6.6. Frequency Stability -- 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 for 800MHz band operation and 1.5PPM or better for 900MHz band operation. 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 for the 800MHz band and 0.1 PPM or better for the 900MHz band, the absolute accuracy of the transmitter is inherently better than 1.9 PPM in the 800MHz band and 0.5 PPM in the 900MHz band. This is accomplished by programming U600 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 813.0625 and 899.48125 MHz while locked to a Motorola R2660C service monitor.

Temperature (Degrees C)	Frequency Error(Hz)		Frequency Error(PPM)	
	800MHz	900MHz	800MHz	900MHz
-30	32	21	0.039	0.023
-20	23	59	0.028	0.066
-10	31	44	0.038	0.049
0	4	20	0.005	0.022
10	17	54	0.021	0.060
20	35	4	0.043	0.004
30	8	65	0.010	0.072
40	26	9	0.032	0.010
50	21	2	0.026	0.002
60	37	44	0.046	0.049

Table 6-2: Transmitter Frequency Stability – Frequency Error vs. Temperature

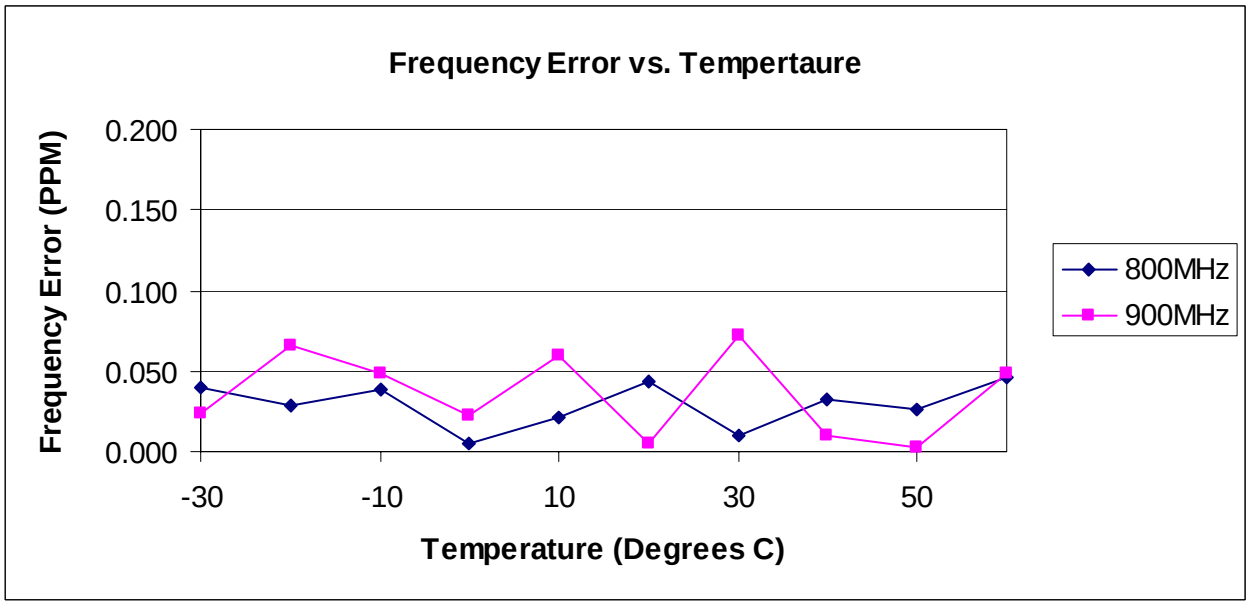

Figure 6-23: Transmitter Frequency Stability – Frequency Error vs. Temperature

Power Supply Voltage (V)	Frequency Error (Hz)		Frequency Error (PPM)	
	800MHz	900MHz	800MHz	900MHz
4.3	29	12	0.036	0.013
4.2	41	46	0.050	0.051
4.1	2	13	0.002	0.014
4	22	36	0.027	0.040
3.9	57	39	0.070	0.043
3.8	42	26	0.052	0.029
3.7	36	23	0.044	0.026
3.6	0	18	0.000	0.020

Table 6-3: Transmitter Frequency Stability - Frequency Error vs. Voltage

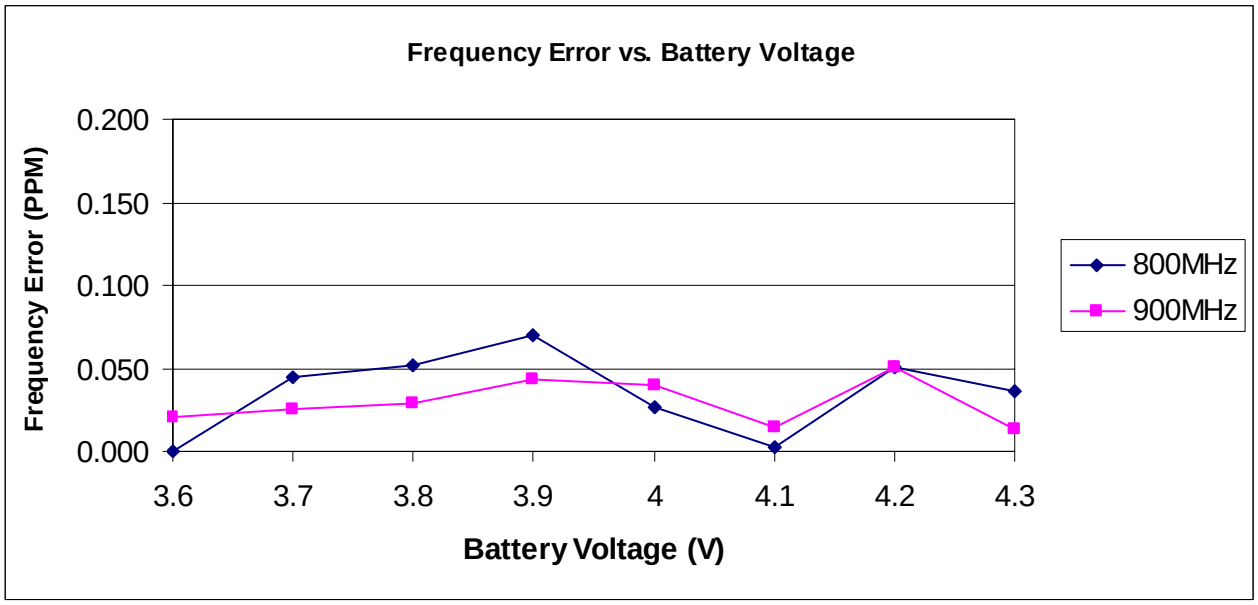

Figure 6-24: Transmitter Frequency Stability - Frequency Error vs. Voltage

6.7. Power Line Conducted Spurious Voltage -- Pursuant 47 CFR 15.207

Conducted voltage limits per 47 CFR 15.207(a):

The conducted voltage shall not exceed 250 uV (48 dBuV) when measured with a 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. Figures 6-28 and 6-29 demonstrate compliance with the cited limit. Each figure contains two measurement traces in addition to the applicable limit line (FCC_B). The upper trace portrays the amplitude of the voltage measured during sweeping with a peak detector while the lower trace represents the amplitude of the voltage measured using an average detector. These detectors facilitated the measurement process. Measurements with a quasi-peak detector lie between these bounds.

Per FCC 15.107(d), if the level of the voltage measured using the quasi-peak instrumentation is 6dB or more, higher than the level of the same voltage measured with instrumentation having an average detector and a 9kHz minimum bandwidth, that voltage is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13 dB for comparison to the limits.

To assure compliance, the maximum voltage apparent in Figure 6-25 of 52.04 dBuV at 0.766 MHz was re-measured with the quasi-peak and average detector. The quasi-peak reading was 47.66 dBuV and the average reading was 30.9 dBuV. Since there is more than 6dB of difference between the quasi-peak and average readings, a 13dB reduction to the quasi-peak reading is implemented, representing a quasi-peak voltage of 34.66 dBuV. The same procedure was used for the other five frequencies and the results are tabulated in the Table 6-3.

To assure compliance, the maximum voltage apparent in Figure 6-26 of 56.74dBuV at 0.638 MHz was re-measured with the quasi-peak and average detector. The quasi-peak reading was 51.73 dBuV and the average reading was 33.18 dBuV. Since there is more than 6dB of difference between the quasi-peak and average readings, a 13dB reduction to the quasi-peak reading is implemented, representing a quasi-peak voltage of 38.73 dBuV. The same procedure was used for the other five frequencies and the results are tabulated in the Table 6-4.

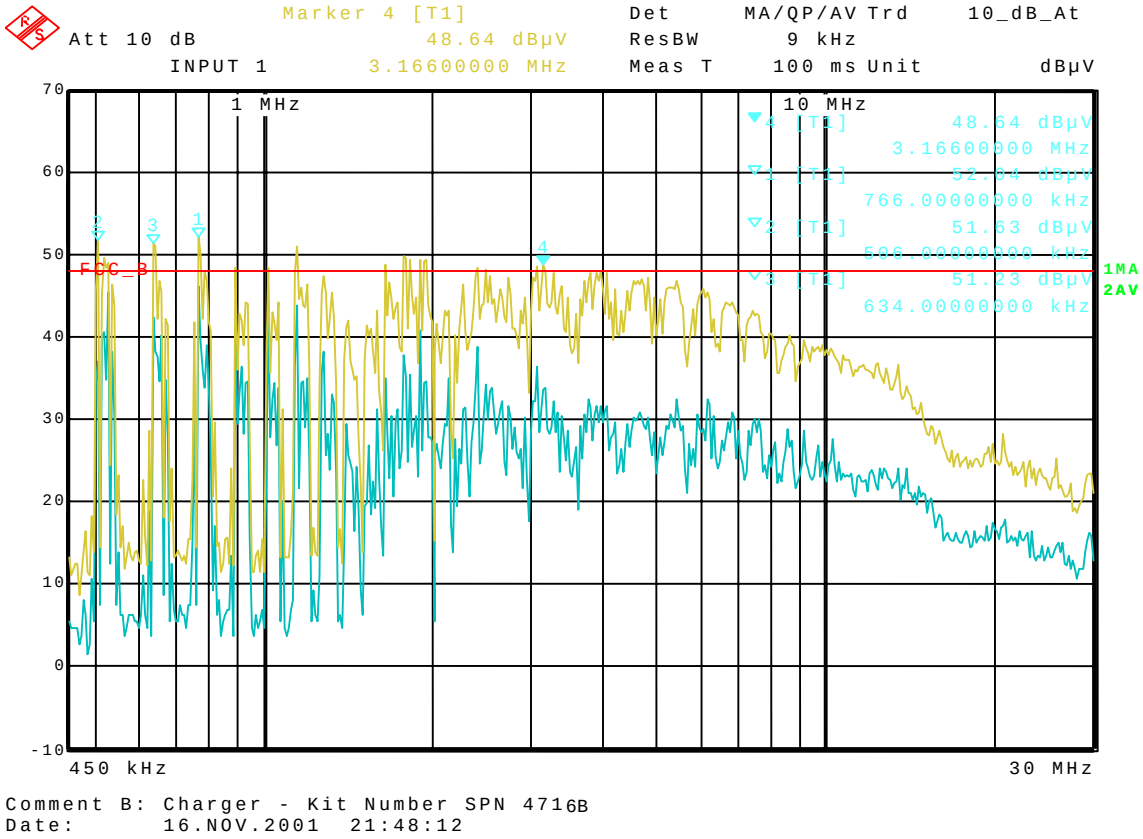

Figure 6-25: Phase Line Voltage with a Peak and Average Detector (Radio in transmit mode at 806.0625 MHz)

Frequency (MHz)	Average (dBuV)	Quasi-Peak (dBuV)	QPK Per FCC 15.107(d) (dBuV)
0.506	22.99	40.18	27.18
0.634	30.04	48.84	35.84
0.766	30.9	47.66	34.66
1.15	27.96	46.64	33.64
1.782	17.06	40.83	27.83
3.166	19.19	40.58	27.58

Table 6-4: Phase Line Voltage Data- Quasi-Peak and Average (Radio in transmit mode at 806.0625 MHz)

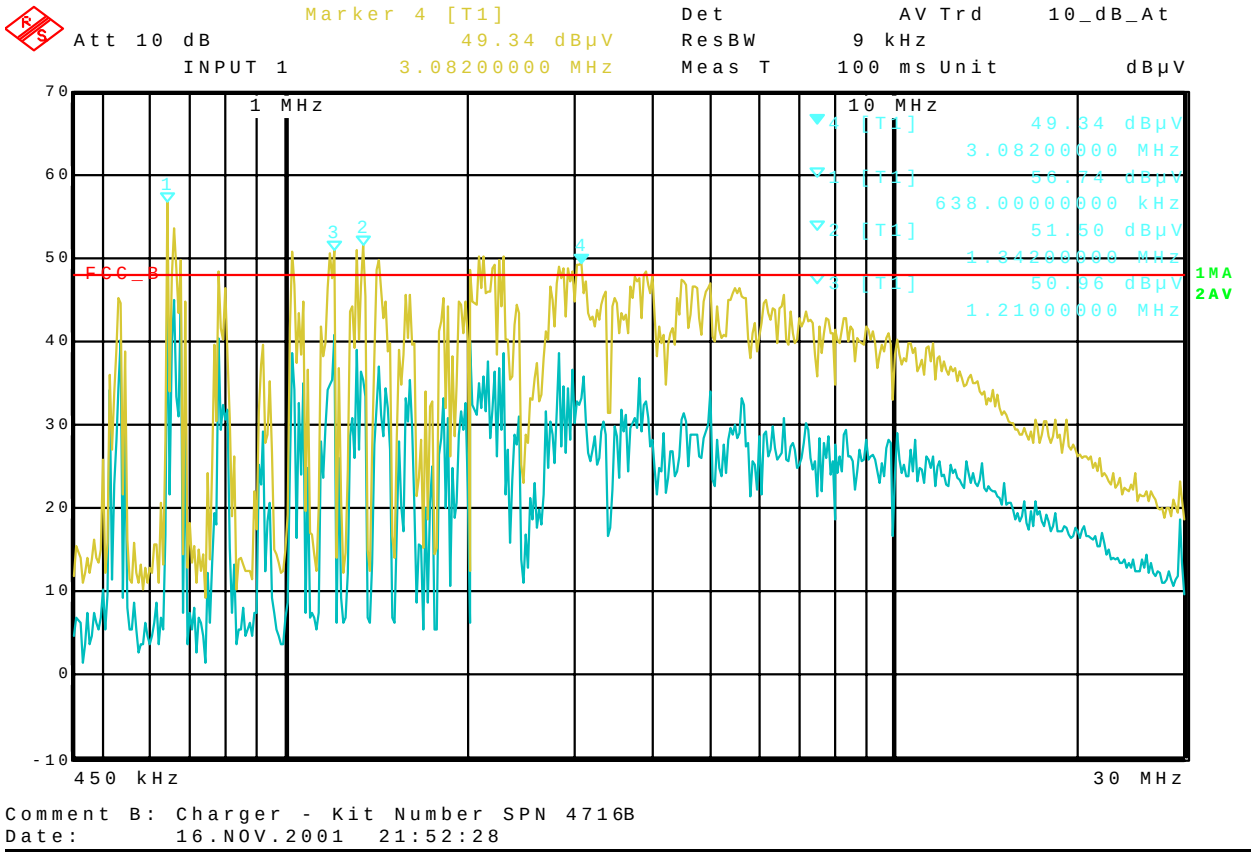

Figure 6-26: Neutral Line Voltage with a Peak and Average detector (Radio in transmit mode at 806.0625 MHz)

Frequency (MHz)	Average (dBuV)	Quasi-Peak (dBuV)	QPK Per FCC 15.107(d) (dBuV)
0.638	33.18	51.73	38.73
1.026	27.27	46.01	33.01
1.21	29.52	47.21	34.21
1.342	29.03	47.53	34.53
2.094	24.68	45.75	32.75
3.082	26.44	44.69	31.69

Table 6-5 Neutral Line Voltage Data-Quasi-Peak and Average (Radio in transmit mode at 806.0625 MHz)