

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
**Report No.:** RFCFQC-WTW-P23070144-3  
**FCC ID:** 2A3ULMSPORT1  
**Product:** MOMENTUM Sport  
**Brand:** SENNHEISER  
**Model No.:** MSPORT1 (refer to item 3.1 for more details)  
**Received Date:** 2023/7/6  
**Test Date:** 2023/7/19 ~ 2023/7/27  
**Issued Date:** 2023/11/17

**Applicant:** Sonova Consumer Hearing GmbH

**Address:** Am Labor 1, 30900 Wedemark, Germany

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

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**FCC Registration /** (1) 788550 / TW0003

**Designation Number:** (2) 281270 / TW0032

**Approved by:** \_\_\_\_\_

*Jeremy Lin*

**Date:** \_\_\_\_\_

2023/11/17

Jeremy Lin / Project Engineer

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Prepared by : Polly Chien / Specialist

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## Release Control Record

Issue No.	Description	Date Issued
RFCFQC-WTW-P23070144-3	Original release.	2023/11/17

## 1 Certificate

**Product:** MOMENTUM Sport

**Brand:** SENNHEISER

**Test Model:** MSPORT1 (refer to item 3.1 for more details)

**Sample Status:** Engineering sample

**Applicant:** Sonova Consumer Hearing GmbH

**Test Date:** 2023/7/19 ~ 2023/7/27

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.247)

**Measurement** ANSI C63.10-2013

**procedure:** KDB 558074 D01 15.247 Meas Guidance v05r02

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Standard / Clause	Test Item	Result	Remark
15.247(b)	RF Output Power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(d)	Conducted Out of Band Emissions	Pass	Meet the requirement of limit.
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -11.74 dB at 0.52600 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -4.2 dB at 191.99 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -7.7 dB at 2483.50 MHz
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

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

Measurement	Specification	Expanded Uncertainty (k=2) (±)
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.79 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.00 dB
	30 MHz ~ 1 GHz	2.93 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	1.76 dB
	18 GHz ~ 40 GHz	1.77 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 General Description

Product	MOMENTUM Sport
Brand	SENNHEISER
Test Model	MSPORT1 (refer to note for more details)
Status of EUT	Engineering sample
Power Ratings	Left earbud & Right earbud: 3.66Vdc, 75mAh (from battery) or 3.8Vdc, 72mAh (from battery) Charging Case: 5Vdc, 1A (from Type-C USB interface) 3.6Vdc, 820 mAh (from battery) or 3.6Vdc, 900 mAh (from battery)
Power Supply (Nominal & Testing)	5Vdc, 1A (from Type-C USB interface)
Nominal Testing Voltage (Vnom)	3.66 Vdc ~ 3.8Vdc
Operating Temperature range	0~45°C
Modulation Type	GFSK
Transmission Technology	DSSS
Technology	Bluetooth
Operating Frequency	2.402 GHz ~ 2.48 GHz
No. of channels	40
Channel Spacing	2MHz
Channel Bandwidth	80MHz
Data Transfer Rate	BT-LE 1M: 1Mbps BT-LE 2M 2Mbps
Output Power	4.864 mW (6.87 dBm)
HW Version	Earbuds: BHC212-R-MAIN-R3 Charging Case: ACP212-Main-R4
SW Version	Earbuds: FW3.10.10 Charging Case: BTL V0.4.0 + FW V0.14.0

Note:

1. This test report is for Right Earbud.
2. The EUT system model no. MSPORT1 contains the following devices. The enclosure of earbuds includes 1 color, and 2 colors for charging case.

Device Name	Brand Name	Device Model No.
Right Earbud	SENNHEISER	MSPORT1 R
Left Earbud	SENNHEISER	MSPORT1 L
Charging Case	SENNHEISER	MSPORT1 C

\* MSPORT1 R and MSPORT1 L with BT, BT LE function.

\* Charging case is solely used for charging MSPORT1 R and MSPORT1 L only.

3. The device BT EDR and BT LE cannot transmit simultaneously.

4. The EUT uses following accessories.

USB Cable		
Brand	Model	Specification
SENNHEISER	110735002301	Signal Line : 0.4M shielded cable w/o core

5. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Antenna No.	Gain (dBi)	Antenna Type	Connector Type
	2400~2483.5 MHz		
1 (Left Earbud)	-0.07	PIFA	none(contact type)
2 (Right Earbud)	-1.02	PIFA	none(contact type)

\*Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

### 3.3 Channel List

40 channels are provided for BT-LE:

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



### 3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan these ways and find the worst case as a representative test condition.
Worst Case:	Worst Condition: Y-axis

Following channel(s) was (were) selected for the final test as listed below:

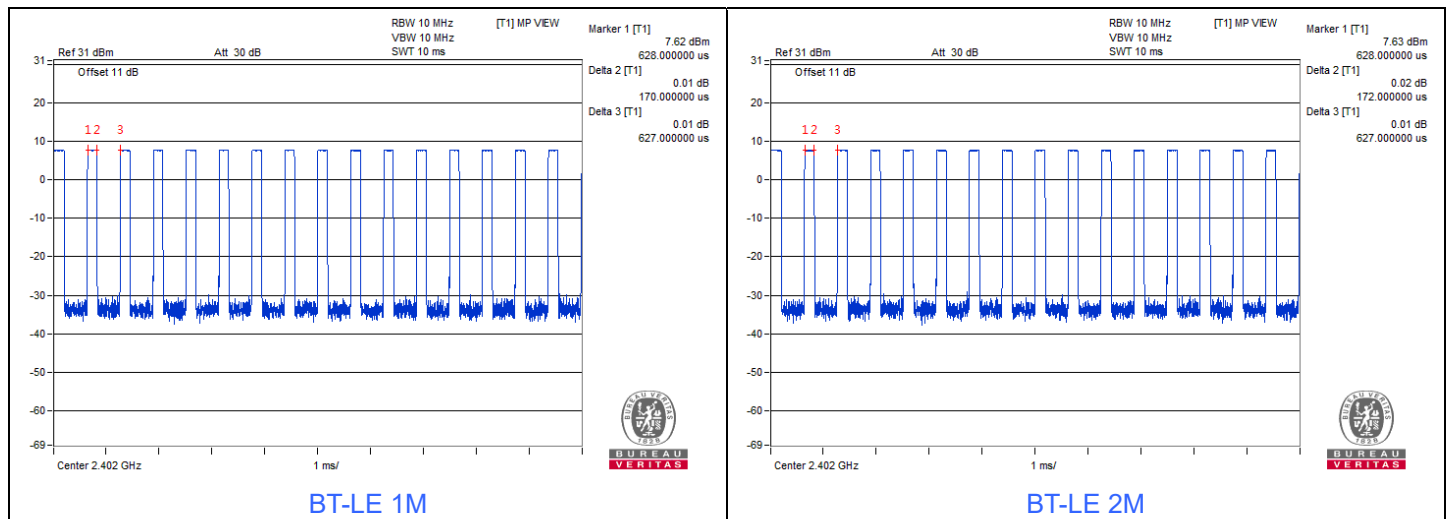
Test Item	EUT Configure Mode	Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power / Power Spectral Density	A	BT-LE 1M	0, 19, 39	GFSK	1Mb/s
		BT-LE 2M	0, 19, 39	GFSK	2Mb/s
6 dB Bandwidth / Conducted Out of Band Emissions	A	BT-LE 1M	0, 19, 39	GFSK	1Mb/s
		BT-LE 2M	0, 19, 39	GFSK	2Mb/s
AC Power Conducted Emissions	B, D	Charging Mode			
Unwanted Emissions below 1 GHz	A	BT-LE 1M	39	GFSK	1Mb/s
	B, D	Charging Mode			
Unwanted Emissions above 1 GHz	A, B	BT-LE 1M	0, 19, 39	GFSK	1Mb/s
		BT-LE 2M	0, 19, 39	GFSK	2Mb/s
EUT Configure Mode:	A	Right Earbuds			
	B	Right Earbuds + Left Earbuds + Charging case + Adapter			
	C	Right Earbuds + Left Earbuds + Charging case + NoteBook			
	D	Right Earbuds + Left Earbuds + Charging case + Wireless charger + Adapter			
	E	Right Earbuds + Left Earbuds + Charging case + Wireless charger + NoteBook			

Note: The EUT has been pre-test on Mode A-E. Therefore, Mode A, B, D were chosen for final test.

### 3.5 Duty Cycle of Test Signal

**BT-LE 1M:** Duty cycle =  $0.17 \text{ ms} / 0.627 \text{ ms} \times 100\% = 27.1\%$ , duty factor =  $10 * \log (1/\text{Duty cycle}) = 5.67 \text{ dB}$

**BT-LE 2M:** Duty cycle =  $0.172 \text{ ms} / 0.627 \text{ ms} \times 100\% = 27.4\%$ , duty factor =  $10 * \log (1/\text{Duty cycle}) = 5.62 \text{ dB}$



### 3.6 Test Program Used and Operation Descriptions

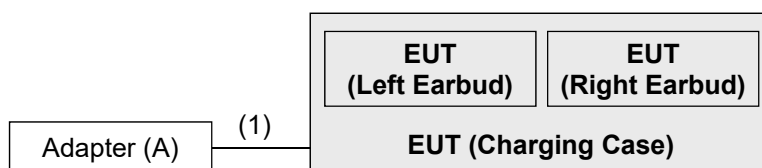
Controlling software Blue Test3 version 3.3.16.1687 has been activated to set the EUT under transmission condition continuously at specific channel frequency.

### 3.7 Connection Diagram of EUT and Peripheral Devices

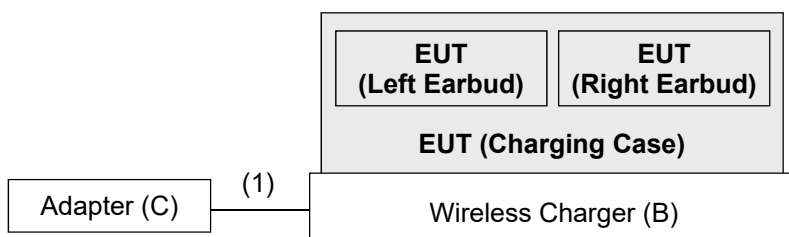
Test Mode A



Test Mode B



Test Mode D



### 3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	ASUS	AD827M	N/A	N/A	Provided by Lab
B	Wireless Charger	Mophie	WRLS-CHGPAD-AC	NA	NA	Supplied by applicant
C	Adapter	Mophie	AC-ADAPTR-BLK-NA	NA	NA	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	0.4	Yes	0	Accessory of EUT

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Peak Power Analyzer Keysight	8990B	MY51000485	2023/1/19	2024/1/18
Wideband Power Sensor Keysight	N1923A	MY58020002	2023/1/18	2024/1/17
		MY58140009	2023/1/18	2024/1/17

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/7/27

### 4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSV3044	101105	2023/2/22	2024/2/21
Software BV	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/7/27

### 4.3 6 dB Bandwidth

Refer to section 4.2 to get information of the instruments.

### 4.4 Conducted Out of Band Emissions

Refer to section 4.2 to get information of the instruments.

#### 4.5 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
EMI Test Receiver R&S	ESCI	100613	2022/12/5	2023/12/4
LISN R&S	ENV216	101826	2023/3/23	2024/3/22
	ESH3-Z5	100311	2022/9/12	2023/9/11
RF Coaxial Cable Woken	5D-FB	Cable-cond1-01	2023/1/7	2024/1/6
Software BVADT	BVADT_Cond_ V7.3.7.4	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2022/8/31	2023/8/30

Notes:

1. The test was performed in HY - Conduction 1.
2. Tested Date: 2023/7/20

#### 4.6 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	MFT-151SS-0.5T	N/A	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-1213	2022/10/20	2023/10/19
EMI Test Receiver R&S	ESR3	102782	2022/12/12	2023/12/11
Loop Antenna Electro-Metrics	EM-6879	269	2022/9/19	2023/9/18
Loop Antenna TESEQ	HLA 6121	45745	2022/7/27	2023/7/26
Preamplifier EMCI	EMC330N	980782	2023/1/16	2024/1/15
	EMC001340	980201	2022/9/23	2023/9/22
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/1/7	2024/1/6
	EMCCFD400-NM-NM- 500	201233	2023/1/16	2024/1/15
	EMCCFD400-NM-NM- 3000	201235	2023/1/16	2024/1/15
	EMCCFD400-NM-NM- 9000	201236(with PAD)	2023/1/16	2024/1/15
Signal & Spectrum Analyzer R&S	FSW43	101866	2023/1/10	2024/1/9
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MF-7802BS	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208674	N/A	N/A

Notes:

1. The test was performed in WM - 966 chamber 8.
2. Tested Date: 2023/7/19

#### 4.7 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	MFT-151SS-0.5T	N/A	N/A	N/A
EMI Test Receiver R&S	ESR3	102782	2022/12/12	2023/12/11
Horn Antenna RFSPIN	DRH18-E	210103A18E	2022/11/13	2023/11/12
Horn Antenna Schwarzbeck	BBHA 9170	9170-1049	2022/11/13	2023/11/12
Preamplifier EMCI	EMC118A45SE	980808	2022/12/29	2023/12/28
	EMC184045SE	980788	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMC101G-KM-KM-2000	201254	2023/1/16	2024/1/15
	EMC101G-KM-KM-3000	201257	2023/1/16	2024/1/15
	EMC101G-KM-KM-5000	201260	2023/1/16	2024/1/15
	EMC104-SM-SM-1000	210102	2023/1/16	2024/1/15
	EMC104-SM-SM-3000	201231	2023/1/16	2024/1/15
	EMC104-SM-SM-9000	201243	2023/1/16	2024/1/15
Signal & Spectrum Analyzer R&S	FSW43	101866	2023/1/10	2024/1/9
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MF-7802BS	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208674	N/A	N/A

Notes:

1. The test was performed in WM - 966 chamber 8.
2. Tested Date: 2023/7/20 ~ 2023/7/21

## 5 Limits of Test Items

### 5.1 RF Output Power

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)

### 5.2 Power Spectral Density

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz.

### 5.3 6 dB Bandwidth

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

### 5.4 Conducted Out of Band Emissions

Below 20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

### 5.5 AC Power Conducted Emissions

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Notes:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

### 5.6 Unwanted Emissions below 1 GHz

Radiated emissions up to 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Notes:

3. The lower limit shall apply at the transition frequencies.
4. Emission level (dBuV/m) = 20 log Emission level (uV/m).



## 5.7 Unwanted Emissions above 1 GHz

Radiated emissions above 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

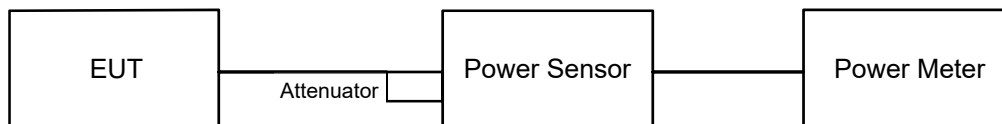
### Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

## 6 Test Arrangements

### 6.1 RF Output Power

#### 6.1.1 Test Setup



#### 6.1.2 Test Procedure

##### Peak Power:

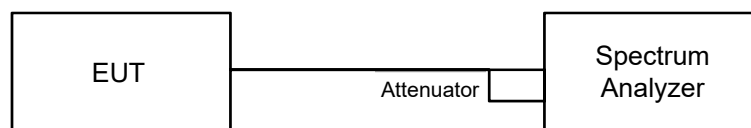
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

##### Average Power:

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

### 6.2 Power Spectral Density

#### 6.2.1 Test Setup

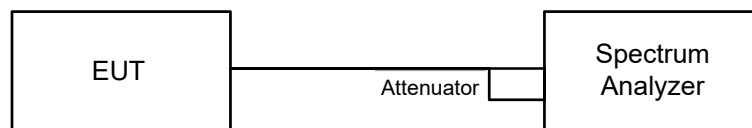


#### 6.2.2 Test Procedure

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to: 3 kHz.
- d. Set the VBW  $\geq 3 \times$  RBW.
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

### 6.3 6 dB Bandwidth

#### 6.3.1 Test Setup

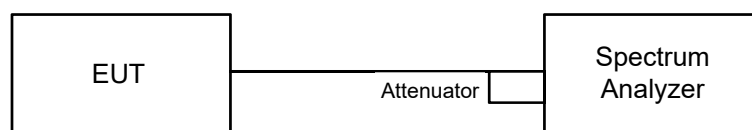


#### 6.3.2 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 6.4 Conducted Out of Band Emissions

#### 6.4.1 Test Setup



#### 6.4.2 Test Procedure

##### MEASUREMENT PROCEDURE REF

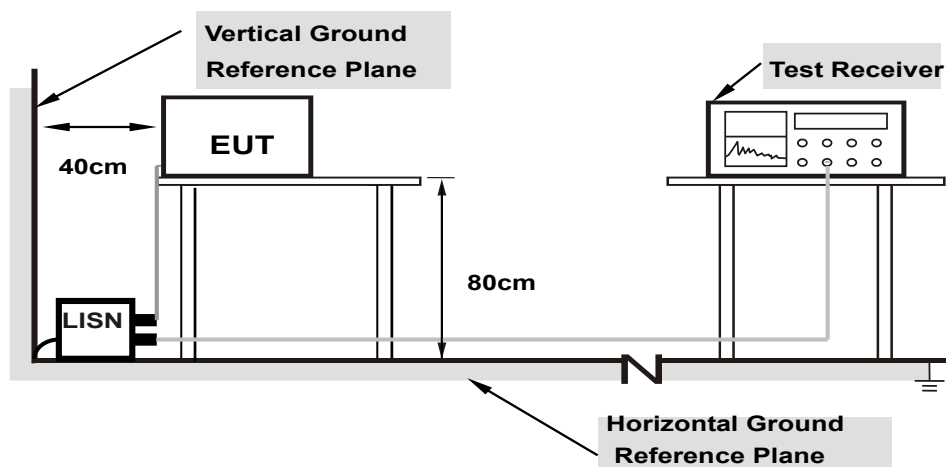
- Set the RBW = 100 kHz.
- Set the VBW  $\geq 300$  kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

##### MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW  $\geq 300$  kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

## 6.5 AC Power Conducted Emissions

### 6.5.1 Test Setup



**Note: 1. Support units were connected to second LISN.**

For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 6.5.2 Test Procedure

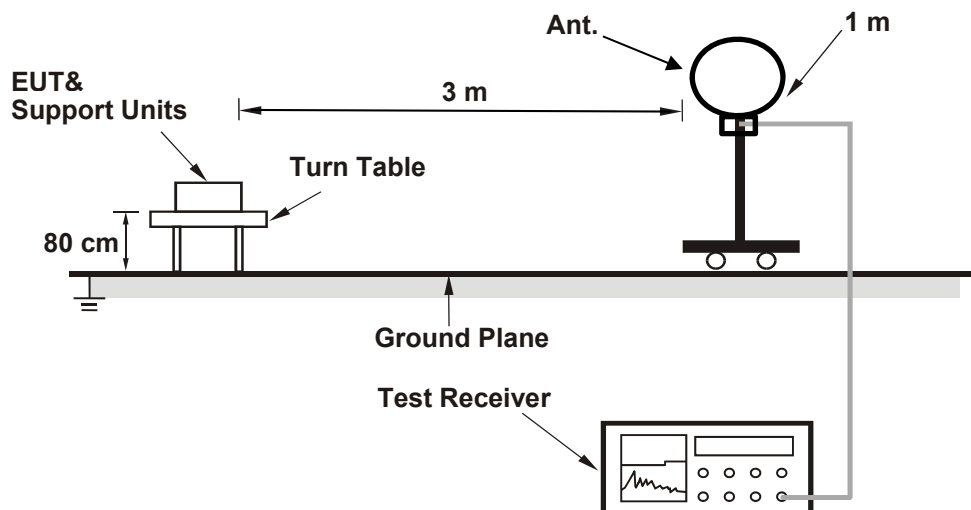
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz-30 MHz.

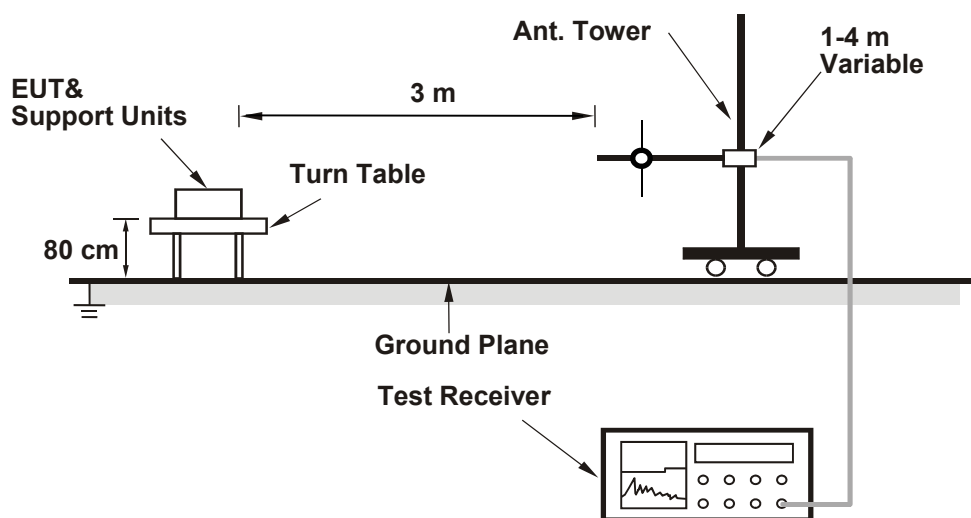
## 6.6 Unwanted Emissions below 1 GHz

### 6.6.1 Test Setup

#### For Radiated emission below 30 MHz



#### For Radiated emission above 30 MHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

## 6.6.2 Test Procedure

### For Radiated emission below 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

#### Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

### For Radiated emission above 30 MHz

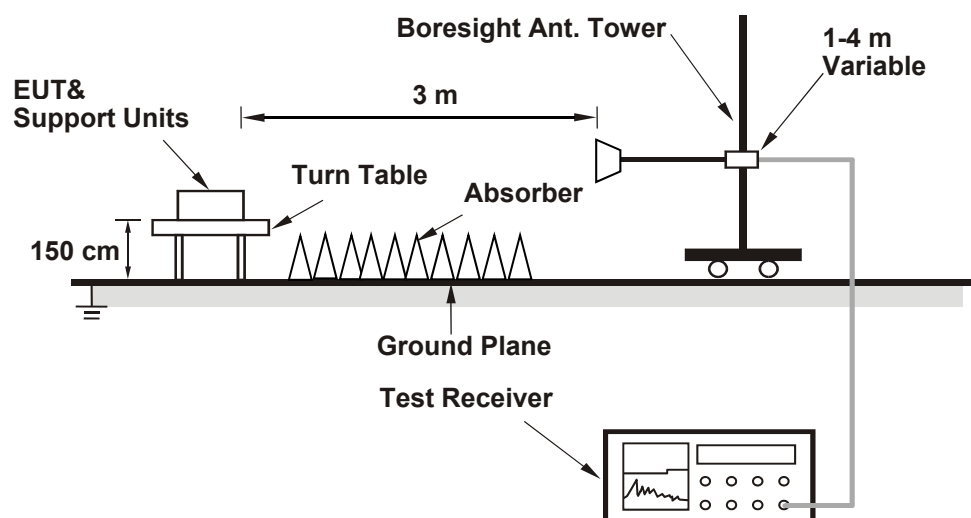
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. 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.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

#### Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

## 6.7 Unwanted Emissions above 1 GHz

### 6.7.1 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 6.7.2 Test Procedure

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 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.
- The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

#### Notes:

- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
- For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or 10 Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

## 7 Test Results of Test Item

### 7.1 RF Output Power

Input Power:	3.66 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Gary Lin
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#### BT-LE 1M

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	4.688	6.71	30	Pass
19	2440	4.732	6.75	30	Pass
39	2480	4.864	6.87	30	Pass

Note: The antenna gain is -1.02 dBi < 6 dBi, so the output power limit shall not be reduced.

#### BT-LE 2M

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	4.656	6.68	30	Pass
19	2440	4.699	6.72	30	Pass
39	2480	4.842	6.85	30	Pass

Note: The antenna gain is -1.02 dBi < 6 dBi, so the output power limit shall not be reduced.

#### For Average Power

##### BT-LE 1M

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.55	6.58
19	2440	4.592	6.62
39	2480	4.613	6.64

##### BT-LE 2M

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.529	6.56
19	2440	4.581	6.61
39	2480	4.592	6.62



## 7.2 Power Spectral Density

Input Power:	3.66 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Gary Lin
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### BT-LE 1M

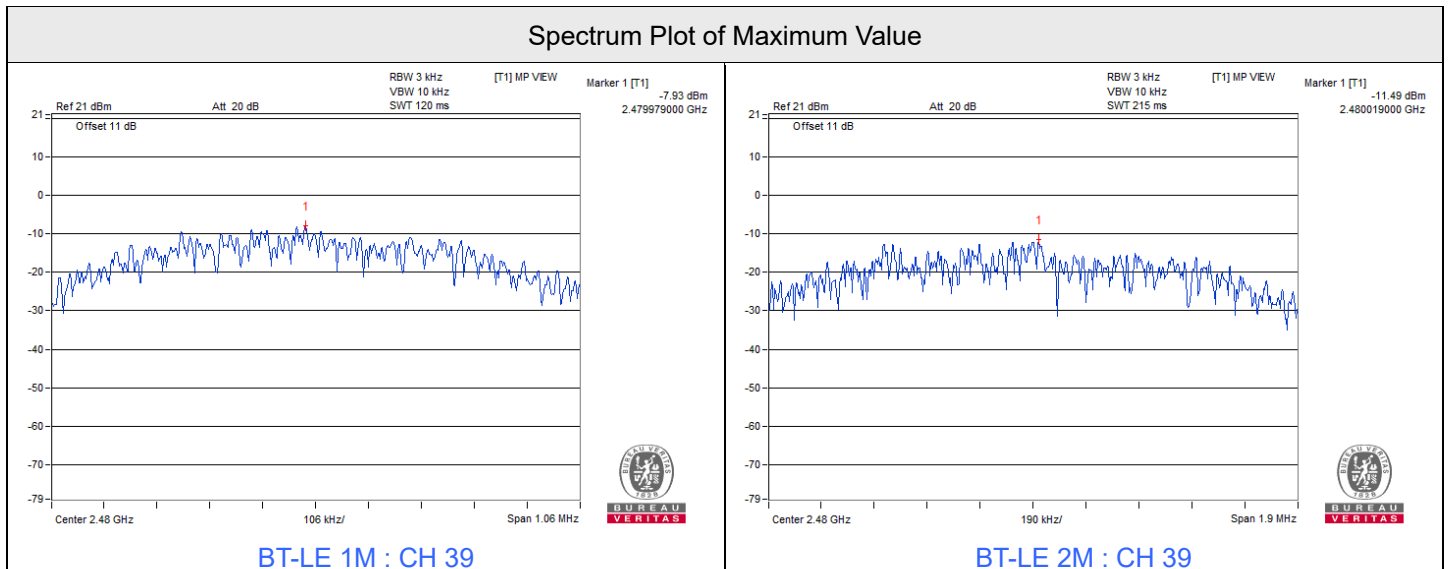
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	2402	-8.06	8	Pass
19	2440	-8.03	8	Pass
39	2480	-7.93	8	Pass

Note: The antenna gain is -1.02 dBi < 6 dBi, so the power density limit shall not be reduced.

### BT-LE 2M

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	2402	-11.67	8	Pass
19	2440	-11.63	8	Pass
39	2480	-11.49	8	Pass

Note: The antenna gain is -1.02 dBi < 6 dBi, so the power density limit shall not be reduced.



### 7.3 6 dB Bandwidth

Input Power:	3.66 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Gary Lin
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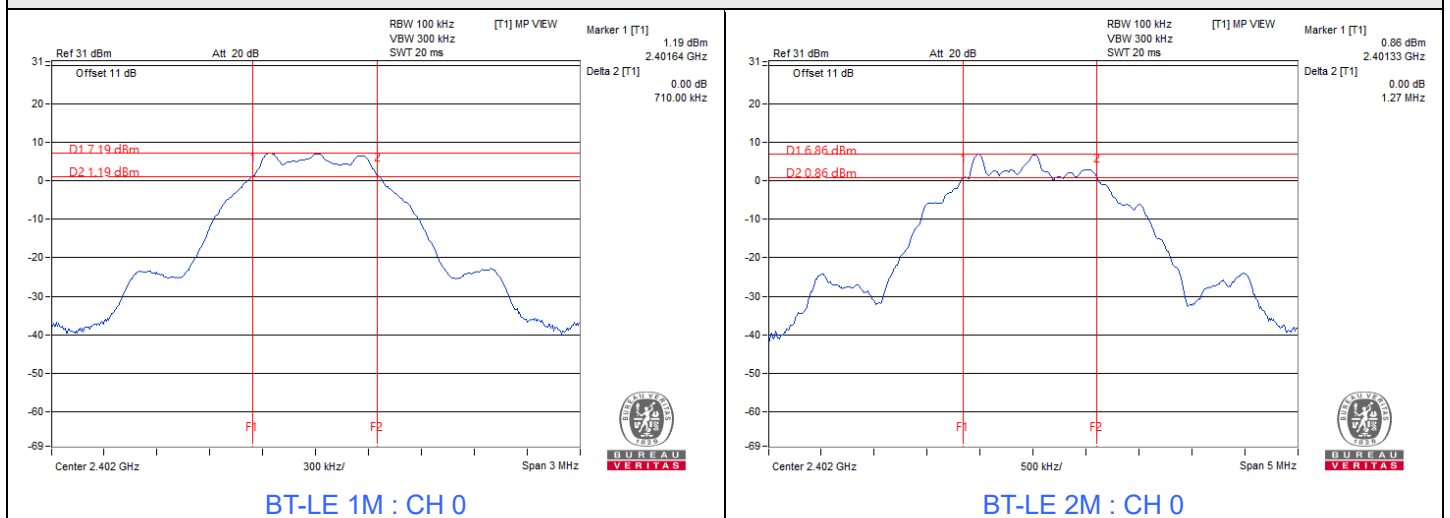
#### BT-LE 1M

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2402	0.71	0.5	Pass
19	2440	0.72	0.5	Pass
39	2480	0.71	0.5	Pass

#### BT-LE 2M

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.27	0.5	Pass
19	2440	1.27	0.5	Pass
39	2480	1.27	0.5	Pass

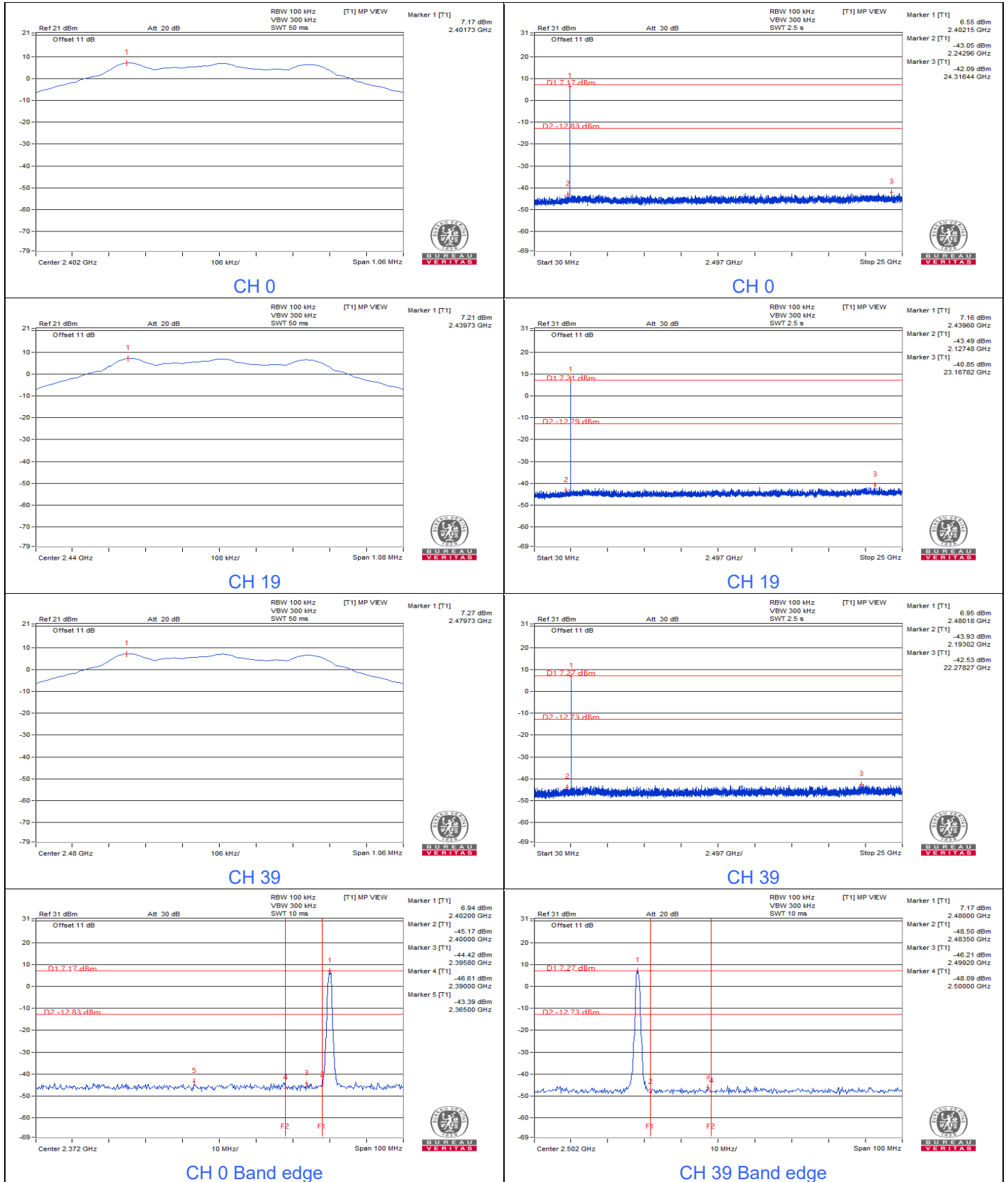
Spectrum Plot of Minimum Value



### 7.4 Conducted Out of Band Emissions

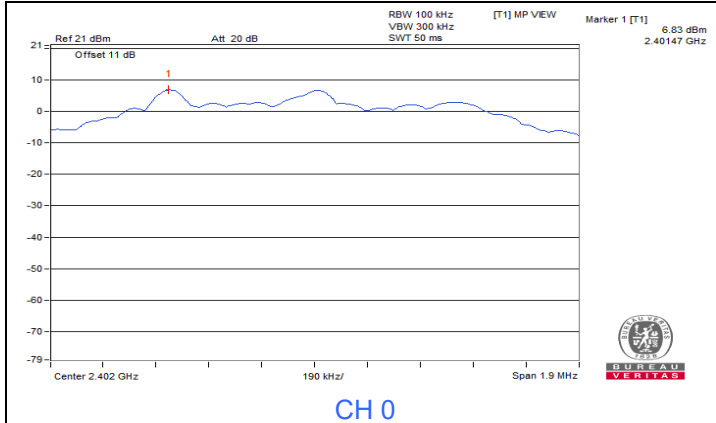
Input Power:	3.66 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Gary Lin
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#### BT-LE 1M

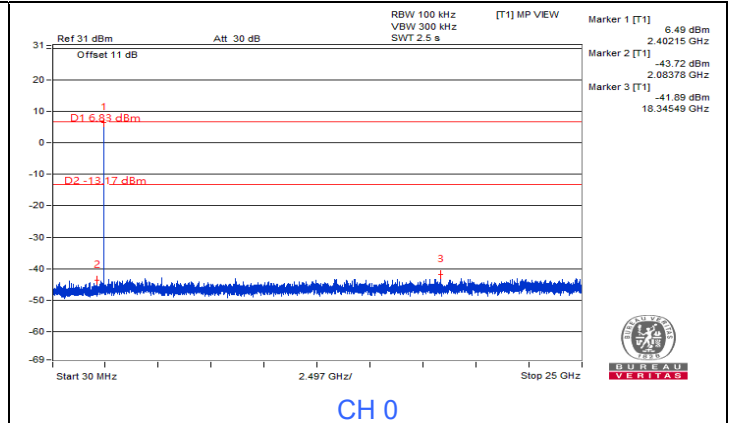




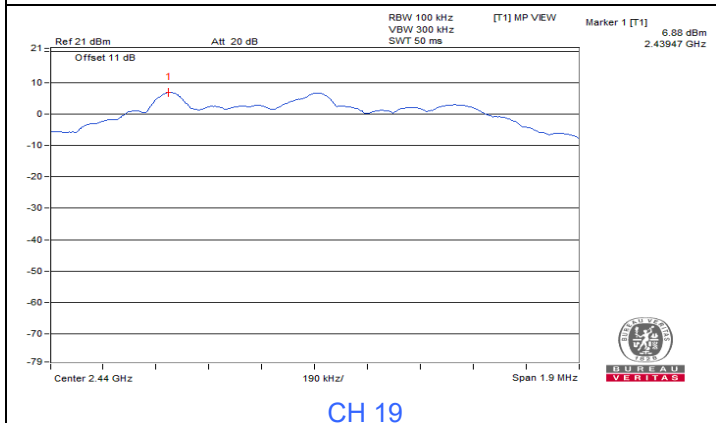
BT-LE 2M



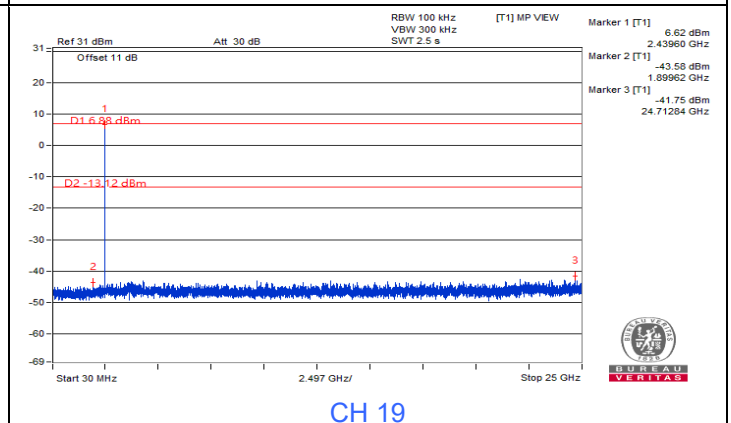
CH 0



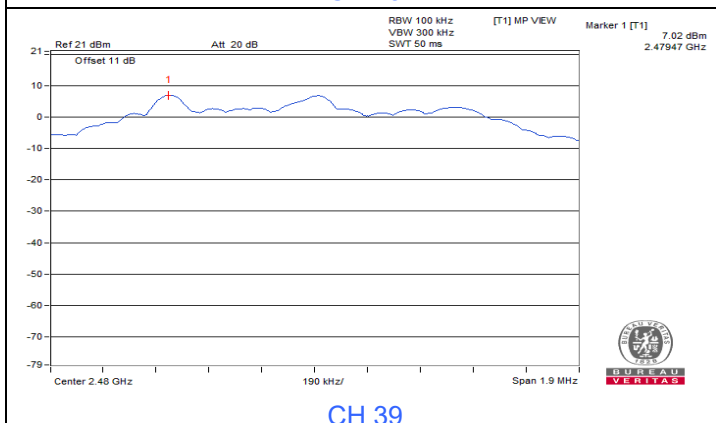
CH 0



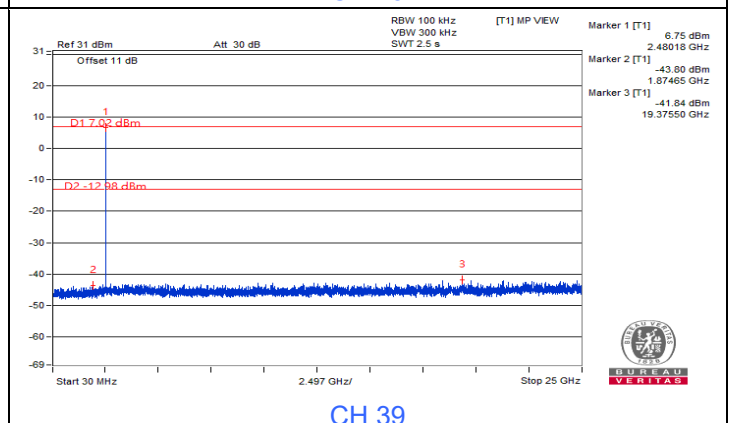
CH 19



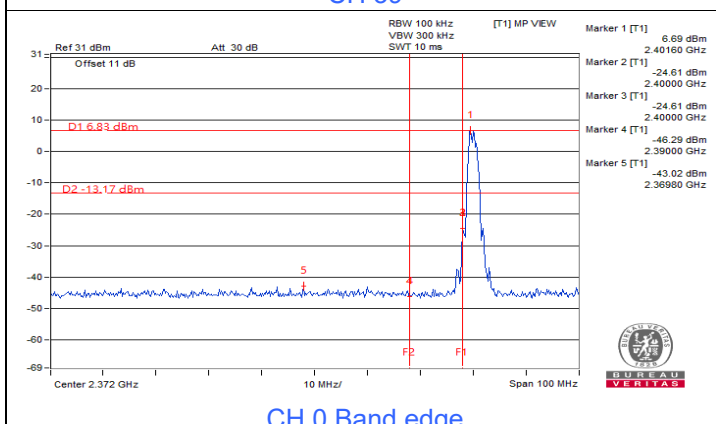
CH 19



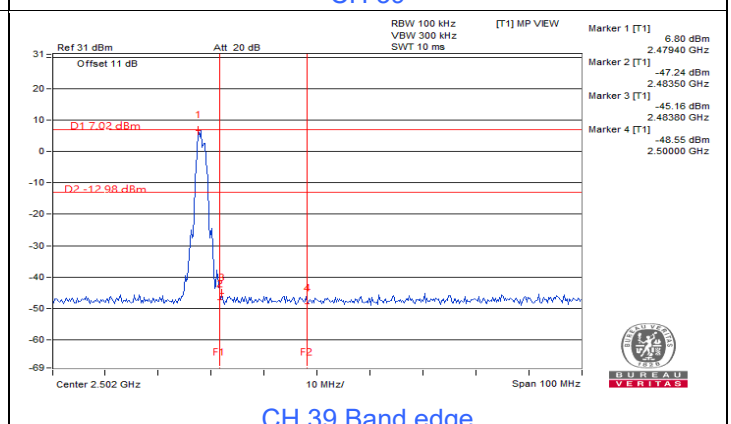
CH 39



CH 39



CH 0 Band edge



CH 39 Band edge

## 7.5 AC Power Conducted Emissions

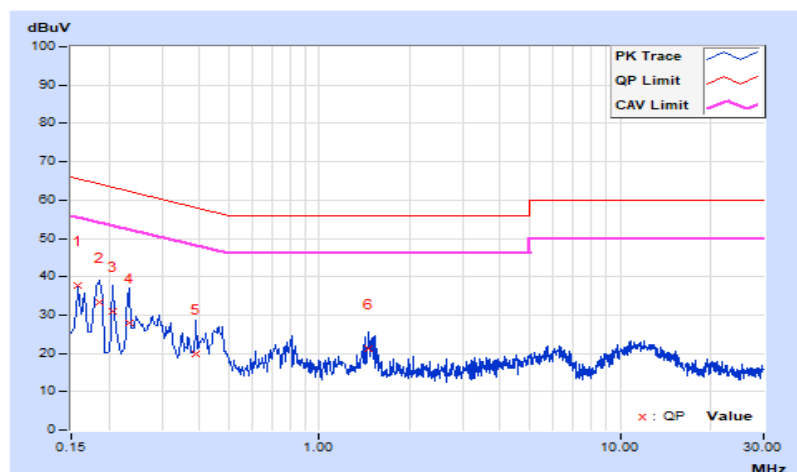
### Mode B

RF Mode	Charging Mode		
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	9.67	28.00	7.50	37.67	17.17	65.57	55.57	-27.90	-38.40
2	0.18600	9.69	23.61	9.98	33.30	19.67	64.21	54.21	-30.91	-34.54
3	0.20600	9.70	21.26	4.25	30.96	13.95	63.37	53.37	-32.41	-39.42
4	0.23400	9.72	18.17	10.40	27.89	20.12	62.31	52.31	-34.42	-32.19
5	0.39000	9.79	10.18	2.00	19.97	11.79	58.06	48.06	-38.09	-36.27
6	1.45800	9.88	11.49	2.51	21.37	12.39	56.00	46.00	-34.63	-33.61

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

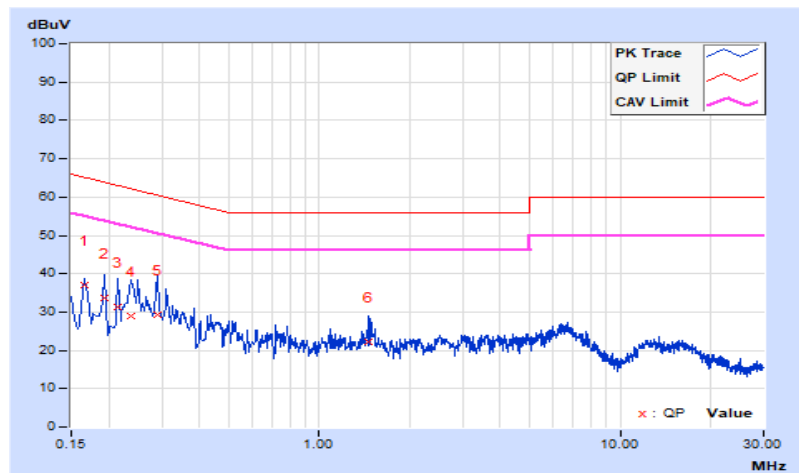


RF Mode	Charging Mode		
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16600	9.67	27.25	7.11	36.92	16.78	65.16	55.16	-28.24	-38.38
2	0.19400	9.70	24.08	8.21	33.78	17.91	63.86	53.86	-30.08	-35.95
3	0.21400	9.70	21.71	6.62	31.41	16.32	63.05	53.05	-31.64	-36.73
4	0.23786	9.71	19.35	11.00	29.06	20.71	62.17	52.17	-33.11	-31.46
5	0.28982	9.73	19.68	10.69	29.41	20.42	60.53	50.53	-31.12	-30.11
6	1.46200	9.86	12.47	4.54	22.33	14.40	56.00	46.00	-33.67	-31.60

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



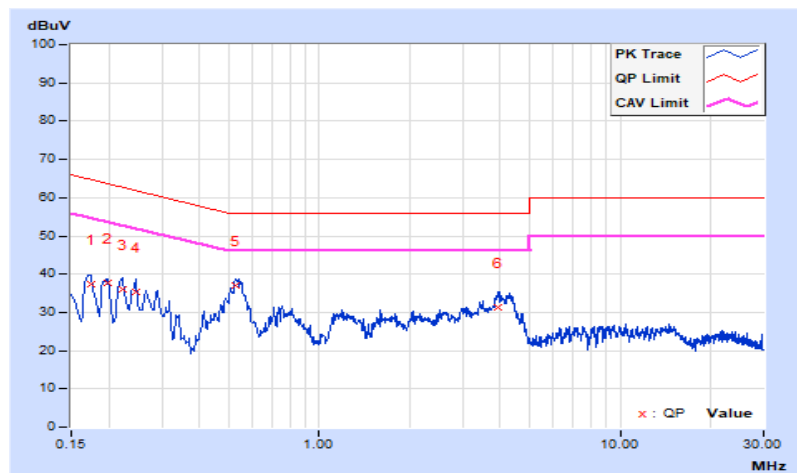
### Mode D

RF Mode	Charging Mode		
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17400	9.68	27.77	20.15	37.45	29.83	64.77	54.77	-27.32	-24.94
2	0.19728	9.70	28.11	20.09	37.81	29.79	63.72	53.72	-25.91	-23.93
3	0.22152	9.71	26.18	19.42	35.89	29.13	62.76	52.76	-26.87	-23.63
4	0.24600	9.72	25.48	18.52	35.20	28.24	61.89	51.89	-26.69	-23.65
<b>5</b>	<b>0.52600</b>	<b>9.80</b>	<b>27.10</b>	<b>24.46</b>	<b>36.90</b>	<b>34.26</b>	<b>56.00</b>	<b>46.00</b>	<b>-19.10</b>	<b>-11.74</b>
6	3.92200	9.95	21.40	17.12	31.35	27.07	56.00	46.00	-24.65	-18.93

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

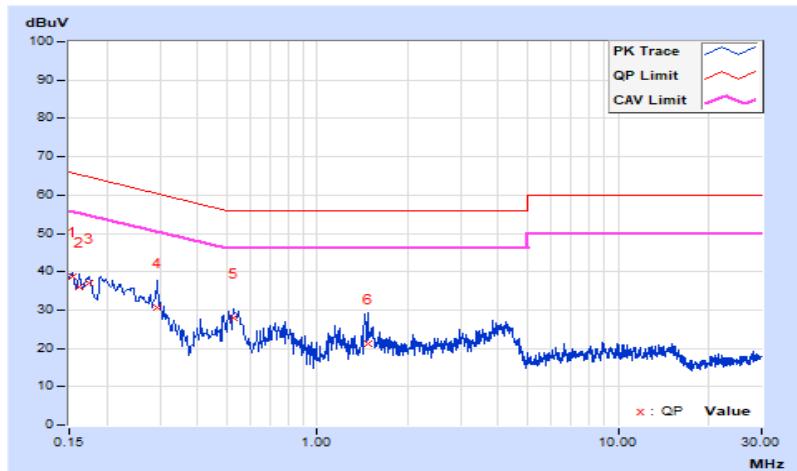


RF Mode	Charging Mode		
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	9.66	28.90	19.42	38.56	29.08	65.78	55.78	-27.22	-26.70
2	0.16200	9.67	26.27	16.18	35.94	25.85	65.36	55.36	-29.42	-29.51
3	0.17400	9.68	27.23	18.79	36.91	28.47	64.77	54.77	-27.86	-26.30
4	0.29400	9.73	20.95	13.17	30.68	22.90	60.41	50.41	-29.73	-27.51
5	0.52600	9.78	18.09	14.75	27.87	24.53	56.00	46.00	-28.13	-21.47
6	1.47400	9.86	11.27	3.26	21.13	13.12	56.00	46.00	-34.87	-32.88

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value





## 7.6 Unwanted Emissions below 1 GHz

### Mode A

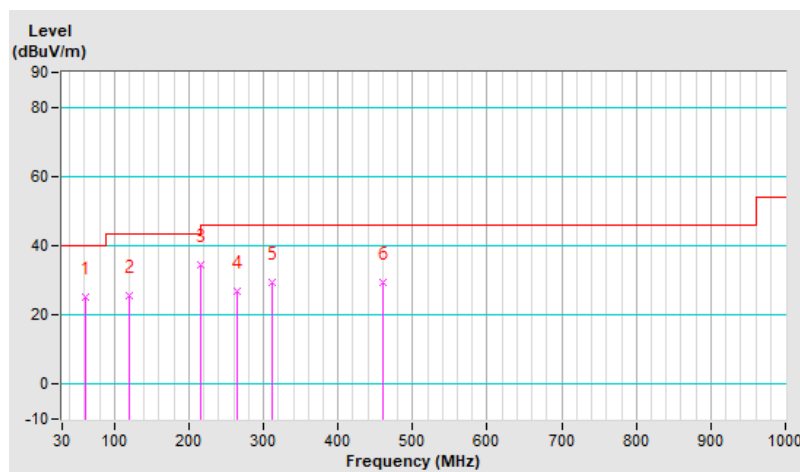
RF Mode	BT-LE 1M	Channel	CH 39 : 2480 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	Quasi-Peak (QP), RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu	Test Date	2023/7/19

#### Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	61.04	25.1 QP	40.0	-14.9	1.49 H	175	39.4	-14.3
2	120.21	25.6 QP	43.5	-17.9	1.49 H	288	40.9	-15.3
3	216.24	34.4 QP	46.0	-11.6	1.49 H	234	51.2	-16.8
4	263.77	26.8 QP	46.0	-19.2	1.00 H	264	40.9	-14.1
5	312.27	29.4 QP	46.0	-16.6	1.00 H	0	41.6	-12.2
6	460.68	29.6 QP	46.0	-16.4	1.49 H	195	38.1	-8.5

#### 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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

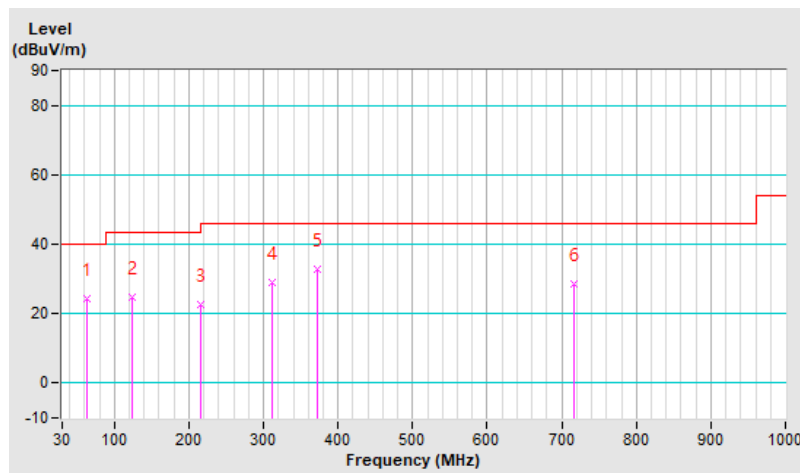


<b>RF Mode</b>	BT-LE 1M	<b>Channel</b>	CH 39 : 2480 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	Quasi-Peak (QP), RB = 120kHz
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Titan Hsu	<b>Test Date</b>	2023/7/19

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	62.98	24.4 QP	40.0	-15.6	1.01 V	206	38.6	-14.2
2	123.12	24.9 QP	43.5	-18.6	1.50 V	231	40.0	-15.1
3	216.24	22.7 QP	46.0	-23.3	1.50 V	347	39.5	-16.8
4	312.27	28.8 QP	46.0	-17.2	1.50 V	247	41.0	-12.2
5	371.44	32.6 QP	46.0	-13.4	1.50 V	158	43.6	-11.0
6	716.76	28.6 QP	46.0	-17.4	1.01 V	324	32.4	-3.8

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



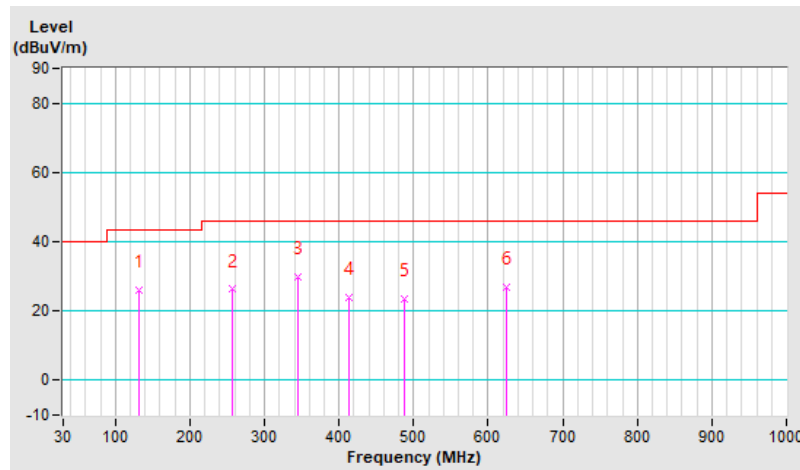
### Mode B

<b>RF Mode</b>	Charging Mode		
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	Quasi-Peak (QP), RB = 120kHz
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Titan Hsu	<b>Test Date</b>	2023/7/19

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	131.85	25.9 QP	43.5	-17.6	1.01 H	287	40.3	-14.4
2	256.01	26.2 QP	46.0	-19.8	1.01 H	217	40.7	-14.5
3	344.28	29.7 QP	46.0	-16.3	1.01 H	180	41.4	-11.7
4	413.15	23.9 QP	46.0	-22.1	1.01 H	178	33.8	-9.9
5	486.87	23.5 QP	46.0	-22.5	2.00 H	256	31.6	-8.1
6	624.61	26.7 QP	46.0	-19.3	1.01 H	86	31.9	-5.2

#### 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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

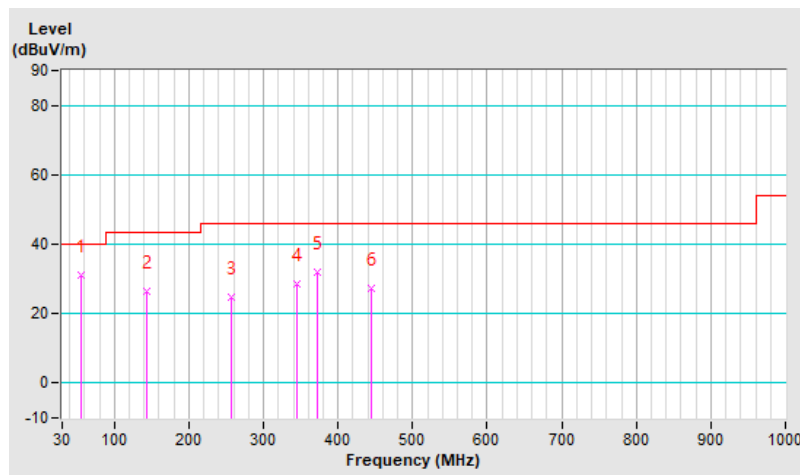


RF Mode	Charging Mode		
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	Quasi-Peak (QP), RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu	Test Date	2023/7/19

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	56.19	30.9 QP	40.0	-9.1	1.00 V	4	44.5	-13.6
2	143.49	26.6 QP	43.5	-16.9	1.00 V	304	40.0	-13.4
3	256.01	24.9 QP	46.0	-21.1	1.99 V	17	39.4	-14.5
4	345.25	28.5 QP	46.0	-17.5	1.49 V	96	40.3	-11.8
5	371.44	31.8 QP	46.0	-14.2	1.49 V	18	42.8	-11.0
6	445.16	27.2 QP	46.0	-18.8	1.49 V	87	36.1	-8.9

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



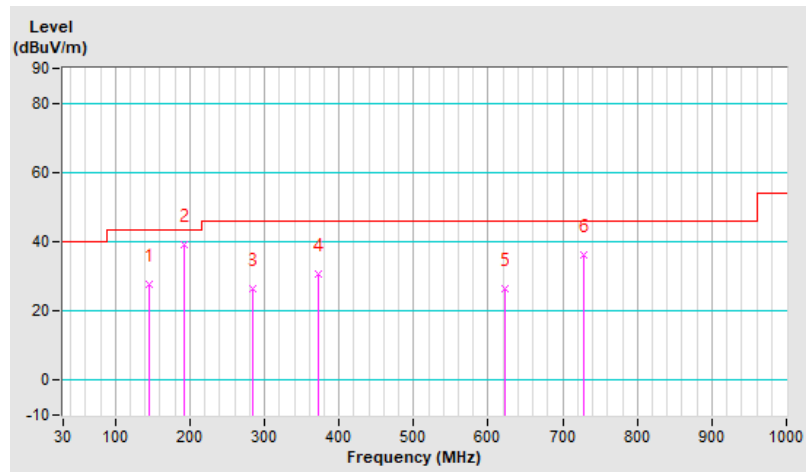
### Mode D

<b>RF Mode</b>	Charging Mode		
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	Quasi-Peak (QP), RB = 120kHz
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Titan Hsu	<b>Test Date</b>	2023/7/19

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	144.46	27.9 QP	43.5	-15.6	2.00 H	267	41.2	-13.3
<b>2</b>	<b>191.99</b>	<b>39.3 QP</b>	<b>43.5</b>	<b>-4.2</b>	<b>1.51 H</b>	<b>86</b>	<b>55.5</b>	<b>-16.2</b>
3	284.14	26.4 QP	46.0	-19.6	1.51 H	215	39.4	-13.0
4	371.44	30.6 QP	46.0	-15.4	1.01 H	97	41.6	-11.0
5	622.67	26.3 QP	46.0	-19.7	1.01 H	248	31.5	-5.2
6	727.43	36.1 QP	46.0	-9.9	2.00 H	192	39.5	-3.4

#### 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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

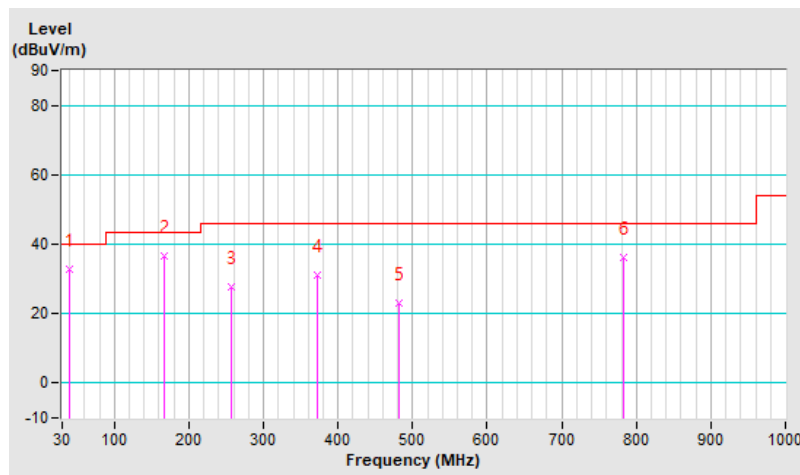


<b>RF Mode</b>	Charging Mode		
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	Quasi-Peak (QP), RB = 120kHz
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Titan Hsu	<b>Test Date</b>	2023/7/19

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39.70	32.7 QP	40.0	-7.3	1.49 V	168	46.5	-13.8
2	167.74	36.6 QP	43.5	-6.9	1.00 V	168	50.0	-13.4
3	256.01	27.8 QP	46.0	-18.2	1.00 V	194	42.3	-14.5
4	371.44	30.9 QP	46.0	-15.1	1.99 V	170	41.9	-11.0
5	482.02	23.2 QP	46.0	-22.8	1.99 V	2	31.4	-8.2
6	783.69	36.0 QP	46.0	-10.0	1.00 V	194	38.6	-2.6

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



## 7.7 Unwanted Emissions above 1 GHz

<b>RF Mode</b>	BT-LE 1M	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 kHz, DET=Peak
<b>Input Power</b>	3.66 Vdc	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Greg Lin	<b>Test Date</b>	2023/7/21

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.0 PK	74.0	-17.0	1.04 H	124	24.7	32.3
2	2390.00	44.4 AV	54.0	-9.6	1.04 H	124	12.1	32.3
3	*2402.00	97.3 PK			1.04 H	124	65.0	32.3
4	*2402.00	96.2 AV			1.04 H	124	63.9	32.3
5	4804.00	50.8 PK	74.0	-23.2	1.12 H	129	47.3	3.5
6	4804.00	39.3 AV	54.0	-14.7	1.12 H	129	35.8	3.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.4 PK	74.0	-17.6	1.02 V	274	24.1	32.3
2	2390.00	44.1 AV	54.0	-9.9	1.02 V	274	11.8	32.3
3	*2402.00	94.2 PK			1.02 V	274	61.9	32.3
4	*2402.00	93.1 AV			1.02 V	274	60.8	32.3
5	4804.00	49.4 PK	74.0	-24.6	1.42 V	138	45.9	3.5
6	4804.00	36.7 AV	54.0	-17.3	1.42 V	138	33.2	3.5

### 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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.



<b>RF Mode</b>	BT-LE 1M	<b>Channel</b>	CH 19 : 2440 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 kHz, DET=Peak
<b>Input Power</b>	3.66 Vdc	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Greg Lin	<b>Test Date</b>	2023/7/21

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	97.7 PK			1.16 H	124	65.4	32.3
2	*2440.00	96.6 AV			1.16 H	124	64.3	32.3
3	4880.00	51.1 PK	74.0	-22.9	1.15 H	136	47.6	3.5
4	4880.00	39.6 AV	54.0	-14.4	1.15 H	136	36.1	3.5

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	94.8 PK			1.04 V	282	62.5	32.3
2	*2440.00	93.7 AV			1.04 V	282	61.4	32.3
3	4880.00	49.7 PK	74.0	-24.3	1.44 V	147	46.2	3.5
4	4880.00	36.9 AV	54.0	-17.1	1.44 V	147	33.4	3.5

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.





<b>RF Mode</b>	BT-LE 1M	<b>Channel</b>	CH 39 : 2480 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 kHz, DET=Peak
<b>Input Power</b>	3.66 Vdc	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Greg Lin	<b>Test Date</b>	2023/7/21

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	98.5 PK			1.23 H	125	66.2	32.3
2	*2480.00	97.4 AV			1.23 H	125	65.1	32.3
3	2483.50	57.8 PK	74.0	-16.2	1.23 H	125	25.4	32.4
4	2483.50	46.0 AV	54.0	-8.0	1.23 H	125	13.6	32.4
5	4960.00	51.8 PK	74.0	-22.2	1.14 H	122	47.8	4.0
6	4960.00	40.3 AV	54.0	-13.7	1.14 H	122	36.3	4.0

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	95.6 PK			1.03 V	274	63.3	32.3
2	*2480.00	94.5 AV			1.03 V	274	62.2	32.3
3	2483.50	57.2 PK	74.0	-16.8	1.03 V	274	24.8	32.4
4	2483.50	45.7 AV	54.0	-8.3	1.03 V	274	13.3	32.4
5	4960.00	50.2 PK	74.0	-23.8	1.48 V	145	46.2	4.0
6	4960.00	37.5 AV	54.0	-16.5	1.48 V	145	33.5	4.0

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.



<b>RF Mode</b>	BT-LE 2M	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 kHz, DET=Peak
<b>Input Power</b>	3.66 Vdc	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Greg Lin	<b>Test Date</b>	2023/7/21

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.1 PK	74.0	-16.9	1.03 H	125	24.8	32.3
2	2390.00	44.5 AV	54.0	-9.5	1.03 H	125	12.2	32.3
3	*2402.00	97.3 PK			1.03 H	125	65.0	32.3
4	*2402.00	94.2 AV			1.03 H	125	61.9	32.3
5	4804.00	50.6 PK	74.0	-23.4	1.13 H	131	47.1	3.5
6	4804.00	39.1 AV	54.0	-14.9	1.13 H	131	35.6	3.5

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.7 PK	74.0	-17.3	1.04 V	279	24.4	32.3
2	2390.00	44.0 AV	54.0	-10.0	1.04 V	279	11.7	32.3
3	*2402.00	94.4 PK			1.04 V	279	62.1	32.3
4	*2402.00	91.3 AV			1.04 V	279	59.0	32.3
5	4804.00	49.1 PK	74.0	-24.9	1.48 V	145	45.6	3.5
6	4804.00	36.4 AV	54.0	-17.6	1.48 V	145	32.9	3.5

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency, the limit was restricted at the RF Output Power.



<b>RF Mode</b>	BT-LE 2M	<b>Channel</b>	CH 19 : 2440 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 kHz, DET=Peak
<b>Input Power</b>	3.66 Vdc	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Greg Lin	<b>Test Date</b>	2023/7/21

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	97.5 PK			1.19 H	121	65.2	32.3
2	*2440.00	94.4 AV			1.19 H	121	62.1	32.3
3	4880.00	50.8 PK	74.0	-23.2	1.12 H	131	47.3	3.5
4	4880.00	39.2 AV	54.0	-14.8	1.12 H	131	35.7	3.5

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	94.6 PK			1.05 V	277	62.3	32.3
2	*2440.00	91.5 AV			1.05 V	277	59.2	32.3
3	4880.00	49.3 PK	74.0	-24.7	1.42 V	145	45.8	3.5
4	4880.00	36.2 AV	54.0	-17.8	1.42 V	145	32.7	3.5

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.



<b>RF Mode</b>	BT-LE 2M	<b>Channel</b>	CH 39 : 2480 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 kHz, DET=Peak
<b>Input Power</b>	3.66 Vdc	<b>Environmental Conditions</b>	23°C, 66% RH
<b>Tested By</b>	Greg Lin	<b>Test Date</b>	2023/7/21

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	98.2 PK			1.20 H	122	65.9	32.3
2	*2480.00	95.1 AV			1.20 H	122	62.8	32.3
3	2483.50	58.2 PK	74.0	-15.8	1.20 H	122	25.8	32.4
4	<b>2483.50</b>	<b>46.3 AV</b>	<b>54.0</b>	<b>-7.7</b>	<b>1.20 H</b>	<b>122</b>	<b>13.9</b>	<b>32.4</b>
5	4960.00	51.4 PK	74.0	-22.6	1.13 H	124	47.4	4.0
6	4960.00	40.1 AV	54.0	-13.9	1.13 H	124	36.1	4.0

**Antenna Polarity & Test Distance : Vertical at 3 m**

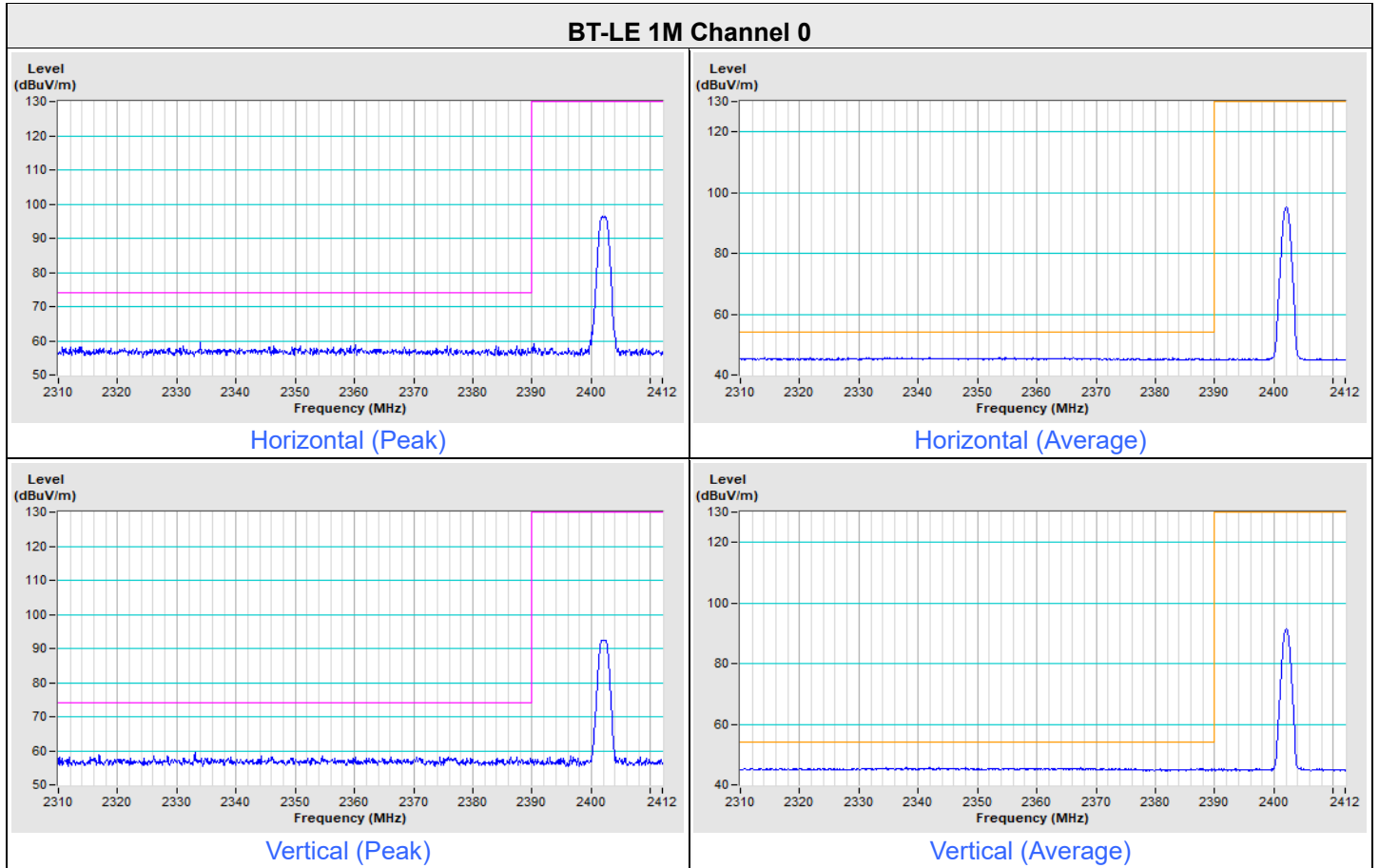
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	95.2 PK			1.01 V	280	62.9	32.3
2	*2480.00	92.1 AV			1.01 V	280	59.8	32.3
3	2483.50	57.5 PK	74.0	-16.5	1.01 V	280	25.1	32.4
4	2483.50	45.8 AV	54.0	-8.2	1.01 V	280	13.4	32.4
5	4960.00	49.9 PK	74.0	-24.1	1.41 V	146	45.9	4.0
6	4960.00	37.2 AV	54.0	-16.8	1.41 V	146	33.2	4.0

**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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.

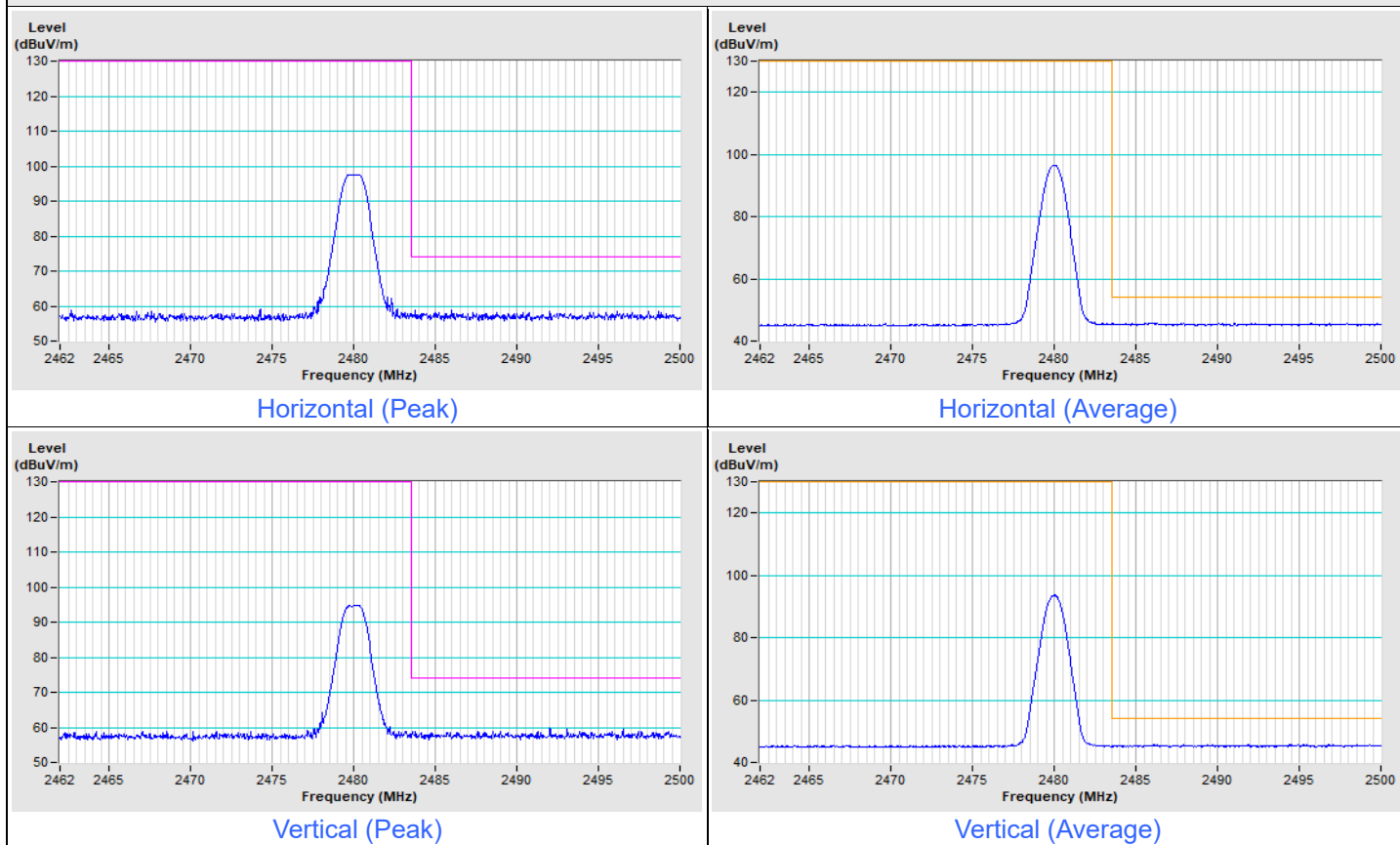
### Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	Peak (PK), RB = 1 MHz, VB = 3 MHz Peak (AV), RB = 1 MHz, VB = 10 kHz
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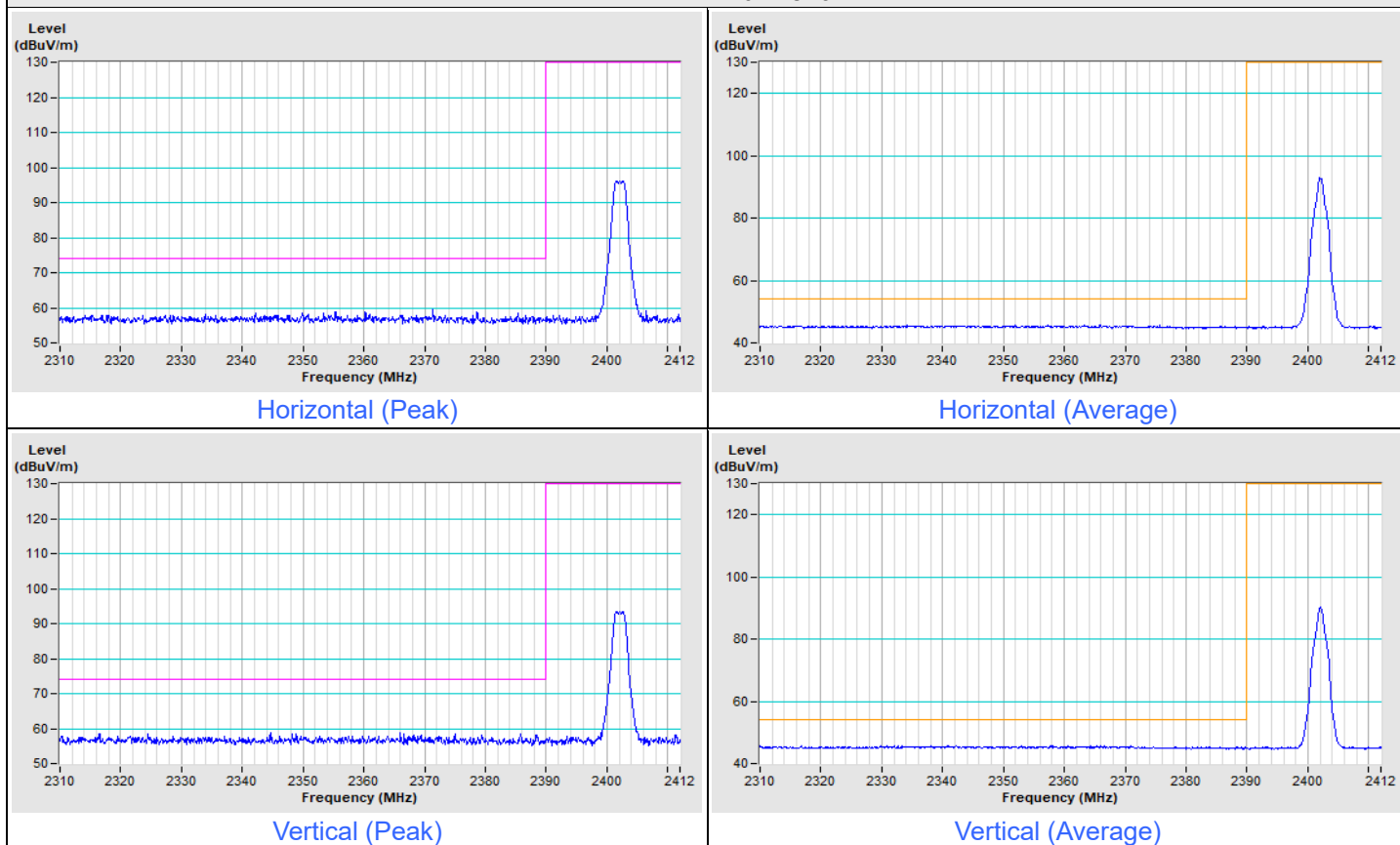
Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	Peak (PK), RB = 1 MHz, VB = 3 MHz Peak (AV), RB = 1 MHz, VB = 10 kHz
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### BT-LE 1M Channel 39



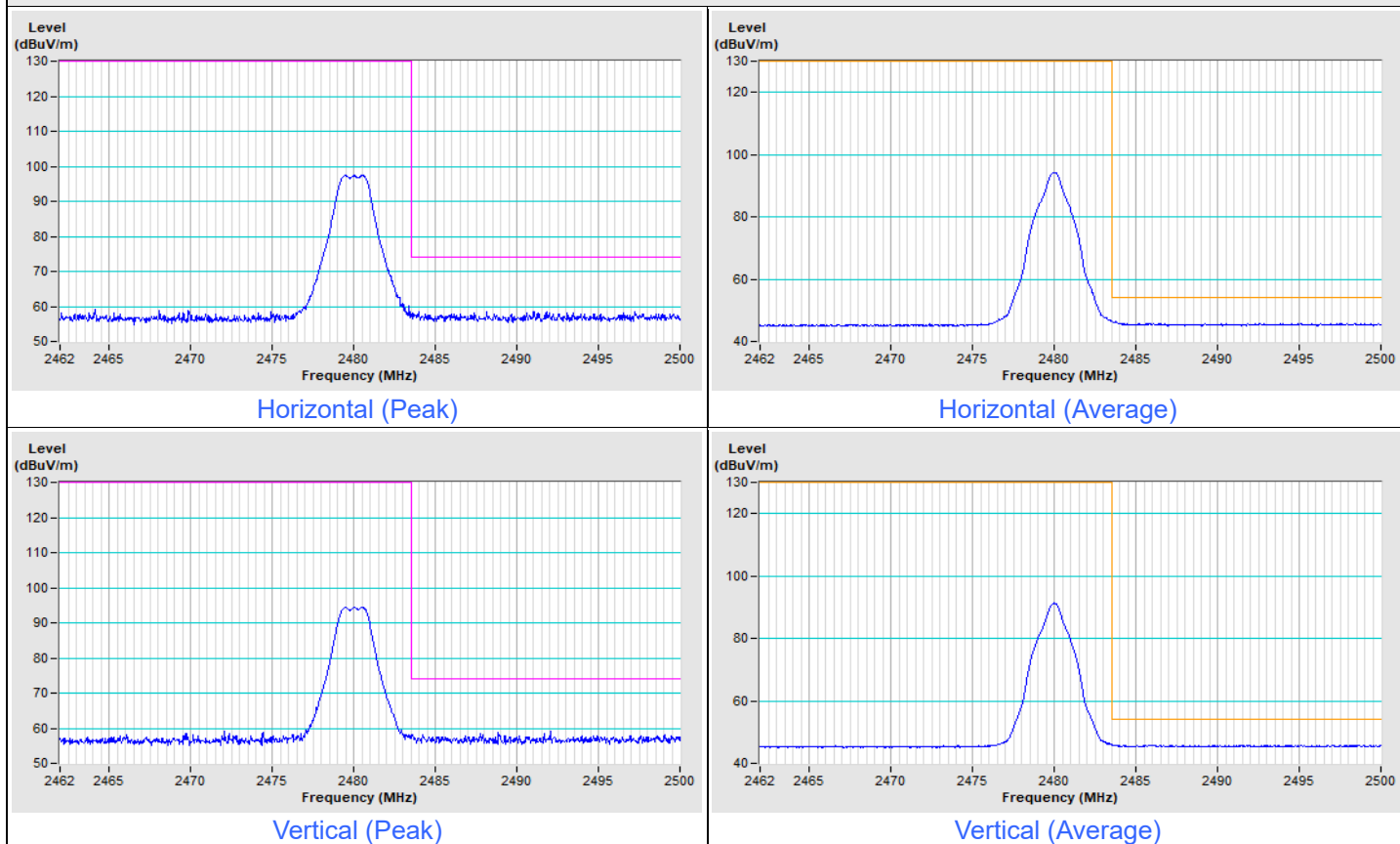
Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	Peak (PK), RB = 1 MHz, VB = 3 MHz Peak (AV), RB = 1 MHz, VB = 10 kHz
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**BT-LE 2M Channel 0**



Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	Peak (PK), RB = 1 MHz, VB = 3 MHz Peak (AV), RB = 1 MHz, VB = 10 kHz
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**BT-LE 2M Channel 39**





## 8 Pictures of Test Arrangements

Please refer to the attached file: CFQC-WTW-P23070144-1 (TSup Photo\_Right Earbud)

## 9 Construction Photos of EUT

Please refer to the attached file: CFQC-WTW-P23070144 (EUT Photo)

## 10 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** <http://ee.bureauveritas.com.tw>

The address and road map of all our labs can be found in our web site also.

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