FCC Test Report

Report No.:	RFBEBU-WTW-P23080601
FCC ID:	E8HRG-2308
Product:	Dongle
Brand:	ALIENWARE, DELL
Model No.:	PRO-M-D
Received Date:	2023/8/24
Test Date:	2023/8/29 ~ 2023/9/5
Issued Date:	2023/9/12
Applicant:	Chicony Electronics Co., Ltd.
Address:	No.69, Sec. 2, Guangfu Rd., Sanchong Dist., New Taipei City 241, Taiwan(R.O.C.)
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

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBEBU-WTW-P23080601	Original release.	2023/9/12

1 Certificate of Conformity

Product:	Dongle
Brand:	ALIENWARE, DELL
Test Model:	PRO-M-D
Sample Status:	Engineering sample
Applicant:	Chicony Electronics Co., Ltd.
Test Date:	2023/8/29 ~ 2023/9/5
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 : Annie Chang , **Date:** 2023/9/12

Annie Chang / Senior Specialist

Approved by : Jeremy Lin , **Date:** 2023/9/12

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 -9.52dB at 0.16900MHz.
15.215	Channel Bandwidth Measurement	PASS	Meet the requirement of limit.
15.209 15.249 (a) 15.249 (d)	Radiated Emission and Bandedge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -6.7dB at 55.03MHz.
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	9 kHz ~ 30 MHz	3.00 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.38 dB
	30 MHz ~ 1 GHz	5.7 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 6 GHz	4.83 dB
	6 GHz ~ 18 GHz	5.37 dB
	18 GHz ~ 40 GHz	5.24 dB

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

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Dongle
Brand	ALIENWARE, DELL
Test Model	PRO-M-D
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	GFSK
Operating Frequency	2403 ~ 2480 MHz
Number of Channel	78
Field Strength	81.2dBuV/m (3m)
Antenna Type	Chip Antenna with 0.5dBi gain
Antenna Connector	N/A
Accessory Device	Refer to note as below
Data Cable Supplied	Refer to note as below

Note:

1. The EUT uses following accessories.

Item	Brand	Model	Specification
Extender	Chicony	771-02308L-B01	-
USB Cable	Chicony	095-02308L-B01	Shielded without core, 2.0m

2. 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.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

78 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2403	20	2423	40	2443	60	2463
1	2404	21	2424	41	2444	61	2464
2	2405	22	2425	42	2445	62	2465
3	2406	23	2426	43	2446	63	2466
4	2407	24	2427	44	2447	64	2467
5	2408	25	2428	45	2448	65	2468
6	2409	26	2429	46	2449	66	2469
7	2410	27	2430	47	2450	67	2470
8	2411	28	2431	48	2451	68	2471
9	2412	29	2432	49	2452	69	2472
10	2413	30	2433	50	2453	70	2473
11	2414	31	2434	51	2454	71	2474
12	2415	32	2435	52	2455	72	2475
13	2416	33	2436	53	2456	73	2476
14	2417	34	2437	54	2457	74	2477
15	2418	35	2438	55	2458	75	2478
16	2419	36	2439	56	2459	76	2479
17	2420	37	2440	57	2460	77	2480
18	2421	38	2441	58	2461		
19	2422	39	2442	59	2462		

3.2.1 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. For Unwanted Emission below/ above 1 GHz has EUT with NB/ EUT(X/Y/Z -Axis) with Extender+USB Cable+NB mode. Pre-scan these modes and find the worst case as a representative test condition.
Worst Case:	1. For Unwanted Emission below/ above 1 GHz: EUT(Y -Axis) with Extender+USB Cable+NB

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	-	√	-

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
-	0 to 77	0, 42, 77	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
-	0 to 77	42	GFSK

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
-	0 to 77	42	GFSK

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.

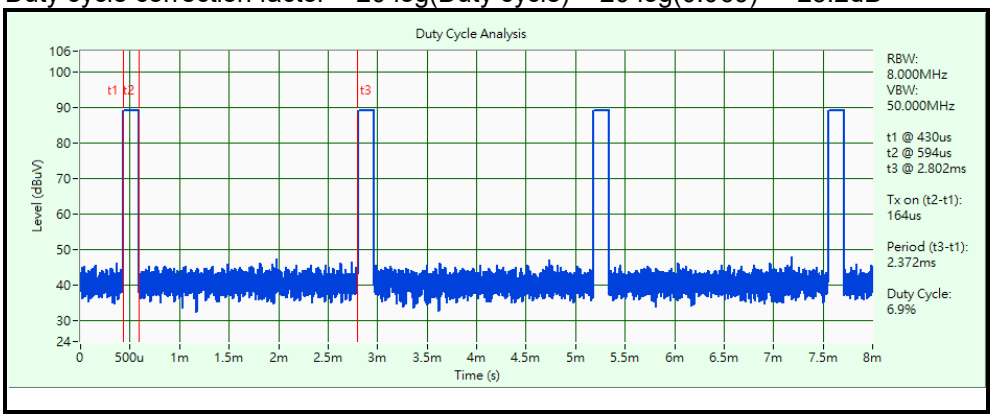
EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	0 to 77	0, 42, 77	GFSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	23deg. C, 69%RH	120Vac, 60Hz (System)	William Su
RE<1G	23deg. C, 69%RH	120Vac, 60Hz (System)	William Su
PLC	25deg. C, 75%RH	120Vac, 60Hz (System)	Jed Wu
APCM	25deg. C, 76%RH	120Vac, 60Hz (System)	Pirar Hsieh

3.3 Duty Cycle of Test Signal

Duty cycle correction factor = 20 log(Duty cycle) = 20 log(0.069) = -23.2dB



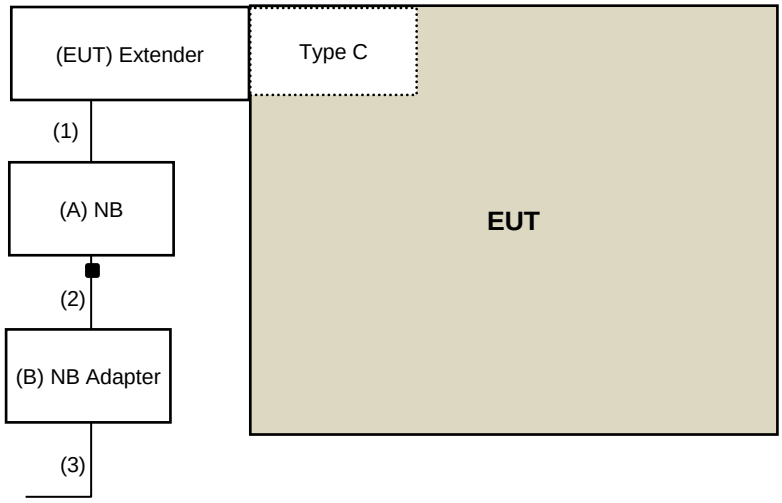
3.4 Description of Support Units

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	NB	DELL	P90F	N/A	N/A	Provided by Lab
B	NB Adapter	DELL	LA65NS2-01	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	2.0	Y	0	Supplied by applicant
2	DC cable	1	1.8	N	1	Provided by Lab
3	AC cable	1	0.9	N	0	Provided by Lab

3.4.1 Configuration of System under Test



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

Below 1 GHz:

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	2022/10/21	2023/10/20
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2023/5/25	2024/5/24
	CDNE-M3	00091	2023/5/25	2024/5/24
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2023/6/5	2024/6/4
Preamplifier EMCI	EMC001340	980269	2023/6/27	2024/6/26
Preamplifier HP	8447D	2432A03504	2023/2/16	2024/2/15
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2023/6/27	2024/6/26
Signal Analyzer R&S	FSV40	101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
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: 2023/8/29

Above 1 GHz:

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Band Pass Filter Micro-Tronics	BRM17690	005	2023/5/25	2024/5/24
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
High Pass Filter Wainwright	WHK 3.1/18G-10SS	SN 8	2023/5/25	2024/5/24
Horn Antenna EMCO	3115	00028257	2022/11/13	2023/11/12
Horn Antenna ETS-Lindgren	3117-PA	00215857	2022/11/13	2023/11/12
Horn Antenna Schwarzbeck	BBHA 9170	212	2022/10/20	2023/10/19
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2023/6/5	2024/6/4
Notch Filter Micro-Tronics	BRC50703-01	010	2023/5/25	2024/5/24
Preamplifier EMCI	EMC0126545	980076	2023/2/16	2024/2/15
	EMC184045B	980175	2022/9/3	2023/9/2
		980235	2023/2/16	2024/2/15
Preamplifier HP	8449B	3008A01201	2023/2/16	2024/2/15
RF Coaxial Cable EMCI	EMC104	190801	2023/7/6	2024/7/5
		190804	2023/7/6	2024/7/5
RF Coaxial Cable EMEC	EM102-KMKM-3.5	EM102-KMKM-3.5-02	2022/9/27	2023/9/26
RF Coaxial Cable HUBER+SUHNER	SF-104	Cable-CH6-01	2023/7/6	2024/7/5
Signal Analyzer R&S	FSV40	101042	2022/9/5	2023/9/4
		101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
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 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: 2023/8/29

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:

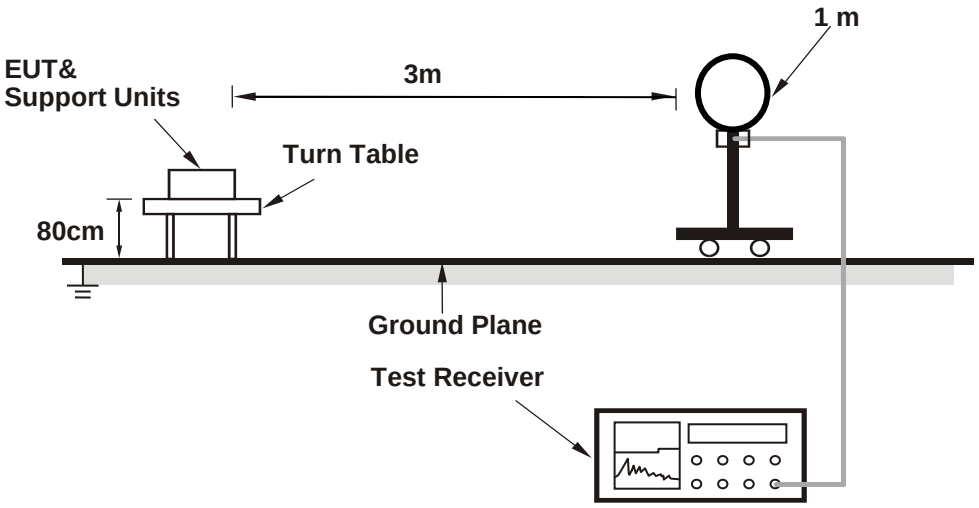
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection at 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

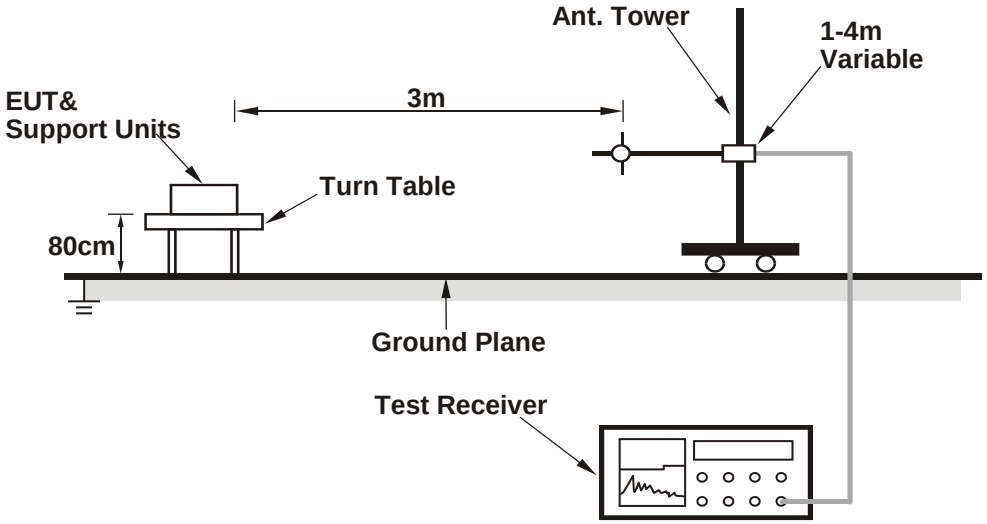
No deviation.

4.1.5 Test Setup

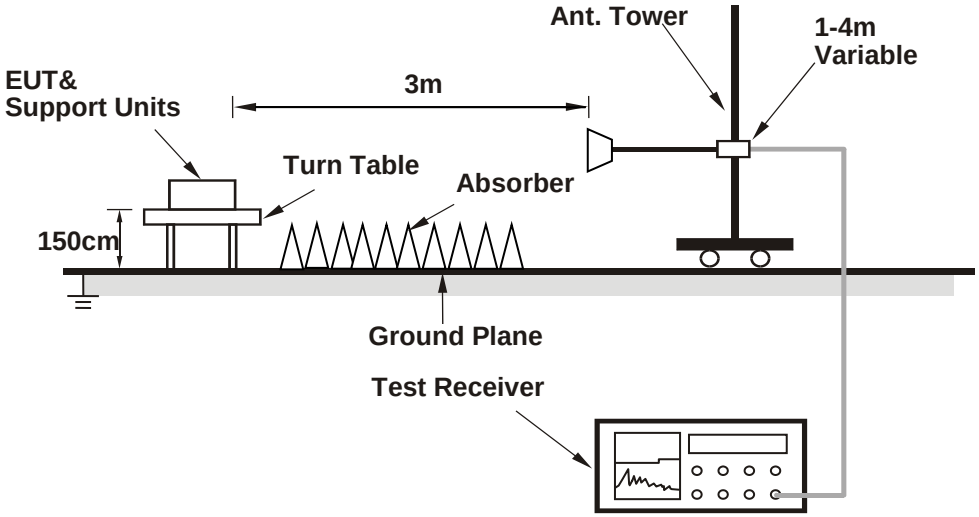
For Radiated emission below 30MHz



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

a. Connected the EUT to Notebook PC via Extender with USB Cable.
b. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	GFSK	**Channel**	CH 0：2403 MHz
Frequency Range	1 GHz ~ 25 GHz	**Detector Function & Bandwidth**	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS

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	54.5 PK	74.0	-19.5	1.54 H	204	55.6	-1.1
2	2390.00	39.7 AV	54.0	-14.3	1.54 H	204	40.8	-1.1
3	2400.00	47.9 PK	74.0	-26.1	1.54 H	204	49.0	-1.1
4	2400.00	24.7 AV	54.0	-29.3	1.54 H	204	25.8	-1.1
5	*2403.00	103.8 PK	114.0	-10.2	1.54 H	204	104.9	-1.1
6	*2403.00	80.6 AV	94.0	-13.4	1.54 H	204	81.7	-1.1
7	4806.00	49.9 PK	74.0	-24.1	1.13 H	300	42.2	7.7
8	4806.00	26.7 AV	54.0	-27.3	1.13 H	300	19.0	7.7
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	53.8 PK	74.0	-20.2	2.71 V	192	54.9	-1.1
2	2390.00	39.4 AV	54.0	-14.6	2.71 V	192	40.5	-1.1
3	2400.00	44.5 PK	74.0	-29.5	2.71 V	192	45.6	-1.1
4	2400.00	21.3 AV	54.0	-32.7	2.71 V	192	22.4	-1.1
5	*2403.00	100.4 PK	114.0	-13.6	2.71 V	192	101.5	-1.1
6	*2403.00	77.2 AV	94.0	-16.8	2.71 V	192	78.3	-1.1
7	4806.00	49.1 PK	74.0	-24.9	1.83 V	241	41.4	7.7
8	4806.00	25.9 AV	54.0	-28.1	1.83 V	241	18.2	7.7

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.
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(0.069) = -23.2 dB

RF Mode	GFSK	Channel	CH 42：2445 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS

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	*2445.00	104.4 PK	114.0	-9.6	1.35 H	207	105.3	-0.9
2	*2445.00	81.2 AV	94.0	-12.8	1.35 H	207	82.1	-0.9
3	4890.00	50.3 PK	74.0	-23.7	1.20 H	331	42.5	7.8
4	4890.00	27.1 AV	54.0	-26.9	1.20 H	331	19.3	7.8
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	*2445.00	102.3 PK	114.0	-11.7	2.69 V	189	103.2	-0.9
2	*2445.00	79.1 AV	94.0	-14.9	2.69 V	189	80.0	-0.9
3	4890.00	49.5 PK	74.0	-24.5	1.88 V	254	41.7	7.8
4	4890.00	26.3 AV	54.0	-27.7	1.88 V	254	18.5	7.8

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.
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(0.069) = -23.2 dB

RF Mode	GFSK	Channel	CH 77：2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS

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	103.7 PK	114.0	-10.3	1.63 H	204	104.6	-0.9
2	*2480.00	80.5 AV	94.0	-13.5	1.63 H	204	81.4	-0.9
3	2483.50	46.3 PK	74.0	-27.7	1.63 H	204	47.1	-0.8
4	2483.50	23.1 AV	54.0	-30.9	1.63 H	204	23.9	-0.8
5	4960.00	49.8 PK	74.0	-24.2	1.24 H	299	42.1	7.7
6	4960.00	26.6 AV	54.0	-27.4	1.24 H	299	18.9	7.7
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	101.2 PK	114.0	-12.8	2.20 V	189	102.1	-0.9
2	*2480.00	78.0 AV	94.0	-16.0	2.20 V	189	78.9	-0.9
3	2483.50	43.8 PK	74.0	-30.2	2.20 V	189	44.6	-0.8
4	2483.50	20.6 AV	54.0	-33.4	2.20 V	189	21.4	-0.8
5	4960.00	48.9 PK	74.0	-25.1	1.77 V	254	41.2	7.7
6	4960.00	25.7 AV	54.0	-28.3	1.77 V	254	18.0	7.7

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.
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(0.069) = -23.2 dB

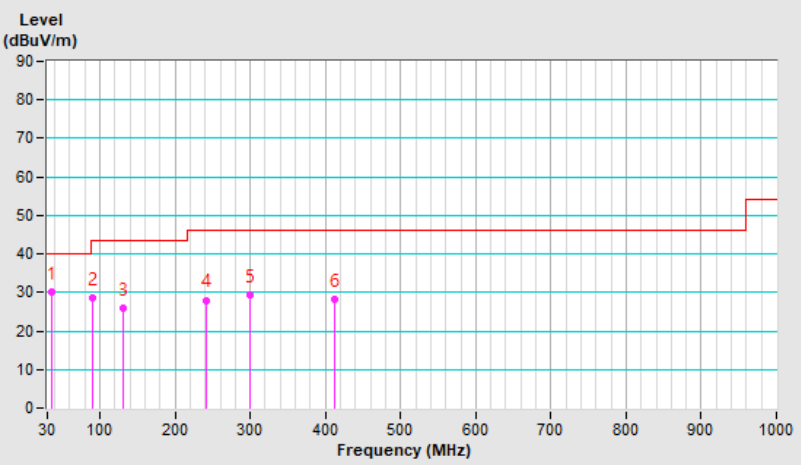
BELOW 1GHz WORST-CASE DATA

RF Mode	GFSK	Channel	CH 42：2445 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak

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	36.35	30.0 QP	40.0	-10.0	1.03 H	220	39.9	-9.9
2	89.36	28.5 QP	43.5	-15.0	1.11 H	213	42.7	-14.2
3	131.46	25.9 QP	43.5	-17.6	1.06 H	218	35.6	-9.7
4	241.46	28.0 QP	46.0	-18.0	1.21 H	227	36.7	-8.7
5	299.95	29.4 QP	46.0	-16.6	1.17 H	159	35.6	-6.2
6	413.10	28.1 QP	46.0	-17.9	1.09 H	79	31.7	-3.6

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.

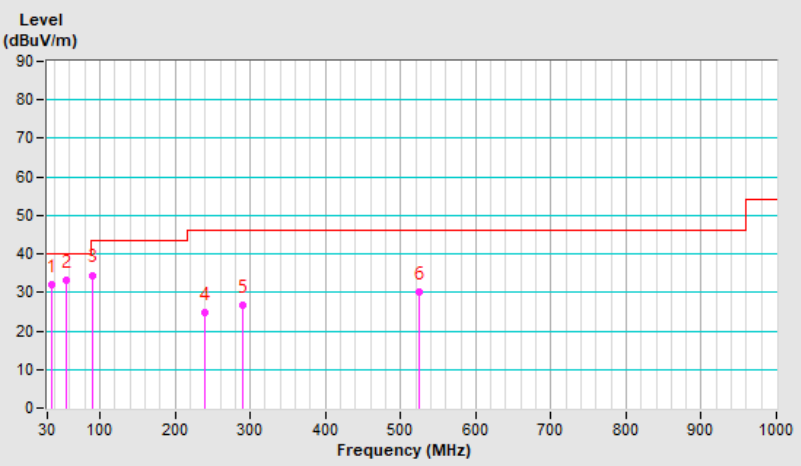


RF Mode	GFSK	Channel	CH 42：2445 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak

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	35.34	32.1 QP	40.0	-7.9	1.00 V	200	42.2	-10.1
2	**55.03**	**33.3 QP**	**40.0**	**-6.7**	**1.02 V**	**178**	**41.8**	**-8.5**
3	89.56	34.5 QP	43.5	-9.0	1.11 V	254	48.7	-14.2
4	239.57	24.9 QP	46.0	-21.1	1.05 V	77	33.7	-8.8
5	289.72	26.8 QP	46.0	-19.2	1.13 V	128	33.2	-6.4
6	525.14	30.2 QP	46.0	-15.8	1.07 V	178	31.5	-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 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.



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
EMI Test Receiver R&S	ESR3	102412	2022/12/21	2023/12/20
EMI Test Receiver R&S	ESCS 30	100276	2023/4/20	2024/4/19
LISN Schwarzbeck	NSLK 8128	8128-244	2022/11/8	2023/11/7
LISN Schwarzbeck	NNLK 8121	8121-808	2023/5/2	2024/5/1
LISN Schwarzbeck	NNLK 8121	8121-731	2023/6/9	2024/6/8
LISN Schwarzbeck	NNLK 8129	8129229	2023/6/27	2024/6/26
LISN R&S	ENV216	101197	2023/7/12	2024/7/11
High Voltage Probe Schwarzbeck	TK9420	00982	2022/12/14	2023/12/13
RF Coaxial Cable PEWC	5D-FB	Cable-CO5-01	2023/1/19	2024/1/18
Fixed Attenuator STI	STI02-2200-10	NO.4	2022/9/2	2023/9/1
50 ohm terminal resistance LYNICS	0900510	E1-01-305	2023/2/13	2024/2/12
50 ohm terminal resistance LYNICS	0900510	E1-011286	2022/9/19	2023/9/18
50 ohm terminal resistance LYNICS	0900510	E1-011285	2022/9/19	2023/9/18
Isolation Transformer Erika Fiedler	D-65396	017	2022/9/8	2023/9/7
Software BVADT	Cond_V7.3.7.4	NA	NA	NA

Note: 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. The VCCI Site Registration No. C-11093.
4. Tested Date: 2023/8/30

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.

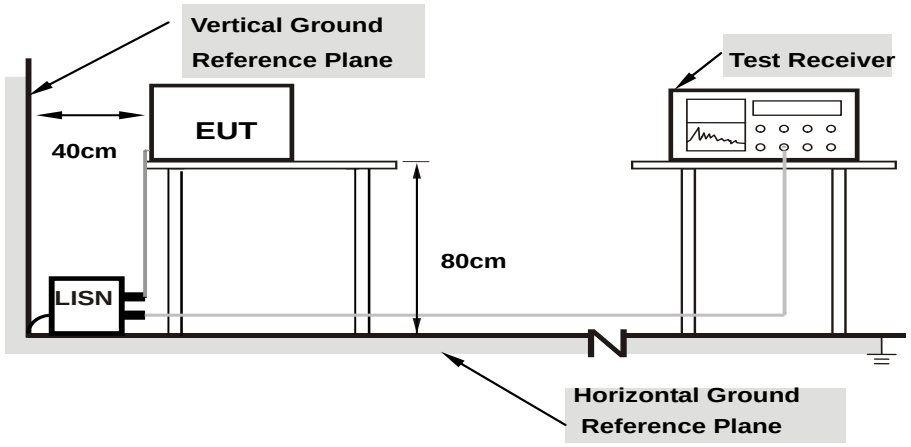
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

Same as item 4.1.6.

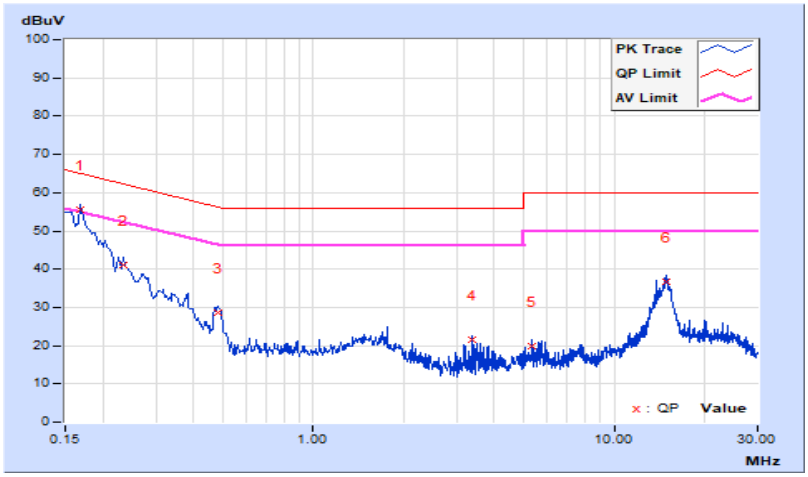
4.2.7 Test Result

RF Mode	GFSK	Channel	CH 42：2445 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz

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	**0.16900**	**10.03**	**45.46**	**28.34**	**55.49**	**38.37**	**65.01**	**55.01**	**-9.52**	**-16.64**
2	0.23362	10.06	31.04	15.45	41.10	25.51	62.32	52.32	-21.22	-26.81
3	0.48016	10.07	18.43	7.06	28.50	17.13	56.34	46.34	-27.84	-29.21
4	3.37976	10.16	11.42	4.55	21.58	14.71	56.00	46.00	-34.42	-31.29
5	5.35729	10.23	9.56	4.71	19.79	14.94	60.00	50.00	-40.21	-35.06
6	14.82178	10.52	26.07	20.41	36.59	30.93	60.00	50.00	-23.41	-19.07

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

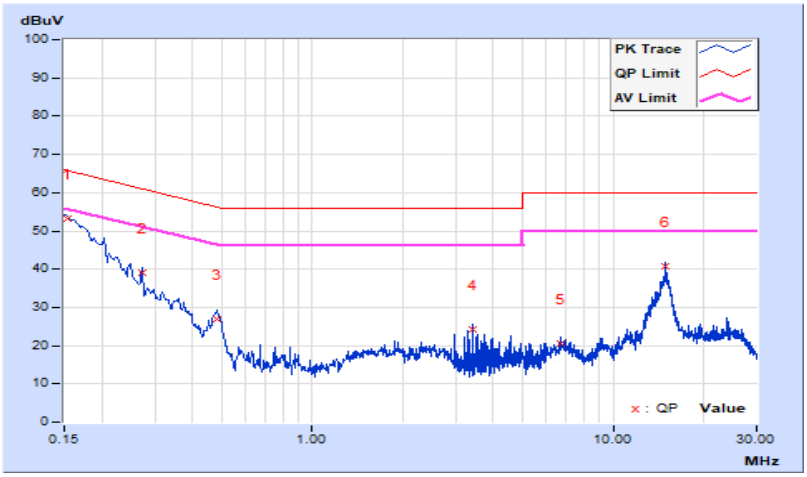


RF Mode	GFSK	Channel	CH 42：2445 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz

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	0.15380	10.01	43.28	24.31	53.29	34.32	65.79	55.79	-12.50	-21.47
2	0.27163	10.07	29.13	11.39	39.20	21.46	61.07	51.07	-21.87	-29.61
3	0.48397	10.08	16.92	7.82	27.00	17.90	56.27	46.27	-29.27	-28.37
4	3.41397	10.16	14.00	3.93	24.16	14.09	56.00	46.00	-31.84	-31.91
5	6.67624	10.27	10.12	5.55	20.39	15.82	60.00	50.00	-39.61	-34.18
6	14.92061	10.51	30.27	24.79	40.78	35.30	60.00	50.00	-19.22	-14.70

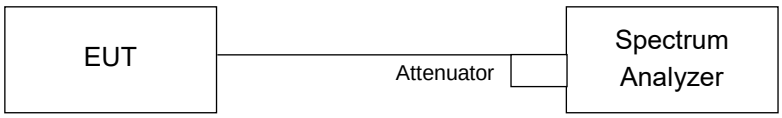
Remarks:

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	2023/5/9	2024/5/8

NOTE: 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: 2023/9/5

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.

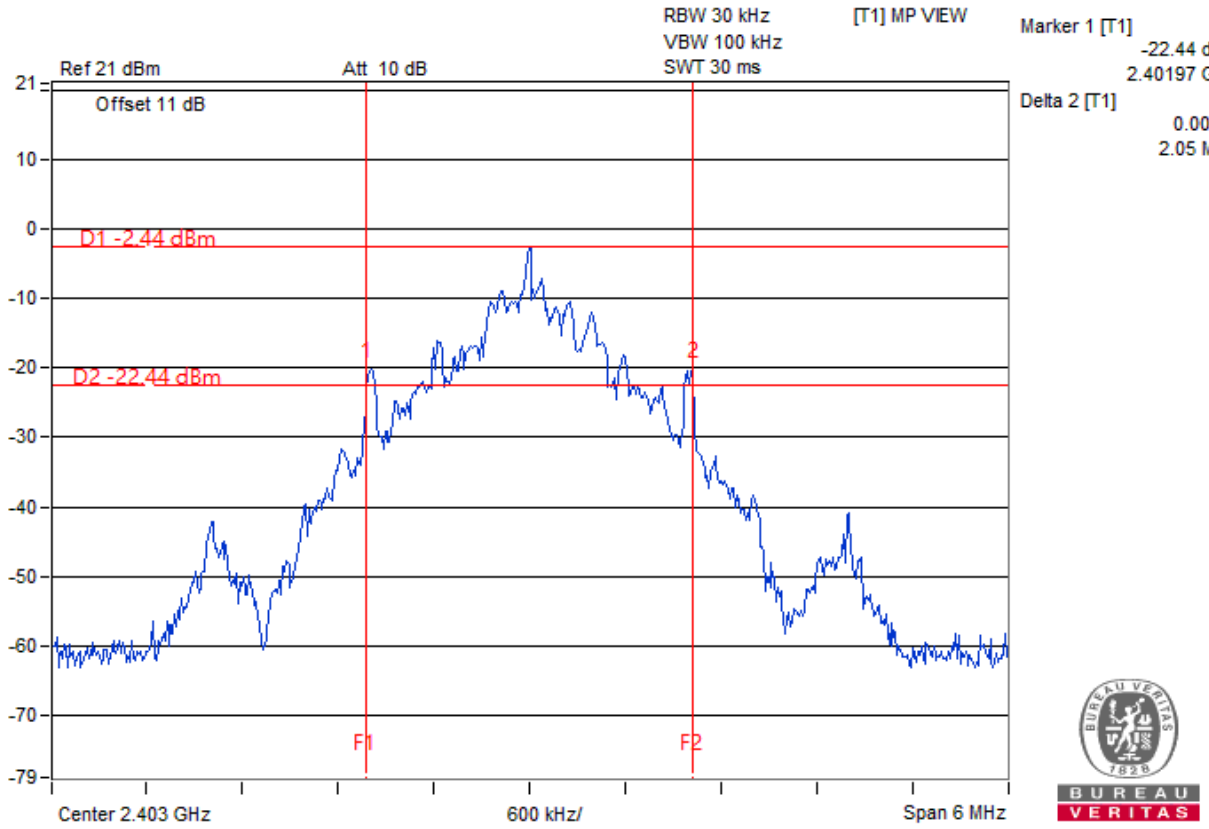
4.3.5 EUT Operating Condition

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

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	2403	2.05
42	2445	2.05
77	2480	2.03

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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