Test Report Serial Number:	**45461743 R1.0**
Test Report Date:	**16 June 2022**
Project Number:	**1596**

EMC Test Report - New Filing

Applicant:

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

FCC ID:	IC Registration Number
2AEOCPC211	**-**
Product Model Number / HVIN	Product Name / PMN
WALKER III 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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Table of Contents

1.0 REVISION HISTORY *5*
2.0 CLIENT AND DUT INFORMATION *6*
3.0 SCOPE *7*
4.0 TEST RESULT SUMMARY *8*
5.0 NORMATIVE REFERENCES *10*
6.0 FACILITIES AND ACCREDITATIONS *11*
7.0 CONDUCTED POWER *12*
8.0 MODULATION RESPONSE *20*
9.0 OCCUPIED BANDWIDTH AND EMISSION MASKS *25*
10 CONDUCTED OUT OF BAND SPURIOUS EMISSIONS *33*
11.0 RADIATED SPURIOUS TX EMISSIONS *47*
12.0 RADIATED SPURIOUS RX EMISSIONS *58*
13.0 FREQUENCY STABILITY *64*
APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT *67*
APPENDIX B – EQUIPMENT LIST AND CALIBRATION *72*
APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY *73*
END OF REPORT *73*

Table of Figures

Figure A.1 – Test Setup Conducted Measurements *67*
Figure A.2 – Test Setup Audio Modulation Response Measurements *68*
Figure A.3 – Test Setup Radiated Emissions Measurements Below 30MHz *69*
Figure A.4 – Test Setup Radiated Emissions Measurements 30-1000MHz *70*
Figure A.5 – Test Setup Radiated Emissions Measurements 30-1000MHz *70*
Figure A.6 – Test Setup Frequency Stability Measurements *71*

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Table of Plots

Plot 7.1 – Conducted Output Power, Channel 1, AM 13
Plot 7.2 – Conducted Output Power, Channel 20, AM 14
Plot 7.3 – Conducted Output Power, Channel 40, AM 15
Plot 7.4 – Conducted Output Power, Channel 1, FM 16
Plot 7.5 – Conducted Output Power, Channel 20, FM 17
Plot 7.6 – Conducted Output Power, Channel 40, FM 18
Plot 8.1 – Audio Frequency and Low Pass Filter Response, AM 21
Plot 8.2 – Modulation Limiting Response, AM 22
Plot 8.3 – Audio Frequency and Low Pass Filter Response, FM 23
Plot 8.4 – Modulation Limiting Response, FM 24
Plot 9.1 – Occupied Bandwidth, Channel 1, AM 26
Plot 9.2 – Occupied Bandwidth, Channel 20, AM 27
Plot 9.3 – Occupied Bandwidth, Channel 40, AM 28
Plot 9.4 – Occupied Bandwidth, Channel 1, FM 29
Plot 9.5 – Occupied Bandwidth, Channel 20, FM 30
Plot 9.6 – Occupied Bandwidth, Channel 40, FM 31
Plot 10.1 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 1, AM 34
Plot 10.2 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 1, AM 35
Plot 10.3 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 20, AM 36
Plot 10.4 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 20, AM 37
Plot 10.5 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 40, AM 38
Plot 10.6 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 40, AM 39
Plot 10.7 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 1, FM 40
Plot 10.8 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 1, FM 41
Plot 10.9 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 20, FM 42
Plot 10.10 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 20, FM 43
Plot 10.11 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 40, FM 44
Plot 10.12 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 40, FM 45
Plot 11.1 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, without Accessories, Front 48
Plot 11.2 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, without Accessories, Side 49
Plot 11.3 – Radiated Spurious Emissions OATS, 30 - 1000MHz, without Accessories, Horizontal 50
Plot 11.4 – Radiated Spurious Emissions OATS, 30 - 1000MHz, without Accessories, Vertical 51
Plot 11.5 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, with Accessories, Front 53
Plot 11.6 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, with Accessories, Side 54
Plot 11.7 – Radiated Spurious Emissions OATS, 30 - 1000MHz, with Accessories, Horizontal 55
Plot 11.8 – Radiated Spurious Emissions OATS, 30 - 1000MHz, with Accessories, Vertical 56
Plot 12.1 – Radiated Rx Emissions OATS, 9kHz - 30MHz, Front 59
Plot 12.2 – Radiated Rx Emissions OATS, 9kHz - 30MHz, Side 60
Plot 12.3– Radiated Spurious Emissions OATS, 30 - 1000MHz, Horizontal 61
Plot 12.4– Radiated Spurious Emissions OATS, 30 - 1000MHz, Vertical 62

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Table of Tables

Table 7.1 – Summary of Conducted Power Measurements (RMS) 19
Table 7.2 – Compliance to §2.1033(c)(8) – 13.8VDC, AM 19
Statement - Compliance to §95.977 20
Table 9.1 - Summary of Occupied Bandwidth and Emission Mask Results 32
Table 10.1 – Summary of Conducted Out of Band Emissions 46
Table 11.1 – Summary of Radiated Tx Emissions, without Accessories 52
Table 11.2 – Summary of Radiated Tx Emissions, with Accessories 57
Table 12.1 – Summary of Radiated Rx Emissions 63
Table 13.1 – Summary of Frequency Stability Results (AM) 65
Table 13.2 – Summary of Frequency Stability Results (FM) 66
Table A.1 – Setup - Conducted Measurements Equipment 67
Table A.2 – Setup - Audio Modulation Equipment 68
Table A.3 – Setup - Radiated Emissions Equipment 69
Table A.4 – Setup - Frequency Stability Measurement Equipment 71

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1.0 REVISION HISTORY

Revision History					
Samples Tested By:	Art Voss, P.Eng.		**Date(s) of Evaluation:**		27 May - 1 June, 2022
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		n/a	Art Voss	10 June, 2022
1.0	Initial Release		n/a	Art Voss	16 June, 2022

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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	
DUT Information		
Device Identifier(s):	FCC ID:	2AEOCPC211
	IC ID:	-
Device Type:	Mobile 4W AM/FM CBRS Transceiver	
Device Model(s) / HVIN:	Walker III FCC	
Device Marketing Name / PMN:	Walker III FCC	
Firmware Version ID Number / FVIN:	-	
Host Marketing Name / HMN:	-	
Test Sample Serial No.:	#2	
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	
DUT Power Source:	12 VDC	
DUT Dimensions [WxLxH]	170mm x 200mm x 50mm	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

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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 WALKER III FCC is Mobile 4W AM / FM CBRS 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.

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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 C63.26:2015 ANSI C63.4:2014	§2.1046 §2.1033(c)(8) §95.967	27 May, 2022	**Complies**
8.0	Modulation Response	ANSI/TIA/EIA-382-A ANSI/TIA-603-E ANSI C63.26:2015 ANSI C63.4:2014	§2.1047 §95.975 §95.977	30 - 31 May, 2022	**Complies**
9.0	Occupied Bandwidth	ANSI/TIA/EIA-382-A ANSI C63.26:2015 ANSI C63.4:2014	§2.1049 §95.973	31 May, 2022	**Complies**
	Emission Mask	ANSI/TIA/EIA-382-A ANSI C63.26:2015 ANSI C63.4:2014	§2.1049 §95.979	31 May, 2022	**Complies**
10.0	Conducted TX Spurious Emissions	ANSI/TIA/EIA-382-A ANSI C63.26:2015 ANSI C63.4:2014	§2.1051 §95.979	31 May, 2022	**Complies**
11.0	Radiated TX Spurious Emissions	ANSI/TIA/EIA-382-A ANSI C63.26:2015 ANSI C63.4:2014	§2.1053 §95.979	1 June, 2022	**Complies**
12.0	Radiated Receiver Emissions	ANSI C63.26:2015 ANSI C63.4:2014	§15 Subpart B §15.109(d)	1 June, 2022	**Complies**
13.0	Frequency Stability	ANSI/TIA/EIA-382-A ANSI C63.26:2015 ANSI C63.4:2014	§2.1055 §95.965	3 June, 2022	**Complies**

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Test Station Day Log					
Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
27 May 2022	24.8	15	100.7	**EMC**	**7**
30 May 2022	23.6	17	101.8	**EMC**	**8**
31 May 2022	23.4	16	102.2	**EMC**	**8, 9, 10**
1 June 2022	14.0	77	101.2	**OATS**	**11, 12**
3 June 2022	19.6	17	102.1	**TC**	**13**

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.

10 June 2022
Date

PROFESSIONAL PROVINCE OF A. F. VOSS # 31327 BRITISH COLUMBIA ENGINEER

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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 C63.26-2015	American National Standard of Procedures for Compliance Testing of Transmitters Used in Licensed Radio Services
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	Code of Federal Regulations
Title 47:	Telecommunication
Part 2:	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR	Code of Federal Regulations
Title 47:	Telecommunication
Part 15:	Radio Frequency Devices
Subpart B:	Unintentional Radiators
CFR	Code of Federal Regulations
Title 47:	Telecommunication
Part 95:	Personal Radio Service
Subpart D:	Citizens Band Radio Service (CBRS)

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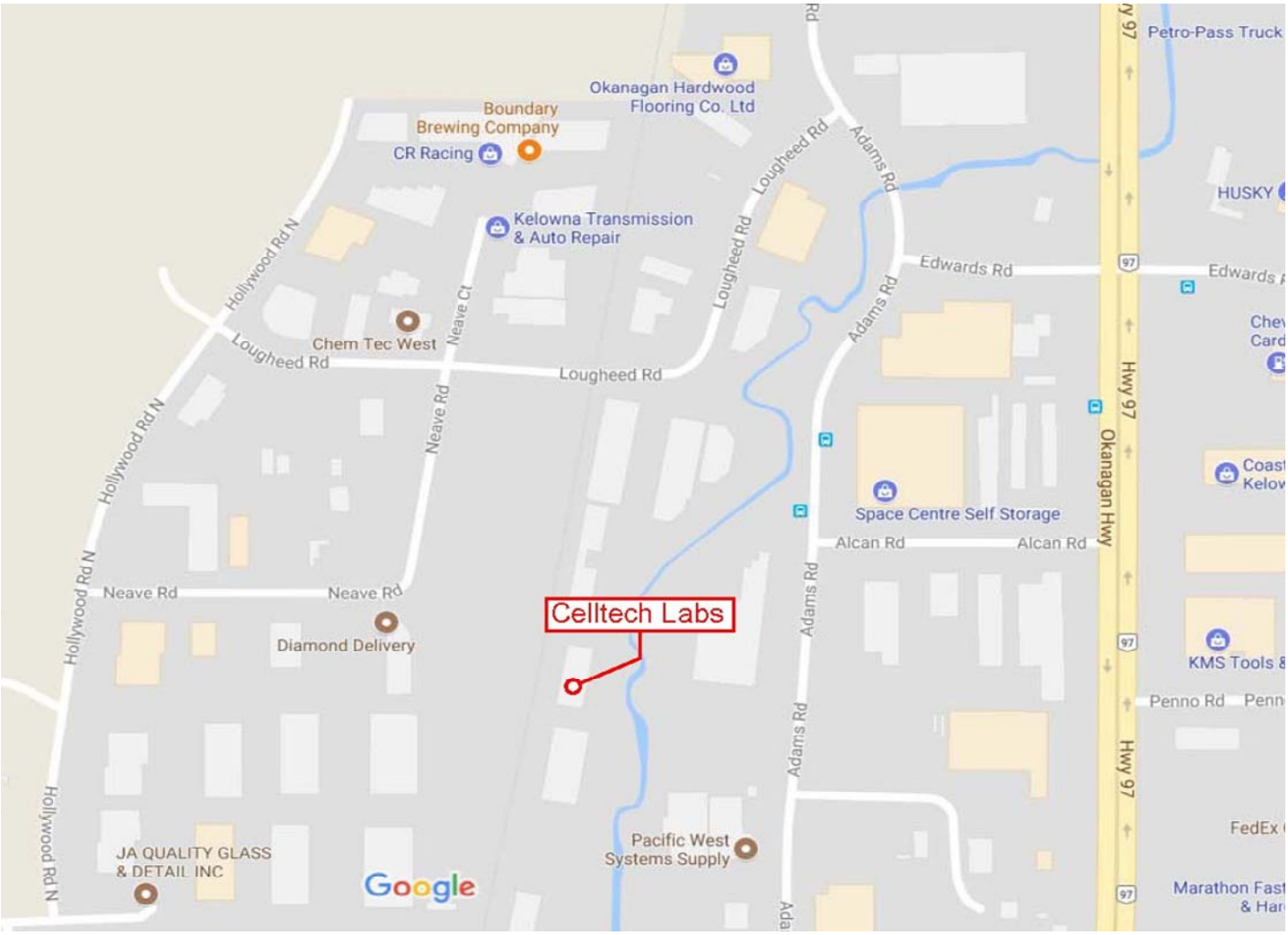
6.0 FACILITIES AND ACCREDITATIONS

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 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.

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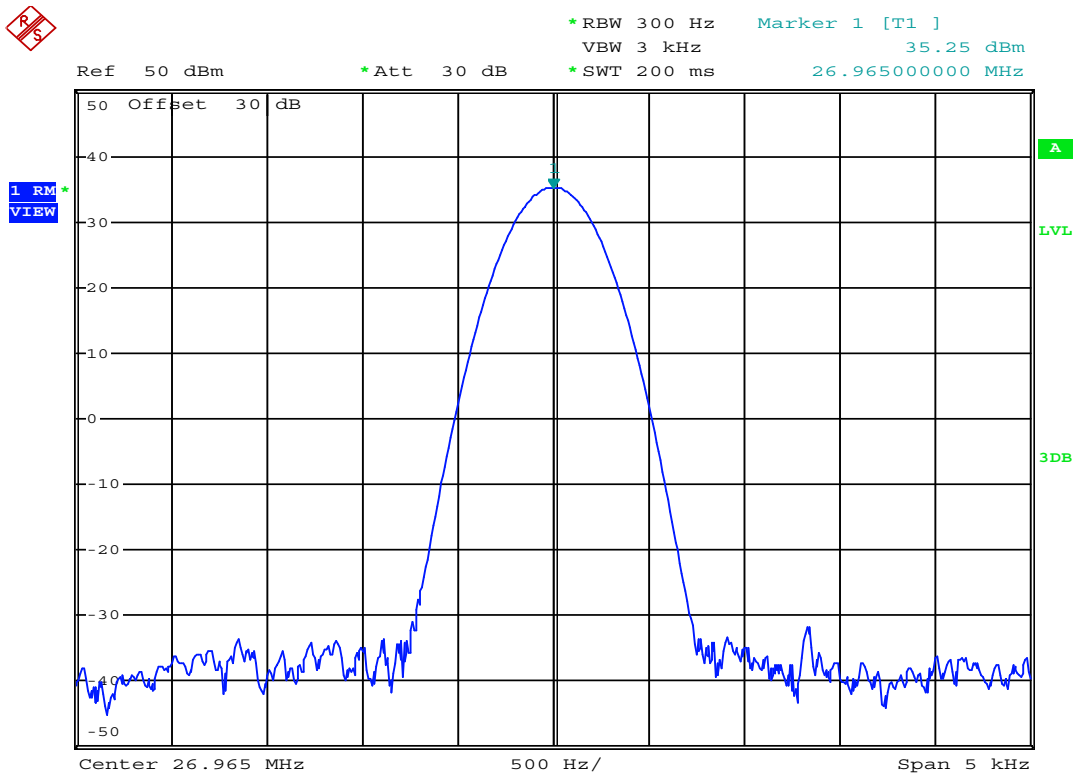
Plot 7.1 – Conducted Output Power, Channel 1, AM

Conducted Power:



Date: 27.MAY.2022 15:39:50

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
1	26.965	AM	35.25

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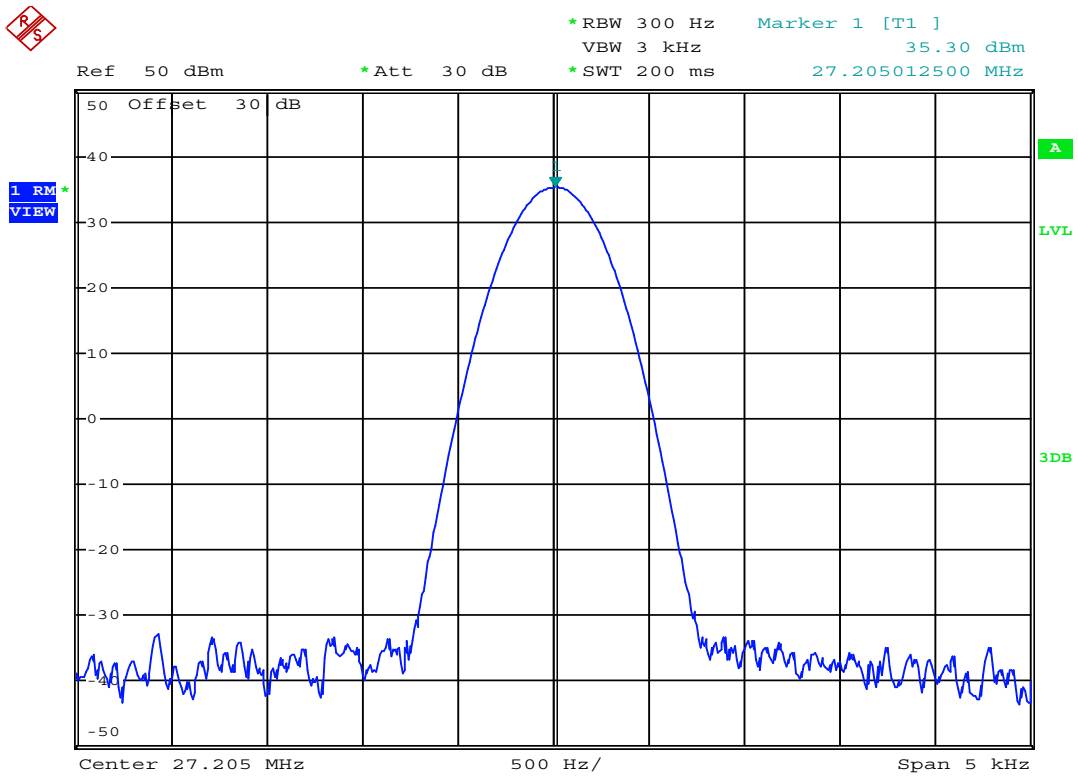
Plot 7.2 – Conducted Output Power, Channel 20, AM

Conducted Power:



Date: 27.MAY.2022 15:48:30

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
20	27.205	AM	35.30

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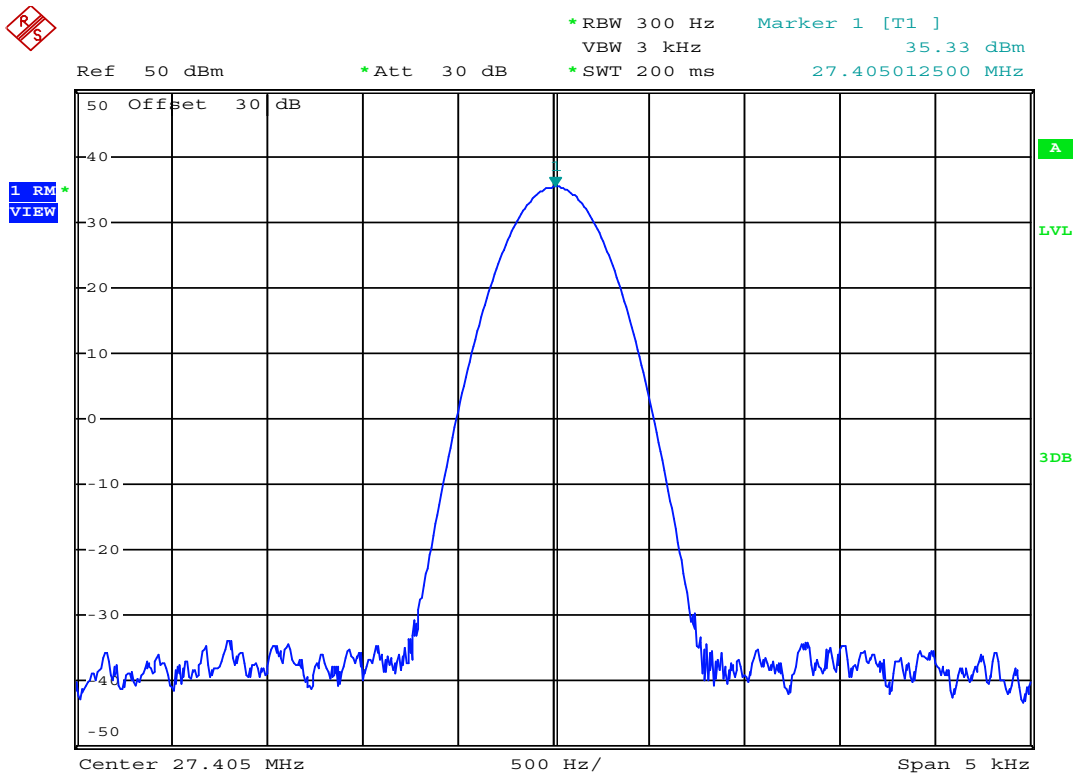
Plot 7.3 – Conducted Output Power, Channel 40, AM

Conducted Power:



Date: 27.MAY.2022 15:39:10

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
40	27.405	AM	35.33

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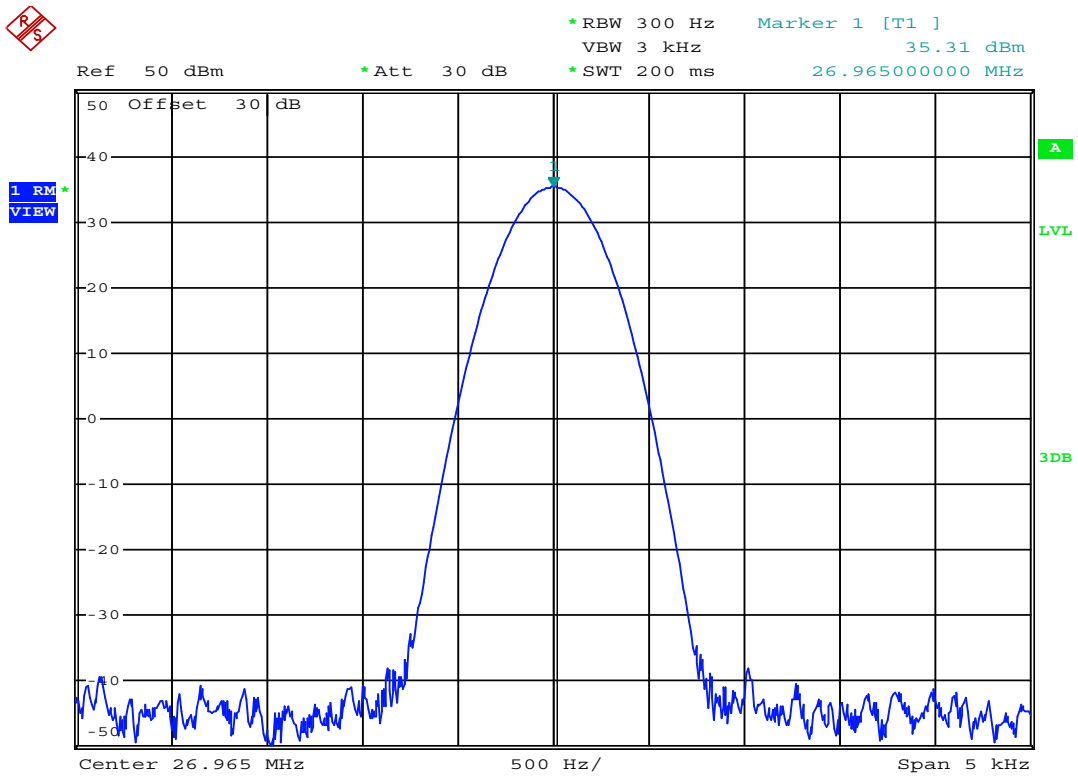
Plot 7.4 – Conducted Output Power, Channel 1, FM

Conducted Power:



Date: 27.MAY.2022 15:44:59

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
1	26.965	FM	35.31

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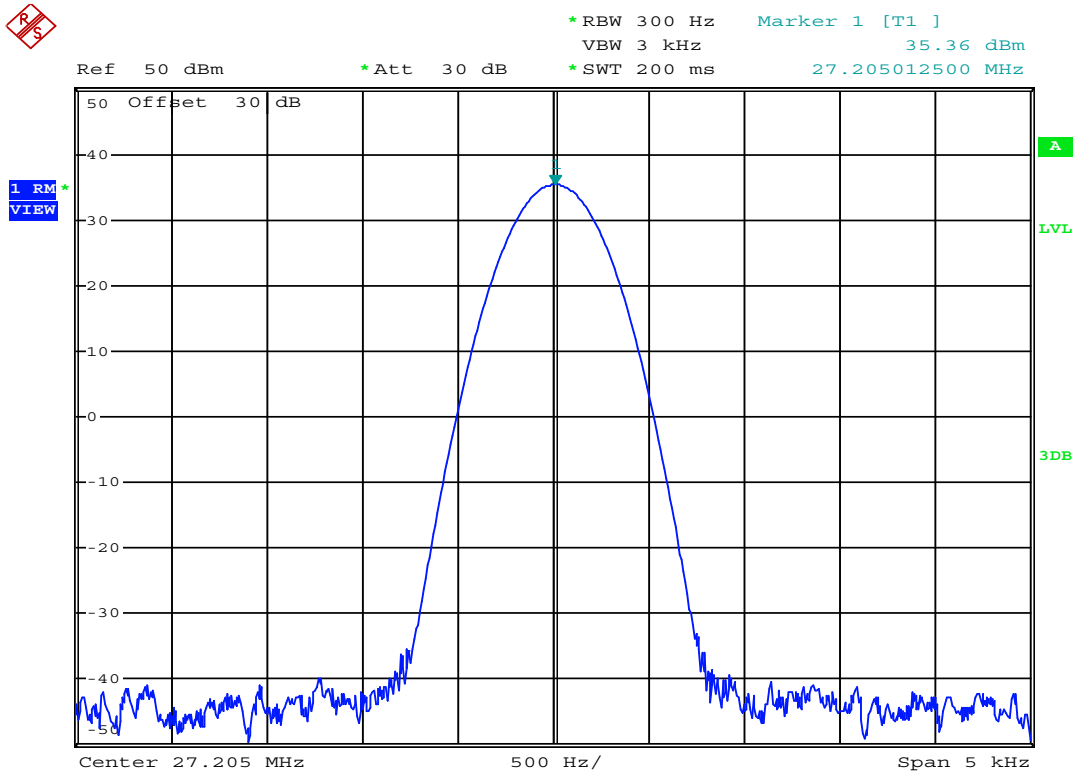
Plot 7.5 – Conducted Output Power, Channel 20, FM

Conducted Power:



Date: 27.MAY.2022 15:45:47

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
20	27.205	FM	35.36

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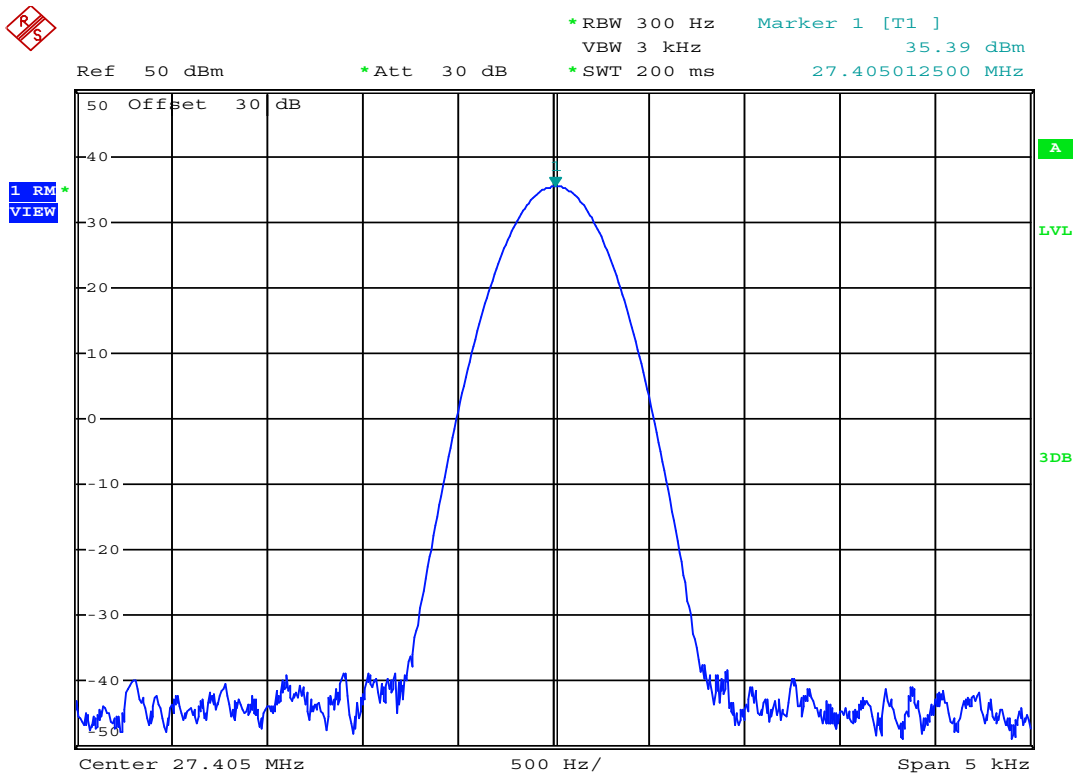
Plot 7.6 – Conducted Output Power, Channel 40, FM

Conducted Power:



Date: 27.MAY.2022 15:44:04

Channel Number	Channel Frequency *(MHz)*	Modulation	Conducted Power *(dBm)*
40	27.405	FM	35.39

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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	35.25	36	0.75
20	27.205		35.30		0.70
40	27.405		35.33		0.67
1	26.965	FM	35.31		0.69
20	27.205		35.36		0.64
40	27.405		35.39		0.61
				Result:	Complies

Conducted Margin = P_{Limit} - P_{Meas}

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

FCC CFR 47 §2.1033(c)(8): Power to Transmitter: AM	
Measured Receiver Current:	IRx = 0.20A
Measured Total Current:	ITx = 1.39A
Transmitter Current (ITx - IRx):	IXmitter = 1.19A
Power to Transmitter:	(13.8VDC)(1.19) = 16.4W
Result:	Complies

FCC CFR 47 §2.1033(c)(8): Power to Transmitter: FM	
Measured Receiver Current:	IRx = 0.20A
Measured Total Current:	ITx = 1.39A
Transmitter Current (ITx - IRx):	IXmitter = 1.19A
Power to Transmitter:	(13.8VDC)(1.19) = 16.4W
Result:	Complies

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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= $20Log(V_{FREQ}/V_{REF})$

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.

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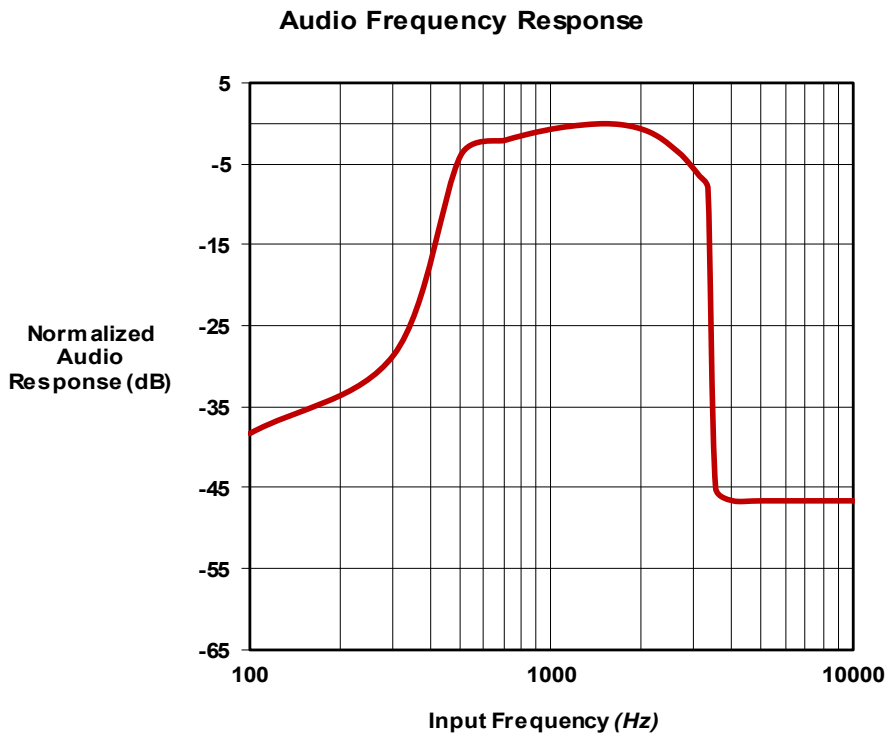
Plot 8.1 – Audio Frequency and Low Pass Filter Response, AM

Audio Frequency and Low Pass Filter Response (AM)

Measured Audio Response		
Freq	Audio Response (@ 50% MI)	
(Hz)	*(mV)*	*(dB)**
100	2300.00	-38.291
300	750.00	-28.558
500	44.00	-3.926
700	35.50	-2.061
900	31.50	-1.023
1100	29.40	-0.424
1300	28.40	-0.123
1500	**28.00**	**0.000**
1700	28.40	-0.123
1900	29.50	-0.453
2100	31.40	-0.995
2300	34.40	-1.788
2500	38.80	-2.833
2700	43.80	-3.886
2900	50.80	-5.174
3100	59.30	-6.518
3300	70.30	-7.996
3500	5000.00	-45.036
4000	6000.00	-46.620
5000	6000.00	-46.620
10000	6000.00	-46.620
*** Normalize to 2600Hz**		



Note: 50% MI could not be achieved above 3600Hz.

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

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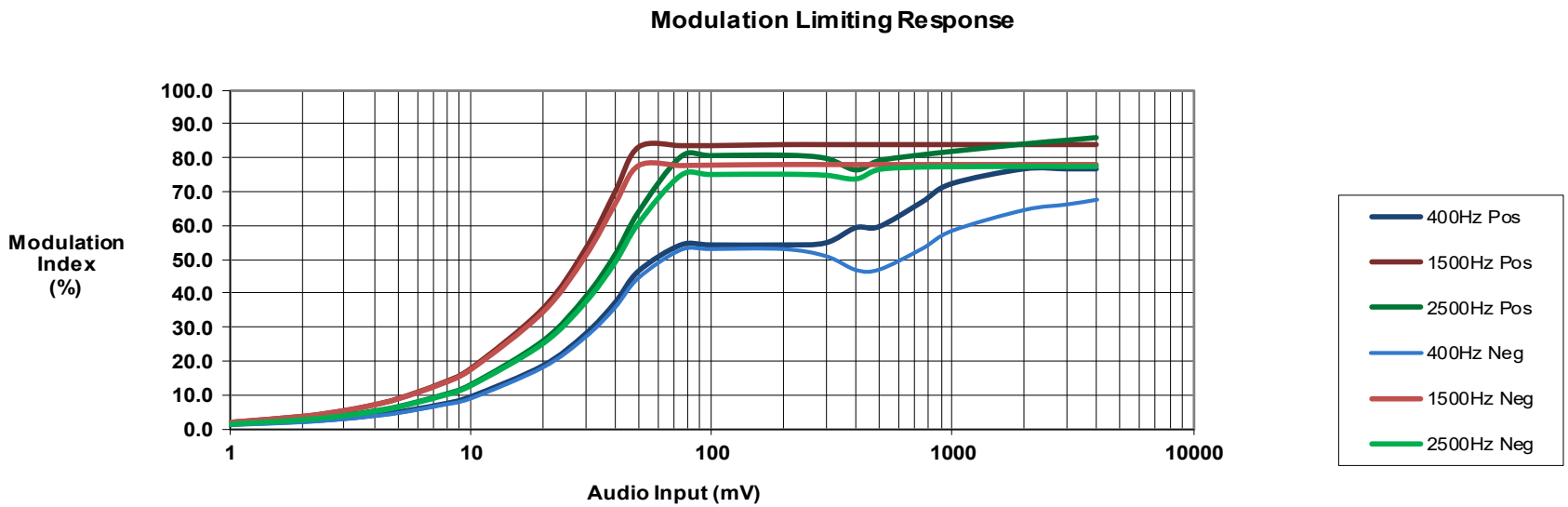
Plot 8.2 – Modulation Limiting Response, AM

Modulation Limiting Response (AM)



Measured Modulation Response [Modulation Index (%)]

Freq (Hz)	Audio Input (mV) 1	2	3	4	5	7.5	10	20	30	40	50	75	100	200	300	400	500	750	1000	2000	3000	4000	Deviation
400	1.2	2.1	2.9	3.8	4.8	7.0	9.3	18.5	27.9	37.3	46.5	54.2	54.2	54.2	54.8	59.3	59.6	66.8	72.3	76.7	76.7	76.7	Positive
1500	2.0	3.8	5.5	7.2	9.0	13.5	17.9	35.6	53.1	70.2	83.3	83.7	83.7	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
2500	1.5	2.8	4.1	5.4	6.7	9.9	13.1	26.0	38.8	51.5	64.0	80.2	80.5	80.6	79.7	76.3	79.0	80.7	81.7	83.9	85.0	85.8	
400	1.2	2.0	2.9	3.9	4.7	7.0	9.0	18.2	27.1	36.0	44.7	53.0	53.2	53.2	51.1	47.0	47.2	53.3	58.6	64.8	66.4	67.8	Negative
1500	2.0	3.7	5.5	7.2	8.9	13.2	17.5	34.5	50.9	66.5	77.7	77.7	77.8	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	
2500	1.6	2.8	4.1	5.3	6.6	9.8	12.9	25.3	37.5	49.4	60.9	75.0	75.2	75.3	75.0	73.9	76.7	77.4	77.5	77.6	77.6	77.6	

.	1500Hz
Audio Input @ Maximum Deviation:	28mV
Maximum Measured Modulation Index:	85.8%
Result:	Complies

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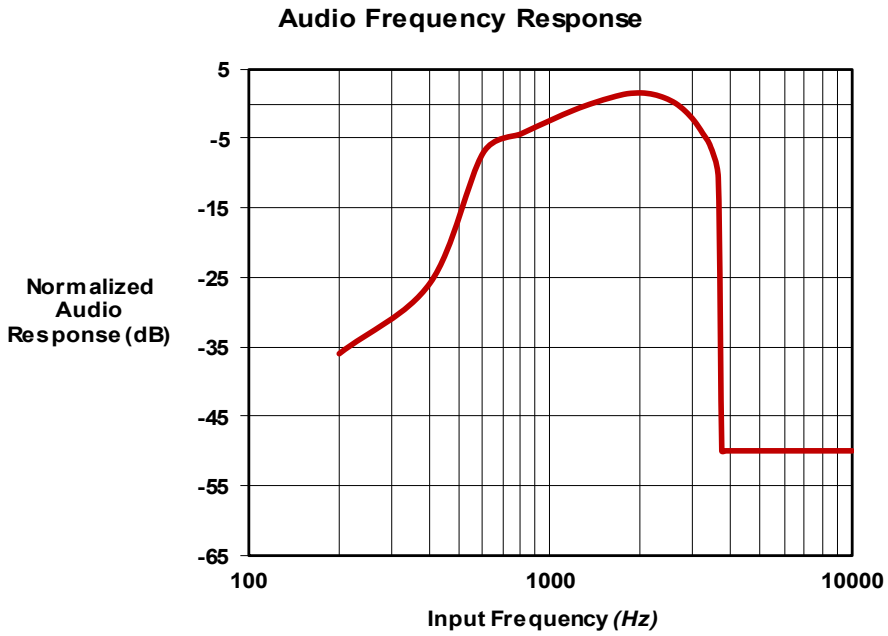
Plot 8.3 – Audio Frequency and Low Pass Filter Response, FM

Audio Frequency and Low Pass Filter Response (FM)

Measured Audio Response		
Freq	Audio Response (@ 20% Deviation)	
(Hz)	*(mV)*	*(dB)**
200	1200.00	-36.009
400	372.00	-25.836
600	43.00	-7.094
800	31.50	-4.391
1000	25.20	-2.453
1200	21.20	-0.952
1400	18.80	0.092
1600	17.20	0.865
1800	16.20	1.385
2000	**16.00**	**1.493**
2200	16.40	1.278
2400	17.40	0.764
2600	19.00	0.000
2800	21.60	-1.114
3000	25.40	-2.522
3200	31.20	-4.308
3400	39.30	-6.313
3600	65.00	-10.683
3700	6000.00	-49.988
3800	6000.00	-49.988
4000	6000.00	-49.988
10000	6000.00	-49.988
*** Normalize to 2000Hz**		



Note: 20% Deviation (+/-400Hz) could not be achieved above 3600Hz.

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

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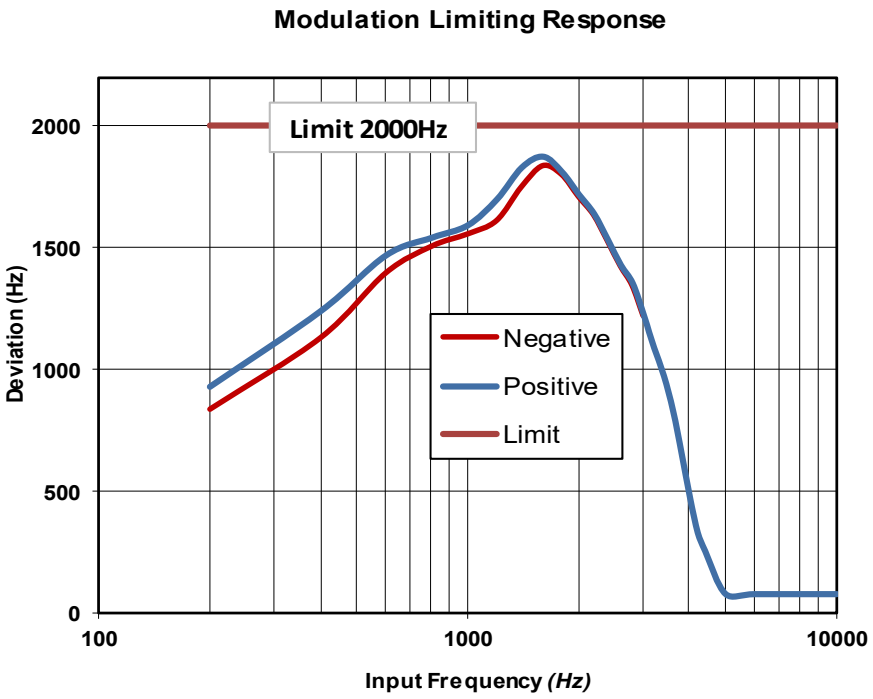
Plot 8.4 – Modulation Limiting Response, FM

Modulation Limiting Response (FM)

Measured Frequency Response		
Input Freq (Hz)	Frequency Deviation (Hz)	
	Positive	*Negative*
200	931	841
400	1242	1135
600	1470	1400
800	1543	1510
1000	1593	1560
1200	1700	1615
1400	1830	1752
1600	1875	1840
1800	1812	1805
2000	1720	1715
2200	1640	1639
2400	1532	1532
2600	1430	1430
2800	1355	1350
3000	1225	1225
3100	1155	1153
3200	1090	1090
3400	975	972
3600	832	830
3800	655	651
4000	476	478
4200	333	335
4400	257	258
5000	81	82
6000	81	63
10000	81	63



Audio Input Amplitued:	1600mV
Maximum Deviation:	1.875kHz
Result:	Complies

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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**

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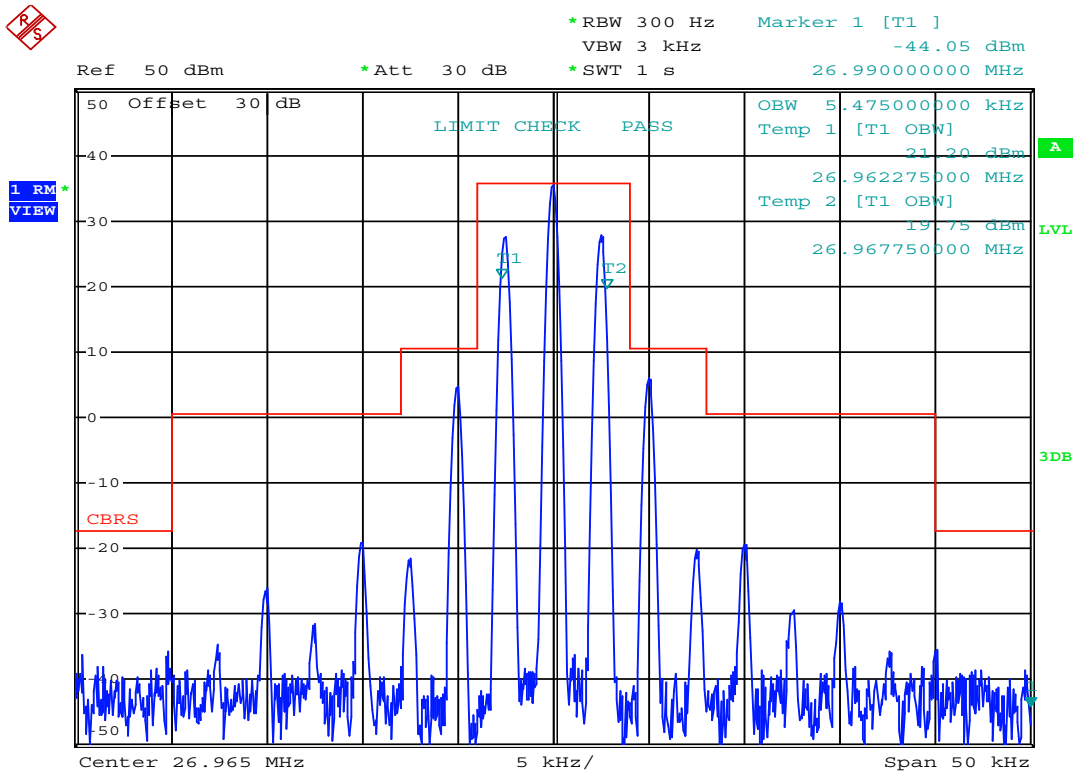
Plot 9.1 – Occupied Bandwidth, Channel 1, AM

Occupied Bandwidth / Emissions Mask:



Date: 31.MAY.2022 15:31:49

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
1	26.965	AM	5.48

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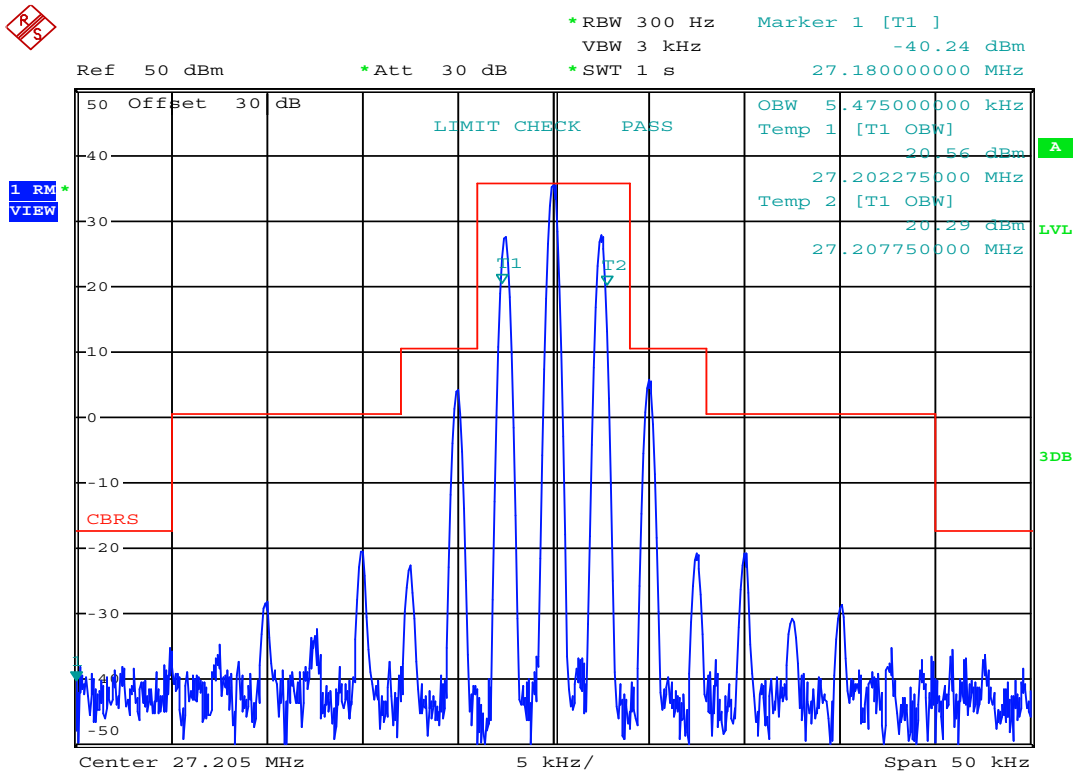
Plot 9.2 – Occupied Bandwidth, Channel 20, AM

Occupied Bandwidth / Emissions Mask:



Date: 31.MAY.2022 15:32:33

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
20	27.205	AM	5.48

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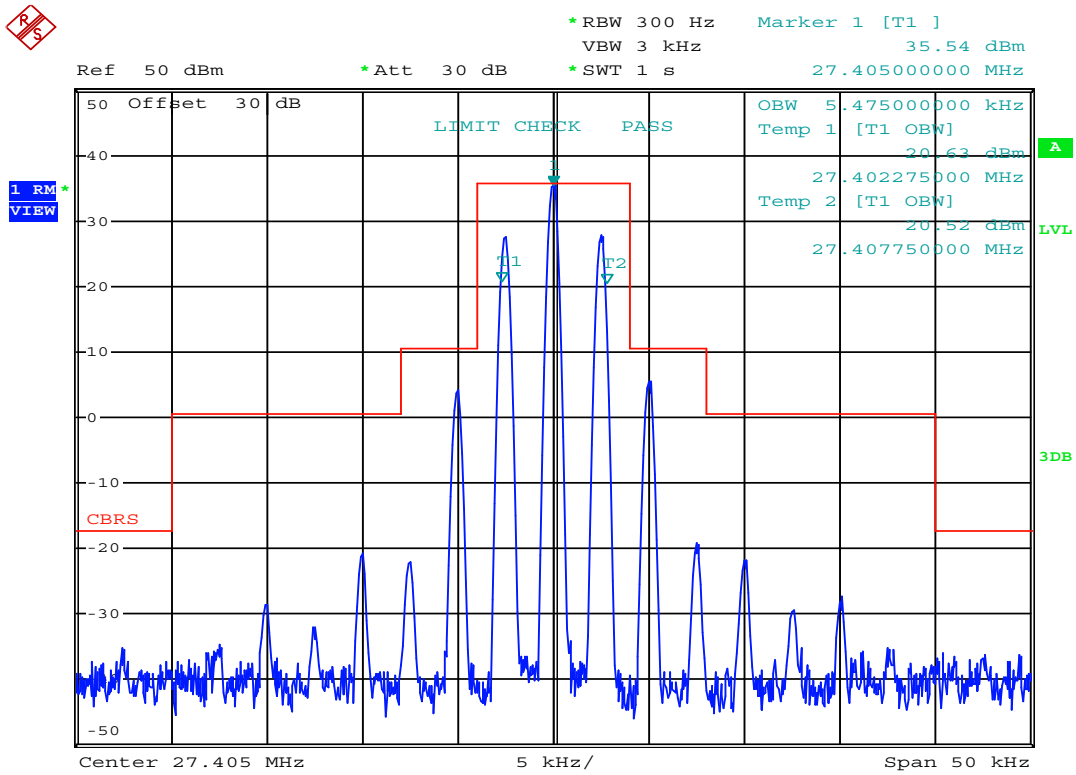
Plot 9.3 – Occupied Bandwidth, Channel 40, AM

Occupied Bandwidth / Emissions Mask:



Date: 31.MAY.2022 15:31:14

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
40	27.405	AM	5.48

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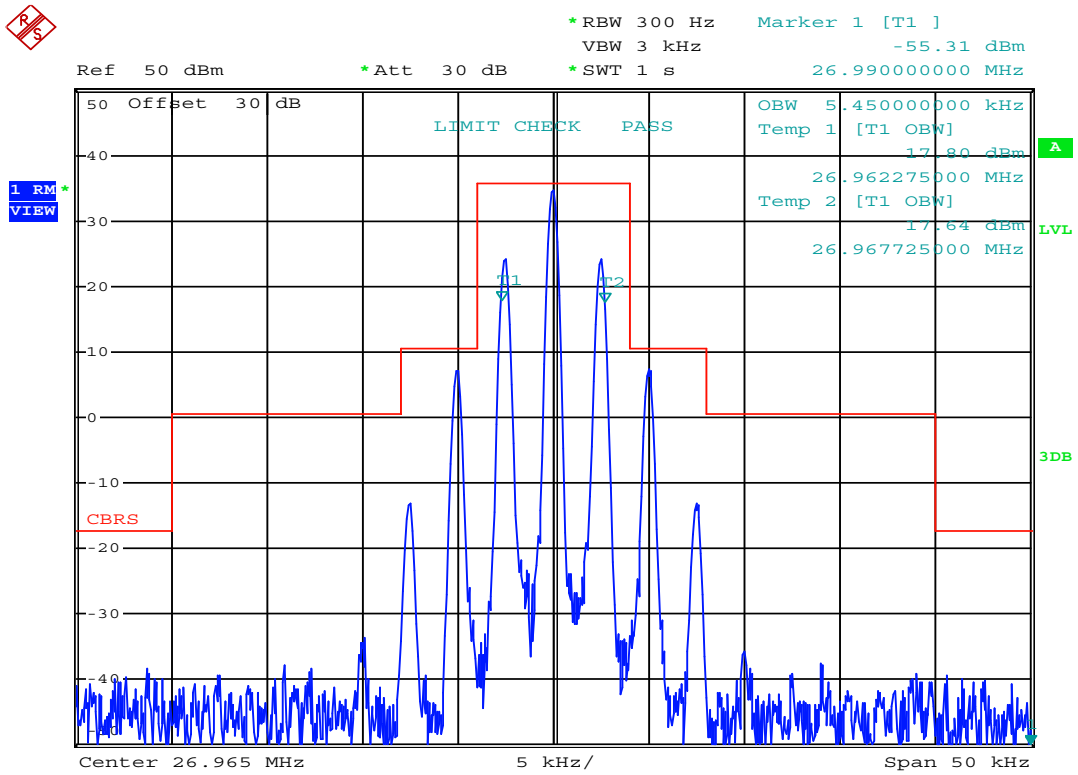
Plot 9.4 – Occupied Bandwidth, Channel 1, FM

Occupied Bandwidth / Emissions Mask:



Date: 31.MAY.2022 15:45:40

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
1	26.965	FM	5.45

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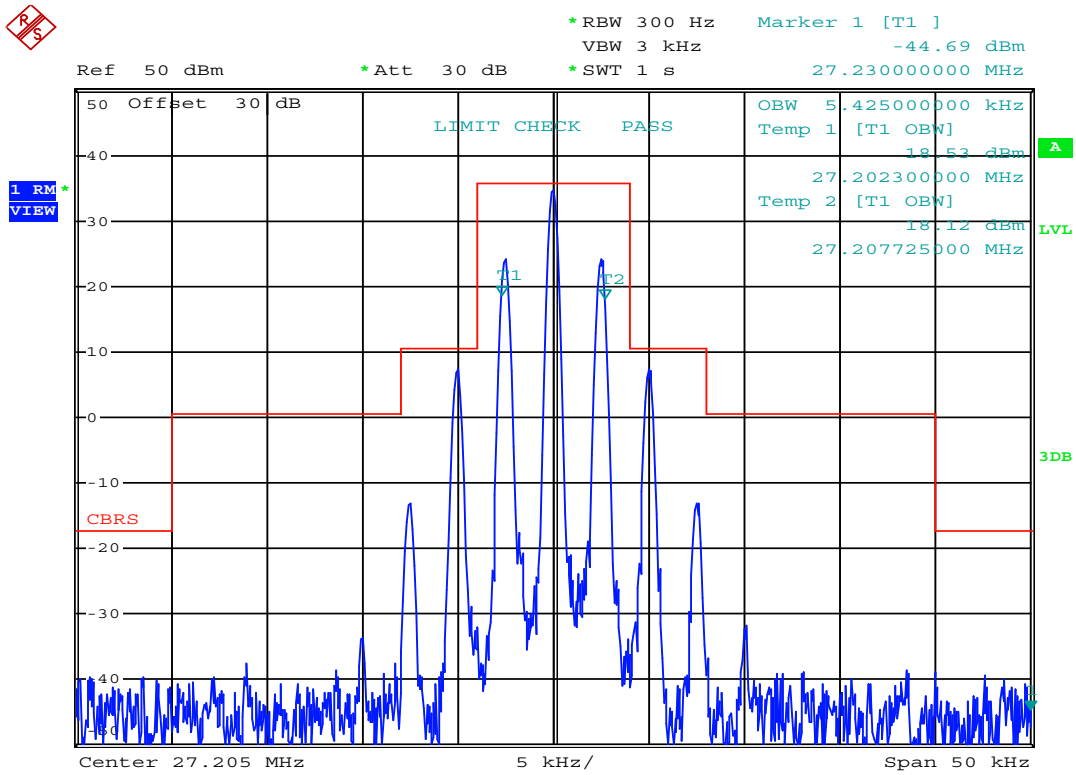
Plot 9.5 – Occupied Bandwidth, Channel 20, FM

Occupied Bandwidth / Emissions Mask:

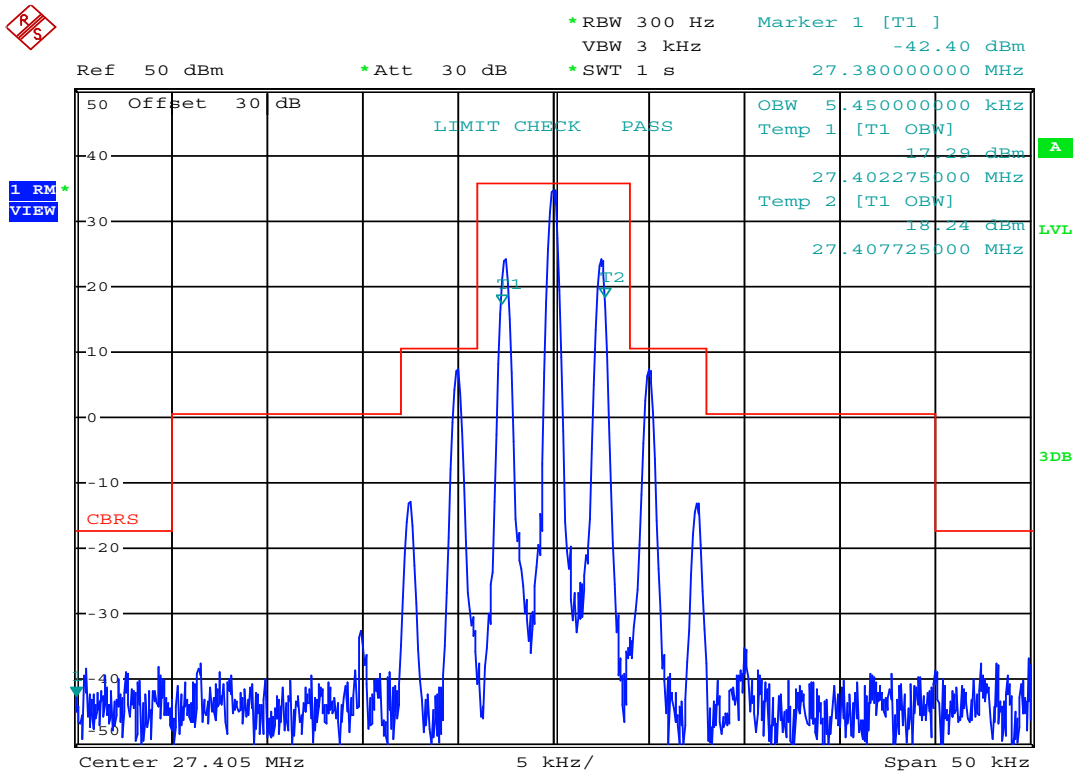


Date: 31.MAY.2022 15:44:29

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
20	27.205	FM	5.4

Plot 9.6 – Occupied Bandwidth, Channel 40, FM

Occupied Bandwidth / Emissions Mask:



Date: 31.MAY.2022 15:45:08

DUT Channel	Channel Frequency *(MHz)*	DUT Modulation	Occupied Bandwidth *(kHz)*
40	27.405	FM	5.45

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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	5.48	8.0	5K47A3E	Pass
20	27.205		5.48		5K47A3E	Pass
40	27.405		5.48		5K47A3E	Pass
1	26.965	FM	5.45		5K45F3E	Pass
20	27.205		5.43		5K42F3E	Pass
40	27.405		5.45		5K45F3E	Pass
					Results:	Complies

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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**

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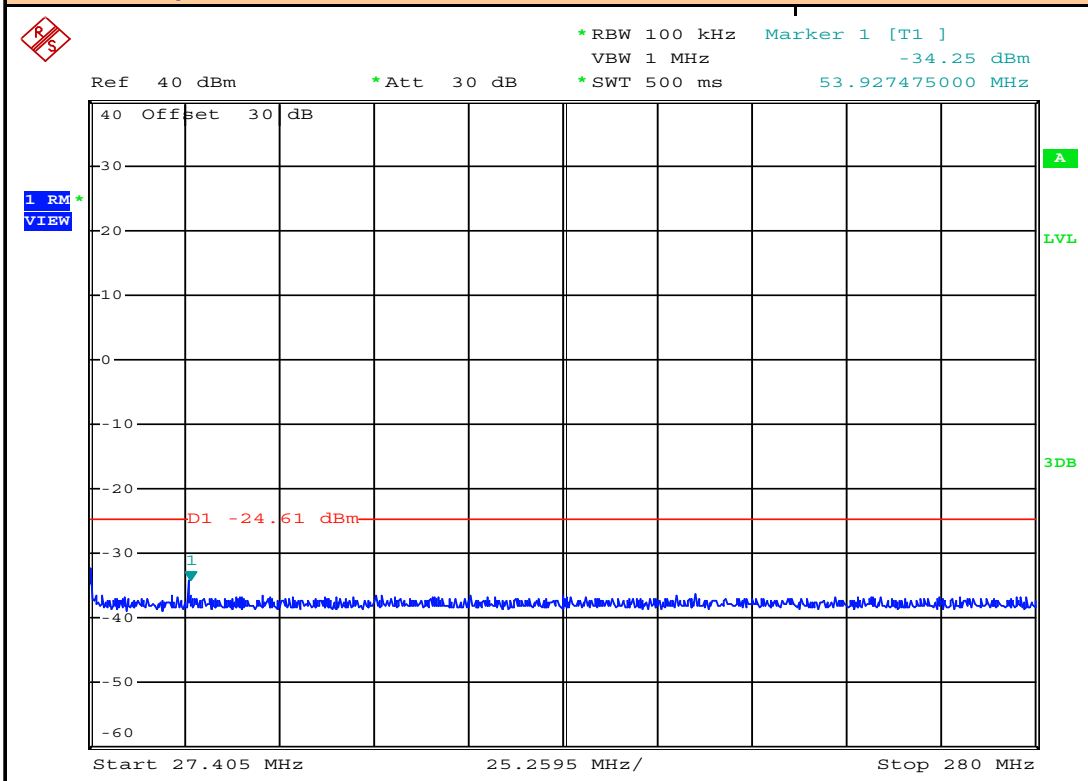
Plot 10.1 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 1, AM

Conducted Spurious Emissions:



Date: 31.MAY.2022 17:23:18

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

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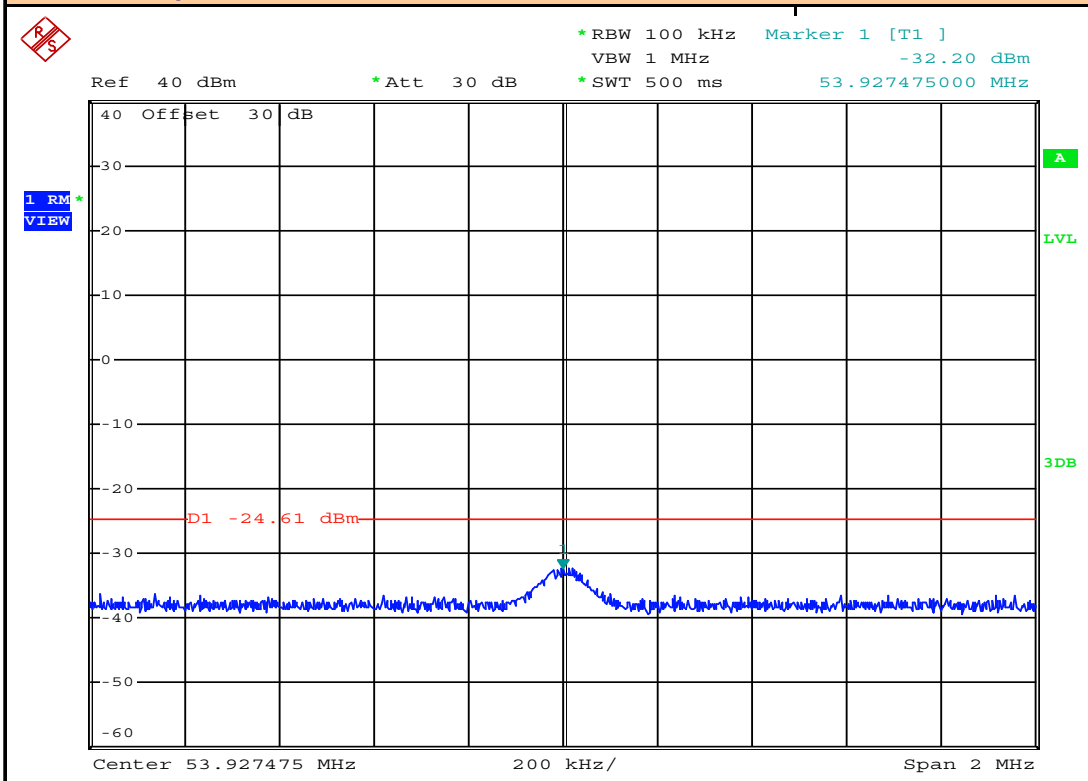
Plot 10.2 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 1, AM

Conducted Spurious Emissions:



Date: 31.MAY.2022 17:23:39

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
1	26.965	AM	53.93	-32.20

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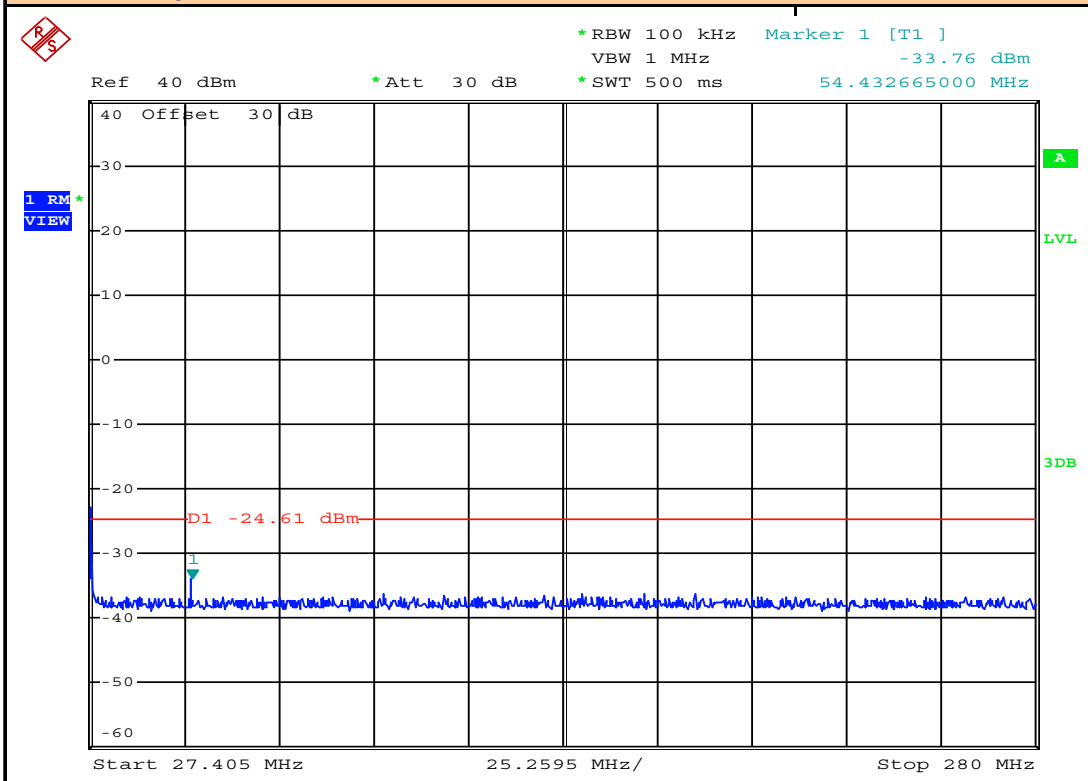
Plot 10.3 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 20, AM

Conducted Spurious Emissions:



Date: 31.MAY.2022 17:24:24

Channel Number	Channel Frequency *(MHz)*	Modulation	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
20	27.205	AM	-	-

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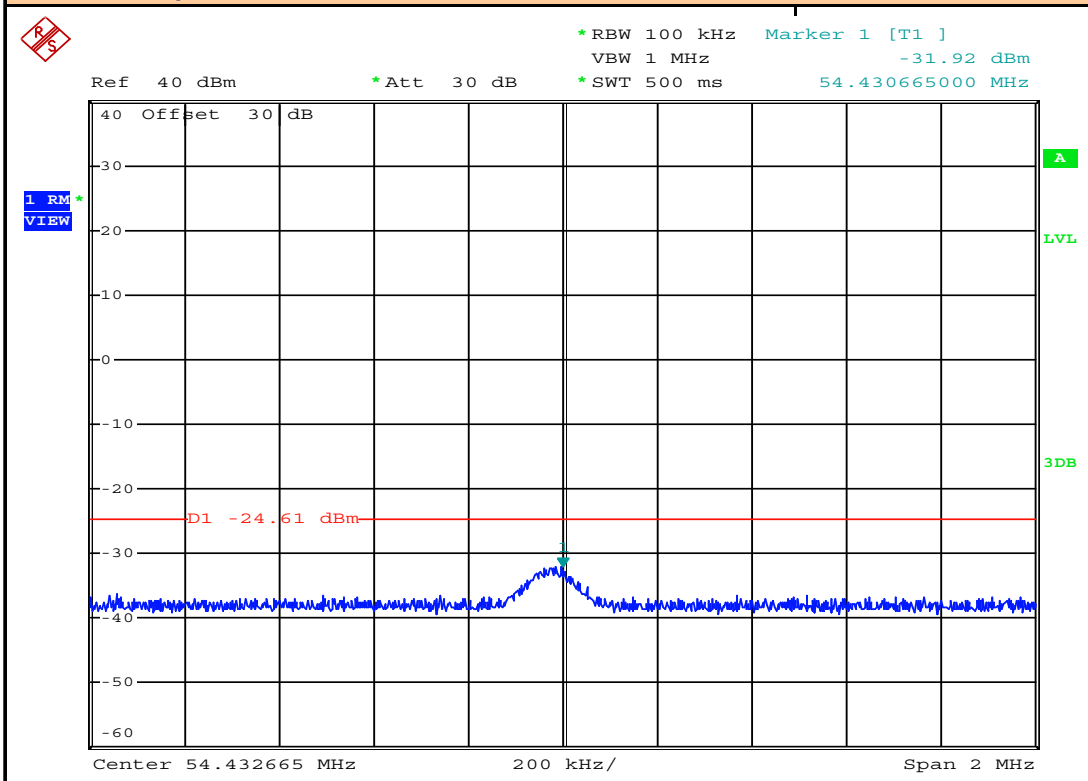
Plot 10.4 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 20, AM

Conducted Spurious Emissions:



Date: 31.MAY.2022 17:24:44

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
20	27.205	AM	54.43	-31.92

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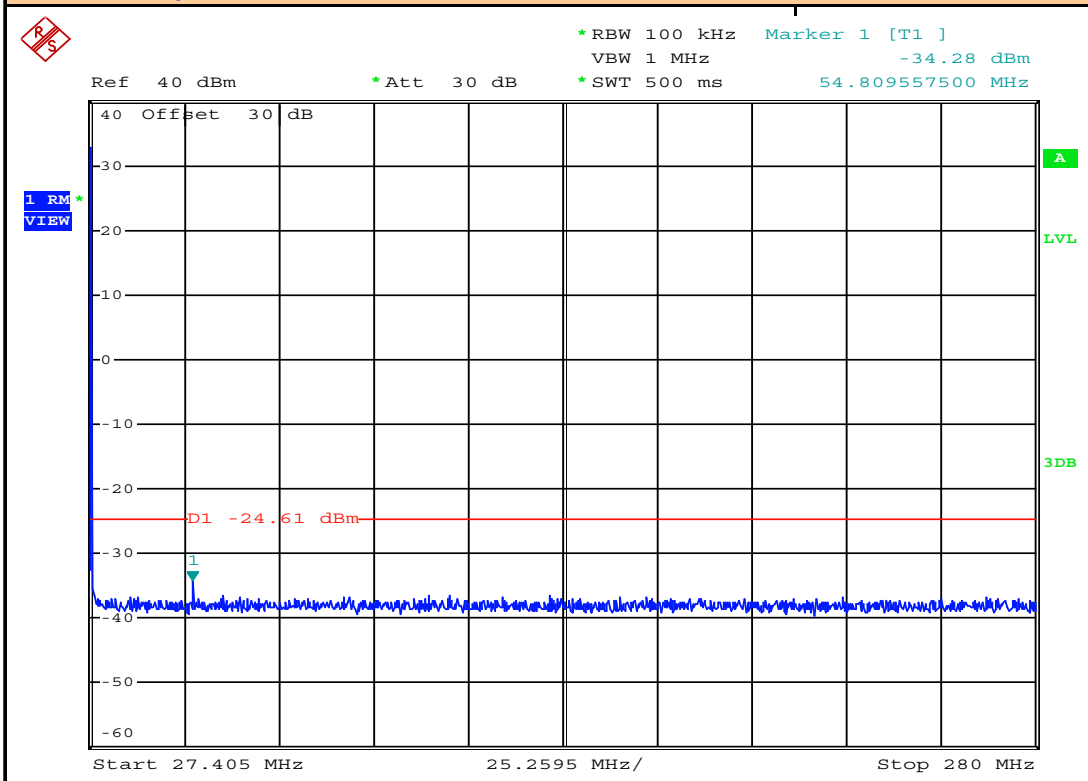
Plot 10.5 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 40, AM

Conducted Spurious Emissions:



Date: 31.MAY.2022 17:22:20

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

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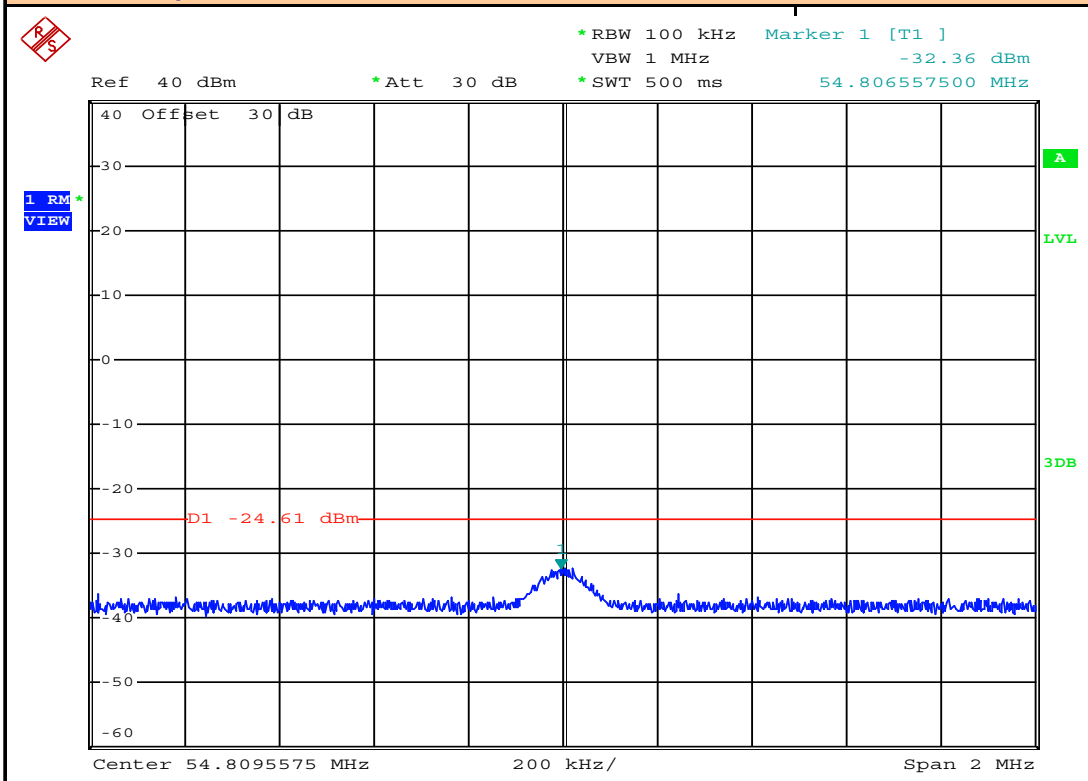
Plot 10.6 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 40, AM

Conducted Spurious Emissions:



Date: 31.MAY.2022 17:22:38

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
40	27.405	AM	54.81	-32.36

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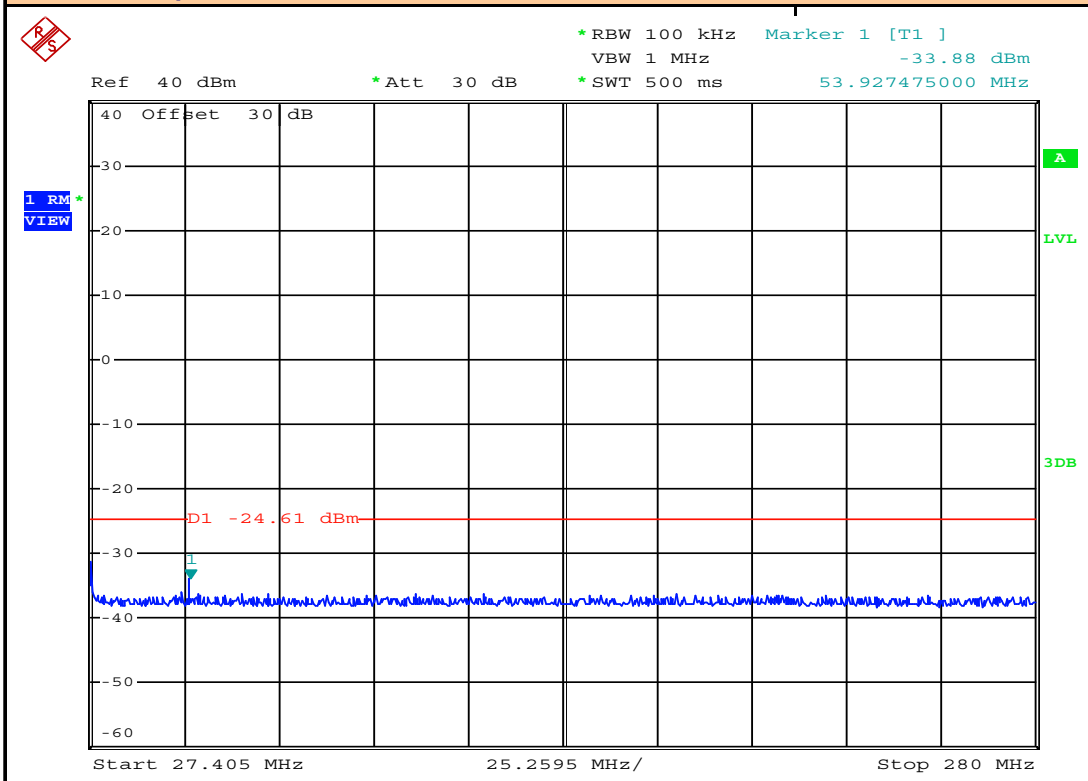
Plot 10.7 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 1, FM

Conducted Spurious Emissions:



Date: 12.JUN.2022 12:57:10

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

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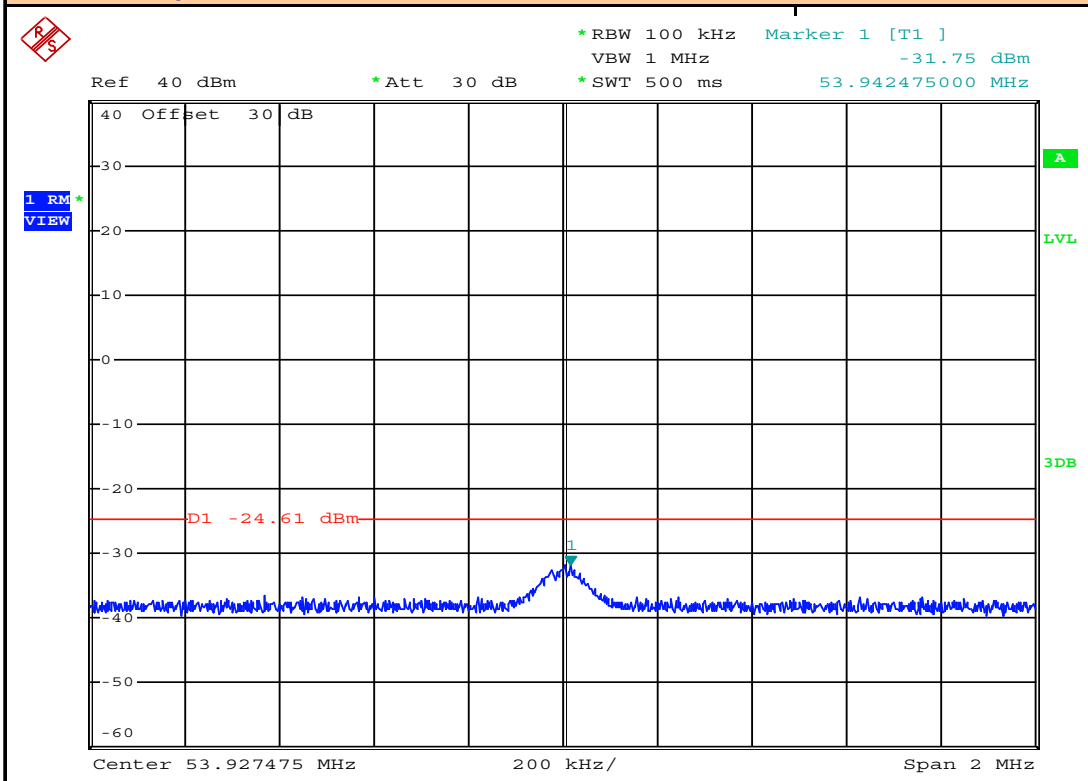
Plot 10.8 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 1, FM

Conducted Spurious Emissions:



Date: 12.JUN.2022 12:57:41

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
1	26.965	FM	53.94	-31.75

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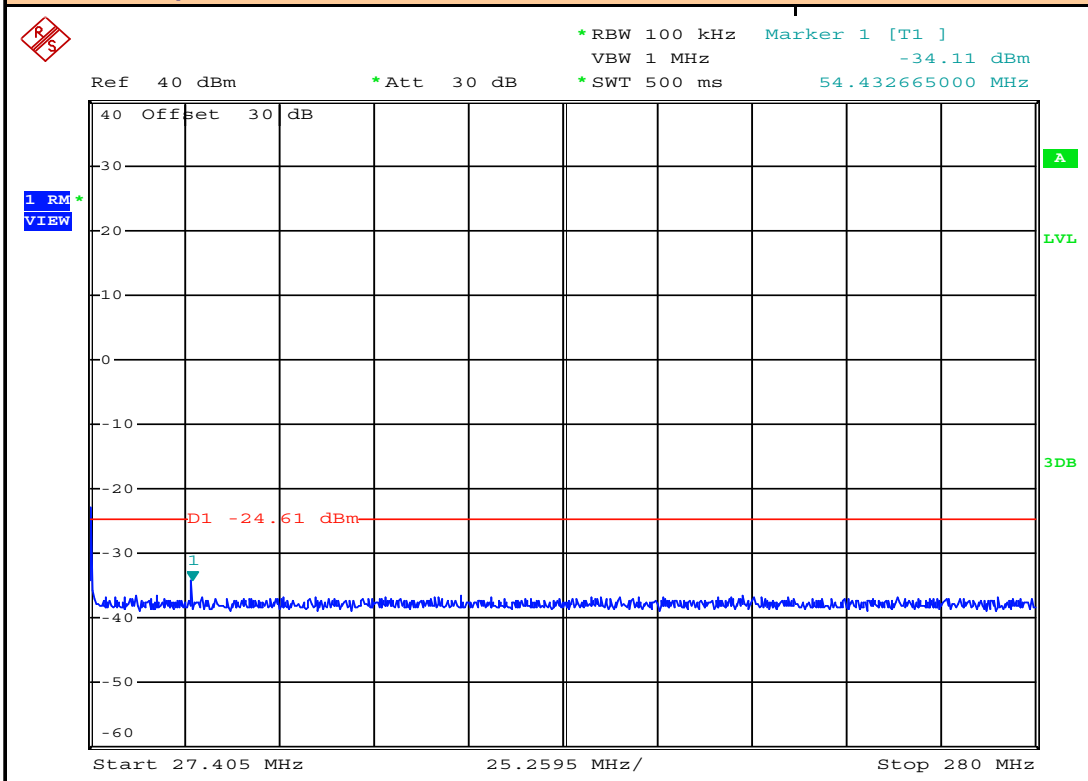
Plot 10.9 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 20, FM

Conducted Spurious Emissions:



Date: 12.JUN.2022 12:55:58

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
20	27.205	FM	-	-

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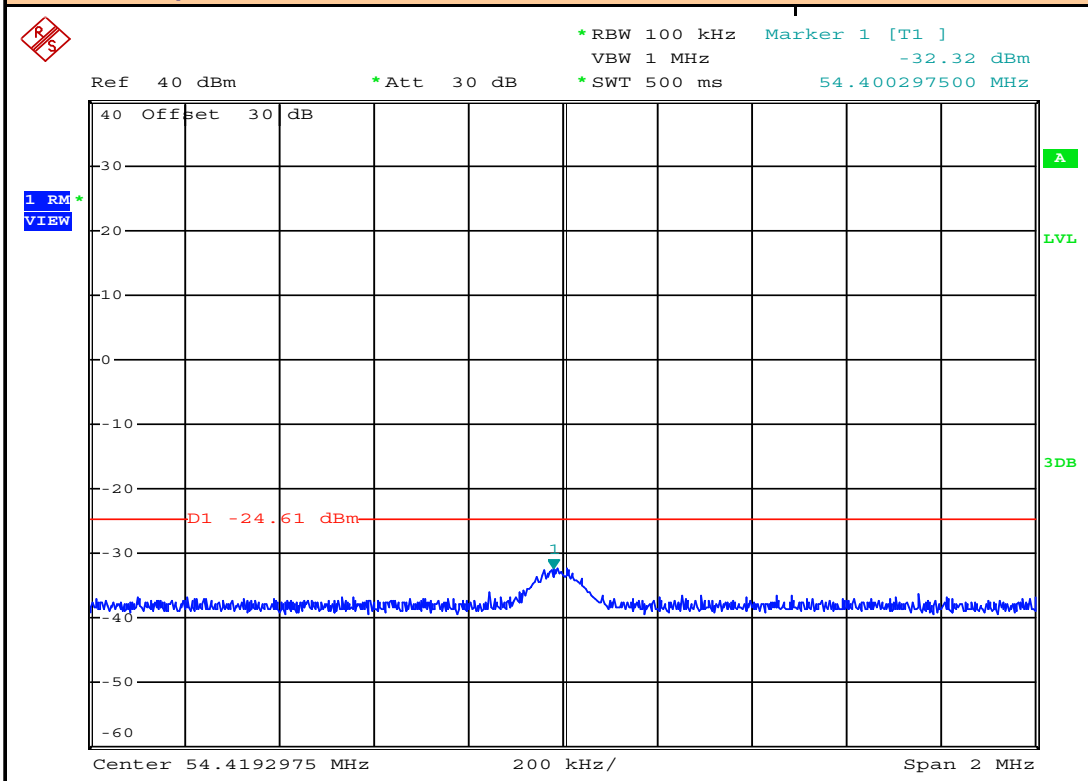
Plot 10.10 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 20, FM

Conducted Spurious Emissions:



Date: 12.JUN.2022 12:54:54

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
20	27.205	FM	54.40	-32.32

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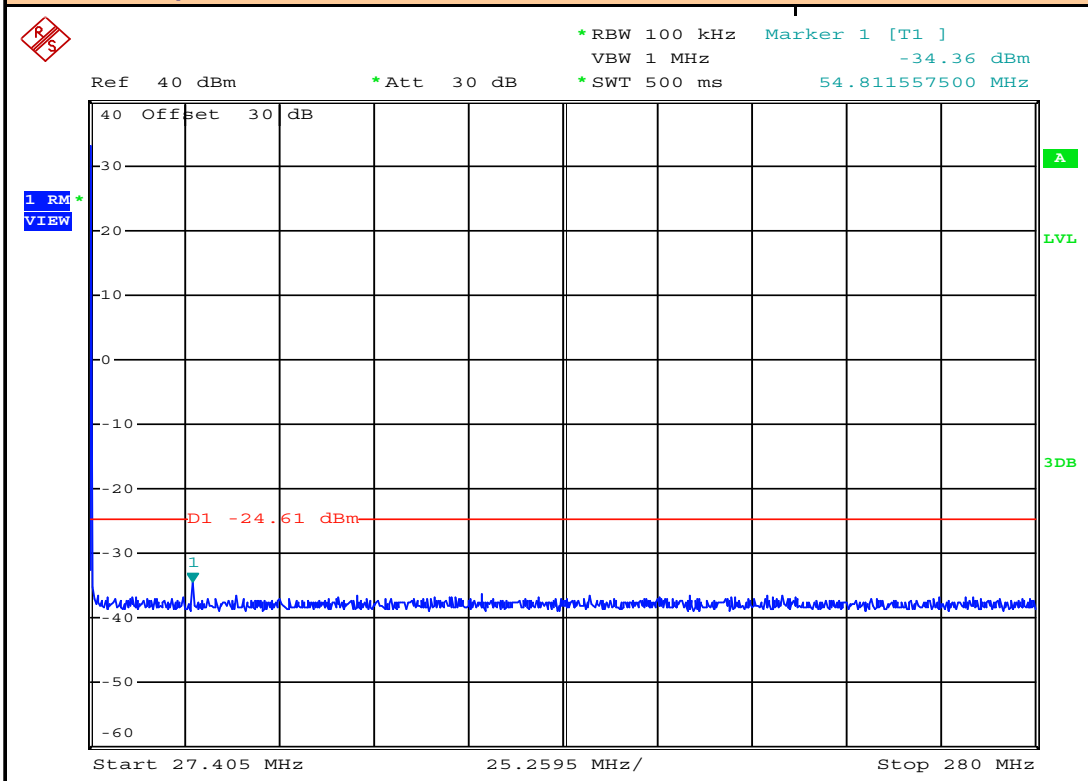
Plot 10.11 – Conducted Out of Band Emissions, 27MHz – 280MHz, Channel 40, FM

Conducted Spurious Emissions:



Date: 12.JUN.2022 12:58:27

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

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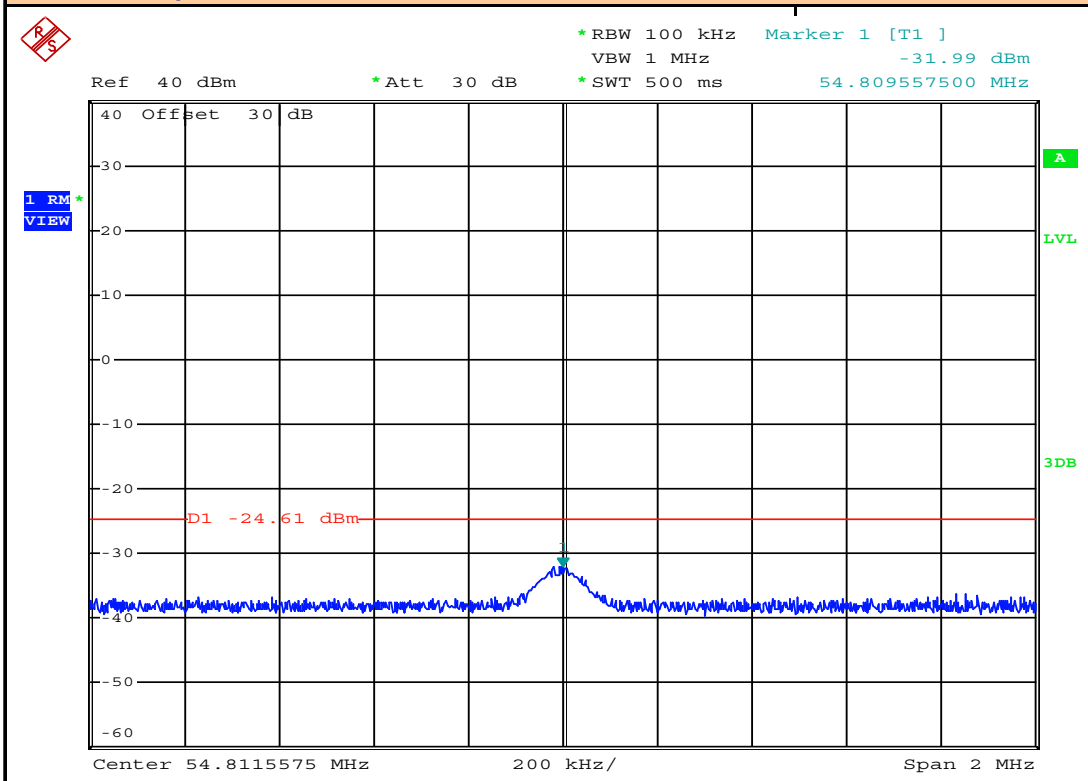
Plot 10.12 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 40, FM

Conducted Spurious Emissions:



Date: 12.JUN.2022 12:58:48

Channel Number	Channel Frequency (MHz)	Modulation	Emission Frequency (MHz)	Measured Emission (dBm)
40	27.405	FM	54.81	-31.99

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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	35.84	53.93	-32.20	68.04	60.0	8.04
20	27.205		35.84	54.43	-31.92	67.76		7.76
40	27.405		35.84	54.81	-32.36	68.20		8.20
1	26.965	FM	35.84	53.94	-31.75	67.59		7.59
20	27.205		35.84	54.40	-32.32	68.16		8.16
40	27.405		35.84	54.81	-31.99	67.83		7.83
								Complies

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

Margin = [Att] - Limit

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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**

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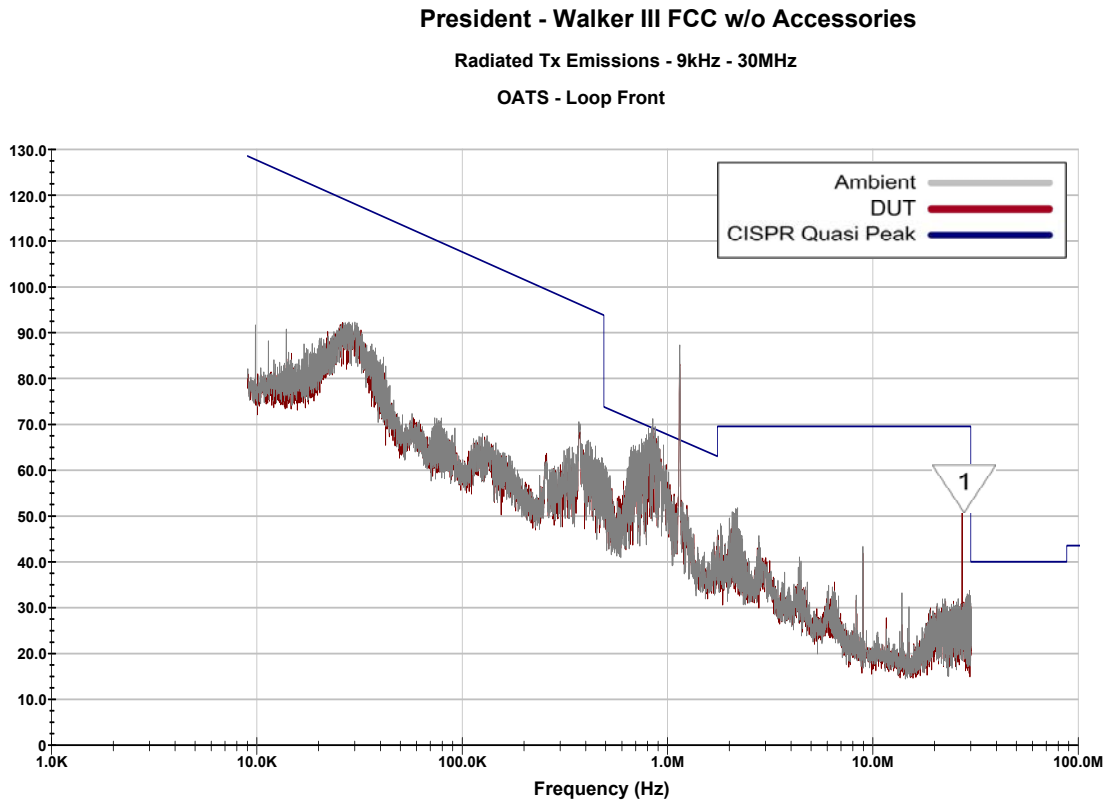
Plot 11.1 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, without Accessories, Front

Radiated Tx Emissions:



10:30:01 AM, Wednesday, June 15, 2022

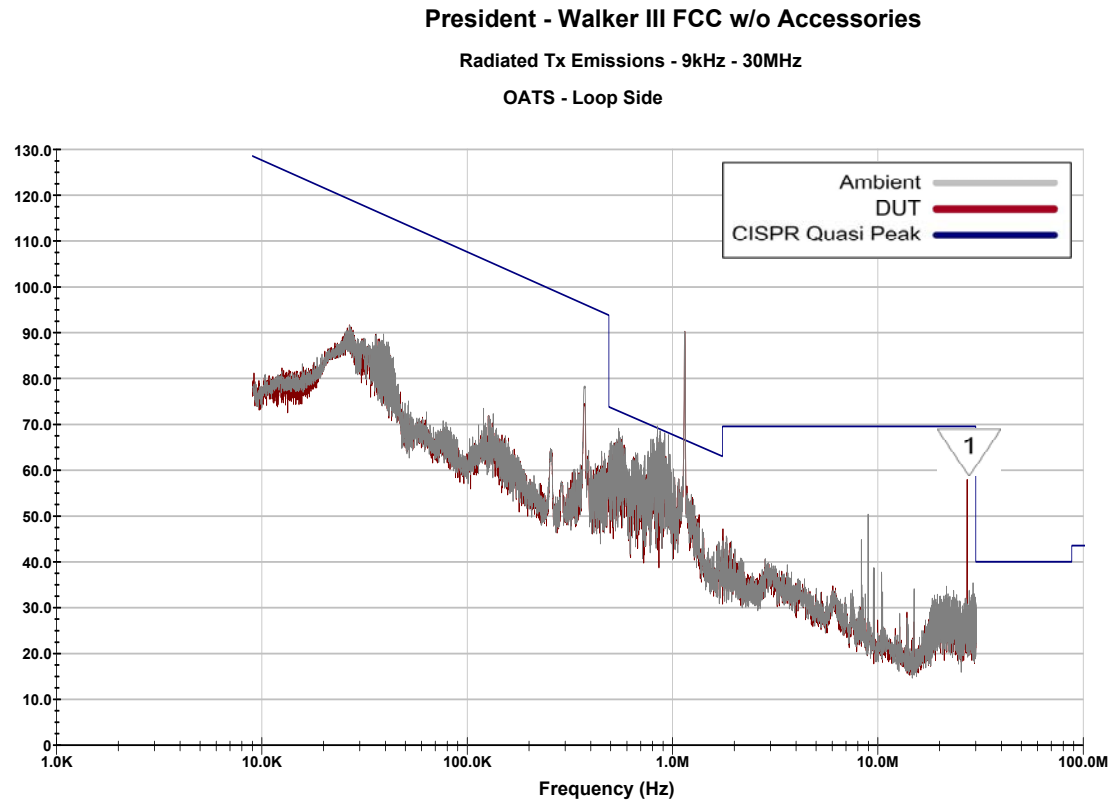
Profile Build: 2020.10.19

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:



10:30:01 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

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

Marker 1: Fundamental

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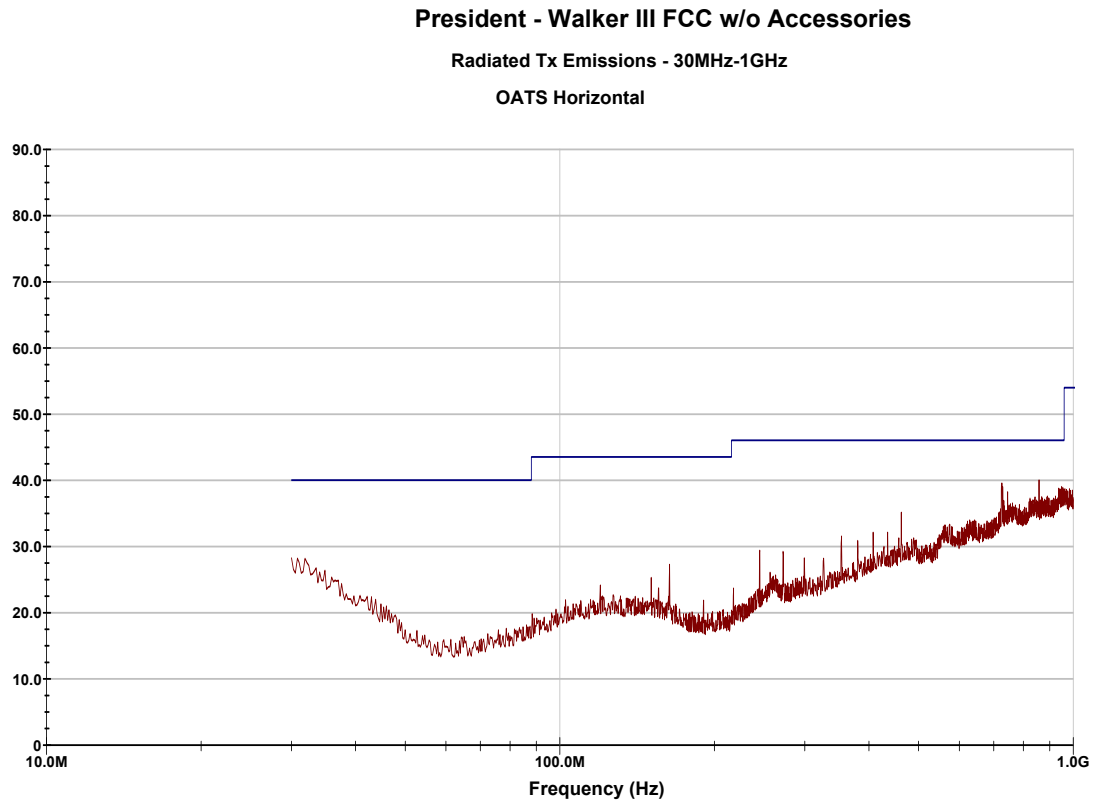
Plot 11.3 – Radiated Spurious Emissions OATS, 30 - 1000MHz, without Accessories, Horizontal

Radiated Tx Emissions:



11:10:34 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Horizontal	-	-

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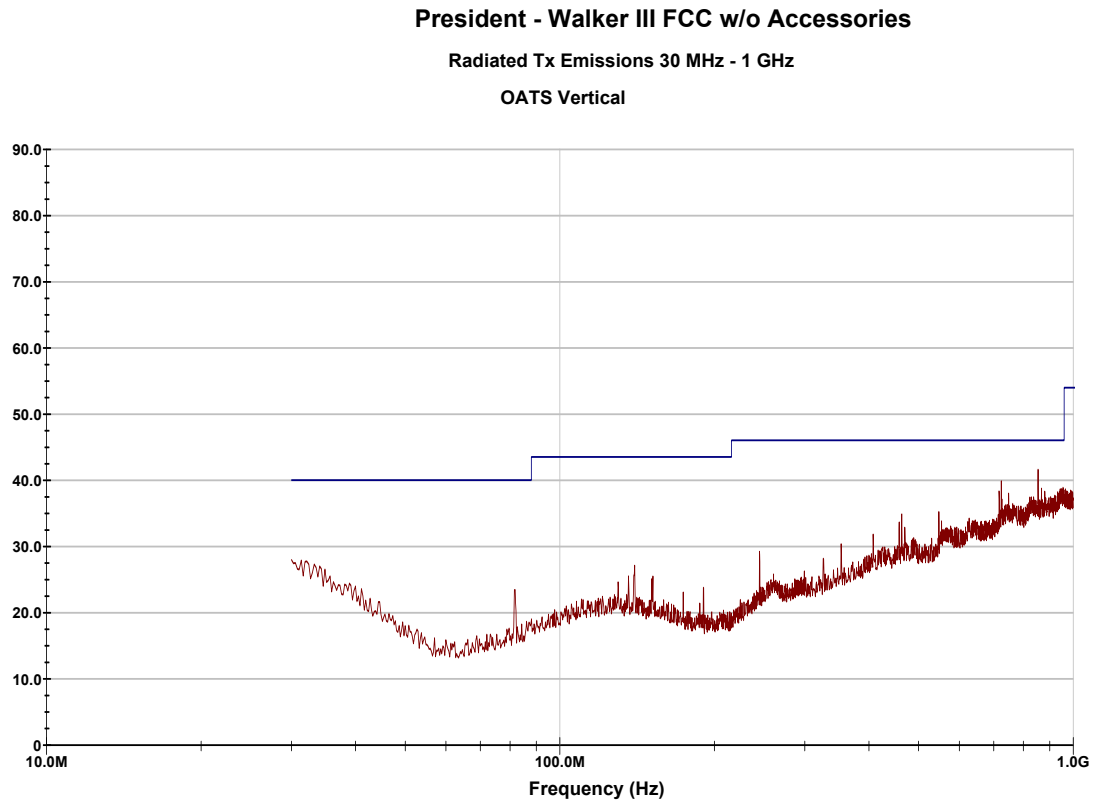
Plot 11.4 – Radiated Spurious Emissions OATS, 30 - 1000MHz, without Accessories, Vertical

Radiated Tx Emissions:



11:10:34 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Vertical	-	-

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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	27.205	Front *	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	27.205	Side *	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	27.205	Front **	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	27.205	Side **	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
30-1000MHz	27.205	Horizontal *	81.84 MHz	14.91	12.40	0.77	0.00 (3)	28.1 (2)	40.0	**11.9**
30-1000MHz	27.205	Horizontal *	163.11 MHz	15.66	15.20	0.99	0.00 (3)	31.8 (2)	43.5	**11.7**
30-1000MHz	27.205	Horizontal *	172.29 MHz	14.19	14.40	0.99	0.00 (3)	29.6 (2)	43.5	**13.9**
30-1000MHz	27.205	Horizontal *	217.92 MHz	14.63	14.00	1.35	0.00 (3)	30.0 (2)	46.0	**16.0**
30-1000MHz	27.205	Horizontal *	299.19 MHz	14.50	18.50	1.35	0.00 (3)	34.4 (2)	46.0	**11.6**
30-1000MHz	27.205	Horizontal *	435.10 MHz	15.02	22.00	1.91	0.00 (3)	38.9 (2)	46.0	**7.1**
30-1000MHz	27.205	Horizontal *	913.90 MHz	10.05	29.40	2.92	0.00 (3)	42.4 (2)	46.0	**3.6**
30-1000MHz	27.205	Vertical *	81.57 MHz	12.24	12.40	0.77	0.00 (3)	25.4 (2)	40.0	**14.6**
30-1000MHz	27.205	Vertical *	139.89 MHz	11.50	16.50	0.99	0.00 (3)	29.0 (2)	43.5	**14.5**
30-1000MHz	27.205	Vertical *	151.77 MHz	10.34	16.00	0.99	0.00 (3)	27.3 (2)	43.5	**16.2**
30-1000MHz	27.205	Vertical *	190.65 MHz	10.76	13.70	0.99	0.00 (3)	25.4 (2)	43.5	**18.1**
30-1000MHz	27.205	Vertical *	244.92 MHz	12.51	16.80	1.35	0.00 (3)	30.7 (2)	46.0	**15.3**
30-1000MHz	27.205	Vertical *	353.20 MHz	10.44	19.50	1.64	0.00 (3)	31.6 (2)	46.0	**14.4**
30-1000MHz	27.205	Vertical *	407.80 MHz	9.49	21.50	1.91	0.00 (3)	32.9 (2)	46.0	**13.1**
30-1000MHz	27.205	Vertical *	458.20 MHz	10.19	22.50	1.91	0.00 (3)	34.6 (2)	46.0	**11.4**
30-1000MHz	27.205	Vertical *	463.80 MHz	11.34	22.60	1.91	0.00 (3)	35.8 (2)	46.0	**10.2**
30-1000MHz	27.205	Vertical *	470.10 MHz	9.15	22.70	1.91	0.00 (3)	33.8 (2)	46.0	**12.2**
30-1000MHz	27.205	Vertical *	547.80 MHz	9.49	24.20	2.18	0.00 (3)	35.9 (2)	46.0	**10.1**
30-1000MHz	27.205	Vertical *	717.20 MHz	8.51	27.60	2.60	0.00 (3)	38.7 (2)	46.0	**7.3**
30-1000MHz	27.205	Vertical *	724.20 MHz	9.60	28.00	2.60	0.00 (3)	40.2 (2)	46.0	**5.8**
30-1000MHz	27.205	Vertical *	854.40 MHz	9.50	29.50	2.78	0.00 (3)	41.8 (2)	46.0	**4.2**
								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

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

Where ACF^E is the Electric Antenna Correction Factor

* Without Manufacturer's Accessories, ** With Manufacturer's Accessories

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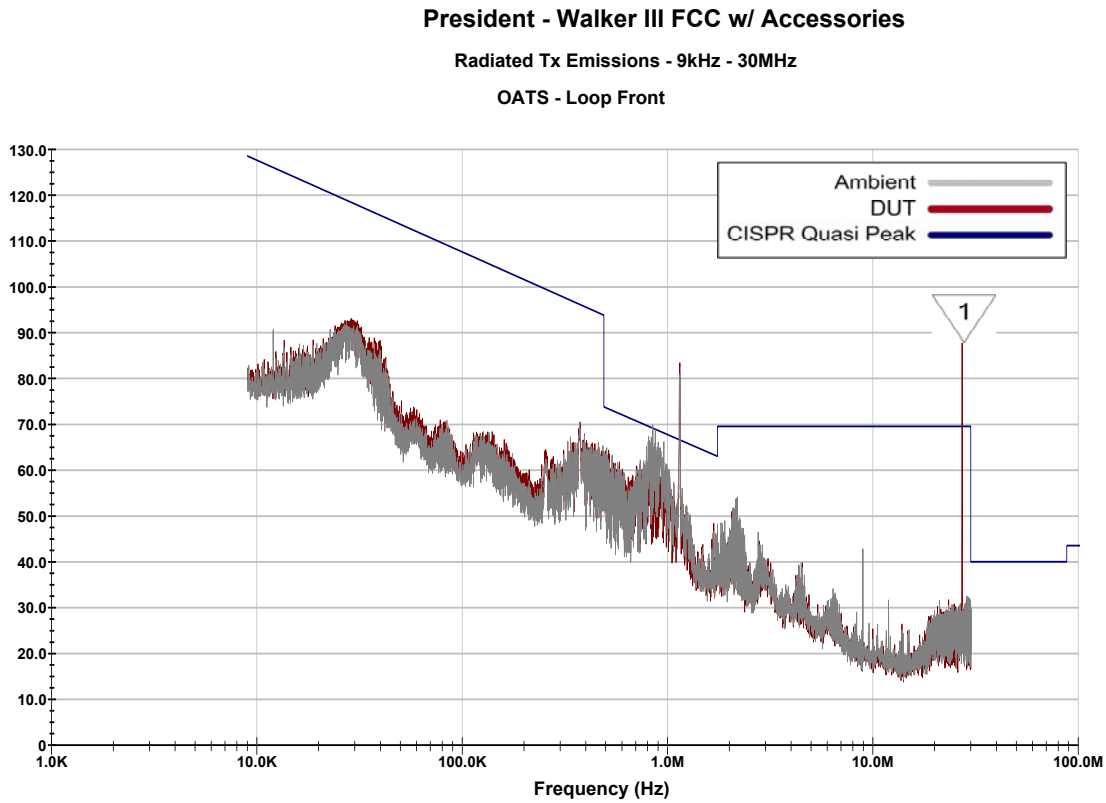
Plot 11.5 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, with Accessories, Front

Radiated Tx Emissions:



11:20:28 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

Marker 1: Fundamental

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

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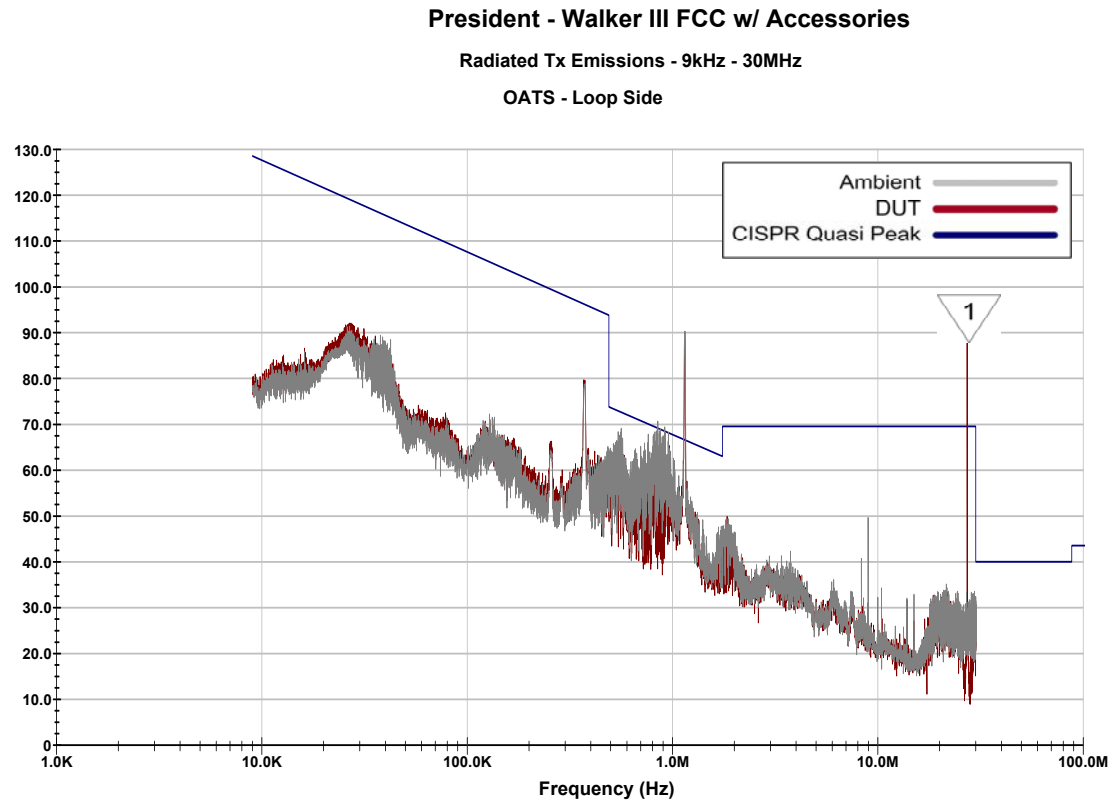
Plot 11.6 – Radiated Spurious Emissions OATS, 9kHz - 30MHz, with Accessories, Side

Radiated Tx Emissions:



11:20:28 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

Marker 1: Fundamental

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

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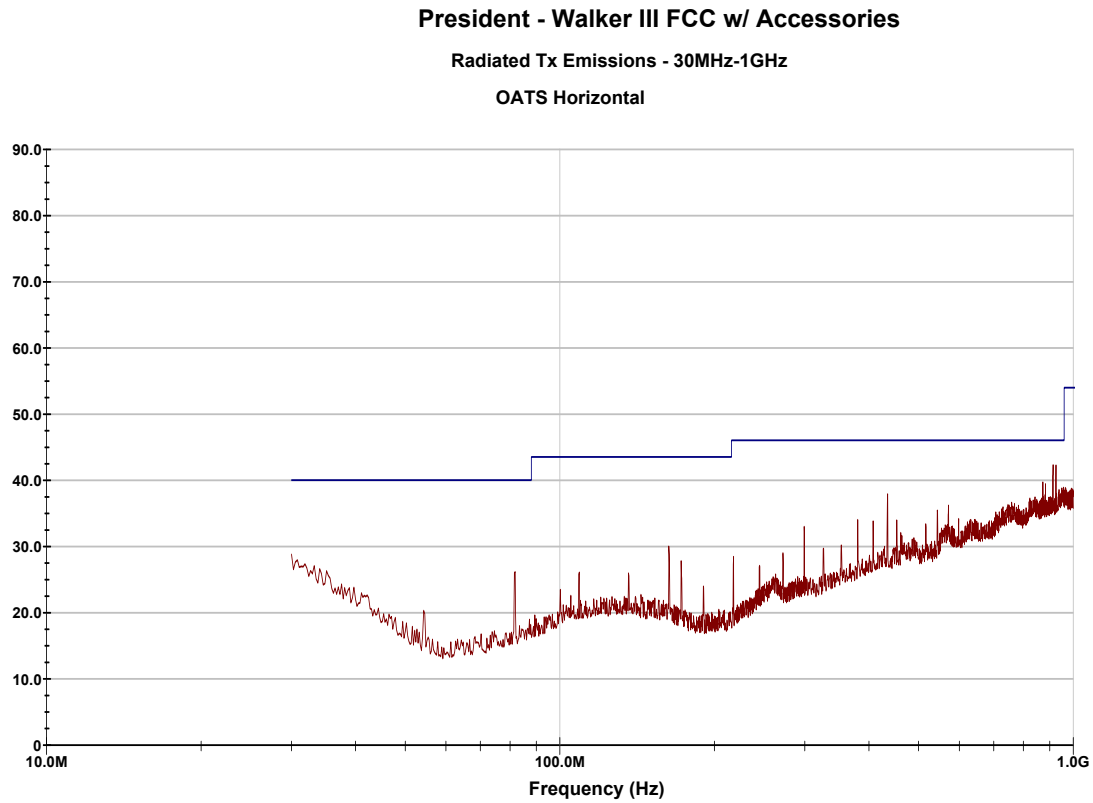
Plot 11.7 – Radiated Spurious Emissions OATS, 30 - 1000MHz, with Accessories, Horizontal

Radiated Tx Emissions:



11:43:03 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Horizontal	-	-

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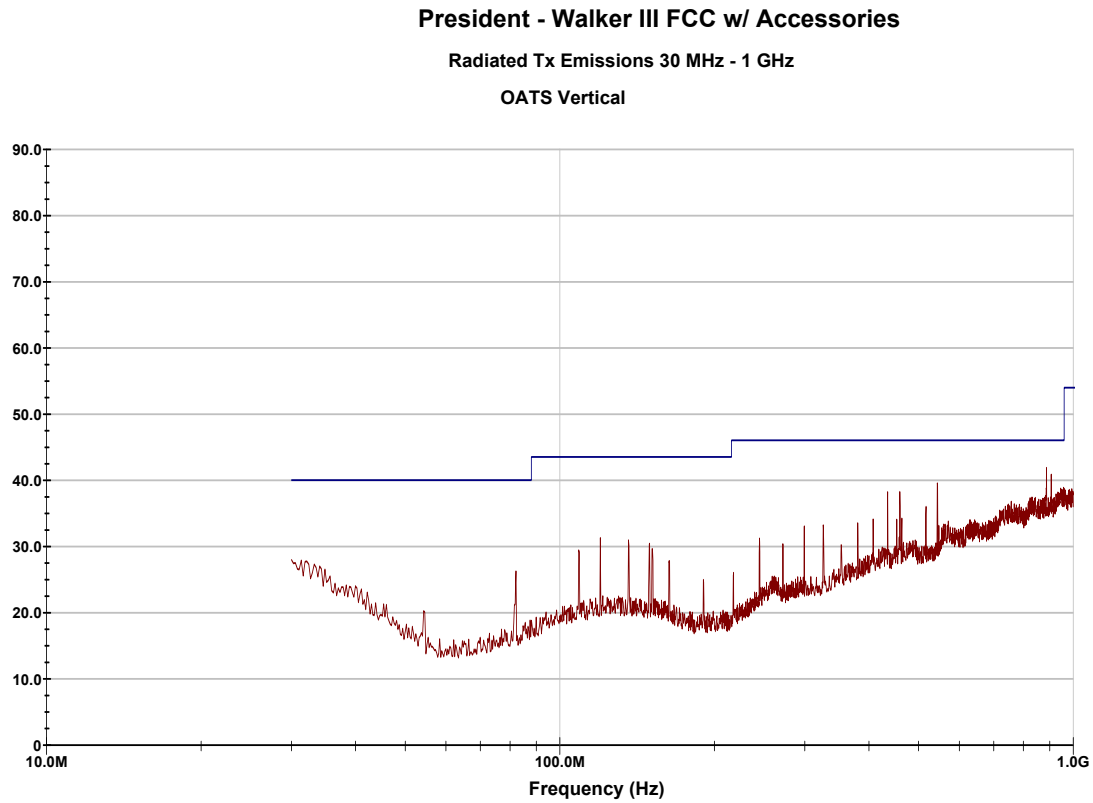
Plot 11.8 – Radiated Spurious Emissions OATS, 30 - 1000MHz, with Accessories, Vertical

Radiated Tx Emissions:



11:43:03 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Vertical	-	-

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Table 11.2 – Summary of Radiated Tx Emissions, with 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	27.205	Front *	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	27.205	Side *	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	27.205	Front **	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
9kHz - 30MHz	27.205	Side **	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	n/a	**n/a**
30-1000MHz	27.205	Horizontal **	150.69 MHz	10.09	16.10	0.99	0.00 (3)	27.2 (2)	43.5	**16.3**
30-1000MHz	27.205	Horizontal **	163.65 MHz	12.92	15.20	0.99	0.00 (3)	29.1 (2)	43.5	**14.4**
30-1000MHz	27.205	Horizontal **	217.92 MHz	9.83	14.00	1.35	0.00 (3)	25.2 (2)	46.0	**20.8**
30-1000MHz	27.205	Horizontal **	245.19 MHz	12.64	16.90	1.35	0.00 (3)	30.9 (2)	46.0	**15.1**
30-1000MHz	27.205	Horizontal **	272.19 MHz	11.52	17.80	1.35	0.00 (3)	30.7 (2)	46.0	**15.3**
30-1000MHz	27.205	Horizontal **	299.19 MHz	9.78	18.50	1.35	0.00 (3)	29.6 (2)	46.0	**16.4**
30-1000MHz	27.205	Horizontal **	353.90 MHz	11.54	19.50	1.64	0.00 (3)	32.7 (2)	46.0	**13.3**
30-1000MHz	27.205	Horizontal **	380.50 MHz	9.97	20.40	1.64	0.00 (3)	32.0 (2)	46.0	**14.0**
30-1000MHz	27.205	Horizontal **	407.80 MHz	9.80	21.50	1.91	0.00 (3)	33.2 (2)	46.0	**12.8**
30-1000MHz	27.205	Horizontal **	435.10 MHz	9.22	22.00	1.91	0.00 (3)	33.1 (2)	46.0	**12.9**
30-1000MHz	27.205	Horizontal **	462.40 MHz	11.64	22.50	1.91	0.00 (3)	36.0 (2)	46.0	**10.0**
30-1000MHz	27.205	Horizontal **	724.90 MHz	9.06	28.00	2.60	0.00 (3)	39.7 (2)	46.0	**6.3**
30-1000MHz	27.205	Horizontal **	729.10 MHz	8.47	28.30	2.60	0.00 (3)	39.4 (2)	46.0	**6.6**
30-1000MHz	27.205	Horizontal **	854.40 MHz	9.35	29.50	2.78	0.00 (3)	41.6 (2)	46.0	**4.4**
30-1000MHz	27.205	Vertical **	81.57 MHz	12.24	12.40	0.77	0.00 (3)	25.4 (2)	40.0	**14.6**
30-1000MHz	27.205	Vertical **	139.89 MHz	11.50	16.50	0.99	0.00 (3)	29.0 (2)	43.5	**14.5**
30-1000MHz	27.205	Vertical **	151.77 MHz	10.34	16.00	0.99	0.00 (3)	27.3 (2)	43.5	**16.2**
30-1000MHz	27.205	Vertical **	190.65 MHz	10.76	13.70	0.99	0.00 (3)	25.4 (2)	43.5	**18.1**
30-1000MHz	27.205	Vertical **	244.92 MHz	12.51	16.80	1.35	0.00 (3)	30.7 (2)	46.0	**15.3**
30-1000MHz	27.205	Vertical **	353.20 MHz	10.44	19.50	1.64	0.00 (3)	31.6 (2)	46.0	**14.4**
30-1000MHz	27.205	Vertical **	407.80 MHz	9.49	21.50	1.91	0.00 (3)	32.9 (2)	46.0	**13.1**
30-1000MHz	27.205	Vertical **	458.20 MHz	10.19	22.50	1.91	0.00 (3)	34.6 (2)	46.0	**11.4**
30-1000MHz	27.205	Vertical **	463.80 MHz	11.34	22.60	1.91	0.00 (3)	35.8 (2)	46.0	**10.2**
30-1000MHz	27.205	Vertical **	470.10 MHz	9.15	22.70	1.91	0.00 (3)	33.8 (2)	46.0	**12.2**
30-1000MHz	27.205	Vertical **	547.80 MHz	9.49	24.20	2.18	0.00 (3)	35.9 (2)	46.0	**10.1**
30-1000MHz	27.205	Vertical **	717.20 MHz	8.51	27.60	2.60	0.00 (3)	38.7 (2)	46.0	**7.3**
30-1000MHz	27.205	Vertical **	724.20 MHz	9.60	28.00	2.60	0.00 (3)	40.2 (2)	46.0	**5.8**
30-1000MHz	27.205	Vertical **	854.40 MHz	9.50	29.50	2.78	0.00 (3)	41.8 (2)	46.0	**4.2**
								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

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

Where ACF^E is the Electric Antenna Correction Factor

* Without Manufacturer's Accessories, ** With Manufacturer's Accessories

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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.

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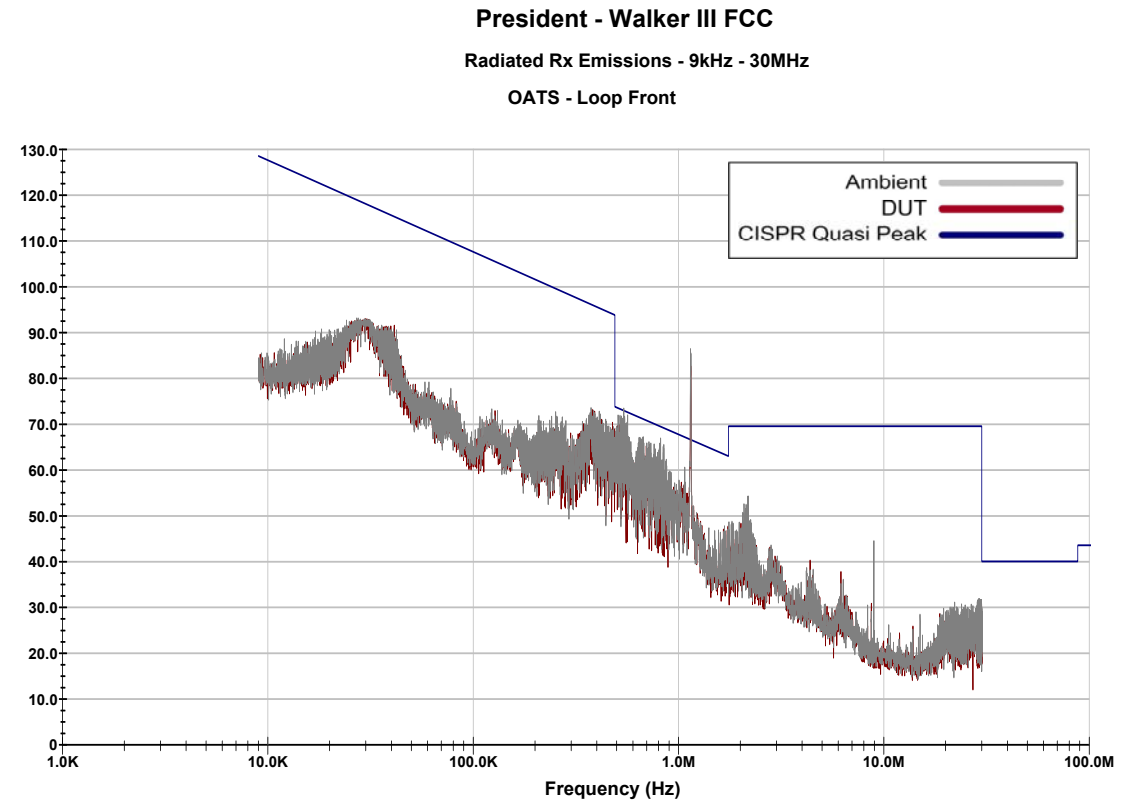
Plot 12.1 – Radiated Rx Emissions OATS, 9kHz - 30MHz, Front

Radiated Rx Emissions:



10:47:19 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.19

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

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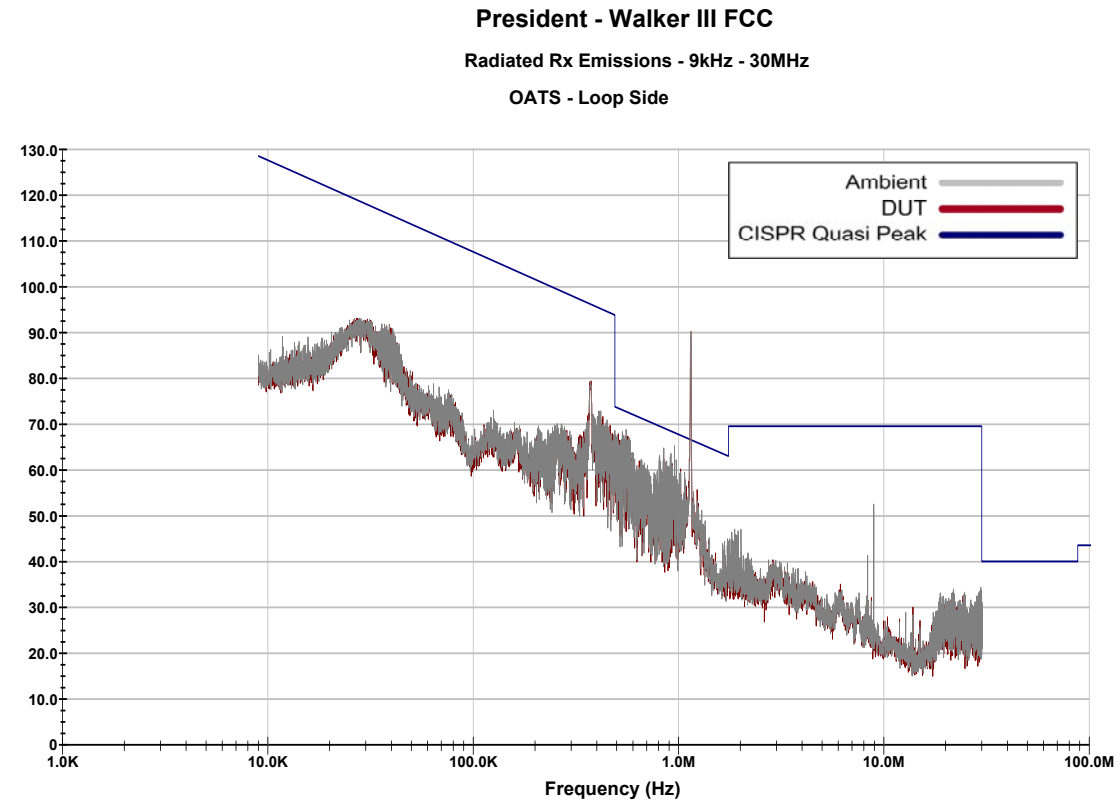
Plot 12.2 – Radiated Rx Emissions OATS, 9kHz - 30MHz, Side

Radiated Rx Emissions:



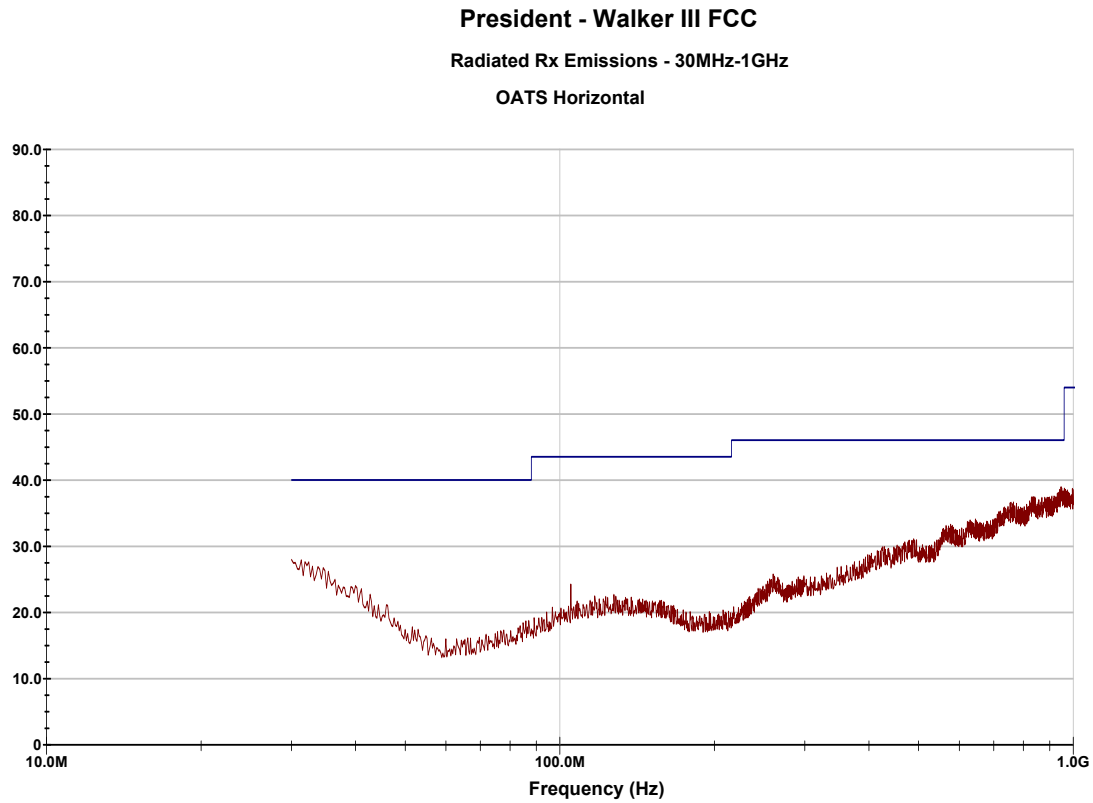
10:47:19 AM, Wednesday, June 15, 2022

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:



10:59:19 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.01

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

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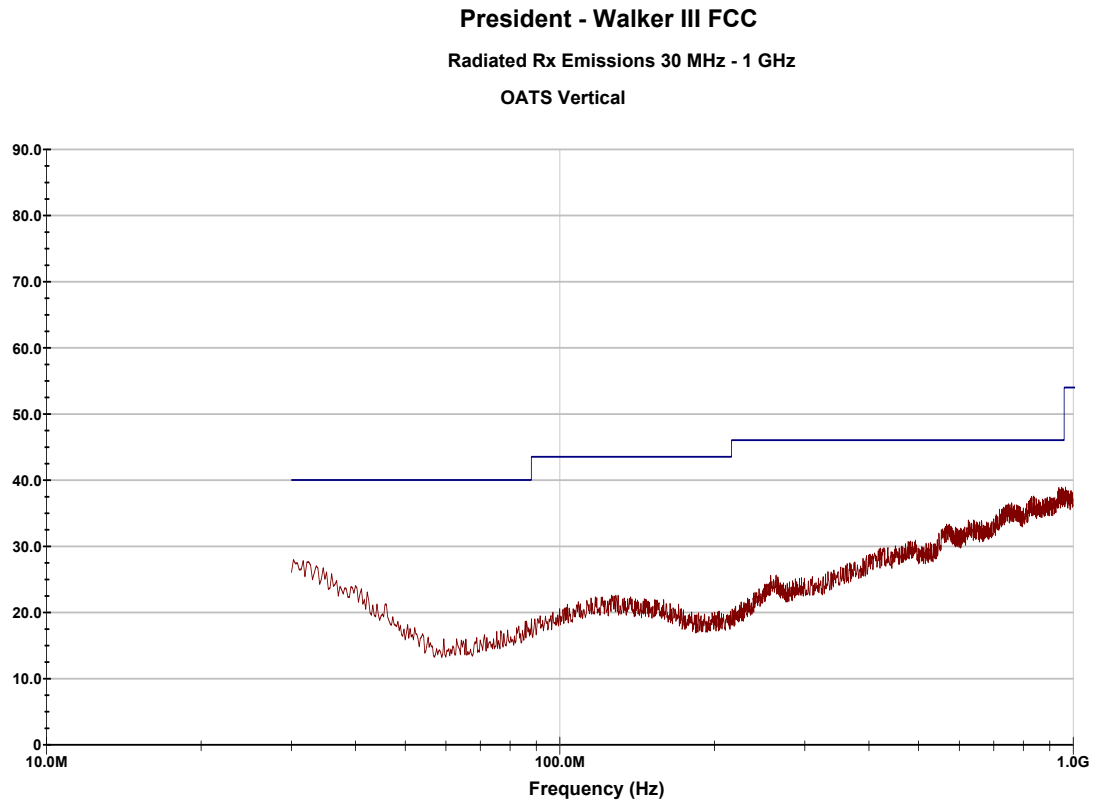
Plot 12.4– Radiated Spurious Emissions OATS, 30 - 1000MHz, Vertical

Radiated Rx Emissions:



10:59:19 AM, Wednesday, June 15, 2022

Profile Build: 2020.10.01

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

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Table 12.1 – Summary of Radiated Rx Emissions

Summary of Radiated Rx 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	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	ND	ND (1)	0.00	0.00	0.00 (3)	ND (2)	56.9	**n/a**
30-1000MHz	916.0	Vertical	ND	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

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

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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

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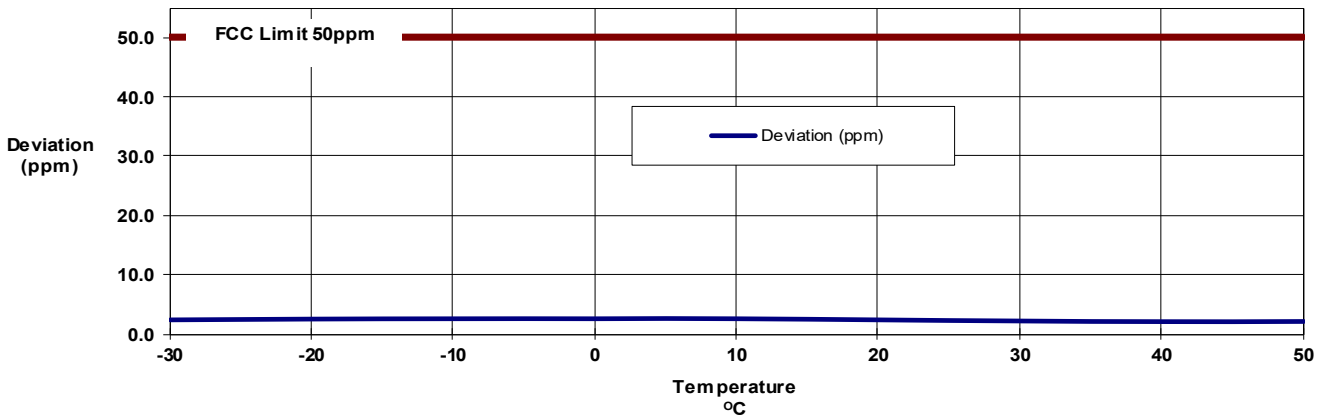
Table 13.1 – Summary of Frequency Stability Results (AM)

Frequency Stability

Nominal Frequency (MHz):	27.205
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	27.205000	27.20506395	64	2.35
-20		27.20506574	66	2.42
-10		27.20506680	67	2.46
0		27.20506691	67	2.46
10		27.20506690	67	2.46
20		27.20506380	64	2.35
30		27.20506103	61	2.24
40		27.20505935	59	2.18
50		27.20505966	60	2.19
			Maximum Deviation:	2.46
			Maximum Limit:	50.00
			Result:	Complies

Frequency Stability Measurements (Voltage)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
15.9 (115%)	27.205000	27.20506385	64	2.35
13.8		27.20506380	64	2.35
11.73 (85%)		27.20506378	64	2.34
			Maximum Deviation:	2.35
			Maximum Limit:	50.00
			Result:	Complies

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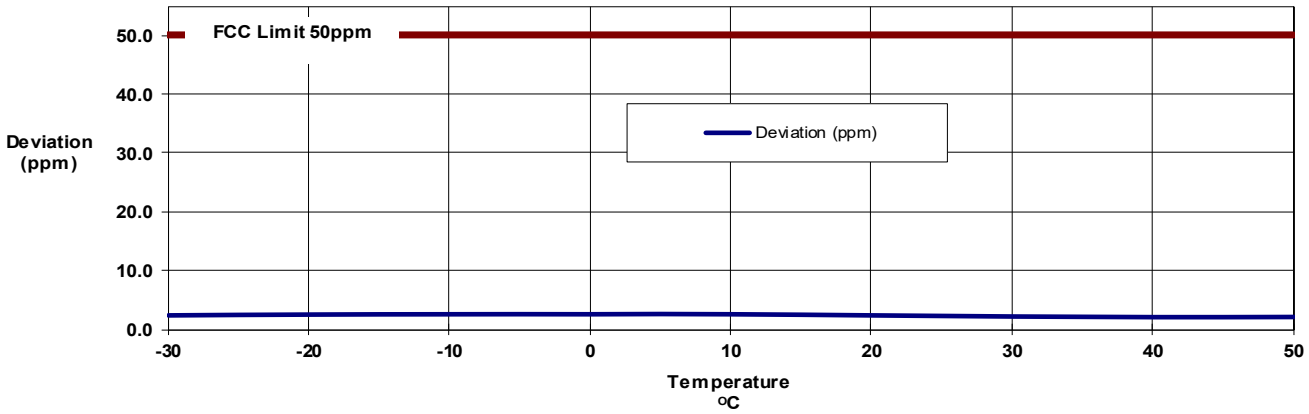
Table 13.2 – Summary of Frequency Stability Results (FM)

Frequency Stability

Nominal Frequency (MHz):	27.205
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	27.205000	27.20506398	64	2.35
-20		27.20506582	66	2.42
-10		27.20506685	67	2.46
0		27.20506698	67	2.46
10		27.20506695	67	2.46
20		27.20506386	64	2.35
30		27.20506115	61	2.25
40		27.20505931	59	2.18
50		27.20505969	60	2.19
			Maximum Deviation:	2.46
			Maximum Limit:	50.00
			Result:	Complies

Frequency Stability Measurements (Voltage)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
15.9 (115%)	27.205000	27.20506392	64	2.35
13.8		27.20506386	64	2.35
11.73 (85%)		27.20506398	64	2.35
			Maximum Deviation:	2.35
			Maximum Limit:	50.00
			Result:	Complies

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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

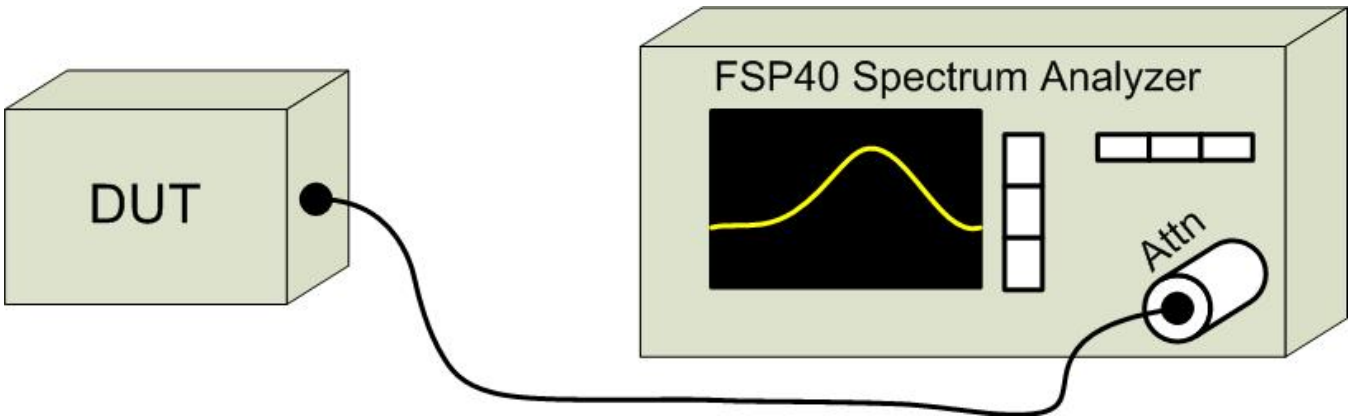

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Table A.2 – Setup - Audio Modulation Equipment

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

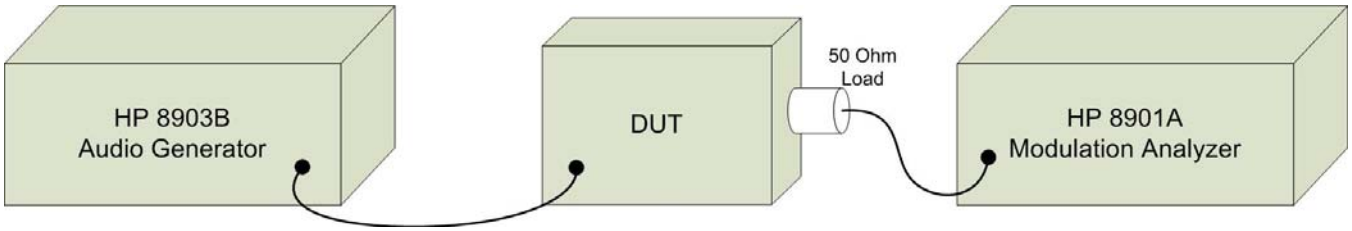

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Table A.3 – Setup - Radiated Emissions Equipment

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

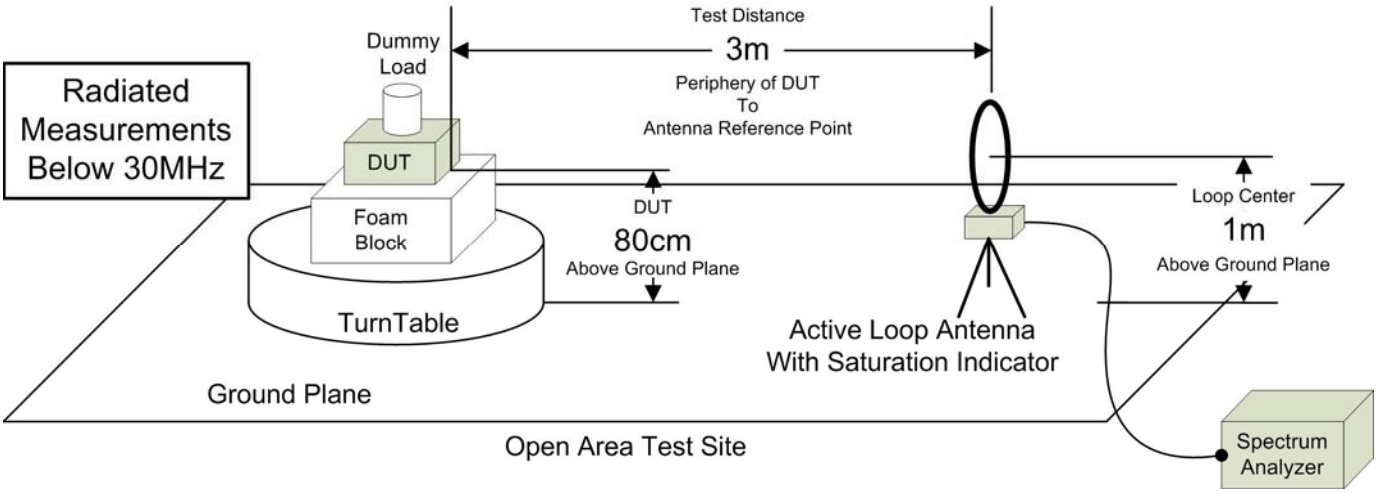

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Figure A.4 – Test Setup Radiated Emissions Measurements 30-1000MHz

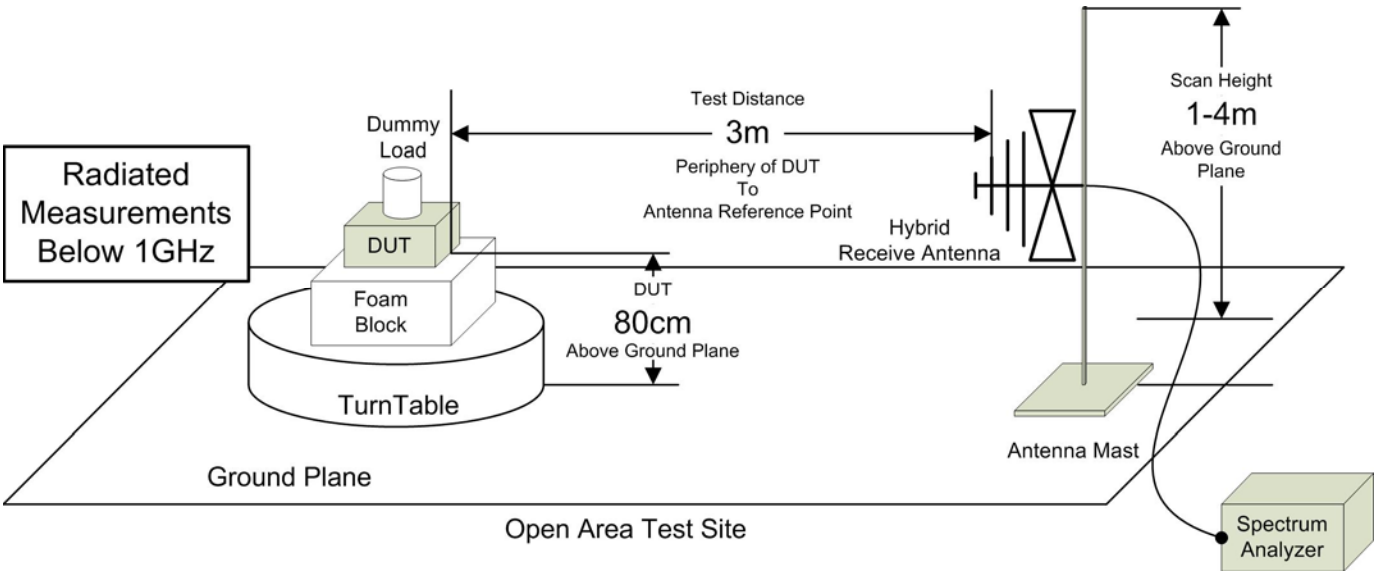

Figure A.5 – Test Setup Radiated Emissions Measurements 30-1000MHz

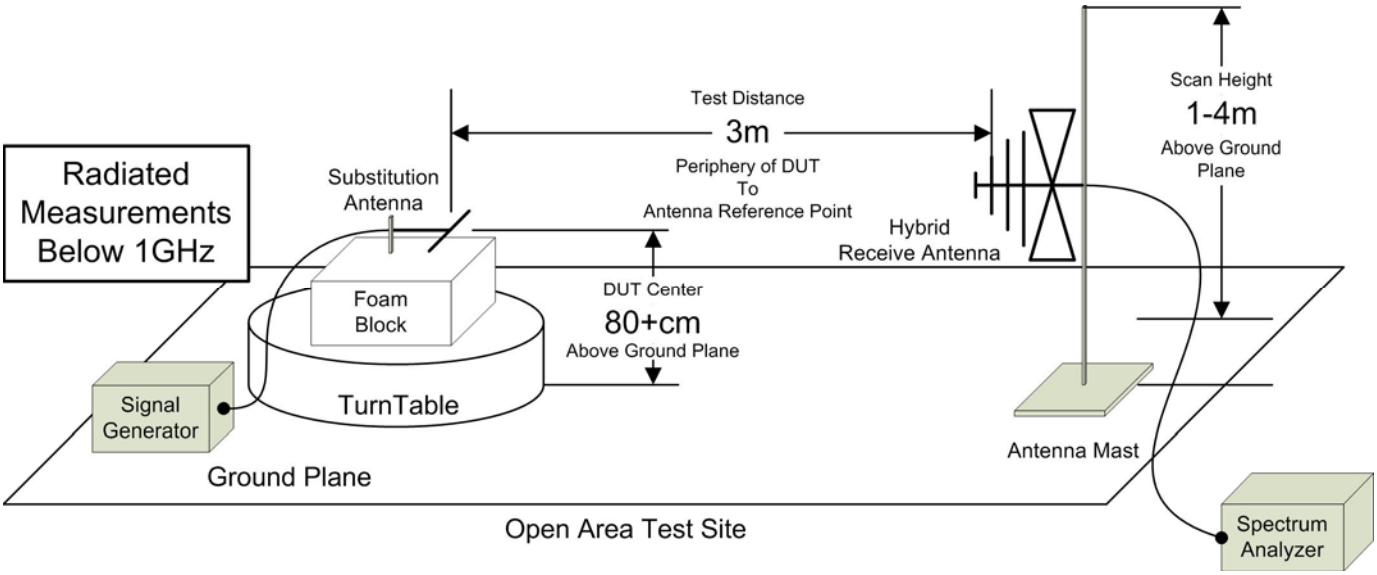

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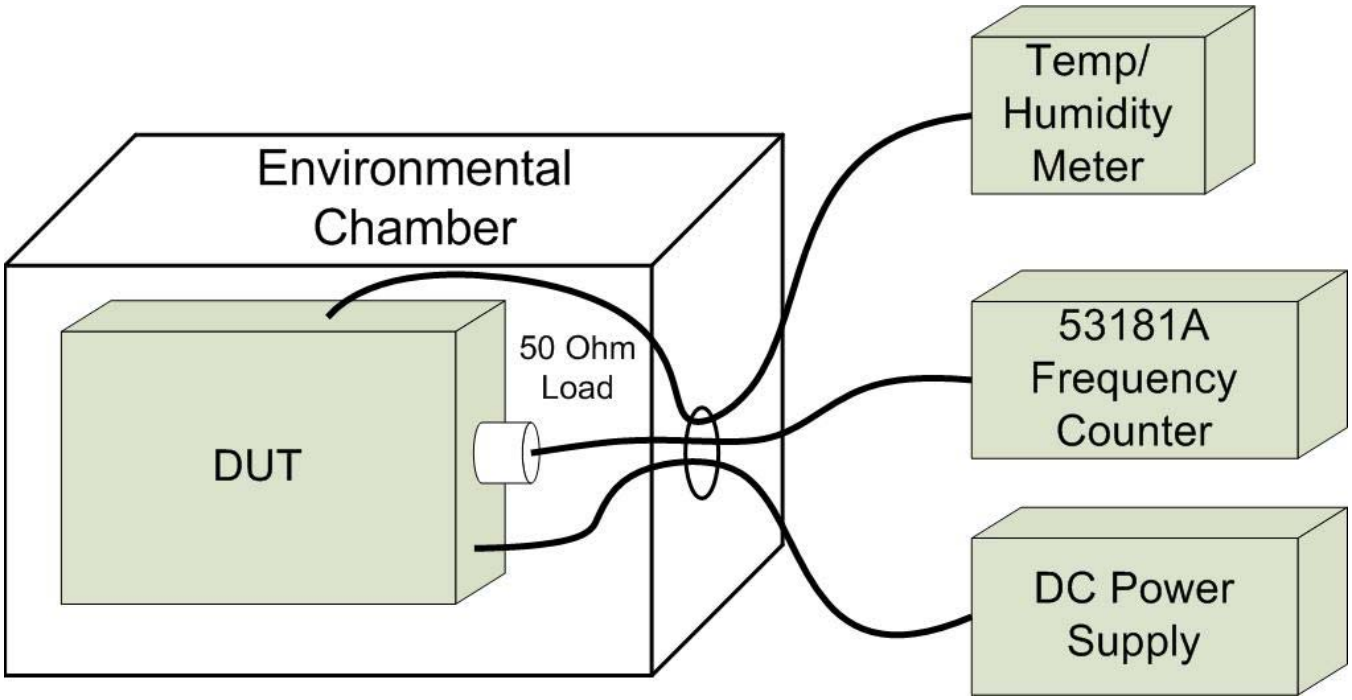
Table A.4 – Setup - Frequency Stability Measurement Equipment

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



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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
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	10 Dec 2020	Triennial	10 Dec 2023
00224	HP	8903B	3729A18691	Audio Analyzer	11 Dec 2020	Triennial	11 Dec 2023
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
00003	HP	53181A	3736A05175	Frequency Counter	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
00263	Koaxis	KP10-1.00M-TD	263	1m Armoured Cable	COU	n/a	COU
00275	TMS	LMR400	n/a	25m 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

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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

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