

High Gain Omnidirectional Base Station Antenna for Sub-6 Band

Junyi Xu Sirao Wu Qiang Chen

School of Engineering, Tohoku University

1. Introduction

Base station antennas for Sub-6 communication systems require omnidirectional and highly directional radiation patterns[1-2]. In this paper, a high gain vertical polarized omnidirectional base station antenna for Sub-6 band is proposed. The utilized radome enlarges the aperture of the antenna so that the gain also increases. By utilizing several elements in one layer and the medium radome, an omnidirectional radiation pattern is realized with a compact geometry.

2. Antenna Design And Evaluation

In Fig 1, the structure of proposed MxN elements base station antenna is shown[4]. The radius of the conducting cylinder is r_0 , which is mainly adjusted to satisfy the requirement of roundness. And the radius of radome cylinder[3] is r_2 with the thickness t and permittivity ϵ_r . In this research, FR4 ($\epsilon_r=4.4$) is selected as the material of the radome. All the antenna elements are placed averagely on the circumference with radius of r_1 .

In Fig 2, the radiation pattern of 1 element 1 layer case is shown. It is obviously that the maximum gain of the antenna w/ radome is much larger than the one w/ radome. And the decrease of the beamwidth is also observed.

3. Conclusion

A high gain vertical polarized omnidirectional base station antenna for Sub-6 band was proposed. The utilized radome enlarged the aperture of the antenna so that the gain also increased. By utilizing several elements in one layer and the medium radome, an omnidirectional radiation pattern was realized with a compact geometry. And 5 dB increase of gain was observed.

Acknowledgment

These research results were obtained from the commissioned research by National Institute of Information and Communications Technology (NICT), Japan.

References

- [1] R. W. Masters, "The super turnstile antenna," Broadcast News, no. 42, January 1946.
- [2] Y. Mushiake, (Ed.) *Antenna Engineering Handbook*, The OHM-Sha, Ltd., October, 1980.
- [3] D. Jackson and N. Alexopoulos, "Gain enhancement methods for printed circuit antennas," in IEEE Transactions on Antennas and

Propagation, vol. 33, no. 9, pp. 976-987, September 1985, doi: 10.1109/TAP.1985.1143709.

- [4] Qiang Chen, Junyi Xu, "A technology using the radome for the base station antenna to achieve high gain.", Japan Patent PCT/JP2022/012896, March 18, 2022.

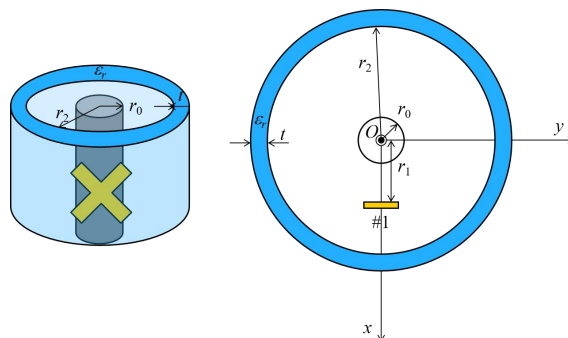


Fig. 1 Proposed antenna structure. (a) Geometry of the proposed antenna. (b) Top view of the proposed antenna.

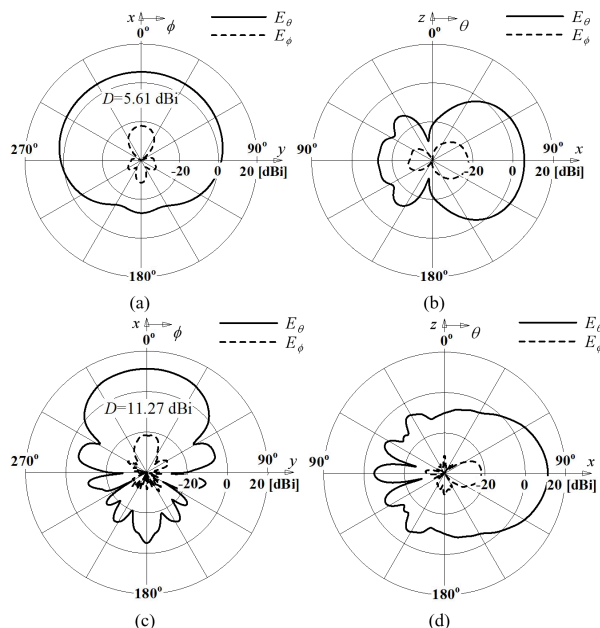


Fig. 2 Radiation pattern with 1 element 1 layer case. (a) xoy w/o radome. (b) xoz w/o radome. (c) xoy w/ radome. (d) xoz w/ radome.