## Exhibit 7. Report of Measurements

### 7.1 RF Power Output §2.1046

| Mobile Limit, §90.729(b) | Measured RF Power Output |
|---|---|
| **50 W ERP** | **1.0 W PEP** |

**Additional requirement**: Complies with emission mask §90.210(f) during power output test. Please refer to the Occupied Bandwidth Plot, Figure 7.2.

**Procedure**: The Test Radio was previously tuned up on 221.4975 MHz in accordance with the Tune-up Procedure. The equipment was connected as shown in Figure 7.1 below. Total RF attenuation between Test Radio antenna terminals and wattmeter was measured at 30 dB. Wattmeter power offset was adjusted by an equal and opposite amount so that the wattmeter would indicate power in peak watts when adjusted per the manufacturer's instructions. A computer terminal was used to select internally generated continuous pseudo-random QPSK test modulation and it also controlled the transmit key. The selected modulation represents the maximum amplitude and symbol rate condition which occurs during regular operation. After recording the peak watts, the wattmeter was removed and spectrum analyzer was attached in its place. The spectrum analyzer was set initially to 10 kHz resolution bandwidth (i.e., 2.5 times the authorized bandwidth), 0 dBm ref. level (representing 30 dBm = 1W) and peak hold to corroborate that the peak emission was at 0 dBm when the transmitter was keyed. This is evidenced in Fig. 7.3. The spectrum analyzer was then adjusted to 100 Hz resolution bandwidth and 10 kHz span and the plot of occupied bandwidth was obtained. See Section 7.3.

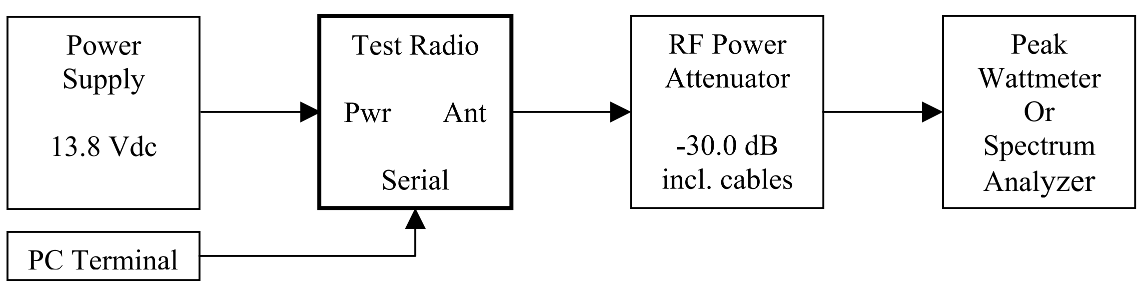



Figure 7.1 Test Block Diagram

### 7.2 *Modulation Characteristics §2.1047*

This test is not applicable. Application of external data does not affect modulation level.

ETR No. 31269-01
DATA SHEET

MANUFACTURER : SOPHIA COMMUNICATIONS
MODEL : CD1201
S/N : 20
SPECIFICATION : FCC-90 OPEN FIELD SPURIOUS RADIATED EMISSIONS
DATE : AUGUST 6, 2002
NOTES : TRANSMIT AT MHz (FULL POWER) INTO 50 OHMS
: TEST DISTANCE IS 3 METERS

| Freq. MHz | Ant Pol | Mtr. Rdg. dBuV | ERP dBm | Attenuation dB | Minimum Attenuation dB |
|---|---|---|---|---|---|
| 443.0 | H | 21.4 | -61.2 | 94.2 | 55 |
| | V | 30.7 | -62.6 | 95.6 | 55 |
| 664.0 | H | 32.5 | -58.6 | 91.6 | 55 |
| | V | 35.4 | -59.3 | 92.3 | 55 |
| 886.0 | H | 27.8 | -56.7 | 89.7 | 55 |
| | V | 30.6 | -55.7 | 88.7 | 55 |
| 1107.0 | H | 60.9 | -58.7 | 91.7 | 55 |
| | V | 65.8 | -56.6 | 89.6 | 55 |
| 1329.0 | H | 60.1 | -58.3 | 91.3 | 55 |
| | V | 62.5 | -58.4 | 91.4 | 55 |
| 1550.0 | H | 53.9 | -52.8 | 85.8 | 55 |
| | V | 54.6 | -55.4 | 88.4 | 55 |
| 1772.0 | H | 52.7 | -56.8 | 89.8 | 55 |
| | V | 55.5 | -56.7 | 89.7 | 55 |
| 1993.0 | H | 45.9 | -53.3 | 86.3 | 55 |
| | V | 44.7 | -54.4 | 87.4 | 55 |
| 2215.0 | H | 41.9 | -54.8 | 87.8 | 55 |
| | V | 42.9 | -55.0 | 88.0 | 55 |

Checked by ______________________

Richard E. King

### *7.3 Occupied Bandwidth §2.1049*

| Limit, §90.210(f): | Result: |
|---|---|
| Emission Mask F. | Complies, see Fig. 7.2 |

**Emission Mask F:** For transmitters operating in the 220-222 MHz frequency band, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth $f_o$ to the edge of the authorized bandwidth $f_e$: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 2 kHz up to and including 3.75 kHz: **30 + 20($f_d$ – 2) dB or 55 + 10 log (P), or 65 dB, whichever is the lesser attenuation.**

(3) On any frequency beyond 3.75 kHz removed from the center of the authorized bandwidth $f_d$: **At least 55 + 10 log (P) dB.**

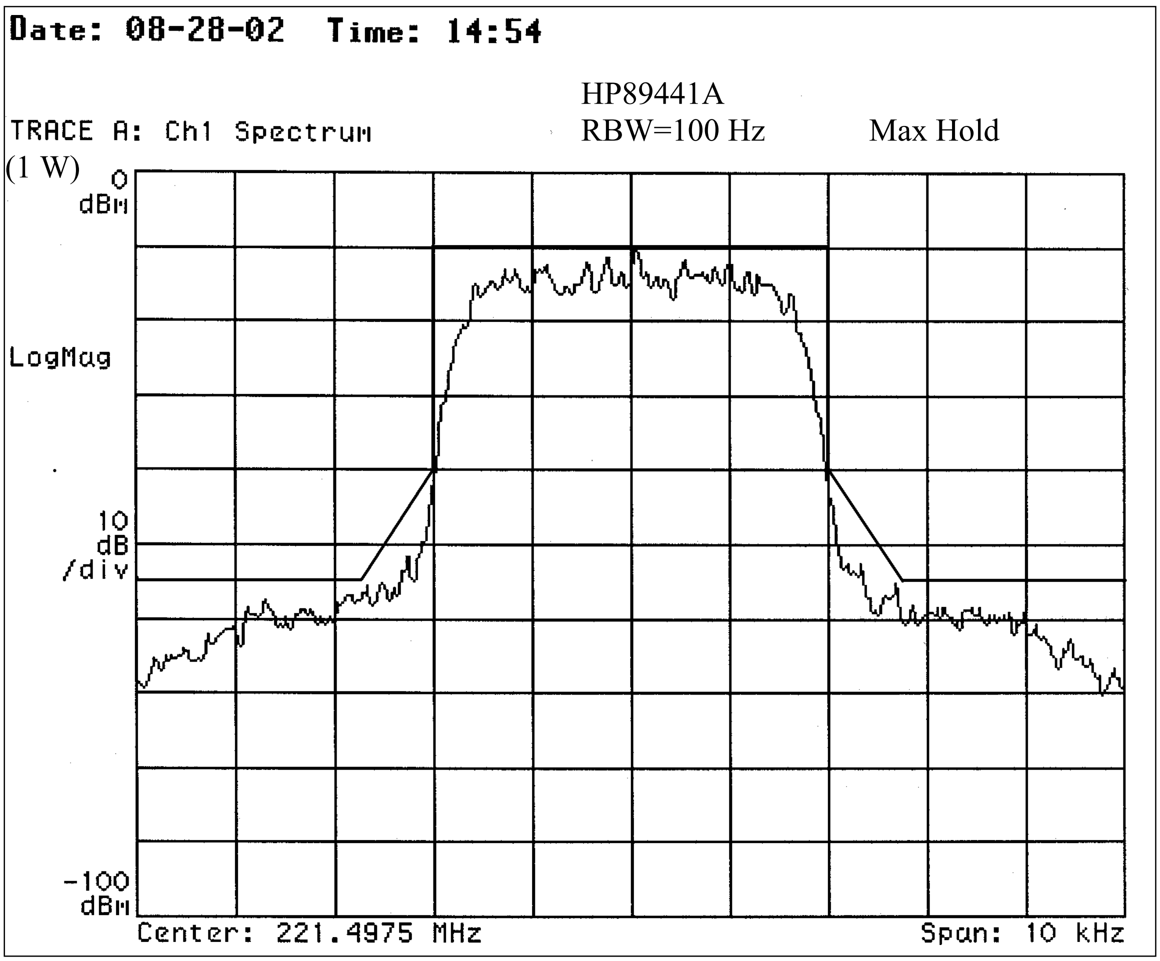



Figure 7.2 Occupied Bandwidth Plot plus Emission Mask F.

**Procedure:** The Test Radio was operated identically to the method used in the RF Power Output Test. The test setup is as shown in Fig. 7.1 above with the spectrum analyzer attached to the RF attenuator output. Total loss from antenna terminals to spectrum analyzer input was 30 dB which results in 0 dBm on the spectrum analyzer plot being equivalent to 1 Watt PEP at the antenna terminals. The spectrum analyzer was set for 100 Hz resolution bandwidth and operated in peak hold mode as indicated by 90.210(e)(4). Transmission duration was sufficient to allow the emission profile to fully develop.

## *7.4 Spurious Emissions at Antenna Terminals §2.1051*

**Requirements:**

| Limit, §90.210(f)(3): | Result: |
|---|---|
| **55 + 10 log (P) = 55 dB** | **Complies, (see table)** |

**Results:**

| Frequency, MHz | Attenuation, dB |
|---|---|
| fo +/- 125 kHz | 57 (Fig. 7.3) |
| fo +/- 5 MHz | 61 (Fig. 7.4) |
| $2f_o$ = 442.995 | 63 |
| 3fo = 664.4925 | 68 |
| 4fo through 10fo | 72 (Sensitivity Limit) |

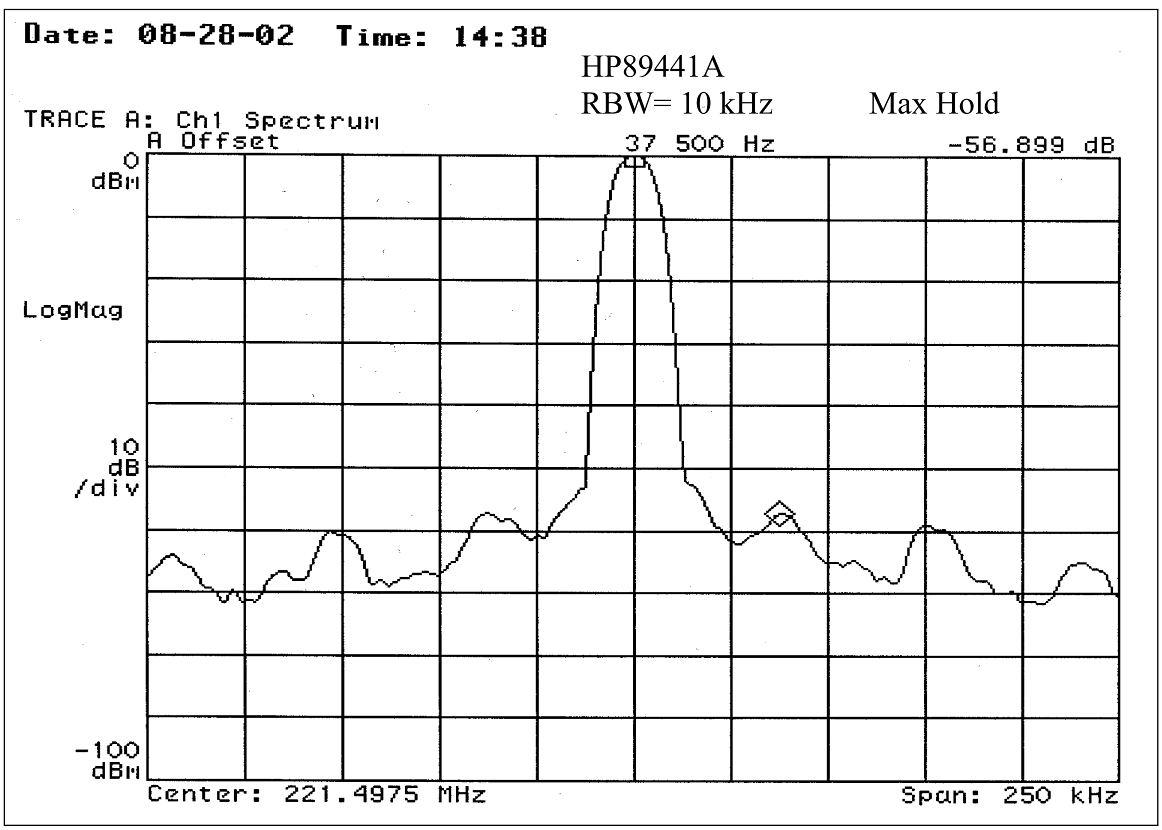



Figure 7.3 Conducted Spurious Emissions $f_o$ +/- 125 kHz

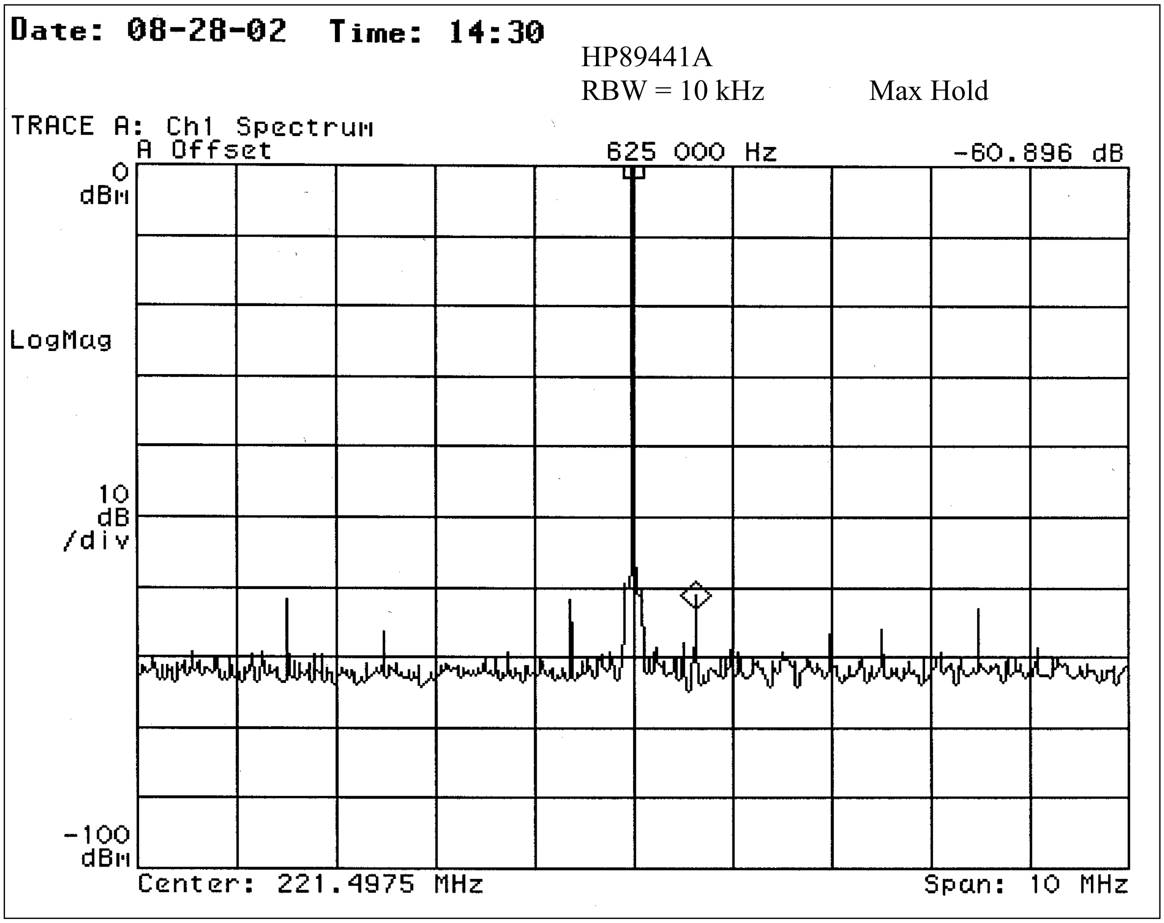



Figure 7.4 Conducted Spurious Emissions $f_o$ +/- 5 MHz

**Procedure:** The test setup was the same as used in the Occupied Bandwidth Test. The spectrum analyzer was adjusted for resolution bandwidth of 10 kHz and peak hold. Ref level was 0 dBm representing the rated transmitter power (P=1W PEP). Spurious emissions must register 55+10logP below rated power or 55 dB in this case. The frequency spectrum was searched from lowest oscillator frequency to the transmitter's tenth harmonic. Due to the 10 kHz resolution bandwidth setting of the spectrum analyzer, the noise floor was at –72 dBm which limited the measurement sensitivity to 72 dB below rated power.

### *7.5 Field Strength of Spurious Radiation §2.1053*

| Limit, §90.210(f)(3): | Result: |
|---|---|
| 30 dBm –55 dB = -25 dBm | Complies (See Exhibit titled Spurious Radiation Test Data) |

**Requirements:** Reference EIA/TIA TSB78 or EIA/TIA 603. At spurious output frequencies, the equivalent radiated power of the tested transmitter must be less than that produced by a –25 dBm signal source driving a substitute resonant half wave dipole. The value –25 dBm is based on the case P=1W or 30 dBm and 55 dB spurious suppression.

**Results:** Compliance is shown in the separate exhibit, Spurious Radiation Test Data, prepared during transmitter spurious radiation testing at Elite Electronic Engineering.

**Procedure:** Spurious radiation testing was carried out in accordance with ANSI C63.4 at Elite Engineering's FCC registered test site in Downer's Grove, IL. The measured field strength of spurious radiation was converted back to an equivalent dipole radiated power (ERP) using the (worst case) free space path loss equation. This power was then converted to a power relative to the rated transmitter power (labeled Attenuation). The relative powers must be at least 55 dB below the rated power (labeled Minimum Attenuation).

## *7.6 Frequency Stability §2.1055*

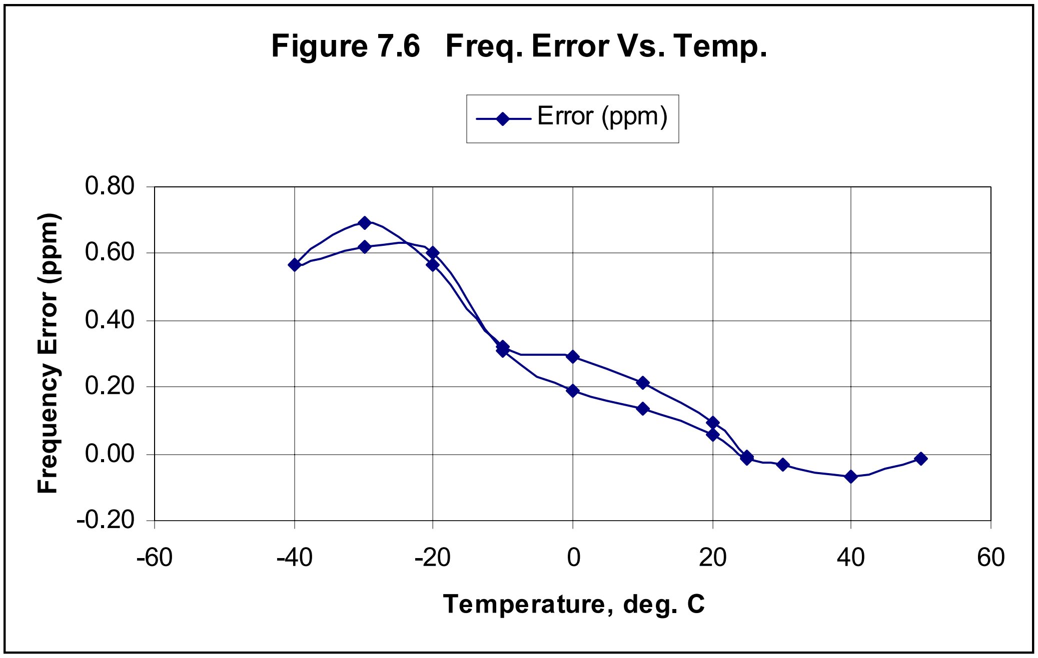
### 7.6.1 Frequency Stability Vs. Temperature

**Requirements:**

| Frequency Error Limit for Mobile, §90.213(a) | Measured Peak Frequency Error vs. Temperature |
|---|---|
| +/-1.5 ppm | +0.69, -.07 ppm (see data table and graph below) |

**Results:**

| Temp, deg. C | Freq Error (Hz) | Error (ppm) |
|---|---|---|
| 25 | -3.4 | -0.01 |
| 20 | 30.8 | 0.09 |
| 10 | 69.7 | 0.21 |
| 0 | 95.5 | 0.29 |
| -10 | 105.8 | 0.32 |
| -20 | 186.8 | 0.56 |
| -30 | 229.2 | 0.69 |
| -40 | 186.8 | 0.56 |
| -30 | 205.8 | 0.62 |
| -20 | 199.2 | 0.60 |
| -10 | 103.4 | 0.31 |
| 0 | 63.4 | 0.19 |
| 10 | 44.5 | 0.13 |
| 20 | 19.45 | 0.06 |
| 25 | -4.7 | -0.01 |
| 30 | -11 | -0.03 |
| 40 | -22.6 | -0.07 |
| 50 | -4.1 | -0.01 |




**Procedure:** This test was conducted in accordance with §2.1055(a)(1) and (b). The transmitter had been previously tuned up on channel 100 and set on frequency at 221.4975 MHz, in accordance with the Tune-up Procedure. The test radio was placed in the temperature test chamber and wired as shown in the test block diagram below. Pseudo-random QPSK test data transmission was selected by the PC terminal which represents normal operation.

The Vector signal analyzer was adjusted to 221.4975 MHz center frequency and set to properly demodulate the test QPSK signal. In this mode, the test transmitter's carrier frequency error relative to the analyzer's frequency setting can be read out in Hertz directly from the analyzer screen. The analyzer's frequency reference is an external GPS-based frequency standard whose manufacturer states is accurate to $<3 \times 10^{-12}$ when its status light is blinking at one pulse per second.

The DC voltmeter was attached to the 20 MHz TCXO tuning terminal (AFC in circuit diagrams) to monitor the voltage applied to the TCXO by the AFC DAC. This allowed verificatoin that the tuning voltage applied during transmission did not change as the temperature was changed.

The temperature chamber was first stabilized at 25 deg. C and then adjusted down in 5 or 10 degree Celsius steps to –40 deg. C and then brought back up in temperature in steps to +50 deg. C. At each temperature setting the chamber was allowed to stabilize for at least 30 minutes before measurements were taken. The PC terminal was used to control the transmitter key. There were no noticeable frequency changes due to heating effects.

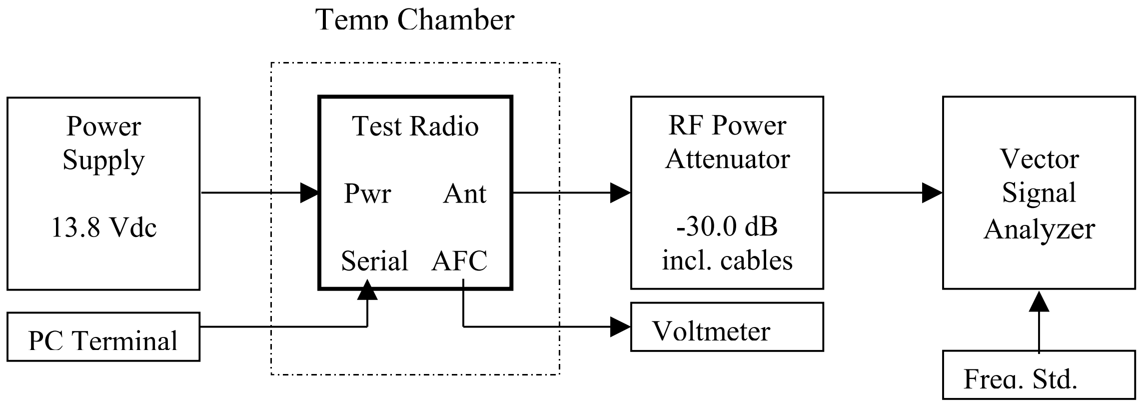



Figure 7.7 Test Setup for Frequency Stability Vs. Temperature

### 7.6.2 Frequency Stability Vs. Voltage

**Requirements:**

| Frequency Error Limit for Mobile, §90.213(a) | Measured peak frequency error vs. Suppy Voltage |
|---|---|
| +/-1.5 ppm | Complies (See table) |

**Results:**

| Supply Voltage | % of rated | Frequency change |
|---|---|---|
| 13.8 | 100 | 0 (reference) |
| 13.1 | 95 | < 0.1 ppm |
| 12.4 | 90 | < 0.1 ppm |
| 11.7 | 85 | < 0.1 ppm |
| 14.5 | 105 | < 0.1 ppm |
| 15.2 | 110 | < 0.1 ppm |
| 15.9 | 115 | < 0.1 ppm |

**Procedure:** This test was conducted in accordance with §2.1055(d). The transmitter had been previously tuned up on channel 100 and set on frequency at 221.4975 MHz, in accordance with the Tune-up Procedure. The test radio was connected as shown in the test setup diagram below. Pseudo-random QPSK test data transmission was selected by the PC terminal which represents normal operation.

The Vector signal analyzer was adjusted to 221.4975 MHz center frequency and set to properly demodulate the test QPSK signal. In this mode, the test transmitter's carrier frequency error relative to the analyzer's frequency setting can be read out in Hertz directly from the analyzer screen. The analyzer's frequency reference is an external GPS-based frequency standard whose manufacturer states is accurate to $<3 \times 10^{-12}$ when its status light is blinking at one pulse per second.

The DC voltmeter was attached to the power supply terminals of the test radio. The power supply was intially set to the rated voltage, 13.8 Vdc. The transmitter was keyed and transmit frequency at this voltage was recorded as the reference frequency. The power supply voltage was then stepped down 15% and then up 15% and the transmitter was keyed at each voltage. The transmitter frequency didn't vary significantly in any case. This can be explained by the fact that the frequency determining circuitry is powered by a double regulation system, the first 6-volt regulator maintaining its output voltage stable down to a supply voltage of  less than 7 Vdc.

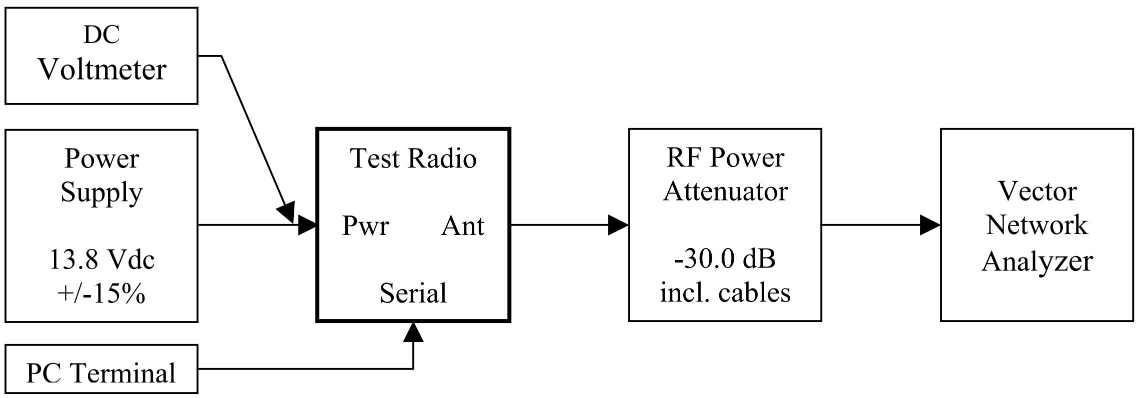



Figure 7.8 Test Setup for Frequency Stability vs. Supply Voltage

### *7.7 <u>Measurement Procedure §§2.947, 2.1041, 2.1057</u>*

Transmitter testing was conducted using generally accepted engineering laboratory techniques and in accordance with EIA/TIA TSB78  titled Land Mobile Linear Analog Modulation Communications Equipment Measurement and Performance (equivalent to EIA/TIA603). ANSI C63.4 also applies for spurious radiation testing.

Because the transmitter tuning range spans only ½ percent of the output frequency range**, all transmitter tests were conducted at the center of the range on FCC channel 100 for mobiles, i.e., <u>221.4975 MHz.</u>**

Frequencies investigated during the Spurious Radiation at Antenna Terminals Test were in the range 32 kHz to 2.215 GHz representing the lowest clock frequency and the transmitter's tenth harmonic frequency, respectively. Frequencies investigated for the Spurious Radiation Test were from 30 MHz to 2.215 GHz.

The RF network analyzer and the RF signal source were used in checking the attenuation of the RF attenuator and associated coax connecting cables and adapters over the frequency search range.

Additional procedural details are presented along with the specific procedures above.

### 7.8 Measurement Facilities

All but spurious radiation testing was conducted at the applicant's engineering facilities in Burr Ridge, IL. Spurious radiation testing was conducted by Elite Engineering personnel using their own equipment at their FCC registered 3 meter test site in Downers Grove, IL.

### 7.9 Equipment List §2.947(d)

| Instrument | Manufacturer and Model |
|---|---|
| Power Supply | Astron VS-12M or RM-35M |
| RF Power Attenuator | Bird 100A-MFN-30 |
| Power Meter | Agilent E4416A |
| Peak and Avg Power Sensor | Agilent E9321A |
| Vector Signal Analyzer | HP 89441A |
| Frequency Standard (GPS) | TrueTime Model XL-DC |
| Temperature Chamber | Tenney Jr. |
| Temperature Controller | Watlow Series 942 |
| Digital Voltmeter | Fluke 187 |
| RF Network Analyzer | Agilent 8714ES |
| RF Signal Source | Agilent E4437B |
| Personal Computer | Dell Inspiron 3000 |

### 7.10 Statement of Test Supervisor §2.911(d)

Date: August 30, 2002

The undersigned performed or supervised the performance of technical tests reported in this application and attests that all procedures were conducted in accordance with good engineering practice and to the best of his knowledge all data reported are accurate.

The qualifications of the undersigned include the following:

1. BSEE, University of the Pacific, 1975.

2. Twenty-four years experience in the design, development and evaluation of radio communications products.

Signed,

*John Fred Cleveland*

John F. Cleveland
Staff Engineer
Sophia Communications, Inc. (CX2 Technologies)