UNIFIED COMPLIANCE LABORATORY

427 West 12800 South
Draper, UT 84020

Test Report

Certification

FCC ID	SWX-UDB
ISED ID	6545A-UDB
Equipment Under Test	UDB
Test Report Serial Number	TR9355_02
Date of Test(s)	11 – 12, 15 – 18 July; 2, 7 – 8, 14 August; 10 September 2024
Report Issue Date	11 September 2024

Test Specification	Applicant
47 CFR FCC Part 15, Subpart E	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.

NVLAP TESTING ilac-MRA

NVLAP LAB CODE 600241-0

Certification of Engineering Report

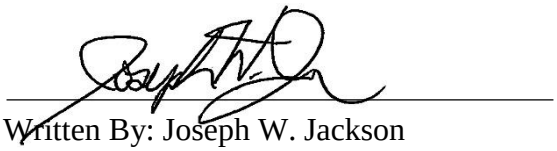
This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	UBIQUITI
Model Number	UDB
FCC ID	SWX-UDB
ISED ID	6545A-UDB

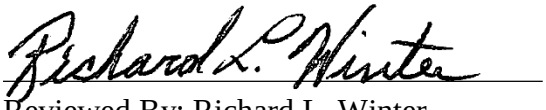
On this 11th day of September 2024, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory



Written By: Joseph W. Jackson



Reviewed By: Richard L. Winter

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	11 September 2024
02	Amended Section 5.4	23 September 2024

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1 Client Information

1.1 Applicant

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Alex Macon
Title	Compliance

1.2 Manufacturer

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Alex Macon
Title	Compliance

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	UBIQUITI
Model Number	UDB
Serial Number	942A6F40644E
Dimensions (cm)	13.0 x 5.5 x 3.4

2.2 Description of EUT

The UDB is a wireless bridging PoE adapter. The UDB has a 2.4 GHz and 5 GHz transmitter for wireless communications. The 5 GHz is operating in the UNII-1, UNII-2a, UNII-2c, and UNII-3 bands. The UDB can operate with an internal and external antenna. The UDB has one PoE port to power a PoE supported device. The UDB is powered from 120 – 240 Volts AC Mains.

Band	WiFi Mode	Modulation Bandwidth	Modulation Type	Frequency (MHz)
UNII-1	a	20 MHz	OFDM	5180, 5200, 5210, 5240
	ac	20 MHz	VHT	5180, 5200, 5210, 5240
	ac	40 MHz	VHT	5190, 5230
	ac	80 MHz	VHT	5210

This report covers the circuitry of the device subject to FCC Part 15, Subpart E. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory test report.

2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: UBIQUITI MN: UDB SN: 942A6F40644E	PoE Bridging Adapter	See Section 2.4
BN: Dell MN: XPS 13 SN: N/A	Laptop Computer	Ethernet / Un-Shielded Cat 5E

Notes: (1) EUT
(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT

Name of Ports	No. of Ports Fitted to EUT	Cable Description/Length
AC Mains	1	Power Cable/1m
PoE Output	1	Unshielded Cat 5E/7m

2.5 Operating Environment

Power Supply	120 Volts AC Mains
AC Mains Frequency	60 Hz
Temperature	25.7 – 26.3 °C
Humidity	26.9 – 35.8 %
Barometric Pressure	1015 mBar

2.6 Operating Modes

The UDB was tested using test software in order to enable a constant transmission. The measurements within this report are corrected to reference a 100% duty cycle. All emission modes of 802.11 a/ac were investigated. All measurements are reported with the worst-case mode (802.11ax) unless otherwise stated.

2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.

2.8 Block Diagram of Test Configuration

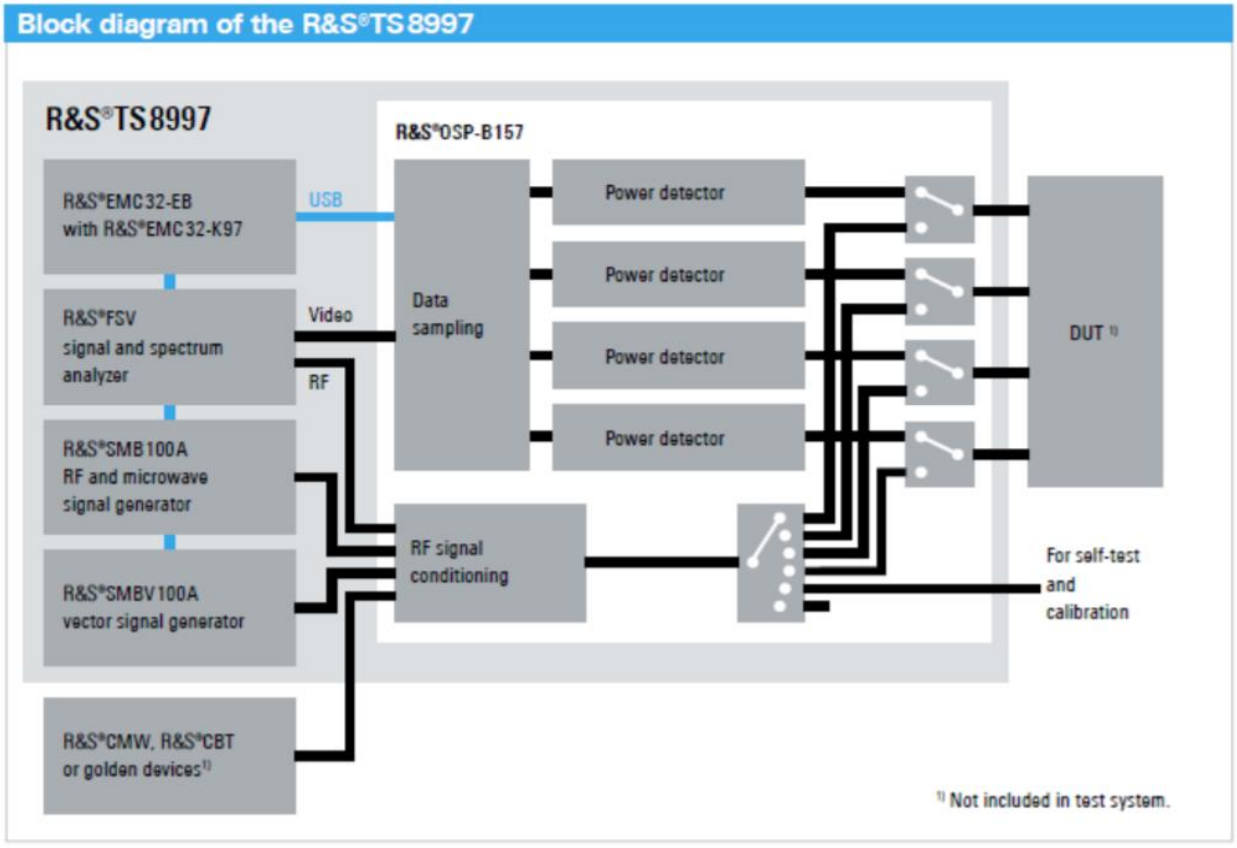


Diagram 1: Test Configuration Block Diagram

2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

There were no deviations, opinions, additional information or interpretations from the test specification.

3 Test Specification, Method and Procedures

3.1 Test Specification

Title	47 CFR FCC Part 15, Subpart E, Section 15.407 Limits and methods of measurement of radio interference characteristics of Unlicensed National Information Infrastructure Devices
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures

3.2.1 47 CFR FCC Part 15 Section 15.407

See test standard for details.

3.3 FCC Part 15, Subpart E

3.3.1 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.407(a)	N/A	Antenna requirements	Structural Requirement	Compliant
15.407(b)	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.407(c)	RSS-247 §6.2.2, §6.2.3	Bandwidth Requirement	5180 to 5210	Compliant
15.407(e)	RSS-247 §6.2.2, §6.2.3	Peak Output Power	5180 to 5210	Compliant
15.407(f)	RSS-247 §6.2.2, §6.2.3	Antenna Conducted Spurious Emissions	0.009 to 40000	N/A
15.407(g)	RSS-247 §6.2.2, §6.2.3	Radiated Spurious Emissions	0.009 to 40000	Compliant
15.407(h)	RSS-247 §6.2.2, §6.2.3	Peak Power Spectral Density	5180 to 5210	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.				

3.4 Results

In the configuration tested, the EUT complied with the requirements of the specification.

3.5 Test Location

Testing was performed at the Unified Compliance Laboratory 3-Meter and 10-Meter chambers located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2025. This site has also been registered with Innovations, Science and Economic Development (ISED) department as was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until 30 June 2025.

Unified Compliance Laboratory has been assigned Designation Number US5037 by the FCC and Conformity Assessment Number US0223 by ISED.

4 Test Equipment

4.1 Conducted Emissions at Mains Ports

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	AFJ	FFT3010	UCL-6754	1/23/2024	2/26/2025
LISN	AFJ	LS16C/10	UCL-2512	7/08/2024	7/08/2025
ISN	Teseq	ISN T800	UCL-2974	7/09/2024	7/09/2025
LISN	AFJ	LS16C\10	UCL-6749	1/29/2024	1/29/2025
AC Power Source	Laplace Instruments	AC1000A	UCL-2857	N/A	N/A
Test Software	UCL	Revision 1	UCL-3107	N/A	N/A

Table 1: List of equipment used for Conducted Emissions Testing at Mains Port

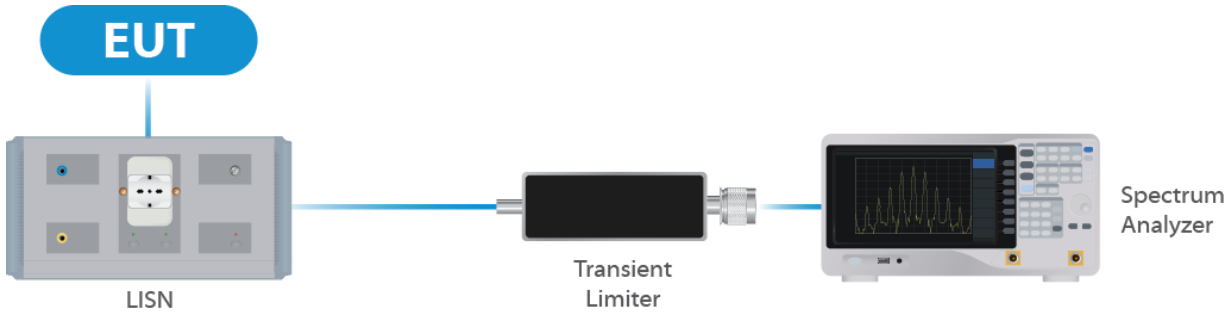


Figure 1: Conducted Emissions Test

4.2 Direct Connect at the Antenna Port Tests

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	R&S	FSV40	UCL-2861	11/27/2023	11/27/2024
Signal Generator	R&S	SMB100A	UCL-2864	N/A	N/A
Vector Signal Generator	R&S	SMBV100A	UCL-2873	N/A	N/A
Switch Extension	R&S	OSP-B157WX	UCL-2867	4/12/2024	4/19/2025
Switch Extension	R&S	OSP-150W	UCL-2870	4/12/2024	4/19/2025

Table 2: List of equipment used for Direct Connect at the Antenna Port

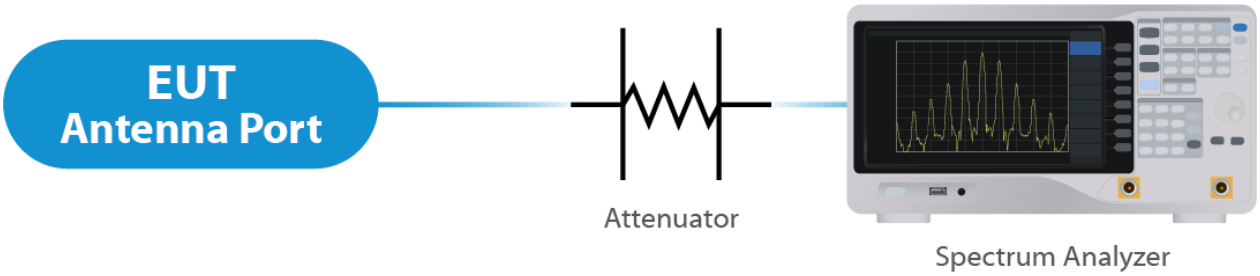


Figure 2: Direct Connect at the Antenna Port Test

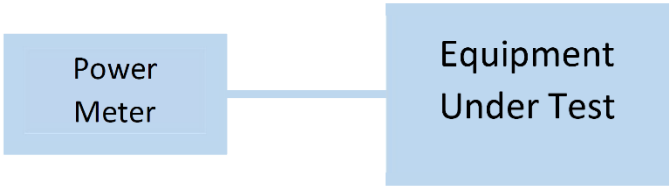


Figure 3: Output Power Measurement

4.3 Radiated Emissions

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	Keysight	N9038A	UCL-2778	1/25/2024	1/29/2025
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-2889	1/19/2024	1/19/2026
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3062	2/22/2023	2/22/2025
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3071	1/11/2023	1/11/2025
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	3/10/2023	3/10/2025
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	1/27/2023	1/27/2025
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	3/10/2023	3/10/2025
1 – 18 GHz Amplifier	Com-Power	PAM 118A	UCL-3833	1/19/2024	1/19/2026
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 3: List of equipment used for Radiated Emissions

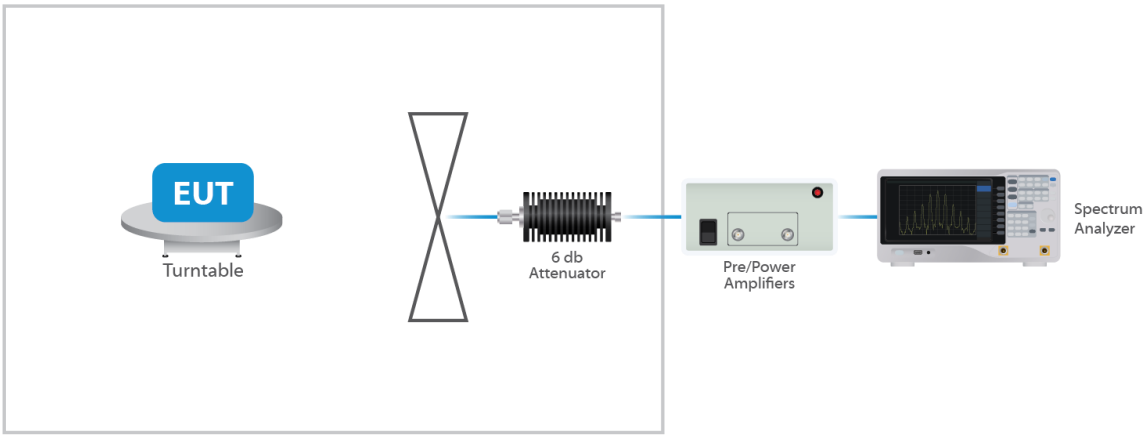


Figure 4: Radiated Emissions Test

4.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

4.5 Measurement Uncertainty

Test	Uncertainty (± dB)	Confidence (%)
Conducted Emissions	1.44	95
Radiated Emissions (9 kHz to 30 MHz)	2.50	95
Radiated Emissions (30 MHz to 1 GHz)	4.38	95
Radiated Emissions (1 GHz to 18 GHz)	4.37	95
Radiated Emissions (18 GHz to 40 GHz)	3.93	95
Direct Connect Tests	**K Factor**	**Value**
Emissions Bandwidth	2	2.0%
Output Power	2	1.0 dB
Peak Power Spectral Density	2	1.3 dB
Band Edge	2	0.8 dB
Transmitter Spurious Emissions	2	1.8 dB

5 Test Results

5.1 §15.203 Antenna Requirements

The EUT uses an integral internal antenna and a Dipole external antenna. Per the manufacturer, the Maximum gain of the internal antenna per chain is 5 dBi and the external antenna is 4 dBi. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The antenna internal antenna is not user replaceable while the external antenna is user replaceable. For CDD transmissions, directional gain is calculated as follows.

Array Gain = 10 log(NANT/NSS) dB
NANT = number of transmit antennas and
NSS = number of spatial streams. NSS = 1 considered worst case.

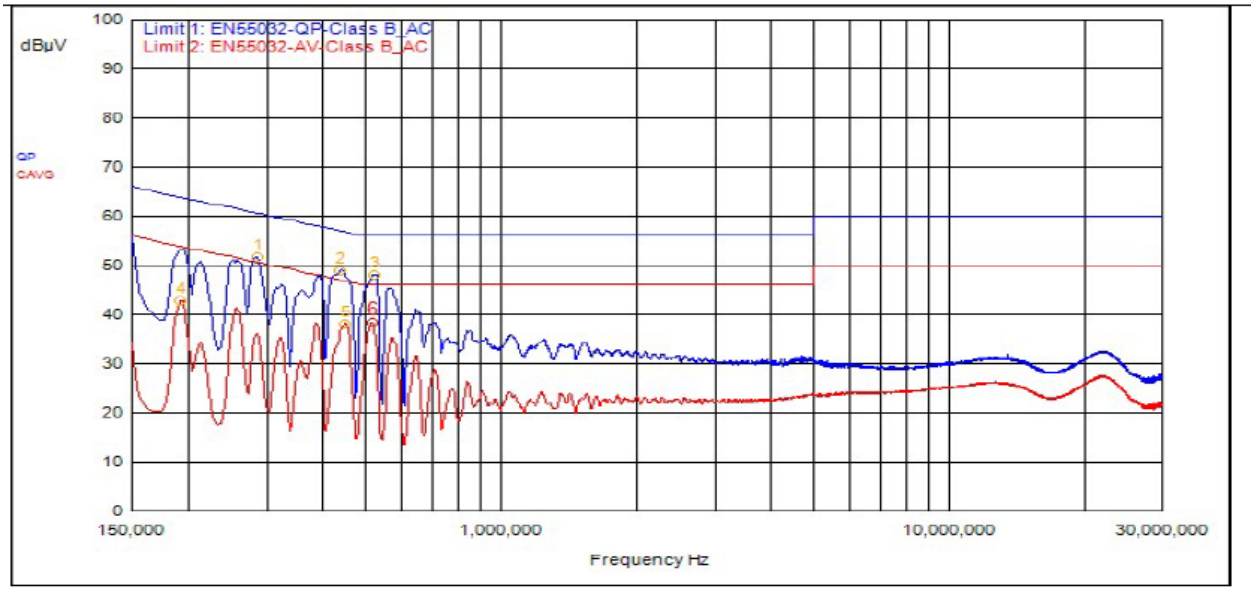
For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for NANT ≤ 4;
For PSD measurements when Nss=1: Array Gain = 10 log(NANT/NSS) dB + Antenna Gain (dBi). Or 3.01 dB + 5 dBi = 8.01 dBi for the internal antenna and 3.01 dB + 4 dBi = 7.01 dBi for the external antenna.

Results

The EUT complied with the specification

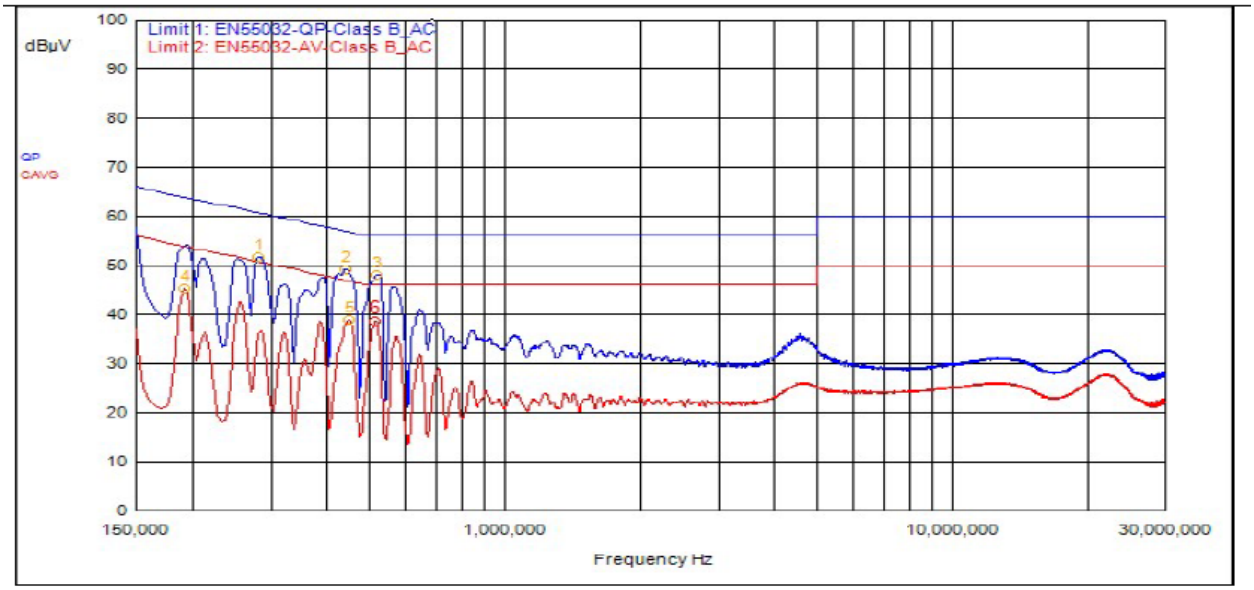
5.2 Conducted Emissions at Mains Ports Data

5.2.1 Line



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.	P/F
MU	MHz	dB	dB	dB	Type	dBµV	dBµV	dBµV	dB	dBµV	dB	P/F
3	519,000kHz	9.49			QPeak	38.70	48.19	56.00	-7.81			
2	438,000kHz	9.49			QPeak	39.35	48.84	57.10	-8.26			
1	285,000kHz	9.48			QPeak	42.22	51.70	60.67	-8.97			
4	192,000kHz	9.49			C_AVG	33.34	42.83			53.95	-11.12	
5	447,000kHz	9.49			C_AVG	28.70	38.19			46.93	-8.74	
6	516,000kHz	9.49			C_AVG	28.96	38.45			46.00	-7.55	

5.2.2 Neutral



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.	P/F
MU	MHz	dB	dB	dB	Type	dBµV	dBµV	dBµV	dB	dBµV	dB	P/F
2	441,000kHz	9.64			QPeak	39.63	49.27	57.04	-7.77			
3	516,000kHz	9.63			QPeak	38.55	48.18	56.00	-7.82			
1	282,000kHz	9.63			QPeak	42.09	51.72	60.76	-9.04			
4	192,000kHz	9.62			C_AVG	35.58	45.20			53.95	-8.75	
5	447,000kHz	9.64			C_AVG	29.24	38.88			46.93	-8.05	
6	513,000kHz	9.63			C_AVG	28.91	38.54			46.00	-7.46	

Result

The EUT complied with the specification limit.

5.3 §15.403(i) 26 dB Emissions Bandwidth

All chains were measured under the guidance of KDB 789033 Section II.C. and KDB 66291 D01. Please see associated annex for details on instrument settings.

5.3.1 Internal Antenna

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
OFDM 20	5180	16.8	23.4
OFDM 20	5210	20.8	37.8
OFDM 20	5240	34.5	59.4
VHT 20	5180	18.3	21.7
VHT 20	5210	18.3	21.1
VHT 20	5240	18.3	21.7
VHT 40	5190	37.5	42.0
VHT 40	5230	37.5	42.3
VHT 80	5210	77.0	83.5

5.3.2 External/Internal Antenna

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
OFDM 20	5180	17.0	21.8
OFDM 20	5210	27.3	41.7
OFDM 20	5240	25.5	37.0
VHT 20	5180	18.5	22.0
VHT 20	5210	18.3	22.2
VHT 20	5240	18.3	22.5
VHT 40	5190	37.0	43.1
VHT 40	5230	37.5	41.7
VHT 80	5210	77.0	83.0

Result

All chains were tested and the highest bandwidth per chain is reported above.
The 26 dB bandwidths are reported for information purposes. Please see Annex for all bandwidth measurements.

5.4 §15.407(a)(2) Maximum Average Output Power

All chains/outputs were measured and summed under the guidance of KDB 789033 Section II. E.2. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average RF conducted output power measured for this device was 24.89 dBm or 314.77 mW. The limit is 30 dBm, or 1 Watt when using an antenna with 23 dBi (Fixed point to point) or 6 dBi (indoor/outdoor access point) or less gain. The internal antenna has a gain of 5 dBi and the external antenna has a gain of 4 dBi.
Internal Antenna

5.4.1 Internal Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0_Nss2	35	19.36	24.36	7.46
OFDM 20	5210	Mcs0_Nss2	43	23.45	28.45	11.30
OFDM 20	5240	Mcs0_Nss2	45	24.89	29.89	12.62
VHT 20	5180	Mcs0_Nss2	45	15.89	20.89	3.31
VHT 20	5210	Mcs0_Nss2	45	16.05	21.05	3.22
VHT 20	5240	Mcs0_Nss2	45	15.92	20.92	2.97
VHT 40	5190	Mcs0_Nss2	45	16.58	21.58	1.95
VHT 40	5230	Mcs0_Nss2	45	16.69	21.69	1.35
VHT 80	5210	Mcs0_Nss2	45	16.04	21.04	-1.47

5.4.2 External/Internal Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0_Nss2	36	19.25	24.25	7.13
OFDM 20	5210	Mcs0_Nss2	44	23.52	28.52	11.22
OFDM 20	5240	Mcs0_Nss2	47	23.49	28.49	11.23
VHT 20	5180	Mcs0_Nss2	47	15.50	20.50	2.67
VHT 20	5210	Mcs0_Nss2	47	15.05	20.05	2.47
VHT 20	5240	Mcs0_Nss2	47	15.03	20.03	2.32
VHT 40	5190	Mcs0_Nss2	47	16.04	21.04	1.02
VHT 40	5230	Mcs0_Nss2	47	15.84	20.84	0.61
VHT 80	5210	Mcs0_Nss2	47	15.32	20.32	-2.13

5.4.3 Internal Antenna - Canada (Indoor Use Only)

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0_Nss2	32	17.89	22.89	5.92
OFDM 20	5210	Mcs0_Nss2	32	17.68	22.68	5.49
OFDM 20	5240	Mcs0_Nss2	33	17.66	22.66	5.44
VHT 20	5180	Mcs0_Nss2	45	15.89	20.89	3.31
VHT 20	5210	Mcs0_Nss2	45	16.05	21.05	3.22
VHT 20	5240	Mcs0_Nss2	45	15.92	20.92	2.97
VHT 40	5190	Mcs0_Nss2	45	16.58	21.58	1.95
VHT 40	5230	Mcs0_Nss2	45	16.69	21.69	1.35
VHT 80	5210	Mcs0_Nss2	45	16.04	21.04	-1.47

5.4.4 External/Internal Antenna – Canada (Indoor Use Only)

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0_Nss2	30	16.64	21.64	4.65
OFDM 20	5210	Mcs0_Nss2	32	17.02	22.02	4.76
OFDM 20	5240	Mcs0_Nss2	32	16.91	21.91	4.86
VHT 20	5180	Mcs0_Nss2	45	15.89	20.89	3.31
VHT 20	5210	Mcs0_Nss2	45	16.05	21.05	3.22
VHT 20	5240	Mcs0_Nss2	45	15.92	20.92	2.97
VHT 40	5190	Mcs0_Nss2	45	16.58	21.58	1.95
VHT 40	5230	Mcs0_Nss2	45	16.69	21.69	1.35
VHT 80	5210	Mcs0_Nss2	45	16.04	21.04	-1.47

Result

In the configuration tested, the maximum summed average RF output power was less than 1 watt; therefore, the EUT compiled with the requirements of the specification (see spectrum analyzer plots in attached Annex).

5.5 §15.407(b) Spurious Emissions

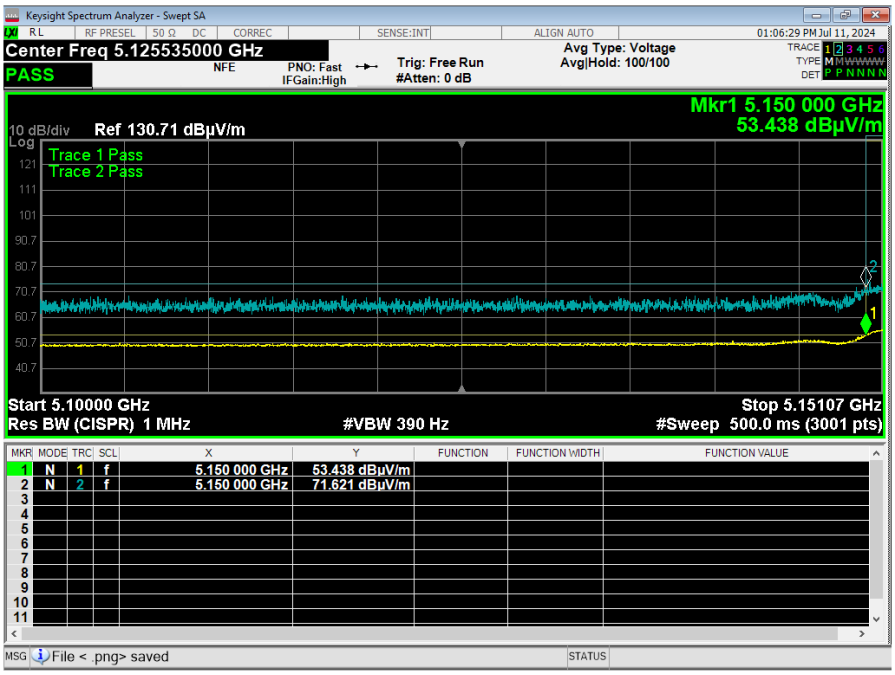
5.5.1 Conducted Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The graphs show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown below are plots with the EUT turned to the upper and lower channels with the antenna gain of 5 dBi accounted for. These demonstrate compliance with the provisions of this section at the band edges.

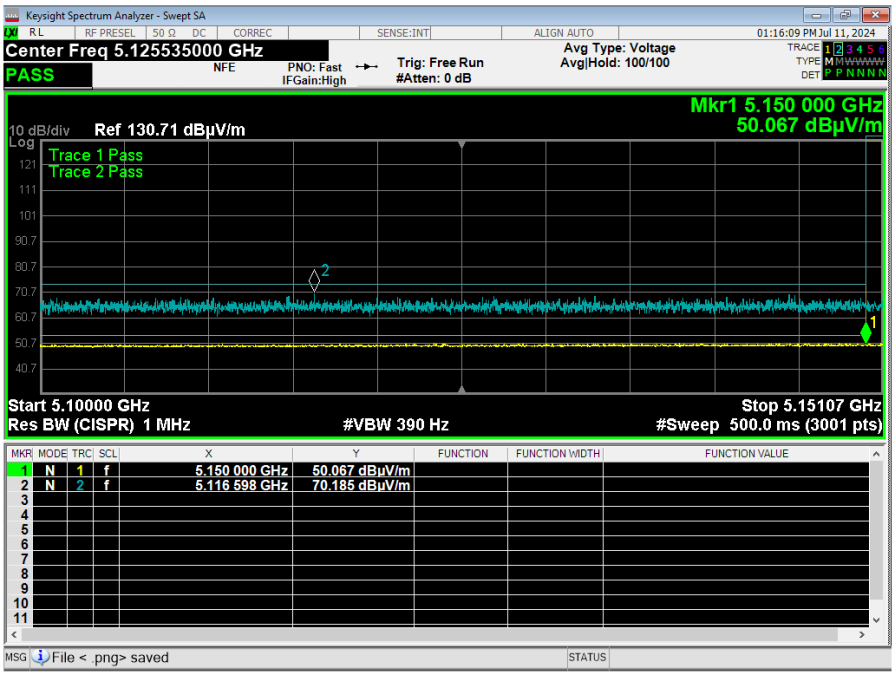
The emissions must be remain below -27 dBm EIRP.

Result

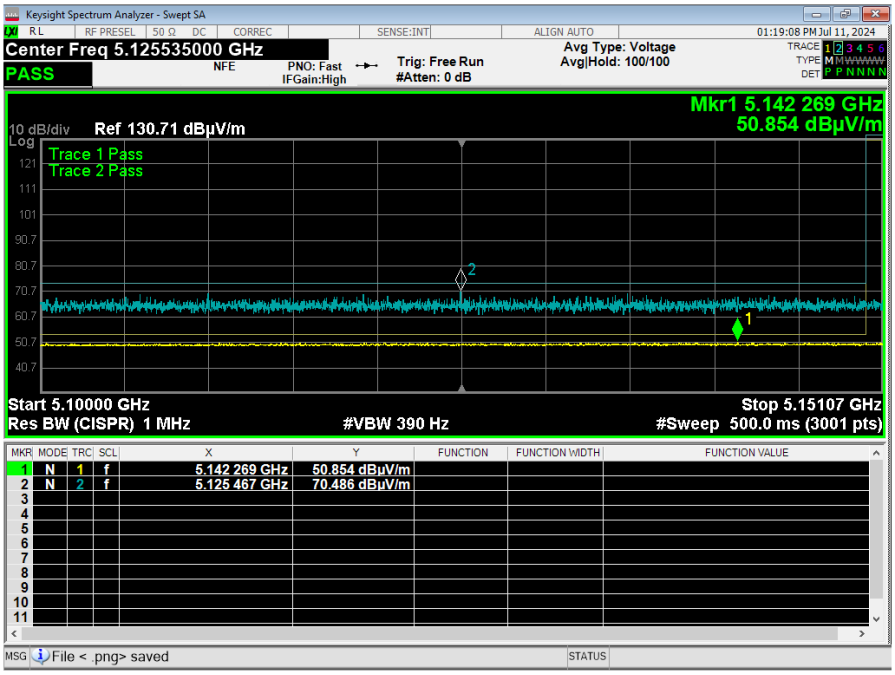
Conducted spurious emissions were below -27 dBm; therefore, the EUT complies with the specification.



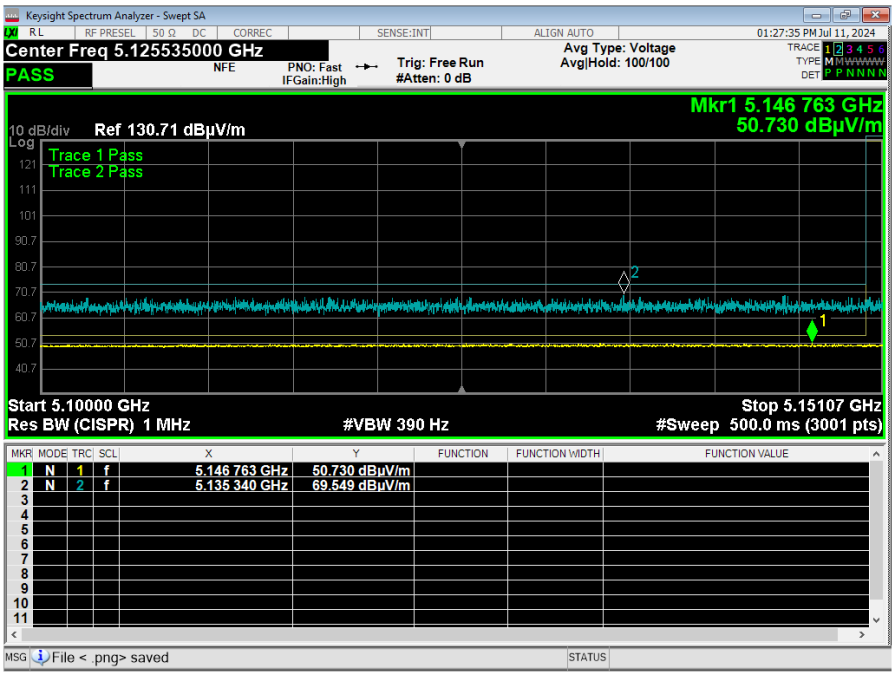
Graph 1: Band Edge Low a Mode 20 MHz



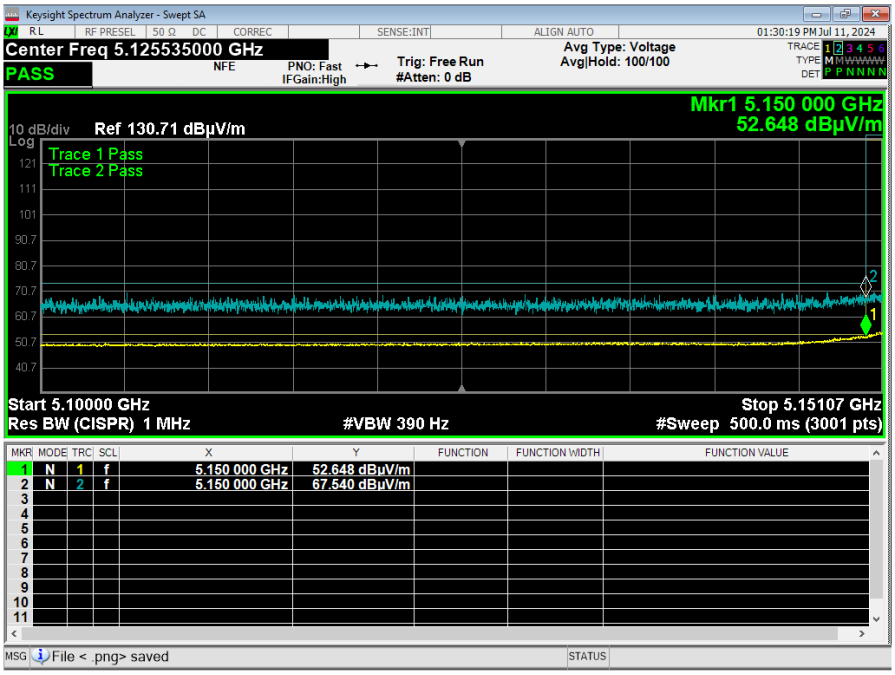
Graph 2: Band Edge High a Mode 20 MHz



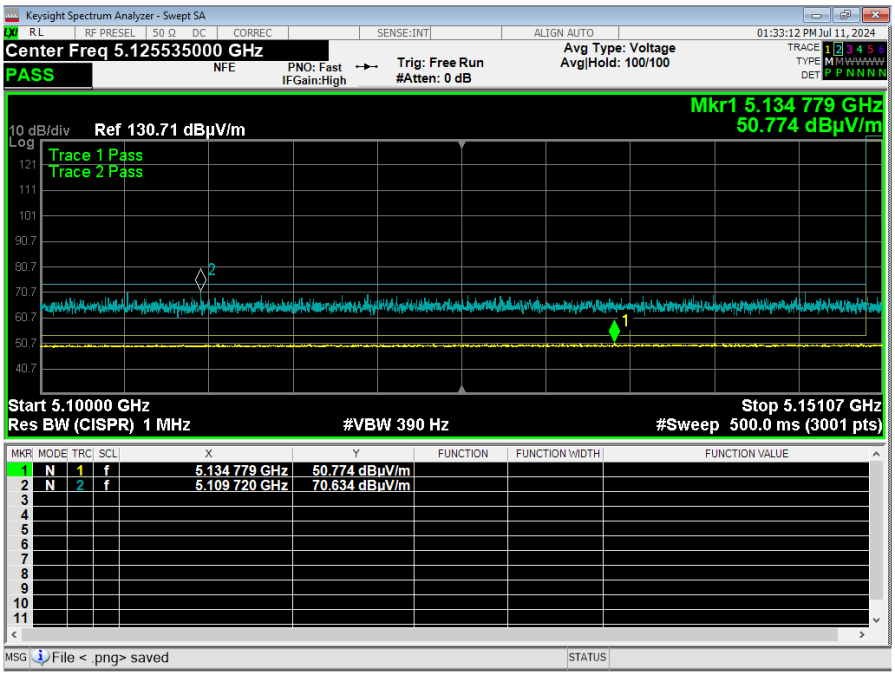
Graph 3: Band Edge Low ac Mode 20 MHz



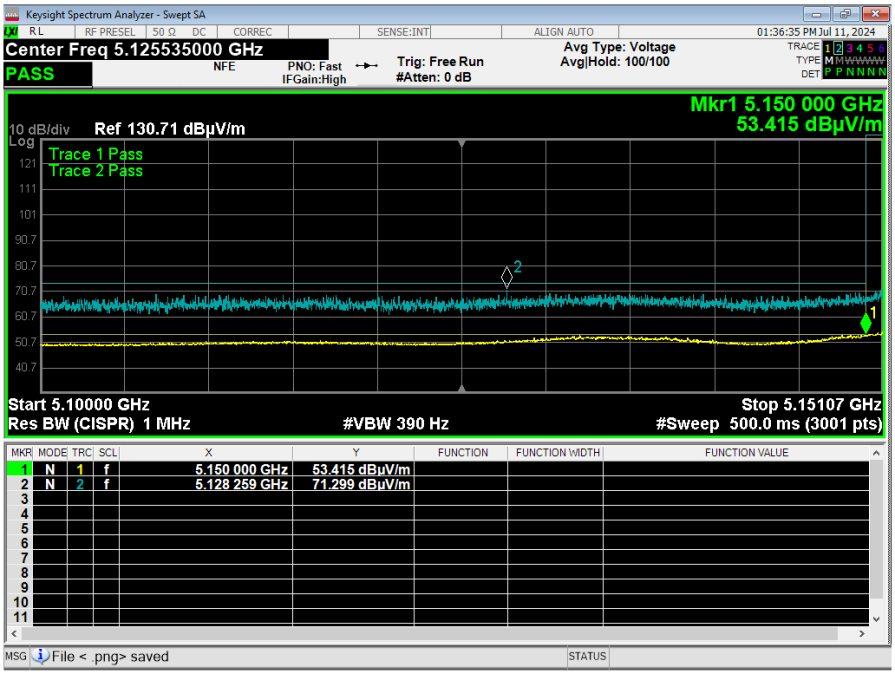
Graph 4: Band Edge High ac Mode 20 MHz



Graph 5: Band Edge Low ac Mode 40 MHz



Graph 6: Band Edge High ac Mode 40 MHz



Graph 7: Band Edge ax Mode 80 MHz

5.5.2 Radiated Spurious Emissions in the Restricted Bands of § 15.205

The EUT uses various power settings based on the channel in use. In order to reduce test time, the radiated spurious emissions at the lowest, middle, and highest channel were measured at the maximum power of TP45, as this setting was found to be worst case for spurious emissions. Power was subsequently reduced during in-band and band edge testing. The band edge at the restricted band ending at 5180 MHz was measured using radiated measurement or conducted at the antenna port methods. [For radiated] All emissions modes were tested, and the worst-case measurement are shown below. For frequencies above 1 GHz, a measurement of 3 meters was used. For frequencies below 1 GHz, a measurement distance of 10 meters was used.
Correction Factor = Antenna Factor + Cable Loss - Pre-Amplifier Gain, and is added to the Receiver reading.

Result

All emissions in the restricted bands of § 15.205 met the limits specified in § 15.209; therefore, the EUT complies with the specification. All emissions me the limits specified in § 15.407(b). Representative band edge plots are included in this report. See Annex for Conducted Band edge plots.

Internal Antenna

QuasiPeak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
55.914 MHz	36.099	40	-3.901	2	1	Vertical	-8.31
59.593 MHz	31.468	40	-8.532	52	1.131	Vertical	-8.836
156.38 MHz	27.183	40	-12.817	246	1.131	Vertical	-12.477
778.37 MHz	32.04	47	-14.96	128	2.567	Vertical	1.411
235.1 MHz	28.778	47	-18.222	131	1	Horizontal	-8.241

Table 4: Radiated Emissions 30 – 1000 MHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.358 GHz	64.139	74	-9.861	275	1.838	Vertical	9.188
12.5 0GHz	57.637	74	-16.363	277	1.643	Vertical	9.879
14.536 GHz	58.457	74	-15.543	252	1.643	Vertical	13.655
10.355 GHz	64.111	74	-9.889	305	1.5	Horizontal	9.182
15.547 GHz	59.676	74	-14.324	263	1.643	Horizontal	11.356
16.85 GHz	58.065	74	-15.935	316	2.146	Horizontal	13.691

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.358 GHz	51.195	54	-2.805	275	1.838	Vertical	9.188
12.50 GHz	49.24	54	-4.76	277	1.643	Vertical	9.879
14.536 GHz	45.204	54	-8.796	252	1.643	Vertical	13.655
10.355 GHz	50.187	54	-3.813	305	1.5	Horizontal	9.182
15.547 GHz	45.232	54	-8.768	263	1.643	Horizontal	11.356
16.85 GHz	44.715	54	-9.285	316	2.146	Horizontal	13.691

Table 5: Radiated Emissions 1 – 17 GHz at the Lowest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.42 GHz	63.458	74	-10.542	227	2.329	Vertical	9.285
12.50 GHz	57.717	74	-16.283	223	2.645	Vertical	9.879
14.732 GHz	59.674	74	-14.326	157	1.643	Vertical	14.145
10.421 GHz	63.859	74	-10.141	276	1.834	Horizontal	9.286

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
12.50 GHz	58.103	74	-15.897	276	1.638	Horizontal	9.879
14.694 GHz	59.498	74	-14.502	244	2.142	Horizontal	14.329

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.42 GHz	51.318	54	-2.682	227	2.329	Vertical	9.285
12.50 GHz	49.503	54	-4.497	223	2.645	Vertical	9.879
14.732 GHz	45.997	54	-8.003	157	1.643	Vertical	14.145
10.421 GHz	50.075	54	-3.925	276	1.834	Horizontal	9.286
12.50 GHz	50.018	54	-3.982	276	1.638	Horizontal	9.879
14.694 GHz	46.424	54	-7.576	244	2.142	Horizontal	14.329

Table 6: Radiated Emissions 1 – 17 GHz at the Middle Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.48 GHz	65.346	74	-8.654	207	2.329	Vertical	9.415
12.50 GHz	57.762	74	-16.238	209	1.643	Vertical	9.879
14.178 GHz	58.026	74	-15.974	165	2.65	Vertical	13.359
10.491 GHz	62.163	74	-11.837	270	1.834	Horizontal	9.45
12.50 GHz	57.682	74	-16.318	271	3.656	Horizontal	9.879
14.757 GHz	58.412	74	-15.588	111	2.82	Horizontal	14.022

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.48 GHz	50.895	54	-3.105	207	2.329	Vertical	9.415
12.50 GHz	50.099	54	-3.901	209	1.643	Vertical	9.879
14.178 GHz	45.195	54	-8.805	165	2.65	Vertical	13.359
10.491 GHz	47.774	54	-6.226	270	1.834	Horizontal	9.45
12.50 GHz	49.328	54	-4.672	271	3.656	Horizontal	9.879
14.757 GHz	45.493	54	-8.507	111	2.82	Horizontal	14.022

Table 7: Radiated Emissions 1 – 17 GHz at the Highest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
20.955 GHz	50.935	74	-23.065	190	Vertical	-0.351
20.967 GHz	61.162	74	-12.838	205	Vertical	-0.392
35.082 GHz	57.219	74	-16.781	24	Vertical	5.936
20.954 GHz	56.704	74	-17.296	238	Horizontal	-0.347
33.497 GHz	55.241	74	-18.759	315	Horizontal	4.734
35.042 GHz	57.614	74	-16.386	359	Horizontal	6.172
39.627 GHz	55.92	74	-18.08	327	Horizontal	3.965

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
20.955 GHz	37.556	54	-16.444	190	Vertical	-0.351
20.967 GHz	47.428	54	-6.572	205	Vertical	-0.392
35.082 GHz	43.819	54	-10.181	24	Vertical	5.936
20.954 GHz	41.306	54	-12.694	238	Horizontal	-0.347
33.497 GHz	42.477	54	-11.523	315	Horizontal	4.734
35.042 GHz	44.174	54	-9.826	359	Horizontal	6.172
39.627 GHz	43.058	54	-10.942	327	Horizontal	3.965

Table 8: Radiated Emissions 17 – 40 GHz at the Highest Frequency (worse case)

External/Internal Antenna

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
55.914 MHz	36.099	40	-3.901	2	1	Vertical	-8.31
59.593 MHz	31.468	40	-8.532	52	1.131	Vertical	-8.836
156.38 MHz	27.183	40	-12.817	246	1.131	Vertical	-12.477
778.37 MHz	32.04	47	-14.96	128	2.567	Vertical	1.411
235.1 MHz	28.778	47	-18.222	131	1	Horizontal	-8.241

Table 9: Radiated Emissions 30 – 1000 MHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
11.046 GHz	54.7	74.0	-19.3	42	2.19	Vertical	10.45
12.500 GHz	58.06	74.0	-15.94	45	2.73	Vertical	9.88
14.084 GHz	57.55	74.0	-16.45	349	2.73	Vertical	13.16
10.998 GHz	54.49	74.0	-19.51	187	1.87	Horizontal	9.32
12.500 GHz	58.34	74.0	-15.66	42	2.08	Horizontal	8.32
14.248 GHz	57.96	74.0	-16.04	275	1.66	Horizontal	12.2

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
11.046 GHz	41.7	54.0	-12.3	42	2.19	Vertical	10.45
12.500 GHz	49.8	54.0	-4.2	45	2.73	Vertical	9.88
14.084 GHz	44.56	54.0	-9.44	349	2.73	Vertical	13.16
10.998 GHz	40.88	54.0	-13.12	187	1.87	Horizontal	9.32
12.500 GHz	52.06	54.0	-1.94	42	2.08	Horizontal	8.32
14.248 GHz	43.55	54.0	-10.45	275	1.66	Horizontal	12.2

Table 10: Radiated Emissions 1 – 17 GHz at the Lowest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
5.218 GHz	50.64	74.0	-23.36	197	1.66	Vertical	-12.06
6.947 GHz	43.64	74.0	-30.36	137	1.66	Vertical	-7.18
12.500 GHz	58.37	74.0	-15.63	80	1.66	Vertical	9.88
5.216 GHz	46.07	74.0	-27.93	356	1.5	Horizontal	-12.2
12.500 GHz	57.33	74.0	-16.67	44	2.08	Horizontal	8.32

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
14.709 GHz	56.56	74.0	-17.44	54	1.66	Horizontal	12.93

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
5.218 GHz	41.01	54.0	-12.99	197	1.66	Vertical	-12.06
6.947 GHz	35.73	54.0	-18.27	137	1.66	Vertical	-7.18
12.500 GHz	51.67	54.0	-2.33	80	1.66	Vertical	9.88
5.216 GHz	35.29	54.0	-18.71	356	1.5	Horizontal	-12.2
12.500 GHz	51.07	54.0	-2.93	44	2.08	Horizontal	8.32
14.709 GHz	43.6	54.0	-10.4	54	1.66	Horizontal	12.93

Table 11: Radiated Emissions 1 – 17 GHz at the Middle Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
5.240 GHz	52.85	74.0	-21.15	269	1.5	Vertical	-12.12
10.938 GHz	55.11	74.0	-18.89	256	1.66	Vertical	11.57
12.500 GHz	58.55	74.0	-15.45	77	1.66	Vertical	9.88
12.500 GHz	58.42	74.0	-15.58	78	1.66	Vertical	9.88
13.878 GHz	57.75	74.0	-16.25	121	2.19	Vertical	13.33
14.704 GHz	58.30	74.0	-15.70	150	2.19	Vertical	14.28
16.994 GHz	57.34	74.0	-16.66	294	2.73	Vertical	14.61
16.995 GHz	57.33	74.0	-16.67	293	1.66	Vertical	14.62
10.984 GHz	53.88	74.0	-20.12	229	2.08	Horizontal	9.49
12.500 GHz	56.64	74.0	-17.36	39	2.29	Horizontal	8.32
12.500 GHz	56.24	74.0	-17.76	51	2.29	Horizontal	8.32
14.148 GHz	55.75	74.0	-18.25	268	1.87	Horizontal	11.94
14.771 GHz	56.60	74.0	-17.40	269	2.29	Horizontal	12.66
16.998 GHz	56.22	74.0	-17.78	312	1.66	Horizontal	13.59

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
5.240 GHz	42.52	54.0	-11.48	269	1.5	Vertical	-12.12

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
10.938 GHz	42.05	54.0	-11.95	256	1.66	Vertical	11.57
12.500 GHz	52.39	54.0	-1.61	77	1.66	Vertical	9.88
12.500 GHz	52.21	54.0	-1.79	78	1.66	Vertical	9.88
13.878 GHz	44.77	54.0	-9.23	121	2.19	Vertical	13.33
14.704 GHz	45.28	54.0	-8.72	150	2.19	Vertical	14.28
16.994 GHz	43.83	54.0	-10.17	294	2.73	Vertical	14.61
16.995 GHz	44.05	54.0	-9.95	293	1.66	Vertical	14.62
10.984 GHz	40	54.0	-14	229	2.08	Horizontal	9.49
12.500 GHz	48.98	54.0	-5.02	39	2.29	Horizontal	8.32
12.500 GHz	48.69	54.0	-5.31	51	2.29	Horizontal	8.32
14.148 GHz	42.8	54.0	-11.2	268	1.87	Horizontal	11.94
14.771 GHz	43.3	54.0	-10.7	269	2.29	Horizontal	12.66
16.998 GHz	42.91	54.0	-11.09	312	1.66	Horizontal	13.59

Table 12: Radiated Emissions 1 – 17 GHz at the Highest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Pol.	Correction (dB)
20.96 GHz	61.41	74.0	-12.59	174	Vertical	-0.36
24.95 GHz	52.28	74.0	-21.72	281	Vertical	2.22
33.82 GHz	55.71	74.0	-18.30	184	Vertical	5.07
20.96 GHz	60.77	74.0	-13.34	269	Horizontal	-0.38
30.81 GHz	53.19	74.0	-20.81	355	Horizontal	2.22
33.44 GHz	55.45	74.0	-18.55	83	Horizontal	4.40

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Pol.	Correction (dB)
20.96 GHz	47.07	54.0	-6.96	174	Vertical	-0.36
24.95 GHz	39.12	54.0	-14.88	281	Vertical	2.22
33.82 GHz	42.51	54.0	-11.49	184	Vertical	5.07
20.96 GHz	46.22	54.0	-7.78	269	Horizontal	-0.38
30.81 GHz	39.90	54.0	-14.10	355	Horizontal	2.22
33.44 GHz	42.12	54.0	-11.88	83	Horizontal	4.40

Table 13: Radiated Emissions 17 – 40 GHz at the Highest Frequency (worse case)

5.6 §15.407(a) Maximum Power Spectral Density

All chains were measured and summed under the guidance of KDB 789033 Section II. F. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 17 dBm in any 1 MHz band during any time interval of continuous transmission.

As per KDB 662911, When the EUT is using spatial-multiplexing in HE modes, there is not additional array gain to accommodate. When the EUT uses Nss=1 data rates, the internal antenna gain is 5 dBi + Array gain of 3.01 dB which is a total of 8.01 dBi, and the external antenna gain is 4 dBi + Array gain of 3.01 dB which is a total of 7.01 dBi.

5.6.1 Internal Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Measured PSD
OFDM 20	5180	Mcs0	35	7.46
OFDM 20	5210	Mcs0	43	11.30
OFDM 20	5240	Mcs0	45	12.62
VHT 20	5180	Mcs0	45	3.31
VHT 20	5210	Mcs0	45	3.22
VHT 20	5240	Mcs0	45	2.97
VHT 40	5190	Mcs0	45	1.95
VHT 40	5230	Mcs0	45	1.35
VHT 80	5210	Mcs0	45	-1.47

5.6.2 External/Internal Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Measured PSD
OFDM 20	5180	Mcs0	36	7.13
OFDM 20	5210	Mcs0	47	11.22
OFDM 20	5240	Mcs0	47	11.23
VHT 20	5180	Mcs0	47	2.67
VHT 20	5210	Mcs0	47	2.47
VHT 20	5240	Mcs0	47	2.32
VHT 40	5190	Mcs0	47	1.02
VHT 40	5230	Mcs0	47	0.61

VHT 80	5210	Mcs0	47	-2.13

Result

The maximum summed average power spectral density was less than the limit of 17dBm; therefore, the EUT complies with the specification.

-- End of Test Report --