Part 15 Devices

The amateur bands at VHF and higher have come under considerable pressure during the past decade and will continue to face a variety of threats for some time to come. Commercial users have coveted large segments of the UHF and microwave spectrum for new digital wireless devices, including portions of the microwave bands amateurs have amicably shared with government services for decades. It is uncertain whether we can continue to share this space with commercial users or how much spectrum will be allocated to the Amateur Service on a primary basis.

Reallocation of the UHF and microwave bands, which began in the early 1990s and will continue for the next decade, is only one potential threat to amateur access to the spectrum at UHF and higher. A more immediate problem is the rapidly expanding presence of so-called Part 15 devices on the amateur bands. Most SSB/CW operators at 50 MHz and higher have already noticed an increase in the number of birdies, beeping tones, hash and unidentifiable noise of all types on the bands. Many of these signals originate with a variety of consumer, commercial and scientific devices that legally emit radio signals within the amateur bands.

Part 15 Devices

Many unlicensed electrical and electronic devices that intentionally or unintentionally radiate signals in the radio spectrum are regulated by Part 15 of Title 47 of the Code of Federal Regulations. Part 15 devices have been around for several decades, but in recent years they have proliferated such devices include with advances in technology. Such devices include electric motors, light dimmers, computers, televisions, wireless garage-door openers, radio-controlled toys, portable telephones, cordless home-speaker systems and countless other modern electronic gadgets. Within certain limits, they are all allowed to radiate signals in the 50-MHz to 241-GHz range, even within frequency ranges that are assigned to licensed services—including the Amateur Radio bands.

Part 15 regulations distinguish among three classes of unlicensed devices: intentional, unintentional and incidental radiators. Intentional radiators are designed to radiate radio signals as a part of their normal operation. They include such things as cordless telephones, wireless data networks (such as Bluetooth), microwave motion sensors and remote surveillance cameras. They may carry voice, data, video or other kinds of information in a variety of transmission modes.

Unintentional radiators generate RF energy as a result of their normal operating functions, but are not intended to do so. Televisions, scanning receivers, computer games and mÎ any other electronic devices incorporate oscillators, frequency multipliers and other digital circuits that produce low-level RF energy over broad frequency ranges. Some of this RF energy may unintentionally radiate outside the confines of the device. Nearly all electronic gadgets that incorporate computer chips are apt to be low-level radiators of RF energy.

Incidental radiators include a wide range of electrical equipment that generate RF in the course of normal operation, but are not designed to do so. Examples include electrical power transmission lines, light switches, motors, spark plugs and other similar equipment that produce sparks in their normal operation. Sparks generated by the on-off action of switches and brushes generate electromagnetic radiation over a wide frequency range, from radio energy to light. Such incidental radiators have been the bane of radio and television reception for a long time.

Part 15 devices are regulated and must be certified that they meet minimum standards, but they are not individually licensed or type accepted. Low-power intentional radiators may operate nearly anywhere in the radio spectrum above 50 MHz, subject to certain field-strength limits that depend on frequency. They are banned only from certain sensitive parts of the radio spectrum, such as those reserved for radio astronomy and the aeronautical band.

Some intentional radiators, especially those that are permitted higher power levels, may be assigned to specific frequency bands, usually on a shared secondary non-interference basis. One example is cordless-telephone operation in the 902-928 MHz band, which radio amateurs also use on a secondary basis. Certain kinds of local-area networks (LANs) operating within 2400-2483.5 and 5725-5850 MHz may be allowed up to 1 W of transmitted power and the use of high-gain antennas.

Protection against Interference

However defined and regulated, no Part 15 device may cause harmful interference to any licensed service. That principle is incorporated into the printed notice required on all Part 15 devices: *"This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation."* This warning suggests that radio amateurs are fully protected, but the definition of "harmful" actually requires amateurs to accept quite a bit of offending interference in practice.

Harmful interference means the offending signal must endanger the functioning of another device (like a radio receiver) or seriously degrade, obstruct or repeatedly interrupt a licensed service. Mere detection of a Part 15 device on an amateur band, no matter how annoying, is unlikely to meet the test of "harmful" unless it can be demonstrated that the interference seriously degrades normal operations.

The reality is that for radio amateurs, most kinds of interference—however inconvenient or annoying—do not meet the test to be considered "harmful." The FCC is likely to point out that merely moving the operating frequency slightly (which amateurs can easily do, unlike operators of most other licensed services) can effectively avoid the offending interference in most cases. For example, many 6-meter operators are bothered by the 14th harmonic of television color-burst oscillators, which appears around 50.113 MHz. It is clearly a nuisance, as this signal lies within the DX window and is adjacent to the international DX calling frequency. So what happens? That frequency is simply avoided by most serious weak-signal operators.

In other cases, the solution may not

This Month

December 9	Good EME conditions
December 14	Geminids meteor shower peaks

Emil Pocock, W3EP ♦ Box 100, Lebanon, CT 06249 (Voice 860-642-4347, fax 860-594-0259) ♦ w3ep@arrl.org

be so simple. Interference to established repeaters might be more difficult to resolve, for example. More insidious is the potential for interference from broadband modes, such as video, spread spectrum and the cumulative interference from many low-power digital devices. In these cases, moving the operating frequency may not help. These problems are likely to worsen over time.

What Can Be Done?

Weak-signal operators at VHF and higher will probably spend more time and ingenuity dealing with interference from Part 15 devices in the future. The warning labels on consumer devices do not provide a great deal of protection in practice. Neighbors are unlikely to be sympathetic when you tell them that their entertainment equipment is interfering with your radio, and the FCC will not spend time investigating annoying interference that does not meet the test of "harmful." The FCC is more likely to take notice where manufacturers have clearly overstepped the bounds of Part 15 or sold devices that are likely to create harmful interference, such as imported high-power cordless telephones operating on the 2-meter band.

Even so, there are several options. If you can track down the offending Part 15 device to a particular neighbor, it may be worth the trouble to discuss the problem and help resolve it. There are usually things that can be done to mitigate interference of unintentional radiators, such as installing ferrite beads on external wiring, shielding or grounding the devices, shortening wires, bypassing connectors with small-value capacitors and so forth. Some consumer electronics are shielded better than others; maybe some do not radiate signals within your favorite band. In these cases, convincing a neighbor to purchase a different product may resolve a problem and perhaps have other benefits to the user.

Ironically, one solution may come from the very technology that has caused the recent explosion in wireless digital devices. Sophisticated digital filtering and signal processing holds out some expectation that receivers of the future may automatically remove many more varieties of unwanted signals. We might also hope that manufacturers of low-cost digital devices would take better care to shield cases and otherwise minimize RF radiation. This good engineering practice would do a great deal to improve the general RF environment for all such devices.

The *ARRL RFI Book* has many suggestions for resolving a wide range of radio-frequency interference.[1] If a problem is serious or persistent, you may need to file a complaint with the FCC. Thoroughly document the situation and send a copy to Ed Hare, W1RFI, at ARRL (**w1rfi@arrl.org**). Other sources of information include the text of the Part 15 regulations (**www.arrl.org/tis/info/part15.html**) and the "Report of the ARRL Ad Hoc Spectrum Strategy Committee" (**www.arrl.org/announce/board.html**).

Part 15 devices are everywhere. This collection was scavenged from an Editor's work area. Part 15 covers most any electronic device that keeps time or interacts with the user in any way. In this group, the cat meows when there is movement nearby and the stuffed cowboy sings a digitally recorded Christmas tune.

ON THE BANDS

Activity during September lived up to its billing as a month for tropospheric ducting and transequatorial propagation. Tropospheric conditions were above average across much of the eastern half of the US and adjacent Canada during the first two weeks of the month, including the VHF-contest weekend. Solar activity continued at surprisingly high levels, suggesting that Cycle 23 will have a double peak and may provide one more season of worldwide 50-MHz DX before beginning its long decline. The hopes of 6-meter DXers were raised further with the appearance of widespread openings across the geomagnetic equator as early as the first week in September. Thanks to K1WVX, WB2AMU, K4TAX, W7GJ, AB7UQ, N8PUM, EA2LU, G3FPK, G4ASR, G4UPS and VK3KK for their reports not otherwise acknowledged in the summaries. Dates and times are in UTC.

Six-Meter DX

The summer sporadic-E season had hardly ended when the first signs of F-layer propagation commenced in late August with early transequatorial (TE) contacts in various parts of the world. On September 1, W5UWB (EL17), N8II (FM19) and many others worked CE3SAD and CE4WJK after 2200, perhaps the first TE contacts of the fall season from the US. Subsequently, stations scattered across the southern part of the country reported several additional days with CE, LU, PY and ZP contacts, mostly in late afternoon.

Europeans experienced their full share of TE propagation into South America, southern Africa and the adjacent Indian Ocean. Noteworthy calls in European logs included 5N6EAM, 5R8EE, C98RF, D44DV, FR1GZ, TT8JE and GØKZG/mm in the Indian Ocean. Japanese reported the usual VK, YB and ZL crowd, along with 3D2AG, 9M2/JI1ETU, FK8CA and P29ZTC. This is no doubt just a sample of what was accomplished during the September TE openings.

More interesting perhaps were the east-west DX contacts adjacent to equator. VU2ZAP hooked up with HZ1MD, JY9NX, ET3VSC, TT8JE and TR8XX all on September 7 after 1400, and added D44TD and 9N7QJ later in the month. DU1EV worked A45XR among his September catches, while DU1ZV and DU1/GM4COK also found HZ1MD. The Saudi station also worked others in Southeast Asia, including 9V1DJ and YF1OO. VR2XMT worked FR1GZ, GØKZG/mm and VU2RM.

Tropospheric Ducting

Excellent tropospheric conditions blanketed the northeastern part of the US and adjacent Canada, primarily from Minnesota and Iowa east to Connecticut and New Jersey, for much of the first week in September. On the evening of September 2-3, Dick Hart, KØMQS (EN31) was on the western side of the opening. He worked several dozen 2-meter stations in Michigan, Ohio, Pennsylvania, New Jersey, New York and Connecticut, as far eastward as W1COT and W3EP (both FN31) up to 1670 km distant.

NØDQS (EN22) in western Iowa took his rover station out for a spin that evening and

[1]E. Hare, W1RFI, Ed., *The ARRL RFI Book* (Newington, Connecticut: ARRL, 1998, ISBN: 0-87259-683-4). Order No. 6834, $20. ARRL publications are available from your local ARRL dealer or directly from the ARRL. See the ARRL Bookcase elsewhere in this issue or check out the full ARRL publications line at **www.arrl.org/shop/**.