



Certificate No.: 3745.01



China

## FCC/ISED - TEST REPORT

Report Number : **709502203712-00B** Date of Issue: March 9, 2022

Model : 9290034985,9290034986,9290034987

Product Type : LED Device

Applicant : Signify (China) Investment Co., Ltd.

Address : Building no.9, Lane 888, Tianlin Road, Minhang District Shanghai,  
200233 China

Manufacturer : Signify (China) Investment Co., Ltd.

Address : Building no.9, Lane 888, Tianlin Road, Minhang District Shanghai,  
200233 China

Test Result :  **Positive**       **Negative**

Total pages including Appendices : 37

*TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.*

*TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch issued reports.*

*This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.*



# 1 Table of Contents

1	Table of Contents.....	2
2	Details about the Test Laboratory .....	3
3	Description of the Equipment under Test.....	4
4	Summary of Test Standards .....	6
5	Summary of Test Results.....	7
6	General Remarks.....	8
7	Test Setups .....	9
8	Systems test configuration .....	12
9	Technical Requirement.....	13
9.1	Conducted Emission .....	13
9.2	Conducted peak output power and e.i.r.p.....	16
9.3	6dB bandwidth and 99% Occupied Bandwidth .....	18
9.4	Power spectral density .....	21
9.5	Spurious RF conducted emissions.....	23
9.6	Band edge.....	28
9.7	Spurious radiated emissions for transmitter .....	30
10	Test Equipment List.....	35
11	System Measurement Uncertainty .....	36
12	Photographs of Test Set-ups .....	37
13	Photographs of EUT .....	38



## 2 Details about the Test Laboratory

### Details about the Test Laboratory

#### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch  
No.16 Lane, 1951 Du Hui Road,  
Shanghai 201108,  
P.R. China

#### Designation

Number: CN1183

Test Firm FCC  
Registration  
Number: 820234

IC Company  
Number: 25988

CAB identifier: CN0101

Telephone: +86 21 6141 0123  
Fax: +86 21 6140 8600



### 3 Description of the Equipment under Test

#### Description of the Equipment Under Test

Product: LED Device

HVIN: 34985

PMN: hue

Model no.: 9290034985,9290034986,9290034987

FCC ID: 2AGBW9290034985X

IC: 20812-34985X

Options and accessories: NA

Rating: 100-130V~,50/60Hz

RF Transmission Frequency: 2405~2480MHz (Zigbee);  
2402~2480MHz (BT 5.0 LE)

Modulation: Zigbee:16-ary orthogonal modulation, O-QPSK PHY  
BLE:GFSK PHY

Channel list:

Operation Frequency each of channel: Zigbee			
Channel	Frequency	Channel	Frequency
11	2405 MHz	19	2445 MHz
12	2410 MHz	20	2450 MHz
13	2415 MHz	21	2455 MHz
14	2420 MHz	22	2460 MHz
15	2425 MHz	23	2465 MHz
16	2430 MHz	24	2470 MHz
17	2435 MHz	25	2475 MHz
18	2440 MHz	26	2480 MHz



<b>Operation Frequency each of channel: Bluetooth Low Energy</b>							
Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Antenna Type: Onboard PCB antenna

Antenna Gain: 2.08dBi

Description of the EUT: The Equipment Under Test (EUT) is a LED Device which support 2.4GHz Zigbee (250kbps data rate) and BT 5.0 LE (1Mbps,2Mbps,500kbps and 125kbps data rate). There are 3 models in all, only different is the size of the LED device. We chose model 9290034987 to perform all tests and listed the worst data in this report.

Test sample no.: SHA-601395-00

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.



## 4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5 Amendment 1 March 2019	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2013).

## 5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition	Pages	Test Site	Test Result			
			Pass	Fail	N/A	
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	13-15	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (b) (3) & RSS-247 5.4(d)	Conducted peak output power	15-17	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1) & RSS-247 5.1(b)	20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1) & RSS-247 5.1(b)	Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(2) & RSS-247 5.2(a) & RSSGEN 6.7	6dB bandwidth and 99% Occupied Bandwidth	18-20	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e) & RSS-247 5.2(b)	Power spectral density	21-22	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	23-26	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & RSS-247 5.5	Band edge	27-28	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	29-33	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses an onboard PCB antenna, which gain is 2.08dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



## 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: 2AGBW9290034985X, IC: 20812-34985X complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-247, RSS-GEN.

This report is only for the 2.4GHz Zigbee test report, for the 2.4GHz BLE test report please refer to 709502203712-00A.

### SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: January 12, 2022

Testing Start Date: January 26, 2022

Testing End Date: March 3, 2022

-TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:

Prepared by:

Tested by:



Hui TONG  
Review Engineer

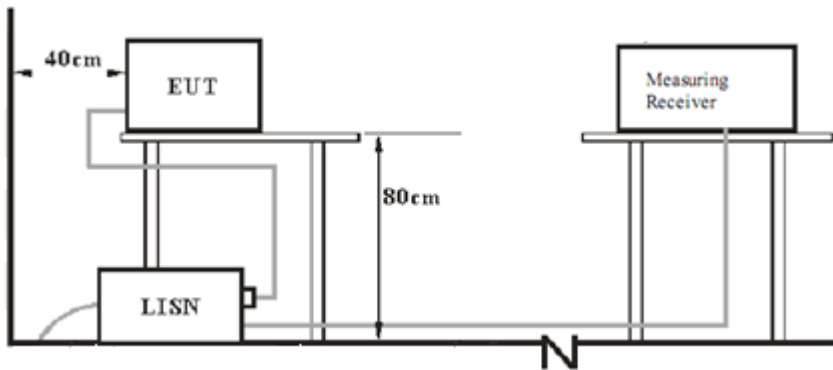
Jiayi XU  
Project Engineer

Wang Yiquan  
Test Engineer



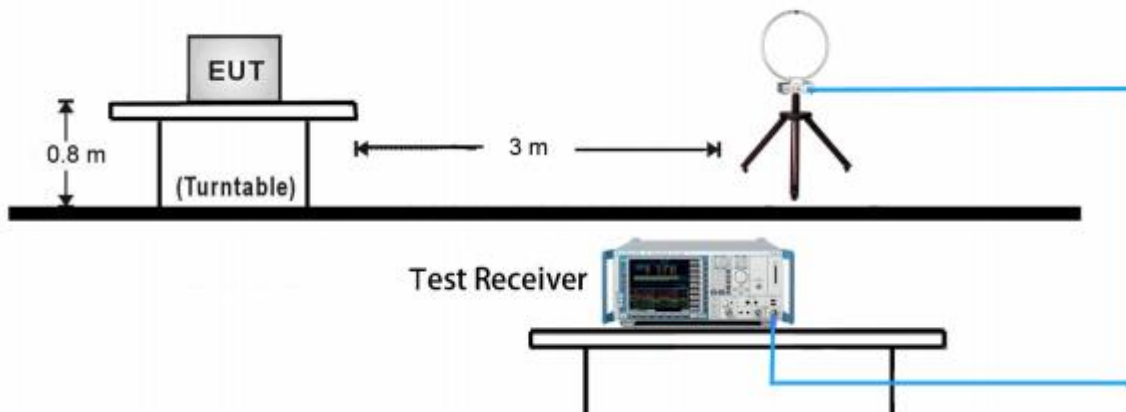
## 7 Test Setups

### 7.1 AC Power Line Conducted Emission test setups

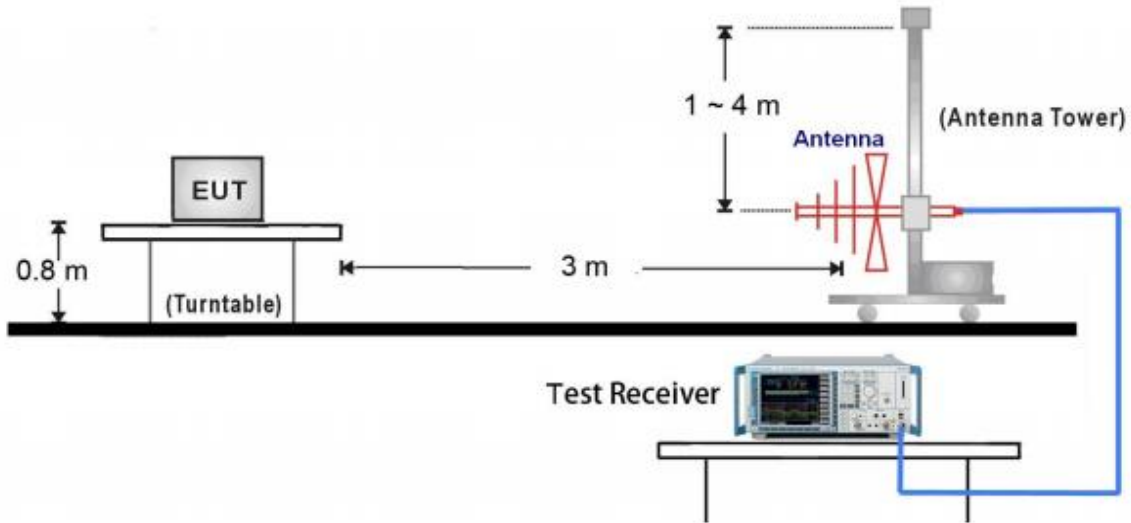


### 7.2 Radiated test setups

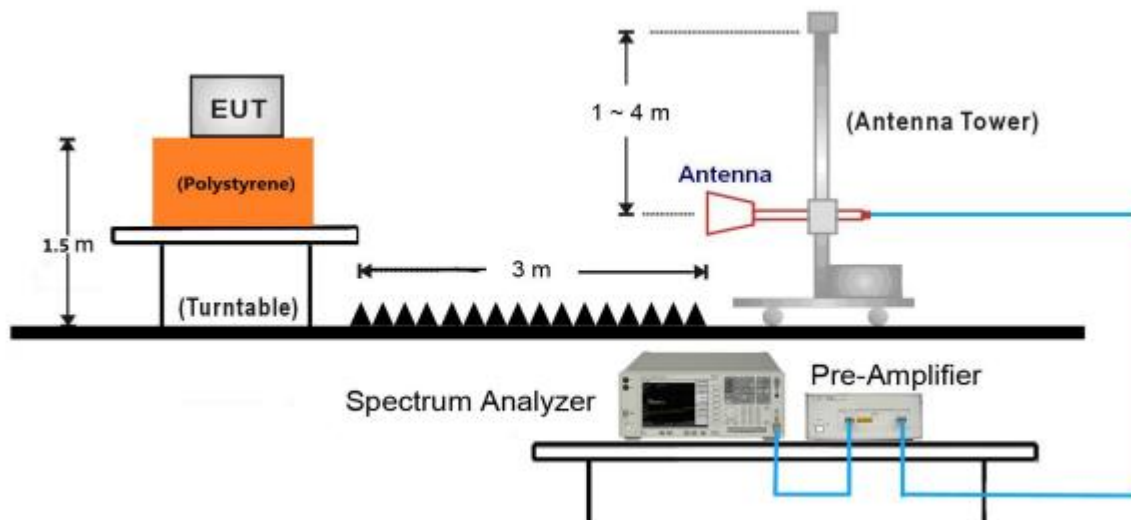
#### 9kHz ~ 30MHz Test Setup:



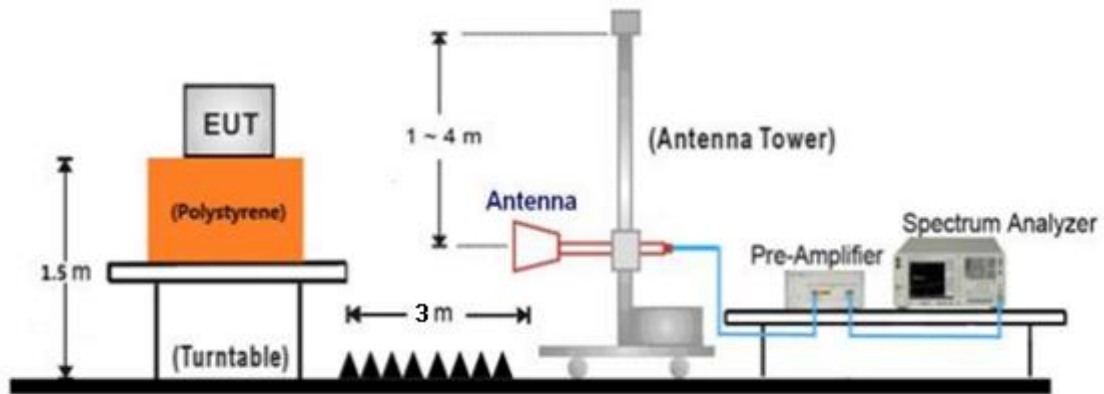
30MHz ~ 1GHz Test Setup:



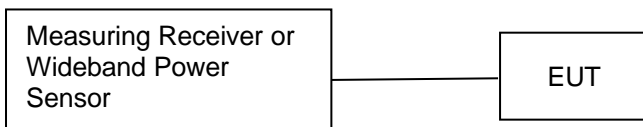
1GHz ~ 18GHz Test Setup:



### 18GHz ~ 40GHz Test Setup:



### 7.3 Conducted RF test setups



## 8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenove	E470	PF-OU5TS7 17/09

Test software: HueApprobationTool

The system was configured to channel 11, 18, and 26 for the test.

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.



## 9 Technical Requirement

### 9.1 Conducted Emission

#### Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

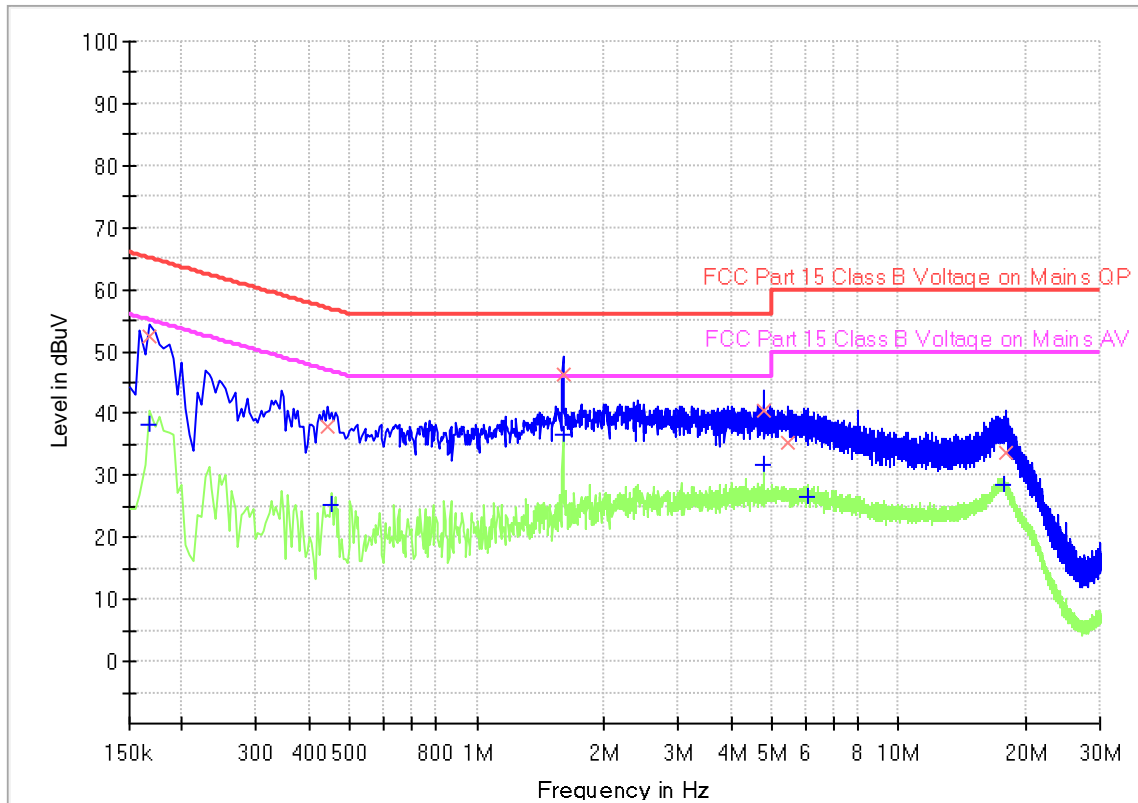
#### Limit

Frequency MHz	QP Limit dB $\mu$ V	AV Limit dB $\mu$ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

## Conducted Emission

Product Type : LED Device  
 M/N : 9290034987  
 Operating Condition : Mode 1: Tx\_2405MHz  
 Test Specification : L-line  
 Comment : AC 120V/60Hz



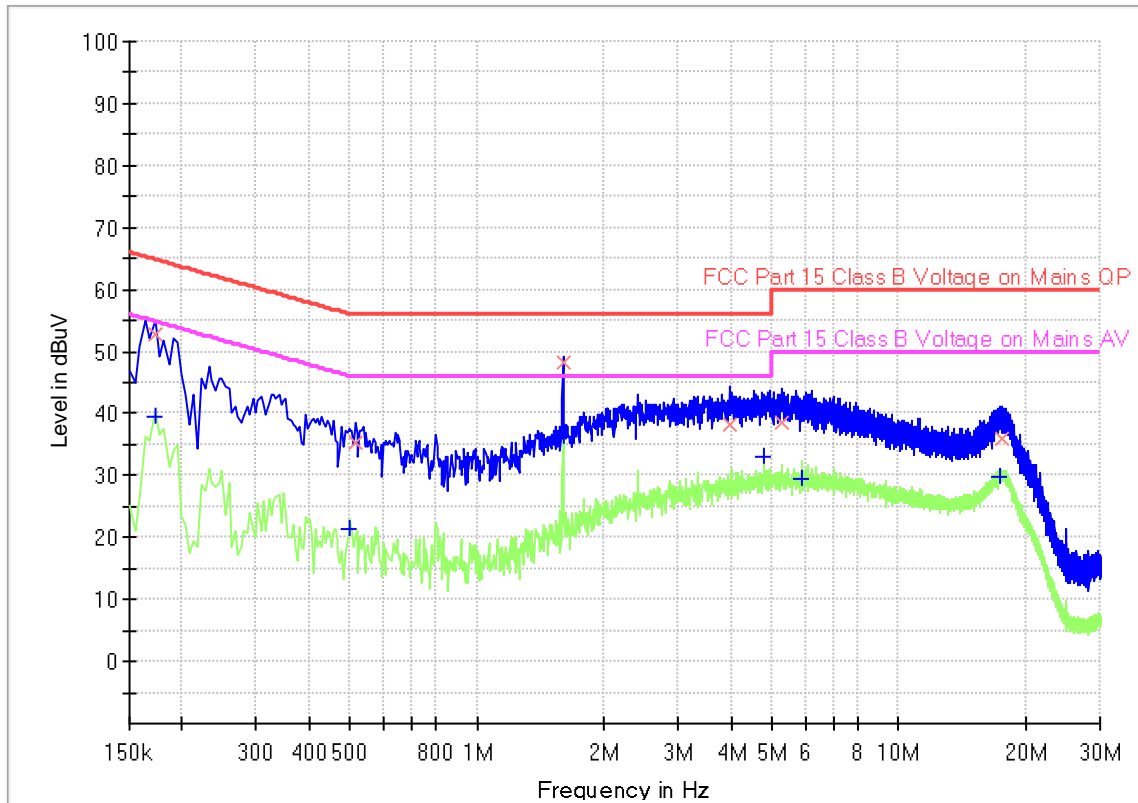
## Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.168000	---	38.11	55.06	16.95	1000.0	9.000	L1	19.5
0.168000	52.28	---	65.06	12.78	1000.0	9.000	L1	19.5
0.442500	37.92	---	57.01	19.09	1000.0	9.000	L1	19.5
0.451500	---	25.36	46.85	21.49	1000.0	9.000	L1	19.5
1.599000	---	36.59	46.00	9.41	1000.0	9.000	L1	19.5
1.599000	46.27	---	56.00	9.73	1000.0	9.000	L1	19.5
4.798500	40.52	---	56.00	15.48	1000.0	9.000	L1	19.6
4.798500	---	31.79	46.00	14.21	1000.0	9.000	L1	19.6
5.478000	35.16	---	60.00	24.84	1000.0	9.000	L1	19.6
6.112500	---	26.62	50.00	23.38	1000.0	9.000	L1	19.6
17.691000	---	28.50	50.00	21.50	1000.0	9.000	L1	19.8
18.028500	33.72	---	60.00	26.28	1000.0	9.000	L1	19.8

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)  
 Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator



Product Type : LED Device  
 M/N : 9290034987  
 Operating Condition : Mode 1: Tx\_2405MHz  
 Test Specification : N-line  
 Comment : AC 120V/60Hz



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.172500	---	39.54	54.84	15.30	1000.0	9.000	N	19.5
0.172500	52.70	---	64.84	12.14	1000.0	9.000	N	19.5
0.501000	---	21.30	46.00	24.70	1000.0	9.000	N	19.5
0.514500	35.20	---	56.00	20.80	1000.0	9.000	N	19.5
1.599000	---	36.21	46.00	9.79	1000.0	9.000	N	19.5
1.599000	48.21	---	56.00	7.79	1000.0	9.000	N	19.5
3.975000	38.13	---	56.00	17.87	1000.0	9.000	N	19.5
4.798500	---	32.93	46.00	13.07	1000.0	9.000	N	19.5
5.302500	38.45	---	60.00	21.55	1000.0	9.000	N	19.6
5.905500	---	29.49	50.00	20.51	1000.0	9.000	N	19.6
17.308500	---	29.95	50.00	20.05	1000.0	9.000	N	19.8
17.619000	35.93	---	60.00	24.07	1000.0	9.000	N	19.8

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)  
 Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator



## 9.2 Conducted peak output power and e.i.r.p.

### Test Method

1. Use the following spectrum analyzer settings:  
 RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW  
 Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Use a power meter to measure the conducted peak output power.

### Limits

According to §15.247 (b) (1) & RSS-247 5.4(d), limit as below:

conducted peak output power

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

e.i.r.p.

Frequency Range MHz	Limit (EIRP) W	Limit dBm
2400-2483.5	≤4	≤36

Test result as below table

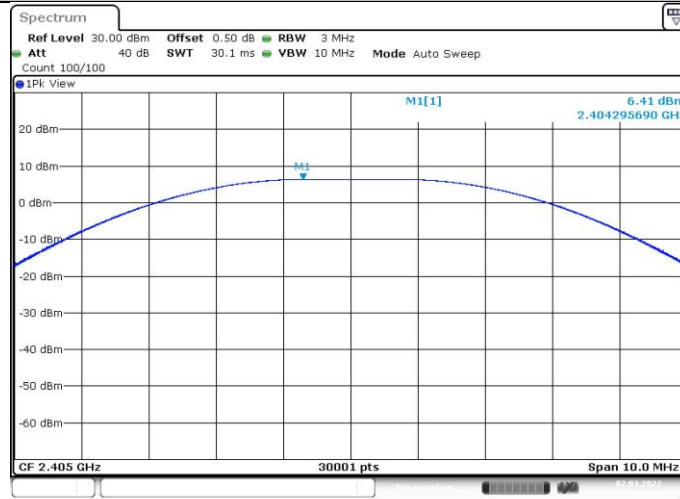
TestMode	Channel	Conducted Peak Output Power Result[dBm]	Limit[dBm]	Verdict
ZIGB	2405	6.41	≤30	PASS
	2440	6.02	≤30	PASS
	2480	5.81	≤30	PASS

TestMode	Channel	EIRP Result[dBm]	Limit[dBm]	Verdict
ZIGB	2405	8.49	≤36	PASS
	2440	8.10	≤36	PASS
	2480	7.89	≤36	PASS





ZIGB\_Ant1\_2405



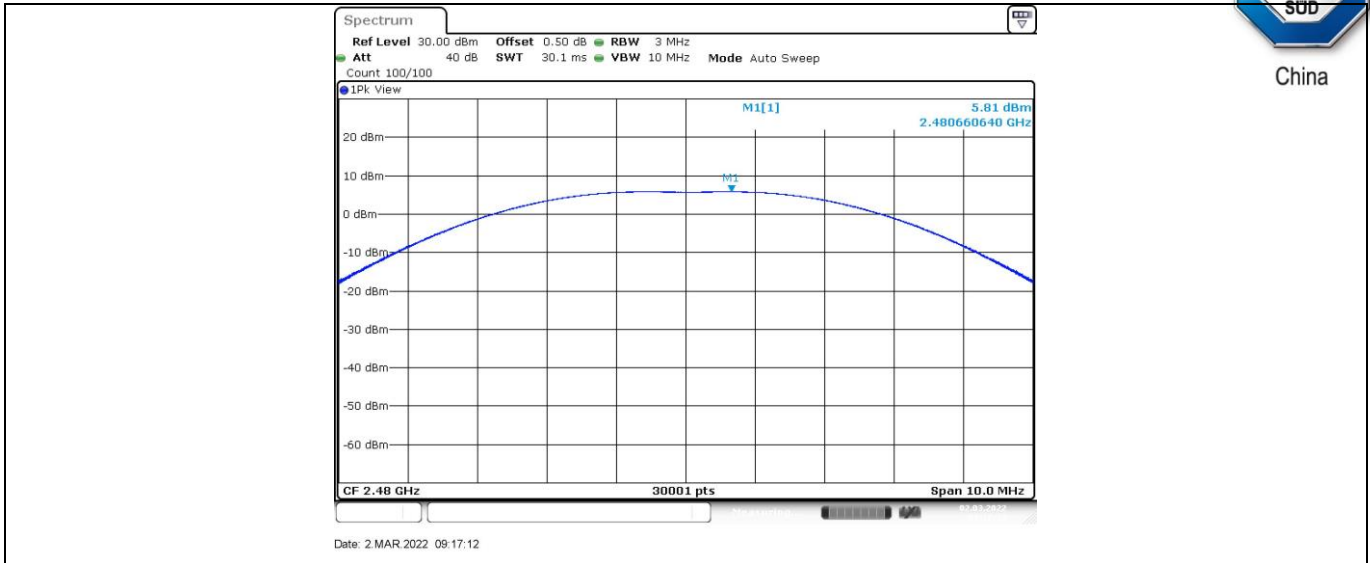
Date: 2.MAR.2022 09:12:21

ZIGB\_Ant1\_2440



Date: 2.MAR.2022 09:14:54

ZIGB\_Ant1\_2480



### 9.3 6dB bandwidth and 99% Occupied Bandwidth

#### Test Method

1. Use the following spectrum analyzer settings:  
RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

#### Limit

Limit [kHz]

≥500

#### Test Method for 99 % Bandwidth

1. Use the following spectrum analyzer settings:  
RBW=1% to 5% of the actual occupied, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

#### Limit

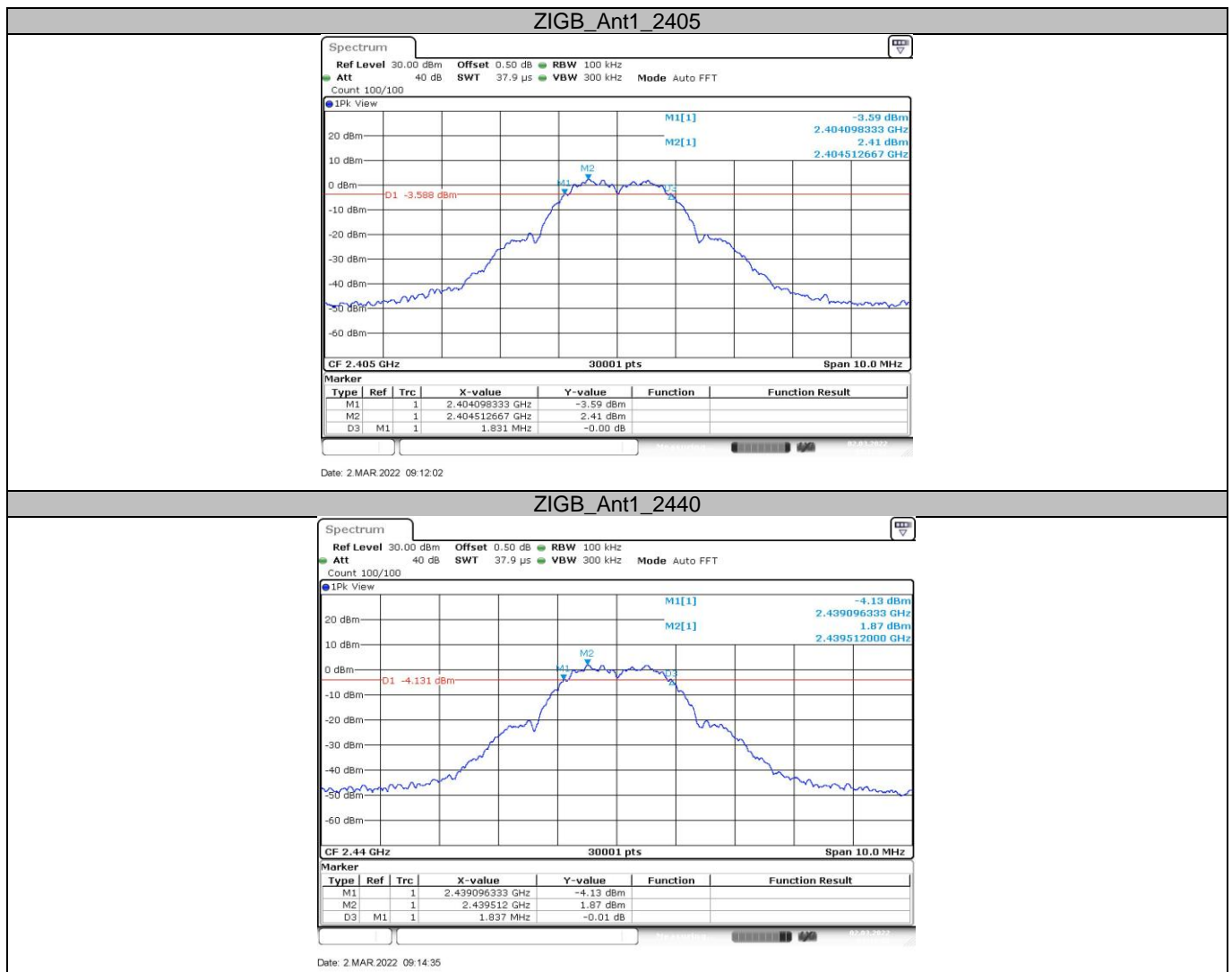
Limit [kHz]

N/A

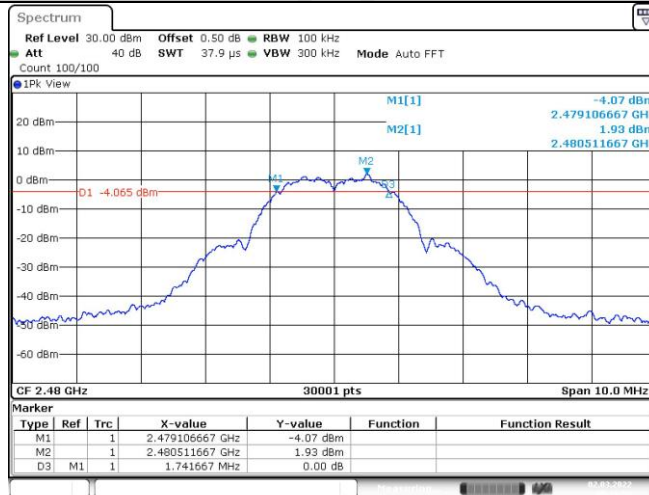
Test result

Frequency	6dB bandwidth	Result	99% occupied bandwidth
MHz	kHz		MHz
2402	1831	Pass	2.368
2440	1837	Pass	2.368
2480	1742	Pass	2.378

6dB Bandwidth



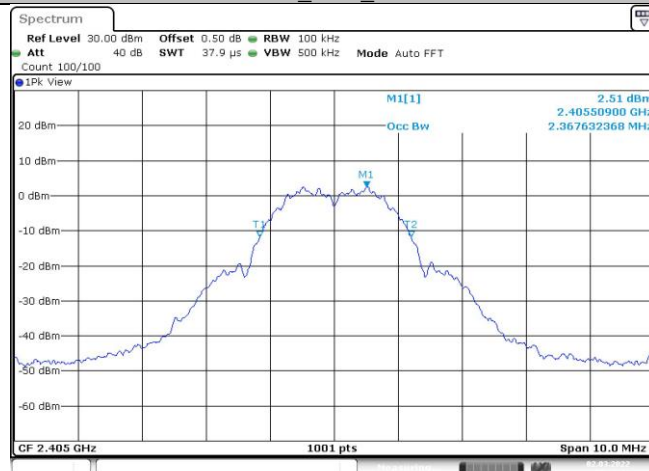
ZIGB\_Ant1\_2480



Date: 2.MAR.2022 09:16:53

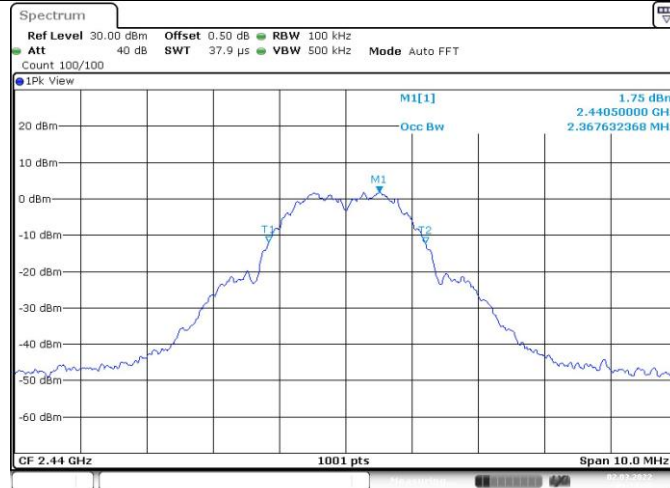
99% Occupied Bandwidth

ZIGB\_Ant1\_2405



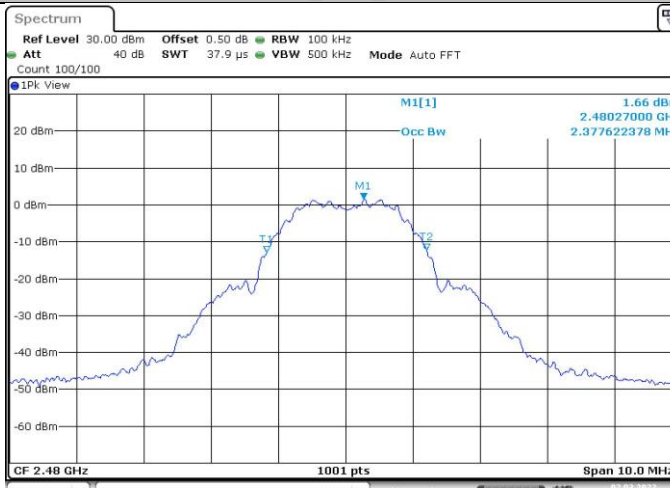
Date: 2.MAR.2022 09:12:12

ZIGB\_Ant1\_2440



Date: 2.MAR.2022 09:14:46

ZIGB\_Ant1\_2480



Date: 2.MAR.2022 09:17:03

### 9.4 Power spectral density

#### Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.  
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

#### Limit

Limit [dBm/3kHz]

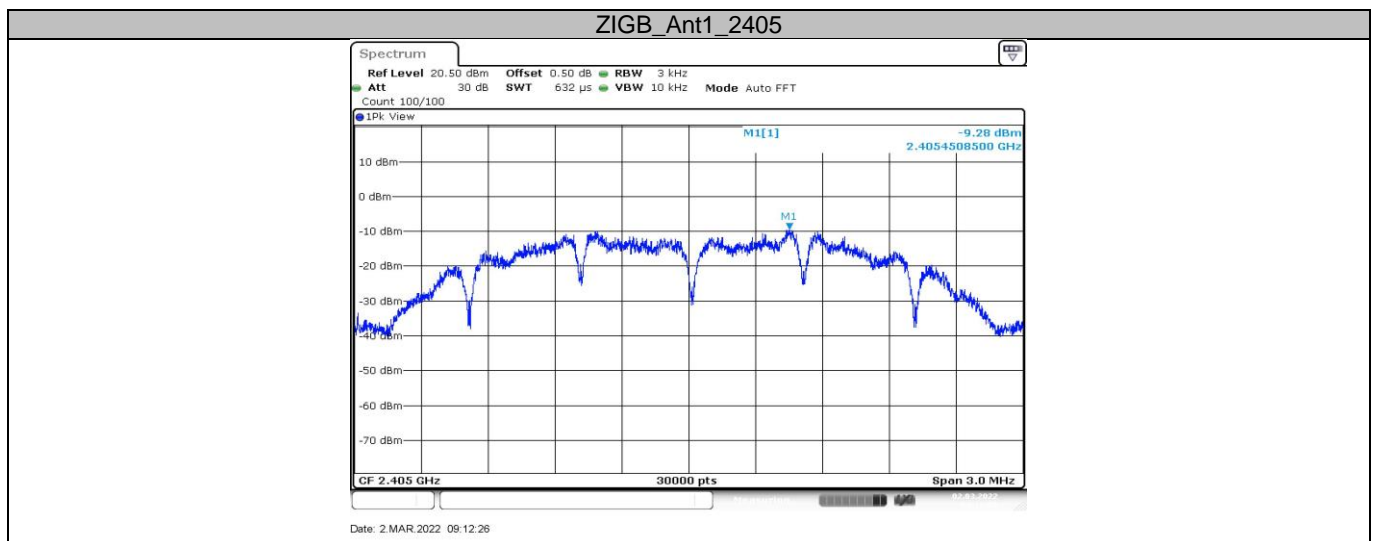
≤8



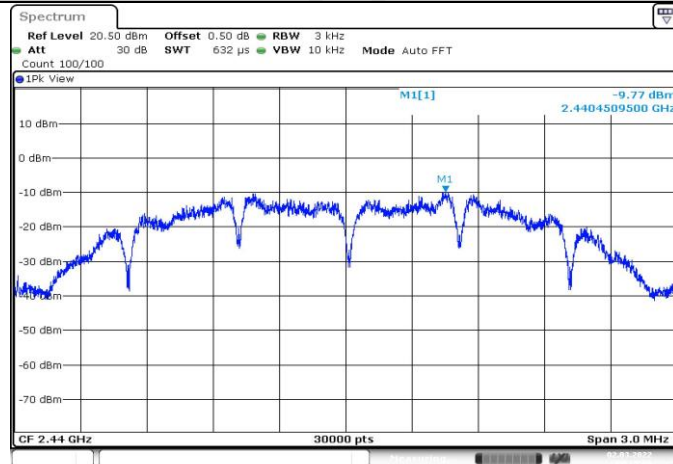
**Test result**

Frequency MHz	Power spectral density dBm/3kHz	Result
Top channel 2405MHz	-9.28	Pass
Middle channel 2440MHz	-9.77	Pass
Bottom channel 2480MHz	-10.02	Pass

**Power spectral density**

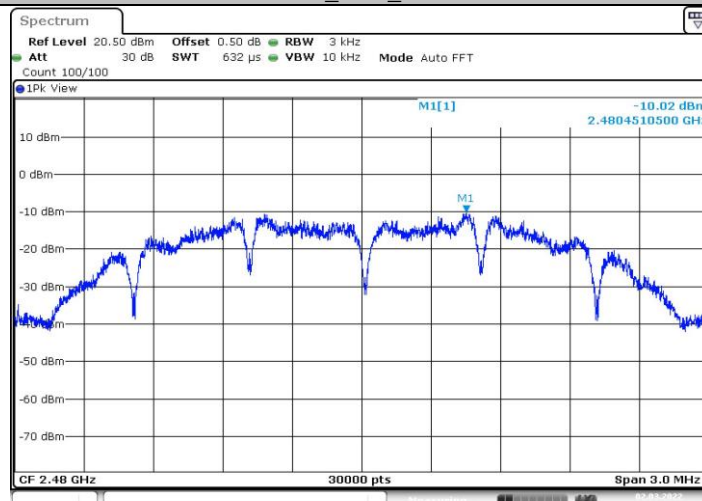


ZIGB\_Ant1\_2440



Date: 2.MAR.2022 09:15:00

ZIGB\_Ant1\_2480



Date: 2.MAR.2022 09:17:18

## 9.5 Spurious RF conducted emissions

### Test Method

1. Establish a reference level by using the following procedure:
  - a. Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
  - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
  - a. Set the center frequency and span to encompass frequency range to be measured.
  - b. 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) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

### Limit



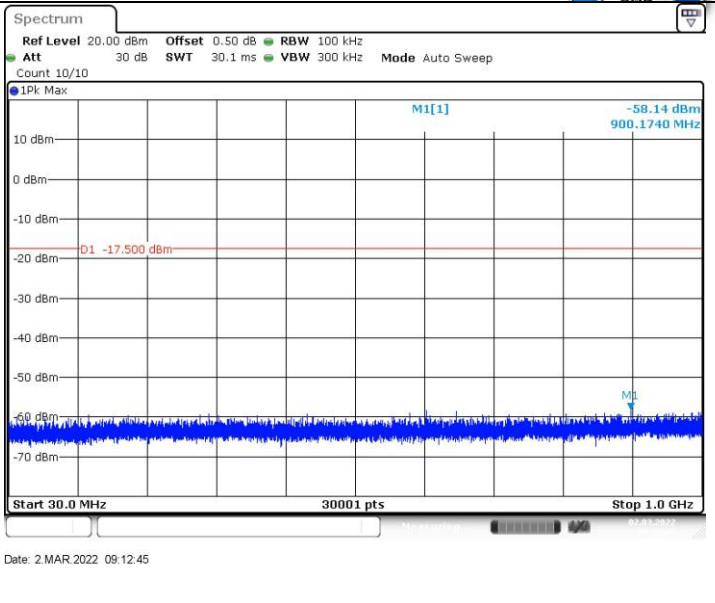
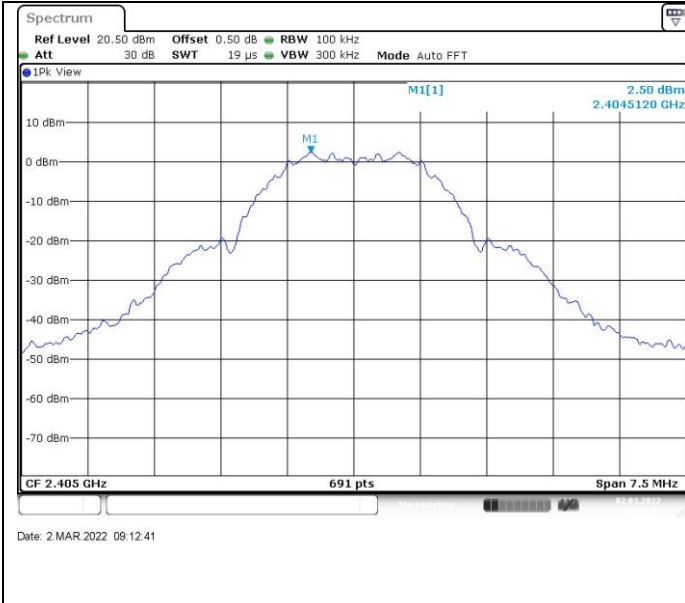
China

Frequency Range MHz	Limit (dBc)
30-25000	-20

**Spurious RF conducted emissions**

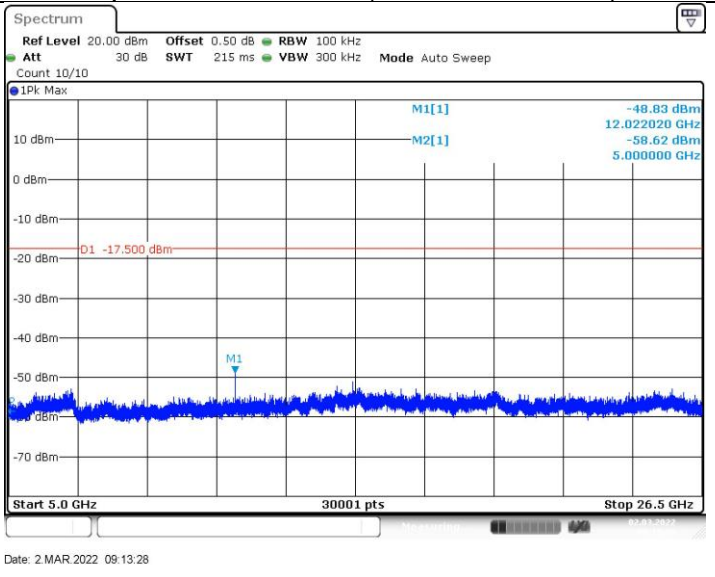
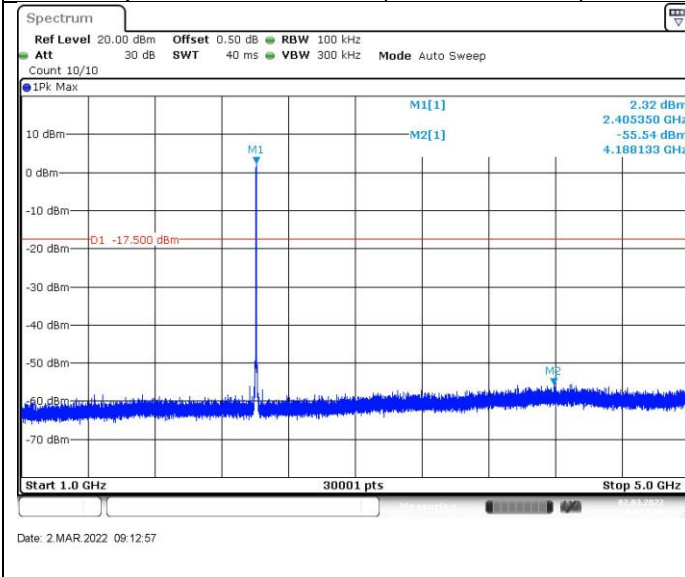
Out-of-Band Emissions	
Channel 11 (2405MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)





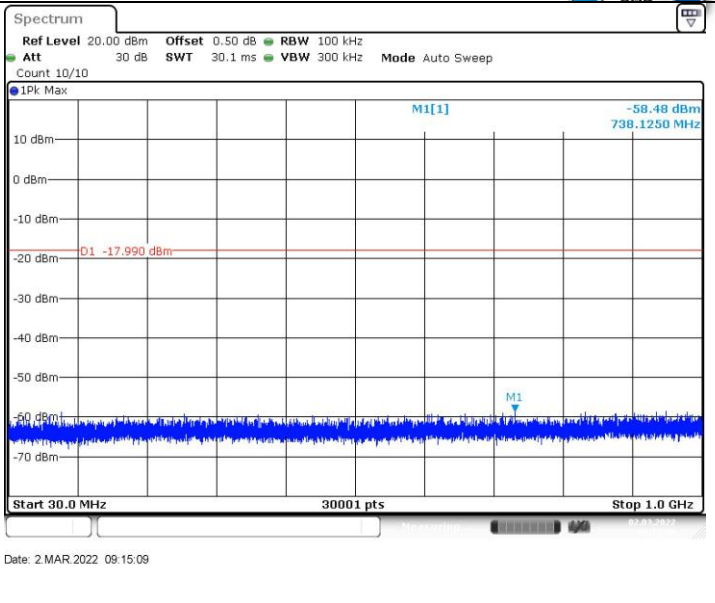
Spurious Emission (1GHz –5GHz)

Spurious Emission (5GHz –26.5GHz)

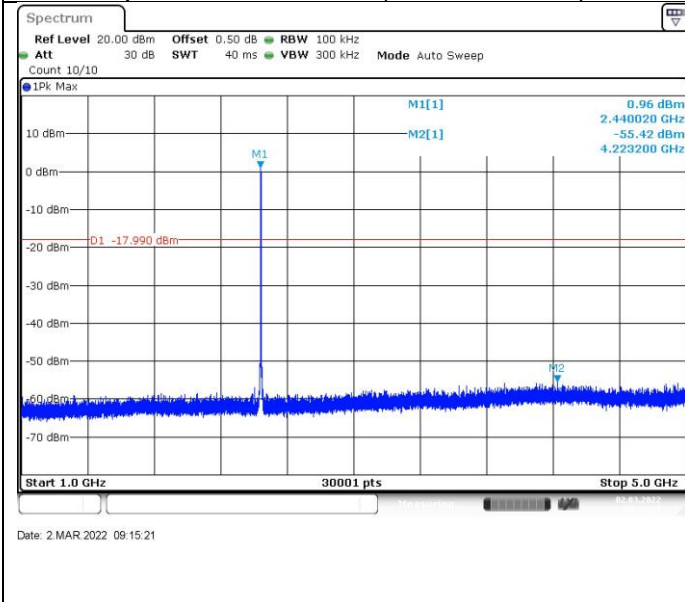


Out-of-Band Emissions  
Channel 18 (2440MHz)

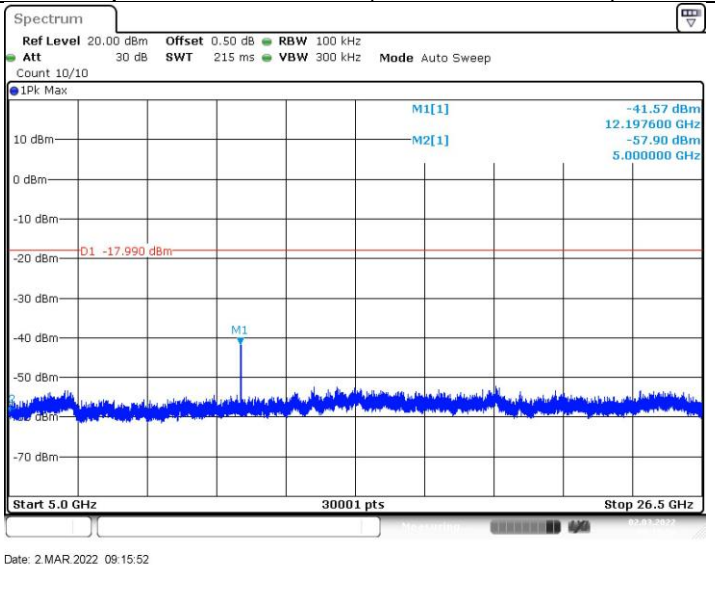
Reference point	Spurious Emission (30MHz – 1GHz)
-----------------	----------------------------------



Spurious Emission (1GHz –5GHz)

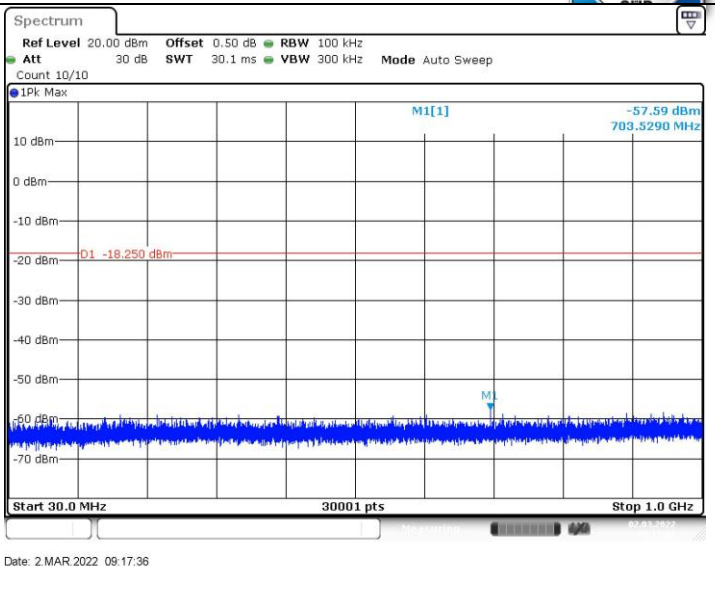
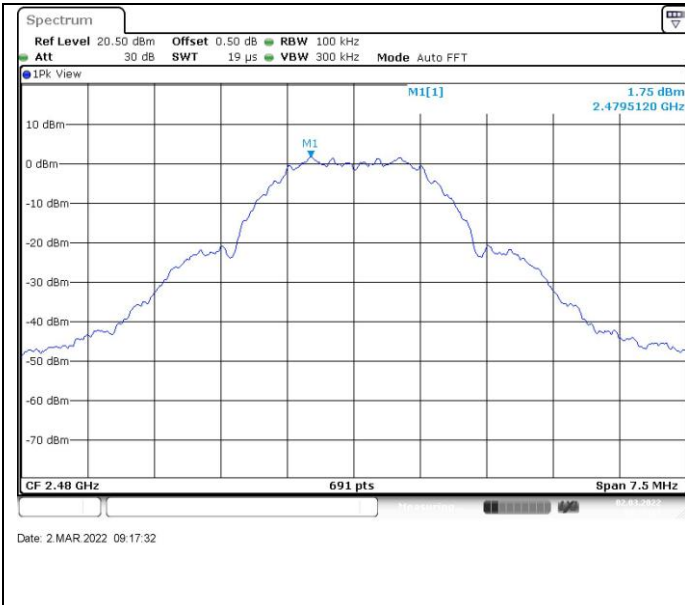


Spurious Emission (5GHz –26.5GHz)



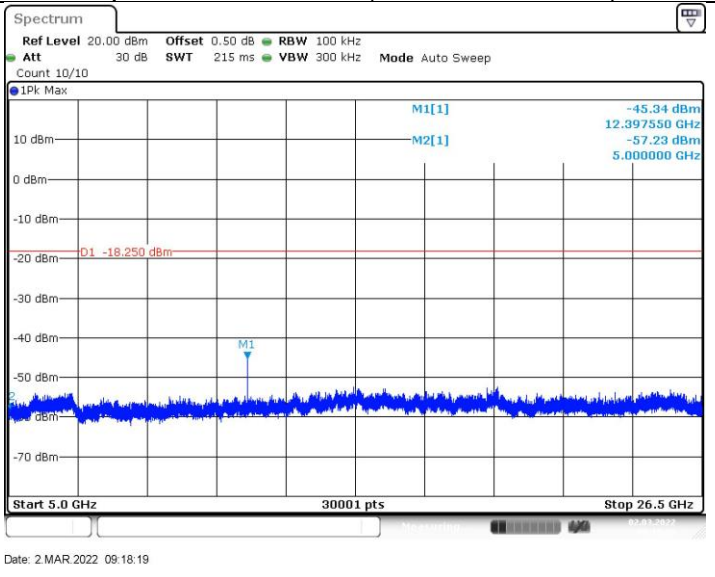
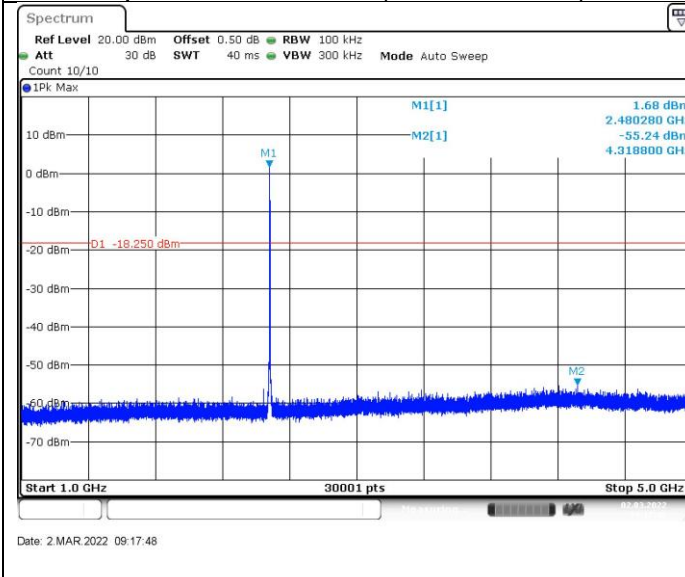
Out-of-Band Emissions  
Channel 26 (2480MHz)

Reference point	Spurious Emission (30MHz – 1GHz)
-----------------	----------------------------------



Spurious Emission (1GHz –5GHz)

Spurious Emission (5GHz –26.5GHz)



## 9.6 Band edge

### Test Method

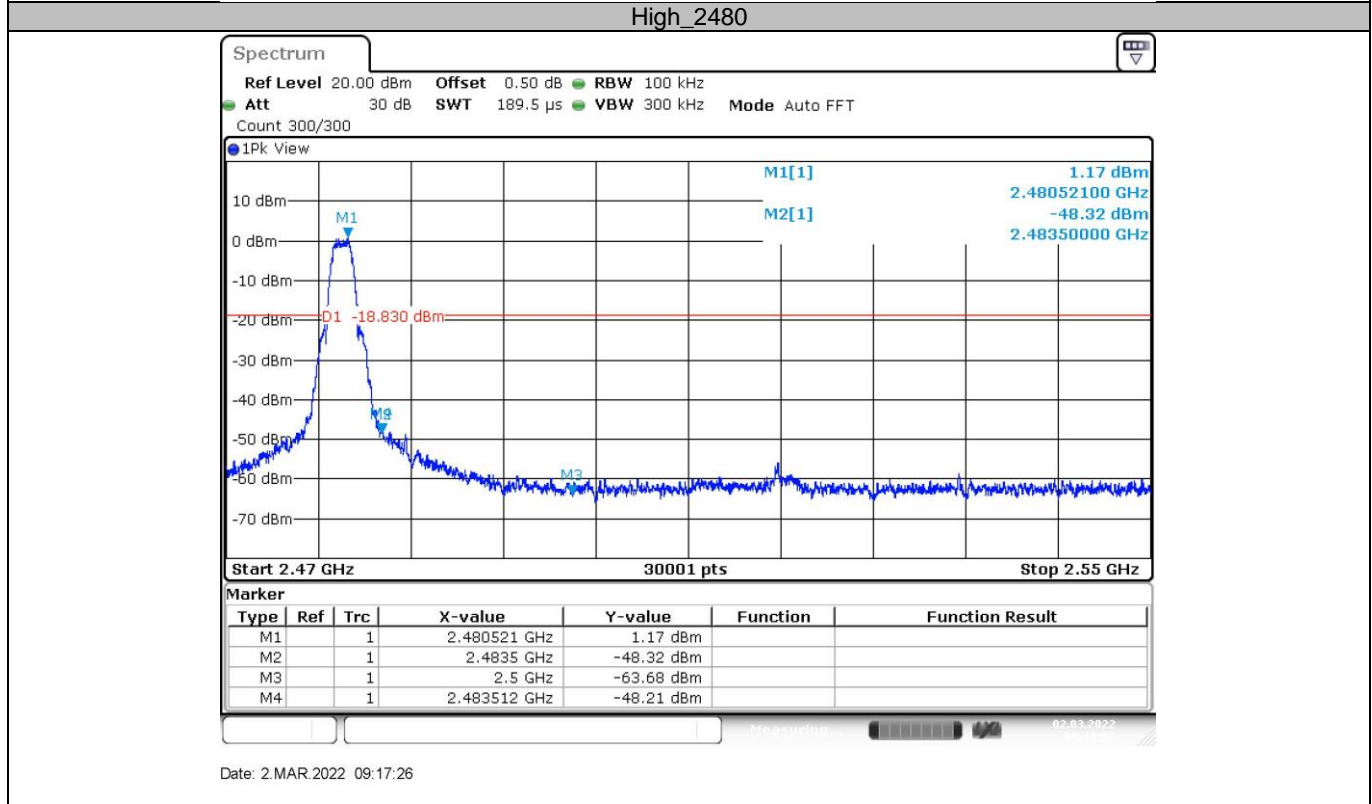
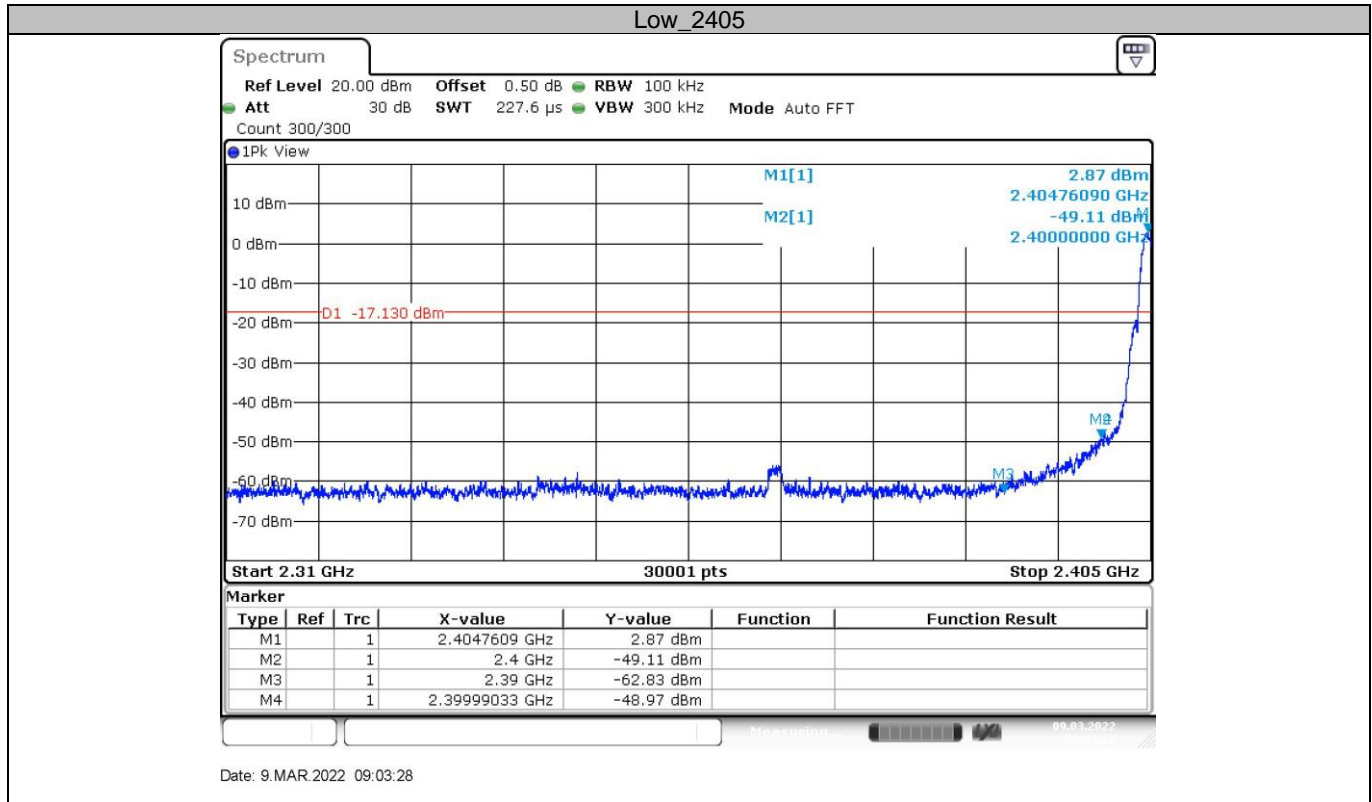
- 1 Use the following spectrum analyzer settings:  
Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 100 kHz, VBW $\geq$ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

### Limit

According to §15.247(d) and RSS-247 5.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen 8.10, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.



Test result



## 9.7 Spurious radiated emissions for transmitter

### Test Method

1. The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Use the following spectrum analyzer settings According to C63.10:

#### For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 100 kHz to 120 kHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

#### For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

#### Procedures for average unwanted emissions measurements above 1000 MHz

- a) RBW = 1MHz.
- b) VBW ≥ [3 × RBW].
- c) Detector = RMS (power averaging), if  $[\text{span} / (\# \text{ of points in sweep})] \leq \text{RBW} / 2$ . Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
- d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of  $1 / D$ , where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then 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:

- 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is  $[10 \log (1 / D)]$ , where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
- 2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is  $[20 \log (1 / D)]$ , where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
- 3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

## Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205 and RSS-GEN 8.10 must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Measured Distance Meters
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30	30	30

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

### Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Pre-scan with three orthogonal axis and worst case as X axis. The only worse case test result is listed in the report.

### Test result

Channel 11 (2405MHz)					
Frequency	Measure	Limit	Margin	Detector	Polarization
(MHz)	Level (dBuV/M)	(dBuV/M)	(dB)		
2384.2	43.92	74	30.08	Peak	Horizontal
4810.4	43.22	74	30.78	Peak	Horizontal
7216.3	54.51	74	19.49	Peak	Horizontal
7216.3	51.10	54	2.90	AV	Horizontal
2383.3	43.57	74	30.43	Peak	Vertical
4810.4	42.51	74	31.49	Peak	Vertical
7213.5	51.96	74	22.04	Peak	Vertical
Channel 18 (2440MHz)					
Frequency	Measure	Limit	Margin	Detector	Polarization
(MHz)	Level (dBuV/M)	(dBuV/M)	(dB)		
4880.1	43.25	74	30.75	Peak	Horizontal
7351.7	53.00	54	1.00	AV	Horizontal
7351.7	50.17	74	23.83	Peak	Horizontal
4880.1	46.06	74	27.94	Peak	Vertical
7348.3	49.61	74	24.39	Peak	Vertical
Channel 26 (2480MHz)					
Frequency	Measure	Limit	Margin	Detector	Polarization
(MHz)	Level (dBuV/M)	(dBuV/M)	(dB)		
2483.5	57.24	74	16.76	Peak	Horizontal
2483.5	49.7	54	4.30	AV	Horizontal
7441.2	53.68	74	20.32	Peak	Horizontal
7441.2	50.4	54	3.60	AV	Horizontal
2483.5	51.7	74	22.3	Peak	Vertical
7441.3	49.73	74	24.27	Peak	Vertical

### Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

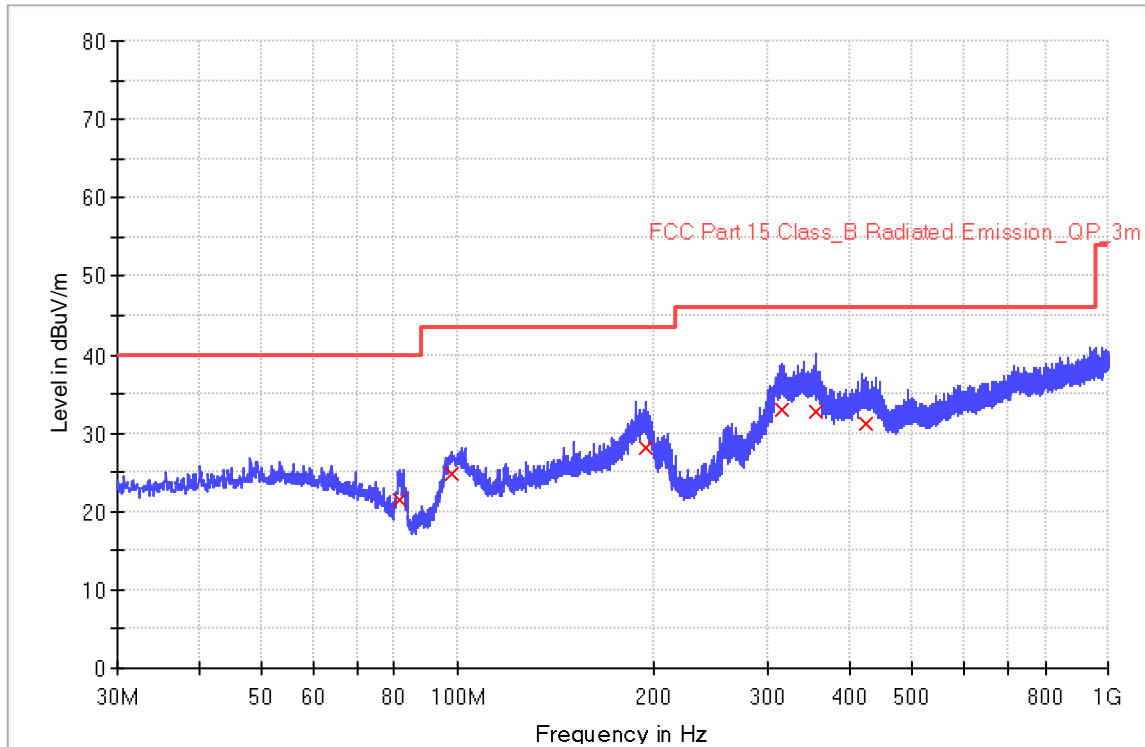




The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2022/03/01 - 10:14
Limit: FCC_Part15.209_RE(3m)_ClassB	Engineer: Wang Yiquan
Probe: VULB9168	Polarity: Horizontal
EUT: LED Device, Model no: 9290034987	Power: AC 120V,60Hz
Note: Transmit by at channel 2405MHz.	

RE\_VULB9168\_pre\_Cont\_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
81.200000	21.4	1000.0	120.000	100.1	H	309.0	15.5	18.7	40.0
97.840000	24.8	1000.0	120.000	100.1	H	242.0	15.8	18.7	43.5
194.160000	28.2	1000.0	120.000	100.1	H	185.0	18.3	15.3	43.5
316.120000	33.0	1000.0	120.000	100.1	H	33.0	22.0	13.0	46.0
355.400000	32.7	1000.0	120.000	100.1	H	91.0	22.6	13.3	46.0
425.320000	31.1	1000.0	120.000	100.1	H	144.0	25.1	14.9	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

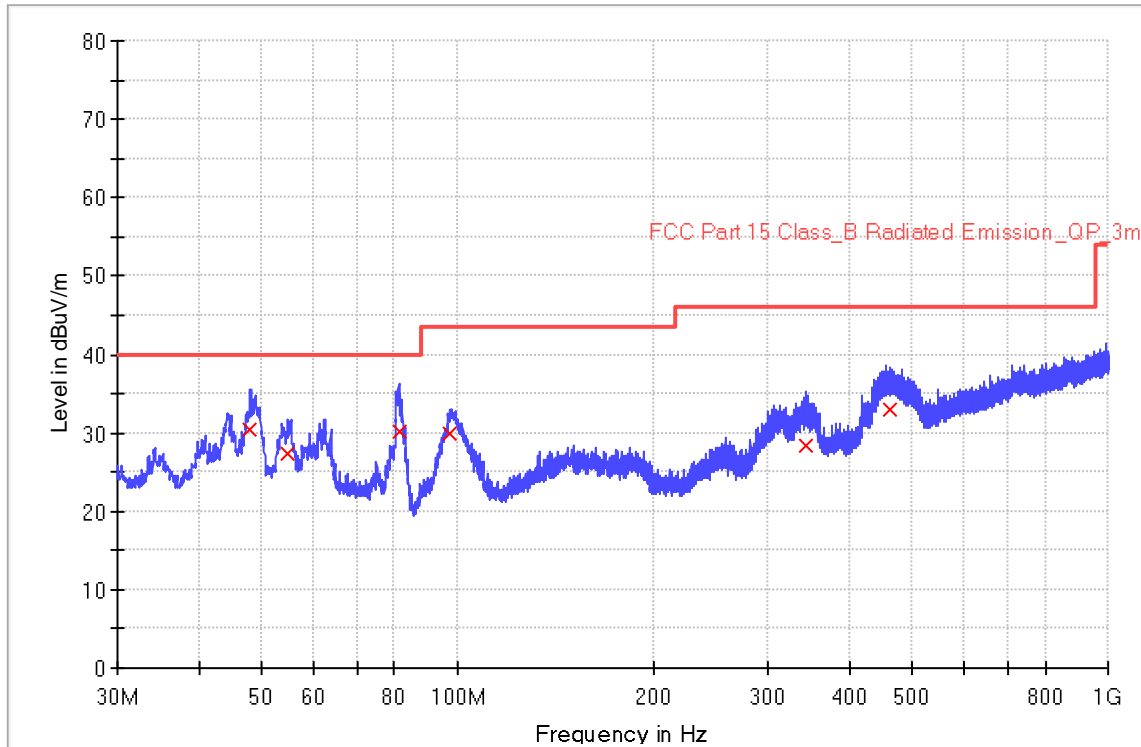
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2022/03/01 - 10:43
Limit: FCC_Part15.209_RE(3m)_ClassB	Engineer: Wang Yiquan
Probe: VULB9168	Polarity: Vertical
EUT: LED Device, Model no: 9290034987	Power: AC 120V,60Hz
Note: Transmit by at channel 2405MHz.	

RE\_VULB9168\_pre\_Cont\_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
48.040000	30.5	1000.0	120.000	100.1	V	59.0	20.5	9.5	40.0
54.680000	27.4	1000.0	120.000	100.1	V	335.0	20.4	12.6	40.0
81.200000	30.2	1000.0	120.000	100.1	V	99.0	15.5	9.8	40.0
97.560000	30.0	1000.0	120.000	100.1	V	138.0	15.8	13.6	43.5
343.440000	28.5	1000.0	120.000	100.1	V	241.0	22.6	17.5	46.0
461.560000	33.0	1000.0	120.000	100.1	V	187.0	25.8	13.0	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



## 10 Test Equipment List

List of Test Instruments  
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2021-8-2	2022-8-1
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2021-8-2	2022-8-1
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2021-8-2	2022-8-1
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-3-16	2022-3-15
	Horn Antenna	Rohde & Schwarz	HF907	102393	2021-3-15	2024-3-14
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2021-8-2	2022-8-1
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2021-5-21	2022-5-20
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2020-9-23	2023-9-22
3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-8	2024-5-7	
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2021-8-2	2022-8-1
	LISN	Rohde & Schwarz	ENV216	101924	2021-8-2	2022-8-1

### Measurement Software Information

Test Item	Software	Manufacturer	Version
C	Bluetooth and WiFi Test System	Shenzhen JS tonscond co.,ltd	2.6.77.0518
RE	EMC 32	Rohde & Schwarz	V9.15.00
CE	EMC 32	Rohde & Schwarz	V9.15.03

#### C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density\*
- Spurious RF conducted emissions
- Band edge



## 11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, $\pm 3.16\text{dB}$
Radiated Disturbance	30MHz to 1GHz, $\pm 5.03\text{dB}$ (Horizontal) $\pm 5.12\text{dB}$ (Vertical) 1GHz to 18GHz, $\pm 5.49\text{dB}$ 18GHz to 40GHz, $\pm 5.63\text{dB}$
Carrier power conducted measurement	50MHz~18GHz, $\pm 1.238\text{dB}$
Spurious Emission Conducted Measurement	9kHz ~40GHz, $\pm 1.224\text{dB}$

### Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.



## 12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



## 13 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

---

THE END