Compliance
Test
Services

623 E. 100 S.
Salt Lake City, UT 84102

Test Report

Certification

FCC ID	2AJAC-CORELITE
IC ID	7848A-CORELITE
Equipment Under Test	C4-CORE-LITE
Test Report Serial Number	TR8081_01
Date of Test(s)	March 22, 2023 through March 29, 2023
Report Issue Date	10 May2023

Test Specification	Applicant
47 CFR FCC Part 15, Subpart C RSS-Gen Issue 5	Snap One LLC 1800 Continental Blvd., Suite 200-300 Charlotte NC 28273 U.S.A.

NVLAP TESTING ilac-MRA

NVLAP LAB CODE 600293-0

Certification of Engineering Report

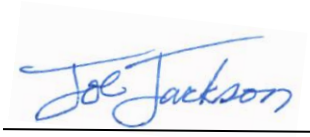
This report has been prepared by Compliance Test Services (CTS) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the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

Applicant	Snap One LLC
Manufacturer	Snap One LLC
Brand Name	Control 4
Model Number	C4-CORE-LITE
FCC ID	2AJAC-CORELITE
IC ID	7848A-CORELITE

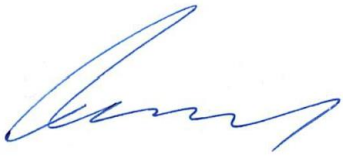
On this 10th day of May 2023, I individually and for Compliance Test Services certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Compliance Test Services 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.

Compliance Test Services



Reviewed By: Joe Jackson



Written By: Clay Allred

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	10 April 2022

Table of Contents

1 Client Information

1.1 Applicant

Company	Snap One LLC 1800 Continental Blvd., Suite 200-300 Charlotte NC 28273 U.S.A.
Contact Name	Joshua Tucker
Title	Regulatory Compliance Engineer

1.2 Manufacturer

Company	Snap One LLC 1800 Continental Blvd., Suite 200-300 Charlotte NC 28273 U.S.A.
Contact Name	Joshua Tucker
Title	Regulatory Compliance Engineer

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	Control 4
Model Number	C4-CORE-LITE
Hardware Version	Rev 3.0
Serial Number / MAC Address	N/A
Rating/power supply	Input: AC 100V-240 VAC,50Hz/60Hz, 0.3A, or PoE +
RCB revision	Rev 3.0
Schematic revision	Rev 3.0
Firmware/Software revision	3.3.3
Dimensions (mm)	30.1 x 189 x 118.5
Antenna	(2.7dBi)

2.2 Description of EUT

The C4-CORE-LITE is a controller for Contol4's home automation system. The C4-CORE-LITE has an Ethernet port, HDMI port, USB port for maintenance, and 3 IR ports. An 802.15.4(ZigBee) transceiver, which is used for communication with other devices in the system. These units are powered by 100-240 VAC, 60/50Hz.

The highest internal clocks or internal clock frequency on the EUT is the 2.4 GHz Zigbee wireless and internal DDR 1.6 GHz clock.

This report covers the circuitry of the device subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Compliance Test Services 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: Control4 MN: C4-CORE-LITE MAC: N/A	Controller	See Section 2.4
BN: Samsung MN: UN43NU6900BXZA SN: 09643CPMB13335K	4K TV	HDMI, Blue Jeans Cable (Note 2)
BN: Dell MN: XPS SN: n/a	Laptop	Network/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	Shielded Cable	Ferrite Core Installed	Cable Description/Length
HDMI Port	1	Yes	No	<3m, HDMI Cable
AC Input	1	No	No	120-240V 50-60Hz <3m
Ethernet	1	No	No	
IR/Serial/Relay GPIO	3	No	No	<3m
USB interface	1	Yes	No	<3m

2.5 Operating Environment

Power Supply	120V
AC Mains Frequency	60Hz
Temperature	22 – 24 °C
Humidity	20 – 27 %
Barometric Pressure	1019 mBar

2.6 Operating Modes

The C4-CORE-LITE was connected to a personal computer laptop and tested using test software in order to enable to constant duty cycle greater or equal to 98% of the Zigbee transceiver. The Zwave radio was also enabled to ensure emissions during simultaneous transmission were compliant. The measurements within this report are corrected to reference a 100% duty cycle.

2.7 EUT Exercise Software

EUT firmware version 3.3.3 was used to operate the transmitter using a constant transmit mode.

2.8 Block Diagram of Test Configuration

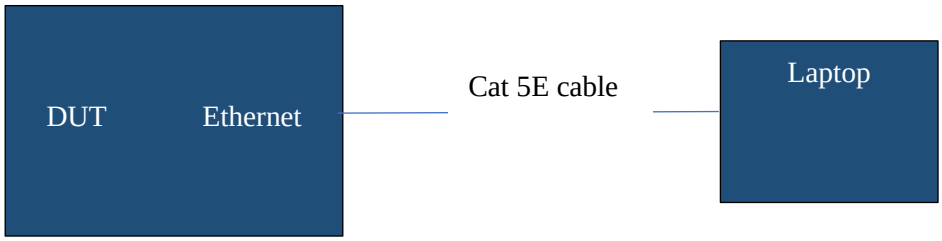


Diagram 1: Test Configuration Block Diagram

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 C 15.203, 15.207, 15.209 and 15.247 Limits and methods of measurement of radio interference characteristics of radio frequency devices.
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.203	N/A	Antenna requirements	Structural Requirement	Compliant
15.207	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.247(a)	RSS-247 § 5.2	Bandwidth Requirement	2400 to 2483.5	Compliant
15.247(b)	RSS-247 § 5.4	Peak Output Power	2400 to 2483.5	Compliant
15.247(d)	RSS-247 § 5.4	Antenna Conducted Spurious Emissions	0.009 to 40000	N/A
15.247(d)	RSS-247 § 5.4	Radiated Spurious Emissions	0.009 to 40000	Compliant
15.247(e)	RSS-247 § 5.2	Peak Power Spectral Density	2400 to 2483.5	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 558074 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.				

3.3 Results

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

3.4 Test Location

Testing was performed at the Compliance Test Services Draper location at 427 West 12800 South, Draper, UT 84020. Compliance Test Services is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600293-0 which is effective until December 31, 2023.

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-2500	6/27/2022	6/27/2023
LISN	AFJ	LS16C/10	UCL-6749	12/6/2021	12/6/2023
ISN	Teseq	ISN T800	UCL-2974	6/27/2022	6/272023
LISN	Com-Power	LIN-120C	UCL-2612	1/24/2023	1/24/2024
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

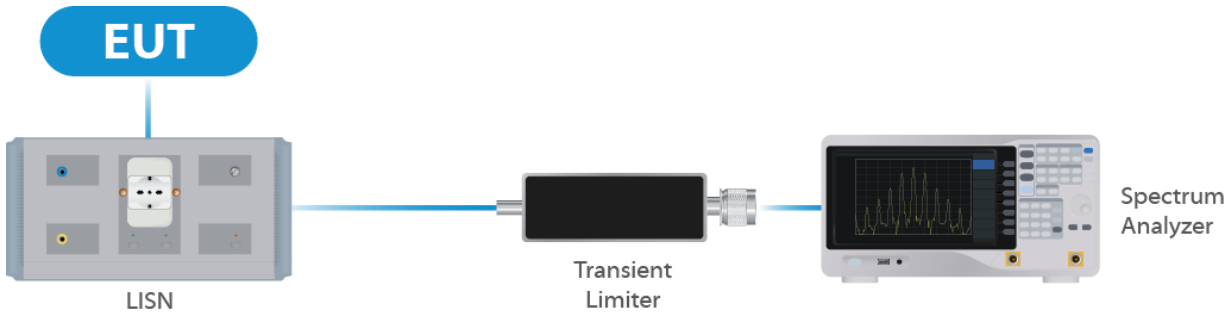


Figure 1: Conducted Emissions Test

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	11/7/2022	11/7/2023
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	2/22/2023	2/22/2024
Switch Extension	R&S	OSP-150W	UCL-2870	2/22/2023	2/22/2024

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

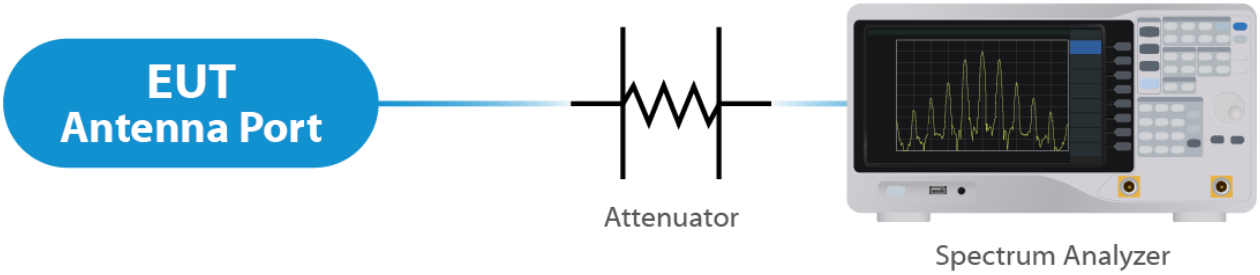


Figure 2: Direct Connect at the Antenna Port Test

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	1274/2023	1274/2024
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-2889	10/7/2021	10/7/2023
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	9/22/2022	9/22/2024
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	1/27/2023	1/27/2025
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	6/09/2022	6/09/2024
1 – 18 GHz Amplifier	Com-Power	PAM 118A	UCL-3833	12/9/2022	12/9/2023
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 3: List of equipment used for Radiated Emissions

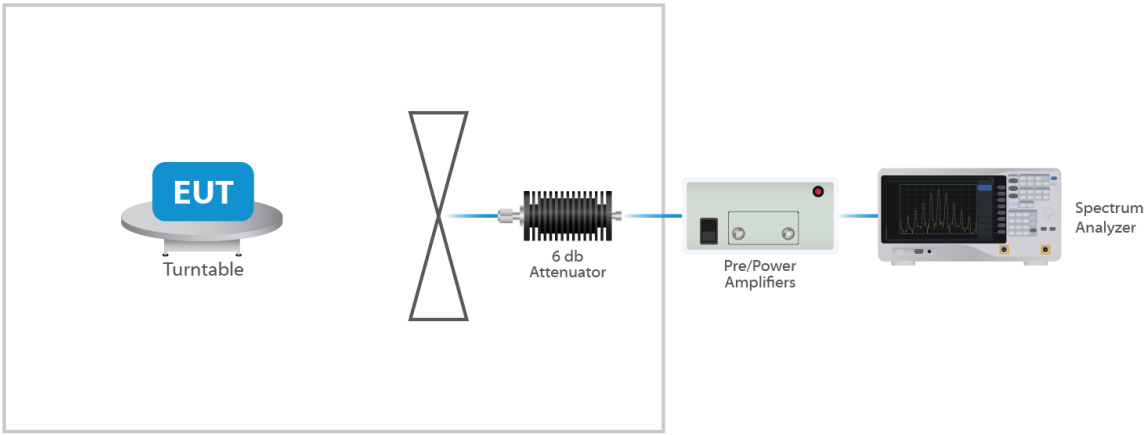


Figure 3: Radiated Emissions Test

4.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Compliance Test Services 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
Asymmetric Mode Conducted Emissions	3.61	95
Shielded CDN Conducted Emissions	3.33	95
Radiated Emissions (30 MHz to 1 GHz)	4.38	95
Radiated Emissions (1 GHz to 17 GHz)	4.37	95

5 Test Results

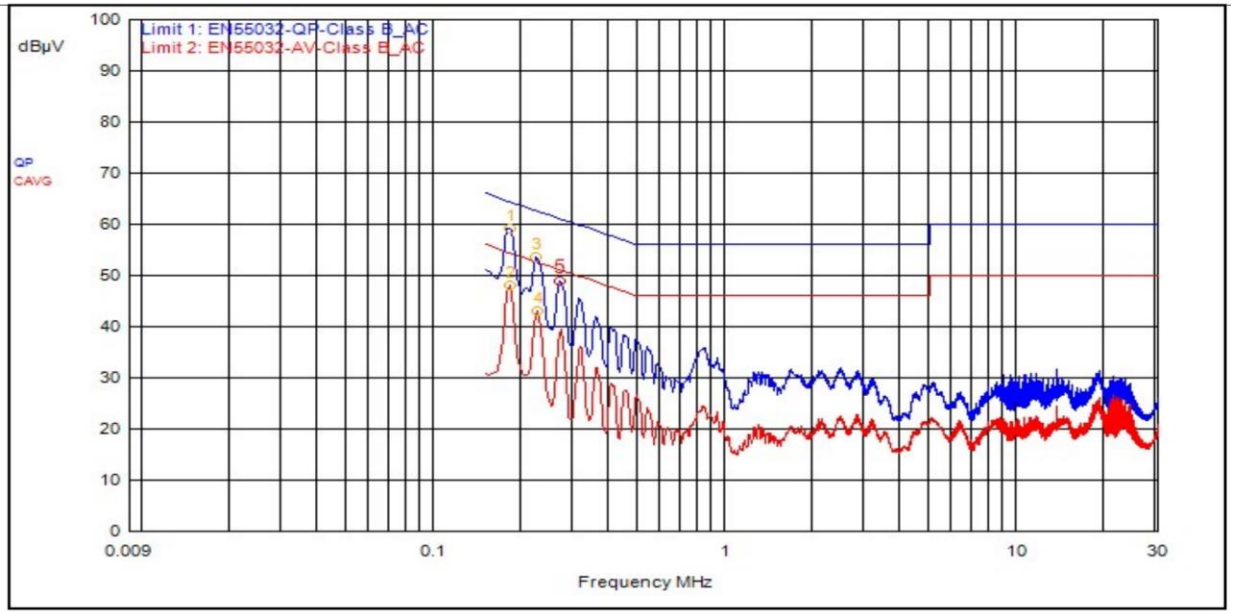
5.1 §15.203 Antenna Requirements

The EUT uses an internal antenna with a maximum gain of 2.7 dBi per manufacturer. The antenna is not user replaceable.

Results

The EUT complied with the specification

5.2 Conducted Emissions at Mains Ports Data (Hot Lead)



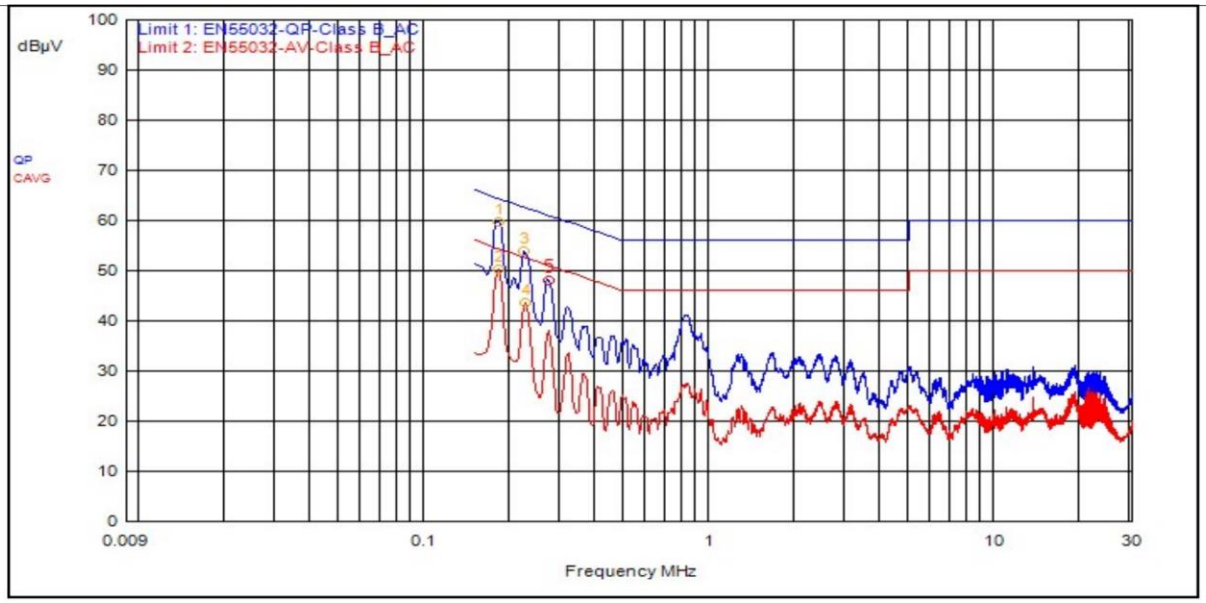
ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.
1	180,000kHz	9.5	0.0		QPeak	49.7	59.2	64.5	-5.3		
3	222,000kHz	9.5	0.0		QPeak	44.0	53.5	62.7	-9.2		
5	267,000kHz	9.5	0.1		QPeak	39.3	48.9	61.2	-12.3		
2	180,000kHz	9.5	0.0		C_AVG	38.6	48.1			54.5	-6.3
4	225,000kHz	9.5	0.0		C_AVG	33.5	43.1			52.6	-9.6

Sample Field Strength Calculation
Meas. Level = Meter Read + Probe (LISN Factor)+ Cable

Result

The EUT complied with the specification limit by a margin of -5.3 dB.

5.3 Conducted Emissions at Mains Ports Data (Neutral Lead)



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.
1	180,000kHz	9.5	0.0		QPeak	50.1	59.6	64.5	-4.9		
3	222,000kHz	9.5	0.0		QPeak	44.2	53.8	62.7	-9.0		
5	270,000kHz	9.5	0.1		QPeak	38.4	48.0	61.1	-13.1		
2	180,000kHz	9.5	0.0		C_AVG	40.6	50.2			54.5	-4.3
4	225,000kHz	9.5	0.0		C_AVG	34.1	43.7			52.6	-9.0

Sample Field Strength Calculation
Meas. Level = Meter Read + Probe (LISN Factor)+ Cable

Result

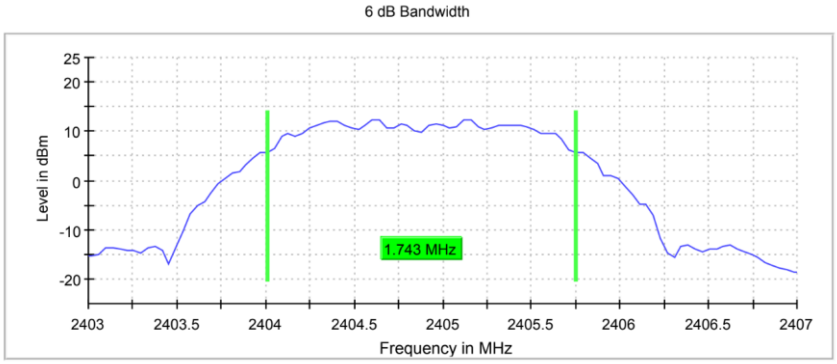
The EUT complied with the specification limit by a margin of -4.3 dB.

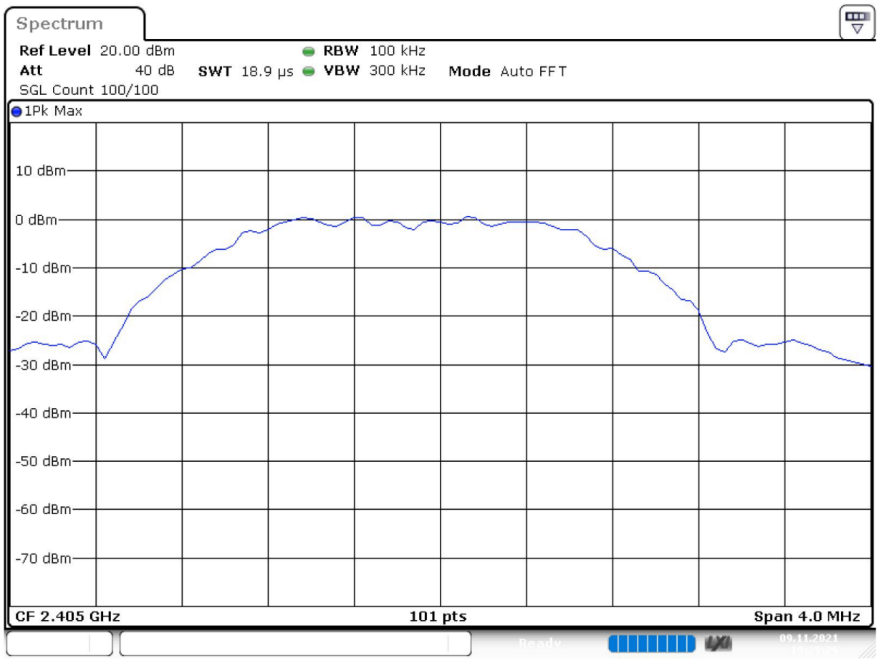
5.5 §15.247(a)(2) Emissions Bandwidth

Frequency (MHz)	Emissions 6 dB Bandwidth (MHz)	Emissions 99% Bandwidth (MHz)
2405	1.74	2.23
2440	1.70	2.22
2475	1.70	2.23

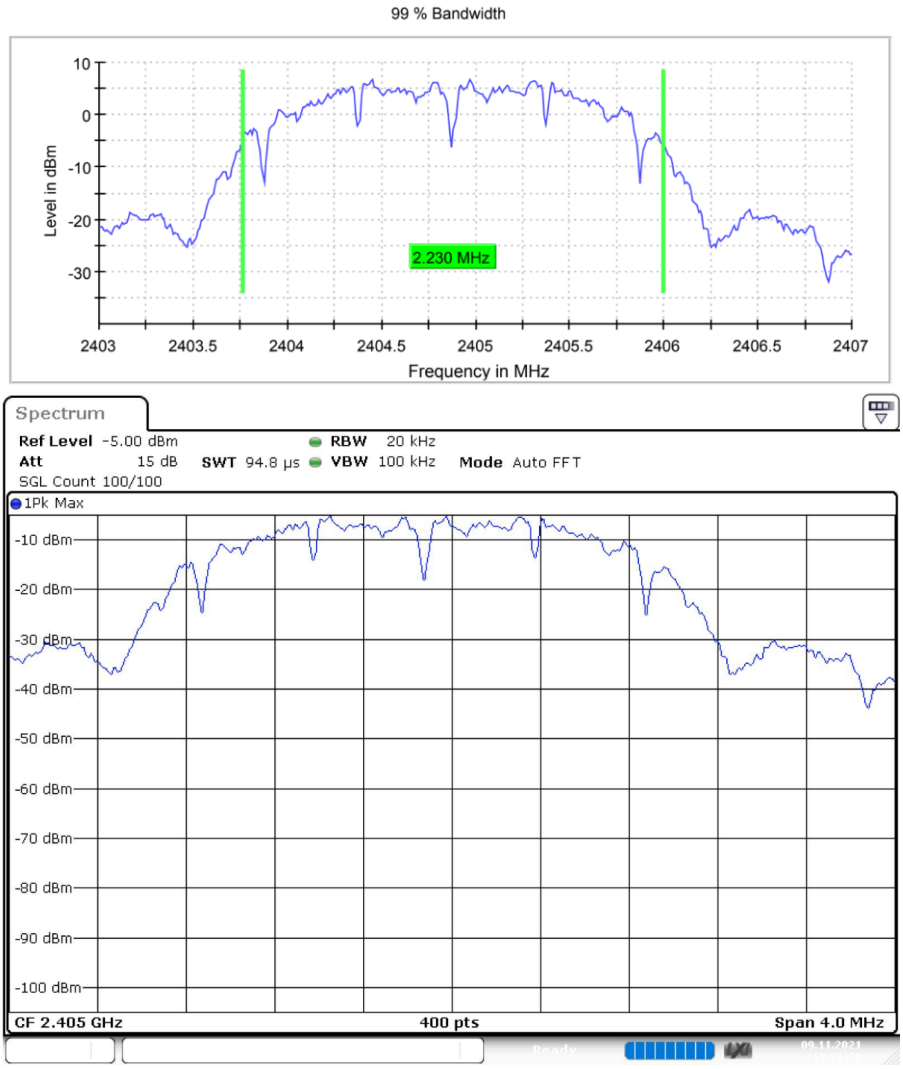
Result

In the configuration tested, the 6 dB bandwidth was greater than 500 kHz; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plots Below).

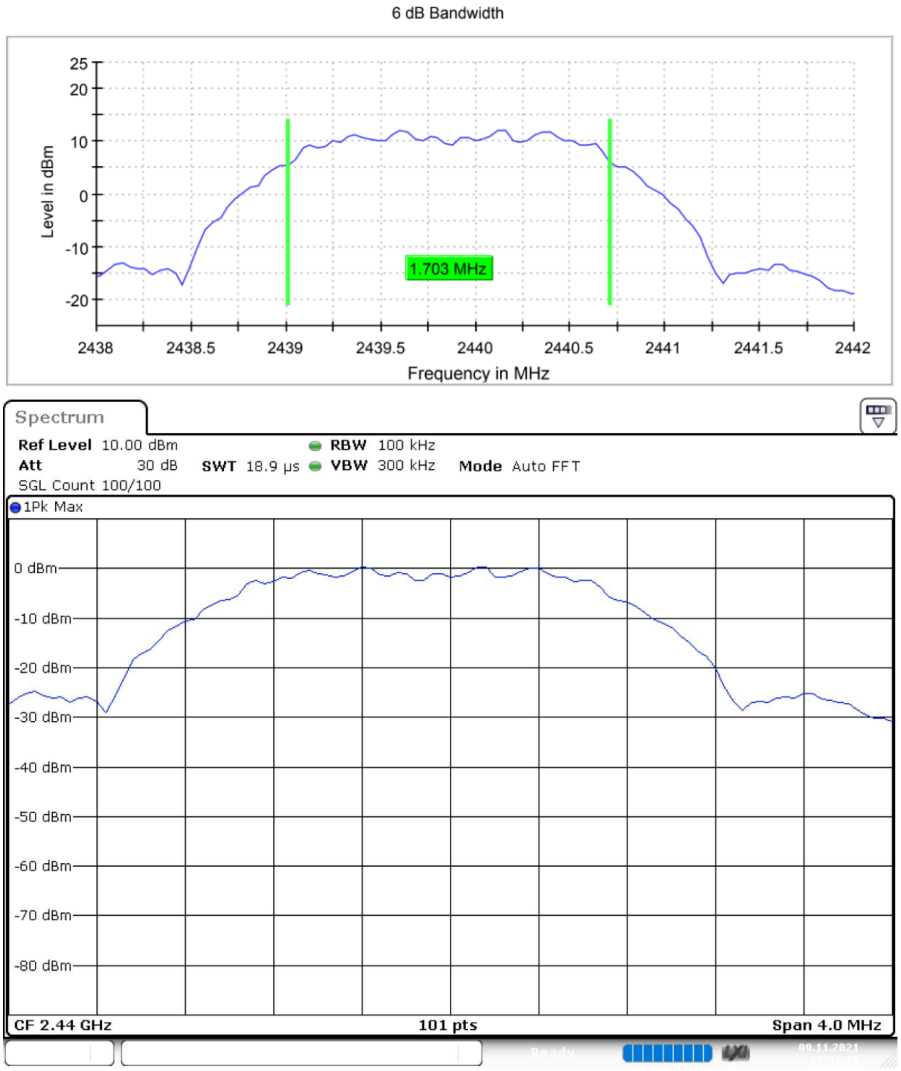




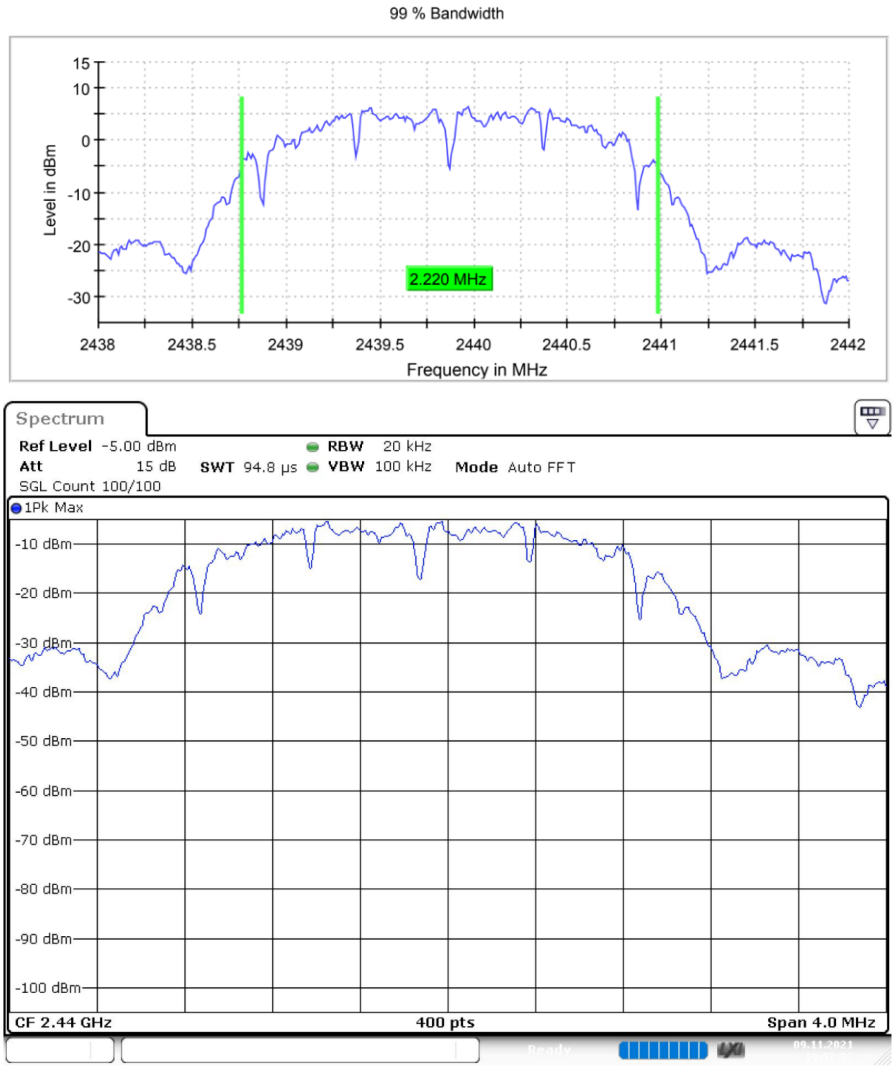
Graph 1: 6dB OBW Plot and Screenshot (2405MHz)



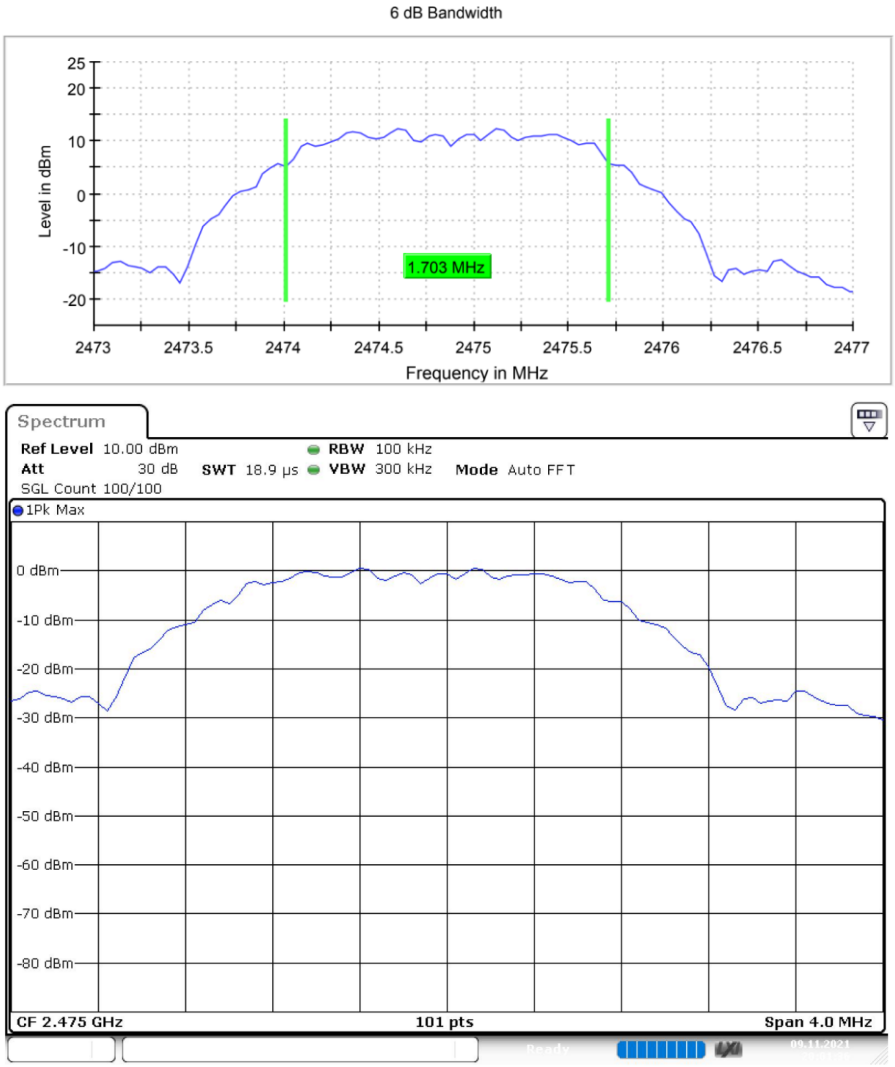
Graph 2: 99% OBW Plot and Screenshot (2405MHz)



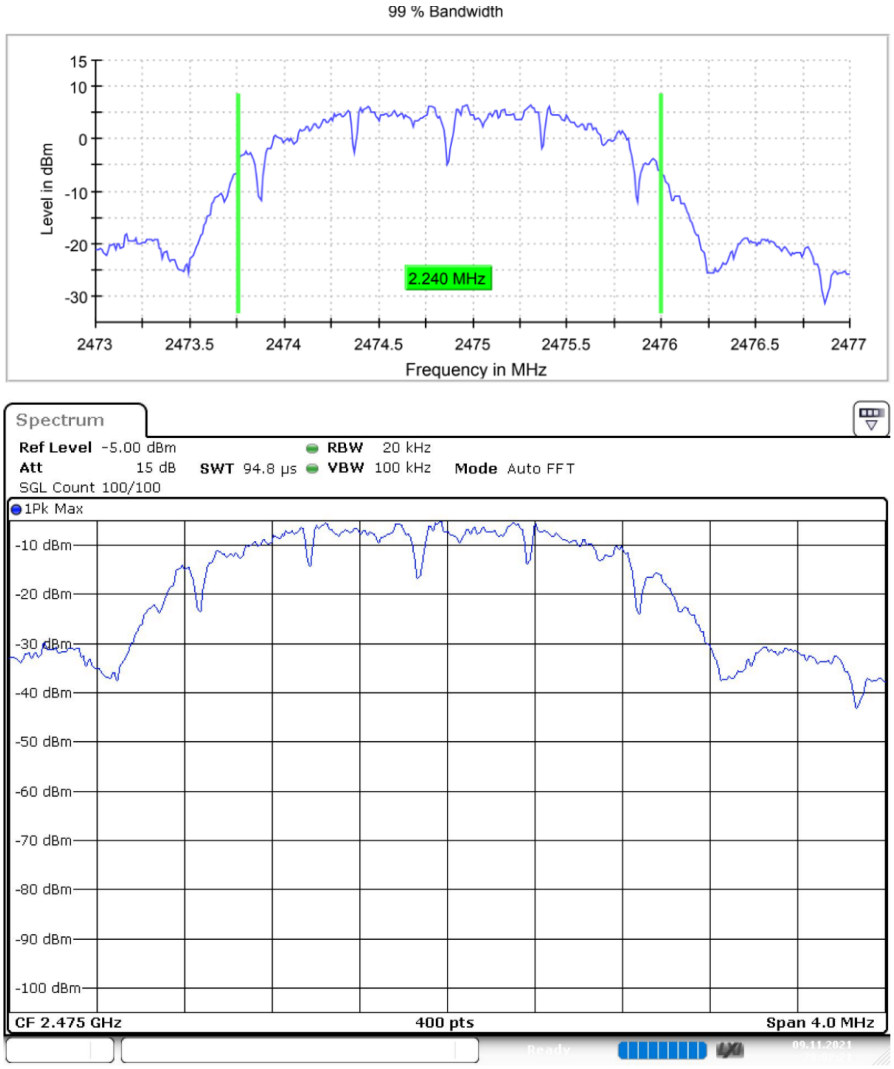
Graph 3: 6dB OBW Plot and Screenshot (2440MHz)



Graph 4: 99% OBW Plot and Screenshot (2440MHz)



Graph 5: 6dB OBW Plot and Screenshot (2475MHz)



Graph 6: 99% OBW Plot and Screenshot (2475MHz)

5.6 §15.247(b)(3) Maximum Average Output Power

The maximum average RF conducted output power measured for this device was 17.1 dBm or 51.29 mW. The limit is 30 dBm or 1 Watt when using antennas with 6 dBi or less gain. The antenna has a gain of 2.7 dBi.

Frequency (MHz)	Measured Output Power (dBm)	Output Power (mW)
2405	17.1	51.29
2440	17.0	50.12
2475	17.0	50.12

Result

In the configuration tested, the maximum average RF output power was less than 1 watt; therefore, the EUT complied with the requirements of the specification.

5.7 §15.247(d) Spurious Emissions

5.7.1 Conducted Spurious Emissions

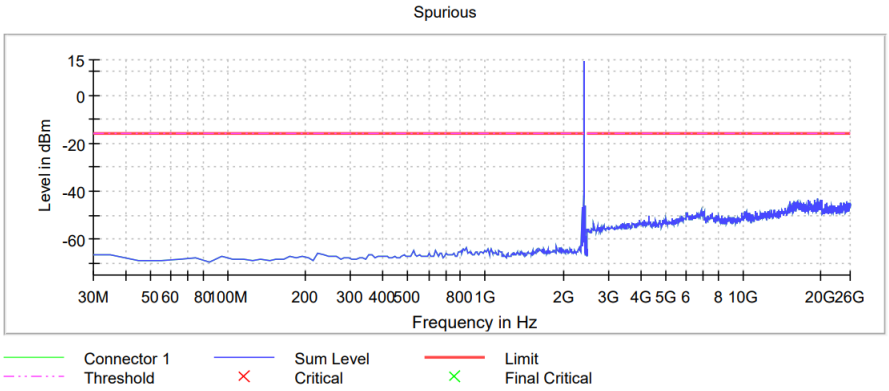
The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The table show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown below and within the Annex are plot(s) with the EUT tuned to the upper and lower channels. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be attenuated 30 dB below the highest power spectral density level measured within the authorized band as measured with a 100 kHz RBW.

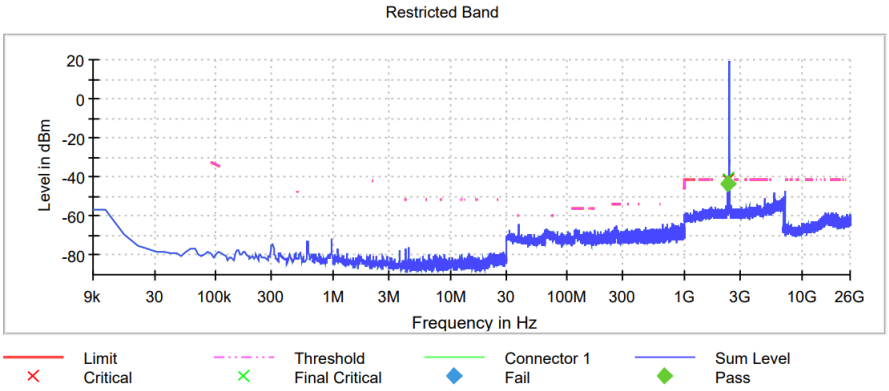
Result

Conducted spurious emissions were attenuated 30 dB or more below the fundamental; therefore, the EUT complies with the specification.

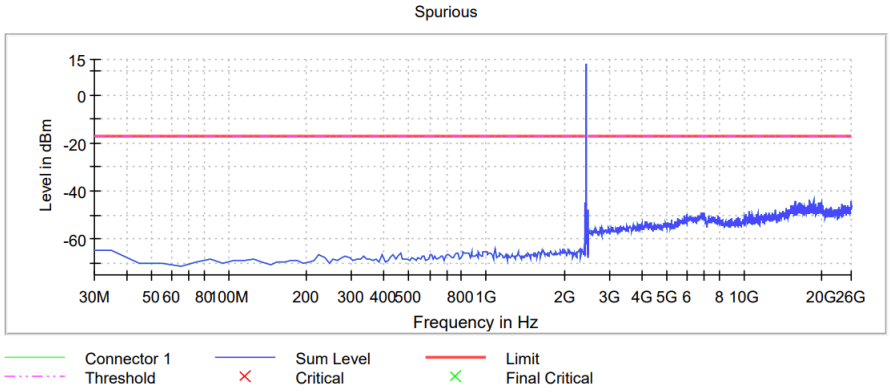
Conducted Spurious



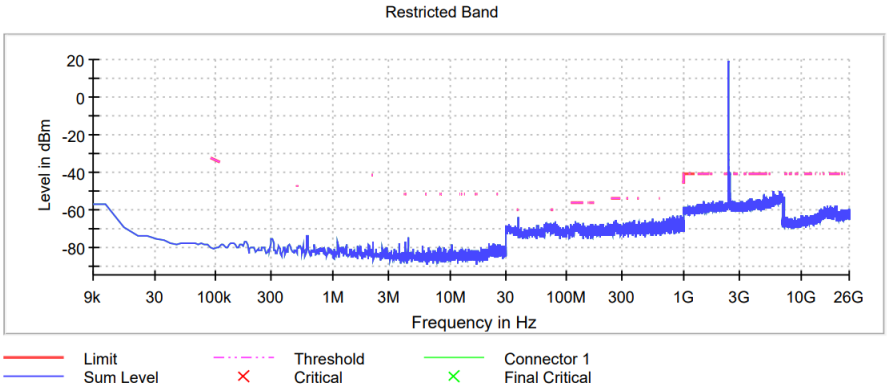
Graph 7: TX Spurious Plot (2405MHz)



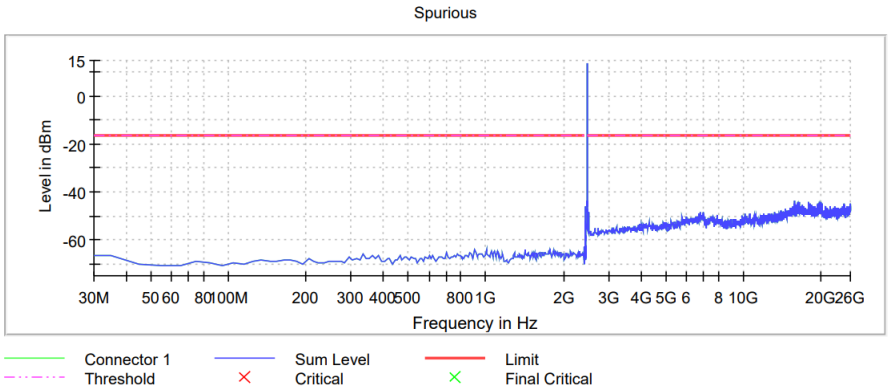
Graph 8: Restricted band Average Plot (2405MHz)



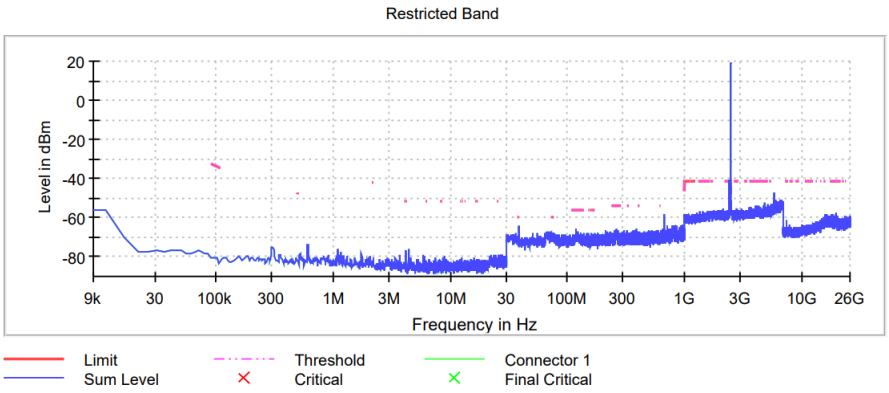
Graph 9: TX Spurious Plot (2440MHz)



Graph 10: Restricted band Average Plot (2445MHz)

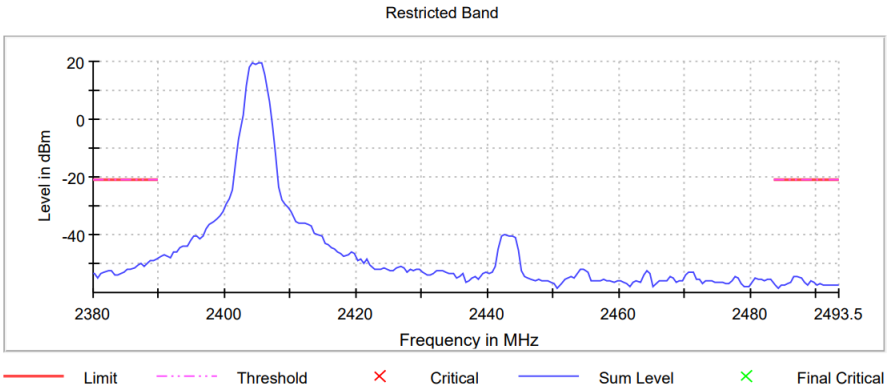


Graph 11: TX Spurious Plot (2475MHz)

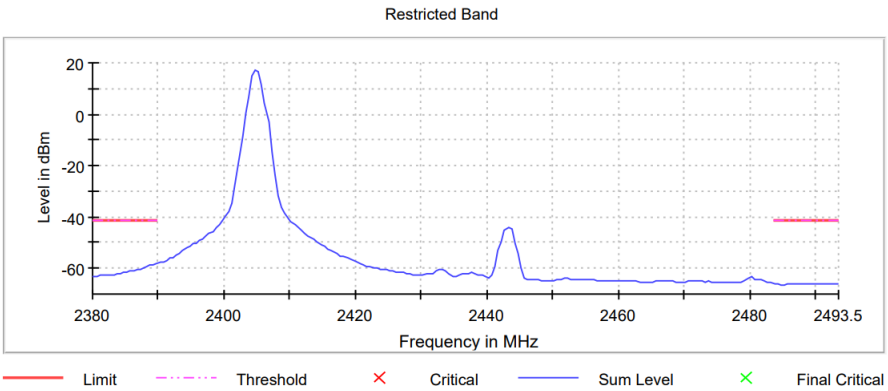


Graph 12: Restricted band Average Plot (2475MHz)

Bande Edge

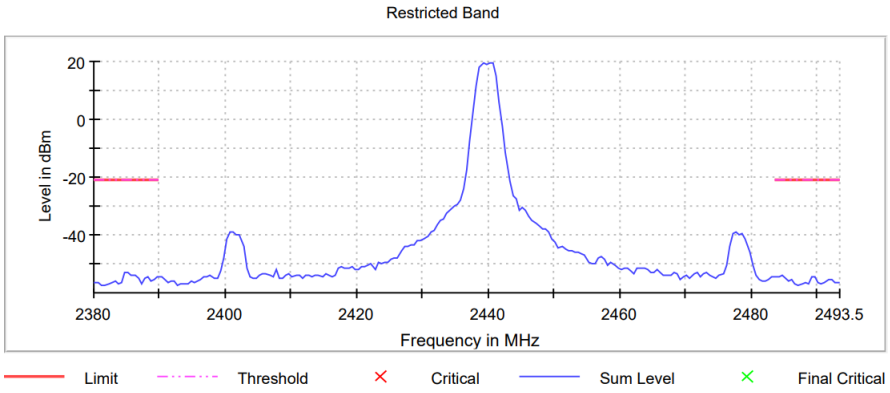


Peak

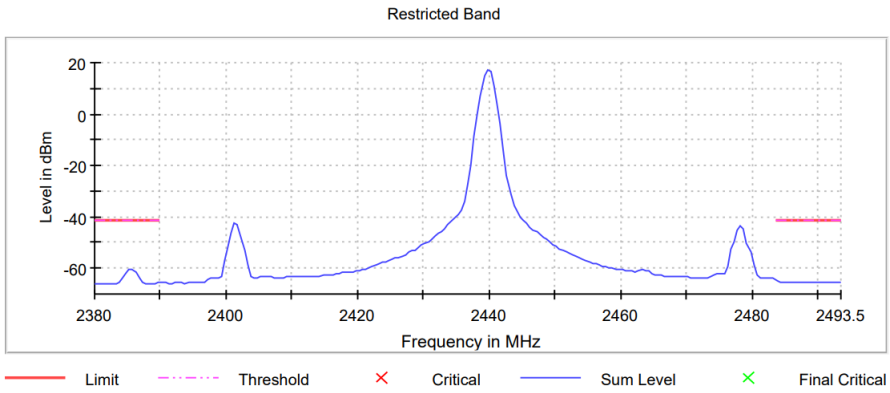


Average

Graph 13: Band Edge Plot (2405MHz)

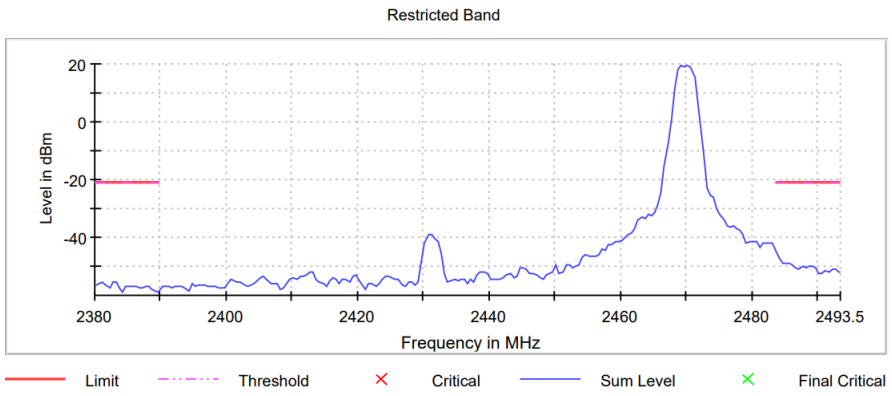


Peak

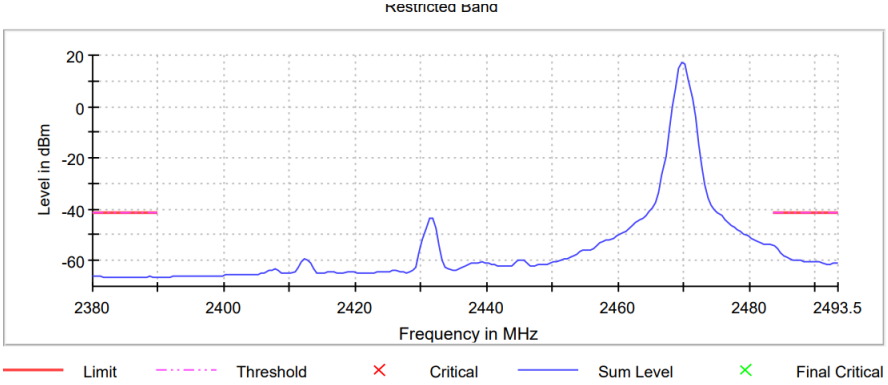


Average

Graph 14: Band Edge Plot (2440MHz)



Peak



Average

Graph 15: Band Edge Plot (2470MHz)

5.7.2 Radiated Spurious Emissions in the Restricted Bands of §15.205

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emissions was investigated to measure any radiated emissions in the restricted bands. The following tables show measurements of any emissions that fell into the restricted bands of §15.205. The tables show the worst-case emissions measured from the EUT. For frequencies above 18.0 GHz, a measurement distance of 1 meter was used. The noise floor was a minimum of 6 dB below the limits. The emissions in the restricted bans must meet the limits specified in §15.209. Tabular data for each of the spurious emissions is shown below for each of the units. Plots of the band edges are also shown.

Result

All emissions in the restricted bands of §15.205 met the limits specified in §15.209; therefore, the EUT complies with the specification.

Radiated Spurious Emissions per 15.209

Frequency	Det.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
6399.3	PK	49.77	74	-24.23	288	2.4	Vertical	1M	6.46
7216.4	PK	56.29	74	-17.71	70	2.71	Vertical	1M	9.35
7212.8	PK	55.14	74	-18.86	346	2.89	Horizontal	1M	9.33
6399.3	AV	39.96	54	-14.04	288	2.4	Vertical	1M	6.46
7216.4	AV	45.72	54	-8.28	70	2.71	Vertical	1M	9.35
7212.8	AV	44.09	54	-9.91	346	2.89	Horizontal	1M	9.33
16013	PK	51.32	74	-22.68	32	1.5	Vertical	1M	3.68
16279	PK	50.57	74	-23.43	110	1.5	Horizontal	1M	1.69
16013	AV	37.63	54	-16.37	32	1.5	Vertical	1M	3.68
16279	AV	36.41	54	-17.59	110	1.5	Horizontal	1M	1.69
7321.2	PK	56.19	74	-17.81	73	2.76	Vertical	1M	8.99
11908	PK	51.05	74	-22.95	206	2.4	Vertical	1M	14.81
7318.1	PK	53.12	74	-20.88	324	1.88	Horizontal	1M	9.02
7321.2	AV	45.99	54	-8.01	73	2.76	Vertical	1M	8.99
11908	AV	37.84	54	-16.16	206	2.4	Vertical	1M	14.81
7318.1	AV	42.25	54	-11.75	324	1.88	Horizontal	1M	9.02
16257.7	PK	49.62	54	-4.38	1.5	52	Vertical	1M	1.84
17230	PK	48	54	-6	1.5	25	Vertical	1M	-2.28
17731.8	PK	48.21	54	-5.79	1.5	308	Vertical	1M	-2.02
25598	PK	50.41	54	-3.59	1.5	225	Vertical	1M	0.84
16002.5	PK	49.35	54	-4.65	1.5	271	Horizontal	1M	3.92
17715.9	PK	48.2	54	-5.8	1.5	141	Horizontal	1M	-1.93
22078.2	PK	48.32	54	-5.68	1.5	271	Horizontal	1M	-0.3
25753.6	PK	50.4	54	-3.6	1.5	298	Horizontal	1M	0.49
7411.3	PK	54.77	74	-19.23	67	2.58	Vertical	1M	7.87
7408	PK	49.76	74	-24.24	103	3.28	Horizontal	1M	7.88
7411.3	AV	44.26	54	-9.74	67	2.58	Vertical	1M	7.87

Frequency	Det.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
7408	AV	39.03	54	-14.97	103	3.28	Horizontal	1M	7.88
16005.2	PK	50.15	54	-3.85	309	1.5	Vertical	1M	3.86
17014.1	PK	48.15	54	-5.85	337	1.5	Vertical	1M	-2.01
25230	PK	51.29	54	-2.71	208	1.5	Vertical	1M	0.72
25364.8	PK	51.13	54	-2.87	291	1.5	Vertical	1M	0.41

Sample Field Strength Calculation
Level = Receiver Reading + Correction Factor
Correction Factor = Antenna Factor + Cable Factor - Amplifier
Margin = Level - Limit

Result

The EUT complied with the specification limit by a margin of -2.71 dB.

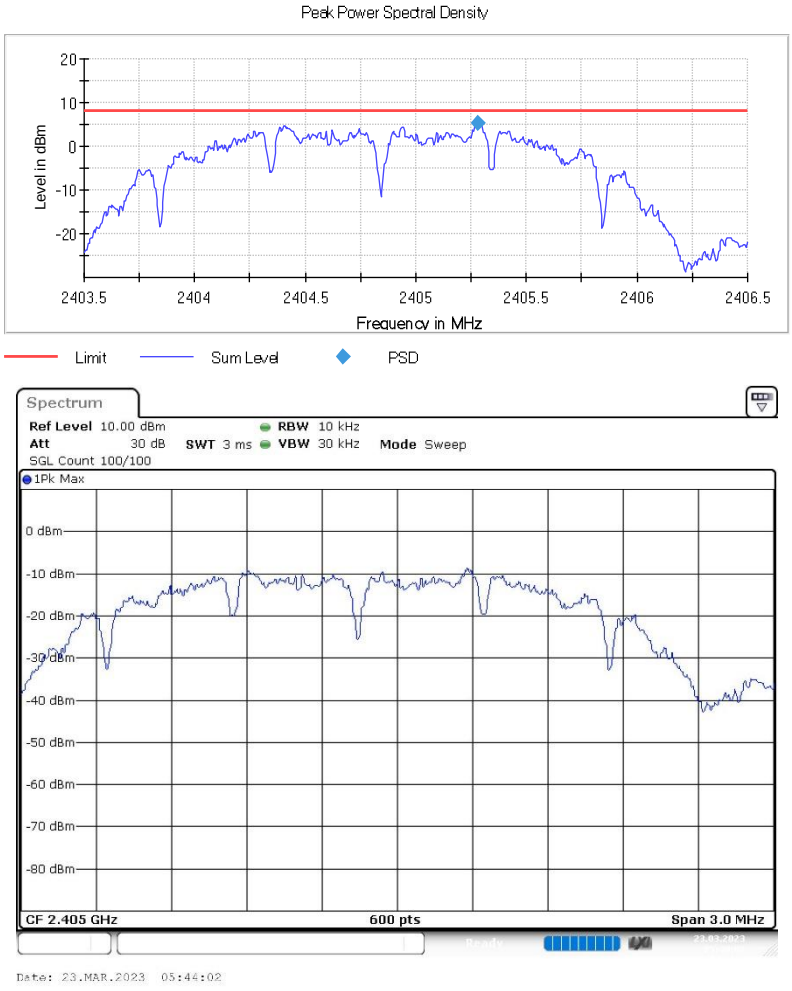
5.8 §15.247(e) Maximum Average Power Spectral Density

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. Results of this testing are summarized.

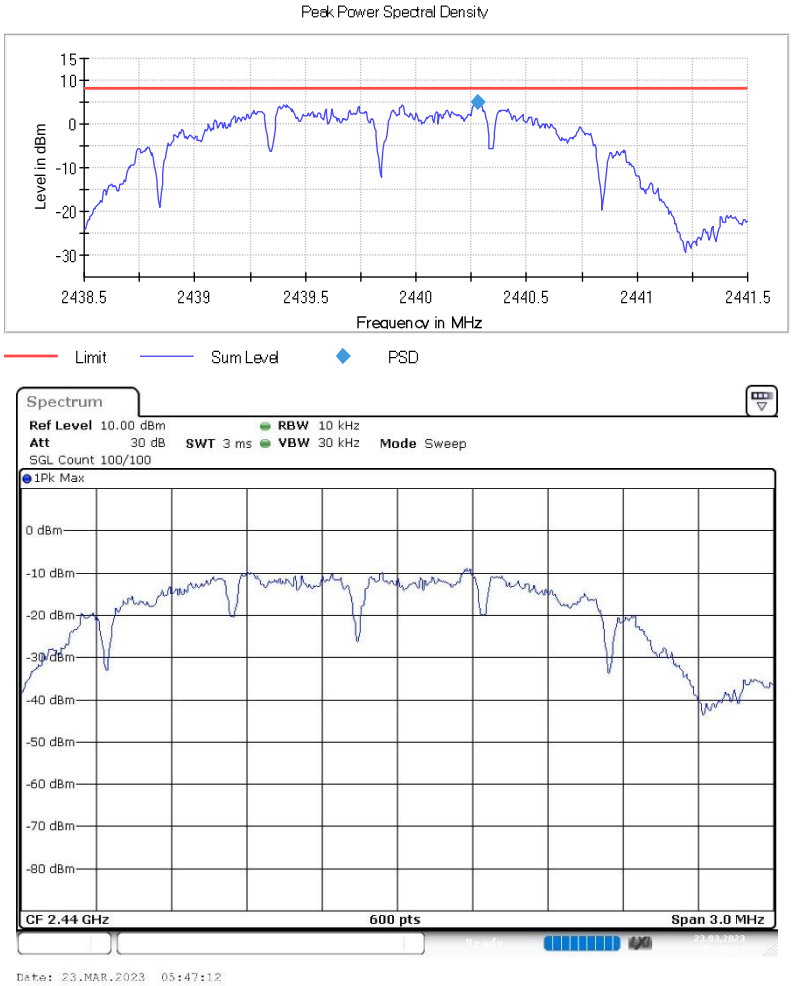
Frequency (MHz)	Measurement (dBm)	Criteria (dBm)
2405	5.31	8.0
2440	5.14	8.0
2475	5.01	8.0

Result

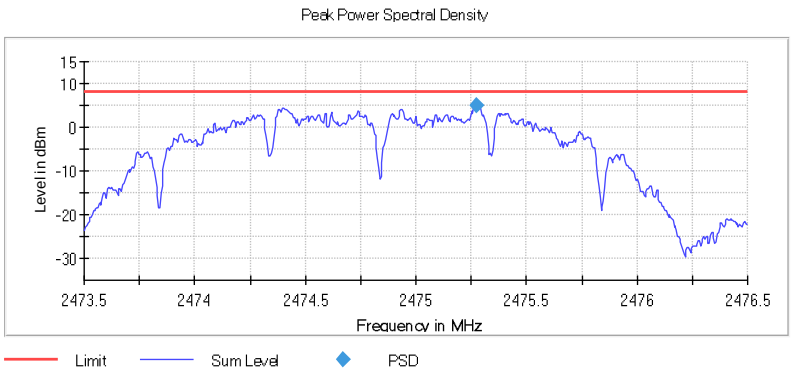
The maximum average power spectral density was less than the limit of 8 dBm; therefore, the EUT complies with the specification (see spectrum analyzer plots Below).

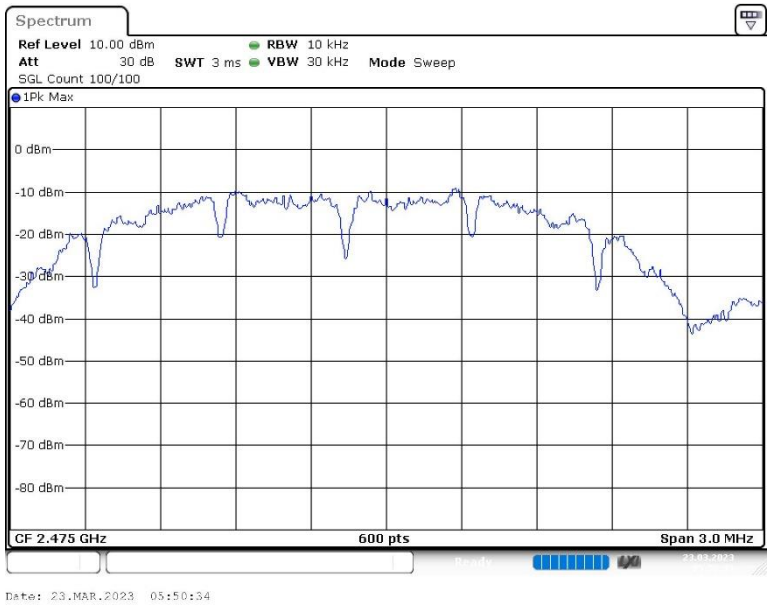


Graph 16: PSD Plot and Screenshot (2405MHz)



Graph 17: PSD Plot and Screenshot (2440MHz)





Graph 18: PSD Plot and Screenshot (2475MHz)

-- End of Test Report --