

FCC Test Report

Report No.: RFBUIY-WTW-P22020030

FCC ID: XGB-K1AR

Test Model: KONE AIR

Received Date: 2022/3/28

Test Date: 2022/3/31 ~ 2022/4/20

Issued Date: 2022/5/5

Applicant: Voyetra Turtle Beach, Inc.

Address: 44 South Broadway, 4th Floor White Plains NY 10601 USA

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



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information	6
3.1 General Description of EUT	6
3.2 Description of Test Modes	7
3.2.1 Test Mode Applicability and Tested Channel Detail	8
3.3 Duty Cycle of Test Signal	9
3.4 Description of Support Units	10
3.4.1 Configuration of System under Test	10
3.5 General Description of Applied Standards	10
4 Test Types and Results	11
4.1 Radiated Emission and Bandedge Measurement	11
4.1.1 Limits of Radiated Emission and Bandedge Measurement	11
4.1.2 Test Instruments	12
4.1.3 Test Procedures	13
4.1.4 Deviation from Test Standard	13
4.1.5 Test Setup	14
4.1.6 EUT Operating Conditions	15
4.1.7 Test Results	16
4.2 Channel Bandwidth	21
4.2.1 Test Setup	21
4.2.2 Test Instruments	21
4.2.3 Test Procedure	21
4.2.4 Deviation from Test Standard	21
4.2.5 EUT Operating Condition	21
4.2.6 Test Results	22
5 Pictures of Test Arrangements	23
Appendix – Information of the Testing Laboratories	24

Release Control Record

Issue No.	Description	Date Issued
RFBUIY-WTW-P22020030	Original release.	2022/5/5

1 Certificate of Conformity

Product: Wireless Mouse

Brand: ROCCAT

Test Model: KONE AIR

Sample Status: Engineering sample

Applicant: Voyetra Turtle Beach, Inc.

Test Date: 2022/3/31 ~ 2022/4/20

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 :



Date:

2022/5/5

Jessica Cheng / Senior Specialist

Approved by :



Date:

2022/5/5

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	N/A	Power supply is 1.5Vdc from battery
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 -4.7dB at 2390.00MHz.
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	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions	9kHz ~ 40GHz	2.63 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1000MHz	5.62 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.41 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless Mouse
Brand	ROCCAT
Test Model	KONE AIR
Status of EUT	Engineering sample
Power Supply Rating	1.5Vdc from battery
Modulation Type	GFSK
Operating Frequency	2403MHz ~ 2480MHz
Number of Channel	78
Field Strength	76.6 dBuV/m (3m)
Antenna Type	Metal antenna with 2.45dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. Bluetooth & SRD technologies can not transmit at same time.
2. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
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	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (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

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	Note	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery

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, 37, 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	0	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.

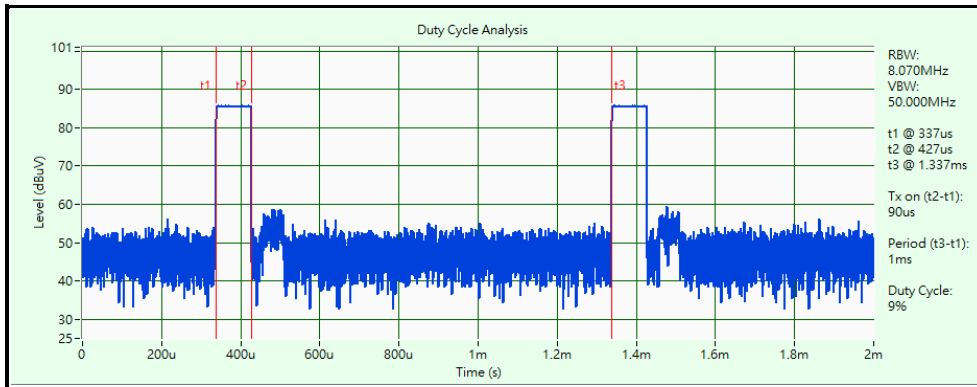
EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	0 to 77	0, 37, 77	GFSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE$\geq$1G	19deg. C, 70%RH	1.5Vdc	Jed Wu
RE<1G	19deg. C, 70%RH	1.5Vdc	Jed Wu
APCM	25deg. C, 76%RH	1.5Vdc	Dalen Dai

3.3 Duty Cycle of Test Signal

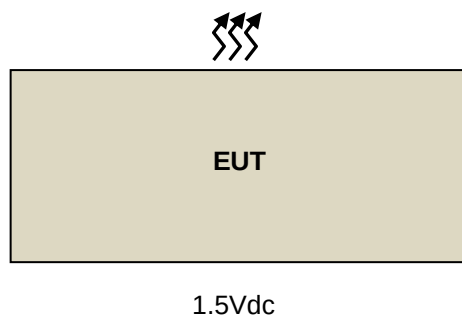
Duty cycle correction factor = $20 \log(\text{Duty cycle}) = 20 \log(0.09) = -20.9\text{dB}$



3.4 Description of Support Units

The EUT has been tested as an independent unit together without other necessary accessories or support units.

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	$2400/F(\text{kHz})$	300
0.490 ~ 1.705	$24000/F(\text{kHz})$	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

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
Spectrum Analyzer KEYSIGHT	N9030A	MY54490260	2021/7/23	2022/7/22
Spectrum Analyzer R&S	FSV40	101042	2021/9/9	2022/9/8
Software BVADT	ADT_Radiated_V8.7.08	NA	NA	NA
Software BVADT	ADT_RF Test Software V6.6.5.4	NA	NA	NA
Auto Control System(Antenna Tower, Table, Controller) ADT	SC100+AT100+TT100	NA	NA	NA
Pre_Amplifier EMCI	EMC001340	980269	2021/6/29	2022/6/28
LOOP ANTENNA EMCI	LPA600	270	2021/9/2	2023/9/1
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2021/7/13	2022/7/12
Pre_Amplifier Agilent	8447D	2944A10505	2022/2/17	2023/2/16
Bi-log Broadband Antenna Schwarzbeck	VULB9168	139	2021/11/1	2022/10/31
Antenna (Large Biconical) Schwarzbeck	VHBA 9123	480	2021/6/17	2022/6/16
RF Coaxial Cable TIMES	LMR-600	Cable-RF1-01	2022/3/10	2023/3/9
Horn Antenna ETS-Lindgren	3117	00034127	2021/11/14	2022/11/13
Pre_Amplifier Agilent	8449B	3008A01887	2022/2/17	2023/2/16
RF Coaxial Cable HUBER SUHNER	SF-104	Cable-RF-03	2021/7/8	2022/7/7
RF Coaxial Cable EMCI	EMC 104	Cable-RF-01	2021/7/8	2022/7/7
RF Coaxial Cable EMCI	EMC 104	Cable-RF-02	2021/7/8	2022/7/7
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 7	2021/5/28	2022/5/27

- NOTE:** 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 horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Linkou 966 Chamber 6 (CH 6).
4. Tested Date: 2022/4/12 ~2022/4/20

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:

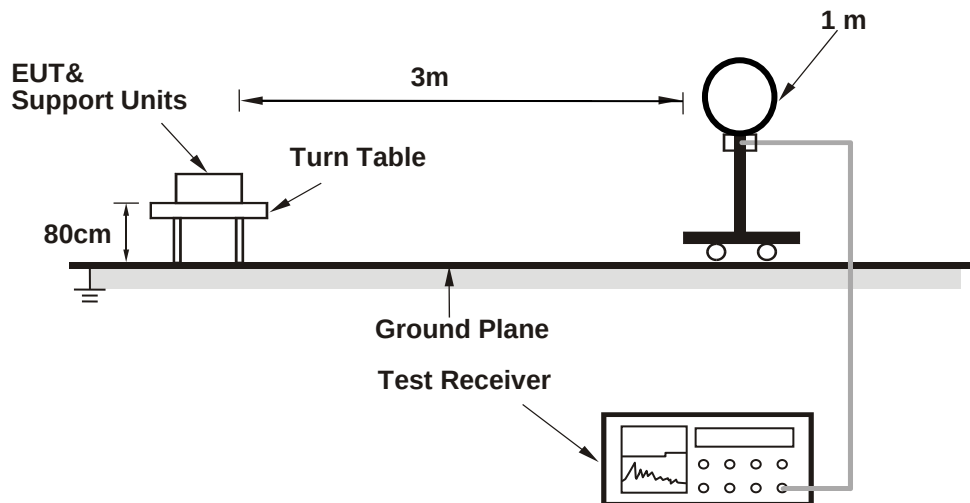
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection at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

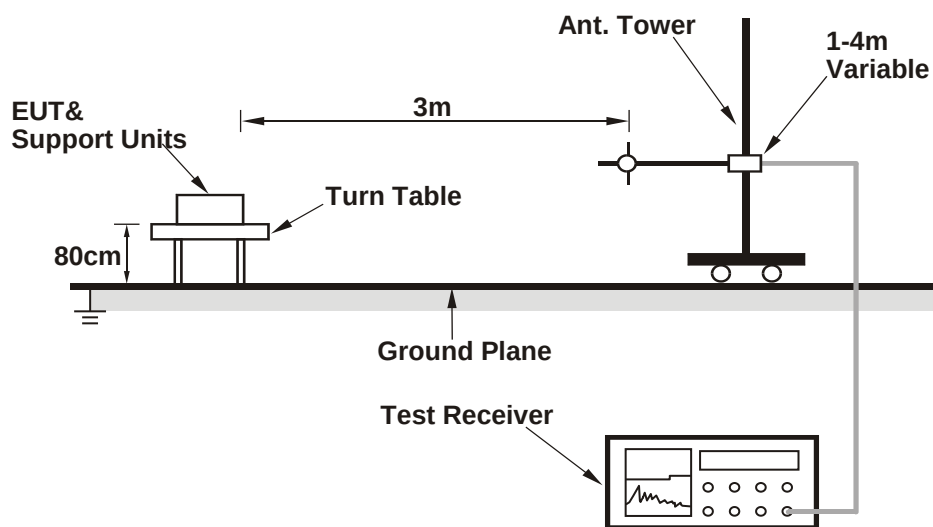
No deviation.

4.1.5 Test Setup

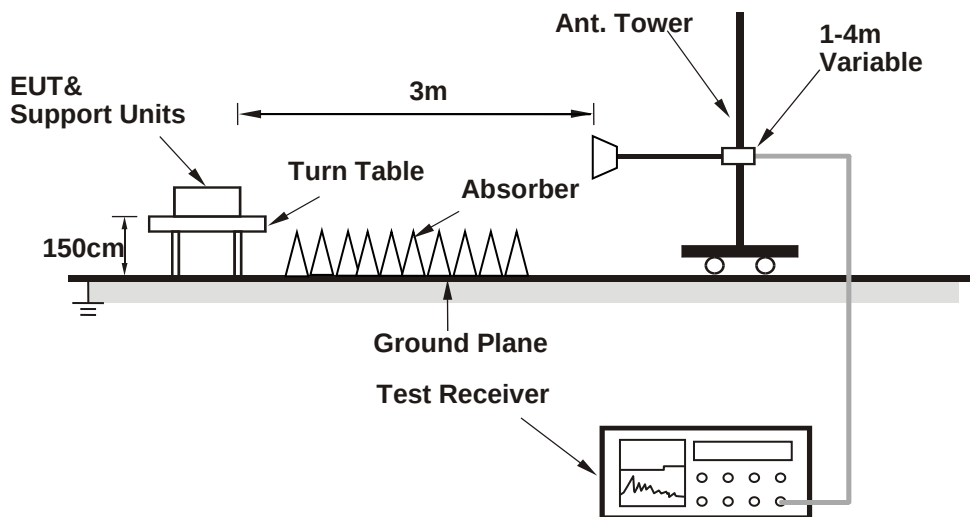
For Radiated emission below 30MHz



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

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

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	TX GFSK	Channel	CH 0 : 2403 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB=1MHz,VB=3MHz(RMS)
Environmental Conditions	19°C, 70% RH	Tested By	Jed Wu

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	55.6 PK	74.0	-18.4	1.14 H	175	57.9	-2.3
2	2390.00	49.3 AV	54.0	-4.7	1.14 H	175	51.6	-2.3
3	2400.00	44.6 PK	74.0	-29.4	1.14 H	175	46.9	-2.3
4	2400.00	23.7 AV	54.0	-30.3	1.14 H	175	26.0	-2.3
5	*2403.00	97.5 PK	114.0	-16.5	1.14 H	175	99.8	-2.3
6	*2403.00	76.6 AV	94.0	-17.4	1.14 H	175	78.9	-2.3
7	4806.00	51.1 PK	74.0	-22.9	2.91 H	83	45.6	5.5
8	4806.00	30.2 AV	54.0	-23.8	2.91 H	83	24.7	5.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	53.4 PK	74.0	-20.6	1.34 V	10	55.7	-2.3
2	2390.00	43.7 AV	54.0	-10.3	1.34 V	10	46.0	-2.3
3	2400.00	41.1 PK	74.0	-32.9	1.34 V	10	43.4	-2.3
4	2400.00	20.2 AV	54.0	-33.8	1.34 V	10	22.5	-2.3
5	*2403.00	91.3 PK	114.0	-22.7	1.34 V	10	93.6	-2.3
6	*2403.00	70.4 AV	94.0	-23.6	1.34 V	10	72.7	-2.3
7	4806.00	50.0 PK	74.0	-24.0	1.09 V	326	44.5	5.5
8	4806.00	29.1 AV	54.0	-24.9	1.09 V	326	23.6	5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
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(0.09) = -20.9dB

RF Mode	TX GFSK	Channel	CH 37 : 2440 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB=1MHz,VB=3MHz(RMS)
Environmental Conditions	19°C, 70% RH	Tested By	Jed Wu

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	95.5 PK	114.0	-18.5	1.12 H	173	97.7	-2.2
2	*2440.00	74.6 AV	94.0	-19.4	1.12 H	173	76.8	-2.2
3	4880.00	51.4 PK	74.0	-22.6	2.87 H	79	45.8	5.6
4	4880.00	30.5 AV	54.0	-23.5	2.87 H	79	24.9	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	*2440.00	89.6 PK	114.0	-24.4	1.38 V	16	91.8	-2.2
2	*2440.00	68.7 AV	94.0	-25.3	1.38 V	16	70.9	-2.2
3	4880.00	50.2 PK	74.0	-23.8	1.05 V	323	44.6	5.6
4	4880.00	29.3 AV	54.0	-24.7	1.05 V	323	23.7	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(0.09) = -20.9dB

RF Mode	TX GFSK	Channel	CH 77 : 2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB=1MHz,VB=3MHz(RMS)
Environmental Conditions	19°C, 70% RH	Tested By	Jed Wu

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	94.3 PK	114.0	-19.7	1.42 H	167	96.4	-2.1
2	*2480.00	73.4 AV	94.0	-20.6	1.42 H	167	75.5	-2.1
3	2483.50	60.2 PK	74.0	-13.8	1.42 H	167	62.3	-2.1
4	2483.50	39.3 AV	54.0	-14.7	1.42 H	167	41.4	-2.1
5	4960.00	51.0 PK	74.0	-23.0	2.86 H	58	45.3	5.7
6	4960.00	30.1 AV	54.0	-23.9	2.86 H	58	24.4	5.7
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	88.2 PK	114.0	-25.8	1.30 V	19	90.3	-2.1
2	*2480.00	67.3 AV	94.0	-26.7	1.30 V	19	69.4	-2.1
3	2483.50	54.6 PK	74.0	-19.4	1.30 V	19	56.7	-2.1
4	2483.50	33.7 AV	54.0	-20.3	1.30 V	19	35.8	-2.1
5	4960.00	50.1 PK	74.0	-23.9	1.03 V	315	44.4	5.7
6	4960.00	29.2 AV	54.0	-24.8	1.03 V	315	23.5	5.7

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(0.09) = -20.9dB

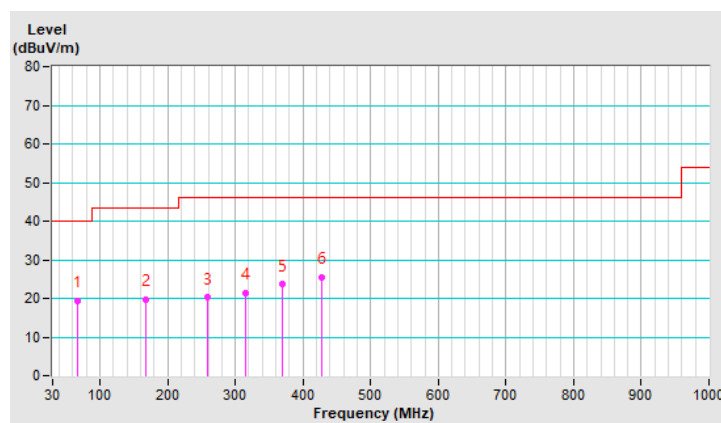
BELOW 1GHz WORST-CASE DATA

RF Mode	TX/RX GFSK	Channel	CH 0 : 2403 MHz
Frequency Range	9 kHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Environmental Conditions	19°C, 70% RH	Tested By	Jed Wu

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	66.42	19.4 QP	40.0	-20.6	1.05 H	149	29.1	-9.7
2	166.92	19.6 QP	43.5	-23.9	1.89 H	311	27.6	-8.0
3	258.73	20.2 QP	46.0	-25.8	1.54 H	360	27.8	-7.6
4	314.94	21.4 QP	46.0	-24.6	1.39 H	44	26.6	-5.2
5	369.06	23.6 QP	46.0	-22.4	1.28 H	169	27.9	-4.3
6	427.12	25.5 QP	46.0	-20.5	1.15 H	92	28.2	-2.7

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

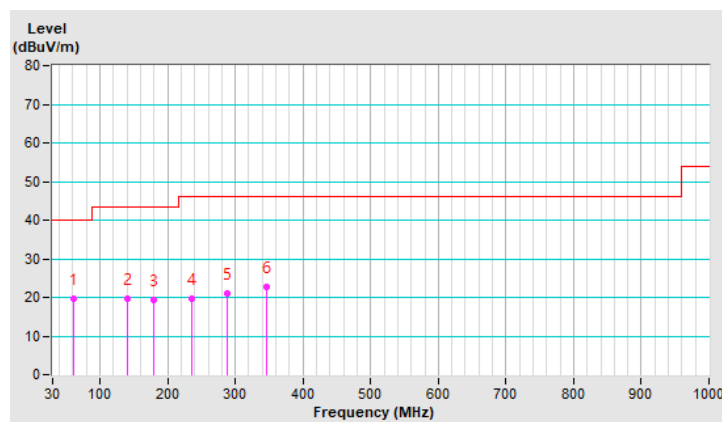


RF Mode	TX/RX GFSK	Channel	CH 0 : 2403 MHz
Frequency Range	9 kHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Environmental Conditions	19°C, 70% RH	Tested By	Jed Wu

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	60.22	19.8 QP	40.0	-20.2	1.52 V	260	28.9	-9.1
2	141.21	19.8 QP	43.5	-23.7	1.34 V	348	28.3	-8.5
3	179.96	19.3 QP	43.5	-24.2	1.62 V	212	28.5	-9.2
4	236.51	19.7 QP	46.0	-26.3	2.01 V	216	28.8	-9.1
5	287.78	21.0 QP	46.0	-25.0	1.75 V	100	27.2	-6.2
6	345.78	22.8 QP	46.0	-23.2	2.13 V	228	27.6	-4.8

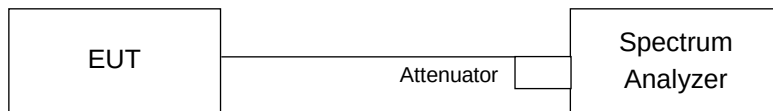
Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Channel Bandwidth

4.2.1 Test Setup



4.2.2 Test Instruments

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

- 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: 2022/3/31

4.2.3 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.2.4 Deviation from Test Standard

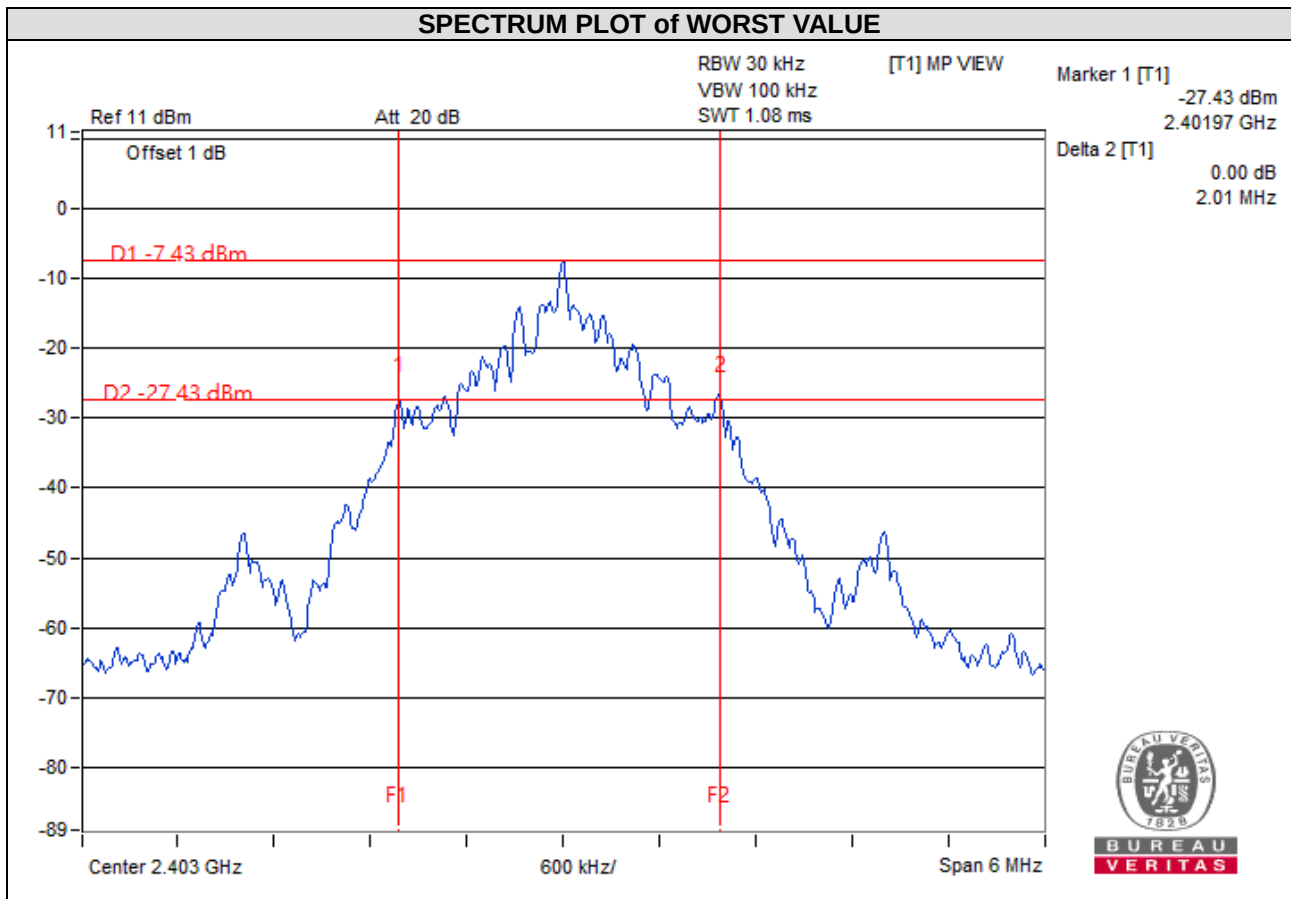
No deviation.

4.2.5 EUT Operating Condition

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

4.2.6 Test Results

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	2403	2.01
37	2440	1.74
77	2480	1.74



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---