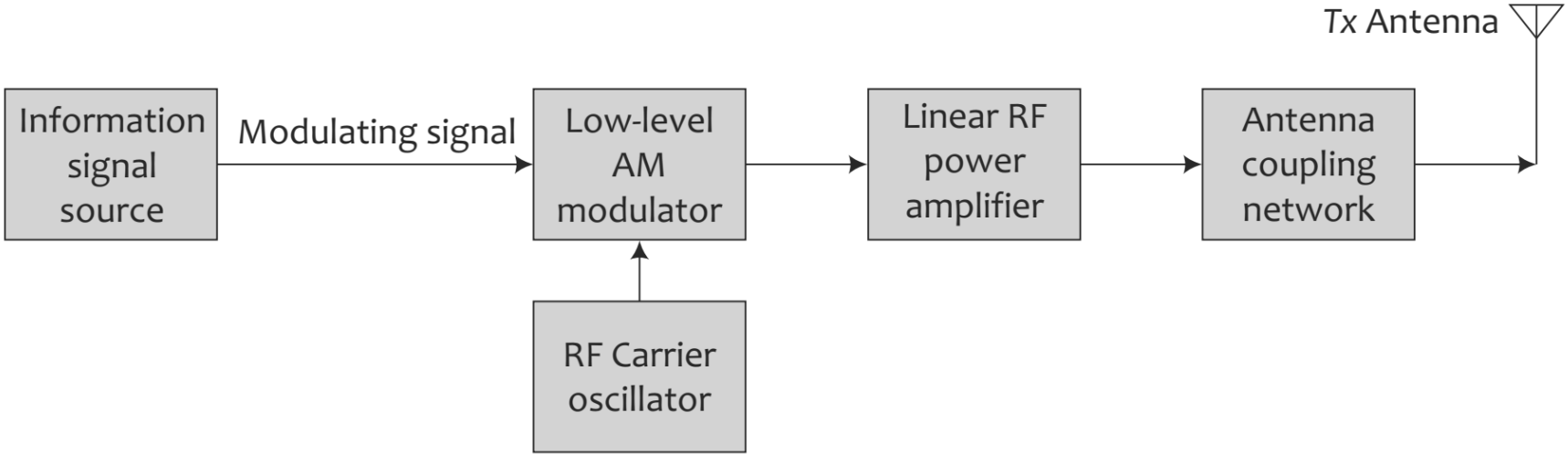
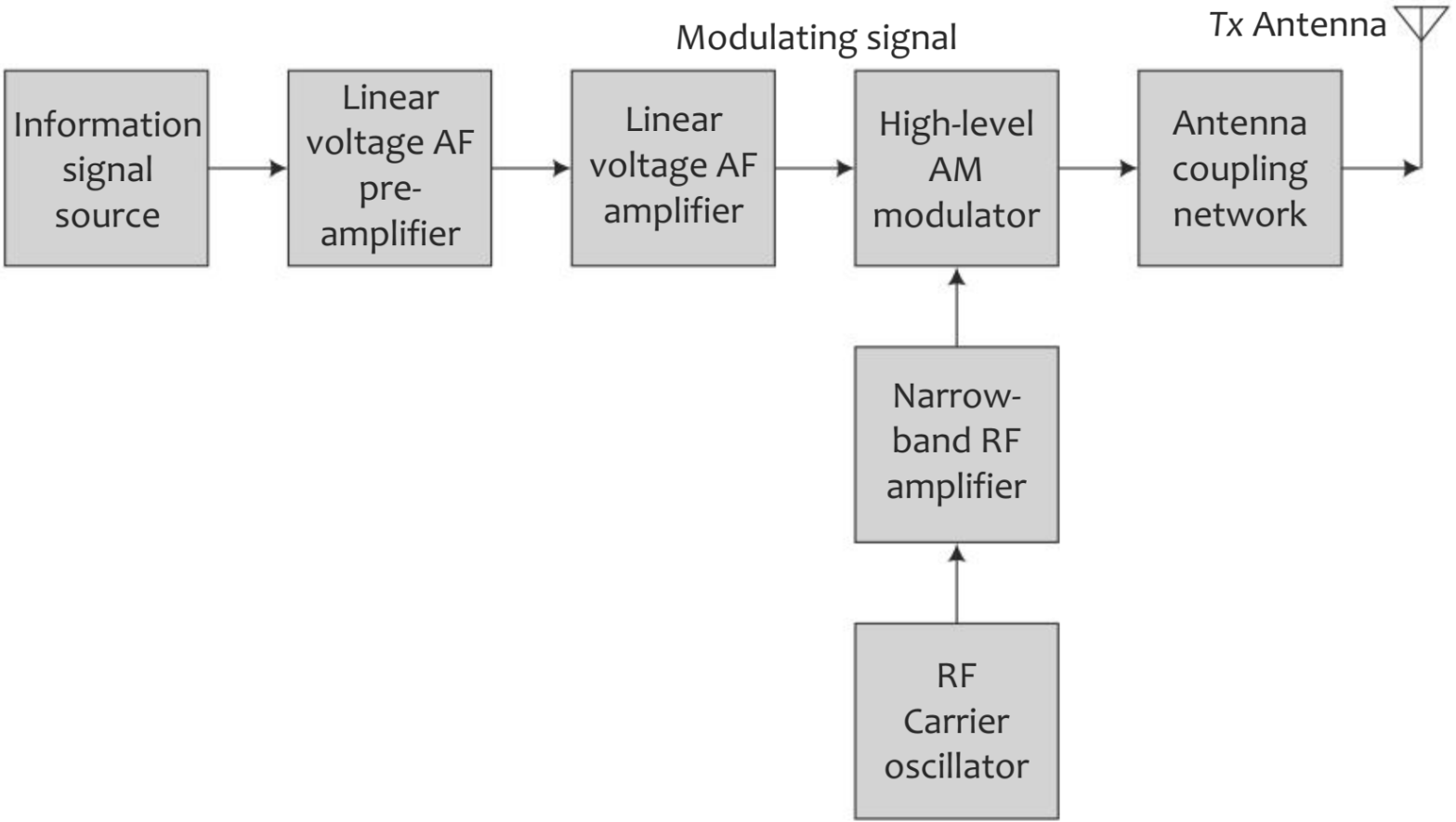
Module:5 Transmitter & Receivers

Radio transmitter - Classification of transmitters - Low level and High level AM Transmitters, FM Transmitter. Radio receiver - Receiver characteristics, Tuned Radio Frequency (TRF) Receiver, Superheterodyne receiver (AM and FM), Choice of IF and oscillator frequencies, Tracking and Alignment – AGC, AFC. Pre-emphasis and De-emphasis.

AM transmitter – Low Level



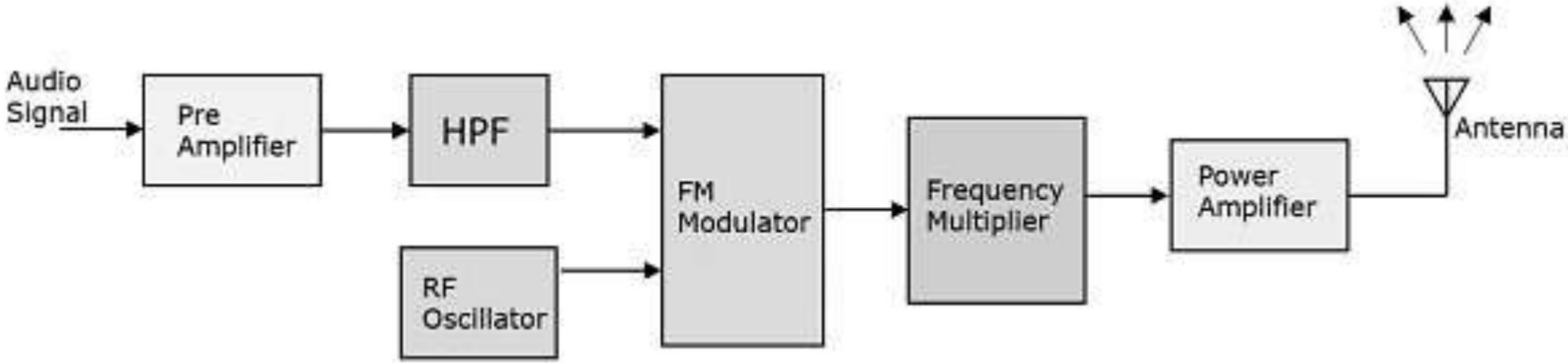
AM transmitter – High Level



AM transmitter – High Level

Low Level Modulation	High Level Modulation
This modulation is carried out at low power level.	This modulation is carried out at high power level.
Needs lesser amplifier stages	Needs more amplifier stages
After modulation linear amplifiers can only be used. This gives lower power efficiency.	Non linear amplifiers can also be used. This leads to higher power efficiency.
Power loss in amplifiers is higher, the cooling problem is severe.	The power loss is less, the cooling problem is not severe.

FM transmitter



Radio Receivers

Radio receiver is an electronic equipment which pick ups the desired signal, reject the unwanted signal and demodulate the carrier signal to get back the original modulating signal.

- Select desired signal and reject unwanted signal
- Amplify the desired R.F. signal
- Demodulate the selected amplified signal
- After demodulation, the original modulating signal is obtained which must be amplified.
- Apply the amplified demodulated signal to the loudspeaker.

Receiver Characteristics

Receiver Characteristics

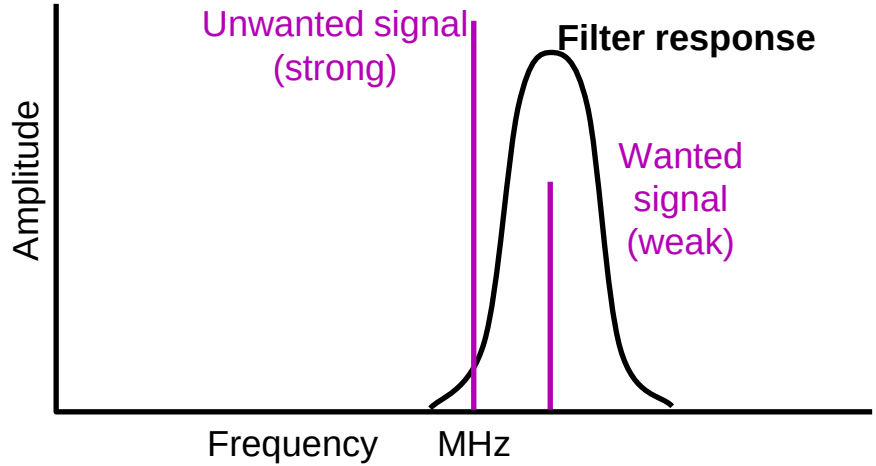
- Frequency stability
- Selectivity
- Bandwidth
- Sensitivity
- Dynamic range
- Fidelity
- Signal-to-noise ratio (SNR)

Frequency Stability

- Frequency stability is the same as for transmitters
  - Accuracy of tuning to an entered or displayed frequency
  - Ability to remain on frequency without drifting off
  - Often given in **ppm** – parts-per-million
  - 1ppm error at 28MHz is 28Hz.

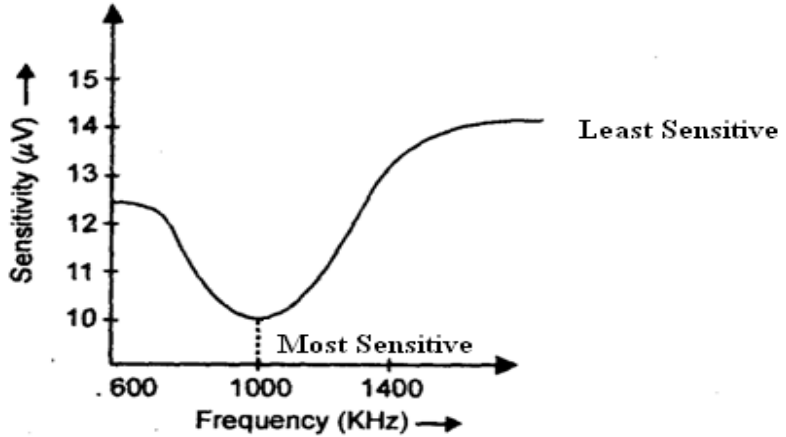
Selectivity

- Selectivity is the ability to separate the wanted signal from nearby unwanted signals (other stations)



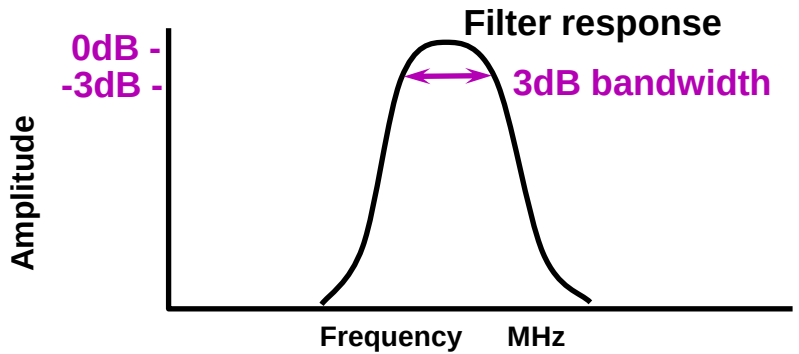
Sensitivity:-

- Ability to amplify weak signals.
- Broadcast receivers/ radio receivers should have **reasonably high** sensitivity so that it may have good response to the desired signal.
- But should **not have excessively high** sensitivity otherwise it will pick up all undesired noise signals.



Bandwidth

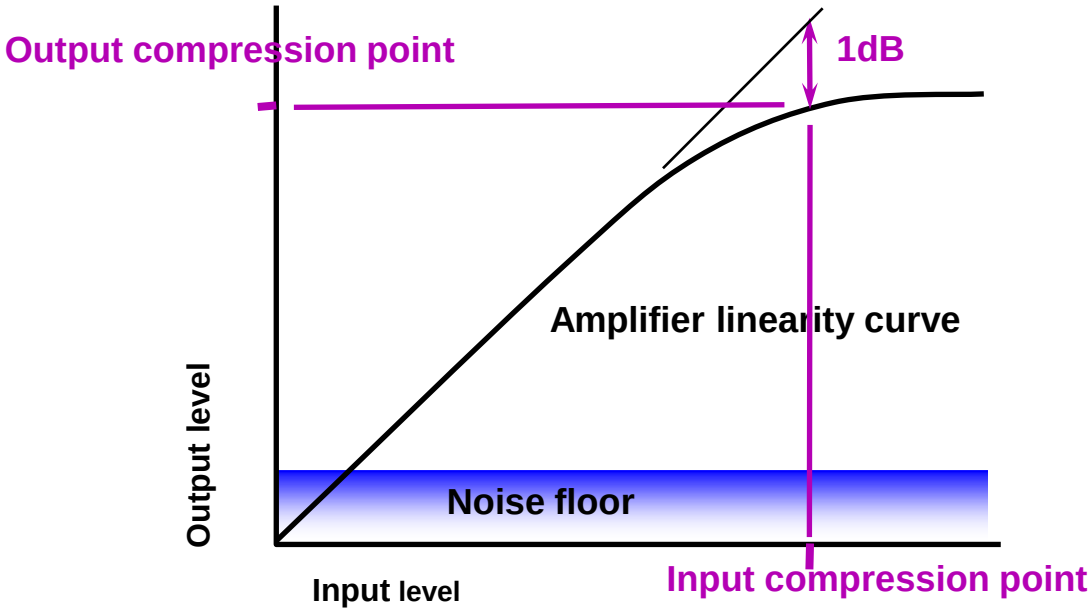
- Band of frequencies which the receiver should accept
  - SSB uses 2.5 to 3kHz
  - VHF FM typically 7.5 or 15kHz
  - Usually 3dB BW specified



Dynamic Range

- Dynamic range is the range of signal levels between the smallest and greatest a receiver can handle
  - Lower limit set by sensitivity
  - Upper limit set by distortion or AGC control range

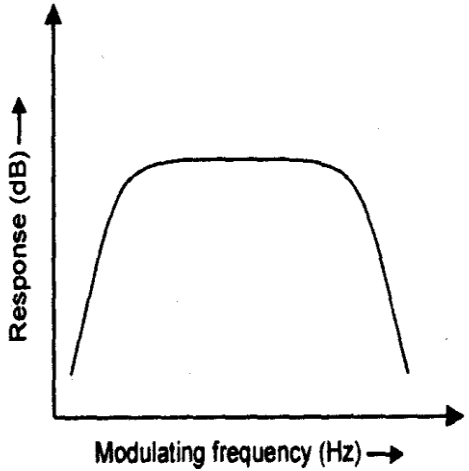
Dynamic Range



Signal to Noise Ratio

Fidelity:-

Fidelity means the ability of the receiver to reproduce correctly the various modulating frequencies components present in the input signal

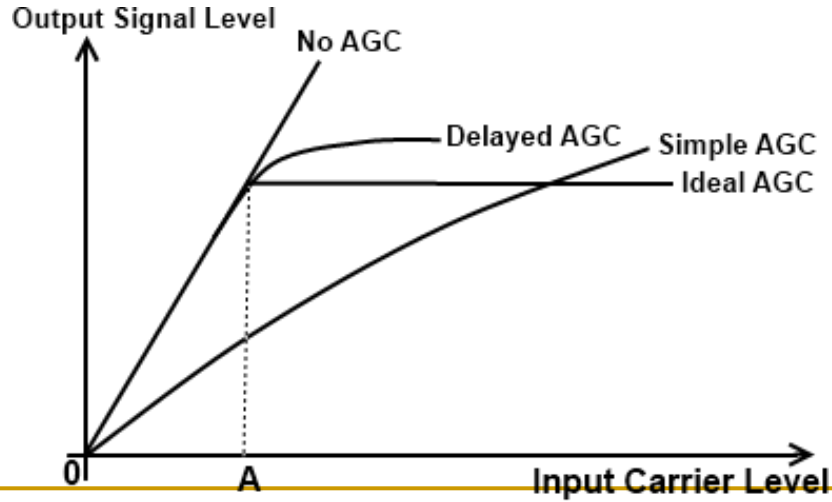


- Radio receiver should have high fidelity or accuracy.

- It is determined by the high frequency response. Therefore it should have high AF amplifier frequency response over entire audio frequency range.

Automatic Gain Control (AGC)

- AGC or AVC (Automatic Volume Control) is a system by means of which the overall gain of radio receiver is varied automatically with the variations in the strength of received signals, to maintain the output constant.



TRF (Tuned Radio Frequency) Receiver