Technician Licensing Class

Modulation modes, amateur satellite operation, operating activities, non-voice communications

T 8 A - T 8 D

Valid
July 1, 2018 Through June 30, 2022

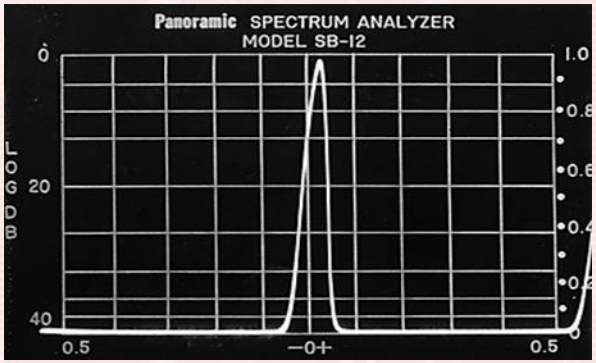
Developed by Bob Bytheway, K3DIO, and
updated to 2018 Question Pool by NQ4K for Sterling Park Amateur Radio Club

T 8 A
Topics

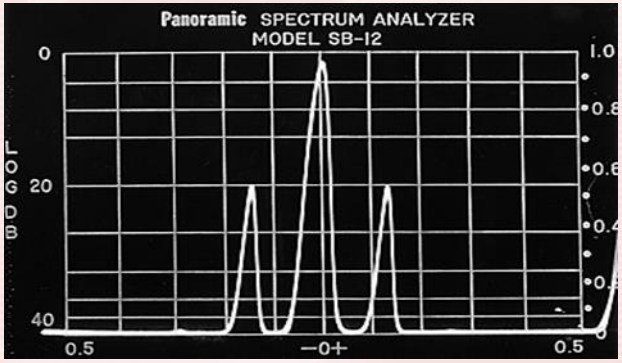
- Modulation modes:
  - bandwidth of various signals;
  - choice of emission type

T 8 A

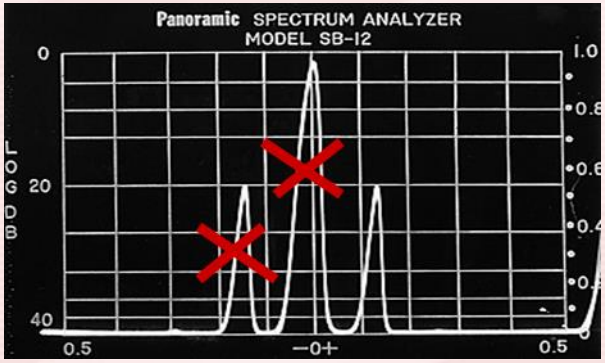
- Single sideband (SSB) is a form of amplitude modulation. T8A01



Carrier only CW



Tones produce both side bands or AM

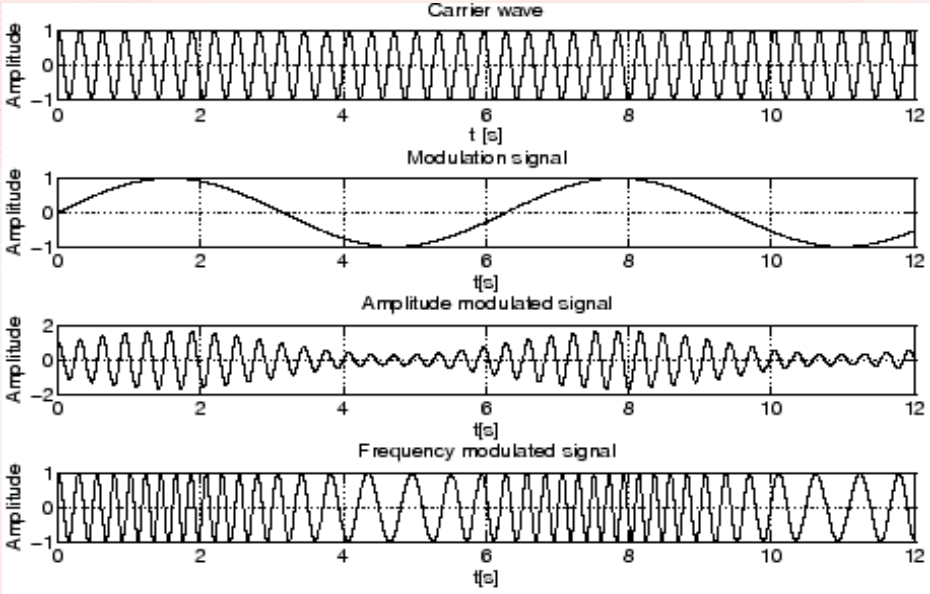


Remove one sideband and suppress carrier becomes SSB

- SSB (single sideband) is the voice mode most often used for long-distance (weak signal) contacts on the VHF and UHF bands. T8A03

T 8 A

- Frequency modulation (FM) us most commonly used for VHF and UHF repeaters. T8A04

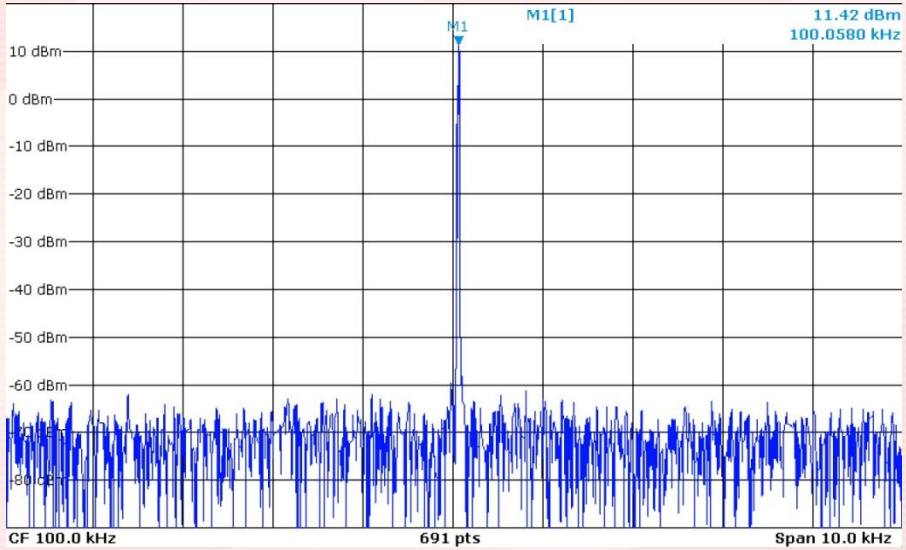


- The most common type of modulation used for VHF packet radio transmission is FM. T8A02

T 8 A

- The type of emission that has the narrowest bandwidth is CW. T8A05

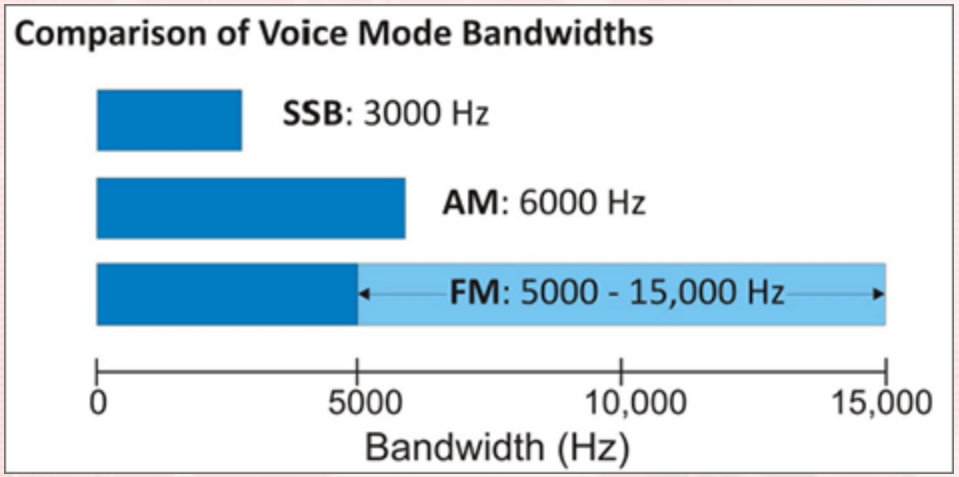
CW Signal	**500 Hz wide**
SSB Signal	**2 - 3 kHz wide**
FM Signal	**5 - 15 kHz wide**
UHF Fast-Scan TV	**~ 6 MHz**



- Upper sideband is normally used for 10 meter HF, VHF and UHF single-sideband communications. as our communications mode. T8A06

T 8 A

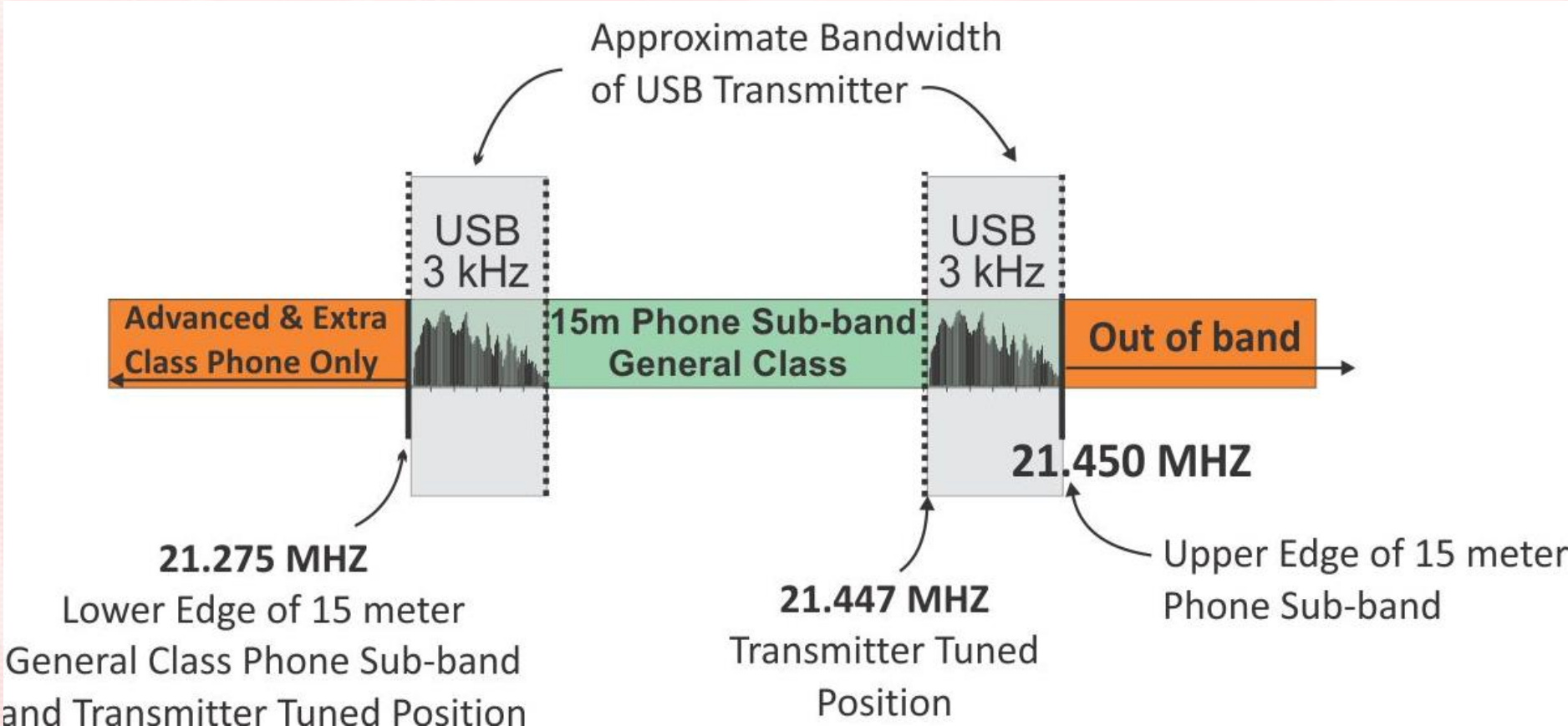
- The primary advantage of single sideband over FM for voice transmissions is SSB signals have narrower bandwidth. T8A07



CW Signal	**500 Hz wide**
SSB Signal	**2 - 3 kHz wide**
FM Signal	**5 - 15 kHz wide**
UHF Fast-Scan TV	**~ 6 MHz**

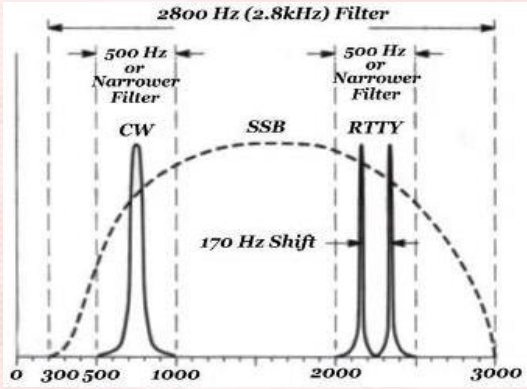
T 8 A

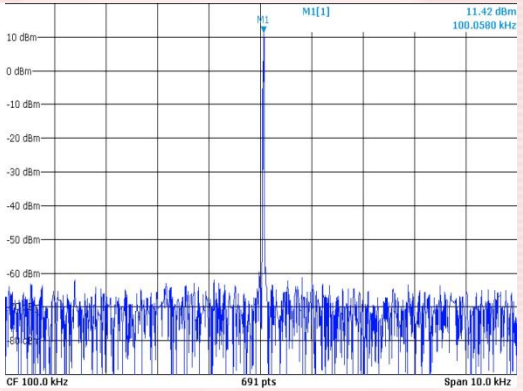
- 3 kHz is the approximate bandwidth of a single sideband voice signal. T8A08



T 8 A

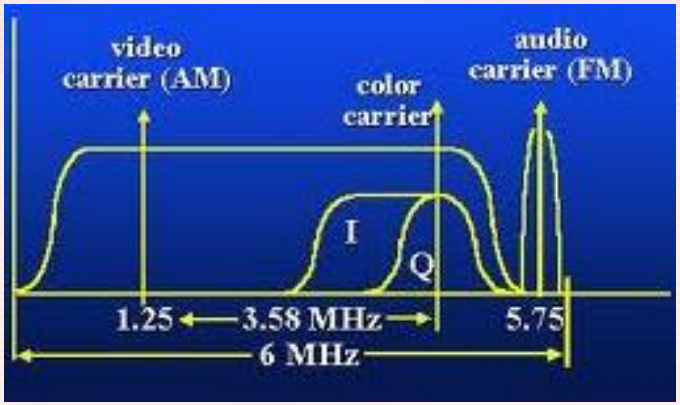
- The approximate bandwidth of a VHF repeater FM phone signal is between 10 and 15 kHz. T8A09
- 150 Hz is the approximate maximum bandwidth required to transmit a CW signal. T8A11





T 8 A

- The typical bandwidth of an analog fast-scan TV transmission on the 70 cm band is about 6 MHz. T8A10



- An analog fast scan color TV signal is the type of transmission indicated by the term NTSC. T8D04

T 8 B
Topics

- Amateur satellite operation;
  - Doppler shift;
  - basic orbits;
  - operating protocols;
  - transmitter power considerations;
  - telemetry and telecommand;
  - satellite tracking

T 8 B

- Telemetry information is typically transmitted by satellite beacons is health and status of the satellite. T8B01

- The impact of using too much effective radiated power on a satellite uplink is blocking access by other users. T8B02

T 8 B

- The following are provided by satellite tracking programs:
  - Maps showing the real-time position of the satellite track over the earth
  - The time, azimuth, and elevation of the start, maximum altitude, and the end of a pass
  - The apparent frequency of the satellite transmission, including effects of Doppler shift

✓ **All of these answers are correct.** T8B03

T 8 B

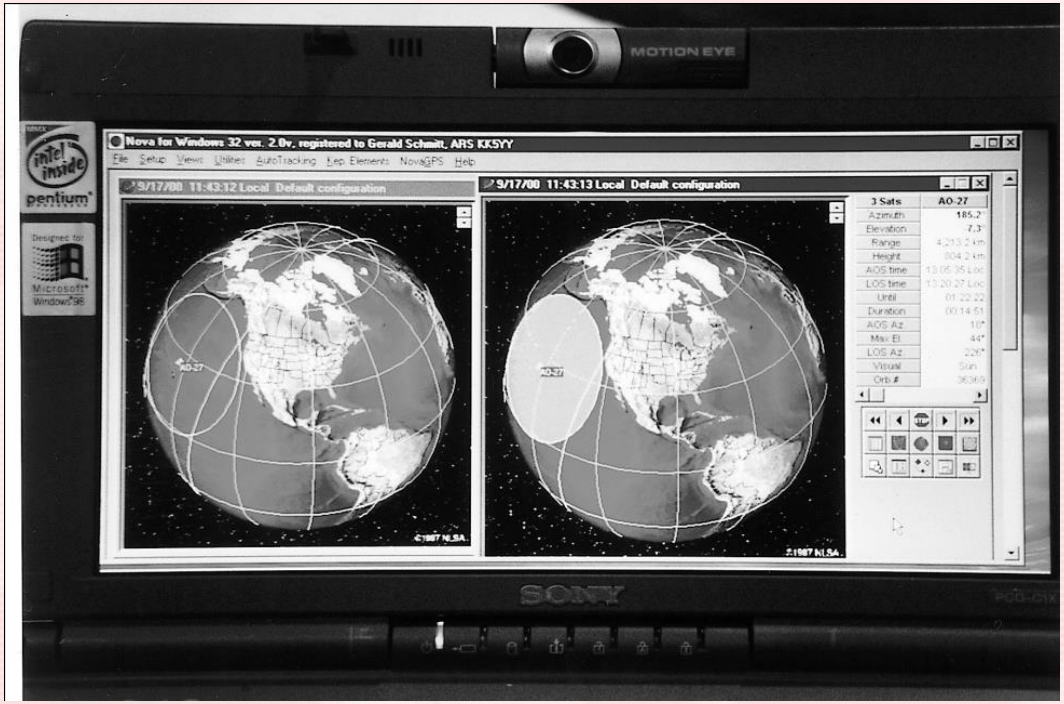
- The modes of transmission is commonly used by amateur radio satellites is SSB, FM, and CW/data. T8B04

- A Satellite beacon is a transmission from a space station that contains information about a satellite. T8B05

T 8 B

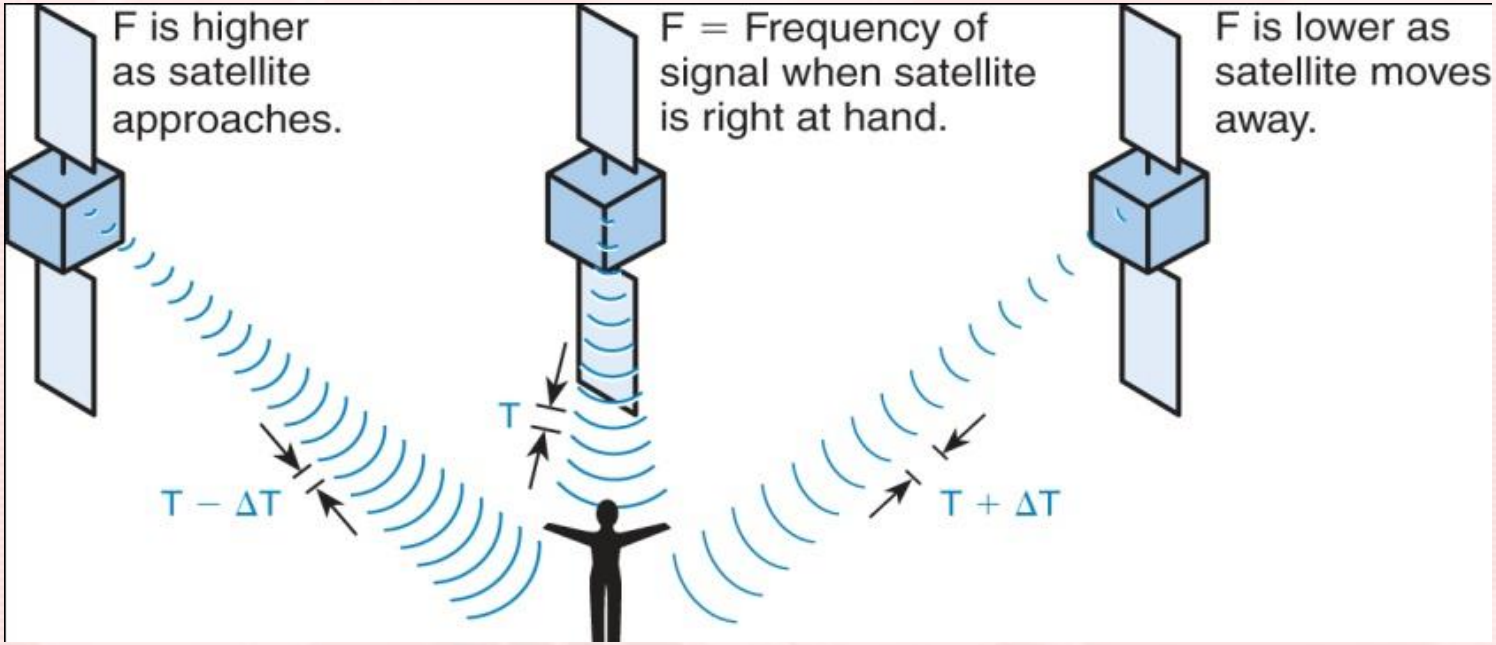
- Keplerian elements are inputs to a satellite tracking program. T8B06

Computer programs and websites can show you where and when an amateur satellite or the Space Station will be in range of your ham station.



T 8 B

- With regard to satellite communications, an observed change in signal frequency caused by relative motion between the satellite and the earth station is called Doppler shift. T8B07



Doppler Effect

T 8 B

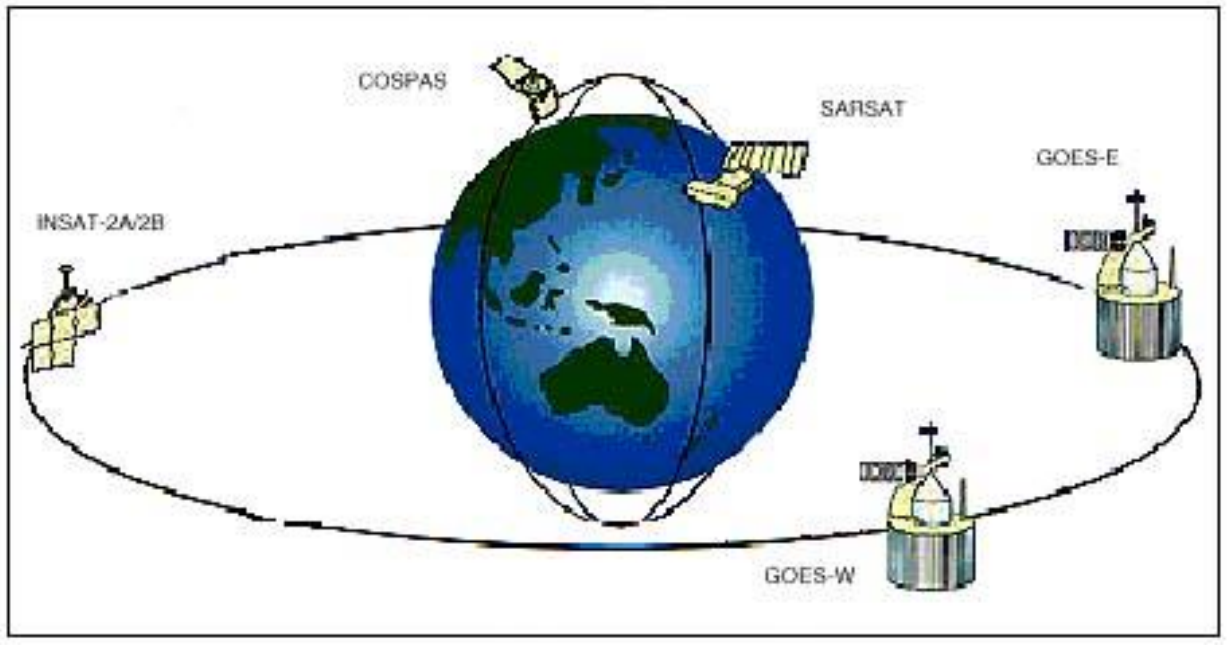
- When a satellite is operating in mode U/V it means the satellite uplink is in the 70 cm band and the downlink is in the 2 meter band. T8B08

Frequency Bands	Frequency Range	Modes
High Frequency	21 - 30 MHz	Mode H
VHF	144 - 146 MHz	Mode V
UHF	435 - 438 MHz	Mode U
L band	1.26 - 1.27 GHz	Mode L
S band	2.4 - 2.45 GHz	Mode S
C band	5.8 GHz	Mode C
X band	10.4 GHz	Mode X
K band	24 GHz	Mode K

- Rotation of the satellite and its antennas causes spin fading of satellite signals. T8B09

T 8 B

- The initials LEO tell you that the satellite is in a Low Earth Orbit. T8B10



T 8 B

- Anyone who can receive the telemetry signal may receive telemetry from a space station.
T8B11

- A good way to judge whether your uplink power is neither too low nor too high is that your signal strength on the downlink should be about the same as the beacon?

T 8 C
Topics

- Operating activities:
  - radio direction finding;
  - radio control;
  - contests;
  - linking over the internet;
  - grid locators

T 8 C

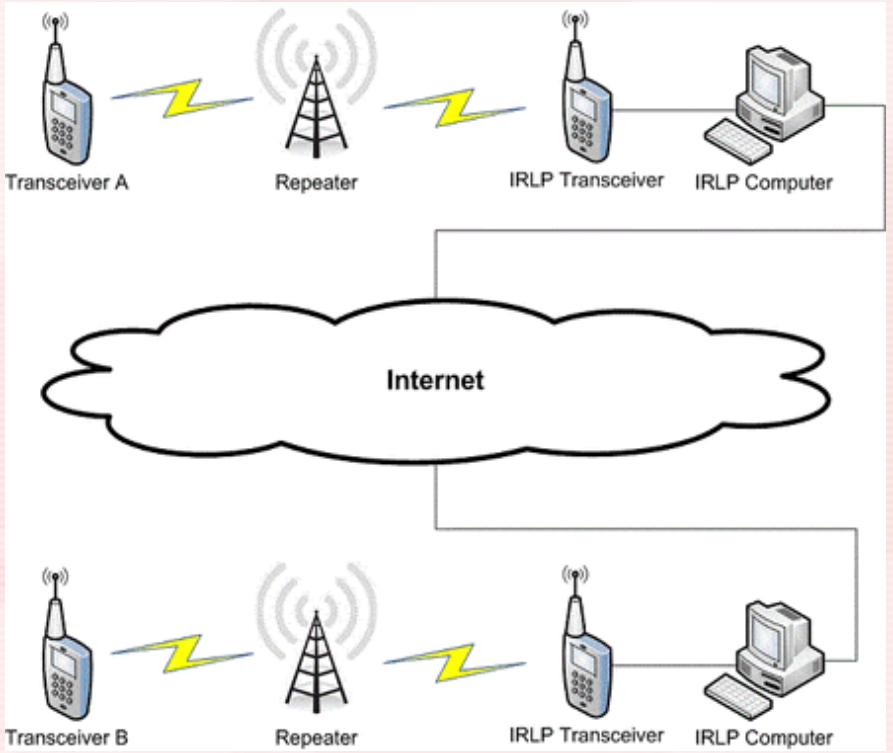
- To locate sources of noise interference or jamming, use radio direction finding equipment. T8C01
- A directional antenna would be useful for a hidden transmitter hunt. T8C02

T 8 C

- A popular operating activity that involves contacting as many stations as possible during a specified period of time is called contesting. T8C03
- When contacting another station in a radio contest a good procedure is to send only the minimum information needed for the proper identification and the contest exchange. T8C04
- A grid locator is a letter-number designator assigned to a geographic location. T8C05

T 8 C

- The Internet Radio Linking Project (IRLP) is a technique to connect amateur radio systems, such as repeaters, via the Internet using **V**oice **O**ver **I**nternet **P**rotocol. T8C08



T 8 C

- Access to some IRLP nodes is accomplished by using DTMF signals. T8C06

- Voice over Internet Protocol (VoIP) as used in amateur radio is a method of delivering voice communications over the Internet using digital techniques. T8C07

T 8 C

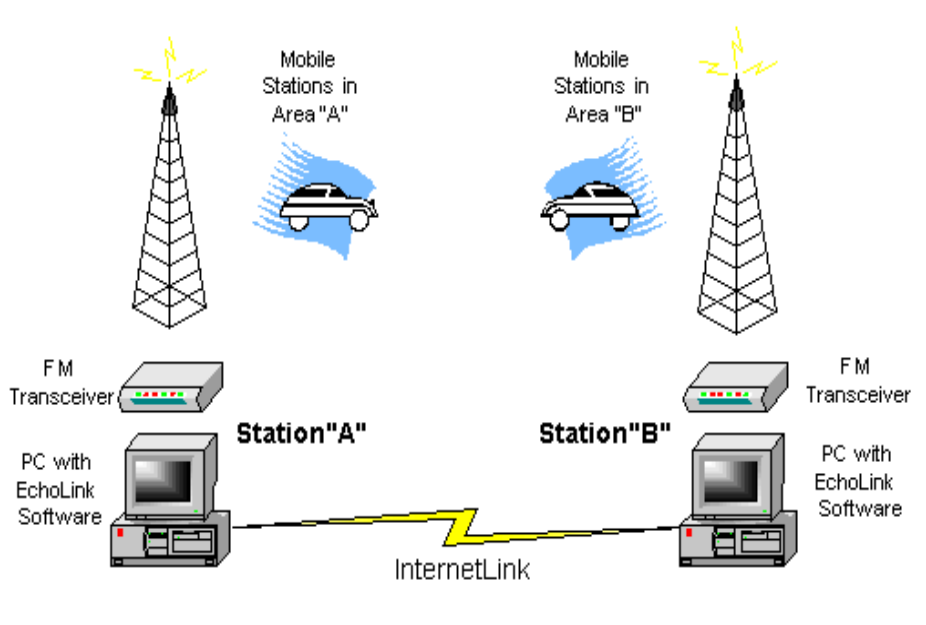
- You might obtain a list of active nodes that use VoIP:
  - By subscribing to an on line service
  - From on line repeater lists maintained by the local repeater frequency coordinator
  - From a repeater directory.

    - All of these choices are correct T8C09

T 8 C

- Before you may use the EchoLink system to communicate using a repeater you must register your call sign and provide proof of license. T8C10

- A gateway is the name given to an amateur radio station that is used to connect other amateur stations to the internet. T8C11

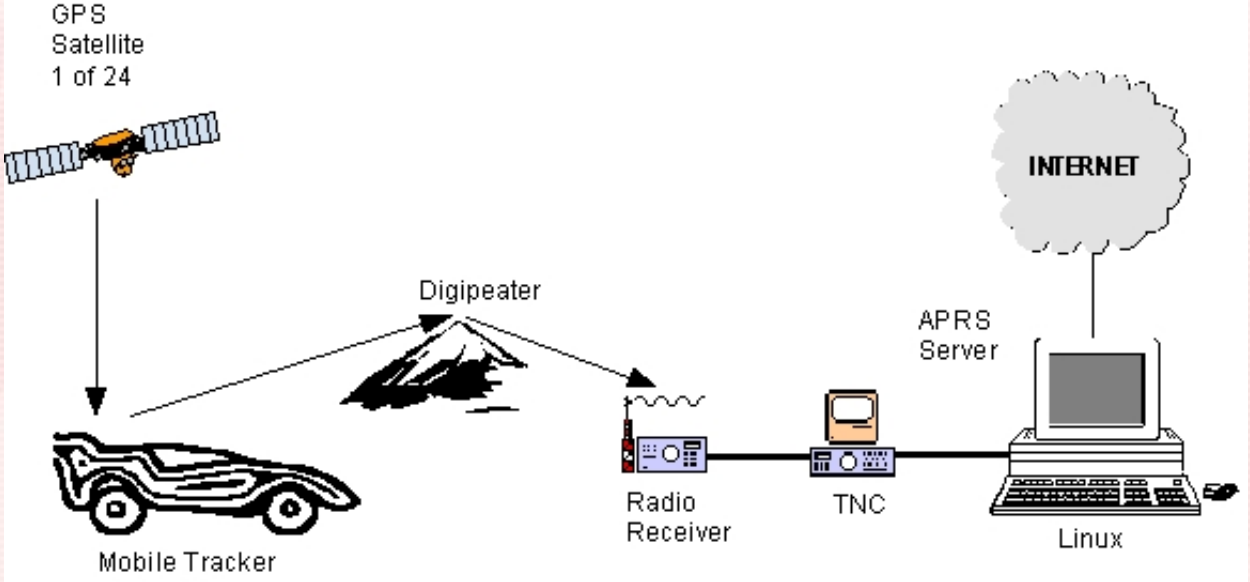


T 8 D
Topics

- Non-voice and digital communications:
  - image signals;
  - digital modes;
  - CW;
  - packet radio;
  - PSK31;
  - APRS;
  - error detection and correction;
  - NTSC;
  - amateur radio networking;
  - Digital Mobile/Migration Radio

T 8 D

- The term “APRS” means Automatic Packet Reporting System. T8D02
- A Global Positioning System receiver provides data to the transmitter when sending automatic position reports from a mobile amateur radio station. T8D03



T 8 D

- An application of APRS (Automatic Packet Reporting System) is that it provides real time tactical digital communications in conjunction with a map showing the locations of stations. T8D05

- The abbreviation PSK means Phase Shift Keying. T8D06
- DMR (Digital Mobile Radio) is a technique for time-multiplexing two digital voice signals on a single 12.5 kHz repeater channel. T8D07

T 8 D

- The following are examples of a digital communications method:
  - Packet radio
  - IEEE 802.11
  - JT65
    - All of these choices are correct. T8D01

T 8 D

- The following may be included in packet transmissions:
  - A checksum which permits error detection;
  - A header which contains the call sign of the station to which the information is being sent;
  - Automatic repeat request in case of error;
    - ✓ All of these choices are correct. T8D08
- International Morse code is the code used when sending CW in the amateur bands. T8D09

T 8 D

- The following operating activities is supported by digital mode software in the WSJT suite:
  - Moonbounce or Earth-Moon-Earth
  - Weak-signal propagation beacons
  - Meteor scatter
    - ✓All of these choices are correct. T8D10

T 8 D

- An ARQ transmission system is a digital scheme whereby the receiving station detects errors and sends a request to the sending station to retransmit the information. T8D11

- Broadband-Hamnet(TM), also referred to as a high-speed multi-media network, is an amateur-radio-based data network using commercial Wi-Fi gear with modified firmware T8D12

T 8 D

- FT8 is a digital mode capable of operating in low signal-to-noise conditions that transmits on 15-second intervals. T8D13

- An electronic keyer is a device that assists in manual sending of Morse code. T8D14

Element 2 Technician Class Question Pool

T 8 A – T 8 D

T8A01 Which of the following is a form of amplitude modulation?

A. Spread-spectrum

B. Packet radio

C. Single sideband

D. Phase shift keying

T8A02 What type of modulation is most commonly used for VHF packet radio transmissions?

A. FM

B. SSB

C. AM

D. Spread Spectrum

T8A03 Which type of voice mode is most often used for long-distance (weak signal) contacts on the VHF and UHF bands ?

A. FM

B. DRM

C. SSB

D. PM

T8A04 Which type of modulation is most commonly used for VHF and UHF voice repeaters?

A. AM

B. SSB

C. PSK

D. FM

T8A05 Which of the following types of emission has the narrowest bandwidth?

A. FM voice

B. SSB voice

C. CW

D. Slow-scan TV

T8A06 Which sideband is normally used for 10 meter HF, VHF and UHF single-sideband communications?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Inverted sideband

T8A07 What is an advantage of single sideband (SSB) over FM for voice transmissions?

A. SSB signals are easier to tune
B. SSB signals are less susceptible to interference
C. SSB signals have narrower bandwidth
D. All of these choices are correct

T8A08 What is the approximate bandwidth of a single sideband (SSB) voice signal?

A. 1 kHz
B. 3 kHz
C. 6 kHz
D. 15 kHz

T8A09 What is the approximate bandwidth of a VHF repeater FM phone signal?

A. Less than 500 Hz
B. About 150 kHz
C. Between 10 and 15 kHz
D. Between 50 and 125 kHz

T8A10 What is the typical bandwidth of analog fast-scan TV transmissions on the 70 cm band ?

A. More than 10 MHz
B. About 6 MHz
C. About 3 MHz
D. About 1 MHz

T8A11 What is the approximate maximum bandwidth required to transmit a CW signal?

A. 2.4 kHz
B. 150 Hz
C. 1000 Hz
D. 15 kHz

T8B01 What telemetry information is typically transmitted by satellite beacons?

A. The signal strength of received signals

B. Time of day accurate to plus or minus 1/10 second

C. Health and status of the satellite

D. All of these choices are correct

T8B02 What is the impact of using too much effective radiated power on a satellite uplink?

A. Possibility of commanding the satellite to an improper mode

B. Blocking access by other users

C. Overloading the satellite batteries

D. Possibility of rebooting the satellite control computer

T8B03 Which of the following are provided by satellite tracking programs?

A. Maps showing the real-time position of the satellite track over the earth

B. The time, azimuth, and elevation of the start, maximum altitude, and end of a pass

C. The apparent frequency of the satellite transmission, including effects of Doppler shift

D. All of these choices are correct

T8B04 What mode of transmission is commonly used by amateur radio satellites?

A. SSB

B. FM

C. CW/data

D. All of these choices are correct

T8B05 What is a satellite beacon?

A. The primary transmit antenna on the satellite

B. An indicator light that that shows where to point your antenna

C. A reflective surface on the satellite

D. A transmission from a satellite that contains status information

T8B06 Which of the following are inputs to a satellite tracking program?

A. The weight of the satellite

B. The Keplerian elements

C. The last observed time of zero Doppler Shift

D. All of these answers are correct

T8B07 With regard to satellite communications, what is Doppler shift?

A. A change in the satellite orbit

B. A mode where the satellite receives signals on one band and transmits on another

C. An observed change in signal frequency caused by relative motion between the satellite and the earth station

D. A special digital communications mode for some satellites

T8B08 What is meant by the statement that a satellite is operating in mode U/V?

A. The satellite uplink is in the 15 meter band and the downlink is in the 10 meter band

B. The satellite uplink is in the 70 cm band and the downlink is in the 2 meter band

C. The satellite operates using ultraviolet frequencies

D. The satellite frequencies are usually variable

T8B09 What causes spin fading when referring to satellite signals?

A. Circular polarized noise interference radiated from the sun

B. Rotation of the satellite and its antennas

C. Doppler shift of the received signal

D. Interfering signals within the satellite uplink band

T8B10 What do the initials LEO tell you about an amateur satellite?

A. The satellite battery is in Low Energy Operation mode

B. The satellite is performing a Lunar Ejection Orbit maneuver

C. The satellite is in a Low Earth Orbit

D. The satellite uses Light Emitting Optics

T8B11 Who may receive telemetry from a space station?

A. Anyone who can receive the telemetry signal

B. A licensed radio amateur with a transmitter equipped for interrogating the satellite

C. A licensed radio amateur who has been certified by the protocol developer

D. A licensed radio amateur who has registered for an access code from AMSAT

T8B12 Which of the following is a good way to judge whether your uplink power is neither too low nor too high?

A. Check your signal strength report in the telemetry data

B. Listen for distortion on your downlink signal

C. Your signal strength on the downlink should be about the same as the beacon

D. All of these choices are correct

T8C01 Which of the following methods is used to locate sources of noise interference or jamming?

A. Echolocation

B. Doppler radar

C. Radio direction finding

D. Phase locking

T8C02 Which of these items would be useful for a hidden transmitter hunt?

A. Calibrated SWR meter
B. A directional antenna
C. A calibrated noise bridge
D. All of these choices are correct

T8C03 What operating activity involves contacting as many stations as possible during a specified period?

A. Contesting

B. Net operations

C. Public service events

D. Simulated emergency exercises

T8C04 Which of the following is good procedure when contacting another station in a radio contest?

A. Be sure to sign only the last two letters of your call if there is a pileup calling the station

B. Work the station twice to be sure that you are in his log

C. Send only the minimum information needed for proper identification and the contest exchange

D. All of these choices are correct

T8C05 What is a grid locator?

A. A letter-number designator assigned to a geographic location

B. A letter-number designator assigned to an azimuth and elevation

C. An instrument for neutralizing a final amplifier

D. An instrument for radio direction finding

T8C06 How is access to some IRLP nodes accomplished?

A. By obtaining a password which is sent via voice to the node

B. By using DTMF signals

C. By entering the proper Internet password

D. By using CTCSS tone codes

T8C07 What is meant by Voice Over Internet Protocol (VoIP) as used in amateur radio?

- A set of rules specifying how to identify your station when linked over the internet to another station
- A set of guidelines for contacting DX stations during contests using internet access
- A technique for measuring the modulation quality of a transmitter using remote sites monitored via the internet
- A method of delivering voice communications over the internet using digital techniques

T8C08 What is the Internet Radio Linking Project (IRLP)?

A. A technique to connect amateur radio systems, such as repeaters, via the internet using Voice Over Internet Protocol (VoIP)

B. A system for providing access to websites via amateur radio

C. A system for informing amateurs in real time of the frequency of active DX stations

D. A technique for measuring signal strength of an amateur transmitter via the internet

T8C09 How might you obtain a list of active nodes that use VoIP?

A. By subscribing to an on line service

B. From on line repeater lists maintained by the local repeater frequency coordinator

C. From a repeater directory

D. All of these choices are correct

T8C10 What must be done before you may use the EchoLink system to communicate using a repeater?

A. You must complete the required EchoLink training

B. You must have purchased a license to use the EchoLink software

C. You must be sponsored by a current EchoLink user

D. You must register your call sign and provide proof of license

T8C11 What name is given to an amateur radio station that is used to connect other amateur stations to the Internet?

A. A gateway

B. A repeater

C. A digipeater

D. A beacon

T8D01 Which of the following is a digital communications method?

A. Packet
B. IEEE 802.11
C. JT65
D. All of these choices are correct

T8D02 What does the term “APRS” mean?

A. Automatic Packet Reporting System

B. Associated Public Radio Station

C. Auto Planning Radio Set-up

D. Advanced Polar Radio System

T8D03 Which of the following devices is used to provide data to the transmitter when sending automatic position reports from a mobile amateur radio station?

A. The vehicle speedometer

B. A WWV receiver

C. A connection to a broadcast FM sub-carrier receiver

D. A Global Positioning System receiver

T8D04 What type of transmission is indicated by the term "NTSC?"

A. A Normal Transmission mode in Static Circuit

B. A special mode for earth satellite uplink

C. An analog fast scan color TV signal

D. A frame compression scheme for TV signals

T8D05 Which of the following is an application of APRS (Automatic Packet Reporting System)?

A. Providing real time tactical digital communications in conjunction with a map showing the locations of stations

B. Showing automatically the number of packets transmitted via PACTOR during a specific time interval

C. Providing voice over Internet connection between repeaters

D. Providing information on the number of stations signed into a repeater

T8D06 What does the abbreviation PSK mean?

A. Pulse Shift Keying

B. Phase Shift Keying

C. Packet Short Keying

D. Phased Slide Keying

T8D07 Which of the following best describes DMR (Digital Mobile Radio)?

A. A technique for time-multiplexing two digital voice signals on a single 12.5 kHz repeater channel

B. An automatic position tracking mode for FM mobiles communicating through repeaters

C. An automatic computer logging technique for hands-off logging when communicating while operating a vehicle

D. A digital technique for transmitting on two repeater inputs simultaneously for automatic error correction

T8D08 Which of the following may be included in packet transmissions?

A. A check sum which permits error detection

B. A header which contains the call sign of the station to which the information is being sent

C. Automatic repeat request in case of error

D. All of these choices are correct

T8D09 What code is used when sending CW in the amateur bands?

A. Baudot

B. Hamming

C. International Morse

D. Gray

T8D10 Which of the following operating activities is supported by digital mode software in the WSJT suite?

A. Moonbounce or Earth-Moon-Earth

B. Weak-signal propagation beacons

C. Meteor scatter

D. All of these choices are correct

T8D12 Which of the following best describes Broadband-Hamnet(TM), also referred to as a high-speed multi-media network?

A. An amateur-radio-based data network using commercial Wi-Fi gear with modified firmware

B. A wide-bandwidth digital voice mode employing DRM protocols

C. A satellite communications network using modified commercial satellite TV hardware

D. An internet linking protocol used to network repeaters

T8D14 What is an electronic keyer?

A. A device for switching antennas from transmit to receive

B. A device for voice activated switching from receive to transmit

C. A device that assists in manual sending of Morse code

D. An interlock to prevent unauthorized use of a radio