LAB Assignment No. 6:

TO STUDY GENERATION OF DOUBLE SIDE BAND AMPLITUDE MODULATE (AM) WAVEFORMS, USING DSB/SSB TRANSMITTER

APPARATUS:

Oscilloscope DSB/SSB Traine

Power supply Connecting leads

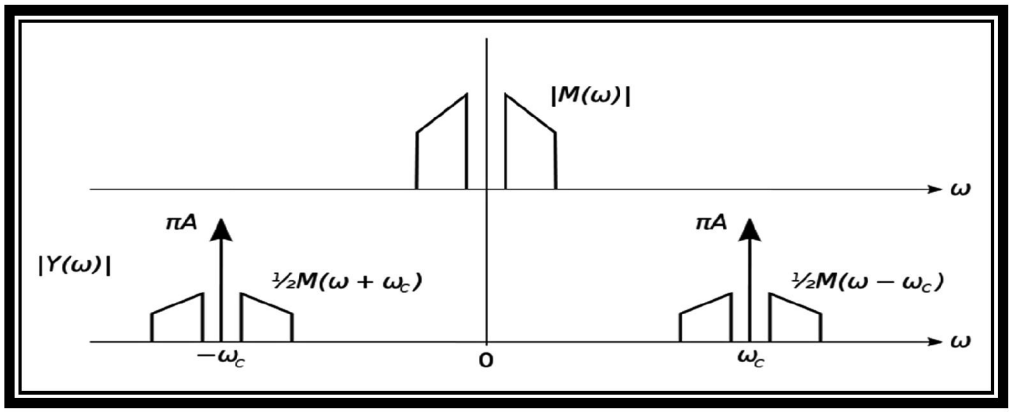
THEORY:

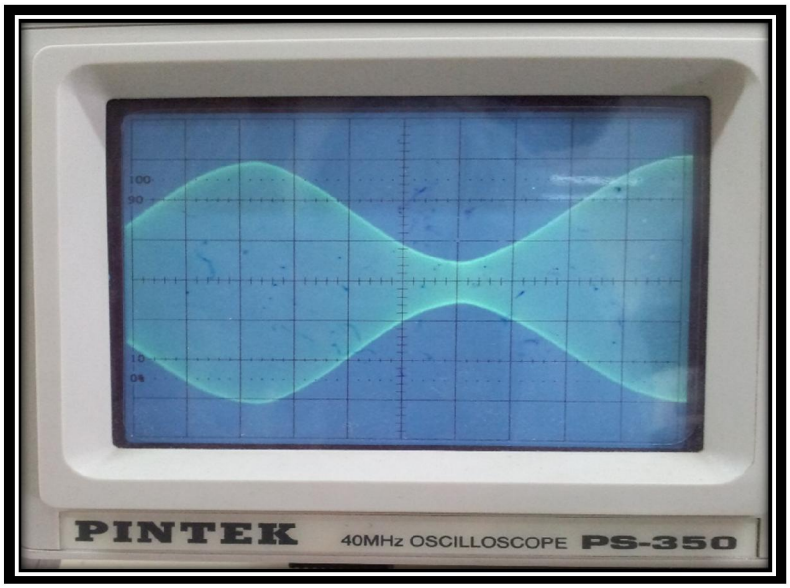
A communications system is a collection of individual communications networks usually capable of interconnection and interoperation to form an integrated whole.

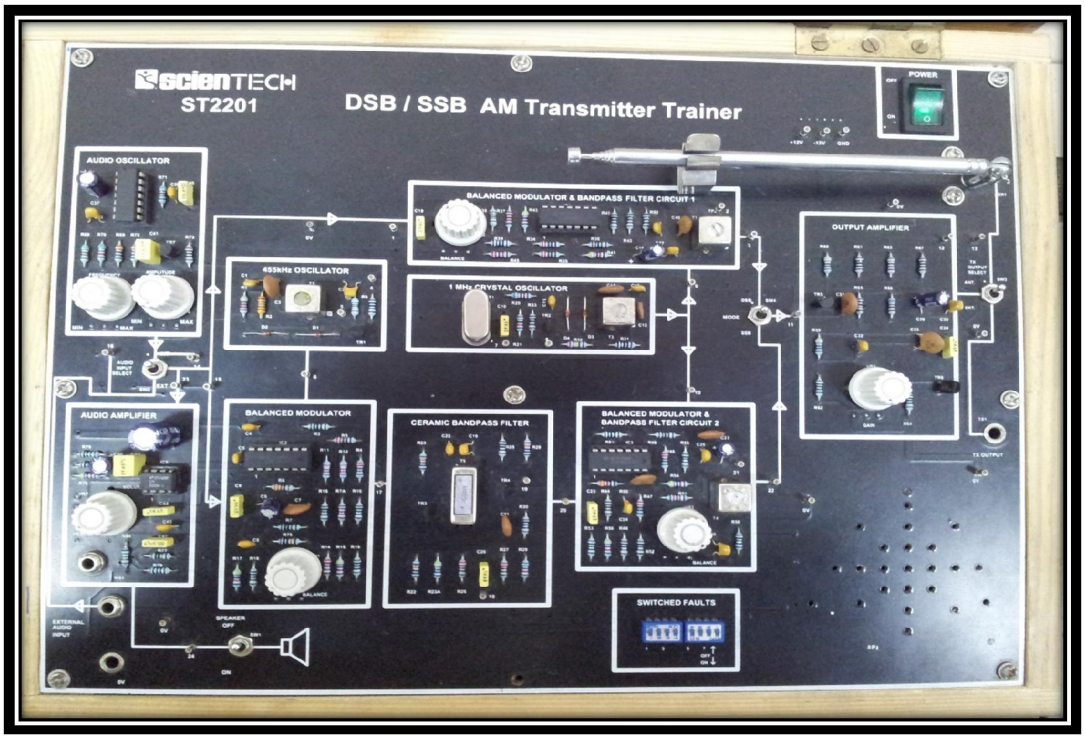
In electronics and telecommunications, modulation is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal which typically contains information to be transmitted.

Amplitude modulation (AM) is a technique used in electronic communication, most commonly for transmitting information via a radio carrier wave. AM works by varying the strength of the transmitted signal in relation to the information being sent.

In the double-sideband suppressed-carrier transmission (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 implies an increase of the cover in DSB-SC, compared to AM, for the same power used.







V_{min} = 0.0475 , V_{max} = 0.125

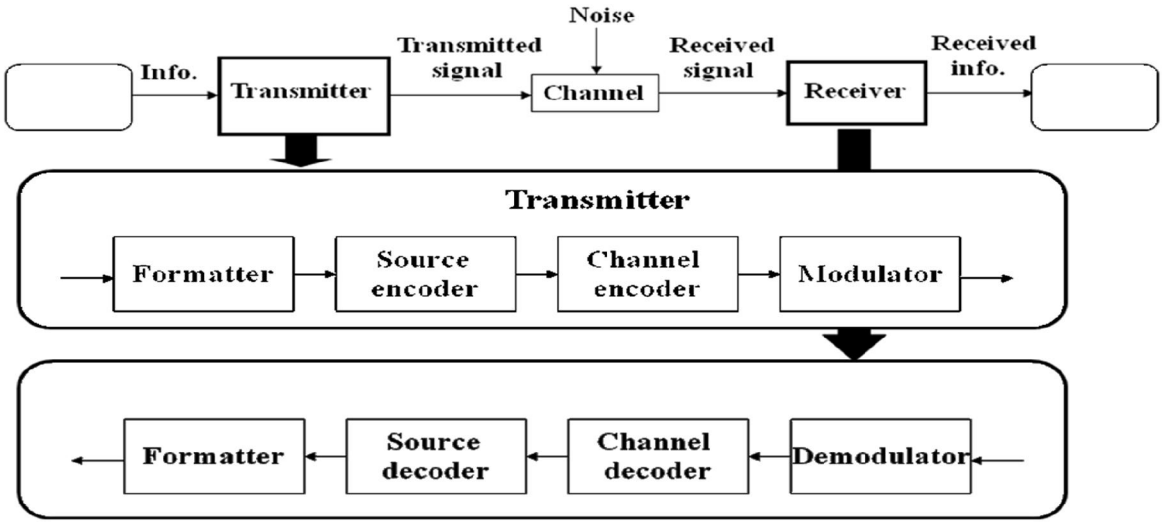
Modulation index = (0.125 – 0.0475) / (0.125 + 0.0475)

= 0.45

=45%

Draw and explain the block diagram of simple communication System.

Communication is a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior. A general block diagram of a simple communication system is as:



A communication system consists of a transmitter which transmits the encoder signal to the receiver through the channel which have noise & other signals to reduce it. A receiver is a device which receives the encoded signals & decodes it for the use of the user.

Write different ranges of radio frequency spectrum write their names and further more explain about their real life application.

DESCRIPTION	ABBREVIATION	FREQUENCY	APPLICATION
Very low	VLF	3 to 30 KHz	Strom detection, time signals
Low	LF	30 to 300 KHz	Broadcasting(long wave),navigation
Medium	MF	300 to 3000 KHz	Broadcasting(medium wave),cord less phones
High	HF	3 to 30 MHz	Broadcasting(Short wave),Aeronautical.

Very high	VHF	30 to 300 MHz	F.M broadcasting, Business radio
Ultra high	UHF	300 to 3000 MHz	T.V Broadcasting, Mobile phones.
Super high	SHF	3 to 30 GHz	Satellite, point to point link
Extremely high	EHF	30 to 300 GHz	Multimedia wireless links

Explain Modulation, Amplification, Transmission and Reception w.r.t wireless communication?

Modulation :

It is the process of varying one or more properties of high frequency periodic called the carrier signal, with respect to a modulating signal.

Amplification:

In wireless communication, amplification means to amplify or enhance the power of the signals so that it can reach the receiver.

Transmission:

In wireless communication, transmission means to transmit the encoded signals to the receiver.

Reception:

In wireless communication, reception means to receive the transmitted signal.

Which methods are used to generate Double sided band signal?

Different methods used to generate Double sided band signal are:

- Amplitude modulation
- Multiplier Modulator
- Nonlinear Modulation (Balance modulator)
- Switching Modulation (uses square wave)

How many methods are there to generate carrier frequency? What should be the characteristics of Carrier signals?

A unique frequency used to "carry" data within its boundaries is known as carrier frequency. It is measured in cycles per second, or Hertz.

Carrier frequencies are generated by:

- Unmodulated radio
- Radar
- Carrier communication
- Transmitter
- LRC circuits
- Crystal oscillator

A carrier signal is a transmitted electromagnetic pulse or wave at a steady base frequency of alternation on which information can be imposed by increasing signal strength, varying the base frequency, varying the wave phase, or other means. This variation is called modulation. A carrier signal is something like a sine wave which have fixed amplitude and high frequency.

Why is it necessary to balance a DSB signal?

Because of the power consideration, it is necessary to balance a DSB signal. I.e. it requires less amount of power for the transmission.

What is the relationship between carrier frequency and modulating signal?

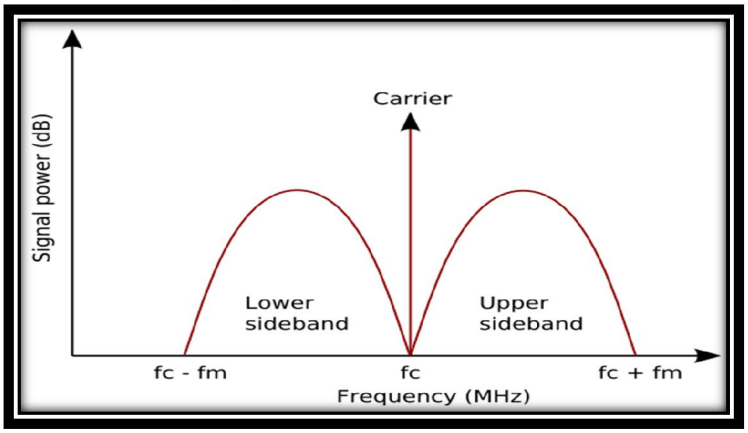
The relationship between carrier and modulating signal is as:

$$M(t) = g(t) \text{ X } \cos(\omega ct)$$

Why upper and lower bands are equal in DSB?

The signal components above the carrier frequency constitute the upper sideband (USB) and those below the carrier frequency constitute the lower sideband (LSB). In conventional AM transmission, the carrier and both sidebands are present, sometimes called double sideband amplitude modulation (DSB-AM).

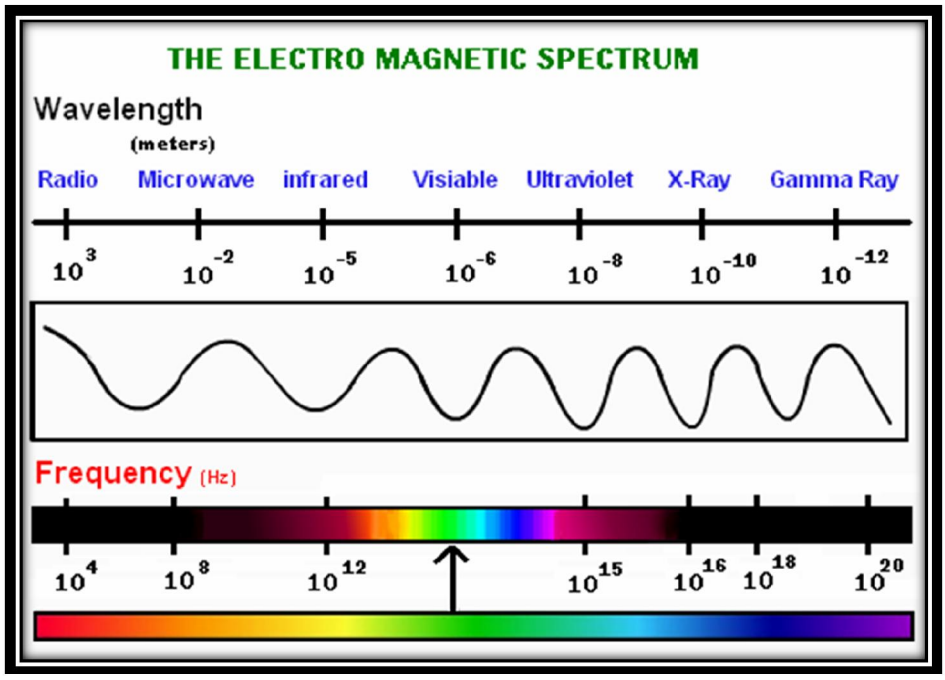
Upper and lower bands are equal in a DSB because same component (f_m) is added and subtracted from (f_c)



What is the band width of signal if f_C and f_M are carrier and modulation frequencies?

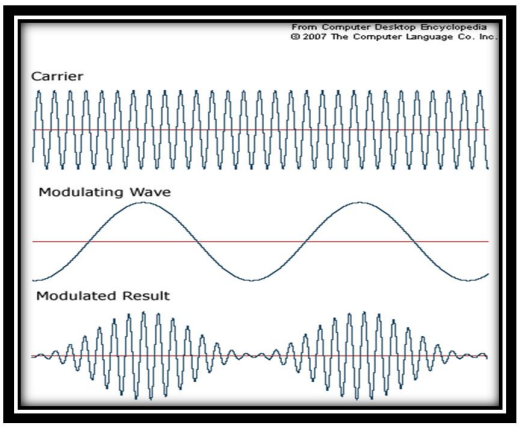
The amount of data that can be transmitted in a fixed amount of time, expressed in bits.In double side band modulation the bandwidth of the signal is double of the frequency of the modulating frequency.

List complete frequencies present in the electromagnetic spectrum?



Write down the basic difference between an AM Modulator and AM demodulator circuit?

Amplitude modulation is a type of modulation where the amplitude of the carrier signal is varied in accordance with the information bearing signal.



Demodulation is the act of extracting the original information-bearing signal from a modulated carrier wave. A demodulator is an electronic circuit used to recover the information content from the modulated carrier wave. So, AM demodulation/detector/envelope detector is the process to separate the carrier & modulating signal.

Search the web for different types of antennas and their purposes?

In general, any antenna falls under one of these categories:

- Omnidirectional
- Directional

Omnidirectional:

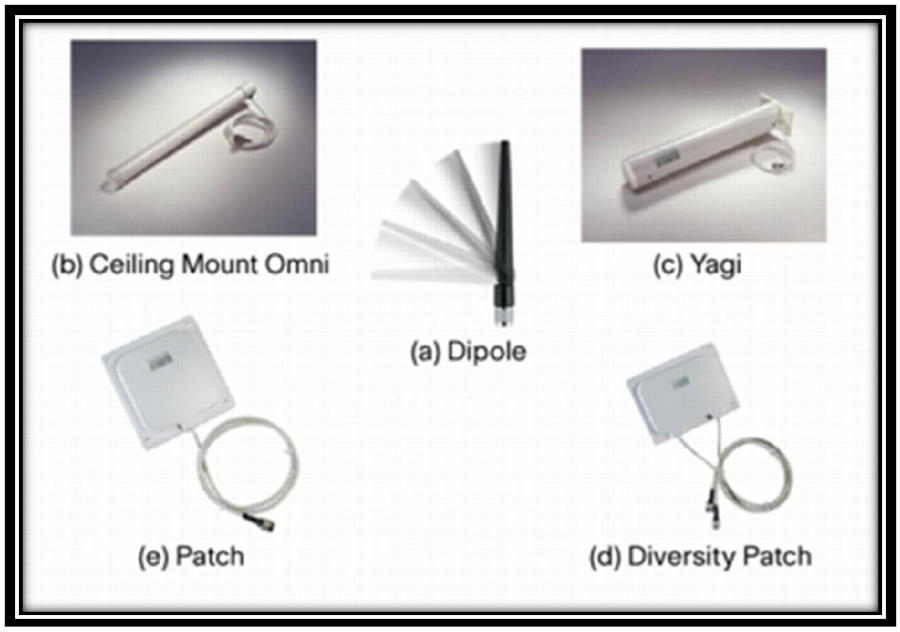
An omnidirectional antenna is designed to provide a 360-degree radiation pattern. This type of antenna is used when coverage in all directions from the antenna is required.

Directional:

Directional antennas come in many different styles and shapes. An antenna does not offer any added power to the signal. It simply redirects the energy it receives from the transmitter. When the antenna redirects this energy, it has

the effect to provide more energy in one direction and less energy in all other directions. As the gain of a directional antenna increases, the angle of radiation usually decreases. This provides a greater coverage distance with a reduced coverage angle. Directional antennas include yagi antennas, patch antennas, and parabolic dishes. Parabolic dishes have a very narrow radio frequency (RF) energy path. The installer must be accurate in how these are aimed at each other.

Various Antennas Commonly Found in WLAN Systems:



LAB Assignment No. 7:

TO CALCULATE THE MODULATION INDEX OF DSB BY TRAPEZOIDAL PATTERN

APPARATUS:

Oscilloscope DSB/SSB Traine

Power supply Connecting leads

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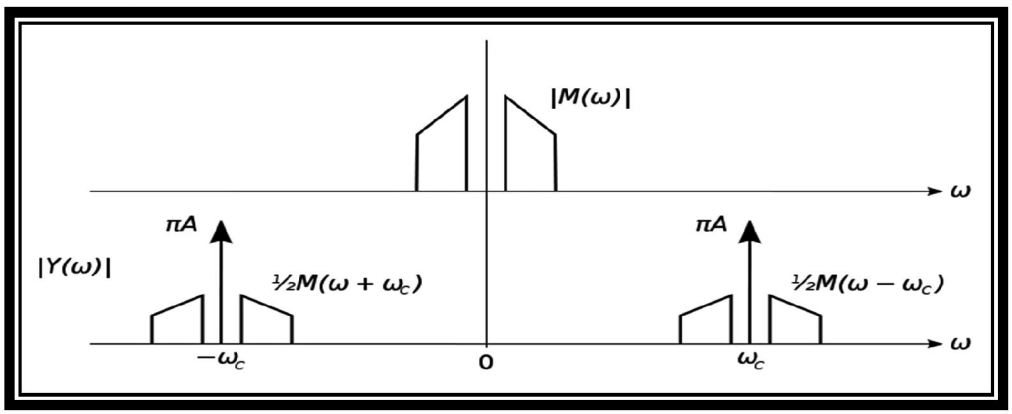

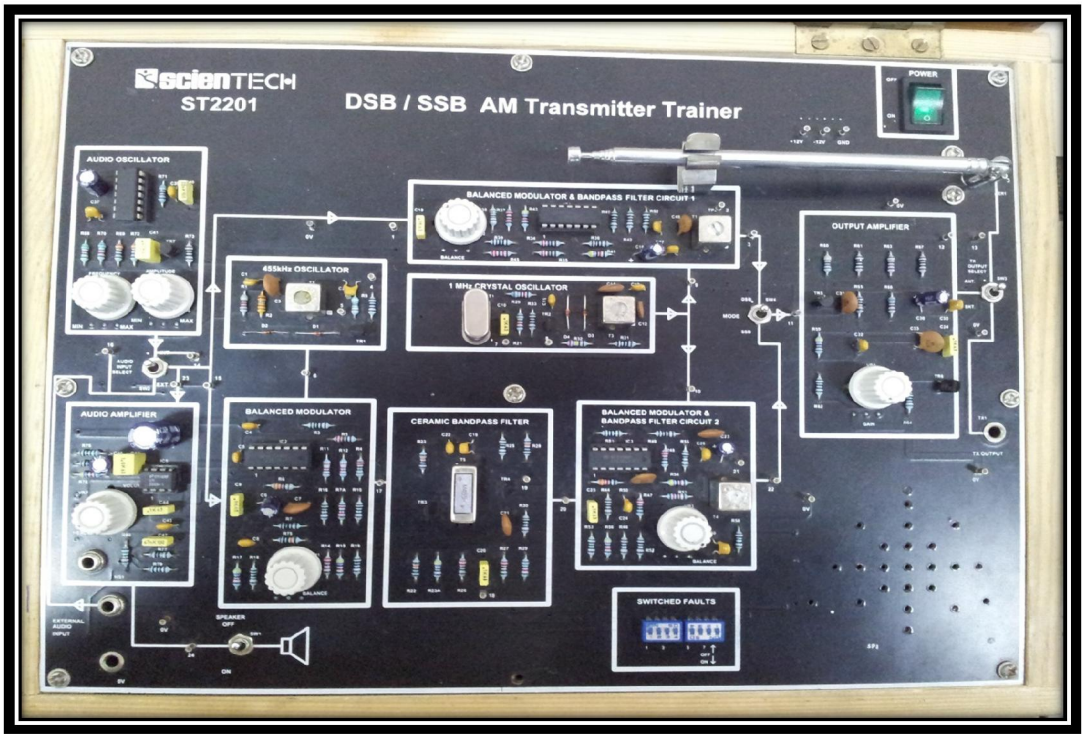

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Amplitude modulation (AM) is a technique used in electronic communication, most commonly for transmitting information via a radio carrier wave. AM works by varying the strength of the transmitted signal in relation to the information being sent.

Modulation Index:

The AM modulation index is the measure of the amplitude variation surrounding an un modulated carrier. As with other modulation indices, in AM this quantity (also called "modulation depth") indicates how much the modulation varies around its "original" level. For AM, it relates to variations in carrier amplitude and is defined as:

$$h = \frac{\text{peak value of } m(t)}{A} = \frac{M}{A},$$

Where M and A are the message amplitude and carrier amplitude, respectively.

So if $h = 0.5$, carrier amplitude varies by 50% above (and below) its un modulated level; for $h = 1.0$, it varies by 100%. To avoid distortion, modulation depth must not exceed 100 percent. Transmitter systems will usually incorporate a limiter circuit (such as a vogad) to ensure this. However, AM demodulators can be designed to detect the inversion (or 180-degree phase reversal) that occurs when modulation exceeds 100 percent; they automatically correct for this defect. Variations of a modulated signal with percentages of modulation are shown below. In each image, the maximum amplitude is higher than in the previous image (note that the scale changes from one image to the next.

Observation and Calculations:

Un suppressed:

V_{max} = 325mv

V_{min} = 130mv

Modulation index = $V_{max} - V_{min}$ / $V_{max} + V_{min}$

= 325mv – 130mv / 325mv + 130mv.

= 0.428

= 42.8 %

Suppressed:

V_{max} = 200mv

V_{min} = 0mv

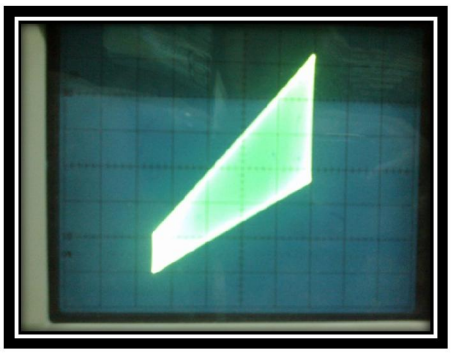
Modulation index = $V_{max} - V_{min}$ / $V_{max} + V_{min}$

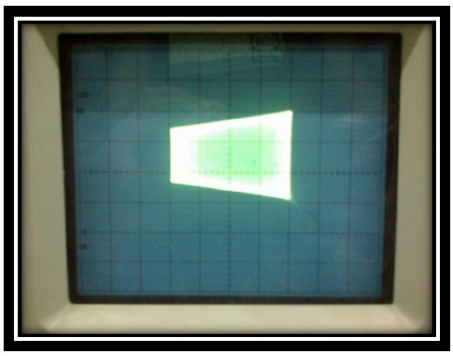
= 200mv – 0mv / 200mv + 0mv.

= 1=100%

OBSERVED WAVEFORMS:

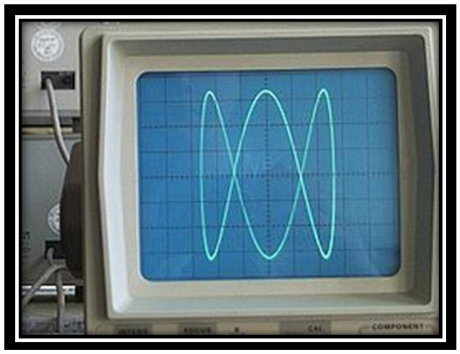
DSB | AM: $\mu = 1$ 100% modulation | AM: $\mu < 1$ undermodulation | AM: $\mu > 1$ overmodulation





Write a short introduction of Lissjeous patterns and their applications?

Lissajous patterns are formed when you combine periodic wave moving back and forth with periodic wave moving up and down this exhibit does this electronically allowing the visitor to control the frequency of the X and Y motions independently. Resulting pattern can be observed on oscilloscope. Electronics engineers use Lissajous patterns to measure radio signal frequencies.



What is the X-Y operation of the oscilloscope?

An X-Y measurement, where the Y input provides vertical deflection and X input provides horizontal deflection. For some measurements, an external horizontal deflection is required. This is also referred to as X-Y operation permits the oscilloscope to perform many types of measurements not possible with conventional sweep operation. The CRT display becomes an electronic graph of two instantaneous voltages. The display may be a direct comparison of two voltages such as during phase measurement, or frequency measurement with Lissajous waveforms.

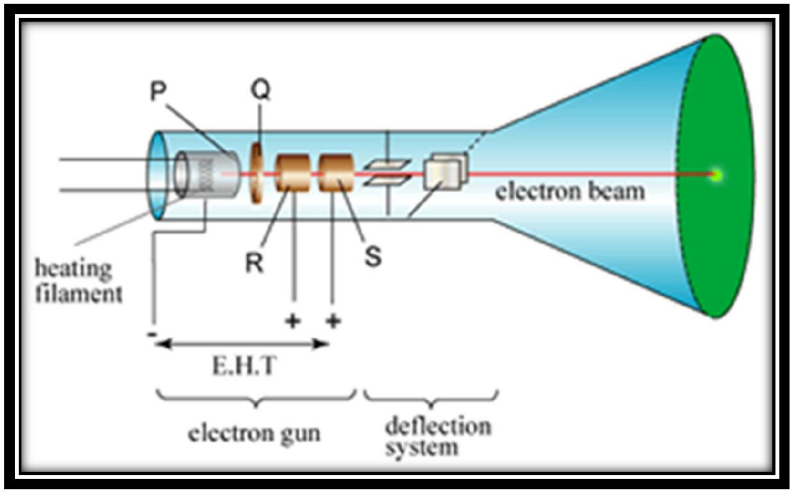
What is meant by modulation index and explain how did you measure the modulation index in the experiment?

Modulation index also called "modulation depth" indicates how much the modulation varies around its "original" level. Modulation index is measured using formula

$$\text{Modulation index} = V_{max} - V_{min} / V_{max} + V_{min}$$

Search the web for internal architecture of Analog and Digital oscilloscope? What is meant by a storage oscilloscope? What is the basic difference between Analog and Digital oscilloscopes?

Analog oscilloscope:



Digital oscilloscope:

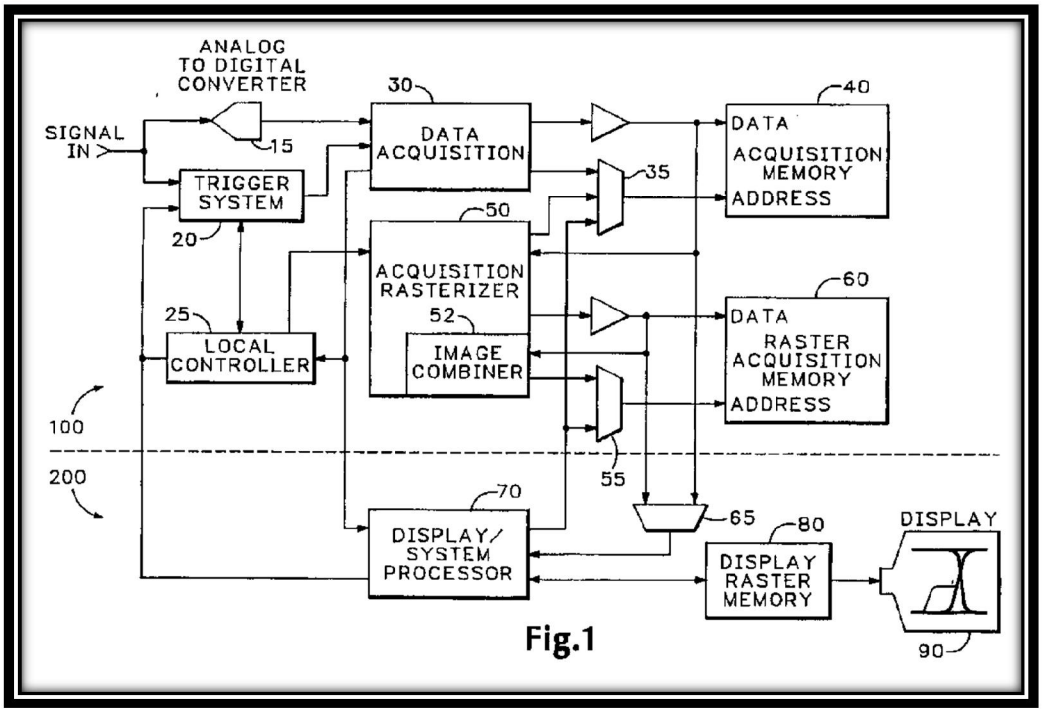


Fig.1

A storage oscilloscope is an oscilloscope which stores the signal It is now the most common type of oscilloscope in use because of the advanced storage features.

Digital oscilloscope use digital pulses to generate or storing of a signal. In this oscilloscope all the signals are converted in digital form and then operated while in analog oscilloscope cathode ray is used and all signals are deal without converting them in pulses.

Write a comment about balancing the DSB signal, what is trapezoidal pattern for the balanced state?

Amplitude modulation is a way for a signal to be transmitted over distances. The AM signal is originally sent with a carrier signal in the form of a wave, which is then modulated, or changed, by an audio signal that is also in the form of a wave. This produces a signal that has the original carrier signal plus two bands, one on top of the original and one on the bottom. These are

referred to as sidebands and are exact copies of each other. A signal like this is called double-sideband amplitude modulated (DSB-AM) signal.

What is the relation between the no. of side bands and modulation frequency?

In radio communications, a sideband is a band of frequencies higher than or lower than the carrier frequency, containing power as a result of the modulation process. The sidebands consist of all the Fourier components of the modulated signal except the carrier. All forms of modulation produce sidebands. Amplitude modulation of a carrier wave normally results in two mirror-image sidebands. The signal components above the carrier frequency constitute the upper sideband (USB), and those below the carrier frequency constitute the lower sideband (LSB). In conventional AMtransmission, the carrier and both sidebands are present, sometimes called double sideband amplitude modulation (DSB-AM). Single-sideband modulation (SSB) or Single-sideband suppressed-carrier (SSB-SC) is a refinement of amplitude modulation that more efficiently useselectrical power and bandwidth.

Amplitude modulation produces a modulated output signal that has twice the bandwidth of the original baseband signal. Single-sideband modulation avoids this bandwidth doubling, and the power wasted on a carrier, at the cost of somewhat increased device complexity and more difficult tuning at the receiver.

What is modulation Index, How does it help to identify an under and over modulated signal?

Modulation index also called "modulation depth" indicates how much the modulation varies around its "original" level. Modulation index is measured using formula

$$\text{Modulation index} = V_{max} - V_{min} / V_{max} + V_{min}$$

Percentage of modulation indicates the under and over modulated signal.

LAB Assignment No. 8:

TO STUDY DOUBLE SIDEBAND AM RECEPTION

APPARATUS:

Oscilloscope DSB/SSB Traine

Power supply Connecting leads

THEORY:

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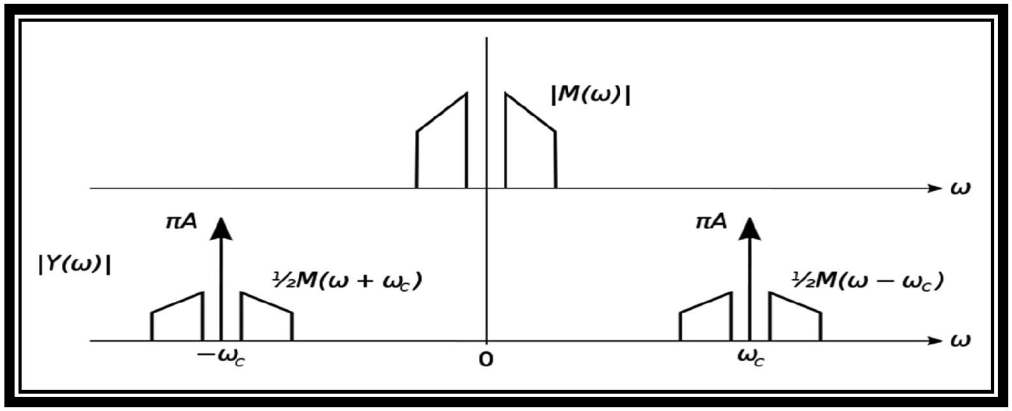

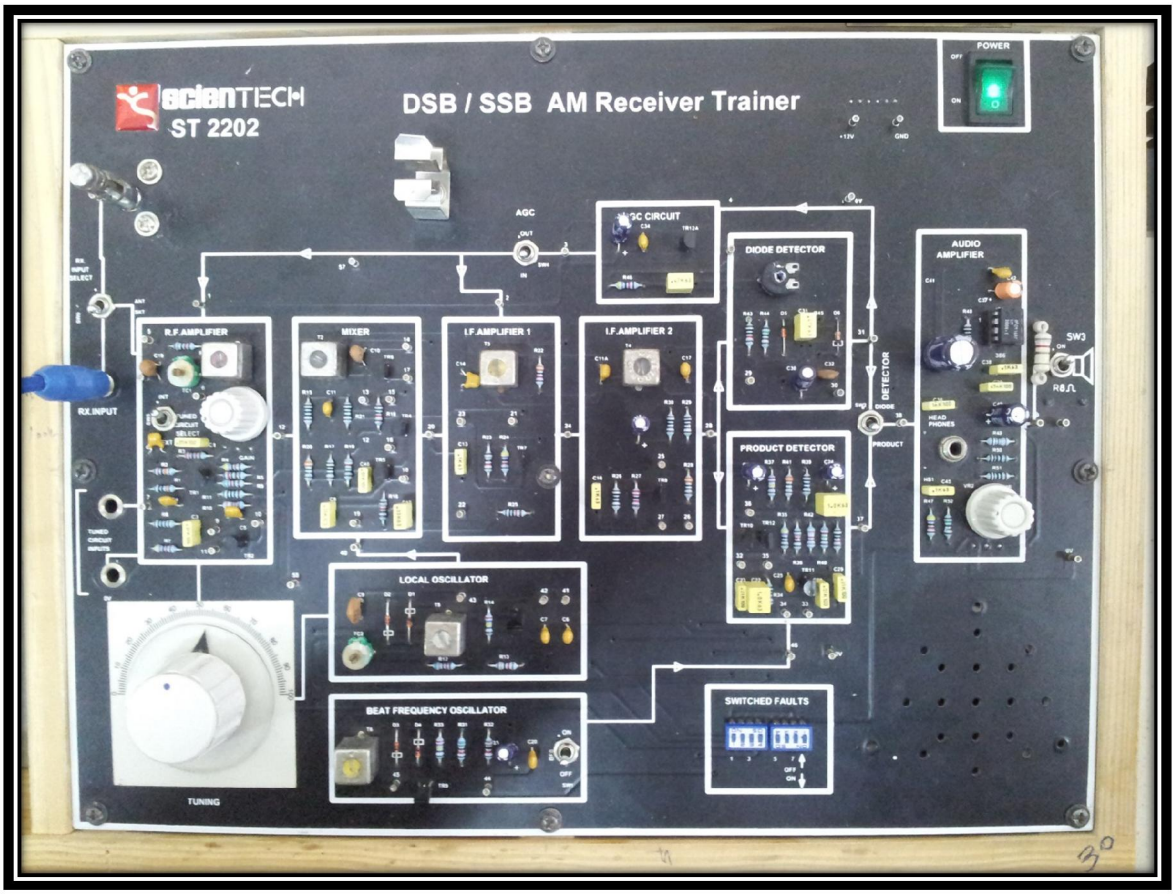

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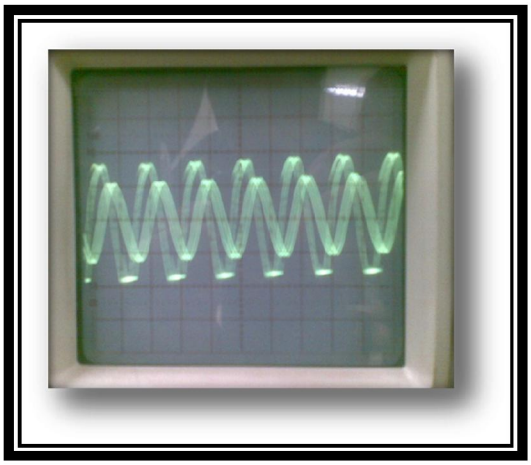
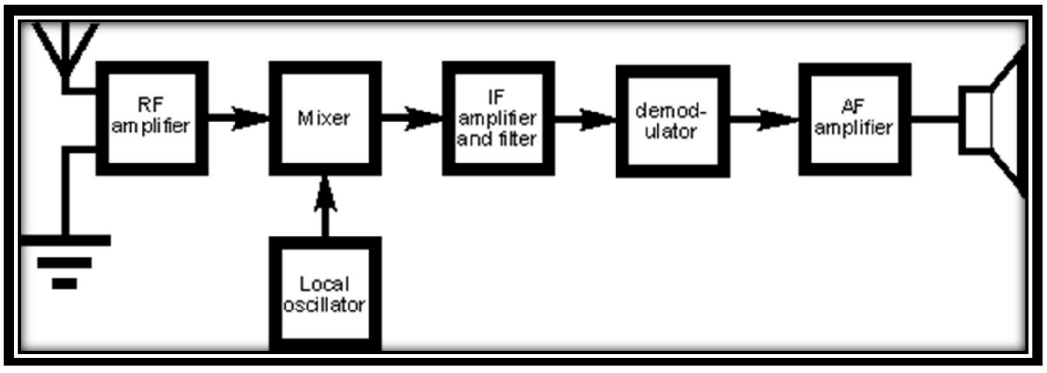
Amplitude modulation of a carrier wave normally results in two mirror-image sidebands. The signal components above the carrier frequency constitute the upper sideband (USB), and those below the carrier frequency constitute the lower sideband (LSB). In conventional AM transmission, the carrier and both sidebands are present, sometimes called double sideband amplitude modulation (DSB-AM). Amplitude modulation is inefficient in power usage; at least two-thirds of the power is concentrated in the carrier signal. The carrier signal contains none of the original information being

transmitted (voice, video, data, etc.). However, it does contain information about the frequency, phase and amplitude needed to demodulate the received signal most simply and effectively. In some communications systems, lower total cost can be achieved by eliminating some of the carrier, thereby lowering electrical power usage even though this requires greater receiver complexity and cost.



Draw the Block diagram of AM receiver?



What is super heterodyning and super heterodyne receiver? Can there be an under heterodyne receiver? If so, then what are its limitations?

Super heterodyning:

To heterodyne means to mix to frequencies together so as to produce a beat frequency, namely the difference between the two. Amplitude modulation is a heterodyne process: the information signal is mixed with the carrier to produce the side-bands. The side-bands occur at precisely the sum and

difference frequencies of the carrier and information when you use the lower side-band the difference between the two frequencies,

you are super heterodyning. Strictly speaking, the term super heterodyne refers to creating a beat frequency that is lower than the original signal.

Super heterodyne receiver:

A super heterodyne receiver contains a combination of amplification with frequency mixing, and is by far the most popular architecture for a microwave receiver.

To heterodyne means to mix two signals of different frequencies together, resulting in a "beat" frequency. Actually, two signals are always created, the sum frequency and the difference frequency. These are referred to as the two sidebands. The sum frequency is the upper sideband, and the difference frequency is the difference sideband. In most microwave receivers, the upper sideband is ignored.

What is a tune circuit and difference between in the local oscillator and tank circuit?

Tune circuit consists of an inductor, represented by the letter L, and a capacitor, represented by the letter C. When connected together, they can act as an electrical resonator, an electrical analogue of a tuning fork, storing energy oscillating at the circuit's resonant frequency.

LC circuits are used either for generating signals at a particular frequency, or picking out a signal at a particular frequency from a more complex signal. They are key components in many electronic devices, particularly radio equipment, used in circuits such as oscillators, filters, tuners and frequency mixers.

A local oscillator is an electronic oscillator used to generate a signal normally for the purpose of converting a signal of interest to a different frequency using a mixer. This process of frequency conversion also referred to as heterodyning, produces the sum and difference frequencies of the

frequency of the local oscillator and frequency of the input signal of interest. These are the beat frequencies.

Normally the beat frequency is associated with the lower sideband, the difference between the two. Tune circuit is also known as tank circuit.

When we tune the receiver what do you think we are changing in the circuit and because of that which response of the circuit changes?

When we tune the receiver we are changing the frequency of the receiver so that it can synchronize with the transmitter & produce the require result.

In return, the circuit will run smoothly & indicate that the transmitted and receiver is in the correct position to work. Frequency & amplitude of the circuit will change. Receiving voltage will also change.

What is the image frequency ? How the RF circuit works better for image frequency rejection?

In heterodyne receivers, an image frequency is an undesired input frequency equal to the station frequency plus twice the intermediate frequency. The image frequency results in two stations being received at the same time, thus producing interference. Image frequencies can be eliminated by sufficient attenuation on the incoming signal by the RF amplifier filter of the super heterodyne receiver.

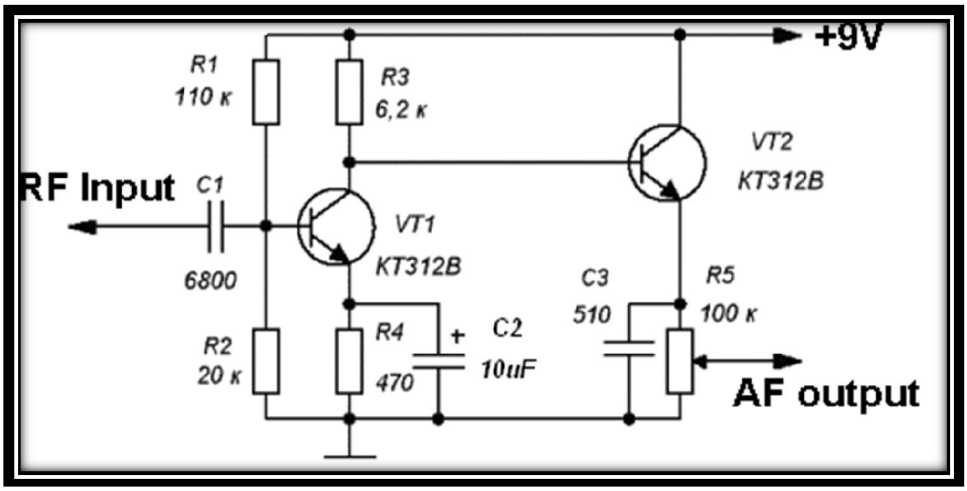
Sensitivity to the image frequency can be minimised only by

- A filter that precedes the mixer or
- A more complex mixer circuit that suppresses the image. In most receivers this is accomplished by a band pass filter in the RF front end. In many tuneable receivers, the band pass filter is tuned in tandem with the local oscillator.

Image rejection is an important factor in choosing the intermediate frequency of a receiver. The farther apart the band pass frequency and the image frequency are, the more the band pass filter will attenuate any interfering image signal. Since the frequency separation between the band

pass and the image frequency is $2f_i$, a higher intermediate frequency improves image rejection. It may be possible to use a high enough first IF that a fixed-tuned RF stage can reject any image signals.

Search a circuit for Transistor AM detector.



What can you comment about the selectivity of RF section?

Radio frequency (RF) radiation is a subset of electromagnetic radiation with a wavelength of 100 km to 1 mm, which is a frequency of 3 kHz to 300 GHz, respectively. This range of electromagnetic radiation constitutes the radio spectrum and corresponds to the frequency of alternating current electrical signals used to produce and detect radio waves. RF can refer to electromagnetic oscillations in either electrical circuits or radiation through air and space. Like other subsets of electromagnetic radiation, RF travels at the speed of light.

Why it is feasible to convert frequencies from RF range to IF (intermediate frequency) range.

In communications and electronic engineering, an intermediate frequency (IF) is a frequency to which a carrier frequency is shifted as an intermediate step in transmission or reception. The intermediate frequency is created by mixing the carrier signal with a local oscillator signal in a process called heterodyning, resulting in a signal at the difference or beat frequency.

Intermediate frequencies are used in superheterodyneradio receivers, in which an incoming signal is shifted to an IF for amplification before final detection is done.

Compare the characteristics of Microwaves, Radio waves, Infra red , X rays and Gamma rays and draw a complete table to support your answer.

RADIO WAVES:

1. They have longest wavelengths in EM spectrum
2. Radio waves are Omni-directional. They travel in all the directions.
3. They are used for public communication.

MICROWAVES:

1. Microwaves are good for transmitting information from one place to another because microwave energy can penetrate haze, light rain and snow, clouds, and smoke.
2. Microwaves are always used for private & secure purposes.
3. Microwaves are not Omni-directional.

INFRA-RED:

To make infrared pictures like the one is shown we can use special cameras and film that detect differences in temperature, and then assign different brightness or false colors to them. This provides a picture that our eyes can interpret.

X-RAYS:

X-Rays play an important role in many facets of human life ranging from medical applications to spectroscopy in astrophysics.

Gamma Ray:

Gamma-rays have the smallest wavelengths and the most energy of any other wave in the electromagnetic spectrum. These waves are generated by radioactive atoms and in nuclear explosions. Gamma-rays can kill living cells, a fact which medicine uses to its advantage, using gamma-rays to kill cancerous cells.

LAB Assignment No. 9:

TO STUDY THE OPERATION OF A DIODE DETECTOR

APPARATUS:

Oscilloscope DSB/SSB Traine

Power supply Connecting leads

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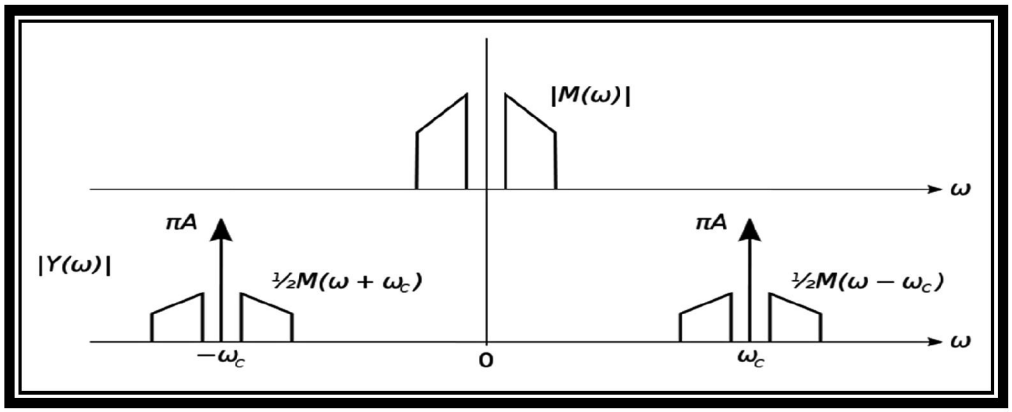
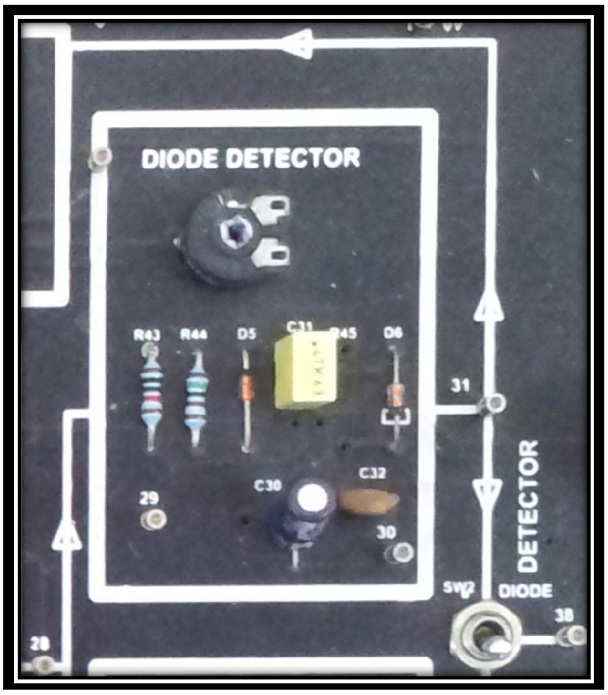
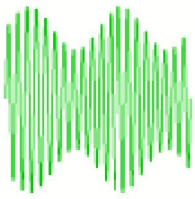
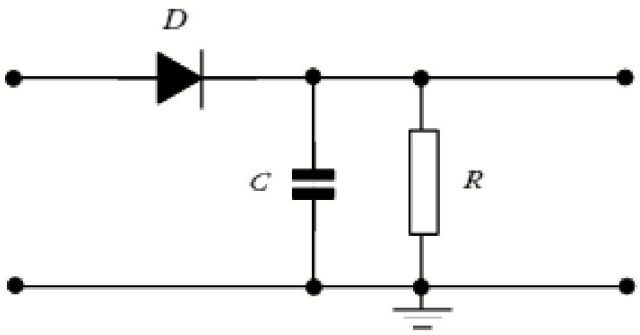




A diode detector is simply a diode between the input and output of a circuit, connected to a resistor and capacitor in parallel from the output of the circuit to the ground. If the resistor and capacitor are correctly chosen, the output of this circuit should approximate a voltage-shifted version of the original (baseband) signal. A simple filter can then be applied to filter out the DC component.

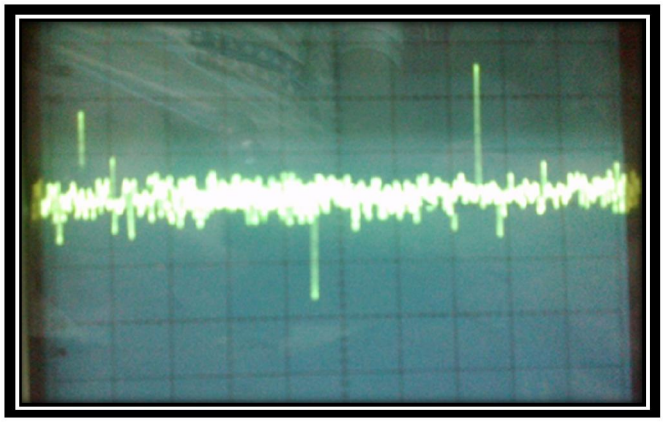


Input, $s\{t\}$



Output, $m\{t\}$

OBSERVED WAVEFORMS:

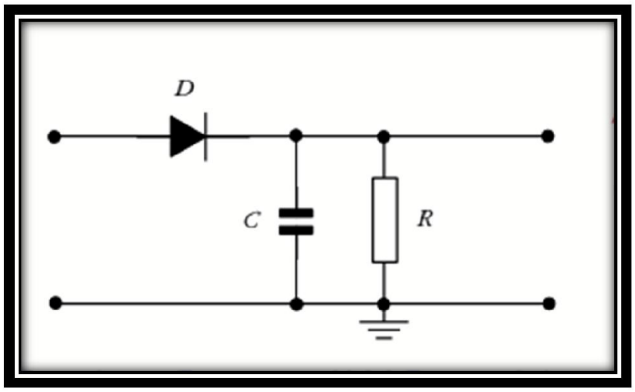


What is a diode detector? How do you design a diode detector?

A diode detector is simply a diode between the input and output of a circuit, connected to a resistor and capacitor in parallel from the output of the circuit to the ground. If the resistor and capacitor are correctly chosen, the output of this circuit should approximate a voltage-shifted version of the original (baseband) signal. A simple filter can then be applied to filter out the DC component.

What are different types of diode detector configuration?

In a diode detector the diode is connected to a parallel combination of the capacitor and resistor. When the diode is in forward biased, it will conduct. Otherwise the storage voltage of the capacitor will conduct.



What is the limitation of the diode detector circuit?

The limitation of diode detector circuit is that it conducts only when the diode is forward biased.

Write down advantages and disadvantages of Diode detector?

A diode detector connects a circuit's input and output. The diode detector also attaches to a capacitor and resistor from the circuit's output, running to the ground. This is the simplest form of a device known as an envelope detector, which is commonly used to take incoming AC and convert it into a smoother DC wave. Diode detectors have a number of applications controlling the flow of not only electrical current but other forms of energy, for everything from powering your house to delivering medicine dosage.

If we increase the value of RC, what will happen to the received signal?

The envelope detector will essentially average the signal if the RC time constant is high enough. In this case, the signal will be held at its peak until the next pulse arises. The magnitude of the output of the envelope detector may be too small, so a baseband amplifier may be needed.

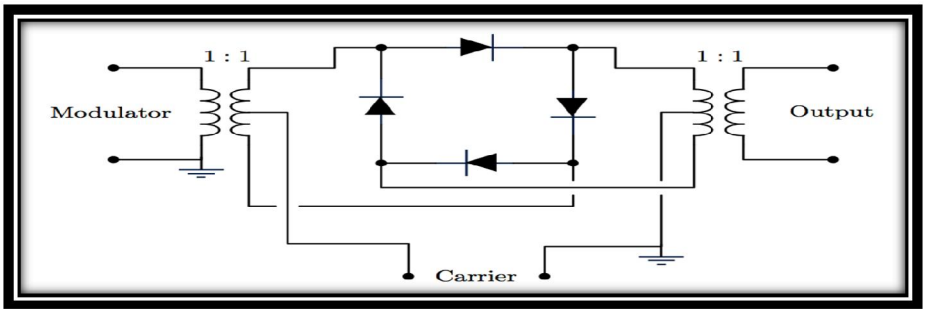
Why diode detector is called as "envelope detector and linear detector"?

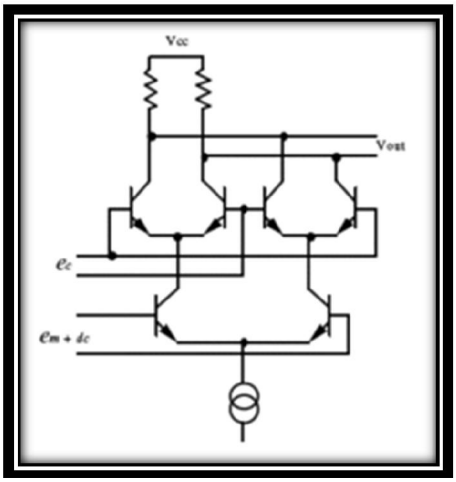
The simplest form of envelope detector is the detector. If the RC time constant is high than the curve become linear as shown above & the diode detector gives the linear waveform as shown and is known as the linear detector.

Under what conditions a DSB modulator is used as a DSB demodulator?

In order to use DSB modulator as a DSB demodulator the carrier must be reinserted at the receiver.

Draw the circuit diagrams for ring and switching modulators?





What is the difference between coherent and non coherent demodulation? What type of detection is this you used in the lab?

In many cases, we have to modulate the transmitted signal to higher frequency bands, usually known as the radio frequency (RF) bands, to suit the propagation characteristics of the communication channels. The simplest RF channel is the non-dispersive channel which changes the amplitude and phase of the transmitted signal. There are two ways to perform demodulation over the non-dispersive channel.

The first way is to estimate the phase distortion and use the matched filter as in a baseband communication system. This method is usually referred to as coherent demodulation. The second approach, known as noncoherentdemodulation, is to avoid using the phase information in the demodulation process at all.

LAB Assignment No. 10:

TO STUDY THE SINGLE SIDEBAND AM GENERATION

APPARATUS:

Oscilloscope DSB/SSB Traine

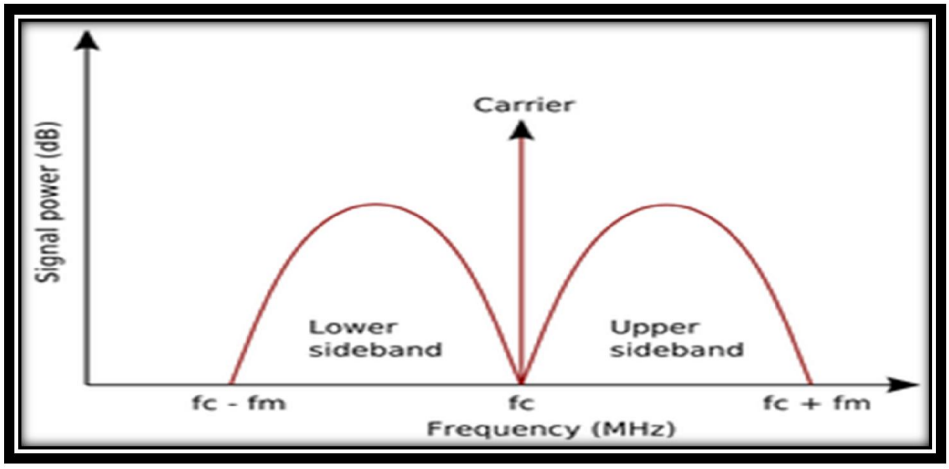
Power supply Connecting leads

THEORY:

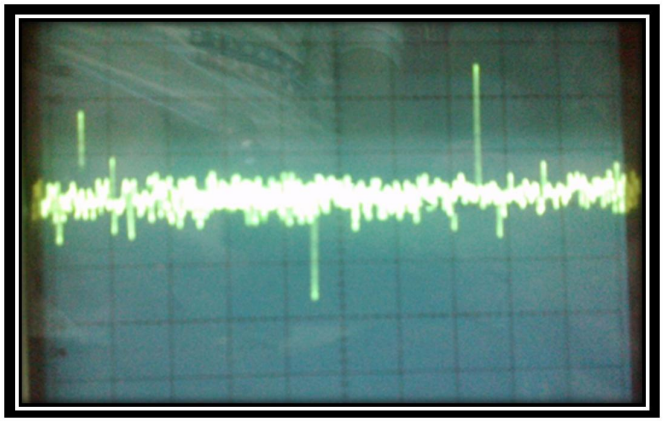
A communications system is a collection of individual communications networks usually capable of interconnection and interoperation to form an integrated whole.

In electronics and telecommunications, modulation is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal which typically contains information to be transmitted.

Amplitude modulation (AM) is a technique used in electronic communication, most commonly for transmitting information via a radio carrier wave. AM works by varying the strength of the transmitted signal in relation to the information being sent.



In radio communications, single-sideband modulation (SSB) or single-sideband suppressed-carrier (SSB-SC) is a refinement of amplitude modulation that more efficiently uses transmitter power and bandwidth. Amplitude modulation produces an output signal that has twice the bandwidth of the original baseband signal. Single-sideband modulation avoids this bandwidth doubling, and the power wasted on a carrier, at the cost of increased device complexity and more difficult tuning at the receiver.



What are the different forms of AM modulation?

There are many different types of amplitude modulation i.e. Commercial amplitude modulation, DSB-SC (double sideband suppressed carrier) AM, and SSB (single sideband) AM. We are mainly concerned with the commercial amplitude modulation and the DSB-SC techniques for the purposes of this lab.

What is the basic difference between the SSB-C and SSB-SC?

SSB signal with an additional carrier is known as SSB-C. SSB signal without an additional carrier is known as SSB-SC or single side band with suppressed carrier signal.

Why we prefer SSB as compare to the DSB? Give solid reasons.

SSB is more bandwidth efficient than DSB, allowing us to send more signals on the same channel. When synchronous detection is used for SSB-SC with errors in synchronization, the resulting distortion is less serious in SSB-SC compared to DSB SC.

What is the disadvantage of SSB?

To receive SSB, the carrier has to be recreated in the receiver on exactly the right frequency. This makes SSB transmissions tricky to tune in. SSB has the nick name of "Donald Duck" because this is what it sounds like if the receiver tuning is not quite right. Also music is very difficult to tune in. This is the main disadvantage of SSB.

What are different methods used for generation of SSB? Which method is used in the lab?

The single side band (SSB) modulated waveform can be generated using two methods:

- Frequency discrimination method
- Phase discrimination method

We use frequency discrimination method in the lab for the generation of SSB.

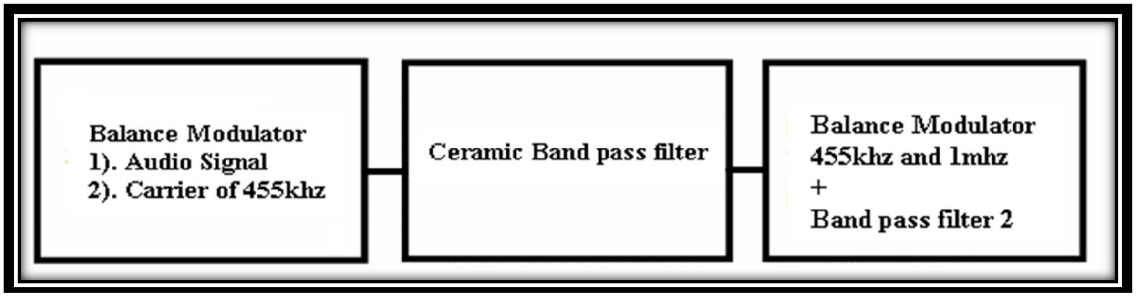
Comment on the difference in generation methods of SSB and DSB.

The two methods of SSB generation are Frequency discrimination method and Phase discrimination method.

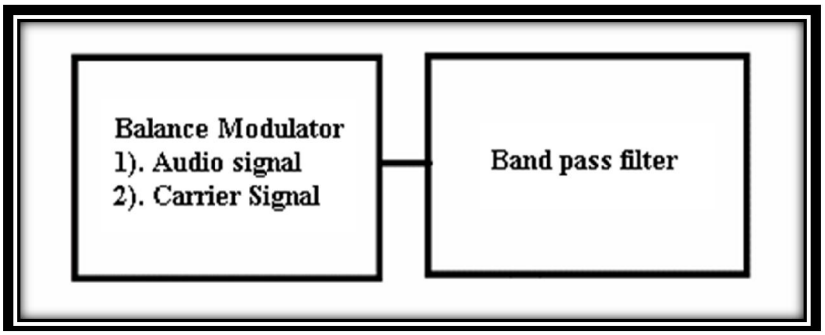
The frequency discrimination method of SSB generation is based on suppressing one of the sidebands from the double-side-band suppressed carrier (DSB-SC) modulated waveform. The second method of SSB generation, the 'phase discrimination method', is based on the time domain representation of the SSB waveform, Hence laboratory implementation of the 'phase discriminator' method of SSB generation requires two 'DSB-SC' generators, in addition to two phase shifters and an adder.

Draw the complete block diagram for the generation method of DSB and SSB you used in lab?

Block diagram for the generation SSB:



Block diagram for the generation of DSB:



In the lab, you modulated the modulating signal twice once with a high frequency carrier and then with medium frequency carrier, why did you do that, give reasons.

This is because we multiply the modulating signal with the carrier signal having frequency less than 455 kHz and separate the USB from the LSB signal. We cannot transmit the signal with this carrier so we again multiply the signal with high frequency components.

LAB Assignment No. 11:

TO STUDY THE SINGLE SIDEBAND AM RECEPTION

APPARATUS:

Oscilloscope DSB/SSB Traine

Power supply Connecting leads

THEORY:

A communications system is a collection of individual communications networks usually capable of interconnection and interoperation to form an integrated whole.

In electronics and telecommunications, modulation is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal which typically contains information to be transmitted.

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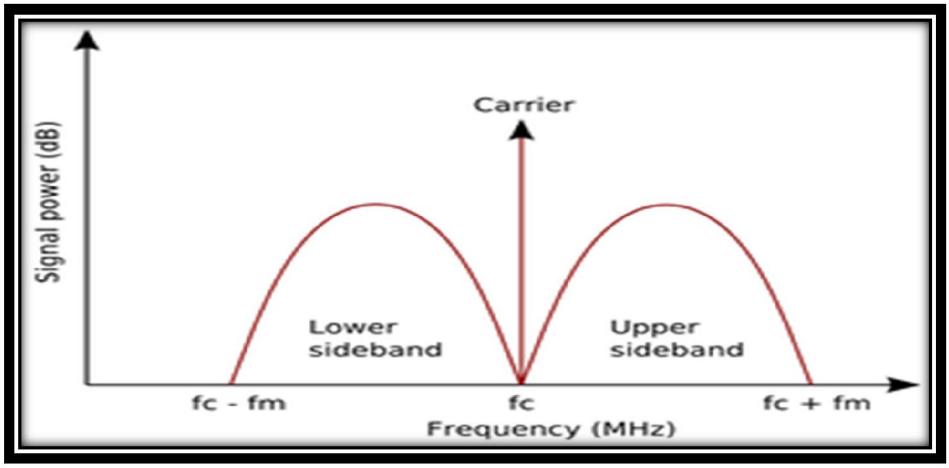

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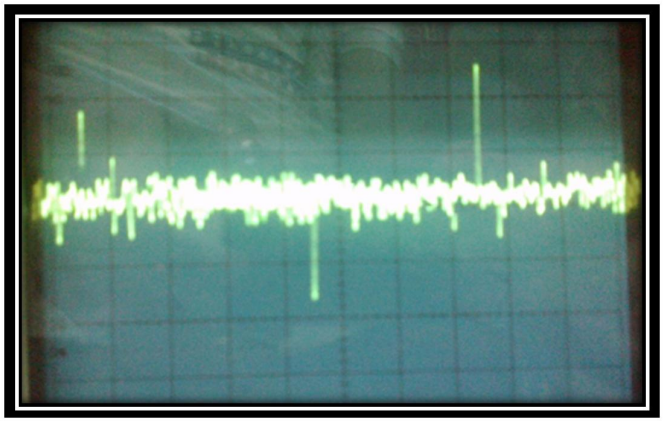


What is the use of the carrier frequency on the receiving end? How it is recovered from the transmitted signal in case of with carrier communication?

At the receiver when the modulated signal passes through the low pass filter then carrier being the high frequency signal cannot pass through the low pass filter tuned to BHz. So the original information signal is received at the receiver side and carrier is recovered at the receiver.

How higher frequency components can be removed at the receiver? In light of that what type of Low pass filter is used in the trainer, is it active or passive? Which of them is better?

A low-pass filter is a filter that passes low-frequency signals but attenuates signals with frequencies higher than the cutoff frequency.

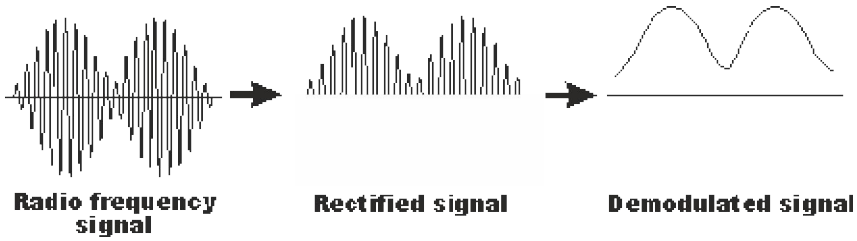
What kind of different circuits are used for AM detection?

There are two types of circuits are used for Am detection.

- Envelope detector
- Product detector

How many operations are involved in the AM demodulation?

The AM demodulation process is outlined in the diagram below. This particular example applies particularly to a diode detector.



Basics of AM demodulation / detection

When demodulating a signal, two basic steps may be considered:

- **Create baseband signal:** The main element of AM demodulation is to create the baseband signal. This can be achieved in a number of ways – one of the easiest is to use a simple diode and rectify the signal. This leaves elements of the original RF signal. When other forms of demodulation are sued, they too leave some elements of an RF signal.
- **Filter:** The filtering removes any unwanted high frequency elements from the demodulation process. The audio can then be presented to further stages for audio amplification, etc.

Why AM signals used for large distance transmission?

AM signal are used to travel the information to higher distances because it is less effected by interference and it can pass through the obstacles etc. Aerial dimensions are of the same order as the wavelength, λ, of the signal

Of all the AM generation schemes which one is used commercially and why?

VSB (vestigial side band) scheme is used because it contains the benefits of both DSB and SSB.