Proceedings of
INTERNATIONAL CONFERENCE ON COMPUTING, COMMUNICATION AND ENERGY SYSTEMS (ICCCES-16)
In Association with IET, UK & Sponsored by TEQIP-II
29th-30th, Jan. 2016

Paper ID: EE04

DESIGN AND DEVELOPMENT OF AM BROADCASTING SYSTEM OF VOICE AND DATA

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Abstract— in double sideband (DSB) AM broadcasting two sidebands carry the same information. Indeed one sideband signal is enough to recover the baseband signal at the receiving end. Hence one of the sideband can be cut out from the DSB signal and is commonly known as single sideband (SSB) signal. Other than only transmitting one sideband signal, two different information carried in the individual sideband can be applied in the AM broadcasting to replace the DSB AM one. As a result only one carrier is necessary to transmit and receive two different kind of information. Not only the bandwidth efficiency is enhanced but also a useful multipurpose broadcasting system is established. In this paper attempt were made to simulate the ISB broadcasting system. A communication system is simulated in Matlab where audio as well as text file is encoded at transmitter using single channel and at receiver side faithfully decoded to get original signal.

Index Terms— AM, broadcasting, communication, ISB, modulation.

I. INTRODUCTION

Terrestrial broadcasting has a history extending back to the late 19th century. In the beginning the reception is very poor and limited to short distance. Then development is made to achieve growth in commercial market as well as to develop defense system. Various factors are affecting the broadcasting of signal like fading, noise, interferences. To design a faithful system development were made in communication techniques and communication instruments. The one way to achieve this improvement is to selecting the modulation techniques. There are many modulation techniques developed and designed. One of them is Amplitude Modulation (AM).

In Amplitude Modulation the transmission efficiency is very less as both side bands carries same information and carriers do not carry information. Therefore transmission of carrier is nothing but waste of energy

To improve system efficiency Double Sideband signal is used where carrier is suppressed, but both side band carry same information. In the double-sideband suppressed-carrier (DSB-SC) modulation, unlike AM, the wave carrier is not transmitted thus a great percentage of power that is dedicated to it is distributed between the sidebands, which imply an

increase of the cover in DSB-SC, compared to AM, for the same power used. The power efficiency is still the problem with AM transmission. As frequency spectrums are assigned to each service provider is limited therefore a provider may think to transmit more Information within same allocated bandwidth. One way is to reduce the separation between two transmitted information signals but it leads to problem at receiver end. There may be possibility of having interference between two adjacent signals.

To utilize frequency spectrum efficiently traditional ISB uses two different signals are modulated by different carrier signal. Therefore upper sideband and lower sideband carries different information. When ISB is first transmitted it carries both analog signals. IN this proposed work efforts will be made to implement an AM transmission system which will carry digital data along with analog signal through analog modulation technique. This combination will allow a provider to transmit voice signal along with some useful digital data like information of transmitted song to be displayed on stereo system.

II. SURVEY OF LITERATURE

AM broadcasting's main advantage vis-à-vis FM broadcasting (conveys information over a carrier wave by varying its instantaneous frequency) is superior coverage FM provides a superior signal when the signal-to-noise ratio is high, but AM can, if properly implemented, provide usable signals at far lower pre- demodulation signal-to noise ratios. Thus, AM is a more rugged form of modulation. Added to AM's superior ruggedness is the coverage advantage of operating at a frequency range of 540 to 1600 kHz rather than in the FM band of 88 to 108 MHz [1]. Chen-hao Qi, Man Feng and Le-nan Wu have proposed a DSB modulation technique where carrier energy can be utilized to carry digital modulated data with sufficient bit error rate. Analog amplitude modulation (AM) broadcasting which employs double sideband (DSB) is widely used around the world. The advantage is obvious. AM receivers are low priced when using envelop detection for demodulation because of their easy design. However, the constant voltage in DSB brings extra power waste. Here author have proposed a way to add some keying information before carrier is modulated [3]. Yu-On Yam, Qi-Jing Chen, Che-Tat have discussed The necessity and realization of the

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AM dual Mode radio .the study shows that current DSB transmission has some disadvantages, in DSB grate portion of power is not used .Also AM broadcasting is suffered from co channel and adjacent channel interference.[6]\SSB or Single Sideband, is a type of AM without the carrier and one sideband.DSB or double sideband is AM with the carrier suppressed, but both upper and lower sidebands are used. DSB is
Compatible with SSB receivers, the receiver merely rejecting the unwanted or redundant sideband. The use of both sidebands to carry two separate channels of information is called ISB, or independent sideband [9].

III. PROPOSED WORK

As the demand of the atmosphere resource has been increasing recently, it is the time to replace AM scheme with Single Sideband (SSB). But the problem of the circuit complexity of the corresponding receiver is arises. However with nowadays technology of integrated circuit, it is possible to develop a synchronous AM radio receiver in form of chipset which cost can be reduced relative low level. The study of literature reveals that study of transmission of (broadcasting of) information is still in progress. Many researchers have worked to developed efficient ISB system. With the help of above background the work is focused to develop a multipurpose broadcasting system, which enhanced bandwidth efficiency. The work will be used as guideline for further development of ISB system. The system will carry users' voice data (analog) along with digital signals.

This work can be also extended to make communication free of cast in small organization. Video signal can be use as one of the information in communication.

IV. TRANSMITTER AND RECEIVER

Fig (1) shows the prototype of the transmitter system. The SSB system is implemented by using inbuilt function.

'y = ssbmod(x,fc,fs,ini_phase,'upper')'

FSK modulation is performed by the function.

'y = fskmod(x,M,freq_sep,nsamp,Fs)'

Both signals are modified with respect to suitable carrier and added to generate ISB signal. The lower sideband of the signal carries fsk modulated data signal and upper sideband of signal carries modulated voice. The sampling frequency is selected such that it can satisfy the Nyquist criteria.

Fig (2) shows the proposed block diagram of receiver. The received signal is made free from noise by using band pass and low pass filters. Two filters are designed one for USB and another for LSB.

The output of corresponding filter is applied to respective SSB-demodulator. The data signal is recovered back by employing FSK-demodulator and decoder

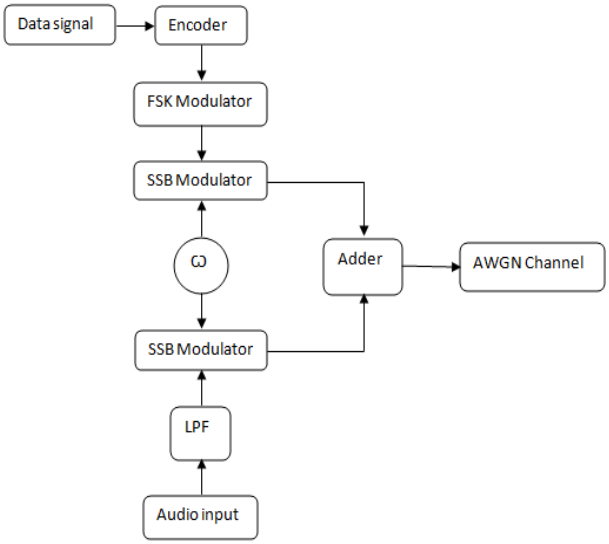

Fig 1 Transmitter Block Diagram

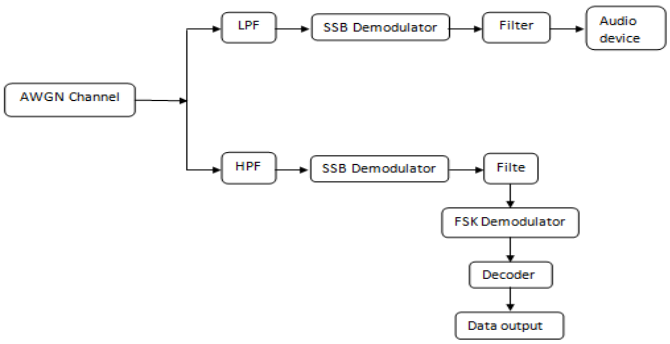

Fig 2 Receiver Block Diagram

V. SYSTEM PERFORMANCE

The system result shows the performance of transmitter as well as receiver. The spectrum of both sidebands is calculated. The effect of SNR on AWGN channel capacity is evaluated

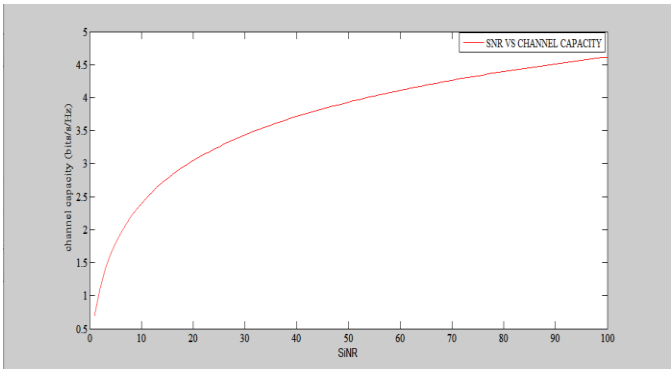

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Fig3 SNR vs. channel capacity

The comparison of transmitted and received audio signal gives effect of noise as well as response of channel to different audio frequency component.

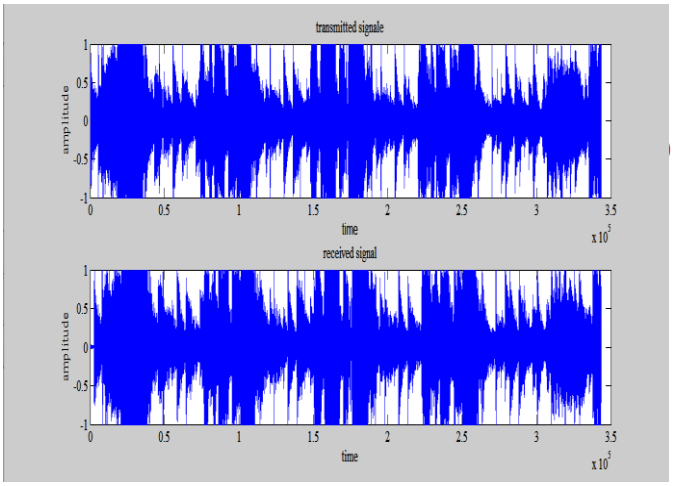

Fig 4 transmitted and received audio signal

(1)

Table I Comparison of error detection of FSK, QAM and DBPSK

	Number of error detected (out of 11000 bits)		
S/N (dB)	FSK	QAM	DBPSK
1	5421	9545	5524
2	5418	9537	5522
4	5407	9517	5511
6	5405	9493	5516
8	5399	9451	5497
10	5406	9405	5477
12	5396	9333	5431
15	5415	9191	5383
17	5409	9084	5297
20	5390	8843	5075
22	5432	8568	4809
25	5446	8014	4137

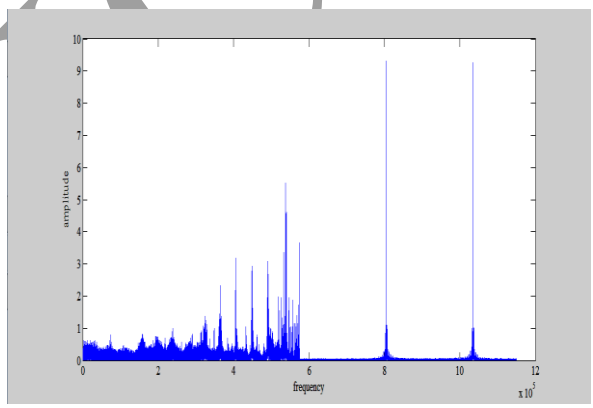

Fig 5 Spectrum of transmitted signal

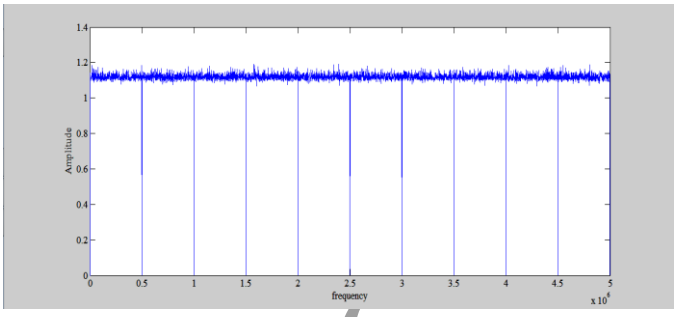

Fig 6 Frequency response of channel

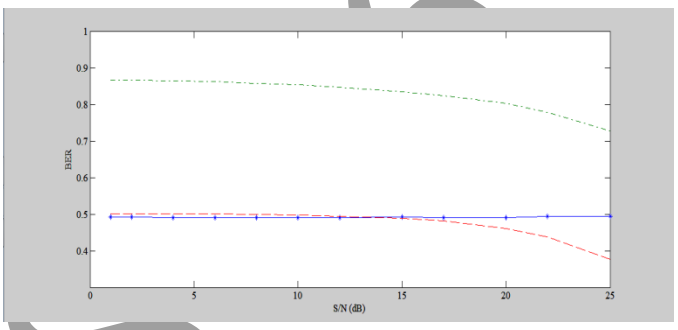

Fig 7 Comparison BER of different digital modulation scheme

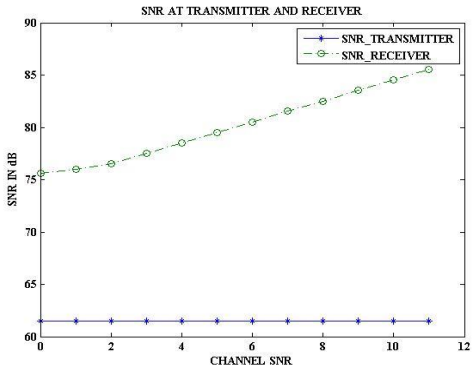

Fig 8 SNR at transmitter and receiver

VI. CONCLUSION

An AM broadcasting system is simulated in Matlab environment and simulation result shows that it is possible to transmit both audio as well as text information simultaneously using single channel and data can be recovered correctly. The data signal can be sent faithfully without introducing major or unrecoverable errors.

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