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

TEST REPORT

FOR

57-71 GHz WIRELESS TRANSMITTER

MODEL NUMBERS: C420 / P421 / D621 / P621

FCC ID: 2AMP5-46211
IC: 22992-46211

REPORT NUMBER: R15397752-E1b

ISSUE DATE: 2024-10-30

Prepared for
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ACCREDITED
CERT #0751.06

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2024-10-11	Initial Issue	Mike Antola
V2	2024-10-30	Misc. editorial updates	Mike Antola

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. DECISION RULES AND MEASUREMENT UNCERTAINTY 6

4.1. METROLOGICAL TRACEABILITY 6

4.2. DECISION RULES 6

4.3. MEASUREMENT UNCERTAINTY 6

4.4. SAMPLE CALCULATION 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. OUTPUT POWER 7

5.3. MANUFACTURER'S DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. SOFTWARE AND FIRMWARE 7

5.5. WORST-CASE CONFIGURATION AND MODE 7

6. DESCRIPTION OF TEST SETUP 8

7. TEST AND MEASUREMENT EQUIPMENT 12

8. SUMMARY TABLE 16

9. APPLICABLE LIMITS AND TEST RESULTS 17

9.1. FAR-FIELD DISTANCE AND MEASUREMENT DISTANCE 17

9.2. 6 dB / 99% BANDWIDTHS 18

9.3. RADIATED POWER 24

9.4. CONDUCTED OUTPUT POWER 27

9.5. SPURIOUS EMISSIONS 29

9.6. AC MAINS LINE CONDUCTED EMISSIONS 54

9.7. FREQUENCY STABILITY 57

9.8. GROUP INSTALLATION 59

10. SETUP PHOTOS 60

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Altowav Inc
7801 E. Bush Lake Rd., Suite 300
Minneapolis, MN, 55439, USA

EUT DESCRIPTION: 57-71 GHz Wireless Transmitter

MODEL: D621 / C420 / P421 / P621

SERIAL NUMBER: KB-C0-00-DA / KB-C0-01-02

SAMPLE RECEIPT DATE: 2024-08-20

DATES TESTED: 2024-08-23 to 2024-10-02

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

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
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Mike Antola
Staff 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 Subpart C, 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.

Customer provided data includes:

1.) Antenna Gain (See section 5.3)

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}
Conducted Disturbance, 0.15 to 30 MHz	3.4
Radiated Emissions, 9 kHz - 30 MHz	2.9
Radiated Emissions, 30-1000 MHz	6.0
Radiated Emissions, 1-18 GHz	4.7
Radiated Emissions, 18-26 GHz	4.5
Radiated Emissions, 26-40 GHz	5.3
Radiated Emissions, 40-200 GHz	2.9

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 60 GHz data communications radio. The models covered in this test report are C420, P421, D621, P621. Model differences are discussed in Section 5.5 and only the worst-case model was tested.

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 Peak Conducted Output Power.

The highest peak output radiated power is 41.26 dBm (13.37 W) EIRP.

5.3. MANUFACTURER'S DESCRIPTION OF AVAILABLE ANTENNA

A single antenna array model has a maximum antenna gain of 21.36 dBi. The models included as part of this evaluation utilize a two antenna array configuration having equal gain. Thus, the total maximum antenna gain is 24.36 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was version 10.11.0.108.

The test utility software used during testing was QRCT, Version 4.0.211.0.

5.5. WORST-CASE CONFIGURATION AND MODE

All models utilize two antenna tile configuration. The only difference between models is the use of a different processor (i.e., non-RF related circuitry). Preliminary measurements were made it was determined that model D621 yielded worst-case results. As such, full testing was performed on model D621 only.

For in-band tests, each model was tested at all four supported channels. For spurious emissions in the frequency range of 40 – 110 GHz, testing was performed at the low, mid and high channels. For all other spurious emissions frequency ranges, testing was performed on the worst-case channel only (mid, Channel 2).

6. DESCRIPTION OF TEST SETUP

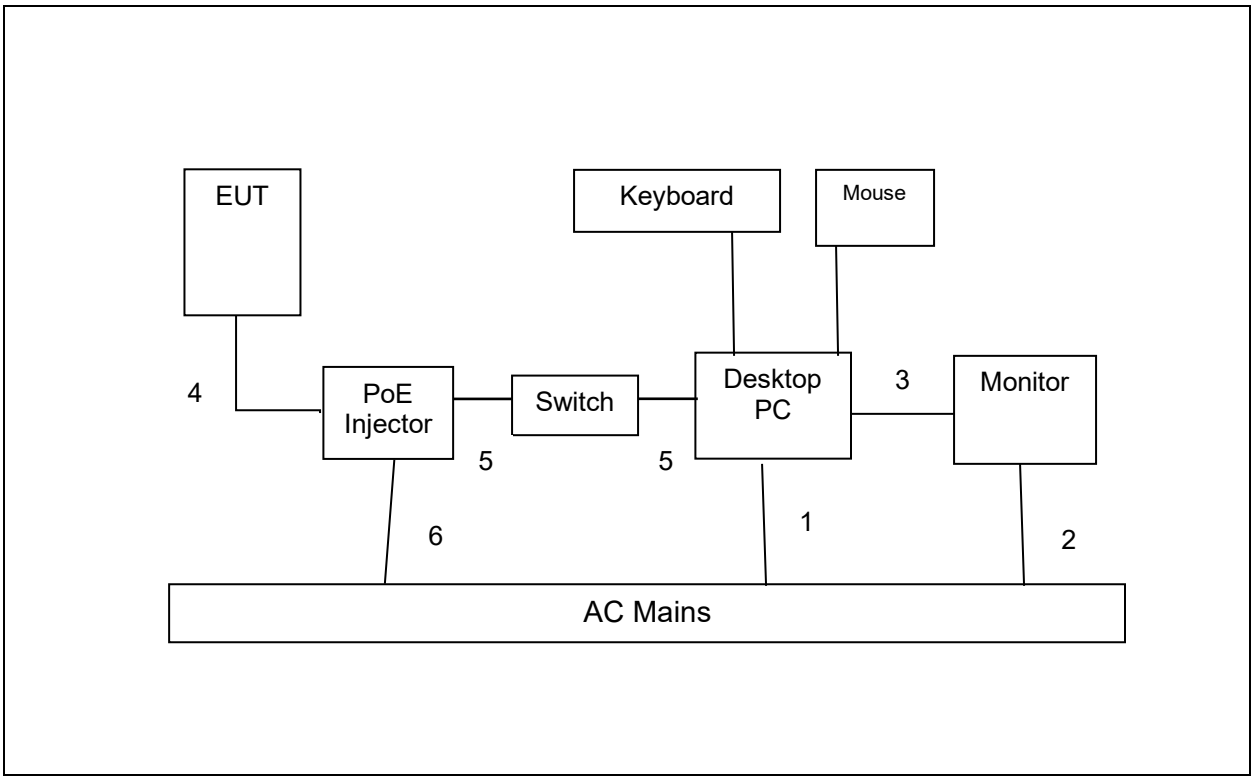
SUPPORT EQUIPMENT

Support Equipment List			
Description	**Manufacturer**	**Model**	**Serial Number**
Desktop computer	Dell	D07S	12XG942
Monitor	Viewsonic	VS15562	WAV2403G3834
Keyboard	Microsoft	1031	7619804016525
Mouse	Dell	MS111-P	-
Ethernet switch	SSCEE	IG204	IG2042403096031
POE for D621	Procet	AA01040	PT2411020850
POE for C420	Procet	EN30GT	PT2411020857

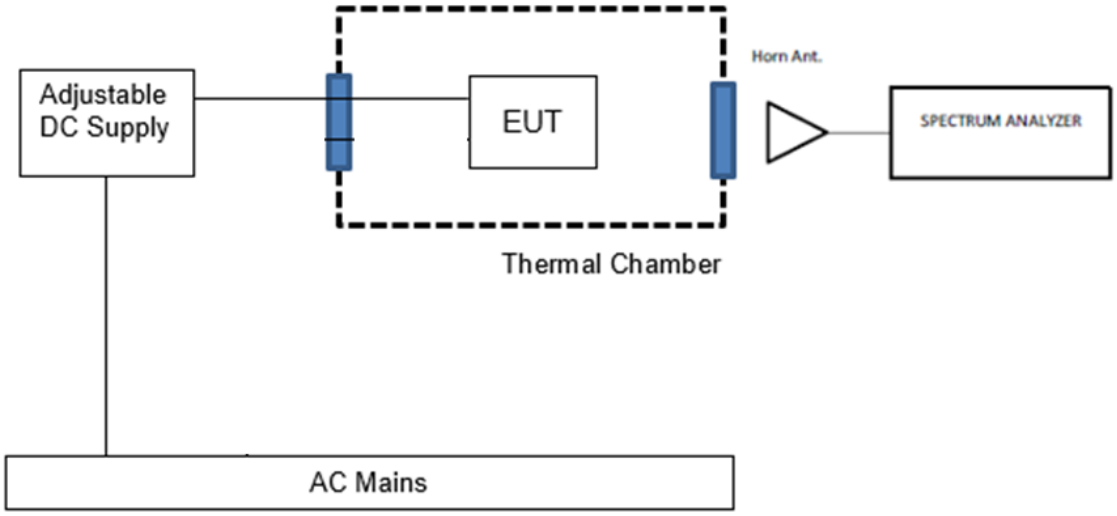
I/O CABLES

I/O Cable List					
Cable No	**Port**	**# of Identical Ports**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Power	1	IEC	< 3	Power for desktop computer
2	Power	1	IEC	< 3	Power for monitor
3	Video	1	VGA	< 3	Video cable for desktop to monitor
4	Ethernet	1	RJ45	> 3	Ethernet from PoE to EUT
5	Ethernet	1	RJ45	> 3	Ethernet from Desktop to PoE
6	Power	1	IEC	< 3	Power for PoE

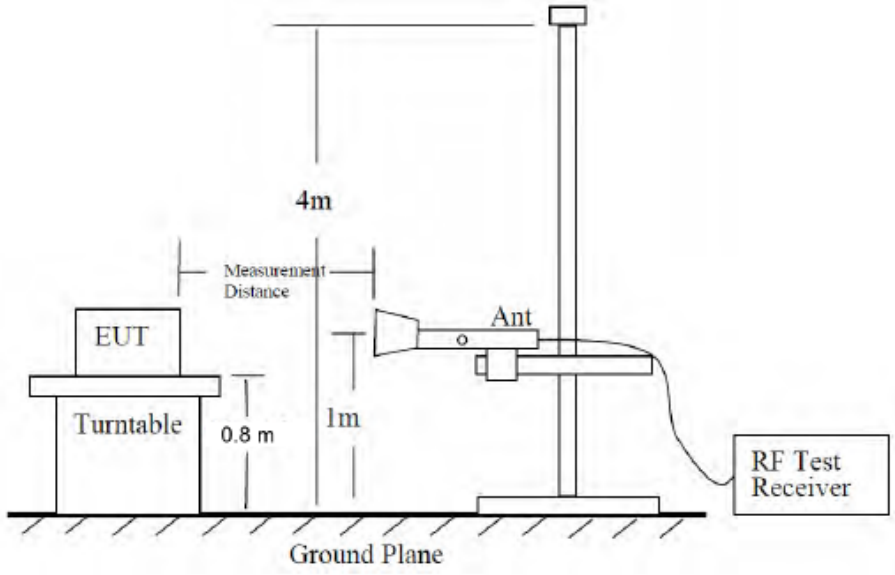
TEST SETUP



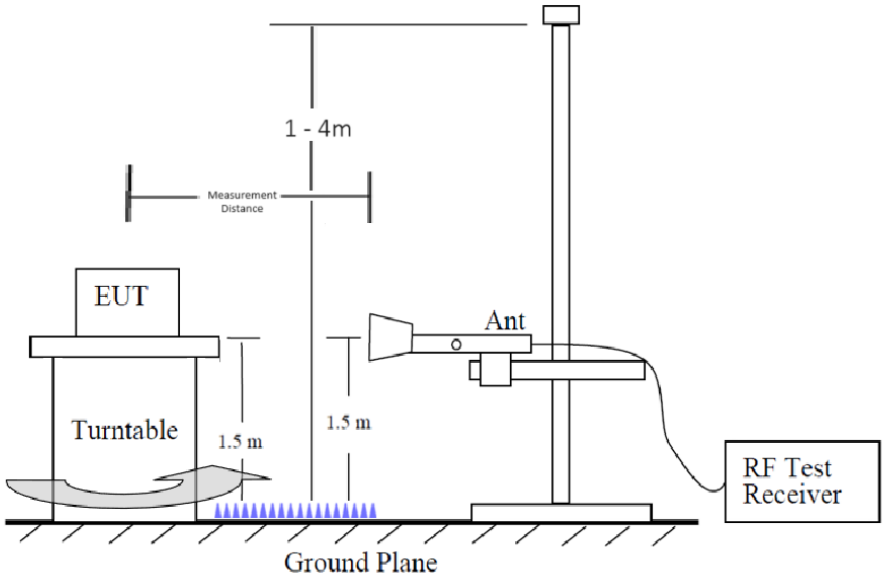
SETUP DIAGRAM FOR TESTS



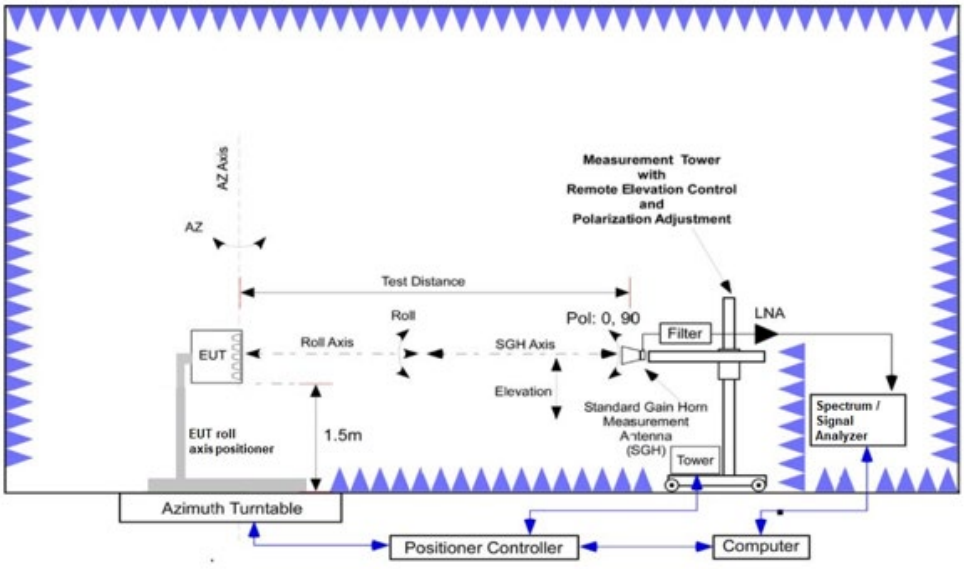
Frequency Stability



Radiated Emissions – Below 1GHz



Radiated Emissions – 1-18GHz



Radiated Emissions – Above 18GHz

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 4)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-01-24	2025-01-24
	1-18 GHz				
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
	Gain-Loss Chains				
207638	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-22	2025-05-22
207640	Gain-loss string: 1-18GHz	Various	Various	2024-05-22	2025-05-22
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-04-16	2025-04-16
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241204	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	30-1000 MHz				
90629	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-30	2026-01-30
	Gain-Loss Chains				
91976	Gain-loss string: 25-1000MHz	Various	Various	2024-05-08	2025-05-08
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-03-05	2025-03-05
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

Test Equipment Used - Line-Conducted Emissions / Frequency Stability (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2024-04-04	2025-04-04
179892	Environmental Meter	Fisher Scientific	15-077-963	2024-08-12	2025-08-12
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2024-08-01	2025-08-01
70374	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2024-07-30	2025-07-30
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2024-04-04	2025-04-04
PS214	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
91432	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	NA	NA
207726	Temp/Humid Chamber	Thermotron	SM-32-8200	2024-01-12	2025-01-12
206203	Standard Gain Horn, 50-75GHz	Custom Microwave Inc.	HO15R	2024-02-14	2025-02-28
206607	WR15 Downconverter	VDI	WR15.0SAX-F	2024-04-16	2025-04-30
206459	Spectrum Analyzer	Rohde & Schwarz	FSW50	2023-11-15	2024-11-15

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

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	18-40 GHz				
204907	Horn Antenna, 18-26.5GHz	Com Power	AH-826	2024-02-14	2025-02-28
204908	Horn Antenna, 26.5-40GHz	Com Power	AH-640	2024-02-14	2025-02-28
240019	18-40GHz Amplifier	Amplical	AMP18G40-50	2024-03-05	2025-03-31
	40-50 GHz				
206209	Standard Gain Horn, 40-50GHz	Custom Microwave Inc.	HO22R	2024-02-14	2025-02-28
205910	Low Noise Amplifier	Eravant	SBL-3335033040-2222-E1	2024-03-14	2025-03-31
207949	Band Pass Filter	Eravant	SWF-4510460-2F2F-B1	2024-03-14	2025-03-31
	50-75 GHz				
206203	Standard Gain Horn, 50-75GHz	Custom Microwave Inc.	HO15R	2024-02-14	2025-02-28
206607	WR15 Downconverter	VDI	WR15.0SAX-F	2024-04-16	2025-04-30
253266	Band Pass Filter	Eravant	SWF-53304330-15-B1	2024-10-01	2025-10-01
	75-110 GHz				
206222	Standard Gain Horn, 75-110GHz	Custom Microwave Inc.	HO10R	2024-02-14	2025-02-28
207249	WR10 Downconverter	VDI	WR10.0SAX-F	2024-04-16	2025-04-30
205913	Low Noise Amplifier	Eravant	SBL-7531142050-1010-E1	2024-04-03	2025-04-30
	110-170 GHz				
206242	Standard Gain Horn, 110-170GHz	Custom Microwave Inc.	HO6R	2024-02-14	2025-02-28
206555	WR6.5 Downconverter	VDI	WR6.5SAX-F	2024-04-16	2025-04-30
205912	Low Noise Amplifier	Eravant	SBL-1141741860-0606-E1	2024-04-18	2025-04-30
	170-260 GHz				
206244	Standard Gain Horn, 170-260GHz	Custom Microwave Inc.	HO4R	2024-02-14	2025-02-28
206556	WR4.3 Downconverter	VDI	WR4.3SAX-F	2024-04-16	2025-04-30
	Receiver & Software				
206459	Spectrum Analyzer	Rohde & Schwarz	FSW50	2023-11-15	2024-11-15
mmWave	mmWave Software	UL	V2022.7.29		
	Additional Equipment used				

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
207161	Signal Generator	Rohde and Schwarz	SMA100B	2024-07-11	2025-07-11
226395	Thermal Power Sensor	Rohde and Schwarz	NRP75WG	2024-01-09	2025-01-09
206568	Isolator, 50-75GHz	Mi-Wave	115V/385	NA	NA
206569	Diode Detector, 50-75GHz	Mi-Wave	950V/385	NA	NA
239539	Environmental Meter	Fisher Scientific	15-077-963	2023-07-19	2025-07-19
208201	350 MHz High-Definition Oscilloscope	Teledyne Lecroy	HDO6034A	2023-12-21	2024-12-21
211004	200 MHz Low-Noise Voltage Amplifier	Femto	HVA-200M-40-B	NA	NA
211009	Signal Generator Extension Module, WR15 (50-75GHz)	VDI	WR15SGX	NA	NA

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	Compliant
15.255 (c) (1) (i)	RSS-210 J.3.3 a)	EIRP (non-FDS/Radar)	43 dBm (Peak) 40 dBm (Average)	Compliant
15.255 (e)	RSS-210 J.4 (b), J.4 (a)	Conducted Power (non-FDS/Radar)	500 mW (Peak)	Compliant
15.255 (d)	RSS-210 J.4, J.5	Spurious Emissions < 40GHz	FCC 15.209 RSS-Gen	Compliant
15.255 (d)	RSS-210 J.4, J.5	Spurious Emissions 40 – 200GHz	90 pW/cm^2	Compliant
15.255 (f)	RSS-210 J.6	Frequency Stability	Within Band	Compliant
15.255 (h)	RSS-210 J.7	Group installation	No Beam Forming / Phase Locking	Compliant

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)	Far Field Distance (m)	Measurement Distance Used (m)
18-26.5	0.0113	2.11	3
26.5-40	0.0075	1.65	3
40-50	0.0060	1.01	3
50-75	0.0040	0.66	3
75-110	0.0027	0.44	3
110-170	0.0018	0.29	3
170-200	0.0015	0.15	3

Radiated spurious emissions limits above 18 GHz are based on a 3-meter measurement distance. As such, testing from 18-200GHz 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 facing the RX antenna, which was polarized vertically. Refer to test setup photos exhibit for details.

9.2. 6 dB / 99% BANDWIDTHS

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).

§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 C63.10-2020, Clause 9 for details.

TESTED BY

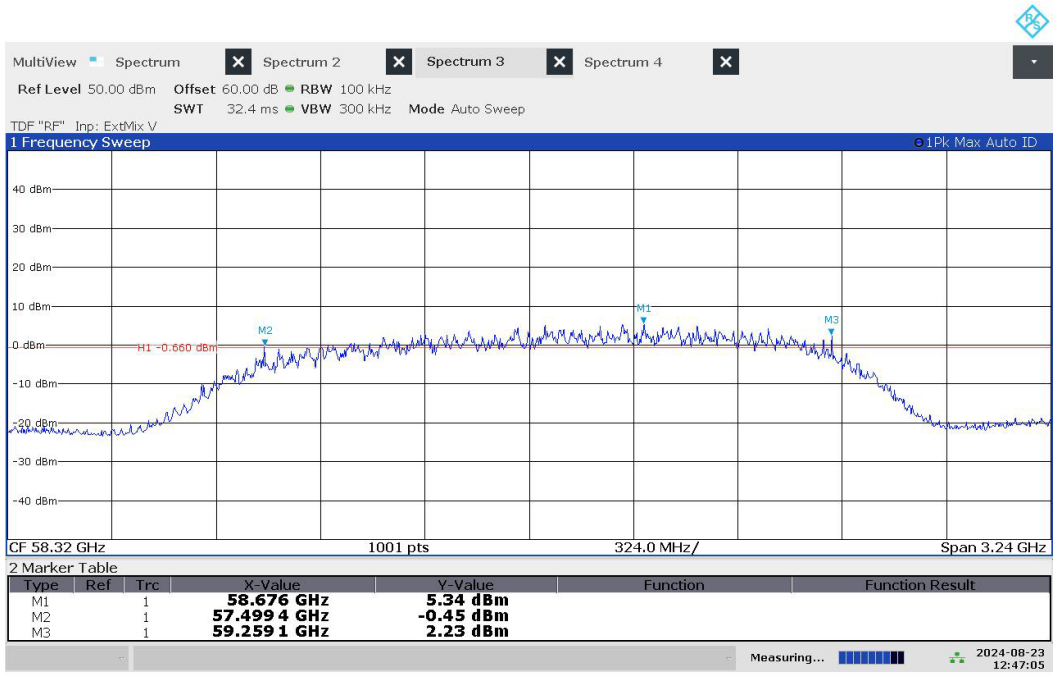
Employee IDs: 23854
Test Dates: 2024-08-27
Test Location: Chamber 3

RESULTS

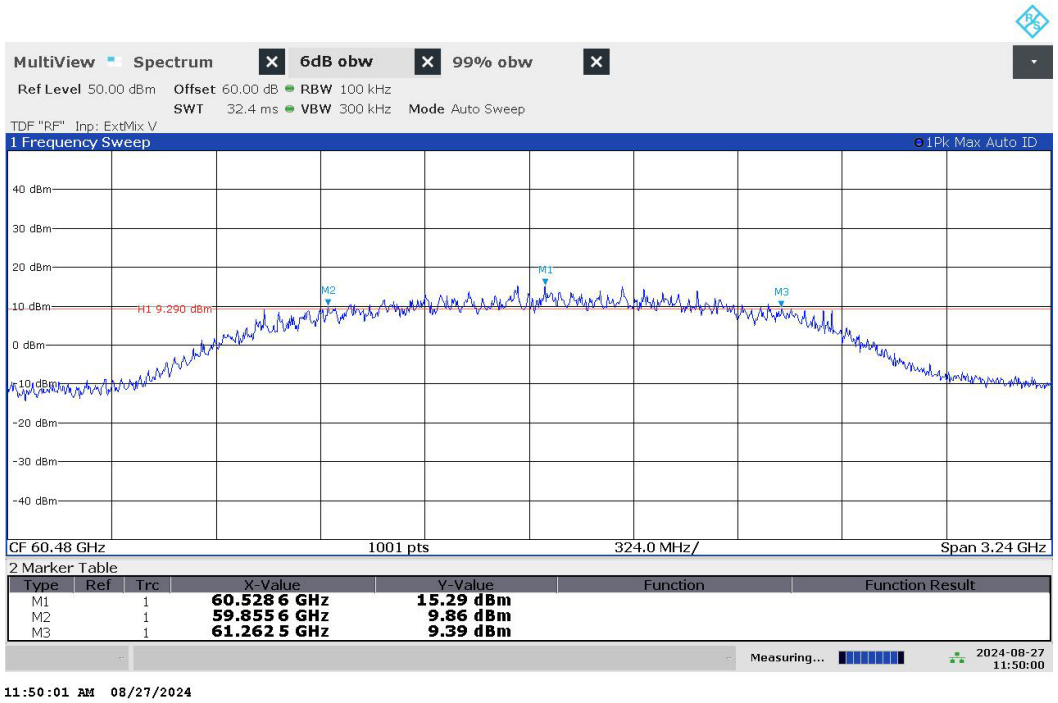
Model	Channel	Frequency (GHz)	Marker M3 (GHz)	Marker M2 (GHz)	6 dB Bandwidth (GHz)
D621	1	58.32	59.259	57.499	1.760
	2	60.48	61.263	59.856	1.407
	3	62.64	63.382	61.818	1.564
	4	64.80	65.540	63.895	1.645

Model	Channel	Frequency (GHz)	99% Bandwidth (GHz)
D621	1	58.32	2.078
	2	60.48	2.274
	3	62.64	2.324
	4	64.80	2.527

6 dB BANDWIDTH



Channel 1



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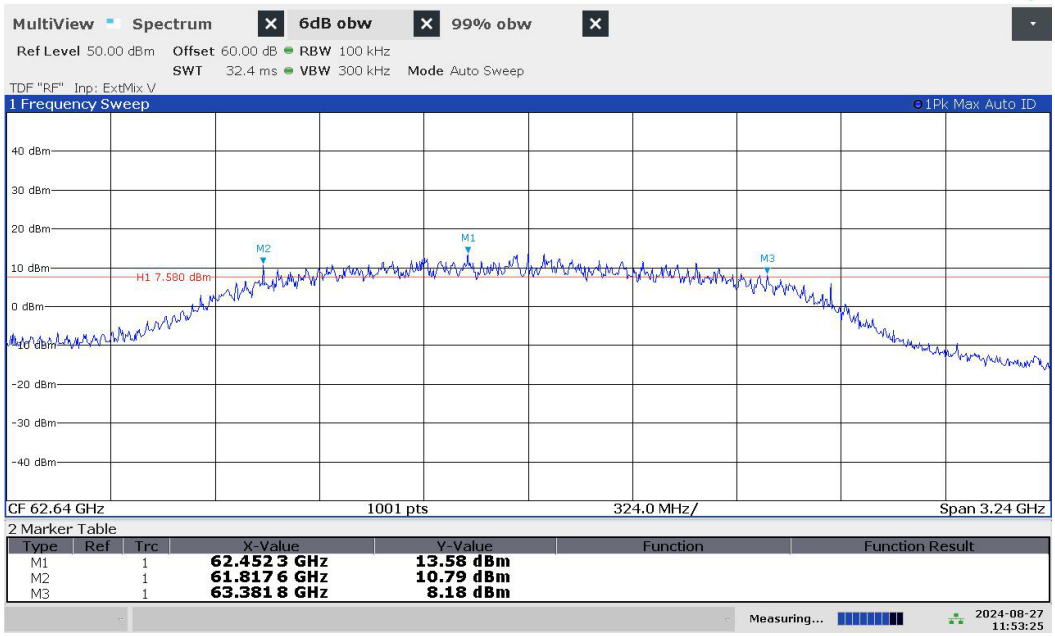

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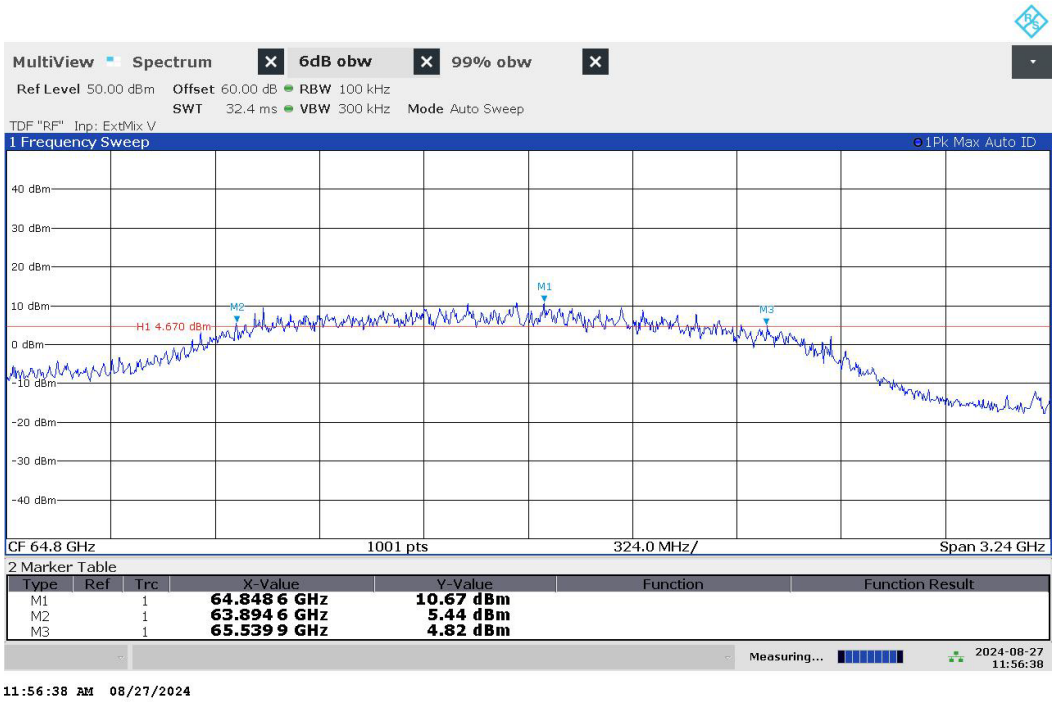
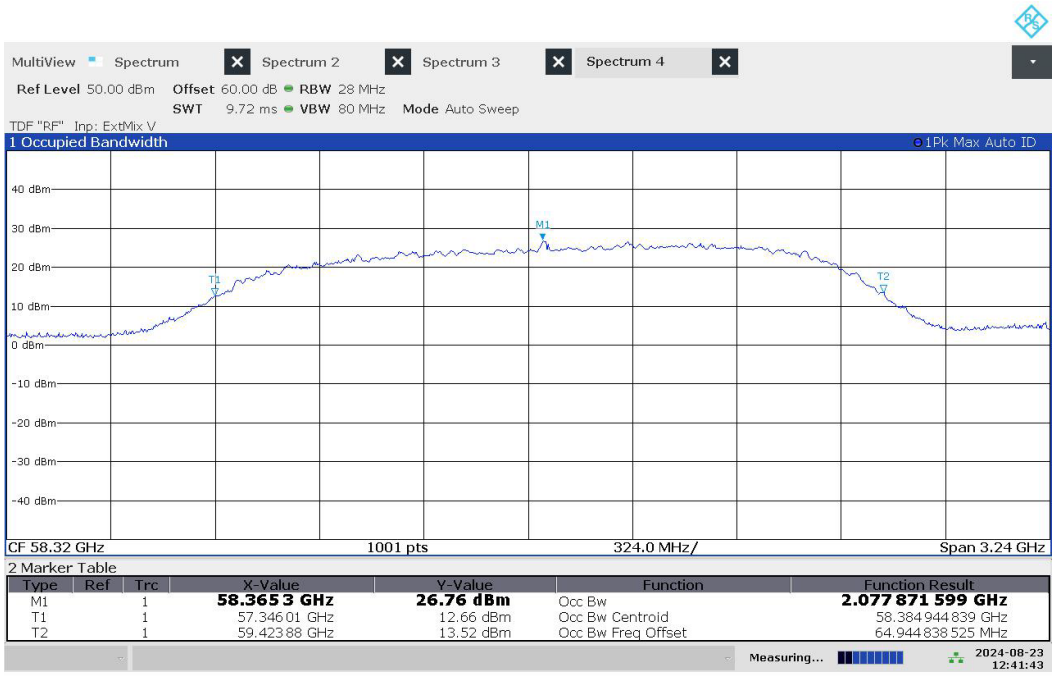
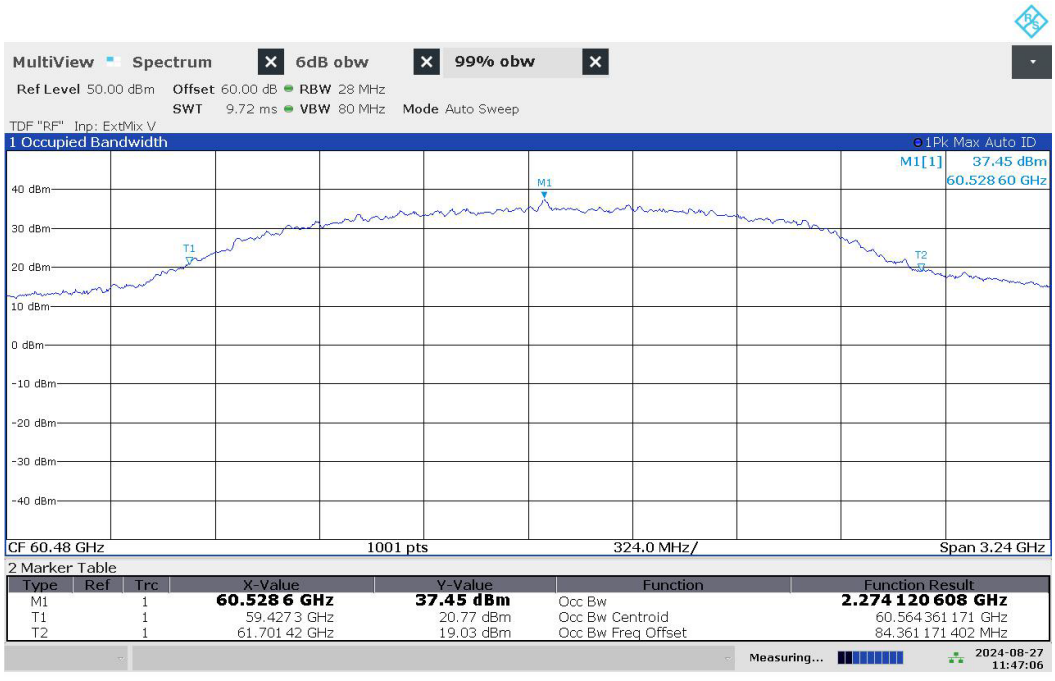


Channel 4

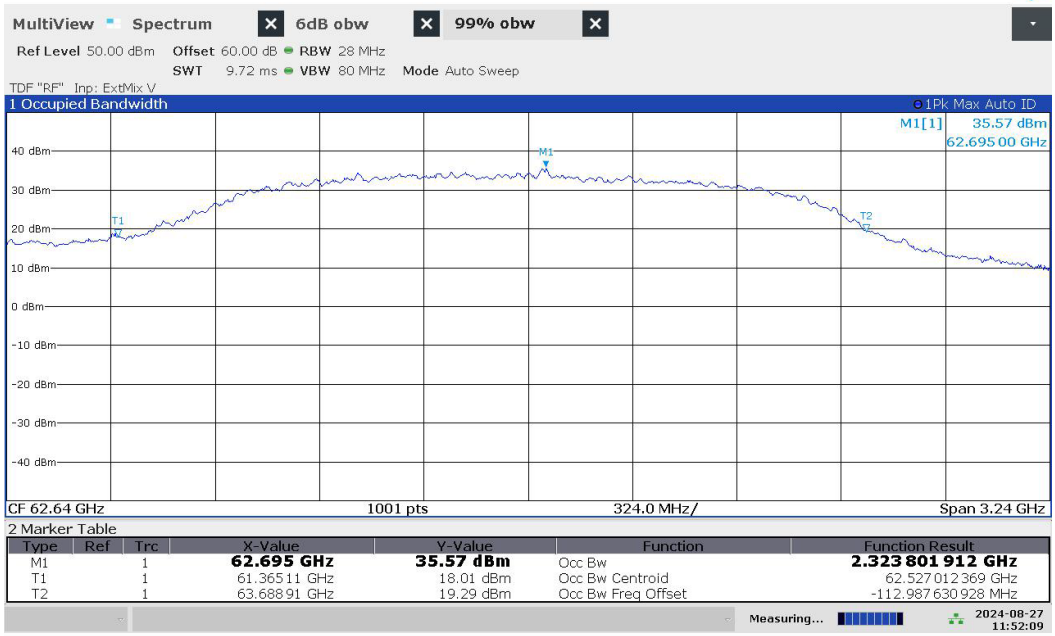
99% BANDWIDTH



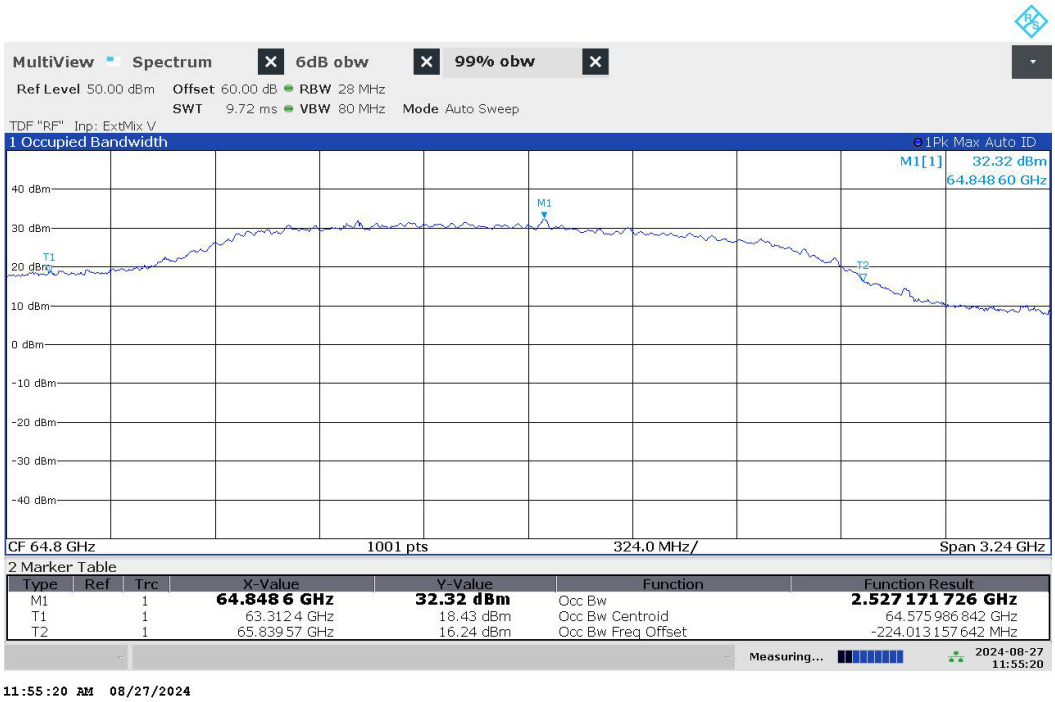
Channel 1



Channel 2



Channel 3



Channel 4

9.3. RADIATED POWER

REQUIREMENT

FCC

§15.255 (c)

Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(1) Devices other than field disturbance sensors shall comply with one of the following power limits, as measured during the transmit interval:

(i) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

ISED

RSS-210 Clause J.3.3

Following are the conditions for devices other than FDS:

a) Except when J.3.3(b) applies, the average e.i.r.p. of any emission shall not exceed 40 dBm and the peak e.i.r.p. of any emission shall not exceed 43 dBm.

b) For fixed point-to-point equipment located outdoors:

(i) The average e.i.r.p. of any emission shall not exceed 82 dBm minus 2 dB for every dB the antenna gain is less than 51 dBi. The peak e.i.r.p. of any emission shall not exceed 85 dBm minus 2 dB for every dB the antenna gain is less than 51 dBi.

(ii) The provisions for reducing the transmit power based on the antenna gain, as per J.3.3(b)(i), shall not require that the power levels be reduced below the limits specified in J.3.3(a).

(iii) Compliance testing shall be performed using the highest gain and the lowest gain antennas with which the equipment is certified. Further, this equipment shall not be marketed and operated with antennas other than those listed in the certification application with which the equipment is certified.

TEST PROCEDURE

ANSI C63.10-2020 Clause 9.9

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

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

The single antenna array configuration has dimensions of 25mm x 18mm. The two antenna array configuration measures 50mm x 18mm. Far-field boundary was calculated using the largest antenna dimension (50mm) and highest operating frequency (64.8GHz) as the worst-case.

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
64.8	0.050	0.0046	1.08

All measurements were made at a 3-meter distance, thus ensuring the far-field boundary was maintained.

RESULTS

Model	Frequency (GHz)	Meas Distance (m)	DSO Value (mV)	Detector (Pk/Av)	Substitution Power (dBm)	Gain/Loss (dB)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
D621	58.32	3	56.5	Pk	-15.54	54.99	39.45	43	-3.55
	58.32	3	41.32	Av	-16.95	54.99	38.04	40	-1.96
	60.48	3	82.9	Pk	-13.85	55.11	***41.26***	43	-1.74
	60.48	3	62.25	Av	-15.21	55.11	39.90	40	-0.10
	62.64	3	66.3	Pk	-14.17	55.37	41.20	43	-1.80
	62.64	3	45.83	Av	-15.82	55.37	39.55	40	-0.45
	64.80	3	38	Pk	-16.02	55.50	39.48	43	-3.52
	64.80	3	24.53	Av	-18.34	55.50	37.16	40	-2.84

Where:

DSO Value = Value measured from the EUT on the oscilloscope via connection using an RF detector

Substitution Power = Power value recorded that matched the DSO value when EUT is replaced with a mmWave source

Gain/Loss = Total measurement system path loss (i.e., Free-space path loss + Waveguide loss - Rx antenna gain)

EIRP (dBm) = Substitution Power (dBm) + Gain/Loss (dB)

TESTED BY

Employee IDs: 23854
Test Dates: 2024-08-27
Test Location: Chamber 3

9.4. 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

Model	Frequency (GHz)	Peak EIRP (dBm)	EUT Antenna Gain (dBi)	Peak Conducted Power (dBm)	Conducted Limit (dBm)[1]	Margin (dB)
D621	58.32	39.45	24.36	15.09	27	-11.91
	60.48	41.26	24.36	16.90	27	-10.10
	62.64	41.20	24.36	16.84	27	-10.16
	64.80	39.48	24.36	15.12	27	-11.88

Notes:
1-Conducted limit is 500mW, which equates to 27 dBm

TESTED BY

Employee IDs: 23854
Test Dates: 2024-08-27
Test Location: Chamber 3

9.5. 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/cm^2 at a distance of 3 m for emissions between 40 GHz and 200 GHz

TEST PROCEDURE - BELOW 18 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 C63.10 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 18 GHz

ANSI C63.10-2020 Clause 9.10

External harmonic mixers, waveguides and LNA's are utilized, where appropriate.

The measurement 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 measurement 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.

Above 40 GHz, the 90 pW/cm^2 limit was converted to dBm as follows:

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

From 18 – 40 GHz, the 500 uV/m limit was converted to dBm as follows:

$$[20 * \log (500)] - 95.2 = -41.2\ dBm$$

In the frequency range of 40 – 110 GHz, testing was performed at the low, mid and high channels. For all other spurious emissions frequency ranges, testing was performed on the worst-case channel only (mid, Channel 2).

For the investigation of simultaneous transmission of multiple wireless technologies of 2.4GHz WLAN and 60GHz data communication, no noticeable new emissions with high amplitude was found.