6.5. Frequency Stability Data -- Pursuant 47 CFR 2.1055a(1), 2.1055(d)2

Measurements were made per method described in paragraph 7.4. Because of the transmitter's dependence on the stability of the base station oscillator, it is not possible to provide stability data for this transmitter as is commonly supplied for certification per 47 CFR 2.1055 for a radio with a locally stabilized oscillator.

The following information is provided to clarify how the transmitter attains the necessary accuracy of 2.5 PPM or better. The transmitter's suppressed carrier emission is produced by mixing of a modulated intermediate frequency with a higher, digitally synthesized injection frequency with a resolution of 12.5 kHz. Both of these frequencies are derived from a temperature compensated crystal oscillator (Y300 in Figure 4-1). Transmission frequency accuracy is enhanced by the radio receiver circuitry which causes the radio operating frequency to become locked to within 0.4 PPM of the base station once it has acquired the primary control channel. Thus the temperature and voltage frequency stability of the transmitter is within 0.4 PPM accuracy of the higher stability base station oscillator.

The AFC routine and frequency locking mechanism are implemented using both hardware and software. The hardware and software combined provide an automatic frequency control function which locks the receiver to within 0.4 PPM of the control channel oscillator. Since the base station stability is FCC regulated to be 1.5 PPM or better, the absolute accuracy of the transmitter is inherently better than 1.9 PPM. This is accomplished by programming U601 while the radio is in operation.

Transmitter frequency stability is guaranteed over all specified environmental operating conditions (battery voltage, temperature, humidity, etc.) because of the nature of the base station frequency locking mechanism. The frequency stability of the transmitter is maintained until the battery voltage drops below 3.55 volts. Any voltage below 3.55 volts is outside the specified operating range of the transmitter and linearity is degraded below 3.55 volts. For this reason, the radio shuts down (while in transmit mode) when the voltage drops below 3.55 volts.

Note:

Frequency stability is independent of modulation scheme (Quad –QPSK, Quad-16QAM, Quad-64QAM). The data shown in following tables was taken with the radio set to transmit a Quad-16QAM signal at 820.9875 MHz while locked to a R2660C service monitor.

Temperature (°Centigrade)	Frequency Error (Hz)	Frequency Error (PPM)
-30	19.30	0.024
-20	54.31	0.066
-10	32.84	0.040
0	6.39	0.008
10	-21.91	-0.027
20	-15.53	-0.019
30	16.82	0.020
40	-29.51	-0.036
50	24.58	0.030
60	-2.84	-0.003

Figure 6-37: Transmitter Frequency Stability Data - Frequency vs. Temperature

Voltage (Volts)	Error in (Hz)	Error in (PPM)
3.55	-41.13	-0.050
3.60	-38.22	-0.047
3.70	-31.95	-0.039
3.80	-31.56	-0.038
3.90	-29.79	-0.036
4.00	-42.95	-0.052
4.10	-32.80	-0.040
4.20	-33.90	-0.041

Figure 6-38: Transmitter Frequency Stability Data - Frequency vs. Voltage

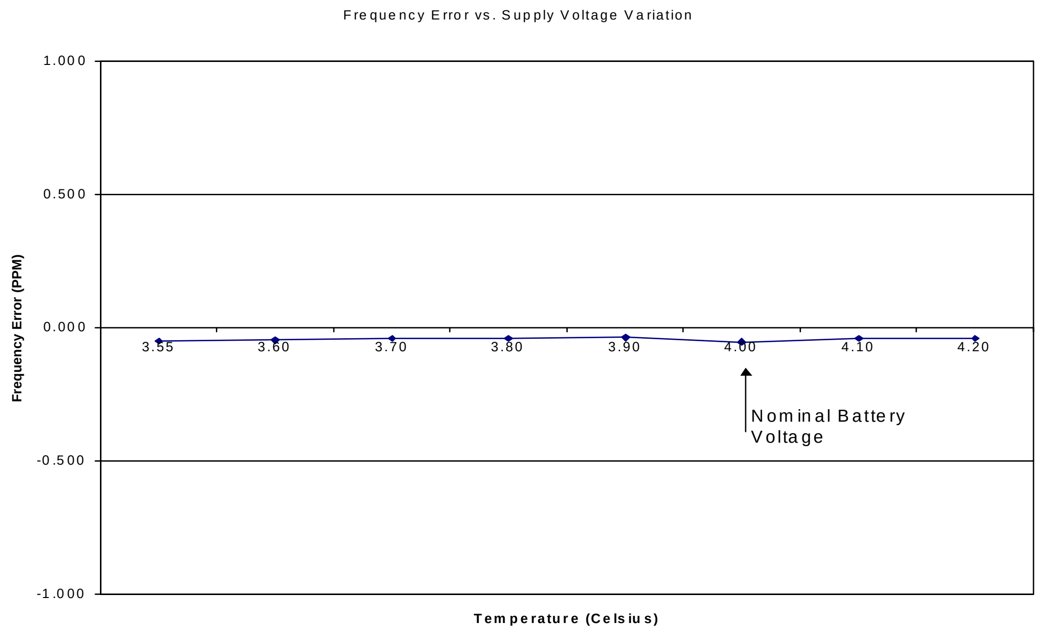

Figure 6-39: Frequency Stability vs. Voltage

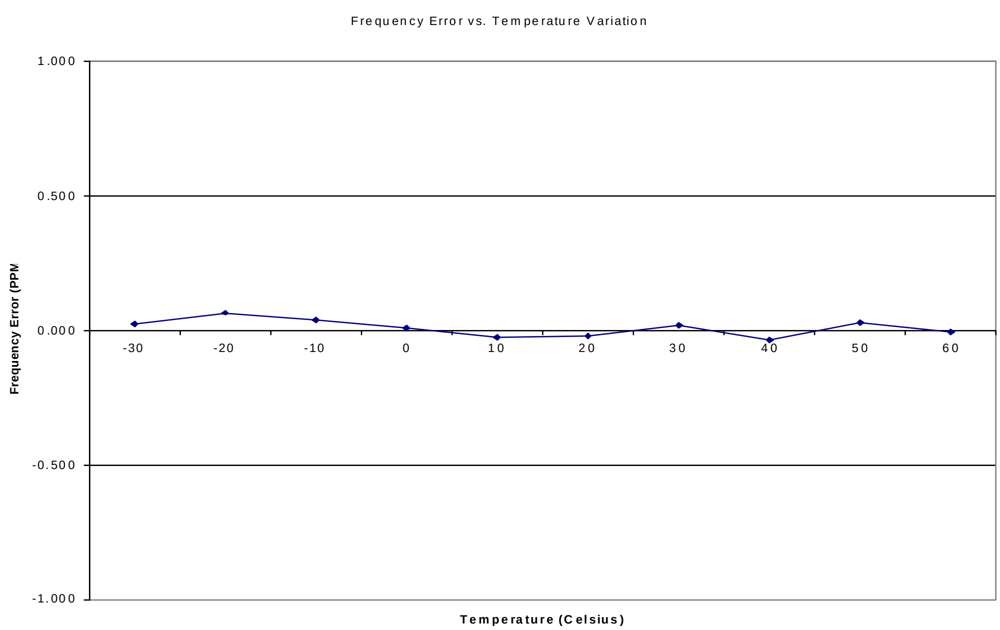

Figure 6-40: Frequency Stability vs. Temperature

6.6. Power Line Conducted Spurious Emissions -- Pursuant 47 CFR 15.207

Conducted emission limits per 47 CFR 15.207(a). The conducted emissions shall not exceed 250 uV (48 dBuV) when measured with a quasi-peak detector over the frequency range 450 kHz to 30 MHz.

This portable RF device can transmit while resting in a battery charger that is connected to the AC power line. Figure 6-41 contains two measurement traces in addition to the applicable limit line (FCCBCN). The upper trace portrays the amplitude of the emissions measured during sweeping with a peak detector (a pessimestic view) while the lower trace represents the amplitude of the emissions measured using an average detector. These detectors facilitated the measurement process. Measurements with a quasi-peak detector lie between these bounds.

To assure compliance the maximum emission at 750 kHz (Marker 2) apparent in Figure 6-41 of 52.62 dBuV measured with a peak detector was only 47.07 dBuV when measured using a quasi-peak detector in Figure 6-42. Furthermore per FCC 15.107d, If the level of the emission measured using the quasi-peak instrumentation is 6dB or more, higher than the level of the same emission measured with instrumentation having an average detector and a 9kHz minimum bandwidth, that emission is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13 dB for comparison to the limits. Then the result for this frequency would be 47.07dBuV –13dB = 34.07dBuV. The same procedure was used for Freq 518kHz (Marker 1), Freq 878kHz (Marker 3), Freq 1.266MHz (Marker4) and their corresponding results are shown in Figure 6-42. Similarly, in Figure 6-43, the maximum emission of 53.47dBuV at 658kHz (Marker 2) measured with a peak detector was only 36.46 dBuV with quasi-peak per FCC 15.107d in Figure 6-44. The same procedure was used for Freq 522kHz (Marker 1), Freq 774kHz (Marker 3), 1.038MHz (Marker 4) and their corresponding results are shown in Figure 6-44.

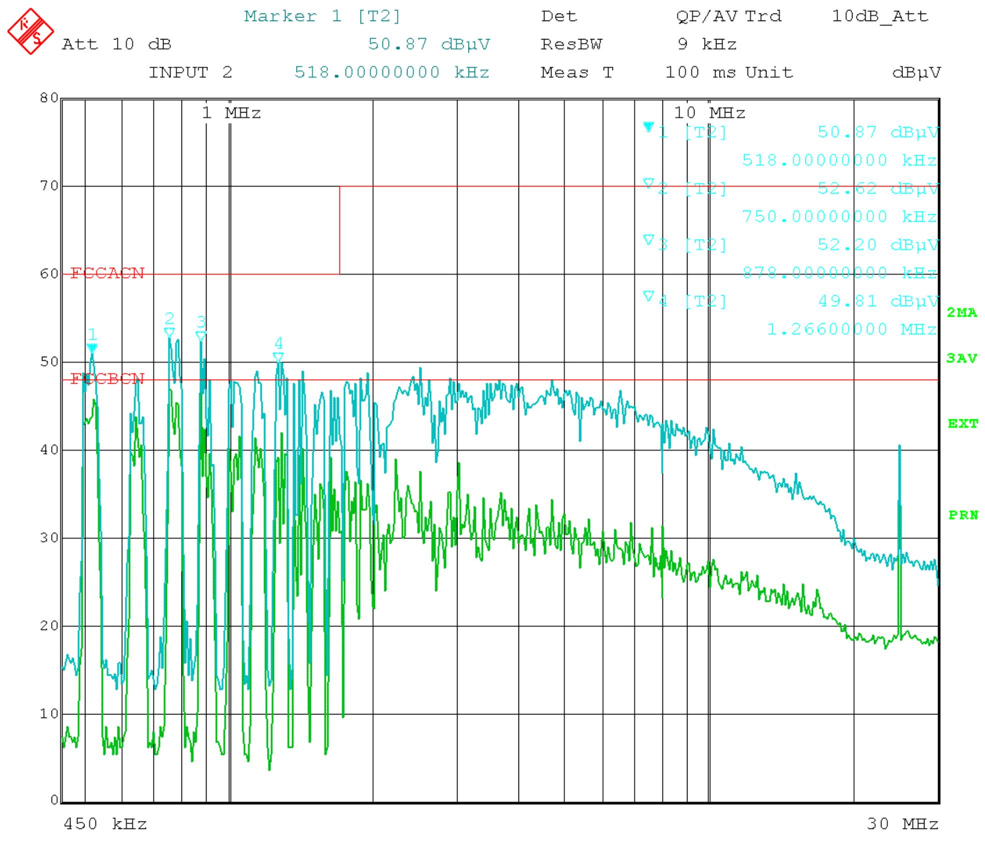

Figure 6-41: Phase Line Emissions with a peak detector (Radio in transmit mode at 820.9875 MHz)

Freq (MHz)	Quasi-Peak (dBuV)	Average (dBuV)	QPK Per FCC 15.107d (dBuV)
0.518	45.54	34.86	32.54
0.750	47.07	28.28	34.07
0.878	44.14	26.02	31.14
1.266	41.20	21.98	28.20

Figure 6-42: Phase Line Emissions Data -Quasi-peak and Average - (Radio in transmit mode at 820.9875 MHz)

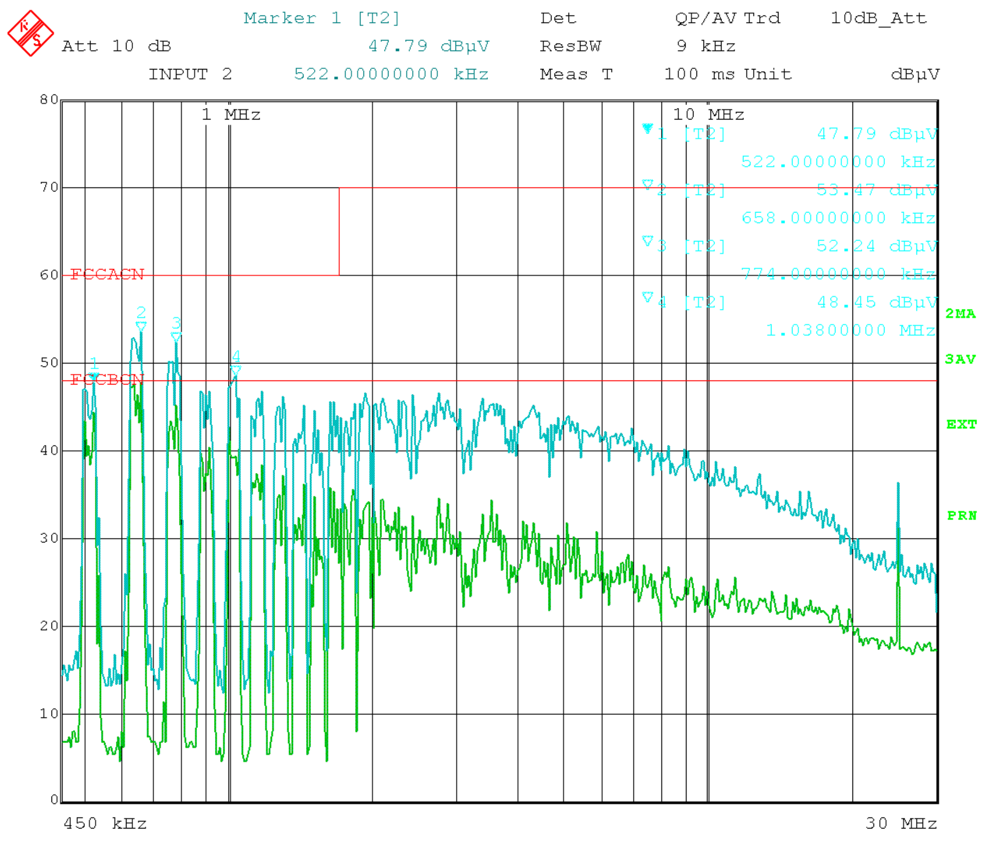

Figure 6-43: Neutral Line Emissions with a peak detector (Radio in transmit mode at 820.9875 MHz)

Freq (MHz)	Quasi-peak (dBuV)	Average (dBuV)	QPK Per FCC 15.107d (dBuV)
0.522	44.80	32.31	31.80
0.658	49.46	32.55	36.46
0.774	47.45	33.45	34.45
1.038	40.46	21.03	27.46

Figure 6-44: Neutral Line Emissions Data -Quasi-peak and Average - (Radio in transmit mode at 820.9875 MHz)