FCC RF Test Report

For

EDITORS KEYS HEAD OFFICE

Test Standards:	Part 15C Subpart C §15.249
Product Description:	WBL
Tested Model:	WBL
Additional Model:	WBL-US,WBL-UK
Brand Name:	EDITORS KEYS
FCC ID:	2A7PPWBL-XX
Classification	DXX-Low Power Communication Device Transmitter
Report No.:	EC2206008RF01
Tested Date:	2022-06-13 to 2022-06-23
Issued Date:	2022-06-23
Prepared By:	Jerry Wang / Engineer
Approved By:	Tiny Yang / RF Manager

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2022.06.23	Valid	Original Report

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Summary of Test Result

FCC Rule	Description	Limit	Result	Remark
15.215(c)	20dB Bandwidth	NA	Pass	-
15.249(a)	Field strength of the fundamental signal	15.249(a)	Pass	-
15.249(a)(d)/15.209	Radiated Band Edges and Radiated Spurious Emission	15.249(a)(d)/15.209	Pass	Under limit 10.95 dB at 62.01 MHz
15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 23.43 dB at 0.668 MHz
15.203	Antenna Requirement	N/A	Pass	-

1 Test Laboratory

1.1 Test facility

CNAS (accreditation number:L11138)

Hunan Ecloud Testing Technology Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number:CN1244 , Test Firm Registration Number:793308)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

ISED(CAB identifier: CN0012, ISED# :24347)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the Wireless Device Testing Laboratories list of innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.

A2LA (Certificate Number:4895.01)

Hunan Ecloud Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

2 General Description

2.1 Applicant

Editors Keys Head Office
517-518 Royal Exchange, Manchester, M2 7EN，United Kingdom

2.2 Manufacturer

Shenzhen Etaixin Technology Co., Ltd.
3/F 2 Dong Da Xing Chuang Ye Industrial Park ,Shajing Town ,518125 ,Baoan District,Shen Zhen City ,GuangDong Province,China

2.3 General Description Of EUT

Product	WBL
Model No.	WBL
Additional No.	WBL-US, WBL-UK
Difference Description	Only the model name is different
FCC ID	2A7PPWBL-XX
Power Supply	3.7Vdc from battery
Modulation Type	GFSK
Operating Frequency	2403MHz~2480MHz
Number Of Channel	16
Antenna Type	PCB Antenna type with 2.34dBi gain
HW Version	V01
SW Version	V01
I/O Ports	Refer to user's manual
Cable Supplied	N/A

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

2.4 Modification of EUT

No modifications are made to the EUT during all test items.

2.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.249
- ANSI C63.10-2013

3 Test Configuration of Equipment Under Test

3.1 Descriptions of Test Mode

The Operation Frequency each of channel as follows:

Operation Frequency each of channel			
No.:	Frequency(MHz)	No.:	Frequency(MHz)
01	**2403**	09	2414
02	2426	10	2436
03	**2441**	11	2459
04	2463	12	2473
05	2407	13	2419
06	2422	14	2439
07	2445	15	2453
08	2466	**16**	**2480**

Note:

according to ANSI C63.10 2013, for unlicensed wireless device frequency range more than 10MHz, measurement shall be performed and reported at low, middle and high frequency

a. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

b. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

3.2 Test Mode

3.2.1 Antenna Port Conducted Measurement

Summary table of Test Cases	
Test Item	**2.4G Wireless**
Conducted Test Cases	LCH: Mode 1: CH01_2403 MHz MCH: Mode 2: CH03_2441 MHz HCH: Mode 3: CH16_2480 MHz

3.2.2 Radiated Emission Test (Below 1GHz)

	2.4G Wireless	
Radiated Test Cases	Transmitting	LCH: Mode 1: CH01_2403 MHz MCH: Mode 2: CH03_2441 MHz HCH: Mode 3: CH16_2480 MHz
	Transmitting+Charging	

Note : 1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.

2. All above modes were tested, but only the worst case test mode 1 while transmitting was reported.

3.2.3 Radiated Emission Test (Above 1GHz)

	2.4G Wireless	
Radiated Test Cases	Transmitting	LCH: Mode 1: CH01_2403 MHz MCH: Mode 2: CH03_2441 MHz HCH: Mode 3: CH16_2480 MHz
	Transmitting+Charging	

Note : 1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.

2. All above modes were tested, but only the worst case transmitting was reported.

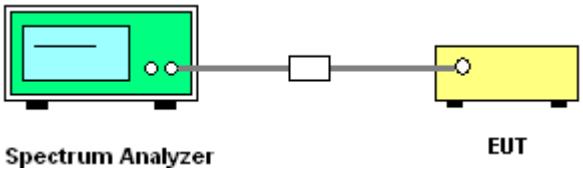
3.3 Support Equipment

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Adapter	HUAWEI	HW-059200CHQ	FCC SDOC	N/A	N/A
2.	2.4G Dongle	Hastech	HW086-1	2AC9LHW086-1	N/A	N/A

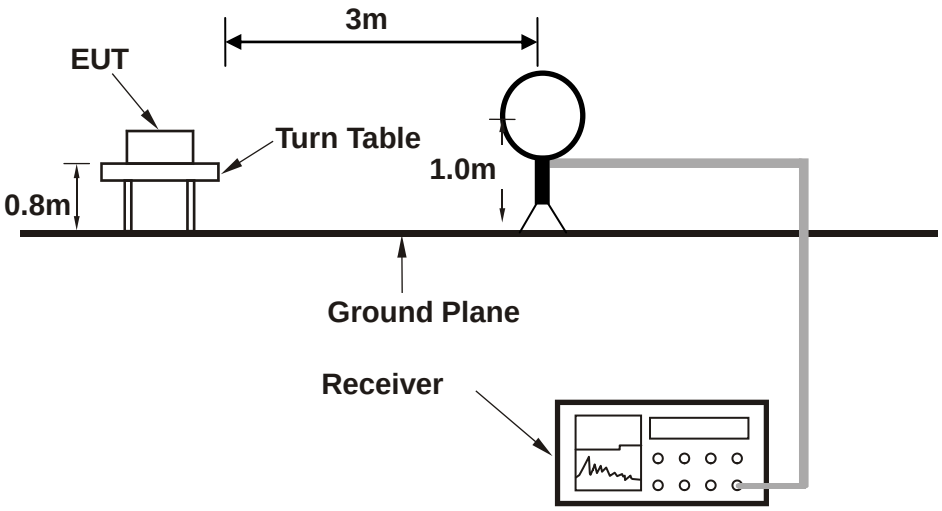
3.4 Test Setup

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

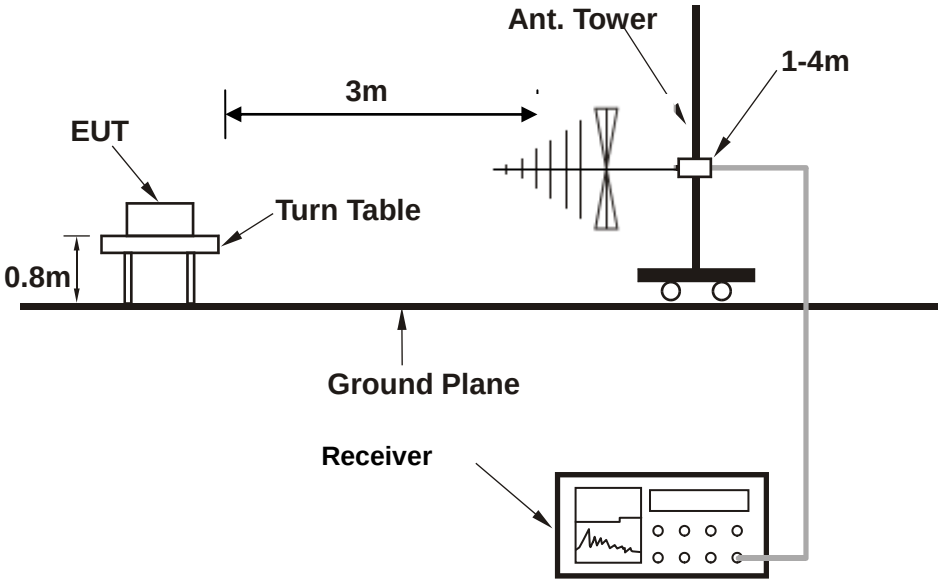
Setup diagram for Conducted Test



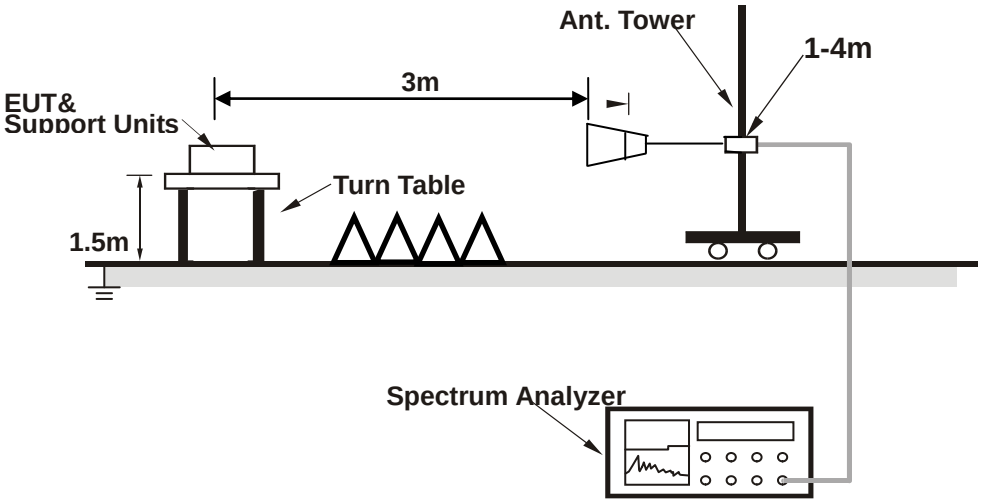
Setup diagram for Radiation(9KHz~30MHz) Test



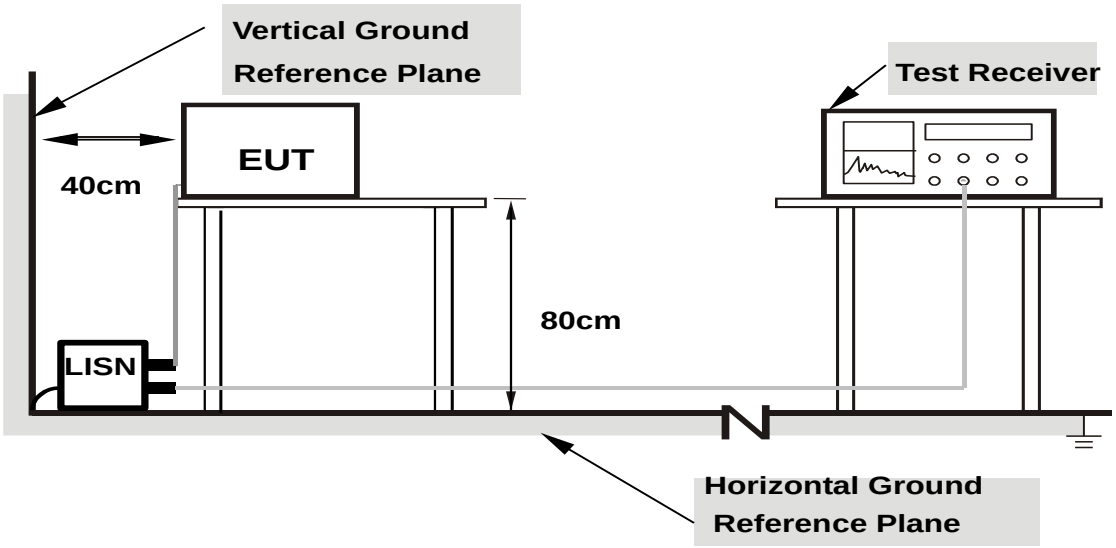
Setup diagram for Radiation(Below 1G) Test



Setup diagram for Radiation(Above1G) Test



Setup diagram for AC Conducted Emission Test



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

3.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 5 + 10 = 15 (dB)

For all radiated test items:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

Over Limit (dB μ V/m) = Level(dB μ V/m) - Limit Level (dB μ V/m)

4 Test Result

4.1 20dB Occupy Bandwidth Measurement

4.1.1 Limit of 20dB Occupy Bandwidth

None; for reporting purposes only.

4.1.2 Test Procedures

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument.
3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.

   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;

   RBW = 1% to 5% of the 20 dB bandwidth; VBW = approximately 3 times RBW; Sweep = auto;

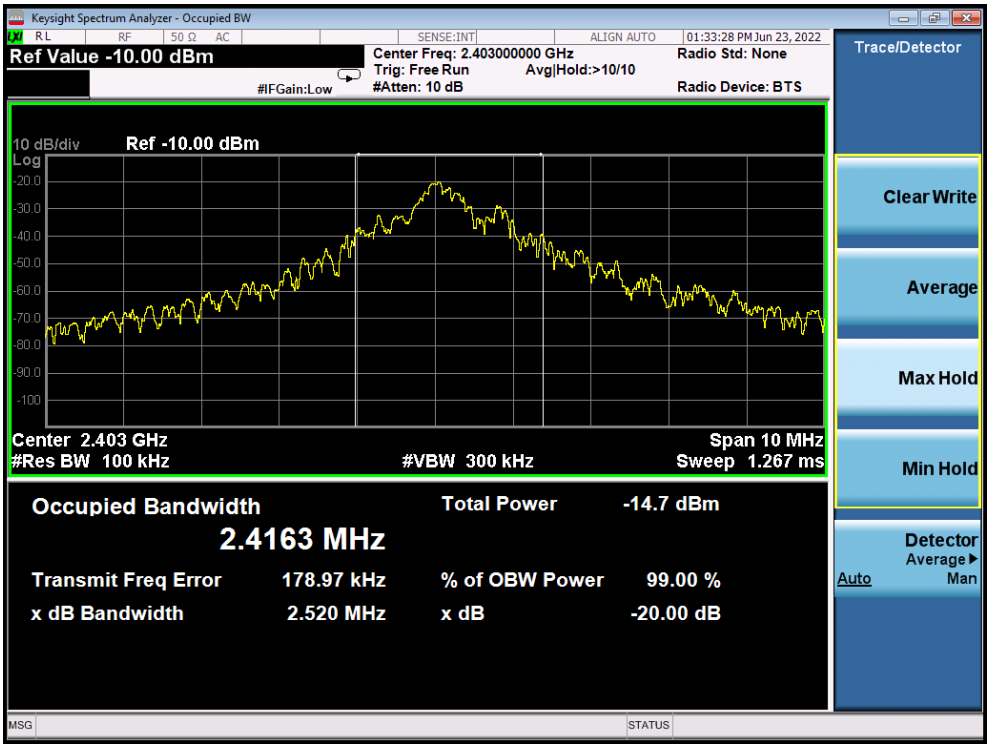
   Detector function = peak; Trace = max hold.

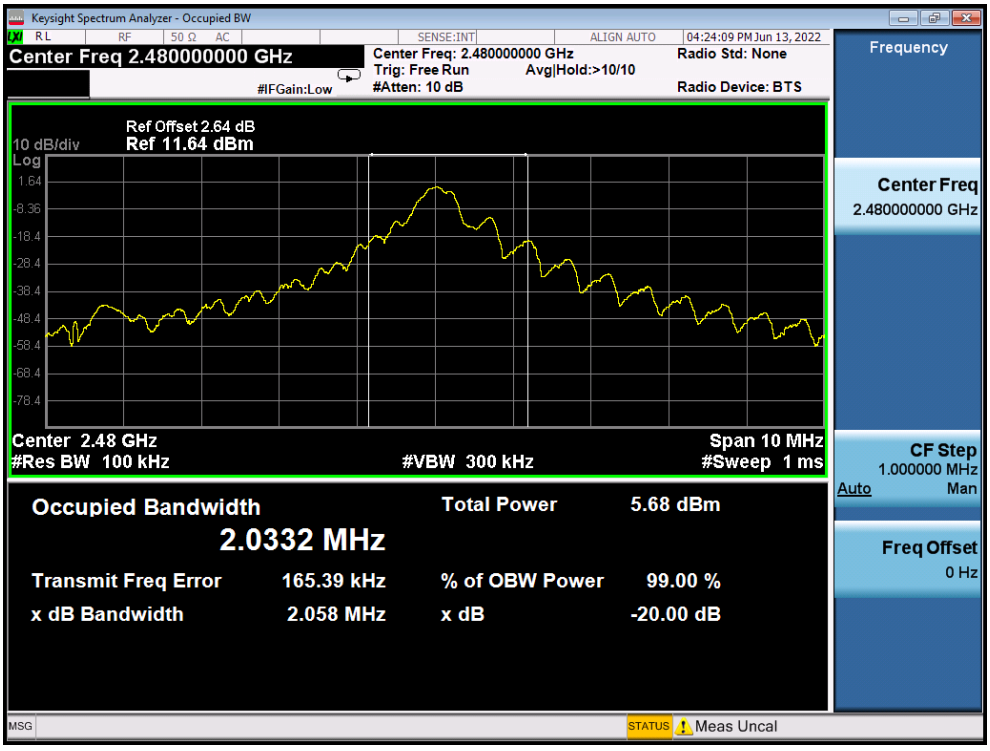
4.1.3 Test Result of 20dB Bandwidth

Test Mode :	2.4G Wireless Transmitting	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	57~60%

Channel.	20dB Bandwidth [MHz]	Verdict
LCH	2.520	PASS
MCH	2.211	PASS
HCH	2.058	PASS

20dB Plot

Graphs	
GFSK/LCH	

GFSK/MCH	
GFSK/HCH	

4.2 Field Strength of The Fundamental Signal, Radiated Band Edges and Spurious Emission Measurement

4.2.1 Limit of Fundamental Signal, Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209&15.249 limits as below.

Frequency (MHz)	Field Strength (microvolts/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

Frequency (MHz)	Field Strength (millivolts/meter)	Measurement Distance (meters)
2400-2483.5	50	3m

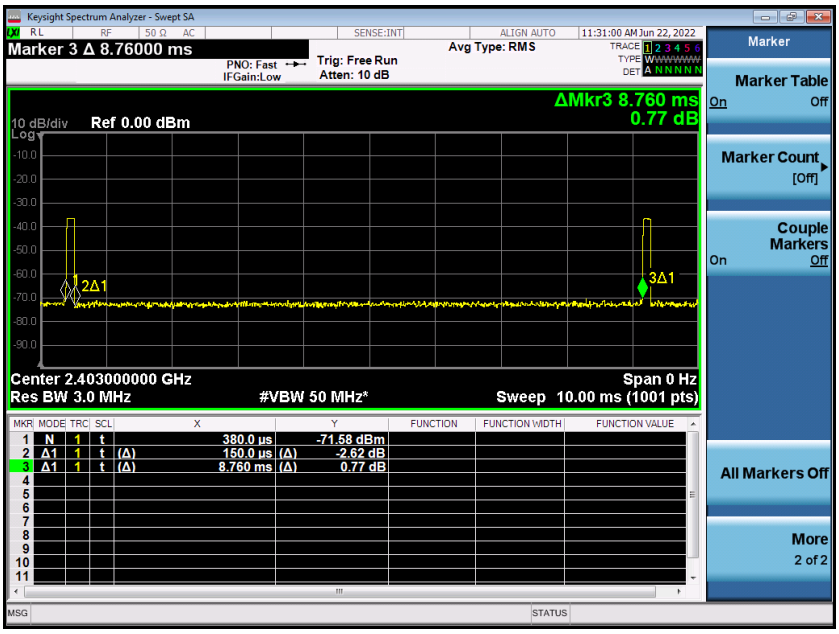
Note: The frequency range from 9KHz to 10th harmonic (25GHz) are checked, and no any emissions were found from 18GHz to 25GHz, So the radiated emissions from 18GHz to 25GHz were not record.

4.2.2 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The measurement distance is 3 meter.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) The EUT shall be configured to operate at the maximum achievable duty cycle.
   (2) Measure the duty cycle D of the transmitter output signal as described in 11.6.
   (3) RBW = 1 MHz (unless otherwise specified).
   (4) VBW ≥ [3 × RBW].
   (5) Detector = RMS (power averaging), if span / (# of points in sweep) ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
   (6) Averaging type = power (i.e., rms):
      a. As an alternative, the detector and averaging type may be set for linear voltage averaging.
      b. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
   (7) Sweep time = auto.
   (8) Perform a trace average of at least 100 traces.
   (9) A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
      a. If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
      b. If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
      c. If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

(10) Reduction of the measured emission amplitude levels to account for operational duty cycle is not permitted. Determining compliance is based on emission levels occurring during transmission; it is not based on an average across ON and OFF times of the transmitter.

Band	Duty Cycle(%)	VBW Setting
2.4G Wireless	1.7	10kHz



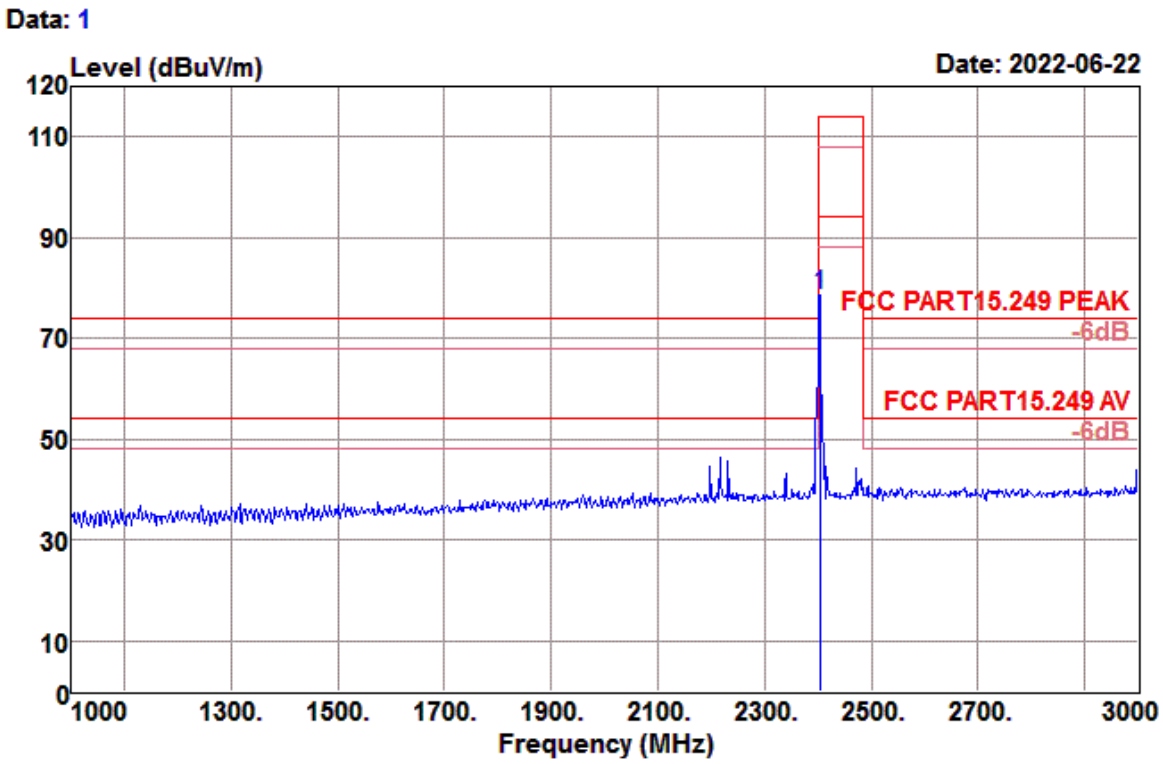
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

4.2.3 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

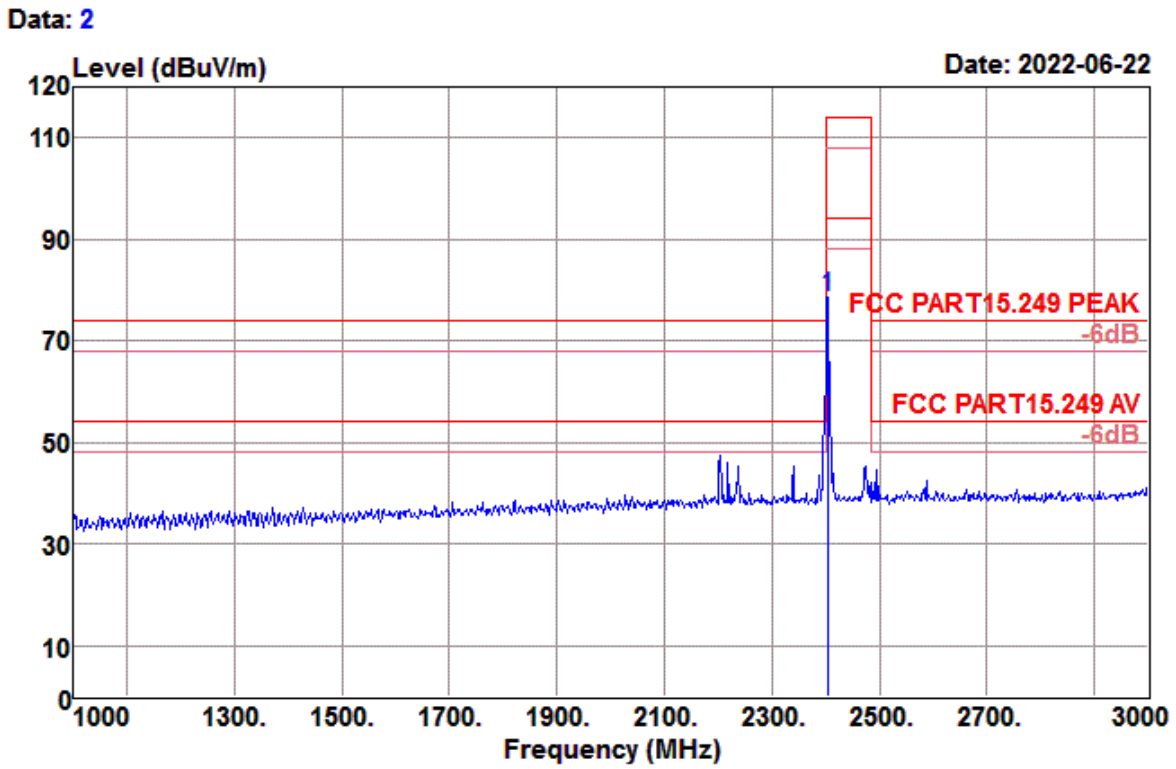
4.2.4 Field Strength of The Fundamental Signal

Test Mode :	Mode 1: CH01_2403MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	1GHz~3GHz	**Polarization :**	Horizontal



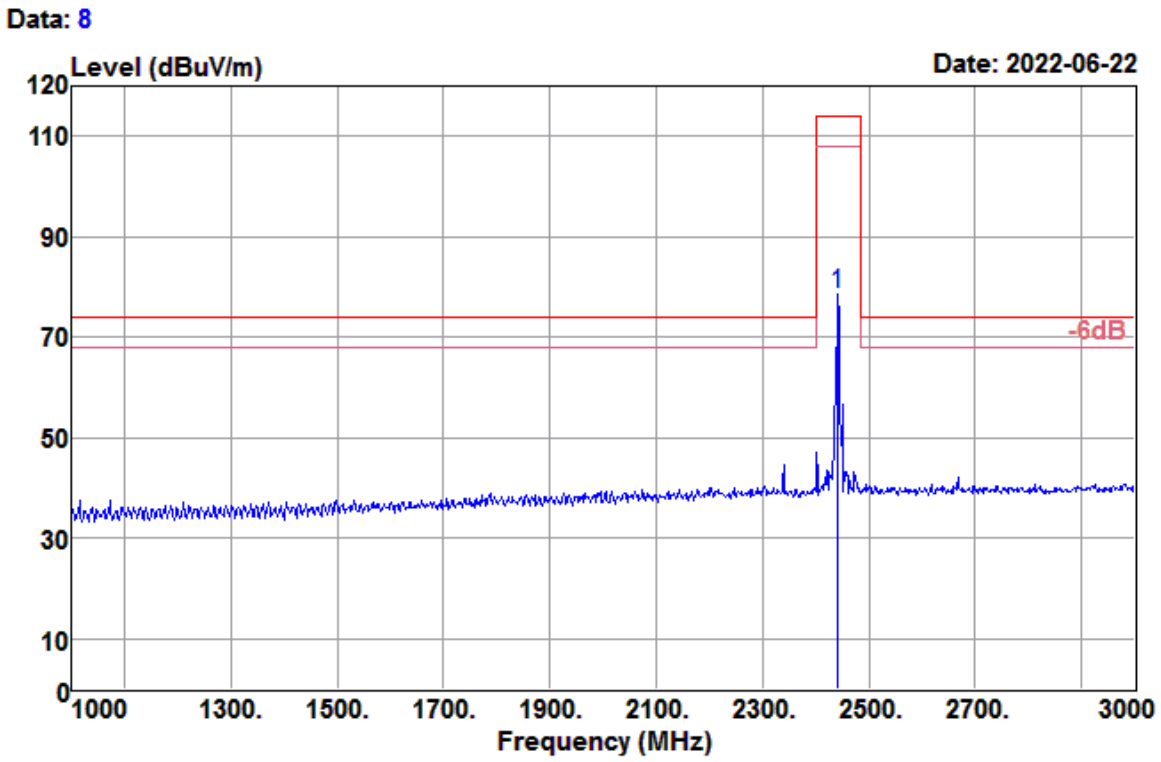
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2403.000	106.27	27.59	4.17	59.50	78.53	114.00	-35.47	Peak

Test Mode :	Mode 1: CH01_2403MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	1GHz~3GHz	Polarization :	Vertical



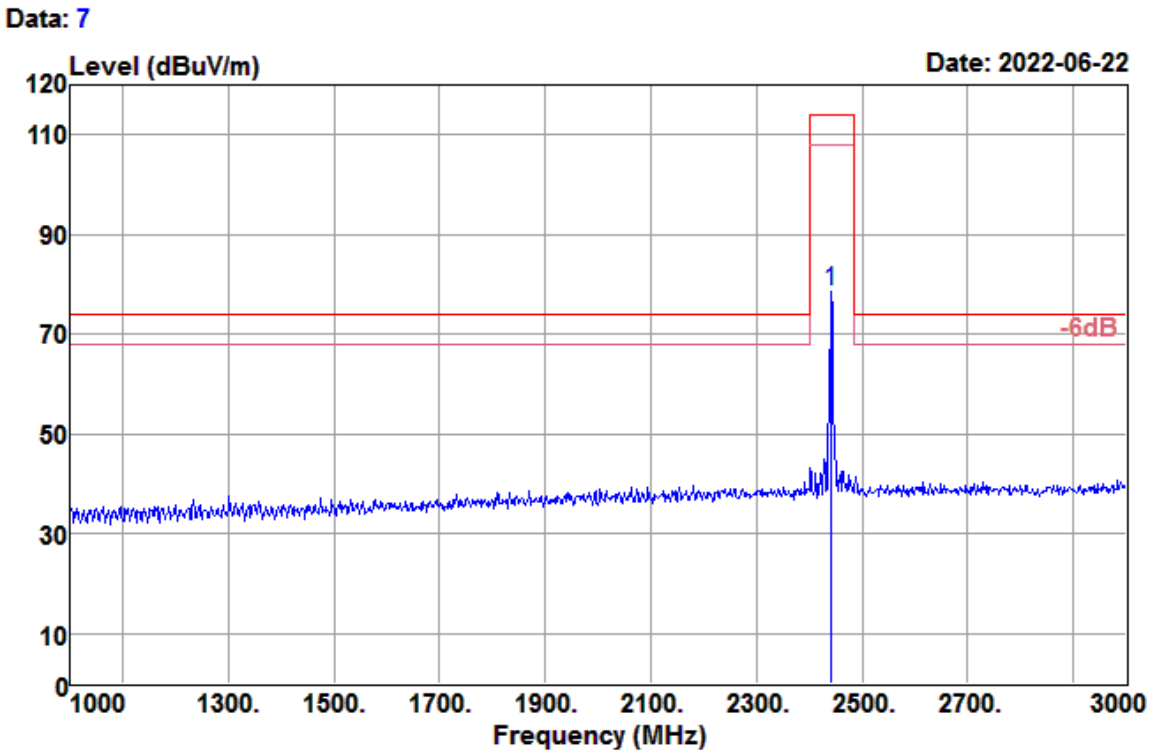
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2403.000	106.27	27.59	4.17	59.50	78.53	114.00	-35.47	Peak

Test Mode :	Mode 2: CH03_2441MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	1GHz~3GHz	Polarization :	Horizontal



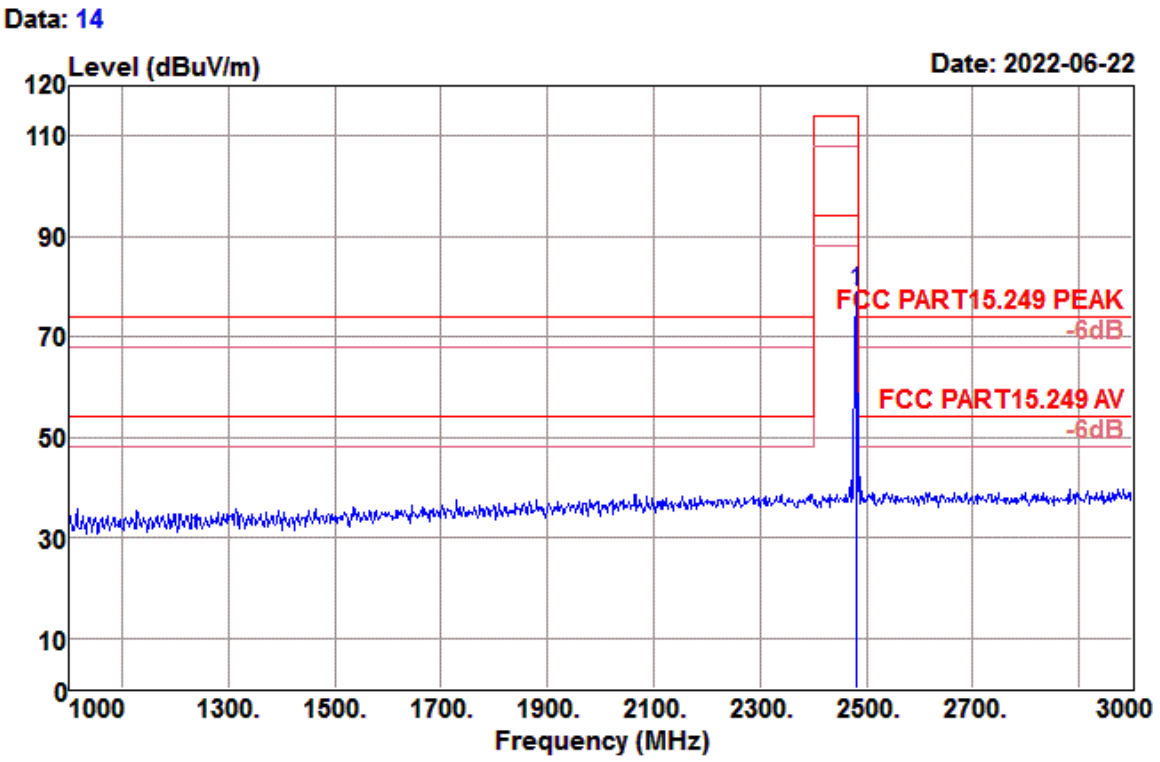
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2441.000	106.31	27.67	4.18	59.46	78.70	114.00	-35.30	Peak

Test Mode :	Mode 2: CH03_2441MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	1GHz~3GHz	Polarization :	Vertical



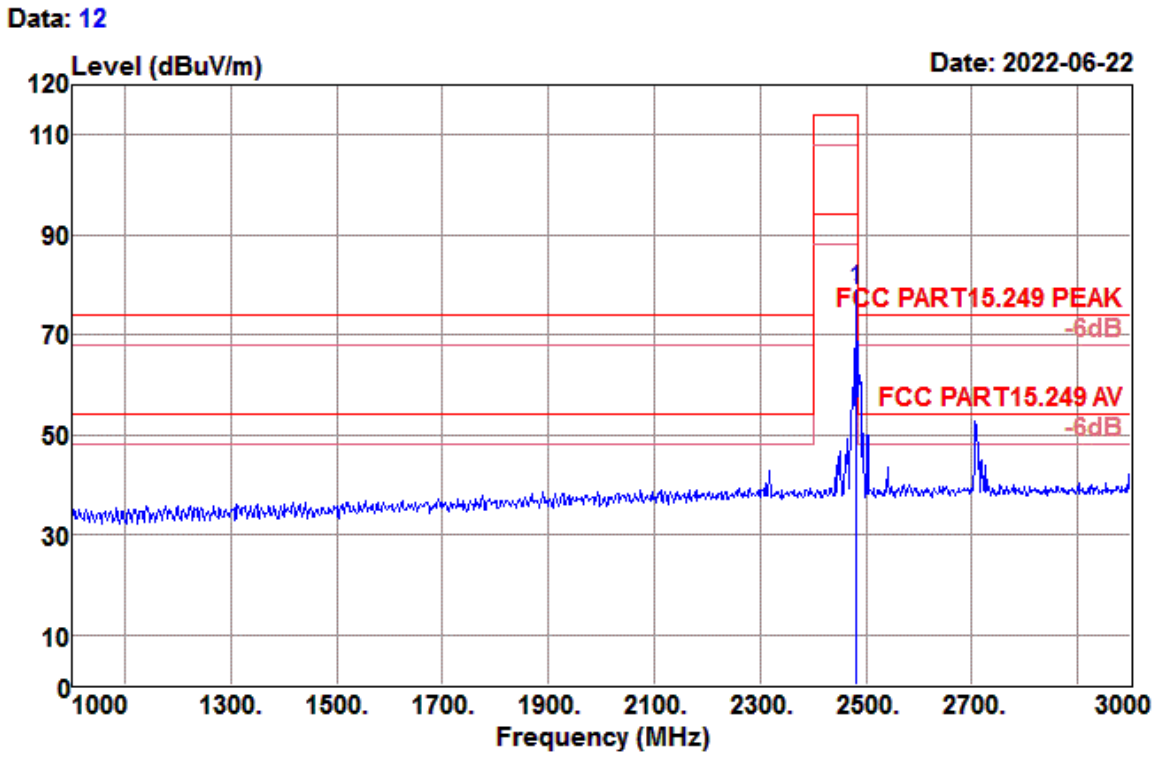
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2441.000	106.31	27.67	4.18	59.46	78.70	114.00	-35.30	Peak

Test Mode :	Mode 3: CH16_2480 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	1GHz~3GHz	Polarization :	Horizontal



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2480.000	106.42	27.76	4.19	59.42	78.95	114.00	-35.05	Peak

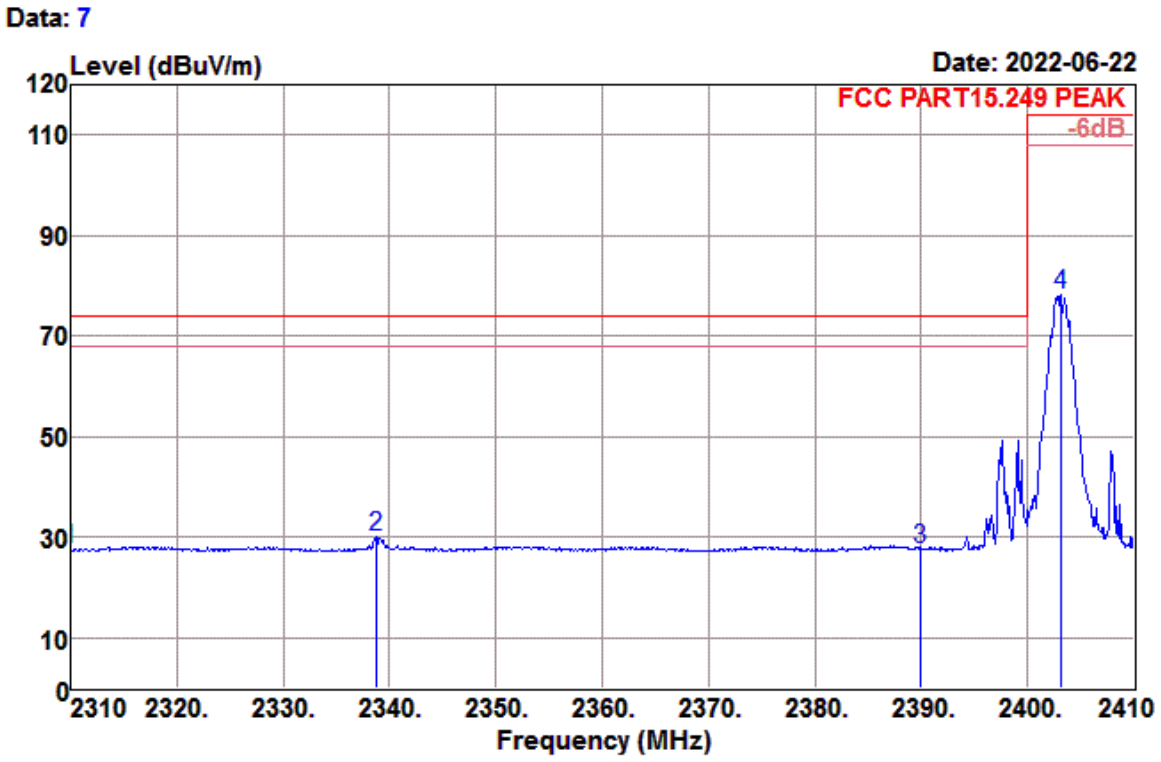
Test Mode :	Mode 3: CH16_2480 MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	1GHz~3GHz	**Polarization :**	Vertical



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2480.000	106.42	27.76	4.19	59.42	78.95	114.00	-35.05	Peak

4.2.5 Test Result of Radiated Spurious at Band Edges

Test Mode :	Mode 1: CH01_2403MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	2.31GHz~2.41GHz	**Polarization :**	Horizontal

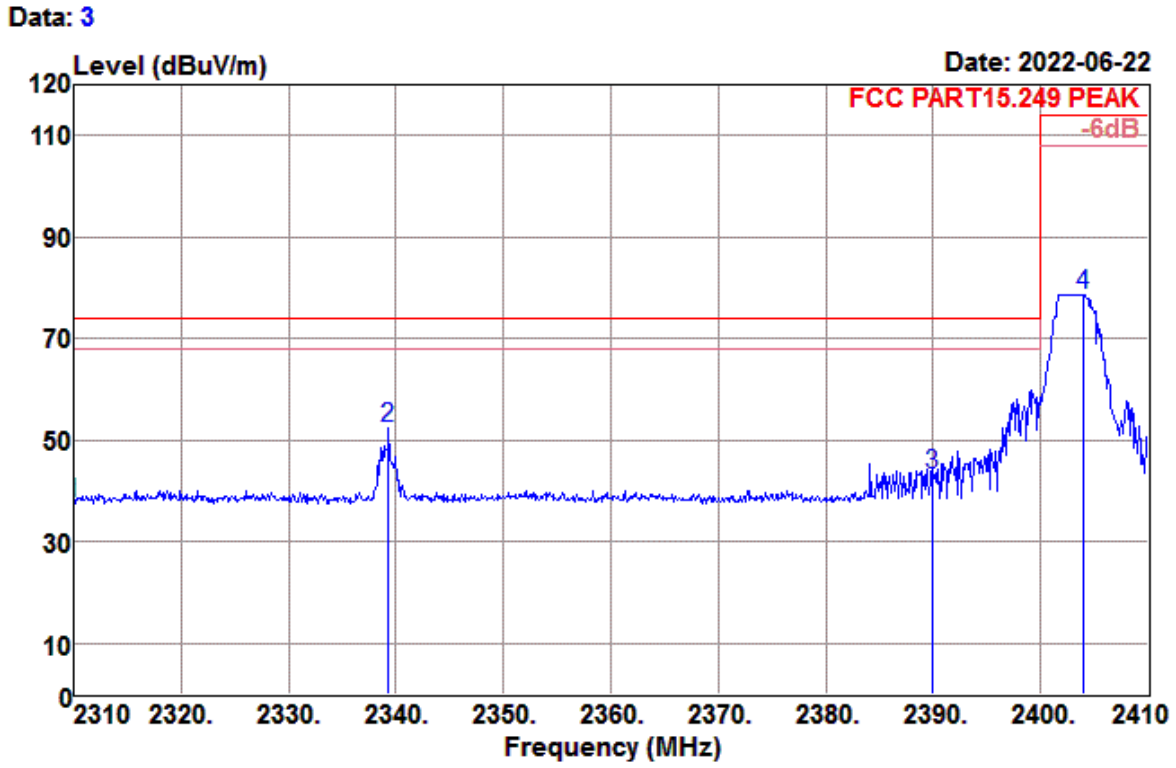


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	55.66	27.38	4.08	59.59	27.53	74.00	-46.47	Peak
2338.800	58.03	27.45	4.11	59.56	30.03	74.00	-43.97	Peak
2390.000	55.47	27.56	4.16	59.51	27.68	74.00	-46.32	Peak
2403.200	106.09	27.59	4.17	59.50	78.35	114.00	-35.65	Peak

Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
2310.000	27.53	1.7%	35.39	-7.86	54.00	-61.86	Average
2338.800	30.03	1.7%	35.39	-5.36	54.00	-59.36	Average
2390.000	27.68	1.7%	35.39	-7.71	54.00	-61.71	Average
2403.200	78.35	1.7%	35.39	42.96	94.00	-51.04	Average

Note:According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Test Mode :	Mode 1: CH01_2403MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	2.31GHz~2.41GHz	Polarization :	Vertical

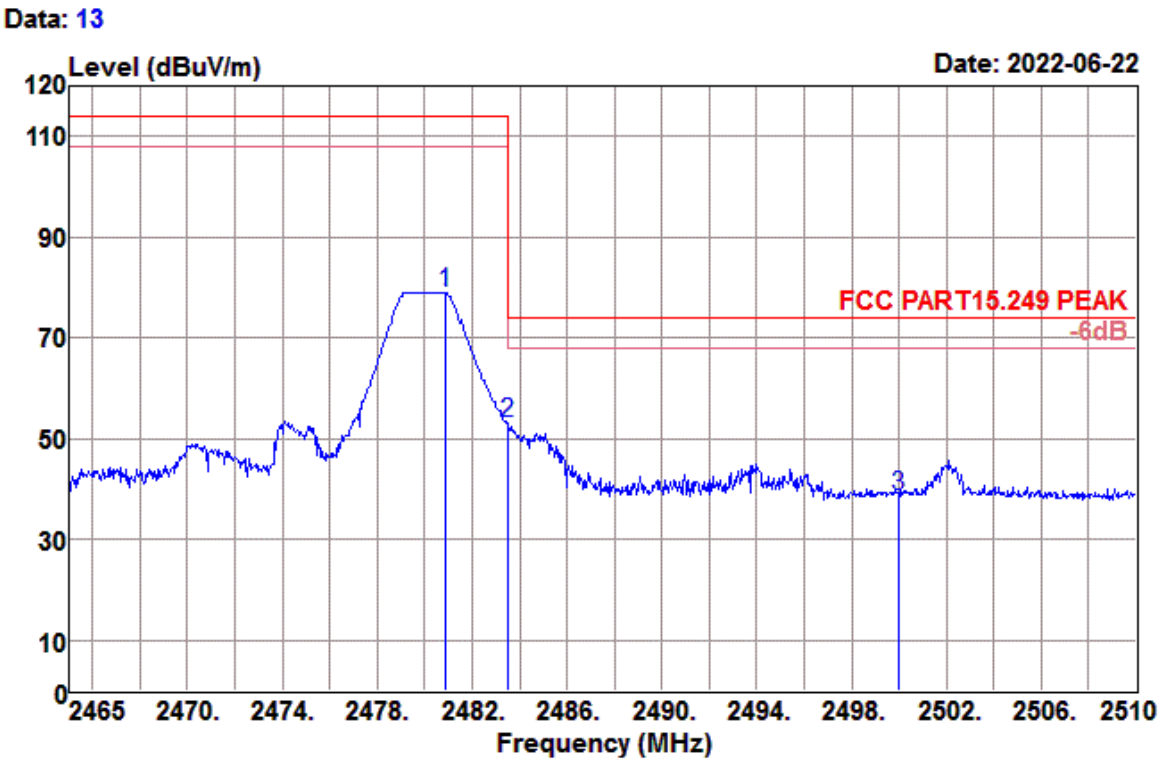


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	65.68	27.38	4.08	59.59	37.55	74.00	-36.45	Peak
2339.300	80.49	27.45	4.11	59.56	52.49	74.00	-21.51	Peak
2390.000	70.84	27.56	4.16	59.51	43.05	74.00	-30.95	Peak
2404.000	106.27	27.59	4.17	59.50	78.53	114.00	-35.47	Peak

Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
2310.000	37.55	1.7%	35.39	2.16	54.00	-51.84	Average
2339.300	52.49	1.7%	35.39	17.10	54.00	-36.90	Average
2390.000	43.05	1.7%	35.39	7.66	54.00	-46.34	Average
2404.000	78.53	1.7%	35.39	43.14	94.00	-50.86	Average

Note:According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Test Mode :	Mode 3: CH16_2480 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	2.465GHz~2.51GHz	Polarization :	Horizontal

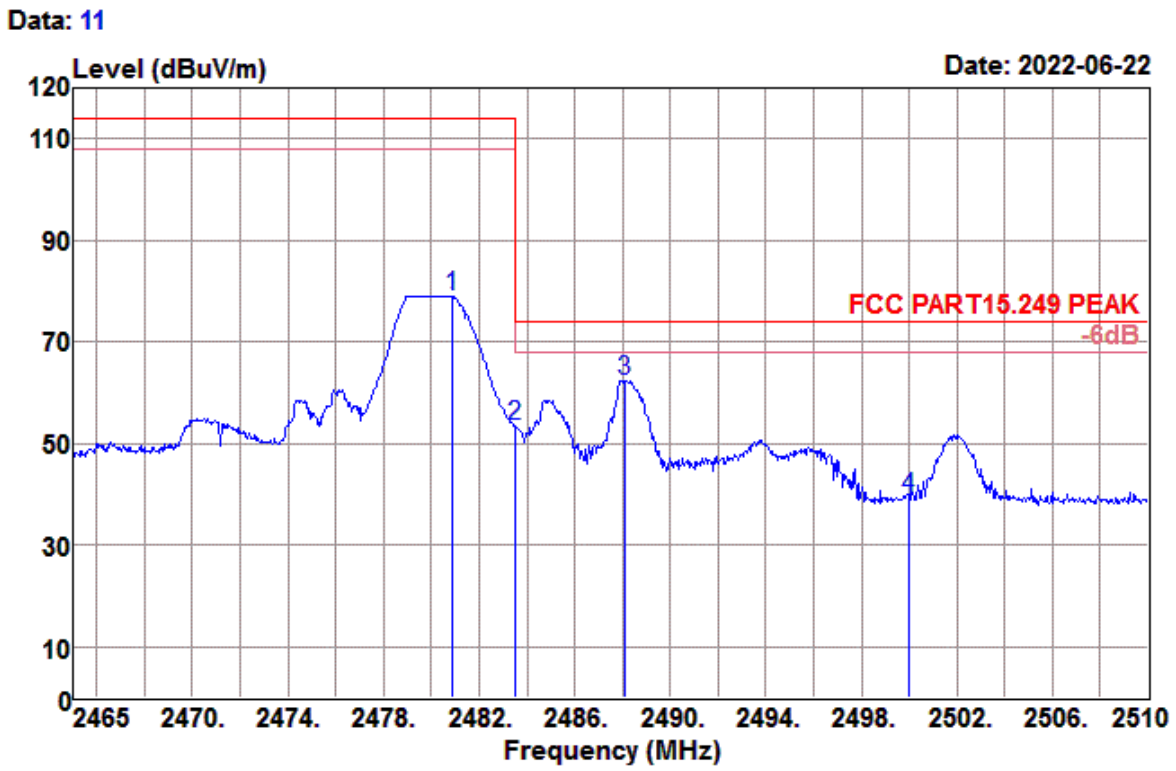


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2480.840	106.41	27.76	4.19	59.42	78.94	114.00	-35.06	Peak
2483.500	80.72	27.76	4.19	59.42	53.25	74.00	-20.75	Peak
2500.000	66.03	27.80	4.19	59.40	38.62	74.00	-35.38	Peak

Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
2480.840	78.94	1.7%	35.39	43.55	94.00	-50.45	Average
2483.500	53.25	1.7%	35.39	17.86	54.00	-36.14	Average
2500.000	38.62	1.7%	35.39	3.23	54.00	-50.77	Average

Note:According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Test Mode :	Mode 3: CH16_2480 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	2.465GHz~2.51GHz	Polarization :	Vertical



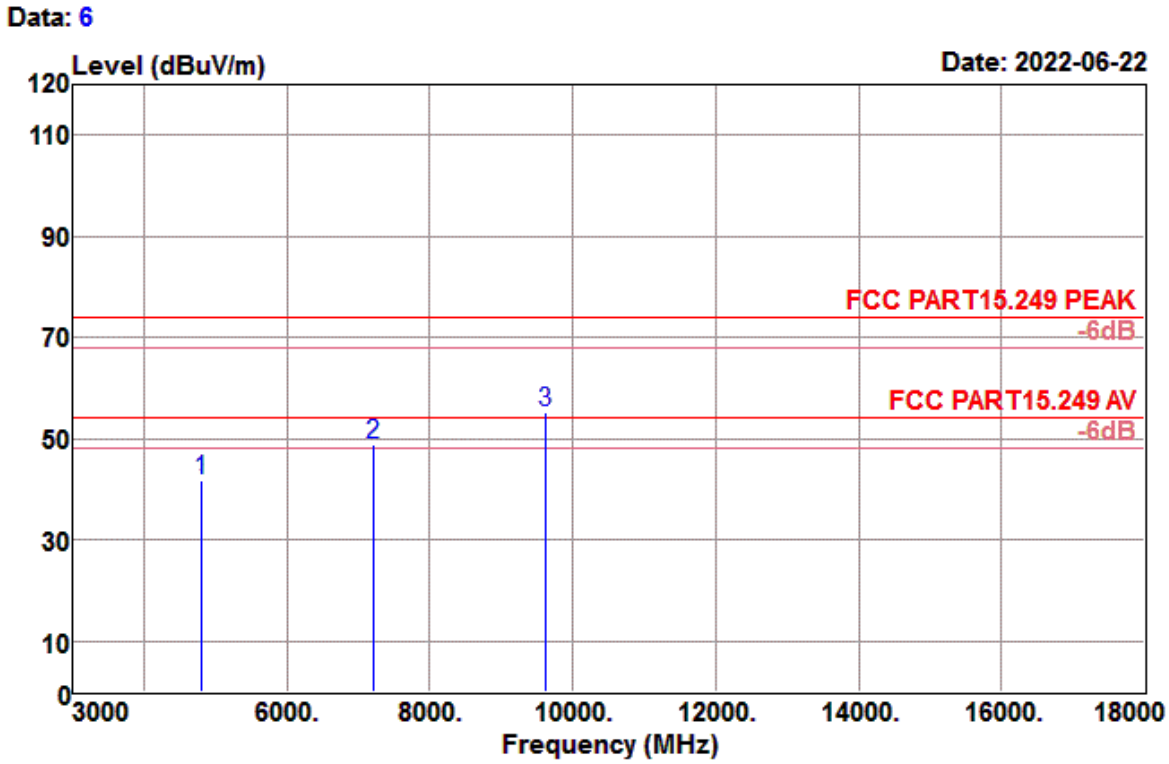
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2480.840	106.41	27.76	4.19	59.42	78.94	114.00	-35.06	Peak
2483.500	81.07	27.76	4.19	59.42	53.60	74.00	-20.40	Peak
2488.130	89.83	27.77	4.19	59.41	62.38	74.00	-11.62	Peak
2500.000	66.64	27.80	4.19	59.40	39.23	74.00	-34.77	Peak

Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
2480.840	78.94	1.7%	35.39	43.55	94.00	-50.45	Average
2483.500	53.60	1.7%	35.39	18.21	54.00	-35.79	Average
2488.130	62.38	1.7%	35.39	26.99	54.00	-27.01	Average
2500.000	39.23	1.7%	35.39	3.84	54.00	-50.16	Average

Note:According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

4.2.6 Test Result of Radiated Spurious Emission

Test Mode :	Mode 1: CH01_2403 MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	3GHz~18GHz	**Polarization :**	Horizontal



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4806.000	63.21	30.93	6.46	58.98	41.62	74.00	-32.38	Peak
7209.000	63.40	35.40	8.62	58.52	48.90	74.00	-25.10	Peak
9624.000	62.93	38.40	11.64	57.75	55.22	74.00	-18.78	Peak

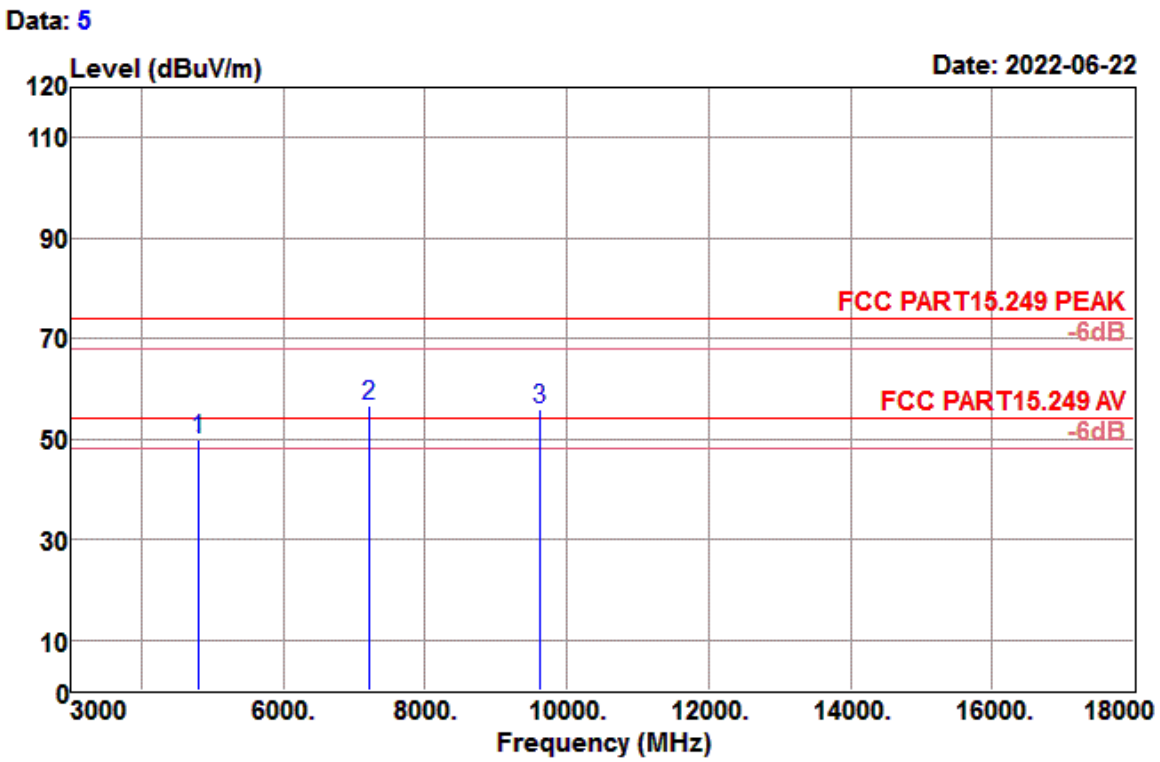
Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
4806.000	41.62	1.7%	35.39	6.23	54.00	-47.77	Average
7209.000	48.90	1.7%	35.39	13.51	54.00	-40.49	Average
9624.000	55.22	1.7%	35.39	19.83	54.00	-34.17	Average

Note:

According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Test Mode :	Mode 1: CH01_2403 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	3GHz~18GHz	Polarization :	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4806.000	71.61	30.93	6.46	58.98	50.02	74.00	-23.98	Peak
7209.000	71.23	35.40	8.62	58.52	56.73	74.00	-17.27	Peak
9624.000	63.49	38.40	11.64	57.75	55.78	74.00	-18.22	Peak

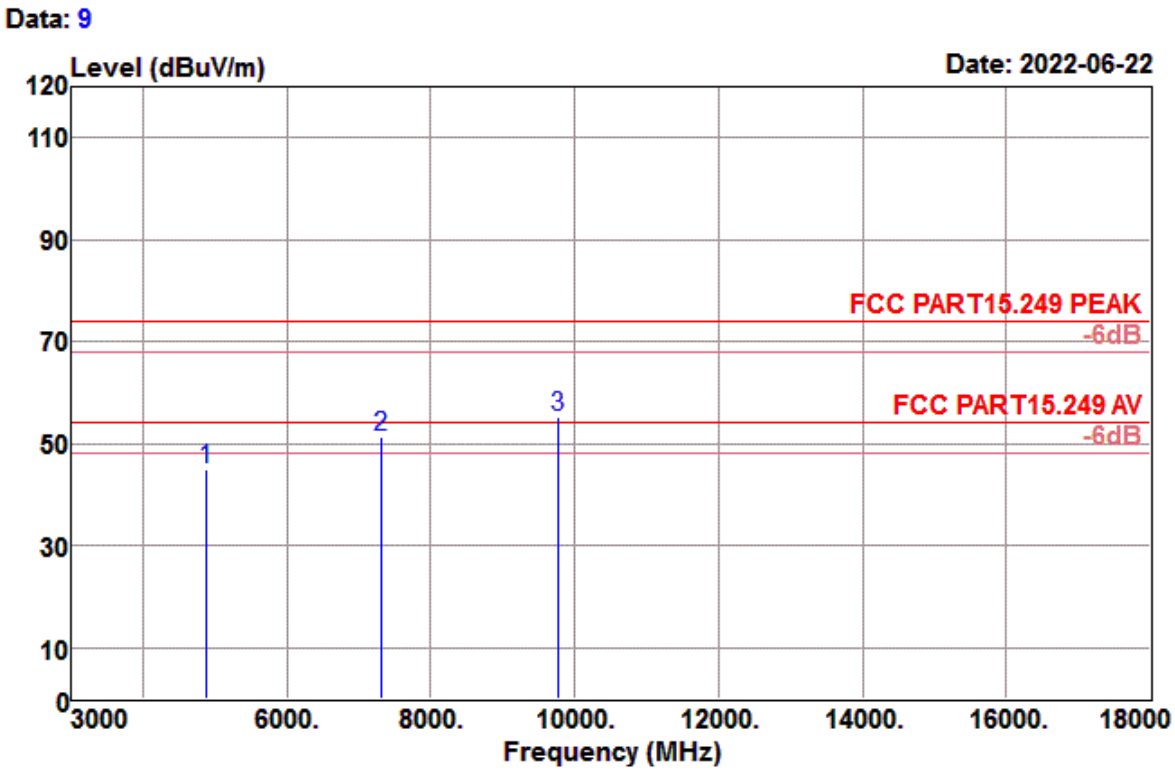
Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
4806.000	50.02	1.7%	35.39	14.63	54.00	-39.37	Average
7209.000	56.73	1.7%	35.39	21.34	54.00	-32.66	Average
9624.000	55.78	1.7%	35.39	20.39	54.00	-33.61	Average

Note:

According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Test Mode :	Mode 2: CH03_2441 MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	3GHz~18GHz	**Polarization :**	Horizontal



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4882.000	65.90	31.03	7.03	58.95	45.01	74.00	-28.99	Peak
7323.000	65.30	35.68	8.98	58.47	51.49	74.00	-22.51	Peak
9764.000	63.26	38.51	11.15	57.69	55.23	74.00	-18.77	Peak

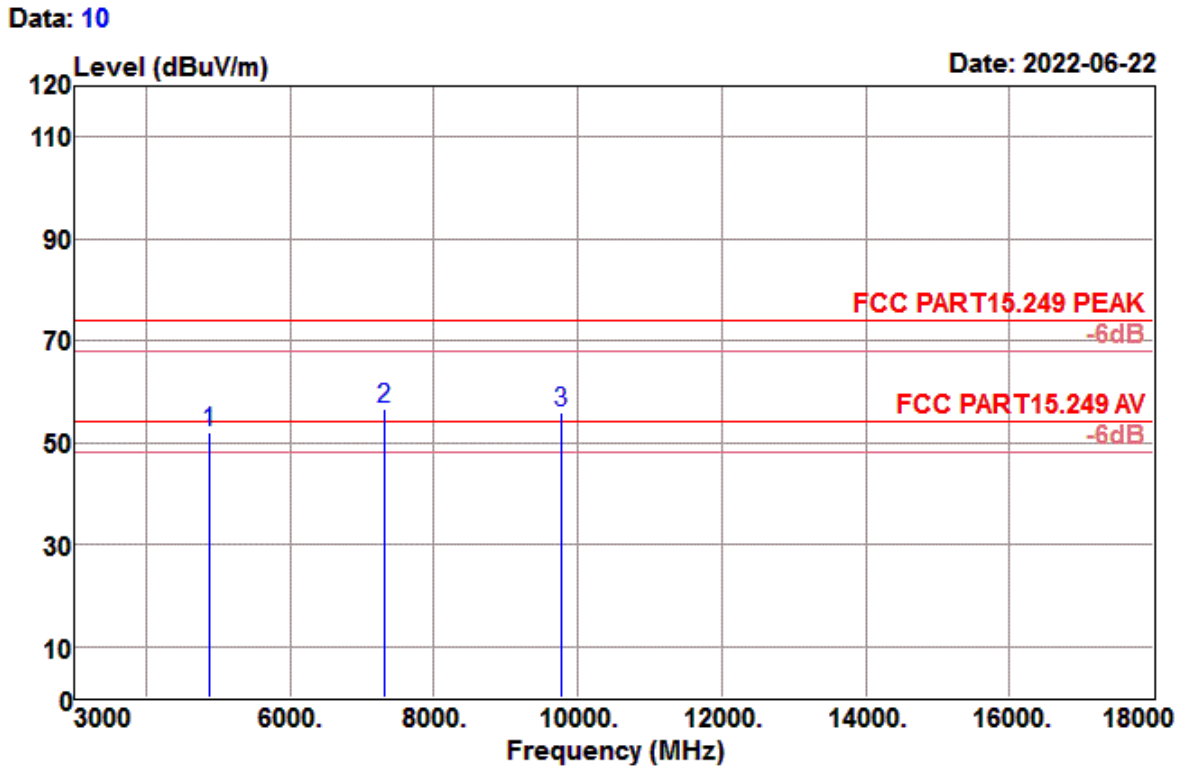
Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
4882.000	45.01	1.7%	35.39	9.62	54.00	-44.38	Average
7323.000	51.49	1.7%	35.39	16.10	54.00	-37.90	Average
9764.000	55.23	1.7%	35.39	19.84	54.00	-34.16	Average

Note:

According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Test Mode :	Mode 2: CH03_2441 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	3GHz~18GHz	Polarization :	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4882.000	72.93	31.03	7.03	58.95	52.04	74.00	-21.96	Peak
7323.000	70.55	35.68	8.98	58.47	56.74	74.00	-17.26	Peak
9764.000	63.92	38.51	11.15	57.69	55.89	74.00	-18.11	Peak

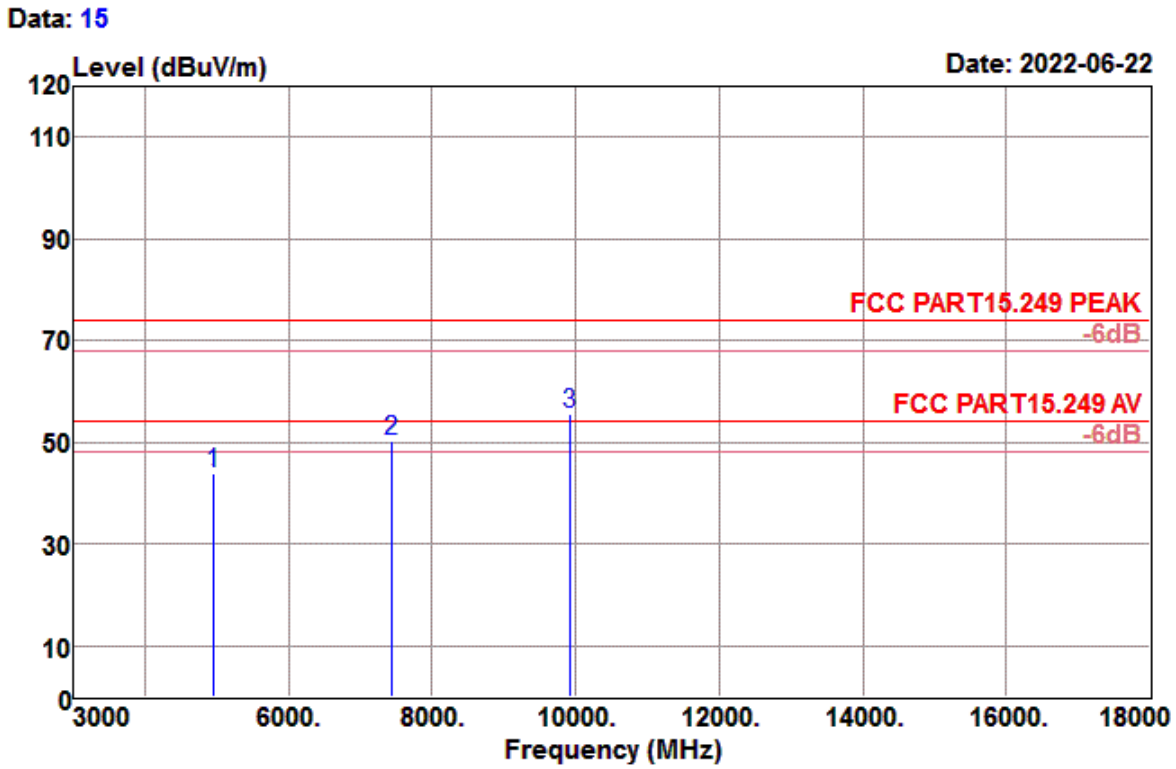
Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
4882.000	52.04	1.7%	35.39	16.65	54.00	-37.35	Average
7323.000	56.74	1.7%	35.39	21.35	54.00	-32.65	Average
9764.000	55.89	1.7%	35.39	20.50	54.00	-33.50	Average

Note:

According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Test Mode :	Mode 3: CH16_2480 MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	3GHz~18GHz	**Polarization :**	Horizontal



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	64.04	31.14	7.62	58.92	43.88	74.00	-30.12	Peak
7440.000	63.62	35.96	9.03	58.42	50.19	74.00	-23.81	Peak
9920.000	62.31	38.64	12.18	57.63	55.50	74.00	-18.50	Peak

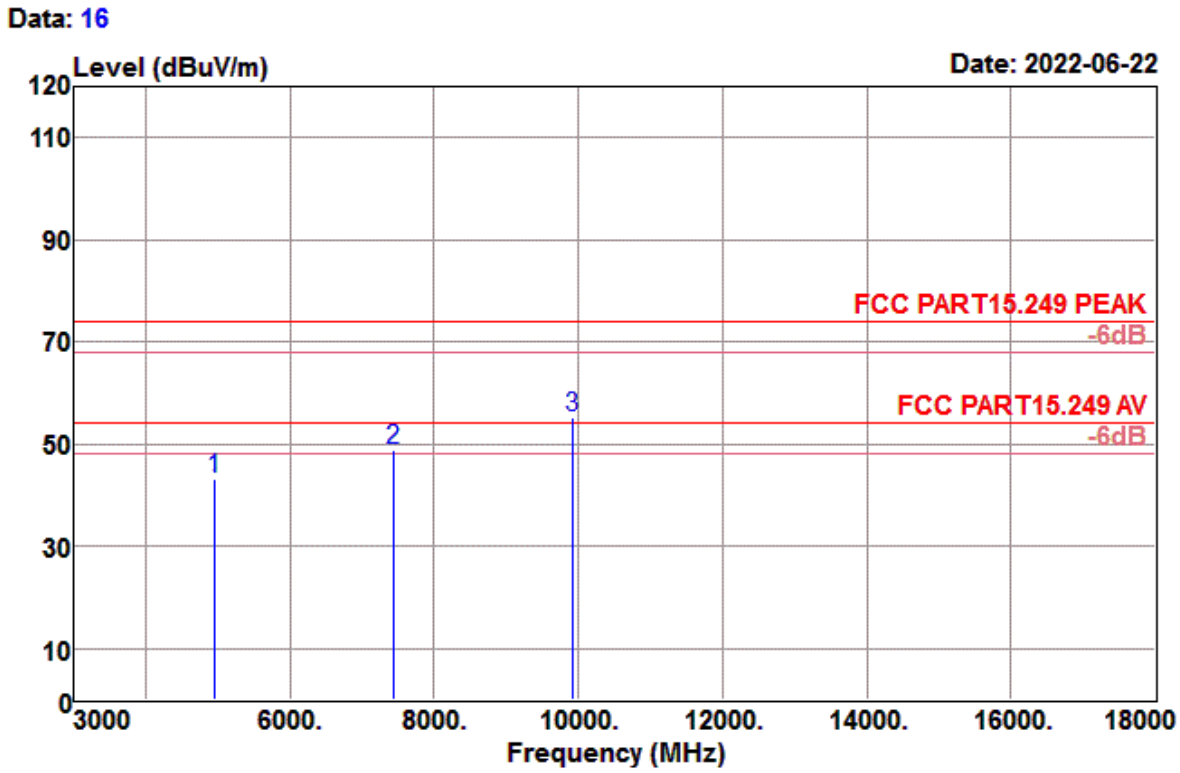
Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
4960.000	43.88	1.7%	35.39	8.49	54.00	-45.51	Average
7440.000	50.19	1.7%	35.39	14.80	54.00	-39.20	Average
9920.000	55.50	1.7%	35.39	20.11	54.00	-33.89	Average

Note:

According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Test Mode :	Mode 3: CH16_2480 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	3GHz~18GHz	Polarization :	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	63.47	31.14	7.62	58.92	43.31	74.00	-30.69	Peak
7440.000	62.13	35.96	9.03	58.42	48.70	74.00	-25.30	Peak
9920.000	62.05	38.64	12.18	57.63	55.24	74.00	-18.76	Peak

Freq. MHz	Peak Level dBuV/m	DT	DT factor (dB)	Level dBuV/m	Limit dBuV/m	OverLimit dB	Remark
4960.000	43.31	1.7%	35.39	7.92	54.00	-46.08	Average
7440.000	48.70	1.7%	35.39	13.31	54.00	-40.69	Average
9920.000	55.24	1.7%	35.39	19.85	54.00	-34.15	Average

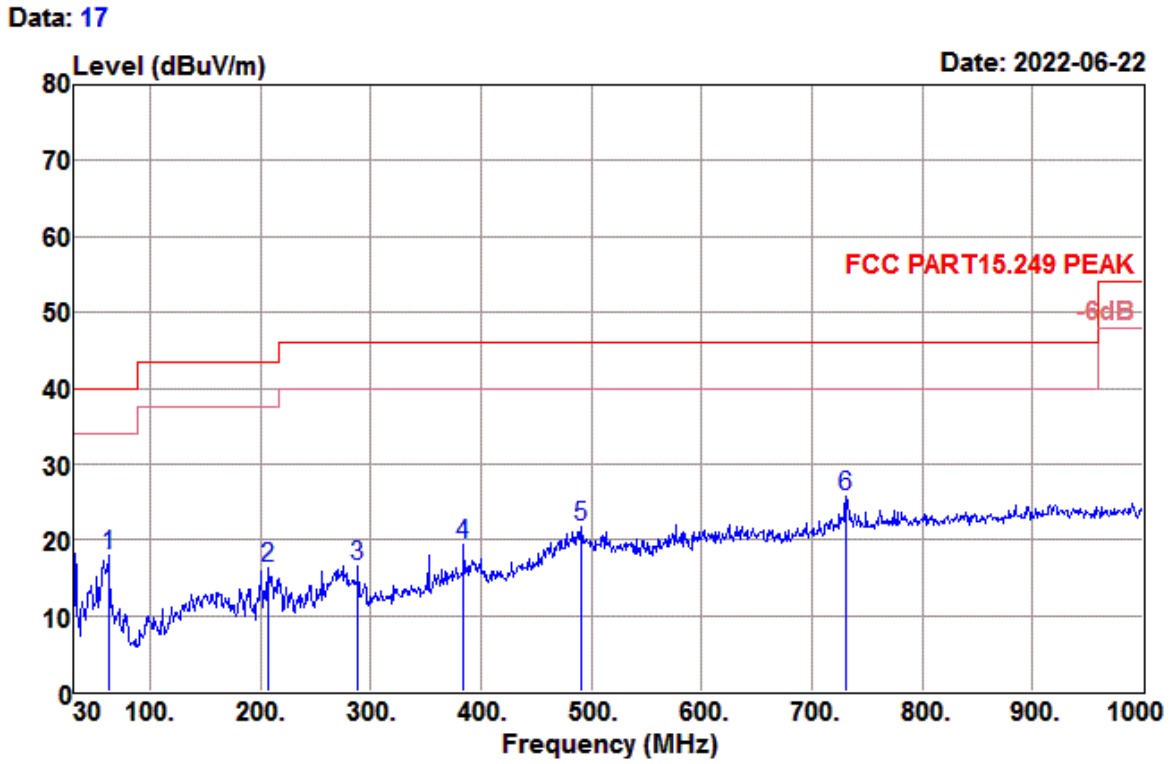
Note:

According to C63.10 section 11.12.2.5.2 correction factor for Average mode is 20*log(1/duty cycle)

Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

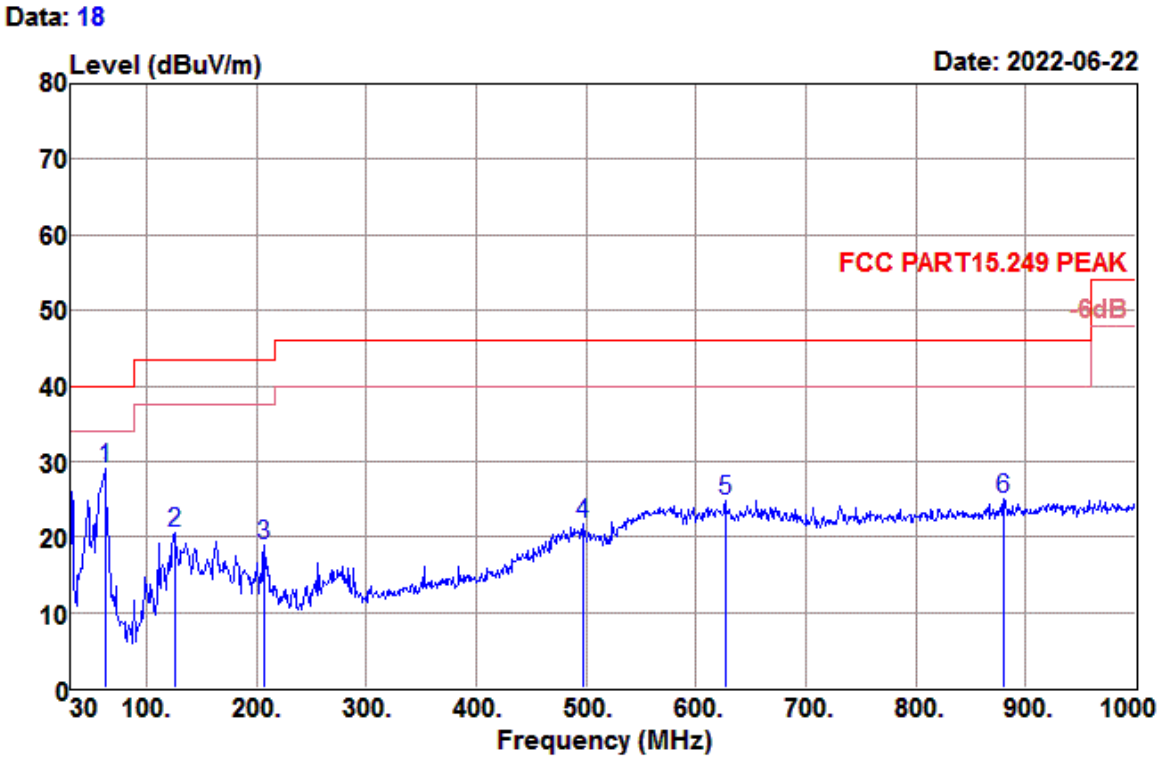
4.2.7 Test Result of Radiated Spurious Emission (30MHz ~ 1GHz)

Test Mode :	Mode 1: CH01_2403 MHz	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	63~65%
Frequencey Range	30MHz~1GHz	**Polarization :**	Horizontal



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
62.010	34.90	14.35	1.45	32.65	18.05	40.00	-21.95	Peak
207.510	35.99	10.09	2.80	32.67	16.21	43.50	-27.29	Peak
288.020	32.67	13.07	3.33	32.64	16.43	46.00	-29.57	Peak
384.050	33.49	14.83	3.81	32.72	19.41	46.00	-26.59	Peak
490.750	33.43	16.75	4.43	32.83	21.78	46.00	-24.22	Peak
730.340	32.16	20.52	5.45	32.35	25.78	46.00	-20.22	Peak

Test Mode :	Mode 1: CH01_2403 MHz	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequencey Range	30MHz~1GHz	Polarization :	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
62.010	45.90	14.35	1.45	32.65	29.05	40.00	-10.95	Peak
125.060	39.03	12.10	2.11	32.66	20.58	43.50	-22.92	Peak
206.540	38.66	10.10	2.79	32.67	18.88	43.50	-24.62	Peak
496.570	33.13	16.87	4.46	32.84	21.62	46.00	-24.38	Peak
626.550	33.27	19.00	5.07	32.66	24.68	46.00	-21.32	Peak
880.690	29.45	21.53	6.18	32.11	25.05	46.00	-20.95	Peak

4.3 AC Conducted Emission Measurement

4.3.1 Limit of AC Conducted Emission

For equipment 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.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

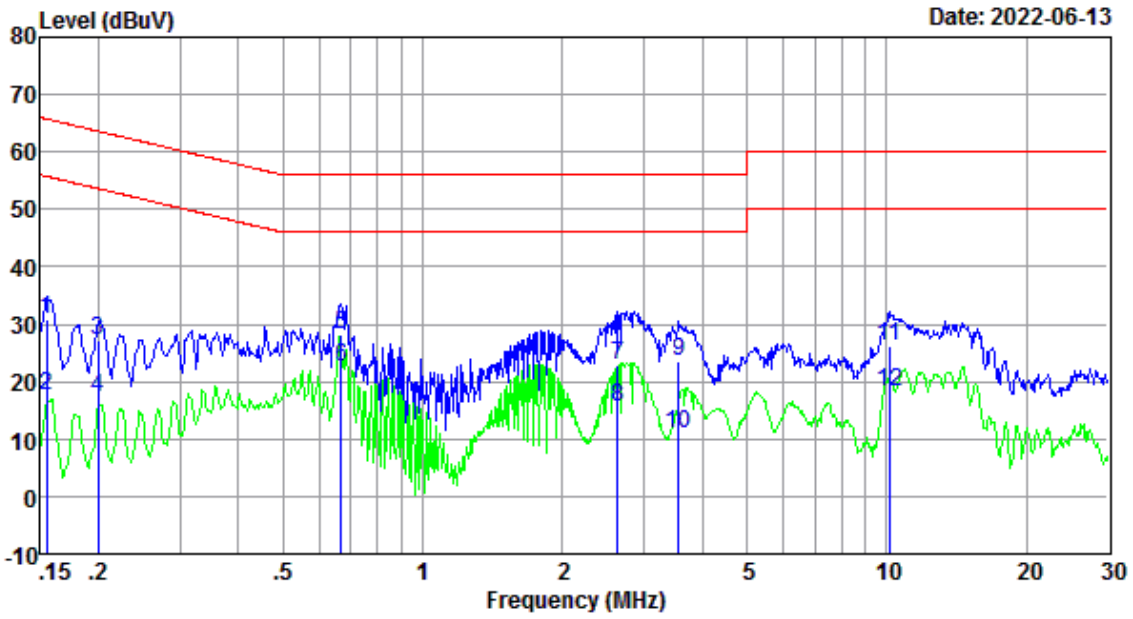
*Decreases with the logarithm of the frequency.

4.3.2 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

4.3.3 Test Result of AC Conducted Emission

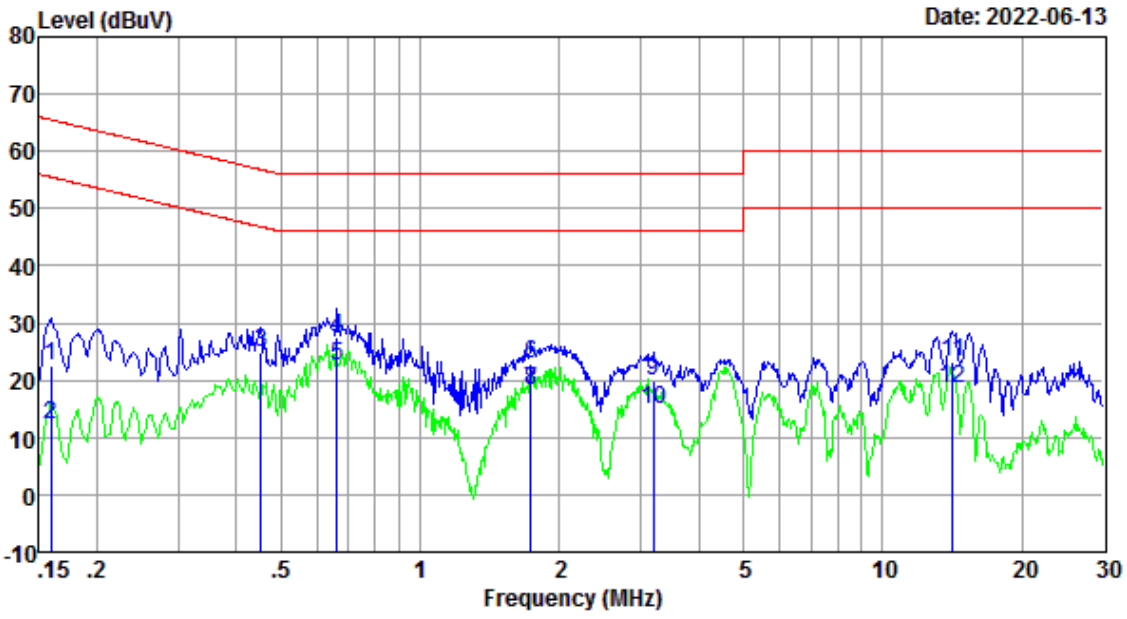
Test Mode :	Mode 1	Temperature :	24℃
Test Engineer :	Jack Liu	Relative Humidity :	52%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	2.4G Linking + Charging from Adapter		



Freq MHz	Reading level dBuV	LISN/ISN factor dB	Cable loss dB	Result level dBuV	Limit level dBuV	Over limit dB	Remark
0.155	21.40	9.54	0.03	30.97	65.74	-34.77	QP
0.155	8.10	9.54	0.03	17.67	55.74	-38.07	Average
0.200	17.60	9.52	0.03	27.15	63.62	-36.47	QP
0.200	7.60	9.52	0.03	17.15	53.62	-36.47	Average
0.668	18.40	9.74	0.03	28.17	56.00	-27.83	QP
0.668	12.80	9.74	0.03	22.57	46.00	-23.43	Average
2.636	13.10	9.60	0.06	22.76	56.00	-33.24	QP
2.636	6.00	9.60	0.06	15.66	46.00	-30.34	Average
3.565	13.80	9.59	0.08	23.47	56.00	-32.53	QP
3.565	1.30	9.59	0.08	10.97	46.00	-35.03	Average
10.125	16.10	9.81	0.13	26.04	60.00	-33.96	QP
10.125	8.20	9.81	0.13	18.14	50.00	-31.86	Average

Result Level= Reading Level + LISN Factor + Cable Loss

Test Mode :	Mode 1	Temperature :	24℃
Test Engineer :	Jack Liu	Relative Humidity :	52%
Test Voltage :	120Vac / 60Hz	Phase :	NEUTRAL
Function Type :	2.4G Linking + Charging from Adapter		



Freq	Reading level	LISN/ISN factor	Cable loss	Result level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.159	12.90	9.63	0.03	22.56	65.52	-42.96	QP
0.159	2.60	9.63	0.03	12.26	55.52	-43.26	Average
0.452	15.20	9.66	0.03	24.89	56.85	-31.96	QP
0.661	17.80	9.66	0.03	27.49	56.00	-28.51	QP
0.661	12.80	9.66	0.03	22.49	46.00	-23.51	Average
1.734	13.30	9.66	0.06	23.02	56.00	-32.98	QP
1.734	8.60	9.66	0.06	18.32	46.00	-27.68	Average
1.734	8.60	9.66	0.06	18.32	46.00	-27.68	Average
3.190	10.20	9.66	0.07	19.93	56.00	-36.07	QP
3.190	5.20	9.66	0.07	14.93	46.00	-31.07	Average
14.213	12.90	10.13	0.13	23.16	60.00	-36.84	QP
14.213	8.20	10.13	0.13	18.46	50.00	-31.54	Average

Result Level= Reading Level + LISN Factor + Cable Loss

4.4 Antenna Requirements

4.4.1 Standard Applicable

According to antenna requirement of §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 re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded..

4.4.2 Antenna Connected Construction

An embedded-in antenna design is used.

4.4.3 Antenna Gain

The antenna peak gain of EUT is 2.34 dBi.

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	Keysight	N9010A	MY56070788	2021-12-28	2022-12-27	Conducted
Power Sensor	Keysight	U2021XA	MY56510025	2021-12-30	2022-12-29	Conducted
Power Sensor	Keysight	U2021XA	MY57030005	2021-12-30	2022-12-29	Conducted
Power Sensor	Keysight	U2021XA	MY56510018	2021-12-30	2022-12-29	Conducted
Power Sensor	Keysight	U2021XA	MY56480002	2021-12-30	2022-12-29	Conducted
Thermal Chamber	Sanmtest	SMC-408-CD	2435	2022-04-18	2023-04-17	Conducted
Base Station	R&S	CMW 270	101231	2021-12-28	2022-12-27	Conducted
Signal Generator (Interferer)	Keysight	N5182B	MY56200384	2021-12-28	2022-12-27	Conducted
Signal Generator (Blocker)	Keysight	N5171B	MY56200661	2021-12-28	2022-12-27	Conducted

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV 40	101433	2021-12-29	2022-12-28	Radiation
Amplifier	Sonoma	310	363917	2021-12-29	2022-12-28	Radiation
Amplifier	Schwarzbeck	BBV 9718	327	2021-12-30	2022-12-29	Radiation
Amplifier	Narda	TTA1840-35-HG	2034380	2021-11-17	2022-11-16	Radiation
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-051	2020-02-14	2023-02-13	Radiation
Broadband Antenna	Schwarzbeck	VULB 9168	9168-757	2020-09-27	2023-09-26	Radiation
Horn Antenna	Schwarzbeck	BBHA 9120 D	1677	2020-02-14	2023-02-13	Radiation
Horn Antenna	COM-POWER	AH-1840	101117	2021-06-05	2024-06-04	Radiation
Test Software	Auidx	E3	6.111221a	N/A	N/A	Radiation
Filter	Micro-Tronics	BRM 50702	G266	N/A	N/A	Radiation

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
LISN	R&S	ENV216	102125	2021-12-29	2022-12-28	Conducted
LISN	R&S	ENV432	101327	2021-12-29	2022-12-28	Conducted
EMI Test Receiver	R&S	ESR3	102143	2021-12-30	2022-12-29	Conducted
EMI Test Software	Audix	E3	N/A	N/A	N/A	Conducted

N/A: No Calibration Required

6 Uncertainty of Evaluation

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	3.29dB
Radiated emission	30MHz ~ 1GHz	5.40dB
	1GHz ~ 18GHz	5.03dB
	18GHz ~ 40GHz	5.21dB

MEASUREMENT	UNCERTAINTY
Occupied Channel Bandwidth	±57.212Hz
RF output power, conducted	±1.04dB
Power density, conducted	±2.31dB
Emissions, conducted	±2.18dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

APPENDIX A. SETUP PHOTOGRAPHS

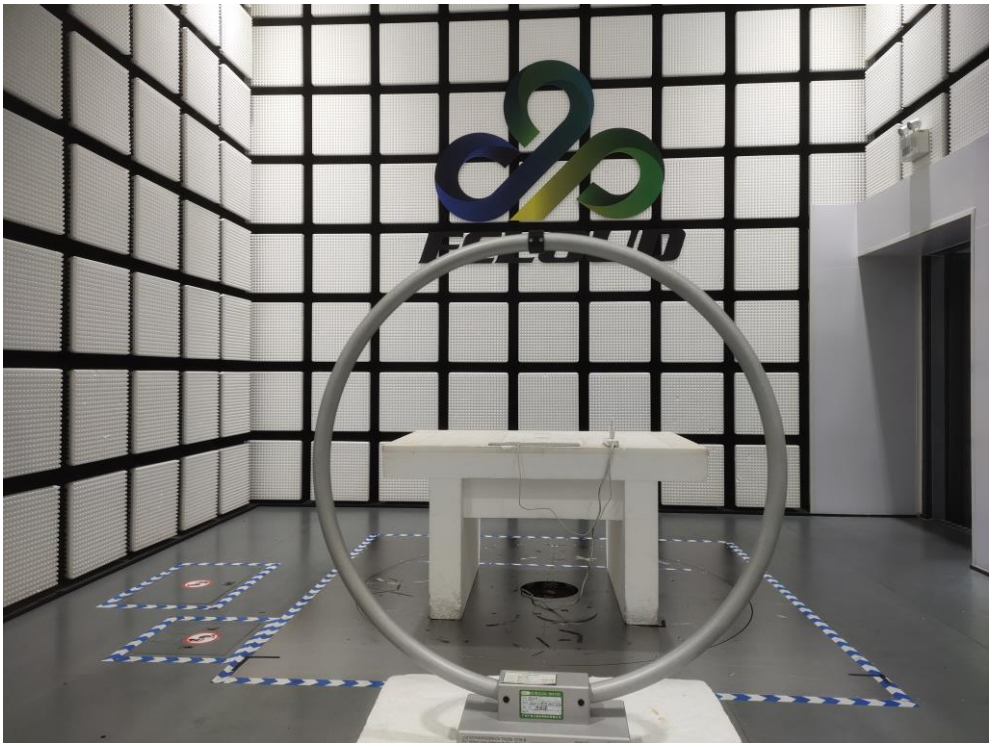


Fig. 1 Radiated emission setup photo(Below 30MHz)

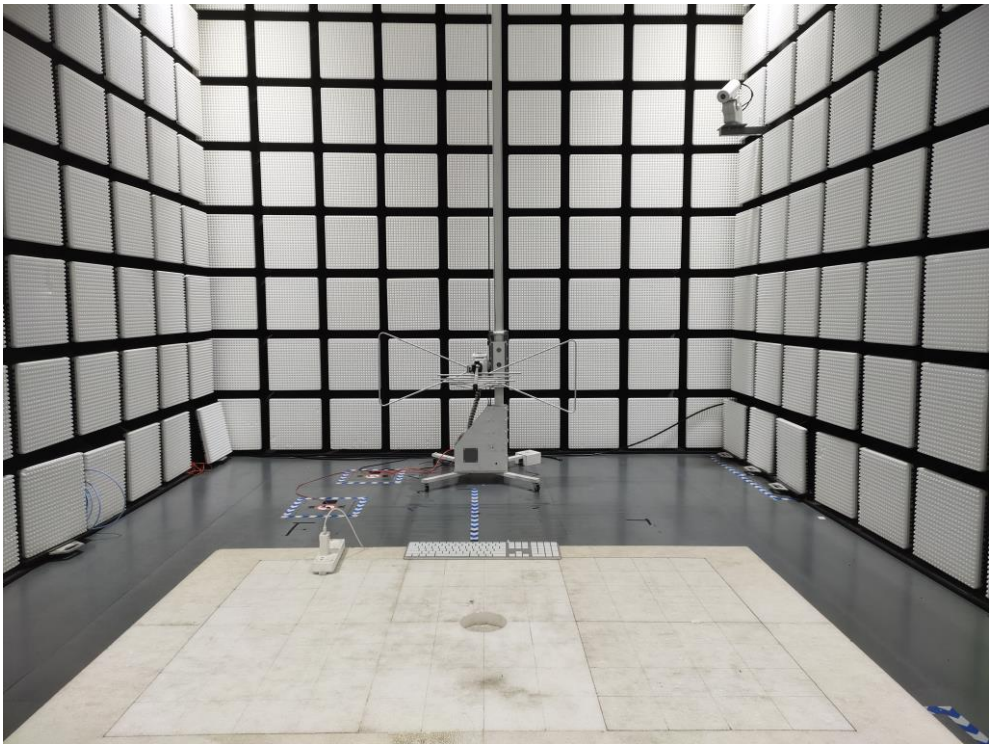


Fig. 2 Radiated emission setup photo(30MHz-1GHz)

Fig. 3 Radiated emission setup photo(Above 1GHz)

Fig. 4 Power line conducted emission setup photo

----------End of the report----------