

TEST REPORT

FCC 60 GHz Radar Test for TMCTAW5W
Certification

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-RF-2607-FC003-R2

DATE OF ISSUE
August 28, 2026

Tested by
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Accredited by KOLAS, Republic of KOREA

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Applicant	LG Electronics Inc. 222 LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 17709, South Korea
Product Name	LG Smart Thermostat
Model Name	TMCTAW5W
FCC ID	2BO3L-TMCTAW5W
Date of Test	June 11, 2026 ~ August 28, 2026
Location of Test	■ Permanent Testing Lab □ On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)
Test Standard Used	Part 15.255
Test Results	PASS
Brand	LG

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	July 16, 2026	Initial Release
1	August 10, 2026	Revised the Product Name.
2	August 28, 2026	Added test results under simultaneous transmission conditions.

Notice

Content
Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance. The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr This test report provides test result(s) under the scope accredited by the Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA. (KOLAS (KS Q ISO/IEC 17025) Accreditation No. KT197)

CONTENTS

1. EUT DESCRIPTION	5
2. TEST METHODOLOGY	6
2.1 EUT CONFIGURATION	6
2.2 EUT EXERCISE	6
2.3 GENERAL TEST PROCEDURES	6
2.4 DESCRIPTION OF TEST MODES	6
3. INSTRUMENT CALIBRATION	7
4. FACILITIES AND ACCREDITATIONS	7
4.1 FACILITIES	7
4.2 EQUIPMENT	7
5. ANTENNA REQUIREMENTS	8
6. MEASUREMENT UNCERTAINTY	8
7. SUMMARY TEST OF RESULTS	9
7.1 ADDITIONAL DESCRIPTIONS ABOUT TEST	10
8. TEST RESULT	11
8.1 OCCUPIED BANDWIDTH	11
8.2 RF OUTPUT POWER	13
8.3 SPURIOUS EMISSIONS	18
8.4 FREQUENCY STABILITY	29
8.5 AC Power line Conducted Emissions	32
9. LIST OF TEST EQUIPMENT	34
10. Annex A Test Setup Photo	35

1. EUT DESCRIPTION

Model	TMCTAW5W	
Additional Model	-	
EUT Type	LG Smart Thermostat	
EUT Serial Number	603HTAV00320	
Power Supply	24 VAC, 50/60 Hz	
Frequency Range	60.45 GHz ~ 61.45 GHz	
Antenna Type	Antenna in Package	
Antenna Peak Gain(dBi)	3.0	
Modulation Type	FMCW	
EIRP	Peak	16.34 dBm
Manufacturer	HYUNDAI HT GLOBAL COMPANY LIMITED Lot M, Binh Xuyen Industrial Zone, Binh Nguyen Commune, Phu Tho Province, Vietnam	

2. TEST METHODOLOGY

The measurement procedure described in the “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices” (ANSI C63.10-2020) Operating Under 47 CFR §15.255 were used in the measurement.

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on EIRP measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx Frequency that was for the purpose of the measurements.

2.3 GENERAL TEST PROCEDURES

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above the ground plane below 1 GHz and 1.5 m above 1 GHz with absorbers between the EUT and receiving antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set far-field distance away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10-2020.

2.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antennas(Up to 40 GHz) for measurement are calibrated in accordance with the requirements of C63.5-2017.

4. FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea. This test facility has completed the evaluation in compliance with the standards and evaluation period required for chamber validity verification. ANSI C63.4-2014 + C63.4a-2017 and ANSI C63.25.1-2018

Detailed description of test facility was submitted to the Commission and accepted dated February 26,2026 (Registration Number: KR0032).

4.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of §15.203

6. MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty
Occupied Bandwidth	95 kHz
RF Output Power	0.68 dB
Conducted Disturbance (150 kHz ~ 30 MHz)	1.54 dB
Radiated Disturbance (9 kHz ~ 30 MHz)	4.54 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 dB
Radiated Disturbance (1 GHz ~ 18 GHz)	5.80 dB
Radiated Disturbance (18 GHz ~ 40 GHz)	5.86 dB
Radiated Disturbance (Above 40 GHz)	5.44 dB
Transmitter Frequency Stability	27.94 kHz

Coverage factor $k = 2$, Confidence levels of 95 %

7. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit			Test Condition	Test Result
AC Power line Conducted Emissions	§15.207	Frequency (MHz)	Qyasu-peak (dBμV)	Average (dBμV)	Conducted	PASS
		0.15 – 0.5	66 to 56	56 to 46		
		0.5 – 5	56	46		
		5 - 30	60	50		
Occupied Bandwidth	§2.1049	60.45 ~ 61.45 GHz			Radiated	PASS
Radiated power	§15.255(c)(2)(ii)	< EIRP 20 dBm (Peak)				PASS
Spurious emissions	§15.209, §15.255(d)	0.009 – 0.490 MHz: 2400/F[kHz] 0.490 – 1.705 MHz: 24000/F[kHz] 1.705 – 30.0 MHz: 30 μV/m 30 – 88 MHz: 100 μV/m 88 – 216 MHz: 150 μV/m 216 – 960 MHz: 200 μV/m 960 – 40 000 MHz: 500 μV/m 40 – 200 GHz: < -9.92 dBm(EIRP)				PASS
Frequency stability	§15.255(f)	60.45 ~ 61.45 GHz				PASS

Note:

- According to the test result of the report (Report No: TRRFCC26-0010, TRRFCC26-0009), we performed the test for only worst case in module report.
- The decision rule applies 'simple acceptance'
- This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 60 GHz and 2.4 GHz and 5 GHz Bands simultaneously on each antenna.

Simultaneous transmission Scenario	Bluetooth	Thread	5 GHz WLAN	60 GHz	Test Case
Bluetooth + 5 GHz WLAN+ 60 GHz	on	-	on	on	Scenario1
Thread + 5 GHz WLAN + 60 GHz	-	on	on	on	Scenario2

7.1 ADDITIONAL DESCRIPTIONS ABOUT TEST

All tests is performed by radiated measurement and applied below conditions.

: Measurement distance of fundamental tests is as follow.

$$\text{Wavelength}[m] = \text{Speed of light}[m/s] / \text{Measurement frequency}[Hz] = (3 \times 10^8) / (61.45 \times 10^9) = 0.0048$$

$$(2 \times (\text{EUT Antenna dimension})^2) / \text{Wavelength} = (2 \times (0.00230)^2) / 0.0048 = 0.002 \text{ m}$$

$$(2 \times (\text{measurement Antenna dimension})^2) / \text{Wavelength} = (2 \times (0.04179)^2) / 0.0048 = 0.71 \text{ m}$$

For fundamental and out-of-band emissions the largest far-field distance of either the EUT antenna or measurement antenna shall be used. **So, measurement distance is 1.0 m.**

: Spurious emissions measurement distance is shown in table below. (Far field)

Frequency Range (GHz)	Wavelength (cm)	Far Field Distance (m)	Measured Distance (m)
40 ~ 60	0.50	1.354	1.5
60 ~ 90	0.33	0.856	1.0
90 ~ 140	0.21	0.572	1.0
140 ~ 200	0.15	0.365	1.0

8. TEST RESULT

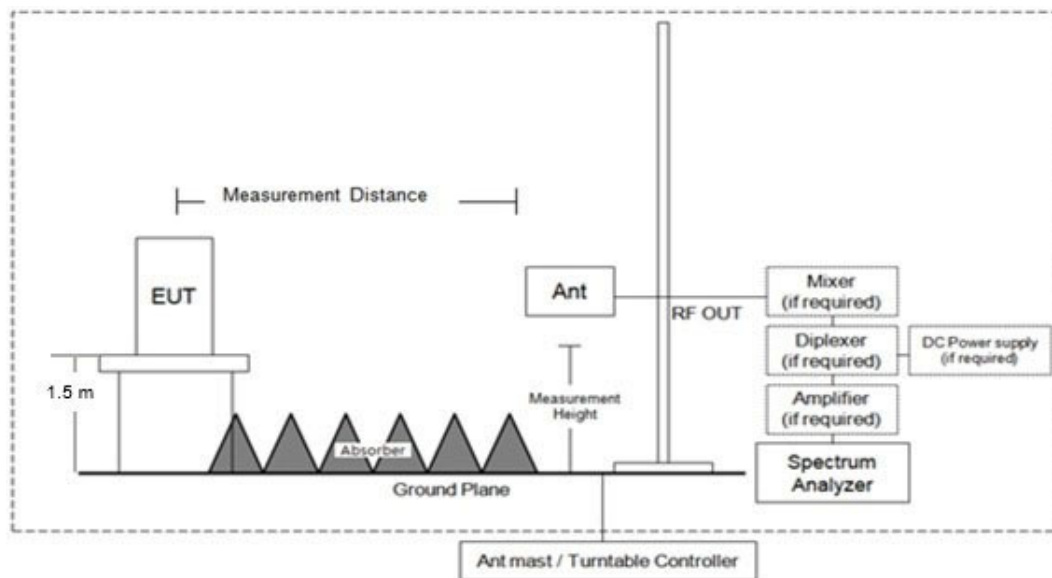
8.1 OCCUPIED BANDWIDTH

▣ TEST REQUIREMENT

§2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

According to ANSI C63.10-2020, 9.4.

The occupied bandwidth (OBW) is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

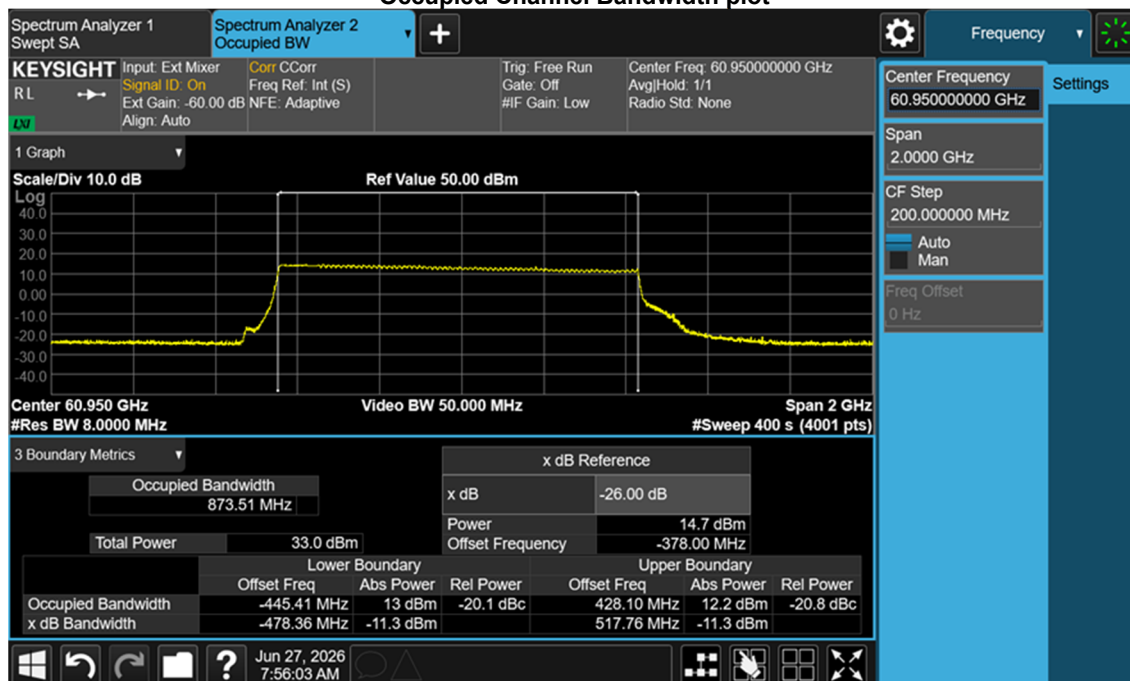
- a) The following procedure shall be used for measuring 99% power bandwidth: Use the following spectrum analyzer settings:
 - 1) Span equal to approximately 1.5 times the OBW, centered on the carrier frequency
 - 2) RBW, prefer 1% to 5% of OBW, or a minimum of 1 MHz if this is not possible due to a large OBW
 - 3) VBW approximately $3 \times \text{RBW}$
 - 4) Set the reference level of the instrument as required to reduce the chance of the signal amplitude exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.1.6.
 - 5) Sweep = No faster than coupled (auto) time.
 - 6) Detector function = peak.
 - 7) Trace = max-hold.

TEST RESULT

TEST CONDITIONS:		Occupied Channel Bandwidth (MHz)
T nom	V nom	873.51

RESULT PLOT

Occupied Channel Bandwidth plot



8.2 RF OUTPUT POWER

▣ TEST REQUIREMENT

§15.255 Operation within the band 57-71 GHz.

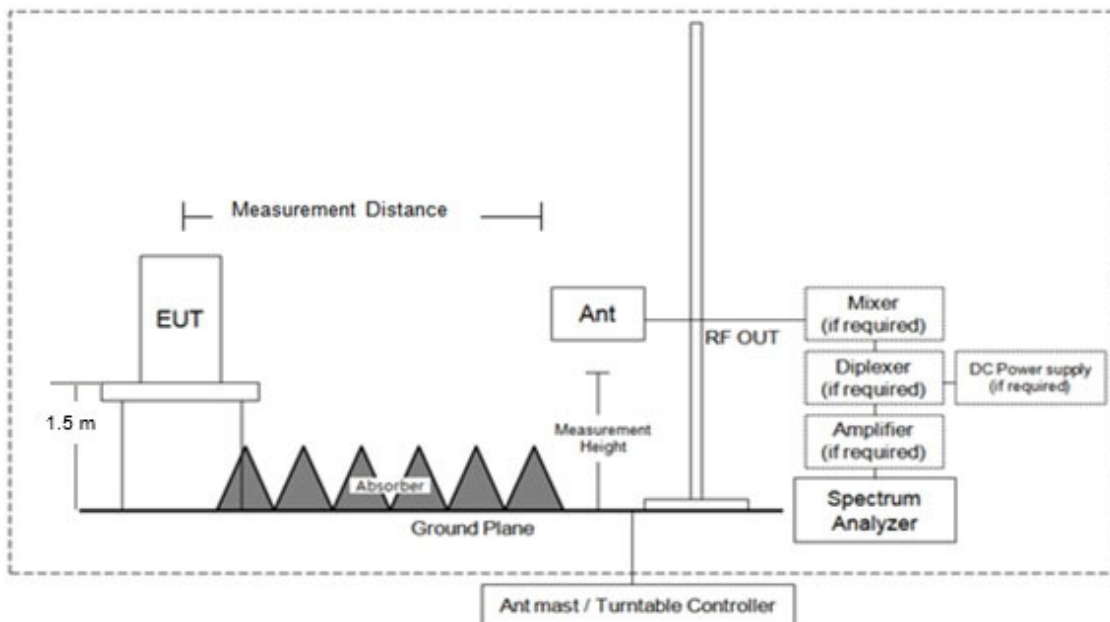
(c) *Radiated power limits.* Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(2) Field disturbance sensors/radars

(II) **57.0-61.56 GHz** : the peak EIRP shall not exceed 3 dBm except that the peak EIRP shall not exceed 20 dBm if the sum of continuous transmitter off-times of at least two milliseconds equals at least 16.5 milliseconds within any contiguous interval of 33 milliseconds;.

▣ TEST CONFIGURATION

40 GHz – 200 GHz



▣ TEST PROCEDURE

According to ANSI C63.10-2020, 9.8.

Where applicable, the following procedure shall be used for measuring the field strength from millimeter-wave systems:

- a) Set up the test as follows:
 - 1) For conducted measurements, connect the external mixer or spectrum analyzer, with appropriate attenuation as needed to reduce the chance of damage or overload to the measurement instrumentation, to the output port of the EUT.
 - 2) For radiated measurements, connect the measurement antenna for the fundamental frequency band to a spectrum analyzer via an external mixer, or directly to the spectrum analyzer if the instrument supports the required frequency range.
- b) For all measurements
 - 1) For pulsed emissions, the procedures in 4.1.5.2.4 and Annex C shall be used.
 - 2) For FMCW emissions, the procedures in 4.1.5.2.8 and Annex L shall be used.
 - 3) For any other emission, set spectrum analyzer RBW, VBW, detector, span, and so on, to the proper values.
- c) For radiated measurements:
 - 1) Place the measurement antenna at a measurement distance that is in the far-field of the measurement antenna, in the far-field of the EUT antenna, and meets the measurement distance requirements for final radiated measurements as specified in 9.1.4.
 - 2) Place the measurement antenna in the main beam of the EUT then maximize the fundamental emission using the procedures of 9.7, noting that multiple peaks can be found at different beam orientations and/or polarizations.
 - 3) Correct the power reading from the spectrum analyzer for any external gain and/or attenuation between the measurement antenna and the spectrum analyzer. This is the power at the output of the measurement antenna
 - 4) Calculate the EIRP from the power at the output of the measurement antenna using Equation (22), and then convert to linear form using Equation (24).
 - 5) Where applicable, calculate conducted output power from the EIRP using Equation (27).
- d) For conducted measurements:
 - 1) Correct the power reading from the spectrum analyzer for any external gain and/or attenuation between the EUT and the spectrum analyzer. This is the conducted output power of the EUT.
 - 2) Calculate the EIRP from the conducted output power of the EUT using Equation (23), and then convert to linear form using Equation (24).
- e) Repeat the preceding sequence to determine the EIRP and where applicable, conducted power for each detector (peak and average) as required.

Repeat the preceding sequence for every operating configuration supported by the EUT.

We are performed this test according to Procedure 6 in KDB 364244 D01 v01r01.

6. FUNDAMENTAL EMISSION MEASUREMENT

The majority of §15.255 output power limits are specified in terms of peak EIRP. When using a spectrum

or signal analyzer to perform radiated power measurements to determine the peak EIRP, several factors must be considered:

Spectrum and signal analyzers typically do not have an available resolution bandwidth capable of fully capturing fundamental emissions with bandwidths on the order of several GHz; therefore, a 1-MHz RBW shall be used in conjunction with the peak hold function while sweeping in free run mode until the maximum amplitude has been captured.

There are at least two possible approaches for determining the peak EIRP using a spectrum or signal analyzer: 1) To directly measure the peak amplitude of the radiated power for use in determining the peak EIRP.

Note:

According to ANSI C63.10-2020/cor1-2023, Annex L

D.C.F Calculation (Desensitization Correction Factor of the FMCW signal)

$$a = \frac{1}{\left(1 + \left[\left(\frac{2 \times \ln 2}{\pi}\right) \times \left(\frac{BW_{chirp}}{T_{chirp} \times RBW^2}\right)\right]\right)^{0.25}}$$

D.C.F = 20xlog10(1/ a)

BWchirp= 0.87351 GHz

RBW= 1 MHz

Tchirp= 17.5 us

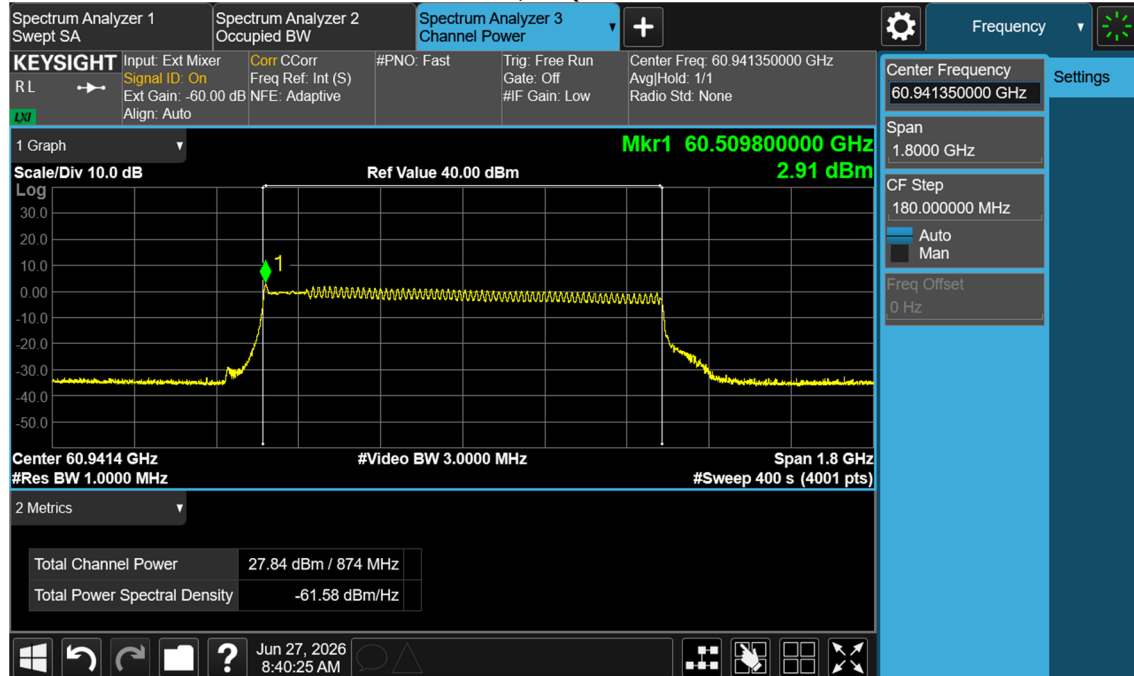
D.C.F= 13.4336 dB

TEST RESULTS

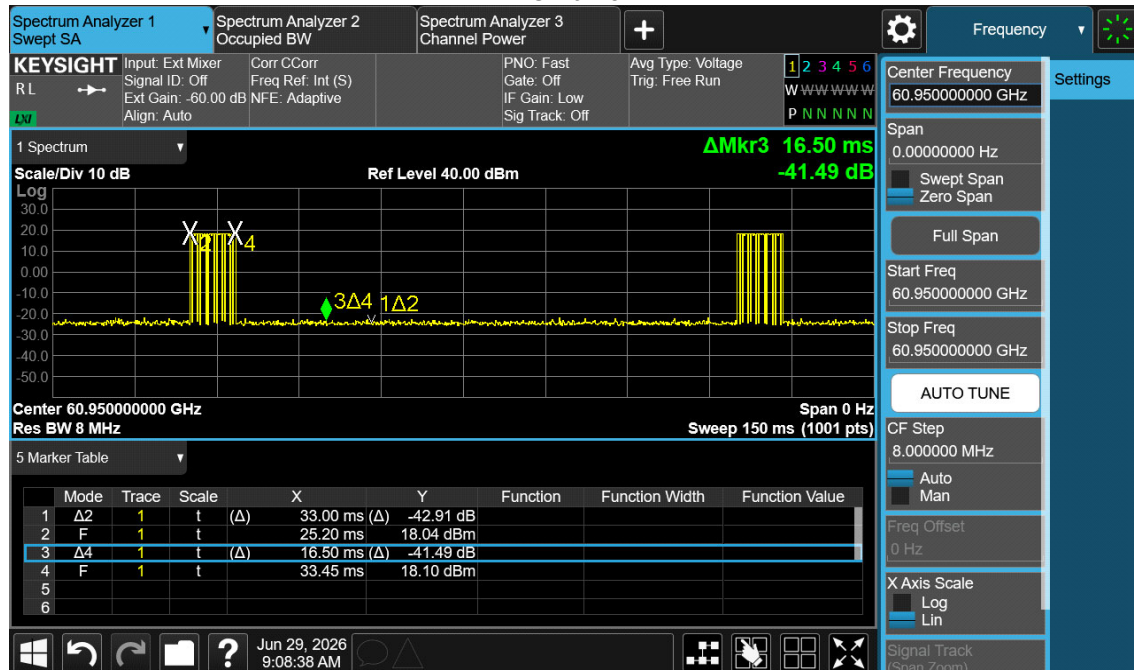
Frequency	Measured Level	D.C.F	Results	Limit	Margin	Off-time	Measurement Type
[GHz]	[dBm]	[dB]	[dBm]	[dBm]	[dB]	[ms]	
60.94	2.91	13.43	16.34	20	3.66	≥ 16.5	PK

RESULT PLOT

Peak, Output Power



Off-time



8.3 SPURIOUS EMISSIONS

▣ TEST REQUIREMENT

§ 15.209 Radiated emission limits; general requirements.

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meter)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

§15.255 Operation within the band 57-71 GHz.

- (d) *Limits on spurious emissions.*

- (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/cm² at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

▣ TEST PROCEDURE

For below 40 GHz

According to ANSI C63.10-2020, 9.11.

3. The EUT is placed on a turntable, which is 1.5 m above ground plane.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until the measurements for all frequencies are complete.

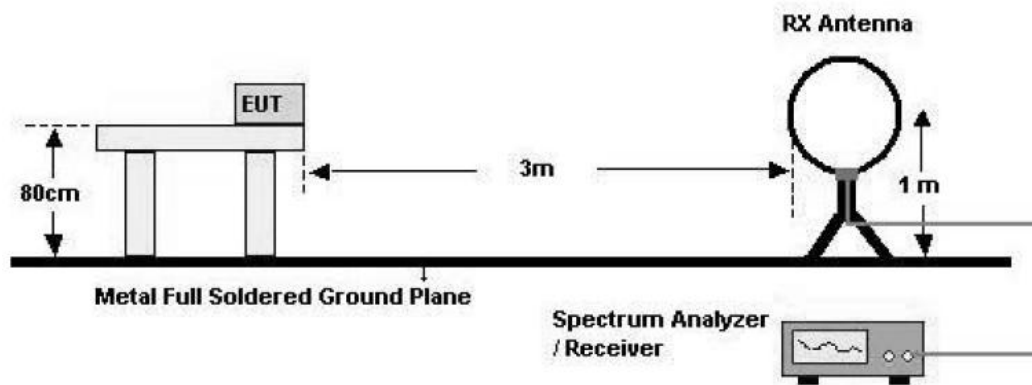
For Above 40 GHz

According to ANSI C63.10-2020, 9.10.

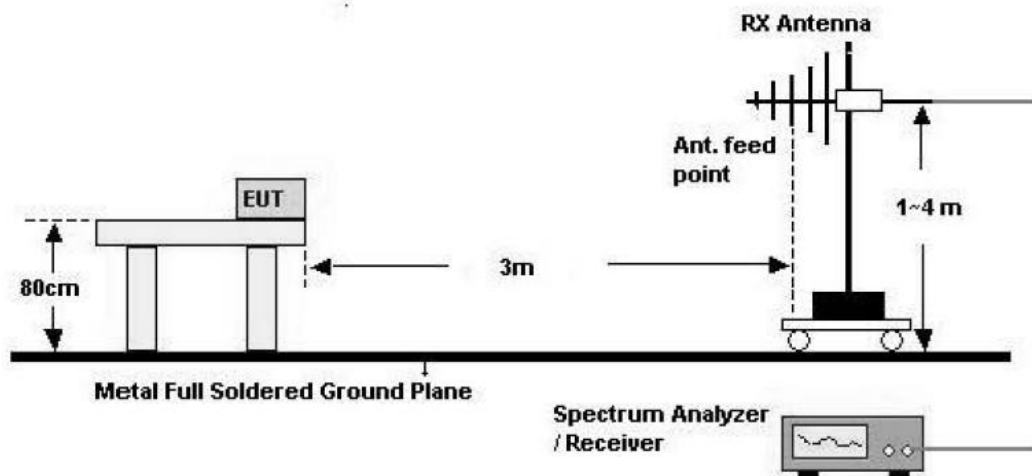
1. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.
2. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.
3. Calculate the distance to the far field boundary and determine the maximum measurement distance.
4. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.
5. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.
6. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.
7. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.
8. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.
9. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.
10. Calculate the EIRP from the measured field strength and then convert to the linear.
11. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
12. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

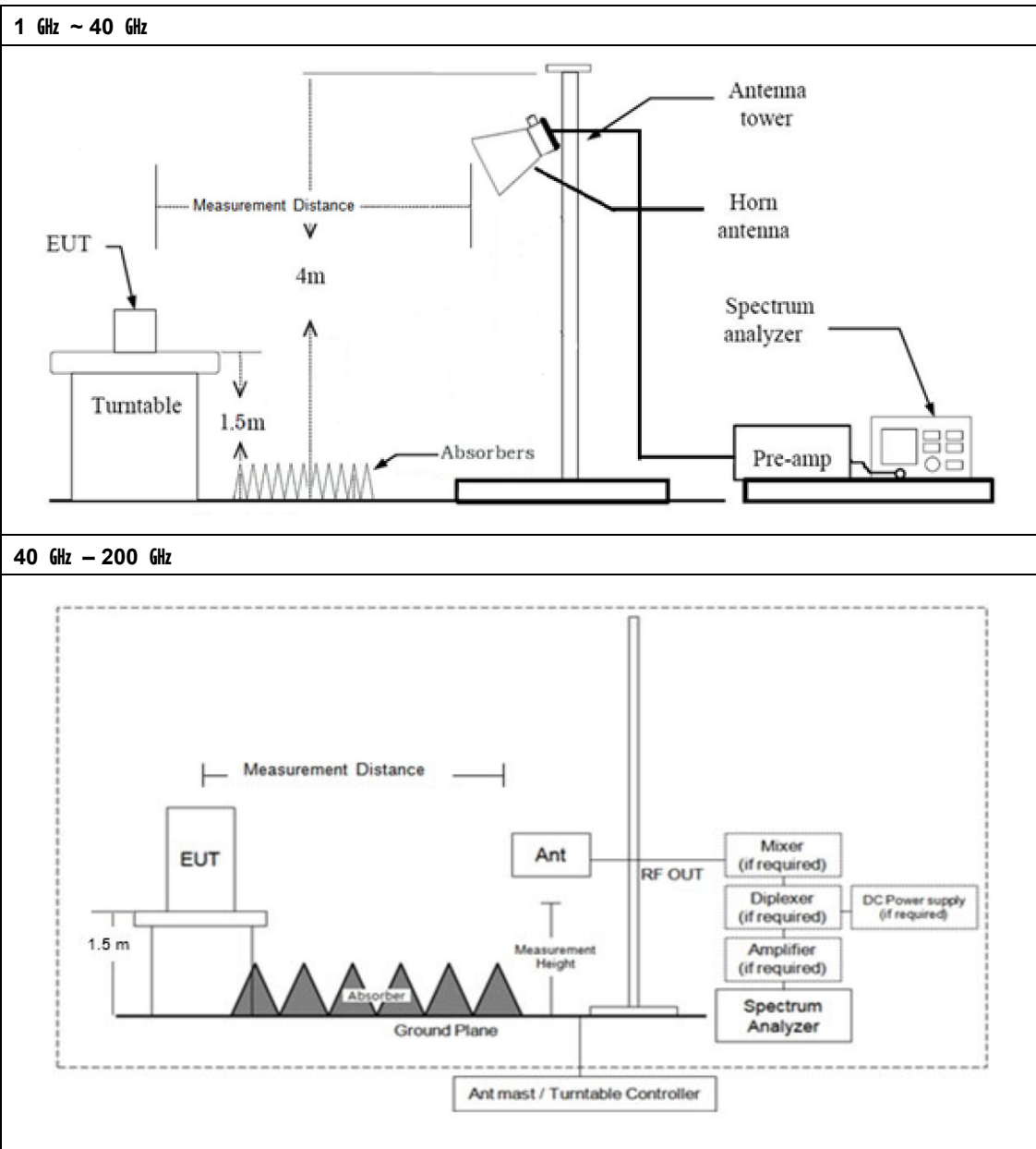
▣ TEST CONFIGURATION

Below 30 MHz



30 MHz - 1 GHz





TEST RESULTS

[60 GHz]

9 kHz ~ 30 MHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. Factor	Cable Loss	Ant. Pol.	Total	Limit	Margin
MHz	dBμV	dB/m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

- The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
- Limit line = specific Limits (dBμV) + Distance extrapolation factor
- Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
- We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

30 MHz ~ 1 GHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. Factor	Cable Loss	Ant. Pol.	Total	Limit	Margin
MHz	dBμV	dB/m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

- Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
- We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

1 GHz ~ 18 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

18 GHz – 40 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[GHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

40 GHz ~ 200 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[GHz]	[dBμV]	[dB/m]	[H/V]	[dBm]	[dBm]	[dB]
51.656	-100.37	59.62	H	-40.76	-9.92	30.84
40.102	-99.72	57.65	V	-42.07	-9.92	32.15

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

Notes:

- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain + Distance Factor
- Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[Simultaneous transmission Scenario 1]

9 kHz ~ 30 MHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. Factor	Cable Loss	Ant. Pol.	Total	Limit	Margin
MHz	dBμV	dB/m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Limit line = specific Limits (dBμV) + Distance extrapolation factor
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

30 MHz ~ 1 GHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. Factor	Cable Loss	Ant. Pol.	Total	Limit	Margin
MHz	dBμV	dB/m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

1 GHz ~ 18 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
2 774	41.49	5.77	H	35.72	54	18.28
2 776	41.12	5.77	V	35.35	54	18.65

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

18 GHz – 40 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[GHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

40 GHz ~ 200 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[GHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

Notes:

- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain + Distance Factor
- Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[Simultaneous transmission Scenario 2]

9 kHz ~ 30 MHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. Factor	Cable Loss	Ant. Pol.	Total	Limit	Margin
MHz	dBμV	dB/m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Limit line = specific Limits (dBμV) + Distance extrapolation factor
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

30 MHz ~ 1 GHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. Factor	Cable Loss	Ant. Pol.	Total	Limit	Margin
MHz	dBμV	dB/m	dB	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

1 GHz ~ 18 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
2 531	34.51	6.57	H	27.94	54	26.06
4 798	34.44	0.61	V	33.83	54	20.17

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

18 GHz – 40 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[GHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

40 GHz ~ 200 GHz

Operation Frequency: Continuous TX Mode

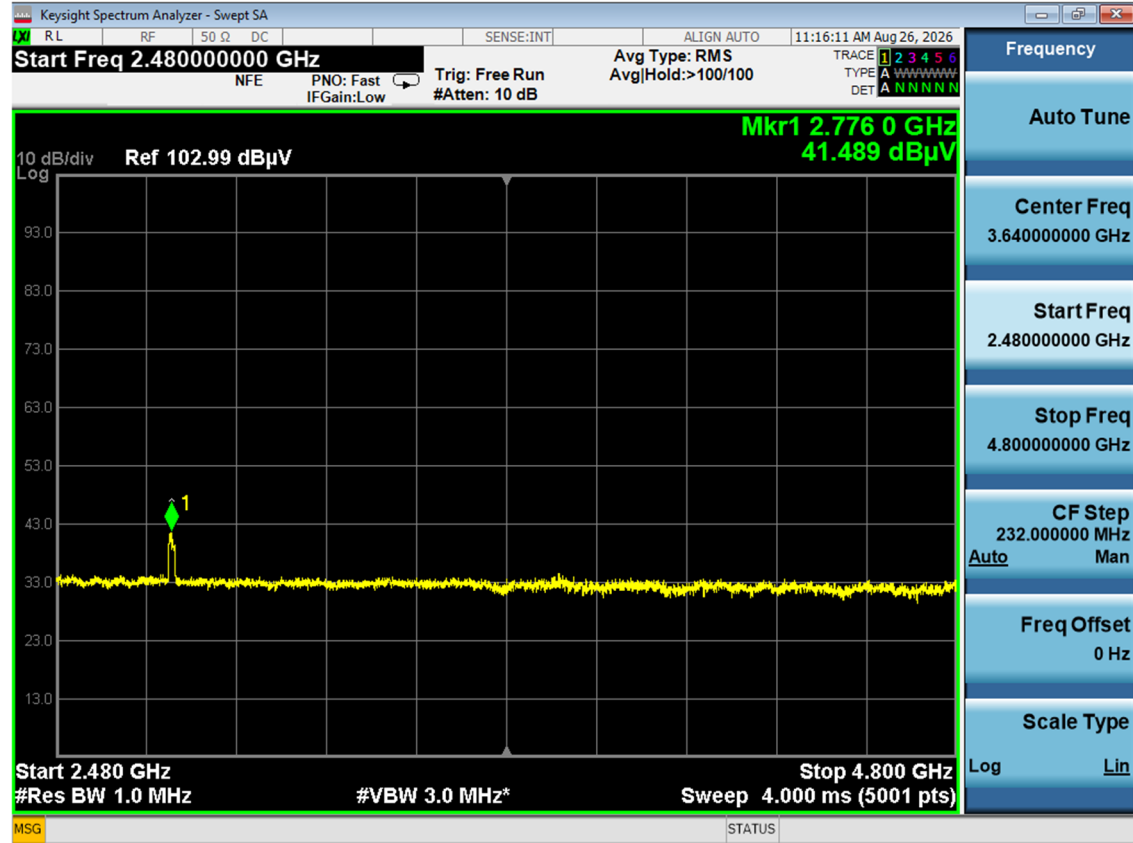
Frequency	Reading	A.F. + C.L. – Amp. G. + D.F.	Ant. Pol.	Total	Limit	Margin
[GHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

※ A.F.: Antenna Factor, C.L.: Cable Loss, Amp. G.: Amplifier Gain, D.F.: Distance Factor

Notes:

- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain + Distance Factor
- Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

TEST PLOT



Note: Only the worst case plots for Spurious Emissions.

8.4 FREQUENCY STABILITY

▣ TEST REQUIREMENT

§15.255 Operation within the band 57-71 GHz.

- (f) **Frequency stability.** 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.

▣ TEST PROCEDURE

According to ANSI C63.10-2020, 6.8.

Some unlicensed wireless device requirements specify frequency stability tests with variation of supply voltage and temperature; the requirements can be found in the regulatory specifications for each type of unlicensed wireless device. The procedures listed in 6.8.1 and 6.8.2 shall be used for frequency stability tests.

6.8.1 Frequency stability with respect to ambient temperature

- a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.
- b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory agency is the recommended measuring instrument.

- c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
- d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.
- e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
- f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 min, 5 min, and 10 min after the EUT is energized. Four measurements in total are made.

- g) Measure the frequency at each of frequencies specified in 5.6.
- h) Switch OFF the EUT but do not switch OFF the oscillator heater.
- i) Lower the chamber temperature by not more than 10 °C, and allow the temperature inside the chamber to stabilize.
- j) Repeat step f) through step i) down to the lowest specified temperature.

6.8.2 Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature (+15 °C to +25 °C). An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

- a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency measuring instrument.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory agency is the recommended measuring instrument.

- b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
- c) Measure the frequency at each of the frequencies specified in 5.6.
- d) Repeat the above procedure at 85% and 115% of the nominal supply voltage as described in 5.13.

Note: Frequency stability was investigated at 10 °C intervals from – 20 °C to +50 °C after the unit had stabilized, and the readings were recorded in a tabular format. The voltage supplied to the EUT was 24.0 V, and the reference temperature was set at 20 °C.

TEST RESULTS

Reference: 24 V at 20°C

Voltage (V)	Temp. (°C)	Meas. Time	Frequency (GHz)	Frequency Error (GHz)
24	+20(Ref)	Startup	60.95128	-
	-20		60.94991	0.00137
	-10		60.95013	0.00115
	0		60.95034	0.00094
	10		60.95083	0.00045
	30		60.95110	0.00018
	40		60.95133	-0.00005
	50		60.95156	-0.00028
24	+20(Ref)	2 min	60.94950	-
	-20		60.95031	-0.00081
	-10		60.95023	-0.00073
	0		60.95114	-0.00164
	10		60.95063	-0.00113
	30		60.95130	-0.00180
	40		60.95213	-0.00263
	50		60.95106	-0.00156
24	+20(Ref)	5 min	60.95050	-
	-20		60.95021	0.00029
	-10		60.94923	0.00127
	0		60.95004	0.00046
	10		60.95053	-0.00003
	30		60.95160	-0.00110
	40		60.95043	0.00007
	50		60.95086	-0.00036
24	+20(Ref)	10 min	60.95020	-
	-20		60.95031	-0.00011
	-10		60.94933	0.00087
	0		60.95054	-0.00034
	10		60.95133	-0.00113
	30		60.95130	-0.00110
	40		60.95213	-0.00193
	50		60.95186	-0.00166
20.4	20	-	60.94984	0.00144
27.6	20		60.94997	0.00131

8.5 AC Power line Conducted Emissions

▣ TEST REQUIREMENT

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

Sample Calculation

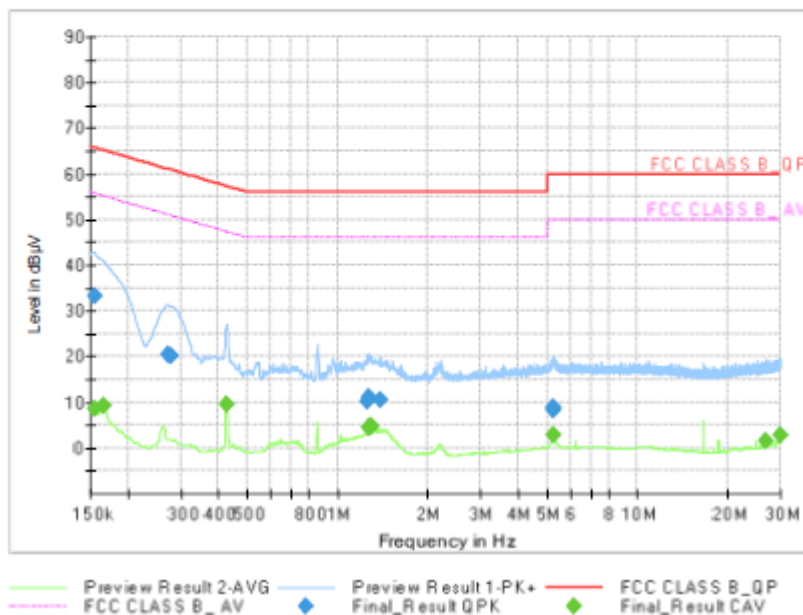
Quasi-peak(Final Result) = Measured Value + Correction Factor

TEST RESULT

Common Information

EUT : TMCTAW5W
Operating Conditions : 60 GHz
Comment :

Full Spectrum



Final Result_QPK

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	33.30	65.75	32.46	9.000	N	9.6
0.2715	20.34	61.07	40.73	9.000	N	9.6
0.2783	20.23	60.87	40.64	9.000	N	9.6
1.2628	10.26	56.00	45.74	9.000	L1	9.7
1.2673	11.04	56.00	44.96	9.000	L1	9.7
1.3865	10.38	56.00	45.62	9.000	L1	9.7
5.2228	8.88	60.00	51.12	9.000	L1	9.8
5.2363	8.74	60.00	51.26	9.000	L1	9.8
5.2565	8.36	60.00	51.64	9.000	L1	9.8

Final Result_CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	8.68	55.75	47.08	9.000	N	9.6
0.1658	9.18	55.17	45.99	9.000	N	9.6
0.4268	9.53	47.32	37.79	9.000	L1	9.7
1.2650	4.46	46.00	41.54	9.000	L1	9.7
1.2875	4.62	46.00	41.38	9.000	L1	9.7
1.3010	4.71	46.00	41.29	9.000	L1	9.7
5.2250	2.84	50.00	47.16	9.000	L1	9.8
26.9060	1.51	50.00	48.49	9.000	L1	10.0
29.9030	2.77	50.00	47.23	9.000	L1	10.0

9. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Signal Analyzer	FSW85	Rohde&Schwarz	101256	10/16/2026	Annual
PXA Signal Analyzer	N9030B	Keysight	MY57143020	07/04/2027	Annual
Temperature & Humidity Chamber	PL-2KP	ESPEC	14005385	06/17/2027	Annual
Antenna Mast Controller	CO3000	Innco system GmbH	CO3000/842/35030115/L	N/A	N/A
Antenna Mast	MA4640-XP-ET	Innco system GmbH	S3AM	07/01/2027	Annual
Turn Table	DS1500-S-1t	Innco system GmbH	6290425	N/A	N/A
RF Switching System	FBSR-03A (3dB ATT+LNA)	TNM system	S3L4	10/20/2026	Annual
RF Switching System	FBSR-03A (Thru)	TNM system	S3L5	10/20/2026	Annual
Loop Antenna	FMZB 1513	Schwarzbeck Mess-Elektronik OHG	1513-175	06/24/2027	Biennial
Trilog Broadband Antenna	VULB 9168	Schwarzbeck Mess-Elektronik OHG	01135	08/12/2028	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck Mess-Elektronik OHG	9120D-1191	10/21/2027	Biennial
Horn Antenna	BBHA 9170	Schwarzbeck Mess-Elektronik OHG	BBHA9170124	03/23/2027	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	M19RH-180423-1	02/21/2028	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	M12RH-180423-1	02/21/2028	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	M08RH-180501-1	02/21/2028	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	M05RH-180501-1	02/21/2028	Biennial
Horn Antenna	SAR-2309-15-S2	ERAVANT	08394-01	12/19/2026	Biennial
Harmonic Mixer	WR-19	VDI	SAX 771	02/20/2028	Annual
Harmonic Mixer	WR-15	VDI	SAX 936	02/20/2028	Annual
Harmonic Mixer	WR-12	VDI	SAX 773	02/20/2028	Annual
Harmonic Mixer	WR-08	VDI	SAX 779	02/20/2028	Annual
Harmonic Mixer	WR-05	VDI	SAX 774	02/20/2028	Annual
DC Power Supply	PWR800L	KIKUSUI	RK000880	06/29/2027	Annual
LISN	ENV216	Rohde&Schwarz	102245	07/10/2027	Annual
Source Module	WR-19	OML INC.	S19MS-A-160516-1	07/03/2027	Annual
Source Module	WR-12	OML INC.	S12MS-A-160419-1	07/03/2027	Annual
Source Module	WR-08	OML INC.	S08MS-A-160419-1	07/03/2027	Annual
Source Module	WR-05	OML INC.	S05MS-A-160419-1	07/03/2027	Annual
EMI Test Receiver	ESR	Rohde&Schwarz	101910	07/09/2027	Annual

Notes:

- Equipment listed above that calibrated during the testing period was set for test after the calibration.
- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date, or will be test after the calibration is completed.

10. Annex A_Test Setup Photo

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2607-FC003-P