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Rules and Regulations

Reporter

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Title: Overall Revision of the Rules Regarding Industrial Scientific and Medical (ISM) Equipment

Action: Final rule.

Agency

FEDERAL REGISTER

Identifier: [Gen. Docket No. 20718; FCC 85-445]

Administrative Code Citation

47 CFR Parts 0, 2, and 18

Synopsis

SUMMARY: The FCC amends Part 0 (dealing with the organization and function of the Commission), Part 2, Subparts I and J (dealing with the marketing rules and equipment authorization procedures), Part 18 of its Rules (dealing with industrial, scientific, and medical (ISM) equipment) by deleting administrative provisions which have become burdensome and obsolete and providing four additional frequency bands exclusively for the operation of ISM equipment. The intended effect is to provide a more efficient equipment authorization program for ISM devices, more comprehensive regulations, uniform methods of measurements, and provisional technical standards for RF lighting devices.

Text

SUPPLEMENTARY INFORMATION:

Regulations

List of Subjects

47 CFR Part 0

Organization and functions.

47 CFR Part 2

Imports.

47 CFR Part 18

Business and industry, Household appliances, Medical devices, Scientific equipment.

Third Report and Order

In the matter of overall revision of the rules regarding industrial, scientific, and medical (ISM) equipment under Parts 0, 2, and 18, Gen. Docket No. 20718.

By the Commission: Commissioner Quello concurring in the result.

*nIntroduction and Summary**

n* Footnotes appear after signature.

1. This proceeding was initiated to revise the regulations concerning industrial, scientific, and medical (ISM) equipment under 47 CFR Parts 0, 2, and 18.(1)(2) These rules were adopted in 1946 in order to protect radiocommunication services from receiving interference from the operation of ISM equipment. In light of the changes in spectrum allocation and the proliferation of ISM equipment as well as radiocommunication services, we questioned whether some of the regulations adopted in 1946 were still adequate. We started by releasing several notices inquiring into the suitability of the prescribed technical standards, methods of measurements, and the effectiveness of the equipment authorization and enforcement program.(3) We continued, in response to comments filed on these notices, and based on our experience in dealing with ISM equipment, and in view of the continued rarity of incidences of interference from the operation of such equipment, by amending the technical standards only for induction cooking ranges and by deleting the requirement for filing the Form 724.(4) We then proceeded by issuing a *Third Notice of Proposed Rule Making*(5) (*Notice*) addressing the following topics: (1) the adoption of a more liberal and efficient equipment authorization program, (2) the deletion of burdensome and obsolete administrative rules, (3) the addition of four ISM frequency bands, (4) technical standards for RF lighting devices, and (5) the implementation of uniform methods of measurements.(6)(7) In the *Notice*, we indicated that the general technical standards would be revised when further study has been undertaken. We are also seeking more information from the CCIR and CISPR, (8) which, in Resolution 63 of the 1979 Geneva World Administrative Radio Conference (WARC), were invited to collaborate in preparing a recommendation on the emission limits from ISM equipment.
2. Comments on the *Notice* are very supportive of the Commission's proposal. The consensus is that a more liberal authorization program is justified when dealing with an established industry and that the current technical standards are adequate to control electromagnetic interference from classical ISM equipment (large industrial machines, scientific and medical apparatus). However, commenters have requested minor changes and some clarification in the area of: (1) terminology

and definitions used under Part 18, (2) equipment authorization requirements and enforcement, and (3) methods of measurements. This *Order* takes into account, to the extent practicable, the comments filed in response to the *Notice* and amends the rules accordingly.⁽⁹⁾ A list of the commenters is given in Appendix A of this document. The new rules and measurement procedures adopted herein are contained in Appendices B and C, respectively.

Restructure of Part 18 and Terminology

3. The Rules governing ISM equipment under Part 18, especially with respect to the administrative provisions, have grown complex and quite difficult for the layman to comprehend. In the *Notice*, we proposed to rewrite Part 18 in its entirety and organize it into only three subparts rather than the nine subparts to the old Part 18. We believe that this would yield a better understanding of the rules, and decrease publication costs by reducing the length of the text (by about 40%). The intricacy of Part 18 primarily results from the amendments to 47 CFR Part 2 dealing with the administrative rules for all equipment regulated by the Commission and from the development of new technologies which have rendered inappropriate some of the definitions and terminology used. No objections to the new format were voiced, but a few changes to the terminology used were requested. The American Telephone & Telegraph Company (AT&T) notes that the latest amendments to § 2.1 with regard to the definition of "ISM equipment" and "harmful interference" have not been reflected in § 18.107.⁽¹⁰⁾ We agree that the definitions in Part 18 should be consistent with the ones used under Part 2 and are rewording § 18.107 accordingly. In response to the National Electrical Manufacturers Association (NEMA) comments, we clarify that, for the purposes of our rules, ISM equipment only includes machines which generate RF energy from 9 kHz to 3 THz (3,000 GHz) for non-telecommunication purposes. Equipment which operates and generates energy below 9 kHz or above 3 THz is not included under this definition. We also affirm, in response to Dash, Strauss and Goodhue's (DSG) comments, that nuclear magnetic resonance equipment which generates RF energy and is used for identifying and determining the structure, conformation, and movement of molecules and their phases in the fields of medicine, chemistry, and physics, fall under the category of general ISM equipment.⁽¹¹⁾ Other comments of an editorial nature have also been considered and are acknowledged, to the extent possible, as shown in Appendices B and C.

Applications and Authorizations

4. In the *Notice*, we reported that difficulties in implementing the administrative regulations have evolved, especially because of the complexity of the equipment authorization program.⁽¹²⁾ We proposed to solve these problems by simplifying the regulations and by deleting burdensome and obsolete rules. The intended effect is to institute a more comprehensible authorization and enforcement program and to increase the efficiency of our service to the public. The comments received endorse the changes proposed by the Commission. Inquiries have been made on the possibility of expanding the verification procedure for certain devices, relaxing the labeling requirements, and on the authorization procedures applicable to microwave ovens and RF lighting devices.

A. Equipment Authorization

5. Most ISM equipment is required to be authorized as meeting the pertinent technical standards, in accordance with one or more of the following procedures: (1) type approval, (2) on-site certification, and (3) prototype certification.⁽¹³⁾ Confusion, however, has been caused by the fact that all three procedures, in some cases, can be applied to the same equipment. For instance, the same ultrasonic device can either be type approved, certified on-site by a competent engineer, or prototype certified by the Commission. Further adding to the complexity, the Commission imposes a triennial recertification requirement for certain ISM equipment (See § 18.142); manufacturers or operators must have their devices retested every three years by a competent engineer to assure continued compliance. In the *Notice*, we proposed to simplify the equipment authorization program by placing all ISM equipment under notification except for consumer products which would be subject to certification, and for one-of-a-kind equipment and ultrasonic devices operating below 90 kHz with less than 500 watts which would be verified. We also suggested to continue type approval only for consumer microwave ovens and to delete the triennial certification requirement.⁽¹⁴⁾
6. The comments received are very supportive of the proposed program. The General Electric Company (GE), NEMA, and the International Business Machines Corporation (IBM) suggest that verification be extended to "large unwieldy" equipment and/or "custom-built devices in small quantities". GE, NEMA, and IBM state that verification would ease the testing requirements on manufacturers for large equipment built in small volume which has repetitive applications; the operator could assume the responsibility of testing the equipment, in some instances. Verification, IBM mentions, would also permit operators to modify their devices a few years after installation (as is often the case) without having to request any authorization from the Commission. Notification in such cases, the commenters believe, would not be cost effective since tests would have to be performed on similar equipment and authorization from the FCC would also have to be obtained, possibly creating a marketing delay.
7. The vast majority of nonconsumer ISM devices are in fact large and unwieldy and are typically built in low quantities. Therefore, the manufacturers' comments are interpreted as requesting that virtually all nonconsumer ISM equipment be placed under verification. In retrospect, it appears that there is much to be gained by doing so and little reason not to. It is now clear that attempting to distinguish whether an equipment should be verified or notified on the basis of whether it is "one-of-a-kind" would only lead to confusion, and consequently, there would likely ensue numerous requests for interpretation of the rules. For the kind of equipment involved here, where manufacturers have had a long history of compliance and the equipment changes little from year to year, notification would provide little information of use to the Commission. Accordingly, we are placing all nonconsumer ISM equipment into the verification category. As explained later in the discussion of the measurement procedures, manufacturers may either verify equipment for a given installation or, if a suitable measurement site is used, can verify compliance by performing tests on only one unit of an equipment which is representative of units produced subsequently. Consumer ISM equipment will be subject to certification as proposed. We shall also permit the operation of equipment, to determine customer acceptability, prior to the receipt of grants from the Commission, to avoid marketing delays.⁽¹⁵⁾ See Appendix B, § 2.809. Also for certified equipment, when the same or essentially the same model will

be marketed under more than one trade name, we shall require reports of measurements only for the basic device; such a procedure will be referred to as a multiple listing. See Appendix B, §§ 18.203 through 18.211.

8. R&B Enterprises (R&B), a test facility, suggests that the Commission impose a triennial reverification requirement to assure continued compliance with the regulations. R&B states that no burden would be placed on the operator since the tests are relatively easy and inexpensive (around \$5,000 each). We disagree. Many manufacturers and operators have found that one of the most burdensome regulations under Part 18 is the requirement to retest equipment at predetermined intervals.⁽¹⁶⁾ The Commission through experience has found it unnecessary to require manufacturers or operators to test their equipment at fixed time intervals when dealing with mature industries.⁽¹⁷⁾ There is nothing in the record to indicate that any useful purpose would be served by placing such a requirement on manufacturers or operators of ISM equipment.
9. In the *Notice*, we proposed to continue type approval for microwave ovens because the measuring instrumentation needed to evaluate such equipment has not been commercially available for more than a decade. More precisely, the present FCC methods of measurements call for the use of field intensity meters (FIMs) with linear amplifiers and average reading detectors which are no longer manufactured.⁽¹⁸⁾ The Commission initially started type approving microwave ovens due to the unfamiliarity of the industry with the pertinent test methodology and techniques for achieving compliance. Over the years, the industry has matured and we feel today that there is sufficient familiarity with the test procedures. Manufacturers have had little difficulty in achieving compliance. This is evidenced by the high rate of compliance found in our type approval tests. Nevertheless, the type approval procedure has been maintained because of the limited availability of the necessary measuring instrumentation and the complexities involved in establishing an alternate test procedure. We have learned, however, that suitable measurement equipment is once again available on the market.⁽¹⁹⁾ Certification, instead of type approval, can thus be applied to consumer microwave ovens. While we anticipate that some manufacturers have enjoyed the benefit of no mandatory requirement to test the equipment themselves, we do not see this service as a reason to continue type approval. The Commission will start accepting applications for certification immediately, but to allow manufacturers enough time to make arrangements for having measurements performed, we shall continue to type approve consumer microwave ovens until September 1, 1986.
10. In response to some questions raised on the applicable equipment authorization procedures for RF lighting devices, we clarify that devices marketed and/or used for general purpose or consumer applications will be subject to certification. All other RF lighting devices will be subject to verification. The new equipment authorization requirements are specified in Appendix B under § 18.203.

B. Equipment Identification

11. As proposed in the *Notice*, we shall require that certified equipment carry an FCC identifier. No other labeling requirements will be imposed. We believe that requiring manufacturers to include information about the interference potential of their equipment in the instruction manual is sufficient to warn the operator. Also, in the past we have found

that a label placed on the device itself is often misinterpreted by the layman as being a warning against radiation which is hazardous to human life. No objections to our proposal have been voiced.

C. Miscellaneous Regulations

12. In the *Notice*, we concluded that §§ 18.21-18.29, which state that ISM equipment not in conformance to Part 18 requirements may only be operated with a license, were obsolete and could be deleted. Licensing of ISM devices, if necessary, can only be made under Part 5 of the Rules on an experimental basis. Based on the fact that the Commission has never issued a license for ISM equipment for non-experimental purposes and that no objections to the discontinuation of these regulations have been made, we are deleting §§ 18.21-18.29.

Technical Standards

13. Although the revision of the technical standards is not the primary area of interest of this proceeding, we did request comments in the *Notice* on whether additional technical standards are needed as a result of the opening of four new ISM frequency bands, and on what interim standards should be imposed for RF lighting devices. Other subjects of a technical nature which were raised in the comments are also addressed below.

A. Addition of Four ISM Bands

14. In the *Notice*, we proposed no in-band limits for the four new ISM frequency bands. Out-of-band emissions were to be the same as apply already to that particular type of equipment. We requested comments on the suitability of such standards, particularly, with regard to ISM equipment at 6.78 MHz # 15 kHz which, in accordance with footnote 524 of the U.S. Table of Frequency Allocations, must be made with the coordination of other administrations whose services might be affected. No objections were received from the Interdepartment Radio Advisory Committee, which oversees U.S. Government use of the spectrum or from other possibly concerned parties. Spectrum Measurement Corporation (SMC) requested an additional ISM frequency. However, SMC's request exceeds the scope of this proceeding as we previously mentioned in footnote 9, *supra*.

B. RF Lighting Devices

15. RF lighting is a term which applies to a new technology whereby radio frequency (RF) energy is used to produce light more efficiently. Of concern to the Commission is the potential for a small portion of that energy escaping into space and causing radio interference. With the frequencies currently utilized by RF lighting devices, AM broadcast is the most likely candidate to receive interference. Most RF lighting products operate under the conditions of a waiver.(20) The waiver pertains to the triennial certification requirement of § 18.142. As a condition of the waiver, the Commission imposes the technical standards specified under Part 15, Subpart J, instead of the ones under Part 18. In order to study further the effects of RF lighting devices on radiocommunication, we have issued a *Notice of Inquiry* in Gen. Docket 83-806.(21) In the *Notice*, we proposed to delete the triennial certification requirement of § 18.142 and at the same time adopt only one set of technical standards for RF lighting devices in order to simplify the rules, pending further action in Gen. Docket 83-806. The standards which we find to be the most

suitable to protect the radiocommunication services, for the time being, are the ones specified under Part 15, Subpart J.

16. NAB, which represents the interest of the majority of the AM broadcasting community, feels that such a proposal would still be inadequate to deter incidences of interference to AM radio reception because it would not impose field strength limits below 30 MHz. NAB believes that "at minimum, an appropriate limit should be 25 m V/m at a distance of 10 meters" for frequencies below 30 MHz.(22) Other parties affected by the rules on RF lighting devices, such as NEMA and GE, support the Commission's proposal. GE and NEMA also advocate the possibility of establishing voluntary industry standards with the cooperation of NAB and have submitted to the Commission several reports on the progress made in their studies. The data filed by NEMA and GE have been incorporated in Docket 83-806 and will be considered in that proceeding.
17. Although the concerns of NAB are understandable, we disagree with imposing a fixed radiated emission limit of 25 m V/m at 10 meters for frequencies below 30 MHz. We do not dispute the need for controlling radiation from RF lighting devices; however, insufficient information has been submitted as to whether a radiated emission limit is indeed necessary below 30 MHz, and what limit might be appropriate. NAB does not provide any in-depth analysis of the potential problems. We note, for example, that the man-made radio noise below 30 MHz is very high and that a field strength limit of 25 m V/m at 10 meters might be too stringent at certain frequencies to permit the effective operation of RF lighting products.(23)
18. The emission limits under Part 15, Subpart J, which were adopted to control the electromagnetic interference from digital or computing devices to radiocommunication services, seem to be serving the same purpose, for the moment, when they are applied to RF lighting devices. We have not received, to this date, any reports of interference from the operation of RF lighting devices to radiocommunication services when the technical standards of Part 15, Subpart J are met. For the reasons given above, we shall adopt in this proceeding the technical standards of Part 15, Subpart J for RF lighting devices, pending further development in Gen. Docket 83-806. The question of radiation limits below 30 MHz, which has also been raised by GE and NEMA in their comments in Gen. Docket 83-806, will be addressed with more depth in that docket.(24)

C. Miscellaneous

19. In an open meeting with the Commission staff held on August 21, 1984, manufacturers of medical diagnostic ultrasonic equipment expressed their desire to have such equipment exempted from Part 18. This matter is currently under review and further action is expected in the near future. In the meantime, the relaxation in the equipment authorization requirements from type approval to verification for such equipment will ease the burden of these rules. The Ultrasonic Industry Association, Inc. (UIA) which represents major manufacturers of ultrasonic equipment, and other parties, filed comments in this docket requesting that the radiated emission limits for such equipment be deleted, retaining only limits for line conducted emissions. The reasons given by the commenters are that ultrasonic devices which meet the prescribed conduction limits seldom exceed the radiation limits. Reference is also made by UIA to the *First Notice* in this proceeding in

which we proposed to exempt from the out-of-band radiated emission limits ultrasonic equipment which would comply with the conducted RF voltage limits in the 9 kHz to 30 MHz frequency range. Also, we indicated in the *First Notice* that proof of compliance with the out-of-band radiated emissions would only be necessary when requested by the Commission.(25) The test data accumulated by the FCC laboratory show that the nature of the emissions from ultrasonic equipment is such that compliance with the conduction limits has always led to conformance with the radiation limits below 30 MHz. We, therefore, see no objection to accommodating UIA's request.

20. The Aerospace and Flight Test Radio Coordinating Council (AFTRCC), in light of the low likelihood of interference, and the characteristics of the environment of use, feels that ISM equipment at aerospace manufacturing plants should be exempt from the testing procedures and the emission limits in Part 18. We cannot exempt such equipment from the technical standards, as requested by AFTRCC, without explicit studies demonstrating that noncompliance with Part 18 will not be a threat to radiocommunication services. The low incidence of interference reports cannot be the sole determining factor for granting an exemption. The only assumption we can make from AFTRCC's comments is that their systems have not been a source of interference because they have been operating in compliance with Part 18.
21. IBM raises the issue of dual or multiple regulations for certain devices it manufactures. More precisely, IBM is concerned that two different sets of standards may be applied to its computer plasma displays (CPDs). A CPD is a special type of video monitor intended to be used as a peripheral for a computer. The image on the screen is generated by applying radio frequency (RF) energy to gases in the "picture tube" in order to ionize those gases. IBM is concerned that, since the equipment utilizes RF energy to ionize a gas, it might be considered as subject to the requirements in Part 18. On the other hand, since the device is basically a peripheral for a computer, it also appears to be subject to the emissions limits for computing devices in Part 15, Subpart J. IBM feels that CPDs are much more akin to conventional computer monitors than ISM equipment and asserts that only the computer rules should apply. IBM notes that the computer standards are generally more stringent than those for ISM equipment.
22. We agree with IBM that, in general, two sets of standards should not apply to a single piece of equipment. In fact, the definition of a computing device in § 15.4(n) specifically excludes digital electronics included in ISM equipment. In other words, ISM equipment that utilizes digital electronics is governed only by the Part 18 rules. In the case of CPDs, what is unusual is that it is clearly a piece of computer equipment which only incidentally generates and uses RF energy to ionize a gas. We do not view CPDs as falling under the definition of ISM equipment because it is not the fundamental purpose of such equipment to generate and use RF energy for ISM applications. Accordingly, CPDs are subject only to the rules for computer equipment in Part 15, Subpart J. We believe that in most cases the rules are clear as to whether Parts 15 or 18 apply to a piece of equipment. If further guidance is needed, inquiries should be directed to the Chief Scientist.(26)
23. In response to DSG's requests, we are adding a new § 18.309 to indicate the frequency range over which the measurements of field strength and conducted voltage levels must be recorded to verify compliance with the rules. In our proposal we only specified the

frequency range in the methods of measurements. This addition will provide the public with a better insight on the extent of the emission limits. See Appendix B, § 18.309.

Methods of Measurements

24. In the *Notice* we proposed to consolidate the methods of measurements for ISM equipment and to issue them separately from the Rules in a document entitled MP-5, "Methods of Measurements for ISM Equipment". It is less costly for the Commission to publish the methods of measurements separately from the rest of the rules. It is also advantageous to manufacturers and test facilities that are only concerned with measurement procedures for certain types of products. MP-5 is not a mandatory test procedure, but is basically a guideline and a summary of the methods used at the FCC laboratory for evaluating the radiated radio noise from ISM equipment. MP-5 supersedes FCC Bulletins OCE 39 (dealing with medical diathermy equipment), OCE 20 (discussing microwave ovens), and Test Procedure No. 2 (regarding ultrasonic equipment). Comments on the proposed MP-5 are positive but requests for clarification or changes have been made in the area of test sites, measuring instrumentation, attenuation law factors, and line conducted measurements.
25. Consumer products or certified equipment, as described in MP-5, should be tested on an open field site or at a location which yields comparable results. Classical ISM or verified equipment can be tested at any location. It was not our intent in the proposal, as AFTRCC, GE, IBM, and others interpreted, to preclude testing equipment on-site, i.e., testing a given piece of equipment at its actual place of installation.(27) Sections 2.1 and 2.1.1 of MP-5 indicate that this is permitted. However, it appears that some clarification is needed as to what the criteria will be for accepting data taken at a manufacturer's plant or at a location other than an open field. That is, in what situations will the measurements be considered sufficiently representative of how the equipment will perform at any installation, that the marketing of that equipment may be based on that single set of measurements? If the individual installation has unique shielding, we shall consider the test results as being representative of that case only. For example, in situations where the equipment is located in a building with metal walls or deep inside a building, with measurements taken outside that building, cannot be considered representative of how the equipment will perform at any other installation; the same degree of shielding may not be present. Some judgment must be exercised in choosing a location other than an open field, as has been done in the past, if only a single set of measurements is to be performed. If due to the location of the equipment in a large city, or for some other reason, measurements as outlined in MP-5 are impractical because large buildings or other objects are in the path where measurements should be taken, every effort should be made to obtain necessary measurements at the nearest clear location(s).
26. Modifications to the minimum 6 dB bandwidth of the measuring instrumentation we proposed to use for frequencies below 30 MHz have been requested by several parties.(28) The consensus is that from 150 kHz to 30 MHz the 6 dB bandwidth of the measuring instrumentation should be specified to be at least 9 kHz, and below 150 kHz at least 200 Hz. Commenters believe that the Commission's proposal of 3 kHz minimum bandwidth below 450 kHz might contradict its requirement to use a radio noise meter or spectrum analyzer which conforms with ANSI (American National Standards Institute) C63.2-1980

standards. We find no apparent reason for not applying the ANSI C63.2-1980 standards to MP-5 and modify § 2.2.2 accordingly. This will help exporting manufacturers to perform only one set of measurements for verification of compliance with FCC rules and other countries' regulations.

27. In response to questions raised by SMC, we specify that the measurements need not always be undertaken at the distance at which the emission limits are applied. Due to the nature and the configuration of most ISM equipment, testing may be made at closer distances, especially for equipment for which the limits are specified at distances greater than 30 meters; a sufficient number of measurements should be taken to plot a representative polar radiation pattern and to assure the correct determination of the major lobes. This should enable parties undertaking the measurements to record more accurately the attenuation factors applicable to a particular equipment. As an alternative, measurements may be made at a fixed closer distance, provided the field strength limits are readjusted using an attenuation law factor of $1/d$ (where d is the distance measured in appropriate units).
28. Commenters note that the proposed MP-5 only deals with radiated radio noise and suggest that the power line conducted radio noise measurements for ISM equipment be made in accordance with MP-4, "FCC Methods of Radio Noise Emissions from Computing Devices", and/or ANSI C63.4-1981. We find merit in such a request especially since the tests undertaken by the FCC laboratory are similar to what is stated in MP-4. Conducted measurements are usually performed with the aid of a line impedance stabilization network (LISN). (29) The use of a LISN assures repeatable measurements by stabilizing the impedance between the device under test and the power source. The limits for most ISM equipment were established using a 5 uH/50 ohm LISN. Some commenters believe that the use of a 50 mu H/50 ohm LISN will be more appropriate especially below 2 MHz. However, we feel that the use of a LISN other than the one specified will cause inaccurate readings. We will, therefore, specify in MP-5 that measurements are to be made using the LISN with which the conducted voltage limits have been specified. We have accepted, in the past, that measurements be made with LISN's other than the one indicated in the methods of measurements, but only because the required LISN was not always available commercially. Most test facilities are now equipped with both 5 mu H and 50 mu H LISN's. However, parties encountering difficulty in procuring the required LISN should contact the FCC laboratory.
29. Additional information on interconnecting cables, accessories, and applicators has been included in MP-5. Also, to allow more flexibility, we shall accept radiated radio noise measurements above 1 GHz made with a broadband linearly polarized horn antenna or any other comparable antenna. (30) We wish to emphasize that MP-5 is a *recommended* procedure and that alternatives are permitted by the Commission as long as they are justifiable. We recommend that parties who intend to use alternate procedures contact the FCC laboratory prior to undertaking them.

Enforcement

30. Changes in 47 CFR Part 0, more specifically § 0.314, are made to delegate authority to the "Engineer in Charge" for dealing with enforcement cases. Such action, along with the sampling program instituted by the Office of Science and Technology, should deter any

circumvention of the rules, especially in light of the liberalization of the equipment authorization program.

Final Regulatory Analysis

31. Pursuant to [5 USC 601](#) *et seq.*, an Initial Regulatory Flexibility Analysis was incorporated in paragraph 26 of the *Third Notice of Proposed Rule Making*. In paragraph 26 of this *Notice*, written comments on this Analysis were solicited. No comments in response to this request were received.

I. Need for and Objective of Rule

The rule changes shown in Appendices B and C will simplify the equipment authorization program associated with the operation of ISM equipment. They will reduce the amount of paper work handled by the FCC laboratory and required from applicants filing for equipment authorization with the Commission. They will also provide for more uniform methods of measurements for evaluating ISM equipment. Such action is taken in light of the difficulties encountered in implementing some of the regulations by the FCC; it is also a result of the FCC's recognition that manufacturers of ISM equipment for the most part represent a mature industry for which certain regulations are burdensome and obsolete.

II. Summary of Issues Raised in Comments on Initial Analysis

No issues were raised in public comment or agency assessment.

III. Significant alternatives

None. *Ordering Clauses*

32. Accordingly, it is Ordered that, pursuant to sections 1, 4(i), 302, and 303 of the Communications Act of 1934, as amended, Parts 0, 2, and 18 Are Amended, as shown in Appendices B and C, effective September 27, 1985. It is further ordered that this proceeding, Gen. Docket 20718, is terminated.
33. Further information on this matter may be obtained by contacting Liliane M. Volcy (202) 653-8247, Office of Science & Technology.

Federal Communications Commission.

William J. Tricarico,

Secretary.

Note. Appendix C, "Methods of Measurements of Radio Noise Emissions . . .", will not be published herein. However, copies of the complete text of this Report and Order may be obtained from the International Transcription Service, 1919 M St., NW., Washington, D.C. 20554, Tel.: (202) 857-3800. A copy is also available for public inspection in the FCC Dockets Branch, Rm. 239 and the FCC Library, Rm. 639, both located at 1919 M St., NW. Appendix C is also filed at the Office of the Federal Register, 1100 L St., NW., Washington, D.C.

Footnotes

- (1) ISM equipment is defined under [47 CFR 2.1](#) as devices or appliances designed to generate and use locally radio frequency (RF) energy for industrial, medical, domestic

or similar purposes, excluding applications in the field of telecommunications. Examples are microwave ovens, industrial heaters and sealers, ultrasonic room humidifiers, nuclear magnetic resonance machines, and certain particle accelerators.

- (2) ISM equipment may be operated on any frequency. In certain frequency bands, ISM equipment is permitted unlimited radiation. These bands which are specified in the U.S. Table of Frequency Allocations are usually referred to as "ISM frequencies" or "ISM frequency bands". Other users of these ISM frequency bands must accept any interference received within these bands from the operation of ISM equipment.
- (3) *See* Gen. Docket 20718: [*Notice of Inquiry*, 58 FCC2d 636 \(1976\)](#), [*Notice of Proposed Rule Making*, 68 FCC2d 876 \(1979\)](#), and [*Second Notice of Proposed Rule Making*, 70 FCC2d 1314 \(1979\)](#).
- (4) *See* Gen. Docket 20718: *First Report and Order*, [*44 FR 48178 \(1979\)*](#), *Memorandum, Opinion and Order*, [*44 FR 74702*](#), and *Second Report and Order*, [*48 FR 51302 \(1983\)*](#). A Form 724 had to be filed to notify the Commission of the location of each ISM equipment. This information which was sought to assist in locating interference has proven to be of little value with the advances in spectrum monitoring techniques.
- (5) *See Third Notice of Proposed Rule Making* in Gen. Docket 20718, FCC 84-578, [*49 FR 47628*](#), -- FCC2d -- (adopted November 21, 1984).
- (6) RF lighting is a broad term which applies to new technologies developed to produce light more efficiently, whereby the 60 hertz AC electrical power is converted to radio frequencies and is used to stimulate a gas inside a bulb. Lighting products are being developed for both home and industrial use. Some types are intended as replacements for standard household Edison light bulbs, and others are designed to be used with fluorescent light fixtures. RF lighting devices are treated under our Rules as general or miscellaneous ISM equipment.
- (7) The four ISM frequency bands added recently to the U.S. Table of Frequency Allocations as a result of the 1979 WARC are: 6.78 MHz # 15 kHz, 61.25 GHz # 250 MHz, 122.50 GHz # 500 MHz, and 245 GHz # 1.0 GHz. *See Second Report and Order* in Gen. Docket 80-739, FCC 83-511, [*49 FR 2357 \(1984\)*](#) (dealing with the implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979).
- (8) CCIR is the French acronym for International Radio Consultative Committee, an arm of the International Telecommunication Union (ITU). CISPR is the French acronym for International Special Committee on Radio Interference, an arm of the International Electrotechnical Commission (IEC).
- (9) Some comments made on the *Notice* exceed the scope of this proceeding and will not be considered. They are (1) the request by the Committee on Radio Frequencies of the National Academy of Sciences to discontinue the operation of ISM equipment in the frequency bands in which radio astronomy and remote sensors services are permitted, and (2) the suggestion by Spectrum Measurement Corporation to add 20.34 MHz as an ISM frequency to the U.S. Table of Frequency Allocations.

- (10) *See Second Report and Order* in Gen. Docket 80-739, op. cit., at C-7 and C-8.
- (11) *See* Fischetti, "Probing the Human Body," 20 IEEE Spectrum 74 (Jan 1983) for additional information. *See also* Horgan, "Medical Electronics," 22 IEEE Spectrum 89 (Jan 1985).
- (12) *See Third Notice of Proposed Rule Making* in Gen. Docket 20718, op. cit., paragraphs 13 and 21.
- (13) Under type approval, a grant of equipment authorization is issued by the Commission based on examination and measurement of one or more sample units at its laboratory. On-site certification requires that a qualified party test the device at the user's premises, that measurements be made occasionally to assure continued compliance and that records of the test results be kept; it is very often associated with the triennial certification rule of § 18.142. Prototype certification is similar to certification as defined under Part 2, Subpart J; a grant of equipment authorization is issued by the Commission based on a written application and test data submitted by the applicant.
- (14) *See Third Notice of Proposed Rule Making* in Gen. Docket 20718, op. cit., at 6, paragraph 17. *See also* 47 CFR Part 2, Subpart J for additional information on the FCC equipment authorization procedures.
- (15) *See Public Notice* No. 3037, released March 8, 1985, entitled "FCC Laboratory Authorization Processing -- Speed of Service".
- (16) Cf. *Order Granting Limited Waiver*, FCC 83-361, released August 5, 1983 and *Petitions for Waiver* filed by NEMA (Public Notice, September 5, 1984, Mimeo No. 6400).
- (17) Cf. *Report and Order* in Gen. Docket 83-10, FCC 84-21, 49 FR 3991 (1984) (dealing with the expansion of the verification and notification equipment authorization procedures).
- (18) *See Third Notice of Proposed Rule Making* in Gen. Docket 20718, op. cit., paragraph 14.
- (19) *See* Electro-Metrics comments in Gen. Docket 20718, dated December 20, 1984.
- (20) *See Order Granting Limited Waiver*, op. cit., paragraph 19.
- (21) *See Notice of Inquiry* in Gen. Docket 83-806, FCC 83-360, 48 FR 37235 (1983).
- (22) *See* NAB reply comments in Gen. Docket 20718, filed February 22, 1985, at 3.
- (23) *See* CCIR Report No. 258-4, "Man-made Radio Noise" (1982) for specific values in this region of the spectrum.
- (24) *See* GE comments in Gen. Docket 83-806, filed October 31, 1983, at 16, Tables III and IV. *See also* NEMA comments in Gen. Docket 83-806, filed October 21, 1983, at 32 and 33.
- (25) *See Notice of Proposed Rule Making* in Gen. Docket 20718, op. cit., Appendix C, §§ 18.108, 18.112, and 18.116.

(26) Cf. Section 2.11 of FCC/OST Bulletin 62, "Understanding the FCC regulations concerning computing devices," May 1984, for further information on the Commission's policy regarding multiple technical regulations.

(27) *See Third Notice of Proposed Rule Making* in Gen. Docket 20718, op. cit., Appendix B, sections 2.1-2.1.3.

(28) The 6 dB bandwidth of a measuring instrument represents its resolution-filter bandwidth or its band-pass characteristics.

(29) A LISN is a network inserted in the supply-mains lead of the equipment under test (EUT) to provide a specified measuring impedance for radio noise voltage measurements and to isolate the EUT from the supply mains at radio frequencies.

(30) Cf. MP-4, "FCC Methods of Measurement of Radio Noise Emissions from Computing Devices" (1983), at 8, section 4.2.4.

Appendix A

The following parties filed comments in response to the *Third Notice of Proposed Rulemaking* in this docket:

1. Aerospace and Flight Test Radio Coordinating Council
2. American College of Chest Physicians
3. American Telephone and Telegraph Company
4. Branson Ultrasonics Corporation
5. Edwin L. Bronaugh
6. Dash, Strauss and Goodhue ¹
7. Dukane Corporation (Dukane)
8. Electro-Metrics
9. Fusion Systems Corporation
10. General Electric Company 1
11. Lewis Corporation
12. National Academy of Sciences
13. National Electrical Manufacturers Association
14. Pepper, Hamilton & Scheetz
15. R & B Enterprises
16. Spectrum Measurement Corporation
17. Ultrasonic Industry Association, Inc.

The following parties filed reply comments:

¹ These late-filed comments have been accepted because they enhance the diversity of view points on the issues at hand and thereby serve the public interest.

1. General Electric Corporation
2. International Business Machines Corporation
3. National Association of Broadcasters
4. National Electrical Manufacturers Association

Appendix B

PART 0 -- [AMENDED]

A. 47 CFR Part 0 is amended as follows:

1. The authority citation for Part 0 continues to read as follows:

Authority: Secs. 4, 5, 303, 307, 308, 309, 48 Stat., as amended, 1066, 1068, 1082, 1083, 1084, 1085; [47 U.S.C. 154](#), [303](#), [307](#), [308](#), [309](#).

2. In Part 0, § 0.314 paragraphs (m) and (n) are revised to read as follows:

§ 0.314 Additional authority delegated.

* * * * *

(m) Issuances of notices and orders to operators of industrial, scientific, and medical (ISM) equipment, as provided in § 18.115 of this chapter.

(n) Requests for permission to resume operation of ISM equipment on a temporary basis, as provided by § 18.115 of this chapter, and requests for extensions of time within which to file final reports, as provided by § 18.117 of this chapter.

* * * * *

PART 2 -- [AMENDED]

B. 47 CFR Part 2 is amended as follows:

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

Authority: Sec. 4, 303, 48 Stat. 1066, 1082, as amended ([47 U.S.C. 154](#), [303](#), unless otherwise noted).

2. In Part 2, § 2.809 is revised to read as follows:

§ 2.809 Exemption for ISM equipment.

(a) The announcement and offer for sale of ISM equipment which is subject to the provisions of Part 18 of this chapter, and which is in the conceptual developmental, design or pre-production stage is permitted prior to determination of compliance, provided the prospective buyer is advised in writing at the time of the announcement or offer for sale that said equipment is subject to FCC Rules and that said equipment shall comply with the appropriate FCC Rules prior to final delivery to the buyer or to the distribution centers.

(b) Manufacturers of nonconsumer ISM equipment shall have the option of insuring compliance with applicable technical specifications of this chapter at each end user's location after installation, provided the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the manufacturer of the equipment.

(c) ISM equipment subject to the provisions of this chapter may be operated prior to determination of compliance and, when appropriate, obtaining authorization from the Commission under the following circumstances:

- (1) While testing for purposes of determining equipment compliance.
- (2) When demonstrating equipment at trade shows, provided a conspicuous notice is displayed to specify that the device has not been tested for compliance or approved by the Commission. If the device is offered for sale or lease, the provisions of § 2.809(a) shall apply.
- (3) While testing at customer's premises to determine equipment acceptability.

3. In Part 2, the title and paragraph (b) of § 2.1033 are revised to read as follows:

§ 2.1033 Application for certification.

* * * * *

(b) The application shall be accompanied by a report of measurements, and such other attachments as specified in the rules governing that particular equipment.

* * * * *

§§ 2.1037 and 2.1039 [Removed]

4. In Part 2, §§2.1037 and 2.1039 are removed.

C. 47 CFR Part 18 is revised in its entirety to read as follows:

PART 18 -- INDUSTRIAL, SCIENTIFIC, AND MEDICAL EQUIPMENT

Subpart A -- General Information

Sec.

18.101 Basis and purpose.

18.103 Organization and applicability of the rules.

18.105 Other applicable rules.

18.107 Definitions.

18.109 General technical requirements.

18.111 General operating conditions.

18.113 Inspection by Commission representatives.

18.115 Elimination and investigation of harmful interference.

18.117 Report of interference investigation.

18.119 Importation.

Subpart B -- Applications and Authorizations

18.201 Scope.

18.203 Equipment authorization.

18.205 Description of measurement facilities.

18.207 Technical report.

18.209 Identification of authorized equipment.

18.211 Multiple listing of equipment.

18.213 Information to the user.

Subpart C -- Technical Standards

18.301 Operating frequencies.

18.303 Prohibited frequency bands.

18.305 Field strength limits.

18.307 Conduction limits.

18.309 Frequency range of measurements.

18.311 Methods of measurements.

Authority: Secs. 4, 303, 307, *48 Stat. 1066*, 1082, 1083, as amended; sec. 303, [*82 Stat. 290*](#); [*47 U.S.C. 154*](#), [*302*](#), [*303*](#), [*307*](#).

Subpart A -- General Information

§ 18.101 Basis and purpose.

The rules in this part, in accordance with the applicable treaties and agreements to which the United States is a party, are promulgated pursuant to section 302 of the Communications Act of 1934, as amended, vesting the Federal Communications Commission with authority to regulate industrial, scientific, and medical equipment (ISM) that emits electromagnetic energy on frequencies within the radio frequency spectrum in order to prevent harmful interference to authorized radio communication services. This part sets forth the conditions under which the equipment in question may be operated.

§ 18.103 Organization and applicability of the rules.

The rules in this part are divided into the following subparts:

- (a) Subpart A contains general information and definitions for use in this part.
- (b) Subpart B describes the procedures and requirements for authorization to market or operate ISM equipment under this part.
- (c) Subpart C contains the technical standards for ISM equipment.

§ 18.105 Other applicable rules.

Other Commission rule parts relating to the authorization and operation of ISM equipment include the following:

- (a) Part O describes the Commission's organization and delegations of authority. This part also lists available Commission publications, standards and procedures for access to Commission records, and location of Commission field offices.
- (b) Part 1 contains the rules of practice and procedure for adjudicatory proceedings including hearing proceedings; procedures for reconsideration and review of the Commission's actions; provisions concerning violation notices and for forfeiture proceedings; and the requirements for environmental impact statements.

- (c) Part 2 contains special requirements in international regulations, agreements, treaties, and the table of frequency allocations. This part also contains requirements and procedures concerning the marketing, the equipment authorization, and the importation of radio frequency devices into the United States.

§ 18.107 Definitions.

- (a) **Radio frequency (RF) energy.** Electromagnetic energy at any frequency in the radio spectrum from 9 kHz to 3 THz (3,000 GHz).
- (b) **Harmful interference.** Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter.
- (c) **Industrial, scientific, and medical (ISM) equipment.** Equipment or appliances designed to generate and use locally RF energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunication. Typical ISM applications are the production of physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal and acceleration of charged particles.
- (d) **Industrial heating equipment.** A category of ISM equipment used for or in connection with industrial heating operations utilized in a manufacturing or production process.
- (e) **Medical diathermy equipment.** A category of ISM equipment used for therapeutic purposes, not including surgical diathermy apparatus designed for intermittent operation with low power.
- (f) **Ultrasonic equipment.** A category of ISM equipment in which the RF energy is used to excite or drive an electromechanical transducer for the production of sonic or ultrasonic mechanical energy for industrial, scientific, medical or other noncommunication purposes.
- (g) **Consumer ISM equipment.** A category of ISM equipment used or intended to be used by the general public in a residential environment, notwithstanding use in other areas. Examples are domestic microwave ovens, jewelry cleaners for home use, ultrasonic humidifiers.
- (h) **ISM frequency.** A frequency assigned by this part for the use of ISM equipment. A specified tolerance is associated with each ISM frequency. See § 18.301.
- (i) **Marketing.** As used in this part, marketing shall include sale or lease, offer for sale or lease, advertising for sale or lease, the import or shipment or other distribution for the purpose of sale or lease or offer for sale or lease. See Subpart I of Part 2 of this chapter.

Note. -- In the foregoing, sale (or lease) shall mean sale (or lease) to the user or a vendor who in turn sells (or leases) to the user. Sale shall not be construed to apply to devices sold to a second party for manufacture or fabrication into a device which is subsequently sold (or leased) to the user.

§ 18.109 General technical requirements.

ISM equipment shall be designed and constructed in accordance with good engineering practice with sufficient shielding and filtering to provide adequate suppression of emissions on frequencies outside the frequency bands specified in § 18.301.

§ 18.111 General operating conditions.

- (a) Persons operating ISM equipment shall not be deemed to have any vested or recognizable right to the continued use of any given frequency, by virtue of any prior equipment authorization and/or compliance with the applicable rules.
- (b) Subject to the exceptions in paragraphs (c) and (d) of this section and irrespective of whether the equipment otherwise complies with the rules in this part, the operator of ISM equipment that causes harmful interference to any authorized radio service shall promptly take whatever steps may be necessary to eliminate the interference.
- (c) The provisions of paragraph (b) of this section shall not apply in the case of interference to an authorized radio station or a radiocommunication device operating in an ISM frequency band.
- (d) The provisions of paragraph (b) of this section shall not apply in the case of interference to a receiver arising from direct intermediate frequency pickup by the receiver of the fundamental frequency emissions of ISM equipment operating in an ISM frequency band and otherwise complying with the requirements of this part.

§ 18.113 Inspection by Commission representatives.

Upon request by a representative of the Commission the manufacturer, owner, or operator of any ISM equipment shall make the equipment available for inspection and promptly furnish the Commission with such information as may be required to indicate that the equipment complies with this part.

§ 18.115 Elimination and investigation of harmful interference.

- (a) The operator of ISM equipment that causes harmful interference to radio services shall promptly take appropriate measures to correct the problem.
- (b) If the operator of ISM equipment is notified by the Commission's Engineer in Charge (EIC) that operation of such equipment is endangering the functioning of a radionavigation or safety service, the operator shall immediately cease operating the equipment. Operation may be resumed on a temporary basis only for the purpose of eliminating the harmful interference. Operation may be resumed on a regular basis only after the harmful interference has been eliminated and approval from the EIC obtained.
- (c) When notified by the EIC that a particular installation is causing harmful interference, the operator or manufacturer shall arrange for an engineer skilled in techniques of interference measurement and control to make an investigation to ensure that the harmful interference has been eliminated. The EIC may require the engineer making the investigation to furnish proof of his or her qualifications.

§ 18.117 Report of interference investigation.

- (a) An interim report on investigations and corrective measures taken pursuant to § 18.115 of this Part shall be filed with the EIC of the local FCC office within 30 days of notification of harmful interference. The final report shall be filed with the EIC within 60 days of notification.
- (b) The date for filing the final report may be extended by the Engineer in Charge when additional time is required to put into effect the corrective measures or to complete the

investigation. The request for extension of time shall be accompanied by a progress report showing what has been accomplished to date.

§ 18.119 Importation.

ISM equipment shall be refused entry or withdrawal for consumption into the Customs territory of the United States, unless accompanied by a copy of FCC Form 740, in accordance with the provisions of Subpart K, Part 2 of this chapter.

Subpart B -- Applications and Authorizations

§ 18.201 Scope.

This subpart contains the procedures and requirements for authorization to market or operate ISM equipment under this part.

§ 18.203 Equipment authorization.

(a) Consumer ISM equipment, unless otherwise specified, shall be subject to certification prior to use or marketing. An application for certification shall be filed with the Commission on an FCC Form 731, pursuant to the relevant sections in Part 2, Subpart J of this chapter and shall also be accompanied by:

(1) A description of measurement facilities pursuant to § 18.205 or reference to such information already on file with the Commission.

(2) A technical report pursuant to § 18.207 and 18.311.

Note. -- The Commission will accept applications for either type approval or certification until September 1, 1986, for consumer microwave ovens. After that date, only applications for certification will be accepted for filing.

(b) Consumer ultrasonic equipment generating less than 500 watts and operating below 90 kHz, and non-consumer ISM equipment shall be subject to verification, in accordance with the relevant sections of part 2, Subpart J of this chapter.

(c) Grants of equipment authorization issued, as well as on-site certifications performed, before March 1, 1986, remain in effect and no further action is required.

§ 18.205 Description of measurement facilities.

(a) Any party filing a report of measurements with the Commission shall include in that report a description of the measurement facilities. If such a description is already on file with the Commission, it may be included by reference.

(b) The description shall include the following information:

(1) Location of test site.

(2) Physical description of the test site accompanied by photographs 8 x 10 in size. Photographs smaller than 8 x 10 will be acceptable if they are of sufficient clarity and mounted on paper 8 x 10 .

(3) Scaled drawing showing the dimensions of the site, the physical layout of supporting structures and all structures within 5 times the distance between the measuring set and the device under test.

- (4) Description of structures used to support the device being measured and the test instrumentation.
 - (5) List of measuring equipment used and information concerning the calibration of the measuring equipment, i.e., when the equipment was last calibrated and frequency of calibration.
 - (6) A statement indicating whether this facility is available to do measurement work for others on a contract basis.
- (c) This information shall be kept current at all times. At least every three (3) years, the organization filing the data shall advise that the data on file are current.
- Note. -- OST Bulletin 55, "Characteristics of Open Field Test Sites", provides further guidance on open field test sites.

§ 18.207 Technical report.

When required by the Commission a technical report shall include at least the following information:

- (a) A description of the measurement facilities in accordance with § 18.205. If such a description is already on file with the Commission, it may be included by reference.
- (b) A copy of the installation and operating instructions furnished to the user. A draft copy of such instructions may be submitted with the application, provided a copy of the actual document to be furnished to the user is submitted as soon as it is available, but no later than 60 days after the grant of the application.
- (c) The full name and mailing address of the manufacturer of the device and/or applicant filing for the equipment authorization.
- (d) The FCC Identifier, trade name(s), and/or model number(s) under which the equipment is or will be marketed.
- (e) A statement of the rated technical parameters that includes:
 - (1) A block and schematic diagram of the circuitry.
 - (2) Nominal operating frequency.
 - (3) Maximum RF energy generated.
 - (4) Electrical power requirements of equipment.
 - (5) Any other pertinent operating characteristics.
- (f) A report of measurements, including a list of the measuring equipment used, and a statement of the date when the measuring equipment was last calibrated and when the measurements were made. The frequency range that was investigated in obtaining the report of measurements shall be indicated. See also §§ 18.309 and 18.311.

§ 18.209 Identification of authorized equipment.

Each device for which a grant of equipment authorization is issued under this part shall be identified pursuant to the applicable provisions of Subpart J of Part 2 of this chapter. Changes in the identification of authorized equipment may be made pursuant to § 2.933 of Part 2 of this

chapter. FCC Identifiers as described in §§ 2.925 and 2.926 of this chapter shall not be used on equipment subject to verification.

§ 18.211 Multiple listing of equipment.

- (a) When the same or essentially the same equipment will be marketed under more than one FCC Identifier, equipment authorization must be requested on an FCC Form 731 for each FCC Identifier.
- (b) If equipment authorization for additional FCC Identifiers is requested in the initial application, a statement shall be included describing how these additional devices differ from the basic device which was measured and stating that the report of measurements submitted for the basic device applies also to the additional devices.
- (c) If equipment authorization for additional FCC Identifiers is requested after a grant has been issued by the FCC for the basic device, the application may, in lieu of the report of measurements, be accompanied by a statement including:
 - (1) FCC Identifier of device for which measurements are on file with the FCC.
 - (2) Date when equipment authorization was granted for the device(s) listed under paragraph (c)(1) of this section and the file number of such grant.
 - (3) Description of the difference between the device listed under paragraph (c)(1) of this section and the additional device(s).
 - (4) A statement that the report of measurements filed for the device listed under paragraph (c)(1) of this section applies also to the additional device(s).
 - (5) Photographs pursuant to § 2.1033(c).

§ 18.213 Information to the user.

Information on the following matters shall be provided to the user in the instruction manual for any type of ISM equipment:

- (a) The interference potential of the device or system
- (b) Maintenance of the system
- (c) Simple measures that can be taken by the user to correct interference.

Subpart C -- Technical Standards

§ 18.301 Operating frequencies.

ISM equipment may be operated on any frequency above 9 kHz except as indicated in § 18.303. The following frequency bands, in accordance with § 2.106 of the rules, are allocated for use by ISM equipment:

ISM frequency	Tolerance
6.78 MHz	# 15.0 kHz
13.56 MHz	# 7.0 kHz

ISM frequency	Tolerance
27.12 MHz	# 163.0 kHz
40.68 MHz	# 20.0 kHz
915 MHz	# 13.0 MHz
2,450 MHz	# 50.0 MHz
5,800 MHz	# 75.0 MHz
24,125 MHz	# 125.0 MHz
61.25 GHz	# 250.0 MHz
122.50 GHz	# 500.0 MHz
245.00 GHz	# 1.0 GHz

Note. -- The use of the 6.78 MHz # 15 kHz frequency band is subject to the conditions of footnote 524 of the Table of Allocations. See § 2.106.

§ 18.303 Prohibited frequency bands.

Operation of ISM equipment within the following safety, search and rescue frequency bands is prohibited: 490-510 kHz, 2170-2194 kHz, 8354-8374 kHz, 121.4-121.6 MHz, 156.7-156.9 MHz, and 242.8-243.2 MHz.

§ 18.305 Field strength limits.

- (a) ISM equipment operating on a frequency specified in § 18.301 is permitted unlimited radiated energy in the band specified for that frequency.
- (b) The field strength levels of emissions which lie outside the bands specified in § 18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency	RF Power generated by equipmen t (watts)	Field strength limit (μ V/m)	Distan c e (mete rs)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500	25	300
		500 or more	25 Power	300

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (μ V/m)	Distance (meters)
			9	
			500	
	Any non-ISM frequency	Below 500	15	300
		500 or more	15 Power	300
			500	9 500
Industrial heaters and RF stabilized arc welders	On or below 5725 MHz	Any	10	1,600
	Above 5725 MHz	Any	(1)	(1)
Medical diathermy	Any ISM frequency	Any	25	300
	Any non-ISM frequency	Any	15	300
Ultrasonic	Below 490 kHz	Below 500	2400 -- -- F(kHz)	300
		500 or more	2400 <u>Power -- -- --</u> <u>9 F(kHz) 500</u>	300
	490 to 1,600 kHz	Any	24000 -- -- -- F(kHz)	30
	Non-ISM frequency above 1.6 MHz	Any	15	30
Induction cooking ranges	Below 90 kHz	Any	1500	30
	On or above 90 KHz	Any	300	30

Reduced to the greatest extent possible.

Notes. --

- (1) Field strength may not exceed 10 $\mu\text{V/m}$ at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.
 - (2) Field strength may not exceed 10 $\mu\text{V/m}$ at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.
 - (3) Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.
- (c) The field strength limits for RF lighting devices shall be the following:

Frequency (MHz)	Field strength limit at 30 meters ($\mu\text{V/m}$)
Non-consumer equipment:	
30-88	030
88-216	050
216-1000	070
Consumer equipment:	
30-88	010
88-216	015
216-1000	020

Notes. -- 1. The tighter limit shall apply at the boundary between two frequency ranges.

2. Testing for compliance with these limits may be made at closer distances, provided a sufficient number of measurements are taken to plot the radiation pattern, to determine the major lobes of radiation, and to determine the expected field strength level at 30 meters. Alternatively, if measurements are made at only one closer fixed distance then the permissible field strength limits shall be adjusted using $1/d$ as an attenuation factor.

§ 18.307 Conduction limits.

For the following equipment, which is designed to be connected to a low voltage public utility power line, the RF voltage conducted back into the power lines measured with a line impedance stabilization network (LISN) shall be limited to:

- (a) Ultrasonic equipment:

Frequency (MHz)	Maximum RF line voltage
-----------------	-------------------------

measured with a 5 μ H/50 ohmLISN (μ V)

0.010-0.49	01000
0.49-30	0 200

(b) Induction cooking ranges manufactured after February 1, 1980:

Frequency (MHz)	Maximum RF line voltage measured with a 5 μ H/50 ohm LISN (mV)
0.010-0.1	10-1 (linear interpolation)
0.1-0.5	1
0.5-30	0.25

(c) RF lighting devices:

Frequency (MHz)	Maximum RF line voltage measured with a 50 μ H/50 ohm LISN (μ V)
Non-consumer equipment:	
0.45 to 1.6	01000
1.6 to 30	03000
Consumer equipment:	
0.45 to 30	0 250

Notes.

1. For ultrasonic equipment, compliance with these conduction limits shall preclude the need to show compliance with the field strength limits below 30 MHz unless requested by the Commission.
2. These limits shall apply to RF lighting devices, pending further action in General Docket 83-806.
3. The tighter limits shall apply at the boundary between two frequency ranges.

§ 18.309 Frequency range of measurements.

(a) For field strength measurements:

Frequency band in which device operates (MHz)	Range of frequency measurements	
	Lowest frequency	Highest frequency
Below 1.705	Lowest frequency generated in the device or 9 kHz, whichever is lower	30 MHz.
1.705 to 30do	400 MHz.
30 to 500	Lowest frequency generated in the device or 25 MHz, whichever is lower	Tenth harmonic or 1000 MHz, whichever is higher.
500 to 1000	Lowest frequency generated in the device or 100 MHz, whichever is lower	Tenth harmonic.
Above 1000do	Tenth harmonic or highest detectable emission.

(b) For conducted powerline measurements, the frequency range over which the limits are specified will be scanned.

§ 18.311 Methods of measurements.

The measurement techniques which will be used by the FCC to determine compliance with the technical requirements of this Part are set out in FCC Measurement Procedure MP-5, "Methods of Measurements of Radio Noise Emissions from ISM equipment". Although the procedures in MP-5 are not mandated, manufacturers are encouraged to follow the same techniques which will be used by the FCC.

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