Test Report Serial Number:	**45461687 R1.0**
Test Report Date:	**4 November 2021**
Project Number:	**1561**

EMC Test Report - New Filing

Applicant:

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

FCC ID:	IC Registration Number
2AEOCPC208	**-**
Product Model Number / HVIN	**Product Name / PMN**
THOMAS FCC	**-**

In Accordance With:

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

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**

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1.0 DOCUMENT CONTROL

Revision History					
Samples Tested By:	Art Voss, P.Eng.		**Date(s) of Evaluation:**	19 - 27 October 2021	
Report Prepared By:	Art Voss, P.Eng.		**Report Reviewed By:**	Art Voss	
Report Revision	**Description of Revision**		**Revised Section**	**Revised By**	**Revision Date**
0.1	Draft Release		n/a	Art Voss	3 November 2021
1.0	Initial Release		n/a	Art Voss	4 November 2021

2.0 CLIENT AND DUT INFORMATION

Client Information		
Applicant Name (FCC)	**President Electronics USA**	
Applicant Address (FCC)	1007 Collier Center Way	
	Naples, FL, 34110	
	USA	
Applicant Name (ISED)		
Applicant Address (ISED)		
DUT Information		
Device Identifier(s):	**FCC ID:**	**2AEOCPC208**
	IC ID:	**-**
Device Type:	Citizen's Band AM/FM Transceiver	
Device Model(s) / HVIN:	Thomas FCC	
Device Marketing Name / PMN:	-	
Firmware Version ID Number / FVIN:	-	
Host Marketing Name / HMN:	-	
Test Sample Serial No.:	TA #1	
Equipment Class (FCC):	Licensed Non-Broadcast Station Transmitter (TNB)	
Transmit Frequency Range:	26.965MHz - 27.405MHz	
Test Channels:	40 Channels	
Manuf. Max. Rated Output Power:	4W (36dBm)	
Manuf. Max. Rated BW/Data Rate:	8kHz	
Antenna Make and Model:	n/a	
Antenna Type and Gain:	0dBi (Typical), 3dBi (Max)	
Modulation:	AM/FM	
Mode:	Simplex	
Emission Designator:	See Section 8.0	
DUT Power Source:	12 - 24VDC	
DUT Dimensions [HxWxL]	43mm x 125mm x 200	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

3.0 SCOPE

Preface:

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.

Device Description:

The Thomas FCC is a mobile AM/FM Citizen's Band 4W transceiver.

Application:

This is an application for a New Certification, Single.

Regulatory Requirement:

As per FCC 47 CFR 2 Subpart I and the Radiocommunication Regulations of Canada, Equipment Authorization is require for this *Equipment* by means of Certification in accordance with FCC 47 CFR §95 Subpart D, CBRS.

Scope of Work:

The scope of this investigation is limited only to the evaluation of the Thomas FCC to determine compliance to the *Rules* identified herein.

RF Exposure:

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

4.0 TEST RESULT SUMMARY

TEST SUMMARY

Referenced Standard(s):		FCC CFR Title 47 Parts 2, 95D, 15B			
Section	**Description of Test**	**Procedure Reference**	**Applicable Rule Part(s) FCC**	**Test Date**	**Result**
7.0	Conducted Power (Fundamental) Compliance to §2.1033(c)(8)	ANSI/TIA/EIA-382-A ANSI/TIA-603-E ANSI C63.10:2013 ANSI C63.4:2014	§2.1046 §2.1033(c)(8) §95.967	19 Oct 2021	**Complies**
8.0	Modulation Response	ANSI/TIA/EIA-382-A ANSI/TIA-603-E ANSI C63.10:2013 ANSI C63.4:2014	§2.1047 §95.975 §95.977	19 Oct 2021	**Complies**
9.0	Occupied Bandwidth	ANSI/TIA/EIA-382-A ANSI C63.10:2013 ANSI C63.4:2014	§2.1049 §95.973	19 Oct 2021	**Complies**
	Emission Mask	ANSI/TIA/EIA-382-A ANSI C63.10:2013 ANSI C63.4:2014	§2.1049 §95.979	19 Oct 2021	**Complies**
10.0	Conducted TX Spurious Emissions	ANSI/TIA/EIA-382-A ANSI C63.10:2013 ANSI C63.4:2014	§2.1051 §95.979	19 Oct 2021	**Complies**
11.0	Radiated TX Spurious Emissions	ANSI/TIA/EIA-382-A ANSI C63.10:2013 ANSI C63.4:2014	§2.1053 §95.979	27 Oct 2021	**Complies**
12.0	Radiated Receiver Emissions	ANSI C63.10:2013 ANSI C63.4:2014	§15 Subpart B §15.109(d)	27 Oct 2021	**Complies**
13.0	Frequency Stability	ANSI/TIA/EIA-382-A ANSI C63.10:2013 ANSI C63.4:2014	§2.1055 §95.965	20 Oct 2021	**Complies**

Test Station Day Log

Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
19 Oct 2021	22.3	16	101.6	**EMC**	**7, 8, 9, 10**
20 Oct 2021	22.6	17	101.2	**EMC**	**13**
27 Oct 2021	4.0	81	101.5	**TC**	**11, 12**

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

3 November 2021
Date

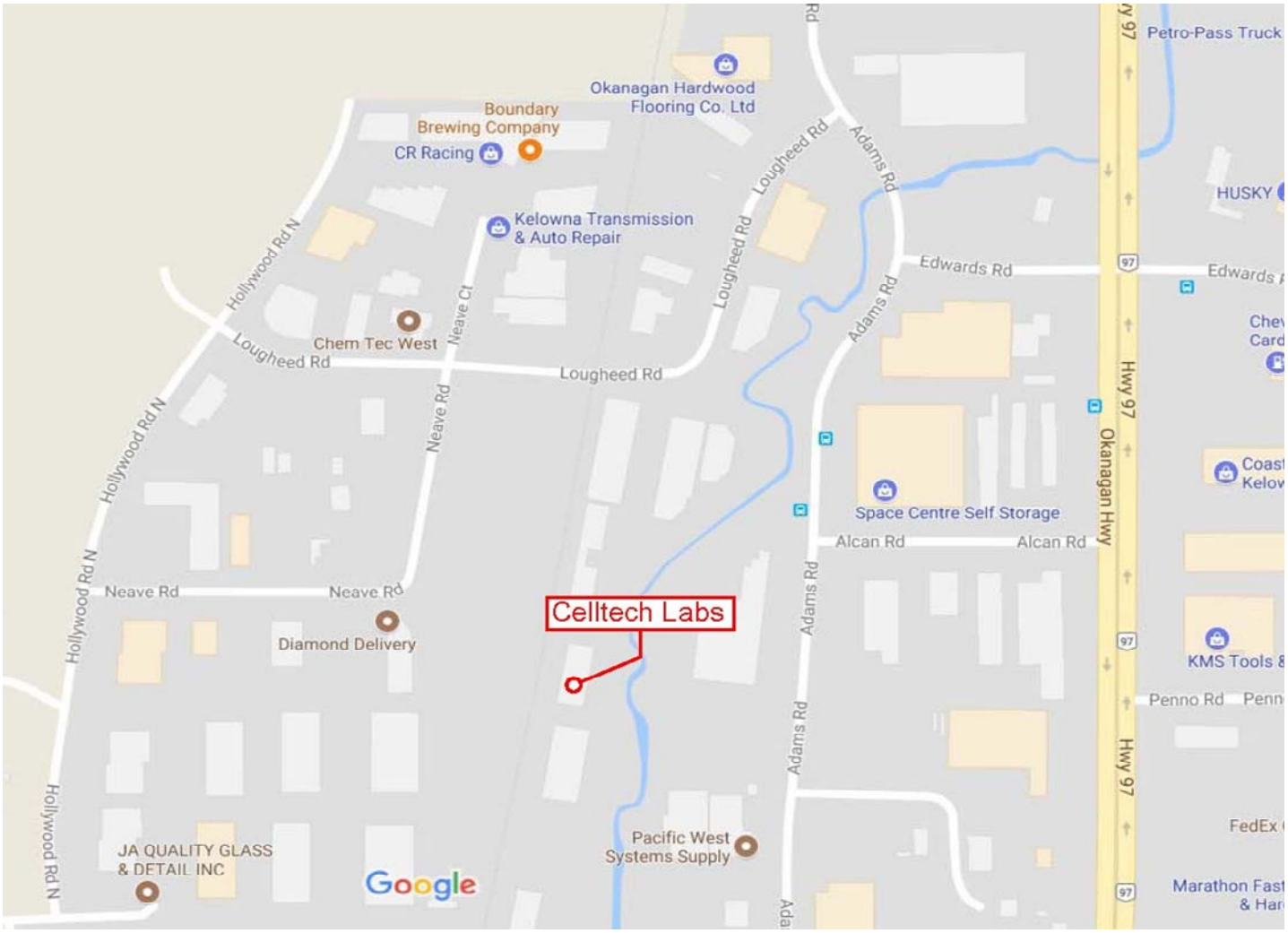
5.0 NORMATIVE REFERENCES

Normative References	
ISO/IEC 17025:2017	General requirements for the competence of testing and calibration laboratories
ANSI C63.4-2014	American National Standard of Procedures for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electric and Electronic Equipment in the Range of 9kHz to 40GHz
ANSI/TIA-382-A	Minimum Standards - Citizens Band Radio Service Amplitude Modulated (AM) Transceivers Operating in the 27 MHz Band (Revision of EIA-382)
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (Revision of TIA-603-D)
CFR Title 47: Part 2:	Code of Federal Regulations Telecommunication Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR Title 47: Part 15: Subpart B:	Code of Federal Regulations Telecommunication Radio Frequency Devices Unintentional Radiators
CFR Title 47: Part 95: Subpart D:	Code of Federal Regulations Telecommunication Personal Radio Service Citizens Band Radio Service (CBRS)

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. 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 EIA/TIA-382-A, TIA-603-E

Limits	
47 CFR §95.967	(a) When transmitting amplitude modulated (AM) voice signals or frequency modulated (FM) voice signals, the mean carrier power must not exceed 4 Watts.

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.
TIA-603-E	**2.2.1 Conducted Carrier Output Power Rating** The conducted carrier power output rating for a transmitter is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

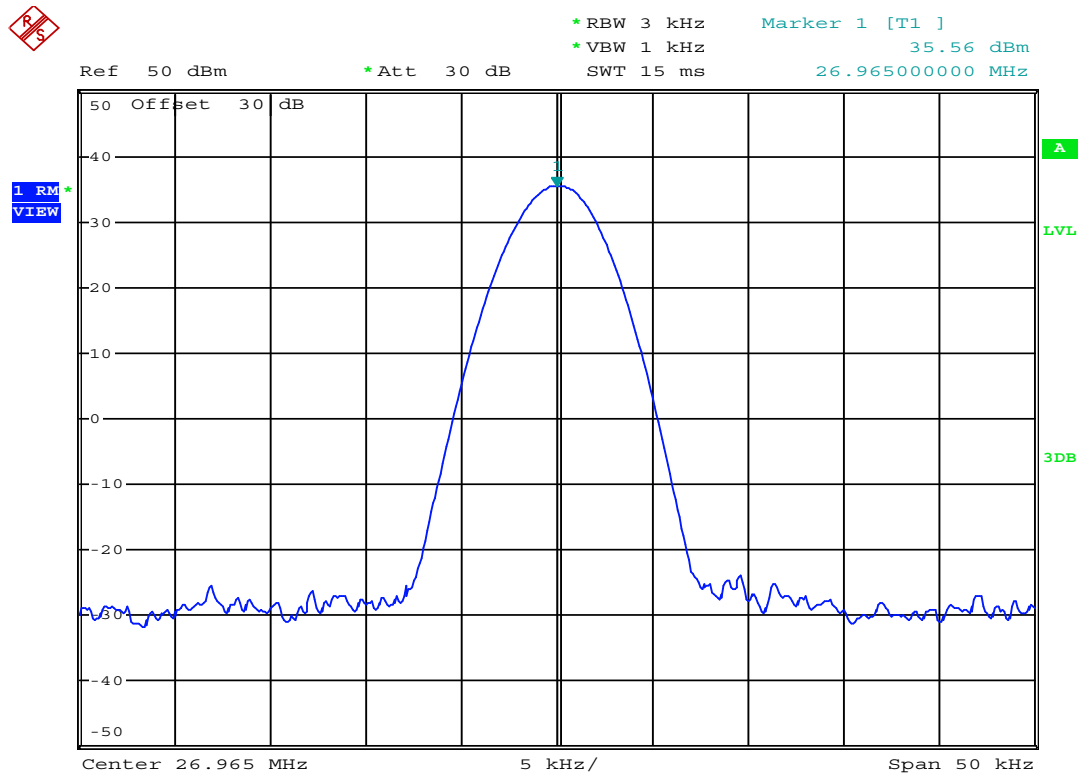
Test Setup	Appendix A - Figure A.1

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 Automatic 6dB Cursor Bandwidth measurement. The output power of the DUT was set to the manufacturer's highest output power setting at the Low, Mid and High frequency channels as permitted by the device. The DUT was set to transmit at its maximum Duty Cycle.

Plot 7.1 – Conducted Output Power, Channel 1, AM

Conducted Power:

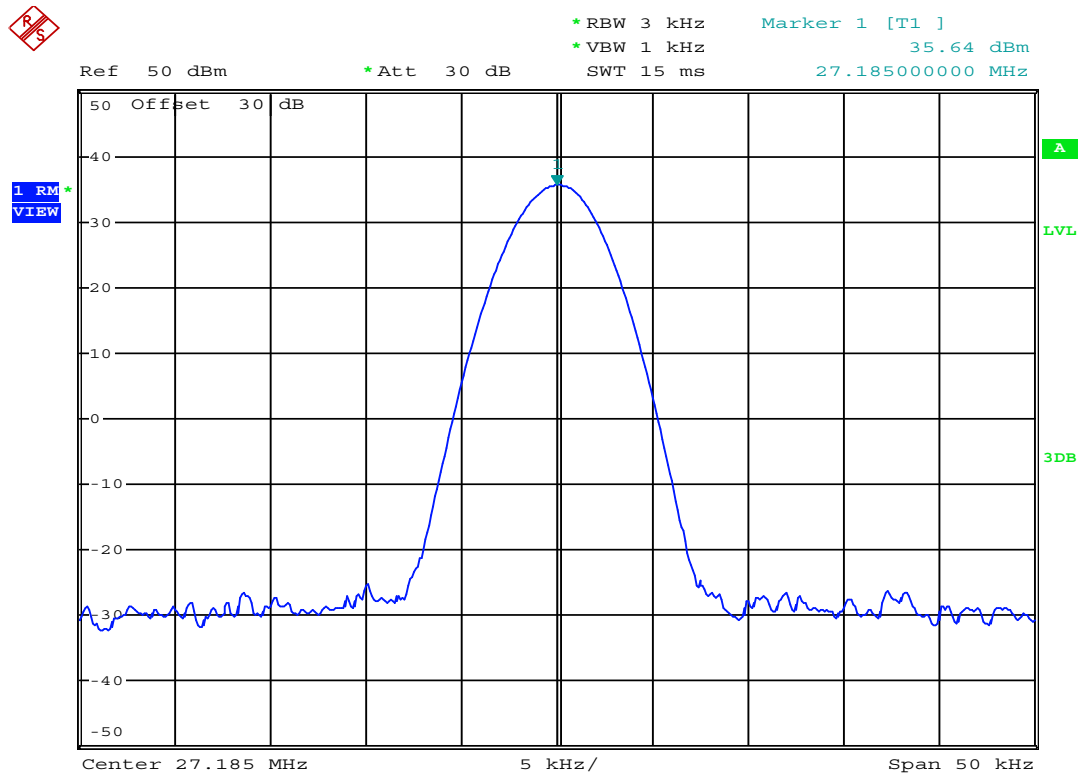


Date: 19.OCT.2021 10:10:18

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
1	26.965	AM	35.56

Plot 7.2 – Conducted Output Power, Channel 19, AM

Conducted Power:

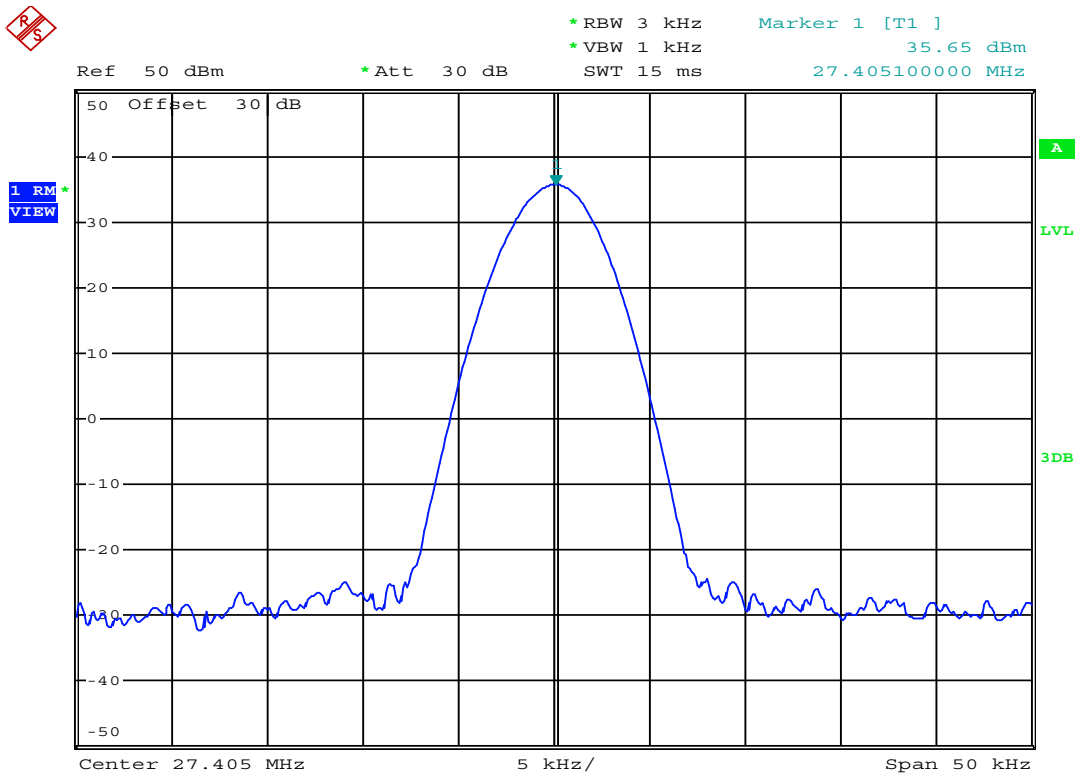


Date: 19.OCT.2021 10:12:55

Channel Number	Channel Frequency (MHz)	Modulation	Conducted Power (dBm)
19	27.185	AM	35.64

Plot 7.3 – Conducted Output Power, Channel 40, AM

Conducted Power:

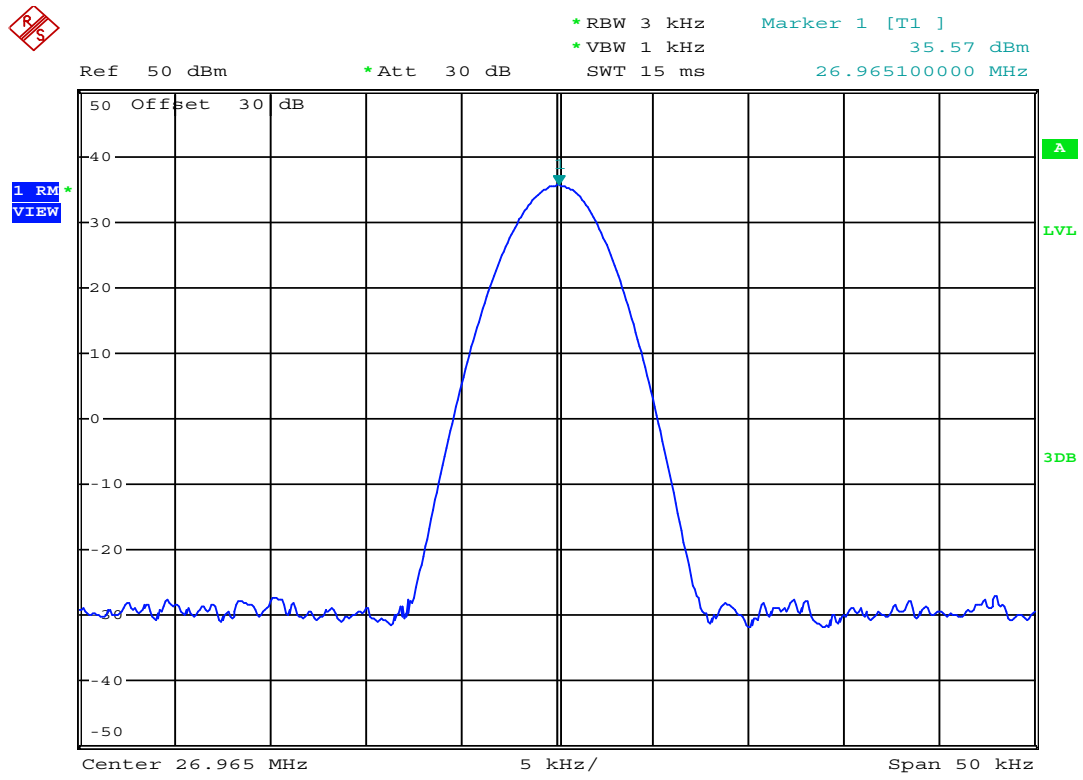


Date: 19.OCT.2021 10:11:53

Channel Number	Channel Frequency (MHz)	Modulation	Conducted Power (dBm)
40	27.405	AM	35.65

Plot 7.4 – Conducted Output Power, Channel 1, FM

Conducted Power:

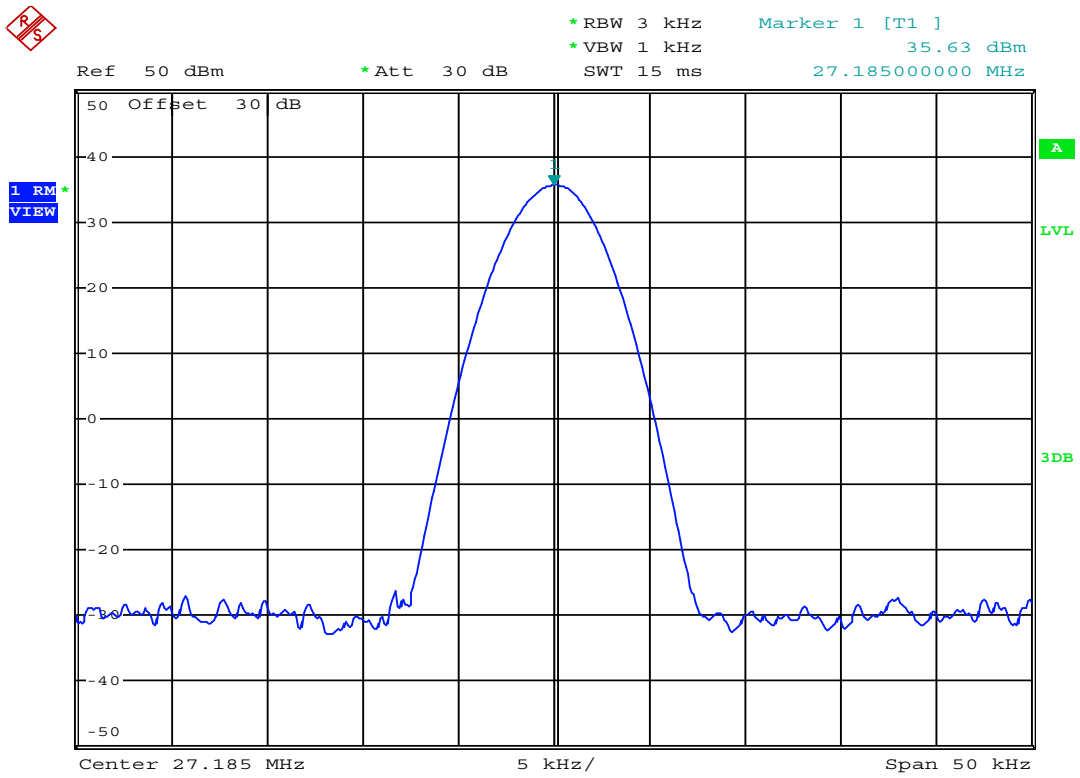


Date: 19.OCT.2021 11:16:07

Channel Number	Channel Frequency (MHz)	Modulation	Conducted Power (dBm)
1	26.965	FM	35.57

Plot 7.5 – Conducted Output Power, Channel 19, FM

Conducted Power:

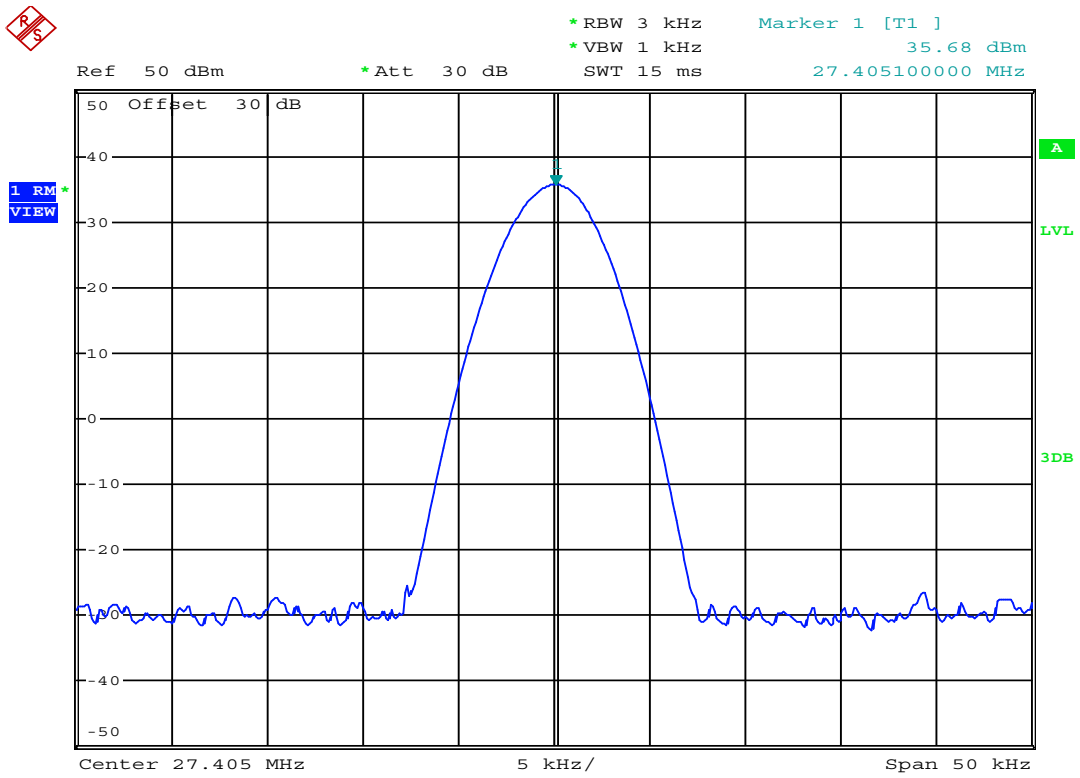


Date: 19.OCT.2021 11:15:05

Channel Number	Channel Frequency (MHz)	Modulation	Conducted Power (dBm)
19	27.185	FM	35.63

Plot 7.6 – Conducted Output Power, Channel 40, FM

Conducted Power:



Date: 19.OCT.2021 11:16:56

Channel Number	Channel Frequency (MHz)	Modulation	Conducted Power (dBm)
40	27.405	FM	35.68

Table 7.1 – Summary of Conducted Power Measurements (RMS)

Conducted Power Measurement Results:					
Channel Number	Frequency (MHz)	Modulation	Measured Power [P_{Meas}] (dBm)	Limit [P_{Lim}] (dBm)	Margin (dB)
1	26.965	AM	35.560	36	0.4
19	27.185		35.640		0.4
40	27.405		35.650		0.4
1	26.965	FM	35.570		0.4
19	27.185		35.630		0.4
40	27.405		35.680		0.3
				Result:	Complies

Table 7.2 – Compliance to §2.1033(c)(8) – 13.8VDC, AM

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.16A
Measured Total Current:	ITx = 1.45A
Transmitter Current (ITx - IRx):	IXmitter = 1.29A
Power to Transmitter:	(13.8VDC)(1.29) = 17.8W
Result:	Complies

Table 7.3 – Compliance to §2.1033(c)(8) – 13.8VDC, FM

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.16A
Measured Total Current:	ITx = 1.45A
Transmitter Current (ITx - IRx):	IXmitter = 1.29A
Power to Transmitter:	(13.8VDC)(1.29) = 17.8W
Result:	Complies

Table 7.4 – Compliance to §2.1033(c)(8) – 27.6VDC, AM

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.09A
Measured Total Current:	ITx = 0.77A
Transmitter Current (ITx - IRx):	IXmitter = 0.68A
Power to Transmitter:	(27.6VDC)(0.68) = 18.8W
Result:	Complies

Table 7.5 – Compliance to §2.1033(c)(8) – 27.6VDC, FM

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.09A
Measured Total Current:	ITx = 0.77A
Transmitter Current (ITx - IRx):	IXmitter = 0.68A
Power to Transmitter:	(27.6VDC)(0.68) = 18.8W
Result:	Complies

8.0 MODULATION RESPONSE

Test Conditions	
Normative Reference	**FCC 47 CFR §2.1047, §95.975**

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%. (c) When emission type F3E is transmitted the peak frequency deviation shall not exceed ±2 kHz.

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-603-E	**2.2.6 Audio Frequency Response** 2.2.6.2.1 Constant deviation test method (300 Hz to 3000 Hz) a) Connect the equipment as illustrated. b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤50 Hz to ≥15,000 Hz. Turn the de-emphasis function off. c) Set the DMM to measure rms voltage. d) Adjust the transmitter per the manufacturer's procedure for full rated system deviation. e) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation. f) Set the test receiver to measure rms deviation and record the deviation reading. g) Record the DMM reading as V_{REF} . h) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz. i) Vary the audio frequency generator output level until the deviation reading that was recorded in step f) is obtained. j) Record the DMM reading as V_{FREQ} . k) Calculate the audio frequency response at the present frequency as: audio frequency response= $20\text{Log}(V_{FREQ}/V_{REF})$

Statement - Compliance to §95.977

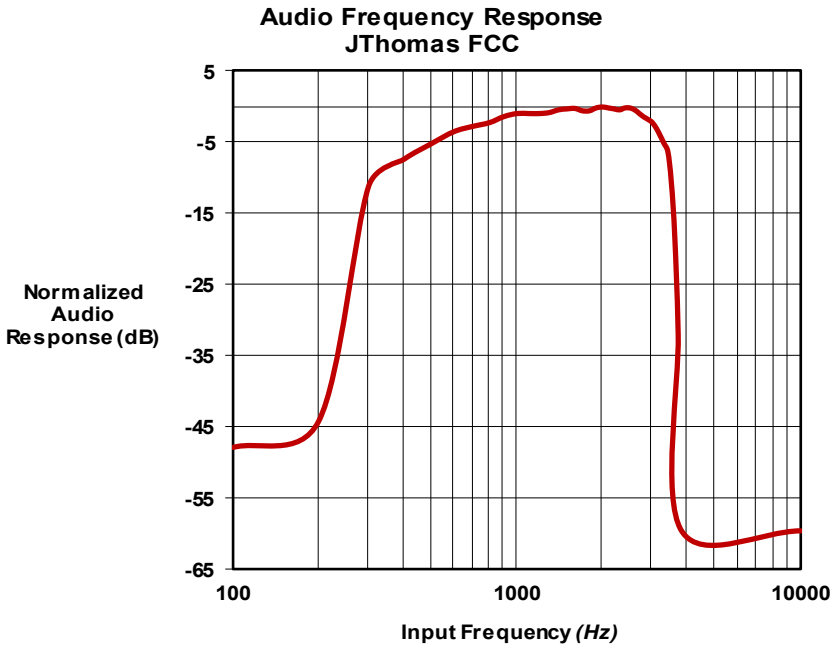
§95.977 CBRS tone transmissions.
In addition to the tones permitted under §95.377, CBRS transmitter types may be designed to transmit brief tones to indicate the beginning or end of a transmission.

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, AM

Audio Frequency and Low Pass Filter Response (AM)

Measured Audio Response		
Freq	Audio Response (@ 50% MI)	
(Hz)	(mV)	(dB)*
100	1550.00	-47.959
200	1020.00	-44.324
300	22.50	-11.196
400	14.50	-7.380
500	11.25	-5.175
600	9.25	-3.475
700	8.50	-2.741
800	8.00	-2.214
900	7.25	-1.359
1000	6.90	-0.929
1100	6.90	-0.929
1200	6.90	-0.929
1300	6.80	-0.802
1400	6.50	-0.410
1500	6.40	-0.276
1600	6.35	-0.208
1700	6.60	-0.543
1800	6.60	-0.543
1900	6.30	-0.139
2000	6.20	0.000
2100	6.30	-0.139
2200	6.40	-0.276
2300	6.50	-0.410
2400	6.30	-0.139
2500	6.30	-0.139
2600	6.50	-0.410
2700	6.90	-0.929
2800	7.30	-1.419
2900	7.60	-1.768
3000	8.00	-2.214
3100	8.80	-3.042
3200	9.90	-4.065
3300	11.25	-5.175
3400	12.75	-6.262
3500	21.00	-10.597
3600	52.00	-18.472
3700	250.00	-32.111
3800	6000.00	-59.715
10000	6000.00	-59.715
* Normalize to 2000Hz		

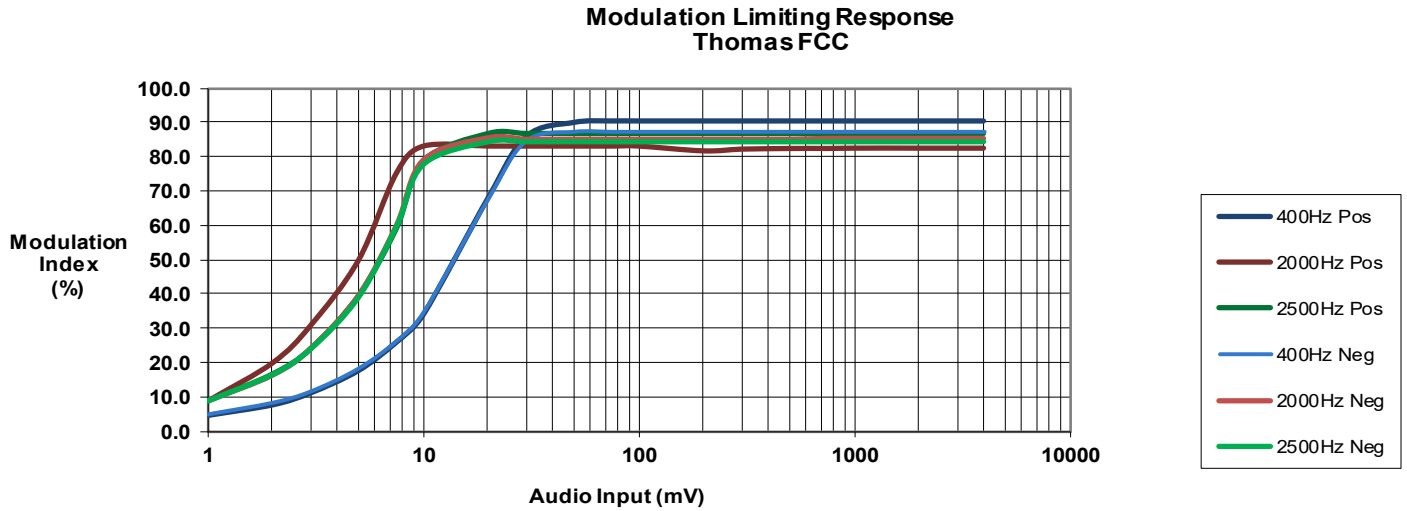


Note: 50% MI could not be achieved above 3700Hz.

Audio Frequency at -6dB Attenuation:	3350Hz
Result:	Complies

Plot 8.2 – Modulation Limiting Response, AM

Modulation Limiting Response (AM)



Measured Modulation Response [Modulation Index (%)]

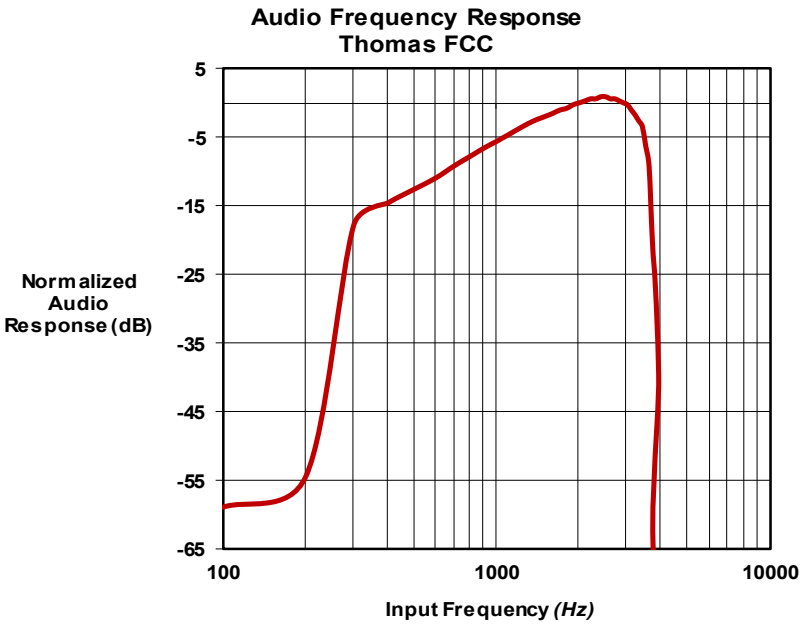
Freq (Hz)	Audio Input (mV)																			
	1	2	3	5	7.5	10	20	30	50	75	100	200	300	500	750	1000	2000	3000	4000	Deviation
400	4.7	7.8	11.3	17.8	26.1	34.2	68.2	86.0	90.1	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	Positive
2000	9.0	20.1	31.0	50.0	75.3	83.0	83.0	83.0	83.0	83.0	83.0	81.6	82.1	82.3	82.3	82.4	82.4	82.4	82.4	
2500	8.6	16.5	24.0	39.5	59.2	78.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	
400	4.6	8.0	11.3	17.9	25.9	34.1	67.3	84.3	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	Negative
2000	9.0	16.5	24.2	39.6	60.0	78.8	85.2	84.8	84.8	84.8	84.8	84.8	84.8	84.8	85.0	85.0	85.0	85.0	85.0	
2500	8.8	16.5	24.0	39.1	59.8	77.8	84.4	84.4	84.4	84.4	84.4	84.4	84.4	84.4	84.4	84.4	84.4	84.4	84.4	

Audio Frequency @ Maximum Deviation:	2000Hz
Audio Input @ Maximum Deviation:	6.20mV
Maximum Measured Modulation Index:	90.5%
Result:	Complies

Plot 8.3 – Audio Frequency and Low Pass Filter Response, FM

Audio Frequency and Low Pass Filter Response (FM)

Measured Audio Response		
Freq	Audio Response (@ 20% Deviation)	
(Hz)	*(mV)*	*(dB)**
100	1375.00	-58.959
200	825.00	-54.522
300	12.00	-17.777
400	8.30	-14.575
500	6.60	-12.584
600	5.45	-10.921
700	4.45	-9.161
800	3.80	-7.789
900	3.30	-6.564
1000	2.95	-5.590
1100	2.65	-4.658
1200	2.40	-3.798
1300	2.20	-3.042
1400	2.05	-2.428
1500	1.95	-1.994
1600	1.85	-1.537
1700	1.75	-1.054
1800	1.70	-0.802
1900	1.60	-0.276
2000	1.55	0.000
2100	1.50	0.285
2200	1.45	0.579
2300	1.45	0.579
2400	1.40	0.884
2500	1.40	0.884
2600	1.45	0.579
2700	1.45	0.579
2800	1.50	0.285
2900	1.55	0.000
3000	1.60	-0.276
3100	1.75	-1.054
3200	1.90	-1.768
3300	2.10	-2.638
3400	2.30	-3.428
3500	3.20	-6.296
3600	4.50	-9.258
3700	16.00	-20.276
3800	35.00	-27.075
3900	150.00	-39.715
4000	6000.00	-71.756
10000	6000.00	-71.756
*** Normalize to 750Hz**		



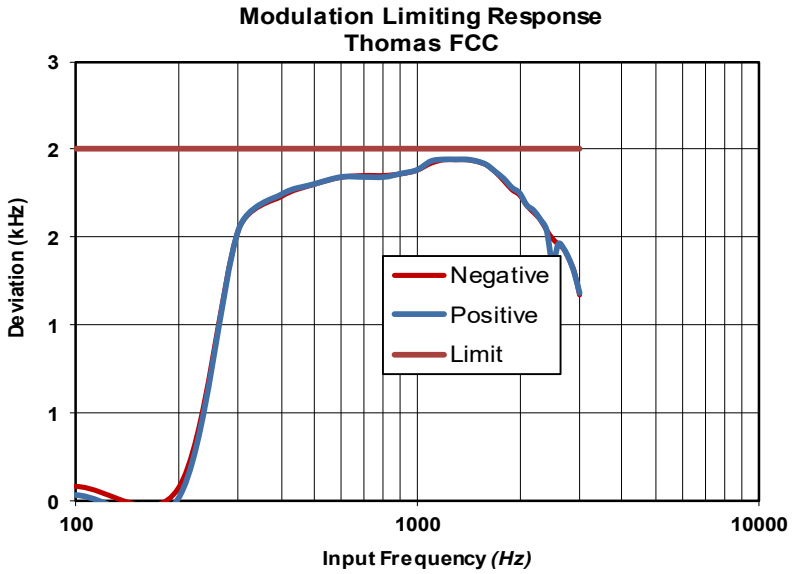
Note: 20% Deviation (+/-400Hz) could not be achieved above 3900Hz.

Audio Frequency at -6dB Attenuation:	**3450Hz**
Result:	**Complies**

Plot 8.4 – Modulation Limiting Response, FM

Modulation Limiting Response (FM)

Measured Frequency Response		
Input Freq (Hz)	Frequency Deviation (kHz)	
	Positive	*Negative*
100	0.03	0.08
200	0.01	0.07
300	1.54	1.54
400	1.74	1.73
500	1.80	1.80
600	1.84	1.84
700	1.84	1.85
800	1.84	1.85
900	1.86	1.86
1000	1.88	1.88
1100	1.93	1.92
1200	1.94	1.94
1300	1.94	1.94
1400	1.94	1.94
1500	1.93	1.93
1600	1.91	1.91
1700	1.87	1.87
1800	1.83	1.82
1900	1.78	1.77
2000	1.75	1.74
2100	1.68	1.68
2200	1.65	1.64
2300	1.60	1.60
2400	1.54	1.54
2500	1.35	1.49
2600	1.46	1.46
2700	1.43	1.43
2800	1.37	1.37
2900	1.29	1.30
3000	1.18	1.17



Audio Input Amplitued:	175mV
Maximum Deviation:	1.94kHz
Result:	Complies

9.0 OCCUPIED BANDWIDTH AND EMISSION MASKS

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

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 and FM. The authorized bandwidth for emission types A3E and F3E 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 and F3E (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.

Measurement Procedure

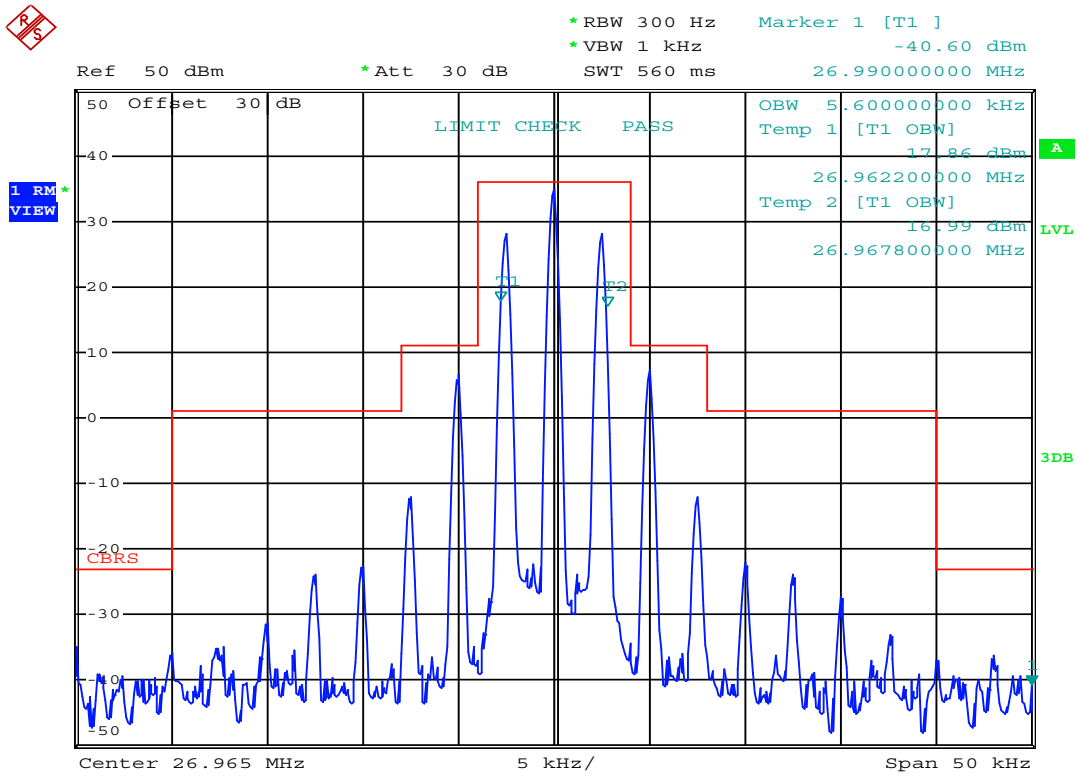
TIA 382 23.2 Transmitter Modulation Occupied Bandwidth

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, AM

Occupied Bandwidth / Emissions Mask:

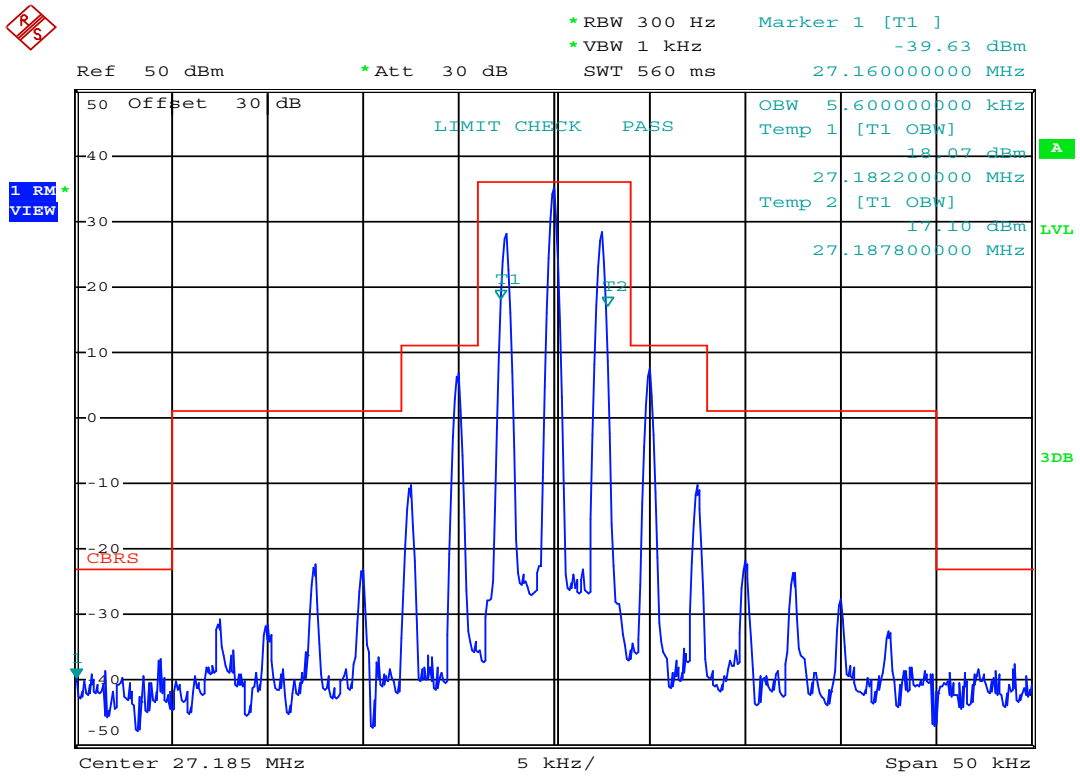


Date: 19.OCT.2021 15:00:42

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
1	26.965	AM	5.6

Plot 9.2 – Occupied Bandwidth, Channel 19, AM

Occupied Bandwidth / Emissions Mask:

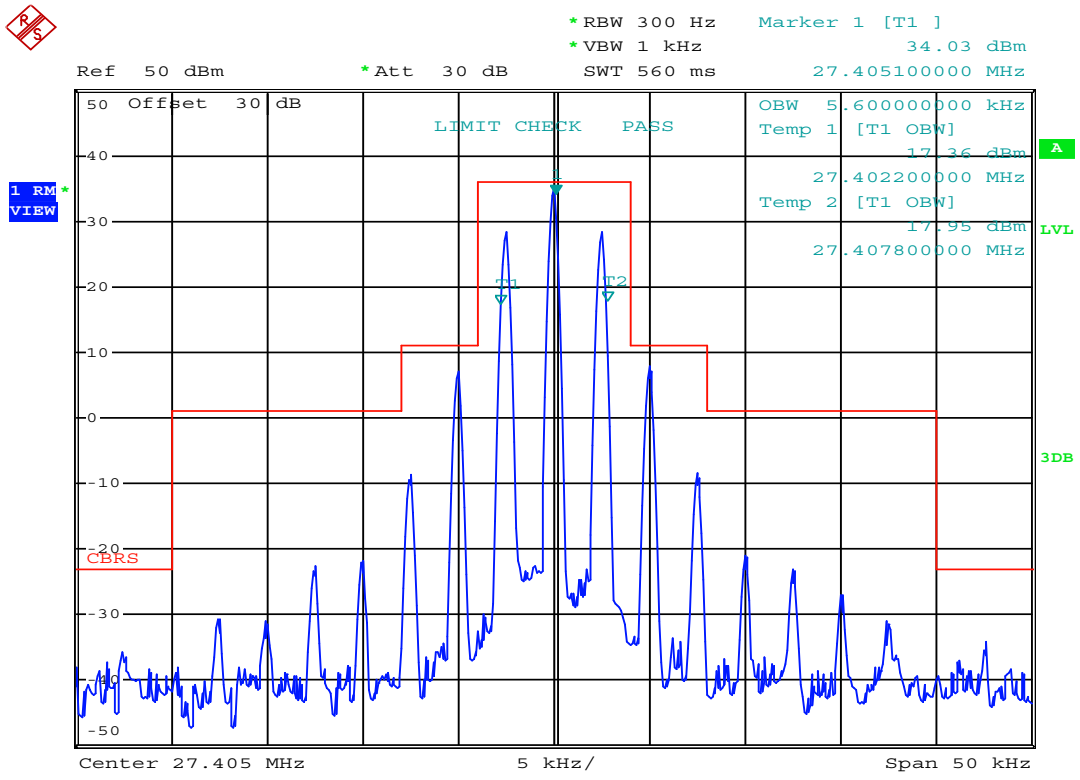


Date: 19.OCT.2021 15:01:20

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
19	27.185	AM	5.6

Plot 9.3 – Occupied Bandwidth, Channel 40, AM

Occupied Bandwidth / Emissions Mask:

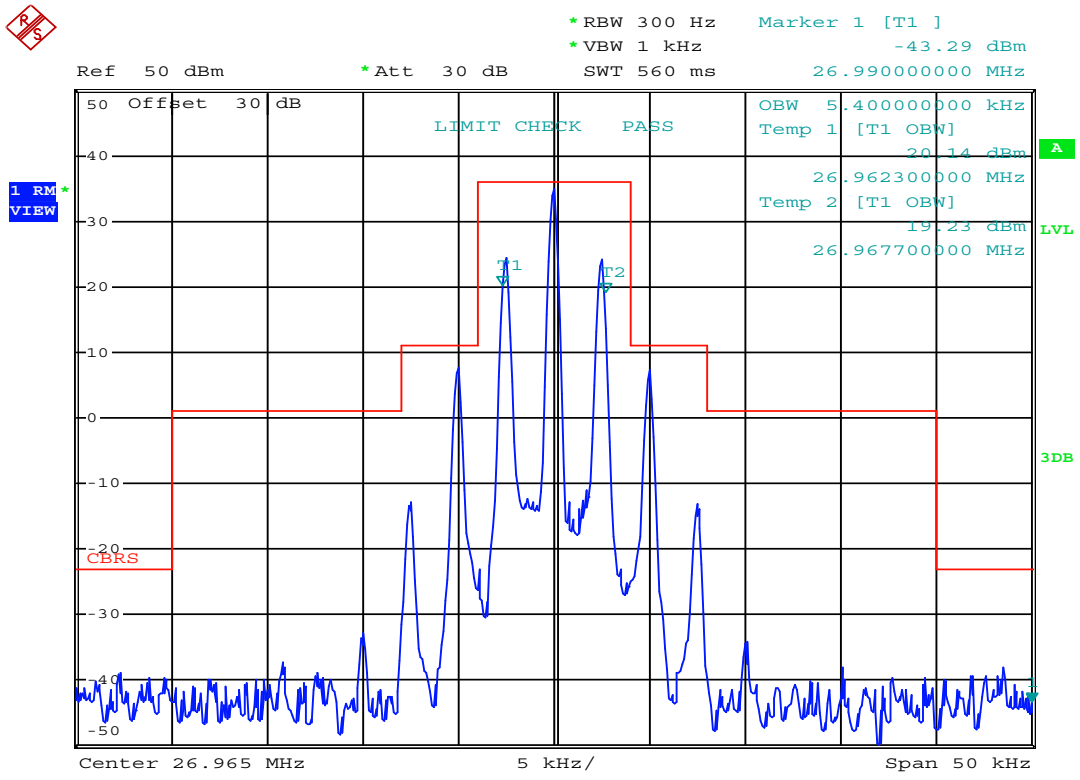


Date: 19.OCT.2021 14:59:56

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
40	27.405	AM	5.6

Plot 9.4 – Occupied Bandwidth, Channel 1, FM

Occupied Bandwidth / Emissions Mask:

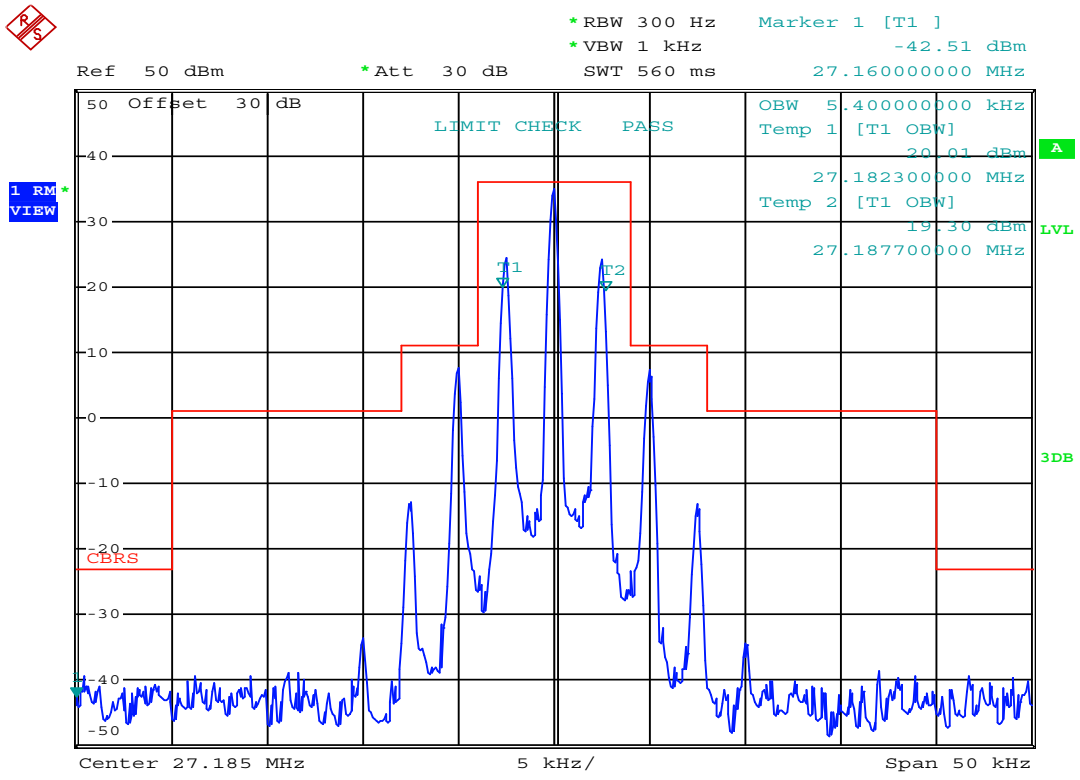


Date: 19.OCT.2021 15:07:04

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
1	26.965	FM	5.4

Plot 9.5 – Occupied Bandwidth, Channel 19, FM

Occupied Bandwidth / Emissions Mask:

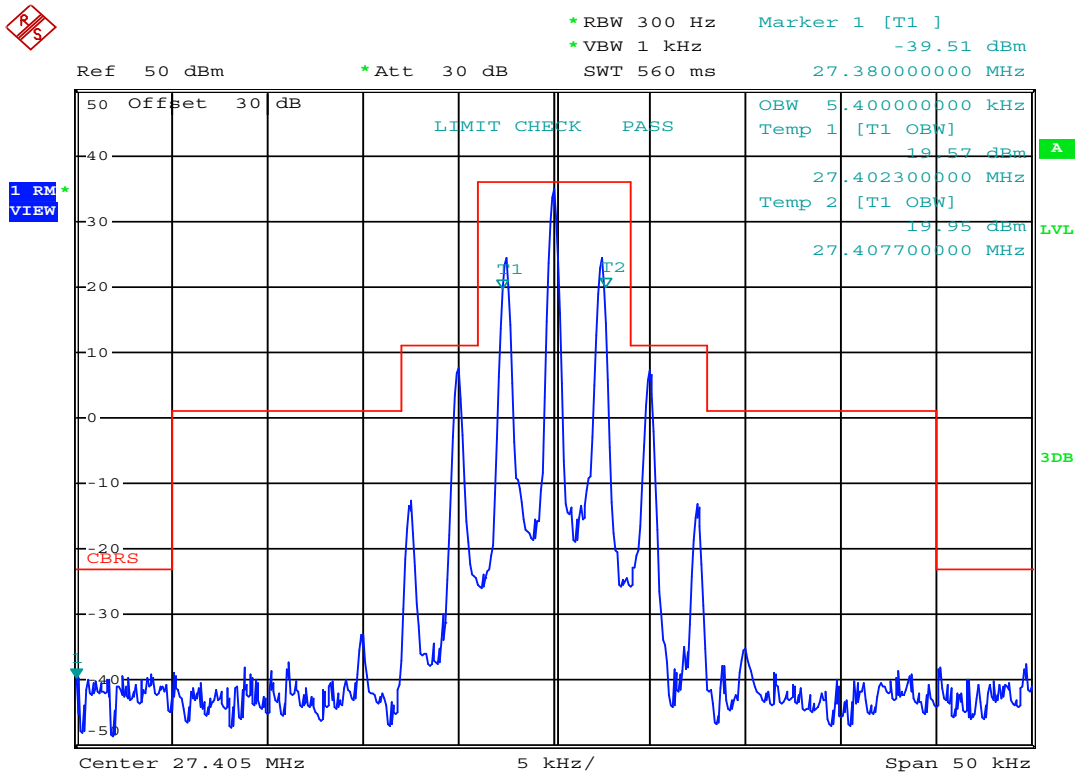


Date: 19.OCT.2021 15:06:04

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
19	27.185	FM	5.4

Plot 9.6 – Occupied Bandwidth, Channel 40, FM

Occupied Bandwidth / Emissions Mask:



Date: 19.OCT.2021 15:07:41

DUT Channel	Channel Frequency (MHz)	DUT Modulation	Occupied Bandwidth (kHz)
40	27.405	FM	5.4

Table 9.1 - Summary of Occupied Bandwidth and Emission Mask Results

Occupied Bandwidth / Emmisions Mask Results:						
Channel Number	Channel Frequency (MHz)	Modulation	Measured Occupied Bandwidth (kHz)	Limit (kHz)	Emission Designator	Emissions Mask Results
1	26.965	AM	5.6	8.0	5K60A3E	Pass
19	27.185		5.6		5K60A3E	Pass
40	27.405		5.6		5K60A3E	Pass
1	26.965	FM	5.4		5K40F3E	Pass
19	27.185		5.4		5K40F3E	Pass
40	27.405		5.4		5K40F3E	Pass
					Results:	Complies

10 CONDUCTED OUT OF BAND SPURIOUS EMISSIONS

Test Conditions	
Normative Reference	**FCC 47 CFR §95.979**

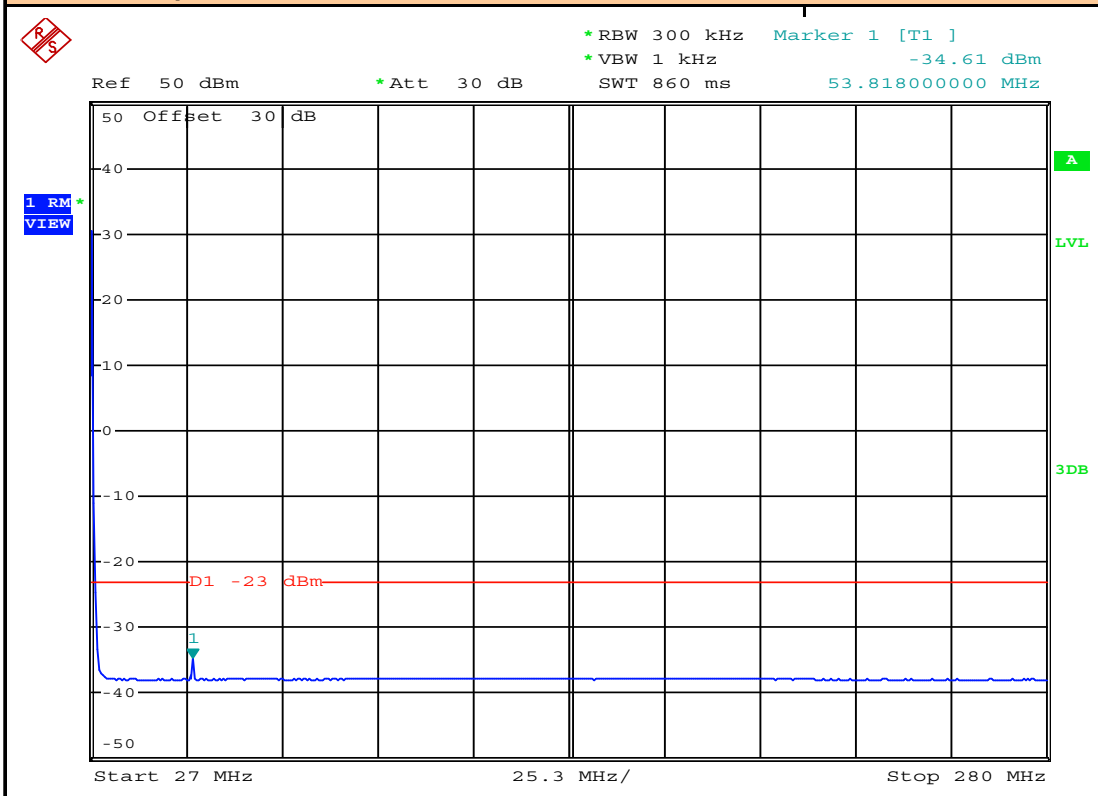
Limits	
47 CFR §95.979	Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section. (a) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table: For A3E, F3E (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.

Measurement Procedure	
TIA 382 21.2	**Transmitter Conducted Spurious and Harmonic Emissions** The transmitter RF output shall be connected to the standard nonradiating 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, 27MHz – 280MHz, Channel 1, AM

Conducted Spurious Emissions:

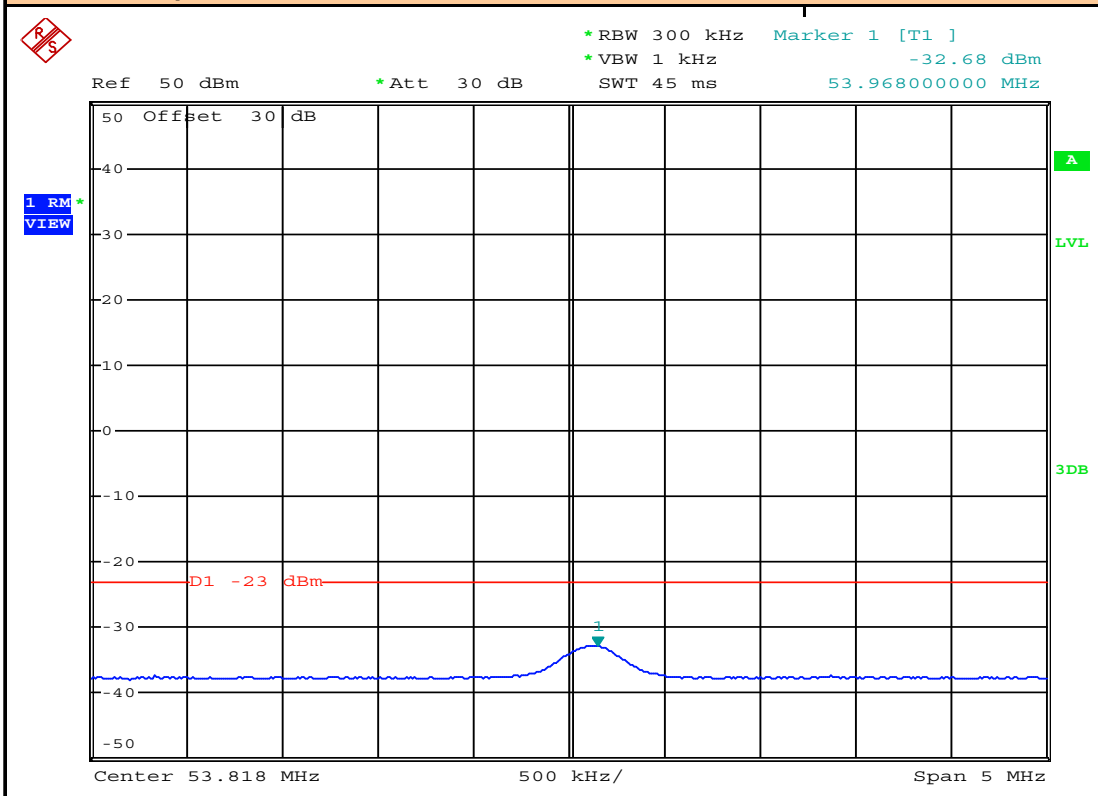


Date: 19.OCT.2021 15:16:15

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
1	26.965	AM	-	-

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

Conducted Spurious Emissions:

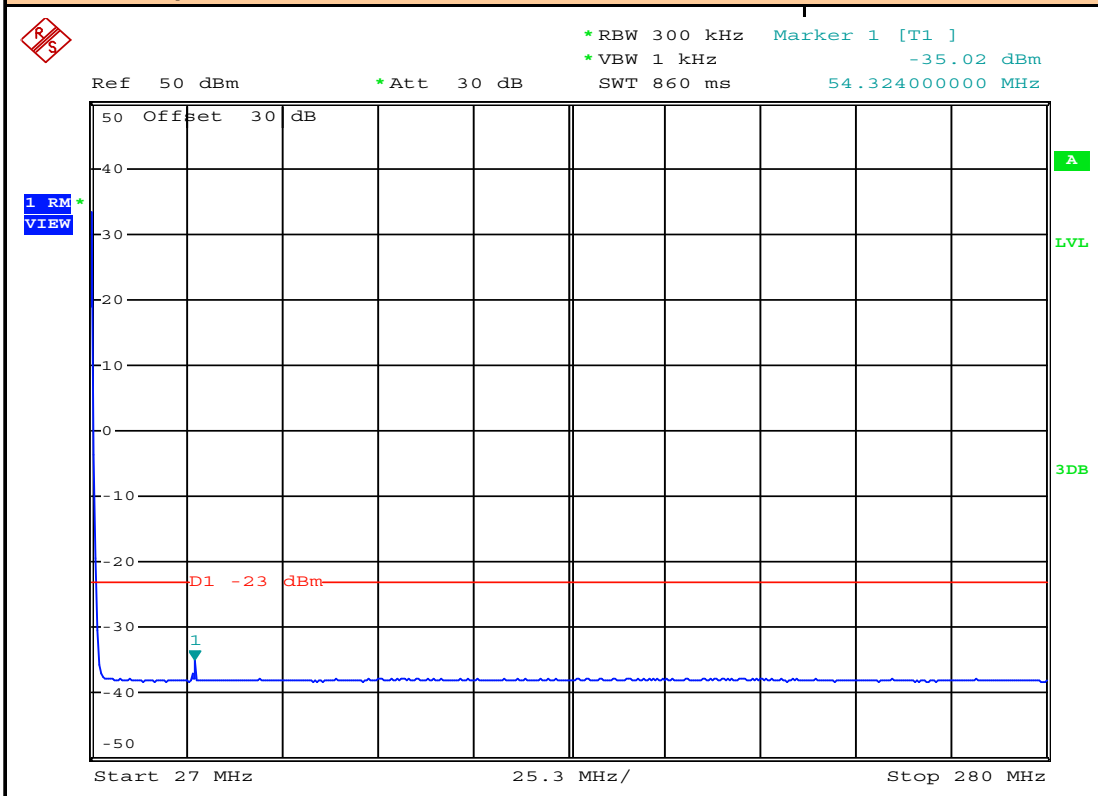


Date: 19.OCT.2021 15:16:36

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
1	26.965	AM	53.96	-32.68

Plot 10.3 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 19, AM

Conducted Spurious Emissions:

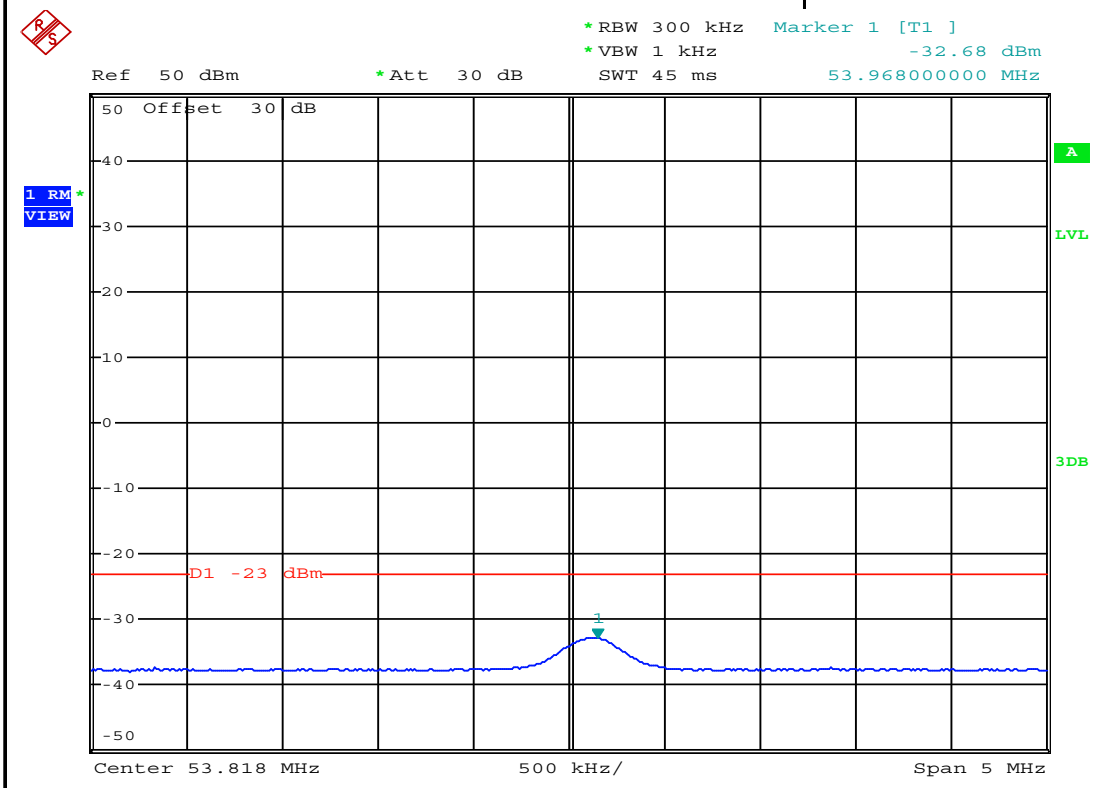


Date: 19.OCT.2021 15:17:24

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
19	27.185	AM	-	-

Plot 10.4 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 19, AM

Conducted Spurious Emissions:

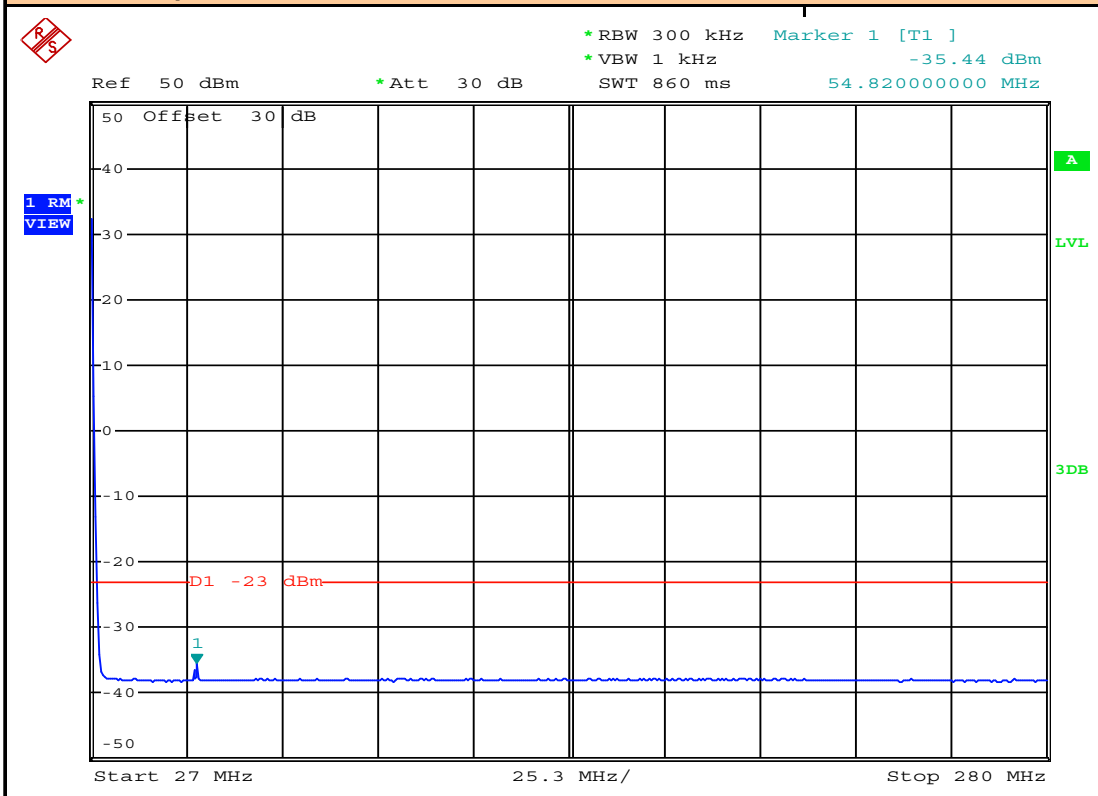


Date: 19.OCT.2021 15:16:36

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
19	27.185	AM	53.97	-32.68

Plot 10.5 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 40, AM

Conducted Spurious Emissions:

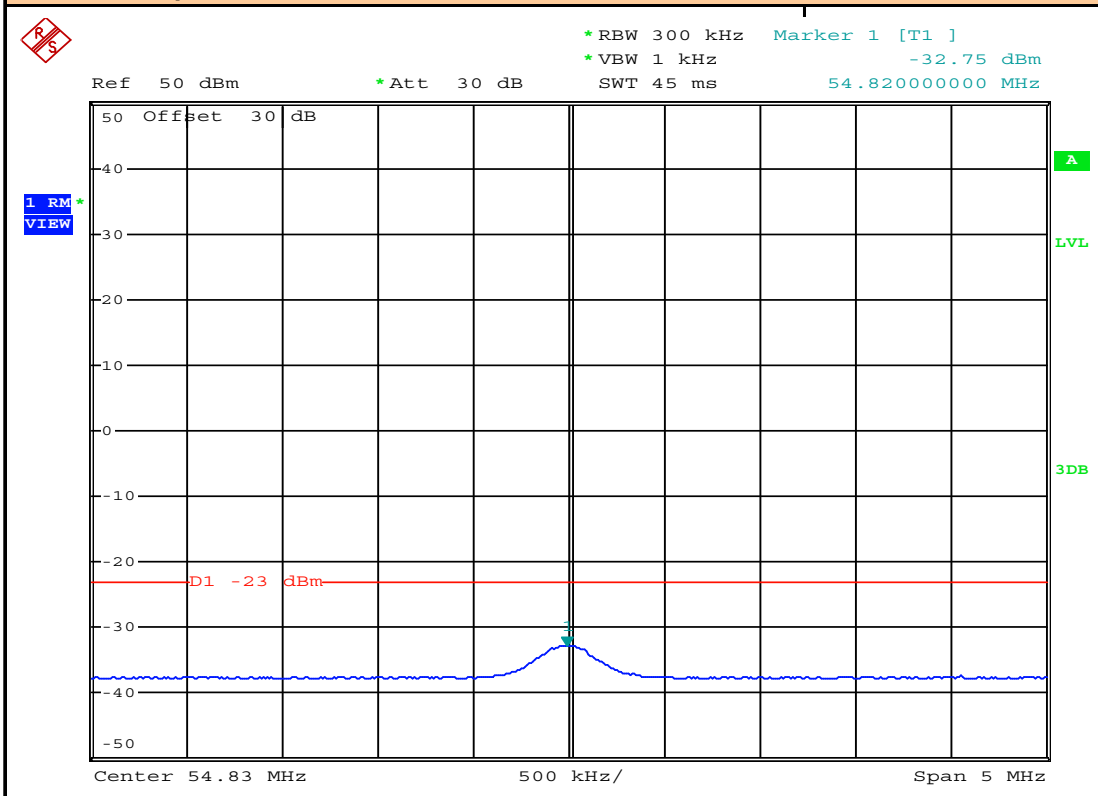


Date: 19.OCT.2021 15:15:24

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
40	27.405	AM	-	-

Plot 10.6 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 40, AM

Conducted Spurious Emissions:

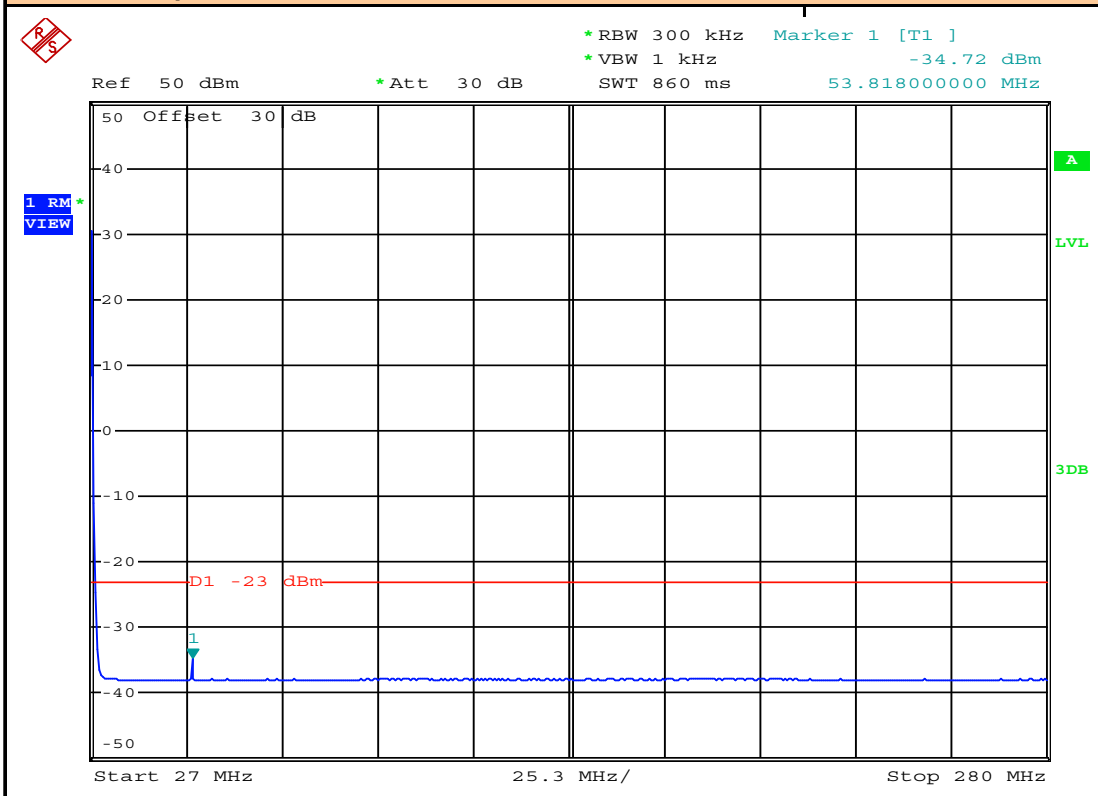


Date: 19.OCT.2021 15:14:36

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
40	27.405	AM	54.82	-32.75

Plot 10.7 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 1, FM

Conducted Spurious Emissions:

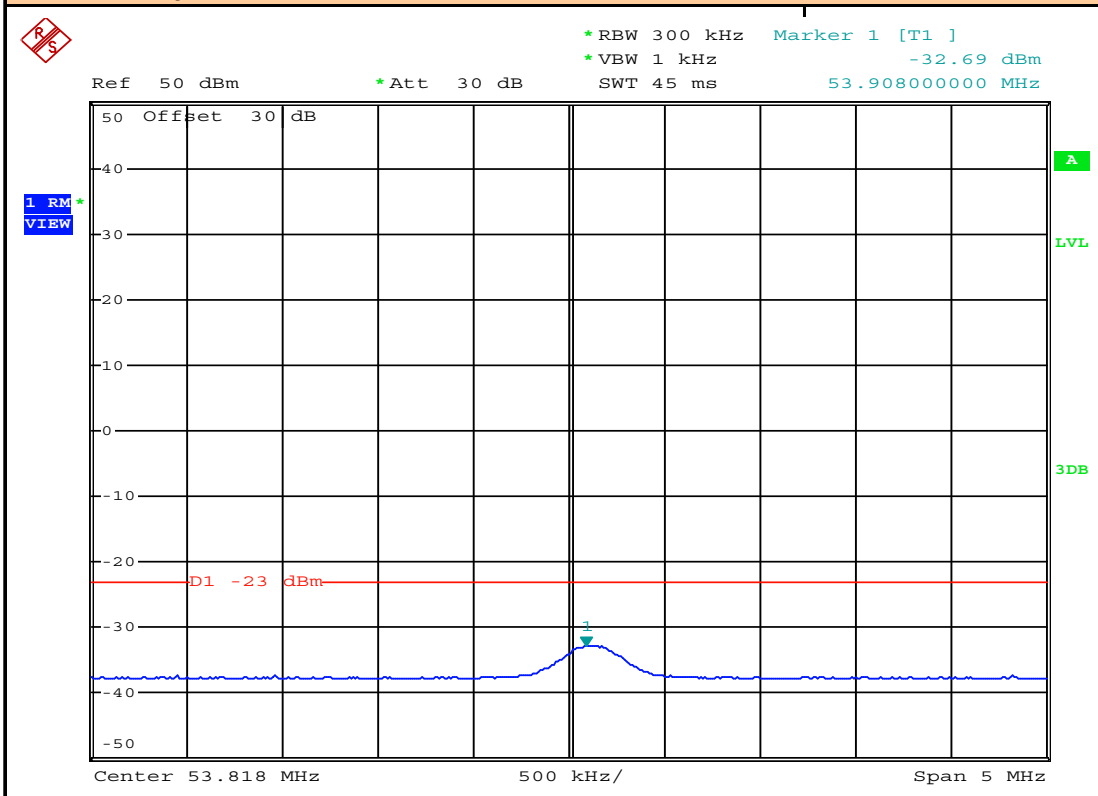


Date: 19.OCT.2021 15:19:47

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
1	26.965	FM	-	-

Plot 10.8 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 1, FM

Conducted Spurious Emissions:

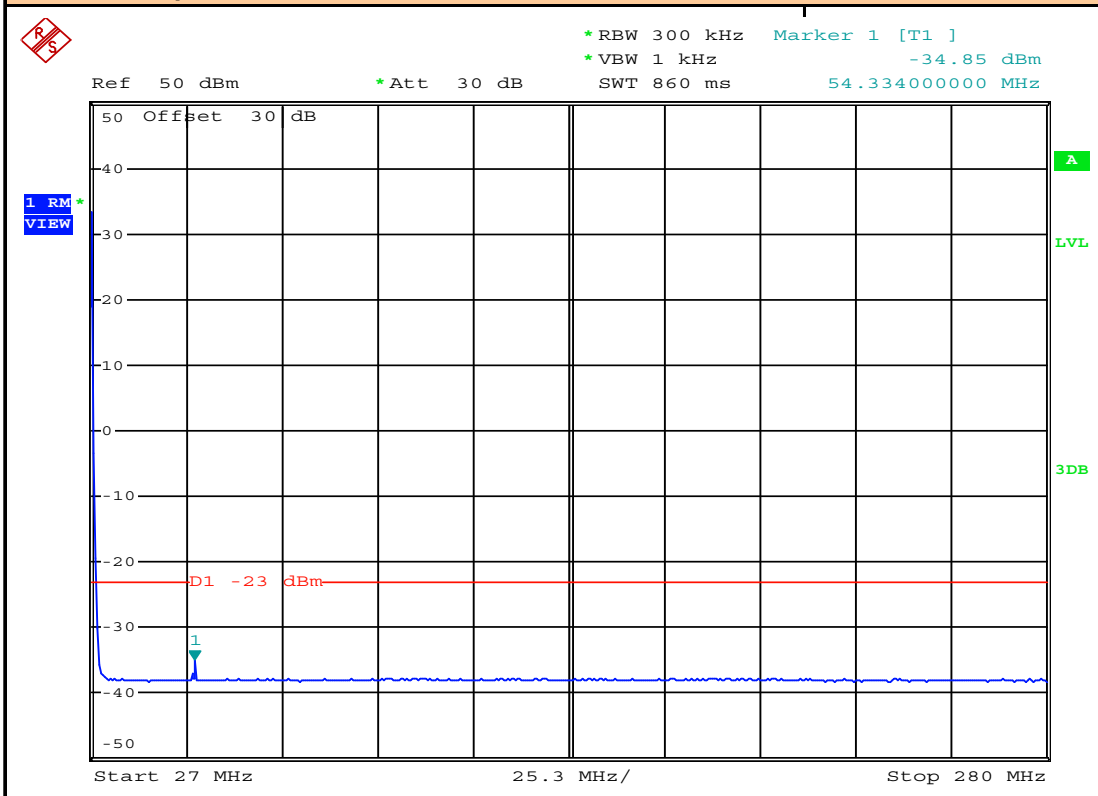


Date: 19.OCT.2021 15:20:00

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
1	26.965	FM	53.91	-32.69

Plot 10.9 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 19, FM

Conducted Spurious Emissions:

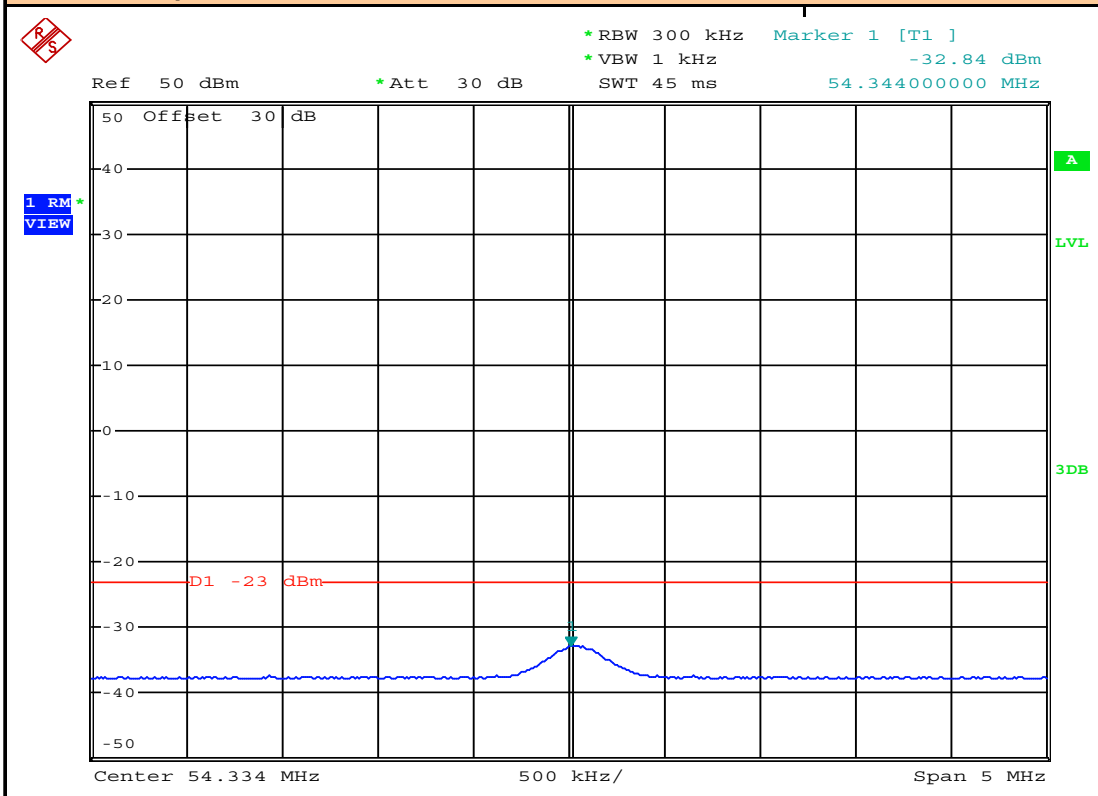


Date: 19.OCT.2021 15:18:40

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
19	27.185	FM	-	-

Plot 10.10 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 19, FM

Conducted Spurious Emissions:

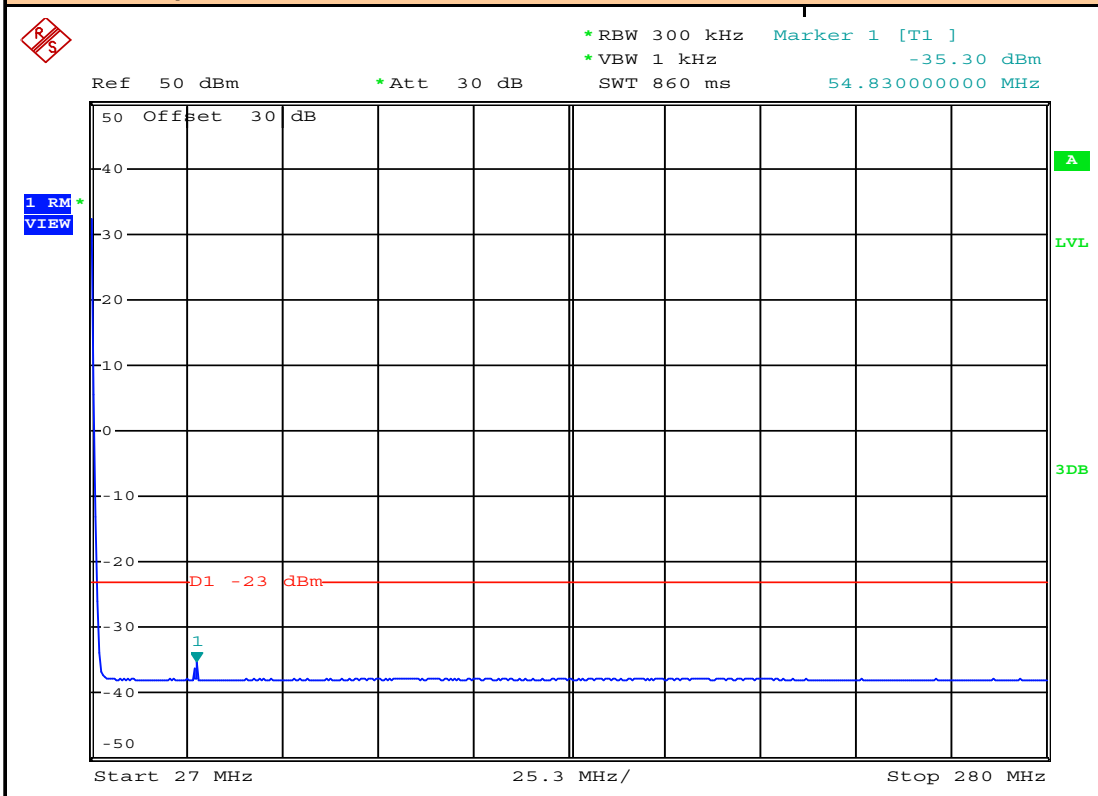


Date: 19.OCT.2021 15:18:59

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
19	27.185	FM	54.34	-32.84

Plot 10.11 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 40, FM

Conducted Spurious Emissions:

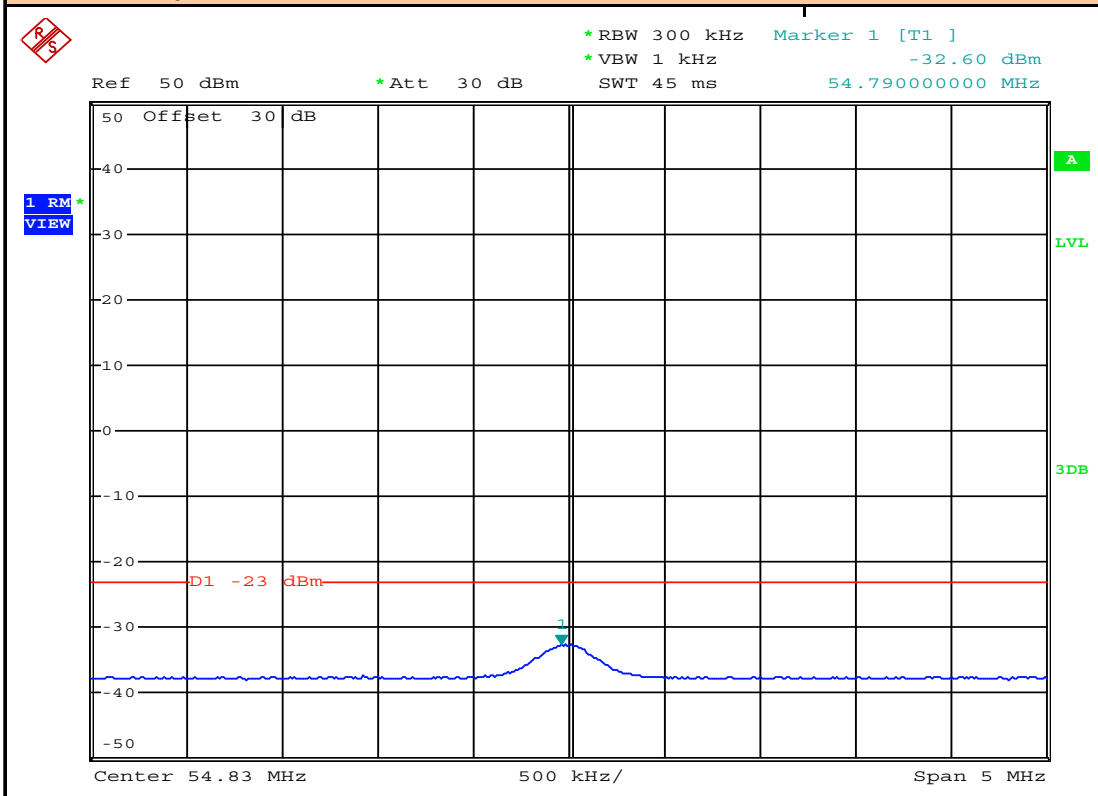


Date: 19.OCT.2021 15:20:44

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
40	27.405	FM	-	-

Plot 10.12 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 40, FM

Conducted Spurious Emissions:



Date: 19.OCT.2021 15:21:01

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
40	27.405	FM	54.79	-32.60

Table 10.1 – Summary of Conducted Out of Band Emissions

Conducted Spurious Emissons Measurement Results:								
Channel Number	Frequency (MHz)	Modulation	Fundamental Power [P_{Fund}] (dBm)	Emission Frequency (MHz)	Measured Emission [P_{Meas}] (dBm)	Attenuation [Att] (dBm)	Limit (dB)	Margin (dB)
1	26.965	AM	35.56	53.96	-32.68	68.24	60.0	8.2
19	27.105		35.64	53.97	-32.68	68.32		8.3
40	27.105		35.65	54.82	-32.75	68.40		8.4
1	26.965	FM	35.57	53.91	-32.69	68.26		8.3
19	27.105		35.63	54.34	-32.84	68.47		8.5
40	27.105		35.68	54.79	-32.60	68.28		8.3
								Complies

Attenuation [Att] = Fundamental Power [Pf_{und}] - Measured Emission [P_{meas}]
Margin = [Att] - Limit

11.0 RADIATED SPURIOUS TX EMISSIONS

Test Conditions	
Normative Reference	**FCC 47 CFR §95.979, RSS-236, ANSI C63.10**

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, F3E (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. (c) Measurement conditions and procedures. Subject to additional measurement standards and procedures established pursuant to part 2, subpart J, the following conditions and procedures must be used. (1) The unwanted emissions limits requirements in this section must be met both with and without the connection of permitted attachments, such as external speakers, microphones, power cords and/or antennas.

Measurement Procedure

TIA 382 22.2 Transmitter Radiated Spurious and Harmonic Emissions

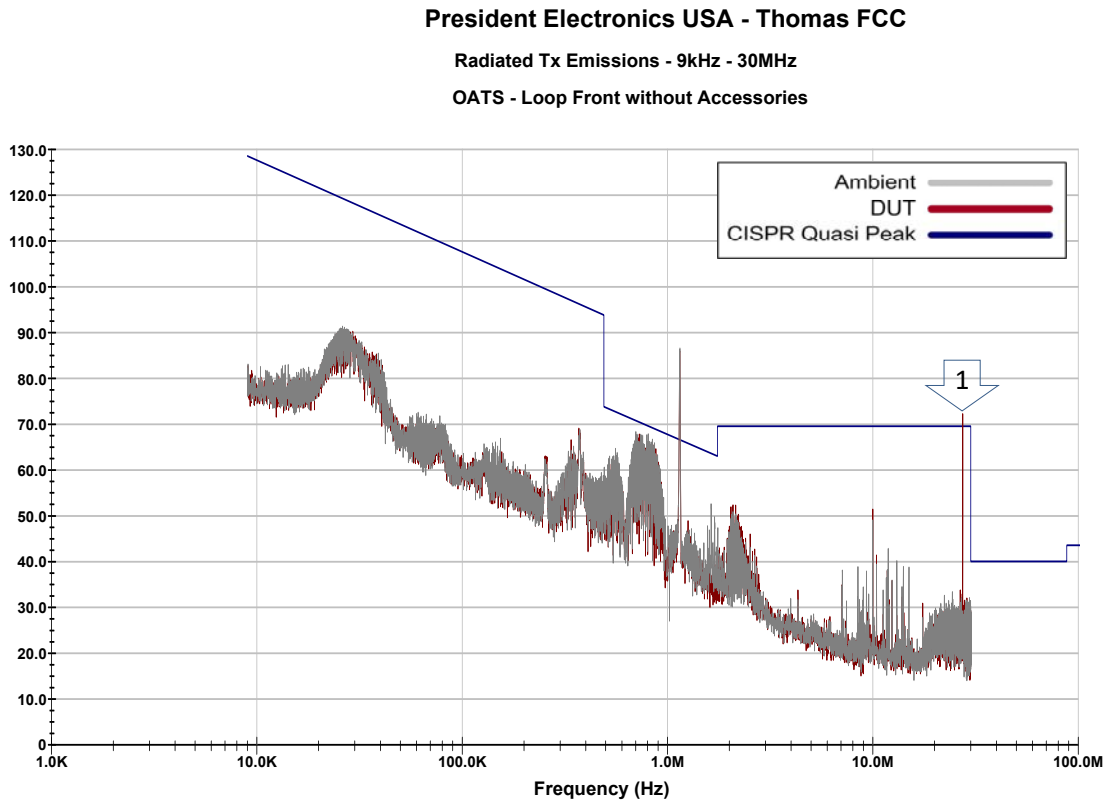
The transmitter shall be terminated in a nonradiating dummy load and shall be keyed but not modulated.

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. Measurements were repeated with and without approved accessories.

Test Setup	Appendix A Figure A.3

Plot 11.1 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, without Accessories, Front

Radiated Tx Emissions:



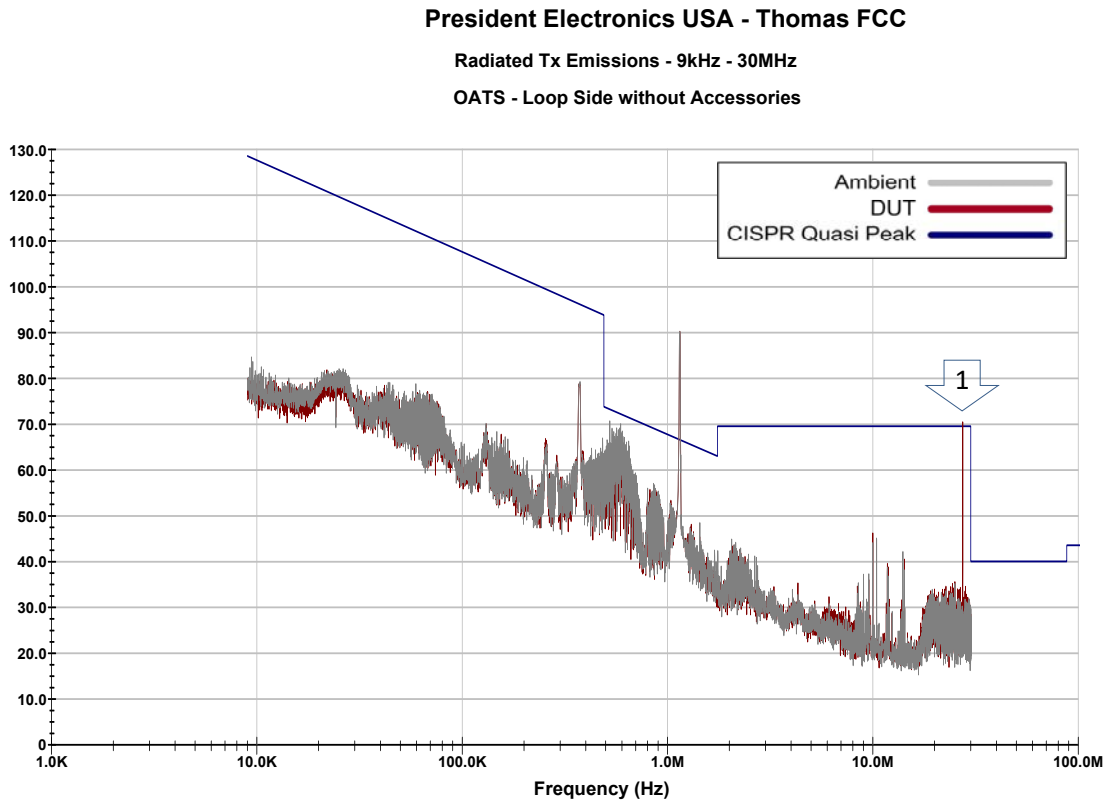
Profile Build: 2020.10.19

Marker 1: Fundamental

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Front	ND	ND

Plot 11.2 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, without Accessories, Side

Radiated Tx Emissions:



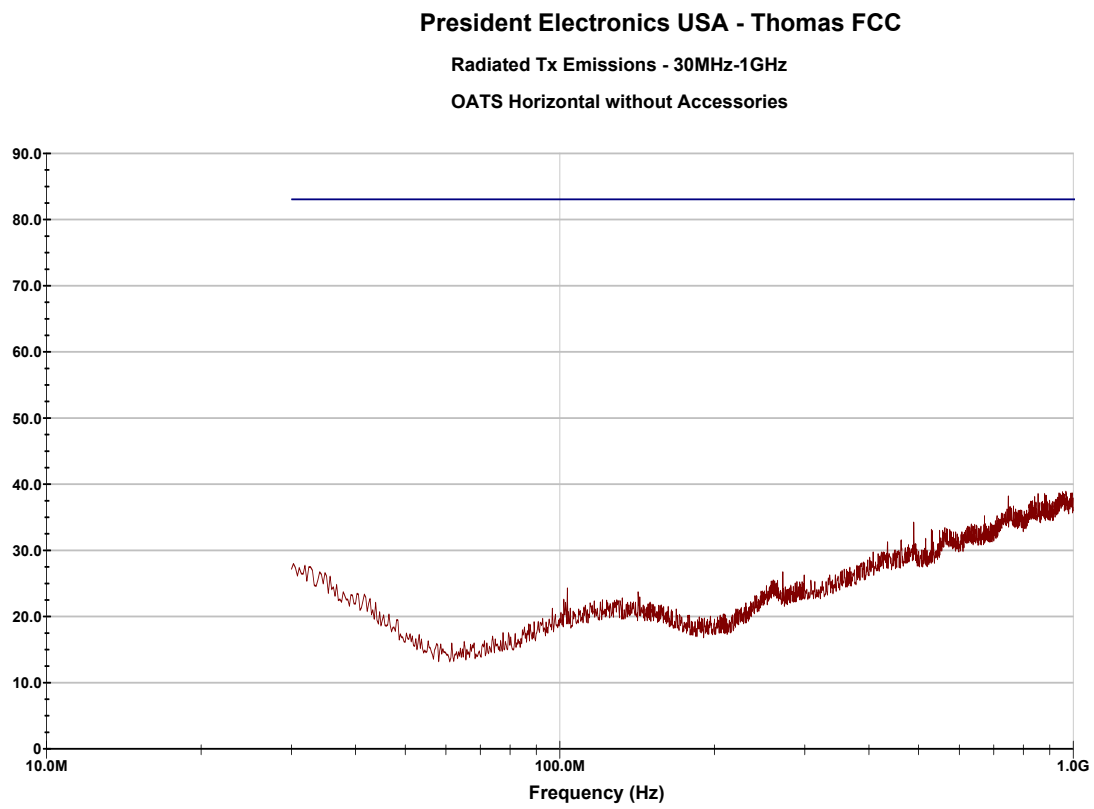
Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Side	ND	ND

Marker 1: Fundamental

Plot 11.3 – Radiated Spurious Emissions OATS, 30 - 1000MHz, without Accessories, Horizontal

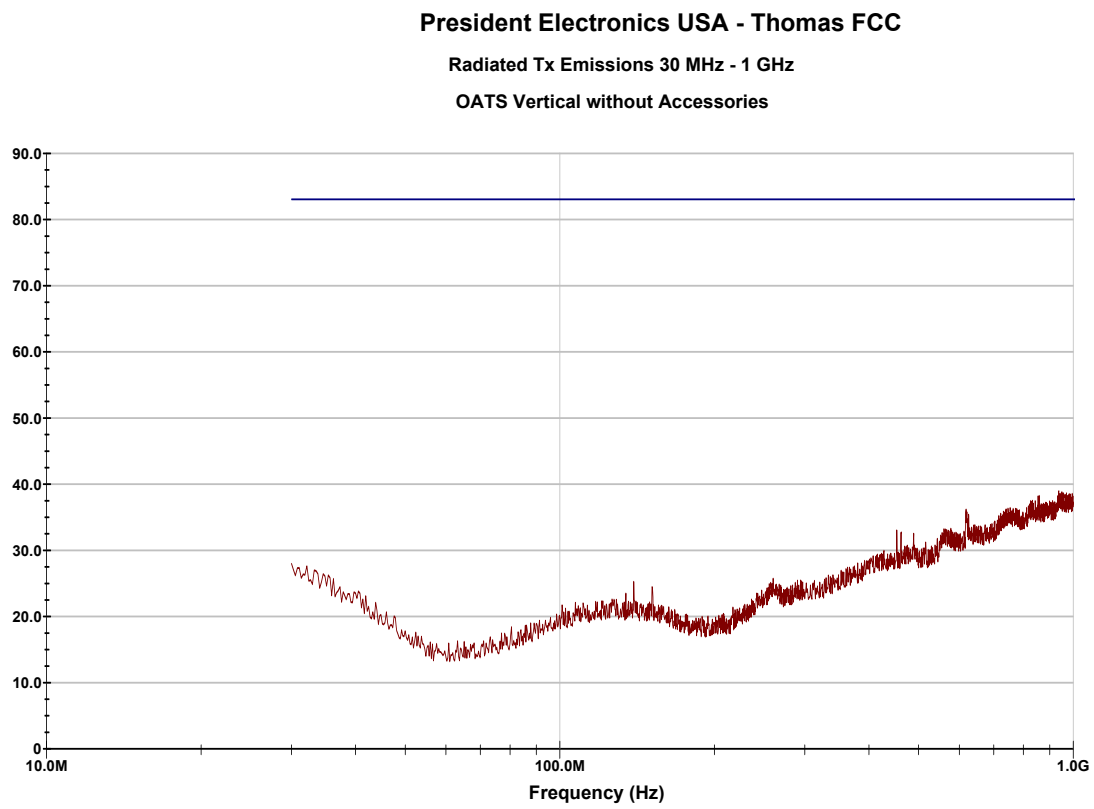
Radiated Tx Emissions:



Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

Plot 11.4 – Radiated Spurious Emissions OATS, 30 - 1000MHz, without Accessories, Vertical

Radiated Tx Emissions:



02:17:59 PM, Thursday, November 04, 2021

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

Table 11.1 – Summary of Radiated Tx Emissions, without Accessories

Summary of Radiated Tx Emissions										
Measured Frequency Range (MHz)	Channel Frequency (MHz)	Antenna Polarization	Emission Frequency	Measured Emission [E_{Meas}] (dBuV)	Antenna ACF [ACF] (dB)	Cable Loss [L_C] (dB)	Amplifier Gain [G_A] (dB)	Corrected Emission [E_{Corr}] (dBuV/m)	Limit (dBuV)	Margin (dB)
9kHz - 30MHz	27.405	Front	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz		Side	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
30-1000MHz		Horizontal	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	83.0	**n/a**
30-1000MHz		Vertical	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	83.0	**n/a**
								Results:		**Complies**

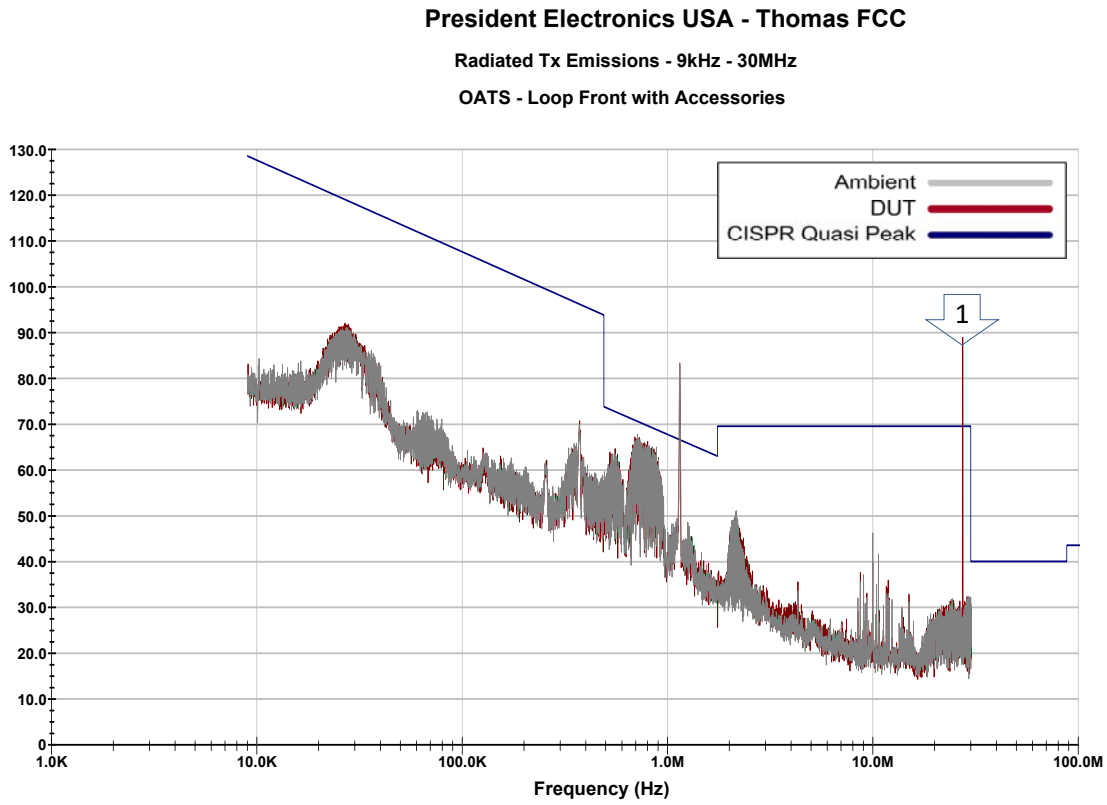
(1) No Emissions Detected (ND) above ambient or within 20dB of the limit
(2) Antenna ACF, Cable Loss and Amplifier Gain corrected in Spectrum Analyzer Transducer Factor
(3) External Amplier not used

$E_{Corr} = E_{Meas} + ACF + L_C - G_A$

Limit @ 60dB attenuation = -26dBm = 83dBuV/m @ 3m

Plot 11.5 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, with Accessories, Front

Radiated Tx Emissions:



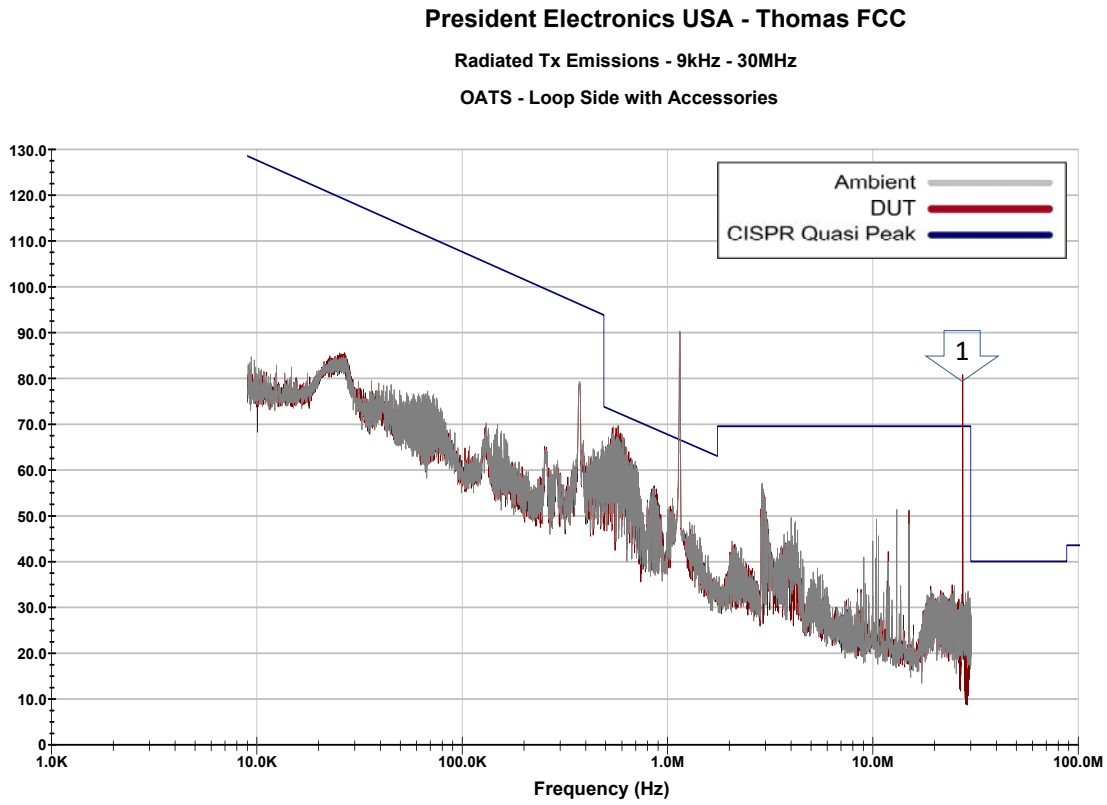
Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Front	ND	ND

Marker 1: Fundamental

Plot 11.6 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, with Accessories, Side

Radiated Tx Emissions:



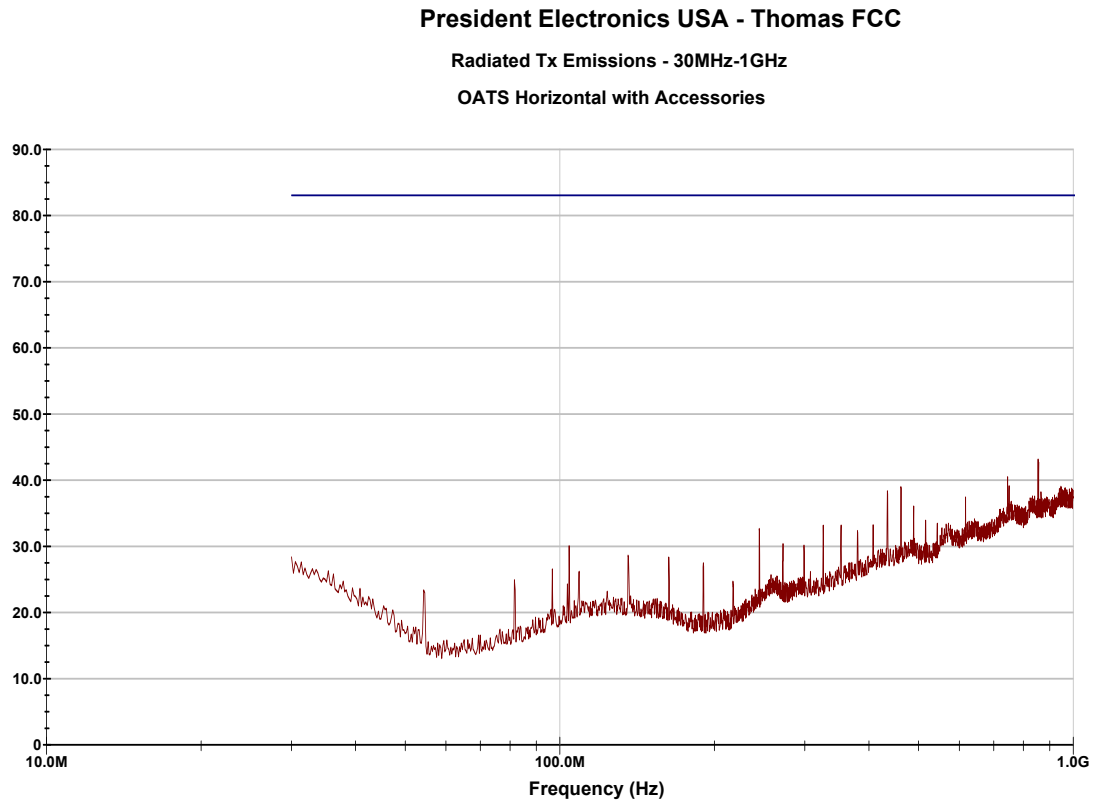
Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Side	ND	ND

Marker 1: Fundamental

Plot 11.7 – Radiated Spurious Emissions OATS, 30 - 1000MHz, with Accessories, Horizontal

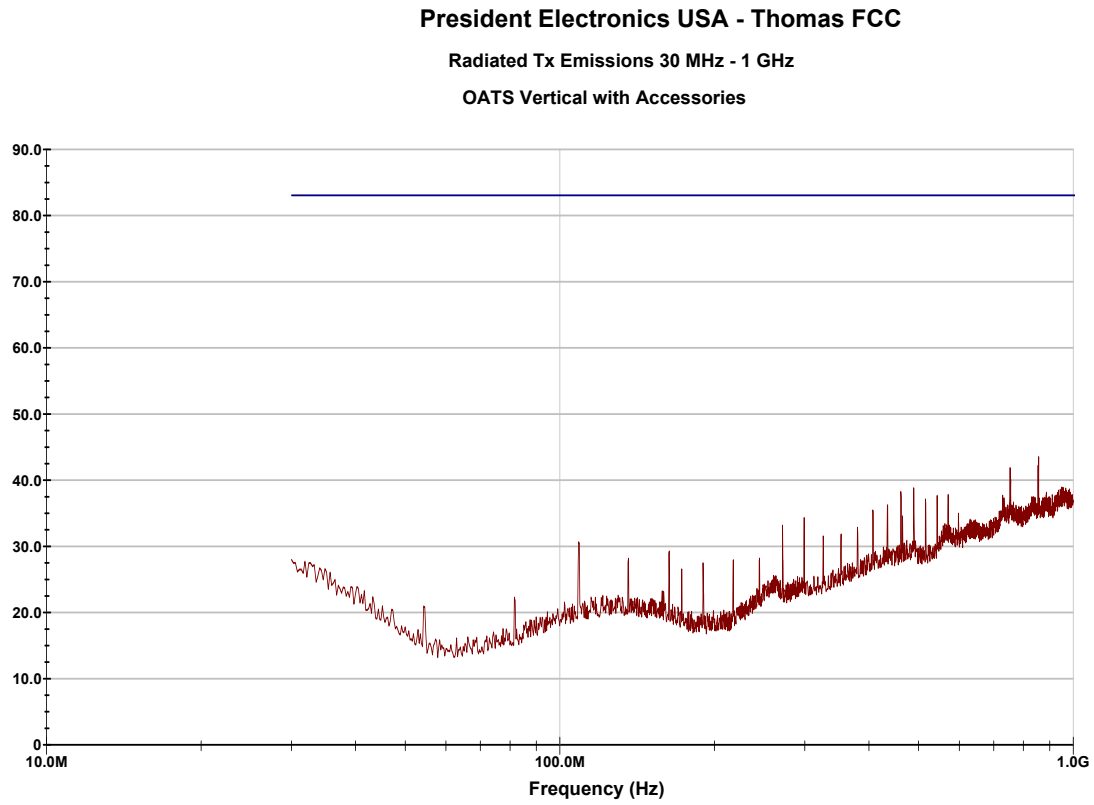
Radiated Tx Emissions:



Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

Plot 11.8 – Radiated Spurious Emissions OATS, 30 - 1000MHz, with Accessories, Vertical

Radiated Tx Emissions:



02:17:59 PM, Thursday, November 04, 2021

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

Table 11.2 – Summary of Radiated Tx Emissions, with Accessories

Summary of Radiated Tx Emissions (Restricted Band)										
Measured Frequency Range (MHz)	Channel Frequency (MHz)	Antenna Polarization	Emission Frequency	Measured Emission [E_{Meas}] (dBuV)	Antenna ACF [ACF] (dB)	Cable Loss [L_C] (dB)	Amplifier Gain [G_A] (dB)	Corrected Emission [E_{Corr}] (dBuV/m)	Limit (dBuV)	Margin (dB)
9kHz - 30MHz	27.405	Front	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz		Side	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
30-1000MHz		Horizontal	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	83.0	**n/a**
30-1000MHz		Vertical	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	83.0	**n/a**
								Results:	**Complies**	

(1) No Emissions Detected (ND) above ambient or within 20dB of the limit
(2) Antenna ACF, Cable Loss and Amplifier Gain corrected in Spectrum Analyzer Transducer Factor
(3) External Amplier not used

$E_{Corr} = E_{Meas} + ACF + L_C - G_A$

Limit @ 60dB attenuation = -26dBm = 83dBuV/m @ 3m

12.0 RADIATED SPURIOUS RX EMISSIONS

Test Procedure	
Normative Reference	**FCC 47 CFR §15.109, ICES-003(6.2)** **ANSI C63.4:2014**

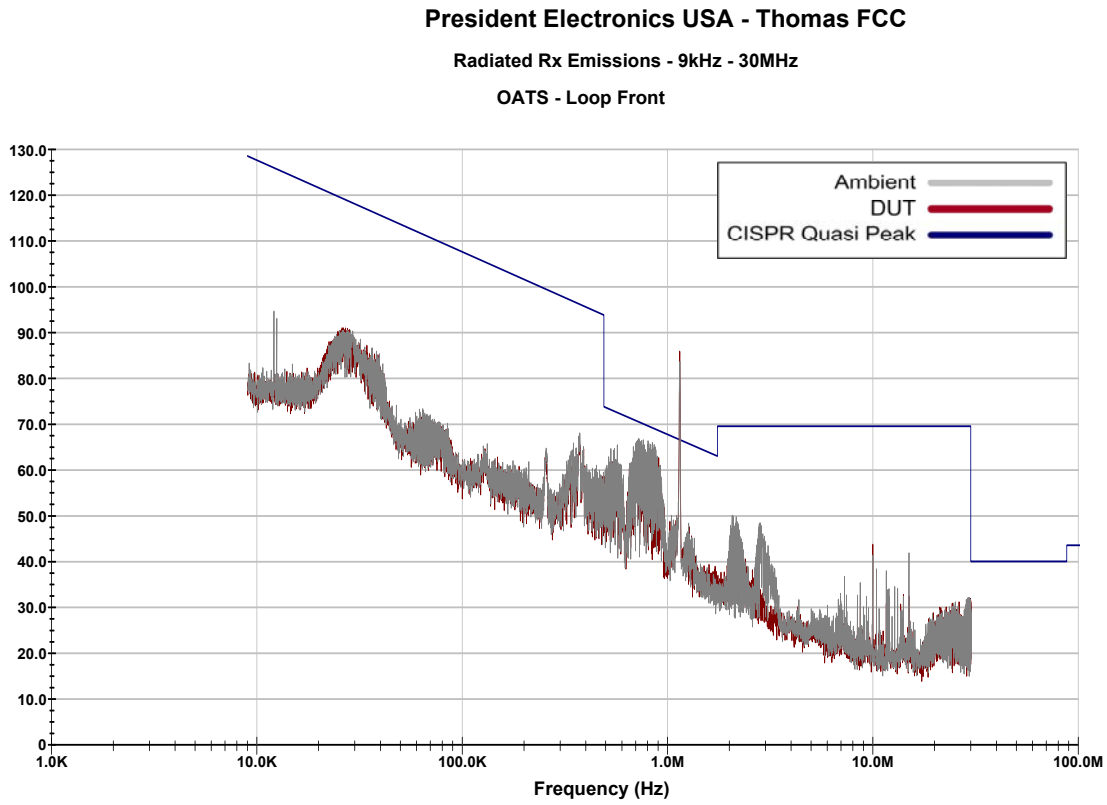
Limits	
47 CFR §15.109	(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values: 30-88MHz: 40dBuV/m 88-216MHz: 216-960MHz: > 960MHz: 54dBuV/m
ICES-003(6.2.1)	6.2.1 - Radiated Emissions Limits Below 1 GHz Class B: ITE that does not meet the conditions for Class A operation shall comply with the Class B radiated limits set out in Table 5 determined at a distance of 3 metres. 30-88MHz: 40dBuV/m 88-216MHz: 216-960MHz: > 960MHz: 54dBuV/m

Test Setup	Appendix A Figure A.3

Measurement Procedure
The DUT was set up as per ANSI C63.4:2014. Emissions were scanned between 30MHz and 1000MHz. The turntable was rotated 360 degrees and the antenna was elevated to 4m to optimize the measured emissions.

Plot 12.1 – Radiated Rx Emissions OATS, 9kHz - 30MHz, Front

Radiated Rx Emissions:

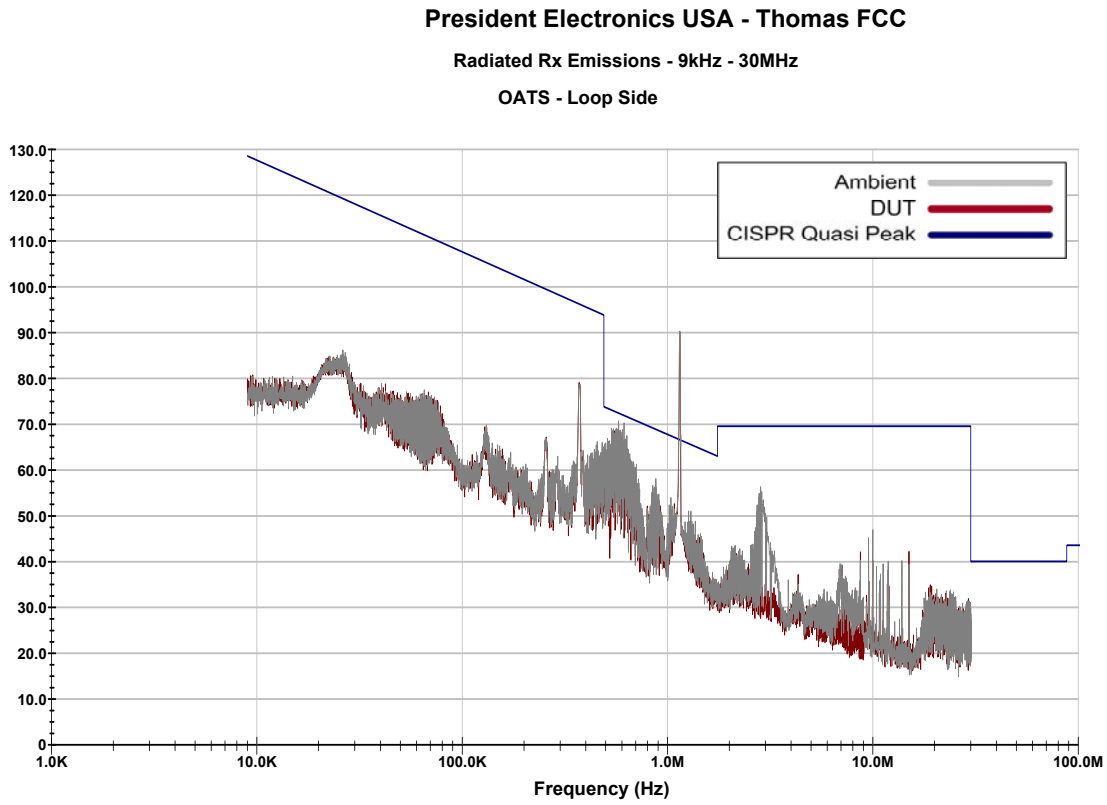


Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Front	ND	ND

Plot 12.2 – Radiated Rx Emissions OATS, 9kHz - 30MHz, Side

Radiated Rx Emissions:

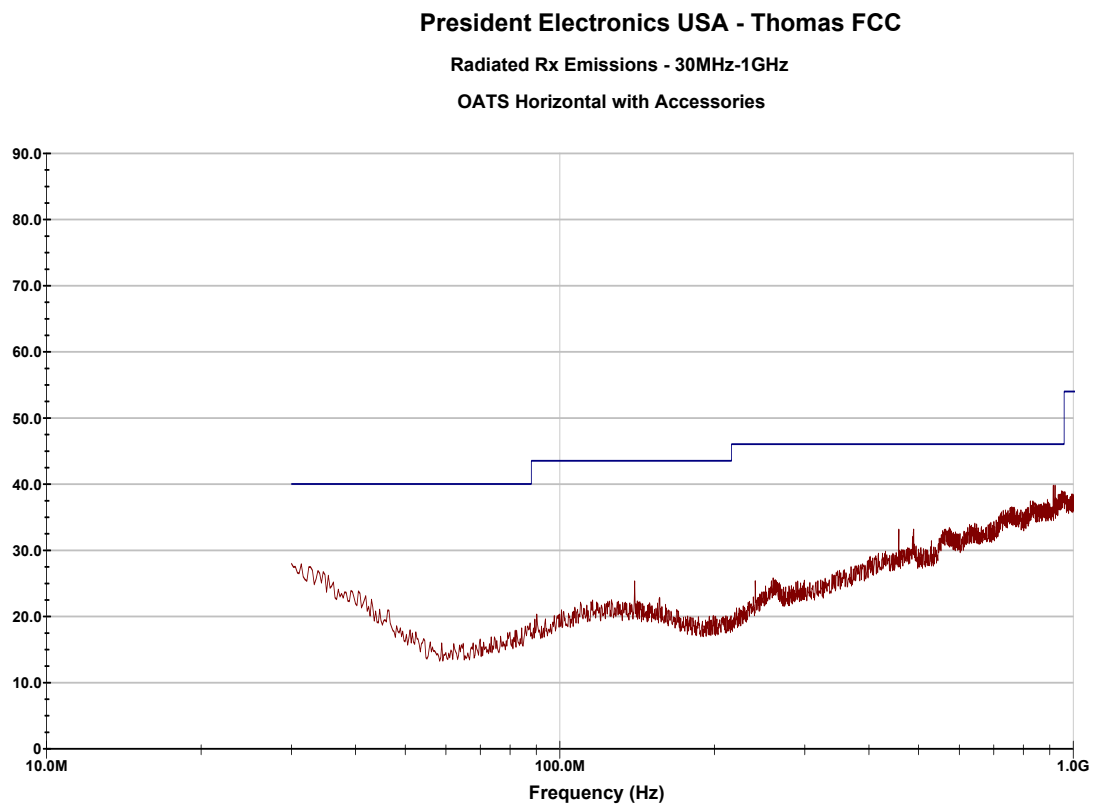


Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Side	ND	ND

Plot 12.3– Radiated Spurious Emissions OATS, 30 - 1000MHz, Horizontal

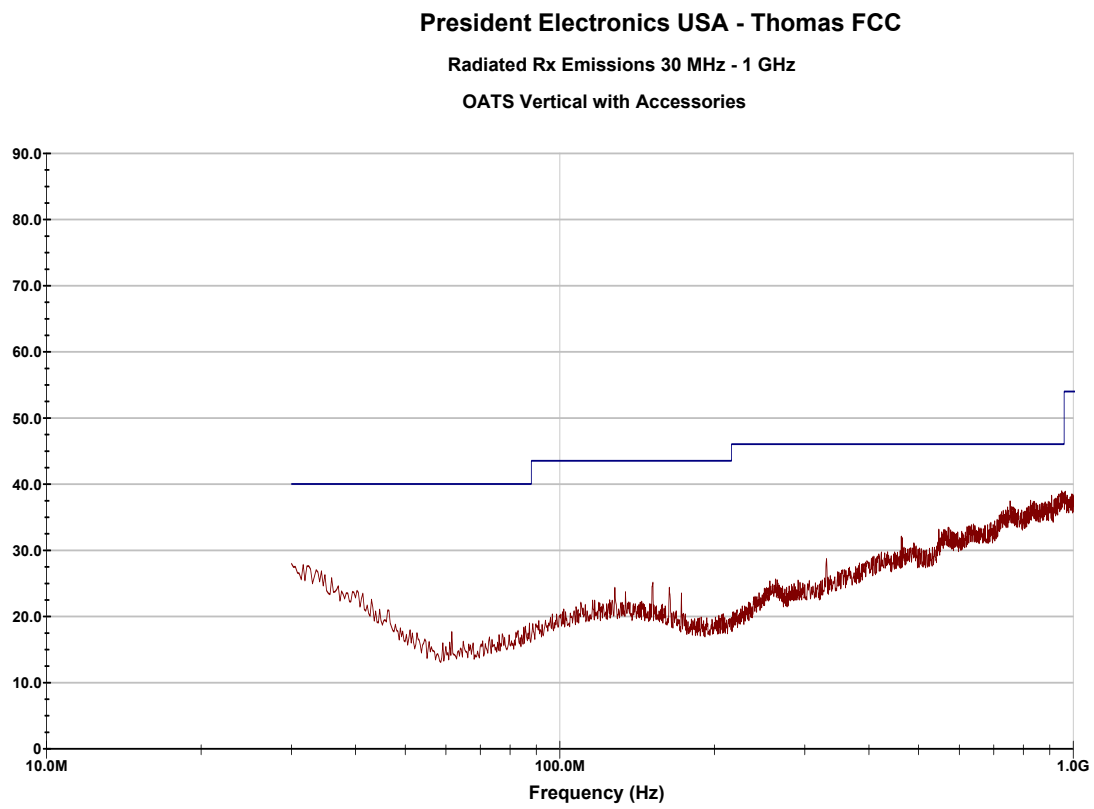
Radiated Rx Emissions:



Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

Plot 12.4– Radiated Spurious Emissions OATS, 30 - 1000MHz, Vertical

Radiated Rx Emissions:



Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

Table 12.1 – Summary of Radiated Rx Emissions

Summary of Radiated Rx Emissions										
Measured Frequency Range (MHz)	Channel Frequency (MHz)	Antenna Polarization	Emission Frequency	Measured Emission [E_{Meas}] (dBuV)	Antenna ACF [ACF] (dB)	Cable Loss [L_C] (dB)	Amplifier Gain [G_A] (dB)	Corrected Emission [E_{Corr}] (dBuV/m)	Limit (dBuV)	Margin (dB)
9kHz - 30MHz	916.0	Front	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	916.0	Side	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
30-1000MHz	916.0	Horizontal	750.1MHz	ND (1)	0.00	0.00	0.00 (3)	ND (2)	56.9	**n/a**
30-1000MHz	916.0	Vertical	755.7MHz	ND (1)	0.00	0.00	0.00 (3)	ND (2)	56.9	**n/a**
								Results:	**Complies**	

(1) No Emissions Detected (ND) above ambient or within 20dB of the limit
(2) Antenna ACF, Cable Loss and Amplifier Gain corrected in Spectrum Analyzer Transducer Factor
(3) External Amplier not used

$E_{Corr} = E_{Meas} + ACF + L_C - G_A$

13.0 FREQUENCY STABILITY

Test Conditions	
Normative Reference	**FCC 47 CFR §2.1055, §95.965, RSS-Gen, ANSI C63.10**

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:

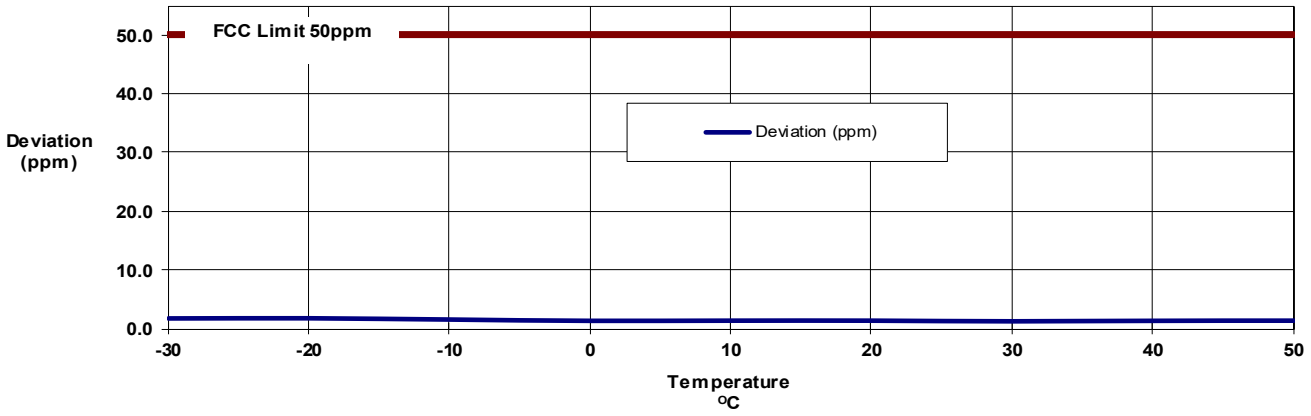
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Test Setup	Appendix A Figure A.4

Table 13.1 – Summary of Frequency Stability Results

Frequency Stability

Nominal Frequency (MHz):	27.185
Nominal Channel BW (KHz):	CW
Nominal Voltage (VDC):	12.0
Nominal Temperature (°C):	20



Frequency Stability Measurements (Temperature)				
Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
-30	27.185000	27.185047	47	1.72
-20		27.185047	47	1.74
-10		27.185042	42	1.53
0		27.185036	36	1.34
10		27.185037	37	1.36
20		27.185037	37	1.35
30		27.185034	34	1.25
40		27.185036	36	1.34
50		27.185037	37	1.36
			Maximum Deviation:	1.74
			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%)*	27.185000	27.185037	37	1.36
12.0 (100%)		27.185037	37	1.35
10.2 (85%)		27.185036	36	1.33
			Maximum Deviation:	1.36
			Maximum Limit:	50.00
			Result:	Complies

*This device is capable of operating at 12 and 24VDC

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

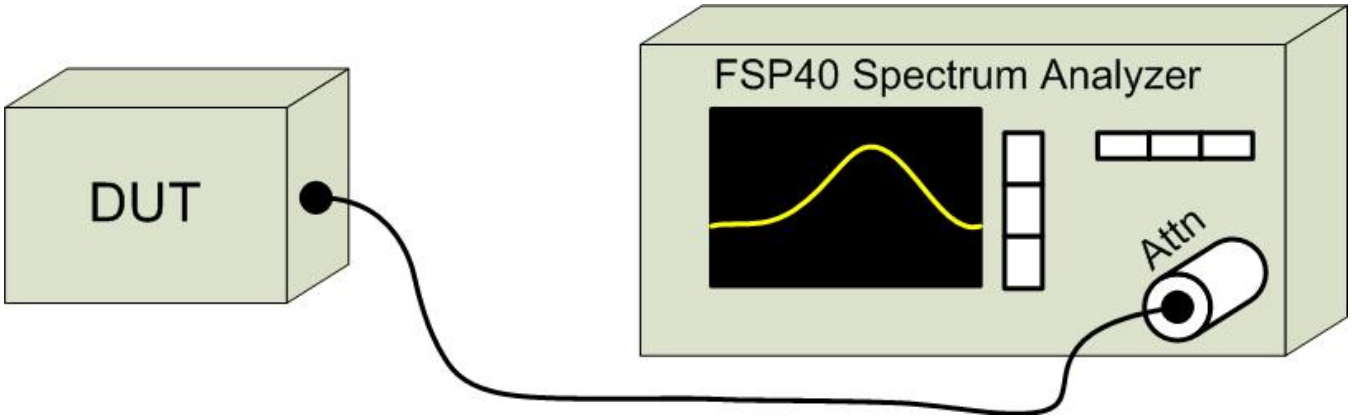


Table A.2 – Setup - Audio Modulation Equipment

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

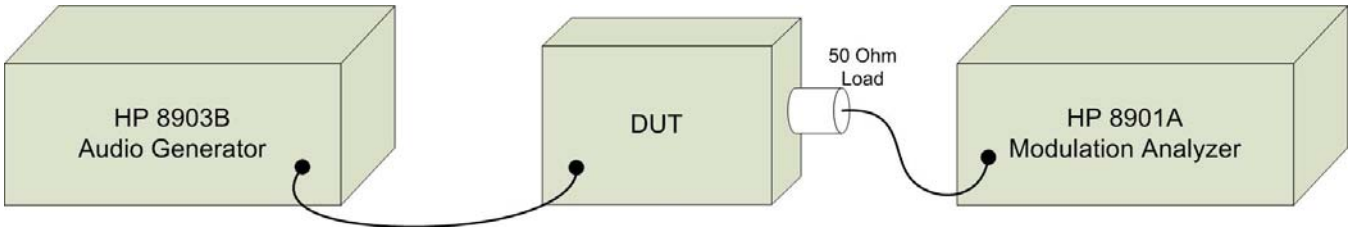


Table A.3 – Setup - Radiated Emissions Equipment

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 Below 30MHz

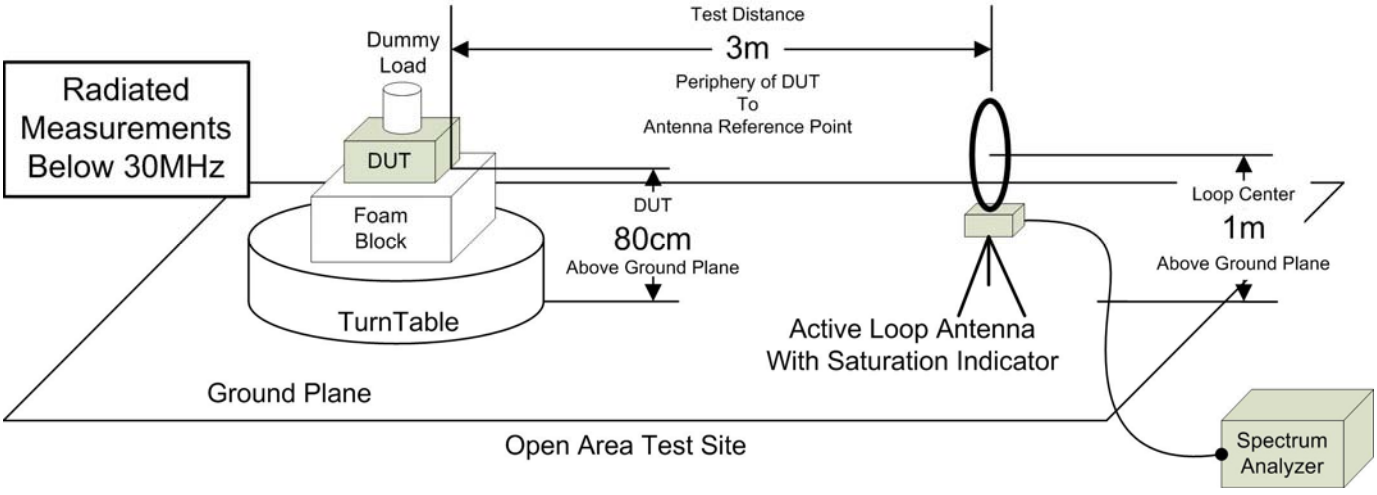


Figure A.4 – Test Setup Radiated Emissions Measurements 30-1000MHz

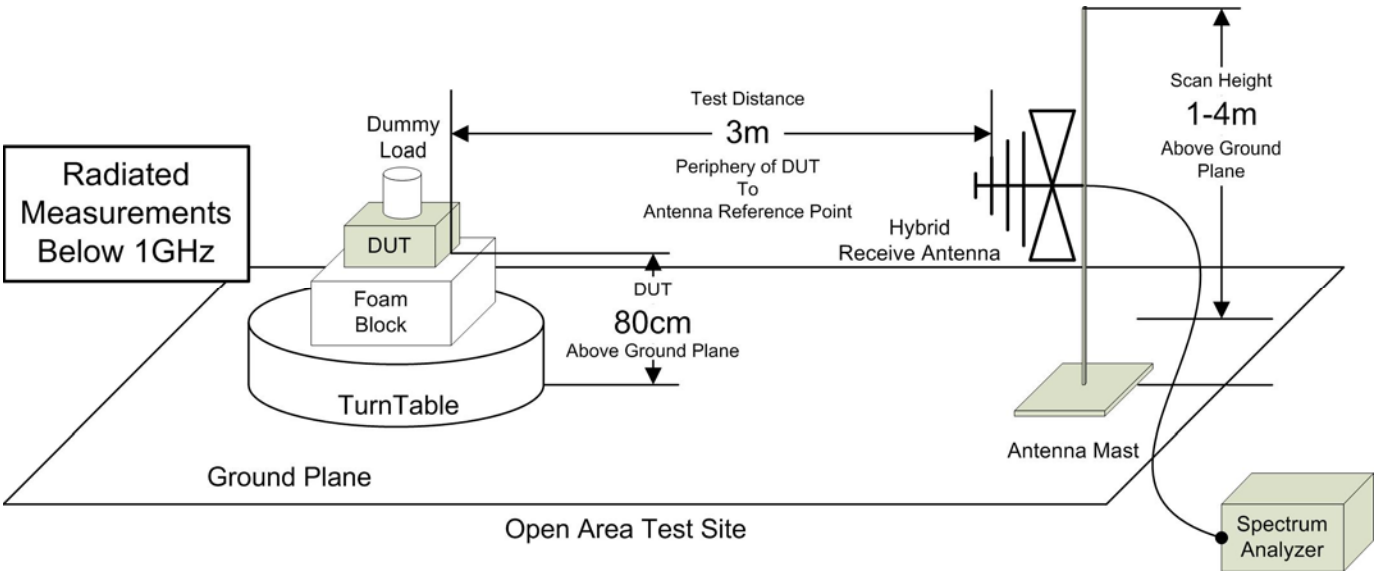


Figure A.5 – Test Setup Radiated Emissions Measurements 30-1000MHz

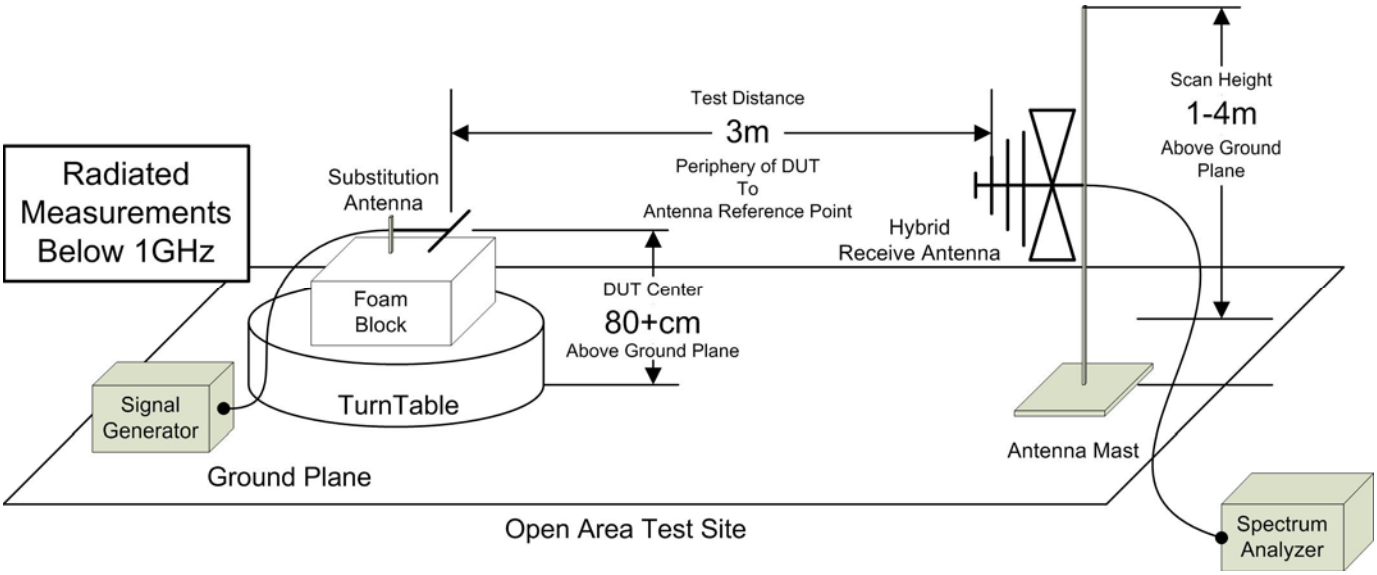
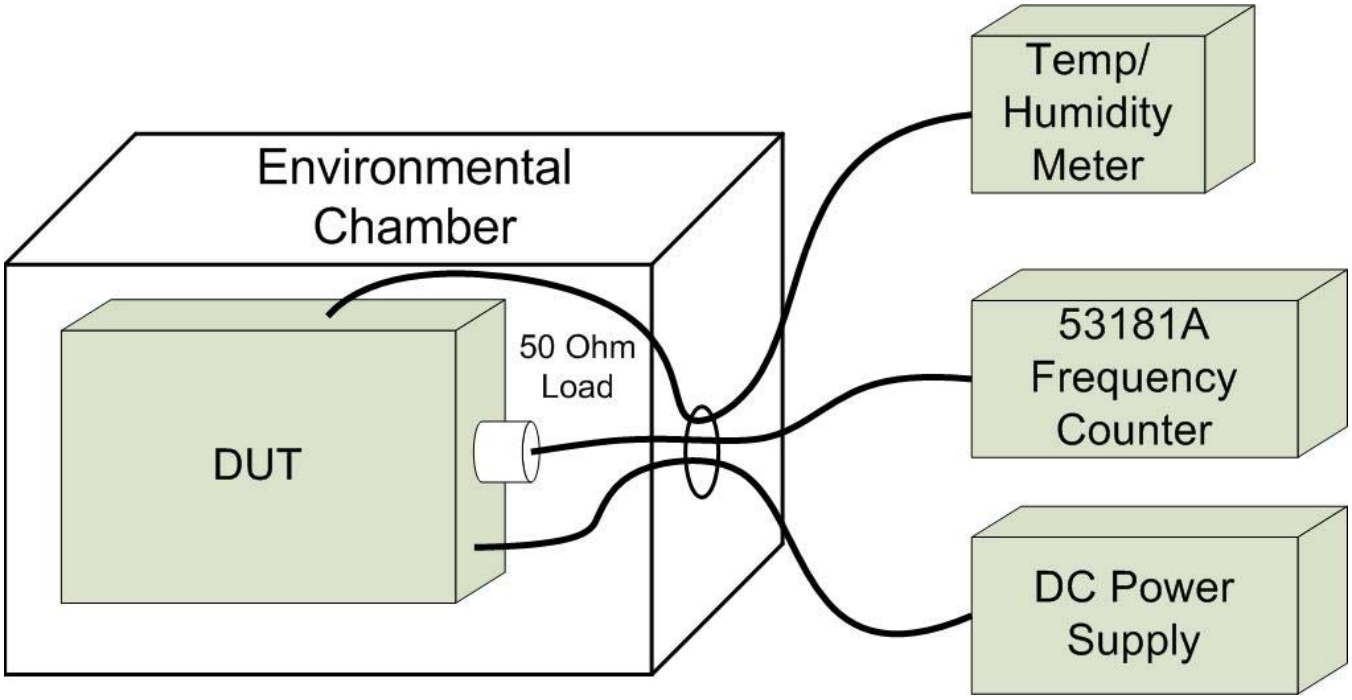


Table A.4 – Setup - Frequency Stability Measurement Equipment

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.6 – 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
00034	ETS	3115	6267	Double Ridged Guide Horn	26 Nov 2018	Triennial	26 Nov 2021
00035	ETS	3115	6276	Double Ridged Guide Horn	22 Mar 2019	Triennial	21 Mar 2022
00085	EMCO	6502	9203-2724	Loop Antenna	11 Jun 2019	Triennial	11 Jun 2022
00333	HP	85685A	3010A01095	RF Preselector	23 Jun 2020	Triennial	30 Jun 2023
00049	HP	85650A	2043A00162	Quasi-peak Adapter	23 Jun 2020	Triennial	23 Jun 2023
00051	HP	8566B	2747A05510	Spectrum Analyzer	23 Jun 2020	Triennial	23 Jun 2023
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	10 Aug 2021	Triennial	10 Aug 2024
00005	HP	8648D	3847A00611	Signal Generator	23 Jun 2020	Triennial	23 Jun 2023
00006	R&S	SMR20	100104	Signal Generator	29 May 2017	Triennial	29 May 2020
00003	HP	53181A	3736A05175	Frequency Counter	23 Jun 2020	Triennial	23 Jun 2023
00257	Com-Power	LI-215A	191934	LISN	5 Sep 2018	Triennial	5 Sep 2021
00250	Circuit Test	DMR-1800	TE182	Digital Multi-Meter - DVM	23 Jun 2020	Triennial	23 Jun 2023
00071	EMCO	2090	9912-1484	Multi-Device Controller	n/a	n/a	n/a
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
00236	Nokia	-	236	ESD Table	NCR	n/a	NCR
00255	Expert ESD	A4001	A4001-155	ESD Target	COU	n/a	COU
00064	NARDA	3020A	n/a	Bi-Directional Coupler	COU	n/a	COU
00263	Koaxis	KP10-1.00M-TD	263	1m Armoured Cable	COU	n/a	COU
00263B	Koaxis	KP10-1.00M-TD	263B	1m Armoured Cable	COU	n/a	COU
00264	Koaxis	KP10-7.00M-TD	264	7m Armoured Cable	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

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	
Radiated Emissions 30MHz - 200MHz	
U_{LAB} = 5.14dB U_{CISPR} = 6.3dB	
Radiated Emissions 200MHz - 1000MHz	
U_{LAB} = 5.90dB U_{CISPR} = 6.3dB	
Radiated Emissions 1GHz - 6GHz	
U_{LAB} = 4.80dB U_{CISPR} = 5.2dB	
Radiated Emissions 6GHz - 18GHz	
U_{LAB} = 5.1dB U_{CISPR} = 5.5dB	
Power Line Conducted Emissions 9kHz to 150kHz	
U_{LAB} = 2.96dB U_{CISPR} = 3.8dB	
Power Line Conducted Emissions 150kHz to 30MHz	
U_{LAB} = 3.12dB U_{CISPR} = 3.4dB	
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

Other Measurement Uncertainties (U_{LAB})
RF Conducted Emissions 9kHz - 40GHz
U_{LAB} = 1.0dB U_{CISPR} = n/a
Frequency/Bandwidth 9kHz - 40GHz
U_{LAB} = 0.1ppm U_{CISPR} = n/a
Temperature
U_{LAB} = 1^{O}C U_{CISPR} = n/a

END OF REPORT

