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

In the Matter of	)	
	)	
	)	
Amendment of Parts 2, 15, and 97 of the	)	
Commission's Rules to Permit Use of Radio	)	ET Docket No. 94-124
Frequencies Above 40 GHz for New Radio	)	RM-8308
Applications	)	
	)	

THIRD REPORT AND ORDER

Adopted: July 6, 1998 **Released: July 15, 1998**

By the Commission:

INTRODUCTION

1. By this action, we adopt rules that will encourage the commercial development and use of a portion of the "millimeter wave" frequencies above 40 GHz.[1] First, we adopt rules that provide additional interference protection for vehicle radar collision avoidance systems in the 76-77 GHz band by suspending authorization for amateur station transmissions in the 76-77 GHz band. To offset any potential impact on amateur service operations resulting from this suspension we are amending our rules to establish a co-primary allocation in the 77.5-78 GHz band for the amateur and amateur-satellite services ("Amateur Radio Services"). In addition, we are adopting rules to establish a spectrum etiquette for unlicensed operation in the 59-64 GHz band. We believe that this spectrum etiquette will promote the efficient use of the 59-64 GHz band without hampering the development of new products and services. Moreover, we are amending our rules to establish a spurious emission limit for unlicensed millimeter wave transmitters in the 76-77 GHz band to protect radio astronomy services in the 217-231 GHz band. Finally, we are taking this opportunity to clarify rules adopted earlier in the *Memorandum Opinion and Order and Fourth Notice of Proposed Rule Making* ("*MO&O*", "*Fourth Notice*") in this proceeding. We believe that these actions will stimulate the development of new services for consumers and promote national competitiveness by enabling development of technology for potential use in other parts of the world.

BACKGROUND

2. In the *Notice of Proposed Rule Making* ("*Notice*") on radio operations above 40 GHz we proposed to open a total of 18 GHz of spectrum between 40.5 GHz and 153 GHz for commercial development.[2] We specifically proposed thirteen frequency bands for potential use by new millimeter wave technology: 40.5-42.5 GHz, 47.2-48.2 GHz, 59-64 GHz, 122-123 GHz, 126-127 GHz, 139-140 GHz, and 152-153 GHz. We proposed to divide these bands between licensed and unlicensed devices, with unlicensed spectrum further divided between vehicle radar systems and general unlicensed devices.

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[1] The term "millimeter wave" refers to the wavelength of radio signals between 30 GHz and 300 GHz.

[2] *See Notice of Proposed Rule Making* in ET Docket 94-124, 9 FCC Rcd 7078 (1994).

3. In the *First Report and Order and Second Notice of Proposed Rule Making* ("*First Order*", "*Second Notice*") in this proceeding, the Commission made available the 76-77 GHz band for use by unlicensed vehicle radar systems. It proposed to temporarily restrict amateur station access in the 76-77 GHz band in order to ensure that vehicle radar systems will not receive interference from amateur stations transmitting in this band and requested comment on the need for this restriction.[3] In order to ensure that amateur station access to spectrum near 77 GHz would be maintained without the threat of preemption by higher priority services, the Commission also proposed to create a co-primary amateur allocation in the 77.5-78 GHz band and sought comment on the need for this allocation. In addition, the Commission proposed a power density limit for spurious emissions in the 200-231 GHz band from unlicensed millimeter wave transmitters and requested comments on the need for measurements above 200 GHz to prevent interference to radio astronomy operations in the 217-231 GHz band. Further, the Commission adopted rules for unlicensed operation in the 59-64 GHz band. The implementation of these rules was delayed at the request of industry to provide additional time for industry to develop and submit a spectrum etiquette that would ensure that the spectrum is used effectively and efficiently.

4. Subsequent to the *First Order*, on December 13, 1996, the Millimeter Wave Communications Working Group ("MWCWG") submitted a proposed spectrum etiquette for unlicensed operation in the 59-64 GHz band.[4] In the *Fourth Notice* the Commission proposed to incorporate the spectrum etiquette into the regulations and sought specific comment on items contained in the proposed spectrum etiquette.[5] Further, in the *MO&O* the Commission permitted interim operating authority in the 59-64 GHz band provided the equipment satisfied the requirements of the proposed spectrum etiquette.

5. The American Radio Relay League ("ARRL"), Hewlett Packard Company ("HP"), National Academy of Sciences Committee on Radio Frequencies ("CORF"), American Automobile Manufactures Association ("AAMA"), General Motors Corporation ("GM"), and the Consumer Electronics Manufacturers Association ("CEMA") filed comments in response to the *Second Notice*.[6] GM filed reply comments concerning CORF's comments regarding the *Second Notice*.[7] The Millimeter Wave Communications Working Group ("MWCWG") filed comments in response to the

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[3] *See First Report and Order and Second Notice of Proposed Rule Making* in ET Docket 94-124, 11 FCC Rcd 4481 (1995).

[4] *See* Public Notice, *Commission Receives Industry Proposal for Unlicensed Operation Above 40 GHz* , DA 97-288, released February 10, 1997.

[5] *See Memorandum Opinion and Order and Fourth Notice of Proposed Rule Making*, 12 FCC Rcd 12212 (1997), at para. 24.

[6] *See* Comments of the American Radio Relay League, Incorporated in response to the Second Notice of Proposed Rule Making dated June 27, 1996. *See* Comments of Hewlett-Packard Company on the Second Notice of Proposed Rule Making dated May 28, 1996. *See* Comments of the National Academy of Sciences through the Committee on Radio Frequencies dated May 28, 1996. *See* Comments of the American Automobile Manufacturers Association dated May 28, 1996. *See* Comments of General Motors Corporation dated May 28, 1996. See Reply Comments of the Consumer Manufacturers Association dated June 27, 1996.

[7] *See* Reply Comments of General Motors Corporation dated June 27, 1996.

Fourth Notice.[8]

AMATEUR RADIO SERVICES

6. In the *Second Notice*, the Commission proposed to protect vehicle radar systems operating in the 76-77 GHz band from potential interference by temporarily restricting amateur station transmissions in the 76-77 GHz band until spectrum sharing criteria can be established. The Commission recognized that amateur operators would like to maintain their access to spectrum in the 76-77 GHz band and indicated that this temporary restriction could be removed at a future time upon demonstration that safety will not be compromised from other in-band transmissions or if specific sharing recommendation guidelines do not compromise public safety. The Commission explained that such a modification of the rules will not significantly harm the amateur services because of the limited use of the 76-77 GHz band by amateur stations and the availability of the 75.5-76.0 GHz band on a primary basis and the 77-81 GHz band on secondary basis. The Commission also noted that inconvenience to amateur operators from this restriction should be minor and would be outweighed by the potential interference problems and related public safety concerns. The Commission stated its intention to revisit the issue of whether the 76-77 GHz band can be shared with amateur stations or other users within five years and that if it were to become apparent that particular types of radio services or devices will not interfere with vehicle radar systems or if adequate sharing criteria can be established, the restriction may be relaxed.

7. In the *Second Notice*, the Commission proposed to amend Part 2 of the rules to upgrade the status of the Amateur Radio Services in the 77.5-78 GHz band from secondary to co-primary with Government and non-Government radiolocation services. This proposal was intended to offset any potential detrimental impact on the Amateur Radio Services due to the temporary restriction of the 76-77 GHz band by providing access to nearby spectrum that will not be preempted by higher priority services. The proposal to upgrade the allocation to the Amateur Radio Service in the 77.5-78 GHz band would continue to foster amateur operator experimentation using millimeter wave technology.

8. The Commission is adopting its proposal to suspend access to the 76-77 GHz band by amateur stations in order to ensure against potential interference to vehicle radar systems that we expect will operate in this band. As noted in the *Second Notice*, amateur station transmissions in the 76-77 GHz band is not significant at this time. Thus, this action will not have an immediate impact on amateur operators because there is little or no use of this band. Further, we are unable to ascertain what future amateur station transmissions might take place in this band and therefore cannot evaluate the potential for interference to vehicle radar systems. Because harmful interference to vehicle radar systems could affect public safety, we will proceed with the utmost amount of caution. We agree with the AAMA and GM that until additional studies are performed to measure in-band and out-of-band interference to vehicular radar systems in the 76-77 GHz band and usable spectrum sharing standards are developed, amateur stations should not have access to this band.[9] The ARRL filed comments opposing adoption of the temporary restriction, indicating that the record in this proceeding does not demonstrate that there is any incompatibility between amateur service operation in the 76-77 GHz

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[8] *See* Comments of the Millimeter Wave Communications Working Group dated September 26, 1997.

[9] *See* Comments of the American Automobile Manufacturers Association dated May 28, 1996.

band and vehicle radar systems.[10] The ARRL indicated that, rather than suspending amateur station transmissions in the band to accommodate a potential sharing partner, the burden of establishing compatibility between incumbent users and newcomers should be on the newcomer and requests that if the Commission imposes any temporary restriction that it be for a fixed term, and the burden to establish the need for an extension of this restriction be placed on the manufacturers of the vehicle radar systems. The Commission plans on revisiting this issue in about five years or at such time as spectrum sharing standards are developed. The Commission encourages the ARRL to work with AAMA and GM to develop and submit to the Commission a spectrum sharing plan for the 76-77 GHz band within this five year period. Accordingly, the Commission will temporarily restrict amateur station access to the 76-77 GHz band.

9. The Commission believes that upgrading the status of the Amateur Radio Services to co-primary in the 77.5-78 GHz band is needed to ensure that future amateur station access to spectrum near 77 GHz is maintained without the threat of preemption by higher priority services. In its comments, the ARRL requested that the Commission proceed without delay to implement this allocation.[11] The Commission believes that this allocation is needed if we are to continue to foster amateur operator experimentation using millimeter wave technology. Accordingly, the Commission is amending Section 2.106 of the rules to establish the co-primary amateur and amateur-satellite service allocation in the 77.5-78 GHz band.

SPECTRUM ETIQUETTE

10. In the *Fourth Notice*, the Commission proposed to adopt the spectrum etiquette submitted by the MWCWG for unlicensed operation in the 59-64 GHz band. The proposed spectrum etiquette called for a coordination channel in the 59.0-59.05 GHz band. In addition, the proposed spectrum etiquette contained a transmitter identification requirement that would require transmitters operating with an output power equal to or greater than 0.1 mW in the 59.05-64 GHz band to transmit, within any one second interval of transmission, a transmitter identification consisting of the FCC ID number, serial number of the transmitter and 24 bytes of user definable data. Further, the proposed etiquette also specified a peak emissions limit of 18 $\mu W/cm^2$, as measured three meters from the transmit antenna. Moreover, the proposed spectrum etiquette limited the peak transmitter output power to 500 mW. Finally, the proposed spectrum etiquette contained a limit on the peak output power of transmitters that use less than 100 MHz bandwidth in the 59.05-64 GHz band in accordance with the following equation: $P_{peak} \leq 500$ mW * [Transmitter Bandwidth / 100 MHz]. Further, we indicated that a pulse desensitization correction factor must be applied if the bandwidth of the measuring instrument is less than the pulse repetition frequency. The Commission generally sought comments on all aspects of the proposed etiquette. The Commission also sought particular comments on the need for a coordination channel and transmitter identification requirement.

11. The Commission is adopting the proposed spectrum etiquette. The Commission believes that the adopted spectrum etiquette provides the best plan to maximize the number of users and minimize the potential for interference in the 59-64 GHz band. The coordination channel from 59.0-59.05 GHz provides access to spectrum that will be used to determine methods of limiting potential interference and establishing techniques for spectrum sharing between diverse systems. In addition,

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[10] *See* Comments of the American Radio Relay League, Incorporated in response to the Second Notice of Proposed Rule Making Dated June 27, 1996.

[11] *Id.*

the transmitter output power and peak emission limits will minimize the potential for interference and provide for greater spectrum reuse. We note that when taking these measurements the operator of the measurement equipment is responsible for following the guidelines contained in the measurement equipment manufacturers manual.[12] Moreover, the transmitter identification requirement for transmitters operating with more than 0.1 mW of output power is essential to provide for successful sharing and coordination between users. We note that, no comments were filed expressing opposition to the proposed spectrum etiquette. We believe the etiquette adopted herein will accelerate the development of low cost devices. Accordingly, the Commission will adopt the proposed transmitter identification requirements, coordination channel, transmitter output power limitation and the peak emission limit for unlicensed operation in the 59-64 GHz band.

EMISSION LIMITS ABOVE 200 GHZ

12. In the *Second Notice*, the Commission proposed to apply a power density limit of 1000 pW/cm^2, as measured at 3 meters from the transmitting antenna, to emissions between 200 GHz and 231 GHz in order to protect radio astronomy operations in the 217-231 GHz band. The Commission noted that this limit was recommended by the National Telecommunications and Information Administration ("NTIA").[13] The Commission requested comment on whether the limit on spurious emissions should be extended only to cover the radio astronomy band at 217-231 GHz instead of the entire 200-231 GHz band and requested comment on whether the emissions limit should apply to all unlicensed millimeter wave transmitters or only to vehicle radar systems operating in the 76-77 GHz band since the third harmonic of the 76-77 GHz vehicle radar systems falls within the 228-231 GHz band. Moreover, the Commission requested comments on whether it might be possible, instead, to allow vehicle radar manufacturers to avoid such limits by demonstrating, in collaboration with NTIA and radio astronomy users, that there would be a low probability of interference to radio astronomy operations.

13. Within the 217-231 GHz band, the Commission is adopting a spurious emission limit of 1000 pW/cm^2, as measured at 3 meters, for unlicensed millimeter wave transmitters that operate in the 76-77 GHz band. CORF requests that a more stringent emission limit of 2 pW/cm^2 is needed to provide the same protection that other radio astronomy bands receive from vehicle radar systems in the 46.7-46.9 GHz band.[14] CORF indicates that the 217-231 GHz band is one of the most important radio astronomy bands and that this tighter emission level is needed to provide adequate interference protection. While we recognize the importance of protecting sensitive radio astronomy bands, we believe CORF's proposed limit is too strict. We are relying on NTIA's suggestion to limit the spurious emissions to 1000 pW/cm^2 as being sufficient to provide adequate protection to radio astronomy operations in the 217-231 GHz band. In addition, we note that emissions in this frequency range tend to be highly focused and directional. Given that radio astronomy equipment discriminates against off-beam signals and that vehicle radars will be used when in motion, we believe there is little likelihood

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[12] Any need to employ a pulse desensitization correction factor would be contained in the application notes for the measurement instrumentation employed and does not need to be separately specified in the regulations.

[13] *See* letter of November 2, 1995, from Richard D. Parlow of NTIA to Richard D. Smith, Chief, Office of Engineering and Technology.

[14] *See* Comments of the National Academy of Sciences through the Committee on Radio Frequencies dated May 28, 1996.

of interference to radio astronomy operations. AAMA indicates that its members are interested in pursuing the avoidance of limits through a demonstration that there would be a low probability of interference to radio astronomy operations, even without a standard above 200 GHz on unwanted emissions.[15] AAMA believes that permitting such a demonstration, in lieu of establishing emission limits, would be beneficial by allowing an orderly introduction of these radar products to the public at a reasonable cost. We note that the commenting parties have not made any showing that a "demonstration" method would work and that no evidence was provided to show that a demonstration method satisfied the parties concerns regarding potential interference to radio astronomy operations in the 217-231 GHz band. We understand that equipment is currently available to make these measurements and we believe that commercial measurement sites will be more readily available in the near future.

14. HP states that equipment in the 59-64 GHz band should be exempt from testing for spurious emissions above 200 GHz because the third harmonic of this equipment falls within the 177-192 GHz band and the fourth harmonic falls within the 236-256 band and these two bands fall outside the radio astronomy band located at 217-231 GHz.[16] We agree. We are granting HP's request that systems operating in the 59-64 GHz band be exempt from this requirement. For similar reasons we are not requiring measurement of emissions above 200 GHz for unlicensed equipment operating in the 46.7-46.9 GHz band. Accordingly, we are adopting a spurious emission limit of 1000 pw/cm^2, as measured at 3 meters, for all unlicensed millimeter wave transmitters in the 76-77 GHz band.

OTHER MATTERS

15. In the *MO&O* and *Fourth Notice* the Commission corrected typographical errors that were contained in the *Order* in this proceeding. The Commission corrected § 15.215 and § 15.31(f)(1). Section 15.31(f)(1) was corrected to reflect that inverse linear-distance-squared extrapolation factor (40 dB per decade) for measurements above 40 GHz applies only to measurements performed in the near field. Additionally, the Commission stated that the inverse linear-distance factor (20 dB per decade) correctly extrapolates the change in signal level versus distance when measurements are made in the far field.

16. The Commission takes this opportunity to clarify the *MO&O* and *Fourth Notice* in this proceeding concerning unlicensed operation above 40 GHz. Subsequent to the release of this item, the Commission noted that the amendment to Section 15.31(f)(1) concerning the extrapolation factor applied to measurements performed at a distance other than that specified in the rule was confusing. While the inverse linear-distance (20 dB per decade) extrapolation factor contained in the rules is correct, the reference to an inverse linear-distance extrapolation factor applies to a field strength measurement whereas emissions from devices operating under Sections 15.253 and 15.255 are based on spectral power density. Power density measurements would be extrapolated using an inverse linear-distance-squared factor. The regulations also prohibit measurements in the near field but provided a conversion formula for such measurements. Accordingly, Section 15.31 is being amended to clarify these points.

17. In addition, HP filed comments requesting that the power limits adopted for

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[15] *See* Comments of the American Automobile Manufacturers Association dated May 28, 1996.

[16] *See* Comments of Hewlett-Packard Company on the Second Notice of Proposed Rule Making dated May 28, 1996.

communication devices be extended to include all Industrial, Scientific and Medical ("ISM") devices in the 61-61.5 GHz band. We find that the request is outside of the scope of this proceeding and therefore would need to be considered in a separate rule making proceeding and comment solicited thereon.

ORDERING CLAUSES

18. IT IS ORDERED that Parts 2 and 15 of the Commission's Rules and Regulations ARE AMENDED as specified in **Appendix B**, effective 30 days after publication in the Federal Register. Authority for issuance of this Third Report and Order is contained in Sections 4(i), 301,302, 303(e), 303(f), 303(g), 303(r), 304 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(g), 303(r), 304 and 307.

19. IT IS FURTHER ORDERED that the Commission's Office of Public Affairs, Reference Operations Division, SHALL SEND a copy of this Third Report and Order, including the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

20. For further information regarding the Third Report and Order in this proceeding, contact Rodney P. Conway (202) 418-2904, Office of Engineering and Technology.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas

Magalie Roman Salas
Secretary

APPENDIX A

FINAL REGULATORY FLEXIBILITY ANALYSIS FOR THIRD REPORT AND ORDER

As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603 ("RFA"), an Initial Regulatory Flexibility Analysis ("IRFA") was incorporated into the *Second Notice of Proposed Rule Making* ("*Second Notice*") and the *Fourth Notice of Proposed Rule Making* (*Fourth Notice*) in ET Docket No. 94-124.[17] The Commission sought written public comments on the proposals in the *Notice*, including the IRFA. The Commission's Final Regulatory Flexibility Analysis ("FRFA") in this Third Report and Order conforms to the RFA, as amended by the Contract with America Advancement Act of 1996 (CWAAA), Pub. L. No. 104-121, 110 Stat. 847 (1996).[18]

Need for and Objective of the Rules. Our objectives are to adopt a spectrum etiquette that provides for a maximum number of operators in the unlicensed 59-64 GHz band, to temporarily restrict amateur station access to the 76-77 GHz band until an effective spectrum sharing plan is developed to permit use of the band by vehicular radar systems and amateur stations, to provide amateur stations co-primary access to spectrum in the 77.5-78 GHz band to offset any negative effects of the temporary restriction in the 76-77 GHz band, and to establish an emissions limit above 200 GHz for some millimeter wave transmitters in order to protect radio astronomy users in the 217-231 GHz band.

Summary of Significant Issues Raised by Public Comments in Response to the IRFA. No comments were submitted in direct response to either IRFA.

Description and Estimates of the Number of Small Entities to Which the Rules Will Apply. For the purposes of this Third Report and Order, the RFA defines a "small business" to be the same as a "small business concern" under the Small Business Act, 15 U.S.C. § 632, unless the Commission has developed one or more definitions that are appropriate to its activities.[19] Under the Small Business Act, a "small business concern" is one that: 1) is independently owned and operated; 2) is not dominant in its field of operation; and 3) meets any additional criteria established by the Small Business Administration (SBA).[20] Since the Regulatory Flexibility Act amendments were not in effect until the record in this proceeding was closed, the Commission did not request information regarding the number of small businesses that might use this service and is unable at this time to determine the number of small businesses that would be affected by this action.

The Commission has not developed a definition of small entities applicable to unlicensed communications devices. Therefore, we will utilize the SBA definition applicable to manufacturers of Radio and Television Broadcasting and Communications Equipment. According to the SBA regulations, unlicensed transmitter manufacturers must have 750 or fewer employees in order to

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[17] *See* 9 FCC Rcd 7078 (1994).

[18] 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.*

[19] *See* 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 5 U.S.C. § 632).

[20] *See* 15 U.S.C. § 632.

qualify as a small business concern.[21] Census Bureau data indicates that there are 858 U.S. companies 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.[22] The Census Bureau category is very broad, and specific figures are not available as to how many of these firms will manufacture unlicensed communications devices. However, we believe that many of them may qualify as small entities.

As noted, this section describes and estimates the number of small entities to which the proposed rules apply. The rules in Part 97 of the Commission's Rules, 47 CFR Part 97, apply to individuals who are qualified 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 CFR § 97.113. Amateur radio licensees are therefore not addressed in this regulatory flexibility analysis.

Description of Projected Reporting, Recordkeeping and Other Compliance Requirements. The Commission has adopted rules that limit the level of emissions between 217-231 GHz and implement a spectrum etiquette for systems operating in the 59-64 GHz band. Measurements of the emission levels and spectrum etiquette will be reported to the Commission as part of the normal equipment authorization process under our certification procedure.

Significant Alternatives and Steps Taken to Minimize Significant Economic Impact on a Substantial Number of Small Entities Consistent with Stated Objectives. No alternatives or other steps were addressed in this proceeding.

Report to Congress. The Commission shall send a copy of this Final Regulatory Flexibility Analysis, along with this Third 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 the FRFA will be published in the Federal Register.

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[21] *See* 13 C.F.R. § 121.201, (SIC) Code 3663.

[22] *See* U.S. Dept. of Commerce, *1992 Census of Transportation, Communications and Utilities* (issued May 1995), SIC category 3663.

APPENDIX B: FINAL RULES

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

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

1. The authority 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 2.106, the Table of Frequency Allocations, is amended by revising columns 5 and 6 for the frequency bands 76-77 GHz and 77-81 GHz, to read as follows:

Section 2.106 Table of Frequency Allocations:

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International Table			United States table		FCC use designators	
Region 1--allocation GHz	Region 2 -- allocation GHz	Region 3 -- allocation GHz	Government	Non-Government	Rule part(s)	Special-use frequencies
			Allocation GHz	Allocation GHz		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			* * * * *			
76-77 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	76-77 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	76-77 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	76-77 RADIO LOCATION	76-77 RADIO LOCATION Amateur	RADIO FRE-QUENCY DEVICES (15)	
77-77.5 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	77-77.5 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	77-77.5 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	77-77.5 RADIO LOCATION	77-77.5 RADIO LOCATION Amateur Amateur-Satellite	Amateur (97)	
77.5-78 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	77.5-78 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	77.5-78 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	77.5-78 RADIO LOCATION	77.5-78 RADIO LOCATION AMATEUR AMATEUR-SATELLITE	AMATEUR (97)	
78-81 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	78-81 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	78-81 RADIO LOCATION Amateur Amateur-Satellite Space Research (space-to-Earth)	78-81 RADIO LOCATION 912	78-81 RADIO LOCATION Amateur Amateur-Satellite 912	Amateur (97)	

3. Section 2.1033 is amended by adding a new paragraph (b)(13) to read as follows:

Section 2.1033 Application for Certification.

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(b)(13) Applications for certification of transmitters operating within the 59.0-64.0 GHz band under Part 15 shall also be accompanied by an exhibit demonstrating compliance with the provisions of 15.255 (g) and (i) of this chapter.

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

PART 15 - RADIO FREQUENCY DEVICES

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

AUTHORITY: Sec 4, 302, 303, 304, 307 and 624A of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, 304, 307 and 544A.

2. Section 15.31 is amended by revising paragraph (f)(1) to read as follows:

Section 15.31 Measurement standards.

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(f)(1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

3. Section 15.33 is amended by revising paragraph (a)(3), to read as follows:

Section 15.33 Frequency range of radiated measurements.

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(a) Unless otherwise noted in the specific rule section under which the equipment operates

for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

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(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

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4. Section 15.35 is amended by revising paragraphs (b) and (c) to read as follows:

.Section 15.35 Measurement detector functions and bandwidth.

* * * * *

(b) On any frequency of frequencies above 1000 MHz, the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules, e.g., see Section 15.255. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. Measurement of AC power line conducted emissions are performed using a CISPR quasi-peak detector, even for devices for which average radiated emission measurements are specified.

(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

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5. Section 15.253 is amended by redesignating paragraph (c)(4) as paragraph (c)(1), redesignating paragraph (c)(1) as paragraph (c)(2)(i), redesignating paragraph (c)(2) as paragraph (c)(2)(ii), by redesignating paragraph (c)(3) as paragraph (c)(2)(iii), and by adding

new paragraphs (c)(3) and (c)(4), to read as follows:

Section 15.253 Operation within the bands 46.7-46.9 GHz and 76.0-77.0 GHz.

* * * * *

(c) * * *

(1) Radiated emissions below 40 GHz shall not exceed the general limits in Section 15.209 of this part.

(2) Radiated emissions outside the operating band and between 40 GHz and 200 GHz shall not exceed the following:

(2)(i) For vehicle-mounted field disturbance sensors operating in the band 46.7-46.9 GHz: 2. pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

(2)(ii) For forward-looking vehicle-mounted field disturbance sensors operating in the band 76-77 GHz: 600 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

(2)(iii) For side-looking or rear-looking vehicle-mounted field disturbance sensors operating in the band 76-77 GHz: 300 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

(c)(3) For radiated emissions above 200 GHz from field disturbance sensors operating in the 76-77 GHz band: the power density of any emission shall not exceed 1000 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

(c)(4) For field disturbance sensors operating in the 76-77 GHz band, the spectrum shall be investigated up to 231 GHz.

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6. Section 15.255 is amended to read as follows:

Section 15.255 Operation within the band 59.0-64.0 GHz.

(a) Operation under the provisions of this section is not permitted for the following products:

(1) Equipment used on aircraft or satellites.

(2) Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. For the purposes of this section, the reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment.

(b) Within the 59-64 GHz band, emission levels shall not exceed the following:

(1) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 $\mu W/cm^2$, as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 $\mu W/cm^2$, as measured 3 meters from the radiating structure.

(2) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power density of any emission, measured during the transmit interval, shall not exceed 9 $\mu W/cm^2$, as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 $\mu W/cm^2$, as measured 3 meters from the radiating structure. In addition, the average power density of any emission outside of the 61.0-61.5 GHz band, measured during the transmit interval, but still within the 59-64 GHz band, shall not exceed 9 nW/cm^2, as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 nW/cm^2, as measured three meters from the radiating structure.

(3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (b)(2) of this section, the peak transmitter output power shall not exceed 0.1 mW and the peak power density shall not exceed 9 nW/cm^2 at a distance of 3 meters.

(4) Peak power density shall be measured with an RF detector that has a detection bandwidth that encompasses the 59-64 GHz band and has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

(5) The average emission limits shall be calculated, based on the measured peak levels, over the actual time period during which transmission occurs.

(c) Limits on spurious emissions:

(1) The power density of any emissions outside the 59.0-64.0 GHz band shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in Section 15.209 of this part.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

(d) Only spurious emissions and transmissions related to a publicly-accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 59-64 GHz band, are permitted in the 59.0-59.05 GHz band.

NOTE: The 59.0-59.05 GHz is reserved exclusively for a publicly-accessible coordination channel. The development of standards for this channel shall be performed pursuant to authorizations issued under Part 5 of this chapter.

(e) Except as specified below, the total peak transmitter output power shall not exceed 500 mW.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g. for frequency hopping devices).

(2) Peak transmitter output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 59-64 GHz band and that has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

(3) For purposes of demonstrating compliance with this paragraph, corrections to the transmitter output power may be made due to the antenna and circuit loss.

(f) * * * * *

(g) * * * * *

(h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

(i) Within any one second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm^2, as measured 3 meters from the radiating structure, must transmit a transmitter identification at least once. Each application for equipment authorization must declare that the equipment contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields.

1. FCC Identifier, which shall be programmed at the factory.

2. Manufacturer's serial number, which shall be programmed at the factory.

3. Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The grantee must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

C. Title 47 of the Code of Federal Regulations, Part 97, is amended as follows:

PART 97 - AMATEUR RADIO SERVICE

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

AUTHORITY: 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. Section 97.301, Authorized frequency bands, is amended by revising paragraph (a) for the wavelength band 4 mm to read as follows:

§ 97.301 Authorized frequency bands.

* * * * *

(a) * * *

Wavelength band	ITU - Region 1	ITU - Region 2	ITU - Region 3	Sharing requirements see § 97.303 (Paragraph)
*	*	*	*	*
EHF	GHz	GHz	GHz	
*	*	*	*	*
4 mm	75.5-81.0.....	75.5-81.0.....	75.5-81.0.....	(b), (c), (h), (r).
*	*	*	*	*

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3. Section 97.303 is amended by revising paragraphs (b), (c) and (h) and by adding a new paragraph (r), to read as follows:

§ 97.303 Frequency sharing requirements.

* * * * *

(b) No amateur station transmitting in the 1900-2000 kHz segment, the 70 cm band, the 33 cm band, the 13 cm band, the 9 cm band, the 5 cm band, the 3 cm band, the 24.05-24.25 GHz segment, the 77.0-77.5 GHz segment, the 78-81 GHz segment, the 144-149 GHz segment, and the 241-248 GHz segment shall cause harmful interference to, nor is protected from interference due to the operation of, the Government radiolocation service.

(c) No amateur station transmitting in the 1900-2000 kHz segment, the 3 cm band, the 77.0-77.5 GHz segment, the 78-81 GHz segment, the 144-149 GHz segment, and the 241-248 GHz segment shall cause harmful interference to, nor is protected from interference due to the operation of, stations in the non-Government radiolocation service.

* * * * *

(h) No amateur station transmitting in the 23 cm band, the 3 cm band, the 24.05-24.25 GHz segment, the 77-77.5 GHz segment, the 78-81 GHz segment, the 144-149 GHz segment, and the 241-248 GHz segment shall cause harmful interference to, nor is protected from interference due to the operation of, stations authorized by other nations in the radiolocation service.

* * * * *

(r) In the 4 mm band:

(1) Authorization of the 76-77 GHz segment of the 4 mm band for amateur station transmissions is suspended until such time that the Commission may determine that amateur station transmissions in this segment will not pose a safety threat to vehicle radar systems operating in this segment.

(2) In places where the amateur service is regulated by the FCC, the 77.5-78 GHz segment is allocated to the amateur service and amateur-satellite service on a co-primary basis with the Government and non-Government radiolocation services.