

# Radio Lab Handbook

## Vocabulary List

**Alternator** – A device use to produce alternating current (ac).

**Alternating Current (ac)** – Electrical current that flows first in one direction ion a wire and then in the other. The applied voltage is also changing polarity. This direction reversal continues at a rate that depends on the frequency of the ac.

**Amateur Satellite** – A spacecraft dedicated to reception and retransmission of amateur radio signals.

**Amateur Television (ATV)** – Transmitting visual images over the airwaves.

**Ampere (A)** – The basic unit of electrical current.

**Amplitude Modulation (AM)** – A method of combining an information signal and an RF carrier. Shortwave broadcast stations use this type of modulation, as do stations in the Standard Broadcast Band (535-1705 kHz)

**AMSAT** – The Radio Amateur Satellite Corporation, non-for-profit corp. dedicated to the advancement of Amateur Radio satellites.

**Antenna Switch** – A switch used to connect one transmitter, receiver or transceiver to several different antennas.

**Antenna Tuner** – A device that matches the antenna system input impedance to the transmitter, receiver or transceiver output impedance. Also called an antenna-matching network, impedance-matching network or Transmatch.

**ARES** – Amateur Radio Emergency Service: sponsored by ARRL, and presents a way for local amateurs to provide emergency communications while working with the Red Cross and Emergency Operations Centers.

**Autopatch** – a device that allows repeater users to make telephone calls through a repeater.

**Band-Pass Filter** – A circuit that allows signals to go through it only if they are within a certain range of frequencies. It attenuates signals above and below this range.

**Band Plan** – Agreements between operators about how to use the band, rather than FCC regulations.

**Beacon Station** – An amateur station transmitting communications for the purposes of observation of propagation and reception or other related experimental activities.

**Block Diagram** – A drawing using boxes to represent sections of a complicated device or process.

**Capacitor** – An electrical component usually formed by separating two conductive plates with an insulating material. A capacitor stores energy in an *electric filed*.

**Cell Phone** – A portable radio that connects to a series of cells to transmit signals in analog, digital and PCS.

**Centi** – The metric prefix for 10(-2), or divided by 100.

**Citizen Band Radio (CB)** – A non-licensed low-power radio service for use by the general public.

**Closed, or Complete Circuit** – An electrical circuit with an uninterrupted path for the current to follow. Turning a switch on, for example, closes or completes the circuit, allowing current to flow.

**Closed Repeater** – A repeater that is restricted in use to only those authorized by a club or group.

**Conductor** – A material that has a loose grip on its electrons, so an electrical current can pass through it.

**Controlled Environment** – Any area in which an RF signal may cause radiation exposure to people who are aware of the radiated electric and magnetic fields and who can exercise some control over their exposure to these fields. The FCC generally considers amateur operators to be in a controlled RF exposure environment to determine the maximum permissible exposure levels.

**Control Operator** – An amateur operator designated by the licensee of a station to be responsible for the transmissions of an amateur station.

**CQ** – “Calling and station”: the general call when requesting a conversation with anyone.

**Crystal-Controlled Transmitter** – A simple type of transmitter that consists of a crystal oscillator followed by driver and power amplifier stages.

**Crystal Oscillator** – A circuit that uses a quartz crystal to keep the frequency of a transmitter constant.

**CTCSS** – Continuous tone-coded squelch system, used to limit repeater interference

**Current** – A flow of electrons in an electrical circuit.

**CW** – (Morse code) – A communications mode transmitted by on/off keying of a radio-frequency signal.

**D region** – The lowest region of the ionosphere. The D region contributes very little to the short-wave radio propagation. It acts mainly to absorb energy from radio waves as they pass through it. This absorption has significant effect of signals below about 7.5 MHz during daylight.

**Data** – Computer communications modes, often called digital communications because digital computers are used.

**Deci** – The metric prefix for 10(-1), or dividing by 10.

**Detector** – The stage in a receiver in which the modulation (voice or other information) is recovered from the RF signal.

**Digital** – Computer based communications.

**Direct Current (dc)** – Electrical current that flows in one direction only.

**Dual-Band Antenna** – An antenna designed for use on two different Amateur Radio bands.

**Dummy Antenna** – A device for transmitter testing or adjusting that allows a signal to be generated but not transmitted over the air.

**Duplex** – Transmitting on one band while receiving on another.

**Duplexer** – A device that allows a dual-band radio to use a single dual-band antenna.

**Duty Cycle** – A measure of the amount of time a transmitter is operating at full output power during a single transmission. A low duty cycle means less RF radiation exposure for the same PEP output.

**DX** – Distance, foreign countries.

**E region** – The second lowest ionospheric region, the E region exists only during the day. Under certain conditions, it may refract radio waves enough to return them to Earth.

**Electromagnetic Spectrum** – A graphic representation of a range of frequencies from 60 Hz electrical current, through radio waves, visible light, ultra violet light, X-rays and Gamma rays.

**Electron** – A tiny, negatively charged particle, normally found in an area surrounding the nucleus of an atom. Moving electrons make up an electrical current.

**Emergency** – A situation where there is a danger to lives or property.

**Emergency Traffic** – Messages with life and death urgency or requests for medical help and supplies that leave an area shortly after an emergency.

**Emission** – The transmitted signal from an amateur station.

**EMR** – Electromagnetic Radiation

**F region** – A combination of the two highest ionospheric regions, the F1 and F2 regions. The F region refracts radio waves and returns them to Earth. Its height varies greatly depending on the time of day, season of the year and amount of sunspot activity.

**Family Radio Service** – A non-licensed low-power radio service for use by the general public.

**Earth-Moon-Earth (EME) or Moonbounce** – A method of communicating with others stations by reflecting radio signals off the Moon's

**Electromotive Force (EMF)** – The force or pressure that pushes a current through a circuit.

**Emergency Traffic** – Messages with life or death urgency or requests for medical help and supplies that leave an area shortly after an emergency.

**Energy** – The ability to do work; the ability to exert a force to move some object.

**Feed Line** – The wires or cables used to connect a transmitter, receiver or transceiver to an antenna.

**Filter** – A circuit that will allow some signals to pass through it but will greatly reduce the strength of others.

**Frequency** – The number of complete cycles of an alternating current that occur per second.

**Frequency Discriminator** – A type of detector used in FM receivers.

**Frequency Modulation (FM)** – The type of signals used to communicate by voice (phone) over most repeaters. FM is a method of combining and RF carrier with an information signal, such as voice. The voice information (or data) changes the RF carrier frequency in the modulation process.

**Giga** – The metric prefix for  $10^9$ , or times 1,000,000,000.

**Global Positioning Service**

**Ground-Wave Propagation** – The manner in which radio waves travel along the Earth's surface.

**Harmonic** – A signal from an oscillator or transmitter that occurs on whole-number multiples (2x, 3x, 4x, etc) of the desired operating frequency.

**High Frequency (HF)** – Radio frequencies from 1800 kHz up to 30 MHz

**High-Pass Filter** – A filter that allows signals above the cutoff frequency to pass through. It attenuates signals below the cutoff frequency.

**Health and Welfare Traffic** – Messages about the well being of individuals in a disaster area.

**Hertz (Hz)** – An alternating-current frequency of one cycle per second. The basic unit of frequency.

**Inductance** – A measure of the ability of a coil to store energy in the *magnetic field*.

**Inductor** – An electrical component usually composed of a coil of wire wound on a central core. An inductor stores energy in a magnetic field.

**Input Frequency** – A repeater's receiving frequency. To use a repeater, transmit on the input frequency and receive on the output frequency.

**Insulator** – A material that maintains a tight grip on its electrons, so that an electric current cannot pass through it (within voltage limits).

**Intermediate Frequency (IF)** – The output frequency of a mixing stage in a superheterodyne receiver. The subsequent stages in the receiver are tuned for maximum efficiency at the IF.

**Internet Remote Base** – Controlling an Amateur Radio station remotely through a computer.

**International Telecommunication Union (ITU)** – International radio organization responsible for distribution of radio frequencies.

**Ionosphere** – A region of electrically charged (ionized) gasses high in the atmosphere. The ionosphere bends radio waves as they travel through it, returning them to Earth.

**Ionizing Radiation** – Electromagnetic radiation that has sufficient energy to knock electrons free from their atoms, producing positive and negative ions. X-rays, gamma rays and ultraviolet radiation are examples of ionizing radiation.

**ISS** – International Space Station.

**Kilo** – The metric prefix of 10(3), or times 1000.

**Limiting** – A stage of an FM receiver that makes the receiver less sensitive to amplitude variations and pulse noise.

**Line-of-Sight Propagation** – The term used to describe VHF and UHF propagation in a straight line directly from one station to another.

**Low-Pass Filter** – A filter that allows signals below the cutoff frequency to pass through and attenuates signals above the cutoff frequency.

**Maximum Useable Frequency (MUF)** – The highest-frequency radio signal that will reach a particular destination using **sky-wave propagation**, or *skip*. The MUF may vary for radio signals sent to different destination.

**MAYDAY** – International distress call for voice communications.

**Mega** – The metric prefix for 10(6), or times 1,000,000.

**Metric Prefixes** – A series of terms used in the metric system of measurement. We use metric prefixes to metric prefixes indicate multiples of 10.

**Metric System** – A system of measurement developed by scientist and used in most countries of the world. This system uses a set of prefixes that are multiples of 10 to indicate quantities larger or smaller than the basic unit.

**Micro** – The metric prefix for 10(-6), or divided by 1,000,000.

**Microphone** – A device that converts sound waves into electrical energy.

**Milli** – The metric prefix for 10(-3), or divided by 1000.

**Mobile Device** – A radio transmitting device designed to be mounted in a vehicle.

**Modem** – Short for modulator/demodulator. A modem modulates a radio signal to transmit data and demodulates a received signal to recover transmitted data.

**Modulate** – To vary the amplitude, frequency or phase of a radio-frequency signal.

**Modulation** – The process of varying a radio wave in some way to send information.

**Nonionizing Radiation** – Electromagnetic radiation that does not have sufficient energy to knock electrons free from their atoms. Radio frequency (RF) radiation is nonionizing.

**Ohm** – The basic unit of electrical resistance, used to describe the amount of opposition to current.

**Ohm's Law** – A basic law of electronics. Ohm's Law gives a relationship between voltage (E), current (I), and resistance  $R$ . The voltage applied to a circuit is equal to the current through the circuit times the resistance of the circuit ( $E=IR$ ).

**Offset** – The difference between a repeater's input frequency and output frequency.

**Open Circuit** – An electrical circuit that does not have a complete path, so current can't flow through the circuit.

**Open Repeater** – A repeater that can be used by all hams who have a license that authorizes operation on the repeater frequencies.

**OSCAR** – Orbiting Satellite Carrying Amateur Radio

**Output Frequency** – A repeater's transmitting frequency.

**Packet Radio** – A communications system in which information is broken into short bursts. The bursts (packets) also contain addressing and error-detection information.

**Parallel Circuit** – An electrical circuit in which the electrons follow more than one path in going from the negative supply terminal to the positive terminal.

**Phone** – Another name for voice communications.

**Phonetic Alphabet** – Standard words used on voice modes to make it easier to understand letters of the alphabet, such as those in call signs.

**Pico** – The metric prefix for  $10^{-12}$ , or divide by 1,000,000,000,000.

**PL** – Private Line, used to block repeater interference.

**Portable Device** – A radio transmitting device designed to have a transmitting antenna that is generally within 20 centimeters of a human body.

**Power** – The rate of energy consumption. We calculate power in an electrical circuit by multiplying the voltage applied to the circuit times the current through the circuit ( $P=IE$ ).

**Power Supply** – A circuit that provides a direct-current (dc) output at some desired voltage from an ac input voltage.

**Priority Traffic** – Emergency-related messages, but not as important as Emergency traffic.

**Product Detector** – A device that allows a receiver to process CW and SSB signals.

**Propagation** – The manner in which radio waves travel.

**Q signals** – Three-letter symbols beginning with Q. Used on CW to save time and to improve communication.

**QSL Card** – A postcard that serves as a confirmation of communication between two hams.

**Radio Amateur Civil Emergency Service (RACES)** – a part of the Amateur Service that provides radio communications for civil preparedness organizations during local, regional or national civil emergencies.

**Radioteletype (RTTY)** – Radio signals sent from one teleprinter machine to another machine. Anything that one operator types on his teleprinter will be printed on the other machine.

RF Carrier

**Receiver** – A device that converts radio signals into audio signals.

**Reflection** – Signals that travel by **line-of-sight propagation** are bounced off of large objects like buildings.

**Remote Base** – An HF amateur station setup to operate by remote control, usually by connecting to the Internet through a computer.

**Repeater** – An amateur station that receives a signal and retransmits it for greater range.

**Resistance** – The ability to oppose an electric current.

**Resistor** – Any material that opposes a current in an electrical circuit. An electronic component especially designed to oppose current.

**RF Burn** – A burn produced by coming in contact with exposed RF voltages.

**RF Radiation** – Waves of electric and magnetic energy. Such electromagnetic radiation with frequencies as low as 3 kHz and as high as 300 GHz are considered to be part of the RF region.

**RF Safety** – Preventing injury or illness to humans from the effects of radio-frequency energy.

**Series Circuit** – an electrical circuit in which all the electrons must flow through every part of the circuit. There is only one path for the electrons to follow.

**Signal Report System (RST)** – A system of numbers used for signal reports: R is readability, S is strength and T is tone.

**Single Sideband (SSB)** – Emission mode that describes the type of voice emission used on the HF bands.

**Sine Wave** – electricity building slowly to a peak voltage in one direction, then decreasing to zero and reversing to build to a peak in the opposite direction.

**Short Circuit** – An electrical circuit in which the current does not take the desired path, but finds a shortcut instead. Often the current goes directly from the negative power-supply terminal to the positive one, bypassing the rest of the circuit.

**Simplex Operation** – Receiving and transmitting on the same frequency.

**Skip Zone** – An area of poor radio communication, too distant for ground waves and too close for sky waves. Radio waves “skip or hop” over it.

**Sky-Wave Propagation** – The method by which radio waves travel through the ionosphere and back to Earth. Sometimes called skip, sky-wave propagation has a far greater range than **line-of sight** and **ground-wave propagation**.

**Space Station** – An amateur station located more than 50 km above the Earth’s surface.

**Specific Absorption Rate (SAR)** – A term that describes the rate at which RF energy is absorbed into the human body. Maximum permissible exposure (MPE) limits are based on whole-body SAR values.

**SOS** – A Morse Code call for emergency assistance.

**Sunspots** – Dark spots on the surface of the sun. When there are few sunspots, long-distance radio propagation is poor on the higher-frequency bands. When there are many sunspots, long-distance HF propagation improves.

**Sunspot Cycle** – The number of sunspots increases and decreases in a predictable cycle that lasts about 11 years.

**SWR Meter** – A measuring instrument that can indicate when an antenna system is working well.

**Tactical Communications** – Names used to identify a location or function during local emergency communications.

**Teleprinter** – A machine that can convert keystrokes (typing) into electrical impulses. The teleprinter can also convert the proper electrical impulses back into text. Computers have largely replaced teleprinters for amateur radioteletype work.

**Temperature Inversion** – A condition in the atmosphere in which a region of cool air is trapped beneath warmer air.

**Terminal** – An inexpensive piece of equipment that can be used in place of a computer in a packet radio station.

**Third-Party Communications** – Messages passed from one amateur to another on behalf of a third person.

**Transceiver** – A radio transmitter and receiver combined in one unit.

**Transmitter** – A device that produces radio-frequency signals.

**Troposphere** – The region in Earth's atmosphere just above the Earth's surface and below the ionosphere.

**Tropospheric Bending** – When radio waves are deformed in the troposphere, they return to Earth farther away than the visible horizon.

**Tropospheric Ducting** – A type of VHF propagation that can occur when warm air overruns cold air (a temperature inversion).

**Uncontrolled Environment** – Any area in which an RF signal may cause radiation exposure to people who may not be aware of the radiated electric and magnetic fields.

**Variable-Frequency Oscillator (VFO)** – An oscillator used in receivers and transmitters. The frequency is set by a tuned circuit using capacitors and inductors. The frequency can be changed by adjusting the components in the tuned circuit.

**VDT** – Video Display Terminal

**Visible Horizon** – The most distant point one can see by line of sight.

**Volt (V)** – The basic unit of electrical pressure or EMF.

**Voltage** – The EMF or pressure that causes electrons to move through an electrical circuit.

**Watt** – The unit of power in the metric system.

**Wavelength** – The distance an ac signal will travel during the time it takes the signal to go through one complete cycle.