

# TEST REPORT

Report No. ....: CTC2025023003

FCC ID.....: 2BM94-3S

Applicant .....: Fast Metal LLC

2899 S. Shari Ave., Suite D Yuma, AZ 85365, Yuma Arizona Address....:

**United States** 

Manufacturer....: Micron Eyewear Manufactory Co. Ltd.

Address..... Liao Bian Tau Dong keng, Dongguan 523458, China

Product Name .....: Smart glasses

Trade Mark .....: Fast Metal

FMi32BKSMS1 Model/Type reference....:

Listed Model(s) .....: FMi32TTFBS1, FMi33BKSM02, iGlass-3S, FMi3

Standard ....: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Test Report Form No .....: CTC-TR-058 A1

Master TRF.....: Dated 2024-09-20

Date of receipt of test sample.....: Feb. 24, 2025

Date of testing.....: Feb. 24, 2025 ~ Feb. 26, 2025

Date of issue..... Mar. 11, 2025

**PASS** Result....:

Compiled by:

(Printed name+signature) Alicia Liu

Supervised by:

(Printed name+signature) Eric Zhang

Approved by:

(Printed name+signature) Totti Zhao Alicia Zizzhang Jeanso

This test report may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CTC. The Test Result in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CTC within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.

For anti-fake verification, please visit the official website of China Inspection And Testing

TRF No: CTC-TR-058 A1 Society: yz.cnca.cn



3.9.

#### **Table of Contents Page** TEST SUMMARY ......3 1.1. TEST STANDARDS. 1.2. 13 1 4 Test Facility .......4 1.5. 1.6. GENERAL INFORMATION .......6 2.1. 2.2. 2.3. 24 25 3.1. 3.2. 3.3. 3.4. 3.5. 3.6. 3.7. 3.8.

For anti-fake verification, please visit the official website of China Inspection And Testing

TRF No: CTC-TR-058\_A1 Society: yz.cnca.cn

Page 3 of 58

## 1. TEST SUMMARY

## 1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Operation within the bands 902–928MHz, 2400–2483.5MHz, and 5725–5850MHz.

ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

Report No.: CTC2025023003

# 1.2. Report Version

Revised No.	Report No.	Date of issue	Description
01	CTC2025023003	Mar. 11, 2025	Original

# 1.3. Test Description

FCC Part 15 Subpart C (15.247)				
Test Item	Standard Section	Result	Test	
rest item	FCC	Result	Engineer	
Antenna Requirement	15.203	Pass	Alicia Liu	
Conducted Emission	15.207	Pass	Alicia Liu	
Conducted Band Edge and Spurious Emissions	15.247(d)	Pass	Alicia Liu	
Radiated Band Edge and Spurious Emissions	15.205&15.209&15.247(d)	Pass	Alicia Liu	
6dB Bandwidth	15.247(a)(2)	Pass	Alicia Liu	
Occupied Bandwidth	1	Pass	Alicia Liu	
Conducted Max Output Power	15.247(b)(3)	Pass	Alicia Liu	
Power Spectral Density	15.247(e)	Pass	Alicia Liu	
Transmitter Radiated Spurious	15.209&15.247(d)	Pass	Alicia Liu	

## Note:

<sup>1.</sup> The measurement uncertainty is not included in the test result.

<sup>2.</sup> N/A: means this test item is not applicable for this device according to the technology characteristic of device.



Page 4 of 58 Report No.: CTC2025023003

# 1.4. Test Facility

#### Address of the report laboratory

## CTC Laboratories, Inc.

Add: Room 101 of Building B, Room 107, 108, 207, 208 of Building A, No. 7, Lanqing 1st Road, Luhu Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China

#### Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

#### FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 951311, Aug 26, 2017.

Page 5 of 58

Report No.: CTC2025023003



1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.

Test Items	Measurement Uncertainty	Notes
DTS Bandwidth	±0.0196%	(1)
Maximum Conducted Output Power	±0.686 dB	(1)
Maximum Power Spectral Density Level	±0.743 dB	(1)
Band-edge Compliance	±1.328 dB	(1)
Unwanted Emissions In Non-restricted Freq Bands	9kHz-1GHz: ±0.746dB 1GHz-26GHz: ±1.328dB	(1)
Conducted Emissions 9kHz~30MHz	±3.08 dB	(1)
Radiated Emissions 30~1000MHz	±4.51 dB	(1)
Radiated Emissions 1~18GHz	±5.84 dB	(1)
Radiated Emissions 18~40GHz	±6.12 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

#### 1.6. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15 °C to 35 °C
Relative Humidity:	20 % to 75 %
Air Pressure:	101 kPa





2. GENERAL INFORMATION

# 2.1. Client Information

Applicant:	Fast Metal LLC
Address:	2899 S. Shari Ave., Suite D Yuma, AZ 85365, Yuma Arizona United States
Manufacturer:	Micron Eyewear Manufactory Co. Ltd.
Address:	Liao Bian Tau Dong keng, Dongguan 523458, China
Factory:	Micron Eyewear Manufactory Co. Ltd.
Address:	Liao Bian Tau Dong keng,Dongguan 523458, China

# 2.2. General Description of EUT

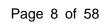
Product Name:	Smart glasses
Trade Mark:	Fast Metal
Model/Type reference:	FMi32BKSMS1
Listed Model(s):	FMi32TTFBS1, FMi33BKSM02, iGlass-3S, FMi3
Model Difference:	Only the model names are different.
Sample ID:	CTC240509-003-S001
Power Supply:	DC 5V/140mA
Hardware Version:	/
Software Version:	/
Bluetooth 5.3 / BLE	
Modulation:	GFSK
Operation Frequency:	2402MHz~2480MHz
Channel Number:	40
Channel Separation:	2MHz
Data Rate:	1Mbps
Antenna Type:	Ceramic Antenna
Antenna Gain:	0.10dBi





2.3. Accessory Equipment Information

Equipment Information				
Name	Model	S/N	Manufacturer	
Notebook	ThinkPad T460s	/	Lenovo	
POWER SUPPLY	/	/	/	
Cable Information				
Name	Shielded Type	Ferrite Core	Length	
USB Cable	Unshielded	No	100cm	
Test Software Inforn	nation			
Name	Version	/	/	
JS1120-3	V3.3.38	/	/	
BT FCC Tool	V2.24	/	/	





# 2.4. Operation State

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BT BLE, 40 channels are provided to the EUT. Channels 00/19/39 were selected for testing.

Operation Frequency List:

Channel	Frequency (MHz)
00	2402
01	2404
:	:
18	2438
19	2440
20	2442
:	i i
38	2478
39	2480

Note: The display in grey were the channel selected for testing.

#### Test Mode:

#### For RF test items:

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 Bluetooth instrument under large package sizes transmission.

For Radiated spurious emissions test item:

The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.



# 2.5. Measurement Instruments List

RF Test System - SRD					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	MXA Signal Analyzer	Keysight	N9020A	MY52091402	Aug. 21, 2025
2	Test Software	Tonscend	JS1120-3	V3.3.38	/

Report No.: CTC2025023003

	Radiated emission				
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 07, 2025
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-648	Dec. 07, 2025
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 12, 2025
4	Pre-Amplifier	SONOMA	310	186194	Dec. 12, 2025
5	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 12, 2025
6	Test Receiver	R&S	ESCI7	100967	Dec. 12, 2025
7	3m chamber 2	Frankonia	EE025	/	Oct. 23, 2025
8	Test Software	FARA	EZ-EMC	FA-03A2	/

	Conducted Emission				
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	LISN	R&S	ENV216	101112	Dec. 12, 2025
2	LISN	R&S	ENV216	101113	Dec. 12, 2025
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 12, 2025
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 12, 2025
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 12, 2025
6	Test Software	R&S	EMC32	6.10.10	/

Note: 1. The Cal. Interval was one year.

- 2. The Cal. Interval was three years of the antenna.
- 3. The cable loss has been calculated in test result which connection between each test instruments.



## 3. TEST ITEM AND RESULTS

#### 3.1. Conducted Emission

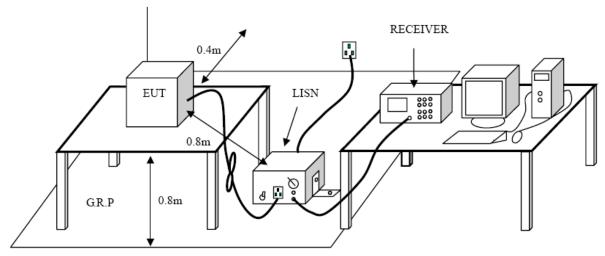
#### **Limit**

#### FCC CFR Title 47 Part 15 Subpart C Section 15.207

Fraguency (MHz)	Conducted Limit (dBμV)		
Frequency (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.

## **Test Configuration**



#### **Test Procedure**

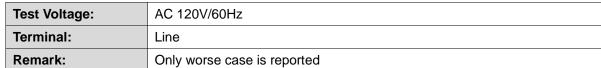
- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- 3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm / 50  $\mu$ H coupling impedance for the measuring equipment.
- 4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- 7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 8. During the above scans, the emissions were maximized by cable manipulation.

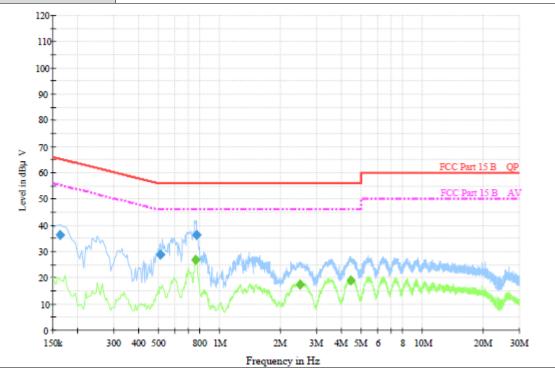
#### **Test Mode**

Please refer to the clause 2.4.

CTC Laboratories, Inc.

#### **Test Result**





## Final Measurement Detector 1

	Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
Γ	0.163500	36.5	1000.00	9.000	On	N	9.4	28.8	65.3	
	0.510000	28.7	1000.00	9.000	On	N	9.6	27.3	56.0	
Γ	0.766500	36.4	1000.00	9.000	On	N	9.4	19.6	56.0	

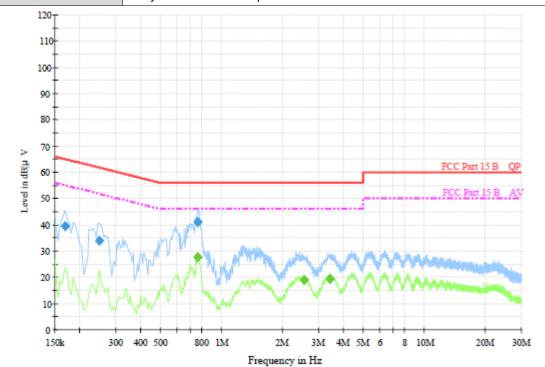
# Final Measurement Detector 2

Frequency (MHz)	Average (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ	Comment
0.757500	26.8	1000.00	9.000	On	N	9.3	19.2	46.0	
2.499000	17.5	1000.00	9.000	On	N	9.5	28.5	46.0	
4.407000	18.8	1000.00	9.000	On	N	9.5	27.2	46.0	

Emission Level = Read Level + Correct Factor



**Test Voltage:** AC 120V/60Hz Terminal: Neutral Remark: Only worse case is reported



# **Final Measurement Detector 1**

	Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
	0.168000	39.5	1000.00	9.000	On	L1	9.5	25.6	65.1	
[	0.249000	34.0	1000.00	9.000	On	L1	9.5	27.8	61.8	
[	0.762000	41.0	1000.00	9.000	On	L1	9.6	15.0	56.0	

## Final Measurement Detector 2

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.762000	27.7	1000.00	9.000	On	L1	9.6	18.3	46.0	
2.544000	19.0	1000.00	9.000	On	L1	9.6	27.0	46.0	
3.403500	19.5	1000.00	9.000	On	L1	9.4	26.5	46.0	

Emission Level = Read Level + Correct Factor

TRF No: CTC-TR-058\_A1 Society: <u>yz.cnca.cn</u>



## 3.2. Radiated Emission

#### **Limit**

FCC CFR Title 47 Part 15 Subpart C Section 15.209

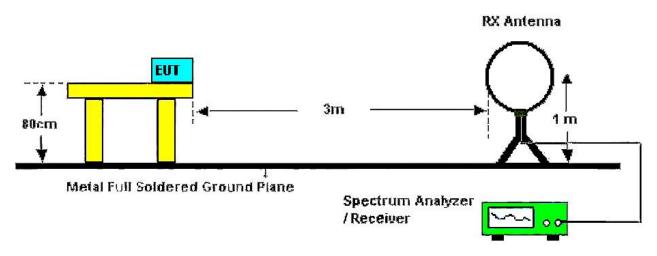
011 13.203	
Field Strength	Measurement Distance
(microvolts/meter)	(meters)
2400/F (kHz)	300
24000/F (kHz)	30
30	30
100	3
150	3
200	3
500	3
	Field Strength (microvolts/meter)  2400/F (kHz)  24000/F (kHz)  30  100  150  200

Frequency Range (MHz)	dBµV/m (at 3 meters)				
Frequency Range (MHZ)	Peak	Average			
Above 1000	74	54			

#### Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBμV/m)=20log Emission Level (μV/m).

## **Test Configuration**



Below 30MHz Test Setup

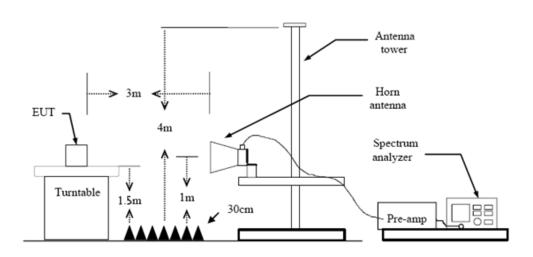
Ant. feed point 1~4 m

Metal Full Soldered Ground Plane

Spectrum Analyzer

30-1000MHz Test Setup

/Receiver



Above 1GHz Test Setup

#### **Test Procedure**

- 1. The EUT was setup and tested according to ANSI C63.10:2013.
- 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. 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.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Use the following spectrum analyzer settings
- (1) Span shall wide enough to fully capture the emission being measured;
- (2) 9k 150kHz:

RBW=300 Hz, VBW=1 kHz, Sweep=auto, Detector function=peak, Trace=max hold

(3) 0.15M – 30MHz:

RBW=10 kHz, VBW=30 kHz, Sweep=auto, Detector function=peak, Trace=max hold

(4) 30M - 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold

CTC Laboratories, Inc.



Page 15 of 58 Report No.: CTC2025023003

If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(5) From 1 GHz to 10<sup>th</sup> harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.8 Duty Cycle.

#### **Test Mode**

Please refer to the clause 2.4.

#### **Test Result**

#### 9 kHz~30 MHz

From 9 kHz to 30 MHz: The conclusion is PASS.

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

1000.000

Ant. Pol. Horizontal TX BLE 1M Mode 2402MHz **Test Mode:** Only worse case is reported. Remark: dBuV/m 90.0 80 70 60 FCC Part15 Class B 3M Radiation Margin -6 dB 50 40 30 Marrie Marrier St. Company of the St. Company of th <u>6</u> 20

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	96.4362	43.56	-21.86	21.70	43.50	-21.80	QP
2	149.4857	37.72	-17.65	20.07	43.50	-23.43	QP
3	193.7728	42.27	-20.87	21.40	43.50	-22.10	QP
4	281.0075	41.49	-17.73	23.76	46.00	-22.24	QP
5 *	374.6225	56.21	-15.31	40.90	46.00	-5.10	QP
6	851.0353	28.83	-5.44	23.39	46.00	-22.61	QP

(MHz)

300.00

#### Remarks:

-10 30.000

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

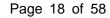
60.00

Ant. Pol. Vertical TX BLE 1M Mode 2402MHz Test Mode: Remark: Only worse case is reported. dBuV/m 90.0 80 70 60 FCC Part15 Class B 3M Radiation Margin -6 dB 50 40 30 20 10 -10 30.000 (MHz) 1000.000 60.00 300.00

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	45.2166	37.15	-18.13	19.02	40.00	-20.98	QP
2	56.0007	41.14	-18.84	22.30	40.00	-17.70	QP
3	87.4177	37.92	-22.18	15.74	40.00	-24.26	QP
4	141.8262	33.38	-18.24	15.14	43.50	-28.36	QP
5 *	369.4047	43.90	-15.50	28.40	46.00	-17.60	QP
6	890.7278	28.69	-5.11	23.58	46.00	-22.42	QP

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





Ant. Pol.	Horizontal
Test Mode:	TX BLE 1M Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4803.270	31.09	-3.45	27.64	54.00	-26.36	AVG
2	4804.827	44.00	-3.45	40.55	74.00	-33.45	peak

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX BLE 1M Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4803.966	31.28	-3.45	27.83	54.00	-26.17	AVG
2	4804.699	45.14	-3.45	41.69	74.00	-32.31	peak

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX BLE 1M Mode 2440MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4880.250	43.91	-3.38	40.53	74.00	-33.47	peak
2 *	4880.634	30.53	-3.38	27.15	54.00	-26.85	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol. Vertical		
Test Mode: TX BLE 1M Mode 2440MHz		
Remark:	No report for the emission which more than 20 dB below the prescribed limit.	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4880.389	44.49	-3.38	41.11	74.00	-32.89	peak
2 *	4880.934	30.60	-3.38	27.22	54.00	-26.78	AVG

## Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX BLE 1M Mode 2480MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4959.061	44.32	-3.23	41.09	74.00	-32.91	peak
2 *	4959.792	30.34	-3.23	27.11	54.00	-26.89	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical	
Test Mode: TX BLE 1M Mode 2480MHz		
Remark:	No report for the emission which more than 20 dB below the prescribed limit.	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4959.378	44.47	-3.23	41.24	74.00	-32.76	peak
2 *	4960.082	30.35	-3.23	27.12	54.00	-26.88	AVG

## Remarks:

 $1. Factor \ (dB/m) = Antenna \ Factor \ (dB/m) + Cable \ Factor \ (dB) - Pre-amplifier \ Factor$ 

2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX BLE 2M Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4803.818	31.04	-3.45	27.59	54.00	-26.41	AVG
2	4804.178	44.36	-3.45	40.91	74.00	-33.09	peak

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical	
Test Mode: TX BLE 2M Mode 2402MHz		
Remark:	No report for the emission which more than 20 dB below the prescribed limit.	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4803.832	31.35	-3.45	27.90	54.00	-26.10	AVG
2	4804.163	44.13	-3.45	40.68	74.00	-33.32	peak

## Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX BLE 2M Mode 2440MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4880.309	30.53	-3.38	27.15	54.00	-26.85	AVG
2	4880.856	43.86	-3.38	40.48	74.00	-33.52	peak

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX BLE 2M Mode 2440MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4880.213	30.56	-3.38	27.18	54.00	-26.82	AVG
2	4880.642	43.62	-3.38	40.24	74.00	-33.76	peak

#### Remarks

 $1. Factor \ (dB/m) = Antenna \ Factor \ (dB/m) + Cable \ Factor \ (dB) - Pre-amplifier \ Factor$ 

2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX BLE 2M Mode 2480MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4959.632	30.43	-3.23	27.20	54.00	-26.80	AVG
2	4959.827	43.96	-3.23	40.73	74.00	-33.27	peak

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX BLE 2M Mode 2480MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4959.742	31.47	-3.23	28.24	54.00	-25.76	AVG
2	4960.933	45.85	-3.23	42.62	74.00	-31.38	peak

## Remarks:

 $1. Factor \ (dB/m) = Antenna \ Factor \ (dB/m) + Cable \ Factor \ (dB) - Pre-amplifier \ Factor$ 

2.Margin value = Level -Limit value



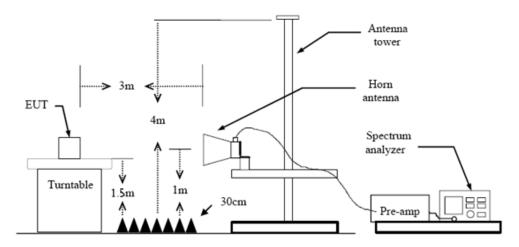
## 3.3. Band Edge Emissions (Radiated)

#### Limit

#### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d)

Restricted Frequency Band	(dBµV/m	) (at 3m)
(MHz)	Peak	Average
2310 ~ 2390	74	54
2483.5 ~ 2500	74	54

#### **Test Configuration**



#### **Test Procedure**

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- The receiver set as follow:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

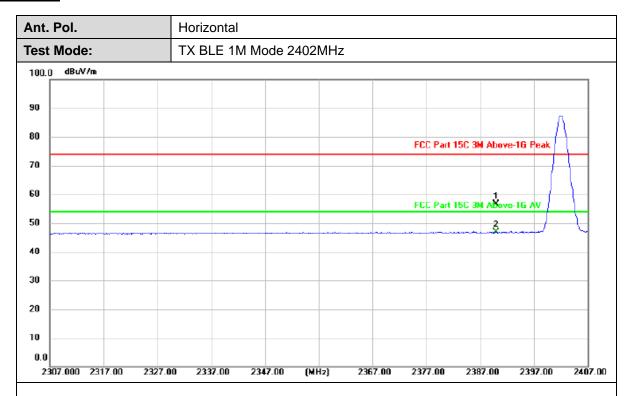
RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.8 Duty Cycle.

#### **Test Mode**

Please refer to the clause 2.4.

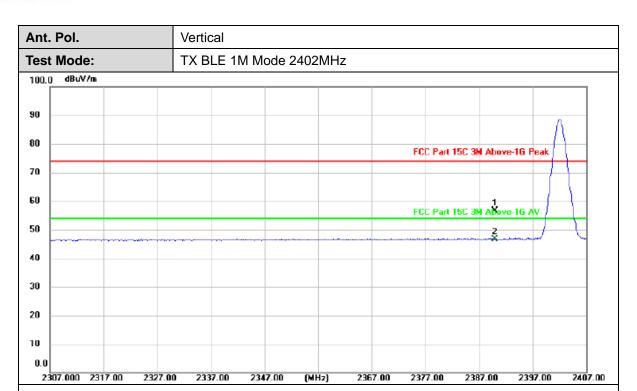
#### **Test Result**



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	2390.000	25.06	31.57	56.63	74.00	-17.37	peak
2 *	2390.000	15.39	31.57	46.96	54.00	-7.04	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

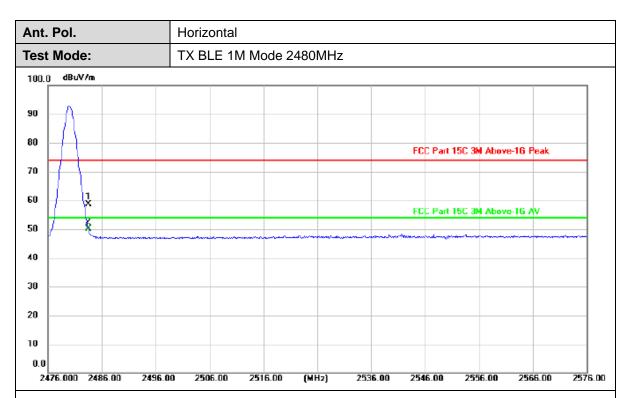


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	24.98	31.57	56.55	74.00	-17.45	peak
2 *	2390.000	15.05	31.57	46.62	54.00	-7.38	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



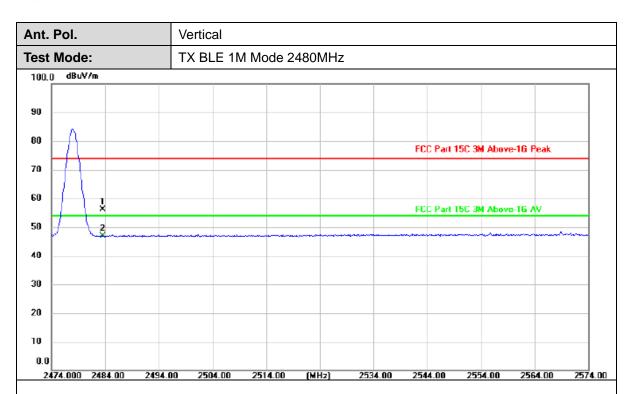


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	26.82	31.73	58.55	74.00	-15.45	peak
2 *	2483.500	18.36	31.73	50.09	54.00	-3.91	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



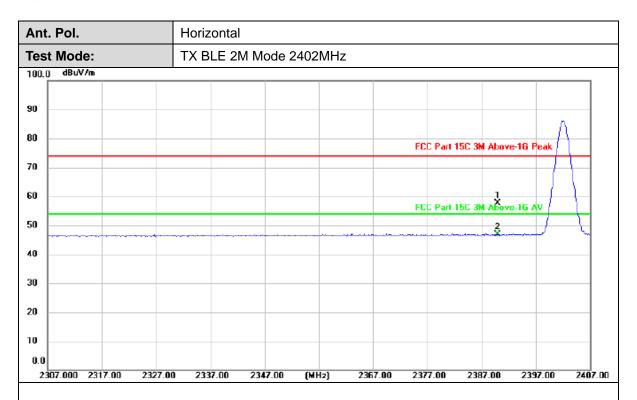


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	24.42	31.73	56.15	74.00	-17.85	peak
2 *	2483.500	15.11	31.73	46.84	54.00	-7.16	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





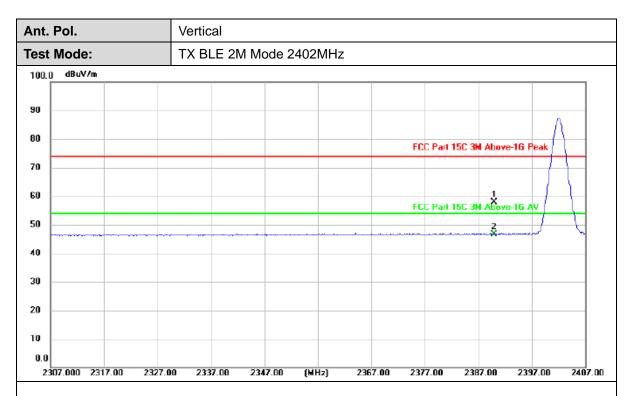
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector	
1	2390.000	26.13	31.57	57.70	74.00	-16.30	peak	
2 *	2390.000	15.28	31.57	46.85	54.00	-7.15	AVG	

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



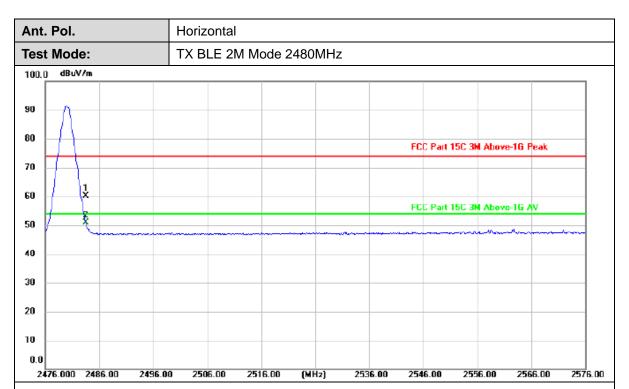


No. Frequency (MHz)		Reading (dBuV)		Factor Level (dB/m)		Margin (dB)	Detector	
	1	2390.000	26.26	31.57	57.83	74.00	-16.17	peak
	2 *	2390.000	15.17	31.57	46.74	54.00	-7.26	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





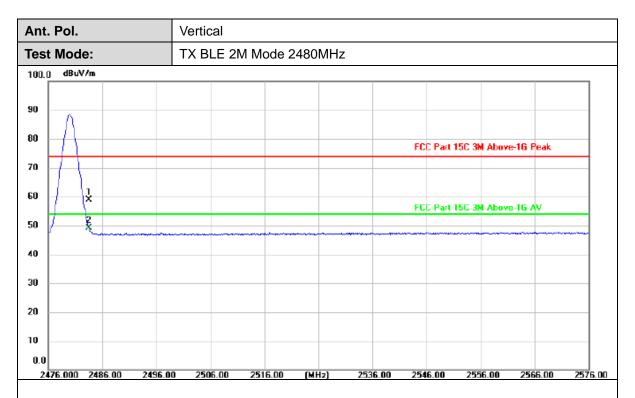
No.		Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	1	2483.500	28.46	31.73	60.19	74.00	-13.81	peak
	2 *	2483.500	19.18	31.73	50.91	54.00	-3.09	AVG

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value





	No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)		Margin (dB)	Detector	
	1	2483.500	27.23	31.73	58.96	74.00	-15.04	peak	_
	2 *	2483.500	17.48	31.73	49.21	54.00	-4.79	AVG	Ī

#### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

Page 33 of 58

Report No.: CTC2025023003



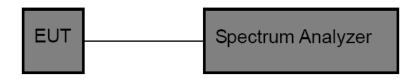
# 3.4. Band Edge and Spurious Emissions (Conducted)

#### **Limit**

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d)

In any 100 kHz bandwidth outside the frequency band 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

#### **Test Configuration**



#### **Test**

#### **Procedure**

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- Use the following spectrum analyzer settings: RBW = 100 kHz, VBW ≥ RBW, scan up through 10<sup>th</sup> harmonic. Sweep = auto, Detector function = peak, Trace = max hold.
- 4. Measure and record the results in the test report.

#### **Test Mode**

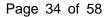
Please refer to the clause 2.4.

#### **Test Result**

#### **Band Edge Conducted Test**

TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
DLE 4M	A n+1	Low	2402	2.20	-51.01	≤-17.8	PASS
DLE_IIVI	BLE_1M Ant1	High	2480	1.96	-51.52	≤-18.04	PASS
DIE OM	A net1	Low	2402	1.64	-33.08	≤-18.36	PASS
BLE_2M Ant1	Anti	High	2480	1.88	-53.65	≤-18.13	PASS

CTC Laboratories, Inc.





**Conducted Spurious Emissions Test** 

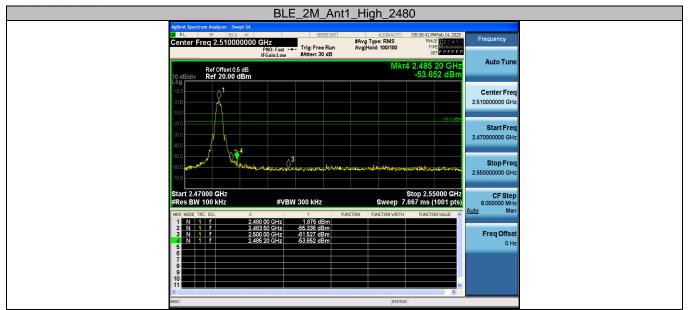
TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
			Reference	1.30	1.30		PASS
		2402	30~1000	1.30	-63.4	≤-18.7	PASS
			1000~26500	1.30	-54.25	≤-18.7	PASS
			Reference	1.03	1.03		PASS
BLE_1M	Ant1	2440	30~1000	1.03	-63.62	≤-18.97	PASS
_			1000~26500	1.03	-55.29	≤-18.97	PASS
		2480	Reference	2.10	2.10		PASS
			30~1000	2.10	-63.7	≤-17.9	PASS
			1000~26500	2.10	-55.35	≤-17.9	PASS
		2402	Reference	-0.44	-0.44		PASS
			30~1000	-0.44	-63.7	≤-20.44	PASS
			1000~26500	-0.44	-50.29	≤-20.44	PASS
		2440	Reference	-1.28	-1.28		PASS
BLE_2M	Ant1		30~1000	-1.28	-63.75	≤-21.28	PASS
			1000~26500	-1.28	-55.99	≤-21.28	PASS
		2480	Reference	-0.68	-0.68		PASS
			30~1000	-0.68	-63.76	≤-20.68	PASS
			1000~26500	-0.68	-56.16	≤-20.68	PASS



## Band Edge Conducted Test plot as follows:

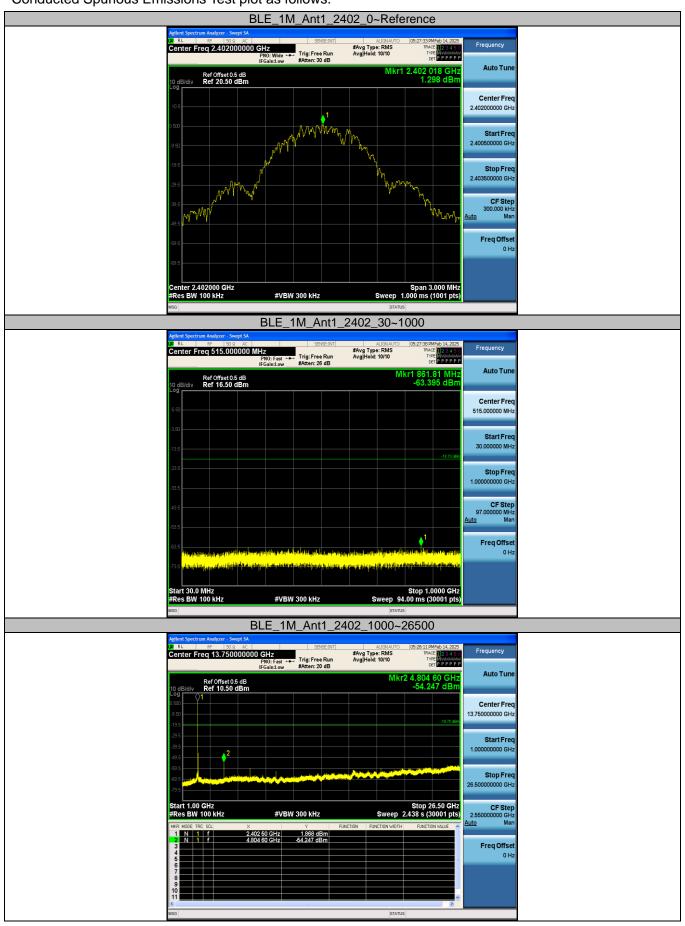




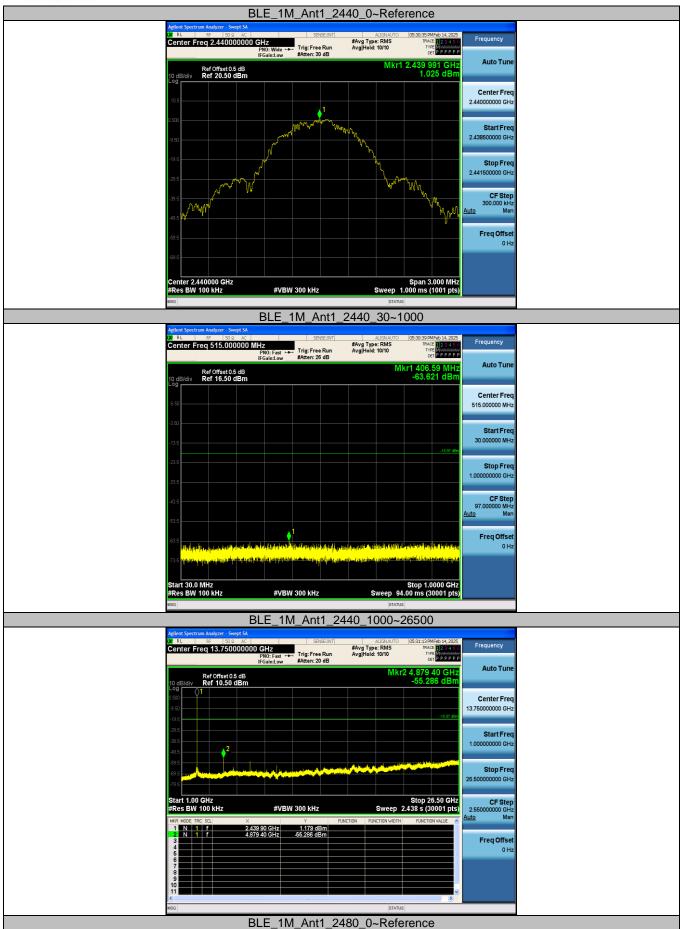




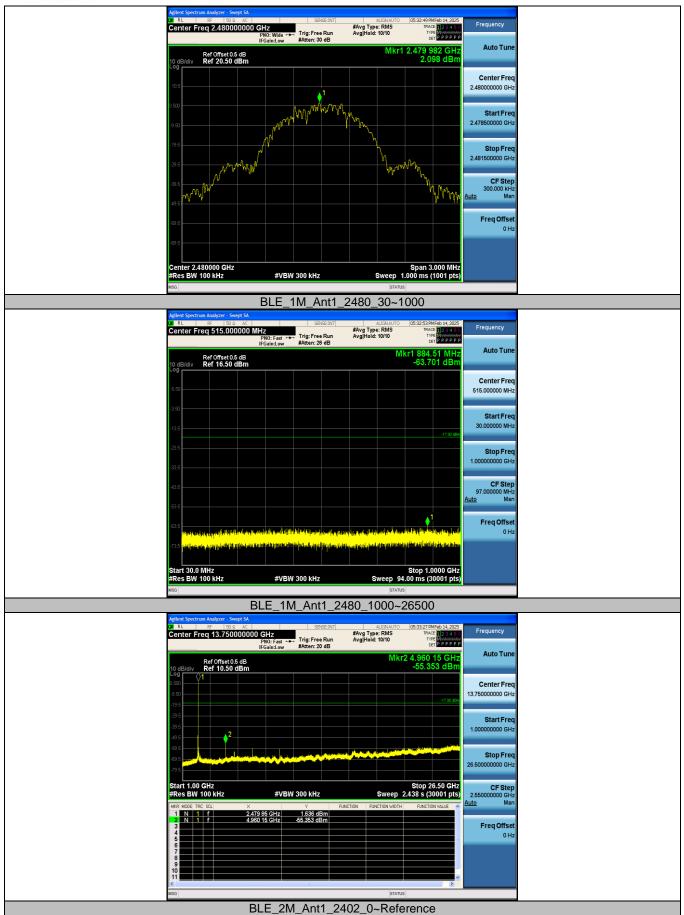
## Conducted Spurious Emissions Test plot as follows:



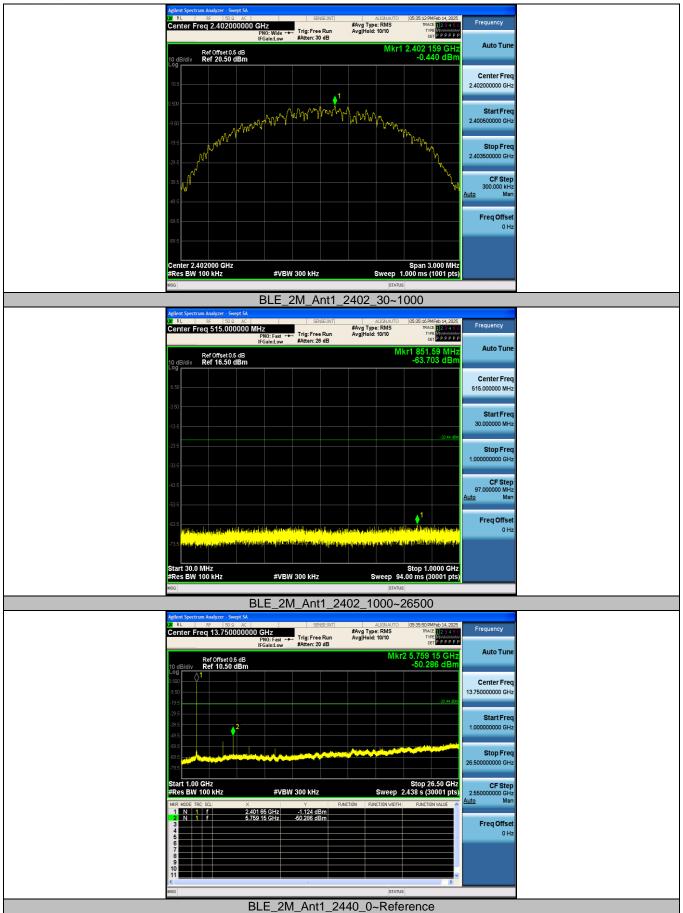


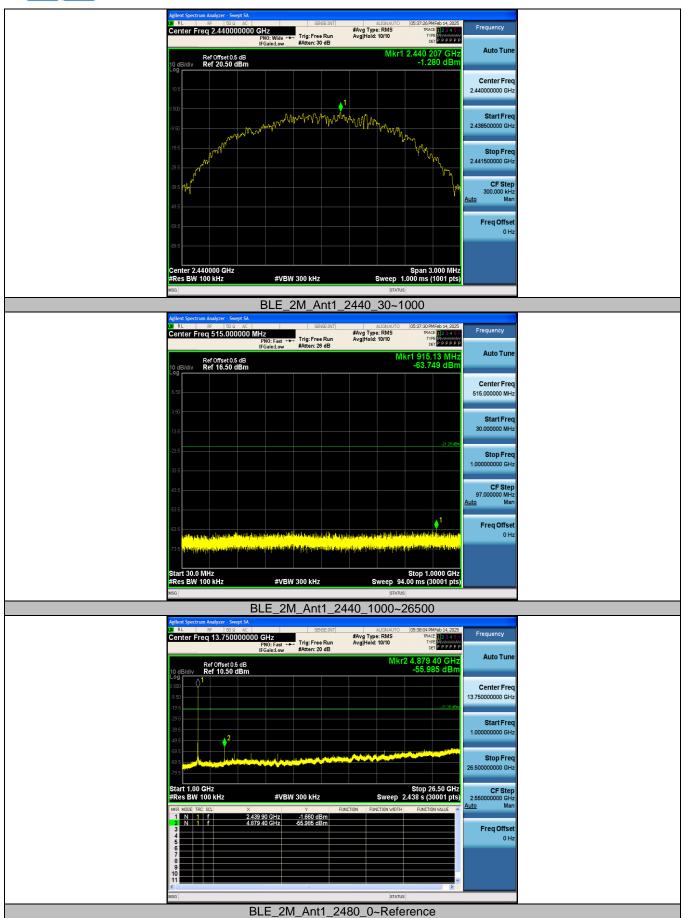


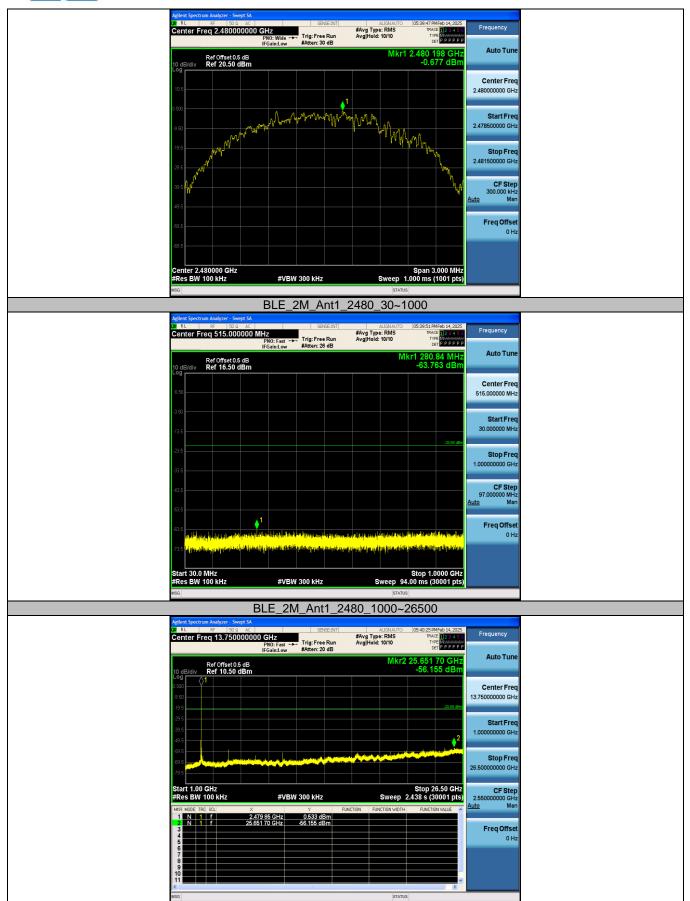
















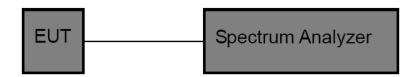
## 3.5. DTS Bandwidth

#### **Limit**

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2)

Test Item	Limit	Frequency Range (MHz)
DTS Bandwidth	≥500 kHz (6dB bandwidth)	2400~2483.5

## **Test Configuration**



## **Test Procedure**

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. DTS Spectrum Setting:
  - (1) Set RBW = 100 kHz.
  - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.
  - OCB Spectrum Setting:
  - (1) Set RBW =  $1\% \sim 5\%$  occupied bandwidth.
  - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

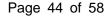
NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

## **Test Mode**

Please refer to the clause 2.4.

#### **Test Result**

TRF No: CTC-TR-058\_A1 For anti-fake verifica Society: <u>yz.cnca.cn</u>





## 99% Bandwidth:

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
		2402	1.0443	2401.4775	2402.5218		
BLE_1M	Ant1	2440	1.0452	2439.4815	2440.5267		
		2480	1.0497	2479.4738	2480.5235		
		2402	2.0606	2400.9815	2403.0421		
BLE_2M Ant1	Ant1	2440	2.0649	2438.9827	2441.0476		
		2480	2.0487	2478.9934	2481.0421		



TRF No: CTC-TR-058\_A1 For anti-fake verification, please visit the official website of China Inspection And Testing Society: <a href="mailto:yz.cnca.cn">yz.cnca.cn</a>

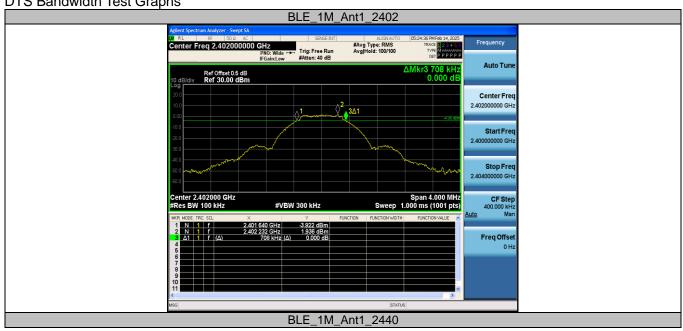


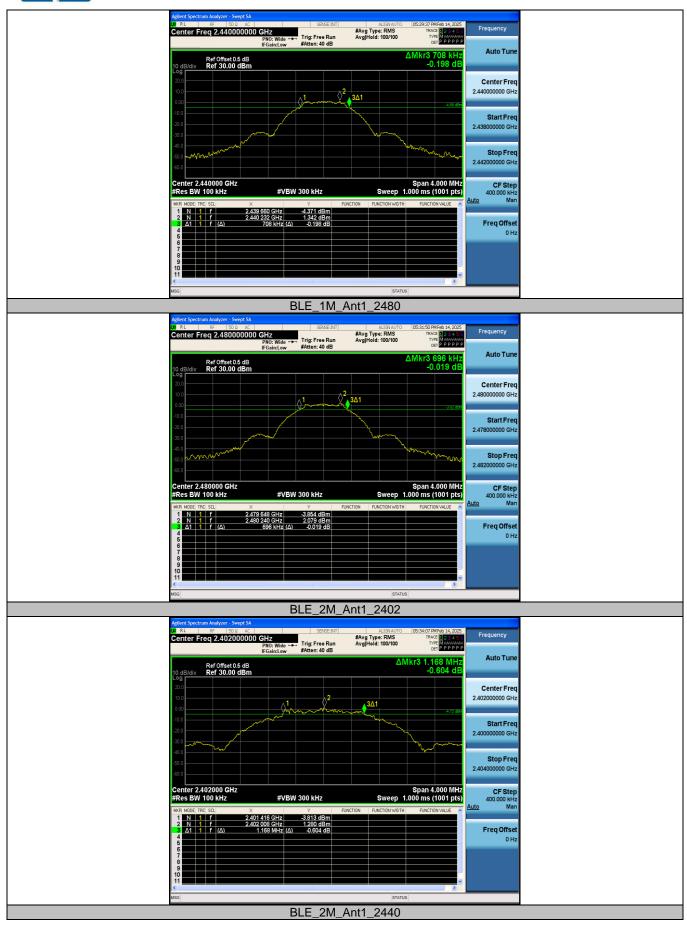


#### DTS Bandwidth:

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
		2402	0.708	2401.640	2402.348	0.5	PASS
BLE_1M Ant1	Ant1	2440	0.708	2439.660	2440.368	0.5	PASS
	2480	0.696	2479.648	2480.344	0.5	PASS	
		2402	1.168	2401.416	2402.584	0.5	PASS
BLE_2M Ant1	Ant1	2440	1.236	2439.348	2440.584	0.5	PASS
	2480	1.408	2479.324	2480.732	0.5	PASS	

DTS Bandwidth Test Graphs







TRF No: CTC-TR-058\_A1 For anti-rake Verifica Society: <u>vz.cnca.cn</u>



# 3.6. Peak Output Power

## **Limit**

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3)

Section	Test Item	Limit	Frequency Range (MHz)
FCC CFR 47 Part15.247 (b)(3)	Maximum Conducted Output Power	1 Watt or 30dBm	2400~2483.5
ISED RSS-247 5.4 d	EIRP	4 Watt or 36dBm	2400~2483.5

## **Test Configuration**



## **Test Procedure**

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
  - (1) Set RBW ≥ DTS Bandwidth.
  - (2) Set VBW ≥ 3\*RBW.
  - (3) Set Span ≥ 3\*RBW.
  - (4) Sweep time = Auto couple.
  - (5) Detector = Peak.
  - (6) Trace mode = Max hold.

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

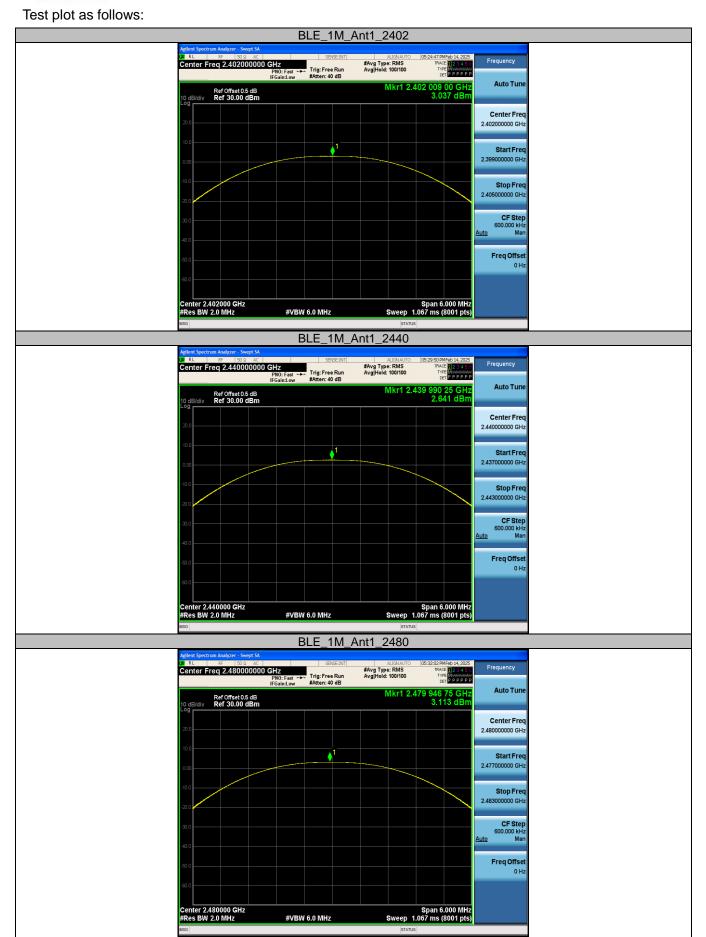
## **Test Mode**

Please refer to the clause 2.4.

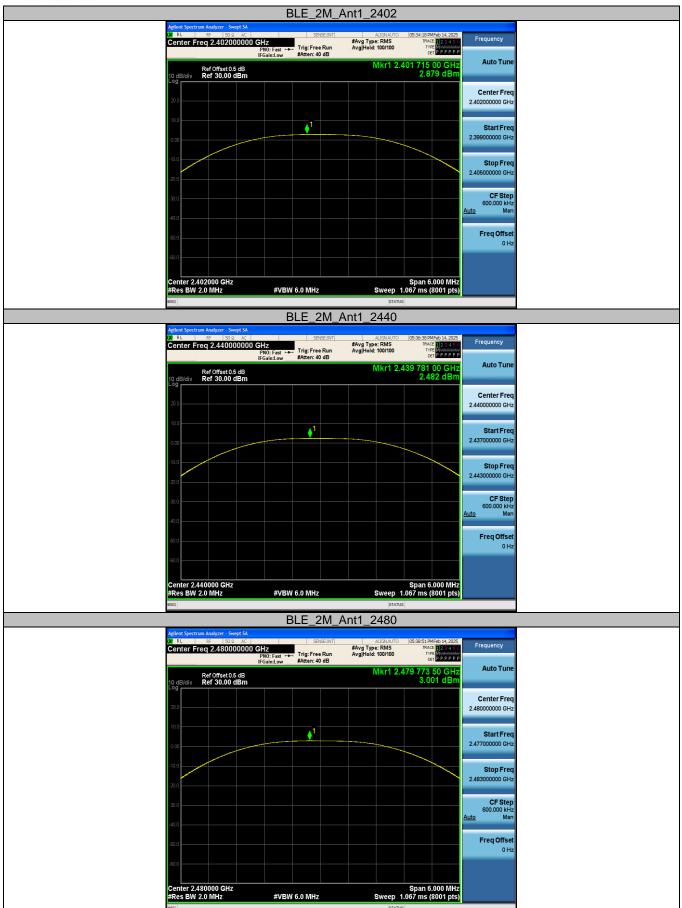
## **Test Result**

TestMode	Antenna	Freq(MHz)	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	3.04	≤30	PASS
		2440	2.64	≤30	PASS
		2480	3.11	≤30	PASS
BLE_2M	Ant1	2402	2.88	≤30	PASS
		2440	2.48	≤30	PASS
		2480	3.00	≤30	PASS

TRF No: CTC-TR-058\_A1 For anti-fake verifica Society: <u>yz.cnca.cn</u>







Page 52 of 58

Report No.: CTC2025023003



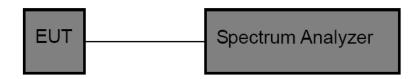
# 3.7. Power Spectral Density

#### **Limit**

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e)

Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	8 dBm (in any 3 kHz)	2400~2483.5

## **Test Configuration**



#### **Test Procedure**

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
- 3. Spectrum Setting:

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz. Set the VBW to: 10 kHz.

Detector: peak. Sweep time: auto.

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

#### **Test Mode**

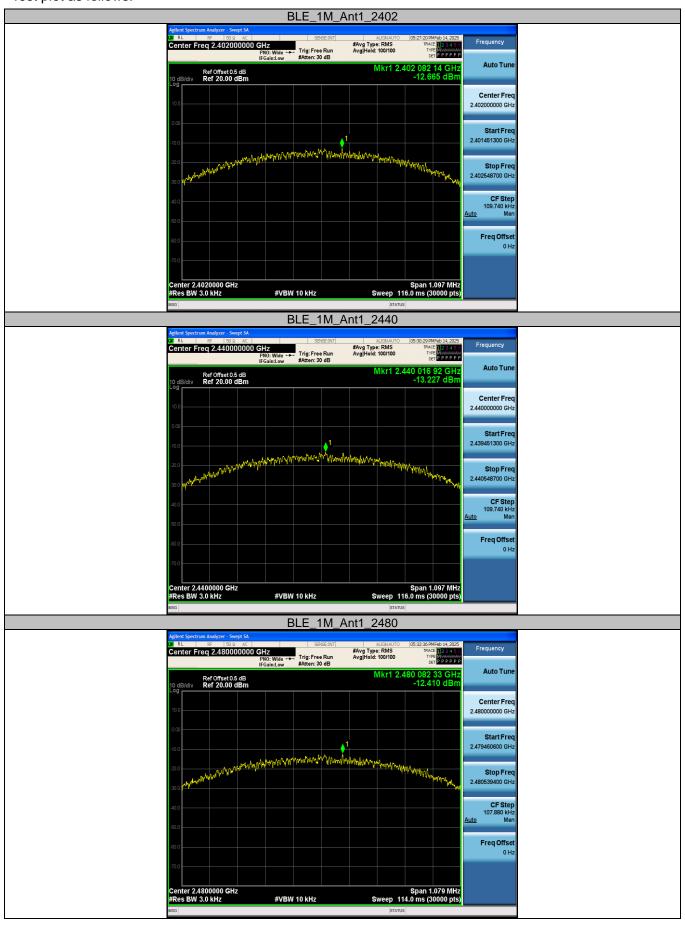
Please refer to the clause 2.4.

#### **Test Result**

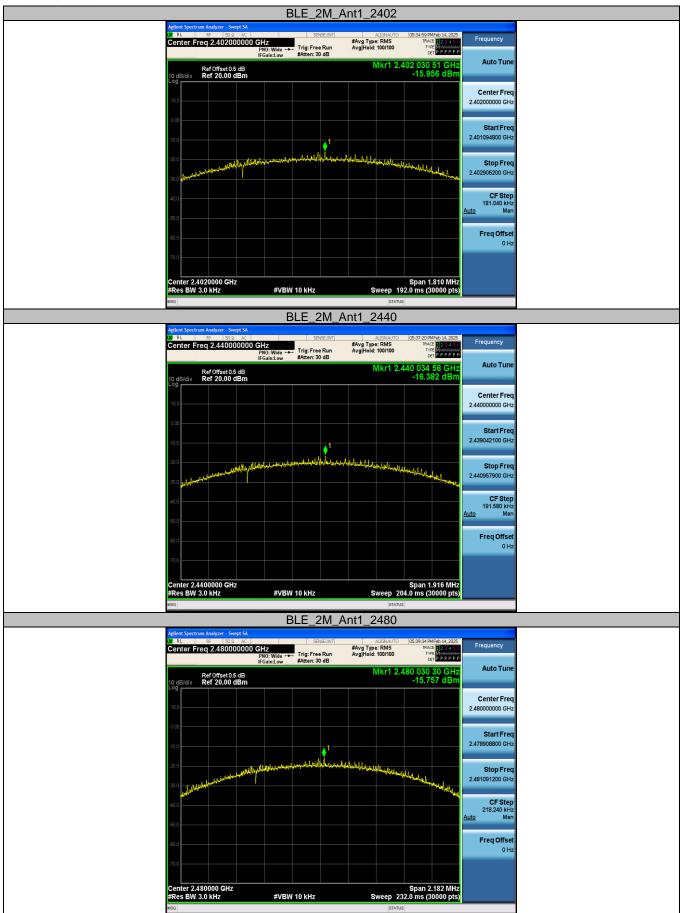
TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
		2402	-12.67	≤8.00	PASS
BLE_1M Ant1	Ant1	2440	-13.23	≤8.00	PASS
		2480	-12.41	≤8.00	PASS
	BLE_2M Ant1	2402	-15.96	≤8.00	PASS
BLE_2M		2440	-16.38	≤8.00	PASS
		2480	-15.76	≤8.00	PASS

TRF No: CTC-TR-058\_A1 For anti-fake verification, please visit the official website of China Inspection And Testing Society: <a href="mailto:yz.cnca.cn">yz.cnca.cn</a>









Page 55 of 58

age 55 of 58 Report No.: CTC2025023003

## 3.8. Duty Cycle

## **Limit**

None, for report purposes only.

## **Test Configuration**



#### **Test Procedure**

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
- 3. Spectrum Setting:

Set analyzer center frequency to test channel center frequency.

Set the span to 0Hz. Set the RBW to 10MHz.

Set the VBW to 10MHz.

Detector: Peak. Sweep time: Auto.

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

## **Test Mode**

Please refer to the clause 2.4.

## **Test Result**

Test Mode	Frequency (MHz)	Transmission Duration (ms)	Transmission Period (ms)	Duty Cycle (%)	1/T Minimum VBW (kHz)	Final Setting for VBW (kHz)
	2402	2.14	2.50	85.60	0.47	1
BLE_1M	2440	2.14	2.50	85.60	0.47	1
	2480	2.12	2.50	84.80	0.47	1
	2402	1.08	1.26	85.71	0.93	1
BLE_2M	2440	1.06	1.24	85.48	0.94	1
	2480	1.06	1.24	85.48	0.94	1

TRF No: CTC-TR-058\_A1 For anti-fake ve

Test plot as follows:







Page 58 of 58 Report No.: CTC2025023003

## 3.9. Antenna Requirement

#### Requirement

## FCC CFR Title 47 Part 15 Subpart C Section 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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

## FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i)

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### **Test Result**

Result

The directional gain of the antenna is less than 6dBi, please refer to the EUT internal photographs antenna photo.

PASS. The EUT has 1 antenna: a Ceramic Antenna for BT. Note: Antenna use a permanently attached antenna which is not replaceable.  Not using a standard antenna jack or electrical connector for antenna replacement.  The antenna has to be professionally installed (please provide method of installation).	
**************************************	