

# FCC TEST REPORT

## FCC ID:2A6I9-X8

Report Number..... : ZKT-230413L2629E

Date of Test..... Apr. 10 to Apr. 17, 2023

Date of issue ..... : Apr. 17, 2023

Total number of pages ..... 33

Test Result ..... : PASS

Testing Laboratory..... : Shenzhen ZKT Technology Co., Ltd.

Address ..... : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name ..... : **Shenzhen IDEEBO Technology Co., LTD**

Address ..... : 4th Floor, Building 7, Jingxuan Industrial Park, Huangbeiling, Yousong Community, Longhua Street, Longhua District, Shenzhen

Manufacturer's name ..... : **Shenzhen IDEEBO Technology Co., LTD**

Address ..... : 4th Floor, Building 7, Jingxuan Industrial Park, Huangbeiling, Yousong Community, Longhua Street, Longhua District, Shenzhen

Test specification:

Standard..... : FCC CFR Title 47 Part 15 Subpart C Section 15.249  
ANSI C63.10:2013

Test procedure..... : /

Non-standard test method ..... : N/A

**Test Report Form No.** ..... : TRF-EL-111\_V0**Test Report Form(s) Originator** .... : ZKT Testing**Master TRF** ..... : Dated: 2023-01-05

This device described above has been tested by ZKT, 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 ZKT, this document may be altered or revised by ZKT, personal only, and shall be noted in the revision of the document.

Product name..... : Window Cleaning Robot

Trademark ..... : Alfabot

Model/Type reference ..... : X8,X7,X8M,X8S,X8P,X9,X10

Ratings..... : DC 3V by AAA battery

Testing procedure and testing location:

Testing Laboratory .....: Shenzhen ZKT Technology Co., Ltd.

Address .....: 1/F, No. 101, Building B, No. 6, Tangwei Community  
Industrial Avenue, Fuhai Street, Bao'an District,  
Shenzhen, China

Tested by (name + signature) .....: Alen He



Reviewer (name + signature).....: Joe Liu



Approved (name + signature) .....: Lake Xie



## Table of Contents

## Page

<b>1.VERSION</b>	<b>5</b>
<b>2.SUMMARY OF TEST RESULTS</b>	<b>6</b>
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
<b>3. GENERAL INFORMATION</b>	<b>8</b>
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 DESCRIPTION OF TEST MODES	9
3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	9
3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	10
3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	11
<b>4. EMC EMISSION TEST</b>	<b>13</b>
4.1 CONDUCTED EMISSION MEASUREMENT	13
4.1.1 1POWER 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	14
4.2 RADIATED EMISSION MEASUREMENT	15
4.2.1 RADIATED EMISSION LIMITS	15
4.2.2 TEST PROCEDURE	16
4.2.3 DEVIATION FROM TEST STANDARD	16
4.2.4 TEST SETUP	16
4.2.5 EUT OPERATING CONDITIONS	17
<b>5. BANDWIDTH OF FREQUENCY BAND EDGE</b>	<b>23</b>
5.1 TEST REQUIREMENT:	23
5.2 TEST PROCEDURE	23
5.3 DEVIATION FROM TEST STANDARD	23
5.4 TEST SETUP	23
5.5 EUT OPERATING CONDITIONS	24
5.6 TEST RESULT	25
<b>6. CHANNEL BANDWIDTH</b>	<b>27</b>
7.1 APPLIED PROCEDURES / LIMIT	27
7.2 TEST PROCEDURE	27
7.3 DEVIATION FROM STANDARD	27
7.4 TEST SETUP	27

Table of Contents	Page
7.5 EUT OPERATION CONDITIONS	27
7.6 TEST RESULTS	28
8. CONDUCTED SPURIOUS EMISSION	30
8.1 APPLICABLE STANDARD	30
8.2 TEST PROCEDURE	30
8.3 DEVIATION FROM STANDARD	30
8.4 TEST SETUP	30
8.5 EUT OPERATION CONDITIONS	30
9.ANTENNA REQUIREMENT	32
10. TEST SETUP PHOTO	33
11. EUT CONSTRUCTIONAL DETAILS	33

## 1.VERSION

Report No.	Version	Description	Approved
ZKT-230413L2629E	Rev.01	Initial issue of report	Apr. 17, 2023

## 2.1 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 15.203	Antenna requirement	PASS	
FCC part 15.207	AC Power Line Conducted Emission	N/A	
FCC part 15.249	Fundamental & Radiated Spurious Emission Measurement	PASS	
FCC part 15.215 (c)	20dB Channel Bandwidth	PASS	
FCC part 15.205	Band Edge	PASS	

NOTE:

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

#### 2.11.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.

Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225

Designation Number: CN1299

IC Registered No.: 27033

#### 2.21.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded 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(<1G)	$\pm 4.68\text{dB}$
5	All emissions radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$



### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Product Name:	Window Cleaning Robot
Model No.:	X8,X7,X8M,X8S,X8P,X9,X10
Model Different.:	All the same except colour and model name.
Serial No.:	N/A
Hardware Version:	HV1.0
Software Version:	SV1.0
Sample(s) Status:	Engineer sample
Operation Frequency:	2432MHz~2471MHz
Channel Numbers:	3
Channel Separation:	/
Modulation Type:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	0dBi
Power supply:	DC 3V by AA battery
SWITCHING POWER ADAPTER:	N/A
Battery:	N/A

Channel	Frequency
1	2432 MHz
2	2452 MHz
3	2471 MHz

**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	2432MHz
The middle channel	2452MHz
The Highest channel	2471MHz



## 3.2 1.1DESCRIPTION OF TEST MODES

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: 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.	

Test Software	TX Test Tool
Power level setup	<0dBm

## 3.3 1.2BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

## Radiated Emission



EUT

## Conducted Spurious



EUT

## 3.4 1.3DESCRIPTION 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	Window Cleaning Robot	Alfabot	X8	N/A	EUT

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.

### 3.51.4 EQUIPMENTS LIST FOR ALL TEST ITEMS

#### Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY55370835	Oct. 18, 2022	Oct. 17, 2023
2	Spectrum Analyzer (1GHz-40GHz)	R&S	FSQ	100363	Oct. 17, 2022	Oct. 16, 2023
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	101169	Oct. 18, 2022	Oct. 17, 2023
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	N/A	Oct. 17, 2022	Oct. 16, 2023
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	Oct. 17, 2022	Oct. 16, 2023
6	Loop Antenna	TESEQ	HLA6121	58357	Oct. 17, 2022	Oct. 16, 2023
7	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	060747	Oct. 18, 2022	Oct. 17, 2023
8	Amplifier (1GHz-26.5GHz)	Agilent	8449B	3008A00315	Oct. 18, 2022	Oct. 17, 2023
9	RF cables1 (9kHz-30MHz)	N/A	9kHz-30MHz	N/A	Oct. 18, 2022	Oct. 17, 2023
10	RF cables2 (30MHz-1GHz)	N/A	30MHz-1GHz	N/A	Oct. 18, 2022	Oct. 17, 2023
11	RF cables3 (1GHz-40GHz)	N/A	1GHz-40GHz	N/A	Oct. 18, 2022	Oct. 17, 2023
12	ESG Signal Generator	Agilent	E4421B	N/A	Oct. 22, 2022	Oct. 21, 2023
13	Signal Generator	Agilent	N5182A	N/A	Oct. 22, 2022	Oct. 21, 2023
14	Magnetic Field Probe Tester	Narda	ELT-400	0-0344	Oct. 17, 2022	Oct. 16, 2023
15	MWRF Power Meter Test system	MW	MW100-RPCB	N/A	Oct. 22, 2022	Oct. 21, 2023
16	D.C. Power Supply	LongWei	TPR-6405D	N/A	\	\
17	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	\	\
18	RF Software	MW	MTS8310	V2.0.0.0	\	\
19	Turntable	MF	MF-7802BS	N/A	\	\
20	Antenna tower	MF	MF-7802BS	N/A	\	\

## Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	Oct. 22, 2022	Oct. 21, 2023
2	LISN	CYBERTEK	EM5040A	E1850400149	Oct. 22, 2022	Oct. 21, 2023
3	Test Cable	N/A	C01	N/A	Oct. 18, 2022	Oct. 17, 2023
4	Test Cable	N/A	C02	N/A	Oct. 18, 2022	Oct. 17, 2023
5	EMI Test Receiver	R&S	ESC13	101393	Oct. 17, 2022	Oct. 16, 2023
6	EMC Software	Frad	EZ-EMC	Ver.EMC-CO N 3A1.1	\	\

#### 4. EMC EMISSION TEST

##### 4.1 1.5CONDUCTED 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 1.5.1POWER LINE CONDUCTED EMISSION Limits

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quas -peak	Average	
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.

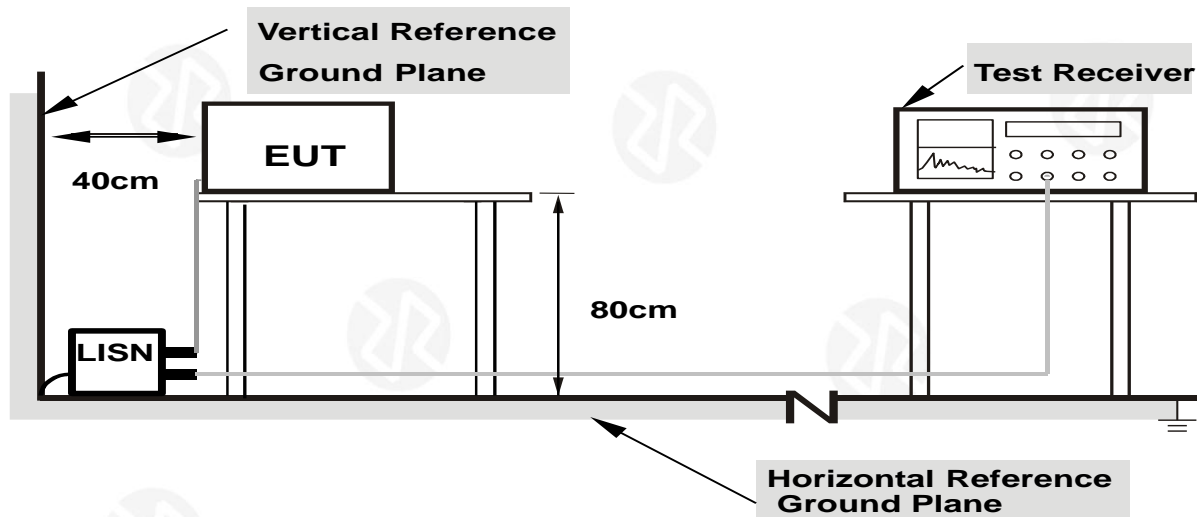
##### 4.1.2 1.5.2TEST PROCEDURE

- 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 1.5.3DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.4 1.5.4TEST SETUP



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

#### 4.1.5 1.5.5EUT 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 :	26°C	Relative Humidity:	54%
Pressure :	101kPa	Phase :	L
Test Voltage :	N/A		

#### 4.2 1.6RADIATED 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 1.6.1RADIATED 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

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
24.0-24.25 GHz	250	2500

##### 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).

#### 4.2.2 1.6.2 TEST PROCEDURE

- a. 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.
- b. 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.
- c. 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.
- d. 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.
- e. 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.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- g. 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:

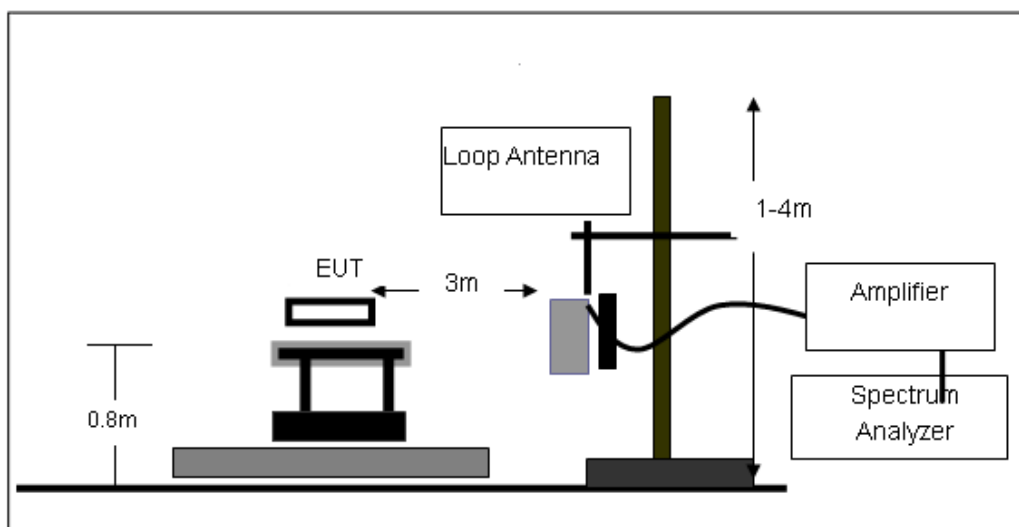
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

#### 4.2.3 1.6.3 DEVIATION FROM TEST STANDARD

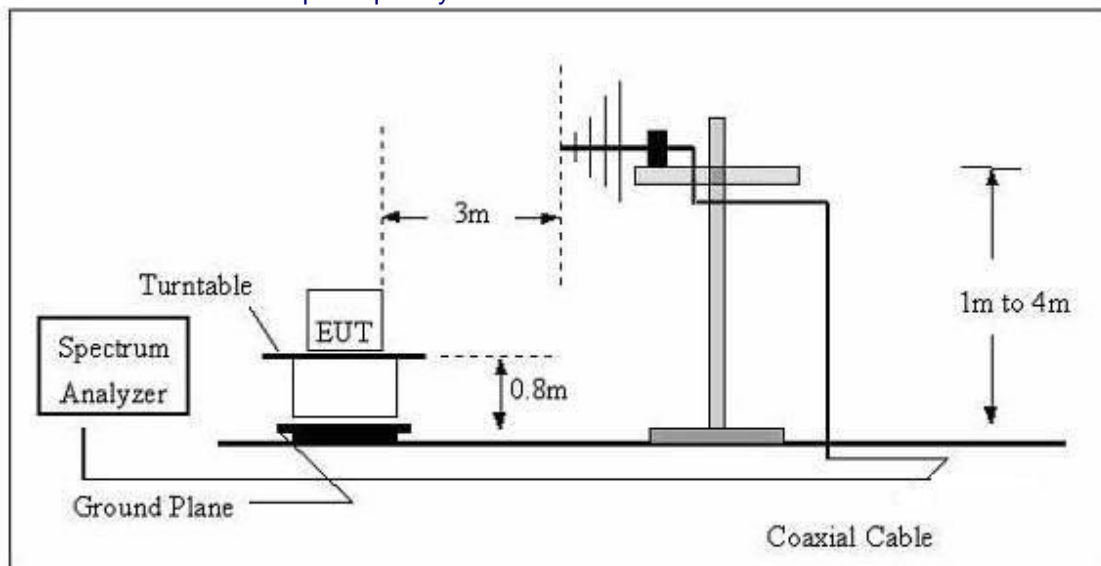
No deviation

#### 4.2.4 1.6.4 TEST SETUP

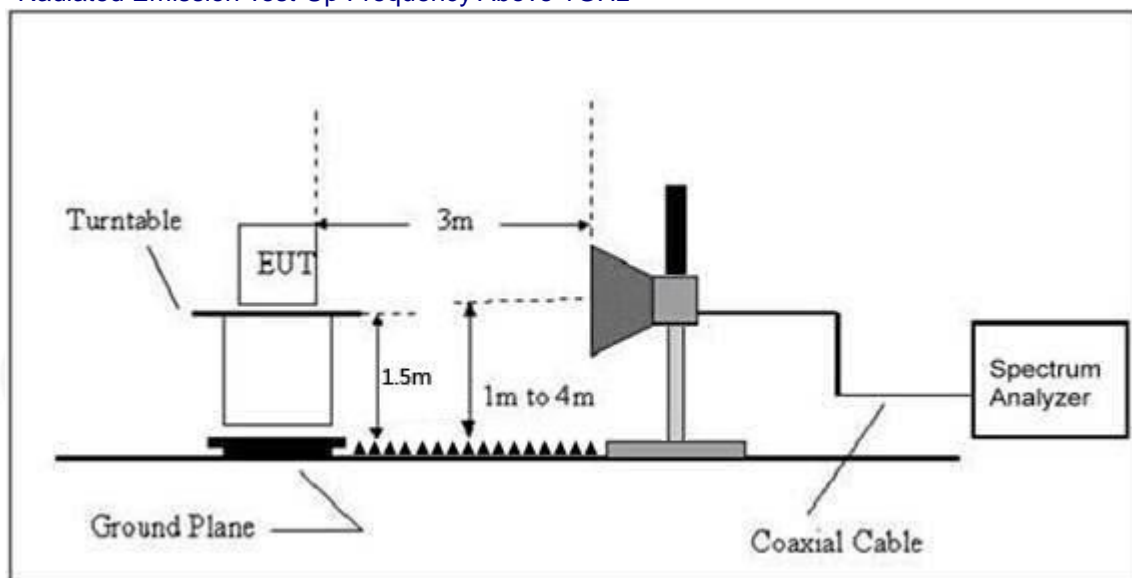
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



4.2.5 1.6.5EUT OPERATING CONDITIONS

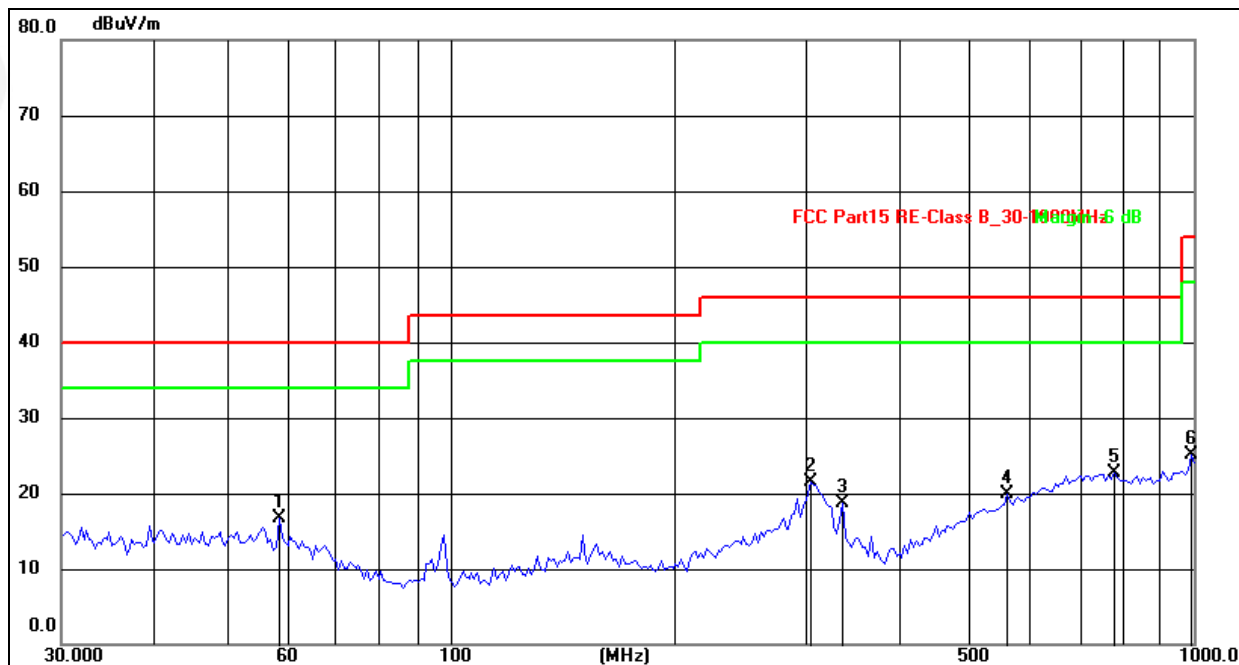
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

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.

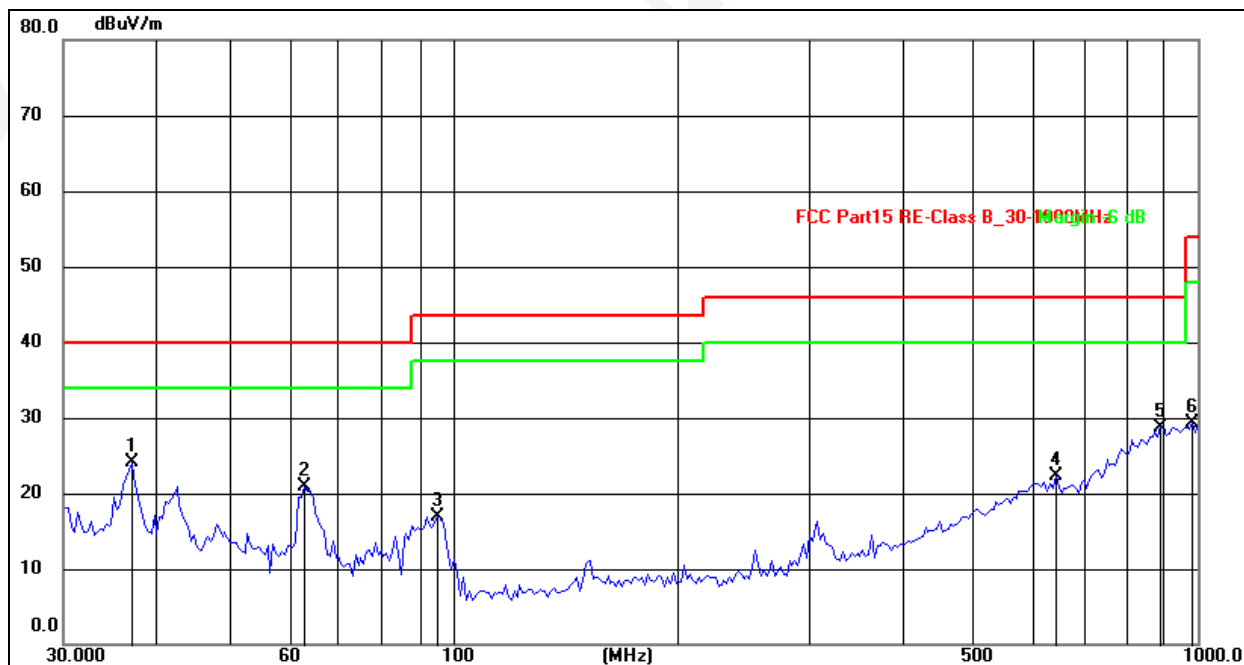
2Between 30MHz – 1GHz

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	DC3.0V		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	58.9217	30.90	-14.22	16.68	40.00	-23.32	QP
2	306.2163	38.40	-16.96	21.44	46.00	-24.56	QP
3	337.2155	35.46	-16.83	18.63	46.00	-27.37	QP
4	560.6928	29.77	-9.93	19.84	46.00	-26.16	QP
5	782.3453	29.55	-6.90	22.65	46.00	-23.35	QP
6	991.2719	30.14	-5.05	25.09	54.00	-28.91	QP

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	DC3.0V		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	37.0248	41.33	-17.31	24.02	40.00	-15.98	QP
2	63.2023	39.55	-18.64	20.91	40.00	-19.09	QP
3	95.4269	38.34	-21.34	17.00	43.50	-26.50	QP
4	645.1194	29.99	-7.72	22.27	46.00	-23.73	QP
5	892.2908	29.76	-0.96	28.80	46.00	-17.20	QP
6	982.6200	29.54	-0.31	29.23	54.00	-24.77	QP

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.

Field Strength of The Fundamental Signal  
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2432.00	92.17	27.26	5.39	30.18	94.64	114.00	-19.36	Vertical
2432.00	91.45	27.26	5.39	30.18	93.92	114.00	-20.08	Horizontal
2452.00	90.41	27.33	5.43	30.06	93.11	114.00	-20.89	Vertical
2452.00	84.06	27.33	5.43	30.06	86.76	114.00	-27.24	Horizontal
2471.00	91.45	27.40	5.47	29.93	94.39	114.00	-19.61	Vertical
2471.00	88.29	27.40	5.47	29.93	91.23	114.00	-22.77	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2432.00	81.10	27.26	5.39	30.18	83.57	94.00	-10.43	Vertical
2432.00	79.39	27.26	5.39	30.18	81.86	94.00	-12.14	Horizontal
2452.00	78.27	27.33	5.43	30.06	80.97	94.00	-13.03	Vertical
2452.00	74.46	27.33	5.43	30.06	77.16	94.00	-16.84	Horizontal
2471.00	82.44	27.40	5.47	29.93	85.38	94.00	-8.62	Vertical
2471.00	78.70	27.40	5.47	29.93	81.64	94.00	-12.36	Horizontal

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:2432MHz									
V	4864.00	51.00	30.55	5.77	31.12	57.34	74.00	-16.66	Pk
V	4864.00	30.86	30.55	5.77	31.12	37.20	54.00	-16.80	AV
V	7296.00	49.09	30.33	6.32	36.04	61.12	74.00	-12.88	Pk
V	7296.00	31.57	30.33	6.32	36.04	43.60	54.00	-10.40	AV
V	9728.00	49.59	30.85	7.45	37.58	63.77	74.00	-10.23	Pk
V	9728.00	31.47	30.85	7.45	37.58	45.65	54.00	-8.35	AV
V	12160.00	49.69	31.02	8.99	39.10	66.76	74.00	-7.24	Pk
V	12160.00	31.47	31.02	8.99	39.10	48.54	54.00	-5.46	AV
H	4864.00	51.34	30.55	5.77	31.12	57.68	74.00	-16.32	Pk
H	4864.00	31.19	30.55	5.77	31.12	37.53	54.00	-16.47	AV
H	7296.00	49.98	30.33	6.32	36.04	62.01	74.00	-11.99	Pk
H	7296.00	31.24	30.33	6.32	36.04	43.27	54.00	-10.73	AV
H	9728.00	49.98	30.85	7.45	37.58	64.16	74.00	-9.84	Pk
H	9728.00	31.24	30.85	7.45	37.58	45.42	54.00	-8.58	AV
H	12160.00	49.98	31.02	8.99	39.10	67.05	74.00	-6.95	Pk
H	12160.00	30.24	31.02	8.99	39.10	47.31	54.00	-6.69	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:2452MHz									
V	4904.00	50.77	30.55	5.77	31.46	57.45	74.00	-16.55	Pk
V	4904.00	31.66	30.55	5.77	31.46	38.34	54.00	-15.66	AV
V	7356.00	49.30	30.33	6.32	36.15	61.44	74.00	-12.56	Pk
V	7356.00	31.34	30.33	6.32	36.15	43.48	54.00	-10.52	AV
V	9808.00	49.37	30.85	7.45	37.76	63.73	74.00	-10.27	Pk
V	9808.00	31.34	30.85	7.45	37.76	45.70	54.00	-8.30	AV
V	12260.00	49.27	31.02	8.99	39.10	66.34	74.00	-7.66	Pk
V	12260.00	31.34	31.02	8.99	39.10	48.41	54.00	-5.59	AV
H	4904.00	52.13	30.55	5.77	31.46	58.81	74.00	-15.19	Pk
H	4904.00	31.69	30.55	5.77	31.46	38.37	54.00	-15.63	AV
H	7356.00	52.84	30.33	6.32	36.15	64.98	74.00	-9.02	Pk
H	7356.00	31.47	30.33	6.32	36.15	43.61	54.00	-10.39	AV
H	9808.00	52.84	30.85	7.45	37.76	67.20	74.00	-6.80	Pk
H	9808.00	31.47	30.85	7.45	37.76	45.83	54.00	-8.17	AV
H	12260.00	49.34	31.02	8.99	39.10	66.41	74.00	-7.59	Pk
H	12260.00	31.47	31.02	8.99	39.10	48.54	54.00	-5.46	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:2471MHz									
V	4942.00	50.47	30.55	5.77	31.79	57.48	74.00	-16.52	Pk
V	4942.00	32.01	30.55	5.77	31.79	39.02	54.00	-14.98	AV
V	7413.00	52.98	30.33	6.32	36.38	65.35	74.00	-8.65	Pk
V	7413.00	32.33	30.33	6.32	36.38	44.70	54.00	-9.30	AV
V	9884.00	52.98	30.85	7.45	36.50	66.08	74.00	-7.92	Pk



V	9884.00	32.82	30.85	7.45	36.50	45.92	54.00	-8.08	AV
V	12355.00	52.98	31.02	8.99	39.11	70.06	74.00	-3.94	Pk
V	12355.00	32.22	31.02	8.99	39.11	49.30	54.00	-4.70	AV
H	4942.00	50.56	30.55	5.77	31.79	57.57	74.00	-16.43	Pk
H	4942.00	32.23	30.55	5.77	31.79	39.24	54.00	-14.76	AV
H	7413.00	52.15	30.33	6.32	36.38	64.52	74.00	-9.48	Pk
H	7413.00	32.49	30.33	6.32	36.38	44.86	54.00	-9.14	AV
H	9884.00	52.75	30.85	7.45	36.50	65.85	74.00	-8.15	Pk
H	9884.00	32.59	30.85	7.45	36.50	45.69	54.00	-8.31	AV
H	12355.00	52.65	31.02	8.99	39.11	69.73	74.00	-4.27	Pk
H	12355.00	32.59	31.02	8.99	39.11	49.67	54.00	-4.33	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. BANDWIDTH OF FREQUENCY BAND EDGE

### 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

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 in § 15.209, whichever is the lesser attenuation

### 5.2 TEST PROCEDURE

Above 1GHz test procedure as below:

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- Test the EUT in the lowest channel, the Highest channel

Note:

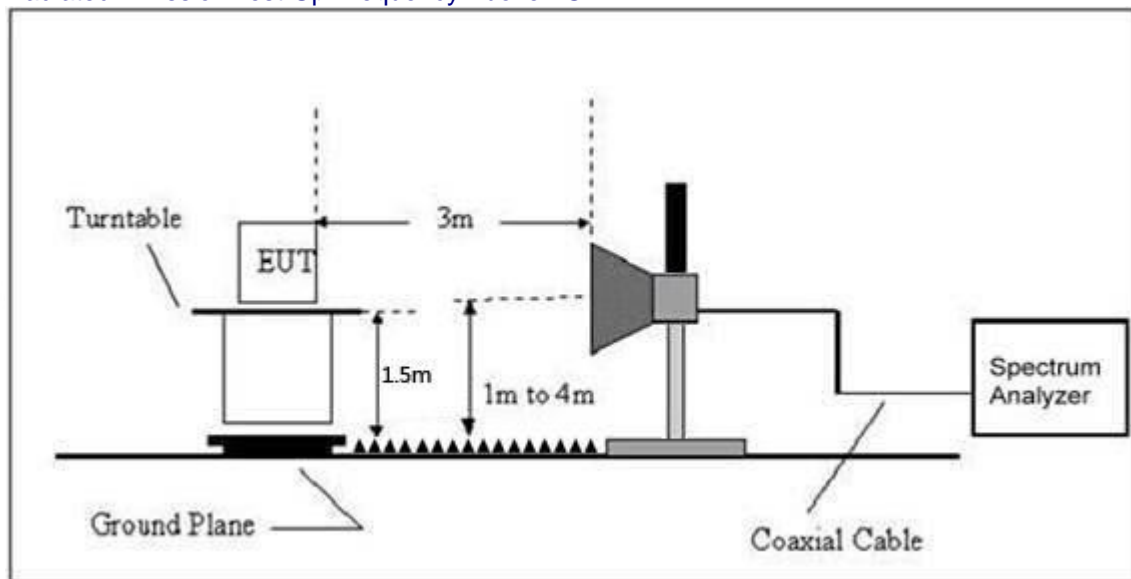
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 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.

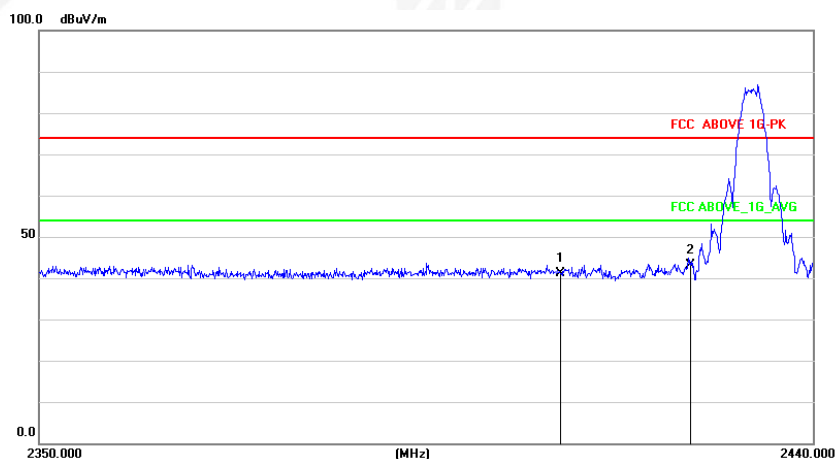
## 5.6 TEST RESULT

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Test Voltage :	DC3.0V
Test Mode :	TX Mode		

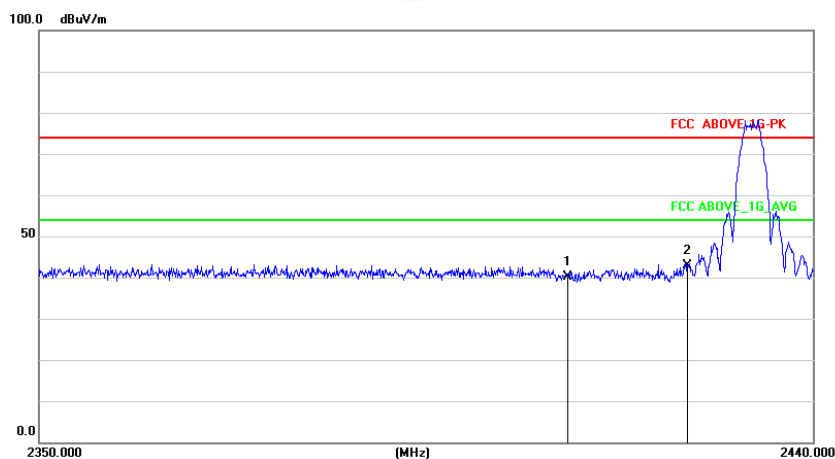
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	39.31	27.59	5.38	30.18	42.10	74.00	-31.90	Horizontal
2400.00	42.44	27.58	5.39	30.18	45.23	74.00	-28.77	Horizontal
2390.00	37.25	27.59	5.38	30.18	40.04	74.00	-33.96	Vertical
2400.00	41.34	27.58	5.39	30.18	44.13	74.00	-29.87	Vertical

2432MHz Horizontal



2432MHz Vertical

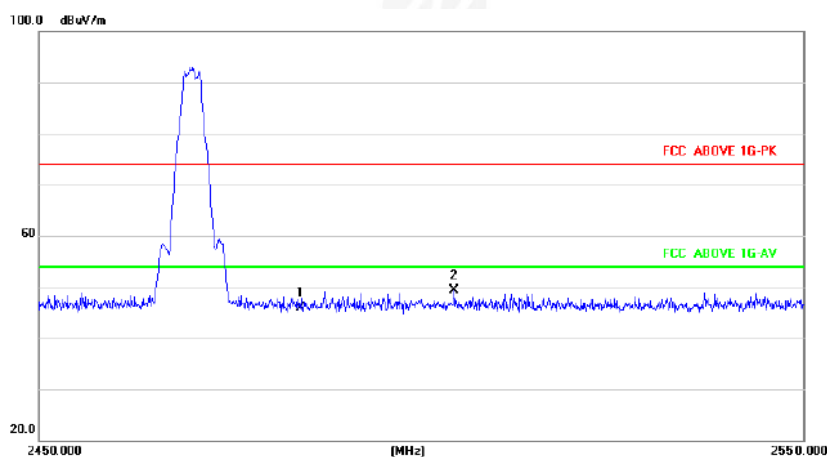


Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Test Voltage :	DC3.0V
Test Mode :	TX Mode		

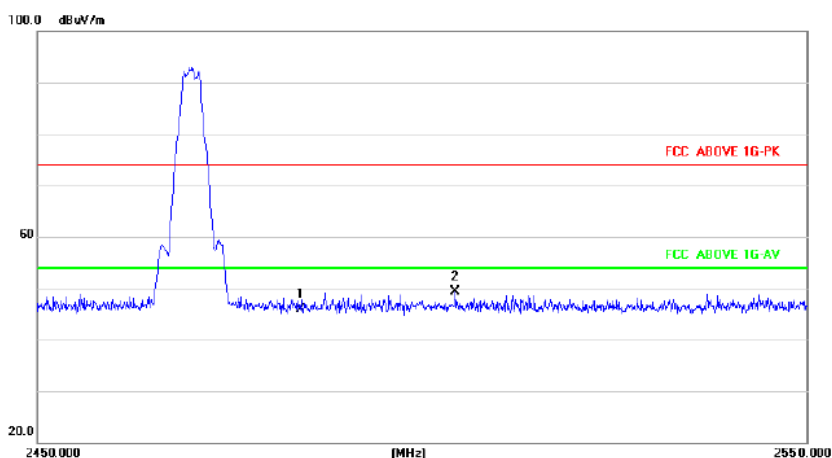
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	35.86	27.53	5.47	29.93	38.93	74.00	-35.07	Horizontal
2500.00	37.02	27.55	5.49	29.93	40.13	74.00	-33.87	Horizontal
2483.50	34.49	27.53	5.47	29.93	37.56	74.00	-36.44	Vertical
2500.00	35.92	27.55	5.49	29.93	39.03	74.00	-34.97	Vertical

2471MHz Horizontal



2471MHz Vertical



## 6. CHANNEL BANDWIDTH

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10: 2013

### 7.1 APPLIED PROCEDURES / LIMIT

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

### 7.2 2.1TEST PROCEDURE

1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 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) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 7.3 2.2DEVIATION FROM STANDARD

No deviation.

### 7.4 2.3TEST SETUP



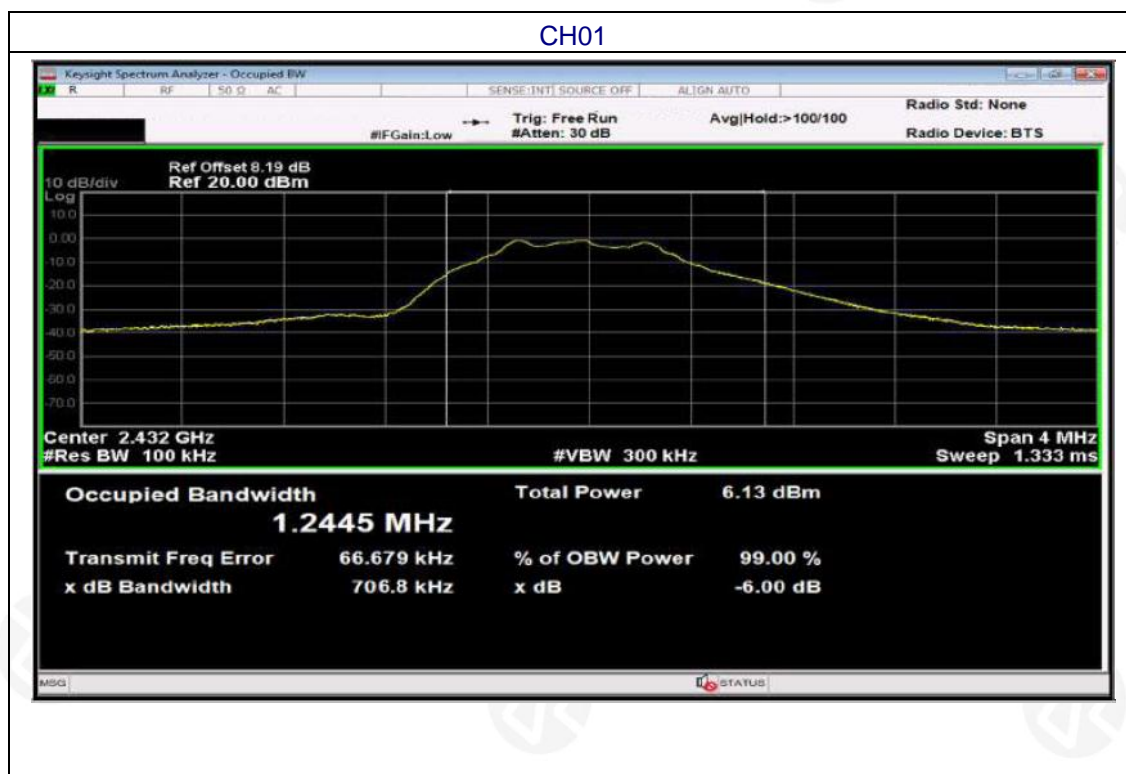
### 7.5 2.4EUT OPERATION CONDITIONS

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.

## 7.6 2.5TEST RESULTS

Temperature :	26℃	Relative Humidity :	54%
Test Mode :	GFSK	Test Voltage :	DC3.0V

Test channel	Channel Bandwidth (MHz)	Result
Lowest	0.706	Pass
Middle	0.707	
Highest	0.799	





## CH02



## CH03





## 8. CONDUCTED SPURIOUS EMISSION

Test Requirement:	FCC Part15 C Section 15.249
Test Method:	ANSI C63.10: 2013

### 8.1 APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 8.2 TEST PROCEDURE

Using the following spectrum analyzer setting:

- A) Set the RBW = 100KHz.
- B) Set the VBW = 300KHz.
- C) Sweep time = auto couple.
- D) Detector function = peak.
- E) Trace mode = max hold.
- F) Allow trace to fully stabilize.

### 8.3 DEVIATION FROM STANDARD

No deviation.

### 8.4 TEST SETUP

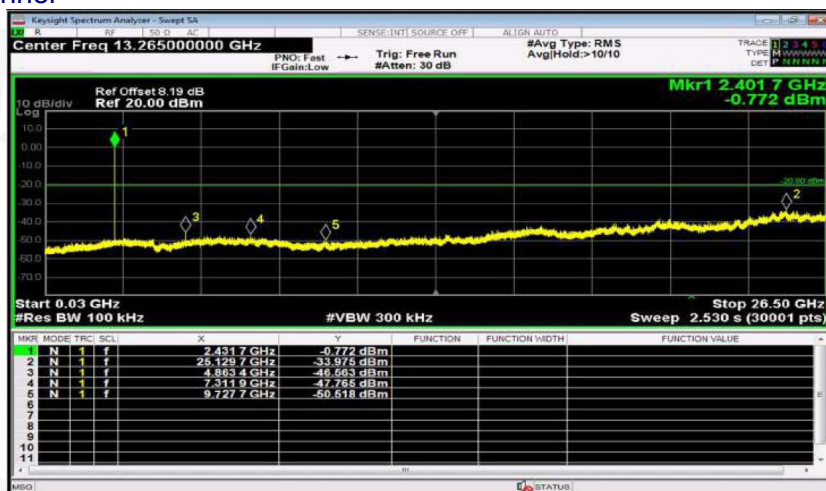


### 8.5 EUT OPERATION CONDITIONS

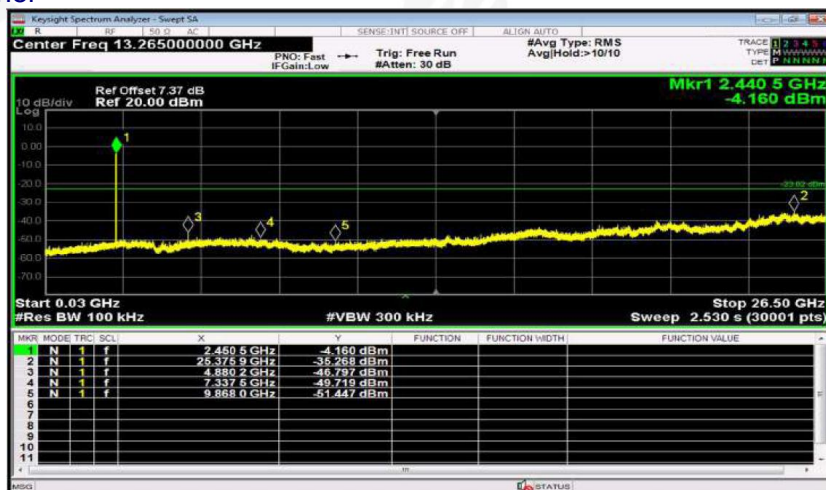
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 8.6 TEST RESULTS

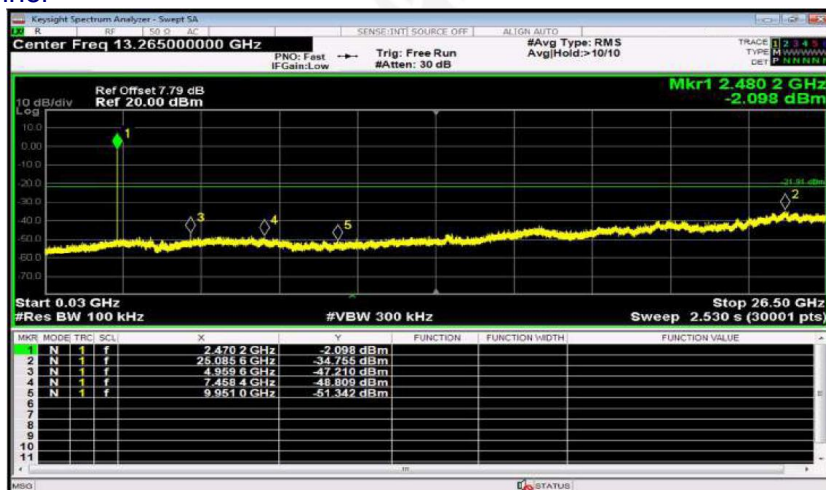
### Lowest channel



### Middle channel



### Highest channel



## 9.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 antennas are PCB antenna, the best case gain of the antennas are 0dBi, reference to the appendix II for details	

**10. TEST SETUP PHOTO**

Reference to the appendix I for details.

**11. EUT CONSTRUCTIONAL DETAILS**

Reference to the appendix II for details.

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