



# FCC Part 74 FM STL & LPAS Test Report

<b>APPLICANT</b>	R.V.R. USA
	7782 NW 46 Street Miami FL 33166 USA
<b>FCC ID</b>	RHDPTRL-940-960
<b>MODEL NUMBER</b>	PTRL-LCD
<b>PRODUCT DESCRIPTION</b>	FM BROADCAST TRANSMITTER
<b>DATE SAMPLE RECEIVED</b>	08/01/2019
<b>DATE TESTED</b>	08/12/2019
<b>TESTED BY</b>	Tim Royer
<b>APPROVED BY</b>	Franklin Rose
<b>TEST RESULTS</b>	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Report Version	Description	Issue Date
1999UT19TestReport	Rev1	Initial Issue	09/04/2019

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

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## GENERAL REMARKS

### 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**  
**Designation #: US1070**

**Tested by:**



**Name and Title** Tim Royer, Project Manager / EMC Testing Engineer  
**Date** 08/12/2019

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**Reviewed and Approved by:**



**Name and Title** Franklin Rose, Project Manager / EMC Testing Technician  
**Date** 09/05/2018

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## GENERAL INFORMATION

<b>EUT Description</b>	FM BROADCAST TRANSMITTER
<b>FCC ID</b>	RHDPTRL-940-960
<b>Model Number</b>	PTRL-LCD
<b>EUT Power Source</b>	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz
	<input type="checkbox"/> DC Power
	<input type="checkbox"/> Battery Operated Exclusively
<b>Test Item</b>	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
<b>Type of Equipment</b>	<input checked="" type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
<b>Antenna Connector</b>	DIN
<b>Test Conditions</b>	The temperature was 26°C Relative humidity of 50%.
<b>Modification to the EUT</b>	No Modification to EUT.
<b>Test Exercise</b>	The EUT was placed in continuous transmit and was operated in "Test Mode" for digital emissions tests.
<b>Applicable Standards</b>	FCC CFR 47 Part 2, & 74, ANSI/TIA 603-D:2010, ANSI C63.4 2014, ETSI EN 300-422-1 V1.4.2
<b>Test Facility</b>	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070

## FREQUENCY OF OPERATION

**STL STATION OPERATION:** 74.501, 74.502

### §74.501 Classes of aural broadcast auxiliary stations.

(a) *Aural broadcast STL station.* A fixed station for the transmission of aural program material between the studio and the transmitter of a broadcasting station other than an international broadcasting station.

(b) *Aural broadcast intercity relay (ICR) station.* A fixed station for the transmission of aural program material between radio broadcast stations, other than international broadcast stations, between FM radio broadcast stations and their co-owned FM booster stations, between noncommercial educational FM radio stations and their co-owned noncommercial educational FM translator stations assigned to reserved channels (Channels 201 to 220), between FM radio stations and FM translator stations operating within the coverage contour of their primary stations, or for such other purposes as authorized in §74.531.

(c) *Aural broadcast microwave booster station.* A fixed station in the broadcast auxiliary service that receives and amplifies signals of an aural broadcast STL or intercity relay station and retransmits them on the same frequency.

### §74.502 Frequency assignment.

(b) The frequency band 944-952 MHz is available for assignment to aural STL and ICR stations. One or more of the following 25 kHz segments may be stacked to form a channel which may be assigned with a maximum authorized bandwidth of 300 kHz except as noted in the following Table. The channel, will be assigned by its center frequency, channel bandwidth, and emission designator. The following frequencies are the centers of individual segments. When stacking an even number of segments, the center frequency specified will deviate from the following frequencies in that it should correspond to the actual center of stacked channels. When stacking an odd number of channels, the center frequency specified will correspond to one of the following frequencies.

<b>Operating Frequency</b>	Band 2: 944 – 952 MHz (STL Transmitter, PT 74E)
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## FREQUENCY OF OPERATION

### LOW POWER AUXILIARY OPERATION: 74.801, 74.802

#### §74.801 Definitions.

*Low power auxiliary station.* An auxiliary station authorized and operated pursuant to the provisions set forth in this subpart. Devices authorized as low power auxiliary stations are intended to transmit over distances of approximately 100 meters for uses such as wireless microphones, cue and control communications, and synchronization of TV camera signals.

#### §74.802 Frequency assignment.

(a)(1) Frequencies within the following bands may be assigned for use by low power auxiliary stations:

941.500-944.000 MHz

944.000-952.000 MHz

952.850-956.250 MHz

956.45-959.85 MHz

<b>Operating Frequency</b>	<p>Band 1: 941.5 – 944 MHz (LPAS, PT 74H)</p> <p>Band 2: 944 – 952 MHz (LPAS, PT 74H)</p> <p>Band 3: 952.85 – 956.25 MHz (LPAS, PT 74H)</p> <p>Band 4: 956.45 – 959.85 MHz (LPAS, PT 74H)</p>
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## TEST FREQUENCIES

### OVERALL OPERATION:

<b>Operating Frequency</b>	Band 1: 941.5 – 944 MHz (LPAS, PT 74H) Band 2: 944 – 952 MHz (LPAS, PT 74H) Band 2: 944 – 952 MHz (STL Transmitter, PT 74E) Band 3: 952.85 – 956.25 MHz (LPAS, PT 74H) Band 4: 956.45 – 959.85 MHz (LPAS, PT 74H)
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<b>Testing Frequency</b>	Low: 941.7 MHz Mid: 950 MHz High: 959.65 MHz
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## RESULTS SUMMARY

FCC Rule Part	Requirement	Result
2.1046(a), 74.534(a) - (c), 74.861(a), (d)(1)	Conducted Power	<b>PASS</b>
2.1047(a) – (d)	Modulation Characteristics	<b>PASS</b>
2.1049(e)(3) – (5)	Occupied Bandwidth	<b>PASS</b>
74.535(a)(1)(i)-(ii), 74.861(d)(4)(i), (iv)	Emission Mask	<b>PASS</b>
2.1051(a), 74.535(a)(iii), 74.861(d)(3)	Spurious Emissions at Antenna Terminal	<b>PASS</b>
2.1053, 74.535(a)(iii), 74.861(d)(3)	Radiated Field Strength of Spurious Emissions	<b>PASS</b>
2.1055(a)(3), 74.561, 74.861(c)	Frequency Stability	<b>PASS</b>



## RF POWER OUTPUT

**Rule Part No.:** 2.1046(a), 74.534(b), 74.861(a), (d)(1)

### Requirement:

#### §74.534 Power limitations.

(a) *Transmitter output power.* (1) Transmitter output power shall be limited to that necessary to accomplish the function of the system.

(2) In the 17,700 to 19,700 MHz band, transmitter output power shall not exceed 10 watts.

(b) In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the values specified in the following table. In cases of harmful interference, the Commission may, after notice and opportunity for hearing, order a change in the equivalent isotropically radiated power of this station.

Frequency band (MHz)	Maximum Allowable <sup>1</sup> EIRP (dBW)
944 to 952	+ 40
17,700 to 18,600	+ 55
18,600 to 19,700	+ 35

#### §74.861 Technical requirements.

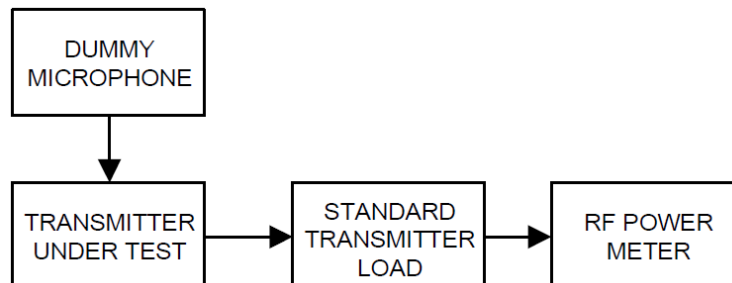
(a) Except as specified in paragraph (e) of this section, transmitter power is the power at the transmitter output terminals and delivered to the antenna, antenna transmission line, or any other impedance-matched, radio frequency load. For the purpose of this subpart, the transmitter power is the carrier power.

(d) For low power auxiliary stations operating in the bands other than those allocated for TV broadcasting, the following technical requirements are imposed.

(1) For all bands except the 1435-1525 MHz band, the maximum transmitter power which will be authorized is 1 watt. In the 1435-1525 MHz band, the maximum transmitter power which will be authorized is 250 milliwatts. Licensees may accept the manufacturer's power rating; however, it is the licensee's responsibility to observe specified power limits.

**Method of Measurement:** ANSI C63.26

### Test Setup Diagram:



Applicant: R.V.R. USA  
 FCC ID: RHDPTL-940-960  
 Report: 1999UT19TestReport\_Rev1

## RF POWER OUTPUT

### Test Data: Mean Output Power Measurement Table

Power	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Power Limit (W)	Margin (W)
High	941.70	42.13	16.33	n/a	n/a
High	950.00	42.03	15.96	10,000	9984.04
High	959.65	42.01	15.89	n/a	n/a
Low	941.70	29.96	0.99	1.0	0.01
Low	950.00	29.96	0.99	1.0	0.01
Low	959.65	29.97	0.99	1.0	0.01

**Rated Output Power** = 0 - 20 W

**Measured Output Power, High** = 16.33 W

**Calculated Tolerance (W)** = +/- 3.67

**Calculated Tolerance (dBm)** = +/- 0.99

**Measured Output Power, Low** = 0.99 W

**Calculated Tolerance (W)** = +/- 0.01

**Calculated Tolerance (dBm)** = +/- 0.03

### FCC Part 2.1033(C)(8)

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

### Test Data: Power In the Final Stage

Power at Final Stage: (110 VAC) (1.57 A) = **70 Watts**

## MODULATION CHARACTERISTICS

**Rule Part No.:** Part 2.202(g)(III)(3) "Sound Broadcasting"

**Test Requirements:** Part 2.202(g)(III)(3)

Description of emission	Necessary bandwidth		Designation of emission
	Formula	Sample calculation	
<b>III-A. FREQUENCY MODULATION</b>			
3. Sound Broadcasting			
Sound broadcasting	$B_n = 2M + 2DK$ , K = 1 (typically)	Monaural, D = 75,000 Hz, M = 15,000, Bandwidth: 18,000 Hz = 180 kHz	180KF3E

**Type of Emission:** 180KF3E

$$B_n = 2M + 2DK$$

$$B_n = 2(15K) + 2(75K) (1) = 180K$$

Where:

M = 15 (Modulation Frequency, kHz)

D = 75 (Peak Deviation, kHz)

K = 1 (constant value)

## AUDIO FREQUENCY RESPONSE

**Rule Part No.:** FCC Part 2.1047(a), (b)

**Test Requirements:** FCC Part 2.1047(a)

### §2.1047 Measurements required: Modulation characteristics.

(a) *Voice modulated communication equipment.* A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

**Method of Measurement:** ANSI C63.26 s. 5.3.3, Limits & Reference per ISED BETS-6

**Test Setup Diagram:**

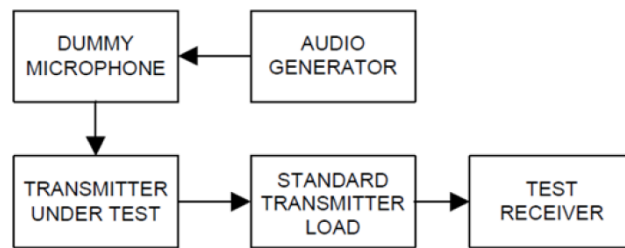
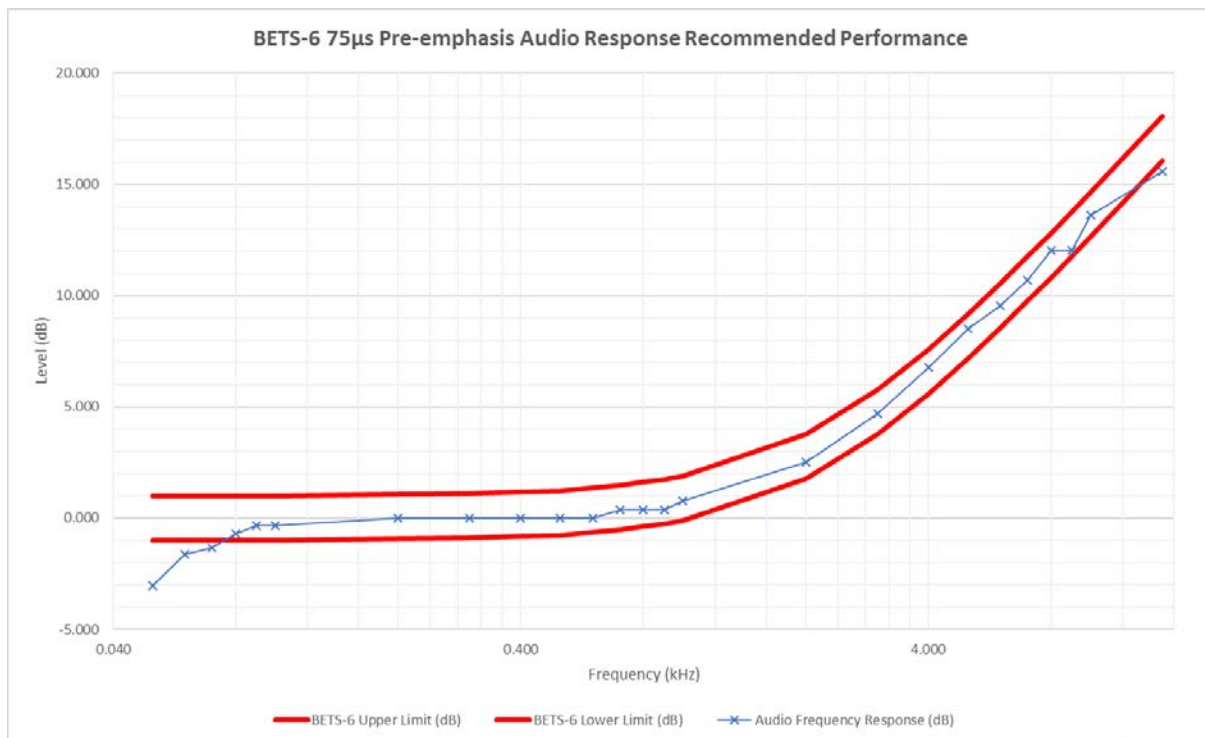


Figure 3—Equipment set-up audio frequency response (constant input)

### Test Data: Audio Frequency Response Plot



## AUDIO INPUT VS MODULATION

**Rule Part No.:** FCC Part 2.1047(b)

**Test Requirements:** FCC Part 2.1047(b)

(b) *Equipment which employs modulation limiting.* A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

**Method of Measurement:** ANSI C63.26 s. 5.3.2

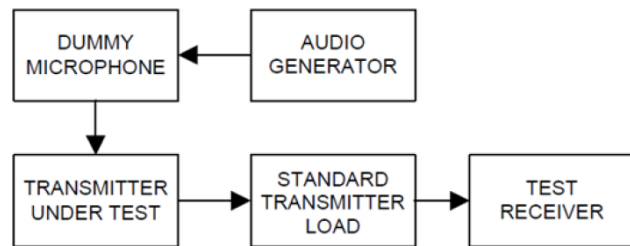


Figure 3—Equipment set-up audio frequency response (constant input)

**Test data: Modulation Limiting: n/a**

This equipment is not equipped with a modulation limiting circuit.

## OCCUPIED BANDWIDTH

**Rule Part No.:** FCC Part 2.1049(e)(3) – (5)

**Requirement:** 2.1049(e)(3)-(5)

**§2.1049 Measurements required: Occupied bandwidth.**

(e) Transmitters for use in the Radio Broadcast Services:

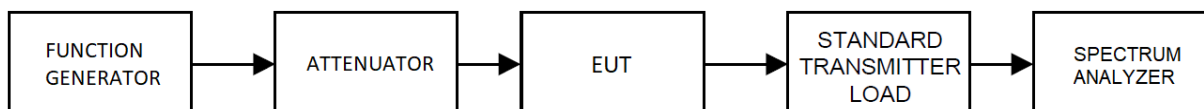
(3) FM broadcast transmitter not used for multiplex operation—when modulated 85 percent by a 15 kHz input signal.

(4) FM broadcast transmitters for multiplex operation under Subsidiary Communication Authorization (SCA) —when carrier is modulated 70 percent by a 15 kHz main channel input signal, and modulated an additional 15 percent simultaneously by a 67 kHz subcarrier (unmodulated).

(5) FM broadcast transmitter for stereophonic operation—when modulated by a 15 kHz input signal to the main channel, a 15 kHz input signal to the stereophonic subchannel, and the pilot subcarrier simultaneously. The input signals to the main channel and stereophonic subchannel each shall produce 38 percent modulation of the carrier. The pilot subcarrier should produce 9 percent modulation of the carrier.

**Method of Measurement:** ANSI C63.26 s. 5.4.4

**Test Setup Diagram:**

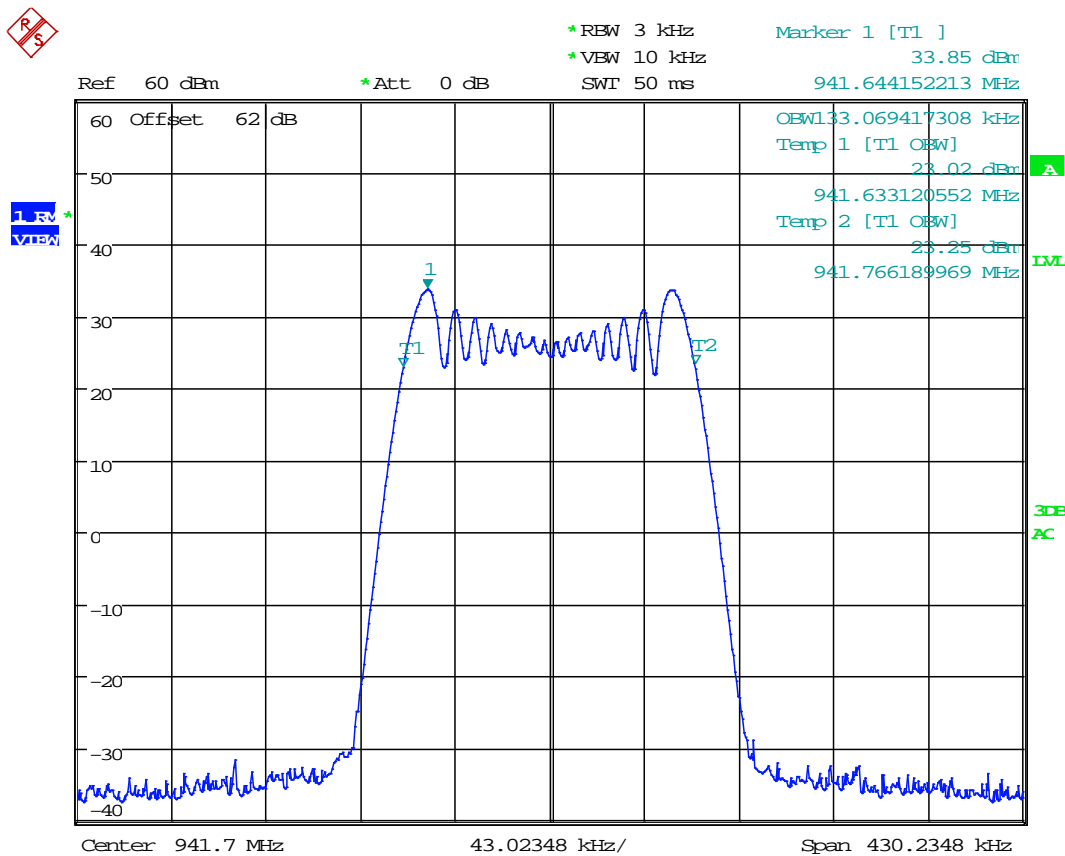


## OCCUPIED BANDWIDTH & EMISSION MASK

### Test Data: Occupied Bandwidth Table

Frequency (MHz)	20dB OBW (kHz)
941.70	133.07
950.00	134.45
959.65	135.14

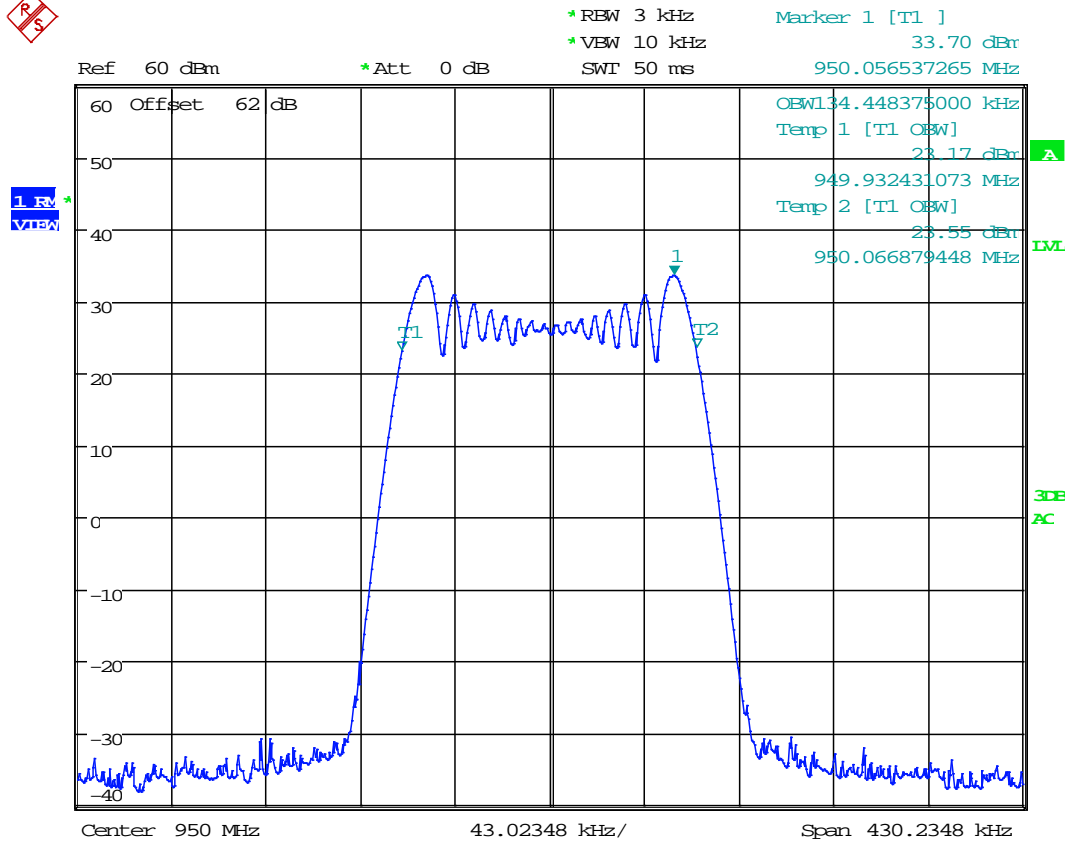
### 20dB OCCUPIED BANDWIDTH PLOT Low End of band



Date: 26.AUG.2019 13:32:33

# OCCUPIED BANDWIDTH & EMISSION MASK

## 20dB OCCUPIED BANDWIDTH PLOT Middle of band

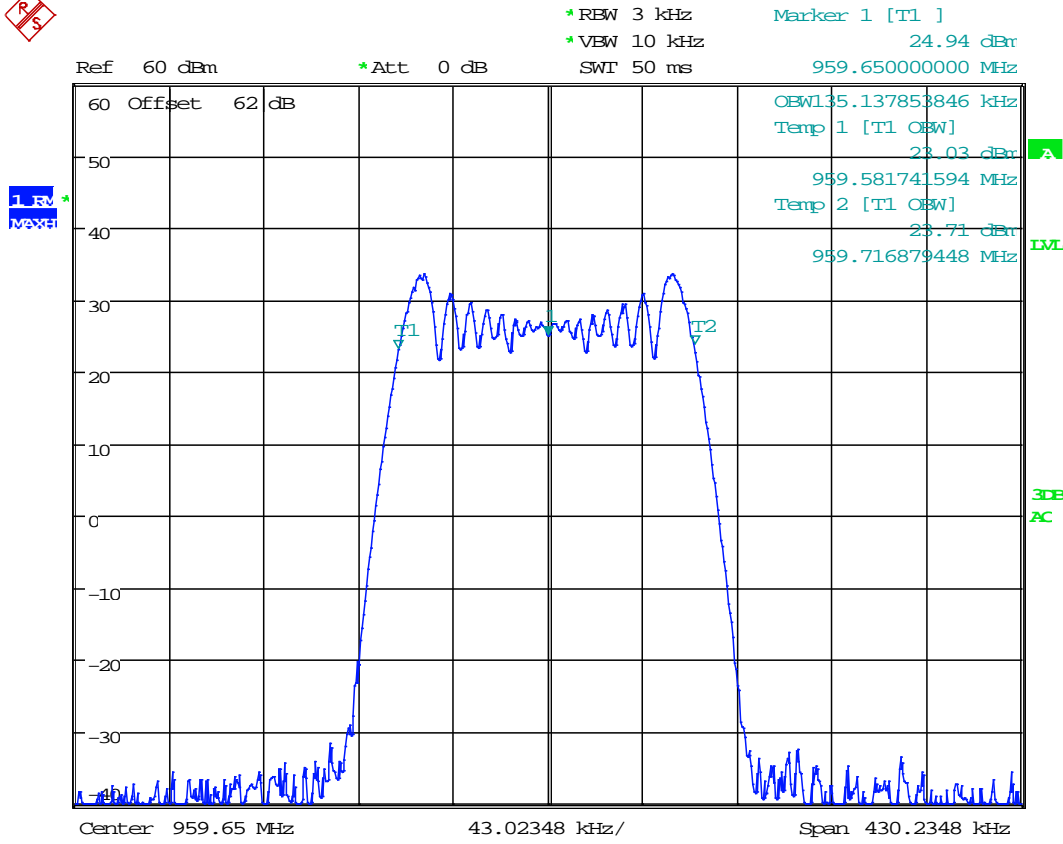


Date: 26.AUG.2019 13:30:21



# OCCUPIED BANDWIDTH & EMISSION MASK

## 20dB OCCUPIED BANDWIDTH PLOT High End of band



Date: 26.AUG.2019 13:28:40

## EMISSION MASK

**Rule Part No.:** FCC Part 74.535(a)(1)(i)-(ii), 74.861(d)(4)(i)

**Requirement:** 74.535(a)(1)(i)-(ii), 74.861(d)(4)(i), (iv)

### §74.535 Emission and bandwidth.

(1) When using frequency modulation:

(i) On any frequency removed from the assigned (center) frequency by more than 50% up to and including 100% of the authorized bandwidth: At least 25 dB in any 100 kHz reference bandwidth ( $B_{REF}$ );

(ii) On any frequency removed from the assigned (center) frequency by more than 100% up to and including 250% of the authorized bandwidth: At least 35 dB in any 100 kHz reference bandwidth;

(iii) On any frequency removed from the assigned (center) frequency by more than 250% of the authorized bandwidth: At least  $43 + 10 \log_{10}(P_{MEAN})$  in watts) dB, or 80 dB, whichever is the lesser attenuation, in any 100 kHz reference bandwidth.

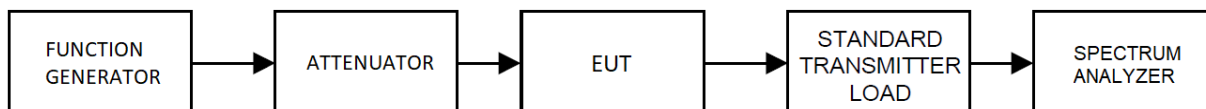
### §74.861 Technical requirements.

(4)(i) For the 653-657 MHz, 941.5-944 MHz, 944-952 MHz, 952.850-956.250 MHz, 956.45-959.85 MHz, 1435-1525 MHz, 6875-6900 MHz and 7100-7125 MHz bands, analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08).

(iv) For the 944-952 MHz band, the requirements of this paragraph (d)(4) shall not apply to the applications for certification of equipment for that band until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in section 73.3700(a)(2) of this chapter.

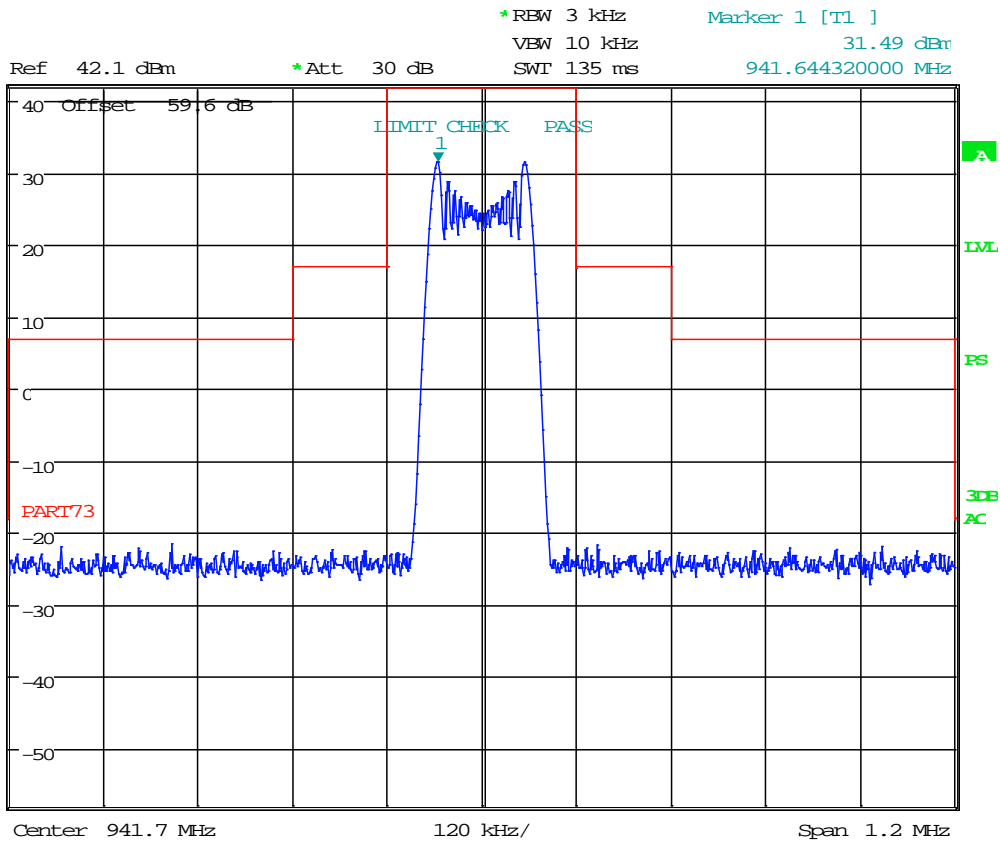
**Method of Measurement:** ANSI C63.26 s. 5.4.4

**Test Setup Diagram:**



# EMISSION MASK

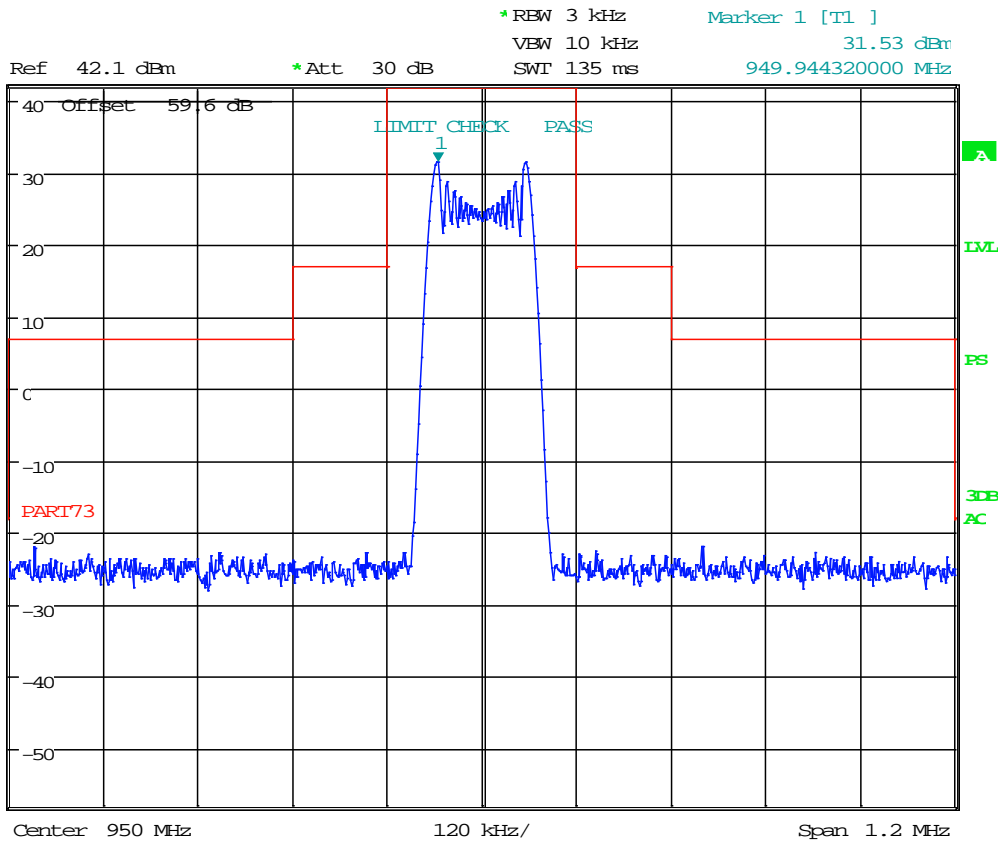
## EMISSION MASK PLOT Low End of band, STL Mask



Date: 5.SEP.2019 14:41:56

# EMISSION MASK

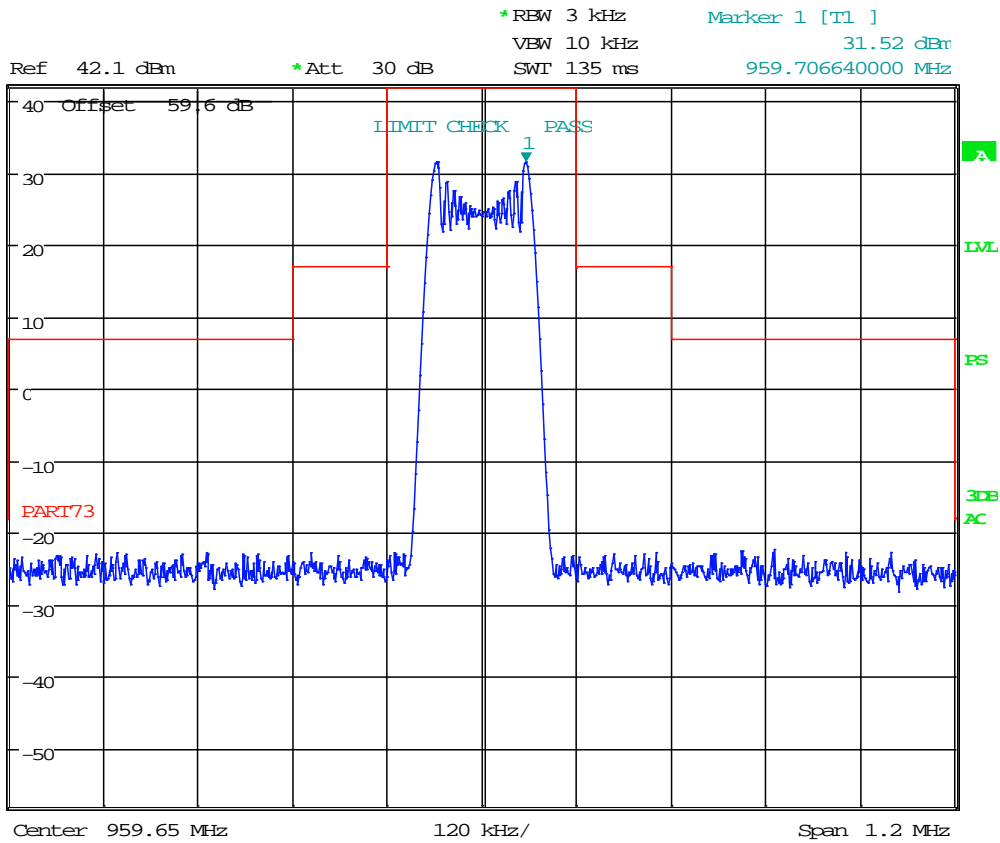
## EMISSION MASK PLOT Middle of band, STL Mask



Date: 5.SEP.2019 14:43:30

# EMISSION MASK

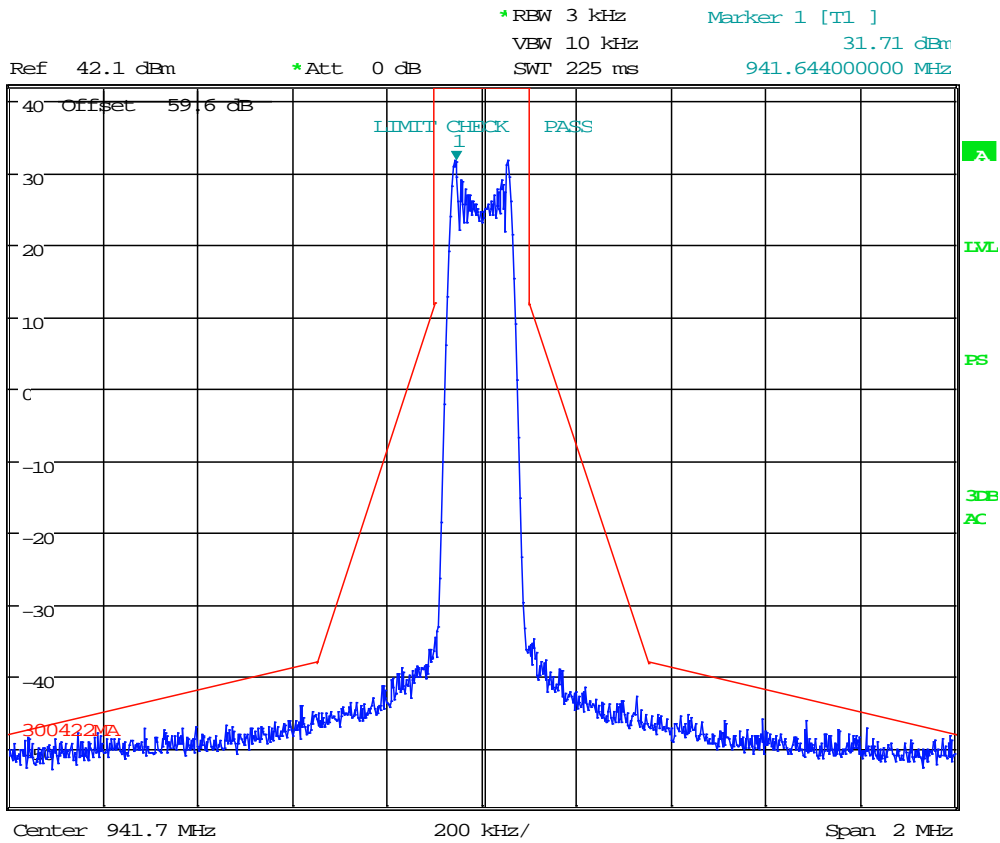
## EMISSION MASK PLOT High End of band, STL Mask



Date: 5.SEP.2019 14:45:46

# EMISSION MASK

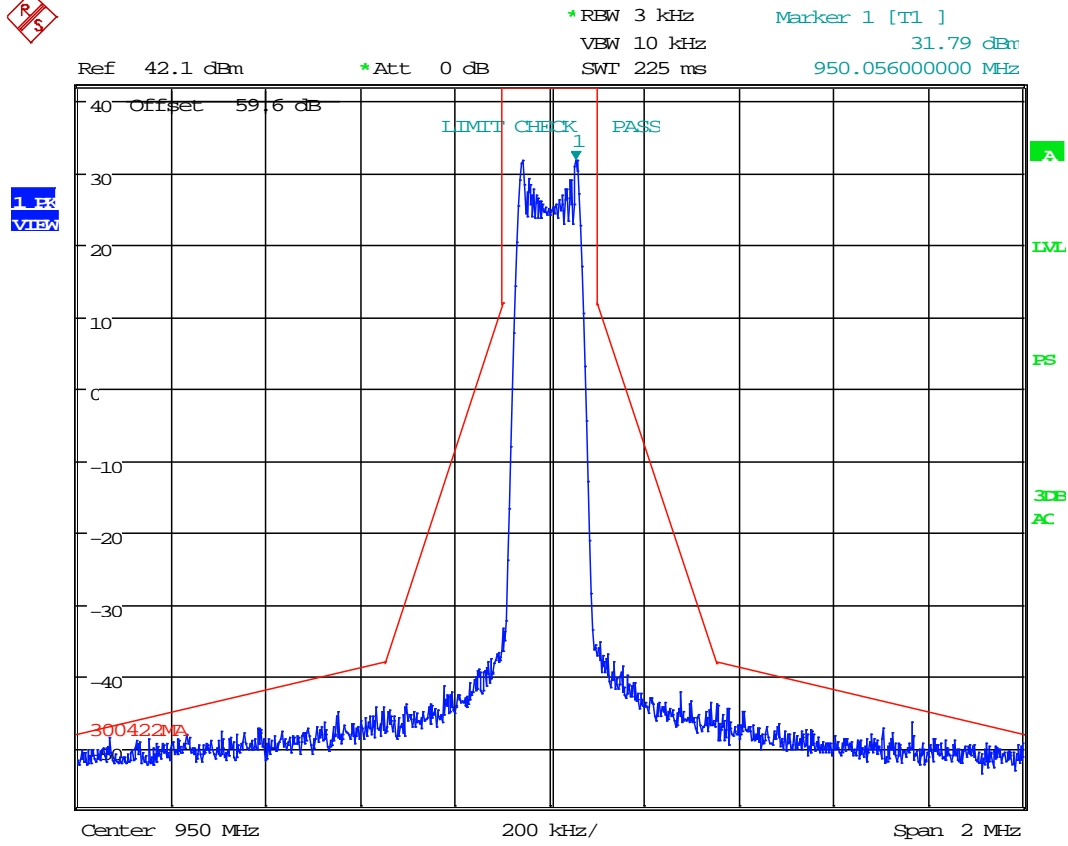
## EMISSION MASK PLOT Low End of band, LPAS Mask



Date: 5.SEP.2019 15:10:34

# EMISSION MASK

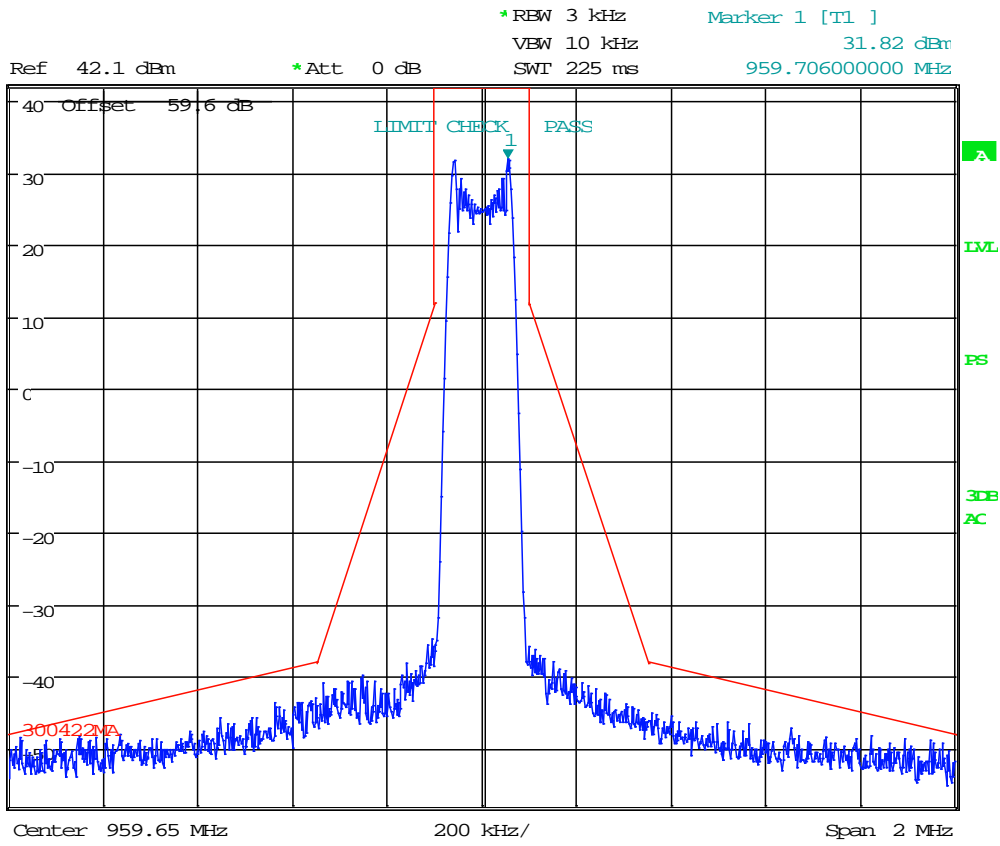
## EMISSION MASK PLOT Middle of band, LPAS Mask



Date: 5.SEP.2019 15:07:06

# EMISSION MASK

## EMISSION MASK PLOT High End of band, LPAS Mask



Date: 5.SEP.2019 15:16:55



## SPURIOUS EMISSIONS AT ANTENNA TERMINAL

**Rule Part No.:** Part 2.1051, 74.535(a)(iii), 74.861(d)(3)

**Test Requirements:** 74.535(a)(iii), 74.861(d)(3)

### §74.535 Emission and bandwidth.

(1) When using frequency modulation:

(i) On any frequency removed from the assigned (center) frequency by more than 50% up to and including 100% of the authorized bandwidth: At least 25 dB in any 100 kHz reference bandwidth ( $B_{REF}$ );

(ii) On any frequency removed from the assigned (center) frequency by more than 100% up to and including 250% of the authorized bandwidth: At least 35 dB in any 100 kHz reference bandwidth;

(iii) On any frequency removed from the assigned (center) frequency by more than 250% of the authorized bandwidth: At least  $43 + 10 \log_{10}(P_{MEAN}$  in watts) dB, or 80 dB, whichever is the lesser attenuation, in any 100 kHz reference bandwidth.

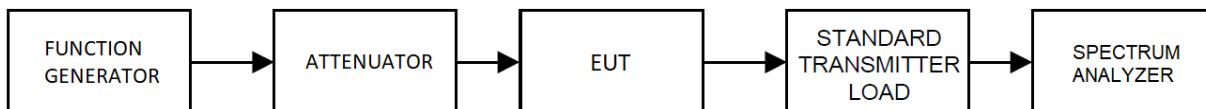
### §74.861 Technical requirements.

(3) For the 26.1-26.480 MHz, 161.625-161.775 MHz, 450-451 MHz, and 455-456 MHz bands, the occupied bandwidth shall not be greater than that necessary for satisfactory transmission and, in any event, an emission appearing on any discrete frequency outside the authorized band shall be attenuated, at least,  $43 + 10 \log_{10}$  (mean output power, in watts) dB below the mean output power of the transmitting unit. The requirements of this paragraph shall also apply to the applications for certification of equipment for the 944-952 MHz band until January 13, 2018.

**Method of Measurement:** ANSI C63.26 s. 5.7.3, 5.7.4

**Note:** A notch filter was used to attenuate the fundamental emission of the EUT during testing.

**Test Setup Diagram:**



## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### Test Data: Low Frequency

Harmonic	Harmonic (MHz)	Loss at Harmonic (dB)	Analyzer offset (dB)	Measured Level (dBm)	Correction (dB)	Level (dBm)	Limit (dBc)	Limit (dBm)	Margin (dB)
2	1883.40	-58.56	30.00	-50.63	-28.56	-22.07	55.13	-13.00	9.07
3	2825.10	-56.34	30.00	-46.61	-26.34	-20.27	55.13	-13.00	7.27
4	3766.80	-55.73	30.00	-90.39	-25.73	-64.66	55.13	-13.00	51.66
5	4708.50	-55.65	30.00	-76.02	-25.65	-50.37	55.13	-13.00	37.37
6	5650.20	-57.94	30.00	-90.55	-27.94	-62.61	55.13	-13.00	49.61
7	6591.90	-59.13	30.00	-90.55	-29.13	-61.42	55.13	-13.00	48.42
8	7533.60	-57.15	30.00	-90.55	-27.15	-63.40	55.13	-13.00	50.40
9	8475.30	-56.92	30.00	-90.55	-26.92	-63.63	55.13	-13.00	50.63
10	9417.00	-56.92	30.00	-90.55	-26.92	-63.63	55.13	-13.00	50.63

### Test Data: Middle Frequency

Harmonic	Harmonic (MHz)	Loss at Harmonic (dB)	Analyzer offset (dB)	Measured Level (dBm)	Correction (dB)	Level (dBm)	Limit (dBc)	Limit (dBm)	Margin (dB)
2	1900.00	-58.41	30.00	-48.19	-28.41	-19.78	55.13	-13.00	6.78
3	2850.00	-56.11	30.00	-46.59	-26.11	-20.48	55.13	-13.00	7.48
4	3800.00	-55.38	30.00	-92.91	-25.38	-67.53	55.13	-13.00	54.53
5	4750.00	-55.40	30.00	-69.28	-25.40	-43.88	55.13	-13.00	30.88
6	5700.00	-57.46	30.00	-90.57	-27.46	-63.11	55.13	-13.00	50.11
7	6650.00	-58.47	30.00	-90.09	-28.47	-61.62	55.13	-13.00	48.62
8	7600.00	-57.57	30.00	-101.17	-27.57	-73.60	55.13	-13.00	60.60
9	8550.00	-56.92	30.00	-101.17	-26.92	-74.25	55.13	-13.00	61.25
10	9500.00	-56.92	30.00	-101.17	-26.92	-74.25	55.13	-13.00	61.25

### Test Data: High Frequency

Harmonic	Harmonic (MHz)	Loss at Harmonic (dB)	Analyzer offset (dB)	Measured Level (dBm)	Correction (dB)	Level (dBm)	Limit (dBc)	Limit (dBm)	Margin (dB)
2	1919.30	-58.22	30.00	-45.96	-28.22	-17.74	55.13	-13.00	4.74
3	2878.95	-56.31	30.00	-46.65	-26.31	-20.34	55.13	-13.00	7.34
4	3838.60	-55.18	30.00	-96.68	-25.18	-71.50	55.13	-13.00	58.50
5	4798.25	-55.59	30.00	-69.25	-25.59	-43.66	55.13	-13.00	30.66
6	5757.90	-57.80	30.00	-96.24	-27.80	-68.44	55.13	-13.00	55.44
7	6717.55	-58.81	30.00	-96.03	-28.81	-67.22	55.13	-13.00	54.22
8	7677.20	-57.29	30.00	-90.38	-27.29	-63.09	55.13	-13.00	50.09
9	8636.85	-56.92	30.00	-106.45	-26.92	-79.53	55.13	-13.00	66.53
10	9596.50	-56.92	30.00	-97.77	-26.92	-70.85	55.13	-13.00	57.85

## RADIATED FIELD STRENGTH OF SPURIOUS EMISSIONS

**Rule Part No.:** Part 2.1053(a), 74.535(a)(iii), 74.861(d)(3)

**Test Requirements:** 74.535(a)(iii), 74.861(d)(3)

### **§74.535 Emission and bandwidth.**

(1) When using frequency modulation:

(i) On any frequency removed from the assigned (center) frequency by more than 50% up to and including 100% of the authorized bandwidth: At least 25 dB in any 100 kHz reference bandwidth ( $B_{REF}$ );

(ii) On any frequency removed from the assigned (center) frequency by more than 100% up to and including 250% of the authorized bandwidth: At least 35 dB in any 100 kHz reference bandwidth;

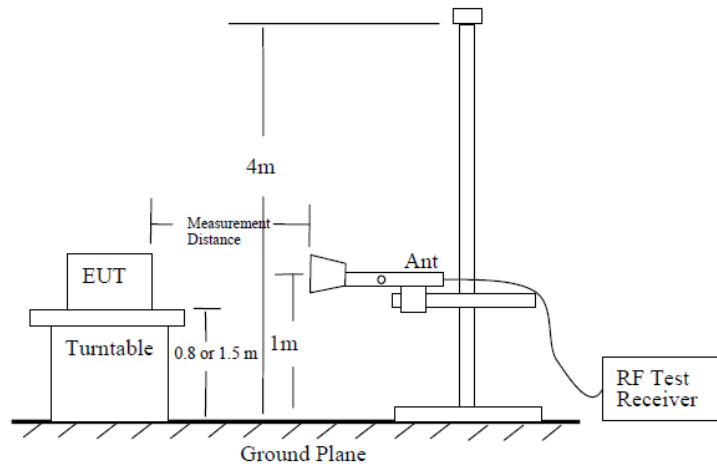
(iii) On any frequency removed from the assigned (center) frequency by more than 250% of the authorized bandwidth: At least  $43 + 10 \log_{10}(P_{MEAN}$  in watts) dB, or 80 dB, whichever is the lesser attenuation, in any 100 kHz reference bandwidth.

### **§74.861 Technical requirements.**

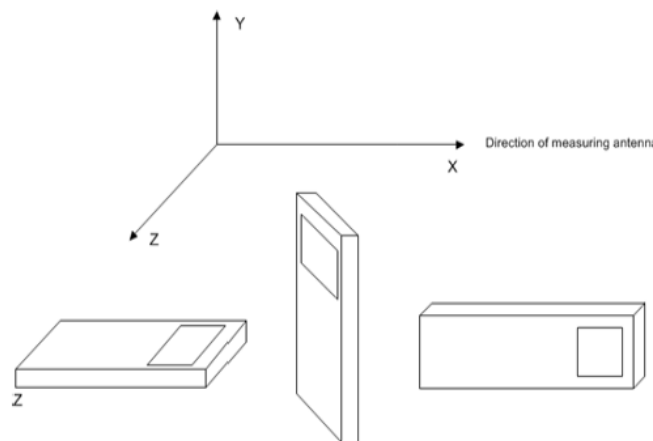
(3) For the 26.1-26.480 MHz, 161.625-161.775 MHz, 450-451 MHz, and 455-456 MHz bands, the occupied bandwidth shall not be greater than that necessary for satisfactory transmission and, in any event, an emission appearing on any discrete frequency outside the authorized band shall be attenuated, at least,  $43 + 10 \log^{10}$  (mean output power, in watts) dB below the mean output power of the transmitting unit. The requirements of this paragraph shall also apply to the applications for certification of equipment for the 944-952 MHz band until January 13, 2018.

## FIELD STRENGTH OF SPURIOUS EMISSIONS

### Test Site Setup:



### EUT Orientation(s):



**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:** Six (6) or more of the highest emissions of each worst-case operational mode of the EUT are represented below. Emissions 20 dB below the limit were not required to be reported.

## FIELD STRENGTH OF SPURIOUS EMISSIONS

### Test Data: Low Frequency

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBμV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
941.70	1883.40	PK	15.54	H	5.03	30.95	3.00	51.52	-45.86	-13.00	32.86
941.70	1883.40	PK	13.29	V	5.03	30.95	3.00	49.27	-48.11	-13.00	35.11
941.70	2825.10	PK	21.27	V	6.16	32.41	3.00	59.84	-37.54	-13.00	24.54
941.70	2825.10	PK	22.51	H	6.16	32.41	3.00	61.08	-36.30	-13.00	23.30
941.70	3766.80	PK	15.81	H	8.65	33.13	3.00	57.59	-39.79	-13.00	26.79
941.70	3766.80	PK	16.03	V	8.65	33.13	3.00	57.81	-39.57	-13.00	26.57
941.70	4708.50	PK	14.40	V	7.14	33.88	3.00	55.42	-41.96	-13.00	28.96
941.70	4708.50	PK	13.83	H	7.14	33.88	3.00	54.85	-42.53	-13.00	29.53
941.70	5650.20	PK	21.10	H	8.21	34.54	3.00	63.85	-33.52	-13.00	20.52
941.70	5650.20	PK	17.39	V	8.21	34.54	3.00	60.14	-37.23	-13.00	24.23
941.70	6591.90	PK	21.05	V	9.15	35.65	3.00	65.85	-31.53	-13.00	18.53
941.70	6591.90	PK	17.53	H	9.15	35.65	3.00	62.33	-35.05	-13.00	22.05
941.70	7533.60	PK	27.76	H	9.76	35.88	3.00	73.40	-23.98	-13.00	10.98
941.70	7533.60	PK	28.52	V	9.76	35.88	3.00	74.16	-23.22	-13.00	10.22
941.70	8475.30	PK	28.60	V	10.21	35.94	3.00	74.75	-22.62	-13.00	9.62
941.70	8475.30	PK	25.96	H	10.21	35.94	3.00	72.11	-25.26	-13.00	12.26
941.70	9417.00	PK	25.27	H	10.86	36.39	3.00	72.52	-24.85	-13.00	11.85
941.70	9417.00	PK	26.92	V	10.86	36.39	3.00	74.17	-23.20	-13.00	10.20

### Test Data: Middle Frequency

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBμV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
950.00	1900.00	PK	8.08	V	5.05	30.99	3.00	44.12	-53.26	-13.00	40.26
950.00	1900.00	PK	13.98	H	5.05	30.99	3.00	50.02	-47.36	-13.00	34.36
950.00	2850.00	PK	18.49	H	6.18	32.32	3.00	56.99	-40.39	-13.00	27.39
950.00	2850.00	PK	15.78	V	6.18	32.32	3.00	54.28	-43.10	-13.00	30.10
950.00	3800.00	PK	14.48	V	8.06	33.14	3.00	55.68	-41.70	-13.00	28.70
950.00	3800.00	PK	14.55	H	8.06	33.14	3.00	55.75	-41.63	-13.00	28.63
950.00	4750.00	PK	18.21	H	6.93	33.90	3.00	59.04	-38.34	-13.00	25.34
950.00	4750.00	PK	17.10	V	6.93	33.90	3.00	57.93	-39.45	-13.00	26.45
950.00	5700.00	PK	17.15	V	8.18	34.60	3.00	59.93	-37.45	-13.00	24.45
950.00	5700.00	PK	16.61	H	8.18	34.60	3.00	59.39	-37.99	-13.00	24.99
950.00	6650.00	PK	19.02	H	9.16	35.64	3.00	63.82	-33.55	-13.00	20.55
950.00	6650.00	PK	19.17	V	9.16	35.64	3.00	63.97	-33.40	-13.00	20.40
950.00	7600.00	PK	27.71	V	9.93	35.84	3.00	73.48	-23.90	-13.00	10.90
950.00	7600.00	PK	29.01	H	9.93	35.84	3.00	74.78	-22.60	-13.00	9.60
950.00	8550.00	PK	25.10	H	10.20	35.98	3.00	71.28	-26.10	-13.00	13.10
950.00	8550.00	PK	25.89	V	10.20	35.98	3.00	72.07	-25.31	-13.00	12.31
950.00	9500.00	PK	27.06	V	10.73	36.55	3.00	74.34	-23.04	-13.00	10.04
950.00	9500.00	PK	26.68	H	10.73	36.55	3.00	73.96	-23.42	-13.00	10.42

## FIELD STRENGTH OF SPURIOUS EMISSIONS

### Test Data: High Frequency

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBμV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dBm)
959.65	1919.30	PK	4.68	V	5.07	31.11	3.00	40.86	-56.51	-13.00	43.51
959.65	1919.30	PK	11.11	H	5.07	31.11	3.00	47.29	-50.08	-13.00	37.08
959.65	2878.95	PK	17.50	H	6.20	32.25	3.00	55.95	-41.42	-13.00	28.42
959.65	2878.95	PK	13.11	V	6.20	32.25	3.00	51.56	-45.81	-13.00	32.81
959.65	3838.60	PK	9.08	V	7.38	33.19	3.00	49.65	-47.73	-13.00	34.73
959.65	3838.60	PK	4.33	H	7.38	33.19	3.00	44.90	-52.48	-13.00	39.48
959.65	4798.25	PK	18.41	H	7.06	33.93	3.00	59.40	-37.97	-13.00	24.97
959.65	4798.25	PK	10.89	V	7.06	33.93	3.00	51.88	-45.49	-13.00	32.49
959.65	5757.90	PK	8.96	V	8.17	34.67	3.00	51.80	-45.58	-13.00	32.58
959.65	5757.90	PK	11.76	V	8.17	34.67	3.00	54.60	-42.78	-13.00	29.78
959.65	6717.55	PK	13.83	V	9.15	35.77	3.00	58.75	-38.63	-13.00	25.63
959.65	6717.55	PK	11.76	H	9.15	35.77	3.00	56.68	-40.70	-13.00	27.70
959.65	7677.20	PK	22.28	H	10.04	35.90	3.00	68.22	-29.15	-13.00	16.15
959.65	7677.20	PK	20.76	V	10.04	35.90	3.00	66.70	-30.67	-13.00	17.67
959.65	8636.85	PK	20.81	V	10.20	36.02	3.00	67.03	-30.35	-13.00	17.35
959.65	8636.85	PK	21.67	H	10.20	36.02	3.00	67.89	-29.49	-13.00	16.49
959.65	9596.50	PK	22.10	H	10.72	36.59	3.00	69.41	-27.96	-13.00	14.96
959.65	9596.50	PK	21.85	V	10.72	36.59	3.00	69.16	-28.21	-13.00	15.21

## FREQUENCY STABILITY

**Rule Parts. No.:** Part 2.1055(a)(3), 74.561, 74.861(c)

**Test Requirements:** Part 2.1055(a)(3)

### §2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(3) From  $0^{\circ}$  to  $+50^{\circ}$  centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

**Test Requirements:** Part 74.561, 73.1545(b)

### §74.561 Frequency tolerance.

In the bands above 944 MHz, the operating frequency of the transmitter shall be maintained in accordance with the following table:

Frequency band (MHz)	Tolerance as percentage of assigned frequency
944 to 952	0.005

$$944 \text{ MHz} * 0.005 = 4720 \text{ kHz}$$

### §74.861 Technical requirements.

(c) Low power auxiliary transmitters not required to operate on specific carrier frequencies shall operate sufficiently within the authorized frequency band edges to insure the emission bandwidth falls entirely within the authorized band.

**Method of Measurements:** ANSI C63.26 5.6

## FREQUENCY STABILITY

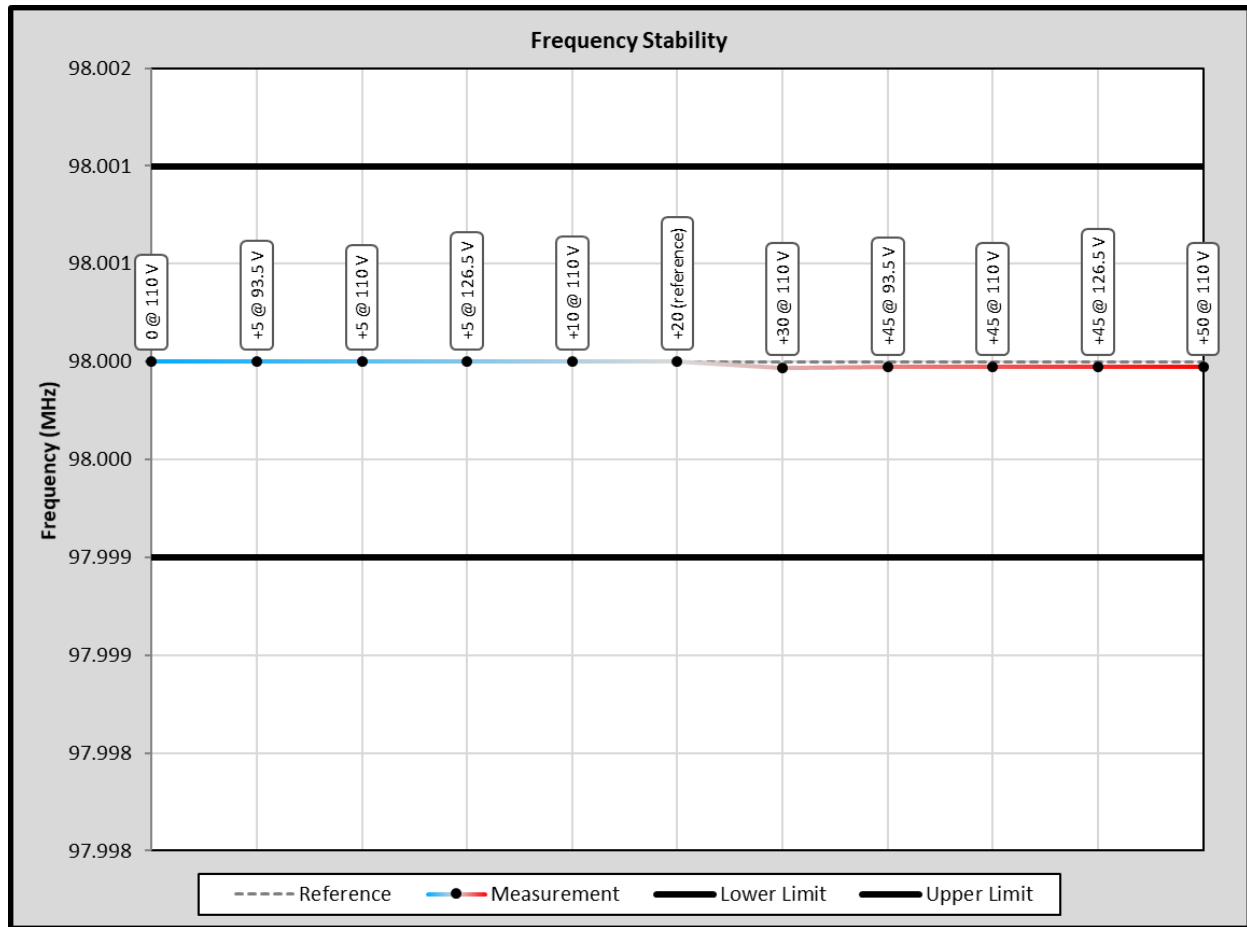
### Test Data: Frequency Stability Table

Minimum of FCC PT 74 & BETS-6 Limit	1	+/- kHz	
Lower Limit	97.998999	MHz	
Upper Limit	98.000999	MHz	
Rated Supply Voltage	110.0	<input checked="" type="radio"/> AC <input type="radio"/> DC	
Temperature / Voltage Variation			
Temperature (°C)	Supplied Voltage (V)	Frequency (MHz)	Deviation (kHz)
0	110.0	97.999999	0.002
+5	93.5	98.000001	-0.002
+5	110.0	98.000001	-0.002
+5	126.5	98.000001	-0.002
+10	110.0	98.000001	0.000
+20 (reference)	110	97.999999	0.000
+30	110.0	97.999969	0.032
+45	93.5	97.999972	0.027
+45	110.0	97.999972	0.027
+45	126.5	97.999972	0.027
+50	110.0	97.999972	0.029



# FREQUENCY STABILITY

## Test Data: Frequency Stability Plot



## 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:

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

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	$\pm 49.5$ Hz	(1)
RF Conducted Power	$\pm 0.93$ dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	$\pm 1.86$ dB	
Occupied Bandwidth	$\pm 2.65$ %	
Audio Frequency Response	$\pm 1.86$ dB	
Modulation limiting	$\pm 1.88$ %	
Radiated RF Power	$\pm 1.4$ dB	
Maximum frequency deviation: Within 300 Hz and 6 kHz of audio freq. Within 6 kHz and 25 kHz of audio freq.	$\pm 1.88$ % $\pm 2.04$ %	
Rad Emissions Sub Meth up to 26.5GHz	$\pm 2.14$ dB	
Rad Emissions Sub Meth up to 18-40 GHz	$\pm 2.04$ %	
Adjacent channel power	$\pm 1.47$ dB	(1)
Intermodulation - Tx	$\pm 2.07$ dB	
Noise Figure	$\pm 1.00$ dB	
Transient Frequency Response	$\pm 1.88$ %	
Temperature	$\pm 1.0$ °C	(1)
Humidity	$\pm 5.0$ %	
Radiated Emissions to 6.0GHz	$\pm 4.4$ dB	
Power line conducted emissions	$\pm 3.9$ dB	

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

## EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
CHAMBER	Panashield	3M	N/A	03/12/19	03/12/21
Antenna: Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/11/19
Antenna: Biconical 1057	Eaton	94455-1	1057	12/13/17	12/13/19
Antenna: Log-Periodic 1243	Eaton	96005	1243	04/20/18	04/20/21
Antenna: Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	01/30/17	01/30/20
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 KMKM-0670-01 KFKF-0197-00	02/27/19	02/27/21
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
EMI Test Receiver R & S ESU 40	Rohde & Schwarz	ESU 40	100320	08/28/18	08/28/20
Comb Generator	Com-Power Corp	CGO-515	291728	NA	NA
Function Generator	Standford	DS340	25200	02/21/18	02/21/20
Modulation Analyzer	HP	8901A	3050A05856	04/13/17	04/13/20
Audio Analyzer	HP	8903B	3011A13084	02/20/18	02/20/20
Audio Load	Heathkit	ID-5252	00714	NA	NA
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	NA	NA
Type K J Thermometer	Martel	303	080504494	11/06/17	11/06/19
Frequency Counter Small Chamber	HP	5385A	3242A07460	08/22/17	08/22/19
High Power Attenuator NFNF 30dB 2000W DC-1G	Bird	8329-300	4980	08/01/2019	08/01/2021
Attenuator N 30dB 500W DC-2.5G	Bird	8325	1761	08/01/2019	08/01/2021
Attenuator N 30dB 100W DC-6G	Pasternack	PE7214-30	#110	08/01/2019	08/01/2021
Attenuator N 20dB 20W DC-4G	Narda	766-20	0605	08/01/2019	08/01/2021
Attenuator N 10dB 20W DC-4G	Narda	766-10	0010	08/01/2019	08/01/2021
Tunable Notch Filter 54-210 MHz	Eagle	210BFBF	54-210 MHz (#42)	08/01/2019	08/01/2021
Coaxial Cable - BMBM-0061-01 RG400	Pasternack	PE3582LF-24	BMBM-0061-01	08/01/2019	08/01/2021
Coaxial Cable - BMBM-0184-01 Silver	TEK		BMBM-0184-01	08/01/2019	08/01/2021
Coaxial Cable - BMBM-0183-01 RG400	Pasternack	PE3582LF-72	BMBM-0183-01	08/01/2019	08/01/2021
XLR Breakout Cable (input)	Timco	n/a	n/a	n/a	n/a

### \*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

**END OF REPORT**