APPENDIX 8
DATA REQUIRED BY 2.1046 THROUGH 2.1057:

2.1046 **RF Power Output**.

Power output is measured at the RF output terminal with a Narda 30dB attenuator used as a 50 Ohm dummy load.

The transmitter was tuned in accordance with the tune up procedure (Appendix 2), with a supply voltage of 28 VDC at the final amplifier stage.

Test Set-Up:

Test Equipment:

- HP Power Meter	Model #	EPM-441A
- HP Power Sensor	Model #	ECP-E18A
- 2 Narda 30 dB Attenuators	Model #	HFP- 5100/30

Test condition:

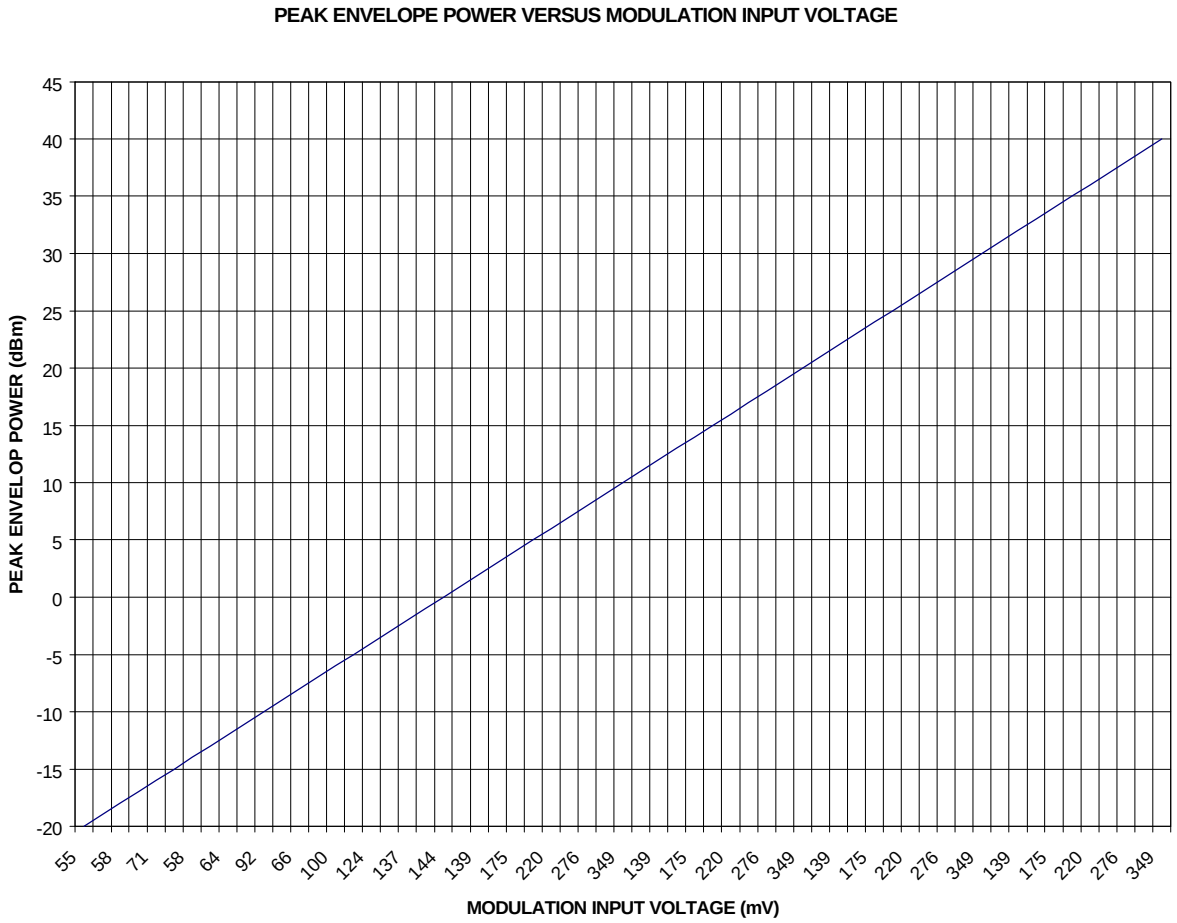
Modulation type: 4QPSK Random Symbols

Test Result:

Frequency	Output Power
216.01 MHz	39.60 dBm
217.01 MHz	39.50 dBm
218.01 MHz	39.50 dBm
219.99 MHz	39.40 dBm

2.1047 **Modulation Characteristics**.

A curve showing the peak envelope power versus the modulation input voltage is shown in figure 1



2.1049 **Occupied Bandwidth**

Test Set-Up:

Test Equipment:

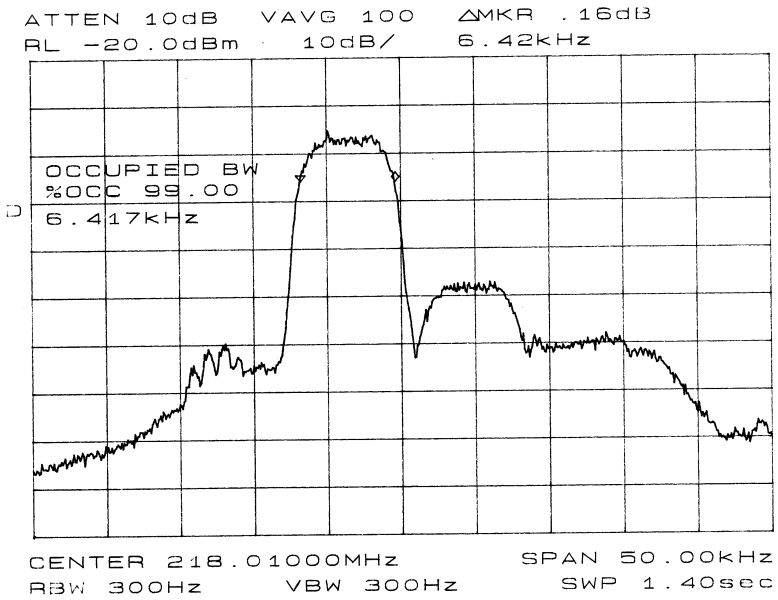
- HP Spectrum Analyzer	Model # 8560E
- 2 Narda 30 dB Attenuators	Model # MOD 766-30

Test condition:

Modulation: Internally generated signal corresponding to the encoded 10 kbits/s 4QPSK Random Symbols.
Transmit frequency: 218.01 MHz.
Transmit power: 10 W.

Test Result:

Figure 2 is a plot of a 99% occupied bandwidth measured with a HP 8560E spectrum analyzer. The plot shows that the total mean power is well within the 20 kHz bandwidth.



2.1051 **Spurious Emissions at Antenna Terminal**

Test Set-Up:

Test Equipment:

- HP Spectrum Analyzer Model # 8560E
- 2 Narda 30 dB Attenuators Model # MOD 766-30

Test conditions:

Modulation: Internally generated signal corresponding to the encoded 10 kbits/s 4QPSK Random symbols.
Transmit frequency: 218.01 MHz.
Transmit power: 10 W

Test Result:

Spurious emissions were measured throughout the RF spectrum from 10 kHz to 2 GHz. Any emissions that were between the required attenuation and the noise floor of the spectrum analyzer were recorded.

Spurious Frequency (MHz)	dBc below the fundamental frequency
218.025	54 dBc
218.032	40 dBc
436.02	68 dBc
654.03	80 dBc
872.04	78 dBc
1090.05	75 dBc
1308.06	> 82 dBc
1526.07	> 82 dBc
1744.08	> 82 dBc
1955.97	> 82 dBc

2.1053 **Field Strength of Spurious Radiation**.

A. The following tests were performed at an open-field test site, with the measurement instrument antenna located in the far field (3 meters) from the test antenna. The test result shows the relative radiated power of each spurious emission with reference to the rated power output of the transmitter.

Reference level calculation:

Reference level for the spurious radiation was taken as an ideal dipole excited by 10 watt. First, the magnitude of the fundamental frequency when radiated from an ideal dipole is calculated in V/m and then it is changed to dBm, since the spectrum analyzer measures the magnitude of the harmonic and spurious emission in dBm.

$$E = \frac{(49.2\ Pt)^{1/2}}{R}$$

Where: E = electric field intensity V/m
Pt = transmitter power in watts
R = distance in meters

$$\Rightarrow E = \frac{(49.2 \times 10)^{1/2}}{3}$$

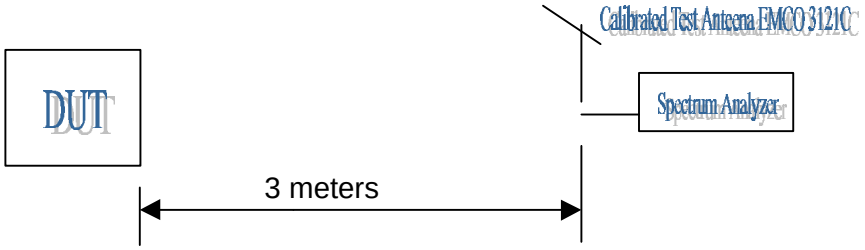
$E = 7.40$ V/m = 7400000 μV/m

$E = 20\text{Log}(7400000) = 137$ dBμ/m

Since 1μV = -107 dBm, the reference fundamental frequency becomes

137 – 107 = 30 dBm

Test Set-Up:



Test Equipment:

- HP Spectrum Analyzer Model # 8560E
- Calibrated test Antenna EMCO Model 3121C

Test condition:

Modulation: Single Tone.
Transmit power: 10 W
Transmit frequency: 218.01 MHz

Test Results:

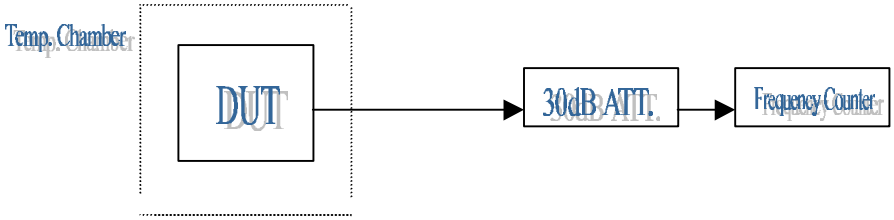
Spurious Frequency, MHz	dBc below the fundamental frequency
436.02	112 dBc
654.03	123 dBc
872.04	> 130 dBc
1090.05	> 130 dBc
1308.06	> 130 dBc
1526.07	> 130 dBc
1744.08	> 130 dBc
1955.98	> 130 dBc

The magnitudes of all other spurious frequencies were 20 dB or more below the fundamental frequency.

2.1055 **Frequency stability.**

a. Frequency Stability as a function of temperature.

Test Set-Up:



Test Equipment:

- HP Frequency Counter Model # 53181A
- Narda 30 dB Attenuator Model # MOD 766-30
- Associated Environmental System Temperature Chamber

Test condition:

Modulation: Single Tone
Transmit frequency: 218.003 MHz.
Transmit power: 10 W
Supply voltage: 220VAC

Frequency measurements were made at –30 º C and at intervals of 10 º C through the range –30º to +50º C. At each temperature, the unit was exposed to test chamber ambient for 30 minutes. No short-term transient keying effect s on the frequency of the transmitter is detected. No COLD START measurements are performed, since the unit is not designed to be used in mobile station.

Test Result:

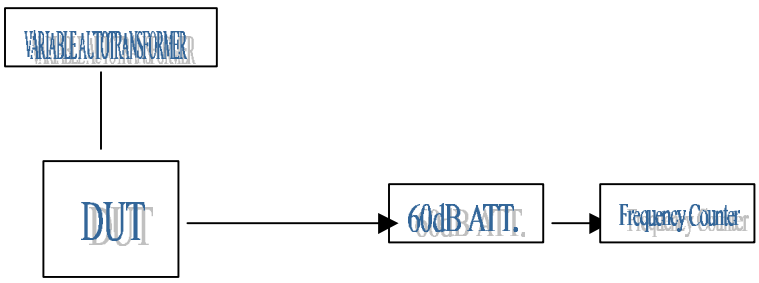
Temperature (ºC)	Frequency (MHz)
-30	218.003012
-20	218.003009
-10	218.003015
0	218.003016
10	218.003015
20	218.003017
30	218.003004
40	218.002994
50	218.002986

Maximum frequency error: 218003017 – 218002986 = 31 Hz.

Test results show that the frequency stability is better than 0.15 PPM with variation of temperature from -30° C to +50° C. No short-term transient keying effects on the frequency of the transmitter is detected.

a. Frequency stability as a function of primary supply voltage.

Test Set-Up:



Test Equipment:

- HP Frequency Counter	Model # 53181A
- 2 Narda 30 dB Attenuators	Model # MOD 766-30
- Powerstat Variable Autotransformer	Type: 116B

Test condition:

Modulation:	Single Tone
Transmit frequency:	218.003 MHz.
Transmit power:	10 W

The frequency stability as a function of primary supply voltage was measured with an HP53181A frequency counter. The nominal primary supply voltage to the unit is 220 VAC. The variable autotransformer was used to vary the primary supply voltage from 85 to 115 percent of the 220 VAC nominal value.

Supply Voltage (VAC)	Frequency (MHz)
187	218.003000 MHz
197	218.003000 MHz
207	218.002999 MHz
217	218.002999 MHz
227	218.002999 MHz
237	218.002999 MHz
247	218.002999 MHz
257	218.002999 MHz

Maximum frequency error: 218003000 – 218002999 = 1 Hz.

Test results show that the frequency stability is better than 0.005 PPM with variation of primary supply voltage from 85 to 115 percent of the nominal value.

2.1057 **Frequency Range of Measurements**

The measurements for 2.1051 and 2.1053 were conducted over the frequency range 10 kHz to 2 GHz in accordance with paragraph (a) of 2.2057.

Statement of Test Data Accuracy

Fairfield Industries, Inc. attests to the accuracy of test data presented in accordance with 2.1.046 through 2.1057.

Tests performed by:

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