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FCC PART 90 & RSS-119 (i12)

VHF BASE STATION

TEST REPORT

APPLICANT	COMTRONIX COMMUNICATIONS INC.
ADDRESS	42327 RIO NEDO, SUITE A TEMECULA CA 92590 USA
FCC ID	2AHI ALBR100C
IC CERT	21255-LBR100C
MODEL NUMBER	LBR-100
PRODUCT DESCRIPTION	VHF LOW BAND REPEATER
DATE SAMPLE RECEIVED	3/16/2016
FINAL TEST DATE	3/28/2016
TESTED BY	Cory Leverett
APPROVED BY	Tim Royer
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
514AUT16TestReport_	Rev1	Initial Issue	4/7/2016

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.

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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
☐ 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, under my supervision, at:

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

Authorized Signatory Name:



Authorized Signatory Name: _____

Cory Leverett
Project Manager/Testing Technician

Date: 3/31/2016

GENERAL INFORMATION

EUT Specification

EUT Description	VHF LOW BAND REPEATER
FCC ID	2AH1ALBR100C
IC CERT	21255-LBR100C
Model Number	LBR-100
Operating Frequency	39.05 – 49.95 MHz
Test Frequencies	39.45, 44.09, 49.55 MHz
Type of Emission	16K0F3E
Modulation	FM Analog Voice
EUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power 13.8 VDC Nominal
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☐ Pre-Production
	☒ Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable
Test Conditions	Temperature: 24-26°C Relative Humidity: 50 - 65%.
Modification to the EUT	None
Test Exercise	The EUT was modulated as required by standard.
Regulatory Standard	FCC CFR 47 Part 90, 22
Measurement Standard	ANSI/TIA 603-D:2010 ANSI C63.4 – 2014 RSS-GEN ISSUE 4 RSS-119 ISSUE 12
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA.

TEST RESULTS SUMMARY

TEST DESCRIPTION	FCC RULE PART NO.	IC RSS 119	RESULT
RF Power Output	2.1046(a), 90.205	Sec 5.4	Pass
Modulation Characteristics	2.1047(a)(b), 90.207	Sec 5.5	Pass
Occupied Bandwidth	2.1049(c)(h), 90.210 (b)	Sec 5.5	Pass
Spurious Emissions at Antenna Terminal	2.1051(a), 90.210(b)	Sec 5.8	Pass
Field Strength of Spurious Radiation	2.1053, 90.210 (b)	Sec 5.8	Pass
Frequency Stability	2.1055, 90.213	Sec 5.3	Pass

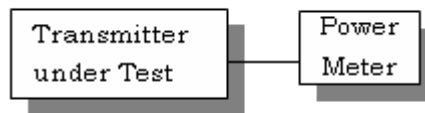
RF POWER OUTPUT

Specification: FCC Part 2.1046(a) & 90.205
IC RSS-119 sec 5.4

Limits: Limit on power is geographically dependent. The Rf power is measured and reported only

Procedure: RF power is measured by using a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage (if battery operated), or a properly adjusted power supply (if not battery operated), and the transmitter properly adjusted the RF output measures:

Diagram:



Test Data: Conducted Power Output Table

Tuned Frequency (MHz)	RF POWER	
	(W)	(dBm)
39.45	122.74	50.89
44.09	123.02	50.90
49.55	118.85	50.75

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

INPUT POWER: (13.8V) (16.2A) = 223.56 Watts

MODULATION CHARACTERISTICS

Requirements: FCC Part 2.1033(c), 2.1033(c) (4), 2.1047(a)(b), 90.209, & 90.207
IC RSS-119 sec 5.5

BANDWIDTH CALCULATION

Type of Emission: 16K0F3E

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 5000$$

$$K = 1$$

$$B_n = 2(3000) + 2(5000) = 16.0k$$

MODULATION CHARACTERISTICS

AUDIO FREQUENCY RESPONSE

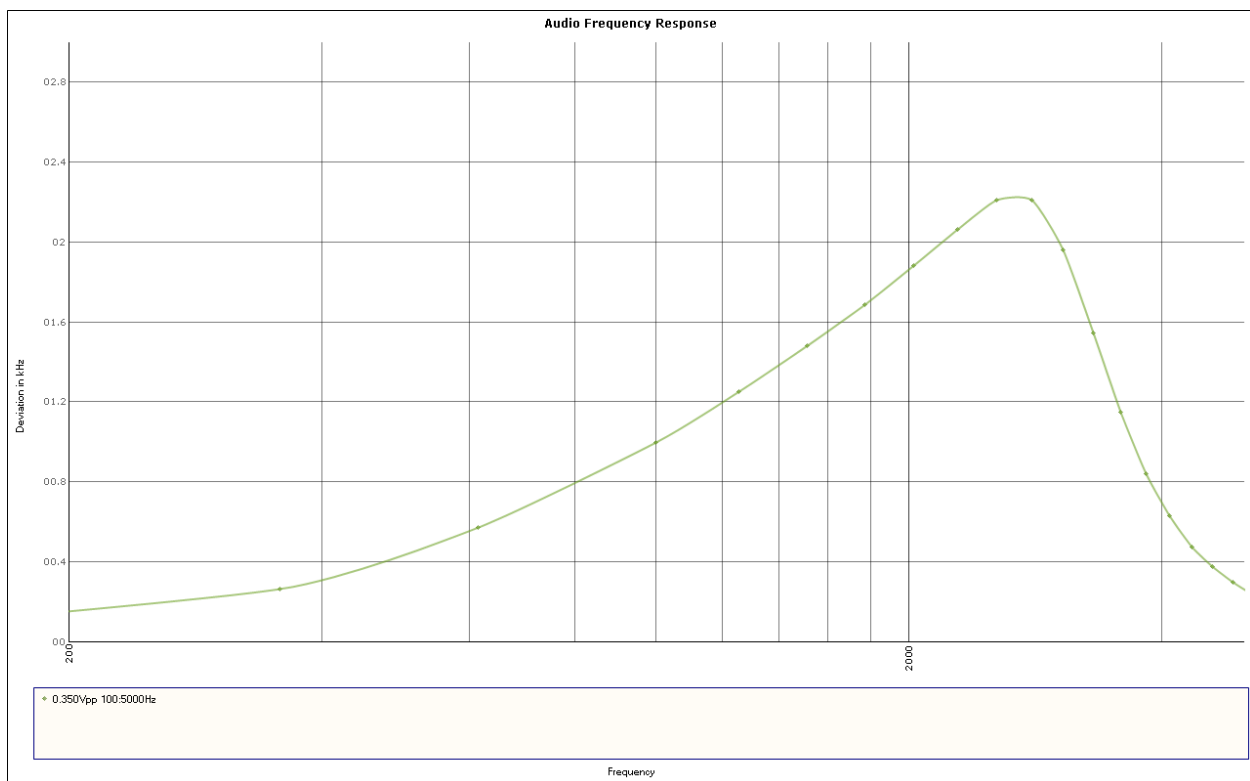
Rule Part No.: Part 2.1047(a) (b)

Test Requirements: Reporting Only

Method of Measurement: ANSI/TIA-603 § 2.2.6 Audio Frequency Response

TEST DATA:

AUDIO FREQUENCY RESPONSE – 25 kHz



MODULATION CHARACTERISTICS

AUDIO LOW PASS FILTER

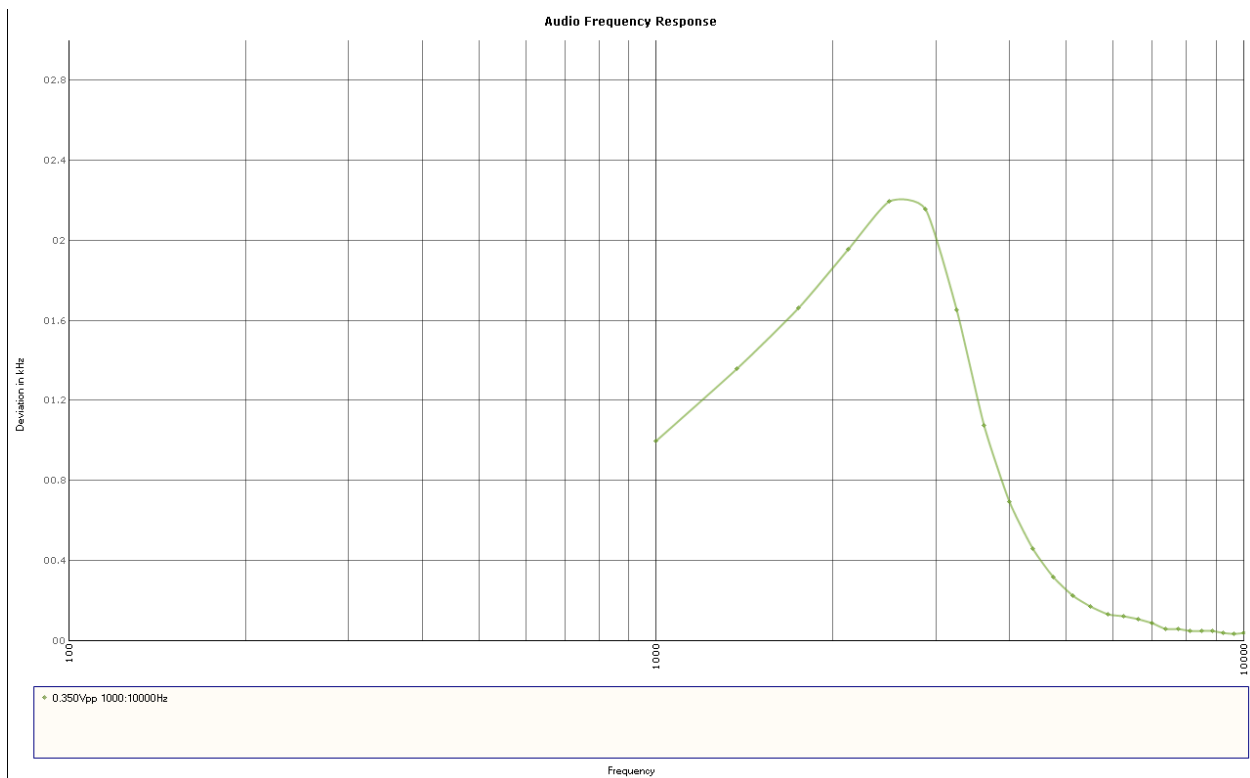
Rule Part No.: Part 2.1047(a) (b)

Test Requirements: For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all the circuitry installed between the modulation limiter and the modulated stage shall be submitted.

Method of Measurement: ANSI/TIA-603 § 2.2.15 Audio Low pass filter Response

TEST DATA:

AUDIO LOW PASS FILTER 25 kHz



MODULATION CHARACTERISTICS –

AUDIO INPUT VERSUS MODULATION

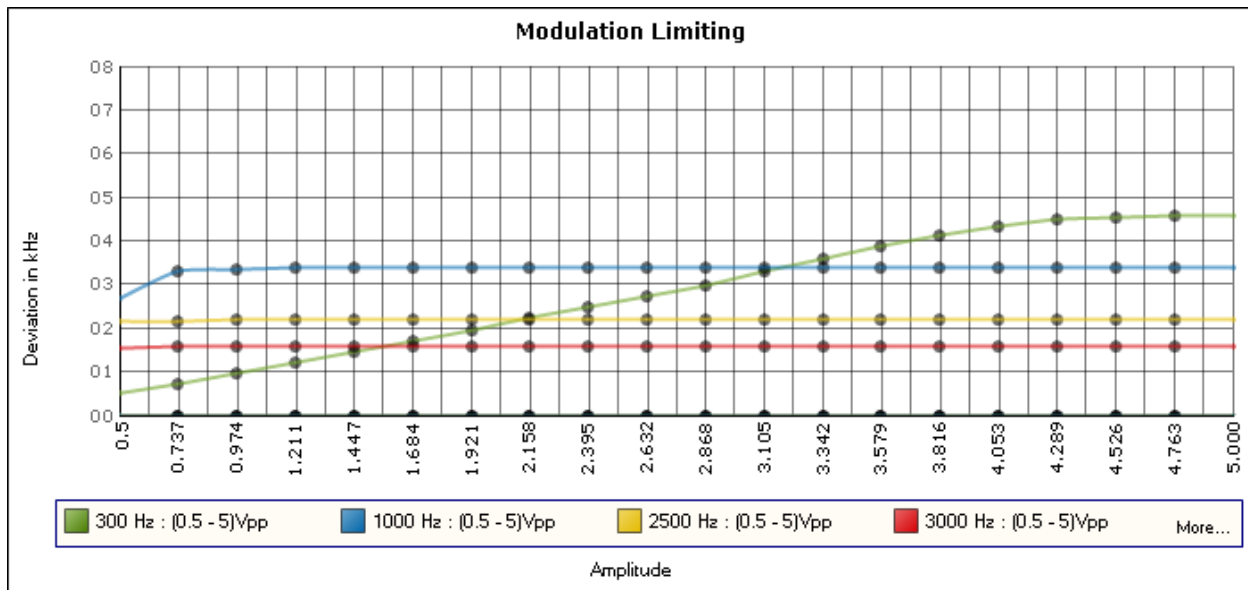
RULE PART NO: Part 2.1047(b)

REQUIREMENT Modulation cannot exceed 100% of the rated FM deviation.

Method of Measurement: ANSI/TIA-603 § 2.2.3

Test data:

MODULATION LIMITING 25 kHz



OCCUPIED BANDWIDTH

Specification.: FCC Rule Part 2.1049(c) & 90.210 (b)
IC RSS-119 sec 5.5

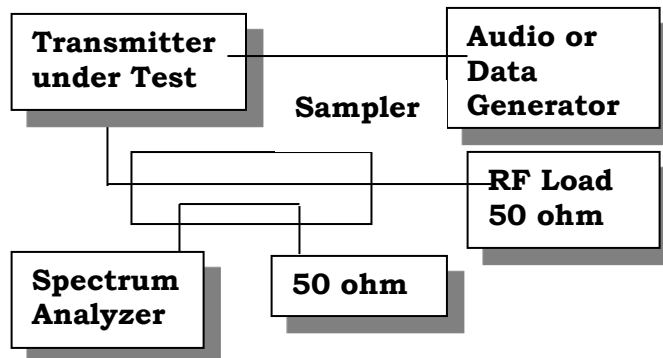
Limits:

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated 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.

Procedure: ANSI/TIA-603 § 2.2.11 Sideband Spectrum

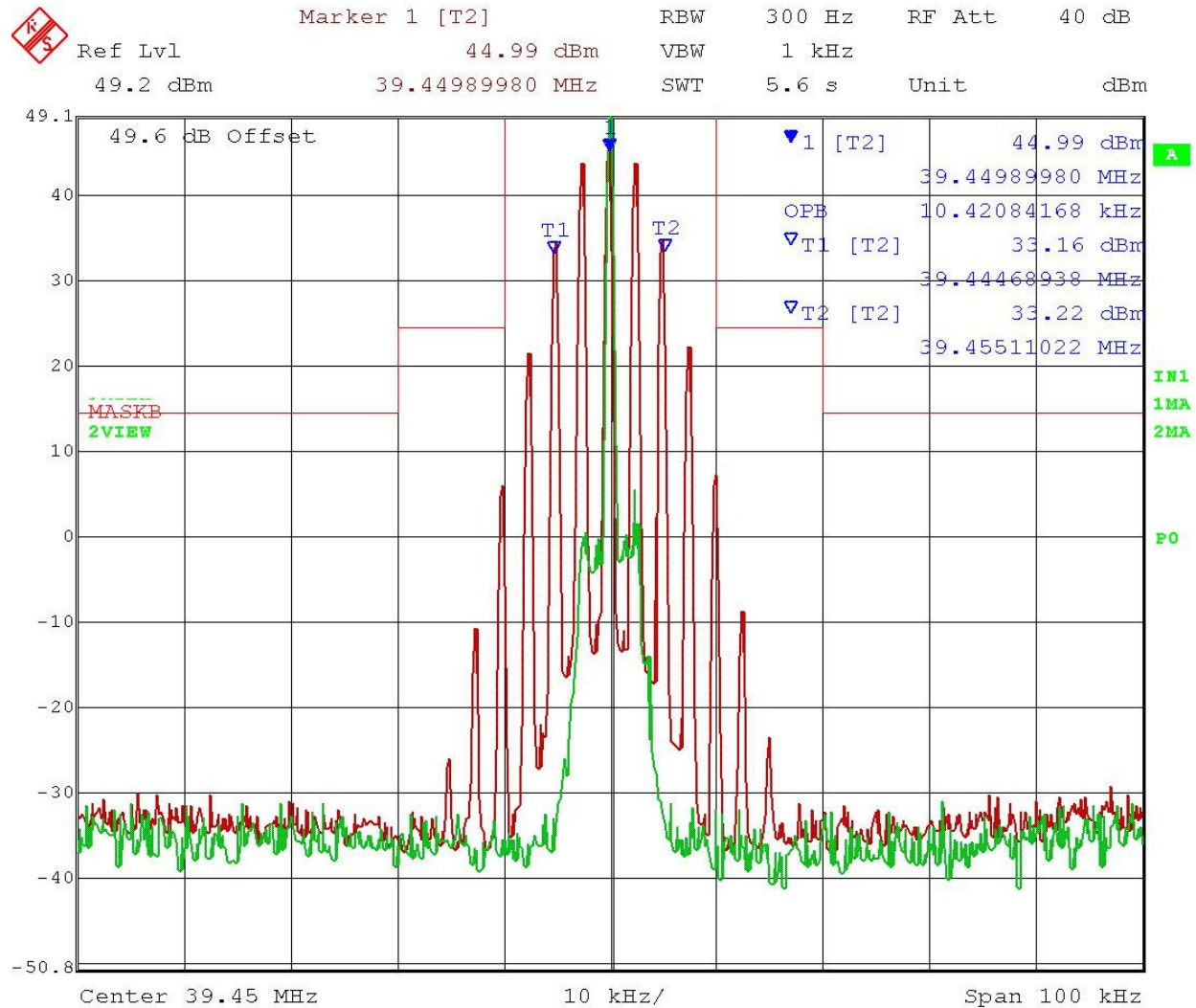
Diagram:



OCCUPIED BANDWIDTH

TEST FREQ. 39.45 MHz

Part 90.210(b) Emission Mask B – Equipment with audio Low pass filter

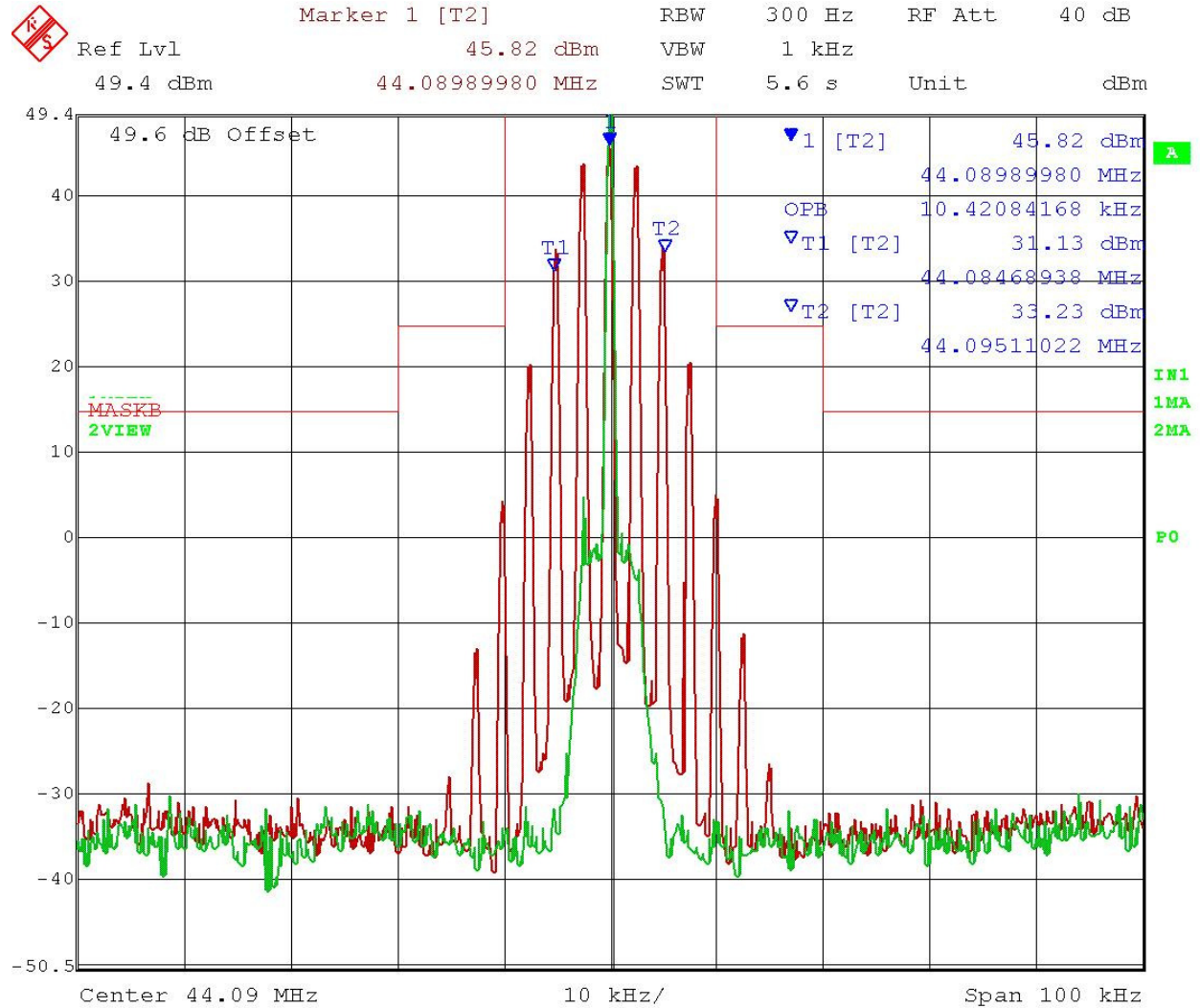


Date: 28.MAR.2016 13:19:41

OCCUPIED BANDWIDTH

TEST FREQ. 44.09 MHz

Part 90.210(b) Emission Mask B – Equipment with audio Low pass filter

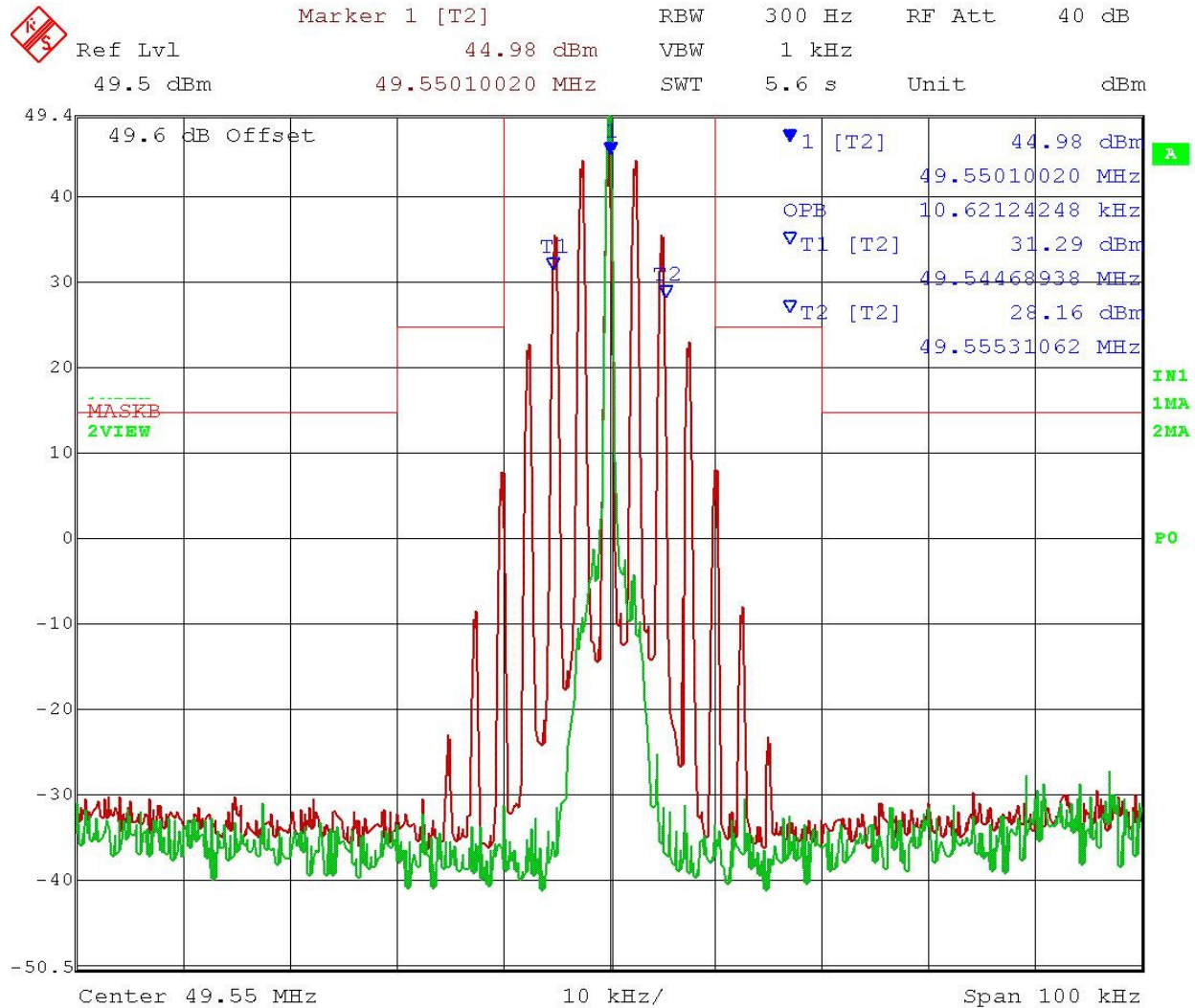


Date: 28.MAR.2016 13:17:52

OCCUPIED BANDWIDTH

TEST FREQ. 49.55 MHz

Part 90.210(b) Emission Mask B – Equipment with audio Low pass filter



Date: 28.MAR.2016 13:16:00

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

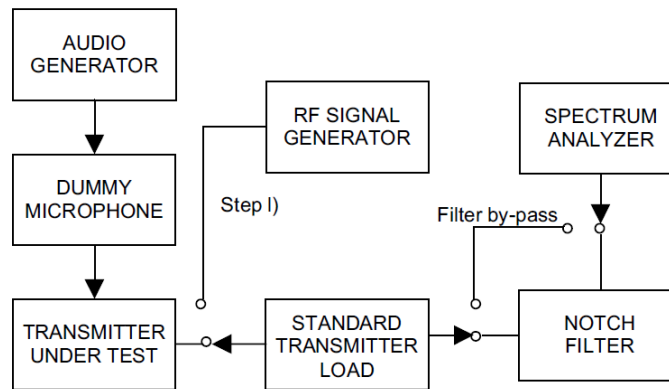
Specification: FCC Rule Part 2.1051(a), 90.210, 22.359 (a)
IC RSS-119 sec 5.8

Limits:

Rule Part	Requirement
90.210 (b), 22.359 (a)	$43 + 10\log (P) \text{ dB}$

Procedure: ANSI/TIA-603 § 2.2.13 Unwanted Emissions:
Conducted Spurious

Diagram :



TEST FREQ. 39.45 MHz

	dBm	Watts	Limit
Power Output	50.74	118.58	63.74
	Frequency	dBc	Margin
	39.45	0	0.0
	78.90	84.9	21.2
	118.35	71.6	7.9
	157.80	81.8	18.1
	197.25	82.5	18.7
	236.70	81.7	18.0
	276.15	96.4	32.7
	315.60	94.6	30.9
	355.05	98.9	35.2
*	394.50	102.7	39.0

* Indicates only the noise floor was present

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

TEST FREQ. 44.09 MHz

	dBm	Watts	Limit
Power Output	50.904	123.14	63.90
	Frequency	dBc	Margin
	44.09	0	0.0
	88.18	84.4	20.5
	132.27	68.6	4.7
	176.36	84.5	20.6
	220.45	96.3	32.4
	264.54	94.7	30.8
	308.63	92.2	28.3
	352.72	93.4	29.5
	396.81	99.3	35.4
*	440.90	113.5	49.6

* Indicates only the noise floor was present

TEST FREQ. 49.55 MHz

	dBm	Watts	Limit
Power Output	50.893	122.83	63.893
	Frequency	dBc	Margin
	49.55	0	0.0
	99.10	88.0	24.1
	148.65	72.1	8.2
	198.20	90.0	26.1
	247.75	96.0	32.1
	297.30	86.8	22.9
	346.85	91.6	27.7
	396.40	94.6	30.7
	445.95	99.5	35.6
*	495.50	118.6	54.7

* Indicates only the noise floor was present

Result: Meets Requirement

FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

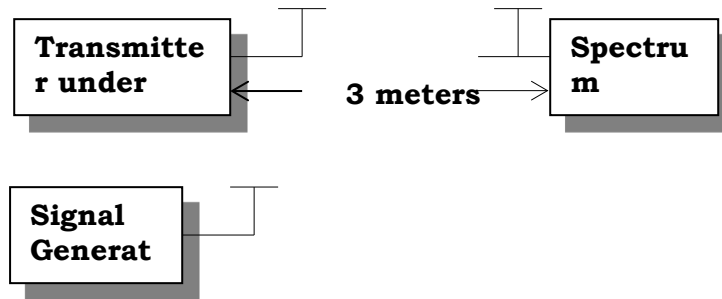
Specification FCC Rule Part 2.1053, 90.210, 22.359
IC RSS-119 sec 5.8

Limits: Out of Band Emission Limits

Rule Part	Requirement
90.210 (b), 22.359 (a)	$43 + 10\log (P) \text{ dB}$

Procedure : ANSI/TIA-603 § 2.2.12 Unwanted Emissions: Radiated Spurious

Diagram:



TEST FREQ. 39.45 MHz

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
39.45	Hi	50.89	122.74	63.89	25.00
Emission Frequency (MHz)	Ant. Polarity		Below Carrier (dBc)	Margin	
78.90	V		113.76	49.87	
118.35	V		86.92	23.03	
157.80	H		94.35	30.46	
197.25	H		86.45	22.56	
236.70	H		99.21	35.32	
276.15	H		109.77	45.88	
315.60	H		104.45	40.56	
355.05	H		104.57	40.68	
394.50	H		114.47	50.58	

FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

TEST FREQ. 44.09 MHz

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
44.09	Hi	50.90	123.03	63.90	25.00
Emission Frequency (MHz)	Ant. Polarity		Below Carrier (dBc)	Margin	
88.18	H		115.52	51.62	
132.27	H		81.56	17.66	
176.36	V		74.62	10.72	
220.45	H		94.10	30.20	
264.54	V		106.26	42.36	
308.63	H		101.68	37.78	
352.72	H		96.90	33.00	
396.81	H		103.91	40.01	
440.90	H		114.02	50.12	

TEST FREQ. 49.55 MHz

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
49.55	Hi	50.75	118.85	63.75	25.00
Emission Frequency (MHz)	Ant. Polarity		Below Carrier (dBc)	Margin	
99.10	V		100.46	36.71	
148.65	H		88.58	24.83	
198.20	H		99.63	35.88	
247.75	V		104.18	40.43	
297.30	H		111.70	47.95	
346.85	H		100.18	36.43	
396.40	V		115.05	51.30	
445.95	V		110.22	46.47	
495.50	H		113.99	50.24	

Results meet requirements

FREQUENCY STABILITY

Rule Parts. No.: FCC Rule Part 2.1055, Part 90.213
IC RSS-119 sec 5.3

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15%
For Rated Power > 2 Watts is ± 20 PPM

Method of Measurements: ANSI/TIA 603-D: 2.2.2

TEST FREQ: 49.55 MHz

Temperature	Frequency MHz	Cycles	PPM
25°C (reference)	49.549961		
-30°C	49.549847	-114	-2.301
-20°C	49.550016	55	1.110
-10°C	49.550032	71	1.433
0°C	49.550026	65	1.312
10°C	49.550008	47	0.949
20°C	49.549994	33	0.666
30°C	49.549962	1	0.020
40°C	49.549958	-3	-0.061
50°C	49.549968	7	0.141
Battery Voltage (VDC)	Frequency	Cycles	PPM
11.73	49.549960	-1	-0.020
13.80	49.549961		
15.87	49.549963	2	0.040

EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/ Char Date	Due Date
12 Volt Power Supply	Astron	VS-50M	9001191	NA	NA
Antenna: Biconnical	Eaton	94455-1	1057	11/18/15	11/18/17
Antenna: Log-Periodic	Eaton	96005	1243	02/09/16	02/09/18
Digital Multimeter	Fluke	77	35053830	10/21/15	10/21/17
CHAMBER	Panashield	3M	N/A	01/05/16	01/05/19
Antenna: Double-Ridged Horn/ ETS Horn 1	ETS-Lindgren	3117	00035923	06/13/14	06/13/16
EMI Test Receiver R & S ESIB 40	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
Software: Field Strength Program	Timco	N/A	Version 4.0	N/A	N/A
Antenna: Active Loop	ETS-Lindgren	6502	00062529	11/18/15	11/18/17
Hygro-Thermometer	Extech	445703	0602	06/30/15	06/30/17
Attenuator N 30dB 150W DC-6G	Narda	769-30	10267	06/26/15	06/26/17
EMI Test Receiver R & S ESU 40	Rohde & Schwarz	ESU 40	100320	12/15/14	12/15/17
Temp Chamber	Tenney Engineering	TTRC	11717-7	08/20/14	08/20/16
Frequency Counter	HP	5352B	2632A00165	07/01/15	07/01/17
Type K J Thermometer	Martel	303	080504494	10/26/15	10/26/17
Modulation Analyzer	HP	8901A	3050A05856	04/16/15	04/16/17
Function Generator	Stanford	DS340	25200	02/02/16	02/02/18
AC Volt Meter	HP	400FL	2213A14499	07/01/15	07/01/17

* EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

Applicant: COMTRONIX COMMUNICATIONS INC.

FCC ID: 2AHIALBR100C

IC CERT: 21255-LBR100C

TEST SET UP PHOTOS

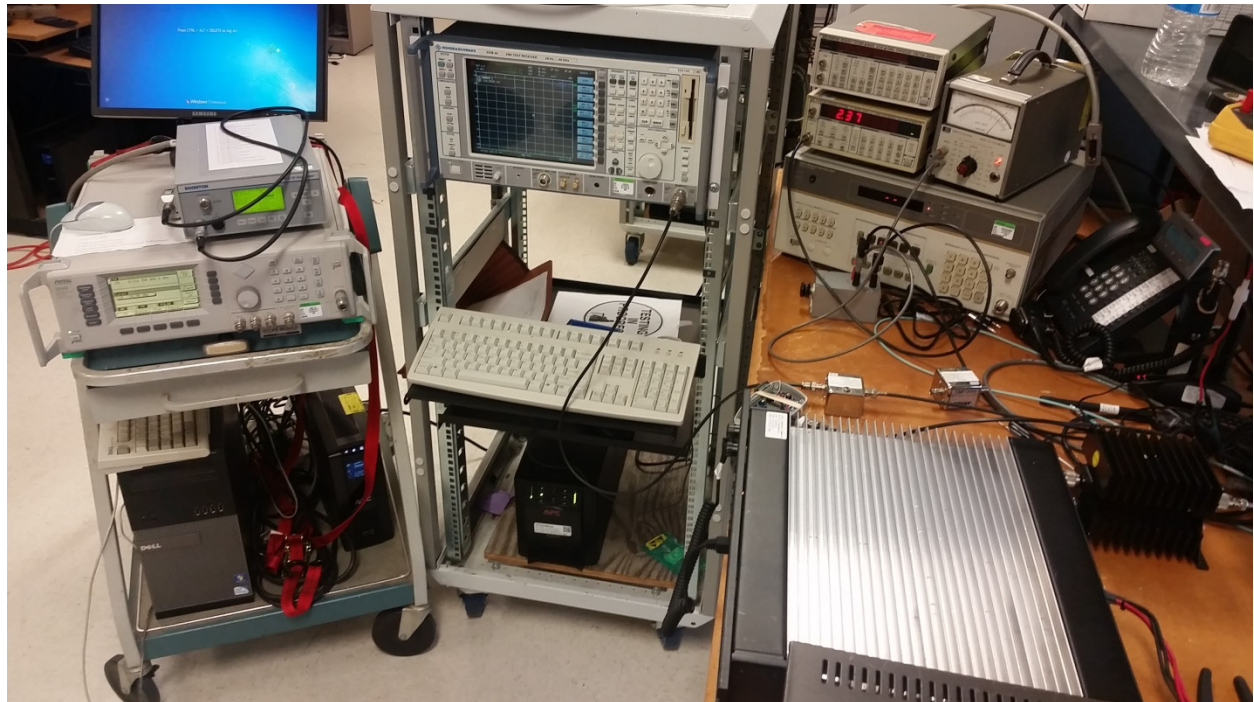
OUTPUT POWER



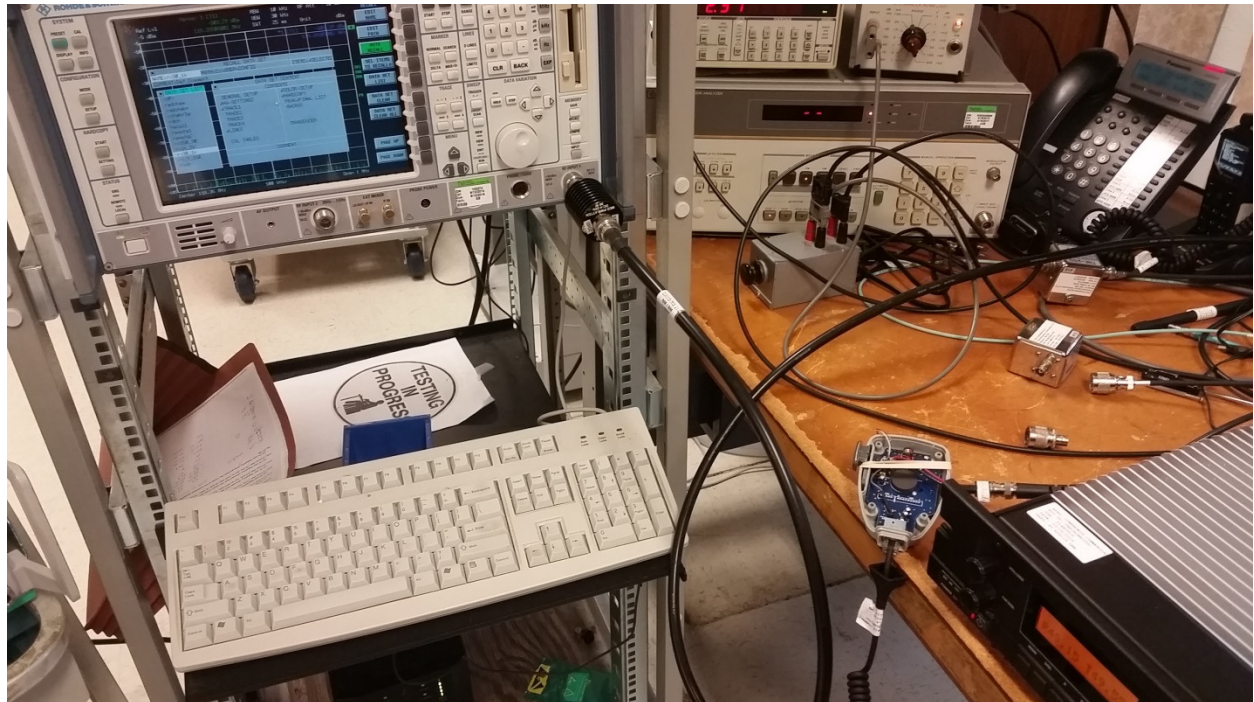
MODULATION CHARACTERISTICS



ANT CONDUCTED EMISSIONS



OCCUPIED BANDWIDTH



TEMPERATURE STABILITY



FIELD STRENGTH SPURIOUS EMISSIONS

