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

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

NOTICE OF PROPOSED RULE MAKING

Adopted: January 9, 1997 **Released: March 3, 1997**

Comment date: May 5, 1997
Reply comment date: June 5, 1997

By the Commission:

I. INTRODUCTION AND EXECUTIVE SUMMARY

1. On December 12, 1995, the American Radio Relay League, Inc. (ARRL) filed a petition for rule making ("*Petition*")[1] requesting amendment of the rules to allow amateur stations to transmit spread spectrum ("SS") type emission technologies employing additional spreading sequences.[2] It also requests that each SS transmitter be required to incorporate a device to automatically limit its power to that actually necessary to carry out the communications.[3] The

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[1] RM-8737.

[2] Spread spectrum is a radio communication technique that diffuses the radio signal energy over a very wide bandwidth, thereby using extremely low power density to exchange messages. *See* 47 C.F.R. § 97.3(c)(8).

[3] *See* 47 C.F.R. § 97.311 (g).

ARRL believes that these rule changes would facilitate the ability of the amateur service to contribute to the development of SS communications.[4]

2. This *Notice of Proposed Rule Making ("Notice")* proposes to amend the Commission's rules for the Amateur Radio Services[5] to authorize amateur stations to make greater use of SS type emission technologies. We believe that our proposed rule changes will allow amateur operators to develop innovations and improvements to communications products, and develop new communications technologies. We believe these proposed rule changes also would allow amateur operators more flexibility to use current and future communications technologies, encourage the amateur service community to expand its experimental activities with SS, and allow amateur stations to transmit SS type emissions that presently are transmitted by other communications devices. These proposed changes also are consistent with our general policy of allowing licensees flexibility to develop more effective and efficient uses of the radio spectrum.

II. BACKGROUND

3. Spread spectrum is a technique whereby the energy of the transmitted signal is distributed over a wide segment of spectrum. The signal power density can be very low and the duration of a transmission on any frequency in the segment of the spectrum can be but a fraction of a second. SS systems, therefore, can evenly share all of the spectrum in the available frequency segment, despite a number of stations transmitting simultaneously. They can often share the same spectrum unobtrusively with non-SS systems because the transmissions may not be noticeable to a casual listener.

4. Special Temporary Authority to experiment with SS transmissions was granted to 25 amateur stations affiliated with the Amateur Radio Research and Development Corporation 16 years ago.[6] These experiments involved on-air evaluation of different spreading rates, frequency ranges, and interference to stations transmitting other emission types.[7] On the basis of these tests, two types of spreading techniques -- frequency hopping and direct sequence -- were

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[4] *Petition* at 1-3. The ARRL states that the benefits to be gained from increased use of SS include improvement in communications reliability, less interference to narrow band communications systems, and more efficient use of radio spectrum.

[5] *See* 47 C.F.R. Part 97.

[6] *See FCC Encourages Amateur Radio Experimentation, FCC News Release,* March 9, 1981.

[7] *See The ARRL Handbook for Radio Amateurs,* 1992, pp 21-7 through 21-17.

authorized by our rules.[8] Under our current rules, SS transmissions may be made on authorized amateur service frequencies above 420 MHz with transmitter powers up to 100 watts.[9] Since introduction of SS in the amateur radio service, numerous commercial applications of SS have also evolved, including personal communications services, remote meter reading and position locating.[10]

III. DISCUSSION

5. Comments. The *Petition* was placed on *Public Notice* January 26, 1996.[11] In response to the *Public Notice* requesting statements opposing or supporting the *Petition*, we received 32 comments and reply comments.[12] The majority of commenters support additional SS communications because of the benefits that may come from experimentation, but suggest that SS be limited to specific spectrum segments of the amateur service frequency bands to protect stations engaged in other types of communication.[13] Some commenters oppose SS due to concerns that greater use of SS will result in interference to amateur stations engaging in satellite communications, weak signal terrestrial and Earth-Moon-Earth communications, and repeaters.[14] In reply, the ARRL argues that the interference potential would not significantly increase because the rules already authorize SS on these amateur service bands. Also, the ARRL points out that concern regarding interference to repeaters is unfounded because most repeater usage occurs on the amateur bands below 420 MHz.[15]

6. Two commercial Part 15 interests, Metricom and Symbol Technologies, request that new types of amateur SS transmissions in the 902-928 and 2400-2450 MHz amateur

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[8] *See Report and Order* Gen. Docket No. 81-414, 50 Fed. Reg. 23425 (1985).

[9] *See* 47 C.F.R. § 97.305(c).

[10] *See* ARRL *Spread Spectrum Sourcebook*, 1991, p. 8-64 and Chapter 9.

[11] *See Public Notice*, Report No. 2118, January 26, 1996.

[12] *See* Appendix A for the list of parties filing Comments and Reply Comments.

[13] *See, e.g.*, Comments of The Indiana Repeater Council at 1; Comments of George Acyl at 5; Comments of Mid-America Coordination Council, Inc. at 1; Comments of SouthEastern Repeater Association, Inc. at 2-3; Comments of Wisconsin Association of Repeaters at 1; Reply Comments of William A. Tannin at 6.

[14] *See, e.g.*, Reply Comments of William A. Tynan at 2.

[15] Reply Comments of ARRL at 2. Repeater stations are restricted to frequency segments specified in Section 97.205(b) of the Commission's rules, 47 C.F.R. § 95.205(b).

frequency bands be prohibited or alternatively, that radiated power limits for new SS types be limited to those governing the unlicensed Part 15 devices with which these bands are shared.[16] Metricom, a service provider using unlicensed devices, acknowledges that spread spectrum experimentation accomplished in the amateur radio service enabled it to develop what it describes as its own technologically leading edge SS systems. However, Metricom also argues that increasing the flexibility for amateur operators to experiment with new types of spread spectrum designs in these two bands would disturb the balance in sharing these bands among different users. Metricom expresses particular concern regarding the 902-928 MHz band, citing our recent *Report and Order* establishing rules for Automatic Vehicle Monitoring Systems.[17] In an Ex Parte filing, Metricom also expresses concern that amateurs operators will obtain commercial Part 15 SS devices and modify them for use under our Part 97 rules.[18] Symbol, a manufacturer of unlicensed devices that operate in these two bands, argues that the disparity between authorized power for amateur stations (100 watts with unlimited antenna gain) and authorized power for unlicensed devices (1 watt with 6 dBi antenna gain) will affect the operation of unlicensed devices in the vicinity of amateur stations.[19]

7. In reply, the ARRL argues that the potential for interference in these bands would not increase significantly because SS has been authorized at the proposed power levels for more than a decade.[20] The ARRL goes on to note, however, that in its petition it proposed to control power by proposing to require automatic transmitter power control to limit radiated power to that level necessary to maintain communications. The ARRL acknowledges the underlying concern that amateur operators might purchase and modify commercial SS products. In response to this concern, ARRL contends that even if this were to occur, interference would be unlikely because such products likely will be designed to use different spreading codes and sequences so that they will not interact with each other when used as unlicensed devices. ARRL further contends that this design feature will minimize interference whether used as unlicensed devices or as amateur stations.[21] Finally, the ARRL notes that the amateur radio service is a licensed service entitled to protection from interference, whereas unlicensed Part 15 devices have no interference

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[16] *See* Letter from Mitchell Lazarus, Counsel for Symbol Technologies, Inc. to Michele Farquhar, Esq., Chief, Wireless Telecommunications Bureau (November 13, 1996); Reply Comments of Metricom, Inc. at 2.

[17] Metricom Reply Comments at 3. *See* 10 FCC Rcd 4695 (1995).

[18] Ex parte Comments of Metricom, December 13, 1996.

[19] *See* Letter from Mitchell Lazarus, Counsel for Symbol Technologies, Inc., at 4.

[20] Reply Comments of ARRL at 5, 9.

[21] *See* Letter from Christopher D. Imlay, General Counsel of the American Radio Relay League, Inc., to Michele Farquhar, Esq., Chief, Wireless Telecommunications Bureau (November 19, 1996).

protection rights under our rules and no domestic or international allocation status.

8. We believe that the amendments requested would increase spectrum efficiency and allow amateur operators to contribute to technological advances in communications systems and equipment. Experiments conducted by amateur operators have shown that stations transmitting SS emissions can co-exist with other amateur stations, and in many cases these spread spectrum emissions are undetectable by other amateur stations. SS publications in the amateur service community, and the comments of the ARRL, show that the effect of restricting amateur stations to using two spreading techniques has been to prevent amateur service licensees from incorporating into their operations technical advances that have been developed in other services. We agree that the current rule prohibits amateur stations from using SS emission types that are routinely used in other communication services, and that such a prohibition is inconsistent with the experimental purpose of the amateur service. As requested by the ARRL and Part 15 equipment providers, we propose to require that automatic power control circuitry which reduces the radiated power of an amateur station transmitting an SS emission to the minimum level necessary to conduct communications, be included in SS equipment. Additionally, we solicit comments, regarding other methods that are available to minimize any potential interference between amateur station operations and Part 15 devices. Accordingly, we tentatively conclude that these amendments are appropriate and consistent with the underlying purposes of the amateur service. We propose, therefore, to facilitate the desire of amateur operators to experiment with, develop, improve, and test practical SS systems.

9. In view of the foregoing, we propose to amend the amateur service rules to allow amateur stations greater flexibility in transmitting SS communications. Specifically, we propose to eliminate the rules that restrict amateur stations to transmitting only frequency hopping and direct sequencing spreading techniques. These proposed rule changes are consistent with our policy of encouraging greater spectrum flexibility by enabling licensees to introduce innovative technologies and to respond quickly to demands for new and different services and applications, without administrative delays.

IV. PROCEDURAL MATTERS

Regulatory Flexibility Act

10. As required by Section 603 of the Regulatory Flexibility Act,[22] the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the expected significant economic impact on small entities by the policies and rules proposed in this *Notice*. Written public comments are requested on the IRFA. Comments must be identified as responses to the IRFA and

[22] 5 U.S.C. § 603.

must be filed by the deadlines for comments on the *Notice* provided below.

Initial Regulatory Flexibility Analysis

I. Need for and Objectives of the Proposed Rule: The need for and objective of this rule making proceeding is to eliminate technical restrictions that amateur radio operators claim hamper their flexibility to experiment with SS emission types.

II. Legal Basis: Authority for this action can be found in Sections 4 (i), and 303(a), (l)(1), and (r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), and 303(a), (l)(1), and (r),

III. Description and Estimate of the Number of Small Entities To Which Rule Will Apply: None. The rules in Part 97 of the Commission's Rules, 47 C.F.R. Part 97, apply to individuals who are qualified to be licensees and/or control operators of amateur radio stations. Small businesses are not eligible to be licensees in the amateur service, and amateur radio operators are prohibited from transmitting communications for compensation, for their pecuniary benefit, and on behalf of their employers. *See* 47 C.F.R. § 97.113.

IV. Description of Projected Reporting, Recordkeeping and Other Compliance Requirements: None. This rule making proceeding does not impose any new or additional recordkeeping, reporting or compliance requirement on amateur service licensees.

V. Significant Alternatives To Proposed Rule Which Minimize Significant Economic Impact on Small Entities and Accomplish Stated Objectives: None. This proceeding will effect only amateur stations that choose to transmit a spread spectrum emission using a spreading technique that is not permitted under the currently effective rules. Small businesses are not eligible to be licensees in the amateur service, and amateur radio operators are prohibited from transmitting communications for compensation, for their pecuniary benefit, and on behalf of their employers. *See* 47 C.F.R. § 97.113.

VI. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rule: None.

Ex Parte Rules - Non-Restricted Proceeding

11. This is a non-restricted notice and comment rule making proceeding. *Ex Parte* presentations are permitted, except during the Sunshine Agenda period, provided that they are disclosed as specified in the Commission's Rules. *See generally* 47 C.F.R. §§ 1.1202, 1.1203, and 1.1206(a).

Comment Dates

12. Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments on or before May 5, 1997, and reply comments on or before June 5, 1997. To file formally in this proceeding, you must file an original and four copies of all comments and reply comments. If you want each Commissioner to receive a personal copy of your comments, you must file an original plus nine copies. You should send comments and reply comments to Office of the Secretary, Federal Communications Commission, Washington, DC 20554. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center of the Federal Communications Commission (Room 239), 1919 M Street, N. W., Washington, DC 20554.

Ordering Clauses

13. Accordingly, IT IS ORDERED that, pursuant to Sections 4 (i), and 303(a), (l)(1), and (r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154 (i), and 303(a), (l)(1), and (r), notice is hereby given of proposed amendments to Part 97 of the Commission's Rules, 47 C.F.R. Part 97, in accordance with the proposals, discussions, and statement of issues in this *Notice of Proposed Rule Making*. Comment is sought regarding such proposals, discussions, and statements.

14. IT IS FURTHER ORDERED that the Secretary shall mail a copy of this document to the Chief Counsel for Advocacy of the Small Business Administration in accordance with paragraph 605(b) of the Regulatory Flexibility Act. Pub. L. No. 96-354, 94 Stat. 1164, 5 U.S.C. §§ 601-612 (1980).

Contact Person

15. For further information concerning this proceeding, contact William T. Cross, Wireless Telecommunications Bureau, (202) 418-0680.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

APPENDIX A

Comments

Mid-America Coordination Council, Inc.
SouthEastern Repeater Association, Inc.
Wisconsin Association of Repeaters
Southern California Repeater and Remote Base Association
The San Bernadino Microwave Society
The Indiana Repeater Council
The Central States VHF Society
Mike Cheponis
John Mock
George R. Isely
Henry B. Ruh
National Communications System
Tucson Amateur Packet Radio Corporation
Robert A. Buaas
Charles M. Albert, Jr.

Reply Comments

American Radio Relay League, Inc.
Naval Postgraduate School
Radio Amateur Satellite Corporation
Manager, National Communications System
Metricom, Inc.
Tucson Amateur Packet Radio Corporation
Robert S. Larkin
James E. Mitzlaff
Robert Brown
Paul H. Trotter
Ronald Klimas
Mike Cheponis
Philip R. Karn
Robert A. Buaas
Robert J. Carpenter
Steven R. Bible
William A. Tynan

APPENDIX B

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is proposed to be 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. In Section 97.3, paragraph (c)(8) is revised to read as follows:

§ 97.3(c)(8) Definitions.

(a) ***

(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.

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

§ 97.305 Authorized emission types.

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(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 or SS modulation emission may be transmitted on any frequency where pulse or SS emissions are not specifically authorized.

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4. Section 97.311 is revised by revising paragraphs (a) and (b) and redesignating paragraphs (c) and (d) as "Reserved" 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) Reserved.

(d) Reserved.

(e) *****

(f) *****

(g) 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 (Eb) 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 $Eb/ (N_0 + I_0)$ ratio of no more than 23 dB at the intended receiver .