FCC 47 CFR PART 15 SUBPART C
ISED RSS-210 ISSUE 11

TEST REPORT

FOR

WIRELESS THERMOSTAT

MODEL NUMBER: THX1200W5

FCC ID: HS9-THX1200WF01
IC: 573F-TH2X1200WF01

REPORT NUMBER: R15799203-E2

ISSUE DATE: 2025-06-18

Prepared for
RESIDEO
2 CORPORATE CENTER DR
MELVILLE, NY 11747 USA

Prepared by
UL LLC
12 LABORATORY DR.
RESEARCH TRIANGLE PARK, NC 27709 USA
TEL: (919) 549-1400

ACCREDITED
CERT #0751.06

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2025-06-11	Initial Issue	Henry Lindbo
V2	2025-06-18	Misc. editorial update	Mike Antola

UL LLC
12 Laboratory Dr., RTP, NC 27709 TEL: (919) 549-1400

TABLE OF CONTENTS

UL LLC
12 Laboratory Dr., RTP, NC 27709 TEL: (919) 549-1400

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Resideo
2 Corporate Center Dr
Melville, NY, USA

EUT DESCRIPTION: Wireless Thermostat

MODEL: THX1200W5

SERIAL NUMBER: 52591160000146

SAMPLE RECEIPT DATE: 2025-05-08

DATES TESTED: 2025-05-12 to 2025-05-28

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-210 Issue 11 Annex J	Complies
ISED RSS-GEN Issue 5 + A1 + A2	Complies

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released For
UL LLC By:

Mike Antola
Sr. Staff Engineer
CONSUMER TECHNOLOGY DIVISION
UL LLC

Prepared By:

Henry Lindbo
Associate Project Engineer
CONSUMER TECHNOLOGY DIVISION
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2020, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC KDB 364244 D01, RSS-GEN Issue 5 + A1 + A2, and RSS-210 Issue 11.

This report contains data provided by the applicant which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

3. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Cert. No. 751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	12 Laboratory Drive Research Triangle Park, NC 27709, U.S.A.	US0067	2180C	825374
☒	2800 Perimeter Dr., Suite B, Morrisville, NC 27560, U.S.A.		27265	

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

PARAMETER	U_{LAB}
Radio frequency	3.5×10^{-8}
All emission, radiated below 40GHz	6 dB
All emissions, radiated above 40GHz	3 dB
Temperature	0.34 °C
Humidity	2.83 %
DC and low frequency voltages	0.57 %

Uncertainty figures are valid to a confidence level of 95%.

4.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a thermostat that contains Redlink (900MHz FHSS), 2.4/5GHz WLAN, BLE, and FMCW Radar radios. This test report covers the testing of the Radar component.

5.2. OUTPUT POWER

The antenna is integral thus radiated measurements are made. The EIRP was measured at the worst-case condition, thus the EIRP measurement conditions correspond to the maximum EUT antenna gain. Therefore, the maximum antenna gain is used to calculate the Conducted Peak Output Power.

The highest peak output power is 4.16 dBm (2.61 mW) EIRP.

5.3. MANUFACTURER'S DESCRIPTION OF AVAILABLE ANTENNAS

The EUT utilizes a 1 element TX and 3 element RX antenna array with a gain of 3.5 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 01.3024.0.

5.5. WORST-CASE CONFIGURATION AND MODE

Only one mode is supported by the radar, so all testing is done in that mode.

UL LLC
12 Laboratory Dr., RTP, NC 27709 TEL: (919) 549-1400

6. DESCRIPTION OF TEST SETUP

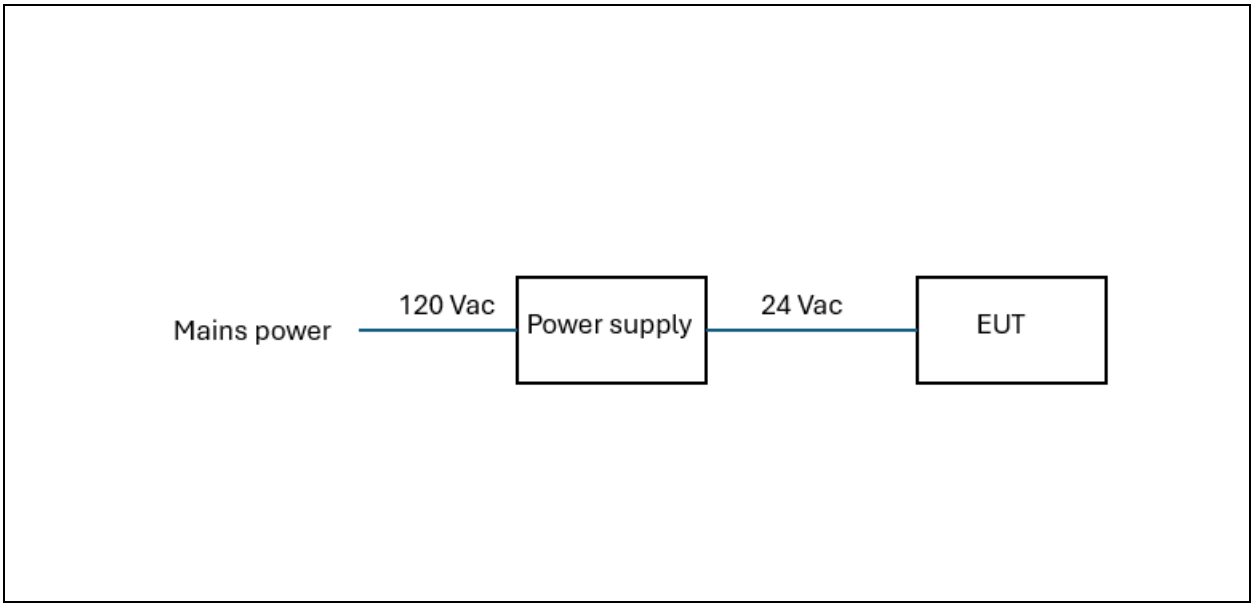
SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC power supply	TRIAD	WAU24-1000	E245587	NA

I/O CABLES

I/O Cable List			
Cable No	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	<3	Connects EUT to power supply

SETUP DIAGRAM FOR TESTS



7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-10-02	2025-10-02
	30-1000 MHz				
159203	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-03-05	2026-03-05
	1-18 GHz				
86408	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-06-19	2025-06-19
	18-40 GHz				
91186	Horn Antenna, 18-26GHz	Antenna Research Associates	MWH-1826/B	2024-05-16	2025-05-16
	Gain-Loss Chains				
91975	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-10	2025-05-31
91978	Gain-loss string: 25-1000MHz	Various	Various	2024-05-10	2025-05-31
91977	Gain-loss string: 1-18GHz	Various	Various	2024-07-17	2025-07-31
136042	Gain-loss string: 18-40GHz	Various	Various	2024-05-10	2025-05-31
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
72823	Spectrum Analyzer	Agilent	E4446A	2024-06-30	2025-06-30
81018	Spectrum Analyzer	Agilent	E4446A	2024-07-31	2025-07-31
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200540	Environmental Meter	Fisher Scientific	15-077-963	2023-07-19	2025-07-19

Note: All equipment was in calibration at the time of test.

Test Equipment Used - mmWave Test Equipment (Morrisville – Chamber 3)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	18-40 GHz				
204908	Horn Antenna, 26.5-40GHz	Com Power	AH-640	2025-02-28	2026-02-28
240019	18-40GHz Amplifier	Amplical	AMP18G40-50	2025-04-24	2026-04-24
	40-50 GHz				
206209	Standard Gain Horn, 40-50GHz	Custom Microwave Inc.	HO22R	2025-02-28	2026-02-28
205910	Low Noise Amplifier	Eravant	SBL-3335033040-2222-E1	2025-04-25	2026-04-25
207949	Band Pass Filter	Eravant	SWF-4510460-2F2F-B1	2025-04-25	2026-04-25
	50-75 GHz				
206203	Standard Gain Horn, 50-75GHz	Custom Microwave Inc.	HO15R	2025-02-28	2026-02-28
206607	WR15 Downconverter	VDI	WR15.0SAX-F	2025-04-24	2026-04-24
170553	WR15 Downconverter	OML	C15H1DC01	2024-09-12	2025-09-12
	75-110 GHz				
206222	Standard Gain Horn, 75-110GHz	Custom Microwave Inc.	HO10R	2025-02-28	2026-02-28
207249	WR10 Downconverter	VDI	WR10.0SAX-F	2025-04-24	2026-04-24
205913	Low Noise Amplifier	Eravant	SBL-7531142050-1010-E1	2025-04-28	2026-04-28
	110-170 GHz				
206242	Standard Gain Horn, 110-170GHz	Custom Microwave Inc.	HO6R	2025-02-28	2026-02-28
206555	WR6.5 Downconverter	VDI	WR6.5SAX-F	2025-04-24	2026-04-24
205912	Low Noise Amplifier	Eravant	SBL-1141741860-0606-E1	2025-05-01	2026-05-01
	170-260 GHz				
206244	Standard Gain Horn, 170-260GHz	Custom Microwave Inc.	HO4R	2025-02-28	2026-02-28
206556	WR4.3 Downconverter	VDI	WR4.3SAX-F	2025-04-24	2026-04-24
	Receiver & Software				
206459	Spectrum Analyzer	Rohde & Schwarz	FSW50	2024-12-23	2025-12-23
mmWave	mmWave Software	UL	V2022.7.29		
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 2021)		
	Additional Equipment used				
207161	Signal Generator	Rohde and Schwarz	SMA100B	2024-07-11	2025-07-11
80814	Diode Detector, 0.01-33GHz	Agilent	8474C	NA	NA
239539	Environmental Meter	Fisher Scientific	15-077-963	2023-07-19	2025-07-19

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
208201	350 MHz High-Definition Oscilloscope	Teledyne Lecroy	HDO6034A	2025-01-13	2026-01-13
211004	200 MHz Low-Noise Voltage Amplifier	Femto	HVA-200M-40-B	NA	NA

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
207726	Temp/Humid Chamber	Thermotron	SM-32-8200	2025-01-15	2026-01-15
179892	Environmental Meter	Fisher Scientific	15-077-963	2024-08-12	2025-08-12
92852	CW-AC Power Source	Ametek	CW2501	NA	NA
214284	Spectrum Analyzer	Rohde & Schwarz	FSW50	2025-03-14	2026-03-14
206203	Standard Gain Horn, 50-75GHz	Custom Microwave Inc.	HO15R	2025-02-28	2026-02-28
170553	WR15 Downconverter	OML	C15H1DC01	2024-09-12	2025-09-12
207161	Signal Generator	Rohde and Schwarz	SMA100B	2024-07-11	2025-07-11

Test Equipment Used – AC Line Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
72095	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2024-08-01	2025-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2024-08-01	2025-08-01
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2025-04-17	2026-04-17
84681	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2025-04-17	2026-04-17

Note: All equipment was in calibration at the time of test.

8. SUMMARY TABLE

FCC Section	RSS Section	Test Description	Test Limit	Test Result
15.255 (e)	RSS-210 J.3.3 d) RSS-Gen 6.7	Occupied Bandwidth (6dB / 99%)	N/A	Complies
15.255 (c) (2) (v)	RSS-210 J.3.2 a)	EIRP FDS/Radar (61.0-61.5GHz)	From 61-61.5GHz: 43 dBm (Peak) 40 dBm (Average) From 57-71GHz, outside 61-61.5GHz: 13 dBm (Peak) 10 dBm (Average)	Complies
15.255 (e)	RSS-210 J.4 (b), J.4 (a)	Conducted Power (non-FDS/Radar)	500 mW (Peak)	Complies
15.255 (d)	RSS-210 J.4, J.5	Spurious Emissions < 40GHz	FCC 15.209 RSS-Gen	Complies
15.255 (d)	RSS-210 J.4, J.5	Spurious Emissions 40 – 200GHz	90 pW/cm^2	Complies
15.255 (f)	RSS-210 J.6	Frequency Stability	Within Band	Complies
15.255 (h)	RSS-210 J.7	Group installation	No Beam Forming / Phase Locking	Complies
15.207	RSS-Gen 7.2	AC Power LineConducted Emissions	FCC 15.207 RSS-Gen	Complies

9. APPLICABLE LIMITS AND TEST RESULTS

9.1. FAR-FIELD DISTANCE AND MEASUREMENT DISTANCE

The measurement distance is in the far field per formula $2D^2/\lambda$ where D is the largest dimension of the antenna.

For fundamental / band edge emissions, the largest far-field distance of either the EUT antenna or measurement antenna shall be used. In this case, the measurement antenna has the largest far-field distance. For above 18 GHz spurious emissions, the far-field distance shall be based on the measurement antenna. The EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest EIRP reading on the receive spectrum analyzer.

Frequency Range (GHz)	Wavelength (m)	Rx Antenna Diagonal dim. (m)	Far Field Distance (m)	Measurement Distance Used (m)
40-50	0.0060	0.069	1.61	3.00
50-75	0.0040	0.046	1.05	3.00
75-110	0.0027	0.031	0.70	3.00
110-170	0.0018	0.02	0.46	3.00
170-200	0.0012	0.013	0.31	3.00

Radiated spurious emissions limits above 40 GHz are based on a 3-meter measurement distance. As such, testing from 40-200 GHz was performed at 3-meters.

In-band testing was performed at a 3-meter distance, which was still in the far-field based on the maximum EUT / measurement antenna dimension.

Radiated power levels are investigated while the receive antenna was rotated through all angles to determine the worst-case polarization/positioning. The worse-case orientation of the EUT was with the front fact facing the RX antenna, which was polarized vertically. Refer to test setup photos exhibit for details.

9.2. DUTY CYCLE

REQUIREMENT

None; for reporting purposes only.

TEST PROCEDURE

The fundamental is measured using a Standard Gain Horn Antenna, Low Noise Amplifier and a Diode Detector connected to an Oscilloscope. Pulse widths, burst lengths, and periods are measured, then the duty cycle is calculated.

RESULTS

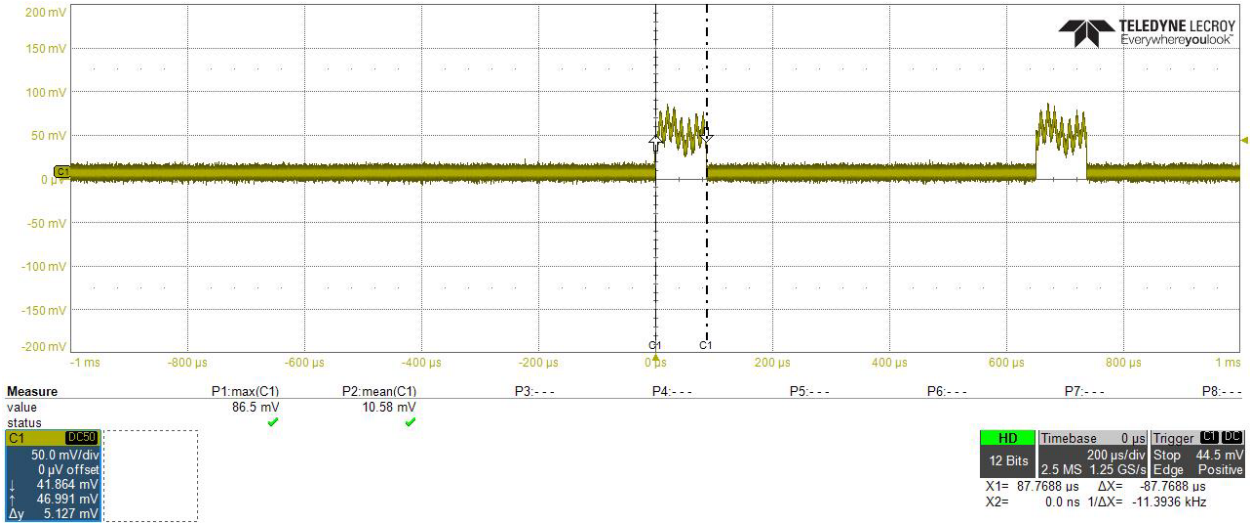
Duty cycle linear = On Time / Period
Duty cycle % = Duty cycle linear * 100

Burst On Time (ms)	Burst Period (ms)	Chirp On Time (us)	Chirp Period (us)	total DC (%)
10.520	40.050	87.769	648.532	3.555

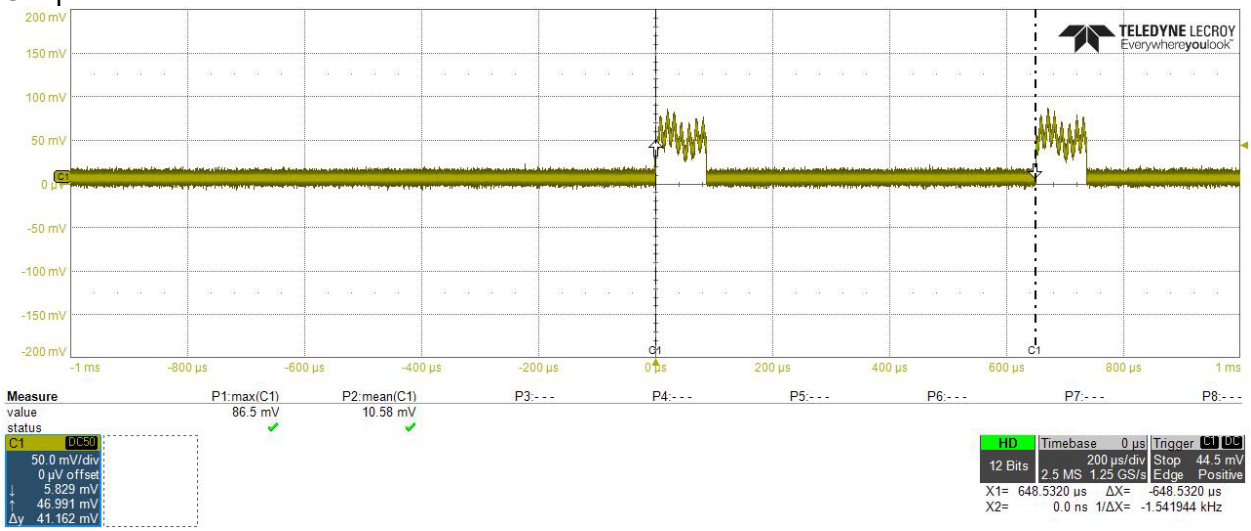
TESTED BY

Employee IDs: 23854
Test Dates: 2025-05-12
Test Location: Chamber 3

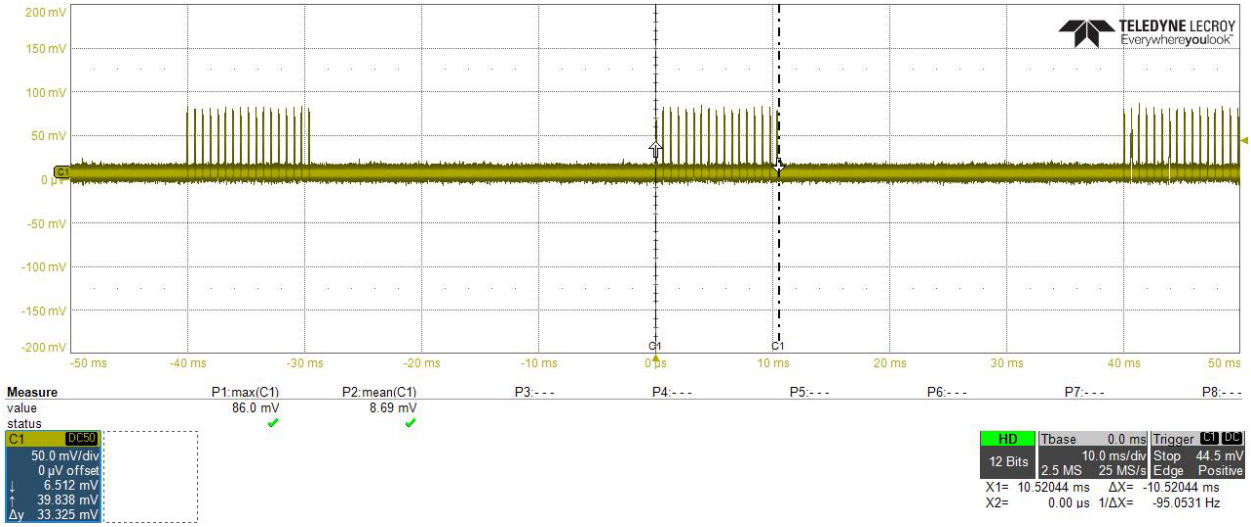
Chirp On Time



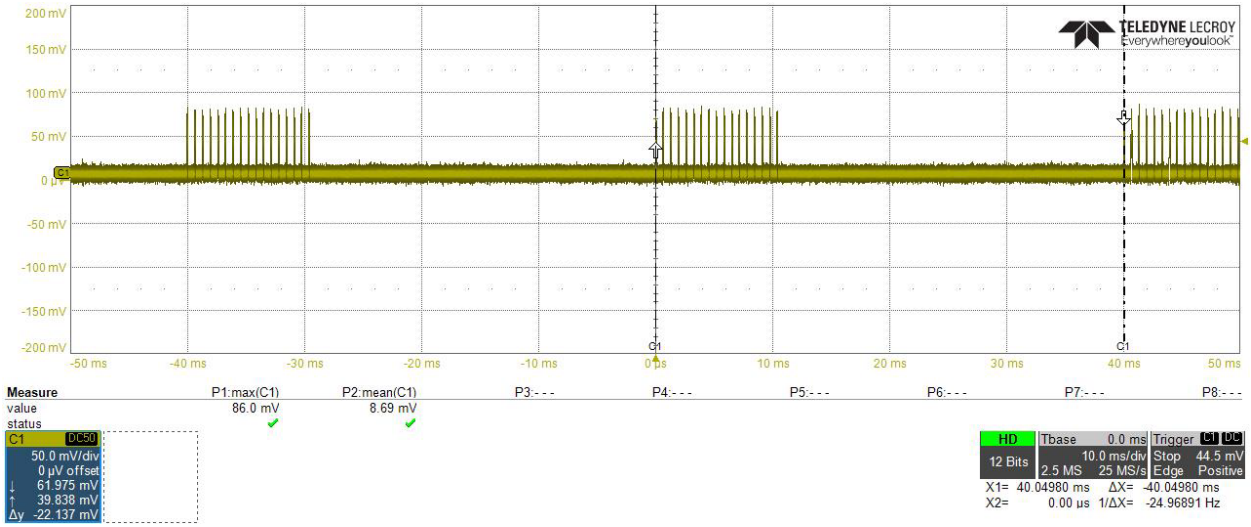
Chirp Period



Frame On Time



Frame Period



9.3. 99% BANDWIDTH

REQUIREMENT

§15.255 (e) (2) / RSS-210 Clause J.3.3 d)

Devices other than field disturbance sensors/radars with an emission bandwidth of less than 100 megahertz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 megahertz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kilohertz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (*e.g.,* for frequency hopping devices).

§15.255 (c) (3) / RSS-210 Clause J.3.2 c)

For pulsed field disturbance sensors/radars operating in the 57-64 GHz band that have a maximum pulse duration of 6 ns, the average EIRP shall not exceed 13 dBm and the transmit duty cycle shall not exceed 10% during any 0.3 µs time window. In addition, the average integrated EIRP within the frequency band 61.5-64.0 GHz shall not exceed 5 dBm in any 0.3 µs time window. Peak emissions shall not exceed 20 dB above the maximum permitted average emission limit applicable to the equipment under test. The radar bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna.

§RSS-GEN 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

TEST PROCEDURE

The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter. Refer to C63.10, Clause 9 for details.

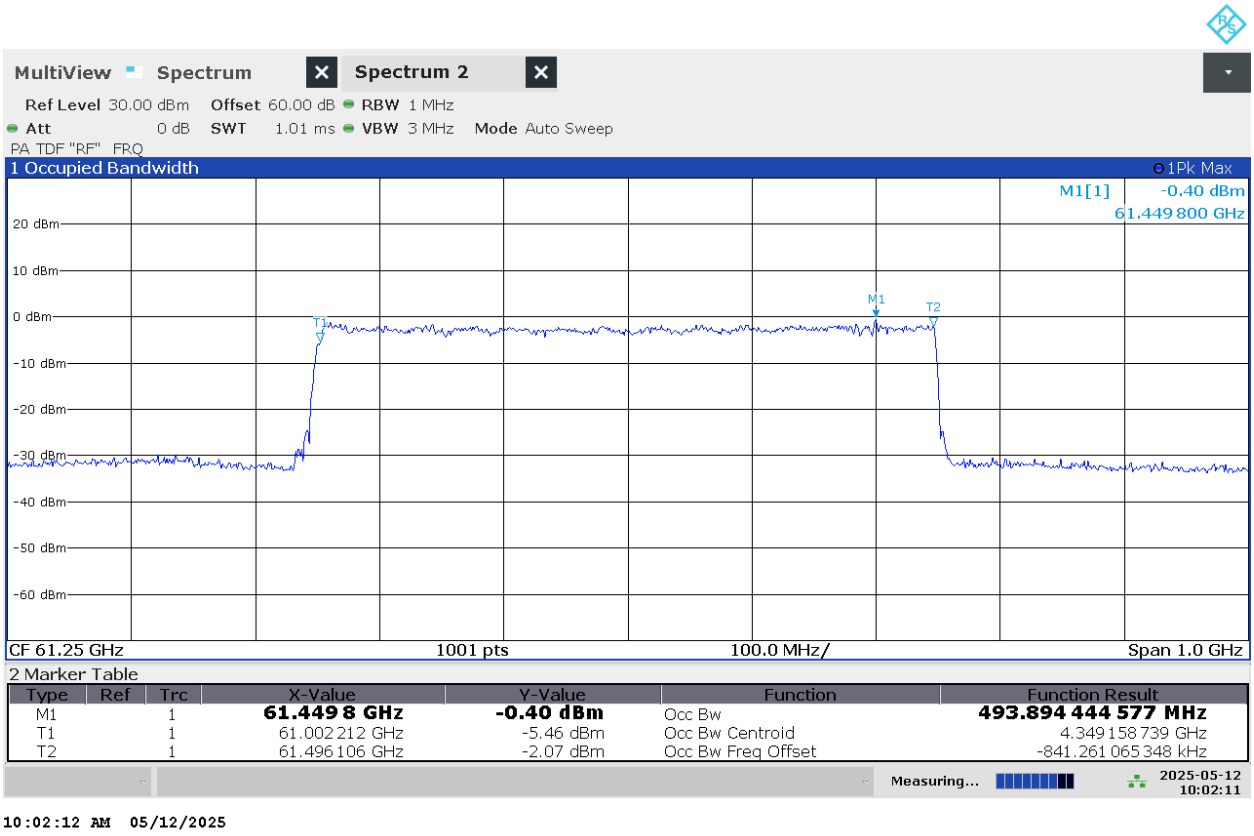
RESULTS

99% Bandwidth (MHz)	F Low (GHz)	F High (GHz)
493.894	61.002	61.496

TESTED BY

Employee IDs: 23854
Test Dates: 2025-05-12
Test Location: Chamber 3

99% BANDWIDTH



9.4. RADIATED POWER

REQUIREMENT

FCC

§15.255 (c) (2) (v) ***61.0-61.5 GHz:*** For field disturbance sensors/radars that occupy 500 MHz bandwidth or less that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm. In addition, the average power of any emission outside of the 61.0-61.5 GHz band, measured during the transmit interval, but still within the 57-71 GHz band, shall not exceed 10 dBm, and the peak power of any emission shall not exceed 13 dBm.

ISED

RSS-210 Clause J.3.2

FDS devices operating in the 57-71 GHz band shall not exceed –10 dBm peak transmitter conducted output power and 10 dBm peak e.i.r.p. The following exceptions apply:

(a) FDS devices that occupy a bandwidth of 500 MHz or less and where this bandwidth is contained wholly within the frequency band 61.0-61.5 GHz shall comply with the following limits: the equipment shall not exceed 40 dBm average e.i.r.p. and 43 dBm peak e.i.r.p. in the 61.0-61.5 GHz band. In addition, the average and peak e.i.r.p. of any emission outside of the band 61.0-61.5 GHz, but still within the band 57-71 GHz, shall not exceed 10 dBm average e.i.r.p. and 13 dBm peak e.i.r.p.

TEST PROCEDURE

ANSI C63.10-2020 Clause 9

The measured power level is converted to EIRP using ANSI C63.10 Eqs. (22) and (23):

Calculate the EIRP from the radiated measurement in the far-field using Equation (22):

$$EIRP = 21.98 - 20\log(\lambda) + 20\log(d_{Meas}) + P - G \quad (22)$$

where

$EIRP$	is the equivalent isotropic radiated power, in dBm
λ	is the wavelength of the emission under investigation [300/f(MHz)], in m
d_{Meas}	is the measurement distance, in m
P	is the power measured at the output of the measurement antenna, in dBm
G	is the gain of the measurement antenna, in dBi

NOTE—The measured power P includes all applicable instrument correction factors up to the connection to the measurement antenna.

Calculate the EIRP from the conducted power using Equation (23):

$$EIRP = P_{Cond} + G_{EUT} \quad (23)$$

where

$EIRP$	is the equivalent isotropic radiated power, in dBm
P_{Cond}	is the measured power at feedpoint of the EUT antenna, in dBm
G_{EUT}	is the gain of the EUT radiating element (antenna), in dBi

FMCW CORRECTION FACTOR CALCULATION

FMCW correction factor (equation L.1) is calculated using guidance from C63.10 2020 Annex L.

FMCW correction factor (Equation L.1) is calculated as follows:

$$\alpha = \frac{1}{\sqrt{1 + \left(\frac{2\ln(2)}{\pi}\right)^2 \left(\frac{BW_{Chirp}}{T_{Chirp}B^2}\right)^2}}$$

where

α	is the reduction in amplitude
BW_{Chirp}	is the FMCW Chirp Bandwidth
T_{Chirp}	is the FMCW Chirp Time
B	is the 3 dB IF Bandwidth = RBW

FAR FIELD BOUNDARY CALCULATIONS

The far-field boundary is given in ANSI C63.10-2020 Clause 9.1.4 as:

$R_{far\ field} = 2D^2 / \lambda$

where:

D = Largest Antenna Dimension, including the reflector, in meters
λ = wavelength in meters

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
61.5	0.0065	0.0049	0.0173

UL LLC
12 Laboratory Dr., RTP, NC 27709 TEL: (919) 549-1400

RESULTS

Peak Power of fundamental emission

Measured Pk Power (dBm)	FMCW correction factor (dB)	Corrected Pk Power (dBm)	Pk Power Limit (dBm)	Limit Margin (dB)
-0.12	-4.28	4.16	43	-38.84

Average Power of fundamental emission

Average Power (dBm)	Average Power Limit (dBm)	Limit Margin (dB)
-13.13	40	-53.13

Peak Power within band but outside of 61.0 – 61.5 GHz

Pk Power (dBm)	Pk Power Limit (dBm)	Limit Margin (dB)
-14.51	13	-21.51

Average Power within band but outside of 61.0 – 61.5 GHz

Pk Power (dBm)	Average Power Limit (dBm)	Limit Margin (dB)
-14.51	10	-24.51

TESTED BY

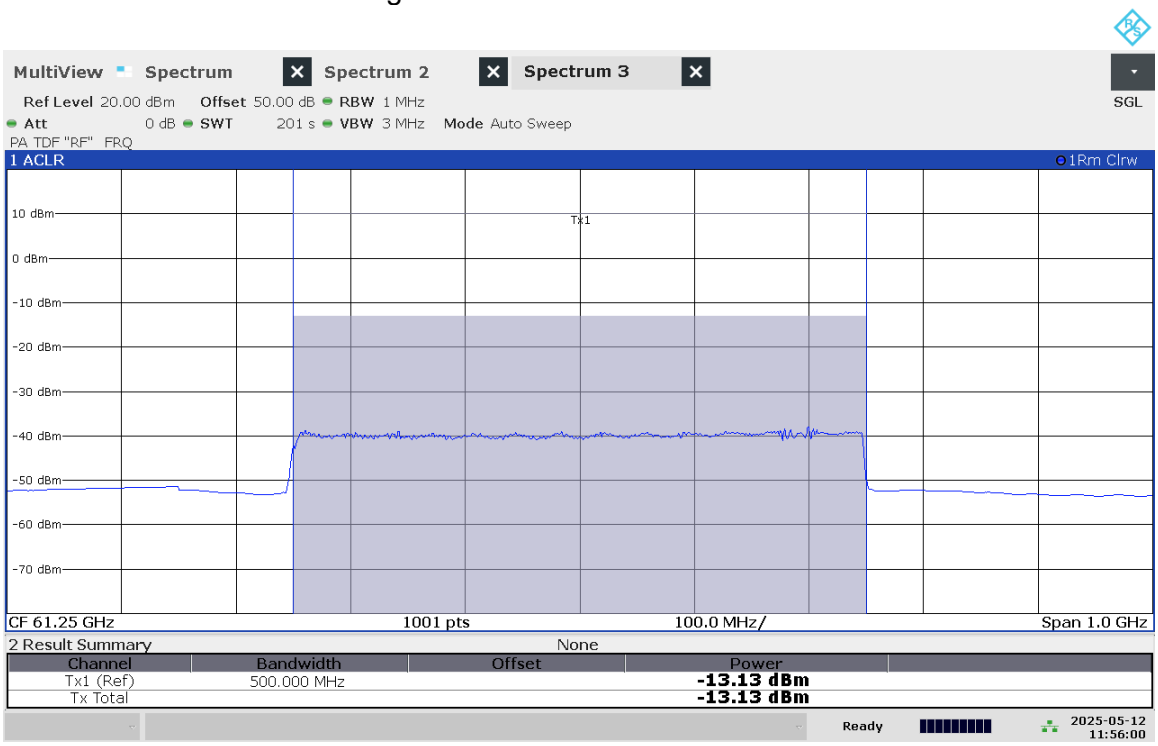
Employee IDs: 23854
Test Dates: 2025-05-12
Test Location: Chamber 3

RESULTS

Fundamental Emission Peak Power

11:02:16 AM 05/12/2025

Fundamental Emission Average Power



11:56:01 AM 05/12/2025

Peak and Average Power with 57.0-71.0 GHz but outside of 61.0-61.5 GHz

9.5. CONDUCTED OUTPUT POWER

REQUIREMENT

FCC

§15.255 (e)

(1) Except as specified in paragraph (e)(2) of this section, the peak transmitter conducted output power of devices other than field disturbance sensors/radars shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (c) of this section.

(2) Devices other than field disturbance sensors/radars with an emission bandwidth of less than 100 megahertz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 megahertz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kilohertz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (*e.g.,* for frequency hopping devices).

ISED

RSS-210 Clause J.3.3

c) Except as specified in J.3.3(d), the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the e.i.r.p. limits specified in J.3.3(a) and J.3.3(b).

d) For devices with an emission bandwidth less than 100 MHz, the peak transmitter conducted output power (PTCOP) shall be less than or equal to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purpose of J.3.3(d), emission bandwidth is the instantaneous frequency range occupied by a steady radiated signal with modulation, outside which the radiated power spectral density is 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth. The centre frequency shall be stationary during the measurement interval, even if not stationary during normal operation (e.g. for frequency hopping devices).

TEST PROCEDURE

The maximum EUT antenna gain is subtracted from the Peak EIRP.

RESULTS

Peak Power (dBm)	EUT Antenna Gain (dB)	Conducted Power (dBm)	Conducted Power Limit (mW)	Conducted Power Limit (dBm)	Limit Margin (dB)
4.16	3.50	0.66	500	27.00	-26.34

TESTED BY

Employee IDs: 23854
Test Dates: 2025-05-12
Test Location: Chamber 3

9.6. SPURIOUS EMISSIONS

REQUIREMENT

FCC

§15.255 (e)

(1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

ISED

RSS-210 Clause J.4

Any emissions outside the band 57-71 GHz shall consist solely of spurious emissions and shall not exceed:

(a) the fundamental emission levels

(b) the general field strength limits specified in RSS-Gen, *General Requirements for Compliance of Radio Apparatus*, for emissions below 40 GHz

(c) 90 pW/cm2 at a distance of 3 m for emissions between 40 GHz and 200 GHz

TEST PROCEDURE - BELOW 40 GHz

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1 GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.26 and set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range. Peak detection is used unless otherwise noted as quasi-peak or average.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements; as applicable for linear voltage averaging measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

TEST PROCEDURE – ABOVE 50 GHz

ANSI C63.10-2020 Clause 9.10

External harmonic mixers are utilized.

The measurement distance is in the far field per formula $2D^2/\lambda$ where D is the larger dimension of the antenna.

Frequency Range (GHz)	Wavelength (m)	Rx Antenna Diagonal dim. (m)	Far Field Distance (m)	Measurement Distance Used (m)
40-50	0.0060	0.069	1.61	3.00
50-75	0.0040	0.046	1.05	3.00
75-110	0.0027	0.031	0.70	3.00
110-170	0.0018	0.02	0.46	3.00
170-200	0.0012	0.013	0.31	3.00

Radiated spurious emissions limits above 40 GHz are based on a 3-meter measurement distance. As such, testing from 40-170GHz was performed at 3-meters. Above 170GHz, testing was performed at a 0.5-meter distance and the data was corrected, accordingly, to the 3-meter limit.

The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each mixer band that yields a minimum system noise floor at least 6 dB below the spurious emissions limit.

The power is measured, the EIRP is calculated, then the extrapolated power density at a 3 meter distance is calculated.

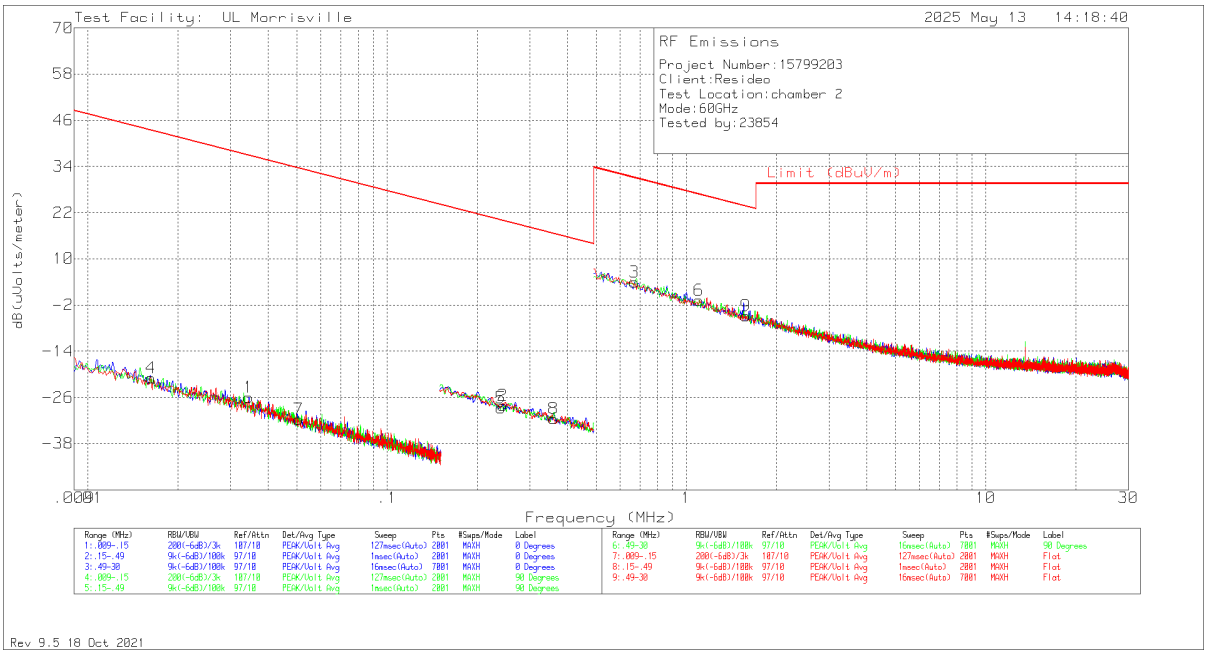
The 90 pW/cm^2 limit was converted to dBm by the following equation:

10 * log(90 [pW/cm^2] * 100^2 * 10^{-12} * 4pi* (3m)^2 *1000) = -9.92 dBm

TESTED BY

Employee IDs: 23854
Test Dates: 2025-05-12 to 2025-05-19
Test Location: Chamber 3, Chamber 2

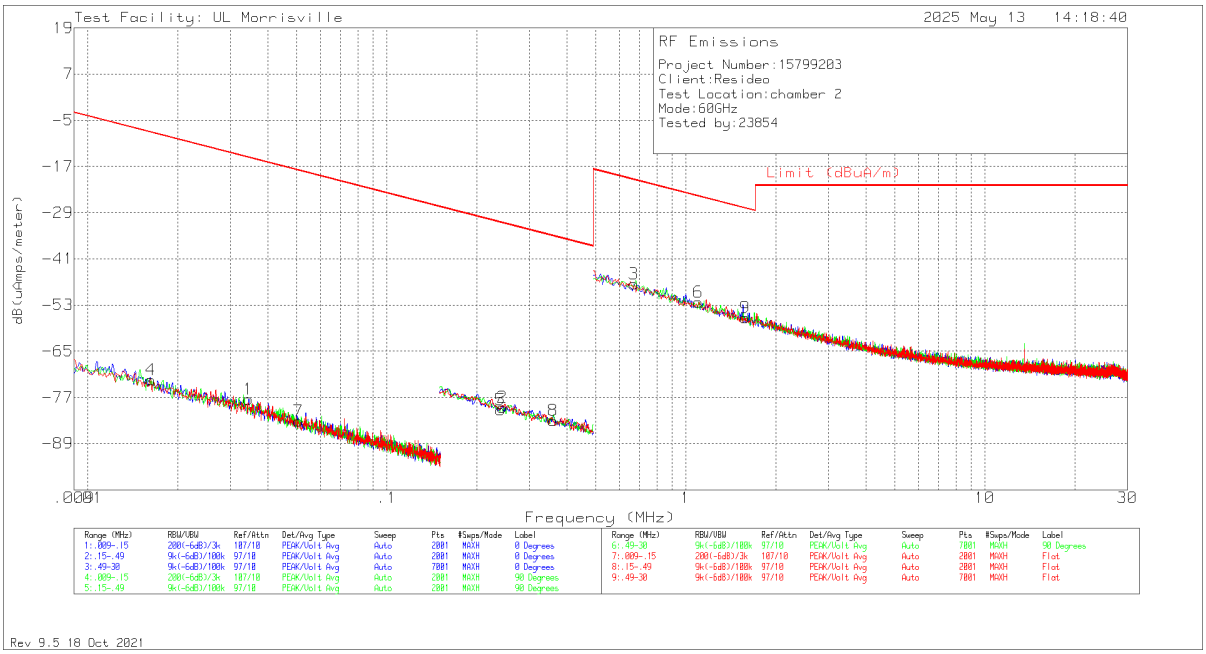
SPURIOUS EMISSION 9 kHz TO 30 MHz (FCC)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ANT (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.01624	43.13	Pk	15.8	.1	-80	-20.97	43.39	-64.36	0-360	90 degs
1	.03449	41.11	Pk	12.8	.1	-80	-25.99	36.85	-62.84	0-360	0 degs
7	.05068	36.7	Pk	11.5	.1	-80	-31.7	33.51	-65.21	0-360	Flat
5	.23993	40.27	Pk	10.9	.1	-80	-28.73	20	-48.73	0-360	90 degs
2	.24401	40.96	Pk	10.9	.1	-80	-28.04	19.86	-47.9	0-360	0 degs
8	.35927	37.53	Pk	10.9	.1	-80	-31.47	16.5	-47.97	0-360	Flat
3	.67129	32.82	Pk	11	.1	-40	3.92	31.07	-27.15	0-360	0 degs
6	1.10132	28.05	Pk	11	.2	-40	-.75	26.77	-27.52	0-360	90 degs
9	1.58194	23.85	Pk	11.1	.2	-40	-4.85	23.62	-28.47	0-360	Flat

Pk - Peak detector

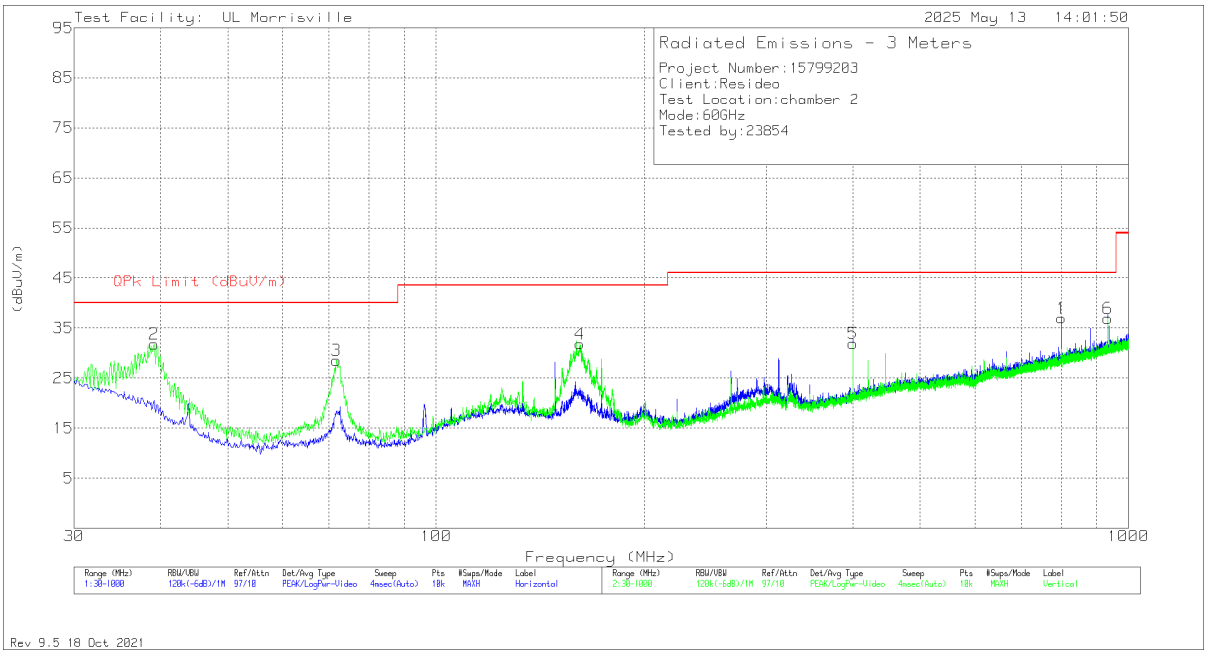
SPURIOUS EMISSION 9 kHz TO 30 MHz (ISED)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ANT (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
1	.03449	41.11	Pk	-38.7	.1	-80	-77.49	-14.65	-62.84	0-360	0 degs
2	.24401	40.96	Pk	-40.6	.1	-80	-79.54	-31.64	-47.9	0-360	0 degs
3	.67129	32.82	Pk	-40.5	.1	-40	-47.58	-20.43	-27.15	0-360	0 degs
4	.01624	43.13	Pk	-35.7	.1	-80	-72.47	-8.11	-64.36	0-360	90 degs
5	.23993	40.27	Pk	-40.6	.1	-80	-80.23	-31.5	-48.73	0-360	90 degs
6	1.10132	28.05	Pk	-40.5	.2	-40	-52.25	-24.73	-27.52	0-360	90 degs
7	.05068	36.7	Pk	-40	.1	-80	-83.2	-17.99	-65.21	0-360	Flat
8	.35927	37.53	Pk	-40.6	.1	-80	-82.97	-35	-47.97	0-360	Flat
9	1.58194	23.85	Pk	-40.4	.2	-40	-56.35	-27.88	-28.47	0-360	Flat

Pk - Peak detector

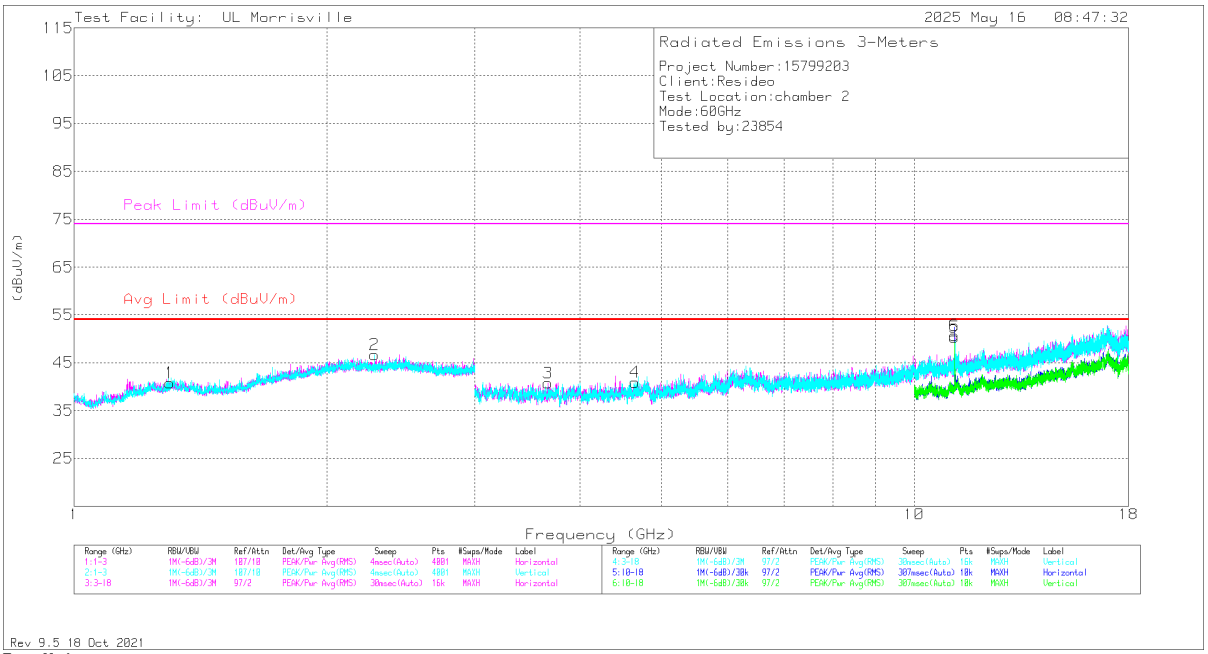
SPURIOUS EMISSION 30 TO 1000 MHz



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	159203 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	39.118	42.53	Pk	20.9	-31.6	31.83	40	-8.17	0-360	100	V
3	71.807	44.95	Pk	14.7	-31.1	28.55	40	-11.45	0-360	100	V
4	161.435	43.45	Pk	18.7	-30.3	31.85	43.52	-11.67	0-360	100	V
5	399.958	38.5	Pk	22.1	-28.7	31.9	46.02	-14.12	0-360	100	V
1	799.986	36.18	Pk	28	-27.2	36.98	46.02	-9.04	0-360	99	H
6	933.361	33.3	Pk	29.4	-25.8	36.9	46.02	-9.12	0-360	100	V

Pk - Peak detector

SPURIOUS EMISSION 1 GHz TO 18 GHz

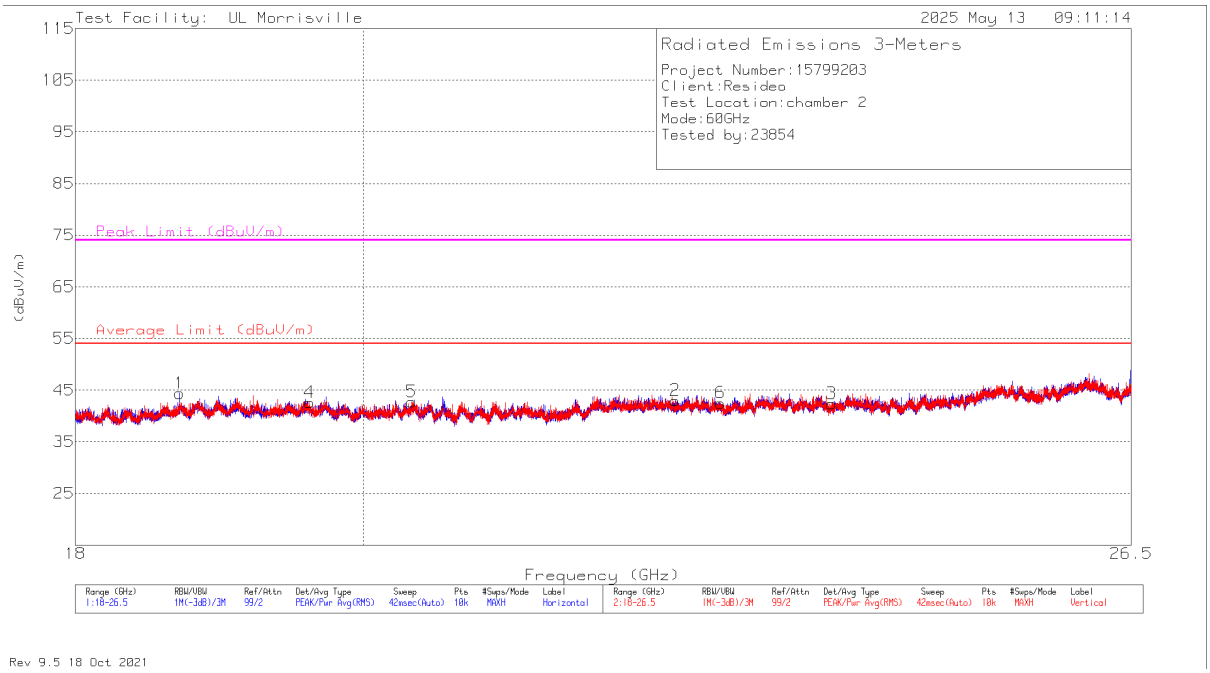


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2995	34.62	Pk	29.4	-23.2	40.82	54	-13.18	74	-33.18	0-360	200	H
2	* 2.2775	37.75	Pk	32.1	-23.2	46.65	54	-7.35	74	-27.35	0-360	200	V
3	* 3.66469	52.03	Pk	33.1	-44.4	40.73	54	-13.27	74	-33.27	0-360	200	H
5	* 11.17329	67.53	Pk	37.8	-39.2	66.13	-	-	74	-7.87	86	168	H
	* 11.17197	35.71	Av	37.8	-39.2	34.31	54	-19.69	-	-	86	168	H
4	* 4.65094	50.94	Pk	34.1	-44.1	40.94	54	-13.06	74	-33.06	0-360	200	V
6	* 11.17289	62.03	Pk	37.8	-39.2	60.63	-	-	74	-13.37	4	101	V
	* 11.17288	42.21	Av	37.8	-39.2	40.81	54	-13.19	-	-	4	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
Av - Average detection

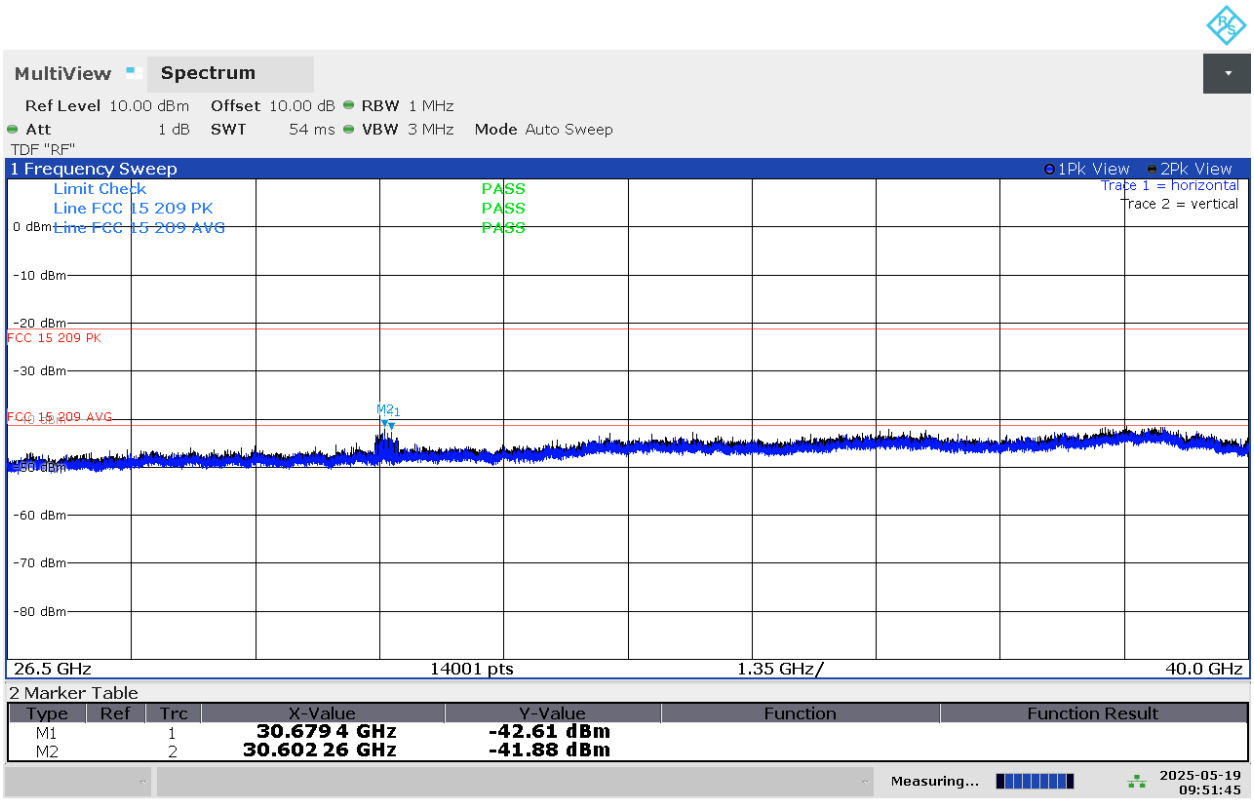
SPURIOUS EMISSIONS 18 GHz TO 26.5 GHz



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	204704 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 18.70033	49.38	Pk	33.1	-38.1	44.38	54	-9.62	74	-29.62	0-360	101	H
2	* 22.42296	46.66	Pk	34.1	-37.8	42.96	54	-11.04	74	-31.04	0-360	299	H
3	* 23.74458	45.29	Pk	34.5	-37.4	42.39	54	-11.61	74	-31.61	0-360	199	H
4	* 19.61144	47.71	Pk	33.2	-38.3	42.61	54	-11.39	74	-31.39	0-360	251	V
5	* 20.36106	46.94	Pk	33.6	-37.8	42.74	54	-11.26	74	-31.26	0-360	299	V
6	* 22.79692	46.02	Pk	34.1	-37.6	42.52	54	-11.48	74	-31.48	0-360	150	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

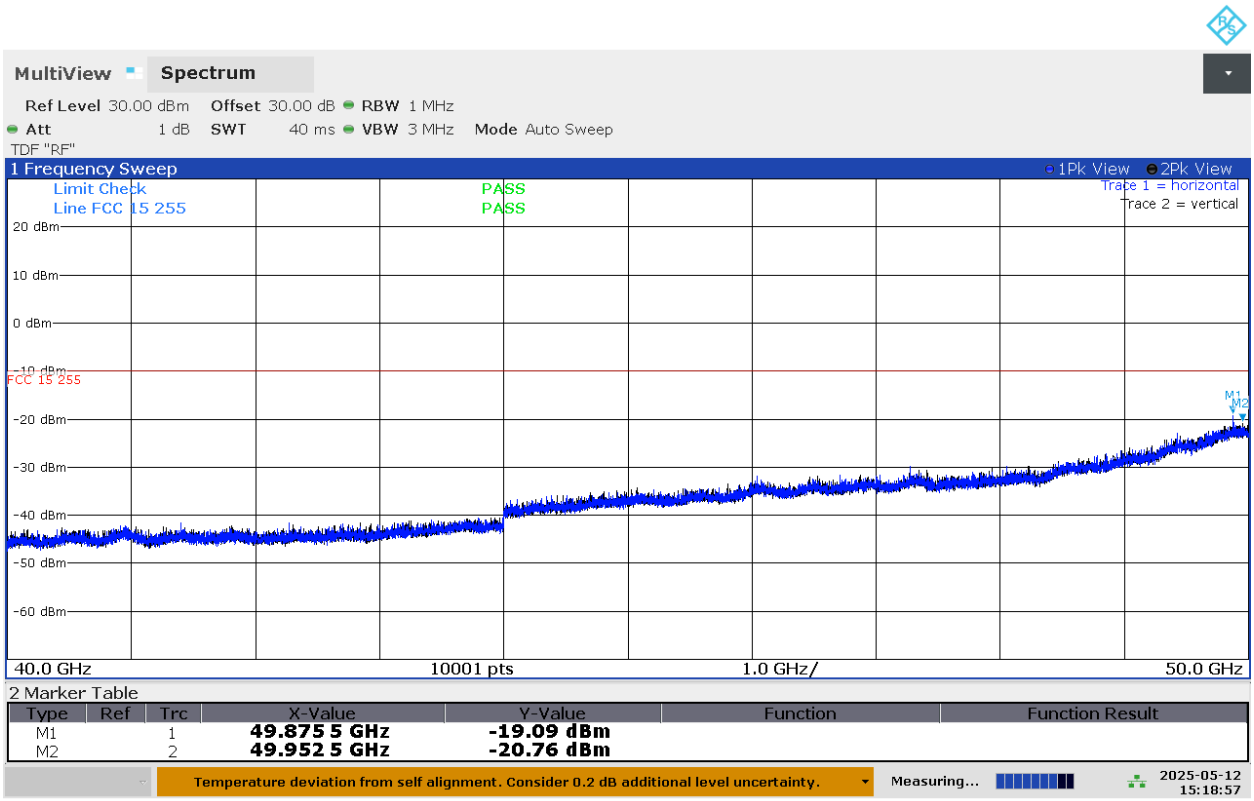
SPURIOUS EMISSIONS 26.5 GHz TO 40 GHz



Marker	Frequency (GHz)	Detector	Sweep Time (s)	Measured Value (dBm)	Limit (dBuV/m)	Limit (dBm)	Margin (dB)
1	30.66640	Pk	201	-43.13	74	-21.25	-21.88
	30.81430	Avg	201	-57.38	54	-41.25	-16.13
2	30.51836	Pk	201	-41.59	74	-21.25	-20.34
	30.81106	Avg	201	-57.38	54	-41.25	-16.13

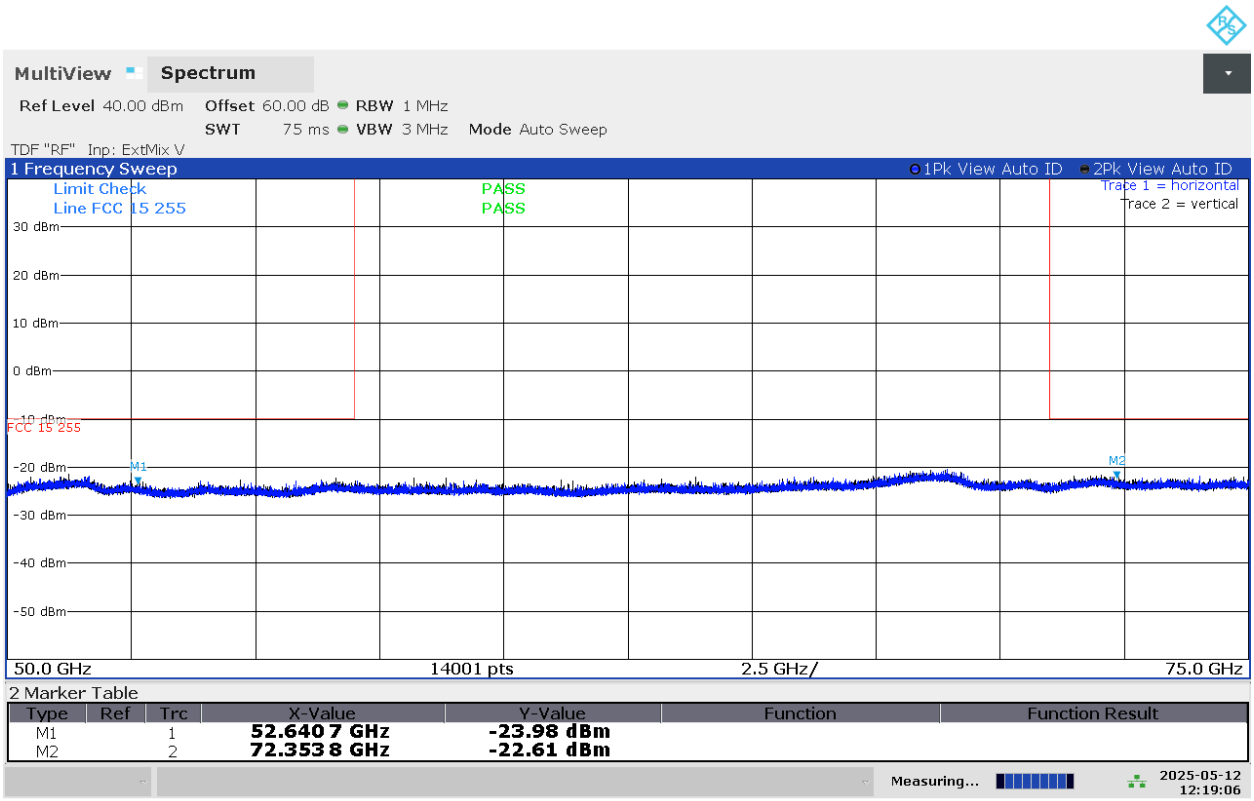
Note: Markers 1 and 2 in this range are treated as subharmonics of the fundamental emission and are therefore measured using the guidance in C63.10 Annex L

SPURIOUS EMISSIONS 40 GHz TO 50 GHz

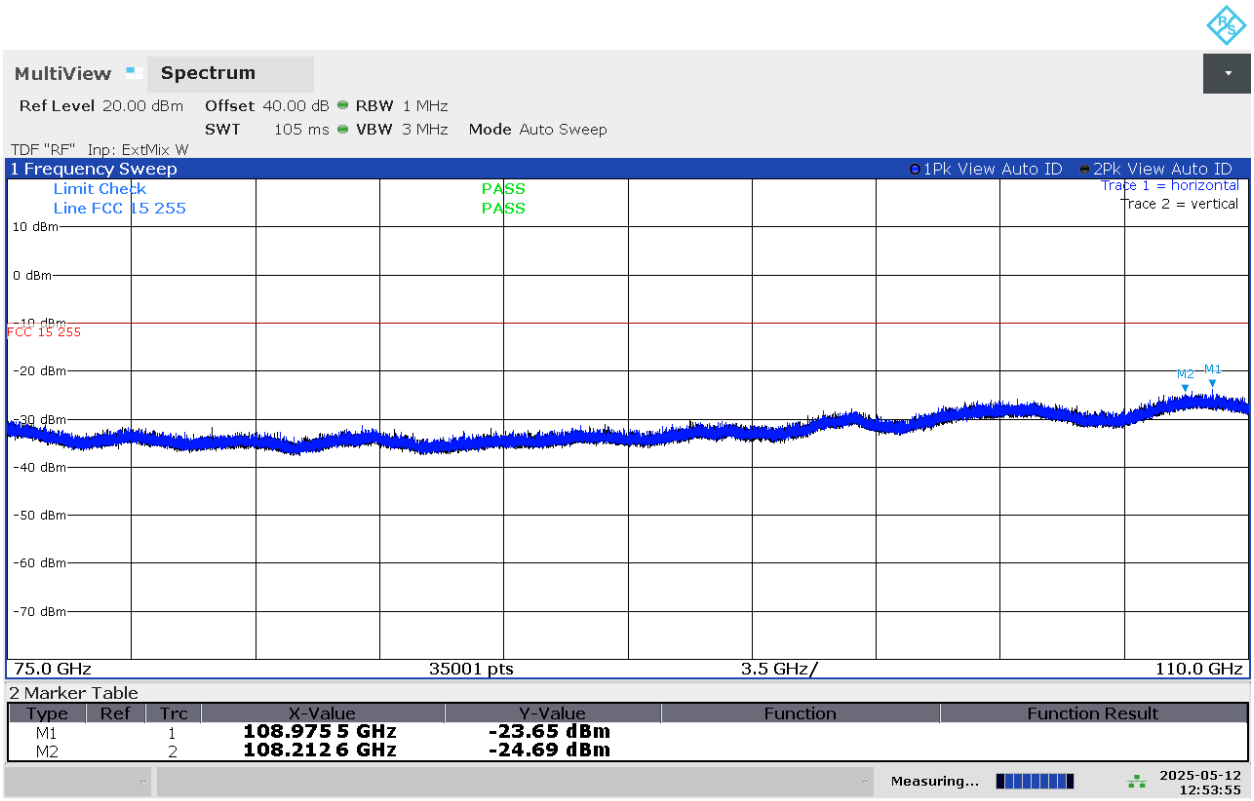


03:18:57 PM 05/12/2025

SPURIOUS EMISSIONS 50 GHz TO 75 GHz

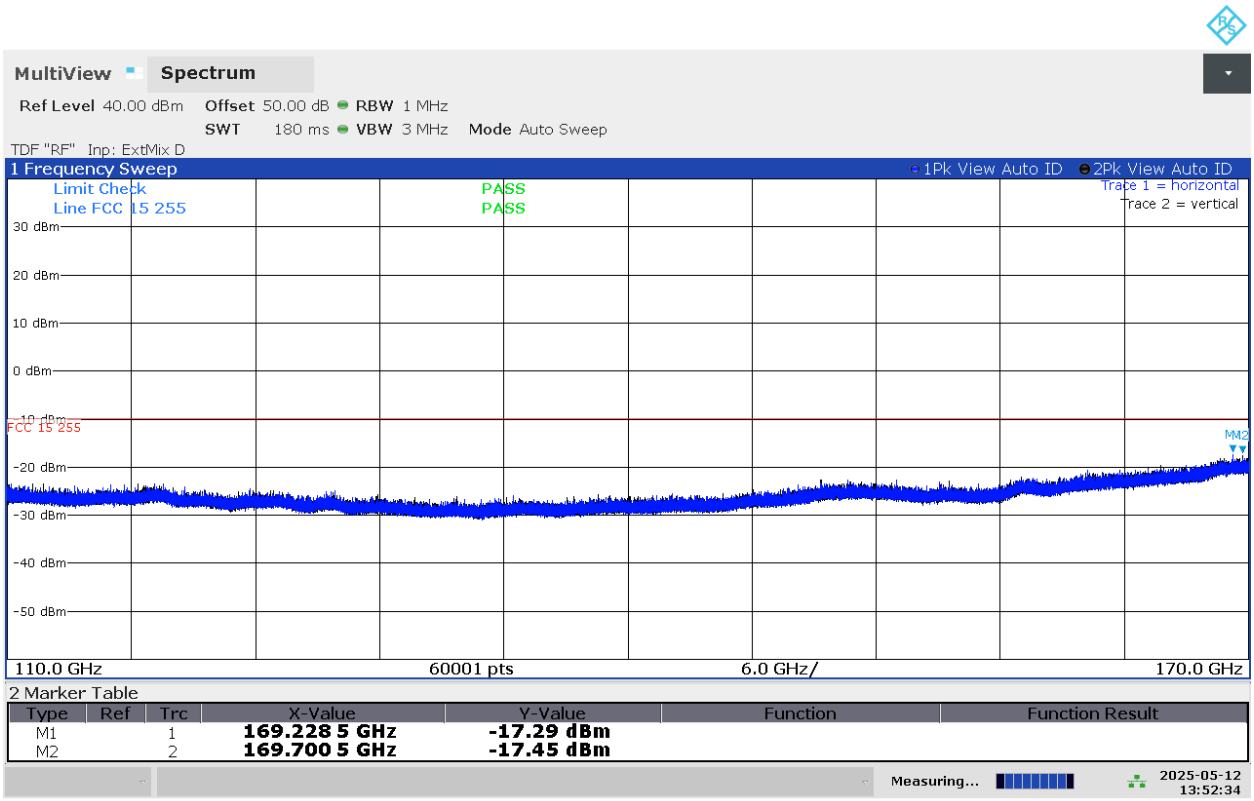


SPURIOUS EMISSIONS 75 GHz TO 110 GHz



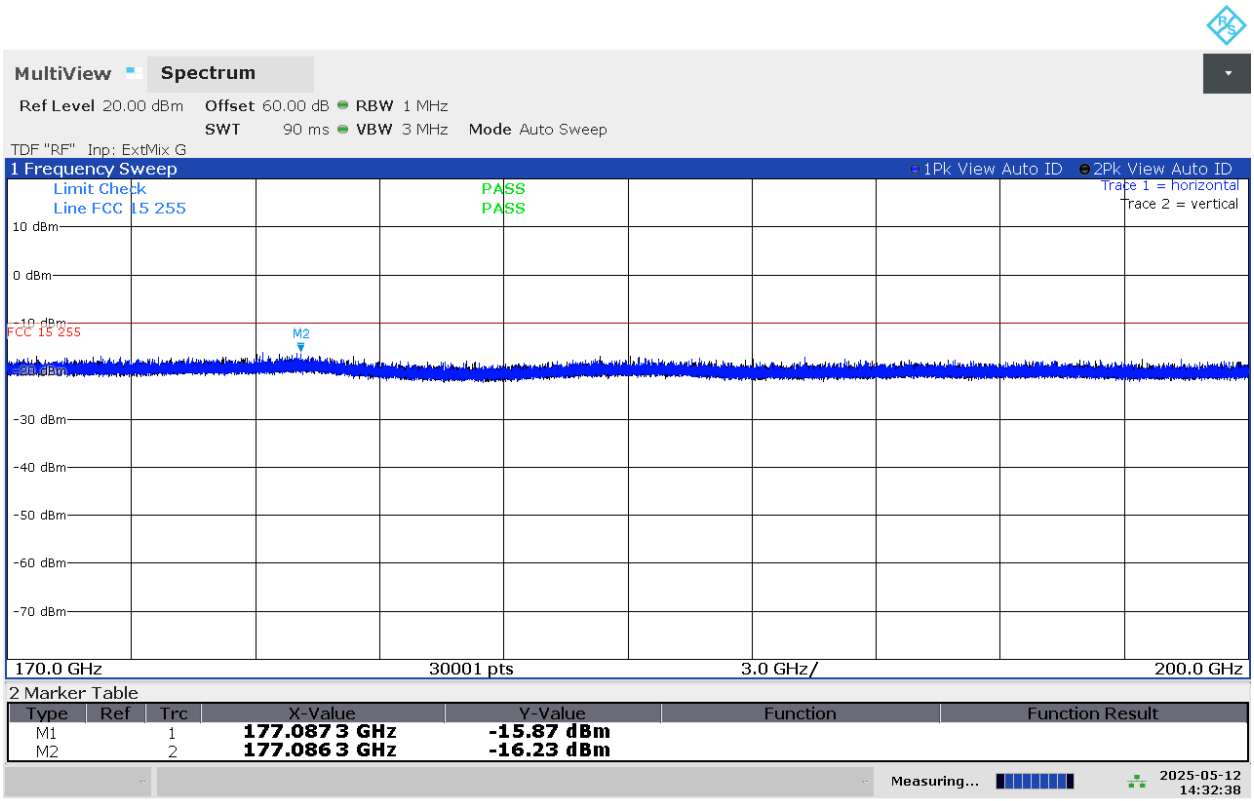
12:53:55 PM 05/12/2025

SPURIOUS EMISSIONS 110 GHz TO 170 GHz



01:52:34 PM 05/12/2025

SPURIOUS EMISSIONS 170 GHz TO 200 GHz



02:32:38 PM 05/12/2025

9.7. RECEIVER SPURIOUS EMISSIONS

REQUIREMENT

The Rx spurious emission limits are the same as the Tx spurious emission limits. All emissions were measured with the transmitters and receivers operating simultaneously. The receiver spurious performance is documented by the transmit spurious results above.

9.8. AC MAINS LINE CONDUCTED EMISSIONS

REQUIREMENT

§15.207
RSS-GEN, Section 7.2

Frequency range	Limits (dBµV)	
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

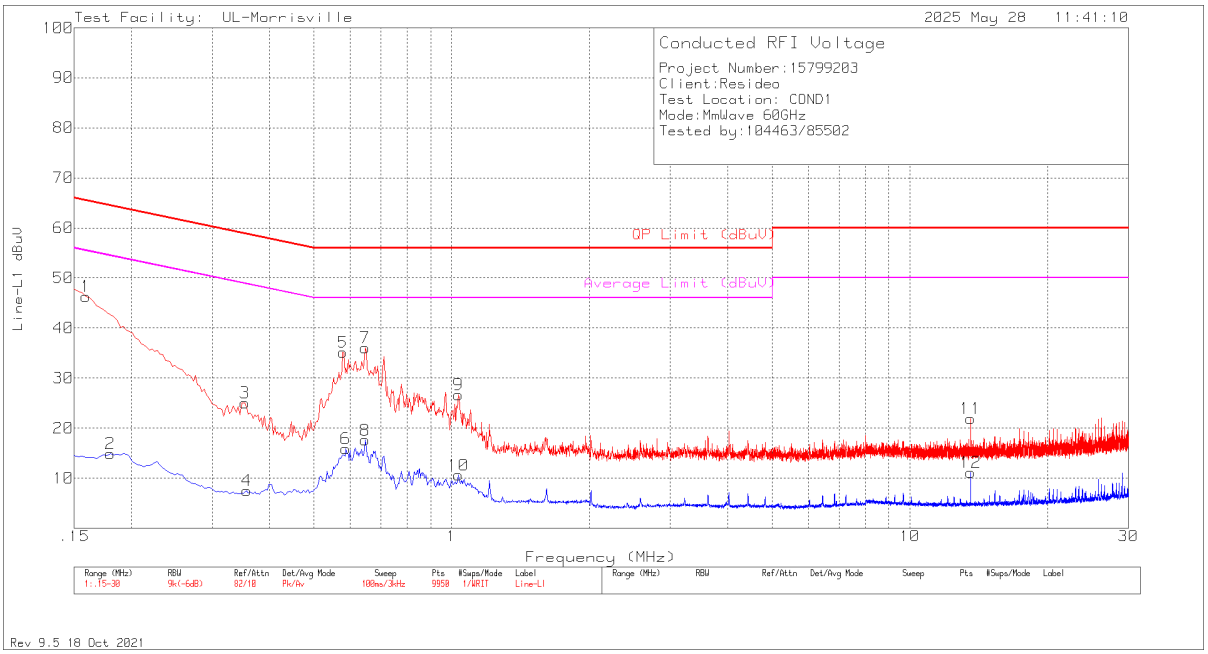
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both lines.

TESTED BY

Employee IDs: 104463/85502
Test Dates: 2025-05-28
Test Location: COND1

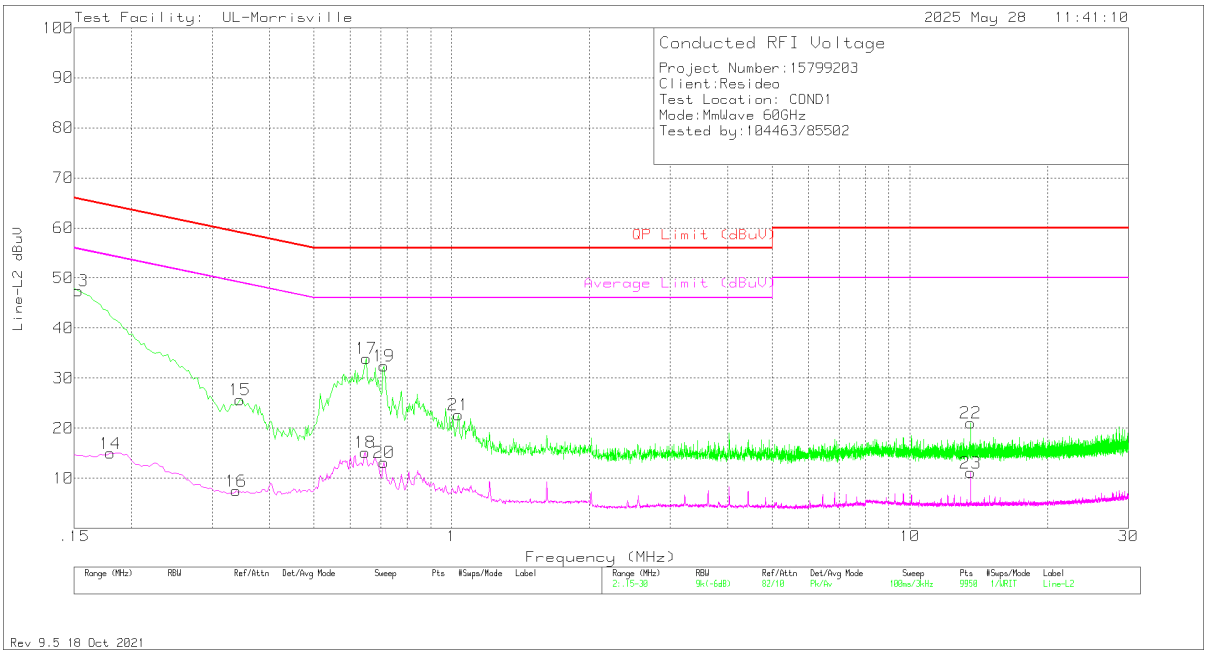
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	**Frequency (MHz)**	**Meter Reading (dBuV)**	**Det**	**LISN VDF (dB)**	**Cbl/Limiter (dB)**	**Corrected Reading dBuV**	**QP Limit (dBuV)**	**Margin (dB)**	**Average Limit (dBuV)**	**Margin (dB)**
1	.159	36.38	Pk	.2	9.7	46.28	65.52	-19.24	-	-
2	.18	4.94	Av	.2	9.7	14.84	-	-	54.49	-39.65
3	.354	15.25	Pk	.1	9.7	25.05	58.87	-33.82	-	-
4	.357	-2.32	Av	.1	9.7	7.48	-	-	48.8	-41.32
5	.579	25.41	Pk	0	9.7	35.11	56	-20.89	-	-
6	.588	6.16	Av	0	9.7	15.86	-	-	46	-30.14
7	.648	26.31	Pk	0	9.7	36.01	56	-19.99	-	-
8	.648	7.88	Av	0	9.7	17.58	-	-	46	-28.42
9	1.035	16.97	Pk	0	9.7	26.67	56	-29.33	-	-
10	1.035	.88	Av	0	9.7	10.58	-	-	46	-35.42
11	13.563	12.05	Pk	.1	9.7	21.85	60	-38.15	-	-
12	13.563	1.38	Av	.1	9.7	11.18	-	-	50	-38.82

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.153	37.58	Pk	.2	9.7	47.48	65.84	-18.36	-	-
14	.18	5.05	Av	.2	9.7	14.95	-	-	54.49	-39.54
16	.339	-2.36	Av	.1	9.7	7.44	-	-	49.23	-41.79
15	.345	15.86	Pk	.1	9.7	25.66	59.08	-33.42	-	-
18	.648	5.42	Av	0	9.7	15.12	-	-	46	-30.88
17	.651	24.24	Pk	0	9.7	33.94	56	-22.06	-	-
19	.711	22.74	Pk	0	9.7	32.44	56	-23.56	-	-
20	.711	3.44	Av	0	9.7	13.14	-	-	46	-32.86
21	1.035	12.93	Pk	0	9.7	22.63	56	-33.37	-	-
22	13.563	11.24	Pk	.1	9.7	21.04	60	-38.96	-	-
23	13.563	1.27	Av	.1	9.7	11.07	-	-	50	-38.93

Pk - Peak detector
Av - Average detection

9.9. FREQUENCY STABILITY

REQUIREMENT

FCC

§15.255 (f)
Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

ISED

RSS-210 Clause J.6
Fundamental emissions shall be contained within the frequency bands specified in this annex during all conditions of operation when tested at the temperature and voltage variations specified for the frequency stability measurement in RSS-Gen.

TEST PROCEDURE

ANSI C63.10-2020 Clause 9.5
The radio module is placed in an environmental chamber, with power furnished by an adjustable source. The carrier frequency is counted at each condition and compared with the reference condition.

RESULTS

Temperature (°C)	Input Voltage (Vac)	99% OBW Upper Frequency (GHz) @ 0 Minutes	99% OBW Lower Frequency (GHz) @ 0 Minutes	99% OBW Upper Frequency (GHz) @ 2 Minutes	99% OBW Lower Frequency (GHz) @ 2 Minutes	99% OBW Upper Frequency (GHz) @ 5 Minutes	99% OBW Lower Frequency (GHz) @ 5 Minutes	99% OBW Upper Frequency (GHz) @ 10 Minutes	99% OBW Lower Frequency (GHz) @ 10 Minutes	Upper Frequency Limit (GHz)	Lower Frequency limit (GHz)
-20	120	61.002627	61.496898	61.002878	61.496803	61.002686	61.496803	61.002867	61.496785	61.0	61.5
-10	120	61.002799	61.496803	61.002626	61.496815	61.002787	61.496805	61.002679	61.496869	61.0	61.5
0	120	61.002362	61.496845	61.002504	61.496887	61.002983	61.496695	61.002677	61.496799	61.0	61.5
10	120	61.002570	61.495489	61.002444	61.496524	61.002573	61.496321	61.002734	61.496613	61.0	61.5
20	120	61.002179	61.496203	-	-	-	-	-	-	61.0	61.5
20	102	61.001905	61.496238	-	-	-	-	-	-	61.0	61.5
20	138	61.002051	61.496330	-	-	-	-	-	-	61.0	61.5
30	120	61.002481	61.496368	61.002270	61.496607	61.002139	61.496388	61.002003	61.496488	61.0	61.5
40	120	61.002089	61.496388	61.001930	61.496205	61.002102	61.496345	61.001882	61.496429	61.0	61.5
50	120	61.002036	61.496319	61.002064	61.496300	61.001503	61.496338	61.001985	61.496306	61.0	61.5

TESTED BY

Employee IDs: 23854
Test Dates: 2025-05-14
Test Location: Conducted 1

9.10. GROUP INSTALLATION

REQUIREMENT

FCC

§15.255 (h)

Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

ISED

RSS-210 Clause J.7

Any transmitter that is certified under this annex may be mounted in a group installation for simultaneous operation with one or more certified transmitters, without any additional equipment authorization. However, no transmitter operating under the provisions of this annex shall be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

RESULTS

The EUT does not have any external phase locking inputs for beam forming.

UL LLC
12 Laboratory Dr., RTP, NC 27709 TEL: (919) 549-1400

10. SETUP PHOTOS

Please refer to report R15799203-EP1 for setup photos.

END OF TEST REPORT