FCC Test Report

Report No.:	RFBDBO-WTW-P21110499-1
FCC ID:	2AAUCGMODMS
Test Model:	GMO-DMS-HYOOBK-01
Received Date:	2021/11/15
Test Date:	2022/1/13 ~ 2022/4/19
Issued Date:	2022/8/22
Applicant:	Thermaltake Technology Co., Ltd.
Address:	5F.,No.185,Sec.2,Tiding Blvd.,Neihu Dist., Taipei City 114, Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
FCC Registration / Designation Number:	198487 / TW2021

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Release Control Record

Issue No.	Description	Date Issued
RFBDBO-WTW-P21110499-1	Original release.	2022/8/22

1 Certificate of Conformity

Product:	DAMYSUS Wireless RGB Ergonomic Gaming Mouse
Brand:	Thermaltake
Test Model:	GMO-DMS-HYOOBK-01
Sample Status:	Engineering sample
Applicant:	Thermaltake Technology Co., Ltd.
Test Date:	2022/1/13 ~ 2022/4/19
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.249) ANSI C63.10: 2013

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.

Prepared by : Jessica Cheng , **Date:** 2022/8/22

Jessica Cheng / Senior Specialist

Approved by : Jeremy Lin , **Date:** 2022/8/22

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -13.78dB at 0.15000MHz.
15.215	Channel Bandwidth Measurement	PASS	Meet the requirement of limit.
15.209 15.249 15.249 (d)	Radiated Emission and Bandedge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -10.6dB at 2475.00MHz.
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	2.63 dB
AC Power Conducted Emissions	150 kHz ~ 30 MHz	3.00 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.38 dB
	30 MHz ~ 1 GHz	5.62 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 6 GHz	4.61 dB
	6 GHz ~ 18 GHz	5.41 dB
	18 GHz ~ 40 GHz	5.14 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	DAMYSUS Wireless RGB Ergonomic Gaming Mouse
Brand	Thermaltake
Test Model	GMO-DMS-HYOOBK-01
Status of EUT	Engineering sample
Power Supply Rating	3.7Vdc from battery or 5Vdc from host equipment
Modulation Type	GFSK
Operating Frequency	2405MHz ~ 2475MHz
Number of Channel	15
Field Strength	83.4dBuV/m (3m)
Antenna Type	PCB antenna with 3.73dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	Shielded USB type C cable (1.8m)

Note:

1. Bluetooth & SRD technologies can not transmit at same time.
2. The EUT uses following rechargeable battery.

Manufacturer	Shenzhen DongHui Energy Co., Ltd.
Model	802036
Rating	3.7Vdc, 500mAh

3. Due to radiated measurements are made and the antenna gain is already accounted for this device, so provide an antenna datasheet and/or antenna measurement report is not required. The antenna dimensions and pictures (include antenna wire length if have) are stated in EUT photo exhibit.
4. The EUT was pre-tested with the following modes:

Pre-Scan:	1. For Unwanted Emission below 1 GHz has Battery / Laptop / AC Adapter mode of power supply. Pre-scan these modes and find the worst case as a representative test condition. 2. For AC Power Conducted Emission items: Laptop / AC Adapter mode of power supply. Pre-scan these modes and find the worst case as a representative test condition.
Worst Case:	1. For Unwanted Emission below 1 GHz Laptop mode is the worst case of power supply. 2. For AC Power Conducted Emission Laptop mode is the worst case of power supply.

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 Description of Test Modes

15 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2405	9	2445
2	2410	10	2450
3	2415	11	2455
4	2420	12	2460
5	2425	13	2465
6	2430	14	2470
7	2435	15	2475
8	2440		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	-	-	√	Operating Mode (Powered from Battery)
B	-	√	√	-	Charging Mode (Powered from Laptop)

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

☒ 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).

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
A	1 to 15	1, 8, 15	GFSK

Radiated Emission Test (Below 1GHz):

☒ 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).

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
B	-	-	-

Power Line Conducted Emission Test:

☒ 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).

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
B	-	-	-

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ 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).

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

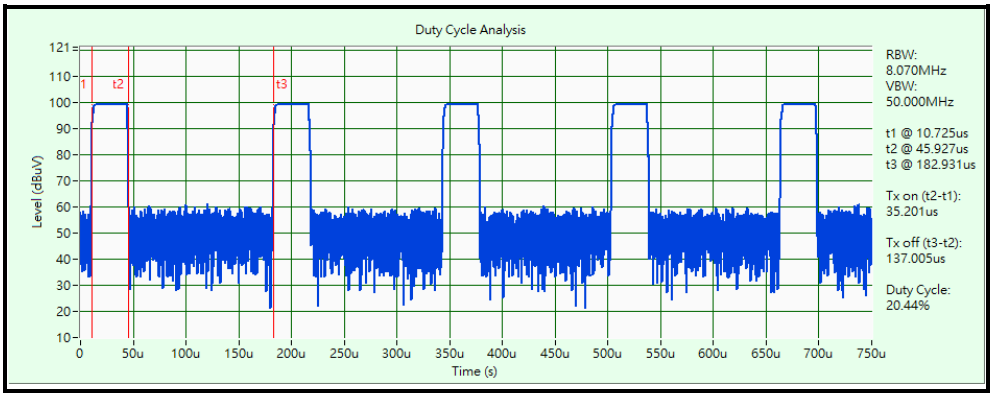
EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
A	1 to 15	1, 8, 15	GFSK

Test Condition:

Applicable To	EUT Configure Mode	Environmental Conditions	Input Power	Tested By
RE≥1G	A	23deg. C, 67%RH	3.7Vdc	Ian Chang
RE<1G	B	23deg. C, 67%RH	120Vac, 60Hz (System)	Ian Chang
PLC	B	25deg. C, 75%RH	120Vac, 60Hz (System)	Ian Chang
APCM	A	25deg. C, 76%RH	3.7Vdc	Dalen Dai

3.3 Duty Cycle of Test Signal

Duty cycle correction factor = 20 log(Duty cycle) =20 log(0.2044) = -13.7dB



3.4 Description of Support Units

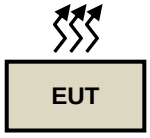
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Lenove	81LG	PHNGBDP	DoC	Provided by Lab
B	Adapter	Lenovo	PA-1450-55LL	N/A	N/A	Provided by Lab

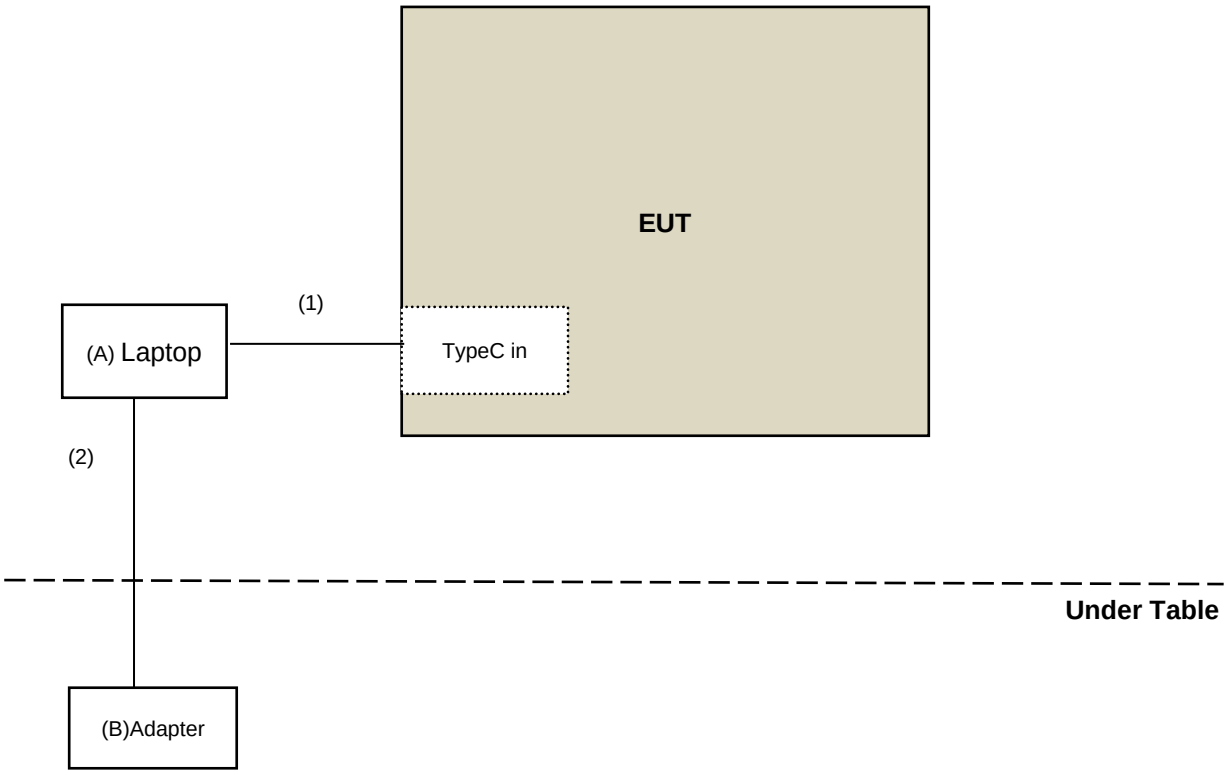
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Type-A to C cable	1	1.8	Y	N	Supplied by applicant
2	DC Cable	1	1.8	Y	N	Provided by Lab

3.4.1 Configuration of System under Test

Mode A- Operating Mode (Powered from Battery)



Mode B - Charging Mode (Powered from Laptop)



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.249)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

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

NOTE:

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 1000MHz, 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 20dB under any condition of modulation.

4.1.2 Test Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
* LOOP ANTENNA EMCI	LPA600	270	2021/9/2	2023/9/1
Bi_Log Antenna Schwarzbeck	VULB 9168	137	2021/10/27	2022/10/26
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2021/5/6	2022/5/5
	CDNE-M3	00091	2021/5/6	2022/5/5
Pre_Amplifier EMCI	EMC001340	980269	2021/6/29	2022/6/28
Pre_Amplifier HP	8447D	2432A03504	2021/2/18	2022/2/17
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2021/7/13	2022/7/12
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Spectrum Analyzer R&S	FSV40	101544	2021/5/24	2022/5/23
Test Receiver Agilent	N9038A	MY51210129	2021/3/12	2022/3/11
		MY51210137	2021/6/16	2022/6/15
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A
BandPass Filter MICRO-TRONICS	BRM17690	005	2021/5/28	2022/5/27
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	2021/5/28	2022/5/27
Horn Antenna ETS-Lindgren	3117-PA	00215857	2021/11/14	2022/11/13
Horn Antenna EMCO	3115	00028257	2021/11/14	2022/11/13
		00027024	2021/11/14	2022/11/13
Horn Antenna Schwarzbeck	BBHA 9170	212	2021/10/13	2022/10/12
Notch filter MICRO-TRONICS	BRC50703-01	010	2021/5/28	2022/5/27
Pre_Amplifier EMCI	EMC001340	980269	2021/6/29	2022/6/28
Pre-amplifier HP	8449B	3008A01201	2021/2/19	2022/2/18
Pre-amplifier (18GHz-40GHz) EMCI	EMC184045B	980175	2021/9/4	2022/9/3
RF Coaxial Cable HUBER SUHNER	SF-102	Cable-CH6-01	2021/7/8	2022/7/7
RF Coaxial Cable EM	EM102-KMKM-3.5+1M	EM102-KMKM-3.5+1M-01	2021/7/8	2022/7/7
RF Coaxial Cable WOKEN	WC01	Cable-CH10-03	2021/7/8	2022/7/7
RF Coaxial Cable Rosnol	K1K50-UP0279-K1K50-3000	Cable-CH10(3m)-04	2021/7/8	2022/7/7
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Spectrum Analyzer Agilent	E4446A	MY51100009	2021/6/29	2022/6/28

Spectrum Analyzer KEYSIGHT	N9030A	MY54490260	2021/7/23	2022/7/22
Spectrum Analyzer R&S	FSV40	101544	2021/5/24	2022/5/23
		101042	2021/9/9	2022/9/8
Test Receiver Agilent	N9038A	MY51210129	2022/4/8	2023/4/7
		MY51210137	2021/6/16	2022/6/15
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to NML/ROC and NIST/USA
2. The test was performed in Linkou 966 Chamber 6 (CH 6).
3. Tested Date: 2022/1/13

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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.

f. The test-receiver system was set to peak and average detect 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

2. 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 at frequency above 1GHz. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty factor. The duty factor refer to Chapter 3.3 of this report.

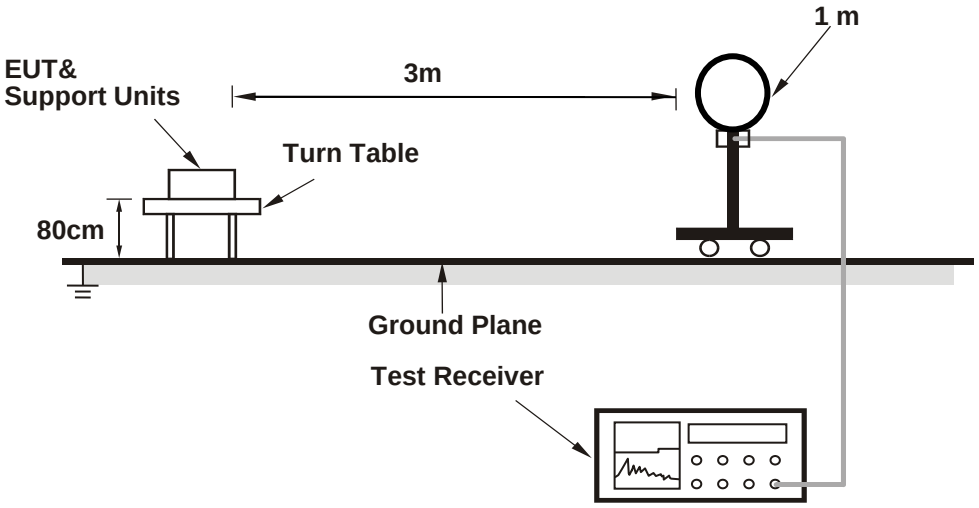
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

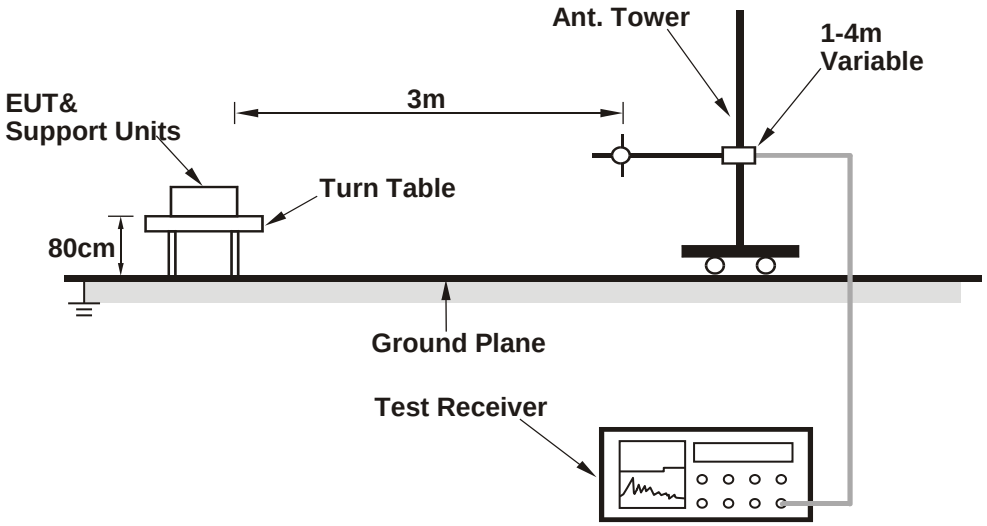
No deviation.

4.1.5 Test Setup

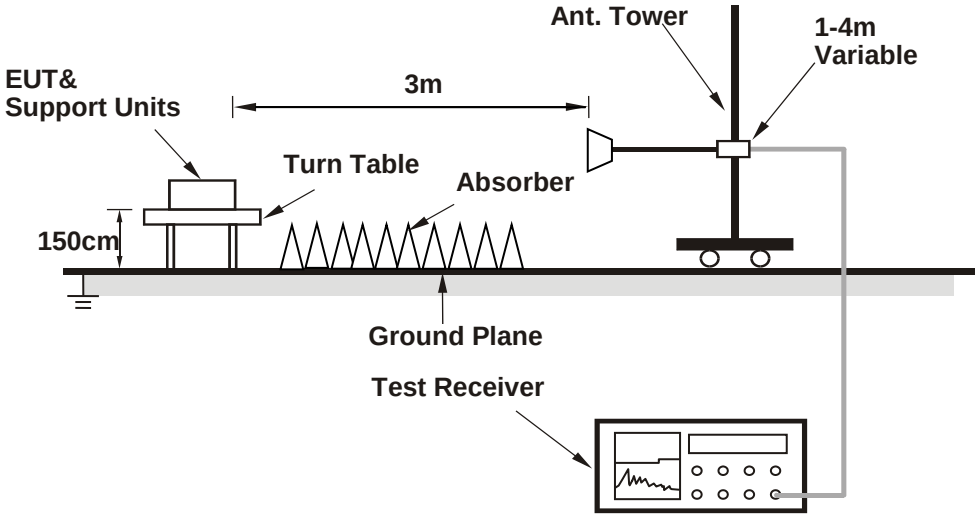
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

Mode A

Set the EUT under transmission condition continuously at specific channel frequency.

Mode B

Connected the EUT to Notebook PC and set the EUT under charging condition.

4.1.7 Test Results

Mode A

ABOVE 1GHz DATA

RF Mode	TX GFSK	Channel	CH 1：2405 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	58.3 PK	74.0	-15.7	1.54 H	187	60.7	-2.4
2	2390.00	42.7 AV	54.0	-11.3	1.54 H	187	45.1	-2.4
3	2400.00	38.5 PK	74.0	-35.5	1.54 H	187	40.9	-2.4
4	2400.00	24.8 AV	54.0	-29.2	1.54 H	187	27.2	-2.4
5	*2405.00	96.8 PK	114.0	-17.2	1.54 H	187	99.2	-2.3
6	*2405.00	83.1 AV	94.0	-10.9	1.54 H	187	85.5	-2.3
7	4810.00	45.9 PK	74.0	-28.1	3.16 H	237	40.6	5.4
8	4810.00	32.2 AV	54.0	-21.8	3.16 H	237	26.9	5.4
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	52.5 PK	74.0	-21.5	3.37 V	147	54.9	-2.4
2	2390.00	41.0 AV	54.0	-13.0	3.37 V	147	43.4	-2.4
3	2400.00	34.7 PK	74.0	-39.3	3.37 V	147	37.1	-2.4
4	2400.00	21.0 AV	54.0	-33.0	3.37 V	147	23.4	-2.4
5	*2405.00	93.0 PK	114.0	-21.0	3.37 V	147	95.4	-2.3
6	*2405.00	79.3 AV	94.0	-14.7	3.37 V	147	81.7	-2.3
7	4810.00	44.7 PK	74.0	-29.3	1.27 V	269	39.4	5.4
8	4810.00	31.0 AV	54.0	-23.0	1.27 V	269	25.7	5.4

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.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula: 20 log(Duty cycle) = 20 log(0.2044) = -13.7dB

RF Mode	TX GFSK	Channel	CH 8：2440 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	96.9 PK	114.0	-17.1	1.56 H	192	99.1	-2.2
2	*2440.00	83.2 AV	94.0	-10.8	1.56 H	192	85.4	-2.2
3	4880.00	46.3 PK	74.0	-27.7	1.87 H	145	40.7	5.6
4	4880.00	32.6 AV	54.0	-21.4	1.87 H	145	27.0	5.6
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	93.3 PK	114.0	-20.7	3.41 V	152	95.5	-2.2
2	*2440.00	79.6 AV	94.0	-14.4	3.41 V	152	81.8	-2.2
3	4880.00	45.2 PK	74.0	-28.8	2.68 V	169	39.7	5.6
4	4880.00	31.5 AV	54.0	-22.5	2.68 V	169	26.0	5.6

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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula: 20 log(Duty cycle) = 20 log(0.2044) = -13.7dB

RF Mode	TX GFSK	Channel	CH 15：2475 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

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	*2475.00	97.1 PK	114.0	-16.9	1.53 H	199	99.2	-2.1
2	***2475.00**	**83.4 AV**	**94.0**	**-10.6**	**1.53 H**	**199**	**85.5**	**-2.1**
3	2483.50	40.5 PK	74.0	-33.5	1.53 H	199	42.5	-2.0
4	2483.50	26.8 AV	54.0	-27.2	1.53 H	199	28.8	-2.0
5	4950.00	46.2 PK	74.0	-27.8	1.57 H	188	40.6	5.6
6	4950.00	32.5 AV	54.0	-21.5	1.57 H	188	26.9	5.6
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	*2475.00	93.6 PK	114.0	-20.4	3.49 V	144	95.7	-2.1
2	*2475.00	79.9 AV	94.0	-14.1	3.49 V	144	82.0	-2.1
3	2483.50	37.0 PK	74.0	-37.0	3.49 V	144	39.0	-2.0
4	2483.50	23.3 AV	54.0	-30.7	3.49 V	144	25.3	-2.0
5	4950.00	45.1 PK	74.0	-29.0	2.14 V	156	39.4	5.6
6	4950.00	31.4 AV	54.0	-22.7	2.14 V	156	25.7	5.6

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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula: 20 log(Duty cycle) = 20 log(0.2044) = -13.7dB

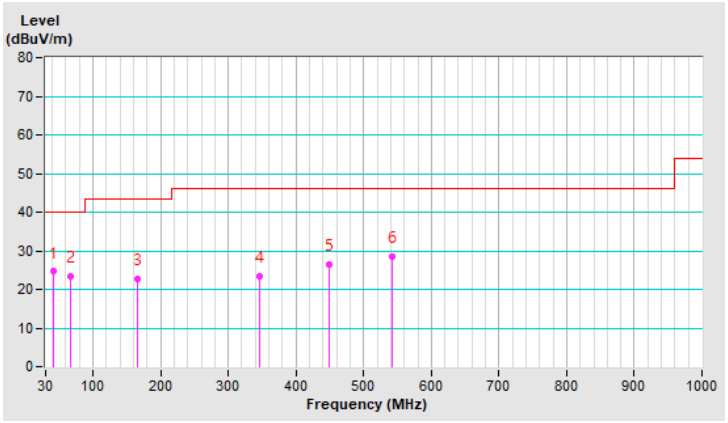
Mode B- Charging Mode (Powered from Notebook)

Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	41.64	24.6 QP	40.0	-15.4	2.05 H	209	31.9	-7.3
2	65.89	23.4 QP	40.0	-16.6	2.24 H	228	31.6	-8.2
3	165.80	22.7 QP	43.5	-20.8	2.45 H	248	29.0	-6.3
4	346.22	23.4 QP	46.0	-22.6	2.72 H	275	26.8	-3.3
5	449.04	26.5 QP	46.0	-19.6	2.96 H	298	27.3	-0.9
6	542.16	28.5 QP	46.0	-17.5	3.20 H	322	28.0	0.5

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 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

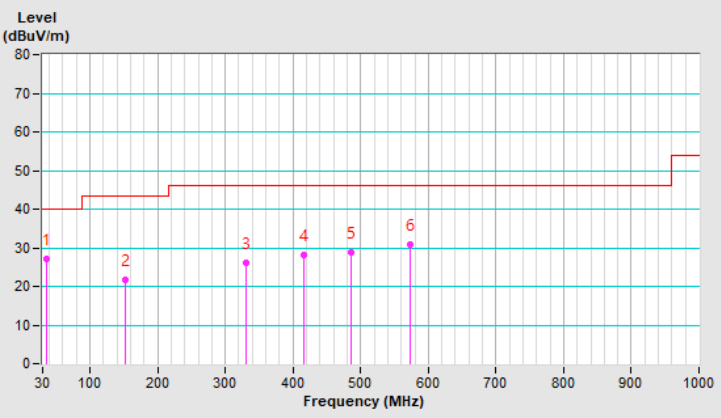


Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	35.82	27.1 QP	40.0	-12.9	1.28 V	29	35.3	-8.2
2	151.25	21.8 QP	43.5	-21.7	1.62 V	62	28.2	-6.3
3	329.73	26.1 QP	46.0	-19.9	2.15 V	114	29.5	-3.4
4	416.06	28.2 QP	46.0	-17.8	2.44 V	143	29.9	-1.7
5	485.90	28.8 QP	46.0	-17.3	2.66 V	165	29.1	-0.3
6	573.20	30.9 QP	46.0	-15.1	3.10 V	208	29.5	1.3

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 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

Note: 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 0.50MHz.

4.2.2 Test Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 Ohms Terminator LYNICS	0900510	E1-01-305	2022/2/9	2023/2/8
Attenuator STI	STI02-2200-10	NO.4	2021/9/3	2022/9/2
DC LISN R&S	ESH3-Z6	844950/018	2021/7/25	2022/7/24
		100219	2021/7/25	2022/7/24
High Voltage Probe Schwarzbeck	TK9420	00982	2021/12/24	2022/12/23
Isolation Transformer Erika Fiedler	D-65396	017	2021/9/9	2022/9/8
LISN Schwarzbeck	NSLK 8128	8128-244	2021/11/11	2022/11/10
	NNLK8129	8129229	2021/5/20	2022/5/19
	NNLK 8121	8121-731	2021/4/28	2022/4/27
LISN R&S	ENV216	101196	2021/4/26	2022/4/25
	ESH3-Z5	100220	2021/11/25	2022/11/24
RF Coaxial Cable Commate	5D-FB	Cable-CO5-01	2022/1/28	2023/1/27
Software BVADT	Cond_V7.3.7.4	N/A	N/A	N/A
Test Receiver R&S	ESR3	102412	2022/1/22	2023/1/21

Notes:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Linkou Conduction 5.
3. Tested Date: 2022/4/19

4.2.3 Test Procedures

a. The EUT was 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/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

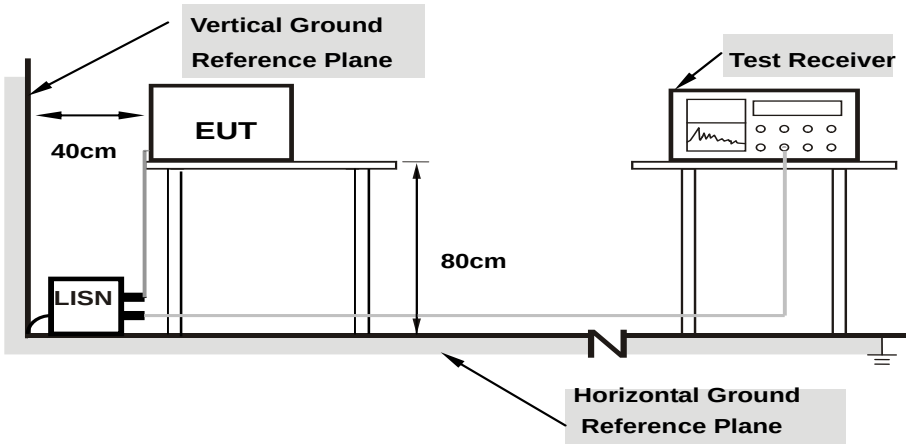
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation From Test Standard

No deviation.

4.2.5 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).

4.2.6 EUT Operating Condition

Connected the EUT to Notebook PC and set the EUT under charging condition.

4.2.7 Test Results

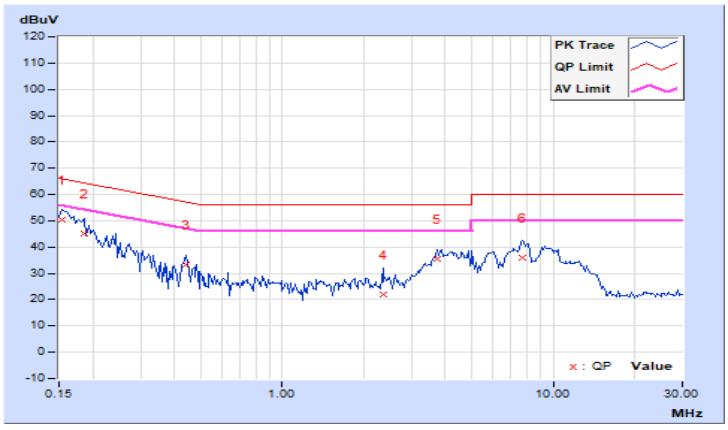
Mode B- Charging Mode (Powered from Notebook)

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**	25°C, 75% RH
Tested By	Ian Chang		

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	0.15391	9.91	40.32	24.02	50.23	33.93	65.79	55.79	-15.56	-21.86
2	0.18516	9.91	35.31	20.00	45.22	29.91	64.25	54.25	-19.03	-24.34
3	0.44297	9.93	23.23	18.36	33.16	28.29	57.01	47.01	-23.85	-18.72
4	2.35156	10.04	12.13	2.76	22.17	12.80	56.00	46.00	-33.83	-33.20
5	3.74219	10.12	25.25	16.38	35.37	26.50	56.00	46.00	-20.63	-19.50
6	7.67969	10.28	25.50	18.82	35.78	29.10	60.00	50.00	-24.22	-20.90

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



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**	25°C, 75% RH
Tested By	Ian Chang		

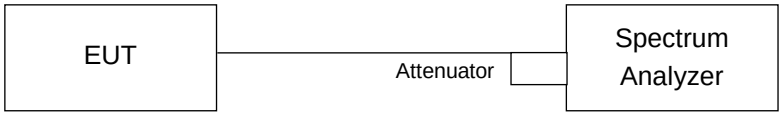
Phase Of Power : Neutral (N)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	**0.15000**	**9.92**	**42.30**	**25.12**	**52.22**	**35.04**	**66.00**	**56.00**	**-13.78**	**-20.96**
2	0.22422	9.93	30.85	15.69	40.78	25.62	62.66	52.66	-21.88	-27.04
3	0.36484	9.95	18.71	5.68	28.66	15.63	58.62	48.62	-29.96	-32.99
4	2.05859	10.05	13.31	5.73	23.36	15.78	56.00	46.00	-32.64	-30.22
5	3.80859	10.13	25.06	15.90	35.19	26.03	56.00	46.00	-20.81	-19.97
6	8.70313	10.33	26.01	20.08	36.34	30.41	60.00	50.00	-23.66	-19.59

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

4.3 Channel Bandwidth

4.3.1 Test Setup



4.3.2 Test Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101544	2021/5/24	2022/5/23
		101042	2021/9/9	2022/9/8

Notes:

1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in LK - Oven
3. Tested Date: 2022/1/13

4.3.3 Test Procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

4.3.4 Deviation from Test Standard

No deviation.

4.3.5 EUT Operating Condition

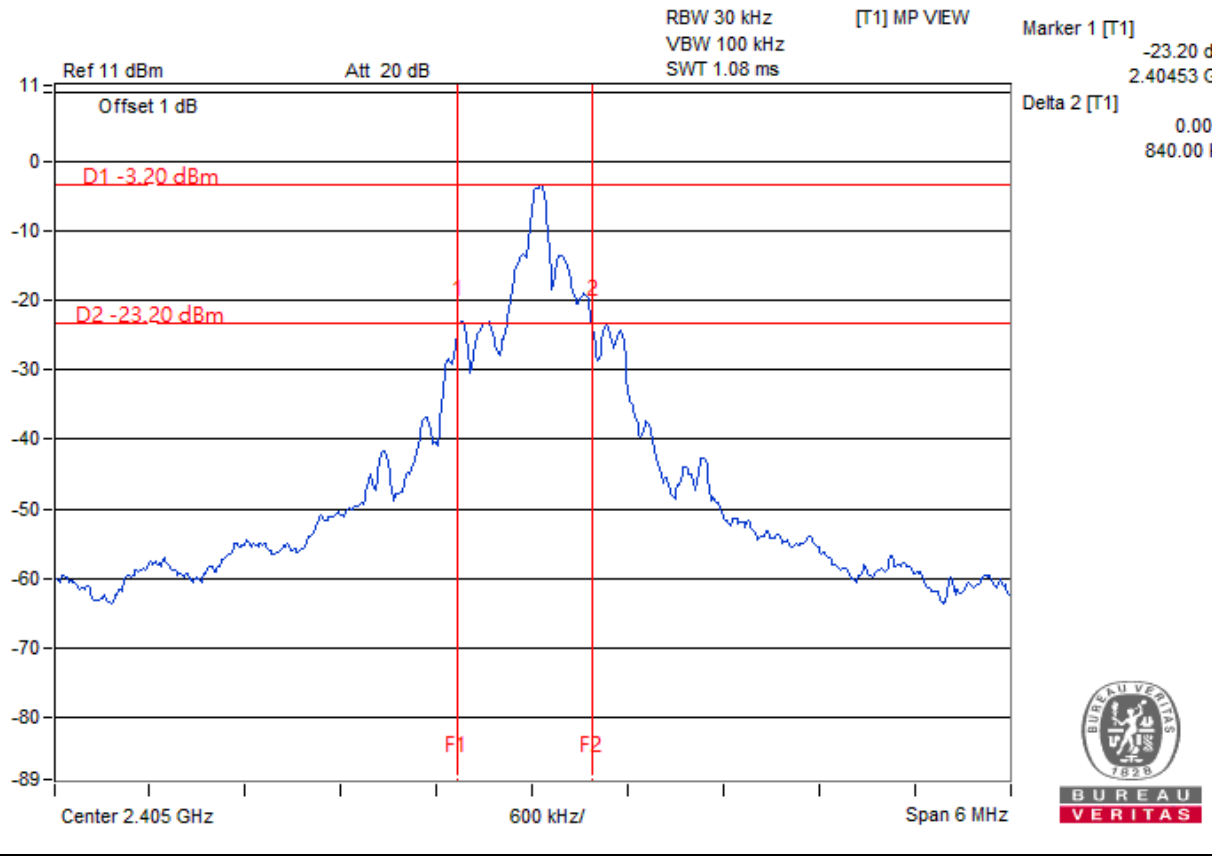
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.6 Test Results

Mode A

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	2405	0.840
8	2440	0.830
15	2475	0.830

SPECTRUM PLOT of WORST VALUE



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

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

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