7.3 Bands and Privileges

The frequencies and modes and methods that hams are allowed to use are all known to the rules and regulations as *privileges*. What gives the FCC authority to grant privileges is the Communications Act of 1934. What then grants these privileges to you is your license. By signing Form 605 and applying for a license, you agree to be bound by the FCC rules and that means staying within the privileges of your license.

FREQUENCY PRIVILEGES

The most important privileges are *frequency privileges*. Once upon a time, at the dawn of radio, hams and broadcasters and commercial and military stations were all mixed in together in one big band. That didn't work very well when the one big band got crowded. Soon, the powers that be decided to shoo the hams off to the "worthless" frequencies with wavelengths shorter than 200 meters (1.5 MHz and higher). That worked fine for hams because they soon discovered that those frequencies were precisely the ones that supported the best long-distance communications! That couldn't last long and it didn't; soon the shortwave bands were carved up among the different users and hams had their first "bands."

Today, there are literally hundreds of bands and dozens of different types of radio spectrum users. The frequency privileges granted to the various services are called *allocations*. For example, amateurs are allocated 144-148 MHz, the 2 meter band. **Figure 7-4** is a grand overview of the radio spectrum and where amateurs have frequency privileges. You can see that amateur allocations are sprinkled throughout the radio spectrum, not concentrated in or excluded from any one region. As you recall from our discussion on propagation, radio signals of different frequencies propagate differently. Thus, it's fortunate that spectrum planning has resulted in amateurs having access to a wide range of frequencies in which to both experiment and apply to different communications needs.

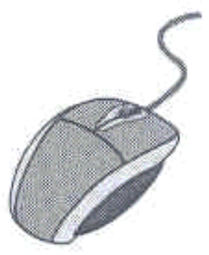


Table 7-2 shows the Technician VHF/UHF frequency privileges that you are expected to know for your license exam. Remember that a band can be referred to by frequency ("50 MHz") or by wavelength ("6 meters"). Use the formula f (in MHz) = 300 / wavelength (in meters) or wavelength (in meters) = 300 / f (in MHz) to convert between frequency and wavelength. [T1B03 to T1B07]

You should memorize the frequencies for the most common bands used by Technicians: 6 meters (50-54 MHz), 2 meters (144-148 MHz) and 70 cm (420-450 MHz). Hams keep a chart of their privileges handy, since not many of us have every one of them memorized. To help you remember your privileges, copy the information onto a piece of paper and tape it in your car or near your computer or on the refrigerator. Take every opportunity to recite the information, reinforcing it time after time. You'll find that it's not nearly as hard as it seems at first!

Table 7-2
VHF and UHF Technician Amateur Bands
ITU Region 2

Band (Wavelength)	*Frequency Limits*
VHF Range	
6 meters	50 - 54 MHz
2 meters	144 - 148 MHz
1.25 meters	219 - 220 MHz
1.25 meters	222 - 225 MHz
UHF Range	
70 centimeters	420 - 450 MHz
33 centimeters	902 - 928 MHz
23 centimeters	1240 - 1300 MHz
13 centimeters	2300 - 2310 MHz
13 centimeters	2390 - 2450 MHz

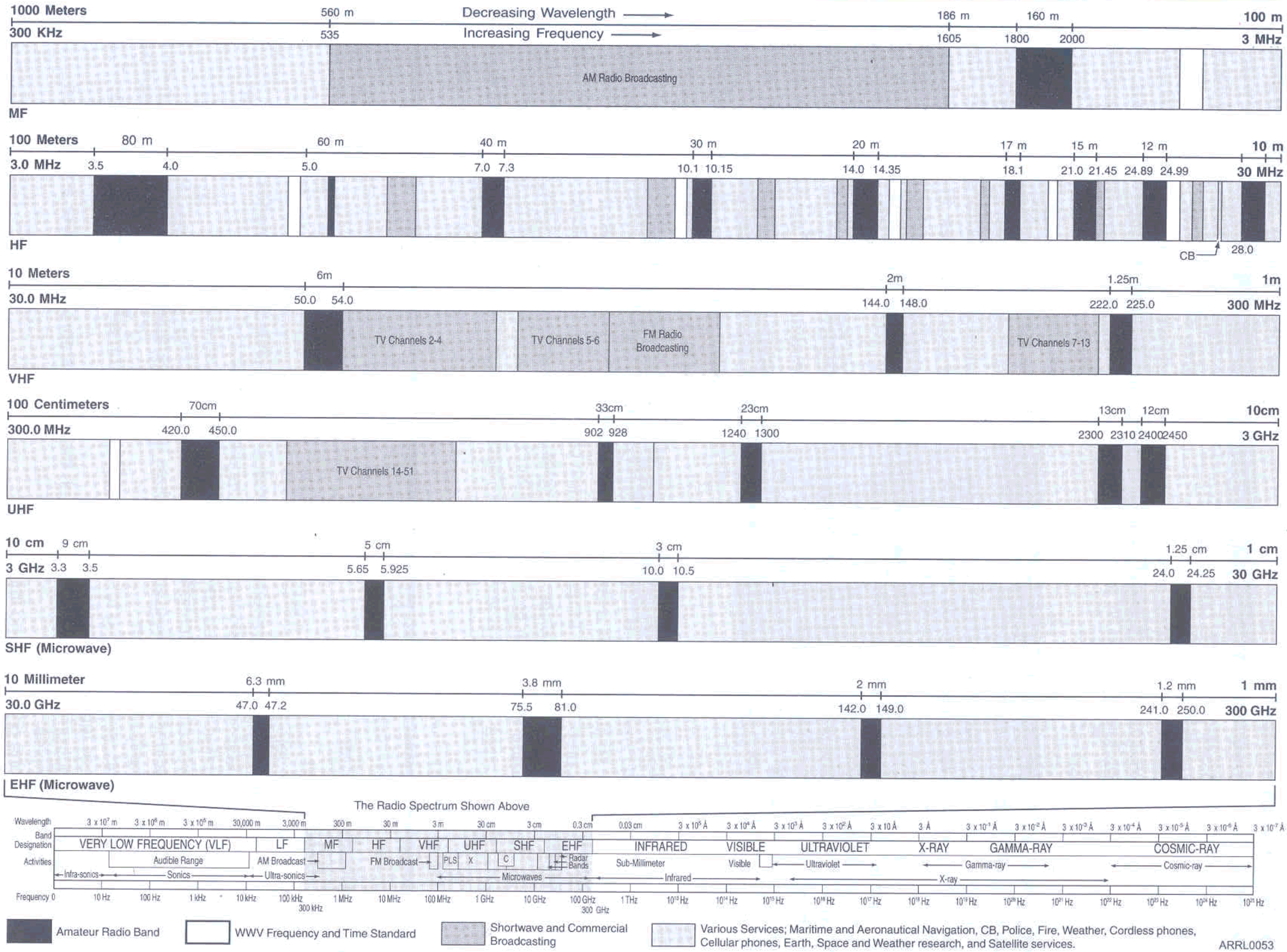


Figure 7-4 — Amateur allocations, the black rectangles in the chart, are distributed relatively evenly throughout the radio spectrum. The variations in propagation at these different frequencies give hams a lot of opportunities to experiment with different types of communications systems and methods.

Table 7-3

Technician HF Privileges

200 watts PEP maximum output

Band (Wavelength)	*Frequency (MHz)*
80 meters	3.525-3.600 (CW only)
40 meters	7.025-7.125 (CW only)
15 meters	21.025-21.200 (CW only)
10 meters	28.000-28.300 (CW, RTTY and data)
	28.300-28.500 (CW and SSB)

Emission Type Designators

As you read about amateur rules and regulations, you will occasionally encounter *emission mode designators*, such as A1A for amplitude-modulated CW for aural reception or J3E for single-sideband, suppressed-carrier telephony. It is not necessary to memorize these codes, but it is a good idea to know where to look them up if you need to. A table of designators for the most common amateur emission types can be found on this book's Web site and a complete discussion of emission types is contained in *The ARRL Handbook*.

The HF privileges for Technicians in **Table 7-3** are useful and interesting. Depending on solar activity (increasing daily at the beginning of 2010), the 10 meter band can provide contacts worldwide and you can try out RTTY and other HF data modes. The CW-only privileges on other bands will acquaint you with "classic" ham radio on the shortwave bands.

Within the amateur HF bands, access to frequencies is determined by license class. From the Technician class, as higher class licenses are obtained more and more frequency privileges are granted until all amateur privileges are granted to Amateur Extra licensees. For example, on the 80 meter band, Technicians may use CW from 3.525-3.600 MHz.

EMISSION PRIVILEGES

Within most of the ham bands, additional restrictions are made by mode or *emission type*. (Emission is the formal name for any radio signal from a transmitter.) Just as a frequency privilege is permission to use a specific frequency, an *emission privilege* is permission to communicate using a particular mode, such as phone, CW, data or image. **Table 7-4** lists the modes that can be used by amateurs — as a Technician class licensee, you can use all of them.

The combination of frequency, license class and emission privileges makes for a fairly complicated division of the amateur bands into *sub-bands*. Parts of the ham bands in which only certain modes can be used are called *mode-restricted*. As a Technician licensee, though, your situation is very simple: There is a small CW-only sub-band occupying the

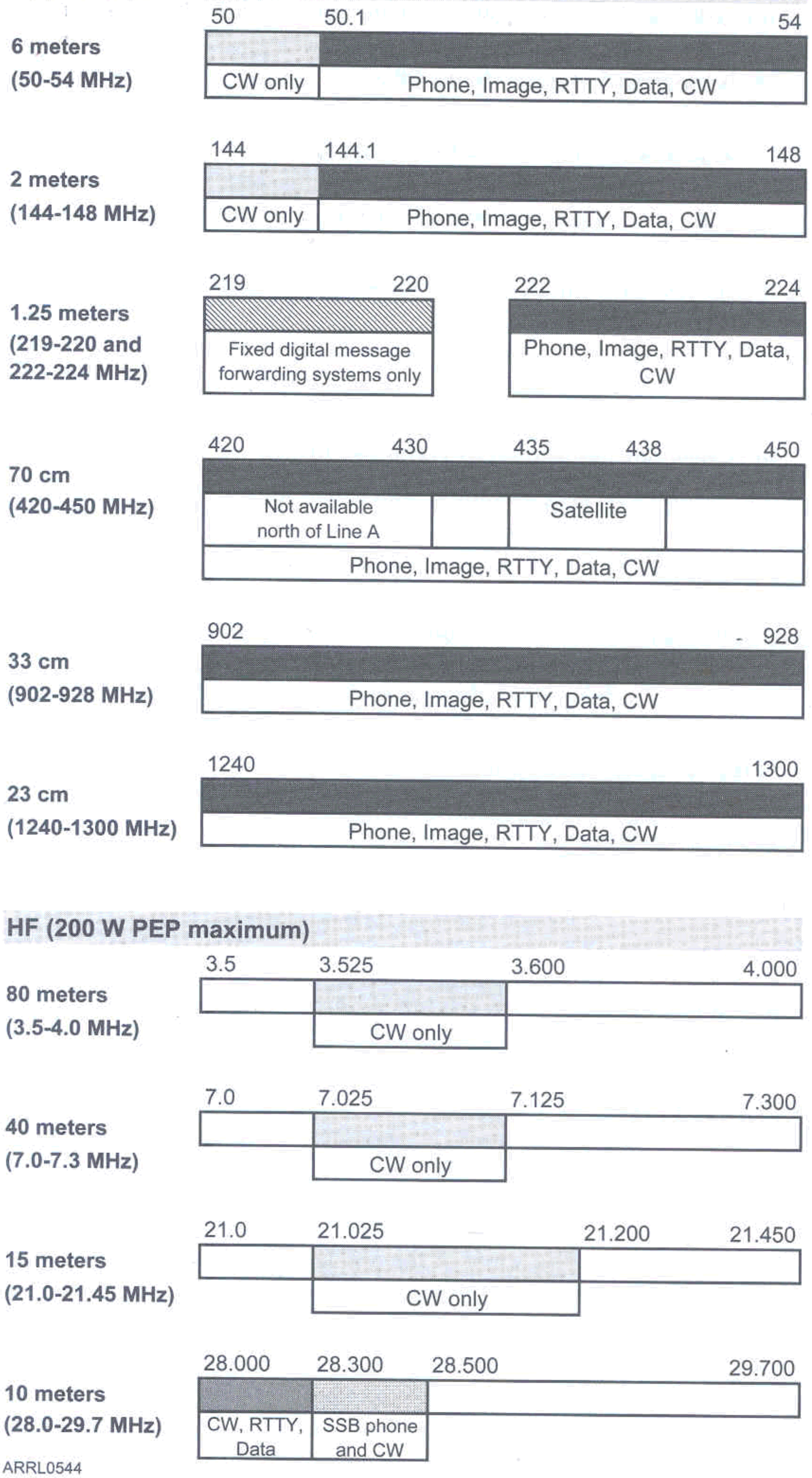
Table 7-4

Amateur Emission Types

Emission	*Description*
CW	Morse code telegraphy
Data	Computer-to-computer communication modes, usually called digital modes
Image	Television (fast-scan and slow-scan) and facsimile or fax
MCW	Tone-modulated CW, Morse code generated by keying an audio tone
Phone	Speech or voice communications
Pulse	Communications using a sequence of pulses whose characteristics are modulated in order to carry information
RTTY	Narrow-band, direct-printing telegraphy received by automatic equipment, such as a computer or teleprinter
SS	Spread-spectrum communications in which the signal is spread out over a wide band of frequencies
Test	Transmissions containing no information

Table 7-5

VHF/UHF (1500 W PEP maximum)



bottom 100 kHz of the 6 and 2 meter bands. The segment of the 1.25 meter band from 219-220 MHz is restricted to digital message forwarding only. [T8D05] For all amateur allocations above 222 MHz, there are no other subbands! **Table 7-5** shows all of the subdivisions of amateur bands through 23 cm. [T1B10, T1B11]

Why have mode-restricted subbands? Because the methods of operating for the different modes are sometimes not compatible. CW and phone operation, for example, are conducted quite differently and the signals interfere with each other. In the past few years, with the increasing number of digital modes, incompatibilities between digital and CW signals are causing interference between these two groups of operators. Hams have worked around this problem voluntarily by using narrow-bandwidth modes, such as CW, at the low-frequency end of the bands and wider-bandwidth signals, from data through voice, higher in the band. That is the price of flexibility to experiment and use all the different modes!

POWER LIMITS

The maximum power an amateur is allowed to generate at the output of the transmitter or amplifier is 1500 watts of *peak envelope power* (PEP). PEP is the average power during one RF cycle of the radio signal at the very peak of a modulating waveform, such as for speech. For a CW signal, PEP is measured during the *key-down period* in which the transmitter is ON. FM, you will recall, is a constant-power mode, so it does not matter whether you are speaking or not.

Regardless of the maximum out-

put power allowed, amateurs are expected to use the minimum power required to carry out the desired communication. [T2A11] That doesn't mean you have to turn down the output power until you can just barely be heard — that's probably not the desired communication! What it means is that if you can carry out your intended communications with less power, you should do so.

Transmitter output power is measured at the output of the last amplifier, whether internal to the transmitter or an external piece of equipment, at the input to the antenna feed line — not at the antenna or anywhere along the feed line. The limit of 1500 watts is allowed nearly everywhere on the ham bands except on the following frequencies:

- In the Novice/Technician sub-bands on 80, 40 and 15 meters, all amateurs are limited to 200 watts PEP
- Novice and Technician licensees are limited to 200 watts PEP in their 10 meter allocation between 28.0 and 28.5 MHz.
- All amateurs are limited to 200 watts PEP on the 30 meter band.
- All amateurs are limited to 50 watts PEP in the 219-220 MHz segment of the 1.25 meter band
- Stations being operated as beacons are limited to 100 watts PEP
- Stations operating in the 70 cm band near certain military installations may be limited to 50 watts PEP or less.
- There are other restrictions for Novice class licensees and for stations operating on the 60 meter band.

Most amateurs rarely use or *run* more than a few hundred watts on the VHF and UHF bands. Exceptions would be while pursuing very weak-signal methods, such as Earth-Moon-Earth (EME) or tropospheric propagation where high power is required to establish and maintain contact. High power levels at these frequencies can create safety hazards. We discuss RF safety in the **Safety** chapter of this book.