MODULE 06 FIELD EXERCISE

Listen to the Spectrum

TASK: Using an open-source software-defined radio, tune across three bands, log at least five signals, and recognize at least four modulations by ear and by their waterfall signature.

CONDITION: Given a computer running SDR++ (free, open-source, GPL-3.0, for Windows, macOS, or Linux) with a low-cost RTL-SDR receiver (about $25, 29 to 1700 MHz, 2.4 MHz of spectrum at once) and an antenna; or, with no hardware, a public WebSDR in a browser. Work receive-only: the Electronic Communications Privacy Act bars intercepting mobile phone and pager traffic, so stay on broadcast, amateur, and utility signals.

STANDARD: The receiver tuned across the AM broadcast band (530 to 1700 kHz), the FM broadcast band (87 to 108 MHz), and an HF amateur band (40 m, 7.000 to 7.300 MHz, or 20 m, 14.000 to 14.350 MHz); at least five signals logged by frequency, band, and demodulator; and at least four of AM, FM, SSB, CW, and a digital mode (FT8 or PSK31) recognized by ear and waterfall shape. For each, the band named with why it suits the traffic, and its bandwidth compared to the others.

Task 1 · Set up the receiver

1. Install SDR++ (free, open source, GPL-3.0) for your operating system. Plug in an RTL-SDR receiver and connect its antenna. No hardware yet? Open a public WebSDR in a browser instead; it needs nothing but the link.
2. Set the gain: tune to a strong FM broadcast station and raise the gain until the audio is hiss-free, then back off slightly. Drag the waterfall's lower (min) limit up until the background noise floor sits at the bottom of the display, so weak signals stand out.
3. Learn the two views: the spectrum shows signal strength across frequency right now; the waterfall shows it scrolling over time, so brief transmissions leave a trail.

Task 2 · AM broadcast: amplitude modulation

1. Set the demodulator to AM (10 kHz filter). Tune the AM broadcast band, 530 to 1700 kHz, and find a station.
2. On the waterfall, look for a central carrier with a sideband on each side. The audio rides in the changing strength of the carrier: this is amplitude modulation.
3. Log the frequency. Note that this is the medium-wave band; by day it is ground wave, and after dark distant stations appear as the D layer fades and skywave returns (Unit 05).

Task 3 · FM broadcast: frequency modulation

1. Set the demodulator to WFM (150 kHz filter). Tune the FM broadcast band, 87 to 108 MHz.
2. Note the wide, flat-topped block on the waterfall, roughly 150 kHz across, and the full, quiet audio. The audio rides in the carrier's frequency, not its strength.
3. Log the frequency. This is VHF: line of sight, local coverage (Unit 02). Compare its width to the AM signal you just heard.

Task 4 · HF amateur band: SSB and CW

1. Tune an HF amateur band: 40 m (7.000 to 7.300 MHz) or 20 m (14.000 to 14.350 MHz). Voice lives in the phone segment (7.125 to 7.300, or 14.150 to 14.350); Morse and data live below it.
2. For voice, set USB above 10 MHz or LSB below 10 MHz (so LSB on 40 m, USB on 20 m). SSB is a narrow trace about 3 kHz wide with no carrier; it sounds like a duck until you tune it exactly right.
3. For CW, set the CW mode (a very narrow filter). Morse is on-off tones, the narrowest signals on the band, and its dots and dashes draw tracks on the waterfall. Log one SSB and one CW signal.

Task 5 · A digital mode

1. Tune a digital watering hole. FT8 sits near 7.074 MHz and 14.074 MHz; PSK31 near 7.040 MHz and 14.070 MHz.
2. FT8 appears as many narrow traces about 50 Hz wide that repeat on a fixed 15-second cycle. PSK31 is a razor-thin line about 31 Hz wide. Neither sounds like voice.
3. Log the frequency and mode. Note how little bandwidth these use compared to FM: that is why they carry so far on low power (Unit 08).

Task 6 · Tie it together

1. For each of your five-plus logged signals, name the band and why that band suits the traffic: HF for long-distance skywave, VHF and UHF for local line of sight.
2. Rank your signals by bandwidth on the waterfall: FM broadcast widest, then AM, then SSB, then CW and the digital modes narrowest. Note which would reach farthest on the same low power.
3. For any signal you could not identify, match its waterfall shape and sound against the Signal Identification Wiki.

Task 7 · Field notes

Log every signal: frequency, band, modulation, demodulator used, and how it looked on the waterfall. Note which band carried which traffic and which modes were narrowest. Optional: tune the NOAA weather channels (162.400 to 162.550 MHz, NFM) for a steady local signal to practice on. Write one line on what surprised you about where things live in the spectrum.

#	Frequency	Band	Modulation	Waterfall shape	Notes
1	Receiver up	SDR++ / WebSDR	gain set, noise floor at the bottom		
2	AM	AM · 530–1700 kHz	carrier + 2 sidebands one station logged		
3	FM	WFM · 87–108 MHz	wide ~150 kHz block one station logged		
4	SSB + CW	USB/LSB · CW	one SSB, one CW logged		
5	Digital	FT8 / PSK31	one digital mode identified		
6	Connect	Explain	band + bandwidth reasoning for each		