Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 90 & INDUSTRY CANADA RSS-119

Test Lab:	Applicant:
Rhein Tech Laboratories, Inc. 360 Herndon Parkway Suite 1400 Herndon, VA 20170 Contact: ATCBINFO@rheintech.com Phone: 703-689-0368 Fax: 703-689-2056 Web Site: www.rheintech.com	E. F. Johnson 299 Johnson Ave. P.O. Box 1249 Waseca, MN 56093-0514 Contact: John Oblak Phone: 507-835-6276 Fax: 507-835-6666 Email: Joblak@efjohnson.com

FCC ID:	ATH2425171	**FRN NUMBER:**	0005-8136-88
MODEL:	242-5172	**RTL WORK ORDER NUMBER:**	2004059
EQUIPMENT TYPE:	PTT 800 MHz	**RTL QUOTE NUMBER:**	QRTL04-064
DATE OF TEST REPORT:	July 2, 2004		

FCC Classification:	TNF – Licensed Non-Broadcast Transmitter Held to Face
FCC Rule Part(s):	Part 90: Private Land Mobile Radio Services
Industry Canada Standard:	RSS-119: Land Mobile and Fixed Radio Transmitters and Receivers, 27.41MHz to 960MHz

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance (ppm)	Emission Designator
762.0125 – 805.9875	3.0	1.5 (0.4 with AFC)	11K0F3E
762.0125 – 805.9875	3.0	1.5 (0.4 with AFC)	16K0F3E
762.0125 – 805.9875	3.0	1.5 (0.4 with AFC)	8K10F1E
762.0125 – 805.9875	3.0	1.5 (0.4 with AFC)	8K10F1D
806.0125 – 868.9875	3.3	1.5	14K0F3E
806.0125 – 868.9875	3.3	1.5	16K0F3E
806.0125 – 868.9875	3.3	1.5	8K10F1E
806.0125 – 868.9875	3.3	1.5	8K10F1D

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to or exclusions from the FCC Part 2, FCC Part 90, Industry Canada RSS-119, ANSI C61.1; 4.5, ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1.

Signature: _____ Date: July 2, 2004

Typed/Printed Name: Desmond A. Fraser Position: President

Signature: _____ Date: July 2, 2004

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

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1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 90 (Subpart K): This subpart sets forth special requirements applicable to the use of certain frequencies or frequency bands.

Industry Canada RSS-119: This document sets forth standards for radio transmitters and receivers for the land mobile and fixed services in bands allocated within the 27.41 MHz to 960 MHz range.

All measurements contained in this application were conducted in accordance with the FCC Rules and Regulations CFR47 Part 90, Industry Canada RSS-119, and ANSI/TIA/EIA603-2002 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. The measurement instrumentation conforms to the ANSI C61.1; 4.5 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier, and cables.

1.2 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C61.1; 4.5 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for Certification. A DoC report is on file for the receiver section and digital interface for the EUT. The IF, LO and up to the 2nd LO were investigated.

2 EQUIPMENT INFORMATION

2.1 TEST SYSTEM DETAILS

The test sample was received on April 7, 2004. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are:

TABLE 2-1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Portable Radio	E.F. Johnson	242-5172-810-BA1	51720A000A00001	ATH2425171	N/A	015815

TABLE 2-2: EXTERNAL COMPONENTS IN TEST CONFIGURATION

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Cable	E.F. Johnson	242-5180	NA	NA	N/A	015827
Charter	E.F. Johnson	AA16740	1123327073	NA	N/A	015826
Adapter	E.F. Johnson	Audio Accessory	NA	NA	N/A	015825
Headset	E.F. Johnson	5890015059	NA	NA	N/A	015824
1/4 wave antenna	E.F. Johnson	501 0105 012	NA	NA	N/A	015823
1/2 Wave Antenna	E.F. Johnson	501 0103 013	NA	NA	N/A	015822
Microphone	E.F. Johnson	242-5180	NA	NA	N/A	015821
3600 MAH Battery	E.F. Johnson	587-5100-360	NA	NA	N/A	015820
3600 MAH Battery	E.F. Johnson	587-5100-360	NA	NA	N/A	015819
3600 MAH Battery	E.F. Johnson	587-5100-360	NA	NA	N/A	015818
3600 MAH Battery	E.F. Johnson	587-5100-360	NA	NA	N/A	015817
Alkaline Cell Pack	E.F. Johnson	242-5180	100803-433ATH	NA	N/A	015816
Cable for accessory adaptor	E.F. Johnson	NA	NA	NA	N/A	015814
Accessory Adapter	E.F. Johnson	SYS1097-3015	0311214811	NA	N/A	015813
Charger Kit	E.F. Johnson	585-5100-210	55-65575	NA	N/A	015812

2.2 WORST CASE CONFIGURATION OF TESTED SYSTEM

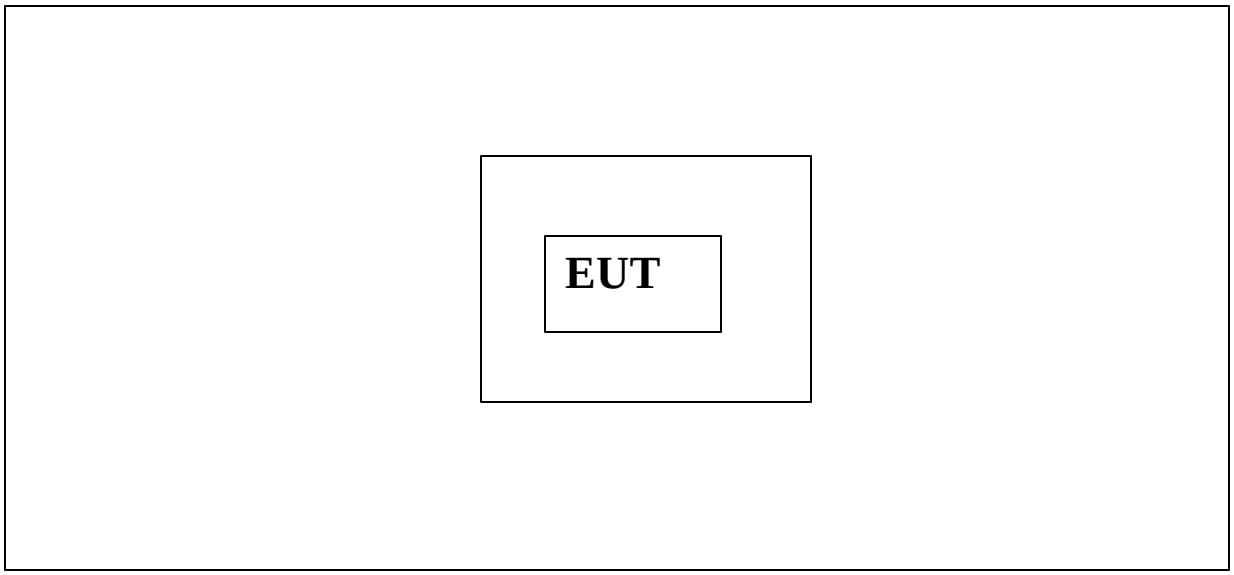


FIGURE 2-1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 FCC PART 2.1033(C)(8); DC VOLTAGES AND CURRENTS

The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range where:

7.5 volts @ 1.61A

4 RF POWER OUTPUT - §2.1046

4.1 ANSI/TIA/EIA-603-1992, SECTION 2.2.1 TEST PROCEDURE

Connect the equipment as illustrated below. Measure the transmitter output power during the defined duty cycle. The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

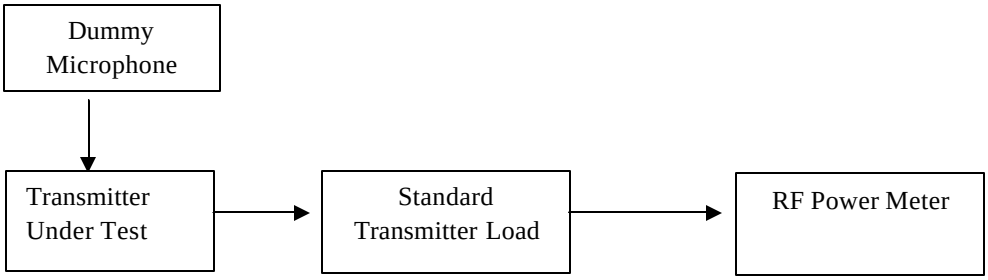


FIGURE 4-1: ILLUSTRATION OF HOW THE EQUIPMENT IS CONNECTED

4.2 RF POWER OUTPUT TEST EQUIPMENT

TABLE 4-1: RF POWER OUTPUT TEST EQUIPMENT

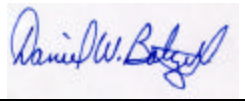
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	7/30/04
901186	Agilent Technologies	E9323A (50 MHz – 6 GHz)	Peak & Average Power Sensor	US40410380	7/30/04

4.3 RF POWER OUTPUT TEST DATA

TABLE 4-2: RF POWER OUTPUT TEST DATA

Frequency (MHz)	Channel	Peak Power Measured (dBm)	Average Power Measured (dBm)	Average Power (Watt)
762.0125	1	34.88	34.77	3.0
769.0125	2	34.95	34.83	3.0
775.9875	3	34.86	34.73	3.0
792.0125	4	34.94	34.78	3.0
799.0125	5	34.91	34.62	2.9
805.9875	6	34.94	34.71	3.0
806.0125	7	35.19	35.04	3.2
814.5125	8	35.13	35.00	3.2
823.9875	9	35.06	34.94	3.1
851.0125	10	35.05	34.91	3.1
859.5125	11	35.00	34.91	3.1
868.9875	12	35.07	35.02	3.2

TEST PERSONNEL:



DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

4.4 MODULATION CHARACTERISTICS - §2.1047 TEST PROCEDURE

The modulation characteristic tests do not apply to digital modulation; only to those channels with analog modulation.

4.5 MODULATION CHARACTERISTICS TEST EQUIPMENT

TABLE 4-3: MODULATION CHARACTERISTICS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz-1300 MHz)	2406A00178	6/18/04
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	8/6/04
901054	Hewlett Packard	HP 3586B	Selective Level Meter	1928A01892	9/9/04
901088	Hewlett Packard	8954A	Transceiver Interface	2146A00139	8/13/04

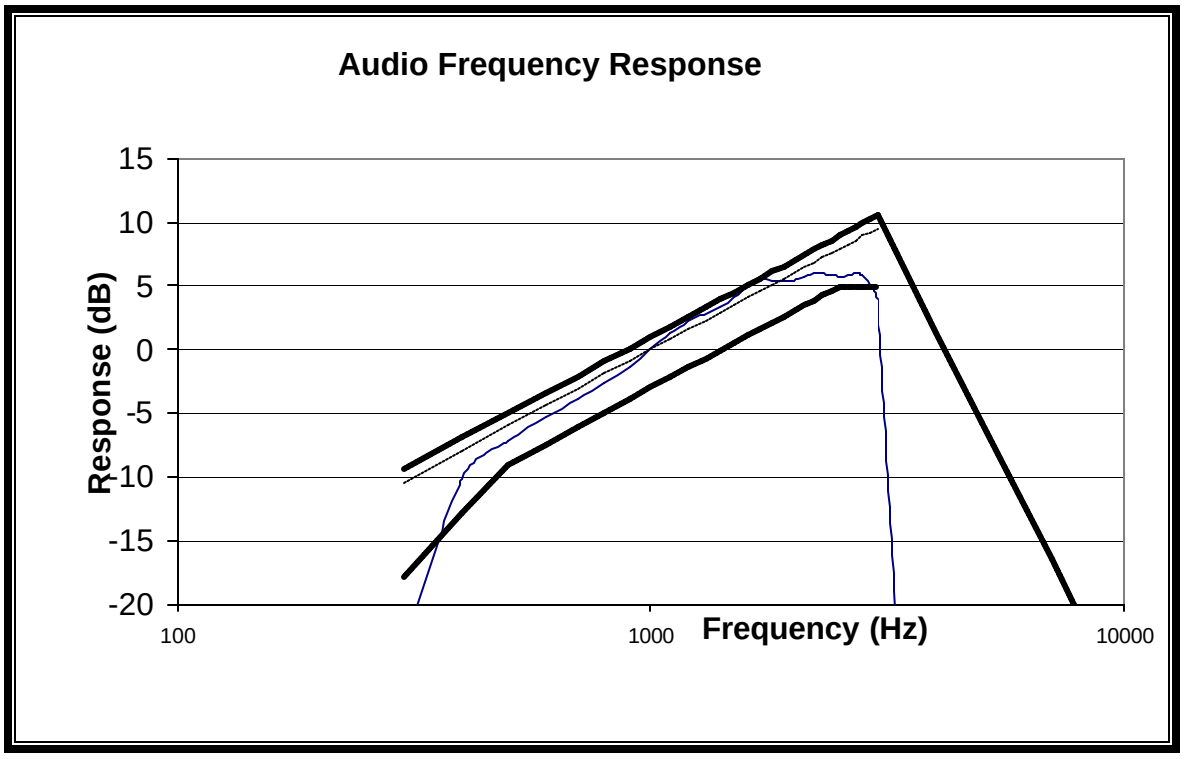
5 FCC PART 2 §2.1047 (A): MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE

5.1 TEST PROCEDURE

ANSI/TIA/EIA-603-2002, 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 is 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)

5.2 TEST DATA

PLOT 5-1: AUDIO FREQUENCY RESPONSE



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 26, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

6 FCC PART 2 §2.1047 (A): MODULATION CHARACTERISTICS - AUDIO LOW PASS FILTER RESPONSE

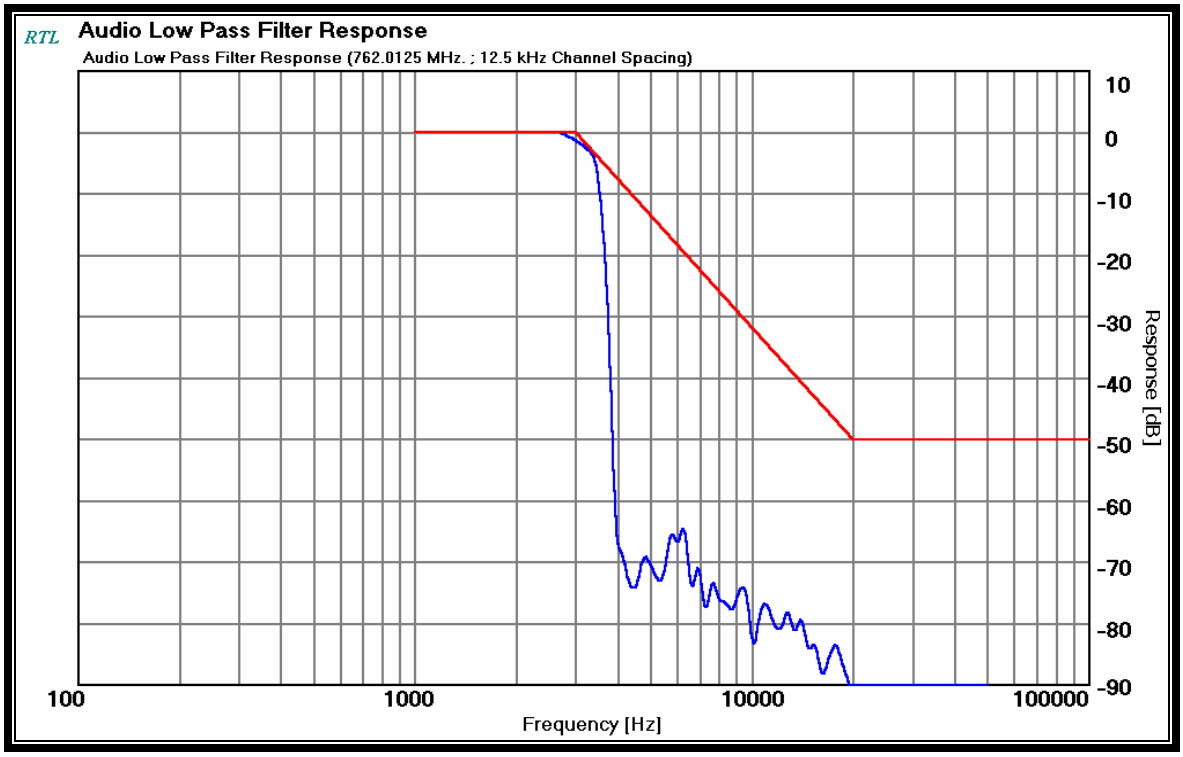
6.1 TEST PROCEDURE

ANSI/TIA/EIA-603-2002, 2.2.15

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

6.2 TEST DATA

PLOT 6-1: AUDIO LOW PASS FILTER RESPONSE



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 27, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

7 FCC PART 2 §2.1047 (B): MODULATION CHARACTERISTICS - MODULATION LIMITING

7.1 TEST PROCEDURE

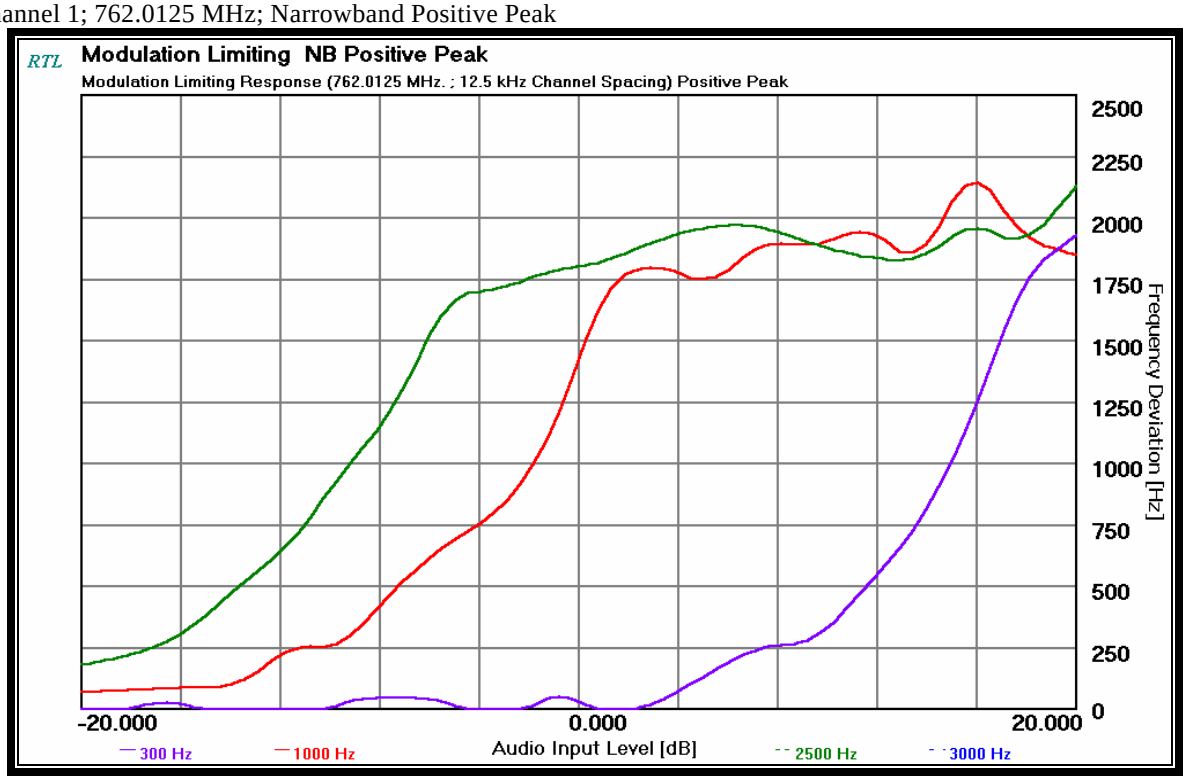
ANSI/TIA/EIA-603-2002, section 2.2.3

The transmitter is adjusted for full rated system deviation. The audio input level is adjusted for 60% of rated system deviation at 1000 Hz. Using this level as a reference (0 dB), the audio input level is varied from the reference to a level +20 dB above it and –20 dB under it, for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level is recorded. Both Positive and Negative Peak deviations were recorded.

7.2 TEST DATA

PLOT 7-1: MODULATION LIMITING RESPONSE (POSITIVE PEAK)

Channel 1; 762.0125 MHz; Narrowband Positive Peak

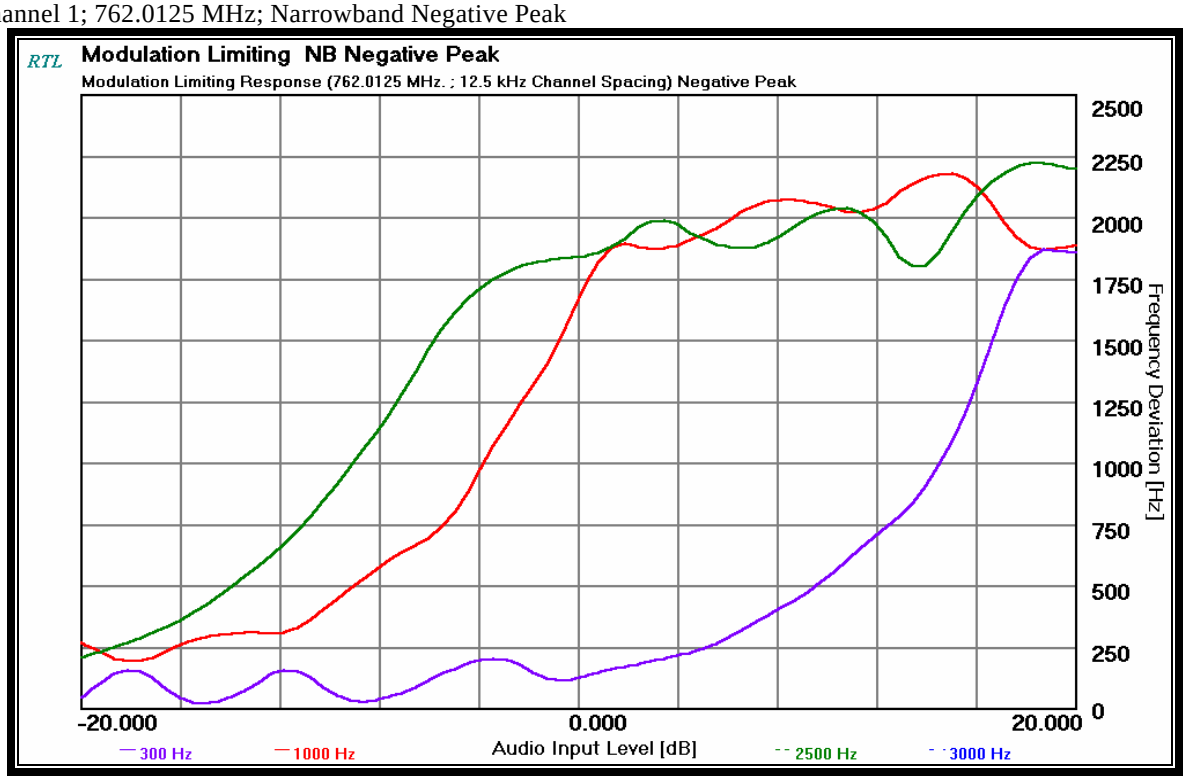


TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 7-2: MODULATION LIMITING RESPONSE (NEGATIVE PEAK)

Channel 1; 762.0125 MHz; Narrowband Negative Peak

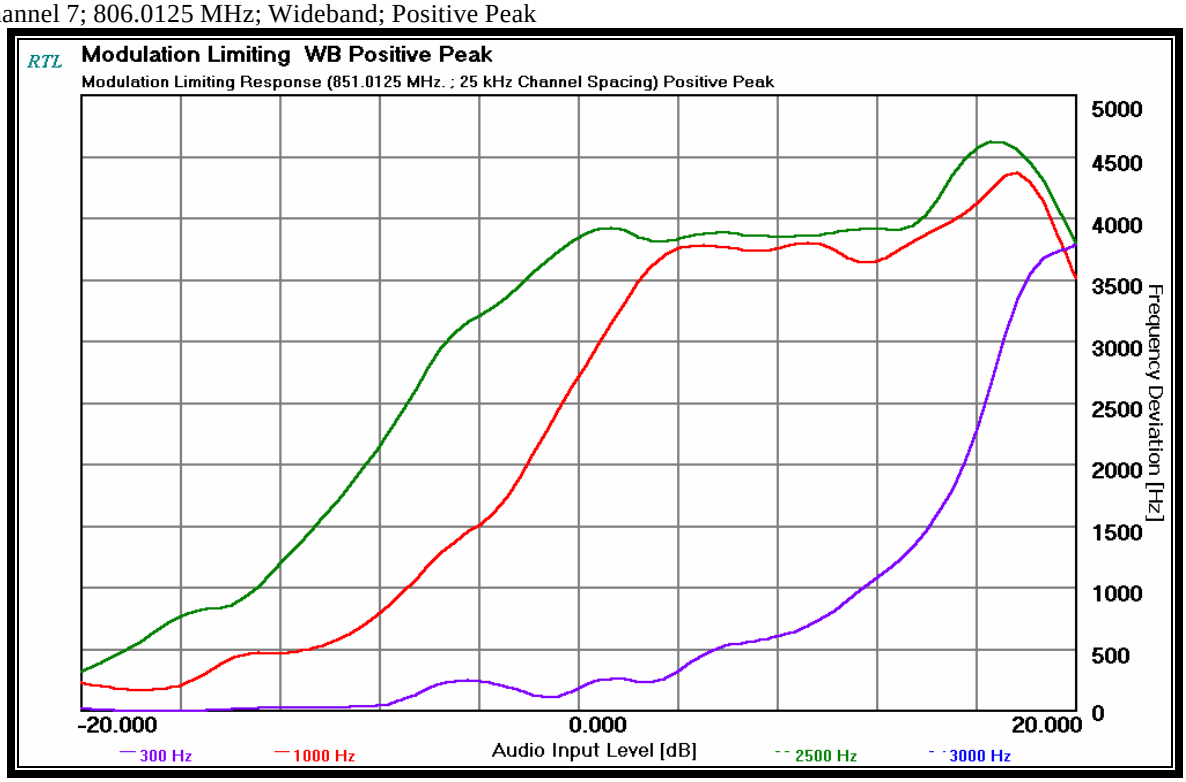


TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 7-3: MODULATION LIMITING RESPONSE (POSITIVE PEAK)

Channel 7; 806.0125 MHz; Wideband; Positive Peak

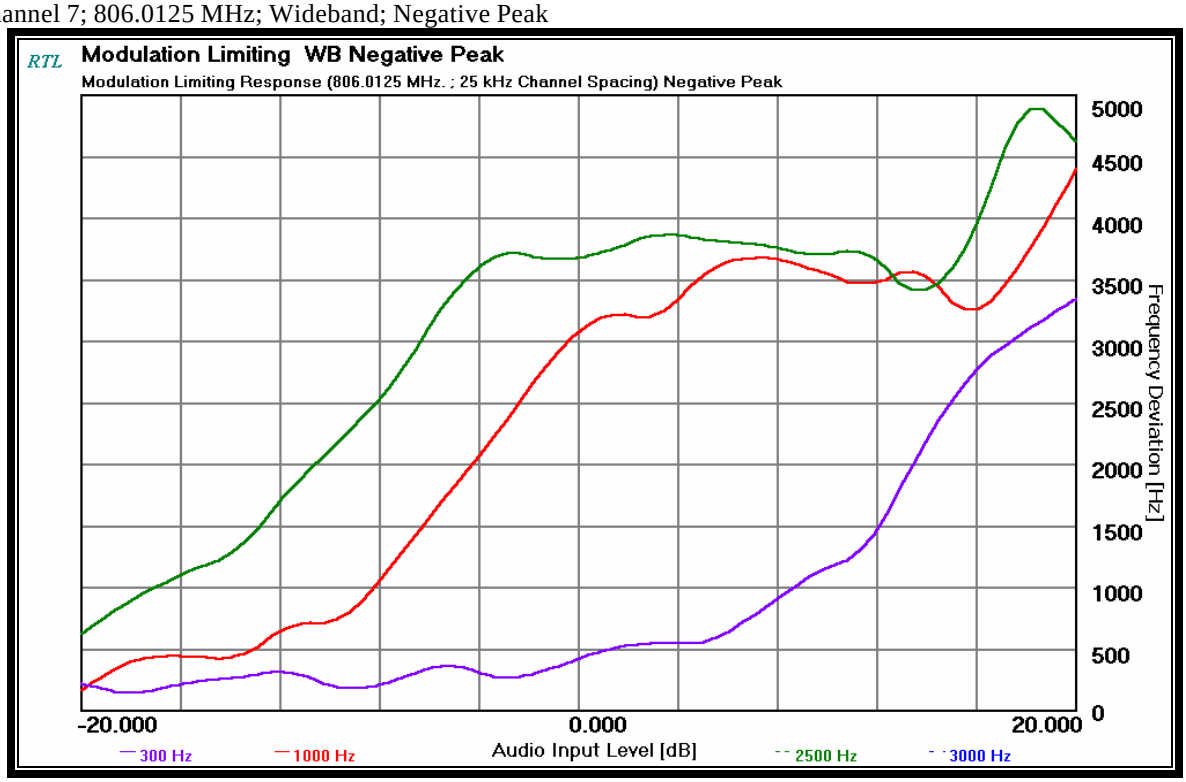


TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 7-4: MODULATION LIMITING RESPONSE (NEGATIVE PEAK)

Channel 7; 806.0125 MHz; Wideband; Negative Peak

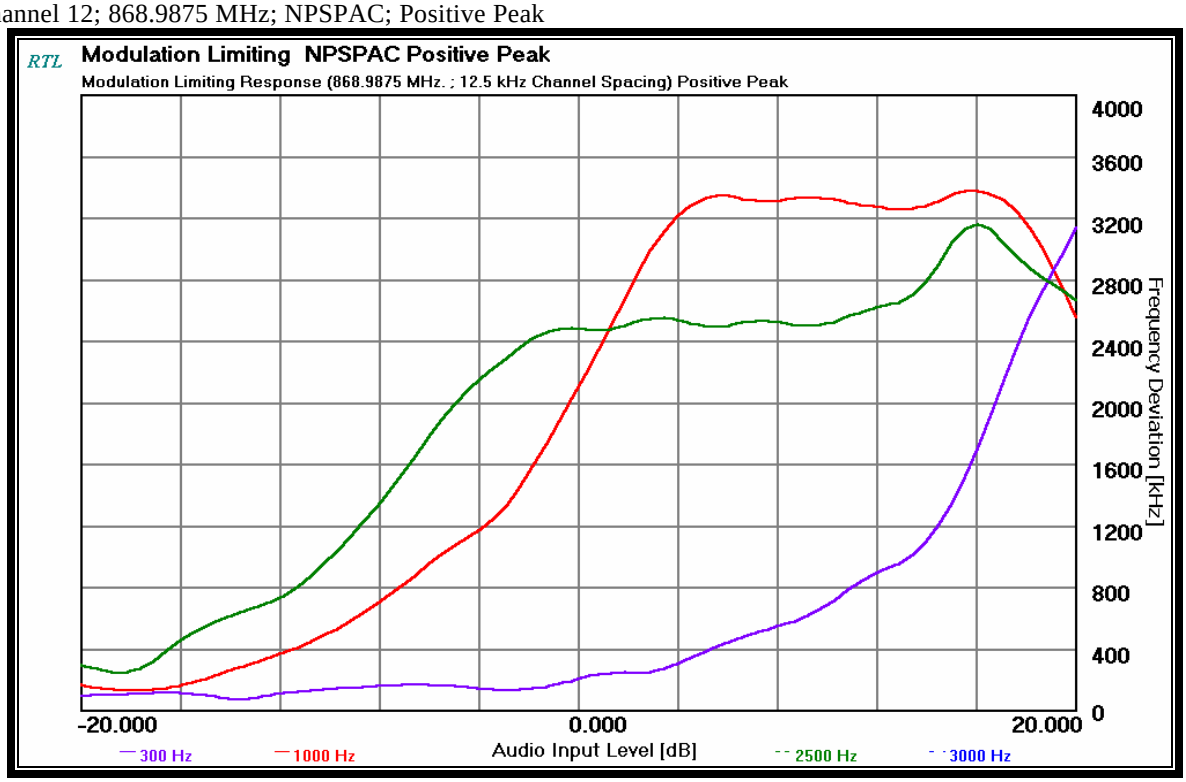


TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 7-5: MODULATION LIMITING RESPONSE (POSITIVE PEAK)

Channel 12; 868.9875 MHz; NPSPAC; Positive Peak

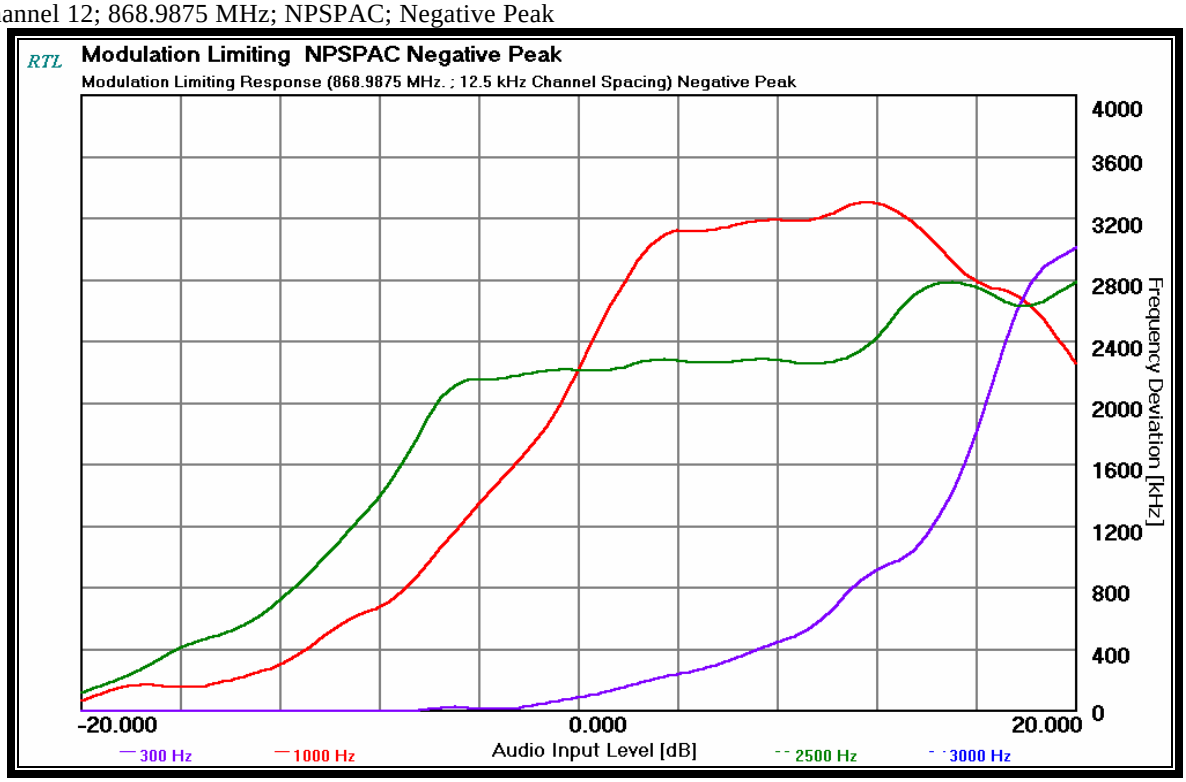


TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 7-6: MODULATION LIMITING RESPONSE (NEGATIVE PEAK)

Channel 12; 868.9875 MHz; NPSPAC; Negative Peak



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

8 FCC RULES AND REGULATIONS PART 90 §90.543 (A): EMISSION LIMITATIONS: ACCP REQUIREMENTS

Transmitters designed to operate in the 764-776 MHz and 794-806 MHz frequency bands must meet the emission limitations of this section.

8.1 TEST PROCEDURE

For portable transmitter designed to operate with a 12.5 kHz channel bandwidth, the ACCP shall be in accordance to the following table:

Offset from center frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACCP (dBc)
9.375	6.25	-40
15.625	6.25	-60
21.875	6.25	-60
37.5	25	-50
62.5	25	-65
87.5	25	-65
150	100	-65
250	100	-65
>400 to receive band	30(s)	-75
In the receive band	30(s)	-100

For a portable transmitter designed to operate with a 25 kHz channel bandwidth, the ACCP shall be in accordance with the following table:

Offset from center frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACCP (dBc)
15.625	6.25	-40
21.875	6.25	-60
37.5	25	-65
62.5	25	-65
87.5	25	-65
150	100	-65
250	100	-65
>400 to receive band	30(s)	-75
In the receive band	30(s)	-100

FCC Rules and Regulations Part 90 §90.543 (b)

Setting Reference Level - Part 90 §90.543 (b)(1): Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth to the channel size, (25 kHz). Set the frequency offset of the measurement to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth. Record this power as the reference power level.

Measuring the power level at the frequency offset <600 kHz - Part 90 §90.543 (b)(2): Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth as shown in the table. Measure ACCP in dBm. These measurements were made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power level. The absolute ACCP values must be less than the values given in the table for each condition.

Measuring the power level at the frequency offset >600 kHz - Part 90 §90.543 (b)(3): Set the spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and sample detection mode. Sweep +/-6 MHz from the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the power. The response at frequencies >600 kHz must be less than the values listed in the table.

8.2 TEST DATA

TABLE 8-1: 12.5 KHZ DATA

			769.0125 MHz		799.0125 MHz	
Offset from Center Freq. kHz	**Measurement BW kHz**	**Max ACP dBc**	**Max ACP low offset dBc**	**Max ACP high offset dBc**	**Max ACP low offset dBc**	**Max ACP high offset dBc**
(+/-)9.375	6.25	-40	-56.33	-56.66	-63.65	-62.71
(+/-)15.625	6.25	-60	-71.46	-66.50	-72.85	-71.91
(+/-)21.875	6.25	-60	-69.33	-69.24	-71.82	-70.59
(+/-)37.5	25	-50	-69.59	-65.08	-67.48	-66.64
(+/-)62.5	25	-65	-70.7	-68.45	-70.24	-68.96
(+/-)87.5	25	-65	-72.88	-71.62	-71.92	-70.90
(+/-)150	100	-65	-68.68	-67.89	-69.33	-67.16
(+/-)250	100	-65	-71.46	-71.34	-71.18	-72.01

			769.0125 MHz	799.0125 MHz
Offset from Center Freq. kHz	**Measurement BW kHz**	**Max ACP dBc**	**Max ACP DBc**	**Max ACP dBc**
<400 to receive band	30(s)	-75	-96.00	-110.67
In receive band	30(s)	-100	-111.83	-108.33

TABLE 8-2: 12.5 KHZ DATA C4FM

			769.0125 MHz		799.0125 MHz	
Offset from Center Freq. KHz	**Measurement BW KHz**	**Max ACP dBc**	**Max ACP low offset dBc**	**Max ACP high offset DBc**	**Max ACP low offset dBc**	**Max ACP high offset dBc**
(+/-)9.375	6.25	-40	-43.52	-42.70	-42.4	-41.00
(+/-)15.625	6.25	-60	-69.32	-65.01	-71.40	-70.11
(+/-)21.875	6.25	-60	-68.52	-64.32	-71.97	-71.57
(+/-)37.5	25	-50	-69.26	-64.73	-67.70	-65.44
(+/-)62.5	25	-65	-69.39	-67.39	-68.46	-67.33
(+/-)87.5	25	-65	-72.72	-70.57	-69.36	-69.01
(+/-)150	100	-65	-69.06	-69.62	-67.01	-67.91
(+/-)250	100	-65	-70.10	-72.66	-69.20	-71.15

			769.0125 MHz	799.0125 MHz
Offset from Center Freq. KHz	**Measurement BW KHz**	**Max ACP dBc**	**Max ACP DBc**	**Max ACP dBc**
<400 to receive band	30(s)	-75	-94.17	-111.00
In receive band	30(s)	-100	-110.17	-119.67

TABLE 8-3: 25 KHZ DATA

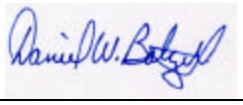
			769.0125 MHz		799.0125 MHz	
Offset from Center Freq. KHz	**Measurement BW KHz**	**Max ACP dBc**	**Max ACP low offset dBc**	**Max ACP high offset dBc**	**Max ACP low offset dBc**	**Max ACP high offset dBc**
(+/-)15.625	6.25	-40	-71.21	-66.09	-72.51	-71.64
(+/-)21.875	6.25	-60	-73.80	-69.00	-70.83	-72.53
(+/-)37.5	25	-65	-69.71	-66.31	-68.86	-68.58
(+/-)62.5	25	-65	-70.97	-70.19	-71.48	-70.14
(+/-)87.5	25	-65	-72.94	-70.84	-71.20	-70.24
(+/-)150	100	-65	-68.95	-68.09	-68.85	-67.94
(+/-)250	100	-65	-71.46	-77.63	-72.09	-77.00

			769.0125 MHz	799.0125 MHz
Offset from Center Freq. KHz	**Measurement BW KHz**	**Max ACP dBc**	**Max ACP DBc**	**Max ACP dBc**
<400 to receive band	30(s)	-75	-92.67	-111.00
In receive band	30(s)	-100	-110.67	-117.83

TABLE 8-4: TEST EQUIPMENT (ACCP REQUIREMENTS)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	07/15/04

TEST PERSONNEL:



DANIEL BALTZELL		MAY 2, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

9 FCC RULES AND REGULATIONS PART 90 §90.543 (E): PROTECTION OF GNSS (1559-1610 MHZ) BAND

For operations in the 764 to 776 MHz and 794 to 806 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to –70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

9.1 TEST PROCEDURE

Substitution Method:

The EUT was set up at an antenna-to-EUT distance of 3 meters on an open area test site. The EUT was placed on a nonconductive turntable 1.0 meter above the ground plane. The physical arrangement of the EUT was varied through three orthogonal planes in order to determine the effect on the EUT's emissions in amplitude, direction, and frequency. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The worst-case, maximum radiated emission was recorded and used as reference for the measurement. The EUT was then replaced by a ½ wave dipole antenna and polarized in accordance with the EUT's antenna polarization. The ½ wave dipole antenna was connected to an RF signal generator with a coaxial cable. The search antenna height, and search antenna polarity, was set to levels that produced the maximum reading obtained. The signal generator was adjusted to a level that produced that maximum radiated emission level. The signal generator level was recorded and corrected by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal ½ wave dipole antenna. The signal generator corrected level is the EIRP level.

9.2 TEST DATA

Frequencies tested: 1559-1610 MHz Carrier Frequencies: 762.0125, 799.0125 MHz
The worst-case Output Power (highest) levels are shown.

TABLE 9-1: TEST RESULTS - EIRP IN GNSS BAND

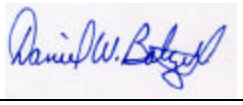
Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)*	Antenna Factor (dBd)	EIRP (dBm)	EIRP (dBW)	Margin (dB)
1605.31 (Channel 2)	-67.3	0.5	6.8	-61.0	-91.0	-21.0
1584.400 (Channel 5)	-55.4	0.5	6.8	-49.1	-79.1	-9.1
1598.025 (Channel 5)	-45.7	6.7	6.8	-45.7	-75.7	-5.7
1609.873 (Channel 5)	-60.6	0.5	6.8	-54.3	-84.3	-14.3

*Cable loss from transmitting antenna to signal generator
*Measurement accuracy is +/- .5 dB

TABLE 9-2: TEST EQUIPMENT (EIRP IN GNSS BAND)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	not req'd
900917	Hewlett Packard	8648	Signal Generator (100 kHz – 3200 MHz)		08/5/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	07/15/04
900814	Electrometrics	RGA-60	Double ridge Horn (1 – 18 GHz)	2310	02/17/06
901262	ETS	3115	Double ridge Horn (1 – 18 GHz)	6748	2/4/05
901232	IW Microwave Products	KPW-1503-2400-KPS	High Frequency RF Cables	240"	9/5/04
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	9/5/04
901132	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	5/13/04
901128	Par Electronics	806-902 (25W)	UHF Notch Filter	N/A	5/13/04

TEST PERSONNEL:



DANIEL BALTZELL		JULY 1, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

10 OCCUPIED BANDWIDTH - §2.1049

10.1 OCCUPIED BANDWIDTH - §2.1049 TEST PROCEDURE

The antenna output terminal of the EUT was connected to the input of a 50W spectrum analyzer through a matched 10dB attenuator. The radio transmitter was operating at maximum output power with and without internal data modulation. 100% of the in-band modulation was below the specified mask.

(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:
(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(d) *Emission Mask D—12.5 kHz channel bandwidth equipment.* For transmitters designed to operate with a 12.5 kHz channel bandwidth, 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_0 to 5.625 kHz removed from f_0: 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 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88$ kHz) dB.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(g) *Emission Mask G.* For transmitters that are not equipped with an audio low-pass filter pursuant to §90.211(b), 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 (f_d in kHz) of more than 5 kHz, but no more than 10 kHz: At least 83 log (f_d/5) dB;
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least 116 log (f_d/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation;
(3) 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.

(h) *Emission Mask H.* For transmitters that are not equipped with an audio low-pass filter pursuant to §90.211(b), 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 (f_d 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 (f_d in kHz) of more than 4 kHz, but no more than 8.5 kHz: At least 107 log (f_d/4) dB;
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 8.5 kHz, but no more than 15 kHz: At least 40.5 log (f_d/1.16) dB;
(4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 15 kHz, but no more than 25 kHz: At least 116 log (f_d/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.

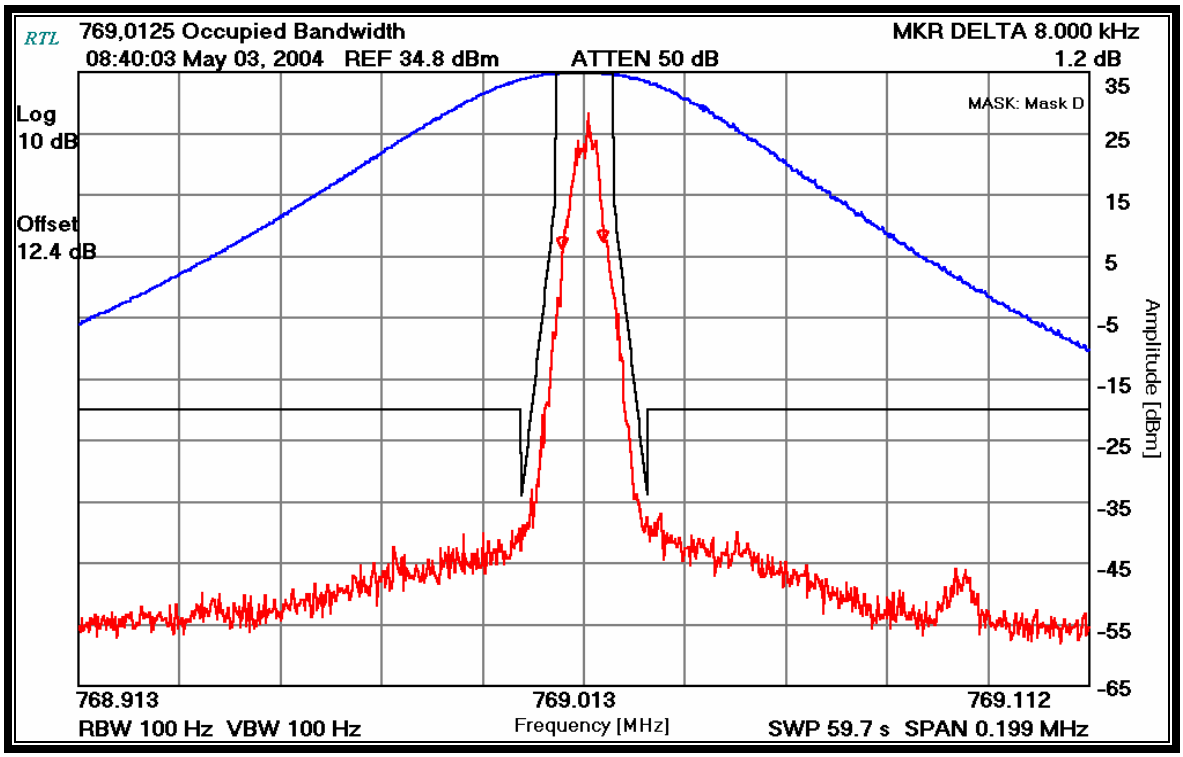
10.2 OCCUPIED BANDWIDTH TEST EQUIPMENT

TABLE 10-1: OCCUPIED BANDWIDTH TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz – 40 GHz)	3943A01719	7/15/04

10.3 OCCUPIED BANDWIDTH TEST DATA

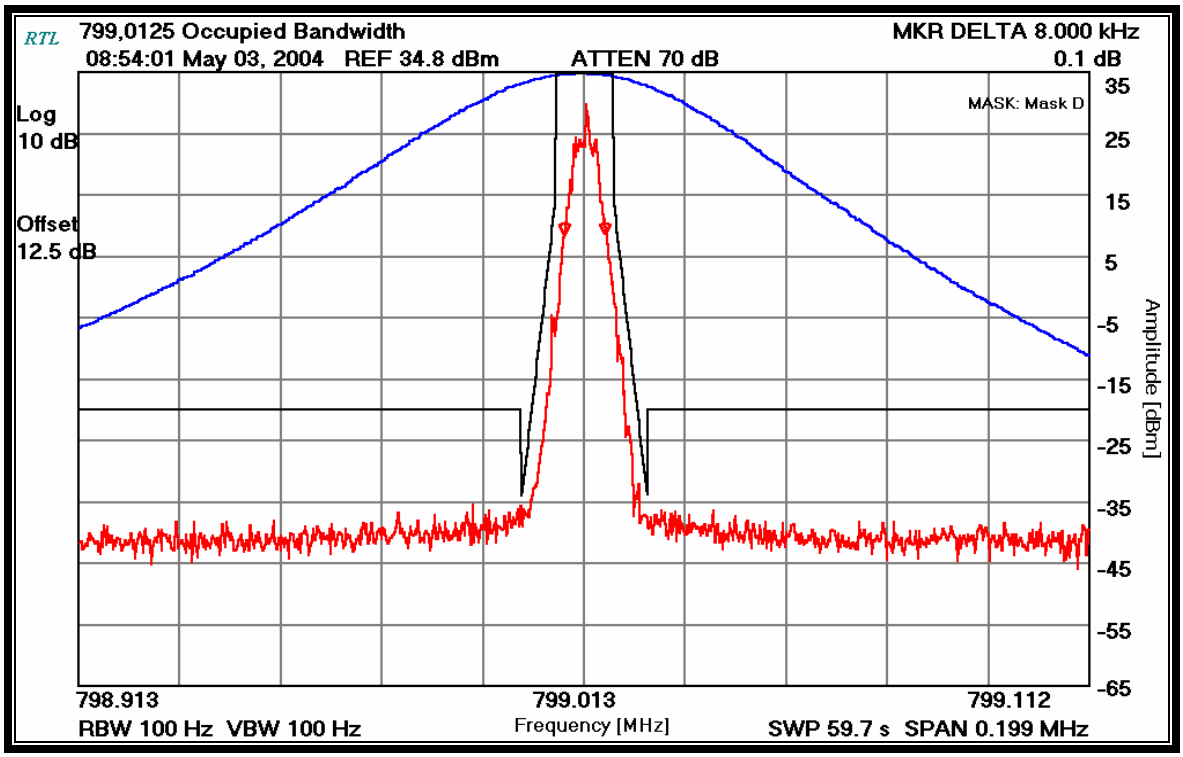
PLOT 10-1: MASK D (769.0125 MHZ; CH 2; C4FM), 8 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		MAY 3, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

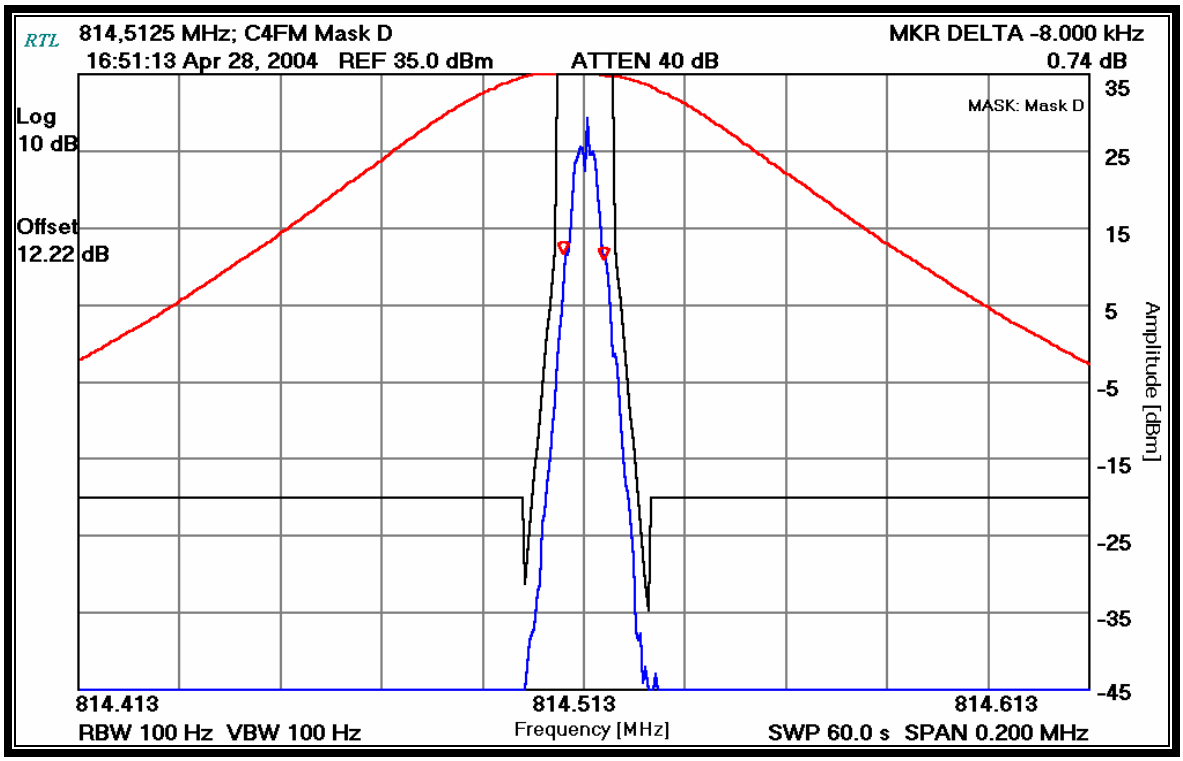
PLOT 10-2: MASK D (799.0125 MHZ; CH 2; C4FM), 8 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		MAY 3, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

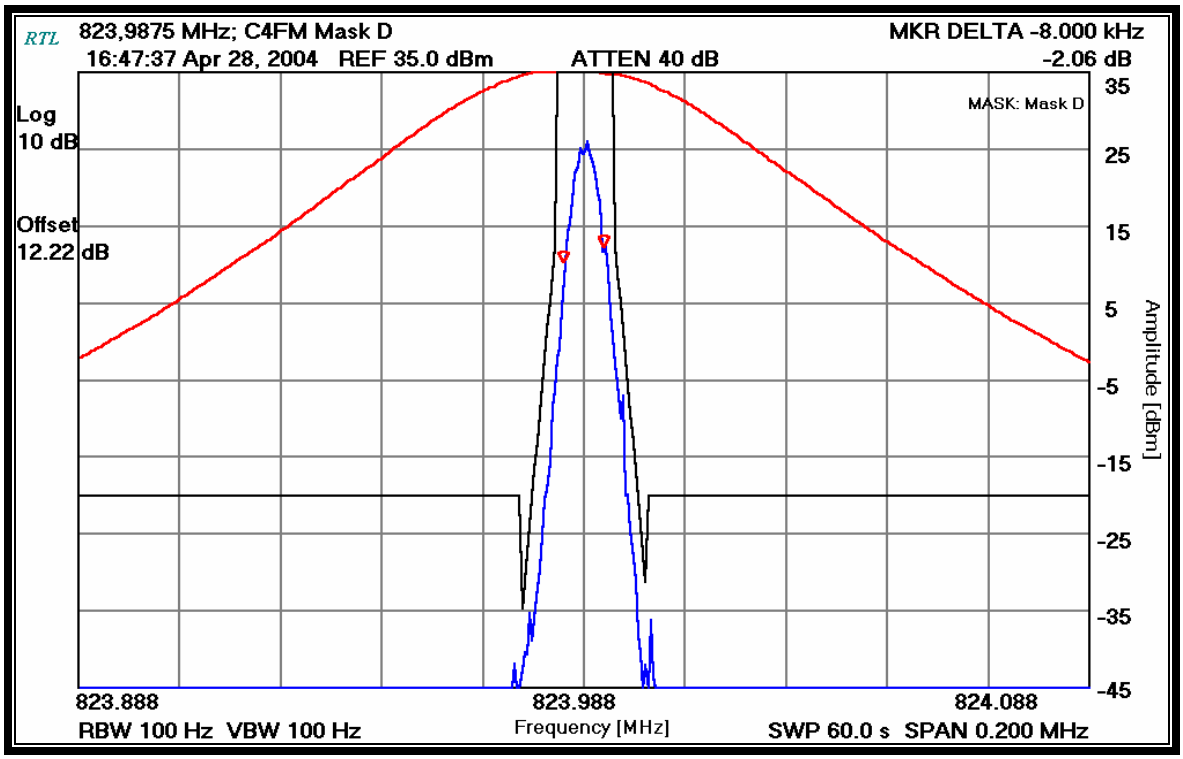
PLOT 10-3: MASK D (814.5125 MHZ; CH 8; C4FM), 8 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

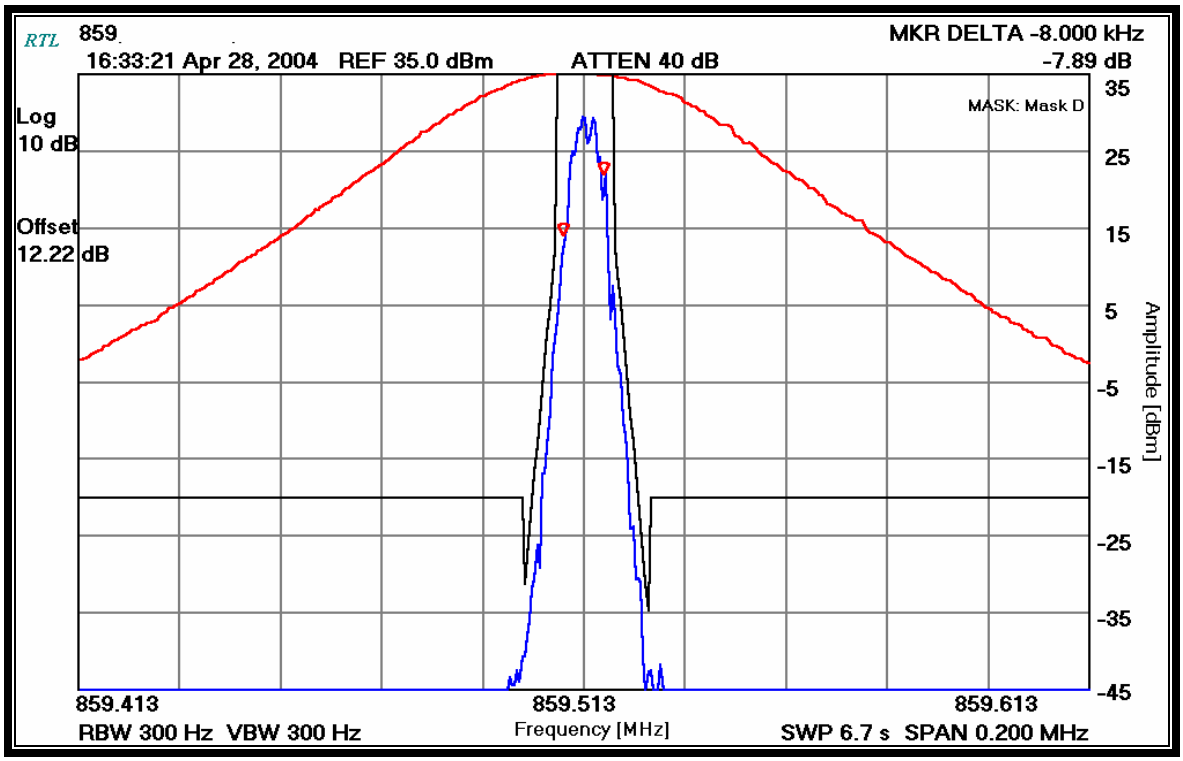
PLOT 10-4: MASK D (823.9875 MHZ; CH 9; C4FM), 8 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

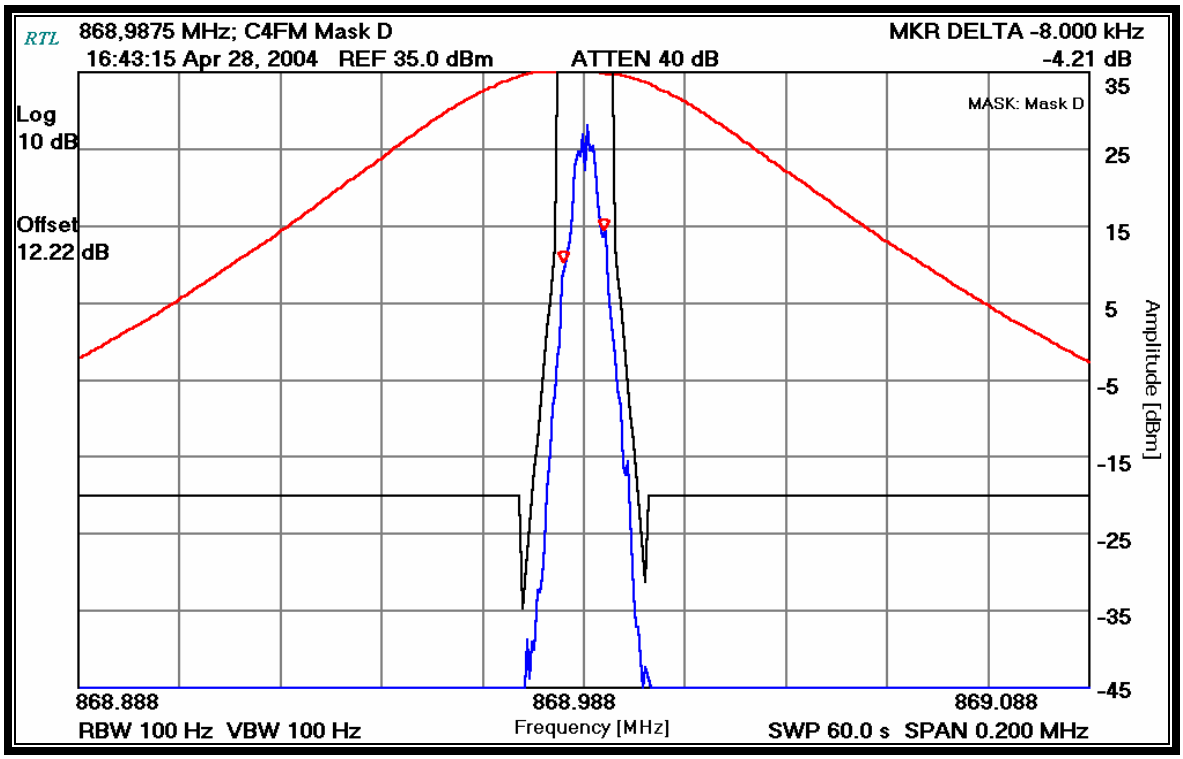
PLOT 10-5: MASK D (859.5125 MHZ; CH 11; C4FM), 8 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

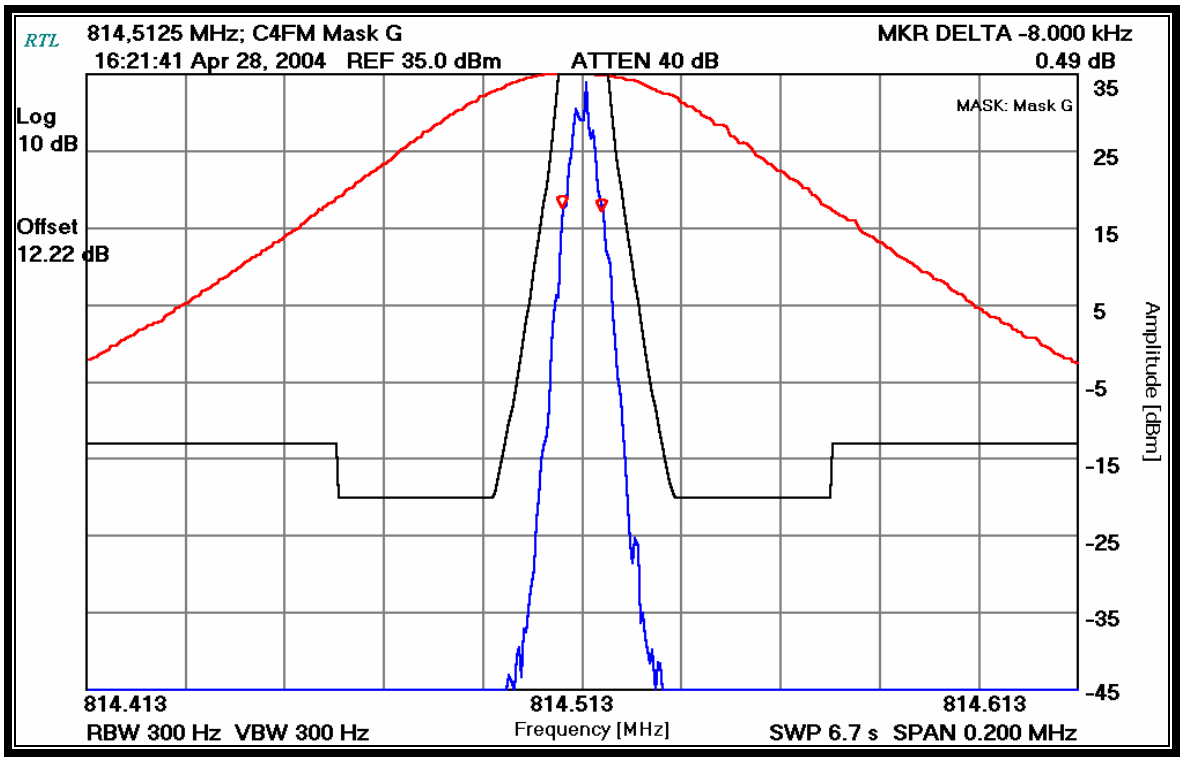
PLOT 10-6: MASK D (868.9875 MHZ; CH 12; C4FM), 8 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

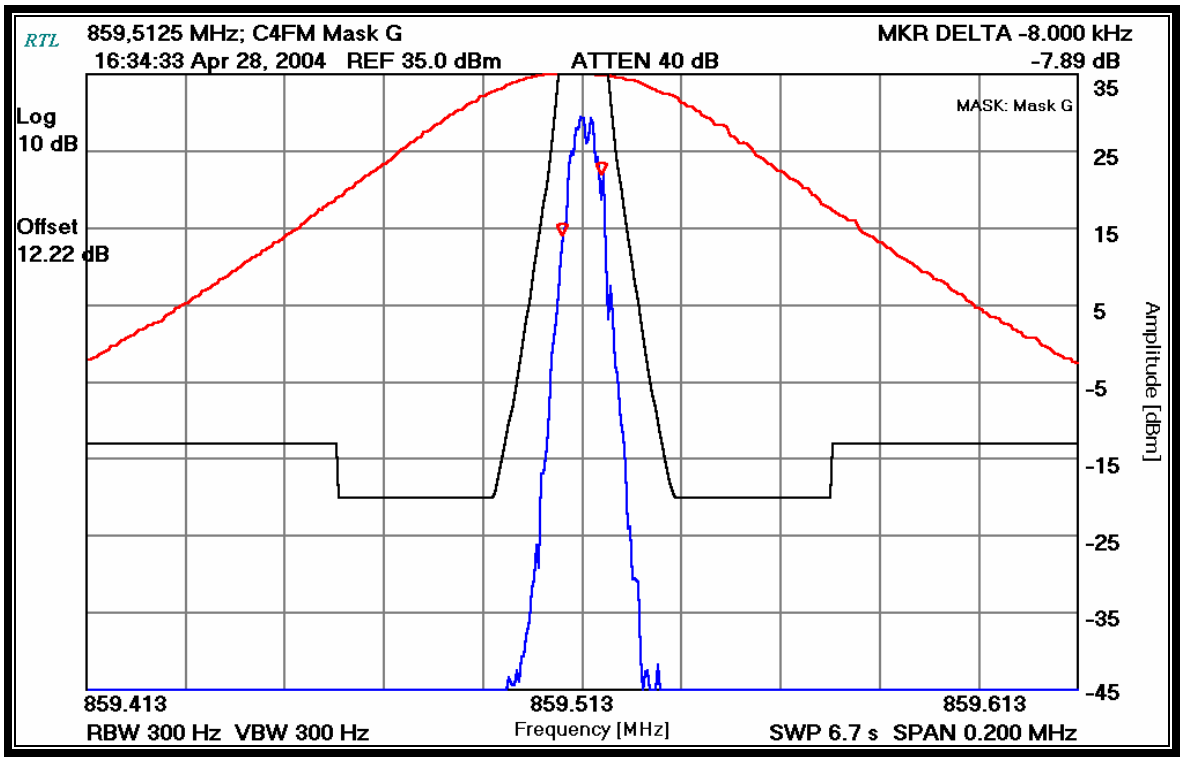
PLOT 10-7: MASK G (814.5125 MHZ; CH 8; C4FM), 10 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

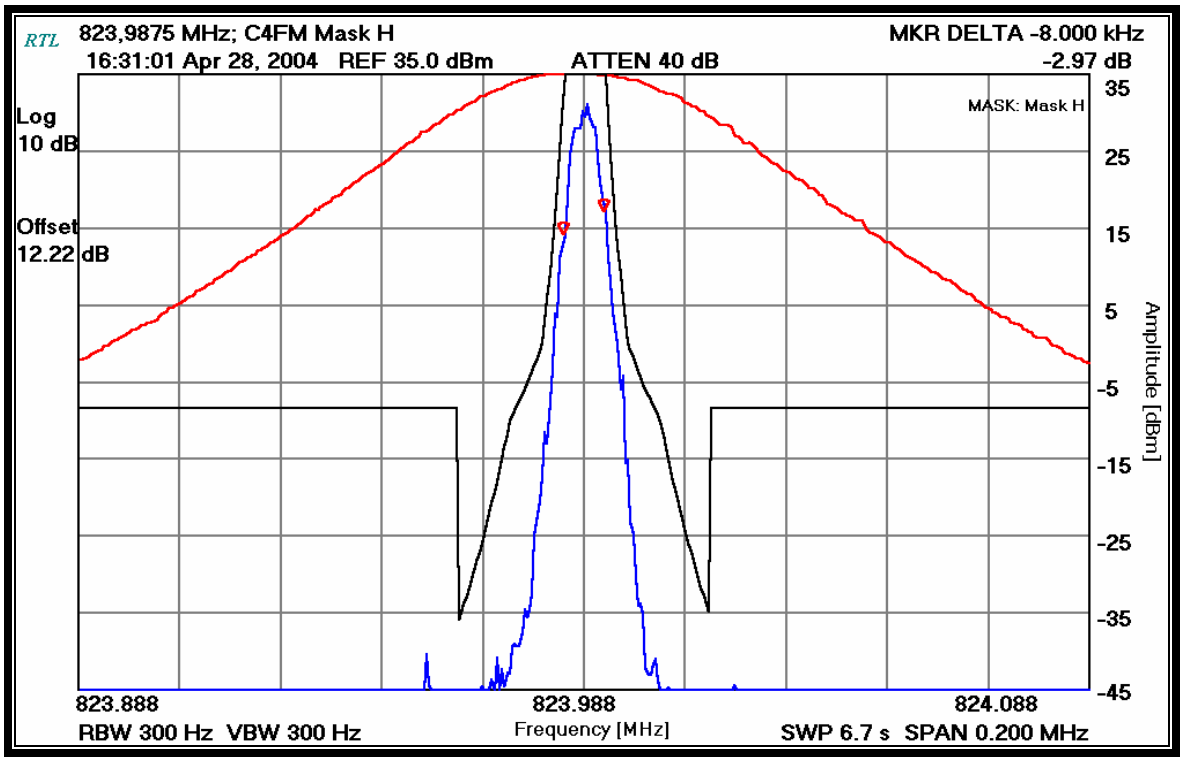
PLOT 10-8: MASK G (859.5125 MHZ; CH 11; C4FM), 10 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

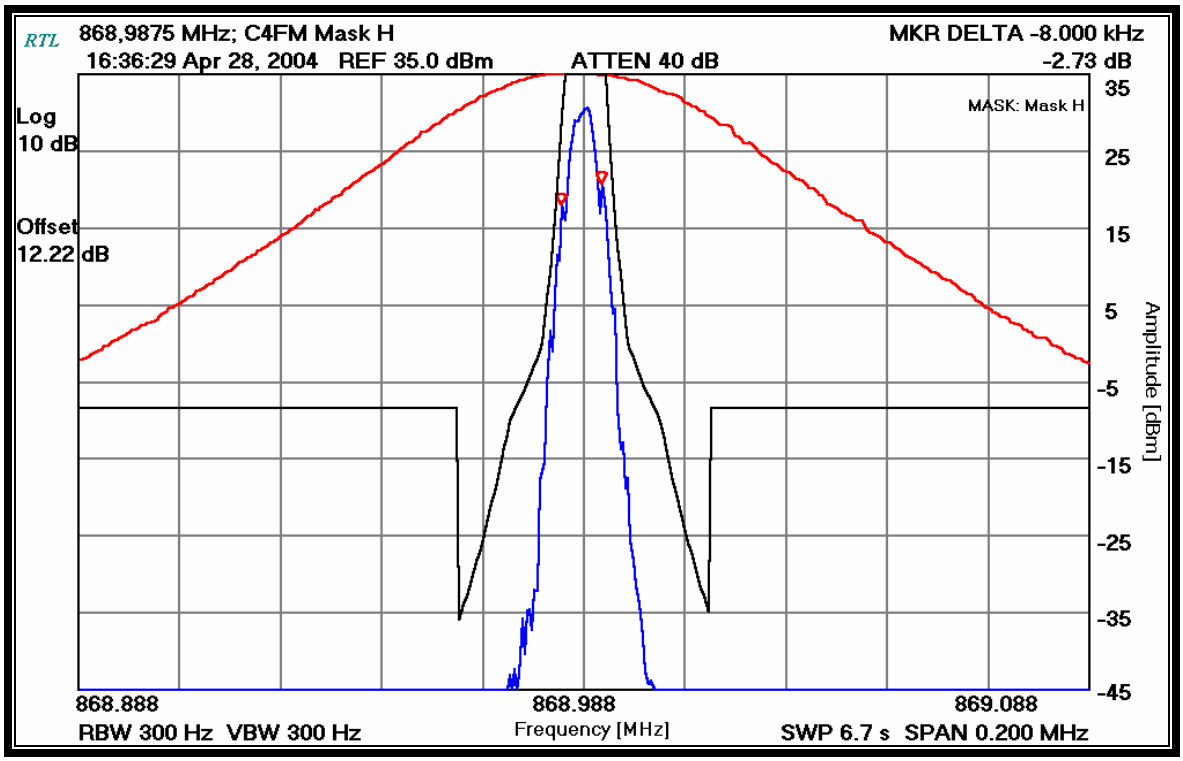
PLOT 10-9: MASK H (823.9875 MHZ; CH 9; C4FM), 10 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

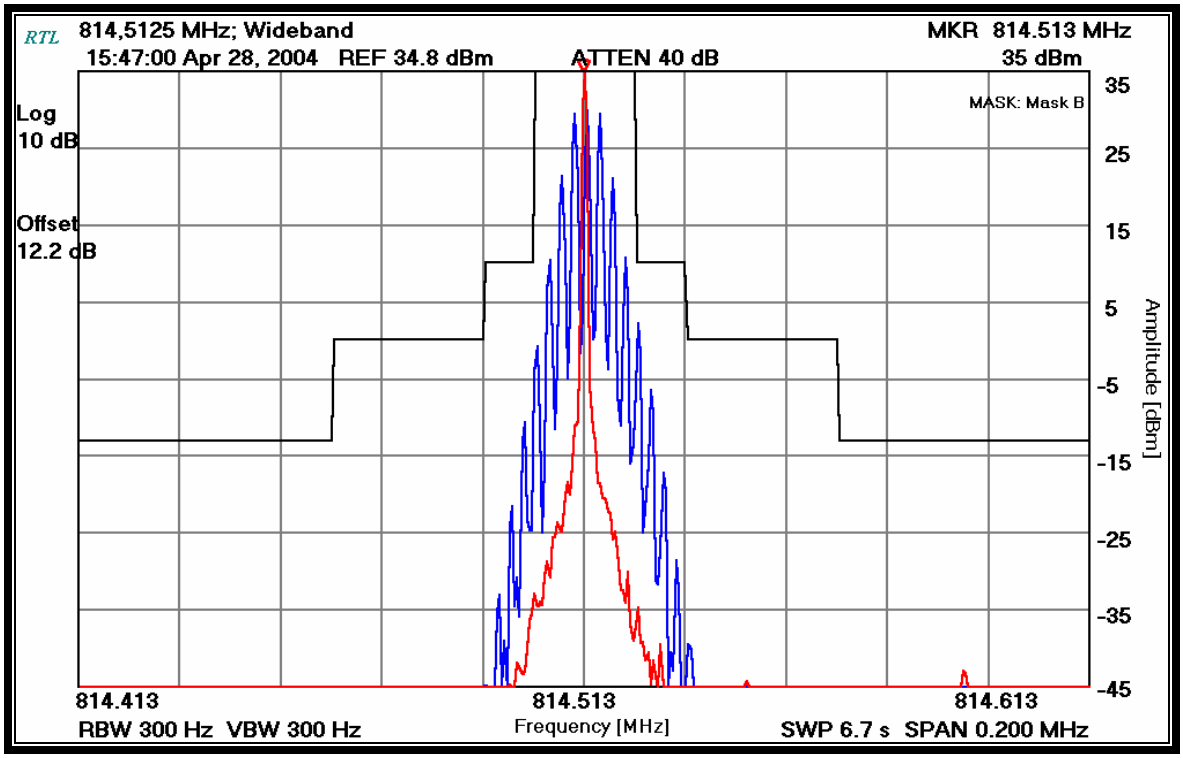
PLOT 10-10: MASK H (868.9875 MHZ; CH 12; C4FM), 10 KHZ



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

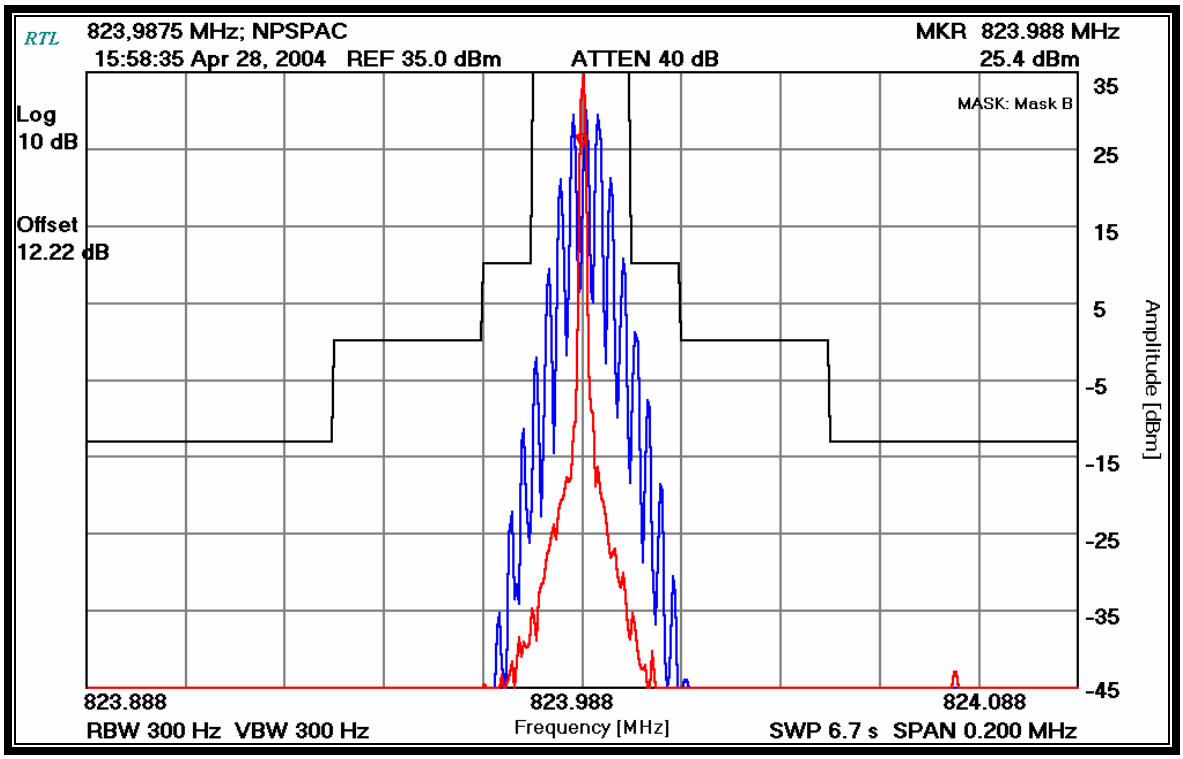
PLOT 10-11: MASK B (814.5125 MHZ; CH 8; WIDEBAND)



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

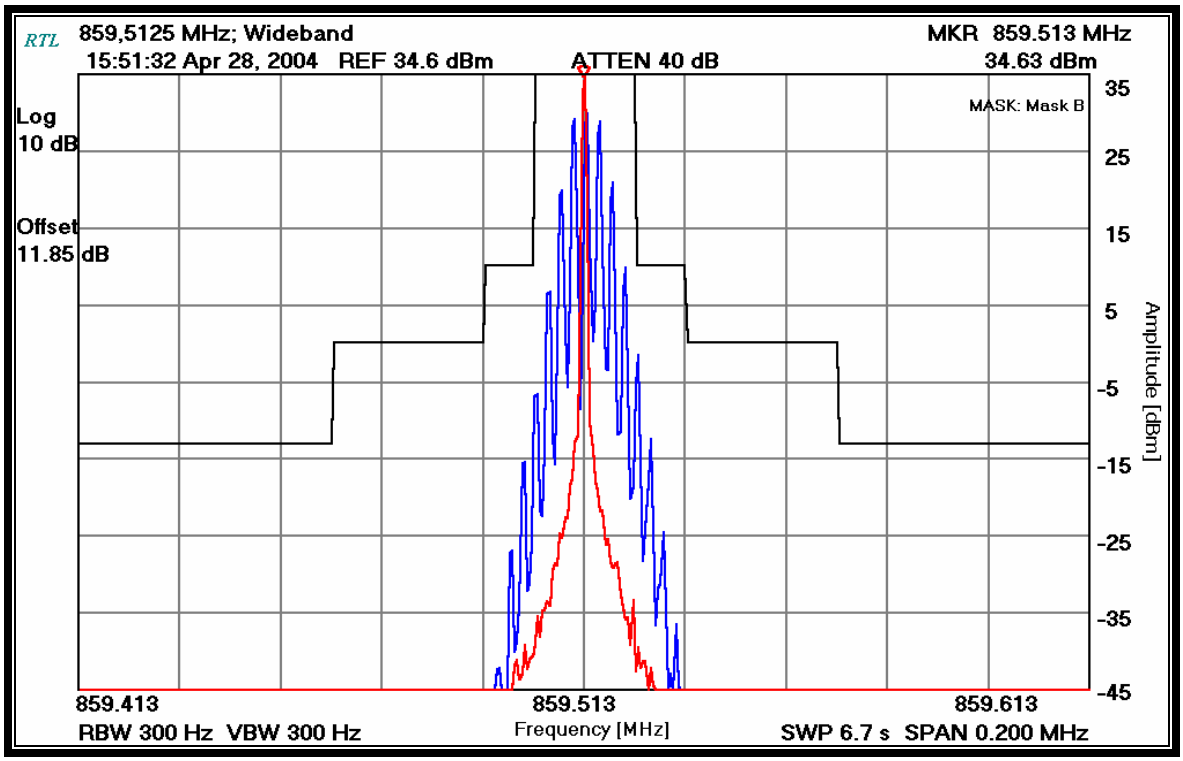
PLOT 10-12: MASK B (823.9875 MHZ; CH. 9; NPSPAC)



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

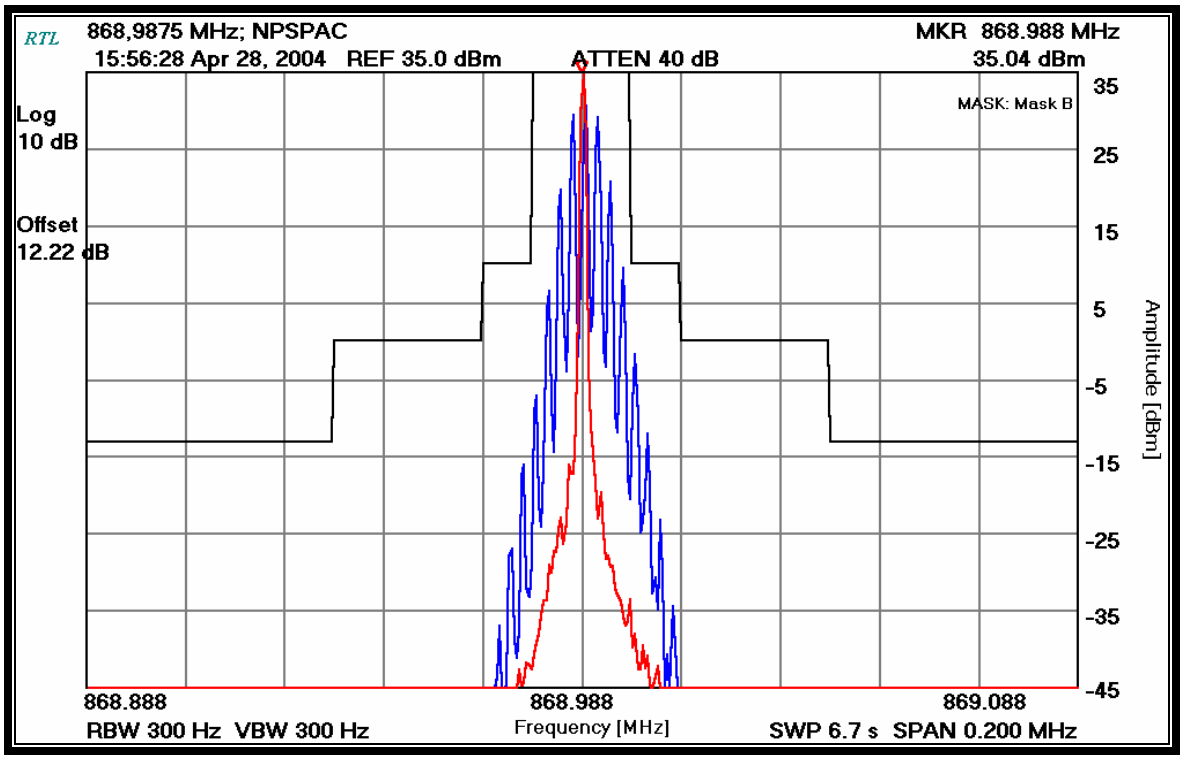
PLOT 10-13: MASK B (859.5125 MHZ; CH. 11; WIDEBAND)



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 10-14: MASK B (868.9875 MHZ; CH. 12; NPSPAC)



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 28, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

11 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051

11.1 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051 TEST PROCEDURE

The level of the various conducted spurious frequencies was measured by means of a calibrated spectrum analyzer. The antenna output terminal of the EUT was connected to the input of a 50 Ω spectrum analyzer through a notch filter. The transmitter was operating at maximum power.

11.2 SPURIOUS EMISSIONS AT ANTENNA TERMINAL TEST EQUIPMENT

TABLE 11-1: SPURIOUS EMISSIONS AT ANTENNA TERMINAL TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz – 40 GHz)	3943A01719	7/15/04
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	8/6/04
901132	PAR Electronics	806-902 (25W)	UHF Notch Filter	N/A	5/13/04

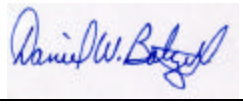
11.3 CONDUCTED SPURIOUS EMISSIONS TEST DATA

TABLE 11-2: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 1 AT 762.0125 MHZ)

Operating Frequency (MHz): 762.0125
Channel: 1
Measured Conducted Power (dBm): 34.77
Modulation: Analog
Limit (dBc): 54.77 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1524.025	-50.7	1.1	84.4	-29.6
2286.038	-54.3	9.3	79.8	-25.0
3048.050	-59.2	0.5	93.5	-38.7
3810.063	-59.4	0.1	94.1	-39.3
4572.075	-71.9	8.8	97.9	-43.1
5334.088	-75.5	5.5	104.8	-50.0
6096.100	-79.8	1.2	113.4	-58.6
6858.113	-82.7	6.1	111.4	-56.6
7620.125	-86.4	1.0	120.2	-65.4

TEST PERSONNEL:



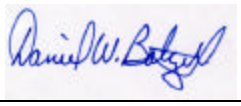
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-3: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 2 AT 769.0125 MHZ)

Operating Frequency (MHz): 769.0125
Channel: 2
Measured Conducted Power (dBm): 34.83
Modulation: Analog
Limit (dBc): 54.83 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1538.025	-50.9	1.1	84.6	-29.8
2307.038	-47.6	9.5	72.9	-18.1
3076.050	-56.5	0.6	90.7	-35.9
3845.063	-60.6	0.2	95.2	-40.4
4614.075	-67.4	4.8	97.4	-42.6
5383.088	-77.7	5.6	106.9	-52.1
6152.100	-78.5	1.3	112.0	-57.2
6921.113	-81.0	5.8	110.0	-55.2
7690.125	-83.8	1.7	116.9	-62.1

TEST PERSONNEL:



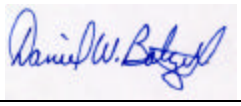
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-4: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 3 AT 775.9875 MHZ)

Operating Frequency (MHz): 775.9875
Channel: 3
Measured Conducted Power (dBm): 34.73
Modulation: Analog
Limit (dBc): 54.73 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1551.975	-51.9	0.7	85.9	-31.2
2327.963	-43.3	9.1	68.9	-14.2
3103.950	-53.7	0.8	87.6	-32.9
3879.938	-58.5	0.0	93.2	-38.5
4655.925	-71.3	3.6	102.4	-47.7
5431.913	-83.0	9.8	107.9	-53.2
6207.900	-72.2	1.2	105.7	-51.0
6983.888	-80.1	3.2	111.6	-56.9
7759.875	-81.6	0.0	116.3	-61.6

TEST PERSONNEL:



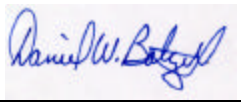
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-5: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 4 AT 792.0125 MHZ)

Operating Frequency (MHz): 792.0125
Channel: 4
Measured Conducted Power (dBm): 34.78
Modulation: Analog
Limit (dBc): 54.78 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1584.025	-53.8	0.0	88.6	-33.8
2376.038	-39.5	7.2	67.1	-12.3
3168.050	-54.4	0.0	89.2	-34.4
3960.063	-58.6	0.0	93.4	-38.6
4752.075	-80.8	1.5	114.1	-59.3
5544.088	-105.7	32.9	107.6	-52.8
6336.100	-75.8	0.1	110.5	-55.7
7128.113	-80.3	1.2	113.9	-59.1
7920.125	-83.3	0.0	118.1	-63.3

TEST PERSONNEL:



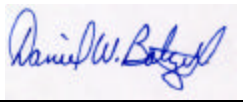
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-6: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 5 AT 799.0125 MHZ)

Operating Frequency (MHz):	799.0125
Channel:	5
Measured Conducted Power (dBm):	34.62
Modulation:	Analog
Limit (dBc):	54.62 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1598.025	-54.3	0.3	88.6	-34.0
2397.038	-48.3	7.8	75.1	-20.5
3196.050	-56.5	0.5	90.6	-36.0
3995.063	-52.0	0.1	86.5	-31.9
4794.075	-84.2	0.6	118.2	-63.6
5593.088	-93.1	18.2	109.5	-54.9
6392.100	-74.3	0.7	108.2	-53.6
7191.113	-86.1	1.9	118.8	-64.2
7990.125	-92.5	0.6	126.5	-71.9

TEST PERSONNEL:



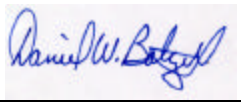
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-7: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 6 AT 805.9875 MHZ)

Operating Frequency (MHz): 805.9875
Channel: 6
Measured Conducted Power (dBm): 34.71
Modulation: Analog
Limit (dBc): 54.71 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1611.975	-56.4	0.9	90.2	-35.5
2417.963	-50.6	6.0	79.3	-24.6
3223.950	-58.5	1.4	91.8	-37.1
4029.938	-50.0	1.5	83.2	-28.5
4835.925	-79.8	1.6	112.9	-58.2
5641.913	-86.4	12.0	109.1	-54.4
6447.900	-79.4	1.0	113.1	-58.4
7253.888	-79.1	2.0	111.8	-57.1
8059.875	-90.0	0.5	124.2	-69.5

TEST PERSONNEL:



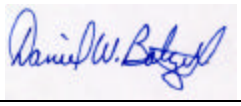
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-8: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 7 AT 806.0125 MHZ)

Operating Frequency (MHz):	806.0125
Channel:	7
Measured Conducted Power (dBm):	35.04
Modulation:	Analog
Limit (dBc):	55.04 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1612.025	-54.1	0.0	89.1	-34.1
2418.038	-50.5	5.5	80.0	-25.0
3224.050	-59.2	0.0	94.2	-39.2
4030.063	-51.0	0.0	86.0	-31.0
4836.075	-85.3	0.6	119.7	-64.7
5642.088	-87.4	10.1	112.3	-57.3
6448.100	-84.2	0.0	119.2	-64.2
7254.113	-81.1	0.3	115.8	-60.8
8060.125	-91.2	0.0	126.2	-71.2

TEST PERSONNEL:



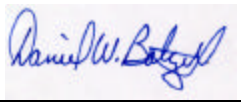
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-9: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 8 AT 814.5125 MHZ)

Operating Frequency (MHz):	814.5125
Channel:	8
Measured Conducted Power (dBm):	35.0
Modulation:	Analog
Limit (dBc):	55.0 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1629.025	-55.4	0.1	90.3	-35.3
2443.538	-53.7	5.1	83.6	-28.6
3258.050	-64.1	0.9	98.2	-43.2
4072.563	-47.2	1.0	81.2	-26.2
4887.075	-77.0	1.3	110.7	-55.7
5701.588	-82.1	6.6	110.5	-55.5
6516.100	-79.9	1.1	113.8	-58.8
7330.613	-83.5	1.2	117.3	-62.3
8145.125	-91.0	1.4	124.6	-69.6

TEST PERSONNEL:



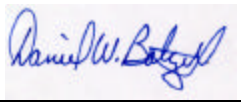
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-10: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 9 AT 823.9875 MHZ)

Operating Frequency (MHz):	823.9875
Channel:	9
Measured Conducted Power (dBm):	34.94
Modulation:	Analog
Limit (dBc):	54.94 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1647.975	-60.5	0.0	95.4	-40.5
2471.963	-60.6	4.8	90.7	-35.8
3295.950	-65.2	0.0	100.1	-45.2
4119.938	-51.3	0.4	85.8	-30.9
4943.925	-74.6	5.8	103.7	-48.8
5767.913	-86.7	1.2	120.4	-65.5
6591.900	-77.8	0.4	112.3	-57.4
7415.888	-84.7	1.4	118.2	-63.3
8239.875	-91.3	5.9	120.3	-65.4

TEST PERSONNEL:



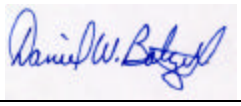
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-11: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 10 AT 851.0125 MHZ)

Operating Frequency (MHz):	851.0125
Channel:	10
Measured Conducted Power (dBm):	34.91
Modulation:	Analog
Limit (dBc):	54.91 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1702.025	-55.3	0.8	89.4	-34.5
2553.038	-56.7	4.7	86.9	-32.0
3404.050	-67.1	0.8	101.2	-46.3
4255.063	-63.6	1.0	97.5	-42.6
5106.075	-81.7	0.3	116.3	-61.4
5957.088	-78.0	2.7	110.2	-55.3
6808.100	-88.4	10.0	113.3	-58.4
7659.113	-85.8	1.1	119.6	-64.7
8510.125	-88.5	3.1	120.3	-65.4

TEST PERSONNEL:



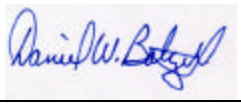
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-12: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 11 AT 859.5125 MHZ)

Operating Frequency (MHz):	859.5125
Channel:	11
Measured Conducted Power (dBm):	34.91
Modulation:	Analog
Limit (dBc):	54.91 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1719.025	-59.1	0.0	94.0	-39.1
2578.538	-58.6	3.9	89.6	-34.7
3438.050	-64.3	1.1	98.1	-43.2
4297.563	-55.9	0.8	90.0	-35.1
5157.075	-87.8	2.6	120.1	-65.2
6016.588	-66.6	5.5	96.0	-41.1
6876.100	-87.6	1.0	121.5	-66.6
7735.613	-89.1	3.4	120.6	-65.7
8595.125	-89.2	2.3	121.8	-66.9

TEST PERSONNEL:



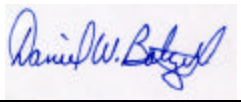
DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 11-13: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 12 AT 868.9875 MHZ)

Operating Frequency (MHz):	868.9875
Channel:	12
Measured Conducted Power (dBm):	35.02
Modulation:	Analog
Limit (dBc):	55.02 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1737.975	-58.2	0.1	93.1	-38.1
2606.963	-62.0	2.6	94.4	-39.4
3475.950	-61.1	0.0	96.1	-41.1
4344.938	-57.8	1.3	91.5	-36.5
5213.925	-85.7	0.0	120.7	-65.7
6082.913	-74.6	0.9	108.7	-53.7
6951.900	-90.1	3.0	122.1	-67.1
7820.888	-85.2	0.1	120.1	-65.1
8689.875	-91.6	9.1	117.5	-62.5

TEST PERSONNEL:



DANIEL BALTZELL		APRIL 12, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

12 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

12.1 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

ERP Measurements by Substitution Method:

The EUT was placed on a turntable 3 meters from the receive antenna. The EUT was placed on the turntable with the transmitter transmitting into a non-radiating load. The field of maximum intensity was found by rotating the EUT 360 degrees in all 3 orthogonal axes, and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A horn antenna was substituted in place of the EUT. The horn was fed by a signal generator, and the input level adjusted to the same field strength level as the EUT. The conducted power from the signal generator was recorded. The signal generator level was corrected by subtracting the connecting cable loss, and further corrected with the horn gain referenced to a ½ wave dipole measurement.

The spectrum analyzer was set to the following settings:

1. Resolution Bandwidth - 1 MHz
2. Video Bandwidth = 10 Hz
3. Sweep Speed = 200 ms
4. Detector Mode = Positive Peak

12.2 RADIATED SPURIOUS TEST EQUIPMENT

TABLE 12-1: RADIATED SPURIOUS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	7/03/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/15/04
900928	Hewlett Packard	83752A	Synthesized Sweeper (0.01 - 20 GHz)	3610A00866	8/5/04
900905	Rhein Tech Labs	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	9/10/04
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	2/17/06
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	3/15/05
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/10/05
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	3/15/05
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	5/5/05

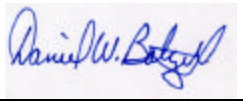
12.3 RADIATED SPURIOUS EMISSIONS TEST DATA - §2.1053

TABLE 12-2: RADIATED SPURIOUS EMISSIONS (769.0125 MHZ, CH 2)

Operating Frequency (MHz): 769.0125
Channel: 2
Measured Conducted Power (dBm): 34.83
Modulation: Analog narrowband
Distance (m): 3
Limit (dBc): 54.83 (50+10LogP)

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Level (dBc)	Margin (dB)
1538.0250	-61.3	0.5	4.7	91.9	-37.1
2307.0375	-49.7	0.6	5.0	80.1	-25.3
3076.0500	-66.2	0.8	6.2	95.6	-40.8
3845.0625	-63.6	0.9	5.9	93.4	-38.6
4614.0750	-64.3	1.0	7.0	93.1	-38.3
5383.0875	-69.6	1.0	6.6	98.8	-44.0
6152.1000	-63.8	1.4	7.0	93.0	-38.2
6921.1125	-67.8	1.4	7.7	96.3	-41.5
7690.1250	-58.5	1.3	7.9	86.7	-31.9

TEST PERSONNEL:



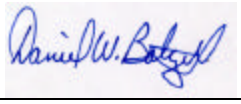
DANIEL BALTZELL		MAY 2, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 12-3: RADIATED SPURIOUS EMISSIONS (799.0125 MHZ, CH 5)

Operating Frequency (MHz):	799.0125
Channel:	5
Measured Conducted Power (dBm):	34.62
Modulation:	Analog Narrowband
Distance (m):	3
Limit (dBc):	54.62 (50+10LogP)

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Level (dBc)	Margin (dB)
1598.0250	-50.2	0.5	4.7	80.6	-26.0
2397.0375	-42.9	0.8	5.1	73.2	-18.6
3196.0500	-50.9	0.8	6.1	80.2	-25.6
3995.0625	-50.7	0.9	5.9	80.3	-25.7
4794.0750	-59.3	1.0	7.0	87.9	-33.3
5593.0875	-60.8	1.1	6.5	90.0	-35.4
6392.1000	-47.9	1.5	7.5	76.5	-21.9
7191.1125	-53.8	1.4	7.6	82.2	-27.6
7990.1250	-43.7	1.3	8.4	71.2	-16.6

TEST PERSONNEL:



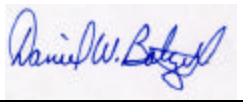
DANIEL BALTZELL		MAY 2, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 12-4: RADIATED SPURIOUS EMISSIONS (814.5125 MHZ, CH 8)

Operating Frequency (MHz):	814.5125
Channel:	8
Measured Conducted Power (dBm):	35.0
Modulation:	Analog narrowband
Distance (m):	3
Limit (dBc):	55.0 (50+10LogP)

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Level (dBc)	Margin (dB)
1629.0250	-61.3	0.5	4.7	75.0	-20.0
2443.5375	-49.7	0.6	5.0	75.3	-20.3
3258.0500	-66.2	0.8	6.2	81.5	-26.5
4072.5625	-63.6	0.9	5.9	79.9	-24.9
4887.0750	-64.3	1.0	7.0	85.2	-30.2
5701.5875	-69.6	1.0	6.6	80.6	-25.6
6516.1000	-63.8	1.4	7.0	72.7	-17.7
7330.6125	-67.8	1.4	7.7	84.3	-29.3
8145.1250	-58.5	1.3	7.9	76.4	-21.4

TEST PERSONNEL:



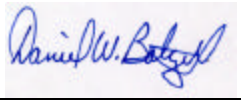
DANIEL BALTZELL		MAY 2, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 12-5: RADIATED SPURIOUS EMISSIONS (859.5125, CH 11)

Operating Frequency (MHz):	859.5125
Channel:	11
Measured Conducted Power (dBm):	35.0
Modulation:	Analog Narrowband
Distance (m):	3
Limit (dBc):	55.0 (50+10LogP)

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Level (dBc)	Margin (dB)
1719.0250	-56.0	0.5	4.7	86.7	-31.8
2578.5375	-63.8	0.7	5.3	94.1	-39.2
3438.0500	-55.5	0.8	6.0	85.2	-30.3
4297.5625	-49.7	0.9	6.6	78.9	-24.0
5157.0750	-53.0	1.1	6.8	82.2	-27.3
6016.5875	-47.0	1.4	6.7	76.6	-21.7
6876.1000	-47.3	1.5	7.7	76.0	-21.1
7735.6125	-55.8	1.3	8.0	84.0	-29.1
8595.1250	-40.6	1.4	8.1	68.8	-13.9

TEST PERSONNEL:



DANIEL BALTZELL		MAY 2, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

13 FREQUENCY STABILITY / TEMPERATURE VARIATION - §2.1055

13.1 MEASUREMENT METHOD:

The frequency stability of the transmitter was measured by:

1. Temperature: The temperature was varied from -30°C to +60°C at intervals no more than 10°C throughout the temperature range using an environmental chamber. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement.
2. Primary Supply Voltage: The primary supply voltage was varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied. The EUT was tested down to the battery endpoint.

13.2 TIME PERIOD AND PROCEDURE:

1. The carrier frequency of the transmitter was measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment was subjected to an overnight "soak" at -30°C without any power applied.
3. After the overnight "soak" at -30°C, the measurement of the carrier frequency of the transmitter was made within a three-minute interval after applying power to the transmitter.
4. Frequency measurements were made at 10°C intervals up to +60°C, then back to room temperature. A minimum period of one hour was provided to allow stabilization of the equipment at each temperature level.

13.3 FREQUENCY TOLERANCE:

The minimum frequency stability shall be +2.5ppm referenced to a received carrier frequency from a base station.

13.4 FREQUENCY STABILITY TEST EQUIPMENT

TABLE 13-1: FREQUENCY STABILITY TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
900946	Tenney Engineering, Inc	TH65	Temperature Chamber with Humidity	11380	2/3/05
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/15/04

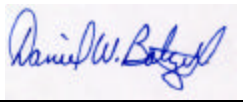
13.5 FREQUENCY STABILITY TEST DATA - §2.1055

Operating Frequency: 769.0125 MHz
Channel: 2 Wideband
Reference Voltage: 7.5 VDC
Deviation Limit: 5 PPM RE: AFC not locked to Base Station

TABLE 13-2: FREQUENCY STABILITY DATA - §2.1055: TEMPERATURE

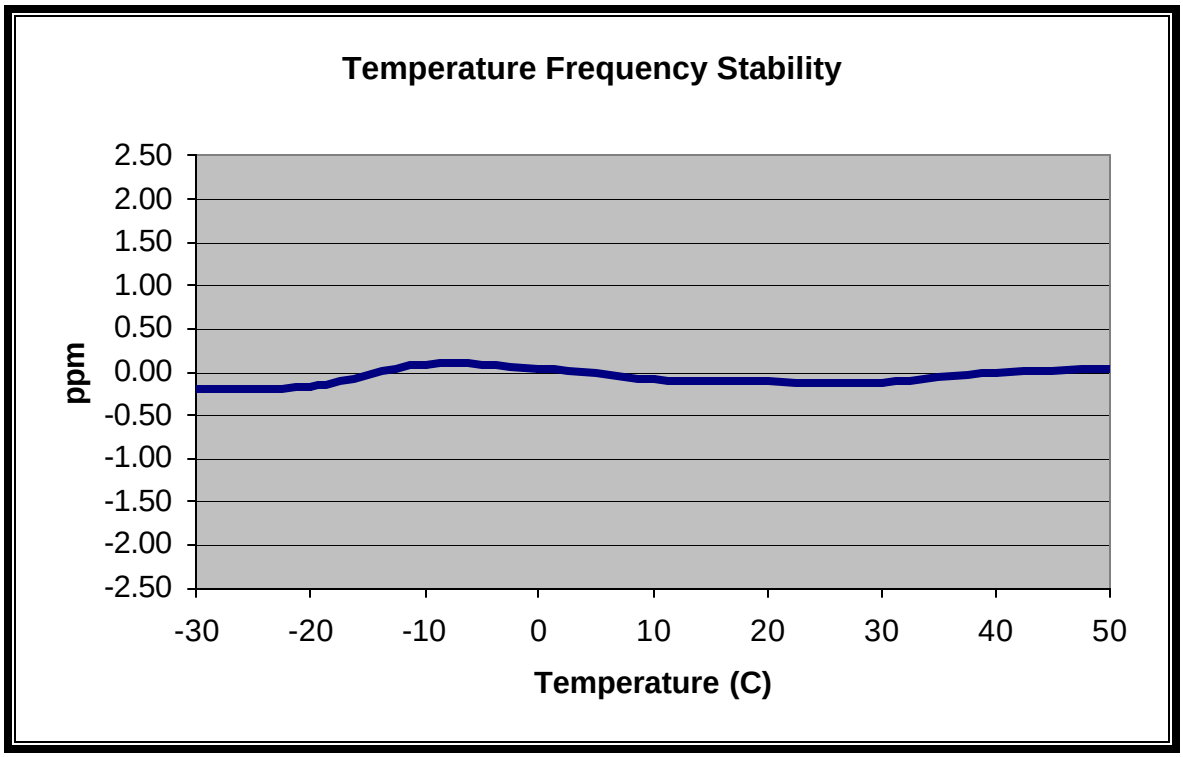
Temperature (°C)	Measured Frequency (MHz)	ppm
-30	769.012350	-0.20
-20	769.012375	-0.16
-10	769.012570	0.09
0	769.012530	0.04
10	769.012435	-0.08
20	769.012415	-0.11
30	769.012410	-0.12
40	769.012495	-0.01
50	769.012525	0.03

TEST PERSONNEL:



DANIEL BALTZELL		APRIL 29, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

PLOT 13-1: TEMPERATURE FREQUENCY STABILITY - §2.1055



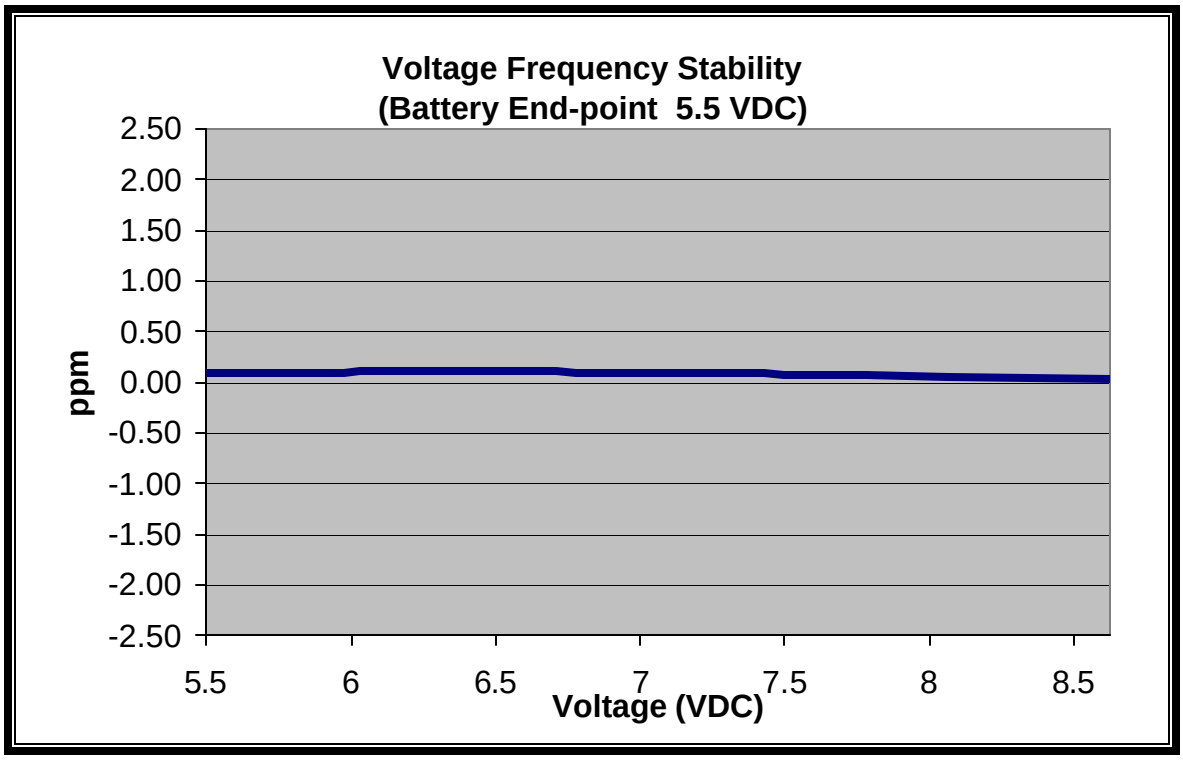
TEST PERSONNEL:

DANIEL BALTZELL		APRIL 29, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

TABLE 13-3: FREQUENCY STABILITY DATA - §2.1055: VOLTAGE

Voltage (DC)	Measured Frequency (MHz)	ppm
5.5	769.012570	0.09
6.375	769.012583	0.11
7.5	769.012565	0.08
8.625	769.012530	0.04

PLOT 13-2: VOLTAGE FREQUENCY STABILITY - §2.1055



TEST PERSONNEL:

DANIEL BALTZELL		APRIL 29, 2004
TEST ENGINEER	SIGNATURE	DATE OF TEST

14 FCC PART 2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Type of Emission: F3E, F1D, and F1E

Necessary Bandwidth and Emission Bandwidth calculation

The 12.5KHz Analog modulation necessary bandwidth: Bn = 11K0F3E
The 25 kHz Analog modulation necessary bandwidth: Bn = 16K0F3E
NPSPAC modulation necessary bandwidth: Bn = 14K0F3E
The measured C4FM digital modulation necessary bandwidth: Bn = 8K10F1D, 8K10F1E

Calculation:

Max modulation (M) in kHz: 3
Max deviation (D) in kHz for (25 KHz channel spacing analog): 5
Max deviation for (D) in kHz for (12.5 KHz channel spacing): 2.5
Max deviation for (D) in kHz for (NPSPAC): 4
Constant factor (K): 1
$B_{n(12.5KHz\ analog)}$ = 2xM+2xDK = (2x3) +(2x2.5x1) = 11 kHz
$B_{n(25KHz\ analog)}$ = 2xM+2xDK =(2x3) + (2x5x1) = 16 kHz
$B_{n(NPSPAC)}$ = 2xM+2xDK = (2x3) +(2x4x1) = 14 kHz
$B_{n(C4FM)}$ = 8.1 kHz

15 CONCLUSION

The data in this measurement report shows that E.F. Johnson Model 242-5172 FCC ID: ATH2425171, complies with all the requirements of Parts 2 and 90 of the FCC Rules, and Industry Canada RSS-119.