

Modulation

Modulation: the process of converting data into radio waves by adding information to an electronic or optical carrier signal. A carrier signal is one with a steady waveform -- constant height, or amplitude, and frequency.

- Type of modulation in communication systems
 - Analog Modulation
 - AM (Amplitude Modulation)
 - Angle modulation
 - FM (Frequency Modulation)
 - PM (Phase Modulation)
 - Digital Modulation
 - ASK (Amplitude Shift Key)
 - FSK (Frequency Shift Key)

Communication System

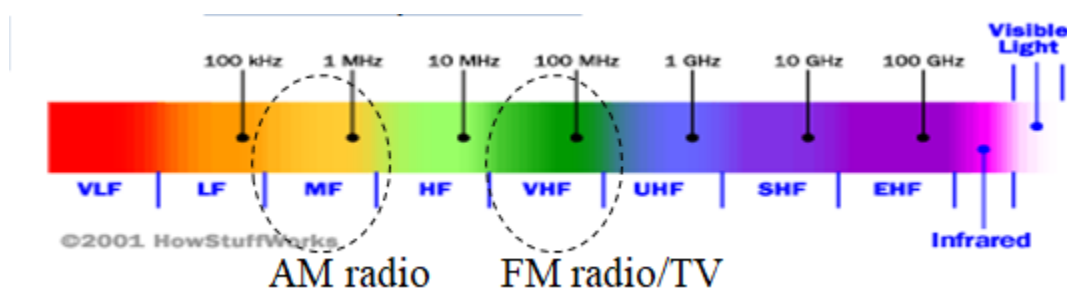
Analog Modulation

Analog Modulation: is to transmit information signals (baseband signals) through a communication channel.

The term baseband is used to designate the band of frequencies representing the original signal as delivered by the input transducer.

For example, the voice signal from a microphone is a baseband signal, and contains frequencies in the range of 0-3000 Hz.

The radio spectrum:

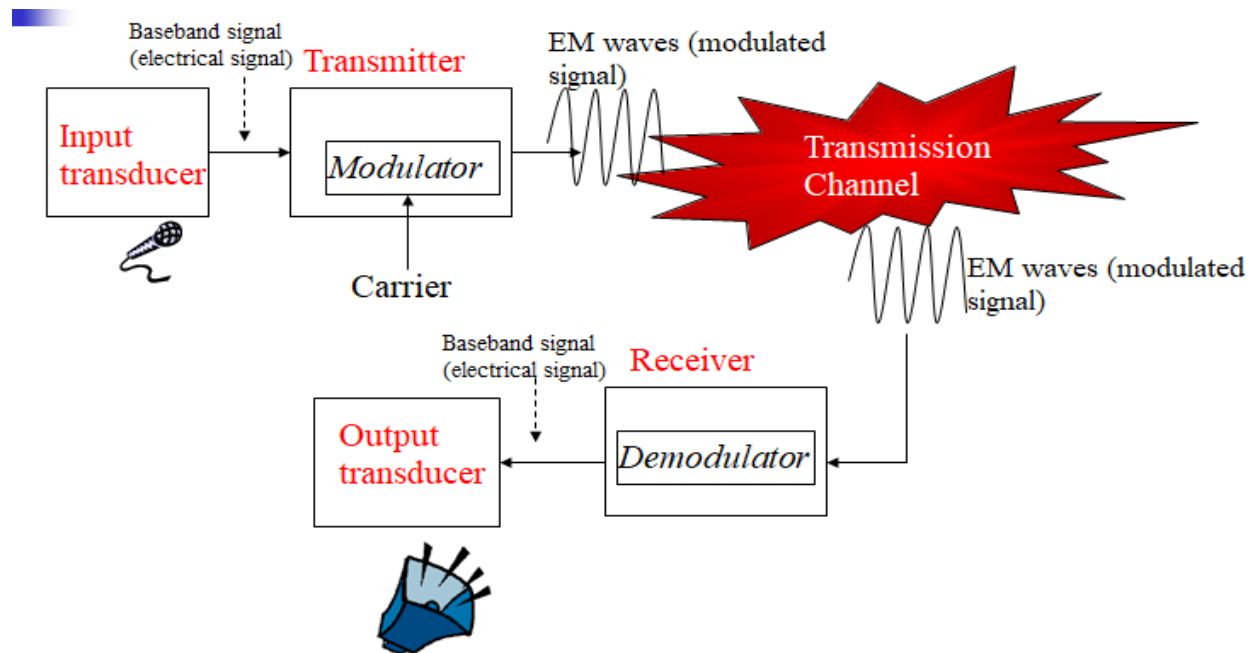


For example, an AM radio system transmits electromagnetic waves with frequencies of around a few hundred kHz (MF band)

The FM radio system must operate with frequencies in the range of 88-108 MHz (VHF band)

The transmitter block in any communications system contains the modulator device and receiver block in any communications system contains the demodulator device

Communication System



Basic analog communications system

Types of Analog Modulation

- **Amplitude Modulation (AM)**

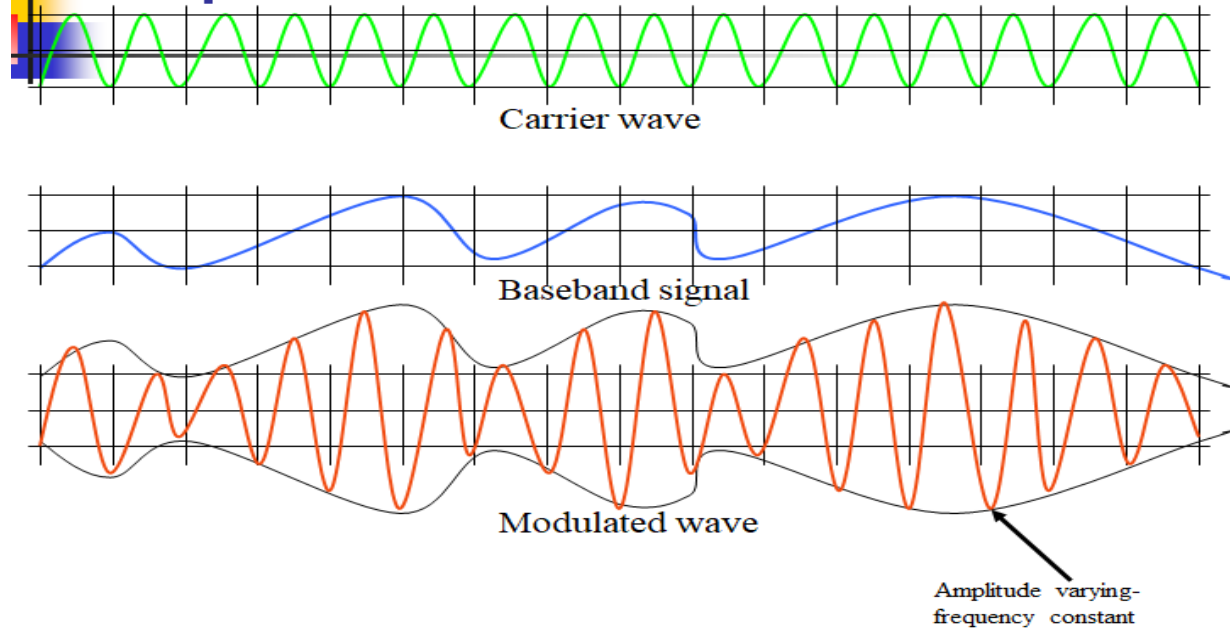
Amplitude modulation is the process of varying the amplitude of a carrier wave in proportion to the amplitude of a baseband signal. The frequency of the carrier remains constant.

- **Frequency Modulation (FM)**

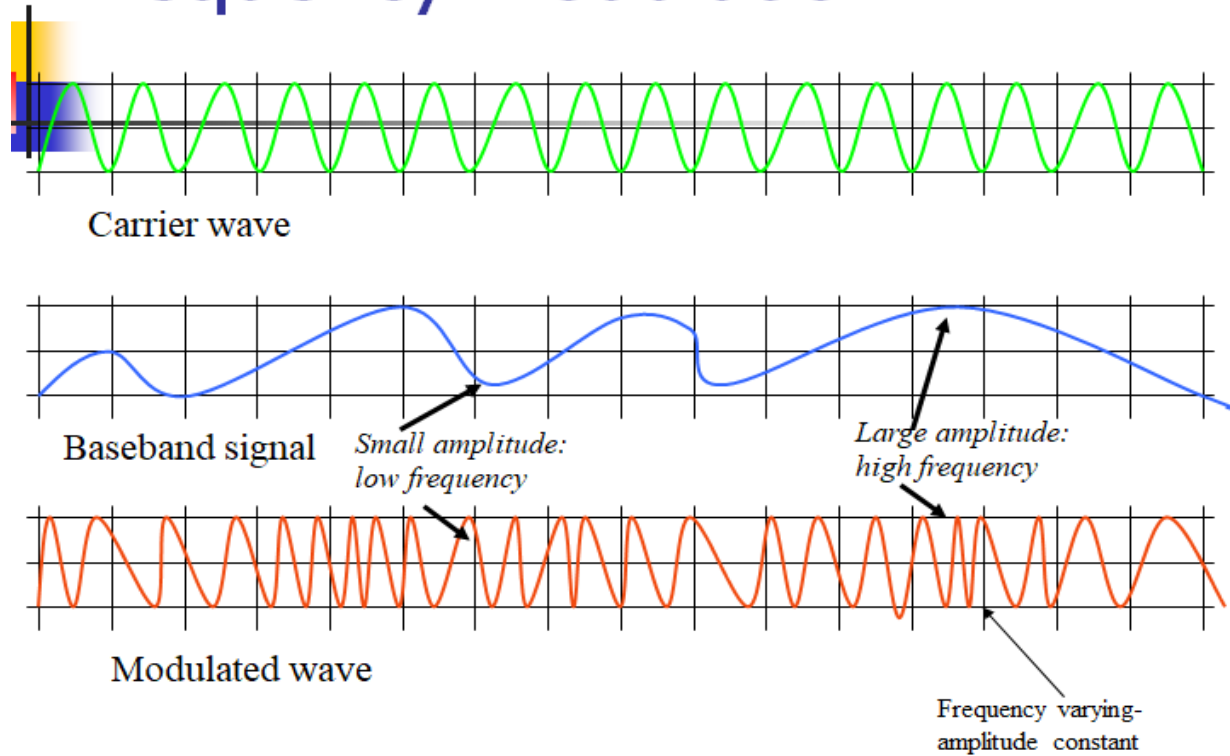
Frequency modulation is the process of varying the frequency of a carrier wave in proportion to the amplitude of a baseband signal. The amplitude of the carrier remains constant.

- **Phase Modulation (PM)** Another form of analog modulation technique

Amplitude Modulation



Frequency Modulation



Communication System

Comparison between AM and FM ?

- AM requires a simple circuit, and is very easy to generate.
- It is simple to tune, and is used in almost all short wave broadcasting.
- The area of coverage of AM is greater than FM (longer wavelengths (lower frequencies))
- The main advantage of FM is its audio quality and immunity to noise.
- The audio quality of a FM signal increases as the frequency deviation increases (deviation from the center frequency).
- The main disadvantage of FM is the larger bandwidth it requires