Engineering and Testing for EMC and Safety Compliance

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FCC & IC Certification Report

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MODEL: P5400 800 MHz Portable Radio

FCC ID: OWDTR-0043-E
IC: 3636B-0043

February 21, 2008

Standards Referenced for this Report	
Part 2: 2007	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2007	Private Land Portable Radio Services
ANSI TIA-603-C-2004	Land Portable FM or PM Communications Equipment - Measurement and Performance Standards
RSS-119 Issue 9 2007	Land Portable and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz

Frequency Range (MHz)	Rated Conducted Power (W) (HP/LP)	Frequency Tolerance (ppm)	Emission Designator
806-824	3.0/0.5	0.48	16K0F3E (Analog Voice; WB)
806-824	3.0/0.5	0.48	14K0F3E (Analog Voice; NPSPAC)
806-824	3.0/0.5	0.48	14K2F1D/E (2-level FSK; EDACS)
806-824	3.0/0.5	0.48	11K9F1D/E (2-level FSK; EDACS)
806-824	3.0/0.5	0.48	8K40F1D/E (4-level C4FM; P25)
851-869	3.0/0.5	0.48	16K0F3E (Analog Voice; WB)
851-869	3.0/0.5	0.48	14K0F3E (Analog Voice; NPSPAC)
851-869	3.0/0.5	0.48	14K2F1D/E (2-level FSK; EDACS)
851-869	3.0/0.5	0.48	11K9F1D/E (2-level FSK; EDACS)
851-869	3.0/0.5	0.48	8K40F1D/E (4-level C4FM; P25)

Report Prepared by Test Engineer: Daniel Baltzell

Document Number: 2007292

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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 800 MHz Portable Radio, FCC ID: OWDTR-0043-E, IC: 3636B-0043**.

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

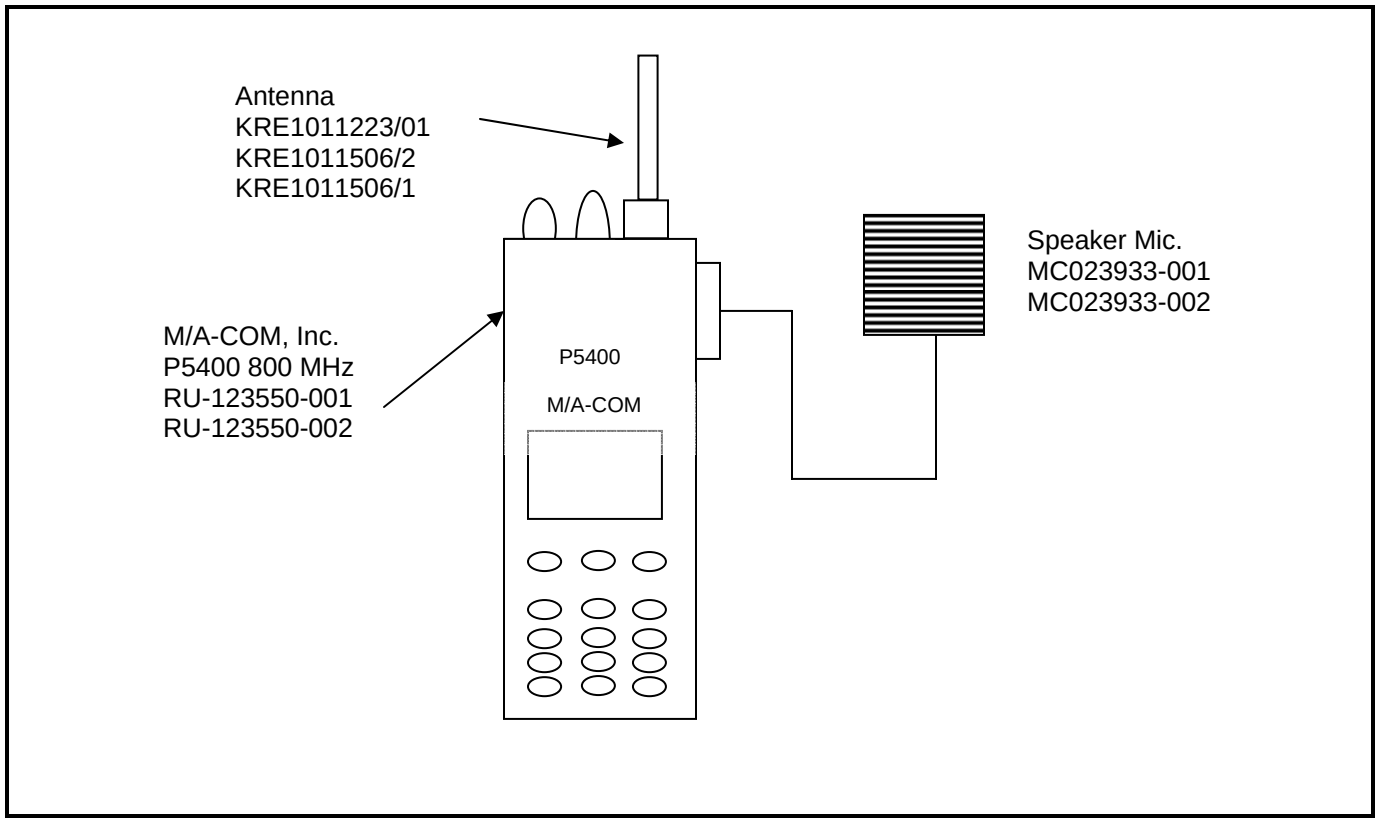
The test sample was received on January 30, 2008. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this testing, as applicable.

Note that the testing covers both the System and Scan version of the P5400. The Scan version is a limited version of the radio with less front panel buttons. The radios are electrically identical except for the lack of buttons on the Scan version.

Table 2-1: Equipment under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Portable Radio	M/A-COM, Inc.	MAEX-C81XX	RU-123550-001 (Scan version)	OWDTR-0043-E	18279
Portable Radio (Adds DTMF keypad)	M/A-COM, Inc.	MAEX-D81XX	RU-123550-002 (System version)	OWDTR-0043-E	18278
Battery	M/A-COM, Inc.	NiMH	BT-023406-003	N/A	17931
Battery	M/A-COM, Inc.	NiCd	BT-023406-001	N/A	17933
Battery	M/A-COM, Inc.	Li-Ion	BT-023406-005	N/A	17932
Microphone	M/A-COM, Inc.	Speaker Mic (w/ antenna)	MC023933-001	N/A	18157
Antenna	M/A-COM, Inc.	High Gain	KRE 101 1506/1	N/A	N/A
Antenna	M/A-COM, Inc.	Wideband Whip	KRE 101 1506/2	N/A	N/A
Antenna	M/A-COM, Inc.	Whip	KRE 101 1223/01	N/A	18277
Battery Charger	M/A-COM, Inc.	8263	00033	N/A	17865

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 V (7.5 V nominal)
NiMH: 6.0 to 9.0 V (7.5 V nominal)
Li-Ion: 6.0 to 9.0 V (7.5 V nominal)
Alkaline: 6.0 to 9.2 V (7.5 V nominal)

Current: 2.5 A

4 FCC Rules and Regulations Part 2 §2.1046(a): RF Conducted Power Output; 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)	809.0	3.3
2(Low Power)	809.0	0.5
3 (High Power)	815.5	3.2
4 (Low Power)	815.5	0.5
5 (High Power)	824.0	3.2
6 (Low Power)	824.0	0.5
7 (High Power)	854.0	3.1
8 (Low Power)	854.0	0.5
9 (High Power)	860.5	3.0
10 (Low Power)	860.5	0.5
11 (High Power)	869.0	3.0
12 (Low Power)	869.0	0.5

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

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

Frequency (MHz)	High Power Rated (W)	Low Power Rated (W)*
806–869	3.0	0.5

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

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	10/24/08
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	10/24/08
900819	Weinschel Corporation	BF0830	Attenuator 10 db	N/A	12/02/08

Test Personnel:

Dan Baltzell		February 1, 2008
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 ohm 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.

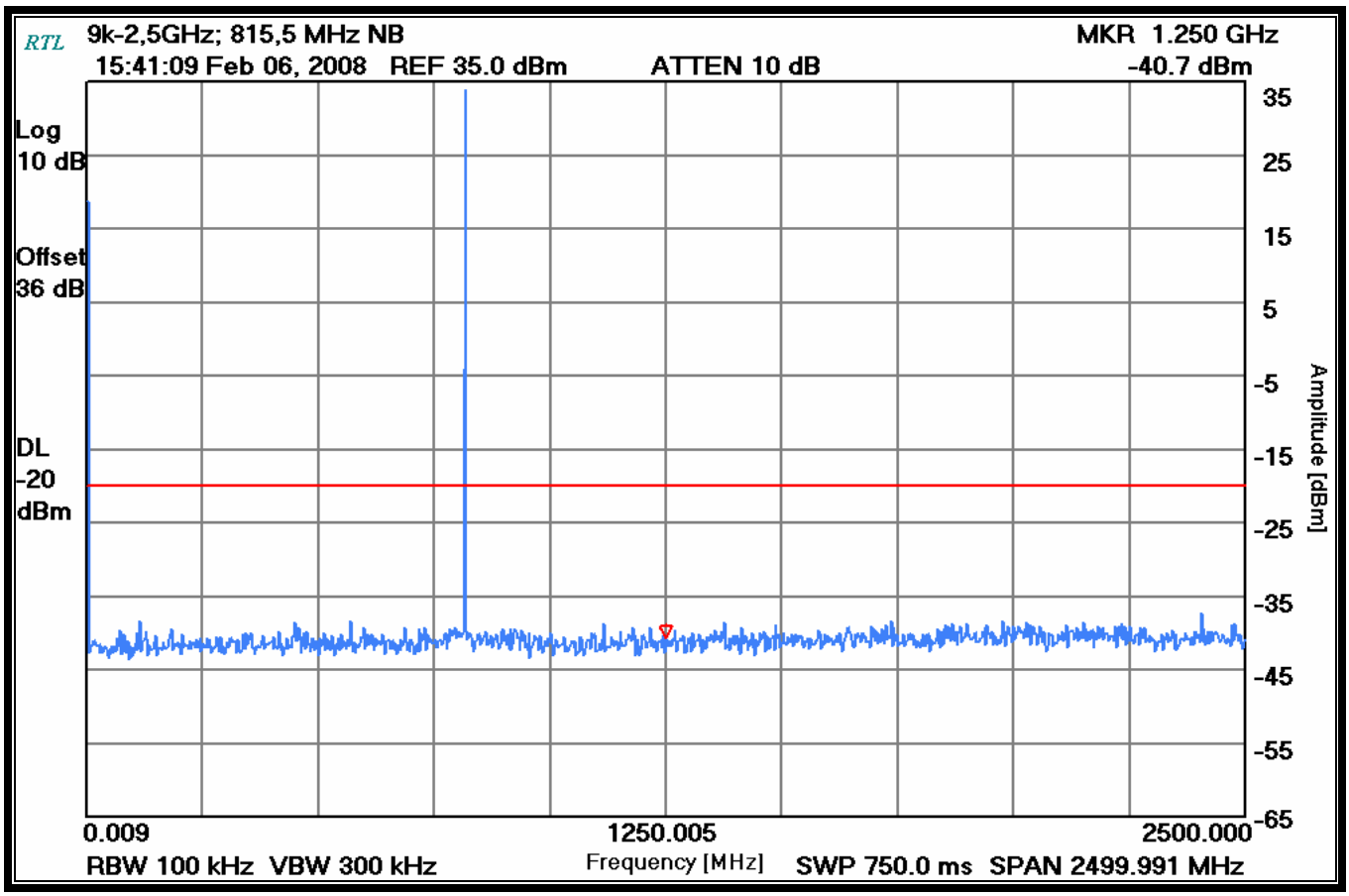
5.2 Test Data

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

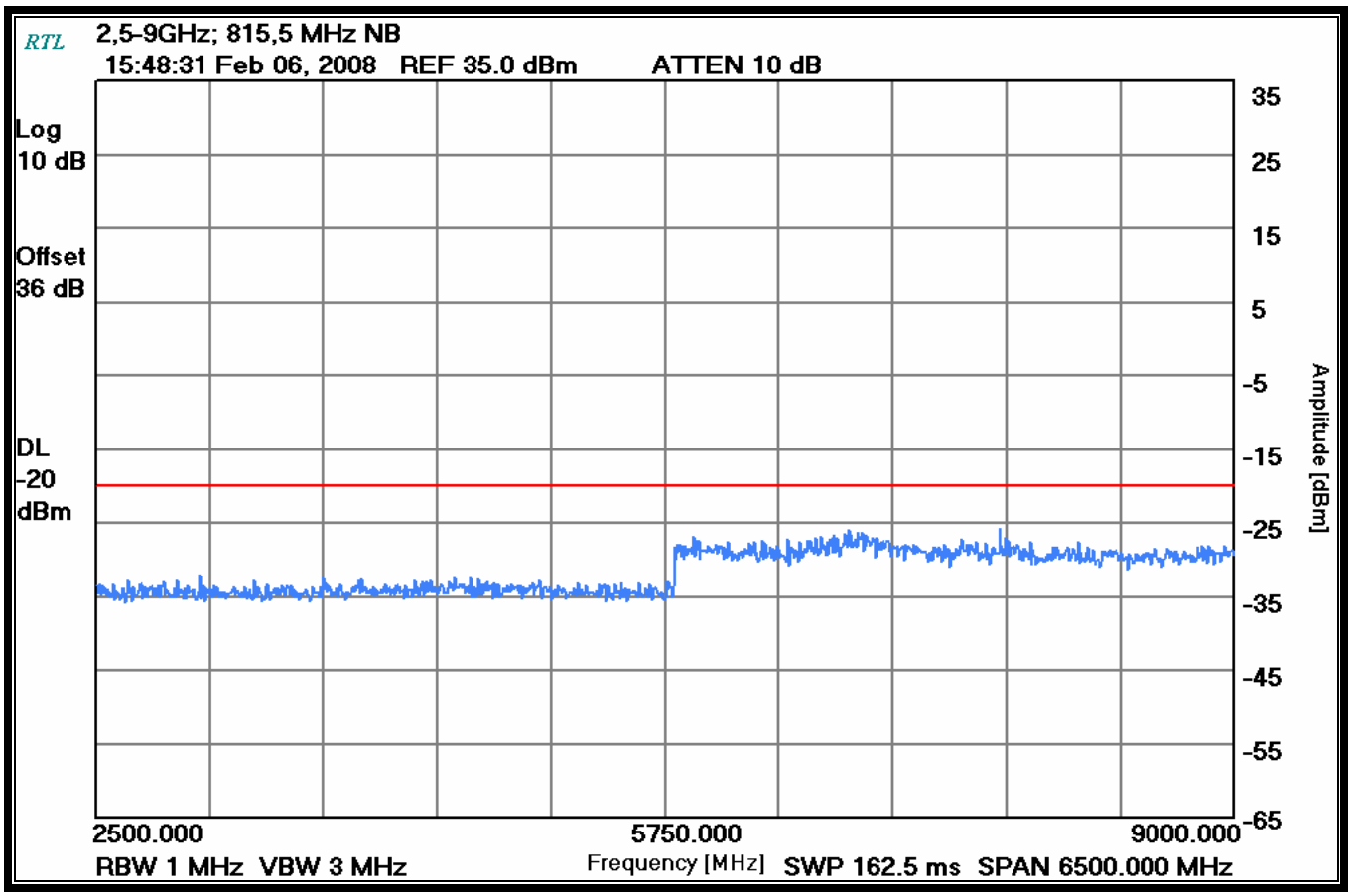
Limit = 50 + 10 Log (P) dB or 70 dB, whichever is greater.

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.

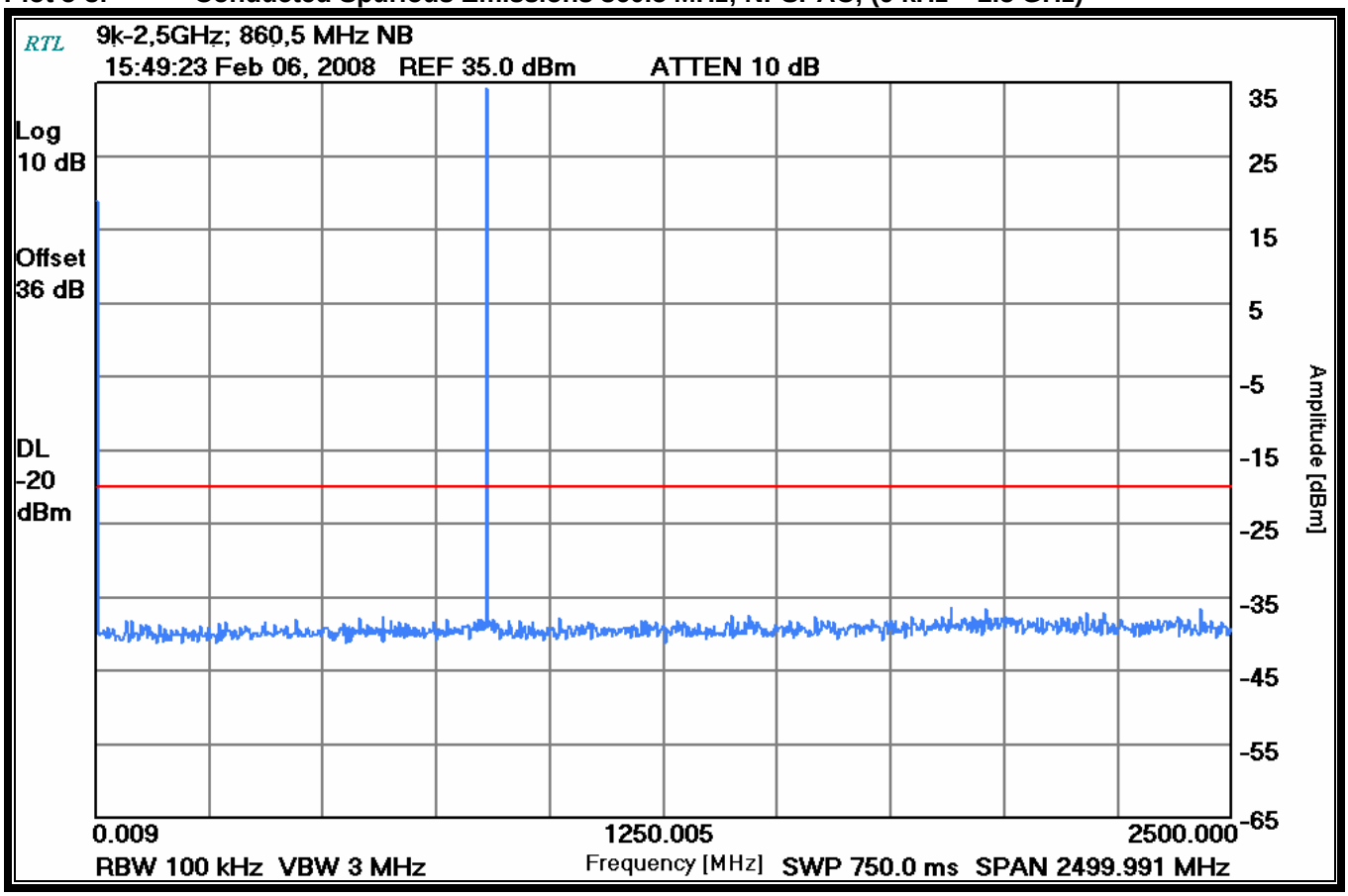
Plot 5-1: Conducted Spurious Emissions 815.5 MHz; NPSPAC; (9 kHz – 2.5 GHz)



Plot 5-2: Conducted Spurious Emissions 815.5 MHz; NPSPAC; (2.5 GHz – 9 GHz)



Plot 5-3: Conducted Spurious Emissions 860.5 MHz; NPSPAC; (9 kHz – 2.5 GHz)



Plot 5-4: Conducted Spurious Emissions 860.5 MHz; NPSPAC; (2.5 GHz – 9 GHz)

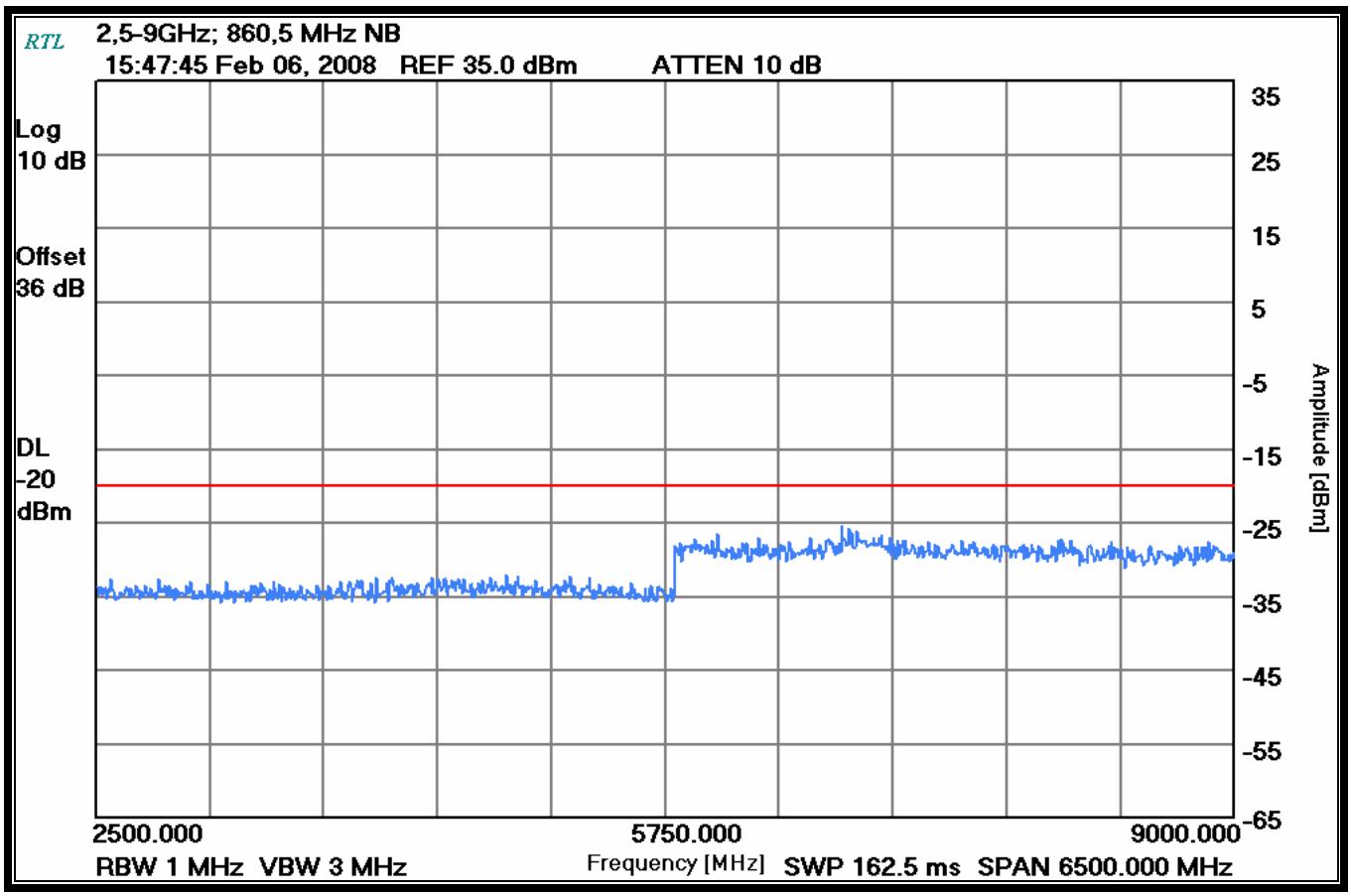


Table 5-1: Test Equipment for Conducted Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/22/08
900819	Weinschel Corporation	BF0830	Attenuator 10 dB	N/A	12/2/08

Test Personnel:

Daniel Baltzell		February 6, 2008
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 ohm 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, high power, are shown.

Table 6-1: Field Strength of Spurious Radiation – 815.5 MHz; NPSPAC; High Power

Freq = 815.5 MHz - Limit = 50 + 10 Log P = 55 dBc - Conducted Power = 35 dBm = 3.2 W

Frequency (MHz)	Measured Level (dBuv)	Polarity (V/H)	Signal Generator Level (dbm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1631.0	40.4	V	-52.8	7.7	5.2	90.3	-35.3
1631.0	45.0	H	-51.1	7.7	5.2	88.6	-33.6
2446.5	29.2	V	-63.1	9.6	7.0	100.7	-45.7
2446.5	27.0	H	-62.2	9.6	7.0	99.8	-44.8
3262.0	27.0	V	-62.0	10.9	7.5	100.4	-45.4
3262.0	27.0	H	-56.6	10.9	7.5	95.0	-40.0
4077.5	25.6	V	-55.0	12.1	7.5	94.6	-39.6
4077.5	25.6	H	-57.4	12.1	7.5	97.0	-42.0
4893.0	26.9	V	-54.9	13.1	8.4	94.6	-39.6
4893.0	26.9	H	-55.7	13.1	8.4	95.4	-40.4
5708.5	26.4	V	-56.9	14.1	8.5	97.5	-42.5
5708.5	26.4	H	-56.6	14.1	8.5	97.2	-42.2
6524.0	29.4	V	-53.3	15.1	9.3	94.1	-39.1
6524.0	28.4	H	-38.3	15.1	9.3	79.1	-24.1
7339.5	26.2	V	-55.1	14.9	8.9	96.1	-41.1
7339.5	26.2	H	-53.4	14.9	8.9	94.4	-39.4
8155.0	25.7	V	-48.1	15.4	9.0	89.5	-34.5
8155.0	25.7	H	-49.0	15.4	9.0	90.4	-35.4

Table 6-2: Field Strength of Spurious Radiation – 860.5 MHz; NPSPAC; High Power

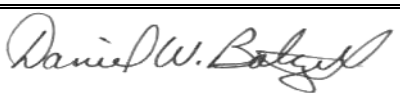
Freq = 860.5 MHz - Limit = 50 + 10 Log P = 54.7dBc - Conducted Power = 34.7 dBm = 2.95 W

Frequency (MHz)	Measured Level (dBuv)	Polarity (V/H)	Signal Generator Level (dbm)	Cable Loss (dB)	Antenna Gain (dBd)	Limit (dBc)	Margin (dB)
1721.0	66.2	V	-25.1	7.9	0.4	67.3	-12.6
1721.0	48.8	H	-46.7	7.9	0.4	88.9	-34.2
2581.5	31.7	V	-59.6	9.7	7.2	96.8	-42.1
2581.5	30.8	H	-59.5	9.7	7.2	96.7	-42.0
3442.0	27.6	V	-57.7	11.2	7.5	96.1	-41.4
3442.0	27.6	H	-57.5	11.2	7.5	95.9	-41.2
4302.5	42.6	V	-41.4	12.6	8.0	80.7	-26.0
4302.5	46.1	H	-37.1	12.6	8.0	76.4	-21.7
5163.0	26.5	V	-54.4	13.2	8.3	94.0	-39.3
5163.0	26.4	H	-52.8	13.2	8.3	92.4	-37.7
6023.5	26.7	V	-58.1	14.4	8.9	98.3	-43.6
6023.5	26.7	H	-57.0	14.4	8.9	97.2	-42.5
6884.0	32.0	V	-49.9	15.1	9.3	90.4	-35.7
6884.0	33.1	H	-47.5	15.1	9.3	88.0	-33.3
7744.5	28.0	V	-54.2	15.1	8.8	95.2	-40.5
7744.5	28.1	H	-52.6	15.1	8.8	93.6	-38.9
8605.0	26.9	V	-45.9	16.0	9.0	87.6	-32.9
8605.0	26.9	H	-45.2	16.0	9.0	86.9	-32.2

Table 6-3: Test Equipment for Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	12/20/08
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
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	10/17/08
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/5/08
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/5/08
901426	Insulated Wire Inc.	KPS-1503-3600-KPS	RF cable, 30'	NA	10/5/08
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	2/1/09
901365	Miteq	JS4-00102600-41-5P	Amplifier, 0.1 - 26 GHz, 30dB gain	N/A	10/8/08

Test Personnel:

Daniel Baltzell		February 5, 2008
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 ohm 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 G: For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

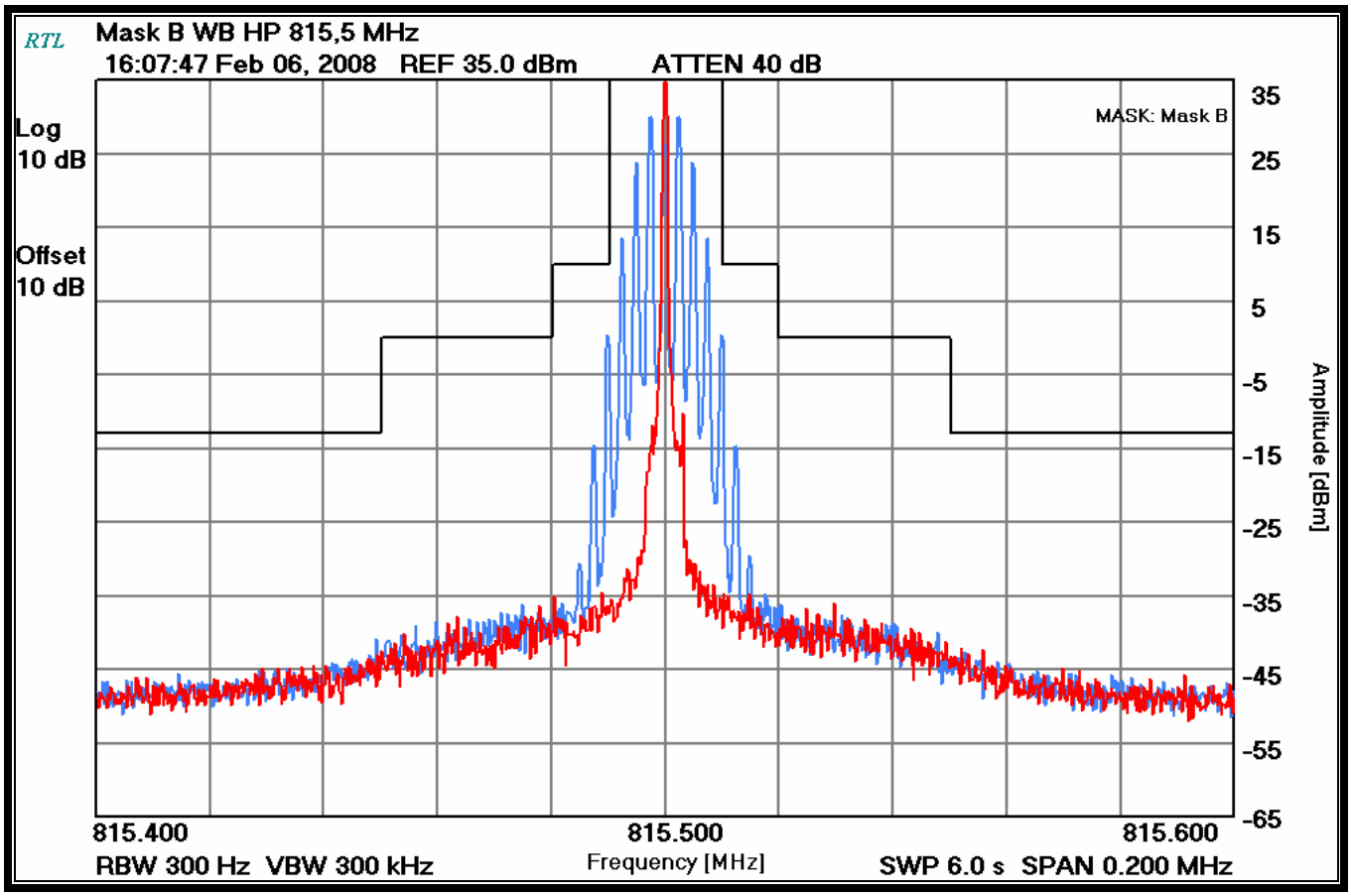
(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: **at least 116 log (fd/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation**;
(2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: **at least 43 + 10 log (P) dB**.

Limit Mask H: For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

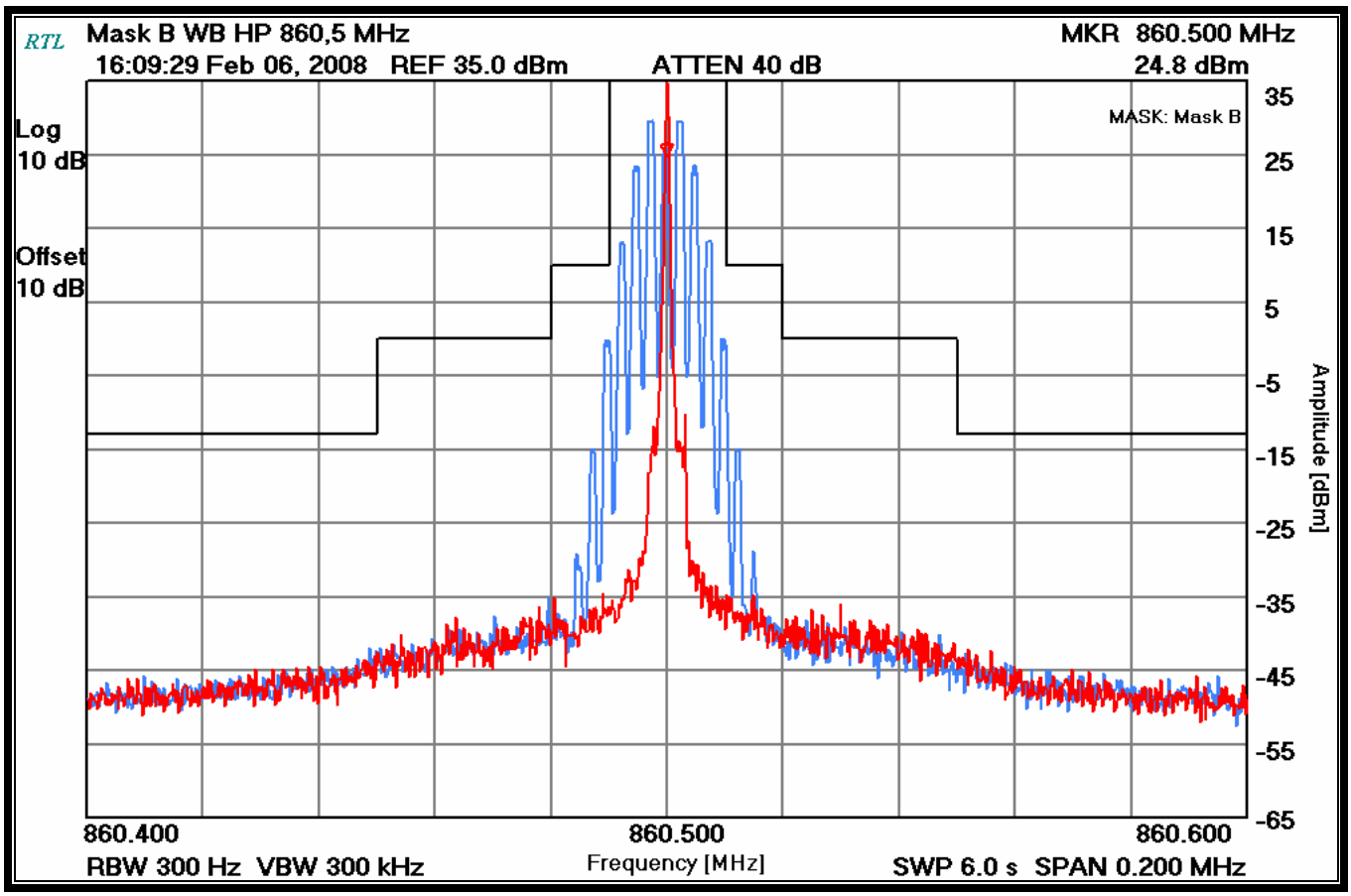
(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of 4 kHz or less: **Zero dB**.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 4 kHz, but no more than 8.5 kHz: **at least 107 log (fd/4) dB**;
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 8.5 kHz, but no more than 15 kHz: at **least 40.5 log (fd/1.16) dB**;
(4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 15 kHz, but no more than 25 kHz: **at least 116 log (fd/6.1) dB**;
(5) On any frequency removed from the center of the authorized bandwidth by more than 25 kHz: **at least 43 + log (P) dB**.

7.2 Test Data

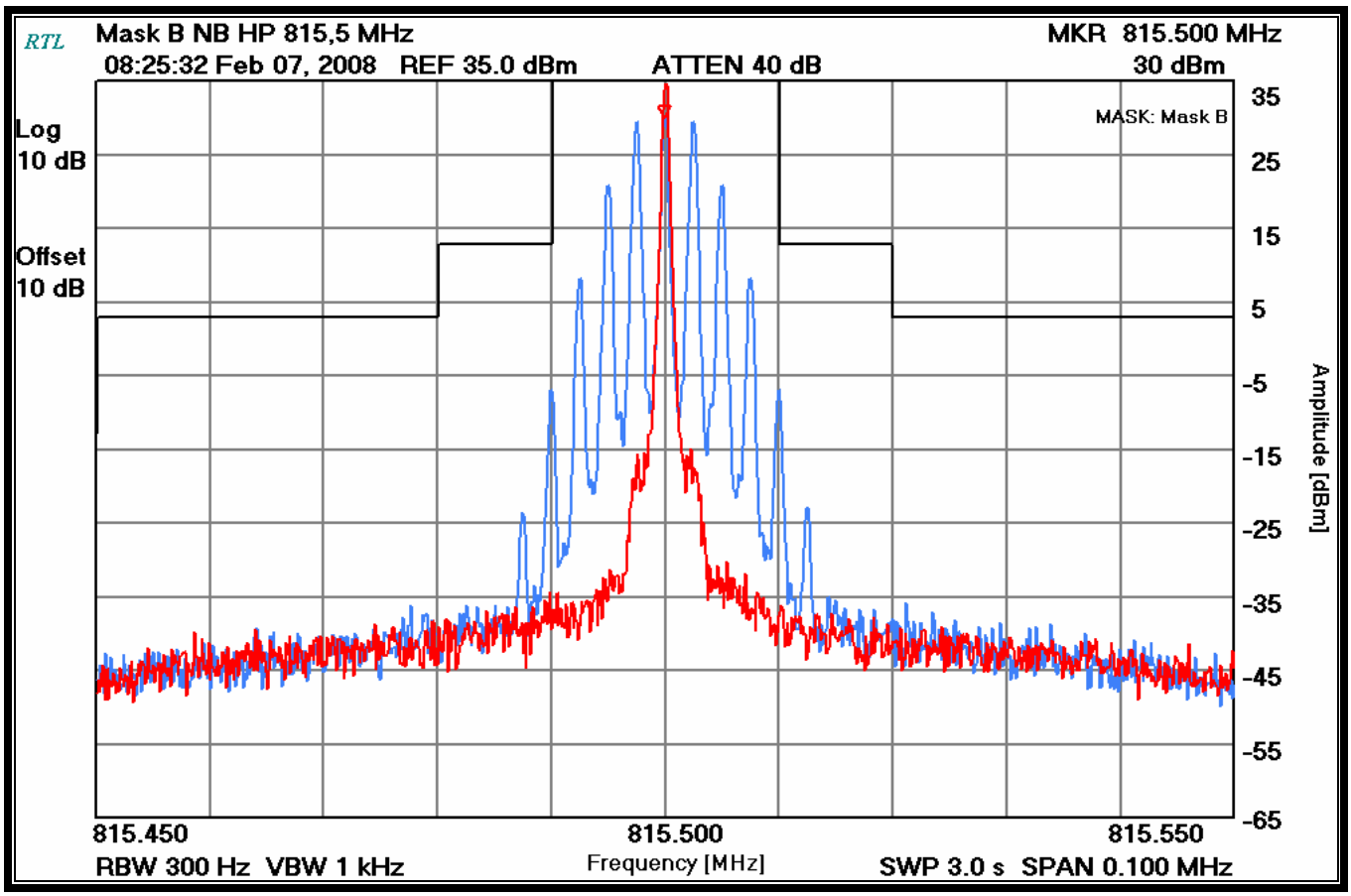
Plot 7-1: Occupied Bandwidth – 815.5 MHz; Mask B; Wide Band Analog; High Power



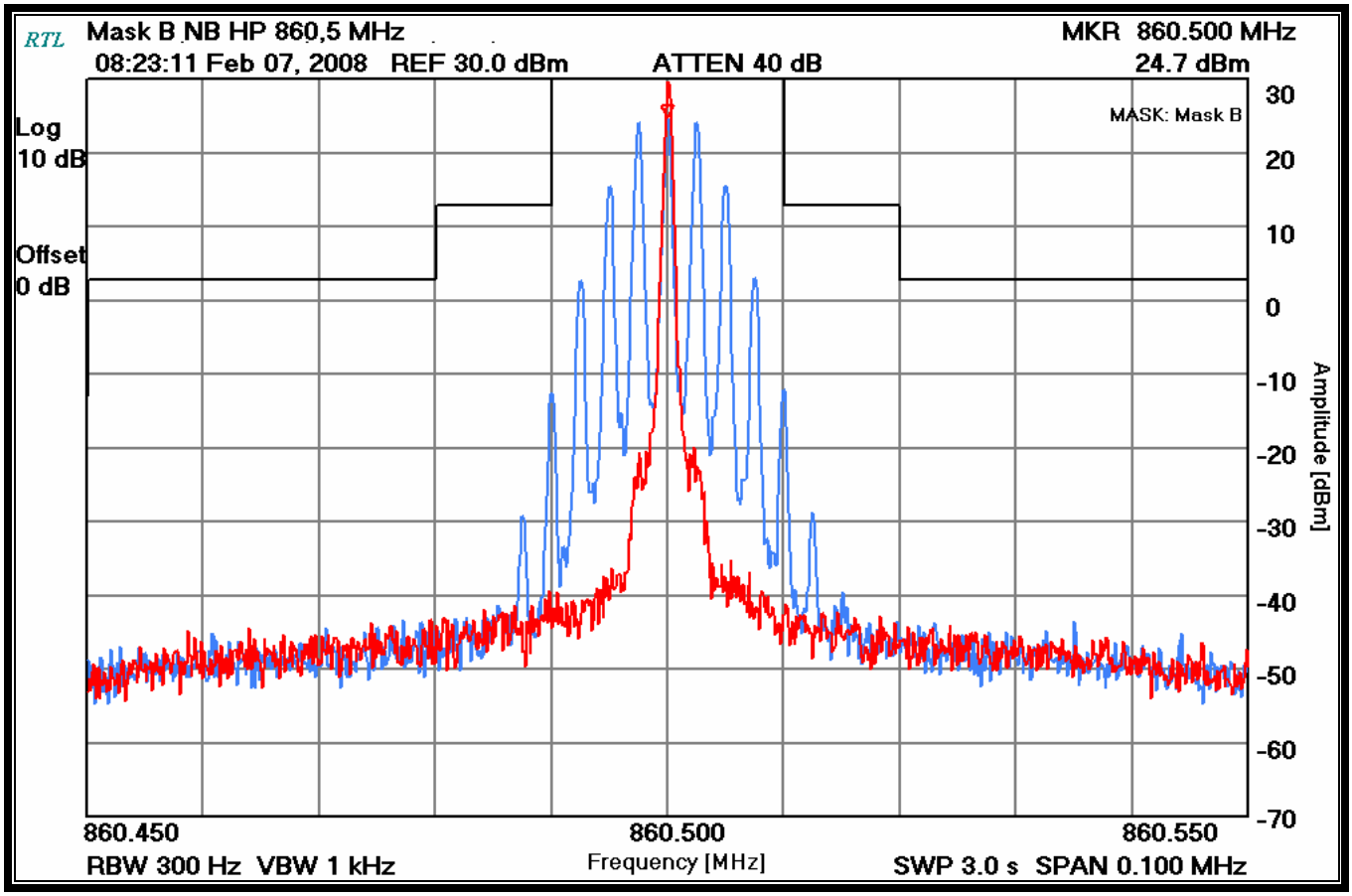
Plot 7-2: Occupied Bandwidth – 860.5 MHz; Mask B; Wide Band Analog; High Power



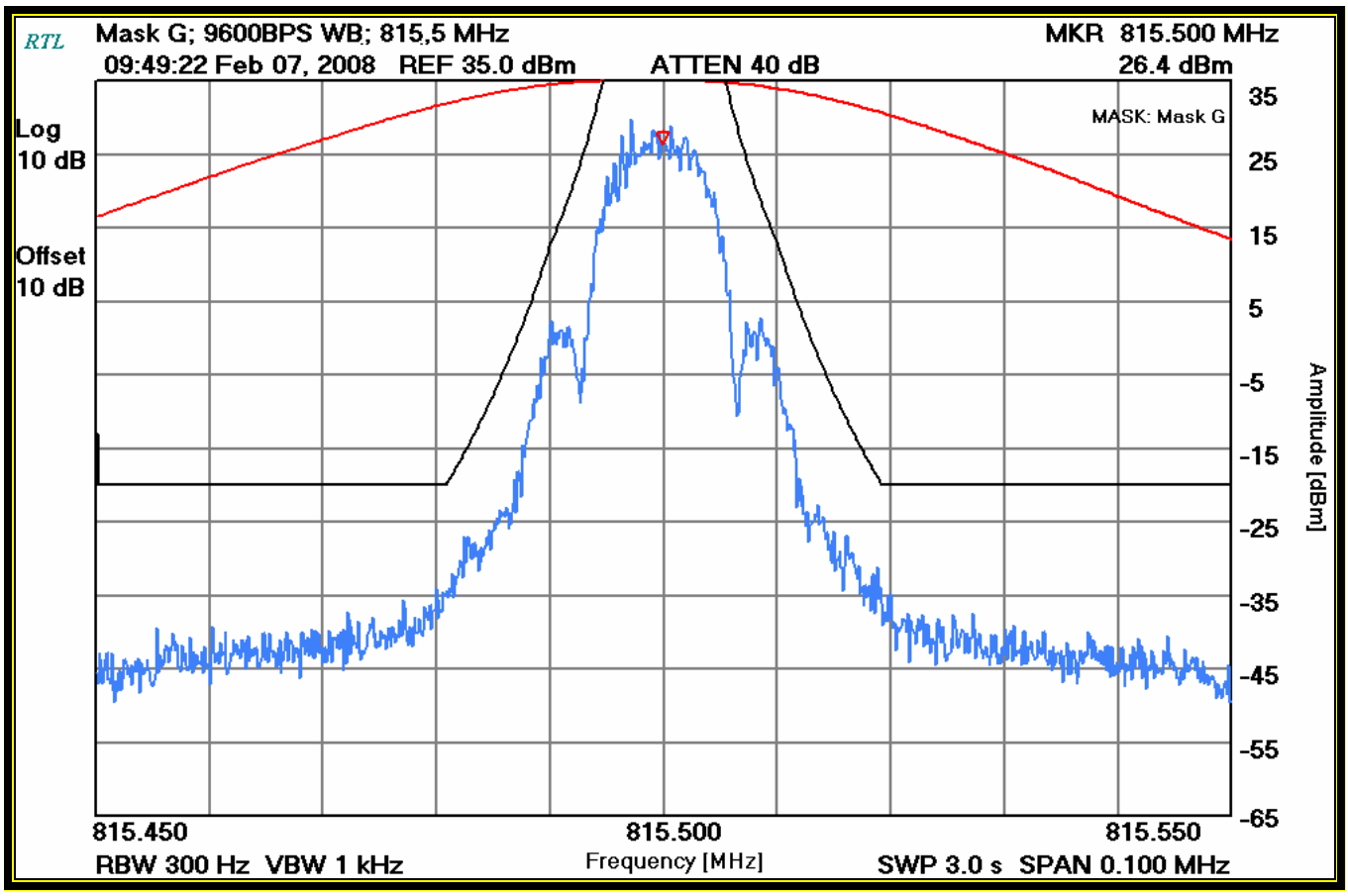
Plot 7-3: Occupied Bandwidth – 815.5 MHz; Mask B; NPSPAC; Analog; High Power



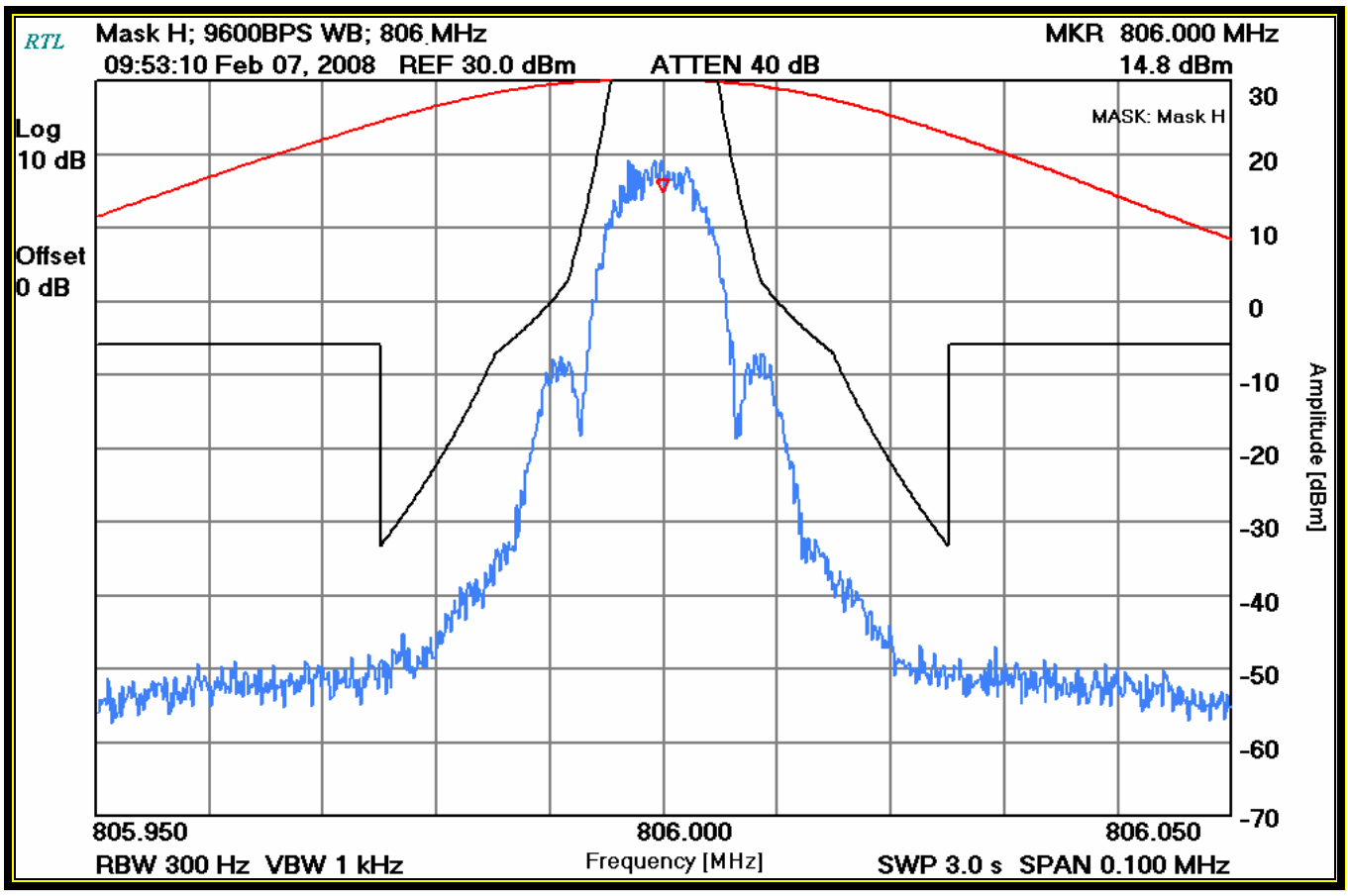
Plot 7-4: Occupied Bandwidth – 860.5 MHz; Mask B; NPSPAC; Analog; High Power



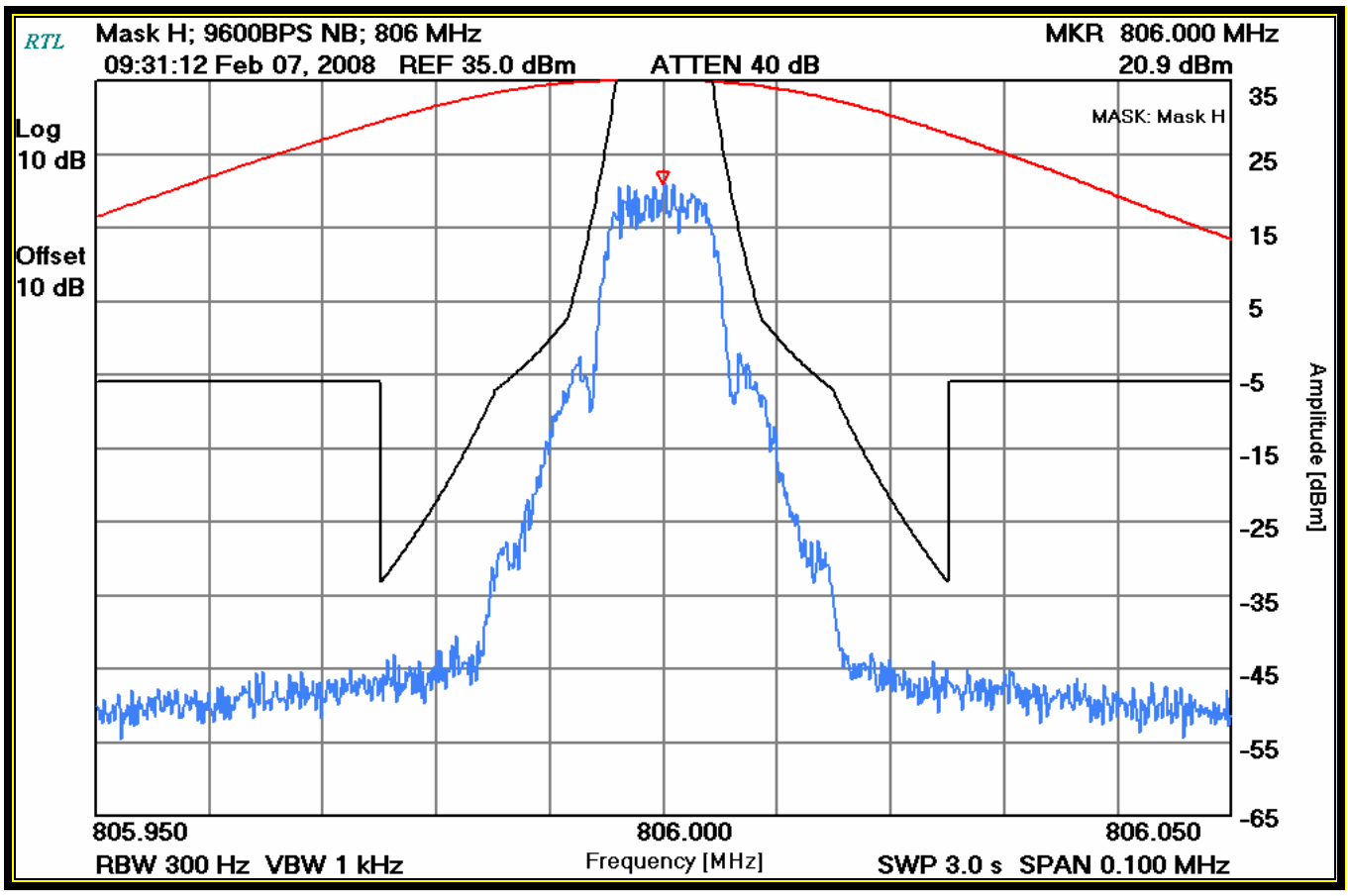
Plot 7-5: Occupied Bandwidth – 815.5 MHz; Mask G; Wide Band; 2-level FSK; 9600 BPS



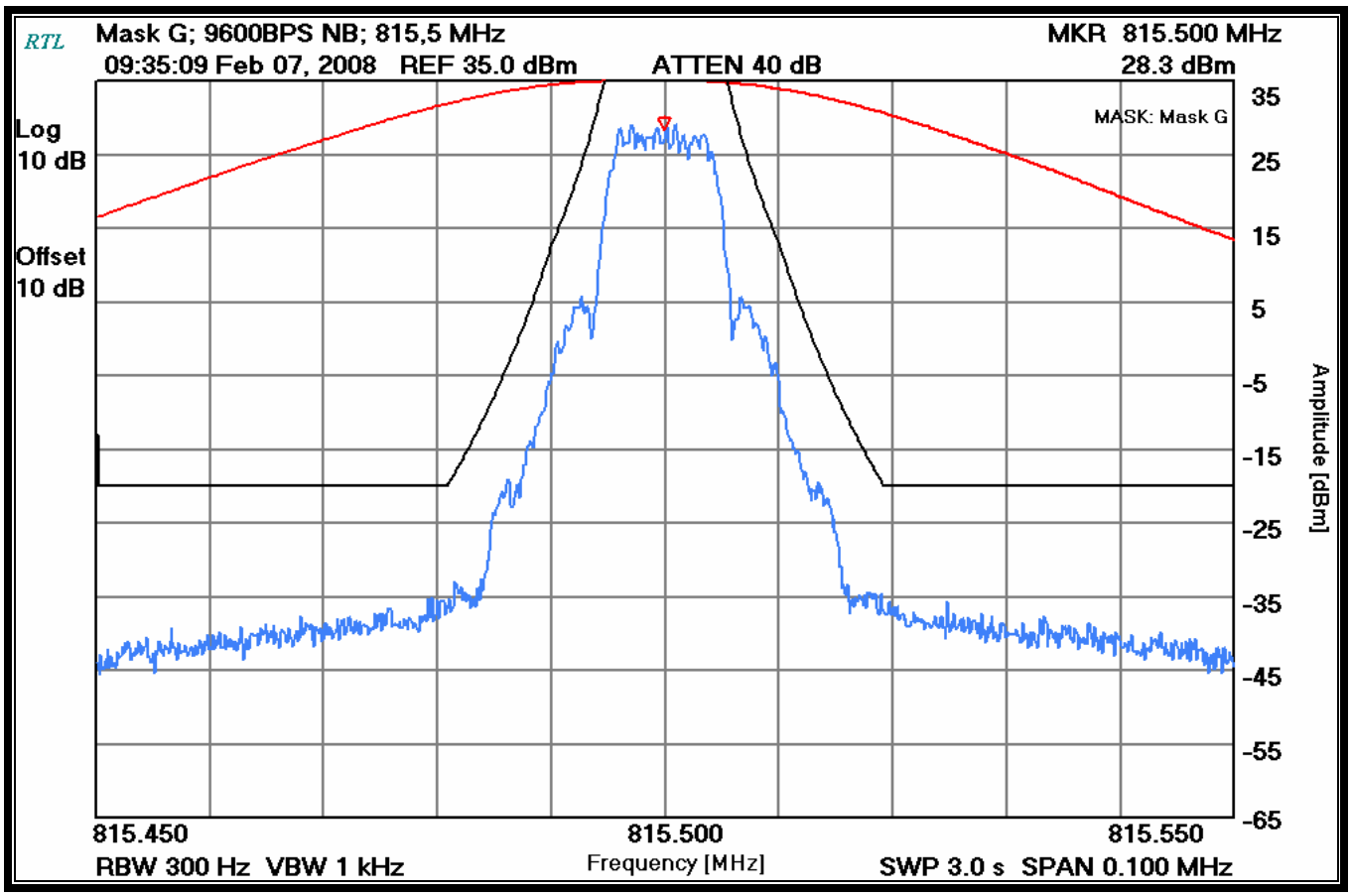
Plot 7-6: Occupied Bandwidth – 806 MHz; Mask H; Wide Band; 2-level FSK; 9600 BPS



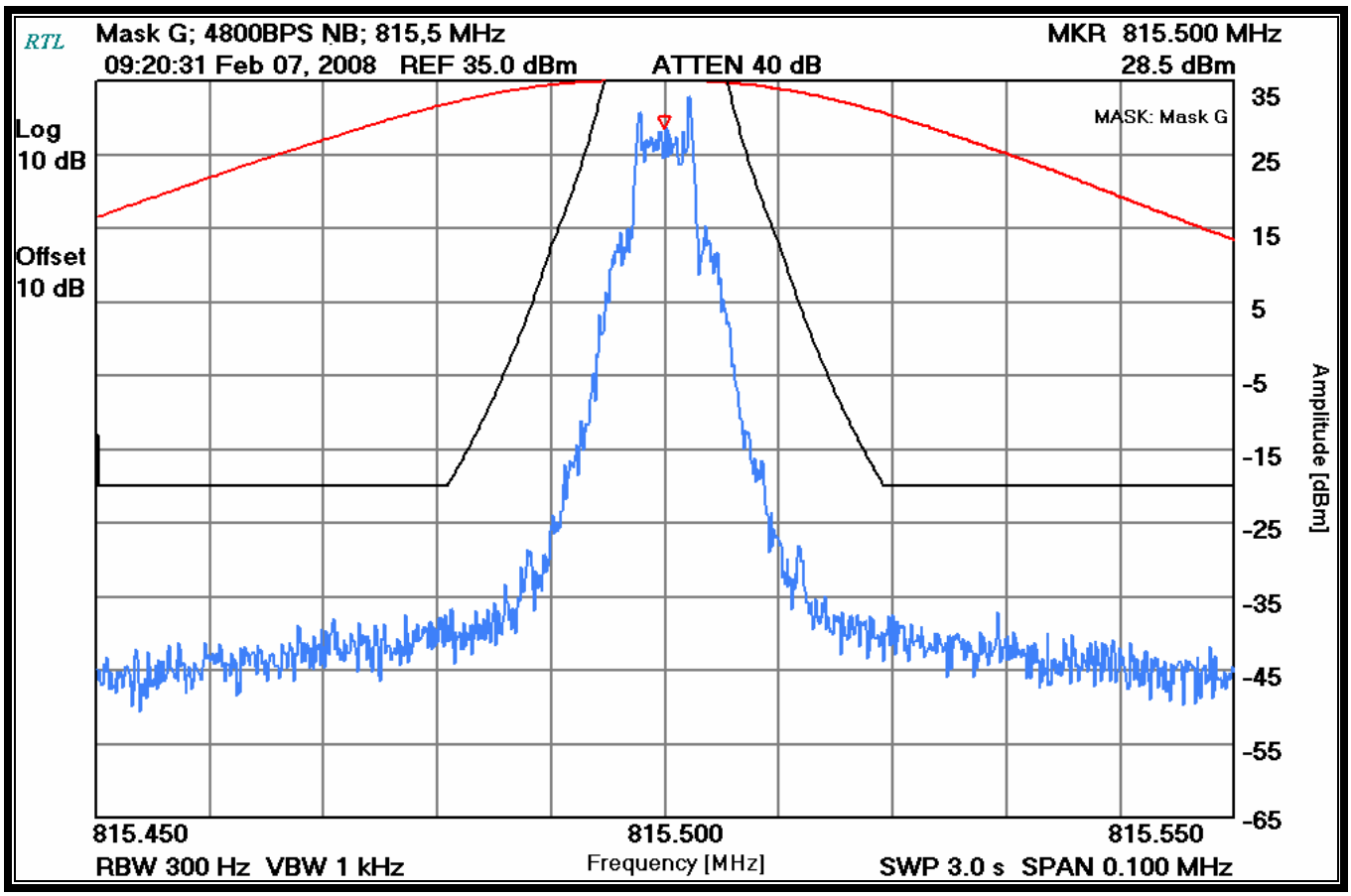
Plot 7-7: Occupied Bandwidth – 806 MHz; Mask H; NPSPAC; 2-level FSK; 9600 BPS



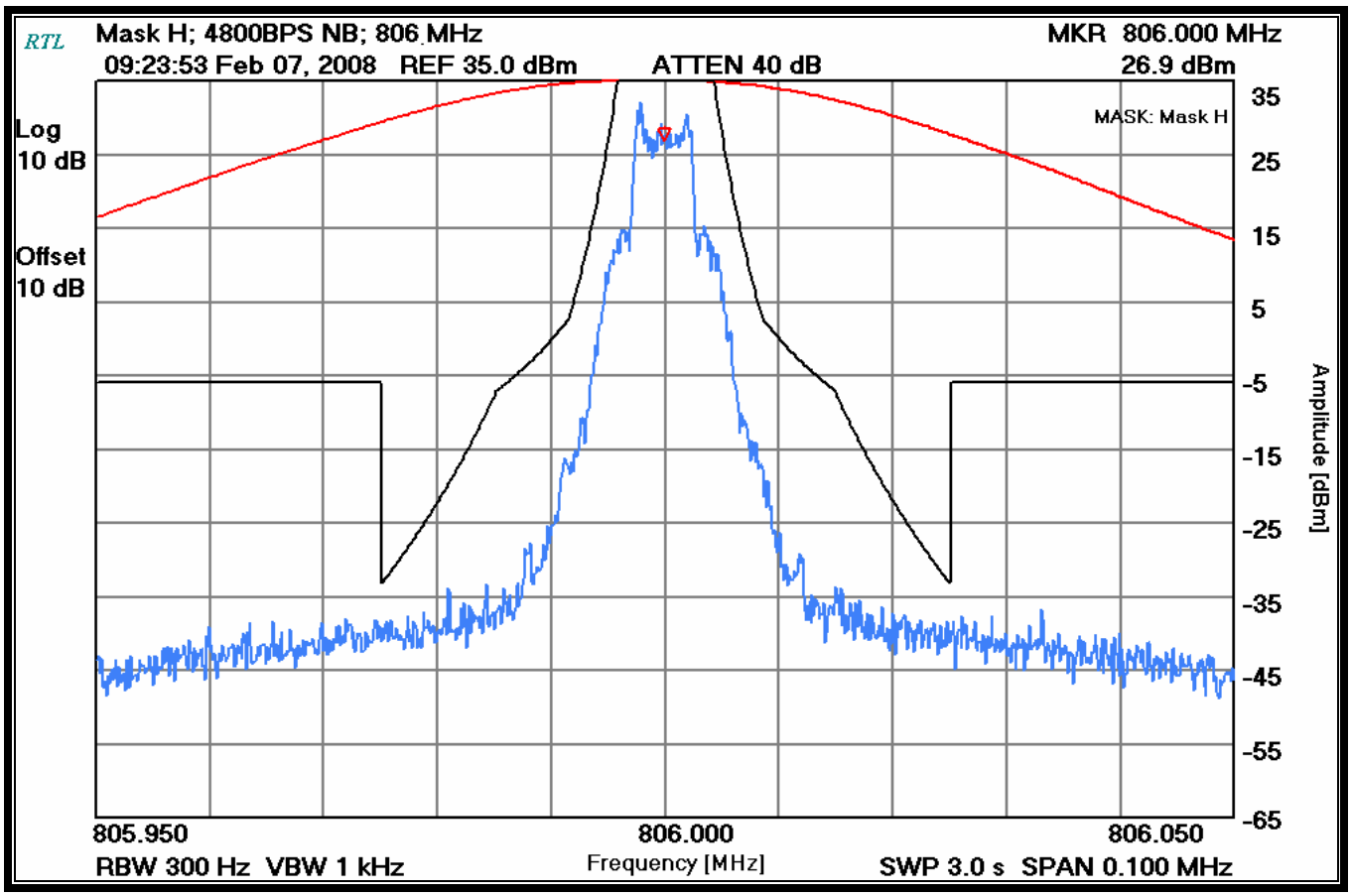
Plot 7-8: Occupied Bandwidth – 815.5 MHz; Mask G; NPSPAC; 2-level FSK; 9600 BPS



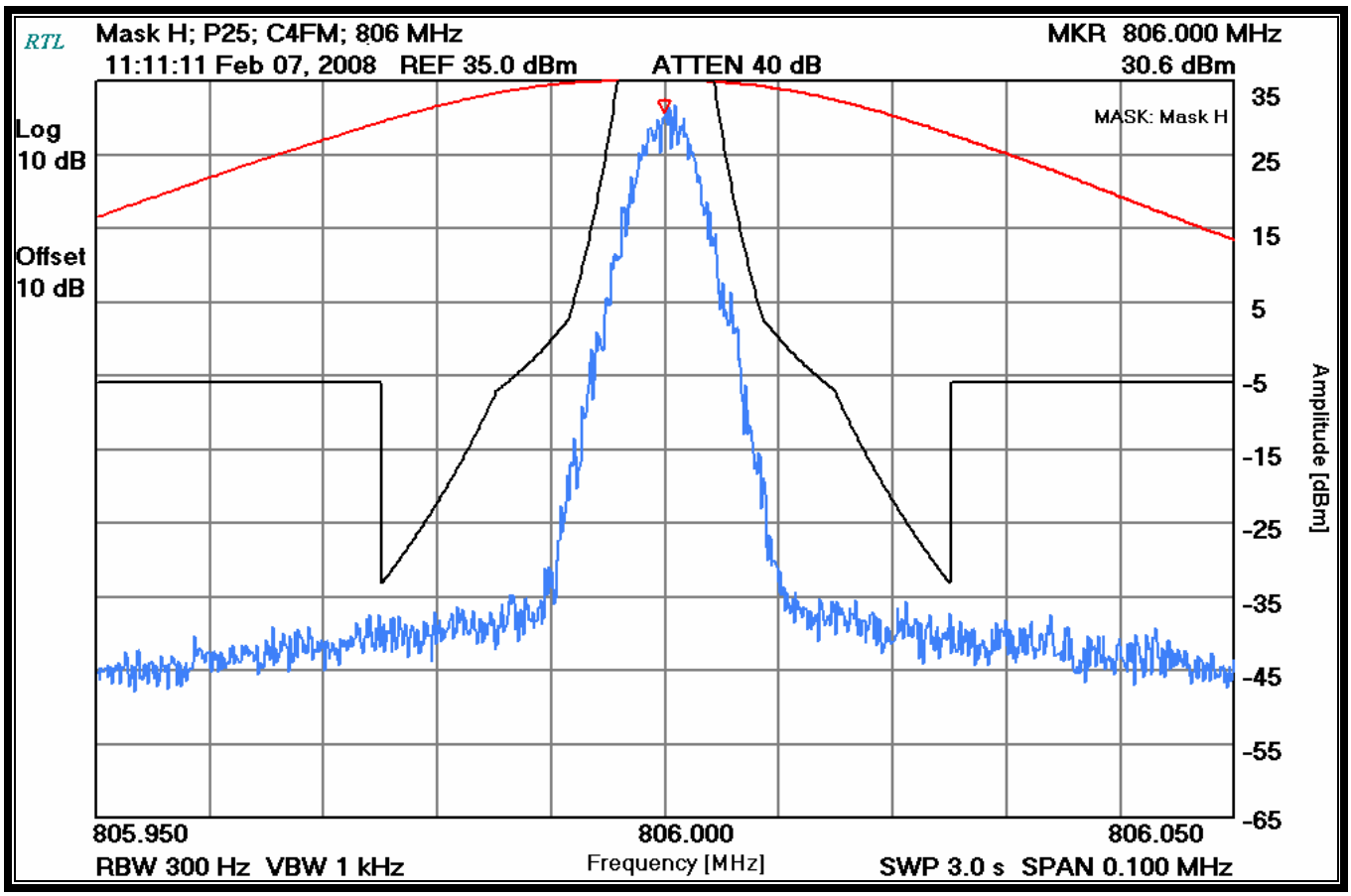
Plot 7-9: Occupied Bandwidth – 815.5 MHz; Mask G; NPSPAC; 2-level FSK; 4800 BPS



Plot 7-10: Occupied Bandwidth – 806 MHz; Mask H; NPSPAC; 2-level FSK; 4800 BPS



Plot 7-11: Occupied Bandwidth – 806 MHz; Mask H; C4FM; NPSPAC; 4-Level FSK; 9600 BPS



Plot 7-12: Occupied Bandwidth – 815.5 MHz; Mask G; NPSPAC; C4FM; 4-Level FSK; 9600 BPS

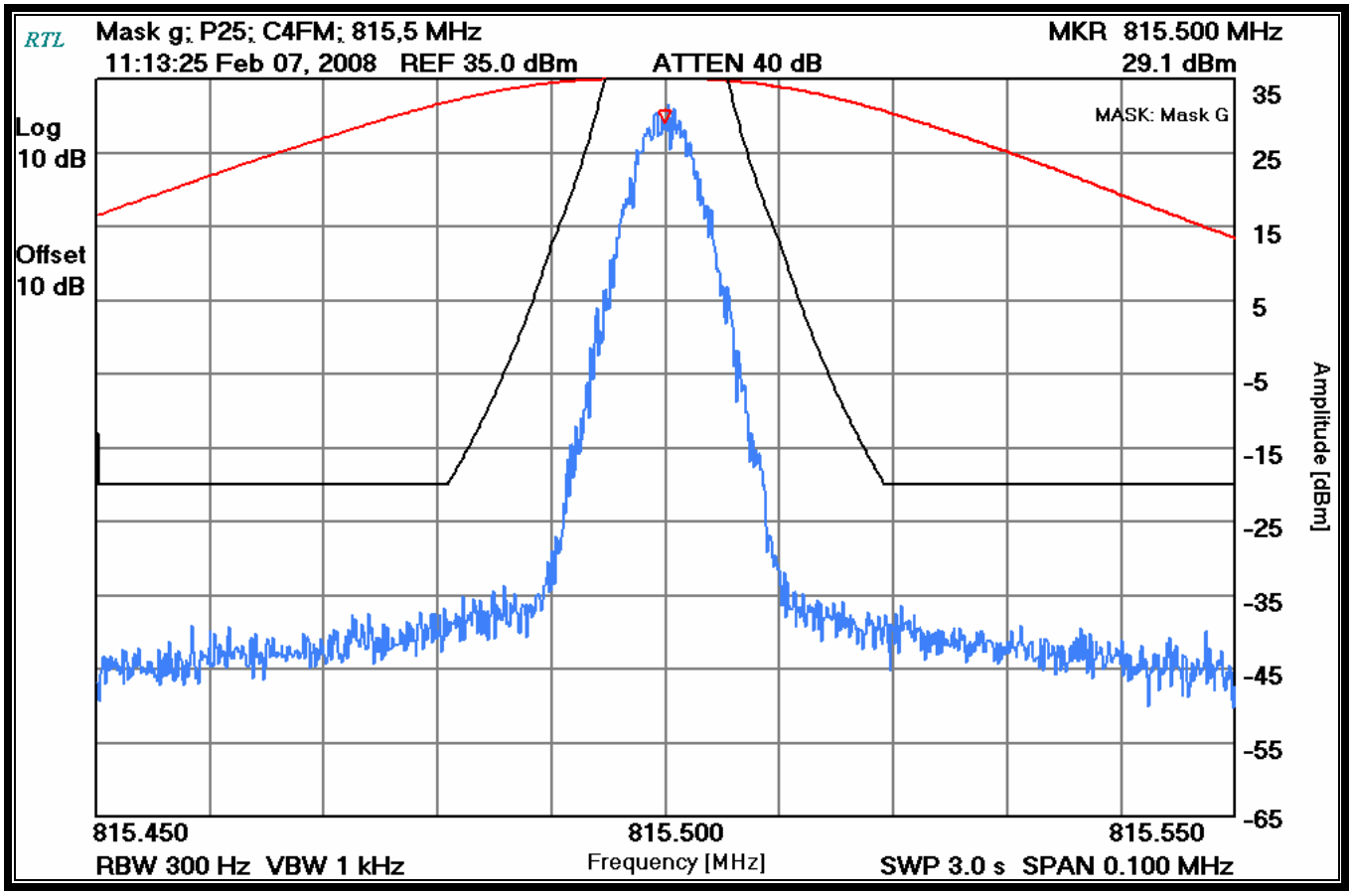
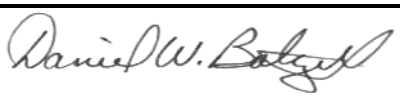


Table 7-1: Test Equipment for Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/22/08
900819	Weinschel Corporation	BF0830	Attenuator 10 dB	N/A	12/2/08
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz - 1300 MHz)	2406A00178	8/20/08
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	12/13/08

Test Personnel:

Daniel Baltzell		February 6 & 7, 2008
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 115% of nominal value.

The worst-case test data are shown below.

8.2 Test Data

8.2.1 CFR 47 Part 90.213 Requirements

For mobile transmitters over 2 Watts output power:

806-809 MHz band: 1.5 ppm
809-824 MHz band: 2.5 ppm
851-854 MHz band: 1.5 ppm
854-869 MHz band: 2.5 ppm

8.2.2 Frequency Stability/Temperature Variation

Plot 8-1: Temperature Frequency Stability – 806 MHz Channel

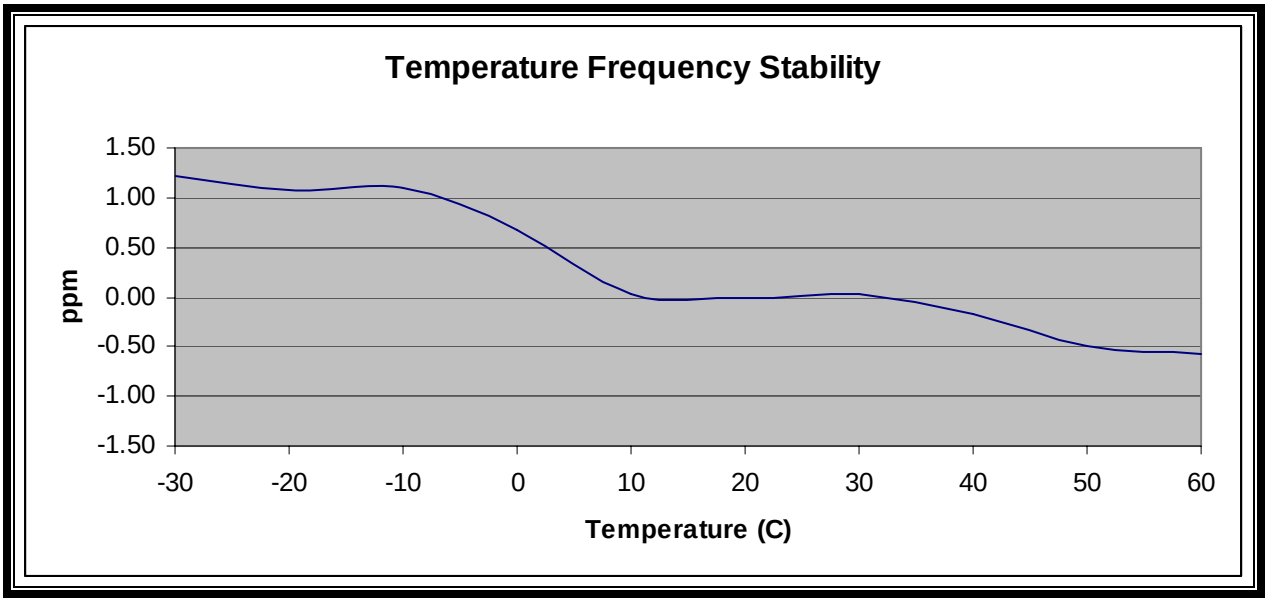


Table 8-1: Frequency Stability/Temperature Variation – 806 MHz

Temperature °C	Measured Frequency (MHz)	Ppm
-30	806.000988	1.20
-20	806.000871	1.06
-10	806.000879	1.07
0	806.000544	0.66
10	806.000023	0.03
20	806.000000	0.00
30	806.000028	0.03
40	806.999854	-0.18
50	806.999604	-0.48
60	806.999541	-0.56

8.2.3 Frequency Stability/Voltage Variation

Plot 8-2: Voltage Frequency Stability – 806 MHz Channel

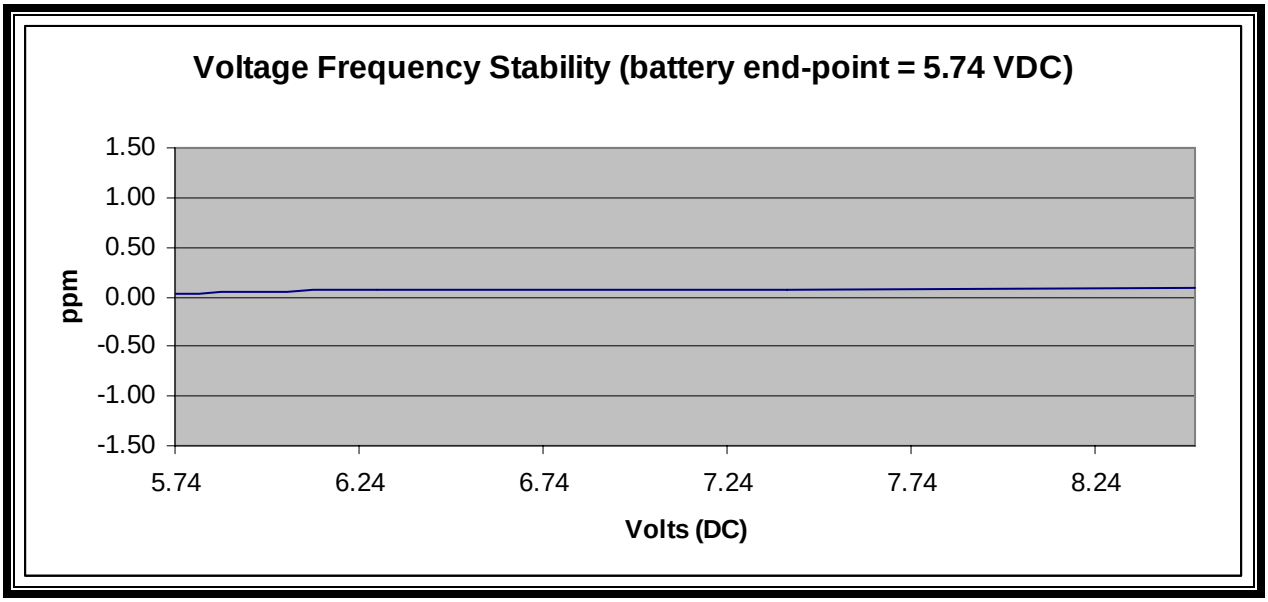


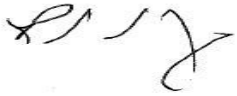
Table 8-2: Frequency Stability/Voltage Variation – 806 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
5.74	806.000017	0.02
6.29	806.000058	0.07
7.4	806.000058	0.07
8.51	806.000067	0.08

Table 8-3: Test Equipment for Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	3/27/08
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	1/30/09

Test Personnel:

Rick McLay		February 1, 2008
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; 815.5 MHz; Wide Band

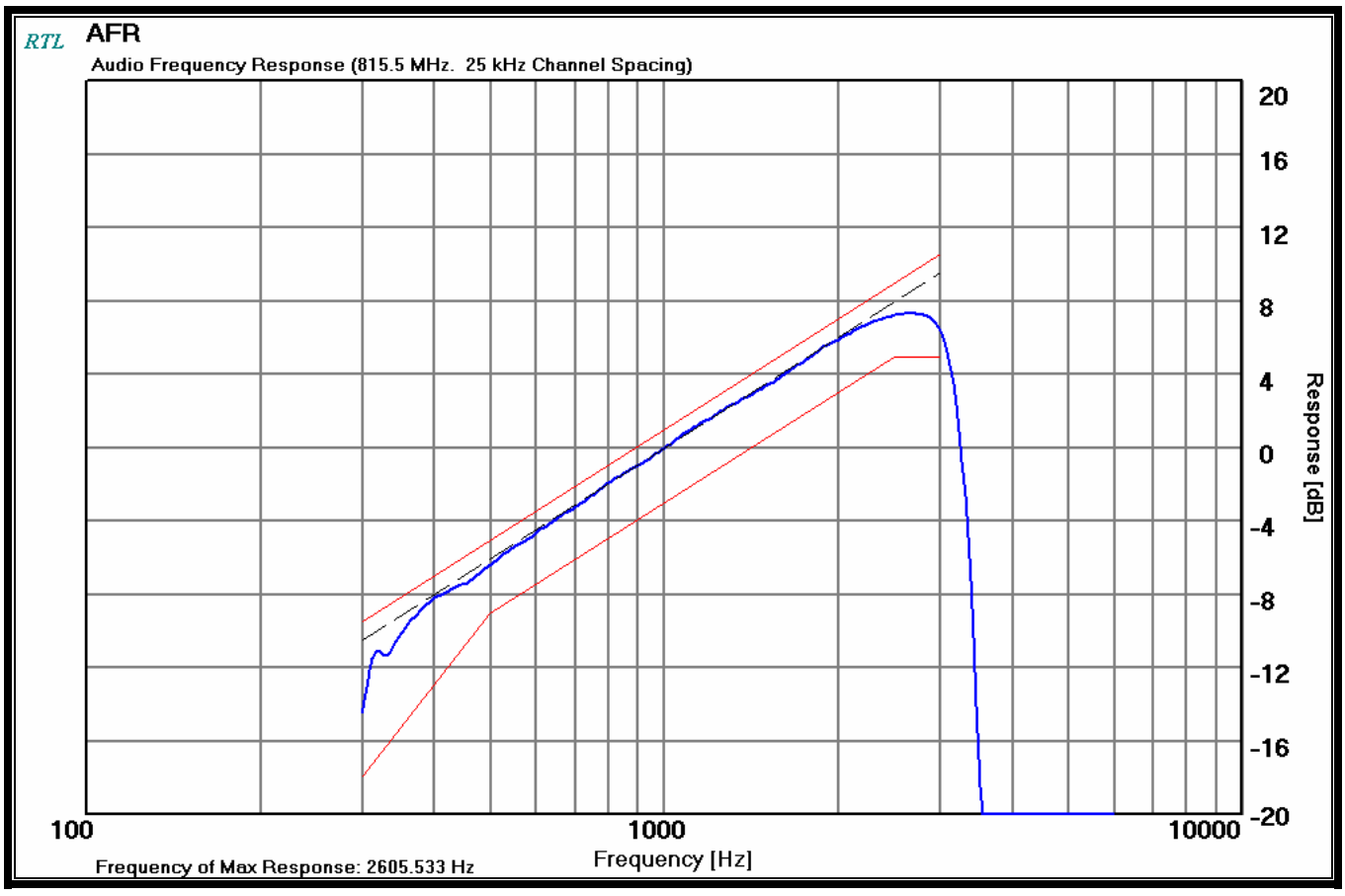
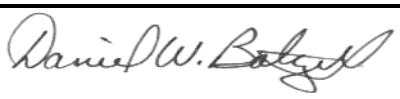


Table 9-1: Test Equipment for Audio Frequency Response

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	12/13/08
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	8/21/08
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	10/17/08
901088	Hewlett Packard	8954A	Transceiver interface	2146A00139	12/10/08

Test Personnel:

Daniel Baltzell		February 5, 2008
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

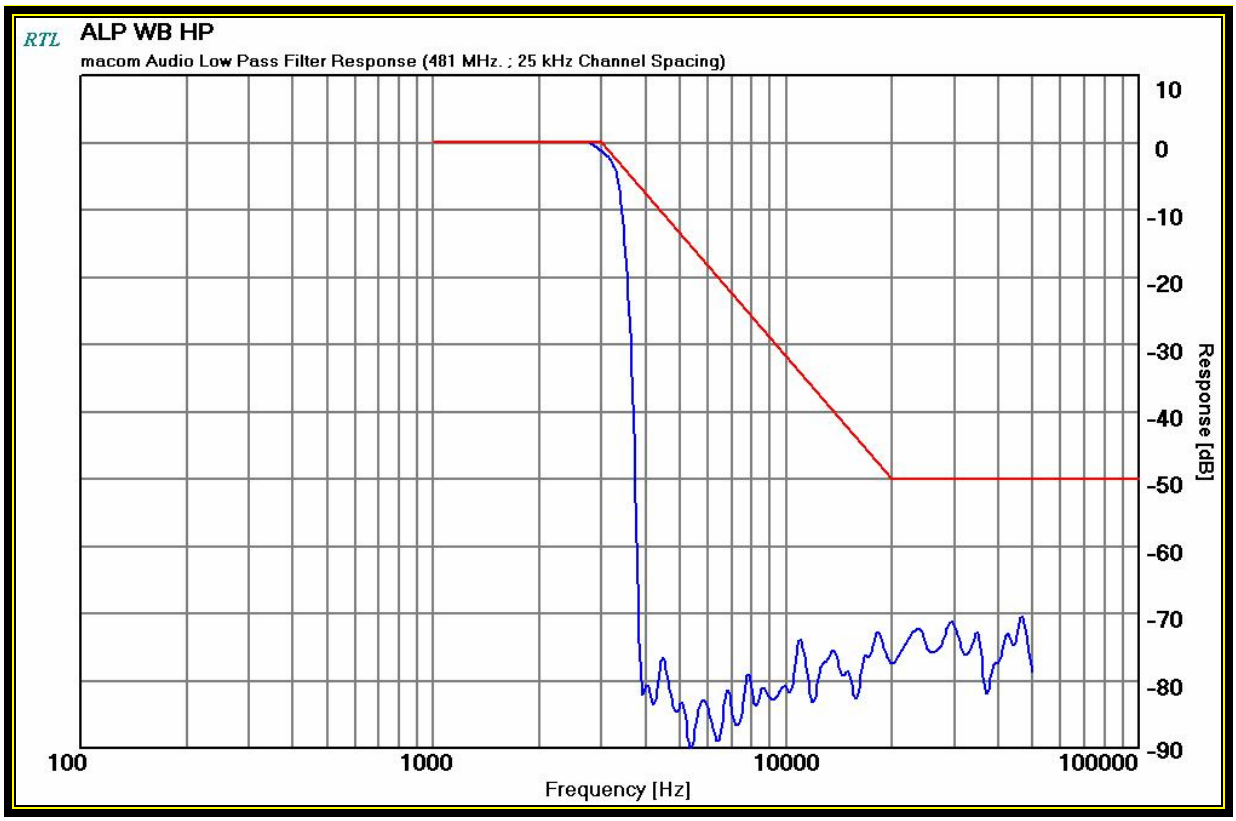
2.1047(a) Voice modulated communication equipment: a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter,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

ANSI TIA-603-C-2004, 2.2.15

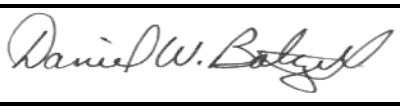
The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

10.2 Test Data

Plot 10-1: Modulation Characteristics – Audio Low Pass Filter; 815.5 MHz; Wide Band



Test Personnel:

Daniel Baltzell		February 5, 2008
Test Technician/Engineer	Signature	Date Of Test

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

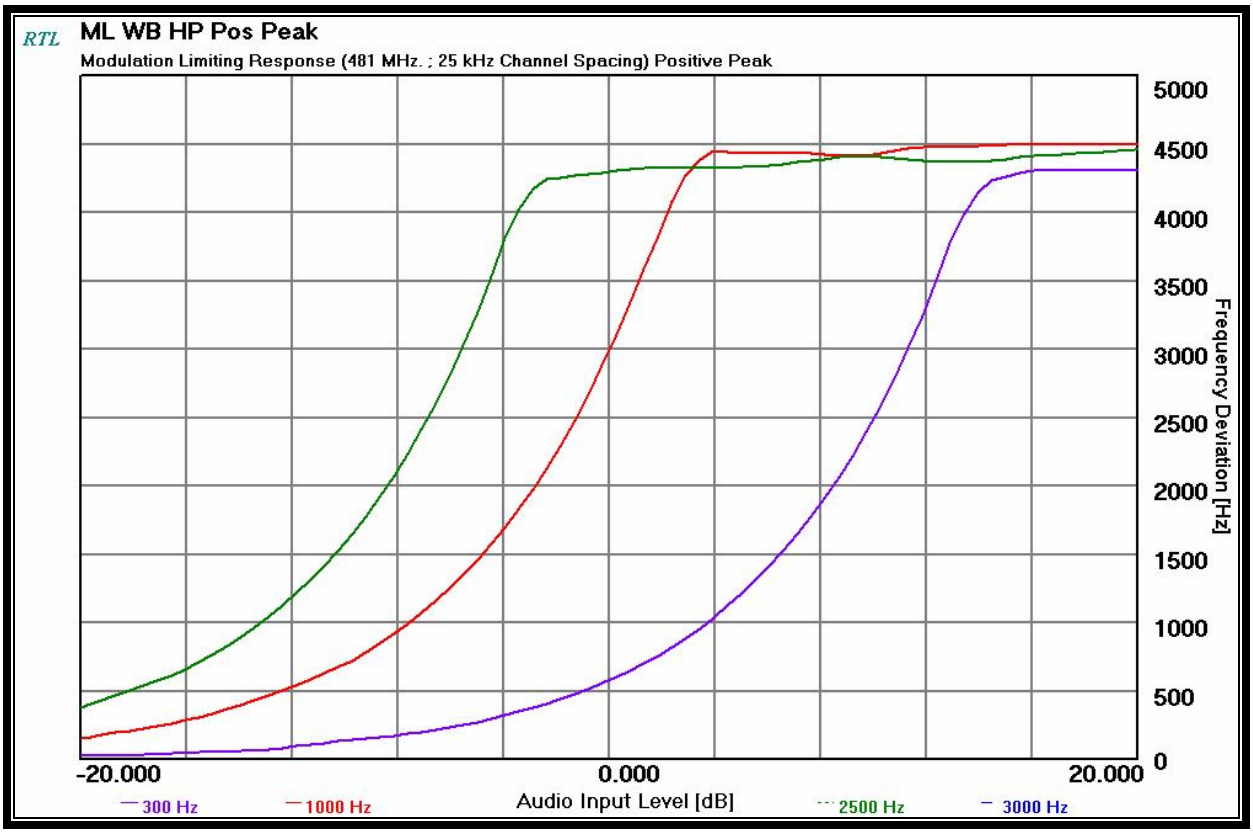
11.1 Test Procedure

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

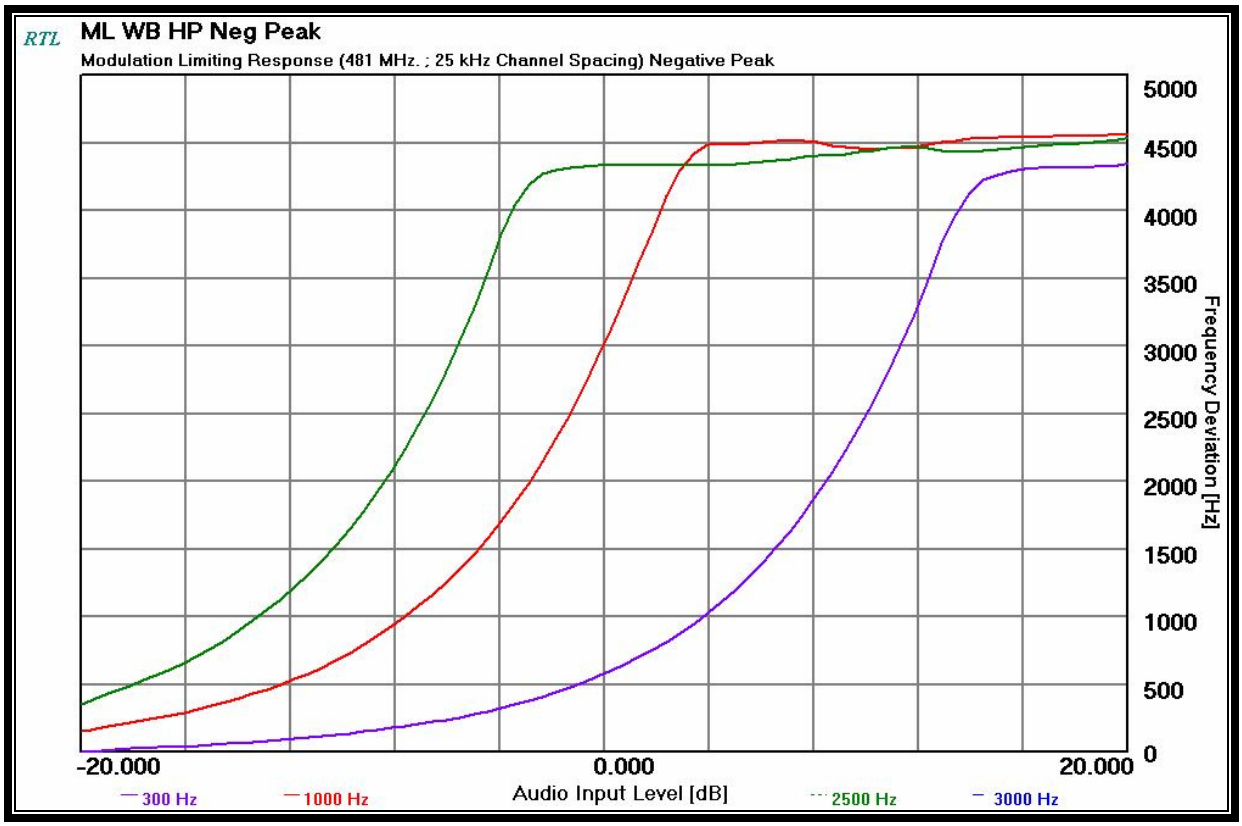
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level as a reference (0 dB), the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500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

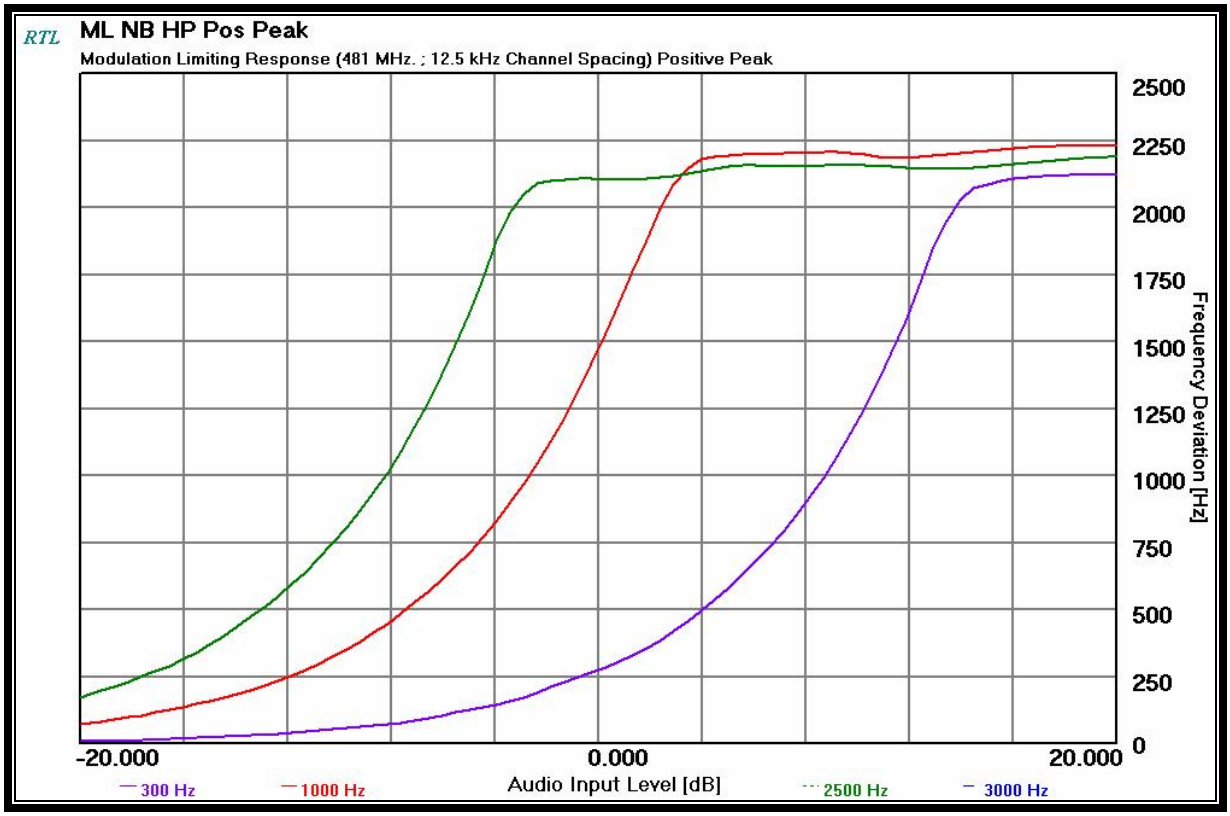
Plot 11-1: Modulation Characteristics – Modulation Limiting: 815.5 MHz; Wide Band; Positive Peak



Plot 11-2: Modulation Characteristics – Modulation Limiting: 815.5 MHz; Wide Band; Negative Peak



Plot 11-3: Modulation Characteristics – Modulation Limiting: 815.5 MHz; NPSPAC; Positive Peak



Plot 11-4: Modulation Characteristics – Modulation Limiting: 815.5 MHz; NPSPAC; Negative Peak

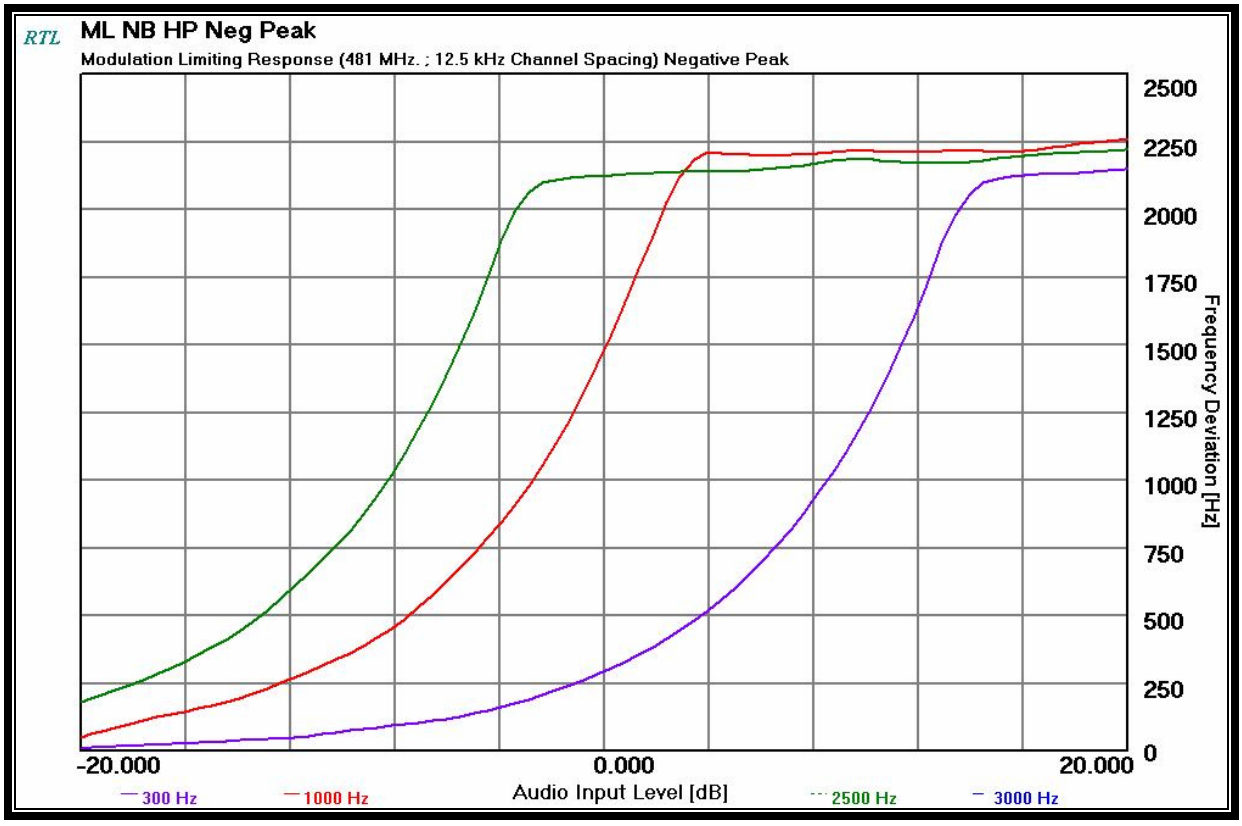
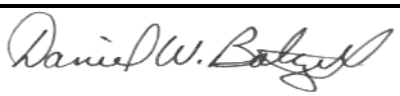


Table 11-1: Test Equipment for Modulation Limiting

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	12/13/08
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	8/21/08
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	10/17/08
901088	Hewlett Packard	8954A	Transceive interface	2146A00139	12/10/08

Test Personnel:

Daniel Baltzell		February 5, 2008
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 – NPSPAC
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 4.0
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 14.0 kHz
Emission designator: 14K0F3E

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; NPSPAC; 12.5 kHz Channel Spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 2400
Bn = 3.86D + 0.27R = 3.86(2400) + 0.27(9600)(1) = 11.9 kHz
Emission designator: 11K9F1D, 11K9F1E

Digital Data – 4 level C4FM (P25 Standard); 4800 bps; NPSPAC Band; 12.5 kHz Channel Spacing
Calculation:
Data rate in sps (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 800 MHz Portable Radio, FCC ID: OWDTR-0043-E, IC: 3636B-0043**, complies with all the applicable requirements of Parts 90 and 2 of the FCC Rules and Regulations, and Industry Canada RSS-119 Issue 9 2007.