Lecture 14: FDM & AM Radio

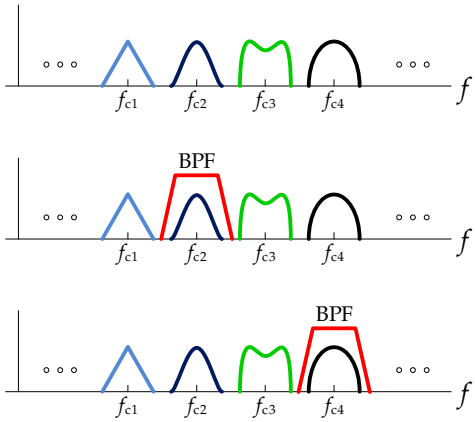
Prof. Mohammed Hawa
Electrical Engineering Department
The University of Jordan

EE421: Communications I: Lecture 14. For more information read Chapter 4 in your textbook or visit http://wikipedia.org/.

Multiplexing: FDM

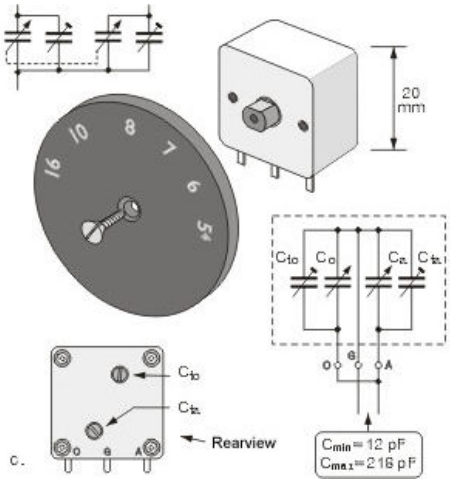
- Frequency Division Multiplexing (**FDM**) is a process that allows the transmission of several signals over the same channel at the same time.
- This is achieved by modulating the different signals on different carriers with different **carrier frequencies**.
- The receiver isolates one signal from the rest using a **tunable BPF**.

Receiver Uses Tunable BPF

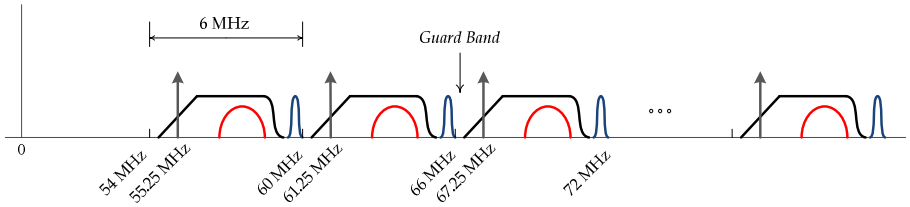


BPF specifications: Center, Bandwidth, Gain, Roll-off (order).

Ganged Capacitor



TV Broadcasting (FDM)

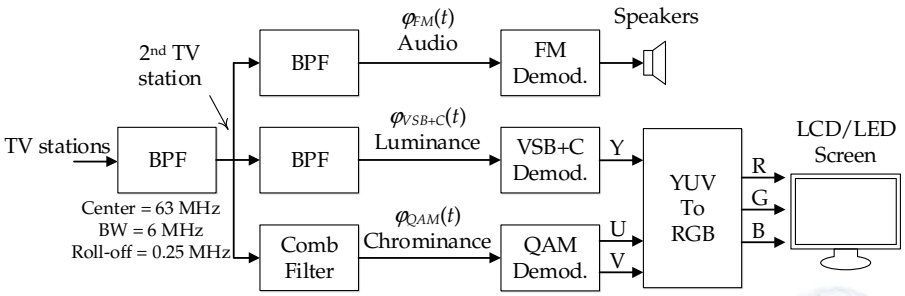


- For an FDM system, you need to know:
  - *Broadcast frequencies* for the stations (i.e., allocated spectrum) [Government].
  - *Bandwidth* of each station [Standard].
  - *Guardband* between adjacent stations [Standard].

TV Broadcasting

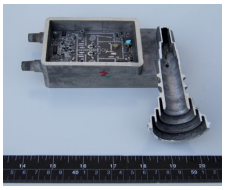
- Terrestrial TV uses broadcast frequencies within the ranges:
- VHF (Very High Frequency): 30 MHz to 300 MHz
- UHF (Ultra High Frequency): 300 MHz and 3 GHz.

TV Receiver: Filters

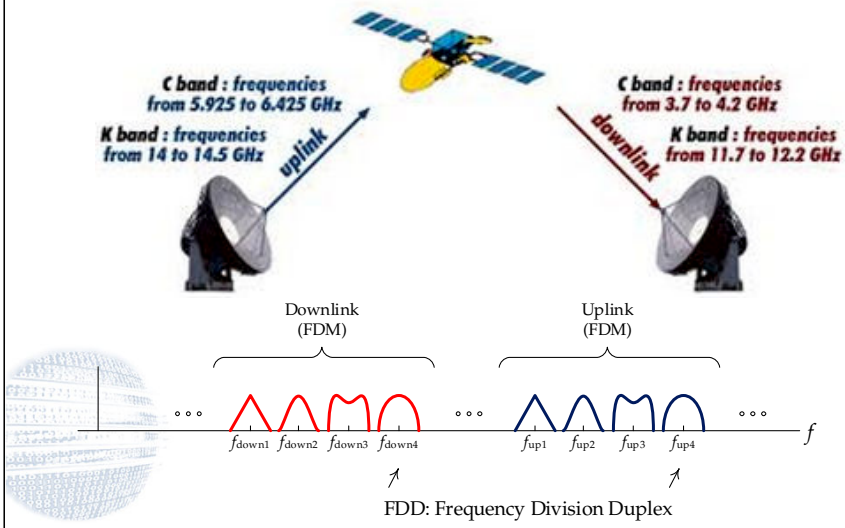


TV Broadcasting

- Satellite TV uses broadcast frequencies within the ranges (Uplink/Downlink):
- C band: 6/4 GHz
- Ku band: 14/10-12 GHz
- Ka band: 27-31/18-20 GHz

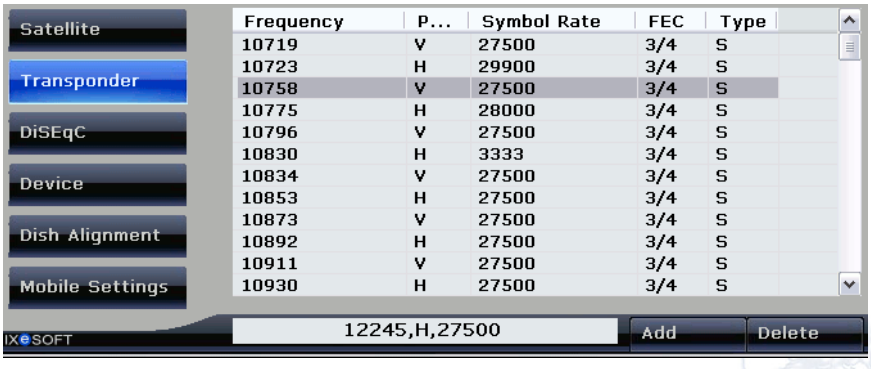


FDD: Uplink/Downlink



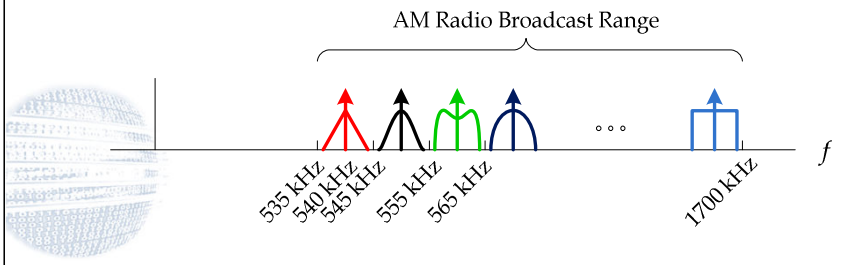
FDD: Frequency Division Duplex

Homework: Satellite Receiver



AM Radio Broadcasting

- Each station is an AM modulation of human voice.
- FDM is used to multiplex signals on the air waves.
- **US:** Each station occupies a bandwidth of 10 kHz.
- **Europe:** Each station occupies a bandwidth of 9 kHz.



HW: Look at Your Radio Dial