Test Report Serial Number:	**45461548 R1.0**
Test Report Date:	**8 November 2019**
Project Number:	**1473**

EMC Test Report - New Filing

Applicant:

President Electronics USA
1007 Collier Center Way
Naples, FL, 34110
USA

FCC ID:	IC Registration Number
2AEOCPC204	**20240-PC204**
Product Model Number / HVIN	Product Name / PMN
Taylor FCC	**Taylor FCC**

In Accordance With:

FCC 47 CFR Part 95 Subpart D, Part 15 Subpart B
Licensed Non-Broadcast Station Transmitter (TNB)

RSS-GEN, RSS-236 Issue 1
Citizen Band (26.960 to 27.410 MHz)

Approved By:

Ben Hewson, President
Celltech Labs Inc.
21-364 Lougheed Rd.
Kelowna, BC, V1X 7R8
Canada

Test Lab Certificate: 2470.01

IC Registration 3874A-1

FCC Registration: CA3874

Table of Contents

Table of Figures

Table of Plots

Table of Tables

1.0 DOCUMENT CONTROL

Revision History				
Samples Tested By:	Art Voss, P.Eng.	**Date(s) of Evaluation:**		29 Oct - 1 Nov, 2019
Report Prepared By:	Art Voss, P.Eng.	**Report Reviewed By:**		Ben Hewson
Report Revision	**Description of Revision**	**Revised Section**	**Revised By**	**Revision Date**
0.1	Initial Draft Release	n/a	Art Voss	5 November 2019
0.2	Revised FCC ID / IC ID	Cover, 2.0	Art Voss	5 November 2019
	Revised Plots	11.0		
1.0	Initial Release	n/a	Art Voss	8 November 2019

2.0 CLIENT AND DUT INFORMATION

Client Information	
Applicant Name	President Electronics USA
Applicant Address	1007 Collier Center Way
	Naples, FL, 34110
	USA
DUT Information	
Device Identifier(s):	**FCC ID:** 2AEOCPC204
	IC: 20240-PC204
Device Type:	Mobile CB Radio Transceiver
Type of Equipment/Class (FCC):	Licensed Non-Broadcast Station Transmitter (TNB)
Type of Equipment/Class (ISED):	Citizen's Band (26.960 to 27.410MHz)
Device Model(s) / HVIN:	Taylor FCC
Device Marketing Name / PMN:	Taylor FCC
Firmware Version ID Number / FVIN:	n/a
Host Marketing Name / HMN:	n/a
Test Sample Serial No.:	T/A Sample - Identical Prototype
Transmit Frequency Range:	26.965 - 27.405 MHz (Chan. 1-40)
Number of Channels:	40
Manuf. Max. Rated Output Power:	4.0W AM
Manuf. Max. Rated BW/Data Rate:	8kHz
Antenna Make and Model:	n/a
Antenna Type and Gain:	External Whip, 0dBi nominal (3dBi maximum).
Modulation:	AM
Mode:	n/a
Emission Designator:	5K50A3E
DUT Power Source:	12 - 24 VDC External
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

3.0 SCOPE

This Certification Report was prepared on behalf of:

President Electronics USA

,(the '*Applicant*"), in accordance with the applicable Federal Communications Commission (FCC) CFR 47 and Innovation, Scientific and Economic Development (ISED) Canada rules parts and regulations (the '*Rules*'). The scope of this investigation was limited to only the equipment, devices and accessories (the '*Equipment*') supplied by the *Applicant*. The tests and measurements performed on this *Equipment* were only those set forth in the applicable *Rules* and/or the Test and Measurement Standards they reference. The *Rules* applied and the Test and Measurement Standards used during this evaluation appear in the Normative References section of this report. The limits set forth in the technical requirements of the applicable *Rules* were applied to the measurement results obtained during this evaluation and ,unless otherwise noted, these limits were used as the Pass/Fail criteria. The Pass/Fail statements made in this report apply to only the tests and measurements performed on only the *Equipment* tested during this evaluation. Where applicable and permissible, information including test and measurement data and/or results from previous evaluations of same or similar equipment, devices and/or accessories may be cited in this report.

As per FCC CFR 47 Part §2.1091 and §2.1093, an RF Exposure evaluation report is required for this *Equipment* and the results of the RF Exposure evaluation appear in a separate exhibit from this report.

The Receiver of this *Equipment* is subject to Equipment Certification or Supplier's Declaration of Conformity (SDoC) in accordance with 47 CFR Part §15.101. The Receiver was evaluated in accordance with 47 CFR Part §15 Subpar B and ICES-003. A statement of the application of the SDoC procedure appears in a separate exhibit from this report.

Application: This is an application for a new FCC and ISED certification.

4.0 TEST RESULT SUMMARY

TEST SUMMARY						
Referenced Standard(s):		**FCC CFR Title 47 Parts 2, 95D, 15B, ISED RSS-Gen, RSS-236**				
Section	**Description of Test**	**Procedure Reference**	**Applicable Rule Part(s) FCC**	**Applicable Rule Part(s) ISEDC**	**Test Date**	**Result**
7.0	Conducted Power (Fundamental)	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1046 §2.1033(c)(8) §95.967	RSS-Gen RSS-236 5.2	29 Oct 2019	**Complies**
8.0	Modulation Response	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1047 §95.975 §95.977	RSS-Gen	30 Oct 2019	**Complies**
9.0	Occupied Bandwidth	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1049 §95.973	RSS-Gen RSS-236 5.3.2	30 Oct 2019	**Complies**
	Emission Mask	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1049 §95.979	RSS-Gen RSS-236 5.4.4	30 Oct 2019	**Complies**
10.0	Conducted TX Spurious Emissions	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1051 §95.979	RSS-Gen RSS-236 5.4.4	30 Oct 2019	**Complies**
11.0	Radiated TX Spurious Emissions	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1053 §95.979	RSS-Gen RSS-236 5.4.4	31 Oct 2019	**Complies**
12.0	Frequency Stability	ANSI/TIA/EIA-382-A ANSI C63.4:2014	§2.1055 §95.965	RSS-Gen	1 Nov 2019	**Complies**
SDoC	Radiated Receiver Emissions	ANSI C63.4:2014	§15 Subpart B	ICES-003	31 Oct 2019	**Complies**

Test Station Day Log					
Date	**Ambient Temp (°C)**	**Relative Humidity (%)**	**Barometric Pressure (kPa)**	**Test Station**	**Tests Performed Section(s)**
29 Oct 2019	20.7	18	103.9	**EMC**	**7**
30 Oct 2019	19.9	17	103.5	**EMC**	**8,9,10**
31 Oct 2019	20.5	17	103.0	**SAC**	**11**
31 Oct 2019	7.5	20	103.1	**OATS**	**11, SDoC**
1 Nov 2019	19.6	18	103.8	**TC**	**12**

EMC - EMC Test Bench
SAC - Semi-Anechoic Chamber
OATS - Open Area Test Site
TC - Temperature Chamber
LISN - LISN Test Area
ESD - ESD Test Bench
IMM - Immunity Test Area
RI - Radiated Immunity Chamber

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.

Art Voss, P.Eng.
Technical Manager
Celltech Labs Inc.

8 November 2019
Date

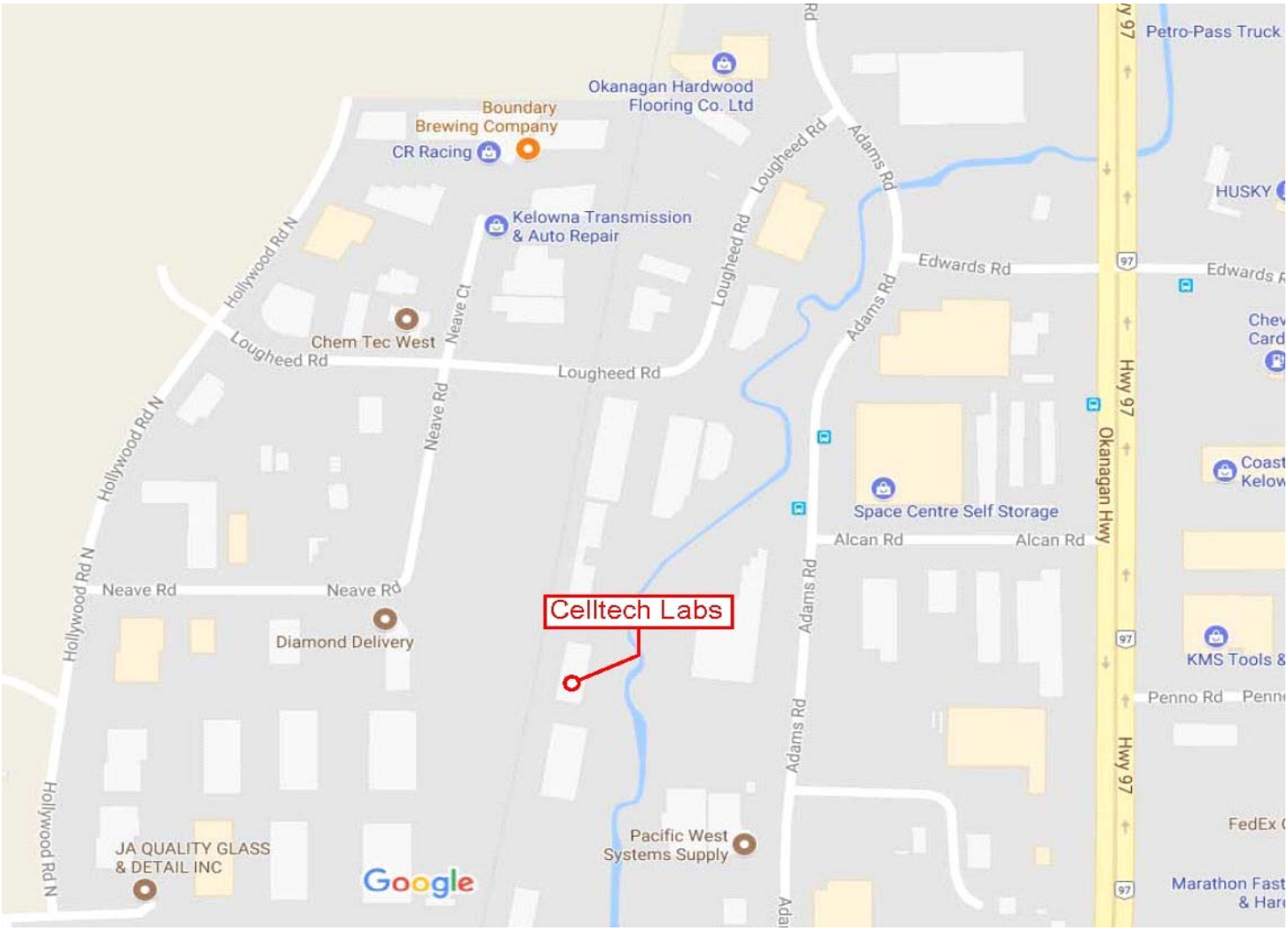
5.0 NORMATIVE REFERENCES

Normative References	
ISO/IEC 17025:2017	General requirements for the competence of testing and calibration laboratories
IEEE/ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/EIA/TIA-382-A-1989	Minimum Standards - Citizens Band Radio Service Amplitude Modulated (AM) Transceivers Operating in the 27MHz Band
CFR Title 47: Part 2:	Code of Federal Regulations Telecommunication Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR Title 47: Part 95: Subpart D:	Code of Federal Regulations Telecommunication Personal Radio Service Citizens Band Radio Service (CBRS)
CFR Title 47 Part 15 Title 47: Part 15: Subpart B:	Code of Federal Regulations Telecommunication Radio Frequency Devices Unintentional Radiators
ISED RSS-Gen Issue 5:	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification General Requirements and Information for the Certification of Radiocommunication Equipment
ISED RSS-236 Issue 1:	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification General Radio Service Equipment Operating in the Band 26.960 to 27.410 MHz (Citizens Band)

6.0 FACILITIES AND ACCREDITATIONS

Facility and Accreditation:

The facilities used to evaluate this device outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site (OATS) conforms to the requirements set forth in ANSI C63.4 and is filed and listed with the FCC under Test Firm Registration Number CA3874A-1 and Industry Canada under Test Site File Number IC 3874A-1. Celltech is accredited to ISO 17025, through accrediting body A2LA and with certificate 2470.01.



7.0 CONDUCTED POWER

Test Procedure	
Normative Reference	**FCC 47 CFR §2.1046, §2.1033(c)(8), §95.967, RSS-236** **EIA/TIA-382-A**

Limits	
47 CFR §95.967	Each CBRS transmitter type must be designed such that the transmitter power can not exceed the following limits: (1) 4 W Carrier power when transmitting emission type A1D or A3E;
RSS-236 5.2	The transmitter output power shall not exceed 4.0 watts for a DSB mode of operations.

General Procedure	
EIA/TIA-382-A	**19. TRANSMITTER CARRIER POWER OUTPUT** Transmitter Carrier Power Output for this service is the power (rms) available at the output terminals of the transmitter when the output terminals are connected to a standard output load. This measurement shall be performed without modulation, at standard test. conditions.

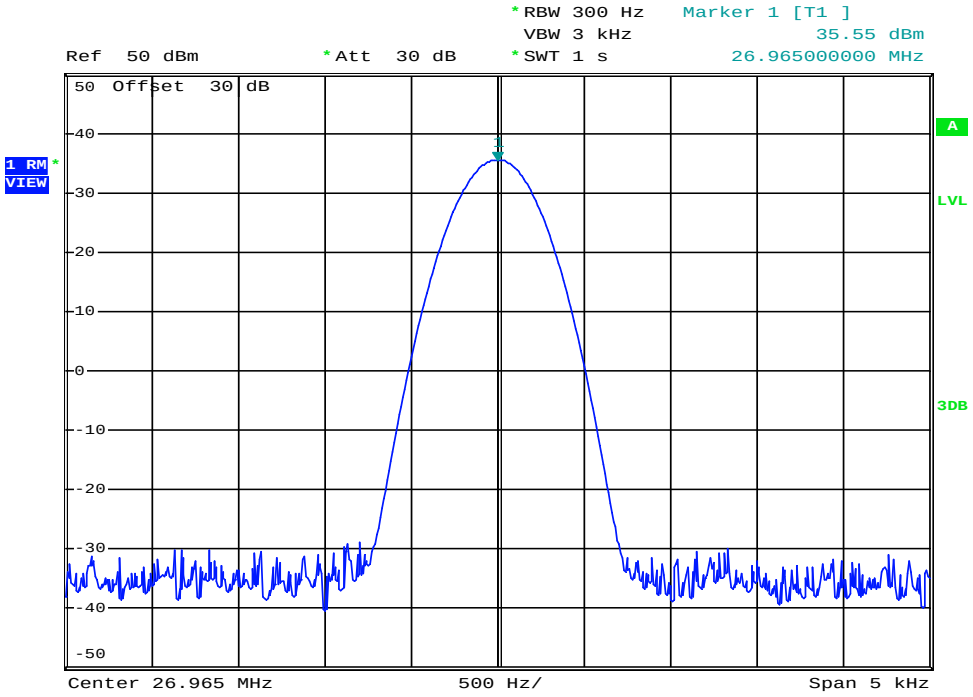
Test Setup	Appendix A - Figure A.1

Measurement Procedure

The DUT was connected to a Spectrum Analyzer (SA) via a 30dB attenuator connected to the DUT's antenna port. The SA was configured as above using the Max Hold, Marker Peak functions. The output power of the DUT was set to the manufacturer's highest output power setting at the Low, Mid and High frequency channels was set to transmit at its maximum Duty Cycle.

Plot 7.1 – Conducted Output Power – Channel 1

Conducted Power (RMS)

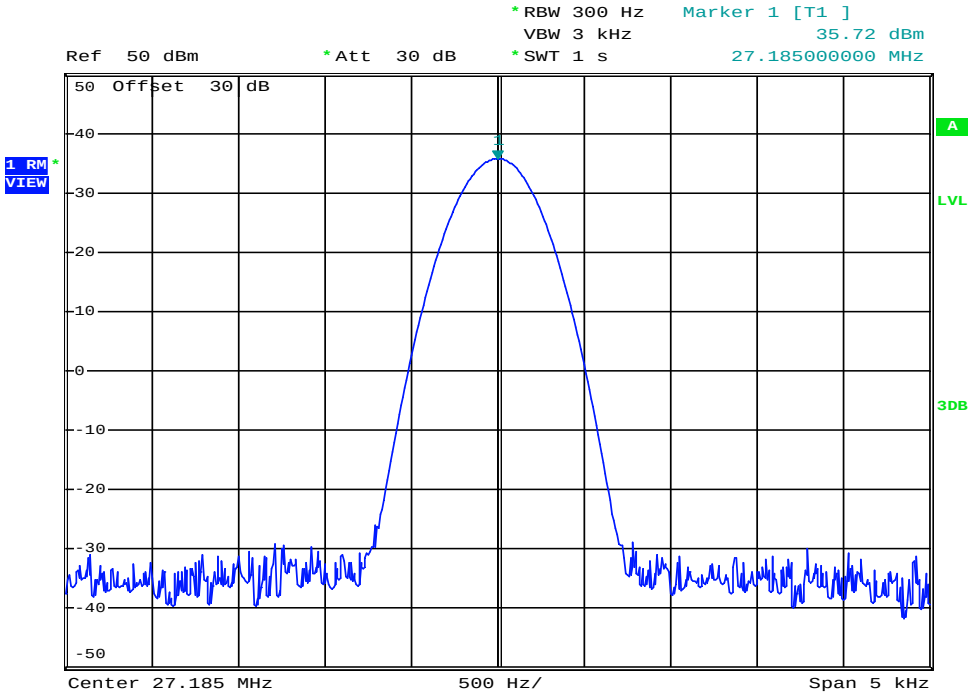


Date: 27.OCT.2019 14:29:02

Channel Frequency: **26.965** MHz	Audio Input Frequency **n/a** Hz	Audio Input Amplitude **n/a** mV
DUT Modulation: **CW**	Nominal Supply Voltage **13.80** VDC	Measured Channel Power: **35.55** dBm

Plot 7.2 – Conducted Output Power – Channel 19

Conducted Power (RMS)

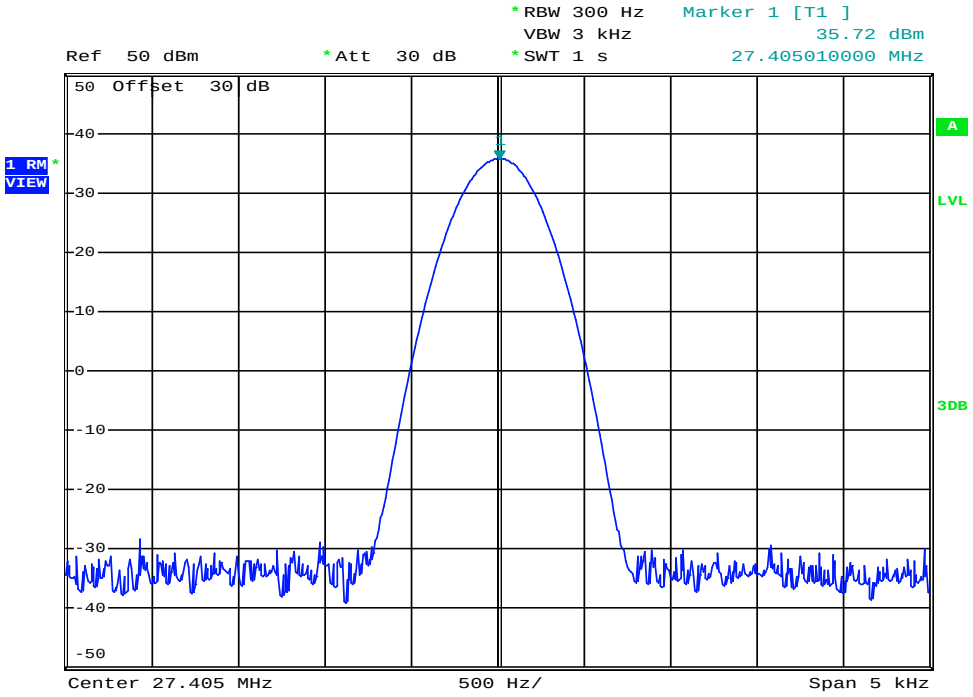


Date: 27.OCT.2019 14:30:25

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
27.185 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	**Nominal Supply Voltage**	**Measured Channel Power:**
CW	**13.80** VDC	**35.72** dBm

Plot 7.3 – Conducted Output Power – Channel 40

Conducted Power (RMS)



Date: 27.OCT.2019 14:28:06

Channel Frequency: **27.405** MHz	Audio Input Frequency **n/a** Hz	Audio Input Amplitude **n/a** mV
DUT Modulation: **CW**	Nominal Supply Voltage **13.80** VDC	Measured Channel Power: **35.72** dBm

Table 7.1 – Summary of Conducted Power Measurements (RMS)

Conducted Power Measurement Results							
Channel	Frequency (MHz)	Modulation	Nominal Input Voltage (VDC)	Measured Power [E_{Meas}] (dBm)	Measured Power [E_{Meas}] (W)	Limit (W)	Margin (dB)
1	26.965	CW	13.8	35.55	3.59	4.0	**0.5**
19	27.185			35.72	3.73		**0.3**
40	27.405			35.72	3.73		**0.3**
					Result:	**Complies**	

(1) The output power is factory set to maximum
Margin = 10*Log(Limit / E_{meas})

Table 7.2 – Compliance to §2.1033(c)(8)

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.20A
Measured Total Current:	ITx =1.58A
Transmitter Current (ITx - IRx):	IXmitter = 1.38A
Power to Transmitter:	(13.8VDC)(1.38) = 19.04W
Result:	**Complies**

8.0 MODULATION RESPONSE

Test Conditions	
Normative Reference	**FCC 47 CFR §2.1047, §95.975, RSS-236 5.3.2**

Limits	
47 CFR §2.1047	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.
47 CFR §95.975	Each CBRS transmitter type must be designed such that the modulation characteristics are in compliance with the rules in this section. (a) When emission type A3E is transmitted with voice modulation, the modulation percentage must be at least 85%, but not more than 100%. (b) When emission type A3E is transmitted by a CBRS transmitter having a transmitter output power of more than 2.5 W, the transmitter must contain a circuit that automatically prevents the modulation percentage from exceeding 100%.
RSS-236	5.3.2) When emission type A3E is transmitted by a CB transmitter having a total power of greater than 2.5 W, the CB transmitter must automatically prevent the modulation from exceeding 100%.

Measurement Procedure

TIA 382 25.2 Transmitter Audio Frequency Response

Operate the transmitter under standard test conditions and monitor the output with a modulation monitor or calibrated test receiver. The audio input signal applied through a suitable impedance matching network, as specified by the manufacturer, shall be adjusted to obtain 50% modulation at the maximum audio frequency response of the transmitter, and this point shall be taken as the 0 dB reference level. Vary the modulating frequency from 100 Hz to 10,000 Hz and record the input levels necessary to maintain a constant 50% modulation.

Graph the audio level in dB relative to the 0 dB reference level as a function of the modulating frequency. Record any audio frequency where it is impossible to perform the measurement.

TIA 382 24.2.2 Transmitter Modulation Limiting

The transmitter is modulated by a sinusoidal audio signal applied to the microphone input jack. First the audio input frequency is adjusted to deliver 50% modulation at the audio frequency that produces the maximum modulation level. Record the modulation input level (mV) and use this level as O dB for plotting modulation limiting. Increment the audio signal level to 40 dB above the reference level. Record the modulation level (%). Repeat the measurements using a 400 Hz and a 2500 Hz sinusoidal audio signal. Record the modulation level (%). Perform for both positive and negative modulation.

Test Setup	Appendix A Figure A.2

Statement - Compliance to §95.977

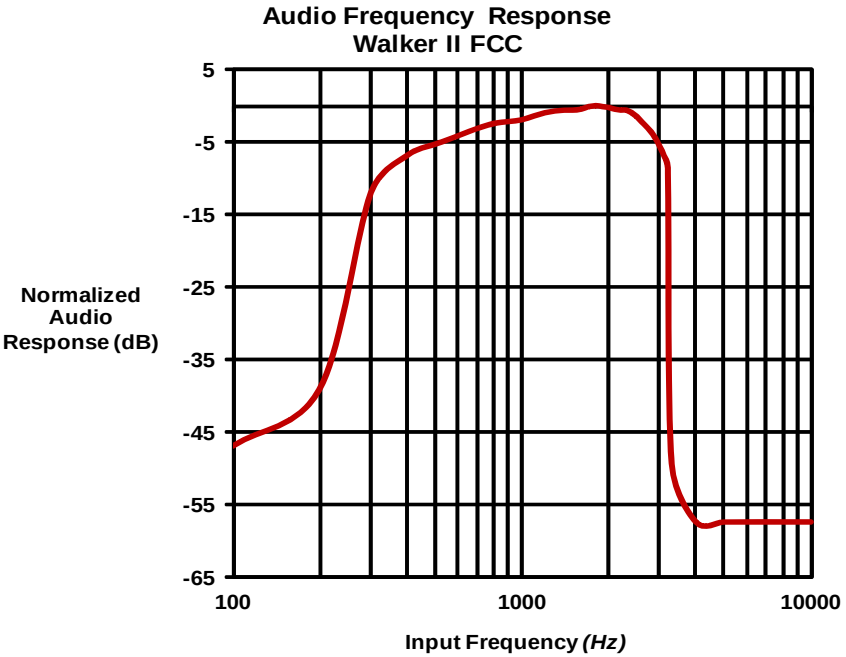
§95.977 CBRS tone transmissions.
In addition to the tones permitted under §95.377, CBRS transmitter types may be designed to transmit brief tones to indicate the beginning or end of a transmission.

This device is capable of transmitting a brief (less than one second) audio tone, “Roger Beep”, when the PTT button is released on the microphone indicating end of transmission. This function is user selectable and complies with the requirements of §95.377. See User’s Manual page 11.

Plot 8.1 – Audio Frequency and Low Pass Filter Response

Audio Frequency and Low Pass Filter Response

Measured Audio Response		
Freq	Audio Response (@ 50% MI)	
(Hz)	*(mV)*	*(dB)**
100	1500.00	-46.872
200	600.00	-38.913
300	27.00	-11.977
400	15.00	-6.872
500	12.50	-5.288
600	11.00	-4.178
700	9.75	-3.130
800	9.00	-2.435
900	8.75	-2.190
1000	8.50	-1.938
1100	8.00	-1.412
1200	7.60	-0.966
1300	7.40	-0.734
1400	7.30	-0.616
1500	7.30	-0.616
1600	7.20	-0.496
1700	6.90	-0.127
1800	6.80	0.000
1900	6.90	-0.127
2000	7.00	-0.252
2100	7.20	-0.496
2200	7.30	-0.616
2300	7.30	-0.616
2400	7.60	-0.966
2500	8.10	-1.520
2600	8.80	-2.239
2700	9.50	-2.904
2800	10.30	-3.607
2900	11.40	-4.488
3000	13.00	-5.629
3100	15.00	-6.872
3200	18.25	-8.575
3300	2000.00	-49.370
4000	5000.00	-57.329
5000	5000.00	-57.329
6000	5000.00	-57.329
7500	5000.00	-57.329
10000	5000.00	-57.329
*** Normalize to 750Hz**		

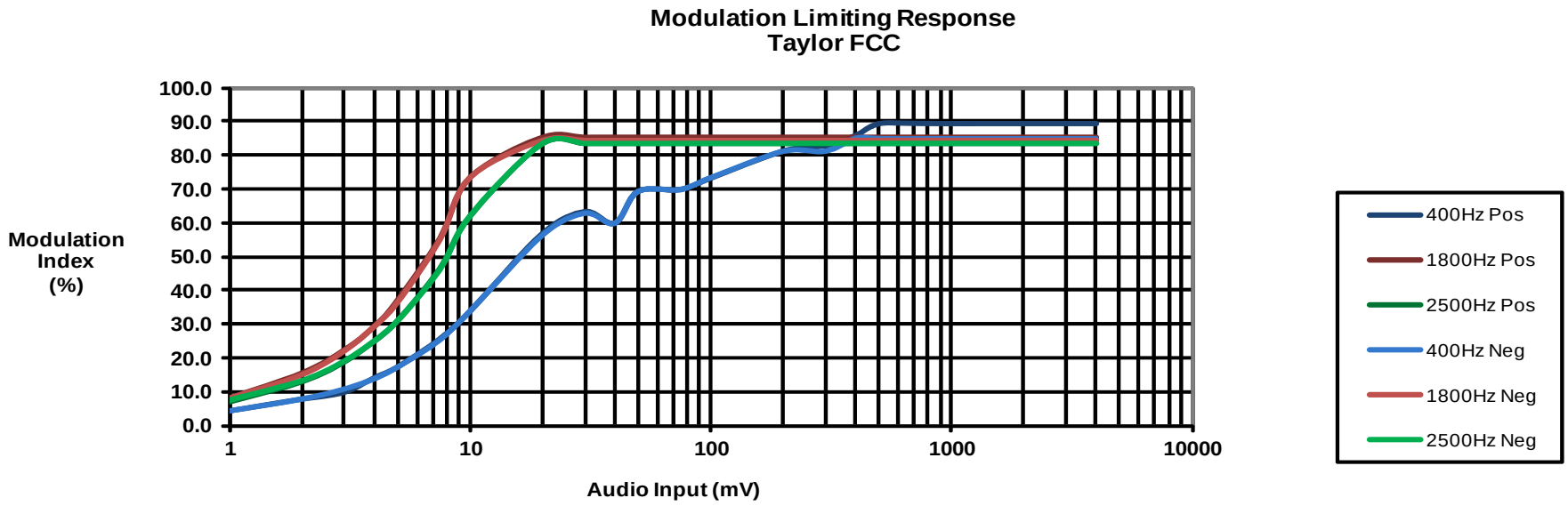


Note: 50% MI could not be achieved above 3300Hz.

Audio Frequency at 6dB Attenuation:	**3050Hz**
Result:	**Complies**

Plot 8.2 – Modulation Limiting Response

Modulation Limiting Response



Measured Modulation Response [Modulation Index (%)]

Freq (Hz)	Audio Input (mV)																						Deviation
	1	2	3	4	5	7.5	10	20	30	40	50	75	100	200	300	400	500	750	1000	2000	3000	4000	
400	4.5	8.0	10.0	14.3	17.5	25.8	34.0	57.0	63.5	60.0	69.5	70.0	73.4	81.4	83.0	86.0	89.5	89.5	89.5	89.5	89.5	89.5	Positive
1800	8.0	15.5	22.3	29.3	37.1	55.5	73.6	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	85.5	
2500	7.0	13.0	18.8	25.0	31.0	46.5	62.0	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	
400	4.5	8.0	11.0	14.0	17.5	25.5	34.0	56.5	63.0	60.0	69.5	70.0	73.5	81.3	81.3	85.2	85.0	85.0	85.0	85.0	85.0	85.0	Negative
1800	8.0	15.0	22.0	29.3	36.5	55.0	73.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	
2500	7.2	13.0	18.8	24.8	30.8	46.0	62.0	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	

Audio Frequency @ Maximum Deviation:	400Hz
Audio Input @ Maximum Deviation:	4000mV
Maximum Measured Modulation Index:	89.5%
Result:	Complies

9.0 OCCUPIED BANDWIDTH AND EMISSION MASKS

Test Conditions	
Normative Reference	**FCC 47 CFR §2.1049, §95.973, RSS-236**

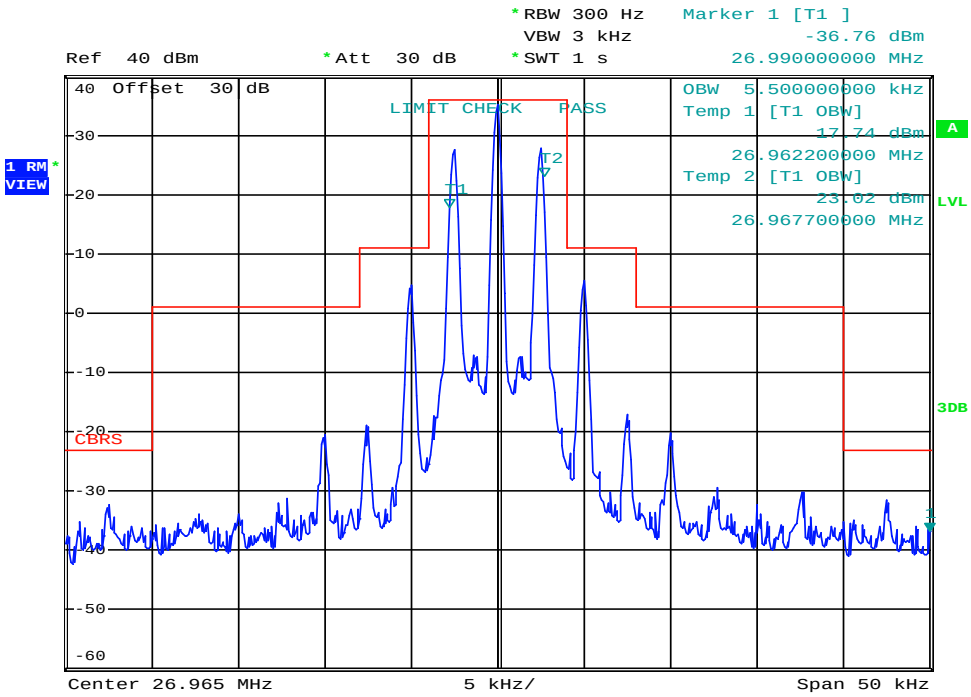
Limits	
47 CFR §95.973	Each CBRS transmitter type must be designed such that the occupied bandwidth does not exceed the authorized bandwidth for the emission type under test. (a) AM. The authorized bandwidth for emission type A3E is 8 kHz.
RSS-236 5.3.2	The authorized bandwidth for emission type A1D or A3E is 8 kHz.
47 CFR §95.979	Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section. (a) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table: For A3E (1), (3), (5), (6) (1) 25 dB (decibels) in the frequency band 4 kHz to 8 kHz removed from the channel center frequency; (3) 35 dB in the frequency band 8 kHz to 20 kHz removed from the channel center frequency; (5) 53 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 250% of the authorized bandwidth. (6) 60 dB in any frequency band centered on a harmonic (i.e., an integer multiple of two or more times) of the carrier frequency.
RSS-236 4.4.4	For A1D and A3E: _ At least 25 dB 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 bandwidth by more than 100% up to and including 250% of the authorized bandwidth. _ At least 53 + 10 log10 (T) dB on any frequency removed from the center of the authorized bandwidth by more than 250%. _ At least 60 dB on any frequency twice or greater than twice the fundamental frequency.

Measurement Procedure
TIA 382 23.2 Transmitter Modulation Occupied Bandwidth
The transmitter is modulated by a sinusoidal audio signal applied to the microphone input jack. First, the frequency is adjusted to deliver 50% modulation at the highest audio response level (minimum applied audio level). Then the audio signal level is increased 16 dB and the audio frequency is readjusted to 2500 Hz The analyzer is adjusted to display each of the discrete modulation sidebands and their respective harmonic products within +/- 50 kHz of the carrier frequency.

Test Setup	Appendix A Figure A.1

Plot 9.1 – Occupied Bandwidth Channel 1

Occupied Bandwidth



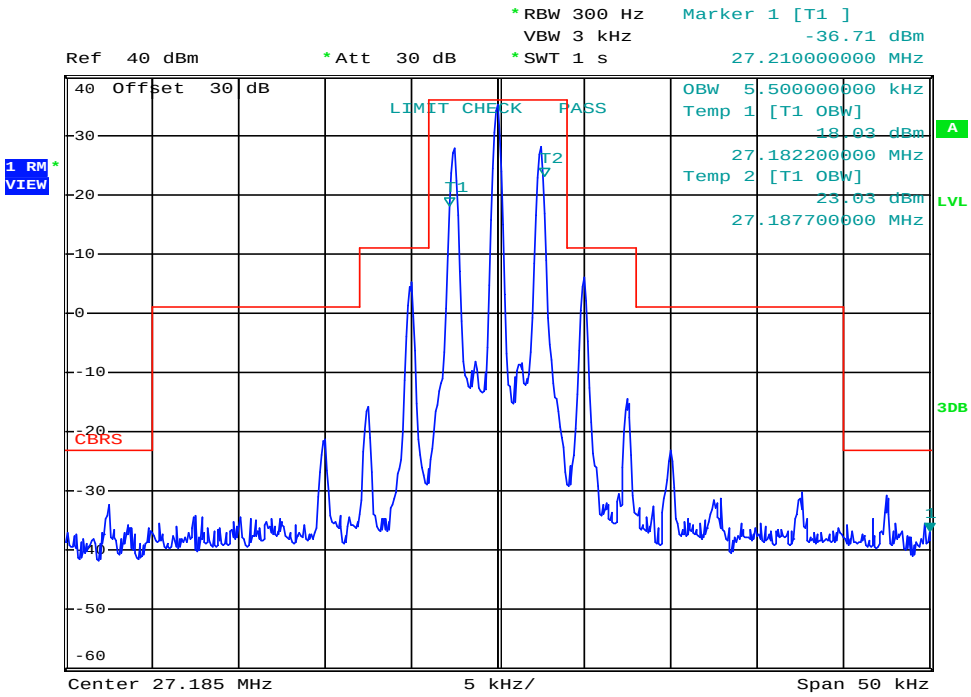
Date: 28.OCT.2019 16:57:43

Channel Frequency:	Audio Input Frequency	Audio Input Level*
26.965 MHz	**2500.00** Hz	**43** mV
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
AM	**13.80** VDC	**5.50** kHz

* Audio Input Level > 16dB of Level Required for 50% Modulation Index

Plot 9.2 – Occupied Bandwidth Channel 19

Occupied Bandwidth



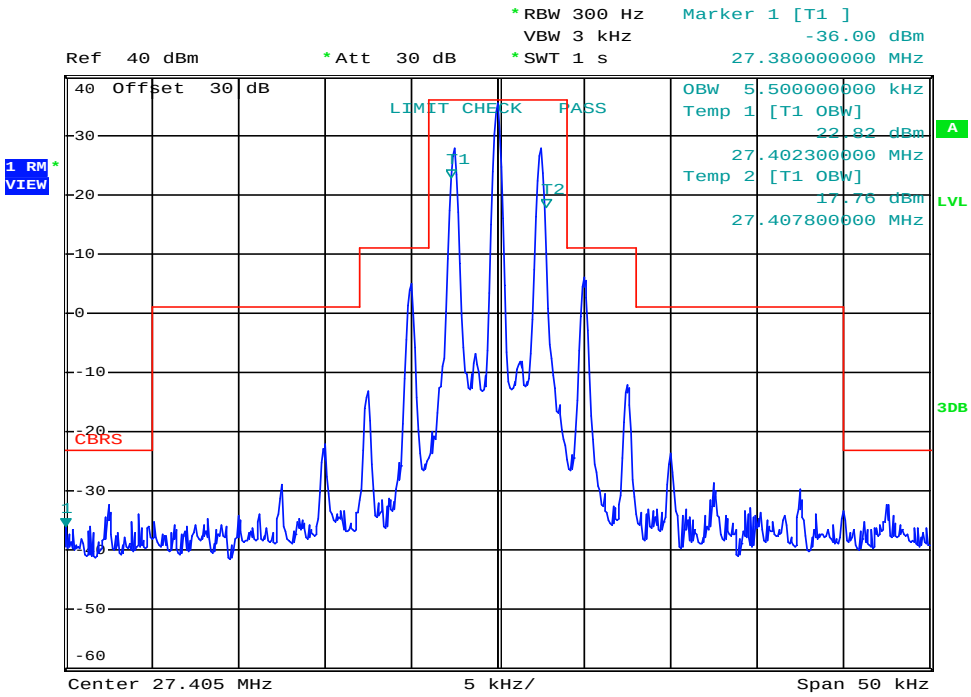
Date: 28.OCT.2019 17:02:13

Channel Frequency:	Audio Input Frequency	Audio Input Level*
27.185 MHz	**2500.00** Hz	**43** mV
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
AM	**13.80** VDC	**5.50** kHz

* Audio Input Level > 16dB of Level Required for 50% Modulation Index

Plot 9.3 – Occupied Bandwidth Channel 40

Occupied Bandwidth



Date: 28.OCT.2019 17:00:49

Channel Frequency:	Audio Input Frequency	Audio Input Level*
27.405 MHz	**2500.00** Hz	**43** mV
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
AM	**13.80** VDC	**5.50** kHz

* Audio Input Level > 16dB of Level Required for 50% Modulation Index

Table 9.1 - Summary of Occupied Bandwidth and Emission Mask Results

Occupied Bandwidth Measurement Results							
Channel	**Frequency** *(MHz)*	**DUT Modulation**	**Measured Occupied Bandwidth** *(kHz)*	**Authorized Bandwidth** *(kHz)*	**Margin** *(kHz)*	**Emission Mask**	**Emission Designator**
1	26.965	AM	5.5	8.0	2.5	PASS	5K50A3E
19	27.185		5.5		2.5	PASS	5K50A3E
40	27.405		5.5		2.5	PASS	5K50A3E
Margin = Authorized BW - Measured BW							
					Result:	**Complies**	

§95.971 CBRS emission types.

Each CBRS transmitter type must be designed such that its capabilities are in compliance with the emission type rules in this section.

(a) Permitted emission types. CBRS transmitter types may transmit only AM voice emission type A3E and SSB voice

This device only transmits AM voice emission type A3E		
	Result:	**Complies**

10.0 CONDUCTED OUT OF BAND SPURIOUS EMISSIONS

Test Conditions	
Normative Reference	**FCC 47 CFR §95.979, RSS-236**

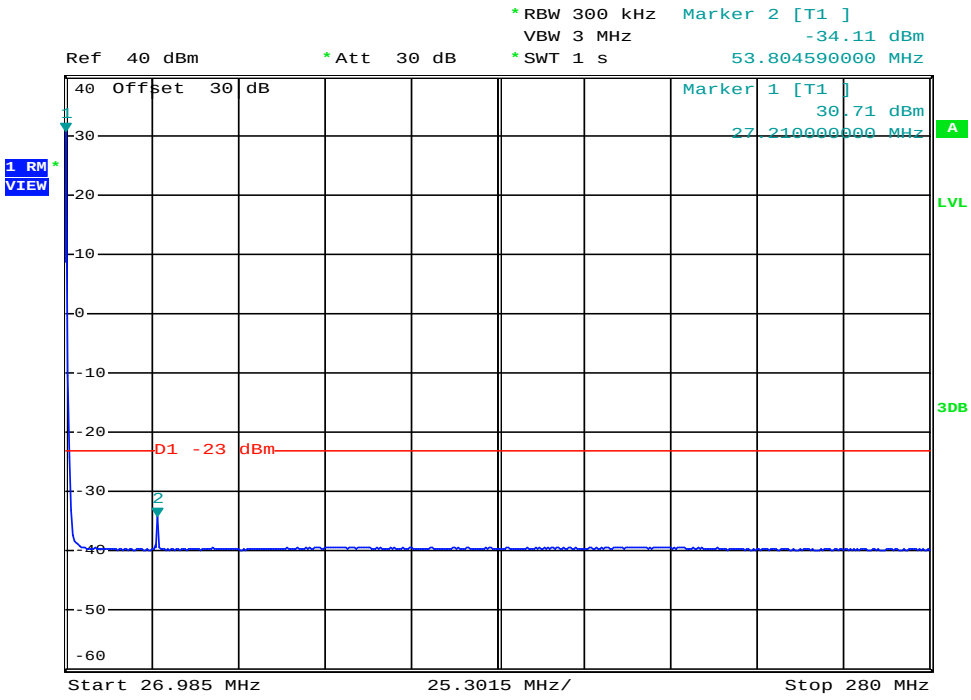
Limits	
47 CFR §95.979	Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section. (a) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table: For A3E (1), (3), (5), (6) (1) 25 dB (decibels) in the frequency band 4 kHz to 8 kHz removed from the channel center frequency; (3) 35 dB in the frequency band 8 kHz to 20 kHz removed from the channel center frequency; (5) 53 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 250% of the authorized bandwidth. (6) 60 dB in any frequency band centered on a harmonic (i.e., an integer multiple of two or more times) of the carrier frequency.
RSS-236 4.4.4	For A1D and A3E: _ At least 25 dB 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 bandwidth by more than 100% up to and including 250% of the authorized bandwidth. _ At least 53 + 10 log10 (T) dB on any frequency removed from the center of the authorized bandwidth by more than 250%. _ At least 60 dB on any frequency twice or greater than twice the fundamental frequency.

Measurement Procedure
TIA 382 21.2 Transmitter Conducted Spurious and Harmonic Emissions
The transmitter RF output shall be connected to the standard non-radiating output load. The output shall be sampled and displayed using spectrum analysis techniques. 2500 Hz modulation shall be applied at a level 16 dB above that required to produce 50% modulation at the frequency of maximum response. The sampled output shall be analyzed from the lowest frequency generated in the equipment to the 10th harmonic of the fundamental signal and the levels of all spurious outputs attenuated not more than 20 dB below the maximum required attenuation shall be recorded.

Test Setup	Appendix A A.1

Plot 10.1 – Conducted Out of Band Emissions, 30MHz – 280MHz, Channel 1

Conducted Spurious Emissions to 10th Harmonic

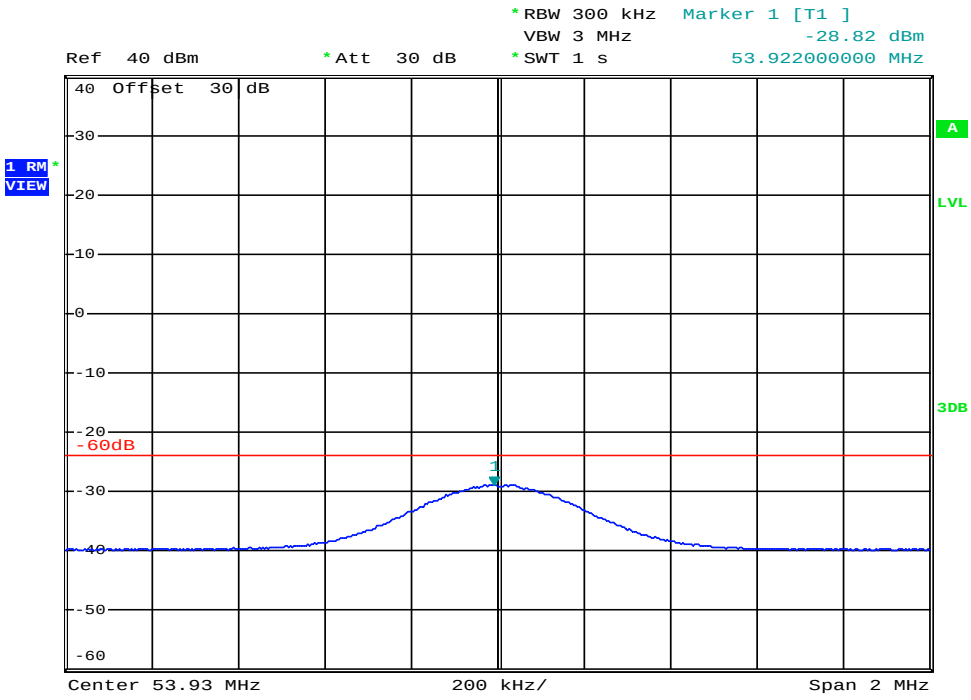


Date: 28.OCT.2019 17:15:47

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
26.965 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	**Nominal Supply Voltage**	**Measured Spurious Emission:**
CW	**13.80** VDC	**-34.11** dBm

Plot 10.2 – Conducted Out of Band Emissions, Channel 1, 2nd Harmonic

Conducted Spurious Emissions

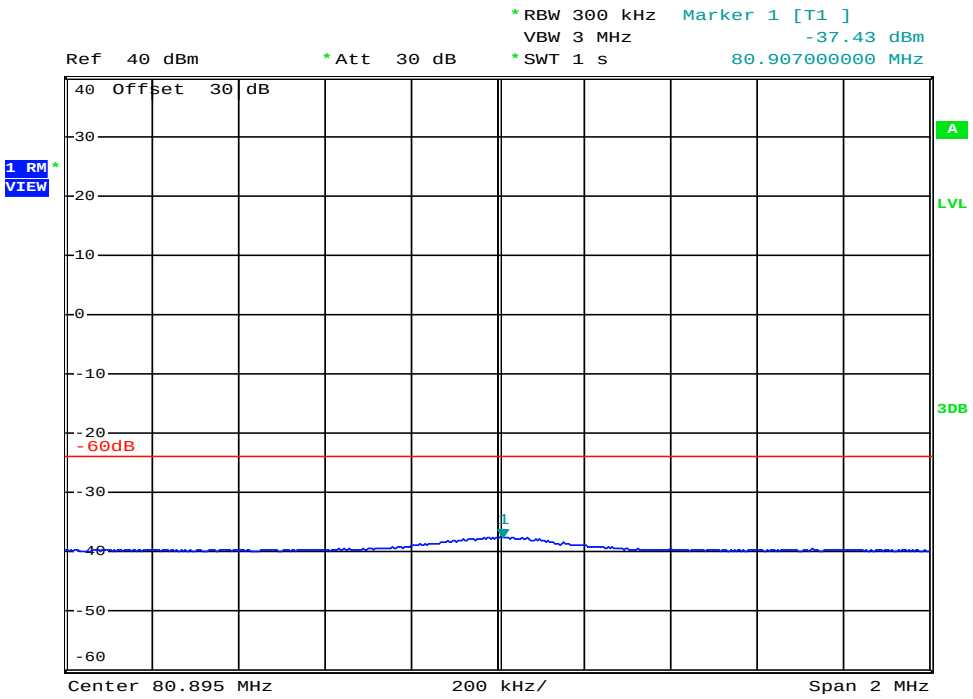


Date: 28.OCT.2019 18:05:14

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
26.965 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-28.82** dBm

Plot 10.3 – Conducted Out of Band Emissions, Channel 1, 3rd Harmonic

Conducted Spurious Emissions

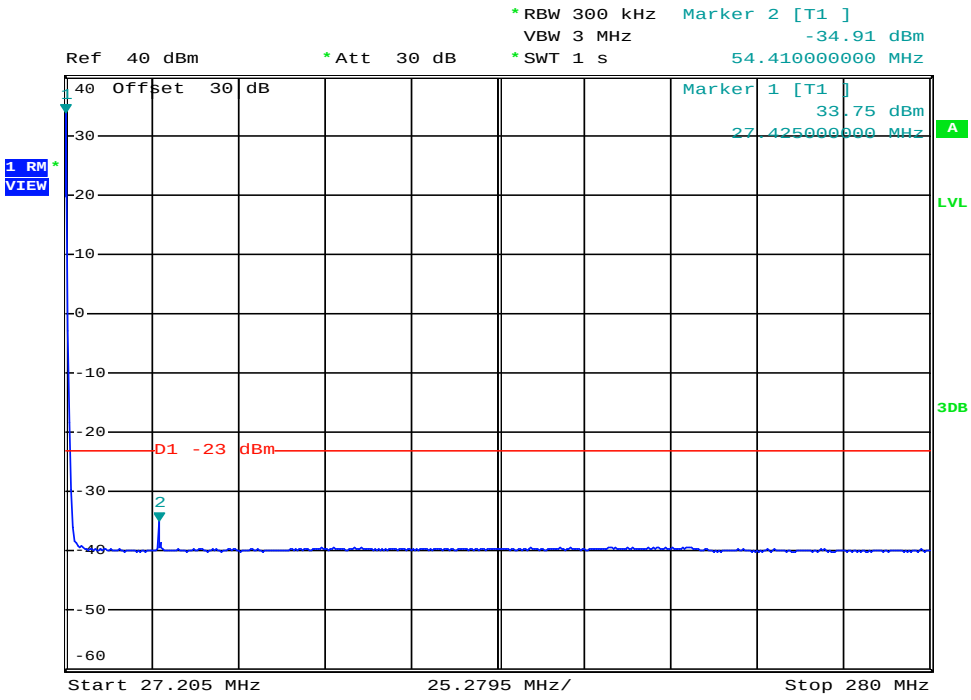


Date: 28.OCT.2019 18:05:49

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
26.965 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	**Nominal Supply Voltage**	**Measured Spurious Emission:**
CW	**13.80** VDC	**-37.43** dBm

Plot 10.4 – Conducted Out of Band Emissions, 30MHz – 280MHz, Channel 19

Conducted Spurious Emissions to 10th Harmonic

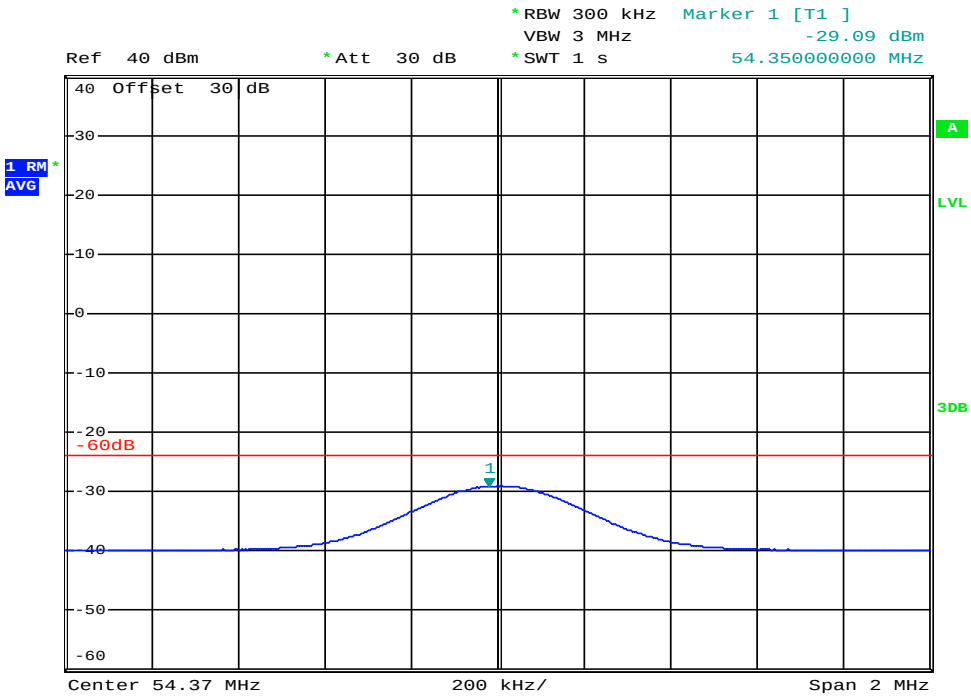


Date: 28.OCT.2019 17:56:15

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
27.185 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-34.91** dBm

Plot 10.5 – Conducted Out of Band Emissions, Channel 19, 2nd Harmonic

Conducted Spurious Emissions

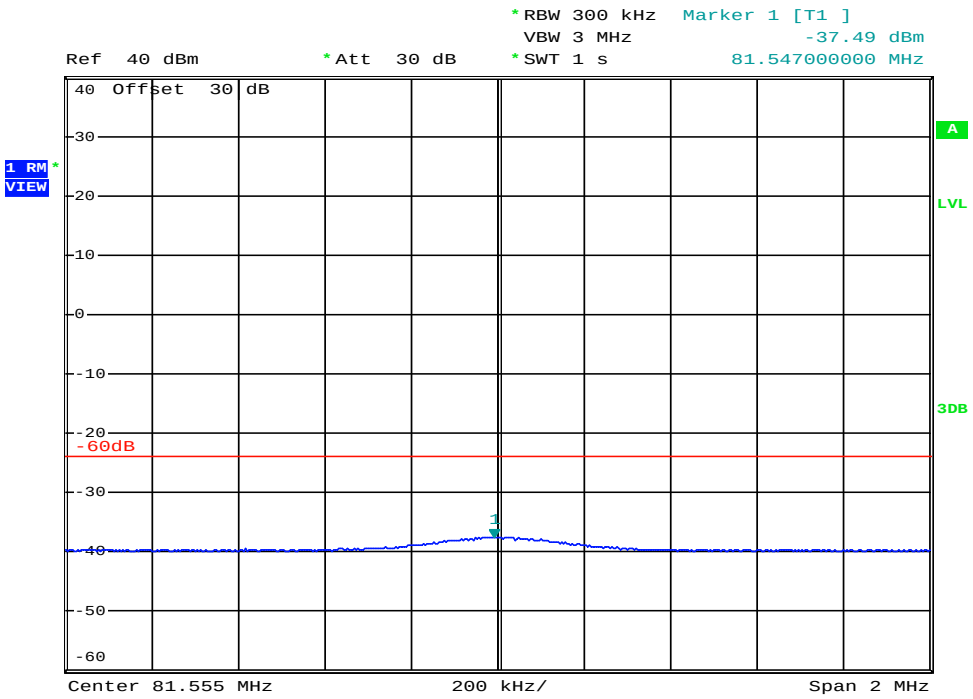


Date: 28.OCT.2019 18:09:20

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
27.185 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-29.09** dBm

Plot 10.6 – Conducted Out of Band Emissions, Channel 19, 3rd Harmonic

Conducted Spurious Emissions

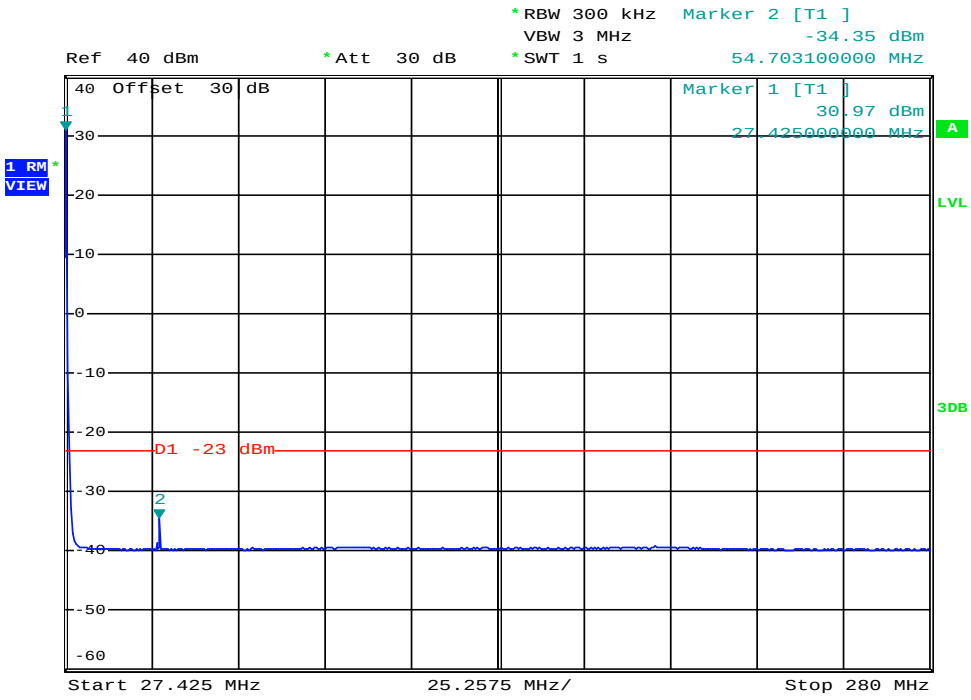


Date: 28.OCT.2019 18:09:51

Channel Frequency: **27.185** MHz	Audio Input Frequency **n/a** Hz	Audio Input Amplitude **n/a** mV
DUT Modulation: **CW**	Nominal Supply Voltage **13.80** VDC	Measured Spurious Emission: **-37.49** dBm

Plot 10.7 – Conducted Out of Band Emissions, 30MHz – 280MHz, Channel 40

Conducted Spurious Emissions to 10th Harmonic

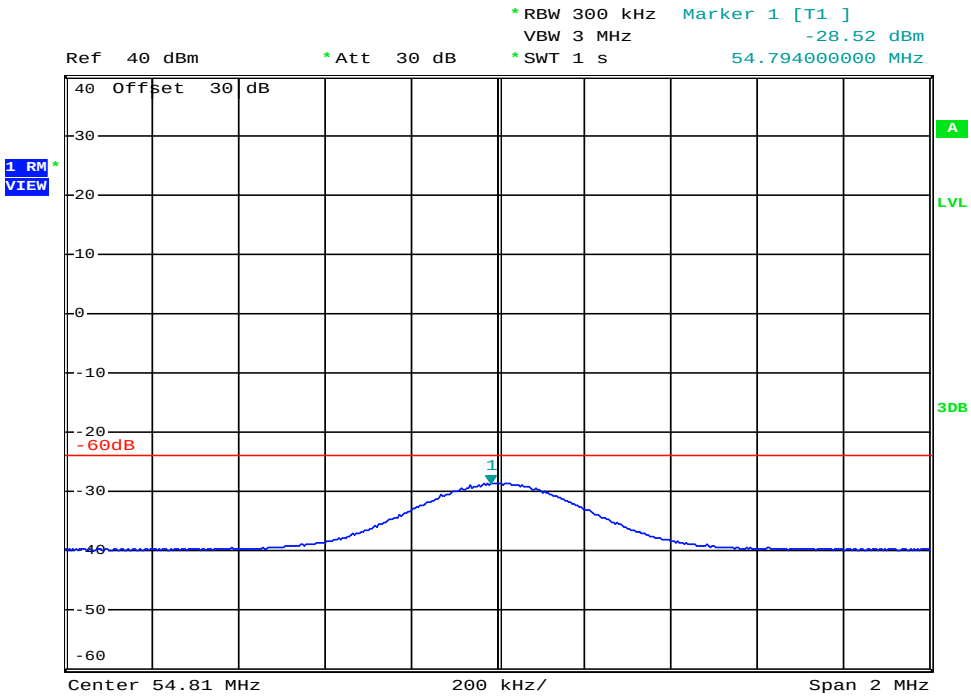


Date: 28.OCT.2019 17:54:59

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
27.405 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-34.35** dBm

Plot 10.8 – Conducted Out of Band Emissions, Channel 40, 2nd Harmonic

Conducted Spurious Emissions

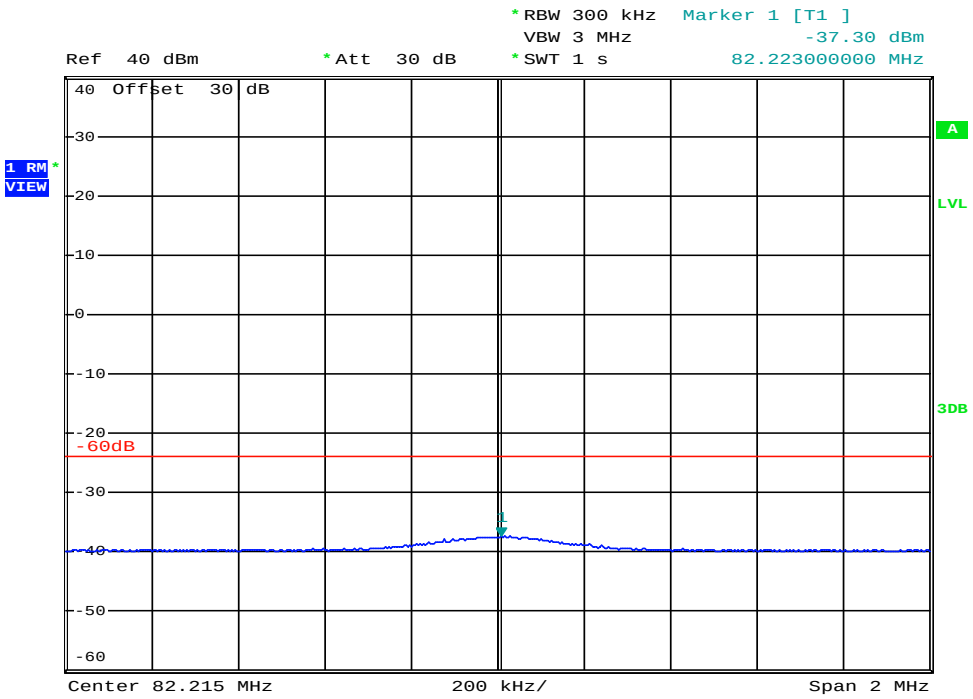


Date: 28.OCT.2019 18:07:10

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
27.405 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-28.52** dBm

Plot 10.9 – Conducted Out of Band Emissions, Channel 40, 3rd Harmonic

Conducted Spurious Emissions



Date: 28.OCT.2019 18:07:37

Channel Frequency:	Audio Input Frequency	Audio Input Amplitude
27.405 MHz	**n/a** Hz	**n/a** mV
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-37.30** dBm

Table 10.1 – Summary of Conducted Out of Band Emissions

Conducted Spurious Emissions							
Channel Frequency ***(MHz)***	**Emission Frequency** ***(MHz)***	**DUT Modulation**	**Fundamental Power [P]** ***(dBm)***	**Out of Band Emission [P_E]** ***(dBm)***	**Attenuation** ***[dB]***	**Limit** ***(dB)***	**Margin** ***(dB)***
26.965	53.93	CW	35.5	-28.8	64.4	60.0	4.36
	80.89		35.5	-37.4	73.0		12.97
27.185	54.37		35.7	-29.1	64.8		4.81
	81.55		35.7	-37.5	73.2		13.21
27.405	54.83		35.7	-28.5	64.2		4.24
	82.21		35.7	-37.3	73.0		13.02
Attenuation = P - P_E							
Margin = Limit - Attenuation							
					Result:	**Complies**	
All Spurious Emissions were evaluated to the 10th harmonic (280MHz). No other emissions were observed.							
Data for fundamental and spurious emissions presented using an RMS detector.							

11.0 RADIATED SPURIOUS EMISSIONS

Test Conditions	
Normative Reference	**FCC 47 CFR §95.979, RSS-236**

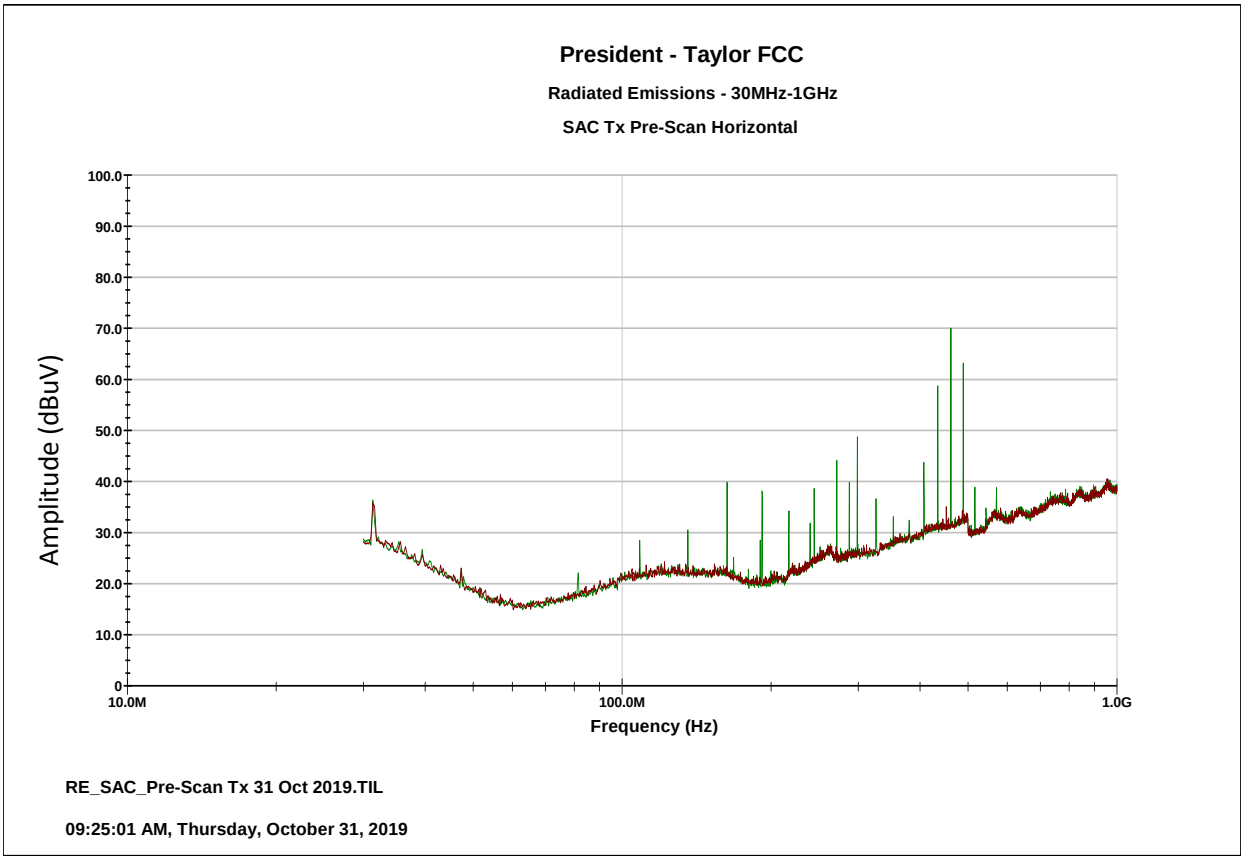
Limits	
47 CFR §95.979	Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section. (a) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table: For A3E (1), (3), (5), (6) (1) 25 dB (decibels) in the frequency band 4 kHz to 8 kHz removed from the channel center frequency; (3) 35 dB in the frequency band 8 kHz to 20 kHz removed from the channel center frequency; (5) 53 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 250% of the authorized bandwidth. (6) 60 dB in any frequency band centered on a harmonic (i.e., an integer multiple of two or more times) of the carrier frequency.
RSS-236 4.4.4	For A1D and A3E: _ At least 25 dB 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 bandwidth by more than 100% up to and including 250% of the authorized bandwidth. _ At least 53 + 10 log10 (T) dB on any frequency removed from the center of the authorized bandwidth by more than 250%. _ At least 60 dB on any frequency twice or greater than twice the fundamental frequency.

Measurement Procedure
TIA 382 22.2 Transmitter Radiated Spurious and Harmonic Emissions The transmitter shall be terminated in a non-radiating dummy load and shall be keyed but not modulated. For each spurious frequency, raise and lower the receiver antenna to obtain a maximum reading on the FIM with the antenna at horizontal polarity. Then the turntable should be rotated to further increase this maximum reading. Repeat this procedure of raising and lowering the antenna and rotating the turntable until the highest possible signal has been obtained. The effect of the simulated accessory connections shall be noted, so that the measurement series producing the maximum radiation level can be recorded.

Test Setup	Appendix A Figure A.3

Plot 11.1 – Radiated Spurious Emissions Pre-Scan, 30MHz – 1000MHz, Horizontal

Radiated Spurious Emissions Pre-Scan

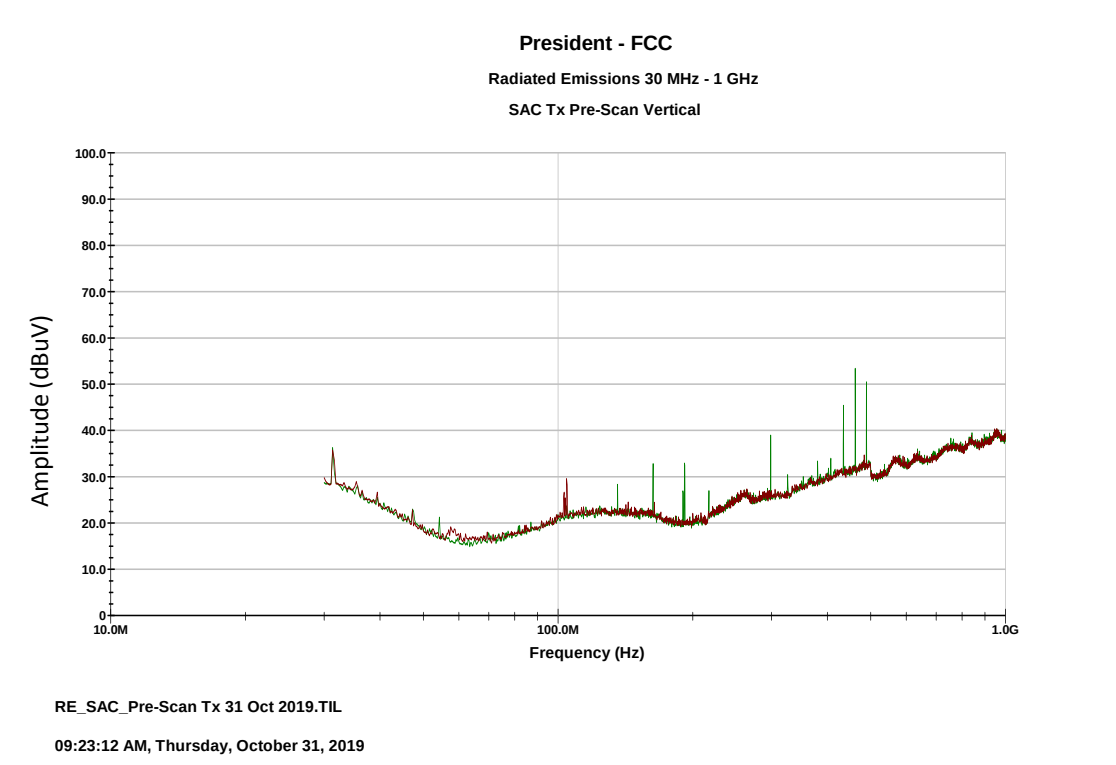


Red Trace: Ambient, Green Trace: DUT

Frequency Span:	30MHz to 1000MHz
Channel Frequency (Ch 1):	26.965MHz
Modulation:	CW
Polarization:	Horizontal

Plot 11.2 – Radiated Spurious Emissions Pre-Scan, 30MHz – 1000MHz, Vertical

Radiated Spurious Emissions Pre-Scan

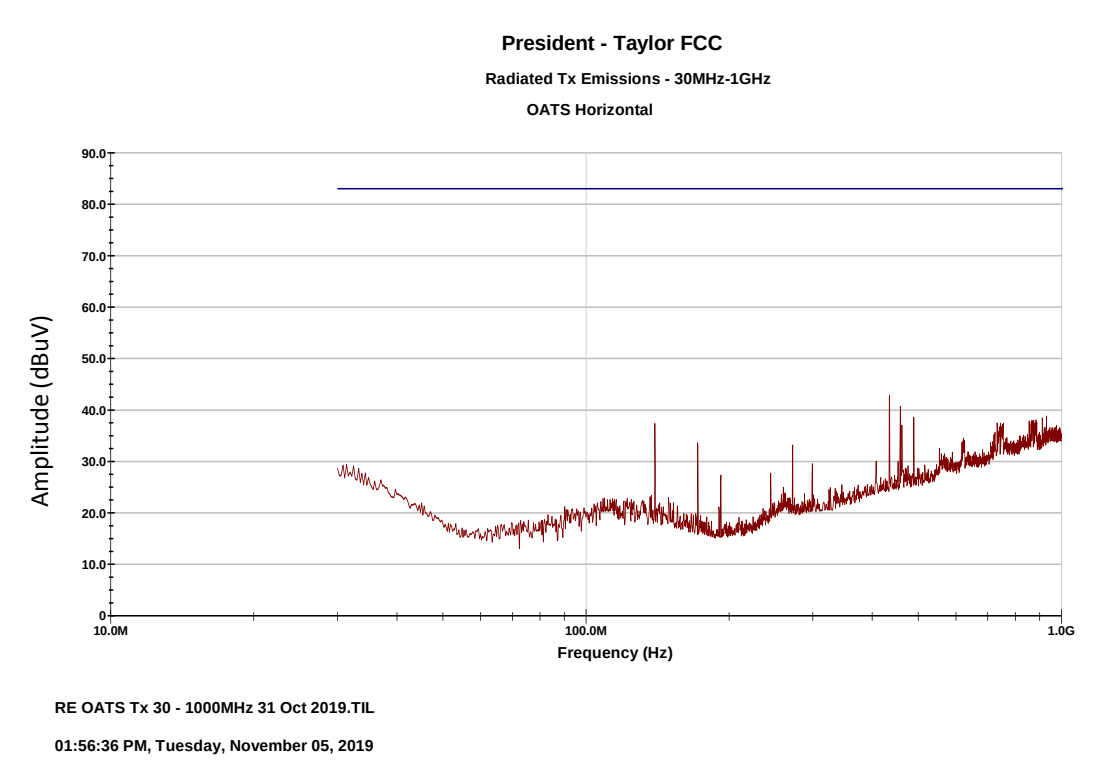


Red Trace: Ambient, Green Trace: DUT

Frequency Span:	30MHz to 1000MHz
Channel Frequency (Ch 1):	26.965MHz
Modulation:	CW
Polarization:	Vertical

Plot 11.2 – Radiated Spurious Emissions OATS, 30MHz – 1000MHz, Horizontal

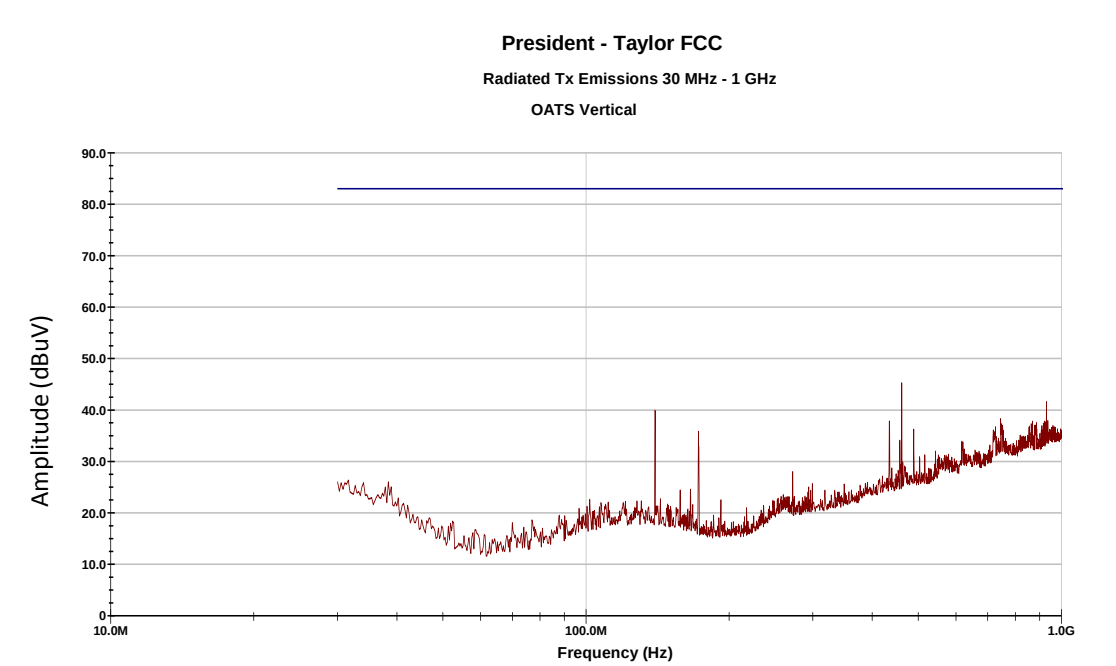
Radiated Spurious Emissions Pre-Scan



Frequency Span:	30MHz to 1000MHz
Channel Frequency (Ch 1):	26.965MHz
Modulation:	CW
Polarization:	Horizontal

Plot 11.2 – Radiated Spurious Emissions OATS, 30MHz – 1000MHz, Vertical

Radiated Spurious Emissions Pre-Scan



Frequency Span:	30MHz to 1000MHz
Channel Frequency (Ch 1):	26.965MHz
Modulation:	CW
Polarization:	Vertical

Table 11.1 – Summary of Radiated Spurious Emissions

Radiated Spurious Emissions								
Channel Frequency *(MHz)*	**Emission Frequency** *(MHz)*	**Out of Band Emission [P_E]** *(dBuV @ 3m)*	**Antenna Polarization**	**DUT Modulation**	**Fundamental Power [P]** *(dBuV)*	**Attenuation** *[dB]*	**Limit** *(dB)*	**Margin** *(dB)*
26.965	134.8	37.3	Horizontal	CW	143.0	105.7	60.0	45.70
	161.8	33.6				109.4		49.40
	269.7	33.2				109.8		49.80
	404.5	30.0				113.0		53.00
	431.4	42.8				100.2		40.20
	458.4	40.7				102.3		42.30
	485.4	38.6				104.4		44.40
	134.8	39.9	Vertical			103.1		43.10
	431.4	37.8				105.2		45.20
	458.4	45.3				97.7		37.70
	485.4	36.3				106.7		46.70
Attenuation = P - P_E Margin = Limit - Attenuation								
							Result:	**Complies**
Peak Detector compared to QP limits. Data for spurious emissions presented using a peak detector.								

12.0 FREQUENCY STABILITY

Test Conditions	
Normative Reference	**FCC 47 CFR §2.1055, §95.965, RSS-Gen**

Limits	
47 CFR §95.965	Each CBRS transmitter type must be designed such that the transmit carrier frequency (or in the case of SSB transmissions, the reference frequency) remains within 50 parts-per-million of the channel center frequencies specified in §95.963 under all normal operating conditions.

Measurement Procedure

47 CFR §2.1055 Frequency Stability

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

(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

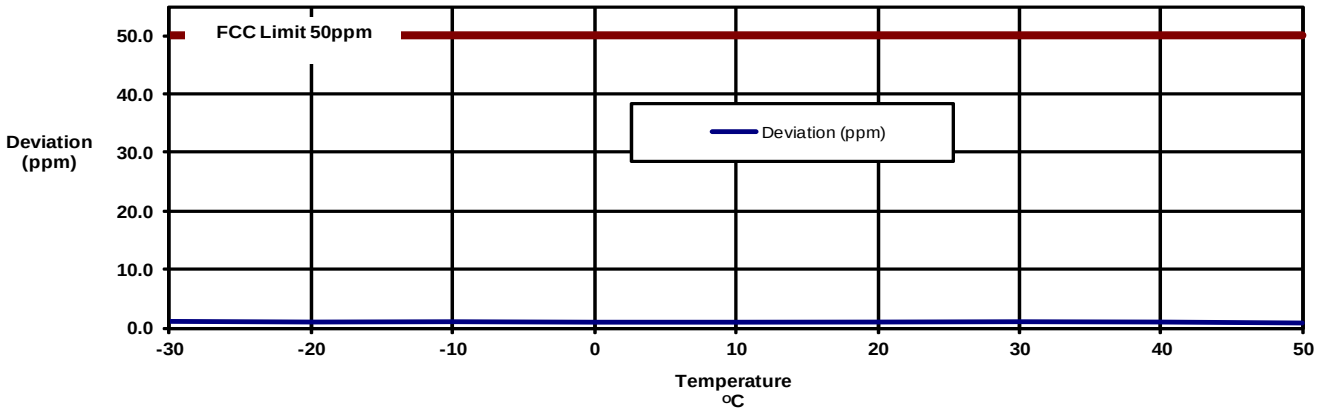
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Test Setup	Appendix A Figure A.4

Table 12.1 – Summary of Frequency Stability Results

Frequency Stability

Nominal Frequency (MHz):	27.185
Nominal Channel BW (KHz):	CW
Nominal Voltage (VDC):	13.8
Nominal Temperature (°C):	20



Frequency Stability Measurements (Temperature)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
-30	26.965000	26.965031	31	1.15
-20		26.965027	27	0.99
-10		26.965028	28	1.04
0		26.965025	25	0.94
10		26.965026	25	0.95
20		26.965027	27	1.01
30		26.965029	29	1.07
40		26.965026	26	0.97
50		26.965019	19	0.70
			Maximum Deviation:	1.15
			Maximum Limit:	50.00
			Result:	Complies

Frequency Stability Measurements (Voltage)

Voltage* (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
27.6 (115%)	26.965000	26.965027	27	1.00
13.8 (100%)		26.965025	25	0.93
11.7 (85%)		26.965026	26	0.96
			Maximum Deviation:	1.00
			Maximum Limit:	50.00
			Result:	Complies

*This device is capable of 12 or 24VDC operation.

APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT

Table A.1 – Setup - Conducted Measurements Equipment

Equipment List			
Asset Number	**Manufacturer**	**Model Number**	**Description**
00241	R&S	FSU40	Spectrum Analyzer

Figure A.1 – Test Setup Conducted Measurements

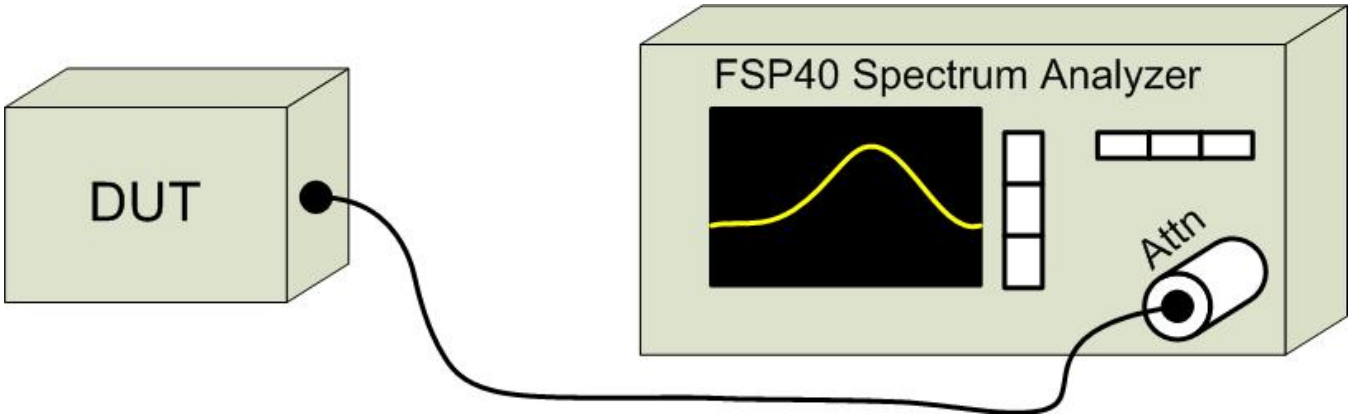


Table A.2 – Setup - Audio Modulation Equipment

Equipment List			
Asset Number	**Manufacturer**	**Model Number**	**Description**
00028	HP	8901A	Modulation Analyzer
00027	HP	8903B	Audio Analyzer/Generator

Figure A.2 – Test Setup Audio Modulation Response Measurements

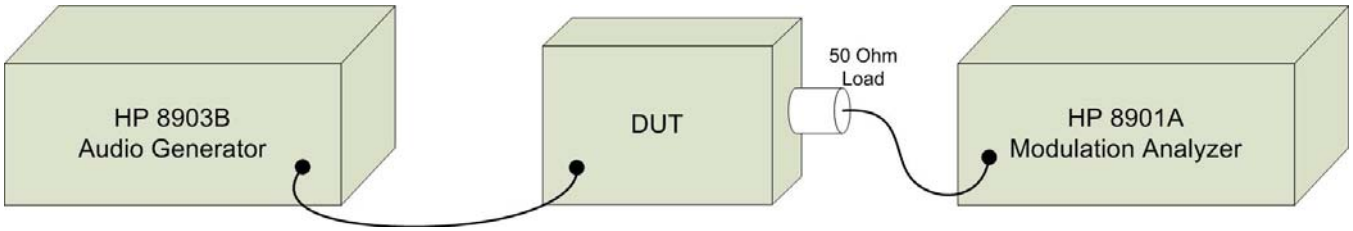


Table A.3 – Setup - Radiated Emissions Equipment

Equipment List			
Asset Number	**Manufacturer**	**Model Number**	**Description**
00051	HP	8566B	Spectrum Analyzer
00049	HP	85650A	Quasi-peak Adapter
00047	HP	85685A	RF Preselector
00072	EMCO	2075	Mini-mast
00073	EMCO	2080	Turn Table
00071	EMCO	2090	Multi-Device Controller
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier
00241	R&S	FSU40	Spectrum Analyzer
00050	Chase	CBL-6111A	Bilog Antenna
00275	Coaxis	LMR400	25m Cable
00276	Coaxis	LMR400	4m Cable
00278	TILE	34G3	TILE Test Software
00034	ETS	3115	Double Ridged Guide Horn

CNR: Calibration Not Required
COU: Calibrate On Use

Figure A.3 – Test Setup Radiated Emissions Measurements

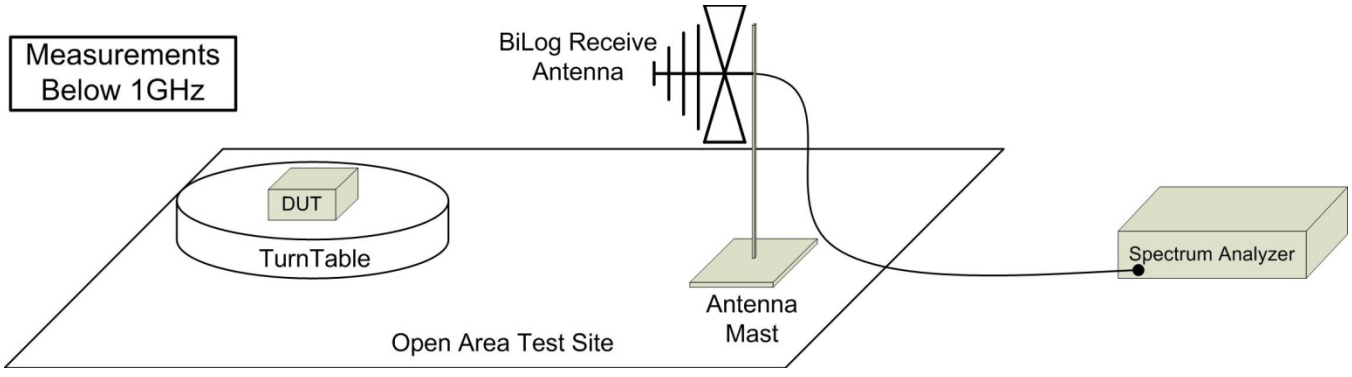
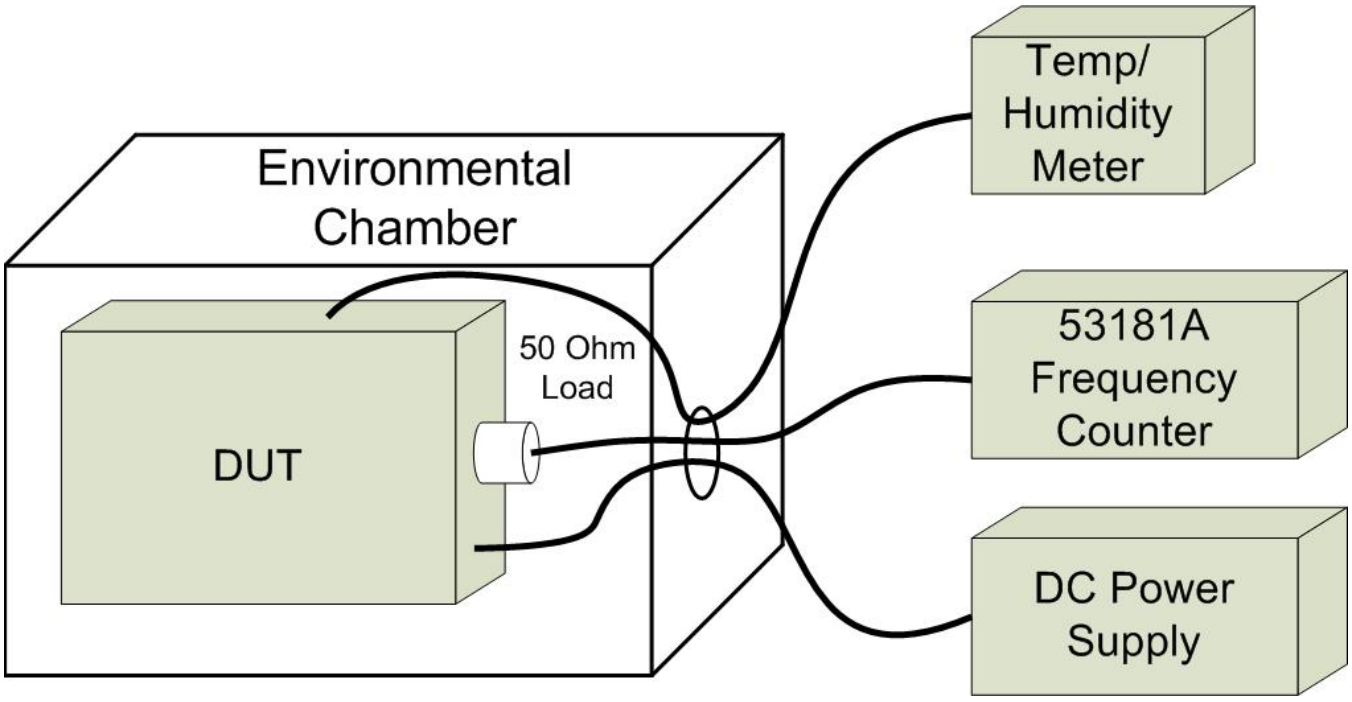


Table A.4 – Setup - Frequency Stability Measurement Equipment

Equipment List			
Asset Number	**Manufacturer**	**Model Number**	**Description**
n/a	ESPEC	ECT-2	Environmental Chamber
00003	HP	53181A	Frequency Counter
n/a	HP	E3611A	Power Supply
00234	VWR	61161-378	Temp/Humidity Meter

Figure A.4 – Test Setup Frequency Stability Measurements



APPENDIX B – EQUIPMENT LIST AND CALIBRATION

Equipment List

(*)	Asset Number	Manufacturer	Model Number	Serial Number	Description	Last Calibrated	Calibration Interval	Calibration Due
*	00050	Chase	CBL-6111A	1607	Bilog Antenna	3 Jan 2019	Triennial	3 Jan 2022
*	00047	HP	85685A	2837A00826	RF Preselector	23 Jun 2017	Triennial	23 Jun 2020
*	00049	HP	85650A	2043A00162	Quasi-peak Adapter	23 Jun 2017	Triennial	23 Jun 2020
*	00051	HP	8566B	2747A05510	Spectrum Analyzer	23 Jun 2017	Triennial	23 Jun 2020
*	00223	HP	8901A	3749A07154	Modulation Analyzer	27 Dec 2017	Triennial	27 Dec 2020
*	00224	HP	8903B	3729A18691	Audio Analyzer	28 Dec 2017	Triennial	28 Dec 2020
*	00241	R&S	FSU40	100500	Spectrum Analyzer	15 May 2018	Triennial	15 May 2021
*	00005	HP	8648D	3847A00611	Signal Generator	21 Jun 2017	Triennial	21 Jun 2020
*	00003	HP	53181A	3736A05175	Frequency Counter	21 Jun 2017	Triennial	21 Jun 2020
*	00072	EMCO	2075	0001-2277	Mini-mast	n/a	n/a	n/a
*	00073	EMCO	2080	0002-1002	Turn Table	n/a	n/a	n/a
*	00081	ESPEC	ECT-2	0510154-B	Environmental Chamber	NCR	n/a	CNR
*	00234	VWR	61161-378	140320430	Temp/Humidity Meter	New	Triennial	New
*	00201	HP	E3611A	KR83015294	DC Power Supply	COU	n/a	COU
*	00275	TMS	LMR400	n/a	25m Cable	COU	n/a	COU
*	00276	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
*	00277	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
*	00278	TILE	34G3	n/a	TILE Test Software	NCR	n/a	NCR

* Used during the course of this investigation
NCR: No Calibration Required
COU: Calibrate On Use

APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY

CISPR 16-4 Measurement Uncertainty (U_{LAB})	
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence interval using a coverage factor of k=2	
30MHz - 200MHz	
U_{LAB} = 5.14dB U_{CISPR} = 6.3dB	
200MHz - 1000MHz	
U_{LAB} = 5.90dB U_{CISPR} = 6.3dB	
1GHz - 6GHz	
U_{LAB} = 4.80dB U_{CISPR} = 5.2dB	
6GHz - 18GHz	
U_{LAB} = 5.1dB U_{CISPR} = 5.5dB	
If the calculated uncertainty **U_{lab}** is **less** than **U_{CISPR}** then:	
1	Compliance is deemed to occur if **NO** measured disturbance exceeds the disturbance limit
2	Non-Compliance is deemed to occur if **ANY** measured disturbance **EXCEEDS** the disturbance limit
If the calculated uncertainty **U_{lab}** is **greater** than **U_{CISPR}** then:	
3	Compliance is deemed to occur if **NO** measured disturbance, increased by (**U_{lab} - U_{CISPR}**), exceeds the disturbance limit
4	Non-Compliance is deemed to occur if **ANY** measured disturbance, increased by (**U_{lab} - U_{CISPR}**), **EXCEEDS** the disturbance limit

