International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), December 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

PERFORMANCE AND IMPROVEMENT OF VARIOUS ANTENNAS IN MODERN WIRELESS COMMUNICATION SYSTEM

R Sambasiva Nayak[1] , 2. Dr. R.P. Singh[2]

[1]*Research Scholar, Sri Satya Sai University of Technology and Medical Sciences, (India)*

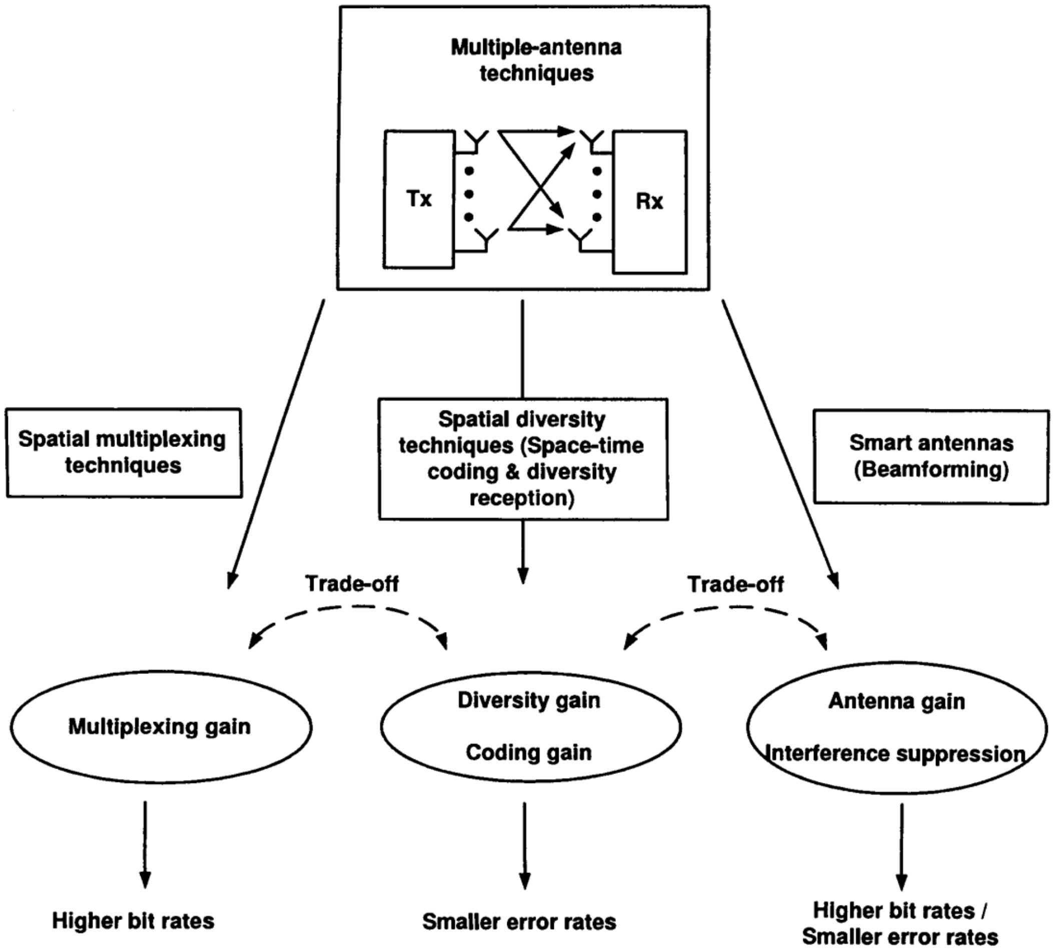
ABSTRACT

The telecommunications industry has experienced a tremendous growthover the past few years, specifically in wireless communications, which has become a very important part of everyone's life. This expansion has been supported by the wide spread usage of mobile telephones and wireless devices. Even though the throughput data rate of such systems is limited when compared to that of wired systems, recent developments in wireless technology are able to provide competitive solutions. But, bandwidth limitations, propagation loss, time variations, noise, interference, and multipath fading make the wireless channel a particularly challenging communication pipe that does not easily accommodate large data rates. Further challenges arise from power limitation as well as size and speed of devices in wireless portables. The research community has generated a number of promising solutions for significant improvements in link performance. One of the most promising future technologies in mobile radio communications to improve link performance is multiple antenna elements at the transmitter and at the receiver, benefits of which are next described.

II BENEFITS OF MULTIPLE ANTENNAS FOR WIRELESS COMMUNICATIONS

The great potential of using multiple antennas for wireless communicationshas only become apparent during the last 20 years. At the end of the 1990s, multiple antenna techniques were shown to provide a novel means to achieve both higher bit rates and smaller error rates. Correspondingly, they constitute an important technology for modern wireless communications.

Diagrammatic overview of multiple antenna techniques



Higher Bit Rates with Spatial Multiplexing

Spatial multiplexing techniques simultaneously transmit independent information sequences, often called layers, over multiple antennas. Using M transmit antennas, the overall bit rate compared to a singleantenna system is thus theoretically enhanced by a factor of M without requiring extra bandwidth or extra transmission power. A well-known spatial multiplexing scheme is the Bell-Labs Layered Space-Time Architecture (BLAST).

Smaller Error Rates through Spatial Diversity

Similar to channel coding, multiple antennas can also be used to improve the average bit error rate (BER) of a system, by transmitting or receiving redundant signals representing the same information sequence. By means of two-dimensional coding in time and space, commonly referred to as space-time coding, the information sequence is spread out over multiple transmit antennas. At the receiver, an appropriate combining (such as maximum ratio receiver combiner (MRRC) architecture) of the redundant signals has to be performed. Optionally, multiple receive antennas can be used, in order to further improve the average BER performance (diversity reception). The advantage over conventional channel coding is that redundancy can be accommodated in the spatial domain, rather than in the time domain. Correspondingly, a coding gain (and thus an improved error performance) can be achieved without lowering the effective bit rate compared to a single-antenna transmission. Additionally, a spatial diversity gain is achieved which also contributes to an improved error performance.

III LITERATURE REVIEW

This section reviews and discusses some techniques to design an MPA for better performance offered by various researchers. A simple technique used by researchers is etching slots or cuts on the patch or on ground. A number of antennas have been achieved by using this technique because the slots of different shapes influence the current paths on the patch and results various modes at the resonant frequencies.

A triband bowtie antenna is proposed using this simple technique. This antenna was obtained by inserting two pairs of slot with different length of isosceles triangle without increasing area of triangle. This antenna is designed to operate for three different bands in wireless applications. Antenna was resonated at three different bands but its dimensions were made for middle frequency band. This antenna was resonated for 3.5 GHz, 4.5 GHz and 5.8 GHz.

D. N. Patel et. al. [1] has proposed a high gain antenna based on zero index metamaterial structure for WLAN applications. The gain enhancement is achieved by loading a microstrip antenna operating at 5.28 GHz WLAN band with single layer superstratemetamaterial structure. Compared to existing designs, the proposed antenna configuration provides reasonably good gain enhancement of 8.1 dBi.

Kumar et al. [2] the characteristics of a rectangular microstrip antenna with an L-shaped probe are investigated. A foam layer with a thickness of around 10% of the wavelength is used as the supporting substrate. An impedance bandwidth of 35% and an average gain of 7.5 dBi can be achieved. The radiation pattern is stable across the passband.

Wong et al. [3]a new broad-band design of a probe-fed rectangular patch antenna with a pair of wide slits is proposed and experimentally studied. The proposed design is with an air substrate, and experimental results show that, simply by inserting a pair of wide slits at one of the radiating edges of the rectangular patch, good impedance matching over a wide bandwidth can easily be achieved for the proposed antenna. With an air substrate of thickness about 8% of the wavelength of the center operating frequency, the proposed antenna can have an impedance bandwidth of about 24%. For frequencies within the impedance bandwidth, good radiation characteristics are also observed, with a peak antenna gain of about 7.2 dBi.

Szentpaliet al. [4] The history of the metamaterial concept is outlined. The story started with the Institution of Veselago and continued almost thirty years later with the works of Pendry and co-workers. Their constructions resulting negative relative dielectric constant and negative magnetic permeability are also reviewed. The difference between the metamaterial structures and the photonic crystals is described. The experimental verifications are also presented.

3.1 Noteworthy Contribution

Ziolkowski et al. [5] The design, fabrication, and testing of several metamaterials that exhibit double negative (DNG) medium properties at X band frequencies are reported. DNG media are materials in which the permittivity and permeability are both negative. Simulation and experimental results are given that demonstrate the realization of DNG metamaterials matched to free-space. The extraction of the effective permittivity and permeability for these metamaterials from reflection and transmission data at normal incidence is treated. It is shown that the metamaterials studied exhibit DNG properties in the frequency range of interest.

Liu et al. [6] In this letter, a triband bowtie antenna for 3.5/4.5/5.8-GHz applications using slot technique is presented. The proposed microstrip-fed antenna forms operating frequencies by inserting two pairs of slots with different lengths on the isosceles triangle microstrip patch without increasing the overall antenna area. The size of the proposed antenna is determined by the middle resonant frequency f_0, and thus it is compact in nature. The geometry of the bowtie antenna is symmetrical to the direction of the feedline. The proposed antenna is designed, analyzed, and verified by simulations and measurements.

Emadian et al. [7] A novel single-layer dual band-notched printed circle-like slot antenna for ultrawideband (UWB) applications is presented. The proposed antenna comprises a circle-like slot, a trident-shaped feed line, and two nested C-shaped stubs. By using a trident-shaped feed line, much wider impedance bandwidth is obtained. Due to inserting a pair of nested C-shaped stubs on the back surface of the substrate, two frequency band-notches of 5.1-6.2 (WLAN) and 3-3.8 GHz (WiMAX) are achieved. The nested stubs are connected to the tuning stub using two cylindrical via pins. The designed antenna has a total size of 26×30 mm^2 and operates over the frequency band between 2.5 and 25 GHz. Throughout this letter, experimental results of the impedance bandwidth, gain, and radiation patterns are compared and discussed.

IV RESEARCH METHODOLOGY

In term of the current technology, it is a tremendous task to compact the antennas without diminishing its function. For the time being, aboard there are many researches being put forward, to downsize the volume of the antenna, such as to attach a parasitic patch to the radiation patch; or to apply a F-shaped micro strip patchor a Coplanar waveguide resonant unit.

The increase of integration of electronic equipment usually demands that the antenna can provide two or more wireless service in a broad frequency range. The broadband antenna and the multiband antenna are qualified to such a demand. This, however, results in the complexity of the type of antenna. The kinds of the CPW-fed antenna and the planar monopole antenna

V THREE TYPES OF NEW ANTENNA DESIGNS

Mini Micro-Strip Antenna

As an antenna currently applied widely on the radio equipments of 100MHz~100GHz's frequency domain, the micro-strip antenna employs micro-strip patch as its radiation source. Being compact and light-weighted, it can also ingrate into a system with active device and electric circuits. Up till now, micro-strip antenna's experimental and computing methods are both ripe. In general, the miniaturization of the antenna means only to downsize its volume, and to leave its working frequency intact.

Ultra-Wideband Antenna

Ultra-wideband antenna mainly applies to short range radio communication system with features of strongantimultipatheffect, wide bandwidth and low power, thus making ultra - wideband antenna research highpointUltrawidebandantenna, commonly known as the antenna with very wide bandwidth, is capable of sending picoseconds or nanoseconds narrow-band signals. Technology features of ultra-wideband antenna are mainly as follows:

(1) Tiny reflection and allows UWB antenna have a good input impedance matching within working frequency bandwidth;

(2) The antenna frequency bandwidth should meet the demands of 3.1GHz to 10.6GHz;

(3) High standard of non-dispersion characteristic and difficulty of antenna design increases;

(4) Very small volume;

(5) Radio efficiency should guarantee the effect of Omni-direction, and should be high and stable;

(6) Power pattern in each frequency bin should be nearly same and has stable gain.

VI BROADBAND POLARIZATION DIVERSITY ANTENNA

As an effective communication technology, diversity technique compensates for channel fading and thus becomes research highpoint with the development of mobile communication technology. The feature of diversity technology is to choose the best signal, receive the sample signal through various means and then combine and classify them. The implementation process of this technology cost little and doesn't need to increase the transmission power or bandwidth.

REFERENCE

1. Darshansinh N Patel and Mohammed G Vayada, "Improvement in Characteristics of Microstrip Patch Antenna with the Help of Zero Index Metamaterial Structure", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 6, June 2015.

2. G. Kumar and K. P. Roy, "Board Band Microstrip Antenna", London, Artech House, 2003.

3. K. L. Wong and N. H. Hsu, "A broad-band rectangular patch antenna with a pair of wide slits", IEEE Transactions on Antennas and Propagation, vol. 49, no. 9, pp. 1345–1347, 2001.

4. B. Szentpali, "Metamaterials: a new concept in the microwave technique", Proc. TELSIKS, pp. 127-132, 2003.

5. R. W. Ziolkowski, "Design, fabrication, and testing of double negative metamaterials," IEEE Trans. Antennas Propagat., vol. 51, no. 7, pp. 1516-1529, July 2003.

6.Liu H., "Single feed slotted bowtie antenna for triband application", IEEE Antenna and Wireless Propagation Letter, Vol. 12, pp 1658-61, 2014.

7. Emadian, S.R. Ghobadi, C. ; Nourinia, J. ; Mirmozafari, M.H. and J. Pourahmadazar, "Bandwidth Enhancement of CPW-Fed Circle-Like Slot Antenna With Dual Band-Notched Characteristic", IEEE Antennas and Wireless Propagation Letters, Vol.11, pp.543-546,2012.

8. Frank Fitzek, Andreas kopsel, Adam wolisz, ManjunathKrishnam and Martin Reisslein, "Providing application-level QoS in 3G/4G wireless systems: a comprehensive framework based on multirate CDMA", IEEE Wireless Communications, April 2002.

9. DipankarRaychaudhuri, and Narayan B. Mandayam, "Frontiers of Wireless and Mobile Communications", Proceedings of the IEEE, Vol. 100, No. 4, April 2012.

10. I. J. Bahl and P. Bhartia, “Microstrip Antennas”, Artech House, 1980.

11. Ao Li, “Concept of Home Network and Operations Review”, China Telecommunications Construction, pp.17-22, 2005.

12. J. R. James, P. S. Hall, C.Wood, “Microstrip Antenna Theory and Design”, *Peter Peregrinus,* 1981.

13. Vivekanand Sharma, Sandeep Kumar, Sanjay Singh, and Faiz Ali, “Compact Microstrip Patch Antenna Using Parasitic Technique for C-Band Line of Sight Communication”, European Journal of Advances in Engineering and Technology, 2015, 2(6): 10-13.