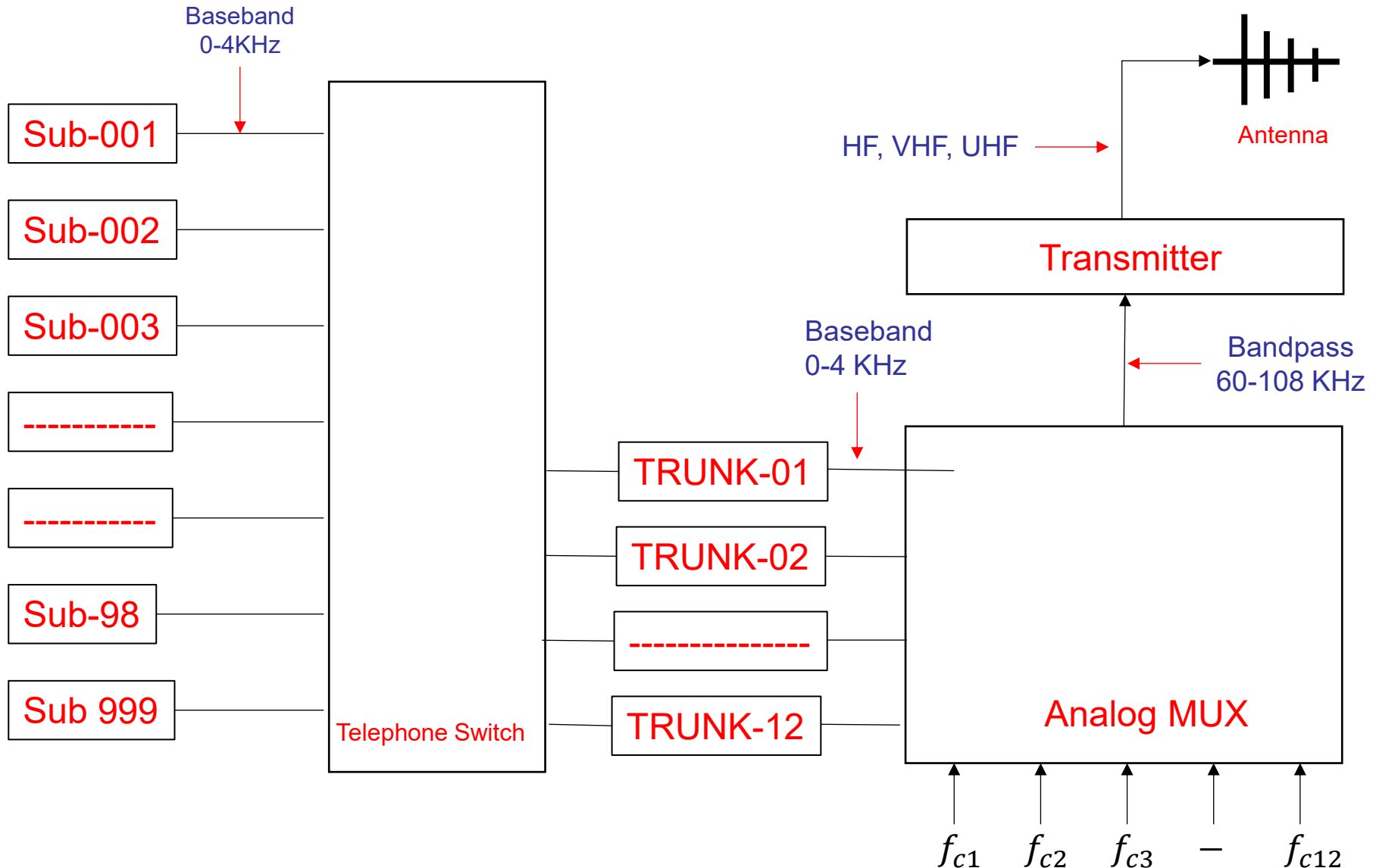


TELECOMMUNICATION ANALOGUE MULTIPLEX SYSTEMS

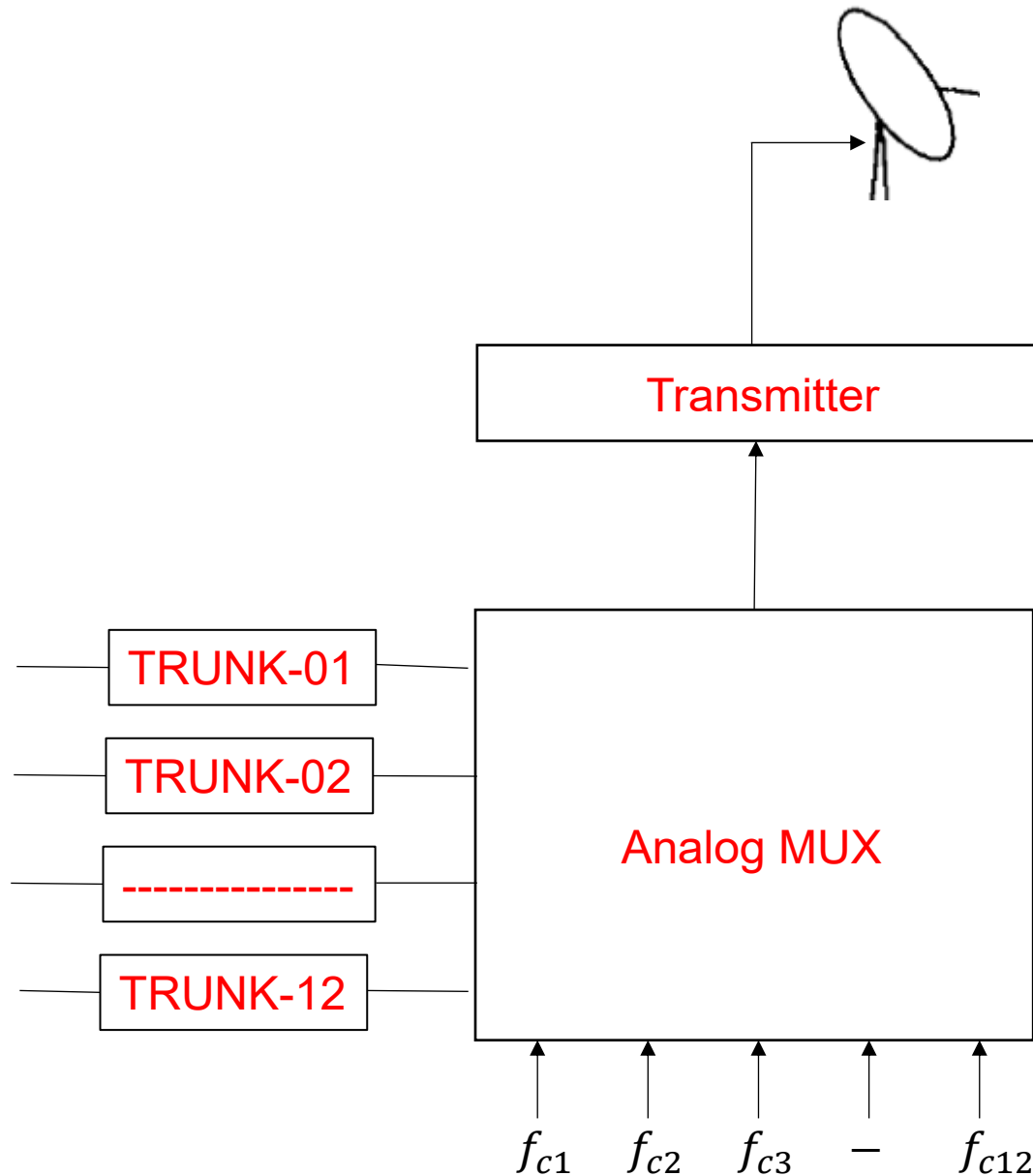
EEEN 462 – ANALOGUE COMMUNICATION

Tuesday, 10 June 2025

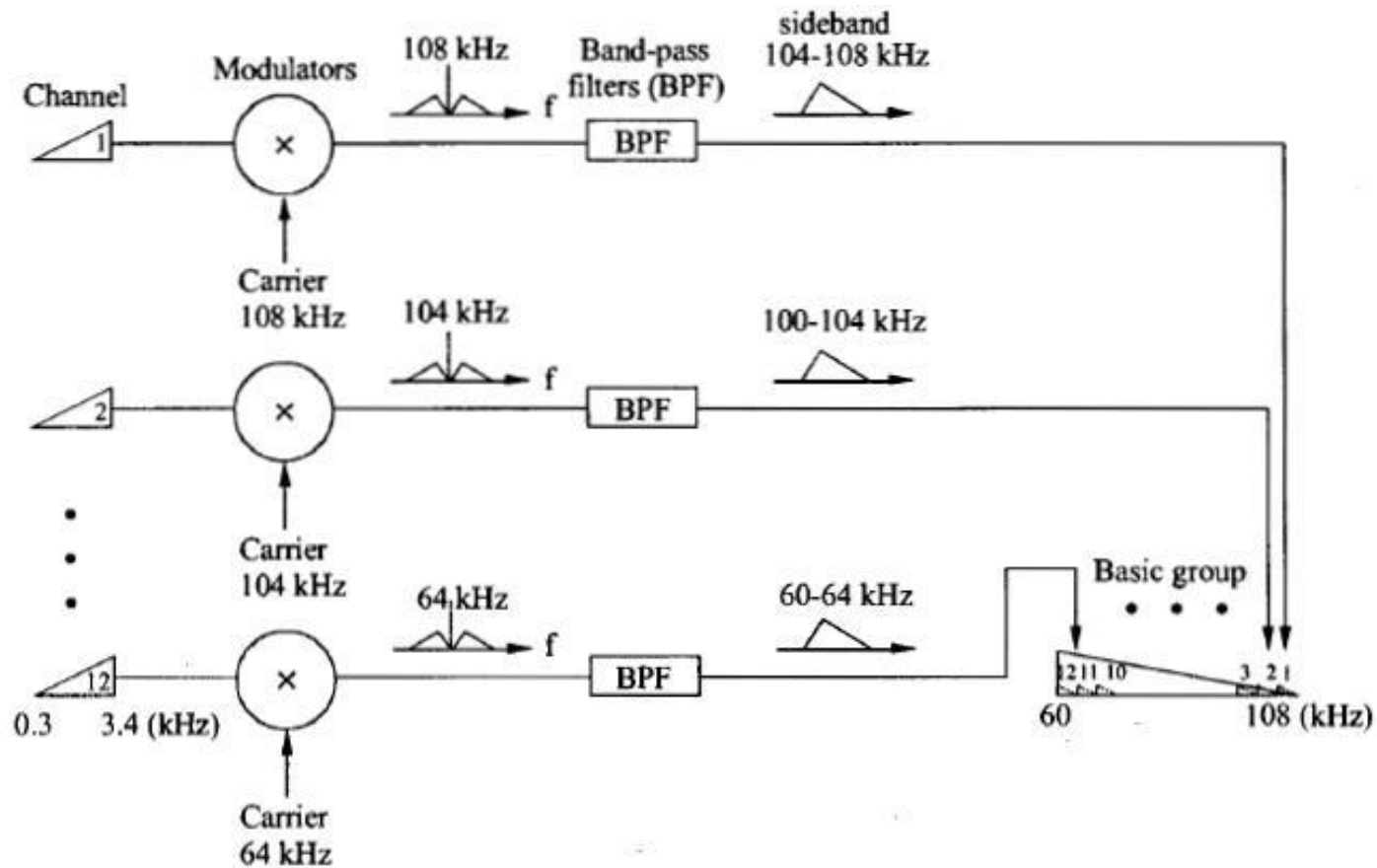
FDM IN ANALOGUE TERRESTRIAL RADIO SYSTEM



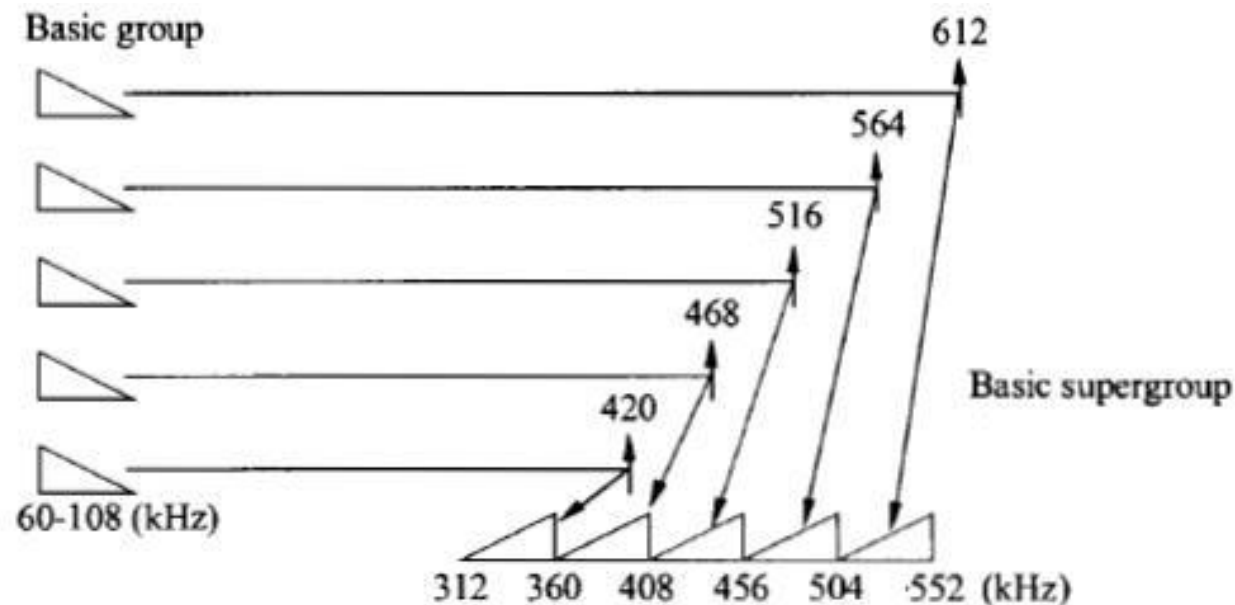
FDM IN ANALOGUE SATELLITE SYSTEM



STANDARD ANALOGUE RADIO MULTIPLEX SYSTEM – FORMATION OF A GROUP



ANALOGUE RADIO MULTIPLEX SYSTEM – FORMATION OF A SUPERGROUP

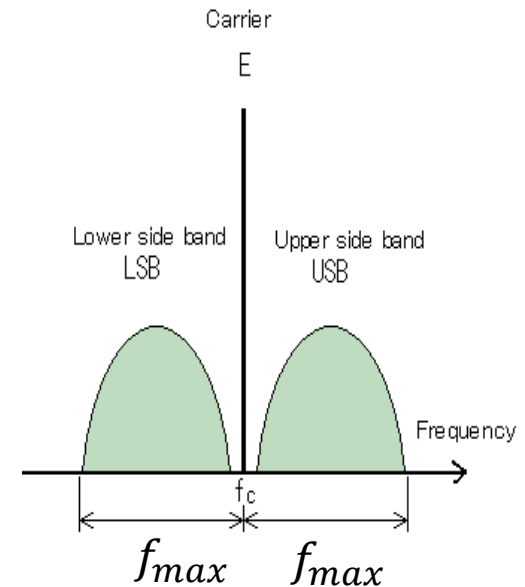


FDM DESIGN EXAMPLE

1. Design a frequency plan for analog multiplexing of telephone channels each with a bandwidth of 4KHz over a frequency band between 60KHz and 108 KHz using:
 - a) Double-sideband amplitude modulation.
 - b) Single Sideband Amplitude Modulation

AMPLITUDE MODULATION REVIEW

1. **Wasteful of power:** AM is wasteful of power since most of the signal power is in the carrier signal A_c yet the carrier carries no information.
2. **Wasteful of bandwidth:** AM transmits information on two sidebands which occupy twice the signal bandwidth yet only one bandwidth is required.

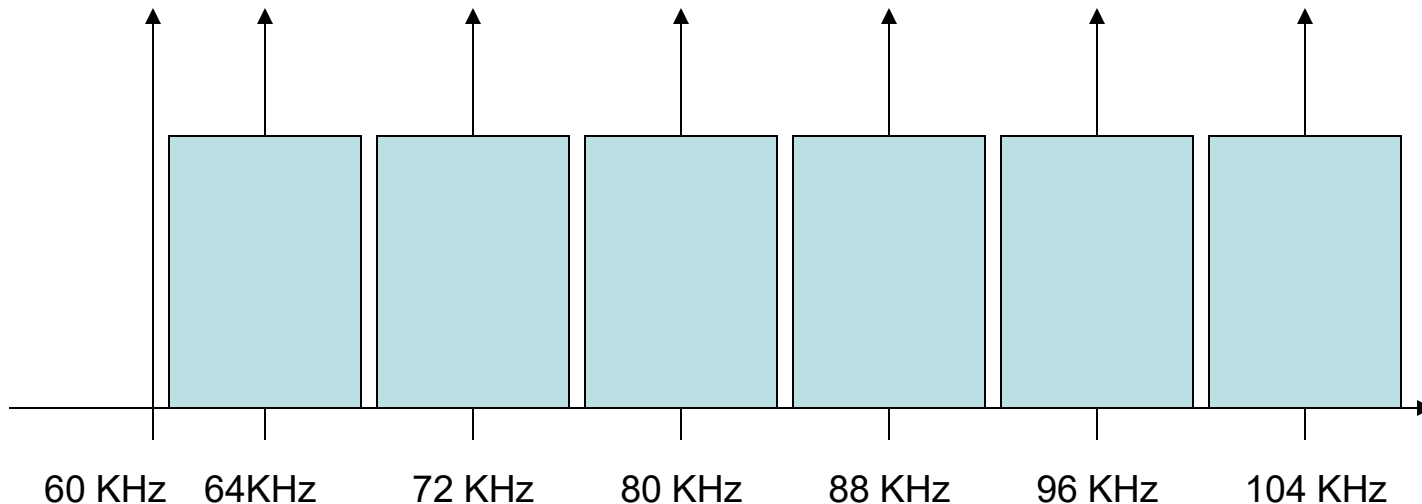


SOLUTION 1 (a)

- Bandwidth of DSB AM signal is $2 \times 4\text{KHz} = 8\text{KHz}$.
- Number of channels, N , is therefore:

$$N = \frac{108 - 60}{8} = 6 \text{ channels}$$

- The frequency plan is as shown below.

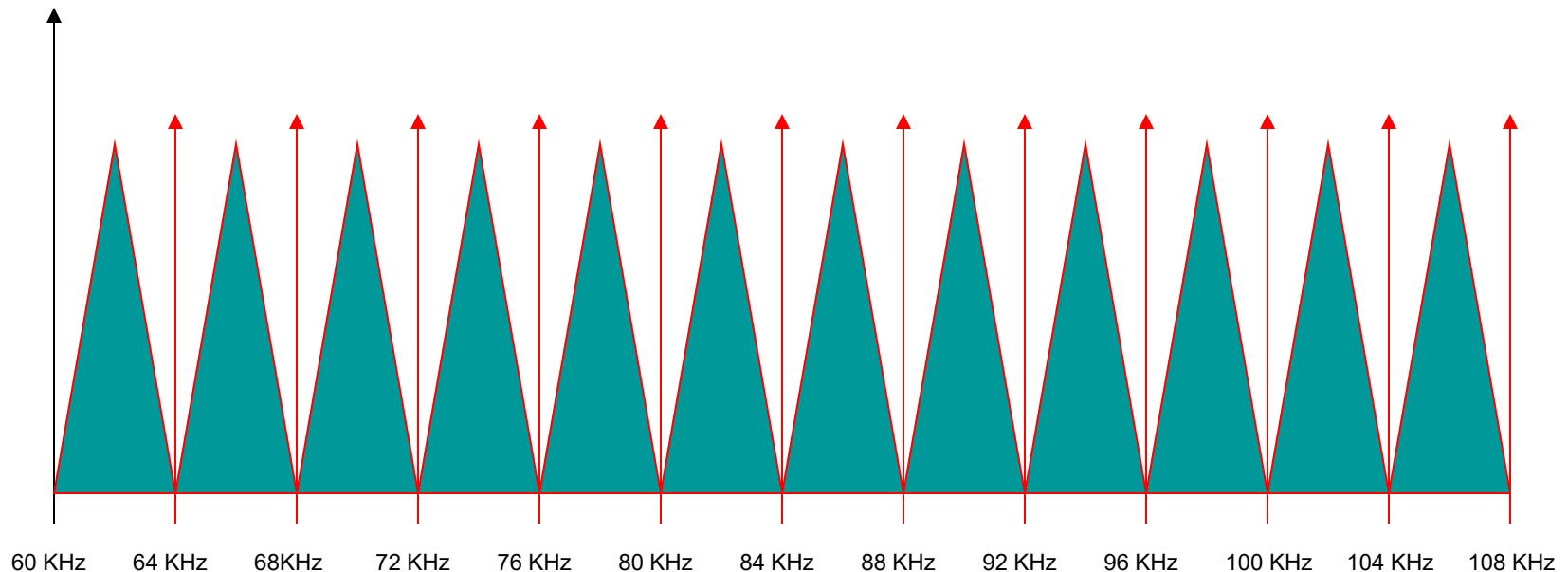


SOLUTION 1 (b)

1. Bandwidth of Single Sideband (SSB) AM signal is **4KHz**
2. Number of channels, N , is therefore given by:

$$N = \frac{108 - 60}{4} = 12 \text{ Channels}$$

3. The frequency plan is as shown below.

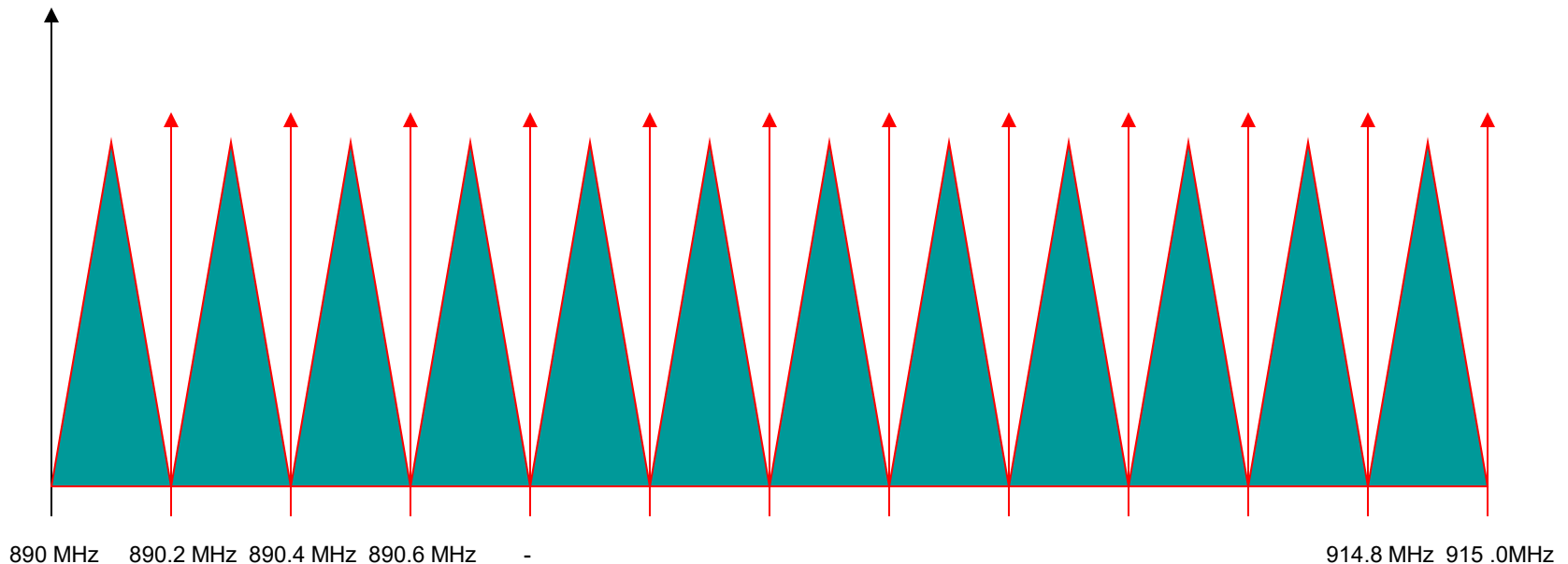


EXAMPLE 2

1. Design a frequency plan for multiplexing of telephone channels each with a bandwidth of 200KHz over a frequency band between 890 MHz and 915 MHz using:
 - a) Single Sideband Amplitude Modulation
 - b) Double-sideband amplitude modulation.

SOLUTION 2(a)

1. Bandwidth of Single Sideband (SSB) AM signal is **200 KHz**
2. Number of channels, N , is therefore given by:
$$N = \frac{915 - 890}{0.2} = 125 \text{ Channels}$$
3. The frequency plan is as shown below.

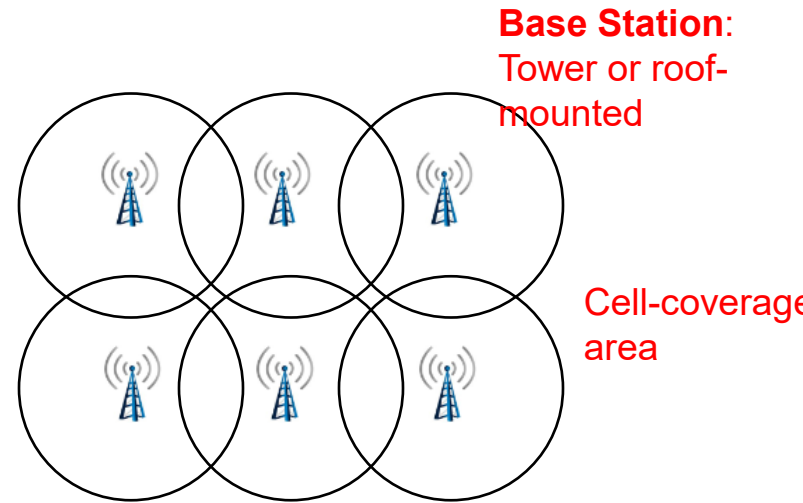


CELLULAR NETWORKS

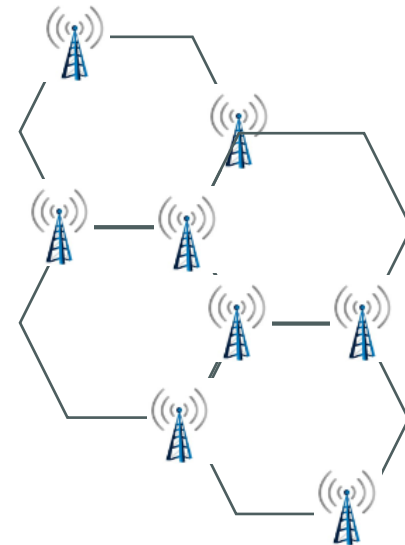
A cellular network (or mobile network) is a telecommunications network where the link to and from end nodes is wireless and the network is distributed over land areas called cells.



(b) Model of cellular network with cells represented as hexagons (Centre-excited)



(a) Cellular network with overlapping cells



(c) Model of cellular network with cells represented as hexagons (Corner-excited)

TELECOMMUNICATION TOWER

Mobile Communication Antennas:

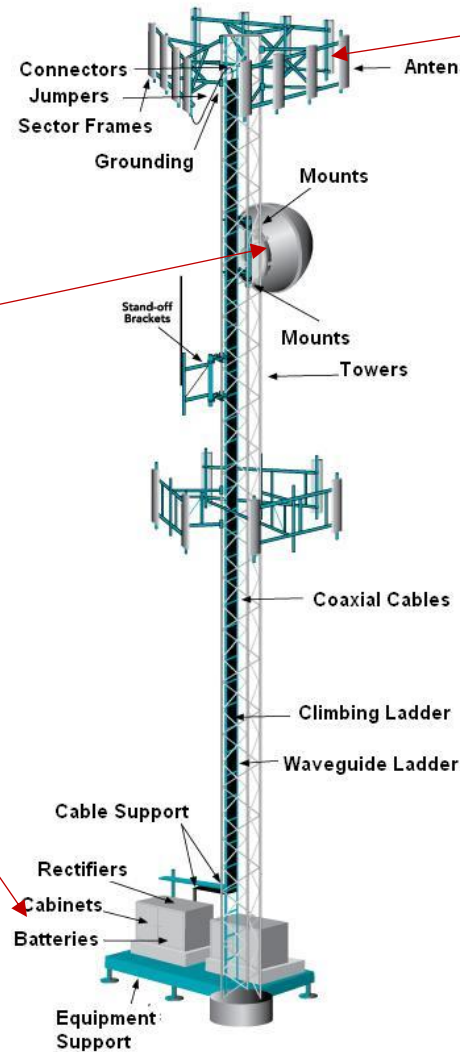
Mobile phones transmit to and receive signals from these antennas

Parabolic antennas

Line of sight antennas that transmit and receive signals from the the mobile switching centre.

Telecommunication Cabinet:

Contains units that multiplex, demultiplex, transmit and receive signals from the switching centre



ORGANIZATION OF A MOBILE NETWORK

