Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	**)**	
	)	
Amendment of Parts 2 and 97 of the Commission's	**)**	**RM-_____**
Rules Regarding Implementation of the Final Acts	**)**	
of the World Radiocommunication Conference	**)**	
(Geneva, 2015) To Allocate the Band 5351.5 - 5366.5	**)**	
kHz to the Amateur Radio Service	**)**	

To: The Commission

PETITION FOR RULE MAKING

ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.401 of the Commission's Rules (47 C.F.R. § 1.401), hereby respectfully requests that the Commission issue a *Notice of Proposed Rule Making* at the earliest possible date, proposing to amend Section 2.106 of the Commission's Rules and several sections of Part 97 of the Commission's Rules as proposed in the attached Appendix hereto. This Petition proposes to implement domestically that portion of the Final Acts of the 2015 World Radiocommunication Conference ("WRC-15")[1] that provided for the international allocation of the band 5351.5 - 5366.5 kHz to the Amateur Radio Service on a secondary basis. As good cause for this Petition, ARRL states as follows:

I. Introduction.

1. WRC-15 concluded on November 27, 2015, more than a year ago. Considered at WRC-15 was Agenda Item 1.4, which was to "consider a possible new allocation to the amateur service on a secondary basis within the band 5250 - 5450 kHz." This Agenda Item was premised on Resolution

[1] WRC-15 Final Acts, (Geneva, 2015).

649 from WRC-12, which invited WRC-15 to consider the possibility of making an allocation of an appropriate amount of spectrum, not necessarily contiguous, to the Amateur Service on a secondary basis within the band 5250-5450 kHz. That 2012 Resolution in turn was based on a study of spectrum requirements for a secondary allocation to the Amateur Service within the band 5250-5450 kHz, and also upon sharing studies on the impacts to other services currently allocated in that band and in the adjacent bands worldwide.

2. Presented at WRC-15 were the following arguments in favor of the Agenda Item 1.4 proposal: (a) allocations to the amateur service in the high frequency (HF) bands allow radio amateurs to play an important role in delivery of communications in support of disaster relief operations; (b) radio communications in the HF bands are dependent on propagation factors; (c) there is a need for an operating frequency close to the maximum usable frequency (MUF) for varying distances and time of day; (d) current amateur radio allocations exist at 3500 kHz and 7000 kHz; (e) an allocation at 5 MHz will bridge the propagation gap between the 3500 kHz and the 7000 kHz amateur radio bands and enable the amateur service to maintain stable communication over various distances for the full 24 hours, especially for use when providing communications in disaster situations and during relief operations.

3. In response to Agenda Item 1.4, the Final Acts of WRC-15 included a modification to the International Table of Allocations to add, within the band 5003-7450 kHz, a secondary allocation in all three International Telecommunication Union (ITU) Regions to the amateur service of the band 5351.5-5366.5 kilohertz. Remaining primary in that band were the fixed and mobile services (except aeronautical mobile).

A new international footnote, 5.A14 was added to that allocation, which reads as follows:

> Stations in the amateur service using the frequency band 5 351.5-5 366.5 kHz shall not exceed a maximum radiated power of 15 W (e.i.r.p.). However, in Region 2 in Mexico,

> stations in the amateur service using the frequency band 5 351.5-5 366.5 kHz shall not exceed a maximum radiated power of 20 W (e.i.r.p.). In the following Region 2 countries: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Dominica, El Salvador, Ecuador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela, as well as the overseas territories of the Netherlands in Region 2, stations in the amateur service using the frequency band 5 351.5-5 366.5 kHz shall not exceed a maximum radiated power of 25 W (e.i.r.p.).

4. The Commission has not to date commenced a docket proceeding proposing to implement this new WRC-15 allocation in the domestic Table of Allocations. Nor has it yet taken any action to implement any of the other portions of the WRC-15 Final Acts. There is urgency with respect to the 5351.5-5366.5 kHz allocation however, as is explained below. The Commission is respectfully requested to permit the expanded communications capability offered by this new allocation without additional delay. Such implementation as proposed herein will allow radio Amateurs engaged in emergency and disaster relief communications, and especially those between the United States and the Caribbean basin to more reliably, more flexibly and more capably conduct those communications (and preparedness exercises therefor), before the next hurricane season in the summer of 2017. The same is respectfully requested.

II. Background.

5. The effort of ARRL and the Amateur Radio community generally to obtain a contiguous allocation in the 5 MHz band began in or about 2001. On July 24, 2001, ARRL filed a Petition for Rule Making [2] ("2001 Petition") requesting that the Commission create a domestic secondary amateur service allocation in the 5250-5400 kHz band. The Petition noted that there was then a current need for 150 kilohertz of usable spectrum around 5000 kHz for the Amateur Service, in order to fill the ionospheric propagation gap between the propagation paths provided by the Amateur Service allocations in the 3500-4000 kHz (80-meter) and 7000-7300 kHz (40-meter) bands. The

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

Petition argued that there are numerous times when the existing amateur service allocations in the 3500-4000 kHz and 7000-7300 kHz bands do not provide reliable communications due to solar cycles, and due to seasonal and daily variations in the ionosphere. Thus, an allocation in the 5000 kHz range would provide optimum propagation conditions on occasions when ionospheric conditions do not permit the use of other, higher or lower frequency bands. During the summer months, frequencies in the 3500 kHz band have excessive atmospheric noise for the transmitter power used, while the 7000 kHz band may penetrate the ionosphere. [3] Importantly, this propagation gap occasionally interrupts emergency communications by Amateur Radio operators between, most notably, the U.S. and the Caribbean islands during and immediately after hurricanes and severe weather disasters.[4] Because Amateur stations use relatively low power and increasingly use digital modulation requiring low multipath delay, operating frequencies should be chosen near the maximum usable frequency for the desired path and time. That is standard protocol in the operation of disaster relief networks. Finally, ARRL argued that an allocation in the 5000 kHz range would relieve periodic, substantial overcrowding of the 3500 kHz and 7000 kHz bands. These are small allocations, heavily used worldwide on a shared basis at all times of the day and night, and there is no reservation of those bands for emergency communications only.

6. The experimental operations authorized by the Commission in 1999 and 2000 and conducted by ARRL established that Amateur stations can co-exist with incumbent operations

[3] HF communications rely on the electrical charging (ionization) of the ionosphere (atmospheric altitudes between 50-500 km) to refract the radio signal back to Earth, thus to achieve long-distance propagation. The ionosphere varies with the solar cycle, the seasons, and the time of day and thus, the frequencies at which signals are refracted vary correspondingly. Frequencies which provide reliable communication at one time may not do so a short time later. There are times when the 3500-4000 kHz band is too low in frequency and the 7000-7300 kHz is too high for reliable communication. If the frequency is too high, the wave will penetrate the ionosphere and not be refracted; if it is too low, the signal may be absorbed by the atmosphere. It is also notable that these frequency ranges are susceptible to high levels of atmospheric noise which reduces communications capability, especially in the summer months, and especially when electrical storms are present.

[4] ARRL sponsored experimental tests in the 5200 kHz band beginning in 1999, which resulted in successful provision of communications paths between the U.S. and Caribbean countries, even during the summer months, when atmospheric noise is especially disruptive to HF communications, without reported interference.

without causing harmful interference. Additionally, based upon the results of tests and computer analyses authorized under these experimental assignments, ARRL found that propagation in the 5000 kHz band is more stable near sunrise and sunset for Amateur Radio communications, while the 7000 kHz band is better at night and the 3500 kHz band is better during the day on the U.S. mainland and Caribbean Basin paths studied, generally speaking. Furthermore, it was found that the atmospheric noise level at 3500 kHz is higher than in the 5000 kHz or 7000 kHz bands.

7. Earlier than ARRL's field tests, the National Telecommunications and Information Administration ("NTIA") published several spectrum requirements reports that supported the additional Amateur Radio allocation requirement.[5] Additionally, the International Amateur Radio Union (IARU), the worldwide association of Amateur Radio national societies had in the late 1990s established a requirement for a narrow allocation near 5000 kHz to account for changes in propagation conditions. At the time, there were pending proposals for an amateur allocation around 5000 kHz in Europe.

8. With respect to incumbent fixed service allocations in the 5000 kHz band, ARRL argued in its 2001 Petition that the trend for incumbent 5000 kHz fixed service operations was to migrate to alternative technologies such as microwave, satellite and fiber for long haul communications.[6] Therefore, ARRL argued, the HF spectrum around 5000 kilohertz should become increasingly available for Amateur Radio use. The 5250-5400 kHz segment was identified as the least

[5] *See* Department of Commerce, *U.S. National Spectrum Requirements: Projections and Trends*, NTIA Special Publication 94-31, March 1995. *See* also Department of Commerce, *High Frequency Spectrum Planning Options*, NTIA Special Publication 96-332, November 1996. Although these cited reports focused on the 4945-4995 kHz band, the specified frequency range illustrated that an allocation around 5000 kHz was needed. Publication 94-31, at page 168, noted that, with respect to a new allocation near 5000 kHz, the requirement "is for about 50 kHz near 5 MHz, on a shared basis. Particularly desirable for communications during solar cycle minima when maximum usable frequencies are below 3.5 MHz."

[6] *See* Department of Commerce, *U.S. National Spectrum Requirements: Projections and Trends*, NTIA Special Publication 94-31, March 1995. That prediction proved accurate over time.

encumbered portion of the 5100-5450 kHz band at the time. It was also suggested that the low utilization of this band by Federal government operators[7] would permit Amateur stations to dynamically select frequencies within the allocation so as to avoid interference to primary services, and that the success of such dynamic frequency selection had already been demonstrated by Amateurs following their access to the 10 MHz band following WARC-79. Those facts, and the absence of reports of interference attributable to amateur operations during the experimental operations led to the conclusion that interference to Federal government users was unlikely. ARRL's 2001 Petition proposed technical rules for the 5250-5400 MHz band which were similar to the rules for Amateur use of the 3500 kHz and 7000 kHz bands: i.e., output power limited to 1500 watts PEP with the entire band limited to RTTY, data, phone and image emission types.

9. NTIA objected to the proposed 5250-5400 kHz allocation, stating in 2001 that the band was at that time extensively used by federal agencies, and that they needed immediate access to these HF frequencies in times of emergency.[8] NTIA was concerned that ARRL's proposal did not offer any procedure for a Federal agency to immediately reclaim a frequency for emergency use once amateur operations have been established, nor would the FCC's complaint processes at the time allow resolution of interference to federal emergency operations without unacceptable delay. NTIA was concerned that ARRL's proposed use of "listen-before-transmit" protocols by Amateurs would not necessarily be sufficient to avoid harmful interference in all instances to Federal stations. In addition, NTIA noted that some federal agencies in the 5 MHz band used automatic link establishment (ALE) systems that sample channels periodically to determine channel availability. It expressed concern that

[7] The band is primarily used by the United States Government for ship-to-shore and fixed point-to-point communications.
[8] *See*, the 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.

amateur operations in the 5250-5400 kHz band would preclude co-channel ALE sampling, thereby eliminating an otherwise usable channel from the agency's frequency list.

10. Thus, instead of an allocation of a contiguous band of any size at all, NTIA counterproposed the allocation to the Amateur Service of five specific frequencies: 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz and 5405 kHz, on a secondary basis.[9] NTIA urged that amateur transmissions on these frequencies be limited to single sideband telephony (emission designator 2K80J3E) centered on the above frequencies, with a power limit of the equivalent of 50 W PEP transmitter output power into an antenna with a gain of 0 dBd. NTIA took the position that that these limited frequencies and technical limits would permit sharing in this limited spectrum. The Commission found 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 3500 kHz and 7000 kHz Amateur bands, and proposed the allocation requested by ARRL.[10] In making the proposal, the Commission stated that it appeared that Amateur Radio operators should be able to avoid interference to primary operations in the band due to the limited numbers of primary assignments.[11] 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.

11. Notwithstanding a very large number of filed comments supporting the creation of a contiguous allocation to the Amateur Service, NTIA's position was that the five limited channels and

[9] *See* letter from Fredrick R. Wentland, Acting Associate Administrator for Spectrum Management to Edmund Thomas, Chief, OET, dated March 13, 2003.
[10] *Notice of Proposed Rulemaking*, ET Docket 02-98, 17 FCC Rcd 8954 (2002).
[11] The Commission stated that 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 were non-Federal Government assignments.

technical limits would permit sharing in this limited spectrum. Although the Commission found that frequencies in the 5250-5400 kHz range would be useful to Amateurs in completing disaster communications links at times when the 3.5 and 7 MHz bands are not available due to ionospheric conditions, and expressed its appreciation of the desire and efforts of the Amateur Radio community to assist with disaster communications, the Commission was (not unreasonably) obligated to protect Federal Government users of that spectrum with homeland security responsibilities. Therefore, it did not at the time permit access to the entire 5250-5400 kHz band, but instead, pursuant to NTIA's suggestion, allocated only the 5 lightly used channels on a secondary basis to the Amateur Service. On May 14, 2003, the Commission released a *Report and Order* in ET Docket No. 02-98, FCC 03-105, 18 FCC Rcd. 10258 (2003) which, among other things, allocated to the Amateur Service five channels within the band 5250-5450 kHz on a secondary basis. The purpose of the allocation, according to paragraph 1 of the *Report and Order*, was to provide "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." The allocation was made pursuant to Footnote US381 to Section 2.106 of the Commission's Rules, the Table of Allocations. [12]

12. Pursuant to and by way of implementing that allocation in the Part 97 service rules, the Commission in the same *Report and Order* amended Section 97.303 to add a new subsection (s) thereto, which reads as follows:

[12] That U.S. footnote (since renumbered as US23), read at the time as follows:

> 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.

> (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.

The Commission said that it recognized that the five channels would not give the Amateur Service the 150 kilohertz of spectrum in the 5000 kHz range ARRL originally asked for, or the flexibility to use different transmission modes. However, it represented at the time a "compromise," which would give the Amateur Service access to new spectrum while protecting the Federal government agency uses. Thus, the Commission limited Amateur operation to upper sideband voice transmissions only, with power not to exceed the equivalent of 50 W PEP transmitter output power into an antenna with a gain of 0 dBd, or 50 W ERP. For the purpose of computing ERP, the transmitter peak envelope power is multiplied by the antenna gain relative to a dipole or the equivalent calculation in decibels. A half wave dipole antenna is presumed to have a gain of 0 dBd. Licensees using other antennas were obligated to maintain in their station records either manufacturer data on the antenna gain or calculations of the antenna gain. This was a cumbersome method of calculation of power by radio Amateurs.

13. The Amateur Service benefited significantly from the allocation of even the five channels in the 5 MHz band. As ARRL had noted to the Commission in ET Docket 02-98, the channels at 5 MHz have, in the fourteen years since the 2003 *Report and Order* in that proceeding, provided an important bridge for radio Amateurs between the propagation characteristics of the Amateur 3.5-4.0

MHz and 7.0-7.3 MHz Amateur bands, and they have proven useful to a limited extent in Amateur Radio disaster communications planning. Because of strong admonitions provided by ARRL to Amateur Radio operators relative to their obligations vis-à-vis Federal agency primary use of and access to these few channels, the access provided for the Amateur Service, with the assistance of NTIA, has been successful without qualification. *Neither ARRL, nor apparently NTIA is aware of a single reported instance of interference to a Federal user by a radio amateur operating at 5 MHz to date*.

14. Two years after the channel allocation was made, in March of 2005, ARRL surveyed Amateur Radio operators who used the 5 MHz channels. A large number of licensees responded and offered their concerns. In general, the respondents stated that they had no problem setting up and using Amateur stations on these channels. Most survey respondents used the channels regularly, at least monthly, if not more frequently. While the channels were then routinely used for normal amateur communications, they are potentially subject to regulated use pursuant to Commission-issued Emergency Communication Declarations (ECDs).

15. The survey respondents noted substantial received interference on the channel centered at 5368 kHz. They requested substitution of that channel with a different 2.8 kHz bandwidth channel around 5.3 MHz. They also requested an opportunity to use emissions in addition to single-sideband telephony (emission designator 2K80J3E). The desired additional emissions include the following: (1) 150HA1A (Morse telegraphy, on-off keying, which continues to be used by Amateur stations because of its reliability in difficult conditions, and is a narrowband emission that works well in the limited allocations); (2) 60H0J2B (popularly known as “PSK31” a narrowband keyboard data mode); and (3) 2K80J2D (data such as PACTOR III, a popular, narrowband data mode).

16. With respect to power on those channels, typical transmitter output power in modern Amateur Radio transceivers is 100 watts PEP. The 50-watt PEP transmitter output power limit initially applicable to the Amateur channels in this portion of the HF spectrum was found to significantly limit communications reliability. There are, at certain times of the year, and more often in the southern latitudes, high static and atmospheric noise levels in this frequency range. Users urged that slightly higher transmitter power output would, especially in connection with weather-related emergency communications, substantially increase Amateur Radio communications reliability in the use of these channels. Users therefore urged that there be sought an increase in permitted ERP from 50 watts to 100 watts PEP. Such an increase would, they argued, reduce the necessity of measurement, assuming (as is typical) the use of a 0 dBd gain dipole antenna. Nor would there be any effect on the interference potential to Federal government stations, because of the operating protocols used successfully on these channels. These include immediate cessation of transmissions by an Amateur station upon detection of another station of any type attempting to use the channel, or detection of a non-Amateur signal on a channel.

17. Given these reasonable requests, ARRL on March 3, 2006 corresponded with the Interdepartment Radio Advisory Committee (IRAC) of NTIA concerning consensus on certain modifications to the Commission's rules governing the use of channels at 5 MHz. Subsequently, ARRL made a presentation to the IRAC about Amateur use of these channels over the three years since the allocation of the channels was made in 2003. In the letter and the presentation, ARRL requested that the IRAC consider some minor liberalization of the rules governing Amateur use of the five channels at 5 MHz. The IRAC responded favorably by letter dated May 12, 2006,[13] wherein it was stated that the IRAC would look favorably upon a proposal by ARRL to the Commission for

[13] See the Letter of Karl Nebbia, Deputy Associate Administrator, Office of Spectrum Management, NTIA to Paul L. Rinaldo, then ARRL Chief Technology Officer, dated May 12, 2006.

modification of Sections 2.106 (Footnote US381) and Section 97.303(s) of the Rules in the following respects:

A. Replacing the frequency 5368.0 kHz with 5358.5 kHz.

B. Allowing additional emissions, specifically 150HA1A[14] (Morse telegraphy by means of on-off keying); 60H0J2B (narrowband emission mode PSK31); and 2K80J2D (narrowband data emission PACTOR-III), provided that the operators using these modes utilize great care to limit the length of transmissions so as to avoid interference with Federal operations.

C. Allowing a power increase from 50 watts to 100 watts ERP, provided that Amateurs utilize Voice-Operated Transmit (VOX) while in the Single Sideband emission mode, so as to permit the Amateur operator to hear an attempt by another station, which may be a Federal user, to utilize the channel.

18. Premised on this understanding with the IRAC, ARRL filed on October 10, 2006 a Petition for Rule Making[15] to make the changes listed above. In the Petition, ARRL noted its appreciation to NTIA for its willingness to accommodate the needs of the Amateur Service for additional flexibility in the use of the 5 MHz channels allocated for its use on a secondary basis. ARRL noted that it specifically and the Amateur Radio community in general were well-aware of, and specifically acknowledged the need for immediate, interference-free access by Federal agencies to the channels at 5 MHz from time to time. The reason that Amateur use of these channels has been successful, and the reason for the unblemished record of interference avoidance during the past fourteen years, is that Amateurs have been diligent in monitoring the channels for any non-Amateur activity. They are aware that hearing any unusual (i.e. non-Amateur) signal on any of the five channels must cause Amateur operation on those channels to cease immediately. In order to ensure compatibility with superseding Federal use of the segment, United States Amateur Radio licensees

[14] The IRAC letter mistakenly specified the emission designator as "150H0H1H" but it is apparent that the IRAC intended to approve use of Morse code by means of on-off keying, which is the emission 150HA1A.
[15] *See*, RM-11353, per *Public Notice*, Report No. 2799, released December 8, 2006.

would agree to the conditions that NTIA deemed necessary, such as the use of Voice-Operated Transmit (VOX) rather than Push-to-Talk (PTT) for SSB voice transmissions. This would ensure that a Federal user could interrupt an Amateur transmission quickly and easily without waiting for an unpredictable end of an Amateur PTT transmission.

19. The Commission issued a *Notice of Proposed Rule Making*[16] on May 7, 2010 in response to RM-11353, proposing to make the changes in the 5 MHz channels sought by ARRL. After the comments filed in response to that NPRM supported the proposed changes, the Commission issued a *Report and Order*, FCC 11-171 on November 18, 2011[17] replacing one of the five channels (5368 kHz) with a less encumbered frequency (5358.5 kHz); increasing the maximum authorized power amateur stations may transmit from 50 watts ERP to 100 watts ERP; and authorized amateur stations to transmit three additional emission designators (150HA1A, 60H0J2B, and 2K80J2D) so as to permit use of Morse telegraphy and different forms of narrowband data in addition to SSB telephony. The Commission also adopted an additional operational rule that prohibits the use of automatically controlled digital stations on these channels. [18]

20. With respect to the power limit change, the Commission stated in the 2011 Report and

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[16] *Amendment of Parts 2 and 97 of the Commission's Rules to Facilitate Use by the Amateur Radio Service of the Allocation at 5 MHz,* FCC 10-76, ET Docket 10-98, 25 FCC Rcd. 5108, 75 Fed. Reg. 33748 (2010)

[17] *Amendment of Parts 2 and 97 of the Commission's Rules to Facilitate Use by the Amateur Radio Service of the Allocation at 5 MHz,* FCC 11-171, ET Docket 10-98, 26 FCC Rcd. 16551, 77 Fed. Reg. 5406 (2011).

[18] The Commission amended Footnote US381 to Section 2.106 of the Commission's Rules (which has since been renumbered as Footnote US23), and Section 97.303(s) of the Amateur Service Rules, to implement the changes suggested by ARRL and agreed to by the IRAC. The new Footnote US23 read, and currently reads as follows:

> * * * * *
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> US23 In the band 5330.5-5406.4 kHz (60 m band), the assigned frequencies 5332, 5348, 5358.5, 5373, and 5405 kHz are allocated to the amateur service on a secondary basis. Amateur service use of the 60 m band frequencies is restricted to a maximum effective radiated power of 100 W PEP and to the following emission types and designators: phone (2K80J3E), data (2K80J2D), RTTY (60H0J2B), and CW (150HA1A). Amateur operators using the data and RTTY emissions must exercise care to limit the length of transmissions so as to avoid causing harmful interference to Federal stations.
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> * * * * *

Order as follows (footnotes omitted):

> Twelve commenters…specifically state that they support the proposed power increase. For example, Kinter identifies a situation where the 50 W PEP power limit "hindered the communication between a field group preparing for an emergency drill across the state and the state control center" and states that additional power would have allowed him to hear clearly above the noise. ARRL states that a transmitter power output increase to 100 W PEP limit would substantially increase the communications reliability in the use of these channels without significantly increasing the risk of interference to Federal users. Similarly, Slye states that "most stations are 100 Watt units, and a 3 dB increase in signal may make the difference in maintaining essential communications, while the increased potential for harmful interference is slight." We agree with these commenters that the current power limitation of 50 W PEP hinders communications and that a small amount of additional power would make it easier for amateur users to communicate in the band.
> Three commenters… state the proposed power increase should not be adopted or that it will cause problems for incumbents in the band. We believe that the examples cited by the twelve commenters above offer compelling reasons to support our tentative conclusion that an increase in maximum power would serve to facilitate many amateur radio communications with minimal risk of harmful interference. We also reject requests for higher power limits, such as 500 W PEP. There is no indication that a greater power limit would produce substantially greater benefits or that any increased potential for harmful interference at this power limit has been fully considered. Additionally, we do not believe that it would be useful to complicate the rules by establishing different power limits for different circumstances, as some commenters suggest. Because the minimal 50 W PEP increase does not significantly increase the potential for interference between stations, such a distinction is not necessary or warranted. Just as with the existing 50 W PEP power limit, a 100 W limit that applies to all channels will be straightforward, easy to understand, and easy to apply. Thus, we conclude that there is a tangible benefit—greater communication abilities that will enhance amateur emergency communication activities—that will accrue if we increase the power limit to 100 W PEP and that the record shows that the costs (*i.e.*, the increased potential for harmful interference) are minimal.

21. ARRL recognized that the increased operating privileges on the five channels at 5 megahertz triggered a concurrently greater obligation by the secondary Amateur Radio users to scrupulously avoid interference to primary government stations. ARRL committed to and did disseminate a "best practices" guide for radio Amateurs operating on the channels. The Commission in the 2011 Report and Order cited with approval ARRL's components of "best practices" and of a viable band plan for the five channels. These included the ability to clear a channel quickly if Federal users need it; the means of determining attempted channel access by Federal users immediately,

regardless of emission type; a way to discourage usurpation of one or more of the channels by any one emission type; the means to minimize Federal and Amateur interaction on any of the channels due to differing emission types; and absolute and strict adherence to listen-before-transmit prior to and during an ongoing amateur communication. These practices are and have been adhered to by Amateur Radio operators and they have been, to the knowledge of ARRL, completely successful to date. ARRL has not been made aware of a single instance of either preclusion of Federal users or actual interference to a Federal user on any of the channels. At paragraph 11 of the 2011 *Report and Order*, the Commission acknowledged this:

> Amateurs have proven, through interference-free operation on these channels, that compatible sharing of the channels is possible. The proposed minor changes retain sufficient safeguards to protect the primary and important Federal Government operations that make use of these channels from time to time, and the need to continue the excellent track record of interference avoidance to those operations is well-understood by Radio Amateurs nationwide.

III. The Commission Should Allocate 5351.5 – 5366.5 kHz To The Amateur Service On A Secondary Basis Pursuant to WRC-15 With Parameters Now Applicable to the Five Channels.

22. While the Amateur Radio community is grateful to the Commission and to NTIA for the accommodation over the past 14 years of *some* access to the 5 megahertz band, the five channels are, simply stated, completely inadequate to accommodate the emergency preparedness needs of the Amateur Service in this HF frequency range. While, long ago, the need was identified for an international secondary allocation on the order of 150 kilohertz in the vicinity of 5 MHz, the five, 2.8-kilohertz channels have not provided sufficient capacity to enable competent emergency preparedness and disaster relief capability. At the end of ARRL's March, 2006 letter to the IRAC with respect to the enhancements sought in the use of the five channels at 5 MHz, ARRL noted that "(u)ltimately, amateurs would like to have an international secondary allocation of at least 50 kHz around 5 MHz. This is a spectrum

requirement established by the International Amateur Radio Union, which ARRL endorses. WRC-10 would be the earliest opportunity for consideration of a future agenda item concerning this band." As noted above, NTIA spectrum studies have acknowledged the need for at least 50 kilohertz of contiguous spectrum at 5 MHz. As ARRL also noted in the Docket 10-98 proceeding:

> Ultimately, it is hoped that consideration can be given to a domestic secondary allocation of a band of frequencies in the vicinity of the existing channels. A continuous band rather than discrete channels is more normal for the Amateur Service, as it affords the opportunity for dynamic frequency selection according to band occupancy. In the meantime, the increased flexibility in the use of the five channels allocated to the Amateur Service on a secondary basis will greatly facilitate emergency communications preparedness and will permit a substantial degree of additional flexibility in the use of the channels without any increase in interference potential.

The opportunity referred to in the quote above now exists today.

23. Given the foregoing, ARRL welcomed the result of WRC-15. While the contiguous band allocated in all three ITU regions for Amateur use is but 15 kilohertz wide, it will, if implemented functionally, and in addition to, rather than in lieu of the channels now in use, and if the Part 97 service rules for this contiguous band are thoughtfully enacted, *radically* improve the current, very limited capacity of the Amateur Service in the United States to address emergencies and disaster relief. This is most notably true in the Caribbean basin, but the same effect will be realized elsewhere as well, at all times of the day and night, and at all times of the sunspot cycle. Moreover, an internationally harmonized allocation at 60 meters enhances the utility of the allocation for amateur communications in all countries of the world. As more countries adopt the WRC-15 result, including several Caribbean countries that rely on the low HF bands for communication among each other and with the United States during weather-related emergencies, the United States should be the leader in enhancing and encouraging this volunteer resource and the interoperability it provides.

24. WRC-15 allocated a contiguous band to the Amateur Service from 5351.5 – 5366.5 kHz. A traditional, contiguous band affords the flexibility necessary to economically use the allocated spectrum

as user needs and propagation conditions change. The present restriction of Morse telegraphy, telephony and data signals to the centers of five discrete channels does not provide this vital level of flexibility, agility, and frequency re-use. Nor does channelized operation provide a rapid means of continuing Amateur communications by immediate changing of frequencies when a non-Amateur signal is detected, necessitating immediate abandonment of the operating frequency by the radio Amateurs involved. The current channel structure is spectrally inefficient, limiting the capacity of a channel to a single signal when multiple signals are permitted within the authorized bandwidth. WRC-15 recognized that efficient spectrum utilization in a service that utilizes signals of varying emissions and bandwidths requires the allocation of a contiguous band, not channels with arbitrary limits on capacity that are less than what the state of the technology permits. That this can be done without increasing the risk of interference to primary users, taking into account dynamic frequency selection by licensees as an interference avoidance mechanism that has proven successful for 14 years, is at this point a "given."

25. ARRL requests that the Commission, while implementing 5351.5 – 5366.5 kHz, retain four of the five channels[19] currently authorized for use by radio Amateurs, and that the Commission retain the service rules governing Amateur use of those channels without change. There are now well-established, Amateur Radio operating protocols and networks of stations using those channel allocations, and the service rules in the six years following their enactment have proven to be beneficial to Amateur Radio disaster relief communications and also sufficient to avoid interference to primary users.[20] It is best too,

[19] Specifically, ARRL requests that the current rules with respect to the channels centered at 5332 kHz, 5348 kHz, 5373 kHz and 5405 kHz be retained without change pursuant to Footnote US23 and the existing service rules. The channel 5358.5 kilohertz is subsumed within the new band allocation at 5351.5 – 5366.5 kHz.

[20] Collaborative efforts between primary service users and Amateur Radio on the authorized 60 meter channels have occurred with increasing frequency to the benefit of all parties, to the present time. In 2016, for instance, the Armed Forces Day Crossband Communication Test, held on Saturday, May 14, included military stations using 60 meter channels to communicate directly with Amateur Radio stations on the band. The Pennsylvania Command and Communications Rally, held in late April, similarly demonstrated Amateur Radio interoperability with federal stations at these channels. Perhaps most notably, the massive Cascadia Rising emergency preparedness exercise, simulating a VHF and above radio blackout in the Northwestern United States, relied on all five of the presently authorized channels to permit direct interface between federal and non-federal primary service stations and Amateur Radio operators. This

during the initial years of operation in the band 5351.5 – 5366.5 kHz (the "60-meter band") to discourage high levels of Amateur use while the interference avoidance mechanisms are first being implemented and used in the contiguous band. It is believed that the emergency preparedness networks that currently meet on the four channels outside the contiguous band will wish to continue to do so for the indefinite future.

26. Furthermore, ARRL proposes that the same service rules now governing the five channels are both necessary and sufficient to provide functional, interference-free operation in the contiguous 60-meter band. It is neither necessary nor desirable to establish sub-bands for various modes of operation for Amateur Radio operations in the 60-meter band. With a total contiguous allocation of only 15 kHz, Amateur users will require maximum flexibility to utilize the few authorized emission types throughout the allocation as needs vary over time. American radio amateurs have demonstrated that they can successfully utilize allocations without mandatory subbands within the 160 meter band (1800 – 2000 kHz), which is much larger than will be the 60-meter band. Radio amateurs around the world routinely use the amateur allocations without mandatory mode restrictions by subband imposed by their countries. The utility of a harmonized worldwide allocation at 60 meters is enhanced by harmonization, to the extent practical, of operating conditions. Such harmonization becomes more critical when the allocated spectrum is minimal in the first place. The implementation of the WRC-15 result, therefore, should carry over the existing regulatory structure for the current five channels in terms of permitted emission types, power level, and access by class of Amateur licensee. That which has worked well in terms of interference avoidance to primary users should continue, at least during the initial years of Amateur

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capability is clearly useful to the partner agencies served by Amateur Radio in times of communication need. It is among the reasons that the Commission has implemented a policy limiting the designation of communication emergencies to one of the five authorized 60 meter channels. This capability ought not be abandoned, inasmuch as Article 4.4 of the ITU Radio Regulations permits the United States to retain it on a non-interference basis—the same basis under which Amateur Radio is authorized on the 60-meter channels now.

access. Thus, it is recommended that the requirements of Footnote US23 and Section 97.303(h) of the Commission's rules now applicable to the five channels be applied as well to the contiguous band.

27. It is recognized that the WRC-15 final acts specifically identified a power limit for the 60-meter band of 15 watts effective isotropic radiated power (e.i.r.p.). It is possible for United States radio Amateurs to comply with this restriction using techniques and antenna modeling tools that are readily available to them. However, imposition of this power limit domestically is neither necessary as a matter of compliance with international treaty requirements, it completely defeats the entire premise for the allocation in the first place. Nor is the power limit necessary in order to protect primary services from interference, either domestically or internationally. For precisely the same reasons that the Commission consented to a power increase on the five channels as recently as 2011, the Commission should permit a power level of 100 watts PEP, assuming use of a 0 dBd gain antenna, in the contiguous 60-meter band. To impose the power limit adopted at WRC-15 for the contiguous band would render the band unsuitable for emergency and public service communications, especially between the United States mainland and the Caribbean basin, at the very times it is needed most: during the summer storms and hurricane seasons when high levels of atmospheric noise are present. A power limit of 15 watts e.i.r.p. is unarguably insufficient to permit reliable communications on the paths that are most critical. [21]

28. The ITU Radio Regulations permit assignments at variance with the International Table of Allocations, provided that there is a non-interference condition attached limiting the use of such an assignment relative to stations operating in accordance with the Table. Article 4.4 of the Radio Regulations reads as follows:

[21] The output of 15 watts e.i.r.p. under the WRC-15 result equates to roughly 9 watts e.r.p. into a half wave dipole as a reference antenna. This potential reduction of more than 10 dB in the authorized output of a United States Amateur Radio station is inadequate for all but the most robust digital communication modes under ideal propagation conditions. It is not at all adequate for the regional public service, emergency, and inter-service communications upon which amateurs, partner and served agencies, and those they serve have come to rely.

> Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations.

The proposed Appendix attached hereto incorporates an appropriate non-interference condition to satisfy RR 4.4.

29. The Amateur Service in the United States has made adequate demonstration of the need to utilize 100 watts PEP output in this frequency range, for the specific purpose of conducting emergency and disaster relief communications. As recently as 2011, the Commission acknowledged[22] this:

> We agree with these commenters that the current power limitation of 50 W PEP hinders communications and that a small amount of additional power would make it easier for amateur users to communicate in the band…We believe that the examples cited by the twelve commenters above offer compelling reasons to support our tentative conclusion that an increase in maximum power would serve to facilitate many amateur radio communications with minimal risk of harmful interference.

Prior to the implementation of the five channels in 2003, NTIA's extremely conservative plan for allowing Amateur Radio access to those five channels included a proposed power limit of the equivalent of 50 W PEP transmitter output power into an antenna with a gain of 0 dBd. Given this; given the unqualified success in Amateur Radio sharing of the five channels with primary Federal users, and the absence of any interference claims from any international source whatsoever, it is readily apparent that there is no benefit whatsoever in strict adherence to the 15 watt e.i.r.p. limit in the WRC-15 Final Acts. Indeed, as discussed hereinabove pursuant to Footnote 5.A14, Mexico decided at WRC-15 to permit its radio Amateurs the use of 20 watts e.i.r.p., and most of the countries in the Caribbean basin planned at the outset to permit the use of 25 watts e.i.r.p. for their radio Amateurs. Thus, because there is no

[22] *Amendment of Parts 2 and 97 of the Commission's Rules to Facilitate Use by the Amateur Radio Service of the Allocation at 5 MHz, op.cit,* 26 FCC Rcd. 16551 at 16555 (2011).

apparent justification for adherence to the 15-watt e.i.r.p. limit for United States Amateurs; because the use of 100 watts PEP with reference to a 0 dBd gain antenna has been found by the Commission to facilitate Amateur radio communications with minimal risk of harmful interference (and consented to by the IRAC quite recently); and because the experience gained in the past 14 years with power limits of 50 watts PEP and 100 watts PEP has been interference-free operation, it is respectfully requested that the power level permitted for the contiguous 60-meter band be the same as for the individual channels at 5 MHz.[23]

30. ARRL suggests that the 60 meter band should be made available to all classes of Amateur Radio licensee of General Class or above, as is the case with the five channels now. It is not necessary to permit Technician Class licensees to utilize this limited allocation. Entry-level radio Amateurs may not have the requisite experience to operate in accordance with the interference avoidance protocols with which more experienced licensees will be proficient.

IV. Summary

31. In summary, implementing the result of WRC-15 and allocating the band 5351.5 - 5366.5 kHz to the Amateur Radio Service on a secondary basis; retaining the four discrete channels at 5 MHz that are outside the proposed contiguous allocation; authorizing all amateurs of General Class or above to use the contiguous band; and adopting the power limit now applicable to the five channels at 5 MHz for the contiguous band, are in the public interest, convenience, and necessity. The WRC-15 result moves the United States toward the newly agreed-upon international opportunity for worldwide Amateur operation at 60 meters. It maximizes spectral efficiency by permitting amateurs to operate throughout a band as

[23] ARRL proposes no change to Section 97.3(i) which currently reads as follows:

> (i) No station may transmit with an effective radiated power (ERP) exceeding 100 W PEP on the 60 m band. For the purpose of computing ERP, the transmitter PEP will be multiplied by the antenna gain relative to a half-wave dipole antenna. A half-wave dipole antenna will be presumed to have a gain of 1 (0 dBd). Licensees using other antennas must maintain in their station records either the antenna manufacturer's data on the antenna gain or calculations of the antenna gain.

conditions and availability warrant. It gives primary service users certainty as to where radio Amateurs will be located within the broader fixed and mobile service band between 5250 – 5450 MHz, and protects those primary users with the same successful interference avoidance techniques and protocols that have been used for the past 14 years domestically, with which radio amateurs have the technical training and experience to comply. ARRL urges adoption of the WRC-15 result by the rule changes proposed in the Appendix at the earliest possible time, in any case in advance of the 2017 hurricane season.

32. Amateur Radio has proved a capable, appropriate, and valuable partner to authorized primary users of the existing 60 meter channels, not only as responsible secondary users who understand their obligations not to interfere with communications in the primary services, but also as contributors, when necessary and when asked, to the missions of the primary users on these channels. Amateur Radio has proved its worth and the worth of the present arrangement on 60 meters. The capability for reliable voice communications and interoperability at sufficient and reasonable power levels ought to be encouraged and fostered by immediate implementation of the WRC-15 result relative to the band 5351.5 - 5366.5 kHz for the Amateur Radio Service.

Therefore, the foregoing considered, ARRL, the national association for Amateur Radio, hereby respectfully requests that the Commission issue a Notice of Proposed Rule Making at the earliest possible

date, proposing the regulatory changes set forth herein and in the attached Appendix.

Respectfully submitted,

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APPENDIX

1. Section 2.106 of the Commission's Rules is modified in part to read as follows:

47 CFR Part 2 - FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

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SUBPART B — Allocation, Assignment, and Use of Radio Frequencies

*** * ***

§2.106 Table of Frequency Allocations.

*** * ***

4.995-5.003 STANDARD FREQUENCY AND TIME SIGNAL (5 MHz)	4.995-5.005 STANDARD FREQUENCY AND TIME SIGNAL (5 MHz)	
5.003-5.005 STANDARD FREQUENCY AND TIME SIGNAL Space research	US1 US340	
5.005-5.06 FIXED BROADCASTING 5.113	5.005-5.06 FIXED US22 US340	Aviation (87) Private Land Mobile (90)
5.06-5.25 FIXED Mobile except aeronautical mobile 5.133	5.06-5.351.5 FIXED US22 Mobile except aeronautical mobile	Maritime (80) Aviation (87) Private Land Mobile (90)
5.25-5.351.5 FIXED MOBILE except aeronautical mobile	US212 US340	
5.351.5-5.366.5 FIXED MOBILE except aeronautical mobile	5.351.5-5.366.5 FIXED Mobile except aeronautical mobile Amateur US23 US212 US340	Amateur Radio (97)

*** * ***

2. Footnote US23 to the Table of Allocations (Section 2.106 of the Commission's Rules) is modified to read as follows:

UNITED STATES (US) FOOTNOTES

* * * * *

US23 In the band 5330.5-5406.4 kHz (60 m band), the assigned frequencies 5332, 5348, 5373, and 5405 kHz and the band 5351.5-5366.5 kHz are allocated to the amateur service on a secondary basis. Amateur service use of the 60 m band frequencies is restricted to a maximum effective radiated power of 100 W PEP and to the following emission types and designators: phone (2K80J3E), data (2K80J2D), RTTY (60H0J2B), and CW (150HA1A). Amateur operators using the data and RTTY emissions must

exercise care to limit the length of transmissions so as to avoid causing harmful interference to Federal stations.

* * * * *

3. Section 97.303(h) of the Commission's Rules is modified to read as follows:

47 CFR Part 97 - AMATEUR RADIO SERVICE

*** * ***

Subpart D—Technical Standards

*** * ***

§97.303 Frequency sharing requirements.

* * *

(h) *60 m band:*

(1) In the 5330.5-5406.4 kHz band (60 m band), amateur stations may transmit only:

(a) in the 5351.5-5366.5 kHz band; and

(b) on the center frequencies of the four channels specified in the table below. In order to meet the requirement of operation on the center frequencies of these four channels, control operators of stations transmitting phone, data, and RTTY emissions (emission designators 2K80J3E, 2K80J2D, and 60H0J2B, respectively) may set the carrier frequency 1.5 kHz below the center frequency as specified in the table below. For CW emissions (emission designator 150HA1A), the carrier frequency is set to the center frequency. Amateur operators shall ensure that their emissions do not occupy more than 2.8 kHz centered on each of these center frequencies.

60 M channels (kHz)

Carrier	Center
5330.5	5332.0
5346.5	5348.0
5371.5	5373.0
5403.5	5405.0

(2) Amateur stations transmitting on the 60 m band must not cause harmful interference to, and must accept interference from, stations authorized by:

(i) The United States (NTIA and FCC) and other nations in the fixed service; and

(ii) Other nations in the mobile except aeronautical mobile service.

* * *

4. Section 97.305(c) is modified to read as follows:

§97.305 Authorized emission types.

****

(c) A station may transmit the following emission types on the frequencies indicated, as authorized to the control operator, subject to the standards specified in §97.307(f) of this part.

Wavelength band	**Frequencies**	**Emission types authorized**	**Standards see §97.307(f), paragraph:**
****	****	****	****
HF:			
****	****	****	****
60 m	5332 kHz, 5348 kHz, 5373 kHz, 5405 kHz, 5351.5-5366.5 kHz	Phone, RTTY, data	(14).
****	****	****	****

5. Section 97.307(f) is modified to read as follows:

§97.307 Emission standards.

* * *

(f) The following standards and limitations apply to transmissions on the frequencies specified in §97.305(c) of this part.

* * *

(14) *In the 60 m band:*

(i) A station may transmit only phone, RTTY, data, and CW emissions using the emission designators and any additional restrictions that are specified in the table below (except that the use of a narrower necessary bandwidth is permitted):

60 M Band Emission Requirements

Emission type	**Emission designator**
Phone	2K80J3E

Data	2K80J2D
RTTY	60H0J2B
CW	150HA1A

(ii) The following requirements also apply:

(A) When transmitting the phone, RTTY, and data emissions outside the 5351.5-5366.5 kHz segment, the suppressed carrier frequency may be set as specified in §97.303(h)(1).

(B) The control operator of a station transmitting data or RTTY emissions must exercise care to limit the length of transmissions so as to avoid causing harmful interference to United States Government stations.

*** * ***