Before the
Federal Communications Commission
Washington, D.C. 20554

GEN. Docket No. 87-389

In the Matter of

Revision of Part 15	RM-5193
of the Rules regarding	RM-5250
the operation of radio	RM-5575
frequency devices without an	
individual license.	

FIRST REPORT AND ORDER

Adopted: March 30, 1989; Released: April 18, 1989

By the Commission:

TABLE OF CONTENTS

INTRODUCTION

1. By this action, the Commission is amending Parts 2 and 15 of the Rules regarding the non-licensed operation of radio frequency (RF) devices and the equipment authorization procedures associated with this equipment.

The objective of this action is to achieve more effective use of the radio frequency spectrum while providing additional technical and operational flexibility in the design, manufacture and use of non-licensed devices. This objective will be achieved by: 1) providing for the production of equipment for non-licensed use on almost any frequency with minimal restrictions on usage, bandwidth, modulation technique and other technical parameters; 2) establishing uniformity among the technical standards for various non-licensed operations; 3) clarifying and simplifying our administrative requirements; and, 4) retaining, to the greatest extent possible, operations currently permitted under the rules.

BACKGROUND

2. The rules for non-licensed use of RF devices were established approximately fifty years ago. In 1938, the Commission allowed devices employing relatively low level RF signals to be operated without the need for individual licensing as long as their operation caused no harmful interference to licensed services and the devices did not generate emissions or field strength levels greater than a specified level. [1] Typical kinds of equipment operated under these regulations were wireless record players, carrier current communication systems and remote control devices.

3. At the time this standard was adopted, most Part 15 RF devices were designed to operate in the MF (0.3-3 MHz) and HF (3-30 MHz) frequency bands, and compliance was relatively easy to achieve. However, as the industry designed products intended for operation on higher frequencies, it became more difficult to meet the field strength limit specified in this early standard since the allowable field strength level decreased as the operating frequency increased. Accordingly, over the years the Commission amended and expanded Part 15 of the rules to permit the non-licensed operation of devices at higher frequencies in those cases where it could be determined that the mass-marketing of such products would not result in harmful interference to authorized radio services. In the 1950's, the Commission adopted new technical standards for devices such as radio receivers and low power transmitters operating in the 27 MHz band and above 70 MHz. In the 1960's through the 1980's, provisions were made under Part 15 to permit the operation of additional equipment such as wireless microphones, telemetry systems, garage door openers, TV interface devices (e.g., video cassette recorders), field disturbance sensors (e.g., anti-pilferage systems for retail stores), auditory assistance devices, control and security alarm apparatus, and cordless telephones.

4. The provisions for new devices generally were adopted in response to petitions for rule making that requested authorization only for the specific device in question. This incremental method of adopting device-specific regulations resulted in rules that are lengthy and difficult for the public to understand. It has resulted in the adoption of standards that are overly complex and, in some cases, unnecessarily restrictive. There are also a number of apparent inconsistencies in the technical standards between Part 15 devices that have similar interference potentials. Early standards adopted to control interference are frequently significantly different from what is needed at the present time due to improvements in equipment, such as receiver sensitivity, the increased proliferation of both licensed and non-licensed operations, and changes to the frequency allocations of authorized radio services.

5. The Commission believed it would be desirable to restore technical flexibility and administrative convenience to the regulations for RF devices operated without licenses and to modify and amend these regulations to address changes in the nature and number of such devices that have occurred in recent years. It therefore adopted the *Notice of Proposed Rule Making (Notice)* in this proceeding to consider a comprehensive revision of Part 15 of its rules. [2] The Commission received 340 comments and 56 reply comments in response to the *Notice*. [3]

DISCUSSION

I. GENERAL

6. In the *Notice*, the Commission proposed to revise and reorganize Part 15 of the rules in its entirety. The Commission sought to strike an equitable balance between the needs of the public for the services provided by non-licensed RF devices and the need to ensure that these devices do not cause harmful interference to licensed radio services. The major features of the proposed new rules for non-licensed RF devices were: 1) to allow manufacturers to produce non-licensed equipment for use on almost any frequency with minimal restrictions on usage, bandwidth, modulation technique and other technical parameters; 2) to establish uniformity between the technical standards for various non-licensed operations; 3) to clarify and simplify our administrative requirements; and, 4) to retain, to the greatest extent possible, operations currently allowed under the rules.

7. Many commenting parties agree with our tentative conclusion that there is need for a comprehensive revision of Part 15 of the rules and support the basic framework of our proposal for this revision. These parties represent a wide field of interests ranging from manufacturers of electronic equipment to licensees of authorized radio services. Supporting comments state that a comprehensive revision and modernization of the Part 15 rules is long overdue in light of the rapidly evolving capabilities of electronic technology.

8. Parties supporting our basic plan for revising Part 15 generally believe that the proposed rules would facilitate and encourage development and marketing of new types of Part 15 devices. They state that under the existing regulatory system, manufacturers often are reluctant to incur the legal expenses and delays associated with the rule making process in order to market a new product, especially when their competitors can manufacture similar products without expending resources on the regulatory process once the Commission adopts the rule changes requested in the petition. They state that the proposal to allow low power, non-licensed equipment to operate on most frequencies without prior FCC approval as long as the equipment meets the technical standards for the frequency on which it operates would eliminate these constraints, thereby affording manufacturers considerable new freedom and flexibility to design and introduce equipment for new kinds of services. RTT, EIA/CEG and others point out that the public's desire for low power, non-licensed RF equipment is evidenced by the veritable explosion of new and improved types of such products in recent years.

9. Almost all of the parties commenting on the general organization of the Part 15 rules state that the proposed changes would simplify these regulations and improve their internal consistency. Supporting parties also believe that the technical protections that would be provided by emissions limits, restrictions on use of specific frequency bands, and other technical standards as generally proposed in the *Notice* would ensure that Part 15 devices do not cause interference to licensed radio services. These commenting parties believe that the proposed revision of Part 15 would allow for expanded use of non-licensed products in a manner that would improve the quality of life for the American public without causing harmful interference to licensed radio communications services.

10. Many commenting parties, including most of those who specifically state that they favor the basic approach of the proposed revision, request modifications to specific aspects of these proposals. These requests generally pertain to individualized issues relating to the adequacy of the rules for protecting authorized services from interference from Part 15 devices or to the need for less stringent regulations in particular areas. The commenting parties address virtually all of the specific provisions of the proposed rules, seeking clarifications, changes in definitions, and modifications of technical standards, measurement procedures and other provisions affecting the applicability of the rules.

11. A number of parties representing the interests of authorized radio services and recognized "passive" radio uses, such as radio astronomy, oppose any restructuring or revision of the Part 15 rules that would encourage or facilitate the operation of significant numbers of low power, non-licensed RF devices or that would allow such devices to operate at higher emissions levels. These parties, who consist primarily of radio astronomers and amateur radio operators, are concerned that the proliferation of low power RF devices could increase the level of ambient RF "noise" and thereby disrupt reception of relatively low level radio signals or signals transmitted by licensed radio stations.

12. We continue to believe it is desirable and appropriate to restore the technical flexibility originally provided for operation of non-licensed RF devices in the Part 15 rules. The current system that requires rule making for authorization of new Part 15 devices imposes delays and costs on innovating parties that tend to have a chilling effect on the development and marketing of new products. This system is also unfair to innovating firms, in that once the rule making to authorize a device is completed, competing firms may then market similar products without incurring these regulatory burdens. We also find that the existing rules are overly complex and, in some places, are unclear such that it may be difficult for parties to determine whether a particular new device or modification of an existing device would comply with the rules. It is apparent from the record and from our own general observation of the market for electronic equipment that there is strong demand by the public for the types of devices that are typically authorized under Part 15. It is, therefore, all the more important that we make every effort to remove all regulatory constraints that may unnecessarily impede the market from introducing new RF devices. We believe that with proper technical and operational rules it is possible to provide for expanded operation of non-licensed RF devices while maintaining a satisfactory RF environment for operation of licensed radio services and recognized passive users of the radio spectrum.

13. Accordingly, we are adopting a comprehensive revision of the Part 15 rules that incorporates the basic framework proposed in the *Notice*. [4] The new rules are designed to provide a balance of our competing goals of eliminating unnecessary regulatory barriers and burdens on the development of new low power RF equipment and maintaining adequate interference protections for authorized radio services and recognized passive users of low level RF signals. We have attempted to eliminate all unnecessary and overly restrictive technical regulations. However, in some instances our decision to permit greater technical flexibility has necessitated that we adopt standards that are more restrictive than those of the existing Part 15 rules. In addition, we have also taken this opportunity to tighten the Part 15 technical standards to reduce interference to authorized radio services, in particular, the AM broadcast service.

14. In the sections that follow, we discuss each of the specific issues addressed in the *Notice* or raised by the commenting parties, present our decisions on these issues, and describe the specific provisions of the new rules.

II. DEVICES SUBJECT TO PART 15

15. The current Part 15 defines and regulates the emissions from "restricted radiation devices." This term is defined in the current Section 15.4(d) as "[a] device in which the generation of radio frequency energy is intentionally incorporated into the design and in which the radio frequency energy is conducted along wires or is radiated . . . " Several categories of restricted radiation devices, such as low power communication devices, field disturbance sensors, biomedical telemetry devices, computing devices, receivers, etc., are defined or discussed in the rules. Both devices that intentionally generate and radiate radio frequency energy, e.g., transmitters, and that intentionally generate but unintentionally radiate radio frequency energy, e.g., receivers and computers, are regulated as restricted radiation devices. A separate type of device which does not intentionally generate radio frequency energy but radiates radio frequency energy during the course of operation is defined as incidental radiators, e.g., electric motors, light dimmers, etc. No standards have been established for incidental radiators; however, these devices are permitted to operate only on a non-interference basis.

16. In order to simplify the technical requirements and to avoid confusion between the various types of devices, we proposed in the *Notice* to delete the definition of a restricted radiation device. That term would be replaced by new definitions recognizing the two basic types of devices operated under Part 15: intentional radiators and unintentional radiators. Intentional radiators would be defined as devices that intentionally generate and emit radio frequency energy by radiation or induction. Unintentional radiators would be defined as devices that intentionally generate radio frequency energy for use within the device, or that send signals by conduction to associated equipment via connecting wires, but which are not intended to emit radio frequency energy by radiation or induction. None of the comments opposed these proposed definitions. We continue to believe these definitional changes would serve to simplify the rules and reduce confusion with regard to determining the specific provisions of the

rules that are applicable to a given device. Accordingly, we are deleting the existing definition of restricted radiation devices and are adopting new definitions for intentional and unintentional radiators as set forth in Section 15.3 in Appendix B.

III. GENERAL TECHNICAL STANDARDS

17. The operation of radio frequency equipment used by the authorized services can be disrupted if that equipment receives undesired emissions. Part 15 devices have the potential to contribute to the undesired emissions that interfere with the satisfactory operation of authorized and recognized radio services. The emissions from a Part 15 device may be radiated over the air or conducted through the power line. As part of our plan to provide flexibility for the development of new Part 15 equipment, we are adopting technical standards that we believe will minimize the probability that harmful interference will be caused to the authorized radio services by Part 15 devices while still permitting effective economical operation of such devices in most frequency bands. These standards restrict the maximum levels of conducted and radiated emissions. They apply to both intentional and unintentional radiators. Additional protection to sensitive authorized services is provided by the establishment of various restricted frequency bands within which only spurious emissions from intentional radiators are permitted.

A. General Conducted Emission Limits

18. As indicated in the *Notice*, the current rules specify a number of different limits for conducted emissions depending on the type of Part 15 device. [5] In addition, the rules specify different frequency ranges over which these limits are to be measured. Consistent with our objective to eliminate, to the extent possible, device-specific regulations, we proposed to apply a single limit of 250 uV for all intentional and unintentional radiators, except for Class A digital devices. [6] This limit would apply over the frequency range 450 kHz to 30 MHz. We indicated that we believed such a limit would be sufficient to ensure that Part 15 devices do not cause interference to authorized services operating in that range irrespective of the type of modulation or emission used. We also proposed to measure line conducted emissions with the devices connected to the utility power service through a 50 ohm/50 uH line-impedance stabilization network (LISN), rather than a 50 ohm/5 uH LISN as provided in the current rules, and measurement instrumentation employing a quasi-peak detector function. [7] While the present rules require the use of a 50 ohm/5 uH LISN in some cases, it was felt that a 50 ohm/50 uH would provide better impedance matching and, therefore, more accurate measurements at frequencies below 10 MHz. The use of this value LISN would also conform with the American National Standards Institute (ANSI) Standard C63.4 and the standards recommended by International Special Committee on Radio Interference (CISPR). A few commenting parties object to the conducted limits proposed in the *Notice*. For example, TV receiver manufacturers indicate that even though the limit proposed to be applied to their equipment is a higher value than under the existing rules, the use of a 50 ohm/50 uH LISN and measurement instrumentation employing a quasi-peak detector results in a lower emission limit. The comments indicate that tighter limits are not required since TV receivers and similar devices have never been sources of interference. Other comments request an increase in the permitted levels for conducted emissions, especially for Class A digital devices. However, the comments submitted by individual operators in the Amateur Radio Service (ARS) and by individuals who regularly listen to international broadcast stations (shortwave) indicate that devices such as TV receivers and computers are major sources of interference in the frequency bands below 30 MHz and argue for more stringent conducted emissions limits.

19. The interference potential of Part 15 devices below 30 MHz is controlled principally by the limit placed on conducted emissions. We believe that the limits proposed in the *Notice* will provide sufficient flexibility to design cost-effective equipment. Further, based on past experience with these limits, we believe that they are sufficient to alleviate many of the interference problems currently being encountered. Therefore, we are adopting the limits which were proposed in the *Notice*. We are also adopting the use of the standard 50 ohm/50 uH LISN and the use of CISPR quasi-peak measurement instrumentation. Transition provisions have been provided for all present radio frequency devices. These transition periods will allow the manufacture and importation of equipment under the current rules for ten years for receivers and five years for other radio frequency devices. This should provide manufacturers ample time to make any needed changes to their equipment.

B. General Radiated Emission Limits

1. Radiated Emission Limits for Intentional Radiators

20. In the *Notice*, we proposed to permit Part 15 intentional radiators to operate without restrictions as to bandwidth, duty cycle, modulation technique or application as long as the equipment does not operate in certain restricted bands and it complies with the following general emission limits:

Frequency Band (MHz)	Field Strength (uV/m)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

The limits proposed were based on our experience as to the level that could be permitted without undue risk of interference to authorized radio services, the limits currently specified for Class B computing devices, and, for frequencies above 960 MHz, the recommendations of NTIA. At frequencies equal to or below 1000 MHz, we proposed to base the limits on CISPR quasi-peak measurements. Above 1000 MHz, we proposed to base the limits on peak measurements. We also proposed to limit spurious emissions from intentional radiators to the same levels as proposed for the general emissions limits.

21. A number of commenters support the concept of general radiated limits. GM, among others, indicates that the general limit will provide needed flexibility in the design of Part 15 devices. GM further notes that the licensed communications services have not been significantly impacted by the widespread proliferation of personal computers and other Class B computing devices that presently must comply with the proposed limits.

22. A number of objections to the proposed limits were also submitted. Several commenters, representing various authorized communications services, requested that the limits be modified to further protect their operations. The League indicates that its engineering analysis found that interference to amateur operations could occur at distances ranging from 78 meters (at 14 MHz) to 102 meters (at 28 MHz) from Part 15 devices operating at the proposed limits below 30 MHz. [8] Above 30 MHz, the League indicates that operation under the general limits could cause interference at distances ranging from 0.56 km (at 420 MHz) to 1.9 km (at 902 MHz). A number of commenters were concerned that Part 15 devices could interfere with the reception of International Broadcast (shortwave) stations. In addition, comments from individual amateur operators indicate that they have experienced interference from computing devices. EIA/LMRS submits that land mobile operations could receive interference from Part 15 devices operating under the general limits at distances ranging from 77 to 106 feet. NAB states that spurious emissions greater than the fundamental signal should not be permitted.

23. Manufacturers of Part 15 devices, on the other hand, express concern that the proposed limits are too low. GM requests an increase of 6 dB in the proposed limit below 1705 kHz for pulsed systems to compensate for the change in measurement technique from average to CISPR quasi-peak measurements. GM adds that while it realizes the Commission's desire to reduce interference to AM broadcast service, there is no compelling reason to reduce permitted emission limits below 490 kHz. LPB and other manufacturers of intentional radiators using the frequency band 510-1705 kHz and employing "leaky" coaxial cables as their antennas, object to the deletion of the current Section 15.7 of the rules. They further request that the field strength limit for such systems be made the same as that provided for Travelers' Information Stations (TIS) under Part 90 of the rules. [9]

24. We continue to believe that the proposed general radiated emission limits are appropriate for guarding against interference to authorized services by Part 15 devices. The limits for emissions between 1.705 and 30 MHz will provide essentially the same protection to authorized services as the existing rules. We observe that Part 15 devices already are permitted to operate in the 1.705-10 MHz band at higher limits without known interference problems to the authorized radio services. We also believe that interference distances calculated by the League and others for frequencies below 30 MHz are overly optimistic and that the actual potential for interference from Part 15 devices is significantly less. This is due to the high background noise levels and the large number of authorized high power stations below 30 MHz. In this regard, we note that the majority of Part 15 devices operating on frequencies between 1.705 and 30 MHz are field disturbance sensors for control of entry into buildings or tag sensors for deterring shoplifting that have an effective range of a few feet and normally are used in buildings that attenuate the range of the emissions. Thus, the risk of interference to shortwave broadcasts and ARS transmissions by Part 15 devices operating below 30 MHz at the new emissions levels appears to be very low.

25. The proposed general limits in the band 30-960 MHz band are the same as the limits currently applied to Class B computing devices. The claims of computer interference from individual ARS operators are not persuasive enough to warrant more stringent limits. For example, they do not indicate if the reported interference resulted from a computer co-located with the equipment receiving interference, if the source of the interference was a Class B (residential) computer, or if the computer was in compliance with our technical standards. Moreover, as stated by GM, licensed communications have not been significantly impacted by the widespread proliferation of Class B computing devices. On this basis, we continue to believe that the proposed rules for the 30-960 MHz range are adequate to guard against significant interference to authorized services from Part 15 equipment.

26. For frequencies above 960 MHz, the proposed limit is the same as that which the Commission recently adopted in GEN Docket No. 86-422 to ensure that emissions from Part 15 devices do not interfere with safety and other sensitive services operating on the exist [10] In view of the Commission's finding that this limit is adequate for protecting sensitive services from interference by Part 15 operations, we believe this same limit also is appropriate to minimize the probability of interference by Part 15 devices to any authorized service above 960 MHz.

27. We are, however, amending our proposal with regard to the measurement of radiated emissions. As discussed below in paragraphs 91-95, we are requiring that emissions be measured using the quasi-peak detector function for frequencies below 1000 MHz and the average detector function, with a corresponding limit on peak emissions, for frequencies above 1000 MHz. We are also requiring that peak emission limits apply to some pulse modulation systems that employ a low pulse-repetition frequency. However, in response to GM's concerns we will continue to permit the operation of devices on frequencies below 490 kHz under the existing emission limits, including the use of measurement instrumentation employing an average detector. As with other frequency bands for which we are retaining average measurements, we are adopting a corresponding limit on the level of emissions measured with instrumentation with a peak detector. That peak limit is 20 dB above the maximum permitted average emission level. The addition of this limit on peak emission levels will reduce the potential for interference to the authorized services, especially from Part 15 devices employing pulse modulation techniques. A similar change in measurement technique is not being provided for other bands under the general emission limits. First, while the general limits for the band 0.51-1.705 MHz are the same as the existing limits, except for the method of measurement, we believe that the use of CISPR quasi-peak measurement techniques is needed to provide additional protection from interference to the AM broadcast service. Second, the general limits above 1.705 MHz are new standards. Thus, we believe that the additional protection from interference to the authorized services afforded by the use of CISPR quasi-peak measurement techniques is appropriate for these bands.

28. Some manufacturers of intentional radiators employing "leaky" coaxial cables as antennas are under the impression that such systems are subject to Section 15.7 of the Commission's current rules. This is not the case. Rather, these devices are subject to the provisions of Section 15.111 and also the equipment authorization requirements provided in the existing Section 15.131. As stated in OST Bulletin No. 63, "[a] communication system where a wire is routed through [an] area and connected to a transmitter for the express purpose of

radiating a signal into space is not considered to be a carrier current system and Section 15.7 does not apply. Such a system is considered to be a low power communication device and the wire is treated as an antenna." [11] We concur with this interpretation of the rules. We also are rejecting the request of these parties for an increase in the permissible power level for these devices to the same level authorized for Travelers' Information Stations. Operation of a Travelers' Information Station is conducted under a license issued by this Commission. The licensees in this service are known to the Commission and can easily be identified should interference occur. Moreover, the licensing process requires coordination with other users of the spectrum to avoid potential interference problems. To permit leaky cable transmission systems operating without a license under Part 15 to transmit at higher power levels would undermine our system for avoiding interference to licensed stations.

29. Finally, we agree with the comment from NAB that it is necessary to subject spurious emissions from intentional radiators to more stringent control than our proposal in the *Notice*. We are concerned that our proposal to limit spurious emissions to the same levels provided in the general emissions limits would serve to permit excessive levels of unnecessary emissions that would further increase the level of background RF noise. We note that spurious emissions do not contribute to the transmission of information between RF devices. Accordingly, the new rules will preserve the policy in the current rules that restricts spurious emissions from Part 15 devices to a level not in excess of the device's fundamental emissions.

2. Exceptions to the General Limits

30. The present rules permit Part 15 intentional radiators to operate in a number of frequency bands at field strength levels greater than the general emission limits. To the greatest extent possible, we proposed to retain these exceptions and, at the same time, to delete certain operating restrictions. For example, we proposed to remove the bandwidth and channelization requirements in the 27 MHz and 49 MHz bands. Further, we proposed to delete the requirement to use a microphone as an input source for transmitters in the 88-108 MHz band. We are retaining provisions for certain specific devices that operate at higher field strengths but are less likely to cause interference due to limited numbers of units in operation and the nature of the areas in which they are operated. [12] The following paragraphs contain discussions of the comments received regarding existing Part 15 operations.

31. *Operation in the Bands 160 - 190 kHz and 510 - 1705 kHz.* The *Notice* did not propose any changes to the existing operations permitted in the frequency bands 160-190 kHz and 510-1705 kHz. Several comments were received with regard to operation in these bands. ANARC and others request that the Commission permit increased power, e.g., up to 20 watts, larger antennas, and an expansion of the permitted band of operation to 130-190 kHz due to interference being received from the Ground Wave Emergency Network (GWEN). [13] Several comments request that the permitted power level be increased up to one watt in the band 510-1705 kHz along with an increase in the permitted maximum length of the antenna. They allege that permitting an increase in power and length of the antenna would not result in interference to the authorized services, particularly AM broadcast stations, since AM stations and other users transmit at much higher power levels than permitted under Part 15.

32. While the requested increases in power and antenna size would make Part 15 operations more reliable, such increases could result in increased interference to the authorized services such as AM broadcasting. Interference is not dependent solely on the transmitted power levels. Rather, interference is based on the field strength levels of the received signals, both desired and undesired. The propagation characteristics of these bands could result in the reception of high field strength levels from the Part 15 devices, creating interference to the authorized radio services. Further, an expansion of the permitted frequency band 160-190 kHz could cause interference to the International Fixed Public Radiocommunication Services operating under Part 23 of our rules. Because of the possibility of this increased potential for interference, the requested changes are not being adopted.

33. *Operation in the Bands 27 MHz and 49 MHz.* The *Notice* proposed to expand the frequency band at 27 MHz to include 26.96-27.28 MHz, to delete the prohibition against voice or continuous wave (CW) transmissions in the 27 MHz band, and to delete the present channelization and bandwidth limitations in both the 27 MHz and the 49 MHz bands. [14] The permitted field strength levels would remain as specified in the current rules, i.e., 10,000 uV/m at 3 meters, except that they would be based on CISPR quasi-peak measurements.

34. GM, in its comments, requests that a 6 dB increase be provided for pulsed systems to compensate for the change from average to CISPR quasi-peak measurement techniques. We agree with GM that the emission limits for these bands should be changed to accommodate existing systems. Accordingly, we are retaining average measurements for radiated emissions for operations in the 27 MHz and 49 MHz bands, as well as other bands in which operation currently is permitted under Part 15. However, in order to ensure that excessive peak levels from pulse modulated systems do not cause interference to authorized operations, we are adopting concurrently a limit on the peak level of radiated emissions that is 20 dB above the maximum permitted average limits.

35. *Perimeter Protection Systems.* Under the current rules, perimeter protection systems operate within the frequency bands 40.66-40.70 MHz, 54-72 MHz and 76-88 MHz. The maximum permitted field strengths of the radiated emissions are specified at 30 meters. In the *Notice*, the Commission proposed to delete the specific provisions for perimeter protection systems in Section 15.310 of the rules. [15] These provisions were to be replaced by a new section that would limit emissions in the frequency band 40.66-40.70 MHz to 1000 uV/m at 3 meters, e.g., 20 dB higher than the general emission limit for other frequencies in the 30-88 MHz band, and provide technical standards for frequency control for devices operating in this band. The *Notice* also proposed to retain the existing emission limits for the 54-72 MHz and 76-88 MHz bands. These limits are the same as the new general limit; however, the new limit would be specified at 3 meters whereas the existing limit is specified at 30 meters. We also proposed to delete the requirement that spurious emissions from these devices be attenuated below the fundamental emission.

36. Comments from the manufacturers of perimeter protection systems object to our proposed application of CISPR quasi-peak measurements; the distance at which the measurements would be made, due to near field effects; and, the requirement to use buried cables for perimeter protection systems. GM, Senstar and Stellar request an increase in the permitted field strength limits to compensate for the change to CISPR quasi-peak measurements.

37. In response to the comments, we note that the proposed new limit in the band 40.66-40.70 MHz represents a 6 dB increase above the level currently permitted for perimeter protection systems. This 6 dB increase will offset the change from CISPR quasi-peak measurements and guard against interference to authorized services. None of the comments requesting a higher field strength limit in the 40.66-40.70 MHz band to offset the change to CISPR quasi-peak measurements provided information to demonstrate than an increase in the emission limit above that proposed would not cause interference to the authorized services. The application of CISPR quasi-peak measurements will prevent manufacturers from shortening the duty cycle of the signal to increase the power of the transmitter while staying within the field strength limits. Such additional interference protection is needed as this band will no longer be limited to perimeter protection systems. Rather, this band now will be available for any type of operation. Thus, we are denying the requests to further increase the emission limit in the range 40.66-40.70 MHz to compensate for the change to CISPR quasi-peak measurements. We are retaining the existing emission limit on the fundamental frequency for perimeter protection systems in the frequency bands 54-72 MHz and 76-88 MHz, as proposed. We conclude that the general emission limit for the 30-88 MHz band is also appropriate for operation in these bands. CISPR quasi-peak measurements are currently required for these devices.

38. As proposed, the new rules standardize these field strength limits at a distance of 3 meters and permit measurement at a greater distance than this in order to avoid near field measurement problems. Further, the current requirement for perimeter protection systems to use buried cables has been deleted from the regulations. As long as the emission limits are not exceeded, it does not matter whether the radiating sources employed by perimeter protection systems are buried or are above ground. However, in order to limit the potential for interference to the reception of television broadcasts, we are retaining the existing regulations concerning the frequency bands of operation and the requirement that perimeter protection systems be used in industrial, business and commercial applications.

39. As a separate issue dealing not with the standards but with the method of measurement, CDC, in its reply comments, requests that the Commission permit the manufacturers of perimeter protection systems to perform initial measurements at the antenna terminals since the signal levels are so low that they are below the background noise limit. While the radiated field strength of the fundamental emission would still be measured, only those spurious emissions that exceed a certain value, based on measurements taken at the antenna terminals, would be required to be measured at the installation site, i.e., field strength measurements would be determined only for the fundamental emission and the spurious emissions so indicated. In this manner, the number of spurious emissions for which the field strengths would be measured can be reduced along with a corresponding reduction in testing time and expense. In considering CDC's suggestion, we note that the rules, as proposed, will permit the use of alternative measurement techniques. While CDC's proposed measurement technique may be useful in many applications, we do not find it desirable to incorporate this approach into the rules as a general measurement policy. The acceptability of this and other alternative procedures will continue to be judged on a case-by-case basis.

40. *Control and Security Alarm Devices and Other Periodic Operation.* In the *Notice*, we proposed, in general, to retain the current regulations regarding control and security alarm devices and other periodic transmitters. The major proposed change was to limit peak emissions to no more than 20 dB above the permitted average emission limits. In addition, emissions appearing within the restricted frequency bands would be measured using the CISPR quasi-peak detector function, as specified for other Part 15 devices. All other radiated emissions limits would continue to be measured using the average detector function. [16]

41. The comments request that the limits on peak emissions, spurious emissions and fundamental emissions in the ISM bands be relaxed. Genie and other manufacturers of garage door openers object to limiting peak emissions to no more than 20 dB above the average limits. Genie also requests that spurious emissions be required to be attenuated no more than 10 dB below the level of the fundamental emission. CORF, on the other hand, requests that the limits on spurious emissions be reduced to the general emission limits due to the proliferation of control and security alarm devices. For example, this could reduce the limit from a maximum of 1.250 uV/m to 500 uV/m in the bands above 960 MHz. NAB requests that spurious emissions that fall within the FM radio band, 88-108 MHz, be reduced to 100 uV/m at 3 meters. Similarly, they request that emissions that fall within the band 130-174 MHz be reduced to 100-375 uV/m, based on a linear interpolation, at 3 meters. NAB states that these limits will provide greater protection to FM and TV.

42. We continue to believe that a limit on peak emissions is necessary for control and security alarm devices and other periodic systems. The transmission of excessive peak levels of emissions increases the probability that interference will be caused to the authorized services. Further, recent advances in technology permit the inexpensive application of modulation techniques with very high peak to average ratios. Such emissions could likely be a potential for harmful interference. To avoid interference that could result from use of this technology, we are imposing the same limit on peak emissions of no more than 20 dB greater than the specified limit on average emissions on control and security alarm devices and other periodic operations that we are applying to all other Part 15 devices for which an average emission limit is specified. This limit should accommodate the vast majority of devices being manufactured and should ensure that the potential for interference to the authorized services is minimized.

43. We find that additional attenuation requirements for spurious emissions are not required to control interference potential from control and security alarm devices and other periodic transmitters. The limits on spurious

emissions are the same as required under the present regulations. The comments provided no information to persuade us that additional attenuation is needed. Therefore, we are retaining the existing regulations for spurious emissions from control and security alarm devices and other periodic transmitters; provided, however, that spurious emissions need not be attenuated below the general emission limits.

44. *Cordless Telephones and Other 49 MHz Transmitters.* The *Notice* proposed that field strength limits for cordless telephones be based on CISPR quasi-peak measurements. The *Notice* also proposed to tighten the limit on spurious emissions for cordless telephones and proposed to eliminate the existing requirement that cordless telephones be self-contained. This latter provision would allow the use of external inputs for additional features such as computer modem connections. Finally, for devices other than cordless telephones operating in the 49 MHz band, the *Notice* proposed to delete the channelization and bandwidth limits.

45. The comments generally oppose the proposal to tighten the spurious emission requirements for cordless phones. A number of the comments point out that such a change would significantly increase the cost and complexity of cordless phones and are unnecessary. AT&T, in its comments, suggests that the attenuation of spurious emissions be based on the maximum permitted field strength instead of the actual field strength, resulting in a limit of 500 uV/m at 3 meters. Most commenters support our proposal to delete the requirement that cordless telephones be self-contained. AT&T and OCI object to allowing the attachment of modems to cordless telephones. They state that allowing modems to be connected could encourage long transmission times which could disrupt service for other users of cordless telephones. Other commenters object to the proposal for general operation within the frequency band 49.82-49.90 MHz. They indicate that this would increase the possibility of interference to cordless telephones. AT&T states that a single 49 MHz transmitter could cause interference to multiple cordless telephone channels. [17] EIA/PCS and AT&T also request that "baby monitors" operating in this band be required to be voice activated or to incorporate timers to reduce the interference potential to cordless telephones. These "baby monitors" are wireless intercom systems that are marketed primarily for the purpose of monitoring a nursery.

46. We agree with the comments that the proposed requirements for attenuation of spurious emissions from cordless telephones would be overly burdensome. We do not agree, however, that the attenuation of spurious emissions should be based on the maximum permitted field strength. First, the 26 dB attenuation points define a close approximation to the occupied bandwidth, and the maximum occupied bandwidth for cordless telephones remains at 20 kHz. Thus, the 26 dB attenuation points must still be met for emissions removed more than 10 kHz from the carrier to show compliance with the bandwidth limits. Second, as indicated earlier, spurious emissions do not contribute anything to the transmission of information. Spurious emissions serve only to pollute the spectrum, reducing its availability to other users. No indication has been provided that the manufacturers have any difficulty complying with the existing limit or that this limit could be relaxed without increasing the potential for interference. Accordingly, the proposed changes will not be adopted and we will retain the spurious emission attenuation requirements specified in the current regulations, e.g., emissions removed from the center of the transmission by 10-20 kHz must be attenuated by 26 dB. Further, since transmitters, other than cordless telephones, operating in the 49.82-49.90 MHz band are similar to the transmitters used as cordless telephones, we are amending the regulations to specify the same limit on unwanted emissions as applied to cordless telephones. We are retaining the existing specification that radiated emissions from cordless telephones and other 49 MHz transmitters be based on measurements with an average detector and are adopting a corresponding limit on peak emissions that is 20 dB above the maximum permitted average limit. Since cordless telephones currently use frequency modulation and it does not appear that any other 49 MHz transmitters exceed the current emission limit by more than 20 dB on peak emissions, this should not result in any changes being required for present equipment. Since the changes in the rules applied to cordless telephones and other 49 MHz transmitters are not as extensive as those proposed in the *Notice*, the long transition period proposed in the *Notice* is not needed.

47. As to the objections to allowing the connection of modems to cordless telephones and the operation of other Part 15 devices such as "baby monitors" on the 49 MHz band, we again point out that no protection from receiving interference is provided to Part 15 devices, regardless of the source of interference. Thus, there is no basis for prohibiting the connection of modems to cordless telephones or for restricting the operation of other Part 15 devices on the 49 MHz band. These changes to the regulations will be adopted as proposed. We are cognizant however of the large number of people who have come to depend on cordless telephones for many communications needs. Thus, we intend to consider addressing a possible reduction in the permitted field strength limits for operation of devices other than cordless telephones within the frequency band 49.82-49.90 MHz in a subsequent Notice of Proposed Rule Making.

48. *Operation in the FM Broadcast Band.* The *Notice* proposed to delete the requirement to use a microphone as an input source for intentional radiators operating in the FM broadcast band, 88-108 MHz, and to specify the field strength limits for such devices at a distance of 3 meters. NAB requests that the FM band be designated as a restricted band and that Part 15 devices not be permitted to operate in the band. Alternatively, NAB requests that the maximum permitted field strength be reduced to 150 uV/m at 3 meters. Further, it states that it does not agree with the proposed limit on spurious emissions of 150 uV/m at 3 meters. Radio Listed Services requests that the emission limits for Part 15 devices operating in the FM broadcast band be increased to 400 uV/m at 15 meters to provide an operating range of about 800 feet.

49. We disagree with NAB's position that Part 15 devices should be restricted from operation in the FM radio band or subject to restrictions on radiated emissions more stringent that those currently in place. Indeed, transmissions within the FM broadcast band are not as susceptible to receiving interference as transmissions in the AM and TV broadcast bands. With a frequency modulated signal, the receiver will tend to pick up only the strongest signal. Due to this "capture effect", an FM broadcast receiver requires that the desired signal be only about 2 dB above the level of the undesired signal on the same frequency in

order to be received without interference. Thus, a Part 15 intentional radiator could transmit, in most circumstances, on the same frequency as that used by a local broadcast station without mutual interference being caused, provided the power from the Part 15 transmitter is kept low. A Part 15 transmitter operated in this manner would be severely limited in range, and it is only within that range that interference to the reception of the FM broadcast station would be encountered. If the power level for Part 15 transmitters in the FM band were allowed to increase, as requested by Radio Listed Services, the range at which interference to the FM broadcast stations could occur would also increase. For these reasons, we will not accede to requests by the commenters that the emission limits for operation in the FM broadcast band be changed or that the FM broadcast band be restricted. Thus, the new rules will not include special provisions for Part 15 devices operating on frequencies in the 88-108 MHz band. However, we are retaining the current Section 15.175 of the regulations to permit the continued operation in this band by educational institutions of custom built telemetry devices used for experimentation without the need to obtain a grant of equipment authorization. These existing provisions were inadvertently omitted from the *Notice*

50. *Operation in the TV Bands.* We are satisfied that our proposed general emission limits are adequate to prevent harmful interference to TV receivers from Part 15 transmitters operating in the television broadcast bands. Of great concern, however, is the more intensive use of these bands that may occur with the introduction of various forms of High Definition Television (HDTV). We note that the comments in this proceeding recognize the potential impact of Part 15 devices on the development of HDTV. The Commission has already taken steps to protect the television bands by delaying further consideration of its proposals for land mobile licensees to share spectrum in the UHF band pending the outcome of the inquiry into HDTV. We believe that, here too, prudence dictates a conservative approach. For this reason, at the present time, we are not allowing intentional radiators operated under the general limits to have their fundamental emissions located in the frequency bands allocated to television broadcast stations.

51. At the same time, we see no necessity to prohibit the continued operation of those devices already placing emissions in the television bands. Periodic transmitters have been permitted in these bands for years. They operate intermittently and have not been a source of interference. It would not serve the public interest to remove them now. Similarly, we permit the operation of perimeter protection systems for commercial premises in the television bands. We anticipate little difficulty from such devices and will permit them to remain. Unintentional radiators, e.g., receivers, have long been permitted to radiate in the television bands, at considerably higher levels than the general limits we are adopting today. As explained in paragraphs 79-82, these devices will be expected to decrease the level of their emissions over time. Spurious emissions from intentional radiators will be permitted in the television bands at the general limits. The level of spurious emissions and emissions from unintentional radiators can generally be expected to be much lower than the fundamental signals of transmitters. Thus, their interference potential is not as great.

52. *Field Disturbance Sensors above 900 MHz.* By proposing to require CISPR quasi-peak measurements below 1000 MHz and peak measurements above 1000 MHz, the *Notice* effectively proposed to change the emission standards applicable to field disturbance sensors. In comments addressing this proposal, Allen-Bradley requests that field disturbance sensors continue to be subject to average emission measurements for all frequencies. Allen-Bradley also requests that an allowance for peak emissions up to 20 dB above the average limits be permitted to accommodate field disturbance sensors that use pulsed emissions. Gillespie, Prudhon & Associates, Inc. and Wilkens Engineering request increased power levels for field disturbance sensors, up to as high as one watt. As discussed in paragraph 94, we concur with the comments from Allen-Bradley and are retaining the specification of average emission limits with a corresponding limit on peak emissions equal to 20 dB above the maximum permitted average limits. The combination of average and peak emission limits is sufficient to control potential interference. We are not adopting the proposal from Gillespie, Prudhon & Associates, Inc. and Wilkens Engineering to permit field disturbance sensors to operate at higher power levels. Their comments did not provide justification for this power level and did not provide any indication that such higher power levels would not result in interference to other radio services.

53. *Cable Locating Equipment.* Cable locating equipment[18] currently is regulated under the provisions of Section 15.7 of the rules. In view of the proposed deletion of Section 15.7, the regulations proposed in the *Notice* would have required cable locating equipment to meet emission standards similar to those in the current Section 15.111, along with additional requirements such as certification of the transmitter and operation with an antenna of the type provided by the grantee. A number of comments suggest changes to these standards. The Fisher Research Laboratory suggests that we define cable locating equipment as test equipment, exempt from the regulations; define the pipes and cables as not constituting antennas; provide alternative specifications such as a maximum input power of one watt with the frequency band restricted to 70-90 kHz and 160-190 kHz; or, require testing at three typical installations for certification. Dynatel requests the Commission to place cable locating equipment under the verification procedure and to implement standards based on power output, limiting output power to no more than one watt over the frequency band 45-490 kHz and ten watts over the frequency band 9-45 kHz. Dynatel states that ten watts at the lower frequency range is needed to permit the location of long fiber optic cables. Metrotech filed similar comments but requests that an output power of 50 watts be permitted to allow the location of 40 mile long fiber optic cables buried five feet deep.

54. Cable locating systems do not appear to have ever been a source of radio frequency interference in the many years that they have been operated. These devices are used intermittently and for relatively short periods of time. Thus, the Commission agrees with Dynatel that these devices should be authorized under our verification procedure. Further, because the electrical properties of the pipe or cable that is used as the "antenna" cannot be known in advance of each use of the detection equipment, the level of the radiated field strength will vary with each use of the equipment. For this reason, we agree

with the comments that a limit on maximum output power over a specified frequency range is a more appropriate standard for this type of equipment. Accordingly, we are adopting a power output limit of 10 watts over the frequency range 9-45 kHz and one watt over the frequency range 45-490 kHz, as proposed by Dynatel. In addition, we are requiring cable locating equipment to comply with the AC power line conducted emission limits for those devices that connect to the AC power line.

3. New Bands

55. In the *Notice*, we proposed to authorize the operation of Part 15 devices on a number of new frequency bands, namely the frequency bands allocated to industrial, scientific and medical (ISM) devices, [19] at higher emission levels. These frequency bands are: 13.553-13.567 MHz, 26.96-27.28 MHz, 40.66-40.70 MHz, 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz. As under the general limits, operation within these bands would not entail restrictions on channelization, bandwidth, type of modulation, or type of operation. The Commission stated that establishment of these new bands would enable manufacturers to introduce new equipment providing major benefits to consumers and to take advantage of new technologies without the need for Commission rule making.

56. A number of commenters object to permitting the operation of Part 15 devices on ISM frequency bands. FAA indicates that allowing operation of Part 15 devices on the ISM bands is a disservice to the public, as there are many Government and commercial operations with high powered transmissions within and adjacent to these bands. FAA states that ISM bands allocated to the government should not become locations for concentrations of Part 15 devices. Other comments, such as those of Allen-Bradley and GE, express the belief that such a large number of Part 15 users might operate on the ISM bands that the Commission might decide to implement restrictions on authorized ISM users to protect the operators of Part 15 devices from interference. The League and individual ARS operators object to allowing Part 15 devices within ISM frequency bands allocated to the Amateur Radio Service, citing the possibility of interference both to and from Part 15 operation. [20]

57. GM, on the other hand, supports the use of the proposed new bands by Part 15 devices. GM states that the FCC should leave the decision of whether any high power transmission, be it from ISM equipment, U. S. Government systems, or amateur radio, will cause interference to a Part 15 device to the manufacturer and its engineering staff. SEIA, in its comments, states that Part 18 devices are allowed unlimited radiation in the ISM bands, and, since both Part 18 and Part 15 devices are regulated to protect authorized services, these devices should be treated similarly with respect to emission limits. Other comments from the manufacturers of control and security alarm devices request that a new classification be established under Part 15 to permit higher emissions levels for Part 15 devices located in industrial, commercial or business establishments. They indicate such an approach would be similar to the differentiation between Class A and Class B computers. [21] In support of this approach they indicate that spurious emissions from transmitters in the authorized radio services are now permitted at higher levels than emissions from Part 15 devices. NTIA responds to these comments by stating that the number of transmitters in the authorized services is a small fraction of the number of Part 15 devices. NTIA also states that interference from a licensed transmitter generally can more easily be traced and eliminated than interference from Part 15 devices because the frequency and location of a licensed station are ordinarily known, whereas it is more difficult and expensive to locate and eliminate a multitude of Part 15 devices.

58. We continue to believe that there are many possible applications for Part 15 devices within these ISM bands. The fact that these frequencies may not be suitable for certain consumer devices is not a reason to prohibit Part 15 operation. We note that presently there are many Part 15 applications that are tolerant of interference or isolated from potential interference sources. We believe that manufacturers, if given the opportunity to use the ISM frequencies, will develop many new and practical uses of Part 15 devices. Thus, we will not restrict the use of these bands by Part 15 equipment because of the possibility of interference to that equipment by equipment operating under other rule parts.

59. We also believe that the probability that Part 15 operations will cause interference to authorized services in the ISM bands above 900 MHz is low. First, the rate at which radiated emissions are attenuated, especially from intervening objects, is quite high in these bands. Second, the potential for the Part 15 device to receive interference is much greater than the potential for the Part 15 device to cause interference. Because of the possible applications which exist for viable uses of these bands, the proposed rules are being implemented.

60. As for requests from SEIA that Part 15 devices be permitted to operate with additional field strength in the bands allocated for ISM operation under Part 18, we note that Part 18 is an authorized service. Part 18 devices are permitted to radiate without a limit on the level of radiation only in those frequency bands in which ISM operation is the primary authorized service. Part 18 devices operated in this manner are not required to provide any protection from interference to other authorized services located within the ISM bands. For this reason and the potential for such Part 15 devices to cause interference to authorized radio services located in the ISM bands, we are denying SEIA's request. Further, we find that the request by the manufacturers of control and security alarm devices to establish a special classification under the Part 15 rules permitting higher emissions is beyond the scope of this proceeding. We also note that, in many instances, the need for higher emissions levels can be met through operation under one of the authorized services. In view of the absence of interference protection for Part 15 devices, it would appear that, wherever possible, operation under the authorized services would be preferable to operation under the Part 15 rules. We therefore encourage parties with need to operate RF equipment at higher emissions levels than those permitted herein to seek authorization under other provisions of our rules.

4. Restricted Bands

61. *Frequency Bands Designated as Restricted.* In the *Notice*, we proposed to prohibit the operation of Part 15 intentional radiators on the frequencies used by certain sensitive radio services, i.e., frequency bands allocated for services involving safety-of-life or for services that utilize very low received signal levels. [22] These proposed restricted bands were coordinated with the NTIA prior to

the release of the *Notice*. Only spurious emissions at or below the general field strength limits would be permitted within these bands. We also questioned the need to establish or maintain restricted bands for transmitters operated below 70 MHz. We indicated that it appeared that the proposed general limits below 70 MHz would be sufficiently low to provide adequate interference protection for sensitive services without the need for restricted bands.

62. A number of commenting parties request that other frequency bands be specified as restricted bands in addition to those proposed in the *Notice*. USCG, NTIA, and several others propose that the Loran C radionavigation band, 90-110 kHz, be designated as restricted. NTIA also requests that these bands be restricted: 1) 162.0125-164.43 MHz, 164.72-166.73 MHz, and 167.72-173.2 MHz, for wind shear detection around airports and to warn pilots when emergency action is needed, for protection of national and visiting foreign dignitaries, and for tracking of wildlife; 2) 821-824 MHz and 866-869 MHz, for nationwide common spectrum for Federal, state and local disaster relief teams, hospitals, emergency relief groups, etc.; and, 3) 1718.8-1722.2 MHz, for radio astronomy. AFTRCC and Rockwell request that the aeronautical flight test voice communications frequencies, 2.8-22 MHz and 123.2-123.8 MHz, and the aeronautical flight test telemetry frequencies, 1435-1530 MHz, be restricted. NAB asks that the commercial broadcast radio and television bands, 530-1610 kHz, 54-72 MHz, 76-108 MHz, 174-216 MHz and 470-806 MHz, and part of the television broadcast auxiliary bands, 2450-2483.5 MHz, be restricted. EIA/LMRS asks that the land mobile bands be restricted. The Pacific Companies [23] ask that the common carrier microwave bands be restricted. The League and many individual amateur operators ask that the bands allocated to the Amateur Radio Service be restricted. A number of individual comments request that the bands allocated for International Broadcast (shortwave) stations be restricted. The FAA requests that most other frequency bands allocated for use by the U. S. Government, 0.19-0.435 MHz, 0.51-0.535 MHz, 118-137 MHz, 162-174 MHz, 225-400 MHz, 406-420 MHz, 1215-1400 MHz, 1710-1850 MHz, 2700-3000 MHz, 7125-8500 MHz, 14.5-15.35 GHz and 21.2-23.6 GHz, be restricted.

63. Several parties, particularly manufacturers of control and security alarm devices, object to the expansion of the restricted bands beyond those specified in the current regulations. For example, SEIA objects to the concept that governmental users have a right to determine what levels of emissions will be tolerated and in what frequency bands. SEIA further states that the Interdepartment Radio Advisory Committee (IRAC) under NTIA will not provide details about actual users' activities in these bands, making it impossible for SEIA or others to challenge the assumption that protection is needed. ITI states that because the *Notice* did not examine the actual usage in these bands, no rationale exists for the FCC to make a determination to restrict them. Transcience alleges that frequencies are made exclusive to the U. S. Government by a process not based on interference but merely on potential interference, no matter how unlikely the possibility that actual interference will occur. DORCMA contends that proponents of additional restricted bands generally offer no support for their request, other than to assert the importance of their operations in those bands. DORCMA states that, for example, NTIA does not supply any data or arguments with respect to the susceptibility or likelihood of interference to the 821-824 MHz and 866-869 MHz bands. Linear requests that all existing and proposed restricted bands be made available for use by Part 15 devices absent a factual supported showing that interference will be caused by such devices. Linear further objects to protecting passive uses of the spectrum, such as radio astronomy, and adds that spurious emissions from the authorized radio services, such as Part 90, are permitted at higher levels than that produced by Part 15 devices, rendering arguments in favor of retaining the proposed restricted bands arbitrary and capricious. [24]

64. Comments from some manufacturers of Part 15 devices request that operation of other Part 15 devices be prohibited in certain frequency bands. Micrilor and OCI ask that the 902-928 MHz band be restricted to spread spectrum operations to provide interference protection to their planned spread spectrum system. Sensormatic wants the 902-928 MHz and 2400-2500 MHz band restricted to permit only field disturbance sensors in order to provide interference protection to their Part 15 anti-shoplifting sensor tags. Sensormatic states that we should restrict other devices from these bands, including spread spectrum devices, in order to protect Part 15 operations that have become established under the current regulations. RADAR Inc. requests that the bands used by police radar detectors, 10.50-10.55 GHz and 24.05-24.25 GHz, be restricted.

65. NTIA and a number of others support the application of restricted bands below 70 MHz, stating that such restrictions are needed to prevent interference to the authorized services operating in those bands. A number of comments request an exemption from the proposed standard that only spurious emissions would be permitted in the restricted bands. Schlage requests a clarification that swept frequency field disturbance sensors would not be foreclosed from operating in certain restricted bands as their equipment currently operates in the proposed restricted bands between 2 and 30 MHz without interference. Checkpoint, which has a swept frequency field disturbance sensor operating around 8.2 MHz, makes a similar request. Dynatel indicates that there are a large number of passive electronic markers used by telephone companies that should be exempted from the restricted bands. These markers are used to indicate location points for underground cables that must eventually be relocated. It states that these markers, when interrogated by a transmitter, respond with a signal at 101.4 kHz. The interrogating transmitter produces a radiated signal level of about 5 uV/m at 75 meters which is less than that stated by USCG as needed to protect Loran C operation at 100 kHz.

66. We continue to believe that only those frequency bands allocated for services involving safety-of-life or for services that are required by the nature of their operation to use signals received at very low received levels should be designated as restricted bands. We, therefore, are designating as restricted from operation by Part 15 devices those bands proposed to be restricted in the *Notice* and some of the bands requested to be designated as restricted by the commenting parties. [25] The additional bands are:

(1) 90-110 kHz: Loran C radionavigation systems used for radionavigation by aircraft, ships, and, in the near future, land vehicles;

(2) 123.2-123.8 MHz: aeronautical flight test voice communications; [26]

(3) 162.0125-164.43 MHz, 164.72-166.73 MHz, and 167.72-173.2 MHz: wind shear detection around airports and to warn pilots when emergency action is needed, protection of national and visiting foreign dignitaries, and tracking of wildlife;

(4) 1435-1530 MHz and 2310-2390 MHz: aeronautical flight test telemetry; and,

(5) 1718.8-1722.2 MHz: radio astronomy.

We believe that it is not necessary to include the broadcast services, the amateur radio service and other operations raised by the commenters in the list of restricted bands. The emission limits being adopted in this proceeding should be adequate to protect these operations from interference. Further, since Part 15 devices must operate without protection from interference, we will not restrict bands used under Part 15 to operation by specific devices except where such a restriction is needed to reduce the potential for interference to the authorized services.

67. We conclude that the restricted bands below 70 MHz should be implemented to provide additional interference protection to the designated authorized radio services. Nevertheless, we will permit certain radio frequency operations within these bands at frequencies below 70 MHz. These operations are swept frequency field disturbance sensors, transmitters used by telephone companies to detect electronic markers, and cable locating equipment.

68. There are several swept frequency field disturbance sensor systems currently in operation on frequencies in the band 1.705-30 MHz. These systems have been operated without any known instances of interference to authorized radio services. We believe that these existing operations can be allowed to continue since they place signals in the restricted bands for only short periods of time. We note that the next highest restricted frequency band above 30 MHz is 37.5-38.25 MHz. Accordingly, we will permit the continued operation of swept frequency field disturbance sensors in the band 1.705-37 MHz; provided, 1) the frequency sweep must not stop with the fundamental emission located within a restricted band; and, 2) the fundamental emission must be located outside of the restricted bands more than 99 percent of the time that the device is actively transmitting.

69. We recognize that telephone companies presently operate transmitters at 101.4 kHz to locate electronic markers used to determine the location of buried cable. The 90 to 110 kHz band is used for Loran C operations and is being designated as a restricted band. Nevertheless, we are exempting these transmitters from the requirement that only spurious emissions are permitted in the restricted bands. These devices are used only intermittently by trained operators. Thus, the potential for interference being caused to Loran C operations is minimal. For similar reasons, we also are exempting cable locating equipment operated on frequencies below 490 kHz. Such equipment has never been found to be a source of interference.

70. *Limits for Spurious Emissions in the Restricted Bands.* The *Notice* proposed to limit spurious emissions in the restricted bands to the same levels as the general field strength limits. A number of comments suggest different spurious emission limits. NTIA requests that the proposed limits in the restricted bands below 960 MHz be reduced as follows:

Frequency Band (MHz)	Proposed Limit (uV/m at 3m)	NTIA Limit (uV/m at 3m)
30 - 88	100	15
88 - 216	150	27
216 - 960	200	67
Above 960	500	500

NTIA states that its proposed emission limits are based on calculations of the theoretical noise level of "typical" radio receivers. [27] It states that these more restrictive limits are necessary to provide adequate protection to receivers against the cumulative effects of multiple Part 15 devices. CORF requests that the limits for spurious emissions in the restricted bands be based on the threshold data contained in CCIR (International Radio Consultative Committee) Report 224-5. [28] CORF further requests that we require spurious emissions in the restricted bands to be attenuated at least 12 dB below the general limits or, as an alternative, that the limits on emissions in certain passive radio astronomy bands [29] be specified as 125 uV/m or 200 uV/m at 3 meters. CORF states that if the emission limits are reduced by 6 to 12 dB below the levels proposed in the *Notice*, it would not object to the use of average limits, as it uses average detection techniques for its receivers. CORF and others also request that these restricted bands and their associated emission limits apply to devices operated under Part 18 of our rules. [30]

71. Manufacturers of control and security alarm devices request that the limits for spurious emissions within the restricted frequency bands be increased. Chamberlain and others support the proposed spurious emission limits but argue that these limits should be based on average measurements. Genie requests that the limit above 216 MHz be increased to 1000 uV/m at 3 meters. Stanley wants the emission limit above 1000 MHz increased to 1000 uV/m at 3 meters, as measured by an average detector. DORCMA requests that average measurements be retained for emission limits in the restricted bands. DORCMA states that, by converting to CISPR quasi-peak measurements, the permitted emission limits are reduced by 4 to 13 dB below what would be allowed if average detectors were permitted. It further argues that if measurements were made with a peak detector, as proposed in the *Notice* for frequencies above 1000 MHz, the level of emissions would be reduced by 5 to 15 dB below the level of emissions that would be permitted if measurements were made by an average detector.

72. We note that NTIA's calculations represent the theoretical noise level generated within a receiver under ideal conditions. They do not take into consideration existing background noise levels and other noise sources which must be exceeded in order for a signal to be detected. NTIA's calculations appear to represent a worst case situation. NTIA also has not supplied any information detailing the cumulative effect referenced in their comments. Further, we do not believe that spurious emissions at the limits proposed in the *Notice* would cause interference problems to the authorized services. As stated by GM, there is no evidence that licensed communication services have been significantly impacted by the widespread proliferation of computing devices operating under the proposed limits. For these reasons, we are not adopting NTIA's proposal for tighter emission limits for the restricted bands.

73. The arguments presented by CORF are similar to those contained in their comments to Docket No. 86-422. CORF and the National Radio Astronomy Observatory jointly filed a Petition for Reconsideration of our *Report and Order* in Docket No. 86-422, requesting that the spurious emission limits in the restricted bands between 1000-5000 MHz that are allocated for radio astronomy be reduced from 500 uV/m to 125 uV/m. This matter was addressed by the Commission and resolved in an order adopted February 10, 1989. [31] In accordance with that order, we are retaining the emission limit of 500 uV/m at 3 meters, based on an average measurement, for spurious emissions from Part 15 devices that are located within the restricted bands above 1000 MHz. However, we wish to emphasize that we expect the actions being taken in this Order, making all Part 15 intentional radiators subject to the restricted bands and establishing emission limits above 1000 MHz, to reduce the level of emissions which appear in the radio astronomy bands from all Part 15 devices.

74. As stated above, we are retaining the emission limit established in Docket No. 86-422 for radio frequency signals appearing in the restricted frequency bands above 1000 MHz. Arguments from the manufacturers of control and security alarm devices for increases in the permissible level of emissions in this area of the spectrum were addressed in that earlier proceeding. Since no additional information was filed in conjunction with the *Notice* in this proceeding, we are not persuaded to increase that emission limit. In regard to the emission limits in the restricted bands below 1000 MHz, the levels proposed in the *Notice* are 16.5 to 30.5 dB higher than the 15 uV/m at 3 meters emission limit currently specified for control and security alarm devices. As noted by DORCMA, the change from average measurements to CISPR quasi-peak measurements results in a reduction in the permitted signal levels by 4 to 13 dB. Thus, the emission limits proposed in the *Notice* are effectively 3.5 to 26.5 dB higher than those specified under the current regulations. Therefore, we do not expect compliance with the spurious emission limits for the restricted bands below 1000 MHz to present design problems for the manufacturers of control and security alarm devices. We believe that the limits proposed in the *Notice* are sufficient to minimize the probability that interference would be caused to authorized radio services in the restricted bands. For that reason, we are denying the requests from the manufacturers of control and security alarm devices to change these limits.

5. Radiated Emission Limits for Unintentional Radiators

75. *Emission Limits*. In the *Notice*, we proposed to apply the same general emission limits we proposed for intentional radiators to unintentional radiators. Comments were requested as to whether it would be desirable to permit higher emission limits on the local oscillator frequency of a superheterodyne receiver. We stated that we believed these limits to be well within the capability of the current state-of-the-art in radio frequency design technology and that the limits appear to be sufficient to protect the authorized services from harmful interference. [32] Further, we recognized that the suppression of radio frequency emissions usually entails some costs in the design and manufacture of such devices. Because the proposed general limits would result in a significant reduction in the permitted level of radiated emissions from receivers, we proposed a liberal transition provision of ten years to allow receiver manufacturers sufficient time to develop equipment that complies with the new emission standards.

76. A number of comments object to the proposed limits. For example, PCA states that the limits are too strict and proposes that receivers be subject to the limits applied to Class A (non-residential) digital devices. EIA/CEG wants the proposed limits relaxed with no limit applied above 960 MHz. Thomson CE believes that higher limits on local oscillator frequency components should be permitted for superheterodyne receivers as these are not a known source of interference. It adds that the proposed limits are too strict for TV and radio receivers. Spectrum Measurement Corp. requests that the limits applied to the 40.68 MHz and 915 MHz ISM bands be deleted since ISM devices are permitted to radiate at any signal level. [33]

77. A number of comments object to our establishing emission limits and test requirements above 1000 MHz. For example, CBEMA states that there is no basis for a limit above 1000 MHz. CBEMA submits that there have been no indications of objectionable interference from unintentional radiators at the higher frequencies and the imposition of limits above 1000 MHz is arbitrary and capricious. AT&T states that frequencies above 1000 MHz have limited transmission range, and there is little, if any, evidence that interference has occurred in this range. AT&T adds that we have not defined test methods above 1000 MHz and the current information on test site calibration only goes to 1000 MHz. IDCMA states that manufacturers have made substantial investments in test equipment that is capable of testing only below 1000 MHz. IDCMA adds that the Commission must compile better information concerning the costs, availability and accuracy of test equipment that can measure above 1000 MHz and the likelihood of harmful interference occurring above 1000 MHz before implementing these regulations. IBM states that an increase in the range of measurements could add 10-15 percent to the time required for testing, adding that we should rely on the non-interference requirement for Part 15 devices rather than requiring a demonstration of compliance with emission limits above 1000 MHz. Further, a number of commenting parties indicate that the range of measurement table for unintentional radiators requires clarification.

78. PBS states that the proposed limits for unintentional radiators appear reasonable and prudent. PBS opposes any relaxation of the TV receiver local oscillator radiation limits, adding that the near universal use of solid state devices and other improvements in TV receiver tuners have eased the burden of meeting emission specifications and dramatically lowered the cost of doing so. PBS states that the costs imposed by both the existing and proposed limits for TV broadcast receivers are negligible. Chamberlain, supported by many of the comments from amateur operators, also opposes higher limits for TV receivers, stating that these receivers are the single largest source of potential interference to licensed services. Genie states that the Commission should prescribe the same emission limits for all unintentional radiators since they are all capable of causing interference to the authorized services operating in the restricted bands. [34] NTIA urges the Commission to reduce the permitted emission limits below the levels proposed to be allowed for intentional radiators. NTIA states that present day radio and TV receivers are sources of interference. NTIA further states that the spectrum above 1000 MHz contains restricted bands and many

critical systems which need protection from interference from Part 15 devices. NTIA submits that the frequencies at which interference could be encountered are increased by the higher clock speeds employed in digital devices and other equipment incorporating digital devices. USCG and others request that an emission limit of 5 uV/m at 300 meters be applied within the frequency band of 90-110 kHz for unintentional radiators in order to protect Loran C operations at 100 kHz. [35] NAB, NCTA and a number of individual comments want the emission limits to be tighter than what was proposed. [36] Finally, Martin Prehm and other individuals request that the Commission implement limits that would provide interference protection at a distance of about 10 feet.

79. As indicated in a number of the comments and based on our own experience, unintentional radiators can certainly be sources of interference. We believe that the limits proposed in the *Notice* are sufficient to reduce the possibility of such interference. These are the same limits that have been applied satisfactorily to residential computer products. We also believe that the limit on the level of radio frequency energy conducted onto the AC powerline is sufficient to protect Loran C operations and, therefore, that additional limits on radiated emissions within the band 90-110 kHz are not needed. Further, no evidence was submitted to justify higher limits for the emissions from the local oscillator in superheterodyne receivers. Such a relaxation in the limit on the local oscillator emission of a superheterodyne receiver could lead to increased interference to the authorized services.

80. The spectrum above 1000 MHz contains many critical radio services. There is a distinct need to provide interference protection to those radio services. Technological advancements have permitted the manufacture of inexpensive Part 15 consumer devices, particularly those incorporating digital circuitry, which have the capability of emitting high levels of unwanted RF signals above 1000 MHz. Further, we are adopting a number of general application "consumer" bands for use by intentional radiators at higher frequencies. These intentional radiators will have potentially large numbers of associated receivers producing emissions above 1000 MHz. Discussion concerning suitable test equipment, the calibration of measurement sites, and the sensitivity and proliferation of equipment in the authorized services is contained in paragraph 98 of this Order and is applicable to the need for measuring emissions from unintentional radiators at higher frequency ranges. No evidence was submitted to justify tighter limits from unintentional radiators. Interference protection at the distances requested by Martin Prehm and others could require the emission limits to be reduced by as much as 20 dB. We believe that not only are such tighter standards economically infeasible but that standards should not be imposed to protect an operator of a radio frequency device from self-inflicted interference. We believe that the limits being adopted in this Order can be economically met by the manufacturers of unintentional radiators. [37] Accordingly, we are adopting the emission limits proposed in the *Notice*, as modified by the use of average emission limits above 1000 MHz with a corresponding limit on peak emissions 20 dB higher than the maximum permitted average limit.

81. We are revising the frequency ranges over which radiated emissions must be measured from what was proposed in the *Notice*. First, in response to the comments we are clarifying the table specifying the range of measurements. Second, since the local oscillator emissions from superheterodyne receivers generally attenuate rapidly at higher level harmonics, superheterodyne receivers that do not employ digital devices need not be measured beyond the second harmonic of the highest local oscillator frequency. Third, because of the degree of spectrum congestion below 1000 MHz and the wide range of spectrum over which digital devices generate radio frequency emissions, we are retaining the current range of measurements for unintentional radiators operating between 1.705 and 108 MHz, i.e., up to 1000 MHz. Fourth, we are eliminating radiated emission tests for most unintentional radiators in which the highest frequency generated or used is less than 1.705 MHz. Such devices need only to be measured for emissions conducted onto the AC power lines. [38]

82. The changes to the emission limits being adopted in this Order are expected to result in an eventual reduction in background radio spectrum noise levels and a decrease in interference to the authorized radio services. To ensure that the application of these limits, including the increases in the required range of measurement, does not present major difficulties to the manufacturers of receivers, we are adopting the proposed ten year transition period. This ten year period is appropriate because of the extensive changes being made to the emission limits applied to receivers. Since the changes in the standards being adopted for unintentional radiators other than receivers are not significant, transition provisions of three years for authorization and five years for manufacture and importation, as applied to intentional radiators, are being implemented for those devices. A detailed discussion of these transition provisions is provided below in this *Report and Order*.

83. *Antenna Conducted Limits for Receivers.* In the *Notice*, we proposed to limit the amount of radio frequency energy conducted from a receiver's antenna terminals to no greater than 2 nW. This proposal is consistent with CCIR Recommendation 478-3 [39] and would limit interference to the authorized services resulting from signals being conducted from the receiver to the antenna. Under the current regulations, receivers are tested for radiated emissions with an antenna attached. The proposed change would permit the radiated emission test on a receiver to be conducted with the antenna terminals connected to a shielded termination, instead of having to employ an antenna, simplifying the test procedure.

84. In its comments, EIA/CEG objects to this proposal and states that emissions from receivers are primarily from the chassis. Gillespie, Prudhon & Associates, Inc. and Wilkens Engineering request that receivers that tune to the ISM bands be exempted from this requirement because the anticipated level of emissions from authorized ISM equipment can be expected to exceed normal receiver radiation levels. Thomson CE requests that this provision be made optional, permitting receivers to be measured with an antenna connected or with the antenna terminals terminated. Thomson CE adds that the proposed limit could be troublesome for UHF TV tuners having to meet critical noise figure requirements and could compromise other desirable performance characteristics by eliminating potentially important performance design trade-offs and could add significantly to the cost of the tuner assembly.

85. We do not agree with the comments of EIA/CEG that emissions from receivers are primarily from the chassis. The point from which these emissions occur depends on the design of the receiver. If, as stated by EIA/CEG, the emissions are primarily from the chassis, compliance with the antenna conducted limits would have no impact on the manufacturers of receivers. We also disagree with the comment of Gillespie, Prudhon & Associates, Inc. and Wilkens Engineering. While there are a large number of authorized operations conducted within the frequency bands allocated primarily for ISM devices, these authorized operations are not subject to the non-interference requirement applicable to Part 15 devices. [40] Part 15 devices must operate on the condition that interference not be caused to the authorized services. Thus, there is a need to reduce the emissions from Part 15 devices to a level sufficient to lower the probability that interference will be received by the authorized services. However, we do agree with Thomson CE that the test for antenna conducted emissions should be made optional and are so amending the regulations. Thus, the responsible party has the following options: 1) measure the radiated emissions from the receiver with an antenna connected to the antenna terminals of the receiver and without the need to measure the level of the antenna power conducted emissions; or, 2) measure the radiated emissions from the receiver with the antenna terminals terminated and shielded and measure the level of the power at the antenna terminals. In either case, the level of the radiated emissions from the receiver would be attenuated sufficiently to reduce the probability that interference to the authorized services would result.

86. *Frequency Range of Receivers.* In the *Notice*, the Commission proposed to apply the general emission standards to CB receivers and to all receivers that operate in the frequency range 30-1000 MHz. Under the current rules, only CB receivers and receivers that operate in the frequency bands 30-901 MHz and 935-940 MHz are subject to emission standards. In addition, the *Notice* invited comments regarding the need to further expand the frequency range over which receivers would be subject to the standards. Only two comments address this proposal. Rockwell objects to expanding the frequency range for receivers above 960 MHz generally as this also would include receivers employed for aircraft distance measuring equipment and air traffic control transponders from which there have been no known interference problems. CORF recommends that receivers that tune up to 1427 MHz be subject to the general emission limits to protect radio astronomy operations. We agree with Rockwell that receivers associated with aircraft distance measuring equipment and air traffic control transponders have not been found to be sources of interference. Further, the need to regulate receivers operating within the frequency band 960-1427 MHz has not been sufficiently justified by CORF. Thus, we are amending the regulations to apply the emission standards to CB receivers and receivers that operate in the frequency range of 30-960 MHz.

87. *Power Line Carrier Systems (PLC's).* PLC's are carrier current systems employed by electric power utility entities on their transmission lines, excluding those lines that connect the distribution substation to the customer or house wiring, for protective relaying, telemetry, and other general supervision of the power system. PLC's are permitted to operate within the frequency range of 10-490 kHz without a limit on the level of the radiated emissions. Power line carrier telephone and data systems are not permitted under these provisions, unless operated by the electric power utility under the stated conditions. Information regarding PLC's must be supplied to an industry-operated entity recognized by both the Commission and the NTIA, in accordance with Section 90.63(g) of our rules. As with other Part 15 devices, PLC's operate under the conditions that interference not be caused to other radio operations and any interference that is received must be accepted. No changes were proposed in the *Notice* affecting the rules on PLC's.

88. The USCG, FAA, NTIA and others request that power line carrier systems be subject to limits on the amount of radio frequency energy radiated within the band 75-125 kHz. They indicate that this is needed to provide additional interference protection to Loran C operations at 100 kHz. The USCG supplied a table showing the maximum level of radiated emissions which could be tolerated from PLC's within the frequency band 75-125 kHz without interference to Loran C operations. These comments also request that data concerning the operating characteristics of PLC's be made public to facilitate the location of interference sources to Loran C operations. As stated by the FAA, a non-interference basis condition can not be established unless the Loran C user has access to PLC technical and operational information including frequency, power, emission type, transmitter and receiver locations, duty cycle, duration of transmissions, etc. Objections to the changes sought by USCG and other comments were filed by UTC. UTC asserts that the public release of data regarding PLC operations, as required to be filed under Section 90.63(g) of our rules, would expose electric utilities to tremendous security risks. UTC adds that, because data on PLC operations reveals sensitive information vital to national security, release must be carefully controlled. UTC notes that a proposal to restrict PLC operation is premature as a method of disseminating information, to be established by an agreement between the Commission and NTIA, is under development.

89. While there were a number of substantive arguments in favor of limiting the emissions from PLC's within the frequency band of 75-125 kHz, we are not adopting limits at this time. Requiring compliance with the emission limits sought by USCG would mandate electric utilities to perform radiated emission measurements on all power lines used for PLC operation. This would be an extremely burdensome requirement for the electric utilities and would serve only to limit interference to Loran C reception by vehicles and aircraft that are located extremely close to power lines carrying PLC information. We would expect that, normally, those vehicles and aircraft would be near enough to the power lines to receive interference to Loran C reception for only short periods of time and could move a small distance from the power lines, if necessary, to alleviate the problem. Thus, it appears that the regulatory burden caused by imposing emission limits on PLC's would be excessive considering the possible limited benefits. Since PLC's must still operate under the condition that interference to the authorized radio services is not permitted, we are not adopting the limits to PLC operation proposed by the USCG and others. Further, we agree with UTC that it would be premature to order the immediate public release of PLC information prior to the finalization of the agreement between the Commission and NTIA. The nec-

essary information will become available in a manner worked out in that agreement. The agreement is not being constrained by this rule making proceeding.

C. Measurement Techniques

90. The *Notice* proposed a number of measurement techniques which would apply to Part 15 devices. These measurement techniques are discussed in the following paragraphs. While several comments object to the Commission establishing new standards without interested parties being able to simultaneously review the updated measurement procedures, the *Notice* addressed the measurement standards that could affect substantially the level of the emission being measured. Further, it was indicated in the *Notice* that updated measurement procedures for all intentional and unintentional radiators would be proposed soon for public comment. Thus, interested parties will have the opportunity to comment on any changes to the measurement procedures that may apply to their equipment.

91. *Detector Functions of Measuring Instruments.* The current Part 15 regulations express most field strength limits, and some conducted limits, in terms of the average value of the emission. In the *Notice*, we proposed the use of measurement instrumentation with a CISPR quasi-peak detector for radiated and conducted measurements below 1000 MHz. We indicated that the use of such a detector would provide a better indication of the interference potential of an emission. Further, the general emission limits were established based on CISPR quasi-peak measurements. We also proposed that emissions above 1000 MHz would be measured using a peak detector. [41] However, we recognized that control and security alarm devices and other periodic operations conducted under the current rules, would be significantly impacted by a change to quasi-peak measurements due to the extensive use of pulsed emissions by those devices. Therefore, the *Notice* proposed to retain average limits for such devices, except for emissions within the restricted bands. The *Notice* also proposed to place an associated limit on peak emissions for periodic transmitters, equal to 20 dB above the maximum permitted average limits.

92. A number of objections were raised against the required use of CISPR quasi-peak and peak measurements, mostly by the manufacturers of control and security alarm devices. Many of the comments state that the quasi-peak detector function was designed to measure the degradation of broadcast signals and that it was not necessarily intended for signals at the frequencies used by Part 15 devices. DORCMA and individual control and security alarm device manufacturers contend that average measurements provide a better indication of the interference potential of a device. DORCMA adds that the change to peak measurements above 1000 MHz would result in a reduction in permitted signal levels of 5 to 15 dB and that such a reduction is unreasonable, unnecessary and would cause unjustifiable economic hardship. SEIA and others argue that if average measurements are acceptable to reduce the potential for interference by the fundamental and spurious emissions of control and security alarm devices to services on non-restricted bands, they should also be acceptable to prevent interference to the authorized services in the restricted bands. Further, SEIA alleges that narrow band receivers tend to be immune to peak emissions. SEIA requests that the emission limits above 1000 MHz be increased by 20 dB if peak detectors are required. SEIA also states that eliminating average measurements in the restricted bands would require manufacturers to reduce output power to comply with the quasi-peak limits. Genie and Linear state that quasi-peak detectors will not provide uniform and neutral results, are inherently equipment sensitive, and are capable of yielding inaccurate measurements. CBEMA requests that average measurements be applied to digital devices for broadband emissions. NEMA requests that average measurements continue to be used for measurements of the emissions of field disturbance sensors. NEMA and GE state that quasi-peak measurements are appropriate for the European regulatory approach that permits the operation of equipment that complies with the limits even if interference is caused. They argue that such measurements are not appropriate for the U. S. where operation must cease if interference is caused. Thus, they contend that the limits for Part 15 devices do not need to be as strict.

93. In contrast, a number of comments support the change from measurement instrumentation using an average detector to instrumentation using a CISPR quasi-peak or peak detector. CDC states that the quasi-peak detector was designed to correlate best with the perceptibility of noise, i.e., interference, and, unlike average detectors, prevents systems from using shorter duty cycles to obtain higher emission levels which are not indicated with average measurements. NTIA states that average measurements were appropriate when amplitude and frequency modulation with constant carriers were the only types of non-licensed devices in use. NTIA in support of the use of CISPR quasi-peak and peak measurements, adds that current equipment uses suppressed carrier, pulsed and spread spectrum modulation. Hence, more sophisticated measurement techniques are required. Digital, while also requesting higher limits on conducted emissions, wants the standards to be stated in terms of average and quasi-peak and to require measurements for both.

94. We continue to believe that the use of measurement instrumentation employing a CISPR [42] quasi-peak detector is appropriate for measuring emissions from Part 15 devices below 1000 MHz. As indicated by CDC and NTIA, the parameters of the CISPR quasi-peak detector were designed to consider the interference potential of radio frequency emissions to the authorized radio services, including those services allocated on the frequency bands employed by control and security alarm devices. The quasi-peak detector provides a better indication of the energy being radiated by the Part 15 device that could be detected as interference by a receiver in the authorized radio services than would be provided by average or peak detectors. [43] As an alternative to CISPR quasi-peak measurements, we will permit the measurement of emissions with instrumentation employing a peak detector with a measurement bandwidth equivalent to that of a CISPR quasi-peak detector. This is appropriate since peak measurements will result in levels equal to or greater than those obtained by the quasi-peak detector. However, we remain concerned that implementing CISPR quasi-peak measurements below 1000 MHz for all Part 15 devices would result in a need for many manufacturers to discontinue the production of a several existing devices which have not been demonstrated to be sources of interference. For that reason, we are retaining the use of measurement instrumentation employing an average detector, as was applied to periodic transmitters, for all operations currently permitted under Part 15 except for

operation in the band 0.51-1.705 MHz and non-periodic operation in the band 40.66-40.70 MHz, e.g., perimeter protection systems. [44] The application of measurements with a CISPR quasi-peak detector is being employed within these bands to provide additional interference protection to AM broadcast stations and because the band 40.66-40.70 MHz is being expanded to permit general types of Part 15 operation. The impact to perimeter protection systems, the only non-periodic system presently being operated in the band 40.66-40.70 MHz, from the change in measurement technique is minimized by the increased field strength limit that is being adopted. However, we also recognize that allowing the continued application of average measurements could permit high level peak emissions that could interfere with the authorized radio services. For this reason, we are adopting a corresponding limit on peak emissions of 20 dB above the maximum permitted limit on average emissions which will be applied wherever average emission limits are specified in the rules. This is the same peak limit that we proposed and are adopting for control and security alarm devices and other periodic transmitters. We also recognize that pulse modulated systems subject to measurement with a CISPR quasi-peak detector can generate excessive peak emissions if the pulse-repetition frequency is extremely low. For that reason, we are requiring pulse modulated systems for which a CISPR quasi-peak measurement is specified to demonstrate compliance with the standards based on the peak level of their emissions if their pulse-repetition frequency (PRF) is 20 Hz or less. There do not appear to be any existing devices with a PRF of 20 Hz or less that would be impacted by this change to the measurement requirements.

95. Our proposal to use measurement instrumentation employing peak detectors for frequencies above 1000 MHz was based on the general availability of peak-reading measurement equipment and the lack of CISPR agreement of specifications for a quasi-peak detector at those frequencies. However, we agree with the comments that the proposed limits above 1000 MHz, especially the general radiated emission limit, are too restrictive when measured with a peak detector. Instead, we believe that the emission limit recently adopted in the previously cited *Report and Order* in Docket No. 86-422 is appropriate for the general limit and measurement instrumentation employing an average detector should continue to be employed. In order to prevent possible interference from high level peak emissions and to provide additional interference protection to operations in the restricted bands above 1000 MHz, we are adopting a corresponding limit on peak emissions of 20 dB above the maximum permitted average limits, the same as we are applying where average measurements are used below 1000 MHz. While this is a compromise made necessary by the lack of quasi-peak measurement procedures for frequencies above 1000 MHz, we believe that it offers sufficient interference protection to the authorized radio services. Further, this standard addresses most of the objections from the manufacturers of control and security alarm devices, field disturbance sensors, and other equipment for which measurements above 1000 MHz are required.

96. *Frequency Range of Radiated Measurements for Intentional Radiators.* In the *Notice*, we generally proposed measuring emissions from intentional radiators to at least the tenth harmonic of the highest fundamental frequency of the device. Measurements would be limited by the state of the art in measurement techniques. The present rules do not require emissions from most intentional radiators to be measured above 1000 MHz. DORCMA and other manufacturers of control and security alarm devices object to this proposal due to the increased cost of testing and test equipment. They state that no rationale was provided for this change and there is no need for measuring emissions at higher frequencies. Genie requests 2000 MHz to be the upper limit for measuring emissions. Linear states that the FCC does not have procedures for the calibration of measurement test sites above 1000 MHz. Pittway adds that at frequencies above 2000 MHz the level of emissions attenuates so significantly that there is virtually no likelihood of harmful interference and it is unlikely that signals at the higher order harmonics could be detected above the typical noise floor of available test equipment.

97. NTIA, in its comments, notes that the spectrum above 1000 MHz contains a number of restricted bands and many critical systems. NTIA adds that the risk of interference from intentional radiators is increased by the sophisticated modulation techniques employed in newer Part 15 devices as well as by advances in radio frequency technology that permit the use of higher carrier frequencies. NTIA concludes that these technologies make it likely that spurious emissions will be produced above 1000 MHz and that the proposal to test to the tenth harmonic is reasonable.

98. In addition to the view expressed by NTIA, we see several additional reasons for requiring a demonstration of compliance with the emission limits at higher frequency ranges. First, authorized radio services are increasingly using frequency bands above 1000 MHz. Second, the equipment used by the authorized radio services, including equipment used above 1000 MHz. similarly is growing more sensitive. The cost to manufacturers of Part 15 devices for new test equipment and for the additional time needed to perform such tests is not sufficient justification for limiting the frequency range of required measurements to a fixed frequency such as 2000 MHz. The necessary test equipment is readily available. We also note that most manufacturers of control and security alarm transmitters already are required to test to 2000 MHz. Generally, test equipment that can be used to measure to 2000 MHz also can be used to test up to the tenth harmonic of currently manufactured control and security alarm devices. Thus, we reject the argument that our proposal will impose high costs by requiring the purchase of additional test equipment. Further, while manufacturers of Part 15 devices have been required to test above 1000 MHz for some time, the lack of specific test site calibration procedures from the Commission for frequencies above 1000 MHz has not caused problems with these tests in the past. Thus, we do not consider the argument that there is no published test site calibration information for testing above 1000 MHz to be sufficient reason to adopt an alternate requirement for the range of frequencies to be measured. Finally, a demonstration of compliance with the regulations at frequencies to the tenth harmonic is required for most equipment operating under the other Commission rule parts, e.g., equipment which is authorized under our type acceptance procedure. This testing requirement does not appear to cause substantial burdens to the manufacturers of equipment used in the authorized services. For these reasons we are adopting the proposal to require testing of Part 15 intentional radiators

to at least the tenth harmonic of their highest fundamental frequency or to the highest frequency that can be practicably measured. [45] To further clarify this requirement, we are defining the highest frequency practicable in the present state of the art of measuring techniques as 40 GHz. We realize that these changes will increase the range over which compliance must be demonstrated for some intentional radiators and, therefore, are adopting liberal time periods for compliance in order to ensure that these changes do not present major difficulties to the manufacturers of intentional radiators. We will allow equipment to be authorized under the current standards for three years, and we will allow manufacture and importation under the current standards for five years.

99. *Measurement Distances for Digital Devices.* In the *Notice*, we proposed to retain the existing distances for measurement of digital devices, i.e., 3 meters for Class B devices and 30 meters for Class A devices. However, several comments requested changes to these measurement distances. Digital, in its comments, requests that measurements of both Class A and Class B devices be specified at a distance of 10 meters. IBM requests that we permit the testing of small Class A devices at 3 meters. Spectrum Measurement Corp. requests that a distance of 6 meters apply to both Class A and Class B digital devices. CBEMA and a number of other commenters request that the Class A limits be specified at 10 meters.

100. The Commission is not changing the 3 meter measurement distance specified for Class B devices. A general specification of greater than 3 meters for these devices does not appear to be feasible because the low signal levels permitted for Class B devices normally could not be accurately measured at a greater distance. However, for Class A devices, a measurement distance of 10 meters would permit easier detection of signal at the higher Class A levels. Thus, we are adopting the radiated emission limits for Class A digital devices at a distance of 10 meters and are adjusting the limits for these devices by an appropriate amount, i.e., three times the limit specified at 30 meters. If testing at alternative distances is necessary for either Class A or Class B devices due to measurement in the near field or other reasons, such tests can be performed under the provisions being adopted in Section 15.31(f) in Appendix B.

101. *Measurement Standards.* The *Notice* proposed to add a new section to the rules to specify a number of standards that would be applicable to the measurement of emission levels from various devices. This proposal addressed measurement procedures used by the Commission and standards relating to on-site testing, test distances, adjustments to the equipment under test, line-impedance stabilization networks, system configurations, and other general test requirements. A number of comments addressed these proposals. In general, many of the comments indicate that these standards should be contained in the Commission's separately published measurement procedures. They submit that this would avoid requiring a manufacturer to consult both the rules and the measurement procedures to determine how to test the equipment. Other comments argue that the measurement procedures employed by the Commission should be subject to notice and comment prior to their implementation and should have the status of regulations.

102. We continue to believe it is useful to include certain elements pertaining to measurement of electromagnetic emissions from Part 15 devices in the rules generally as proposed in the *Notice*. The measurement specifications included in the rules will also be indicated in the measurement procedures for testing equipment to avoid the need for parties testing equipment to refer to both the measurement procedures and the rules for a full specification of the test requirements. Further, we intend in the near future to initiate rule making on each of the measurement procedures.

103. The comments also address specific features of the proposed measurement standards. IBM states that if the equipment is sampled by the Commission for testing, the measurement procedures in effect at the time the equipment was verified or authorized by the Commission should be employed. AT&T, IDCMA, IBM and Spectrum Measurement Corp. state that we should not impose a requirement to consult with the Commission when measurement procedures other than those published by and employed by the Commission are used to test equipment. IBM states that if we require swept frequency equipment to be tested with the frequency sweep stopped, we should clarify that the sweep need be stopped only at those frequencies chosen for final reported measurements. Amador, AT&T and IBM state that we should not preclude the use of anechoic chambers or open field test sites that use electro-magnetically transparent overhead structures in favor of open field test sites. DORCMA, Genie and Linear state that our reference to a variation in supply voltage is relevant only to AC power line voltage. They submit that battery powered equipment should be tested at the voltage provided by a new battery since a new battery generally produces the highest emission levels and the "end of life" point for a battery does not provide a suitable test condition. AT&T, DORCMA, EIA/CEG and IBM state that we should specify that tests be conducted with the controls set to produce maximum emissions, provided that such settings are consistent with the use of device for its intended purpose and the equipment is operated in a typical manner, since setting the controls to maximize emissions may not represent a usable operating condition. [46] NECIS and Tandy add that the emissions should not have to be maximized from systems consisting of multiple devices as this is unduly burdensome. AT&T and Linear state that the length of the wire leads required to be attached to the equipment under test should be the length used with the equipment in a typical application or should be specified at a length of one meter or one-quarter wavelength. Sensormatic states that the requirement to test composite systems with all of the devices in the system functioning does not describe a measurement method with sufficient particularity, leaving unresolved how a multiple antenna system would be tested. EIA/CEG states that we should clarify that every possible combination of accessories, peripherals or central control units does not need testing and that the testing of one typical configuration is acceptable. CBEMA and NCR state that when testing mixed Class A/Class B digital devices and that test indicates compliance only with the Class A limits, we should not require the Class A device to be identified as the source of the higher level emissions. IBM states that we should place the reference to the 13 dB allowance for wideband conducted emissions in the separately published measurement procedure bulletin for digital devices. Finally, AT&T, EIA/CEG and others argue that if the equipment is sampled by the Commission for testing, it should test the equipment under the same con-

ditions, e.g., the same distance, antennas, test configurations and measurement procedures, employed by the party performing the test.

104. To further clarify these regulations and to respond to the comments regarding the specific standards proposed in the *Notice*, we are changing several provisions of the proposed measurement standards. First, we will indicate that when the Commission samples equipment to determine that a product continues to comply with the regulations, we will employ the measurement procedures that were in effect at the time that the equipment was authorized or verified. Second, we are not adopting the proposed requirement to consult with the Commission when measurement procedures other than those published by the Commission are used. Third, we are amending the proposed rules to state that for swept frequency equipment, the frequency sweep is stopped only at those frequencies chosen for the final reported measurements. Fourth, we have added language that test sites other than open field test sites may be employed if they are properly calibrated so that the measurement results correspond to what would be obtained from an open field site. Fifth, we are amending the proposed rules to state that battery operated equipment will be tested at the voltage of a new battery. Sixth, we are clarifying that only those controls readily accessible to or intended to be accessible to the consumer need to be adjusted to maximize the level of the emissions. While a number of comments objected to fully exercising the device under test, it must be recognized that the device may be fully exercised by the consumer. As the device is required to comply under such conditions, there is no basis for changing this language. However, the specific test configuration which is employed and the manipulation of that configuration to maximize emissions will be addressed in the individual measurement procedures. Seventh, we are amending the rules to state that lead lengths greater than one meter are not required for testing. Eighth, we are continuing to require that composite systems be tested with all of the devices functioning, as under the current regulations. In addition, we have added clarifying language that if more than one antenna or other radiating source is designed to emit at the same time, measurements shall be performed with all radiating sources that are to be employed emitting. Additional provisions, such as the number of test radials, will be included in the separate measurement procedures. The use of the measurement procedures is proper here as the comments indicated concern only with describing the measurement method with sufficient particularity. Ninth, we have clarified that only one test using peripherals or external accessories is required and that all possible equipment combinations do not need to be tested. We are also clarifying that when a manufacturer makes both accessories (peripherals) and a central control unit, this equipment must be tested in combination with each other unless it can be demonstrated that the central control unit or accessories normally would be marketed or used with equipment from a different entity. This resolves the present problem where the responsible party is unable to demonstrate the compliance of its equipment when combined with other equipment that it manufactures. Currently, manufacturers of such equipment often combine their product with another manufacturer's product to demonstrate compliance, even though that equipment might not normally be used in that combination. Tenth, we have amended the proposed rules to clarify the emission standards that apply when Class A and Class B digital devices are combined. Eleventh, we have deleted the reference to the 13 dB allowance provided for wideband conducted emissions from digital devices. This 13 dB allowance currently is contained in FCC/OET MP-4, the measurement procedures for computing devices. The 13 dB allowance for wideband conducted emissions will be addressed in another proceeding.

105. We are not adopting the request by AT&T and EIA/CEG to use the same test conditions employed by the responsible party when we audit equipment. While we are permitting the responsible party to use alternative measurement procedures, we do so under the condition that equivalent results must be obtained. In addition, we are amending the language to permit testing at either closer or greater distances, depending on the particular case, to eliminate problems of testing in the near field and testing at distances where the background noise level exceeds the signal strength to be measured. Specific extrapolation and interpolation values are provided for measurements at different distances.

106. In addition to the changes discussed above, we are amending the proposed rules to retain Sections 15.76(c), 15.77(c), 15.79(d) and 15.143(e) of the current regulations. These sections address the frequencies at which measurements are required for receivers and intentional radiators, depending on the number of bands in which they operate and the width of those bands. Further, we have deleted the requirement that "suitable adjustment" must be made to the measured results for emissions that are wider than the bandwidth of the measuring instrument. Such adjustments are not needed with the use of CISPR quasi-peak measurements as these measurements determine the permitted emission level per unit bandwidth anywhere within the entire range of frequencies emitted by the Part 15 device. Thus, this measurement procedure is effective in controlling interference potential without a corresponding need to integrate the measured field strength to a high level simply because the Part 15 device is broadbanded. It is also not needed with average/peak measurements as the bandwidth of such measurement instrumentation must be "suitably adjusted" in order to perform the emission measurements.

IV. AUTHORIZATIONS AND APPLICATIONS

A. Equipment Authorization Program

107. A number of amendments were proposed to the authorization procedures applicable to Part 15 devices. Most of these amendments involved placing the equipment authorization requirements contained in Part 15 into Part 2 of the rules. A few changes to the specific authorization procedures were also proposed. For example, the *Notice* proposed to relax the equipment authorization procedure applied to intentional radiators operating in the frequency band 88-108 MHz from type approval to certification and to change the procedure applied to superheterodyne receivers associated with control and security alarm devices from certification to notification. [47] These changes are consistent with the procedures applied to other similar Part 15 devices. In addition, the *Notice* proposed expanding the requirements for information with respect to measurement facilities, submission of photographs of notified Part 15 equipment, and a number of

other changes to the procedures and requirements for authorization of Part 15 devices. These changes are addressed in the following paragraphs.

108. *Description of Measurement Facilities.* In the *Notice*, we proposed to move the requirement to file descriptions of the measurement facilities used in testing equipment from Part 15 to Part 2 of the rules. We proposed to change the current language to clarify who must retain the description of the measurement facilities. For equipment subject to verification, this data would be retained by the party responsible for the equipment. If the equipment is subject to certification or notification, the description of the measurement facilities would be filed with the Commission. The *Notice* also proposed additional filing requirements with regard to measurement facilities, i.e., a chart showing ambient emissions from 30-1000 MHz if chart recorders are used; a plot of site attenuation data; a description of the types of measurements which would be performed at the test facility; and, a sample calculation showing how the readings taken from the instrumentation are converted to the levels specified in the regulations. A number of objections to our proposal were received from AT&T, CBEMA, Digital, Linear, NCR and others. These parties object to the requirement for photographs of test sites, a chart showing ambient emissions, the description of structures at distances beyond the measurement facilities and the calibration requirements for measurement instrumentation. Other objections include the lack of reference to calibration using vertical polarization, the use of FCC Bulletin OET 55, the submission of a statement as to whether the test facility will perform contract work, and the submission of a statement regarding the types of equipment to be tested at the facility.

109. Our proposal was intended primarily to place the equipment authorization requirements contained in Part 15 into Part 2 of the rules with some added clarification. Because of the concerns raised in the comments, we are, for the most part, retaining the existing provisions for measurement site descriptions. However, we are modifying these provisions to clarify that for equipment subject to verification, the site description may be retained either by the party responsible for the equipment or by the laboratory that performed the equipment testing. As under the current rules, a description of the measurement site must be submitted to the Commission for equipment subject to notification or certification. [48] In addition, we are adopting the proposal that a description of the type of equipment intended to be measured at the site be retained or submitted to the Commission, as appropriate. This latter change is useful in determining the type of instrumentation needed for testing at the site. These changes are not expected to impose substantial additional burdens on test laboratories or manufacturers.

110. *Notified Equipment.* The *Notice* proposed to amend the rules to require that photographs of the external appearance of Part 15 devices accompany the submission of an application for a grant of notification to the Commission. This requirement was proposed to allow the Commission to identify the specific Part 15 equipment for which a grant of notification is issued. The only objection to this proposal came from AT&T. They requested that line sketches be allowed instead of photographs. We believe the staff will be able to identify specific Part 15 equipment from photographs or line sketches. Therefore, we are requiring that applicants submit either photographs or line drawings of the external appearance of the equipment with their application for a grant of notification. The photographs or line sketches submitted must be sufficiently detailed to allow identification of the equipment.

111. *Application for Certification.* The *Notice* proposed to place all of the procedures for obtaining a grant of certification into Subpart J of Part 2. We also proposed the following changes to the present rules: to delete the requirement for schematic diagrams for unintentional radiators and to add a requirement for submission of a description of any changes to the equipment which were needed to allow it to comply with the regulations. We further proposed in connection with the description of changes made to non-compliant equipment to achieve compliance, that extensive retrofitting of a device could result in a denial of the application unless the applicant attests that it will make those changes to all equipment marketed under the grant of certification. The *Notice* proposed to retain the other existing regulations pertaining to certification.

112. A number of comments, e.g., CBEMA, Linear, Digital, AT&T, NCR, etc., object to these proposals, particularly the requirement to submit a description of changes made to the equipment to comply with the standards. These parties also object to retaining the requirements to submit a copy of the instruction manual, the description of the circuit functions of the device, information on oscillators employed in the device and photographs of the equipment. No objections were received to deleting the requirement for schematic diagrams for unintentional radiators.

113. We generally find that the proposed requirements are necessary to sufficiently describe the equipment for which certification is being sought. However, in response to the comments we are not adopting the proposed requirement for submission of a description of the changes made to non-compliant equipment in order to comply with the rules and the corresponding statement that these changes will be incorporated into the equipment prior to marketing. As provided in Sections 2.907 and 2.931 of the current regulations, certification attaches to all units marketed by the grantee which are identical to the sample tested except for permissive changes and other variations authorized by the Commission. Further, the grantee warrants that each unit marketed under the grant will conform to the unit that was measured and that the data filed with the Commission will continue to be representative of the equipment. Thus, no additional regulation regarding the changes made to certified equipment to comply with the standards is necessary. If changes to the equipment which are needed to comply with the standards are not incorporated, the grant of certification issued by the Commission is not valid. We also are adding a requirement to the rules that the application for certification shall contain a brief description of any peripheral or accessory devices connected to or installed in the equipment which was tested. Further, any such peripherals or accessories must be unmodified, commercially available devices. This change is consistent with the Public Notice issued by our Office of Engineering and Technology on August 17, 1988.

114. *Authorization of Multiple Devices in One Enclosure.* In the *Notice*, the Commission proposed to clarify Sections 2.975 and 2.1033 of the rules, which pertain to application for a grant of notification or certification, by adding a statement that a single FCC identifier may be

assigned to a unit of equipment consisting of multiple devices within a single enclosure (as composite system). These sections currently do not address such equipment. However, the use of a single FCC identifier with composite systems is consistent with the existing provisions of Section 2.925 of the rules, which provides standards for equipment identification, so long as a separate FCC Form 731 and associated fee is submitted for each individual device in the enclosure. Linear opposes this clarification, arguing that the Commission should require a separate FCC identifier on the enclosure for each individual device incorporated therein. It also states that the Commission should permit the individual devices in a composite system to be used separately and in other composite systems without changing their FCC identifiers or obtaining a new grant of authorization. The approach proposed by Linear does not address the fact that the level of emissions from an RF device typically are affected significantly by the enclosure in which it is contained. If we were to permit RF devices to be reconfigured in other enclosures under the same FCC identifier without re-examining whether the device complies with the technical standards, the effectiveness of our authorization program as a means to control interference would quickly be compromised. Accordingly, we are retaining our existing regulations in this area and adding the clarification of Sections 2.975 and 2.1033 proposed in the *Notice*.

115. *Changes to Certified Equipment*. The current regulations define permissive changes that may be made to certified devices. [49] Permissive changes encompass any electrical or mechanical changes to the construction of the device that result in the equipment continuing to comply with the appropriate standards. However, our regulations also reference changes other than permissive changes, which require the issuance of a new grant of authorization, without defining what constitutes a "non-permissive" change. This has generated considerable confusion within the industry. Thus, the *Notice* proposed to add new language as to what constitutes a major modification (non-permissive change), requiring the issuance of a new grant of certification. As proposed, a major modification would be a change to the frequency multiplication circuitry, the basic modulator circuitry or maximum power rating, replacement of an internal circuit board with one of a different type (excluding some changes that are permitted for digital devices), and changes in digital devices to the clock speed, number of board layers, layout or filtering. Thus, major modifications would consist of changes that result in new circuit configurations and other changes that could have a significant impact on the level of the emissions. The *Notice* also proposed to clarify that permissive changes can be performed only by the grantee.

116. The majority of the comments responding to this proposal request that the Commission permit grantees to make any changes to their equipment as long as the equipment still performs the same function. These parties request that they be permitted to market their equipment under its original FCC identifier number, even after modification, without the need to obtain a new grant of certification. CBEMA states that a new grant of authorization should be required only if the grantee wants to change the identification of its products. NEC states that the Commission's regulations are unable to keep pace with the rapidly changing technology in the computer field, and, thus, they oppose any requirement for reauthorization after major modifications. EIA/CEG states that it is unnecessarily burdensome to require reidentification and recertification for modifications that alter the design even where such changes do not degrade compliance with the limits. Tandy opposes the provisions on major modifications, arguing that these provisions would promote unintended and undesired public policy results by requiring reidentification of equipment for modifications which alter the engineering design characteristics of a device but do not degrade performance in terms of the emissions. Tandy argues that the provisions on major modifications discourage interference-related improvements to equipment. Some comments, including those from AT&T, request changes to the current Class II permissive change rules to permit any changes to be made to equipment without a requirement to report such changes as long as the emissions are attenuated more than 6 dB below the permitted limits. CBEMA states that the requirement to report equipment changes to the Commission represents a substantive burden that does not permit rapid response to marketplace pressures for new, upgraded products.

117. The proposals addressing major modifications to certified equipment were intended to clarify that a new grant of certification is required for changes that result in new circuit configurations and other changes that could have a significant impact on the level of the emissions. The Commission generally applies the certification procedure to equipment that it expects to have a higher likelihood of exceeding the emission limits. We generally have found that higher emission levels are typical of equipment that uses "new technology" or is highly complex. Thus, we continue to believe that in order to ensure that equipment subject to certification continues to comply with our rules, it is necessary to recertify such equipment whenever it is modified in a manner that affects its basic emission characteristics. The emission characteristics primarily are affected by changes in frequency, emission type, e.g., the modulation characteristics, and output levels. Thus, changes to the basic frequency determining and stabilizing circuitry (or clock rate), frequency multiplication stages, basic modulator circuit or maximum power ratings constitute changes that could significantly impact the emission characteristics. Such changes must be addressed as major modifications to the equipment, requiring the application for and issuance of a new grant of authorization. Other changes to the equipment generally can be treated under the existing Class I or Class II permissive change procedures. Changes made as permissive changes can still be reviewed by the Commission on an individual basis to determine if the changes should be addressed as major modifications.

118. We believe that the language being adopted in this *Report and Order* provides adequate clarification of the types of modifications to equipment that constitute a major change. This clarification will reduce the necessity of contacting the Commission for guidance whenever changes are made by manufacturers. The new provisions detailing major modifications are not an actual change to the equipment authorization requirements. Rather, this action places within the regulations policies that have been in effect since the start of the certification requirements, though they sometimes have been applied inconsistently due to the lack of specific regulations. Placing this policy within the regulations will remove the ambiguities resulting from its application on an ad hoc basis

through staff interpretation. We are rejecting the requests to allow any changes to be made to equipment without reidentification as long as the equipment continues to perform the same function. Such a change would allow a grantee to obtain one grant of certification for each type of product manufactured and then apply the FCC identifier number for that grant to all of its products that perform the same function, regardless of differences in design, emission levels, or interference potential. If this were allowed to occur, we would no longer be able to identify a particular product as an authorized device. Finally, since the grantee is responsible for compliance of the equipment with the Commission's standards, [50] the authority to make permissive changes must be limited to the grantee.

119. *Party Responsible for Compliance with the Regulations.* The *Notice* specified the general term "manufacturer" to indicate the party responsible for ensuring that a device complies with our regulations. This resulted in some confusion because the manufacturer may not hold the grant of authorization. In that case, the grantee and not the manufacturer is the party responsible for ensuring compliance. Linear, on October 16, 1987, filed a Motion for Consolidation, Request for Clarification and Motion for Extension of Time Within Which to File Comments, requesting, among other things, clarification of the use of the term "manufacturer" as the responsible party. [51] To provide the clarification sought by Linear, we are adding a new Section 2.909 to Part 2 of the regulations in order to designate exactly who is responsible for equipment complying with the appropriate technical standards after a grant of equipment authorization is issued by the Commission or the equipment is verified. That new rule section provides that, with respect to equipment that must be issued a grant of equipment authorization, the holder of that authorization, i.e., the grantee, is the responsible party. This is consistent with 47 CFR Sections 2.903-2.907 and 2.931. For verified equipment, the manufacturer or, in the case of imported equipment, the importer is responsible for the device in accordance with the provisions of existing Sections 2.951-2.957 of our rules. [52] In the case of imported equipment subject to verification, Section 2.953(a) indicates that the importer must warrant compliance. Further, Section 2.955(a) requires the importer of foreign made equipment to retain the verification records. Thus, our designation of the importer as the responsible party for foreign manufactured equipment is a clarification only and does not constitute a change in our regulations. Defining who is responsible for the compliance of radio frequency equipment with the technical standards allows us to discontinue the use of the general term "manufacturer" and substitute instead the term "responsible party".

120. *On - Site Measurements.* In the *Notice*, the Commission proposed to continue its existing policy of permitting on-site measurements of equipment such as perimeter protection systems, carrier current systems and systems employing a leaky coaxial cable as an antenna that are impractical to measure on a laboratory site. This proposal, inadvertently, did not include provisions to allow this equipment to be marketed for installation at the location where on-site testing would be performed. Similar provisions currently exist for devices such as perimeter protection systems. CDC mentions this omission in its reply comments. Senstar recommends that broadband sensors, but not narrowband sensors, be tested at every site even after certification is obtained. We are adopting rules for on-site testing as proposed. We also are changing Section 15.201 of the proposed rules to incorporate provisions to allow the marketing, prior to authorization, of those intentional radiators for which measurements must be made at the installation site. Because of the potential for interference to television reception, we are retaining the current requirement that perimeter protection systems operating on the TV broadcast frequencies must be tested at each installation site, regardless of whether these systems are broadband or narrowband.

121. *Labelling Requirements.* In the *Notice*, we proposed to require all radio frequency devices operating under the provisions of Part 15 to be labelled. This label would indicate that the equipment complies with the regulations and that its operation is subject to the conditions that interference not be caused and that any interference received by the Part 15 device must be accepted. The latter statement would not be required to be included on labels used on receivers associated with the operation of a licensed radio service. Further, we proposed to allow the label information to be placed on the first page of the instruction manual supplied to the user or, alternatively, on the container in which the device is marketed if the Part 15 device is so small or is for such use that it is not practicable to place a label on the device.

122. A number of comments request changes to the proposed labelling requirements. The League and a number of individual commenters want the statement that Part 15 devices must accept interference to be expanded to include a statement referring the user to the manufacturer in the case of received interference. These comments request that the instruction or user manual contain the name and telephone number of a manufacturer's representative that can be contacted should interference occur. NCR and Genie, on the other hand, state that the label should read only that the device complies with Part 15. As stated by Genie, it is up to manufacturers to consider potential interference when developing their product, and a more detailed statement concerning operating conditions can be placed in the instruction manual. CBEMA, Digital and IDCMA state that the label should not reference susceptibility to interference since the Commission does not regulate that facet of the device's performance. Thus, they request that we delete all reference to computers having to accept interference, leaving this matter of product performance to the marketplace. TI states that information on eliminating interference should be in the instruction manual rather than on the equipment, and that the label currently required for computing devices, referencing the instruction manual, is more appropriate. ANARC states that a label regarding the vulnerability to interception of the signals by other parties should be required, such as the label presently required for cordless telephones. NEMA and GE request that the label for Part 15 devices operating in the ISM bands be expanded to state that the band is allocated primarily for non-communication uses of RF energy. Finally, IBM and a number of other parties state that in cases where the label is not included on a device because of size or other limitations, we should permit its inclusion anywhere in the instruction manual, instead of just on the first page, as long as it is prominent. IBM states that prudence dictates that safety and warranty information appear early in the user materials.

123. We believe that the addition to the label of a statement referring the user to a manufacturer's contact in case of interference, as requested by the League and others, would be impracticable. We believe that it would be unreasonable to burden manufacturers with the responsibility for addressing individual interference problems experienced by devices that expressly are not protected from interference. Such a requirement would be costly for manufacturers and the information on a device would become inaccurate over time as personnel, orginizational structures, and telephone numbers of a manufacturer changed. Thus, this request by the League and others is not being adopted. The Commission also is not persuaded to adopt the suggestions of NCR, Genie, CBEMA, Digital and IDCMA for modifying the label. One of the primary operating conditions under Part 15 is that any interference that is received by a Part 15 device must be accepted. We believe that the placement on the label of the simple fact of this condition of operation is sufficient to alert users to the possibility that the device might be subject to interference. With respect to the comments from TI, information regarding the elimination of interference caused by a digital device is required to be provided to the consumer in the text of the instruction manual under both the current and the proposed rules. As long as this information is included in the instruction manual, there does not appear to be a compelling reason to require an additional reference to it on the label, although manufacturers are free to do so. We do not find it necessary to require information on the label to advise users of the vulnerability of signals of Part 15 devices to interception by other parties. There is no indication that users are not aware of this potential or that such interception is occurring in a manner that warrants regulatory action. With respect to the comments from NEMA and GE, because of the large numbers of non-ISM devices authorized to operate within the frequency bands allocated for ISM, we believe that requiring the requested statement could cause confusion by appearing to offer some degree of protection from interference caused by non-ISM sources. No such implication should be made since Part 15 devices must accept interference from any other source of RF energy. Finally, we agree with the comments from IBM and others that, in those cases where the label is not provided on the equipment, it is not necessary to require that the label be presented on the first page of the instruction manual. The new rules will allow the label to be included in a prominent location anywhere in the instruction manual supplied to the user.

124. *Special Accessories.* In the *Notice*, we proposed to require that any special accessories that are needed to enable a device to comply with the rules be supplied with the device. Special accessories are defined as accessory items that cannot be obtained readily from multiple retail sources. The comments from the manufacturers of computing devices generally oppose this proposal. EIA/CEG objects to requiring digital devices to be supplied with special accessories, such as shielded cables, since the manufacturer does not necessarily know to what other devices the equipment will be connected and, without this information, cannot match connectors. IDCMA indicates that manufacturers cannot predetermine what cable lengths or connectors may be required by the consumer. IDCMA suggests that the only requirement should be for the manufacturer to have the accessory available for sale and its use noted in any literature supplied with the device.

125. In its proposal, the Commission's intent was to ensure that Part 15 devices comply with the regulations in the configurations in which they will be used by the consumer. The proposal recognized that if a $ 50.00 connecting cable is required to make the system compliant and if a $ 5.00 cable is available to the consumer and will allow his system to function without regard to compliance, the consumer normally will purchase the cheaper cable, regardless of the interference potential. Further, the consumer generally has no means to determine that the installed digital device system, as configured, complies with our standards. For these reasons, we believe it is necessary to require that any special accessories needed for a device to comply with the rules must be supplied with the device when it is marketed. We have modified, however, the proposed rule to recognize certain situations where it is appropriate to provide flexibility. First, the requirements for supplying special accessories will not apply to equipment that must be professionally installed or is installed by or under the supervision of the party marketing the equipment. Second, any cable or other special accessory that can be readily obtained from multiple retail outlets need not be supplied with the device. The instruction manual, however, must specify the accessories, if any, needed for compliance. Third, in lieu of shipping or packaging the special accessories with the intentional or unintentional radiator, the party responsible for the equipment complying with the rules may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge, at the time of purchase. Information detailing any alternative method used to supply the special accessories shall be included in the application for a grant of equipment authorization or retained in the verification records, as appropriate.

B. Marketing of Digital Devices

126. Section 2.806 of the existing rules provides limited exemptions to the marketing provisions for digital devices. We proposed to clarify that the exemptions to the marketing provisions shown in paragraphs (a) and (c)(2) of that section apply only to digital devices subject to verification. CBEMA, IBM, AT&T, Digital, Aox and other computer manufacturers object to our intended clarification of these exemptions to the marketing regulations, believing that the current exemptions also apply to digital devices subject to certification. IBM requests that we further amend this section to: 1) allow digital devices which have not been authorized to be operated at the facilities of entities working under the authorization of the manufacturer; 2) permit the pre-authorization delivery of equipment to distributors and retailers; 3) permit demonstrations in commercial establishments of personal computers which have not been certified but have been verified to the Class A limits; and, 4) permit the taking of orders for non-authorized personal computers, subject to a disclaimer reading "Pending FCC Approval".

127. Paragraph (a) of Section 2.806 provides an exemption to Section 2.805 of our marketing rules. Section 2.805 provides that a radio frequency device that does not require Commission approval (the implication of this is that the device is subject to verification) must comply with the specified technical standards prior to being marketed. It does not apply to equipment which is subject to a grant of authorization from the Commission, e.g., certification. Thus, our proposed clarification that the

marketing exemptions do not apply to digital devices subject to certification is consistent with the existing construction of the rules, and we will amend Section 2.806 to avoid further misunderstandings. We also are amending Section 2.805 to specifically state that this section applies to the marketing of equipment subject to verification. We are continuing to limit the marketing exceptions in Sections 2.806(a) and (c)(2) to apply only to verified equipment subject to Section 2.805, as clarified, to prevent possible interference to the authorized services that could result from the marketing of Class B personal computers and peripherals that have not been authorized and may not comply with the standards. We concur with the comments from IBM that the facilities of the manufacturer should include the facilities of those entities working under the authorization of the party responsible for the development and manufacture of the equipment. Thus, the new rules will permit digital devices that have not been authorized to be operated at the facilities of other parties associated with the manufacturer/developer of the equipment. However, we do not agree that the marketing regulations should be amended to permit the taking of orders, including orders from distributors or retailers, or pre-authorized delivery of equipment. Such actions could result in the marketing to the public of non-complying equipment.

V. MISCELLANEOUS ISSUES

128. *Campus Radio Systems.* The *Notice* proposed permitting Part 15 AM radio broadcast systems operating in the band 535-1705 kHz to be installed on the campuses of educational institutions. The general emission limits would apply at the boundary of the campus. IBS and LPB comment that this restriction would pose difficulties for city-bound institutions since they have no actual campus. They also argue that no conducted limits should apply outside of the campus as it is highly impracticable to measure or to prevent such emissions. IBS and LPB request that the operating authority for these stations be expanded. In particular, they request that the frequency band be expanded to cover 525-1705 kHz to permit operation at 530 kHz and that operation be permitted on any frequency outside of the protected field strength contours of licensed AM stations. IBS and LPB state that there is no showing of a need to require verification of these systems. Finally, they argue that data to be kept on file should be retained at the studio/office location rather than the location of the transmitting equipment.

129. We recognize the requirement that campus radio stations meet the general emissions at the boundary of the campus may pose certain problems for institutions located in cities. However, operators of campus radio stations will have the option of meeting the emissions standards at the boundary of the institution or of using transmitters that have been authorized for use in this band under the general standards provided (Sections 15.219 or 15.221). We believe the potential for interference to licensed AM stations is too great, particularly in urban areas, to allow campus stations to exceed the standards provided under these options. To simplify verifying compliance with the conducted emissions limits, we will permit measurement of conducted emissions of each individual transmitter used in the system, rather than the system as a whole. We find it desirable to expand the frequency range over which campus stations may operate to include 525 kHz for the reasons indicated by IBS and LPB. The new rules will permit operation of these stations in the band 525-1705 kHz. However, the new rules will specify that campus stations must not operate within the protected field strength contour of licensed AM stations operating on the same frequency. With regard to verification of campus systems, we maintain that it is necessary to perform the required measurements to ensure that the system complies with the emissions standards. Finally, we find it acceptable to permit the verification records to be kept at the station studio, office, control room or transmitter location, as may be preferred by the station operator, and are providing for this discretion in the new rules.

130. *Spread Spectrum Systems.* In the *Notice*, we proposed to retain the current provisions for direct sequence and frequency hopping spread spectrum operation within the frequency bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz. We also proposed to clarify the requirements on the gain processing and bandwidth employed by receivers used with spread spectrum systems to ensure that an actual spread spectrum system, and not just a spread spectrum transmitter, is employed. Further, comments were requested on the feasibility of designating field strength limits instead of the current limit on transmitter output power.

131. While a number of comments addressed the questions raised in the *Notice* concerning the bandwidth of the receiver, the level of gain processing that should be employed in the receiver and the application of field strength limits, we are not resolving these issues in this Order. These issues and the use of spread spectrum modulation techniques other than direct sequence and frequency hopping will be addressed in the near future in another rule making proceeding.

132. *Specialized Field Disturbance Sensors (Vehicle Radar Systems).* The *Notice* observed that the Commission has issued a waiver to Vehicle Radar Safety Systems, Inc. (VRSS) to permit the operation of a collision avoidance system with a field strength limit 9.5 dB higher than permitted for field disturbance sensors under the current rules. [53] Comments were solicited as to whether higher field strength limits should be permitted for field disturbance sensors used in specialized operations requiring additional range, provided the need for additional range can be demonstrated and the likelihood of increased interference is negligible. While the comments addressing this issue generally support our proposal, we are not adopting a specific regulation concerning waivers of the emission limits for field disturbance sensors. We will continue, as in the past, to entertain waiver requests on a case-by-case basis. This will allow requests for waivers to be considered on their individual merits, including whether operation under one of the licensed radio services is feasible. Further, this review will permit coordination with NTIA when an operation is conducted on frequency bands allocated to the U. S. Government.

133. *Automatic Vehicle Identification Systems.* The *Notice* proposed to delete the provisions for automatic vehicle identification systems (AVIS) in the 2.9-4.1 GHz band. The deletion of AVIS was proposed due to the lack of use of these provisions and the inclusion of a number of restricted bands within the currently employed frequency range. Since issuance of the *Notice*, the Commission has been contacted informally by the Arizona Department of Transportation (AZDOT) regarding a multi-state AVIS system it has under development. As stated in the *Notice*,

we are concerned about possible interference to sensitive receivers employed by the U. S. Government for radiolocation systems in those portions of the 2.9-3.6 GHz band that are not listed as restricted bands. On the basis of these considerations, we will continue to permit AVIS systems in those portions of the 2.9-4.1 GHz band that have not been designated as restricted bands. However, we intend to revisit the need for retaining provisions for AVIS in a future rule making proceeding.

134. *Tunnel Radio Systems.* The *Notice* proposed to allow operation under Part 15 within tunnels or mines without the specification of emission limits except for radio frequency energy radiated outside of the tunnel or mine. While none of the comments object to the provisions for a tunnel radio system, Spectrum Measurement Corp. questions why it is necessary to exclude from the tunnel radio provisions an outside system used to receive signals rebroadcast within a tunnel. The reason for exempting RF devices employed within a tunnel or mine from the technical standards, including the individual equipment authorization requirements, was based on the premise that the natural earth and/or water boundaries of the tunnel or mine would tend to act like a screen room, attenuating the signals radiated from that tunnel or mine. Emissions from equipment located outside of the tunnel or mine would not be so attenuated. Thus, RF equipment located outside of the tunnel or mine must still demonstrate compliance with the necessary standards and must comply with the appropriate equipment authorization requirements.

135. *Antenna Connections for Intentional Radiators.* The *Notice* proposed to require Part 15 intentional radiators to be designed in such a manner that only the antenna furnished by the manufacturer could be employed. It stated that the use of a permanently attached antenna or an antenna which employs a unique coupler would satisfy this requirement. This was proposed because the antenna characteristics directly affect the field strength of the radio frequency emissions. A number of comments object to this proposal, citing that such a regulation would make it difficult for the user to replace a broken antenna. The Commission agrees with the comments and is revising the proposed language to permit a manufacturer to design the equipment so that a broken antenna can be replaced by the user. However, in order to ensure that only an antenna of the type originally furnished by the manufacturer is used and to preclude replacement of the original antenna with one that increases the radiated signals, we are prohibiting the use of a standard antenna jack or electrical connector, similar to the regulation presently applied to cordless telephones. In addition, we are exempting from this requirement devices that have standards expressed only in terms of transmitter output power levels instead of field strength limits, devices that must be measured for compliance with our emission standards at the installation site, and devices that must be professionally installed.

136. *Use of Multiple Intentional Radiators.* In the *Notice*, we proposed to prohibit the use of multiple radiators for the purpose of extending transmission range or for extending the area of coverage. Biomedical telemetry devices were proposed to be excluded from this requirement as long as such devices were restricted to a localized area such as a hospital or residence. The comments in this proceeding generally object to this proposal. For example, AT&T states that it sees no need to exclude multiple emitters because the field strength limits will prevent significant interference from any given radiator and the authorization of such operation might enable the provision of a cellular-type building paging system under Part 15. AT&T adds that multiple intentional radiators should be permitted in commercial environments when installed in accordance with the manufacturer's instructions, provided the field strength at a distance of 30 meters outside of the commercial property boundary does not exceed the limits in the proposed Section 15.109(c). Sensormatic objects to the proposal since they use multiple antennas with their field disturbance sensors used for anti-theft tag sensors for the coverage of exits. GM expresses similar concerns about applying this requirement to field disturbance sensors. PA Consulting Group indicates that Part 15 multiple digital spread spectrum repeaters are desirable to permit high throughput coverage of an area. Manufacturers of control and security alarm devices request the deletion of this provision to allow RF link relays for life-safety applications.

137. We are not adopting a prohibition on the use of multiple transmitters to extend transmission range or coverage area. [54] We concur with the comments that multiple devices should be permitted provided the individual transmitters comply with the rules. However, we are denying the request by AT&T to allow multiple intentional radiators in a commercial environment with field strength limits measured 30 meters beyond the property boundary. The higher field strengths used by such systems would pose unacceptable potential for interference to authorized services.

138. *TV Interface Devices.* The *Notice* proposed to delete the limits applied to RF signals that are conducted over the output connecting cable of a TV interface device. Additional changes to TV interface devices, such as the type of equipment authorization that should be applied to cable system terminal devices and the level of attenuation needed for transfer switches were addressed in the comments. However, regulations concerning TV interface devices, including output signal limits, cable terminal devices and transfer switches, were recently finalized by the Commission in Docket No. 85-301 [55] and Docket No. 87-107. [56] As the regulations applicable to TV interference devices were considered in those earlier proceedings, the rules adopted in those proceedings will be incorporated into this Order.

139. *TV Broadcast Receivers.* Upon further consideration, we have decided to retain the definition contained in our current rules for a television broadcast receiver. Our proposed definition would have required that TV receivers be designed to receive both television pictures and sound, whereas the current definition requires only the reception of television pictures. We recognize that in the future some television broadcast receivers may be designed to receive only the video transmission, with the audio signal being provided by a separate receiver. Under such circumstances, the video-only receiver would not fall within our proposed definition of a television broadcast receiver and, therefore, the all-channel tuning requirements [57] would not apply. We continue to believe that it is important to require television receivers to comply with the all-channel tuning regulations, even if those receivers are not designed to receive the audio portion of the television transmission. This is accomplished by retaining the current definition of a television broadcast receiver.

140. We are adopting a minor change to the rules for TV broadcast receivers. Under Section 15.66(d) of the current regulations, when a TV tuner is built-in as part of a video tape recorder which uses a power splitter between the antenna terminals of the video tape recorder and the input terminals of the TV tuner, 4 dB may be subtracted from the noise figure measured at the antenna terminals of the video tape recorder. [58] This 4 dB allowance is to compensate for the effect of the power splitter. Since implementation of this regulation, we have observed that some TV broadcast receivers are being manufactured with more than one UHF tuner to allow operational features such as split-screen viewing. If a TV broadcast receiver incorporates more than one UHF tuner with a power splitter between the antenna terminals of these tuners, we are permitting this same 4 dB allowance to the noise figure measurement taken at the antenna terminals of the receiver. [59]

141. *Exemption for Digital Devices with Low Power Consumption.* In the *Notice*, we proposed to exempt digital devices with a power consumption not exceeding 6 nW from the technical standards, including the authorization, testing and importation requirements. [60] Similarly, we proposed to exempt quartz watches and clocks, modules of quartz watches and clocks, musical greeting cards, and battery powered, hand-held calculators and electronic games not requiring connection to the AC power lines. In its comments, Linear objects to the exemption from the importation requirements for electronic games, stating that there is no apparent difference in interference potential between such games and radio receivers. We disagree with Linear's position. Electronic games operate at much lower frequencies than radio receivers and must be battery operated to qualify under the exemption. As discussed earlier in this Order, the predominate source of lower frequency emissions, i.e., those below 30 MHz, are from the AC power lines. Radio receivers generate emissions at considerably higher frequencies. These higher frequency emissions can radiate effectively from the receiver, regardless of whether or not the receiver is connected to the AC power lines. Because of their low power consumption, the devices proposed for exemption have a low potential for causing interference to the authorized service, and, therefore, it is not necessary to subject them to the authorization, testing and importation requirements. Thus, we are adopting our proposal. This action is consistent with the Public Notice released by our Field Operations Bureau on May 13, 1987. [61]

142. *Radio Frequency Defined to 9 kHz.* The *Notice* proposed to change the definition of radio frequency energy, and the associated definition of digital devices, to include devices operating as low as 9 kHz instead of the current specification of 10 kHz. AT&T and Spectrum Measurement Corp. object to this proposal. Spectrum Measurement Corp. indicates that a number of digital devices, i.e., switching power supplies, were designed with clock rates between 9 kHz and 10 kHz in order to avoid placement under the standards for digital devices. The change to 9 kHz was proposed in the *Notice* to correspond to the change in the definition of radio frequency energy contained in the 1979 Final Acts of the World Administrative Radio Conference, making our rules consistent with international standards. [62] Further, the band 9-10 kHz is allocated for radionavigation and must be protected from interference from Part 15 devices. Thus, a change to the definition of radio frequency energy to include emissions between 9-10 kHz is being adopted in this Order. However, manufacturers are being allowed up to five years before digital devices operating within the band 9-10 kHz must comply with the regulations.

143. *Requests for Allocation of Spectrum.* SEIA, along with a number of manufacturers of control and security alarm devices, requests the Commission to allocate specific frequencies for their equipment, particularly security and life-safety equipment. SEIA requests that we recognize a priority right for Part 15 security and life safety devices to operate in designated frequency segments with protection against interference from any non-safety related devices. Rollins states that the time has come for the Commission to recognize the control and security alarm industry and that it should establish a group of frequencies that they can use with recognition of their use as a valid radio service. These requests involve frequency allocation issues and, therefore, are beyond the scope of this proceeding. Accordingly, we will not address them herein.

VI. TRANSITION TIMES FOR COMPLYING WITH THE NEW RULES

144. As with any significant revision of a long standing regulatory process, it will be necessary for manufacturers to make changes in some Part 15 devices that currently are being marketed. To the extent possible, we have attempted to anticipate the problems that may arise. In the *Notice*, we proposed to provide lengthy transition periods in cases where manufacturers are required to build to tighter standards. More specifically, we proposed to allow receivers to be manufactured and imported under the current regulations for a period of ten years. A similar ten year transition period was proposed for intentional radiators operating at 27 MHz and 49 MHz and for cordless telephones. The possibility of a ten year transition period for other affected devices was raised in the *Notice*.

145. None of the comments objected to the ten year transition period proposed for receivers. The manufacturers of control and security alarm device transmitters, e.g., DORCMA, GM, Genie, ITI, Linear, SEIA and Stanley, request that they be provided the same ten year period allowed for receivers. Linear argues that a long transition time is needed to amortize investment in current designs and tooling, to create new, compliant designs and to obtain the required lines of supply and tools for production. NTIA comments that there should be no transition periods for devices using the new bands made available in this proceeding.

146. As proposed in the *Notice*, we are adopting a ten year transition period for receivers. Because of the significant changes being made to the standards applied to receivers, a longer period is necessary to allow manufacturers to create new, compliant designs. Accordingly, we will allow such receivers to be imported, manufactured domestically and authorized under the existing regulations for a period of ten years following the effective date of this Order. We have not specified an earlier date by which receivers must be authorized to show compliance with the new rules. However, the importers and manufacturers should note that it is their responsibility to determine at what time authorization under the standards adopted in this Order should be obtained. We do not plan to grant any extensions to the manufacture and importation transition period based on the date that authorization was obtained on a receiver. It should be noted that if a

receiver is associated with a transmitter operating under regulations that were not in effect prior to the adoption of this Order, no transition period is being implemented for that receiver. Obviously, such receivers must be designed concurrently with the transmitters and matters such as redesign and retrofitting are not relevant.

147. We are not adopting the ten year transition provisions specifically proposed in the *Notice* for cordless telephones or intentional radiators operating at 27 or 49 MHz. Paragraph 46, *supra*, provides the reasons why this lengthy transition provision is no longer needed for cordless telephones and intentional radiators operating in the 49 MHz band. For intentional radiators operating in the 27 MHz band, the regulations being adopted would not require significant modifications to existing devices, allowing the implementation of a shorter transition provision. For operation in the 27 MHz band, we are retaining the current application of average emission measurements, as indicated in paragraph 34, *supra*. In addition, while we have reduced the levels of unwanted emissions permitted from these devices, we have expanded the existing frequency band to permit operation anywhere within the band 26.96-27.28 MHz. This expansion provides "guard bands", within which currently designed equipment would no longer be required to reduce unwanted emissions. These "guard bands" facilitate the ability of currently designed equipment to comply with the limits on unwanted emissions that are being adopted.

148. We do not believe that it is necessary to provide a ten year period for implementation of the new Part 15 rules for Part 15 devices other than receivers. First, the new rules permit transmitters to operate with higher levels of radiated emissions and therefore a greater potential for causing interference. Second, technical standards for transmitters and unintentional radiators (other than receivers) have not been significantly changed. Thus, the degree of redesign needed to bring these devices into compliance with the new rules is not great. The major change to the regulations that would most likely require the redesign of a product is the adoption of additional restricted bands. The interference protection to be provided to services operating in the restricted bands should be instituted as soon as feasible. Third, in the previously cited *Report and Order* in Docket No. 86-422, the manufacturers of control and security alarm devices, in response to a Commission proposal to adopt emission limits for their devices, indicated that transition times of 24 months on obtaining a new grant of equipment authorization and 30 months on manufacturing and importation was acceptable. Thus, we believe that a general ten year transition period for intentional radiators is unreasonable.

149. Based on these considerations, except for receivers, we will continue to grant authorizations and permit verification of Part 15 devices that meet the previous standards for a period of three years after the effective date of this *Report and Order*. However, except for receivers, within five years of the effective date of this action, any Part 15 equipment that is manufactured domestically or imported must comply with the new rules. These transition provisions are not expected to present any substantial hardships to the manufacturers of Part 15 devices. However, delegated authority is being granted to the Chief Engineer to provide limited extensions of no more than two years to the transition provisions for those situations where it is shown that additional time is needed.

CONCLUSION

150. The actions being taken in this *Report and Order* represent the Commission's best judgements as to the trade-offs between beneficial low power spectrum use and possible interference to the authorized radio services. We recognize that certain increased risks of interference to authorized devices may result from altering our regulations. However, the rules we are adopting are intended to minimize this interference potential. The field strength limits being adopted for general operation on the frequencies allocated to aviation, public safety, land mobile and most other frequency bands used by the authorized services are the same as those now applied to residential computer products, and those products have not proven to be a major source of interference complaints. In addition, this Order establishes a number of restricted frequency bands, applicable to all Part 15 intentional radiators, in order to provide additional protection to the allocated radio services. Further, except for non-residential perimeter protection systems currently allowed under the rules, we are not permitting the operation under the general limits of transmitters in the TV broadcast bands. On balance, we believe that the public interest benefits of the rule changes being adopted outweigh the potential for increased interference. Since we will be allowing large numbers of new devices on new frequencies, we will be closely monitoring, through the equipment authorization process, the interference potential of these devices. If this discovery process reveals potential interference problems, the limits adopted in this proceeding will be revisited.

151. Certain matters either raised in the *Notice* or subsequently brought to our attention require further review. Additional proceedings may be expected to address such issues as standards that should be applied to kits of radio frequency devices, definitions applicable to digital equipment, spread spectrum operation above 900 MHz, the labelling of verified devices to indicate the identity of the responsible party, and expedited proceedings to resolve cases of widespread interference.

PROCEDURAL MATTERS

152. Pursuant to the Regulatory Flexibility Act of 1980, 5 USC 601 *et seq.*, the following final flexibility analysis has been prepared:

I. Need for and purpose of the rules.

The regulations pertaining to the operation of a radio frequency device without an individual license were incrementally promulgated over the last 35 years resulting in device-specific regulations, inequities in technical standards between devices with similar interference potentials, standards that may be too strict or that have become too lax, and regulations that appear to be confusing to the general public. The existing regulations also prohibit a number of radio frequency operations that could be permitted without unduly increasing the potential for interference to authorized radio services. The Commission is adopting a comprehensive revision of the Part 15 rules to resolve these problems in the existing rules.

II. Summary of issues raised by public comments in response to the initial regulatory flexibility analysis, Commission assessment, and changes made as a result.

No commenting parties raised issues specifically in response to the initial regulatory flexibility analysis. The regulations being adopted in this *Report and Order* relax certain standards and apply tighter limits to others. The proposed regulations are technically and economically achievable without undue burden on any entity and are designed to provide the public and industry with additional flexibility in using radio frequency energy for consumer oriented applications without significantly increasing the potential for interference to the authorized services. In many cases, the potential for interference to the authorized services will be decreased by this action. Because these changes to the regulations will result in impact to a number of manufacturers, requiring redesign of their equipment, liberal transition provisions are being adopted. These transition provisions will lessen the impact to manufacturers, allowing many types of devices to be cycled through numerous design changes before compliance with the regulations adopted by this *Report and Order* is required.

III. Significant alternatives considered.

The Commission has considered all of the alternatives presented in this proceeding and has adopted standards that can be achieved by industry while still protecting authorized users of the radio spectrum from interference. Alternatives include deleting all emission standards and restrictions on the marketing of non-complying equipment, retaining the present regulations, adopting the regulations proposed in the *Notice of Proposed Rule Making*, adopting tighter standards than proposed, or a combination of these.

153. The proposal contained herein has been analyzed with respect to the Paperwork Reduction Act of 1980 and found to impose a new or modified information collection requirement on the public. Implementation of any new or modified requirement will be subject to approval by the Office of Management and Budget as prescribed by the Act.

ORDERING CLAUSES

154. Accordingly, IT IS ORDERED that under the authority contained in Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 303(s), 304 and 307 of the Communications Act of 1934, as amended, Parts 2 and 15 of the Commission's Rules and Regulations ARE AMENDED as set forth in Appendix B below. These rules and regulations are effective **June 23, 1989.**

FEDERAL COMMUNICATIONS COMMISSION

Donna R. Searcy
Secretary

APPENDIX A

Comments on GEN Docket No. 87-389 were received from the following:

Phil Adamsak

ADC Telecommunications, Inc. (ADC)

Aerospace & Flight Test Radio Coordinating Council (AFTRCC)

Amador Corporation (Amador)

Ambico, Inc.

Allen-Bradley Company (Allen-Bradley)

American Radio Relay League, Incorporated (the League)

American Telephone and Telegraph Company (AT&T)

Michael St. Angelo

Clifford J. Appel

Arizona Dept. of Transportation (AZDOT)

The Association of American Railroads (AAR)

The Association of Maximum Service Telecasters (MST)

The Association of North American Radio Clubs (ANARC)

Robert M. Ayers

Vincent Bafetti

Gregory A. Baker

Peter Thomas Baldwin

Herbert F. Barnes

C. O. Bennett

Joseph Bennett

Marianne Bense

James A. Betteley

Gerald W. Bishop

Homer P. Blincoe (with Electromagnetic Sciences, Inc.)

Ronold H. Bofeth

Harold F. Bower

Wayne V. Britton

E. Miles Brown

R. J. Brown

Timothy P. Brown

J. L. Browning

James C. Brownlee, Jr.

John W. Bryant

Robert A. Burbe

Gene Burton

Michael Butts

Cliff Buttschardt

David G. Cantor

Donald Carr

Michele Carr
Richard S. Carroll
James A. Carson
The Chamberlain Group, Inc. (Chamberlain)
Henri J. Chapdelaine
George N. Christoff
Rolan O. Clark (President, Fredrick Amateur Radio Club)
Carl Clawson
Oscar E. Clinton
Thomas L. Collinvitti
The Computer and Business Equipment Manufacturers Association (CBEMA)
Computer Contact Corporation
COMSAT Amateur Radio Club (CARC)
Control Data Canada (CDC)
Eileen A. Cook
John G. Cook
Jeffrey L. Cooper
Lewis R. Coulborn
James O. Cowee
Daniel O. Craig
Lester D. Crawford
Harry A. Crespy
Dennis R. Curry
Kenneth A. & Barbara J. Czarniecki
Michael A. Czuhajewski
Dallas Semiconductor (Dallas)
Douglas L. Datwyler
Robert Davidson
Carlton Davis
L. S. Davis, Jr.
Donald F. Deakin
Edward C. Deichler
Philip DeJarlais
Louis J. Devillon
David R. DeSpain
Warren J. Dickie
Tony DiFlorio
Digital Equipment Corporation (Digital)
David G. Doernberg
Door Operator and Remote Controls Manufacturers Association (DORCMA)
Dennis G. Douglas
Joan Drezhlo
Silas T. Dunn III
William K. Dvorak
Jimmie D. Edrington
Electronic Industries Association, Consumer Electronics Group (EIA/CEG)
Electronic Industries Association, Land Mobile Radio Section (EIA/LMRS)
Electronic Industries Association, Personal Communications Section (EIA/PCS)
Electronic Industries Association of Japan, EMC Overseas (Standards and Regulations) Steering Committee for Consumer Electronic Equipment (EIAJ)
Jeff Elson
EnScan, Inc. (EnScan)
Epstein Associates
Barbara B. Erbacher
Frank C. Erbacher
Thomas A. Farr
J. Trent Felten
William J. Fernandez
Kenneth D. Fields
Fifth Generation Audio
Fisher Research Laboratory (Fisher)
Joseph J. Fitzgerald
Terry E. Flach
William F. Flynn
Gerald M. Foley
Mark M. Forbes
Mark S. Fosella
Congressman Barney Frank
Carl Frank
Robert J. Frediani
Free State Amateur Radio Club
John F. Gallagher
Martin H. Gallas
William R. Gardner
Edward T. Gelinas
Gemini Industries, Inc.
General Electric Company (GE)
General Instrument Corporation (GIC)
General Motors Research Corporation (GM)
The Genie Company, A Division of North American Philips Corp. (Genie)
George Jacobs & Associates, Inc.
Geostar Corporation (Geostar)
Gillespie, Prudhon & Associates, Inc. and Wilkens Engineering
E. A. Gillis
Paul & Mary Gilmore
Great River Amateur Radio Club
Gary L. Grebus
Chas. H. Green
S. R. Griffiths, et al (petition)

David Guimont
Leanore Guimont
Bill Hafner
Dean W. Hagerty
John Roulstone Hall
Roger P. Hancock
F. M. Hemrich
Timothy Hendel
Ruth M. Hesch
Corydon L. Hine
Frank D. Hixon
Jeffrey A. Horn
Arthur J. Horswill Jr.
James R. Hough, Jr.
Bruce S. Howard
Thomas P. Hughes
Leo L. Hunter
Fred E. Huntley
C. Vernon Hyson
Independence Amateur Radio Club
Independent Data Communications Manufacturers Association (IDCMA)
Interactive Technologies, Inc. (ITI)
Intercollegiate Broadcasting System, Inc. (IBS)
International Business Machines Corporation (IBM)
Daniel Jackson
James L. Jarvis
Jerold R. Johnson
Johnson County Radio Amateurs Club
William S. Karn
Vern Kaspar
Fred Dennis Kedjierski
Francis A. Keegan
Bernhard E. Keiser
Federick Kelcz
Carl Keller
Christopher Kelly
Thomas M. Kinahan, Jr.
Glenn A. King
James M. Kiskis
Kevin J. Klein
Honorable Burton W. Knight, II
Richard Konecny
Dennis J. Kosakowski
Larry Lambert
Richard E. Lambert
Carl J. La Monica
Donald B. Lawson
Timothy Leanhan
James G. Lee
Fred Lehman
George F. Levy
Karl E. Lewis
Noland L. Lewis
William B. Lill
Linear Corporation (Linear)
William A. Lippman, Jr.
Albert S. Lobel
Loc Rad, Inc. (Loc Rad)
Barry A. Lowry
LPB Inc. (2 comments filed)
Peter D. Macripo
Timothy M. Maksymczak
Mammoth Cave Amateur Radio Club
Louis J. Marotta
Timothy R. & Helen J. Marsh & Arthur P. Kay
Keith Martin
Michael A. McCarthy
Ginger Elizabeth McCausey
Don McClure, Jr.
John McCullough
Jim D. McIntosh
Thomas A. McKee
William L. McNabb, Sr.
Carl H. Menne
C. H. Merrell
Charles J. Michaels
Micrilor, Inc.
Michael Mideke
John A. Milhoan
3M Dynatel Systems Division (Dynatel)
Craig V. Moore
Don Moore
James V. Morgan, Jr.
Daniel Mrock
Gregory J. Mumley
David Murphy
James J. Murphy
R. Donald Murray
National Academy of Sciences' Committee on Radio Frequencies (CORF)
National Association of Broadcasters (NAB)
National Cable Television Association, Inc. (NCTA)
National Electrical Manufacturers Association (NEMA)
Greg J. Nazarow

NCR Corporation (NCR)
John Neary
NEC Information Systems, Inc. (NECIS)
Darrell Neft
Nicholas A. Nelson
W. S. Neustadter
Nitech, Inc. (Nitech)
Robert D. Null
Bernard M. Oliver
Michael Ortlieb
John Osborne
Donald R. Palko
Gerald L. Park
Kermit R. Parker
Floyd X. Passmore
PA Technology
Harry B. Payne, Jr.
Alan Perkins
Pico Macom, Inc. (Pico)
Pioneer Communications of America, Inc. (PCA)
Pittway Corporation, under their division, Alarm Device Manufacturing Company (Pittway)
Henry Pokorny
Martin A. Prehm
Public Broadcasting Service (PBS)
Al Quaglieri
Stanley F. Quayle
Charles E. Quentel
Rabbit Systems, Inc. (RSI)
RADAR Inc. (RADAR)
Radio Listed Services
A Radio Repair Man
Radio Road Inc.
Radio Telecom and Technology, Inc. (RTT)
Vincent Reh
Arthur B. Reis
RF Monolithics, Inc. (RFM)
Richard W. Burden Associates
Marc Richman
Donna Kay Ring
Rockwell International Corporation (Rockwell)
Henry C. Rodewald
Charles J. Ross
Thomas Allen Rounds
P. J. Rovero
Werner Rueggeberg
Gene P. Rybolt
Joseph E. Saloka
Kit Sagendorf
Martin C. Sagendorf
Salient Communications Company (Salient)
San Juan County ARES and SJC Radio Club
Stanley John Scalsky
Luther G. Schimpf
Schlage Electronics (Schlage)
Schlumberger, Sangamo Energy Management Division
Joseph J. Schroeder, Jr.
Mary E. Schneider
Erich Schulman
Security Equipment Industry Association (SEIA)
Sensormatic Electronics Corporation (Sensormatic)
Senstar Corporation (Senstar)
SETI Institute
Shenandoah Valley Amateur Radio Club, Inc.
John D. Shoemaker
David Alkire Smith
Mark J. Smith
Thomas W. Smith
Society for Promotion of Amplitude Modulation (SPAM)
Southern California Repeater and Remote Base Association (SCRRBA)
Spectrum Measurement Corporation
Roger G. Spindler
Stanley Electronics (Stanley)
Mitchell Stern
Merrill G. Stiles
David S. A. Stine
Paul M. Stirling
Kenneth E. Stone
Ernest N. Storrs
Kenneth E. Stringham Jr.
Truman J. Sylvester
John A. Taflan, II
Tandy Corporation (Tandy)
Craig N. Teerlink
Glenn Thomas
Thomson Consumer Electronics, Inc. (Thomson CE)
James A. Thornton, et. al.
James K. Thorusen
Transcience Industries (Transcience)
Stephen Trapp
Herb D. Twitchell
U. S. Department of Commerce, National Telecommunications and Information Administration (NTIA) (3 comments)

U. S. Department of the Interior

U. S. Department of Transportation, U. S. Coast Guard (USCG)

Arthur L. Usher

Utility Tool Company (Utility Tool)

Hector Valinzuela

Vernon Valero

Victor Voss

Robert H. Walker

Richard Warren

Washington Area DX Association (WADXA)

J. Allan Waters

Allen Watson

Ronald H. Wenig

John F. Werner, III

Douglas White(unreadable)

Whitewater Hills Amateur Radio Club Inc.

John Wiley

Stephen Wilmet

James C. Wiskow

Mike Witenko

Karl F. Witter

WNMQ, Inc.

Raymond Wolfe

John R. Wright

Harold E. Wyer

Matthew E. Zilmer

Reply comments on Gen. Docket No. 87-389 were received from the following:

Aerospace & Flight Test Radio Coordinating Council (AFTRCC)

Allen-Bradley Company (Allen-Bradley)

Amador Corporation (Amador)

American Council of Independent Laboratories, Inc. (ACIL)

American Radio Relay League, Inc. (the League)

American Telephone and Telegraph Company (AT&T)

Aox Inc.

ARNAV Systems, Inc.

Association of Maximum Service Telecasters (MST)

Association of North American Radio Clubs (ANARC)

Edward V. Breeden III

David R. Burnett

The Chamberlain Group, Inc. (Chamberlain)

Checkpoint Systems, Inc. (Checkpoint)

Robert A. Christensen

Cincinnati Bell Telephone Company

Richard Terrance Colgan

The Computer and Business Equipment Manufacturers Association (CBEMA)

Control Data Canada, Ltd. (CDC)

Door Operator and Remote Controls Manufacturers Association (DORCMA)

Electronic Industries Association, Consumer Electronics Group (EIA/CEG)

Gambatte Inc.

William R. Gardner

General Electric Company (GE)

General Instrument Corp. (GIC)

General Motors Research Corporation (GM)

Honeywell Inc. (Honeywell)

Independent Data Communications Manufacturers Association, Inc. (IDCMA)

International Business Machines Corporation (IBM)

Linear Corporation (Linear)

Metrotech

3M Dynatel Systems Division (Dynatel)

National Academy of Sciences' Committee on Radio Frequencies (CORF)

National Association of Broadcasters (NAB)

National Association of State Aviation Officials (NASAO)

National Burglar & Fire Alarm Associates, Inc.

National Business Aircraft Association, Inc. (NBAA)

National Electrical Manufacturers Association (NEMA)

O'Neill Communications, Inc. (OCI)

PA Consulting Group

Pittway Corporation (Pittway)

Public Broadcasting Service (PBS)

Rabbit Systems, Inc. (RSI)

Radio Technical Commission for Maritime Services (RTCM)

Rollins, Inc. (Rollins)

Security Equipment Industry Association (SEIA)

Sensormatic Electronics Corporation (Sensormatic)

Senstar Corp. (Senstar)

Stellar Systems Inc. (Stellar)

Tandy Corporation (Tandy)

Texas Instruments, Inc. (TI)

U. S. Department of Commerce, National Telecommunications and Information Administration (NTIA)

U. S. Department of Transportation, Federal Aviation Administration (FAA)

Utilities Telecommunications Council (UTC)

Wild Goose Association

Zenith Electronics Corporation (Zenith)

APPENDIX B

A. Title 47 of the Code of Federal Regulations, Part 2, is amended as follows:

1. The authority citation for Part 2 continues to read as follows:

Authority: Sec. 4, 302, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, and 307, unless otherwise noted.

2. Section 2.801 is amended by revising paragraph (b) to read as follows:

Section 2.801 ***Radiofrequency device defined.***

* * * * *

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this Chapter.

* * * * *

3. Section 2.805 is revised to read as follows:

Section 2.805 ***Equipment that does not require Commission approval.***

In the case of a radio frequency device that, in accordance with the rules in this Chapter, does not have to have a grant of equipment authorization issued by the Commission, e.g., a device subject to verification, but, nevertheless, must comply with specified technical standards prior to use, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purposes of selling or leasing or offering for sale or lease, any such radio frequency device unless, prior thereto, such device complies with the applicable administrative and technical provisions (including verification of the equipment, where required) specified in the Commission's rules.

4. Section 2.806 is amended by revising the title and text to read as follows:

Section 2.806 ***Exemption for a digital device.***

(a) Notwithstanding the provisions in Section 2.805, the announcement and offer for sale of a digital device, subject to verification under the provisions in Part 15 of this Chapter, that is in the conceptual, developmental, design or preproduction stage is permitted prior to verification of compliance, *provided* the prospective buyer is advised in writing at the time of announcement or offer for sale that such equipment is subject to the FCC rules and that such equipment shall comply with the appropriate FCC rules before final delivery to the buyer or to centers of distribution.

(b) Parties responsible for verification of Class A digital devices, as defined in Part 15 of this Chapter, shall have the option of ensuring compliance with the applicable technical specifications of this Chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

(c) A digital device subject to the provisions of this Chapter may be operated prior to a determination of compliance under the following conditions:

(1) Any digital device may be operated for the purpose of compliance testing.

(2) Any digital device may be operated for the purpose of demonstration at a trade show provided there is displayed a conspicuous notice that the device has not been tested for compliance. If a digital device subject to verification is offered for sale or lease at the show, the provisions of Section 2.806(a) shall apply. A digital device subject to a grant of equipment authorization from the Commission may not be offered for sale or lease prior to issuance of the grant of authorization by the FCC, but may be advertised or displayed as provided by Section 2.803.

(3) Any digital device may be operated at the manufacturer's facilities during developmental, design or preproduction states for evaluation of product performance and determination of customer acceptability.

(4) Where customer acceptability of a Class A digital device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, that device may be operated at the user's site during development, design or preproduction stages for evaluation of product performance and determination of customer acceptability.

(5) For the purpose of paragraphs (c)(3) and (c)(4) of this Section, the manufacturer's facilities are considered to include the facilities of the party responsible for compliance with the regulations, the manufacturer, and other entities working under the authorization of the responsible party in connection with the development and manufacture, but not marketing, of the equipment.

5. Section 2.909 is redesignated as Section 2.911.

6. Section 2.910 is redesignated as Section 2.913.

7. A new Section 2.909 is added before the heading "Application Procedures for Equipment Authorizations", to read as follows:

Section 2.909 ***Responsible party.***

The following parties are responsible for the compliance of radio frequency equipment with the applicable technical standards after a grant of equipment authorization is issued by the Commission or the equipment is verified:

(a) In the case of equipment which requires the issuance by the Commission of a grant of equipment authorization, the party to whom that grant of authorization is issued (the grantee).

(b) In the case of equipment subject to authorization under the verification procedure, the manufacturer or, in the case of imported equipment, the importer.

8. A new Section 2.948 is added to read as follows:

Section 2.948 *Description of measurement facilities.*

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this Chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U. S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification or the notification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this Section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

(b) The description shall contain the following information:

(1) Location of the test site.

(2) Physical description of the test site accompanied by photographs 8" x 10" in size. Smaller photographs may be used if they clearly show the details of the test site and are mounted on full size sheets of paper.

(3) A drawing showing the dimensions of the site, physical layout of all supporting structures, and all structures within 5 times the distance between the measuring antenna and the device being measured.

(4) Description of structures used to support the device being measured and the test instrumentation.

(5) List of measuring equipment used.

(6) Information concerning the calibration of the measuring equipment, i.e., the date the equipment was last calibrated and how often the equipment is calibrated.

(7) If desired, a statement as to whether the test site is available to do measurement services for the public on a fee basis.

(8) A plot of site attenuation data taken pursuant to FCC Bulletin OET 55 using a tuned dipole antenna (this provision does not apply to equipment that is not measured on an open field test site).

(9) A description of the types of equipment intended to be measured or other information regarding the types of measurements that would be performed at the test facility.

(c) The Commission will publish a list of those parties who have filed the information required by this section, provided they indicate that they wish to perform measurement services for the public on a fee basis. However, it should be noted that the Commission does not endorse or approve any facility on this list.

9. Section 2.955 is amended by adding new paragraphs (a)(3) and (a)(4) to read as follows:

Section 2.955 *Retention of records.*

(a) * * *

(3) A record of the measurements made on an appropriate test site that demonstrates compliance with the applicable regulations. The record shall identify the measurement procedure that was used and shall include all the data required to show compliance with the appropriate regulations.

(4) For equipment subject to the provisions in Part 15 of this Chapter, the records shall indicate if the equipment was verified pursuant to the transition provisions contained in Section 15.37 of this Chapter.

* * * * *

10. Section 2.975 is amended by revising paragraph (a)(5) and by adding new paragraphs (a)(7), (f) and (g) to read as follows:

Section 2.975 *Application for notification.*

(a) * * *

(5) For devices operated under the provisions of Part 15 of this Chapter, photographs showing the general appearance and the controls available to the user. Photographs should be 8 by 10 inches in size. Smaller photographs may be submitted provided they are sharp and clear, show the necessary detail, and are mounted on paper between 8 by 10 1/2 inches and 8 1/2 by 11 inches. Line sketches may be submitted in lieu of photographs provided those sketches are sufficiently detailed to allow identification of the equipment. For devices operated under the provisions of any other Part and where it is specifically required under the rule section(s) under which the device is to be operated, photographs of the equipment of sufficient clarity to reveal its external appearance and size, both front and back;

* * * * *

(7) For equipment subject to the provisions of Part 15 of this Chapter, the application shall indicate if the equipment is being authorized pursuant to the transition provisions in Section 15.37 of this Chapter.

* * * * *

(f) For a composite system that incorporates only devices subject to certification, verification and/or notification and that are contained in a single enclosure, a separate application, FCC Form 731, with the appropriate fee shall be submitted for each type of device within the enclosure. At the option of the applicant, a single FCC identifier may be requested for that system. Fees are based on the number of devices and types of authorizations.

(g) The records of measurement data, measurement procedures, photographs, circuit diagrams, etc. for the device to which the application applies shall be retained for two years after the manufacture of said equipment has been permanently discontinued, or until the conclusion of an investigation or proceeding if the holder of the grant of equipment authorization is officially notified that an investigation or any other administrative proceeding involving the equipment has been instituted.

11. Section 2.1033 is amended by revising paragraphs (b) and (c) and by adding new paragraphs (b)(1) through (b)(10) to read as follows:

Section 2.1033 *Application for certification.*

* * * * *

(b) The application shall be accompanied by a technical report containing the following information:

(1) The full name and mailing address of the manufacturer of the device and the applicant for certification.

(2) FCC identifier.

(3) A copy of the installation and operating instructions to be furnished the user. A draft copy of the instructions may be submitted if the actual document is not available. The actual document shall be furnished to the FCC when it becomes available.

(4) A brief description of the circuit functions of the device along with a statement describing how the device operates. This statement should contain a description of the ground system and antenna, if any, used with the device.

(5) A block diagram showing the frequency of all oscillators in the device. The signal path and frequency shall be indicated at each block. The tuning range(s) and intermediate frequency(ies) shall be indicated at each block. A schematic diagram also is required for intentional radiators.

(6) A report of measurements of radiated and conducted emissions. This shall identify the test procedure used (e.g., indicate the FCC test procedure used or, if an alternate test procedure was used, a description of the test procedure and the reason it was necessary to use an alternate procedure), the date the measurements were made, the location where the measurements were made, and the device tested (model and serial number, if available). It shall also include a sample calculation showing how the obtained measurements were converted to the levels specified in the applicable rule sections.

(7) A sufficient number of photographs to clearly show the exterior appearance, the construction, the component placement on the chassis, and the chassis assembly. The exterior views shall show the overall appearance, the antenna used with the device (if any), the controls available to the user, and the required identification label in sufficient detail so that the name and FCC identifier can be read. In lieu of a photograph of the label, a sample label (or facsimile thereof) may be submitted together with a sketch showing where this label will be placed on the equipment. Photographs shall be 8 by 10 inches in size. Smaller photographs may be submitted provided they are sharp and clear, show the necessary detail, and are mounted on paper between 8 and 10 1/2 inches and 8 1/2 by 11 inches in size. A sample label or facsimile together with the sketch showing the placement of this label shall be on the same size paper.

(8) If the equipment for which certification is being sought must be tested with peripheral or accessory devices connected or installed, a brief description of those peripherals or accessories. The peripheral or accessory devices shall be unmodified, commercially available equipment.

(9) For equipment subject to the provisions of Part 15 of this Chapter, the application shall indicate if the equipment is being authorized pursuant to the transition provisions in Section 15.37 of this Chapter.

(10) For a device used in decoding the Emergency Broadcast System Attention Signal, as defined in Section 73.906 of this Chapter, the value of the necessary voltage (RMS) or range of voltages of the attention signal to be applied to the input terminals of the decoder which will cause the desired response of the device. In the event that input signals other than the attention signal (excluding signals which in combination form the attention signal), including signals outside this voltage range, will cause false responses by the device, a description of such signals and their input voltage levels that cause such false responses shall be specified in the application and appropriate warnings shall be included in the instructions furnished to the user. The susceptibility of the device to false responses and any lack of reliability in responding to the attention signal at input levels within the rated voltage range may be regarded by the Commission as cause to deny certification.

(c) For a composite system that incorporates only devices subject to certification, verification and/or notification and that are contained in a single enclosure, a separate application, FCC Form 731, shall be submitted with the appropriate fee for each type of device within the enclosure. At the option of the applicant, a single FCC identifier may be requested for that system. Fees are based on the number of devices and types of authorizations.

12. Section 2.1043 is amended by revising paragraphs (a) and (c) and adding a new paragraph (b)(3) to read as follows:

Section 2.1043 *Changes in certificated equipment.*

(a) Changes to the basic frequency determining and stabilizing circuitry (including clock or data rates), frequency multiplication stages, basic modulator circuit or maximum power or field strength ratings shall not be performed without application for and authorization of a new grant of certification. Variations in electrical or mechanical construction, other than these indicated items, are permitted provided the variations either do not affect the characteristics required to be reported to the Commission or the variations are made in compliance with the other provisions of this Section.

(b) * * *

(3) Permissive changes, as detailed above, shall be made only by the holder of the grant of certification. Changes by any party other than the grantee require a new application for and grant of certification.

(c) A grantee desiring to make a change other than a permissive change shall file an application on FCC Form 731 accompanied by the required fees. The grantee shall attach a description of the change(s) to be made and a statement indicating whether the change(s) will be made in all units (including previous production) or will be made only in those units produced after the change is authorized.

* * * * *

13. Section 2.1201 is amended by adding a new paragraph (c) after the Note to read as follows:

Section 2.1201 ***Purpose.***

* * * * *

(c) The provisions of this Subpart shall not apply to musical greeting cards, quartz watches and clocks, modules of quartz watches and clocks, radio frequency devices (including digital devices) whose radio frequency stage has a power consumption not exceeding 6 nW, hand-held calculators and electronic games that do not require connection to the AC power lines, and digital devices in which both the highest frequency generated and the highest frequency used are less than 1.705 MHz and that do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

B. Title 47 of the Code of Federal Regulations, Part 15, is amended as follows:

1. The authority citation for Part 15 is amended to read as follows:

Authority: Sec. 4, 302, 303, 304, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, 304, and 307.

2. Part 15 is revised in its entirety to read as follows:

PART 15 - RADIO FREQUENCY DEVICES

Subpart A - General

Section 15.1	Scope of this Part.
Section 15.3	Definitions.
Section 15.5	General conditions of operation.
Section 15.7	Special temporary authority.
Section 15.9	Prohibition against eavesdropping.
Section 15.11	Cross reference.
Section 15.13	Incidental radiators.
Section 15.15	General technical requirements.
Section 15.17	Susceptibility to interference.
Section 15.19	Labelling requirements.
Section 15.21	Information to user.
Section 15.23	Home-built devices.
Section 15.25	Kits.
Section 15.27	Special accessories.
Section 15.29	Inspection by the Commission.
Section 15.31	Measurement standards.
Section 15.33	Frequency range of radiated measurements.
Section 15.35	Emission limits.
Section 15.37	Transition provisions for compliance with the rules.

Subpart B - Unintentional Radiators

Section 15.101	Equipment authorization of unintentional radiators.
Section 15.103	Exempted devices.
Section 15.105	Information to the user.
Section 15.107	Conducted limits.
Section 15.109	Radiated emission limits.
Section 15.111	Antenna power conducted limits for receivers.
Section 15.113	Power line carrier systems.
Section 15.115	TV interface devices, including cable system terminal devices.
Section 15.117	TV broadcast receivers.

Subpart C - Intentional Radiators

Section 15.201	Equipment authorization requirement.
Section 15.203	Antenna requirement.
Section 15.205	Restricted bands of operation.
Section 15.207	Conducted limits.
Section 15.209	Radiated emission limits, general requirements.
Section 15.211	Tunnel radio systems.
Section 15.213	Cable locating equipment.

Radiated Emission Limits, Additional Provisions

Section 15.215	Additional provisions to the general radiated emission limitations.
Section 15.217	Operation in the band 160 - 190 kHz.
Section 15.219	Operation in the band 510 - 1705 kHz.
Section 15.221	Operation in the band 525 - 1705 kHz.
Section 15.223	Operation in the band 1.705 - 10 MHz.
Section 15.225	Operation within the band 13.553 - 13.567 MHz.
Section 15.227	Operation within the band 26.96 - 27.28 MHz.
Section 15.229	Operation within the band 40.66 - 40.70 MHz.

Section 15.231	Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.
Section 15.233	Operation within the bands 46.60 - 46.98 MHz and 49.66 - 50.0 MHz.
Section 15.235	Operation within the band 49.82 - 49.90 MHz.
Section 15.237	Operation in the bands 72.0 - 73.0 MHz and 75.4 - 76.0 MHz.
Section 15.239	Operation in the band 88 - 108 MHz.
Section 15.241	Operation in the band 174 - 216 MHz.
Section 15.243	Operation in the band 890 - 940 MHz.
Section 15.245	Operation within the bands 902 - 928 MHz, 2435 - 2465 MHz, 5785 - 5815 MHz, 10500 - 10550 MHz, and 24075 - 24175 MHz.
Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz.
Section 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.
Section 15.251	Operation within the bands 2.9-3.26 GHz, 3.267 - 3.332 GHz, 3.339 - 3.3458 GHz, and 3.358 - 3.6 GHz.

Authority: Sec. 4, 302, 303, 304, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, 304, and 307.

Subpart A - General

Section 15.1 *Scope of this Part.*

(a) This Part sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

(b) The operation of an intentional or unintentional radiator that is not in accordance with the regulations in this Part must be licensed pursuant to the provisions of Section 301 of the Communications Act of 1934, as amended, unless otherwise exempted from the licensing requirements elsewhere in this Chapter.

(c) Unless specifically exempted, the operation or marketing of an intentional or unintentional radiator that is not in compliance with the administrative and technical provisions in this Part, including prior Commission authorization or verification, as appropriate, is prohibited under Section 302 of the Communications Act of 1934, as amended, and Subpart I of Part 2 of this Chapter. The equipment authorization and verification procedures are detailed in Subpart J of Part 2 of this Chapter.

Section 15.3 *Definitions.*

(a) *Auditory assistance device.* An intentional radiator used to provide auditory assistance to a handicapped person or persons. Such a device may be used for auricular training in an educational institution, for auditory assistance at places of public gatherings, such as a church, theater, or auditorium, and for auditory assistance to handicapped individuals, only, in other locations.

(b) *Biomedical telemetry device.* An intentional radiator used to transmit measurements of either human or animal biomedical phenomena to a receiver.

(c) *Cable input selector switch.* A transfer switch that is intended as a means to alternate between the reception of broadcast signals via connection to an antenna and the reception of cable television service.

(d) *Cable locating equipment.* An intentional radiator used intermittently by trained operators to locate buried cables, lines, pipes and similar structures or elements. Operation entails coupling a radio frequency signal onto the cable, pipe, etc. and using a receiver to detect the location of that structure or element.

(e) *Cable system terminal device (CSTD).* A TV interface device that serves, as its primary function, to connect a cable system operated under Part 76 of this Chapter to a TV broadcast receiver or other subscriber premise equipment. Any device which functions as a CSTD in one of its operating modes must comply with the technical requirements for such devices when operating in that mode.

(f) *Carrier current system.* A system that transmits radio frequency energy by conduction over the electric power lines. A carrier current system can be designed such that the signals are received by conduction directly from connection to the electric power lines (unintentional radiator) or the signals are received over-the-air due to radiation of the radio frequency signals from the electric power lines (intentional radiator).

(g) *CB receiver.* Any receiver that operates in the Personal Radio Services on frequencies allocated for Citizens Band (CB) Radio Service stations, as well as any receiver provided with a separate band specifically designed to receive the transmissions of CB stations in the Personal Radio Services. This includes the following: (1) a CB receiver sold as a separate unit of equipment; 2) the receiver section of a CB transceiver; 3) a converter to be used with any receiver for the purpose of receiving CB transmissions; and, 4) a multiband receiver that includes a band labelled "CB" or "11-meter" in which such band can be separately selected, except that an Amateur Radio Service receiver that was manufactured prior to January 1, 1960, and which includes an 11-meter band shall not be considered to be a CB receiver.

(h) *Class A digital device.* A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

(i) *Class B digital device.* A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public. Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio commu-

nications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

(j) *Cordless telephone system.* A system consisting of two transceivers, one a base station that connects to the public switched telephone network and the other a mobile handset unit that communicates directly with the base station. Transmissions from the mobile unit are received by the base station and then placed on the public switched telephone network. Information received from the switched telephone network is transmitted by the base station to the mobile unit. Note: The Domestic Public Cellular Radio Telecommunications Service is considered to be part of the switched telephone network. In addition, intercom and paging operations are permitted provided these are not intended to be the primary modes of operation.

(k) *Digital device.* (Previously defined as a computing device). An unintentional radiator (device or system) that generates and uses timing signals or pulses at a rate in excess of 9,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that uses digital techniques or any device or system that generates and uses radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer. A radio frequency device that is specifically subject to an emanation requirement in any other FCC Rule Part or an intentional radiator subject to Subpart C of this Part that contains a digital device is not subject to the standards for digital devices, provided the digital device is used only to enable operation of the radio frequency device and the digital device does not control additional functions or capabilities. Note: Computer terminals and peripherals that are intended to be connected to a computer are digital devices.

(l) *Field disturbance sensor.* A device that establishes a radio frequency field in its vicinity and detects changes in that field resulting from the movement of persons or objects within its range.

(m) *Harmful interference.* Any emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunications service operating in accordance with this Chapter.

(n) *Incidental radiator.* A device that generates radio frequency energy during the course of its operation although the device is not intentionally designed to generate or emit radio frequency energy. Examples of incidental radiators are dc motors, mechanical light switches, etc.

(o) *Intentional radiator.* A device that intentionally generates and emits radio frequency energy by radiation or induction.

(p) *Kit.* Any number of electronic parts, usually provided with a schematic diagram or printed circuit board, which, when assembled in accordance with instructions, results in a device subject to the regulations in this Part, even if additional parts of any type are required to complete assembly.

(q) *Perimeter protection system.* A field disturbance sensor that employs leaky cables as the radiating source. These cables are installed in a manner that allows the system to detect movement within the protected area.

(r) *Peripheral device.* An input/output unit of a system that feeds data into and/or receives data from the central processing unit of a digital device. Peripherals to a digital device include any device that is connected external to the digital device, any device internal to the digital device that connects the digital device to an external device by wire or cable, and any circuit board or card designed for interchangable mounting, internally or externally, that increases the operating or processing speed of a digital device, e.g., "turbo cards" and "enhancement boards". Examples of peripheral devices include terminals, printers, external floppy disk drives and other data storage devices, video monitors, keyboards, control cards, interface boards, external memory expansion cards and other input/output devices that may or may not contain digital circuitry. However, an internal device that contains the central processing unit of a digital device is not a peripheral even though such a device may connect to an external keyboard or other components.

(s) *Personal computer.* An electronic computer that is marketed for use in the home, notwithstanding business applications. Such computers are considered Class B digital devices. Computers which use a standard TV receiver as a display device or meet all of the following conditions are considered examples of personal computers:

(1) Marketed through a retail outlet or direct mail order catalog.

(2) Notices of sale or advertisements are distributed or directed to the general public or hobbyist users rather than restricted to commercial users.

(3) Operates on a battery or 120 volt electrical supply.

If the responsible party can demonstrate that because of price or performance the computer is not suitable for residential or hobbyist use, it may request that the computer be considered to fall outside of the scope of this definition for personal computers.

(t) *Power line carrier systems.* An unintentional radiator employed as a carrier current system used by an electric power utility entity on transmission lines for protective relaying, telemetry, etc. for general supervision of the power system. The system operates by the transmission of radio frequency energy by conduction over the electric power transmission lines of the system. The system does not include those electric lines which connect the distribution substation to the customer or house wiring.

(u) *Radio frequency (RF) energy.* Electromagnetic energy at any frequency in the radio spectrum between 9 kHz and 3,000,000 MHz.

(v) *Scanning receiver.* For the purpose of this rule Part, this is a receiver that automatically switches among four or more frequencies in the range of 30 to 960 MHz and which is capable of stopping at and receiving a radio signal detected on a frequency. Receivers designed solely for the reception of the broadcast signals under Part 73 of the regulations or for operation as part of a licensed station are not included in this definition.

(w) *Television (TV) broadcast receiver.* A device designed to receive television pictures that are broadcast simultaneously with sound on the television channels authorized under Part 73 of this Chapter.

(x) *Transfer switch.* A device used to alternate between the reception of over-the-air radio frequency signals via connection to an antenna and the reception of radio frequency signals received by any other method, such as from a TV interface device.

(y) *TV interface device.* An unintentional radiator that produces or translates in frequency a radio frequency carrier modulated by a video signal derived from an external or internal signal source, and which feeds the modulated radio frequency energy by conduction to the antenna terminals or other non-baseband input connections of a television broadcast receiver. A TV interface device may include a stand-alone RF modulator, or a composite device consisting of an RF modulator, video source and other components devices. Examples of TV interface devices are video cassette recorders and terminal devices attached to a cable system or used with a Master Antenna (including those used for central distribution video devices in apartment or office buildings).

(z) *Unintentional radiator.* A device that intentionally generates radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Section 15.5 *General conditions of operation.*

(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to Section 90.63(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

(d) Intentional radiators that produce Class B emissions (damped wave) are prohibited.

Section 15.7 *Special temporary authority.*

(a) The Commission will, in exceptional situations, consider an individual application for a special temporary authorization to operate an incidental, intentional or unintentional radiation device not conforming to the provisions of this part, where it can be shown that the proposed operation would be in the public interest, that it is for a unique type of station or for a type of operation which is incapable of being established as a regular service, and that the proposed operation can not feasibly be conducted under this Part.

(b) No authorization is required in order to perform testing of equipment for determining compliance with these regulations. Except as provided in Subpart I of Part 2 of this Chapter, this provision does not permit the providing of equipment to potential users in order to determine customer acceptance of the product or marketing strategy, nor does this provision permit any type of operation other than a determination of compliance with the regulations. During this testing, the provisions of Sections 15.5 and 15.205 apply.

Section 15.9 *Prohibition against eavesdropping.*

Except for the operations of law enforcement officers conducted under lawful authority, no person shall use, either directly or indirectly, a device operated pursuant to the provisions of this Part for the purpose of overhearing or recording the private conversations of others unless such use is authorized by all of the parties engaging in the conversation.

Section 15.11 *Cross reference.*

The provisions of Subparts A, H, I, J and K of Part 2 apply to intentional and unintentional radiators, in addition to the provisions of this Part. Also, a cable system terminal device and a cable input selector switch shall be subject to the relevant provisions of Part 76 of this Chapter.

Section 15.13 *Incidental radiators.*

Manufacturers of these devices shall employ good engineering practices to minimize the risk of harmful interference.

Section 15.15 *General technical requirements.*

(a) An intentional or unintentional radiator shall be constructed in accordance with good engineering design and manufacturing practice. Emanations from the device shall be suppressed as much as practicable, but in no case shall the emanations exceed the levels specified in these rules.

(b) An intentional or unintentional radiator must be constructed such that the adjustments of any control that is readily accessible by or intended to be accessible to the user will not cause operation of the device in violation of the regulations.

(c) Parties responsible for equipment compliance should note that the limits specified in this Part will not prevent harmful interference under all circumstances. Since the operators of Part 15 devices are required to cease operation should harmful interference occur to authorized users of the radio frequency spectrum, the parties responsible for equipment compliance are encouraged to employ the minimum field strength necessary for communications, to provide greater attenuation of unwanted emissions than required by these regulations, and to advise the user as to how to resolve harmful interference problems (for example, see Section 15.105(b)).

Section 15.17 *Susceptibility to interference.*

(a) Parties responsible for equipment compliance are advised to consider the proximity and the high power of non-Government licensed radio stations, such as broadcast, 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. Information on non-Government use of the spectrum can be obtained by consulting the Table of Frequency Allocations in Section 2.106 of this Chapter.

(b) Information on U. S. Government operations can be obtained by contacting: Director, Spectrum Plans and Policy, National Telecommunications and Information Administration, Department of Commerce, Room 4096, Washington, D. C. 20230.

Section 15.19 *Labelling requirements.*

(a) In addition to the requirements in Part 2 of this Chapter, a device subject to certification, notification, or verification shall be labelled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

> This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

> This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

> 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.

(b) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified in this Section is required to be affixed only to the main control unit.

(c) When the device is so small or for such use that it is not practicable to place the statement specified in this Section on it, the information required by these paragraphs shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

Section 15.21 *Information to user.*

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Section 15.23 *Home - built devices.*

(a) Equipment authorization is not required for devices that are not marketed, are not constructed from a kit, and are built in quantities of five or less for personal use.

(b) It is recognized that the individual builder of home-built equipment may not possess the means to perform the measurements for determining compliance with the regulations. In this case, the builder is expected to employ good engineering practices to meet the specified technical standards to the greatest extent practicable. The provisions of Section 15.5 apply to this equipment.

Section 15.25 *Kits.*

A TV interface device, including a cable system terminal device, which is marketed as a kit shall comply with the following requirements:

(a) All parts necessary for the assembled device to comply with the technical requirements of this Part must be supplied with the kit. No mechanism for adjustment that can cause operation in violation of the requirements of this Part shall be made accessible to the builder.

(b) At least two units of the kit shall be assembled in exact accordance with the instructions supplied with the product to be marketed. If all components required to fully complete the kit (other than those specified in paragraph (a) which are needed for compliance with the technical provisions and must be included with the kit) are not normally furnished with the kit, assembly shall be made using the recommended components. The assembled units shall be certified or notified, as appropriate, pursuant to the requirements of this Part.

(1) The measurement data required for a TV interface device subject to certification shall be obtained for each of the two units and submitted with an application for certification pursuant to Subpart J of Part 2 of this Chapter.

(2) The measurement data required for a TV interface device subject to notification shall be obtained for the units tested and retained on file pursuant to the provisions of Subpart J of Part 2 of this Chapter.

(c) A copy of the exact instructions that will be provided for assembly of the device shall be submitted with an application for certification or notification. Those parts which are not normally furnished shall be detailed in the application for equipment authorization.

(d) In lieu of the label required by Section 15.19, the following label, along with the label bearing the FCC identifier and other information specified in Sections 2.925 and 2.926, shall be included in the kit with instructions to the builder that it shall be attached to the completed kit:

(Name of Grantee)
(FCC Identifier)

> This device can be expected to comply with Part 15 of the FCC Rules provided it is assembled in exact accordance with the instructions provided with this kit. Operation is subject to the following 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.

(e) For the purpose of this Section, circuit boards used as repair parts for the replacement of electrically identical defective circuit boards are not considered to be kits.

Section 15.27 *Special accessories.*

(a) Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors, are required to enable an unintentional or

intentional radiator to comply with the emission limits in this Part, the equipment must be marketed with, i.e., shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge, at the time of purchase. Information detailing any alternative method used to supply the special accessories shall be included in the application for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in Section 2.909 of this Chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of the text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

(b) If a device requiring special accessories is installed by or under the supervision of the party marketing the device, it is the responsibility of that party to install the equipment using the special accessories. For equipment requiring professional installation, it is not necessary for the responsible party to market the special accessories with the equipment. However, the need to use the special accessories must be detailed in the instruction manual, and it is the responsibility of the installer to provide and to install the required accessories.

(c) Accessory items that can be readily obtained from multiple retail outlets are not considered to be special accessories and are not required to be marketed with the equipment. The manual included with the equipment must specify what additional components or accessories are required to be used in order to ensure compliance with this Part, and it is the responsibility of the user to provide and use those components and accessories.

(d) The resulting system, including any accessories or components marketed with the equipment, must comply with the regulations.

Section 15.29 ***Inspection by the Commission.***

(a) Any equipment or device subject to the provisions of this Part, together with any certificate, notice of registration or any technical data required to be kept on file by the operator, supplier or party responsible for compliance of the device shall be made available for inspection by a Commission representative upon reasonable request.

(b) The owner or operator of a radio frequency device subject to this Part shall promptly furnish to the Commission or its representative such information as may be requested concerning the operation of the radio frequency device.

(c) The party responsible for the compliance of any device subject to this Part shall promptly furnish to the Commission or its representatives such information as may be requested concerning the operation of the device, including a copy of any measurements made for obtaining an equipment authorization or demonstrating compliance with the regulations.

(d) The Commission, from time to time, may request the party responsible for compliance, including an importer, to submit to the FCC Laboratory in Columbia, Maryland, various equipment to determine that the equipment continues to comply with the applicable standards. Shipping costs to the Commission's Laboratory and return shall be borne by the responsible party. Testing by the Commission will be performed using the measurement procedure(s) that was in effect at the time the equipment was authorized or verified.

Section 15.31 ***Measurement standards.***

(a) The following measurement procedures are used by the Commission to determine compliance with the technical requirements. Copies of these procedures are available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161 or from the Commission's current duplicating contractor whose name and address are available from the Commission's Consumer Assistance Office.

(1) FCC/OET MP-1:	FCC Methods of Measurements for Determining Compliance of Radio Control and Security Alarm Devices and Associated Receivers.
(2) FCC/OET MP-2:	Measurement of UHF Noise Figures of TV Receivers.
(3) FCC/OET MP-3:	FCC Methods of Measurements of Output Signal Level, Output Terminal Conducted Spurious Emissions, Transfer Switch Characteristics, and Radio Noise Emissions from TV Interface Devices.
(4) FCC/OET MP-4:	FCC Procedure for Measuring RF Emissions from Computing Devices.
(5) FCC/OET MP-9:	FCC Procedure for Measuring Cable Television Switch Isolation.

(b) All parties making compliance measurements on equipment subject to the requirements of this Part are urged to use these measurement procedures. Any party using other procedures should ensure that such other procedures can be relied on to produce measurement results compatible with the FCC measurement procedures. The description of the measurement procedure used in testing the equipment for compliance and a list of the test equipment actually employed shall be made part of an application for certification or included with the data required to be retained by the party responsible for devices subject to notification or verification.

(c) For swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

(d) Field strength measurements shall be made, to the extent possible, on an open field site. Test sites other than open field sites may be employed if they are properly calibrated so that the measurement results correspond to what would be obtained from an open field site. In the case of equipment for which measurements can be performed only at the installation site, such as perimeter protection systems, carrier current systems, and systems employing a "leaky" coaxial cable as an antenna, measurements for verification or for obtaining a grant of equipment authorization shall be performed at a minimum of three installations that can be demonstrated to be representative of typical installation sites.

(e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(f) To the extent practicable, the device under test shall be measured at the distance specified in the appropriate rule section. The distance specified corresponds to the horizontal distance between the measurement antenna and the closest point of the equipment under test, support equipment or interconnecting cables as determined by the boundary defined by an imaginary straight line periphery describing a simple geometric configuration enclosing the system containing the equipment under test. The equipment under test, support equipment and any interconnecting cables shall be included within this boundary.

(1) At frequencies equal to or above 30 MHz, measurements may be performed at a distance closer than that specified provided this does not result in measurements taken in the near field. When performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance using an inverse linear distance extrapolation factor (20 dB/decade). Measurement at a distance greater than specified is not permitted unless the responsible party can demonstrate that measurements at the specified distance are impractical because of the size of the equipment, the location of the equipment, or other factors, or unless the responsible party can demonstrate that such a measurement would take place in the near field, as could occur when performing measurements on some large digital devices and perimeter protection systems. Measurements shall not be performed at a distance greater than 30 meters unless it can be demonstrated that measurement at a distance of 30 meters or less is impracticable and, further, that the signal level needed to be determined at the distance employed can be detected by the measuring equipment. When performing measurements at a distance greater than that specified, the results shall be interpolated to the specified distance using an inverse linear distance interpolation factor (20 dB/decade).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

(3) The applicant for a grant of certification shall specify the interpolation or extrapolation method used in the application filed with the Commission. For equipment subject to notification or verification, this information shall be retained with the measurement data.

(4) When measurement distances of 30 meters or less are specified in the regulations, the Commission will test the equipment at the distance specified unless measurement at that distance results in measurements being performed in the near field. When measurement distances of greater than 30 meters are specified in the regulations, the Commission will test the equipment at a closer distance, usually 30 meters, extrapolating the measured field strength to the specified distance using the methods shown in this Section.

(5) Measurements shall be performed at a sufficient number of radials around the equipment under test to determine the radial at which the field strength values of the radiated emissions are maximized. The maximum field strength at the frequency being measured shall be reported in an application for certification.

(g) Equipment under test shall be adjusted, using those controls that are readily accessible to or are intended to be accessible to the consumer, in such a manner as to maximize the level of the emissions. For those devices to which wire leads may be attached by the consumer, tests shall be performed with wire leads attached. The wire leads shall be of the length to be used with the equipment if that length is known. Otherwise, wire leads one meter in length shall be attached to the equipment. Longer wire leads may be employed if necessary to interconnect to associated peripherals.

(h) For a composite system that incorporates devices contained either in a single enclosure or in separate enclosures connected by wire or cable, testing for compliance with the standards in this Part shall be performed with all of the devices in the system functioning. If an intentional radiator incorporates more than one antenna or other radiating source and these radiating sources are designed to emit at the same time, measurements of conducted and radiated emissions shall be performed with all radiating sources that are to be employed emitting.

(i) If the device under test provides for the connection of external accessories, including external electrical input signals, the device shall be tested with the accessories attached. The device under test shall be fully exercised with these external accessories. The emission tests shall be performed with the device and accessories configured in a manner that tends to produce maximized emissions within the range of variations that can be expected under normal operating conditions. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port. Only one test using peripherals or external accessories that are representative of the devices that will be employed with the equipment under test is required. All possible equipment combinations do not need to be tested. The accessories or peripherals connected to the device being tested shall be unmodified, commercially available equipment.

(j) If the equipment under test consists of a central control unit and an external or internal accessory(ies) (peripheral) and the party verifying the equipment or applying for a grant of equipment authorization manufactures or assembles the central control unit and at least one of the accessory devices that can be used with that control unit, testing of the control unit and/or the accessory(ies) must be performed using the devices manufactured or assembled by that party, in addition to any other needed devices which the party does not manufacture or assemble. If the party verifying the equipment or applying for a grant of equipment authorization does not manufacture or assemble the central control unit and at least one of the accessory devices that can be used with that control unit or the party can demonstrate that the central control unit or accessory(ies) normally would be marketed or

used with equipment from a different entity, testing of the central control unit and/or the accessory(ies) must be performed using the specific combination of equipment which is intended to be marketed or used together. Only one test using peripherals or accessories that are representative of the devices that will be employed with the equipment under test is required. All possible equipment combinations are not required to be tested. The accessories or peripherals connected to the device being tested shall be unmodified, commercially available equipment.

(k) A composite system is a system that incorporates different devices contained either in a single enclosure or in separate enclosures connected by wire or cable. If the individual devices in a composite system are subject to different technical standards, each such device must comply with its specific standards. In no event may the measured emissions of the composite system exceed the highest level permitted for an individual component. For digital devices which consist of a combination of Class A and Class B devices, the total combination of which results in a Class A digital device, it is only necessary to demonstrate that the equipment combination complies with the limits for a Class A device. This equipment combination may not be employed for obtaining a grant of equipment authorization or verifying a Class B digital device. However, if the digital device combination consists of a Class B central control unit, e.g., a personal computer, and a Class A internal peripheral(s), it must be demonstrated that the Class B central control unit continues to comply with the limits for a Class B digital device with the Class A internal peripheral(s) installed but not active.

(l) Measurements of radio frequency emissions conducted to the public utility power lines shall be performed using a 50 ohm/50 uH line-impedance stabilization network (LISN). Note: Receivers tested under the transition provisions contained in Section 15.37 may be tested with a 50 ohm/5 uH LISN.

(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

(n) Measurements on TV broadcast receivers shall be performed with the receiver tuned to each VHF frequency and also shall include the following oscillator frequencies: 520, 550, 600, 650, 700, 750, 800, 850, 900 and 931 MHz. If measurements cannot be made on one or more of the latter UHF frequencies because of the presence of signals from licensed radio stations or for other reasons to be detailed in the measurement report, measurements shall be made with the receiver oscillator at a nearby frequency. If the receiver is not capable of receiving channels above 806 MHz, the measurements employing the oscillator frequencies 900 and 931 MHz may be omitted.

(o) The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part.

Section 15.33 *Frequency range of radiated measurements.*

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the higher of the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator or the upper frequency of the measurement range applicable to the digital device, as shown in paragraph (b)(1) of this Section.

(b) For unintentional radiators:

(1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3), for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

(2) A unintentional radiator, excluding a digital device, in which the highest frequency generated in the device, the highest frequency used in the device and the highest frequency on which the device operates or tunes are less than 30 MHz and which, in accordance with Section 15.109, is required to comply with standards on the level of radiated emissions within the frequency range 9 kHz to 30 MHz, such as a CB receiver or a device designed to conduct its radio frequency emissions via connecting wires or cables, e.g., a carrier current system not intended to radiate, shall be investigated from the lowest radio frequency generated or used in the device, without going below 9 kHz (25 MHz for CB receivers), up to the frequency shown in the following table. If the unintentional radiator contains a digital device, the upper frequency to be investigated shall be that shown in the table below or in the table in paragraph (b)(1) above, as based on both the highest frequency generated and the highest frequecy used in the digital device, whichever range is higher.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 - 10	400
10 - 30	500

(3) Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this Section.

(c) The above specified frequency ranges of measurements apply to the measurement of radiated emissions and, in the case of receivers, the measurement to demonstrate compliance with the antenna conduction limits specified in Section 15.111. The frequency range of measurements for AC power line conducted limits is specified in Sections 15.107 and 15.207 and applies to all equipment subject to those regulations. In some cases, depending on the frequency(ies) generated and used by the equipment, only signals conducted onto the AC power lines are required to be measured.

(d) Particular attention should be paid to harmonics and subharmonics of the fundamental frequency as well as to those frequencies removed from the fundamental by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

Section 15.35 ***Emission limits.***

The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

(b) On any frequency or frequencies above 1000 MHz, the radiated limits shown are based on the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated. Measurements of AC power line conducted emissions are performed using a CISPR quasi-peak detector, even for devices for which average radiated emission measurements are specified.

(c) When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measured field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in those cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Section 15.37 ***Transition provisions for compliance with the rules.***

Equipment may be authorized, manufactured and imported under the rules in effect prior to (insert date 60 days after date of publication in the Federal Register) in accordance with the following schedules:

(a) *For all intentional and unintentional radiators, except for receivers:* Radio frequency equipment verified by the responsible party or for which an application for a grant of equipment authorization is submitted to the Commission on or after (insert date 3 years after effective date of the R&O) shall comply with the regulations specified in this Part. Radio frequency equipment that is manufactured or imported on or after (insert date 5 years after effective date of the R&O) shall comply with the regulations specified in this Part.

(b) *For receivers:* Except as shown in paragraph (b)(2), receivers subject to the regulations in this Part that are manufactured or imported on or after (insert date 10 years after effective date of the R&O) shall comply with the regulations specified in this Part. However, if a receiver is associated with a transmitter that could not have been authorized under the regulations in effect prior to (insert date 60 days after date of publication in the Federal Register), e.g., a transmitter operating under the provisions of Sections 15.209 or 15.249 (below 960 MHz), the transition provisions in this Section do not apply. Such receivers must comply with the regulations in this Part.

(c) There are no restrictions on the operation or marketing of equipment complying with the regulations in effect prior to (insert date 60 days after date of publication in the Federal Register).

Subpart B - Unintentional Radiators

Section 15.101 *Equipment authorization of unintentional radiators.*

(a) Except as otherwise exempted in Sections 15.23, 15.103, and 15.113, unintentional radiators shall be authorized by the Commission or verified prior to the initiation of marketing, as follows:

Type of Device	Equipment Authorization Required *
TV broadcast receiver	Verification
FM broadcast receiver	Verification
CB receiver	Certification
Superregenerative receiver	Certification
Scanning receiver	Certification
All other receivers subject to Part 15	Notification
TV interface device	Certification
Cable system terminal device	Notification
Stand-alone cable input selector switch	Verification
Class B personal computers & peripherals	Certification
Other Class B digital devices & peripherals	Verification
Class A digital devices & peripherals	Verification
External switching power supplies	Verification
All other devices	Verification

* *See* additional provisions in this Section and in Section 15.103 of this Part.

(b) Only those receivers that operate (tune) within the frequency range of 30-960 MHz and CB receivers are subject to the authorizations shown in paragraph (a). However, receivers indicated as being subject to notification that are contained within a transceiver, the transmitter portion of which is subject to type acceptance, certification or notification, shall be authorized under the verification procedure. Receivers operating above 960 MHz or below 30 MHz, except for CB receivers, are exempt from complying with the technical provisions of this Part but are subject to Section 15.5.

(c) Personal computer mother boards (the circuit board performing the central processing) that are marketed assembled with an enclosure and a power supply must be certificated with that enclosure and power supply.

(d) Peripheral devices, as defined in Section 15.3(r), shall be certified or verified, as appropriate, prior to marketing. However, if a peripheral always will be marketed with a specific personal computer, it is not necessary to obtain a separate grant of certification for that peripheral, provided the specific combination of personal computer and peripheral has received a grant of certification.

(e) Subassemblies to digital devices are not subject to the technical standards in this Part unless they are marketed as part of a system in which case the resulting system must comply with the applicable regulations. Subassemblies include: those devices that are enclosed solely within the enclosure housing the digital device and are not included in the definition of peripherals in Section 15.3(r), such as internal disc drives and memory expansion units; digital devices marketed to another manufacturer to be incorporated into a final product; circuit boards containing the central processing unit that are marketed without an enclosure or power supply; and, switching power supplies that are separately marketed and are solely for use internal to a digital device.

(f) The procedures for obtaining a grant of certification or notification and for verification are contained in Subpart J of Part 2 of this Chapter.

Section 15.103 *Exempted devices.*

The following devices are subject only to the general conditions of operation in Sections 15.5 and 15.29 and are exempt from the specific technical standards and other requirements contained in this Part. The operator of the exempted device shall be required to stop operating the device upon a finding by the Commission or its representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected. Although not mandatory, it is strongly recommended that the manufacturer of an exempted device endeavor to have the device meet the specific technical standards in this Part.

(a) A digital device utilized exclusively in any transportation vehicle including motor vehicles and aircraft.

(b) A digital device used exclusively as an electronic control or power system utilized by a public utility or in an industrial plant. The term public utility includes equipment only to the extent that it is in a dedicated building or large room owned or leased by the utility and does not extend to equipment installed in a subscriber's facility.

(c) A digital device used exclusively as industrial, commercial, or medical test equipment.

(d) A digital device utilized exclusively in an appliance, e.g., microwave oven, dishwasher, clothes dryer, air conditioner (central or window), etc.

(e) Specialized medical digital devices (generally used at the direction of or under the supervision of a licensed health care practitioner) whether used in a patient's home or a health care facility. Non-specialized medical devices, i.e., devices marketed through retail channels for use by the general public, are not exempted. This exemption also does not apply to digital devices used for record keeping or any purpose not directly connected with medical treatment.

(f) Digital devices that have a power consumption not exceeding 6 nW.

(g) Joystick controllers or similar devices, such as a mouse, used with digital devices but which contain only non-digital circuitry or a simple circuit to convert the signal to the format required (e.g., an integrated circuit for analog to digital conversion) are viewed as passive add-on devices, not themselves directly subject to the technical standards or the equipment authorization requirements.

(h) Digital devices in which both the highest frequency generated and the highest frequency used are less than 1.705 MHz and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Digital devices that include, or make provision for the use of, battery eliminators, AC adaptors or battery chargers which permit operation while charging or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, do not fall under this exemption.

(i) Responsible parties should note that equipment containing more than one device is not exempt from the technical standards in this Part unless all of the devices in the equipment meet the criteria for exemption. If only one of the included devices qualifies for exemption, the remainder of the equipment must comply with any applicable regulations. If a device performs more than one function and all of those functions do not meet the criteria for exemption, the device does not qualify for inclusion under the exemptions.

Section 15.105 ***Information to the user.***

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

> NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

> NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
>
> -- Reorient or relocate the receiving antenna.
>
> -- Increase the separation between the equipment and receiver.
>
> -- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
>
> -- Consult the dealer or an experienced radio/TV technician for help.

(c) The provisions of paragraphs (a) and (b) do not apply to digital devices exempted from the technical standards under the provisions of Section 15.103.

(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) needs to be contained only in the instruction manual for the main control unit.

Section 15.107 ***Conducted limits.***

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed the limits in the following table. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted Limit (microvolts)
0.45 - 1.705	1000
1.705- 30.0	3000

(c) For carrier current systems used as unintentional radiators whose emissions are contained within the frequency range 450 kHz to 30 MHz, the provisions of this Section shall not apply. Such systems are subject to radiated emission limits as provided in Section 15.109(e).

(d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Section 15.109 ***Radiated emission limits.***

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	90
88 - 216	150
216 - 960	210
Above 960	300

(c) In the emission tables above, the tighter limit applies at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.

(d) For CB receivers, the field strength of radiated emissions within the frequency range of 25 - 30 MHz shall not exceed 40 microvolts/meter at a distance of 3 meters. The field strength of radiated emissions above 30 MHz from such devices shall comply with the limits in paragraph (a).

(e) Carrier current systems used as unintentional radiators or other unintentional radiators that are designed to conduct their radio frequency emissions via connecting wires or cables and that operate in the frequency range of 9 kHz to 30 MHz, including devices that deliver the radio frequency energy to transducers, such as ultrasonic devices not covered under Part 18 of this Chapter, shall comply with the radiated emission limits for intentional radiators provided in Section 15.209 for the frequency range of 9 kHz to 30 MHz. At frequencies above 30 MHz, the provisions of paragraph (a) of this Section apply.

(f) For a receiver which employs terminals for the connection of an external receiving antenna, the receiver shall be tested to demonstrate compliance with the provisions of this Section with an antenna connected to the antenna terminals unless the antenna conducted power is measured as specified in Section 15.111(a). If a permanently attached receiving antenna is used, the receiver shall be tested to demonstrate compliance with the provisions of this Section.

Section 15.111 *Antenna power conduction limits for receivers.*

(a) In addition to the radiated emission limits, receivers that operate (tune) in the frequency range 30 to 960 MHz and CB receivers that provide terminals for the connection of an external receiving antenna may be tested to demonstrate compliance with the provisions of Section 15.109 with the antenna terminals shielded and terminated with a resistive termination equal to the impedance specified for the antenna, provided these receivers also comply with the following: with the receiver antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal at any frequency within the range of measurements specified in Section 15.33 shall not exceed 2.0 nanowatts.

(b) CB receivers and receivers that operate (tune) in the frequency range 30 to 960 MHz that are provided only with a permanently attached antenna shall comply with the radiated emission limitations in this Part, as measured with the antenna attached.

Section 15.113 *Power line carrier systems.*

Power line carrier systems, as defined in Section 15.3(t), are subject only to the following requirements:

(a) A power utility operating a power line carrier system shall submit the details of all existing systems plus any proposed new systems or changes to existing systems to an industry-operated entity as set forth in Section 90.63(g) of this Chapter. No notification to the FCC is required.

(b) The operating parameters of a power line carrier system (particularly the frequency) shall be selected to achieve the highest practical degree of compatibility with authorized or licensed users of the radio spectrum. The signals from this operation shall be contained within the frequency band 9 kHz to 490 kHz. A power line carrier system shall operate on an unprotected, non-interference basis in accordance with Section 15.5 of this Part. If harmful interference occurs, the electric power utility shall discontinue use or adjust its power line carrier operation, as required, to remedy the interference. Particular attention should be paid to the possibility of interference to Loran C operations at 100 kHz.

(c) Power line carrier system apparatus shall be operated with the minimum power possible to accomplish the desired purpose. No equipment authorization is required.

(d) The best engineering principles shall be used in the generation of radio frequency currents by power line carrier systems to guard against harmful interference to authorized radio users, particularly on the fundamental and harmonic frequencies.

(e) Power line carrier system apparatus shall conform to such engineering standards as may be promulgated by the Commission. In addition, such systems should adhere to industry approved standards designed to enhance the use of power line carrier systems.

(f) These provisions for power line carrier systems apply only to systems operated by a power utility for general supervision of the power system and do not permit operation on electric lines which connect the distribution substation to the customer or house wiring.

Section 15.115 *TV interface devices, including cable system terminal devices.*

(a) Measurements of the radiated emissions of a TV interface device shall be conducted with the output terminal(s) of the device terminated by a resistance equal to the rated output impedance. The emanations of a TV interface device incorporating an intentional radiator shall not exceed the limits in Section 15.109 or Subpart C of this Part, whichever is higher for each frequency. Where it is possible to determine which portion of the device is contributing a particular radio frequency emission, the emissions from the TV interface device portion shall comply with the emission limits in Section 15.109, and the emissions from the intentional radiator shall comply with Subpart C of this Part.

(b) Output signal limits:

(1) At any RF output terminal, the maximum measured RMS voltage, in microvolts, corresponding to the peak envelope power of the modulated signal during maximum amplitude peaks across a resistance (R in ohms) matching the rated output impedance of the TV interface device, shall not exceed the following:

(i) For a cable system terminal device or a TV interface device used with a master antenna, 692.8 times the square root of (R) for the video signal and 155 times the square root of (R) for the audio signal.

(ii) For all other TV interface devices, 346.4 times the square root of (R) for the video signal and 77.5 times the square root of (R) for the audio signal.

(2) At any RF output terminal, the maximum measured RMS voltage, in microvolts, corresponding to the peak envelope power of the modulated signal during maximum amplitude peaks across a resistance (R in ohms) matching the rated output impedance of the TV interface device, of any emission appearing on frequencies removed by more than 4.6 MHz below or 7.4 MHz above the video carrier frequency on which the TV interface device is operated shall not exceed the following:

(i) For a cable system terminal device or a TV interface device used with a master antenna, 692.8 times the square root of (R).

(ii) For all other TV interface devices, 10.95 times the square root of (R).

(3) The term "master antenna" used in this paragraph refers to TV interface devices employed for central distribution within large buildings such as apartments, hospitals, office buildings, etc.

(c) A TV interface device shall be equipped with a transfer switch for connecting the antenna terminals of a receiver selectively either to the receiving antenna or to the radio frequency output of the TV interface device, subject to the following:

(1) When measured in any of its set positions, transfer switches shall comply with the following requirements:

(i) For a cable system terminal device or a TV interface device equipped for use with a cable system or a master antenna, as defined in paragraph (b)(3), the isolation between the antenna and cable input terminals shall be at least 80 dB from 54 to 216 MHz and at least 60 dB from 216 to 550 MHz. The 80 dB limit applies at 216 MHz. In the case of a transfer switch requiring a power source, the required isolation shall be maintained in the event the device is not connected to a power source or power is interrupted.

(ii) For all other TV interface devices, the maximum voltage, corresponding to the peak envelope power of the modulated video signal during maximum amplitude peaks, in microvolts, appearing at the receiving antenna input terminals when terminated with a resistance (R in ohms) matching the rated impedance of the antenna input of the switch, shall not exceed 0.346 times the square root of (R).

(iii) Measurement to determine compliance with the transfer switch limits shall be made using a connecting cable, where required, between the TV interface device and the transfer switch of the type and length 1) provided with the TV interface device, 2) recommended in the instruction manual, or 3) normally employed by the consumer.

(2) A TV interface device shall be designed and constructed, to the extent practicable, so as to preclude the possibility that the consumer may inadvertently attach the output of the device to the receiving antenna, if any, without first going through the transfer switch.

(3) A transfer switch is not required for a TV interface device that, when connected, results in the user no longer having any need to receive standard over-the-air broadcast signals via a separate antenna. A transfer switch is not required to be marketed with a cable system terminal device unless that device provides for the connection of an external antenna. A transfer switch is not required for a device that is intended to be used as an accessory to an authorized TV interface device.

(4) An actual transfer switch is not required for a TV interface device, including a cable system terminal device, that has an antenna input terminal(s); provided, the circuitry following the antenna input terminal(s) has sufficient bandwidth to allow the reception of all TV broadcast channels authorized under Part 73 of this Chapter and: for a cable system terminal device that can alternate between the reception of cable television service and an antenna, compliance with the isolation requirement specified in paragraph (c)(1)(i) can be demonstrated; and, for all other TV interface devices, the maximum voltage appearing at the antenna terminal(s) does not exceed the limit in paragraph (c)(1)(ii).

(5) If a transfer switch is not required, the following label shall be used in addition to the label shown in Section 15.19(a):

This device is intended to be attached to a receiver that is not used to receive over-the-air broadcast signals. Connection of this device in any other fashion may cause harmful interference to radio communications and is in violation of the FCC Rules, Part 15.

(d) A TV interface device, including a cable system terminal device, shall incorporate circuitry to automatically prevent emanations from the device from exceeding the technical specifications in this Part. These circuits shall be adequate to accomplish their functions when the TV interface device is presented, if applicable, with video input signal levels in the range of one to five volts; this requirement is not applicable to a TV interface device that uses a built-in signal source and has no provisions for the connection of an external signal source. For devices that contain provisions for an external signal source but do not contain provisions for the input of an external baseband signal, e.g., some cable system terminal devices, compliance with the provisions of this paragraph shall be demonstrated with a radio frequency input signal of 0 to 25 dBmV.

(e) For cable system terminal devices and TV interface devices used with a master antenna, as defined in paragraph (b)(3), the holder of the grant of authorization shall specify in the instruction manual or pamphlet, if a manual is not provided, the types of wires or coaxial cables necessary to ensure that the unit complies with the requirements of this Part. The holder of the grant of authorization must comply with the provisions of Section 15.27. For all other TV interface devices, the wires or coaxial cables used to couple the output signals to the TV receiver shall be provided by the responsible party.

(f) A TV interface device which is submitted to the Commission as a composite device in a single enclosure containing a RF modulator, video source and other component devices shall be submitted on a single application (FCC Form 731) and shall be authorized as a single device.

(g) An external device or accessory that is intended to be attached to a TV interface device shall comply with the technical and administrative requirements set out in the rules under which it operates. For example, a personal computer must be certificated to show compliance with the regulations for digital devices.

Section 15.117 ***TV broadcast receivers.***

(a) All TV broadcast receivers shipped in interstate commerce or imported from any foreign country into the United States for sale or resale to the public, shall comply with the provisions of this Section. The reference in this Section to TV broadcast receivers also includes devices, such as TV interface devices, that incorporate the tuner portion of a TV broadcast receiver and that are equipped with an antenna or antenna terminals that can be used for the off-the-air reception of TV broadcast signals, as authorized under Part 73 of this Chapter.

(b) TV broadcast receivers shall be capable of adequately receiving all channels allocated by the Commission to the television broadcast service.

(c) On a given receiver, use of the UHF and VHF tuning systems shall provide approximately the same degree of tuning accuracy with approximately the same expenditure of time and effort: *Provided, however,* that this requirement will be considered to be met if the need for routine fine tuning is eliminated on UHF channels.

(1) *Basic tuning mechanism.* If a TV broadcast receiver is equipped to provide for repeated access to VHF television channels at discrete tuning positions, that receiver shall be equipped to provide for repeated access to a minimum of six UHF television channels at discrete tuning positions. Unless a discrete tuning position is provided for each channel allocated to UHF television, each position shall be readily adjustable to a particular UHF channel by the user without the use of tools. If 12 or fewer discrete tuning positions are provided, each position shall be adjustable to receive any channel allocated to UHF television.

Note: The combination of detented rotary switch and pushbutton controls is acceptable, provided UHF channels, after their initial selection, can be accurately tuned with an expenditure of time and effort approximately the same as that used in accurately tuning VHF channels. A UHF tuning system comprising five pushbuttons and a separate manual tuning knob is considered to provide repeated access to six channels at discrete tuning positions. A one-knob (VHF/UHF) tuning system providing repeated access to 11 or more discrete tuning positions is also acceptable, provided each of the tuning positions is readily adjustable, without the use of tools, to receive any UHF channel.

(2) *Tuning controls and channel readout.* UHF tuning controls and channel readout on a given receiver shall be comparable in size, location, accessibility and legibility to VHF controls and readout on that receiver.

Note: Differences between UHF and VHF channel readout that follow directly from the larger number of UHF television channels available are acceptable if it is clear that a good faith effort to comply with the provisions of this Section has been made.

(d) If equipment and controls that tend to simplify, expedite or perfect the reception of television signals (e. g., AFC, visual aids, remote control, or signal seeking capability referred to generally as tuning aids) are incorporated into the VHF portion of a TV broadcast receiver, tuning aids of the same type and comparable capability and quality shall be provided for the UHF portion of that receiver.

(e) If a television receiver has an antenna affixed to the VHF antenna terminals, it must have an antenna designed for and capable of receiving all UHF television channels affixed to the UHF antenna terminals. If a VHF antenna is provided with but not affixed to a receiver, a UHF antenna shall be provided with the receiver.

(f) The picture sensitivity of a TV broadcast receiver averaged for all channels between 14 and 69 inclusive shall not be more than 8 dB larger than the peak picture sensitivity of that receiver averaged for all channels between 2 and 13 inclusive.

(g) The noise figure for any television channel 14 to 69 inclusive shall not exceed 14 dB. A TV receiver model is considered to comply with this noise figure if the maximum noise figure for channels 14-69 inclusive of 97.5% of all receivers within that model does not exceed 14 dB.

(1) The responsible party shall measure the noise figure of a number of UHF channels of the test sample to give reasonable assurance that the UHF noise figure for each channel complies with the above limit.

(2) The responsible party shall insert in his files a statement explaining the basis on which it will rely to ensure that at least 97.5% of all production units of the test sample that are manufactured have a noise figure of no greater than 14 dB.

(3) Within one year after a specific TV receiver model has been verified for compliance, the responsible party shall file a report with the Commission giving the actual UHF noise figure performance of units of that model actually measured during that year. The report, as an alternative, may be filed by the party responsible for the marketing of that model TV broadcast receiver within this country.

(4) In the case of a TV tuner built-in as part of a video tape recorder that uses a power splitter between the antenna terminals of the video tape recorder and the input terminals of the TV tuner or a TV broadcast receiver that uses a power splitter between the antenna terminals of two or more UHF tuners contained within that receiver, 4 dB may be subtracted from the noise figure measured at the antenna terminals of the video tape recorder or TV broadcast receiver for determining compliance of the UHF tuner(s) with the 14 dB noise figure limit.

(h) For a TV broadcast receiver equipped with a cable input selector switch, the selector switch shall provide in any of its set positions isolation between the antenna and cable input terminals of at least 80 dB from 54 to 216 MHz, and of at least 60 dB from 216 to 550 MHz. At 216 MHz, the 80 dB isolation standard applies. In the case of a selector switch requiring a power source, the required isolation shall be maintained in the event the device is not connected to a power source or power is interrupted.

A physical cable input selector switch is not required for a TV broadcast receiver that can alternate between the reception of cable television service and an antenna, provided compliance with the isolation requirement specified in this paragraph can be demonstrated and the circuitry following the antenna input terminal(s) has sufficient bandwidth to allow the reception of all TV broadcast channels authorized under this Chapter.

Subpart C - Intentional Radiators

Section 15.201 *Equipment authorization requirement.*

(a) Intentional radiators operated as carrier current systems and devices operated under the provisions of Sections 15.211, 15.213 and 15.221 shall be verified pursuant to the procedures in Subpart J of Part 2 of this Chapter prior to marketing.

(b) Except as otherwise exempted in paragraph (c) of this Section and in Section 15.23 of this Part, all intentional radiators operating under the provisions of this Part shall be certificated by the Commission pursuant to the procedures in Subpart J of Part 2 of this Chapter prior to marketing.

(c) For devices such as perimeter protection systems which, in accordance with Section 15.31(d), are required to be measured at the installation site, each application for certification must be accompanied by a statement indicating that the system has been tested at three installations and found to comply at each installation. Until such time as certification is granted, a given installation of a system that was measured for the submission for certification will be considered to be in compliance with the provisions of this Chapter, including the marketing regulations in Subpart I of Part 2, if tests at that installation show the system to be in compliance with the relevant technical requirements. Similarly, where measurements must be performed on site for equipment subject to verification, a given installation that has been verified to demonstrate compliance with the applicable standards will be considered to be in compliance with the provisions of this Chapter, including the marketing regulations in Subpart I of Part 2.

(d) For perimeter protection systems operating in the frequency bands allocated to television broadcast stations operating under Part 73 of this Chapter, the holder of the grant of certification must test *each* installation prior to initiation of normal operation to verify compliance with the technical standards and must maintain a list of all installations and records of measurements. For perimeter protection systems operating outside of the frequency bands allocated to television broadcast stations, upon receipt of a grant of certification, further testing of the same or similar type of system or installation is not required.

Section 15.203 *Antenna requirement.*

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, 15.221, or 15.247. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Section 15.205 *Restricted bands of operation.*

(a) Except as shown in paragraph (d), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 - 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	15.35 - 16.2
25.5 - 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 - 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 - 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 - 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 - 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 - 156.9	2200 - 2300	9000 - 9200	

(b) Except as provided in paragraph (d), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraph (d), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this Section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a), the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a), and the fundamental emission is outside of the bands listed in paragraph (a) more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to Section 15.213.

Section 15.207 *Conducted limits.*

(a) For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

(b) The limit in paragraph (a) shall not apply to intentional radiators operated as carrier current systems in the frequency range of 450 kHz to 30 MHz. Such systems are subject to radiated emission limits as provided in Sections 15.205 and 15.209.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Section 15.209 *Radiated emission limits, general requirements.*

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in Sections 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this Part.

(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems operating under the provisions of this Section in the frequency bands allocated to TV broadcast stations, as shown in Part 73 of this Chapter, shall contain their fundamental emissions within the frequency bands 54-72 MHz and 76-88 MHz. Further, the use of such perimeter protection systems is limited to industrial, business and commercial applications.

Section 15.211 *Tunnel radio systems.*

An intentional radiator utilized as part of a tunnel radio system may operate on any frequency provided it meets all of the following conditions:

(a) Operation of a tunnel radio system (intentional radiator and all connecting wires) shall be contained solely within a tunnel, mine or other structure that provides attenuation to the radiated signal due to the presence of naturally surrounding earth and/or water.

(b) Any intentional or unintentional radiator external to the tunnel, mine or other structure, as described in paragraph (a), shall be subject to the other applicable regulations contained within this Part.

(c) The total electromagnetic field from a tunnel radio system on any frequency or frequencies appearing outside of the tunnel, mine or other structure described in paragraph (a) shall not exceed the limits shown in Section 15.209 when measured at the specified distance from the surrounding structure, including openings. Particular attention shall be paid to the emissions from any opening in the structure to the outside environment. When measurements are made from the openings, the distances shown in Section 15.209 refer to the distance from the plane of reference which fits the entire perimeter of each above ground opening.

(d) The conducted limits in Section 15.207 apply to the radio frequency voltage on the public utility power lines outside of the tunnel.

Section 15.213 *Cable locating equipment.*

An intentional radiator used as cable locating equipment, as defined in Section 15.3(d), may be operated on any frequency within the band 9 - 490 kHz, subject to the following limits: within the frequency band 9 kHz, up to, but not including, 45 kHz, the peak output power from the cable locating equipment shall not exceed 10 watts; and, within the frequency band 45 kHz to 490 kHz, the peak output power from the cable locating equipment shall not exceed one watt. If provisions are made for connection of the cable locating equipment to the AC power lines, the conducted limits in Section 15.207 also apply to this equipment.

Radiated Emission Limits, Additional Provisions

Section 15.215 *Additional provisions to the general radiated emission limitations.*

(a) The regulations in Sections 15.217-15.251 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in Section 15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) For those bands of frequencies where alternative radiated emission limitations apply and for which a frequency stability is not specified, it is recommended that the fundamental frequency be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

(d) Where the following sections specify limits on the bandwidth of the emissions, the bandwidth limits include the effects of frequency sweeping, frequency hopping, and other modulation techniques which may be employed.

Section 15.217 *Operation in the band 160 - 190 kHz.*

(a) The total input power to the final radio frequency stage (exclusive of filament or heater power) shall not exceed one watt.

(b) The total length of the transmission line, antenna, and ground lead (if used) shall not exceed 15 meters.

(c) All emissions below 160 kHz or above 190 kHz shall be attenuated at least 20 dB below the level of the unmodulated carrier. Determination of compliance with the 20 dB attenuation specification may be based on measurements at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.

Section 15.219 *Operation in the band 510 - 1705 kHz.*

(a) The total input power to the final radio frequency stage (exclusive of filament or heater power) shall not exceed 100 milliwatts.

(b) The total length of the transmission line, antenna and ground lead (if used) shall not exceed 3 meters.

(c) All emissions below 510 kHz or above 1705 kHz shall be attenuated at least 20 dB below the level of the unmodulated carrier. Determination of compliance with the 20 dB attenuation specification may be based on measurements at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.

Section 15.221 *Operation in the band 525 - 1705 kHz.*

(a) The provisions of this Section are restricted to the operation of an AM broadcast station on a college or university campus or on the campus of any other educational institution. Operation is restricted to the grounds of the campus. For the band 535-1705 kHz, the frequency of operation shall be chosen such that operation is not within the protected field strength contours of licensed AM stations.

(b) On the campus, the field strength of emissions appearing outside of this frequency band shall not exceed the general radiated emission limits shown in Section 15.209 as measured from the radiating source. There is no limit on the field strength of emissions appearing within this frequency band, except that the provisions of Section 15.5 continue to apply.

(c) At the perimeter of the campus, the field strength of any emissions, including those within the frequency band 525 - 1705 kHz, shall not exceed the general radiated emission limits in Section 15.209.

(d) The conducted limits specified in Section 15.207 apply to the radio frequency voltage on the public utility power lines outside of the campus. Due to the large number of radio frequency devices which may be used on the campus, contributing to the conducted emissions, as an alternative to measuring conducted emissions on the AC power lines outside of the campus, it is acceptable to demonstrate compliance with this provision by measuring each individual intentional radiator employed in the system at the point where it connects to the AC power lines. As provided in Section 15.207(b), if only a carrier current system is employed, the AC power line conducted limits do not apply. However, the radiated emission limits provided in this Section apply to carrier current systems.

(e) A grant of equipment authorization is not required for a campus radio system. In lieu thereof, a campus radio system shall be verified for compliance with the regulations in accordance with Subpart J of Part 2 of this Chapter. This data shall be kept on file at the location of the studio, office or control room associated with the transmitting equipment. In some cases, this may correspond to the location of the transmitting equipment.

Section 15.223 *Operation in the band 1. 705 - 10 MHz.*

(a) The field strength of any emission within the band 1.705-10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this Section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measure-

ment instrumentation employing an average detector. The provisions in Section 15.35(b) for limiting peak emissions apply.

(b) The field strength of emissions outside of the band 1.705-10.0 MHz shall not exceed the general radiated emission limits in Section 15.209.

Section 15.225 ***Operation within the band 13. 553 - 13. 567 MHz.***

(a) The field strength of any emissions within this band shall not exceed 10,000 microvolts/meter at 30 meters.

(b) The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits shown in Section 15.209.

(c) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Section 15.227 ***Operation within the band 26. 96 - 27. 28 MHz.***

(a) The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(b) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.

Section 15.229 ***Operation within the band 40. 66 - 40. 70 MHz.***

(a) Unless operating pursuant to the provisions in Section 15.231, the field strength of any emissions within this band shall not exceed 1000 microvolts/meter at 3 meters.

(b) The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits in Section 15.209.

(c) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Section 15.231 ***Periodic operation in the band 40. 66 - 40. 70 MHz and above 70 MHz.***

(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using measurement instrumentation with a CISPR quasi-peak detector.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average limits shown in this table or to the general limits shown in Section 15.209, as measured with a CISPR quasi-peak detector, whichever limit permits a higher field strength.

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

(d) For devices operating within the frequency band 40.66 - 40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ±0.01%. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) and may be employed for any type of operation, including operation prohibited in paragraph (a), provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this Section, except the field strength table in paragraph (b) is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500 **	50 to 150 **
174 - 260	1,500	150
260 - 470	1,500 to 5,000 **	150 to 500 **
Above 470	5,000	500

** linear interpolations

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Section 15.233 ***Operationwithin the bands 46. 60 - 46. 98 MHz and 49. 66 - 50. 0 MHz.***

(a) The provisions shown in this Section are restricted to cordless telephones.

(b) An intentional radiator used as part of a cordless telephone system shall operate on one or more of the following frequency pairs:

Channel	Base Transmitter (MHz)	Handset Transmitter (MHz)
1	46.610	49.670
2	46.630	49.845
3	46.670	49.860
4	46.710	49.770
5	46.730	49.875
6	46.770	49.830
7	46.830	49.890
8	46.870	49.930
9	46.930	49.990
10	46.970	49.970

(c) The field strength of the fundamental emission shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(d) The fundamental emission shall be confined within a 20 kHz band centered on the actual carrier frequency. Modulation products outside of this 20 kHz band shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section 15.209, whichever permits the higher emission levels. Emissions on any frequency more than 20 kHz removed from the center frequency shall consist solely of unwanted emissions and shall not exceed the general radiated emission limits in Section 15.209.

(e) All emissions exceeding 20 microvolts/meter at 3 meters are to be reported in the application for certification. Tests to determine compliance with this requirement shall be performed using an appropriate input signal as prescribed in Section 2.989 of this Chapter.

(f) If the device provides for the connection of external accessories, including external electrical input signals, the device must be tested with the accessories attached. The emission tests shall be performed with the device and accessories configured in a manner which tends to produce the maximum level of emissions within the range of variations that can be expected under normal operating conditions.

(g) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency. The tolerance shall be maintained for a temperature variation of -20 degrees C to +50 degrees C at normal supply voltage, and for variation in the primary voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(h) For equipment authorization, a single application form, FCC Form 731, may be filed for a cordless telephone system, provided the application clearly identifies and provides data for all parts of the system to show compliance with the applicable technical requirements. When a single application form is submitted, both the base station and the portable handset must carry the same FCC identifier. The application shall include a fee for certification of each type of transmitter and notification or certification, if appropriate, for each type of receiver included in the system.

(i) A cordless telephone which is intended to be connected to the public telephone network shall also comply with the applicable regulations in Part 68 of this Chapter. A separate application for registration under Part 68 is required.

(j) The label required under Subpart A shall also contain the following statement: "Privacy of communications may not be ensured when using this phone".

(k) The box or other package in which the individual cordless telephone is to be marketed shall carry a statement in a prominent location, visible to the buyer before purchase, which reads as follows:

> NOTICE: The base units of some cordless telephones may respond to other nearby units or to radio noise resulting in telephone calls being dialed through this unit without your knowledge and possibly calls being misbilled. In order to protect against such occurrences, this cordless telephone is provided with the following features: (to be completed by the responsible party).

An application for certification of a cordless telephone shall specify the complete text of the statement that will be carried on the package and indicate where, specifically, it will be located on the carton.

Section 15.235 *Operation within the band 49. 82 - 49. 90 MHz.*

(a) The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(b) The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section 15.209, whichever permits the higher emission levels. The field strength of any emissions removed by more than 10 kHz from the band edges shall not exceed the general radiated emission limits in Section 15.209. All signals exceeding 20 microvolts/meter at 3 meters shall be reported in the application for certification.

(c) For a home-built intentional radiator, as defined in Section 15.23(a), operating within the band 49.82-49.90 MHz, the following standards may be employed:

(1) The RF carrier and modulation products shall be maintained within the band 49.82-49.90 MHz.

(2) The total input power to the device measured at the battery or the power line terminals shall not exceed 100 milliwatts under any condition of modulation.

(3) The antenna shall be a single element, one meter or less in length, permanently mounted on the enclosure containing the device.

(4) Emissions outside of this band shall be attenuated at least 20 dB below the level of the unmodulated carrier.

(5) The regulations contained in Section 15.23 of this Part apply to intentional radiators constructed under the provisions of this paragraph.

(d) Cordless telephones are not permitted to operate under the provisions of this Section.

Section 15.237 *Operation in the bands 72. 0 - 73. 0 MHz and 75. 4 - 76. 0 MHz.*

(a) The intentional radiator shall be restricted to use as an auditory assistance device.

(b) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the above specified frequency ranges.

(c) The field strength of any emissions within the permitted 200 kHz band shall not exceed 80 millivolts/meter at 3 meters. The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

Section 15.239 *Operation in the band 88 - 108 MHz.*

(a) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

(b) The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(c) The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209.

(d) A custom built telemetry intentional radiator operating in the frequency band of 88-208 MHz and used for experimentation by an educational institute need not be certified provided the device complies with the standards in this Part and the educational institution notifies the Engineer in Charge of the local FCC office, in writing, in advance of operation, providing the following information:

(1) The dates and places where the device will be operated;

(2) The purpose for which the device will be used;

(3) A description of the device, including the operating frequency, RF power output, and antenna; and,

(4) A statement that the device complies with the technical provisions of this Part.

Section 15.241 *Operation in the band 174 - 216 MHz.*

(a) Operation under the provisions of this Section is restricted to biomedical telemetry devices.

(b) Emissions from the device shall be confined within a 200 kHz band which shall lie wholly within the frequency range of 174-216 MHz.

(c) The field strength of any emissions radiated within the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters. The field strength of emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 150 microvolts/meter at 3 meters. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

Section 15.243 *Operation in the band 890 - 940 MHz.*

(a) Operation under the provisions of this Section is restricted to devices that use radio frequency energy to measure the characteristics of a material. Devices operated pursuant to the provisions of this Section shall not be used for voice communications or the transmission of any other type of message.

(b) The field strength of any emissions radiated within the specified frequency band shall not exceed 500 microvolts/meter at 30 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(c) The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in Section 15.209.

(d) The device shall be self-contained with no external or readily accessible controls which may be adjusted to permit operation in a manner inconsistent with the provisions in this Section. Any antenna that may be used with the device shall be permanently attached thereto and shall not be readily modifiable by the user.

Section 15.245 *Operation within the bands 902 - 928 MHz, 2435 - 2465 MHz, 5785 - 5815 MHz, 10500 - 10550 MHz, and 24075 - 24175 MHz.*

(a) Operation under the provisions of this Section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field of Fundamental (millivolts/meter)	Strength Field Strength of Harmonics (millivolts/meter)
902 - 928	500	1.6
2435 - 2465	500	1.6
5785 - 5815	500	1.6
10500 - 10550	2500	25.0
24075 - 24175	2500	25.0

(1) Field strength limits are specified at a distance of 3 meters.

(2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

(3) The emission limits shown in the above table are based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

Section 15.247 *Operation within the bands 902 - 928 MHz, 2400 - 2483. 5 MHz, and 5725 - 5850 MHz.*

(a) Operation under the provisions of this Section is limited to frequency hopping and direct sequence spread spectrum intentional radiators that comply with the following provisions:

(1) For frequency hopping systems, at least 75 hopping frequencies, separated by at least 25 kHz, shall be used. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period. The maximum bandwidth of the hopping channel is 25 kHz.

(2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

(b) The maximum peak output power of the intentional radiator shall not exceed one watt.

(c) Radio frequency output power outside these frequency bands over any 100 kHz bandwidth shall be at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power.

Note: Spread spectrum systems are sharing these bands on a noninterference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of Part 18 of this Chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U. S. Government operations in the 902-928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

Section 15.249 *Operation within the bands 902 - 928 MHz, 2400 - 2483. 5 MHz, 5725 - 5875 MHz, and 24. 0 - 24. 25 GHz.*

(a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 - 928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

(b) Field strength limits are specified at a distance of 3 meters.

(c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

(d) As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Section 15.251 *Operation within the bands 2. 9 - 3. 26 GHz, 3. 267 - 3. 332 GHz, 3. 339 - 3. 3458 GHz, and 3. 358 - 3. 6 GHz.*

(a) Operation under the provisions of this Section is limited to automatic vehicle identification systems (AVIS) which use swept frequency techniques for the purpose of automatically identifying transportation vehicles.

(b) The field strength anywhere within the frequency range swept by the signal shall not exceed 3000 microvolts/meter/MHz at 3 meters in any direction. Further, an AVIS, when in its operating position, shall not produce a field strength greater than 400 microvolts/meter/MHz at 3 meters in any direction within ±10 degrees of the horizontal plane. In addition to the provisions of Section 15.205, the field strength of radiated emissions outside the frequency range swept by the signal shall be limited to a maximum of 100 microvolts/meter/MHz at 3 meters, measured from 30 MHz to 20 GHz for the complete system. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

(c) The minimum sweep repetition rate of the signal shall not be lower than 4000 sweeps per second, and the maximum sweep repetition rate of the signal shall not exceed 50,000 sweeps per second.

(d) An AVIS shall employ a horn antenna or other comparable directional antenna for signal emission.

(e) Provision shall be made so that signal emission from the VIS shall occur only when the vehicle to be identified is within the radiated field of the system.

(f) In addition to the labelling requirements in Section 15.19(a), the label attached to the AVIS transmitter shall contain a third statement regarding operational conditions, as follows:

. . . and, (3) during use this device (the antenna) may not be pointed within ± ** degrees of the horizontal plane.

The double asterisks in condition three (**) shall be replaced by the responsible party with the angular pointing restriction necessary to meet the horizontal emission limit specified in paragraph (b).

(g) In addition to the information required in Subpart J of Part 2, the application for certification shall contain:

(1) Measurements of field strength per MHz along with the intermediate frequency of the spectrum analyzer or equivalent measuring receiver;

(2) The angular separation between the direction at which maximum field strength occurs and the direction at which the field strength is reduced to 400 microvolts/meter/MHz at 3 meters;

(3) A photograph of the spectrum analyzer display showing the entire swept frequency signal and a calibrated scale for the vertical and horizontal axes; the spectrum analyzer settings that were used shall be labelled on the photograph; and,

(4) The results of the frequency search for spurious and sideband emissions from 30 MHz to 20 GHz, exclusive of the swept frequency band, with the measuring instrument as close as possible to the unit under test.

APPENDIX C

Restricted Bands of Operation under Part 15

Frequency (MHz)	Allocation/Use Requiring Restricted Designation
0.09-0.11	Loran C radionavigation
0.49-0.51	Maritime distress frequency
2.1735-2.1905	Mobile distress frequency
8.362-8.366	Maritime and aeronautical survival craft search and rescue
13.36-13.41	Radio astronomy
25.5-25.67	Radio astronomy
37.5-38.25	Radio astronomy
73.0-75.4	73-74.6 MHz: Radio astronomy 74.6-75.4 MHz: Aeronautical radionavigation marker beacon (75.0 MHz) and guard bands
108-121.94	108-117.975 MHz: Aeronautical radionavigation (aircraft-to-tower) 117.975-121.9375 MHz: Aeronautical mobile for safety and regularity of flight 121.4-121.6 MHz: Search and rescue (SARSAT)
123-138	123-123.2: Coordinated search and rescue by mobile, land and aeronautical 123.2-123.8: Aeronautical flight test voice communications 123.5875-137 MHz: Aeronautical mobile for safety and regularity of flight 137-138 MHz: Satellite down link
149.9-150.05	Radionavigation satellite down link
156.7-156.9	Search and rescue (maritime mobile distress and calling on 156.7625-156.8375 MHz)

Frequency (MHz)	Allocation/Use Requiring Restricted Designation
162.0125-167.17 167.72-173.3	Wind shear detection around airports and to warn pilots when emergency action is needed, protection of national and visiting foreign dignitaries, and tracking of endangered and dangerous wildlife requiring receiver sensitivities on the order of -145 dBm
240-285	243 MHz: Search and rescue (SARSAT) Other: U. S. Government satellite down links, military satellites, glide slope indicators, instrument landing systems
322-335.4	322-328.6 MHz: Radio astronomy 328.6-335.4 MHz: Aeronautical radionavigation - instrument landing system glide path
399.9-410	399.9-400.05 MHz: Radionavigation satellite 400.05-400.15 MHz: Standard frequency and time signal 400.15-402 MHz: Satellite down link 402-406 MHz: Meteorological aids (radiosonde) 406-406.1 MHz: Emergency position-indicating radiobeacon (EPIRB) 406.1-410 MHz: Radio astronomy
608-614	Radio astronomy
960-1240	960-1215 MHz: Aeronautical radionavigation 1215-1240 MHz: Satellite down link
1300-1427	1300-1350 MHz: Aeronautical radionavigation 1350-1400 MHz: Spectral line observations of neutral hydrogen 1400-1427 MHz: Radio astronomy
1435-1626.5	1435-1530 MHz: aeronautical flight test telemetry 1530-1559 MHz: Satellite down link 1559-1610 MHz: Satellite down link and aeronautical radionavigation 1610-1626.5 MHz: Aeronautical radionavigation 1610.6-1613.8 MHz: Spectral line observations of OH radical (radio astronomy)
1660-1710	1660-1668.4 MHz: Radio astronomy 1668.4-1670 MHz: Radio astronomy and radiosonde 1670-1710 MHz: Satellite down link and radiosonde

Frequency (MHz)	Allocation/Use Requiring Restricted Designation
1718.8-1722.2	Radio astronomy
2200-2300	Satellite down link
2310-2390	Aeronautical flight test telemetry
2483.5-2500	Radiodetermination satellite down link (Geostar)
2655-2900	2655-2690 MHz: Radio astronomy and satellite down link 2690-2700 MHz: Radio astronomy 2700-2900 MHz: Air traffic control radars
3260-3267	Spectral line observations (radio astronomy)
3332-3339	Spectral line observations (radio astronomy)
3345.8-3358	Spectral line observations (radio astronomy)
3600-4400	3600-4200 MHz: Satellite down link 4200-4400 MHz: Aeronautical radionavigation
4500-5250	4500-4800 MHz: Satellite down link 4800-5000 MHz: Radio astronomy 5000-5250 MHz: Aeronautical radionavigation
5350-5460	Aeronautical radionavigation
7250-7750	Satellite down link
8025-8500	Satellite down link
9000-9200	Aeronautical radionavigation
9300-9500	Radar transponders for maritime search and rescue; airborne weather and ground mapping radar for airborne radionavigation, particularly under poor visibility conditions
10600-12700	10.6-10.7 GHz: Radio astronomy 10.7-12.2 GHz: Satellite down link 12.2-12.7 GHz: Direct broadcast satellite
13250-13400	Aeronautical radionavigation

Frequency (GHz)	Allocation/Use Requiring Restricted Designation
14.47-14.5	Spectral line observations (radio astronomy)
15.35-16.2	15.35-15.4 GHz: Radio astronomy 15.4-15.7 GHz: Shuttle landing system; airborne weather and ground mapping radar for radionavigation 15.7-16.2 GHz: Airport surface detection equipment used to locate and navigate aircraft while on the ground
17.7-21.4	Satellite down link
22.01-23.12	22.01-22.5 GHz: Radio astronomy 22.5-23.0 GHz: Broadcast satellite (22.81-22.86 GHz is also radio astronomy) 23.0-23.07 GHz: Fixed/inter-satellite/mobile (used to fill in the gap between frequency bands) 23.07-23.12 GHz: Radio astronomy
23.6-24.0	Radio astronomy
31.2-31.8	Radio astronomy
36.43-36.5	Radio astronomy
38.6-40.0	Satellite down link
Above 40.0	Numerous bands above 40 GHz would be restricted because of their allocation for radio astronomy, satellite down links, etc. In addition, the rules limit the range of measurements to 40 GHz. Because measurements are not required above 40 GHz, standards have not been established at higher frequencies. Further, there appears to be no current demand for non-licensed operation above 40 GHz. Thus, operation of a Part 15 device above 40 GHz is not being permitted at this time. Specific restricted frequency bands and standards for Part 15 devices operating above 40 GHz will be addressed in a future rule making proceeding, if needed.

FOOTNOTES

[1] The limit applied to these early devices was 15 microvolts/meter (uV/m) at a distance equivalent to the wavelength of the operating frequency divided by 2 Pi. This limit is set forth in Section 15.7 of the existing rules, 47 CFR Section 15.7.

[2] *See, Notice of Proposed Rule Making*, Docket No. 87-389, 2 FCC Rcd 6135 (1987).

[3] A list of the parties filing comments and reply comments is provided in Appendix A. A number of parties filed comments after the specified filing date. These late filed comments have been accepted and included in the record in this proceeding.

[4] A number of changes to the regulations which were proposed in the *Notice* are not being addressed in this Order. We believe additional notice and comment is needed before we can appropriately resolve these issues. These issues include standards for kits of radio frequency devices, field strength limits for spread spectrum transmitters, and the definitions of Class B (residential) digital devices and personal computers. However, we have changed the definition of a peripheral to a digital device to correspond with the Public Notice released by our Office of Engineering and Technology on September 18, 1986, and the News Release issued by our Field Operations Bureau on June 3, 1987, that provided interpretations of the rules.

[5] The energy conducted back into the power line can radiate from the power line. This type of interference usually occurs in the spectrum below 30 MHz. Limits on the amount of RF energy conducted back into the power line protects services such as AM broadcasting, amateur radio and public safety. In some instances, the present rules do not specify any conducted limits because the device was expected to be used in limited quantities or it was believed that the equipment would not generate significant emissions below 30 MHz.

[6] The conducted limits for Class A (non-residential) digital devices were proposed to be 1000 uV over the frequency range 450 kHz to 1.705 MHz and 3000 uV over the frequency range 1.705 MHz to 30 MHz. These are the same limits presently in effect for Class A devices, except the frequency at which the limits are allowed to increase was changed from 1.6 MHz to 1.705 MHz. This change was proposed in anticipation of the expansion of the spectrum allocated to AM broadcasting. As proposed in the *Notice*, conducted limits shall not apply to carrier current systems whose emissions are contained within the frequency band 450 kHz to 30 MHz.

[7] The quasi-peak detector characteristics are detailed in Publication 16 of the International Special Committee on Radio Interference (CISPR).

[8] The interference distances shown were calculated by the League using an attenuation of 20 dB per doubling of distance. The League also calculated other potential interference distances using a free space attenuation of 6 dB per doubling of the distance.

[9] *See,* 47 CFR Section 90.242.

[10] *See, Report and Order*, Docket No. 86-422, 3 FCC Rcd 1702 (1988).

[11] *See,* OST Bulletin No. 63, "Understanding FCC Rules & Regulations under Part 15 for Low Power Transmitters," December 1984.

[12] An example of an operation under Part 15 where device-specific regulations were retained is auditory assistance devices for the handicapped. The permitted field strength level of the radiated emissions of the devices is high enough to cause interference to the authorized radio services. However, the low proliferation of this equipment reduces the probability that interference would be caused.

[13] GWEN is a communication system employed by the Department of Defense.

[14] The 27 MHz band is 26.99-27.26 MHz. Operation currently is permitted on six channels with the maximum bandwidth limited to 20 kHz. *See,* 47 CFR Section 15.116. The 49 MHz band is 49.82-49.90 MHz. Within this band, operation currently is permitted on five channels with the maximum bandwidth limited to 20 kHz. *See,* 47 CFR Sections 15.117-15.119.

[15] Perimeter protection systems are field disturbance sensors that use buried "leaky" cables installed so as to detect any movement within the protected area. Use is limited to industrial, business and commercial applications. *See,* 47 CFR Section 15.310.

[16] In the *Notice*, we inadvertently deleted the 40.66-40.70 MHz band as an authorized band for control and security alarm and other periodic systems. The deletion of this band was an oversight. The provisions to operate in this band are being retained in this Order.

[17] The handset of a cordless telephone transmits and the base station receives within the frequency band 49.82-49.90 MHz on channels 2, 3, 5, 6 and 7.

[18] Cable locating equipment consists of RF generating equipment that is used to couple a signal onto buried cables, pipes, lines or similar structures or elements that act as the antenna. The resulting system acts as an intentional radiator, allowing a trained operator to locate the desired structure or element with a receiver. Operation normally is conducted at low frequencies, below 490 kHz.

[19] ISM devices are regulated under Part 18 of the regulations. Operation as an ISM device entails the use of radio frequency energy to perform work instead of the conveying of information.

[20] The ISM bands allocated to the ARS are those bands at 902-928 Hz and higher frequencies.

[21] For example, Class A computers are permitted to operate at higher field strengths than Class B computers. *See* 47 CFR Sections 15.801-15.840.

[22] Examples of radio services requiring the reception of very low signal levels are satellite down links and radio astronomy.

[23] The comments from the Pacific Companies were filed in connection with the previously cited Docket No. 86-422 and incorporated by that *Report and Order* into this proceeding.

[24] *See,* NTIA's comments regarding emissions from authorized services in paragraph 57, *supra.*

[25] In some cases, the frequency bands employed by the U. S. Government are used for the purpose of national security. Thus, we recognize that the commenting parties are unable to examine the actual use of these bands or their sensitivity to interference. However, use for national security is sufficient justification for designation as a restricted band.

[26] We are not designating the aeronautical flight test voice bands in the frequency range 2.8-22 MHz as restricted bands. Neither AFTRCC nor Rockwell demonstrated that such operation were prone to receiving interference from Part 15 transmitters operating at the proposed emission limits.

[27] This is the "KTB limit" where K equals Boltzmann's constant, T is the temperature in degrees Kelvin, and B is the noise bandwidth. NTIA defined B to equal 30 kHz within the frequency range of 30 to 960 MHz and 300 kHz above 960 MHz. Using this KTB limit, NTIA then determined the field strength

limit that would cause a Part 15 device to produce, at a distance of about 300 meters, a signal level equal to the stated KTB noise value.

[28] *See,* Report 224-5, "Interference Protection Criteria for the Radioastronomy Service", International Telecommunication Union, International Radio Consultative Committee (CCIR), Recommendations and Reports of the CCIR, 1982, Volume II, XVth Plenary Assembly.

[29] These radio astronomy bands are 1400-1427 MHz, 1660.5-1668.4 MHz, 2690-2700 MHz and 4990-5000 MHz.

[30] The request to amend Part 18 of our regulations is outside the scope of this proceeding.

[31] *See, Memorandum Opinion and Order*, Docket No. 86-422, **(add cite).**

[32] The emission limits for digital devices were not proposed to be changed from the current standards.

[33] The level of emissions permitted from Part 18 devices and the applicability of those emission levels to emissions from Part 15 intentional radiators was discussed in paragraph 60 of this Order. This discussion is equally applicable to emissions appearing in the ISM bands from unintentional radiators.

[34] Genie, however, requests the Commission to delete the requirements that their superregenerative receivers be tested "cohered" and that pulse desensitization techniques be applied to measurements taken from a spectrum analyzer. Both of these arguments were considered in the proceeding in Docket No. 86-422 and were dismissed. No new evidence has been submitted by Genie to warrant reconsideration in this proceeding.

[35] Except for CB receivers and unintentional radiators which operate in the frequency range 9 kHz to 30 MHz and which are designed to conduct their emissions via connecting wires or cables, *e.g.,* carrier current systems used as unintentional radiators, the *Notice* did not propose the implementation of radiated emission limits below 30 MHz for unintentional radiators.

[36] NAB and NCTA request that the limits specified under Part 76 of our rules be employed, stating that those limits are more stringent. However, the limits in Part 76 are based on average measurements while the limits proposed in the *Notice* are based on CISPR quasi-peak measurements.

[37] For example, the Commission recently tested a number of TV broadcast receivers and found that several of these receivers already comply with the proposed limits. Also, tighter emission limits have been met for many years by receivers used in the Citizens Band Radio Service without substantial economic penalty.

[38] Radiated emission measurements below 30 MHz must still be performed for CB receivers and devices operating in the frequency range of 9 kHz to 30 MHz that are designed to conduct their radio frequency emissions via connecting wires or cables, *e.g.,* carrier current systems used as unintentional radiators. We are specifying the upper frequency range of measurements for unintentional radiators operating below 1.705 MHz to be 30 MHz as this corresponds to the upper frequency range specified for AC power line conducted emissions. Under the current regulations, for devices operating below 1.705 MHz either no upper frequency range is specified, *e.g.,* for devices designed to conduct their radio frequency emissions via connecting wires or cables, or an upper limit of 1000 MHz is specified, e.g., computing devices. Below 30 MHz, only limits on the amount of radio frequency energy conducted onto the AC power lines apply to most devices. Thus, digital devices in which the highest frequency generated or used is less than 1.705 MHz and which are not designed to permit operation while connected to the AC power lines would be exempt from the technical standards. This should result in an exemption for most, if not all, hand-held calculators, programmable "calculators," electronic games, and musical greeting cards from the regulations. Similarly, most quartz watches and clocks and modules of quartz watches and clocks would be exempt.

[39] *See,* Recommendation 478-3, "Technical Characteristics of Equipment and Principles Governing the Allocation of Frequency Channels between 25 and 1000 MHz for the Land Mobile Service", International Telecommunication Union, International Radio Consultative Committee (CCIR), Recommendations and Reports of the CCIR, 1986, Volume VIII-1, XVIth Plenary Assembly.

[40] Also, see the discussion in paragraph 60, *supra.*

[41] Quasi-peak measurement procedures have not been established above 1000 MHz.

[42] While AT&T and EIA/CEG request that the quasi-peak detector be based on ANSI Publication C63.2 instead of CISPR Publication 16, the ANSI publication has been changed to correspond more closely with CISPR Publication 16. Further, CISPR Publication 16 is the internationally recognized standard.

[43] Thus, we disagree with Genie and Linear that quasi-peak detectors will not provide uniform results, are inherently equipment sensitive and are likely to yield inaccurate measurements. We also disagree with SEIA that eliminating average measurements in the restricted bands would require manufacturers to reduce output power to comply with the quasi-peak limits. First, filtering could be employed in the transmitters to reduce emissions in the restricted bands. Second, as shown in the discussion of the limits in the restricted bands, we have increased the permitted level of spurious emissions in the restricted bands below 1000 MHz by an amount that more than compensates for the change from average to quasi-peak measurements. Further, we disagree with CBEMA that broadband emissions from digital devices should be subject to limits based on measurements with an average detector. The emission limits applied to digital devices were established based on their interference potential when the emissions were measured with a quasi-peak detector. Further, CBEMA has not provided sufficient information to demonstrate that measuring broadband emissions with an average detector would provide equivalent interference protection.

[44] Measurements employing instrumentation with a CISPR quasi-peak detector will still be required to determine the level of radio frequency emissions in the restricted bands, even if emissions from the device are otherwise measured using an average detector.

[45] If a digital device is incorporated in an intentional radiator, testing shall be required to the higher of the tenth harmonic or the frequency range applicable to the digital device, as based on the highest clock rate or data rate of the digital device. However, we are providing a slight relaxation of the emission limits for an intentional radiator if measurements above the tenth harmonic are required because of the incorporation of a digital device. In this case, emissions above the tenth harmonic must be attenuated to the general emission limits applicable to the incorporated digital device (Class A or B), as based on the frequency being measured, or, except for emissions appearing in the restricted frequency bands, to the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

[46] Some of the manufacturers of control and security alarm devices filed comments objecting to procedures currently used to maximize the emissions from their equipment. The Commission previously addressed these matters in connection with the proceeding in Docket No. 86-422. As stated in the *Notice of Proposed Rule Making* in that proceeding, 1 FCC Rcd 1111

(1986), at para. 3, " . . . there is no new evidence or compelling reasons beyond those already addressed in the proceedings that established the regulations for control and security alarm systems to persuade us to consider . . . " the requested changes. Again, no new evidence or compelling reasons have been provided to demonstrate the need to change the existing requirements. The levels at which these emissions are currently maximized are representative of the emission levels that can be produced when the equipment is used by consumers. Therefore, we are not adopting the changes in the procedures used to maximize emissions requested by the manufacturers of control and security alarm devices.

[47] The equipment authorization procedures, as detailed in Subpart J of Part 2 of the regulations, consist of type approval, type acceptance, certification, notification, verification and registration. Except for registration, radio frequency equipment subject to these procedures must be authorized by the Commission or verified by the responsible party before marketing. Under type approval, the equipment is tested by the Commission. Type acceptance and certification require the submission to the Commission of measurement and other data. Under notification and verification, the measurement data demonstrating compliance is retained by the responsible party, unless specifically requested by the Commission. Registration applies to devices interconnected to the public telephone network and requires the submission of measurement data.

[48] *See,* 47 CFR Section 15.38.

[49] *See,* 47 CFR Section 2.1043. Two classes of permissive changes are available: a Class I permissive change is a change to the equipment which results in no change to or a decrease in the levels of the emissions reported to the Commission; a Class II permissive change is a change to the equipment which results in an increase in the levels of the reported emissions yet still permits the equipment to remain in compliance with the emission standards.

[50] *See,* 47 CFR Sections 2.907, 2.931.

[51] The filing from Linear resulted in the release of an *Erratum. See, Erratum* in Docket No. 87-389, DA 87-1760, released December 16, 1987.

[52] *See,* 47 CFR Sections 2.951-2.957.

[53] *See, Order Granting Limited Waiver,* FCC 85-204, adopted April 23, 1985.

[54] The definition of a biomedical telemetry device proposed in the *Notice* reflected the fact that these were the only devices proposed to be permitted to be employed as multiple transmitters. This distinction is no longer required, and the proposed definition is being changed accordingly.

[55] *See, Memorandum, Opinion and Order,* Docket No. 85-301, 3 FCC Rcd 6491 (1988).

[56] *See Memorandum, Opinion, and Order,* Docket No. 87-107, 3 FCC Rcd 4222 (1988).

[57] *See,* 47 CFR Sections 15.65-15.68 of the current regulations.

[58] While the current regulation, 47 CFR Section 15.66, specifies a 12 dB UHF noise figure, the Commission orders that amended this section and implemented the 12 dB noise figure were overturned by the U. S. Court of Appeals for the District of Columbia Circuit on September 17, 1980. *See,* Electronic Industries Ass'n. Consumer v. FCC, 636 F.2d 689 (D.C. Cir. 1980). Thus, the current noise figure requirement, which is being retained in this Order, is 14 dB.

[59] This change to the regulations is exempt from the notice and comment provisions contained in the Administrative Procedures Act in accordance with 5 USC 553(b)(A). Notice and public comment are unnecessary since this change adopts a non-controversial amendment that merely extends an application of the existing rules and should not result in degradation of UHF TV reception.

[60] FCC Form 740 is required to be filed whenever a radio frequency device is imported into the United States. *See,* 47 CFR Sections 2.1201-2.1219.

[61] We are retaining at this time the present exemptions for digital devices. These exemptions are contained in the current Section 15.801 of the rules and in OST Bulletin No. 62, "Understanding the FCC Regulations Concerning Computing Devices," May 1984. Changes to these exemptions may be addressed in a future rule making proceeding.

[62] *See,* 47 CFR Section 2.106, the Table of Frequency Allocations. This table was amended to include the 9-10 kHz band by the Second Report and Order in Docket No. 80-739, 54 RR 2d 1500 (1983).