

2.3.4 Important points about AM transmission

1. Only sidebands contain the information.
2. Lower and upper sideband are identical. Only one sideband is enough to recover the original signal.
3. Carrier component does not contain any information but constitutes $2/3$ of the total power, at full modulation ($m_a = 1$).

2.3.5 Advantages and disadvantages of AM.

a) Advantages :

1. Simple with proven reliability.
2. Low cost.

b) Disadvantages :

1. Wastage of power as most of the transmitted power are in the carrier component which does not contain information. When $m_a = 1$, $2/3$ of the power is wasted.
2. AM requires a bandwidth which is double to audio frequency.
3. Noisy.

2.3.6 AM transmission techniques

(a) Double Sideband Suppressed Carrier (DSB - SC):

It is a technique where it is transmitting both the sidebands without the carrier i.e. the carrier is being suppressed.

$$v_{DSB}(t) \propto [\cos(\omega_c - \omega_m)t + \cos(\omega_c + \omega_m)t]$$

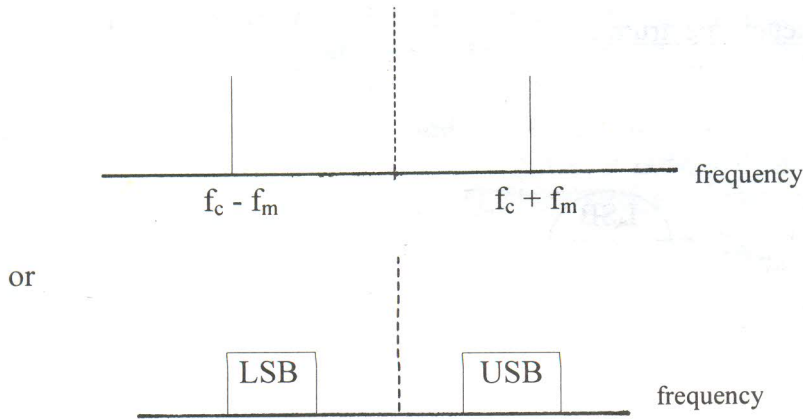
DSBSC - Spectrum Frequency:

Figure 2.9 Frequency spectrum of a Double Sideband Suppressed Carrier System

- i) Power content in DSB : \leq Power as in standard AM.
- ii) Bandwidth : same as in standard AM.
- iii) Disadvantages of DSB : Receiver is complex and expensive.
It requires the re-insertion of the carrier at the receiving end. The carrier must be of the correct frequency and phase as the original carrier.

(b) Single Sideband (SSB)

As both DSB and standard AM waste a lot of power and occupy large bandwidth, SSB is adopted. SSB is a process of transmitting one of the sidebands of the standard AM by suppressing the carrier and one of the sidebands.

Advantages

- Considerable saving of power .
- Increase signal to noise ratio, which increases the efficiency.
- bandwidth requirement is reduced by 50 %, which reduces frequency congestion

Disadvantage

- complex circuitry , as it requires frequency stability.

Figure 2.10 shows an SSB frequency spectrum.

SSB frequency spectrum :

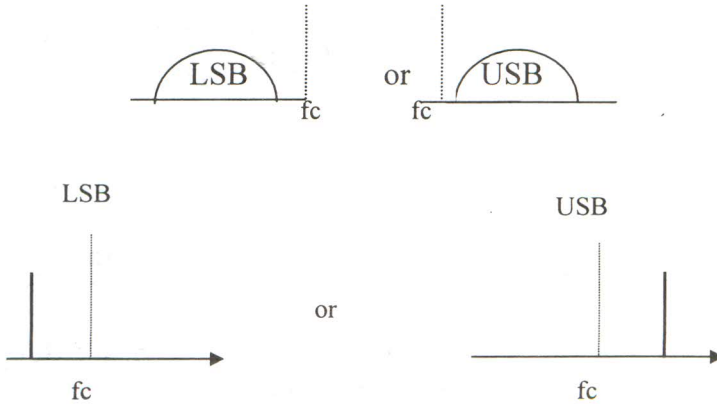


Figure 2.10 Frequency spectrum of a Single Sideband System

SSB Applications :

- i. SSB is used in the systems which require minimum bandwidth such as telephone multiplex system and it is not used in broadcasting.
- ii Point to point communications at frequency below 30 MHz - amateur radio, mobile communications, military and navigation radio, where power saving is needed.

(c) Vestigial Sideband (VSB)

VSB is a technique AM transmission where the carrier, one sideband and a part of the other sideband, are transmitted.

VSB applications:

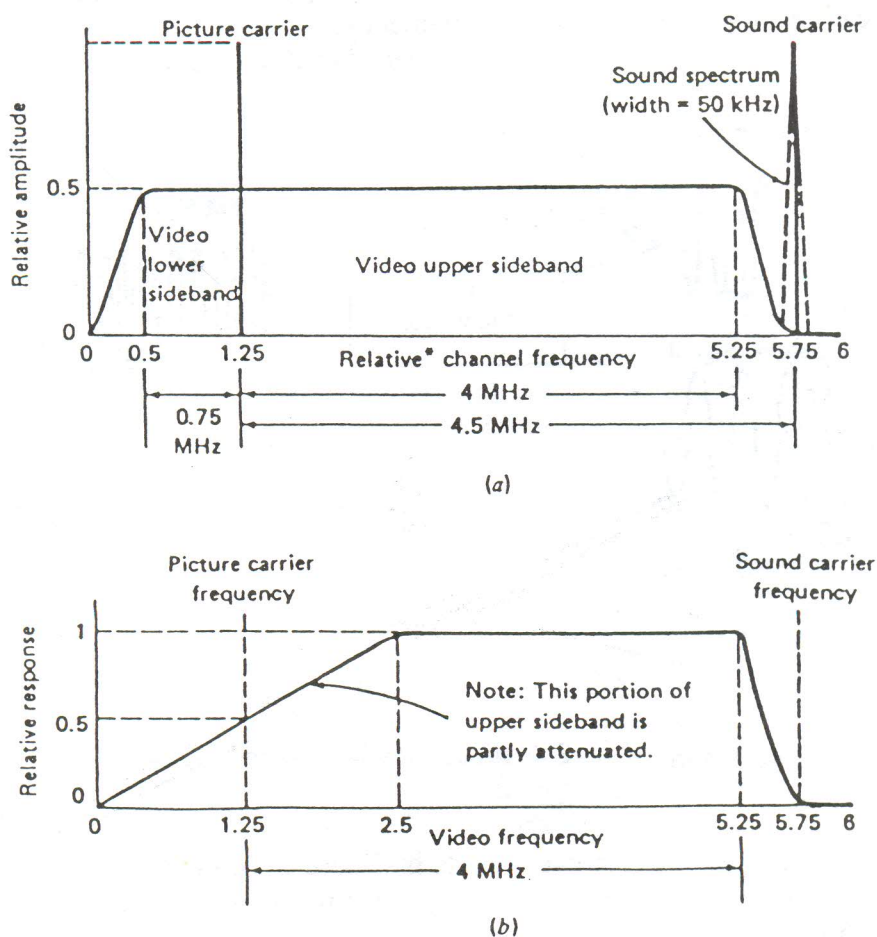
VSB is mainly used in TV broadcasting for their video transmissions. TV signal consists of :

- i) audio signal - is transmitted by FM
- ii) video signal - is transmitted by VSB

A video signal consists a range of frequencies and the maximum frequency is as high as 4.5 MHz . If it is transmitted using the conventional AM system , the required bandwidth is 9.0 MHz (i.e. $2f_{m(max)}$). But according to the standardization , TV signal is limited to 6 MHz only.

So , to reduce to 6 MHz bandwidth , a part of the LSB is not transmitted. In this case, SSB transmission is not applied as it is very difficult to suppress a sideband accurately at high frequency.

The frequency spectrum for the above signal is as shown in figure 2.11.



* That is, 0 corresponds to 82 MHz in Channel 6, 174 MHz in Channel 7, and so on.

Figure 2.11 Frequency spectrum of a Vestigial Sideband