

## Technicians on HF

Depending on solar activity, the 10-meter band can provide contacts worldwide and you can try out RTTY and other HF data modes. The remaining CW-only privileges will acquaint you with “classic” ham radio on the short wave bands.

Table 5-3

### 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)

agency. How do they coordinate? It would be chaos if every country made up their own allocations, since radio waves don't stop at international borders! Realizing the need for international coordination, the *International Telecommunications Union* (ITU) was formed to provide a forum in which countries could work out allocations and many other issues. (You'll learn more about the ITU later on in this section.)

The ITU divides the world into three regions—North and South America form Region 2—and organizes allocations accordingly. Because VHF and UHF signals do not frequently travel beyond the radio horizon, it was decided that allocations in

these frequency ranges did not have to align precisely. As a result, the amateur allocations vary between regions. For example, 50-54 MHz is allocated to a TV channel in Europe instead of Amateur Radio. Table 5-2 shows allocations for Amateur Radio above 50 MHz in Region 2.

Within the amateur HF bands, there is an additional subdivision by license class. Starting with the **Technician**, as higher class licenses are obtained more and more frequency privileges are granted until as an Amateur Extra class licensee all amateur privileges are granted. 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 5-4** lists the modes that can be used by amateurs—as a Technician class licensee, you can use all of them.

The combination of frequency, 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 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. For all amateur allocations above 220 MHz, there are no other sub-bands! **Table 5-5** shows all of the subdivisions of amateur bands through 23 cm.

Why have mode-restricted sub-bands? Because the methods of operating for the different modes are some-

## 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 at [www.arrl.org/hrlm/emission\\_type](http://www.arrl.org/hrlm/emission_type) and a complete discussion of emission types is contained in the *ARRL's FCC Rule Book*.

**Table 5-4****Amateur Emission Types**

<i>Emission</i>	<i>Description</i>
CW	Morse code telegraphy
Data	Computer-to-computer communication modes, usually called <i>digital modes</i>
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

times 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. As more and more signals, even voice, appear on the air in digital form, the FCC is considering proposals to change the subdivision of bands by mode to subdividing by signal bandwidth. (Check the ARRL Web site for more information after this book is published.) A formal division of the bands by bandwidth would help address these problems, although not eliminate them entirely. 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 maximum 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. 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. Fifteen-hundred watts is allowed nearly everywhere on the ham bands except on the following frequencies:

- In the Technician sub-bands on 80-, 40-, and 15-meters all amateurs are limited to 200 watts PEP
- 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

# US Amateur Radio Bands

US AMATEUR POWER LIMITS

At all times, transmitter power should be kept down to that necessary to carry out the desired communications. Power is rated in watts PEP output. Except where noted, the maximum power output is **1500 Watts**.

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**KEY**

**Note:**  
CW operation is permitted throughout all amateur bands except 60 meters.  
MCW is authorized above 50.1 MHz, except for 219-220 MHz.  
Test transmissions are authorized above 51 MHz, except for 219-220 MHz

- = RTTY and data
- = phone and image
- = CW only
- = SSB phone
- = USB phone only
- = Fixed digital message forwarding systems only

- E** = Amateur Extra
- A** = Advanced
- G** = General
- T** = Technician
- N** = Novice

See *ARRL Web* at [www.arrl.org](http://www.arrl.org) for more detailed band plans.

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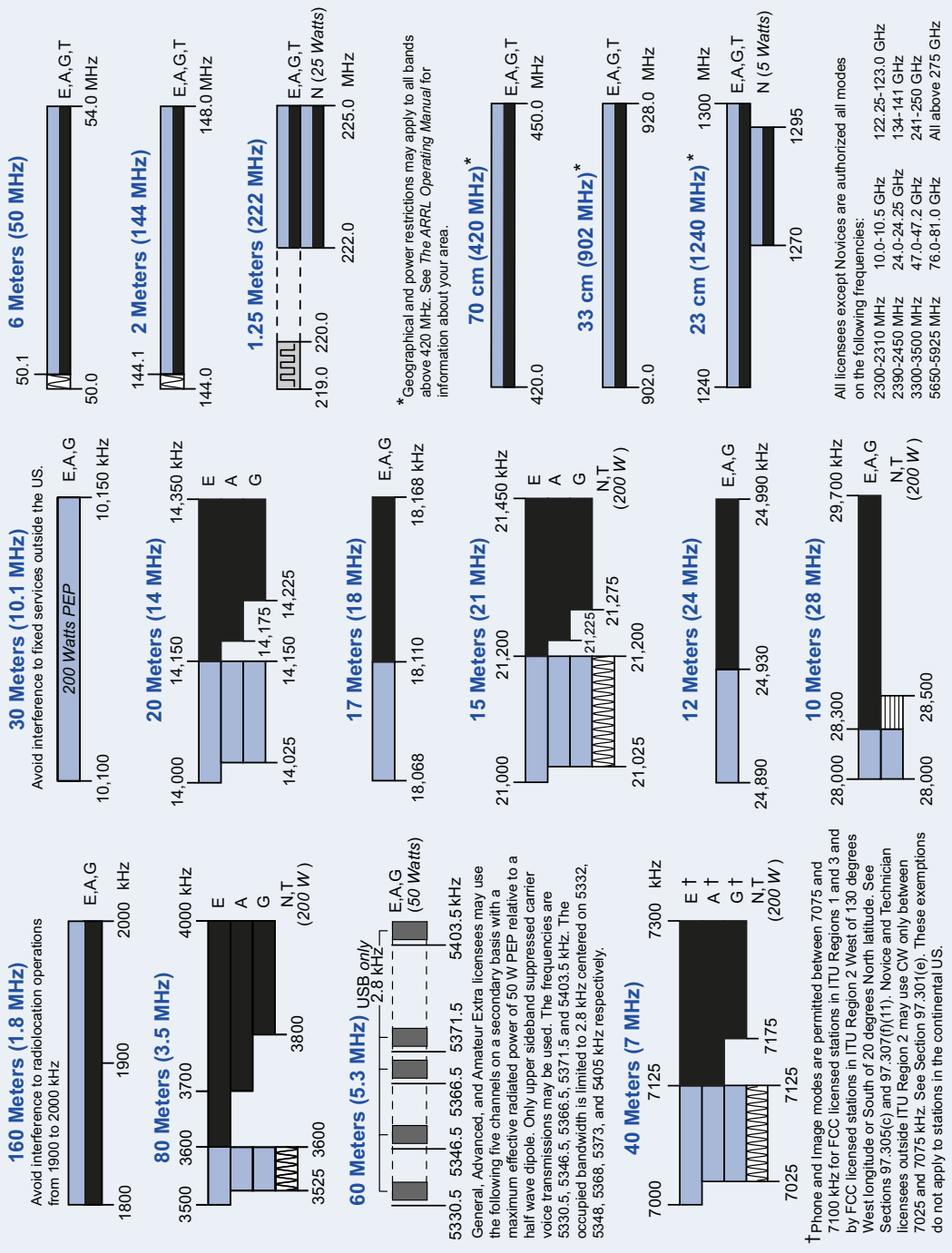
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- Stations being operated as beacons are limited to 100 watts PEP
- Stations operating in the 70-cm band near certain military installations may be limited to 50 watts PEP.

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 final section of this book.

## PRIMARY & SECONDARY ALLOCATIONS

It would be nice if every type of radio user had exclusive access to their allocations. Many amateur bands are exclusively allocated to hams, worldwide. Because spectrum is scarce and many services have valid needs for radio communications, occasionally two services receive *shared allocations*, including some of the amateur bands. When this happens, one group is generally given priority and these are called *primary allocations*. Groups that have access to spectrum on a lower priority receive *secondary allocations*. The groups that receive the allocations are *primary and secondary services*.

The primary service is *protected* from harmful interference by signals from secondary services. The secondary service gains access to the frequencies in the allocation with the understanding that it must not cause harmful interference to primary service users and it must accept interference from primary users. By sharing the bands in this way, more frequencies are available for more users than if every frequency was exclusively allocated to one service alone. Hams share several of our bands and enjoy wider access to frequencies than would otherwise be the case.

All of the UHF and higher-frequency bands have some kind of sharing arrangements. They may apply to certain geographic areas or around certain military installations. A good example is the restriction on 70-cm band operations for amateurs north of “Line A”—approximately 50 miles south of the Canadian border. Because Canada allocated 420-430 MHz to other services, to prevent international interference the FCC has ruled that US amateurs may not use that segment of the band. Frequency sharing of amateur HF bands is less common, but the 60-meter band is shared with US government services and 40-meters is shared with international short wave broadcast stations.

FCC Rule [97.303] lists all of the frequency-sharing requirements for US hams and is available on the ARRL Web site at [www.arrl.org/hrlm/sharing](http://www.arrl.org/hrlm/sharing). It is worth familiarizing yourself with sharing requirements to avoid interference either to or from your station!

*Before you go on, study test questions T1C04-09; T3B08-10; T4B10-12; T6C05.*