

FCC TEST REPORT
FCC ID:2BFZE-K1061R**Report Number.....: ZHT-240407021E**

Date of Test.....: Apr. 07, 2024 - Apr. 16, 2024

Date of issue.....: Apr. 16, 2024

Test Result: PASS

Testing Laboratory.....: Guangdong Zhonghan Testing Technology Co., Ltd.Address: Room 104, Building 1, Yibaolai Industrial Park, Qiaotou Community,
Fuhai Street, Bao'an District, Shenzhen, Guangdong, China**Applicant's name: Dongguan Langao Electronics Co., Ltd.**Address: No. 16, Jiabin Road, Huangjiang Town, Dongguan City, Guangdong P
rovince**Manufacturer's name: Dongguan Langao Electronics Co., Ltd.**Address: No. 16, Jiabin Road, Huangjiang Town, Dongguan City, Guangdong P
rovince**Test specification:**

Standard.....: FCC Part 15 Subpart C Section 15.249

Test procedure.....: ANSI C63.10:2013

Non-standard test method: N/A

This device described above has been tested by ZHT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of ZHT, this document may be altered or revised by ZHT, personal only, and shall be noted in the revision of the document.

Product name.....: Gaming Keyboard

Trademark: N/A

Model/Type reference.....: K1061R, K1060R, K1062R, K1063R, K1065R, K1066R,
K1067R, K1068R, K1069R, K2021R, PC414A, PC268, PC359,
PC265, PC315

Ratings.....: Input: DC 5 V by USB or DC 3.7 V by battery

Testing procedure and testing location:

Testing Laboratory.....: **Guangdong Zhonghan Testing Technology Co., Ltd.**

Address.....: Room 104, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Tested by (name + signature).....: Leon Li

Leon Li

Reviewer (name + signature).....: Baret Wu

Baret Wu

Approved (name + signature).....: Levi Lee

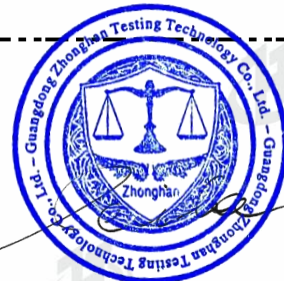


Table of Contents

Page

1. VERSION	5
2. SUMMARY OF TEST RESULTS	6
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
3. GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 DESCRIPTION OF TEST MODES	10
3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	10
3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	10
3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	11
4.1 CONDUCTED EMISSION MEASUREMENT	13
4.1.1 POWER LINE CONDUCTED EMISSION Limits	13
4.1.2 TEST PROCEDURE	13
4.1.3 DEVIATION FROM TEST STANDARD	13
4.1.4 TEST SETUP	14
4.1.5 EUT OPERATING CONDITIONS	14
4.1.6 TEST RESULTS	15
4.2 RADIATED EMISSION MEASUREMENT	17
4.2.1 RADIATED EMISSION LIMITS	17
4.2.2 TEST PROCEDURE	18
4.2.3 DEVIATION FROM TEST STANDARD	18
4.2.4 TEST SETUP	19
4.2.5 EUT OPERATING CONDITIONS	20
5.RADIATED BAND EMISSION MEASUREMENT	26
5.1 TEST REQUIREMENT:	26
5.2 TEST PROCEDURE	26
5.3 DEVIATION FROM TEST STANDARD	26
5.4 TEST SETUP	27
5.5 EUT OPERATING CONDITIONS	27
5.6 TEST RESULT	27
6.1 APPLIED PROCEDURES / LIMIT	28
6.2 TEST PROCEDURE	28
6.3 DEVIATION FROM STANDARD	28
6.4 TEST SETUP	28
6.5 EUT OPERATION CONDITIONS	28
6.6 TEST RESULTS	29

Table of Contents

Page

6.ANTENNA REQUIREMENT	31
7.TEST SETUP PHOTOS	32
8. EUT CONSTRUCTIONAL DETAILS	32

1. VERSION

Report No.	Version	Description	Approved
ZHT-240407021E	Rev.01	Initial issue of report	Apr.16, 2024

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.249) , Subpart C			
Standard Section	Test Item	Judgment	Remark
FCC part 15.207	AC Power Line Conducted Emission	PASS	
FCC part 15.215	Channel Bandwidth& 99% OCB	PASS	
FCC part 15.249	Band Edge	PASS	
FCC part 15.205/15.209	Spurious Emission	PASS	
FCC part 15.249 (a)	Field Strength of Fundamental	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

2.1 TEST FACILITY

Guangdong Zhonghan Testing Technology Co., Ltd.
Add. : Room 104, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District
Shenzhen, Guangdong, China

FCC Registration Number:255941
Designation Number: CN0325
IC Registered No.: 29832
CAB identifier: CN0143

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 % .

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power conducted	$\pm 0.16\text{dB}$
3	Spurious emissions conducted	$\pm 0.21\text{dB}$
4	All emissions radiated(9k-30MHz)	$\pm 4.68\text{dB}$
5	All emissions radiated(<1G)	$\pm 4.68\text{dB}$
6	All emissions radiated(>1G)	$\pm 4.89\text{dB}$
7	Temperature	$\pm 0.5^{\circ}\text{C}$
8	Humidity	$\pm 2\%$
9	Occupied Bandwidth	$\pm 4.96\text{dB}$

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Product Name:	Gaming Keyboard
Model No.:	K1061R,K1060R,K1062R,K1063R,K1065R,K1066R, K1067R,K1068R,K1069R,K2021R, PC414A, PC268, PC359, PC265, PC315
Model Different:	K1061R is tested model, other models are derivative models . The models are identical in circuit, only different on the model names,So the test data of K1061R can represent the remaining models.
Hardware Version:	V1.0
Software Version:	V1.0
Sample(s) Status:	Engineer sample
Operation Frequency:	2408MHz~2474MHz
Channel Numbers:	34
Channel Separation:	2MHz
Modulation Type:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	-0.61dBi
Power supply:	Input: DC 5 V by USB or DC 3.7 V by battery

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2408	10	2426	19	2444	28	2462
2	2410	11	2428	20	2446	29	2464
3	2412	12	2430	21	2448	30	2466
4	2414	13	2432	22	2450	31	2468
5	2416	14	2434	23	2452	32	2470
6	2418	15	2436	24	2454	33	2472
7	2420	16	2438	25	2456	34	2474
8	2422	17	2440	26	2458		
9	2424	18	2442	27	2460		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

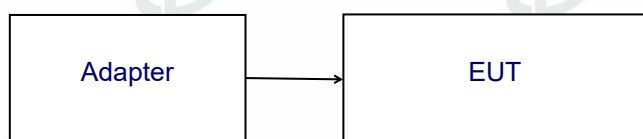
Channel	Frequency
The lowest channel	2408MHz
The middle channel	2440MHz
The Highest channel	2474MHz

3.2 DESCRIPTION OF TEST MODES

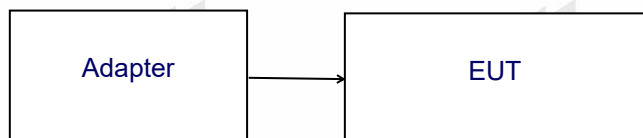
Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: EUT use new battery during the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission



Radiated Emission



3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Adapter	HUAWEI	HW-059200CHQ	N/A	AE

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Equipment	Manufacturer	Model	Last Cal.	Next Cal.
1	Receiver	R&S	ESCI	May 12, 2023	May 11, 2024
2	Loop antenna	EMCI	LAP600	May 12, 2023	May 11, 2024
3	Amplifier	Schwarzbeck	BBV 9743 B	May 12, 2023	May 11, 2024
4	Amplifier	Schwarzbeck	BBV 9718 B	May 12, 2023	May 11, 2024
5	Bilog Antenna	Schwarzbeck	VULB9162	May 12, 2023	May 16, 2024
6	Horn Antenna	Schwarzbeck	BBHA9120D	May 12, 2023	May 16, 2024
7	Horn Antenna	A.H.SYSTEMS	SAS574	May 12, 2023	May 11, 2024
8	Amplifier	AEROFLEX	100KHz-40GHz	May 12, 2023	May 11, 2024
9	Spectrum Analyzer	R&S	FSV40	May 12, 2023	May 11, 2024
10	966 Anechoic Chamber	EMToni	9m6m6m	May 12, 2023	Nov. 24, 2024
11	Spectrum Analyzer	KEYSIGHT	N9020A	May 12, 2023	May 11, 2024
12	WIDBAND RADIO COMMUNICATION TESTER	R&S	CMW500	May 12, 2023	May 11, 2024
13	Single Generator	Agilent	N5182A	May 12, 2023	May 11, 2024
14	Power Sensor	MWRFTest	MW100-RFCB	May 12, 2023	May 11, 2024
15	Audio analyzer	R&S	UPL	May 12, 2023	May 11, 2024
16	Single Generator	R&S	SMB100A	May 12, 2023	May 11, 2024
17	Power Amplifier Shielding Room	EMToni	2m3m3m	Nov. 25, 2021	Nov. 24, 2024

Conduction Test equipment

Equipment	Manufacturer	Model	Last Cal.	Next Cal.
Receiver	R&S	ESCI	May 12, 2023	May 11, 2024
LISN	R&S	ENV216	May 12, 2023	May 11, 2024
ISN CAT 6	Schwarzbeck	NTFM 8158	May 12, 2023	May 11, 2024
ISN CAT 5	Schwarzbeck	CAT5 8158	May 12, 2023	May 11, 2024
Capacitive Voltage Probe	Schwarzbeck	CVP 9222 C	May 12, 2023	May 11, 2024
Current Transformer Clamp	Schwarzbeck	SW 9605	May 12, 2023	May 11, 2024
CE Shielding Room	EMToni	9m4m3m	Nov. 25, 2021	Nov. 24, 2024

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

4.1.1 POWER LINE CONDUCTED EMISSION Limits

FREQUENCY (MHz)	Limit (dBuV)		Standard
	QP	AVG	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) *Decreases with the logarithm of the frequency.

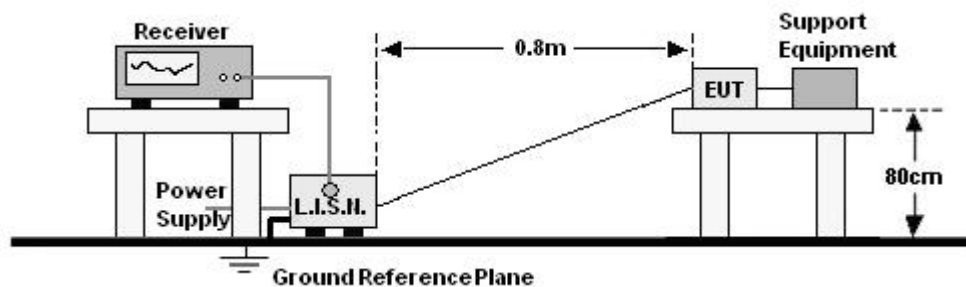
4.1.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP

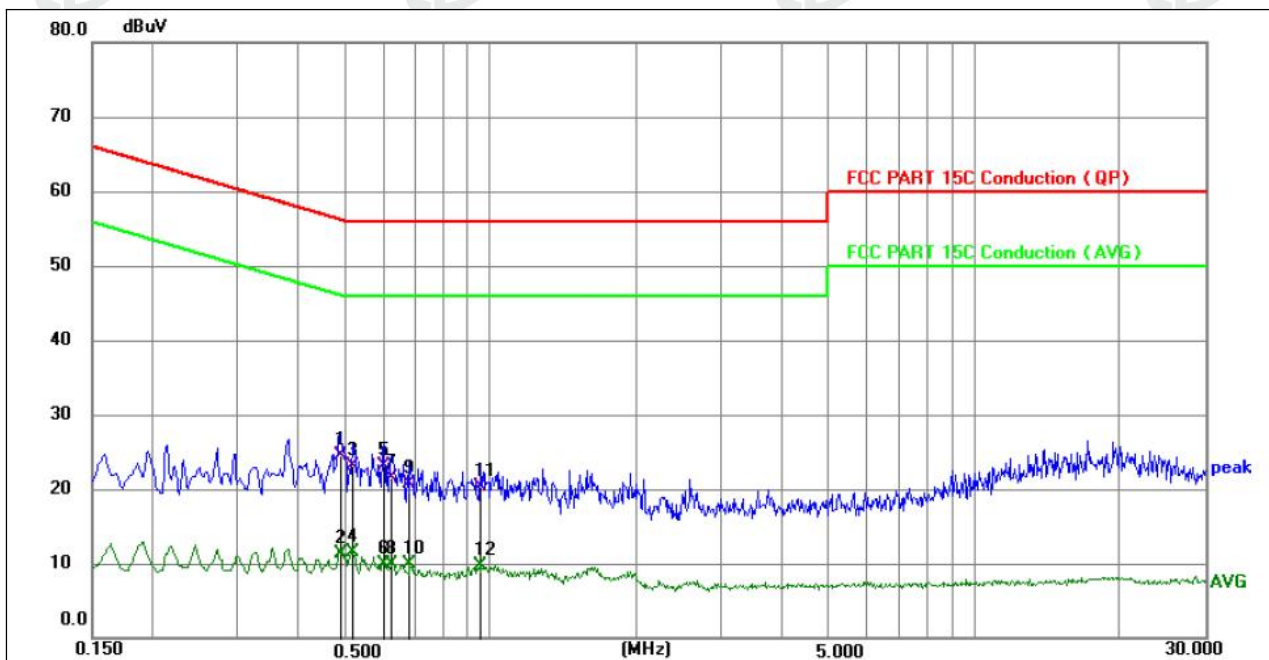


4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

4.1.6 TEST RESULTS

Temperature:	25.1℃	Relative Humidity :	50%
Pressure:	101kPa	Phase :	L
Test Voltage:	AC 120V/60Hz		

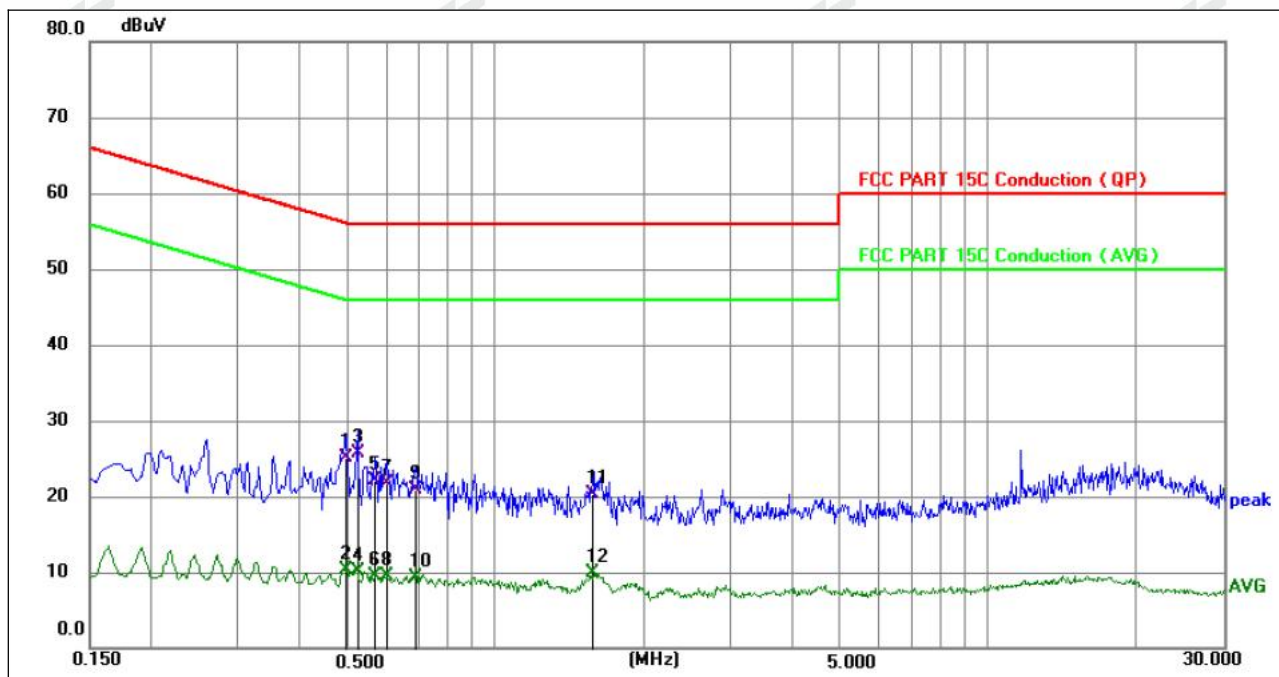


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.4874	13.63	9.89	23.52	56.21	-32.69	QP	P	
2	0.4874	2.39	9.89	12.28	46.21	-33.93	AVG	P	
3 *	0.5054	16.35	9.89	26.24	56.00	-29.76	QP	P	
4	0.5054	4.20	9.89	14.09	46.00	-31.91	AVG	P	
5	0.5594	12.78	9.89	22.67	56.00	-33.33	QP	P	
6	0.5594	2.18	9.89	12.07	46.00	-33.93	AVG	P	
7	0.5955	11.66	9.89	21.55	56.00	-34.45	QP	P	
8	0.5955	1.90	9.89	11.79	46.00	-34.21	AVG	P	
9	0.6134	11.08	9.90	20.98	56.00	-35.02	QP	P	
10	0.6134	1.98	9.90	11.88	46.00	-34.12	AVG	P	
11	1.7880	11.75	9.88	21.63	56.00	-34.37	QP	P	
12	1.7880	1.58	9.88	11.46	46.00	-34.54	AVG	P	

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor

Temperature:	25.1℃	Relative Humidity :	50%
Pressure:	101kPa	Phase :	N
Test Voltage:	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.4964	15.31	9.89	25.20	56.06	-30.86	QP	P	
2	0.4964	0.43	9.89	10.32	46.06	-35.74	AVG	P	
3 *	0.5234	15.88	9.89	25.77	56.00	-30.23	QP	P	
4	0.5234	0.21	9.89	10.10	46.00	-35.90	AVG	P	
5	0.5685	12.21	9.89	22.10	56.00	-33.90	QP	P	
6	0.5685	-0.47	9.89	9.42	46.00	-36.58	AVG	P	
7	0.6000	11.71	9.90	21.61	56.00	-34.39	QP	P	
8	0.6000	-0.44	9.90	9.46	46.00	-36.54	AVG	P	
9	0.6854	10.91	9.90	20.81	56.00	-35.19	QP	P	
10	0.6854	-0.60	9.90	9.30	46.00	-36.70	AVG	P	
11	1.5809	10.37	9.89	20.26	56.00	-35.74	QP	P	
12	1.5809	0.09	9.89	9.98	46.00	-36.02	AVG	P	

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor

4.2 RADIATED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average

4.2.1 RADIATED EMISSION LIMITS

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

According 15.249, the field strength of emissions from intentional radiators operated within 2400MHz-2483.5 MHz shall not exceed 94dB μ V/m (50mV/m).

FCC PART 15.249(a) Except as provided in paragraph (b) of this section, 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)
900-928MHz	50 (94dB μ V/m @3m)	500 (54dB μ V/m @3m)
2400-2483.5MHz	50 (94dB μ V/m @3m)	500 (54dB μ V/m @3m)
5725-5875MHz	50 (94dB μ V/m @3m)	500 (54dB μ V/m @3m)
24.0-24.25GHz	250 (108dB μ V/m @3m)	2500 (68dB μ V/m @3m)

4.2.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.
- For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
Note:

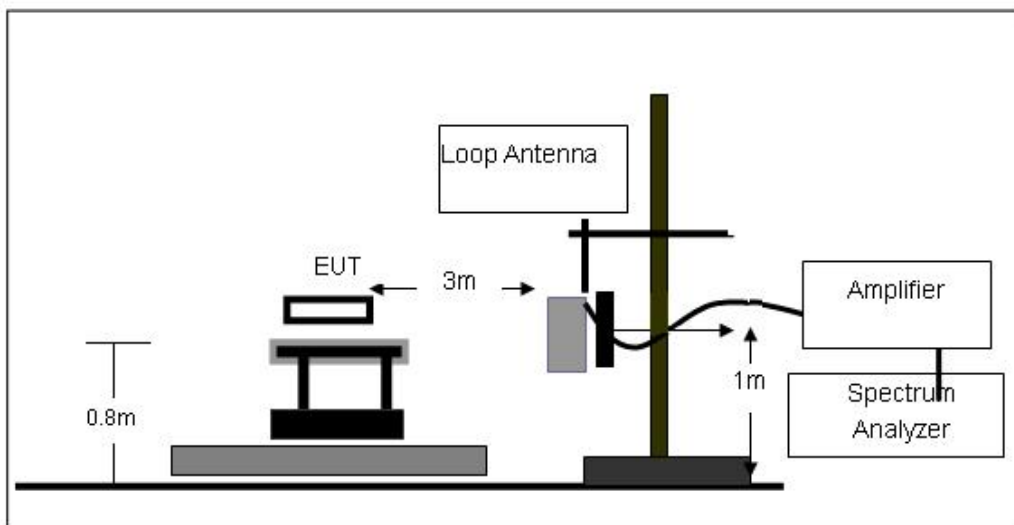
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

4.2.3 DEVIATION FROM TEST STANDARD

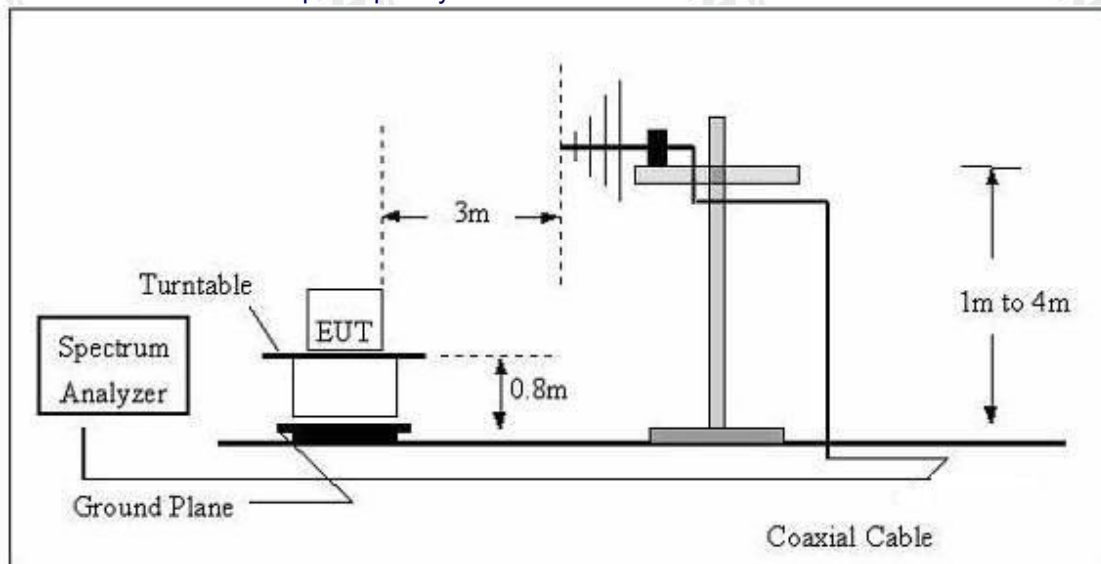
No deviation

4.2.4 TEST SETUP

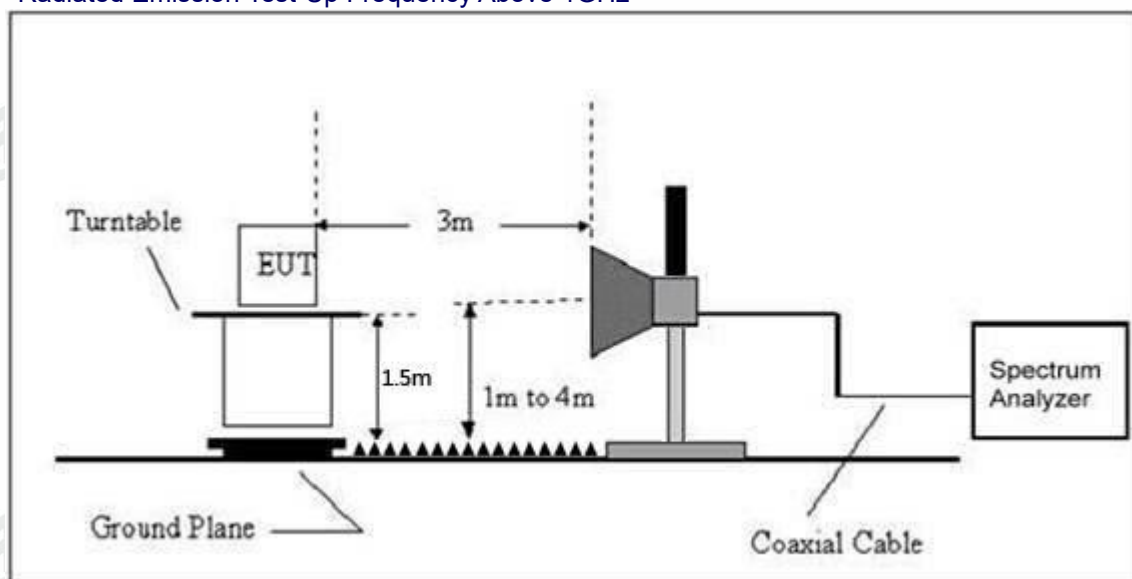
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



4.2.5 EUT OPERATING CONDITIONS

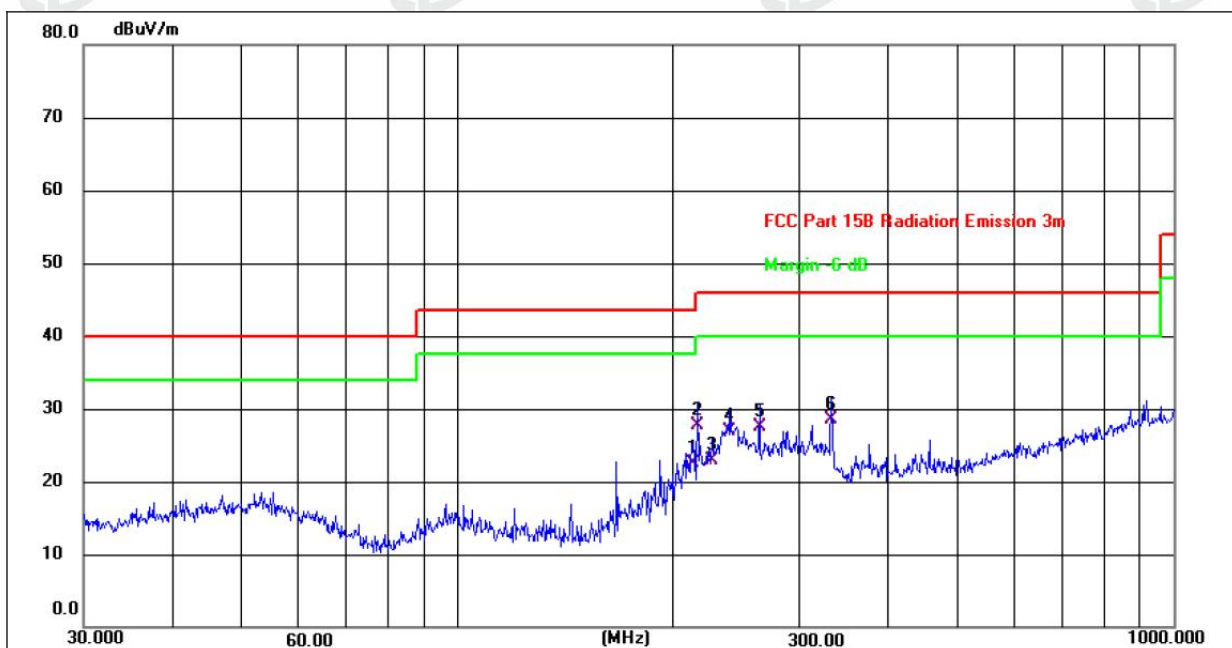
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

4.2.6 TEST RESULTS (Between 9KHz – 30 MHz)

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

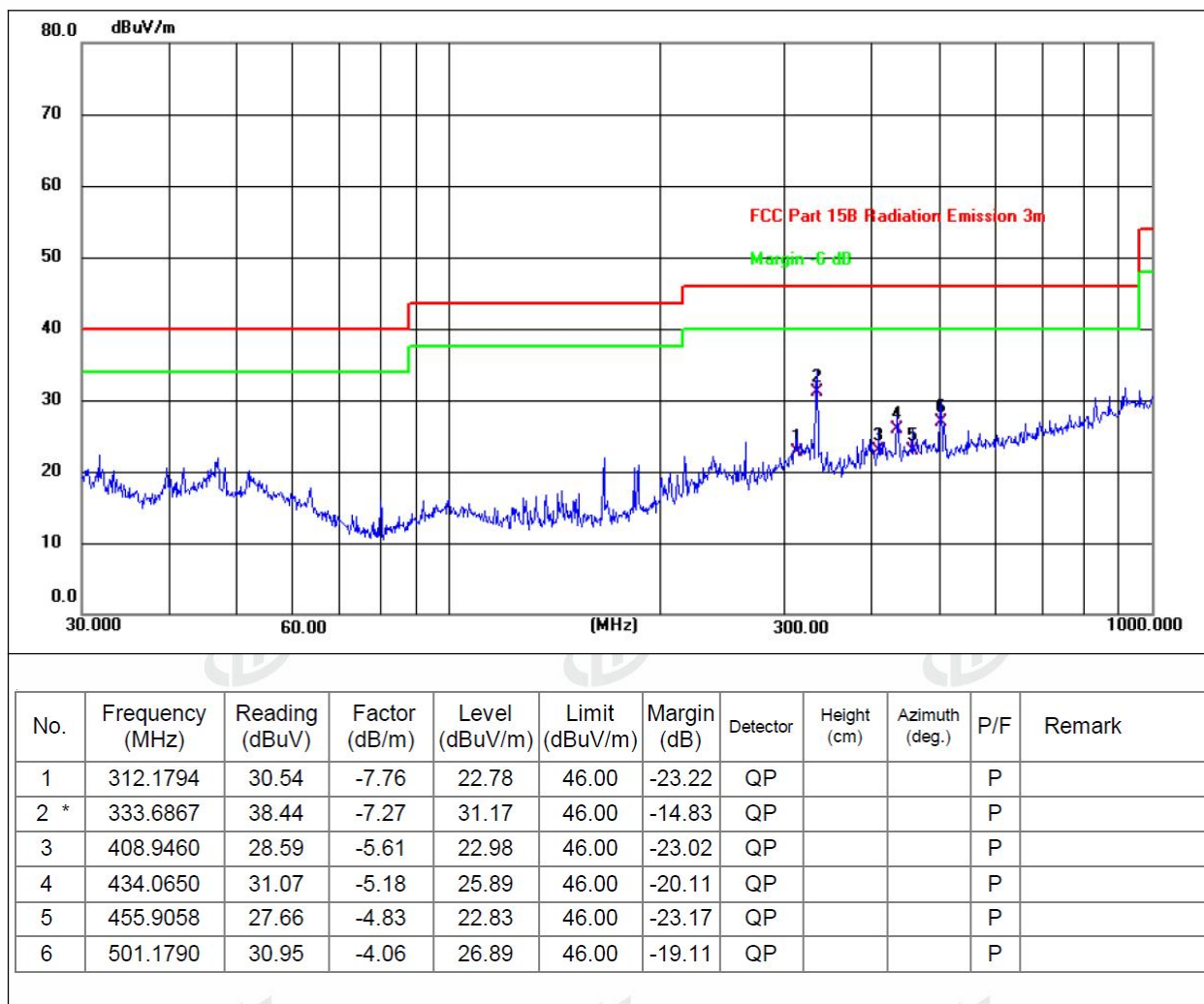
Between 30MHz – 1GHz

Temperature:	25.6℃	Relative Humidity:	47%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	DC 3.7 V		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	213.0151	32.83	-10.41	22.42	43.50	-21.08	QP			P	
2	216.0240	37.94	-10.31	27.63	46.00	-18.37	QP			P	
3	226.0994	32.85	-9.93	22.92	46.00	-23.08	QP			P	
4	239.9873	36.24	-9.43	26.81	46.00	-19.19	QP			P	
5	263.8190	36.25	-8.78	27.47	46.00	-18.53	QP			P	
6 *	332.5187	35.80	-7.29	28.51	46.00	-17.49	QP			P	

Temperature:	25.6°C	Relative Humidity:	47%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	DC 3.7 V		



Remarks:

- 1.Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- 2.The emission levels of other frequencies are very lower than the limit and not show in test report.

Fundamental Test

Polar (H/V)	Frequency	Meter Reading	Pre-ampli fier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	2408	92.86	30.22	4.85	23.98	91.47	114	-22.53	Pk
V	2408	84.68	30.22	4.85	23.98	83.29	94	-10.71	AV
V	2440	96.25	30.22	4.85	23.98	94.86	114	-19.14	Pk
V	2440	87.35	30.22	4.85	23.98	85.96	94	-8.04	AV
V	2474	94.65	30.22	4.85	23.98	93.26	114	-20.74	Pk
V	2474	82.44	30.22	4.85	23.98	81.05	94	-12.95	AV
H	2408	95.62	30.22	4.85	23.98	94.23	114	-19.77	Pk
H	2408	80.35	30.22	4.85	23.98	78.96	94	-15.04	AV
H	2440	93.52	30.22	4.85	23.98	92.13	114	-21.87	Pk
H	2440	82.67	30.22	4.85	23.98	81.28	94	-12.72	AV
H	2474	92.54	30.22	4.85	23.98	91.15	114	-22.85	Pk
H	2474	88.35	30.22	4.85	23.98	86.96	94	-7.04	AV

1GHz~25GHz

Polar (H/V)	Frequency	Meter Reading	Pre-ampli fier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel:2408MHz									
V	4816.00	52.95	30.55	5.77	24.66	52.83	74	-21.17	Pk
V	4816.00	42.82	30.55	5.77	24.66	42.70	54	-11.3	AV
V	7224.00	54.74	30.33	6.32	24.55	55.28	74	-18.72	Pk
V	7224.00	36.94	30.33	6.32	24.55	37.48	54	-16.52	AV
V	9632.00	52.45	30.85	7.45	24.69	53.74	74	-20.26	Pk
V	9632.00	34.47	30.85	7.45	24.69	35.76	54	-18.24	AV
V	12040.00	56.28	31.02	8.99	25.57	59.82	74	-14.18	Pk
V	12040.00	39.57	31.02	8.99	25.57	43.11	54	-10.89	AV
H	4816.00	54.52	30.55	5.77	24.66	54.40	74	-19.6	Pk
H	4816.00	35.39	30.55	5.77	24.66	35.27	54	-18.73	AV
H	7224.00	52.36	30.33	6.32	24.55	52.90	74	-21.10	Pk
H	7224.00	35.52	30.33	6.32	24.55	36.06	54	-17.94	AV
H	9632.00	49.62	30.85	7.45	24.69	50.91	74	-23.09	Pk
H	9632.00	34.74	30.85	7.45	24.69	36.03	54	-17.97	AV
H	12040.00	47.64	31.02	8.99	25.57	51.18	74	-22.82	Pk
H	12040.00	35.97	31.02	8.99	25.57	39.51	54	-14.49	AV

Polar (H/V)	Frequency	Meter Reading	Pre-ampli fier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Middle Channel:2440MHz									
V	4880.00	61.92	30.55	5.77	24.66	61.80	74	-12.2	Pk
V	4880.00	44.24	30.55	5.77	24.66	44.12	54	-9.88	AV
V	7320.00	54.24	30.33	6.32	24.55	54.78	74	-19.22	Pk
V	7320.00	37.34	30.33	6.32	24.55	37.88	54	-16.12	AV
V	9760.00	51.57	30.85	7.45	24.69	52.86	74	-21.14	Pk
V	9760.00	34.66	30.85	7.45	24.69	35.95	54	-18.05	AV
V	12200.00	54.97	31.02	8.99	25.57	58.51	74	-15.49	Pk
V	12200.00	38.67	31.02	8.99	25.57	42.21	54	-11.79	AV
H	4880.00	54.22	30.55	5.77	24.66	54.1	74	-19.9	Pk
H	4880.00	36.74	30.55	5.77	24.66	36.62	54	-17.38	AV
H	7320.00	52.12	30.33	6.32	24.55	52.66	74	-21.34	Pk
H	7320.00	37.32	30.33	6.32	24.55	37.86	54	-16.14	AV
H	9760.00	49.52	30.85	7.45	24.69	50.81	74	-23.19	Pk
H	9760.00	35.74	30.85	7.45	24.69	37.03	54	-16.97	AV
H	12200.00	47.53	31.02	8.99	25.57	51.07	74	-22.93	Pk
H	12200.00	34.59	31.02	8.99	25.57	38.13	54	-15.87	AV

Polar (H/V)	Frequency	Meter Reading	Pre-ampli fier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
High Channel:2474MHz									
V	4948.00	61.51	30.55	5.77	24.66	61.39	74	-12.61	Pk
V	4948.00	47.58	30.55	5.77	24.66	47.46	54	-6.54	AV
V	7422.00	57.37	30.33	6.32	24.55	57.91	74	-16.09	Pk
V	7422.00	37.95	30.33	6.32	24.55	38.49	54	-15.51	AV
V	9896.00	52.15	30.85	7.45	24.69	53.44	74	-20.56	Pk
V	9896.00	34.17	30.85	7.45	24.69	35.46	54	-18.54	AV
V	12370.00	56.35	31.02	8.99	25.57	59.89	74	-14.11	Pk
V	12370.00	38.15	31.02	8.99	25.57	41.69	54	-12.31	AV
H	4948.00	53.72	30.55	5.77	24.66	53.60	74	-20.4	Pk
H	4948.00	36.62	30.55	5.77	24.66	36.50	54	-17.5	AV
H	7422.00	55.35	30.33	6.32	24.55	55.89	74	-18.11	Pk
H	7422.00	37.37	30.33	6.32	24.55	37.91	54	-16.09	AV
H	9896.00	45.11	30.85	7.45	24.69	46.40	74	-27.6	Pk
H	9896.00	38.43	30.85	7.45	24.69	39.72	54	-14.28	AV
H	12370.00	47.85	31.02	8.99	25.57	51.39	74	-22.61	Pk
H	12370.00	32.99	31.02	8.99	25.57	36.53	54	-17.47	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

5. RADIATED BAND EMISSION MEASUREMENT

5.1 TEST REQUIREMENT:

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above	Peak	1MHz	3MHz	Peak
	1GHz	Average	1MHz	3MHz	Average

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

5.2 TEST PROCEDURE

Above 1GHz test procedure as below:

- a. 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. 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 antenna height 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the Highest channel

Note:

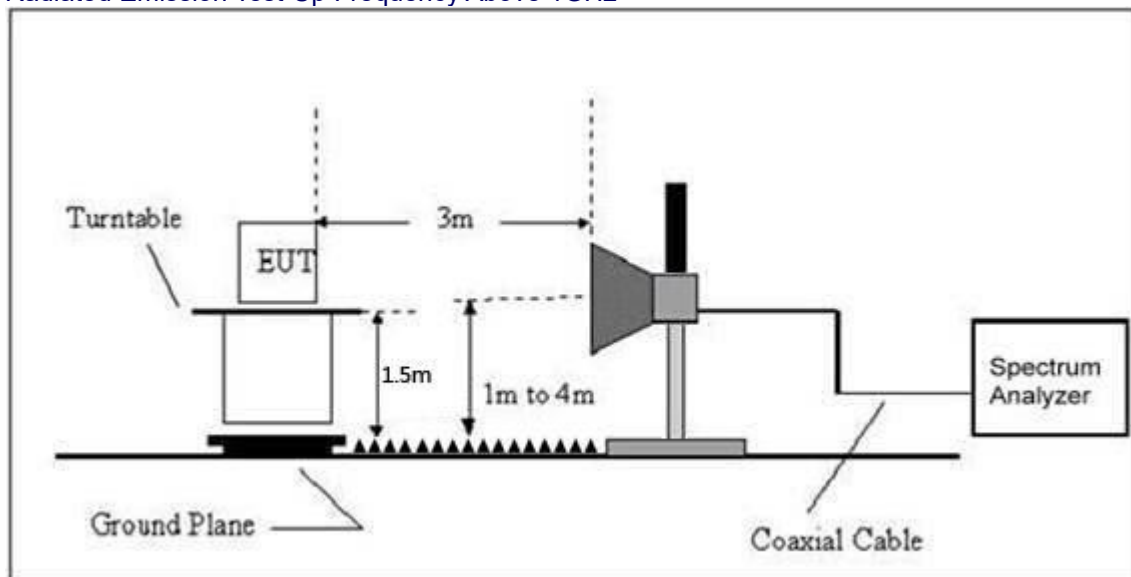
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

5.3 DEVIATION FROM TEST STANDARD

No deviation

5.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



5.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULT

	Polar (H/V)	Frequenc y (MHz)	Meter Reading (dBuV)	Pre- amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV /m)	Margi n (dB)	Detec tor Type	Result
GFSK	Low Channel: 2408MHz										
	H	2390.00	55.78	30.22	4.85	23.98	54.39	74	-19.61	PK	PASS
	H	2390.00	49.87	30.22	4.85	23.98	48.48	54	-5.52	AV	PASS
	H	2400.00	55.27	30.22	4.85	23.98	53.88	74	-20.12	PK	PASS
	H	2400.00	47.79	30.22	4.85	23.98	46.40	54	-7.6	AV	PASS
	V	2390.00	61.85	30.22	4.85	23.98	60.46	74	-13.54	PK	PASS
	V	2390.00	47.95	30.22	4.85	23.98	46.56	54	-7.44	AV	PASS
	V	2400.00	56.17	30.22	4.85	23.98	54.78	74	-19.22	PK	PASS
	V	2400.00	49.85	30.22	4.85	23.98	48.46	54	-5.54	AV	PASS
	High Channel: 2474MHz										
	H	2483.50	58.58	30.22	4.85	23.98	57.19	74	-16.81	PK	PASS
	H	2483.50	48.45	30.22	4.85	23.98	47.06	54	-6.94	AV	PASS
	H	2500.00	61.27	30.22	4.85	23.98	59.88	74	-14.12	PK	PASS
	H	2500.00	50.87	30.22	4.85	23.98	49.48	54	-4.52	AV	PASS
	V	2483.50	61.54	30.22	4.85	23.98	60.15	74	-13.85	PK	PASS
	V	2483.50	48.35	30.22	4.85	23.98	46.96	54	-7.04	AV	PASS
	V	2500.00	58.45	30.22	4.85	23.98	57.06	74	-16.94	PK	PASS
	V	2500.00	47.55	30.22	4.85	23.98	46.16	54	-7.84	AV	PASS
Remark:											
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit											

6. Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10:2013

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.249) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.215	Bandwidth	2400-2483.5	PASS

6.2 TEST PROCEDURE

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

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



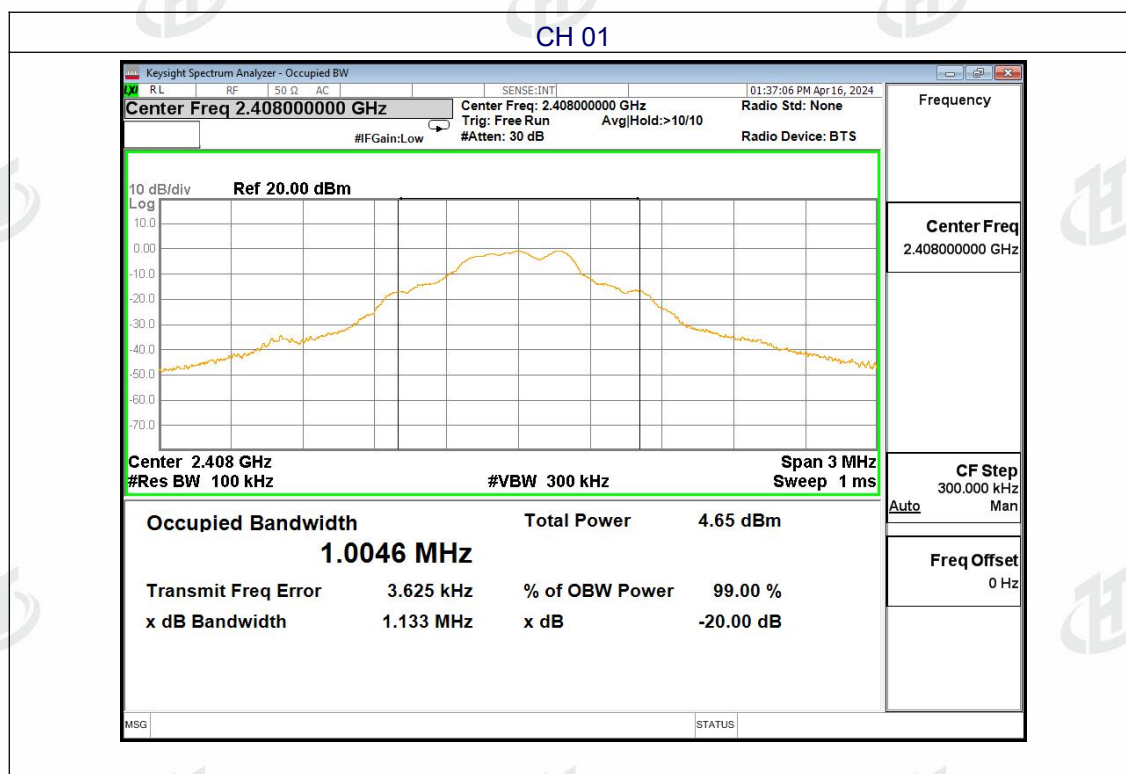
6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

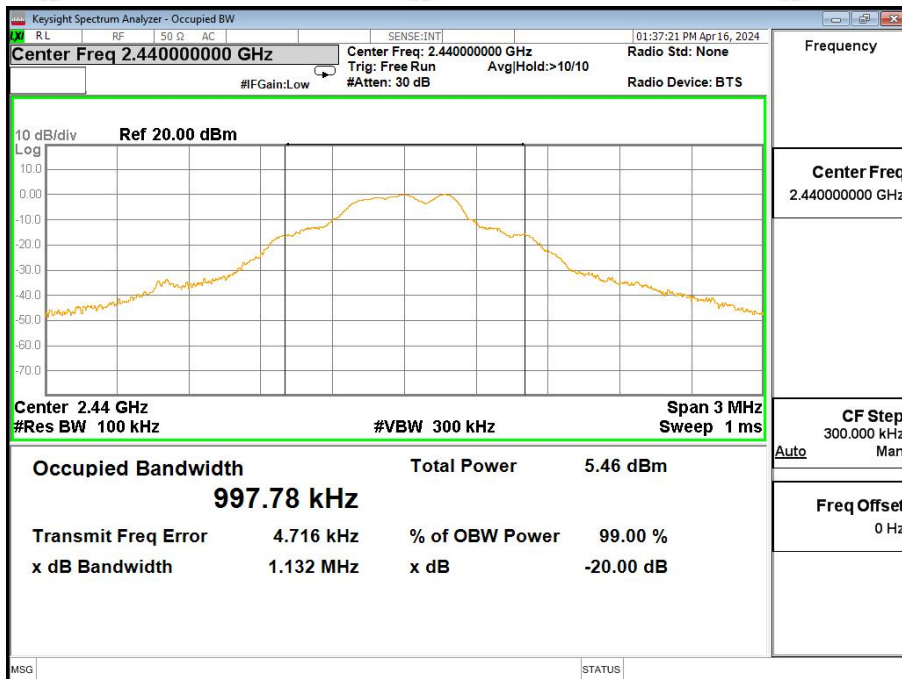
6.6 TEST RESULTS

Temperature :	25.6°C	Relative Humidity :	51%
Test Mode :	GFSK	Test Voltage :	DC 3.7V

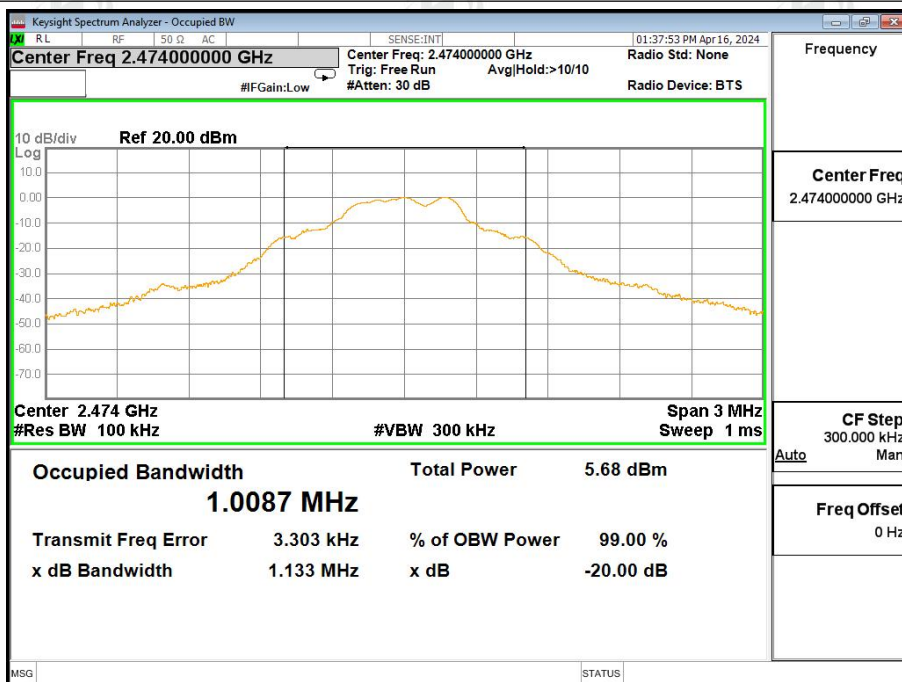
Test channel	Channel Bandwidth (MHz)	Result
Lowest	1.133	Pass
Middle	1.132	
Highest	1.133	



CH17



CH34



6.ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
EUT Antenna:	
The antenna is PCB Antenna, the best case gain of the antennas is -0.61dBi, reference to the appendix II for details	

7. TEST SETUP PHOTOS

Reference to the appendix I for details.

8. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

***** END OF REPORT *****