

FCC Part 15.247

TEST REPORT

For

Cisco Systems, Inc.

125 West Tasman Drive, San Jose, CA 95134, USA

FCC ID: LDKPVDEO2618

Report Type:
Original Report

Product Type:
Cisco Catalyst 9120AX Series
Wi-Fi 6 Access Points

Report Producer : Eva Kao

Report Number : RXZ220627003RF01

Report Date : 2022-7-8

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Manufacturer	Cisco Systems, Inc.
	125 West Tasman Drive, San Jose, CA 95134, USA
Brand(Trade) Name	CISCO
Product (Equipment)	Cisco Catalyst 9120AX Series Wi-Fi 6 Access Points
Main Model Name	C9120AXP-B
Frequency Range	BLE Mode: 2402 ~ 2480 MHz
Channel Number	40
Transmit Power	4.66 dBm
Modulation Technique	BLE Mode: GFSK
Transmit Data Rate	BLE Mode: 1Mbps
Power Operation (Voltage Range)	55Vdc from PoE port
Received Date	2022/6/27
Date of Test	2022/6/30 ~ 2022/7/4

*All measurement and test data in this report was gathered from production sample serial number: RXZ220627003-01 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of *Cisco Systems, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

KDB 558074 D01 15.247 Meas Guidance v05r02

1.4 Statement

Decision Rule: No, (The test results do not include MU judgment)

It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory).

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.5 Measurement Uncertainty

Parameter		Uncertainty
AC Mains		±2.36 (dB)
RF output power, conducted		±0.93 (dB)
Power Spectral Density, conducted		±0.92 (dBm/kHz)
Occupied Bandwidth		±0.35 (MHz)
Unwanted Emissions, conducted		±1.69 (dB)
Emissions, radiated	30 MHz~1GHz	±5.22(dB)
	1 GHz~18 GHz	±6.12(dB)
	18 GHz~40 GHz	±4.99(dB)
Temperature		+/- 1.27 °C
Humidity		+/- 3 %

1.6 Environmental Conditions

Test Site	Test Date	Temperature (°C)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2022/7/4	23	51	1010	Andy Cheng
Radiation Spurious Emissions	2022/6/30 ~ 2022/7/4	22	47	1010	Aaron Pan
Conducted Spurious Emissions	2022/7/4	22.5	58	1010	Jim Chen
6 dB Emission Bandwidth	2022/7/4	22.5	58	1010	Jim Chen
Maximum Output Power	2022/7/4	22.5	58	1010	Jim Chen
100 kHz Bandwidth of Frequency Band Edge	2022/7/4	22.5	58	1010	Jim Chen
Power Spectral Density	2022/7/4	22.5	58	1010	Jim Chen

1.7 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

2 System Test Configuration

2.1 Description of Test Configuration

For BLE mode, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	2440	39	2480

For BLE Modes were tested with channel 0, 19 and 39.

The system was configured for testing in engineering mode, which was provided by manufacturer.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The test software was used “Putty.exe v0.7”

Test Frequency		Low	Middle	High
Power Level Setting	BLE 1M	5	5	5

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
POE Adapter	CISCO	SB-PWR-INJ2	C18426663000003170
NB	DELL	E6410	8N7PXN1

2.5 External Cable List and Details

Cable Description	Length (m)	From	To
RJ-45 Cable	1	EUT	POE Adapter
RJ-45 to USB Serial Cable	2	EUT	NB

2.6 Test Mode

Mode 1: BLE ONLY

Mode 2: WIFI 2.4GHz XOR + WIFI 5GHz Regular + WIFI 2.4GHz Aux + BLE

Mode 3: WIFI 2.4G XOR + WIFI 5GHz Regular + WIFI 5GHz Aux + BLE

Mode 4: WIFI 5G XOR + WIFI 5GHz Regular + WIFI 2.4GHz Aux + BLE

Mode 5: WIFI 5G XOR + WIFI 5GHz Regular + WIFI 5GHz Aux + BLE

Radiated spurious emissions for Transmitting simultaneously test: Mode 2-5.

Full System (Mode 1: BLE ONLY) for all test item.

Conducted output power for worst case :

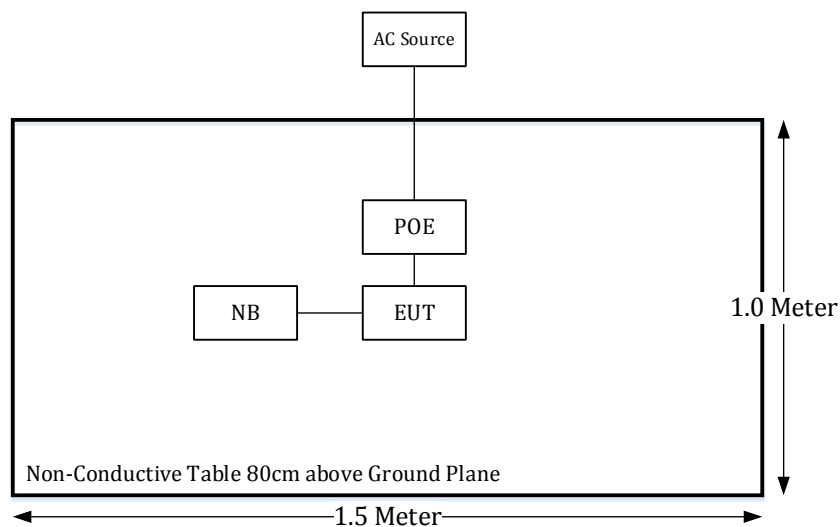
Worst case mode		Output power dBm
XOR WIFI-2.4GHz	N20 Mode, 2437MHz	21.60
XOR WIFI-5GHz	AX40 Mode, 5230MHz	19.91
Regular WIFI-5GHz	AX20 Mode, 5745 MHz	22.82
AUX WIFI-2.4GHz	G Mode, 2437MHz	15.99
AUX WIFI-5GHz	A Mode, 5220MHz	14.80

2.7 Block Diagram of Test Setup

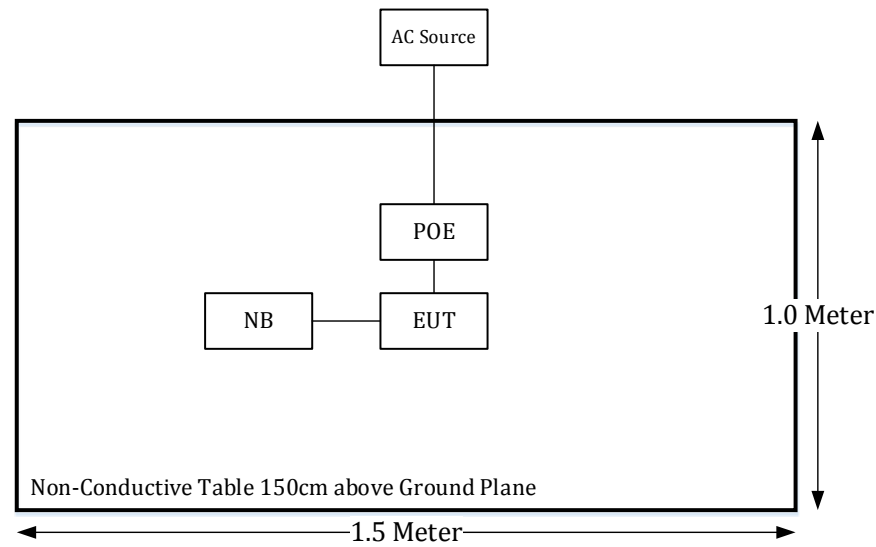
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

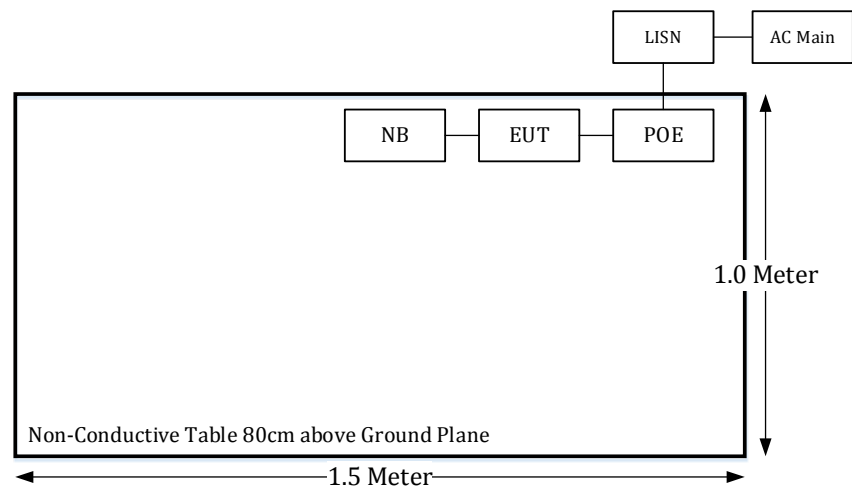
Below 1GHz:



Above 1GHz:



Conduction:



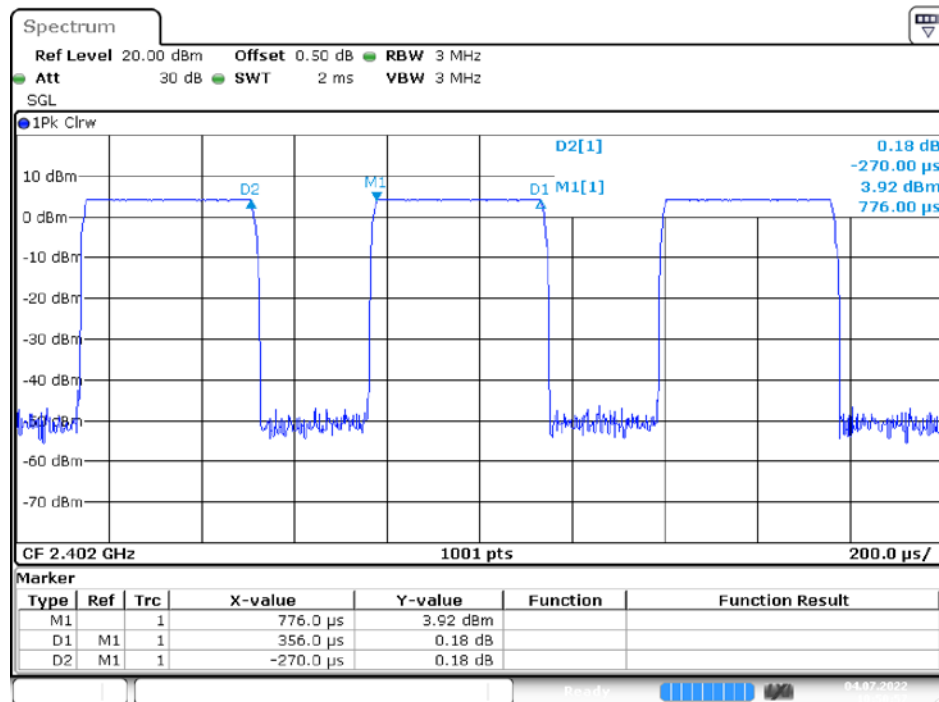
2.8 Duty Cycle

The duty cycle as below:

Radio Mode	Ton (ms)	Ton+Toff (ms)	Duty Cycle (%)
BLE	0.356	0.626	0.57

Please refer to the following plots.

BLE Mode



Date: 4.JUL.2022 10:50:57

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2022/01/14	2023/01/13
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2021/7/23	2022/7/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2021/7/29	2022/7/28
RF Cable	EMEC	EM-CB5D	1	2022/6/7	2023/6/6
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation 3M Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2022/02/14	2023/02/13
Horn Antenna	EMCO	3115	9809-55583	2021/8/26	2022/8/25
Horn Antenna	ETS-Lindgren	3116	62638	2021/8/11	2022/8/10
Preamplifier	Sonoma	310N	130602	2022/6/8	2023/6/7
Preamplifier	A.H. system Inc.	PAM-0118P	466	2021/11/4	2022/11/3
Microwave Preamplifier	EM Electronics Corporation	EM18G40G	60656	2021/12/27	2022/12/26
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2021/12/27	2022/12/26
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2021/11/9	2022/11/8
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2022/1/24	2023/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2021/12/24	2022/12/23
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2022/1/24	2023/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2021/12/24	2022/12/23
Cable	EMC	EMC105-SM-SM-10000	201003	2022/1/24	2023/1/23
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2022/1/24	2023/1/23
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-50CM	15120-1	2022/1/18	2023/1/17
Software	Audix	e3	18621a bac1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2022/1/13	2023/1/12
Cable	UTIFLEX	UFA210A	9435	2021/10/5	2022/10/4
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2022/01/24	2023/01/23

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***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

5 FCC §15.247(i), §1.1307(b)(3)(i) - RF Exposure

5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3)(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

For single RF sources (*i.e.*, any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

5.2 RF Exposure Evaluation Result

The EUT can be used in the following modes, selecting the worst mode for evaluation.

Mode 2: 2.4G XOR + 5G Regular + 2.4G Aux + BLE

Mode 3: 2.4G XOR + 5G Regular + 5G Aux + BLE

Mode 4: 5G XOR + 5G Regular + 2.4G Aux + BLE

Mode 5: 5G XOR + 5G Regular + 5G Aux + BLE

Worst case is Mode 2 :

Project info

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Duty (%)	Tune-up Power (mW)	ERP (dBm)	ERP (mW)
BLE	2480	5	13	300	100%	3.16	15.85	38.46
do0 2.4GHz XOR	2462	22	13	300	100%	158.49	32.85	1927.52
d01 5GHz Regular	5850	23	13	300	100%	199.53	33.85	2426.61
do4 2.4G Aux	2462	16	13	300	100%	39.81	26.85	484.17

Option A

The available maximum time-averaged power is no more than 1 mW

Band	Freq (MHz)	Result Option A
BLE	2480	not exempt
do0 2.4GHz XOR	2462	not exempt
d01 5GHz Regular	5850	not exempt
do4 2.4G Aux	2462	not exempt

Option B

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater.

This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Band	Freq (MHz)	Pth (mW)	X	ERP 20cm (mW)	Ratio	Result Option B
BLE	2480	3060.00	1.905	3060	0.01	exempt
do0 2.4GHz XOR	2462	3060.00	1.903	3060	0.63	exempt
d01 5GHz Regular	5850	3060.00	2.091	3060	0.79	exempt
do4 2.4G Aux	2462	3060.00	1.903	3060	0.16	exempt

Simultaneous Analysis :

Band	Freq (MHz)	PSD Require	PSD (mW/cm ²)	PSD Limit (mW/cm ²)	Simultaneous TX	Ratio
BLE	2480	exempt	0.006	1.000	O	0.006
do0 2.4GHz XOR	2462	exempt	0.280	1.000	O	0.280
d01 5GHz Regular	5850	exempt	0.352	1.000	O	0.352
do4 2.4G Aux	2462	exempt	0.070	1.000	O	0.070
Simultaneous Analysis (Limit 1)						0.708

Result: The EUT meets exemption requirement- RF exposure evaluation greater than **30cm** distance.

6 FCC §15.203 – Antenna Requirements

6.1 Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

6.2 Antenna Information

Manufacturer	Type	Antenna Gain
N/A	Patch antenna	13 dBi

Result: Compliance

7 FCC §15.207(a) – AC Line Conducted Emissions

7.1 Applicable Standard

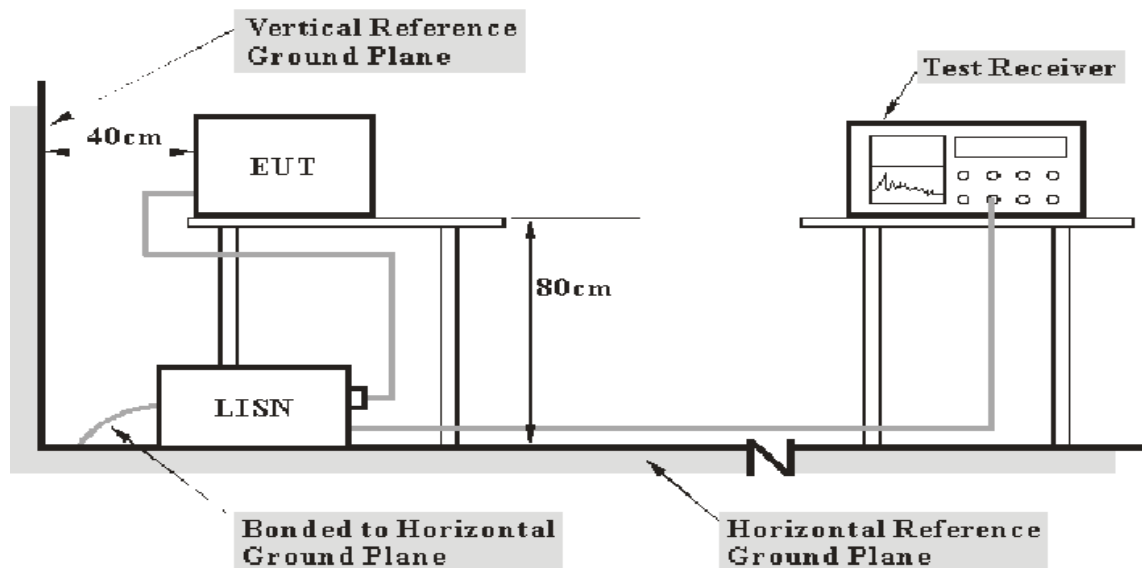
According to §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 ^{Note 1}	56 to 46 ^{Note 1}
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

7.2 EUT Setup



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

7.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

7.4 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

7.5 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

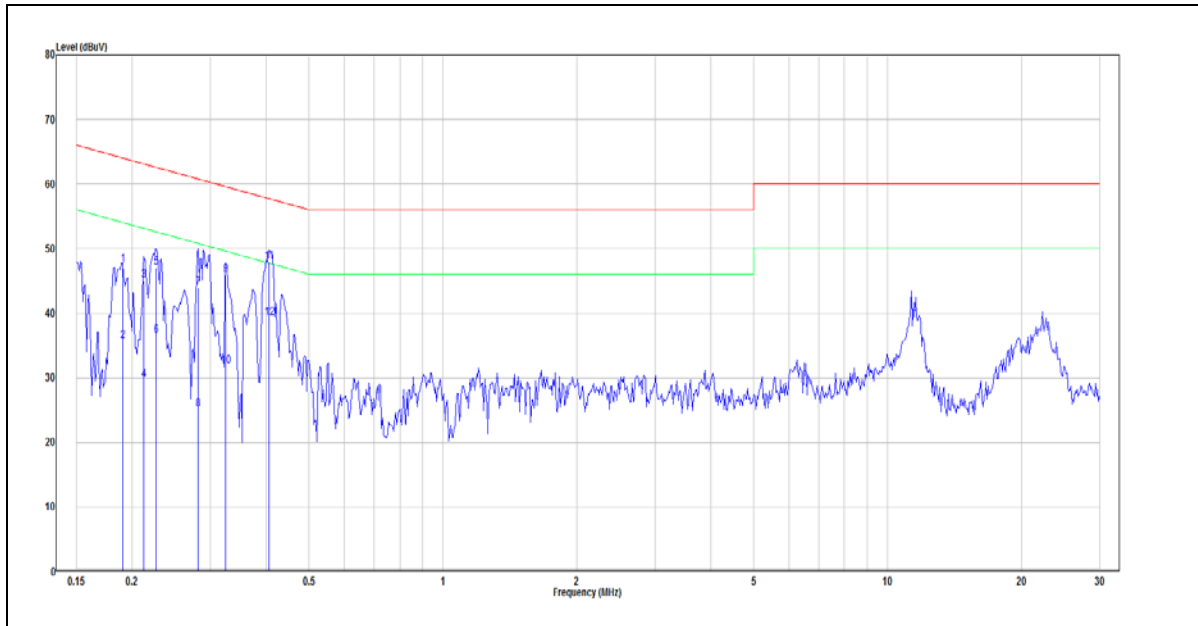
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

$$\text{Over Limit} = \text{Level} - \text{Limit Line}$$

7.6 Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz, Line



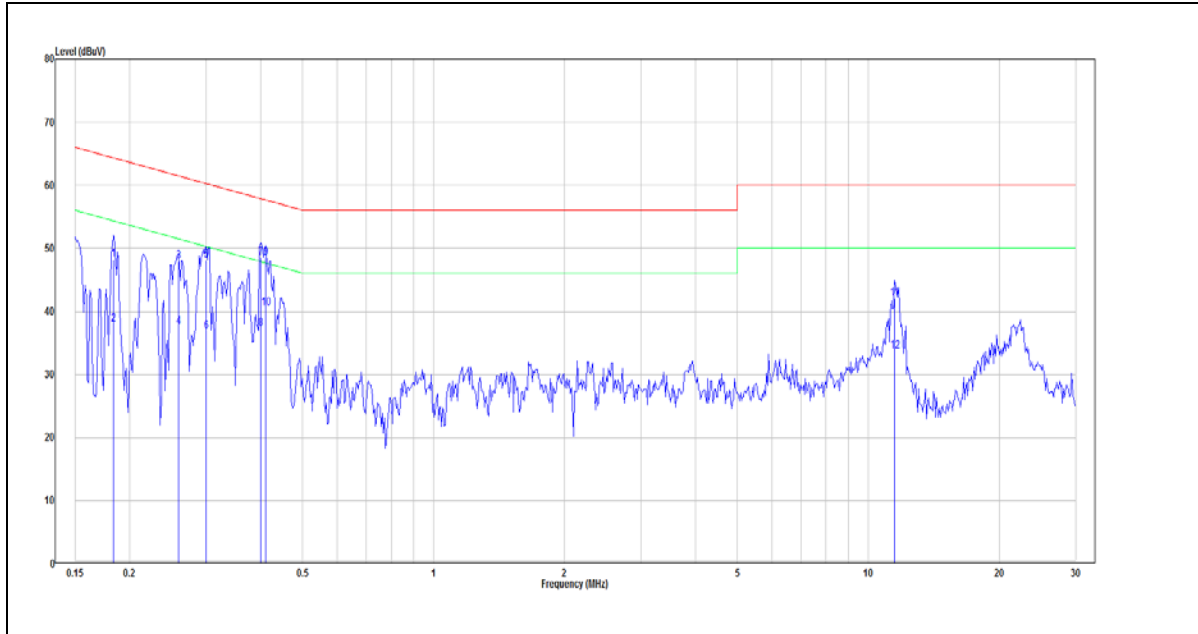
No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)	
1	0.190	27.97	19.52	47.49	64.02	-16.53	QP
2	0.190	16.15	19.52	35.67	54.02	-18.35	Average
3	0.213	25.50	19.52	45.02	63.10	-18.08	QP
4	0.213	10.09	19.52	29.61	53.10	-23.49	Average
5	0.227	27.47	19.52	46.99	62.57	-15.58	QP
6	0.227	16.96	19.52	36.48	52.57	-16.09	Average
7	0.282	24.43	19.52	43.95	60.76	-16.81	QP
8	0.282	5.56	19.52	25.08	50.76	-25.68	Average
9	0.325	26.44	19.52	45.96	59.57	-13.61	QP
10	0.325	12.23	19.52	31.75	49.57	-17.82	Average
11	0.406	28.45	19.53	47.98	57.73	-9.75	QP
12	0.406	19.65	19.53	39.18	47.73	-8.55	Average

Note:

Level (Result) = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral

No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)	
1	0.183	28.62	19.51	48.13	64.33	-16.20	QP
2	0.183	18.43	19.51	37.94	54.33	-16.39	Average
3	0.259	28.41	19.51	47.92	61.47	-13.55	QP
4	0.259	17.98	19.51	37.49	51.47	-13.98	Average
5	0.300	28.48	19.52	48.00	60.24	-12.24	QP
6	0.300	17.22	19.52	36.74	50.24	-13.50	Average
7	0.400	28.90	19.53	48.43	57.86	-9.43	QP
8	0.400	17.75	19.53	37.28	47.86	-10.58	Average
9	0.410	28.91	19.53	48.44	57.64	-9.20	QP
10	0.410	20.97	19.53	40.50	47.64	-7.14	Average
11	11.498	22.26	19.81	42.07	60.00	-17.93	QP
12	11.498	13.88	19.81	33.69	50.00	-16.31	Average

Note:

Level (Result) = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

8.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	608 – 614	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	5. 35 – 5. 46
2.1735 – 2.1905	16.80425 – 16.80475	1300 – 1427	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1435 – 1626.5	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1645.5 – 1646.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1660 – 1710	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1718.8 – 1722.2	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	2200 – 2300	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2310 – 2390	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2483.5 – 2500	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2690 – 2900	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3.332 – 3.339	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3.600 – 4.400	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

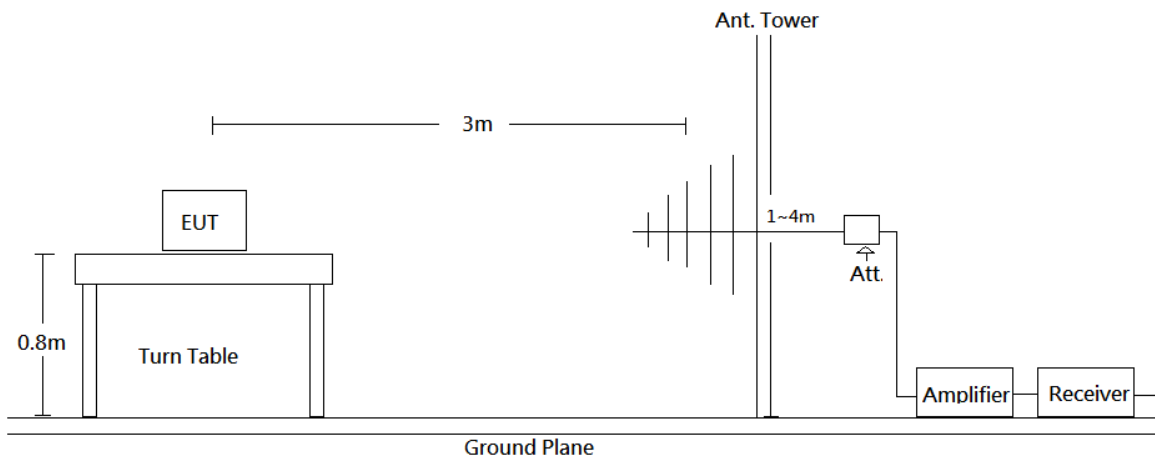
Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

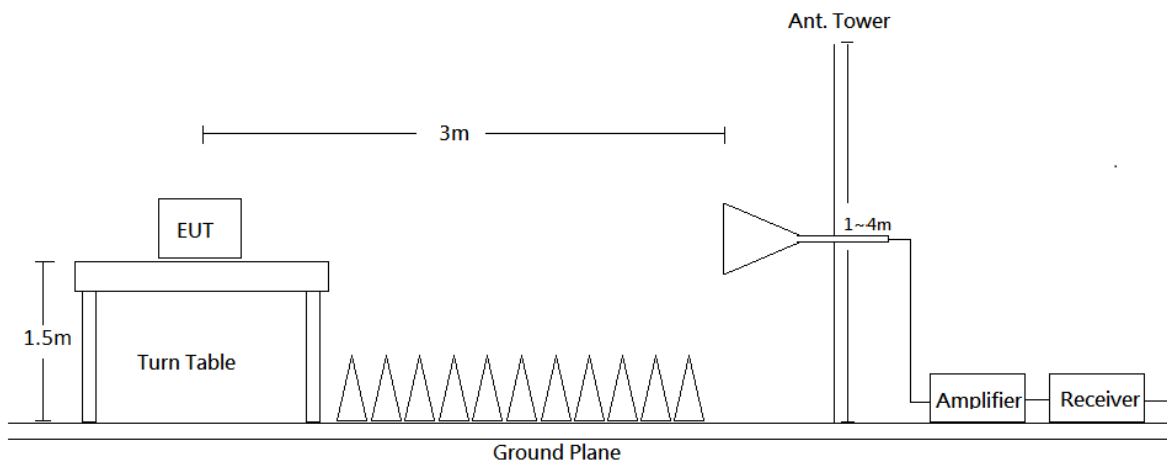
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

8.2 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

8.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	/	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

Note: T is minimum transmission duration

8.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

8.5 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

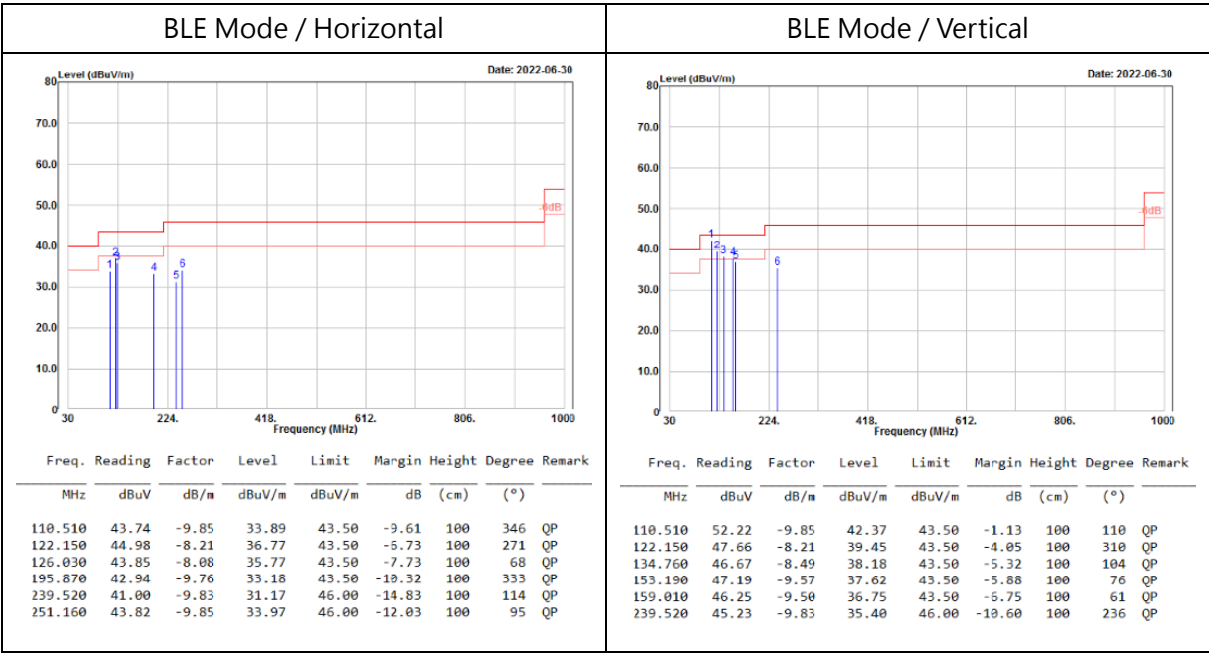
$$\text{Correct Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

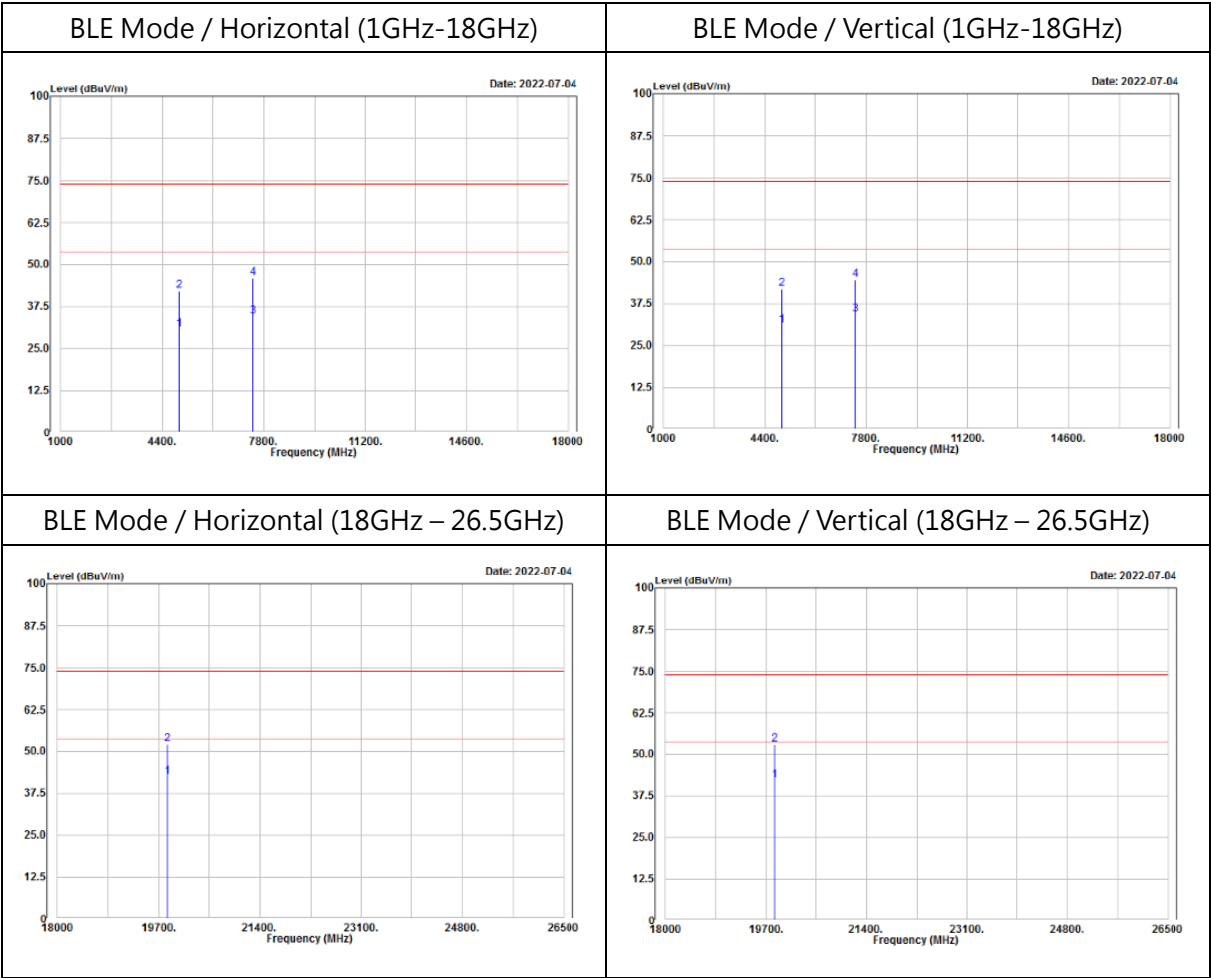
$$\text{Margin} = \text{Result} - \text{Limit}$$

8.6 Test Results

Test Mode: **BLE Mode** (Worst case is BLE mode high channel)
30MHz-1GHz:



Level (Result) = Reading + Factor.
Margin = Level – Limit.
Factor = Antenna Factor + Cable Loss – Amplifier Gain.
Spurious emissions more than 20 dB below the limit were not reported.



Above 1GHz**Horizontal**

Low channel								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	32.55	-2.47	30.08	54.00	-23.92	154	142	Average
4804.000	43.77	-2.47	41.30	74.00	-32.70	154	142	Peak
7206.000	30.88	3.03	33.91	54.00	-20.09	147	154	Average
7206.000	41.40	3.03	44.43	74.00	-29.57	147	154	Peak
Middle channel								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	32.64	-2.24	30.40	54.00	-23.60	151	0	Average
4880.000	44.13	-2.24	41.89	74.00	-32.11	151	0	Peak
7320.000	30.75	3.34	34.09	54.00	-19.91	146	303	Average
7320.000	41.02	3.34	44.36	74.00	-29.64	146	303	Peak
High channel								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	32.78	-2.04	30.74	54.00	-23.26	152	29	Average
4960.000	44.16	-2.04	42.12	74.00	-31.88	152	29	Peak
7440.000	30.91	3.38	34.29	54.00	-19.71	149	317	Average
7440.000	42.33	3.38	45.71	74.00	-28.29	149	317	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Low channel								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	32.56	-2.47	30.09	54.00	-23.91	153	102	Average
4804.000	43.53	-2.47	41.06	74.00	-32.94	153	102	Peak
7206.000	30.88	3.03	33.91	54.00	-20.09	149	252	Average
7206.000	40.76	3.03	43.79	74.00	-30.21	149	252	Peak
Middle channel								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	32.66	-2.24	30.42	54.00	-23.58	151	57	Average
4880.000	43.05	-2.24	40.81	74.00	-33.19	151	57	Peak
7320.000	30.72	3.34	34.06	54.00	-19.94	146	296	Average
7320.000	41.25	3.34	44.59	74.00	-29.41	146	296	Peak
High channel								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	32.85	-2.04	30.81	54.00	-23.19	153	273	Average
4960.000	43.78	-2.04	41.74	74.00	-32.26	153	273	Peak
7440.000	30.84	3.38	34.22	54.00	-19.78	148	317	Average
7440.000	41.17	3.38	44.55	74.00	-29.45	148	317	Peak

Level (Result) = Reading + Factor.

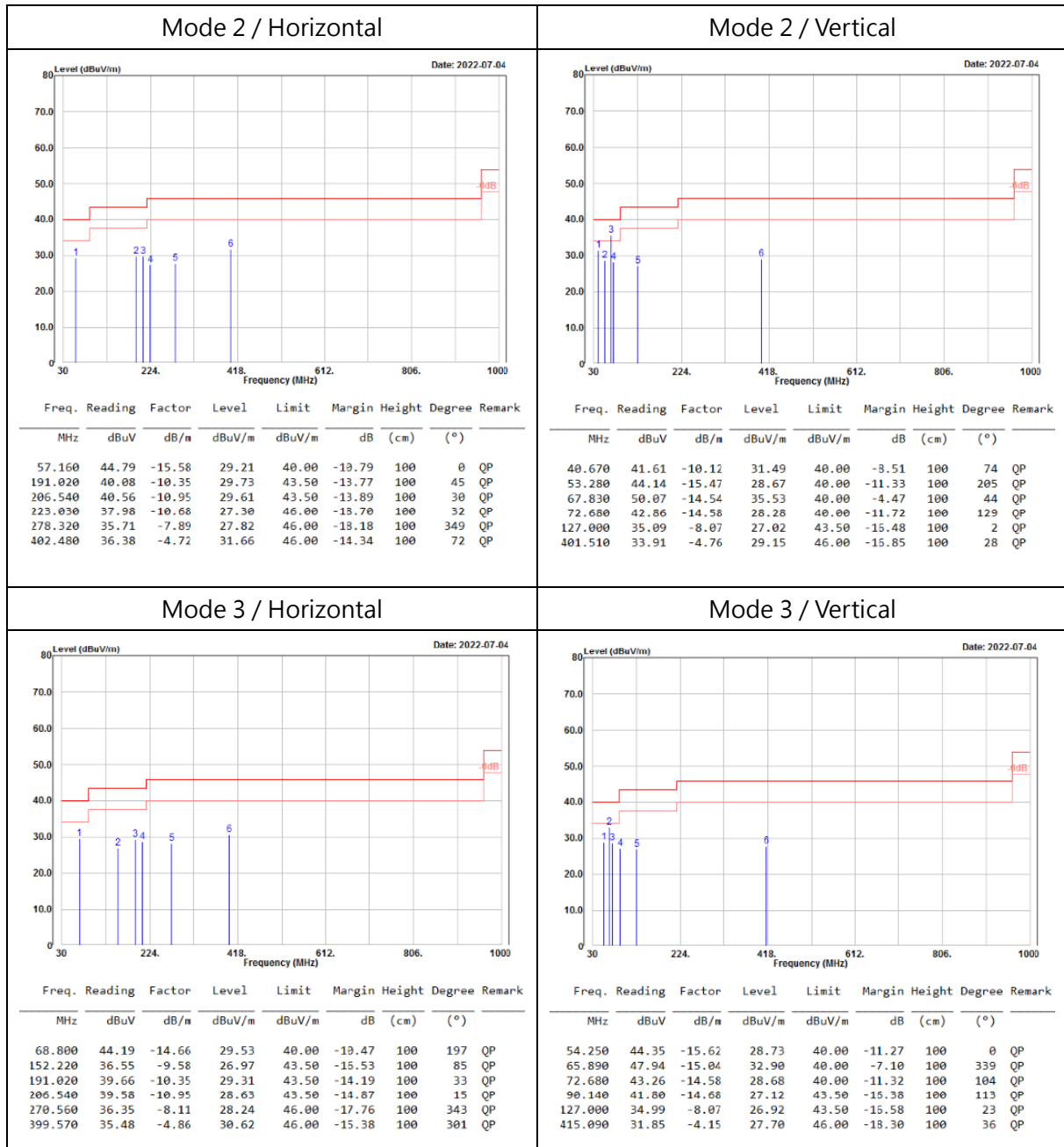
Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Transmitting simultaneously test:

30MHz-1GHz:



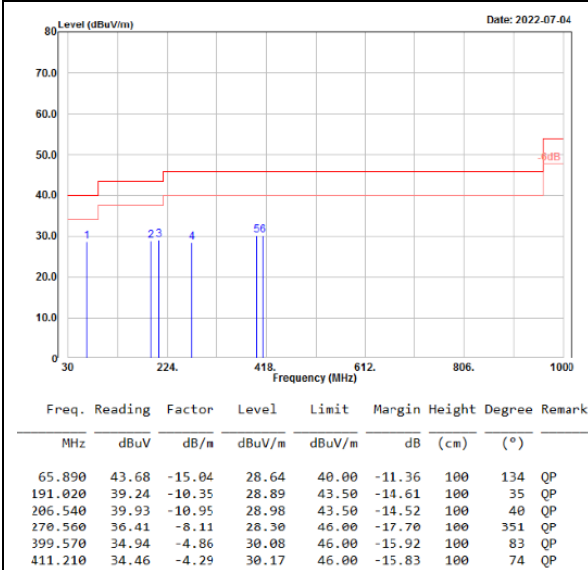
Level (Result) = Reading + Factor.

Margin = Level - Limit.

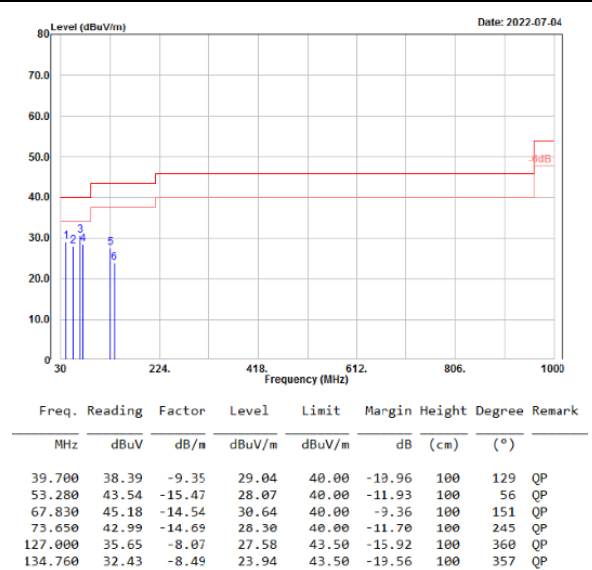
Factor = Antenna Factor + Cable Loss - Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

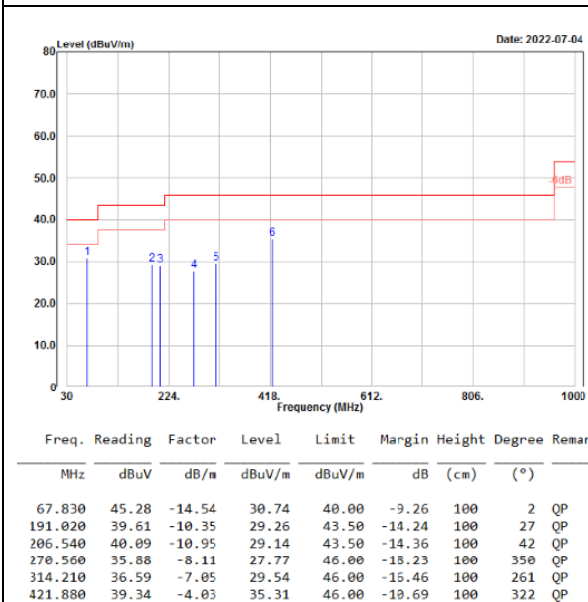
Mode 4 / Horizontal



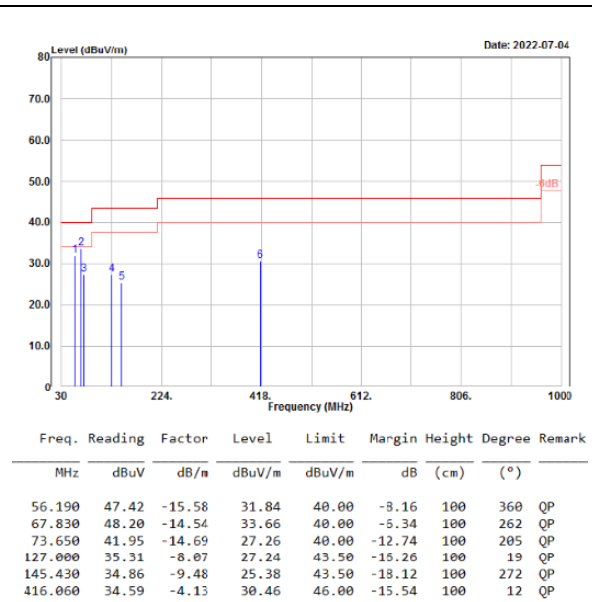
Mode 4 / Vertical



Mode 5 / Horizontal



Mode 5 / Vertical



Level (Result) = Reading + Factor.

Margin = Level - Limit.

Factor = Antenna Factor + Cable Loss - Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz**Mode 2 :**

Horizontal								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	38.15	-2.47	35.68	54.00	-18.32	169	167	Average
4804.000	43.38	-2.47	40.91	74.00	-33.09	169	167	Peak
4874.000	35.33	-2.25	33.08	54.00	-20.92	199	71	Average
4874.000	44.39	-2.25	42.14	74.00	-31.86	199	71	Peak
7206.000	35.63	3.03	38.66	54.00	-15.34	203	263	Average
7206.000	44.40	3.03	47.43	74.00	-26.57	203	263	Peak
7311.000	34.77	3.34	38.11	54.00	-15.89	143	315	Average
7311.000	41.76	3.34	45.10	74.00	-28.90	143	315	Peak
11490.000	35.58	8.62	44.20	54.00	-9.80	154	192	Average
11490.000	40.80	8.62	49.42	74.00	-24.58	154	192	Peak
17235.000	31.51	13.26	44.77	54.00	-9.23	171	185	Average
17235.000	41.42	13.26	54.68	74.00	-19.32	171	185	Peak
19216.000	41.54	-0.57	40.97	54.00	-13.03	150	257	Average
19216.000	51.58	-0.57	51.01	74.00	-22.99	150	257	Peak
19496.000	41.60	0.25	41.85	54.00	-12.15	150	323	Average
19496.000	51.66	0.25	51.91	74.00	-22.09	150	323	Peak
22980.000	38.98	2.57	41.55	54.00	-12.45	150	357	Average
22980.000	49.03	2.57	51.60	74.00	-22.40	150	357	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Vertical								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	37.21	-2.47	34.74	54.00	-19.26	161	102	Average
4804.000	43.27	-2.47	40.80	74.00	-33.20	161	102	Peak
4874.000	34.10	-2.25	31.85	54.00	-22.15	177	84	Average
4874.000	44.17	-2.25	41.92	74.00	-32.08	177	84	Peak
7206.000	35.44	3.03	38.47	54.00	-15.53	185	318	Average
7206.000	40.83	3.03	43.86	74.00	-30.14	185	318	Peak
7311.000	34.54	3.34	37.88	54.00	-16.12	152	273	Average
7311.000	41.40	3.34	44.74	74.00	-29.26	152	273	Peak
11490.000	34.91	8.62	43.53	54.00	-10.47	204	0	Average
11490.000	40.68	8.62	49.30	74.00	-24.70	204	0	Peak
17235.000	31.42	13.26	44.68	54.00	-9.32	169	201	Average
17235.000	41.21	13.26	54.47	74.00	-19.53	150	201	Peak
19216.000	40.30	-0.57	39.73	54.00	-14.27	150	243	Average
19216.000	50.18	-0.57	49.61	74.00	-24.39	150	243	Peak
19496.000	41.37	0.25	41.62	54.00	-12.38	150	104	Average
19496.000	51.39	0.25	51.64	74.00	-22.36	150	104	Peak
22980.000	38.32	2.57	40.89	54.00	-13.11	150	80	Average
22980.000	48.82	2.57	51.39	74.00	-22.61	150	80	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Mode 3:

Horizontal								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	37.18	-2.47	34.71	54.00	-19.29	149	18	Average
4804.000	44.19	-2.47	41.72	74.00	-32.28	149	18	Peak
4874.000	34.79	-2.25	32.54	54.00	-21.46	169	292	Average
4874.000	43.44	-2.25	41.19	74.00	-32.81	169	292	Peak
7206.000	32.42	3.03	35.45	54.00	-18.55	201	173	Average
7206.000	41.54	3.03	44.57	74.00	-29.43	201	173	Peak
7311.000	31.50	3.34	34.84	54.00	-19.16	170	142	Average
7311.000	41.36	3.34	44.70	74.00	-29.30	170	142	Peak
10440.000	32.92	7.97	40.89	54.00	-13.11	152	228	Average
10440.000	43.26	7.97	51.23	74.00	-22.77	152	228	Peak
11490.000	33.01	8.62	41.63	54.00	-12.37	203	292	Average
11490.000	41.11	8.62	49.73	74.00	-24.27	203	292	Peak
15660.000	39.66	11.11	50.77	54.00	-3.23	150	228	Average
15660.000	43.38	11.11	54.49	74.00	-19.51	150	228	Peak
17235.000	31.57	13.26	44.83	54.00	-9.17	149	228	Average
17235.000	41.23	13.26	54.49	74.00	-19.51	149	228	Peak
19216.000	42.32	-0.57	41.75	54.00	-12.25	150	321	Average
19216.000	52.13	-0.57	51.56	74.00	-22.44	150	321	Peak
19496.000	41.61	0.25	41.86	54.00	-12.14	150	264	Average
19496.000	51.63	0.25	51.88	74.00	-22.12	150	264	Peak
20880.000	40.19	1.85	42.04	54.00	-11.96	150	32	Average
20880.000	50.54	1.85	52.39	74.00	-21.61	150	32	Peak
22980.000	39.76	2.57	42.33	54.00	-11.67	150	32	Average
22980.000	49.82	2.57	52.39	74.00	-21.61	150	32	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Vertical								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	36.30	-2.47	33.83	54.00	-20.17	149	0	Average
4804.000	43.17	-2.47	40.70	74.00	-33.30	149	0	Peak
4874.000	34.58	-2.25	32.33	54.00	-21.67	201	153	Average
4874.000	43.38	-2.25	41.13	74.00	-32.87	201	153	Peak
7206.000	32.30	3.03	35.33	54.00	-18.67	171	107	Average
7206.000	41.22	3.03	44.25	74.00	-29.75	171	107	Peak
7311.000	30.92	3.34	34.26	54.00	-19.74	188	7	Average
7311.000	40.70	3.34	44.04	74.00	-29.96	188	7	Peak
10440.000	32.86	7.97	40.83	54.00	-13.17	144	0	Average
10440.000	42.13	7.97	50.10	74.00	-23.90	144	0	Peak
11490.000	32.88	8.62	41.50	54.00	-12.50	167	72	Average
11490.000	40.90	8.62	49.52	74.00	-24.48	167	72	Peak
15660.000	29.72	11.11	40.83	54.00	-13.17	147	0	Average
15660.000	38.51	11.11	49.62	74.00	-24.38	147	0	Peak
17235.000	30.87	13.26	44.13	54.00	-9.87	155	360	Average
17235.000	41.02	13.26	54.28	74.00	-19.72	155	360	Peak
19216.000	42.12	-0.57	41.55	54.00	-12.45	150	18	Average
19216.000	52.09	-0.57	51.52	74.00	-22.48	150	18	Peak
19496.000	41.29	0.25	41.54	54.00	-12.46	150	95	Average
19496.000	51.18	0.25	51.43	74.00	-22.57	150	95	Peak
20880.000	40.04	1.85	41.89	54.00	-12.11	150	18	Average
20880.000	50.25	1.85	52.10	74.00	-21.90	150	18	Peak
22980.000	39.44	2.57	42.01	54.00	-11.99	150	161	Average
22980.000	49.40	2.57	51.97	74.00	-22.03	150	161	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Mode 4:

Horizontal								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	38.15	-2.47	35.68	54.00	-18.32	169	167	Average
4804.000	43.38	-2.47	40.91	74.00	-33.09	169	167	Peak
4874.000	35.33	-2.25	33.08	54.00	-20.92	199	71	Average
4874.000	44.39	-2.25	42.14	74.00	-31.86	199	71	Peak
7206.000	35.62	3.03	38.65	54.00	-15.35	203	263	Average
7206.000	41.37	3.03	44.40	74.00	-29.60	203	263	Peak
7311.000	34.78	3.34	38.12	54.00	-15.88	143	315	Average
7311.000	41.77	3.34	45.11	74.00	-28.89	143	315	Peak
10460.000	36.14	8.06	44.20	54.00	-9.80	154	192	Average
10460.000	41.36	8.06	49.42	74.00	-24.58	154	192	Peak
11490.000	32.15	8.62	40.77	54.00	-13.23	178	185	Average
11490.000	40.39	8.62	49.01	74.00	-24.99	178	185	Peak
15690.000	33.47	11.30	44.77	54.00	-9.23	171	185	Average
15690.000	43.38	11.30	54.68	74.00	-19.32	171	185	Peak
17235.000	31.51	13.26	44.77	54.00	-9.23	200	185	Average
17235.000	41.00	13.26	54.26	74.00	-19.74	200	185	Peak
19216.000	42.67	-0.57	42.10	54.00	-11.90	150	76	Average
19216.000	52.25	-0.57	51.68	74.00	-22.32	150	76	Peak
19496.000	41.67	0.25	41.92	54.00	-12.08	150	350	Average
19496.000	51.46	0.25	51.71	74.00	-22.29	150	350	Peak
20920.000	39.40	1.81	41.21	54.00	-12.79	150	360	Average
20920.000	49.55	1.81	51.36	74.00	-22.64	150	360	Peak
22980.000	39.60	2.57	42.17	54.00	-11.83	150	360	Average
22980.000	49.63	2.57	52.20	74.00	-21.80	150	360	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Vertical								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	33.17	-2.47	30.70	54.00	-23.30	169	137	Average
4804.000	43.99	-2.47	41.52	74.00	-32.48	169	137	Peak
4874.000	33.26	-2.25	31.01	54.00	-22.99	151	201	Average
4874.000	43.23	-2.25	40.98	74.00	-33.02	151	201	Peak
7206.000	31.59	3.03	34.62	54.00	-19.38	144	161	Average
7206.000	41.21	3.03	44.24	74.00	-29.76	144	161	Peak
7311.000	31.80	3.34	35.14	54.00	-18.86	209	327	Average
7311.000	41.04	3.34	44.38	74.00	-29.62	209	327	Peak
10460.000	30.68	8.06	38.74	54.00	-15.26	175	271	Average
10460.000	40.77	8.06	48.83	74.00	-25.17	175	271	Peak
11490.000	30.80	8.62	39.42	54.00	-14.58	160	271	Average
11490.000	40.59	8.62	49.21	74.00	-24.79	160	271	Peak
15690.000	33.20	11.30	44.50	54.00	-9.50	183	283	Average
15690.000	43.18	11.30	54.48	74.00	-19.52	183	283	Peak
17235.000	30.95	13.26	44.21	54.00	-9.79	167	149	Average
17235.000	41.11	13.26	54.37	74.00	-19.63	167	149	Peak
19216.000	42.42	-0.57	41.85	54.00	-12.15	150	189	Average
19216.000	51.88	-0.57	51.31	74.00	-22.69	150	189	Peak
19496.000	41.38	0.25	41.63	54.00	-12.37	150	11	Average
19496.000	51.40	0.25	51.65	74.00	-22.35	150	11	Peak
20920.000	38.32	1.81	40.13	54.00	-13.87	150	317	Average
20920.000	49.23	1.81	51.04	74.00	-22.96	150	317	Peak
22980.000	39.42	2.57	41.99	54.00	-12.01	150	253	Average
22980.000	48.63	2.57	51.20	74.00	-22.80	150	253	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Mode 5:

Horizontal								
4804.000	32.88	-2.47	30.41	54.00	-23.59	149	65	Average
4804.000	42.93	-2.47	40.46	74.00	-33.54	149	65	Peak
7206.000	31.28	3.03	34.31	54.00	-19.69	181	219	Average
7206.000	41.20	3.03	44.23	74.00	-29.77	181	219	Peak
10440.000	32.49	7.97	40.46	54.00	-13.54	200	65	Average
10440.000	42.13	7.97	50.10	74.00	-23.90	200	65	Peak
10460.000	30.51	8.06	38.57	54.00	-15.43	199	359	Average
10460.000	40.55	8.06	48.61	74.00	-25.39	199	359	Peak
11490.000	29.80	8.62	38.42	54.00	-15.58	175	133	Average
11490.000	40.18	8.62	48.80	74.00	-25.20	175	133	Peak
15660.000	29.31	11.11	40.42	54.00	-13.58	150	65	Average
15660.000	32.35	11.11	43.46	74.00	-30.54	150	65	Peak
15690.000	31.67	11.30	42.97	54.00	-11.03	158	327	Average
15690.000	41.89	11.30	53.19	74.00	-20.81	158	327	Peak
17235.000	30.77	13.26	44.03	54.00	-9.97	166	296	Average
17235.000	41.04	13.26	54.30	74.00	-19.70	166	296	Peak
19216.000	43.11	-0.57	42.54	54.00	-11.46	150	194	Average
19216.000	53.30	-0.57	52.73	74.00	-21.27	150	194	Peak
20880.000	40.69	1.85	42.54	54.00	-11.46	150	194	Average
20880.000	50.22	1.85	52.07	74.00	-21.93	150	194	Peak
20920.000	39.29	1.81	41.10	54.00	-12.90	150	109	Average
20920.000	51.66	1.81	53.47	74.00	-20.53	150	109	Peak
22980.000	38.82	2.57	41.39	54.00	-12.61	150	84	Average
22980.000	49.56	2.57	52.13	74.00	-21.87	150	84	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Vertical								
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	32.03	-2.47	29.56	54.00	-24.44	201	288	Average
4804.000	42.65	-2.47	40.18	74.00	-33.82	201	288	Peak
7206.000	31.21	3.03	34.24	54.00	-19.76	168	151	Average
7206.000	40.09	3.03	43.12	74.00	-30.88	168	151	Peak
10440.000	32.22	7.97	40.19	54.00	-13.81	177	346	Average
10440.000	41.38	7.97	49.35	74.00	-24.65	177	346	Peak
10460.000	30.44	8.06	38.50	54.00	-15.50	152	334	Average
10460.000	40.15	8.06	48.21	74.00	-25.79	152	334	Peak
11490.000	29.68	8.62	38.30	54.00	-15.70	144	205	Average
11490.000	39.80	8.62	48.42	74.00	-25.58	144	205	Peak
15660.000	29.07	11.11	40.18	54.00	-13.82	180	346	Average
15660.000	31.24	11.11	42.35	74.00	-31.65	180	346	Peak
15690.000	31.51	11.30	42.81	54.00	-11.19	191	24	Average
15690.000	41.27	11.30	52.57	74.00	-21.43	191	24	Peak
17235.000	30.79	13.26	44.05	54.00	-9.95	211	346	Average
17235.000	40.56	13.26	53.82	74.00	-20.18	211	346	Peak
19216.000	42.83	-0.57	42.26	54.00	-11.74	150	196	Average
19216.000	52.74	-0.57	52.17	74.00	-21.83	150	196	Peak
20880.000	39.51	1.85	41.36	54.00	-12.64	150	51	Average
20880.000	48.64	1.85	50.49	74.00	-23.51	150	51	Peak
20920.000	39.18	1.81	40.99	54.00	-13.01	150	1	Average
20920.000	50.31	1.81	52.12	74.00	-21.88	150	1	Peak
22980.000	38.76	2.57	41.33	54.00	-12.67	150	51	Average
22980.000	47.92	2.57	50.49	74.00	-23.51	150	51	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	54.71	≥ 20	PASS
Middle	2440	52.58	≥ 20	PASS
High	2480	54.32	≥ 20	PASS

Spectrum

Ref Level 20.00 dBm Offset 0.50 dB RBW 100 kHz
 Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep

1Pk Max

M1 3.45 dBm
 2.3858 GHz
 -54.71 dB

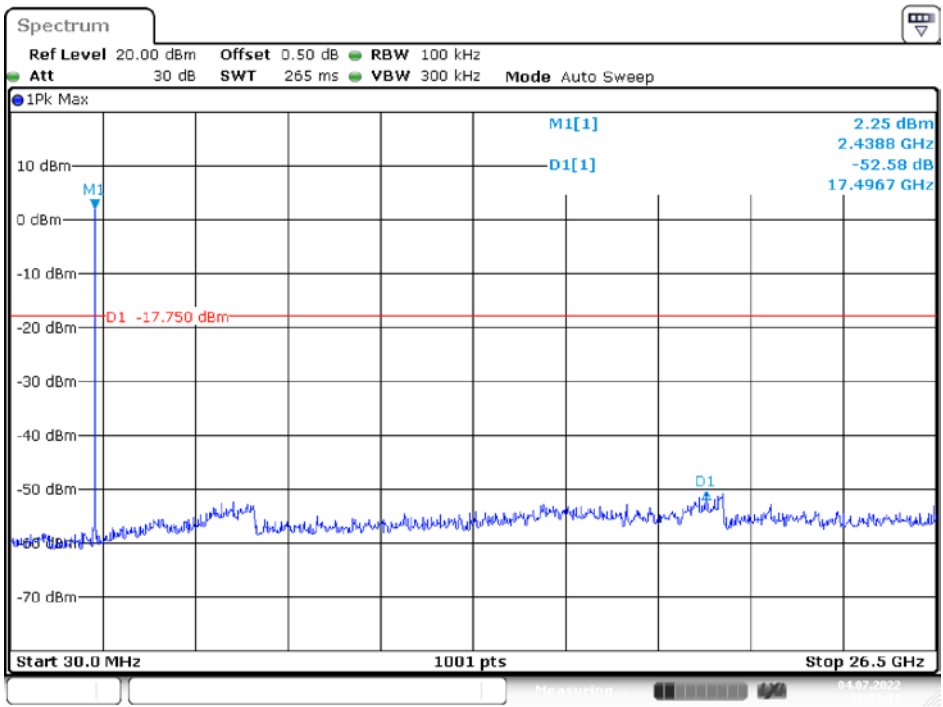
D1 17.5231 GHz

D1 -16.550 dBm

Start 30.0 MHz 1001 pts Stop 26.5 GHz

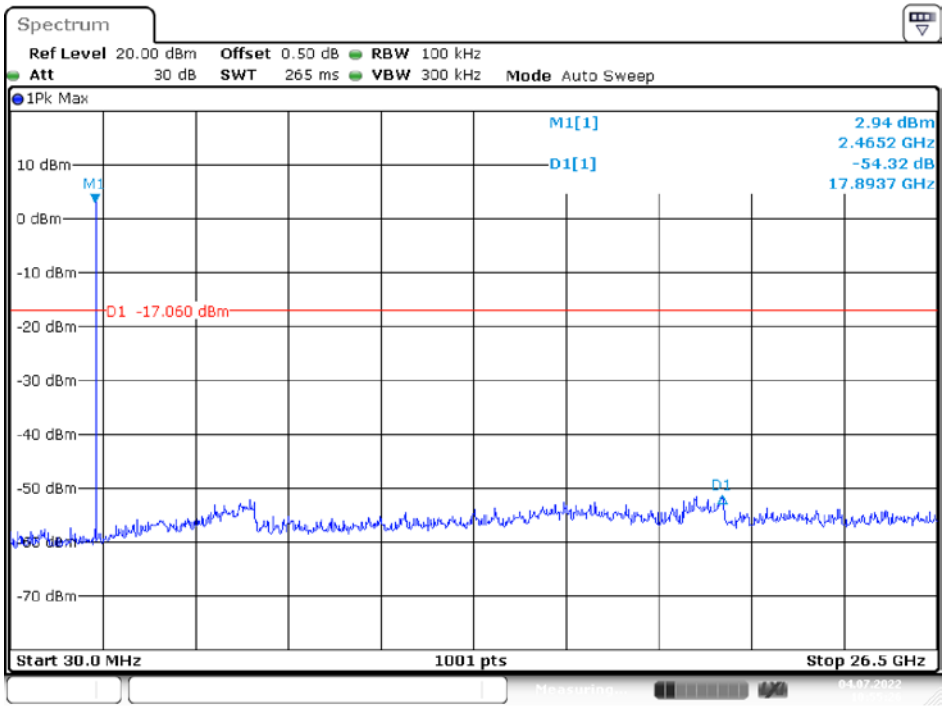
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Middle Channel



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High Channel



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9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

9.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 Test Procedure

The steps for the first option are as follows:

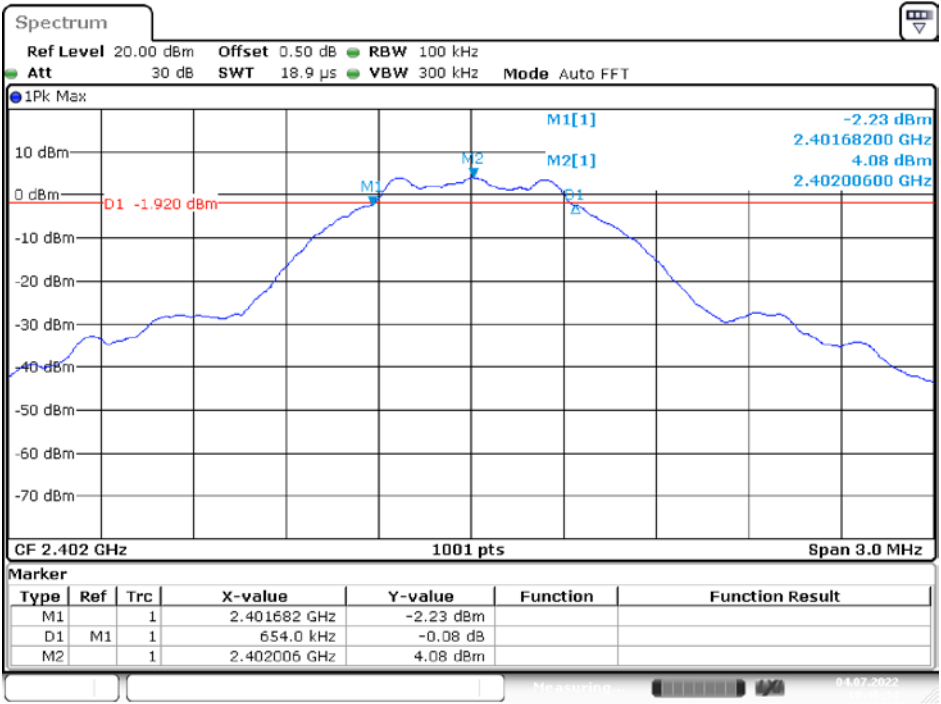
- a) Set RBW = 100 kHz.
- b) Set the VBW $\geq [3 \times \text{RBW}]$.
- c) Detector = peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

9.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
Low	2402	654	> 500	Compliance
Middle	2440	648	> 500	Compliance
High	2480	648	> 500	Compliance

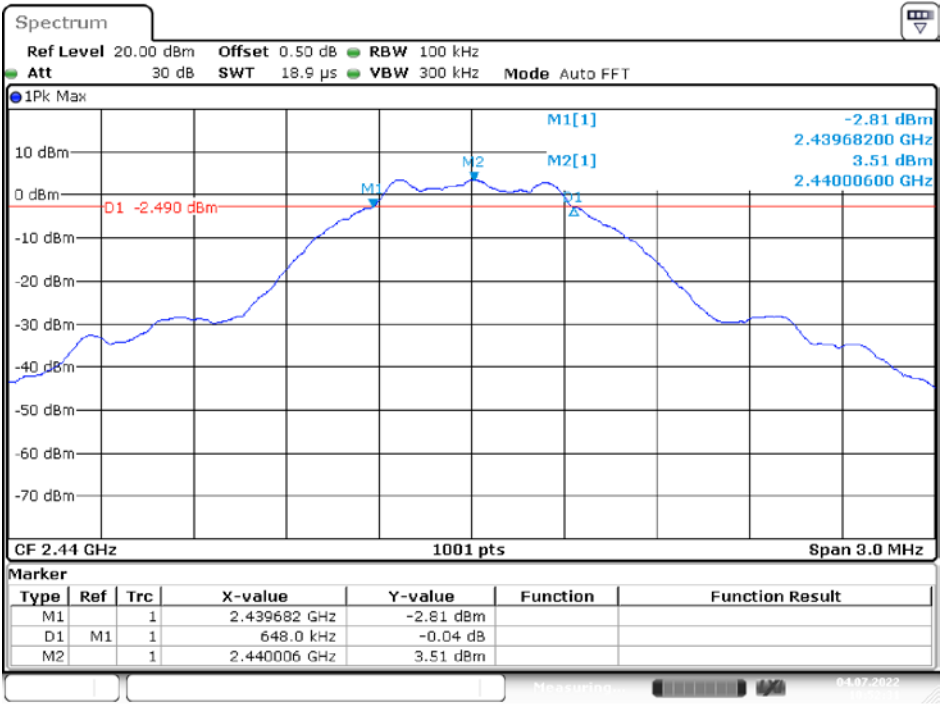
Please refer to the following plots

BLE Mode
Low Channel



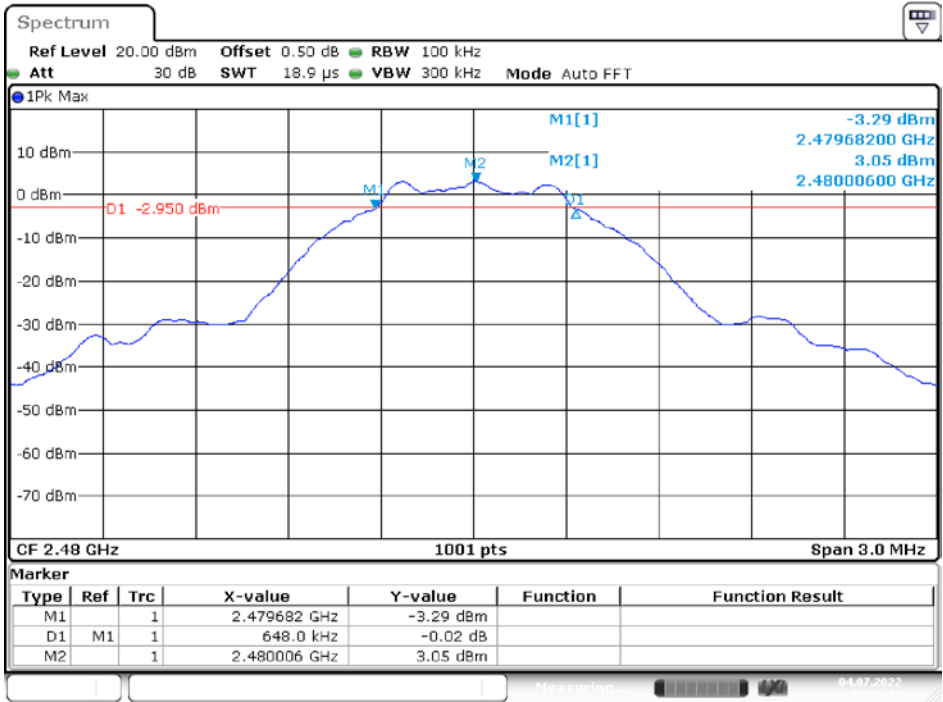
Date: 4.JUL.2022 10:46:35

Middle Channel



Date: 4.JUL.2022 10:52:32

High Channel



Date: 4.JUL.2022 10:54:31

10 FCC §15.247(b)(3) – Maximum Output Power

10.1 Applicable Standard

According to FCC §15.247(b) (3).

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

10.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

10.3 Test Results

Conducted Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Power (W)	Limit (W)	Result
BLE Mode					
Low	2402	4.66	0.003	1	PASS
Middle	2440	3.66	0.002	1	PASS
High	2480	3.14	0.002	1	PASS

11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

11.1 Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

11.2 Test Procedure

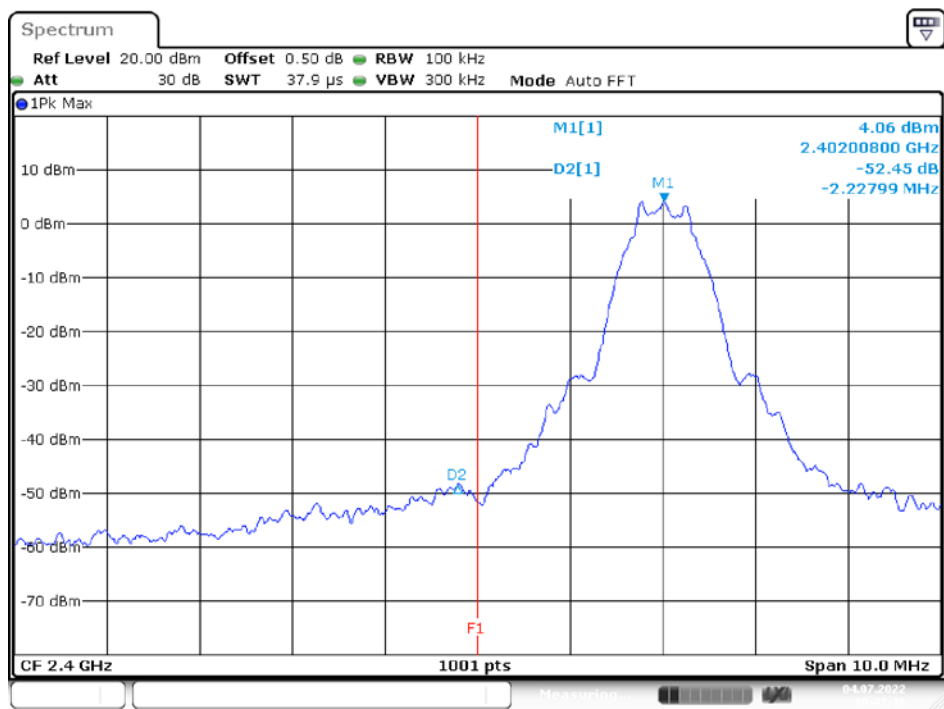
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	52.45	≥ 20	PASS
High	2480	57.34	≥ 20	PASS

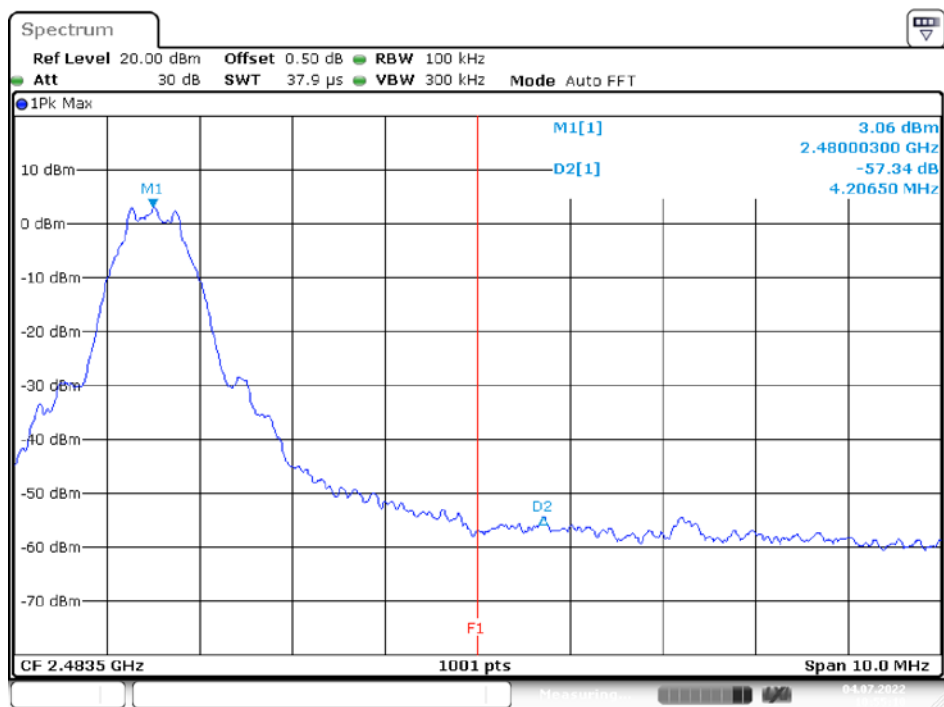
Please refer to the following plots

BLE Mode
Band Edge, Left Side



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Band Edge, Right Side



Date: 4.JUL.2022 10:55:10

12 FCC §15.247(e) – Power Spectral Density

12.1 Applicable Standard

According to FCC §15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

12.2 Test Procedure

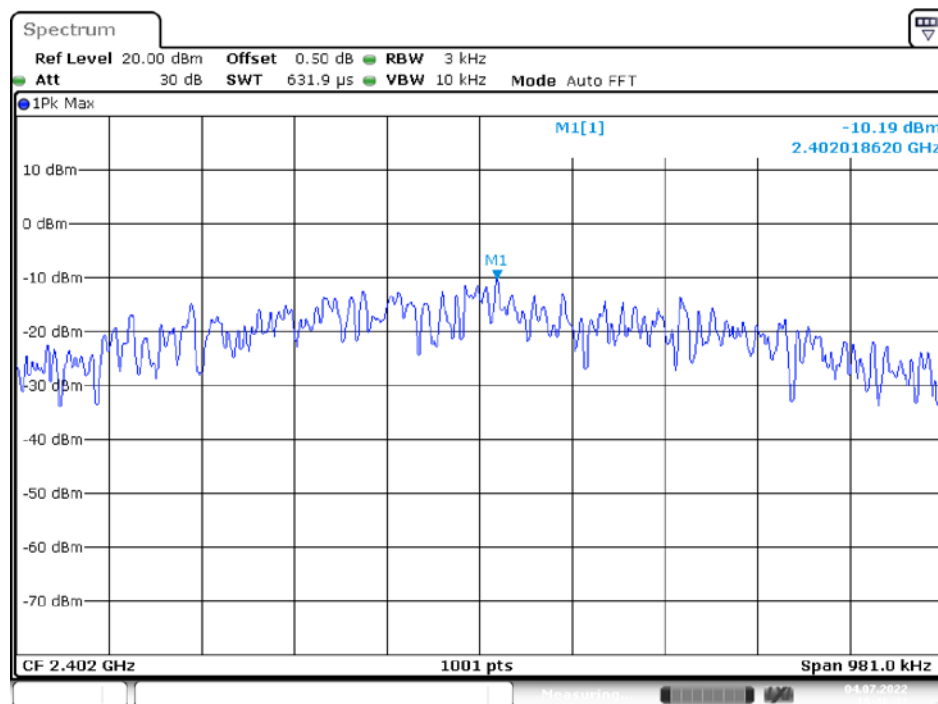
- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq [3 \times \text{RBW}]$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

12.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
Low	2402	-10.19	8	Compliance
Middle	2440	-10.75	8	Compliance
High	2480	-11.19	8	Compliance

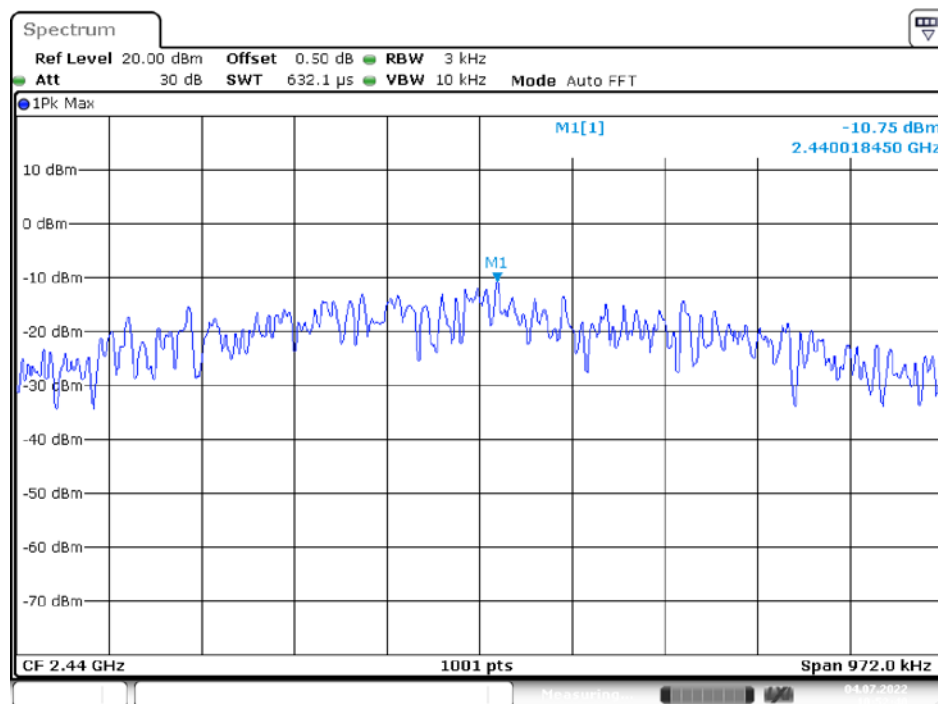
Please refer to the following plots

BLE Mode Low Channel



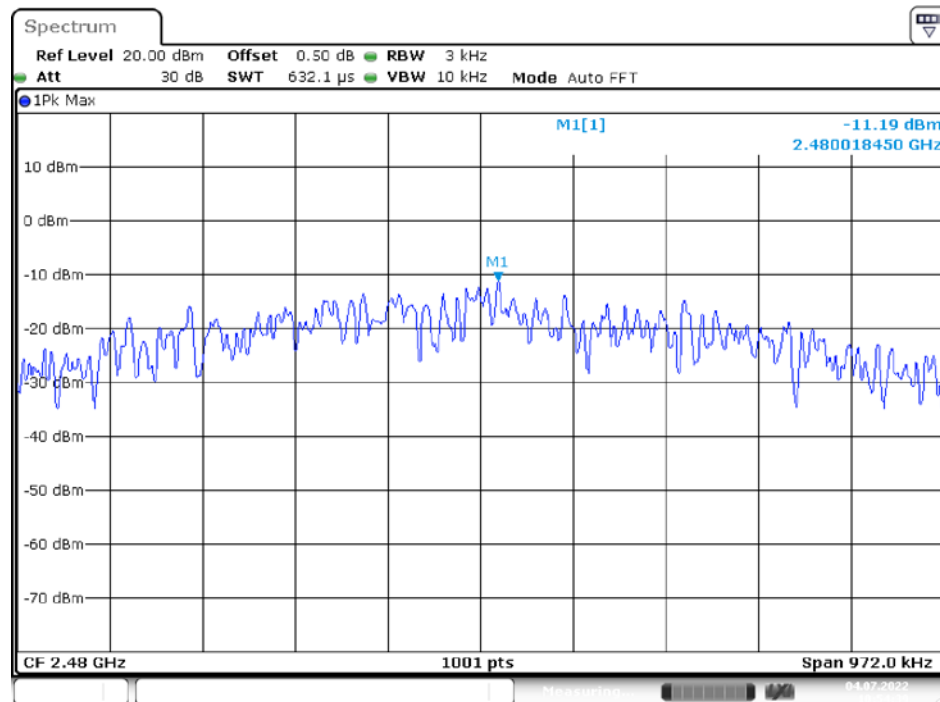
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Middle Channel



Date: 4.JUL.2022 10:52:40

High Channel



Date: 4.JUL.2022 10:54:40

***** END OF REPORT *****