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

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	BBOLI7200
IC CERT #	906B-LI7200
MODEL NUMBERS	LI7190, LI7200, LI7250, LI7700, LI7750, LI7020A
PRODUCT DESCRIPTION	FRS/GMRS TRANSCEIVER
DATE SAMPLE RECEIVED	12/4/07
DATE TESTED	12/7/2007
TESTED BY	Joe Scoglio/Richard Block
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	3345AUT7TestReport.doc
TEST RESULTS	☒ PASS ☐ FAIL

ACCREDITED
Certificate # 0955-01

TABLE OF CONTENTS

GENERAL REMARKS

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

The test results relate only to the items tested.

Summary

The device under test does:
☒ fulfill the general approval requirements as identified in this test report
☐ 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.

ACCREDITED

Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

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

Authorized Signatory Name: *Mario de Aranzeta*

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: 12/10/2007

GENERAL INFORMATION

DUT Specification

DUT Description	FRS/GMRS Transceiver
FCC ID	BBOLI7200
IC Cert #	906B-LI7200
Model Number	LI7200, LI7190, LI7250, LI7700, LI7750, LI7020A
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
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	TIA 603 , FCC CFR 47 Part 2 & Part 95, Industry Canada RSS-210

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 TIA/EIA STANDARD 603 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 TIA 603 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum TIA 603 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 microvolt at the output of the antenna. The ambient temperature of the DUT was 76°F with a humidity of 55%.

RF POWER OUTPUT

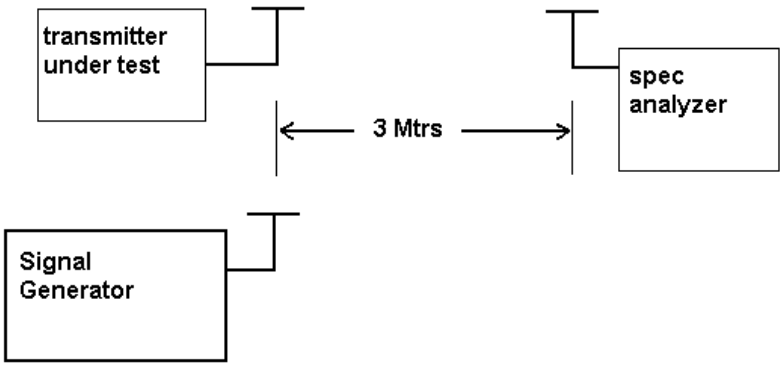
Rule Part No.: 2.1033(c)(6)(7), 2.1046(a), Part 95, RSS-210

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: 1.78 W ERP HIGH, 0.800 W ERP LOW
FRS: 0.3 W ERP

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

FOR HIGH POWER SETTING INPUT POWER: (7.4V)(..61A) = 4.51 Watts
FOR LOW POWER SETTING INPUT POWER: (7.4V)(.500A) = 3.7 Watts

MODULATION CHARACTERISTICS

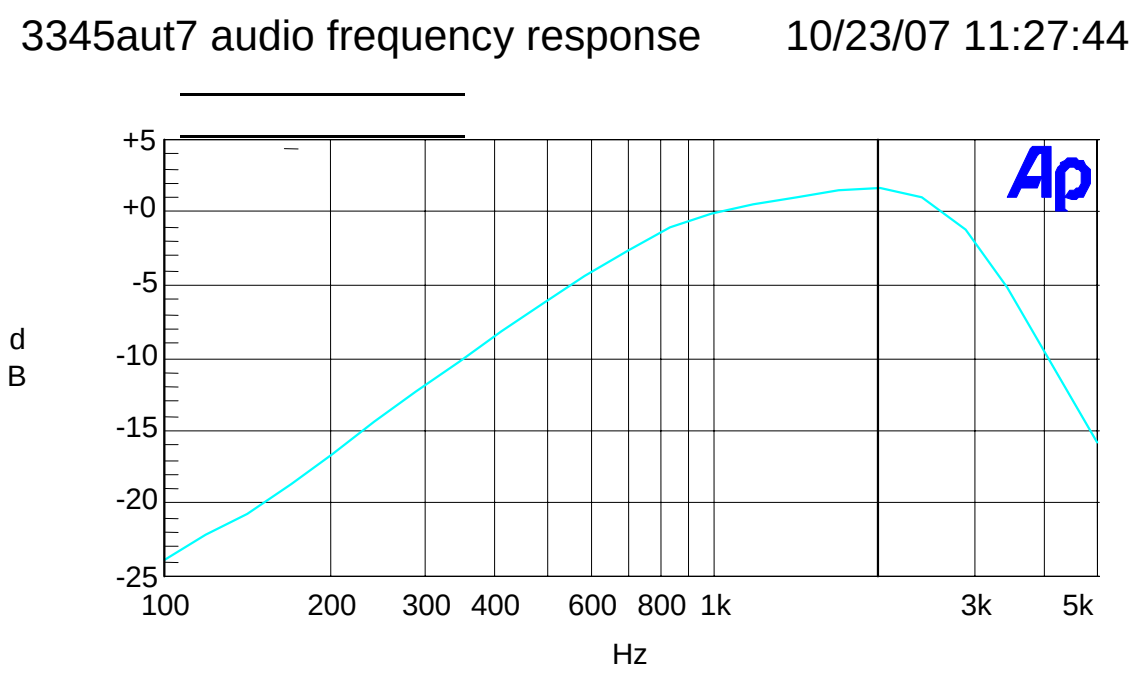
Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

Method of Measurement:

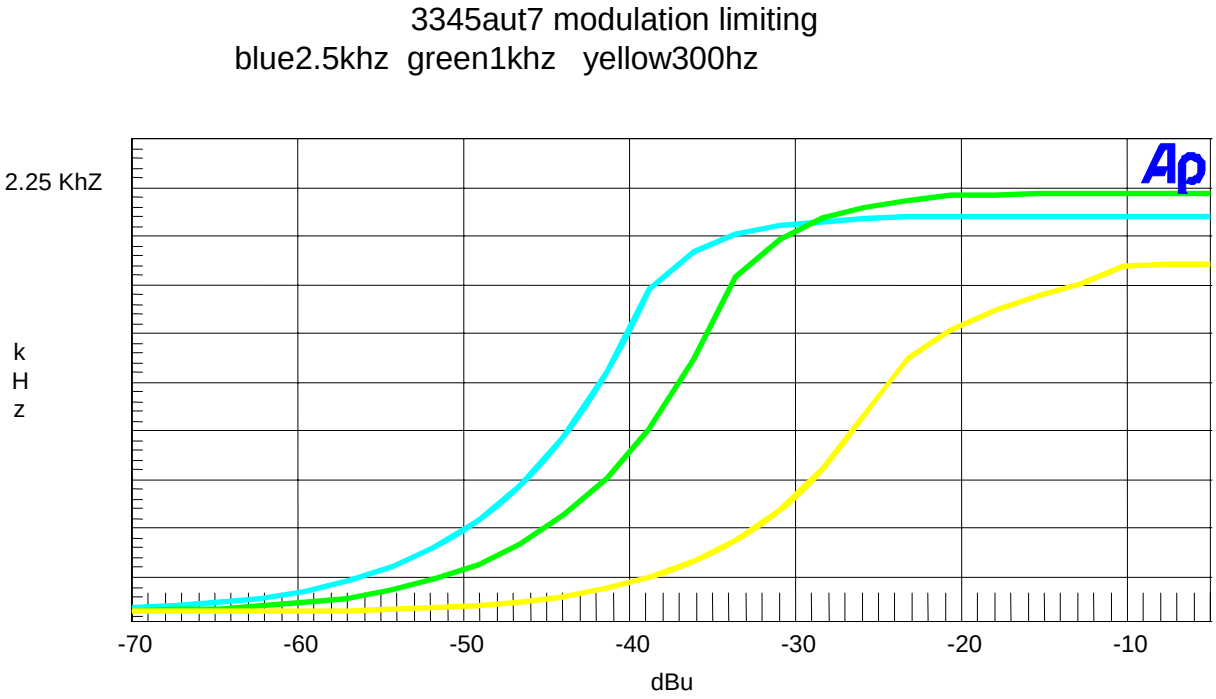
The audio frequency response was measured in accordance with TIA/EIA – 603. The audio frequency response curve is shown below. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.

AUDIO FREQUENCY RESPONSE PLOT



Audio input versus modulation

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

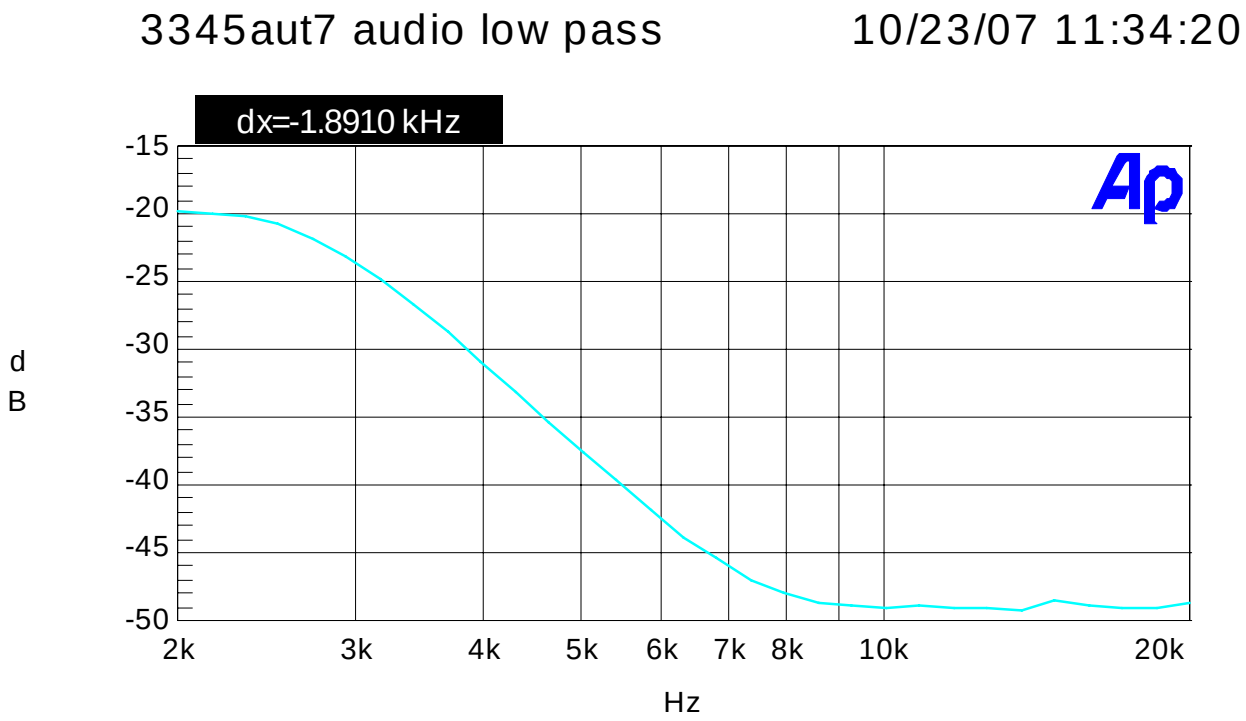


Color	Line Style	Thick	Data	Axis
Cyan	Solid	3	Anlr.Level A	Left
Green	Solid	3	Anlr.Level A	Left
Yellow	Solid	3	Anlr.Level A	Left

modulation limiting.at1

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 1KHz. See below.



Color	Line Style	Thick	Data	Axis	Cursor1	Cursor2
Cyan	Solid	1	Anlr.Level A	Left	..	..

MaxFreq.at1

EMISSION DESIGNATOR AND FREQUENCIES

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

Bn = 2M + 2DK
M = 3000
D = 2.25K
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 12.5KHz

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)

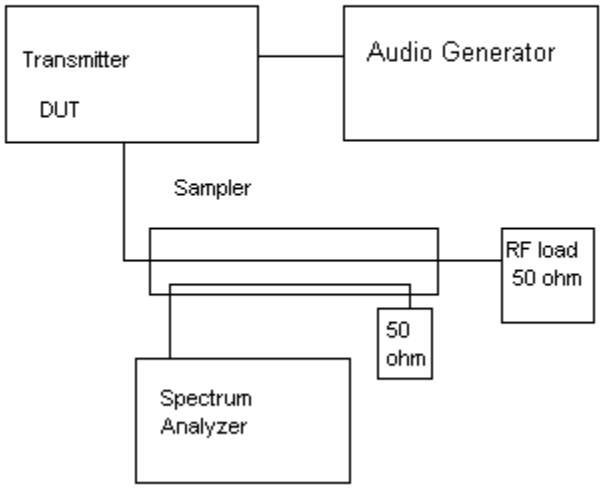
At least 25dB on any frequency removed from the center of the authorized bandwidth by more than 50%up to and including 100% of the authorized bandwidth. At least 35 dB on any frequency removed from the center of the authorized BW by more than 100% up to and including 250% of the authorized BW. At least 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: TIA/EIA-603 para 2.2.11.

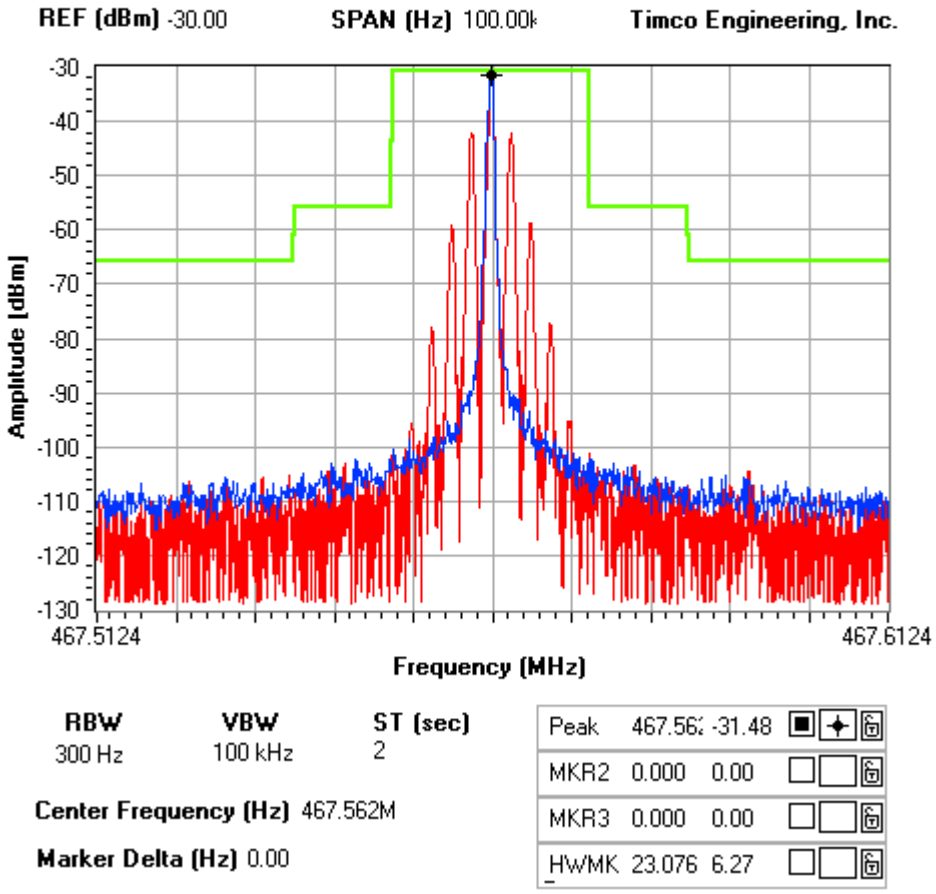
Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT

Occupied BW Test Equipment Setup



NOTES:
3345aut7 occupied bandwidth



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

2.1051 Not applicable, no antenna terminal allowed.

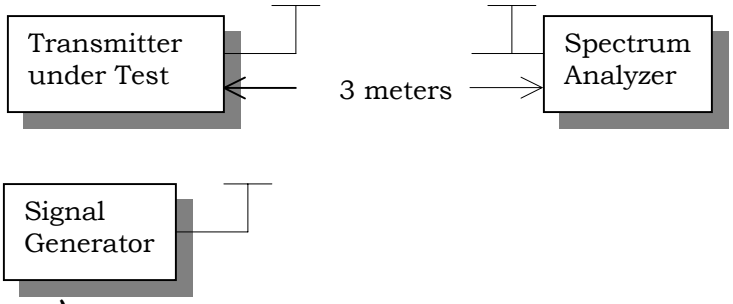
FIELD STRENGTH OF SPURIOUS EMISSIONS - TX

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

Requirements: GMRS: 43 + 10log(1.78) = 45.5 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 TIA/EIA STANDARD 603 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 High Power):

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
462.73	0	0.00
925.45	H	70.61
1388.18	V	61.00
1850.90	H	62.57
2313.63	H	64.03
2776.35	H	67.59
3239.08	H	77.09
3701.80	H	68.53
4164.53	H	79.73
4627.25	H	75.41

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

Requirements: GMRS: 43 + 10log(.8) =42.03 dB
FRS: 43+10log(.3) = 37.7 dB

Test Data (GMRS Mid Power):

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
462.73	0	0.00
925.45	V	69.72
1388.18	V	79.74
1850.90	H	74.28
2313.63	H	65.40
2776.35	H	70.90
3239.08	H	56.77
3701.80	V	56.66
4164.53	V	63.37
4627.25	V	64.02

Test Data (FRS):

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
467.56	0	0.00
935.13	H	63.48
1402.69	V	56.47
1870.25	H	64.94
2337.81	H	53.40
2805.38	H	71.36
3272.94	V	67.56
3740.50	H	69.70
4208.06	H	63.80
4675.63	H	61.38

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.

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
162.5	140.70	3.5	V	0.69	12.84	17.03	26.47
162.5	140.70	9.6	H	0.69	13.16	23.45	20.05
462.7	441.00	2.9	H	1.24	16.81	20.95	25.05
462.7	441.00	4.9	V	1.24	16.33	22.47	23.53
467.5	445.80	3.2	H	1.25	16.86	21.31	24.69
467.5	445.80	6.4	V	1.25	16.47	24.12	21.88

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 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 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 -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.

Method of Measurements: TIA/EIA 603.

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		
Temperature (°C)	**Frequency (MHz)**	**Frequency Stability (PPM)**
REFERENCE		
-30	462.725407	0.50
-20	462.725640	1.00
-10	462.725940	1.65
0	462.726056	1.90
+10	462.725770	1.28
+20	462.725177	0.00
+30	462.724177	-2.16
+40	462.724615	-1.21
+50	462.724212	-2.09

Assigned Frequency (Ref. Frequency) (MHz)		
% Battery	**Frequency (MHz)**	**Frequency Stability (PPM)**
-15%	462.724680	-1.07
0	462.725737	0.0
+15%	462.725783	0.10

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
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/07	3/19/10
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/06	10/11/08
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 5/17/07	5/17/09
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 5/17/07	5/17/09
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 5/17/07	5/17/09
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	CAL 12/1/06	12/1/08