FCC Part 15.247

TEST REPORT

For

Cisco Systems, Inc.

170 West Tasman Dr, San Jose, CA 95134

FCC ID: LDKCNWLI2637

Report Type: Original Report	**Product Type:** Cisco Catalyst 9130AX Series Wi-Fi 6 Access Points

Report Producer : Coco Lin

Report Number : RXZ220722002RF01

Report Date : 2022-08-09

Reviewed By: Andy Shih Andy.Shih

Prepared By: Bay Area Compliance Laboratories Corp.
(New Taipei Laboratory)
70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,
New Taipei City 22183, Taiwan, R.O.C.
Tel: +886 (2) 2647 6898
Fax: +886 (2) 2647 6895
www.bacl.com.tw

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ220722002	RXZ220722002RF01	2022-08-09	Original Report	Coco Lin

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Manufacturer	Cisco Systems, Inc.
	170 West Tasman Dr, San Jose, CA 95134
Brand(Trade) Name	CISCO
Product (Equipment)	Cisco Catalyst 9130AX Series Wi-Fi 6 Access Points
Main Model Name	C9130AXI-B
Frequency Range	BLE Mode: 2402 ~ 2480 MHz
Channel Number	40
Transmit Power	4.78 dBm
Modulation Technique	BLE Mode: GFSK
Transmit Data Rate	BLE Mode: 1Mbps
Power Operation (Voltage Range)	55Vdc from PoE port
Received Date	2022/7/22
Date of Test	2022/7/25 ~ 2022/8/1

*All measurement and test data in this report was gathered from production sample serial number: RXZ220722002-01 (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 Related Submittal(s)/Grant(s)

N/A.

1.4 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

1.5 Statement

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

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.

1.6 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 %

1.7 Environmental Conditions

Test Site	Test Date	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2022/8/1	24.2	50	1010	Jim Chen
Radiation Spurious Emissions	2022/7/25~2022/7/29	21.1~27.2	47~72	1010	Jim Chen
Conducted Spurious Emissions	2022/7/25	26.7	43	1010	Andy Cheng
6 dB Emission Bandwidth	2022/7/25	26.7	43	1010	Andy Cheng
Maximum Output Power	2022/7/25	26.7	43	1010	Andy Cheng
100 kHz Bandwidth of Frequency Band Edge	2022/7/25	26.7	43	1010	Andy Cheng
Power Spectral Density	2022/7/25	26.7	43	1010	Andy Cheng

1.8 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(4TX) + WIFI 2.4GHz Aux + BLE

Mode 3: WIFI 2.4GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 5GHz Aux + BLE

Mode 4: WIFI 5GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 2.4GHz Aux + BLE

Mode 5: WIFI 5GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 5GHz Aux + BLE

Mode 6: WIFI 2.4GHz XOR + WIFI 5GHz Regular(8TX) + WIFI 2.4GHz Aux + BLE

Mode 7: WIFI 2.4GHz XOR + WIFI 5GHz Regular(8TX) + WIFI 5GHz Aux + BLE

Radiated spurious emissions for Transmitting simultaneously test: Mode 2~7.

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

Conducted output power for worst case :

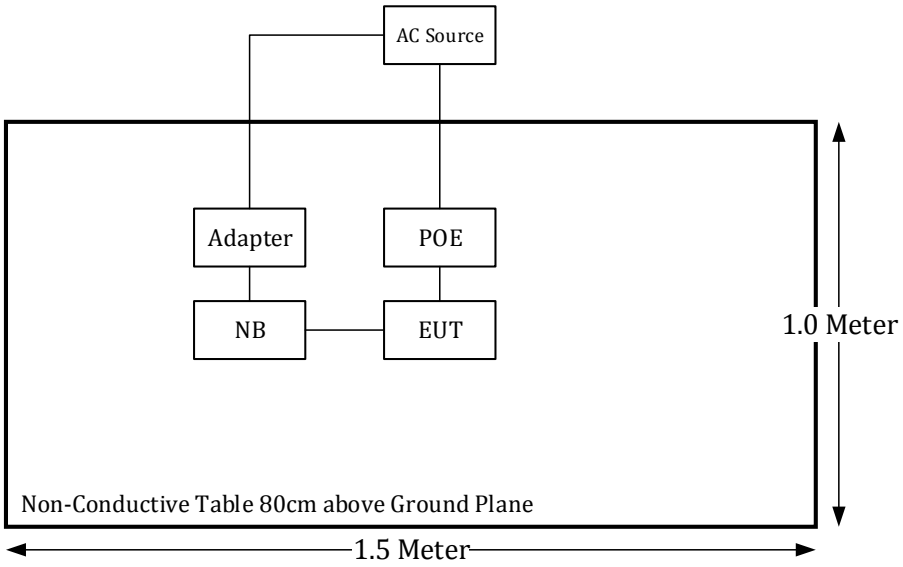
Worst case mode		Output power (dBm)
XOR WIFI-2.4GHz	AX20 Mode, 2437MHz	23.52
XOR WIFI-5GHz	AX80 Mode, 5775MHz	22.48
Regular WIFI-5GHz(4TX)	AX40 Mode, 5230 MHz	21.62
Regular WIFI-5GHz(8TX)	AX20 Mode, 5745MHz	25.68
AUX WIFI-2.4GHz	G Mode, 2437MHz	20.01
AUX WIFI-5GHz	A Mode, 5300MHz	20.22

2.7 Block Diagram of Test Setup

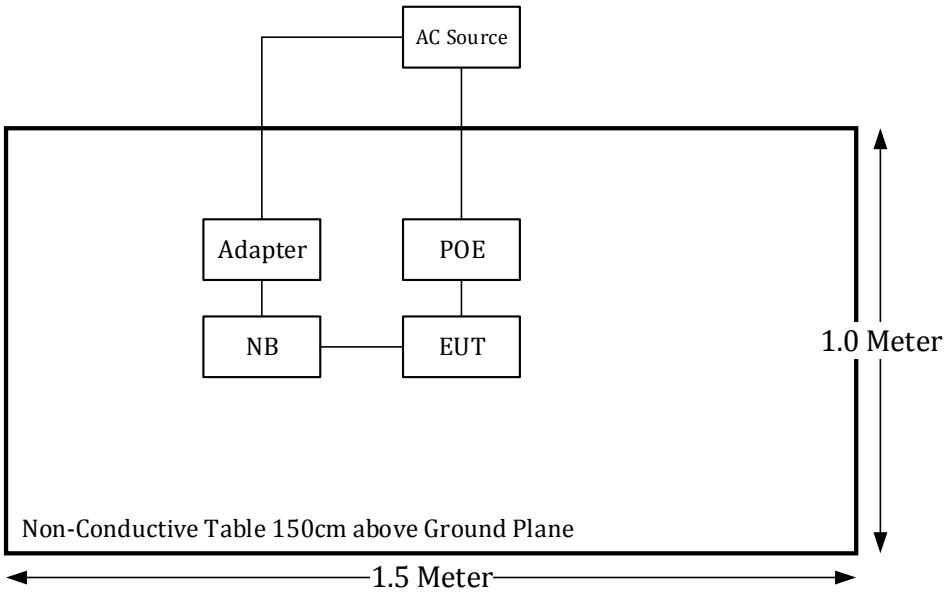
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

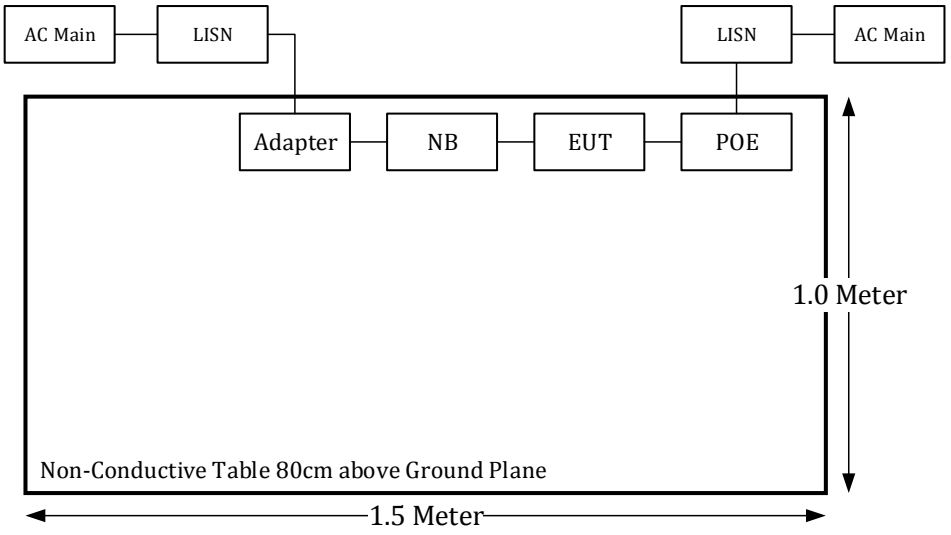
Below 1GHz:



Above 1GHz:



Conduction:


AC Main
LISN
LISN
AC Main
Adapter
NB
EUT
POE
1.0 Meter
Non-Conductive Table 80cm above Ground Plane
1.5 Meter

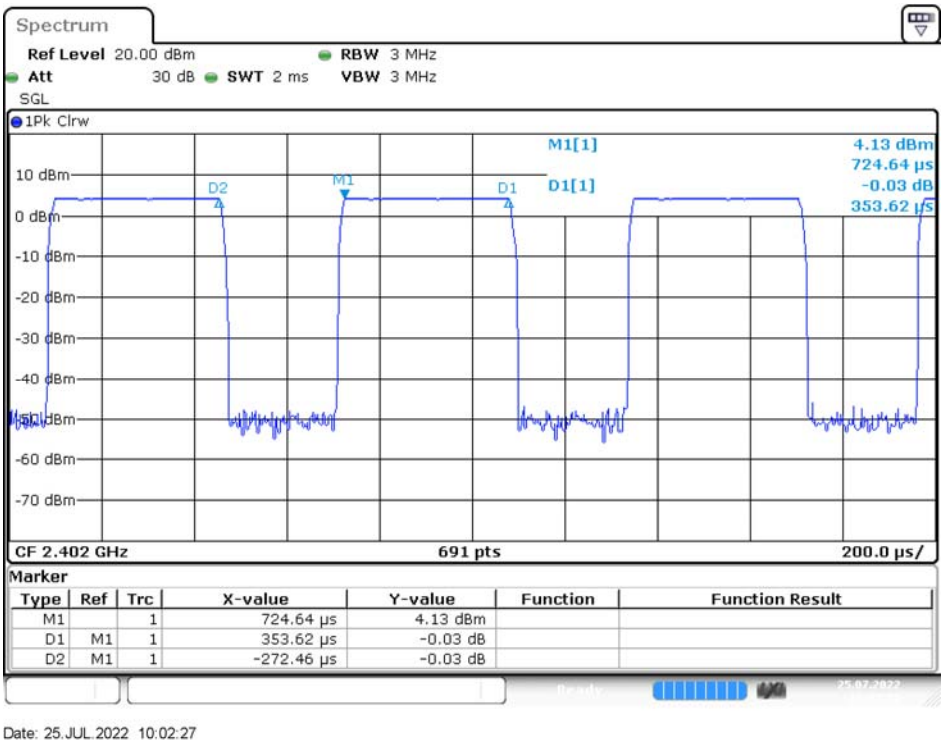
2.8 Duty Cycle

The duty cycle as below:

Radio Mode	T_{on} (ms)	$T_{on}+T_{off}$ (ms)	Duty Cycle (%)
BLE	0.354	0.626	56

Please refer to the following plots.

BLE Mode



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
LISN	Rohde & Schwarz	ENV216	101248	2022/6/22	2023/6/21
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2022/7/21	2023/7/20
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
Microware 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 bacl	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

***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 *Pth* (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). *Pth* is given by:

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

Where

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

and

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

5.2 RF Exposure Evaluation Result

The EUT can be used in the following modes, selecting the worst mode for evaluation.
Mode 2: WIFI 2.4GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 2.4GHz Aux + BLE
Mode 3: WIFI 2.4GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 5GHz Aux + BLE
Mode 4: WIFI 5GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 2.4GHz Aux + BLE
Mode 5: WIFI 5GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 5GHz Aux + BLE
Mode 6: WIFI 2.4GHz XOR + WIFI 5GHz Regular(8TX) + WIFI 2.4GHz Aux + BLE
Mode 7: WIFI 2.4GHz XOR + WIFI 5GHz Regular(8TX) + WIFI 5GHz Aux + BLE

Worst case is Mode 7 :

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	4	300	100%	3.16	6.85	4.84
WIFI 2.4G XOR	2462	24	10	300	100%	251.19	31.85	1531.09
WIFI 5G Regular(8TX)	5850	26	10.02	300	100%	398.11	33.87	2437.81
WIFI 5G AUX	5850	20.5	6	300	100%	112.20	24.35	272.27

Option A

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

Band	Freq (MHz)	Result Option A
BLE	2480	not exempt
WIFI 2.4G XOR	2462	not exempt
WIFI 5G Regular(8TX)	5850	not exempt
WIFI 5G AUX	5850	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)	Result Option B
BLE	2480	3060.00	1.905	3060	exempt
WIFI 2.4G XOR	2462	3060.00	1.903	3060	exempt
WIFI 5G Regular(8TX)	5850	3060.00	2.091	3060	exempt
WIFI 5G AUX	5850	3060.00	2.091	3060	exempt

Simultaneous Analysis :

Band	Freq (MHz)	PSD Require	PSD (mW/cm^2)	PSD Limit (mW/cm^2)	Simultaneous TX	Ratio
BLE	2480	exempt	0.001	1	O	0.001
WIFI 2.4G XOR	2462	exempt	0.222	1	O	0.222
WIFI 5G Regular(8TX)	5850	exempt	0.353	1	O	0.353
WIFI 5G AUX	5850	exempt	0.040	1	O	0.040
Simultaneous Analysis (Limit 1)						0.62

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	Internal Antenna, single-band, single-port, Omni-directional	4 dBi

Result: Compliance

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

7.1 Applicable Standard

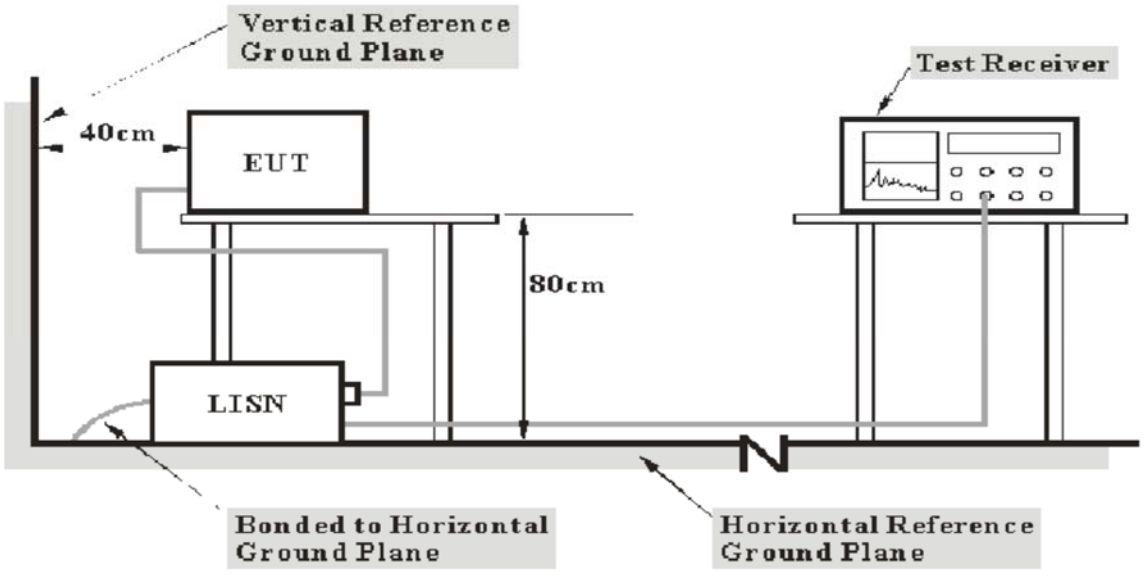
According to §15.207

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 μH/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:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

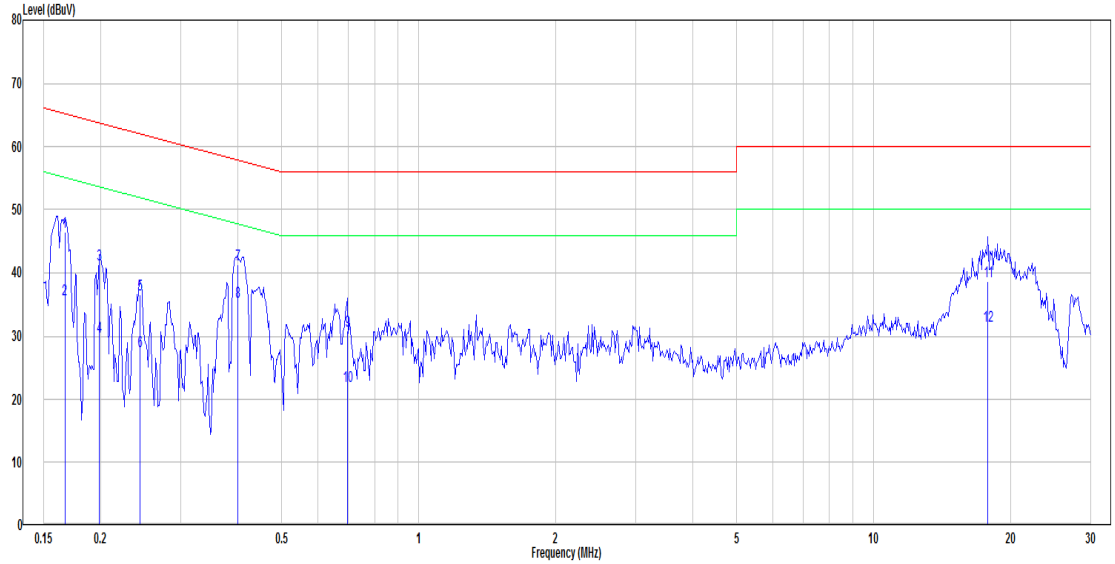
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – 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	0.167	36.77	9.64	46.41	65.12	-18.71	QP
2	0.167	26.13	9.64	35.77	55.12	-19.35	Average
3	0.199	31.73	9.64	41.37	63.67	-22.30	QP
4	0.199	20.22	9.64	29.86	53.67	-23.81	Average
5	0.244	26.98	9.64	36.62	61.95	-25.33	QP
6	0.244	17.96	9.64	27.60	51.95	-24.35	Average
7	0.400	31.66	9.65	41.31	57.86	-16.55	QP
8	0.400	25.79	9.65	35.44	47.86	-12.42	Average
9	0.697	21.26	9.66	30.92	56.00	-25.08	QP
10	0.697	12.42	9.66	22.08	46.00	-23.92	Average
11	17.849	28.84	9.88	38.72	60.00	-21.28	QP
12	17.849	21.65	9.88	31.53	50.00	-18.47	Average

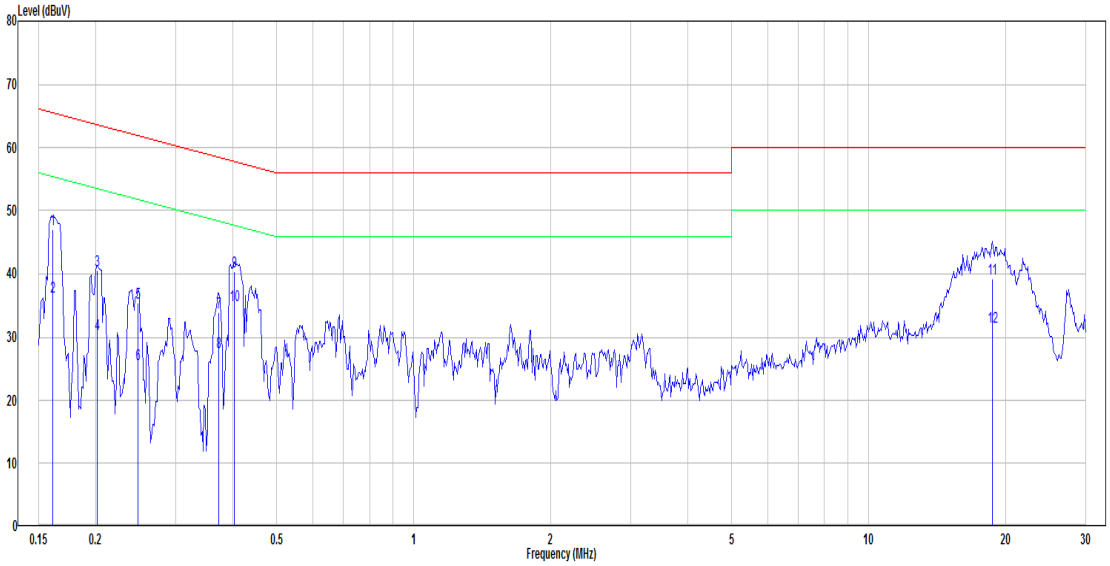
Note:

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	0.161	37.36	9.64	47.00	65.43	-18.43	QP
2	0.161	26.70	9.64	36.34	55.43	-19.09	Average
3	0.202	30.94	9.63	40.57	63.54	-22.97	QP
4	0.202	20.77	9.63	30.40	53.54	-23.14	Average
5	0.248	25.79	9.63	35.42	61.82	-26.40	QP
6	0.248	16.11	9.63	25.74	51.82	-26.08	Average
7	0.373	24.29	9.64	33.93	58.43	-24.50	QP
8	0.373	17.95	9.64	27.59	48.43	-20.84	Average
9	0.404	30.71	9.65	40.36	57.77	-17.41	QP
10	0.404	25.49	9.65	35.14	47.77	-12.63	Average
11	18.721	29.23	9.94	39.17	60.00	-20.83	QP
12	18.721	21.77	9.94	31.71	50.00	-18.29	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:

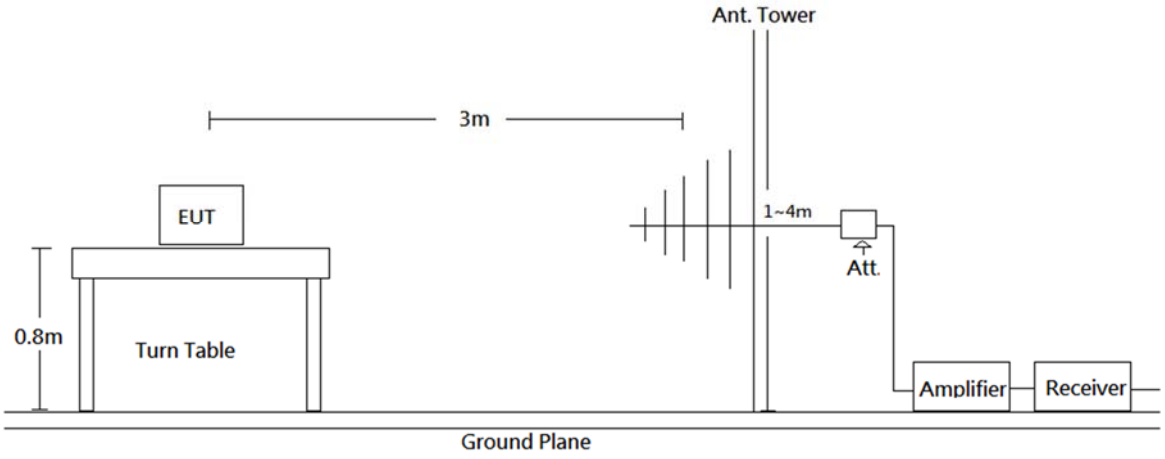
Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** 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.

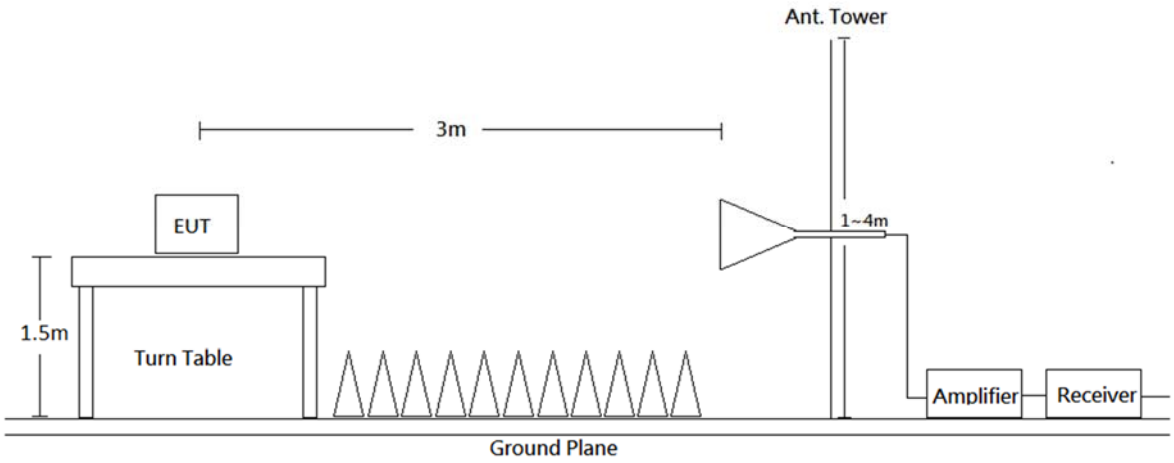
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the 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:

Correct Factor = Antenna Factor + Cable Loss – 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:

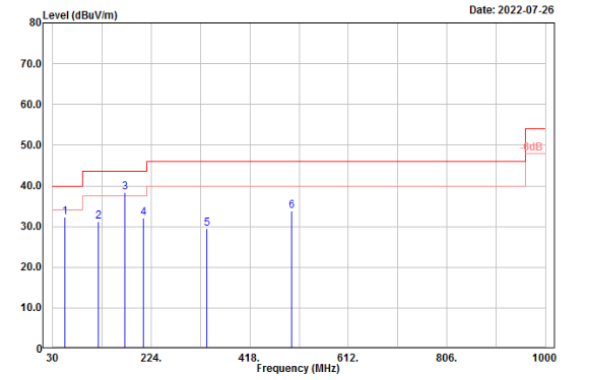
Margin = Result – Limit

8.6 Test Results

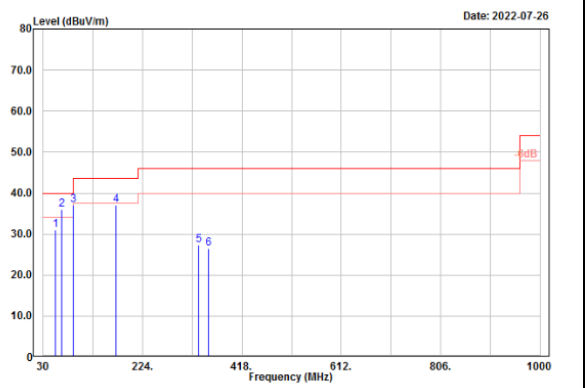
Test Mode: **BLE Mode** (Worst case is BLE mode high channel)

30MHz-1GHz:

BLE Mode / Horizontal	BLE Mode / Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
53.303	47.41	-15.06	32.35	40.00	-7.65	100	23	QP
119.329	39.32	-8.11	31.21	43.50	-12.29	100	17	QP
171.762	48.34	-9.88	38.46	43.50	-5.04	100	274	QP
208.659	42.97	-10.80	32.17	43.50	-11.33	100	197	QP
332.943	35.85	-6.30	29.55	46.00	-16.45	100	340	QP
499.950	35.92	-2.00	33.92	46.00	-12.08	100	257	QP



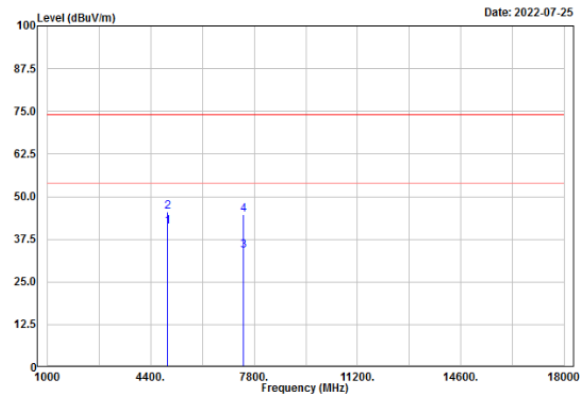
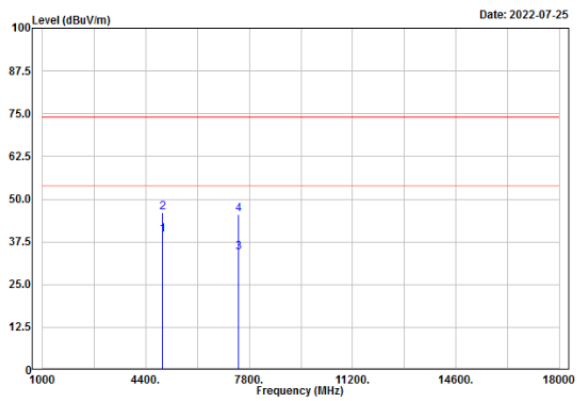
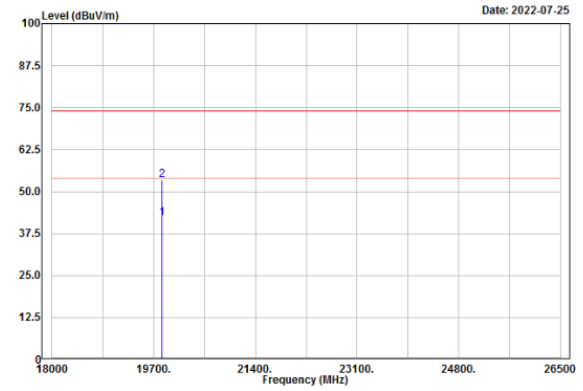
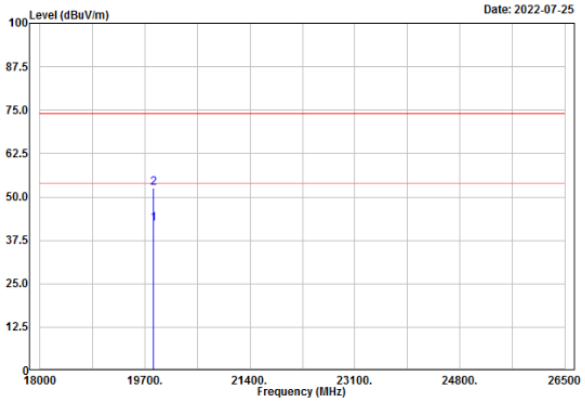
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
54.274	46.20	-15.22	30.98	40.00	-9.02	100	301	QP
66.897	50.27	-14.35	35.92	40.00	-4.08	100	41	QP
88.258	51.75	-14.59	37.16	43.50	-6.34	100	27	QP
172.733	47.10	-9.96	37.14	43.50	-6.36	100	145	QP
332.943	33.54	-6.30	27.24	46.00	-18.76	100	360	QP
352.362	32.11	-5.76	26.35	46.00	-19.65	100	163	QP

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.

BLE Mode / Horizontal (1GHz-18GHz)	BLE Mode / Vertical (1GHz-18GHz)
	
BLE Mode / Horizontal (18GHz – 26.5GHz)	**BLE Mode / Vertical (18GHz – 26.5GHz)**
	

Above 1GHz

Horizontal

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2363.500	47.54	-9.65	37.89	54.00	-16.11	234	313	Average
2363.500	57.09	-9.65	47.44	74.00	-26.56	234	313	Peak
2402.000	110.26	-9.54	100.72			234	313	Average
2402.000	111.02	-9.54	101.48			234	313	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	44.98	-2.47	42.51	54.00	-11.49	146	329	Average
4804.000	51.25	-2.47	48.78	74.00	-25.22	146	329	Peak
7206.000	30.80	3.03	33.83	54.00	-20.17	154	30	Average
7206.000	40.86	3.03	43.89	74.00	-30.11	154	30	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	38.60	-2.24	36.36	54.00	-17.64	148	334	Average
4880.000	47.74	-2.24	45.50	74.00	-28.50	148	334	Peak
7320.000	30.66	3.34	34.00	54.00	-20.00	154	187	Average
7320.000	41.08	3.34	44.42	74.00	-29.58	154	187	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	110.09	-8.87	101.22			252	319	Average
2480.000	110.85	-8.87	101.98			252	319	Peak
2483.830	50.82	-8.82	42.00	54.00	-12.00	252	319	Average
2483.830	62.73	-8.82	53.91	74.00	-20.09	252	319	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	43.30	-2.04	41.26	54.00	-12.74	147	280	Average
4960.000	47.62	-2.04	45.58	74.00	-28.42	147	280	Peak
7440.000	30.75	3.38	34.13	54.00	-19.87	152	156	Average
7440.000	41.28	3.38	44.66	74.00	-29.34	152	156	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)	(°)	
2363.700	46.90	-9.65	37.25	54.00	-16.75	268	355	Average
2363.700	56.86	-9.65	47.21	74.00	-26.79	268	355	Peak
2402.000	106.09	-9.54	96.55			268	355	Average
2402.000	106.84	-9.54	97.30			268	355	Peak
4804.000	44.65	-2.47	42.18	54.00	-11.82	153	0	Average
4804.000	50.94	-2.47	48.47	74.00	-25.53	153	0	Peak
7206.000	30.83	3.03	33.86	54.00	-20.14	157	159	Average
7206.000	41.28	3.03	44.31	74.00	-29.69	157	159	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	39.51	-2.24	37.27	54.00	-16.73	144	28	Average
4880.000	47.96	-2.24	45.72	74.00	-28.28	144	28	Peak
7320.000	30.71	3.34	34.05	54.00	-19.95	148	59	Average
7320.000	41.84	3.34	45.18	74.00	-28.82	148	59	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	105.37	-8.87	96.50			227	357	Average
2480.000	106.11	-8.87	97.24			227	357	Peak
2483.710	48.03	-8.82	39.21	54.00	-14.79	227	357	Average
2483.710	59.56	-8.82	50.74	74.00	-23.26	227	357	Peak
4960.000	41.73	-2.04	39.69	54.00	-14.31	155	19	Average
4960.000	48.21	-2.04	46.17	74.00	-27.83	155	19	Peak
7440.000	30.93	3.38	34.31	54.00	-19.69	151	17	Average
7440.000	42.01	3.38	45.39	74.00	-28.61	151	17	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

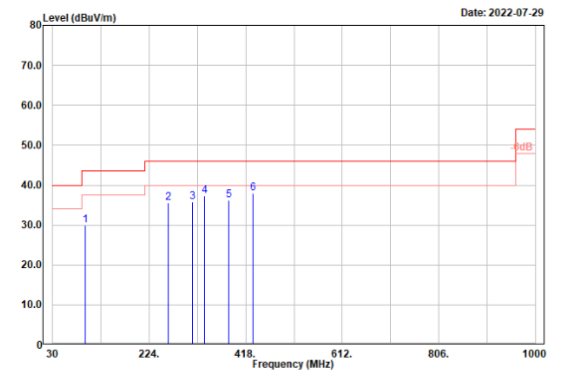
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

Transmitting simultaneously test:

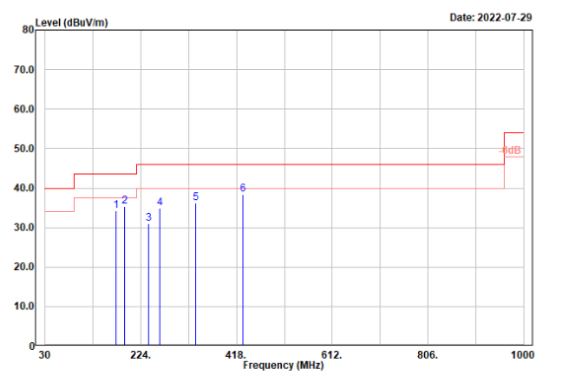
30MHz-1GHz:

Mode 2 / Horizontal



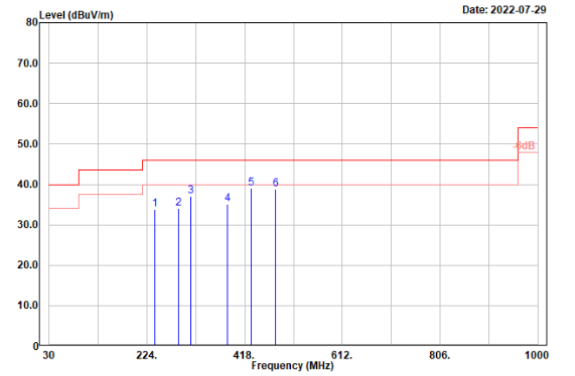
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
95.055	43.15	-13.15	30.00	43.50	-13.50	100	35	QP
263.033	43.99	-8.41	35.58	46.00	-10.42	100	310	QP
311.582	42.46	-6.67	35.79	46.00	-10.21	100	340	QP
335.856	43.50	-6.24	37.26	46.00	-8.74	100	337	QP
383.433	41.27	-5.11	36.16	46.00	-9.84	100	237	QP
431.982	41.47	-3.45	38.02	46.00	-7.98	100	268	QP

Mode 2 / Vertical



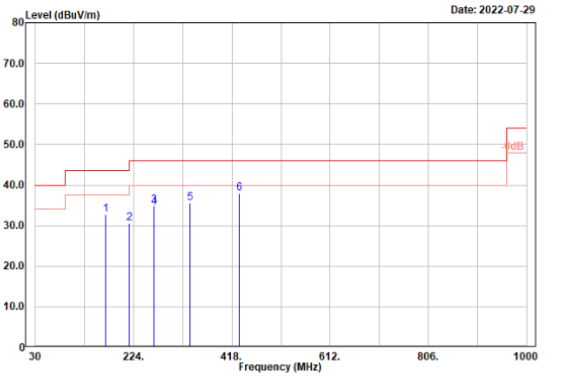
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
174.675	44.39	-10.09	34.30	43.50	-9.20	100	343	QP
191.181	45.18	-9.91	35.27	43.50	-8.23	100	33	QP
239.730	40.38	-9.39	30.99	46.00	-15.01	100	357	QP
263.033	43.42	-8.41	35.01	46.00	-10.99	100	339	QP
335.856	42.55	-6.24	36.31	46.00	-9.69	100	288	QP
431.011	41.87	-3.50	38.37	46.00	-7.63	100	303	QP

Mode 3 / Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
239.730	43.19	-9.39	33.80	46.00	-12.20	100	345	QP
287.307	41.40	-7.33	34.07	46.00	-11.93	100	240	QP
311.582	43.78	-6.67	37.11	46.00	-8.89	100	329	QP
383.433	40.15	-5.11	35.04	46.00	-10.96	100	232	QP
431.011	42.45	-3.50	38.95	46.00	-7.05	100	263	QP
479.560	40.81	-2.10	38.71	46.00	-7.29	100	293	QP

Mode 3 / Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
168.849	42.36	-9.69	32.67	43.50	-10.83	100	333	QP
215.456	41.24	-10.66	30.58	43.50	-12.92	100	212	QP
264.004	43.14	-8.26	34.88	46.00	-11.12	100	33	QP
264.004	42.69	-8.26	34.43	46.00	-11.57	100	33	QP
335.856	41.77	-6.24	35.53	46.00	-10.47	100	294	QP
431.982	41.29	-3.45	37.84	46.00	-8.16	100	302	QP

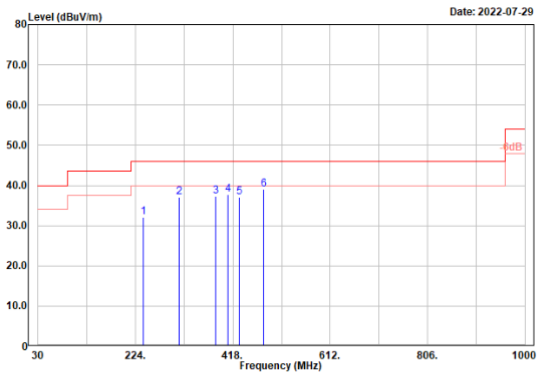
Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

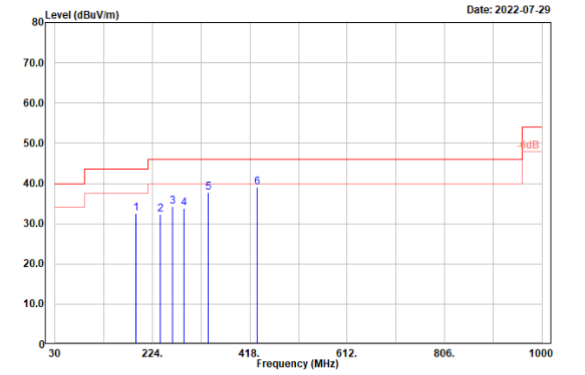
Spurious emissions more than 20 dB below the limit were not reported.

Mode 4 / Horizontal



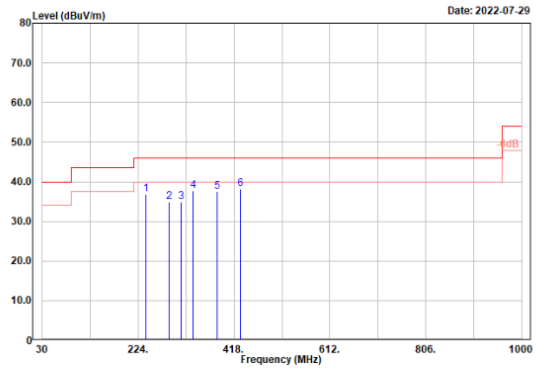
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
239.730	41.47	-9.39	32.08	46.00	-13.92	100	319	QP
311.582	43.72	-6.67	37.05	46.00	-8.95	100	327	QP
383.433	42.38	-5.11	37.27	46.00	-8.73	100	229	QP
407.708	41.75	-4.01	37.74	46.00	-8.26	100	237	QP
431.011	40.66	-3.50	37.16	46.00	-8.84	100	264	QP
479.560	41.06	-2.10	38.96	46.00	-7.04	100	291	QP

Mode 4 / Vertical



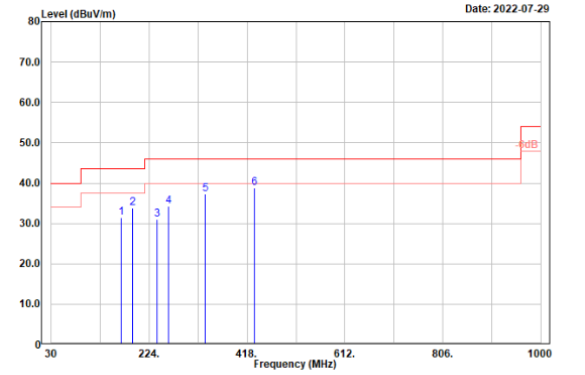
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
191.181	42.33	-9.91	32.42	43.50	-11.08	100	310	QP
239.730	41.62	-9.39	32.23	46.00	-13.77	100	349	QP
264.004	42.43	-8.26	34.17	46.00	-11.83	100	333	QP
287.307	41.14	-7.33	33.81	46.00	-12.19	100	302	QP
335.856	43.99	-6.24	37.75	46.00	-8.25	100	287	QP
431.982	42.38	-3.45	38.93	46.00	-7.07	100	310	QP

Mode 5 / Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
239.730	46.33	-9.39	36.94	46.00	-9.06	100	343	QP
287.307	42.32	-7.33	34.99	46.00	-11.01	100	218	QP
311.582	41.47	-6.67	34.80	46.00	-11.20	100	335	QP
335.856	43.99	-6.24	37.75	46.00	-8.25	100	339	QP
383.433	42.65	-5.11	37.54	46.00	-8.46	100	238	QP
431.011	41.72	-3.50	38.22	46.00	-7.78	100	262	QP

Mode 5 / Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
168.849	41.22	-9.69	31.53	43.50	-11.97	100	341	QP
191.181	43.64	-9.91	33.73	43.50	-9.77	100	329	QP
239.730	40.39	-9.39	31.00	46.00	-15.00	100	353	QP
263.033	42.72	-8.41	34.31	46.00	-11.69	100	341	QP
335.856	43.61	-6.24	37.37	46.00	-8.63	100	290	QP
431.982	42.34	-3.45	38.89	46.00	-7.11	100	309	QP

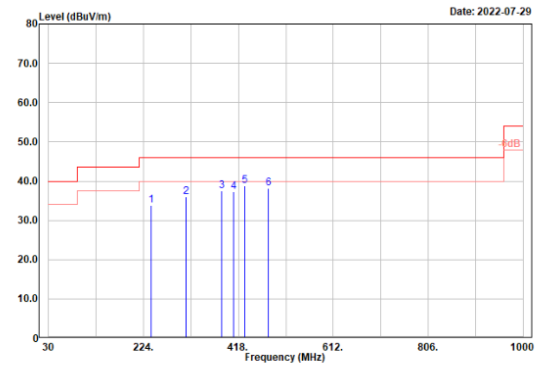
Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

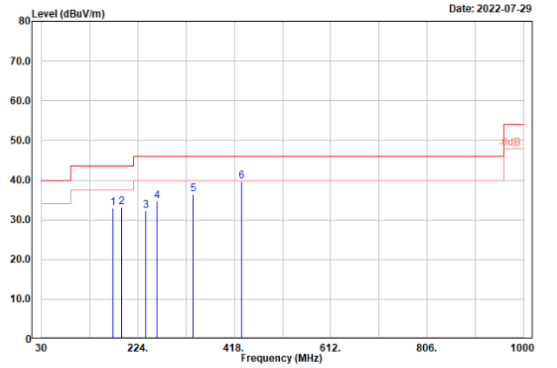
Spurious emissions more than 20 dB below the limit were not reported.

Mode 6 / Horizontal



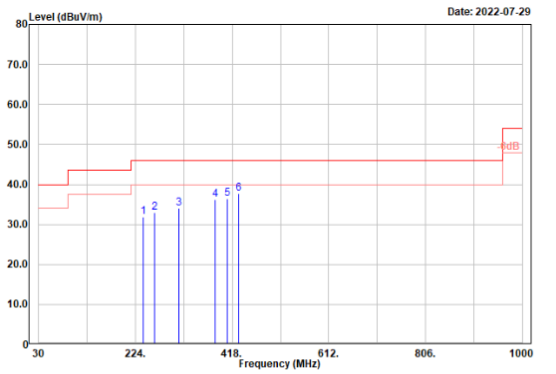
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
239.730	43.11	-9.39	33.72	46.00	-12.28	100	347	QP
311.582	42.76	-6.67	36.09	46.00	-9.91	100	347	QP
383.433	42.59	-5.11	37.48	46.00	-8.52	100	236	QP
407.708	41.33	-4.01	37.32	46.00	-8.68	100	254	QP
431.011	42.31	-3.50	38.81	46.00	-7.19	100	267	QP
479.560	40.28	-2.10	38.18	46.00	-7.82	100	293	QP

Mode 6 / Vertical



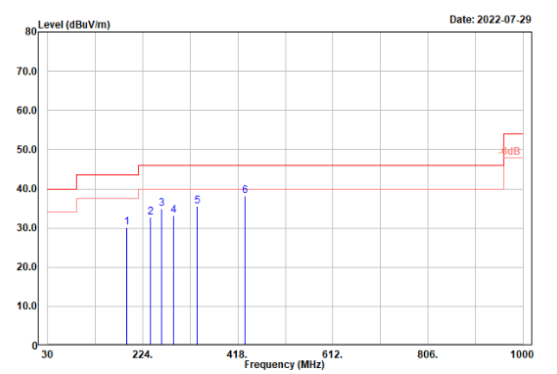
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
173.704	42.93	-10.06	32.87	43.50	-10.63	100	351	QP
191.181	43.16	-9.91	33.25	43.50	-10.25	100	31	QP
239.730	41.62	-9.39	32.23	46.00	-13.77	100	339	QP
263.033	43.12	-8.41	34.71	46.00	-11.29	100	323	QP
335.856	42.75	-6.24	36.51	46.00	-9.49	100	288	QP
431.982	43.02	-3.45	39.57	46.00	-6.43	100	307	QP

Mode 7 / Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
239.730	41.33	-9.39	31.94	46.00	-14.06	100	339	QP
263.033	41.38	-8.41	32.97	46.00	-13.03	100	323	QP
311.582	40.76	-6.67	34.09	46.00	-11.91	100	339	QP
383.433	41.40	-5.11	36.29	46.00	-9.71	100	233	QP
407.708	40.36	-4.01	36.35	46.00	-9.65	100	253	QP
431.011	41.31	-3.50	37.81	46.00	-8.19	100	265	QP

Mode 7 / Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
191.181	40.13	-9.91	30.22	43.50	-13.28	100	317	QP
239.730	42.09	-9.39	32.70	46.00	-13.30	100	345	QP
263.033	43.27	-8.41	34.86	46.00	-11.14	100	333	QP
287.307	40.51	-7.33	33.18	46.00	-12.82	100	321	QP
335.856	41.78	-6.24	35.54	46.00	-10.46	100	279	QP
431.982	41.66	-3.45	38.21	46.00	-7.79	100	313	QP

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	37.85	-3.47	34.38	54.00	-19.62	144	222	Average
4804.000	44.07	-3.47	40.60	74.00	-33.40	144	222	Peak
4874.000	39.13	-3.25	35.88	54.00	-18.12	188	169	Average
4874.000	43.42	-3.25	40.17	74.00	-33.83	188	169	Peak
7206.000	37.90	1.83	39.73	54.00	-14.27	179	334	Average
7206.000	41.26	1.83	43.09	74.00	-30.91	179	334	Peak
7311.000	38.23	2.46	40.69	54.00	-13.31	171	107	Average
7311.000	41.41	2.46	43.87	74.00	-30.13	171	107	Peak
10460.000	39.55	7.20	46.75	54.00	-7.25	203	273	Average
10460.000	41.62	7.20	48.82	74.00	-25.18	203	273	Peak
15690.000	38.56	7.34	45.90	54.00	-8.10	154	47	Average
15690.000	42.33	7.34	49.67	74.00	-24.33	151	47	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	40.90	-0.57	40.33	54.00	-13.67	150	358	Average
19216.000	50.46	-0.57	49.89	74.00	-24.11	150	358	Peak
19496.000	40.71	0.25	40.96	54.00	-13.04	150	147	Average
19496.000	52.08	0.25	52.33	74.00	-21.67	150	147	Peak
20920.000	42.69	1.81	44.50	54.00	-9.50	150	329	Average
20920.000	49.40	1.81	51.21	74.00	-22.79	150	329	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	38.24	-3.47	34.77	54.00	-19.23	165	32	Average
4804.000	44.27	-3.47	40.80	74.00	-33.20	165	32	Peak
4874.000	39.37	-3.25	36.12	54.00	-17.88	182	334	Average
4874.000	43.62	-3.25	40.37	74.00	-33.63	182	334	Peak
7206.000	37.51	1.83	39.34	54.00	-14.66	201	283	Average
7206.000	41.43	1.83	43.26	74.00	-30.74	201	283	Peak
7311.000	38.42	2.46	40.88	54.00	-13.12	192	71	Average
7311.000	43.41	2.46	45.87	74.00	-28.13	192	71	Peak
10460.000	39.67	7.20	46.87	54.00	-7.13	133	149	Average
10460.000	41.72	7.20	48.92	74.00	-25.08	133	149	Peak
15690.000	39.13	7.34	46.47	54.00	-7.53	148	40	Average
15690.000	43.24	7.34	50.58	74.00	-23.42	148	40	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	41.35	-0.57	40.78	54.00	-13.22	150	39	Average
19216.000	51.32	-0.57	50.75	74.00	-23.25	150	39	Peak
19496.000	40.82	0.25	41.07	54.00	-12.93	150	182	Average
19496.000	52.10	0.25	52.35	74.00	-21.65	150	182	Peak
20920.000	42.73	1.81	44.54	54.00	-9.46	150	178	Average
20920.000	49.51	1.81	51.32	74.00	-22.68	150	178	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	37.68	-3.47	34.21	54.00	-19.79	201	262	Average
4804.000	42.96	-3.47	39.49	74.00	-34.51	201	262	Peak
4874.000	38.42	-3.25	35.17	54.00	-18.83	169	166	Average
4874.000	42.46	-3.25	39.21	74.00	-34.79	169	166	Peak
7206.000	37.53	1.83	39.36	54.00	-14.64	171	19	Average
7206.000	41.11	1.83	42.94	74.00	-31.06	171	19	Peak
7311.000	39.47	2.46	41.93	54.00	-12.07	188	23	Average
7311.000	41.56	2.46	44.02	74.00	-29.98	188	23	Peak
10460.000	39.01	7.20	46.21	54.00	-7.79	161	350	Average
10460.000	41.38	7.20	48.58	74.00	-25.42	161	350	Peak
15690.000	38.70	7.34	46.04	54.00	-7.96	199	250	Average
15690.000	42.38	7.34	49.72	74.00	-24.28	199	250	Peak
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	40.59	-0.57	40.02	54.00	-13.98	150	294	Average
19216.000	49.38	-0.57	48.81	74.00	-25.19	150	294	Peak
19496.000	41.38	0.25	41.63	54.00	-12.37	150	360	Average
19496.000	49.78	0.25	50.03	74.00	-23.97	150	360	Peak
20920.000	40.71	1.81	42.52	54.00	-11.48	150	40	Average
20920.000	49.08	1.81	50.89	74.00	-23.11	150	40	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	38.01	-3.47	34.54	54.00	-19.46	204	270	Average
4804.000	45.62	-3.47	42.15	74.00	-31.85	204	270	Peak
4874.000	39.72	-3.25	36.47	54.00	-17.53	199	360	Average
4874.000	42.95	-3.25	39.70	74.00	-34.30	199	360	Peak
7206.000	37.60	1.83	39.43	54.00	-14.57	171	126	Average
7206.000	41.93	1.83	43.76	74.00	-30.24	171	126	Peak
7311.000	39.69	2.46	42.15	54.00	-11.85	142	106	Average
7311.000	42.51	2.46	44.97	74.00	-29.03	142	106	Peak
10460.000	39.05	7.20	46.25	54.00	-7.75	173	309	Average
10460.000	42.33	7.20	49.53	74.00	-24.47	173	309	Peak
15690.000	39.69	7.34	47.03	54.00	-6.97	182	138	Average
15690.000	43.43	7.34	50.77	74.00	-23.23	182	138	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	40.78	-0.57	40.21	54.00	-13.79	150	54	Average
19216.000	49.56	-0.57	48.99	74.00	-25.01	150	54	Peak
19496.000	41.49	0.25	41.74	54.00	-12.26	150	19	Average
19496.000	51.00	0.25	51.25	74.00	-22.75	150	19	Peak
20920.000	40.98	1.81	42.79	54.00	-11.21	150	225	Average
20920.000	49.17	1.81	50.98	74.00	-23.02	150	225	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	38.42	-3.47	34.95	54.00	-19.05	142	250	Average
4804.000	42.89	-3.47	39.42	74.00	-34.58	142	250	Peak
4874.000	37.95	-3.25	34.70	54.00	-19.30	157	52	Average
4874.000	43.01	-3.25	39.76	74.00	-34.24	157	52	Peak
7206.000	38.75	1.83	40.58	54.00	-13.42	189	355	Average
7206.000	41.11	1.83	42.94	74.00	-31.06	189	355	Peak
7311.000	39.00	2.46	41.46	54.00	-12.54	193	82	Average
7311.000	41.33	2.46	43.79	74.00	-30.21	193	82	Peak
10460.000	37.17	7.20	44.37	54.00	-9.63	201	223	Average
10460.000	41.11	7.20	48.31	74.00	-25.69	201	223	Peak
11550.000	35.77	7.70	43.47	54.00	-10.53	178	55	Average
11550.000	40.92	7.70	48.62	74.00	-25.38	178	55	Peak
15690.000	37.74	7.34	45.08	54.00	-8.92	197	131	Average
15690.000	42.90	7.34	50.24	74.00	-23.76	197	131	Peak
17325.000	37.27	13.49	50.76	54.00	-3.24	151	360	Average
17325.000	40.73	13.49	54.22	74.00	-19.78	151	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	42.74	-0.57	42.17	54.00	-11.83	150	106	Average
19216.000	51.58	-0.57	51.01	74.00	-22.99	150	106	Peak
19496.000	41.51	0.25	41.76	54.00	-12.24	150	25	Average
19496.000	52.08	0.25	52.33	74.00	-21.67	150	25	Peak
20920.000	41.43	1.81	43.24	54.00	-10.76	150	95	Average
20920.000	49.78	1.81	51.59	74.00	-22.41	150	95	Peak
23100.000	41.09	2.28	43.37	54.00	-10.63	150	271	Average
23100.000	48.99	2.28	51.27	74.00	-22.73	150	271	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	38.59	-3.47	35.12	54.00	-18.88	192	7	Average
4804.000	44.44	-3.47	40.97	74.00	-33.03	192	7	Peak
4874.000	38.61	-3.25	35.36	54.00	-18.64	177	277	Average
4874.000	43.46	-3.25	40.21	74.00	-33.79	177	277	Peak
7206.000	39.93	1.83	41.76	54.00	-12.24	202	270	Average
7206.000	41.80	1.83	43.63	74.00	-30.37	202	270	Peak
7311.000	39.05	2.46	41.51	54.00	-12.49	171	151	Average
7311.000	42.09	2.46	44.55	74.00	-29.45	171	151	Peak
10460.000	37.41	7.20	44.61	54.00	-9.39	166	340	Average
10460.000	42.35	7.20	49.55	74.00	-24.45	166	340	Peak
11550.000	36.21	7.70	43.91	54.00	-10.09	198	170	Average
11550.000	41.26	7.70	48.96	74.00	-25.04	198	170	Peak
15690.000	38.00	7.34	45.34	54.00	-8.66	135	360	Average
15690.000	42.91	7.34	50.25	74.00	-23.75	135	360	Peak
17325.000	37.47	13.49	50.96	54.00	-3.04	147	18	Average
17325.000	41.94	13.49	55.43	74.00	-18.57	147	18	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	42.89	-0.57	42.32	54.00	-11.68	150	2	Average
19216.000	53.92	-0.57	53.35	74.00	-20.65	150	2	Peak
19496.000	41.62	0.25	41.87	54.00	-12.13	150	317	Average
19496.000	52.21	0.25	52.46	74.00	-21.54	150	317	Peak
20920.000	41.54	1.81	43.35	54.00	-10.65	150	51	Average
20920.000	49.91	1.81	51.72	74.00	-22.28	150	51	Peak
23100.000	41.18	2.28	43.46	54.00	-10.54	150	151	Average
23100.000	50.36	2.28	52.64	74.00	-21.36	150	151	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

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	35.75	-3.47	32.28	54.00	-21.72	200	166	Average
4804.000	42.81	-3.47	39.34	74.00	-34.66	200	166	Peak
7206.000	36.55	1.83	38.38	54.00	-15.62	197	136	Average
7206.000	40.32	1.83	42.15	74.00	-31.85	197	136	Peak
10460.000	34.99	7.20	42.19	54.00	-11.81	165	274	Average
10460.000	40.97	7.20	48.17	74.00	-25.83	165	274	Peak
10600.000	36.92	7.55	44.47	54.00	-9.53	144	47	Average
10600.000	40.75	7.55	48.30	74.00	-25.70	144	47	Peak
11550.000	35.78	7.70	43.48	54.00	-10.52	189	224	Average
11550.000	40.41	7.70	48.11	74.00	-25.89	189	224	Peak
15690.000	35.87	7.34	43.21	54.00	-10.79	201	246	Average
15690.000	42.78	7.34	50.12	74.00	-23.88	201	246	Peak
15900.000	36.62	7.30	43.92	54.00	-10.08	178	117	Average
15900.000	42.00	7.30	49.30	74.00	-24.70	178	117	Peak
17325.000	36.87	13.49	50.36	54.00	-3.64	151	86	Average
17325.000	40.81	13.49	54.30	74.00	-19.70	151	86	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	42.62	-0.57	42.05	54.00	-11.95	150	0	Average
19216.000	51.87	-0.57	51.30	74.00	-22.70	150	0	Peak
20920.000	41.79	1.81	43.60	54.00	-10.40	150	56	Average
20920.000	49.73	1.81	51.54	74.00	-22.46	150	56	Peak
21200.000	42.55	1.85	44.40	54.00	-9.60	150	164	Average
21200.000	49.67	1.85	51.52	74.00	-22.48	150	164	Peak
23100.000	43.16	2.28	45.44	54.00	-8.56	150	133	Average
23100.000	52.60	2.28	54.88	74.00	-19.12	150	133	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	36.07	-3.47	32.60	54.00	-21.40	156	59	Average
4804.000	43.42	-3.47	39.95	74.00	-34.05	156	59	Peak
7206.000	36.93	1.83	38.76	54.00	-15.24	177	127	Average
7206.000	41.32	1.83	43.15	74.00	-30.85	177	127	Peak
10460.000	35.06	7.20	42.26	54.00	-11.74	204	0	Average
10460.000	42.41	7.20	49.61	74.00	-24.39	204	0	Peak
10600.000	36.75	7.55	44.30	54.00	-9.70	192	32	Average
10600.000	41.48	7.55	49.03	74.00	-24.97	192	32	Peak
11550.000	35.91	7.70	43.61	54.00	-10.39	166	32	Average
11550.000	42.80	7.70	50.50	74.00	-23.50	166	32	Peak
15690.000	36.08	7.34	43.42	54.00	-10.58	173	1	Average
15690.000	43.75	7.34	51.09	74.00	-22.91	173	1	Peak
15900.000	36.92	7.30	44.22	54.00	-9.78	180	219	Average
15900.000	43.22	7.30	50.52	74.00	-23.48	180	219	Peak
17325.000	37.11	13.49	50.60	54.00	-3.40	183	242	Average
17325.000	41.47	13.49	54.96	74.00	-19.04	183	242	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	42.83	-0.57	42.26	54.00	-11.74	150	322	Average
19216.000	52.45	-0.57	51.88	74.00	-22.12	150	322	Peak
20920.000	41.98	1.81	43.79	54.00	-10.21	150	29	Average
20920.000	49.99	1.81	51.80	74.00	-22.20	150	29	Peak
21200.000	42.75	1.85	44.60	54.00	-9.40	150	78	Average
21200.000	50.18	1.85	52.03	74.00	-21.97	150	78	Peak
23100.000	43.43	2.28	45.71	54.00	-8.29	150	294	Average
23100.000	53.12	2.28	55.40	74.00	-18.60	150	294	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 6:

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	36.10	-3.47	32.63	54.00	-21.37	199	249	Average
4804.000	43.79	-3.47	40.32	74.00	-33.68	199	249	Peak
4874.000	38.01	-3.25	34.76	54.00	-19.24	183	83	Average
4874.000	43.21	-3.25	39.96	74.00	-34.04	183	83	Peak
7206.000	37.69	1.83	39.52	54.00	-14.48	167	132	Average
7206.000	40.83	1.83	42.66	74.00	-31.34	167	132	Peak
7311.000	37.15	2.46	39.61	54.00	-14.39	169	51	Average
7311.000	41.24	2.46	43.70	74.00	-30.30	169	51	Peak
11490.000	36.13	7.50	43.63	54.00	-10.37	201	206	Average
11490.000	40.26	7.50	47.76	74.00	-26.24	201	206	Peak
17235.000	35.72	12.83	48.55	54.00	-5.45	174	83	Average
17235.000	42.17	12.83	55.00	74.00	-19.00	174	83	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19211.590	40.81	-0.58	40.23	54.00	-13.77	150	340	Average
19211.590	51.26	-0.58	50.68	74.00	-23.32	150	340	Peak
19496.000	43.15	0.25	43.40	54.00	-10.60	150	83	Average
19496.000	52.07	0.25	52.32	74.00	-21.68	150	83	Peak
22980.000	42.47	2.57	45.04	54.00	-8.96	150	136	Average
22980.000	48.81	2.57	51.38	74.00	-22.62	150	136	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	36.33	-3.47	32.86	54.00	-21.14	182	2	Average
4804.000	44.28	-3.47	40.81	74.00	-33.19	182	2	Peak
4874.000	38.15	-3.25	34.90	54.00	-19.10	134	240	Average
4874.000	43.24	-3.25	39.99	74.00	-34.01	134	240	Peak
7206.000	38.43	1.83	40.26	54.00	-13.74	198	310	Average
7206.000	42.00	1.83	43.83	74.00	-30.17	198	310	Peak
7311.000	37.33	2.46	39.79	54.00	-14.21	176	51	Average
7311.000	41.59	2.46	44.05	74.00	-29.95	176	51	Peak
11490.000	36.17	7.50	43.67	54.00	-10.33	201	39	Average
11490.000	41.46	7.50	48.96	74.00	-25.04	201	39	Peak
17235.000	36.25	12.83	49.08	54.00	-4.92	153	290	Average
17235.000	42.39	12.83	55.22	74.00	-18.78	153	290	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	41.71	-0.57	41.14	54.00	-12.86	150	0	Average
19216.000	52.04	-0.57	51.47	74.00	-22.53	150	0	Peak
19496.000	43.37	0.25	43.62	54.00	-10.38	150	39	Average
19496.000	52.23	0.25	52.48	74.00	-21.52	150	39	Peak
22980.000	42.81	2.57	45.38	54.00	-8.62	150	80	Average
22980.000	49.29	2.57	51.86	74.00	-22.14	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 7:

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	36.48	-3.47	33.01	54.00	-20.99	150	274	Average
4804.000	43.88	-3.47	40.41	74.00	-33.59	150	274	Peak
4874.000	37.92	-3.25	34.67	54.00	-19.33	150	59	Average
4874.000	43.43	-3.25	40.18	74.00	-33.82	150	59	Peak
7206.000	38.15	1.83	39.98	54.00	-14.02	150	183	Average
7206.000	41.72	1.83	43.55	74.00	-30.45	150	183	Peak
7311.000	38.54	2.46	41.00	54.00	-13.00	150	109	Average
7311.000	40.92	2.46	43.38	74.00	-30.62	150	109	Peak
10600.000	38.76	7.55	46.31	54.00	-7.69	150	357	Average
10600.000	41.17	7.55	48.72	74.00	-25.28	150	357	Peak
11490.000	38.00	7.50	45.50	54.00	-8.50	150	301	Average
11490.000	40.29	7.50	47.79	74.00	-26.21	150	301	Peak
15900.000	38.11	7.30	45.41	54.00	-8.59	150	347	Average
15900.000	42.08	7.30	49.38	74.00	-24.62	150	347	Peak
17235.000	38.75	12.83	51.58	54.00	-2.42	150	59	Average
17235.000	41.81	12.83	54.64	74.00	-19.36	150	59	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	42.19	-0.57	41.62	54.00	-12.38	150	77	Average
19216.000	52.28	-0.57	51.71	74.00	-22.29	150	77	Peak
19496.000	42.27	0.25	42.52	54.00	-11.48	150	92	Average
19496.000	52.70	0.25	52.95	74.00	-21.05	150	92	Peak
21200.000	42.01	1.85	43.86	54.00	-10.14	150	77	Average
21200.000	49.29	1.85	51.14	74.00	-22.86	150	77	Peak
22980.000	42.36	2.57	44.93	54.00	-9.07	150	360	Average
22980.000	49.21	2.57	51.78	74.00	-22.22	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	37.05	-3.47	33.58	54.00	-20.42	142	321	Average
4804.000	44.27	-3.47	40.80	74.00	-33.20	142	321	Peak
4874.000	38.36	-3.25	35.11	54.00	-18.89	155	211	Average
4874.000	45.11	-3.25	41.86	74.00	-32.14	155	211	Peak
7206.000	38.23	1.83	40.06	54.00	-13.94	183	112	Average
7206.000	42.40	1.83	44.23	74.00	-29.77	183	112	Peak
7311.000	38.76	2.46	41.22	54.00	-12.78	201	180	Average
7311.000	41.07	2.46	43.53	74.00	-30.47	201	180	Peak
10600.000	38.92	7.55	46.47	54.00	-7.53	199	240	Average
10600.000	41.72	7.55	49.27	74.00	-24.73	199	240	Peak
11490.000	38.15	7.50	45.65	54.00	-8.35	178	17	Average
11490.000	41.10	7.50	48.60	74.00	-25.40	178	17	Peak
15900.000	38.44	7.30	45.74	54.00	-8.26	166	310	Average
15900.000	42.45	7.30	49.75	74.00	-24.25	166	310	Peak
17235.000	39.28	12.83	52.11	54.00	-1.89	154	9	Average
17235.000	43.66	12.83	56.49	74.00	-17.51	154	9	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19216.000	42.39	-0.57	41.82	54.00	-12.18	150	172	Average
19216.000	52.72	-0.57	52.15	74.00	-21.85	150	172	Peak
19496.000	42.39	0.25	42.64	54.00	-11.36	150	75	Average
19496.000	52.91	0.25	53.16	74.00	-20.84	150	75	Peak
21200.000	42.04	1.85	43.89	54.00	-10.11	150	123	Average
21200.000	49.73	1.85	51.58	74.00	-22.42	150	123	Peak
22980.000	42.49	2.57	45.06	54.00	-8.94	150	45	Average
22980.000	49.39	2.57	51.96	74.00	-22.04	150	45	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

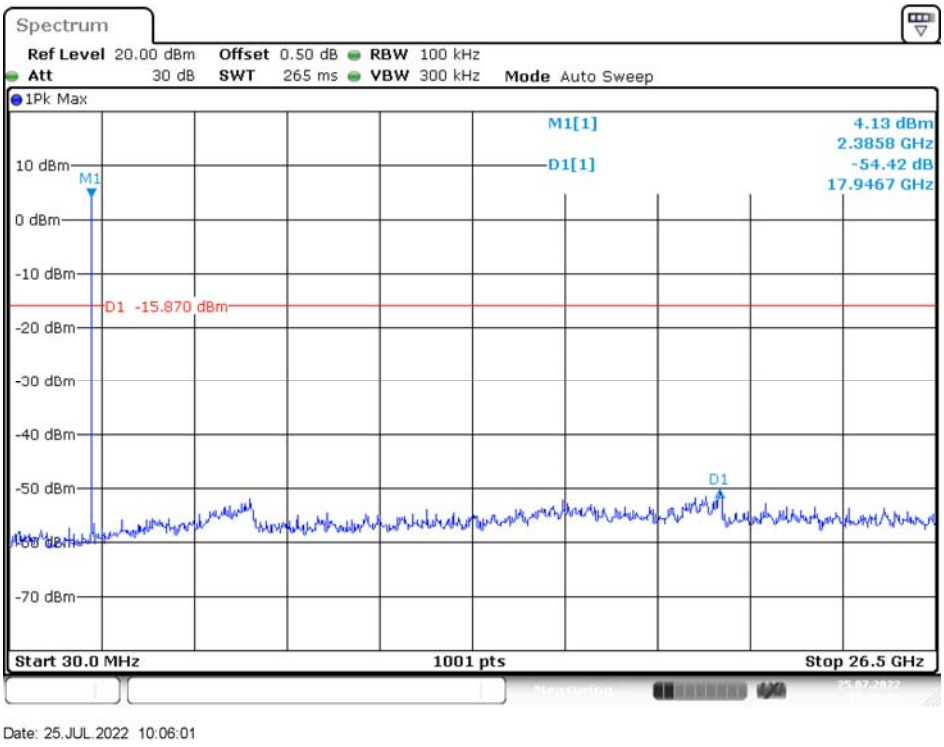
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

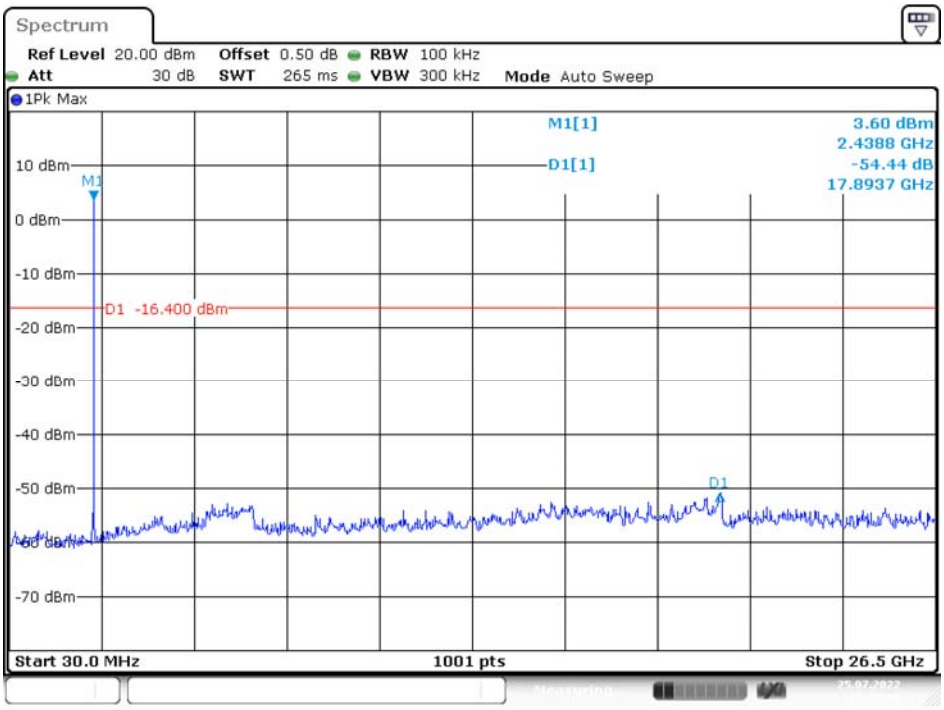
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	54.42	≥ 20	PASS
Middle	2440	54.44	≥ 20	PASS
High	2480	55.06	≥ 20	PASS

BLE Mode

Low Channel



Middle Channel



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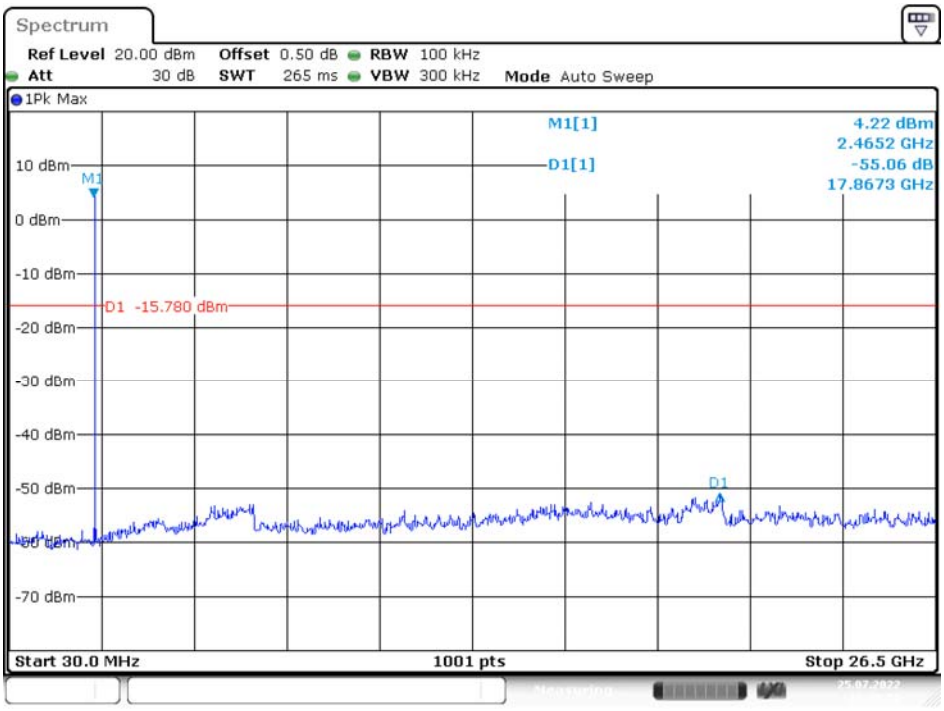
High Channel



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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 ≥ [3 × 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.

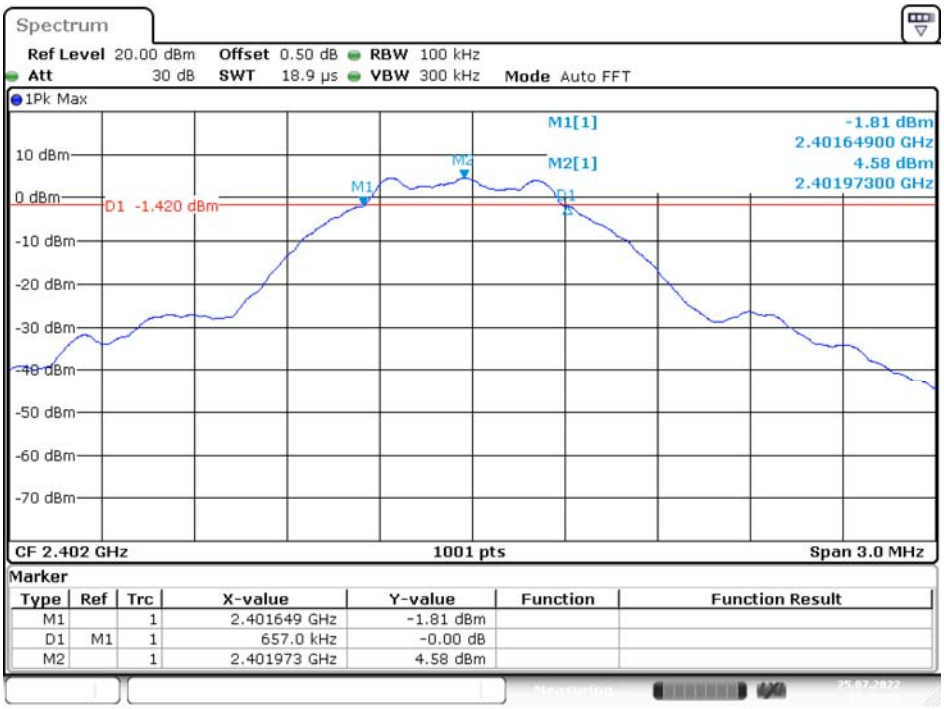
9.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
Low	2402	657	> 500	Compliance
Middle	2440	648	> 500	Compliance
High	2480	648	> 500	Compliance

Please refer to the following plots

BLE Mode

Low Channel



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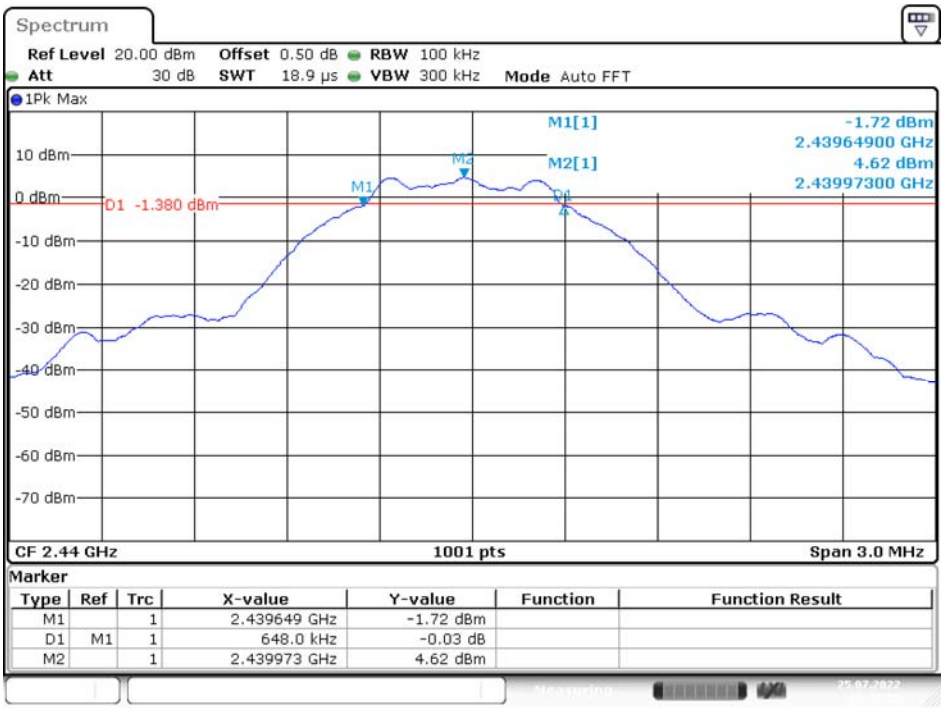
Middle Channel



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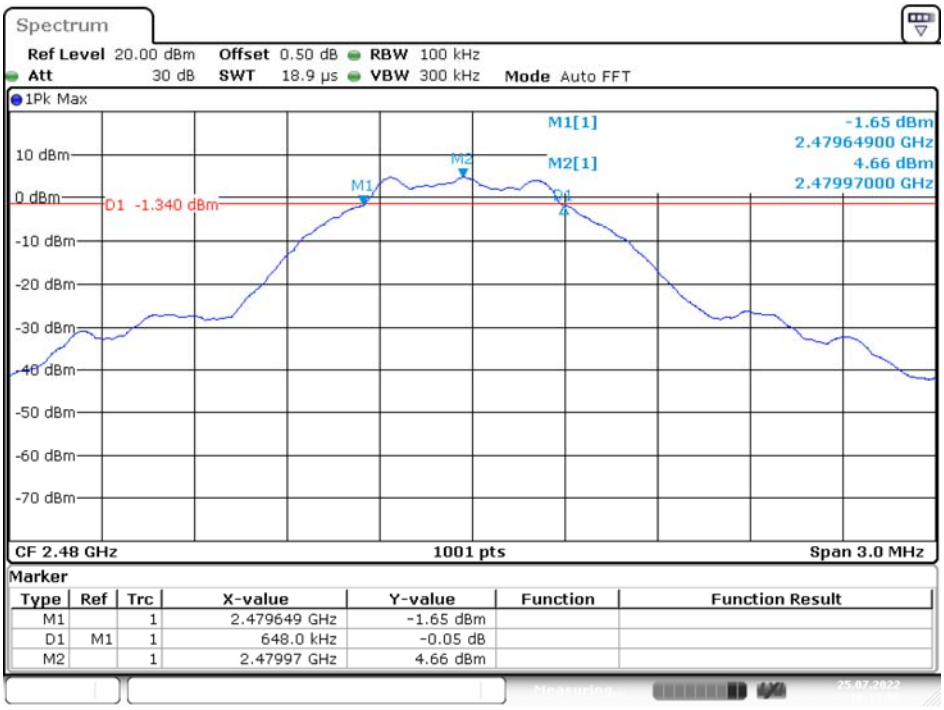
High Channel



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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	4.78	0.003	1	PASS
Middle	2440	4.75	0.003	1	PASS
High	2480	4.72	0.003	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.

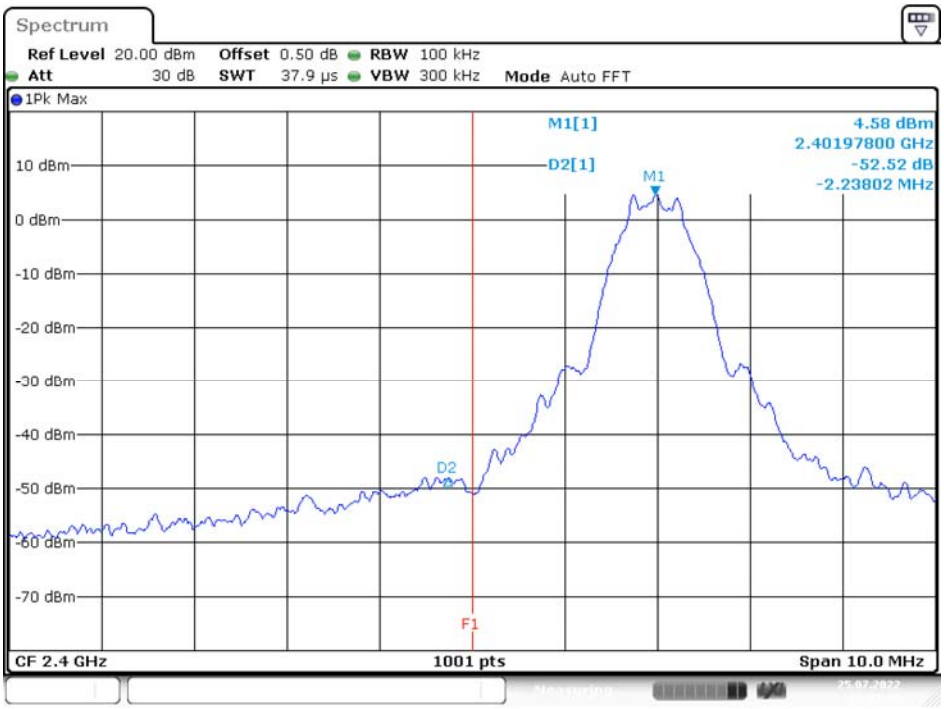
11.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	52.52	≥ 20	PASS
High	2480	56.93	≥ 20	PASS

Please refer to the following plots

BLE Mode

Band Edge, Left Side



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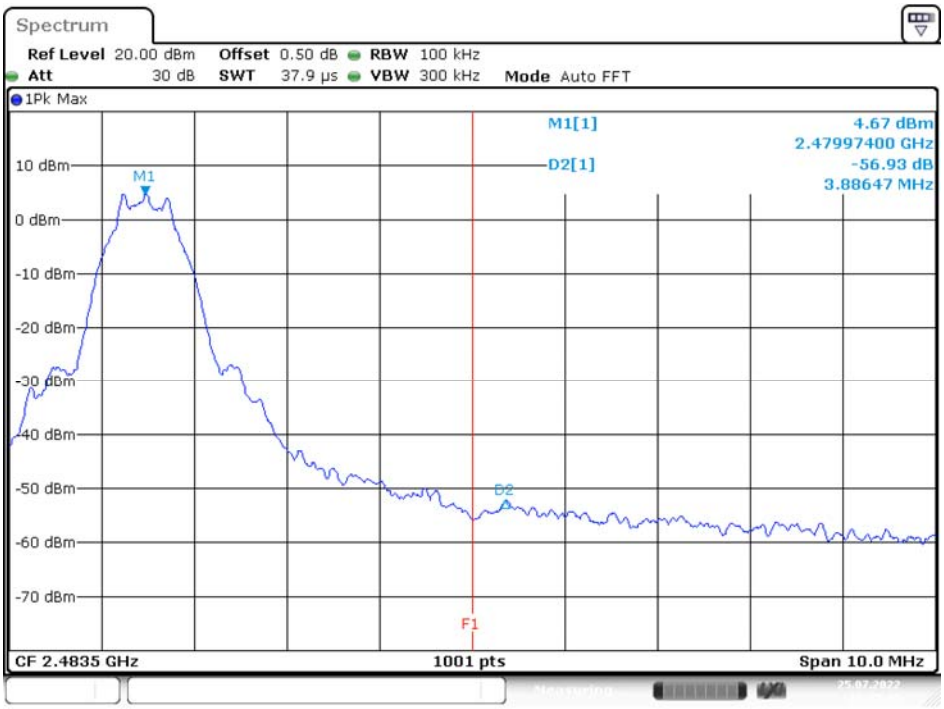
Band Edge, Right Side



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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 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × 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

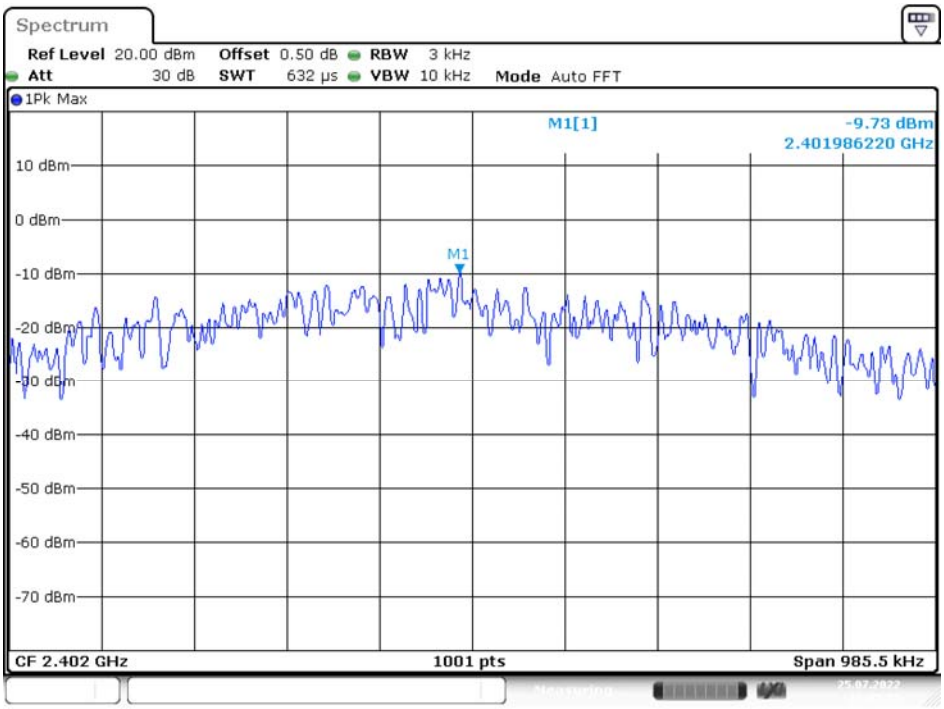
12.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
Low	2402	-9.73	8	Compliance
Middle	2440	-9.66	8	Compliance
High	2480	-9.58	8	Compliance

Please refer to the following plots

BLE Mode

Low Channel



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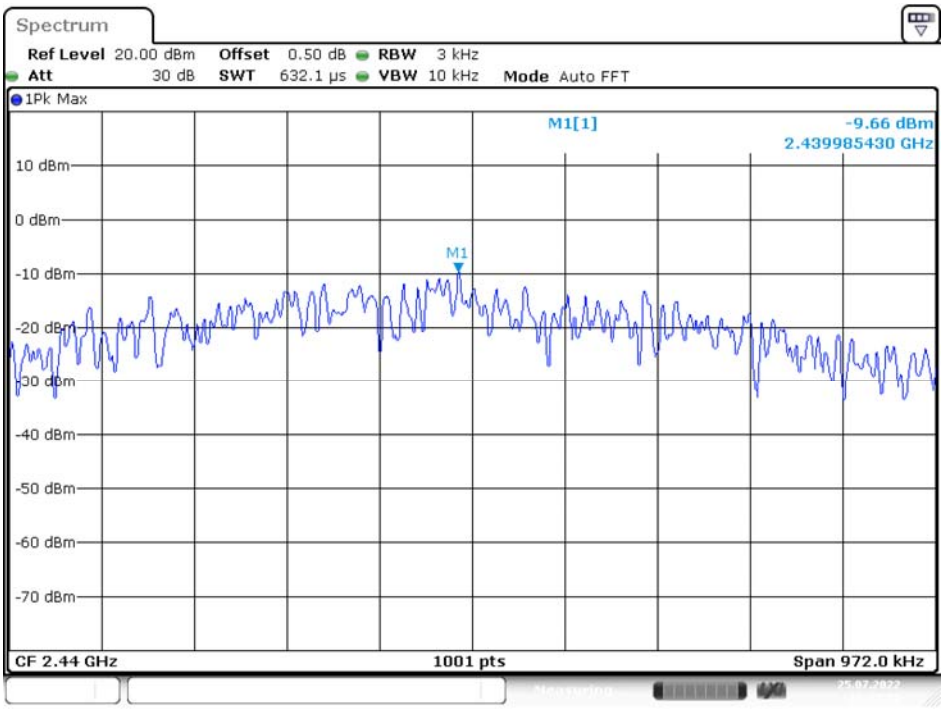
Middle Channel



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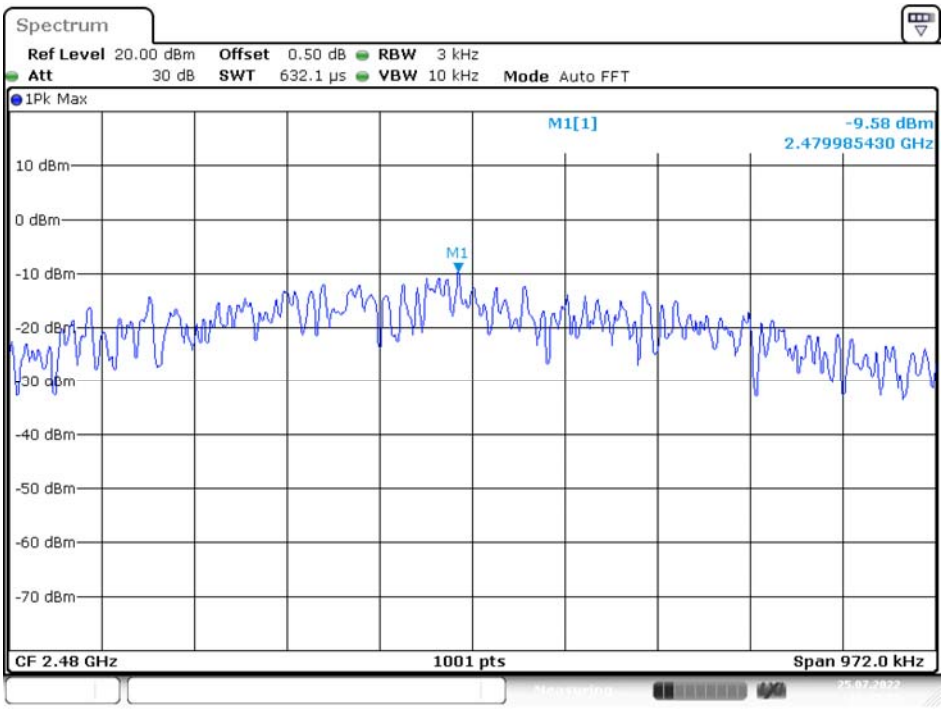
High Channel



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