Vestigial SideBand (VSB) Signals:

1. These are the modification of DSB and SSB. Whereas the **generation of DSB** signals requires twice the signal bandwidth and **generation of SSB** signals require unrealizable filters, **VSB** signals are easy to generate and have bandwidth slightly more than half of the DSB signals (25 - 33% greater than that of SSB signals).

2. These signals are produced by passing DSB signals through **vestigial shapin filters,** which in turn passes some of the **lower (or upper)** sideband and most of the **upper (or lower)** sideband.

3. In VSB modulation, one passband is passed almost completely whereas only a residual portion of the other sideband is retained in such a way that the demodulation process can still **reproduce** the original signal.

4. To recover original signal from the VSB signal, synchronous demodulation is used at the reciever, i.e. the VSB signal is multiplied by the sinusoid of the same frequency and phase as the one used during modulation of the original signal.

5.Since VSB signals with a carrier signal(VSB+C) are intermediate between SSB+C and DSB+C, the **added carrier** required in VSB is larger than that required in Amplitude Modulation (AM), but smaller than that in SSB+C.

6. By looking at the fact that Single Sideband signals with carriers(SSB+C) has a very **low power efficiency,** and use of SSB signals increases the receiver cost and DSB signals need bandwidth twice of the transmitted signal, In **television broadcasting,** video signals have a large bandwidth and they contain enough power in low-frequency region, that one sideband can't be suppressed completely. In this case when both SSB and DSB signals seem to be difficult option to choose, use of Vestigial signals plays and important role. The **vestigial shaping filter** cuts off the lower sideband frequency gradually below the carrier frequency. The resulting spectrum bandwidth is lower than DSB bandwidth.

If spectrum of the modulating signal say m(t) is M(w), then spectrum of the VSB signal is given by

V(w) = [M(w-w')+M(w+w')]H(w); where w' is the carrier frequency and H(w) is the **vestigial shaping filter** .

Demodulated signal is given as:

e(t)=2V(t)cos(w't) ; where V(t) is VSB signal