





FCC PART 95
TEST AND MEASUREMENT REPORT
(CLASS II PERMISSIVE CHANGE)

For
Midland Radio Corporation

5900 Parretta Drive,
Kansas City, MO 64120, USA

FCC ID: MMA77321

Report Type: Class II Permissive Change	Product Type: Transceiver, CB Radio with Weather Alert
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Report Number: R0911171-95	
Report Date: 2009-12-04	
Reviewed By: EMC/RF Supervisor	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" enr2

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0911171-95	Original Report	2009-12-04

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Midland Radio Corporation* and their product, *FCC ID: MMA77321*, Model: 77-321 or the “EUT” as referred to in this report is a transceiver, CB radio with weather alert. The EUT was composed of two parts; a CB radio module and a head unit. The operating frequency is 26.965~27.405 MHz.

1.2 Mechanical Description of EUT

The CB Radio Module measures approximately **155mm (L) x 90mm (W) x 20mm (H)**.
The Head Unit measures approximately **250mm (L) x 212mm (W) x 65mm (H)**.

**The data gathered are from a production sample provided by the manufacturer, serial number: R0911171-1 for the CB Radio Module and serial number: R0911171-2 for the Head Unit assigned by BACL.*

1.3 EUT Photo



CB Radio Module



Head Unit

Additional Photos in Exhibit C

1.4 Objective

This report is prepared on behalf of *Midland Radio Corporation* in accordance with Part 95 Subpart D and Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for effective radiated power and radiated spurious emissions due to the replacement of equivalent PLL IC.

1.5 Related Submittal(s)/Grant(s)

FCC ID: MMA77321, BACL Report Number: R0503081

1.6 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 95 – Personal Radio Service
Subpart D- Citizens Band (CB) Radio Service

Applicable Standards: TIA-603-C, Land Mobile FM or FM Communications Equipment Measurement and Performance Standards. ANSI 63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are: spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2698 and R-2463. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2001670.htm>

2 System Test Configuration

2.1 Justification

The EUT was tested according to TIA/EIA-603A to represent the worst-case results during the final qualification test.

2.2 EUT Exercise Software

The EUT was powered and fully operated by pushing buttons on the head Unit which controls the CB radio.

2.3 Equipment Modifications

NA

2.4 Special Equipment

NA

2.5 Local Support Equipment

N/A

2.6 EUT Internal Configuration Details

Manufacturers	Descriptions	Models	Serial Numbers
Midland Radio Corporation	CB Module PCB Assembly	Rev. 8	09100044381954350
Midland Radio Corporation	Head Unit PCB Board-1	Rev. A	304397-001
Midland Radio Corporation	PCB Board-3	Rev. A L6	304496-001

2.7 External I/O Cabling List and Details

Cable Descriptions	Length (m)	From	To
DC Power Cable	< 1	EUT	DC Power Supply

3 Summary of Test Results

FCC Rules	Descriptions of Test	Result(s)
§2.1046; §95.639	Maximum Transmitter Power	Compliant
§2.1047; §95.637	Modulation Characteristics	N/A *
§2.1049 §95.633; §95.635	Emission Bandwidth and Emission Mask	N/A *
§2.1051; §95.635	Spurious Emissions at Antenna Terminals	N/A *
§2.1053; §95.635	Filed Strength of Spurious Radiation	Compliant
§2.1055; §95.625	Frequency Stability	N/A *
§1.1310; §2.1093	RF Exposure	N/A *

Note: N/A please refer to the following report for test results, FCC ID: MMA77321 BACL Report Number: R0503081*

4 FCC §2.1046 & §95.639 – Maximum Transmitter Power

4.1 Applicable Standard

Per FCC §2.1046 and §95.639, no CB transmitter, under any condition of modulation, shall exceed 4 W Carrier power when transmitting emission type A3E or A1D.

4.2 Test Setup

The radiated emissions tests were performed in the 5-meter test chamber, using the setup in accordance with TIA-603-C §2.2.1 measurement procedures.

4.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Hewlett Packard	Pre amplifier	8447D OPT 010	2944A07030	2009-03-03
Agilent	PSA Series Spectrum Analyzer	E4440A	MY44303352	2009-04-27

**Statement of Traceability:* BACL Corp. attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

4.4 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Connect a low loss RF cable from the antenna port to an attenuator.
3. Connect a low loss RF cable from the antenna port to a spectrum analyzer.

4.5 Test Environmental Conditions

Temperature:	22.5° C
Relative Humidity:	43%
ATM Pressure:	107.9kPa

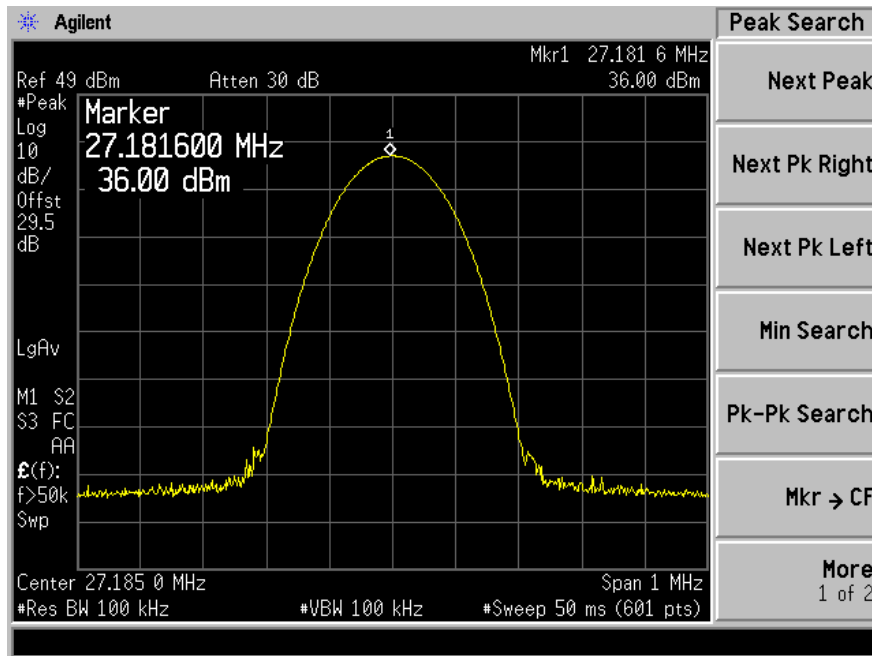
**Testing was performed by Dennis Huang on 2009-11-17.*

4.6 Test Results

Frequency (MHz)	Output Power (dBm)	Output Power (Watts)	FCC Limit (Watts)
27.185	36	3.98	4

Please refer to the following plot.

Output Power



5 FCC §2.1047, §95.631(c) & §95.637(c) - Modulation Characteristics

5.1 Standard Applicable

Per FCC § 2.1047, §95.631(c), and §95.637 (c), when emission type A3E is transmitted, the modulation must be greater than 85% but most not exceed 100%. Simultaneous amplitude modulation and frequency or phase modulation of a transmitter are not permitted.

5.2 Test Results

N/A, Please refer to the following report for test results:
FCC ID: MMA77321, BACL Report Number: R0503081

6 FCC §2.1049 § 95.633 & § 95.635 - Occupied Bandwidth and Emission Mask

6.1 Standard Applicable

Per FCC §2.1049 and FCC §95.633 (a), the authorized bandwidth for emission type A3E transmitted is 8 kHz.

6.2 Test Results

N/A, Please refer to the following report for test results:
FCC ID: MMA77321, BAEL Report Number: R0503081

7 FCC §2.1051 & §95.635 – Spurious Emission at Antenna Terminal

7.1 Standard Applicable

Per FCC §2.1051 and §95.635

7.2 Test Results

N/A, Please refer to the following report for test results:
FCC ID: MMA77321, BACL Report Number: R0503081

8 FCC §2.1053 & §95.635 – Field Strength of Radiated Spurious Emissions

8.1 Standard Applicable

According to FCC §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a half wave dipole antenna.

According to FCC §95.635(b)(1), at least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

According to FCC §95.635(b)(3), at least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

According to FCC §95.635(b)(8), at least $53 + 10 \log_{10}(T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

According to FCC §95.635(b)(9), at least 60 dB on any frequency twice or greater than twice the fundamental frequency.

8.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

8.3 Test Environmental Conditions

Temperature:	15~25 °C
Relative Humidity:	20~32 %
ATM Pressure:	100.9~101.1kPa

** The testing was performed by Dennis Huang on 2009-11-17.*

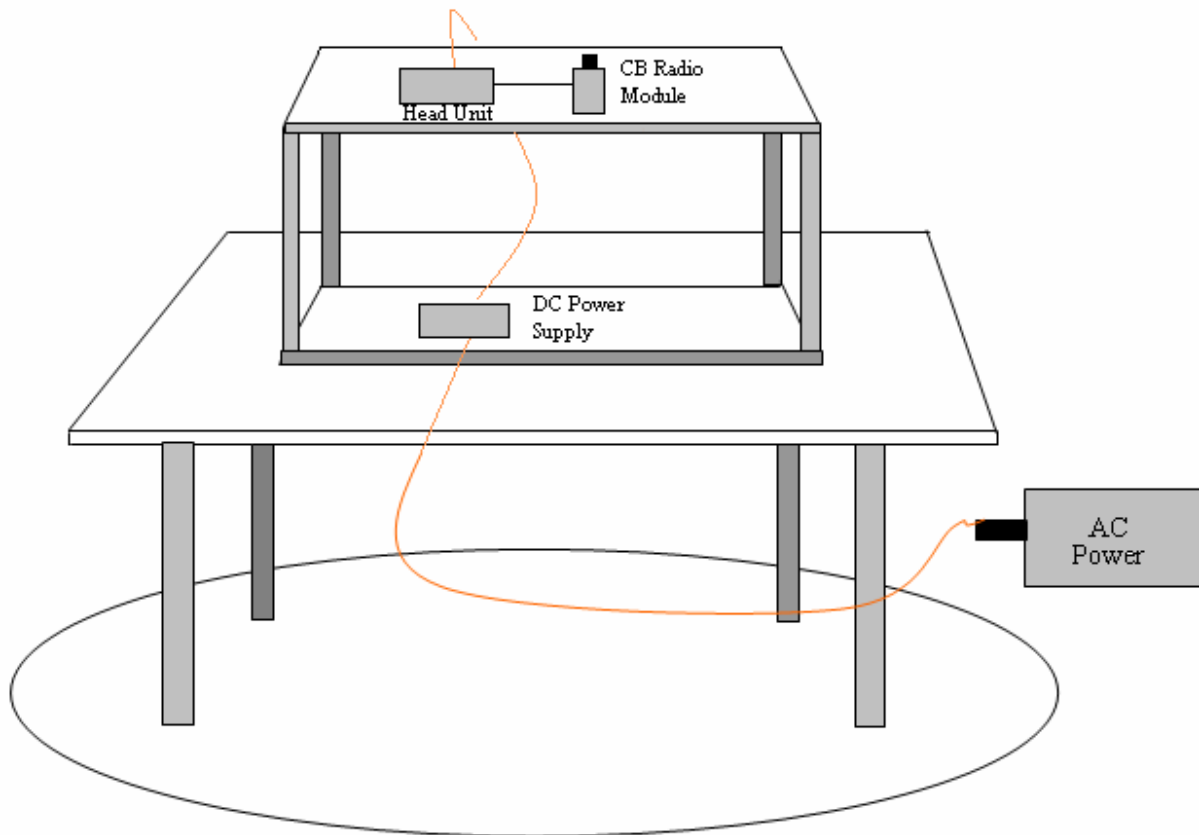
8.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US44303352	2009-05-31
Sunol Sciences	Antenna	JB1	A103105-3	2009-03-25
A.R.A	Horn Antenna	DRG-118/A	1132	2009-07-28
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2009-07-01
Ducommun	Pre-Amplifier	ALN-09173030-01	988251-03R	2009-03-04
Daniels Electronic	50ohm Terminator	50-T-MN	1681	-
HP	Pre-Amplifier	8447D	2944A06639	2009-03-06

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

8.5 Test Setup

Antenna port terminated
with 50 ohm load



8.6 Summary of Test Results

-18.71 dB at 81.555 MHz in the Vertical polarization

Please refer to the following tables for detailed test results.

8.7 Test Result

Worst Case Middle Channel – 27.185 MHz

Indicated		Azimuth (degrees)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
81.555	39.36	61	1.0	V	81.555	-38.63	0	0.074	-42.71	-24	-18.71
81.555	35.91	34	2.0	H	81.555	-42.08	0	0.074	-46.16	-24	-22.16
54.37	29.03	257	1.0	V	54.37	-54.97	0	0.074	-55.534	-24	-31.53
54.37	28.54	194	3.78	H	54.37	-55.46	0	0.074	-51.974	-24	-27.97
108.74	28.10	144	1.0	V	108.74	-51.9	0	0.074	-51.97	-24	-27.97
108.74	24.49	360	1.0	H	108.74	-55.51	0	0.074	-55.58	-24	-31.58

Note: No pre-amp used.

9 FCC §2.1055 §95.625 - Frequency Stability Measurement

9.1 Standard Applicable

FCC §2.1055, §95.625 (b) Each CB transmitter must be maintained within a frequency tolerance of 0.005%.

9.2 Test Results

N/A, Please refer to the following report for test results:
FCC ID: MMA77321, BACL Report Number: R0503081