AM Radio

Session for
"Electronics and Telecommunications"
A Fairfield University E-Course
Powered by LearnLinc

Module: Communication Systems
(in two parts)

- Texts:
  - "Understanding Telephone Electronics," Bigelow, Newnes, 1997, ISBN 0-7506-9944
- References:
  - Electronics Tutorial (Thanks to Alex Pounds)
  - Electronics Tutorial (Thanks to Mark Sokos)
- Part 11 – Broadcast Systems
  - 5 on-line sessions plus one lab
- Part 12 – Transmission & Communications
  - 5 on-line sessions plus one lab
- Mastery Test part 6 follows this Module

Section 11:Broadcast Systems

- Frequency Division Multiplexing
- AM
  - Modulation
  - Demodulation (The Envelope Detector)
- FM
  - Modulation
  - Demodulation (The Phase-Locked-Loop)
- Superhetrodyne receivers
- Television
- Sampling

Section 12:
Transmission and Networks

- Transmission Lines
  - Twisted pair
  - Coaxial Cable
  - Optical Fiber
- Microwave Systems
- Satellite Links
- Telephone Systems
- Local Area Networks
- Cellular Phone Systems

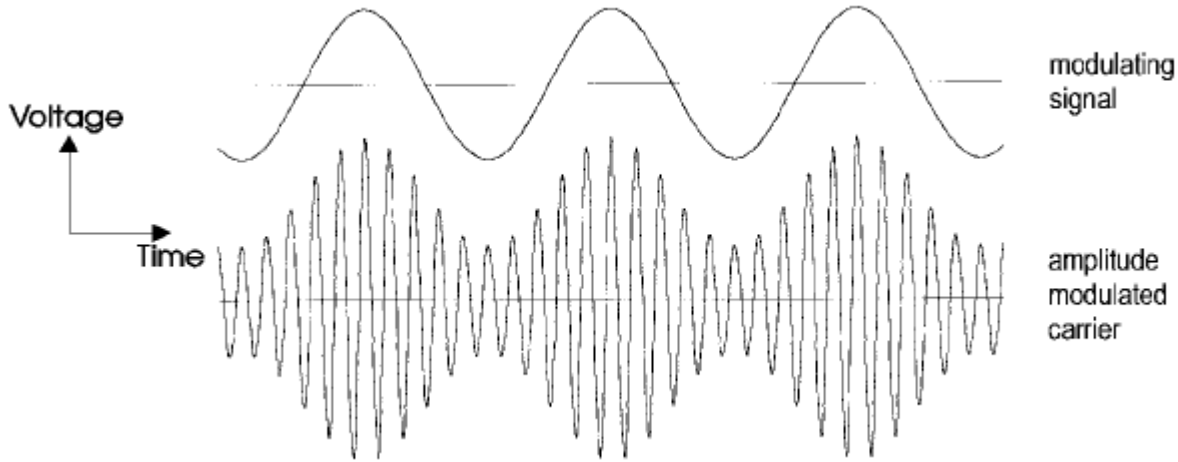
Section 11 Schedule

Session 11a	08/25	Time and Frequency Multiplexing	Notes and Web Sites Bigelow: 167-206
Session 11b	**08/27**	**AM Radio**	**Notes and Web Sites**
Session 11c (Labor Day 09/01)	09/03	FM Radio	Notes and Web Sites
Session 11d	09/08	Transmitters & Receivers	Notes and Web Sites
Session 11e (Lab - 09/13, Sat.)	09/10	Television	Notes and Web Sites
Session 11f (Quiz 11 by 09/21)	09/15	Review for Quiz 11	
Session 11g	09/22	Quiz 11 Results	

Frequency Division Multiplexing

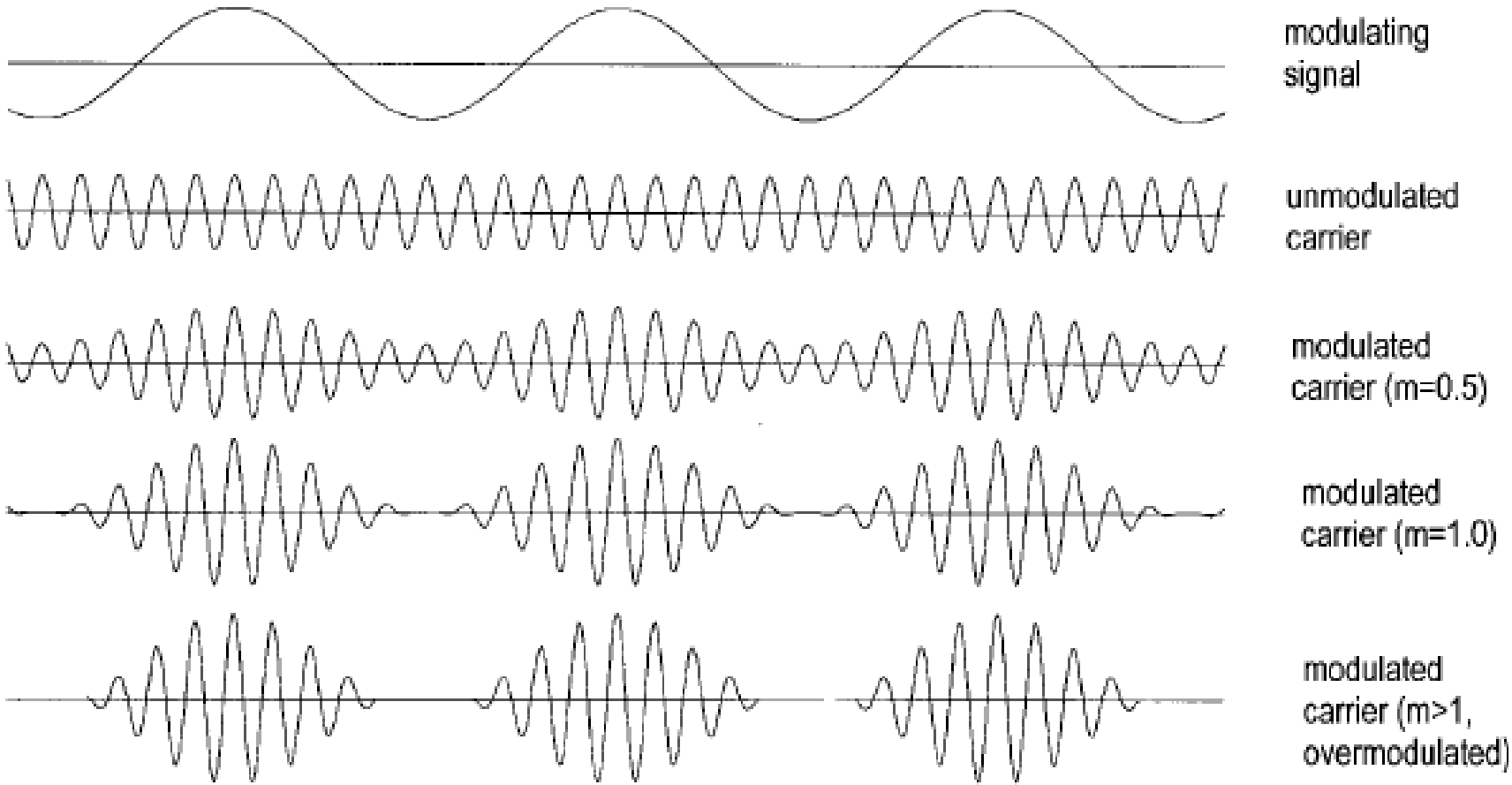
- Here the Bandwidth of the Transmission medium is divided into “Channels” each with enough bandwidth to carry the desired information
- AM Radio: The RF spectrum from 535 kHz to 1600 kHz is divided into overlapping 20 kHz channels (none overlap in a region)
- FM Radio: the RF spectrum from 88 MHz to 108 MHz is divided into 200 kHz channels (double-width for stereo)
- Broadcast TV: The RF Spectrum from 52 MHz to 88 MHz, 174 MHz to 216 MHz, and 470 MHz to 806 MHz is divided into 6 MHZ channels

Amplitude Modulation



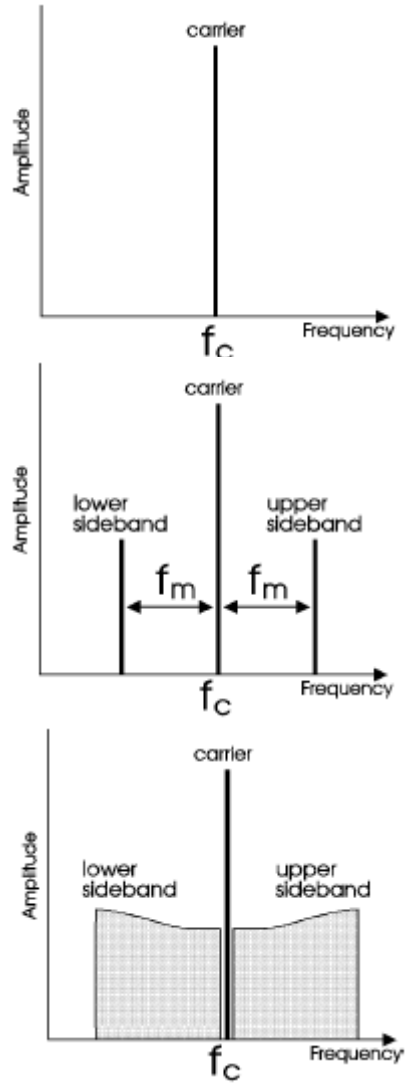
- The amplitude of the carrier varies in proportion to the audio signal
- The carrier amplitude cannot go to zero or the spectrum gets very broad and interferes with other channels (Over modulated carrier)

AM Modulation Index



AM Spectrum

- AM Modulation produces sidebands in the spectrum
- A one kHz audio tone produces 2 sidebands one kHz above and below the carrier frequency
- A general audio signal has a bandwidth (fmin to fmax)
  - the upper sideband goes from fc+fmin to fc+fmax
  - the lower sideband goes from fc-fmin to fc-fmax



AM Facts

- AM audio has a maximum frequency of up to 10 kHz
- An AM radio channel needs 20 kHz bandwidth
  - Two sidebands
  - channel spacing in each region is 20 kHz or more
- The AM Radio band is from 535 kHz to 1605 kHz
- AM transmitters average about 70% modulation to avoid overmodulation

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