UNIFIED COMPLIANCE LABORATORY

427 West 12800 South
Draper, UT 84020

Test Report

Certification

FCC ID	SWX-WAVEML
ISED ID	6545A-WAVEML
Equipment Under Test	Wave-MLO5
Test Report Serial Number	TR9510_02
Date of Test(s)	13, 29 – 30 August; 3 – 5 September; 30 October 2024, 21 December 2024 – 3 January 2025.
Report Issue Date	03 January 2025

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.

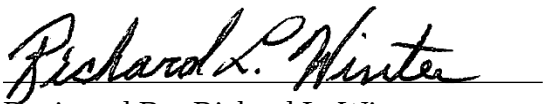
Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	UBIQUITI
Model Number	Wave-MLO5
FCC ID	SWX-WAVEML
ISED ID	6545A-WAVEML

On this 3rd day of January 2025, 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: Clay Allred



Reviewed By: Richard L. Winter

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	15 November 2024
02	Updated with 30 dBi Antenna	3 January 2025

Table of Contents

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	Wave-MLO5
Serial Number	2F2513
Dimensions (cm)	24.9 x 8.2 x 4.8

2.2 Description of EUT

The Wave-MLO5 is a 5 GHz point-to-point customer premise equipment which features wave technology with a high throughput rate. The 5 GHz radio supports U-NII-1, U-NII-2 and U-NII-3 bands. The Wave-MLO5 has Bluetooth LE transceiver for system management. The Wave-MLO5 is an outdoor device and has an Ethernet port which is used for data transfer and is powered using a Model POE-54-30W-10G-WH 54-volt PoE power adapter.

The following is list of the antennas that the Wave-MLO5 can use.

Antenna Type	Model Number	Antenna Gain (dBi)
Omni	AMO-5G10	10 (Note 1)
	AMO-5G13	13
Dish	RD-5G30-LW	30
	RD-5G30	30 (Note 1)
	UISP Dish	30
	AF-5G30-S45	30
	AF-5G23-S45	23
Sector	AP-5AC-90-HD	22
	AM-5AC21-60	21
	AM-5AC22-45	22
	AM-V5G-Ti	21
	AM-M-V5G-Ti	17
	AM-5G16-120	16
	AM-5G17-90	17
	AM-5G19-120	19
	AM-5G20-90	20
Horn	UISP Horn	19.5
	Horn-5	19
Note 1: For reporting purposes the lowest and highest gain antennas are covered in this report		

The table below show the channels used within the different modulation bandwidths.

Band	WiFi Mode	Modulation Bandwidth	Modulation Type	Frequency (MHz)
UNII-3	a	20 MHz	OFDM	5745, 5775, 5825
	ax	20 MHz	HE	5745, 5775, 5825
	ax	40 MHz	HE	5755, 5775, 5795
	ax	80 MHz	HE	5775

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: Wave-MLO5 SN: 2F2513	Wireless Access Point	See Section 2.4
BN: UBIQUITI MN: POE-54-30W-10G-WH SN: N/A	PoE Injector Power Supply	Shielded or Un-shielded Cat 5e cable (Note 2)
BN: Dell MN: XPS 13 SN: N/A	Laptop Computer	Shielded or Un-shielded Cat 5e cable (Note 2)

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 (PoE Injector)	1	3 conductor power cord/80cm
LAN (PoE Injector)	1	Shielded or Un-shielded cat 5e cable/1 meter
Data	1	Shielded or Un-shielded cat 5e cable/1 meter

2.5 Operating Environment

Power Supply	120 Volts AC Mains to 54 Volts PoE
AC Mains Frequency	60 Hz

Temperature	21.4 – 23.7 °C
Humidity	19.7 – 26.8 %
Barometric Pressure	1017 mBar

2.6 Operating Modes

The Wave-MLO5 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/ax 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

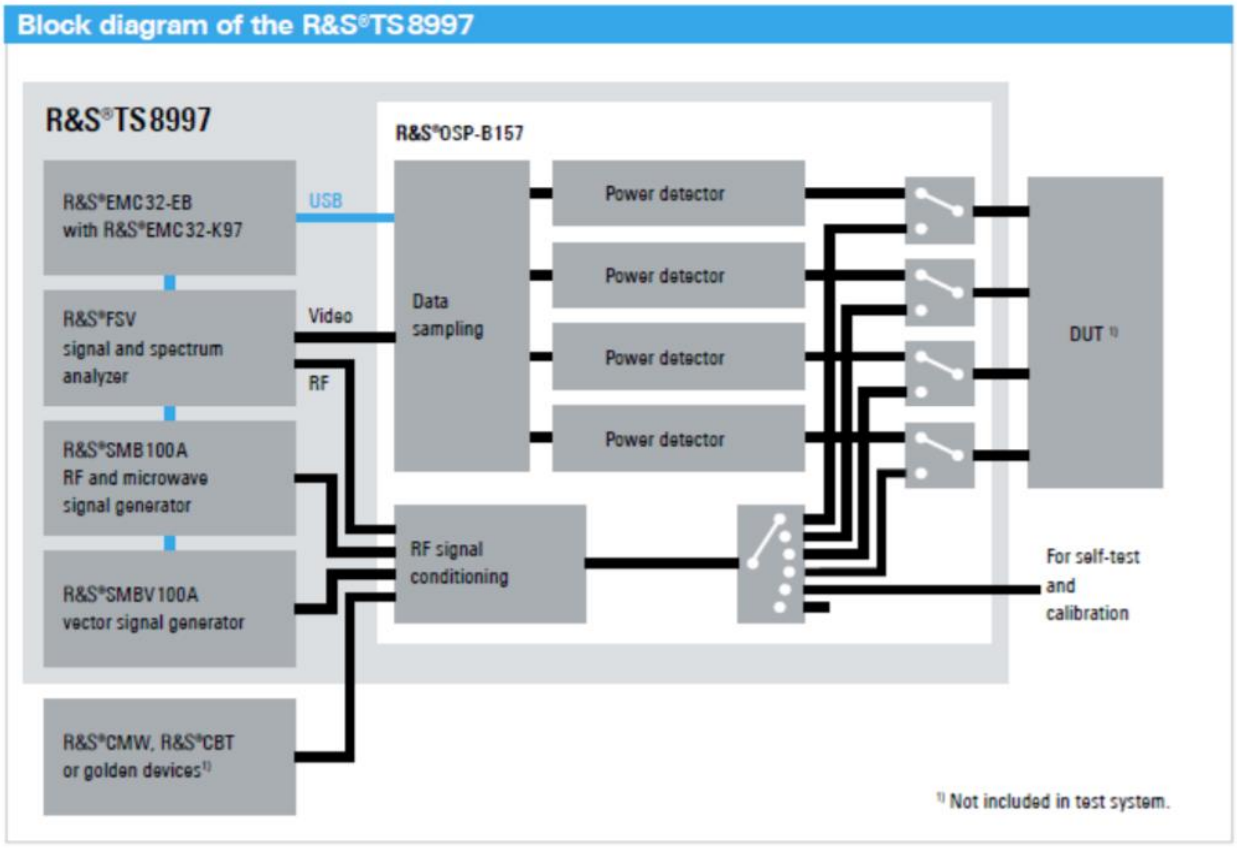


Diagram 1: Test Configuration Block Diagram

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	5725 to 5850	Compliant
15.407(e)	RSS-247 §6.2.2, §6.2.3	Peak Output Power	5725 to 5850	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	5725 to 5850	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

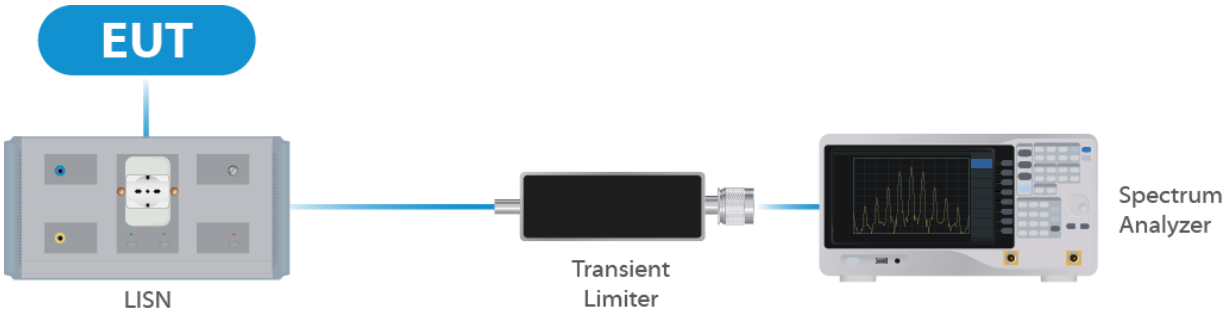


Figure 1: Conducted Emissions Test

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	12/27/2024
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

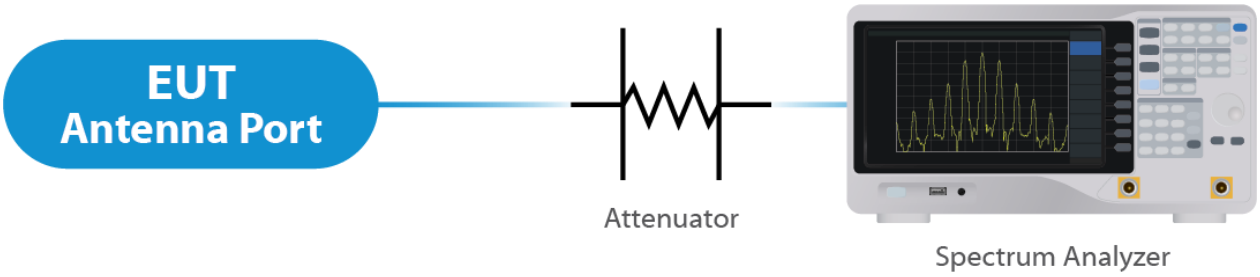


Figure 2: Direct Connect at the Antenna Port Test

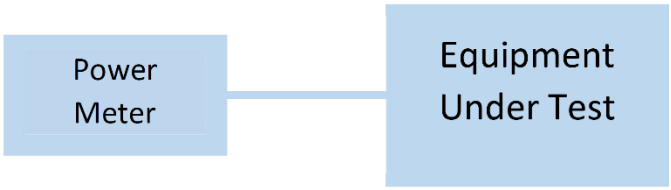


Figure 3: Output Power Measurement

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

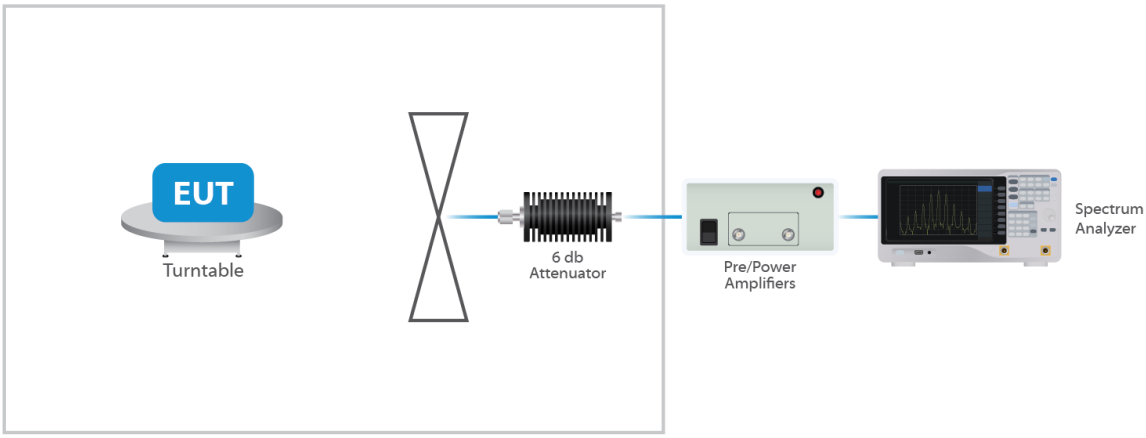


Figure 4: Radiated Emissions Test

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 Omni, Sector, Dish or horn antenna. Per the manufacturer, the Maximum gain of the antenna per chain is 30 dBi. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The 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.

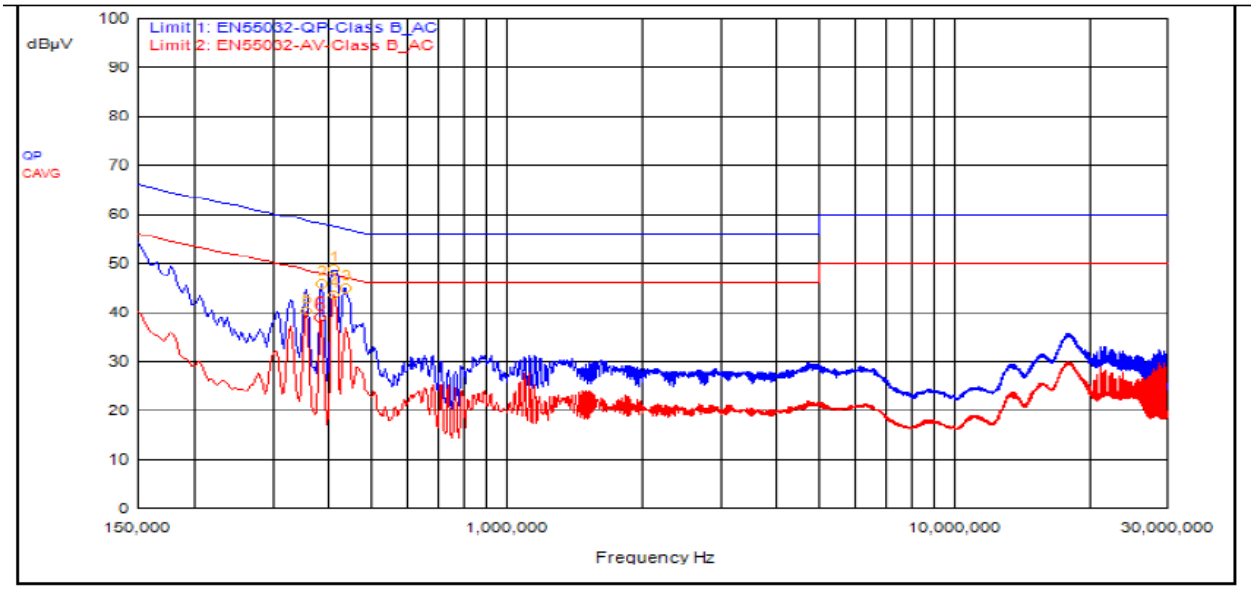
For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for NANT ≤ 4;
For PSD measurements when Nss=1: Array Gain = 10 log(NANT/NSS) dB + Antenna Gain (dBi). Or 3.01 dB + 30 dBi = 33.01 dBi.

Results

The EUT complied with the specification

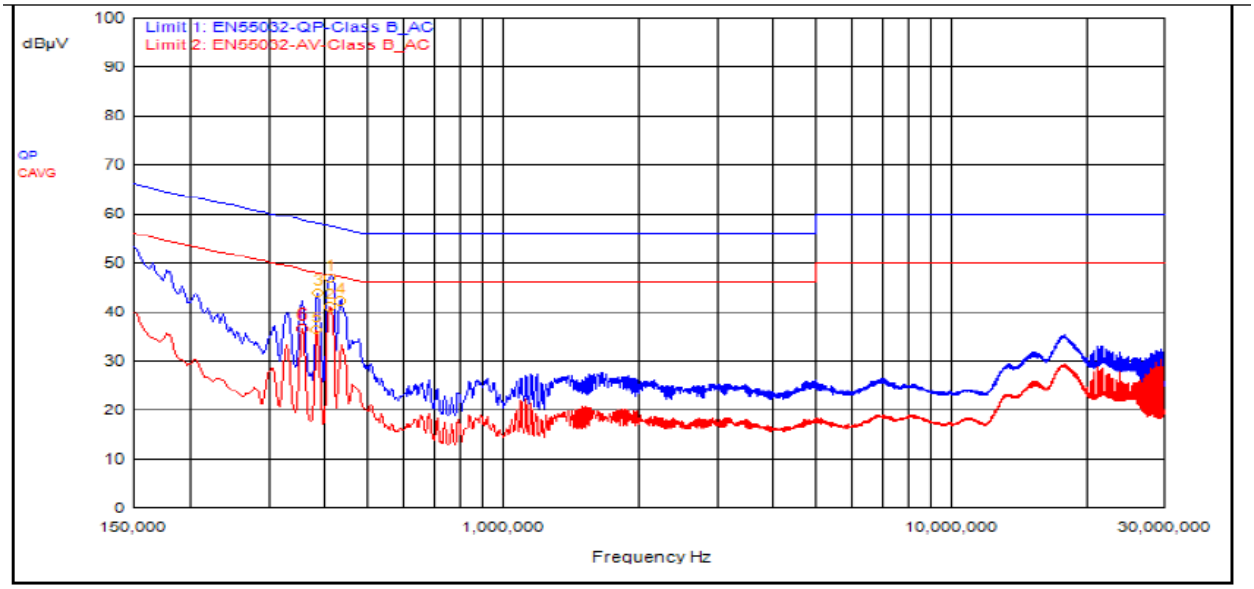
5.2 Conducted Emissions at Mains Ports Data

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
1	411,000kHz	9.49			QPeak	39.26	48.75	57.63	-8.88			
3	435,000kHz	9.49			QPeak	35.61	45.10	57.16	-12.06			
2	387,000kHz	9.48			QPeak	36.48	45.96	58.13	-12.16			
4	411,000kHz	9.49			C_AVG	33.99	43.48			47.63	-4.15	
5	357,000kHz	9.48			C_AVG	30.67	40.15			48.80	-8.65	
6	384,000kHz	9.48			C_AVG	29.47	38.95			48.19	-9.24	

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
1	411,000kHz	9.63			QPeak	37.40	47.03	57.63	-10.60			
3	387,000kHz	9.63			QPeak	34.35	43.98	58.13	-14.15			
4	432,000kHz	9.64			QPeak	32.63	42.27	57.21	-14.95			
2	411,000kHz	9.63			C_AVG	31.42	41.05			47.63	-6.58	
5	384,000kHz	9.63			C_AVG	26.89	36.52			48.19	-11.67	
6	357,000kHz	9.63			C_AVG	27.08	36.71			48.80	-12.09	

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 662911 D01. Please see associated annex for details on instrument settings.

5.3.1 Omni Antenna

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
OFDM 20	5745	25.2	40.0
OFDM 20	5775	26.4	40.0
OFDM 20	5825	25.7	40.0
HE 20	5745	25.0	40.0
HE 20	5775	25.0	40.0
HE 20	5825	20.8	40.0
HE 40	5755	38.3	42.0
HE 40	5775	38.3	42.9
HE 40	5795	38.3	43.7
HE 80	5775	78.0	123.5

5.3.2 Dish Antenna

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
OFDM 20	5745	27.25	38.4
OFDM 20	5775	19.75	34.9
OFDM 20	5825	21.0	34.9
HE 20	5745	19.75	30.8
HE 20	5775	19.5	22.8
HE 20	5825	19.5	28.0
HE 40	5755	38.5	43.53
HE 40	5775	38.5	43.23
HE 40	5795	38.5	42.78

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
HE 80	5775	79.0	87.0

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)(3) Maximum Average Output Power

All chains were measured and summed under the guidance of KDB 789033 Section II. E.2. and KDB 662911 D01. Please see associated annex for details on instrument settings.

The maximum average RF conducted output power measured for this device using the Omni Antenna was 25.94 dBm or 392.64 mW. The limit is 30 dBm, or 1 Watt when using antennas with 6 dBi or less gain. The Omni antenna has a gain of 10 dBi, therefor the adjusted limit is 26 dBm.

The maximum average RF conducted output power measured for this device using the Dish Antenna was 25.86 dBm or 385.48 mW. When using the Dish Antenna, it will only be used in the point-to-point application therefore there is no power limit.

5.4.1 Omni Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power *	Measured EIRP	Measured PSD
OFDM 20	5745	Mcs0	23	25.94	35.94	10.93
OFDM 20	5775	Mcs0	24	25.58	35.58	10.48
OFDM 20	5825	Mcs0	24	25.62	35.62	10.34
HE 20	5745	Mcs0	24	25.87	35.87	5.75
HE 20	5775	Mcs0	24	25.40	35.40	5.77
HE 20	5825	Mcs0	23	25.17	35.17	5.82
HE 40	5755	Mcs0	20	22.93	32.93	4.25
HE 40	5775	Mcs0	20	23.03	33.03	4.20
HE 40	5795	Mcs0	20	23.08	33.08	4.50
HE 80	5775	Mcs0	18	20.79	30.79	5.77

5.4.2 Dish Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power *	Measured EIRP	Measured PSD
OFDM 20	5745	Mcs0	24	22.93	52.93	10.68
OFDM 20	5775	Mcs0	22	21.86	51.86	8.96
OFDM 20	5825	Mcs0	23	22.26	52.26	9.26
HE 20	5745	Mcs0	24	25.86	55.86	10.15
HE 20	5775	Mcs0	22	24.19	54.19	8.54

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power *	Measured EIRP	Measured PSD
HE 20	5825	Mcs0	23	24.91	54.91	8.89
HE 40	5755	Mcs0	22	24.50	54.50	5.72
HE 40	5775	Mcs0	22	24.54	54.54	5.87
HE 40	5795	Mcs0	22	24.45	54.45	5.69
HE 80	5775	Mcs0	19	21.24	51.24	-0.29

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).

* Gated EIRP shown in the Annex is the conducted measurement

5.5 §15.407(b)(4) Spurious Emissions

5.5.1 Spurious Emissions

The frequency ranges 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 within the annex are plots with the EUT turned to the upper and lower channels with the antenna gain of 30 dBi accounted for. These demonstrate compliance with the provisions of this section at the band edges.

All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

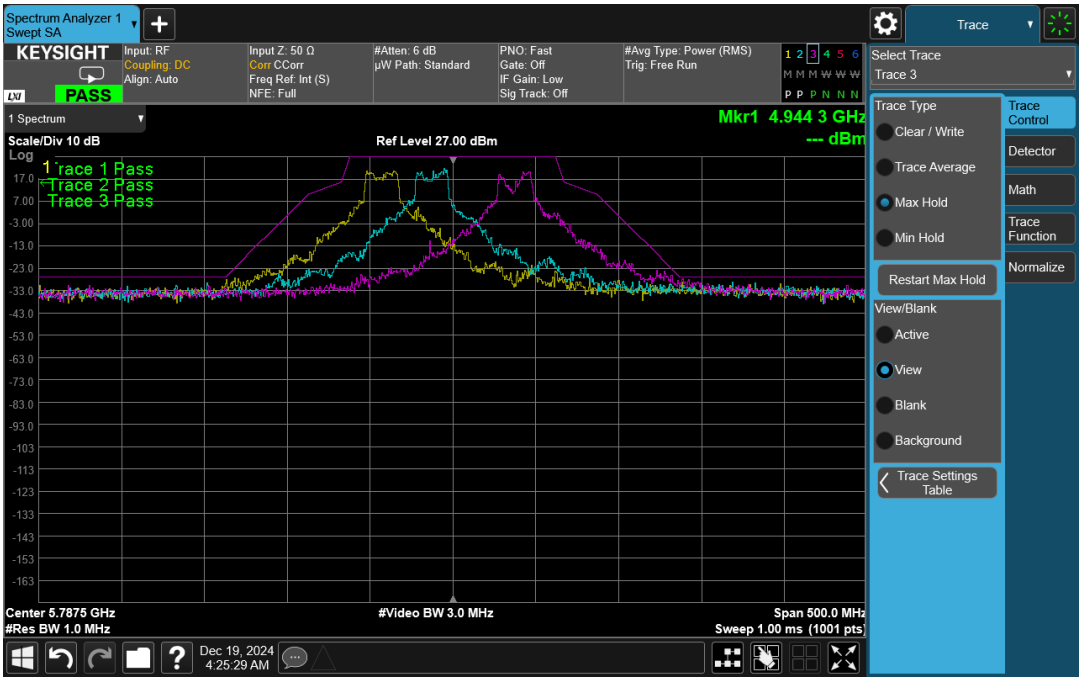
The Emissions of 15.407 (b)(4)(i) were measured conducted for the Omni 10dBi antenna and radiated for the 30dBi Dish antenna.

For Radiated measurements the Correction Factor = Receive Antenna Factor (dBi) + Cable Loss (dB) - Pre-Amplifier Gain (dB), and for Conducted measurement the Correction factor = Cable Loss (dB) and is added back to the measured value.

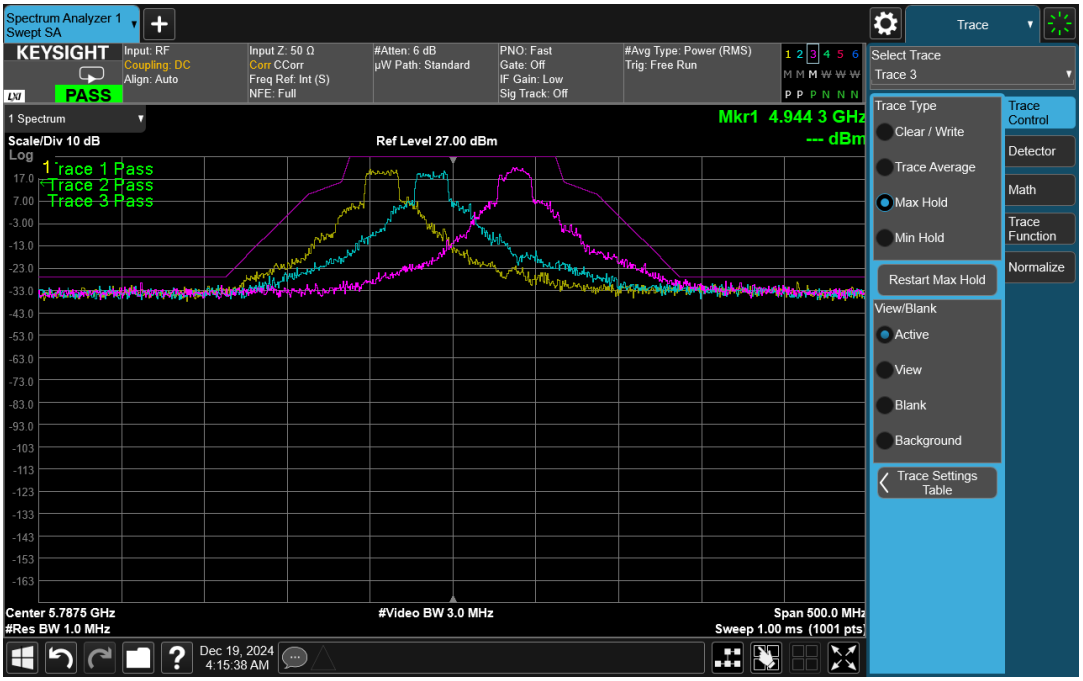
10dBi Omni Antenna

See conducted plots in attached Annex for OMNI 10dBi Antenna.

30dBi Dish Antenna



Wave-MLO5_UNII-3_MASK_OFDM20_TP30_VRT



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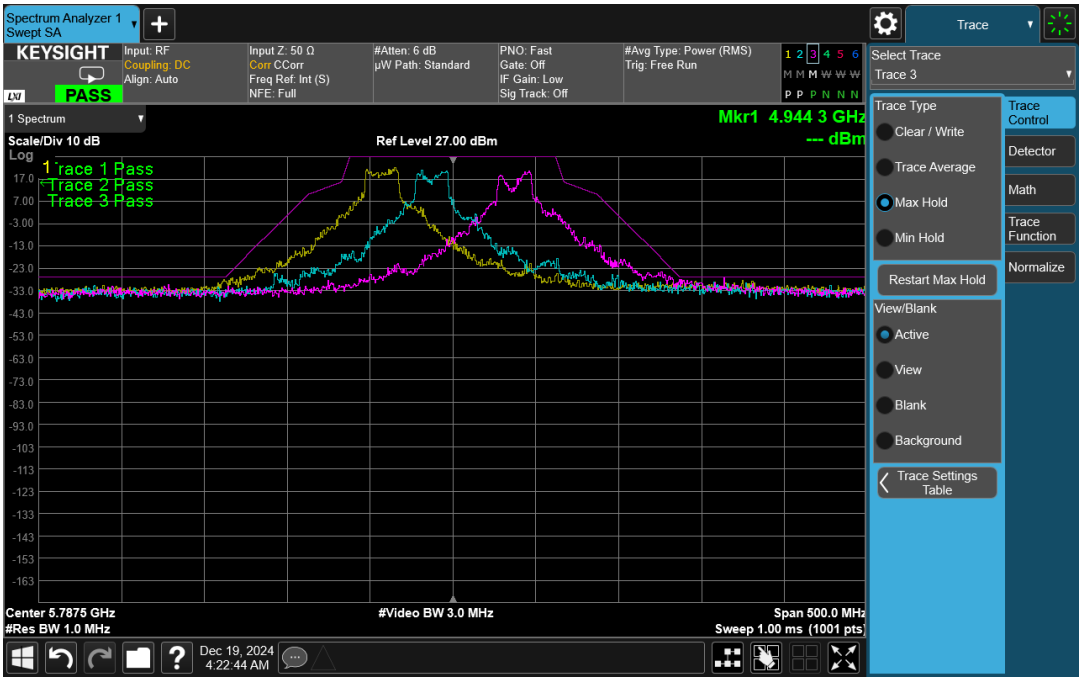

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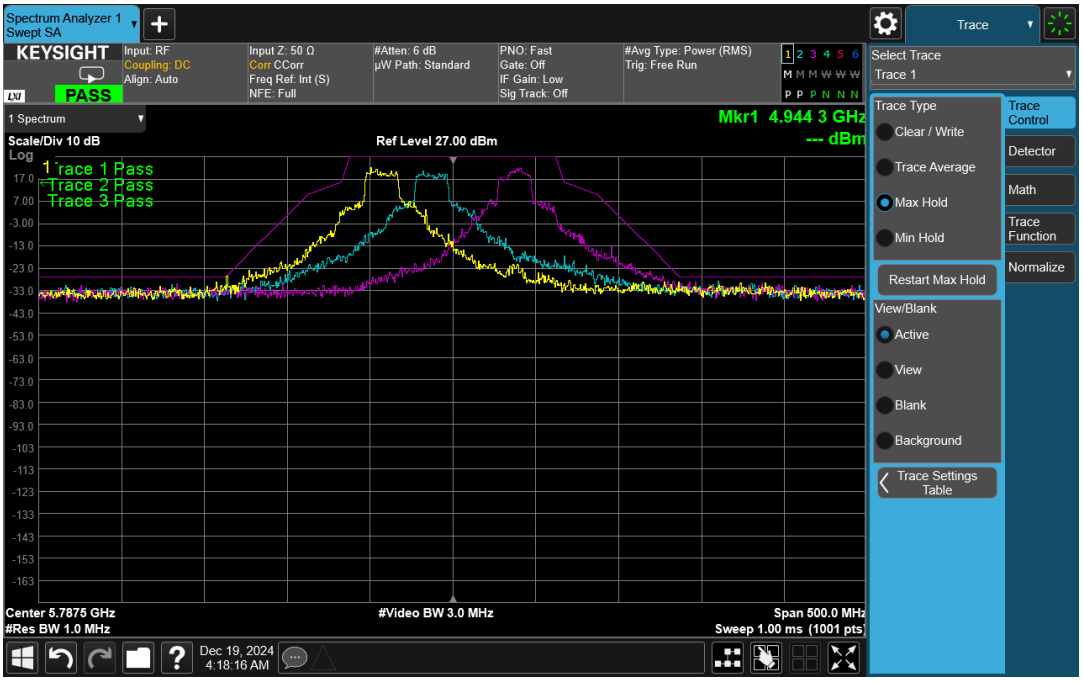

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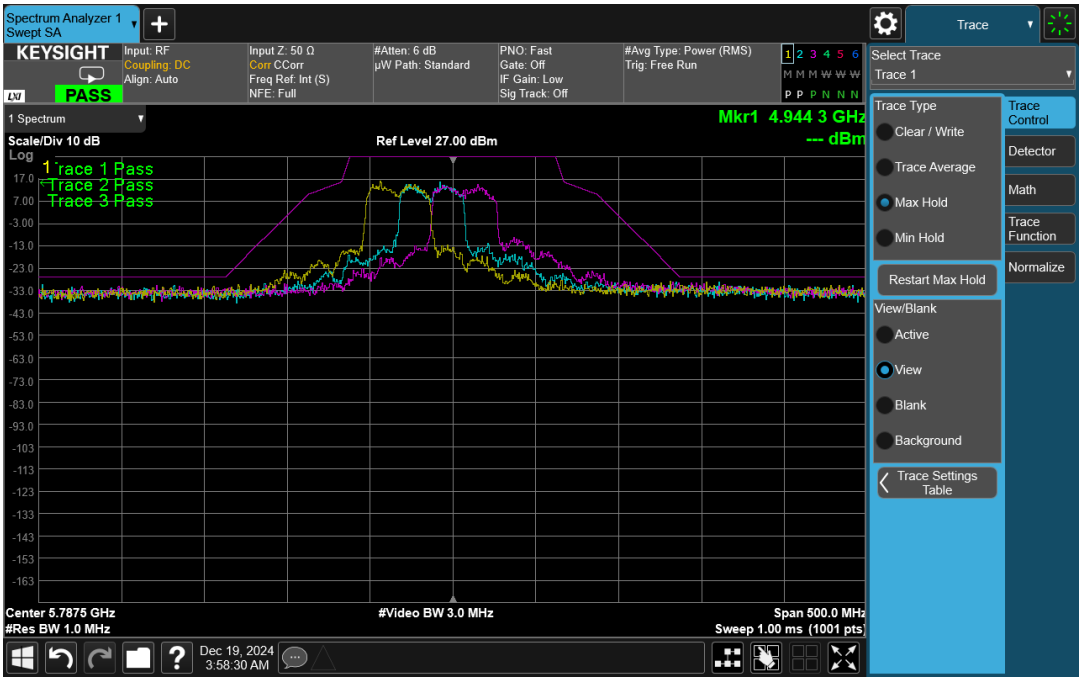
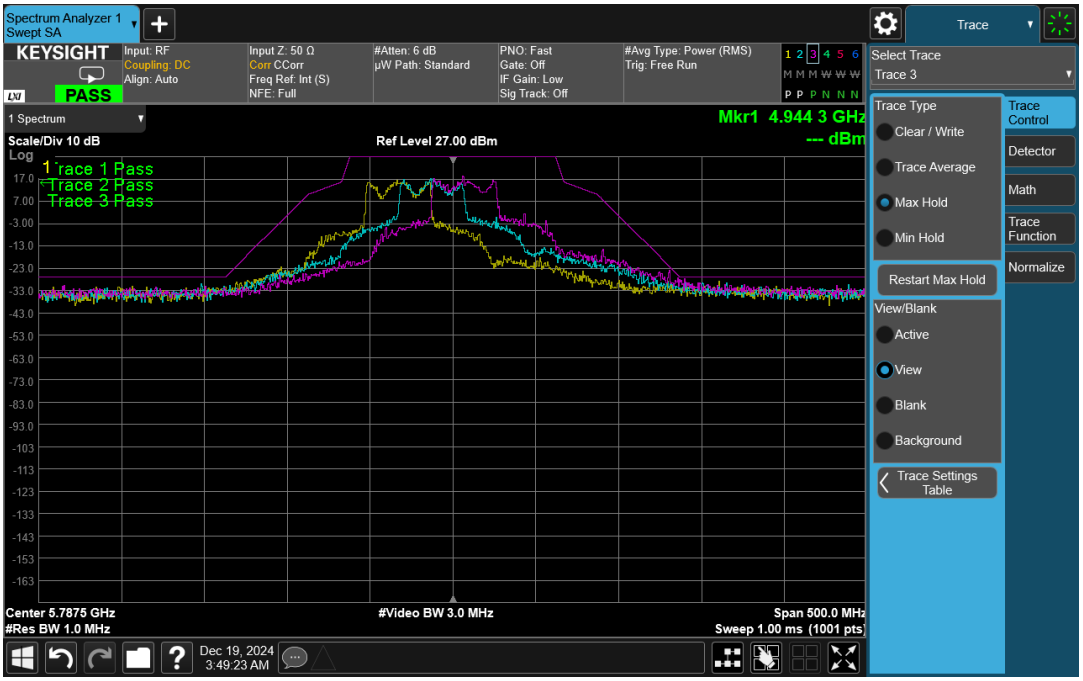
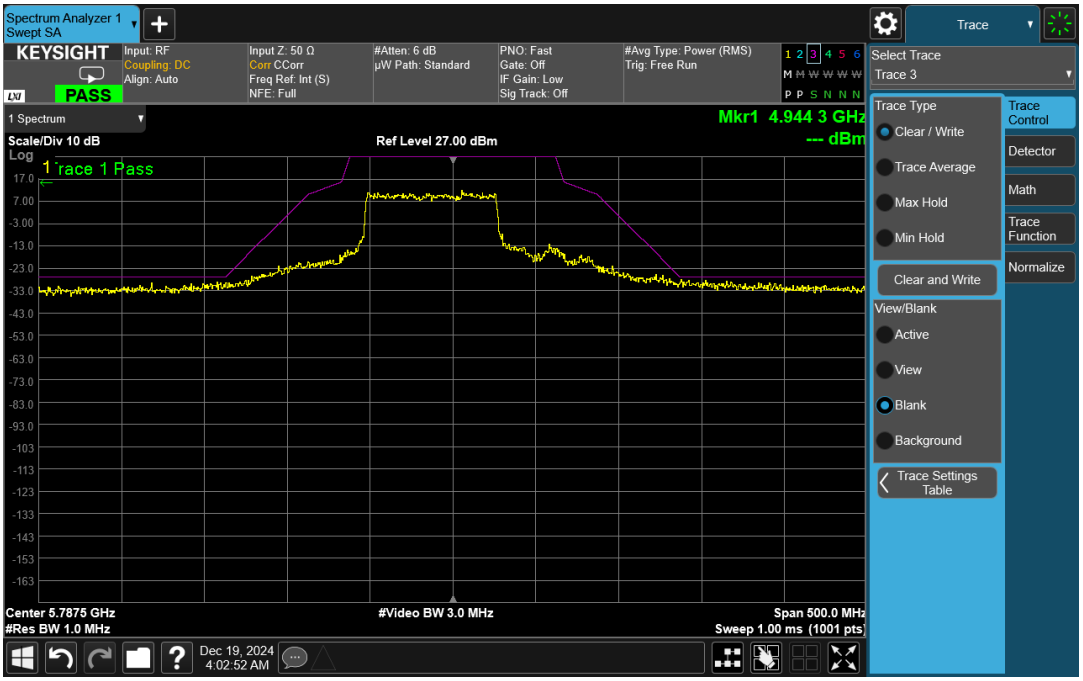


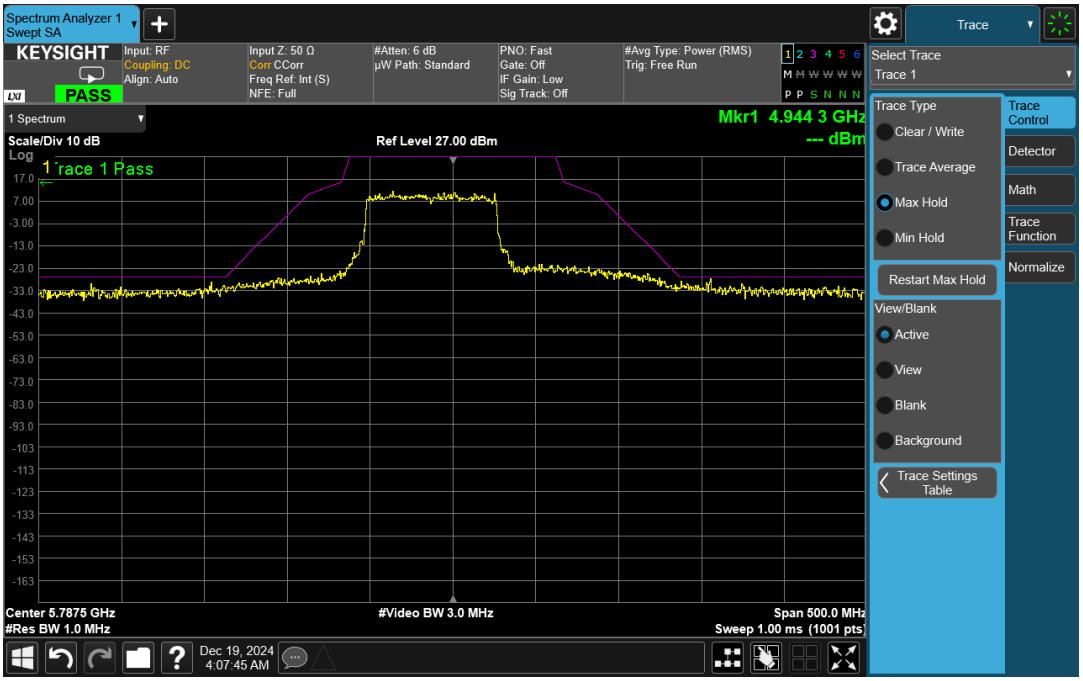
Wave-MLO5_UNII-3_MASK_HE40_TP30_VRT



Wave-MLO5_UNII-3_MASK_HE40_TP30_HZTL



Wave-MLO5_UNII-3_MASK_HE80_TP30_VRT



Wave-MLO5_UNII-3_MASK_HE80_TP30_HZTL

Result

Conducted spurious emissions were attenuated below the limit; therefore, the EUT complies with the specification.

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 TP30.

Correction Factor = Antenna Factor (dBi) + Cable Loss (dB) - Pre-Amplifier Gain (dB), 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. See Annex for Conducted Band edge plots.

5.5.3 Omni Antenna

QuasiPeak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
31.30 MHz	39.85	40.0	-0.15	119	1	Vertical	-4.36
42.05 MHz	28.35	40.0	-11.65	295	1.97	Vertical	-11.55
282.57 MHz	31.96	47.0	-15.04	44	1.8	Horizontal	-9.99

Table 4: Radiated Emissions 30 – 1000 MHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
11.50 GHz	54.15	74.0	-19.85	341	1.643	Vertical	10.78
14.81 GHz	57.12	74.0	-16.88	84	1.643	Vertical	13.88
9.19 GHz	52.31	74.0	-21.69	227	1.643	Horizontal	4.64
10.36 GHz	55.19	74.0	-18.81	205	2.142	Horizontal	9.19

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
11.50 GHz	41.21	54.0	-12.79	341	1.643	Vertical	10.78
14.81 GHz	44.07	54.0	-9.93	84	1.643	Vertical	13.88
9.19 GHz	44.30	54.0	-9.70	227	1.643	Horizontal	4.64
10.36 GHz	45.01	54.0	-8.99	205	2.142	Horizontal	9.19

Table 5: Radiated Emissions 1 – 17 GHz Lowest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.91 GHz	55.59	74.0	-18.41	359	1.643	Vertical	11.29
11.56 GHz	56.11	74.0	-17.89	80	1.643	Vertical	10.76

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
9.24 GHz	54.81	74.0	-19.19	228	1.638	Horizontal	4.98
10.36 GHz	56.06	74.0	-17.94	159	1.638	Horizontal	9.19
11.55 GHz	56.56	74.0	-17.44	262	1.643	Horizontal	10.77
11.93 GHz	52.93	74.0	-21.07	352	1.638	Horizontal	10.26

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.91 GHz	42.09	54.0	-11.91	359	1.643	Vertical	11.29
11.56 GHz	42.97	54.0	-11.03	80	1.643	Vertical	10.76
9.24 GHz	49.18	54.0	-4.82	228	1.638	Horizontal	4.98
10.36 GHz	46.88	54.0	-7.12	159	1.638	Horizontal	9.19
11.55 GHz	44.49	54.0	-9.51	262	1.643	Horizontal	10.77
11.93 GHz	39.90	54.0	-14.10	352	1.638	Horizontal	10.26

Table 6: Radiated Emissions 1 – 17 GHz Middle Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
9.32 GHz	51.06	74.0	-22.94	185	1.638	Vertical	5.43
11.65 GHz	57.11	74.0	-16.89	187	1.643	Vertical	10.45
9.32 GHz	55.30	74.0	-18.70	226	1.638	Horizontal	5.43
10.36 GHz	55.71	74.0	-18.29	204	1.638	Horizontal	9.19
10.97 GHz	54.36	74.0	-19.64	45	2.142	Horizontal	11.25
11.65 GHz	53.65	74.0	-20.35	188	1.638	Horizontal	10.45

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
9.32 GHz	38.97	54.0	-15.03	185	1.638	Vertical	5.43
11.65 GHz	46.79	54.0	-7.21	187	1.643	Vertical	10.45
9.32 GHz	50.21	54.0	-3.79	226	1.638	Horizontal	5.43
10.36 GHz	46.58	54.0	-7.42	204	1.638	Horizontal	9.19
10.97 GHz	41.63	54.0	-12.37	45	2.142	Horizontal	11.25
11.65 GHz	40.65	54.0	-13.35	188	1.638	Horizontal	10.45

Table 7: Radiated Emissions 1 – 17 GHz Highest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
21.04 GHz	64.90	74.0	-9.10	349	Vertical	-0.02
30.94 GHz	55.93	74.0	-18.07	343	Vertical	1.64
35.68 GHz	55.44	74.0	-18.56	95	Vertical	4.97
21.04 GHz	64.73	74.0	-9.27	355	Horizontal	-0.01
33.82 GHz	55.88	74.0	-18.12	327	Horizontal	5.06

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
21.04 GHz	50.26	54.0	-3.74	349	Vertical	-0.02
30.94 GHz	47.11	54.0	-6.89	343	Vertical	1.64
35.68 GHz	42.48	54.0	-11.52	95	Vertical	4.97
21.04 GHz	51.16	54.0	-2.84	355	Horizontal	-0.01
33.82 GHz	42.38	54.0	-11.62	327	Horizontal	5.06

Table 8: Radiated Emissions 17 – 40 GHz Lowest Frequency (worse case)

5.5.4 Dish Antenna

QuasiPeak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
31.30 MHz	39.85	40.0	-0.15	119	1	Vertical	-4.36
42.05 MHz	28.35	40.0	-11.65	295	1.97	Vertical	-11.55
282.57 MHz	31.96	47.0	-15.04	44	1.8	Horizontal	-9.99

Table 9: Radiated Emissions 30 – 1000 MHz

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
11.49 GHz	64.87	74.0	-9.13	165	1.638	Vertical	10.68
11.50 GHz	63.95	74.0	-10.05	164	1.638	Horizontal	10.73

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
11.49 GHz	51.17	54.0	-2.83	165	1.638	Vertical	10.68
11.50 GHz	49.61	54.0	-4.39	164	1.638	Horizontal	10.73

Table 10: Radiated Emissions 1 – 17 GHz Lowest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
11.55 GHz	64.43	74.0	-9.57	164	1.638	Vertical	10.77
6.08 GHz	43.64	74.0	-30.37	164	1.638	Horizontal	-10.38
11.55 GHz	67.17	74.0	-6.83	159	1.638	Horizontal	10.77
14.34 GHz	57.66	74.0	16.34	358	1.638	Horizontal	13.64

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
11.55 GHz	50.62	54.0	-3.38	164	1.638	Vertical	10.77
6.08 GHz	31.13	54.0	-22.87	164	1.638	Horizontal	-10.38
11.55 GHz	51.92	54.0	-2.08	159	1.638	Horizontal	10.77
14.34 GHz	44.22	54.0	-9.78	358	1.638	Horizontal	13.64

Table 11: Radiated Emissions 1 – 17 GHz Middle Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
9.32 GHz	51.06	74.0	-22.94	185	1.638	Vertical	5.43
11.65 GHz	57.11	74.0	-16.89	187	1.643	Vertical	10.45
9.32 GHz	55.30	74.0	-18.70	226	1.638	Horizontal	5.43
10.36 GHz	55.71	74.0	-18.29	204	1.638	Horizontal	9.19
10.97 GHz	54.36	74.0	-19.64	45	2.142	Horizontal	11.25
11.65 GHz	53.65	74.0	-20.35	188	1.638	Horizontal	10.45

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
9.32 GHz	38.97	54.0	-15.03	185	1.638	Vertical	5.43
11.65 GHz	46.79	54.0	-7.21	187	1.643	Vertical	10.45
9.32 GHz	50.21	54.0	-3.79	226	1.638	Horizontal	5.43
10.36 GHz	46.58	54.0	-7.42	204	1.638	Horizontal	9.19
10.97 GHz	41.63	54.0	-12.37	45	2.142	Horizontal	11.25
11.65 GHz	40.65	54.0	-13.35	188	1.638	Horizontal	10.45

Table 12: Radiated Emissions 1 – 17 GHz Highest Frequency

Peak

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
21.04 GHz	64.90	74.0	-9.10	349	Vertical	-0.02

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
30.94 GHz	55.93	74.0	-18.07	343	Vertical	1.64
35.68 GHz	55.44	74.0	-18.56	95	Vertical	4.97
21.04 GHz	64.73	74.0	-9.27	355	Horizontal	-0.01
33.82 GHz	55.88	74.0	-18.12	327	Horizontal	5.06

Avg

Frequency	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
21.04 GHz	50.26	54.0	-3.74	349	Vertical	-0.02
30.94 GHz	47.11	54.0	-6.89	343	Vertical	1.64
35.68 GHz	42.48	54.0	-11.52	95	Vertical	4.97
21.04 GHz	51.16	54.0	-2.84	355	Horizontal	-0.01
33.82 GHz	42.38	54.0	-11.62	327	Horizontal	5.06

Table 13: Radiated Emissions 17 – 40 GHz Lowest 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 662911 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 30 dBm in any 500 kHz band during any time interval of continuous transmission. Results of this testing are summarized.

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 antenna gain of the Omni is 10 dBi + Array gain of 3.01 dB which is a total of 13.01 dBi for a Nss1 limit of 22.99.

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 antenna gain of the Dish is 30 dBi + Array gain of 3.01 dB which is a total of 33.01 dBi for a Nss1 limit of 2.99. However, with the dish antenna the DUT operates as fixed point to point device, and therefore there is no reduction in transmitter conducted power.

5.6.1 Omni Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5745	Mcs0	23	25.41	35.41	10.29
OFDM 20	5775	Mcs0	24	26.14	36.14	10.95
OFDM 20	5825	Mcs0	24	25.50	35.50	10.10
HE 20	5745	Mcs0	24	25.84	35.84	10.12
HE 20	5775	Mcs0	24	26.21	36.21	10.36
HE 20	5825	Mcs0	23	25.14	35.14	9.19
HE 40	5755	Mcs0	20	22.93	32.93	4.25
HE 40	5775	Mcs0	20	23.03	33.03	4.20
HE 40	5795	Mcs0	20	23.15	33.15	4.34
HE 80	5775	Mcs0	18	18.00	28.00	-0.95

5.6.2 Dish Antenna

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5745	Mcs0	24	22.93	52.93	10.68
OFDM 20	5775	Mcs0	22	21.86	51.86	8.96
OFDM 20	5825	Mcs0	23	22.26	52.26	9.26
HE 20	5745	Mcs0	24	25.86	55.86	10.15
HE 20	5775	Mcs0	22	24.19	54.19	8.54
HE 20	5825	Mcs0	23	24.91	54.91	8.89
HE 40	5755	Mcs0	22	24.50	54.50	5.72
HE 40	5775	Mcs0	22	24.54	54.54	5.87
HE 40	5795	Mcs0	22	24.45	54.45	5.69
HE 80	5775	Mcs0	19	21.24	51.24	-0.29

Result

The maximum summed average power spectral density was less than the limit of 30 dBm, therefore, the EUT complies with the specification.

-- End of Test Report --