Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 97 of the	)	WT Docket No. 05-235
Commission's Rules	)	
To Implement WRC-03 Regulations	)	RM-10781, RM-10782, RM-10783,
Applicable to Requirements for	)	RM-10784, RM-10785, RM-10786,
Operator Licenses in the Amateur	)	RM-10787, RM-10805, RM-10806,
Radio Service	)	RM-10807, RM-10808, RM-10809,
	)	RM-10810, RM-10811, RM-10867,
	)	RM-10868, RM-10869, RM-10870

To: The Commission

REPLY TO COMMENTS BY JAMES K. BOOMER

The following is a reply to September 5, 2005 comments submitted by Mr. Leonard H. Anderson regarding *Notice of Proposed Rule Making* (The Notice), FCC 05-143A1, WT Docket No. 05-235 released on July 19, 2005.

Mr. Anderson maintains that Morse code communications in a 500Hz bandwidth offers approximately 3.5dB advantage over SSB voice in a 2.5kHz bandwidth.

Morse code operators can reliably receive messages with a pre-detection carrier-plus-noise-to-noise (C/N) ratio of 3dB. Additionally, reliable SSB voice communications requires a pre-detection carrier-plus-noise-to-noise ratio of 6dB. These figures translate to carrier-to-noise ratios of 0dB and 4.74dB respectively. Now, using Mr. Anderson's bandwidth choices, we can compare the two modes as follows:

0dB C/N in a 500Hz bandwidth translates to –6.99dB in a 2.5kHz bandwidth. Thus, with Mr. Anderson's bandwidth assumptions, Morse code has an advantage of 11.73dB over SSB voice.

We can arrive at the numbers by the following approach, also:

The required carrier input power to a receiver for a given pre-detection carrier-to-noise ratio, with no added input noise, is:

$$C_i\ (\text{dBW}) = (C_o/N_o)_{dB} + 10\log_{10}kT + 10\log_{10}B + F_{dB} \qquad \text{Equation 1}$$

Where,

C_i = Carrier input in decibels (dB) with respect to one Watt (dBW)

$(C_o/N_o)_{dB}$ = Carrier to noise ratio at the demodulator input in dB

k = Boltzmann's constant = $1.38\text{x}10^{-23}$ Joule per degree Kelvin

T = Temperature in degrees Kelvin (Standard temperature = 290 degrees Kelvin)

B = Predetection bandwidth in Hertz

F_{dB} = Receiver noise figure in decibels

Now, at 290 degrees Kelvin (standard temperature), $10\log_{10}kT = -204$; thus Equation 1 becomes:

C_i (dBW) = $(C_o/N_o)_{dB} - 204 + 10\log_{10}B + F_{dB}$

Using Mr. Anderson's bandwidth assumptions, we have:

<u>SSB</u>

Parameters:

$(C_o/N_o)_{dB}$ = 4.74dB

B = 2.5kHz

F = 6dB (typical modern HF receiver)

Then, from Equation 1,

C_i (dBW) = $4.74 - 204 + 10\log_{10}2{,}500 + 6 = -159.28$dBW

<u>Morse Code</u>

Parameters:

$(C_o/N_o)_{dB}$ = 0dB

B = 500Hz

F = 6dB

Then, from Equation 1,

C_i (dBW) = $0 - 204 + 10\log_{10}500 + 6 = -171.01$dBW

The difference between the above two signal levels is: -159.28- (-171.01) = 11.73dB, as noted above.

Thus, with Mr. Anderson's bandwidth assumptions, a Morse code system requires 11.73dB less input signal than a SSB voice system.

A 5WPM signal occupies about 15Hz of bandwidth, whereas a SSB voice signal requires about 1.8kHz.

With the above pre-detection bandwidth assumptions, we have a Morse code system output signal-to-noise (S/N) ratio of 0dB in a 500Hz bandwidth. Thus, we can realize another 15.23dB of Morse code system output S/N improvement by simply adding post-detection filtering ($10\log_{10}(500/15) = 15.23$dB).

It is a fact that Morse code communications can provide critical connectivity with substantially weaker signals than SSB voice, a life-saving advantage in emergencies.