Radio Broadcasting

INTERFACE 11/29/21
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What is Radio?
Spectrum Allocation

- 30 Hz-300 GHz
- Emission of radio waves regulated by national laws, coordinated by the International Telecommunication Union (ITU)
- Radio transmitters must be licensed by governments, under a variety of license classes depending on use, and restricted to certain frequencies and power levels
  - U.S. -- Federal Communications Commission (FCC)
Closer Look at Radio Broadcast Spectrum

- AM Radio
- Short wave radio
- VHF TV Channels 2-6
- FM Radio
- VHF TV Channels 7-13
- Microwaves

- 10 kHz bandwidth from 540-1600 kHz for 106 possible bands
- 200 kHz bandwidth from 88.1-108.1 MHz for 100 possible bands
AM vs. FM Radio

- AM: Amplitude Modulation
- FM: Frequency Modulation
- Other types of modulation exist, used in other applications
AM Radio Broadcast Example

Radio frequency carrier wave e.g. 1,480,000 Hz for WYZE

Sound signal to microphone

Amplitude Modulator

Electrical image of sound formed by microphone

Amplitude Modulated carrier wave -- the AM Radio signal that is transmitted.

Transmitting Antenna

AM transmission tower

If electrical charge is accelerated up and down the conducting tower, electromagnetic waves will radiate at the frequency of the driving signal. In general, the frequency must be above 100 kHz to be practical.
AM Radio Receiving Example

Incoming radio signal

Radio antenna

Signal modulates radio frequency

Tuned together

Radio Frequency Amplifier

1480 kHz

1935 kHz

Local Oscillator

Mixer

455 kHz

Intermediate frequency amplifier (IF)

Detection stage

Rectification

Detection

Audio frequency amplifier

Moveable coil

Changing current in magnetic field generates force to move cone.

Sound
Radio Technology History

1830 - Michael Faraday establishes principle of EM induction

1885 - Heinrich Hertz produces EM waves, confirms light speed travel

1893 - Nikola Tesla gives first public demonstration of radio in St. Louis

1900-1 - Guglielmo Marconi founds the Marconi Wireless Telegraph Company, Ltd. and transmits and receives signals across the Atlantic
More Radio Technology History

1906 - Reginald Fessenden sends the first long-distance transmission of human voice and music (MA -> VA)

1910 - Entertainment broadcasting begins, including radio pioneer Lee De Forest's program, based in the Met Opera House!

1918 - Edwin Armstrong invents the superheterodyne circuit

1920 - First commercial radio station -- an entertainment broadcasting venture called KDKA, based in Wilkinsburg, PA

1933 - Edwin Armstrong develops FM radio
Radio Broadcast History
Great Depression

[While movie houses closed, night clubs languished, and theatrical stock companies disappeared, radio boomed. [...] Thousands of families who had purchased much of their household equipment on credit gave up their vacuum cleaners, their cars, and their furniture, but kept up payments on their radios (Settel 68).]
Fireside Chats

- Evening radio addresses given by FDR between 1933-1944
- Spoke with a familiar tone to millions of Americans about the Great Depression, New Deal, WWII...
- Quelled rumors, responded to newspaper criticism, explained policies directly to Americans

“...stamped by rumors or guesses. Let us unite in banishing fear. We have provided the machinery to restore our financial system, and it is up to you to support and make it work. It is your problem, my friends, your problem no less than it is mine. Together we cannot fail.”
Nazi Germany

- Goebbels claimed that radio was the "eighth great power" in a 1933 speech
  - reference to Napoleon -- press as the "seventh great power"

“We want a radio that reaches the people, a radio that works for the people, a radio that is an intermediary between the government and the nation, a radio that also reaches across our borders to give the world a picture of our character, our life, and our work," Goebbels proclaimed.
Edward Murrow

Reported on the London Blitz for American audiences
Radio Free Europe + Radio Liberty

Founded in 1949/1953; merged in 1976

Anti-communist CIA front organization; moved towards funding from Congress in 1972

Widespread public support from Eisenhower's "Crusade for Freedom" campaign; contributions of ~$1.6 million to expansion of RFE

Notable events: Chernobyl disaster, Czech Velvet Revolution, Glasnost, 1991 August Coup
Broadcast Regulation
Radio Act of 1927 - Establishes Federal Radio Commission -- determine regulatory policy for broadcasting in the U.S.

Communications Act of 1934 - Establishes the FCC as the permanent body to determine regulatory policy of radio and TV in the U.S., subject to Congressional oversight. Fairness Doctrine

1987: Fairness Doctrine abolished

Commerce Clause; Title 47 of Code of Federal Regulations -- regulation of radio
Today
Abolishment of the Fairness Doctrine
Fireside Chats 2.0

ARE AMERICANS OKAY WITH LOSING FREEDOM?
Wires and Lights in a Box speech, RTDNA 1958