

A Compact and High Isolation Dual Polarization Antenna for Micro-base Station

Bo Yin, Xingxing Feng, Shenwei Mao, and Lijun Sun

Abstract—A compact, low-profile and high isolation dual-polarized patch antenna with good radiation pattern is proposed for micro-base station (operating in 2.5-2.7GHz). This antenna consists of two horizontal substrates and two vertical substrates, both placed orthographically. Low-profile is achieved by employing electromagnetic feed and Γ shape feed line. Hybrid feed structure is used to obtain the high port isolation. The differential feed network in port 2 enhances the port isolation and suppresses the cross polarization level. A metal wall is loaded to improve the radiation pattern. For demonstration, the proposed antenna is fabricated and measured. The operation frequency of port 1 and port 2 which can be observed in the measured results are both around 2.6GHz. The desired isolation and radiation characteristics are achieved.

Keywords—Dual-polarized antenna, Micro-base station, Isolation, Low-profile.

I. INTRODUCTION

Although the scale and type of mobile communication service is increasing, mobile traffic service still accounts for a large proportion of the total services. However, there are some practical problems in this industry. For example, insufficient traffic capacity emerging in some crowded public places or office buildings is one issue that plagues us. Additionally, communication interference in remote areas is caused by coverage blind. In order to deal with these problems, a micro-base station should be adopted to provide irreplaceable advantages, except the lower financial and labor cost, compared with the conventional base station.

As base station antennas, microstrip antennas are widely applied because of their characteristics, such as low-profile, lightweight and easy fabrication. What's more, microstrip antennas are conveniently integrated with active circuit [1]. Nowadays, micro base station antenna element with smaller size, compact arrangement, lower height, better integration with circuit is widely used, which makes the coupling

between antenna, surface wave interference, internal environment energy reflection of antenna drawing much attention increasingly. The enhancement of mutual coupling will cause the distortion of antenna radiation pattern and SWR. Besides, it is not facile to obtain high port isolation with the limit of the restricted space. Therefore, low-profile, high isolation and compact micro-strip antennas are promising.

Many studies about impedance match bandwidth and isolation of micro-strip base station antenna have been published. Multilayered structure is used to acquire wide bandwidth in restricted space, but the impedance bandwidth is not wide enough for $VSWR < 1.5$, besides, the front-to-back ratio is unacceptable [2-5]. In [6-7], aperture-coupled microstrip feed is adopted to generate dual polarization characteristic for base station antenna, but the port isolation is not good. A dual-polarized micro-base station antenna consists of a pair of PIFAs in [8], but its gain of the PIFA is 4dBi which needs to improve, and the port isolation is also less than 30dB. A microstrip antenna with parasitic elements has a center frequency around 2.6 GHz is proposed in [9], by using two line-polarized radiation patches, the antenna obtains polarization diversity characteristic, but its size is quite large.

A hybrid-feeding dual-polarized microstrip antenna with an aluminum wall for micro-base station is proposed in this paper. The height of the antenna is 22.2mm. The $+45^\circ$ polarization is generated by electromagnetic feed, and the -45° polarization is excited by a pair of Γ shape micro-strips with a phase difference of 180° . The 33dB port isolation is achieved by using the hybrid-feeding structure and the differential feed network in port 2. Besides, the aluminum walls improve the radiation pattern. The HPBM of each E and H plane are both more than 60° in the whole frequency band, and the cross-polarized level is below 20dB. Furthermore, the front-to-back ratio is 15dB and the gain is more than 7dBi. The proposed antenna satisfies the needs of micro-base station antenna.

II. ANTENNA DESIGN

In order to improve the communication efficiency, ± 45 degree dual polarization antenna is used in this design. Dual polarized antenna is one of the main types of base station antenna. It combines two antennas with orthogonal polarization direction, which can realize the function of receiving or transmitting signals simultaneously. Now the

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