



Test Report - FCC Part 73/ TBC

Applicant: GatesAir, Inc.

Signature:

A handwritten signature in black ink, appearing to read "Tim Royer".

Sr. EMC Engineer
EMC-003838-NE



Name & Title:

Tim Royer, EMC Engineer

Date of Signature

6/12/2024

Signature:

A handwritten signature in black ink, appearing to read "Kristoffer Costa".

Name & Title:

Kristoffer Costa, EMC Technician

Date of Signature

6/12/2024

This test report relates only to the items tested as identified and is not valid for any subsequent changes or modifications made to the equipment under test.

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1. Applicant Information

Applicant: GatesAir, Inc.
Address: 5300 Kings Island Dr.
Ste 101
Mason, Ohio, 45040, United States

1.1 Test Result Summary

The following test procedure and guidance were used for measuring Licensed FM Broadcast Stations (TBC); FCC KDB 442401 and ANSI C63.26-2015. Full test results are available in this report.

No additions to the test methods were needed. There were no deviations, or exclusions from the test methods. No test results are from external providers or from the customer. The test results relate only to the items tested. Timco does not offer opinions and interpretations, only a pass/fail statement.

FCC Clauses	Description of the requirements	Result (Pass, Fail or N/A)
Applicable Clauses from Part 2		
2.1033 (c)(8)	The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.	For Info Only
2.202(g)(III)(3)	Necessary bandwidth (Sound Broadcasting)	Pass
2.1046 (a)	RF Power Output	Pass
2.1047 (a)	Modulation characteristics	Reported
2.1047 (b)	Modulation Limiting	Reported
2.1049 (e)(4)	FM broadcast transmitters for multiplex operation (SCA)	Pass
2.1049 (e)(5)	FM broadcast transmitter for stereophonic operation	Pass
2.202	Bandwidths	Pass
2.1051	Spurious emissions at antenna terminals.	Pass
2.1053	Field strength of spurious radiation.	Pass
2.1055	Frequency stability.	Pass
Applicable Clauses from Part 73		
73.267	Determining operating power.	Pass
73.317	FM transmission system requirements	Pass
73.840	Operating power and mode tolerances.	Pass

2. Location of Testing

2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA").

Testing was performed at IIA's permanent laboratory located at 13146 NW 86th Drive, Suite 400, Alachua, Florida 32615.

FCC test firm # 578780

FCC Designation # US1070

FCC site registration is under A2LA certificate # 0955.01

ISED Canada test site registration # 2056A

EU Notified Body # 1177

For all designations see A2LA scope # 0955.01

3. Test Sample(s) (EUT/DUT)

The test sample was received: 6/4/2024

Dates of Testing: 6/7/2024 – 6/12/2024

3.1 Description of the EUT

A description as well as unambiguous identification of the EUT(s) tested. Where more than one sample is required for technical reasons (such as the use of connected units for the purpose of conducted output power testing where the product units will have integral antennas), each specific test shall identify which unit was tested.

Identification	
FCC ID:	BOI-GXLP50
Brief Description	LPFM Transmitter
Model(s) #	GX50
Firmware version	N/A
Software version	N/A
Serial Number	N/A

Technical Characteristics	
Frequency Range	87.5 MHz- 108 MHz
RF O/P Power (Max.)	55W
Modulation	FM
Bandwidth & Emission Class	F3E
Number of Channels	N/A
Duty Cycle	100%
Antenna Connector	N Type
Voltage Rating (AC or Batt.)	100-240 VAC

Antenna Characteristics			
Antenna	Frequency Range	Mode / BW	Antenna Gain
1	n/a	n/a	0 dBi

- Note: Information such as antenna gain, firmware/software numbers are provided by manufacturer and cannot be validated by the test lab.

3.2 Configuration of EUT

Band (MHz)	Test Frequencies (MHz)	Modulation	Number of Ant
87.5 MHz- 108 MHz	88 MHz 98 MHz 108 MHz	FM	1

Operating conditions during Testing:

The device was operated without the provided antenna(s).

No other modifications of the device under test (including firmware, specific software settings, and input/output signal levels to the EUT) were made.

Peripherals used during Testing:

No peripherals used.

3.3 Test Setup of EUT

Equipment, antenna, and cable arrangement. The setup of the equipment and cable or wire placement on the test site that produces the highest radiated and the highest ac power line conducted emissions shall be shown clearly and described. Information on the orientation of portable equipment during testing shall be included. Drawings or photographs may be used for this purpose.

Test Setups are included in the test report.

4. Test methods & Applicable Regulatory Limits

4.1 Test methods/Standards/Guidance:

Test procedures and guidance for measuring Licensed FM Broadcast Stations (TBC); FCC KDB 442401 and ANSI C63.26-2015.

- 1) ANSI C63.26-2015;
- 2) FCC KDB 442401

4.2 Applied Limits and Regulatory Limits:

- 1) FCC CFR 47 Part 73 (1984)

5. Measurement Uncertainty

Parameter	Uncertainty (dB)
Conducted Emissions	± 3.14 dB
Radiated Emissions (9kHz – 30 MHz)	± 3.08 dB
Radiated Emissions (30 – 200 MHz)	± 2.16 dB
Radiated Emissions (200 – 1000 MHz)	± 2.15 dB
Radiated Emissions (1 GHz – 18 GHz)	± 2.14 dB
Radiated Emissions (18 GHz – 40 GHz)	± 2.31 dB
Note: The uncertainties provided in this table represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of K=2.	

6. Environmental Conditions

6.1 Temperature & Humidity

Measurements performed at the test site did not exceed the following:

Parameter	Measurement
Temperature	23 C +/- 5%
Humidity	55% +/- 5%
Barometric Pressure	30.05 in Hg
Note: Specific environmental conditions that are applicable to a specific test are available in the test result section.	

7. List of Test Equipment and Test Facility

The test equipment used identified by type, manufacturer, serial number, or other identification and the date on which the next calibration or service check is due.

Description of the firmware or software used to operate EUT for testing purposes.

A complete list of all test equipment used shall be included with the test report. The manufacturer's model and serial numbers, and date of last calibration, and calibration interval shall be included. Measurement cable loss, measuring instrument bandwidth and detector function, video bandwidth, if appropriate, and antenna factors shall also be included where applicable.

7.1 List of Test Equipment

Test Equipment						
Type	Device	Manufacturer	Model	SN#	Current Cal	Cal Due
Antenna	Biconical 1057	Eaton	94455-1	1057	11/19/21	11/18/2024
Antenna, NSA	Log-Periodic 1243	Eaton	96005	1243	5/4/21	11/18/2024
Antenna	Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	5/31/23	11/18/2024
CHAMBER	CHAMBER	Panashield	3M	N/A	12/29/23	12/18/2025
Pre-amp	Pre-amp	RF-LAMBDA	RLNA00M45GA	NA	2/27/22	7/26/2025
Receiver	EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	5/27/21	11/18/2024
Receiver	EMI Test Receiver R&S ESW44	Rohde & Schwarz	ESW44	103049	10/13/21	10/12/2024
Function Generator	Function Generator	Standford	DS340	25200	2/22/24	2/21/2027
Signal Generator	Signal Generator HP 8648C	HP	8648C	35537A01679	8/4/22	8/03/2025
Thermometer	Type K J Thermometer	Martel	303	080504494	1/16/23	1/15/2026
Frequency Counter	Frequency Counter Small	HP	5385A	2730A03025	12/12/23	12/11/2026

Software			
Software	Author	Version	Validation on
ESU Firmware	Rohde & Schwarz	4.43 SP3; BIOS v5.1-24-3	2018
RSCCommander	Rohde & Schwarz	1.6.4	2014
ScopeExplorer	LeCroy	v2.25.0.0	2009
Field Strength	Timco	v4.10.7.0	2016

8. Test Results

The results of the test are usually indicated in the form of tables, spectrum analyzer plots, charts, sample calculations, as appropriate for each test procedure.

A description and/or a block diagram of the test setup is usually provided.

The measurement results, along with the appropriate limits for comparison, may be presented in tabular or graphical form. In addition, any variation in the measurement environment may be reported if applicable (e.g., a significant change of temperature that could affect the cable loss and amplifier response).

Unless noted otherwise in the referenced standard, the measurements of **ac power-line conducted emissions and conducted power output** will be reported in units of dB μ V. Unless noted otherwise in the referenced standard, the measurements of **radiated emissions** will be reported in units of decibels, referenced to one microvolt per meter (dB μ V/m) for electric fields, or to one ampere per meter (dBA/m) for magnetic fields, at the distance specified in the appropriate standards or requirements. The measurements of antenna-conducted power for receivers may be reported in units of dB μ V if the impedance of the measuring instrument is also reported. Otherwise, antenna-conducted power will be reported in units of decibels referenced to one milliwatt (dBm). All formulas for data conversions and conversion factors, if used, will be included in this measurement report.

Example:

Freq (MHz)	Meter Reading	+ ACF	+CL	= FS
33	20 dB μ V	+ 10.36 dB/m	+0.40 dB	=30.36 dB μ V/m @ 3m

$EIRP = P_{cond} \text{ (dBm)} + dBi$

8.1 Necessary Bandwidth (Sound Broadcasting)

Requirement from Test procedures and guidance for measuring Licensed FM Broadcast Stations (TBC); FCC KDB 442401 and ANSI C63.26-2015.

Type of Emission: 54K4F3E

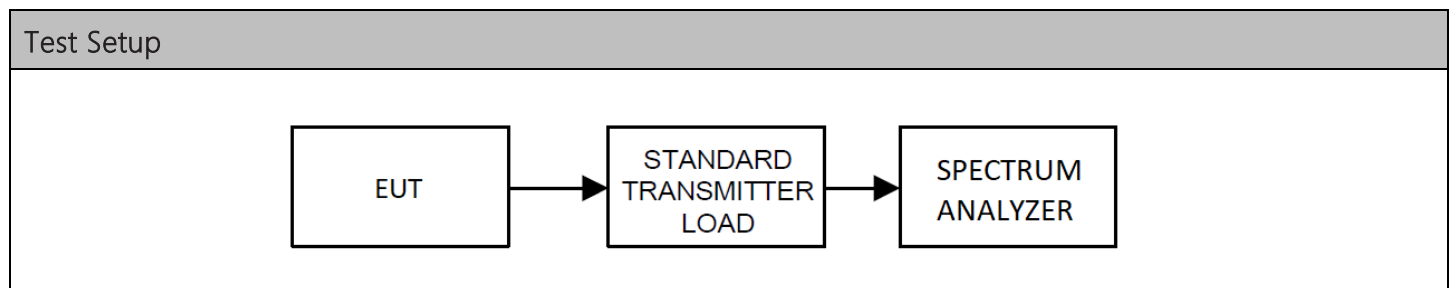
8.2 RF Output Power

Requirement from FCC KDB 442401 and ANSI C63.26-2015.

Method of Measurement: RF power was measured by Indirect Method as described in the standard listed above.

Test Method: Transmitter output power = $E_p \times I_p \times F$

Where: E_p = DC input voltage of final radio stage, I_p = Total DC input current of final radio stage, F = Efficiency factor.



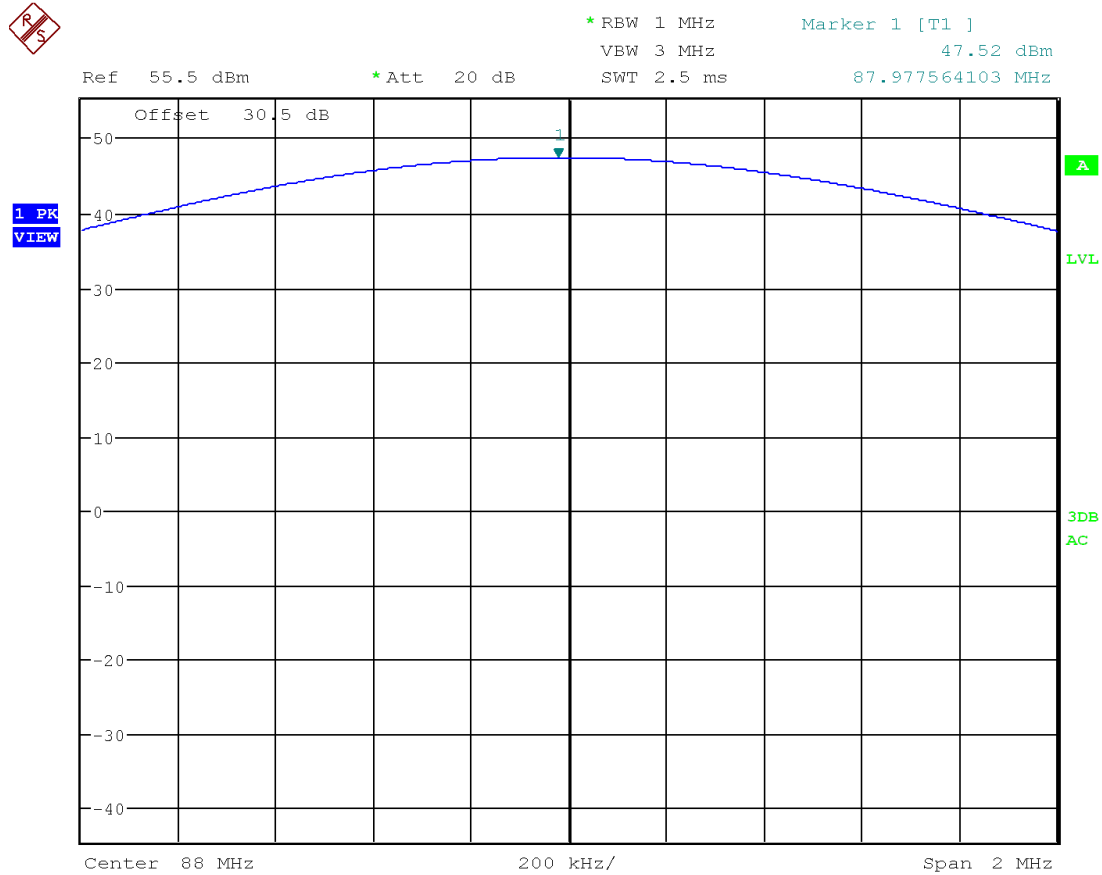
Test Results, Mode 1			
Mode	Tuned Frequency (MHz)	Power Output (dBm)	Power Output (W)
1	88	47.52	56.49
1	98	47.50	56.23
1	108	47.46	55.72

OUTPUT POWER: 56.49 Watts

Part 2.1033 (C) (8) DC Input into the final amplifier

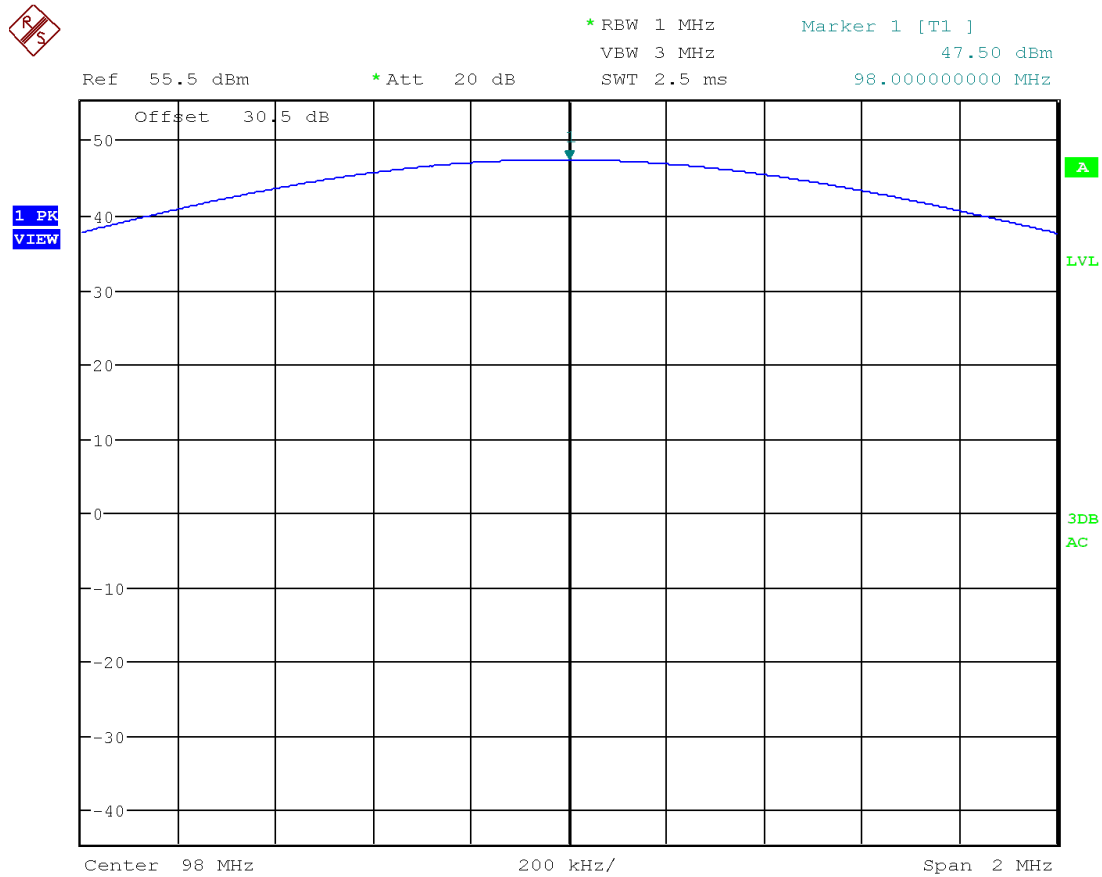
POWER SETTING INPUT POWER: (120V) (0.4583 A) = 55 Watts

8.2.1 RF Output Power Plot, 88 MHz



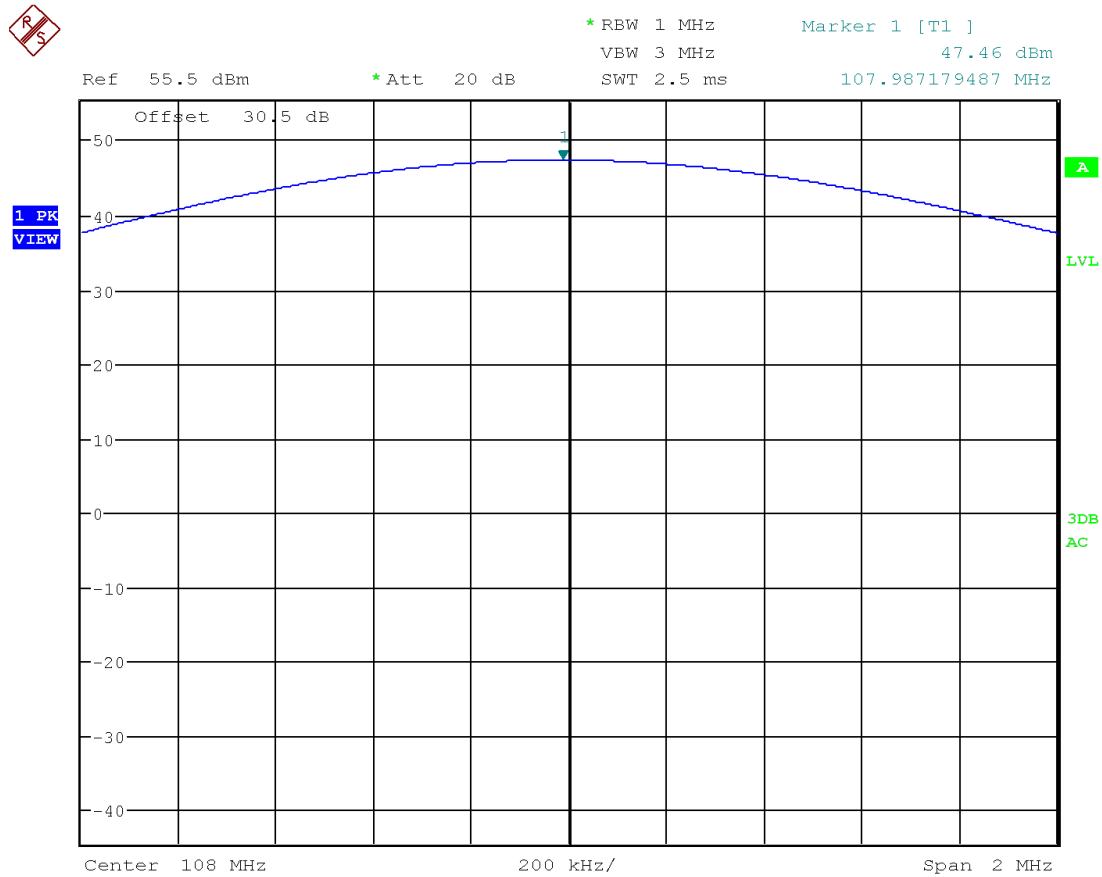
Date: 7.JUN.2024 16:15:24

8.2.2 RF Output Power Plot, 98 MHz



Date: 7.JUN.2024 16:16:14

8.2.3 RF Output Power Plot, 108 MHz



Date: 7.JUN.2024 16:17:42

8.3 Modulation Characteristics

Limits from FCC Part 2.1047 (a) and test procedure from ANSI C63.26-2015

Setup

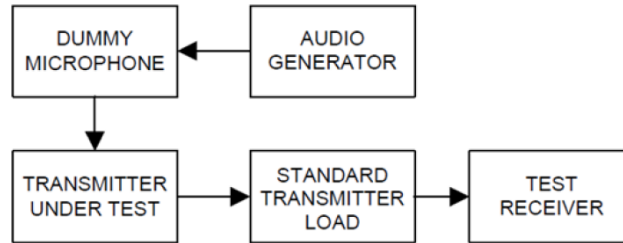


Figure 3—Equipment set-up audio frequency response (constant input)

8.3.1 Results

Included with "GXLP50 Modulator Freq Stability and Modulation Characteristics"

8.4 Modulation Limiting

Limits from FCC Part 2.1047 (b) and test procedure from ANSI C63.26-2015

Setup

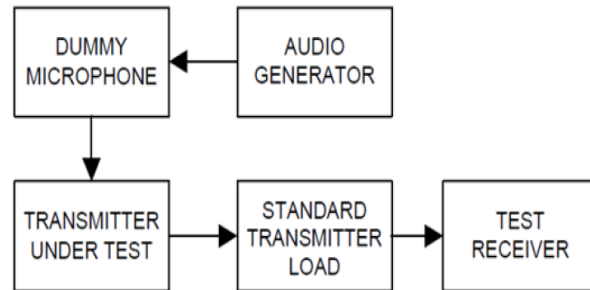


Figure 3—Equipment set-up audio frequency response (constant input)

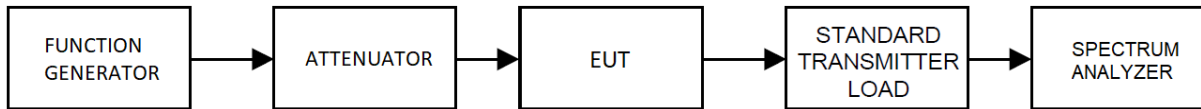
8.4.1 Test Data/ Spectrum Plots

Included with "GXLP50 Modulator Freq Stability and Modulation Characteristics"

8.5 Occupied Bandwidth & Emission Mask

Limits from FCC Part 2.1049 (e)(3) – (5), Part 73.317(b), (c) and test procedure from ANSI C63.26-2015

Setup

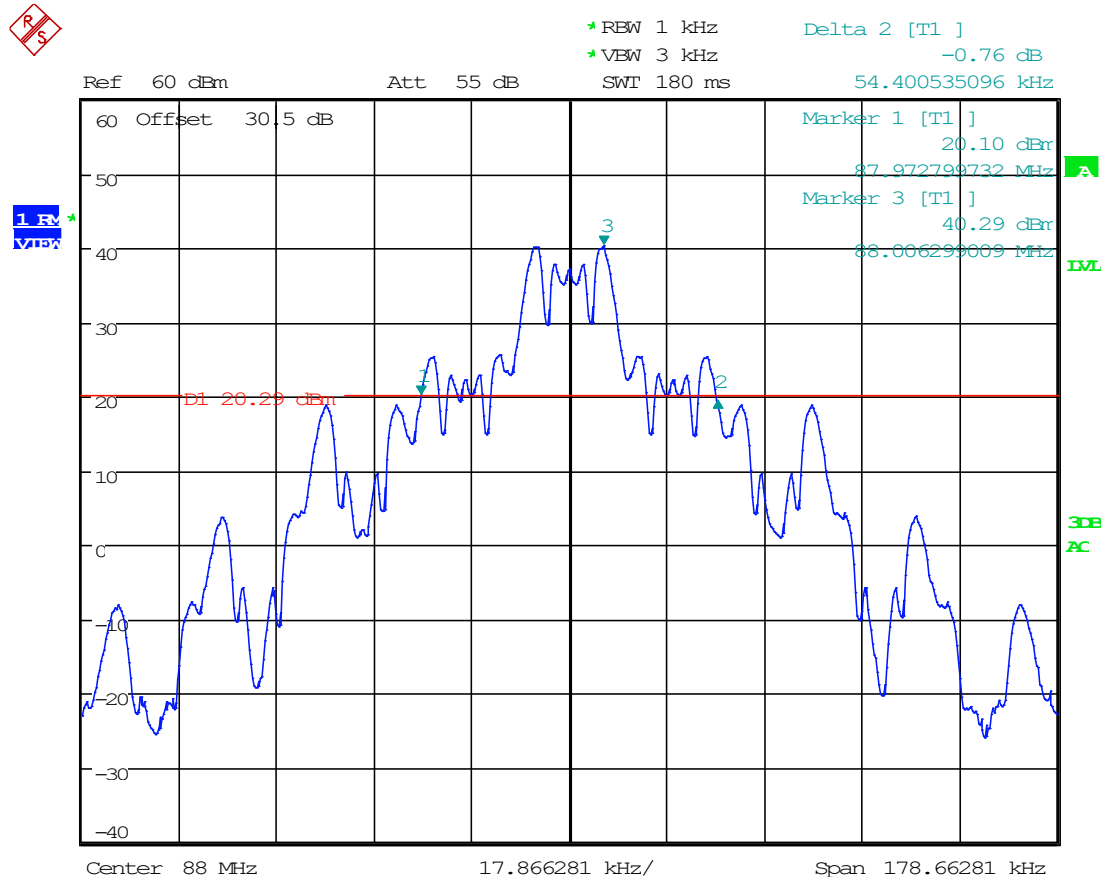


Test Data/ Spectrum Plots

Frequency (MHz)	20dB OBW (kHz)
88	54.40
98	54.08
108	54.28

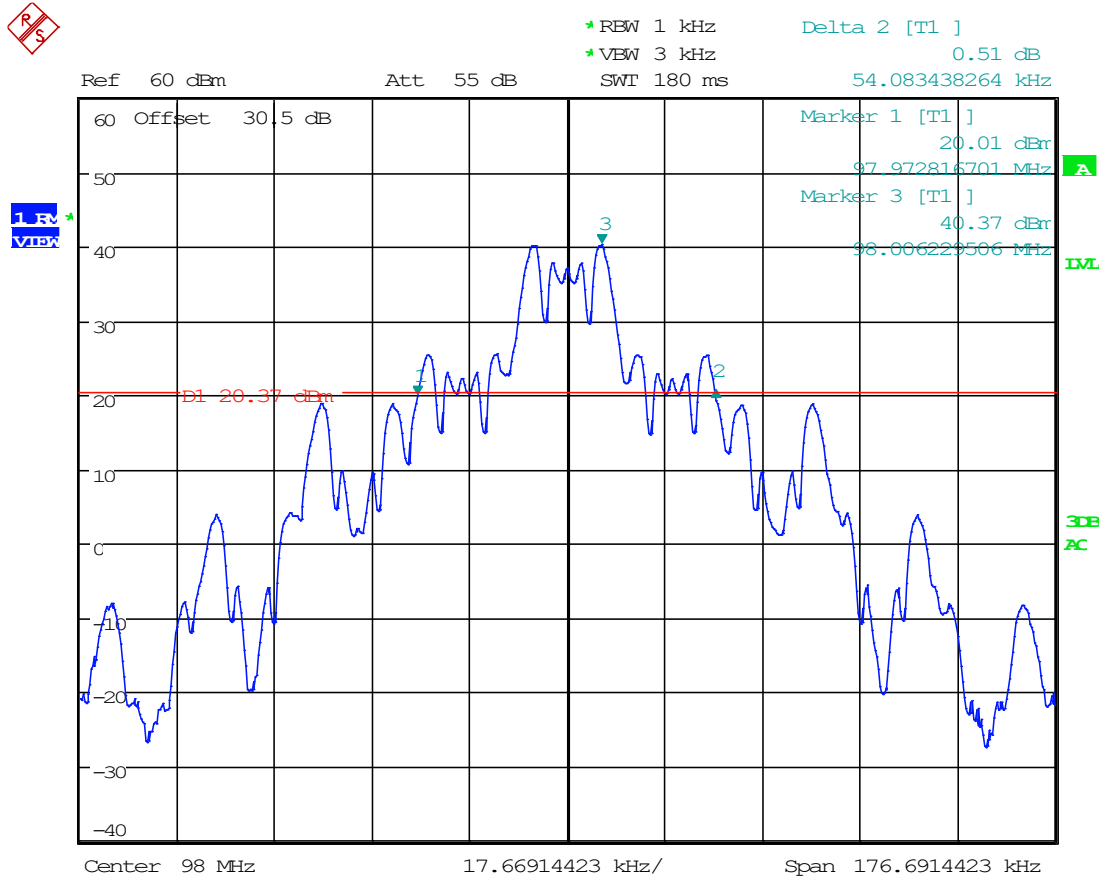
Conducted Emissions Spectrum Plots

8.5.1 20dB Bandwidth Plot, 88 MHz



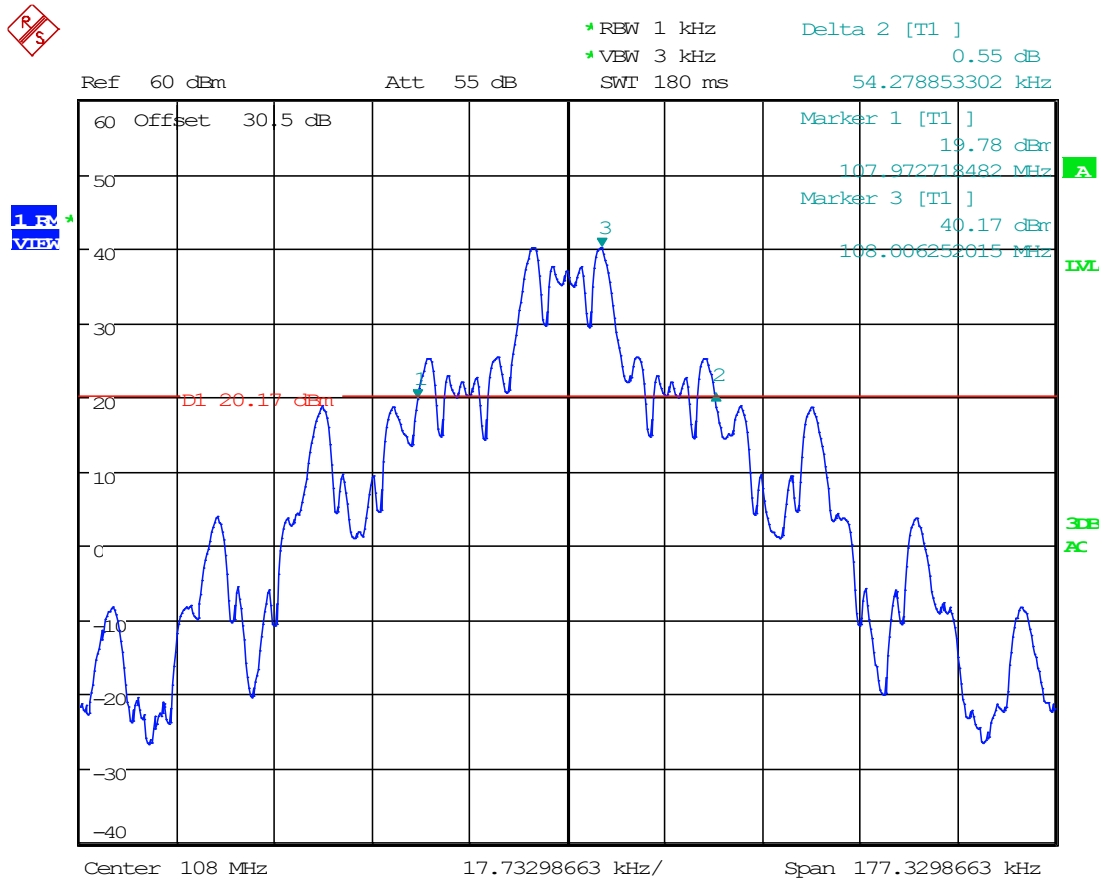
Date: 11.JUN.2024 09:08:01

8.5.2 20dB Bandwidth Plot, 98 MHz



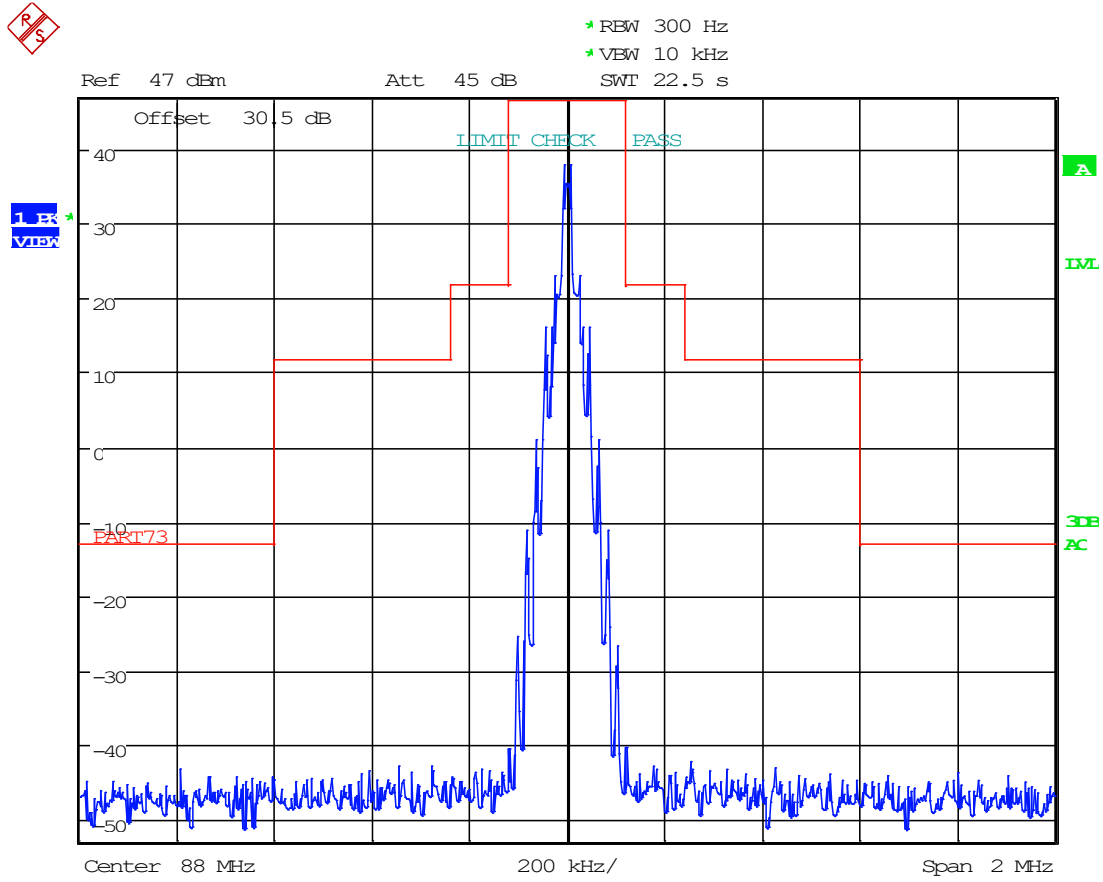
Date: 11.JUN.2024 09:10:15

8.5.3 20dB Bandwidth Plot, 108 MHz



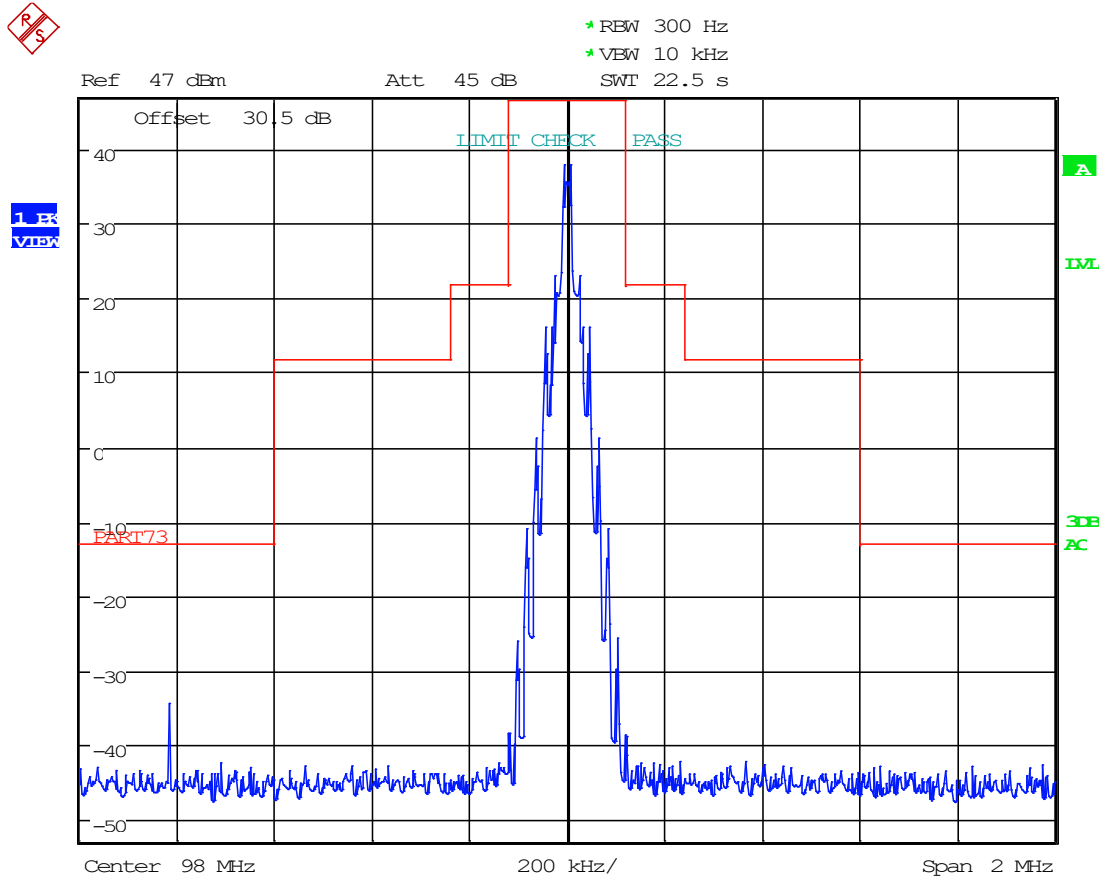
Date: 11.JUN.2024 09:11:39

8.5.4 Emission Mask 73 Plot, 88 MHz



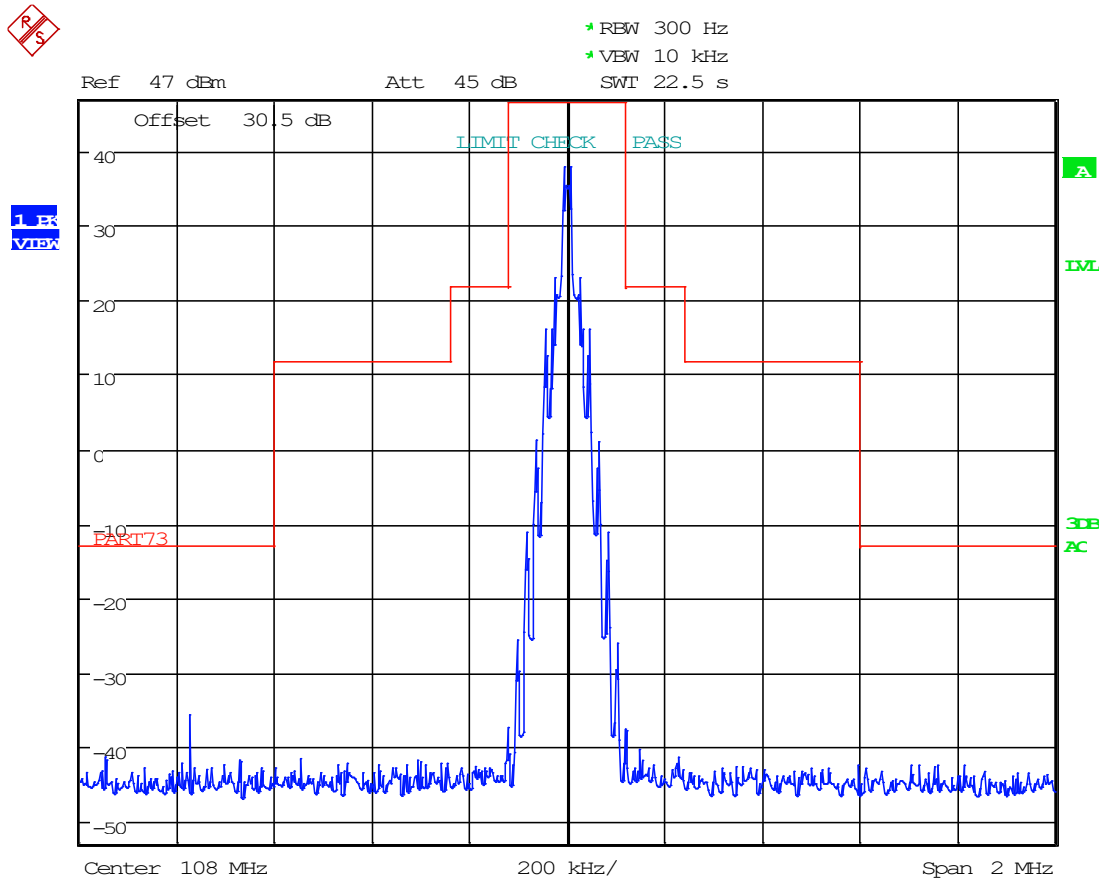
Date: 10.JUN.2024 15:25:58

8.5.5 Emission Mask 73 Plot, 98 MHz



Date: 10.JUN.2024 15:29:44

8.5.6 Emission Mask 73 Plot, 108 MHz

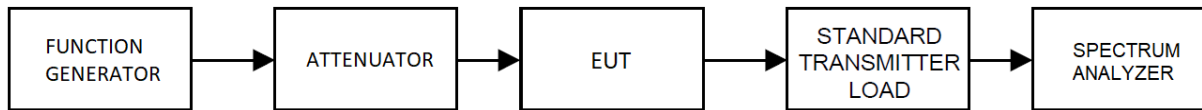


Date: 10.JUN.2024 15:32:25

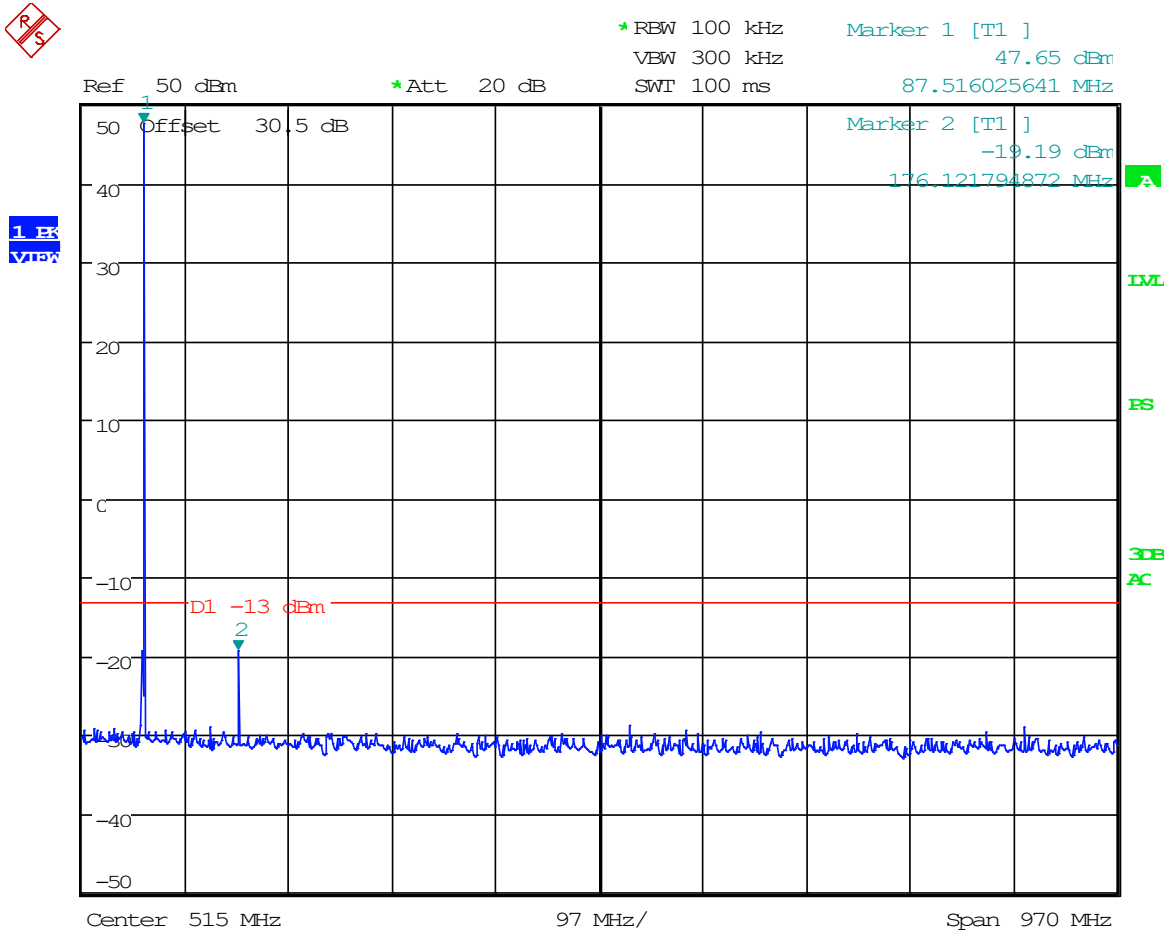
8.6 Spurious Emissions at Antenna Terminals (Conducted)

Limits from FCC Part 2.1051 & 73.317(d) and test procedure from ANSI C63.26-2015

Setup



8.6.1 Spurious Emissions Below 1G, 88 MHz

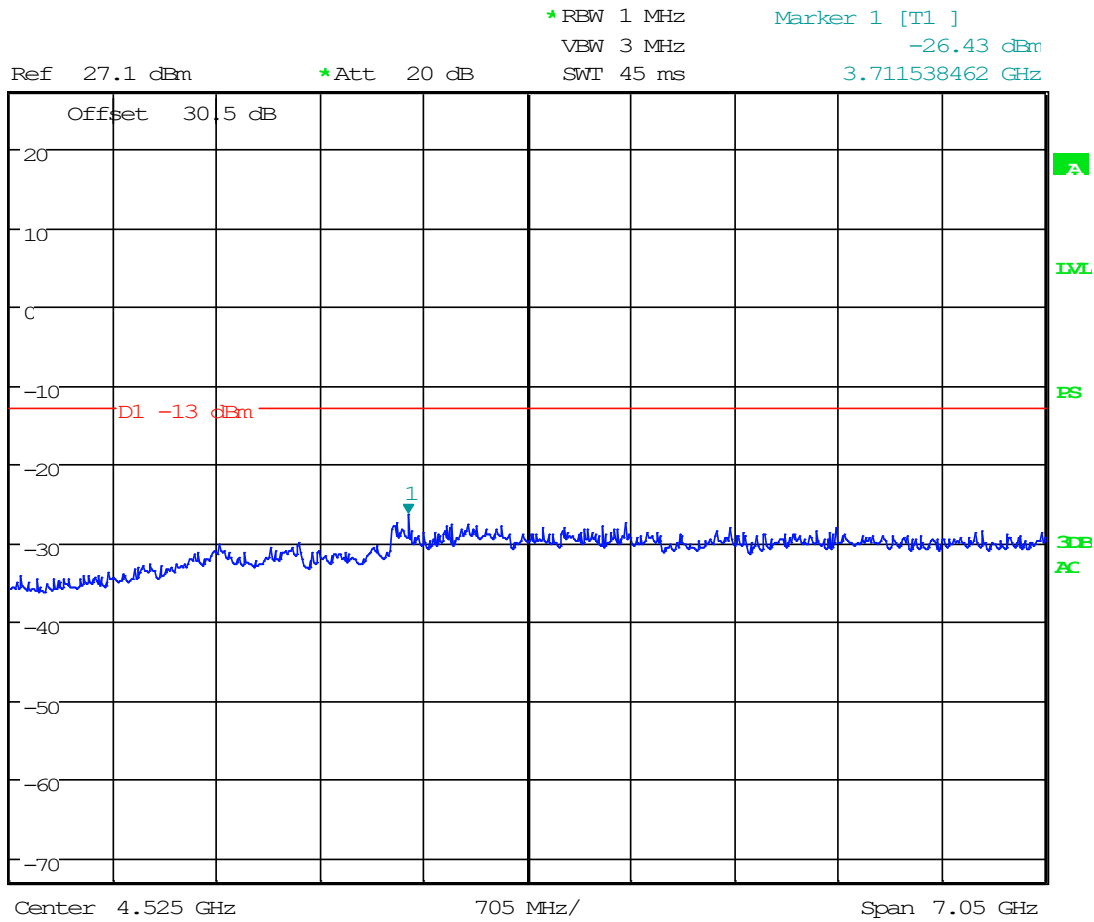


Date: 7.JUN.2024 16:40:39

8.6.2 Spurious Emissions Above 1G, 88 MHz

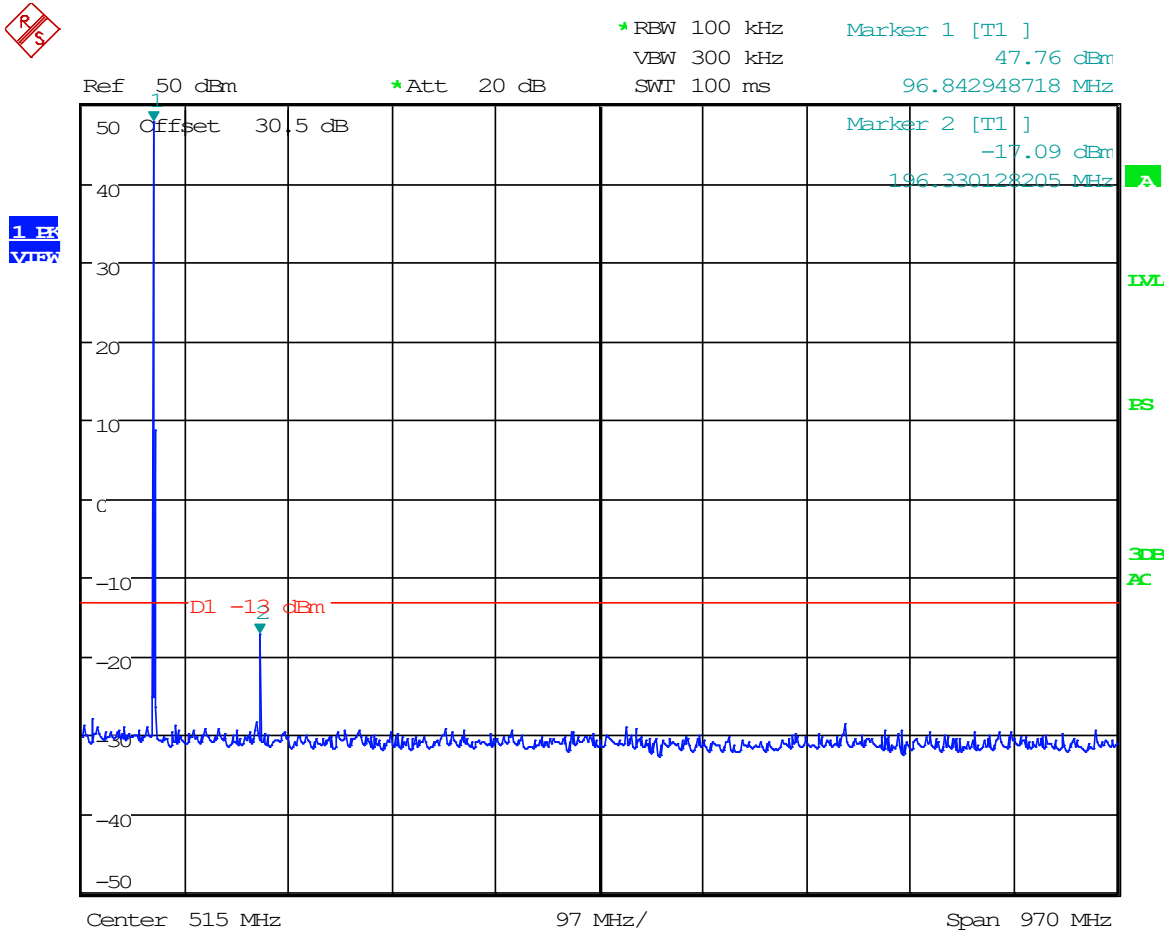


1 PK
VIA



Date: 7.JUN.2024 16:41:38

8.6.3 Spurious Emissions Below 1G, 98 MHz

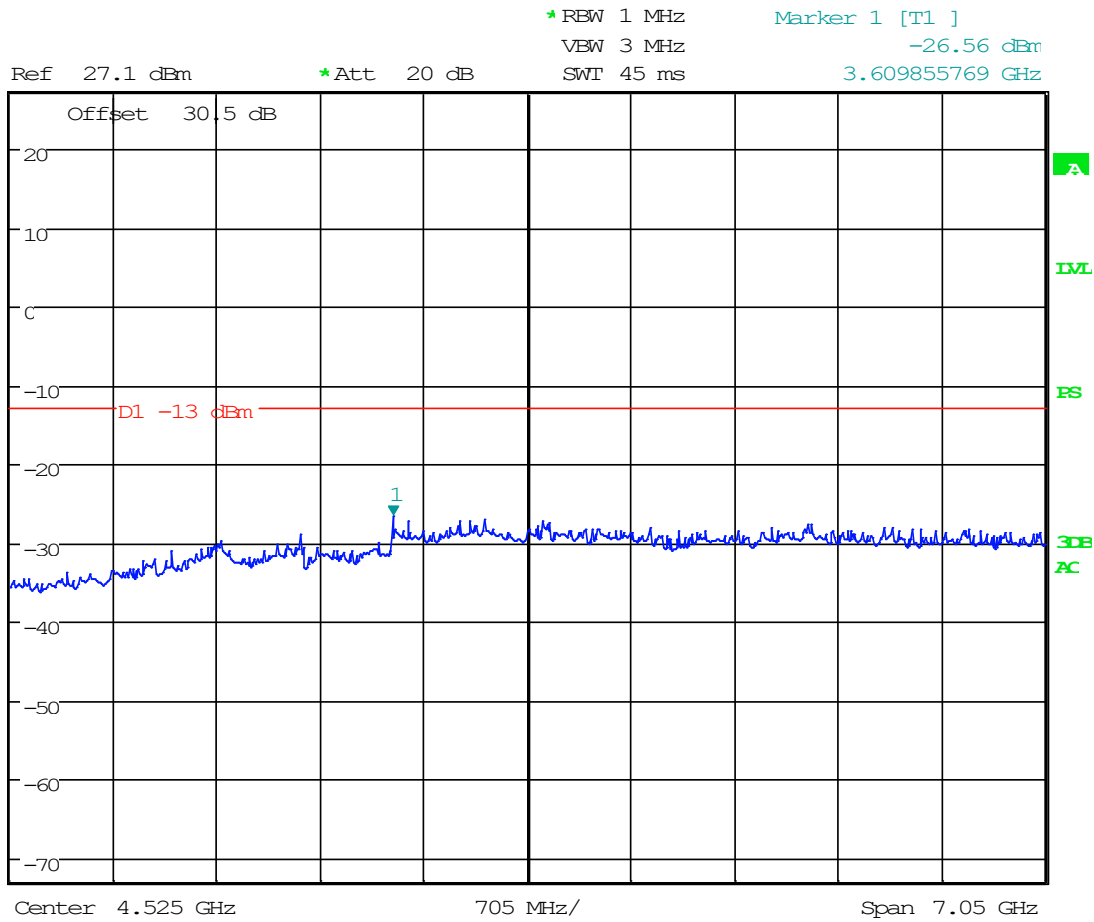


Date: 7.JUN.2024 16:39:51

8.6.4 Spurious Emissions Above 1G, 98 MHz

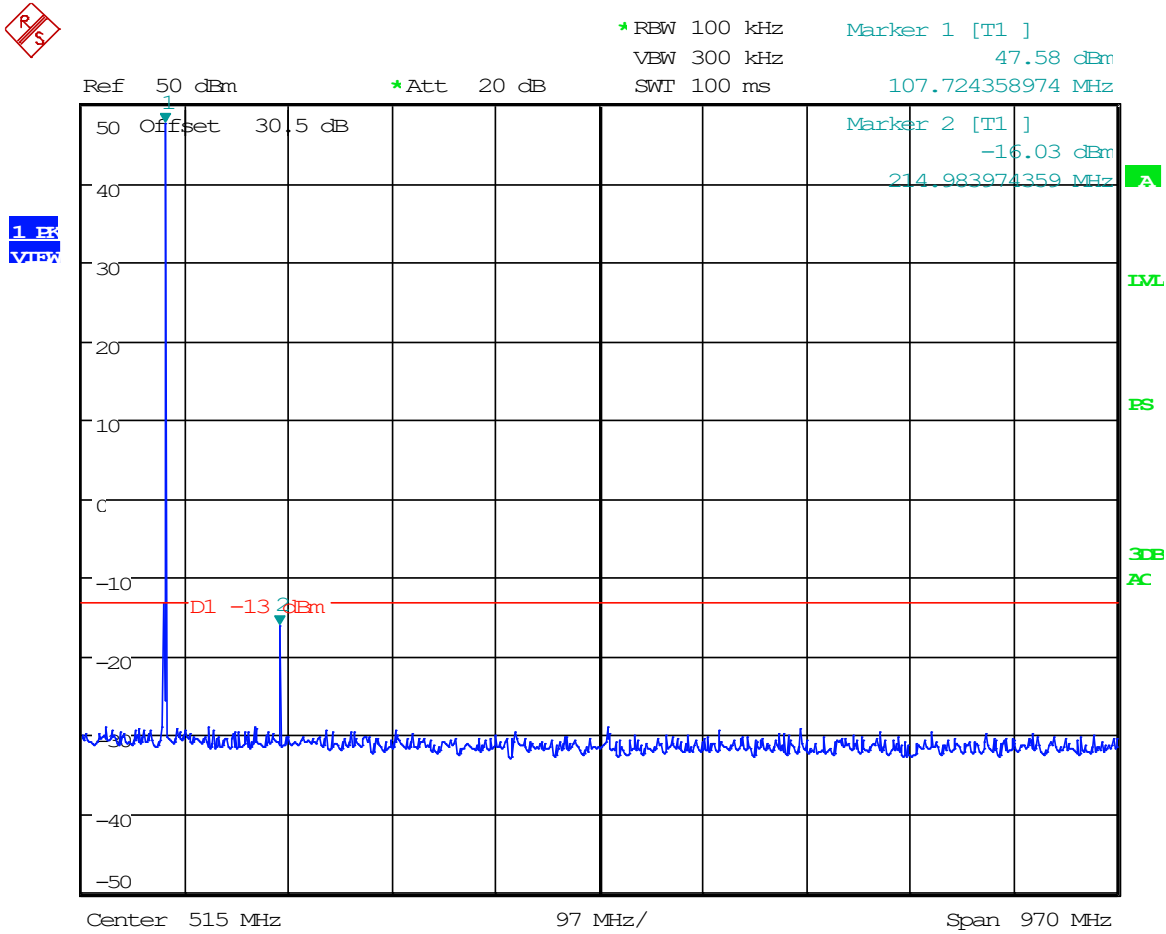


1 PK
VIA



Date: 7.JUN.2024 16:42:12

8.6.5 Spurious Emissions Below 1G, 108 MHz

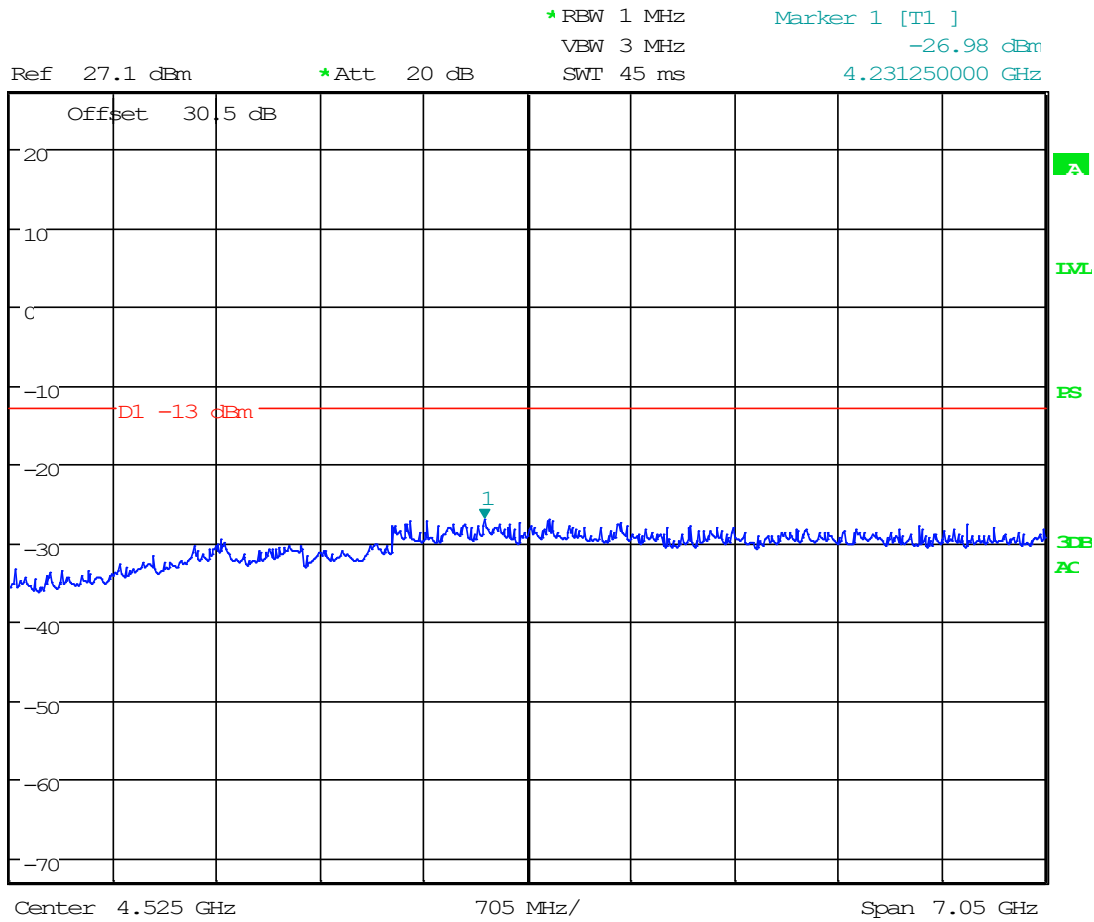


Date: 7.JUN.2024 16:38:57

8.6.6 Spurious Emissions Above 1G, 108 MHz



1 PK
VIA



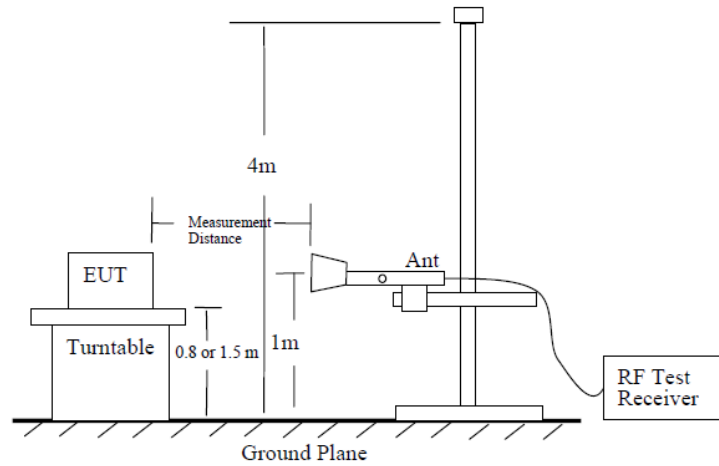
Date: 7.JUN.2024 16:42:54

8.7 Field Strength of Spurious Emissions

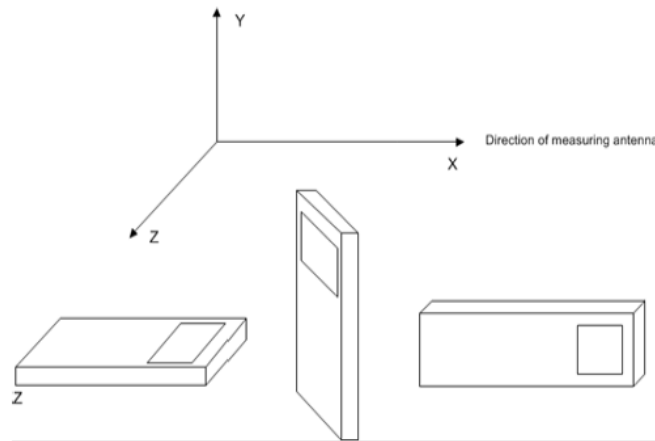
Limits from FCC Part 2.1051 & 73.317(d) and test procedure from ANSI C63.26-2015

Setup

Test Site Setup:



EUT Orientation(s):



Field Strength of Spurious Emissions Tabular Data

8.7.1 Test Data, 88 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
88.00	176.00	PK	21.50	H	-1.54	14.50	3.00	34.46	-62.92	-13.00	49.92
88.00	176.00	PK	14.90	V	-1.54	14.50	3.00	27.86	-69.52	-13.00	56.52
88.00	264.00	PK	12.10	H	-2.03	12.66	3.00	22.73	-74.65	-13.00	61.65
88.00	264.00	PK	10.80	V	-2.03	12.66	3.00	21.43	-75.95	-13.00	62.95
88.00	352.00	PK	12.50	H	-2.12	14.84	3.00	25.22	-72.16	-13.00	59.16
88.00	352.00	PK	11.40	V	-2.12	14.84	3.00	24.12	-73.26	-13.00	60.26
88.00	440.00	PK	17.10	H	-2.40	16.44	3.00	31.14	-66.24	-13.00	53.24
88.00	440.00	PK	18.40	V	-2.40	16.44	3.00	32.44	-64.94	-13.00	51.94
88.00	528.00	PK	17.20	H	-2.76	17.98	3.00	32.42	-64.96	-13.00	51.96
88.00	528.00	PK	24.10	V	-2.76	17.98	3.00	39.32	-58.06	-13.00	45.06
88.00	616.00	PK	11.40	H	-2.90	18.93	3.00	27.43	-69.94	-13.00	56.94
88.00	616.00	PK	13.40	V	-2.90	18.93	3.00	29.43	-67.94	-13.00	54.94
88.00	704.00	PK	11.20	H	-3.11	21.42	3.00	29.51	-67.87	-13.00	54.87
88.00	704.00	PK	12.10	V	-3.11	21.42	3.00	30.41	-66.97	-13.00	53.97
88.00	792.00	PK	11.20	H	-3.32	21.37	3.00	29.25	-68.13	-13.00	55.13
88.00	792.00	PK	11.70	V	-3.32	21.37	3.00	29.75	-67.63	-13.00	54.63
88.00	880.00	PK	11.90	H	-3.54	22.51	3.00	30.87	-66.50	-13.00	53.50
88.00	880.00	PK	12.40	V	-3.54	22.51	3.00	31.37	-66.00	-13.00	53.00

8.7.2 Test Data, 98 MHz

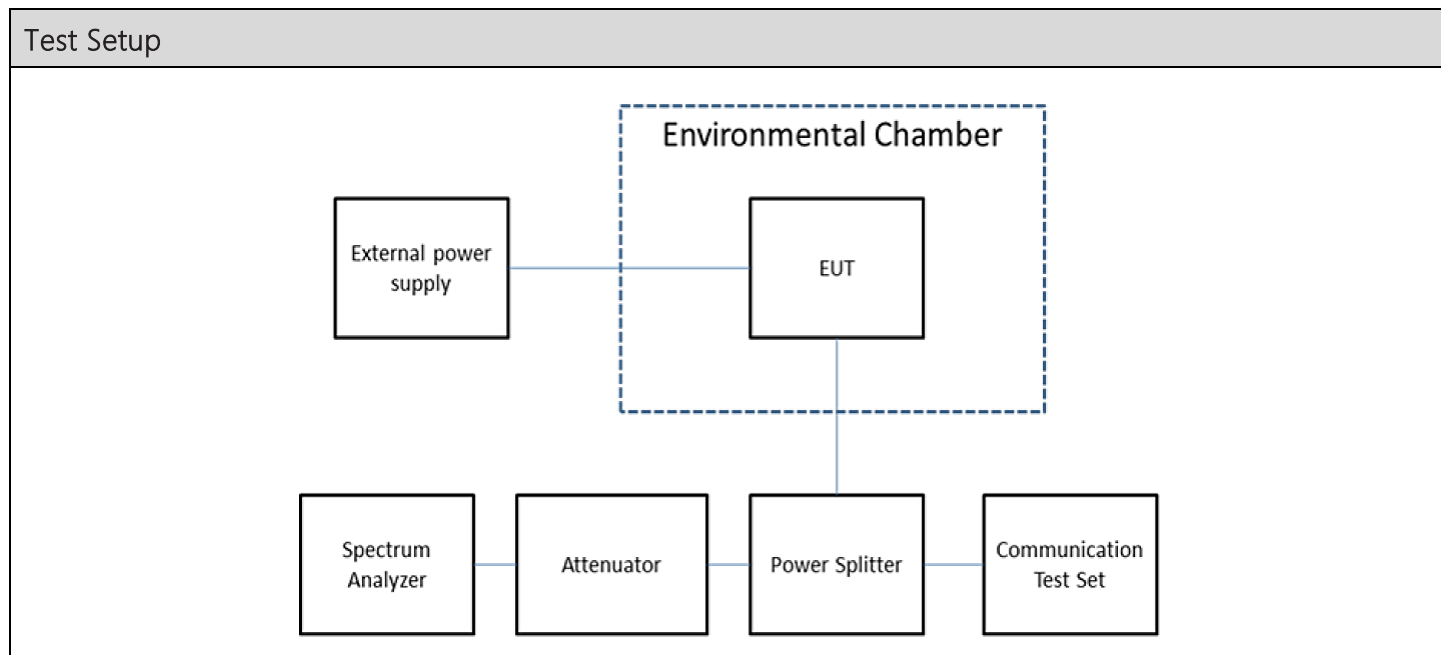
Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
98.00	196.00	PK	21.00	H	-1.61	15.90	3.00	35.29	-62.09	-13.00	49.09
98.00	196.00	PK	15.10	V	-1.61	15.90	3.00	29.39	-67.99	-13.00	54.99
98.00	294.00	PK	11.30	H	-2.08	13.80	3.00	23.02	-74.36	-13.00	61.36
98.00	294.00	PK	11.10	V	-2.08	13.80	3.00	22.82	-74.56	-13.00	61.56
98.00	392.00	PK	17.10	H	-2.27	15.78	3.00	30.61	-66.77	-13.00	53.77
98.00	392.00	PK	15.90	V	-2.27	15.78	3.00	29.41	-67.97	-13.00	54.97
98.00	490.00	PK	12.70	H	-2.62	17.59	3.00	27.67	-69.71	-13.00	56.71
98.00	490.00	PK	15.10	V	-2.62	17.59	3.00	30.07	-67.31	-13.00	54.31
98.00	588.00	PK	11.50	H	-2.87	18.67	3.00	27.30	-70.07	-13.00	57.07
98.00	588.00	PK	17.60	V	-2.87	18.67	3.00	33.40	-63.97	-13.00	50.97
98.00	686.00	PK	11.00	H	-3.06	21.16	3.00	29.10	-68.28	-13.00	55.28
98.00	686.00	PK	13.40	V	-3.06	21.16	3.00	31.50	-65.88	-13.00	52.88
98.00	784.00	PK	10.70	H	-3.30	21.40	3.00	28.79	-68.58	-13.00	55.58
98.00	784.00	PK	10.50	V	-3.30	21.40	3.00	28.59	-68.78	-13.00	55.78
98.00	882.00	PK	11.10	H	-3.54	22.53	3.00	30.09	-67.29	-13.00	54.29
98.00	882.00	PK	11.50	V	-3.54	22.53	3.00	30.49	-66.89	-13.00	53.89
98.00	980.00	PK	12.00	H	-3.69	23.84	3.00	32.15	-65.22	-13.00	52.22
98.00	980.00	PK	11.60	V	-3.69	23.84	3.00	31.75	-65.62	-13.00	52.62

8.7.3 Test Data, 108 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
108.00	216.00	PK	16.90	H	-1.67	11.25	3.00	26.47	-70.90	-13.00	57.90
108.00	216.00	PK	15.40	V	-1.67	11.25	3.00	24.97	-72.40	-13.00	59.40
108.00	324.00	PK	13.70	H	-2.09	14.31	3.00	25.92	-71.46	-13.00	58.46
108.00	324.00	PK	11.00	V	-2.09	14.31	3.00	23.22	-74.16	-13.00	61.16
108.00	432.00	PK	14.70	H	-2.38	16.28	3.00	28.60	-68.78	-13.00	55.78
108.00	432.00	PK	16.00	V	-2.38	16.28	3.00	29.90	-67.48	-13.00	54.48
108.00	540.00	PK	25.30	H	-2.78	18.08	3.00	40.60	-56.78	-13.00	43.78
108.00	540.00	PK	30.80	V	-2.78	18.08	3.00	46.10	-51.28	-13.00	38.28
108.00	648.00	PK	11.20	H	-2.96	19.44	3.00	27.68	-69.69	-13.00	56.69
108.00	648.00	PK	14.00	V	-2.96	19.44	3.00	30.48	-66.89	-13.00	53.89
108.00	756.00	PK	11.00	H	-3.23	21.35	3.00	29.12	-68.26	-13.00	55.26
108.00	756.00	PK	10.30	V	-3.23	21.35	3.00	28.42	-68.96	-13.00	55.96
108.00	864.00	PK	12.20	H	-3.50	22.42	3.00	31.11	-66.26	-13.00	53.26
108.00	864.00	PK	11.40	V	-3.50	22.42	3.00	30.31	-67.06	-13.00	54.06
108.00	972.00	PK	11.40	H	-3.66	23.60	3.00	31.34	-66.04	-13.00	53.04
108.00	972.00	PK	11.50	V	-3.66	23.60	3.00	31.44	-65.94	-13.00	52.94
108.00	1080.00	PK	9.10	H	-3.90	27.06	3.00	32.25	-65.12	-13.00	52.12
108.00	1080.00	PK	10.30	V	-3.90	27.06	3.00	33.45	-63.92	-13.00	50.92

8.8 Frequency Stability

Limits from FCC Part 2.1055(a)(3), Part 73.1545(b) and test procedure from ANSI C63.26-2015

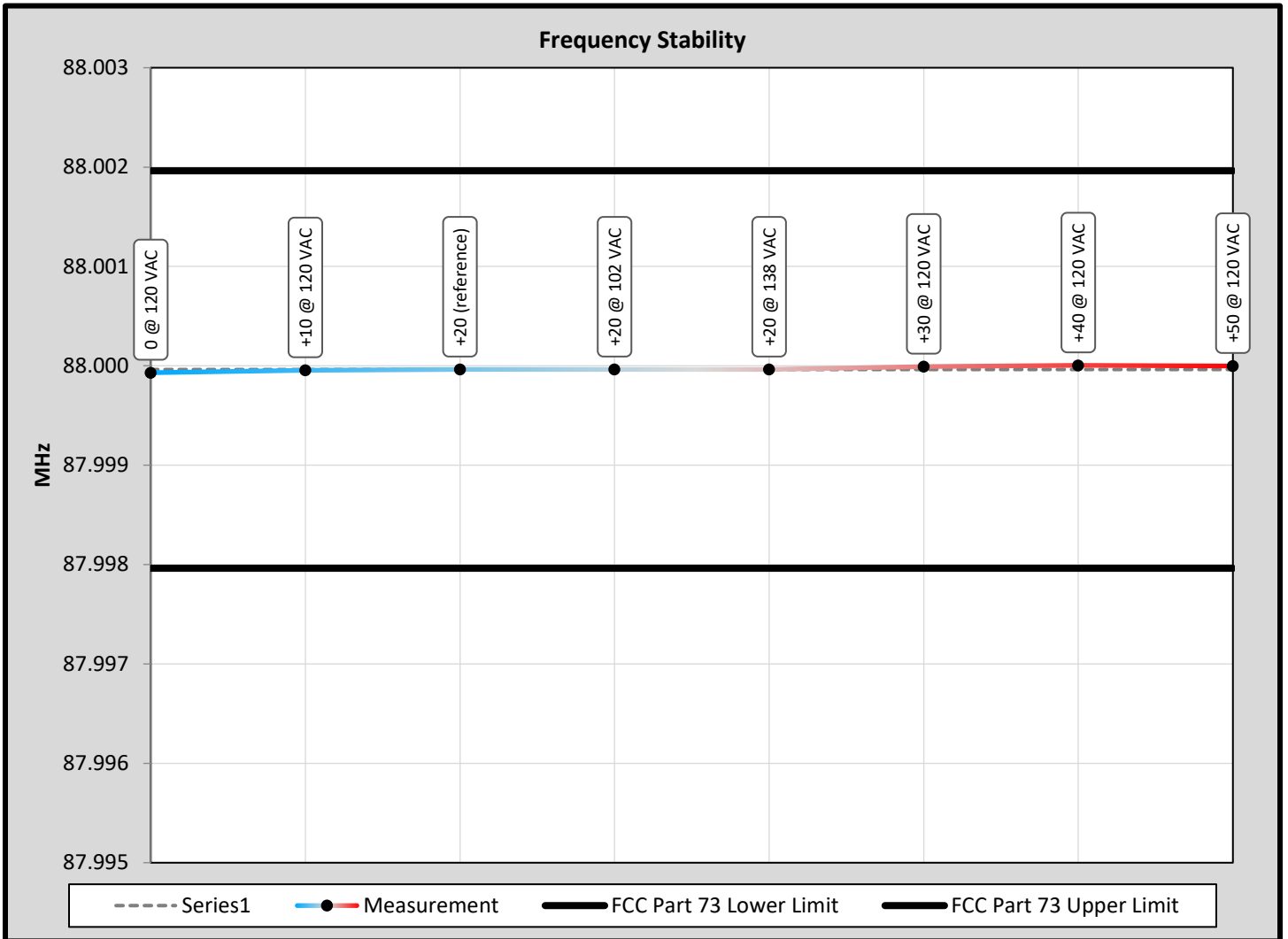


Test Results, Mode 1		
Tuned Frequency (MHz)	Max Deviation (kHz)	Limit (kHz)
88	0.042	±2

8.8.1 Frequency Stability Data

FCC Part 73 Limit	2	+/- kHz	
FCC Part 73 Lower Limit	87.997963	MHz	
FCC Part 73 Upper Limit	88.001963	MHz	
Rated Supply Voltage	120.0	☒ AC ☐ DC	
Temperature / Voltage Variation			
Temperature (°C)	Supplied Voltage (V)	Frequency (MHz)	Deviation (kHz)
0	120.0	87.999931	0.032
+10	120.0	87.999956	0.007
+20 (reference)	120.0	87.999963	0.000
+20	102.0	87.999963	0.000
+20	138.0	87.999963	0.000
+30	120.0	87.999992	-0.029
+40	120.0	88.000005	-0.042
+50	120.0	87.999999	-0.036

8.8.2 Frequency Stability Plot



9. ANNEX-B – Test Setup Photographs

Test setup photographs are located in a separate supplementary ANNEX-B document.

10. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_14105-24_FCC 73_	1	Initial release	6/12/2024
	2	Change in Page 6,12	01/17/2025

END OF TEST REPORT
