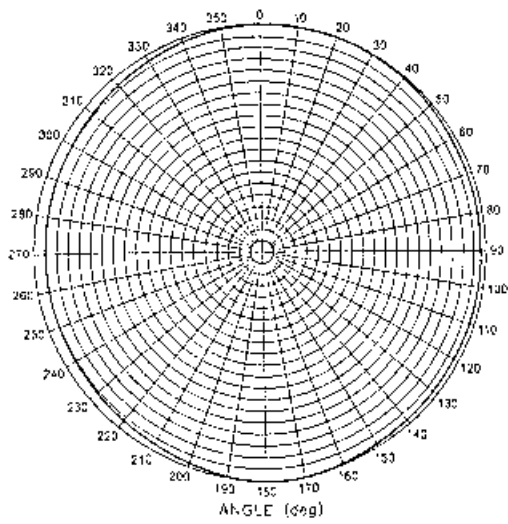


Fig.4 Horizontal radiation pattern

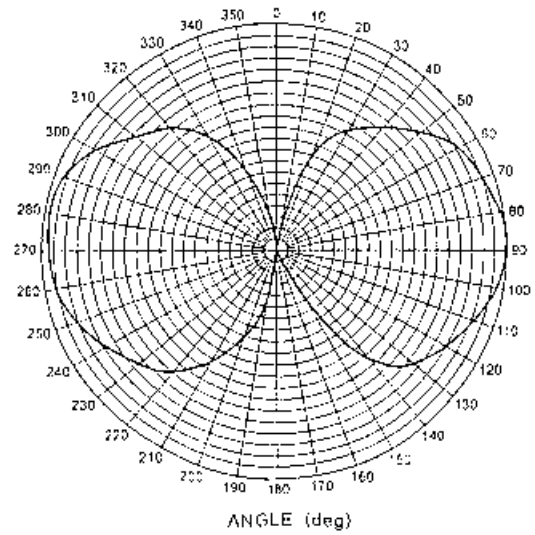


Fig.5 Vertical radiation pattern