# **FCC RF Test Report**

APPLICANT : Xiaomi Communications Co., Ltd.

**EQUIPMENT**: Mobile Phone

BRAND NAME : Xiaomi

MODEL NAME : 2406APNFAG FCC ID : 2AFZZPNFAG

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

TEST DATE(S) : May 02, 2024 ~ May 29, 2024

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

This report contains data that were produced under subcontract by Sporton International Inc. (Shenzhen)

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

JasonJia

Approved by: Jason Jia





Report No.: FR442515B

# Sporton International Inc. (Kunshan)

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

Page Number : 1 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

# **TABLE OF CONTENTS**

REV	ISION	I HISTORY	3
SUN	/MAR	Y OF TEST RESULT	4
1	GENE	RAL DESCRIPTION	5
	1.1	Applicant	5
	1.2	Manufacturer	5
	1.3	Product Feature of Equipment Under Test	5
	1.4	Product Specification of Equipment Under Test	5
	1.5	Modification of EUT	5
	1.6	Testing Location	6
	1.7	Test Software	7
	1.8	Applicable Standards	7
2	TEST	CONFIGURATION OF EQUIPMENT UNDER TEST	8
	2.1	Carrier Frequency Channel	8
	2.2	Test Mode	9
	2.3	Connection Diagram of Test System	10
	2.4	Support Unit used in test configuration and system	11
	2.5	EUT Operation Test Setup	11
	2.6	Measurement Results Explanation Example	11
3	TEST	RESULT	12
	3.1	6dB and 99% Bandwidth Measurement	
	3.2	Output Power Measurement	13
	3.3	Power Spectral Density Measurement	14
	3.4	Conducted Band Edges and Spurious Emission Measurement	15
	3.5	Radiated Band Edges and Spurious Emission Measurement	16
	3.6	AC Conducted Emission Measurement	20
	3.7	Antenna Requirements	22
4	LIST	OF MEASURING EQUIPMENT	23
5	MEAS	SUREMENT UNCERTAINTY	24
APF	PENDI	X A. CONDUCTED TEST RESULTS	
APF	PENDI	X B. AC CONDUCTED EMISSION TEST RESULT	
APF	PENDI	X C. RADIATED SPURIOUS EMISSION	
APF	PENDI	X D. DUTY CYCLE PLOTS	
APF	PENDI	X E. SETUP PHOTOGRAPHS	

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 2 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No. : FR442515B

# **REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR442515B	Rev. 01	Initial issue of report	Jun. 11, 2024

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report only	-
3.2	15.247(b)(3)	Peak Output Power	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 12.80 dB at 2483.56 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 21.54 dB at 0.178 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

#### **Conformity Assessment Condition:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or
  in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of
  non-compliance that may potentially occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

#### Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Sporton International Inc.(Kunshan)

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 4 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 1 General Description

# 1.1 Applicant

Xiaomi Communications Co., Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

#### 1.2 Manufacturer

Xiaomi Communications Co., Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

# 1.3 Product Feature of Equipment Under Test

Product Feature				
Equipment	Mobile Phone			
Brand Name	Xiaomi			
Model Name	2406APNFAG			
FCC ID	2AFZZPNFAG			
IMEI Code	Conducted: 868329070074764/868329070074772 Conduction: 868329070075761/868329070075779 Radiation: 868329070077080/868329070077098(SZ) 868329070078740/868329070078757(KS)			
HW Version	1351N12A			
SW Version	Xiaomi HyperOS 1.0			
EUT Stage	Identical Prototype			

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

# 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification				
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz			
Number of Channels	40			
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)			
Maximum Output Dawer to Antonno	BLE 1Mbps: 15.49 dBm (0.0354 W)			
Maximum Output Power to Antenna	BLE 2Mbps: 15.29 dBm (0.0338 W)			
99% Occupied Bandwidth	BLE 1Mbps:1.039MHz			
39 % Occupied Bandwidth	BLE 2Mbps:2.062MHz			
Antenna Type / Gain	PIFA Antenna type with gain -2.0 dBi			
Type of Modulation	Bluetooth LE : GFSK			

# 1.5 Modification of EUT

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

Sporton International Inc.(Kunshan)Page Number: 5 of 24TEL: +86-512-57900158Report Issued Date: Jun. 11, 2024FCC ID: 2AFZZPNFAGReport Version: Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)				
	No. 1098, Pengxi North Road, Kunshan Economic Development Zone				
Test Site Location	Jiangsu Province 215300 People's Republic of China				
	TEL: +86-512-57900158				
	Sporton Site No.	FCC Designation No.	FCC Test Firm		
Test Site No.	Sporton Site No.	rec besignation No.	Registration No.		
rest site No.	CO01-KS 03CH03-KS TH01-KS	CN1257	314309		

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)			
Test Site Location		uilding 1, No. 2, Tengfeng of et, Baoan District, Shenzhe s Republic of China		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.	
	03CH04-SZ	CN1256	421272	

Note: Test data subcontracted: radiated Spurious Emission test case for LF in section 3.5 of this report.

**Sporton International Inc.(Kunshan)** TEL: +86-512-57900158

FCC ID: 2AFZZPNFAG

Page Number : 6 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	03CH03-KS	AUDIX	E3	210616
3.	CO01-KS	AUDIX	E3	6.2009-8-24
4.	03CH04-SZ	AUDIX	E3	6.2009-8-24

# 1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

#### Remark:

- 1. All test items were verified and recorded according to the standards and without any deviation during the test.
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

FCC ID: 2AFZZPNFAG

Page Number : 7 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 2 Test Configuration of Equipment Under Test

# 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
2400-2483.5 MHz	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 8 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

## 2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z for Adapter and Earphone mode. The worst cases (X plane-Adapter mode) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

	Summary table of Test Cases				
Test Item	Data Rate / Modulation				
rest item	Bluetooth – LE / GFSK				
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps				
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps				
Conducted	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps				
TCs	Mode 4: Bluetooth Tx CH01_2404 MHz_BLE 2Mbps				
	Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps				
	Mode 6: Bluetooth Tx CH38_2478 MHz_BLE 2Mbps				
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps				
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps				
Radiated	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps				
TCs	Mode 4: Bluetooth Tx CH01_2404 MHz_BLE 2Mbps				
	Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps				
	Mode 6: Bluetooth Tx CH38_2478 MHz_BLE 2Mbps				
AC	Mode 1: GSM 850 Idle + WLAN Link(2.4G) + BT Link + USB Cable 1(Charging From				
Conducted	Adaptor)				
Emission	Adaptor)				
Remark: For	Remark: For Radiated Test Cases, The tests were performed with Adapter and USB Cable 1.				

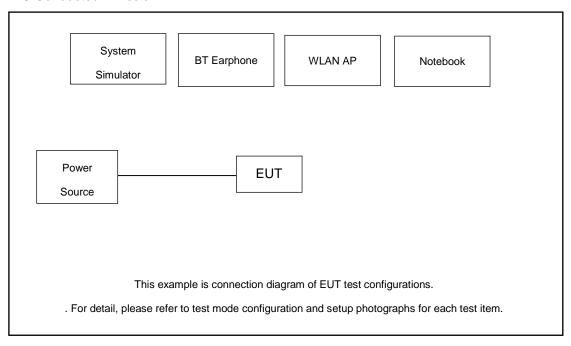
Sporton International Inc.(Kunshan)

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 9 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

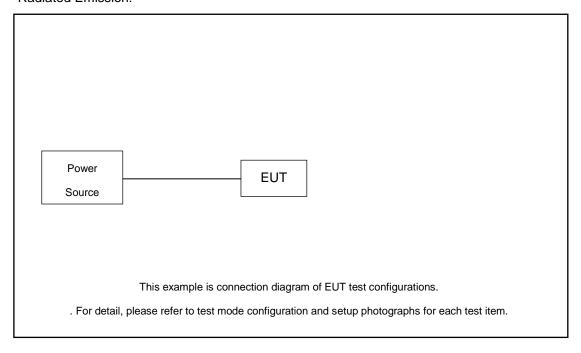
Report No.: FR442515B

# 2.3 Connection Diagram of Test System

#### AC Conducted Emission:



#### Radiated Emission:



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 10 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	XIAOMI	LYEJ02LM	N/A	N/A	N/A
2.	Base Station	Anritus	MT8821C	N/A	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I		shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m

# 2.5 EUT Operation Test Setup

For BLE function, the engineering test program was provided and enabled to make EUT continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

# 2.6 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 1.89 dB and 10dB attenuator.

$$Offset(dB) = RF \ cable \ loss(dB) + attenuator \ factor(dB).$$
  
= 1.89 + 10 = 11.89 (dB)

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

#### 3.1.1 Limit of 6dB and 99% Bandwidth

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

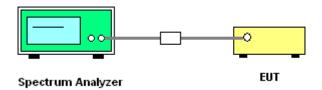
# 3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

#### 3.1.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 11.8
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
- 5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1% to 5% of the 99% OBW and the VBW is set to 3 times of the RBW.
- 6. Measure and record the results in the test report.

#### 3.1.4 Test Setup



#### 3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

Sporton International Inc.(Kunshan)Page Number: 12 of 24TEL: +86-512-57900158Report Issued Date: Jun. 11, 2024FCC ID: 2AFZZPNFAGReport Version: Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 3.2 Output Power Measurement

# 3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

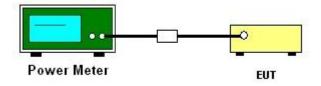
## 3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

#### 3.2.3 Test Procedures

- The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1
   Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
- 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power and record the results in the test report.

#### 3.2.4 Test Setup



#### 3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

#### 3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 3.3 Power Spectral Density Measurement

# 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

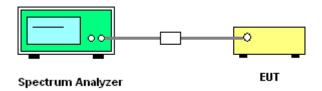
# 3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

#### 3.3.3 Test Procedures

- The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
- 5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
- 6. Measure and record the results in the test report.
- 7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

**Sporton International Inc.(Kunshan)** TEL: +86-512-57900158

FCC ID: 2AFZZPNFAG

Page Number : 14 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 3.4 Conducted Band Edges and Spurious Emission Measurement

#### 3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

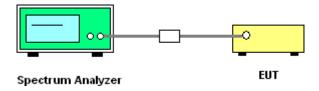
# 3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

#### 3.4.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 11.13
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 3.4.4 Test Setup



## 3.4.5 Test Result of Conducted Band Edges Plots

Please refer to Appendix A.

# 3.4.6 Test Result of Conducted Spurious Emission Plots

Please refer to Appendix A.

Sporton International Inc.(Kunshan)
TEL: +86-512-57900158

 TEL: +86-512-57900158
 Report Issued Date : Jun. 11, 2024

 FCC ID: 2AFZZPNFAG
 Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

: 15 of 24

Page Number

# 3.5 Radiated Band Edges and Spurious Emission Measurement

# 3.5.1 Limit of 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. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

# 3.5.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

Sporton International Inc.(Kunshan)

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 16 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

#### 3.5.3 Test Procedures

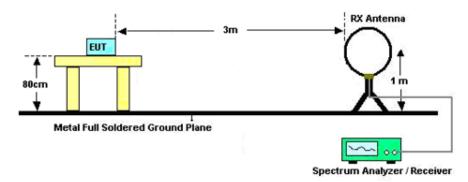
- 1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
- 2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
- 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.
- 4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 5. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
- 7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \ge 1$  GHz for peak measurement. For average measurement:
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Sporton International Inc.(Kunshan)Page Number: 17 of 24TEL: +86-512-57900158Report Issued Date: Jun. 11, 2024FCC ID: 2AFZZPNFAGReport Version: Rev. 01

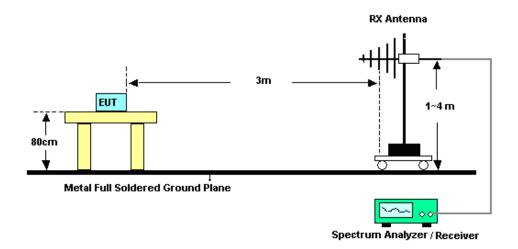
Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 3.5.4 Test Setup

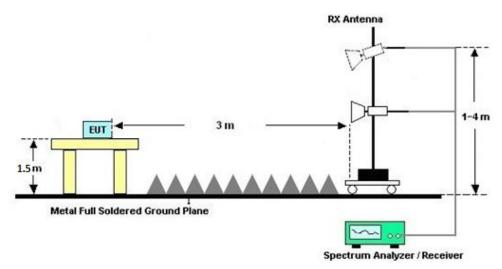
#### For radiated emissions below 30MHz



#### For radiated emissions from 30MHz to 1GHz



#### For radiated emissions above 1GHz



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 18 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

## 3.5.5 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 was not reported.

Report No.: FR442515B

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

## 3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

## 3.5.7 Duty Cycle

Please refer to Appendix D.

# 3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C.

 Sporton International Inc.(Kunshan)
 Page Number
 : 19 of 24

 TEL: +86-512-57900158
 Report Issued Date
 : Jun. 11, 2024

 FCC ID: 2AFZZPNFAG
 Report Version
 : Rev. 01

#### 3.6 AC Conducted Emission Measurement

#### 3.6.1 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.

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

<sup>\*</sup>Decreases with the logarithm of the frequency.

## 3.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

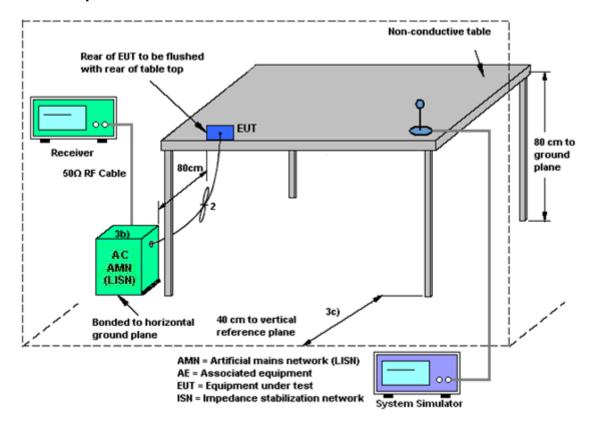
# 3.6.3 Test Procedures

- 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.

Sporton International Inc.(Kunshan) Page Number : 20 of 24 Report Issued Date: Jun. 11, 2024 FCC ID: 2AFZZPNFAG Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 3.6.4 Test Setup



# 3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG Page Number : 21 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 3.7 Antenna Requirements

## 3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

# 3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

#### 3.7.3 Antenna Gain

FCC ID: 2AFZZPNFAG

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

Sporton International Inc.(Kunshan)Page NumberTEL: +86-512-57900158Report Issued

Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

: 22 of 24

# 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	May 15, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GH z	Jan. 02, 2024	May 15, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	May 15, 2024	Jan. 01, 2025	Conducted (TH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 18, 2024	May 25, 2024	Apr. 17, 2025	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 11, 2023	May 25, 2024	Oct. 10, 2024	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Apr. 18, 2024	May 25, 2024	Apr. 17, 2025	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 11, 2023	May 25, 2024	Oct. 10, 2024	Conduction (CO01-KS)
EMI Test Receiver	Keysight	N9038A	MY564000 04	3Hz~8.5GHz;M ax 30dBm	Oct. 10, 2023	May 02, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY553705 28	10Hz-44GHz	Oct. 11, 2023	May 02, 2024	Oct. 10, 2024	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Dec. 21, 2023	May 02, 2024	Dec. 20, 2024	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101116	18GHz~40GHz	Oct. 10, 2023	May 02, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
Amplifier	EM	EM18G40GA	060851	18~40GHz	Jan. 05, 2024	May 02, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2082394	1Ghz-18Ghz	Jan. 05, 2024	May 02, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
Amplifier	Keysight	83017A	MY532703 19	1GHz~26.5GHz	Oct. 10, 2023	May 02, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	May 02, 2024	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 02, 2024	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 02, 2024	NCR	Radiation (03CH03-KS)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 18, 2023	May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Jul. 07, 2023	May 29, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 28, 2022	May 29, 2024	Jun. 27, 2024	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	May 09, 2024	May 29, 2024	May 08, 2025	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 18, 2023	May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F11905001 9	N/A	Oct. 18, 2023	May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	May 29, 2024	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	May 29, 2024	NCR	Radiation (03CH04-SZ)

NCR: No Calibration Required

**Sporton International Inc.(Kunshan)** TEL: +86-512-57900158

FCC ID: 2AFZZPNFAG

Page Number : 23 of 24
Report Issued Date : Jun. 11, 2024
Report Version : Rev. 01

Report No.: FR442515B

# 5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

#### **Uncertainty of Conducted Measurement**

Conducted Spurious Emission & Bandedge	±2.26 dB		
Occupied Channel Bandwidth	±0.1%		
Conducted Power	±0.46 dB		
Conducted Power Spectral Density	±0.88 dB		
Frequency	±0.4 Hz		

#### Uncertainty of AC Conducted Emission Measurement (0.15 MHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	
of 95% (U = 2Uc(y))	2.84 dB

#### 03CH04-SZ

#### Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	5.1 dB
of 95% (U = 2Uc(y))	5.1 dB

#### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	5.1 dB
of 95% (U = 2Uc(y))	5.1 dB

## 03CH03-KS

# <u>Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)</u>

	<u>-                                    </u>
Measuring Uncertainty for a Level of Confidence	5.18 dB
of 95% (U = 2Uc(y))	5.10 UB

#### **Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)**

Measuring Uncertainty for a Level of Confidence	5,22 dB
of 95% (U = 2Uc(y))	3.22 UB

----- THE END -----

 Sporton International Inc.(Kunshan)
 Page Number
 : 24 of 24

 TEL: +86-512-57900158
 Report Issued Date
 : Jun. 11, 2024

 FCC ID: 2AFZZPNFAG
 Report Version
 : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

# **Appendix A. Conducted Test Results**

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



FCC RF Test Report No.: FR442515B

Ambient Condition:  $\underline{25}$  °C,  $\underline{45}$  %RH

**According Standard:** ■Part15C

Test Date: 2024.5.15 Test Engineer: Jiang Jun

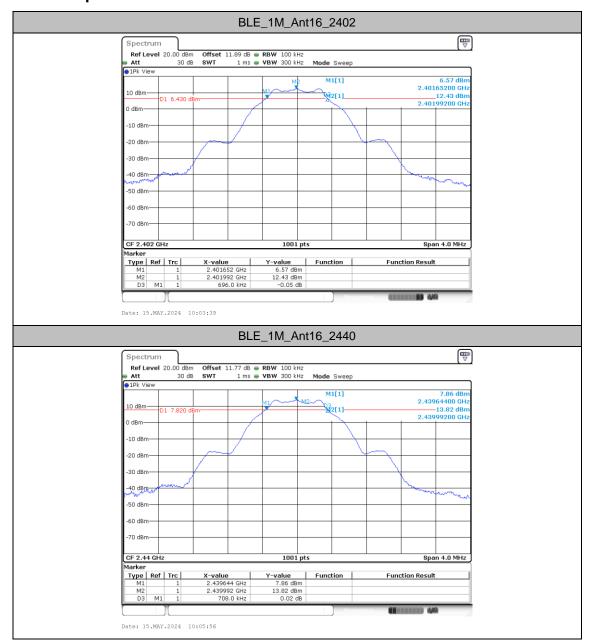
# **DTS Bandwidth**

## **Test Result**

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
		2402	0.70	2401.65	2402.35	0.5	PASS
BLE_1M	Ant16	2440	0.71	2439.64	2440.35	0.5	PASS
		2480	0.71	2479.64	2480.35	0.5	PASS
		2404	1.18	2403.41	2404.59	0.5	PASS
BLE_2M	Ant16	2440	1.19	2439.40	2440.60	0.5	PASS
		2478	1.19	2477.41	2478.60	0.5	PASS

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

# **Test Graphs**



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG : A2 ofA 26



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

: A3 ofA 26



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

: A4 ofA 26

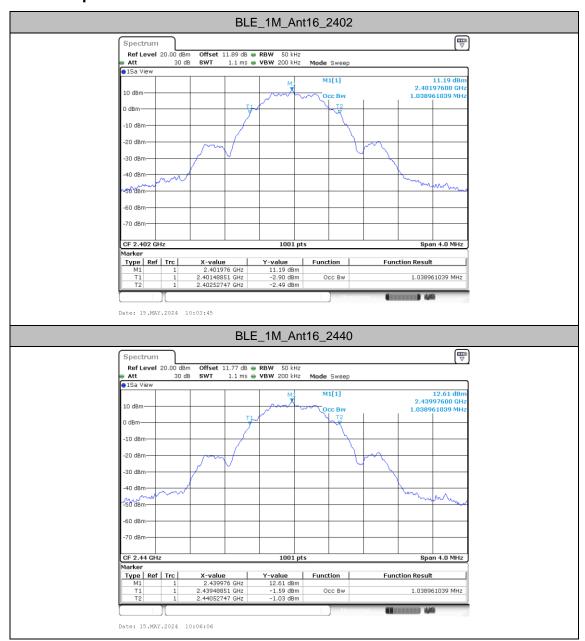
# **Occupied Channel Bandwidth**

# **Test Result**

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M		2402	1.039	2401.4885	2402.5275		
	Ant16	2440	1.039	2439.4885	2440.5275		
		2480	1.035	2479.4885	2480.5235		
		2404	2.062	2402.9850	2405.0470		
BLE_2M	Ant16	2440	2.058	2438.9850	2441.0430		
		2478	2.058	2476.9890	2479.0470		

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

# **Test Graphs**

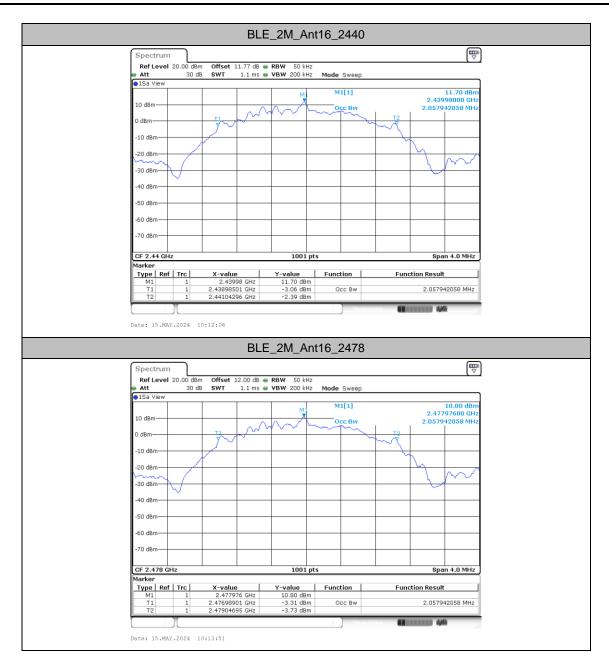


TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG : A6 ofA 26



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG : A7 ofA 26





TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

# Maximum conducted output power

## **Test Result Peak**

TestMode	Antenna	CH.	Peak Conducted Power (dBm)	Conducted Power Limit	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit	Pass/Fail
		0	14.64	30.00	-2.0	12.64	36.00	Pass
BLE1M	Ant16	19	15.49	30.00	-2.0	13.49	36.00	Pass
		39	14.70	30.00	-2.0	12.70	36.00	Pass
		1	14.78	30.00	-2.0	12.78	36.00	Pass
BLE2M	Ant16	19	15.29	30.00	-2.0	13.29	36.00	Pass
		38	14.77	30.00	-2.0	12.77	36.00	Pass

Power setting is default.

# **Test Result Average**

TestMode	Antenna	CH.	Duty Factor (dB)	Average Conducted Power (dBm)
	Ant16	0	2.14	14.57
BLE1M		19	2.14	15.17
		39	2.14	14.40
		01	4.96	14.30
BLE2M	Ant16	19	4.96	14.89
		38	4.96	14.53

# Maximum power spectral density

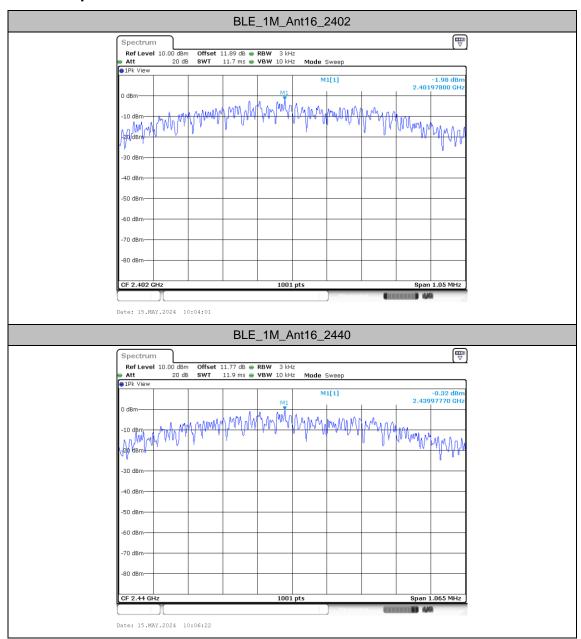
## **Test Result**

TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant16	2402	-1.98	≤8.00	PASS
		2440	-0.32	≤8.00	PASS
		2480	-1.72	≤8.00	PASS
BLE_2M	Ant16	2404	-3.62	≤8.00	PASS
		2440	-2.66	≤8.00	PASS
		2478	-3.51	≤8.00	PASS

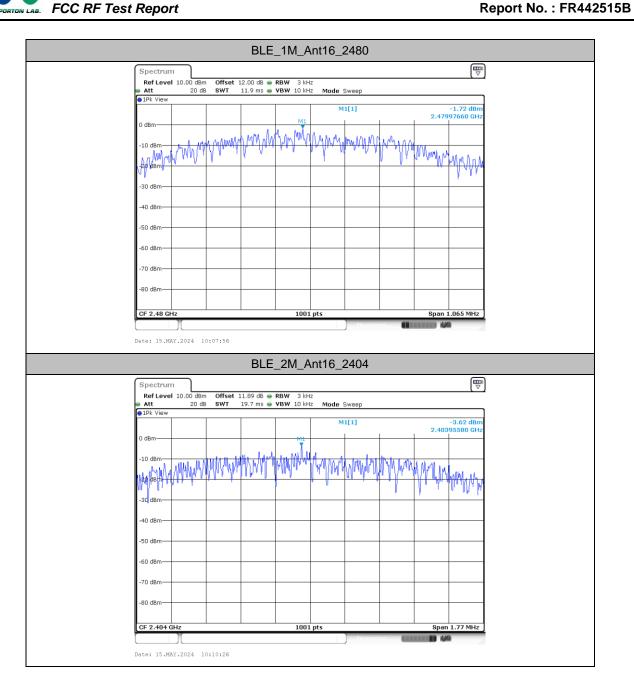
Sporton International Inc.(Kunshan)

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

# **Test Graphs**

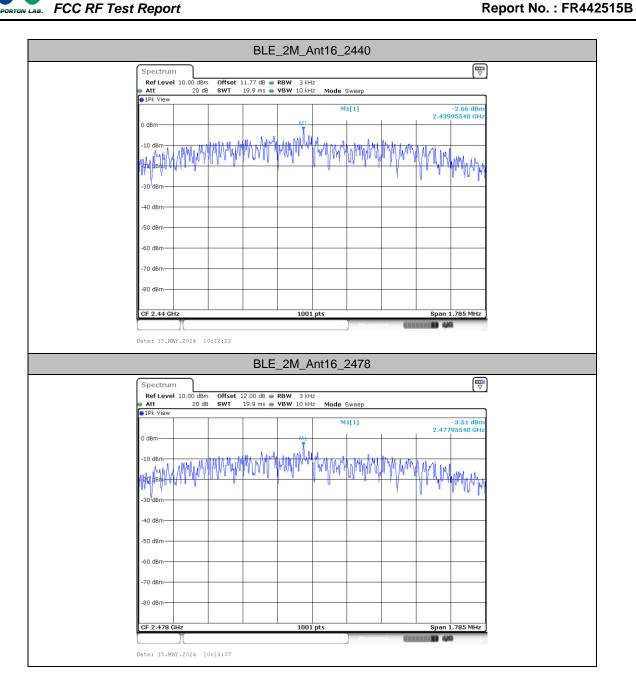


TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

: A11 of A 26



: A12 of A 26

## Reference level measurement

### **Test Result**

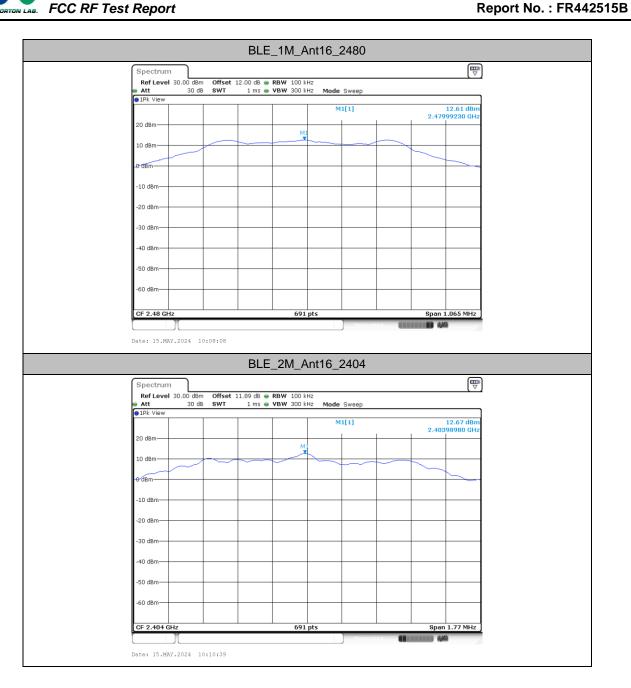
TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
		2402	2402.25	12.38
BLE_1M	Ant16	2440	2440.24	13.93
		2480	2479.99	12.61
	M Ant16	2404	2403.99	12.67
BLE_2M		2440	2439.99	13.75
		2478	2477.99	12.79

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

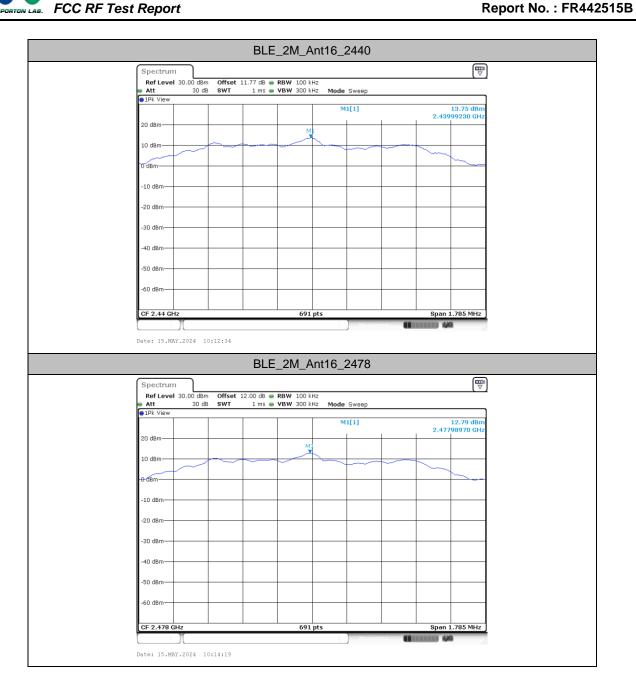
## **Test Graphs**



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



: A15 of A 26



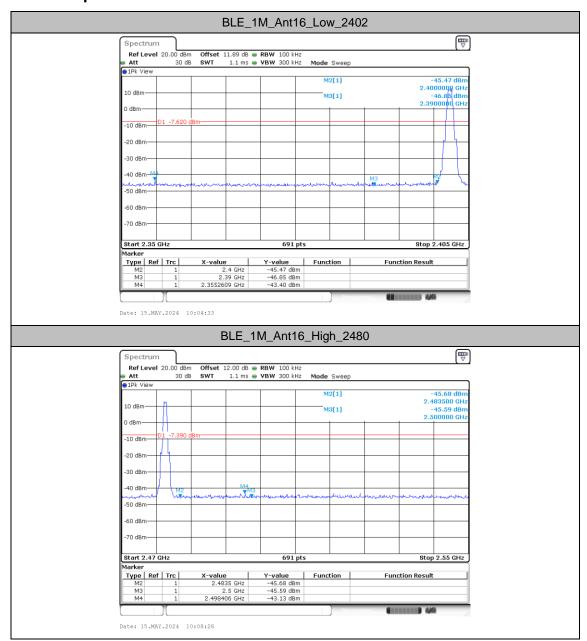
# **Band edge measurements**

### **Test Result**

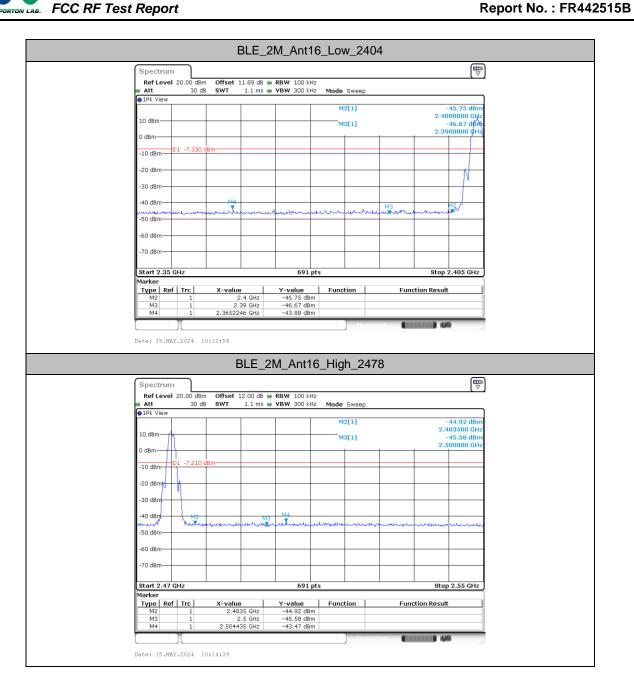
TestMode	Antenna	ChName	nName Freq(MHz) RefLevel[dBm Result[dBm /100KHz] /100KHz]		Limit[dBm /100KHz]	Verdict	
DLE 4M	Ant16	Low	2402	12.38	-43.4	≤-7.62	PASS
BLE_1M		AIILIO	High	2480	12.61	-43.13	≤-7.39
DIE OM	BLE_2M Ant16	Low	2404	12.67	-43.88	≤-7.33	PASS
BLE_2M		High	2478	12.79	-43.47	≤-7.21	PASS

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

## **Test Graphs**



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



: A19 of A26

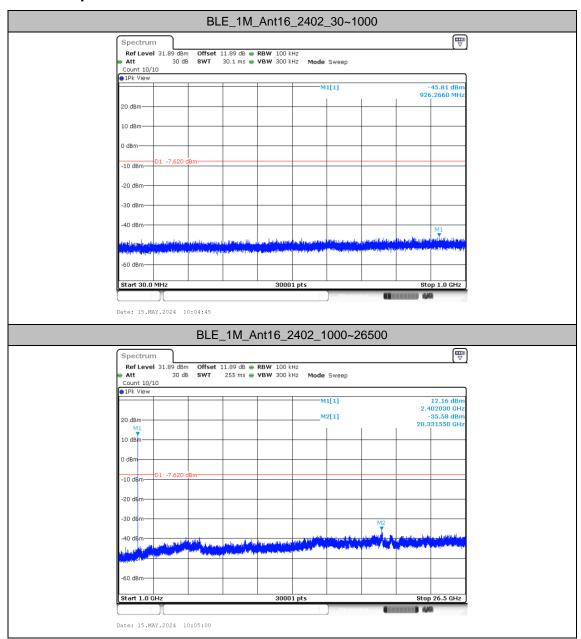
# **Conducted Spurious Emission**

### **Test Result**

T4841-	A 1	Freq(MHz)	FreqRange	RefLevel	Result	Limit	Manaliat
restiviode	TestMode Antenna		[MHz]	[dBm/100KHz]	[dBm/100KHz]	[dBm/100KHz]	Verdict
		2402	30~1000	12.38	-45.81	≤-7.62	PASS
		2402	1000~26500	12.38	-35.58	≤-7.62	PASS
BLE_1M	Ant16	2440	30~1000	13.93	-45.33	≤-6.07	PASS
DLE_TIVI	Antro	2440	1000~26500	13.93	-36.84	≤-6.07	PASS
		2480	30~1000	12.61	-44.82	≤-7.39	PASS
		2400	1000~26500	12.61	-36.52	≤-7.39	PASS
		2404	30~1000	12.67	-45.9	≤-7.33	PASS
		2404	1000~26500	12.67	-34.96	≤-7.33	PASS
DIE OM	Ant16	2440	30~1000	13.75	-45.6	≤-6.25	PASS
BLE_2M	Antro	2440	1000~26500	13.75	-35.51	≤-6.25	PASS
		2478	30~1000	12.79	-45.12	≤-7.21	PASS
		24/0	1000~26500	12.79	-36.03	≤-7.21	PASS

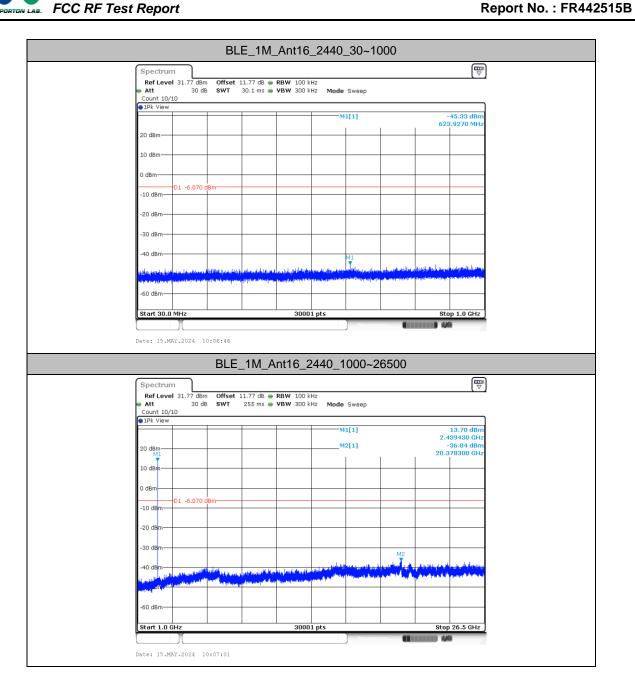
TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

## **Test Graphs**



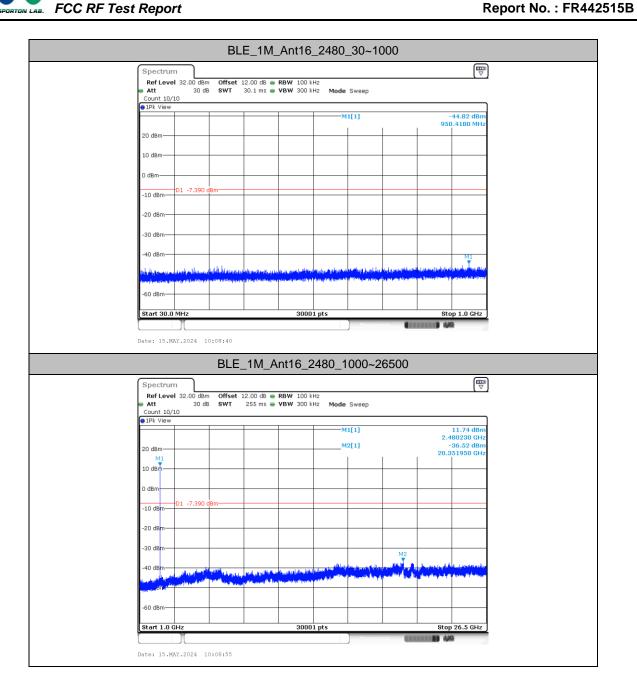
TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

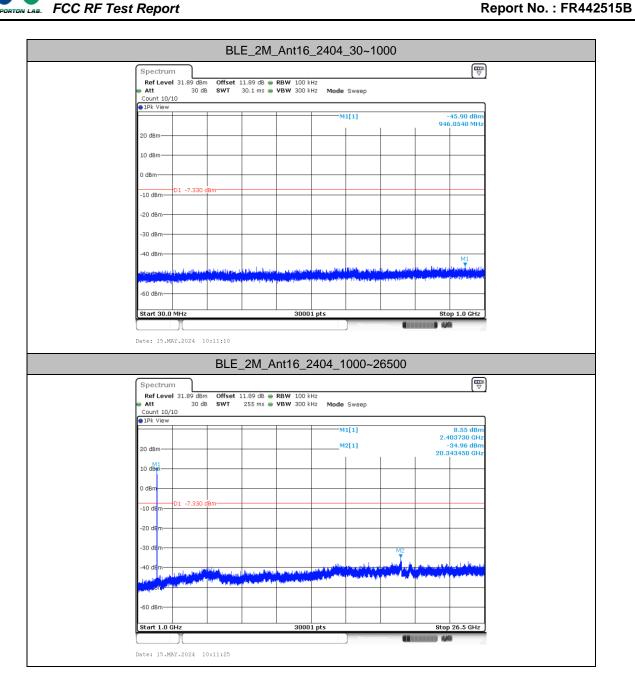


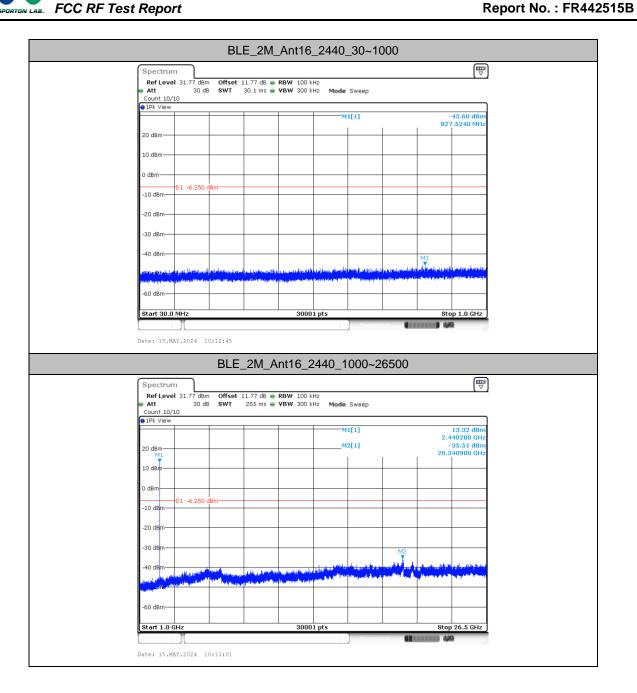


: A22 of A 26

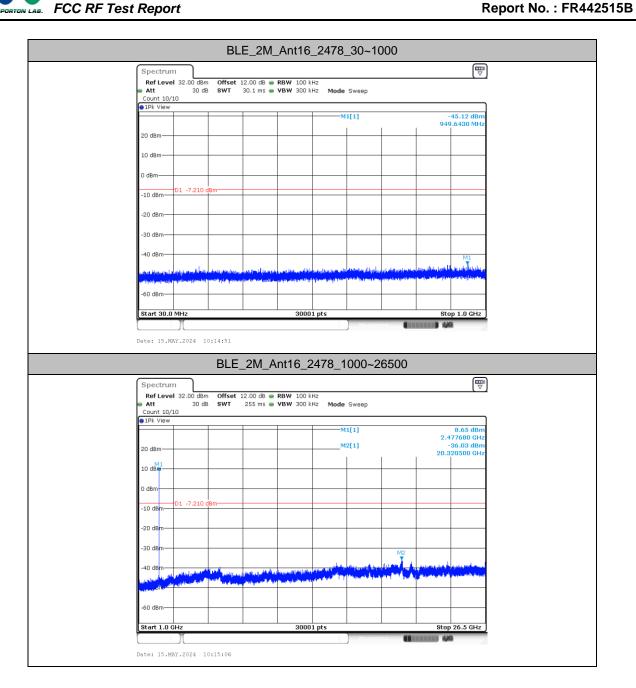






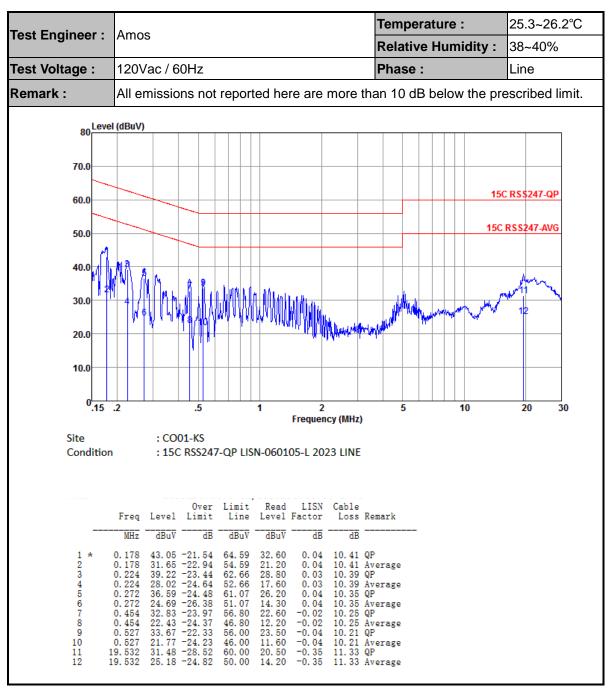


: A25 of A 26



: A26 of A26

## **Appendix B. AC Conducted Emission Test Results**



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



Took Engineer	Amos					Tem	perat	ure :	25.3~26.2°C	
Test Engineer :	Amos					Rela	tive I	Humidity :	38~40%	
Test Voltage :	120Vac / 6	0Hz				Phas	se :		Neutral	
Remark :	All emission	All emissions not reported here are more than 10 dB below the pre							escribed limit.	
80 Leve	l (dBuV)									
00										
70.0										
60.0								150	C RS\$247-QP	
_	$\downarrow \downarrow \downarrow \downarrow \uparrow$							150	RSS247-AVG	
50.0								130	183247-470	
40.0	P.									
30.0	M///fi	ut da la la la		hada a lada da	Milu.					
30.3	<b>1 1                </b>	MANNAN AU		A Lincolnia	YY		Par	HAT HAT A THE STATE OF THE STAT	WANTED STATE OF THE STATE OF TH	
20.0		Asia Mark Asia	17 1	10 12		What was	4			
10.0		1773								
0.15	.2	.5	1	2 Frequen	cy (MHz)	5	j	10	20 30	
Site	: CO	01-KS								
Condition	: 150	RSS247-QP LIS	SN-0601	05-N 20	23 NEUT	RAL				
	Freq Level	Over Limit Limit Line	Read Level	LISN Factor	Cable Loss R	lemark				
	MHz dBuV	dB dBuV	dBuV	₫B	dB					
2 3 4 5 6 7 8	0. 176 27. 96 0. 226 37. 21 0. 226 27. 21 0. 264 34. 14 0. 264 21. 54 0. 444 30. 99 0. 444 19. 49 1. 495 28. 47	-25. 02 64. 68 -26. 72 54. 68 -25. 40 62. 61 -25. 40 52. 61 -27. 15 61. 29 -29. 75 51. 29 -25. 99 56. 98 -27. 49 46. 98 -27. 53 56. 00	17. 50 26. 80 16. 80 23. 79 11. 19 20. 80 9. 30 18. 50	0. 05 0. 02 0. 02 -0. 01 -0. 01 -0. 06 -0. 06 -0. 11	10.36 Q 10.36 A 10.25 Q 10.25 A 10.08 Q	lverage  P  verage  P  verage  P  verage				
11	1.810 29.56	-27. 83 46. 00 -26. 44 56. 00 -27. 24 46. 00	19.60	-0.12	10.08 A 10.08 Q 10.08 A	)P				

#### Note:

- 1. Level(dB $\mu$ V) = Read Level(dB $\mu$ V) + LISN Factor(dB) + Cable Loss(dB)
- 2. Over Limit(dB) = Level(dB $\mu$ V) Limit Line(dB $\mu$ V)

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



# **Appendix C Radiated Spurious Emission Test Data**

Test Engineer :	Corre	Relative Humidity :	48~49%
	Carry	Temperature :	24~25℃

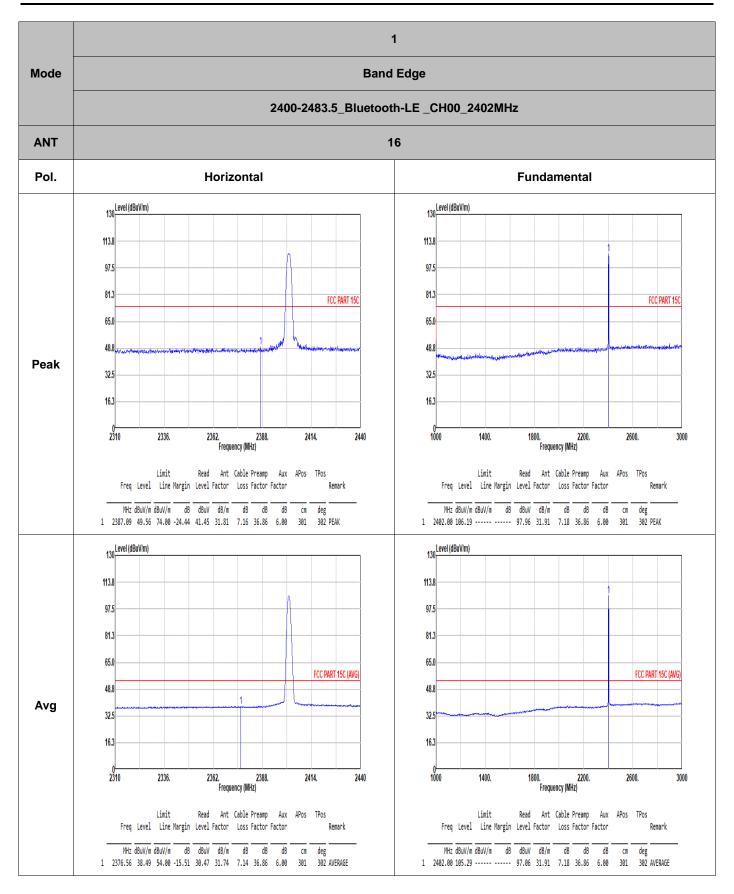
## **Radiated Spurious Emission Test Modes**

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	16	Bluetooth-LE	00	2402	1Mbps	-	-
Mode 2	2400-2483.5	16	Bluetooth-LE	19	2440	1Mbps	-	-
Mode 3	2400-2483.5	16	Bluetooth-LE	39	2480	1Mbps	-	-
Mode 4	2400-2483.5	16	Bluetooth-LE	01	2404	2Mbps	-	-
Mode 5	2400-2483.5	16	Bluetooth-LE	19	2440	2Mbps	-	-
Mode 6	2400-2483.5	16	Bluetooth-LE	38	2478	2Mbps	-	-

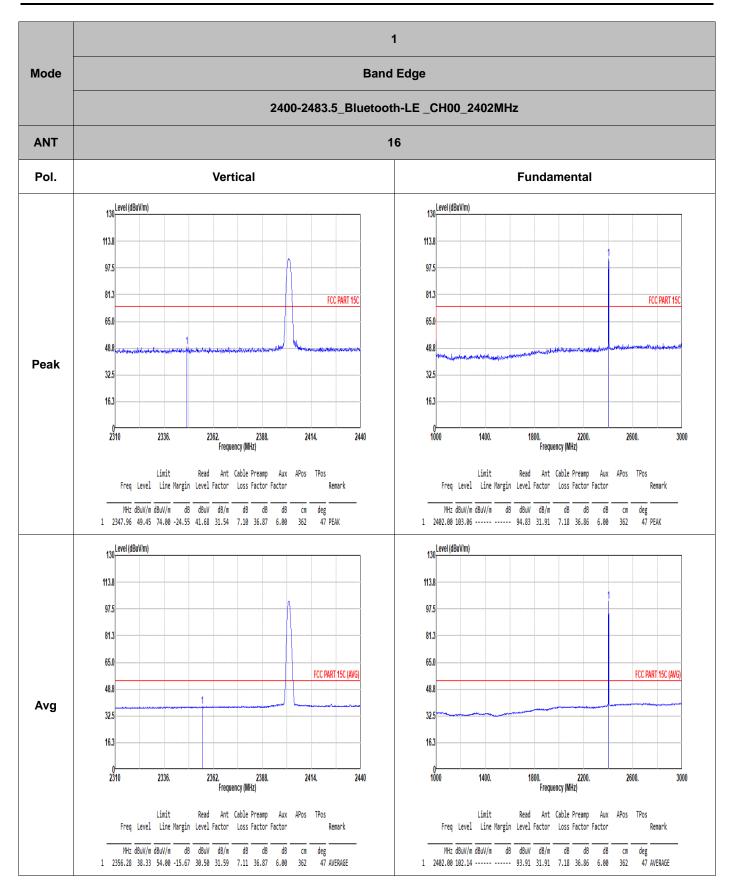
## Summary of each worse mode

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth-LE	00	2376.56	38.49	54.00	-15.51	Н	AVERAGE	Pass	Band Edge
1	Bluetooth-LE	00	4804.00	41.22	74.00	-32.78	Н	PEAK	Pass	Harmonic
2	Bluetooth-LE	19	-	-	-	-	-	-	-	Band Edge
2	Bluetooth-LE	19	4880.00	43.57	74.00	-30.43	V	PEAK	Pass	Harmonic
3	Bluetooth-LE	39	2484.04	40.39	54.00	-13.61	Н	AVERAGE	Pass	Band Edge
3	Bluetooth-LE	39	4960.00	44.22	74.00	-29.78	Н	PEAK	Pass	Harmonic
4	Bluetooth-LE	01	2313.90	39.11	54.00	-14.89	V	AVERAGE	Pass	Band Edge
4	Bluetooth-LE	01	4808.00	42.32	74.00	-31.68	V	PEAK	Pass	Harmonic
5	Bluetooth-LE	19	-	-	-	-	-	-	-	Band Edge
5	Bluetooth-LE	19	4880.00	43.14	74.00	-30.86	V	PEAK	Pass	Harmonic
6	Bluetooth-LE	38	2483.56	41.20	54.00	-12.80	Н	AVERAGE	Pass	Band Edge
6	Bluetooth-LE	38	4956.00	43.97	74.00	-30.03	Н	PEAK	Pass	Harmonic

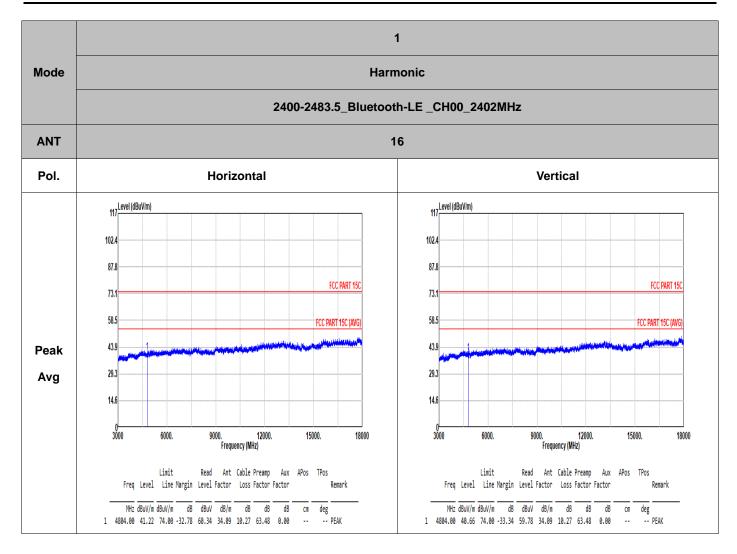
TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG













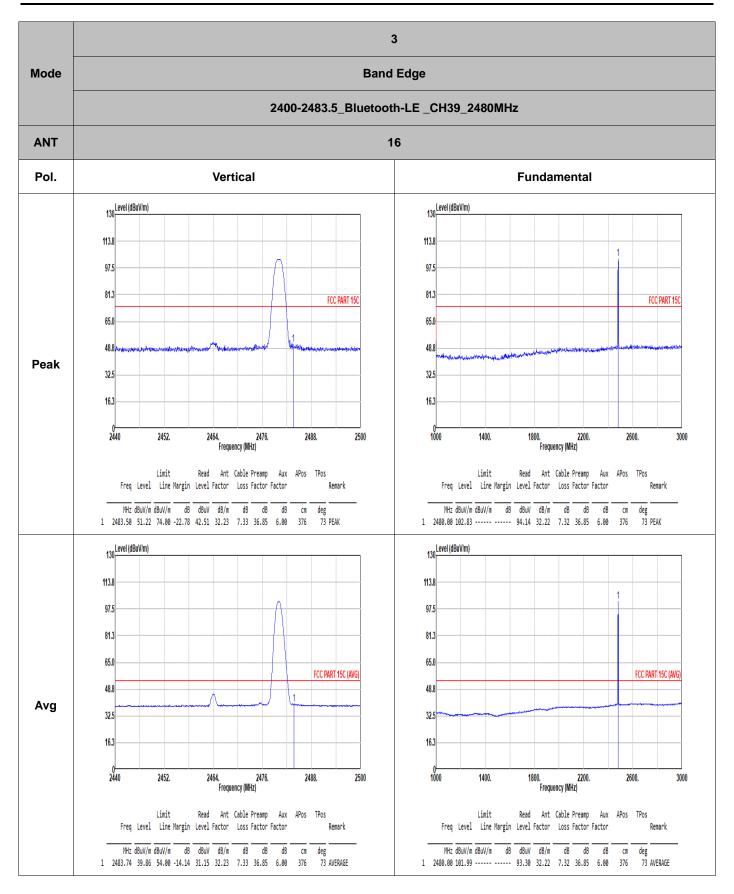
2 Mode Harmonic 2400-2483.5\_Bluetooth-LE \_CH19\_2440MHz **ANT** 16 Pol. Horizontal Vertical 117 Level (dBuV/m) 117 Level (dBuV/m) 102.4 87.8 87.8 FCC PART 15C FCC PART 150 73.1 73.1 58.5 58.5 43.9 43.9 **Peak** 29.3 29.3 Avg 14.6 14.6 9000. Frequency (MHz) 6000. 12000. 15000. 18000 6000. 12000. 15000. 18000 ,. Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor cm deg -- -- PEAK MHz dBuV/m dBuV/m dB dBuV dB/m dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB deg -- PEAK cm 1 4880.00 41.65 74.00 -32.35 60.84 33.94 10.35 63.48 0.00 1 4880.00 43.57 74.00 -30.43 62.76 33.94 10.35 63.48 0.00 2 7320.00 42.26 74.00 -31.74 57.55 35.60 12.79 63.68 0.00 2 7320.00 42.68 74.00 -31.32 57.97 35.60 12.79 63.68 0.00 -- PEAK -- PEAK

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



3 **Band Edge** Mode 2400-2483.5\_Bluetooth-LE \_CH39\_2480MHz **ANT** 16 Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 2440 1000 2452. 2488. 1400. 3000 2476. 2500 2200. 2600. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark Remark MHz dBuV/m dBuV/m dB dBuV dB/m MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB dB dB CM deg cm deg 1 2484.34 54.51 74.00 -19.49 45.79 32.24 7.33 36.85 6.00 1 2480.00 106.28 ----- 97.59 32.22 7.32 36.85 6.00 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>—</u> 2440 1000 4. 2476. Frequency (MHz) 2452. 2488 2500 1400. 2200. 3000 Frequency (MHz) Limit Limit Read Ant Cable Preamp Aux APos TPos Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB 1 2484.04 40.39 54.00 -13.61 31.67 32.24 7.33 36.85 6.00 104 117 AVERAGE 1 2480.00 105.15 ----- 96.46 32.22 7.32 36.85 6.00 104 117 AVERAGE

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



: C7 of C17



3 Mode Harmonic 2400-2483.5\_Bluetooth-LE \_CH39\_2480MHz **ANT** 16 Pol. Horizontal Vertical 117 Level (dBuV/m) 117 Level (dBuV/m) 102.4 87.8 87.8 FCC PART 15C FCC PART 150 73.1 73.1 58.5 58.5 43.9 43.9 **Peak** 29.3 29.3 Avg 14.6 14.6 9000. Frequency (MHz) 6000. 12000. 15000. 18000 6000. 12000. 15000. 18000 Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor cm deg -- -- PEAK MHz dBuV/m dBuV/m dB dBuV dB/m dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB deg -- PEAK CM 1 4960.00 44.22 74.00 -29.78 63.30 33.96 10.44 63.48 0.00 1 4960.00 42.04 74.00 -31.96 61.12 33.96 10.44 63.48 0.00 2 7440.00 41.86 74.00 -32.14 57.04 35.64 12.93 63.75 0.00 2 7440.00 41.90 74.00 -32.10 57.08 35.64 12.93 63.75 0.00 -- PEAK

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



4 **Band Edge** Mode 2400-2483.5\_Bluetooth-LE \_CH01\_2404MHz **ANT** 16 Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 1000 2336. 2414. 2440 1400. 3000 2362. 2388. 2200. 2600. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark Remark MHz dBuV/m dBuV/m dB dBuV dB/m MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB dB dB deg cm deg 1 2342.50 49.76 74.00 -24.24 42.04 31.50 7.09 36.87 6.00 1 2404.00 106.19 ----- 97.94 31.92 7.19 36.86 6.00 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG 48.8 Avg 32.5 32.5 16.3 16.3 2310 1000 2336. 2388. 2414. 2440 1400. 2200. 3000 . Frequency (MHz) Frequency (MHz) Limit Limit Read Ant Cable Preamp Aux APos TPos Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB 1 2342,37 39,06 54,00 -14,94 31,34 31,50 7,09 36,87 6,00 1 2404.00 104.03 ----- 95.78 31.92 7.19 36.86 6.00

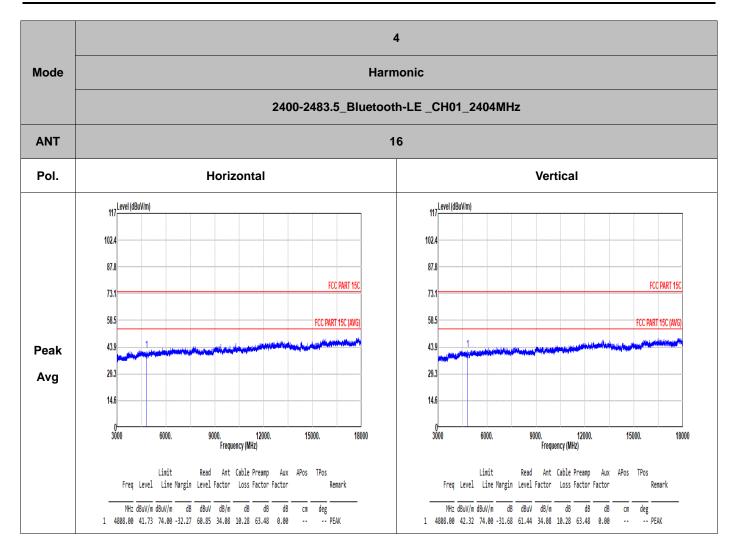
TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



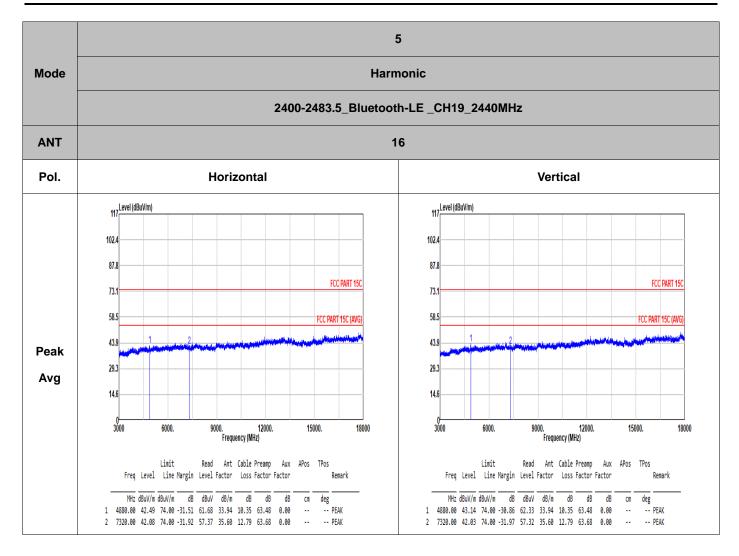
4 **Band Edge** Mode 2400-2483.5\_Bluetooth-LE \_CH01\_2404MHz **ANT** 16 Pol. Vertical **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 1000 2336. 2414. 2440 1400. 3000 2362. 2388. 2200. 2600. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark Remark MHz dBuV/m dBuV/m dB dBuV dB/m MHz dBuV/m dBuV/m dB dBuV dB/m deg dB dB dB dB dB cm deg 1 2378.12 48.79 74.00 -25.21 40.76 31.75 7.14 36.86 6.00 44 PEAK 1 2404.00 102.94 ----- 94.69 31.92 7.19 36.86 6.00 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG 48.8 Avg 32.5 32.5 16.3 16.3 0<u>—</u> 2310 1000 2336. 2414. 2440 1400. 2200. 3000 . Frequency (MHz) Frequency (MHz) Limit Limit Read Ant Cable Preamp Aux APos TPos Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB 1 2313.90 39.11 54.00 -14.89 31.65 31.30 7.04 36.88 6.00 1 2404.00 100.67 ----- 92.42 31.92 7.19 36.86 6.00 362

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG





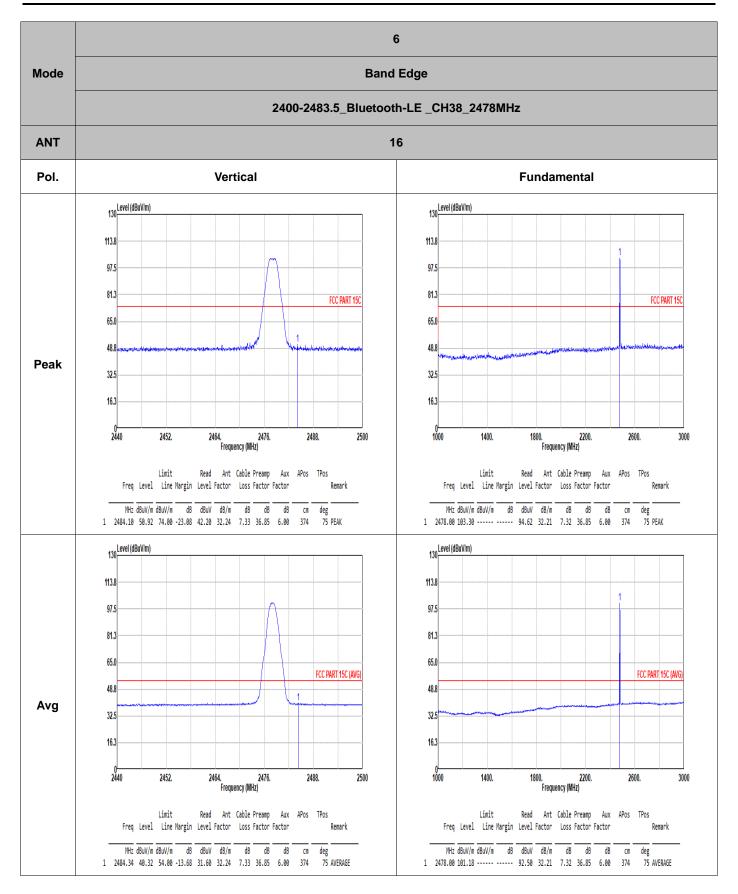




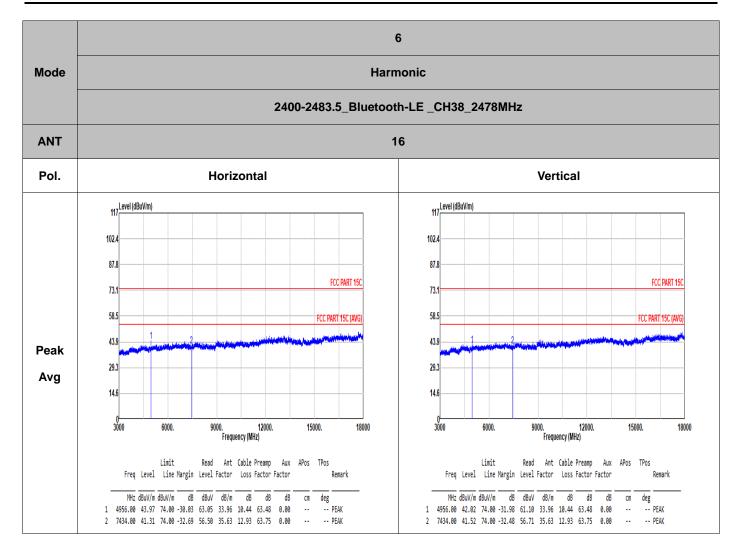


6 **Band Edge** Mode 2400-2483.5\_Bluetooth-LE \_CH38\_2478MHz **ANT** 16 Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 2440 1000 2452. 2488. 1400. 3000 2464. 2476. 2500 2200. 2600. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB dB dB dB CM deg cm deg 1 2483.80 52.22 74.00 -21.78 43.50 32.24 7.33 36.85 6.00 1 2478.00 106.71 ----- 98.03 32.21 7.32 36.85 6.00 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG 48.8 48.8 Avg 32.5 16.3 16.3 0<u>—</u> 2440 1000 4. 2476. Frequency (MHz) 2452. 2488 2500 1400. 2200. 3000 Frequency (MHz) Limit Limit Read Ant Cable Preamp Aux APos TPos Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.56 41.20 54.00 -12.80 32.49 32.23 7.33 36.85 6.00 120 116 AVERAGE 1 2478.00 104.56 ----- 95.88 32.21 7.32 36.85 6.00 120 116 AVERAGE

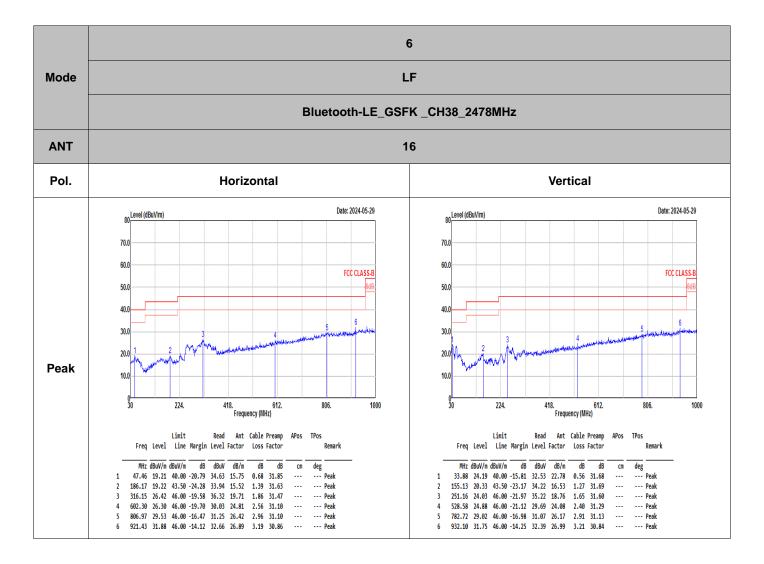
TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG







FCC RF Test Report



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

: C16 of C17

6 18G-25G Mode 2400-2483.5\_Bluetooth-LE \_CH38\_2478MHz **ANT** 16 Pol. Horizontal Vertical 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 15C FCC PART 15C Peak 65.0 65.0 FCC PART 15C (AVG Avg 48.8 48.8

32.5

16.3

18000

19400.

20800.

22200.

Frequency (MHz)

23600.

25000

Note: Only the worst case has assessed 18G ~25GHz to test.

Frequency (MHz)

22200.

23600.

25000

20800.

TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG

32.5

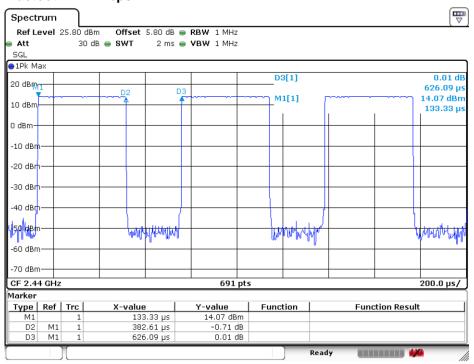
18000

19400.

# Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 1Mbps	61.11	0.383	2.614	2.7KHZ
Bluetooth LE 2Mbps	31.94	0.2	5	5.1KHZ

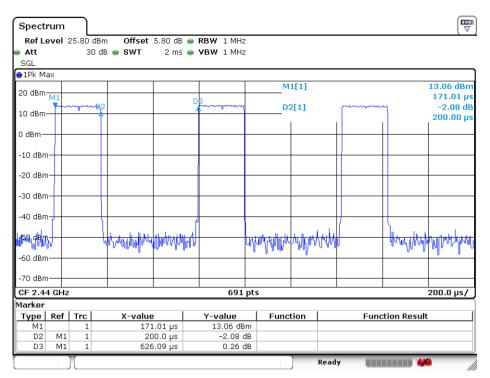
### **Bluetooth LE 1Mbps**



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG



### **Bluetooth LE 2Mbps**



TEL: +86-512-57900158 FCC ID: 2AFZZPNFAG