



# RF TEST REPORT

**Report No.:** SET2016-15100

**Product Name:** Heavy Bag with Punch Tracking Sensor

**FCC ID:** 2AJH6-111200

**IC:** 21892-111200

**Model No. :** 1102-48, 1201-54

**Applicant:** Ten Count Sporting Goods INC.

**Address:** 138 Brantwood Park Rd Ontario, N3P1G3, Canada

**Dates of Testing:** 08/11/2016 — 08/22/2016

**Issued by:** SHENZHEN HUATONGWEI INTERNATIONAL INSPECTION

**Lab Location:** 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao,  
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**Tel:** 86 755 26627338    **Fax:** 86 755 26627238

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## Test Report

**Product Name**.....: Heavy Bag with Punch Tracking Sensor.

**Brand Name**.....: TenCount

**Trade Name** .....: Ten Count Sporting Goods INC.

**Applicant** .....: Ten Count Sporting Goods INC.


**Applicant Address** .....: 138 Brantwood Park Rd Ontario, N3P1G3, Canada


**Manufacturer** .....: Shenzhen MZJ Technology Co., Limited


**Manufacturer Address** .....: Dashuikeng 2nd Village, Shengyigao Industrial Park  
Guanlan Town, Longhua New District, Shenzhen City,  
Guangdong Province, China zip: 518110

**Test Standards** .....: 47 CFR Part 15 Subpart C: Radio Frequency Devices  
ANSI C63.10-2013: American National Standard for  
Testing Unlicensed Wireless Devices  
RSS-247 Issue 1, May 2015 Digital Transmission  
Systems (DTSS), Frequency Hopping Systems (FHSs)  
and Licence-Exempt Local Area Network (LE-LAN)  
Devices  
KDB 558074D01 v03r05

**Test Result**.....: PASS

**Tested by** .....:   
2016.08.23  
Lu Lei, Test Engineer

**Reviewed by** .....:   
2016.08.23  
Zhu Qi, Senior Engineer

**Approved by** .....:   
2016.08.23  
Wu Li'an, Manager

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Change History		
Issue	Date	Reason for change
1.0	2016.08.23	First edition

## 1. General Information

### 1.1. EUT Description

EUT Type	Heavy Bag with Punch Tracking Sensor
Hardware Version	V2.1
Software Version	V1.1
EUT supports Radios application	Bluetooth V4.0 BLE
Frequency Range	2402MHz~2480MHz
Channel Number	40
Bit Rate of Transmitter	1Mbps
Modulation Type	GFSK
Antenna Type	Chip Antenna
Antenna Gain	1.3dBi

Note 1: The EUT is a Heavy Bag with Punch Tracking Sensor, it contain Bluetooth 4.0 BLE chipset operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth 4.0 BLE is  $F(\text{MHz})=2402+2*n$  ( $0 \leq n \leq 39$ ). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 19(2440MHz) and 39 (2480MHz).

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 3: In this report, the Main testing EUT Model 1201-54. The EUT is a Heavy Bag with Punch Tracking Sensor, it contains 2 models, they are 1102-48, 1201-54. They have the same internal structure, and the only difference is the size and color. For a more detailed description, please refer to Declaration Letter supplied by the applicant or manufacturer.

## 1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC / IC Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2013	Radio Frequency Devices
2	ANSI C63.10 2013	American National Standard for Testing Unlicensed Wireless Devices
3	RSS-GEN: Issue 4, November 2014:	General Requirements and Information for the Certification of Radio Apparatus
4	RSS-247: Issue 1, December 2015:	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Standard(s) Section		Description	Result
	FCC	IC		
1	15.203	8.3	Antenna Requirement	PASS
2	15.247(b)(3)	RSS-247 Issue1 - 5.4(4)	Peak Output Power	PASS
3	15.247(a)(2)	RSS-247 Issue1 - 5.2(1)	Bandwidth – 6dB bandwidth	PASS
4	/	RSS Gen clause - 4.6.1	99% Occupied Bandwidth	PASS
5	15.247(d)	RSS-247 Issue1 - 5.5	Conducted Spurious Emission	PASS
6	15.247(e)	RSS-247 Issue1 - 5.2(2)	Power spectral density (PSD)	PASS
7	15.205 15.247(d)	RSS-247 Issue1 - 5.5 RSS - Gen	Band Edge	PASS
8	15.209(a)	RSS-GEN	Spurious emissions radiated below 30MHz	PASS
9	15.247(d) 15.109	RSS-247 Issue1 - 5.5 RSS-Gen	Spurious emissions radiated 30 MHz to 1GHz and above 1GHz	PASS
10	15.107(a), 15.20(c)	RSS-GEN	Conducted Emission	PASS

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 V03r05.

### 1.3. Description of test environment test modes

40 channels are provided for Bluetooth LE 4.0

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

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of this EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX CH 0
Mode 2	TX CH 19
Mode 3	TX CH 39
Mode 4	Normal operating mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Normal operating mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX CH 0
Mode 2	TX CH 19
Mode 3	TX CH 39

Note1: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

Note2: Fully-charged battery was used during test.

## 1.4. Facilities and Accreditations

### 1.4.1. Facilities

#### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories

(identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

#### **FCC-Registration No.: 317478**

Shenzhen Huatongwei International Inspection Co., Ltd. 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 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

#### **IC-Registration No.: 5377B**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

### 1.4.2. Test Environment Conditions

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

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa



## 2. 47 CFR Part 15C Requirements

### 2.1. Antenna requirement

#### 2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### 2.1.2. Antenna Information

**Antenna Category:** Internal antenna

An Internal antenna was placed on PCB, can't be removed.

**Antenna General Information:**

No.	EUT	Ant. Type	Gain(dBi)
1	Heavy Bag with Punch Tracking Sensor	Chip	1.3

#### 2.1.3. Result: comply

The module contains a unique antenna connector, and be marketed and operated only with specific antenna.

## 2.2. Peak Output Power

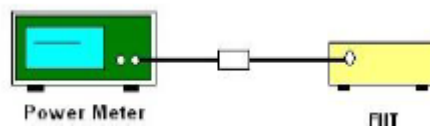
### 2.2.1. Limit of Peak Output Power

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.

### 2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.2.3. Test Setup



### 2.2.4. Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB 558074D01 v03r05.
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.

### 2.2.5. Test Result

Channel	Frequency (MHz)	RF Power(dBm)	Limit (dBm)	Verdict
		GFSK/1Mbps		
0	2402	-4.68	30	PASS
19	2440	-4.77		PASS
39	2480	-5.05		PASS

### 2.3. 6dB & 99% Bandwidth

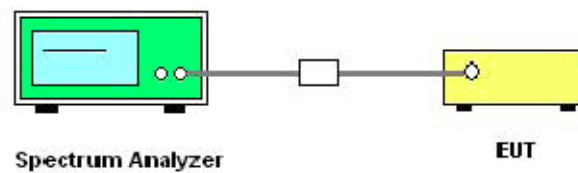
#### 2.3.1. Limit of 6dB & 99% Bandwidth

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

#### 2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

#### 2.3.3. Test Setup



#### 2.3.4. Test Procedures

1. The testing follows FCC KDB 558074D01 v03r05.

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 6dB bandwidth must be greater than 500 kHz.

5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30 kHz and set the Video bandwidth (VBW) = 100 kHz.

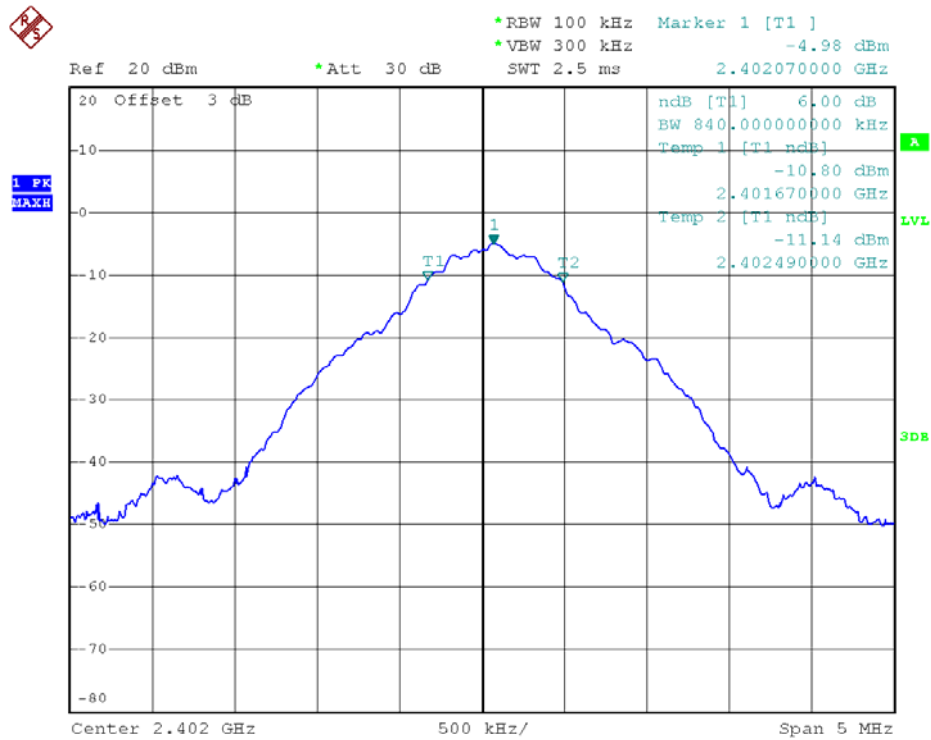
6. Measure and record the results in the test report.

#### 2.3.5. Test Results of 6dB and 99% Bandwidth

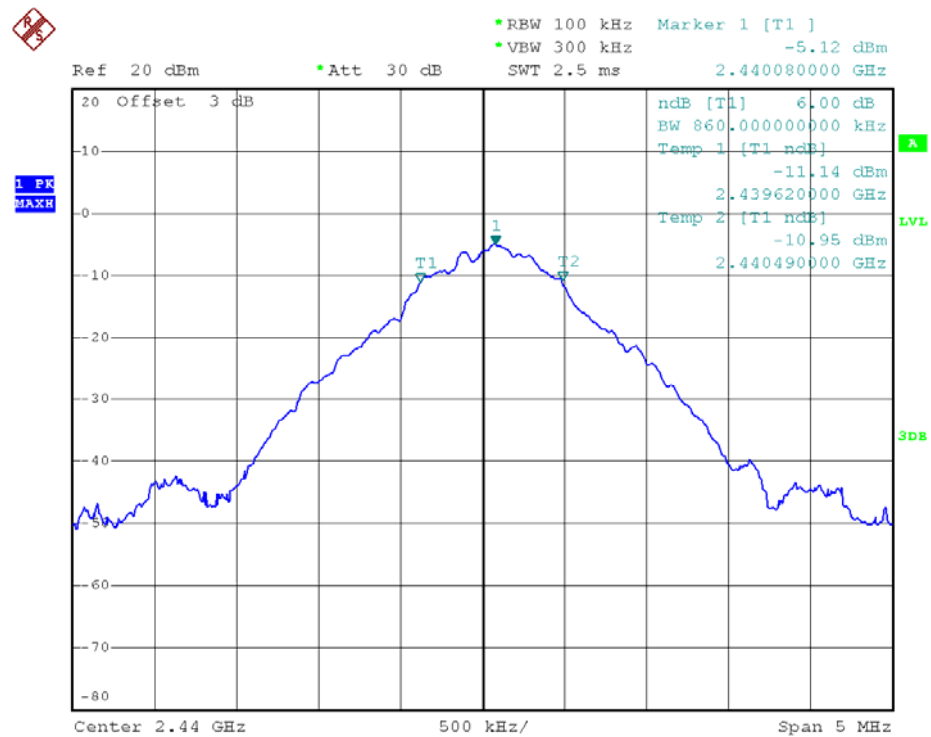
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limits (MHz)	Result
0	2402	0.84	1.74	$\geq 0.5$	PASS
19	2440	0.86	1.76	$\geq 0.5$	PASS
39	2480	0.83	1.78	$\geq 0.5$	PASS

### 2.3.6. Test Results (plots) of Bandwidth

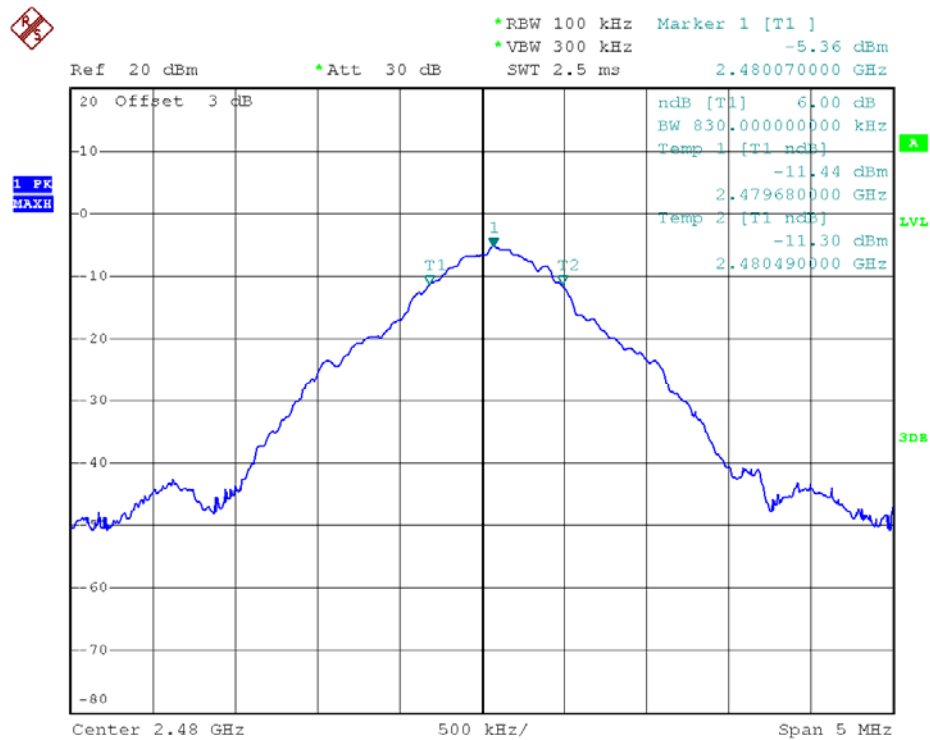
#### 6 dB Bandwidth Plot on channel 0



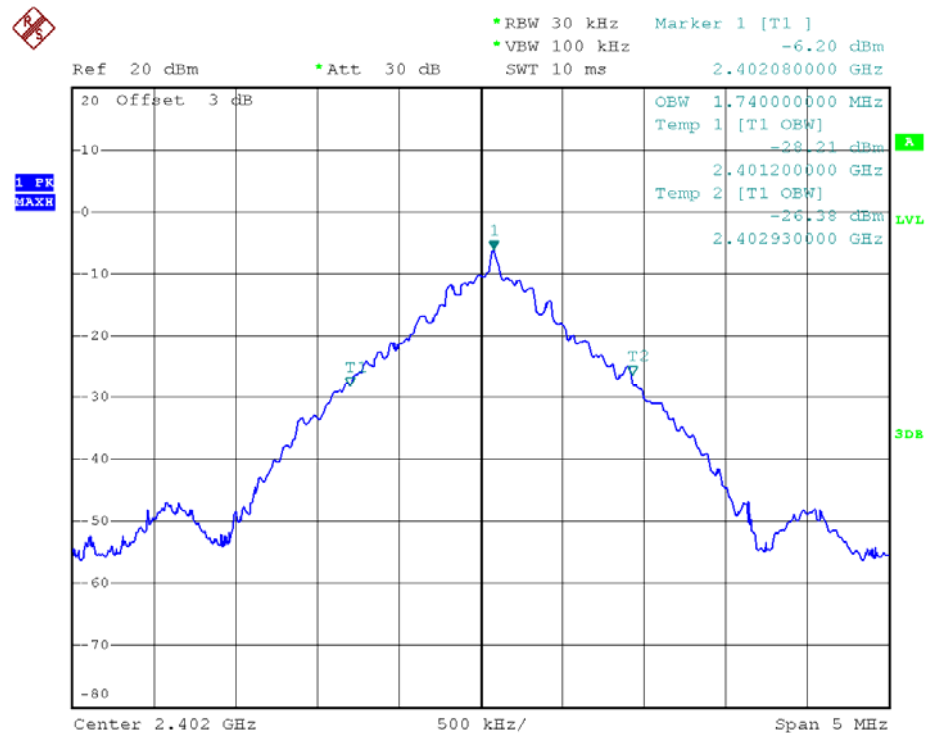
#### 6 dB Bandwidth Plot on channel 19



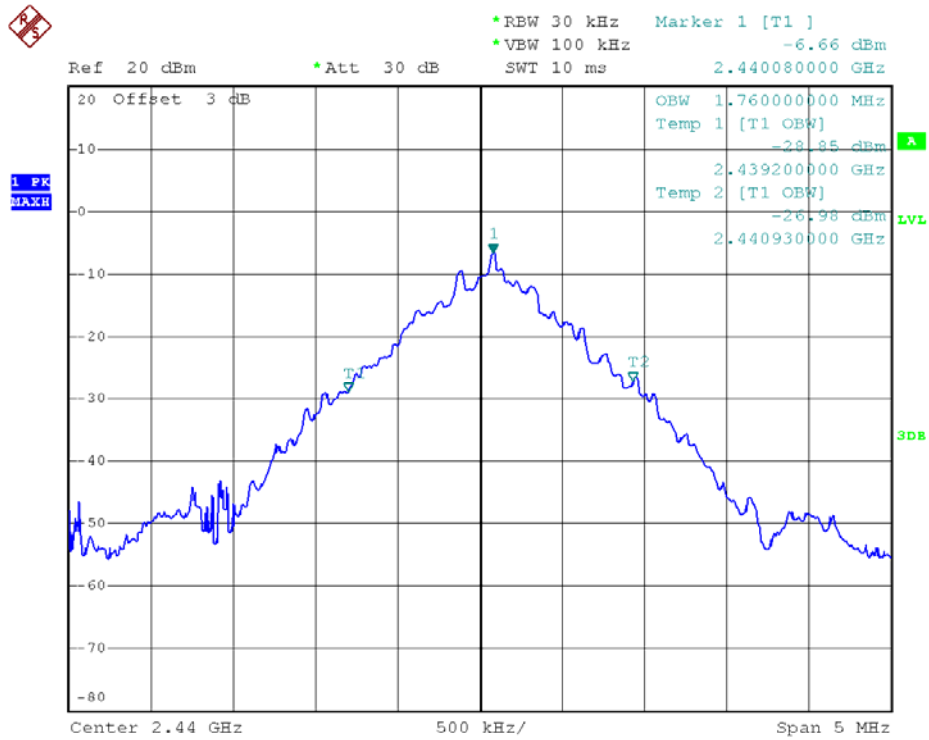
### 6 dB Bandwidth Plot on channel 39



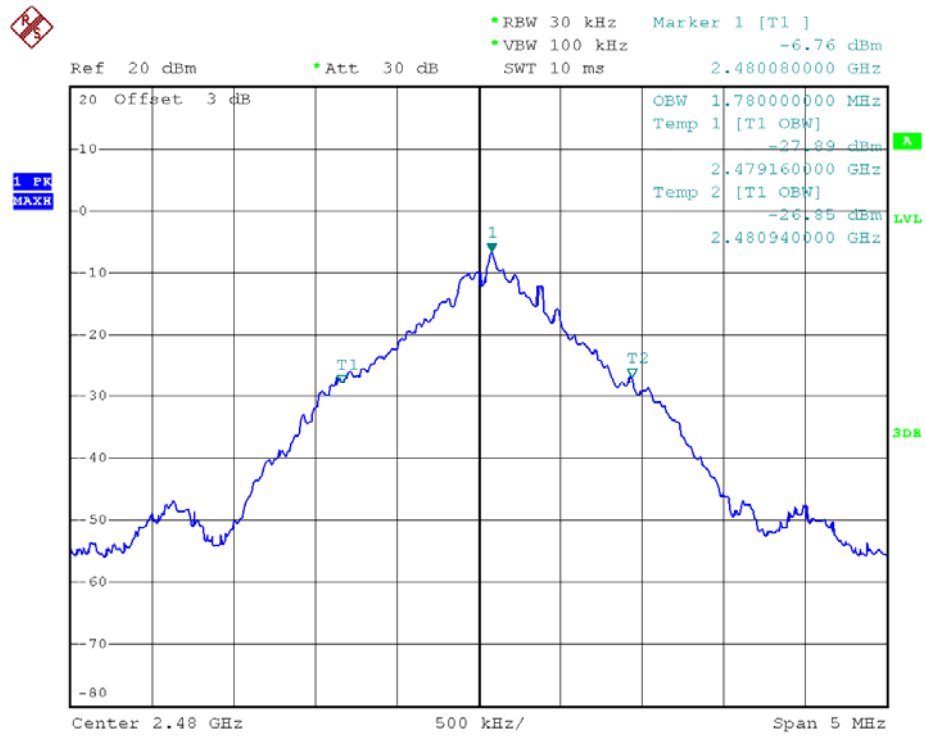
### 99% Bandwidth Plot on channel 0



### 99% Bandwidth Plot on channel 19



### 99% Bandwidth Plot on channel 39



## 2.4. Conducted Band Edges and Spurious Emissions

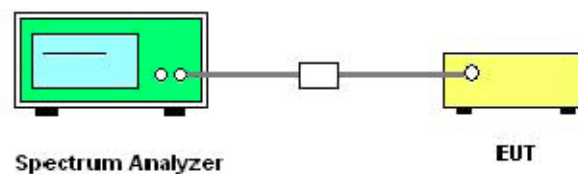
### 2.4.1. Limit of Conducted Band Edges and Spurious Emissions

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

### 2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

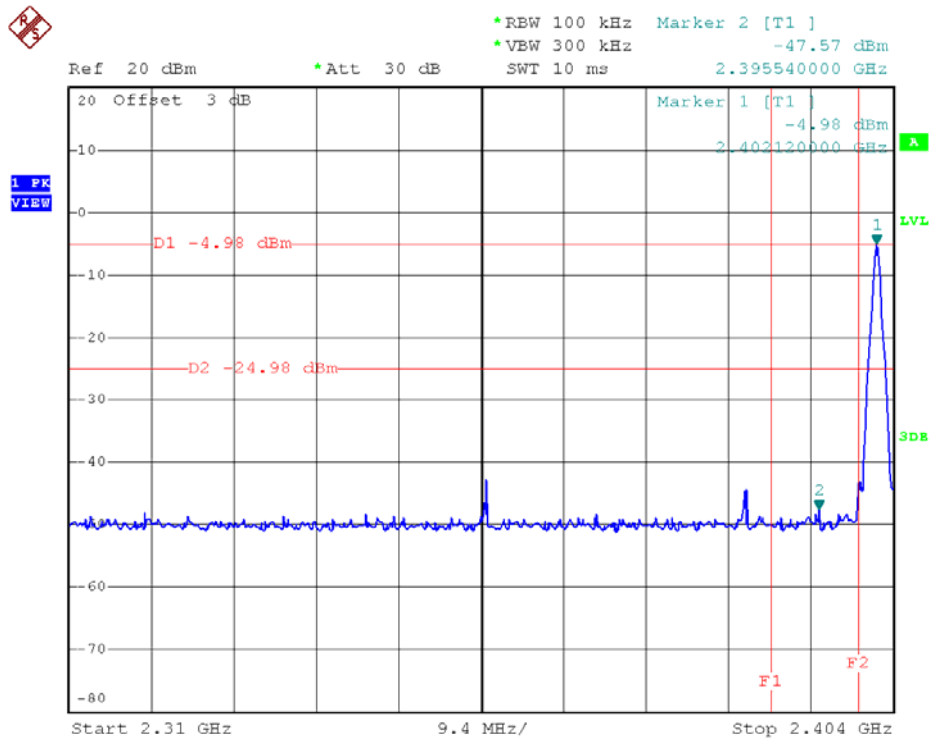
### 2.4.3. Test Setup



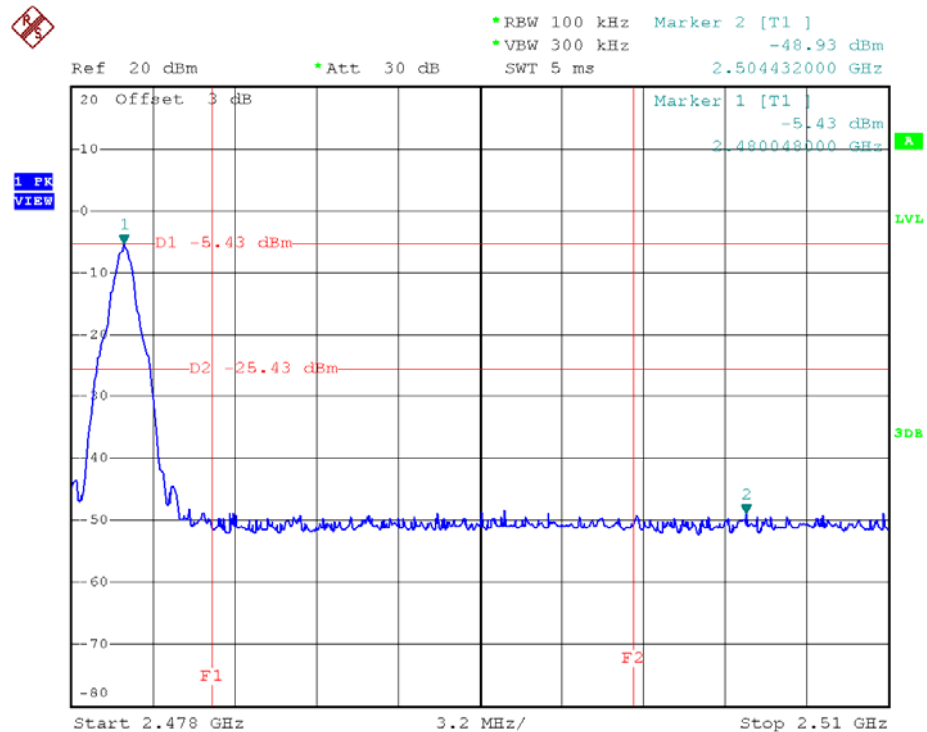
### 2.4.4. Test Procedure

1. The testing follows FCC KDB 558074D01 v03r05.
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 100kHz 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 per 15.247(d).
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.

## 2.4.5. Test Results of Conducted Band Edges



Low Band Edge Plot on Channel 0

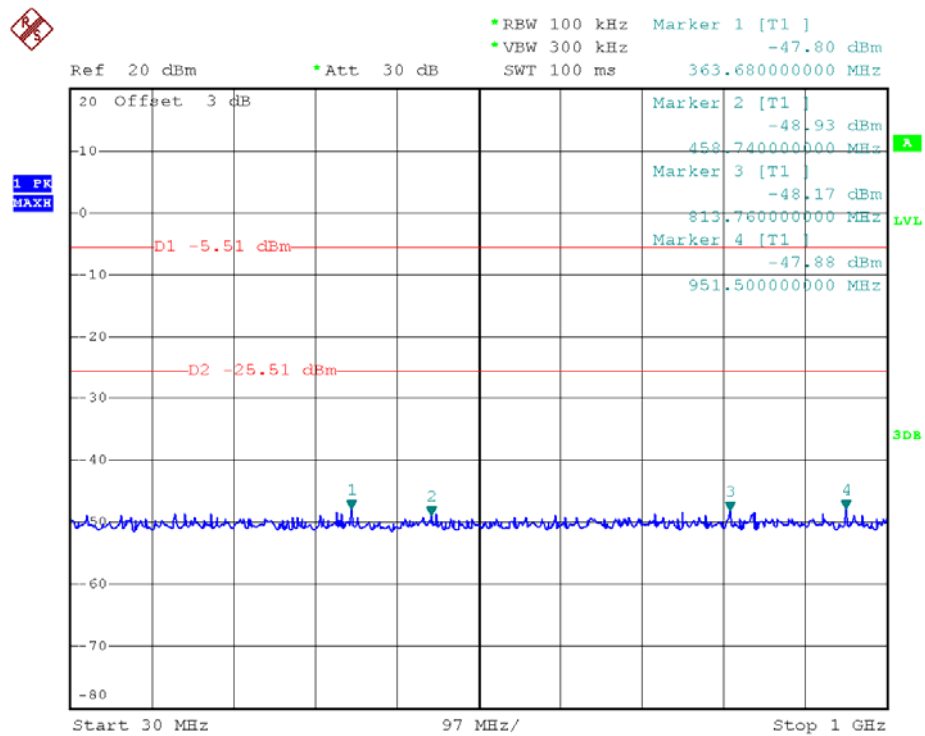


High Band Edge Plot on Channel 39

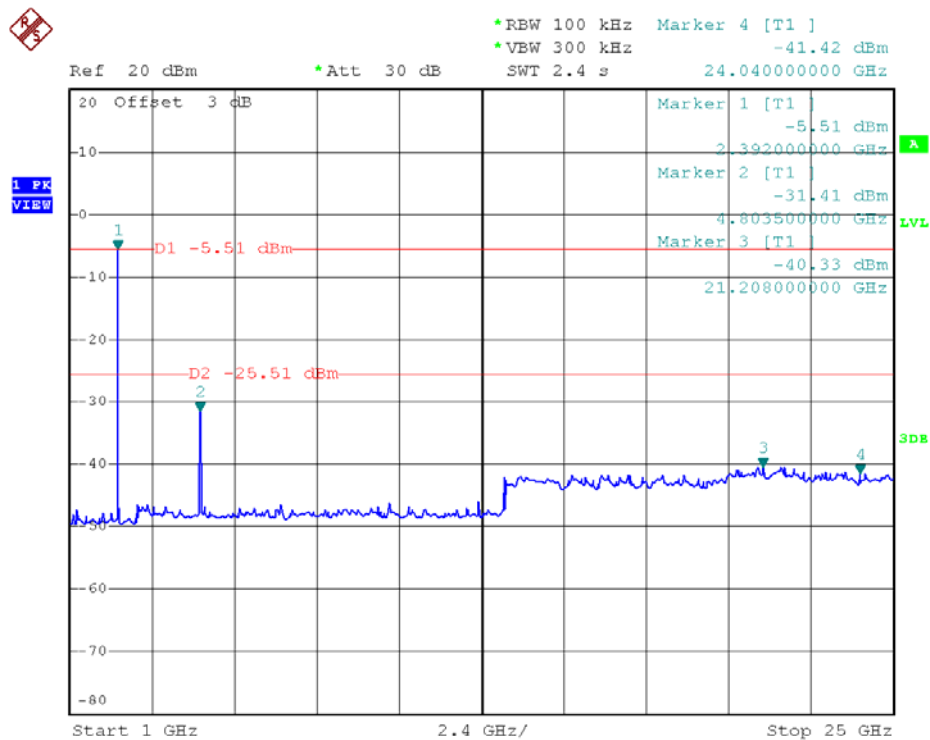


## 2.4.6. Test Result of Conducted Spurious Emission

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

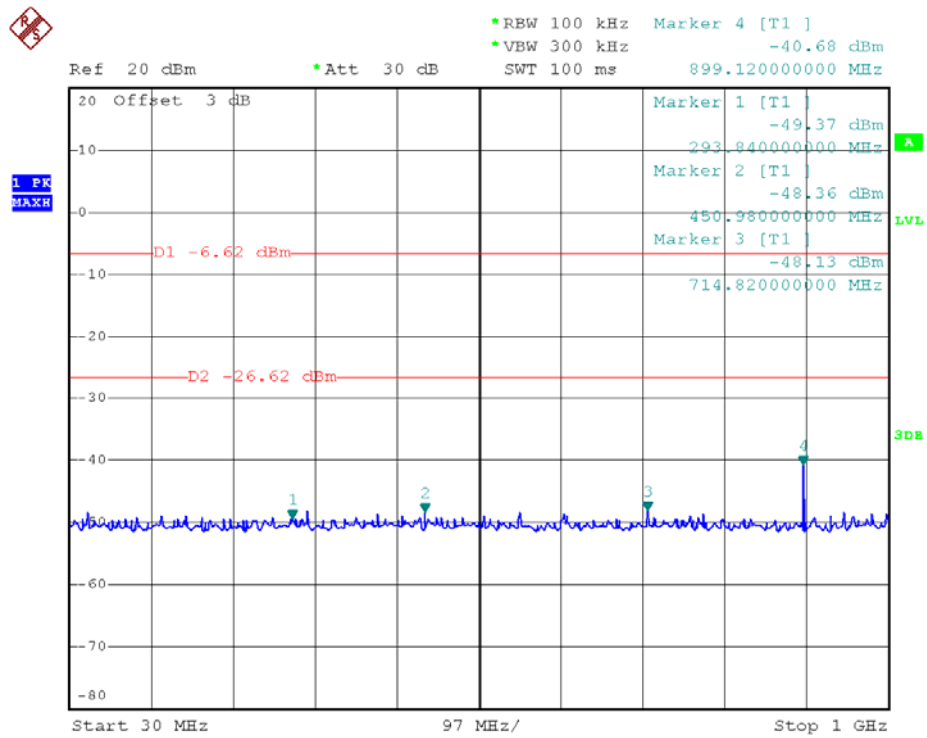


Channel = 0, 30MHz to 1GHz

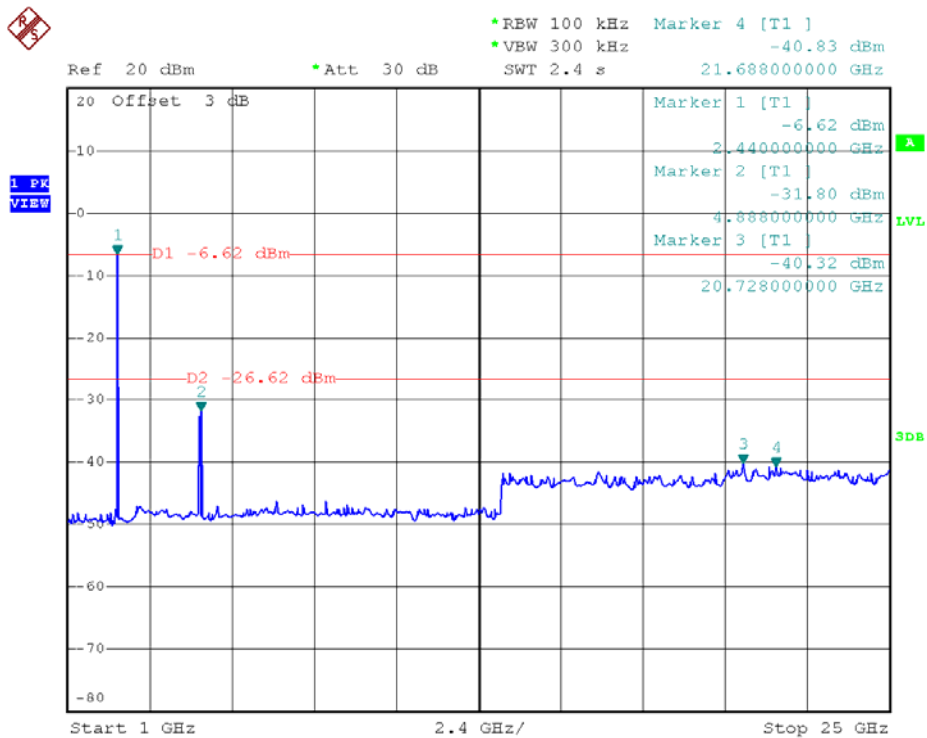


Channel = 0, 1GHz to 25GHz

### Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

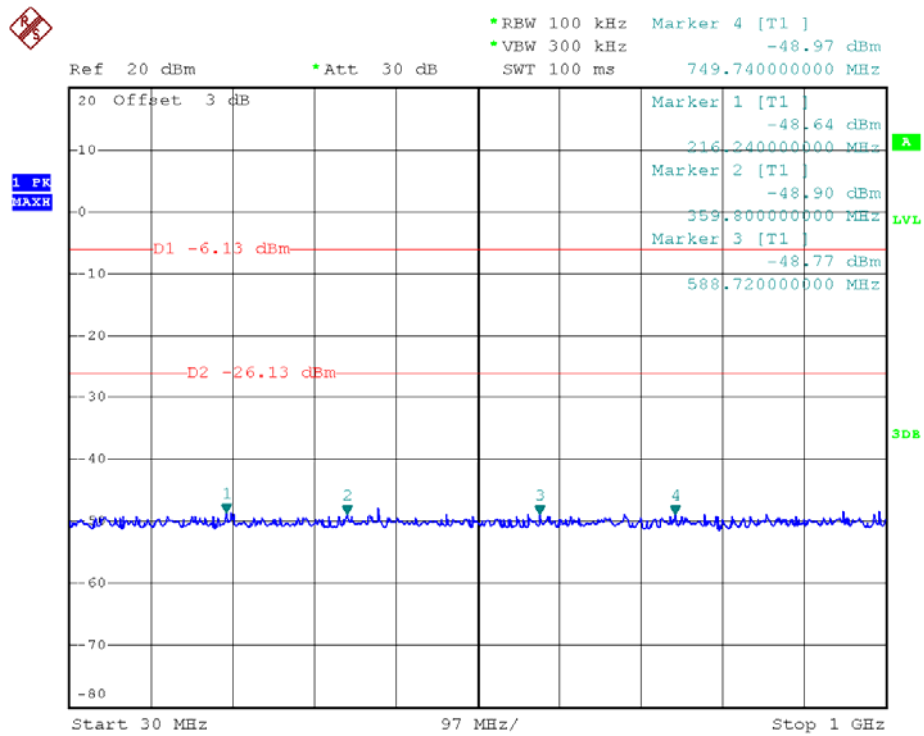


Channel = 19, 30MHz to 1GHz

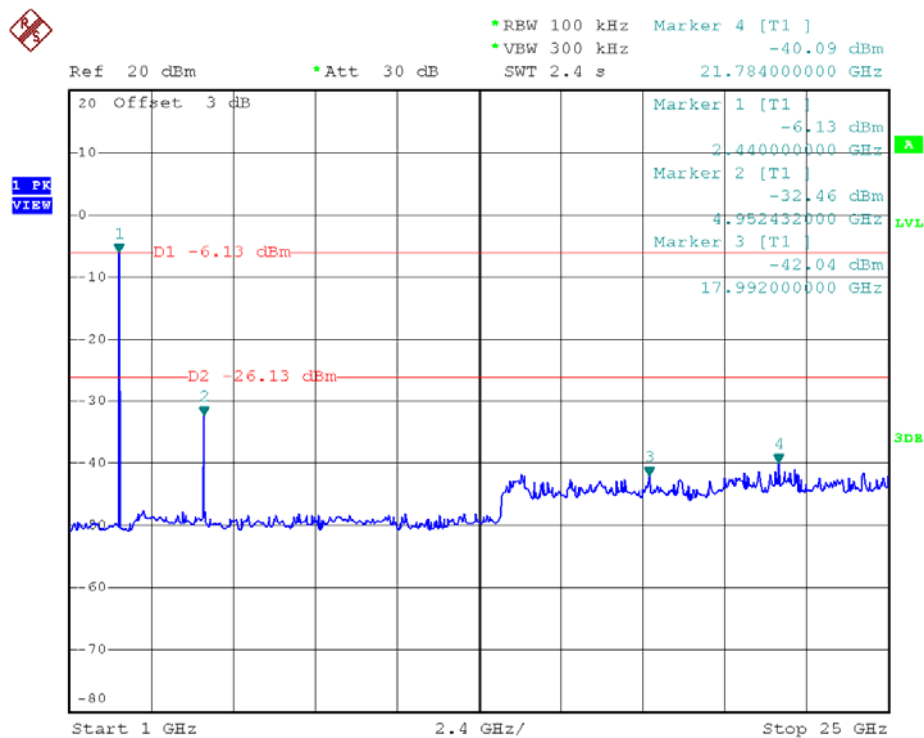


Channel = 19, 1GHz to 25GHz

### Conducted Spurious Emission Plot on Bluetooth LE 1Mbps



Channel = 39, 30MHz to 1GHz



Channel = 39, 1GHz to 25GHz

## 2.5. Power spectral density (PSD)

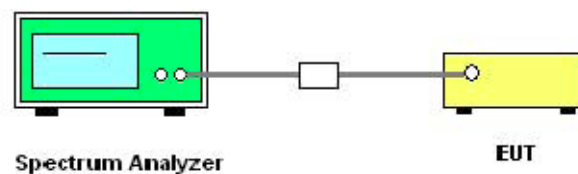
### 2.5.1. Limit of Power Spectral Density

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

### 2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.5.3. Test Setup



### 2.5.4. Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB 558074D01 v03r05.

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.

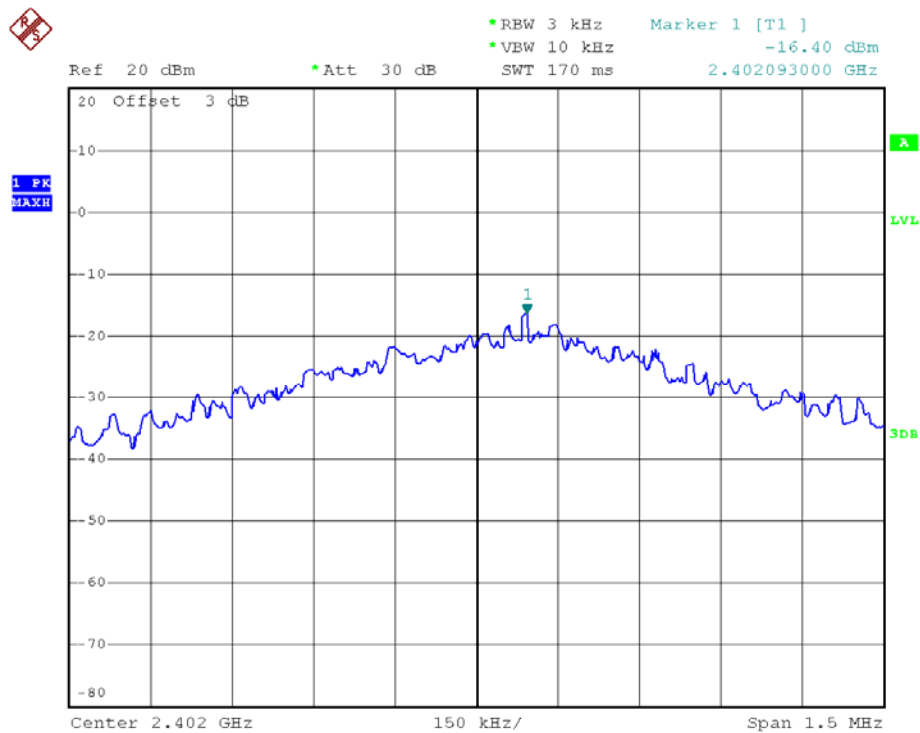
### 2.5.5. Test Results of Power spectral density

Spectral power density (dBm)				
Channel	Frequency (MHz)	PSD/3kHz (dBm)	Limit (dBm/3kHz)	Verdict
0	2402	-16.40	8	PASS
19	2440	-17.03	8	PASS
39	2480	-17.09	8	PASS
Measurement uncertainty: $\pm 1.3$ dB				

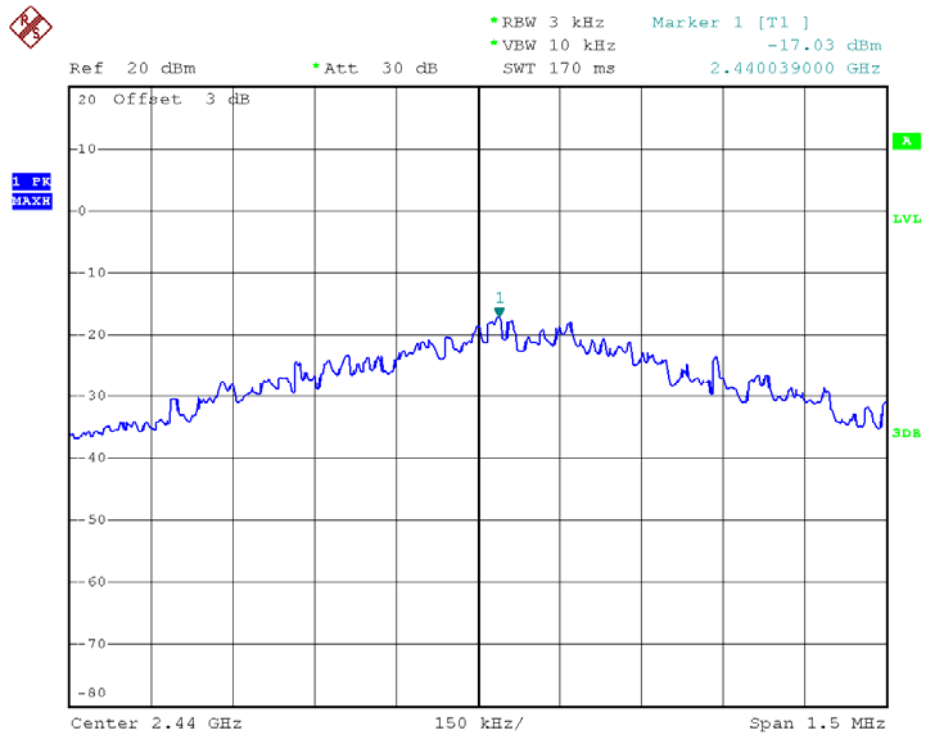
Note:

1. Measured power density (dBm) has offset with cable loss.

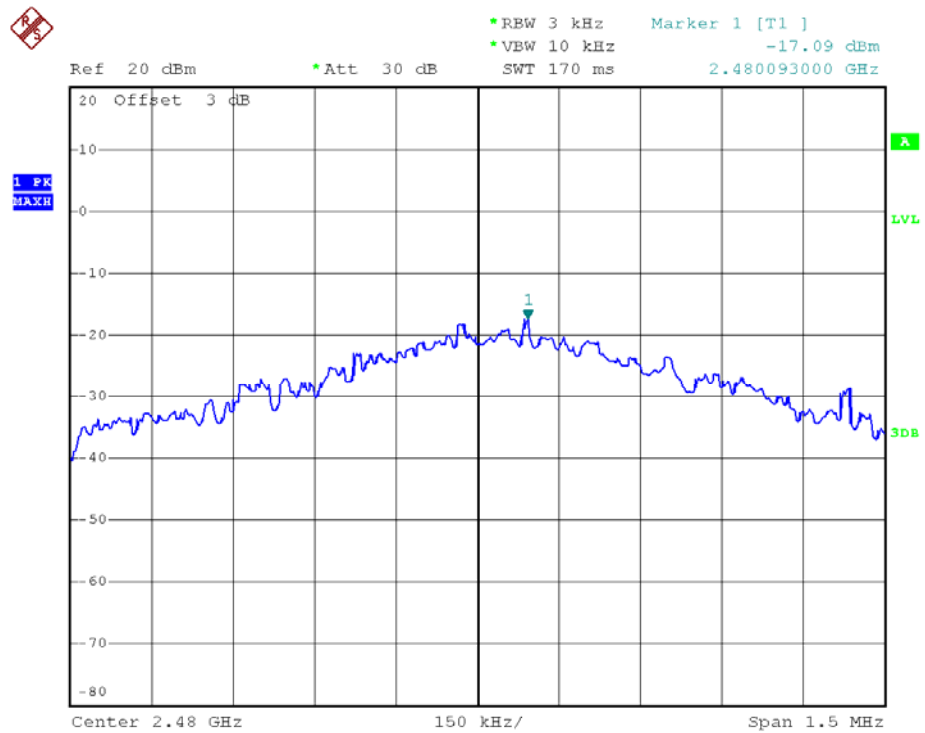
### 2.5.6. Test Results (plots) of Power spectral density



PSD Plot on Channel 0



PSD Plot on Channel 19



PSD Plot on Channel 39

## 2.6. Radiated Band Edge and Spurious Emission

### 2.6.1. 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 FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

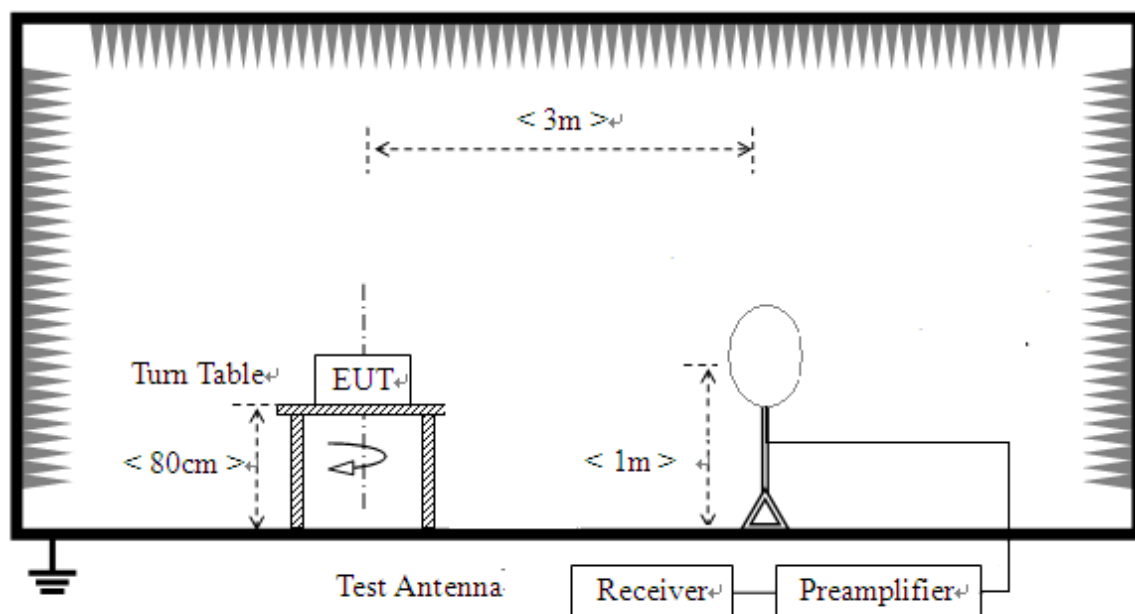
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ )	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

### 2.6.2. Measuring Instruments

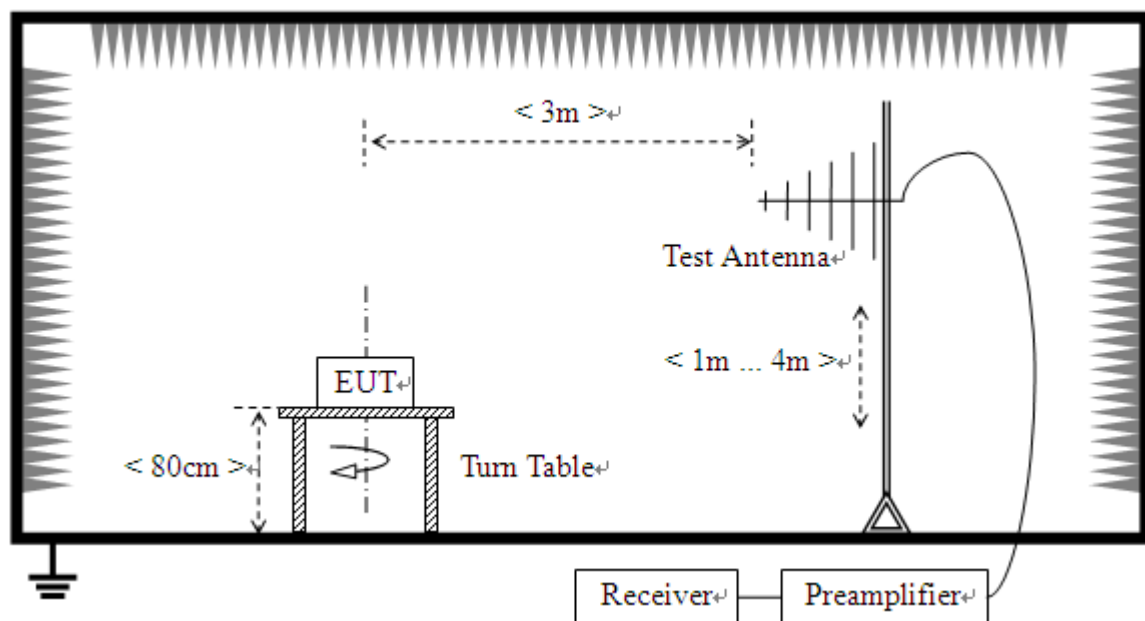
The measuring equipment is listed in the section 3 of this test report.

### 2.6.3. Test Setup

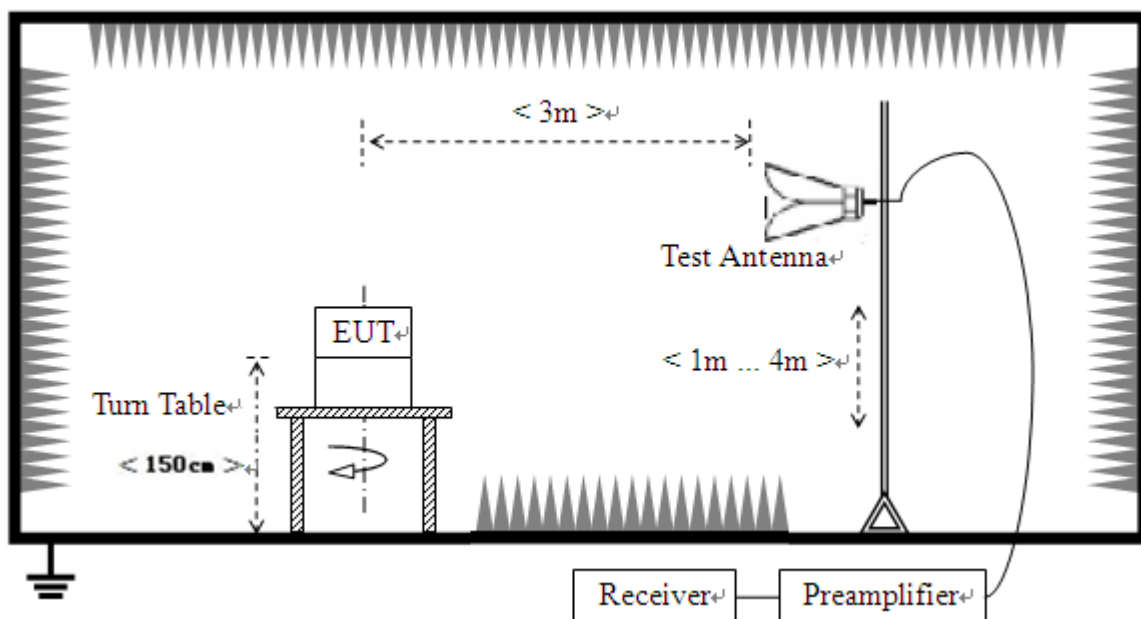
For radiated emissions from 9kHz to 30MHz



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



### For radiated emissions above 1GHz





#### 2.6.4. Test Procedures

1. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported.  
  
Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. For the radiated emission test above 1GHz:  
  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

## NOTE:

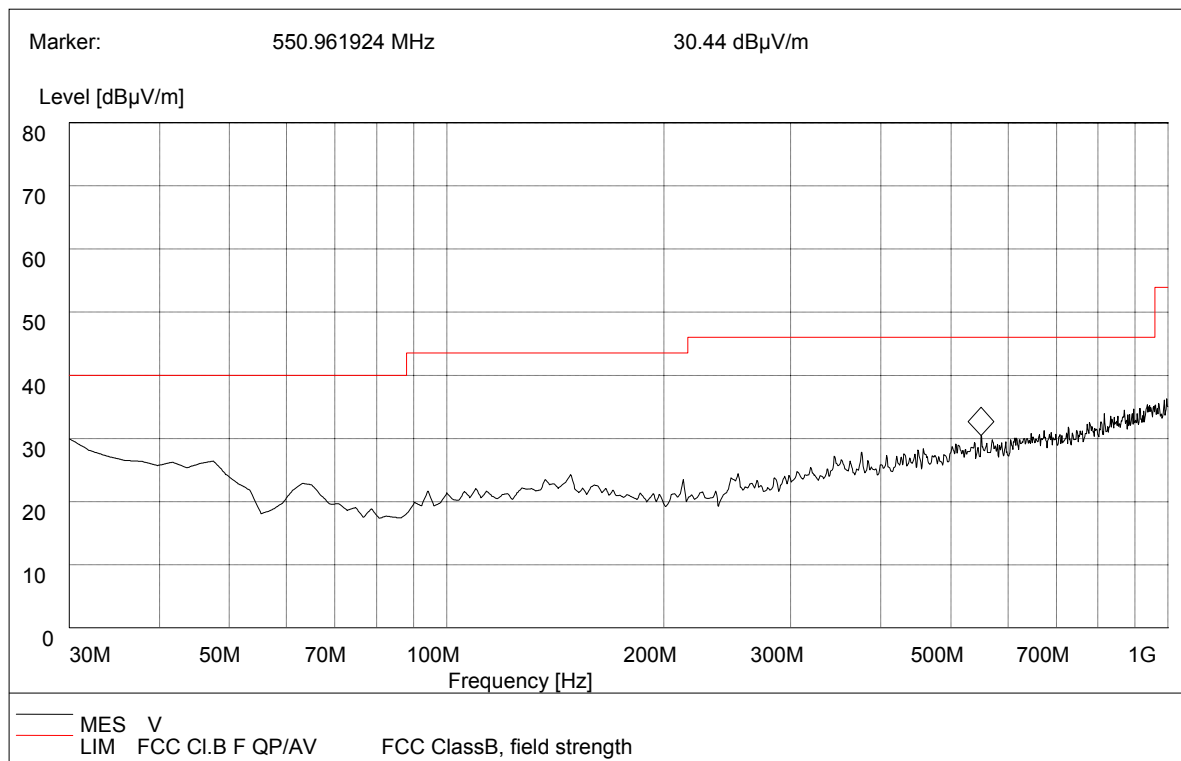
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or 10Hz (Duty cycle  $> 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All radiated emission tests were performed in X, Y, Z axis direction and two models. And found model 1201-54 is the worst mode, only the worst case was recorded in this test report.

## 2.6.5. Test Results of Radiated Band Edge and Spurious Emission

### For 9KHz to 30MHz

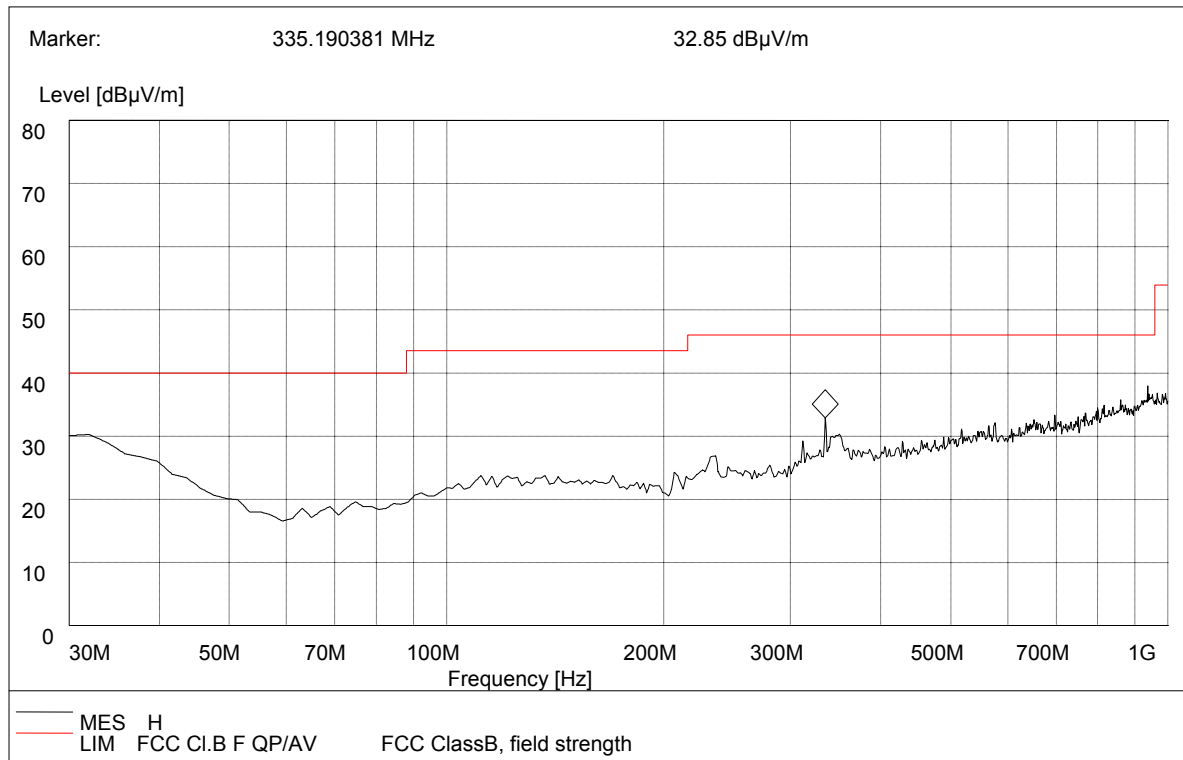
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

### For 30MHz to 1000 MHz



Plot A: 30MHz to 1GHz, Antenna Vertical

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
550.96	30.44	120.000	100.0	46.0	Vertical	Pass



Plot B: 30MHz to 1GHz, Antenna Horizontal

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB $\mu$ V/m)	Antenna	Verdict
335.19	32.85	120.000	100.0	46.0	Horizontal	Pass

**For 1GHz to 25GHz**
**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (0CH\_2402MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	47.10	PK	74.0	-26.9	1.51 H	228	45.8	1.3
2	2390.00	33.60	AV	54.0	-20.4	1.51 H	228	32.3	1.3
3	*2402.00	75.70	PK	/	/	1.53 H	112	74.1	1.6
4	*2402.00	64.50	AV	/	/	1.53 H	112	62.9	1.6
5	4804.00	51.60	PK	74.00	-22.4	1.50 H	254	45.2	6.4
6	4804.00	45.80	AV	54.00	-8.2	1.50 H	254	39.4	6.4

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (0CH\_2402MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	46.70	PK	74.0	-27.3	1.51 V	228	45.4	1.3
2	2390.00	34.40	AV	54.0	-19.6	1.51 V	228	33.1	1.3
3	*2402.00	75.40	PK	/	/	1.50 V	112	73.8	1.6
4	*2402.00	64.30	AV	/	/	1.50 V	112	62.7	1.6
5	4804.00	53.40	PK	74.00	-20.6	1.51 V	254	47	6.4
6	4804.00	44.70	AV	54.00	-9.3	1.51 V	254	38.3	6.4

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (19CH\_2440MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2440.00	75.90	PK	/	/	1.51 H	210	73.8	2.1
2	*2440.00	64.80	AV	/	/	1.51 H	210	62.7	2.1
3	4884.00	53.50	PK	74.00	-20.5	1.53 H	272	47	6.5
4	4884.00	45.90	AV	54.00	-8.1	1.53 H	272	39.4	6.5

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (19CH\_2440MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2440.00	75.60	PK	/	/	1.49 V	112	73.5	2.1
2	*2440.00	64.70	AV	/	/	1.49 V	112	62.6	2.1
3	4884.00	54.80	PK	74.00	-19.2	1.51 V	254	48.3	6.5
4	4884.00	42.50	AV	54.00	-11.5	1.51 V	254	36	6.5

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (39CH\_2480MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2480.00	77.80	PK	/	/	1.55 H	215	75.2	2.6
2	*2480.00	66.50	AV	/	/	1.55 H	215	63.9	2.6
3	2483.50	46.90	PK	74.0	-27.1	1.55 H	211	44.3	2.6
4	2483.50	34.60	AV	54.0	-19.4	1.55 H	211	32	2.6
5	4960.00	52.20	PK	74.0	-21.8	1.55 H	320	45.5	6.7
6	4960.00	46.90	AV	54.0	-7.1	1.55 H	320	40.2	6.7

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (39CH\_2480MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2480.00	77.40	PK	/	/	1.55 V	174	74.8	2.6
2	*2480.00	66.30	AV	/	/	1.55 V	174	63.7	2.6
3	2483.50	46.80	PK	74.0	-27.2	1.55 V	177	44.2	2.6
4	2483.50	35.40	AV	54.0	-18.6	1.55 V	177	32.8	2.6
5	4960.00	55.60	PK	74.0	-18.4	1.55 V	201	48.9	6.7
6	4960.00	45.60	AV	54.0	-8.4	1.55 V	201	38.9	6.7

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)  
- Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level - Limit value
5. " \* ": Fundamental frequency.

## 2.7. Conducted Emission

### 2.7.1. Limit of Conducted Emission

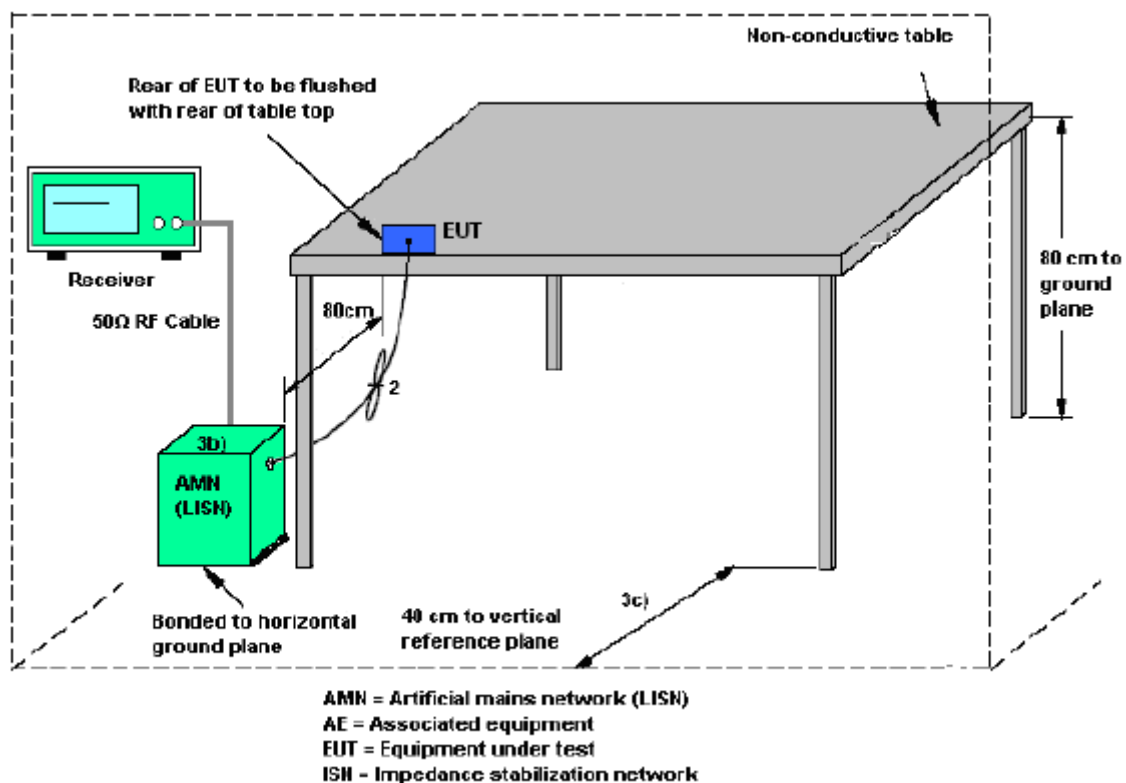
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

### 2.7.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.7.3. Test Setup





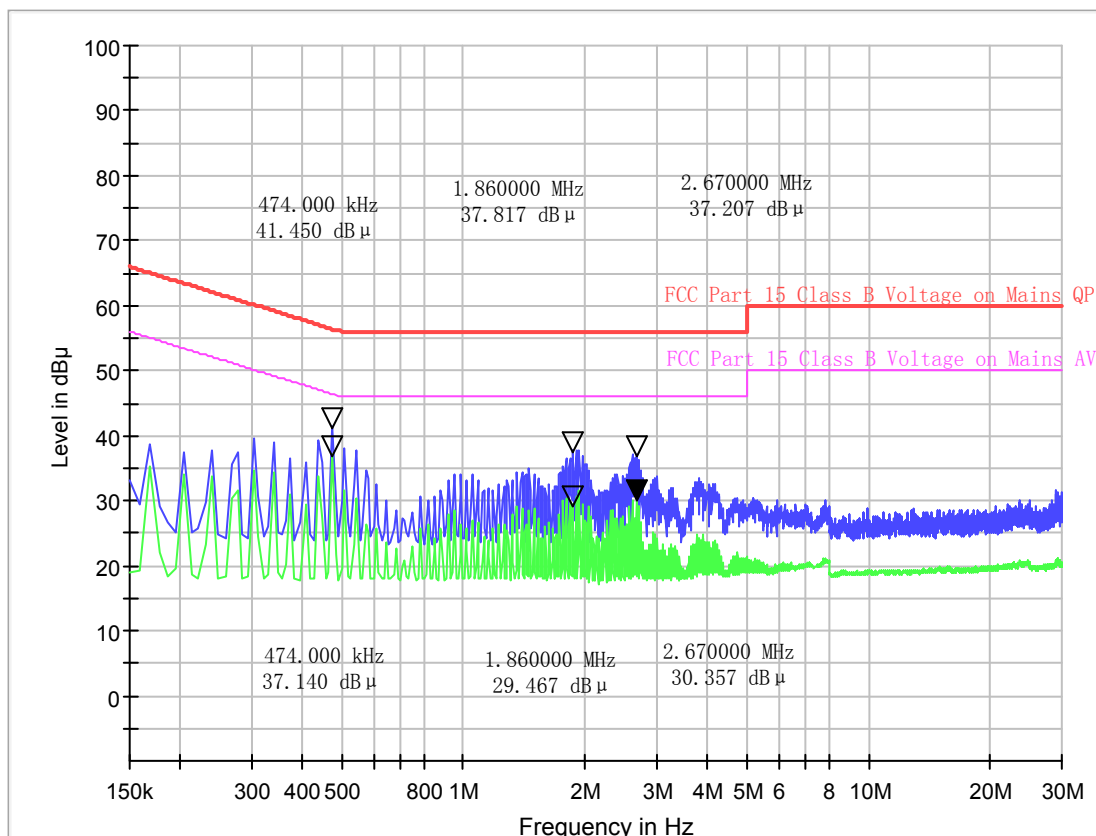
#### **2.7.4. Test Procedures**

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.

#### **2.7.5. Test Result**

1. The EUT configuration of the emission tests is Bluetooth Link.
  2. The power adapter support (100~240V AC, 50/60Hz), the EUT was tested at the (120V/60Hz)
- Adapter model No.: BYX-050200

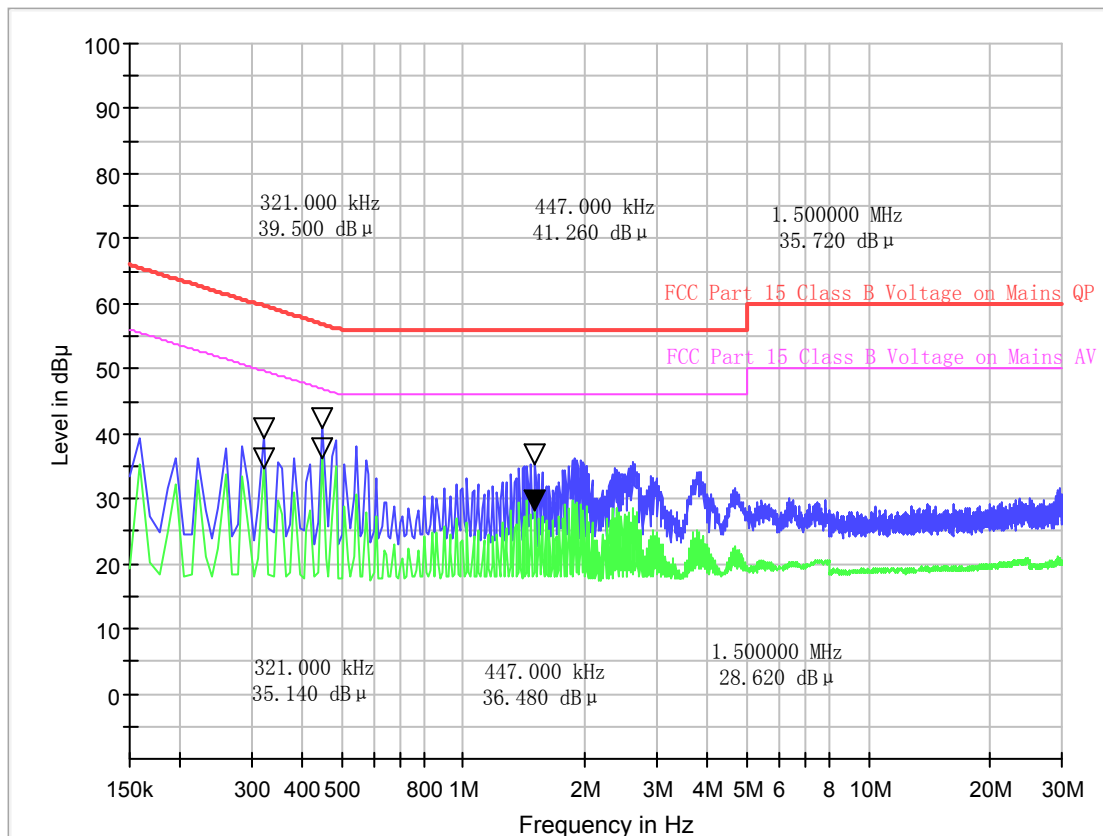
## FCC Part 15 Class B Voltage Test



(Plot A: L Phase)

Conducted Disturbance at Mains Terminals					
QP			AV		
Frequency (MHz)	Limits (dB $\mu$ V)	Measurement Value (dB $\mu$ V)	Frequency (MHz)	Limits (dB $\mu$ V)	Measurement Value (dB $\mu$ V)
0.474	56.4	41.450	0.474	46.4	37.140
1.860	56.0	37.817	1.860	46.0	29.467
2.670	56.0	37.207	2.670	46.0	30.357

## FCC Part 15 Class B Voltage Test



(Plot B: N Phase)

Conducted Disturbance at Mains Terminals					
QP			AV		
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)
0.321	59.7	39.500	0.321	49.7	35.140
0.447	56.9	41.260	0.447	46.9	36.480
1.500	56.0	35.720	1.500	46.0	28.620

### 3. List of measuring equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2015/11/02	2016/11/01
2	RF TEST PANEL	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A	N/A
3	EMI TEST SOFTWARE	Rohde&Schwarz	ESK1	N/A	N/A	N/A
4	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2015/11/08	2016/11/07
5	HORN ANTENNA	ShwarzBeck	9120D	1011	2015/11/08	2016/11/07
6	Loop Antenna	Rohde&Schwarz	HZ-9	838622\013	2015/11/08	2016/11/07
7	Pre-amplifier	ShwarzBeck	BBV 9743	9743-0022	2015/11/02	2016/11/01
8	TURNTABLE	MATURO	TT2.0	N/A	N/A	N/A
9	ANTENNA MAST	MATURO	TAM-4.0-P	N/A	N/A	N/A
10	EMI TEST SOFTWARE	Audix	E3	N/A	N/A	N/A
11	Test cable	Siva Cables Italy	RG 58A/U	W14.02	2015/12/05	2016/12/04
12	Climate Chamber	ESPEC	EL-10KA	05107008	2015/11/02	2016/11/01
13	Spectrum Analyzer	Kysight	N9030A	ATO-67098	2016/07/19	2017/07/18
14	Power Meter	Rohde&Schwarz	NRP2	1020.1809.02	2016.06.02	2017.06.01
15	Power Sensor	Rohde&Schwarz	NRP-Z81	823.3618.03	2016.06.02	2017.06.01
16	SMA Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	N/A	N/A

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

#### 4. Uncertainty of Evaluation

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

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz~30MHz	2.35dB
Radiated emissions	30MHz~1000MHz	2.45dB
	1G~18GHz	2.21dB
	18G~40GHz	1.96dB

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

**\*\* END OF REPORT \*\***