



849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR
352.472.5500
FAX: 352.472.2030
EMAIL: INFO@TIMCOENGR.COM
[HTTP://WWW.TIMCOENGR.COM](http://WWW.TIMCOENGR.COM)

FCC PART 95 SUBPART D
TEST REPORT
FOR CB TRANSCEIVERS

APPLICANT	MIDLAND RADIO CORPORATION
ADDRESS	5900 PARRETTA DRIVE KANSAS CITY, MISSOURI 64120-2134 USA
FCC ID	MMA88182
MODEL NUMBER	88182
PRODUCT DESCRIPTION	CB TRANSCEIVER
DATE SAMPLE RECEIVED	11/18/2016
FINAL TEST DATE	12/06/2016
TESTED BY	Franklin Rose
APPROVED BY	Cory Leverett

Report Number	Version Number	Description	Issue Date
2319ZUT16TestReport_	Rev1	Initial Issue	12/06/2016

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Tested by: 

Name and Title: Franklin Rose, Testing Technician

Date: 12/06/2016

Reviewed and approved by: 

Name and Title: Cory Leverett, Project Manager

Date: 12/06/2016

GENERAL INFORMATION

EUT Specification

EUT Description	CB TRANSCEIVER
FCC ID	MMA88182
Model Number	88182
Serial Number	N/A
Operating Frequency	26.965-27.405 MHz – 40 Channel
Test Frequency	Ch 40 27.405 MHz
Type of Emission	6K00A3E Bn = 2M M = 3000 Bn = 6000
Modulation	A3E
EUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable



TEST ENVIRONMENT

Test Facility	Timco Engineering, Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
Test Condition in the laboratory	Temperature: 24-26°C Relative humidity: 50 - 65%

TEST SETUP SUMMARY

Test Setup Diagram / Description	The EUT was placed on the turntable per setup per ANSI C63.4: 2014. A test set up photo is provided for clarification.
Deviation from the standard / procedure	No deviation
Modification of EUT	No modification
Applicable Standards	EIA/TIA-382-A, FCC CFR 47 PART 95

TEST RESULTS SUMMARY

Specification	FCC Rule Part	RESULTS
Power Output	Part 2.1033(c), Part 95.639 (c) (1)	Pass
Modulation Characteristics	Part 2.1047(a) (b), Part 95.637 (c) (d)	Pass
Occupied Bandwidth	Part 2.1049, 95.633 (a), 95.635 (b) (1) (3) (8)	Pass
Ant Conducted Emissions	Part 2.1051(a), 95.635 (b) (9)	Pass
Field Strength of Spurious Emissions	Part 2.1053, 95.635 (b) (9)	Pass
Frequency Stability	2.1055(a) (b) (d), 95.625 (b)	Pass

RF POWER OUTPUT

Rule Part No.: Part 2.1033(c), Part 95.639 (c) (1)

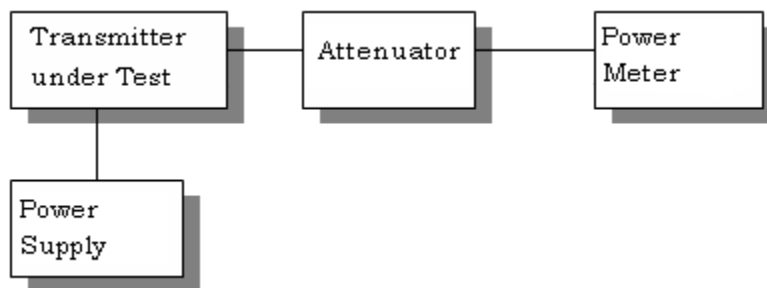
Test Requirements: 4 W Carrier power when transmitting emission type A1D or A3E

Method of Measurement: RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage and the transmitter properly adjusted the RF output measures:

Test Data: Measurement Table

OUTPUT POWER: 3.883 Watts

Test Setup Diagram:



Part 2.1033 (C) (8) DC Input into the final amplifier

Test Data:

INPUT POWER: (13.8V) (2.25A) = 31.05 Watts

Result: Meets Requirements

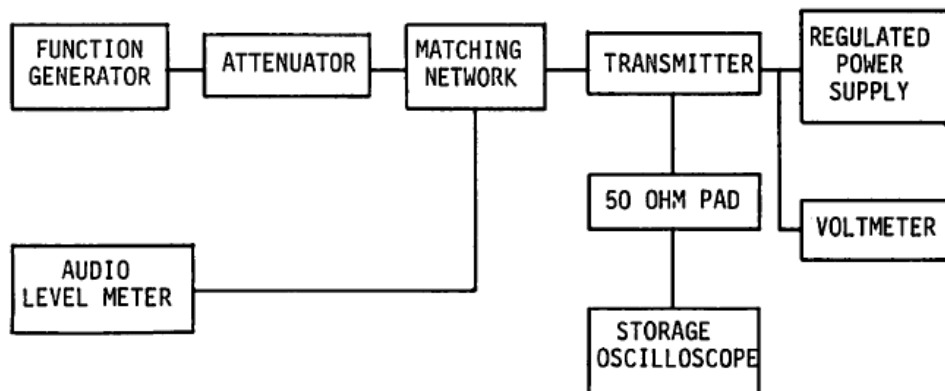
MODULATION CHARACTERISTICS

Rule Part No.: Part 2.1047(a) (b), Part 95.637 (c) (d)

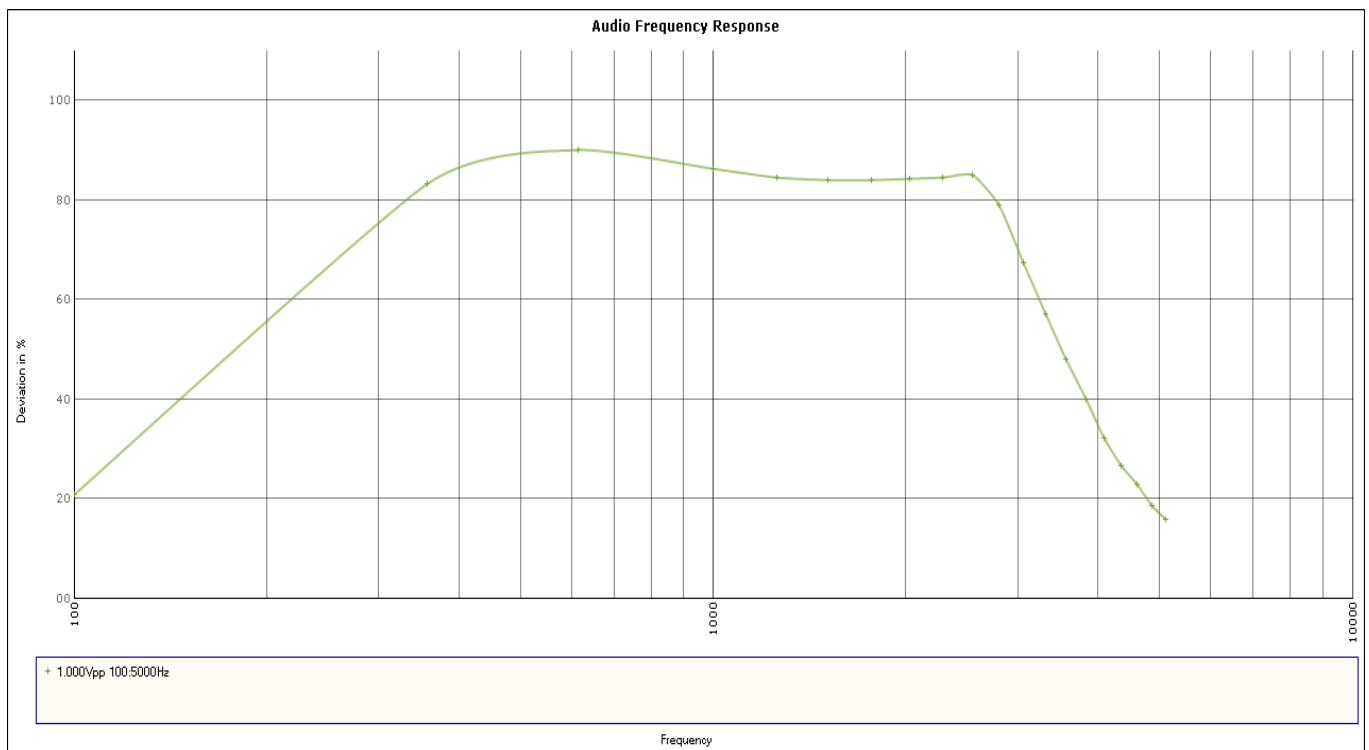
Test Procedure: EIA/TIA-382-A section 24 Modulation Limiting
EIA/TIA-382-A section 25 Audio Frequency Response

Requirements: Modulation must be at least %85 but not in excess of %100, the audio response is for reporting only

Test Setup Diagram:



Test Data: Audio frequency response plot



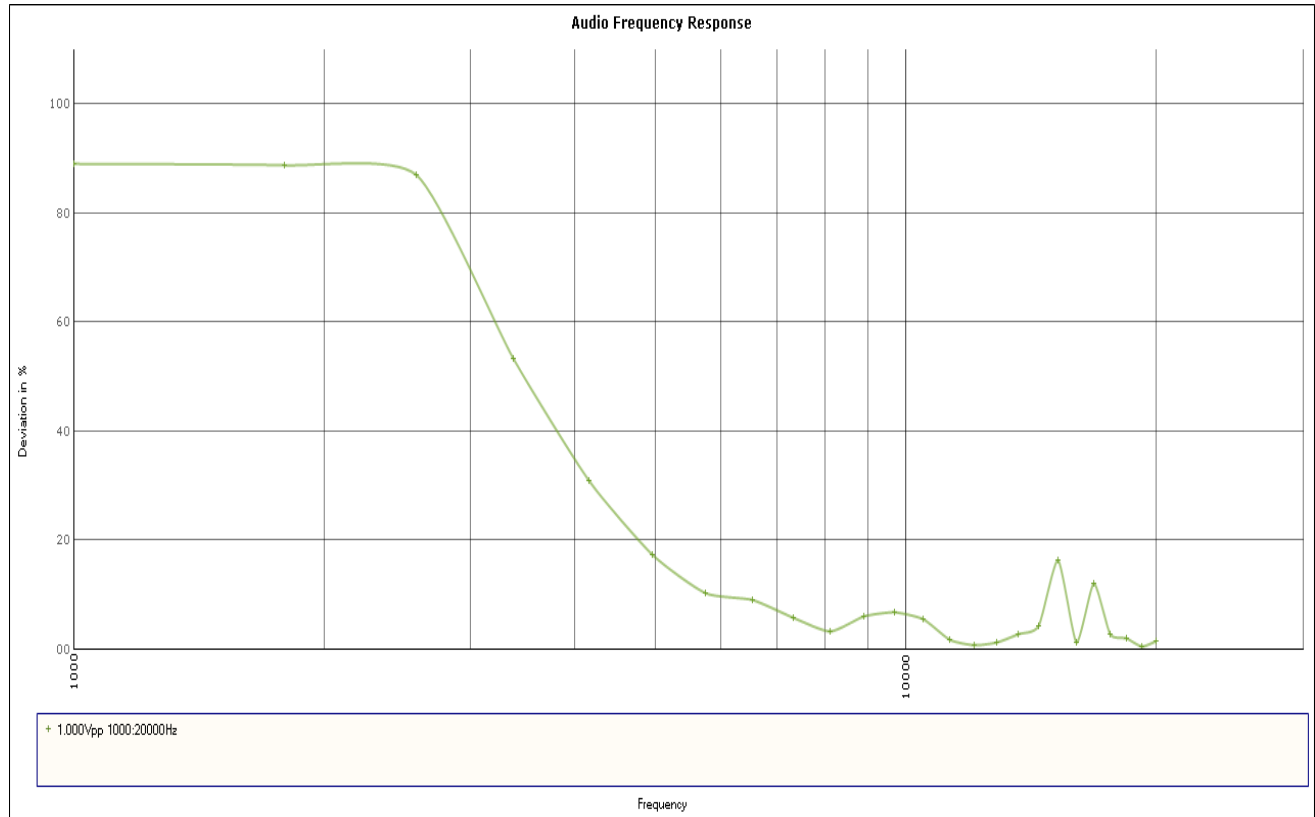
Result: Meets Requirements

APPLICANT: MIDLAND RADIO CORPORATION
FCC ID: MMA88182
REPORT #: 2319ZUT16TestReport_Rev1

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MODULATION CHARACTERISTICS

Test Data: Audio low pass filter plot

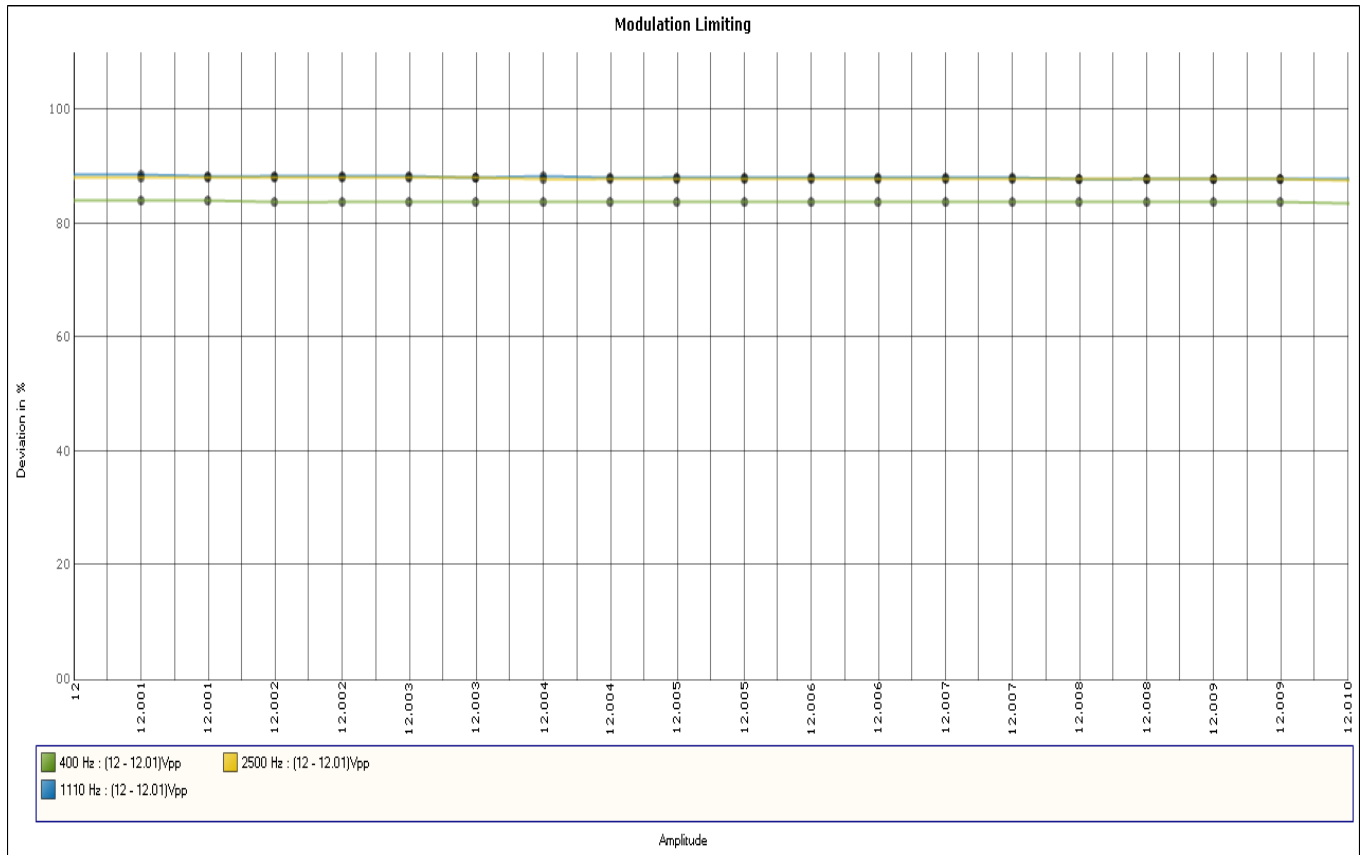


Result: Meets Requirements

MODULATION CHARACTERISTICS

Test Data: Modulation limiting plot

Test data:



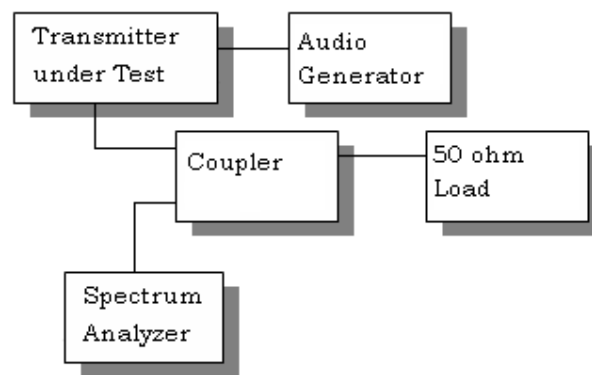
Result: Meets Requirements

OCCUPIED BANDWIDTH

Rule Part No.: Part 2.1049, 95.633 (a), 95.635 (b) (1) (3) (8)

95.631(c) Data in the plots shows that the sidebands from greater than 50% to 100% of the authorized bandwidth must be attenuated by at least 25 dB and from 100 to 250% the sidebands must be attenuated by at least 35 dB. Beyond 250% the sidebands must be attenuated by at least $53 + 10\log (TP)$. The transmitter was modulated with 2500 Hz, adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the unmodulated carrier at the top of the screen. The test procedure diagram and occupied bandwidth photographs follow.

Test procedure diagram:



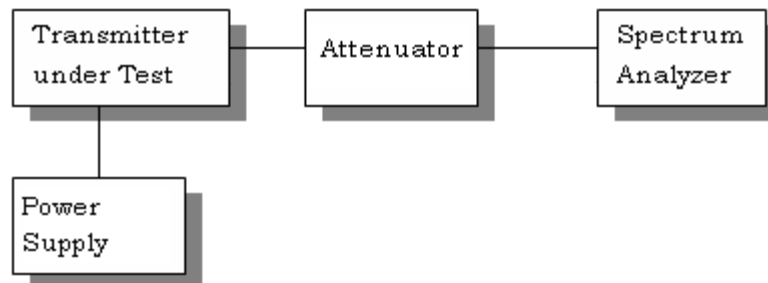
SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a), 95.635 (b) (9)

Requirements: $53 + 10\log(4.00) = 59.0\text{dB}$. Any emissions above 54 MHz must be 60 dBc.

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard EIA/TIA-382-A.

Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was EIA/TIA-382-A.

Test Data: Measurement table

	dBm	Watts	Limit
Power Output	35.89	3.883	60.000

	Frequency MHz	dBc	margin dB
	27.405	0	
	54.81	64.29	4.29
	82.215	68.29	8.29
	109.62	75.29	15.29
*	137.025	69.43	9.43
*	164.43	76.23	16.23
*	191.835	76.93	16.93
*	219.24	83.77	23.77
*	246.645	85.03	25.03
*	274.05	84.23	24.23

* Indicates noise floor

Results Meet Requirements

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053, 95.635 (b) (9)

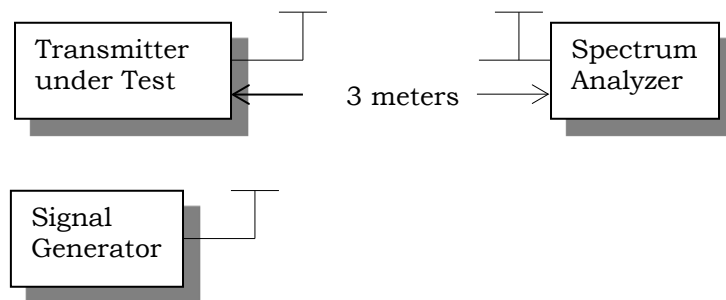
Requirements: Emissions must be attenuated by at least the following below the output of the transmitter.

At least 60 dB on any frequency twice or greater than twice the fundamental frequency.

METHOD OF MEASUREMENT

The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per EIA/TIA-382-A using the substitution method.

Test Setup Diagram:





FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: Measurement Table

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dBc	Bandwidth - BW - kHz
27.40	Hi	35.89	3.88	60	8
Emission Frequency (MHz)	Ant. Polarity		Below Carrier (dBc)	Margin dB	
54.81	V		88.90	28.9	
82.22	H		87.37	27.4	
109.62	V		76.19	16.2	
137.03	V		92.21	32.5	
164.43	H		95.92	35.9	
191.84	H		89.60	29.6	
219.24	H		101.02	41.0	
246.65	H		89.05	29.0	
274.05	H		82.51	22.51	

Result: Meets Requirements

FREQUENCY STABILITY

FCC Rule Part: 2.1055(a) (b) (d), 95.625 (b)

Requirements: Each CB transmitter must be maintained within a frequency tolerance of 0.005% (50 ppm)

Test Procedure:

Temperature and voltage tests were performed to verify that the frequency remains within the .005%, 50 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 °C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15-second intervals. The worst case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 °C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15-second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 °C.

Readings were also taken at $\pm 15\%$ of the battery voltage of 13.8 VDC.

Test Data: Measurement Table

Temperature	Frequency (MHz)	Cycles	PPM
25°C (reference)	27404963	0	0.000
-30°C	27403760	1203000000	43.897
-20°C	27404246	717000000	26.163
-10°C	27404547	416000000	15.180
0°C	27404772	191000000	6.970
10°C	27404888	75000000	2.737
20°C	27404946	17000000	0.620
30°C	27404985	-22000000	-0.803
40°C	27405050	-87000000	-3.175
50°C	27405143	-180000000	-6.568

Battery Voltage	Frequency	Cycles	PPM
11.73	27404959	4000000	0.146
13.8	27404963	0	0.000
15.87	27404962	1000000	0.036

Result: Meets Requirements



EQUIPMENT LIST

DC Power Supply	HP	6286A	1744A03842		na
Antenna: Biconical 1096 Chamber	Eaton	94455-1	1096	07/14/15	07/14/17
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/14/15	07/14/17
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	09/01/16	09/01/18
Digital Multimeter	Fluke	77	35053830	10/21/15	10/21/17
Frequency Counter Large Chamber	HP	5352B	2632A00165	07/01/15	07/01/17
CHAMBER	Panashield	3M	N/A	04/25/16	12/31/17
Software: Field Strength Program	Timco	N/A	Version 4.0	Na	na
Antenna: Active Loop	ETS-Lindgren	6502	00062529	11/18/15	11/18/17
Type K J Thermometer	Martel	303	080504494	10/26/15	10/26/17
Modulation Analyzer	HP	8901A	3050A05856	04/16/15	04/16/17
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Signal Generator HP 8648C	HP	8648C	3623A02898	02/08/16	02/08/18
Attenuator N 30dB 500W DC-2.5G	Bird	8325	1761	05/18/15	05/18/17
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244-01; KMKM-0670-00; KFKF-0198-01	08/08/16	08/08/18
Coaxial Cable - BMBM-0065-00 Black	Belden		BMBM-0065-00	06/08/16	06/08/18



Coaxial Cable - BMBM-0155-00 Black	MIYAZAKI		BMBM-0155-00	05/24/16	05/24/18
Function Generator	Standford	DS340	25200	02/02/16	02/02/18
Tunable Notch Filter 15-30 MHz	Eagle	TNF-200	15-30 MHz (#17)	07/01/15	07/01/17
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	N/A		

***EMI RECEIVER SOFTWARE VERSION**

The receiver firmware used was version 4.43 Service Pack 3

END OF REPORT