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

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In the Matter of	)	
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Amendment of Parts 2 and 97 of the Commission's Rules to Create a Low Frequency Allocation for the Amateur Radio Service	)	ET Docket No. 02-98 RM-9404
	)	
Amendment of Parts 2 and 97 of the Commission's Rules Regarding an Allocation of a Band near 5 MHz for the Amateur Radio Service	)	RM-10209
	)	
Amendment of Parts 2 and 97 of the Commission's Rules Concerning the Use Of the 2400-2402 MHz Band by the Amateur and Amateur-Satellite Services	)	RM-9949

REPORT AND ORDER

Adopted: April 29, 2003: **Released: May 14, 2003**

By the Commission:

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INTRODUCTION

1. The amateur radio service, governed by Part 97 of the Commission's Rules, provides spectrum for amateur radio service licensees to participate in a voluntary noncommercial communication service which provides emergency communications and allows experimentation with various radio techniques and technologies to further the understanding of radio use and the development of new technologies.[1] In this Report and Order ("R&O"), we are providing access to 5 channels in or near the 5250-5400 kHz on a secondary basis for the amateur service, and upgrading the existing secondary amateur service allocation to primary status in the 2400-2402 MHz band. These changes to our Rules will enhance the ability of amateur operators to communicate at 5000 kHz when propagation conditions do not permit communication at 3500 or 7000 kHz, and provide additional protection for the amateur operators now using the 2400-2402 MHz band. We are declining to make an allocation to the amateur service in the 135.7-137.8 kHz or the 160-190 kHz bands, due to potential interference to other operations. We are also declining to add a primary allocation to the amateur satellite service in the 2400-2402 MHz band, due to possible spectrum use conflicts.

2. On May 2, 2002, the Commission adopted a *Notice of Proposed Rulemaking* ("*Notice*") in response to three *Petitions for Rulemaking* submitted by ARRL.[2] The first of these petitions requested that a secondary allocation to the amateur service be made in the 135.7-137.8 kHz and 160-190 kHz band to permit experimentation in the LF[3] frequency range.[4] The second petition requested a secondary amateur allocation in the 5250-5400 kHz band to enhance amateur emergency communications and experimentation when propagation conditions are not favorable in the 3500 kHz and 7000 kHz bands.[5] The third petition requested an upgrade to primary status for the existing secondary amateur allocation and a new primary allocation for the amateur-satellite service in the 2400-2402 MHz band to protect existing amateur operations from future commercial systems which may utilize the band.[6]

135.7-137.8 kHz AND 160-190 kHz Bands (RM-9404)

A. Background and Summary of Proposal

3. The 135.7-137.8 kHz band is part of the 130-148.5 kHz band which is internationally allocated to the fixed and maritime mobile services on a primary basis in all three International Telecommunications Union ("ITU") Regions.[7] In addition, in Region 3, the radionavigation service has a primary allocation in this band.[8] Within the U.S., the band is allocated to both the fixed and maritime

[1] *See* 47 C.F.R. § 97.1.

[2] *See Notice of Proposed Rulemaking*, ET Docket 02-98, 17 FCC Rcd 8954 (2002).

[3] The LF, or low frequency, portion of the spectrum is the frequency region between 30 kHz and 3000 kHz.

[4] *See Petition for Rule Making*, RM-9404, Public Notice Report No. 230, (rel. November 23, 1998).

[5] *See Petition for Rule Making*, RM-10209, Public Notice Report No. 2501 (rel. Aug. 13, 2001).

[6] *See Petition for Rule Making*, RM-9949, Public Notice Report No. 2433 (rel. Aug. 30, 2000).

[7] *See* 47 C.F.R. §§2.104 and 2.106. The U.S. is located in ITU Region 2, which includes the whole of the North and South American continents.

[8] ITU-R Region 3 is generally the Asia-Pacific Region. *See* 47 C.F.R. §2.104(b)(3).

mobile services on a primary basis for both Federal and non-Federal Government users.[9] In the 135.7-137.8 kHz portion of the band, there are currently no non-Federal Government assignments and only one Federal Government assignment. The Federal Government assignment is for a coast station in the maritime mobile service communicating with ships in the Pacific Ocean.

4. The band 160-190 kHz is allocated to the broadcasting service on a primary basis in Region 1 and to the fixed service on a primary basis in Regions 2 and 3.[10] In Region 3, the aeronautical radionavigation service has a secondary allocation in this band. In the U.S., the band is allocated to both the fixed and maritime mobile services on a primary basis for Federal Government users and also to the fixed service on a primary basis for non-Federal Government users.[11] There are no non-Federal Government assignments in the Commission's database for this frequency band. There are ten Federal Government assignments for coast stations communicating with ships at sea, and several Federal Government fixed service sites in this band.

5. In addition, unlicensed devices use the LF spectrum. These systems do not have any allocation status, but are authorized to operate under our Part 15 rules on an unprotected, non-interference basis with respect to all other users. Section 15.209 permits operation of authorized unlicensed systems with field strengths of up to 4.9 microvolts/meter in the 9-490 kHz band. Additionally, Section 15.217 permits use of the 160-190 kHz band for general unlicensed operations limited to one watt total input power to the final radio frequency stage (exclusive of filament or heater power) with the length of the transmission line, antenna and ground lead not to exceed 15 meters. Emissions outside of the 160-190 kHz band must be attenuated by at least 20 dB below the level of the unmodulated carrier. Section 15.113 permits Power Line Carrier ("PLC") systems to operate on power transmission lines for communications important to the reliability and security of electric service to the public in the 9-490 kHz band.[12] PLC systems in this frequency band are primarily used to trip protection circuits if a fault, such as a downed power line, is detected in the power grid.

6. ARRL requested that a secondary allocation to the amateur service be made in the 135.7-137.8 kHz and 160-190 kHz band to permit experimentation in the LF frequency range. In the *Notice*, the Commission proposed to allocate the 135.7-137.8 kHz band to the amateur service on a secondary basis to allow amateur radio operators the ability to experiment more freely with propagation, antenna design and antenna construction.[13] The Commission indicated that this allocation appeared to be acceptable because the incumbent use of the 135.7-137.8 kHz band appeared to be very light, and thus a secondary amateur service allocation in this band would likely raise few interference concerns. The Commission proposed to limit amateur stations operating in the 135.7-137.8 kHz band to an effective isotropically radiated power (EIRP) of 1 W and a transmission bandwidth of 100 Hz. Because of possible difficulties in measuring the EIRP of an amateur station in this frequency range, the Commission also proposed to limit amateur transmitter output power ("TPO") in this band to 100 W peak envelope power (PEP).[14] The

[9] The non-Federal Government services in this band are governed by Parts 23 and 80 of the Commission's Rules, respectively.

[10] ITU-R Region 1 is generally Europe, Africa and the Middle East. *See* 47 C.F.R. §2.104(b)(1).

[11] The non-Federal Government fixed service in this band is regulated under Part 23 of the Commission's Rules.

[12] *See* 47 C.F.R. §§ 15.113, 15.209 and 15.217. *See also* 47 C.F.R. §2.106 footnote US294.

[13] *See Notice* at pages 8962-8963 (paras 22-28).

[14] PEP is defined as the average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelop taken under normal operating conditions. *See* 47 C.F.R. §2.1.

Commission proposed no restrictions on antenna size or design for amateur stations in this band because such restrictions would inhibit experimentation. The Commission also proposed to limit access to this band to amateur operators with General, Advanced or Amateur Extra Class licenses. The Commission sought comment on these proposals.

7. In the *Notice*, the Commission expressed concern that amateur stations operating in the 160-190 kHz band would pose a potential for interference to PLC systems in the 160-190 kHz band, and therefore, proposed to decline ARRL's request for an allocation for the amateur service in this band.[15] The Commission noted, however, that amateur use of the 160 kHz band may continue on an unlicensed, non-interference basis under our Part 15 rules.

8. The Commission also sought comment on whether the United Telecommunications Council ("UTC") PLC database, containing information on the location of the PLCs, could be used by amateur operators to reduce the likelihood of interference. The Commission received comments in response to the *Notice* concerning this band from 64 parties and reply comments from 11 parties.

B. Comments

9. 135.7-137.8 kHz band. In general, the amateur respondents support the establishment of a new secondary allocation for the amateur service in the 135.7-137.8 kHz frequency band. They state that such an allocation would provide the opportunity for amateur operators to learn about propagation and technology previously unavailable to their community, and would permit members of this community to develop and retain highly specialized skills.[16] Commenters also unanimously agree that the UTC database should not be released for security reasons.

10. Many of the amateur commenters assert that we should not consider the existence of Part 15 devices, including PLCs, when we make allocation decisions. Galasso, an amateur operator, argues that the Commission should not consider requiring a licensed service to protect unlicensed operations, and that PLC operators have no legal grounds to require protection. Galasso asserts that the "real" reason utilities are opposed to the allocation is because of the financial impact of replacing PLCs.[17]

11. Amateur respondents also assert that the security of the national power grid is questionable if PLCs are so sensitive to interference that the power grid would be disrupted by the proposed amateur service.[18] ARRL submits that its original analysis states that the separation distance needed to avoid interference between amateurs and PLCs is less than 980 feet for 161 kV lines and less than 120 feet for 765 kV lines at an amateur station EIRP of 0.1 Watt. It further states that interference to amateur stations from PLC operations at those distances would be overwhelming, discouraging amateur use, so that the interference potential to PLCs would be self-limiting.[19] Chester, Urso and Roehrig claim that "experts" have indicated that interference to PLCs would not cause widespread power outages.[20]

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[15] *See Report and Order*, Docket No. 20271, 70 FCC 2d 1193 (1978).

[16] *See e.g.* comments of AMRAD at 2.

[17] *See* reply comments of Galasso.

[18] *See* reply comments of Galasso and comments of Hamel.

[19] *See* comments of ARRL at 9. *See also* comments of Young expressing concern about interference from the power grid.

[20] *See* reply comments of Chester and comments of Urso and Roehrig.

McVey argues that new microprocessor-based relays obviate the need for PLCs; that the PLCs are less reliable than an independent path such as microwave, fiber optic cable or telephone; and that the importance of PLCs to utility companies has been overstated.[21] McVey further claims that PLCs are only used as back up systems and that microwave and fiber optic cable are used when reliability is needed.[22]

12. The utility companies, UTC, and IEEE, disagree with the arguments of the amateur community and oppose allocating the 135.7-137.8 kHz band to the amateur service on a secondary basis. They are concerned about interference to these systems, and state that PLC systems are critical to the functioning of the national power grid and that amateur operations could cause widespread power outages. Public Service Gas and Electric Company (PSG&E) submits that an unplanned trip of a relay could result in instability at several power sites, and that this instability could result in the generating station tripping offline.[23] Pinnacle West indicates that while redundant power schemes are in place, they do not protect against an external signal that causes a false trip. It further states that Frequency-Shift Keyed (FSK) PLC systems are most vulnerable, since the amateur signal could appear on the correct frequency with enough signal strength to exceed the receiver's threshold.[24] In additional, UTC points out that the Commission's analysis on the number and location of PLCs that could be impacted by the proposed action is incorrect. UTC states that most PLCs have a 4 kilohertz wide bandwidth, so that the actual number of PLCs that would be impacted by the proposed new allocation is about 2000, not 430 as indicated in the *Notice*.[25]

13. Pulsar Communications states that McVey is incorrect in his argument that microwave or leased telephone lines are more reliable and secure for control of the power network than PLCs because the phone lines and microwave circuits use common signal paths that, if the bulk path were to be disrupted, could knock out communications for several systems on the grid. It claims that the disruption of a single PLC disrupts one transmission line, but most lines have more than one protective scheme in place. Pulsar also indicates that the new relay types are not as accurate as PLCs over a significant distance.[26] IEEE points out that PLCs cost $100,000 per line, whereas fiber optic cable is $80,000 per mile and would need to run the full length of a power line to perform the same function as one PLC. It stated that microwave towers can cost $500,000 per site, which covers about 30 miles of flat terrain, and multiple sites are needed to cover the entire power line.[27]

14. Many of the utilities indicate that the new amateur allocation would give amateurs the right to demand that interference from a PLC system be resolved. Many of them also submit that they would be forced to retune or replace their PLCs to avoid causing interference to amateur operators. IEEE points out that an amateur newsletter from 1998 indicates that using LF in Central California "looks grim" because of the emission levels from the power lines.

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[21] *See* comments of McVey at 3.

[22] *See* reply comments of McVey at 2 and 5.

[23] *See* comments of PSE&G at 6.

[24] *See* comments of Pinnacle West at 2-3.

[25] *See* comments of UTC at 5.

[26] *See* comments of Pulsar Communications at 2-3.

[27] *See* reply comments of IEEE Power Relay Systems Committee to McVey at 2.

15. 160-190 kHz band. The utilities, UTC, IEEE, and LF Part 15 users such as Bowers and Smick support the tentative decision not to allocate this band to the amateur service. The utilities agreed that that the number of PLC systems that would be impacted by this allocation would be much greater than in the 135 kHz band. Bowers and Smick, both users of this band under our Part 15 rules, indicate that ARRL's proposed limits would "wipeout" Part 15 use in the band. On the other hand, amateur licensees such as Urso and Roehrig urge that we consider allocating a 10 kilohertz segment of the 160 kHz band for amateur phone and image transmissions at the same power levels as proposed for the 135 kHz band. They and other amateur operators submit that we should look at the example of the Federal Government's Ground-Wave Emergency Network (GWEN), which shared this band with PLCs.[28] They claim that GWEN used much higher power than that proposed by ARRL and that it successfully shared the band.[29] However, the IEEE Power Systems Relay Committee points out GWEN operations were very different from the proposed amateur operations in that the PLCs were coordinated with the small number of fixed GWEN sites to avoid interference.[30] IEEE Power Systems Relay Committee points out that amateur stations in the 160-190 kHz band could be anywhere in the U.S. and would operate on an uncoordinated basis.

C. Decision

16. While we agree that amateur experimentation in the 135.7-137.8 kHz and 160-190 kHz portions of the LF spectrum could serve to increase the pool of individuals having knowledge of LF transmissions, we conclude that such operations would pose the potential for harmful interference to systems protecting and controlling the national power grid. Therefore, we find that a new amateur allocation in the LF range of the radio spectrum is not justified when balanced against the greater public interest of an interference-free power grid. Further, we find that the opportunity to experiment with LF operations provided to amateur radio operators under our Part 15 rules and through our experimental licensing process,[31] while less attractive to amateur operators than their own proposal, provides the appropriate means for such use in light of the compelling uses in the band.[32]

17. We disagree with ARRL's and the amateur operators' assertions concerning the consideration we should accord incumbent Part 15 use in these bands in deciding whether to provide an allocation for amateur services. Our decision must be based upon the facts at hand and our evaluation of any potential changes to the spectral environment due to our decision. In evaluating whether new operations should be added to a band, licensed or not, we must consider the potential for interference conflicts between the operations. While unlicensed PLC operations have no protection status, they provide a vital public service. Therefore, we disagree with amateur comments that we should not consider the impact on unlicensed operations when making spectrum allocation decisions.

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[28] The Ground Wave Emergency Network provides survivable connectivity to designated bomber and tanker bases by surviving massive broadband destructive interference produced by nuclear explosions, and recovering quickly from the changes in radiowave propagation caused by the ionization of atoms in the upper atmosphere. GWEN operations were decommissioned in 2000.

[29] *See* comments of ARRL at 9, Azlin, and Urso.

[30] *See* reply comments to ARRL and AMRAD of IEEE Power Systems Relay Committee at 5.

[31] See 47 C.F.R. Part 5.

[32] We note the many comments received from amateur operators asserting that our proposals were too constraining, and asking for a larger bandwidth and higher TPO. We also note that the utility companies assert that our proposed limits were insufficient to protect PLC operations. Our decision makes these discussions moot.

18. We note the significant potential for interference between the proposed amateur operations and the incumbent PLCs. ARRL concedes that amateur operations and power lines with attached PLCs would have to be separated in order to prevent interference. We find that separation distances on the order of 950 meters would be necessary to protect the PLCs from interference. We also find that this distance, coupled with the larger-than-expected number of PLCs potentially impacted by this proposed allocation, increases the likelihood that a PLC-equipped powerline will be close enough to an amateur station to receive interference. We will not jeopardize the reliability of electrical service to the public.

19. We believe that the utility companies have raised a valid concern that an allocation to the amateur service could result in the need for PLCs to modify or cease their operations to avoid causing interference to amateurs. Amateur operators have expressed concern that there may be interference to their operations from the power lines and from PLC devices, and ARRL's statement that interference to amateur stations from PLC operations at the distances indicated in paragraph 18, will be overwhelming confirms this claim. While it appears that other techniques could be used to control the power grid, we find that the utility companies have come to rely on PLC systems for monitoring and control of the power grid, and that the alternatives suggested by McVey and others may not be as effective, and would be costly. We are persuaded that the costs of replacing PLC systems would be significant, would be disruptive to the public, and is not justified merely to open this band to amateur use on a secondary basis.

20. Accordingly, we decline to make an allocation to the amateur service in the LF spectrum at this time. As indicated above, we do believe there is potential for some limited operation in these bands under individual experimental licenses. Operations at LF under our experimental license program will allow amateur use to be coordinated with utility companies on a case-by-case basis, and allow empirical data to be developed on the sharing possibilities in this band for future consideration. In addition, amateurs may still make use of the 160-190 kHz band under our Part 15 rules, which are much more restrictive, and therefore more protective of PLCs, than the limits proposed in the *Notice*.[33]

5250-5400 kHz Band (RM-10209)

A. Background and Summary of Proposal

21. The 5250-5400 kHz band is part of the high-frequency ("HF") frequency region[34]. Internationally, in all three ITU Regions, the band 5250-5400 kHz is allocated on a primary basis to the fixed service, and on a secondary basis to the mobile, except aeronautical mobile, service. There is currently no international amateur service allocation in this band.

22. In the United States, the 5250-5400 kHz band is allocated to the fixed service on a primary basis for Federal Government and non-Federal Government use and on a secondary basis to the mobile, except aeronautical mobile, service. In addition, footnote US340 to the U.S. Table of Frequency Allocations permits Federal and non-Federal Government maritime and aeronautical mobile stations to use bands in the 2-30 MHz region for measuring the quality of reception on radio channels on a secondary, non-interference basis; however, actual communication by these stations is limited to

[33] Our Part 15 limits in the 160-190 kHz band limit unlicensed operations to one watt total input power to the final radio frequency stage (exclusive of filament or heater power) with the length of the antenna transmission line, antenna and ground lead not to exceed 15 meters. These limitations should produce EIRPs in the 0.00005-0.0002 Watt range.

[34] The HF region includes frequencies in the 3000 kHz to 30,000 kHz range

frequencies specifically allocated to these services. The band is primarily used by the United States Government for ship-to-shore and fixed point-to-point communications. There is also a limited amount of non-Federal Government use. In addition, on January 8, 1999, the Commission granted an experimental license to ARRL for 15 stations to compare communications reliability between the 3500-4000 kHz, 5100-5450 kHz and 7000-7300 kHz bands.[35]

23. In the *Notice*, the Commission proposed to establish a secondary allocation to the amateur radio service in the 5250-5400 MHz band in response to ARRL's Petition for Rulemaking.[36] ARRL stated that an allocation in the 5250-5400 kHz band would enhance amateur emergency communications and experimentation in the HF range when propagation conditions are not favorable for communication in the 3000 kHz and 7000 kHz bands. In making this proposal, the Commission stated that it appears that amateur radio operators should be able to avoid interference to primary operations in this band due to the limited numbers of primary assignments.[37] In addition, the Commission indicated that the operational protocol of "listen before transmit" employed by amateur radio operators could further minimize interference, and asked whether use of this technique should be explicitly required in the rules in order to protect the primary operators in the 5250-5400 kHz band. The Commission also proposed to limit the output power of the amateur stations in this band to 1500 W peak envelope power ("PEP"), as requested by ARRL. The Commission invited comments as to whether the 5250-5400 kHz band should be restricted to Amateur radio operators with an Amateur Extra Class license to better ensure compatible sharing with the Federal Government operations.[38] The Commission also invited comment on whether these power limit and operator license requirements would be sufficient to prevent interference to primary users, and whether an EIRP limit or other means to reduce interference would be appropriate for this frequency band.

24. Further, the Commission noted that ARRL's petition did not discuss sub-banding, that ARRL's suggested rules would allow all emission types to use the entire band, and that several commenters suggest that sub-banding would be useful.[39] The Commission requested comment on whether sub-banding is necessary and/or appropriate for the 5000 kHz band.

B. Comments

25. We received comments concerning the proposals for the 5250-5400 kHz band from 214 parties and reply comments from 9 parties. All parties but four support the proposal for a new secondary allocation in the 5250-5400 kHz frequency band for emergency communication and experimentation when the 3000 kHz and 7000 kHz bands are not available due to unfavorable propagation conditions. The supporters, mostly amateur licensees, vary in their views regarding the technical requirements to be imposed upon this band, but did not elaborate on their rationale for their views. Many of the supporters want the band open to General Class, Advanced Class and Amateur Extra Class license class holders;[40]

[35] File number 6206-EX-PL-1998, call sign WA2XSY.

[36] *See Notice, supra,* at paras 38-40.

[37] A search of the Government Master File and the Commission's license databases in this band in January 2002 identified a total of 757 assignments. Twenty-six of those assignments are non-Federal Government.

[38] *See* 47 C.F.R. §97.303(d).

[39] *See Petition for Rule Making,* RM-10209, Public Notice (rel. Aug. 13, 2001) Report No. 2501 at 19.

[40] *See e.g.* comments of Bozarth, Hirth, and West.

others want the band limited to Amateur Extra Class license holders only.[41] Many of the commenters support output power levels between 100-250 W PEP,[42] others recommend ARRL's proposed 1500 W PEP.[43] Several of the commenters oppose an EIRP limit, and no commenter supports one.[44] The commenters are split on whether the band should be divided according to transmission types.[45] The group supporting sub-banding asserts that Amplitude-Modulated (AM) Single-side band (SSB) voice transmissions will cause interference to Continuous Wave (CW) and data transmissions and therefore these transmission types should be separated into different sub-bands. Those opposing sub-banding claim that much of the CW and data sub-bands in other amateur allocations are underutilized, and that many other nations are eliminating their sub-bands. Representatives of the amateur community agree that codifying the listen-before-transmit protocol is not necessary, as it is well ingrained in amateur practice.

26. In opposition, the United Power Line council (UPLC) argues that the 5000 kHz band is one of a number of frequency bands that may be used for providing broadband services via the power line carrier systems. These new services will use new technology to deliver broadband internet and communications via the power lines using multiple carriers throughout the HF spectrum. UPLC claims that any action making the 5250-5400 kHz band available for amateur use should account for the potential impact on future Part 15 broadband Power Line Carrier systems, and that the Commission should defer action on this band until the impact can be fully assessed. UPLC alleges that the inconvenience of a delay is unavoidable because it has not had the opportunity to work with the amateur interests.[46] UPLC requests that, should we make this allocation, we limit the TPO in the 5250-5400 kHz band to 1500 W PEP and restrict access to Amateur Extra Class licensees. In addition, UPLC suggests that we consider adopting antenna height limits and out-of-band emission requirements for amateur operations in this band.[47] The Power Line Carrier Association (PLCA) agrees with the arguments of UPLC and contends that its members would need to notch out the 5250-5400 kHz band if amateur operations are permitted in that band, or face the possibility that they will have to discontinue operation if interference were caused to amateur operations. PLCA also requests that we dismiss ARRL's petition or delay action on it until utilities have the opportunity to complete testing on the new PLC devices.[48]

27. The Homeplug Powerline Alliance (Homeplug) requests that we grant a "safe harbor" for a period of 10 years for consumer equipment currently meeting Part 15 standards, so that their equipment

[41] *See e.g.* comments of Neustadter, Sanden, and Hull. Other commenters indicated that the Advanced and Amateur Extra Class should be considered together. *See* Comments of Courson and Countryman. Huggins suggested that there should be no license restrictions. Kennedy suggested that 50 kHz be set aside for Technician Class licensees.

[42] *See e.g.* comments of Posness, Hazan, and Bozarth. The majority of the commenters who suggested a power level less than 1500 W PEP, recommended the output power of the amateur station should be limited to 200 W PEP.

[43] *See e.g.* comments of Barrell, Nitzberg, and Martin. Other commenters suggested various other power limits, most for specific modes in a portion of the band. *See also e.g.* comments of Lee and Axe.

[44] *See e.g.* comments of ARRL at 12.

[45] *See e.g.* comments of Rauch, Wormser and Bowker, which support subbanding, and comments of Brewer, Bell, and Courson and Silberman, which do not.

[46] *See* comments of UPLC at pages 2-4.

[47] *See* comments of UPLC at page 5.

[48] *See* comments of PLCA at 6.

will be free from interference complaints.[49] Under the "safe harbor" Homeplug seeks, Part 15 equipment operating in accordance with our rules would be deemed as not causing interference to licensed services. Homeplug indicates that it has notched out all of the other amateur bands, and that the time delay between the availability of the allocation and new amateur equipment will give them the opportunity to work with the amateurs to determine whether a problem exists.

28. In its reply comments to Homeplug, ARRL asserts that Homeplug's devices have caused interference to amateur operations in other bands in the past, and expects that this will be the case in the 5250-5400 kHz band as well. ARRL further claims that Homeplug's request for a 10-year safe harbor is illogical because Homeplug is asking for relief from the non-interference basis that its members currently operate under, and that licensed services should not have to avoid interference from Part 15 devices.[50] Concerning PLCA's comments, ARRL states that this organization was not formed until the year 2002, and that we should not delay this proceeding because studies of future systems are incomplete. ARRL argues that "no Part 15 manufacturer is entitled to oppose an allocation to a licensed radio service based on future deployment of an unlicensed device."[51]

29. The National Telecommunication and Information Administration (NTIA) objects to the proposed 5250-5400 kHz allocation. NTIA states that this band is extensively used by federal agencies, and that they need immediate access to these HF frequencies in times of emergency.[52] NTIA states that the proposal does not offer any procedure for a federal agency to immediately reclaim a frequency for emergency use once amateur operations have been established, nor would our existing complaint process resolve interference to federal emergency operations in real time. NTIA submits that some amateur operators using some of the modes of operation proposed in the *Notice* may not be able to hear or recognize a federal station's attempt to communicate because of the difference in modulation types, thus the "listen-before-transmit" protocol proposed would not avoid causing harmful interference in all instances. In addition, NTIA indicates that some federal agencies in this HF band use automatic link establishment (ALE) systems that sample channels periodically to determine channel availability. It states that amateur operations on these channels would preclude ALE systems from sampling a channel successfully for the necessary propagation data, thereby eliminating an otherwise usable channel from the agency's frequency list. NTIA further submits that small Coast Guard vessels utilize low powered HF systems with inefficient antenna, and may be forced to use less optimal frequencies to perform search and rescue operations if an amateur station is using the HF channels in this band.

30. To accommodate some amateur operations in this band, NTIA subsequently proposed that five specific frequencies, 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz and 5405 kHz, be made available to the amateur service on a secondary basis.[53] NTIA further proposes that the amateur

[49] *See* comments of Homeplug at 2-4. Homeplug indicates that these devices represent a new market for consumer electronics which operate as over the power line in the 4-21 MHz range and are regulated under the unintentional radiator rules of §15.209 of the Rules.

[50] *See* reply comments of ARRL at 14.

[51] *See* reply comments of ARRL at 15.

[52] *See* letter from Fredrick R. Wentland, Acting Associate Administrator for Spectrum Management to Edmund Thomas, Chief, OET, dated August 21, 2002. The federal agencies using this band include the Department of Defense, Coast Guard, Department of Justice, and twelve others.

[53] *See* letter from Fredrick R. Wentland, Acting Associate Administrator for Spectrum Management to Edmund Thomas, Chief, OET, dated March 13, 2003.

transmissions on these frequencies be limited to single sideband (upper side band), suppressed carrier (SSB-SC) voice (emission designator 2K86J3E) centered around the above frequencies, and must not exceed the equivalent of 50 W PEP transmitter output power into an antenna with a gain of 0 dBd. NTIA explains that these limited frequencies and technical limits would permit sharing in this limited spectrum.

C. Decision

31. We believe that frequencies in the 5250-5400 kHz range may be useful for completing disaster communications links at times when the 3 and 7 MHz bands are not available due to ionospheric conditions, and appreciate the desire of the amateur radio community to assist with disaster communications. At the same time, since the majority of the affected users are Federal Government licensees with homeland security responsibilities, we give considerable weight to the concerns NTIA has expressed about the potential for interference to these users. Thus, we conclude that it is not reasonable to grant ARRL's original request for the whole of the 5250-5400 kHz band. However, as indicated above, NTIA has reviewed its assignments and has found that 5 channels are lightly used and could be used on a secondary basis by amateur stations. While we recognize that these five channels will not give the amateur service the 150 kilohertz of spectrum in the 5000 kHz range it originally asked for or the flexibility to use multiple transmission modes, this appears to be the best compromise available to give the amateur service access to new spectrum while assuring the Federal Government agencies that their use is protected. We also concur with NTIA's basic proposals that amateur service operations on these channels be limited to SSB-SC modulation, upper sideband voice transmissions only, with power not to exceed equivalent of 50 W PEP transmitter output power into an antenna with a gain of 0 dBd, or 50 W e.r.p. These operating rules will decrease the interference potential between amateur stations and Federal Government users. Accordingly, we are amending sections 2.106, and 97.303 of our rules to provide a secondary allocation to the amateur service on the channels 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz and 5405 kHz as specified by NTIA, and to require that amateur operations be limited to an effective radiated power (e.r.p.) of 50 W, and emission type 2K8J3E, upper sideband voice transmissions only centered on each frequency.[54] For the purpose of computing e.r.p. the transmitter peak envelope power will be multiplied with the antenna gain relative to a dipole or the equivalent calculation in decibels. A half wave dipole antenna will be presumed to have a gain of 0 dBd. Licensees using other antennas must maintain in their station records either manufacturer data on the antenna gain or calculations of the antenna gain. In addition, because we are permitting amateur stations to transmit on 5 discrete frequencies and limiting the transmission mode to single sideband only, dividing the band into smaller sub-bands to be used for other emission types is not practical or necessary. Lastly, we will permit these frequencies to be used by amateur service licensees with a General Class, Advanced Class, or Amateur Extra Class operator license. We believe that the limited number of frequencies and the emission restriction will protect against interference to primary service operations.

32. Because the broadband PLCs would be new services operating in new frequency bands and are not yet deployed, we do not have the same concerns as with the incumbent PLC systems in the 160-190 kHz band. Because these new PLC systems are still in development we expect that they can be designed to be compatible with the other operations in this band, and we deny the UPLC and PLCA request to delay action on this proceeding. The power levels we are adopting are 1/30th of the power

[54] For example, an amateur 2K8J3E upper sideband transmission on 5332 kHz will occupy the spectrum between 5330.5 kHz and 5333.5 kHz. Amateur operators must ensure that their transmissions follow this pattern for each of the specified frequencies. For the example above, this means that an amateur operator might select a tuning (or carrier) frequency of 5330.5 kHz, or make other adjustment to his station to meet the transmission requirements.

levels supported by the UPLC and the ERP restriction provides a limit to the antenna height.[55] We believe that the permitted ERP limitation will significantly reduce the possibility of interference to and from broadband PLCs. Because the allowable power level will be very low, we do not believe that we need additional out-of-band emission limits for amateur operations in this band.

33. Finally, we deny Homeplug's request for a 10-year safe harbor. Unlicensed devices operated in accordance with the Part 15 rules should not cause interference to licensed, allocated services. It is not apparent that there will be significant interference from Homeplug devices, whose signals attenuate quickly, to ARRL operations on these frequencies, which are expected to be sporadic. There is ample alternative spectrum on which Homeplug devices can operate. As a practical matter, we would expect amateur services to take into account the extant Homeplug devices, although they are not required to do so.

2400-2402 MHz Band (RM-9949)

A. Background and Summary of Proposal

34. Internationally, in all three ITU Regions, the band 2300-2450 MHz is allocated on a co-primary basis to the fixed and mobile services and on a secondary basis to the amateur service. In addition, this band is allocated to the radiolocation service on a co-primary basis in ITU Regions 2 and 3, and on a secondary basis in Region 1. Further, in all three ITU Regions, industrial, scientific and medical ("ISM") devices operate in the 2400-2500 MHz band and other radiocommunication services operating in this band must accept interference caused by ISM devices.[56] Typical ISM applications include microwave ovens and devices used for the production of physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal and acceleration of charged particles. The amateur-satellite service is also permitted in the 2400-2450 MHz band on a non-harmful interference basis and administrations must ensure that any harmful interference created by amateur-satellite operations is eliminated.[57]

35. Prior to August 10, 1995, the 2400-2402 MHz band was allocated domestically to Federal Government radiolocation operations[58] on a primary basis and to the amateur service on a secondary basis with amateur-satellite operations permitted on a non-harmful interference basis. However, pursuant to the Omnibus Budget Reconciliation Act of 1993 ("OBRA-93"),[59] the NTIA identified the 2390-2417 MHz band for transfer from shared use to exclusive non-Federal Government

[55] The gain of antenna operating at HF frequencies is directly proportional to its length (height). In order to maintain an amateur station's operation at the 50 W ERP limit, an amateur operator must correspondingly decrease his transmitter power if he wants to increase the gain (height) of his antenna. There is a practical limit on how much an amateur can increase the height of his antenna and decrease the transmitter power.

[56] *See* 47 C.F.R. § 2.106 footnote S5.150. ISM devices are equipment or applications designed to generate and use locally RF energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunication. *See* also 47 C.F.R. §18.107.

[57] *See* 47 C.F.R. §2.106 footnote S5.282.

[58] The Federal-Government allocation was used, to a limited extent, by the military for radar testing systems such as target scattering and enemy radar simulators. The 2390-2400 MHz and the 2402-2417 MHz bands were reallocated prior to August, 1995. *See* NTIA, Spectrum Reallocation Final Report, NTIA Special Publication 95-32 (rel. Feb. 1995).

[59] *See* OBRA-93, § 6001(a) (codified at 47 U.S.C. § 923(a)-(b)).

use spectrum.[60] Any Federal Government operations in the 2400-2402 MHz band after August 10, 1995, operate on a non-interference basis to non-Federal Government uses.[61] This reallocation did not affect the operation of the amateur service on a secondary basis or the operation of amateur-satellite service on a non-harmful interference basis ("NIB") in the 2400-2450 MHz band. Domestically, ISM operations are also permitted throughout the 2400-2500 MHz band under the provisions of footnote 5.150 to the Table of Frequency Allocations and Part 18 of the Commission's rules. Unlicensed Part 15 transmitting devices are also permitted in the 2400-2483 MHz band on a non-harmful interference basis.[62] These devices are used for a variety of operations including cordless phones, wireless local area networks, and other broadband wireless applications using industry standards protocols such as IEEE 802.11b and Bluetooth.[63]

36. On November 18, 1999, the Commission adopted a *Policy Statement* that set forth guiding principles for its spectrum management activities for the new millennium.[64] In considering the bands transferred from Federal Government use, the *Policy Statement* stated that the 2400-2402 MHz band should be placed into a spectrum reserve for future applications. Specifically, the *Policy Statement* indicated that existing ISM and unlicensed usage of the band would restrict new services given current spectrum sharing techniques. Therefore, the band would be reserved until new technologies or other changes would increase the opportunity for new operations and the Commission would be receptive to petitions for reallocation of the reserved bands.

37. In the *Notice,* the Commission proposed to upgrade the allocation for the amateur service in the 2400-2402 MHz band from secondary status to primary status and to add a primary allocation to the amateur-satellite service in this band in response to ARRL's Petition for Rulemaking.[65] In the *Notice,* the Commission noted that primary or secondary allocations in ISM bands must accept interference from, and not hinder the use of, ISM equipment.[66] Because of the heavy use of the 2400-2483.5 MHz band by Part 15 devices, the Commission requested comment on whether the proposed primary amateur and amateur-satellite service allocations would conflict with incumbent unlicensed use of the band. The Commission also proposed to maintain unchanged the Part 97 amateur technical rules for this band.

B. Comments

38. ARRL, Radio Amateur Satellite Corporations (AMSAT) and other amateur radio operators support the proposed allocations for the 2400-2402 MHz band. ARRL states that the proposed upgrade of the amateur service to primary status and the addition of a primary amateur satellite service

[60] In doing so, NTIA took note of the Congressional requirement that amateur operations were to be minimally disrupted by the reallocations. *See NTIA Spectrum Reallocation Final Report*, NTIA Special Report 95-32, February 1995, at 4-30.

[61] *See* 47 C.F.R. §2.106 footnote G123.

[62] *See* 47 C.F.R. §15.247(b)(1), which permits higher-powered operations in this frequency band for spread spectrum transmitters.

[63] *See* 47 C.F.R. §§15.24 and 15.249.

[64] *See Policy Statement, "Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium"*, FCC 99-354, 14 FCC Rcd 19868 (1999).

[65] *See Petition for Rule Making,* RM-9949, Public Notice (rel. Aug. 30, 2000) Report No. 2433.

[66] *See* 47 C.F.R. §2.106, footnote 5.150.

allocation would protect the existing amateur satellite service operations and provide some assurance of the future availability of this spectrum.[67] AMSAT adds that allocating frequencies at the edge of the ISM band would create a reasonable sharing opportunity for amateurs. AMSAT further points out that it expects a technical challenge in dealing with interference from collocated ISM devices such as microwave ovens found in most residences, but that residential operation is intermittent and that should minimize the occurrences of interference.[68] Amateur Radio Research and Development Corporation (AMRAD) and Gibbons agree that the proposed allocation actions would encourage increasing use and investment in amateur satellites.[69] Umina points out that amateurs are beginning to build network links in the 2.4 GHz band and that a portable station could relay information to authorities coordinating disaster relief.[70]

39. ARRL and CQ Communications are concerned that the proposal as set forth in the *Notice* appears to imply that unlicensed users may have priority over licensed users of this band. CQ argues that licensed services should always have priority over unlicensed operations on the use of the bands involved and it is concerned that the Commission "appears to be placing the needs of unlicensed services on a par with those of licensed services.[71] ARRL states that the amateur service now has status in the 2400-2402 MHz band and the apparent concern that this proposed allocation change will conflict with Part 15 devices is illogical because Part 15 devices operate without any allocation status and cannot operate when they cause interference to any licensed station.[72]

40. The IEEE Local and Metropolitan Area Networks Standards Committee (IEEE 802) opposes the proposed allocation of the 2400-2402 MHz band for amateur and amateur satellite use. It states that they are concerned that, if the proposed amateur allocations are made, ARRL will attempt to use the new amateur primary status to raise challenges to Part 15 unlicensed operation in the 2400-2402 MHz band.[73] In reply comments, the Licensed Exempt Association (LEA) states that the inquiry into the potential conflict of the proposed allocations with unlicensed operations was an attempt to determine whether the current technical rules for the 2400-2402 MHz band are adequate to optimize sharing of the band.[74] IEEE 802 suggests that sharing with Part 15 devices could be facilitated by limiting the amateur-satellite operations to the Space-to-Earth direction, as is done on the AMSAT-OSCAR-40 satellite,[75] because aggregate interference from other users in the band could increase the possibility of interference to sensitive receivers on board the satellites.[76] IEEE 802 points out that because of the low power of Part

[67] *See* Comments of ARRL at para 22.

[68] *See* Comments of AMSAT at para 8.

[69] *See* Comments of AMRAD and Gibbons.

[70] *See* comments of Umina at 1.

[71] *See* comments of CQ Communications at para 25-26.

[72] *See* comments of ARRL at para 24.

[73] *See* comments of IEEE 802 at para 5- 6. The IEEE 802 points out that ARRL has twice challenged the Commission's authority to authorize unlicensed Part 15 operations on the basis that they "might possibly" cause interference to amateur operations.

[74] *See* reply comments of LEA at 2-3.

[75] The AMSAT-OSCAR-40 satellite has a transponder which operates in the 2400-2450 MHz band, amongst others.

[76] *See* comments of IEEE 802 at para 14.

15 devices, only those devices located near an amateur earth station would present any possibility of interference. It further states that, since amateur earth stations use directional antennas aimed at the satellite, most Part 15 devices would be in a sidelobe of the antenna, further reducing the probability of interference.[77]

41. IEEE 802 also requests that we establish a "safe harbor" for Part 15 devices in the 2400-2402 MHz band similar to that created at 902 MHz.[78] Under this approach, a Part 15 device would, by definition, not be considered to be causing interference if it operates in accordance with the Part 15 rules. IEEE 802 argues that this safe harbor would preclude recurrent challenges from the amateur community, as well as unreasonable assertions of interference to future amateur service or amateur satellite services which may be designed without adequate consideration of other technical uses of the band.[79] It further asserts that the large number of Part 15 users compared to the low number of licensed amateurs justifies providing this protection.[80] LEA supports the IEEE 802's suggestions for a "safe harbor" and a limit on the amateur-satellite use to downlinks only.

42. In reply comments, ARRL and AMSAT oppose the IEEE 802 proposals for facilitating sharing between amateur and unlicensed operations in the 2400-2402 MHz band. ARRL states that IEEE 802's proposed "safe harbor," is unnecessary because individual Part 15 devices cannot continue to operate where interference is caused to any licensed station. ARRL does not agree that the amateur-satellite allocation should be limited to the downlink direction only because it fails to consider the existing and future satellite operation in this band. AMSAT argues that IEEE 802 does not consider that the 2400-2450 MHz band is the only amateur-satellite service allocation with a bandwidth of 50 megahertz below 10 GHz. AMSAT states that the 2400 MHz band is superior to higher bands for amateur satellite use because it is more cost-effective to generate power at lower frequencies.[81]

C. Decision

43. We are upgrading the existing amateur service (except amateur-satellite service) allocation at 2400-2402 MHz from secondary to primary status. This modification will provide additional protection to the amateur service in this band from future licensed operations. The allocation changes we are making will not alter the interference protection rights among the current users of the band. Even under the current secondary allocation, amateur services are entitled to interference protection from Part 15 devices, and ISM devices are entitled to protection from both amateur operations and Part 15 devices.[82] These relationships will remain the same under the amateur service primary allocation. We observe that the amateur operators have successfully shared this band with Part 15 and Part 18 operations and we have no reason to believe that this sharing will not continue to be successful. Part 15 devices are

[77] *See* reply comments of IEEE 802 at 18.

[78] The Commission enacted a safe harbor provision in PR Docket No. 93-61 which provided that "a Part 15 device will, by definition, not be considered to be causing interference to a multilateration Location Monitoring Service system if it is otherwise operating in accordance with the provisions of Part 15..." *See Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, PR Docket NO. 93-61, released September 16, 1997.

[79] *See* comments of IEEE 802 at para 21.

[80] *See* reply comments of IEEE 802 at 12.

[81] *See* reply comments of AMSAT at para 11-12.

[82] See 47 CFR §2.106, footnote 5.150.

limited in power and this interference potential from them is limited to an area very close to their transmit location. We therefore modify rule sections 2.106, 97.303(j)(2)(iii) and 97.303 (j)(2)(iv) to provide a primary allocation for the amateur service (except amateur-satellite service), consistent with our decision here.[83]

44. Our analysis regarding an amateur-satellite service allocation at 2400-2402 MHz differs from the case of terrestrial use in this band. The amateur-satellite service currently operates on a NIB to other services under international footnote 5.282, not on a secondary basis as some parties suggest.[84] This means that these operations are on an equal footing with Part 15 devices. As both the amateur and unlicensed proponents recognize, the sensitivity of amateur satellite receivers makes them more vulnerable to aggregate interference from other users in this band. The 2400-2402 MHz band is heavily used by both Part 15 and Part 18 devices, and, unlike terrestrial amateur operations, amateur satellite receivers are at greater risk from aggregate interference. We thus conclude that an allocation for the amateur-satellite service would be impractical and difficult to implement, given the protection status afforded ISM devices and the large number of Part 15 devices that operate in the band. Further, maintaining NIB status for the amateur-satellite service in this 2 megahertz band is consistent with the NIB status that an amateur satellite system would operate under from 2400-2450 MHz, so amateur satellite use of this band is not prejudiced by our decision. Because we are maintaining NIB status for the amateur-satellite service, we will not place any restrictions on these operations (e.g., downlink only operation as some parties suggest).

45. Although ARRL is correct that unlicensed users do not have protection rights vis-à-vis licensed users in a band, it is incorrect when it asserts that we need not consider unlicensed use of this band when deciding whether to modify the allocation. The issue here, as discussed above, is whether different uses are compatible and promote efficient use of spectrum. This analysis requires that we consider both licensed and unlicensed use. We conclude that, in the 2400-2402 MHz band, the status quo provides the best mix of uses to promote spectrum efficiency. The extensive use of the band to date by Part 15, Part 18 and amateur users under the existing rules supports this conclusion. ARRL's suggestion to license those devices that have the potential to cause interference to licensed services does not alter our analysis. Even among licensed services, we consider whether uses are compatible and promote efficient use of spectrum. ARRL's approach would merely have us identify the priority between the amateur service and another licensed service.

46. We also conclude that, because we are maintaining the relative allocation status in this band, it is not necessary to implement a "safe harbor" for Part 15 devices. Unlicensed devices operated in accordance with the Part 15 rules should not cause interference to the amateur service, and amateur services can take into account these well known technical characteristics used by unlicensed devices as they operate in the band. The amateur service and unlicensed devices have successfully shared this band in the past, and we have no reason to conclude that these sharing arrangements will not continue to be

[83] *See* 47 CFR §§ 2.106, 97.303(j)(2)(iii) and 97.303(j)(2)(iv) as modified in Appendix C, herein.

[84] *See* 47 CFR §2.106, footnote 5.282. "The amateur-satellite service may operate subject to not causing harmful interference to other services operating in accordance with the Table [of Allocations]." A station of a secondary service may not cause interference to stations of primary services, cannot claim protection from interference caused by stations of primary service but may claim protection from stations of another secondary service or stations operating on a non-interference basis (*see* 47 CFR §2.104(d)(3). Stations operating on a non-interference basis must protect the operation of, and accept interference from, all primary and secondary services operating in the same frequency band.

successful.

PROCEDURAL MATTERS

47. *Final Regulatory Flexibility Certification.* As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared a Final Regulatory Flexibility Certification the possible significant economic impact of the proposals contained in this document on a substantial number of small entities. This certification declares that there is no significant economic impact on small entities because the amateur radio operators are individuals precluded from using this spectrum for commercial purposes, and therefore do not fit the definition of a small entity. In addition, the rules proposed simply make additional spectrum available to the amateur radio service and do not impose any additional fees, costs, or compliance burdens on an amateur radio operator. The Certification is set forth in **Appendix B.**

48. For further information regarding this Report and Order, contact Thomas Derenge, Office of Engineering and Technology, (202) 418-2451, e-mail tderenge@fcc.gov.

ORDERING CLAUSES

49. Accordingly, IT IS ORDERED that pursuant to Sections 1, 4, 301, 302(a), and 303(c) and (f), of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154, 301, 302(a), and 303(c) and (f), this REPORT AND ORDER is hereby ADOPTED.

50. IT IS ALSO ORDERED that Parts 2 and 97 of the Commission's Rules ARE AMENDED as specified in Appendix C, and such rule amendments shall be effective 30 days after publication in the Federal Register.

51. IT IS ALSO ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this REPORT AND ORDER, including the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: List of Commenting Parties

Adam M. Farson	Glenn R. Slaton Jr.	Oscar Emanuel Sanden
Al Tirevold	Gregory L. Hanson	Patricia A. Colvin
Alan Fryer	Hamilton E. Hicks	Patrick E. Brown
Alan J. Wormser	Harry A. Hodges	Patrick E. Hamel
Allan Kruger	Henry J. Borawski	Paul D. Sergi
Amateur Radio Research and Development Corporation (AMRAD)	Holger Kinzel	Paul Harden
Amateur Radio Satellite Corporation	Home Plug Powerline Alliance	Paul R. Goemans
Andrew E. Howard Sr.	Howard D. Rubin	Paul R. Goodman
Anthony G. Angerame	Hugh Inness-Brown	Paul S. Courson
Anthony Tran	IEEE 802	Paul W. Cavnar
Arjun Chatterjee	IEEE/Power Systems Relay Committee (Mark Simon, Chairman)	Peter Burbank
Arnold P. Stein	J. S. MacDonald	Peter J. F. Shaw
ARRL	James Moritz	Philip E. Galasso
Art Pighting	James Kennedy	Philip Lazar
Benjamin T. Morris	James A. Nitzberg	Pinnacle West
Bill Everett	James C. Fletcher	Power Line Communications Association (PLCA)
Bill Ramsey	James E. Fuller	Public Service Electric and Gas Company
Bill Rowlett	James E. Price Jr.	Pulsar Communications
G. Robert Thacker	James E. Whedbee	Quarter Century Wireless Association
Brian P. Mileshosky	James H. Young	Ray Yakesh
Bruce Moyer	James K.Jarvis	Raymond R. Conners
Bruce J. Howes	James L. Anderson	Rich Eyre
California ISO	James Scott Hill	Richard Brittingham
Carl B. Black	James A. Wades	Richard C. Young
Carl Seyersdahl	Jan A. Tarsala	Richard Frey
Cecilio Bayona	Jeffrey D. Chambers	Richard Illman
Charles Green	Jeffrey T. Briggs	Rick McKee
Charles L. Greeno	Jerry L. Ford	Robert H. Wilder
Charles R. Mabbott Sr.	Jerry Rogich	Robert J. Roehrig
Charles P. Adkins	Jess Colvin	Robert L. Bingham.
Charles T. Rauch	J. W. Schnaidt	Robert T. Bohrer
Charles Vest	Joanne C. Thompson	Roger V. Thompson
Charles W. Shaw	John Brewer	Ron Grandmaison
Christopher Kent	John C. Holliman	Ronald Wetjen
Central Iowa Power Cooperative (CIPCO)	John Chamberlain	Ronald Young
Courtney B. Duncan	John E. Sweeney	Ronald Zond
CQ Communications	John Getz	Roy Koeppe
D. B. Vaughan	John Goller	Scott A. Littfin
Daniel Richard Tayloe	John Huggins	Scott Freeberg
Daniel L. Jeswald	John P. Russo	Scott Pederson
Danny C. Douglas	John S. Hirth	Scott E. Robbins

Darrel D. Swenson	John S. Rippey	Seabury A. Lyon
Darrell Upson	John Silberman	Shoukat Khan
Dave Bowker	John Sullivan	Stan Wilson
David Metzger	John Wagner	Stephen B. Miller Jr.
David C. Axe	John Wilson	Stephen Bertsch
David L. Thompson	John Zitzelberger	Stephen F. Baron
David Lininger	Jon M. Pollock	Steve Schroeder
David Muntyan	Joseph Cro	Steven James Robeson
Dennis J. Ponsness	Joseph Falcone	Stuart Satrun
Donald A. Olejnik	Juan P. Ferrari	Theodore E. Drake
Donald B. Chester	Julius B. Chiller	Thomas Butchers
Donald B. Hall	Karl M. Schulte	Thomas Cooper
Donald F. Birk Sr.	Keith Hunt	Thomas Jennings
Donald R. Bozarth	Kenneth A. Hubbard	Thomas Popovic
Doug R. Dunn	Kenneth N. Allen	Thomas R. Gibbons, J.D.
Douglas E. Person	Kenneth R. Wezeman	Thomas R. Isgro
Dwight W. Smith	Larry Robison	Timothy West
Ed Santavicca	Larry D. Tyree	Timothy J. Pettibone
Emmett E. Brooks	License Exempt Alliance	Tim Smith
Entergy Corporation (Dan Glaser)	Leonard J. Umina	Timothy McDonough
Eric Martin	Lloyd Chastant	Todd M. Carpenter
Exelon Corporation	Louis B. Burke Jr.	Thomas G. Azlin
Ford A. Peterson	Lynn and Rosie Lamb	Troy W. Ballard
Frank A. Lynch	Marco A. Wikstrom	United Telecom Council (UTC)
Frank A. Todd	Mark A. Graves	W. Lee McVey, P.E.
Frederick C. Gantzer	Mark S. Bell	Wade Anderson
Fredrick A. West	Mark W. Kahrs, PhD.	Walt Amos
Gareth B. Guadette	Michael Brooks	Walter Duffrain Jr.
Garey Barrell	Michael Bucklaew	Walter E. Wilson Jr.
Gary J. Ferdinand	Michael E. Urso	Walter Scott Neustadter
Gary Lee	Michael J. Bucklaew	Wayne P. Muckleroy
Gary P. Countryman	Michael J. Linden	William D. Papemran
Gene A. Bingham	Michael J. MacDonald	William F. Crowell
George E. Lemaster	Michael J. Nault	William F. Hagen
George Pritchard	Michael J.Linden	William H. Martin
George W. Hippisley	Mike McAlevey	William E. Bowers, PE
George W. Lee	Mike Monnier	William J. Cook
Gerald B. Hull	Nicholas S. Frost	William K. Harding Jr.
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Gerald Steck	National Telecomunciations and Information Administration	William R. Tippett II
Glen E Hazan	NY Independent System Operator, Inc. (NYISO)	Perry I. Klein
Glen Reid	ONCOR Electric Energy Delivery Company	Intellon Corporation
John B. Johnston	Jim Dewey	Jim Detmers
Jonathon B. Smick	Lincoln Electric System	United Power Line Council

APPENDIX B: Final Regulatory Flexibility Certification

1. *Final Regulatory Flexibility Certification.* The Regulatory Flexibility Act of 1980, as amended (RFA),[85] requires that an initial regulatory flexibility analysis be prepared for notice and comment rule making proceedings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."[86] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[87] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[88] A "small business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).[89]

2. In this *Report and Order ("R&O")*, we make 5 channels in or near the 5250-5400 kHz frequency band available on a secondary basis and upgrade the allocation of the 2400-2402 MHz frequency band to the amateur service. The amateur radio service is a voluntary non-commercial communication service comprised of individuals or groups of individuals holding amateur radio licenses issued by the Commission.[90] These individuals are prohibited from using spectrum allocated to the amateur service for communications for hire or for material compensation, or for communications in which the amateur radio operator has a pecuniary interest.[91] Therefore, amateur radio operators do not fit any part of the definition of "small entities" described above, and thus are not classified as such.

3. In addition, even if the amateur radio licensees were hypothetically considered as "small entities," the rule changes promulgated in this *R&O* simply make spectrum available for the amateur radio operations and impose no additional fees, costs, or compliance burdens on an operator. Since the amateur radio service is a voluntary service, it would be up to each individual amateur to purchase or modify equipment to use the new bands. There is no cost associated with the upgrade of the allocation. On the contrary, the amateur radio service receives the positive benefits of access to additional spectrum.

4. Lastly, the use of these five new frequencies in or near the 5250-5400 kHz band on a secondary basis by the amateur service does not impact any small entities because it is primarily used by the Federal Government. The allocation upgrade in the 2400-2402 MHz band also does not impact any

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[85] The RFA, *see* 5 U.S.C. § 601– 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[86] 5 U.S.C. § 605(b).

[87] 5 U.S.C. § 601(6).

[88] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

[89] 15 U.S.C. § 632.

[90] *See* 47 CFR §§97.1 and 97.3(a).

[91] *See* 47 CFR §§97.113(a)(2).

small entities because there are currently only Part 15 and Part 18 operations in that frequency band. The Part 18 operations maintain their right to operate under international footnote 5.150.[92] The current amateur service allocation status is higher than the status of Part 15 operations, so that there will be no additional impact due to this action.

5. Therefore, we certify that the rules in this *R&O* will not have a significant economic impact on a substantial number of small entities. The Commission will send a copy of the *Report and Order*, including a copy of this Final Regulatory Flexibility Certification, in a report to Congress pursuant to the Congressional Review Act.[93] In addition, the *Report and Order* and this Final Certification will be sent to the Chief Counsel for Advocacy of the SBA, and will be published in the Federal Register.[94]

[92] *See* 47 C.F.R. §2.106, footnote 5.150.

[93] *See* 5 U.S.C. § 801(a)(1)(A).

[94] *See* 5 U.S.C. § 605(b).

APPENDIX C: Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR Parts 2 and 97 as follows:

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

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

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:

a. Revise pages 11 and 51 to read as follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

5060-9040 kHz (HF)

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
5060-5250 FIXED Mobile except aeronautical mobile 5.133			5060-5450 FIXED Mobile except aeronautical mobile US212 US340 US381		Maritime (80) Aviation (87) Private Land Mobile (90)
5250-5450 FIXED MOBILE except aeronautical mobile					
5450-5480 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	5450-5480 AERONAUTICAL MOBILE (R)	5450-5480 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	5450-5680 AERONAUTICAL MOBILE (R) 5.111 5.115 US283 US340		Aviation (87)
5480-5680 AERONAUTICAL MOBILE (R) 5.111 5.115					
5680-5730 AERONAUTICAL MOBILE (OR) 5.111 5.115			5680-5730 AERONAUTICAL MOBILE (OR) 5.111 5.115 US340		
5730-5900 FIXED LAND MOBILE	5730-5900 FIXED MOBILE except aeronautical mobile (R)	5730-5900 FIXED Mobile except aeronautical mobile (R)	5730-5900 FIXED MOBILE except aeronautical mobile (R) US340		Maritime (80) Aviation (87)
5900-5950 BROADCASTING 5.134 5.136			5900-5950 BROADCASTING FIXED MOBILE except aeronautical mobile (R) US340 US366		Radio Broadcast (HF) (73) Maritime (80) Aviation (87)
5950-6200 BROADCASTING			5950-6200 BROADCASTING US340		Radio Broadcast (HF) (73)
6200-6525 MARITIME MOBILE 5.109 5.110 5.130 5.132 5.137			6200-6525 MARITIME MOBILE 5.109 5.110 5.130 5.132 US82 US296 US340		Maritime (80)
6525-6685 AERONAUTICAL MOBILE (R)			6525-6685 AERONAUTICAL MOBILE (R) US283 US340		Aviation (87)

2345-2655 MHz (UHF)					Page 51
International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
See previous page for 2300-2450 MHz			See previous page for 2310-2360 MHz	2345-2360 FIXED MOBILE US339 RADIOLOCATION BROADCASTING-SATELLITE US327 5.396	Wireless Communications (27)
			2360-2385 MOBILE US276 RADIOLOCATION G2 Fixed G120	2360-2385 MOBILE US276	
			2385-2390 US363	2385-2390 FIXED MOBILE US363	
			2390-2400 G122	2390-2400 AMATEUR	Amateur (97)
			2400-2402 5.150 G123	2400-2402 AMATEUR 5.150 5.282	ISM Equipment (18) Amateur (97)
			2402-2417 5.150 G122		ISM Equipment (18) Amateur (97)
			2417-2450 Radiolocation G2 5.150 G124	2417-2450 Amateur 5.150 5.282	ISM Equipment (18) Amateur (97)
2450-2483.5 FIXED MOBILE Radiolocation 5.150 S5.397	2450-2483.5 FIXED MOBILE RADIOLOCATION 5.150 5.394		2450-2483.5 5.150 US41	2450-2483.5 FIXED MOBILE Radiolocation 5.150 US41	ISM Equipment (18) Private Land Mobile (90) Fixed Microwave (101)

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b. In the list of United States footnotes, add footnote US 381.

UNITED STATES (US) FOOTNOTES

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US381 The frequencies 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz, and 5405 kHz are allocated to the amateur service on a secondary basis. Amateur use of these frequencies shall be limited to: (1) a maximum effective radiated power (e.r.p.) of 50 W; and, (2) single sideband suppressed carrier modulation (emission designator 2K8J3E), upper sideband voice transmissions only.

PART 97-AMATEUR RADIO SERVICE

3. 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.

4. Section 97.303 is proposed to be amended by revising paragraphs (j)(2)(iii), (j)(2)(iv), and adding new paragraph (s) to read as follows:

§ 97.303 Frequency sharing requirements.

* * * * *

* * * * *

(j) * * * * *

(2) * * *

(iii) The 2390-2417 MHz segment is allocated to the amateur service on a primary basis, and amateur stations operating within the 2400-2417 MHz segment must accept harmful interference that may be caused by the proper operation of industrial, scientific, and medical devices operating within the band.

(iv) The 2417-2450 MHz segment is allocated to the amateur service on a co-secondary basis with the Federal Government radiolocation service. Amateur stations operating within the 2417-2450 MHz segment must accept harmful interference that may be caused by the proper operation of industrial, scientific, and medical devices operating within the band.

* * *

(s) An amateur station having an operator holding a General, Advanced or Amateur Extra Class license may only transmit single sideband, suppressed carrier, (emission type 2K8J3E) upper sideband on the channels 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz, and 5405 kHz. Amateur operators shall ensure that their transmission occupies only the 2.8 kHz centered around each of these frequencies. Transmissions shall not exceed an effective radiated power (e.r.p) of 50 W PEP. For the purpose of computing e.r.p. the transmitter PEP will be multiplied with the antenna gain relative to a dipole or the equivalent calculation in decibels. A half wave dipole antenna will be presumed to have a gain of 0 dBd. Licensees using other antennas must maintain in their station records either manufacturer data on the antenna gain or calculations of the antenna gain. No amateur station shall cause harmful interference to

stations authorized in the mobile and fixed services; nor is any amateur station protected from interference due to the operation of any such station.

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