



**CTC Laboratories, Inc.**

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## TEST REPORT

Report No. ....: GTI20190695F  
FCC ID.....: 2AB75-WM-610  
Applicant.....: Wintop Electronics Co., Ltd  
Address.....: Unit 04 7/F, Bright Way Tower 33, Mong Kok RD, KL, Hong Kong  
Manufacturer.....: Shenzhen Wintop Electronics Co.,Ltd  
Address.....: No.46 Xinhe Road Shangmugu Pinghu Town Longgang District Shenzhen China  
Product Name.....: Wireless Mouse  
Trade Mark.....: N.A.  
Model/Type reference.....: WM-610  
Listed Model(s) .....: WM-697、WM-693  
Standard.....: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.  
Date of receipt of test sample....: 2019.04.13  
Date of testing.....: 2019.04.13 ~ 2019.04.26  
Date of issue.....: 2019.04.26  
Result.....: PASS

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( Printed name+signature) Eric Zhang

Approved by:  
( Printed name+signature) Walter Chen

Testing Laboratory Name : CTC Laboratories, Inc.  
Address : 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

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## 1. TEST SUMMARY

### 1.1. Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.249:** Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices.

### 1.2. Report version

Version No.	Date of issue	Description
00	2019.04.26	Original



### 1.3. Test Description

Test Item	Section in CFR 47	Result	Test Engineer
AC Power Line Conducted Emissions	15.207	N/A	N/A
20dB Occupied Bandwidth	15.215/15.249	PASS	Young He
Field strength of the Fundamental signal	15.249(a)	PASS	Young He
Spurious Emissions	15.209/15.249(a)	PASS	Young He
Band edge Emissions	15.205/15.249(d)	PASS	Young He
Antenna requirement	15.203	PASS	Young He

Note: The measurement uncertainty is not included in the test result.

This device is only powered battery ,no need for part 15.207.



## 1.4. Test Facility

### Address of the report laboratory

#### CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

### Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### CNAS-Lab Code: L5365

CTC Laboratories, Inc. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### IC Registration No.: 9783A

The 3m alternate test site of CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

#### FCC-Registration No.:951311

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.  
RegistrationCN1208, Sep 07, 2017



## 1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen General Testing & Inspection Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for Shenzhen General Testing & Inspection Technology Co., Ltd.

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)

**Note (1):** This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.



## 1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba



## 2.GENERAL INFORMATION

### 2.1. Client Information

Applicant:	Wintop Electronics Co., Ltd
Address:	Unit 04 7/F, Bright Way Tower 33, Mong Kok RD, KL, Hong Kong
Manufacturer:	Shenzhen Wintop Electronics Co.,Ltd
Address:	No.46 Xinhe Road Shangmugu Pinghu Town Longgang District Shenzhen China
Factory:	Shenzhen Wintop Electronics Co.,Ltd
Address:	No.46 Xinhe Road Shangmugu Pinghu Town Longgang District Shenzhen China

### 2.2. General Description of EUT

Product Name:	Wireless Mouse
Model/Type reference:	WM-610
Adding Model(s):	WM-697、WM-693
Model difference:	Just named differently.
Power supply:	Battery: DC 3.0V
Hardware version:	V1.0
Software version:	V1.0
<b>ANT+:</b>	
Supported type:	ANT+
Modulation:	GFSK
Operation frequency:	2405MHz.2442MHz.2474MHz
Antenna type:	PCB Antenna
Antenna gain:	3.9dBi



### 3. Description of Test Modes

#### Peripherals Devices:

OUTSIDE SUPPORT EQUIPMENT						
No.	Equipment	Model	Serial No.	Manufacture	Trade name	Remark
						N.A
						N.A
						N.A

**Note:** All the above equipment /cable were placed in worse case position to maximize emission signals during emission test.

#### Operation Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) mode for testing.

#### ANT+

Channel	Frequency (MHz)
CH <sub>L</sub>	<b>2405</b>
CH <sub>M</sub>	<b>2442</b>
CH <sub>H</sub>	<b>2474</b>

#### TEST MODE:

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The EUT was set to connect with large package sizes transmission.



## 4. Measurement Instruments List

Tonscend JS0806-2 Test system						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated until
1	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Jan. 07, 2017	Dec. 28 2019
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Jan. 07, 2017	Dec. 28 2019
3	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Jan. 07, 2017	Dec. 28 2019
4	Signal Generator	Agilent	E8257D	MY46521908	Jan. 07, 2017	Dec. 28 2019
5	Power Sensor	Agilent	U2021XA	MY5365004	Jan. 07, 2017	Dec. 28 2019
6	Power Sensor	Agilent	U2021XA	MY5365006	Jan. 07, 2017	Dec. 28 2019
7	Simultaneous Sampling DAQ	Agilent	U2531A	TW54493510	Jan. 07, 2017	Dec. 28 2019
8	Climate Chamber	TABAI	PR-4G	A8708055	Jan. 07, 2017	Dec. 28 2019
9	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Jan. 06, 2018	Dec. 28 2019
10	Climate Chamber	ESPEC	MT3065	/	Jan. 04, 2018	Dec. 28 2019
11	300328 v2.1.1 test system	TONSCEND	v2.6	/	/	/

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	Rohde & Schwarz	ESCI	100658	Dec. 28 2019
2	High pass filter	micro-tranics	HPM50111	142	Dec. 28 2019
3	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Dec. 28 2019
4	Ultra-Broadband Antenna	ShwarzBeck	BBHA9170	25841	Dec. 28 2019
5	Loop Antenna	LAPLAC	RF300	9138	Dec. 28 2019
6	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 28 2019
7	Horn Antenna	Schwarzbeck	BBHA 9120D	647	Dec. 28 2019
8	Pre-Amplifier	HP	8447D	1937A03050	Dec. 28 2019
9	Pre-Amplifier	EMCI	EMC051835	980075	Dec. 28 2019
10	Antenna Mast	UC	UC3000	N/A	N/A
11	Turn Table	UC	UC3000	N/A	N/A
12	Cable Below 1GHz	Schwarzbeck	AK9515E	33155	Dec. 28 2019
13	Cable Above 1GHz	Hubersuhner	SUCOFLEX102	DA1580	Dec. 28 2019
14	Splitter	Mini-Circuit	ZAPD-4	400059	Dec. 28 2019
15	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	Dec. 28 2019

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Tel.: (86)755-27521059Fax: (86)755-27521011 [Http://www.sz-ctc.org.cn](http://www.sz-ctc.org.cn)For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : [yz.cncaic.cn](http://yz.cncaic.cn)



16	RF Connection Cable	Chengdu E-Microwave	---	---	Dec. 28 2019
17	High pass filter	Compliance Direction systems	BSU-6	34202	Dec. 28 2019
18	Attenuator	Chengdu E-Microwave	EMCAXX-10R NZ-3	---	Dec. 28 2019
19	High and low temperature box	ESPEC	MT3065	12114019	Dec. 28 2019

Note:1. The Cal. Interval was one year.

2. The cable loss has calculated in test result which connection between each test instruments.

## 5. TEST ITEM AND RESULTS

### 5.1. AC Power Line Conducted Emissions

#### Limit

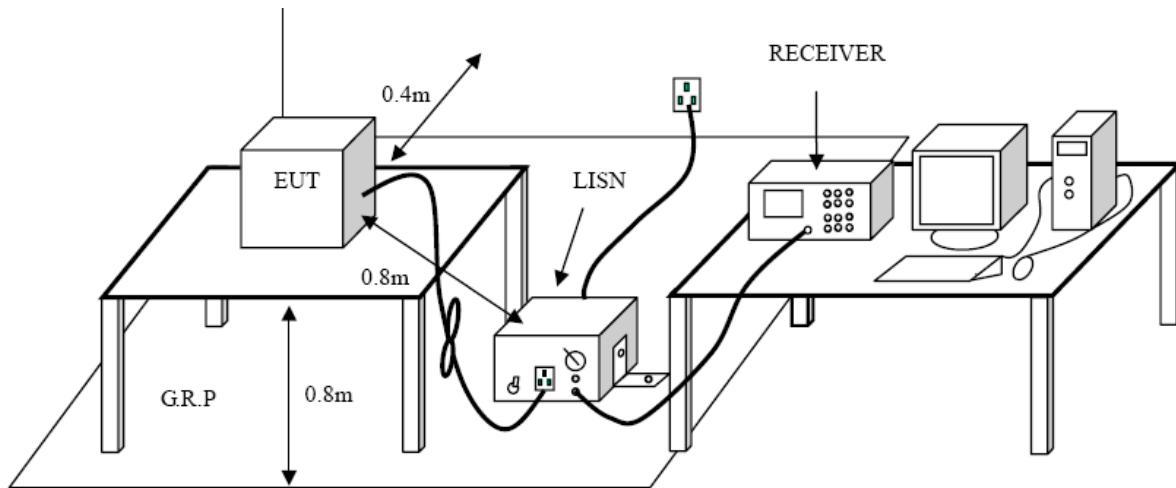
#### Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dB $\mu$ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

#### Test Configuration



#### Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

**Test Mode:**

Please refer to the clause 3

**Test Results**

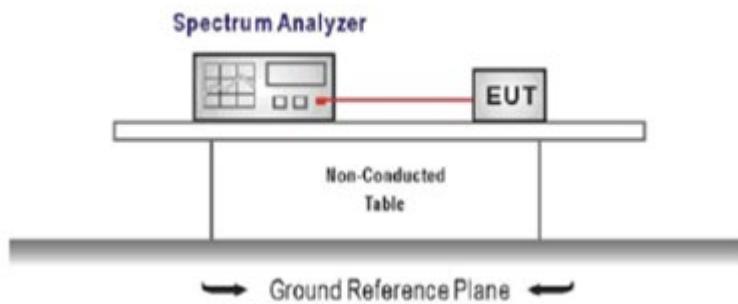
For the mouse, battery powered, no testing required.

## 5.2. 20 dB Occupied Bandwidth

### Limit

Operation frequency range 2400MHz~2483.5MHz.

### TEST CONFIGURATION



### TEST PROCEDURE

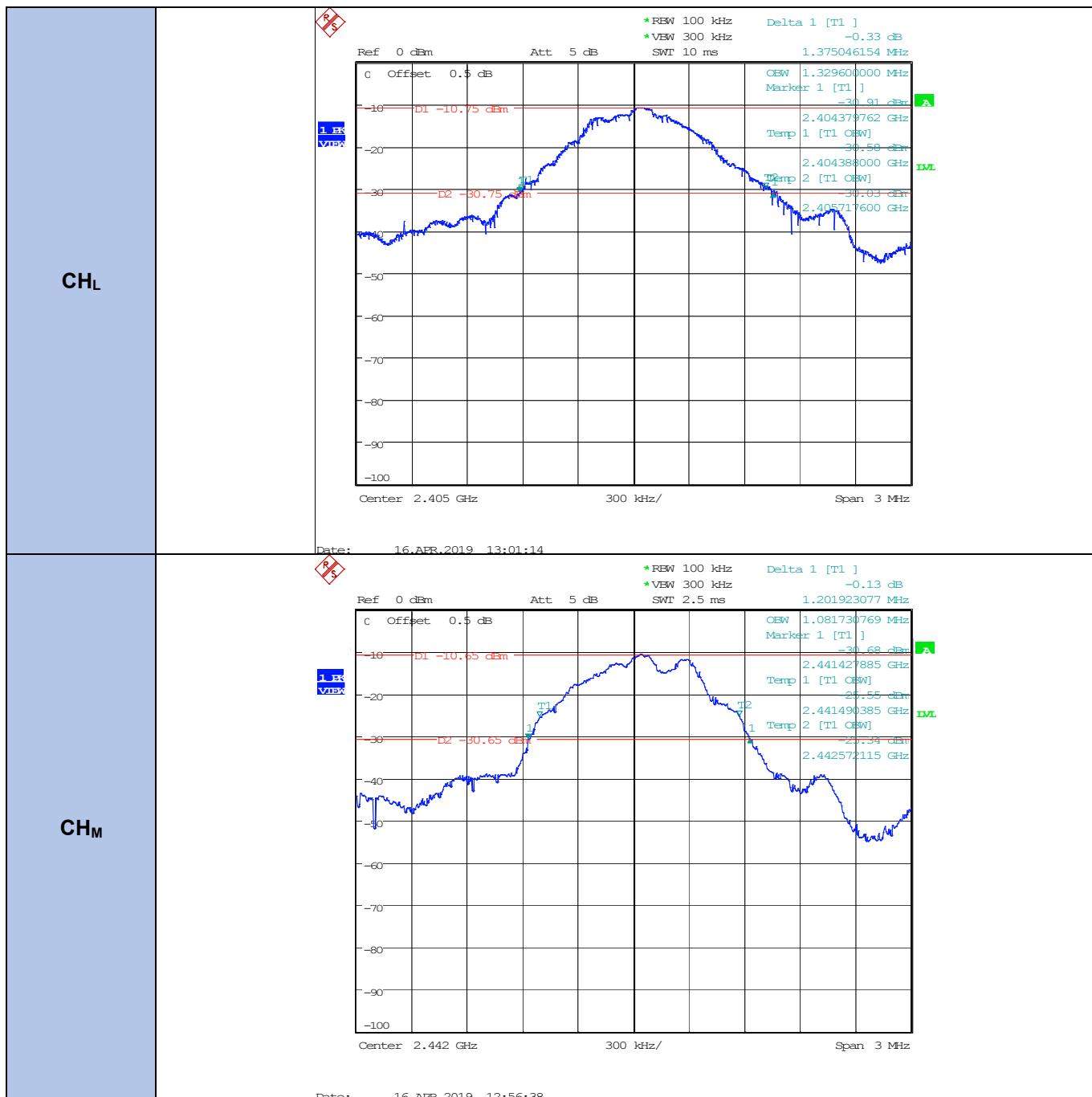
1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:  
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  
RBW  $\geq$  1% of the 20 dB bandwidth, VBW  $\geq$  RBW  
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

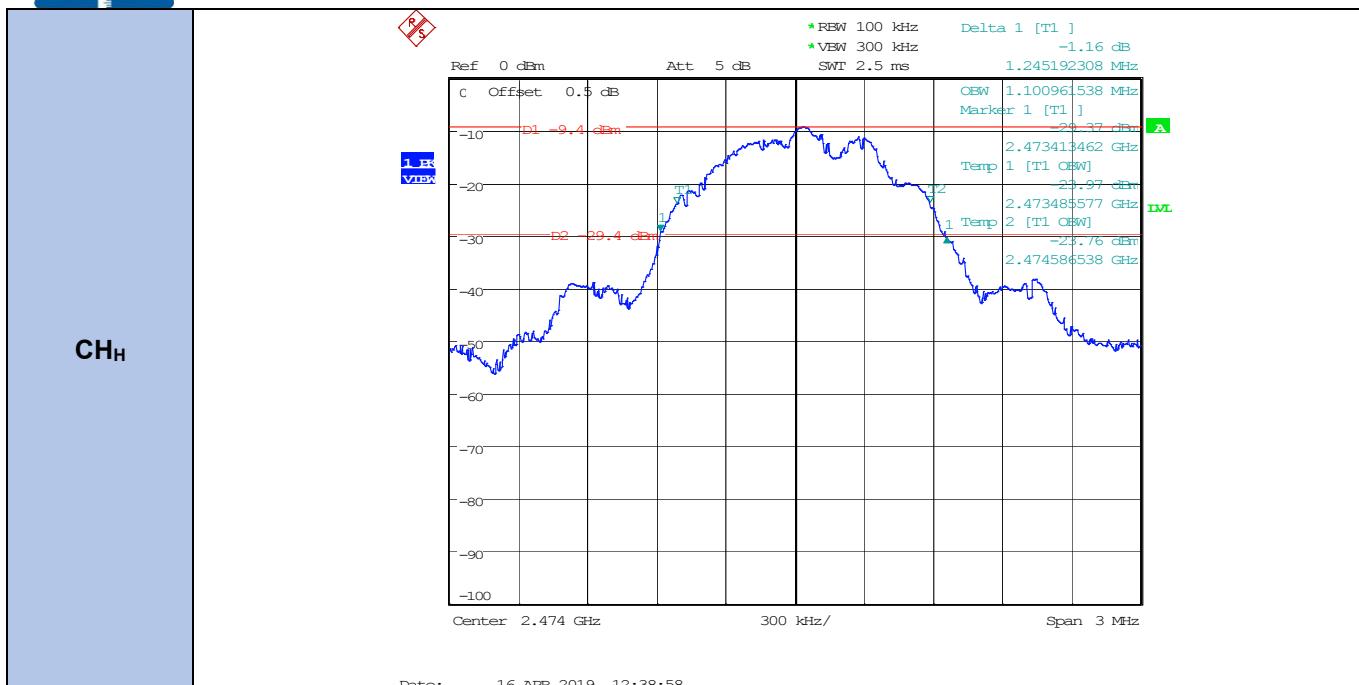
### TEST MODE:

Please refer to the clause 3

### TEST RESULTS

Type	Channel	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
GFSK	CH <sub>L</sub>	1.3750	1.3296	Pass
GFSK	CH <sub>M</sub>	1.2019	1.0817	Pass
GFSK	CH <sub>H</sub>	1.2452	1.1010	Pass





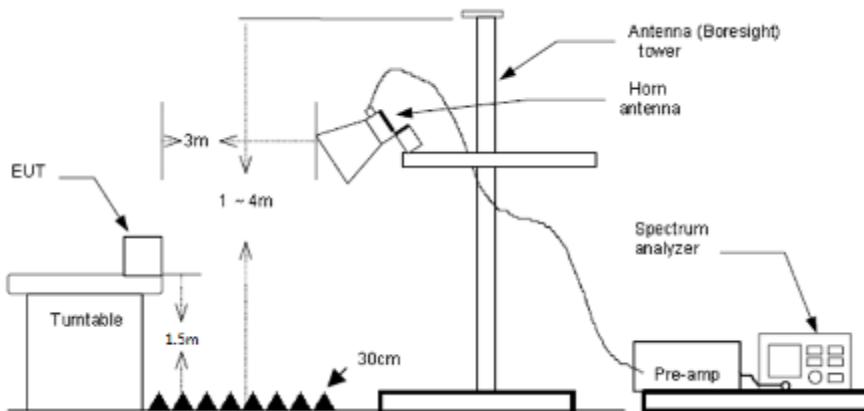
### 5.3. Radiated field strength of the fundamental signal

#### LIMIT

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
2400-2483.5 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
5725-5875 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
24.0-24.25 GHz	250 (108dBuV/m @3m)	2500 (68dBuV/m @3m)

Frequencies above 1000 MHz, the field strength limits are based on average limits

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:  
RBW=1MHz, VBW=3MHz Peak detector for Peak value.  
RBW=1MHz, VBW=3MHz RMS detector for Average value.

#### TEST MODE:

Please refer to the clause 3



## TEST RESULTS

Frequency (MHz)	Read Level (dBuV)	Correction Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin	Polarization	Test value
					(dB)		
2405	61.77	-6.28	55.49	114	-58.51	Vertical	Peak
2405	63.01	-6.28	56.73	114	-57.27	Horizontal	Peak
2442	62.97	-5.63	57.34	114	-56.66	Vertical	Peak
2442	60.32	-5.63	54.69	114	-59.31	Horizontal	Peak
2474	64.11	-6.23	57.88	114	-56.12	Vertical	Peak
2474	63.35	-6.23	57.12	114	-56.88	Horizontal	Peak

### Remark:

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
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

## 5.4. Radiated Spurious Emissions and Bandedge Emission

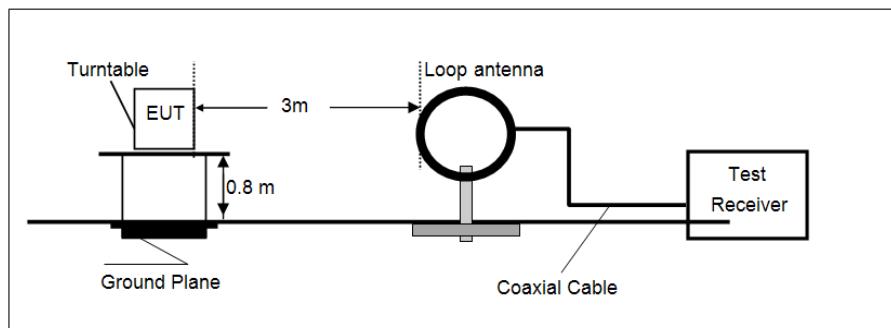
### LIMIT

#### FCC CFR Title 47 Part 15 Subpart C Section 15.209

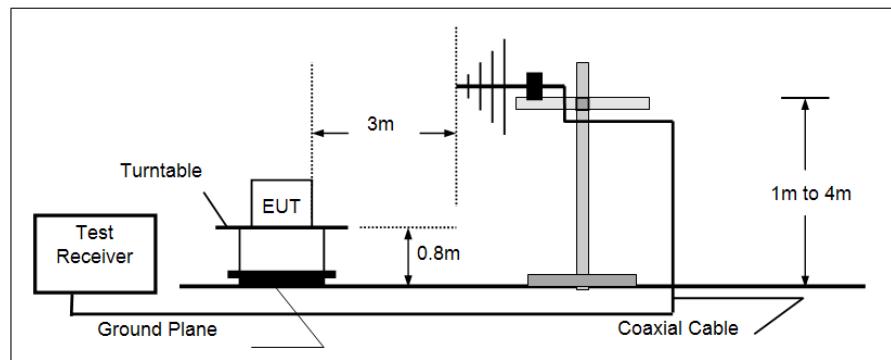
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

### TEST CONFIGURATION

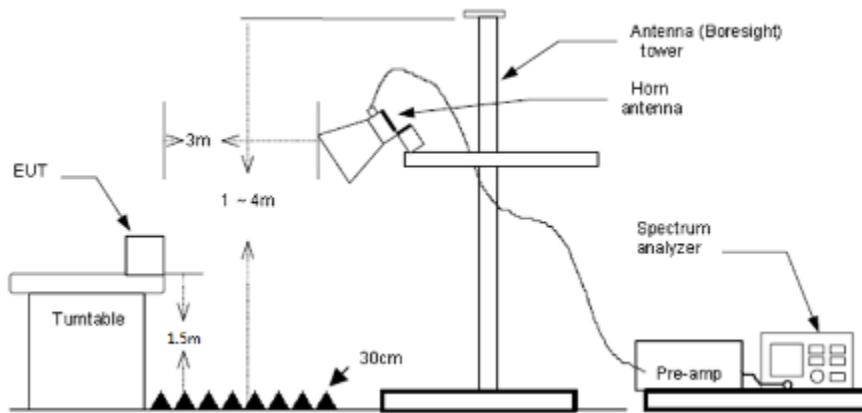
- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



- Above 1 GHz



## TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Below 1 GHz:  
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;  
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
  - (3) From 1 GHz to 10<sup>th</sup> harmonic:  
RBW=1MHz, VBW=3MHz Peak detector for Peak value.  
RBW=1MHz, VBW=3MHz RMS detector for Average value.

## TEST MODE:

Please refer to the clause 3

## TEST RESULTS

Note:

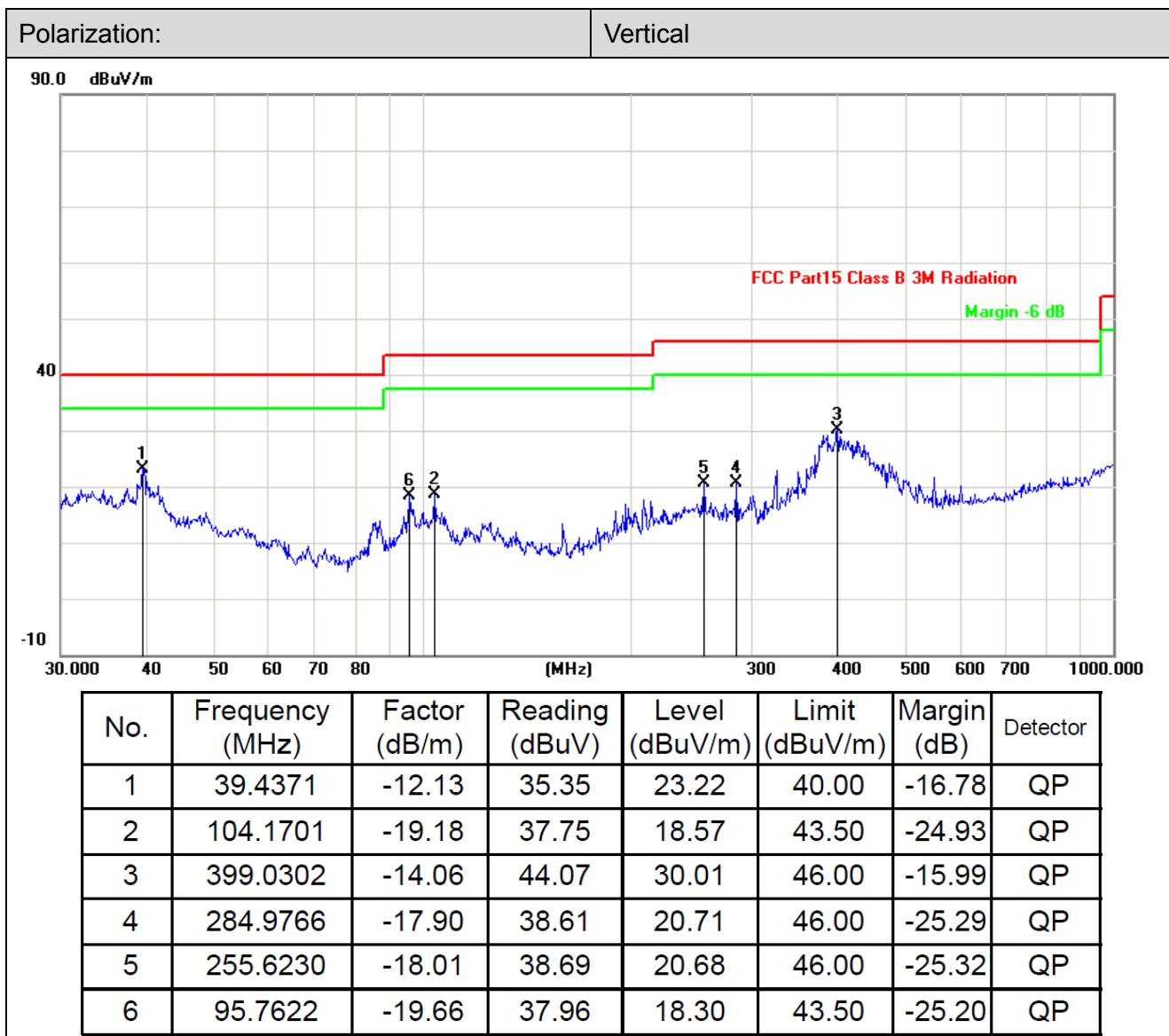
- 1) Above 1GHz Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.

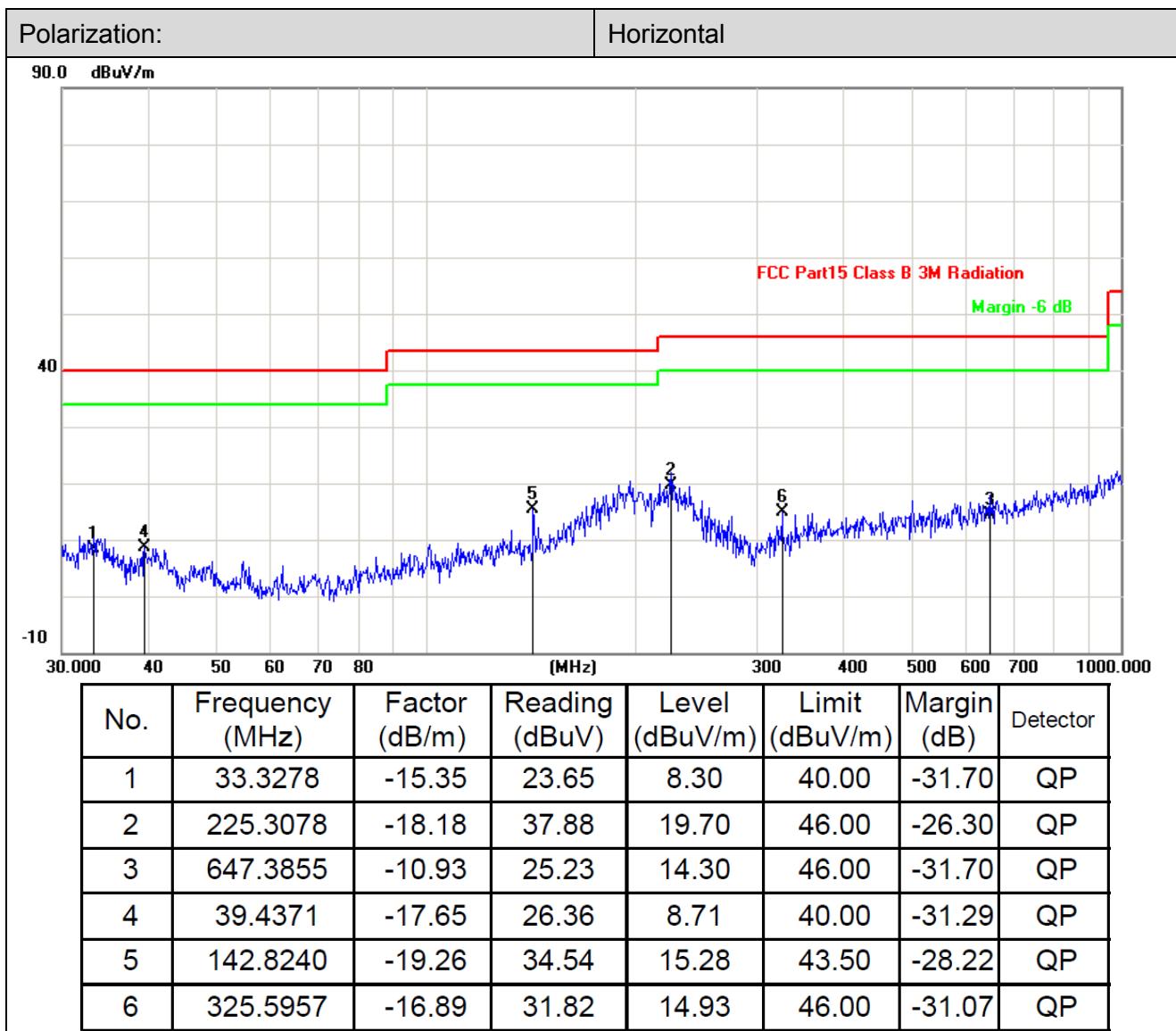
### Radiated Spurious Emissions

#### ■ 9 kHz ~ 30 MHz

The EUT was pre-scanned the frequency band (9 kHz ~ 30 MHz), found the radiated level lower than the limit, so don't show on the report.

#### ■ 30 MHz ~ 1 GHz




**Remark:**

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
3. Margin value = Limit value - Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.



## ■ Above 1 GHz

## 2405MHz:

Frequency (MHz)	Read Level (dBuV)	Correction Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin	Polarization	Test value
					(dB)		
4810	45.23	-4.29	40.94	74	-33.06	Vertical	Peak
7215	42.88	1.05	43.93	74	-30.07	Vertical	Peak
4810	43.54	-4.29	39.25	74	-34.75	Horizontal	Peak
7215	42.08	1.05	43.13	74	-30.87	Horizontal	Peak

## 2442MHz:

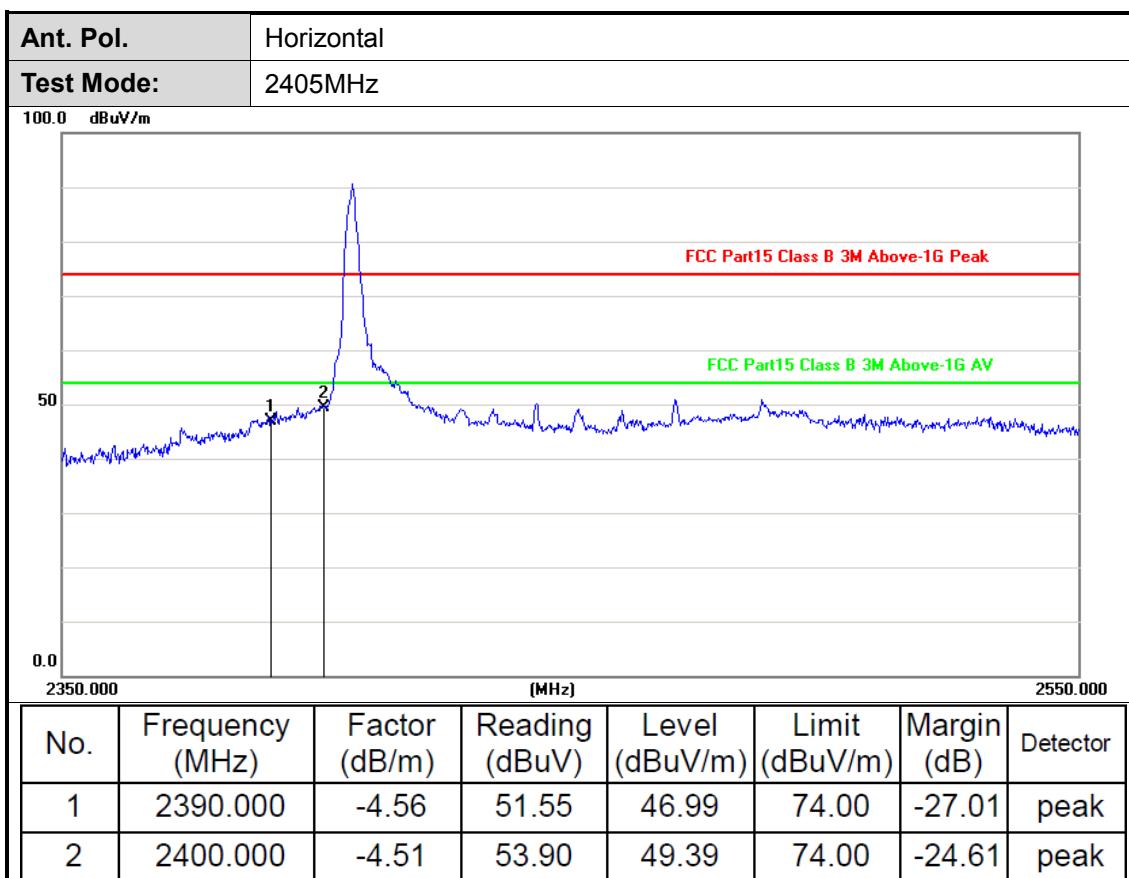
Frequency (MHz)	Read Level (dBuV)	Correction Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin	Polarization	Test value
					(dB)		
4884	43.01	-4.29	38.72	74	-35.28	Vertical	Peak
7326	43.39	1.05	44.44	74	-29.56	Vertical	Peak
4884	44.85	-4.29	40.56	74	-33.44	Horizontal	Peak
7326	41.52	1.05	42.57	74	-31.43	Horizontal	Peak

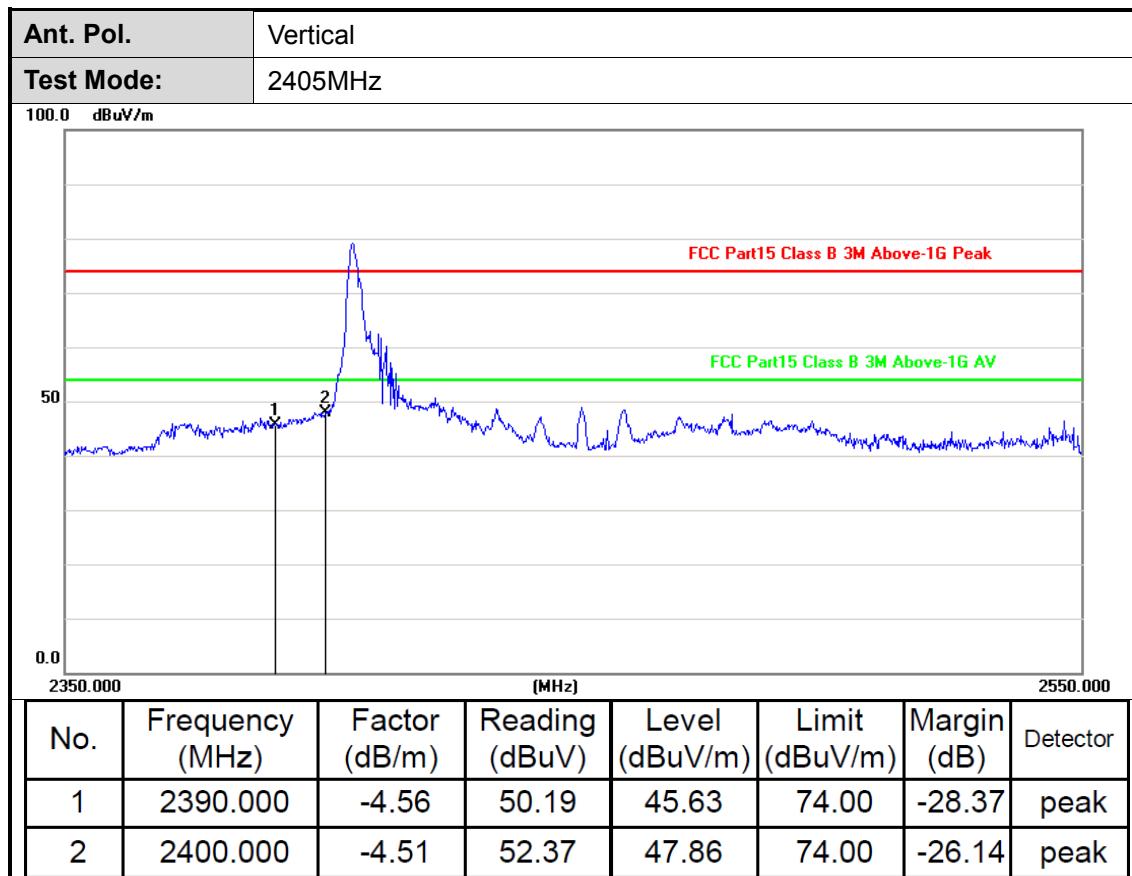
## 2474MHz:

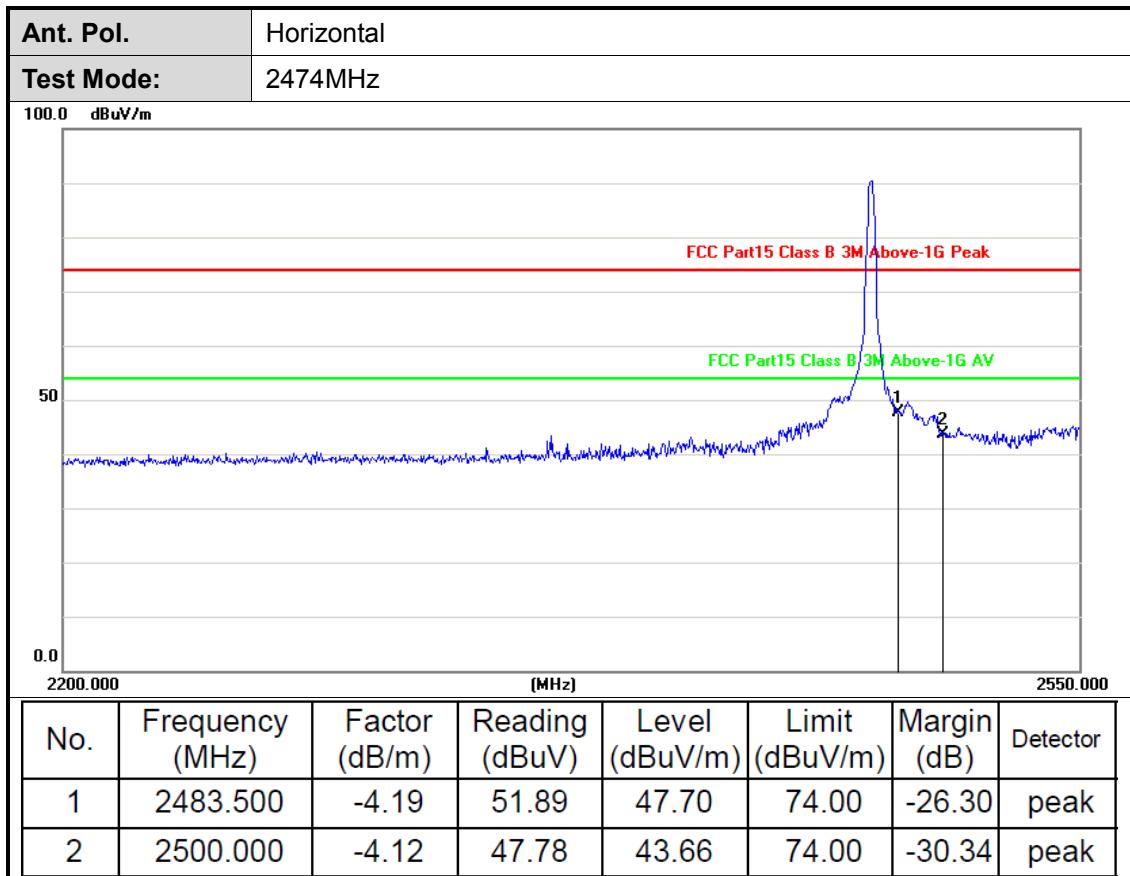
Frequency (MHz)	Read Level (dBuV)	Correction Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin	Polarization	Test value
					(dB)		
4948	48.02	-4.29	43.73	74	-30.27	Vertical	Peak
7422	43.52	1.05	44.57	74	-29.43	Vertical	Peak
4948	44.81	-4.29	40.52	74	-33.48	Horizontal	Peak
7422	43.77	1.05	44.82	74	-29.18	Horizontal	Peak

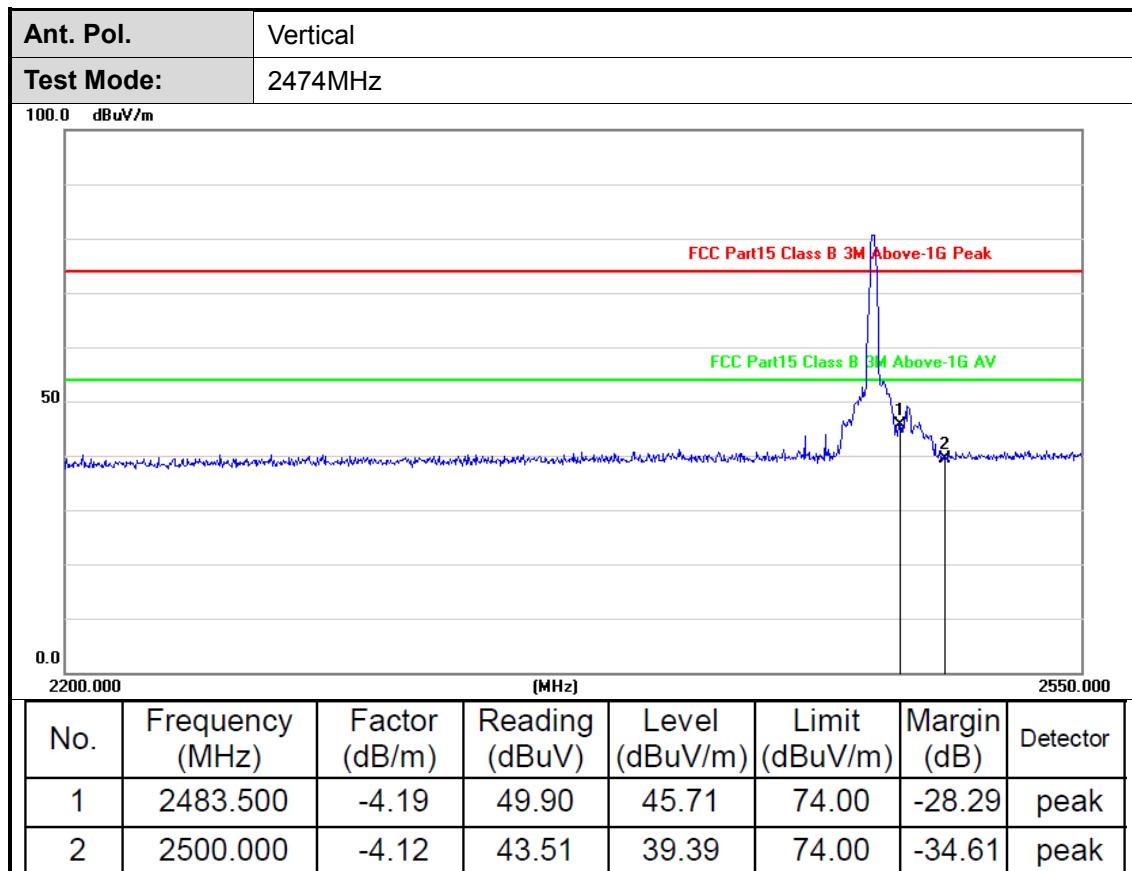
## Remark:

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
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

**Bandedge Emission**





**Remark:**

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
3. Margin value = Limit value - Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.



## 5.5. Antenna requirement

### Requirement

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.203:**

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.

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):**

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

### Test Result

The EUT's antenna is soldered to the PCB. The gain of the antenna is 3.9dBi. meet the standards.

Please reference to the annex: Internal Photographs



## 6. EUT TEST PHOTOS

Please reference to the annex: Test Photo

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For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : [yz.cncaic.cn](http://yz.cncaic.cn)



## 7. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Please reference to the annex: External Photographs and Internal Photographs

\*\*\*\*\*THE END\*\*\*\*\*