

## **FCC ID TEST REPORT**

for

2.4G RF Wireless Optical mouse

Model: DS-2448

FCC ID: TUVDS-2448

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Report Number: TCT130926007F2-1

Date of Test: September 29~October 21, 2013

Date of Report: October 21, 2013

*The results detailed in this test report relate only to the specific sample(s) tested. It is the Application's responsibility to ensure that all production units are manufactured with equivalent EMC characteristics. This report is not to be reproduced except in full, without written approval from TCT Testing Technology.*

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## 1.0 General Details

### 1.1 Test Lab Details

Name :	Shenzhen Tongce Testing Lab
Address:	1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China
Telephone:	13410377511
Fax:	--

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

**FCC Registration Number: 572331**

Shenzhen TCT Testing Technology Co., Ltd., Shenzhen EMC Laboratory: Shenzhen Tongce Testing Lab  
The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.  
Registration Number: 572331

**Industry Canada (IC)**

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing  
Registration Number IC: 10668A-1

### 1.2 Applicant Details

Applicant:	Eastern Times Technology Co., Ltd.
Address:	Building D, Nan An Industry Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China.
Telephone:	008676986800666
Fax:	0086769868002368

Manufacturer:	Dongguan Fegnrun Computer Co.,ltd
Address:	Building D, Nan An Industry Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China
Telephone:	0769-86800511
Fax:	0769-86800338

1.3 Description of EUT

Product:	2.4G RF Wireless Optical mouse
Model No.:	DS-2448
Additional Model No.:	N.A.
Brand Name:	N.A.
Additional Trade Name:	N.A.
Rating:	DC 1.5V Via a AA Battery
Operation Frequency:	2408-2474MHz
Modulation Type:	FSK
Channel spacing:	2 MHz
Channel number:	34
Antenna Designation:	A PIFA antenna, and the maximum antenna gain is 0dBi.

1.4 Statement: --

1.5 Test Duration

September 29, 2013 to October 21, 2013

1.6 Test Engineer

The sample tested by



Printed name: Jack Kang

## 2.0 Test equipments and Associated Equipment used during the test.

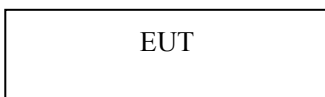
### 2.1 Test Equipments

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	July 07, 2013	July 06, 2014
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	July 07, 2013	July 06, 2014
Pre-amplifier	Teseq	LAN6900	--	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8447D	83153007374	July 08, 2013	July 07, 2014
Pre-amplifier	Agilent	8449B	3008A01738	July 08, 2013	July 07, 2014
Triple-loop antenna	ROHDE&SCHWARZ	HM020	843885/002	July 08, 2013	July 07, 2014
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3117	--	July 08, 2013	July 07, 2014
Horn Antenna	ETS LINDGREN	3160	--	July 08, 2013	July 07, 2014

### 2.2 AE used during the test

Equipment type	Manufacturer	Model
N.A.		
N.A.		
N.A.		

### 2.3. Block Diagram of EUT Configuration



Note: New batteries are used for E.U.T during the test

### 3.0 Technical Details

#### 3.1 Summary of test results

The EUT has been tested according to the following specifications

Requirement	CFR 47 Section	Result
Conduction Emission, 0.15MHz to 30MHz	15.207(a)	N.A.
Radiated Emission Test	Section 15.209, 15.35 Section 15.249(a)(d)	PASS
Band Edge Test	15.249(d)	PASS
Occupied Bandwidth	Section 15.231(c)	PASS
Antenna Requirement	Section 15.203	PASS

Note: This EUT is power by battery only, the conducted emission is not applicable

#### 3.2 Test Standards

FCC Rules and Regulations Part 15 Subpart C 15.249: 2012

### 4.0 EUT Modification

No modification by Shenzhen TCT Testing Technology Co., Ltd

### 5.0 Measurement Uncertainty

(95% confidence levels, k=2)

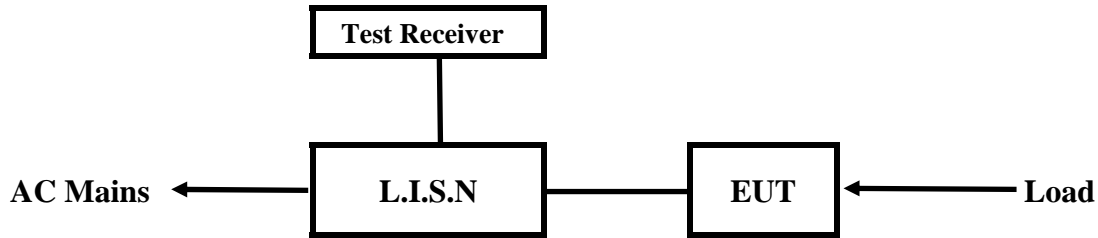
No.	Item	MU
1.	Radio Frequency	$\pm 1 \times 10^{-9}$
2.	Temperature	$\pm 0.1^\circ\text{C}$
3.	Humidity	$\pm 1.0\%$
4.	RF power, conducted	$\pm 0.34\text{dB}$
5.	RF power density, conducted	$\pm 1.45\text{dB}$
6.	Spurious emissions, conducted	$\pm 3.70\text{dB}$
7.	All emissions, radiated	$\pm 4.50\text{dB}$

Note: 1) The EUT is a 2.4G RF Wireless Optical mouse transmitter.

2) Working transmission frequency: 2408-2474MHz, Low channel: 2408MHz, Middle channel: 2440MHz, High channel: 2474MHz

## 6.0 Power Line Conducted Emission Test

### 6.1 Schematics of the test



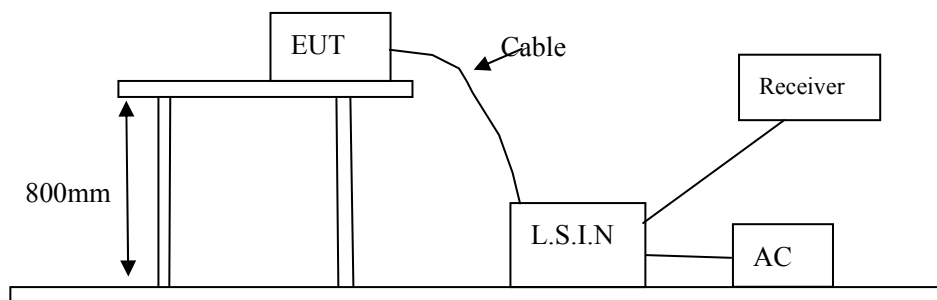
EUT: Equipment Under Test

### 6.2 Test Method and test Procedure

The EUT was tested according to RSS-Gen Issue 3-2010 The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



### 6.3 EUT Operating Condition

Operating condition is according to RSS-Gen Issue 3-2010

- 1) Setup the EUT and simulators as shown on the following
- 2) Enable AF signal and confirm EUT active to normal condition

### 6.4 Test Equipment

Please refer to the Section 2

6.5 Conducted Emission Limit

Frequency(MHz)	Class A Limits (dBμV)		Class B Limits (dBμV)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

- Notes: 1) \*Decreasing linearly with logarithm of frequency.  
2) The tighter limit shall apply at the transition frequencies

6.6 Test specification:

Environmental conditions: Temperature: 22° C Humidity: 52% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

The test was carried out in the following operation mode(s):

- --

6.7 Test result

--

The requirements are FULFILLED

Remarks: The EUT is powered by batteries, so this test is not applicable.



**A Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)**

EUT Description: --  
 Operation Mode: --  
 Tested By: --  
 Test date: --

Start Frequency    Stop Frequency    Step                    IF BW                    Detector                    Final M-Time  
 0.15MHz            30MHz                4.5KHz                10KHz                    QP+AV                    1s

Frequency (MHz)	Reading(dB $\mu$ V)				Limit (dB $\mu$ V)	
	Live		Neutral		Quasi-peak	Average
	Quasi-peak	Average	Quasi-peak	Average		
			--	--		
			--	--		
			--	--		

**B Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)**

EUT Description: --  
 Operation Mode: --  
 Tested By: --  
 Test Data: --

Start Frequency    Stop Frequency    Step                    IF BW                    Detector                    Final M-Time  
 0.15MHz            30MHz                4.5KHz                10KHz                    QP+AV                    1s

Frequency (MHz)	Reading(dB $\mu$ V)				Limit (dB $\mu$ V)	
	Live		Neutral		Quasi-peak	Average
	Quasi-peak	Average	Quasi-peak	Average		
	--	--				
	--	--				
	--	--				

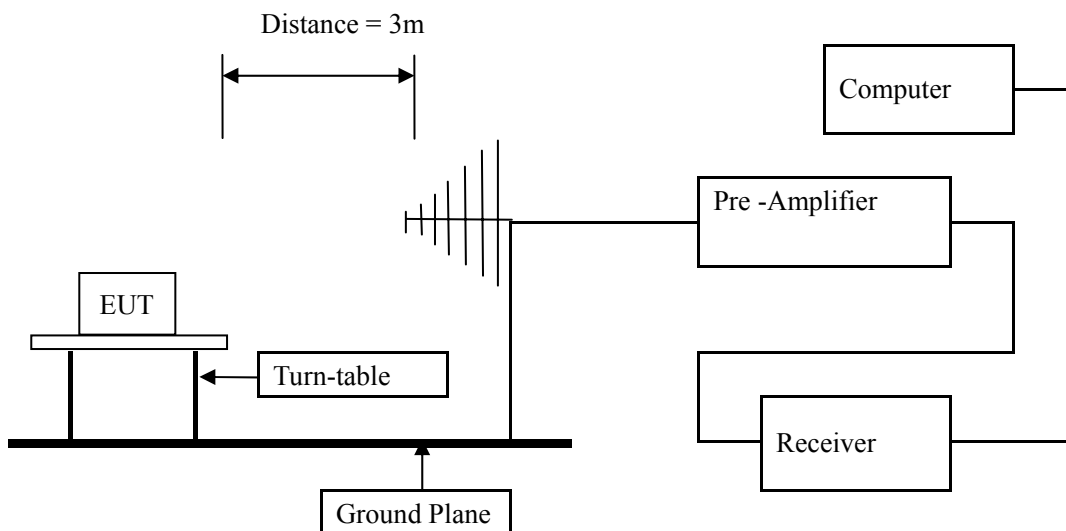
## 7.0 Radiated Emission Test

### 7.1 Test Method and test Procedure:

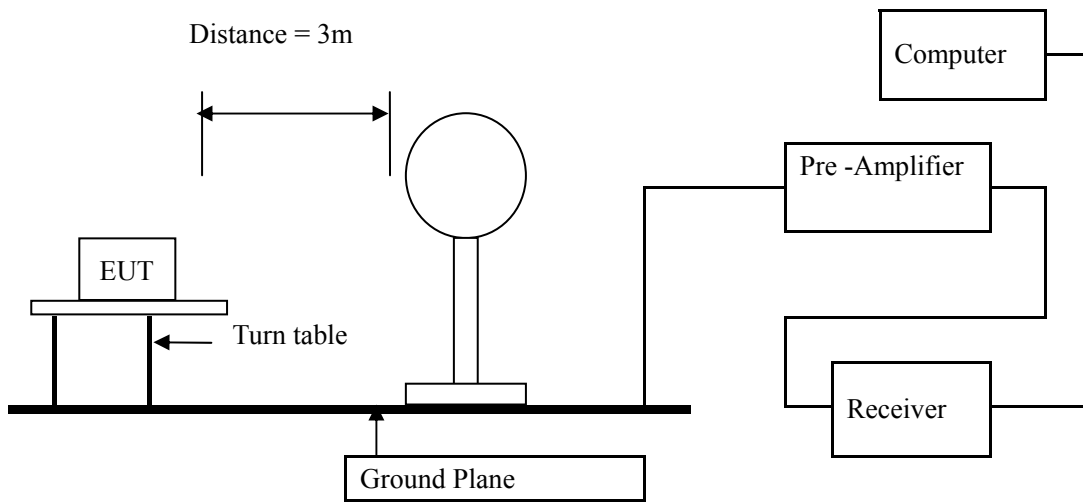
- 1) The EUT was tested according to ANSI C63.10 –2009
- 2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10 –2009.
- 3) The frequency spectrum from 9kHz to 5GHz was investigated. All readings from 9kHz to 30MHz are quasi-peak values with a resolution bandwidth of 9 kHz, measured with loop antenna.  
All readings from 30MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz, measured with Bi-log antenna.  
All readings above 1 GHz are peak values with a resolution bandwidth of 1 MHz, measured with horn antenna.
- 4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for above 30MHz each frequency .  
The antenna high is 1 m to find the maximum emission for each frequency below 30MHz
- 5) Tested distance: 3 meters
- 6) The antenna polarization: Vertical polarization and Horizontal polarization.
- 7) Each azimuth of E.U.T will be tested.

### 7.2 Block diagram of Test setup

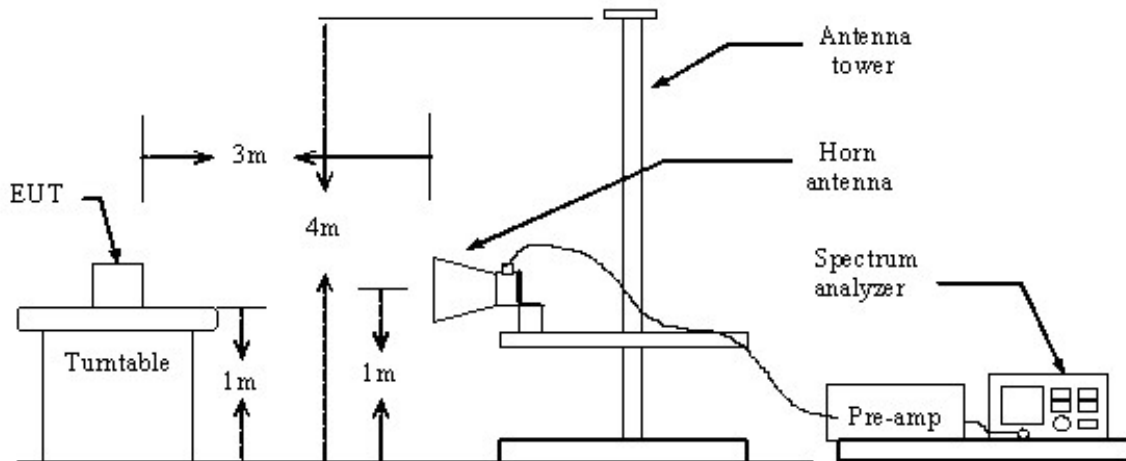
Block diagram of Test setup for frequency 30-1000MHz



Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency above 1GHz



7.3 Limit

According to 15.249(a) requirements:

Fundamental Frequency (MHz)	Filed Strength of(millivolts/meter)	
	Fundamental	Harmonics
902-928	50	0.5
2400-2483.5	50	0.5
5725-5875	50	0.5
24000-24250	250	2.5

For this E.U.T

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)			Field Strength of Harmonics (3m)		
	mV/m	dBuV/m		mV/m	dBuV/m	
2400-2483.5	50	94 (Average)	114 (Peak)	0.5	54 (Average)	74 (Peak)

- Note:
- 1) RF Field Strength (dBuV) = 20 log RF Voltage (uV)
  - 2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
  - 3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

According to 15.249(d) requirements: 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.

Frequencies in restricted band are complied to limit

Frequency Range (MHz)	Distance (m)	Field strength (dBμV/m)
0.009-0.490	3	20log 2400/F (kHz) + 80
0.490-1.705	3	20log 24000/F (kHz) + 40
1.705-30	3	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
- 1) RF Voltage (dBuV) = 20 log RF Voltage (uV)
  - 2) In the Above Table, the tighter limit applies at the band edges.
  - 3) Distance refers to the distance in meters between the measuring instrument antenna and the EUT
  - 4)The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
  - 5) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula  $Ld1 = Ld2 * (d2/d1)$

#### 7.4 Test Equipment

Please refer to the Section 2

#### 7.5 Test specification:

Environmental conditions:    Temperature    23° C    Humidity:    50%    Atmospheric pressure:    103kPa

#### 7.6 Test result

Result:    Pass

**A Radiated Emission (9 kHz----30 MHz)**

Note: 1) Emission Level=Reading+ Cable loss-Antenna factor-Amp factor  
2) The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

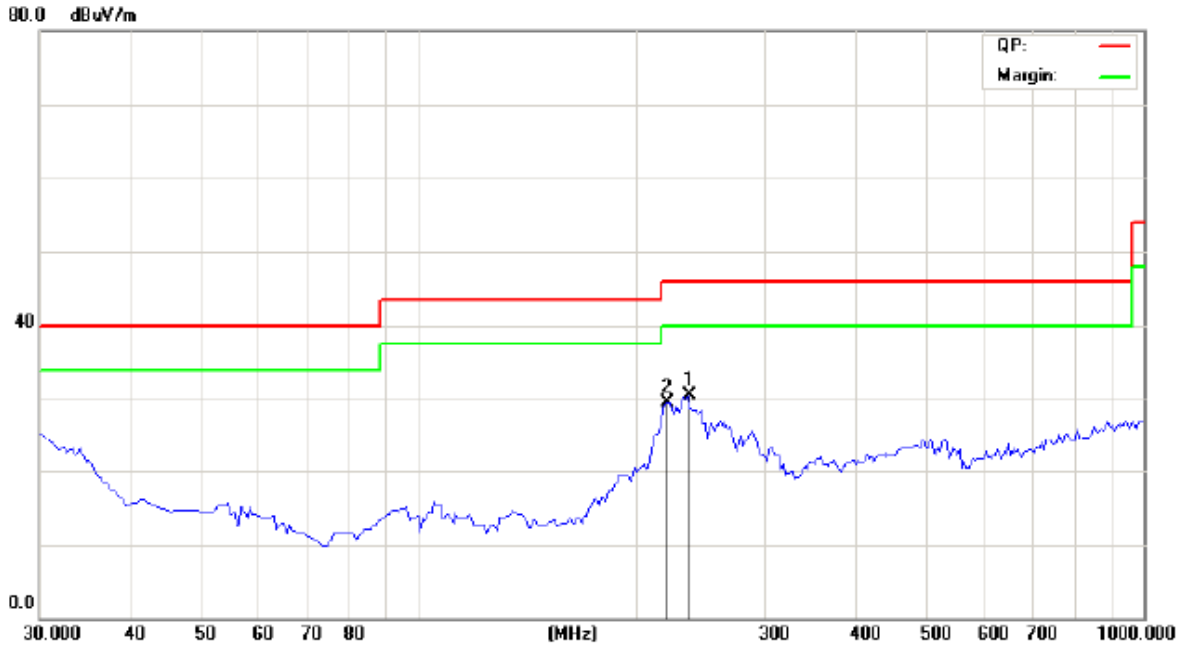
Result: Pass

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
--	--	--
--	--	--
--	--	--
--	--	--

**B General Radiated Emissions Data**  
**Radiated Emission (30MHz----1000MHz)**

**In Horizontal**

Please refer to following diagram for individual



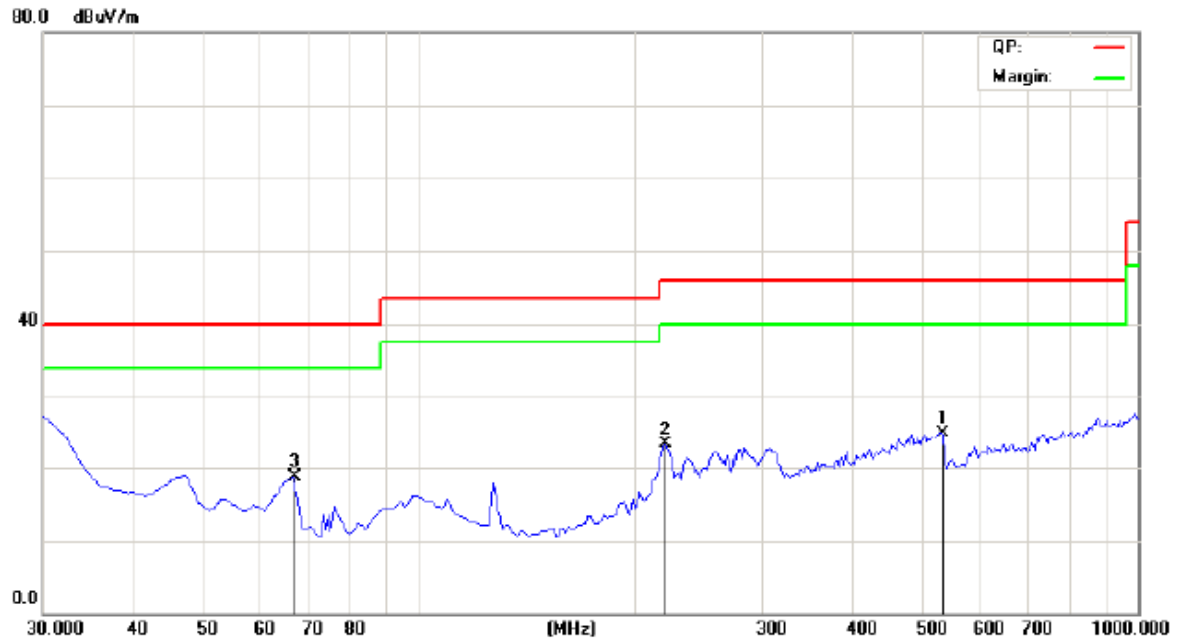
Frequency (MHz)	Level@3m (dBµV/m)	Antenna Polarity	Limit@3m (dBµV/m)
220.7240	29.58	H	46.00
236.0520	30.48	H	46.00



**In Vertical**

Please refer to following diagram for individual

Low channel: 2408 MHz



Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
66.9338	18.73	V	40.00
220.7240	23.23	V	46.00
531.5230	24.94	V	46.00

Note: Measurements were conducted in all channels (high, middle, low), and the worst case (low channel) was submitted only.

**C Fundamental & Harmonics and Spurious Radiated Emission Data (1000MHz-25000MHz)**

<b>Low channel: 2408 MHz</b>				
<b>Frequency (MHz)</b>	<b>Emission PK/AV (dBuV/m)</b>	<b>Horizontal / Vertical</b>	<b>Limits PK/AV (dBuV/m)</b>	<b>Margin (dB)</b>
2408	63.32(PK)	H	114/94	30.68
2408	71.75(PK)	V	114/94	22.25
4816	33.45 (PK)	H	74/54	20.55
4816	38.59(PK)	V	74/54	15.41
16856	45.30(PK)	H	74/54	8.70
16856	42.71(PK)	V	74/54	11.29

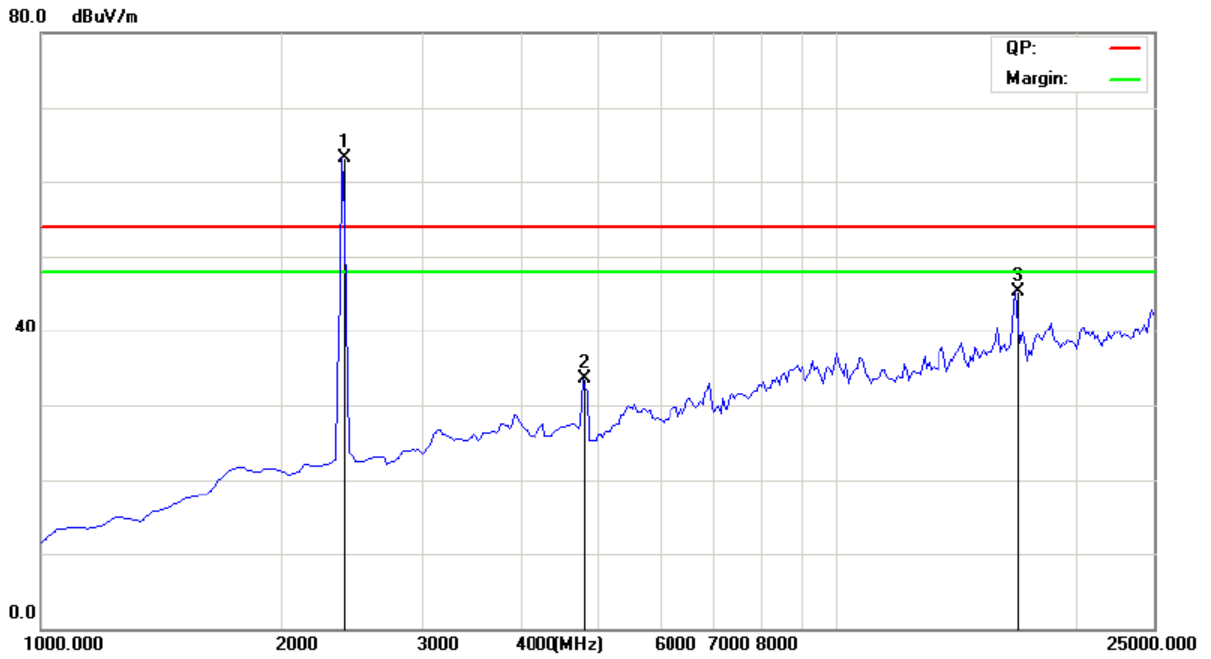
<b>Middle channel: 2440 MHz</b>				
<b>Frequency (MHz)</b>	<b>Emission PK/AV (dBuV/m)</b>	<b>Horizontal / Vertical</b>	<b>Limits PK/AV (dBuV/m)</b>	<b>Margin (dB)</b>
2440	69.89(PK)	H	114/94	24.11
2440	70.84(PK)	V	114/94	23.16
4880	38.26 (PK)	H	74/54	15.74
4880	36.43(PK)	V	74/54	17.57
17080	44.37 (PK)	H	74/54	9.63
17080	44.56 (PK)	V	74/54	9.44

<b>High channel: 2474 MHz</b>				
<b>Frequency (MHz)</b>	<b>Emission PK/AV (dBuV/m)</b>	<b>Horizontal/ Vertical</b>	<b>Limits PK/AV (dBuV/m)</b>	<b>Margin (dB)</b>
2474	61.61 (PK)	H	114/94	32.39
2474	67.77(PK)	V	114/94	26.23
4948	32.69 (PK)	H	74/54	21.31
4948	36.23(PK)	V	74/54	17.77
17318	44.05(PK)	H	74/54	9.95
17318	35.51(PK)	V	74/54	18.49

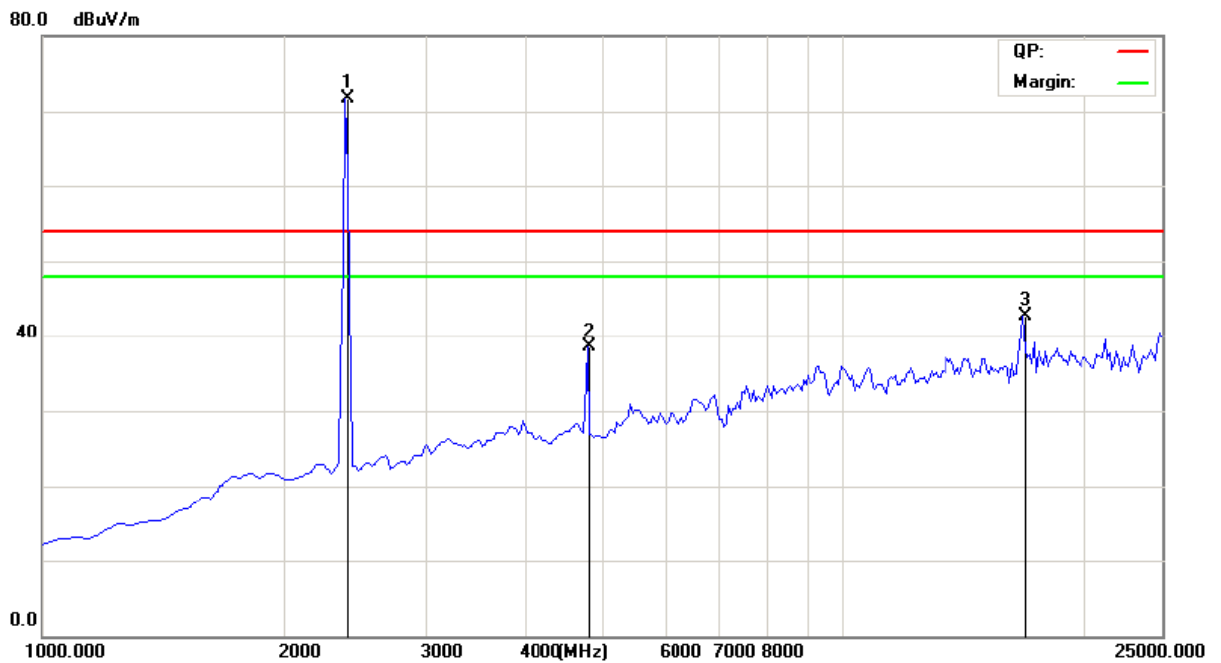
- Note:
- 1) PK= Peak, AV= Average
  - 2) Emission Level = Reading Level + Antenna Factor + Cable Loss.
  - 3) Margin= Limit(AV) – Emission Level
  - 4) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
  - 5) The other emission levels are too small, which are not reported. It is deemed to comply with the requirement of the rule.

Please refer to the following diagram for individual  
Low Channel: 2408 MHz

H

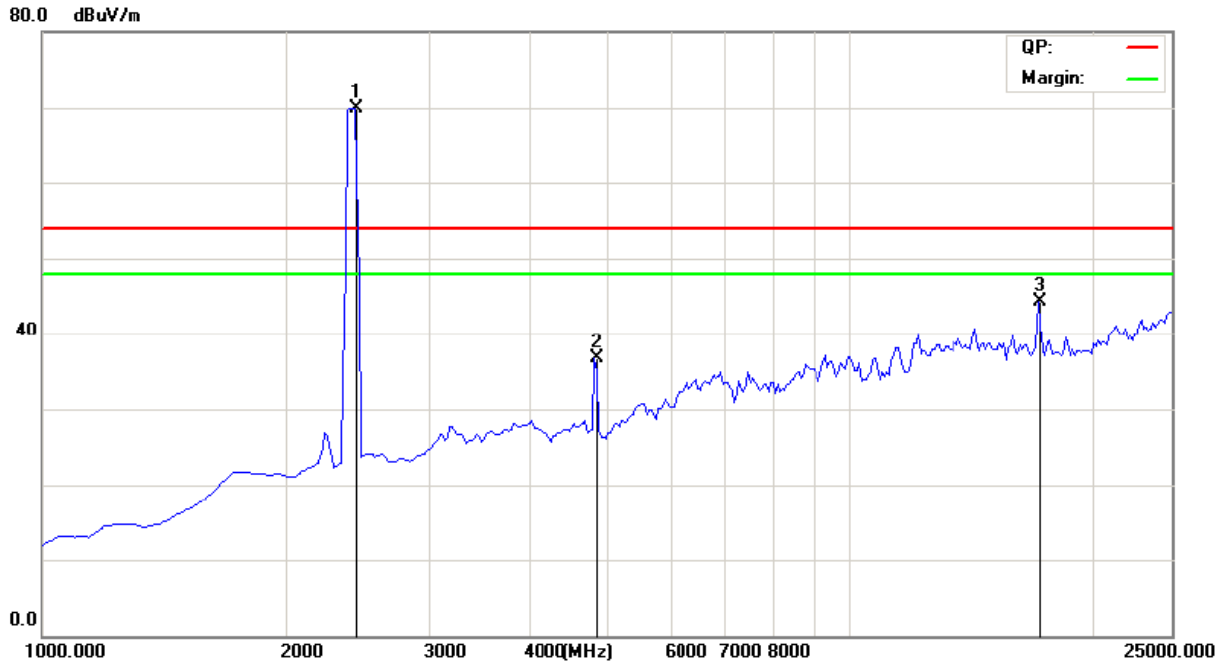


V

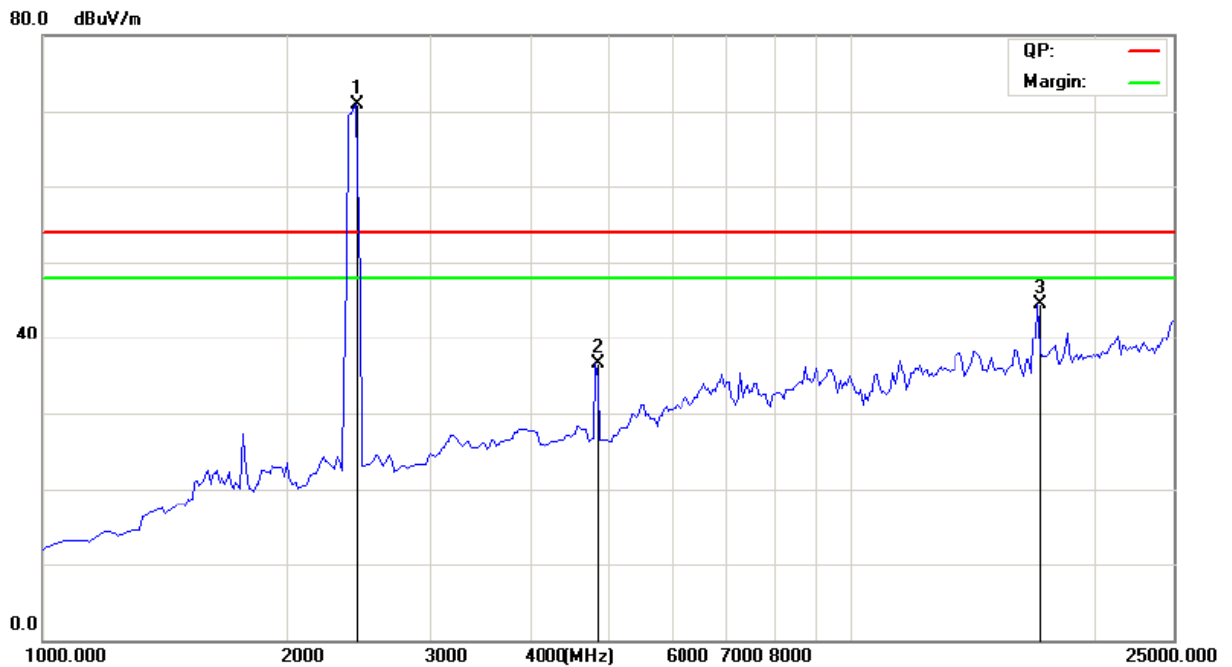


Please refer to following diagram for individual  
Middle Channel: 2440 MHz

H

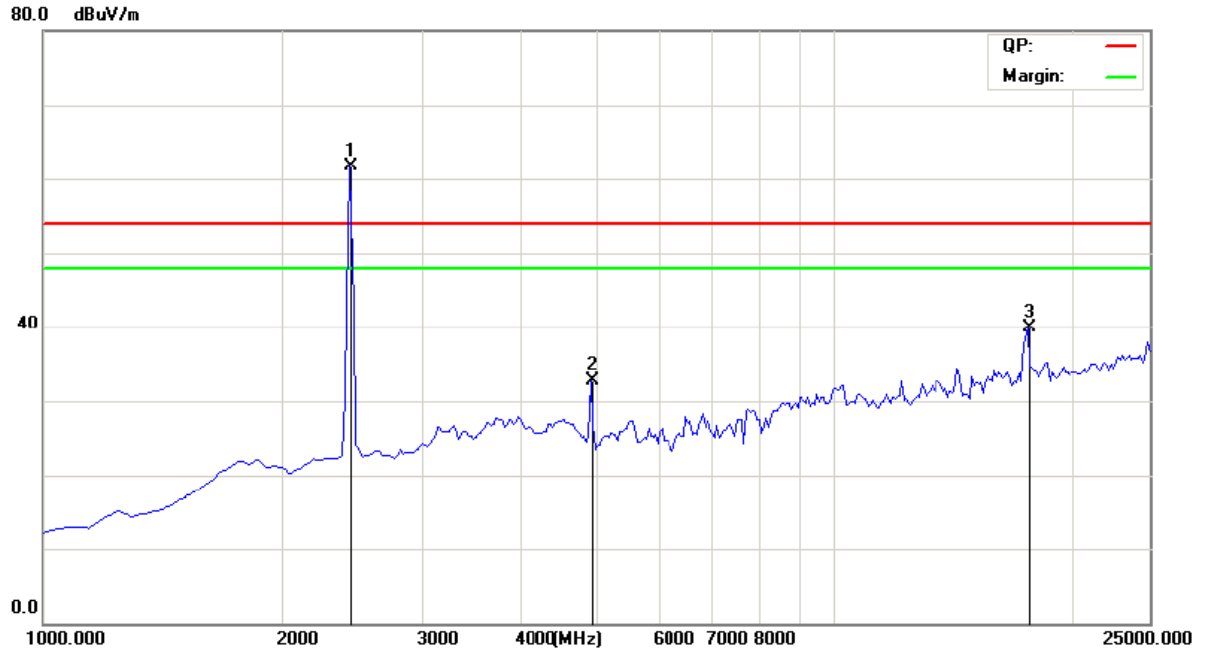


V

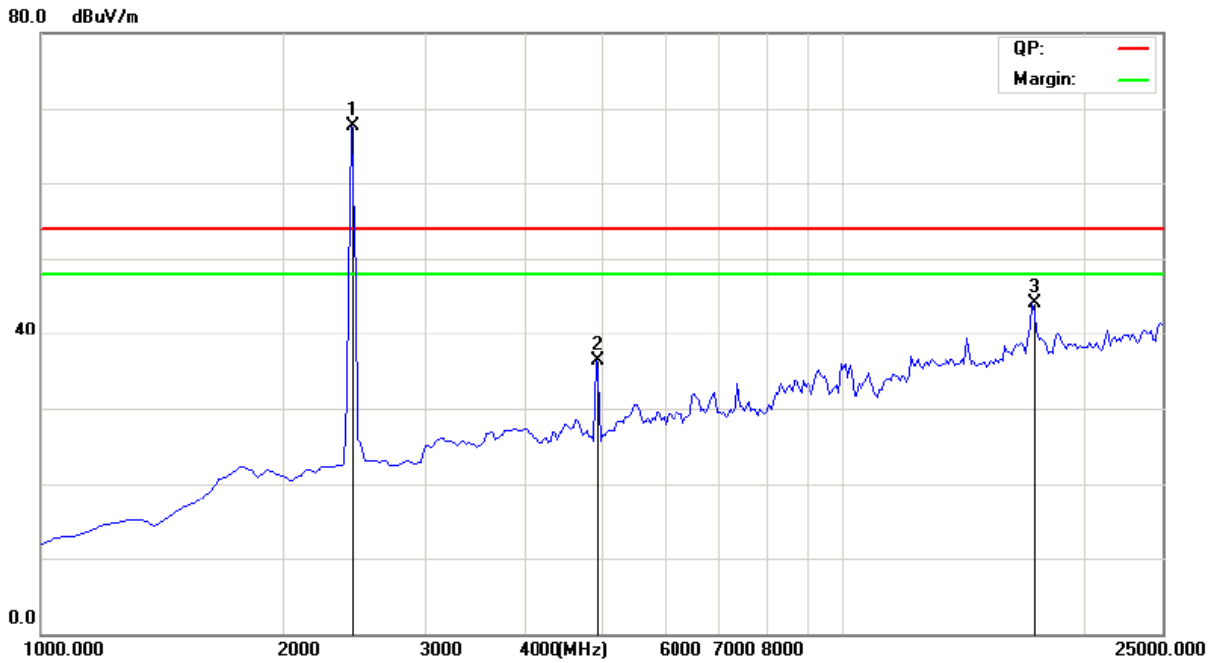


Please refer to following diagram for individual  
High Channel: 2480 MHz

H



V



## **8. Band Edge**

### 8.1 Band Edge Limit

1) According to 15.249(d) requirements: 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.

2) For Emissions in Restricted band, the limit is below the general radiated emission limits in 15.209

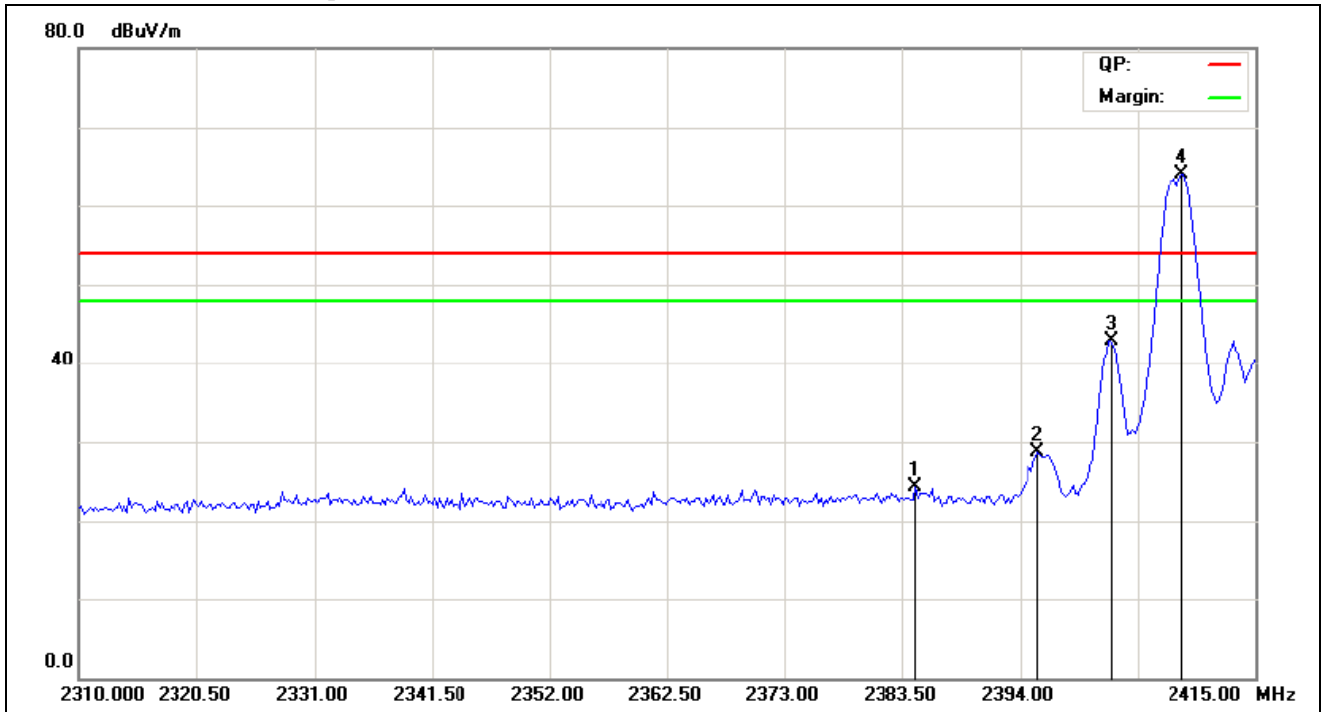
### 8.2 Test Equipment

Please refer to the Section 2

8.3 Test Result

Pass

Low channel in Horizontal polarization

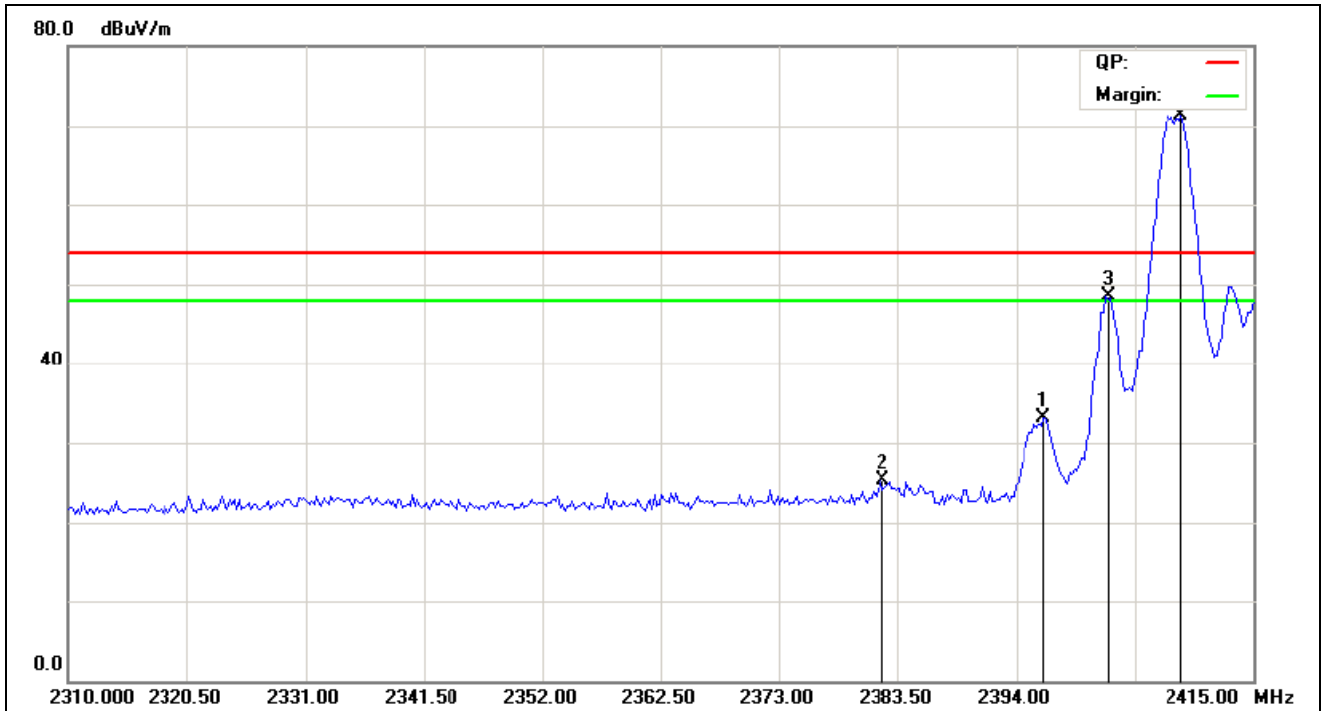


Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Detector	Limit@3m (dB $\mu$ V/m)
2384	24.30	Peak	74.00
2395	28.64	Peak	74.00
2401	42.88	Peak	74.00
2408	62.01	Peak	114.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 24.30 dBuV/m at 2384 MHz, which meets the average limit in 15.209. It is deemed to comply with the requirements.

**Low channel in Vertical polarization**



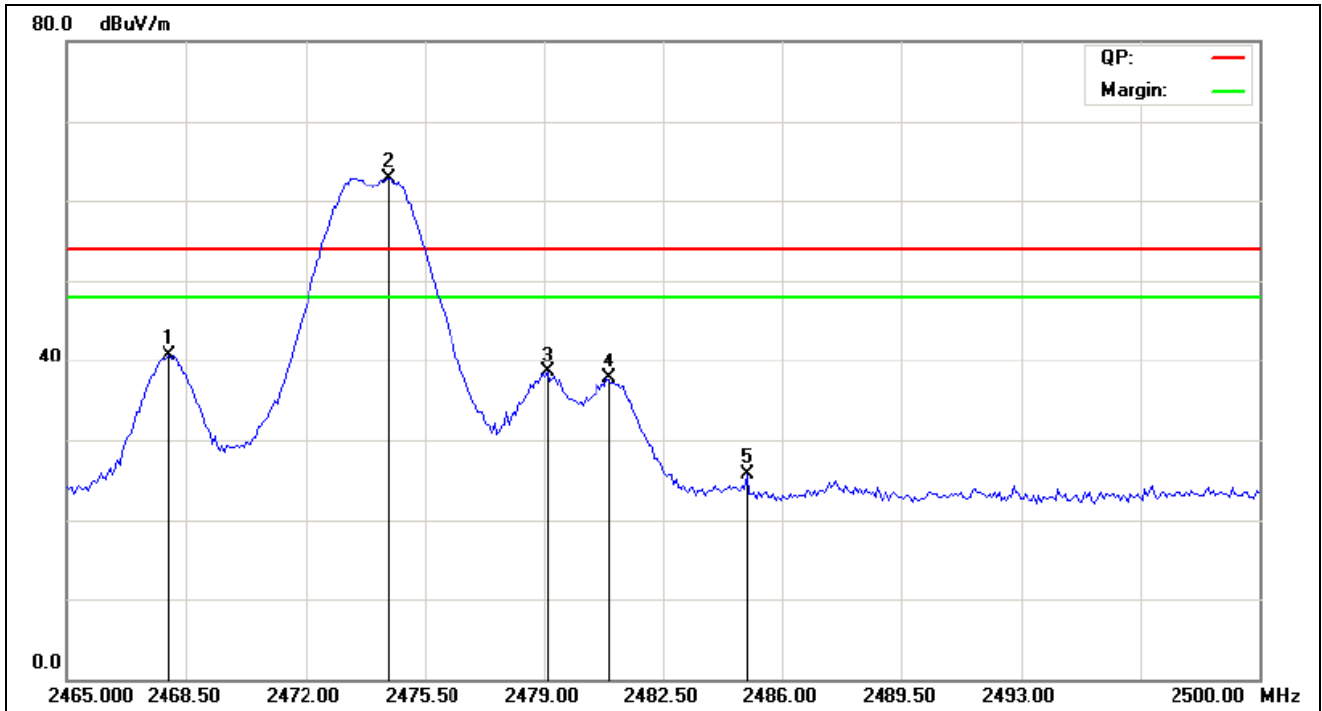
Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Detector	Limit@3m (dB $\mu$ V/m)
2381	25.30	Peak	74.00
2396	33.01	Peak	74.00
2401	48.48	Peak	74.00
2408	71.34	Peak	114.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209.

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 25.30 dBuV/m at 2381 MHz, which meets the average limit in 15.209. It is deemed to comply with the requirements.



High channel in Horizontal polarization

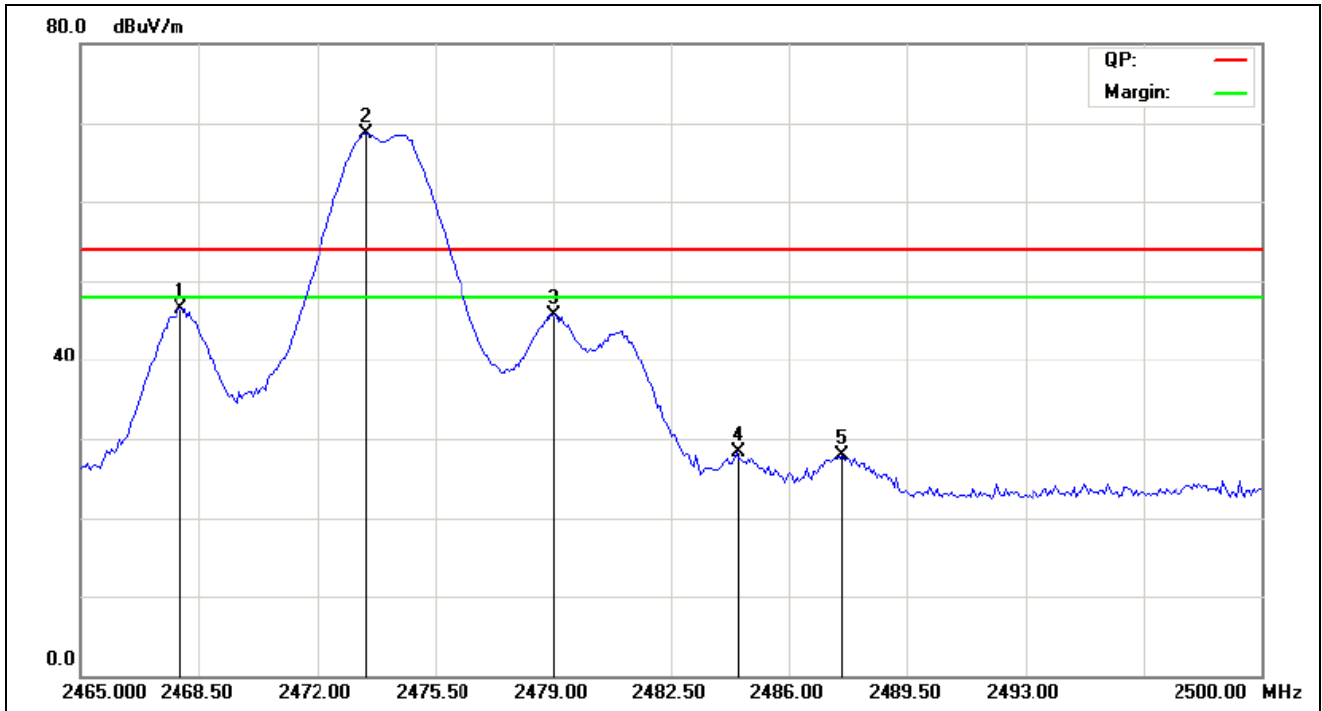


Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Detector	Limit@3m (dB $\mu$ V/m)
2468	40.73	Peak	74.00
2474	62.97	Peak	114.00
2479	38.59	Peak	74.00
2480	37.63	Peak	74.00
2484	25.62	Peak	74.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 25.62 dBuV/m at 2484 MHz, which meets the average limit in 15.209.. It is deemed to comply with the requirements.

**High channel in Vertical polarization**



Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Detector	Limit@3m (dB $\mu$ V/m)
2467	46.55	Peak	74.00
2474	68.80	Peak	114.00
2478	45.66	Peak	74.00
2484	28.34	Peak	74.00
2487	27.85	Peak	74.00

Note: 1) As the table shown above, emissions radiated outside of the specified frequency bands are met the requirements in 15.209.

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 28.34 dBuV/m at 2484 MHz, which meets the average limit in 15.209. It is deemed to comply with the requirements.

## 9.0 Occupied Bandwidth

### 9.1 Test Equipment

Please refer to the Section 2

### 9.2 Test Specification:

Environmental conditions: Temperature 22° C Humidity: 50% Atmospheric pressure: 103kPa

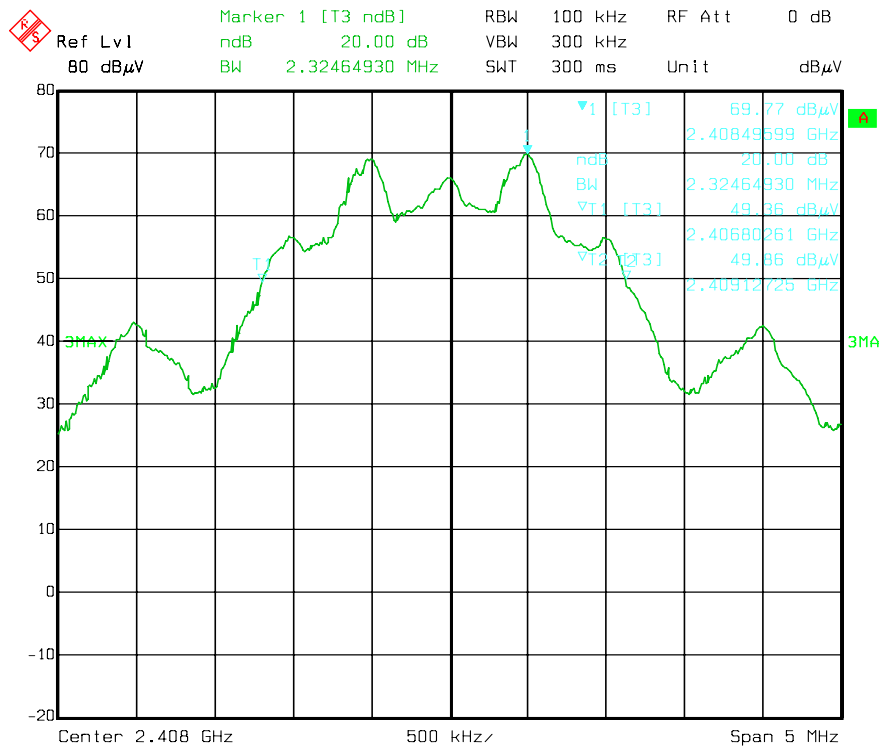
### 9.3 Limit

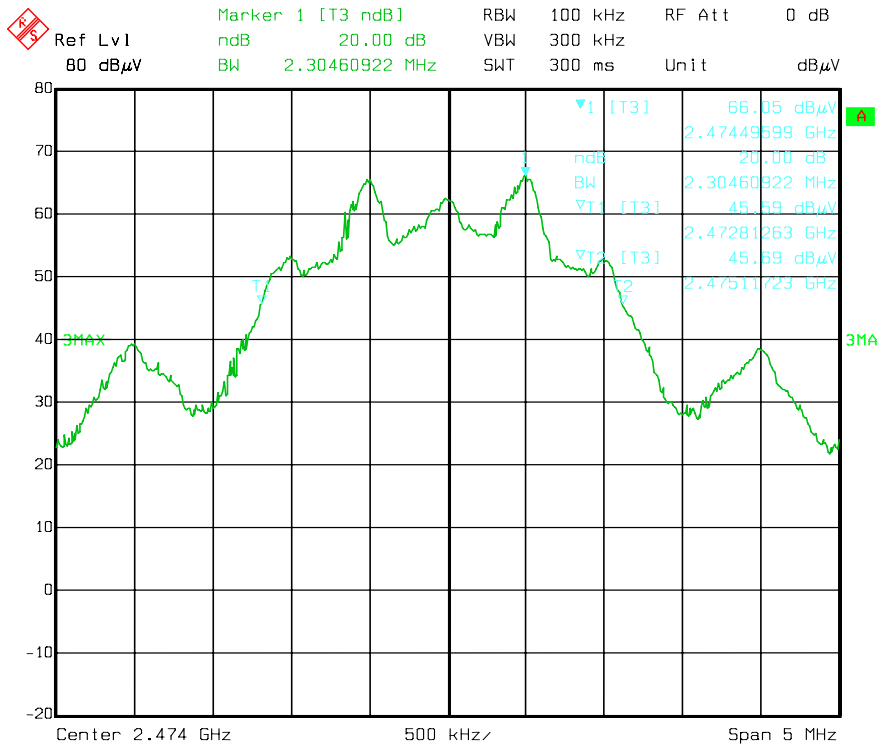
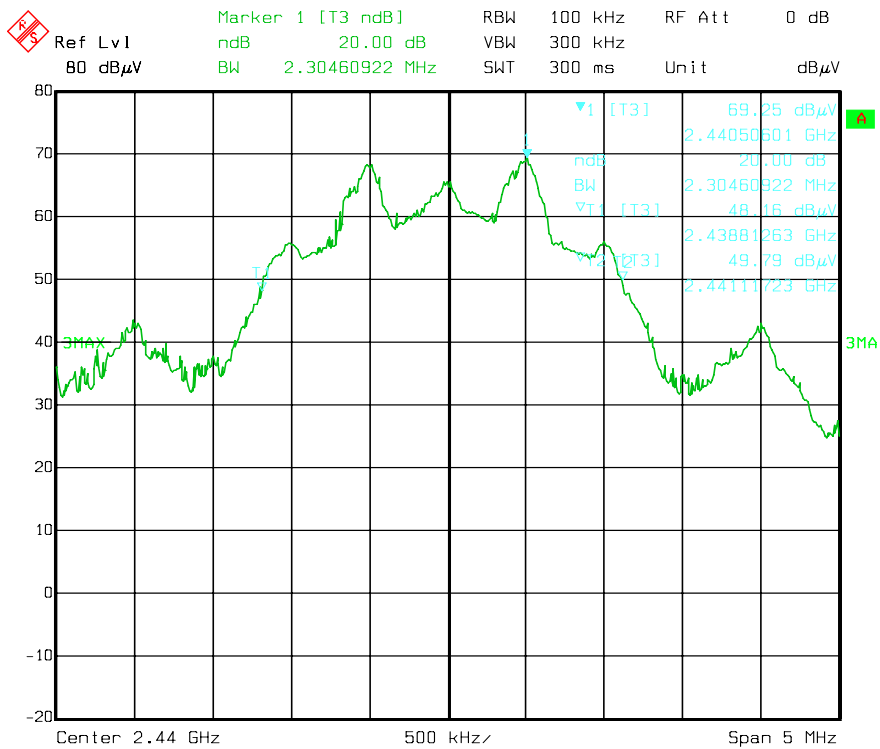
According to 15.231(c), 20dB Bandwidth should be test

### 9.4 Test Result:

Channel	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
Low	2325	--	PASS
Middle	2305	--	PASS
High	2305	--	PASS

Test Data as follows:





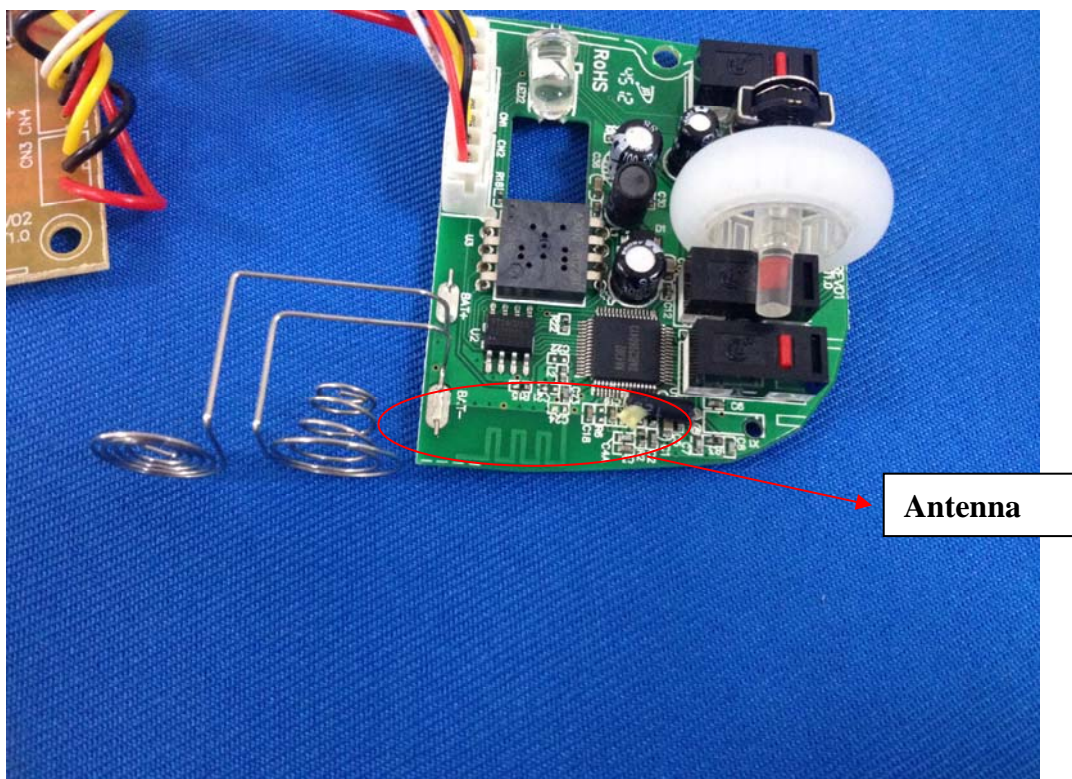
## 10.0 Antenna Requirement

### 10.1 Standard Applicable

For intentional device, according to FCC 47 CFR 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.

### 10.2 Antenna Specification

According to the manufacturer declared, PIFA antennas; the maximum gain of antennas is 0 dBi. and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.



## 11.0 FCC ID Label

IC: TUVDS-2448

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

### Mark Location:



--End of the report--