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DESIGN ASK SYSTEM TO TRANSMIT AND RECEIVE MESSAGE WITH 200 KBPS

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Abstract:

In recent year the digital communication become very important field in life of nations. Due to the capacity, immunity and security. In this paper amplitude shift keying (ASK) modem for one frequency which carry information, when the information is exist logic (1), when the information absence then it is called logic (0). This design ASK is implemented using Simulink and it can be used to transmit and received digital information with data rate (200kbps) using high pass tech, (carrier frequency is 1MHz), the bandwidth of this design acceptable with other system. This system can be become economic when it is used at in which have no need for security. The design process using Simulink, is used as a tool for achieving all steps of the work & its functions because it has high potential, and it is very nearly to hard ware and more economic if compare to hardware and it is more flexibility and easy to achieve the new technology.

Keywords: ASK; MOD; DEMOD; DATA RATE.

1.INTRODUCTION

There are three parts in a communications system. The information also called the base band, medium, and carrier.
Information can be defined in two forms, digital or analog. Analog signal is considered continuous. Its signal amplitude can take on any number of values between the signal maximum and minimum. Voice is analog and can take any number of volume levels between its "dynamic-range" which is the range of volumes your vocal cords can produce. Digital devices convert analog voice to a digital signal by process of sampling and quantization [1]. The analog signal is first sampled and then quantized in levels and then each level is converted to a binary number. For example, we may quantize your voice in 16 levels. Each of these levels can be represented by four bits.
Perhaps you remember when your telephone system went to the "tone" dialing. It went from being a pure analog system to a digital system based on sampling and quantization. Other examples of analog information are music and voice transmitted via FM and AM radio transmissions. Nearly everything else nowadays is digital.
The medium is thing the signal travels through. It can be air, space or wires of all sorts. Each of these mediums offers its own unique set of advantages and distortions that determine what is used as a carrier. A short wire in a chip for example may not need a carrier at all. A signal through space such as for satellite transmission may need a very high frequency carrier that can overcome space loss and other atmospheric losses.
If medium is the road taken, then carrier is the truck that carries the information hence we call it *Carrier*. It is a sinusoid in our case. Depending on the medium, it will have a frequency appropriate to the medium. It can be at light frequencies as in optical fiber or a microwave frequency as for mobile communications. An electromagnetic carrier can be of' any frequency depending on the medium and the communication needs. Most mediums dictate what type of carrier (its frequency. amplitude) can propagate through it and the type of distortions it will suffer while traveling through it [2].
Anything that is wireless is analog -always. Wired signals can be digital or analog. Communications inside a computer are examples of pure digital communications, digital data over digital medium. LAN communications are digital data over analog medium. The AM and FM radios are examples of analog data over analog medium.in general, when we talk about a digital system, we are usually talking about digital information over an analog medium. However, there are exceptions. Pulse Coded inoculation (PCM) is a form of modulation where there is no carrier, so that makes it a pure digital system [3].

2. Types of analog modulation

A carrier, usually a simple sine wave, contains no information in itself. To modulate a carrier, one of its properties (amplitude, frequency or phase) is varied by the information-containing signal. This gives us three possibilities

- Amplitude modulation (AM), where the amplitude or strength of the carrier is varied.

- Frequency modulation (FM), where the frequency of the carrier is varied.
- Phase Modulation (PM), where the phase of the carrier is varied.

It actually turns out that FM and PM are very close relatives (in fact you can't have one without the other). However, we won't say any more about PM here. You will have probably met the terms AM and FM in connection with ordinary radio broadcasts. Commercial radio stations are licensed to use carrier frequencies between about 500 kHz to 1600 kHz using amplitude modulation (the "AM" band), and frequencies between 88 and 108 MHz using frequency modulation (the "FM" band).

However, one point should be made clear: While the type or modulation affects the sound quality, the propagation effects (such as attenuation or diffraction, are not determined by the type of modulation. This means, for example, that while AM radio has a greater range than FM, it's not because of the modulation; it's basically due to the much lower carrier frequency, about, 1 MHz compared to 100 MHz [4,5].

2. AMPLITUDE MODULATION

The simplest form of AM is to simply turn the carrier on and off. This is shown in Figure (1) below and is used, for example in:

- Optical fibers, where the carrier is at IR frequencies (note that an IR wavelength of 1000 nm corresponds to a frequency of 3×10^{14} Hz, or 100,000 GHz).
- IR remote controls. Actually, the scheme used here is a little more complicated. The IR radiation is first turned on and off at a frequency of about 40 kHz. This 40 kHz signal is then itself used as a carrier (it would be termed *a sub carrier* which is modulated by a series of pulses, in sequences corresponding to codes for the various control functions. This scheme helps to avoid IR interference from things like incandescent and fluorescent lamps, which flicker at 100 Hz and other harmonics of the 50 Hz mains frequency.

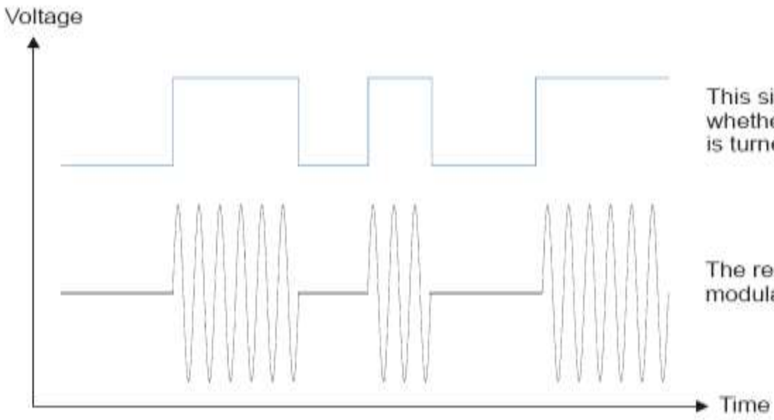

Figure .1 Simple amplitude modulation. Here the carrier is simply turned on or off by the modulating signal.

In the usual case (like AM radio), the modulation is done in a continuous fashion as shown below. Notice that the "envelope" of the carrier has exactly the same shape as the modulating signal.

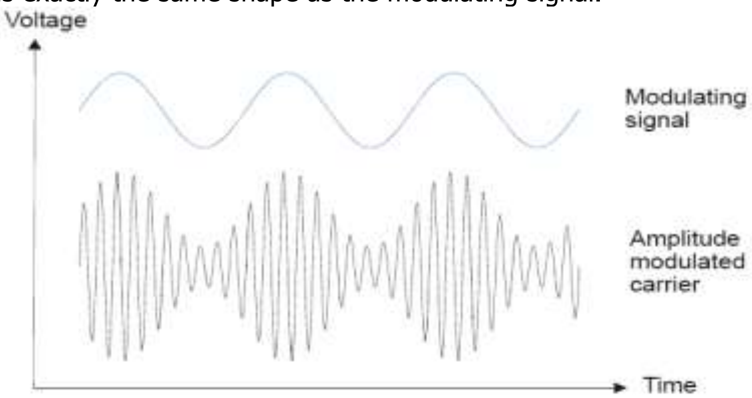

Figure .2 Amplitude modulating a carrier with a sine wave

The voltage waveform of the modulated carrier shown in Figure (2) can be described mathematically by the expression

$v(t) = A_c \cos(2\pi f_c t)\{l + m \cos(2\pi f_m t)\}$

Where A_c = the peak carrier amplitude (with no modulation)

f_c = the carrier frequency

f_m = the modulation (or modulating) frequency

m = the modulation index

The *modulation index* is equal to the ratio of the amplitude of the modulating signal to that of the unmodulated carrier. It is a value between 0 and 1 which describes the "degree of modulation" of the carrier [5,6].

3.1 INTRODUCTION TO ASK

Is a form of modulation that represents digital data as variations in the amplitude of a carrier wave. The amplitude of an analog carrier signal varies in accordance with the bit stream (modulating signal), keeping frequency and phase constant. The level of amplitude can be used to represent binary logic Os and Is. We can think of a carrier signal as an ON or OFF switch. In the modulated signal, logic 0 is represented by the absence of a carrier, thus giving OFF/ON keying operation and hence the name given. Like AM, ASK is also linear and sensitive to atmospheric noise, distortions, propagation conditions on different routes in PSTN, etc. Both ASK modulation and demodulation processes are relatively inexpensive.

The ASK technique is also commonly used to transmit digital data over optical fiber. For (light emitted diode) transmitters, binary 1 is represented by a short pulse of light and binary 0 by the absence of light. Laser transmitters normally have a fixed "bias" current that causes the device to emit a low light level. This low level represents binary 0, while a higher-amplitude light wave represents binary 1, Amplitude-shift keying (ASK) and on-off keying (OOK) receivers are used for intermittent low-data-rate applications like RKE, home security, garage door openers, and remote controls. The data that comes to an ASK or OOK receiver from a remote transmitter is reconstructed in the data slicker.

Advised to read ahead, before attempting the experiment, to consider the modeling of this demodulator. Unlike most other models, you are not free to choose parameters - particularly frequencies. If they are to be tuned to different frequencies, then one of these frequencies must be 2.083 kHz (defined as the MARK frequency). This is a restriction imposed by the BIT CLOCK REGION module, of which the BPF are sub-systems. As a result of this, most other frequencies involved are predetermined.

The transmission of digital signals is increasing at a rapid rate. Low-frequency analogue signals are often converted to digital format (PAM) before transmission. The source signals are generally referred to as base band signals. Of course, we can send analogue and digital signals directly over a medium. From electro-magnetic theory, for efficient radiation of electrical- energy from an antenna it must be at least in the km. An antenna of this size is not practical for efficient transmission. The low-frequency signal is often frequency-translated to a higher frequency range for efficient transmission. The process is called modulation.

The use of a higher frequency range reduces antenna size. In the modulation process, the baseband signals constitute the modulating signal and the high-frequency carrier signal is a sinusoidal waveform. There are three basic ways of Modulating a sine wave carrier. For binary digital modulation, they are called binary Amplitude-shift keying (BASK), binary frequency-shift keying (BFSK) and binary phase shift Keying (BPSK). Modulation also leads to the possibility of frequency multiplexing. In a frequency-multiplexed system, individual signals are transmitted over adjacent, no overlapping frequency bands. They are therefore transmitted in parallel and simultaneously in time. If we operate at higher carrier frequencies, more bandwidth is available for frequency- multiplexing more signals.

In its simplest form, the data slicker is an analog comparator that compares the demodulated ASK signal with a threshold. If the demodulated signal voltage exceeds the threshold, the comparator output goes high, usually to the supply voltage. If the demodulated signal goes below the threshold, the comparator output goes low, usually zero volts or ground. This application notes reviews two aspects of data slicing: forming the comparator threshold, and preventing the comparator output from 'chattering' when no signal is present. The latter operation, often called 'squelching', can be done by introducing simple voltage offsets onto either pin of the data comparator. This offset can come directly from the power supply or from using hysteretic, which is the process of feeding back part of the output voltage from the data slicker comparator.

We will show three different ways to form the threshold, and three different ways to introduce squelch, However, as for analog communication systems, there are many channels (satellite channels, radio channels, etc...) that have band pass characteristics. Transmission of digital information through these channels can be performed using a carrier signal. The frequency content of the original sequence will be shifted to the carrier frequency, which lies in the pass-band of the channel. The digital signal is said to be transmitted by carrier modulation [6,7].

The advantage of Digital communication system is that

1- The primary advantage is the ease with which digital signal compared to analog signal are regenerative.
2- Digital circuits are less subject to distortion and interference than analog circuits.
3- Digital circuits are more reliable and can be produced at lower cost than analog circuits. At so digital hard ware lends it self to more flexible implementation than analog hard wave.
4- Digital technique lends them sleeves naturally to signal processing functions that protect again
5- Much data communication is computer to computer or digital instrument or terminal to computer such digital terminations are naturally test served by digital link.
6- Multiplexing of digital signals (TDM) is simpler than analog signals (FDM).
7- Different types of digital signals (data, telegraph, telephone) can be treated as identical signals in transmission and switching.

3.2 INTRODUCTION TO GENERATION OF ASK

Amplitude shift keying - ASK - in the context of digital communications is a modulation process, which imparts to a sinusoid two or more discrete amplitude levels. These are related to the number of levels adopted by the digital message. For a binary message sequence there are two levels, one of which is typically zero. Thus, the modulated waveform consists of bursts of a sinusoid. There are sharp discontinuities shown at the transition points as shown in Figure (3) below.

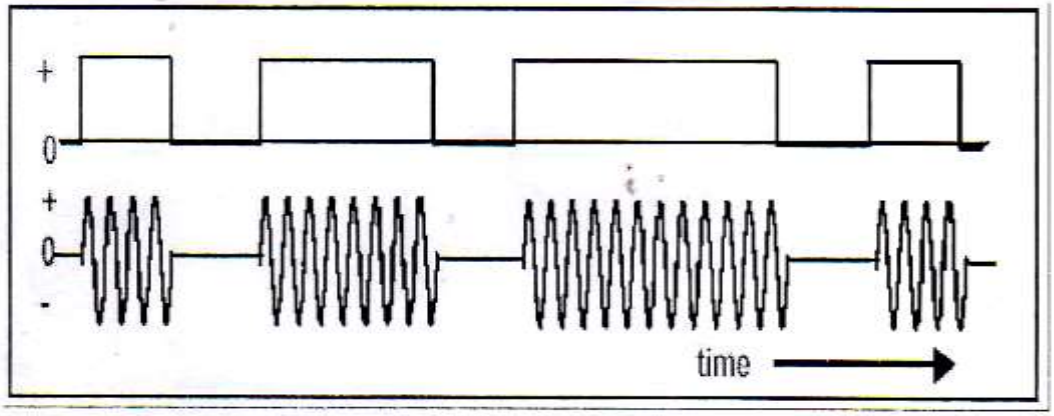

Figure.3 Message & ASK Signal

These result in the signal having an unnecessarily wide bandwidth. Band limiting is generally introduced before transmission, in which case these discontinuities would be "rounded off. The band limiting may be applied to the digital message, or the modulated signal itself. The data rate is often made a sub-multiple of the carrier frequency. One of the disadvantages of ASK, compared with FSK and PSK, for example, and is that it has not got a constant envelope. This makes its processing (e.g., power amplification) more difficult, since linearity becomes an important factor. However, it does make for ease of demodulation with an envelope detector.
As already indicated, the sharp discontinuities in the ASK waveform of Figure (4) imply a wide bandwidth. A significant reduction can be accepted before errors at the receiver increase unacceptably. This can be brought about by band limiting (pulse shaping) the message before modulation, or band limiting the ASK signal itself after generation [7,8].

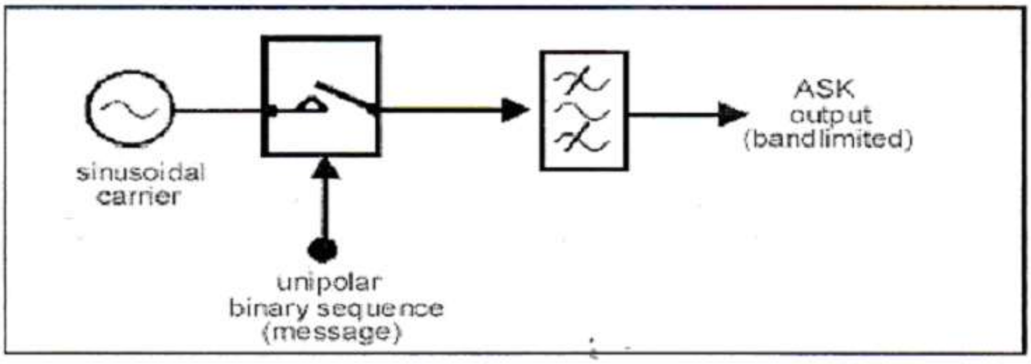

Figure .4 ASK Generation Method

Figure (5) shows the signals present in a model of Figure (4), where the message has been band limited. The shape, after band limiting, depends naturally enough upon the amplitude and phase characteristics of the band limiting filter [9,10].

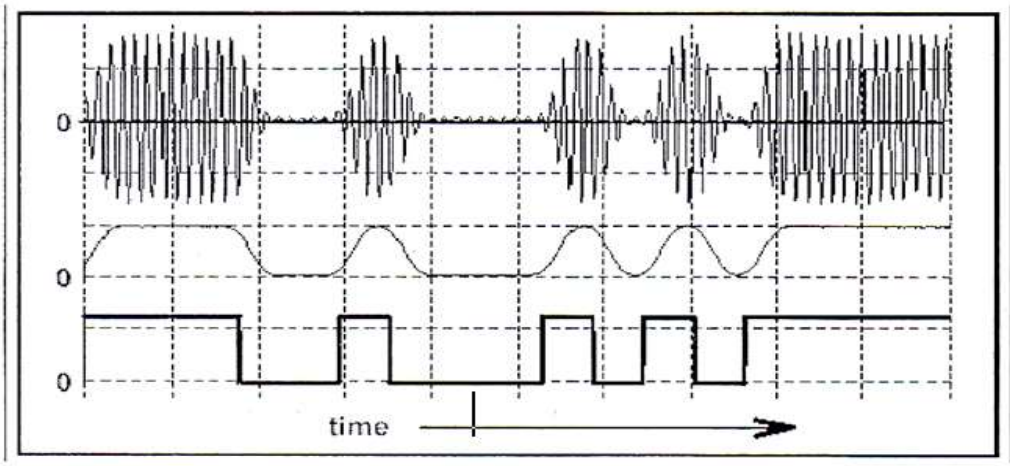

Figure.5 ASK Band Limited Message & Original Message Respectively

6.The Proposed ASK System Design.

6.1 Design of amplitude shift keying modulation by using simulink

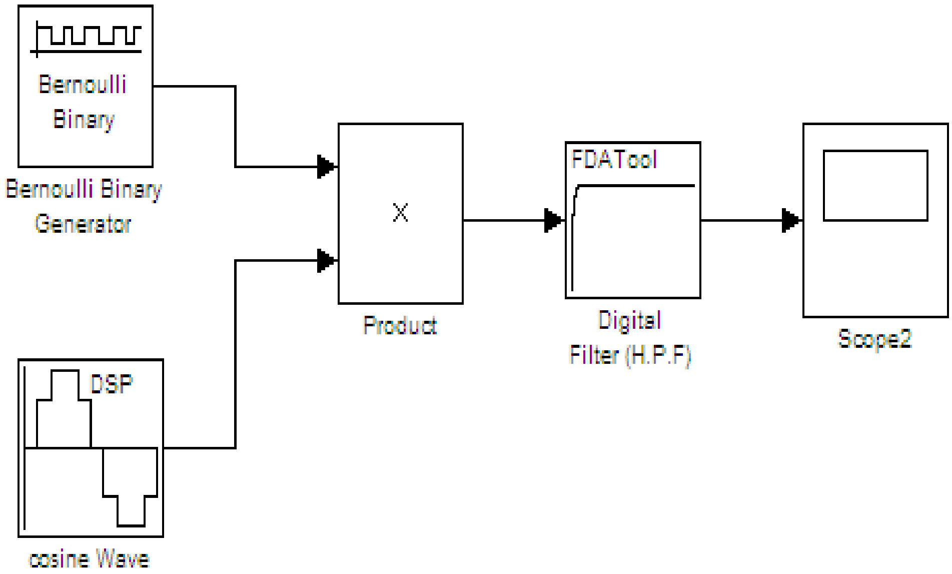

Figure .6 Ask modulation

The circuit of Ask modulation is shown in figure (6) is contain the Ask signal generation represented by using Bernoulli massage , it is taken from communication block by using MATLAB/Simulink with data rate (200 kbps) which generate arbitrary binary non returned to zero (NRZ) sequence with (Tb =1/200k) and fs =10MHZ, this sequence is converted up with carrier frequency of (1MHZ) , and the output signal as shown in Figure (7). The output signal from Bernoulli generator as shown in figure (8) below.

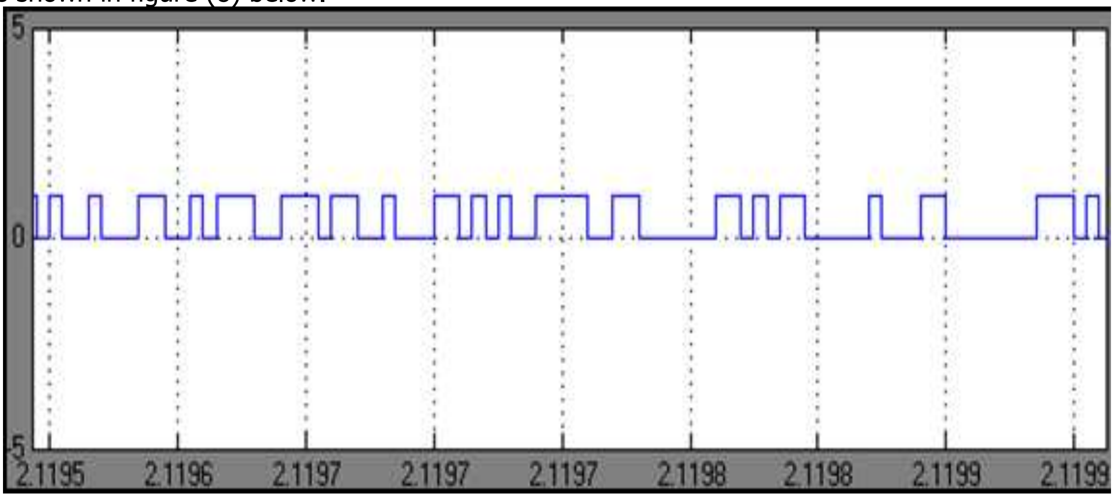

Figure (7)

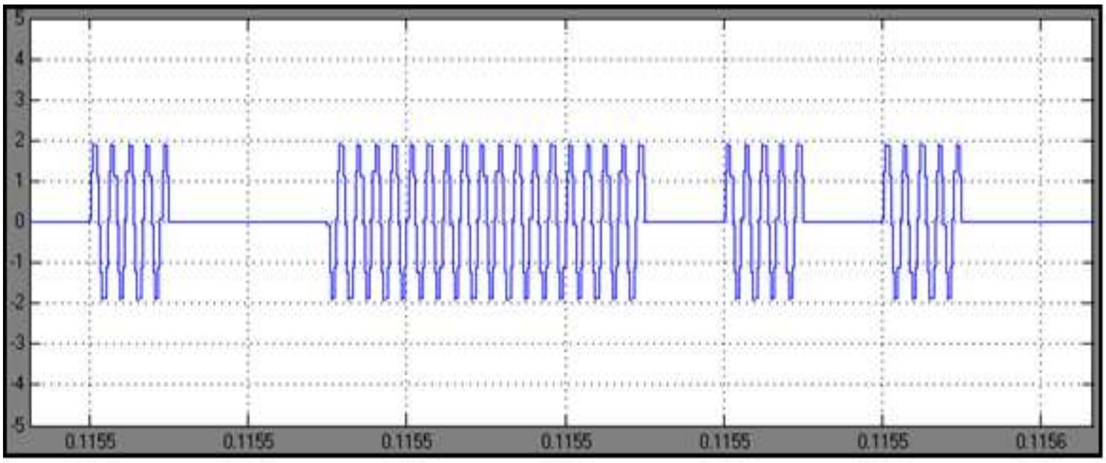

Figure (8)

6.2 Digital High Pass Filter

The digital H.P. F used in the proposed system is IIR second order Butterworth H.P. F designed with 3db cutoff frequency (fc =1MHZ). This filter is implemented using MATLAB / Simulink; it is used to reject unwanted signal. The waveform result from H.P.F is shown in Figure (9)

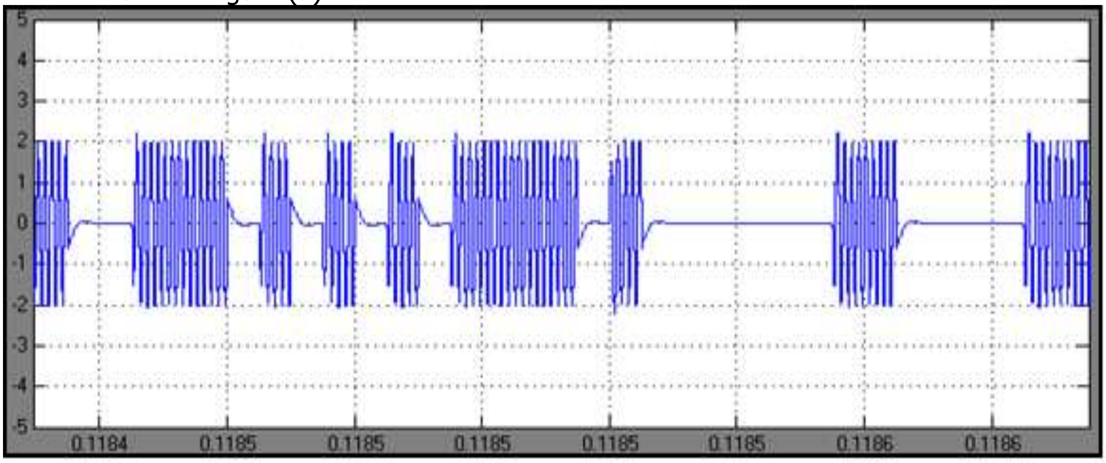

Figure (9)

6.3 Design of amplitude shift keying demodulation by using simulink

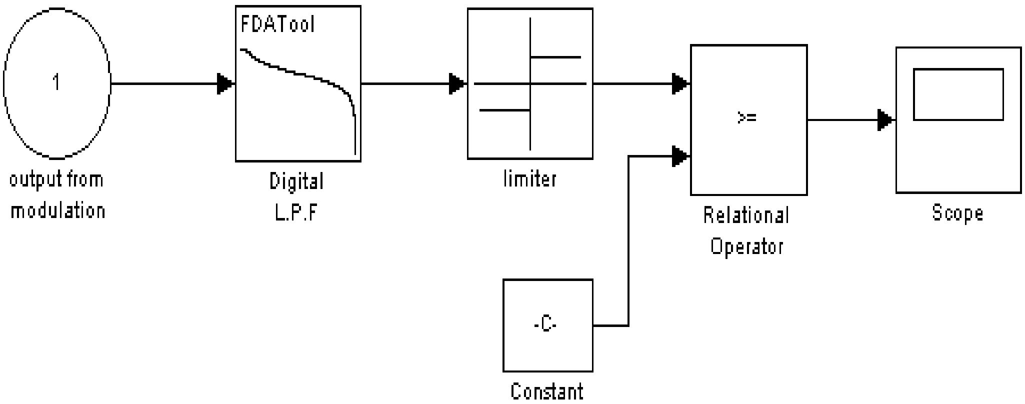

Figure.10 ASK demodulation

As shown in figure (10) the received signal from amplitude shift keying modulation circuit was forced to pass through low pass filter (L.P.F) , this filter has specification of 200kbps (equal to data rate) , it's function to reject the noise and interference which smearing the information also to make the information free from inter-sampling interference (ISI) . The waveform result from (L.P.F) is shown in figure (11)

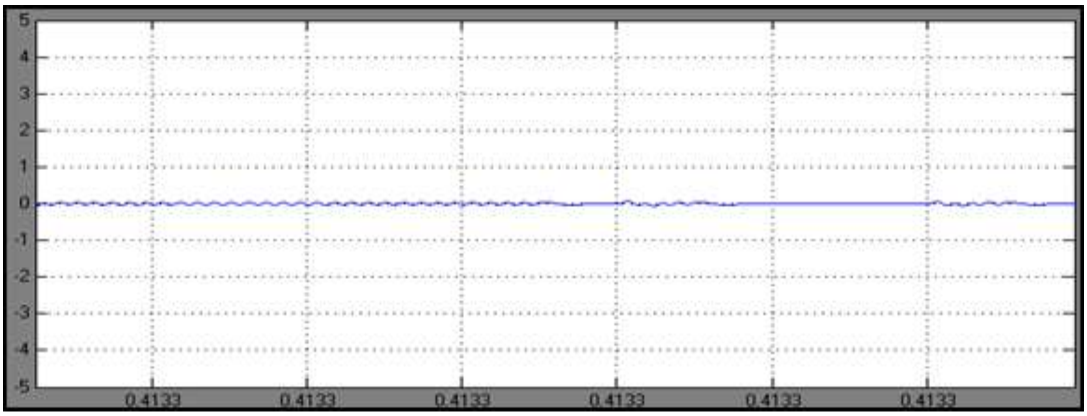

Figure .11

After low pass filter we obtained information signal up to (200kbps) and this information passed through limiter to make the information signal bipolar , after that the signal passed through comparator (relational logical) , to compare the Bipolar signal with very small positive constant value to get unipolar digital signal .All the above processing to make the recovery data like the data before transmitted in order to make correct comparison between them for obtaining bit error rate (BER).the output signal as shown in Figure (12).

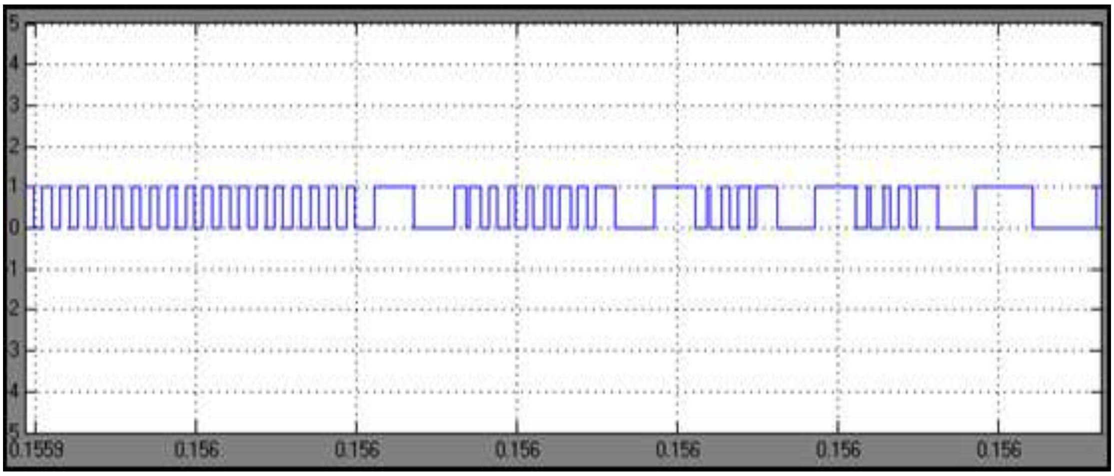

Figure .12

7.CONCLUSION

In this project Amplitude Shift Keying (ASK) modulation and demodulation in digital communication system (DCS) has been achieved .The design was implemented using Simulink technique. In this design the digital information was transmitted with data rate equal (200 kbps) carrying by frequency carrier equal (900KHZ) so that the upper and lower frequency can be calculated as follows- :

fu = fc + fm & fl = fc - fm where fu: upper frequency and fl: lower frequency

It is clear that from equations above the fu and fl are equal to (1.1MHZ) and (700KHZ) respectively .This is done according to the theory of transmission data with using (ASK), which state that ($\Delta f \geq 2$) data rate (R) .The transmitted digital data has been received at the receiver after demodulation process successfully with the same data rate (200 kbps) of transmitted it with delay in time. In order to get real and practical results, the design can be implemented high sampling rate with pass band technique.

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