

TEST REPORT

On behalf of

Hisense Visual Technology Co., Ltd.

Product Name: REMOTE CONTROL

Model No.: ERF3F80H, ERF3J80H, ERF3AA80H, ERF3AI80C,
ERF3ZB80

FCC ID: 2AVIGBR0001

Prepared For: Hisense Visual Technology Co., Ltd.
No.218 Qianwangang Road, Economy & Technology
Development Zone, Qingdao, China

Prepared By: Audix Technology (Shanghai) Co., Ltd.
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File No. : C1D2309020
Report No. : ACI-F20301A4
Date of Test : 2023.09.01-04
Date of Report : 2023.09.15

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

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APPENDIX I

PHOTOGRAPHS OF TEST

APPENDIX II

PHOTOGRAPHS OF EUT

TEST REPORT

Applicant : Hisense Visual Technology Co., Ltd.
EUT Description : REMOTE CONTROL
(A) Model No. : Refer to sec2.1
(B) Power Supply : DC 3V
(C) Test Voltage : DC 3V from AAA*2

Test Procedure Used:

*FCC RULES AND REGULATIONS PART 15 SUBPART C
AND ANSI C63.10-2013*

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: Refer to Sec2.1), which was tested is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

Date of Test : 2023.09.01-04 Date of Report : 2023.09.15

Producer :

Mindy Wang

MINDY WANG / Assistant

Review :

Byron Wu

BYRON WU / Deputy Assistant Manager



For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Signatory :

Kamp Chen

Authorized Signature(s) KAMP CHEN / Manager

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description / Test Item	Test Standard	Results	Meets Limit
EMISSION			
Conducted Emission	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	N/A	15.207
Radiated Emission	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.209(a) 15.205(a)(c)
6 dB Bandwidth Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.247(a)(2)
Maximum Peak Output Power Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.247(b)(3)
Emission Limitations Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.247(d)
Band Edge Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.247(d)
Power Spectral Density Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.247(e)
Antenna Requirement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.203
N/A is an abbreviation for Not Applicable.			

2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

Description : REMOTE CONTROL

Type of EUT : ☒ Production ☐ Pre-product ☐ Pro-type

Model Number : ERF3F80H, ERF3J80H, ERF3AA80H, ERF3AI80C, ERF3ZB80

Test model : ERF3ZB80

Note#1 : The modified histories of report are as follows:

Report No.	Model No.	Rev. Summary	Edition No.	Data of Rev.
ACI-F20301	ERF3F80H, ERF3J80H	Original Report.	0	2020.11.23
ACI- F20301A1	ERF3ZB80H	1.To add one model	Rev. A1	2021.09.29
ACI- F20301A2	ERF3AI80C	1.To add one model	Rev. A2	2022.05.09
ACI- F20301A3	ERF3ZB80**, ERF3ZB80	To add two models	Rev. A3	2022.08.26
ACI- F20301A4	ERF3F80H, ERF3J80H, ERF3AA80H, ERF3AI80C, ERF3ZB80	1.To add one model 2. Change PCB layout and circuit.	Rev. A4	2023.09.15

Note#2 : * represents 0-9 or A-L

Note#3 : All models are the same expect for value of key.

Note#4 : According to the modification, all test items were re-tested. According to the result, we demonstrate that the EUT could be full compliance with the requirement of standards.

Radio Tech	:	Bluetooth v4.2 BLE
Channel Freq.	:	2402MHz-2480MHz
Tested Freq.	:	2402MHz, 2442MHz, 2480MHz
Modulation	:	GFSK
Antenna Info.	:	Antenna Type: PCB Antenna Antenna Gain: 1.21 dBi
Applicant	:	Hisense Visual Technology Co., Ltd. No.218 Qianwangang Road, Economy & Technology Development Zone, Qingdao, China
Manufacturer	:	same as Applicant
Factory	:	same as Applicant

2.2 EUT Specifications Assessed in Current Report

Mode	Modulation	Data Rate(Mbps)
BLE	GFSK	1

Channel List			
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
...	...	...	...
...	...	...	...
...	...	...	...
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

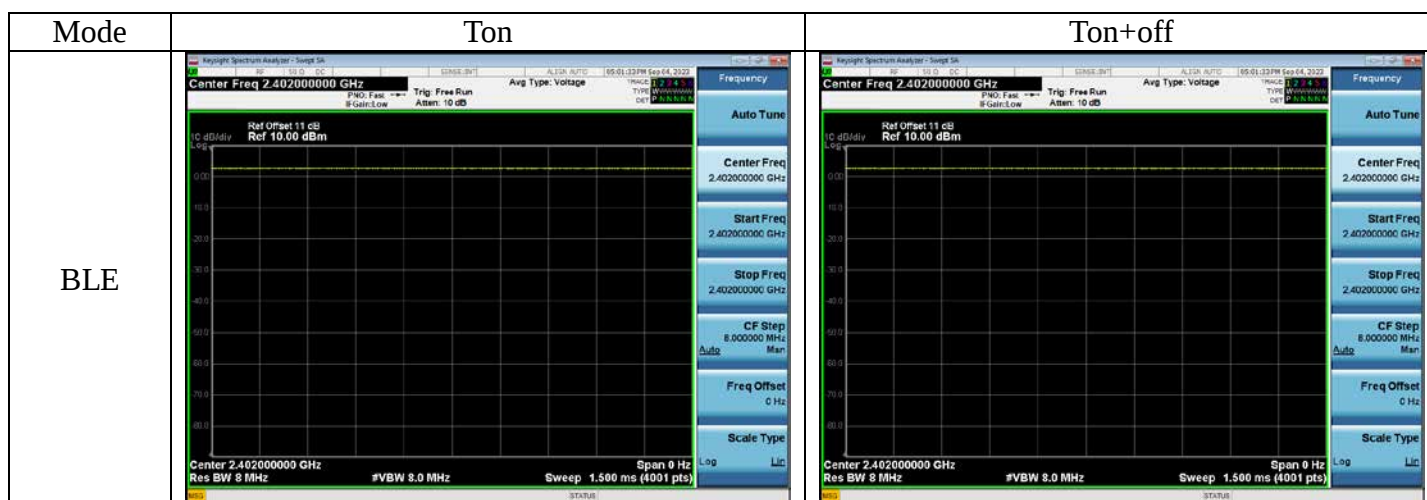
2.3 Test Information

The way “press three specific buttons simultaneously” was used to control EUT work in TX mode, Power Setting and select test channel.

Mode	data rate (Mbps)	Power Setting	Test Channel		Frequency (MHz)
BLE	1	Default	Low:	00	2402
		Default	Middle:	20	2442
		Default	High:	39	2480

2.4 Duty Cycle Check

Mode	Transmission Duration (ms)	Transmission Period (ms)	Duty Cycle (%)
BLE	1.5	1.5	100



2.5 Sample Description

Test Item	Model Number	Sample Number	Date of receipted
Conducted Emission	N/A	N/A	N/A
Radiated Emission	ERF3ZB80	E2023090166-01/02	2023.09.01
Conducted RF Test	ERF3ZB80	E2023090166-02/02	2023.09.01

2.6 Supported equipment

N/A

2.7 Description of Test Facility

Name of Firm : Audix Technology (Shanghai) Co., Ltd.

Site Location : 3F, Building 34, No. 680 Guiping Rd.,
Caohejing, Hi-Tech Park,
Shanghai 200233, China

Accredited by NVLAP, Lab Code : 200371-0

FCC Designation Number : CN5027

Test Firm Registration Number : 954668

3 RADIATED EMISSION TEST

3.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

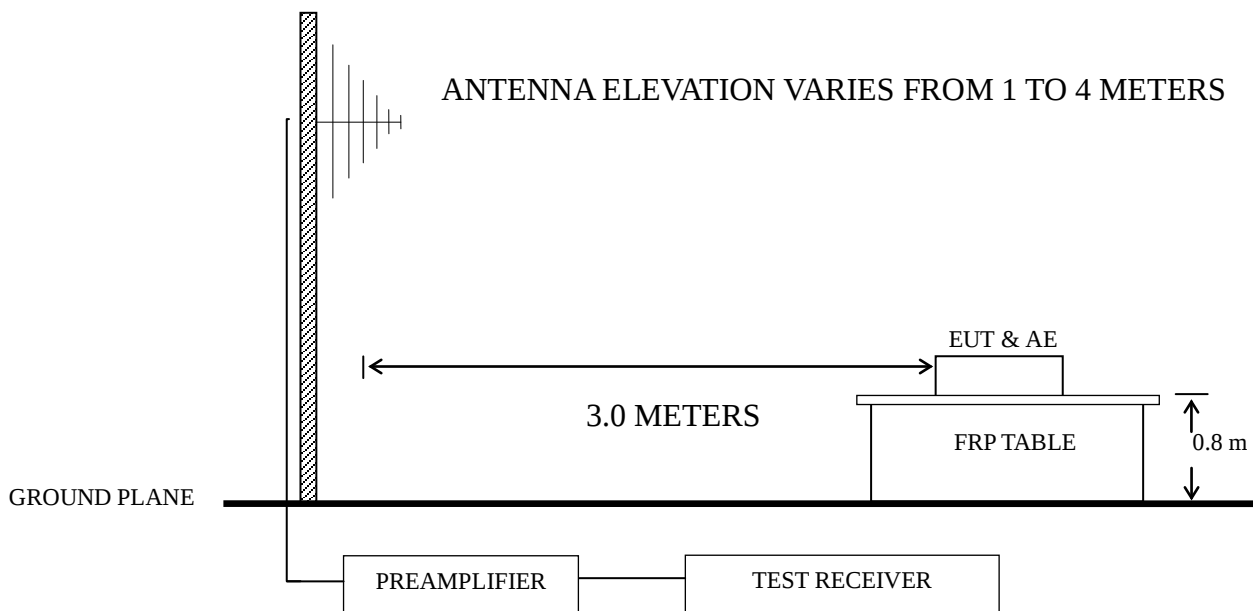
Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Preamplifier	Agilent	8447D	2944A10548	2023.02.22	1 Year
2.	Preamplifier	HP	8449B	3008A00864	2023.02.22	1 Year
3.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2023.08.09	1 Year
4.	Test Receiver	R&S	ESCI	101303	2023.02.22	1 Year
5.	Bilog Antenna+ 6dB Attenuator	Schwarz beck	VULB 9168+ EMCI-N-6-06	708+AT-N0638	2023.02.07	1 Year
6.	Horn Antenna	EMCO	3115	96074878	2022.09.23	1 Year
7.	Horn Antenna	EMCO	3116	00062643	2023.01.30	2 Year
8.	Cavity Band Rejection Filter	Microwave	WT-A3882-R10	WT200312-1-1	2023.02.22	1 Year
9.	Coaxial Switch	Anritsu	MP59B	6200655086	2023.02.22	1 Year
10.	Coaxial Cable	SCHAFFNER	RG 212U-MIL C 17+N1K50-EW06 30-N1K50-15m-1	RE-10m-001/ RE-15m-002	2023.02.22	1 Year
11.	Software	Audix	e3	e3.v9.210616	--	--

3.2 Block Diagram of Test Setup

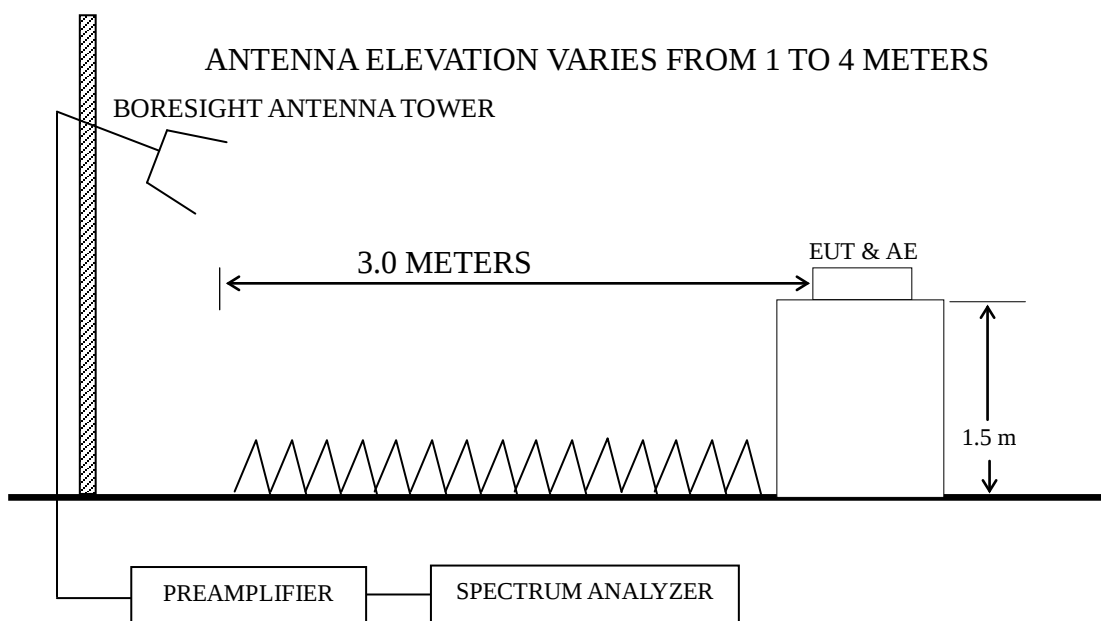
3.2.1 EUT & Peripherals



3.2.2 Below 1GHz



3.2.3 Above 1GHz



3.3 Radiated Emission Limit (§15.209)

Frequency (MHz)	Distance (m)	Field strength limits (μV/m)	
		(μV/m)	dB(μV/m)
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
NOTE 1 - Emission Level dB (μV/m) = 20 log Emission Level (μV/m) NOTE 2 - The tighter limit applies at the band edges. NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system. NOTE 4 - The limits shown are based on Quasi-peak value detector below or equal to 1GHz and Average value detector above 1GHz. NOTE 5 - Above 1 GHz, the limit on peak emission is 20 dB above the maximum permitted average emission limit applicable to the EUT			

3.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec.2.2) were installed as shown on Sec.4.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 4.2.

3.5.2 Turn the EUT on.

3.5.3 The way “press three specific buttons simultaneously” was used to control EUT work in TX mode.

3.5.4 Start test.

3.5.5 Repeat step 4.5.3 and 4.5.4, until the test of all modes finished.

3.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable. Below 1 GHz, the table height is 80 cm above the reference ground plane. Above 1 GHz, the table height is 1.5 m. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the

interference cables were manipulated according to ANSI C63.10: 2013 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESCI was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of Agilent N9010A was set at 1MHz for above 1GHz.

The frequency range from 30 MHz to 25 GHz (Up to 10th harmonics from fundamental frequency) was checked.

All the test results are listed in Sec.4.7.

3.7 Test Results

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

Frequency range: below 1GHz (Worst case emission)

No.	Operation	Mode	Channel	Frequency	Data Page
1.	Transmitting	BLE	00	2402 MHz	P15-16

Frequency range: above 1GHz

No.	Operation	Mode	Channel	Frequency	Data Page
1.	Transmitting	BLE	00	2402 MHz	P17-18
2.			20	2442 MHz	P19-20
3.			39	2480 MHz	P21-22

Band-Edge and Restricted bands:

No.	Operation	Mode	Channel	Frequency	Data Page
1.	Transmitting	BLE	00	2402 MHz	P23-24
2.			39	2480 MHz	P25-26

NOTE 1 – Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin = Limits - Emission Level.

NOTE 2 – “QP” means “Quasi-Peak” values.

NOTE 3 – 0° was the table front facing the antenna. Degree is calculated from 0° clockwise facing the antenna.

NOTE 4 – The emission levels which not reported are too low against the official limit.

NOTE 5 – The emission levels recorded below is data of EUT configured in Lying direction, for this direction was the maximum emission direction during the test. The data of Side & Standing direction are too low against the official limit to be reported.

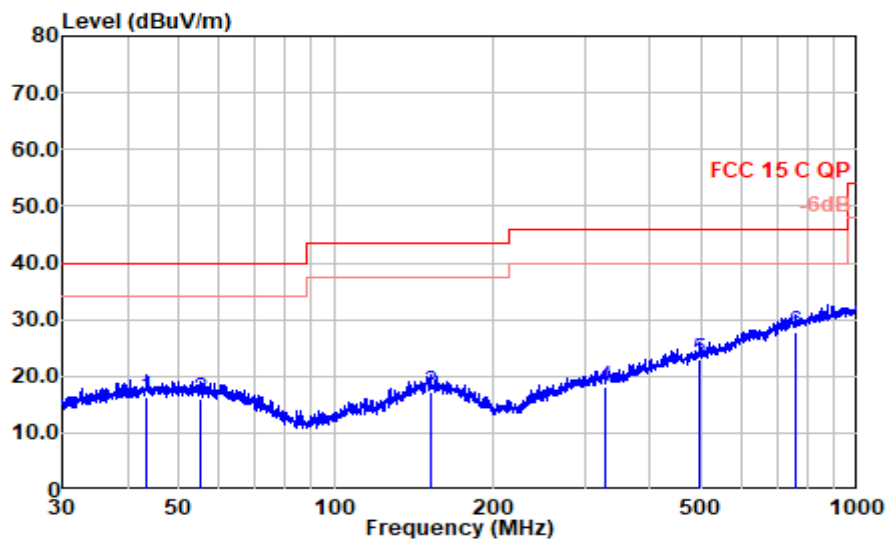
NOTE 6 – All reading are Quasi-Peak values below or equal to 1GHz, Peak and Average values above 1GHz.

For above 1GHz test, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

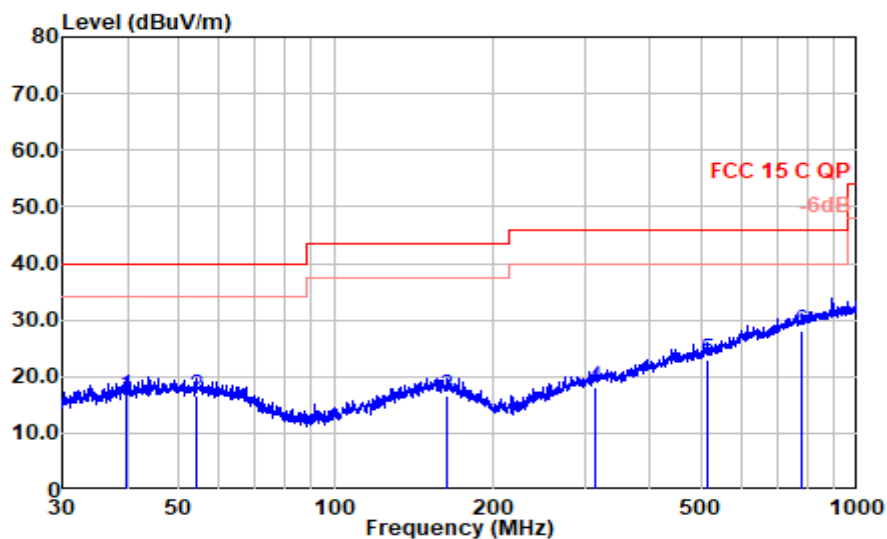
NOTE 7 – The frequency range 2310-2390MHz & 2483.5-2500MHz were tested for Restricted bands.

Radiated emission < 1GHz

Test Date:	2023.09.02	Temp./Hum.:	24°C/53%RH	Test By:	Jarey
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Mode: BLE CH2402**Polarization at Horizontal**

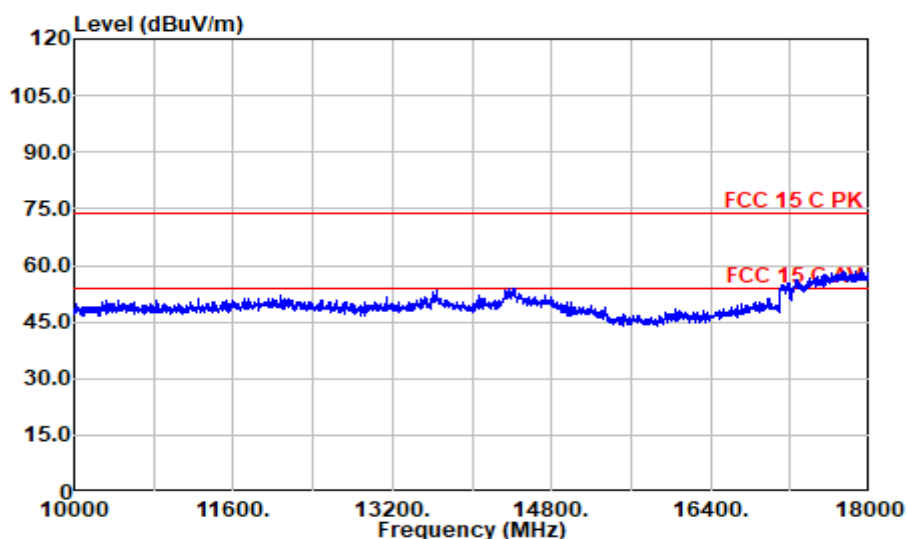
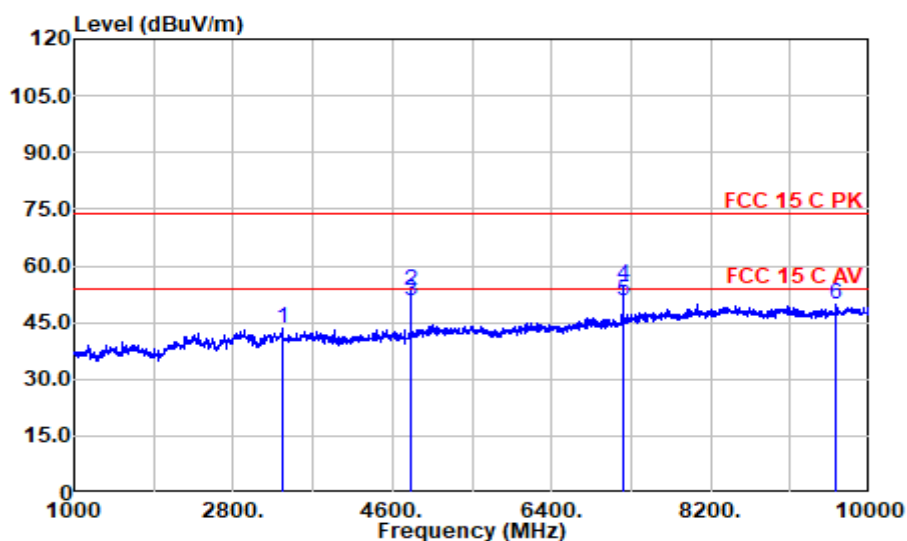
Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
43.659	25.69	19.83	0.72	29.90	16.34	40.00	23.66	QP
55.124	25.35	19.69	0.81	29.88	15.97	40.00	24.03	QP
152.664	25.98	19.37	1.36	29.39	17.31	43.50	26.19	QP
327.887	24.73	20.20	1.97	28.82	18.09	46.00	27.91	QP
496.805	26.44	23.54	2.49	29.49	22.97	46.00	23.03	QP
759.371	24.91	27.99	3.03	28.24	27.68	46.00	18.32	QP

Mode: BLE CH2402**Polarization at Vertical**

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
39.784	26.32	19.56	0.69	29.90	16.66	40.00	23.34	QP
54.356	25.97	19.64	0.80	29.88	16.53	40.00	23.47	QP
163.755	25.40	19.12	1.42	29.35	16.59	43.50	26.91	QP
313.826	25.14	19.73	1.95	28.76	18.06	46.00	27.94	QP
513.633	25.86	23.87	2.53	29.42	22.84	46.00	23.16	QP
779.607	25.26	28.00	3.08	28.12	28.22	46.00	17.78	QP

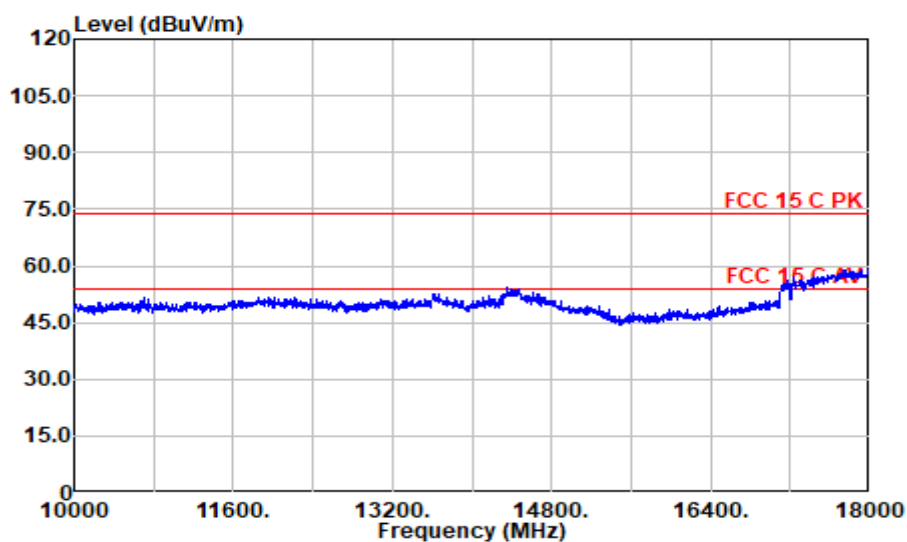
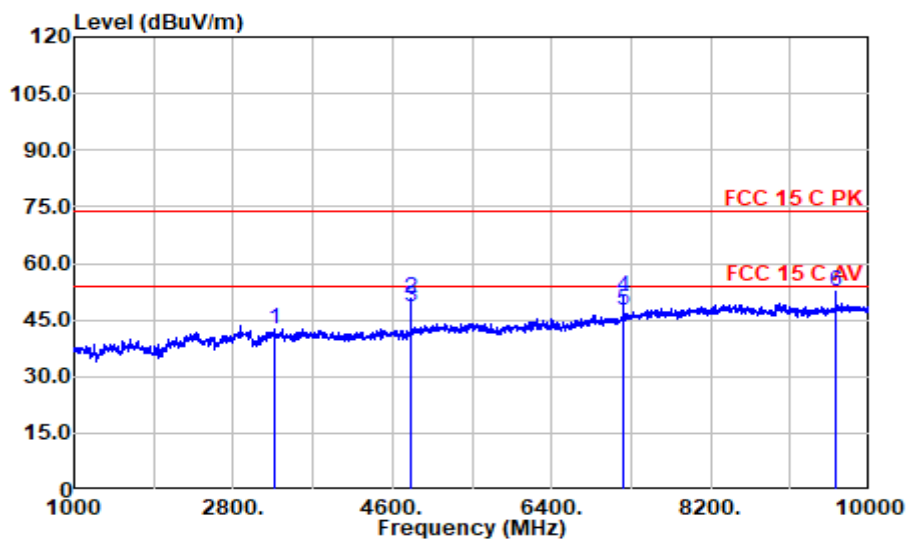
Radiated Emission > 1GHz

Test Date:	2023.09.02	Temp./Hum.:	24°C/53%RH	Test By:	Jarey
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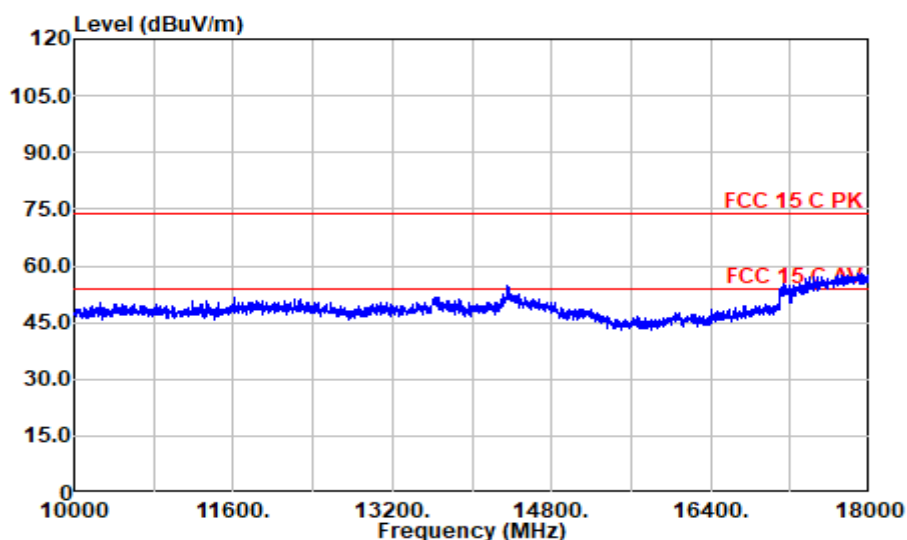
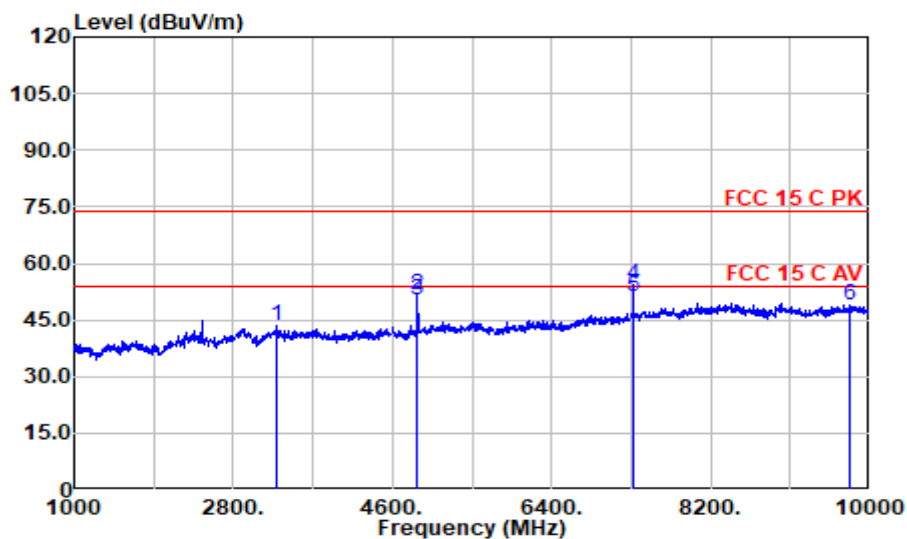
Mode: BLE CH2402

Polarization at Horizontal

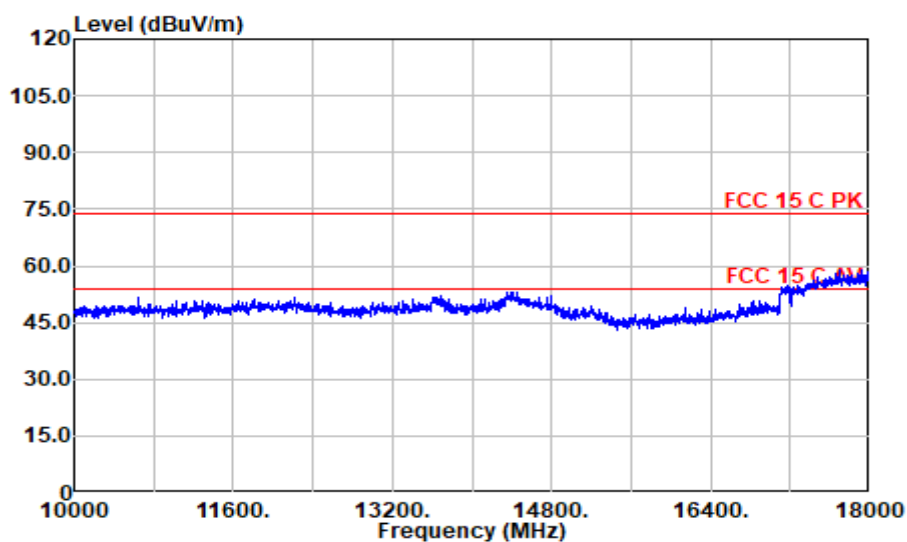
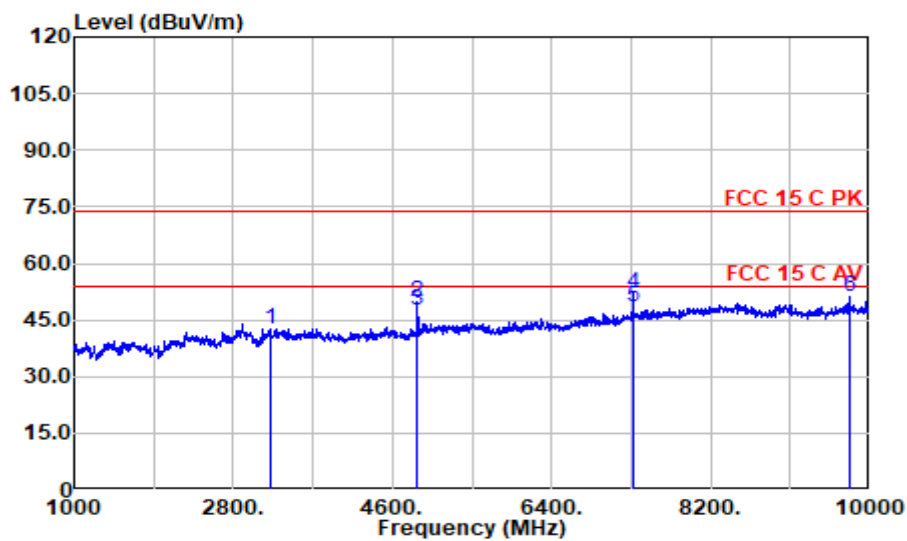
Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
3353.500	41.27	31.20	6.21	35.25	43.44	74.00	30.56	Peak
4804.000	47.68	32.90	7.62	34.67	53.53	74.00	20.47	Peak
4804.000	44.86	32.90	7.62	34.67	50.71	54.00	3.29	Average
7206.000	43.89	36.15	9.48	34.67	54.86	74.00	19.14	Peak
7206.000	39.87	36.15	9.48	34.67	50.84	54.00	3.16	Average
9608.500	34.96	38.40	11.14	34.64	49.86	74.00	24.14	Peak

Mode: BLE CH2402**Polarization at Vertical**

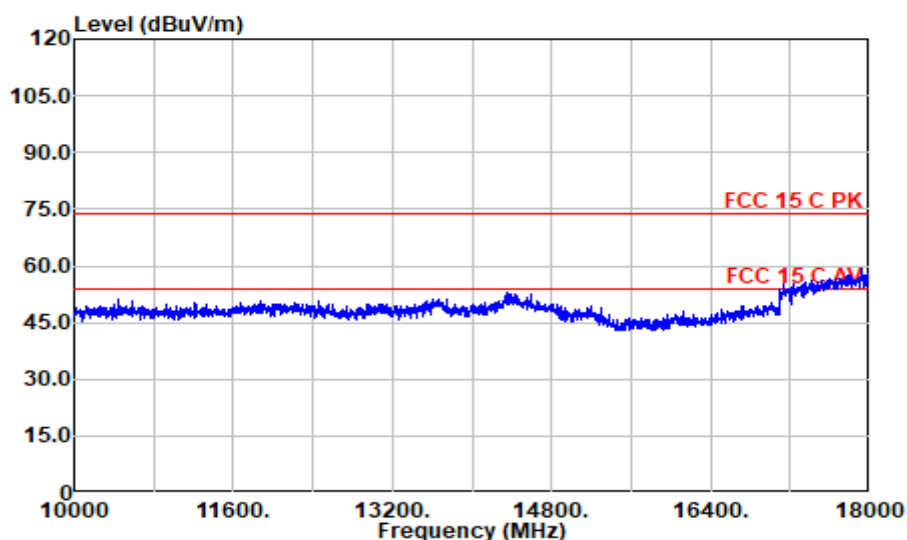
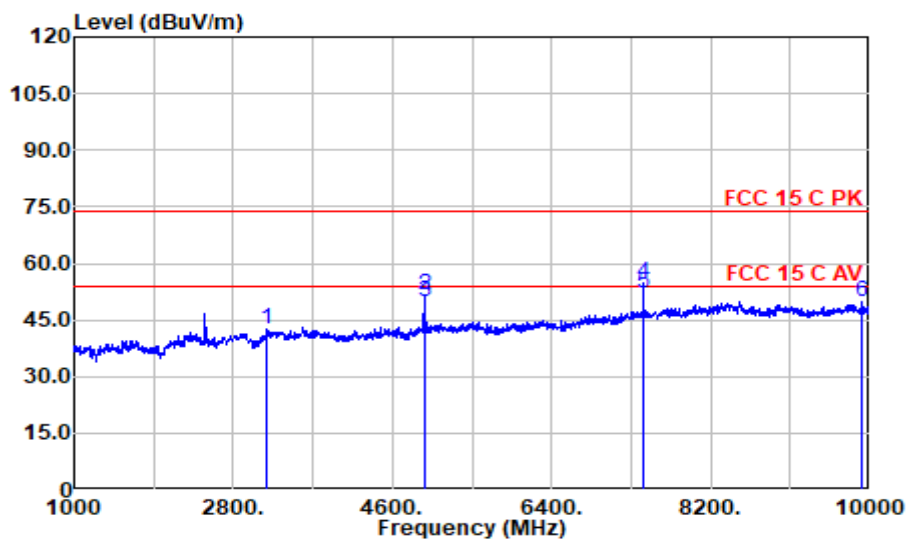
Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
3268.000	40.74	31.07	6.13	35.28	42.66	74.00	31.34	Peak
4804.000	44.86	32.90	7.62	34.67	50.71	74.00	23.29	Peak
4804.000	42.54	32.90	7.62	34.67	48.39	54.00	5.61	Average
7206.000	40.24	36.15	9.48	34.67	51.21	74.00	22.79	Peak
7206.000	36.76	36.15	9.48	34.67	47.73	54.00	6.27	Average
9608.500	37.43	38.40	11.14	34.64	52.34	74.00	21.66	Peak

Mode: BLE CH2442**Polarization at Horizontal**

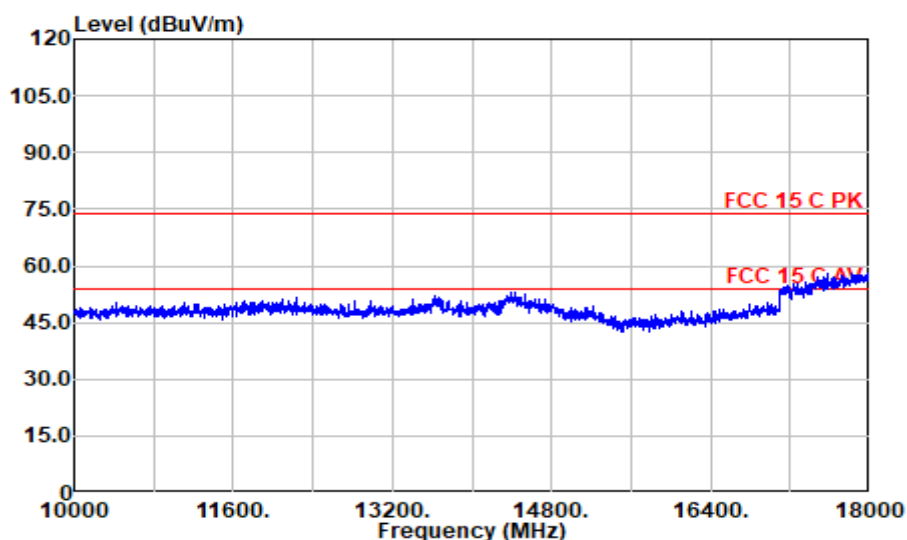
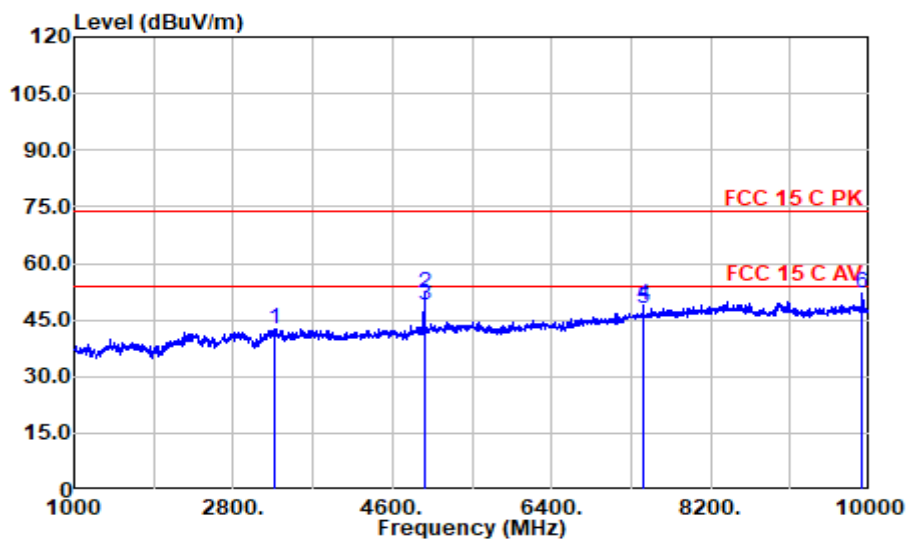
Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
3286.000	41.32	31.14	6.15	35.27	43.33	74.00	30.67	Peak
4884.000	45.24	33.14	7.70	34.64	51.43	74.00	22.57	Peak
4884.000	43.97	33.14	7.70	34.64	50.16	54.00	3.84	Average
7326.000	42.70	36.85	9.61	34.70	54.45	74.00	19.55	Peak
7326.000	39.45	36.85	9.61	34.70	51.21	54.00	2.79	Average
9770.500	34.03	38.23	11.27	34.62	48.91	74.00	25.09	Peak

Mode: BLE CH2442**Polarization at Vertical**

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
3214.000	40.86	30.93	6.08	35.30	42.57	74.00	31.43	Peak
4884.000	43.48	33.14	7.70	34.64	49.67	74.00	24.33	Peak
4884.000	41.19	33.14	7.70	34.64	47.38	54.00	6.62	Average
7326.000	40.22	36.85	9.61	34.70	51.98	74.00	22.02	Peak
7326.000	36.86	36.85	9.61	34.70	48.62	54.00	5.38	Average
9770.500	36.30	38.23	11.27	34.62	51.17	74.00	22.83	Peak

Mode: BLE CH2480**Polarization at Horizontal**

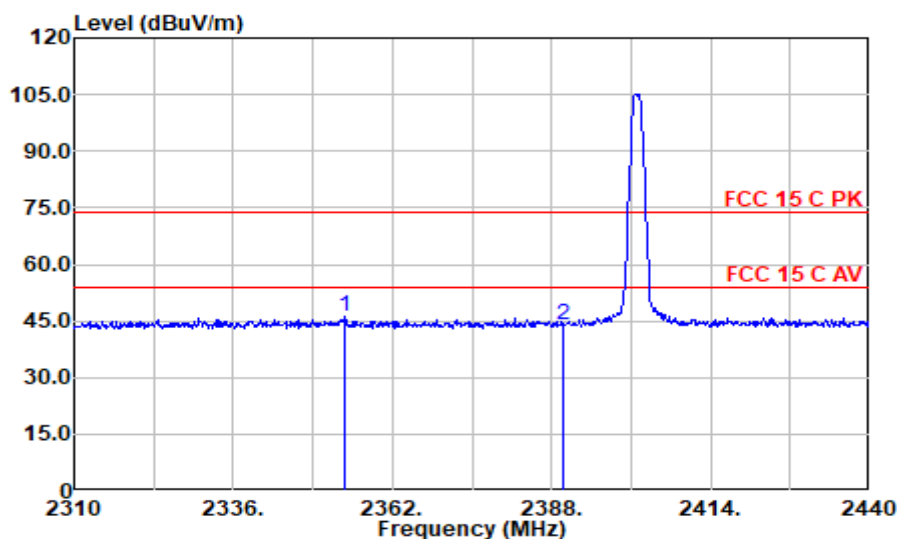
Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
3187.000	40.78	30.86	6.05	35.32	42.37	74.00	31.63	Peak
4960.000	45.14	33.33	7.77	34.61	51.63	74.00	22.37	Peak
4960.000	43.42	33.33	7.77	34.61	49.90	54.00	4.10	Average
7440.000	42.71	37.00	9.73	34.74	54.71	74.00	19.29	Peak
7440.000	39.96	37.00	9.73	34.74	51.96	54.00	2.04	Average
9919.000	34.50	38.40	11.39	34.61	49.68	74.00	24.32	Peak

Mode: BLE CH2480**Polarization at Vertical**

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
3268.000	40.61	31.07	6.13	35.28	42.53	74.00	31.47	Peak
4960.000	45.44	33.33	7.77	34.61	51.92	74.00	22.08	Peak
4960.000	42.59	33.33	7.77	34.61	49.07	54.00	4.93	Average
7440.000	37.07	37.00	9.73	34.74	49.07	74.00	24.93	Peak
7440.000	35.79	37.00	9.73	34.74	47.79	54.00	6.21	Average
9919.000	36.75	38.40	11.39	34.61	51.92	74.00	22.08	Peak

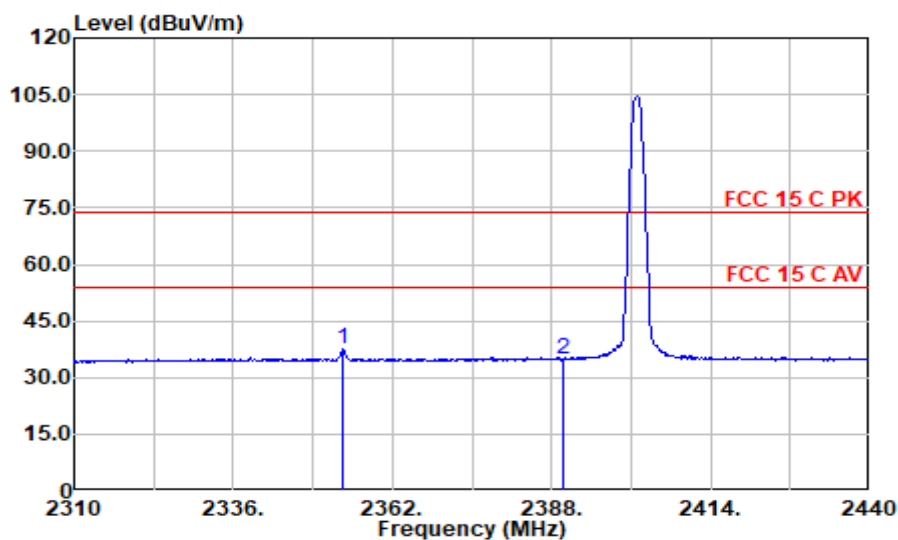
Band-Edge and Restricted bands:

Test Date:	2023.09.02	Temp./Hum.:	24°C/53%RH	Test By:	Jarey
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Mode: BLE CH2402

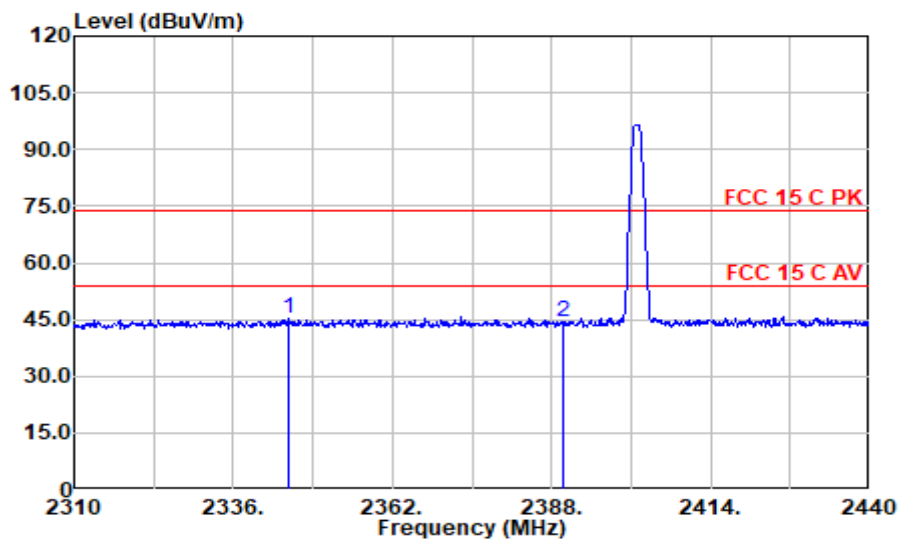
Polarization at Horizontal

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2354.070	48.41	28.40	5.36	36.06	46.11	74.00	27.89	Peak
2390.000	46.14	28.40	5.39	36.02	43.91	74.00	30.09	Peak



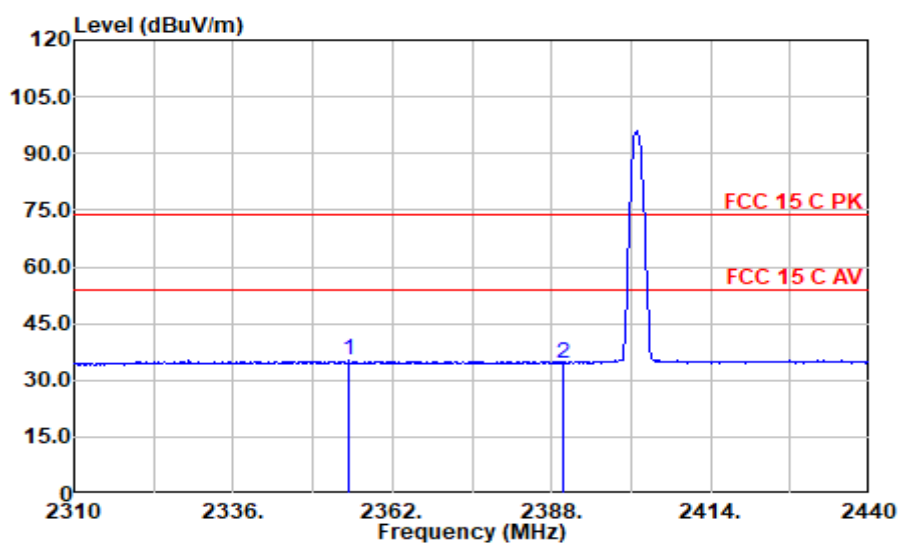
Polarization at Horizontal

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2353.940	39.81	28.40	5.36	36.06	37.51	54.00	16.49	Average
2390.000	37.32	28.40	5.39	36.02	35.09	54.00	18.91	Average

Mode: BLE CH2402

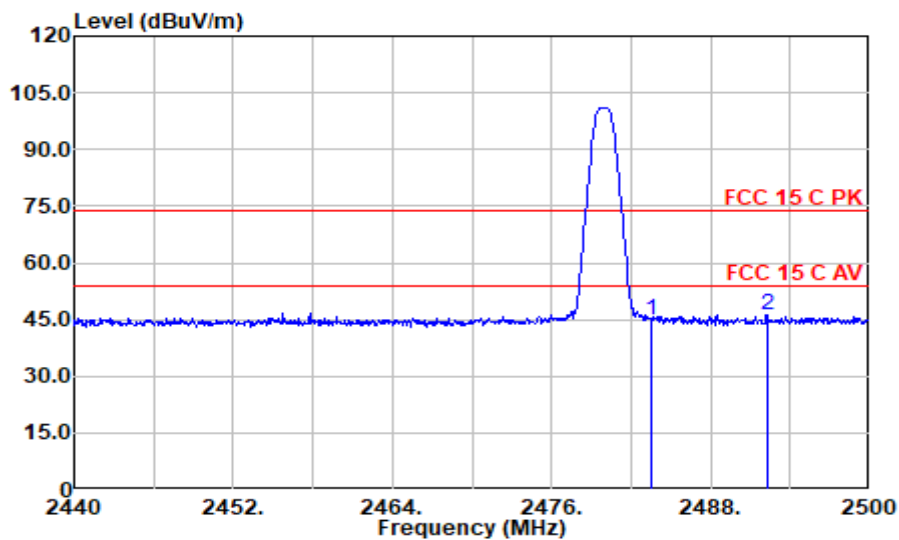
Polarization at Vertical

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2345.100	47.78	28.36	5.35	36.07	45.41	74.00	28.59	Peak
2390.000	46.40	28.40	5.39	36.02	44.18	74.00	29.82	Peak



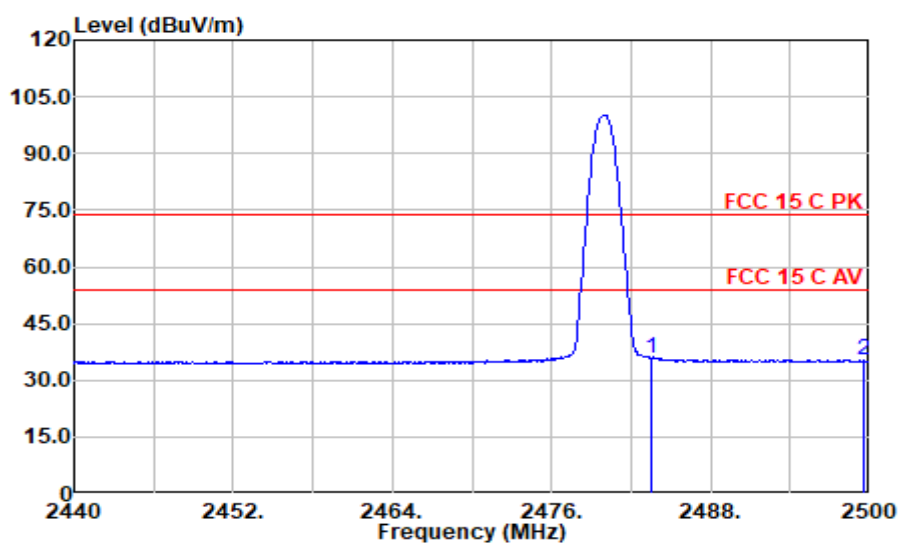
Polarization at Vertical

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2354.980	37.59	28.40	5.36	36.06	35.29	54.00	18.71	Average
2390.000	36.83	28.40	5.39	36.02	34.60	54.00	19.40	Average

Mode: BLE CH2480

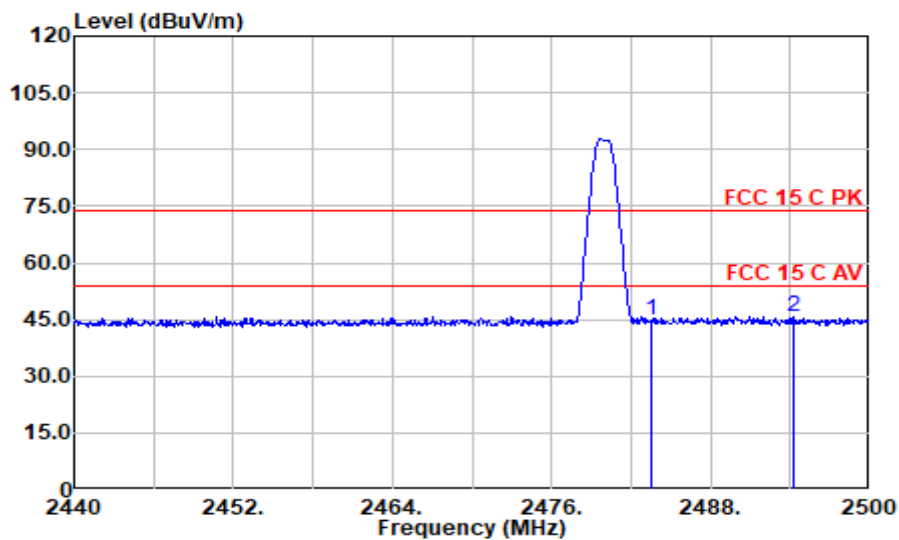
Polarization at Horizontal

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2483.500	46.71	28.43	5.47	35.91	44.70	74.00	29.30	Peak
2492.260	48.36	28.47	5.48	35.90	46.41	74.00	27.59	Peak



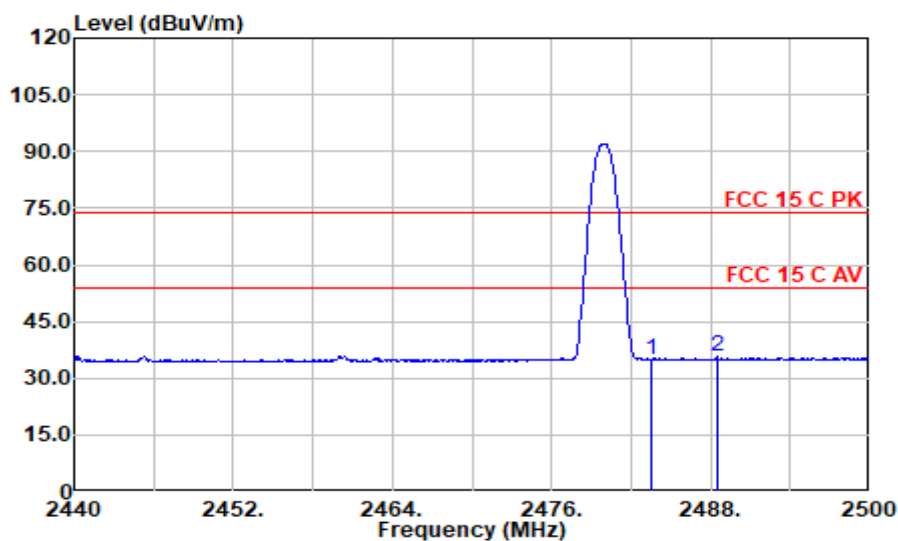
Polarization at Horizontal

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2483.500	37.85	28.43	5.47	35.91	35.84	54.00	18.16	Average
2499.520	37.29	28.50	5.48	35.90	35.37	54.00	18.63	Average

Mode: BLE CH2480

Polarization at Vertical

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2483.500	46.69	28.43	5.47	35.91	44.68	74.00	29.32	Peak
2494.240	47.84	28.48	5.48	35.90	45.89	74.00	28.11	Peak



Polarization at Vertical

Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
2483.500	36.88	28.43	5.47	35.91	34.88	54.00	19.12	Average
2488.480	37.56	28.45	5.47	35.91	35.58	54.00	18.42	Average

4 6 dB BANDWIDTH MEASUREMENT

4.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2023.08.09	1 Year
2.	RF Cable	Mini-Circuits	FLC-3FT-SM SM+	22022838	2023.08.09	1 Year
3.	10 dB Attenuator	Mini-Circuits	BW-S10W2+	001	2023.02.22	1 Year

4.2 Block Diagram of Test Setup



4.3 Specification Limits (§15.247(a)(2))

The minimum 6 dB bandwidth shall be at least 500 kHz.

4.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

4.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with settings: RBW = 100kHz, VBW $\geq 3 \times$ RBW.

The 6 dB bandwidth is defined as the total spectrum the power of which is lower than peak power minus 6 dB .

The test procedure is defined in ANSI C63.10-2013 (the 11.8.2 Measurement Procedure “Option 2” was used).

4.6 Test Results

PASSED.

All the test results are attached in next pages.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

Mode	Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Limit
BLE	00	2402	673.1	500 kHz
	20	2442	672.8	500 kHz
	39	2480	677.5	500 kHz

BLE

CH2402



CH2442



CH2480



5 MAXIMUM PEAK OUTPUT POWER MEASUREMENT

5.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2023.08.09	1 Year
2.	RF Cable	Mini-Circuits	FLC-3FT-SM SM+	22022838	2023.08.09	1 Year
3.	10 dB Attenuator	Mini-Circuits	BW-S10W2+	001	2023.02.22	1 Year

5.2 Block Diagram of Test Setup

The Same as Section. 5.2.

5.3 Specification Limits ((§15.247(b)(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5 MHz is: 1 Watt. (30 dBm)

5.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

5.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) $RBW \geq DTS \text{ Bandwidth}$.
- b) $VBW \geq [3 \times RBW]$.
- c) $\text{Span} \geq [3 \times RBW]$.
- d) Sweep time = auto.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

The test procedure is defined in ANSI C63.10-2013 (11.9.1.1 Measurement Procedure “ $RBW \geq DTS \text{ bandwidth}$ ” was used).

5.6 Test Results

PASSED.

All the test results are listed below.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

Mode	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit
BLE	00	2402	2.838	30 dBm
	20	2442	2.239	30 dBm
	39	2480	1.496	30 dBm

BLE

CH2402



CH2442



CH2480



6 EMISSION LIMITATIONS MEASUREMENT

6.1 Test Equipment

The following test equipment was used during the emission limitations test:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2023.08.09	1 Year
2.	RF Cable	Mini-Circuits	FLC-3FT-SM SM+	22022838	2023.08.09	1 Year
3.	10 dB Attenuator	Mini-Circuits	BW-S10W2+	001	2023.02.22	1 Year

6.2 Block Diagram of Test Setup

The Same as Section. 5.2.

6.3 Specification Limits (§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)). (※This test result attaching to Section. 3.7)

6.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

6.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

Establish a reference level by using the following procedure:

- Set instrument center frequency to DTS channel center frequency.
- Set the span to ≥ 1.5 times the DTS bandwidth.
- Set the RBW = 100 kHz.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Establish an emission level by using the following procedure:

- Set the center frequency and span to encompass frequency range to be measured.
- Set the RBW = 100 kHz.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.

- f) Trace mode = max hold.
 - g) Allow trace to fully stabilize.
 - h) Use the peak marker function to determine the maximum amplitude level.
- Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Scan up through 10th harmonic.

The test procedure is defined in ANSI C63.10-2013 (11.11.2 Reference level measurement and 11.11.3 Emission level measurement was used).

6.6 Test Results

PASSED.

The test data was attached in the next pages.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

Mode	Channel	Frequency (MHz)	Data Page
BLE	00	2402	P35
	20	2442	P36
	39	2480	P37

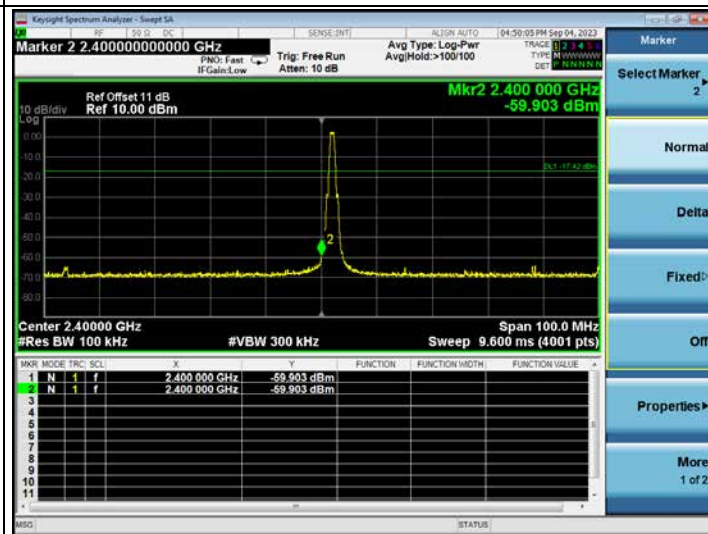
BLE

CH2402

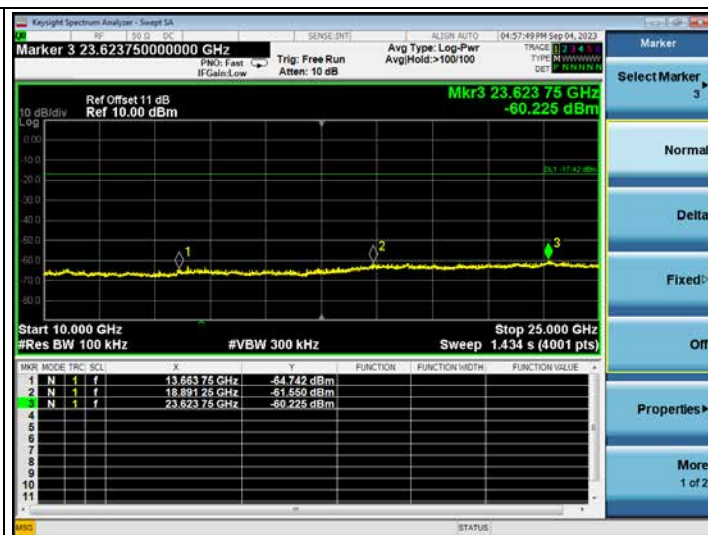
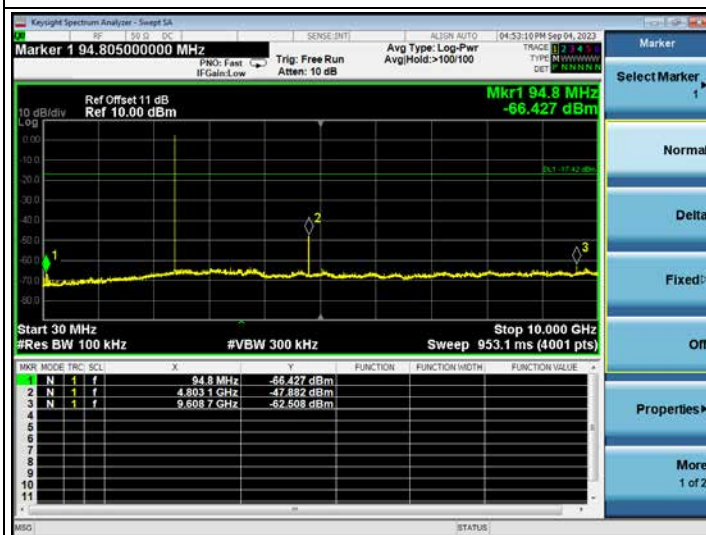
Reference Level



Lower Edge



Emission Level



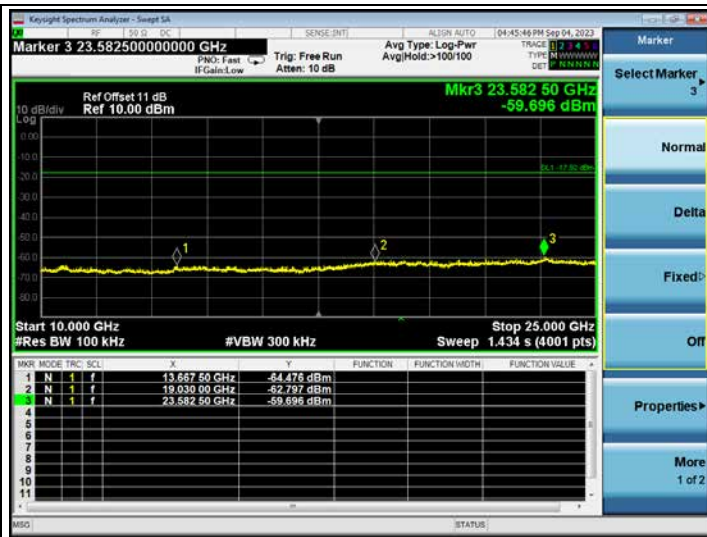
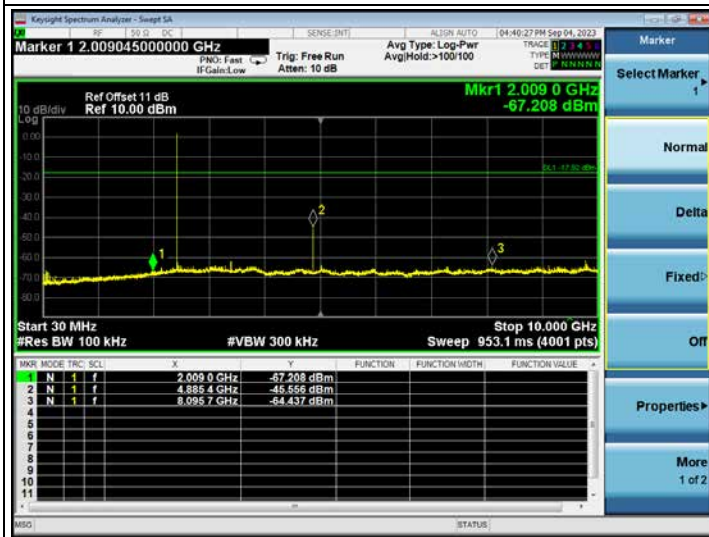
BLE

CH2442

Reference Level



Emission Level



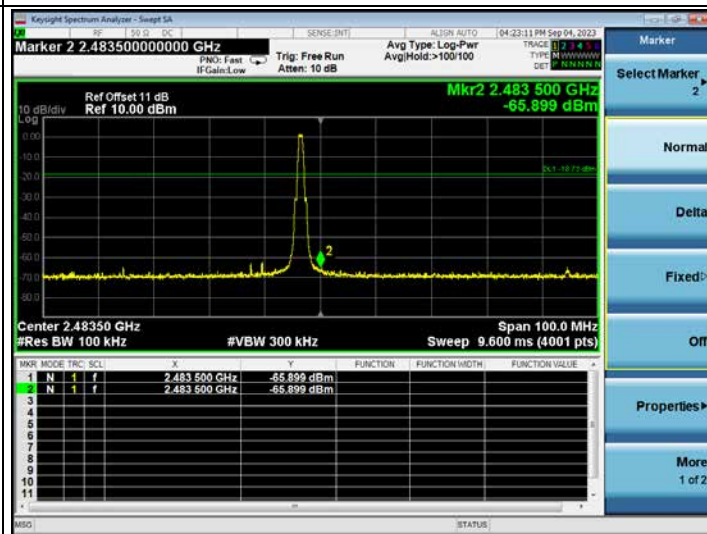
BLE

CH2480

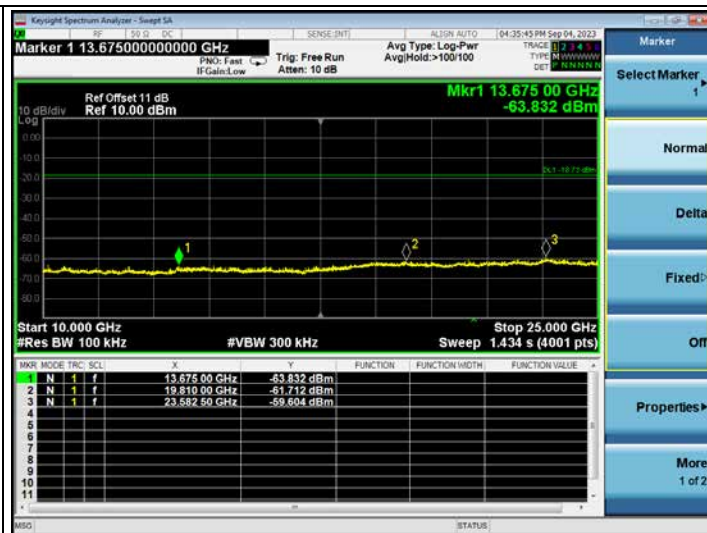
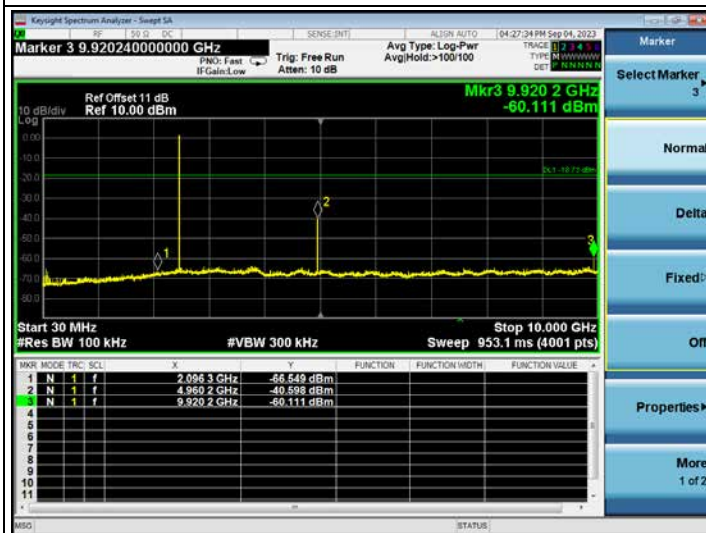
Reference Level



Higher Edge



Emission Level



7 POWER SPECTRAL DENSITY MEASUREMENT

7.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2022.09.15	1 Year
2.	RF Cable	Mini-Circuits	FLC-3FT-SM SM+	22022838	2022.09.21	1 Year
3.	10 dB Attenuator	Mini-Circuits	BW-S10W2+	001	2022.09.21	1 Year

7.2 Block Diagram of Test Setup

The Same as section 5.2.

7.3 Specification Limits (§15.247(e))

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

7.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

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

The test procedure is defined in ANSI C63.10-2013 (11.10.2 Measurement Procedure “Method PKPSD (peak PSD)” was used).

7.6 Test Results

PASSED.

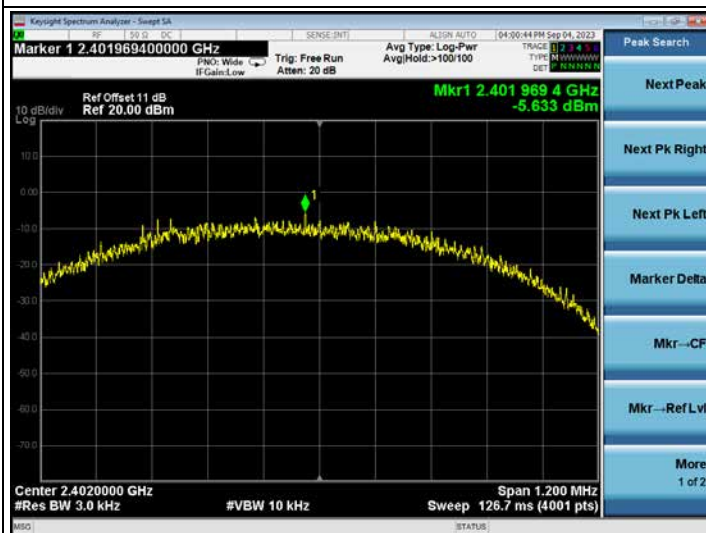
All the test results are attached in next pages.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

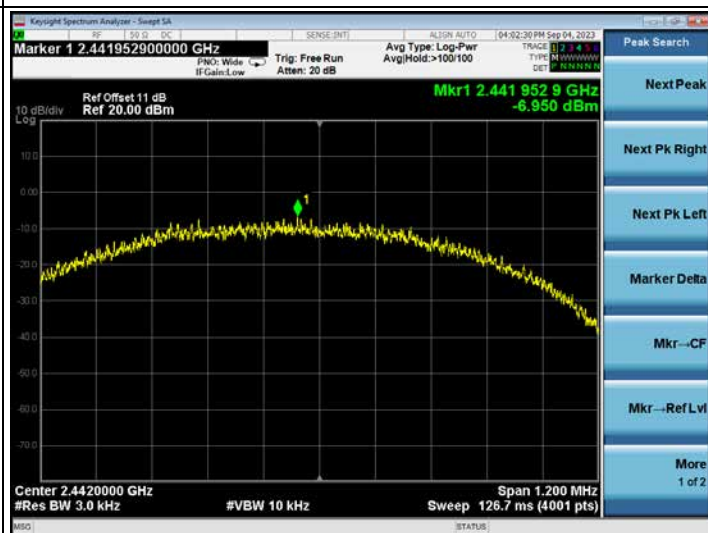
Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit
BLE	00	2402	-5.633	8 dBm
	20	2442	-6.95	8 dBm
	39	2480	-5.812	8 dBm

BLE

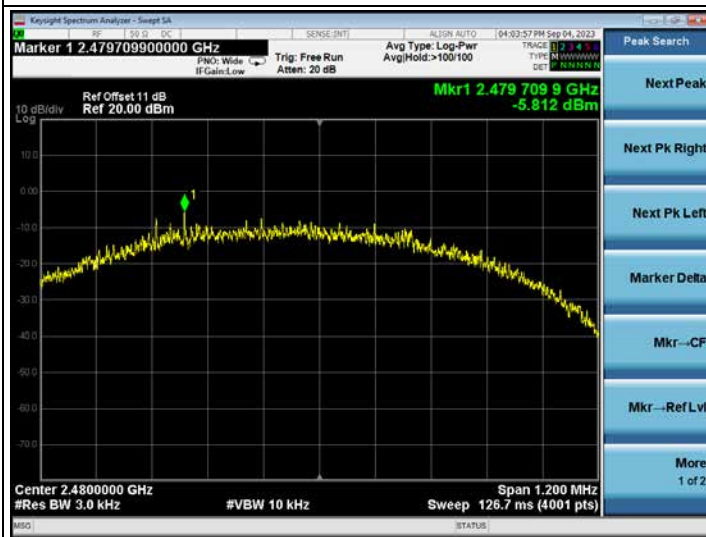
CH2402



CH2442



CH2480



8 ANTENNA REQUIREMENT

8.1 Specification Limits (§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.

8.2 Result

According to KDB 353028 D1, the following describes the three ways that can be used to demonstrate compliance to Section 15.203:

- a) Antenna permanently attached.
- b) Unique (non-standard) antenna connector.
- c) Professional installation.

For this product, the antenna is:

- ☒ Antenna permanently attached
- ☐ Unique (non-standard) antenna connector
- ☐ Professional installation
- ☐ not meet any of ways list above

that

- ☒ compliant
- ☐ not compliant

with the requirement of Section 15.203.

9 DEVIATION TO TEST SPECIFICATIONS

None.

10 MEASUREMENT UNCERTAINTY LIST

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2.

The uncertainties value is not used in determining the PASS/FAIL results.

Test Items/Facilities	Frequency/Equipment/Unit	Uncertainty
Estimation of Uncertainty for Conduction Emission (Shielded Room-1)	9kHz~150kHz(50Ω/50μH -AMN)	3.74 dB
	150kHz~30MHz(50Ω/50μH -AMN)	3.34 dB
	150kHz~30MHz(50Ω/50μH –AMN-CAT 3)	3.46 dB
	150kHz~30MHz(50Ω/50μH –AMN-CAT 5)	3.48 dB
	150kHz~30MHz(50Ω/50μH –AMN-CAT 6)	3.60 dB
	9kHz~30MHz(VP, considering the effect of mains impedance when compared with AMN)	24.64 dB
	9kHz~30MHz(VP)	2.76 dB
	9kHz~30MHz(CP, considering the effect of AE impedance when compared with AMN)	24.64 dB
	9kHz~30MHz(CP)	2.82 dB
Estimation of Uncertainty for Conduction Emission (Shielded Room-3)	9kHz~150kHz(50Ω/50μH -AMN)	3.74 dB
	150kHz~30MHz(50Ω/50μH -AMN)	3.34 dB
Estimation of Uncertainty for Power Clamp	30MHz~300MHz (Absorbing Clamp)	3.68 dB
Estimation of Uncertainty for CDNE	30MHz~300MHz (CDNE-M210)	3.68 dB
	30MHz~300MHz (CDNE-M310)	3.68 dB
Estimation of Uncertainty for EMF	20kHz~10MHz	1.54 dB
Estimation of Uncertainty for Radiated Emission	30M~200MHz (Vertical)	4.56dB
	30M~200MHz (Horizontal)	4.44dB
	200M~1000MHz (Vertical)	5.28dB
	200M~1000MHz (Horizontal)	3.88dB
	1G~6GHz	4.34dB
	6G~18G Hz	4.40dB
	18G~40G Hz	4.04dB