IS-6-What is AM, DSB, and SSB K6SQN

Single Sideband is a method of reducing band space and increasing the efficiency of the transmission. Amplitude modulation requires 100% carrier power and 50% audio power. In other words, 2/3 of the transmission power is in the carrier and 1/3 of the power is in the sidebands, 1/6 in each. Assuming a 100 Watt AM carrier, the power in each sideband would be just 16 Watts. The carrier would be transmitted continually, even when you are not talking. The sidebands are only present when you are talking. Thus, with SSB and DSB, where the carrier is eliminated, the only power required, and transmitted, is when you are talking. Less bandwidth is required with SSB for communications since only one sideband is transmitted. A bonus, the sideband power can be raised to what the carrier power used to be, a six fold power increase in transmission.

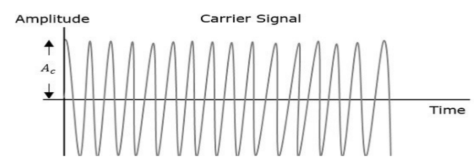


Figure 1 represents a carrier wave as seen on an oscilloscope. Let's assume this is a ham band frequency of 14.250 MHz. The frequency is constant but its amplitude can be controlled by a "base band" frequency such as a tone or several tones as found in speech.

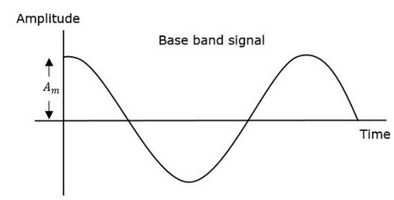


Figure 2 represents a single audio tone. Let's assume this is 3000 Hz. This is your base band frequency. During the modulation process its positive changes increases the amplitude of the carrier. During its negative changes it decreases the carrier amplitude.

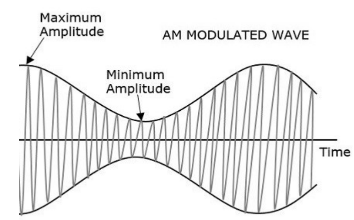
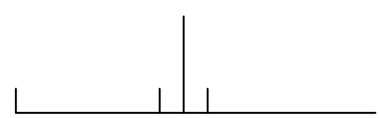


Figure 3 represents the amplitude modulated carrier wave. The base band frequency has increased and decreased the amplitude of the carrier wave. The maximum amplitudes are called the "crests". The minimums are called the "troughs".

Amplitude modulation produces two new frequencies. The sum and difference of the carrier and base band frequencies. 14.253MHz and 14.247 MHz. in this example. These are the "side band" frequencies. The sidebands are mirror images of each other. Each have the same 3000 Hz information. There are four frequencies at the output of an amplitude modulator, the base band, the carrier, and two side bands. In other words, 3000 Hz, 14.250 MHz, 14.253MHz & 14.247MHz.



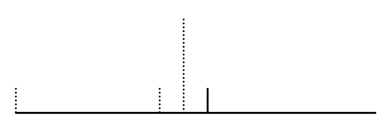


Fig. 4 represents those four frequencies as they would appear on a spectrum analyzer. The tallest line is the carrier. The lines on either side of the carrier are the upper and lower sidebands. The line at the left is the 3000Hz base band.

The sidebands carry the base band audio information. For sideband operation, carrier and base band frequencies are eliminated. A circuit called at balanced modulator does this and outputs only the upper and lower sidebands. This would be DSB, double sideband transmission. Single sideband operation requires a filter to eliminate the other sideband. Fig. 5 represents transmission of the upper sideband.

The audio information imbedded in the sideband is not detectable by itself. It needs to be extracted in a reverse procedure at the receiver. The incoming sideband frequency is mixed with the same frequency as the original carrier. Sum and difference frequencies are produced. Which are, in this example:
(sum) 14.250MHz + 14.253MHz = 28.503MHz (which is filtered out)
(difference) 14.253MHz - 14.250Mhz = 3000Hz (the audio we have recaptured and wish to keep).