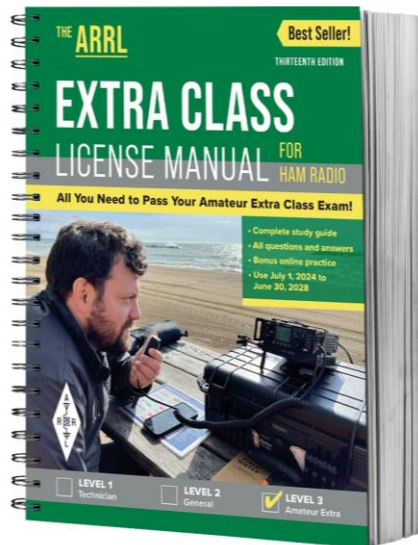


# FCC RULES AND REGULATIONS

## CHAPTER 3

### Extra Class License Manual



- 3.1 Operating Standards
- 3.2 Station Restrictions
- 3.3 Station Control
- 3.4 Amateur Satellite Service
- 3.5 Volunteer Examiner Program
- 3.6 Miscellaneous Rules



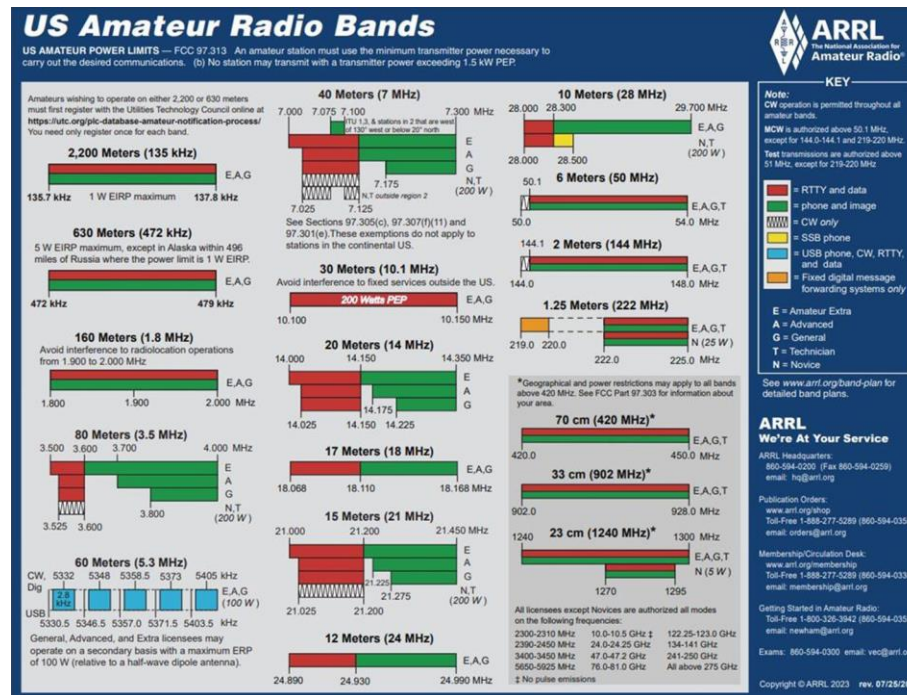
All ARRL  
materials are used  
with permission  
from the ARRL.

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

### Frequency and Emission Privileges

All of the frequency privileges available in Amateur Radio. Extra class gains 250 kHz on 80-75-40-20-15m.



# FCC RULES AND REGULATIONS

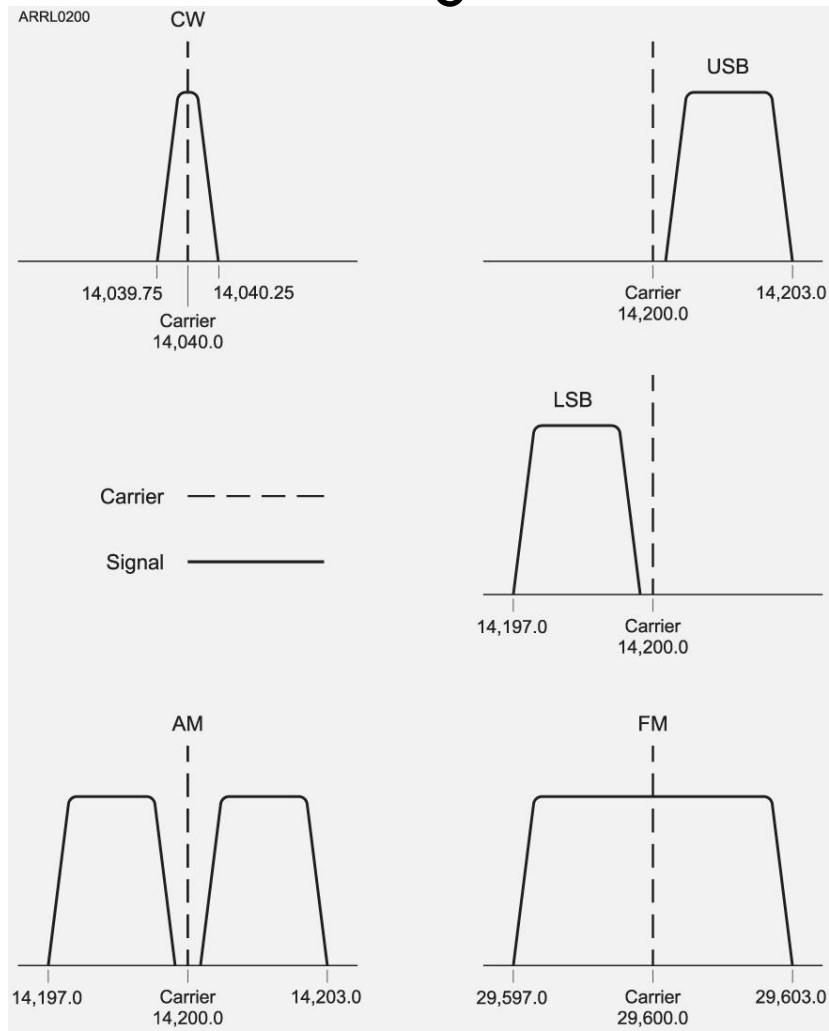
## 3.1 OPERATING STANDARDS

3-2

### Frequency and Emission Privileges

The display shows the transmitted carrier frequency.

Your signal's bandwidth, however, (footprint) depends on what mode you're operating.

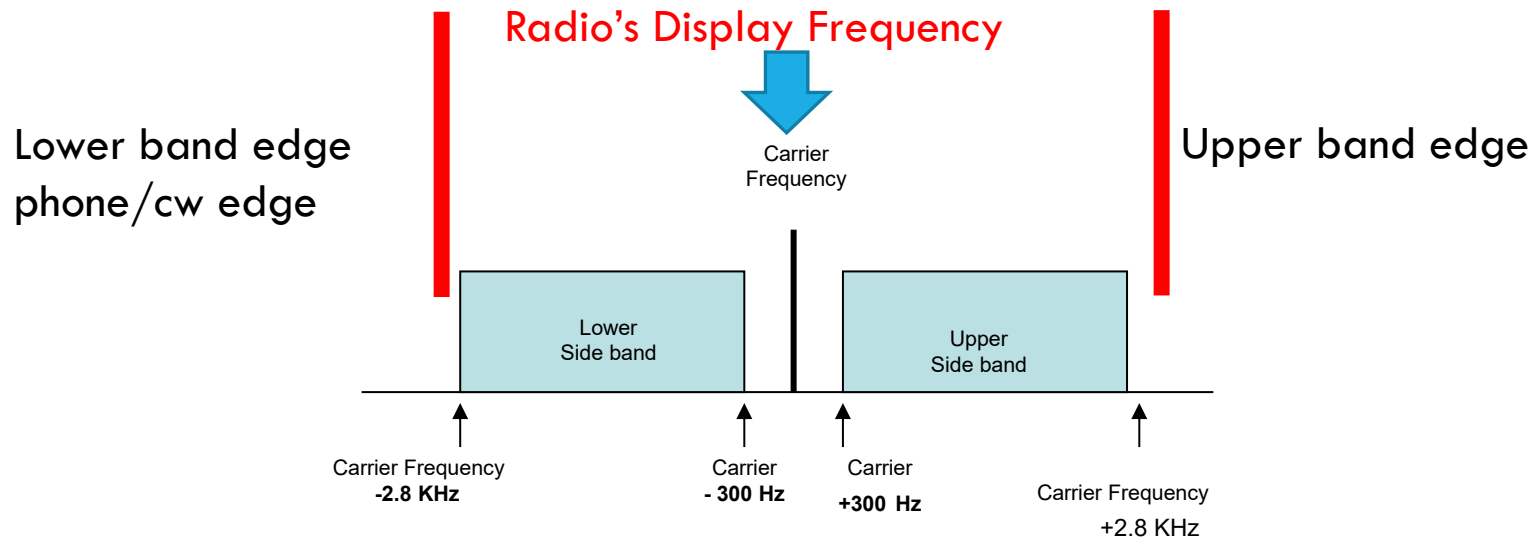


# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-2

### Frequency and Emission Privileges



General Rule: You must keep ALL of your signal's emissions inside the band limits!

FCC definition of bandwidth: determined by the difference between frequency at the mean power and the frequency where the power level 26dB below the mean power.

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-4

- Do not cause harmful interference.
- The prudent operator:
  - Stays 3 kHz below upper band edge with USB.
  - Stays 3 kHz above lower band edge with LSB.
- [E1A02]
- Don't QSO with a station within 3 kHz band edge.
  - 14.348 MHz USB = No! [E1A01]
  - 3.601 MHz LSB = No! [E1A04]
- In digital modes when transmitting FSK or AFSK, you must make sure your sidebands remain within the band segment just as you do with voice modulation.

Example: 14.1472 MHz for 2.8kHz USB AFSK data emission [E1A03]

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-4

### Special Restrictions

#### 30 Meters

- Restricted to CW/Data signals.
- No phone or image signals allowed.
- Limited to 200 W output power.

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-4

### Special Restrictions

#### 60 Meters

- Power limited to 100 W Eff. Radiated Power relative to a dipole (reduce power if using a Yagi)
- Five 2.8 kHz-wide Channels
  - Centered on 5332, 5348, 5358.5, 5373, and 5405 kHz
- USB Voice is the only phone emission allowed
  - Carrier must be 1.5 kHz below channel center
  - Meaning: 5330.5, 5346.5, 5357, 5371.5, and 5403.5 kHz
- RTTY or DATA
  - As USB signals, centered on specified channel center, not to exceed 2.8 kHz wide [E1C01]
  - No automatic control
- CW okay with carrier frequency centered on specified channel center [E1A06]

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-4

### Special Restrictions

#### 630 Meters/2200 Meters

- The maximum power permitted on the 2200 meter band is 1 watt EIRP (equivalent isotropic radiated power) [E1 A07]
- Except in some parts of Alaska, the maximum power permitted on the 630 meter band is 5 watts EIRP. [E1 A09]
- Phone emissions are permitted on the entire 630 meter band [E1 C12]
- Before operating on the 630 meter or 2200 meter bands operators must inform the Utilities Technology Council (UTC) of their callsign and coordinates of the station. Operators may operate after 30 days, providing they have not been told that their station is within 1 km of PLC systems using those frequencies [E1 C03, E1 C07]

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

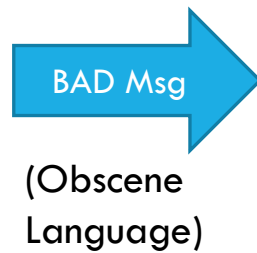
3-5

### Automatic Message Forwarding

Originating Station



Accountable



Msg Forwarding System (Packet AX.25)

The **control operator of the originating station** primarily accountable for the rules violation.

[E1A08]

Discontinue forwarding the communication as soon as you become aware of it.

# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-6

### RACES Operation

**ARES** is administered by ARRL to support public safety and **nongovernmental** organizations.

**RACES** stations are any amateur stations **certified by the responsible civil defense organization for the area served.**  
[E1B09]

Amateurs operating under **RACES** rules must follow operator privileges granted by their license. They may use all amateur service frequencies. [E1B10]

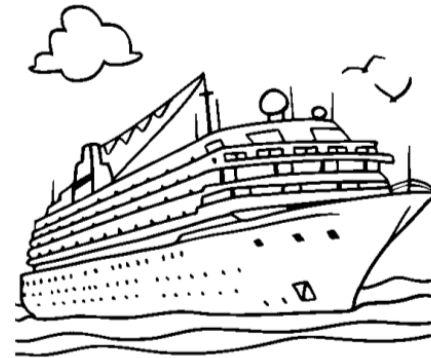
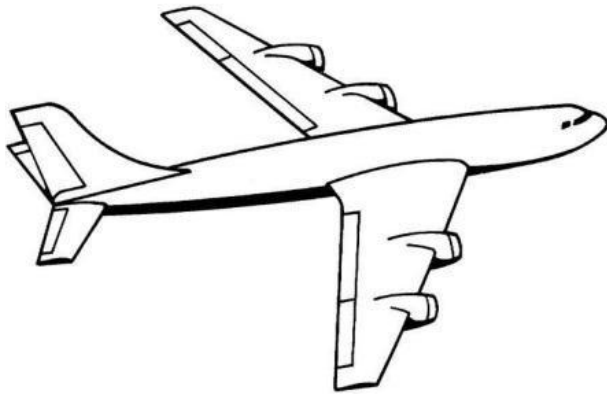
# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-6

### Stations Aboard Ships or Aircraft

In USA airspace or waters



- Must have the Captain's approval.
- FCC License, or alien amateur - reciprocal permit is sufficient. [E1A05]
- Must have radio installation approved by aircraft's pilot-in-command or ship's master. [E1A10]

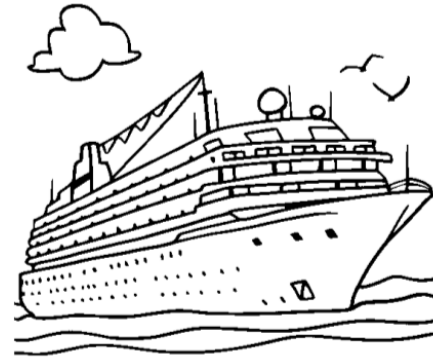
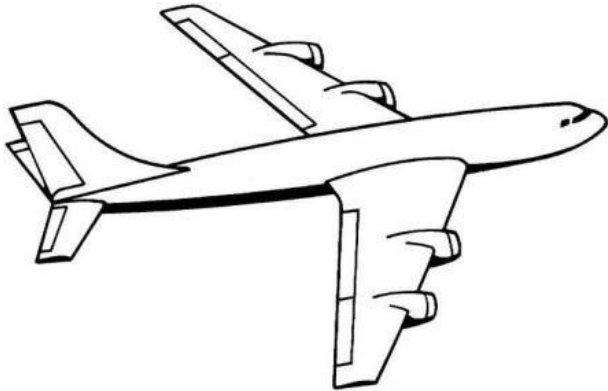
# FCC RULES AND REGULATIONS

## 3.1 OPERATING STANDARDS

3-6

### Stations Aboard Ships or Aircraft

In International airspace or waters



- Must have the Captain's approval.
- FCC licensee or reciprocal operating permit still required. [E1A11]
- Obey ITU Region frequency restrictions for the region you are operating in.

# FCC RULES AND REGULATIONS

## 3.2 STATION RESTRICTIONS

3-7

### Operating Restrictions



Properly Operating  
Amateur Station

Interference to  
broadcast  
signals



FCC may impose  
Quiet Periods.  
[E1B08]

Other Licensed Services with  
receiver of good engineering  
design and adequate selectivity

The amateur station must avoid transmitting during certain hours on frequencies that cause the interference.

*“The amateur station shall not be operated during the hours of 8 p.m to 10:30 p.m. local time, and on Sunday for an additional period of 10:30 a.m. and 1 p.m., local time upon the frequency or frequencies used when interference is created.”*

# FCC RULES AND REGULATIONS

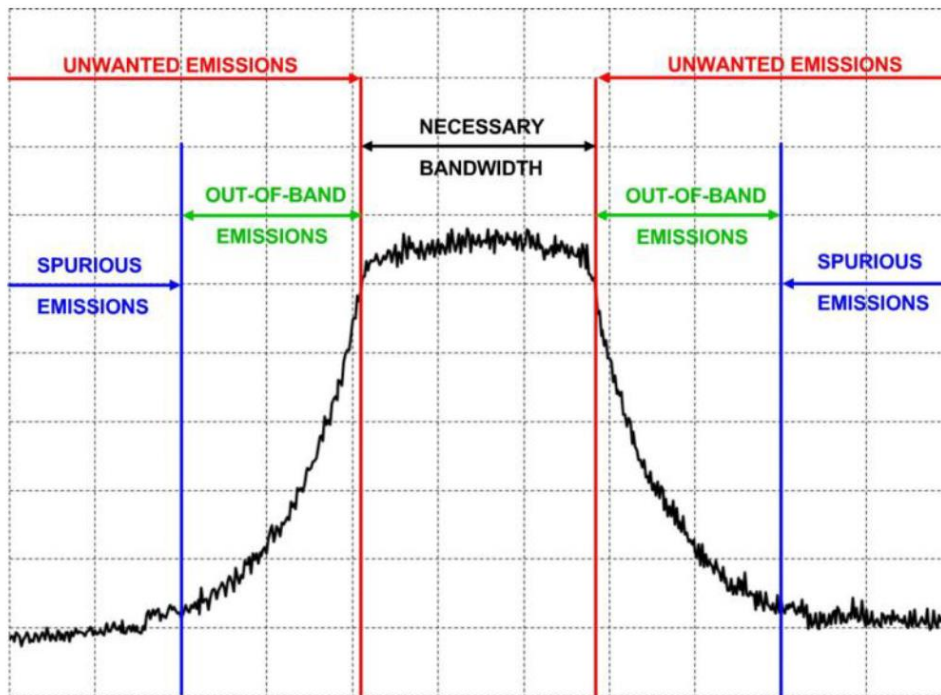
## 3.2 STATION RESTRICTIONS

3-8

### Operating Restrictions

## Spurious Emissions

### Spurious Domain



A spurious emission is an emission outside its necessary bandwidth that can be reduced or eliminated without affecting the information transmitted. [E1B01]

Spurious emissions must be 43 dB below fundamental signal's mean power. [E1C10]

# FCC RULES AND REGULATIONS

## 3.2 STATION RESTRICTIONS

3-8

### Restrictions on Location



If your station is on land that has environmental importance, architecture, cultural, or significance in American History, you may need to submit an Environmental Assessment to the FCC.



Environmental Assessment

# FCC RULES AND REGULATIONS

## 3.2 STATION RESTRICTIONS

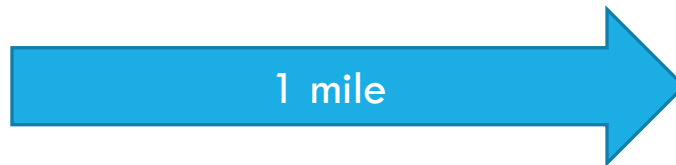
3-8

### Restrictions on Location



Your station

If your station is within 1 mile of an FCC monitoring facility, you must protect that facility from harmful interference. [E1 B03]



FCC MONITORING FACILITY

FCC Engineer in Charge may impose operating restriction on your station.

Allegan, MI  
Belfast, ME  
Canandaigua, NY  
Douglas, AZ  
Ferndale, WA  
Grand Island, NE  
Kenai, AK

Kingsville, TX  
Laurel, MD  
Livermore, CA  
Powder Springs, GA  
Santa Isabel, PR  
Vero Beach, FL  
Waipahu, HI

# FCC RULES AND REGULATIONS

## 3.2 STATION RESTRICTIONS

3-8

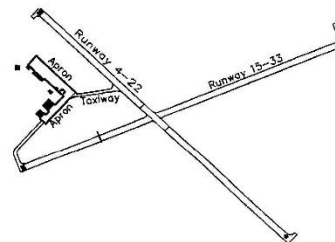
### Restrictions on Antenna Structures

You may not build an antenna structure and antenna higher than **200 feet**, without prior **FCC approval** and Federal Aviation Administration (**FAA**) **notification**.

Antennas near an airport may have further height limitations based on distance from nearest active runway. [E1B06]

Antennas 20 feet or less do not need approval. [www.wireless.fcc.gov/antenna/](http://www.wireless.fcc.gov/antenna/) PRB-1 applies. Antennas can also be restricted by state and local zoning laws. However, it is required that the regulations must make reasonable accommodations for amateur radio. [E1B07, E1B11]

### Aviation Safety



# FCC RULES AND REGULATIONS

## 3.3 STATION CONTROL

3-9

### Local control



If you are present at the station and control its operation, that's local control.

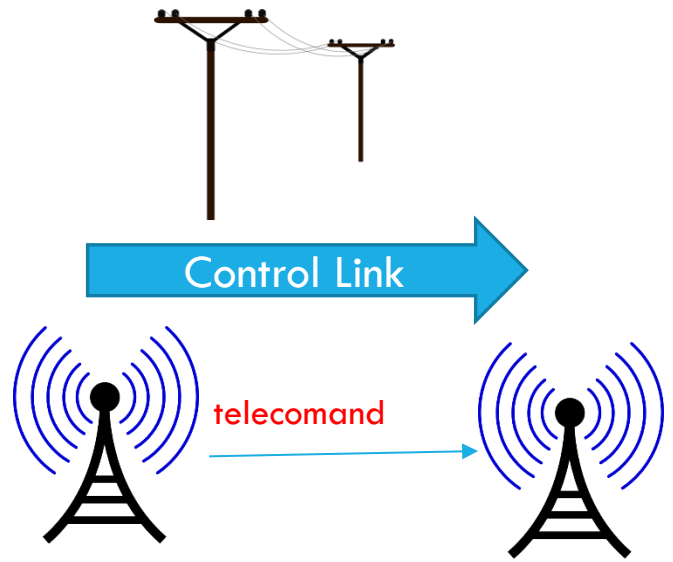
# FCC RULES AND REGULATIONS

## 3.3 STATION CONTROL

### Remote Control



Control Point is no longer at the radio; it's where the control operator is



Control Link Fails:  
3 min Shut-down of TX. [E1C08]



Remote  
Controlled  
Amateur  
Radio Station

# FCC RULES AND REGULATIONS

## 3.3 STATION CONTROL

3-10

### Telecommand and One Way Transmissions

At the location of a station operated by telecommand on or within 50 km of the earth's surface must have

- a photocopy of the license
- a label with the name, address and telephone number of the station licensee
- a label with the name, address and telephone number of the control operator

[E1D05]

1 watt is the maximum power allowed when controlling a model craft by telecommand.

[E1D06]

A space station, beacon station, or telecommand station may transmit one-way communications [E1D12]

# FCC RULES AND REGULATIONS

## 3.3 STATION CONTROL

3-12

### Automatic Control

“A station under automatic control differs from one under local control under automatic control the control operator is not required to be present at the control point.”

An automatically controlled station can never originate third party communications.

An automatically controlled station can only relay third party communications as RTTY or data emissions. [E1C05]

Repeater Controller co-located with the repeater.



Amateur  
Radio Station  
(repeater)

# FCC RULES AND REGULATIONS

## 3.3 STATION CONTROL

3-12

### Telemetry

Retransmitting the signals of other amateur stations is permitted only for auxiliary and space stations.



Auxiliary Station

Retransmitting



Space Stations

Telemetry is one-way transmission of measurements at a distance from the measuring instrument. For balloon telemetry, the data may be any type of data but must also include the callsign of the transmitting station [E1D01, E1D04]

# FCC RULES AND REGULATIONS

## 3.3 STATION CONTROL

3-12

### Telemetry



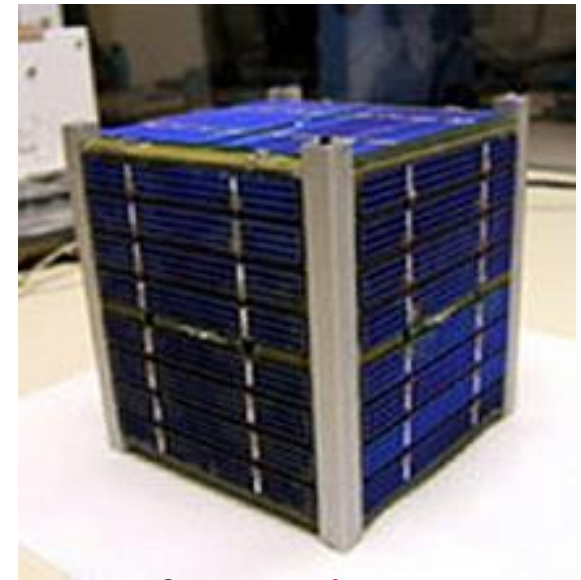
WX Telemetry

(Wind speed  
Wind direction)



Ocean Telemetry

(Wind speed, Wind  
direction, Water temp)



Space Telemetry  
(Battery voltage)

Telemetry is One-Way transmission of measurements [data] at a distance from the measuring instrument. [E1D01]



# FCC RULES AND REGULATIONS

## 3.4 AMATEUR SATELLITE SERVICE 3-12

Amateur-satellite service: a radio service using Amateur stations on satellites orbiting the Earth providing Amateur Radio communications.

Space station: all amateur stations more than 50 km above the Earth are *space stations* (not just the ISS).

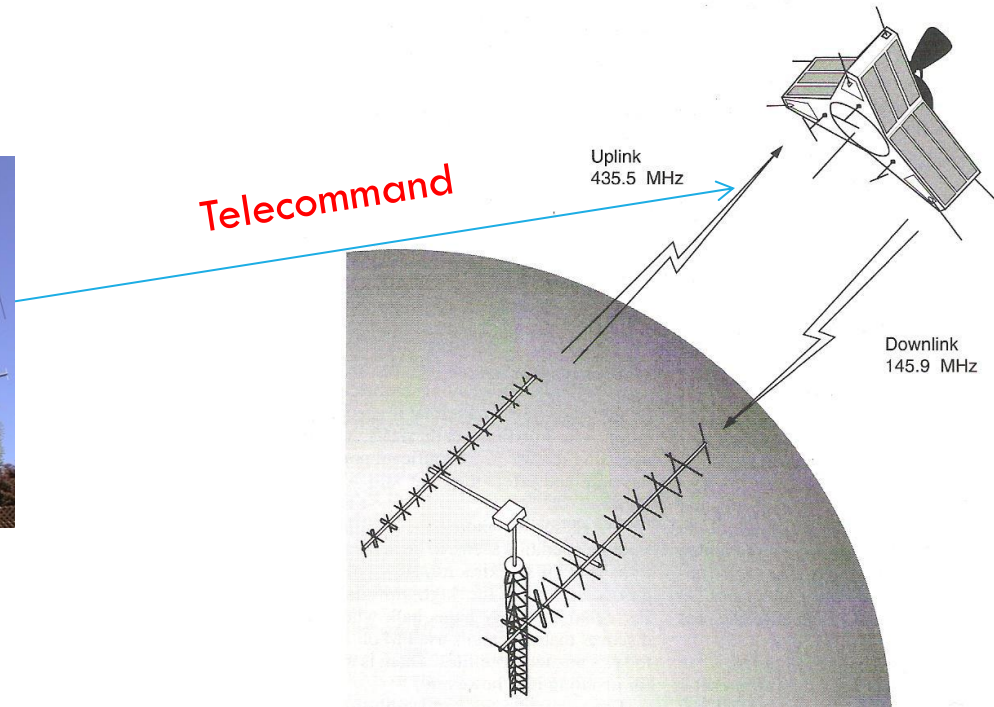
Earth station: amateur-satellite service stations engaging in satellite communications that are on or within 50km of the Earth's surface.

# FCC RULES AND REGULATIONS

## 3.4 AMATEUR SATELLITE SERVICE

3-13

### Telecommand



A *space telecommand station* is an amateur station that transmits communications to initiate, modify or terminate functions of a space station. These commands may include special codes intended to obscure the meaning of messages [E1D03, E1D02]

# FCC RULES AND REGULATIONS

## 3.4 AMATEUR SATELLITE SERVICE

3-13

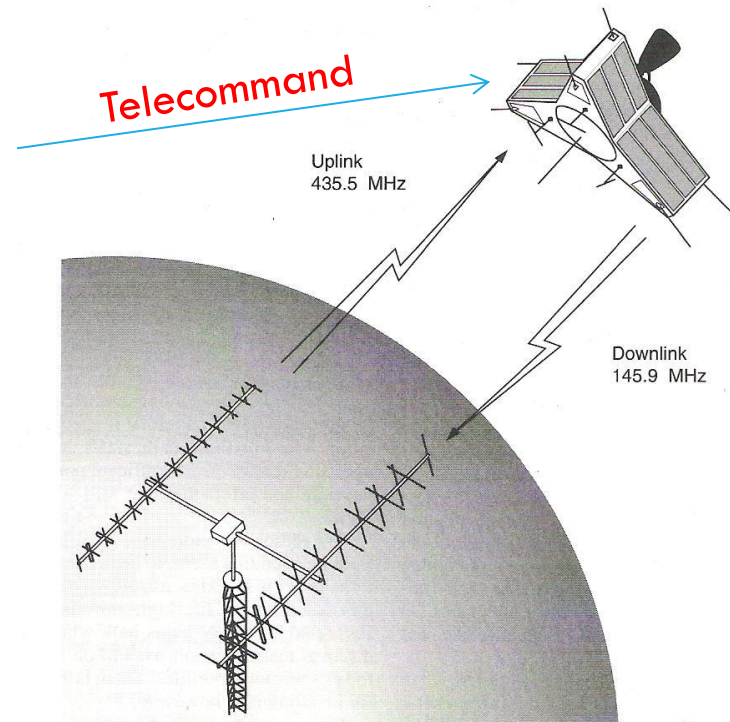
### Satellite Licensing and Frequency Privileges

On the HF bands a space station may only operate on 17, 15, 12, and 10 meter bands and portions of the 40 and 20 meter bands [E1D07]

Segments of the 2 meter and 70, 23, and 13 cm and some microwave bands are also available for space station operation. [E1D08, E1D09]

Any amateur station designated by the space station licensee may be a satellite telecommand station subject to the control operator's license class. [E1D10]

Any amateur station can operate as an Earth station if the privileges of the license allow the operator to use the frequencies and modes on which the satellite operates. [E1D11]

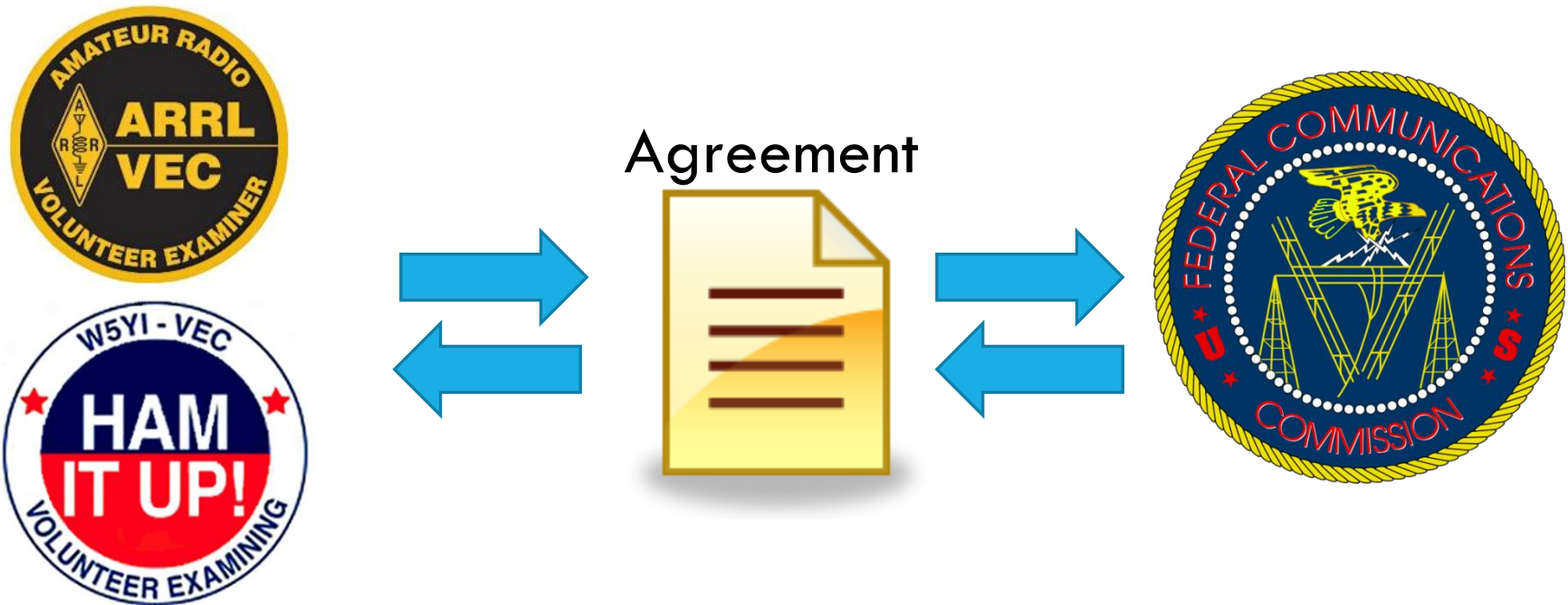


# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

3-14

### The Volunteer Examiner Coordinator



A Volunteer Examiner Coordinator (VEC) is an organization that has entered into an agreement with the FCC to coordinate, prepare, and administer amateur license examinations. [E1E03]

# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

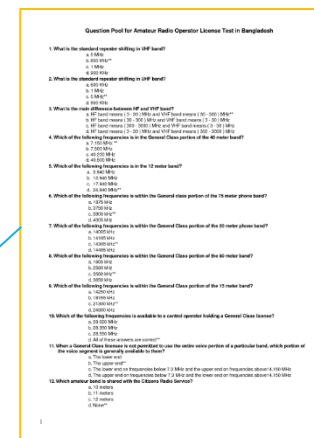
3-14

### The Volunteer Examiner



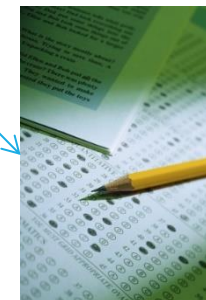
VECs must cooperate in the development and maintenance of the questions used on the exams.

### Question Pool



Build exams from question pool.

The VEC accredits licensed Amateur Radio Operator – the Volunteer Examiners (VEs) – to administer exams.



# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

3-15

### Accreditation



### Accreditation Process

- Age: 18+
- Valid Ham License
- License never been revoked
- General or above license
- Open book test



VE Applicant

The accreditation process is simply the steps that each VEC takes to ensure their VEs meet all the FCC requirements to serve in the Volunteer Examiner program. [E1E04]

VEs and VECs may be reimbursed for actual out-of-pocket expenses to cover the cost of preparing, processing, administering, and coordinating an examination for an amateur radio operator license [E1E01]

# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

3-15

### Exam Preparation

Part 97 tasks the VECs with maintaining the pools of questions for all U.S. amateur license examinations. [E1E02]



Question Pool



- Create test
- Make copies
- Give to VEs



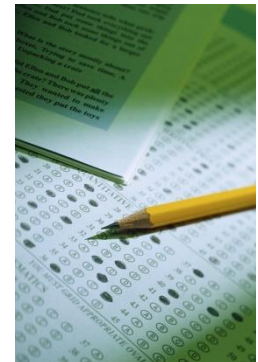
Administer test



Administer test



Administer test



# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

3-17

### Exam Session Administration

- Three or more VEs must administer the test session.
- Cannot give exam to close relatives.  
[E1E08]
- Give exam credit (CSCE) for each exam element passed.
- VEs must hold a license higher than the exam being administered.
- VEs holding an Extra class or higher may give the Extra Class exam.



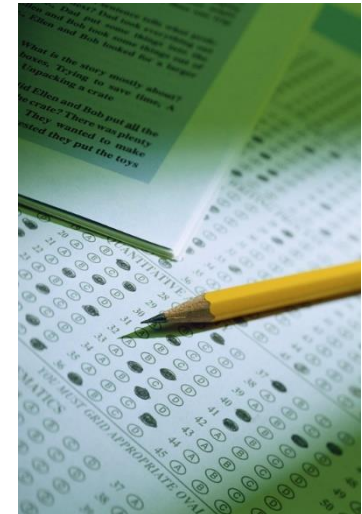
VE



VE



VE

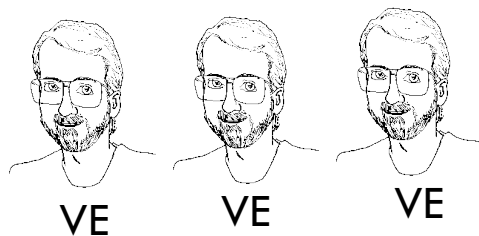


# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

3-17

### During the Exam



Physically present

Monitor via Skype



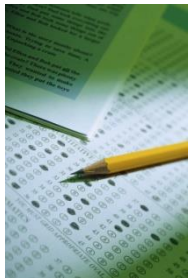
- VEs must supervise and be present during entire exam. [E1E06]
- VEs may monitor using real-time video link (Skype).
- Students must follow directions or terminate their exam. [E1E07]
- Grade test immediately. Passing score of 74% passes.
- Pass ... verify between 3 VEs ... issue CSCE. [E1E11]
- Fail ... Return applications ... inform they failed. [E1E05]
- A VE who fraudulently administers or certifies an examination may face Revocation of the VE's amateur station license grant and the suspension of the VE's amateur operator license grant [E1E09]

# FCC RULES AND REGULATIONS

## 3.5 VOLUNTEER EXAMINER PROGRAM

3-18

### After the Exam



Pass



VE



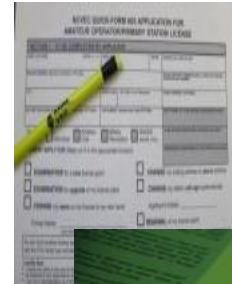
VE



VE



Form 605 & test results



VEs Submit application forms and test papers within 10 days to VEC. [E1E10]

VEC Review paperwork accuracy and submit to FCC.

FCC database



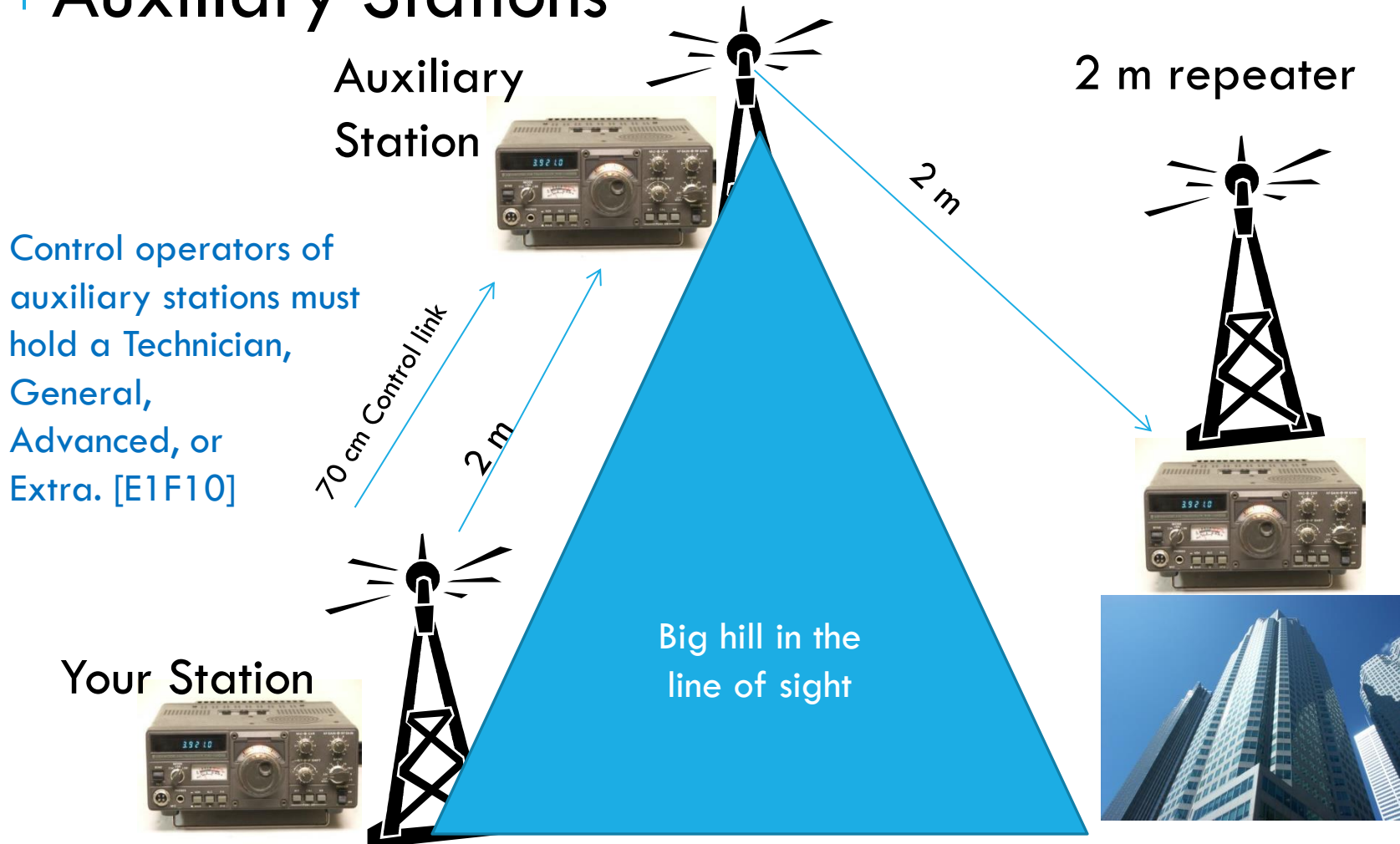


# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-19

### Auxillary Stations



# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-19

### External Power Amplifiers

Manufacturer's New  
RF Power Amp



No FCC  
Certification



Testing

Must satisfy FCC's Spurious  
Emission Standards when operated at the lesser  
of full power output or 1500 W limit. [E1F11]



FCC Certification



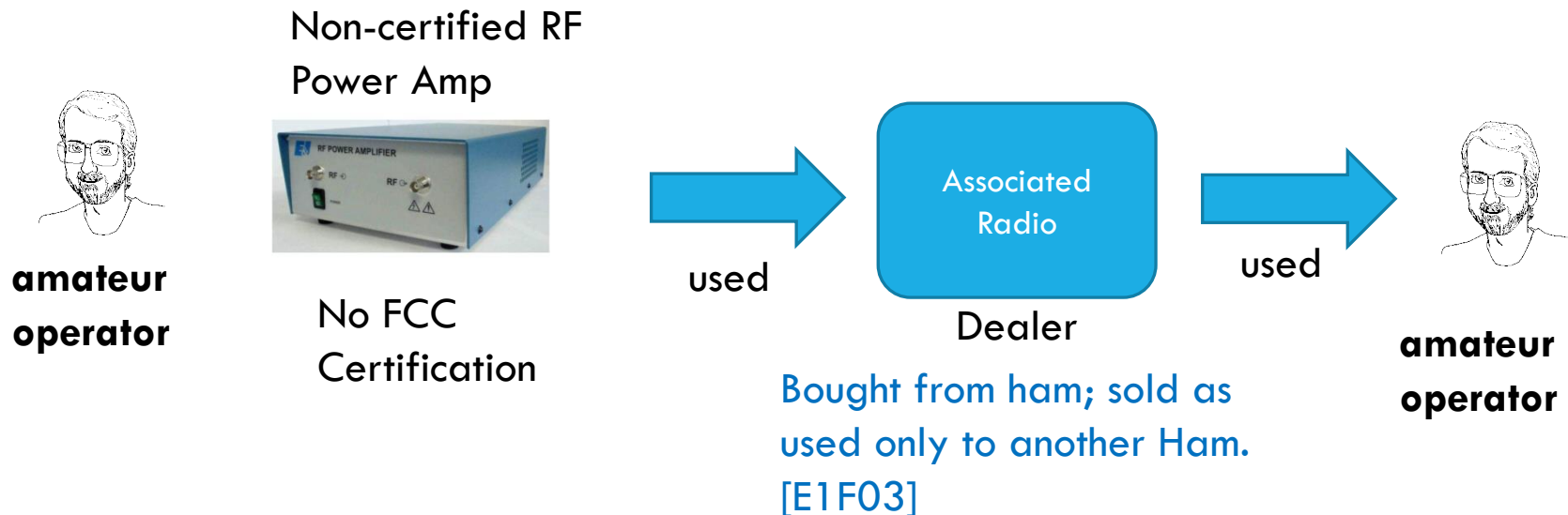
"The List"

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-19

### External Power Amplifiers



# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-20

### 70cm Band Restrictions and National Quiet Zones

Line A runs roughly parallel to and just south of the US/Canadian border. [E1F04]

US stations north of Line A may not transmit on 420-430 MHz. [E1F05]



National Radio Quiet Zone. [E1B05]

National Radio Astronomy Observatory in Green Bank, West Virginia.

Naval Research Lab at Sugar Grove, West Virginia.

If a radiolocation system experiences interference from a 70cm repeater, the control operator of that repeater must cease operation or make changes to the repeater to mitigate the interference [E1B04]

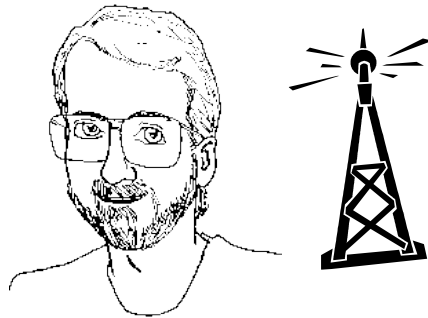
# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-20

### Business and Payment

Yes! I accept the position for \$\$\$.



amateur operator



Business

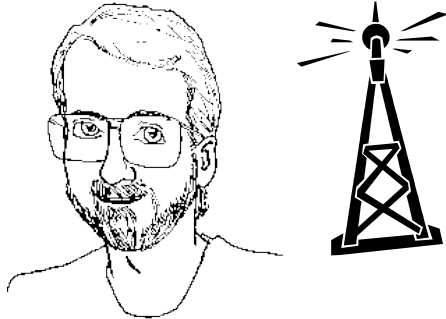
Monetary interest! Msg NOT allowed.

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-20

### Business and Payment



**amateur operator**

- Spouse doing shopping
- What to pick up from store
- I'd like to order a pizza



Neither the amateur nor their employer has a pecuniary (monetary) interest. [E1F07]



**Business**

No monetary interest, then message is allowable.

Amateur stations are prohibited to do communications transmitted for hire or material compensation, except as otherwise provided in the rules. [E1F08]

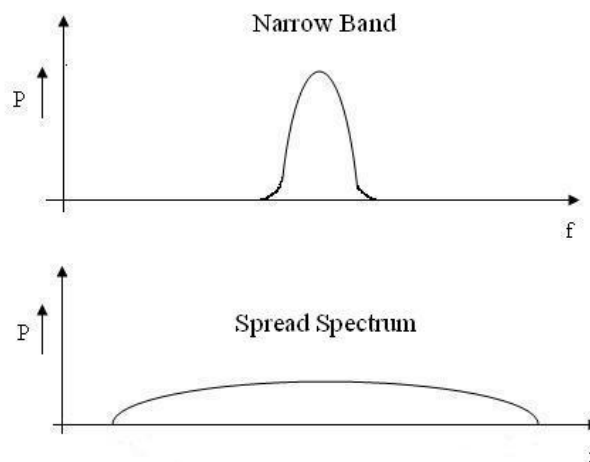
When contacting stations in other countries, communications are limited to remarks of a person nature or incidental to Amateur Radio. [E1C02]

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-20

### Spread Spectrum Operation



- Only on amateur frequencies above 222 MHz. [E1F01]
- Spread Spectrum emission must not cause harmful interference.
- Area regulated by the FCC or in a country that permits SS emissions.
- Must not be used to obscure the meaning of any communication.
- Limited to 10 W power.

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-21

### Non-US Operating Agreements



#### European Conference of Postal and Telecommunications Administrations

- 48 European countries cooperating to regulate posts, radio spectrum and communications networks

CEPT allows US amateurs to travel to and operate from most European countries and their overseas territories without obtaining an additional license or permit.

[E1C11]

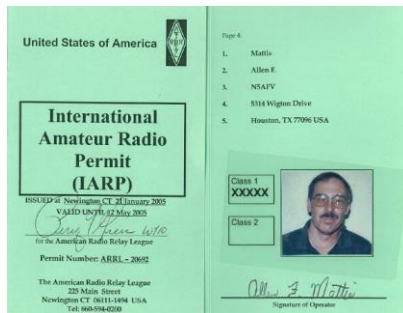
You must also carry with you a copy of FCC Public Notice DA 16-1048. [E1C06]

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-21

### Non-US Operating Agreements



Going to Central or South America?

International Amateur Radio Permit (IARP) allows US amateurs to operate without seeking a special license or permit to enter and operate from several of these countries. [E1C04]

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-21

### Non-US Operating Agreements



ITU Reciprocal Permit – a reciprocal agreement between the US and a country that does not participate in either CEPT or IARP agreements.

Complete rules and procedures for obtaining permission see these web sites.

[www.arrl.org/international-operating](http://www.arrl.org/international-operating)

[www.arrl.org/international-regulatory](http://www.arrl.org/international-regulatory)

A person holding an amateur service license granted by the government of Canada may not exceed U.S. Amateur Extra Class license privileges, e.g., transmitting SSB below 14.150 MHz. [E1F02]

# FCC RULES AND REGULATIONS

## 3.6 MISCELLANEOUS RULES

3-22

### Special Temporary Authority



amateur operator

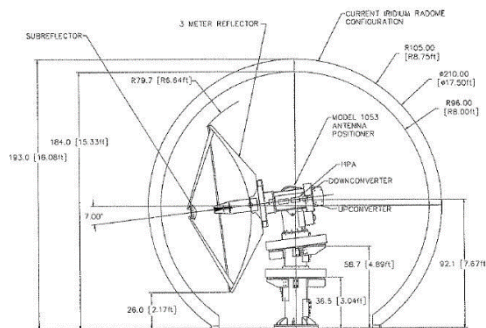


Figure 2 Iridium FLT Outline Drawing



## Experimental Purposes

- Really good reasons provided to FCC, a Special Temporary Authority may be granted to provide experimental amateur communications. [E1F06]
- Special Temporary Authority (STA) permits are temporary.
- Does not grant exclusive rights to a frequency.
- Does not waive all rules ... just specifically spelled out on the STA.
- STA terminated any time by FCC.
- May result in changes to FCC rules but are not permanent waivers.

## Questions & Answers