Engineering and Testing for EMC and Safety Compliance

Accredited under NVLAP Lab Code 200061-0

Certification Report

M/A-COM, Inc.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501
Daryl Popowitch
Phone: (434) 455-9527
E-Mail: popowitda@tycoelectronics.com

MODEL: P5400 UHF-L Portable Radio

FCC ID: OWDTR-0045-E
IC: 3636B-0045

June 1, 2007

Standards Referenced for this Report	
Part 2: 2006	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 15: 2006	Radio Frequency Devices - §15.109: Radiated Emissions Limits
Part 90: 2006	Private Land Portable Radio Services
ANSI C63.4-2003	American National Standard for Methods of Measurement of Radio Noise Emissions from Low -Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz
ANSI TIA-603-C-2004	Land Portable FM or PM Communications Equipment - Measurement and Performance Standards
ANSI/TIA/EIA–102.CAAA; 2002	Digital C4FM/CQPSK Transceiver Measurement Methods
RSS-119; Issue 9; 2007	Land Portable and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz

Frequency Range (MHz)	Rated Transmit Power (W) (Conducted)	Frequency Tolerance (ppm)	Emission Designator
421-430	4.0	0.54	16K0F3E (Analog Voice; WB)
421-430	4.0	0.54	11K0F3E (Analog Voice; NB)
421-430	4.0	0.54	14K2F1D/E (2-level FSK; WB)
421-430	4.0	0.54	10K3F1D/E (2-level FSK; NB; XNB)
421-430	4.0	0.54	7K10F1D/E (2-level FSK; NB)
421-430	4.0	0.54	8K4F1D/E (4-level C4FM; P25)

Report Prepared by Test Engineer: Daniel Biggs

Document Number: 2007147/QRTL07-086

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1 General Information

This following Certification Report is prepared on behalf of **M/A-COM, Inc**. in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **P5400 UHF-L Portable Radio; FCC ID: OWDTR-0045-E, IC: 3636B-0045**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47 and Industry Canada RSS-119. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

1.2 Related Submittal(s)/Grant(s)

This is an original application report.

2 Tested System Details

The test sample was received on March 28, 2007. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this testing, as applicable.

Table 2-1: Equipment under Test (EUT)

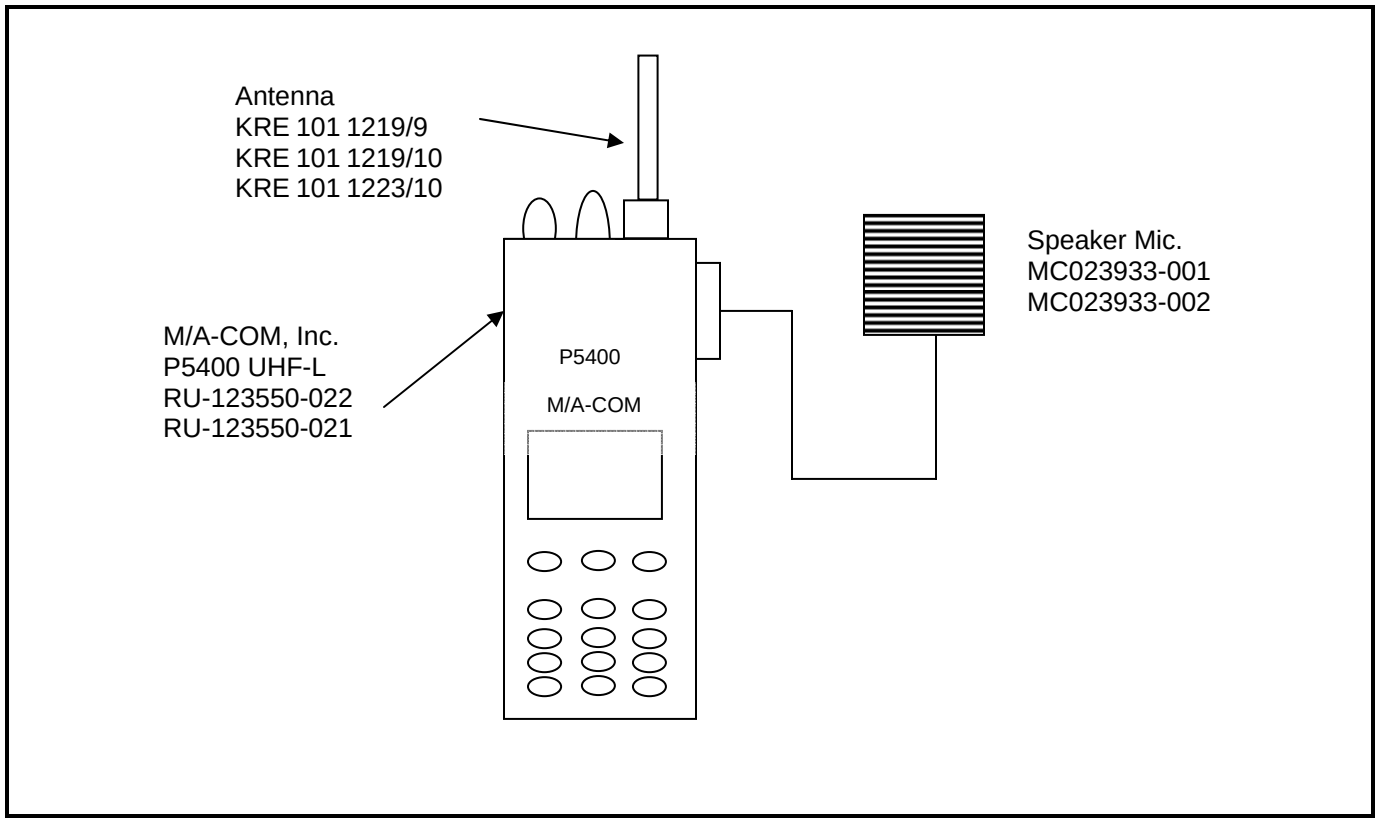
The test system contains the following components:

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Radio	M/A-COM, Inc.	P5400	RU-123550-022 (System version)	OWDTR-0045-E	17923
Radio	M/A-COM, Inc.	P5400	RU-123550-021 (Scan version)	OWDTR-0045-E	N/A
Battery	M/A-COM, Inc.	NiMH	BT-023406-003	N/A	N/A
Battery	M/A-COM, Inc.	NiCd	BT-023406-001	N/A	N/A
Battery	M/A-COM, Inc.	Li-Ion	BT-023406-005	N/A	N/A
Microphone	M/A-COM, Inc.	Speaker Mic (no antenna)	MC023933-001	N/A	017868
Microphone	M/A-COM, Inc.	Speaker Mic (w/ antenna)	MC023933-002	N/A	017869
Antenna	M/A-COM, Inc.	Helical Stub 378-403 MHz	KRE 101 1219/9	N/A	N/A
Antenna	M/A-COM, Inc.	Helical Stub 403-430 MHz	KRE 101 1219/10	N/A	N/A
Antenna	M/A-COM, Inc.	¼ Wave Whip 378-430 MHz	KRE 101 1223/10	N/A	N/A

Table 2-2: Support Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Audio Test Box	M/A-COM, Inc.	MATQ-03424	N/A	N/A	017870
Audio Test Cable	M/A-COM, Inc.	CA-023407-002	N/A	N/A	017869

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2 §2.1033(c)(8) Voltages and Currents Through The Final Amplifying Stage

Nominal DC Voltage:
NiCd: 6.0 to 9.0 (7.5 nom.)
NiMH: 6.0 to 9.0 (7.5 nom.)
LiIon: 6.0 to 9.0 (7.5 nom.)
Alkaline: 6.0 to 9.2 (7.5 nom.)

Current: 2.5 A

4 FCC Rules and Regulations Part 2 §2.1046(a): RF Power Output: Conducted; RSS-119 §6.2: Output Power Test

4.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.1

The EUT was connected with a power sensor/meter through an appropriate 50 ohm attenuator. Attenuator loss was accounted for.

4.2 Test Data

Table 4-1: RF Power Output (High Power): Carrier Output Power (Unmodulated)

Channel	Frequency (MHz)	RF Power Measured (Watt)*
1 (High Power)	406.1125	4.3
2 (High Power)	422.2000	4.3
3 (High Power)	429.9875	4.3

* Measurement accuracy: +/-.02 dB (logarithmic mode)

Table 4-2: RF Power Output (Rated Power)

Channel	Frequency (MHz)	Rated Power (Watt)*
1 (High Power)	406.1125	4.0
2 (High Power)	422.2000	4.0
3 (High Power)	429.9875	4.0

* Measurement accuracy: +/-.02 dB (logarithmic mode)

Table 4-3: Test Equipment for Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901184	Agilent Technologies	E4416A	EPM-P Power Meter, Single Channel	GB41050573	10/03/07
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	10/03/07
900819	Weinschel Corporation	BF0830	Attenuator 10 db	N/A	12/02/08

Test Personnel:

Dan Biggs		March 28, 2007
Test Engineer	Signature	Date Of Test

5 FCC Rules and Regulations Part 2 §2.1051: Spurious Emissions at Antenna Terminals; Part 90 §90.210: Emissions Masks; RSS-119 §5.8: Transmitter Unwanted Emissions

5.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.13.

The transmitter was interfaced with a spectrum analyzer through an appropriate 50 ohm attenuator and a notch filter. The transmitter was operated at maximum power. Attenuator and cable losses were accounted for.

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz.

Digital Modulation: Modulated to its maximum extent using a pseudo random data sequence – 9600 bps.

5.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10xFc.

Limit = 50 + 10 Log (P) dB or 70 dB, whichever is greater.

The worst case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 5-1: Conducted Spurious Emissions – 406.1125 MHz; Narrow Band; High Power

Freq = 406.1125 MHz - Limit = 50 + 10 Log P = 56.3 dBc - Conducted Power = 36.4 dBm = 4.3 W

Frequency (MHz)	SA Level w/ Notch (dBm)	Level (dBc)	Limit (dBc)	Margin(dB)
812.225	-44.2	79.4	56.3	-23.1
1218.338	-56.0	87.3	56.3	-30.9
1624.45	-65.0	101.3	56.3	-44.9
2030.563	-67.3	100.4	56.3	-44.0
2436.675	-66.9	102.8	56.3	-46.4
2842.788	-62.7	95.4	56.3	-39.0
3248.9	-61.4	90.0	56.3	-33.6
3655.013	-65.1	100.4	56.3	-44.0
4061.125	-66.1	97.5	56.3	-41.1

Table 5-2: Conducted Spurious Emissions – 422.2000 MHz; Narrow Band; High Power

Freq = 422.2 MHz - Limit = 50 + 10 Log P = 56.3 dBc - Conducted Power = 36.4 dBm = 4.3 W

Frequency (MHz)	SA Level w/ Notch (dBm)	Level (dBc)	Limit (dBc)	Margin(dB)
844.400	-50.3	85.4	56.3	-29.1
1266.600	-50.3	83.1	56.3	-26.8
1688.800	-64.5	100.9	56.3	-44.6
2111.000	-63.5	97.7	56.3	-41.4
2533.200	-66.5	102.4	56.3	-46.1
2955.400	-60.3	94.2	56.3	-37.9
3377.600	-58.1	88.6	56.3	-32.3
3799.800	-65.7	101.0	56.3	-44.7
4222.000	-67.0	96.7	56.3	-40.4

Table 5-3: Conducted Spurious Emissions – 429.9875 MHz; Narrow Band; High Power

Freq = 429.9875 MHz - Limit = 50 + 10 Log P = 56.3 dBc - Conducted Power = 36.4 dBm = 4.3 W

Frequency (MHz)	SA Level w/ Notch (dBm)	Level (dBc)	Limit (dBc)	Margin(dB)
859.975	-52.0	87.6	56.3	-31.2
1289.963	-48.3	83.2	56.3	-26.8
1719.950	-62.9	99.7	56.3	-43.3
2149.938	-62.4	97.8	56.3	-41.4
2579.925	-65.8	101.7	56.3	-45.3
3009.913	-58.3	91.2	56.3	-34.8
3439.900	-61.2	94.4	56.3	-38.0
3869.888	-65.6	101.8	56.3	-45.4
4299.875	-65.6	90.0	56.3	-33.6

Table 5-4: Test Equipment for Testing Conducted Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901215	Hewlett Packard	8596EM	EMC Analyzer (9 kHz – 12.8 GHz)	3826A00144	10/16/07
901396	MCE Weinschel	48-40-34	Attenuator, 40 dB, DC-18 GHz, 100 W	93453	01/13/09
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	12/05/07

Test Personnel:

Daniel Biggs	Daniel Biggs	March 29, 2007
Test Engineer	Signature	Date Of Test

6 FCC Rules and Regulations Part 2 §2.1053(a): Field Strength of Spurious Radiation; RSS-119 §6.3: Unwanted Emissions

6.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.12

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz.

Digital Modulation: Modulated to its maximum extent using a pseudo random data sequence – 9600 bps.

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

P_d(dBm) = P_g(dBm) – cable loss (dB) + antenna gain (dB)

where:

P_d is the dipole equivalent power
P_g is the generator output power into the substitution antenna

6.2 Test Data

6.2.1 CFR 47 Part 90.210 Requirements

Limit = 50 + 10 Log (P) dB or 70 dB, whichever is greater. The worst case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 6-1: Field Strength of Spurious Radiation – 422.2000 MHz; Narrow Band; High Power

Freq = 422.2 MHz - Limit = 50 + 10 Log P = 56.3 dBc - Conducted Power = 36.4 dBm = 4.3 W

Frequency (MHz)	Measured Level (dBuv)		Signal Gen. Level (db)		Cable Loss (dB)	Antenna Gain (dBd)		Corrected Level (dBc)		Limit (dBc)	Margin (dB)	
422.20	H	V	H	V		H	V	H	V		H	V
844.40	37.9	41.8	-65.7	-61.8	3.9	4.8	5.0	101.2	97.1	56.3	-44.8	-40.7
1266.60	34.4	35.0	-64.6	-64.1	4.9	5.3	5.1	100.6	100.3	56.3	-44.2	-43.9
1688.80	35.4	34.9	-60.7	-59.8	5.5	6.3	6.4	96.3	95.3	56.3	-39.9	-38.9
2111.00	34.6	35.2	-36.6	-35.7	6.1	7.3	6.8	71.8	71.4	56.3	-15.4	-15.0
2533.20	25.9	25.8	-41.9	-41.8	6.5	7.2	7.4	77.6	77.3	56.3	-21.2	-20.9
2955.40	22.6	21.2	-42.2	-42.9	6.7	7.0	7.3	78.3	78.7	56.3	-21.9	-22.3
3377.60	21.6	20.3	-43.6	-45.5	7.1	7.3	7.5	79.8	81.5	56.3	-23.4	-25.1
3799.80	20.2	20.3	-33.7	-32.6	7.3	7.2	7.4	70.2	68.9	56.3	-13.8	-12.5
4222.00	20.1	20.2	-34.6	-34.8	7.8	7.8	8.0	71.0	71.0	56.3	-14.6	-14.6

Table 6-2: Test Equipment for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900791	Schaffner-Chase	CBL6112	Antenna (25 MHz – 2 GHz)	2099	06/12/07
900772	EMCO	3161-02	Horn Antennas (2 – 4 GHz)	9504-1044	05/20/08
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	05/20/08
900323	EMCO	3160-07	Horn Antennas (8.2 – 12 GHz)	9605-1054	07/31/09
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridges Guide Antenna (1-18 GHz)	2310	03/30/09
901215	Hewlett Packard	8596EM	EMC Analyzer (9 kHz – 12.8 GHz)	3826A00144	10/16/07
901426	Insulated Wire Inc.	KPS-1503-3600-KPS	RF Cable, 30'	NA	12/06/07
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF Cable, 20'	NA	12/05/07
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF Cable 36"	NA	12/05/07

Test Personnel:

Daniel Biggs		May 31, 2007
Test Engineer	Signature	Date Of Test

7 FCC Rules and Regulations Part 2 §2.1049: Occupied Bandwidth; Part 90 §90.210(i) & (j): Emissions Masks; RSS-119 §5.8: Transmitter Unwanted Emissions

7.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.11.

The transmitter was interfaced with a spectrum analyzer through an appropriate 50 ohm attenuator and a notch filter. The transmitter was operated at maximum power. Attenuator losses were accounted for.

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz.

The device uses digital modulation modulated to its maximum extent using a pseudo-random data sequence of 9600 bps.

Limit Mask B:

(1) On any frequency removed from the assigned frequency by more than 50%, but not more than 100% of the authorized bandwidth: **at least 25 dB**.
(2) On any frequency removed from the assigned frequency by more than 100%, but not more than 250% of the authorized bandwidth: **at least 35 dB**.
(3) On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth: **at least 43 + 10 log (P) dB.**

Limit Mask C:

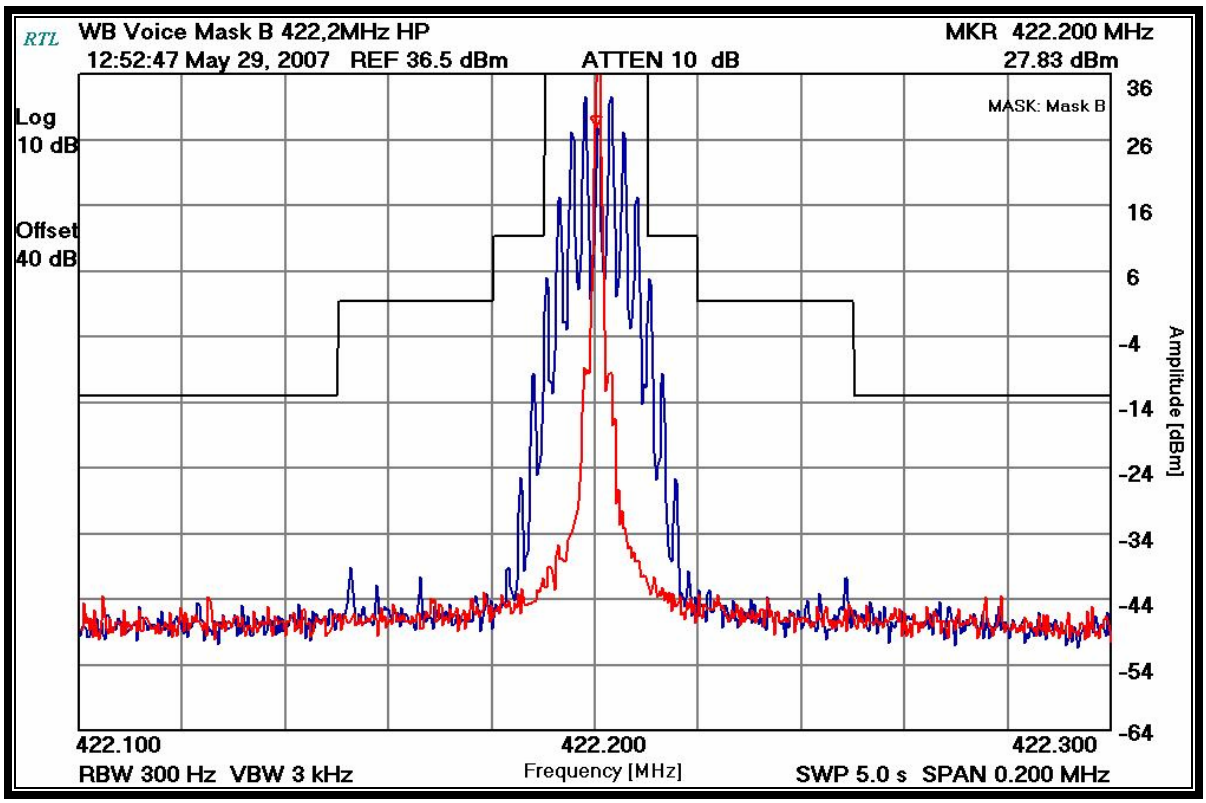
(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: **at least 83 log (fd/5) dB**;
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: **at least 29 log (fd^2/11) dB or 50 dB, whichever is the lesser attenuation;**
(3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: **at least 43 + 10 log (P) dB.**

Limit Mask D:

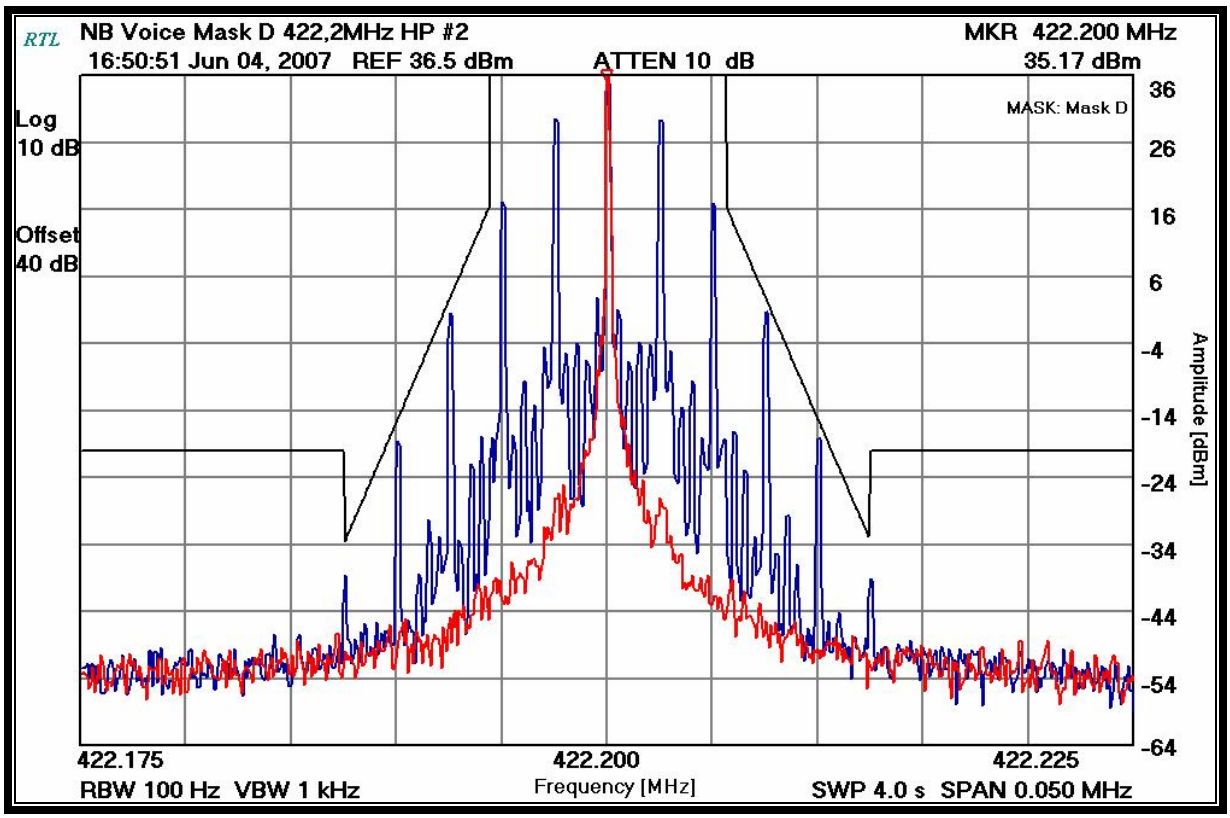
(1) On any frequency removed from the center of the authorized bandwidth f_0: **zero dB**;
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz, but not more than 12.5 kHz: **at least 7.27(fd-2.88 kHz) dB;**
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: **at least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.**

7.2 Test Data

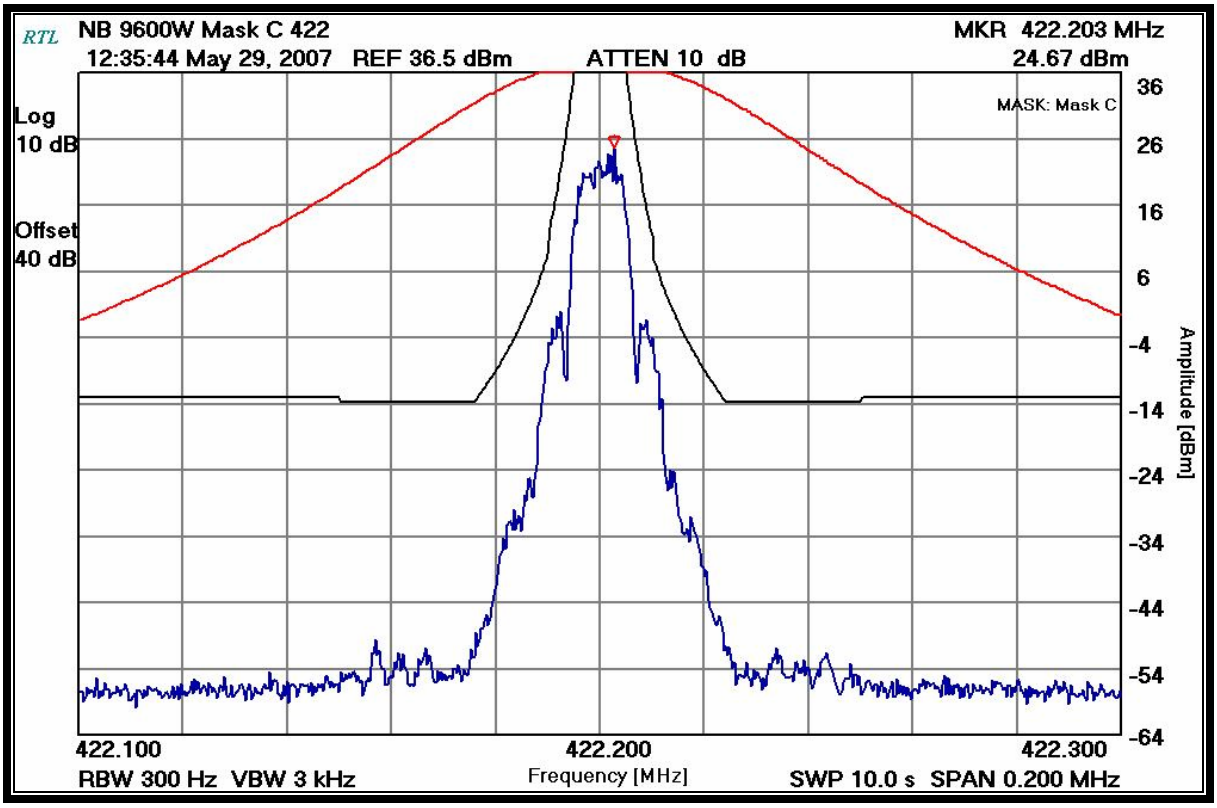
Plot 7-1: Occupied Bandwidth – 422.2000 MHz; Mask B; WB Analog; High Power



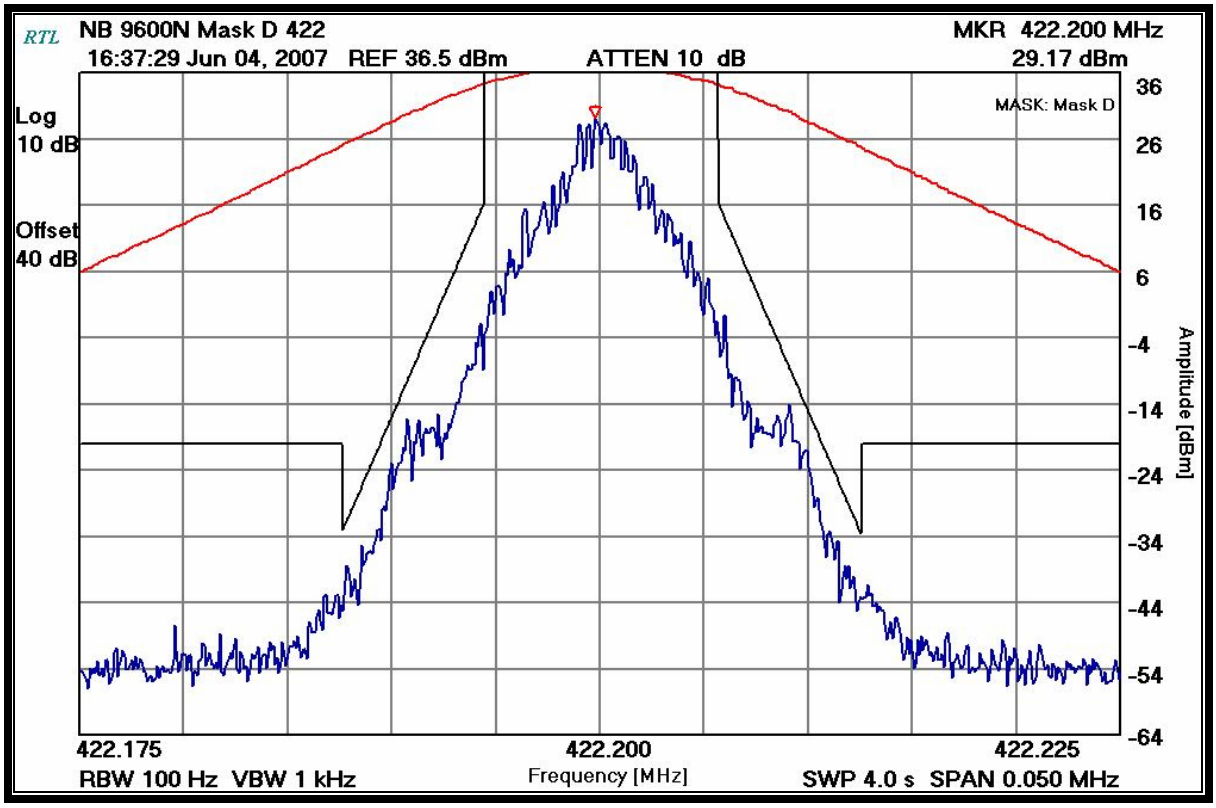
Plot 7-2: Occupied Bandwidth – 422.2000 MHz; Mask D; NB Analog; High Power



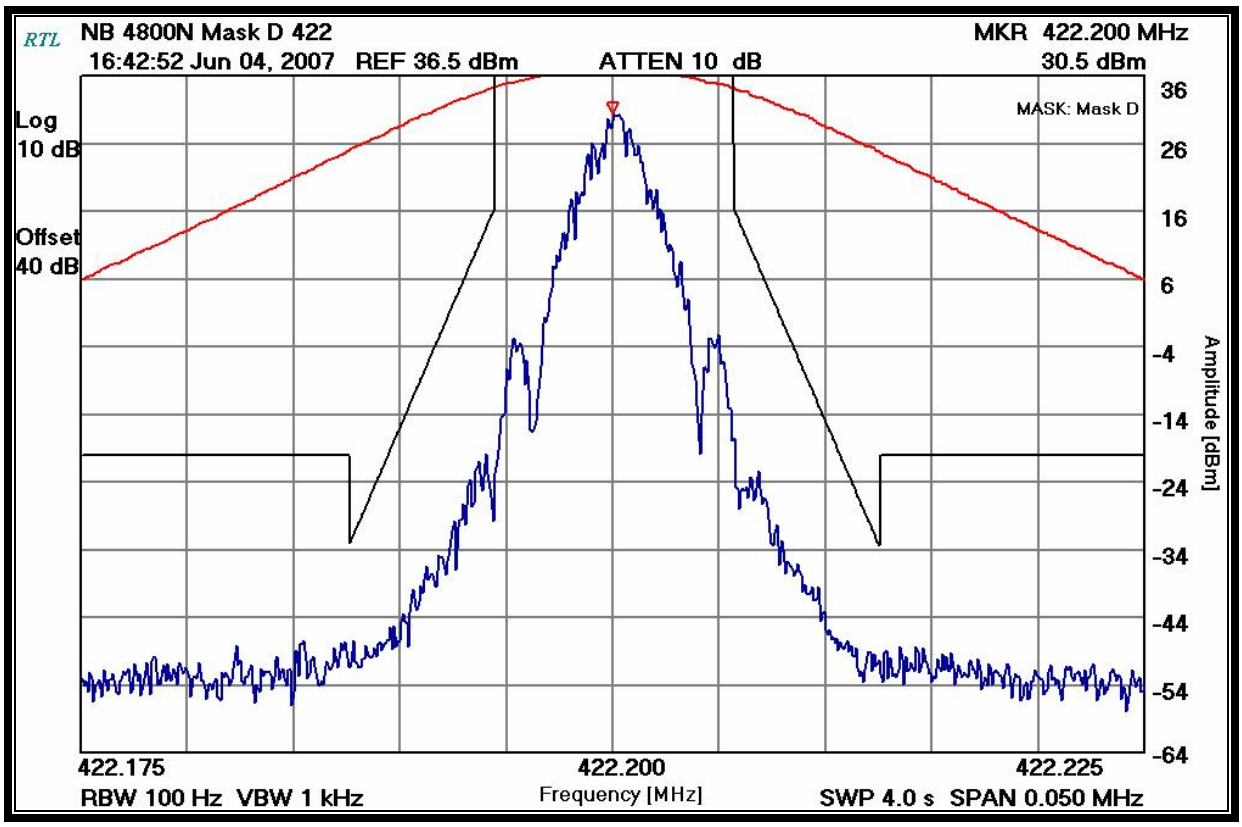
Plot 7-3: Occupied Bandwidth – 422.2000 MHz; Mask C; NB 2-level FSK; 9600 BPS



Plot 7-4: Occupied Bandwidth – 422.2000 MHz; Mask D; NB 2-level FSK; 9600 BPS



Plot 7-5: Occupied Bandwidth – 422.2000 MHz; Mask D; NB 2-level FSK; 4800 BPS



Plot 7-6: Occupied Bandwidth – 422.2000 MHz; Mask D; 4-level C4FM (P25 mode); 4800 SPS

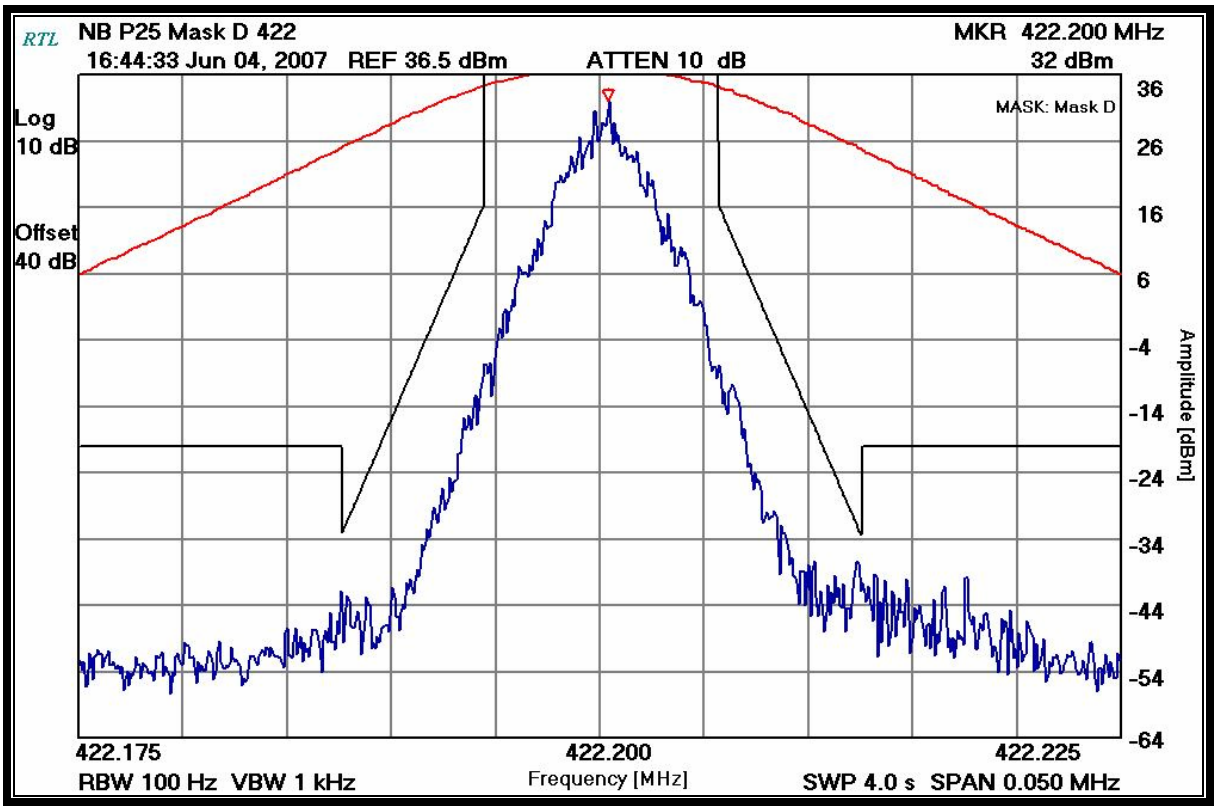


Table 7-1: Test Equipment for Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901215	Hewlett Packard	8596EM	EMC Analyzer (9 kHz – 12.8 GHz)	3826A00144	10/16/07
900912	Hewlett Packard	85662A	EMI Receiver	2542A12739	03/21/08
901396	MCE Weinschel	48-40-34	Attenuator, 40 dB, DC-18 GHz, 100 W	93453	12/02/08

Test Personnel:

Daniel Biggs		May 29 & June 4, 2007
Test Technician/Engineer	Signature	Dates of Tests

8 FCC Rules and Regulations Part 90 §90.213 and Part 2 §2.1055: Frequency Stability

8.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +60°C.

The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10°C through the range. A ½ hour period was observed to stabilize the EUT at each measurement step, and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied from the battery operating end point to 122.7% of nominal value.

The worst-case test data are shown below in Table 8-1 and Table 8-3.

8.2 Test Data

8.2.1 CFR 47 Part 90.213 Requirements

For mobile transmitters over 2 Watts output power:

421-512 MHz band: 5 ppm

Note: In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

8.2.2 Frequency Stability/Temperature Variation

Plot 8-1: Temperature Frequency Stability – 422.2000 MHz Channel

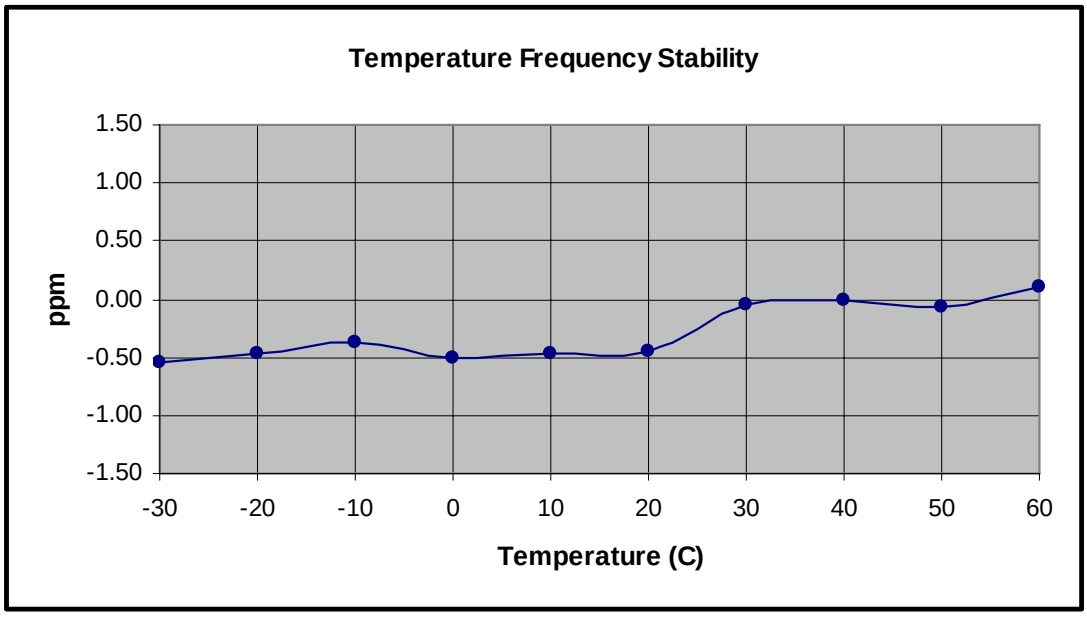


Table 8-1: Frequency Stability/Temperature Variation – 422.2000 MHz

Temperature °C	Measured Frequency (MHz)	ppm
-30	422.199771	-0.54
-20	422.199802	-0.47
-10	422.199843	-0.37
0	422.199784	-0.51
10	422.199800	-0.47
20	422.199811	-0.45
30	422.199982	-0.04
40	422.199992	-0.02
50	422.199968	-0.08
60	422.200044	0.10

Table 8-2: Test Equipment for Testing Frequency Stability/Temperature

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	01/20/08
901396	MCE Weinschel	48-40-34	Attenuator, 40 dB, DC-18 GHz, 100 W	93453	12/02/08
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF Cable 36"	NA	12/12/07
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	12/15/07

Test Personnel:

Daniel Biggs		May 30, 2007
Test Engineer	Signature	Date Of Test

8.2.3 Frequency Stability/Voltage Variation

Plot 8-2: Voltage Frequency Stability – 422.2000 MHz Channel

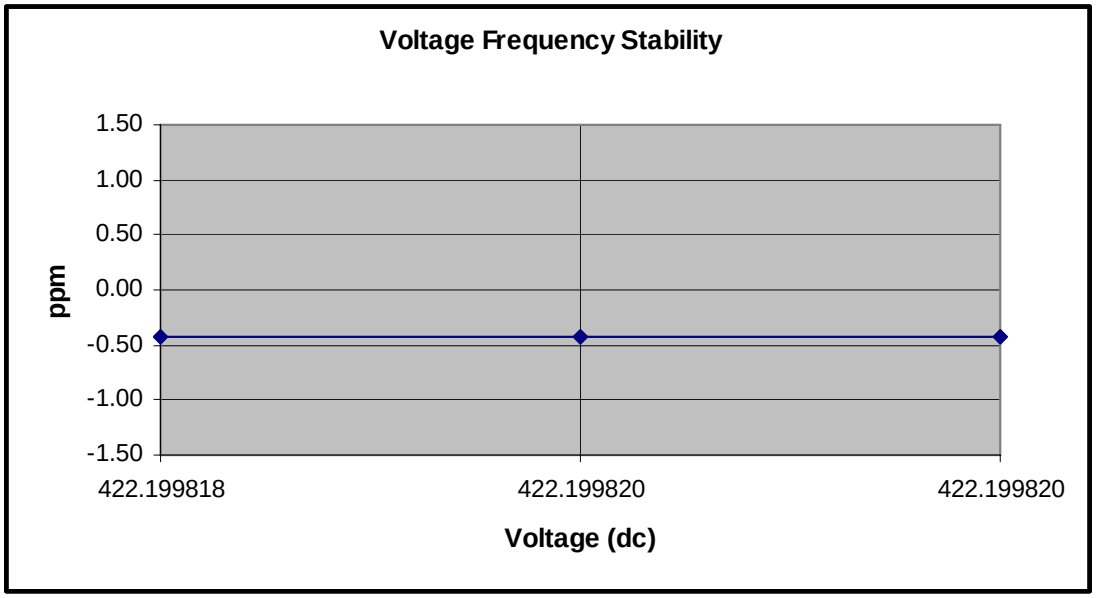


Table 8-3: Frequency Stability/Voltage Variation – 422.2000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0	422.199818	-0.43
7.5	422.199820	-0.43
9.2	422.199820	-0.43

Table 8-4: Test Equipment for Testing Frequency Stability/Voltage

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	12/15/07
901396	MCE Weinschel	48-40-34	Attenuator, 40 dB, DC-18 GHz, 100 W	93453	12/02/08
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	N/A	12/12/07
901247	Wavetek	DM25XT	Digital Multimeter	40804098	12/07/07

Test Personnel:

Daniel Biggs	Daniel Biggs	May 30, 2007
Test Engineer	Signature	Date Of Test

9 FCC Rules and Regulations Part 2 §2.1047(a): Modulation Characteristics - Audio Frequency Response

9.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.6.

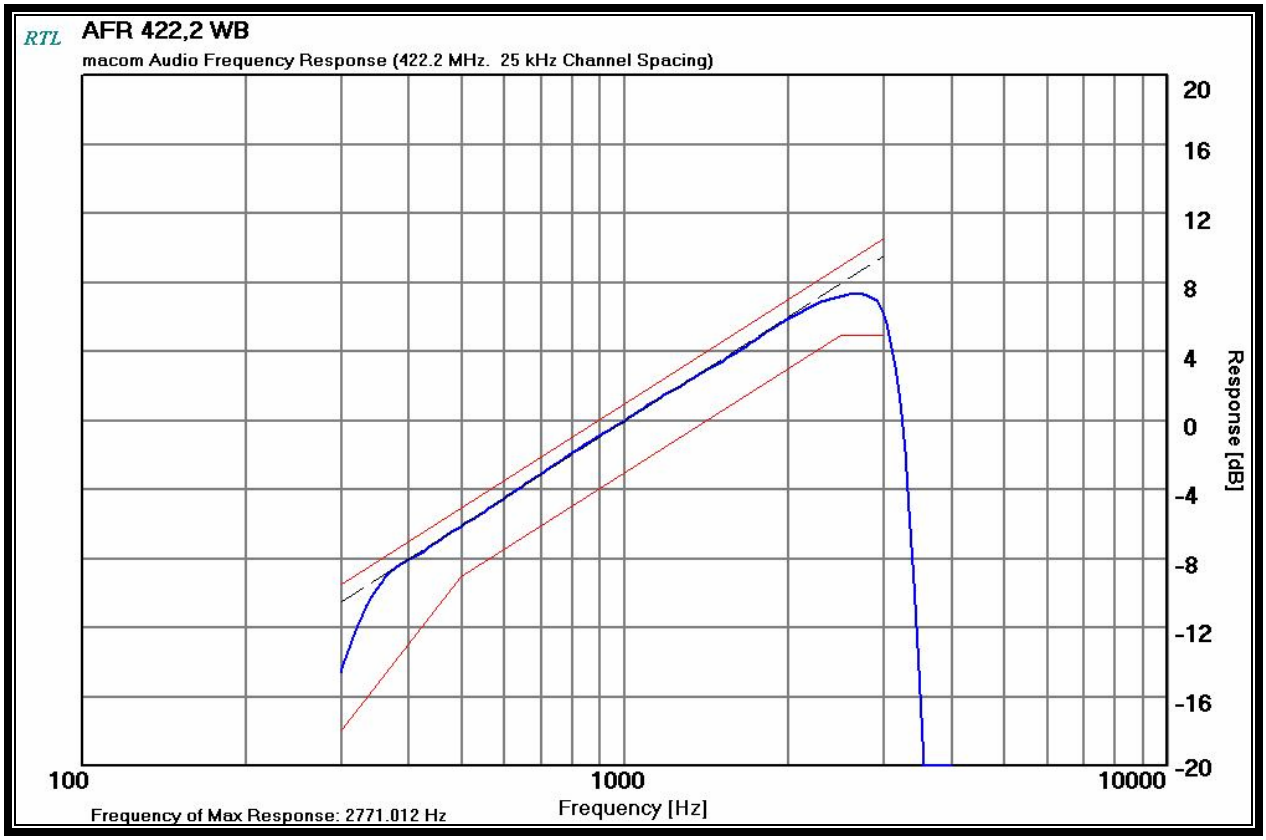
The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

9.2 Test Data

Plot 9-1: Modulation Characteristics - Audio Frequency Response; 422.2000 MHz; WB



Plot 9-2: Modulation Characteristics - Audio Frequency Response; 422.2000 MHz; NB

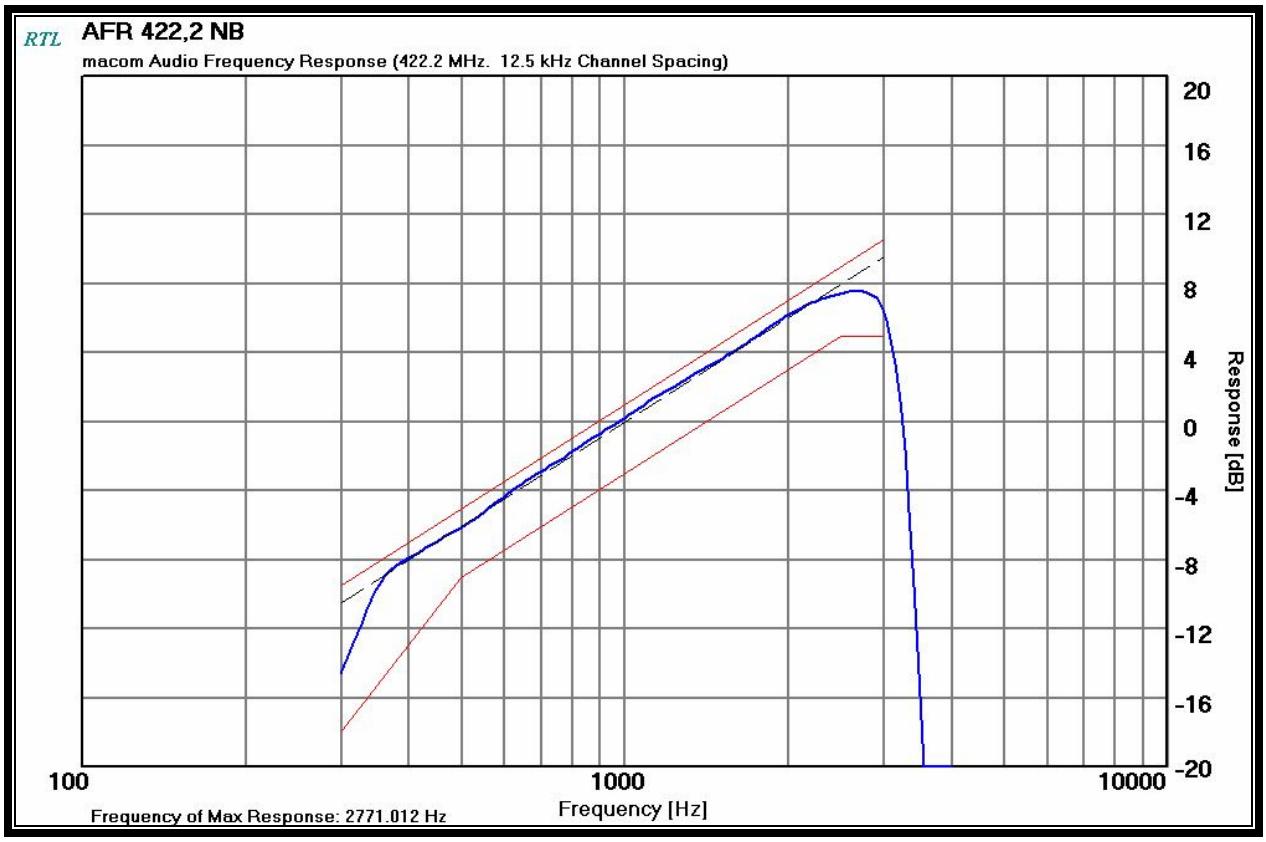


Table 9-1: Test Equipment for Testing Audio Frequency Response

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	12/19/07
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	07/21/07
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	10/19/07

Test Personnel:

Daniel Biggs	Daniel Biggs	May 29, 2007
Test Technician/Engineer	Signature	Date Of Test

10 FCC Rules and Regulations Part 2 §2.1047(a): Modulation Characteristics – Audio Low Pass Filter

10.1 Test Procedure

2.1047(a) Voice modulated communication equipment: a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage, shall be submitted.

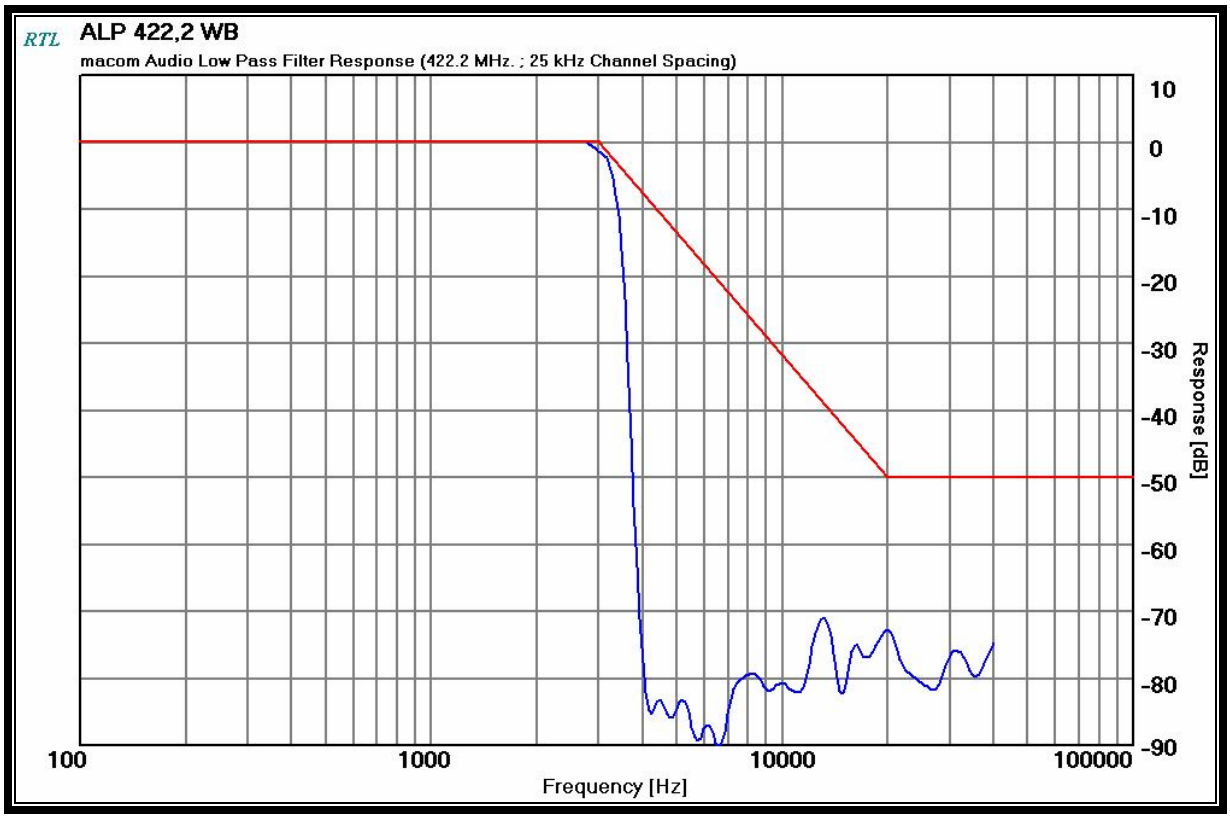
ANSI TIA-603-C-2004, 2.2.15

The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

The audio frequency response of the post-limiter filter can not be measured directly as it is embedded within DSP code. The following plot is a simulation of the audio low pass filter circuitry, and is deemed "equivalent data" per 2.1047(a).

10.2 Test Data

Plot 10-1: Modulation Characteristics – Audio Low Pass Filter; 422.2000 MHz; WB



Plot 10-2: Modulation Characteristics – Audio Low Pass Filter; 422.2000 MHz; NB

11 FCC Rules and Regulations Part 2 §2.1047(b): Modulation Characteristics - Modulation Limiting

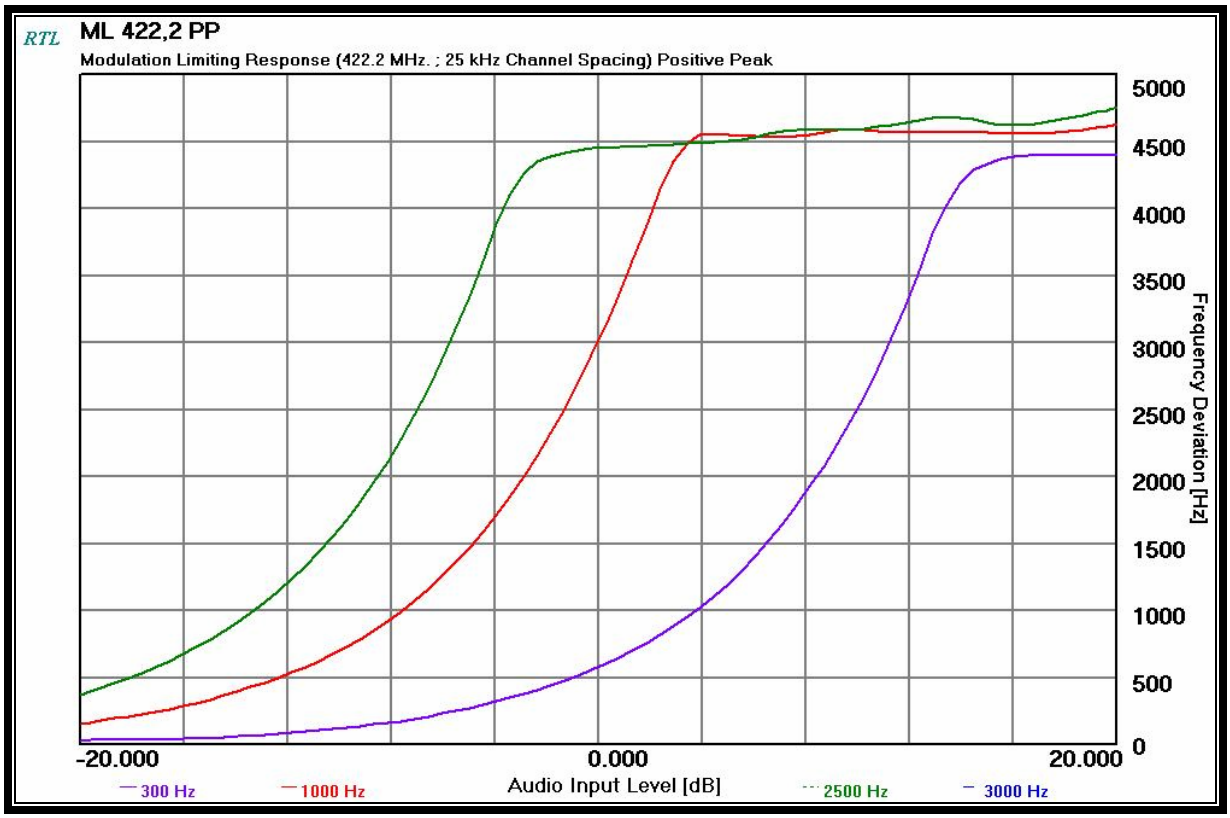
11.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.3.

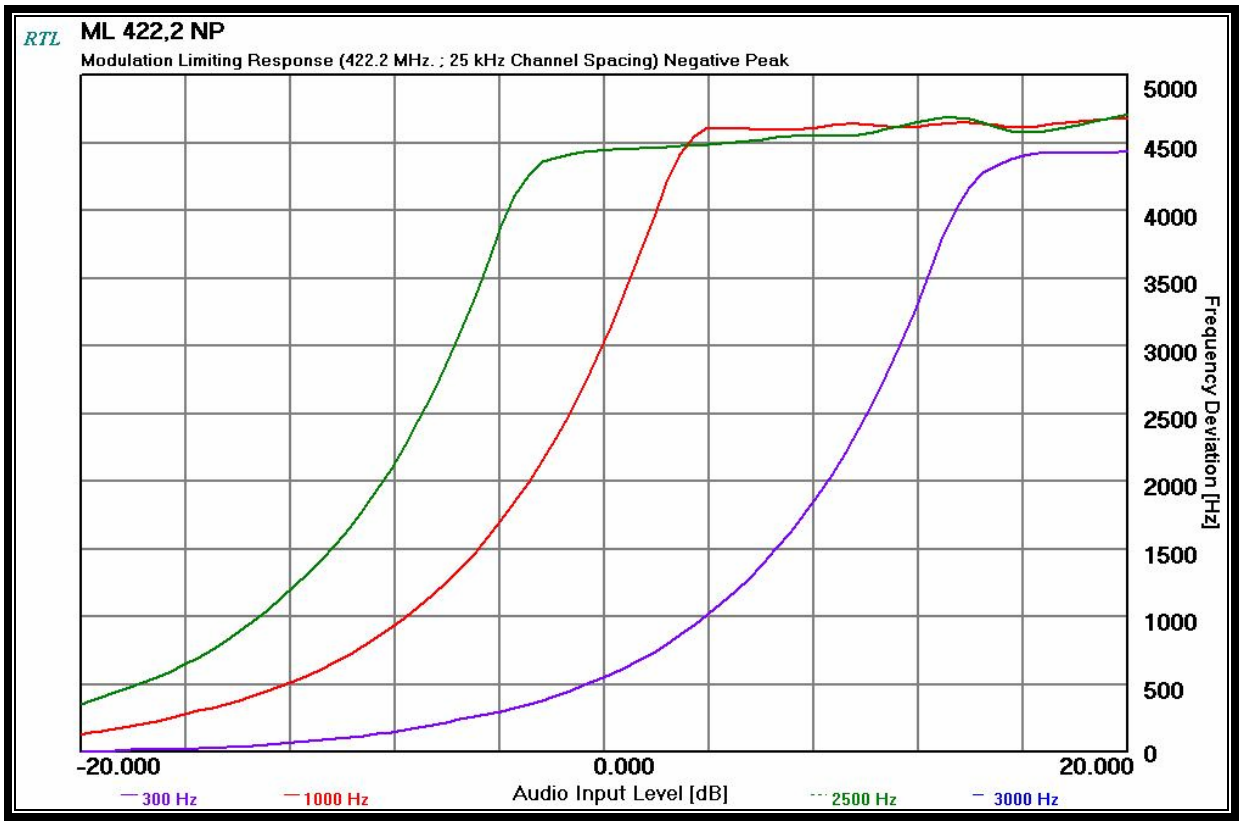
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level as a reference (0 dB), the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

11.2 Test Data

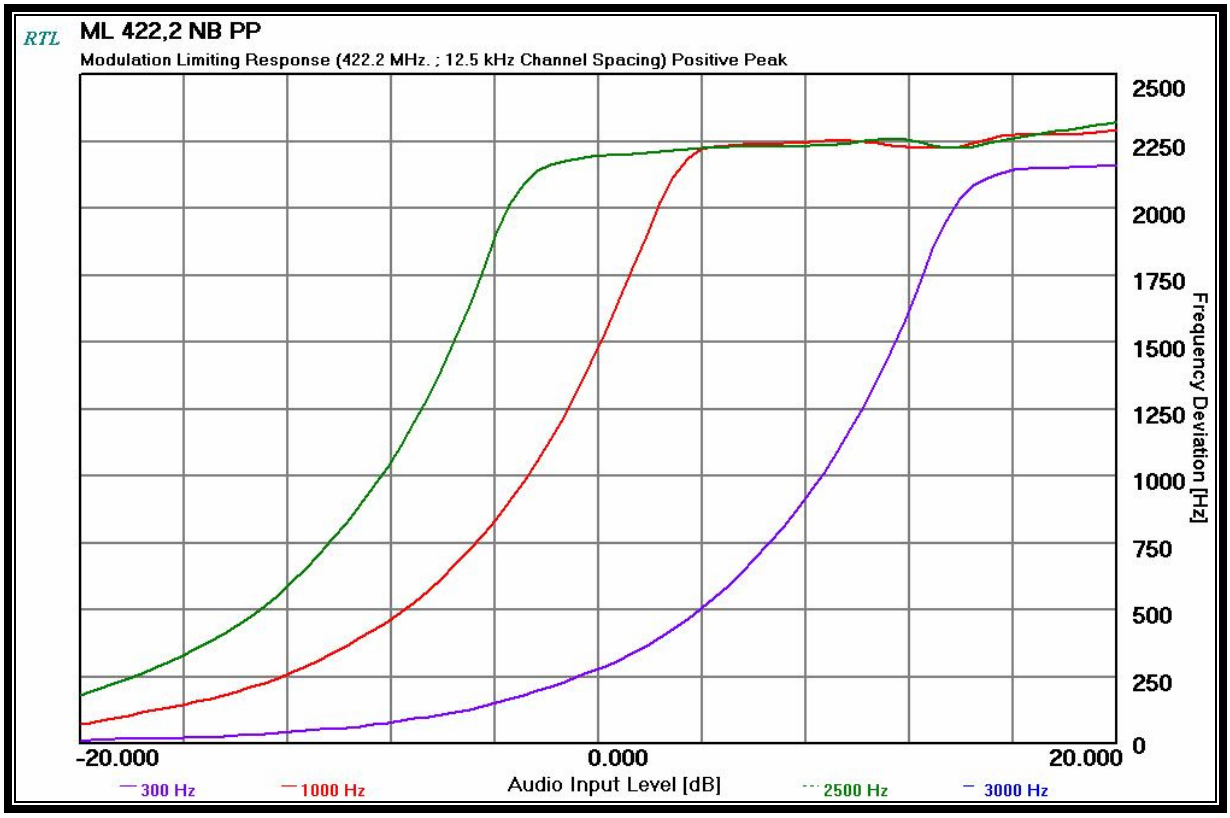
Plot 11-1: Modulation Characteristics – Modulation Limiting: 422.2000 MHz; WB; Positive Peak



Plot 11-2: Modulation Characteristics – Modulation Limiting: 422.2000 MHz; WB; Negative Peak



Plot 11-3: Modulation Characteristics – Modulation Limiting: 422.2000 MHz; NB; Positive Peak



Plot 11-4: Modulation Characteristics – Modulation Limiting: 422.2000 MHz; NB; Negative Peak

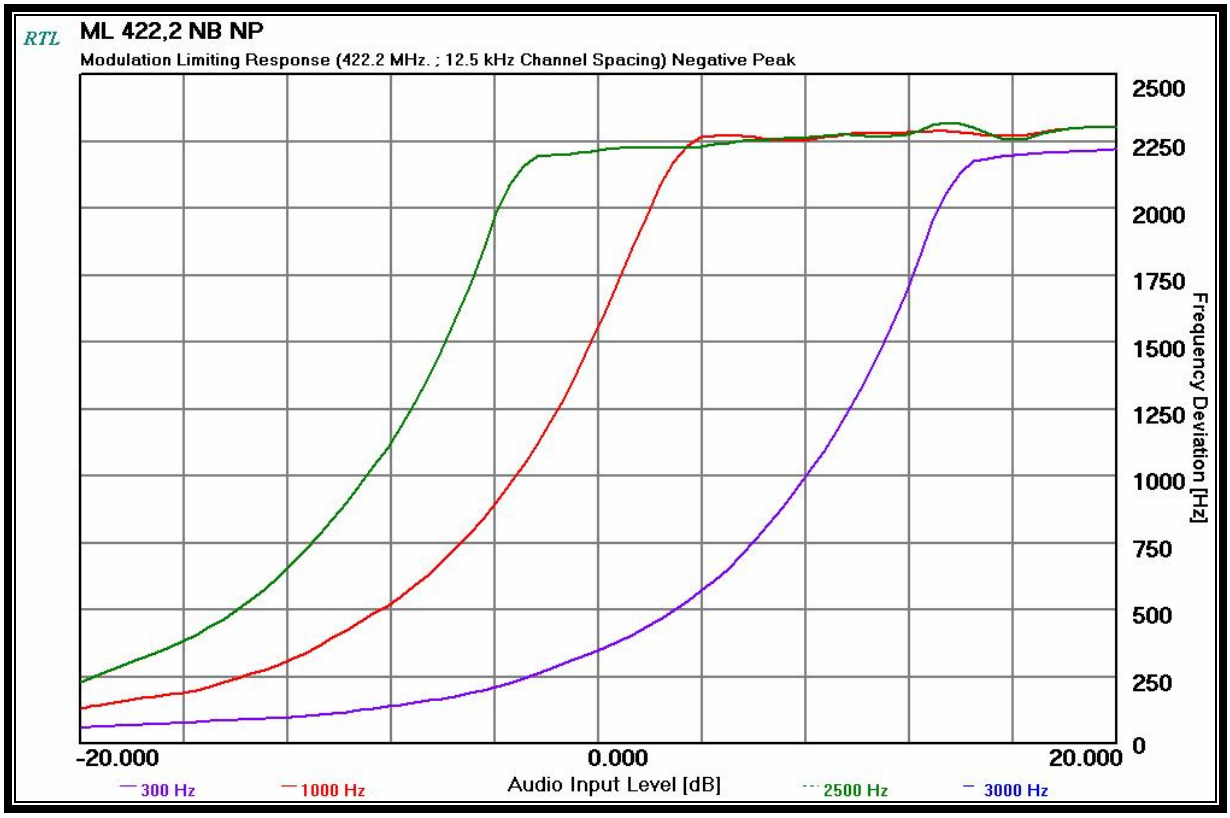


Table 11-1: Test Equipment for Testing Modulation Limiting

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	12/19/07
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	07/21/07
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	10/19/07

Test Personnel:

Daniel Biggs	Daniel Biggs	May 29, 2007
Test Technician/Engineer	Signature	Date Of Test

12 FCC Rules and Regulations Part 2 §2.202: Necessary Bandwidth and Emission Bandwidth

Type of Emission: F3E, F1D, F1E

Voice – Wide Band; 25 kHz Channel Spacing
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 5.0
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 16.0 kHz
Emission designator: 16K0F3E

Voice – Narrow Band; 12.5 kHz Channel Spacing
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

Digital Voice and Data – 2-level FSK; 9600 bps; Wide Band; 25 kHz Channel Spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 3000
Bn = 3.86D + 0.27R = 3.86(3000) + 0.27(9600) = 14.172 kHz
Emission designator: 14K2F1D, 14K2F1E

Digital Voice and Data – 2-level FSK; 9600 bps; Narrow Band; 12.5 kHz Channel Spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 2000
Bn = 3.86D + 0.27R = 3.86(2350) + 0.27(9600) = 10.312 kHz
Emission designator: 10K3F1D, 10K3F1E

Digital Voice and Data – 2-level FSK; 4800 bps; Narrow Band; 12.5 kHz Channel Spacing
Calculation:
Data rate in bps (R) = 4800
Peak deviation of carrier (D) = 1500
Bn = 3.86D + 0.27R = 3.86(1500) + 0.27(4800) = 7.086 kHz
Emission designator: 7K10F1D, 7K10F1E

Digital Data – 4 level C4FM (P25 Standard); 4800 bps; Narrow Band; 12.5 kHz Channel Spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = +/-1.8 kHz
Number of states in each symbol (S) = 2
Bn = $[4800/\log_2(2) + 2(1800)(1)]$ = 8.400 kHz
Emission designator: 8K40F1D, 8K40F1E

13 Conclusion

The data in this measurement report shows that the **M/A-COM, Inc**. Model **P5400 UHF-L Portable Radio, FCC ID: OWDTR-0045-E, IC: 3636B-0045**, complies with all the applicable requirements of Parts 90, 15 and 2 of the FCC Rules and Regulations, and Industry Canada RSS-119, Issue 9, 2007.