

APPENDIX C

NONLICENSED DEVICES

I. Introduction

Part 15 of the FCC's rules defines a class of devices that use the spectrum for which licenses are not required.⁽¹⁾ Some of these "nonlicensed" devices, like cordless telephones, transmit a signal for radiocommunications, while others, like computers, emit radio energy incidental to their operation. Because nonlicensed devices are convenient, economical, and, in most cases, readily available to the public, their use is spreading rapidly.

By limiting the radiated power of most nonlicensed devices, spectrum managers are able to permit their use to "overlay" use by allocated services without causing harmful interference. This overlay approach provides a great deal of flexibility. Although it allows the spectrum to be allocated among the licensed services, the widespread use of nonlicensed devices has raised concerns over interference.

II. Regulatory Status

The FCC's basic objective in permitting the operation of nonlicensed equipment is "effective use of the radio spectrum while providing additional technical and operational flexibility in the design, manufacture and use of non-licensed devices."⁽²⁾ The FCC indicated that "administrative convenience" in designing this system was also desirable.⁽³⁾

Under FCC rules, nonlicensed devices must not cause harmful interference to, and must accept interference from, authorized radio services. This lack of status creates a particularly difficult situation when users of a licensed radio service experience interference that is partly a result of poor design of the licensed equipment, such as poor receiver design. Also, the popularity of nonlicensed devices increases the potential for interference with licensed radio services, while making consumer pressure for continued operation of the nonlicensed device a significant factor in interference resolution. ARRL states that "in the real world of high-volume retailers and residential neighborhoods, it is unrealistic to expect that interference . . . will be resolved in a manner that is entirely satisfactory to the 'protected' service."⁽⁴⁾ NTIA believes that there is value in both licensed devices and nonlicensed services, and that regulatory procedures must, through ensuring reasonable compatibility, encourage the use of both.

Most of those responding to the Notice support the general FCC approach and the associated convenience and status of nonlicensed devices. However, since the completion of the FCC's 1989 revision of Part 15, users have begun requesting rule changes for particular applications.⁽⁵⁾

III. Interference Potential

Some commenters express concern about specific situations where they claim interference is more probable because of the current treatment of nonlicensed devices. NBC believes that interference to televisions is particularly a problem, and that the FCC should, before permitting a new nonlicensed device to be marketed, require greater proof that the device will not cause interference.⁽⁶⁾ Du Treil, Lundin & Rackley states that radio frequency lighting devices cause widespread interference in the AM band and that stricter standards should be applied.⁽⁷⁾ The FAA reports having experienced interference to safety services from nonlicensed transmitters. It believes that further nonlicensed uses should not be permitted in safety-service bands.⁽⁸⁾ ARRL notes that nonlicensed systems could have a significant impact on amateur radio because four of the bands designated by the FCC as consumer bands are allocated to the amateurs.⁽⁹⁾ NSF states that the increased number of nonlicensed devices represents a threat to ground-based radio astronomy activities.⁽¹⁰⁾ It mentions that sharing arrangements between radio astronomy and other services depend upon the predictability of interference and the use of distance separation. Because, separation cannot be guaranteed for nonlicensed systems, radio astronomy bands have been included in the list of restricted bands for nonlicensed, intentional radiators. Still, harmonic and spurious signals for such devices concern NSF. NSF recommends that the FCC further tighten field strength limits for nonlicensed devices, and believes that burdens on consumers and manufacturers from such action would be "slight."⁽¹¹⁾

DOJ/JMD is concerned about the additive result of out-of-band emissions from nonlicensed systems in metropolitan areas.⁽¹²⁾ NBC expresses concern over the general increase of ambient interference levels.⁽¹³⁾ However, ITI argues that the negative additive effects of these systems have not been shown.⁽¹⁴⁾

In contrast, Interior expresses greater concern over potential interference to nonlicensed systems than interference from them.⁽¹⁵⁾ Also, DOJ/JMD fears that the public will be inconvenienced by interference to nonlicensed systems. It

believes that warning labels on Part 15 devices, describing susceptibility to interference, may be useful in educating the public about the limitations of these devices.⁽¹⁶⁾ NPR asserts that many instances of interference to nonlicensed systems, such as garage door openers, cordless telephones, and security devices, stem from the lack of quality in the device receiver.⁽¹⁷⁾ Southwestern Bell states that the use of digital coding on some Part 15 devices would help make them less susceptible to interference.⁽¹⁸⁾

NTIA is aware of cases of interference both to and from nonlicensed devices, and the FCC maintains records of reported cases. Though such reports have been few, many users do not report interference that is resolved locally.⁽¹⁹⁾ Also, the interference from nonlicensed systems may be intermittent or difficult to identify. NTIA believes that increased reporting of interference involving nonlicensed systems would help to evaluate the extent of this claimed problem. In addition, NTIA and the FCC should develop and validate analytic techniques to determine the cumulative impact of low-power radiations. Without such documentation, NTIA and the FCC must be cautious in applying unnecessarily strict and possibly costly regulations. Even in documented cases of interference, spectrum managers must ask whether a method of dealing as a whole with nonlicensed devices can be constructed based upon a few examples. The benefit of allowing public use of inexpensive nonlicensed devices appears to outweigh such problems. Obviously, particular care must be taken in preventing interference to safety systems. The existing FCC approach appears to be working adequately, though some modification may be necessary to ensure its long-term success.

IV. Licensing of Part 15 Devices

Some manufacturers of Part 15 devices are concerned about protecting their equipment from interference; however, licensed users often argue that those devices must be licensed to provide protection. For example, NOAA supports licensing for any device that has a safety or security requirement.⁽²⁰⁾

In general, NTIA believes that licensing would make it more difficult for individuals to obtain and use Part 15 systems. Licensing includes formal procedures for considering a device's ability to operate compatibly with other users. Moreover, it requires users to understand, to varying degrees, system operation and regulatory procedures. These characteristics of licensing limit the operational flexibility and the administrative convenience that the FCC intended in Part 15. If such devices had to be licensed, the sheer numbers of users of devices that radiate intentionally, such as cordless phones, door openers, and baby monitors, would place a tremendous administrative burden on the FCC. Furthermore, many nonlicensed systems do not radiate intentionally, or can be moved to any location. Therefore, licensing does not necessarily ensure compatibility. If at all possible, licensing of each "station" should be avoided. However, other forms of documentation may be helpful. For instance, manufacturers could provide information on product lines and associated frequencies to the FCC or to a nonlicensed device industry coordinating group. This information could be useful in coordinating Part 15 uses, but also may help licensed users avoid conflicts.

V. Allocating Frequencies for Nonlicensed Systems

Based on having experienced interference from nonlicensed devices, the Air Force recommends grouping them into one band.⁽²¹⁾ The concept of designating frequencies for nonlicensed systems does have some merit. For instance, the designation of 2400-2500 MHz as an ISM band has enabled the ubiquitous use of microwave ovens.⁽²²⁾ In that band, licensed services operate at their own risk. Theoretically, a similar approach could be taken with other uses that, under Part 15, are not now licensed. However, the presence of a number of nonlicensed systems operating in the same band in the same environment could pose difficulties. On the other hand, the growing variety of nonlicensed uses, particularly for mass market items, could deny more and more essential spectrum to licensed uses if each were provided a frequency or group of frequencies.

Some commenters state that some Part 15 uses should have a higher status than they now have. For instance, CSAA contends that "low power sensor devices have become too important to continue to operate at sufferance" and Part 15 should specify "a way to identify the devices whose operations warrant protection from interference, not only from other low-power devices but also from the licensed services."⁽²³⁾ ITI recommends that spectrum should be set aside for alarm devices.⁽²⁴⁾ CSAA suggests that the FCC prioritize its treatment of nonlicensed devices, providing more interference protection to safety or emergency systems than to those used for entertainment, convenience, and business. CSAA believes that the FCC's effort to simplify the Part 15 rules has had a negative impact.⁽²⁵⁾

For NTIA to conclude that specific types of nonlicensed devices should be provided frequencies or a more protected status than currently available under Part 15, we would have to balance the benefits to the public for such protection against its costs, including potentially substantial costs of relocating to new bands current Part 15 devices and licensed users. Such an analysis requires, among other things, interference data that documents actual incidents and the nature of the interference interaction that caused them. Without such data, it is difficult to determine sources of the interference and to select the proper solution. Such data did not appear in the record.

Though many other countries have specifically designated frequencies for individual uses, these regulations were written piecemeal as the growth of these systems was being experienced. That approach may no longer be adequate. Currently, the International Electrotechnical Commission (IEC) is considering adoption of a generic standard that applies to all equipment not covered by other standards. The result would be a "Part 15-like" treatment of many devices through general field strength limits.

VI. Standards as a Safeguard

Additional standards for could be used as another approach to dealing with the interference from nonlicensed devices. However, this method could add unnecessary costs. NTIA believes that Part 15 transmitter standards covering field strength levels are adequate. However, in some cases, receiver characteristics, both of nonlicensed equipment and licensed equipment, contribute to the problem. In a world of growing spectrum use, NTIA believes that manufacturers of nonlicensed devices and of licensed equipment should account for inevitable increases in radio noise and potential interference by paying greater attention to receiver susceptibility. Industry rating and labeling nonlicensed equipment to indicate product susceptibility to interference, or to warn buyers of interference potential could be helpful.

The manufacturers and users of nonlicensed devices should match the interference suppression capabilities of their equipment to the function performed. For example, equipment used for emergency or security purposes, such as health monitors used for protection of life, or security systems linked to police departments, should be of high quality. Security alarms, used strictly to frighten burglars, could be susceptible to interference-driven false alarms yet inexpensive, and still be useful to the customer. On the other hand, an alarm designed to alert the local police probably should not be susceptible. These design considerations directly impact equipment markets. However, alteration of the existing Part 15 regulations to grant protection for these devices, and thereby minimize costs to nonlicensed device manufacturers and users, could work to the detriment of licensed use.

VII. Planning and Nonlicensed Devices

Proper planning in the design of Part 15 devices could eliminate problems by enabling manufacturers to select frequencies that would result in interference-free use. This is particularly important for intentional radiators, but can also be concern for other nonlicensed devices.⁽²⁶⁾ However, guidance given within the FCC rules is inadequate to aid in this planning process. Manufacturers are "advised to consider the proximity and the high power of non-Government licensed radio stations, such as broadcasting, amateur and land mobile stations, and of U.S. Government radio stations when choosing operating frequencies during the design of their equipment so as to reduce the susceptibility for receiving harmful interference" by "consulting the Table of Frequency Allocations in Section 2.106 of the Chapter" for information on non-federal users, and by "contacting: Director, Spectrum Plans and Policy, NTIA...." for information on federal use.⁽²⁷⁾ Mere consultation of the allocation tables provides little help in determining the proximity and power of non-federal systems. NTIA has established a procedure for supplying, in response to non-federal requests, summaries of federal use, but those summaries can only provide general information.

More specific, in-depth, analysis is needed to avoid conflicts. Many aspects of the problem should be investigated. First, considering the characteristics of a new nonlicensed system, are there any particular services that are innately compatible with the nonlicensed device in question? For example, if a satellite band is used, does the direction of the satellite transmission lessen the potential for interference to the nonlicensed device? Data openness concepts discussed in Chapter 2 may help equipment designers in their selections of appropriate spectrum bands.

Some cases of interference to nonlicensed systems have been due to the operation of other nonlicensed systems. An intra-industry coordinating group is a reasonable and simple approach to alleviating these issues. One approach that it could take would be to require manufacturers to prioritize their devices. If necessary this issue could be addressed by the FCC through a notice of inquiry.

VIII. Planning and Licensed Systems

The UTC recommends that radio communications users consider the operations of essential nonlicensed operations before planning services.⁽²⁸⁾ However, while licensed frequency use is documented in NTIA and FCC data files, nonlicensed use, in most cases, is not.⁽²⁹⁾ Therefore, the benefits of communications equipment developers researching the characteristics of nonlicensed devices would be limited. As noted earlier, NTIA believes that manufacturer listing of operating frequencies for intentional radiators with the FCC could serve as a useful database. Though they are not required to avoid interference to Part 15, licensed users could use this data to help avoid conflicts.

IX. Conclusions and Recommendations

NTIA supports the existing FCC approach for overlaying the use of nonlicensed devices across the allocated bands, believing it to be efficient and effective. It generally provides licensed users adequate interference protection, and the nonlicensed users flexibility and a light regulatory burden. However, some modification may be necessary to ensure its long-term success.

Licensing of these systems is not generally desirable. The costs to users in added time and expense, and the administrative burden that would be placed on the FCC, would be too great. NTIA recommends that manufacturers provide information on product lines and associated frequencies to the FCC or to a nonlicensed device industry coordinating group to help coordinate Part 15 uses, and to identify, for licensed users, the frequencies on which nonlicensed devices operate.

Specifying frequencies for at least some nonlicensed devices could be desirable if spectrum were available and if a need for special protection of a particular device can be demonstrated to be in the public interest. However, the existence of interference problems must be well documented, not based strictly on a few cases.

In an environment of growing spectrum use, manufacturers of nonlicensed devices and licensed equipment should give greater attention, during device design, to interference susceptibility.

Manufacturers should base their selection of frequencies for Part 15 devices on in-depth analysis. Frequencies chosen for any device that may find widespread use by consumers must be carefully examined for potential interference.

Industry representatives should form a coordinating group to establish priorities among different nonlicensed devices and to help ensure that conflicts between Part 15 devices do not occur. The prioritization of nonlicensed devices may need to be considered by the FCC through the issuance of a notice of inquiry.

Resolution of interference should continue to occur on a case-by-case basis. Interference from licensed use to large numbers of nonlicensed users is the most difficult to resolve. Proper planning must attempt to avoid these situations because resolution, in some cases, may not prove totally satisfactory to either licensed users or the manufacturers of susceptible nonlicensed devices, and it can be difficult for licensed users to enforce their ostensible rights.

Documentation of all cases of nonlicensed device interference, even those resolved locally among parties, should be provided to NTIA and the FCC for evaluation of Part 15 devices from an interference standpoint.

NTIA and the FCC should develop and validate analytic techniques to determine the cumulative interference impact of low-power radiations.

1. See 47 C.F.R. Part 15 (1990).

2. Revision of Part 15 of the Rules Regarding the Operation of Radio Frequency Devices Without an Individual License, First Report and Order, 4 FCC Rcd 3493 at 3493 (1989); Memo. Opinion and Order, 5 FCC Rcd. 3492 (1990) (Part 15 Revision).

3. Id. First Report and Order, at 3494

4. ARRL Comments at 23-24.

5. For example, the FCC has responded to General Motors Research Corporation and M/A-COM, Inc. petitions requesting reconsideration of harmonic emission limits for field disturbance sensors, see Part 15 Revision, 5 FCC Rcd 6288 (1990); LBP Inc., LocRad Inc., Burden Assoc., and the Intercollegiate Broadcasting System petitions for reconsideration of field strength limits applying to carrier current, "leaky cable, and campus radio systems, see Part 15 Revision, Memo. Opinion and Order, 5 FCC Rcd 7729 (1990).

6. NBC Comments at 15. However, NTIA notes that the susceptibility of inexpensive television receivers can contribute to interference cases.

7. Du Treil, Lundin & Rackley Comments at 9.

8. FAA Comments at 3.

9. ARRL Comments at 23-24. The term "consumer bands" refers to those bands where exceptions are made to the Part 15 general field strength limits. These bands are allocated for use by Industrial, Scientific, and Medical (ISM) equipment, and licensed services operate on a secondary basis. Licensed users believe that the large scale entrance of nonlicensed devices into these bands represents a significantly increased potential for interference over that due to ISM alone.

10. NSF Comments at 13-14.

11. NSF Comments at 14.

12. DOJ/JMD Comments at 5.

13. NBC Comments at 15.

14. ITI Comments at 8.

15. Interior Comments para. 53.

16. DOJ/JMD Comments at 5.

17. NPR Comments at 10.

18. Southwestern Bell Comments at 8.

19. In order to minimize reporting, this is a matter of standard operating procedures for many federal agency field offices.

20. NOAA Comments at 5.

21. DOD (Air Force) Comments at 10.

22. ISM equipment, covered under Part 18, also is not licensed. However, the ITU has designated bands for their use. The ISM category includes such equipment as microwave ovens, medical diathermy equipment, and industrial heaters that use radio frequency technology to treat materials.

23. CSAA Comments at 11.

24. ITI Comments at 2.

25. CSAA Comments at 11-12.

26. Recently, the United States raised concerns in CCIR Study Group 8 as to the impact of harmonic radiation from the MAC Packet Decoder, an internal device found in European designs for advanced technology television.

27. 47 C.F.R. § 15.17 (1990).

28. UTC Comments at 17. UTC apparently refers to the current conflict between growing terrestrial and aeronautical use of LORAN-C and power-line-carrier systems operating near 100 kHz. Both the national power system and aviation navigation have public safety requirements.

29. Power-line-carrier is the one notable exception.