



Glossary

The glossary in this edition is primarily focused on words associated with abbreviations or acronyms along with uncommon words. For words and phrases not listed here, please check the index.

A

A index — A geomagnetic-field measurement used to indicate HF propagation conditions. Rising values generally indicate disturbed conditions while falling values indicate improving conditions. See also *K index*.

Admittance (Y) — The reciprocal of impedance.

Alpha (α) — The ratio of transistor collector current to emitter current. It is between 0.92 and 0.98 for a bipolar junction transistor.

Amplitude modulation (AM) — A method of superimposing an information signal on an RF carrier wave in which the amplitude of the RF envelope (carrier and sidebands) is varied in relation to the information signal strength.

Analog-to-digital converter (ADC) — A circuit that converts analog signals to digital values.

Anode — The terminal connected to the positive supply for current to flow through a device.

ASCII — American National Standard Code for Information Interchange

ATV (amateur television) — A fast-scan TV system that can use commercial transmission standards on the 70-cm band and higher frequencies.

Audio FSK (AFSK) — Generating a frequency shift keying (FSK) signal by inputting tones to the transmitter through the audio or microphone input.

Automatic Link Enable (ALE) — A digital mode that uses automatic control to find frequencies at which two stations can communicate.

Automatic Packet Reporting System (APRS) — A system of sending location and other data over packet radio to a common website for tracking and recording purposes.

AX.25 — The amateur implementation of the X.25 communications protocol, used for packet radio.

B

B_z — The B index is a measurement of the Earth's geomagnetic field's strength and orientation with three-dimensional values: B_x, B_y, and B_z. B_z indicates the strength of the north-south field.

Bandwidth (BW) — (1) The frequency range over which a signal or the output of a circuit is within 3 dB of its peak strength within that range. (2) The frequency range over which a circuit or antenna meets a specified performance requirement.

Baseband — (1) The information that modulates a carrier or that is recovered from a modulated signal. (2) A video signal with its lowest frequency component at or near dc.

- Baud** — A unit of signaling speed equal to the number of discrete conditions or events per second. (For example, if an FSK signal changes frequency every 3.33 milliseconds, the signaling or baud rate is 300 bauds or the reciprocal of 0.00333 seconds.) Baud is equivalent to *symbol rate*.
- Beta (β)** — Current gain of a bipolar transistor, the ratio of collector to base current.
- BiCMOS** — A digital logic family that combines bipolar and CMOS technology in a single integrated circuit.
- Bipolar junction transistor (BJT)** — A transistor made of three layers of alternating type material (N or P) creating two PN semiconductor junctions between them.

C

- Cabrillo format** — A standardized digital file format for submitting information in a contest log.
- Cardioid (radiation pattern)** — A heart-shaped antenna pattern characterized by a single main lobe and a deep, narrow null in the opposite direction.
- Cathode** — The terminal connected to the negative supply for current to flow through a device.
- CEPT (European Conference of Postal and Telecommunications Administrations) agreement** — A multilateral operating arrangement that allows US amateurs to operate in many European countries, and amateurs from many European countries to operate in the US.
- Certificate of Successful Completion of Examination (CSCE)** — A document issued by a Volunteer Examiner Team to certify that a candidate has passed specific exam elements at their test session. If the candidate qualified for a license upgrade at the exam session, the CSCE provides the authority to operate using the newly earned license privileges, with special identification procedures.
- Chroma (chrominance)** — Information in a composite video signal that carries the color information. A *chroma burst* is a short period of signal used to synchronize color processing circuitry.
- Circulator** — A passive device with three or more ports that allows radio waves to travel between ports in only one direction.
- CMOS** — Complementary metal oxide semiconductor (digital logic family)
- Code division multiple access (CDMA)** — A method of using spread spectrum techniques to share a common frequency range by assigning each signal a different spreading code.
- Common** — In a transistor circuit (common-emitter/collector/base/source/gate/drain), the transistor electrode that is shared or used as a reference for both input and output circuits.
- Complementary metal-oxide semiconductor (CMOS)** — A type of construction used to make digital integrated circuits with both N-channel and P-channel MOS devices on the same chip.
- Conductance (G)** — The reciprocal of resistance. The real part of complex admittance.
- Cross-modulation** — See *intermodulation distortion*.
- Cross-polarized** — Antennas or signals that are aligned with their polarization at right angles.
- Cutoff frequency (f_c)** — The frequency at which (1) the output power of a passive circuit is reduced to half of its input or (2) the power gain of an active circuit is one-half its peak gain.

D

- Decibel (dB)** — A logarithm of the ratio of two power levels: $\text{dB} = 10 \log (P_2/P_1)$. Power gains and losses are expressed in decibels.
- Depletion mode** — Type of FET in which drain-source current is reduced by reverse bias on the gate.
- Dielectric** — An insulating material in which energy can be stored by an electric field.
- Dielectric constant (k)** — Also known as an insulating material's *relative permittivity* compared to

that of free space. See also *permittivity*.

Digital-to-analog converter (DAC) — A circuit that converts digital values to analog signals.

Digital Amateur Television (DATV) — Amateur television that uses commercial digital television modulation techniques and equipment.

Digital multimeter (DMM) — An instrument with a digital display that measures voltage, current, and resistance.

Digital Radio Mondiale (DRM) — A digital modulation method used to transfer audio and data on HF bands.

DIP — dual in-line package. A type of integrated circuit package with two parallel rows of pins.

Direct digital conversion (DDC) — In a *software defined radio (SDR)* the conversion of RF directly to and from digital data without an intermediate frequency conversion step.

Direct digital synthesizer (DDS) — The technique of generating a signal from a sequence of digital values stored in a table.

Direct FSK — Generating a frequency shift keying (FSK) signal by shifting the transmitter frequency directly under the control of a digital signal.

Direct sequence (DS) — A spread-spectrum communications system in which a very fast binary bit stream is used to shift the phase of an RF carrier.

DSB-SC — Double-sideband, suppressed carrier

DX — Distance. On HF, often used to describe stations in countries outside your own.

E

E plane — The plane of the electric field of an antenna's radiation.

Effective radiated power (ERP) — A measure of the power radiated from an antenna system. ERP takes into account transmitter output power, feed line losses and other system losses, and antenna gain as compared to a dipole. *Effective isotropic radiated power (EIRP)* is the same as ERP except the reference antenna is an isotropic radiator.

Electromagnetic (EM) waves — Energy moving through space or materials in the form of changing electric and magnetic fields.

EME — Earth-Moon-Earth (see also *moonbounce*)

Enhancement mode — An FET in which drain-source current is increased by forward bias on the gate.

Error correction — see *Forward error correction*

Extraordinary or X wave — The cross-polarized component of a radio wave that splits in two upon encountering the ionosphere. See also *ordinary wave*.

F

Fast-scan TV (FSTV) — See *ATV*.

Field-effect transistor (FET) — A semiconductor device that uses voltage to control output current.

Finite Impulse Response (FIR) filter — A digital filter with a response to an impulse signal that lasts for a finite amount of time. See also *Infinite Impulse Response (IIR) filter*.

Forward error correction (FEC) — The method of adding special codes to a data stream so that a receiving system can detect and correct certain types of transmission errors.

Frequency division multiplexing (FDM) — Combining more than one stream of information in a single transmitted signal by using different modulating frequencies.

Frequency hopping (FH) — A spread-spectrum communications system in which the center

frequency of a conventional carrier is altered many times a second in accordance with a pseudorandom list of channels.

Frequency modulation (FM) — A method of superimposing an information signal on an RF carrier wave in which the instantaneous frequency of an RF carrier wave is varied in relation to the information signal strength.

Frequency shift keying (FSK) — A method of digital modulation in which individual bit values are represented by specific frequencies. If two frequencies are used, one is called *mark* and one *space*.

Frequency standard — A circuit or device used to produce a highly accurate reference frequency. The frequency standard may be a crystal oscillator in a marker generator or a radio broadcast, such as from WWV, with a carefully controlled transmit frequency.

Front-to-side (F/S)/back (F/B)/rear (F/R) ratio — The ratio of field strength at the peak of the major lobe to that in the specified direction. Rear implies an average value over a specified angle centered on the back direction.

FT4, FT8 — Digital messaging protocols for use at low signal-to-noise ratios. Part of the *WSJT-X* software suite.

G

G index — An index indicating the impact of a geomagnetic storm on propagation, ranging from minor (G1) to extreme (G5).

G5RV antenna — A multi-band antenna similar to a dipole that is fed in the middle with a specific length of open-wire transmission line to create a low impedance suitable for connecting to a coaxial feed line.

Grid square locator — A 2° longitude by 1° latitude rectangle identified by a four-character label such as “EM48.” Grid square locators are exchanged in some contests, and are used as the basis for some VHF/UHF awards.

H

H plane — The plane of the magnetic field of an antenna’s radiation.

Height above average terrain (HAAT) — The height of an antenna above an average elevation of the surrounding terrain determined by measurements along several radial lines from the antenna.

I

IARP (International Amateur Radio Permit) — A multilateral operating arrangement that allows US amateurs to operate in many Central and South American countries, and amateurs from many Central and South American countries to operate in the US.

IF — Intermediate frequency.

Impedance (Z) — The general term for opposition to current flow, either ac or dc. Impedance is made up of resistance and reactance.

Infinite impulse response (IIR) filter — A digital filter with a response to an impulse signal that persists forever. See also *Finite impulse response filter*.

Intercept point (IP) — The level of a receiver input signal at which distortion products would be as strong as the desired output.

Intermodulation distortion (IMD) — A type of interference that results from the unwanted mixing of two strong signals, producing a signal on an unintended frequency. Often abbreviated as “intermod”.

Isolator — A passive attenuator in which the loss in one direction is much greater than the loss in the

other.

Isotropic — The same in all directions.

J

Joule (J) — The unit of energy in the metric system of measure.

Junction field-effect transistor (JFET) — A field-effect transistor in which the gate electrode and channel are in direct contact and made of opposite types of semiconductor materials (N or P).

JT65 — A multi-tone FSK mode used with extremely low signal-to-noise ratios.

K

K index — A geomagnetic-field measurement used to indicate HF propagation conditions. Rising values generally indicate disturbed conditions while falling values indicate improving conditions. See also *A index*.

Keplerian elements — Parameters that describe a satellite's orbit such that it can be located in the sky at any time.

L

Line A — A line parallel to and approximately 50 miles from the Canadian border, north of which US amateurs may not transmit on 420 – 430 MHz because of interference with Canadian stations.

LO — Local oscillator

Low Earth Orbit (LEO) — Orbits from 200 – 500 miles above the Earth. The International Space Station is in LEO.

M

Maximum Permissible Exposure (MPE) — The highest allowed level of exposure to RF.

Metal-oxide semiconductor FET (MOSFET) — A field-effect transistor with the gate insulated from the channel material. Also called an IGFET or *insulated gate FET*.

Minimum discernible signal (MDS) — The input signal level equal to the receiver's internal noise.

Monolithic microwave integrated circuit (MMIC) — An integrated circuit designed for operation at microwave frequencies. MMICs usually provide simple functions such as amplification.

Moonbounce — A common name for Earth-Moon-Earth (EME) communication in which signals are reflected from the Moon before being received.

MSK144 — A digital mode designed for use with meteor scatter propagation. Part of the *WSJT-X* software suite.

N

Noise blanker (NB) — A circuit that removes noise from the receiver output by muting the receiver during a noise pulse.

Noise figure — The ratio in dB of the noise output power to the noise input power with the input termination at a standard temperature of 290 K. It is a measure of the noise generated in the receiver circuitry. *Noise factor* is the same quantity expressed as a linear ratio.

Noise reduction (NR) — A type of adaptive filtering that removes unwanted noise in a signal's passband.

NTSC — National Television Standard Committee. The US analog television standard.

N-type material — Semiconductor material that has been treated with impurities to give it an excess of electrons.

O

OFCD (Off-center fed dipole) — A dipole fed away from its center point to present a similar feed point impedance on different bands.

Ordinary or O wave — The component of a radio wave that retains its original polarization when it splits in two upon encountering the ionosphere. See also *extraordinary wave*.

Orthogonal Frequency Division Multiplexing (OFDM) — The technique of transmitting digital data by modulating multiple carriers separated to minimize interference between them.

P

PCB (hazardous materials) — Polychlorinated biphenyls, carcinogenic hydrocarbons once added to insulating oils

Peak envelope power (PEP) — The maximum average power level in a signal during one cycle during a modulation peak. (Used for modulated RF signals.)

Peak envelope voltage (PEV) — The maximum voltage in a cycle at the peak of a modulated signal envelope.

Peak inverse voltage (PIV) — The maximum instantaneous anode-to-cathode reverse voltage that may be applied to a diode without damage.

Peak-to-peak (P-P) voltage — The difference between the negative and positive peak voltages of a waveform.

Pedersen ray — A high-angle radio wave that penetrates deeper into the F region of the ionosphere so the wave is bent less than a lower-angle wave and thus travels for some distance through the F region, returning to Earth at a distance farther than normally expected for single-hop propagation.

Period (T) — The time it takes to complete one cycle of an ac waveform.

Permeability (μ) — The ability of a material to store energy in a magnetic field.

Permittivity (ϵ) — The ability of a material to store energy in an electric field.

Phase-locked loop (PLL) — A servo loop consisting of a phase detector, low-pass filter, dc amplifier and voltage-controlled oscillator.

Phase modulation (PM) — A method of superimposing an information signal on an RF carrier wave in which the phase of an RF carrier wave is varied in relation to the information signal strength.

Phase shift keying (PSK) — A method of modulation in which the phase of a carrier signal is varied to represent different digital values.

PIN diode — A diode consisting of a relatively thick layer of nearly pure semiconductor material (intrinsic semiconductor) with a layer of P-type material on one side and a layer of N-type material on the other.

PN junction — The contact area between two layers of opposite-type semiconductor material.

PRB-1 — The FCC regulation requiring local governments to make reasonable accommodations for amateur radio in land-use regulations.

Programmable logic device (PLD) — A digital integrated circuit consisting of individual logic circuit elements and subsystems that can be connected together (programmed) to implement a complex function. If the logic elements are logic gates the device is called a *Programmable Gate Array (PGA)*.

Pseudonoise (PN) — A binary sequence designed to appear to be random (contain an approximately

equal number of ones and zeros). Pseudonoise is generated by a digital circuit and mixed with digital information to produce a direct-sequence spread-spectrum signal.

P-type material — A semiconductor material that has been treated with impurities to give it an electron shortage. This creates excess positive charge carriers, or “holes.”

Q

Q — (circuit or component) A quality factor describing how much energy is lost in a component or circuit due to resistance compared to energy stored in reactance. (frequency response) The ratio of center frequency of a filter to its bandwidth.

Q point — See *operating point*; also called quiescent point.

Q section — A quarter-wave section of transmission line used for impedance matching.

R

RACES — Radio Amateur Civil Emergency Service.

Radians — A unit of angular measurement. There are 2π radians in a circle and 1 radian = 57.3°

Reactance (X) — The opposition to ac current due to capacitance or inductance. The imaginary component of complex impedance.

Receiving directivity factor (RDF) — The ratio of an antenna’s forward gain to its average of gain over all directions, a figure of merit for an antenna’s receiving directivity.

Reflection coefficient (ρ or Γ) — The ratio of the reflected voltage at a given point on a transmission line to the incident voltage at the same point. The reflection coefficient is also equal to the ratio of reflected and incident currents.

Root-mean-square (RMS) voltage — A measure of the effective value of an ac voltage. The value of a dc voltage that would produce the same amount of heat in a resistance as the ac voltage.

S

S or scattering parameters — Ratios of incident and reflected voltage waves at and between the signal ports of a circuit. S parameters are used to describe impedance, gain, SWR, and other parameters of circuits at RF.

Signal-to-noise ratio (SNR) — The numeric ratio of signal power to noise power in a given bandwidth. *Signal-to-noise-plus-distortion (SINAD)* adds distortion product power to the noise power.

Single-sideband, suppressed-carrier signal (SSB) — A radio signal in which only one of the two sidebands generated by amplitude modulation is transmitted. The other sideband and the RF carrier wave are removed before the signal is transmitted.

Slow-scan television (SSTV) — A television system used by amateurs to transmit pictures within a voice signal’s bandwidth allowed on the HF bands by the FCC. Each frame takes several seconds to transmit.

Software defined radio (SDR) — A receiver and/or transmitter based on DSP techniques and with a modulation/demodulation configuration determined entirely by software.

Specific absorption rate (SAR) — The rate at which the body absorbs electromagnetic energy.

Sporadic E — A type of propagation for upper HF, VHF, and lower UHF signals that occurs when signals are reflected by highly-ionized regions of the E layer.

Spread-spectrum (SS) communication — A communications method in which the RF bandwidth of

the transmitted signal is much larger than that needed for traditional modulation schemes, and in which the RF bandwidth is independent of the modulation content. Increasing the bandwidth of the signal by means of a randomizing sequence (*spreading code*) is called *spreading*.

Surface-mount device (SMD) — An electronic component without wire leads, designed to be soldered directly to copper-foil pads on a circuit board.

Surface-mount technology (SMT) — The general term for methods and devices for mounting components directly on printed-circuit boards.

Susceptance (B) — The reciprocal of reactance. The imaginary part of complex admittance.

T

Time division multiplexing (TDM) — Combining more than one stream of information in a single transmitted signal by using different time periods or “slots” for each stream.

Transconductance (g_m) — The ratio of output current to input voltage, primarily used with FETs and vacuum tubes.

Transequatorial propagation (TE) — A form of F-layer ionospheric propagation, in which signals of higher frequency than the expected MUF propagate across the Earth’s magnetic equator.

V

Vector network analyzer (VNA) — A test instrument that measures complex impedance, phase, and amplitude in circuits at RF.

Velocity factor (VF, velocity of propagation) — An expression of how fast a radio wave will travel through a material or transmission line. It is usually stated as a fraction of the speed the wave would have in free space (where the wave would have its maximum velocity). Velocity factor is also sometimes specified as a percentage of the speed of a radio wave in free space.

Vertical interval signaling (VIS) — The method of identifying the type of SSTV signal by sending coded information during the vertical synchronization period.

Vestigial sideband (VSB) — A signal-transmission method in which one sideband, the carrier and part of the second sideband are transmitted.

VOACAP — A propagation prediction program.

Volunteer Examiner (VE) — A licensed amateur who is accredited by a Volunteer Examiner Coordinator (VEC) to administer amateur license exams.

Volunteer Examiner Coordinator (VEC) — An organization that has entered into an agreement with the FCC to coordinate amateur license examinations.

Voltage-controlled oscillator (VCO) — An oscillator whose frequency is varied by means of an applied control voltage.

W

WSJT-X — A suite of digital modes developed by K1JT including FT8, FT4, JT65, MSK144, and WSPR which are used at very low signal-to-noise ratios and for scatter or EME propagation.

WSPR — A digital mode that uses extremely low power and advanced coding techniques for evaluating propagation. Part of the *WSJT-X* software suite.