

FCC Report and Order WT Docket No. 97-12

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

In the Matter of)	
)	
Amendment of the Amateur Service)	WT Docket No. 97-12
Rules to Provide For)	
Greater Use of Spread)	RM-8737
Spectrum Communication)	
Technologies)	

REPORT AND ORDER

Adopted: August 31, 1999

Released: September 3, 1999

By the Commission:

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I. INTRODUCTION AND EXECUTIVE SUMMARY

1. In the *Notice of Proposed Rule Making (Notice)* in this proceeding, the Commission sought comments on proposals to authorize amateur stations to make greater use of spread spectrum (SS) emission technologies.^[1] By this *Report and Order*, we adopt rules allowing amateur stations to transmit additional SS emission types. We conclude that the public interest would be served by removing the restriction in the Amateur Radio Service rules that limit the SS emissions that amateur stations may transmit. Moreover, we believe that this change will (1) allow amateur service licensees to experiment with additional SS emission types; (2) allow amateur radio operators to develop innovations and improvements to communications products and develop

new communications technologies; (3) facilitate the ability of the Amateur Radio Service to contribute to the development of SS communications by allowing amateur stations to transmit and experiment with SS technologies currently used in consumer and commercial products; and (4) promote more efficient use of spectrum allocated to the Amateur Radio Service.

2. The major rule changes we adopt today are summarized below:

- ? We amend our rules to remove the limitation that amateur stations transmit SS emission types using only frequency hopping and direct sequence spreading techniques.
- ? We adopt a requirement that amateur stations use automatic transmitter power control to limit transmitter power to the minimum power necessary to maintain communications.
- ? We amend our rules to remove now-unnecessary recordkeeping and station identification requirements that apply only to stations transmitting SS emissions.

3. Our decisions in this *Report and Order* further our goal to improve amateur radio communication capabilities. In developing these new and amended rules we are guided by three broad policy principles. First, we seek to provide a flexible regulatory framework that allows for continued development of new services through experimentation by amateur radio operators on amateur service spectrum. Second, we seek to promote technological innovation. Finally, we seek to eliminate unnecessary regulatory burdens.

II. BACKGROUND

4. SS is a modulation technique that distributes the energy of the transmitted signal over a segment of spectrum that is much larger than would be needed for a "traditional" modulation scheme. This technique results in the power density of the transmitted signal being very low, and the duration of a transmission on any frequency in the frequency segment being but a fraction of a second, at any point of bandwidth the SS emission occupies. This technique also allows reuse of the bandwidth in the available frequency segment that the SS emission occupies, thereby allowing multiple stations transmitting SS and non-SS systems to use the segment of spectrum simultaneously. While SS modulation techniques have been known for over 60 years, until the last 20 years its use has been almost exclusively for military or other limited applications. In fact, outside of the military context, one of the primary uses of SS was to obscure the content of the message from individuals using receivers capable of reception only on a single channel or for a finite number of channels during some defined time period.

5. Over eighteen years ago, Special Temporary Authority to experiment with SS transmissions was granted to 25 amateur radio stations affiliated with the Amateur Radio Research and Development Corporation.^[2] These experiments involved on-air evaluation of different spreading rates, frequency ranges, and interference to stations transmitting other emission types.^[3] On the basis of these tests, amateur radio stations were authorized to transmit SS emissions using two spreading techniques after June 1, 1986.^[4] Since SS was introduced in the Amateur Radio Service, the rules applicable to SS have not been substantively amended. In the intervening 12 years, however, numerous entities have developed commercial applications of SS, including medical telemetry, Personal Communications Services, remote meter reading and

position locating,[\[5\]](#) including safety applications such as the use of the Global Positioning System for locating ships at sea and other objects or individuals at remote points.

6. Our current Part 97 rules permit amateur stations to transmit SS emissions subject to certain operational constraints. Amateur station SS transmissions may be used only for communications between points where the Amateur Radio Service is regulated by the FCC and may be made only on authorized Amateur Radio Service frequency bands above 420 MHz.[\[6\]](#) SS emissions transmitted by amateur radio stations are limited to two types of spreading techniques -- frequency hopping and direct sequence.[\[7\]](#) Additionally, our rules require that documentation sufficient to enable the FCC to demodulate all transmissions be retained for a period of one year following the last entry in the station records. The rules also prohibit SS emission transmissions made for the purpose of obscuring the meaning of any communication.[\[8\]](#) Further, amateur radio stations transmitting SS emission types are secondary to amateur radio stations transmitting other emission types.[\[9\]](#)

7. On March 3, 1997, the Commission released the *Notice* in this proceeding to examine whether amateur stations should be permitted to transmit SS emission technologies employing additional spreading sequences. The Commission also proposed that each SS transmitter be required to incorporate a device to automatically limit its power to that actually necessary to carry out the communications. We received fifteen comments and twenty-five reply comments in response to the *Notice*.[\[10\]](#)

III. DISCUSSION

A. Elimination of restrictions on spreading techniques

8. *Background.* The *Notice* proposed to amend the Part 97 rules to authorize amateur stations to make greater use of SS type emission technologies. We proposed to allow amateur stations to transmit SS type emission technologies employing additional spreading sequences.[\[11\]](#) Specifically, we proposed to eliminate Sections 97.311(c) and (d),[\[12\]](#) which restrict amateur stations to transmitting SS emissions that use only frequency hopping and direct sequencing spreading techniques.[\[13\]](#) We indicated that this change would allow amateur radio operators to develop innovations and improvements to communications products and technologies.[\[14\]](#) We also stated that it would provide amateur radio operators more flexibility to use current and future communications technologies. Such a rule change also would encourage the amateur radio community to expand its experimental activities with SS and allow amateur stations to transmit SS emissions that presently are transmitted using other communications devices.[\[15\]](#)

9. *Decision.* The comments we received on this proposal generally supported elimination of restrictions on the spreading techniques that amateur radio stations may use. We conclude that the public interest will best be served by eliminating the rules that restrict amateur stations to using only two SS spreading techniques. In this connection, we note that one of the fundamental purposes underlying our Part 97 rules is accommodation of the amateur radio operator's proven ability to contribute to the advancement of the radio art.[\[16\]](#) We agree with William Tynan that we should not continue restricting the spreading techniques available to the amateur service in order to protect Part 15 manufacturers.[\[17\]](#) We also concur with the ARRL that elimination of

this restriction makes it likely that amateur radio operators will use Part 15 devices as a source of SS equipment,[\[18\]](#) and we note that Metricom, a manufacturer of Part 15 devices, supports these changes, provided we also adopt our proposal for automatic power control.[\[19\]](#) We also note that, because certain spreading codes and modulation methods used in Part 15 devices are not permissible in amateur radio communications, the most likely effect of the current rules is that experimentation is conducted by amateur radio licensees under Part 15 rules rather than under the amateur service rules.[\[20\]](#)

10. The manufacturers of unlicensed Part 15 devices argue that the proposed changes could upset the delicate balance that has been struck in the bands they share with the Amateur Radio Service, especially the 915 MHz and 2.4 GHz bands.[\[21\]](#) This balance, however, appears to be based in large part on the unattractiveness of SS experimentation in the amateur service due to the restriction in the rules that limits amateur radio stations to using only two specified techniques for spreading emissions -- frequency hopping and direct sequencing.[\[22\]](#) We do not believe that this concern warrants retaining the current restrictions on amateur radio stations. As an initial matter, we note that Part 15 devices will only receive an SS transmission from an amateur radio station if the station is using the same spreading or coding scheme as the Part 15 device, if the amateur station is transmitting at the same time and on the same channels as the Part 15 device when it is in use, and if the amateur station is within the reception range of the Part 15 device. The Part 15 Coalition has not shown with any degree of certainty that this coincidence of events is likely to happen frequently. Further, Part 15 devices do not require the user to have any technical knowledge of how the device works or its potential for interference[\[23\]](#) and use of unlicensed Part 15 devices is conditioned on the user accepting interference from the operation of an authorized radio station, another Part 15 device, or ISM equipment.[\[24\]](#) Additionally, the use of automatic power controls by amateur stations that transmit SS emissions and other technical solutions discussed below are expected to further reduce the interference potential. We will, therefore, amend Section 97.311 of our rules as proposed.

B. Automatic power control

11. *Background.* Under our current rules, an amateur station must use the minimum power necessary to carry out the desired communications regardless of the emission type, spreading technique, or frequency band used.[\[25\]](#) In addition, amateur stations transmitting SS emission types are restricted to a maximum transmitter power of 100 watts (W).[\[26\]](#) In the *Notice*, we proposed that automatic power control circuitry be required whenever an amateur station transmits an SS emission with more than 1 W.[\[27\]](#) This requirement was intended to ensure that the output power is limited to the minimum level necessary to conduct communications so that interference with other amateur radio stations and users of the frequency bands would be minimized.[\[28\]](#)

12. *Decision.* The comments are divided over the need and ability to implement automatic power controls. Some commentators believe that such controls would have an inhibiting effect on amateur service communications. For example, Messrs. Johnson and Tynan point out that automatic power control devices can not be used for either multi-point-to-multi-point applications or point-to-multi-point applications, such as spacecraft telemetry.[\[29\]](#) Mr. Carpenter states that such control devices would constitute excessive government regulation.[\[30\]](#) Tucson

Amateur Packet Radio Corporation (TAPR) also believes that the proposed rule is unnecessary, and that current Section 97.313(a) is sufficient.[\[31\]](#) While Mr. Karn points out that the use of the automatic power control and other technical measures could lead to an increase in the number of users that can simultaneously share the channel, he nonetheless believes that adoption of automatic power controls should not be mandatory.[\[32\]](#) Further, TAPR and Mr. Karn criticize the present rule as impeding Earth-Moon-Earth (EME) communication experimentation using SS emission types because the 100 W limit is imposed only on stations transmitting SS emissions.[\[33\]](#) They point out that the high antenna gains and skyward-pointing antennas generally used with EME protect terrestrial operations from interference regardless of the emission type the station is transmitting. They conclude, therefore, that the 100 W limit imposed only on stations transmitting SS emission types is unnecessary.[\[34\]](#)

13. In contrast, the implementation of automatic power controls is supported by the American Radio Relay League, Inc. (ARRL).[\[35\]](#) The Central States VHF Society also believes that automatic power controls are necessary. In this connection, it believes that amateur stations transmitting SS emissions will be using the maximum power available because these stations will be sharing spectrum with stations using other communication modes that require the transmission of considerable power.[\[36\]](#)

14. After review of the record, we conclude that the automatic power control requirement proposed in the *Notice* should be adopted. We conclude that such a requirement is reasonable in mixed-mode frequency bands[\[37\]](#) until sharing protocols are sufficiently developed to satisfy users that stations can avoid inter-mode interference.[\[38\]](#) Further, we believe that power limits are a reasonable tradeoff between the wideband characteristics of SS emissions and the ability and flexibility to use various spreading codes.[\[39\]](#) We decline to adopt the suggestion by the ARRL and Mr. Carpenter that the power level of the SS emission be limited to one watt and the automatic power control requirement be dropped.[\[40\]](#) We note that we did not propose to reduce the maximum authorized power for stations transmitting SS emissions.[\[41\]](#) Additionally, we are concerned that reducing the authorized maximum power for SS emissions to the level suggested by the ARRL and Mr. Carpenter could adversely affect SS experimentation in the amateur service and would effectively reduce amateur stations transmitting SS emissions to the status of Part 15 devices.[\[42\]](#)

C. Methods to minimize potential interference.

15. *Background.* In the *Notice*, we also solicited comments regarding methods available, other than automatic power control circuitry, to minimize any potential interference between amateur station operations and Part 15 devices, even though Part 15 devices have no interference protection rights under our rules and no domestic or international allocation status.[\[43\]](#) We solicited these comments because Metricom expressed concern that amateur radio operators will obtain commercial Part 15 SS devices and modify them for use under our Part 97 rules.[\[44\]](#) Symbol, a manufacturer of unlicensed Part 15 devices, was concerned that the disparity between authorized power for amateur stations and unlicensed devices will affect the operation of unlicensed devices in the vicinity of amateur stations.[\[45\]](#)

16. *Decision.* The comments contained technical and other non-regulatory suggestions for mitigating unwanted reception of SS transmissions. For example, Mr. Karn states that SS interference can be minimized by using directional antennas with point-to-point links.[\[46\]](#) For communication over long distances, he recommends minimum power signal relaying over the use of high power and, to address the "near-far problem," [\[47\]](#) he recommends geographical band plans.[\[48\]](#) He further states that transmission sources can be found by using direction finding techniques.[\[49\]](#) Another technique that can be useful in locating and resolving unwanted reception of an SS emission is to allow SS systems to voluntarily incorporate a Morse code identification transmitter that can be demodulated by a conventional receiver.[\[50\]](#) Once the call sign of the transmitting station has been determined, the mailing address of the licensee can be found in many of the numerous internet databases that list licensee information or by accessing the Commission's databases. These suggestions are generally supported by the ARRL.[\[51\]](#) These suggestions also convince us that amateur radio operators interested in SS communication are willing to accommodate each other and other users of the spectrum and that they are willing and capable of resolving interference, should it occur, through technical means. For this reason, we do not believe it is necessary or desirable for us to adopt rules, other than the automatic power control requirement, that specify or could limit methods available for resolving potential interference between amateur station transmissions and other users of these frequency bands.

D. Other issues

1. Station record keeping and identification

17. *Background.* Section 97.311(e) of the Commission's rules requires that the station records document all SS emission transmissions and these records be retained for a period of one year following the last entry. Mr. Johnson is concerned that amateur radio operators may not have the technical expertise or know-how to comply with this rule, and that this rule does not have a bearing on their ability to use SS emission types.[\[52\]](#) He also states that retention of this requirement unnecessarily burdens the station operator, thereby leading to a decline in the incentive to contribute to the development of SS modes within the Amateur Radio Service.[\[53\]](#) TAPR would like the Commission to establish parity between SS and all other emission modes, and delete the requirement of this section.[\[54\]](#) In contrast, ARRL does not believe that this requirement is too burdensome.[\[55\]](#)

18. In addition, Section 97.119(b)(5) requires that a station transmitting an SS emission must transmit its assigned call sign at the end of each communication, and at least every ten minutes during a communication, by a CW[\[56\]](#) or phone emission during SS emission transmission on a narrow bandwidth frequency segment. Alternatively, the station may identify itself by changing one or more parameters of the emission so that a conventional CW or phone emission receiver can be used to determine the station call sign. One of the purposes of station identification is to clearly make the identity of the station transmitting known to those receiving the transmission.

19. TAPR states that this requirement causes interference and, as a result, outweighs any benefits accrued regarding monitoring.[\[57\]](#) Further, it suggests that conventions for station identification should be developed by the amateur radio community rather than the Commission.[\[58\]](#) The Manager of the National Communications System points out there is no currently available

Commercial Off The Shelf (COTS) spread spectrum equipment which complies with this rule.[59] In fact, he believes that deletion of this rule could lead to an increase in the availability of COTS equipment.[60] ARRL does not believe that this requirement is too burdensome; rather, it believes that the requirement is "designed to permit self-regulation and compatibility determinations involving a mode that is difficult to monitor." [61]

20. *Decision.* The basis for the station record keeping requirement was a concern that the Commission and amateur radio licensees could not monitor readily SS emissions and therefore ciphers or other prohibited messages could be transmitted by stations using SS emissions.[62] To date, we are not aware of any instances of improper messages being transmitted by amateur stations and the record in this proceeding does not indicate to the contrary. We agree that this requirement no longer serves a useful purpose and that eliminating it is a logical outgrowth of our proposal to remove restrictions on the spreading techniques that amateur radio stations may transmit.[63] Further, we are concerned that keeping these records may discourage amateur radio operators from experimenting with SS emissions. We see no regulatory purpose being served by requiring amateur radio stations that transmit SS emissions to keep different records than amateur radio stations transmitting any other emission type. Therefore, we will revise Section 97.311 to remove the recordkeeping and retention requirement as requested by Mr. Johnson and TAPR. With respect to the station identification requirement, we will revise the rule as TAPR requests because we find that Section 97.119(b)(5) of the Commission's rules is unclear and also duplicates Sections 97.119(b)(1) and (2).[64] Stations transmitting SS emission types can identify themselves using the methods specified in either of these sections.

2. Types of SS

21. The Central States VHF Society and Mr. William Tynan suggest that we define a "Broad Band" SS that would incorporate the bandwidth proposed by the Commission in the *Notice*, and a "Narrow Band" SS that could occupy a bandwidth of perhaps 10 kHz and be authorized on all the amateur bands above 50 MHz, which are presently open to SSB and AM, so long as the bandwidth of the transmitted signal does not exceed that of an AM voice signal.[65] ARRL opposes this suggestion on the basis that no additional frequency allocations for SS emission types were proposed.[66] Instead, it states that the intent of the *Notice* is to permit the use of additional spreading codes in order to provide SS users with additional flexibility to determine which spreading codes provide the minimum interference to potential narrow band amateur modes.[67] We agree with the ARRL and will not grant this request because it is premised on SS being transmitted on additional amateur service frequency bands. We also believe that subdividing SS emission types is unnecessary and inconsistent with the experimental nature of the Amateur Radio Service.[68]

3. SS emissions and interference to satellite, EME and repeater communications

22. A number of commentors express concern that if a significant number of additional stations start transmitting SS emissions, interference to ongoing modes of amateur service communications will increase. In an effort to mitigate this anticipated problem, Central States VHF Society and Mr. William Tynan propose that spread spectrum emissions be restricted to band segments that are not used by amateur stations for weak signal communications.[69] Mr.

Carpenter also is concerned that the power of stations transmitting SS emissions will cause insurmountable interference for weak signal operators.[\[70\]](#) AMSAT requests that the rules be amended to exclude SS emissions from specific frequency segments used for satellite communications.[\[71\]](#) Mr. Ralph Soifer requests that frequency segments be reserved for EME operations.[\[72\]](#) The Southern California Repeater and Remote Base Association expresses concern about potential interference between stations transmitting SS emissions and amateur stations operating as repeaters.[\[73\]](#) The 220 MHz Spectrum Management Association of Southern California proposes that the burden of interference resolution between SS and the narrowband modes be placed on the "uncoordinated emitter."[\[74\]](#)

23. In contrast, TAPR opposes these requests. It believes that we should restrict our role to setting technical standards and leave the setting of conventions for other operations to the amateur radio community.[\[75\]](#) Mr. Karn states that interference between SS and other amateur use is rare.[\[76\]](#) ARRL argues that most repeater usage is on frequency bands below the bands where SS emissions are authorized and further restrictions on SS spectrum are unnecessary.[\[77\]](#) Its position is that the current rules have already placed stations transmitting SS as subordinate in the hierarchy of emission modes.[\[78\]](#)

24. We agree with the ARRL that the rules we are adopting will adequately address this potential interference concern. Specifically, Section 97.311(b) will require that a station transmitting SS emissions must not cause harmful interference to stations employing other authorized emissions, and must accept all interference caused by stations employing other authorized emissions. This rule change clarifies that stations transmitting SS emissions will remain, as they are now, secondary to other stations on the frequency bands they are authorized to transmit on. We also note that the rule changes do not extend any new frequency allocations to stations transmitting SS emissions. Therefore, concerns about interference to repeater stations or other stations that transmit on frequency bands below the 70 centimeter (cm) frequency band are unfounded because SS emissions are not authorized below the 70 cm frequency band.

25. We will not revise the rules to prevent SS emission types from being transmitted in any frequency band on the basis that SS emissions may interfere with the operating activities of other Amateur Radio Service licensees. We agree with Mr. John C. Koster that the application of rules such as Sections 97.313 and 97.101(c) and (d) should help to minimize interference.[\[79\]](#) We also note that interference between amateur radio stations is already addressed generally by Section 97.101(d), which prohibits operators from willfully or maliciously interfering with or causing interference to any radio communication or signal. Additionally, we believe that excluding specific emission types from additional frequency segments based on the specific operating interests of individual licensees or groups of licensees is inconsistent with the principle that each station licensee and each control operator must cooperate in selecting transmitting channels and in making the most effective use of the frequencies allocated to the Amateur Radio Service and that no frequency will be assigned for the exclusive use of any station.[\[80\]](#) A hallmark of the Amateur Radio Service has been that all frequencies are shared. The expectation of any station that it can operate in a totally interference-free environment, therefore, is unreasonable. We also believe that subdividing amateur service frequency bands would undercut the voluntary band planning that the amateur service community does and would result in a loss of flexibility to

reallocate spectrum as licensee's operating interests change, new technologies are incorporated, and frequency bands in the radio spectrum are reallocated.

4. Outstanding Special Temporary Authority grants

26. During the pendency of this proceeding, two Special Temporary Authority (STA) grants authorizing, among other things, certain amateur radio stations to transmit SS emission types that were not permitted by Section 97.311 and to transmit SS emissions on frequency bands not authorized by Section 97.305(c) have remained in force. The first was granted April 17, 1992, to Mr. Robert A. Buaas.^[81] The second was granted to two amateur radio licensees who also are TAPR members.^[82] Our decision in this proceeding obviates the need for the STAs because it eliminates the restriction on SS emission types that an amateur radio station may transmit. Our decision also does not authorize SS emissions to be transmitted in amateur service frequency bands that are permitted under the STAs. As noted above, the STA granted to Messrs. Jones and Hendricks has expired. We are terminating the STA granted to Mr. Robert A. Buaas as of the date the rules we adopt today become effective, because this *Report and Order* resolves the issues that formed the basis for granting his request.

IV. PROCEDURAL MATTERS

27. We certify that the Regulatory Flexibility Act^[83] does not apply to this rule making proceeding because the rule amendments will not have a significant economic impact on a substantial number of small business entities, as defined in Section 601(3) of the Regulatory Flexibility Act. The amateur radio stations that are the subject of this proceeding are not authorized to transmit any communications on behalf a station control operator's employer or where the station licensee or control operator has a pecuniary interest.^[84]

28. Alternative formats of this *Order* (computer diskette, large print, audio cassette and Braille) are available to persons with disabilities by contacting Martha Contee at (202) 418-0260, TTY (202) 418-2555, or by e-mail at <mcontee@fcc.gov>. This *Report and Order* also is available at the Commission's internet site at: <http://www.fcc.gov/>.

V. ORDERING CLAUSES

29. IT IS ORDERED that effective November 1, 1999, pursuant to Sections 4(i) and (j), 303(r), and 403 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i) and (j), 303(r) and 403, Part 97 of the Commission's Rules, 47 C.F.R. Part 97, IS AMENDED as set forth in [Appendix B](#).

30. IT IS FURTHER ORDERED that the Commission's Office of Public Affairs, Reference Operations Division, SHALL SEND a copy of this *Report and Order* to the Chief Counsel for Advocacy of the Small Business Administration.

31. IT IS FURTHER ORDERED that the STA granted to Mr. Robert A. Buaas IS TERMINATED on the effective date of the rules adopted herein.

Further Information

32. For further information, contact William T. Cross, Policy and Rules Branch, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau, (202) 418-0680.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas

Secretary

APPENDIX A

Comments

Manager, National Communications System

Tucson Amateur Packet Radio Corporation

Robert A. Buaas

The Central States VHF Society

220 MHz Spectrum Management Association

The Part 15 Coalition

Ralph Soifer

Lyle Johnson

Radio Amateur Satellite Corporation (AMSAT)

Robert J. Carpenter

Metricom, Inc.

William A. Tynan

American Radio Relay League, Inc.

Philip R. Karn, Jr.

Robert Brown

Reply Comments

The Central States VHF Society

Ralph Soifer

Lyle Johnson

American Radio Relay League, Inc.

Radio Amateur Satellite Corporation (AMSAT)

Manager, National Communications System

Metricom, Inc.

Tucson Amateur Packet Radio Corporation

Robert A. Buaas

Robert J. Carpenter

William A. Tynan

John C. Koster

Robert James Barron, Jr.

CellNet Data Systems, Inc.

Thomas C. McDermott

W5YI Group, Inc.
Glenn E. Elmore
John R. Bingham
Steven S. Dimse
Steven K. Stroh
Frank H. Perkins, Jr.
Jacob Brodsky
John R. Ackerman
Donald V. Lemke
Guy Story

APPENDIX B

Part 97 of Chapter I of Title 47 of the Code of Federal is amended as follows:

Part 97 - Amateur Radio Service

1. The authority citation for Part 97 continues to read as follows:

Authority citation: 48 Stat. 1066, 1082, as amended; 47 U.S.C. §§ 154, 303. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. §§ 151-155, 301-609, unless otherwise noted.

2. Sections 97.3(a), (b), and (c) are amended by inserting numbers in front of each defined term in the definitions, and revising Section 97.3(c)(8) to read as follows:

§ 97.3 Definitions.

(c) ***

(8) *SS*. Spread spectrum emissions using bandwidth-expansion modulation emissions having designators with A, C, D, F, G, H, J or R as the first symbol; X as the second symbol; X as the third symbol.

* * * * *

3. Section 97.119(b)(5) is removed.

4. Section 97.305(b) is revised to read as follows:

§ 97.305 Authorized emission types.

(b) A station may transmit a test emission on any frequency authorized to the control operator for brief periods for experimental purposes, except that no pulse modulation emission may be transmitted on any frequency where pulse is not specifically authorized and no SS modulation emission may be transmitted on any frequency where SS is not specifically authorized.

* * * * *

5. Section 97.311 is revised to read as follows:

§ 97.311 SS emission types.

(a) SS emission transmissions by an amateur station are authorized only for communications between points within areas where the amateur service is regulated by the FCC and between an area where the amateur service is regulated by the FCC and an amateur station in another country that permits such communications. SS emission transmissions must not be used for the purpose of obscuring the meaning of any communication.

(b) A station transmitting SS emissions must not cause harmful interference to stations employing other authorized emissions, and must accept all interference caused by stations employing other authorized emissions.

(c) When deemed necessary by a District Director to assure compliance with this Part, a station licensee must:

(1) Cease SS emission transmissions;

(2) Restrict SS emission transmissions to the extent instructed; and

(3) Maintain a record, convertible to the original information (voice, text, image, etc.) of all spread spectrum communications transmitted.

(d) The transmitter power must not exceed 100 W under any circumstances. If more than 1 W is used, automatic transmitter control shall limit output power to that which is required for the communication. This shall be determined by the use of the ratio, measured at the receiver, of the received energy per user data bit (E_b) to the sum of the received power spectral densities of noise (N_0) and co-channel interference (I_0). Average transmitter power over 1 W shall be automatically adjusted to maintain an $E_b/(N_0 + I_0)$ ratio of no more than 23 dB at the intended receiver.