ANALOG COMMUNICATION
Course Code: 328452(28)

Manjeet Singh Sonwani

Assistant Professor

Department of Electronics & Telecomm.

Government Engineering College Raipur

Course Contents

UNIT-I AMPLITUDE MODULATION

UNIT-II ANGLE MODULATION

UNIT-III MATHEMATICAL REPRESENTATION OF NOISE

UNIT-IV NOISE IN AM SYSTEMS

UNIT-V NOISE IN ANGLE MODULATED SYSTEMS

Text Books:

1. Principles of Communication Systems, Taub and Schilling, 2nd Edition., Tata McGraw Hill.(Unit-I,II,III,IV,V)

2. Electronic Communication Systems, George F Kennedy, Tata McGraw Hill.

(Unit-I, II)

3. Communication Systems, Simon Haykins, Wiley India

Reference Books:

1. Communication Systems Engineering, Proakis, 2nd Edition, Pearson Education.

2. Modern Digital and Analog Communication, B.P. Lathi, Oxford University Press.

3. Communication Systems (Analog and Digital), Singh and Sapre, 2nd Edition, Tata McGraw Hill

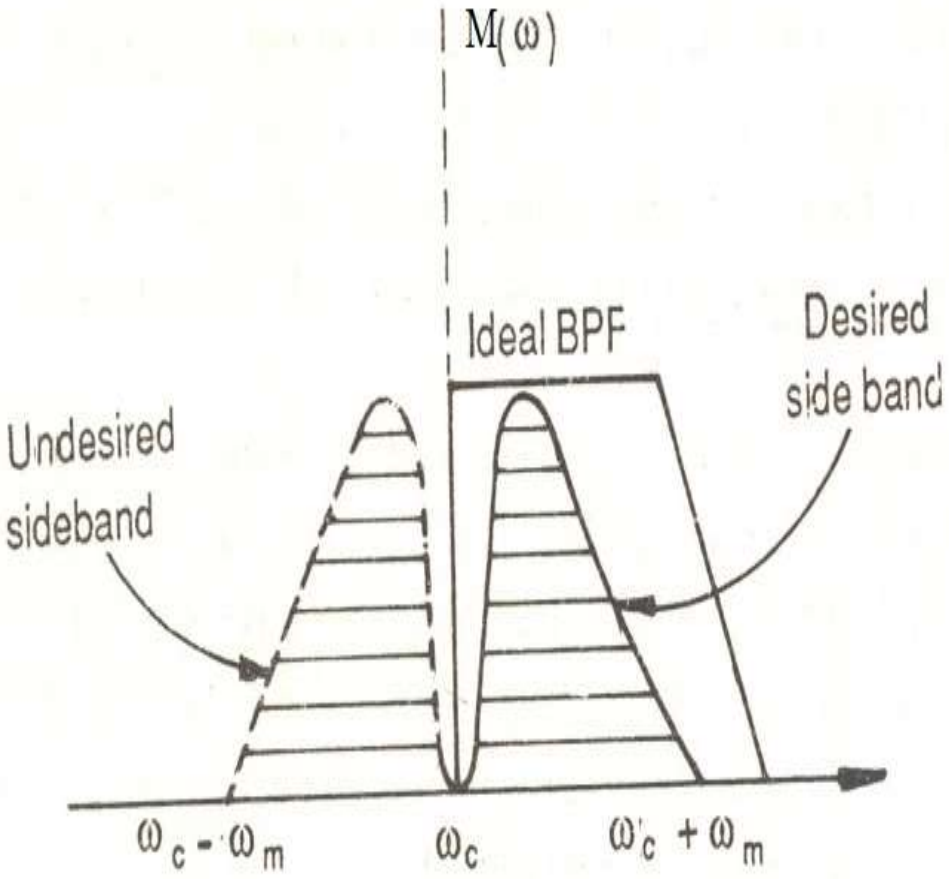
UNIT-I Amplitude Modulation

- Single-sideband modulation Applications
- Methods of generating an SSB signal
- Vestigial-sideband modulation,
- Compatible single sideband
- Multiplexing:FDM,TDM
- Radio Receivers: Receiver types: TRF receivers
- Superhetrodyne receivers
- Sensitivity , selectivity, fidelity and Image frequency and its rejection

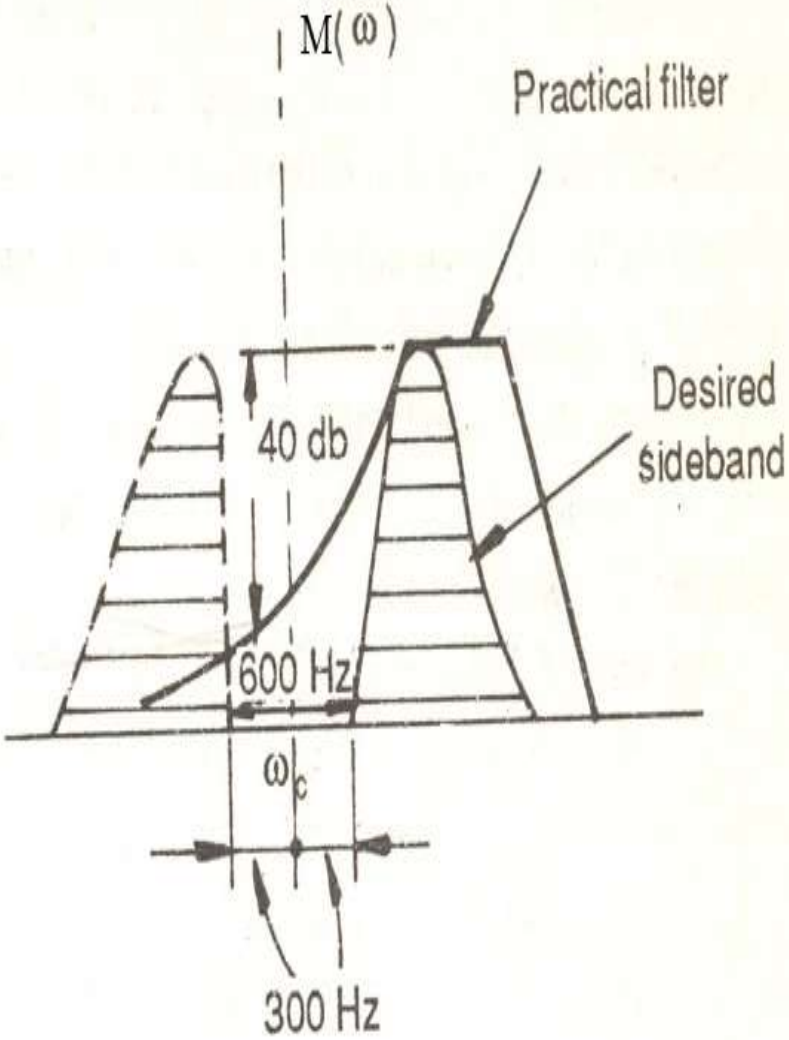
Single Sideband modulation

- A commercial radio communication system contains not only the “transmission” but also some other functions, such as:
  - Carrier-frequency tuning, to select the desired signals
  - Filtering, to separate the desired signal from other unwanted signals
  - Amplifying, to compensate for the loss of signal power incurred in the course of transmission

Single Sideband modulation

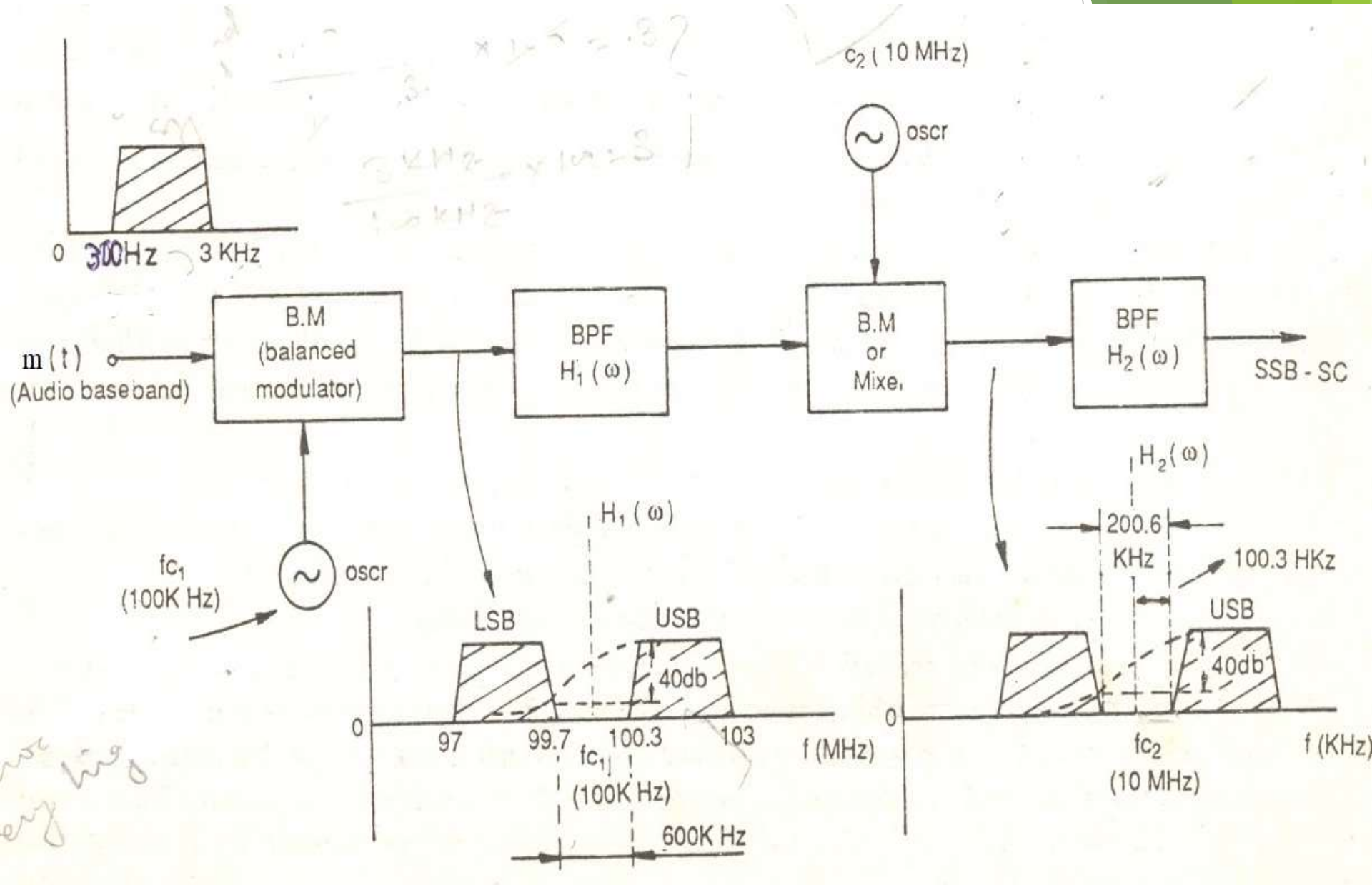


(a)

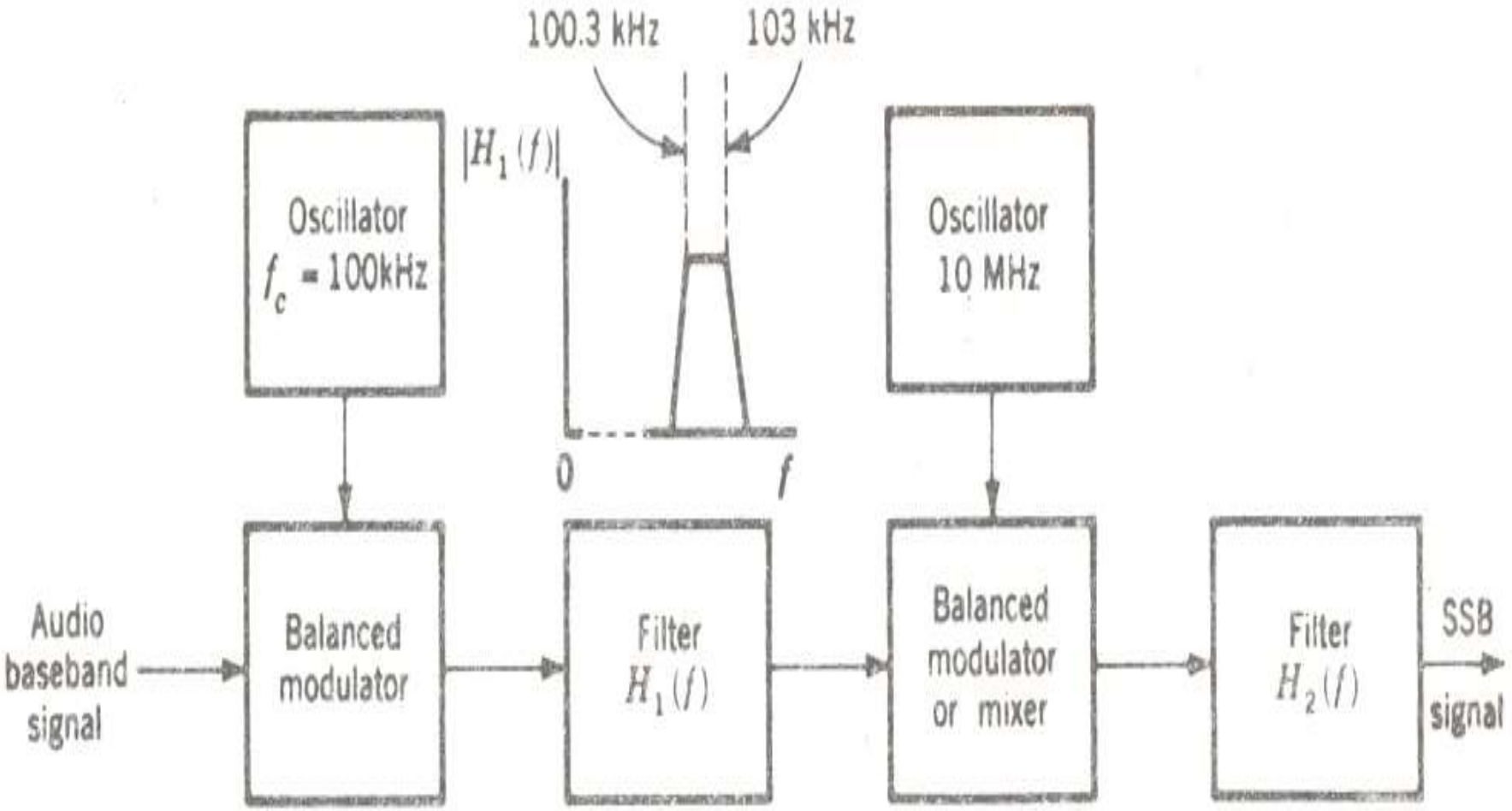


(b)

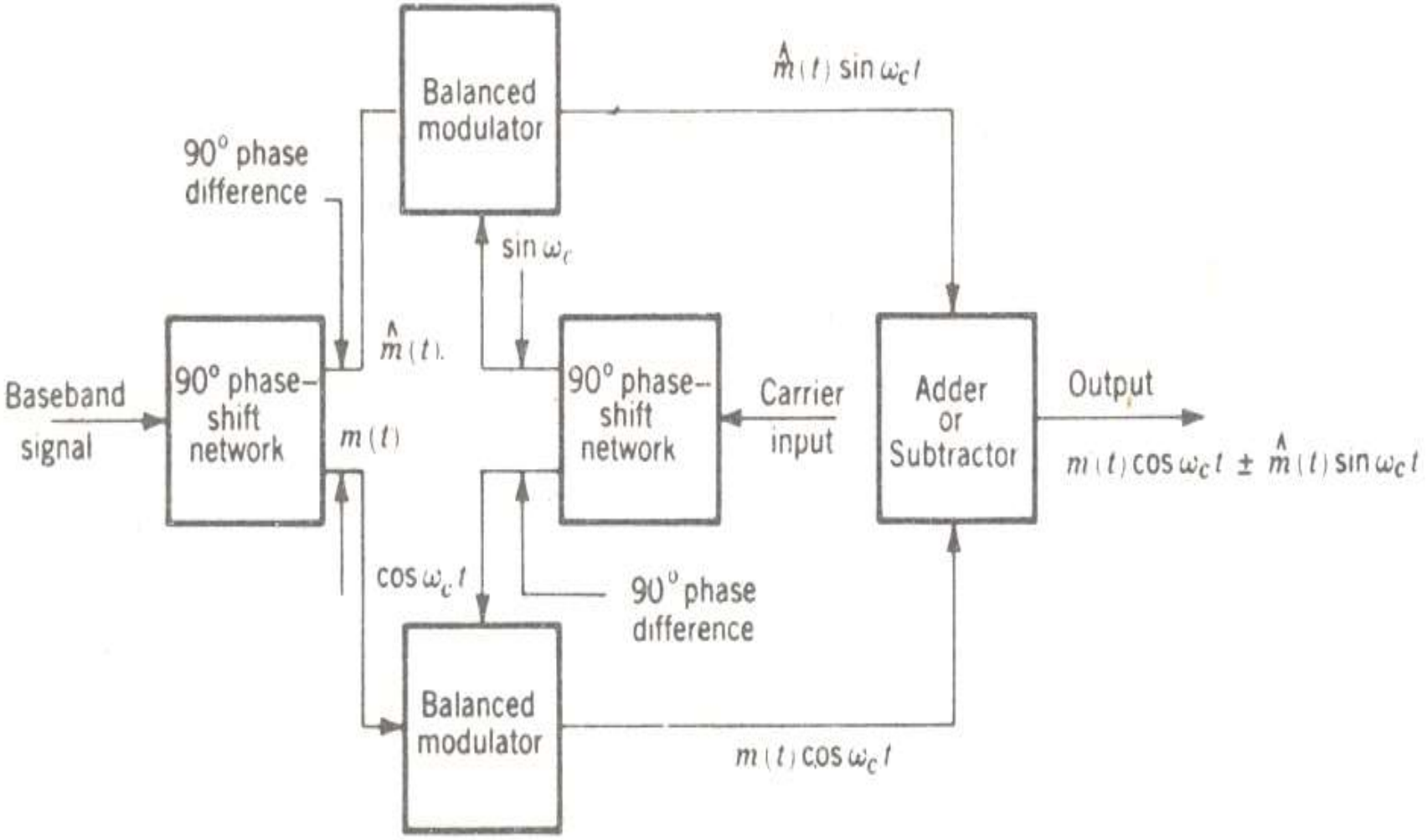
Single Sideband modulation



Methods of generating an SSB signal
First Method

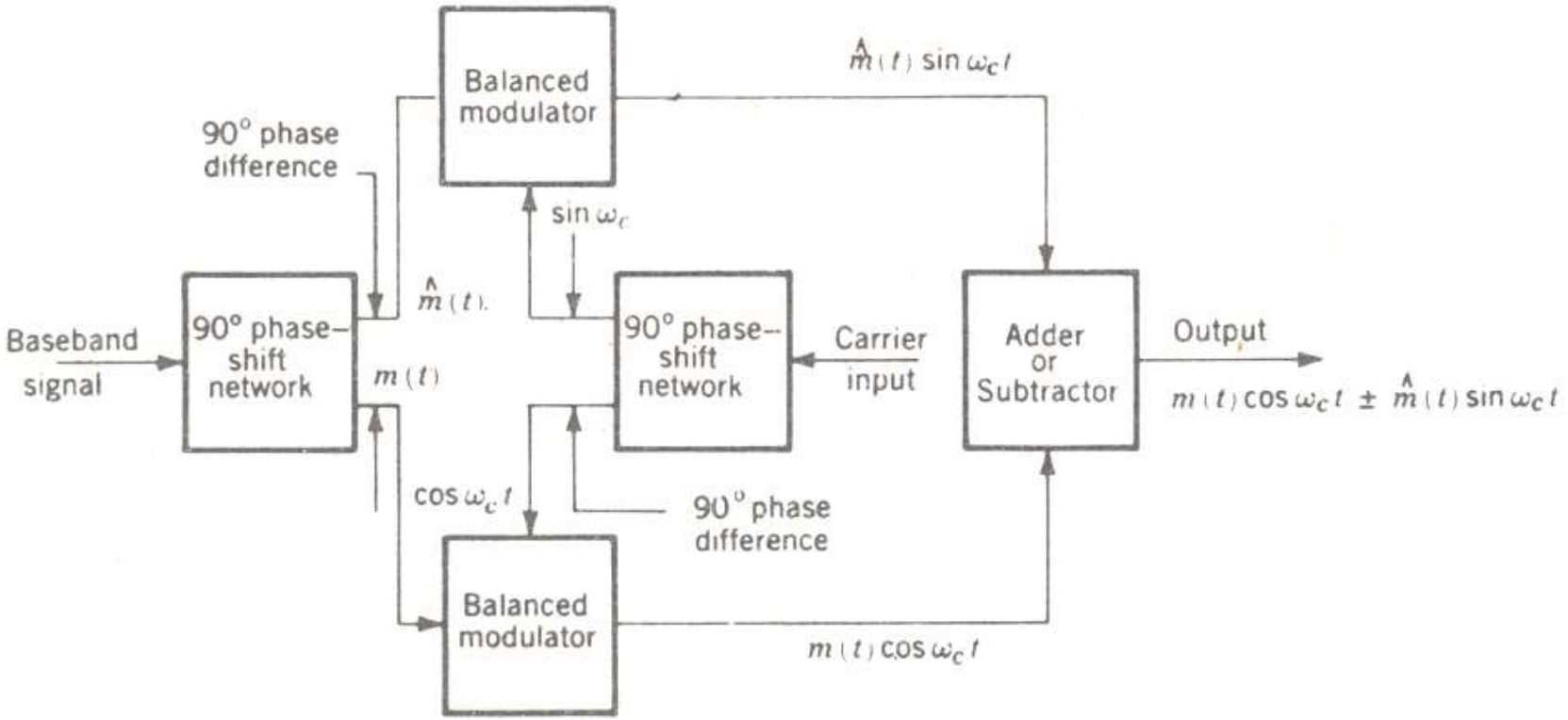


Methods of generating an SSB signal
Phasing Method



Methods of generating an SSB signal
Phasing Method

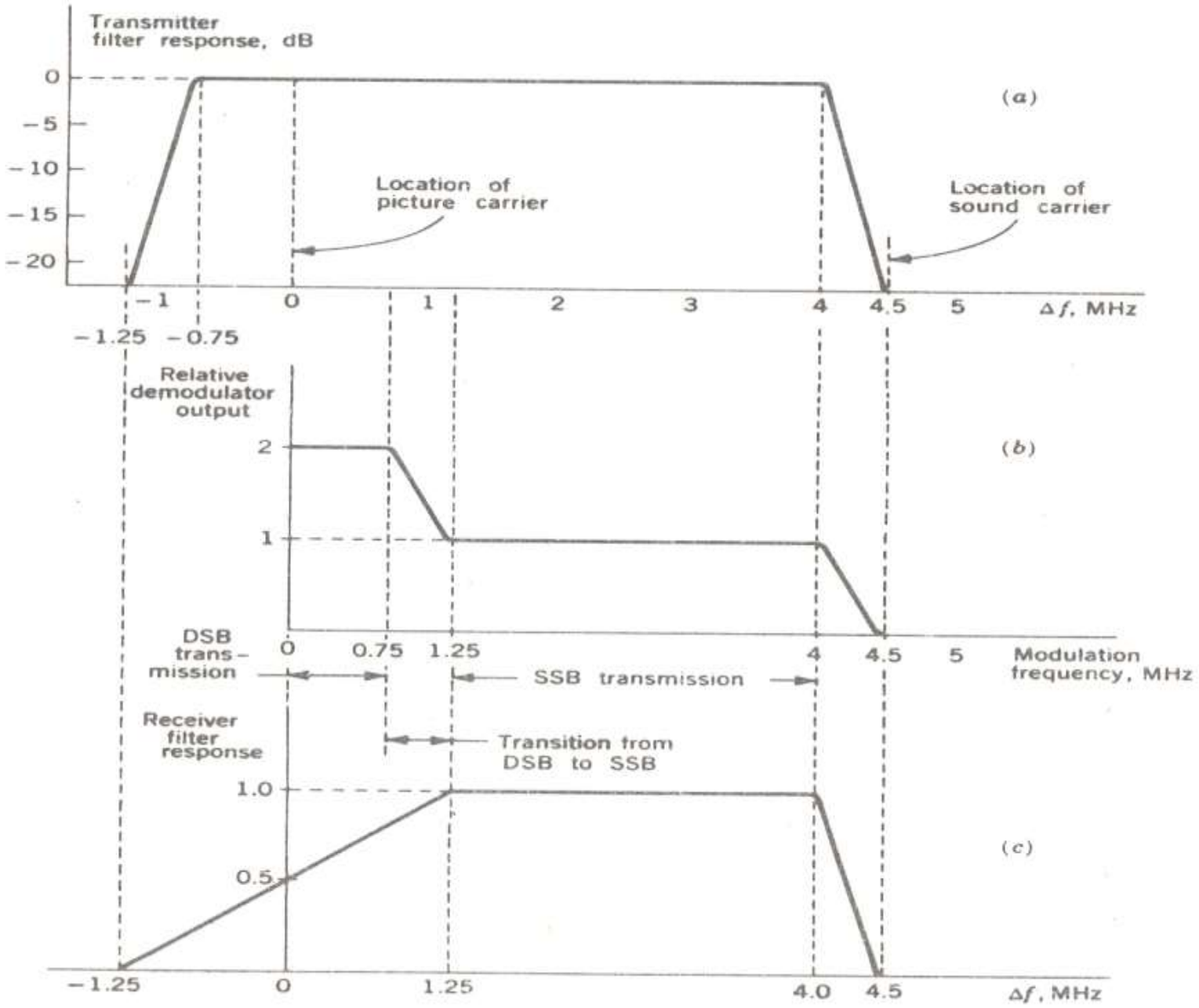
- A commercial radio communication system contains not only the "transmission" but also some other functions, such as:



Vestigial sideband Modulation

- A commercial radio communication system contains not only the "transmission" but also some other functions, such as:
- $V_{1AM}(t)=A(1+m\cos\omega_m t)\cos\omega_c t$
- $= A\cos\omega_c t +(mA/2)[\cos(\omega_c +\omega_m)t + \cos(\omega_c -\omega_m)t]$
- $V_{2AM}(t)=A\cos\omega_c t +(mA/2)\cos(\omega_c +\omega_m)t$
- $= A\cos\omega_c t +(mA/2)\cos\omega_c t.\cos\omega_m t - (mA/2)\sin\omega_c t .\sin\omega_m t$
- $= A[1+(m/2)\cos\omega_m t]\cos\omega_c t. - (mA/2)\sin\omega_c t .\sin\omega_m t$
-
- $A(t) = \sqrt{\{A^2[(1+(m/2)\cos\omega_m t)]^2 + [(mA/2)\sin\omega_m t]^2\}}$
- $= \sqrt{\{A^2(1+(m^2/4) + mA^2\cos\omega_m t\}}$
- $= A^2[(1+(m/2)\cos\omega_m t)]$

Vestigial sideband Modulation……



Radio Receiver

- In radio communications, a **radio receiver** (**receiver** or simply **radio**) is an electronic device that receives **radio** waves and converts the information carried by them to a usable form.
- A commercial radio communication system contains not only the "transmission" but also some other functions, such as:
  - Carrier-frequency tuning, to select the desired signals
  - Filtering, to separate the desired signal from other unwanted signals
  - Amplifying, to compensate for the loss of signal power incurred in the course of transmission
- **Types of Receivers:**
- **Tuned Radio Frequency Receiver**
- **Super heterodyne Receiver**

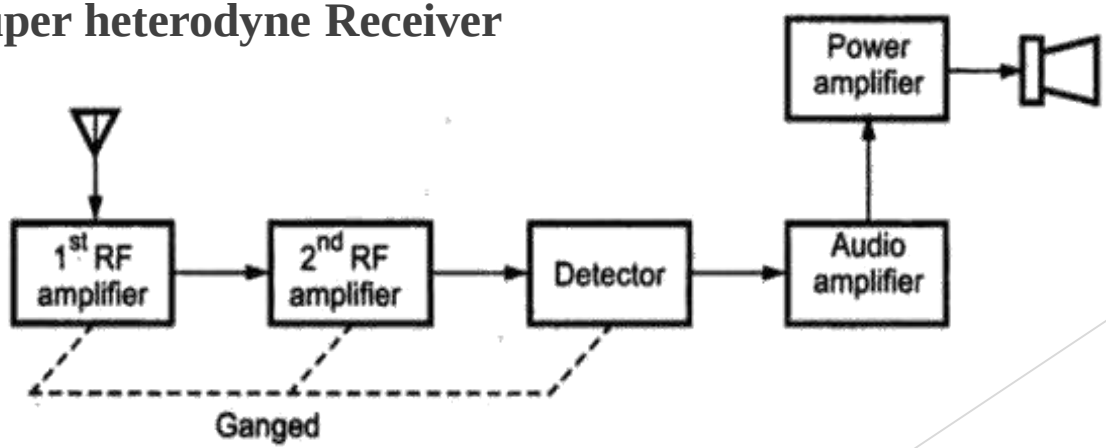


Fig. 1 shows the block diagram of TRF receiver.

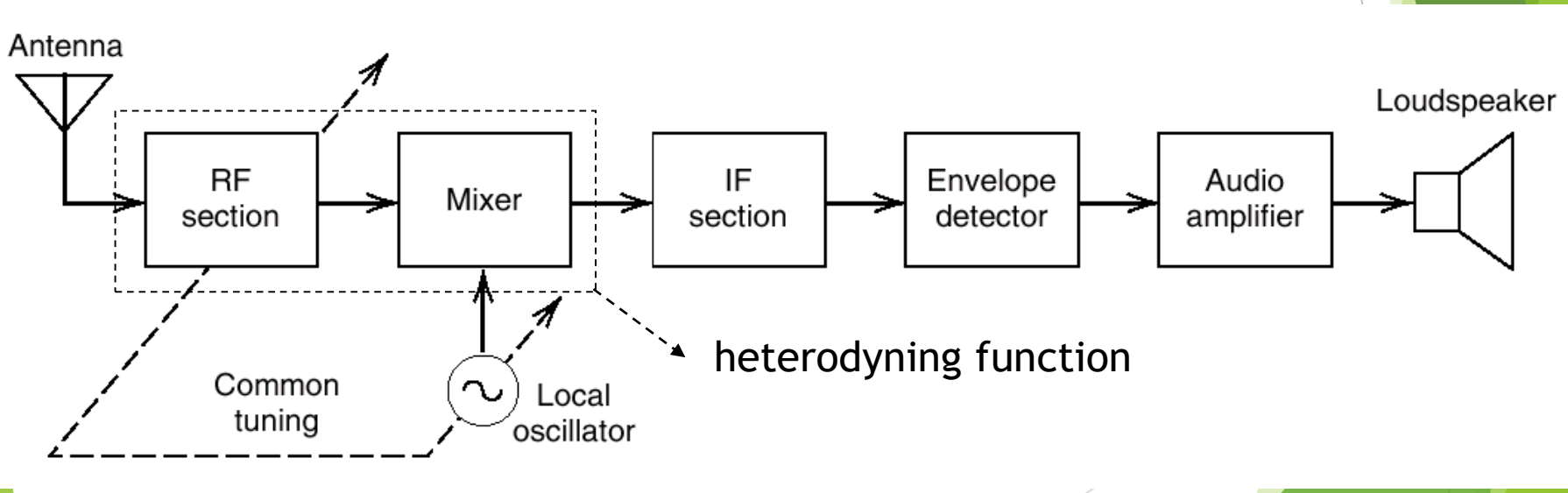
It consists of two or three stages of RF amplifiers, detector, audio amplifier and

Problems in TRF Receivers

- Tracking of tuned circuit
- Instability
- Variable Bandwidth
- TRR.docx
- **Characteristics of Radio Receiver:**
- Selectivity
- Sensitivity
- Fidelity
- Image frequency and its Rejection ratio
- Double spotting
- C RR.docx

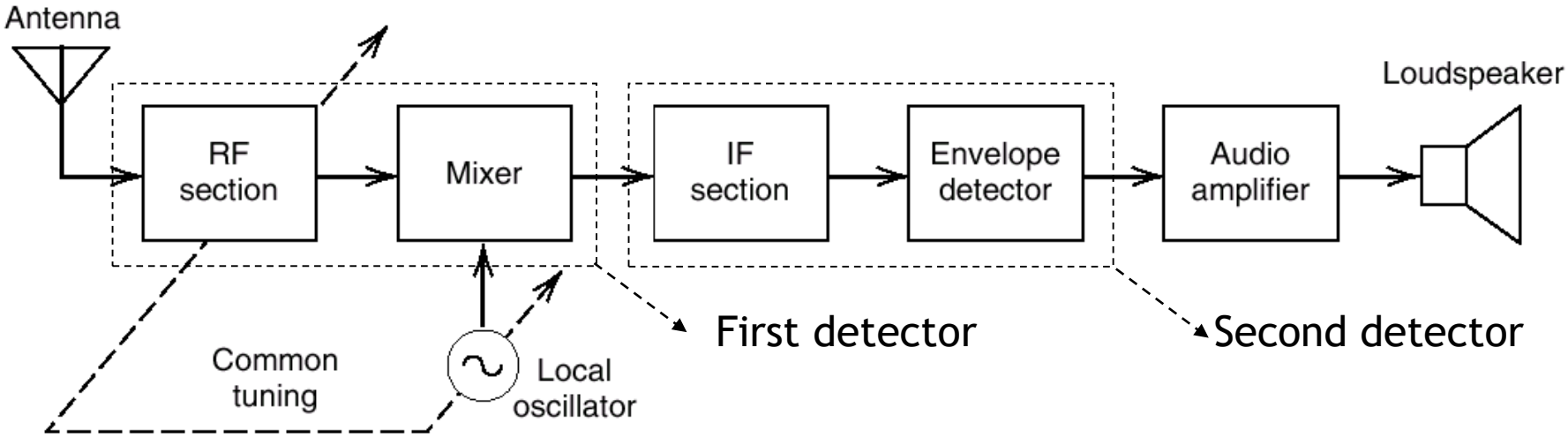
Superheterodyne Receiver

- A superheterodyne receiver or superhet is designed to facilitate the fulfillment of these functions, especially the first two.
  - It overcomes the difficulty of having to build a tunable highly selective and variable filter (rather a fixed filter is applied on IF section).



2.9 Superheterodyne Receiver

Example	*AM Radio*	*FM Radio*
RF carrier range	0.535-1.605 MHz	88-108 MHz
Midband frequency of IF section	0.455 MHz	10.7 MHz
IF bandwidth	10 kHz	200 kHz



2.9 Image Interference

- A cure of image interference is to employ a highly selective stages in the RF session in order to favor the desired signal (at f_{RF}) and discriminate the undesired signal (at $f_{RF} + 2f_{IF}$ or $f_{RF} - 2f_{IF}$).

2.9 Advantage of Constant Envelope for FM modulation

- Observations
  - For FM modulation, any variation in amplitude is caused by noise or interference.
  - For FM modulation, the information is resided on the variations of the instantaneous frequency.
  - So we can use an *amplitude limiter* to remove the amplitude variation, but to retain the frequency variation after the IF section.

THANKS

ANY QUERIES