

Amateur Extra – The Right Answers

Chapter Eight – Modulation, Protocols and Modes

E1B07. What is the highest modulation index permitted at the highest modulation frequency for angle modulation below 29 MHz?

**1.0**

E8B01. What is the term for the ratio between the frequency deviation of an RF carrier wave and the modulating frequency of its corresponding FM-phone signal?

**Modulation index**

E8B02. How does the modulation index of a phase-modulated emission vary with RF carrier frequency (the modulated frequency)?

**It does not depend on the RF carrier frequency**

E8B03. What is the modulation index of an FM-phone signal having a maximum frequency deviation of 3000 Hz either side of the carrier frequency when the modulating frequency is 1000 Hz?

**3**

E8B04. What is the modulation index of an FM-phone signal having a maximum carrier deviation of plus or minus 6 kHz when modulated with a 2-kHz modulating frequency?

**3**

E8B05. What is the deviation ratio of an FM-phone signal having a maximum frequency swing of plus-or-minus 5 kHz when the maximum modulation frequency is 3 kHz?

**1.67**

E8B06. What is the deviation ratio of an FM-phone signal having a maximum frequency swing of plus or minus 7.5 kHz when the maximum modulation frequency is 3.5 kHz?

**2.14**

E8B09. What is meant by deviation ratio?

**The ratio of the maximum carrier frequency deviation to the highest audio modulating frequency**

E8B10. What describes frequency division multiplexing?

**Two or more information streams are merged into a baseband, which then modulates the transmitter**

E8B11. What is digital time division multiplexing?

**Two or more signals are arranged to share discrete time slots of a data transmission**

E2C09. What type of equipment is commonly used to implement a ham radio mesh network?

**A standard wireless router running custom software**

E2D01. Which of the following digital modes is especially designed for use for meteor scatter signals?

**FSK441**

E2D03. Which of the following digital modes is especially useful for EME communications?

**JT65**

E2D09. Which of these digital modes has the fastest data throughput under clear communication conditions?

**300 baud packet**

E2D12. How does JT65 improve EME communications?

**It can decode signals many dB below the noise floor using FEC**

E2D13. What type of modulation is used for JT65 contacts?

**Multi-tone AFSK**

E2D14. What is one advantage of using JT65 coding?

**The ability to decode signals which have a very low signal to noise ratio**

E2E01. Which type of modulation is common for data emissions below 30 MHz?

**FSK**

E2E02. What do the letters FEC mean as they relate to digital operation?

**Forward Error Correction**

E2E03. How is the timing of JT65 contacts organized?

**Alternating transmissions at 1 minute intervals**

E2E04. What is indicated when one of the ellipses in an FSK crossed-ellipse display suddenly disappears?

**Selective fading has occurred**

E2E05. Which type of digital mode does not support keyboard-to-keyboard operation?

**Winlink**

E2E06. What is the most common data rate used for HF packet?

**300 baud**

E2E07. What is the typical bandwidth of a properly modulated MFSK16 signal?

**316 Hz**

E2E08. Which of the following HF digital modes can be used to transfer binary files?

**PACKTOR**

E2E09. Which of the following HF digital modes uses variable-length coding for bandwidth efficiency?

**PSK31**

E2E10. Which of these digital communications modes has the narrowest bandwidth?

**PSK31**

E2E11. What is the difference between direct FSK and audio FSK?

**Direct FSK applies the data signal to the transmitter VFO**

E2E12. Which type of control is used by stations using the Automatic Link Enable (ALE) protocol?

**Automatic**

E2E13. Which of the following is a possible reason that attempts to initiate contact with a digital station on a clear frequency are unsuccessful?

**Your transmit frequency is incorrect**

**The protocol version you are using is not the supported by the digital station**

**Another station you are unable to hear is using the frequency**

E8B07. Orthogonal Frequency Division Multiplexing is a technique used for which type of amateur communication?

**High-speed digital modes**

E8B08. What describes Orthogonal Frequency Division Multiplexing?

**A digital modulation technique using subcarriers at frequencies chosen to avoid intersymbol interference**

E8C01. How is Forward Error Correction implemented?

**By transmitting extra data that may be used to detect and correct transmission errors**

E8C02. What is the definition of symbol rate in a digital transmission?

**The rate at which the waveform of a transmitted signal changes to convey information**

E8C03. When performing phase shift keying, why is it advantageous to shift phase precisely at the zero crossing of the RF carrier?

**This results in the least possible transmitted bandwidth for the particular mode**

E8C04. What technique is used to minimize the bandwidth requirements of a PSK31 signal?

**Use of sinusoidal data pulses**

E8C05. What is the necessary bandwidth of a 13-WPM International Morse code transmission?

**Approximately 52 Hz**

E8C06. What is the necessary bandwidth of a 170-hertz shift, 300-baud ASCII transmission?

**0.5 kHz**

E8C07. What is the necessary bandwidth of a 4800-Hz frequency shift, 9600-baud ASCII FM transmission?

**15.36 kHz**

E8C08. How does ARQ accomplish error correction?

**If errors are detected, a retransmission is requested**

E8C09. What is the name of a digital code where each preceding or following character changes by only one bit?

**Gray code**

E8C10. What is an advantage of Gray code in digital communications where symbols are transmitted as multiple bits

**It facilitates error detection**

E8C11. What is the relationship between symbol rate and baud?

**They are the same**

E8D01. Why are received spread spectrum signals resistant to interference?

**Signals not using the spread spectrum algorithm are suppressed in the receiver**

E8D02. What spread spectrum communications technique uses a high speed binary bit stream to shift the phase of an RF carrier?

**Direct sequence**

E8D03. How does the spread spectrum technique of frequency hopping work?

**The frequency of the transmitted signal is changed very rapidly according to a particular sequence also used by the receiving station**

E8D04. What is the primary effect of extremely short rise or fall time on a CW signal?

**The generation of key clicks**

E8D05. What is the most common method of reducing key clicks?

**Increase keying waveform rise and fall times**

E8D06. Which of the following indicates likely overmodulation of an AFSK signal such as PSK or MFSK?

**Strong ALC action**

E8D07. What is a common cause of overmodulation of AFSK signals?

**Excess transmit audio levels**

E8D08. What parameter might indicate that excessively high input levels are causing distortion in an AFSK signal?

**Intermodulation Distortion (IMD)**

E8D09. What is considered a good minimum IMD level for an idling PSK signal?

**-30 dB**

E8D10. What are some of the differences between the Baudot digital code and ASCII?

**Baudot uses 5 data bits per character, ASCII uses 7 or 8; Baudot uses 2 characters as letters/figures shift codes, ASCII has no letters/figures shift code**

E8D11. What is one advantage of using ASCII code for data communications?

**It is possible to transmit both upper and lower case text**

E8D12. What is the advantage of including a parity bit with an ASCII character stream?

**Some types of errors can be detected**

E2B01. How many times per second is a new frame transmitted in a fast-scan (NTSC) television system?

**30**

E2B02. How many horizontal lines make up a fast-scan (NTSC) television frame?

**525**

E2B03. How is an interlaced scanning pattern generated in a fast-scan (NTSC) television system?

**By scanning odd numbered lines in one field and even numbered ones in the next**

E2B04. What is blanking in a video signal?

**Turning off the scanning beam while it is traveling from right to left or from bottom to top**

E2B05. Which of the following is an advantage of using vestigial sideband for standard fast-scan TV transmissions?

**Vestigial sideband reduces bandwidth while allowing for simple video detector circuitry**

E2B06. What is vestigial sideband modulation?

**Amplitude modulation in which one complete sideband and a portion of the other are transmitted**

E2B07. What is the name of the signal component that carries color information in NTSC video?

**Chroma**

E2B08. Which of the following is a common method of transmitting accompanying audio with amateur fast-scan television?

**Frequency-modulated sub-carrier  
A separate VHF or UHF audio link  
Frequency modulation of the video carrier**

E2B09. What hardware, other than a receiver with SSB capability and a suitable computer, is needed to decode SSTV using Digital Radio Mondiale (DRM)?

**No other hardware is needed**

E2B10. Which of the following is an acceptable bandwidth for Digital Radio Mondiale (DRM) based voice or SSTV digital transmissions made on the HF amateur bands?

**3 kHz**

E2B11. What is the function of the Vertical Interval Signaling (VIS) code sent as part of an SSTV transmission?

**To identify the SSTV mode being used**

E2B12. How are analog SSTV images typically transmitted on the HF bands?

**Varying tone frequencies representing the video are transmitted using single sideband**

E2B13. How many lines are commonly used in each frame on an amateur slow-scan color television picture?

**128 or 256**



E2B14. What aspect of an amateur slow-scan television signal encodes the brightness of the picture?

**Tone frequency**

E2B15. What signals SSTV receiving equipment to begin a new picture line?

**Specific tone frequencies**

E2B16. Which is a video standard used by North American Fast Scan ATV stations?

**NTSC**

E2B17. What is the approximate bandwidth of a slow-scan TV signal?

**3 kHz**

E2B18. On which of the following frequencies is one likely to find FM ATV transmissions?

**1255 MHz**

E2B19. What special operating frequency restrictions are imposed on slow scan TV transmissions?

**They are restricted to phone band segments and their bandwidth can be no greater than that of a voice signal of the same modulation type**