



Test report

REP092619-3R3TRFWL

Date of issue: November 24, 2025

Applicant:

Huupe

Product:

Huupe Mini

Model:

HM2

Variant(s):

N/A

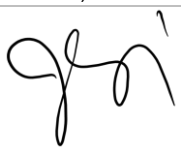
FCC ID: 2BOIM-HM2

ISED Certification Number: 33905-HM2

Specifications:

- ◆ **FCC 47 CFR Part 15, Subpart C – §15.255**
Operation within the band 57-71 GHz
- ◆ **RSS-210, Issue 11 (June 2024)**
Annex J: Devices operating in the band 57-71 GHz

Lab and test locations

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FCC Site Number	Test Firm Registration Number: 392943; Designation Number: US5058
ISED Test Site	2040B-3
Tested by	Chenhao Ma, Wireless Test Technician
Reviewed by	James Cunningham, EMC/WL Manager
Review date	November 24, 2025
Reviewer signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

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Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart C – §15.255	Operation within the band 57-71 GHz
RSS-210, Issue 11 (June 2024) Annex J	Devices operating in the band 57-71 GHz

1.2 Test methods

ANSI C63.10-2020	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
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1.3 Exclusions

None.

1.4 Statement of compliance

Testing was performed against all relevant requirements of the test standard(s).

Results obtained indicate that the product under test complies in full with the tested requirements.

The test results relate only to the item(s) tested.

See “Section 2 Summary of test results” for full details.

1.5 Test report revision history

Table 1.5-1: Test report revision history

Revision #	Issue Date	Details of changes made to test report
REP092619-3TRFEMC	May 28, 2025	Original report issued
REP092619-3R1TRFEMC	June 2, 2025	Added FCC and ISSED ID's, minor edits
REP092619-3R2TRFEMC	November 24, 2025	Updated Section 8.3 following TCB feedback
REP092619-3R3TRFEMC	November 24, 2025	Corrected limit (Section 8.3)

Section 2 Summary of test results

2.1 FCC Part 15, Subpart C, general requirements

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass ¹
§15.31(e)	Variation of power source	Pass
§15.203	Antenna requirement	Pass ²

Note 1: The EUT is AC powered

Note 2: The antenna is integral to the EUT and cannot be removed

2.2 FCC Part 15.255

Part	Test description	Verdict
§15.255(e)	Emission bandwidth	Pass
§15.255(c)	Equivalent isotropically radiated power (EIRP)	Pass
§15.255(d)	Transmitter spurious emissions	Pass
§15.255(e)	Peak conducted output power	Not applicable
§15.255(f)	Frequency stability	Pass

2.3 RSS-210 Annex J

Part	Test description	Verdict
J.4	Emission bandwidth	Pass
J.2	Equivalent isotropically radiated power (EIRP)	Pass
J.4	Transmitter spurious emissions	Pass
J.3	Peak conducted output power	Not applicable
J.6	Frequency stability	Pass

2.4 RSS-GEN

Part	Test description	Verdict
6.7	99% Occupied bandwidth	Pass
7.3	Receiver radiated emission limits	Not applicable ¹
7.4	Receiver conducted emission limits	Not applicable ²
8.8	Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus	Pass ³

Note 1: EUT is neither a stand-alone receiver nor a scanning receiver.

Note 2: The EUT is AC powered

Section 3 Equipment under test (EUT) details

3.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

3.2 Sample information

Receipt date	21-Apr-25
Nemko sample ID number	REP092619

3.3 Testing period

Test start date	21-Apr-25
Test end date	21-Apr-25

3.4 Applicant

Company name	Huupe
Address	17875 Von Karman Ave
City	Irvine
State	CA
Postal/Zip code	92614
Country	United States of America

3.5 Manufacturer

Company name	Huupe
Address	17875 Von Karman Ave
City	Irvine
State	CA
Postal/Zip code	92614
Country	United States of America

3.6 EUT information

Product name	Huupe Mini
Model	HM2
Variant(s)	N/A
Serial number	HMC2443009129
Part number	N/A
Power requirements	100-240VAC, 50-60Hz 0.9A Max
Description/theory of operation	EUT is an interactive basketball hoop. The huupe mini allows you to play mini hoops shooting competitions with others across the world in real-time through tons of different game modes. Real-time feedback and shot tracking. The huupe mini includes Wi-Fi capabilities, as well as Bluetooth connection to a remote control.
Software details	Manufacturing Test software
Operating band	57 – 71 GHz
Operational frequency(-ies)	58-59.39 GHz

3.7 EUT exercise and monitoring details

EUT description of the methods used to exercise the EUT and all relevant ports:

- The EUT was executed to transmit at max power. The setup was determinate by client.

EUT setup/configuration rationale:

- The EUT setup in a configuration that was expected to produce the highest amplitude emissions relative to the limit and that satisfy the maximum transmission power in continuous mode.
- The type and construction of cables used in the measurement set-up were consistent with normal or typical use. Cables with mitigation features (for example, screening, tighter/more twists per length, ferrite beads) have been noted below:
 - None
- The EUT was setup in a manner that was consistent with its typical arrangement and use. The measurement arrangement of the EUT, local ancillary equipment and associated cabling was representative of normal practice. Any deviations from typical arrangements have been noted below:
 - None

3.8 EUT setup details

Table 3.8-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number	Rev.
AC/DC Power Adapter	SIMSUKIAN	SK-PD35A-02CU	24062901006921	N/A
Huupe Mini	Huupe, Inc.	HM2	HMC2443009129	N/A
Huupe Bluetooth Controller	Huupe, Inc.	N/A	N/A	N/A

Table 3.8-2: EUT interface ports

Description	Qty.
Charge port	1
USB port	1

Table 3.8-3: Support equipment

Description	Brand name	Model/Part number	Serial number	Rev.
None				

Table 3.8-4: Inter-connection cables

Cable description	From	To	Length (m)
None			

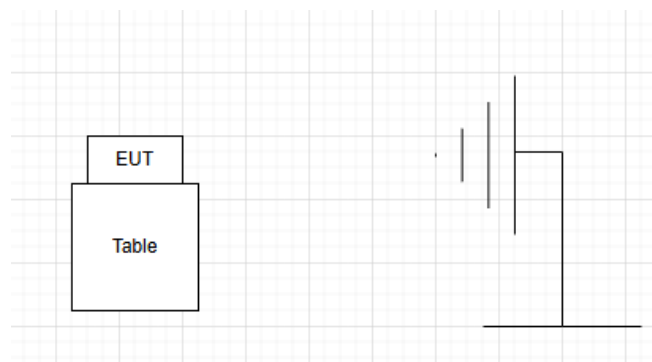


Figure 3.8-1: Test setup diagram

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

None.

4.2 Technical judgement

None.

4.3 Deviations from laboratory test procedures

None.

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ± 5 %, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Table 6.1-1: Measurement uncertainty calculations

Measurement		U_{cispr} dB	U_{lab} dB
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

- Notes:
- Compliance assessment:
 - If U_{lab} is less than or equal to U_{cispr} then:
 - compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
 - non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit
 - If U_{lab} is greater than U_{cispr} then:
 - compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cispr}})$, exceeds the disturbance limit;
 - non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cispr}})$, exceeds the disturbance limit

V-AMN: V type artificial mains network
 AAN: Asymmetric artificial network
 CP: Current probe
 CVP: Capacitive voltage probe
 SAC: Semi-anechoic chamber
 FAR: Fully anechoic room

Section 7 Test equipment

7.1 Test equipment list

Table 7.1-1: Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	E1120	14-Dec-2023	14-Dec-2025
EMI Test Receiver	Rohde & Schwarz	ESU 40	E1121	03-Oct-2023	03-Oct-2025
Environmental chamber	Associated Environmental Systems	HD-210	N/A(Rental)	21-Mar-2025	21-Dec-2025
Antenna, Bilog	Schaffner-Chase	CBL6111C	1480	28-Jun-2024	28-June-2026
DRG Horn (medium)	ETS-Lindgren	3117-PA	E1160	17-May-2024	17-May-2026
Standard Gain Horn Antenna	Eravant	SAZ-2410-42-S1	EW107	11-Feb-2025	11-Feb-2026
Gain Horn Antenna 24 dBi Gain	Eravant Formerly Safe Millimeter	SAZ-2410-2-S1	EW108	VOU	VOU
Low Noise Amplifier	sage Millimeter, Inc.	SBL-1834034030-KFKF	E1228	VOU	VOU
WR-19 Rectangular Gain Horn, 40-60 GHz	SAGE Millimeter, Inc.	SAR-2309-19-S2	E1144	NCR	NCR
Harmonic Mixer 40.....60GHz	Rohde & Schwarz	FS-Z60	E1138	VOU	VOU
WR-15 Rectangular Gain Horn, 50-75 GHz	SAGE Millimeter, Inc.	SAR-2408-15-S2	E1152	NCR	NCR
FS-Z75 Harmonic Mixer 50-75GHZ	Rohde & Schwarz	FS-Z5	E1324	VOU	VOU
WR-10 Rectangular Gain Horn, 75-110 GHz	SAGE Millimeter, Inc.	SAR-2507-10-S2	E1146	NCR	NCR
Harmonic Mixer 75-110GHz	Rohde & Schwarz	FS-Z110	E1154	VOU	VOU
Rectangular gain horn, D band frequency: 110 - 170 GHz	Rohde & Schwarz	SAR-2507-06-S2	E1182	NCR	NCR
Harmonic mixer. Frequency range: 110 - 170 GHz	Radiometer Physics	HM 110 - 170	E1178	VOU	VOU
Rectangular gain horn, WR-5 band frequency: 140 - 220 GHz	SAGE Millimeter, Inc.	SAR-2309-05-S2	E1184	NCR	NCR
Fullband harmonic mixer. Frequency range: 140 - 220 GHz	Radiometer Physics	HM 140-220	E1177	VOU	VOU

Notes: N/A – not applicable
NCR – no calibration required
VOU – verify on use

Table 7.1-2: Test software details

Manufacturer of Software	Details
Rohde & Schwarz	EMC 32 V10.60.15

Notes: None

Section 8 Testing data

8.1 AC power line conducted emissions

8.1.1 References and limits

- FCC 47 CFR Part 15, Subpart C: §15.207
- RSS-Gen: 8.8
- Test method: ANSI C63.10-2014 §6.2

Table 8.1-1: AC power line conducted emissions limit

Frequency of emission, MHz	Conducted limit, dBµV	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Note: * - Decreases with the logarithm of the frequency.

8.1.2 Test summary

Verdict	Pass		
Test date	April 28, 2025	Temperature	21 °C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1008 mbar
Test location	☒ Ground plane ☐ Other:	Relative humidity	66 %

8.1.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power.

8.1.4 Setup details

Port under test	AC power input
EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings:

Resolution bandwidth	9 kHz
Detector mode	– Peak (Preview measurement) – Quasi-peak and average (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak preview measurement) – 5000 ms (Quasi-peak and average final measurement)

8.1.5 Test data

Full Spectrum

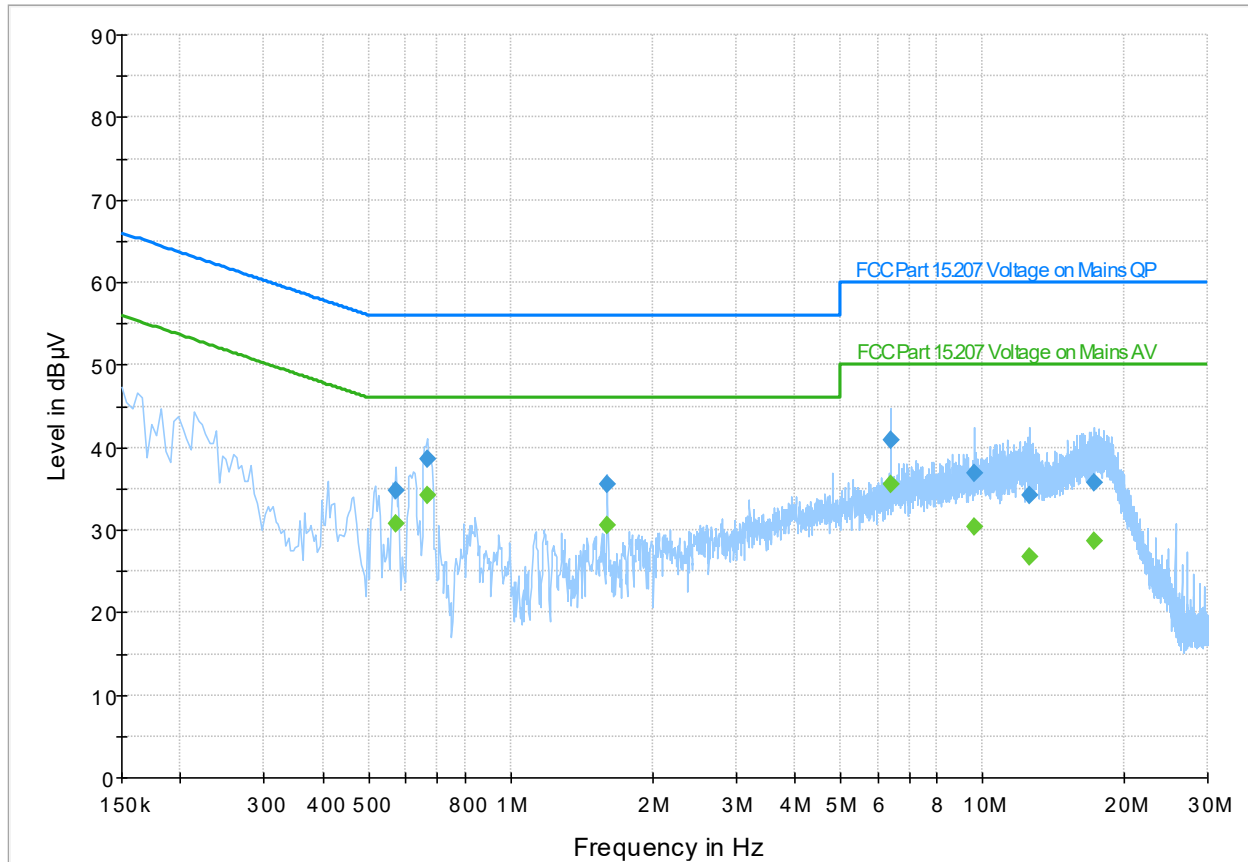


Figure 8.1-1: Conducted emissions at mains port spectral plot (150 kHz - 30 MHz)

Table 8.1-2: Conducted emissions at mains port results

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.570000	34.81	---	56.00	21.19	5000.0	9.000	N	ON	19.6
0.570000	---	30.68	46.00	15.32	5000.0	9.000	N	ON	19.6
0.666000	---	34.15	46.00	11.85	5000.0	9.000	N	ON	19.6
0.666000	38.61	---	56.00	17.39	5000.0	9.000	N	ON	19.6
1.602000	35.58	---	56.00	20.42	5000.0	9.000	L1	ON	19.7
1.602000	---	30.49	46.00	15.51	5000.0	9.000	L1	ON	19.7
6.410000	40.93	---	60.00	19.07	5000.0	9.000	L1	ON	19.8
6.410000	---	35.58	50.00	14.42	5000.0	9.000	L1	ON	19.8
9.614000	36.90	---	60.00	23.10	5000.0	9.000	L1	ON	19.9
9.614000	---	30.39	50.00	19.61	5000.0	9.000	L1	ON	19.9
12.578000	---	26.66	50.00	23.34	5000.0	9.000	L1	ON	20.0
12.578000	34.25	---	60.00	25.75	5000.0	9.000	L1	ON	20.0
17.242000	---	28.61	50.00	21.39	5000.0	9.000	L1	ON	20.0
17.242000	35.65	---	60.00	24.35	5000.0	9.000	L1	ON	20.0

Notes: ¹ Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).

² Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

8.2 Emission bandwidth / 99% occupied bandwidth

8.2.1 References and limits

- FCC 47 CFR Part 15, Subpart C: §15.255(e)
- RSS-210 Annex J: J.3
- ANSI C63.10 §6.9

8.2.2 Test summary

Verdict	Pass		
Test date	April 25, 2025	Temperature	22 °C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1006 mbar
Test location	☐ Wireless bench ☒ Other:3M Chamber	Relative humidity	55 %

8.2.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power using the 99% OBW function.

8.2.4 Setup details

EUT power input during test	120 V AC, 60 Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:

Receiver settings:

Resolution bandwidth	10 MHz (Maximum RBW available in the equipment)
Video bandwidth	40 MHz (Maximum VBW available in the equipment)
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.2.5 Test data

Table 8.2-1: Emission bandwidth / 99% occupied bandwidth test data

Test frequency (MHz)	Emission Bandwidth (MHz)
58695	1401.35

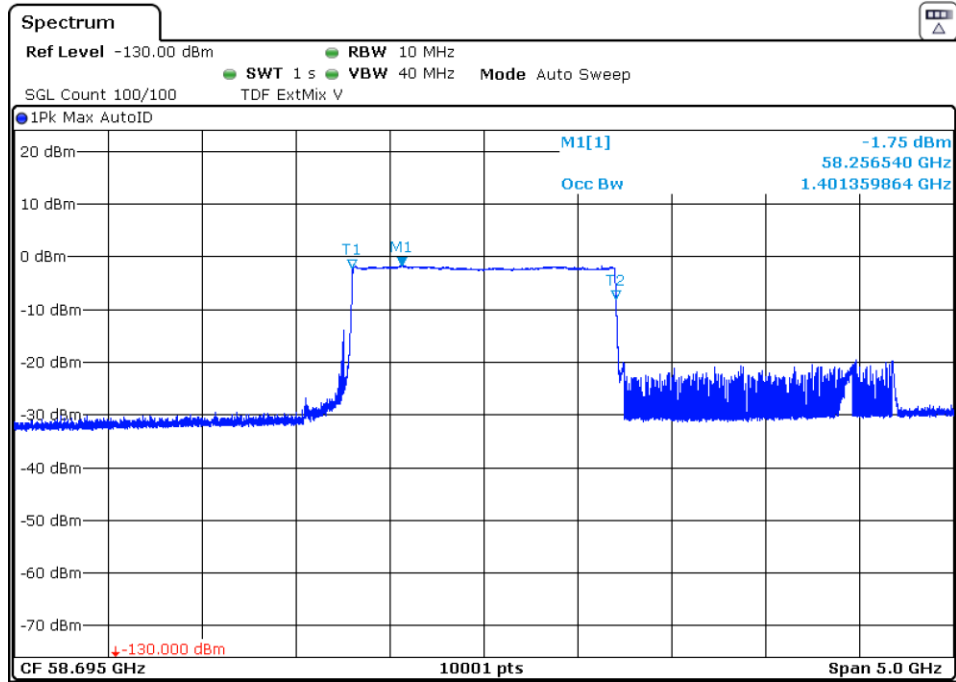


Figure 8.2-1: Emission bandwidth / 99% occupied bandwidth

8.3 Equivalent isotropically radiated power (EIRP)

8.3.1 References and limits

- FCC 47 CFR Part 15, Subpart C: §15.255(c)
- RSS-210 Annex J, J.3.2
- Test method: ANSI C63.10: §9.8

§15.225:

- (c) Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):
- (2) Field disturbance sensors/radars shall not exceed -10 dBm peak conducted output power and 10 dBm peak EIRP except that field disturbance sensors/radars that limit their operation to all or part of the specified frequency band may operate without being subject to a transmitter conducted output power limit if they operate in compliance with paragraph (b)(3) of this section or with one or more of the provisions below:
- (i) **57.0-59.4 GHz:** the peak EIRP level shall not exceed 20 dBm for indoor operation or 30 dBm for outdoor operation;
 - (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;

RSS-210 Annex J:

J.3.2 Emission limits for FDS

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.
- b. FDS devices may operate in any mode as indicated in J.3.2(b)(i) and J.3.2(b)(ii), as long as they operate in only one of these modes for at least 33 ms before switching to another mode.
 - i. FDS devices operating in the **57.0-59.4 GHz** band shall comply with one of the following limits, depending on the operating condition of the device:
 1. the peak e.i.r.p. shall not exceed 20 dBm for indoor usage (devices operating and situated in or designed to be used in, or carried within the interior of a building)
 2. the peak e.i.r.p. for outdoor usage (devices operating, situated in, designed to be used in, or carried in open air) shall not exceed 30 dBm
 - ii. FDS devices operating in the **57.0-61.56 GHz** band shall have the peak e.i.r.p. not exceeding 3 dBm or, if the sum of continuous transmitter off-times of at least 2 ms equals at least 16.5 ms within any contiguous interval of 33 ms, the peak e.i.r.p. shall not exceed 20 dBm.
 - iii. FDS operating in the 57.0-64.0 GHz band shall comply with one of the following limits, depending on the operating condition of the device:
 1. the peak e.i.r.p. shall not exceed 14 dBm and the sum of continuous transmitter off-times of at least 2 ms shall equal at least 25.5 ms within any contiguous interval of 33 ms
 2. for devices employed for outdoor operation (temporary or permanently fixed application) or vehicular uses (excluding in-cabin applications and operations), the peak e.i.r.p. shall not exceed 20 dBm and the sum of continuous transmitter off-times of at least 2 ms shall equal at least 16.5 ms within any contiguous interval of 33 ms
- c. For pulsed FDS devices operating in the 57-64 GHz band that have a maximum pulse duration of 6 ns:
 - i. the average e.i.r.p. shall not exceed 13 dBm and the transmit duty cycle shall not exceed 10% during any 0.3 μs time window
 - ii. the average integrated e.i.r.p. within the 61.5-64.0 GHz band shall not exceed 5 dBm in any 0.3 μs time window
 - iii. peak emissions shall not exceed 20 dB above the maximum permitted average emission limit applicable to the device
 - iv. the 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
- d. For FDS devices installed on UAVs, their peak e.i.r.p. shall not exceed 20 dBm and the sum of continuous transmitter off-times of at least 2 ms shall equal at least 16.5 ms within any contiguous interval of 33 ms. See also J.2(d).

8.3.2 Test summary

Verdict	Pass		
Test date	April 25, 2025	Temperature	21 °C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1003 mbar
Test location	☐ Wireless bench ☒ Other:3M Chamber	Relative humidity	52 %

8.3.3 Notes

This test was performed using the procedure described in ANSI C63.10-2020 section 9.8 using a spectrum analyzer.

The emission bandwidth of the EUT is 1401.35 MHz (See 8.1).

Transmitter operates continuously with 100% duty cycle.

8.3.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:
Measuring distance	0.8 m
Antenna height	1.903 m
Turn table position	0°
Measurement details	The EUT was measured in the maximum field strength emission.

8.3.5 Test data

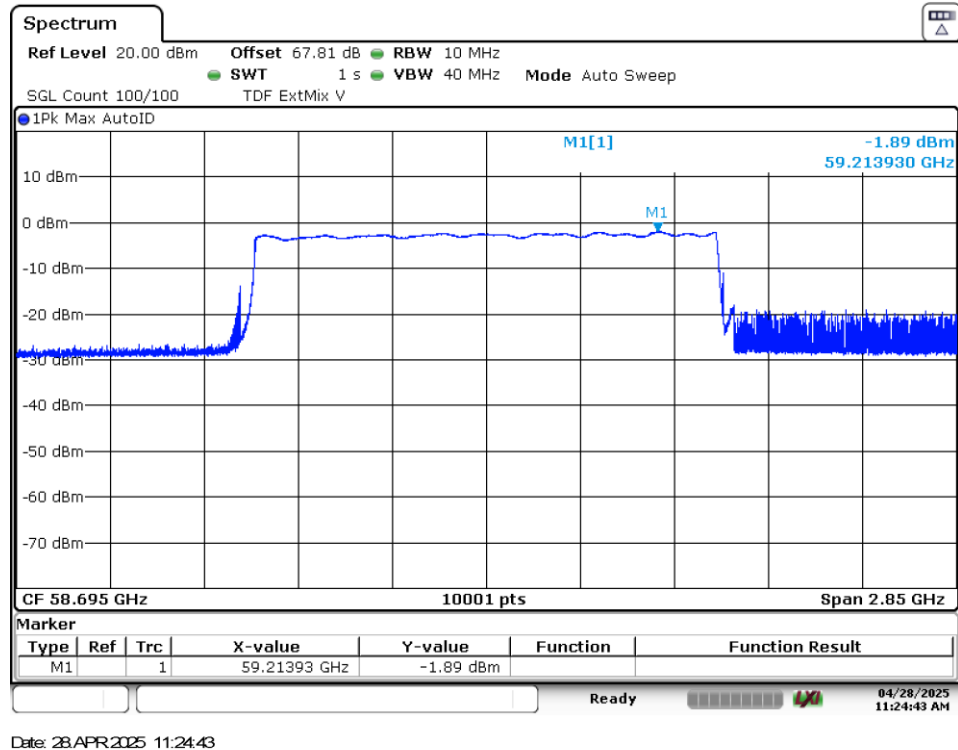


Figure 8.3-1: Power measurement of EUT with spectrum analyzer (peak value). Measurement realized at 0.8 meters.

Table 8.3-1: Power measurement of EUT with spectrum analyzer.

	Center Frequency (GHz)	EIRP density (dBm/10 MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Peak:	58.695	-1.89	19.57	20	0.43

Note: The above plot includes a reference level offset of 67.81 dB to account for free space path loss, measurement antenna gain and cable loss.

Note: $EIRP = EIRP \text{ Density (dBm/10 MHz)} + 10 \times \log(\text{Occupied Bandwidth} / 10) = -1.89 \text{ (dBm/10 MHz)} + 10 \times \log(1401.35 / 10) = 19.57 \text{ dBm}$

Note: Peak EIRP limit = 20 dBm (indoor use, §15.255(c)(2)(i) and RSS-210 Annex J.3.2(b)(1))

8.4 Transmitter spurious emissions

8.4.1 References and limits

- FCC 47 CFR Part 15, Subpart C: §15.255(d)
- RSS-210 Annex J: J.4

§15.255:

(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.

Spurious radiated emissions below 40 GHz must comply with the general field strength limits of Section 15.209. Below 1000 MHz, measurements are made with a CISPR quasi-peak detector and above 1000 MHz measurements are made with an average detector with a 1 MHz RBW at 3 meters. From 40 GHz to 200 GHz the emissions must not exceed 90 pW/cm² (18,000 µV/m) at 3 meters. Measurements are to be performed at the specified limit distance. If it is impractical to make measurements at the limit distance because of the distance or low signal levels, measurements may be performed at a closer distance but a low noise amplifier and/or a higher gain test antenna should be used to make measurements at the greatest distance from the EUT which provides an adequate signal to noise ratio to permit accurate amplitude measurements and extrapolated to the limit distance as specified in Section 15.31.

RSS-210 Annex J:

J.4 Spurious emissions

The power of 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 for emissions below 40 GHz
- c. 90 pW/cm² at a distance of 3 m for emissions between 40 GHz and 200 GHz

8.4.2 Test summary

Verdict	Pass		
Test date	April 21, 2025; April 22, 2025; April 23, 2025	Temperature	20;21;23 °C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1004;1002;1007 mbar
Test location	☐ Wireless bench ☒ Other:3M Chamber	Relative humidity	53;55;56 %

8.4.3 Notes

This test was done at a 3m (below 40 GHz) and 1m (above 40 GHz) measurement distance with the EUT configured to transmit at maximum output power. The spectrum was explored from 30 MHz to 200 GHz. Testing from 30 MHz to 40 GHz was assessed against the FCC 15.209 limits. Above 40 GHz, the limit is defined as 90 pW/cm² at 3m.

Calculation from limit line for this test (above 40 GHz):

$$PD = \frac{EIRP_{Linear}}{4\pi d^2}$$

Where:

PD = Power density at the distance specified by the limit, in W/cm²

EIRP_{Linear} = Equivalent Isotropically Radiated Power, in watts.

d = Distance at which the power density limit is specified, in cm

$$EIRP_{Linear} = (PD)(4\pi)(d^2)$$

$$EIRP_{Linear} = (90 \times 10^{-12})(4\pi)(300^2)$$

$$EIRP_{Linear} = 0.10178 \text{ mW} \approx 85.31 \text{ dB}\mu\text{V/m} @ 3\text{m (From 40 GHz to 75 GHz)}$$

At a measurement distance of 1 m and 0.4 m the calculated limit is:

$$E_{SpecLimit} = E_{Meas} + 20 \text{ Log} \left(\frac{d_{Meas}}{d_{SpecLimit}} \right)$$

$$E_{SpecLimit} = 85.31 + 20 \text{ Log} \left(\frac{3}{1} \right) \approx 94.85 \text{ dB}\mu\frac{V}{m} @ 1 \text{ m (From 75 GHz to 150 GHz)}$$

$$E_{SpecLimit} = 85.31 + 20 \text{ Log} \left(\frac{3}{0.4} \right) \approx 102.81 \text{ dB}\mu\frac{V}{m} @ 0.4 \text{ m (From 150 GHz to 200 GHz)}$$

In the frequency range from 150 GHz to 200 GHz, the EUT was scanned in all directions and polarizations at very close range (< 10 cm) and no observable emissions were detected.

8.4.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated, and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings (below 1 GHz):

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurements) Quasi-peak (final measurements)
Trace mode	Max Hold
Measurement time	5000 ms (final measurements)

Receiver settings (from 1 -40 GHz):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak (preview measurements) Peak and average (final measurements)
Trace mode	Max Hold
Measurement time	5000 ms (final measurements)

Spectrum analyzer settings (above 40 GHz):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold

8.4.5 Test data

Below 40 GHz:

Full Spectrum

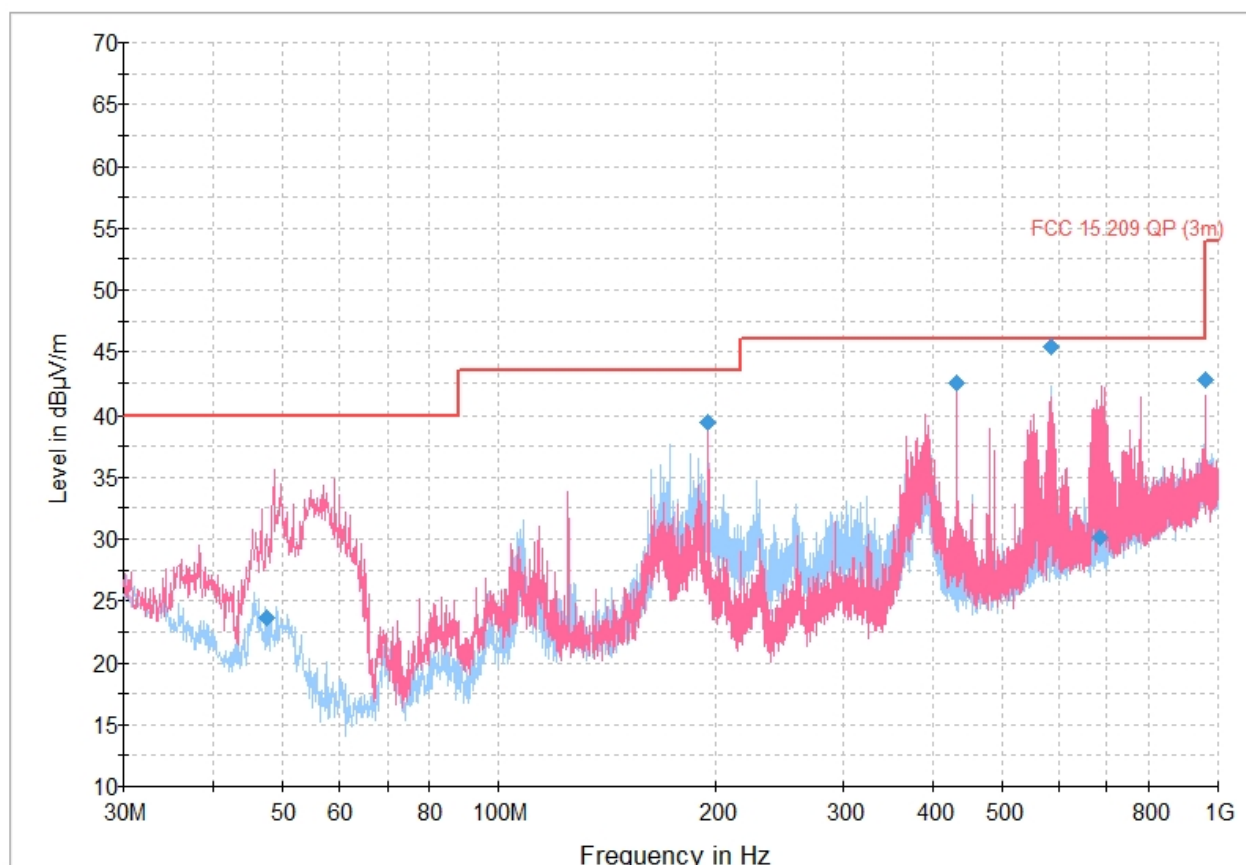


Figure 8.4-1: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 8.4-1: Radiated emissions results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.624000	23.64	40.00	16.36	5000.0	120.000	103.0	V	95.0	17.3
194.997000	39.45	43.50	4.05	5000.0	120.000	168.0	H	249.0	17.9
431.968000	42.51	46.00	3.49	5000.0	120.000	103.0	V	302.0	26.0
584.994000	45.35	46.00	0.65	5000.0	120.000	107.0	H	30.0	29.1
685.799000	30.15	46.00	15.85	5000.0	120.000	237.0	V	323.0	30.5
959.996000	42.70	46.00	3.30	5000.0	120.000	273.0	V	251.0	34.7

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

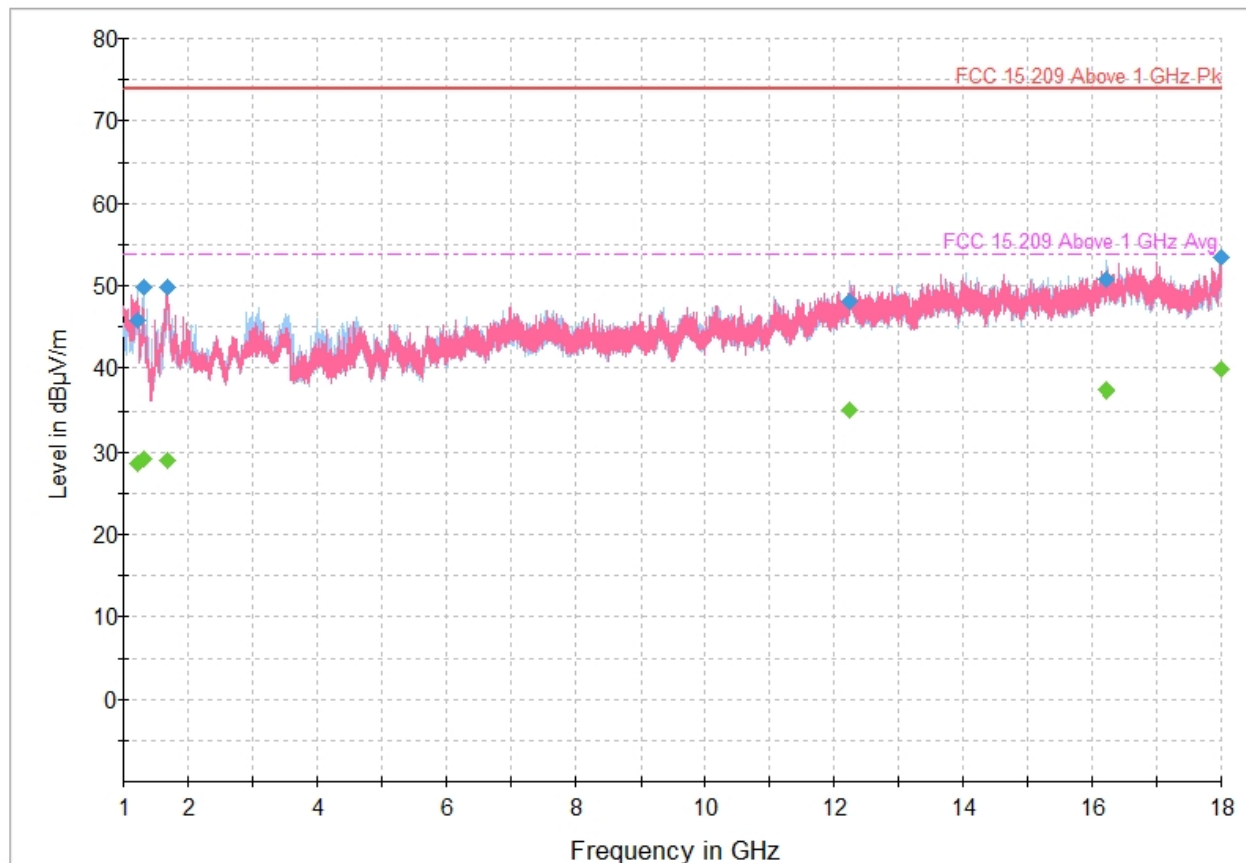


Figure 8.4-2: Radiated emissions spectral plot (1 GHz - 18 GHz)

Table 8.4-2: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1210.133333	---	28.63	53.90	25.27	5000.0	1000.000	173.0	H	219.0	-10.8
1210.133333	45.87	---	73.90	28.03	5000.0	1000.000	173.0	H	219.0	-10.8
1311.233333	49.82	---	73.90	24.08	5000.0	1000.000	127.0	H	0.0	-10.4
1311.233333	---	29.16	53.90	24.74	5000.0	1000.000	127.0	H	0.0	-10.4
1676.733333	49.76	---	73.90	24.14	5000.0	1000.000	284.0	V	0.0	-9.1
1676.733333	---	28.95	53.90	24.95	5000.0	1000.000	284.0	V	0.0	-9.1
12242.555556	48.09	---	73.90	25.81	5000.0	1000.000	302.0	H	82.0	15.7
12242.555556	---	35.07	53.90	18.83	5000.0	1000.000	302.0	H	82.0	15.7
16219.033333	---	37.45	53.90	16.45	5000.0	1000.000	397.0	H	45.0	23.0
16219.033333	50.75	---	73.90	23.15	5000.0	1000.000	397.0	H	45.0	23.0
17989.166667	53.44	---	73.90	20.46	5000.0	1000.000	397.0	H	352.0	24.6
17989.166667	---	39.89	53.90	14.01	5000.0	1000.000	397.0	H	352.0	24.6

Notes: 1 Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

2 Correction factors = antenna factor ACF (dB) + cable loss (dB)

3 Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

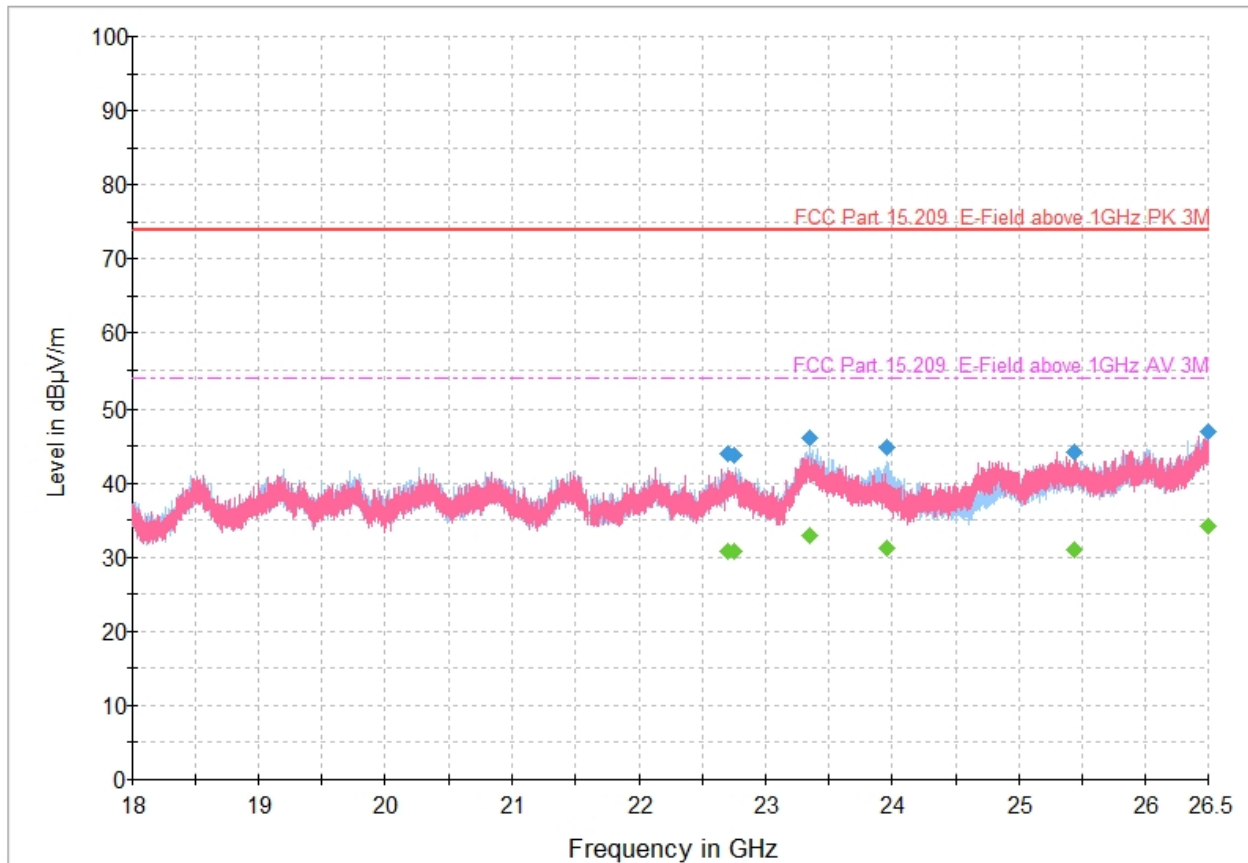


Figure 8.4-3: Radiated emissions spectral plot (18 GHz - 26.5 GHz)

Table 8.4-3: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
22700.912500	44.00	---	73.90	29.90	5000.0	1000.000	365.0	H	232.0	18.0
22700.912500	---	30.74	53.90	23.16	5000.0	1000.000	365.0	H	232.0	18.0
22750.906250	43.76	---	73.90	30.14	5000.0	1000.000	239.0	H	168.0	18.4
22750.906250	---	30.73	53.90	23.17	5000.0	1000.000	239.0	H	168.0	18.4
23346.225000	46.10	---	73.90	27.80	5000.0	1000.000	258.0	H	313.0	21.8
23346.225000	---	32.91	53.90	20.99	5000.0	1000.000	258.0	H	313.0	21.8
23953.393750	44.74	---	73.90	29.16	5000.0	1000.000	362.0	H	0.0	21.6
23953.393750	---	31.15	53.90	22.75	5000.0	1000.000	362.0	H	0.0	21.6
25446.375000	44.26	---	73.90	29.64	5000.0	1000.000	378.0	H	331.0	20.9
25446.375000	---	31.06	53.90	22.84	5000.0	1000.000	378.0	H	331.0	20.9
26499.812500	46.97	---	73.90	26.93	5000.0	1000.000	165.0	H	352.0	24.7
26499.812500	---	34.11	53.90	19.79	5000.0	1000.000	165.0	H	352.0	24.7

Notes: 1 Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

2 Correction factors = antenna factor ACF (dB) + cable loss (dB)

3 Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

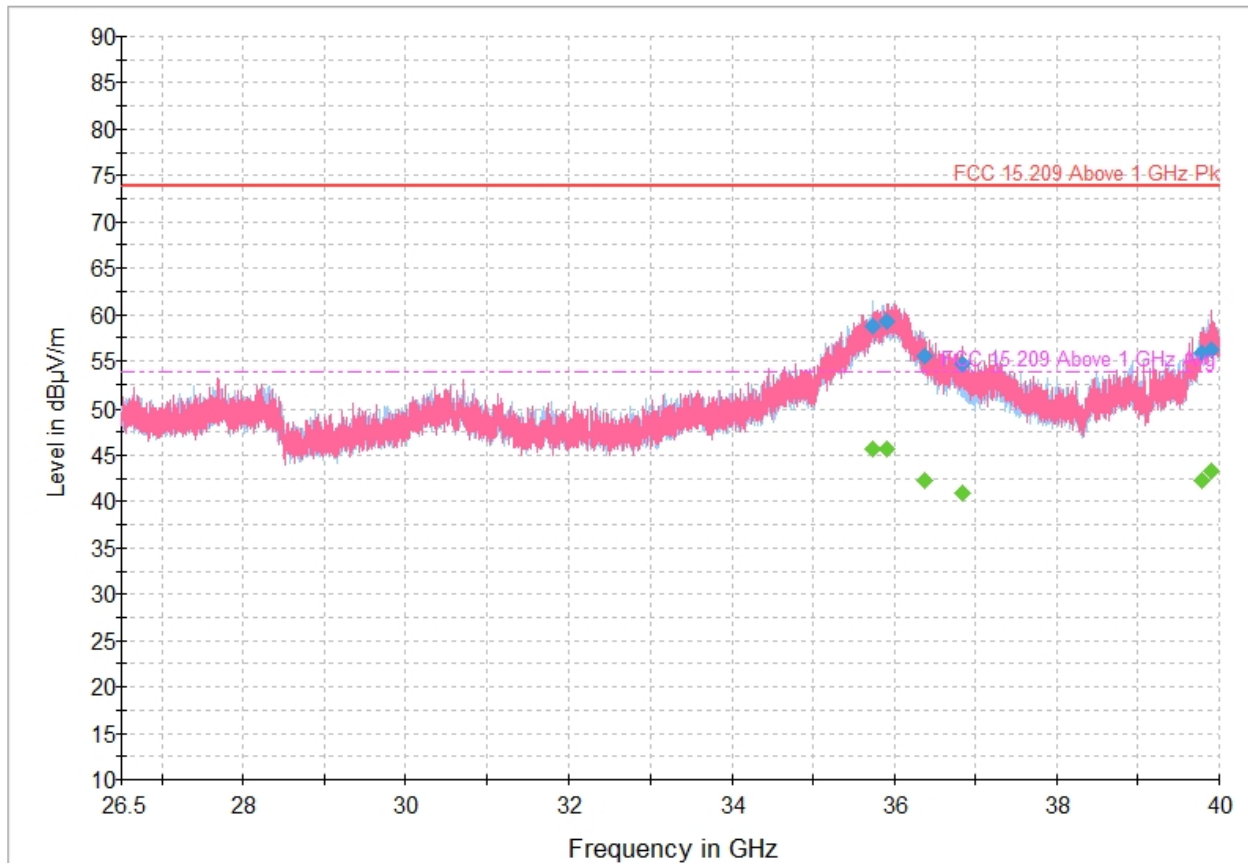


Figure 8.4-4: Radiated emissions spectral plot (26.5 GHz - 40 GHz)

Table 8.4-4: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35733.662500	58.79	---	73.90	15.11	5000.0	1000.000	104.0	H	48.0	19.9
35733.662500	---	45.60	53.90	8.30	5000.0	1000.000	104.0	H	48.0	19.9
35904.587500	---	45.71	53.90	8.19	5000.0	1000.000	184.0	V	8.0	20.4
35904.587500	59.31	---	73.90	14.59	5000.0	1000.000	184.0	V	8.0	20.4
36371.593750	---	42.25	53.90	11.65	5000.0	1000.000	125.0	H	229.0	17.0
36371.593750	55.48	---	73.90	18.42	5000.0	1000.000	125.0	H	229.0	17.0
36834.718750	---	40.97	53.90	12.93	5000.0	1000.000	123.0	V	11.0	15.0
36834.718750	54.60	---	73.90	19.30	5000.0	1000.000	123.0	V	11.0	15.0
39777.231250	55.86	---	73.90	18.04	5000.0	1000.000	106.0	H	18.0	16.7
39777.231250	---	42.23	53.90	11.67	5000.0	1000.000	106.0	H	18.0	16.7
39902.331250	---	43.22	53.90	10.68	5000.0	1000.000	180.0	V	8.0	18.3
39902.331250	56.22	---	73.90	17.68	5000.0	1000.000	180.0	V	8.0	18.3

Notes: 1 Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

2 Correction factors = antenna factor ACF (dB) + cable loss (dB)

3 Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Above 40 GHz:

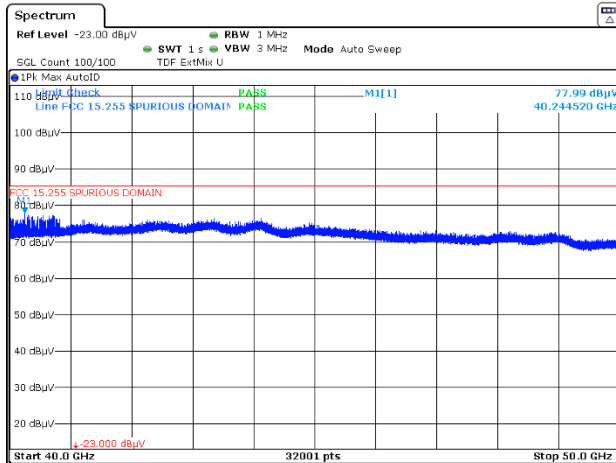


Figure 8.4-5: Unwanted emissions spurious band plot – Field strength measured from 40 to 50 GHz, horizontal polarization.

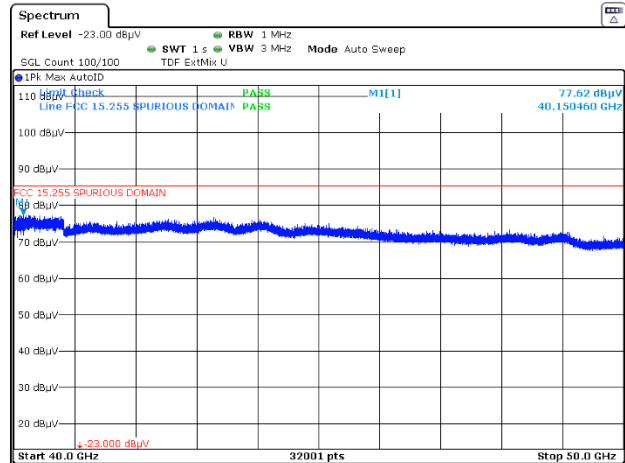
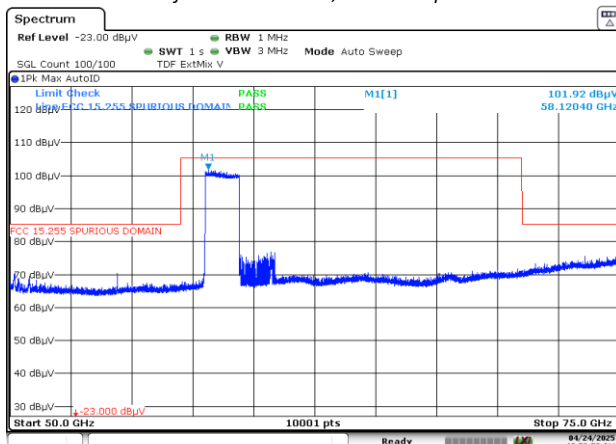
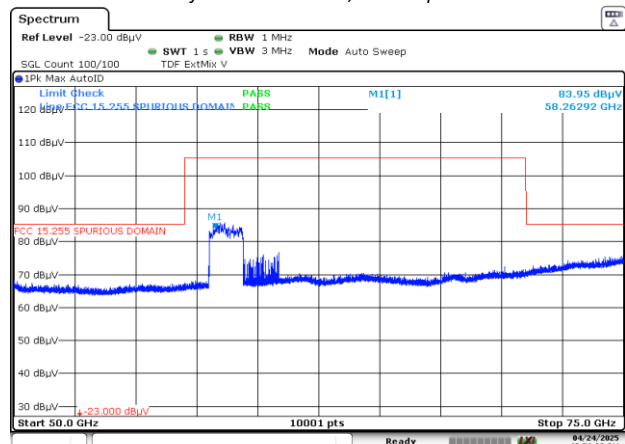


Figure 8.4-6: Unwanted emissions spurious band plot – Field strength measured from 40 to 50 GHz, vertical polarization.



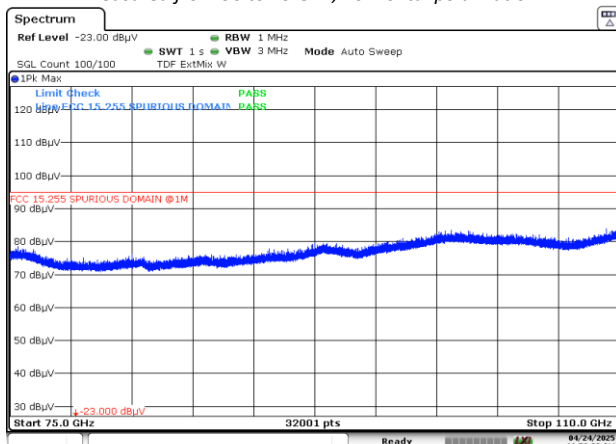
Date: 24/APR/2025 10:58:50

Figure 8.4-7: Unwanted emissions spurious band plot – Field strength measured from 50 to 75 GHz, horizontal polarization.



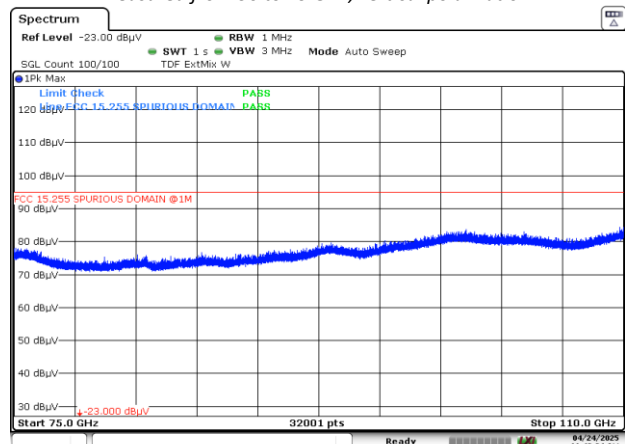
Date: 24/APR/2025 10:51:03

Figure 8.4-8: Unwanted emissions spurious band plot – Field strength measured from 50 to 75 GHz, vertical polarization.



Date: 24/APR/2025 11:52:10

Figure 8.4-9: Unwanted emissions spurious band plot – Field strength measured from 75 to 110 GHz, horizontal polarization.



Date: 24/APR/2025 11:48:04

Figure 8.4-10: Unwanted emissions spurious band plot – Field strength measured from 75 to 110 GHz, vertical polarization.

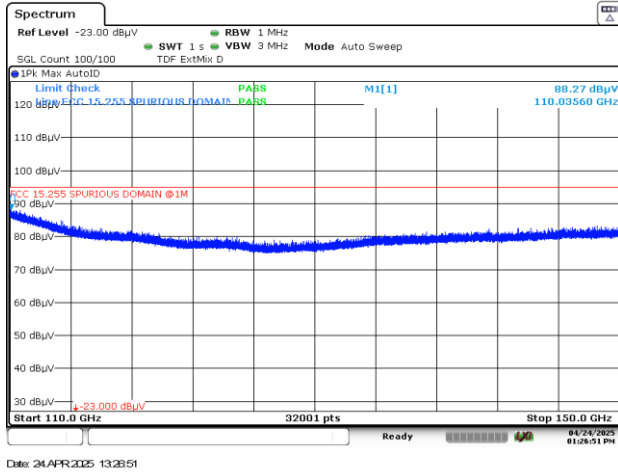


Figure 8.4-11: Unwanted emissions spurious band plot – Field strength measured from 110 to 150 GHz, horizontal polarization.

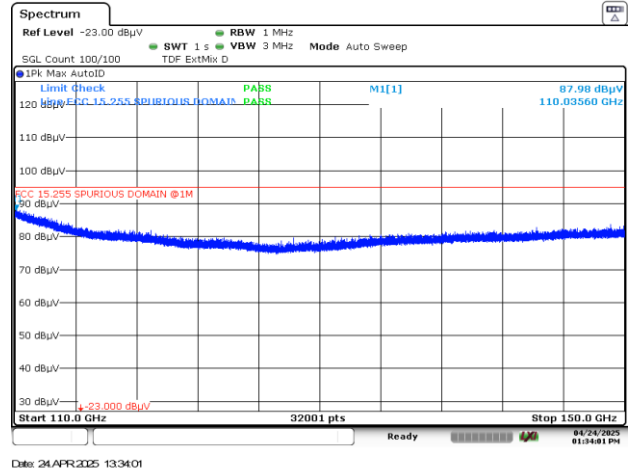


Figure 8.4-12: Unwanted emissions spurious band plot – Field strength measured from 110 to 150 GHz, vertical polarization.

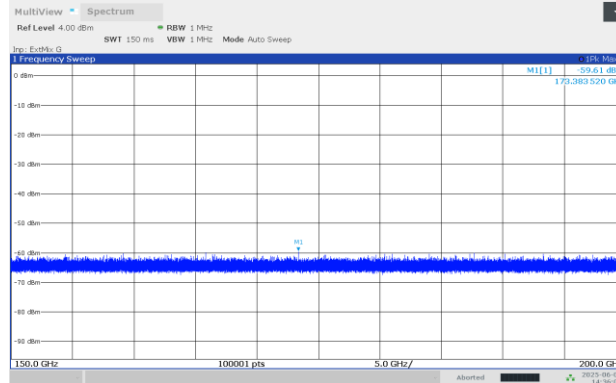


Figure 8.4-13: Unwanted emissions spurious band plot – Field strength measured from 150 to 200 GHz, both polarizations, pre-scan at close (< 10 cm) separation

8.5 Frequency stability

8.5.1 References and limits

- FCC 47 CFR Part 15, Subpart C: §15.255(f)
- RSS-210 Annex J: J.6

§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.

RSS-210 Annex J:

J.6 Transmitter frequency stability

Fundamental emissions shall be contained within the 57-71 GHz frequency band during all conditions of operation when tested at the temperature and voltage variations specified for the frequency stability measurement in RSS-Gen.

8.5.2 Test summary

Verdict	Pass		
Test date	April 25, 2025	Temperature	22 °C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1004 mbar
Test location	☐ Wireless bench	Relative humidity	57 %
	☐ 10 m semi-anechoic chamber		
	☐ 3 m semi-anechoic chamber		
	☒ Other: Temperature chamber		

8.5.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power.

8.5.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:

Spectrum analyzer settings:

Resolution bandwidth	10 MHz
Video bandwidth	40 MHz
Detector mode	Peak
Trace mode	Max Hold

8.5.5 Test data

Table 7.4-1: Frequency stability results.

<i>Voltage</i>	<i>Temperature</i>	<i>Lowest frequency</i>	<i>Highest frequency</i>	<i>CF</i>	<i>ppm</i>	<i>Result</i>
120 V	10	58.00253	59.3853	58.693915	-1.84854E-05	Within the band
120 V	15	58.00035	59.3853	58.692825	-3.7056E-05	Within the band
120 V	20	58.00253	59.3853	58.693915	-1.84854E-05	Within the band
120 V	25	58.00253	59.38313	58.69283	-3.69708E-05	Within the band
120 V	30	58.0035	59.3853	58.6944	-1.02223E-05	Within the band
120 V	35	58.00253	59.38474	58.693635	-2.32558E-05	Within the band

<i>Voltage</i>	<i>Temperature</i>	<i>Lowest frequency</i>	<i>Highest frequency</i>	<i>CF</i>	<i>ppm</i>	<i>Result</i>
102 V	+20°	58.00253	59.38313	58.69283	-3.69708E-05	Within the band
138 V	+20°	58.00035	59.38313	58.69174	-5.55414E-05	Within the band

End of test report