FM TRANSMITTER WORKSHOP

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1. What is radio?
2. Knoll your parts
3. Soldering demo
4. Solder your transmitter
5. Cut antenna
6. Test it!
7. Assemble everything
8. Optional customizations
9. Group jam

1. **What is radio?**
   - Waves!
   - Part of the electromagnetic spectrum
   - Just like visible light, x-rays, microwave radiation
   - Not just AM/FM either: TV, WiFi, cellphone talk and data, walkie-talkies, GPS, etc etc etc!

AM (Amplitude Modulation)

How it works
- Fixed carrier frequency
- Intensity (amplitude) of the carrier frequency is modulated by sound

Frequencies
- 520 Hz to 1710 Hz

Pros
- Can transmit over long distances
- Lots more stations fit in the band
- Circuitry is really simple

Cons
- Susceptible to noise and static interference
- Limited audio quality

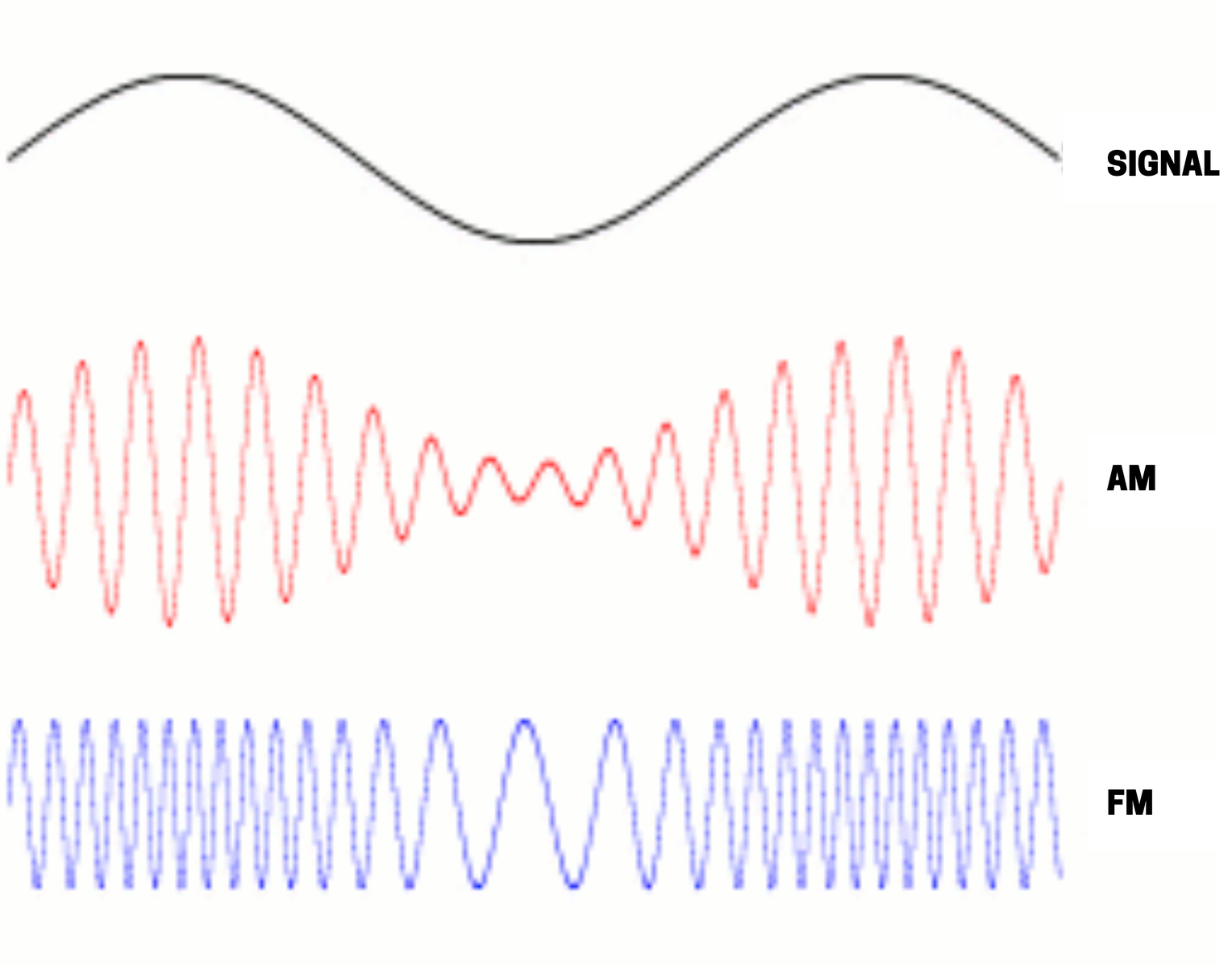
FM (Frequency Modulation)

How it works
- Has carrier frequency, like AM
- Instead of changing amplitude, the freq of the carrier is modulated

Frequencies
- 87.5 to 108.0 MHz

Pros
- Higher-quality audio plus stereo!

Cons
- Shorter broadcast distance (<100 miles) and line-of-sight only
- Longer range requires repeater stations

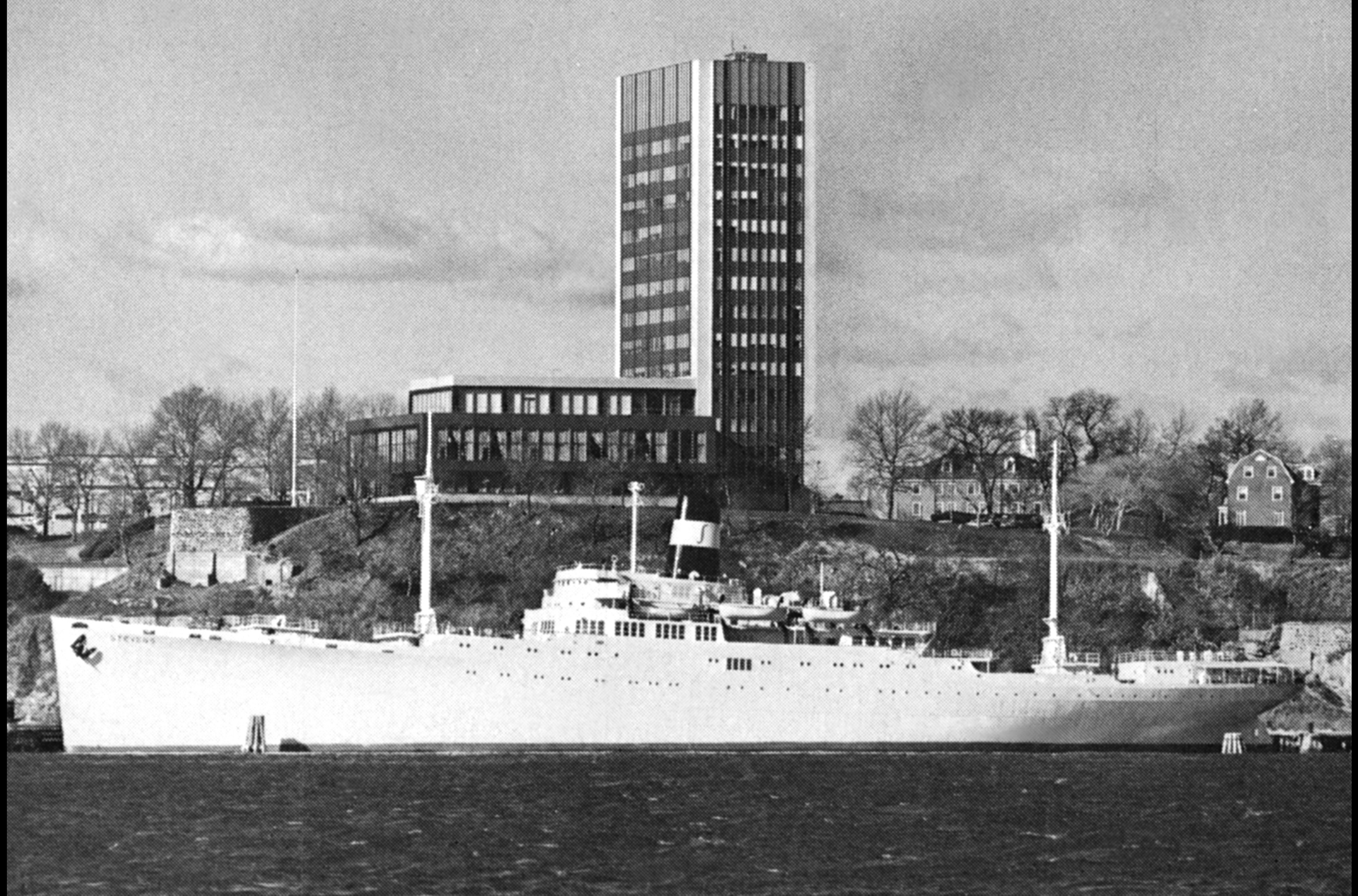

SIGNAL
AM
FM

How broadcasting works

- Sound comes into transmitter circuit as a flow of electricity
- Electricity is piped into an antenna which is carefully tuned to the frequency you want to broadcast at
- Signal is amplified and wiggles along the antenna, giving off electromagnetic radiation
- Your radio’s antenna picks up that radiation, which wiggles down the antenna into your radio’s circuit

Picking your frequency, micro- and pirate-radio, and the FCC

- Find an open slot in the FM band
- Be courteous… and careful!
- Long history of microradio, pirate radio, civil disobedience
- Part 15 and rules about unlicensed transmission



2. Knoll your parts

- Separate parts by type
- Then each part by value
  - Resistors by colored bands
  - Capacitors by number code
- Use Post-Its as labels
- Verify you have everything in the kit
- Get remaining parts from Jeff

3. Soldering demo

4. Solder your transmitter (follow instructions in kit)

1. Flat (axial) resistors
2. Ceramic capacitors
3. Upright (radial) resistors
4. Jumper
5. Fixed inductor coil
6. Transistors*
   (bend one leg back)
7. Mic*
8. Adjustable coil* (tunes your radio)
9. LED*
10. Switch
11. RCA jack
12. Battery holder (cut wire to fit)

* = parts that must be inserted in the proper orientation

5. (Figure out length) and cut antenna

Values we need

Broadcast freq = 87.9 MHz = 87,900,000

Speed of light = 29,979,245,800 centimeters cm per second

Formula

Wavelength of transmission freq in centimeters = speed of light / freq

Calculate antenna length

Wavelength = 29,979,245,800 / 87,900,00 = 341.0608 cm

Antenna length = 1/4 wavelength = 85.2652 cm

BUT! Exact length doesn't matter too much – 85 cm will cover all frequencies

6. Test it!

- Visual inspection of board
- Place near radio tuned to your station
- Attach jumper on left for mic
- Turn on transmitter
- Turn coil until you hear radio go quiet
  - Counter-clockwise for higher frequency
  - Clockwise for lower frequency
- Talk into the mic!
- Move back from radio and fine-tune

7. Assemble everything

- Check all leads are trimmed
- Screw PCB into baseplate (not too tight!)
- Screw from bottom up into battery holder
- Attach rubber feet
- Zip-tie antenna (and/or blob of hot glue in the PCB)
- Test again

8. Optional customizations

- Trim jumper a bit shorter
- Acrylic paint in etching

9. Group jam

- Set up radios around room
- Think of a single, simple sound you can make
- Repeat sound at any interval
- Interval can vary
- You can also be silent – listen to others

THANKS EVERYONE!

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