

filing comments falls on a holiday, comments shall be filed on the next business day before noon, unless the nearest business day precedes the fifth calendar day following a filing, in which case the comments will be due on the preceding business day. For example, if the fifth day falls on a Saturday, then the filing would be due on that preceding Friday. However, if the fifth day falls on Sunday, then the filing will be due on the next day, Monday, before noon (or Tuesday, before noon if the Monday is a holiday).

(2) Parties wishing to respond to a FCC Form 1275 filing must submit comments or oppositions with the Office of the Secretary and the Bureau Chief, Cable Services Bureau. Comments will not be considered properly filed unless filed with both of these Offices. Parties are required to attach a cover sheet to the filing indicating that the submission is a pleading related to an open video system application, the only wording on this cover sheet shall be "Open Video System Certification Application Comments." This wording shall be located in the center of the page and should be in letters at least 1/2 inch in size. Parties shall also include the words "open video systems" on their mailing envelopes.

(f) If the Commission does not disapprove the certification application within ten days after receipt of an applicant's request, the certification application will be deemed approved. If disapproved, the applicant may file a revised certification or refile its original submission with a statement addressing the issues in dispute. Such refilings must be served on any objecting party or parties and on all local communities in which the applicant intends to operate. The Commission will consider any revised or refiled FCC Form 1275 to be a new proceeding and any party who filed comments regarding the original FCC Form 1275 will have to refile their original comments if they think such comments should be considered in the subsequent proceeding.

5. Section 76.1503 is amended by revising paragraph (b)(1) introductory text to read as follows:

§ 76.1503 Carriage of video programming providers on open video systems.

* * * * *

(b) * * *

(1) *Notification.* An open video system operator shall file with the Secretary of the Federal Communications Commission a "Notice of Intent" to establish an open video system, which the Commission will release in a Public Notice. Parties are required to attach a cover sheet to the

filing indicating that the submission is an Open Video System Notice of Intent. The only wording on this cover sheet shall be "Open Video System Notice of Intent" and "Attention: Cable Services Bureau." This wording shall be located in the center of the page and should be in letters at least 1/2 inch in size. Parties shall also include the words "open video systems" on their mailing envelopes. Parties must submit copies of the Notice of Intent with the Office of the Secretary and the Bureau Chief, Cable Services Bureau. The Notice of Intent shall include the following information:

* * * * *

6. Section 76.1513 is amended by adding new paragraphs (d)(8) and (d)(9) to read as follows:

§ 76.1513 Dispute resolution.

* * * * *

(d) * * *

(8) Parties are required to submit the complaint and materials related to these proceedings simultaneously to the Office of the Secretary and the Bureau Chief, Cable Services Bureau.

(9) Pleadings must include a cover sheet indicating that the submission is either an Open Video System Channel Carriage Complaint or related pleading. In either case, the only wording on this cover sheet shall be "Open Video System Channel Carriage Dispute Resolution" and "Attention: Cable Services Bureau." This wording shall be located in the center of the page and should be in letters at least 1/2 inch in size. Parties shall also include the words "open video systems" on their mailing envelopes.

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[FR Doc. 97-11973 Filed 5-12-97; 8:45 am]

BILLING CODE 6712-01-P

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2 and 15

[ET Docket No. 96-8; FCC 97-114]

Spread Spectrum Transmitters

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: By this *Report and Order*, the Commission amends its regulations regarding the unlicensed operation of spread spectrum systems in the 902-928 MHz ("915 MHz"), 2400-2483.5 MHz ("2450 MHz"), and 5725-5850 MHz ("5800 MHz") bands, as proposed in the *Notice of Proposed Rule Making ("NPRM")* in this proceeding. These

amendments permit the use of high gain directional antennas for systems operating as fixed, point-to-point stations in the 2450 MHz and 5800 MHz bands. They also reduce the number of hopping channels for frequency hopping systems operating in the 915 MHz band. In addition, these amendments clarify existing regulations, codify existing policies into the rules, and update the definitions. These amendments will facilitate the growth of spread spectrum systems by enabling and encouraging practical applications for these systems.

DATES: Effective June 12, 1997.

ADDRESSES: Federal Communications Commission, 1919 M Street, N.W., Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: John A. Reed, Office of Engineering and Technology, (202) 418-2455.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's *Report and Order* in ET Docket No. 96-8, FCC 97-114, adopted April 3, 1997, and released April 10, 1997. The complete text of this *Report and Order* is available for inspection and copying during normal business hours in the FCC Reference Center (Room 239), 1919 M Street, NW., Washington, DC, and also may be purchased from the Commission's copy contractor, International Transcription Services, Inc., (202) 857-3800, 2100 M Street, NW., Suite 140, Washington, D.C. 20037.

Summary of the Report and Order

1. In the *Report and Order* ("Order"), the Commission amended Parts 2 and 15 of its regulations regarding unlicensed spread spectrum transmission systems operating in the 915 MHz, 2450 MHz and 5800 MHz bands. Spread spectrum systems use special modulation techniques that spread the energy of the signal being transmitted over a very wide bandwidth. This spreading reduces the power density of the signal at any frequency within the transmitted bandwidth, thereby reducing the probability of causing interference to other signals occupying the same spectrum. The reversal of the signal spreading process in the receiver enables the suppression of strong undesired signals.

2. The *Order* eliminates the limit on directional gain antennas for spread spectrum transmitters operating in the 2450 MHz and the 5800 MHz bands. The operation of these systems is limited to fixed, point-to-point systems. While transmitters in the 5800 MHz band are not required to reduce output power when the directional antenna

gain is increased, the maximum permitted output power of spread spectrum transmitters in the 2450 MHz band is decreased by 1 dB for every 3 dB that the directional antenna gain exceeds 6 dBi. This decrease in the maximum transmitter output power is necessary to reduce the potential for harmful interference to mobile stations operating in the 2450 MHz band, especially mobile licensees in the Public Safety Radio Services under Part 90 of the rules and other Part 15 devices. The waivers previously issued to six companies to permit the manufacture of systems at 2450 MHz and 5800 MHz employing unlimited antenna gain without a reduction in transmitter output power are no longer in effect upon 30 days from the publication of these final rules in the Federal Register. Any system manufactured after that date must comply with the regulations adopted herein.

3. The increase in directional antenna gain will permit users of spread spectrum systems to establish radio links without the delays and costs associated with formal frequency coordination and licensing. Such uses may include backbone connections to the new unlicensed NII system; intelligent transportation system communications links; high speed Internet connections for schools, hospitals, and government offices; energy utility applications; PCS and cellular backbone connections; and T-1 common carrier links in rural areas. However, the operators of these systems are reminded that the operation of Part 15 devices is subject to the conditions that any received interference must be accepted and that harmful interference may not be caused to other radio services. Thus, the Commission strongly recommends that operators of systems that provide critical communication services should exercise due caution to determine if there are any nearby radio services that could be affected by their communications.

4. In the *Order*, the Commission also reduces the minimum number of non-contiguous channels that must be employed by a frequency hopping spread spectrum system in the 915 MHz band from 50 channels to 25 channels. This reduction in the number of hopping channels will enable frequency hopping spread spectrum systems to avoid operations on frequencies used by wideband, multilateration LMS systems operating under Part 90 of the rules, thereby reducing mutual interference problems. Frequency hopping spread spectrum systems that employ less than 50 hopping channels must employ channel bandwidths of at least 250 kHz;

shall not exceed an average time of occupancy on any hopping frequency of 0.4 seconds in any 10 second period; and shall operate with a maximum peak transmitter output power of 250 mW with a directional antenna gain of 6 dBi. Higher antenna gain is permitted only with a corresponding decrease in transmitter output power.

5. In the *Order*, the Commission made several amendments to the rules to clarify existing regulations, codify existing policies into the rules, and update the definitions. These amendments to the rules are summarized below:

—The spectral power density limit for direct sequence systems is modified to indicate that the standard applies to the peak spectral power density, and the measurement procedure employed for measuring spectral power density where the spectrum line spacing can not be resolved is corrected;

—The definition of a direct sequence system is modified, as proposed in the *NPRM*;

—The definition of a pseudorandom sequence and a frequency hopping system is modified, as proposed in the *NPRM*;

—The rules are clarified to permit short duration transmissions under the provisions for frequency hopping systems provided the systems are capable of complying with all of the spread spectrum standards, including the definition of a frequency hopping systems and the eventual distribution of the transmissions over the minimum number of hopping channels;

—An alternative method of measuring the processing gain of a direct sequence system, based on receiver jamming margin, is incorporated into the rules;

—The limits on unwanted emissions are simplified, as proposed in the *NPRM*;

—The existing policy permitting the coordination of a frequency hopping system when the system incorporates intelligence that permits it to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopping sequence to avoid hopping on occupied channels is codified into the rules;

—The prohibition against the marketing and use of external radio frequency power amplifiers that are not certified as part of the system and the prohibition against the marketing and use of antenna/transmitter combinations that are not certified as a system is clarified in the rules;

—The applicability of the RF guidelines for human exposure, as specified in Section 1.1307 of the rules, to Part 15 devices is noted; and

—The prohibition against cross-border operation into Mexico or Canada and the applicability of the non-interference rules to Canadian or Mexican radio operations are noted.

Final Regulatory Flexibility Analysis

6. As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. 603 (RFA), Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making* (“*NPRM*”) in ET Docket No. 96-8.¹ The Commission sought written public comments on the proposals in the *NPRM* including the IRFA. The Commission’s Regulatory Flexibility Analysis (FRFA) in this Report and Order conforms to the RFA, as amended by the Contract with America Advancement Act of 1996 (CWAAA), Public Law 104-121, 110 Stat. 847 (1996).²

7. *Need for and Objective of the Rule.* The objective is to amend Parts 2 and 15 of the rules regarding the operation of spread spectrum transmission systems in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The Commission is also adopting a number of amendments to the spread spectrum regulations to clarify the existing regulations, to codify existing policies into the rules, and to update the current definitions. These changes to the rules will facilitate the growth of the spread spectrum industry by enabling and encouraging practical applications for these products. The new rules will expand the ability of equipment manufacturers to develop spread spectrum systems for unlicensed use that provide users with the flexibility to establish radio links without the delays and costs associated with formal frequency coordination and licensing. Such uses may include intelligent transportation system communications links; high speed Internet connections for schools, hospitals, and government offices; energy utility applications; PCS and cellular backbone connections; and T-1 common carrier links in rural areas. The new rules will also permit frequency hopping spread spectrum systems and wideband, multilateration Location Monitoring Service (LMS) systems to operate within the same frequency band with decreased potential for mutual interference problems.

¹ Amendment of Parts 2 and 15 of the Commission’s Rules Regarding Spectrum Transmitters, 11 FCC Rcd 3068 (1996), 61 FR 15206, April 5, 1996.

² Subtitle II of the CWAAA is “The Small Business Regulatory Enforcement Fairness Act of 1996” (SBREFA), codified at 5 U.S.C. 601 et seq.

8. *Summary of Significant Issues Raised by the Public Comments in Response to the Initial Regulatory Flexibility Analysis.* Only one commenter, Adtran submitted comments that were specifically in response to the IRFA. It agrees with the Commission's assessment that the changes made in the "Order" will have no negative impact on small entities. In general, commenters were supportive of the Commission's proposed changes to the rule. The Commission also received numerous suggestions for improving or modifying the rules. In response to a Petition for Rule Making filed by WMC, the Commission is eliminating the limit on directional gain antennas for spread spectrum transmitters operating in the 2450 MHz and 5800 MHz bands. For spread spectrum systems operating in the 2450 MHz band, the Commission is implementing its proposal to require that the output power for the transmitter be reduced by 1 dB for every 3 dB that the directional gain exceeds 6 dBi. In addition, in response to a Petition for Rule Making filed by SpectraLink, the Commission is reducing, from 50 to 25, the minimum number of channels required for frequency hopping spread spectrum systems operating in the 915 MHz band.

9. *Description and Estimate of the Number of Small Entities Subject to Which the Rules Apply.* The RFA generally defines the term "small business" as having the same meaning as the term "small business concern" under the Small Business Act, 15 U.S.C. 632. Based on that statutory provision, we will consider a small business concern one which: (1) Is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA). The RFA SBREFA provisions also apply to nonprofit organizations and to governmental organizations. Since the Regulatory Flexibility Act amendments were not in effect until the record in this proceeding was closed, the Commission was unable to request information regarding the number of small businesses that manufacture spread spectrum transmitters and is unable at this time to determine the number of small businesses that would be affected by this action. However, the Commission believes that the amendments being adopted in this proceeding clarify permissible methods of operation. With the exception of limits on directional antenna gain versus transmitter output power for systems in the 2450 MHz band, these

amendments should not impact any existing equipment designs. The only parties that would be impacted by the requirement to reduce transmitter output power when high antenna gains are employed are WMC, Cylink, ACS, MDS, Larus, and Wi-LAN Inc. These companies are currently producing this equipment under the conditions of a temporary waiver that permits them to manufacture fixed, point-to-point spread spectrum systems in the 2450 MHz band without a limit on directional antenna gain. All of these companies were notified at the time the waivers were granted that the waivers would expire upon the date of final action in this proceeding.

10. The rules adopted in this *Order* will apply to any entities manufacturing equipment for unlicensed Part 15 spread spectrum transmitters. The Commission has not developed a definition of small entities applicable to manufacturers of spread spectrum transmitters. Therefore, the applicable definition of small entity is the definition under the Small Business Administration ("SBA") rules applicable to manufacturers of "Radio and Television Broadcasting and Communications Equipment". According to the SBA's regulations, radio frequency manufacturers must have 750 or fewer employees in order to qualify as a small business.³ Census Bureau data indicates that there are 858 companies in the United States that manufacture radio and television broadcasting and communications equipment, and that 778 of these firms have fewer than 750 employees and would be classified as small entities.⁴

11. *Description of Projected Reporting, Recordkeeping and Other Compliance Requirements.* Part 15 spread spectrum transmitters are already required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. The changes proposed in this proceeding would not change any of the current reporting or recordkeeping requirements. Further, the proposed regulations add permissible methods of operation and would not require the modification of any existing products, except for those currently operating under limited waivers that expire upon adoption of this *Order*. These requirements include obtaining a grant of certification for the transmitter and meeting the emission limits specified in the rules.

³ See 13 CFR 121.201, Standard Industrial Classification (SIC) Code 3663.

⁴ See U.S. Department of Commerce, *1992 Census of Transportation, Communications and Utilities* (issued May 1995), SIC category 3663.

12. Skills of an application examiner, radio technician or engineer will be needed to meet the requirements. In many cases the studies can be done by a radio technician or engineer. Certification applications are usually done by applications examiners. It is the responsibility of the manufacturer of the device to determine whether the device will comply with the RF radiation limits. This study can be done by calculation or measurement, depending upon the situation.

13. *Significant Alternatives and Steps Taken by Agency to Minimize Significant Economic Impact on a Substantial Number of Small Entities Consistent with Stated Objectives.* In response to concerns raised in comments filed in response to the *NPRM*, the Commission made several minor clarifying amendments to its proposals. However, there was only one issue raised in the comments that could have had a significant economic impact on the manufacturers of spread spectrum systems. In the *NPRM*, the Commission proposed to require that the 3 dB beamwidths of the high gain directional antennas employed with spread spectrum transmitters differ by no more than a factor of two between the vertical and horizontal planes.⁵ Supporting comments were received from Adtran and Digital Wireless; however, Cushcraft, Cylink, the Part 15 Coalition and WMC believe that the requirement is an unnecessary regulation. Cushcraft believes that the majority of antennas already meet this criterion. Cylink states that this proposal may prevent applications that require a different antenna design, such as communications to off-shore platforms. The Commission agrees with the latter commenters that this portion of its proposal is unnecessary.

14. *Commission's Outreach Efforts to Learn of and Respond to the Views of Small Entities pursuant to SBREFA 5 U.S.C. 609.* During the course of this proceeding Office of Engineering and Technology staff members have had numerous ex parte meetings with representatives from Metricom, Inc., Cylink Corporation, Mulcay Consulting Association, and Digital Wireless Corporation.

15. *Report to Congress.* The Commission shall send a copy of this Final Regulatory Flexibility Analysis, along with this Report and Order, in a report to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. 801(a)(1)(A). A copy of this FRFA will

⁵ See *NPRM* at para. 17.

also be published in the **Federal Register**.

List of Subjects

47 CFR Part 2

Communications equipment, Radio.

47 CFR Part 15

Communications equipment, Radio, Reporting and recordkeeping requirements.

Federal Communications Commission

William F. Caton,
Acting Secretary.

Rule Changes

Title 47 of the Code of Federal Regulations, Parts 2 and 15, are amended as follows:

PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

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 2.1, paragraph (c), is amended by removing the definition for "Pseudorandom sequence", by revising the definition for "Direct Sequence Systems", and by revising the definition for "Frequency Hopping Systems" and placing it in alphabetical order to read as follows:

§ 2.1 Terms and definitions.

* * * * *
(c) * * *
* * * * *

Direct Sequence Systems. A spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted signal.

* * * * *

Frequency Hopping Systems. A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. The frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence. The wide RF bandwidth needed by such a system is not required by spreading of the RF energy about the carrier but rather to accommodate the range of frequencies to which the carrier frequency can hop. The test of a frequency hopping system is that the near term distribution of hops

appears random, the long term distribution appears evenly distributed over the hop set, and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

* * * * *

PART 15—RADIO FREQUENCY DEVICES

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

Authority: 47 U.S.C. 154, 302, 303, 304, 307 and 544A.

2. Section 15.3 is amended by adding a new paragraph (cc), to read as follows:

§ 15.3 Definitions.

* * * * *

(cc) *External radio frequency power amplifier.* A device which is not an integral part of an intentional radiator as manufactured and which, when used in conjunction with an intentional radiator as a signal source, is capable of amplifying that signal.

3. A new § 15.204 is added, to read as follows:

§ 15.204 External radio frequency power amplifiers and antenna modifications.

(a) Except as otherwise described in paragraph (b) of this section, no person shall use, manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease), or import, ship, or distribute for the purpose of selling or leasing, any external radio frequency power amplifier or amplifier kit intended for use with a Part 15 intentional radiator.

(b) A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. However, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized. An external radio frequency power amplifier shall be marketed only in the system configuration with which the amplifier is authorized and shall not be marketed as a separate product.

(c) Only the antenna with which an intentional radiator is authorized may be used with the intentional radiator.

4. Section 15.247 is amended by revising paragraphs (a)(1)(i), (b), (c), (d), and (e), and by adding new paragraphs (g) and (h) before the note at the end of the section, to read as follows:

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

(a) * * *

(1) * * *

(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

* * * * *

(b) The maximum peak output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400–2483.5 MHz or 5725–5850 MHz band and for all direct sequence systems: 1 watt.

(2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

(iii) Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators

transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(4) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

(c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

(d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

(e) The processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading/despreading function. The processing gain may be determined using one of the following methods:

(1) As measured at the demodulated output of the receiver: the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on.

(2) As measured using the CW jamming margin method: a signal generator is stepped in 50 kHz increments across the passband of the system, recording at each point the generator level required to produce the recommended Bit Error Rate (BER). This level is the jammer level. The output power of the intentional radiator is measured at the same point. The jammer to signal ratio (J/S) is then calculated,

discarding the worst 20% of the J/S data points. The lowest remaining J/S ratio is used to calculate the processing gain, as follows: $G_p = (S/N)_o + M_j + L_{sys}$, where G_p = processing gain of the system, $(S/N)_o$ = signal to noise ratio required for the chosen BER, M_j = J/S ratio, and L_{sys} = system losses. Note that total losses in a system, including intentional radiator and receiver, should be assumed to be no more than 2 dB.

* * * * *

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hops to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

* * * * *

Note: The following appendix will not appear in the Code of Federal Regulations.

Appendix—Measurement Procedure for Spread Spectrum Transmitters

Federal Communications Commission

Equipment Authorization Division, 7435
Oakland Mills Road, Columbia, MD
21046, Telephone: (301) 725-1585,
Facsimile: (301) 344-2050

Guidance on Measurements for Direct
Sequence Spread Spectrum Systems

Part 15 of the FCC Rules provides for operation of direct sequence spread spectrum transmitters. Examples of devices that operate under these rules include radio local area networks, cordless telephones, wireless cash registers, and wireless inventory tracking systems.

The Commission frequently receives requests for guidance as to how to perform measurements to demonstrate compliance with the technical standards for such systems. No formal measurement procedure has been established for determining

compliance with the technical standards. Such tests are to be performed following the general guidance in Section 15.31 of the FCC Rules and using good engineering practice. The following provides information on the measurement techniques the Commission has accepted in the past for equipment authorization purposes. Alternative techniques may be acceptable upon consultation and approval by the Commission staff. The information is organized according to the pertinent FCC rule sections.

Section 15.31(m): This rule specifies the number of operating frequencies to be examined for tunable equipment.

Section 15.207: Power line conducted emissions. If the unit is AC powered, an AC power line conducted test is also required per this rule.

Section 15.247(a)(2): Bandwidth. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span \gg RBW.

Section 15.247(b): Power output. This is an RF conducted test. Use a direct connection between the antenna port of the transmitter and the spectrum analyzer, through suitable attenuation. Set the RBW > 6 dB bandwidth of the emission or use a peak power meter.

Section 15.247(c): Spurious emissions. The following tests are required:

(1) RF antenna conducted test: Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

(2) Radiated emission test: Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp (and possibly a high-pass filter) is necessary for this measurement. For measurements above 1 GHz, set RBW = 1 MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation, use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

Section 15.247(d): Power spectral density. Locate and zoom in on emission peak(s) within the passband. Set RBW = 3 kHz, VBW > RBW, sweep = (SPAN/3 kHz) e.g., for a span of 1.5 MHz, the sweep should be $1.5 \times 10^6 \div 3 \times 10^3 = 500$ seconds. The peak level measured must be no greater than +8 dBm. If external attenuation is used, don't forget to add this value to the reading. Use the following guidelines for modifying the power spectral density measurement procedure when necessary.

- For devices with spectrum line spacing greater than 3 kHz no change is required.
- For devices with spectrum line spacing equal to or less than 3 kHz, the resolution bandwidth must be reduced below 3 kHz until the individual lines in the spectrum are resolved. The measurement data must then be normalized to 3 kHz by summing the power of all the individual spectral lines

within a 3 kHz band (in linear power units) to determine compliance.

- If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.8 dB for correction to 3 kHz.

- Should all the above fail or any controversy develop regarding accuracy of measurement, the Laboratory will use the HP 89440A Vector Signal Analyzer for final measurement unless a clear showing can be made for a further alternate.

Section 15.247(e): Processing Gain. The Processing Gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration. The test consists of stepping a signal generator in 50 kHz increments across the passband of the system. At each point, the generator level required to produce the recommended Bit

Error Rate (BER) is recorded. This level is the jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. Discard the worst 20% of the J/S data points. The lowest remaining J/S ratio is used when calculating the Processing Gain.

In a practical system, there are always implementation losses which degrade the performance below that of an optimal theoretical system of the same type. Losses occur due to non-optimal filtering, lack of equalization, LO phase noise, "corner cutting in digital processing", etc. Total losses in a system, including transmitter and receiver, should be assumed to be no more than 2 dB.

The signal to noise ratio for an *ideal* non-coherent receiver is calculated from:

$$(1) P_e = \frac{1}{2}e^{-\frac{1}{2}(S/N)_o}$$

where :

Pe = probability of error (BER)

(S/N)_o = the required signal to noise ratio at the receiver output for a given received signal quality

This is an example. You should use the equation (or curve) dictated by your demodulation scheme.

Ref.: Viterbi, A. J. *Principles of Coherent Communications*, (New York: McGraw-Hill 1966), Pg. 207 Using equation (1) shown above, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the Processing Gain (Gp) of the system.

$$G_p = (S/N)_o + M_j + L_{sys}$$

where:

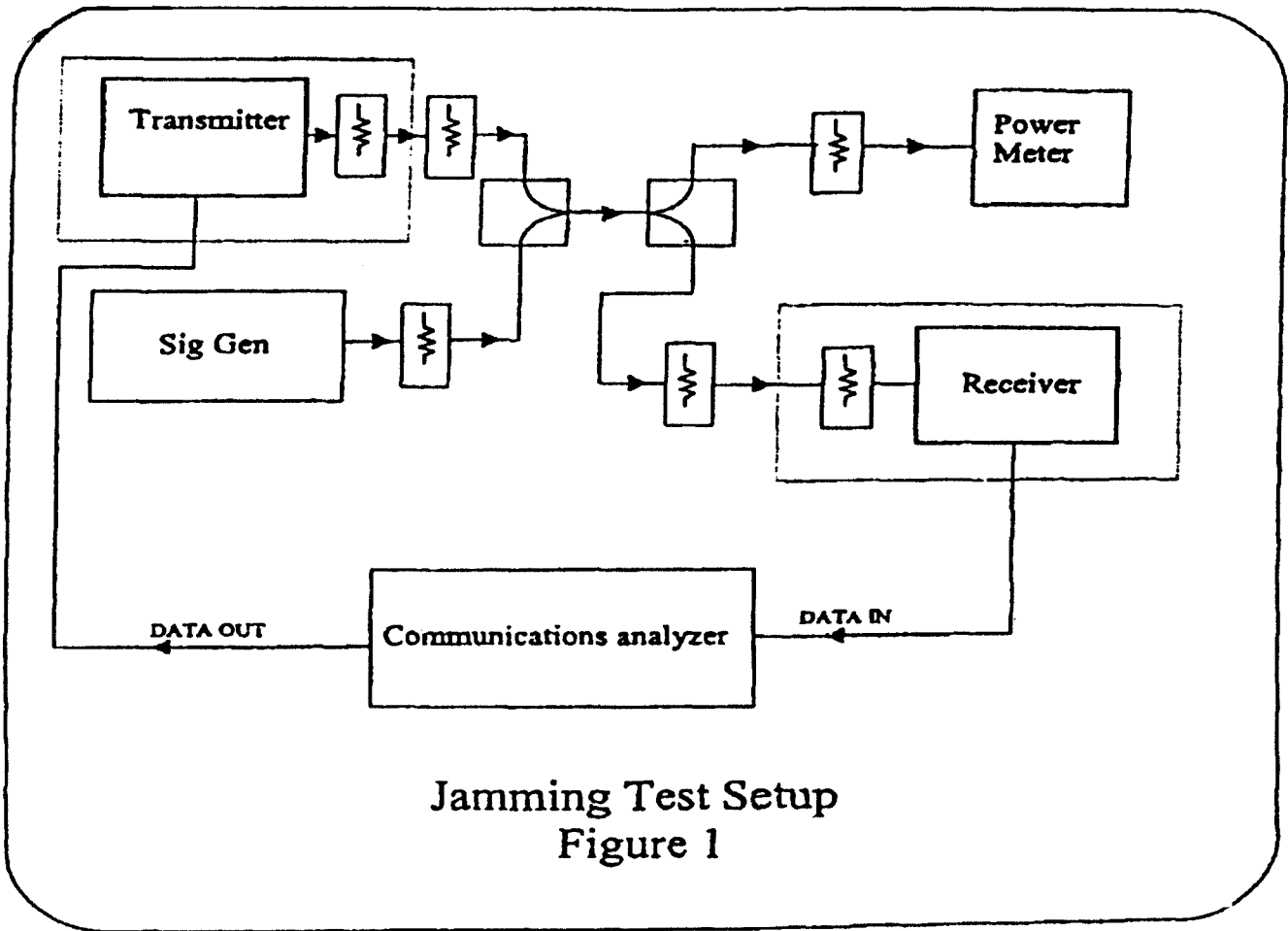
(S/N)_o = Signal to noise ratio

M_j = J/S ratio

L_{sys} = System losses.

Ref.: Dixon, R., *Spread Spectrum Systems* (New York: Wiley, 1984), Chapter 1.

BILLING CODE 6712-01-P



Jamming Test Setup
Figure 1

BILLING CODE 6712-01-C

Alternative Test Procedures

If antenna conducted tests cannot be performed on this device, radiated tests to show compliance with the various conducted

requirements of Section 15.247 are acceptable. As stated previously, a pre-amp must be used in making the following measurements.

(1) Calculate the transmitter's peak power using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:

E is the measured maximum field strength in V/m utilizing the widest available RBW.

G is the numeric gain of the transmitting antenna over an isotropic radiator.

d is the distance in meters from which the field strength was measured.

P is the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$

(2) Measure the power spectral density as follows:

A. Tune the analyzer to the highest point of the maximized fundamental emission. Reset the analyzer to a RBW = 3 kHz, VBW > RBW, span = 300 kHz, sweep = 100 sec.

B. From the peak level obtained in (A), derive the field strength, E, by applying the appropriate antenna factor, cable loss, pre-amp gain, etc. Using the equation listed in (1), calculate a power level for comparison to the +8 dBm limit.

[FR Doc. 97-11584 Filed 5-12-97; 8:45 am]

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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 76

[CS Docket No. 96-40; FCC 97-141]

Telecommunications Act of 1996

AGENCY: Federal Communications Commission.

ACTION: Interim rule.

SUMMARY: This Order establishes the enforcement date of the rule implementing Section 641 of the Communications Act regarding the scrambling of sexually explicit adult video service programming. Section 505 of the Telecommunications Act amends the Communications Act to add Section 641. In this Order, the Commission establishes that the rule implementing Section 641 will be enforced effective May 18, 1997.

DATES: 47 CFR 76.227 will be enforced effective May 18, 1997.

FOR FURTHER INFORMATION CONTACT: Meryl S. Icove, Cable Services Bureau, (202) 418-7200.

SUPPLEMENTARY INFORMATION: This is a synopsis of the Order in CS Docket No. 96-40, FCC 97-141, adopted and released on April 17, 1997. The complete text of this Order is available for inspection and copying during normal business hours in the FCC Reference Center (room 239), 1919 M Street, NW., Washington, DC, and also may be purchased from the Commission's copy contractor, International Transcription Services,

Inc. ("ITS Inc.") at (202) 857-3800, 2100 M Street, NW., Suite 140, Washington, DC 20017.

Synopsis of Order

1. On February 8, 1996, the Telecommunications Act of 1996 ("1996 Act") was enacted. Section 505 of the 1996 Act amends the Communications Act by adding a new Section 641, entitled "Scrambling of Sexually Explicit Adult Video Service Programming." Section 641(a) requires that

[I]n providing sexually explicit adult programming or other programming that is indecent on any channel of its service primarily dedicated to sexually-oriented programming, a multichannel video programming distributor shall fully scramble or otherwise fully block the video and audio portion of such channel so that one not a subscriber to such channel or programming does not receive it.

Section 641(b) provides that:

[u]ntil a multichannel video programming distributor complies with the requirement set forth in subsection (a), the distributor shall limit the access of children to the programming referred to in that subsection by not providing such programming during the hours of the day (as determined by the Commission) when a significant number of children are likely to view it.

The Commission adopted an interim rule (61 FR 09648, March 11, 1996) implementing Section 505 and defining, on an interim basis, the hours of 6:00 am to 10:00 pm as those hours when a significant number of children are likely to view such programming. Order and interim rule in CS Docket No. 96-40, Implementation of Section 505 of the Telecommunications Act of 1996: Scrambling of Sexually Explicit Adult Video Service Programming, 61 FR 09648, March 11, 1996, 11 FCC Rcd 5386 (released March 5, 1996). Section 505 provides that these provisions take effect 30 days after the date of enactment of the 1996 Act, i.e., March 9, 1996. The Commission has not enforced Section 505 due to a temporary restraining order and a number of stays that were granted by the United States District Court for the District of Delaware.

2. Prior to the statute becoming effective the United States District Court for the District of Delaware issued a temporary restraining order enjoining the United States Government, including the Commission, from "enforcing or implementing Section 505 of the Telecommunications Act of 1996 in any manner." The court's order stated that the temporary restraining order "shall remain in force only until the

hearing and determination by the district court of three judges of Plaintiff's Motion for Preliminary Injunction." *Playboy Entertainment Group, Inc. v. United States*, 918 F. Supp. 813 (D. Del. 1996). The Cable Services Bureau ("Bureau") by public notice announced that the Commission would not enforce or implement Section 505 while the temporary restraining order was in effect. Public Notice, Report No. CS 96-17, DA 96-354 (Cable Services Bureau), released March 13, 1996, 11 FCC Rcd 10336 (1996).¹

3. On November 8, 1996, a three judge panel of the United States District Court for the District of Delaware issued an order denying petitions for a preliminary injunction regarding Section 505, and thus lifted the temporary restraining order that was in effect. *Playboy Entertainment Group, Inc. v. United States*, 945 F. Supp. 772 (D. Del. 1996). Thereafter, the Bureau issued a public notice announcing that Section 505 of the Telecommunications Act, and its associated rules, were in effect. Public Notice, DA 96-1906 (Cable Services Bureau), released November 15, 1996.

4. The court, however, ordered that any enforcement of Section 505 was "stayed pending the decision of the Court on plaintiffs' pending Motions to Stay" the opinion of the court pending review by the Supreme Court. *Playboy Entertainment Group, Inc. v. United States*, Civil Action Nos. 96-94/96-107, November 15, 1996. The Bureau announced by public notice that the Commission would not enforce Section 505. Public Notice, DA 96-1915, (Cable Services Bureau), released November 18, 1996.

5. The three judge panel, on December 5, 1996, granted plaintiffs' motion to stay and ordered that any enforcement of Section 505 was "stayed during the pendency of the [parties'] appeal" to the Supreme Court. *Playboy Entertainment Group, Inc. v. United States*, Civil Action Nos. 96-94/96-107, December 5, 1996. On December 9, 1996, the Bureau issued a public notice announcing the court's decision and stating that Section 505 would remain unenforceable pending appeal to the Supreme Court. Public Notice, DA 96-2064 (Cable Services Bureau), released December 9, 1996.

6. On March 24, 1997, the Supreme Court affirmed the District Court's denial of the preliminary injunction. *Playboy Entertainment Group, Inc. v. United States*, 65 U.S.L.W. 3644, 3647,

¹ DA 96-354 and subsequent DA 96-1906, DA 96-1915, and DA 96-2064 were not published in the **Federal Register**.