Frequency Diversity Method in Reduction of Signal Fading on Wireless Communication Network in Nigeria

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ABSTRACT- In wireless communications signal fading is the deviation or the attenuation that a carrier modulated telecommunication signal experiences over a certain propagation media. This paper presents using frequency diversity technique in reduction of signal fading on wireless communication network in Nigeria. It is also to note that fading may vary with time, geographical position or radio frequency and it is often modeled as radom process. In this paper, frequency diversity technique was adopted and has been found to be suitable for reducing signal fading but has to do so to the extend of about 90% in digital communication.

Key Words: Wireless communication, frequency diversity, fading, combing, attenuation.

INTRODUCTION

The need for higher performance is a universal driving motivation in wireless communication system as required to have high voice quality as compared to current cellular mobile radio standards and provide high bit data rate services. In other words, the next generation system are supposed to have a better quality and coverage, good power and bandwidth improved utilization and be deployed in diverse environments. However, fading, attenuation, distortion and interference have been some of the biggest challenges faced by signal communication system. These challenges come about from the imperfect nature of the communication channels. Each attempt to tackle these challenges results to complexity of the system design and therefore create additional problem. Hence, increasing the capacity by mitigating the multipath interference of the channel has been sought in research and this can be achieved by using diversity at the transmitter or receiver.

2.0 WIRELESS COMMUNICATION

The information from the source which is analog in nature is fed into the transmitter for modulation and amplification, after which the modulated signal is transmitter to the receiver through a channel. At the receiver, the information is demodulated and the message signal is reproduced. The channel is the central section of the communication system, which connects the transmitter and the receiver. A channel can be pair of wire or a coaxial cable. The output of channel is usually a distorted version of the input. This distortion during. The process of transmission and reception is due to the non ideal nature of the communication channel.

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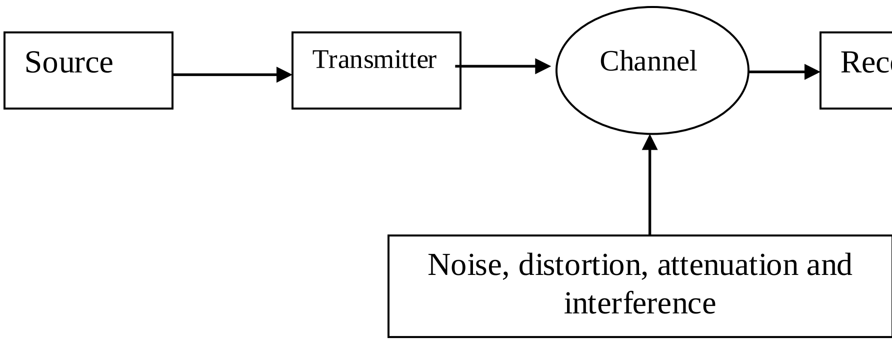

Fig 1

The result that degrades system performance is attenuation, which is progressive decrease in signal power with increase in distance. (Rappaport 2001). Figure 1 shows skeletal fundamental novel of a communication system in a wireless network.

Frequency Diversity: This is a principle of transmitting information on more than one carrier frequency. The rationale behind this technique is that frequencies separated by more than the coherence bandwidth of the channel will be uncorrelated and thus will not have or experience the same fade. (Iheodore S. 2001). This technique is being used to achieve reduction in signal fading and there is a greater assurance of path reliability.

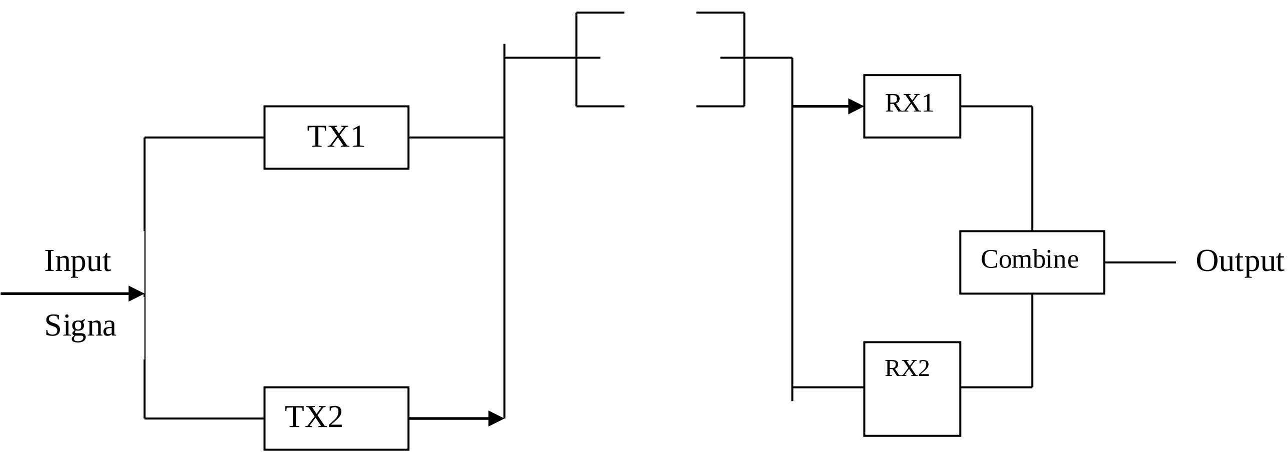

Fig. 2. Frequency Diversity Configuration

This fig 2 shows that when there is a fade on one frequency, it will probably not occ

of one transmitter, or one receiver will not interrupt service for maintenance. So, therefore, failure on transmitter (1) Transmitter (2) is switched on automatically with no dropout of service at all.

Fading: Fading is an attenuation that varies in an irregular ways.

areas with obstacles of various sizes, combined by maintain, building and tunnel. However, the most common cause of fading is multipath. There are many types of fading. They are flat fading, frequency fading, fast fading, slow fading. Most often, these obstacles will completely `cutt off- the signal, although the consequence, of such shawdowing effect will depend on the size of an obstacle and on the difference to it, the received signal strength wick inevitably vary.

Combining

In combining techniques, all antenna maintain established connection at all times. The signals are then combined and presented to the receiver. If the received signals are summoned coherently, it is called equal gain combining but when the received signal are weighted with respect to their signal to noise ratio, and them summed, it is called maximum ratio combine technique.

ATTENUATION

This progressive decrease in signal power with increasing in distance.

3.0 METHODOLOGY/IMPLEMENTATIONS

The implementation of this paper was done using matlabs 7.5 version. This is an organized, purposeful structure regarded as a whole and consisting of interrelated and interdependent elements. These elements continually influence one another to maintain their actually and the existence of the system, in order to achieve the goal of the system.

4.0 DATA ANALYSIS

Analysis of the effect of Bit Error Rate on the Signal to noise ratio. In analyzing the effect of bit error rate on the signal to noise ratio, the bit error rate of the received signal was simulated against the signal to noise ratio using matlab model. The bit error rate of the received signal for frequency diversity was calculated and implemented through matlab simulation.

TABLE 4.1: RESULT OBTAINED FROM SIMULATION OF THE BIT ERROR RATE AGAINST SIGNAL TO-NOISE RATIO FOR FREQUENCY DIVERSITY

EBNO	BIT ERROR RATE
2	0.093600
4	0.037000
6	0.009800
8	0.000400
10	0.000000
12	0.000000
14	0.000000
16	0.000000
18	0.000000
20	0.000000
22	0.000000
24	0.000000
26	0.000000
28	0.000000
30	0.000000

Result of Simulation Work

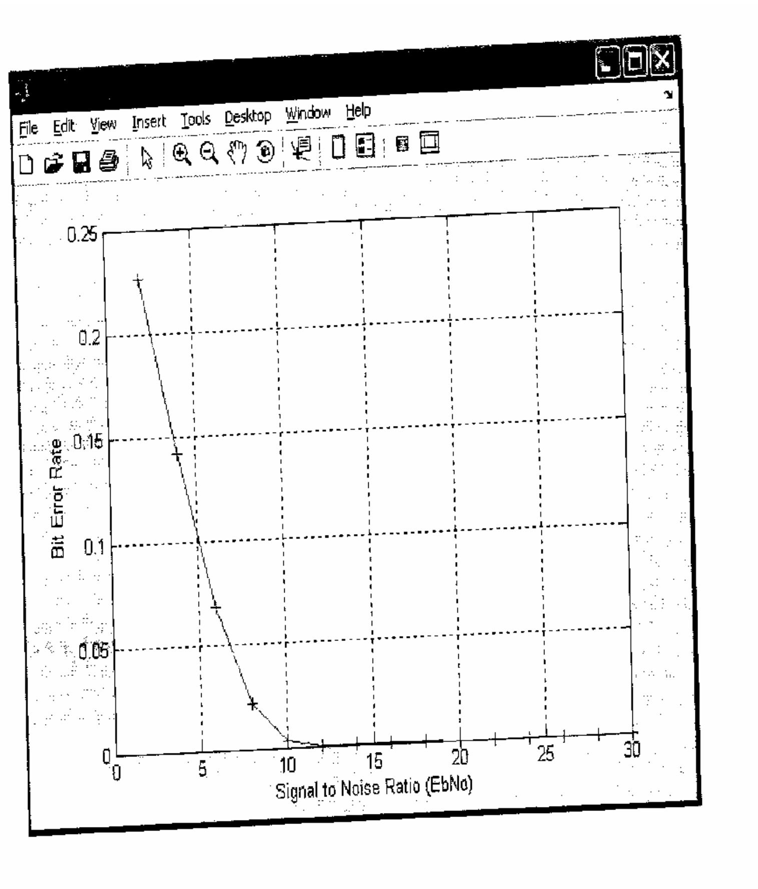

Fig 1 shows that the introduction of bit error rate in the network helps in the reduction of signal fading in the network indicating that as the bit error rate of the received signal increases, the signal to noise ratio decreases, meaning that the number of transmitted signals that were distorted at the receiving end in the network was drastically reduced thereby causing reduction in the signal fading.

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TABLE 4.2 RESULT OBTAINED FROM SIMULATION OF THE BIT ERROR RATE AGAINST SIGNAL TO NOISE RATION FOR THEORETICAL TRANSMISSION

EBNO	BIT ERROR RATE
2	0.226368
4	0.142404
6	0.068311
8	0.003369
10	0.000181
12	0.000002
14	0.000000
16	0.000000
18	0.000000
20	0.000000
22	0.000000
24	0.000000
26	0.000000
28	0.000000
30	0.000000

5.0 CONCLUSION

Therefore is has been ascertained through this research work that effect of fading can be reduced by using diversity to transmit the signal over multiple. The probability of experiencing a fade in this composite channel is then proportional to the probability that all the component channels simultaneous experience a fade is much more an unlikely event. Here frequency diversity was used because there is greater assurance path reliability. It provides food but simple redundancy and has a greater operational advantage.

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