

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
**Report No.:** RFBDKG-WTW-P24050306-2  
**FCC ID:** JNZA00194  
**Product:** Base Station  
**Brand:** Logitech G, logitech G, G  
**Model No.:** A00194  
**Received Date:** 2024/3/13  
**Test Date:** 2024/5/20 ~ 2024/6/6  
**Issued Date:** 2024/6/25

**Applicant:** Logitech Far East Ltd.  
**Address:** #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.  
**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory  
**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan  
**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan  
**FCC Registration /** 723255 / TW2022  
**Designation Number:**

**Approved by:** \_\_\_\_\_, **Date:** 2024/6/25  
May Chen / Manager

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Prepared by : Phoenix Huang / Specialist



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## Release Control Record

Issue No.	Description	Date Issued
RFBDKG-WTW-P24050306-2	Original release.	2024/6/25

## 1 Certificate

**Product:** Base Station

**Brand:** Logitech G, logitech G, G

**Test Model:** A00194

**Sample Status:** Engineering sample

**Applicant:** Logitech Far East Ltd.

**Test Date:** 2024/5/20 ~ 2024/6/6

**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 -13.99 dB at 24.03906 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -6.2 dB at 45.52 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -9.6 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) (±)
RF Output Power	-	1.1 dB
Power Spectral Density	-	1.3 dB
6 dB Bandwidth	-	1050.00 Hz
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.6 dB
AC Power Conducted Emissions	150 kHz ~ 30 MHz	1.9 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.1 dB
	30 MHz ~ 1 GHz	5.5 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	5.1 dB
	18 GHz ~ 40 GHz	5.3 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	Base Station
Brand	Logitech G, logitech G, G
Test Model	A00194
Status of EUT	Engineering sample
Power Supply Rating	5 Vdc from USB interface; 5.15 Vdc from power adapter
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	2 Mbps
Operating Frequency	2.401395776 GHz ~ 2.477395776 GHz
Number of Channel	39
Output Power	3.639 mW (5.61 dBm)

Note:

1. The EUT may have a lot of colors for marketing requirement.
2. The EUT uses following accessories.

Item	Brand	Model	Specification
USB-A to USB-C cable (optional)	G	502-AAA001	Signal Line : shielded with one core, 1.85 m
USB-C to USB-C cable (optional)	G	502-001539	Signal Line : shielded, 2 m
Adapter (optional)	G	DSA-10PF13-05 FCA 515200	AC Input : 100-240 Vac, 50/60 Hz, 0.35 A DC Output : 5.15 Vdc, 2.0 A
Wireless Headset (optional)	Logitech G, logitech G, G	A00186	-

3. There are Bluetooth and SRD(GFSK) technology used for the EUT.
4. Simultaneously transmission condition.

Condition	Technology	
1	Bluetooth	SRD(GFSK)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

5. The device of BT-EDR and BT-LE technology can't transmit simultaneously, it was used timely shared coexistence technology.
6. 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.	RF Chain No.	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
BT Ant E1	0	-1.77	2.4~2.4835	Monopole antenna with extended bandwidth	none
SRD Ant E2	1	-2.51	2.4~2.4835	Monopole antenna with extended bandwidth	none
SRD Ant E3	0	-1.33	2.4~2.4835	Monopole antenna with extended bandwidth	none

Note:

1. For SRD incorporates with SISO function. (1Tx / 1Rx Diversity).
2. For RF Output Power and Power Spectral Density test items, select the highest gain for calculation.

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



### 3.3 Channel List

39 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2401.395776	13	2427.395776	26	2453.395776
1	2403.395776	14	2429.395776	27	2455.395776
2	2405.395776	15	2431.395776	28	2457.395776
3	2407.395776	16	2433.395776	29	2459.395776
4	2409.395776	17	2435.395776	30	2461.395776
5	2411.395776	18	2437.395776	31	2463.395776
6	2413.395776	19	2439.395776	32	2465.395776
7	2415.395776	20	2441.395776	33	2467.395776
8	2417.395776	21	2443.395776	34	2469.395776
9	2419.395776	22	2445.395776	35	2471.395776
10	2421.395776	23	2447.395776	36	2473.395776
11	2423.395776	24	2449.395776	37	2475.395776
12	2425.395776	25	2451.395776	38	2477.395776

### 3.4 Test Mode Applicability and Tested Channel Detail

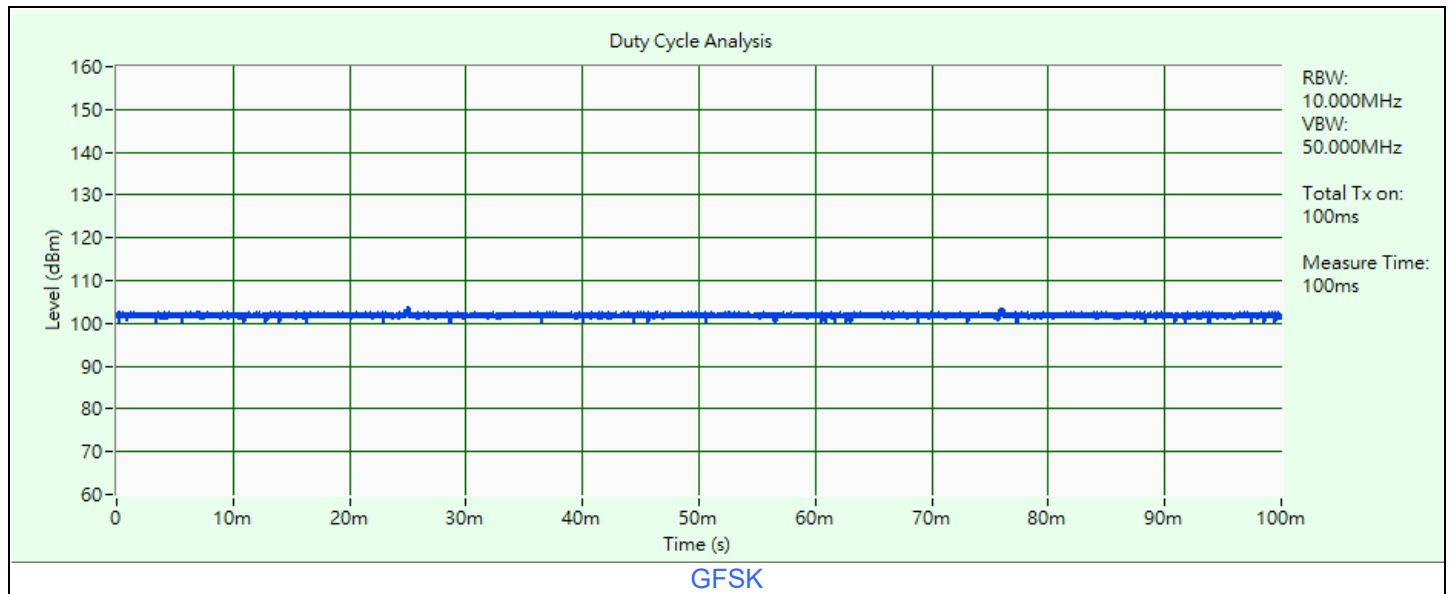
Pre-Scan:	1. For SRD(GFSK) incorporates with SISO function (1Tx / 1Rx Diversity). Pre-scan the chain 0 and chain 1 and find the worst case as a representative test condition. 2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
Worst Case:	1. For SRD(GFSK) technology 1Tx diversity configuration the worst chain on Chain 1.

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

Test Item	Tested Channel	Modulation	Data Rate Parameter
RF Output Power	0, 19, 38	GFSK	2Mb/s
Power Spectral Density	0, 19, 38	GFSK	2Mb/s
6 dB Bandwidth	0, 19, 38	GFSK	2Mb/s
Conducted Out of Band Emissions	0, 19, 38	GFSK	2Mb/s
AC Power Conducted Emissions	0	GFSK	2Mb/s
Unwanted Emissions below 1 GHz	0	GFSK	2Mb/s
Unwanted Emissions above 1 GHz	0, 19, 38	GFSK	2Mb/s

### 3.5 Duty Cycle of Test Signal

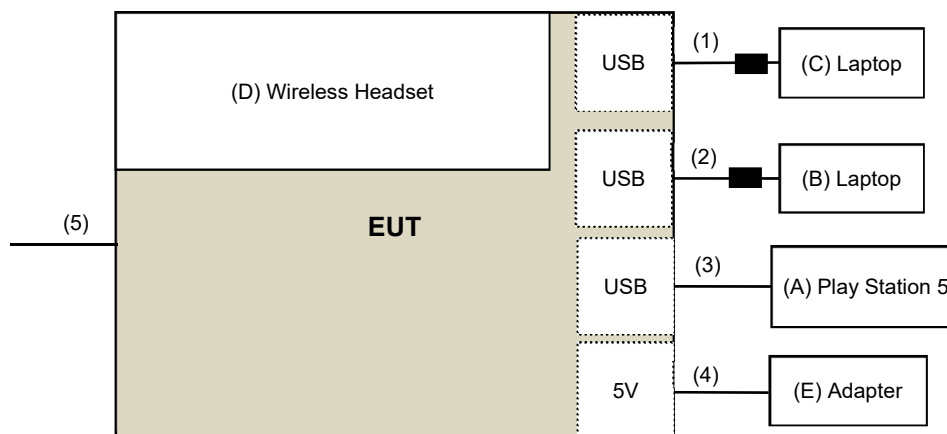
**GFSK:** Duty cycle = 100 ms / 100 ms x 100% = 100.0%



### 3.6 Test Program Used and Operation Descriptions

Controlling software (R1 And BC Lab Tool v1.0.0.15.exe) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

### 3.7 Connection Diagram of EUT and Peripheral Devices



### 3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Play Station 5	SONY	CFI-2018	N/A	N/A	Supplied by applicant
B	Laptop	Lenovo	20U5S01X00 L14	PF-1ANPYA	N/A	Provided by Lab
C	Laptop	Lenovo	20U5S01X00 L14	PF-28LKK7	N/A	Provided by Lab
D	Wireless Headset	Logitech G, logitech G, G	A00186	N/A	N/A	Supplied by applicant
E	Adapter	G	DSA-10PF13-05 FCA 515200	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB-A to USB-C cable	1	1.85	Yes	1	Supplied by applicant
2	USB-A to USB-C cable	1	1.85	Yes	1	Supplied by applicant
3	USB-C to USB-C cable	1	1.5	Yes	0	Supplied by applicant
4	USB-C to USB-C cable	1	2	Yes	0	Supplied by applicant
5	Console Cable	1	0.6	Yes	0	Supplied by applicant (for RF Setup)

## 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
Pulse Power Sensor Anritsu	MA2411B	1726434	2023/6/19	2024/6/18
RF Power Meter Anritsu	ML2495A	1529002	2023/6/17	2024/6/16

Notes:

1. The test was performed in Oven room 2.
2. Tested Date: 2024/5/30

### 4.2 Power Spectral Density

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
MXA Signal Analyzer Keysight	N9020B	MY60112408	2024/3/7	2025/3/6
Software	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room 2.
2. Tested Date: 2024/6/6

### 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
50 ohm terminal resistance Telegartner	50 ohm	3	2023/10/20	2024/10/19
EMI Test Receiver R&S	ESCS 30	847124/029	2023/10/18	2024/10/17
Fixed Attenuator STI	STI02-2200-10	005	2024/2/19	2025/2/18
LISN R&S	ESH3-Z5	835239/001	2024/4/3	2025/4/2
		848773/004	2023/10/13	2024/10/12
RF Coaxial Cable JYEBAO	5D-FB	COCCAB-001	2024/2/19	2025/2/18
Software BVADT	BVADT_Cond_V7.3.7.4	N/A	N/A	N/A

Notes:

1. The test was performed in Conduction 1
2. Tested Date: 2024/6/1

#### 4.6 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-406	2023/10/13	2024/10/12
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	2024/2/17	2025/2/16
Loop Antenna Electro-Metrics	EM-6879	264	2024/2/23	2025/2/22
MXE EMI Receiver Agilent	N9038A	MY51210202	2023/7/19	2024/7/18
Preamplifier EMCI	EMC330N	980701	2024/2/17	2025/2/16
	EMC001340	980142	2024/2/19	2025/2/18
RF Coaxial Cable JYEBAO	5D-FB	LOOPCAB-001	2024/2/19	2025/2/18
		LOOPCAB-002	2024/2/19	2025/2/18
RF Coaxial Cable mTJ	100100-CFD400LW-200	CFD400-200	2024/2/17	2025/2/16
	100100-CFD400LW-400	CFD400-400	2024/2/17	2025/2/16
	100100-CFD400LW-800	CFD400-800	2024/2/17	2025/2/16
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The test was performed in 966 Chamber No. 4.
2. Tested Date: 2024/6/1

#### 4.7 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-783	2023/11/12	2024/11/11
	BBHA 9170	9170-739	2023/11/12	2024/11/11
MXE EMI Receiver Agilent	N9038A	MY51210202	2023/7/19	2024/7/18
Preamplifier EMCI	EMC12630SE	980688	2023/10/3	2024/10/2
	EMC184045SE	980387	2023/8/9	2024/8/8
RF Coaxial Cable EMCI	EMC102-KM-KM-1200	160924	2024/1/29	2025/1/28
	EMC102-KM-KM-4000	200214	2024/1/29	2025/1/28
	EMC104-SM-SM-1200	160922	2024/1/29	2025/1/28
	EMC104-SM-SM-2000	180502	2024/1/29	2025/1/28
	EMC104-SM-SM-6000	210704	2023/11/2	2024/11/1
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The test was performed in 966 Chamber No. 4.
2. Tested Date: 2024/5/20 ~ 2024/5/22

## 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:

1. The lower limit shall apply at the transition frequencies.
2. 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:

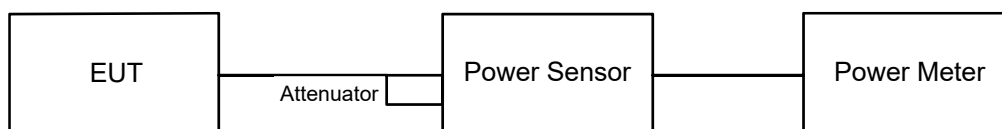
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted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

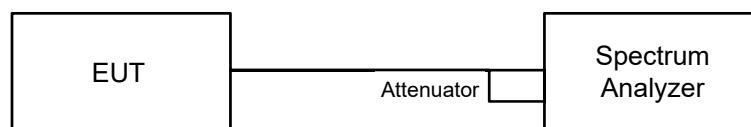
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

##### 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

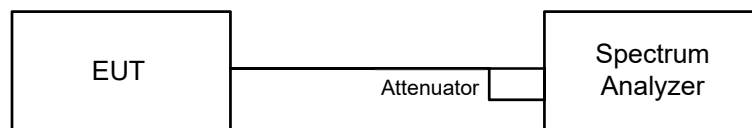


#### 6.2.2 Test Procedure

- 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

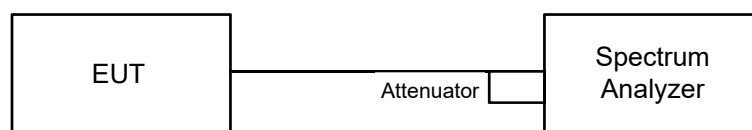


#### 6.3.2 Test Procedure

- 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

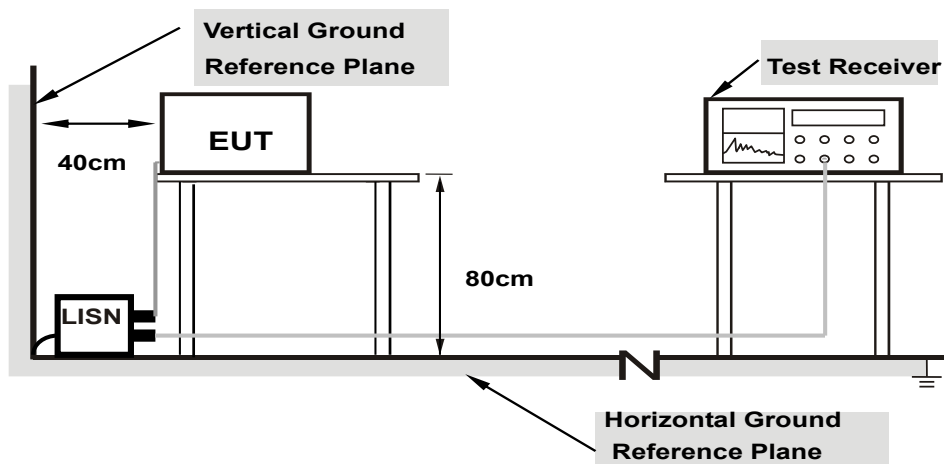
- Set the RBW = 100 kHz.
- Set the VBW  $\geq 300$  kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

##### 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

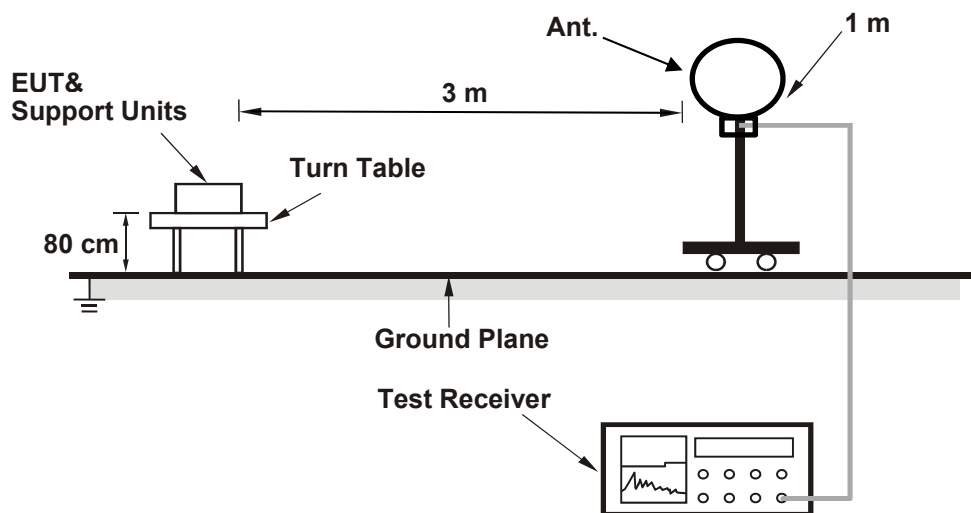
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The 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.

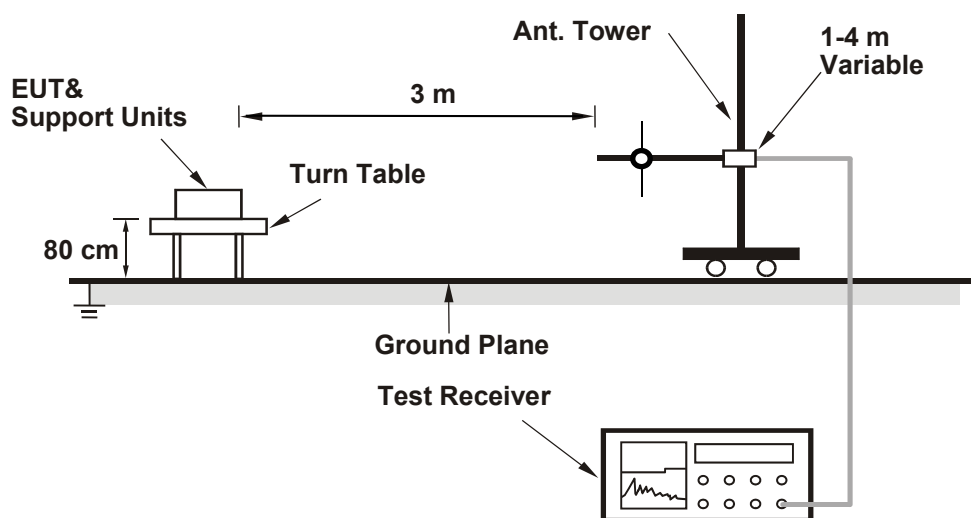
## 6.6 Unwanted Emissions below 1 GHz

### 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

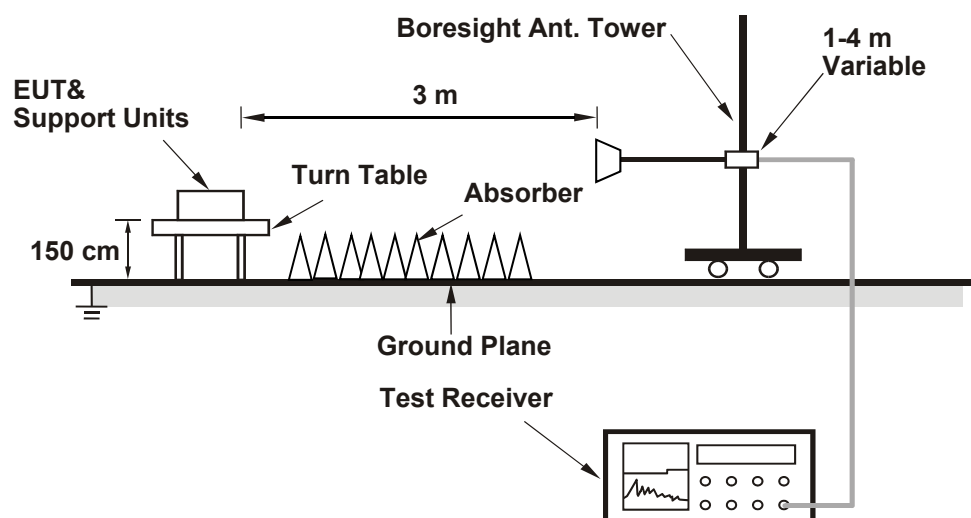
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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/spectrum analyzer 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 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:	5 Vdc	Environmental Conditions:	25°C, 62% RH	Tested By:	John Peng
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#### For Peak Power

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2401.395776	3.639	5.61	30	Pass
19	2439.395776	3.243	5.11	30	Pass
38	2477.395776	2.636	4.21	30	Pass

Note: The antenna gain is -1.33 dBi < 6 dBi, so the output power limit shall not be reduced.

#### For Average Power

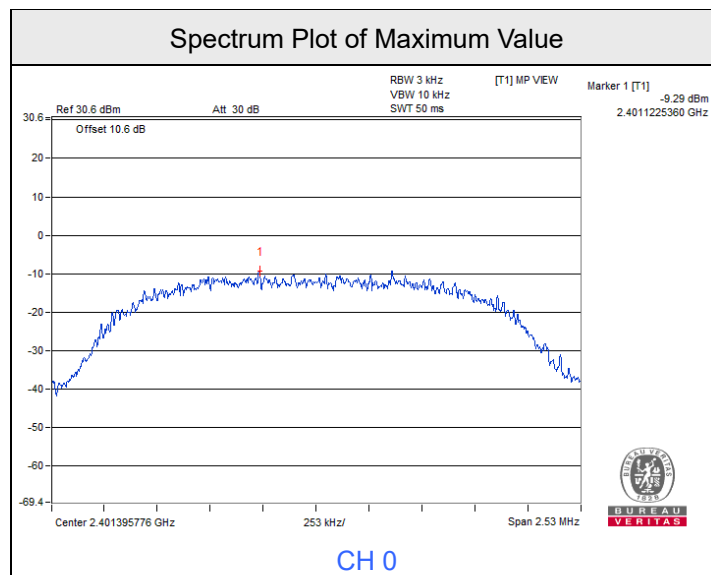
Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2401.395776	2.427	3.85
19	2439.395776	1.799	2.55
38	2477.395776	1.259	1.00

## 7.2 Power Spectral Density

Input Power:	5 Vdc	Environmental Conditions:	25°C, 62% RH	Tested By:	John Peng
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Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	2401.395776	-9.29	8	Pass
19	2439.395776	-10.98	8	Pass
38	2477.395776	-12.62	8	Pass

Note: The antenna gain is -1.33 dBi < 6 dBi, so the power density limit shall not be reduced.

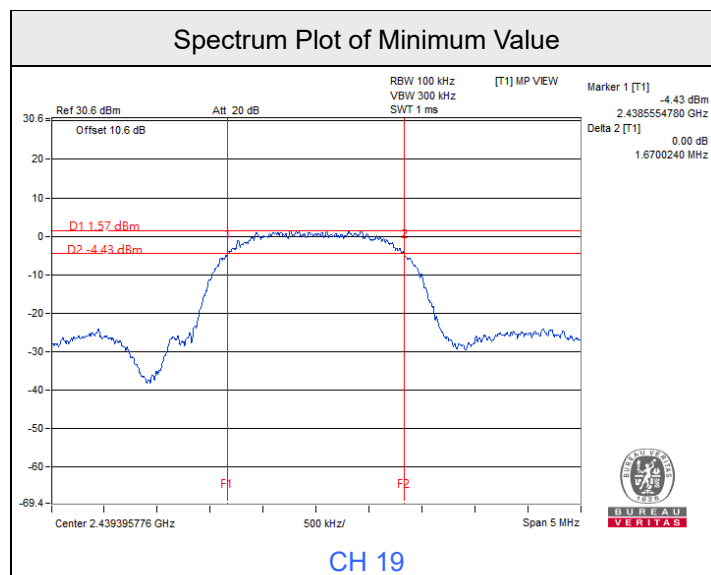




### 7.3 6 dB Bandwidth

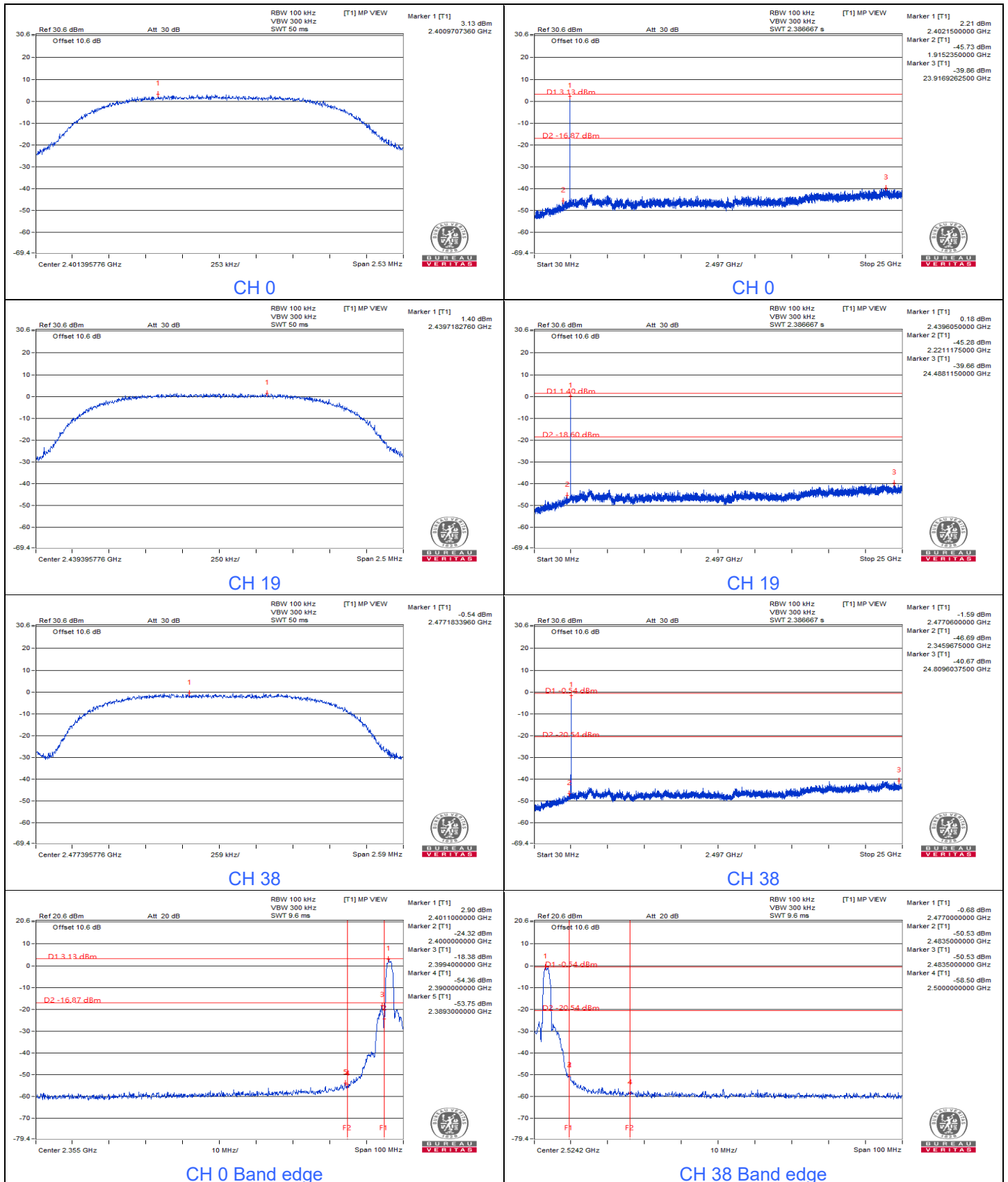
Input Power:	5 Vdc	Environmental Conditions:	25°C, 62% RH	Tested By:	John Peng
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Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Test Result
0	2401.395776	1.69	0.5	Pass
19	2439.395776	1.67	0.5	Pass
38	2477.395776	1.73	0.5	Pass



### 7.4 Conducted Out of Band Emissions

Input Power:	5 Vdc	Environmental Conditions:	25°C, 62% RH	Tested By:	John Peng
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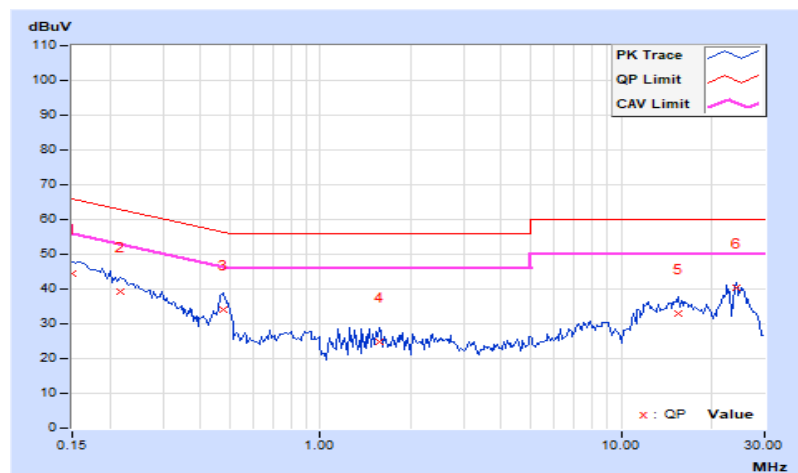
## 7.5 AC Power Conducted Emissions

RF Mode	GFSK	Channel	CH 0 : 2401.395776 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	21 °C, 66 % RH
Tested By	Sampson Chen		

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	0.15000	9.94	34.48	19.45	44.42	29.39	66.00	56.00	-21.58	-26.61
2	0.21641	9.95	29.16	14.00	39.11	23.95	62.96	52.96	-23.85	-29.01
3	0.47422	9.96	24.11	13.87	34.07	23.83	56.44	46.44	-22.37	-22.61
4	1.56641	10.03	14.89	7.04	24.92	17.07	56.00	46.00	-31.08	-28.93
5	15.44141	10.96	22.10	16.11	33.06	27.07	60.00	50.00	-26.94	-22.93
<b>6</b>	<b>24.03906</b>	<b>11.29</b>	<b>29.24</b>	<b>24.72</b>	<b>40.53</b>	<b>36.01</b>	<b>60.00</b>	<b>50.00</b>	<b>-19.47</b>	<b>-13.99</b>

### 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

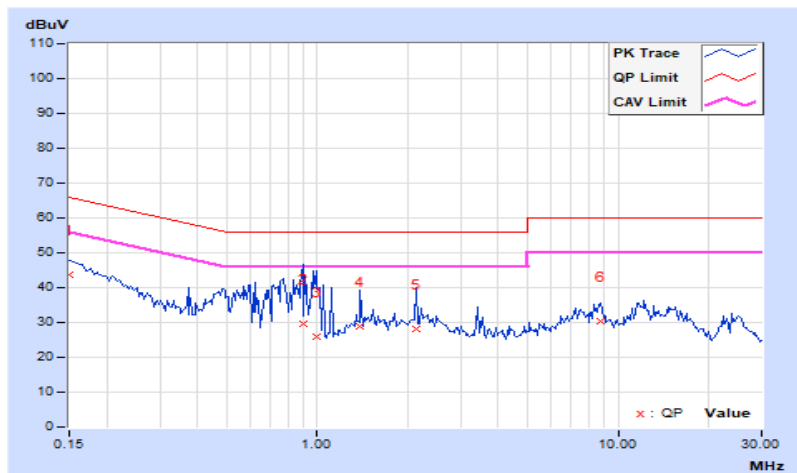


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 0 : 2401.395776 MHz
<b>Frequency Range</b>	150 kHz ~ 30 MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 66 % RH
<b>Tested By</b>	Sampson Chen		

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	0.15000	9.99	33.67	19.35	43.66	29.34	66.00	56.00	-22.34	-26.66
2	0.89609	10.04	19.67	6.44	29.71	16.48	56.00	46.00	-26.29	-29.52
3	0.98984	10.05	15.91	10.04	25.96	20.09	56.00	46.00	-30.04	-25.91
4	1.39453	10.07	18.90	13.30	28.97	23.37	56.00	46.00	-27.03	-22.63
5	2.14453	10.10	17.92	12.16	28.02	22.26	56.00	46.00	-27.98	-23.74
6	8.75781	10.55	19.94	13.28	30.49	23.83	60.00	50.00	-29.51	-26.17

**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



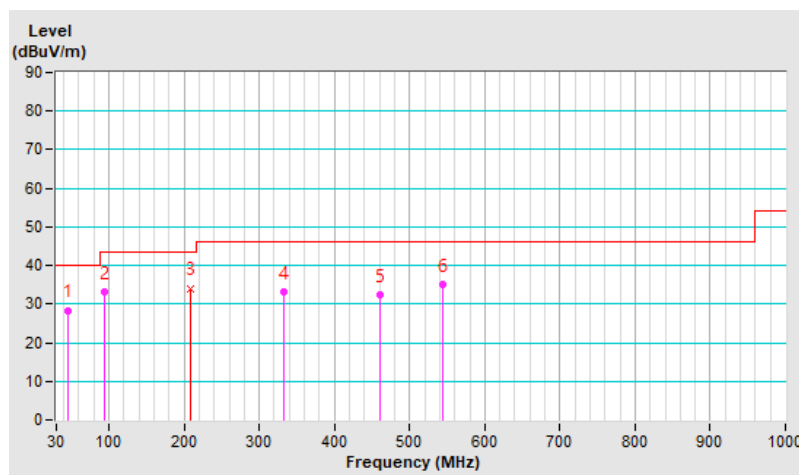
## 7.6 Unwanted Emissions below 1 GHz

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 0 : 2401.395776 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	20 °C, 64 % RH
<b>Tested By</b>	Sampson Chen		

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	46.10	28.4 QP	40.0	-11.6	3.00 H	349	41.2	-12.8
2	94.14	33.1 QP	43.5	-10.4	2.00 H	127	51.4	-18.3
3	208.38	34.1 QP	43.5	-9.4	1.00 H	36	50.4	-16.3
4	332.37	33.1 QP	46.0	-12.9	1.00 H	116	44.6	-11.5
5	459.93	32.3 QP	46.0	-13.7	2.00 H	61	40.5	-8.2
6	544.00	35.1 QP	46.0	-10.9	2.00 H	301	41.8	-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. 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.

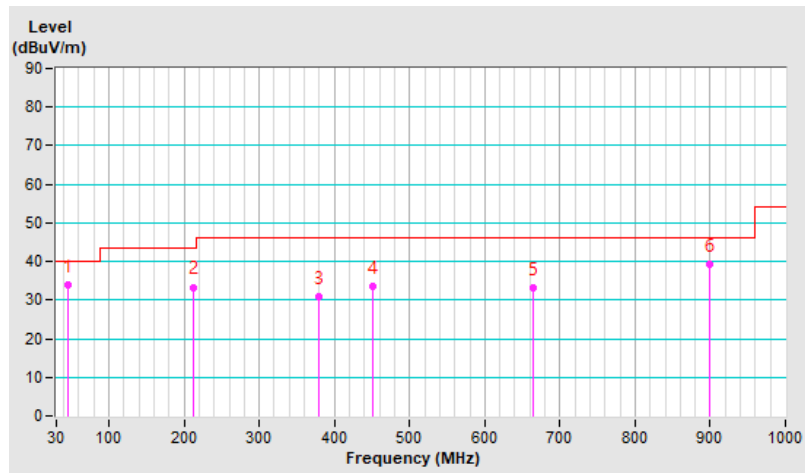


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 0 : 2401.395776 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	20 °C, 64 % RH
<b>Tested By</b>	Sampson Chen		

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	45.52	33.8 QP	40.0	-6.2	1.00 V	286	46.6	-12.8
2	212.14	33.4 QP	43.5	-10.1	1.00 V	134	49.7	-16.3
3	378.30	31.0 QP	46.0	-15.0	1.50 V	154	41.2	-10.2
4	451.46	33.6 QP	46.0	-12.4	2.00 V	166	41.9	-8.3
5	663.65	33.1 QP	46.0	-12.9	1.00 V	182	37.5	-4.4
6	899.19	39.2 QP	46.0	-6.8	3.00 V	168	39.9	-0.7

**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. 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

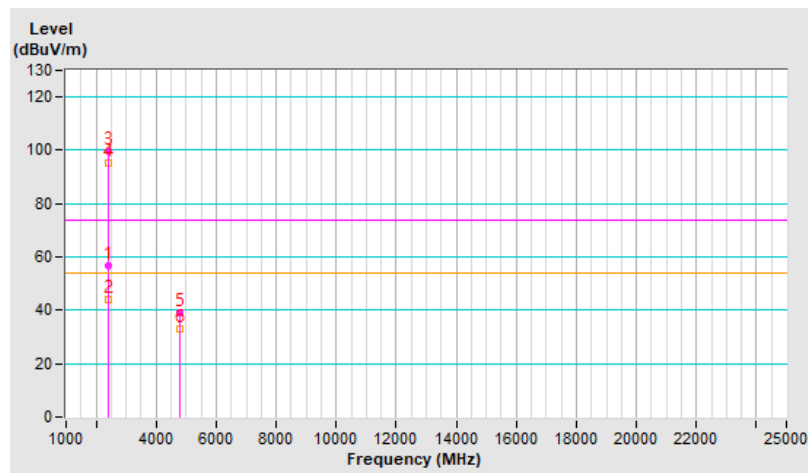
<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 0 : 2401.395776 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 70 % RH
<b>Tested By</b>	Sampson Chen		

#### 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	56.7 PK	74.0	-17.3	1.42 H	192	56.9	-0.2
2	2390.00	44.3 AV	54.0	-9.7	1.42 H	192	44.5	-0.2
3	*2401.395776	99.8 PK			1.42 H	192	100.0	-0.2
4	*2401.395776	95.3 AV			1.42 H	192	95.5	-0.2
5	4802.791552	39.3 PK	74.0	-34.7	2.66 H	134	34.7	4.6
6	4802.791552	33.2 AV	54.0	-20.8	2.66 H	134	28.6	4.6

#### 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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.

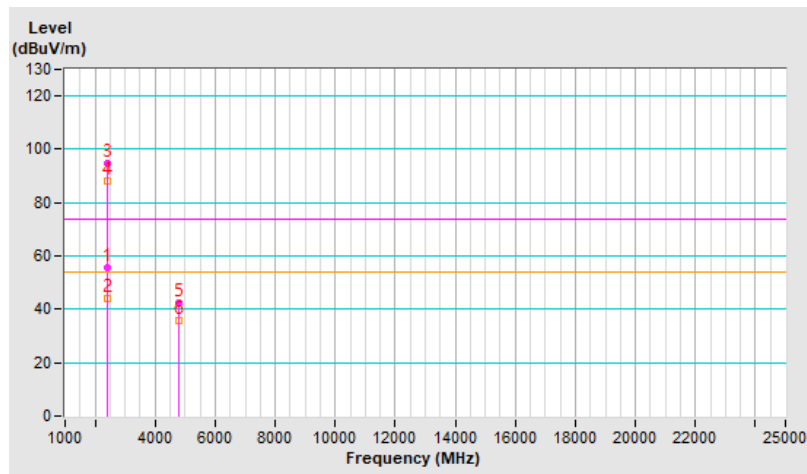


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 0 : 2401.395776 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 70 % RH
<b>Tested By</b>	Sampson Chen		

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	55.7 PK	74.0	-18.3	1.01 V	6	55.9	-0.2
2	2390.00	43.8 AV	54.0	-10.2	1.01 V	6	44.0	-0.2
3	*2401.395776	94.8 PK			1.01 V	6	95.0	-0.2
4	*2401.395776	88.3 AV			1.01 V	6	88.5	-0.2
5	4802.791552	42.2 PK	74.0	-31.8	1.26 V	292	37.6	4.6
6	4802.791552	36.0 AV	54.0	-18.0	1.26 V	292	31.4	4.6

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.





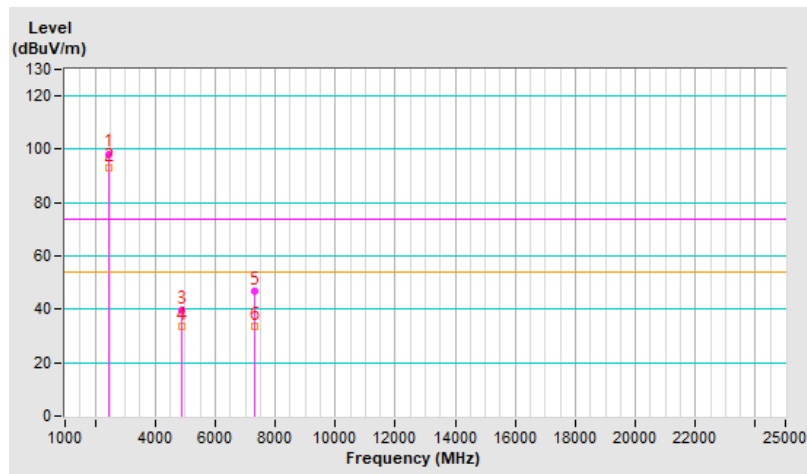


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 19 : 2439.395776 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 70 % RH
<b>Tested By</b>	Sampson Chen		

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	*2439.395776	98.3 PK			1.50 H	180	98.3	0.0
2	*2439.395776	93.3 AV			1.50 H	180	93.3	0.0
3	4878.791552	39.6 PK	74.0	-34.4	2.75 H	157	35.0	4.6
4	4878.791552	33.6 AV	54.0	-20.4	2.75 H	157	29.0	4.6
5	7318.187328	46.6 PK	74.0	-27.4	1.52 H	305	35.0	11.6
6	7318.187328	33.6 AV	54.0	-20.4	1.52 H	305	22.0	11.6

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.



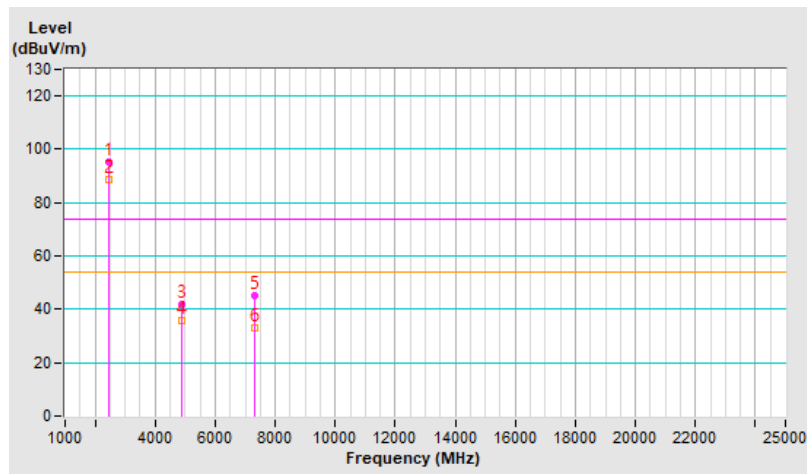


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 19 : 2439.395776 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 70 % RH
<b>Tested By</b>	Sampson Chen		

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	*2439.395776	95.3 PK			1.05 V	10	95.3	0.0
2	*2439.395776	88.7 AV			1.05 V	10	88.7	0.0
3	4878.791552	42.0 PK	74.0	-32.0	1.25 V	273	37.4	4.6
4	4878.791552	35.9 AV	54.0	-18.1	1.25 V	273	31.3	4.6
5	7318.187328	45.0 PK	74.0	-29.0	1.46 V	327	33.4	11.6
6	7318.187328	32.9 AV	54.0	-21.1	1.46 V	327	21.3	11.6

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.

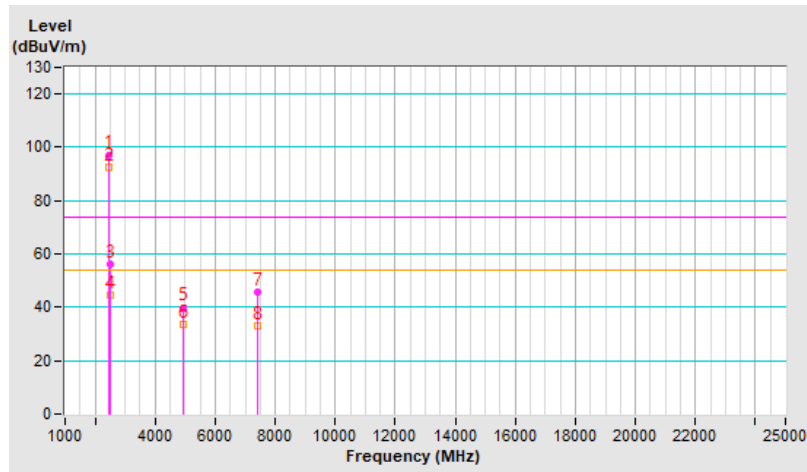


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 38 : 2477.395776 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 70 % RH
<b>Tested By</b>	Sampson Chen		

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	*2477.395776	97.2 PK			1.58 H	176	97.3	-0.1
2	*2477.395776	92.7 AV			1.58 H	176	92.8	-0.1
3	2483.50	56.0 PK	74.0	-18.0	1.58 H	176	56.1	-0.1
<b>4</b>	<b>2483.50</b>	<b>44.4 AV</b>	<b>54.0</b>	<b>-9.6</b>	<b>1.58 H</b>	<b>176</b>	<b>44.5</b>	<b>-0.1</b>
5	4954.791552	39.9 PK	74.0	-34.1	2.72 H	149	35.0	4.9
6	4954.791552	33.8 AV	54.0	-20.2	2.72 H	149	28.9	4.9
7	7432.187328	45.8 PK	74.0	-28.2	1.58 H	291	33.8	12.0
8	7432.187328	33.0 AV	54.0	-21.0	1.58 H	291	21.0	12.0

**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.

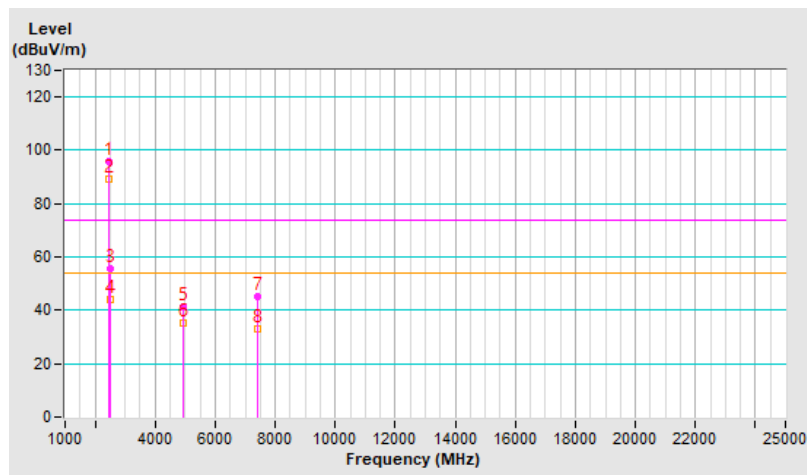


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 38 : 2477.395776 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
<b>Input Power (System)</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	21 °C, 70 % RH
<b>Tested By</b>	Sampson Chen		

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	*2477.395776	96.0 PK			2.64 V	348	96.1	-0.1
2	*2477.395776	89.4 AV			2.64 V	348	89.5	-0.1
3	2483.50	55.5 PK	74.0	-18.5	2.64 V	348	55.6	-0.1
4	2483.50	43.9 AV	54.0	-10.1	2.64 V	348	44.0	-0.1
5	4954.791552	41.1 PK	74.0	-32.9	1.23 V	270	36.2	4.9
6	4954.791552	35.4 AV	54.0	-18.6	1.23 V	270	30.5	4.9
7	7432.187328	45.3 PK	74.0	-28.7	1.47 V	322	33.3	12.0
8	7432.187328	32.8 AV	54.0	-21.2	1.47 V	322	20.8	12.0

**Remarks:**

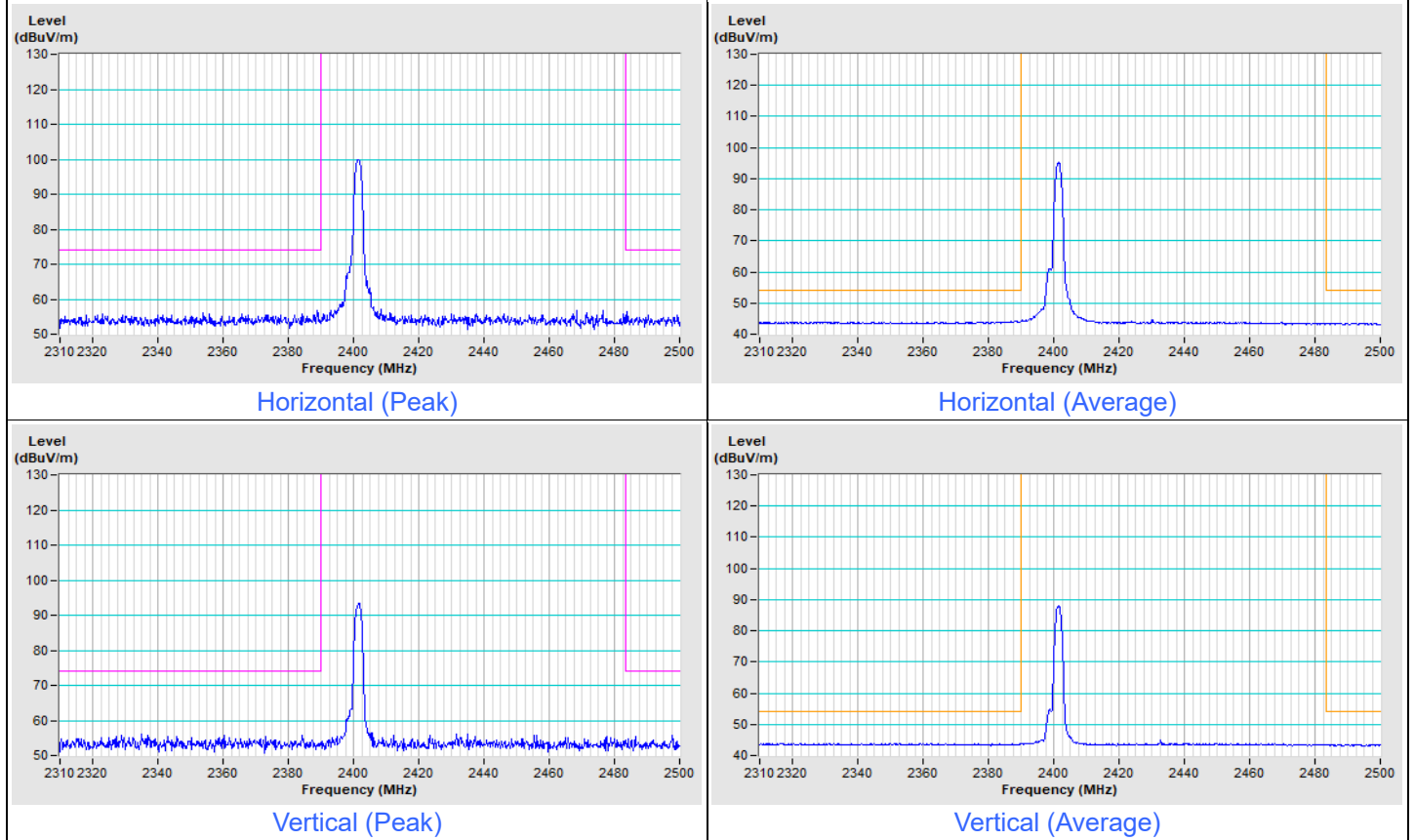
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency,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



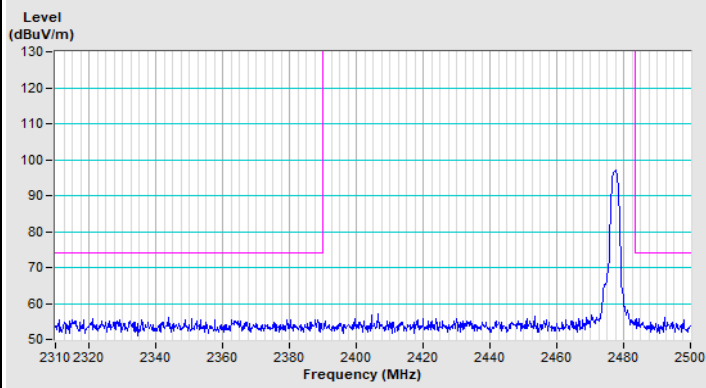
### Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
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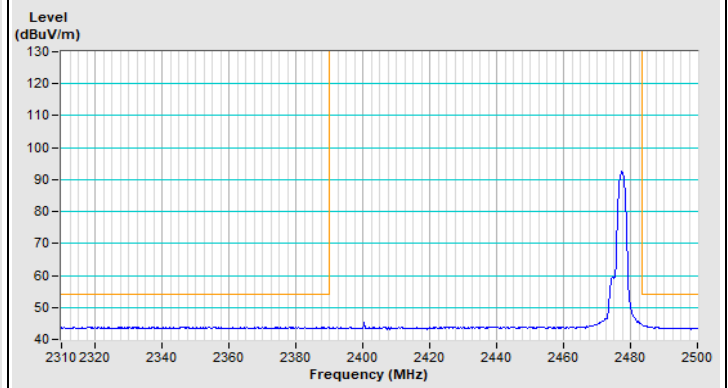
#### GFSK Channel 0



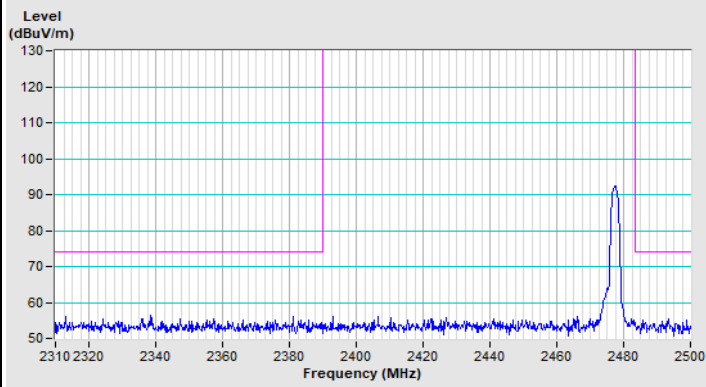
### GFSK Channel 38



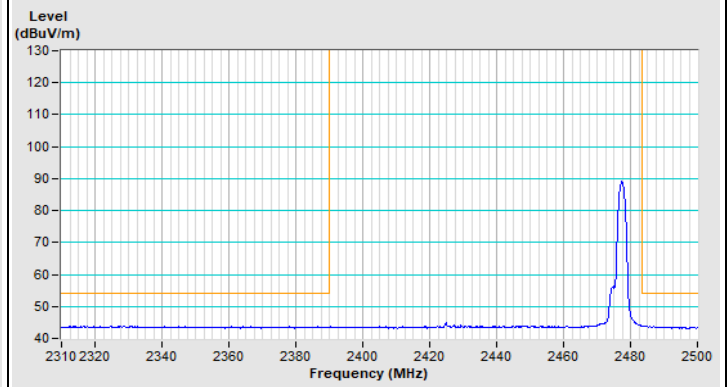
Horizontal (Peak)



Horizontal (Average)



Vertical (Peak)



Vertical (Average)

## 8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)



## 9 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.

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

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