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FCC PART 95 AND IC RSS-210

FRS/GMRS TRANSCEIVER

TEST REPORT

APPLICANT	COBRA ELECTRONICS CORPORATION
	6500 WEST CORTLAND STREET CHICAGO IL 60707 USA
FCC ID	BBO0121A
IC CERT #	906A-0121A
MODEL NUMBERS	CXT135, CX101
PRODUCT DESCRIPTION	FRS/GMRS TRANSCEIVER
DATE SAMPLE RECEIVED	11/23/2011
DATE TESTED	11/30/2011
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2728AT11TestReport.doc
TEST RESULTS	☒ PASS ☐ FAIL

ACCREDITED
Certificate # 0955-01

TABLE OF CONTENTS

STATEMENT OF COMPLIANCE

The test results relate only to the items tested.

Summary

The device under test does:

☒ fulfill the requirements as identified in this test report
☐ not fulfill the requirements as identified in this test report

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.

No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that measurements were made, by me, or under my supervision, at TIMCO ENGINEERING, INC. 849 N.W. State Road 45, Newberry, Florida 32669.

Authorized Signatory Name: Mario de Aranzeta C.E.T.

Signature:

Function: Engineer/Lab Supervisor

Date: December 2, 2011

GENERAL INFORMATION

DUT Specification

DUT Description	FRS/GMRS TRANSCEIVER
FCC ID	BBO0121A
IC Cert #	906A-0121A
Model Number	CXT135, CX101
Operating Frequency	462.5500-462.7250, 462.5625-467.7125
No. of Channels	22
Type of Emission	10K5F3E
Modulation	FM
DUT Power Source	☐ 110–120Vac/50– 60Hz
	☐ DC Power
	☒ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☐ Mobile
	☒ Portable
Antenna	Fixed (not removable)
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.
Modifications	None
Test Exercise	The DUT was placed in continuous transmit mode of operation
Applicable Standards	ANSI/TIA 603-C:2004, ANSI 63.4:2003 FCC CFR 47 Part 2 and Part 95,
Laboratory Environmental Conditions	TEMPERATURE: 76 F HUMIDY: 55%

TEST PROCEDURES

Bandwidth: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: RF power was conducted per ANSI/TIA 603-C: 2004 using the substitution method

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI/TIA 603-C: 2004 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a micro volt at the output of the antenna.

RF POWER OUTPUT

Rule Part No.: 2.1033(c)(6)(7), 2.1046(a), Part 95, RSS-210

Requirements: Power output shall not exceed 0.50 Watts effective radiated power for the FRS channels. There can be no provisions for increasing the power or varying the power. No GMRS channel, under any condition of modulation, shall exceed:

1. 50W Carrier power (average TP during one modulated RF cycle) when transmitting emissions type A1D, F1D, G1D, A3E, F3E, or G3E.
2. 50W peak envelope TP when transmitting emission type H1D, J1D, R1D, H3E, J3E, or R3E.

Method of Measurement: RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:

Test Data:

OUTPUT POWER: GMRS: 0.32 W
FRS: 0.26 W

Rule Part No.: 2.1033 (C)(8) DC Input into the final amplifier

INPUT POWER: (4.5V)(.40A) = 1.80 Watts

MODULATION CHARACTERISTICS

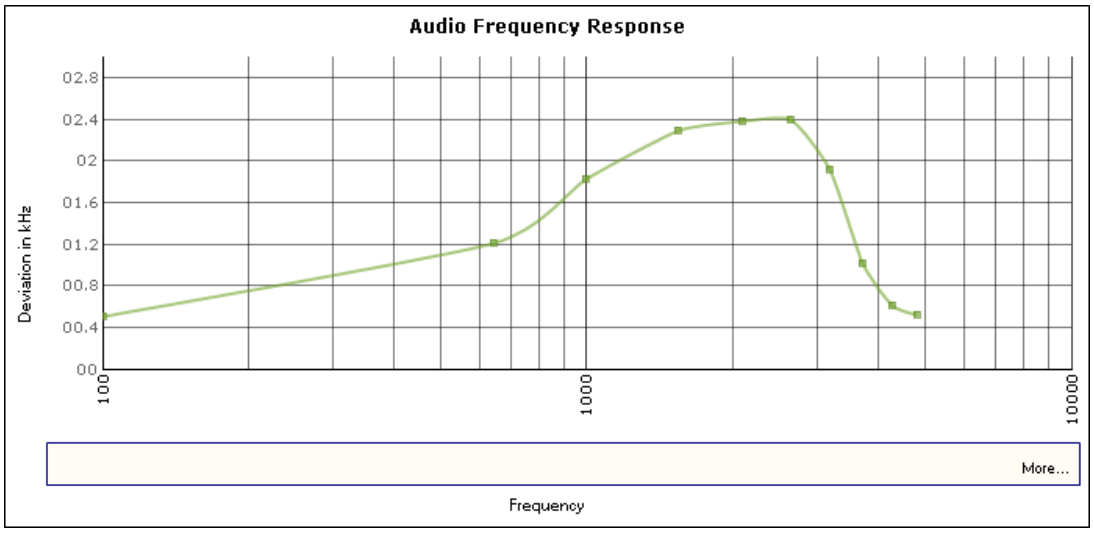
Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

Method of Measurement:

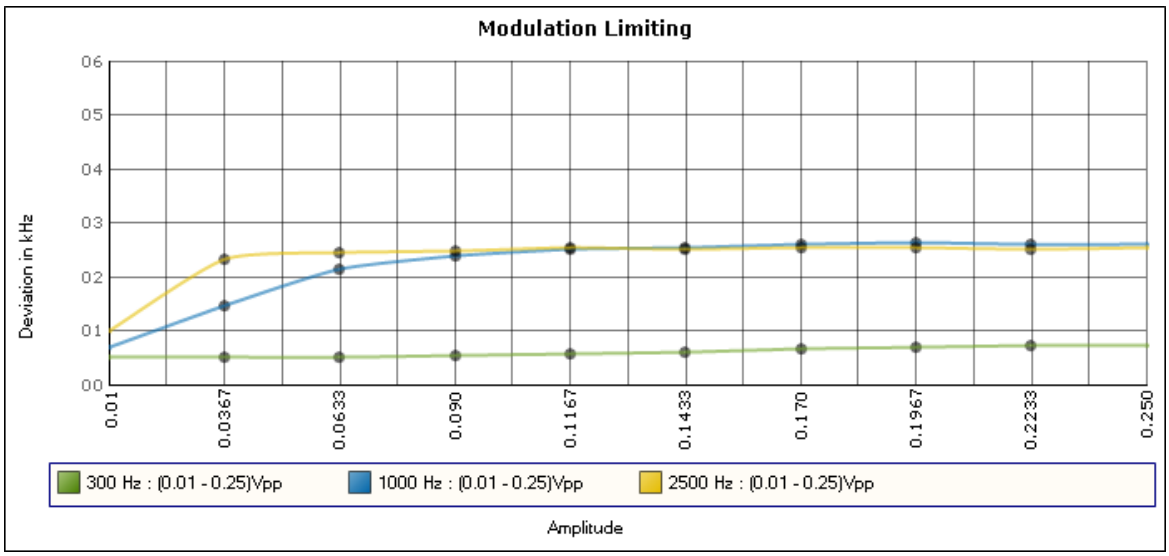
The audio frequency response was measured in accordance with ANSI/TIA 603-C:2004. The audio frequency response curve is shown below. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.

AUDIO FREQUENCY RESPONSE PLOT



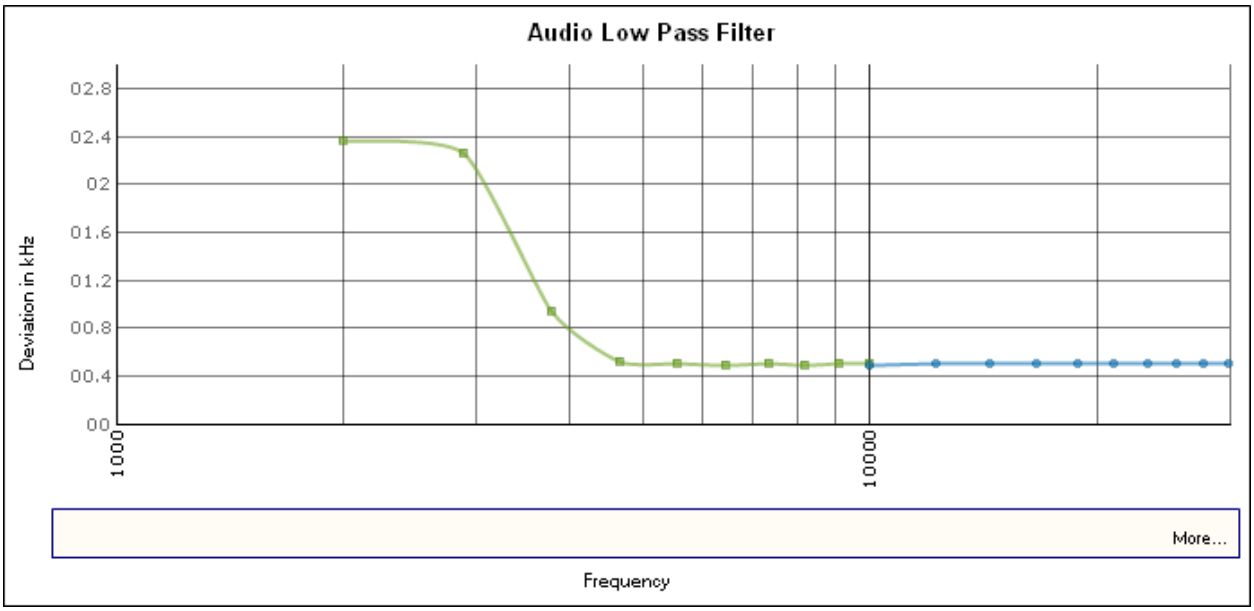
Audio input versus modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C:2004. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz. See the plot below..



Post Limiter Filter

Each GMRS transmitter, except a mobile station transmitter with a power of 2.5Watts or less, must be equipped with an audio low pass filter. At any frequency between 3 & 20 kHz the filter must have an attenuation of 60log (f/3) greater than the attenuation at 1 kHz. See below.



EMISSION DESIGNATOR AND FREQUENCIES

2.1033(c) (4) Type of Emission: 10K5F3E
95.631

Bn = 2M + 2DK
M = 3000
D = 1.75K
Bn = 2(3000) + 2(2250) = 10.5K

GMRS Authorized Bandwidth 20.0 kHz

2.1033(c)(5) GMRS Frequency Range:
95.621

1. 462.5500
2. 462.5625
3. 462.5750
4. 462.5875
5. 462.6000
6. 462.6125
7. 462.6250
8. 462.6375
9. 462.6500
10. 462.6625
11. 462.6750
12. 462.6875
13. 462.7000
14. 462.7125
15. 462.7250

FRS Authorized Bandwidth 12.5 kHz

2.1033(c)(5) FRS Frequency Range:
95.627

1. 462.5625
2. 462.5875
3. 462.6125
4. 462.6375
5. 462.6625
6. 462.6875
7. 462.7125
8. 467.5625
9. 467.5875
10. 467.6125
11. 467.6375
12. 467.6625
13. 467.6875
14. 467.7125 MHz

OCCUPIED BANDWIDTH

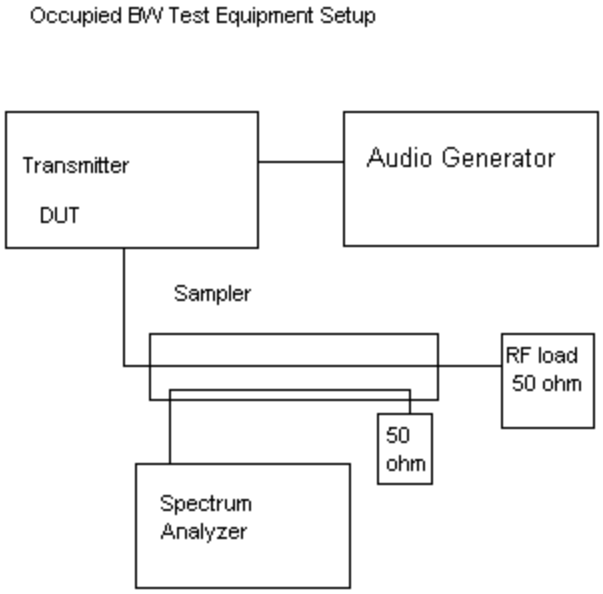
Part 2.1049(c) EMISSION BANDWIDTH:
95.635(b)(1)(3)(7)

At least 25dB on any frequency removed from the center of the authorized bandwidth by more than 50%up to and including 100% of the authorized bandwidth. At least 35 dB on any frequency removed from the center of the authorized BW by more than 100% up to and including 250% of the authorized BW. At least 43+log10(TP) dB on any frequency removed from the center of the authorized bandwidth by more than 250%. See the following plot.

Test procedure: ANSI/TIA 603-C:2004 para 2.2.11.

Test procedure diagram

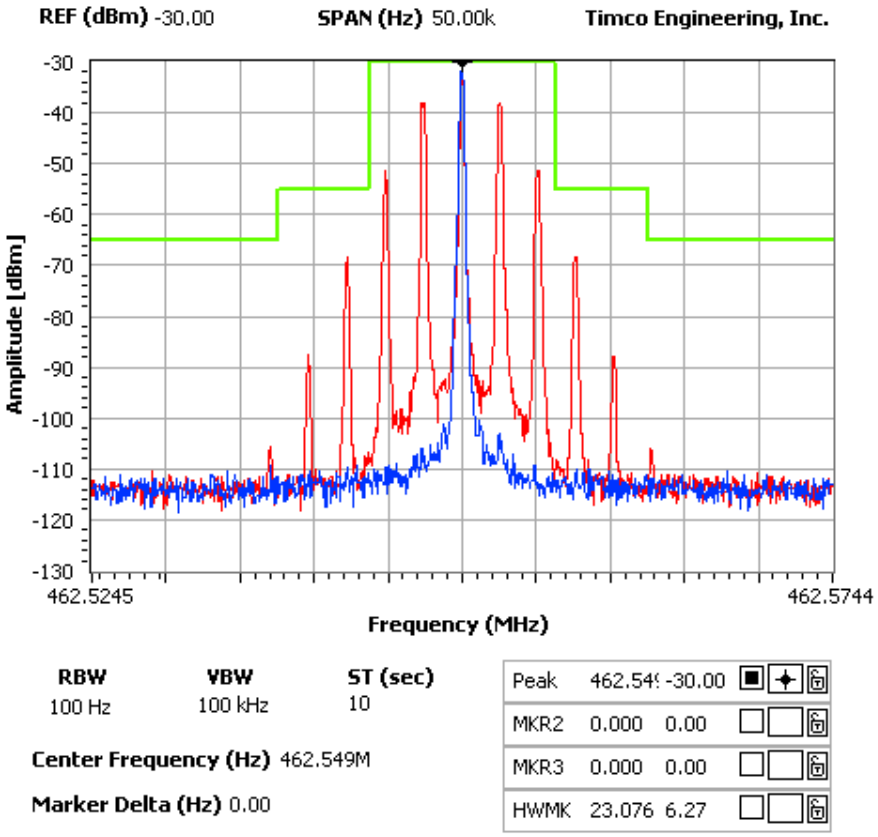
OCCUPIED BANDWIDTH MEASUREMENT



NOTES:

COBRA ELECTRONICS CORPORATION - FCC ID: BBO0121A
OCCUPIED BANDWIDTH PLOT

FCC 95.635 Mask (1) (3) (7)



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

2.1051 Not applicable, no antenna terminal allowed.

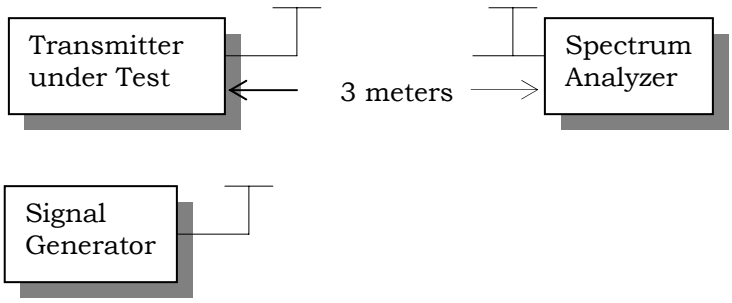
FIELD STRENGTH OF SPURIOUS EMISSIONS - TX

Rule Parts. No.: Part 2.1053
95.635(b)(7)

Requirements: GMRS: 43 + 10log(.32) = 38.0 dB

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 ANSI/TIA 603-C:2004 using the substitution method. Measurements were made at the test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

Test Setup Diagram:



Test Data (GMRS):

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
462.56	V	0.0
925.13	V	67.0
1387.69	V	58.5
1850.25	H	72.6
2312.81	V	66.5
2775.38	V	59.2
3237.94	H	59.1
3700.50	V	55.4
4163.06	H	51.8
4625.63	H	53.5

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
462.73	V	0.0
925.45	V	66.15
1388.18	V	59.10
1850.90	H	71.44
2313.63	V	65.30
2776.35	V	59.03
3239.08	H	57.91
3701.80	V	53.25
4164.53	H	51.04
4627.25	H	53.30

Rule Parts. No.: Part 2.1053
95.635(b)(7)

Requirements: FRS : 43 + 10log(.26) = 37.2 dB

Test Data (FRS):

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
467.56	V	0
935.13	V	64.8
1402.69	V	58.5
1870.25	H	64.7
2337.81	V	66.2
2805.38	H	57.4
3272.94	H	58.8
3740.50	V	53.1
4208.06	H	51.2
4675.63	H	54.9

FIELD STRENGTH OF SPURIOUS EMISSIONS - RX

Rules Part No.: 15.109, - RSS-210, RSS-310

Requirements:

Frequency	Limits
30 – 88	40.0 dBµV/m measured @ 3 meters
80 – 216	43.5 dBµV/m measured @ 3 meters
216 – 960	46.0 dBµV/m measured @ 3 meters
Above 960	54.0 dBµV/m measured @ 3 meters

Test Procedure: The procedure used was ANSI C63.4-2003. The frequency was scanned from 30 MHz to 1.0 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The DUT was measured in three (3) orthogonal planes (as required).

Test Data: Three channels (FRS, GMRS, and Wx) have been tested. No emission was found. The flowing list is noise floor level.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
163.3	86.10	10.8	V	0.62	9.60	21.02	18.98
163.3	144.90	6.4	H	0.69	15.69	22.78	20.72
163.3	160.40	6.2	V	0.74	16.68	23.62	19.88
163.3	173.30	14.4	H	0.79	15.07	30.26	13.24
163.3	447.20	8.3	H	1.25	17.53	27.08	18.92
163.3	448.00	7.6	V	1.25	17.52	26.37	19.63
163.3	664.80	6.7	H	1.66	21.08	29.44	16.56
163.3	689.60	6.7	V	1.69	21.80	30.19	15.81
163.3	872.00	5.7	H	1.94	23.22	30.86	15.14
163.3	912.00	6.8	V	1.97	23.80	32.57	13.43
467.6	302.40	10.1	H	1.10	14.48	25.68	20.32
467.6	361.60	7.5	V	1.16	15.13	23.79	22.21
467.6	447.20	8.5	H	1.25	17.53	27.28	18.72
467.6	447.20	9.1	V	1.25	17.53	27.88	18.12
467.6	607.20	7.3	H	1.61	19.87	28.78	17.22
467.6	779.20	6.3	V	1.86	22.09	30.25	15.75
467.6	1,227.00	11.9	V	2.28	27.77	41.95	12.05
467.6	1,266.00	12.9	H	2.31	27.82	43.03	10.97
467.6	1,490.00	11.6	V	2.49	28.09	42.18	11.82
467.6	1,616.00	11.1	H	2.59	29.00	42.69	11.31
467.6	1,741.00	11.4	H	2.69	29.98	44.07	9.93
467.6	1,832.00	11.3	V	2.77	30.69	44.76	9.24

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 95.621(b), RSS-210

Requirements: Temperature and voltage tests were performed to verify that the frequency remains within the 0.0005%, 5 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25º 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 worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30º 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 + 50º C.

Method of Measurements: ANSI/TIA 603-C: 2004

Test Data:

Assigned Frequency(Ref. Frequency) (MHz)		462.549654
Temperature (ºC)	**Frequency (MHz)**	**Frequency Stability (PPM)**
REFERENCE	462.547877	-3.84
-30	462.548266	-3.00
-20	462.549471	-0.40
-10	462.550178	1.13
0	462.550192	1.16
+10	462.549840	0.40
+20	462.549336	-0.69
+30	462.549296	-0.77
+40	462.549585	-0.15
+50	462.547877	-3.84

Assigned Frequency (Ref. Frequency) (MHz)		
% Battery	**Frequency (MHz)**	**Frequency Stability (PPM)**
-15%	462.549640	-0.03
0	462.549654	0
+15%	462.549551	-0.22

Note: This EUT meets the frequency stability requirement for a FRS: +/- 2.5ppm over temp range of -20 degrees C to +50 degrees C. It also meets the GMRS frequency stability requirements: +/- 5ppm over the temp range –30 degrees C to +50 degrees C.

TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/10/10	5/10/12
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Antenna: Active Loop	ETS-Lindgren	6502	00062529	CAL 9/23/10	9/23/12
Frequency Counter	HP	5385A	2730A03025	CAL 8/17/11	8/17/13
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 7/18/11	7/18/13
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 9/9/11	9/9/13
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 10/28/11	10/28/13
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/10	4/25/12
Antenna	ETS	3117	41534	9/22/2010	9/22/2012
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Electro metrics	BIA-25	1171	1/15/2010	1/15/2012