Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 90

Test Lab:	Applicant:
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FCC ID:	ATH2425191	**TEST REPORT DATE:**	March 7, 2005
MODEL:	242-519x-xxx	**RTL WORK ORDER NUMBER:**	2005008
EQUIPMENT TYPE:	UHF PTT	**RTL QUOTE NUMBER:**	QRTL05-005

FCC Classification:	☒ TNF – Licensed Non-Broadcast Transmitter Held to Face
FCC Rule Part(s):	Part 90: Private Land Mobile Radio Services

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance (PPM, %, or Hz)	Emission Designator
896.0125-900.9875	3.0	2.5 PPM	11K0F3E
935.0125-939.875	3.0	2.5 PPM	11K0F3E
896.0125-900.9875	3.0	2.5 PPM	8K10F1E
935.0125-939.875	3.0	2.5 PPM	8K10F1E
896.0125-900.9875	3.0	2.5 PPM	8K10F1D
935.0125-939.875	3.0	2.5 PPM	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 applicable parts of FCC Part 2, FCC Part 90, ANSI C63.2, ANSI/TIA-603-B-2002, and ANSI/TIA/EIA 603-1.

Signature: _____ Date: March 7, 2005

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

Signature: _____ Date: March 7, 2005

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.

All measurements contained in this application were conducted in accordance with the applicable parts of FCC Rules and Regulations CFR47 Part 90, and ANSI/TIA-603-B-2002 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. The measurement instrumentation conforms to the ANSI C63.2 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 C63.2).

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 January 18, 2005. The FCC identifiers for all equipment, plus descriptions of all cables used in the tested system are shown in the following table.

TABLE 2-1: EQUIPMENT UNDER TEST (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Portable Radio	E.F. Johnson	242-519x-xxx (UHF-High)	N/A	ATH2425191	N/A	016441

TABLE 2-2: EXTERNAL COMPONENTS IN TEST CONFIGURATION

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
NIMH Battery (7.5 VDC)	EF Johnson	587-5100-360	CLI=061206	N/A	N/A	016230
Battery Charger	EF Johnson	585-5100-210	B6-76755	N/A	N/A	016241
AC Adapter	Sunny Computer Technology Co., Ltd.	SYS1097-3015	0403086250	N/A	1.6 M Unshielded	016244
Handset	EF Johnson	V2-10023	0237	N/A	0.8m shielded	015068
Headset	EF Johnson	5890015059	N/A	N/A	1m shielded	014860
1/4 wave Antenna	EF Johnson	N/A	CLI-061202	N/A	N/A	016442
Adapter	EF Johnson	N/A	N/A	N/A	N/A	015825

2.2 WORST CASE CONFIGURATION OF TESTED SYSTEM

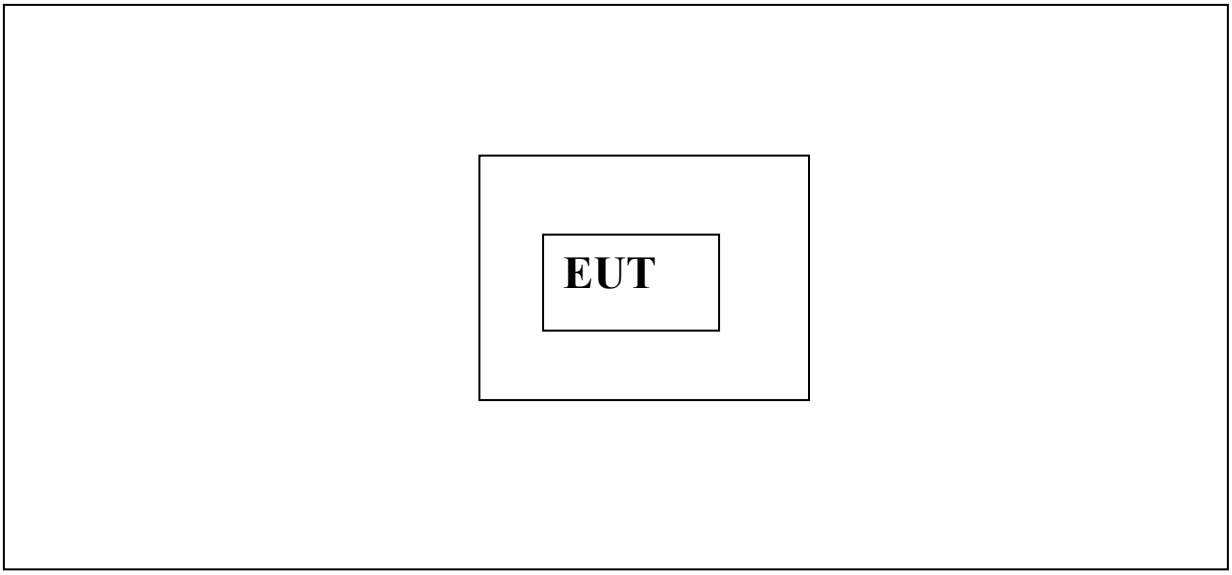


FIGURE 2-1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

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 were:

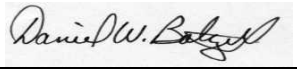
7.5 volts @ 2.16A

3.1 DC VOLTAGES AND CURRENTS TEST EQUIPMENT

TABLE 3-1: DC VOLTAGES AND CURRENTS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901028	Alinco	DM-340MVT	DC Power Supply	002143	N/A
901350	Meterman	33XR	Multimeter	040402802	7/21/05

TEST PERSONNEL:

DANIEL BALTZELL		FEBRUARY 14, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

4 RF POWER OUTPUT - §2.1046

4.1 ANSI/TIA 603-B-2002, 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.

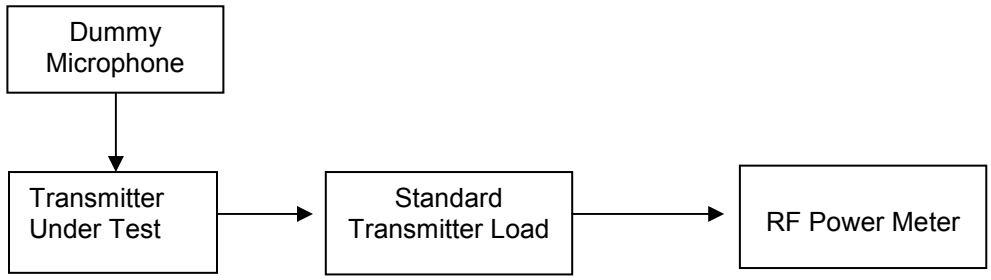


FIGURE 4-1: ILLUSTRATION OF HOW THE EQUIPMENT IS CONNECTED

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	08/02/2005
901186	Agilent Technologies	E9323A (50 MHz - 6 GHz)	Peak & Average Power Sensor	US40410380	09/10/2005

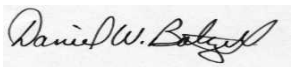
4.3 RF POWER OUTPUT TEST DATA

TABLE 4-2: RF POWER OUTPUT TEST DATA

Frequency (MHz)	Channel	Power Measured (dBm)	Power (Watt)
935.0125	1	34.6	2.9
937.0125	3	34.5	2.8
939.8750	6	34.4	2.8
896.0125	11	34.7	3.0
898.0125	13	34.6	2.9
900.9875	15	34.6	2.9

NOTE: CW measurements used for all power measurements

TEST PERSONNEL:

DANIEL BALTZELL		FEBRUARY 8, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

5 MODULATION CHARACTERISTICS - §2.1047 TEST PROCEDURE

The modulation characteristics tests apply to analog modulation, and do not apply to digital modulation.

5.1 MODULATION CHARACTERISTICS TEST EQUIPMENT

TABLE 5-1: 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	7/7/05
901054	Hewlett Packard	HP3586B	Selective Level Meter	1928A01892	9/8/05
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	9/8/05

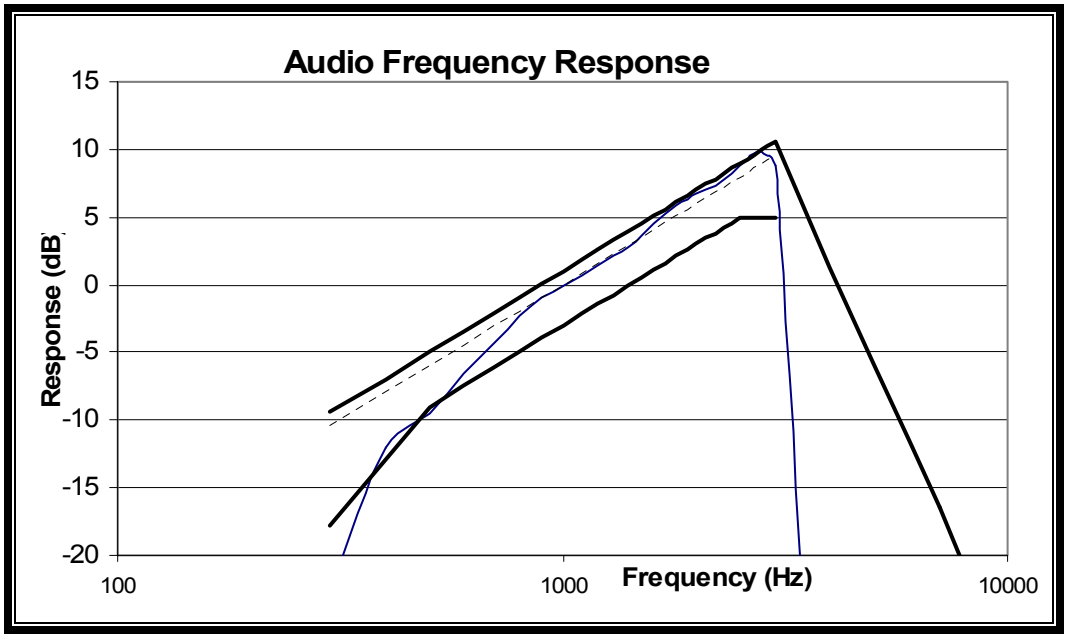
6 FCC PART 2 §2.1047(A): MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE

6.1 TEST PROCEDURE

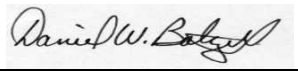
ANSI/TIA-603-B-2002, section 2.2.6. The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic. The input audio level at 1000 Hz is set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference 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).

6.2 TEST DATA

PLOT 6-1: AUDIO FREQUENCY RESPONSE



TEST PERSONNEL:

DANIEL BALTZELL		MARCH 2, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

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

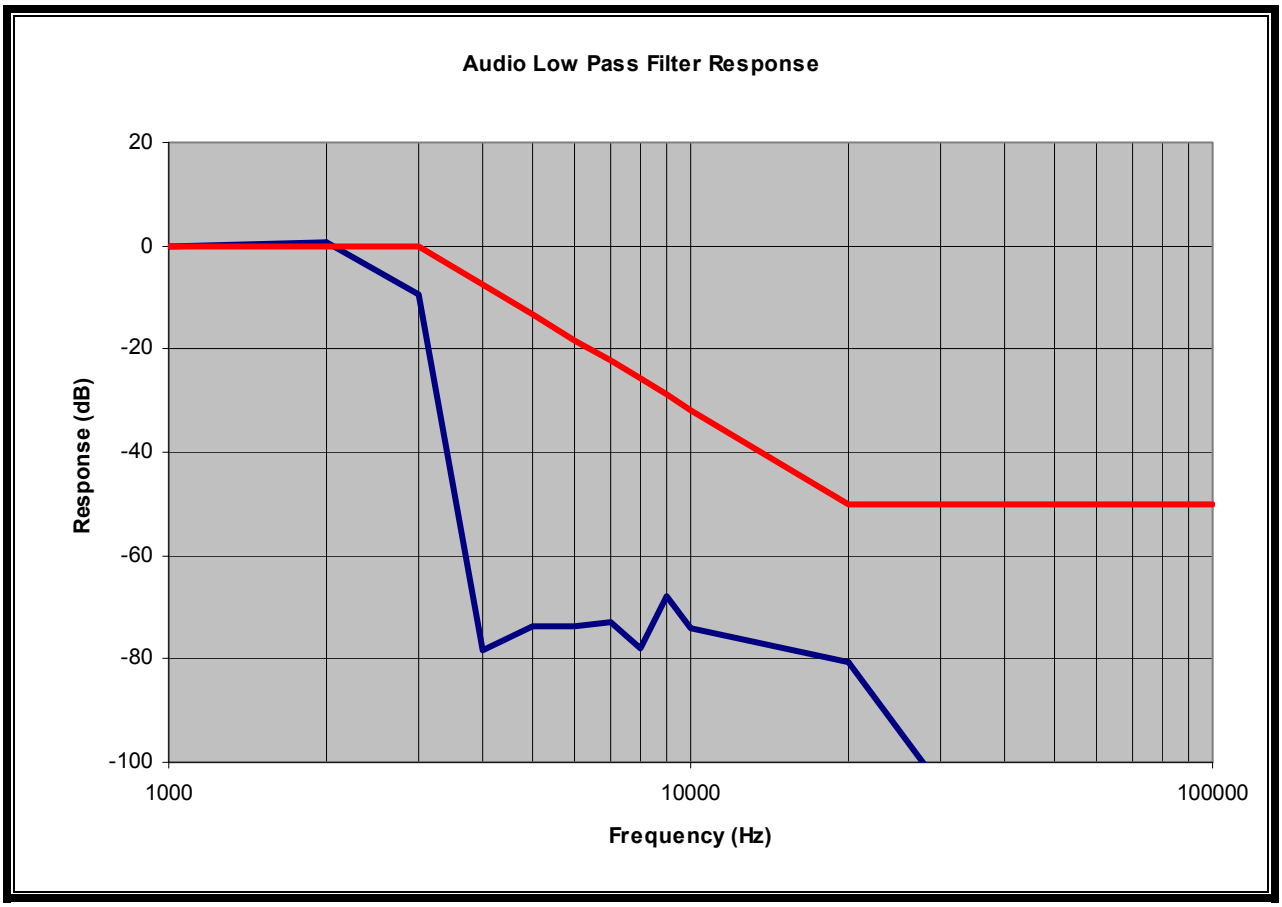
7.1 TEST PROCEDURE

ANSI/TIA-603-B-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.

7.2 TEST DATA

PLOT 7-1: AUDIO LOW PASS FILTER RESPONSE (CHANNEL 3)



TEST PERSONNEL:

DANIEL BALTZELL		FEBRUARY 9, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

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

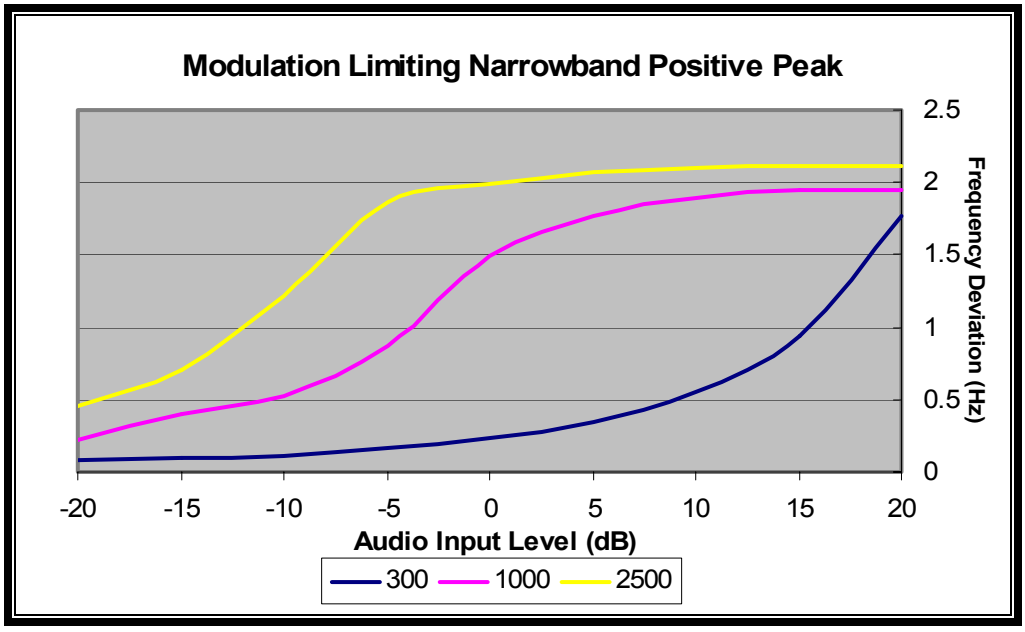
8.1 TEST PROCEDURE

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

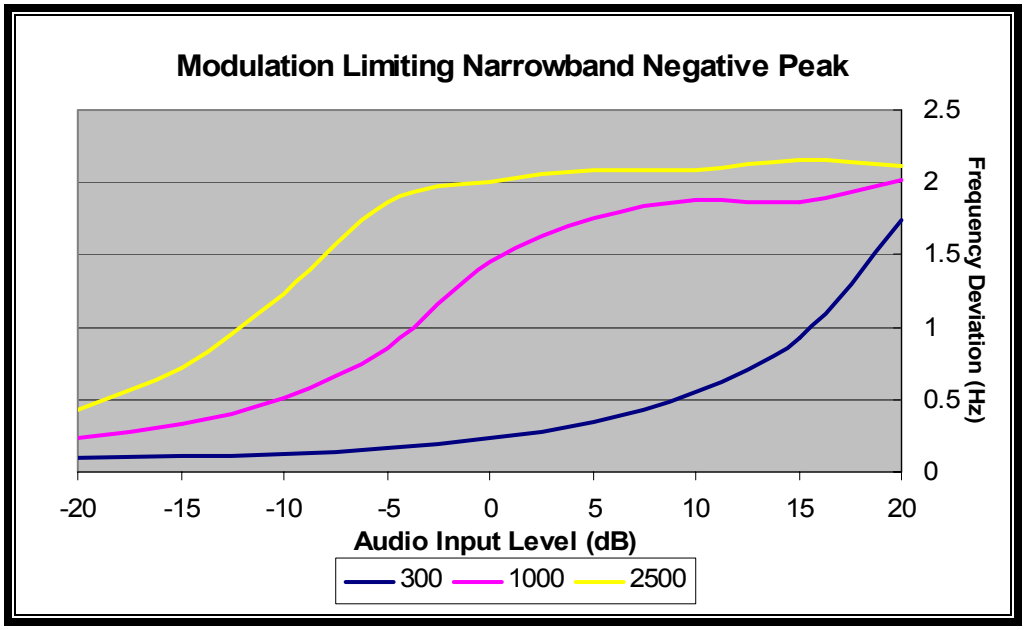
The transmitter is adjusted for full rated system deviation. The audio input level is adjusted for 60% of rated system deviation at 1000 Hz. Using this level as a reference (0 dB), the audio input level is varied from the reference to a level +20 dB above it and –20 dB under it, for modulation frequencies of 300 Hz, 1000 Hz, and 2500 Hz. The system deviation obtained as a function of the input level is recorded. Both Positive and Negative Peak deviations were recorded.

8.2 TEST DATA

PLOT 8-1: MODULATION LIMITING RESPONSE (NARROWBAND POSITIVE PEAK), CHANNEL 3



PLOT 8-2: MODULATION LIMITING RESPONSE (NARROWBAND NEGATIVE PEAK), CHANNEL 3



TEST PERSONNEL:

DANIEL BALTZELL		MARCH 2, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

9 OCCUPIED BANDWIDTH - §2.1049

9.1 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 10 dB 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. Specified Limits:

(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.

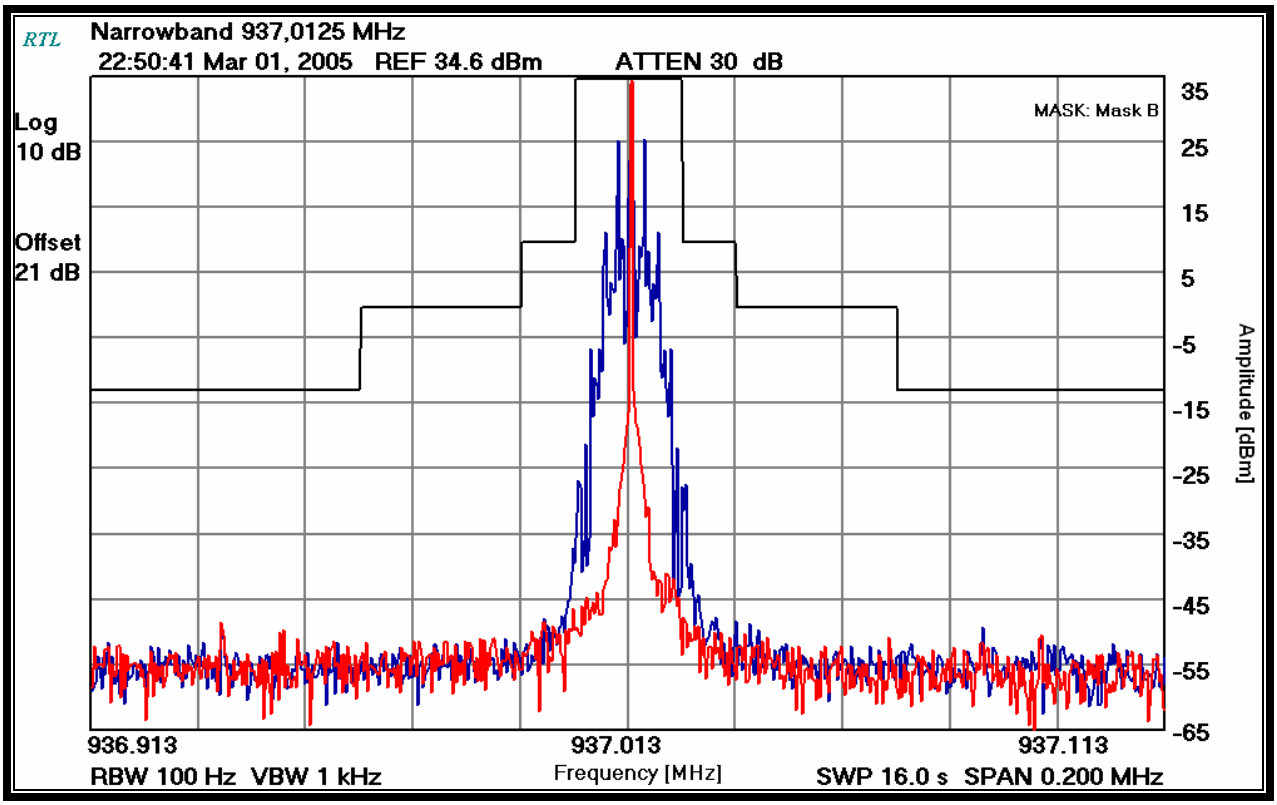
9.2 OCCUPIED BANDWIDTH TEST EQUIPMENT

TABLE 9-1: OCCUPIED BANDWIDTH TEST EQUIPMENT

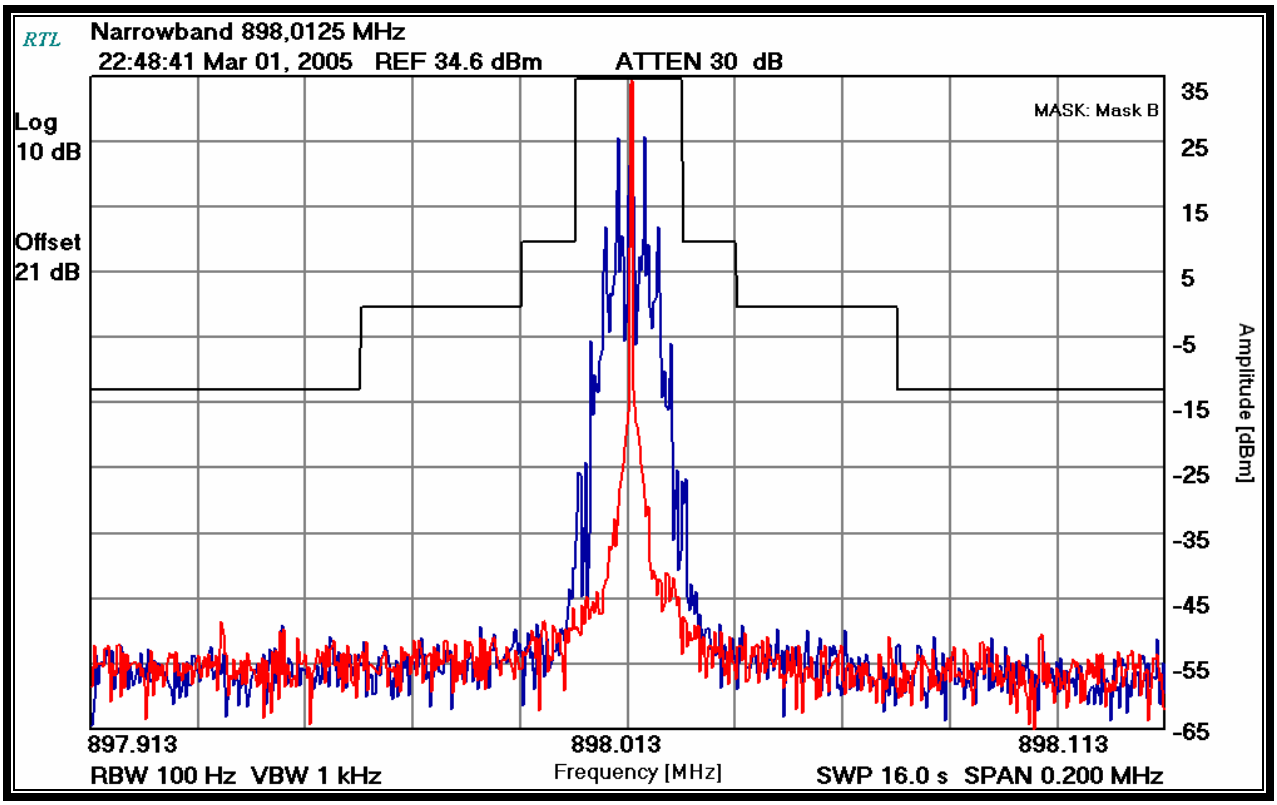
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	8/11/05
901138	Weinschel Corp.	48-20-34 DC-18GHz	Attenuator, 100W 20dB	BK5859	5/13/05
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	9/8/05

9.3 OCCUPIED BANDWIDTH TEST DATA

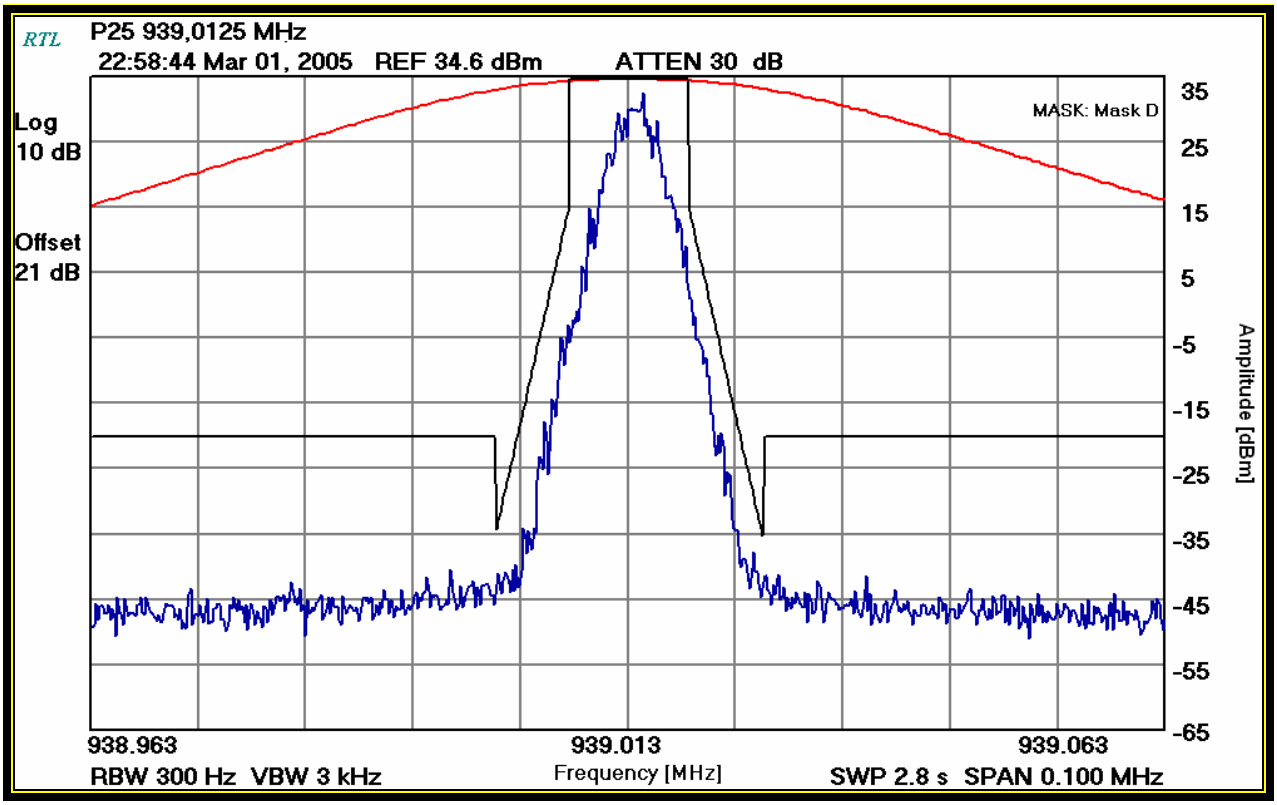
PLOT 9-1: MASK B (937.0125 MHZ; CHANNEL 3; NARROWBAND)



PLOT 9-2: MASK B (898.0125 MHZ; CHANNEL 13; NARROWBAND)



PLOT 9-3: MASK D (939.0125 MHZ, P25 DIGITAL)



TEST PERSONNEL:

DANIEL BALTZELL		MARCH 1, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

10 SPURIOUS EMISSIONS AT ANTENNA TERMINAL - §2.1051

10.1 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.

10.2 SPURIOUS EMISSIONS AT ANTENNA TERMINAL TEST EQUIPMENT

TABLE 10-1: SPURIOUS EMISSIONS AT ANTENNA TERMINAL TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05
901132	PAR Electronics	806-902 (25W)	UHF Notch Filter	N/A	5/13/05

10.3 CONDUCTED SPURIOUS EMISSIONS TEST DATA

TABLE 10-2: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 1 AT 935.0125 MHZ)

Operating Frequency (MHz): 935.0125
Channel: 1
Measured Conducted Power (dBm): 34.6
Modulation: Analog Narrowband
Limit (dBc): 54.6 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1870.0250	-51.7	0.0	86.3	-31.7
2805.0375	-57.3	3.5	88.4	-33.8
3740.0500	-53.9	0.3	88.2	-33.6
4675.0625	-63.6	8.3	89.9	-35.3
5610.0750	-50.4	2.8	82.2	-27.6
6545.0875	-54.8	1.2	88.2	-33.6
7480.1000	-36.1	0.1	70.6	-16.0
8415.1125	-56.2	0.9	89.9	-35.3
9350.1250	-68.7	13.4	89.9	-35.3

TABLE 10-3: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 3 AT 937.0125 MHZ)

Operating Frequency (MHz): 937.0125
Channel: 3
Measured Conducted Power (dBm): 34.5
Modulation: Analog Narrowband
Limit (dBc): 54.5 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1874.0250	-51.8	0.3	86.0	-31.5
2811.0375	-60.6	2.8	92.3	-37.8
3748.0500	-55.9	0.2	90.2	-35.7
4685.0625	-63.6	9.5	88.6	-34.1
5622.0750	-51.8	3.8	82.5	-28.0
6559.0875	-53.2	1.7	86.0	-31.5
7496.1000	-36.0	0.1	70.4	-15.9
8433.1125	-55.6	2.1	88.0	-33.5
9370.1250	-61.5	7.7	88.3	-33.8

TABLE 10-4: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 6 AT 939.8750 MHZ)

Operating Frequency (MHz): 939.8750
Channel: 6
Measured Conducted Power (dBm): 34.4
Modulation: Analog Narrowband
Limit (dBc): 54.4 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1879.7500	-51.5	0.2	85.7	-31.3
2819.6250	-62.5	3.8	93.1	-38.7
3759.5000	-58.0	0.1	92.3	-37.9
4699.3750	-62.7	12.1	85.0	-30.6
5639.2500	-56.2	4.5	86.1	-31.7
6579.1250	-51.9	1.8	84.5	-30.1
7519.0000	-40.2	1.2	73.4	-19.0
8458.8750	-57.1	2.3	89.2	-34.8
9398.7500	-52.6	1.3	85.7	-31.3

TABLE 10-5: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 11 AT 896.0125 MHZ)

Operating Frequency (MHz): 896.0125
Channel: 11
Measured Conducted Power (dBm): 34.7
Modulation: Analog Narrowband
Limit (dBc): 54.7 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1792.0250	-64.0	1.8	96.9	-42.2
2688.0375	-70.8	2.6	102.9	-48.2
3584.0500	-69.0	0.1	103.6	-48.9
4480.0625	-82.5	6.0	111.2	-56.5
5376.0750	-75.7	0.3	110.1	-55.4
6272.0875	-82.1	0.6	116.2	-61.5
7168.1000	-82.8	0.4	117.1	-62.4
8064.1125	-80.3	0.2	114.8	-60.1
8960.1250	-102.3	13.7	123.3	-68.6

TABLE 10-6: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 13 AT 898.0125 MHZ)

Operating Frequency (MHz): 898.0125
Channel: 13
Measured Conducted Power (dBm): 34.6
Modulation: Analog Narrowband
Limit (dBc): 54.6 (50+10LogP)

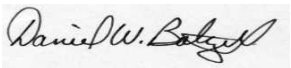
Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1796.0250	-64.2	1.8	97.0	-42.4
2694.0375	-73.4	2.3	105.7	-51.1
3592.0500	-66.1	0.1	100.6	-46.0
4490.0625	-82.9	5.6	111.9	-57.3
5388.0750	-74.1	0.5	108.2	-53.6
6286.0875	-78.0	0.5	112.1	-57.5
7184.1000	-80.2	0.1	114.7	-60.1
8082.1125	-90.4	0.6	124.4	-69.8
8980.1250	-101.5	10.1	126.0	-71.4

TABLE 10-7: CONDUCTED SPURIOUS EMISSIONS (CHANNEL 15 AT 900.9875 MHZ)

Operating Frequency (MHz): 900.9875
Channel: 15
Measured Conducted Power (dBm): 34.6
Modulation: Analog Narrowband
Limit (dBc): 54.6 (50+10LogP)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Spectrum Analyzer Level (dBc)	Margin (dB)
1801.9750	-66.2	1.8	99.0	-44.4
2702.9625	-70.6	2.6	102.6	-48.0
3603.9500	-69.2	0.4	103.4	-48.8
4504.9375	-76.3	5.3	105.6	-51.0
5405.9250	-67.6	0.0	102.2	-47.6
6306.9125	-79.3	0.9	113.0	-58.4
7207.9000	-78.2	0.6	112.2	-57.6
8108.8875	-78.2	2.0	110.8	-56.2
9009.8750	-97.8	13.0	119.4	-64.8

TEST PERSONNEL:

DANIEL BALTZELL		FEBRUARY 8, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

11 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

11.1 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

Radiated and harmonic emissions were measured at a 3 meter outdoor site. The EUT was placed on the turntable with the transmitter transmitting into a non-radiating load. A receiving antenna located 3 meters from the turntable received any signal radiated from the transmitter and its operating accessories. The receiving antenna was varied from 1 to 4 meters and the polarization was varied to determine the worst-case emission level. The EUT was measured in three orthogonal planes with the receive antenna positioned in both horizontal and vertical polarities. The EUT was replaced by a substitution antenna and a signal generator level was obtained by correcting for the cable loss and transmitting gain antenna (referenced to a half-wave dipole). This level was checked using a power divider at the transmitting antenna to assure there was no impedance mismatch between the 50 Ω signal generator and the transmitting antenna.

11.2 RADIATED SPURIOUS TEST EQUIPMENT

TABLE 11-1: RADIATED SPURIOUS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Cal Due Date
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	9/20/05
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	6/23/05
900928	Hewlett Packard	83752A	Synthesized Sweeper, (0.01 - 20 GHz	3610A00866	9/5/05
900905	Rhein Tech Labs	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	9/1/05
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	2/17/06
900154	Compliance Design	Roberts Dipole	Adjustable Elements Dipole Antenna (30 - 1000 MHz)	N/A	10/6/05
900772	EMCO	3161-02	Horn Antenna (2.0 - 4.0 GHz)	9804-1044	5/20/07
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	5/20/07
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	5/5/05

11.3 RADIATED SPURIOUS EMISSIONS TEST DATA - §2.1053

Operating Frequency (MHz): 937.0125
Channel: 3
Measured Conducted Power (dBm): 34.5
Modulation: Analog Narrowband
Distance (m): 3
Limit (dBc): 54.5 (50+10LogP)

TABLE 11-2: RADIATED SPURIOUS EMISSIONS DATA §2.1053 – 937.0125 MHZ; CHANNEL 3

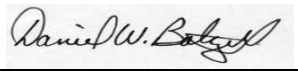
Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Level (dBc)	Margin (dB)
1874.0250	38.5	-34.6	0.9	4.8	65.2	-10.7
2811.0375	59.6	-32.7	1.0	5.8	62.4	-7.9
3748.0500	55.5	-32.7	1.2	5.9	62.5	-8.0
4685.0625	57.5	-29.5	1.2	7.0	58.2	-3.7
5622.0750	46.9	-38.9	1.3	8.6	66.1	-11.6
6559.0875	51.1	-26.7	1.5	7.7	55.0	-0.5
7496.1000	44.6	-31.1	1.3	7.6	59.3	-4.8
8433.1125	34.5	-46.1	1.5	8.4	73.7	-19.2
9370.1250	42.7	-35.9	1.2	8.1	63.5	-9.0

Operating Frequency (MHz): 898.0125
Channel: 13
Measured Conducted Power (dBm): 34.6
Modulation: Analog Narrowband
Distance (m): 3
Limit (dBc): 54.6 (50+10LogP)

TABLE 11-3: RADIATED SPURIOUS EMISSIONS DATA §2.1053 – 898.0125 MHZ; CHANNEL 13

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Level (dBc)	Margin (dB)
1796.0250	24.7	-49.4	0.8	4.8	45.4	-45.4
2694.0375	42.7	-49.6	1.1	5.6	45.1	-45.1
3592.0500	46.3	-43.6	1.2	5.9	38.9	-38.9
4490.0625	37.1	-49.6	1.2	7.0	43.8	-43.8
5388.0750	32.9	-53.3	1.1	6.6	47.8	-47.8
6286.0875	46.4	-33.9	1.4	7.3	28.0	-28.0
7184.1000	30.6	-41.4	1.5	7.6	35.3	-35.3
8082.1125	29.8	-51.5	1.3	8.4	44.4	-44.4
8980.1250	28.3	-51.1	1.5	7.2	45.4	-45.4

TEST PERSONNEL:



DANIEL BALTZELL		FEBRUARY 9, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

12 FREQUENCY STABILITY / TEMPERATURE VARIATION - §2.1055

12.1 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.

12.2 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 a period of 1 hour to stabilize at -30°C without any power applied.
3. After the stabilization period 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 +50°C. A minimum period of 1/2 hour was provided to allow stabilization of the equipment at each temperature level.

12.3 FREQUENCY TOLERANCE

The minimum frequency stability shall be 1.5 ppm.

12.4 FREQUENCY STABILITY TEST EQUIPMENT

TABLE 12-1: 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	2/4/06
901300	Agilent	53131A	Universal Frequency Counter (225 MHz)	MY40001345	11/17/05
901028	Alinco	DM-340MVT	DC Power Supply	002143	N/A
901350	Meterman	33XR	Multimeter	040402802	7/21/05

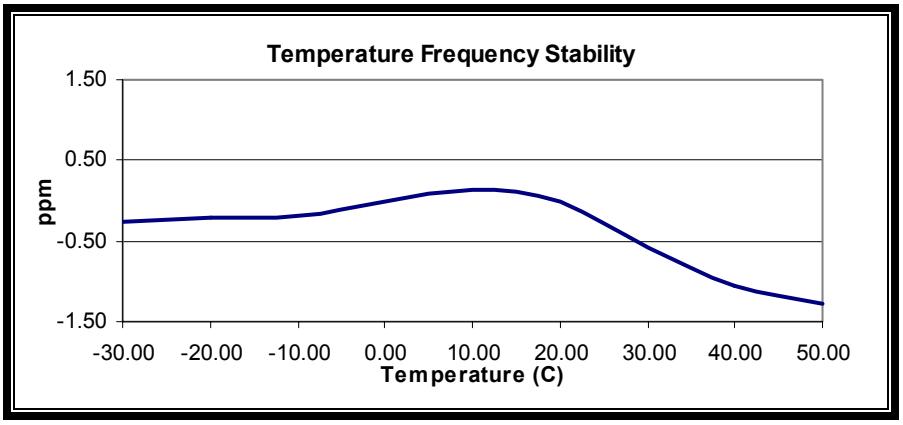
12.5 FREQUENCY STABILITY TEST DATA - §2.1055

Operating Frequency: 937.0125 MHz
Channel: 3
Reference Voltage: 7.5 VDC
Deviation Limit: 1.5 PPM

TABLE 12-2: FREQUENCY STABILITY DATA - §2.1055: TEMPERATURE

Temperature (ºC)	Measured Frequency (MHz)	ppm
-30	937.012252	-0.26
-20	937.012303	-0.21
-10	937.012316	-0.20
0	937.012479	-0.02
10	937.012623	0.13
20	937.012500	0.00
30	937.011958	-0.58
40	937.011509	-1.06
50	937.011314	-1.27

PLOT 12-1: TEMPERATURE FREQUENCY STABILITY - §2.1055



TEST PERSONNEL:

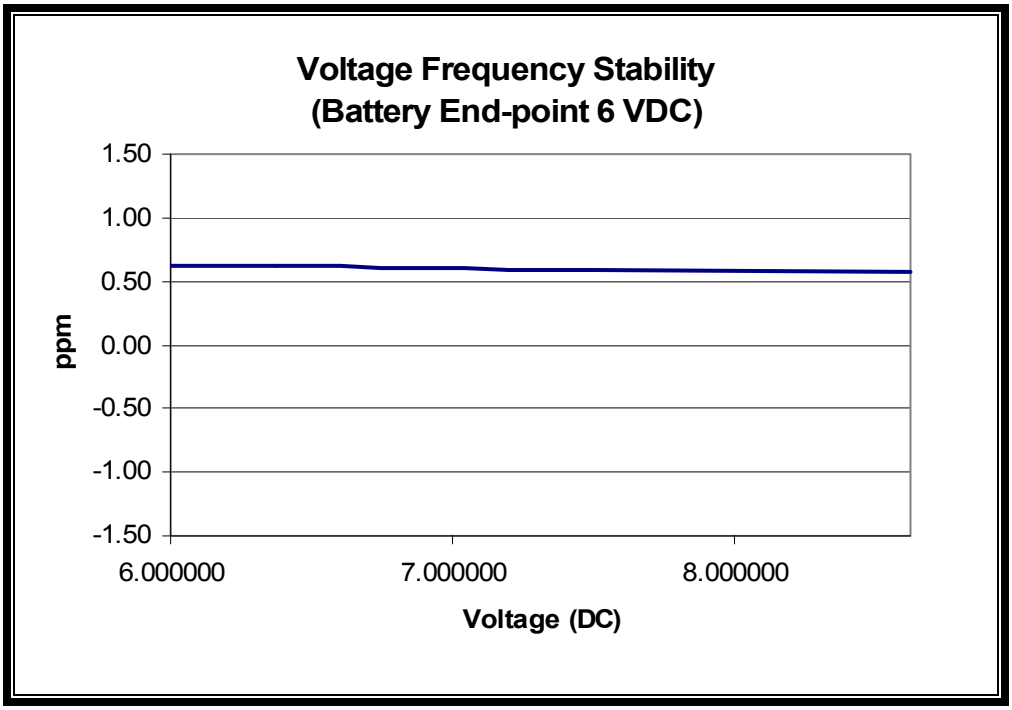
DANIEL BALTZELL		FEBRUARY 14, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

TABLE 12-3: FREQUENCY STABILITY DATA - §2.1055: VOLTAGE

Voltage (DC)	Measured Frequency (MHz)	ppm
6*	937.013083	0.62
6.375000	937.013075	0.61
7.500000	937.013058	0.60
8.625000	937.013033	0.57

* Battery End Point

PLOT 12-2: VOLTAGE FREQUENCY STABILITY - §2.1055



TEST PERSONNEL:

DANIEL BALTZELL		MARCH 2, 2005
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

13 FCC PART 2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Type of Emission: F3E and F1D, F1E

Necessary Bandwidth and Emission Bandwidth Calculation

The 12.5 kHz Analog modulation necessary bandwidth: Bn = 11K0F3E
The P25 Digital modulation necessary bandwidth: Bn = 8K10F1E

Calculation:

Max modulation (M) in kHz: 3
Max deviation for (D) in kHz for (12.5 kHz channel spacing): 2.5
Constant factor (K): 1
$B_{n(12.5\ kHz)}$ = 2xM + 2xDK = (2x3) + (2x2.5x1) = 11 kHz

For P25 digital (with a 9600 bps data rate and peak symbol deviation of +/- 1.65 kHz)
where R = data rate in bps, D = peak deviation in Hz, and S = number of states in each symbol
$B_n = [R/\log_2(S)] + 2DK$, where K = 1
$B_{n(P25\ Digital)} = [9600/\log_2(4)] + 2(1650)(1) = 8.1$ kHz

14 CONCLUSION

The data in this measurement report shows that the EUT, E.F. Johnson Model 242-519x-xxx, FCC ID: ATH2425191, complies with all the applicable requirements of Parts 2 and 90 of the FCC Rules.