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FCC Part 90 Mobile UHF Repeater Test Report

APPLICANT	RITRON, INC.
	505 West Carmel Dr. PO Box 1998 Carmel IN 46032-7564 USA
FCC ID	AIERIT44-465
MODEL NUMBER	RLR-465DMR, RLR-465NX
PRODUCT DESCRIPTION	UHF-DIGITAL REPEATER
DATE SAMPLE RECEIVED	03/6/2018
FINAL TEST DATE	04/02/2018
TESTED BY	Franklin Rose
APPROVED BY	Tim Royer
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
330UT18TestReport_	Rev1	Initial Issue	04/05/2018
330UT18TestReport_	Rev2	Added description of model numbers	04/12/2018

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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, Project Manager/Testing Technician

Date: 04/02/2018



Reviewed and approved by:

Name and Title: Tim Royer, Engineer

Date: 4/6/2018

GENERAL INFORMATION

EUT Specification

EUT Description	UHF-DIGITAL REPEATER
FCC ID	AIERIT44-465
Model Number	RLR-465DMR, RLR-465NX
Operating Frequency	450 – 454 MHz, 456 – 462.5375 MHz, 462.7375 – 467.5375 MHz, 467.7375 - 470 MHz
Test Frequencies	451.025, 453.975, 456.025, 462.5125, 462.7625, 467.5125, 467.7625, 469.975 MHz
Type of Emission	4K00F1E (NXDN Voice), 4K00F1D (NXDN Data), 4K00F2D (NXDN CW ID), 7K60FXE (DMR Voice), 7K60FXD (DMR Data), 6K40F2D (DMR CW ID)
Modulation	FM
EUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power (13.8 V)
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable
Antenna Connector	N
Test Conditions	The temperature was 26°C Relative humidity of 50%.
Modification to the EUT	The EUT was modified for transmitter testing by the manufacturer. See attestation letter.
Test Exercise	The EUT was placed in continuous transmit and was operated in “Test Mode” for digital emissions tests.
Applicable Standards	ANSI/TIA 603-E:2016, ANSI C63.26, FCC CFR 47 Part 2, Part 90
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070

DIFFERENCES IN MODEL NUMBERS

Ritron Inc. has two model numbers included with this filing; the repeater is set up to handle on voice channel in a 6.25 kHz channel while operating as an RLR-465NX or two voice channels in a 12.5 kHz channel while operating as an RLR-465DMR.

RESULTS SUMMARY

Rule Part No.	Test Item	Results
FCC Part 2.1046(a), 90.205(h)	RF Power Output	PASS
2.1033(c)(4), 90.210(b)(5)	Modulation Characteristics	PASS
2.1047(a)(b)	Audio Frequency Response and Low Filter	N/A
2.1047(b)	Audio Input Vs Modulation	N/A
2.1049 (c), 90.210(e)(1), (2); (d)(1), (2)	Occupied Bandwidth, Out-of-Block Emissions (Mask D, E)	PASS
2.1051(a), 90.210(e)(3); (d)(3)	Spurious Emissions at Antenna Terminals	PASS
2.1053(a), 90.210(e)(3); (d)(3)	Field Strength of Spurious Emissions	PASS
2.1055(a)(2), 90.213	Frequency Stability < 1 ppm	PASS
90.214	Transient Frequency Response	N/A

Test Channel Plan

Preprogrammed Ch. No.	Frequency	Emission / Signal
0	460.025 MHz	CW only
1	451.025 MHz	4K00F1E, 4K00F1D / NXDN Voice & Data
2	460.025 MHz	4K00F1E, 4K00F1D / NXDN Voice & Data
3	469.975 MHz	4K00F1E, 4K00F1D / NXDN Voice & Data
4	451.025 MHz	7K60FXE, 7K60FXD / DMR Voice & Data
5	460.025 MHz	7K60FXE, 7K60FXD / DMR Voice & Data
6	469.975 MHz	7K60FXE, 7K60FXD / DMR Voice & Data
7	451.025 MHz	4K00F2D / NXDN CW ID
8	460.025 MHz	4K00F2D / NXDN CW ID
9	469.975 MHz	4K00F2D / NXDN CW ID
A	451.025 MHz	6K40F2D / DMR CW ID
b	460.025 MHz	6K40F2D / DMR CW ID
C	469.975 MHz	6K40F2D / DMR CW ID

EUT INFORMATION

Manufacturer Specified Power Level ("High" & "Low")

EUT employs an input voltage-to-output power regulation method, as well as programming software-controlled continuously variable power output. For testing, this software was used for power adjustments, while maintaining a constant supply of 13.8 VDC. The manufacturer specifies "High Power" shall refer to 10 W RF Output power, and "Low Power" shall refer to 2 W RF Output power.

Testing Not Applicable to Digital-Only Devices

The following tests depend on a sinusoidal tone transmitted in an FM (frequency modulated) signal. The EUT is not capable of analog FM signal, or digital emulation of an FM signal. To perform Audio Frequency Response, Low Pass Filter Response, Modulation Limiting, and Transient Frequency Response testing depends on the ability to generate FM. Therefore, the following tests have been deemed "Not Applicable."

AUDIO FREQUENCY RESPONSE & LOW PASS FILTER RESPONSE

FCC Rule Parts: FCC Part 2.1047(a)

Method of Measurement: ANSI/TIA-603-E

RESULT: Digital emissions only, Not Applicable

AUDIO INPUT VERSUS MODULATION

FCC Rule Parts: FCC Part 2.1047(b)

Method of Measurement: ANSI/TIA-603-E

RESULT: Digital emissions only, Not Applicable

Testing Not Applicable to Continuous Transmitting Devices

Transient Frequency Response testing depends on the ability to "key up" the transmitter. In normal operation the EUT continuously transmits all received signals, and has no method to "key up". Therefore, the following tests have been deemed "Not Applicable."

TRANSIENT FREQUENCY RESPONSE

FCC Rule Parts: FCC Part 90.214

Method of Measurement: ANSI/TIA-603-E

RESULT: Non-Keying Transmitter, Not Applicable

RF POWER OUTPUT

FCC Rule Parts: FCC Part 2.1046(a), 90.205(h), 90.307(c), 90.309 Table C

(h) *450-470 MHz.* (1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 must submit an engineering analysis based upon generally accepted engineering practices and standards that includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.

TABLE 2—450-470 MHz—MAXIMUM ERP/REFERENCE HAAT FOR A SPECIFIC SERVICE AREA RADIUS

	Service area radius (km)									
	3	8	13	16	24	32	40 ⁴	48 ⁴	64 ⁴	80 ⁴
Maximum ERP (w) ¹	2	100	2500	2500	2500	2500	2500	2500	2500	2500
Up to reference HAAT (m) ³	15	15	15	27	63	125	250	410	950	2700

¹Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCC Report R-6602, Fig. 29 (See §73.699, Fig. 10 b).

²Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 dBu.

⁴Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 39 dBu.

(i) *470-512 MHz.* Power and height limitations are specified in §§90.307 and 90.309.

§90.307 Protection criteria.

The tables and figures listed in §90.309 shall be used to determine the effective radiated power (ERP) and antenna height of the proposed land mobile base station and the ERP for the associated control station (control station antenna height shall not exceed 31 meters (100 feet) above average terrain (AAT)).

(c) Mobile units and control stations operating on the frequencies available for land mobile use in any given urbanized area shall afford protection to co-channel and adjacent channel television stations in accordance with the values set forth in table C in §90.309 and paragraph (d) of this section except for channel 15 in New York, NY, and Cleveland, OH, and channel 16 in Detroit, MI, where protection will be in accordance with the values set forth in table D in §90.309 and paragraph (d) of this section.

RF POWER OUTPUT

Test Requirements: Manufacturer Specified Limit: 10 W High, 2 W Low

Method of Measurement: ANSI/TIA-603-E

Test Data: Power Measurement Table

Peak Output Power				
Tuned Freq. MHz	dBm		Watts	
	High	Low	High	Low
451.0250	39.99	32.97	9.98	1.98
453.9750	39.99	33.02	9.98	2.00
456.0250	40.00	33.00	10.00	2.00
462.5125	40.00	33.00	10.00	2.00
462.7625	39.99	33.00	9.98	2.00
467.5125	39.99	33.02	9.98	2.00
467.7625	39.99	33.04	9.98	2.01
469.9750	40.02	33.00	10.05	2.00

Part 2.1033 (c)(8) DC Input into Final Amplifier

INPUT POWER: (13.8 V) (3.0 A) = **41.4 Watts**

Result: Meets Requirements

MODULATION CHARACTERISTICS, NXDN & DMR SIGNALS

FCC Rule Parts: Part 2.1033(c)(4), 90.210(b)(5)

STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
406-512 ²	¹ 6.25	¹³⁶ 20/11.25/6

¹For stations authorized on or after August 18, 1995.

²Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.

³Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth. All stations must operate on channels with a bandwidth of 12.5 kHz or less beginning January 1, 2013, unless the operations meet the efficiency standard of §90.203(j)(3).

⁶Operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the Adjacent Channel Power limits of §90.221.

4K00F1E (NXDN Voice), 4K00F1D (NXDN Data) Bandwidth Calculation

$$B_n = 2(f_d + f_m)$$

$$B_n = 2(1.05 + 0.95) = 4.0 \text{ kHz}$$

Where:

f_m = modulating frequency, kHz
 f_d = deviation, kHz

RESULT: 90.210(b)(5) Necessary Bandwidth for 4K00F1E/F1D = 4.00 kHz

7K60FXE (DMR Voice), 7K60FXD (DMR Data) Bandwidth Calculation

$$B_n = (R/\log_2 S) + (2 \cdot D \cdot K)$$

$$B_n = (9600/2) + (2 \cdot 3.024 \cdot 0.463) = 7.60 \text{ kHz}$$

Where:

R = baud rate (9600)
D = deviation kHz (3.024 kHz)
S = signaling states (4)
K = constant (0.463)

RESULT: 90.210(b)(5) Necessary Bandwidth for 7K60FXE/FXD = 7.60 kHz

MODULATION CHARACTERISTICS, CW SIGNAL

4K00F2D (CW ID) Bandwidth Calculation

$$\begin{aligned} B_n &= 2(f_d + f_m) \\ B_n &= 2(1.3 + 0.7) = \mathbf{4.0 \text{ kHz}} \end{aligned}$$

Where:

f_m = modulating frequency, kHz
 f_d = deviation, kHz

RESULT: 90.210(b)(5) Necessary Bandwidth for 4K00F2D = 4.00 kHz

6K40F2D (CW ID) Bandwidth Calculation

$$\begin{aligned} B_n &= 2(f_d + f_m) \\ B_n &= 2(2.5 + 0.7) = \mathbf{6.4 \text{ kHz}} \end{aligned}$$

Where:

f_m = modulating frequency, kHz
 f_d = deviation, kHz

RESULT: 90.210(b)(5) Necessary Bandwidth for 6K40F2D = 6.40 kHz

OCCUPIED BANDWIDTH 99% / OUT-OF-BLOCK EMISSIONS

FCC Rule Parts: 2.1049 (c), 90.210(e)(1), (2); (d)(1), (2)

Requirements: (d) Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.

(e) Emission Mask E—6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

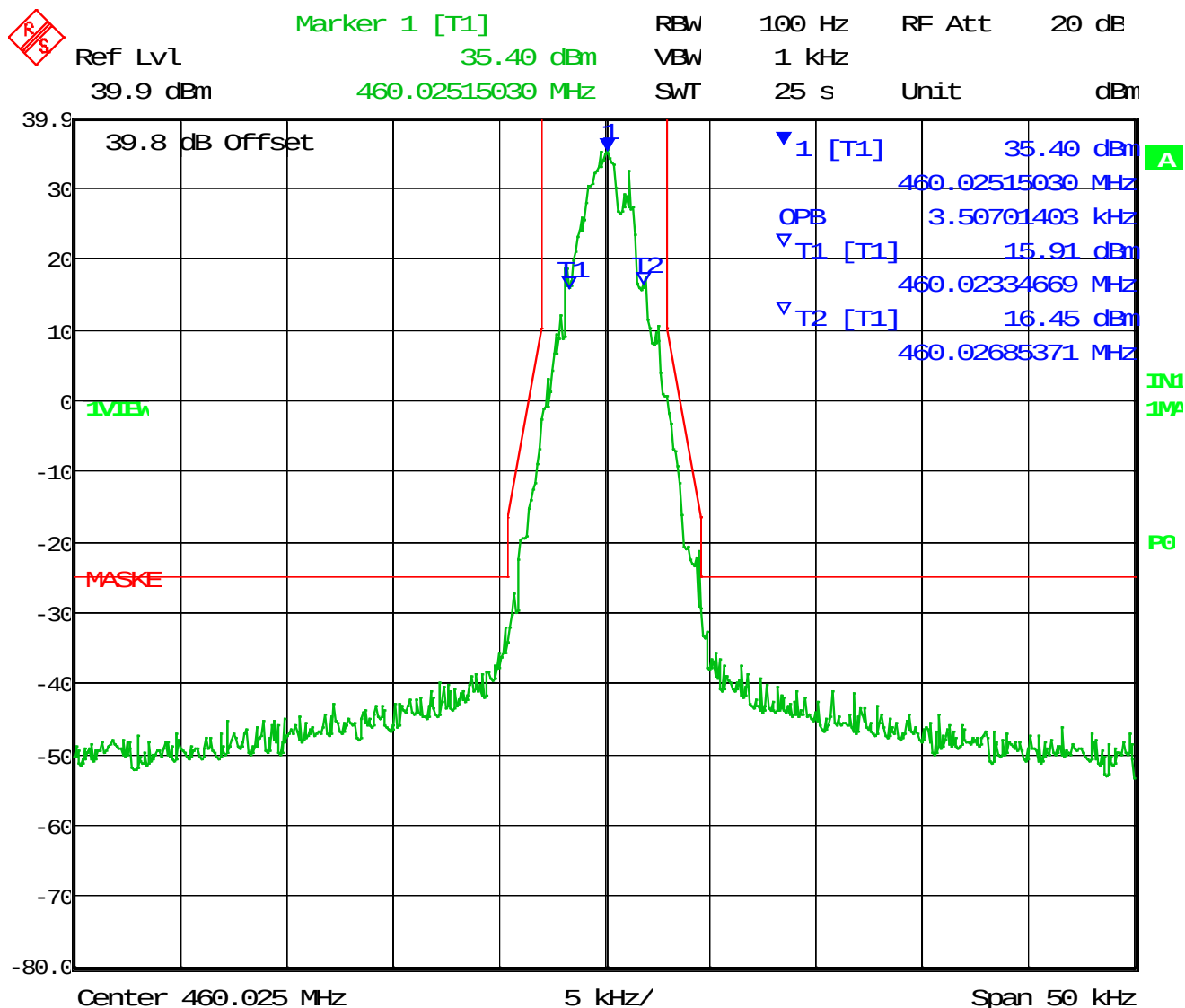
(1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 kHz removed from f_0 : Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least $30 + 16.67(f_d - 3 \text{ kHz})$ or $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.

Method of Measurement: ANSI/TIA-603-E

OCCUPIED BANDWIDTH 99%

Test Data: 4K00F1E/4K00F1D (NXDN Voice & Data)

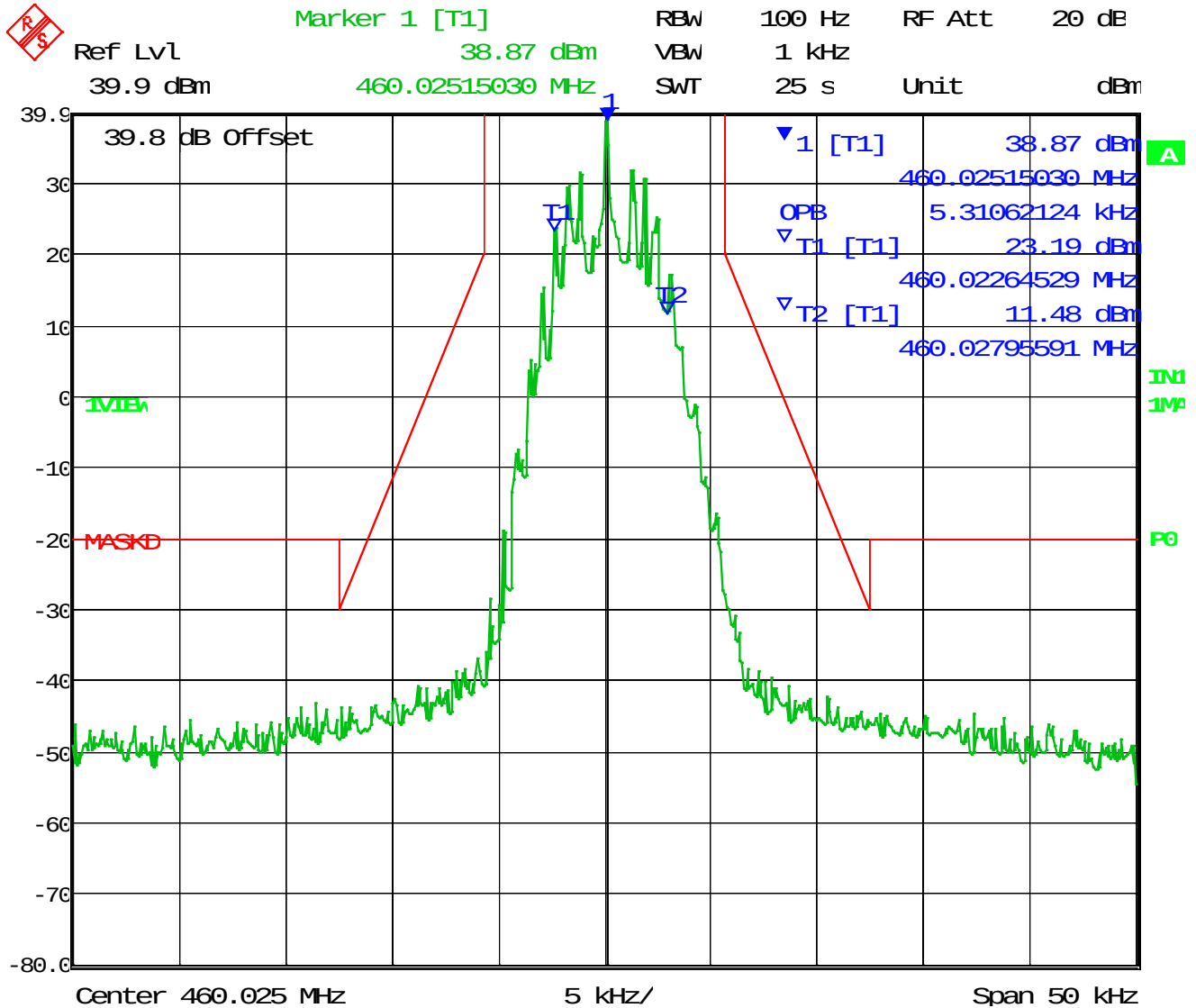


Date: 1.JAN.1997 00:53:15

99 % OBW = 3.51 kHz

OCCUPIED BANDWIDTH 99%

Test Data: 7K60FXE/7K60FXD (DMR Voice & Data)

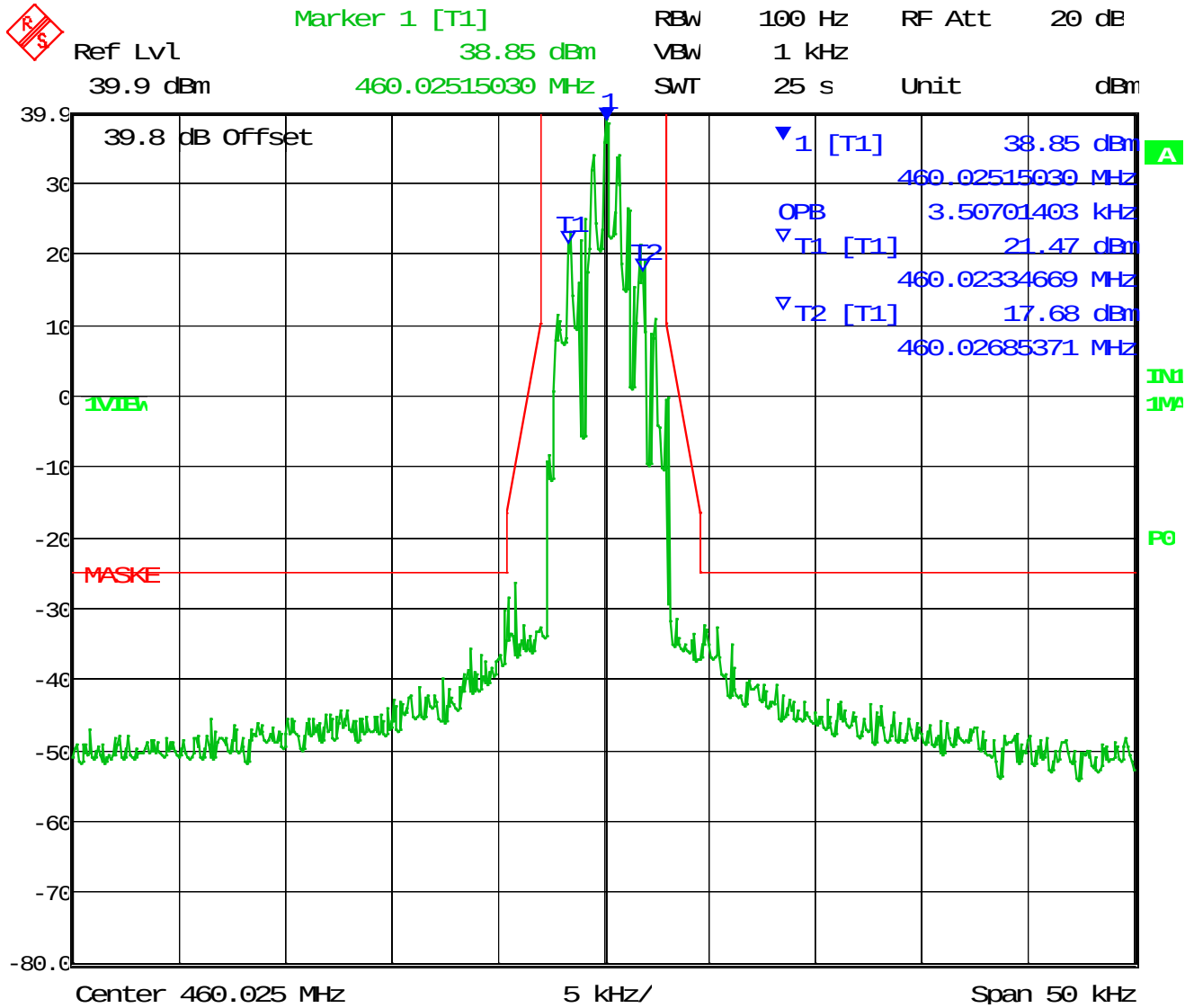


Date: 1.JAN.1997 01:18:19

99 % OBW = 5.31 kHz

OCCUPIED BANDWIDTH 99%

Test Data: 4K00F2D (CW ID)

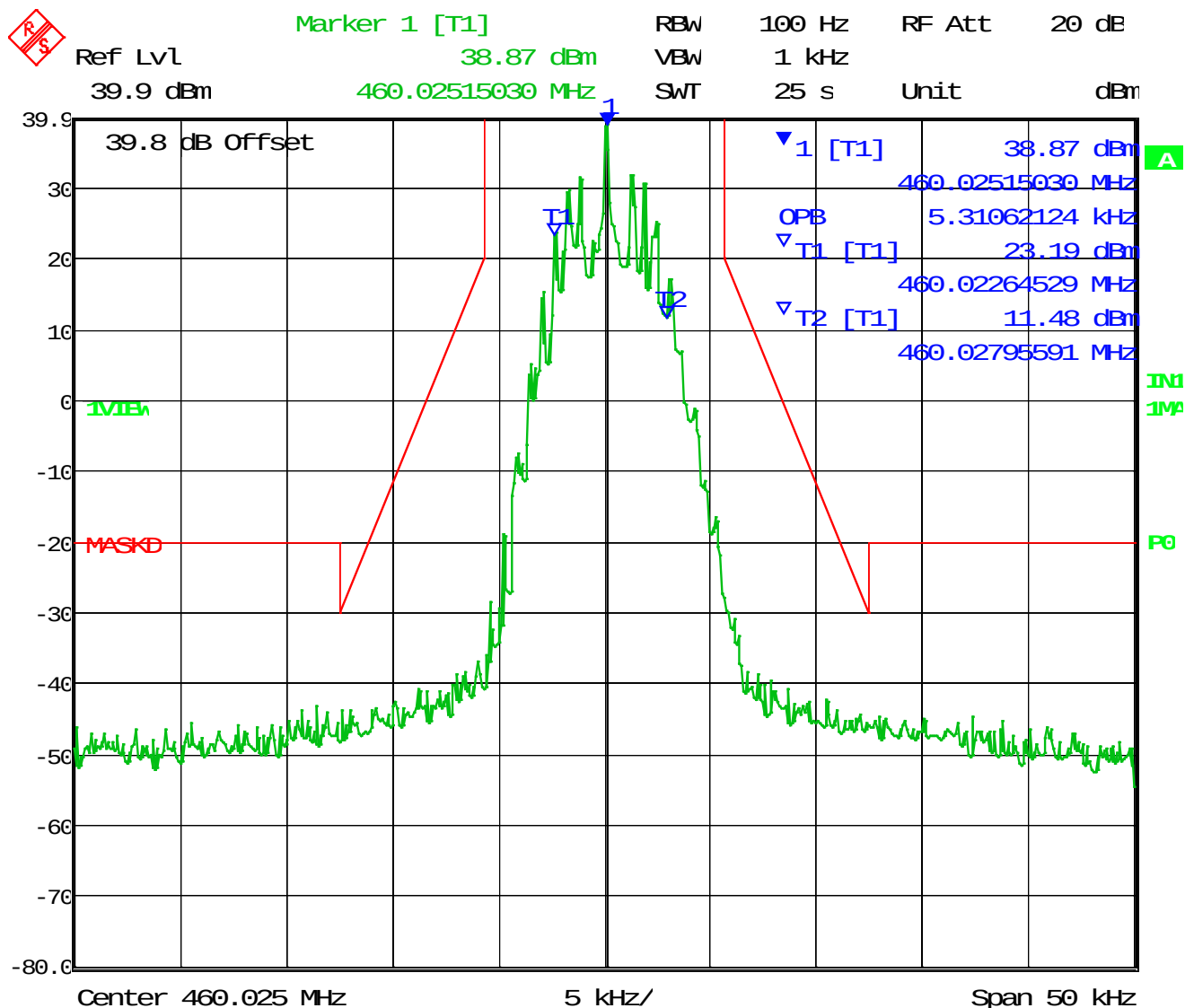


Date: 1.JAN.1997 04:05:05

99 % OBW = 3.51 kHz

OCCUPIED BANDWIDTH 99%

Test Data: 6K40F2D (CW ID)



Date: 1.JAN.1997 01:18:19

99 % OBW = 5.31 kHz

Result: Meets Requirements

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

FCC Rule Parts: FCC Part 2.1051(a), 90.210(e)(3); (d)(3)

Requirements: (d)(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

Peak Output Power Limits, Mask D (12.5 kHz Signals)

Tuned Freq. MHz	dBm		Watts		Limit (dBm)	
	High	Low	High	Low	High	Low
451.0250	39.99	32.97	9.98	1.98	-20.00	-20.00
453.9750	39.99	33.02	9.98	2.00	-20.00	-20.00
456.0250	40.00	33.00	10.00	2.00	-20.00	-20.00
462.5125	40.00	33.00	10.00	2.00	-20.00	-20.00
462.7625	39.99	33.00	9.98	2.00	-20.00	-20.00
467.5125	39.99	33.02	9.98	2.00	-20.00	-20.00
467.7625	39.99	33.04	9.98	2.01	-20.00	-20.00
469.9750	40.02	33.00	10.05	2.00	-20.00	-20.00

(e)(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.

Peak Output Power Limits, Mask E (6.25 kHz Signals)

Tuned Freq. MHz	dBm		Watts		Limit (dBm)	
	High	Low	High	Low	High	Low
451.0250	39.99	32.97	9.98	1.98	-25.00	-25.00
453.9750	39.99	33.02	9.98	2.00	-25.00	-25.00
456.0250	40.00	33.00	10.00	2.00	-25.00	-25.00
462.5125	40.00	33.00	10.00	2.00	-25.00	-25.00
462.7625	39.99	33.00	9.98	2.00	-25.00	-25.00
467.5125	39.99	33.02	9.98	2.00	-25.00	-25.00
467.7625	39.99	33.04	9.98	2.01	-25.00	-25.00
469.9750	40.02	33.00	10.05	2.00	-24.98	-25.00

The more strict limit shall be applied to spurious emissions testing.

More strict limit of 90.210(e)(3); (d)(3) = Mask E, -25 dBm

Method of Measurement: ANSI/TIA-603-E

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 451.025 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	39.99	9.98	-25
Low Power (dBm)	32.97	1.98	-25

HIGH POWER					LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		451.025	0.00	0.00	39.99	0.00
2nd Harmonic		902.050	-33.12	8.12	-42.82	17.82
3rd Harmonic		1353.075	-42.47	17.47	-45.79	20.79
4th Harmonic		1804.100	-40.65	15.65	-41.69	16.69
5th Harmonic		2255.125	-31.18	6.18	-35.47	10.47
6th Harmonic		2706.150	-39.01	14.01	-38.32	13.32
7th Harmonic		3157.175	-35.71	10.71	-40.21	15.21
8th Harmonic		3608.200	-48.41	23.41	-49.48	24.48
9th Harmonic		4059.225	-47.59	22.59	-47.65	22.65
10th Harmonic		4510.250	-37.83	12.83	-52.23	27.23

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 453.975 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	39.99	9.98	-25
Low Power (dBm)	33.02	2.00	-25

HIGH POWER					LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		453.975	0.00	0.00	39.99	0.00
2nd Harmonic		907.950	-33.04	8.04	-42.76	17.76
3rd Harmonic		1361.925	-42.37	17.37	-45.77	20.77
4th Harmonic		1815.900	-40.62	15.62	-41.60	16.60
5th Harmonic		2269.875	-31.17	6.16	-35.38	10.38
6th Harmonic		2723.850	-38.99	13.99	-38.24	13.24
7th Harmonic		3177.825	-35.70	10.70	-40.11	15.11
8th Harmonic		3631.800	-48.39	23.39	-49.39	24.39
9th Harmonic		4085.775	-47.54	22.54	-47.55	22.55
10th Harmonic		4539.750	-37.76	12.76	-52.13	27.13

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 456.025 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	40.00	10.00	-25
Low Power (dBm)	33.00	2.00	-25

					HIGH POWER		LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		456.025	0.00	0.00	40.00	0.00		
2nd Harmonic		912.050	-33.05	8.05	-42.78	17.78		
3rd Harmonic		1368.075	-42.39	17.39	-45.76	20.76		
4th Harmonic		1824.100	-40.63	15.63	-41.64	16.64		
5th Harmonic		2280.125	-31.15	6.15	-35.39	10.39		
6th Harmonic		2736.150	-38.91	13.91	-38.24	13.24		
7th Harmonic		3192.175	-35.68	10.68	-40.21	15.21		
8th Harmonic		3648.200	-48.36	23.36	-49.48	24.48		
9th Harmonic		4104.225	-47.51	22.51	-47.57	22.57		
10th Harmonic		4560.250	-37.80	12.80	-52.17	27.17		

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 462.5125 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	40.00	10.00	-25
Low Power (dBm)	33.00	2.00	-25

HIGH POWER					LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		462.513	0.00	0.00	40.00	0.00
2nd Harmonic		925.025	-33.03	8.03	-42.76	17.76
3rd Harmonic		1387.538	-42.37	17.37	-45.75	20.75
4th Harmonic		1850.050	-40.62	15.62	-41.61	16.61
5th Harmonic		2312.563	-31.17	6.17	-35.44	10.44
6th Harmonic		2775.075	-38.95	13.95	-38.27	13.27
7th Harmonic		3237.588	-35.63	10.63	-40.12	15.12
8th Harmonic		3700.100	-48.36	23.36	-49.47	24.47
9th Harmonic		4162.613	-47.50	22.50	-47.55	22.55
10th Harmonic		4625.125	-37.81	12.81	-52.22	27.22

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 462.7625 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	39.99	9.98	-25
Low Power (dBm)	33.00	2.00	-25

HIGH POWER					LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		462.763	0.00	0.00	39.99	0.00
2nd Harmonic		925.525	-33.07	8.07	-42.73	17.73
3rd Harmonic		1388.288	-42.39	17.39	-45.77	20.77
4th Harmonic		1851.050	-40.63	15.63	-41.66	16.66
5th Harmonic		2313.813	-31.12	6.12	-35.38	10.38
6th Harmonic		2776.575	-38.94	13.94	-38.30	13.30
7th Harmonic		3239.338	-35.67	10.67	-40.19	15.19
8th Harmonic		3702.100	-48.33	23.33	-49.45	24.45
9th Harmonic		4164.863	-47.52	22.52	-47.57	22.57
10th Harmonic		4627.625	-37.76	12.76	-52.16	27.16

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 467.5125 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	39.99	9.98	-25
Low Power (dBm)	33.02	2.00	-25

HIGH POWER					LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		467.513	0.00	0.00	39.99	0.00
2nd Harmonic		935.025	-28.55	3.55	-53.42	28.42
3rd Harmonic		1402.538	-47.19	22.19	-52.75	27.75
4th Harmonic		1870.050	-42.20	17.20	-46.44	21.44
5th Harmonic		2337.563	-41.94	16.94	-42.78	17.78
6th Harmonic		2805.075	-41.41	16.41	-33.60	8.60
7th Harmonic		3272.588	-44.74	19.74	-34.30	9.30
8th Harmonic		3740.100	-50.29	25.29	-33.96	8.96
9th Harmonic		4207.613	-54.29	29.29	-52.72	27.72
10th Harmonic		4675.125	-39.97	14.97	-48.65	23.65

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 467.7625 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	39.99	9.98	-25
Low Power (dBm)	33.04	2.01	-25

					HIGH POWER		LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		467.763	0.00	0.00	39.99	0.00		
2nd Harmonic		935.525	-33.06	8.06	-42.73	17.73		
3rd Harmonic		1403.288	-42.38	17.38	-45.72	20.72		
4th Harmonic		1871.050	-40.58	15.58	-41.68	16.68		
5th Harmonic		2338.813	-31.13	6.13	-35.45	10.45		
6th Harmonic		2806.575	-38.97	13.97	-38.24	13.24		
7th Harmonic		3274.338	-35.64	10.64	-40.16	15.16		
8th Harmonic		3742.100	-48.36	23.36	-49.40	24.40		
9th Harmonic		4209.863	-47.56	22.56	-47.60	22.60		
10th Harmonic		4677.625	-37.77	12.77	-52.17	27.17		

* Indicates Noise Floor of Measurement

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 469.975 MHz

	(dBm)	(Watts)	Limit (dBm)
High Power (dBm)	40.02	10.05	-24.98
Low Power (dBm)	33.00	2.00	-25

			HIGH POWER		LOW POWER	
Frequency			Peak (dBm)	Margin (dB)	Peak (dBm)	Margin (dB)
(fundamental)		469.975	0.00	0.00	40.02	0.00
2nd Harmonic		939.950	-29.87	4.89	-50.23	25.23
3rd Harmonic		1409.925	-52.34	27.36	-51.25	26.25
4th Harmonic		1879.900	-43.92	18.94	-44.79	19.79
5th Harmonic		2349.875	-38.34	13.36	-37.37	12.37
6th Harmonic		2819.850	-36.94	11.96	-32.27	7.27
7th Harmonic		3289.825	-49.59	24.61	-44.55	19.55
8th Harmonic		3759.800	-51.23	26.25	-54.66	29.66
9th Harmonic		4229.775	-57.78	32.80	-52.20	27.20
10th Harmonic		4699.750	-59.40	34.42	-60.92	35.92

* Indicates Noise Floor of Measurement

Result: Meets Requirements

FIELD STRENGTH OF SPURIOUS EMISSIONS

FCC Rule Parts: FCC Part 2.1053(a), 90.210(e)(3), (d)(3)

More strict limit of 90.210(e)(3), (d)(3) = Mask E, -25 dBc

Method of Measurement: ANSI C63.26

Note: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from the lowest frequency generated internally to at least the tenth harmonic of the fundamental. This test was conducted in accordance with the standard listed above 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. The measurements below represent the worst case of all the frequencies tested.

Note: The six (6) highest emissions or more of each worst-case settings of the EUT are represented below. Emissions 20 dB below the limit are not required to be reported.

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 451.025 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBuV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
451.02	35.45	24.47	V	0.67	13.35	38.49	-58.89	-25.00	33.89
451.02	87.48	23.62	H	1.12	10.20	34.94	-62.43	-25.00	37.43
451.02	214.01	23.86	V	1.66	10.80	36.32	-61.06	-25.00	36.06
451.02	344.87	23.48	H	2.12	14.10	39.70	-57.68	-25.00	32.68
451.02	902.05	39.59	H	3.54	21.90	65.03	-32.35	-25.00	7.35
451.02	902.05	36.25	V	3.54	21.90	61.69	-35.69	-25.00	10.69
451.02	1353.07	17.51	H	4.32	28.74	50.57	-46.80	-25.00	21.80
451.02	1353.07	14.09	V	4.32	28.74	47.15	-50.22	-25.00	25.22
451.02	1804.10	16.57	H	5.11	30.34	52.02	-45.36	-25.00	20.36
451.02	1804.10	12.80	V	5.11	30.34	48.25	-49.13	-25.00	24.13
451.02	2255.13	19.39	H	5.69	31.26	56.34	-41.04	-25.00	16.04
451.02	2255.13	14.91	V	5.69	31.26	51.86	-45.52	-25.00	20.52
451.02	2706.15	16.06	H	6.20	32.49	54.75	-42.63	-25.00	17.63
451.02	2706.15	14.76	V	6.20	32.49	53.45	-43.93	-25.00	18.93
451.02	3157.18	15.14	H	6.72	32.76	54.62	-42.75	-25.00	17.75
451.02	3157.18	15.86	V	6.72	32.76	55.34	-42.03	-25.00	17.03
451.02	3608.20	19.09	H	7.15	33.12	59.36	-38.02	-25.00	13.02
451.02	3608.20	18.69	V	7.15	33.12	58.96	-38.42	-25.00	13.42
451.02	4059.23	19.57	H	7.61	33.38	60.56	-36.81	-25.00	11.81
451.02	4059.23	19.17	V	7.61	33.38	60.16	-37.21	-25.00	12.21
451.02	4510.25	17.94	H	8.06	33.91	59.91	-37.47	-25.00	12.47
451.02	4510.25	19.71	V	8.06	33.91	61.68	-35.70	-25.00	10.70

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 453.975 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBuV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
453.98	57.52	23.39	H	0.89	8.49	32.77	-64.61	-25.00	39.61
453.98	115.82	25.55	V	1.23	10.20	36.98	-60.40	-25.00	35.40
453.98	206.41	23.23	V	1.63	10.86	35.72	-61.66	-25.00	36.66
453.98	414.10	23.74	H	2.32	16.61	42.67	-54.70	-25.00	29.70
453.98	907.95	38.50	H	3.55	22.30	64.35	-33.03	-25.00	8.03
453.98	907.95	36.62	V	3.55	22.30	62.47	-34.91	-25.00	9.91
453.98	1361.93	12.20	V	4.33	28.69	45.22	-52.16	-25.00	27.16
453.98	1361.93	12.89	H	4.33	28.69	45.91	-51.47	-25.00	26.47
453.98	1815.90	13.26	V	5.11	30.48	48.85	-48.53	-25.00	23.53
453.98	1815.90	13.85	H	5.11	30.48	49.44	-47.94	-25.00	22.94
453.98	2269.88	14.52	V	5.71	31.35	51.58	-45.80	-25.00	20.80
453.98	2269.88	14.07	H	5.71	31.35	51.13	-46.25	-25.00	21.25
453.98	2723.85	15.15	V	6.22	32.45	53.82	-43.56	-25.00	18.56
453.98	2723.85	16.02	H	6.22	32.45	54.69	-42.69	-25.00	17.69
453.98	3177.82	14.66	V	6.75	32.72	54.13	-43.25	-25.00	18.25
453.98	3177.82	14.35	H	6.75	32.72	53.82	-43.56	-25.00	18.56
453.98	3631.80	18.32	V	7.17	33.16	58.65	-38.73	-25.00	13.73
453.98	3631.80	18.26	H	7.17	33.16	58.59	-38.79	-25.00	13.79
453.98	4085.77	18.26	V	7.64	33.39	59.29	-38.09	-25.00	13.09
453.98	4085.77	17.82	H	7.64	33.39	58.85	-38.53	-25.00	13.53
453.98	4539.75	18.98	V	8.08	33.97	61.03	-36.35	-25.00	11.35
453.98	4539.75	18.54	H	8.08	33.97	60.59	-36.79	-25.00	11.79

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 456.025 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBUV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBUV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
456.02	82.04	24.65	V	1.09	9.01	34.75	-62.62	-25.00	37.62
456.02	112.28	23.71	H	1.21	10.10	35.02	-62.36	-25.00	37.36
456.02	323.08	23.35	H	2.09	13.80	39.24	-58.14	-25.00	33.14
456.02	371.80	23.89	V	2.22	14.90	41.01	-56.37	-25.00	31.37
456.02	912.05	38.28	V	3.56	22.71	64.55	-32.83	-25.00	7.83
456.02	912.05	36.18	H	3.56	22.71	62.45	-34.93	-25.00	9.93
456.02	1368.07	14.98	H	4.33	28.65	47.96	-49.41	-25.00	24.41
456.02	1368.07	12.73	V	4.33	28.65	45.71	-51.66	-25.00	26.66
456.02	1824.10	13.54	H	5.11	30.58	49.23	-48.15	-25.00	23.15
456.02	1824.10	14.29	V	5.11	30.58	49.98	-47.40	-25.00	22.40
456.02	2280.13	18.05	H	5.72	31.41	55.18	-42.20	-25.00	17.20
456.02	2280.13	14.36	V	5.72	31.41	51.49	-45.89	-25.00	20.89
456.02	2736.15	15.30	H	6.23	32.42	53.95	-43.42	-25.00	18.42
456.02	2736.15	15.56	V	6.23	32.42	54.21	-43.16	-25.00	18.16
456.02	3192.18	15.62	H	6.77	32.69	55.08	-42.30	-25.00	17.30
456.02	3192.18	15.28	V	6.77	32.69	54.74	-42.64	-25.00	17.64
456.02	3648.20	18.91	H	7.18	33.19	59.28	-38.10	-25.00	13.10
456.02	3648.20	18.40	V	7.18	33.19	58.77	-38.61	-25.00	13.61
456.02	4104.23	19.45	H	7.65	33.40	60.50	-36.87	-25.00	11.87
456.02	4104.23	18.07	V	7.65	33.40	59.12	-38.25	-25.00	13.25
456.02	4560.25	19.97	H	8.09	34.01	62.07	-35.31	-25.00	10.31
456.02	4560.25	18.27	V	8.09	34.01	60.37	-37.01	-25.00	12.01

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 462.5125 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBuV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
462.51	127.80	23.97	H	1.28	12.44	37.69	-59.69	-25.00	34.69
462.51	135.71	24.25	V	1.32	14.44	40.01	-57.37	-25.00	32.37
462.51	253.85	23.83	H	1.94	12.20	37.97	-59.41	-25.00	34.41
462.51	414.10	24.06	V	2.32	16.61	42.99	-54.38	-25.00	29.38
462.51	925.03	38.82	H	3.58	23.70	66.10	-31.28	-25.00	6.28
462.51	925.03	39.11	V	3.58	23.70	66.39	-30.99	-25.00	5.99
462.51	1387.54	12.84	V	4.35	28.54	45.73	-51.65	-25.00	26.65
462.51	1387.54	13.66	H	4.35	28.54	46.55	-50.83	-25.00	25.83
462.51	1850.05	13.92	V	5.11	30.88	49.91	-47.47	-25.00	22.47
462.51	1850.05	13.86	H	5.11	30.88	49.85	-47.53	-25.00	22.53
462.51	2312.56	15.12	V	5.76	31.62	52.50	-44.88	-25.00	19.88
462.51	2312.56	15.10	H	5.76	31.62	52.48	-44.90	-25.00	19.90
462.51	2775.07	15.07	V	6.28	32.45	53.80	-43.58	-25.00	18.58
462.51	2775.07	18.09	H	6.28	32.45	56.82	-40.56	-25.00	15.56
462.51	3237.59	15.41	V	6.80	32.68	54.89	-42.48	-25.00	17.48
462.51	3237.59	17.24	H	6.80	32.68	56.72	-40.65	-25.00	15.65
462.51	3700.10	17.97	V	7.22	33.19	58.38	-39.00	-25.00	14.00
462.51	3700.10	18.15	H	7.22	33.19	58.56	-38.82	-25.00	13.82
462.51	4162.61	18.49	V	7.71	33.39	59.59	-37.79	-25.00	12.79
462.51	4162.61	18.53	H	7.71	33.39	59.63	-37.75	-25.00	12.75
462.51	4625.13	18.49	V	8.14	33.98	60.61	-36.77	-25.00	11.77
462.51	4625.13	18.31	H	8.14	33.98	60.43	-36.95	-25.00	11.95

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 462.7625 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBuV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
462.76	49.89	24.14	V	0.82	11.23	36.19	-61.19	-25.00	36.19
462.76	107.31	23.48	H	1.19	10.37	35.04	-62.34	-25.00	37.34
462.76	292.31	23.66	V	2.08	13.80	39.54	-57.84	-25.00	32.84
462.76	356.41	23.60	H	2.14	14.96	40.70	-56.68	-25.00	31.68
462.76	925.53	39.22	H	3.58	23.65	66.45	-30.93	-25.00	5.93
462.76	925.53	39.83	V	3.58	23.65	67.06	-30.32	-25.00	5.32
462.76	1388.29	12.64	H	4.35	28.53	45.52	-51.86	-25.00	26.86
462.76	1388.29	14.31	V	4.35	28.53	47.19	-50.19	-25.00	25.19
462.76	1851.05	13.52	H	5.11	30.89	49.52	-47.86	-25.00	22.86
462.76	1851.05	15.48	V	5.11	30.89	51.48	-45.90	-25.00	20.90
462.76	2313.81	15.82	H	5.76	31.63	53.21	-44.17	-25.00	19.17
462.76	2313.81	15.81	V	5.76	31.63	53.20	-44.18	-25.00	19.18
462.76	2776.57	14.98	H	6.28	32.45	53.71	-43.67	-25.00	18.67
462.76	2776.57	14.62	V	6.28	32.45	53.35	-44.03	-25.00	19.03
462.76	3239.34	14.48	H	6.80	32.68	53.96	-43.41	-25.00	18.41
462.76	3239.34	15.40	V	6.80	32.68	54.88	-42.49	-25.00	17.49
462.76	3702.10	19.00	H	7.22	33.19	59.41	-37.96	-25.00	12.96
462.76	3702.10	18.09	V	7.22	33.19	58.50	-38.87	-25.00	13.87
462.76	4164.86	18.52	H	7.71	33.39	59.62	-37.76	-25.00	12.76
462.76	4164.86	18.33	V	7.71	33.39	59.43	-37.95	-25.00	12.95
462.76	4627.63	18.42	H	8.14	33.97	60.53	-36.85	-25.00	11.85
462.76	4627.63	18.33	V	8.14	33.97	60.44	-36.94	-25.00	11.94

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 467.5125 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBUV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBUV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
467.51	118.81	23.60	H	1.24	10.56	35.40	-61.97	-25.00	36.97
467.51	168.94	23.92	V	1.51	15.41	40.84	-56.53	-25.00	31.53
467.51	247.44	24.22	V	1.86	11.74	37.82	-59.56	-25.00	34.56
467.51	330.77	23.74	H	2.09	13.80	39.63	-57.74	-25.00	32.74
467.51	935.03	42.02	H	3.59	23.40	69.01	-28.37	-25.00	3.37
467.51	935.03	41.71	V	3.59	23.40	68.70	-28.68	-25.00	3.68
467.51	1402.54	14.03	V	4.36	28.45	46.84	-50.53	-25.00	25.53
467.51	1402.54	17.29	H	4.36	28.45	50.10	-47.27	-25.00	22.27
467.51	1870.05	12.78	V	5.11	30.92	48.81	-48.57	-25.00	23.57
467.51	1870.05	13.90	H	5.11	30.92	49.93	-47.45	-25.00	22.45
467.51	2337.56	15.10	V	5.79	31.82	52.71	-44.67	-25.00	19.67
467.51	2337.56	14.59	H	5.79	31.82	52.20	-45.18	-25.00	20.18
467.51	2805.07	15.95	V	6.32	32.49	54.76	-42.62	-25.00	17.62
467.51	2805.07	15.03	H	6.32	32.49	53.84	-43.54	-25.00	18.54
467.51	3272.59	15.82	V	6.82	32.65	55.29	-42.08	-25.00	17.08
467.51	3272.59	16.10	H	6.82	32.65	55.57	-41.80	-25.00	16.80
467.51	3740.10	18.25	V	7.27	33.14	58.66	-38.72	-25.00	13.72
467.51	3740.10	18.51	H	7.27	33.14	58.92	-38.46	-25.00	13.46
467.51	4207.61	18.32	V	7.75	33.32	59.39	-37.99	-25.00	12.99
467.51	4207.61	18.72	H	7.75	33.32	59.79	-37.59	-25.00	12.59
467.51	4675.13	18.90	V	8.17	33.89	60.96	-36.41	-25.00	11.41
467.51	4675.13	18.77	H	8.17	33.89	60.83	-36.54	-25.00	11.54

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 467.7625 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBUV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBUV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
467.76	65.96	23.77	V	0.96	6.10	30.83	-66.55	-25.00	41.55
467.76	146.88	23.97	H	1.38	16.18	41.53	-55.85	-25.00	30.85
467.76	424.36	23.92	H	2.36	17.70	43.98	-53.40	-25.00	28.40
467.76	437.18	23.50	H	2.39	16.38	42.27	-55.10	-25.00	30.10
467.76	935.53	42.31	H	3.59	23.40	69.30	-28.08	-25.00	3.08
467.76	935.53	42.10	H	3.59	23.40	69.09	-28.29	-25.00	3.29
467.76	1403.29	19.07	H	4.37	28.44	51.88	-45.50	-25.00	20.50
467.76	1403.29	13.93	V	4.37	28.44	46.74	-50.64	-25.00	25.64
467.76	1871.05	13.05	H	5.11	30.93	49.09	-48.29	-25.00	23.29
467.76	1871.05	14.35	V	5.11	30.93	50.39	-46.99	-25.00	21.99
467.76	2338.81	15.75	H	5.79	31.83	53.37	-44.01	-25.00	19.01
467.76	2338.81	14.94	V	5.79	31.83	52.56	-44.82	-25.00	19.82
467.76	2806.57	15.00	H	6.32	32.48	53.80	-43.58	-25.00	18.58
467.76	2806.57	14.87	V	6.32	32.48	53.67	-43.71	-25.00	18.71
467.76	3274.34	15.54	H	6.82	32.65	55.01	-42.36	-25.00	17.36
467.76	3274.34	14.79	V	6.82	32.65	54.26	-43.11	-25.00	18.11
467.76	3742.10	18.47	H	7.27	33.13	58.87	-38.51	-25.00	13.51
467.76	3742.10	18.09	V	7.27	33.13	58.49	-38.89	-25.00	13.89
467.76	4209.86	18.80	H	7.75	33.32	59.87	-37.51	-25.00	12.51
467.76	4209.86	18.20	V	7.75	33.32	59.27	-38.11	-25.00	13.11
467.76	4677.63	18.56	H	8.17	33.89	60.62	-36.75	-25.00	11.75
467.76	4677.63	19.91	V	8.17	33.89	61.97	-35.40	-25.00	10.40

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 469.975 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Field Strength (dBuV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
469.98	48.53	24.37	V	0.80	11.64	36.81	-60.56	-25.00	35.56
469.98	61.33	23.74	H	0.92	7.10	31.76	-65.62	-25.00	40.62
469.98	344.87	24.06	H	2.12	14.10	40.28	-57.10	-25.00	32.10
469.98	417.95	23.29	V	2.33	17.20	42.82	-54.55	-25.00	29.55
469.98	939.95	41.31	H	3.59	23.60	68.50	-28.88	-25.00	3.88
469.98	939.95	41.38	V	3.59	23.60	68.57	-28.81	-25.00	3.81
469.98	1409.93	14.75	V	4.38	28.39	47.52	-49.86	-25.00	24.86
469.98	1409.93	20.74	H	4.38	28.39	53.51	-43.87	-25.00	18.87
469.98	1879.90	12.91	V	5.11	30.94	48.96	-48.42	-25.00	23.42
469.98	1879.90	14.21	H	5.11	30.94	50.26	-47.12	-25.00	22.12
469.98	2349.88	15.32	V	5.80	31.92	53.04	-44.33	-25.00	19.33
469.98	2349.88	16.60	H	5.80	31.92	54.32	-43.05	-25.00	18.05
469.98	2819.85	15.21	V	6.33	32.43	53.97	-43.41	-25.00	18.41
469.98	2819.85	15.44	H	6.33	32.43	54.20	-43.18	-25.00	18.18
469.98	3289.82	14.25	V	6.83	32.63	53.71	-43.66	-25.00	18.66
469.98	3289.82	15.40	H	6.83	32.63	54.86	-42.51	-25.00	17.51
469.98	3759.80	18.58	V	7.29	33.13	59.00	-38.38	-25.00	13.38
469.98	3759.80	17.73	H	7.29	33.13	58.15	-39.23	-25.00	14.23
469.98	4229.77	18.05	V	7.77	33.33	59.15	-38.23	-25.00	13.23
469.98	4229.77	19.66	H	7.77	33.33	60.76	-36.62	-25.00	11.62
469.98	4699.75	18.56	V	8.19	33.88	60.63	-36.75	-25.00	11.75
469.98	4699.75	18.66	H	8.19	33.88	60.73	-36.65	-25.00	11.65

Result: Meets Requirements

FREQUENCY STABILITY

FCC Rule Parts: FCC Part 2.1055(a)(2), 90.213

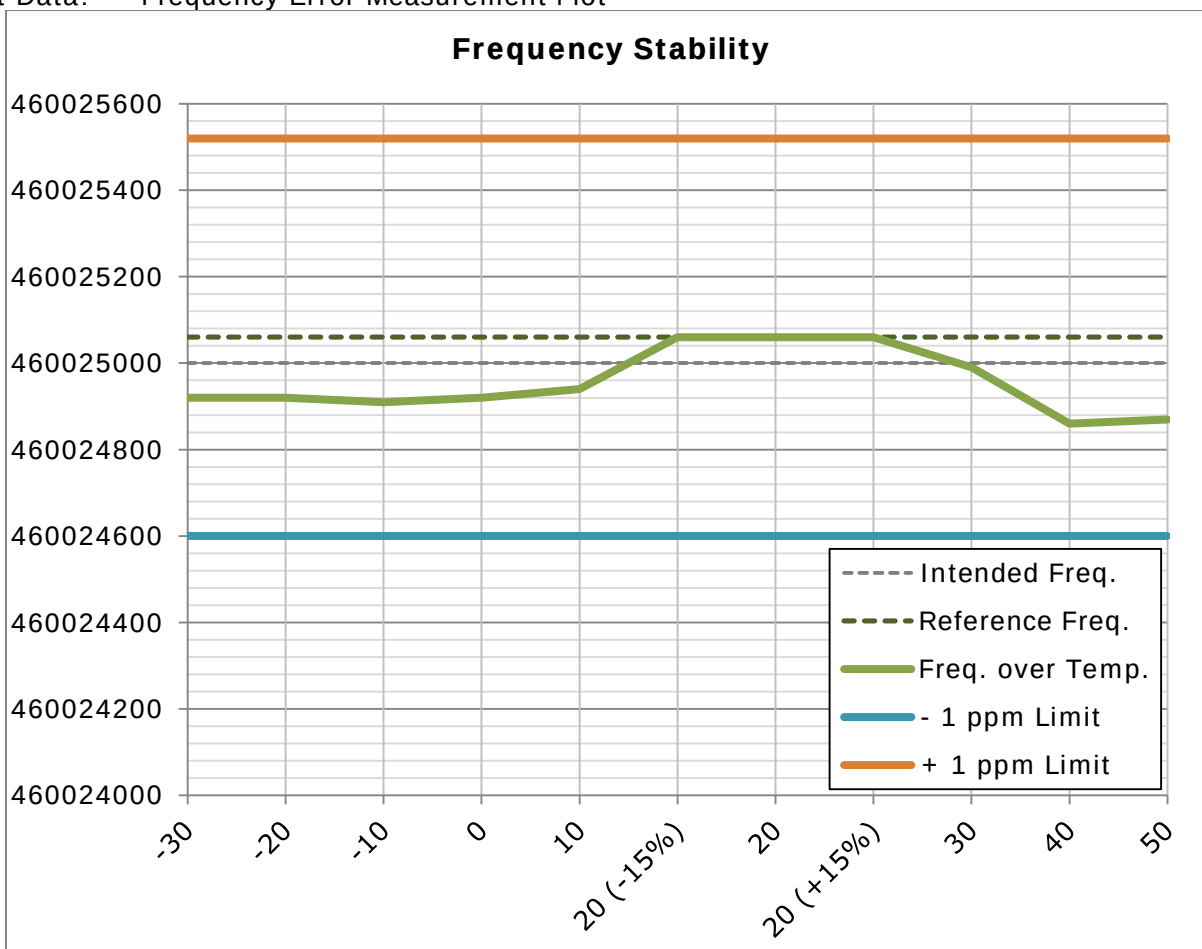
[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
421-512	7 11 14 _{2.5}	8 ₅	8 ₅

⁸In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

Method of Measurements: ANSI/TIA 603-E

Test Data: Frequency Error Measurement Plot



FREQUENCY STABILITY

Test Data: Frequency Error Measurement Table

460.02500 MHz High Power (Worst-case Settings)				
Limit:		1 ppm		
Temperature (°C)	Supplied Voltage (VDC)	Intended Frequency (Hz)	Measured Reference Frequency (Hz)	Deviation (Hz)
20°C (reference)	13.8	460025000	460025060	-60

@ 20°C (reference)				
Supplied Voltage (%)	Supplied Voltage (VDC)	Frequency (Hz)	Deviation (Hz)	PPM
-15%	11.73	460025060	0	0.000
15%	15.87	460025060	0	0.000

Temperature (°C)	Supplied Voltage (VDC)	Frequency (Hz)	Deviation (Hz)	PPM
50	13.8	460024870	190.00000	0.413
40	13.8	460024860	200.00000	0.435
30	13.8	460024990	70.00000	0.152
20	13.8	460025060	0.00000	0.000
10	13.8	460024940	120.00000	0.261
0	13.8	460024920	140.00000	0.304
-10	13.8	460024910	150.00000	0.326
-20	13.8	460024920	140.00000	0.304
-30	13.8	460024920	140.00000	0.304

RESULT: Meets Requirements

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16-4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: “Uncertainty in EMC Measurements” and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	± 49.5 Hz	(1)
RF Conducted Power	± 0.93 dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	± 1.86 dB	
Occupied Bandwidth	± 2.65 %	
Audio Frequency Response	± 1.86 dB	
Modulation limiting	± 1.88 %	
Radiated RF Power	± 1.4 dB	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq.	± 1.88 %	
Within 6kHz and 25kHz of audio Freq.	± 2.04 %	
Rad Emissions Sub Meth up to 26.5GHz	± 2.14 dB	
Adjacent channel power	± 1.47 dB	(1)
Transient Frequency Response	± 1.88 %	
Temperature	± 1.0 °C	(1)
Humidity	± 5.0 %	

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Coaxial Cable - BMBM-0065-01 Black DC-2G	Belden		BMBM-0065-01	07/18/16	07/18/18
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/19
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	09/01/16	09/01/18
Frequency Counter Small Chamber	HP	5385A	3242A07460	08/22/17	08/22/19
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 ; KMKM-0670-01; KFKF-0197-00	N/A	N/A
CHAMBER	Panashield	3M	N/A	04/25/16	5/31/18
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/19
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Antenna: Passive Loop	EMCO	6512	9706-1211	07/26/17	07/26/19
Type K J Thermometer	Martel	303	080504494	11/02/17	11/02/19
EMI Test Receiver R & S ESIB 40	Rohde & Schwarz	ESIB 40	100274	08/18/16	08/18/18
EMI Test Receiver R & S ESU 40	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/19
Attenuator N 20dB 20W DC-12G	Narda	768-20-SP	155	07/10/17	07/10/19
Attenuator N 20dB 20W DC-12G	Narda	768-20-SP	344	07/10/17	07/10/19
Attenuator N 30dB 100W DC-6G	Pasternack	PE7214-30	#109	05/24/17	05/24/19
Attenuator BNC 10dB DC-2G	MiniCircuits	HAT-10+	#54	07/14/17	07/14/19
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	N/A	N/A	N/A
Tunable Notch Filter 250-850 MHz	Eagle	TNF-200	250-850 MHz (#19)	11/19/17	11/19/19
Terminator N 20W DC-18G	Narda	8205	#14	04/06/17	04/06/19

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

END OF TEST REPORT