

Before the
FEDERAL COMMUNICATIONS COMMISSION

January 30, 2006

In the Matter of:)
)
Amendment of Part 97 of the Commission's) **RM-11306**
)
Rules Governing the Amateur Radio Services)

Comments in Support of RM-11306

By

Steve Waterman, K4CJX

1. BACKGROUND AND INTRODUCTION:

I, Steve Waterman, have been a licensed Radio Amateur since 1955, holding the Amateur radio call, K4CJX. I am a member of the American Radio Relay League (hereafter referred to as the "ARRL"), and have been invited to serve on several of its ad-hoc committees to include the HF Digital Band Planning Committee¹, its Amateur Radio Emergency Service® Communications (ARESCOM) committee², and currently serve as a consultant to the ARES® Digital Network Management Committee (ADNMT) committee, which deals mainly with an on-going effort to incorporate Winlink 2000³, an Amateur Radio worldwide messaging system, into the ARRL Amateur Radio Emergency Communications System. Professionally, from 1979 until 1999, I worked in the telecommunications software industry as both Vice President

¹ See www.arrl.org/announce/reports-0307/hf-digital.html

² See www.arrl.org/announce/reports-2004/july/arescom.html

³ See www.winlink.org www.winlink.org.news.htm www.winlink.org/emergency.htm
www.winlink.org/status

of an unregulated subsidiary of a Regional Bell Operating Company, and with an independent telecommunications software and consulting company, where I served a portion of my time as Vice President of Software Development and as a Vice President of Telecommunications Network Design, among other duties. Although, I have had many interests during my tenure in the Amateur radio service, for approximately 20 years, I have been directly involved with Amateur radio and its growth of digital communications from the early days of “RTTY Auto-Start” to today, where I serve as a member of the Winlink 2000 development team and as its Network Administrator. The ARRL has submitted a “Petition for Rule Making,” which has been assigned the FCC number RM-11306, and this Comment is to fully endorse RM-11306 with explanation.

2. DISCUSSION:

In November, 2004, the Federal Communications Commission (hereafter referred to as “the Commission”) in its Order for Rule Making, RM-10740, which denied the Petitioner specific bandwidth standards for full-carrier AM and SSB Amateur Radio emissions, made several comments, that in my opinion, showed great vision and foresight. Specifically, in the Order, the Commission made the following statement:

"4. Voluntary band planning allows amateur stations that desire to pursue different operating activities to pursue these activities by dividing or segmenting the amateur service spectrum. Voluntary band planning also allows the amateur service community the flexibility to 'reallocate' the amateur service spectrum among operating interests as new operating interests and technologies emerge or operating interests and technologies fall into disfavor."

In their Petition, RM-11306, the ARRL recognizes the need for increased responsibility on the part of the Amateur service to continue to maintain the self-regulatory environment it now enjoys. Today, on the HF bands for example those using the various modes of operation *voluntarily* choose where

to operate. Those using CW, which may be placed throughout the HF Amateur bands, *voluntarily* maintains most of their operations in chosen band segments. Likewise, those using RTTY, have *voluntarily* chosen their band segment, as has operations using “local or remote control” such as Winlink 2000 and other such operations of 500 Hz or less per part 97.221(c)⁴. Those using such operations, *voluntarily* operate between the *voluntary* RTTY portions of the bands and the *voluntary* CW portions of the bands, excluding the narrow areas in some of the HF bands, which contain the PSK-31 protocol, where it *voluntarily* operates. However, under the current regulatory restrictions, conflicts arise, not do to any interference issues, but because of the methodologies involved in these digital operations, and the regulatory constraints to advance the radio art. Specifically, attempting to place protocols of different bandwidths, be they analog or digital, is inviting conflict. This is especially true of protocols that utilizes state of the art error control coding and pulse shaped Orthogonal Frequency Division Multiplexing (OFDM) such as Pactor 3, which provides the best spectral efficiency and robustness currently available, with a relatively primitive, encoded, single-carrier Differential Phase Shift Keying (DBPSK) protocols that have little to no error correction. Using higher speed data transfer protocols for store and forward operation certainly requires “local and remote control” as described in Part 97.221. No one is going to sit on the “auto-start” end and watch already prepared off-line prepared binary data transfers with binary attachments as they would while composing on-line text, over the air, with protocols designed for real-time “keyboard” typing speed applications.

Put another way, wider band analog *or* digital modes, and especially, high speed, 100 percent error free wideband data transfer protocols under local and remote control have no business in the same space with the narrow band "conversational," real-time typing speed modes, and experience is showing

⁴ See Part 97.221(b), (c).

that combining such operations of different bandwidths just causes conflict regardless of the nature of the protocols involved. This does not mean that Amateur operators using different modes, be they digital or analog, cannot share the same band space in the Amateur spectrum, but the fact that they are of relatively equivalent bandwidth plays an important role in their ability to co-exist. SSB (emission type J3E) and AM (emission type A3E) operations are a perfect example of this. They are very different operations, but they co-exist. However, you also do not hear CW in the current voice portion of the bands even though it is within Part 97 to allow such operations. Think what would have happened to the advancement of the radio art if the then dominant AM status quo would have had their way, and a separate narrow regulatory segment had been set aside for the “new” and not so popular SSB. Fortunately, those with vision and courage prevailed, and as the Commission states in the above quote from its statements in its Order for Rule Making RM-1-740, within that segment, there is flexibility for the dominance of the more popular mode, while still maintaining room for those modes now mostly out of favor. I believe that the ARRL Petition, RM-11306, reflects the Commission’s statement, conservatively and wisely in there Petition to provide *band segmentation by regulation* rather than by mode of operation. Such a change will provide an opportunity to properly provide appropriate band planning flexibility for all present and foreseeable future protocols to take the Amateur service into the next decade.

On June 4, 2003, in Docket 04-140⁵, in the Commission’s “Discussion” regarding “High Frequency Privileges,” the Commission indicated their concern toward the ability of the Amateur service to further develop the radio art in the present regulatory environment when considering

⁵ Notice of Proposed Rule Making and Order Amendment of Part 97 of the Commission's Rules Governing the Amateur Radio Service §§ 97.3(a)(1), 97.109(d)(e), 97.203(h), 97.205(h), 97.307(d), 97.505(a)(9), 97.507(a)(2)

the “Miller Petition” for integration of voice, image and data transmissions:

"16. Discussion. As an initial matter, we note that one of the purposes of the amateur service is to contribute to the advancement of the radio art. We believe that amateur radio operators using amateur service spectrum to develop new communications systems are using the service in a manner that is consistent with the basis and purpose of the amateur service. We also believe that our Rules should not be an impediment to amateur radio operator’s development of new or improved communication systems. In this regard, we note that the reason amateur radio operators currently may not transmit communications that combine image emission types and data emission types on HF frequency segments where data emissions are authorized is not a technical reason, but rather is because our Rules do not authorize stations to transmit both image and data emission types on any HF frequency segments. **We also note that amateur radio operators apparently have developed communication systems and technologies that transmit both image and data emission types, and that they are using these systems for communicating. For this reason, we are persuaded that our Rules are not in harmony with current emission and operating practices and that our Rules may be impeding amateur radio operators in advancing the radio art.**"

In my opinion, the above statement certainly has merit for more than just integrated voice, data and image transmissions *under* 500 Hz, and that the Petition for Rule Making RM-11306 addresses this matter in a most practical and flexible manner. The Petition provides an excellent pathway toward the further development of the radio art per 97.1. The Petition does this in a *most conservative* manner by preserving and protecting existing analog and digital modes, while providing the proper environment to further develop digital protocols that will advance the radio art:

1. **Bandwidth Separation.** Wisely, bandwidth separation of the narrower bandwidth digital protocols (including CW) will certainly

protect these “conversational typing speed” protocols from present and future wider band protocols whose presentation and purpose will be of a different nature, such as high speed binary data transfer, be it voice data, or image, or any combination, thereof.

In my opinion, the maximum bandwidth suggested by RM-11306 is not set for technical reasons, but due to the *numbers* of those in the domestic Amateur service. My personal preference is that no such bandwidth limit is set since protocols using wider bandwidths are of much less duration for a given amount of data transferred, leaving a lesser “footprint,” if they are to survive. However, I do understand why such constraints may be necessary, and support the experience of the ARRL in such matters.

- 2 **Advancement of the Radio art.** As the world moves into more complex, efficient, and higher speed protocols, the Amateur service will be viewed as antiquated if it does not also produce such protocols, and operations that support them. In year 2000, when speaking at AMRAD⁶ about the “The Future of Amateur Radio” and specifically, “Digital Techniques,” Dale Hatfield, the former FCC Chief of Engineering and Technology, stated;

"provides the opportunity or ‘headroom’ for increases in data rates to more closely match those available on wireline networks and, in the future, on commercial wireless networks as well," and he goes on to quote: "as the rest of the telecommunications world makes the transition to digital techniques - and there are very few exceptions to that trend - the amateur service will look **antiquated** if it is not making progress in that direction as well."

Mr. Hatfield’s vision was obviously accurate, and is certainly amplified today as we move into a world that is either “wired or wireless” and the Amateur service is no exception. The issue today and for the future, is that the most efficient high speed digital data transfer protocols with the smallest relative footprint, use a bandwidth *over* 500 Hz, are generally by their very nature under

⁶The Role of Amateur Radio in the New Century, Remarks by Dale N. Hatfield (W0IF0), Chief, Office on Engineering and Technology, Federal Communications Commission at AMRAD's 25th Anniversary Dinner, Falls Church, VA, June 17, 2000.

local or remote control (“semi-automatic,”) and are therefore, constrained by Part 97.221(c). These narrow bandwidth segments listed in Part 97.221(b)⁷ which contain stations over 500 Hz under local or remote control are extremely limiting, and there is literally no room for current operations, much less for future digital enhancements to the radio art.

- 3. The Deletion of Part 97.221(c.)** This most limiting factor in the further development of high speed digital protocols is the limitation recognized by the ARRL Petition. 97.221(c) was written for a purpose that is no longer applicable. When 97.221(c) was written, there were no protocols being conceived or considered for “local or remote control” with a bandwidth that exceeded 500 Hz. Only HF AX.25.Packet was being considered and only under “automatic control.” But, because of this limitation, the current Part 97.221(c) rule prohibits any operation under “local or remote control” that exceeds 500 Hz to operate outside the very limited space set for such operations. **In “real-life” terms, asking the entire domestic Amateur service to operate while under local or remote control with any state of the art, 100 percent error free protocol using an occupied bandwidth of more than 500 Hz, in a spectrum segment that can barely contain from two-to-a very limited handful of such stations, and which is *shared* by other Amateur stations, including those under fully “automatic control,” is not practical. Expecting any growth or future development under these constraints is not possible.** Also, this has a very negative effect on stations under “local or remote control” to operate effectively during times of emergencies. This is very real and has been experienced greatly in recent domestic disasters, not only for critical operations, which admittedly can take place with some advanced notice and band planning under Sub-Part E of Part 97, but also for “after-the-fact” reporting of health and welfare. It also has a major effect on attempts to handle individual emergencies where pre-planned Sub-Part E operations are not feasible.

The nature of high speed data transfer does not realistically require a control operator on the receiving end of such transmissions. Under “local and remote control,” such transmissions, which are initiated by live human beings (control operators), allow taking advantage of propagation. They also allow the ability to continual

⁷ b) A station may be automatically controlled while transmitting a RTTY or data emission on the 6 m or shorter wavelength bands, and on the 28.120-28.189 MHz, 24.925-24.930 MHz, 21.090-21.100 MHz, 18.105-18.110 MHz, 14.0950-14.0995 MHz, 14.1005-14.112 MHz, 10.140-10.150 MHz, 7.100-7.105 MHz, or 3.620-3.635 MHz segments.

be available for a connection and not just when someone is actually physically present on the “auto-start” end. There has been much recent campaigning on public reflectors that are also reflected in some of the comments for RM-11306 to “kill the robots,” which refer to *both* fully-automatic operation as well as operations under local and remote control, using the slang acronym, “semi-automatic.” Obviously, there is a major difference between fully “automatic control” and “local or remote control” per Part 97.221, since under the later; a control operator *always* initiates the connection. Those who hear of such misperceptions fear the worst, and so state without having any actual experience to substantiate their claims. I know of no such “semi-automatic” operation (local or remote control per Part 97.221(c)) that has been cited by the Commission. Upon making direct inquiries to the Amateur Division of the Commission, I have knowledge of several such queries involving Winlink 2000, which turned out to be an illegal non-identifying station under fully-automatic control, and stations that pirated a user calling a Winlink 2000 station in the voice portion of the band. In both instances, detailed actual connection log files were provided to insure that this was not a valid complaint. It was at that point that Riley Hollingsworth, an attorney assigned by the Commission’s Amateur Division, agreed to a mandatory FEC burst at the end of each transmission, which identifies *both* the calling station and the station called to insure that compliance with the Part 97 rules are maintained.

One aspect, under the microscope by opponents of “semi-automatic” (local and remote control) per Part 97.221(c) is the “hidden transmitter effect” of the initiating station not being able to hear stations operating outside the initiating stations propagation “skip” zone. This is not typical, nor has it been an issue, other than that of “perception,” since the majorities of such operations use a protocol with a bandwidth of more than 500 Hz, and therefore, are within the very narrow band space allocated for such transmissions. Nonetheless, in addition to the ability of Winlink 2000 stations under local and remote control (“semi-automatic”) to automatically scan several frequencies on several bands so that the initiating station may find a clear frequency, steps are being made currently to provide *electronic signal detection* techniques. In fact, the current Winlink 2000 Airmail Client software used with Winlink 2000 on the HF Amateur bands currently deploys passive signal detection, which may be viewed by the control operator before initiating a connection. Such signal detection is proprietary to a particular modem manufacturer, but most recently, in the

development of an experimental high speed protocol by Rick Muething, KN6KB, of the Winlink Development Team, open architecture signal detection was successfully tested. There is no reason why such *electronic signal detection* efforts should not be continued and deployed as enabling technologies bring more such stations under local and remote control. Again, since most of the current operations under local and remote control are using a protocol over 500 Hz, which requires such operations to be placed in very restrictive band segments, the problem is that there is now not much incentive to develop such signal detection techniques for existing or future protocols since there is little band space to use them.

I anticipate that the ARRL will provide *voluntary band plan recommendations to separate analog use such as SSB and AM from digital operations, to include local and remote controlled (“semi-automatic”) operations, without the need for “hard coded” formal regulation, which certainly inhibits any flexibility of use, either for or against such operations, over time.* Granted, this will require those within the Amateur service to continue to accept responsibility for their operations, but this is also necessary under current limited “self-regulation” now enjoyed on our Amateur bands. In addition, as it does effectively today, “self-regulation” through voluntary band planning will certainly not constrain the Commission from continuing to insure the enforcement in instances of willful and malicious interference.⁸

4. **Deletion of Symbol Rate Restrictions.** The 300 symbols per second limitation specified in 97.307(f)(3) and the 1200 symbols per second limitation specified in 97.307(f)(4) should be eliminated.⁹ Modern protocols have little to do with symbol rate, which is a detail of the modulation scheme employed, and much to do with “occupied bandwidth.” For example, Pactor 1 at 500 Hz bandwidth (- 24 dB) with a maximum throughput of 200 bps has a symbol rate of 200 baud, while Pactor 3 (SL6: 18) with a bandwidth of 2200 Hz (-24 dB) with a maximum throughput of 3600 bps (with compression) has a symbol rate of only 100 baud. “Symbol rate” is not readily understood. I noticed that I was quoted on page 8 of the RM-11306 Petition for Rule Making. However, my comments at the time were considering a throughput calculation, and obviously not a “symbol rate.” The symbol rate for the protocol under consideration was a maximum of 100 baud, which of course, is, like other modern

⁸ See 97.101(d)

⁹ See Part 97.307(f)(3) and (4)

protocols, much less than the 300 symbol rate maximum provided by Part 97.307(f)(3) and (4.)

On HF, the "baud rate" reflects the behavior of the protocol channels with "delay spread" (time smearing of symbols) and "Doppler spread" (frequency smearing of symbols). Long symbols (or low baud rate) are robust against "delay spread" (a typical "multi-path" problem). On the other hand, symbols should not get too long, because then high frequency accuracy is required for detecting them, and the "Doppler spread" (caused by fading) gets critical. With more modern protocol development, it is doubtful that "symbol rate" will play a significant role in future digital protocol development. Rather, one would be more concerned with bandwidth, however it is defined. It is for these reasons that I agree with the ARRL in dropping symbol rate maximum provided by Part 97.307(f)(3) and (4).

CONCLUSION

There is another Petition for Rulemaking, RM-11305, outstanding, and I understand that it requests the complete elimination of formal regulatory bandwidth segmentation. This general approach is not unfamiliar to other countries, and has been taken most recently by Canada, Australia and other countries. I would *very much like to see such a band plan for domestic operations*, but in my opinion, and realistically, cooperation would be as it is today during large contests. For those others not operating in these contests; normal operations are difficult at best. Therefore, the more conservative approach taken by the ARRL to request regulated bandwidth segmentation is also consistent with that of the Commission's thoughtful comments in their Order for Rule Making, RM-10740, and will, in my opinion, provide for the next decade *without* impeding the radio art. Not only will such a plan provide an opportunity for technical development of the radio art while protecting and preserving existing analog and digital modes, it will also provide an opportunity to further develop strong National digital network systems for emergency communications. Regulatory bandwidth segmentation, together with proper voluntary band planning, will allow the flexibility needed for the growth or shrinkage of the various systems and

their protocols for the Amateur service without the need of “hard coded” formal regulation by mode of operation. I, therefore, respectfully request the expeditious adoption of RM-11306.

Respectfully Submitted,

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