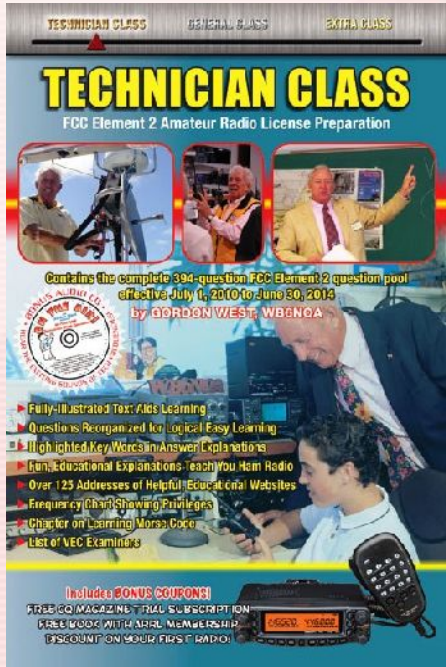
Technician Licensing Class

Talk to Outer Space

Presented by



ELMER
AMATEUR RADIO
HAM IT UP!
A NATIONAL RESOURCE

Amateur Radio Technician Class
Element 2 Course Presentation

ELEMENT 2 SUB-ELEMENTS
(Groupings)

- **About Ham Radio**
- **Call Signs**
- **Control**
- **Mind the Rules**
- **Tech Frequencies**
- **Your First Radio**
- **Going On The Air!**
- **Repeaters**
- **Emergency!**
- **Weak Signal Propagation**

Amateur Radio Technician Class
Element 2 Course Presentation

- **ELEMENT 2 SUB-ELEMENTS (Groupings)**
  - **Talk to Outer Space!**
  - **Your Computer Goes Ham Digital!**
  - **Multi-Mode Radio Excitement**
  - **Run Some Interference Protection**
  - **Electrons – Go With the Flow!**
  - **It's the Law, per Mr. Ohm!**
  - **Go Picture These!**
  - **Antennas**
  - **Feed Me with Some Good Coax!**
  - **Safety First!**

Talk to Outer Space

- T1A5 An amateur station located more than 50 km above the Earth's surface is considered by FCC Part 97 definition a space station.
- T8B4 Any amateur holding a Technician or higher class license may make contact with an amateur station on the International Space Station using 2-meter and 70 cm band amateur radio frequencies.

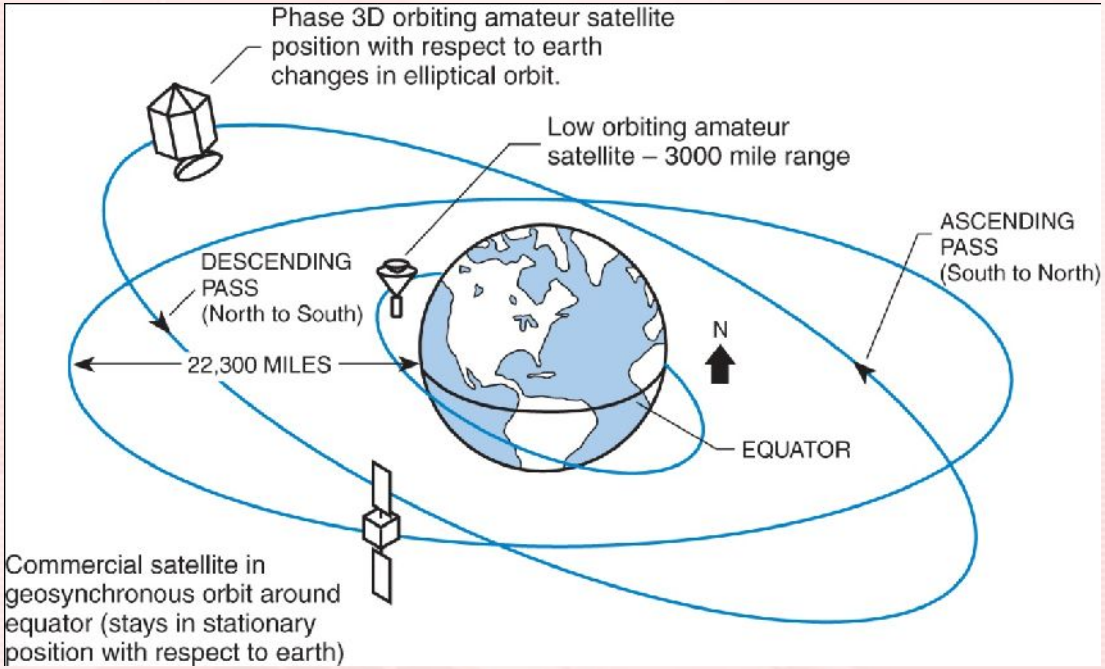
The International Space Station downlink, FM is 145.800 MHz. Use an HT to listen when it's passing over you.

International Space Station has a big ham station on board.

Many Astronaults are licensed radio amateurs.

Talk to Outer Space

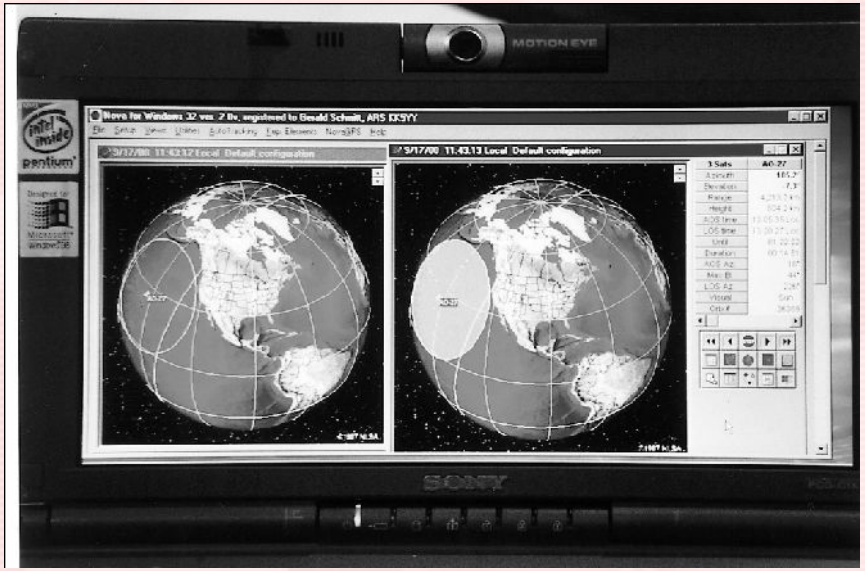
- T8B3 Talking to amateur radio operators in other countries can be done using an amateur radio satellite.
- T8B10 The initials LEO tell you an amateur satellite is in a **L**ow **E**arth **O**rbit.



Orbiting Satellites

Talk to Outer Space

- T8B6 A satellite tracking program can be used to determine the time period during which an amateur satellite or space station can be accessed.



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.

- T8B5 A satellite beacon is a transmission from a space station that contains information about a satellite.

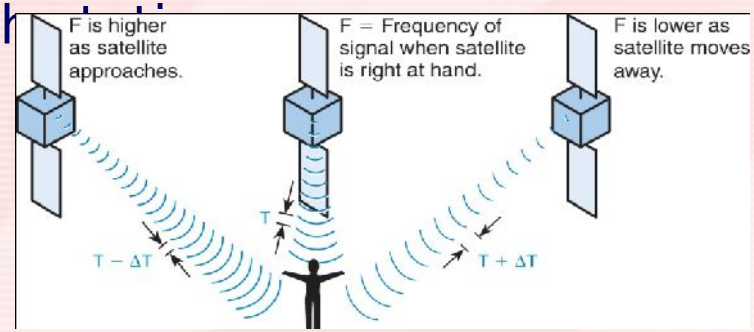
Talk to Outer Space

- T8B9 Rotation of the satellite and its antennas causes "spin fading" when referring to satellite signals.
  - Rotation in space makes the signals fade in and out.
  - This rotation keeps solar panels from overheating.

Tracking and communicating through amateur satellites can be done with a cross-polarized satellite antenna

Talk to Outer Space

- T8B7 With regards to satellite communications Doppler shift is a change in signal frequency caused by relative motion between the satellite and the earth



Doppler Effect

- T8B8 The statement that a satellite is operating in "mode U/V" means that the satellite uplink is in the 70 cm band and the downlink is in the 2 meter band.

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

Talk to Outer Space

- T8B2 The minimum amount of power needed to complete the contact is how much transmitter power should be used on the uplink frequency of an amateur satellite or space station.
  - Just a repeat of previous mention about amount of power output

To work satellites with your handheld, buy a small directional antenna for your satellite radio. You probably won't hear much with your rubber duck antenna.

Talk to Outer Space

- T1A7 The FCC Part 97 definition of ***telemetry*** is a one-way transmission of measurements at a distance from the measuring instrument.
  - **Type of Information**
    - Battery condition: Full
    - Outside temperature: Very cold
    - Power output: Excellent
    - Solar Panels: Bring on the sun!

- T1A6 The FCC Part 97 definition of ***telecommand*** is a one-way transmission to initiate, modify or terminate functions of a device at a distance.
  - **Types of Commands**
    - Turning ON an amateur radio satellite
    - Initiating a satellite mode change
    - Turning OFF a distant propagation radio beacon
    - Changing data ports on a digital repeater system

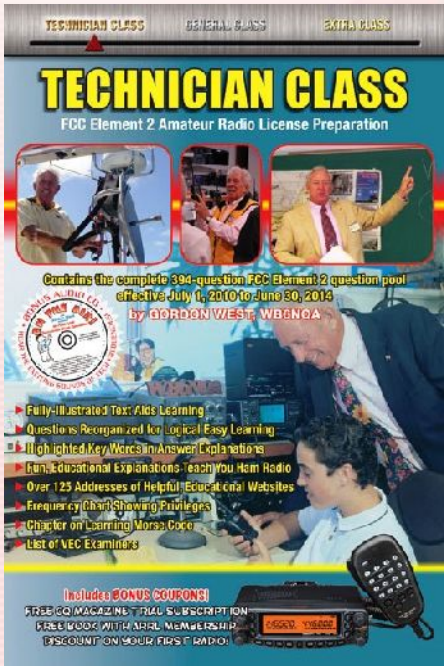
Element 2 Technician Class Question Pool

Talk to Outer Space

Valid July 1, 2010

Through

June 30, 2014



T1A05 What is the FCC Part 97 definition of a space station?

A. Any multi-stage satellite
B. An Earth satellite that carries one of more amateur operators
C. An amateur station located less than 25 km above the Earth's surface
D. An amateur station located more than 50 km above the Earth's surface

T8B04

Which amateur stations may make contact with an amateur station on the International Space Station using 2 meter and 70 cm band amateur radio frequencies?

A. Only members of amateur radio clubs at NASA facilities

B. Any amateur holding a Technician or higher class license

C. Only the astronaut's family members who are hams

D. You cannot talk to the ISS on amateur radio frequencies

T8B03 Which of the following can be done using an amateur radio satellite?

A. Talk to amateur radio operators in other countries
B. Get global positioning information
C. Make telephone calls
D. All of these choices are correct

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

T5B06 What can be used to determine the time period during which an amateur satellite or space station can be accessed?

A. A GPS receiver
B. A field strength meter
C. A telescope
D. A satellite tracking program

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 space station that contains information about a satellite

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

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

T8B02 How much transmitter power should be used on the uplink frequency of an amateur satellite or space station?

A. The maximum power of your transmitter
B. The minimum amount of power needed to complete the contact
C. No more than half the rating of your linear amplifier
D. Never more than 1 watt

T1A07 What is the FCC Part 97 definition of telemetry?

A. An information bulletin issued by the FCC
B. A one-way transmission to initiate, modify or terminate functions of a device at a distance
C. A one-way transmission of measurements at a distance from the measuring instrument
D. An information bulletin from a VEC Congress of the United States

T1A06 What is the FCC Part 97 definition of telecommand?

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B. A one-way radio transmission of measurements at a distance from the measuring instrument

C. A one-way transmission to initiate, modify or terminate functions of a device at a distance

D. An instruction from a VEC