



Shenzhen TCT Testing Technology Co., Ltd.

FCC ID TEST REPORT

for

2.4G Wireless Keyboard

Model: CVD602

FCC ID: RM8CVD602

Prepared for : SHENZHEN XNO ELECTRONICS CO.,LTD
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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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Shenzhen TCT Testing Technology Co., Ltd.

1.0 General Details

1.1 Test Lab Details

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Site Listed with Federal Communication Commission

Registration Number: 572331

For 3m chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number IC: 10668A-1

For 3m chamber

1.2 Applicant Details

Applicant: Shenzhen XNO Electronics Co.,Ltd
Address: 8F, 49 Building, Nanyuan Industrial Zone, Minzhi Village, Longhua Town, Shenzhen City ,China
Telephone: 0755-66800385
Fax: 0755-61204119

Manufacturer: Shenzhen XNO Electronics Co.,Ltd

Address: 8F, 49 Building, Nanyuan Industrial Zone, Minzhi Village, Longhua Town, Shenzhen City ,China
Telephone: 0755-66800385
Fax: 0755-61204119

1.3 Description of EUT

Product:	2.4G Wireless Keyboard
Brand Name:	ICRAIG
Model No.:	CVD602
Additional Model No.	XNO01,XNO02,XNO03,XNO04,XNO05,XNO06,XNO07,XNO08,XNO09
Additional Trade Name	N/A
Rating:	DC 2.2-3.3V (1.5*2 AAA batteries)
Modulation Type:	GFSK
Channel number:	19
Channel spacing	2 MHz
Operation Frequency	2402 MHz-2442 MHz (2432MHz, 2434MHz are not occupied.)
Antenna Designation	A PCB Printed antenna and the maximum gain is 0 dBi

1.4 Submitted Sample

1 Sample(s)

1.5 Test Duration

2013-01-05 to 2013-01-10

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	2012-12-03	2013-12-02
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2012-12-03	2013-12-02
System Controller	CT	SC100	-	2012-02-17	2013-02-16
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	2012-02-17	2013-02-16
Pre-amplifier	Teseq	LAN6900	--	2012-02-17	2013-02-16
Pre-amplifier	Agilent	8447D	83153007374	2012-02-17	2013-02-16
Pre-amplifier	Agilent	8449B	3008A01738	2012-02-17	2013-02-16
Triple-loop antenna	ROHDE&SCHWARZ	HM020	843885/002	2012-02-17	2013-02-16
Horn Antenna	ETS LINDGREN	3117	--	2012-02-17	2013-02-16
Horn Antenna	ETS LINDGREN	3160	--	2012-02-17	2013-02-16

2.2 AE used during the test

Equipment type	Manufacturer	Model
N/A		

3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:			
Standard	Test Type	Result	Notes
FCC Part 15:2011, Paragraph 15.207	Conducted Emission Test	PASS	N/A
FCC Part 15:2011 Subpart C Paragraph 15.249(a)	Radiated Emission Test	PASS	Complies
FCC Part 15:2011 Subpart C Paragraph 15.249(d) Limit	Band Edge Test	PASS	Complies
FCC Part 15:2011 Subpart C Paragraph 15.215(c)	20 dB Bandwidth	PASS	Complies

Note: N/A=Not Applicable

3.2 Test Standards

FCC Part 15:2011 Subpart C, Paragraph 15.249

4.0 EUT Modification

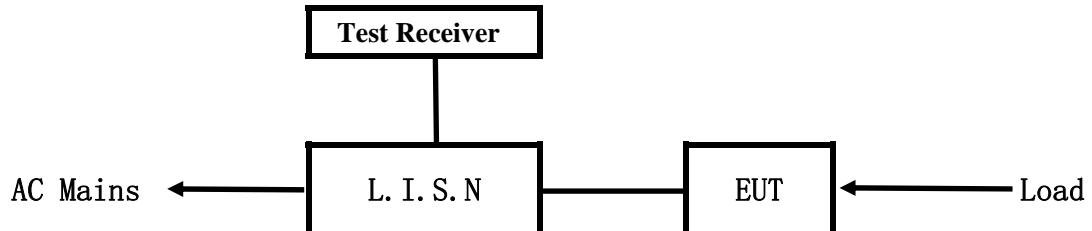
No modification by Shenzhen TCT Testing Technology Co., Ltd

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.	Spurious emissions, conducted	$\pm 3.70\text{dB}$
6.	All emissions, radiated	$\pm 4.50\text{dB}$

6. Power Line Conducted Emission Test

6.1 Schematics of the test



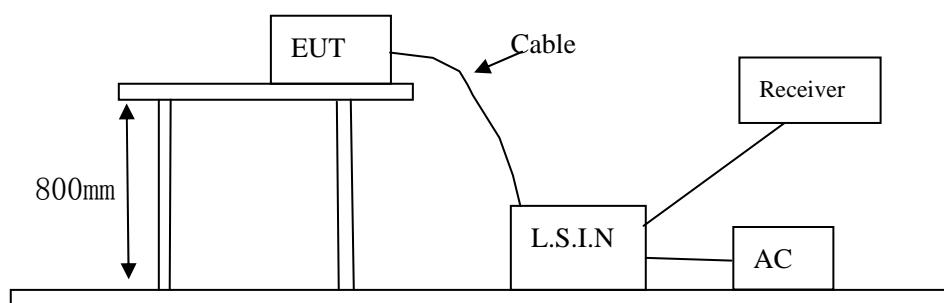
EUT: Equipment Under Test

6.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2009. 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 ANSI C63.10 -2009

- 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 Power line conducted Emission Limit according to Paragraph 15.207

Frequency(MHz)	Class A Limits (dB μ V)		Class B Limits (dB μ V)	
	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 Photo documentation of the test set-up

Please refer to the Section 12

6.7 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 51% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

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

- Normal wireless communication

6.8 Test result

Min. limit margin ---

The requirements are FULFILLED

Remarks: The EUT is powered by batteries, so the test item 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 μ V)				Limit (dB μ V)	
	Line		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

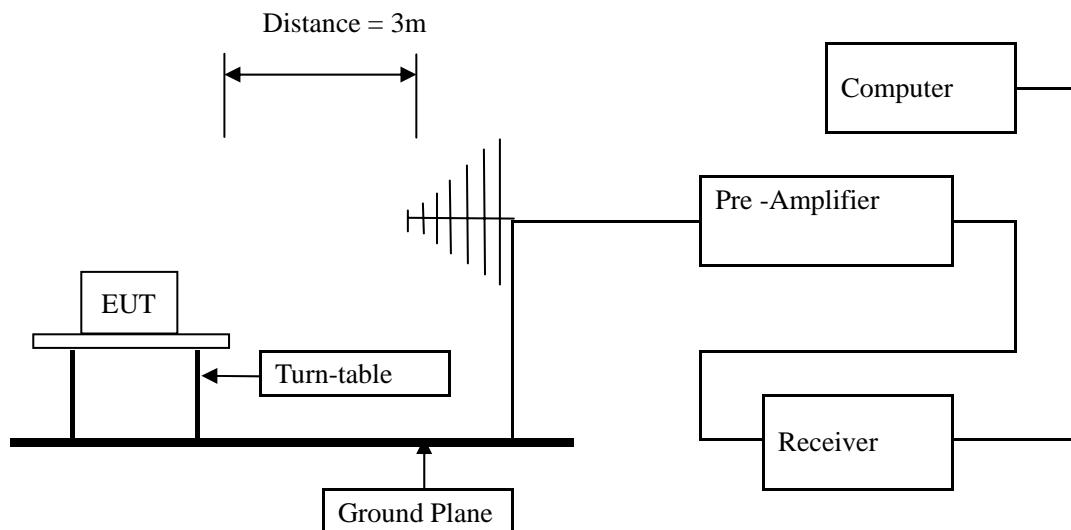
Frequency (MHz)	Reading(dB μ V)					Limit (dB μ V)	
	Live		Neutral				
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

7 Radiated Emission Test

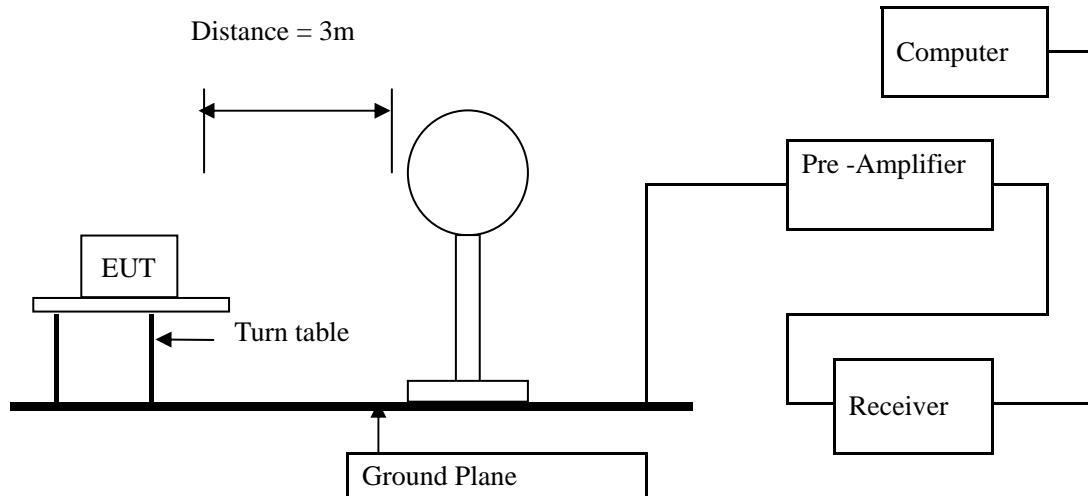
7.1 Test Method and test Procedure:

- 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 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz. Measurements were made at 3 meters.
- 4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- 5) The antenna polarization: Vertical polarization and Horizontal polarization.

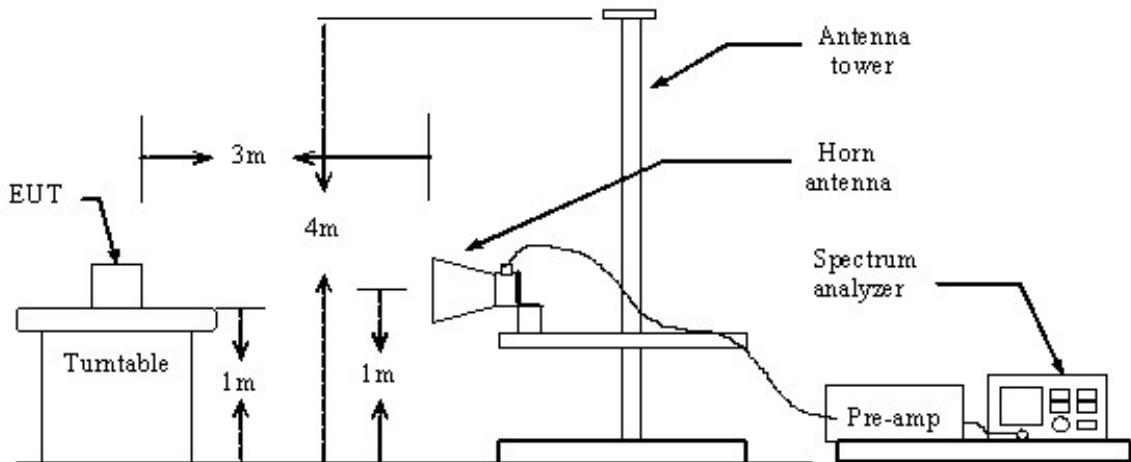
Block diagram of Test setup



Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency above 1GHz



7.2 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2009

7.3 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

A FCC Part 15:2011 Subpart C Paragraph 15.249(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)		Field Strength of Harmonics (3m)	
	mV/m	dBuV/m	uV/m	dBuV/m
2400-2483.5	50	94 (Average)	114 (Peak)	500
				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.

B Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/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) This is a handheld device. 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) All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz. As to 1G-25G, the final emission level got using PK and AV detector.

6) 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 Photo documentation of the test set-up

Please refer to the Section 12

7.5 Test Equipment:

Please refer to the Section 2

7.6 Test specification:

Environmental conditions: Temperature 24° C Humidity: 51% Atmospheric pressure: 103kPa

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

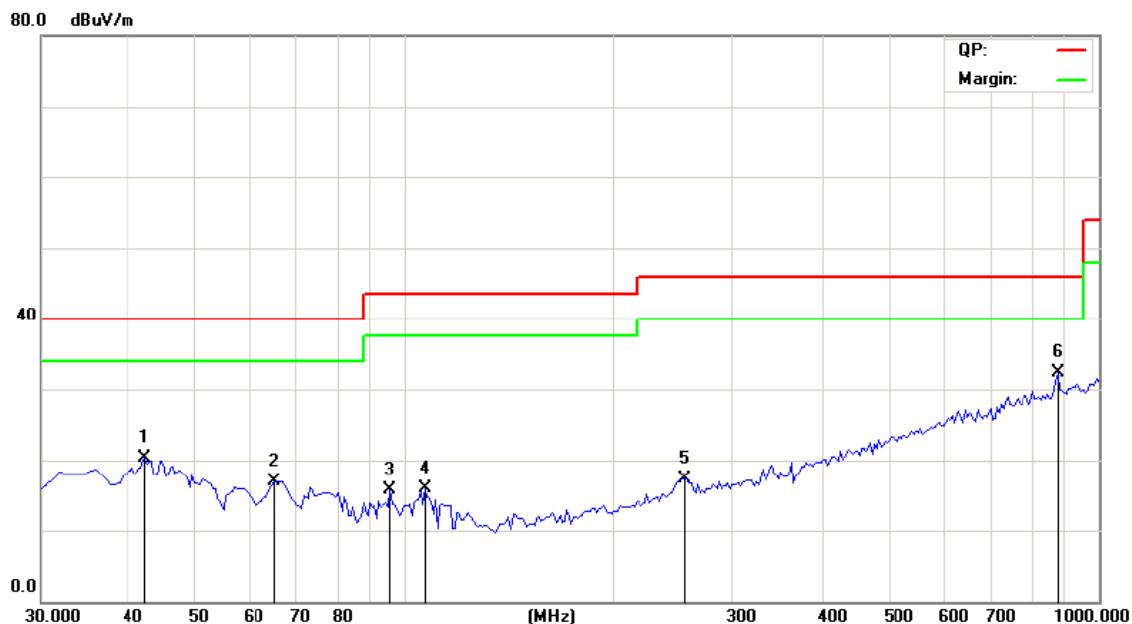
Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
--	--	V	--
--	--	H	--
--	--	V	--
--	--	H	--

B General Radiated Emissions Data

Radiated Emission In Horizontal (30MHz----1000MHz)

Please refer to following diagram for individual

Low channel: 2402 MHz



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
42.3243	20.24	H	40.00
64.9875	16.98	H	40.00
96.0946	15.75	H	43.50
107.7542	15.87	H	43.50
255.4783	17.40	H	46.00
879.4572	32.33	H	46.00

Radiated Emission In Vertical (30MHz----1000MHz)

Please refer to following diagram for individual

Low channel: 2402 MHz



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
36.0175	19.23	V	40.00
42.6247	16.16	V	40.00
103.8537	16.33	V	43.50
239.9833	17.78	V	46.00
642.3354	27.81	V	46.00
883.3264	32.41	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 Radiated Emission Data (1000MHz-25000MHz)

Low channel: 2402 MHz				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2402	81.24(PK)	H	114/94	12.76
2402	77.88(PK)	V	114/94	16.12
4804	40.48(PK)	H	74/54	13.52
4804	39.12(PK)	V	74/54	14.88
7206	--	H	74/54	--
7206	--	V	74/54	--
9608	--	H/V	74/54	--
12010	--	H/V	74/54	--
14412	--	H/V	74/54	--
16814	--	H/V	74/54	--
19216	--	H/V	74/54	--
21618	--	H/V	74/54	--
24020	--	H/V	74/54	--

Middle channel: 2420 MHz				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2420	80.27 (PK)	H	114/94	13.73
2420	76.89 (PK)	V	114/94	17.11
4840	40.34 (PK)	H	74/54	13.66
4840	39.83 (PK)	V	74/54	14.17
7260	--	H	74/54	--
7260	--	V	74/54	--
9680	--	H/V	74/54	--
12100	--	H/V	74/54	--
14520	--	H/V	74/54	--
16940	--	H/V	74/54	--
19360	--	H/V	74/54	--
21780	--	H/V	74/54	--
24200	--	H/V	74/54	--

High channel: 2442 MHz				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal/Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2442	80.11 (PK)	H	114/94	13.89
2442	76.17 (PK)	V	114/94	17.83
4884	40.10 (PK)	H	74/54	13.90
4884	39.09 (PK)	V	74/54	14.91
7326	--	H/V	74/54	--
9768	--	H/V	74/54	--
12210	--	H/V	74/54	--
14652	--	H/V	74/54	--
17094	--	H/V	74/54	--
19536	--	H/V	74/54	--
21978	--	H/V	74/54	--
24420	--	H/V	74/54	--

Note: 1) PK= Peak, AV= Average

2) Emission Level = Reading Level + Antenna Factor + Cable Loss.

3) Margin= Limit(AV) – Emission Level

4) According to section 15.35(b), the peak limit is 20dB higher than the average limit

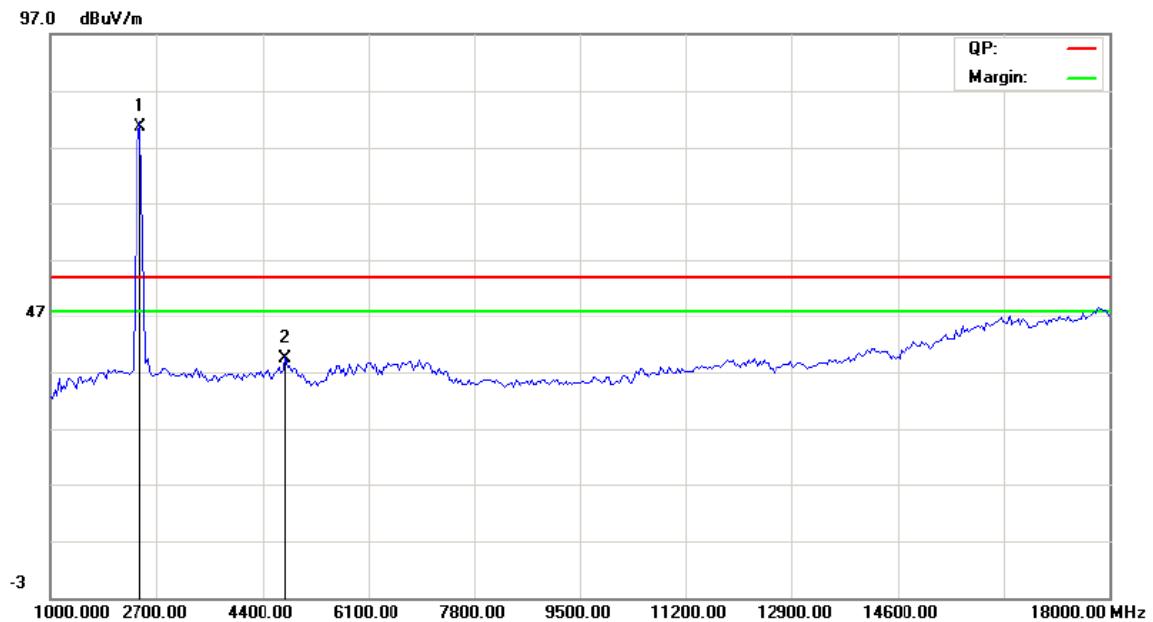
5) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

6) It is the floor noise from 18-25GHz, which is deemed to comply with the requirement of the rule.

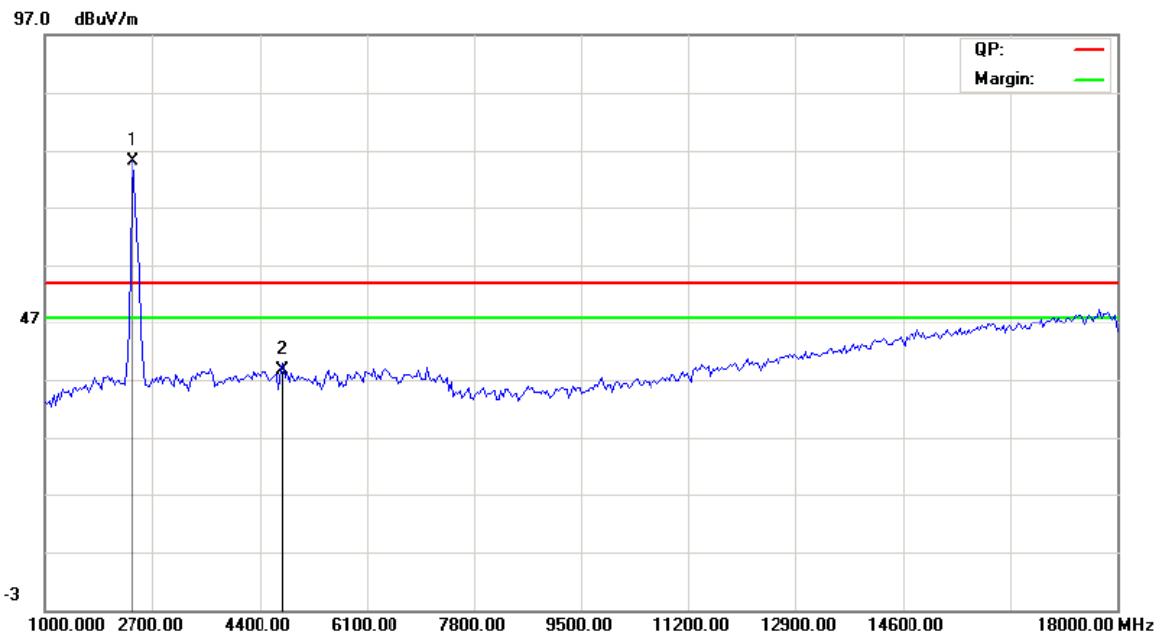
Please refer to the following diagram for individual

Low Channel: 2402 MHz

H

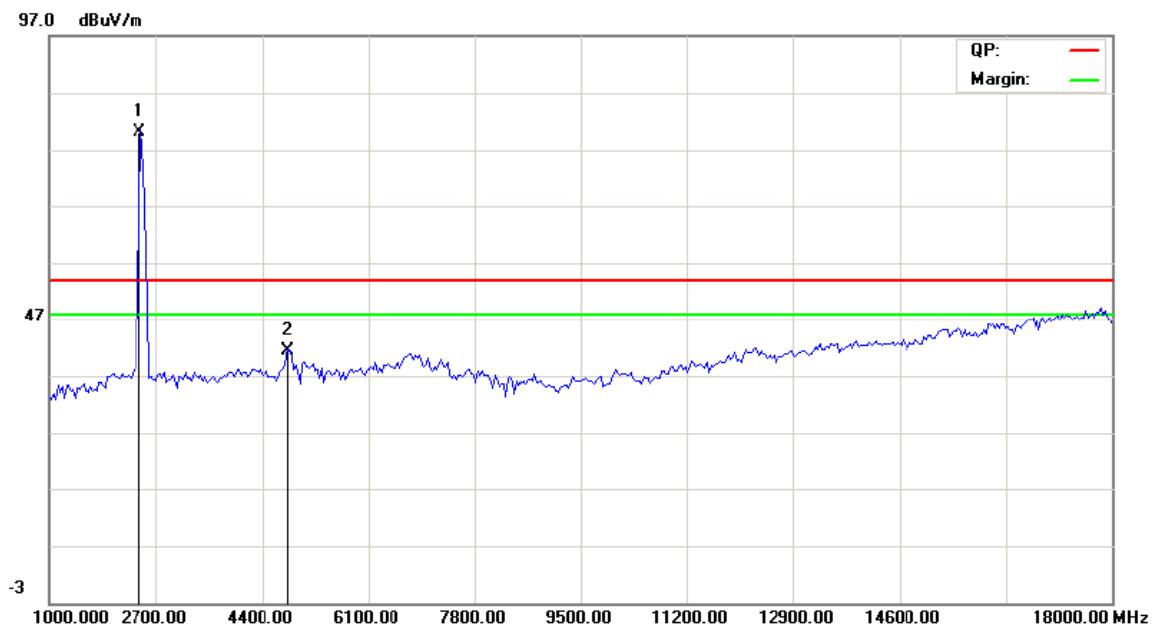


V

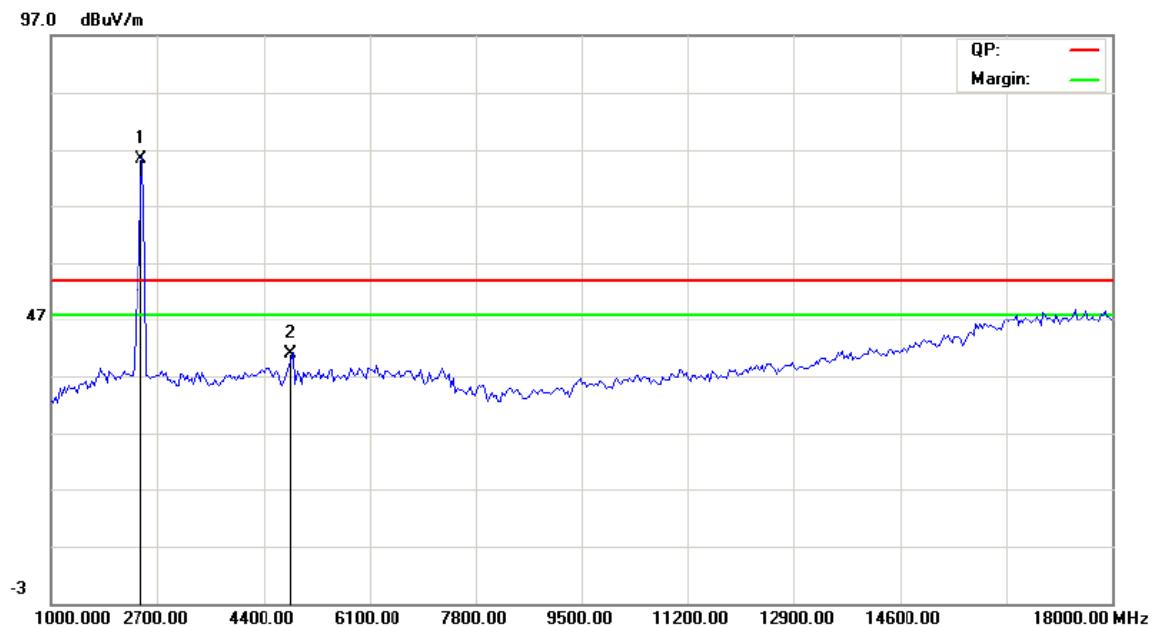


Please refer to following diagram for individual
Middle Channel: 2420 MHz

H



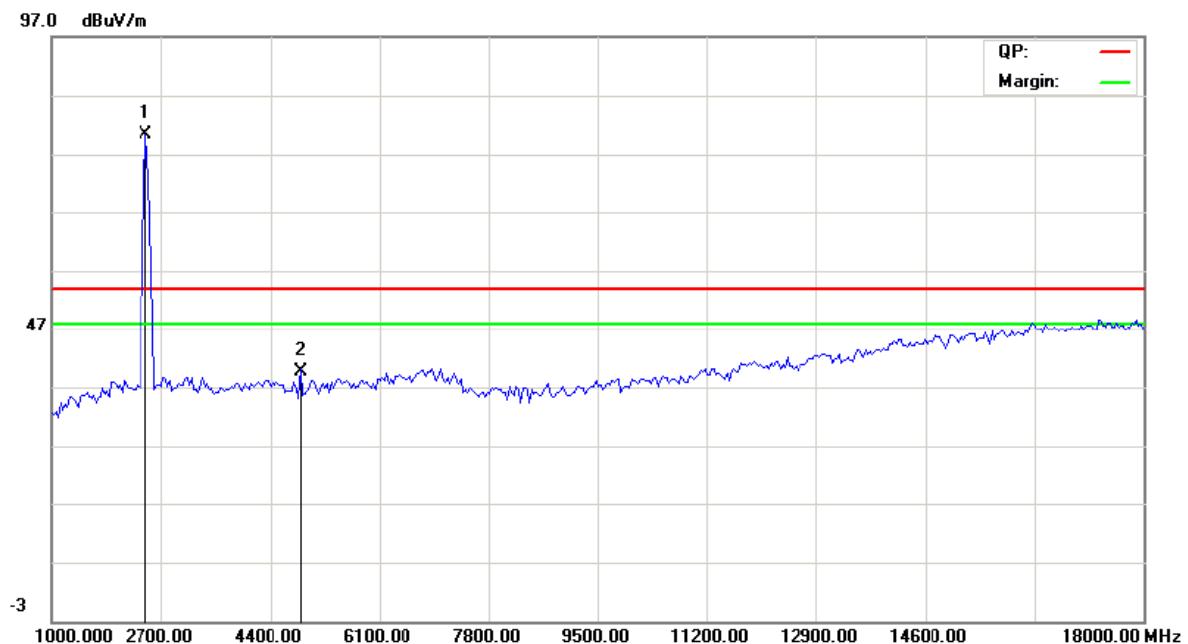
V



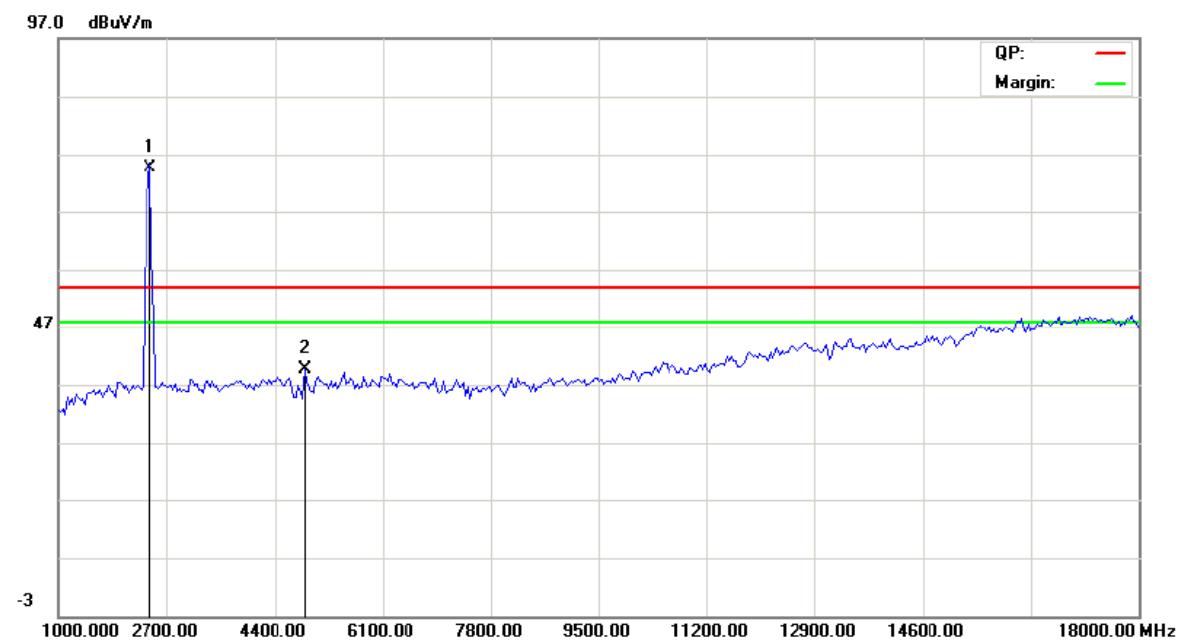
Please refer to following diagram for individual

High Channel: 2442 MHz

H

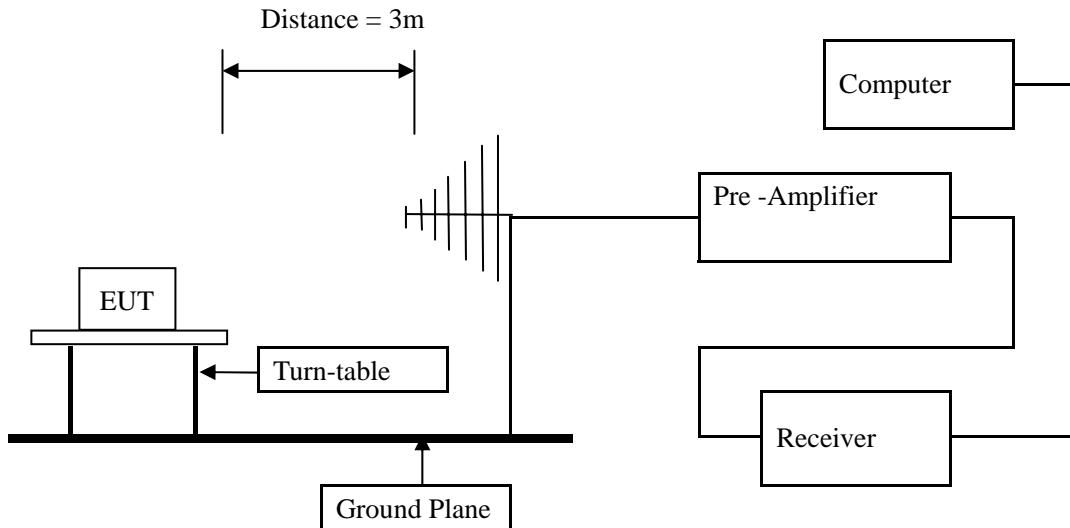


V



8. Band Edge

8.1 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing

8.2 Band Edge Limit

- 1) 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 Section 15.209, whichever is the lesser attenuation.
- 2) For Emissions in Restricted band, the limit is below the general radiated emission limits in Section 15.209. The provisions in Section 15.35 apply to these measurements.

8.3 Test Equipment

Please refer to the Section 2

8.4 Test Procedure

According to KDB 913591:

- 1) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function for the frequency being measured, as required by C63.4 and FCC Rules.
- 2) Choose the span that encompasses both the peak of the fundamental emission and the band edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Observe the amplitude delta between the peak of the fundamental and the peak of the band edge emission and record.
- 3) Subtract the delta measured in step 2) from the field strengths measured in step 1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band edge compliance as required by Section 15.205.

8.5 Test Result

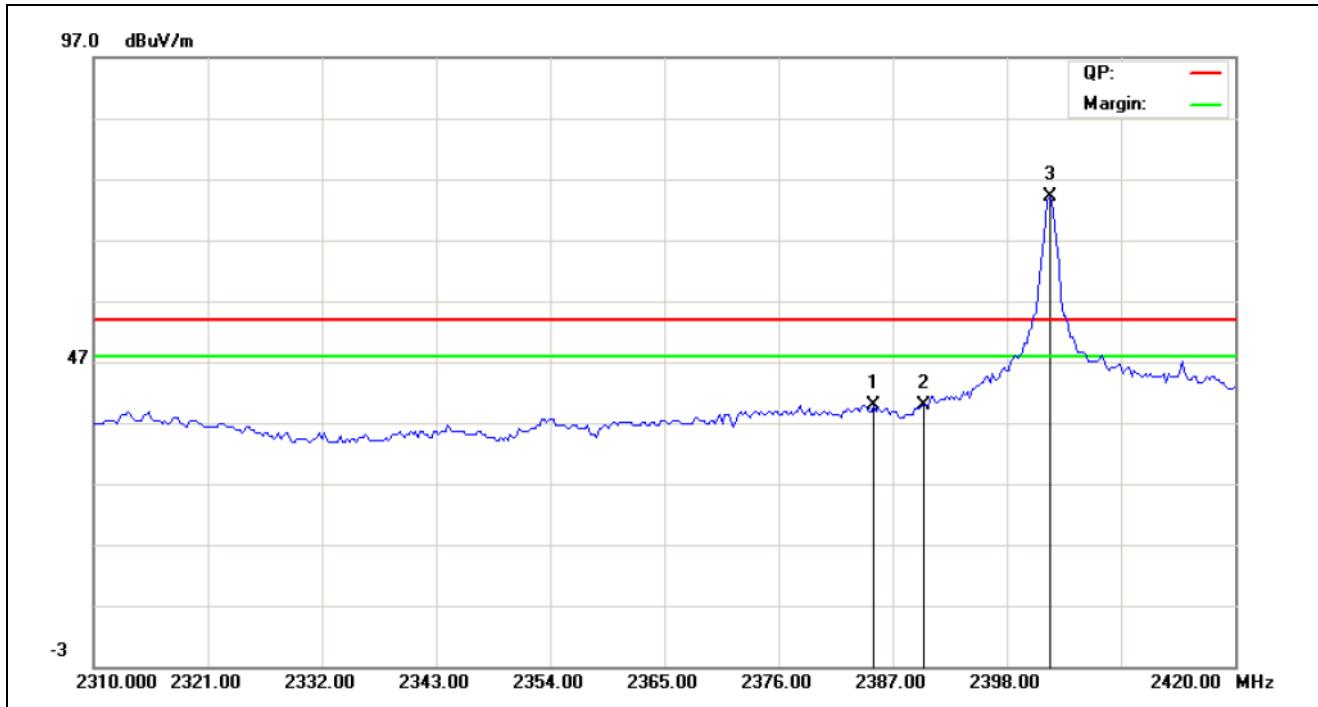
Low channel in Horizontal polarization



Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2387.816	39.96	Peak	74.00
2390.000	40.47	Peak	74.00
2402.144	77.07	Peak	114.00

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

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 44.64 dBuV/m at 2390 MHz, which meets the average limit in section 15.209. It is deemed to comply with the requirements.

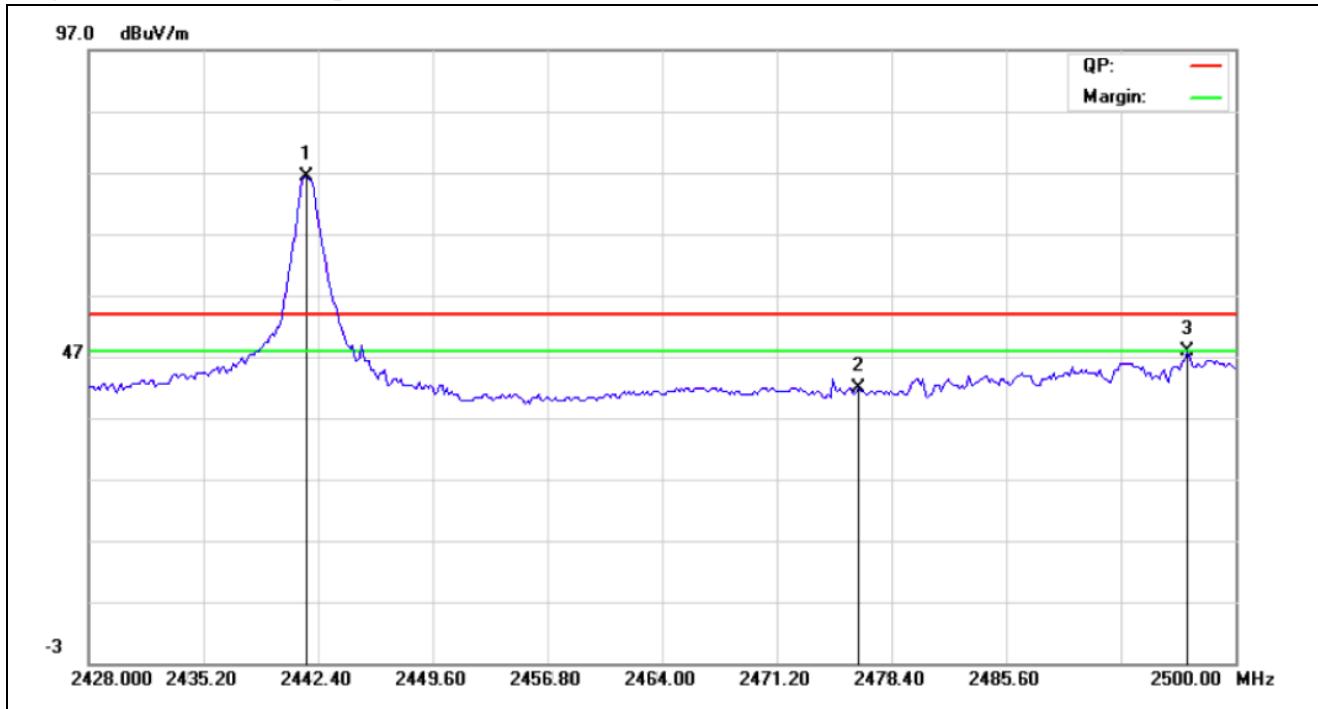
Low channel in Vertical polarization

Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2385.170	39.93	Peak	74.00
2390.000	39.97	Peak	74.00
2402.144	74.07	Peak	114.00

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

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 43.78 dBuV/m at 2390 MHz, which meets the average limit in section 15.209. It is deemed to comply with the requirements.

High channel in Horizontal polarization

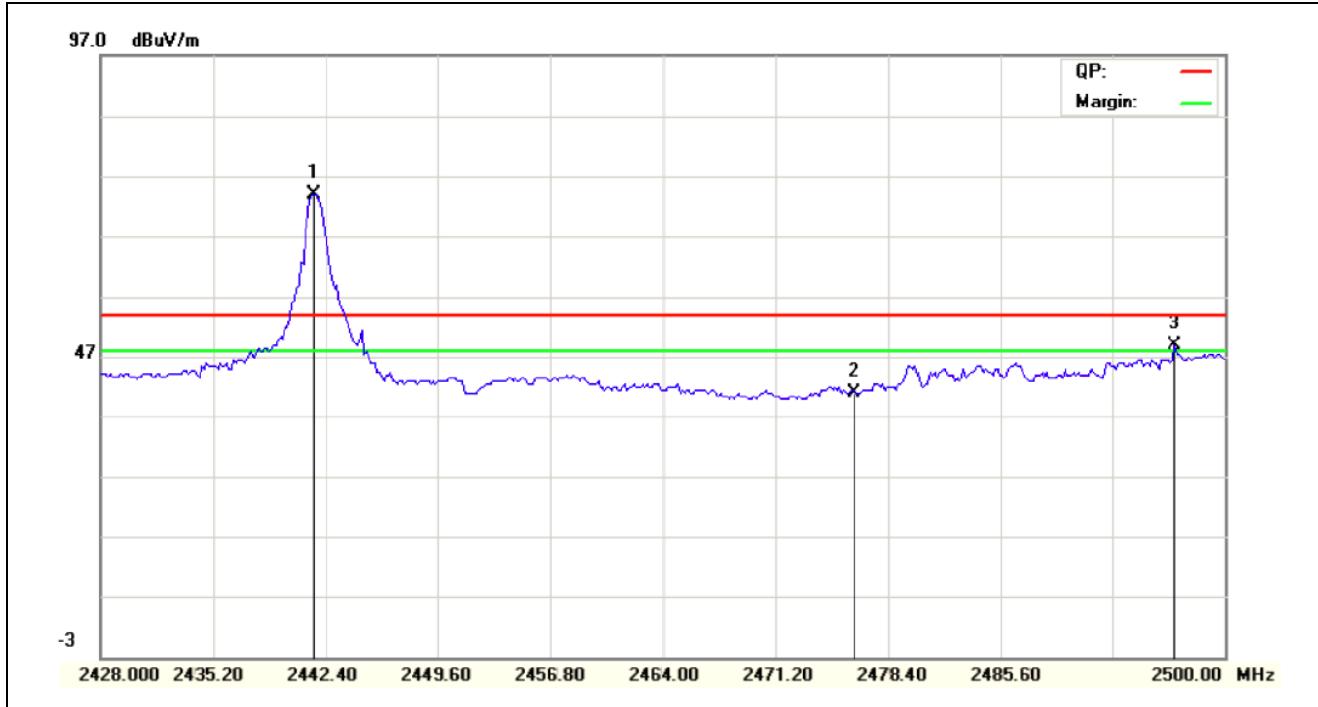


Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2442.012	76.27	peak	114.00
2483.500	41.86	peak	74.00
2497.896	47.91	peak	74.00

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

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 51.75 dBuV/m at 2497.896 MHz, which meets the average limit in section 15.209. It is deemed to comply with the requirements.

High channel in Vertical polarization



Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2442.012	73.75	peak	114.00
2483.500	40.86	peak	74.00
2497.796	48.91	peak	74.00

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

2) Marker-delta method was used to get the final result; the maximum emission in the restricted band is 51.33 dBuV/m at 2497.796 MHz, which meets the average limit in section 15.209. It is deemed to comply with the requirements.

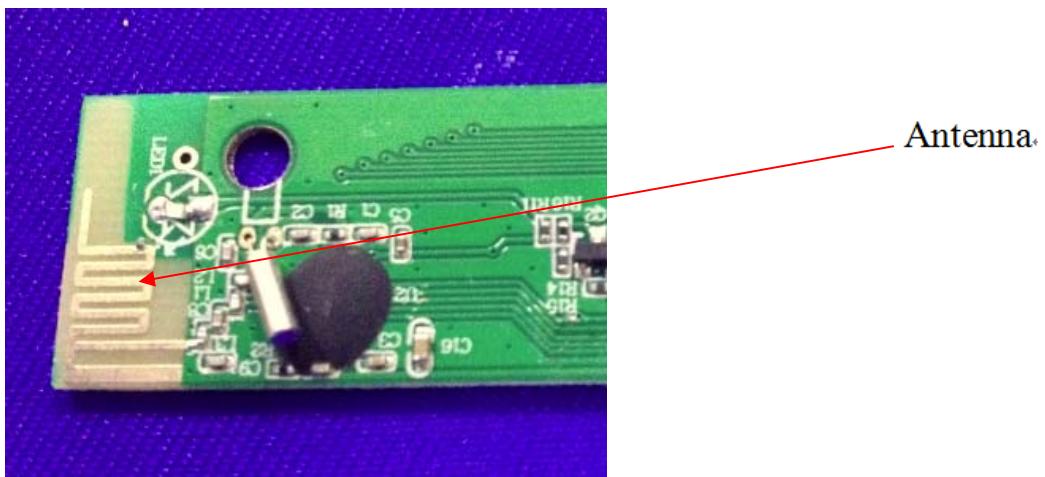
9.0 Antenna Requirement

9.1 Applicable Standard

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

9.2 Antenna Specification

The EUT has an external antenna, which is fixed in the PCB board, and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.



10.0 20dB Bandwidth Measurement

10.1 Test Equipment

Please refer to the Section 2

10.2 Test specification:

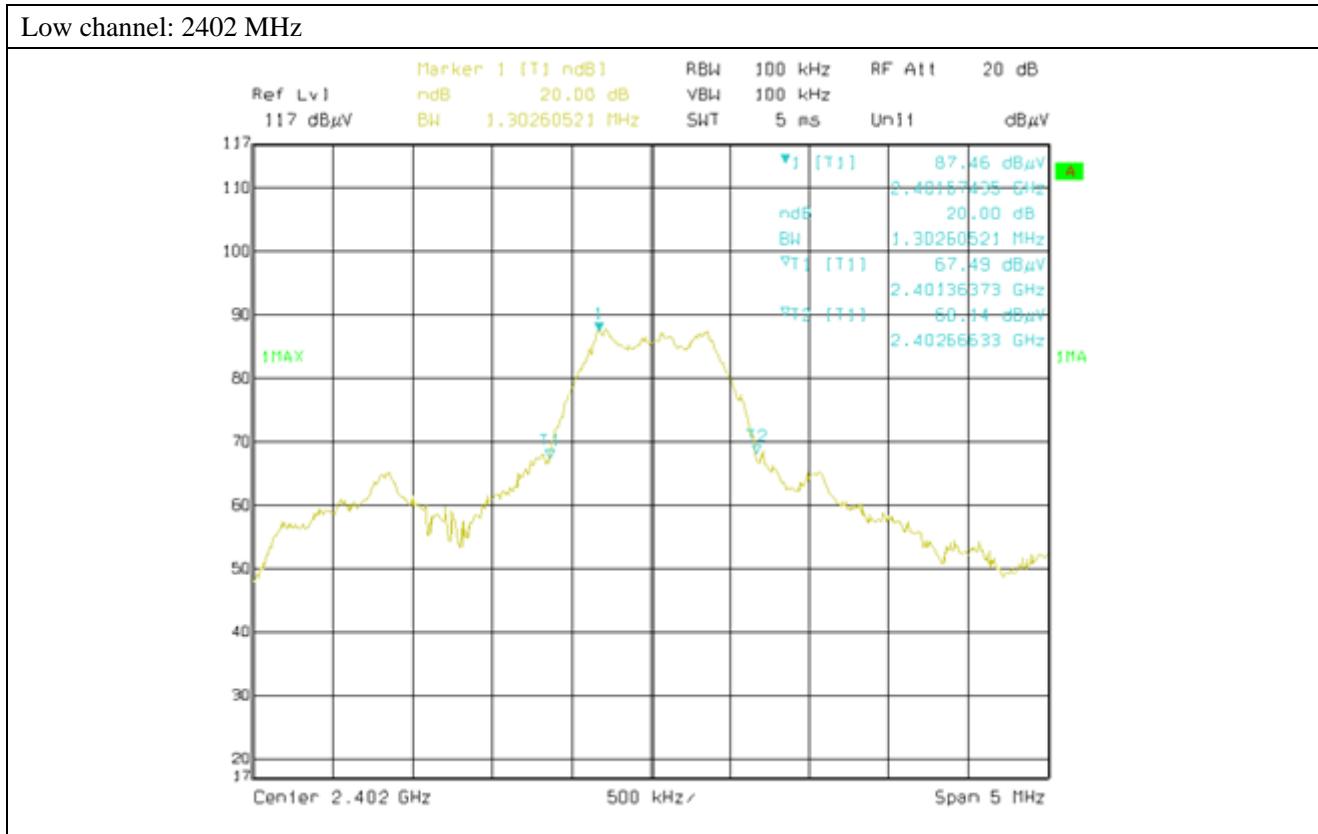
Environmental conditions: Temperature 24°C Humidity: 52% Atmospheric pressure: 103kPa

10.3 Limit

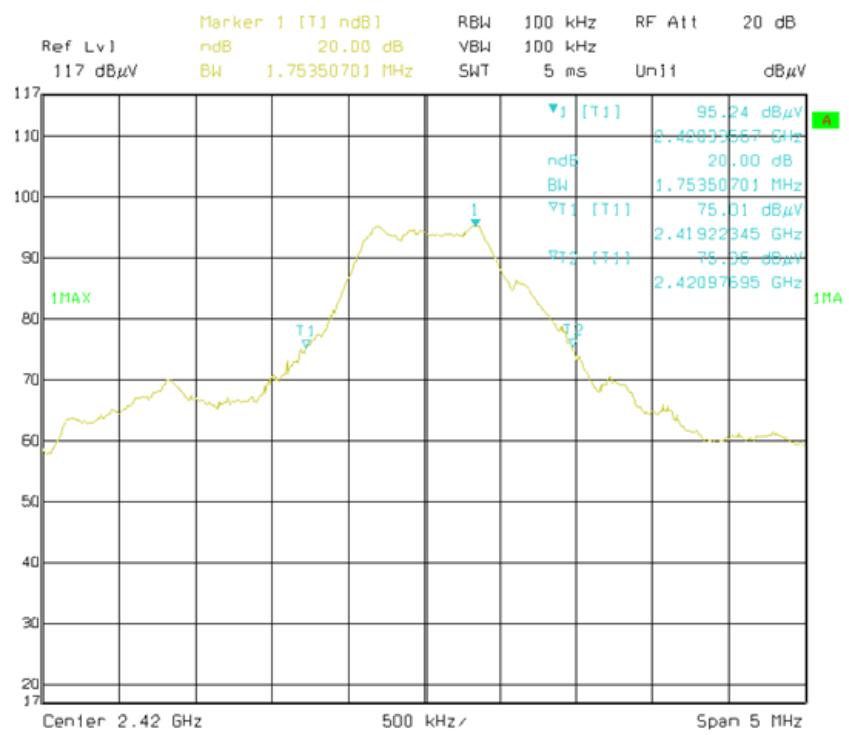
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

10.4 Test Result:

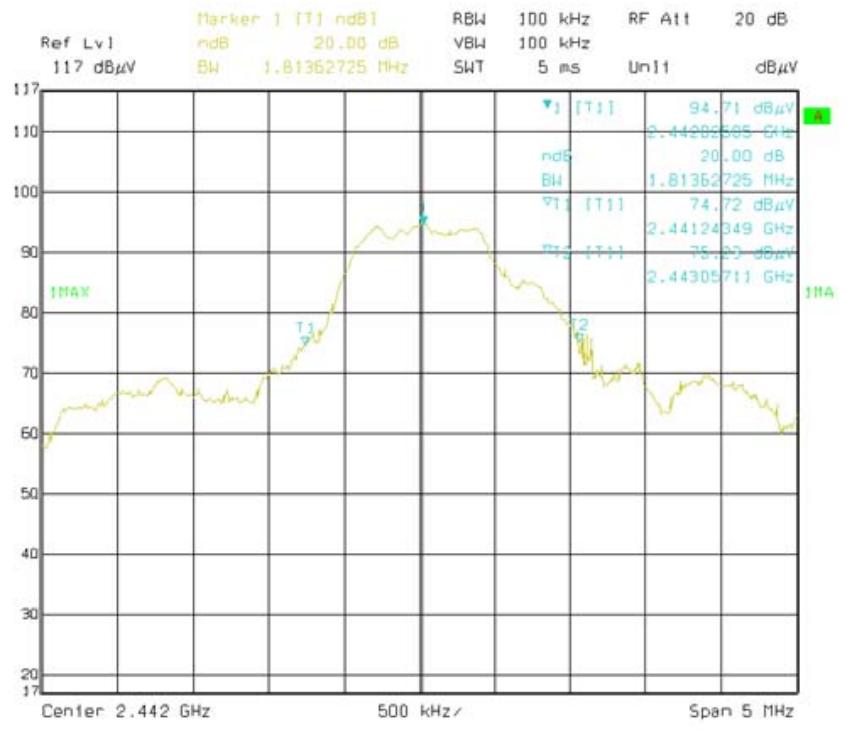
Channel number	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
(Low)	1302.6	---	PASS
(Middle)	1753.5	---	PASS
(High)	1813.6	---	PASS



Middle channel: 2420 MHz



High channel: 2442 MHz



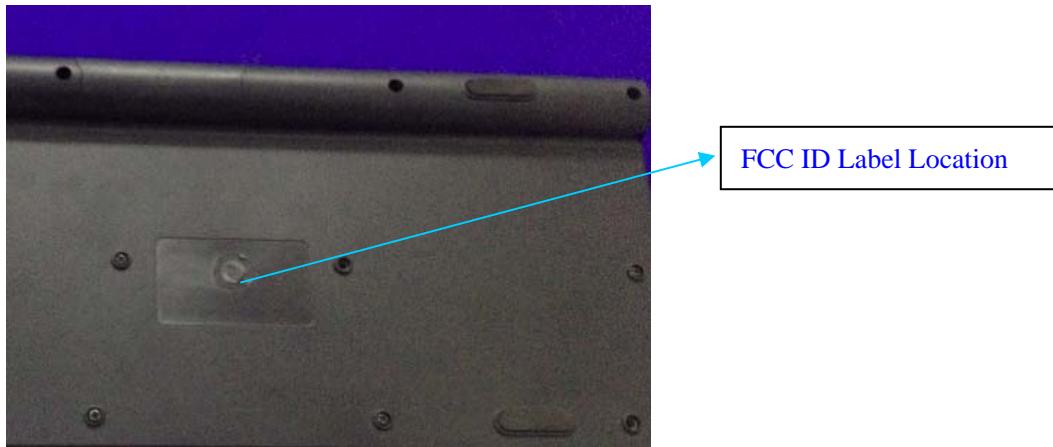
11.0 FCC ID Label

FCC ID: RM8CVD602

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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:

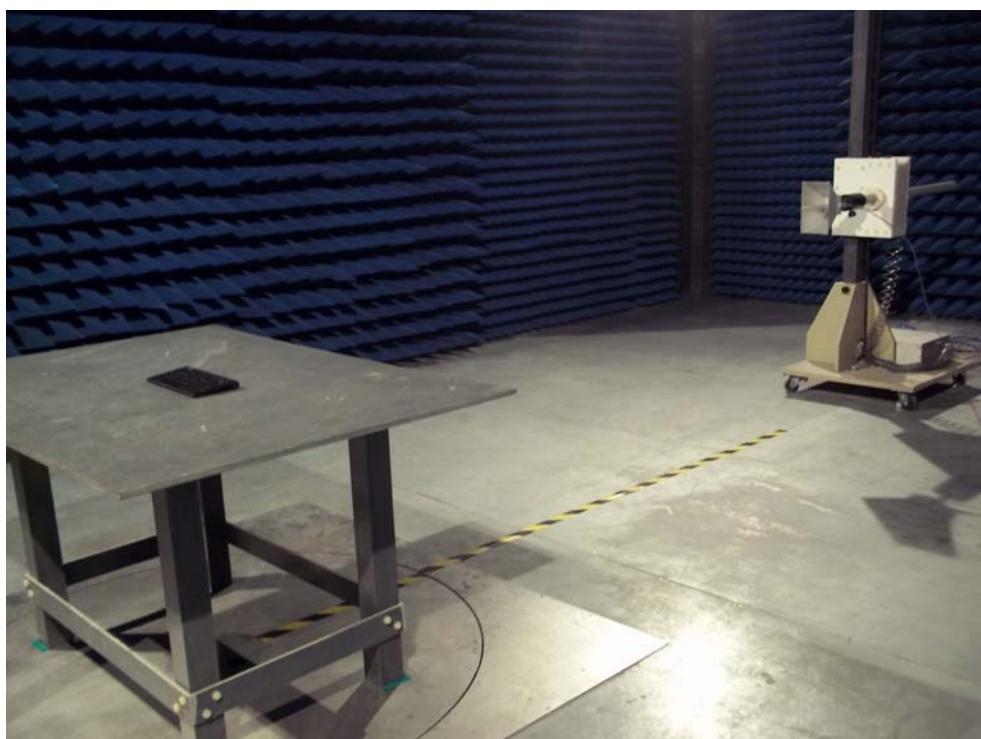
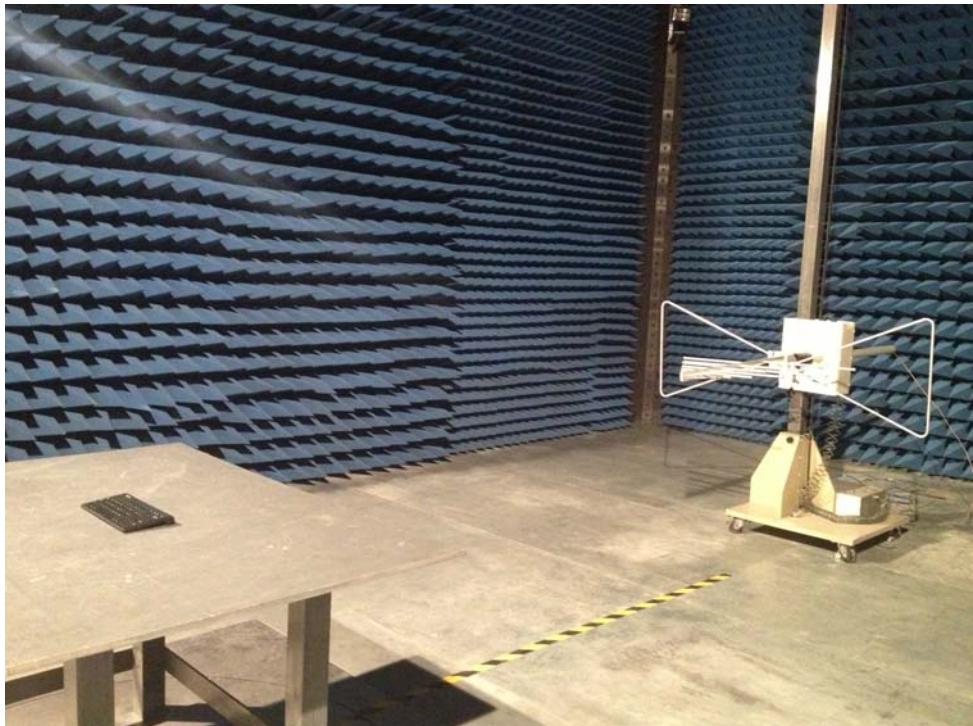


12.0 Photos of testing

12.1 Conducted test View

N/A

12.2 Radiated emission test view



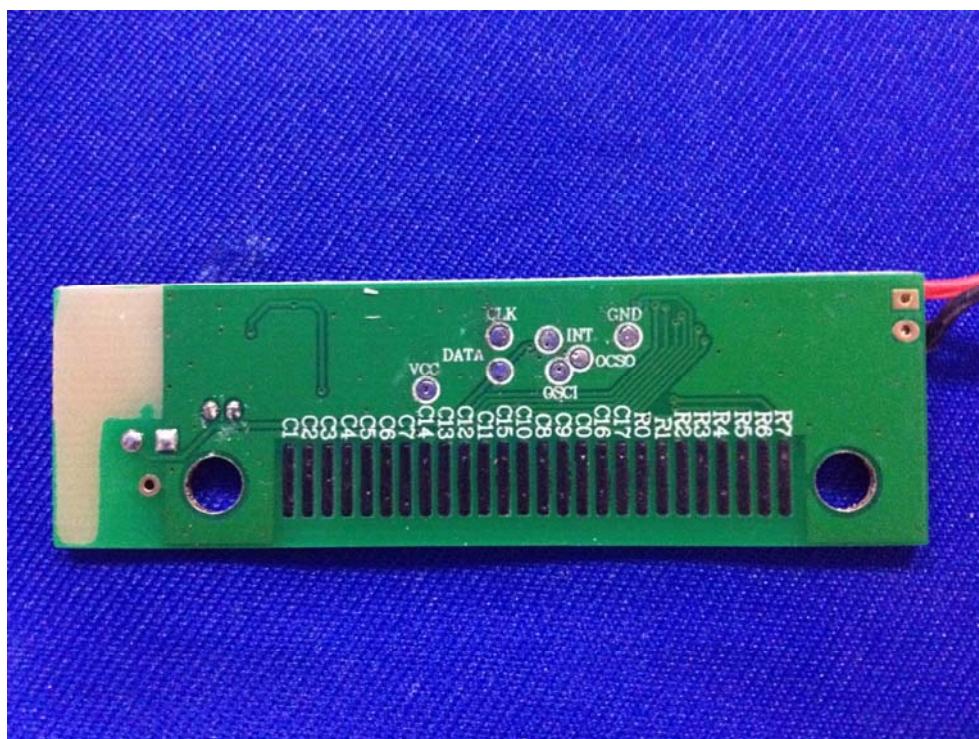
13.0 Photos for the EUT

Outside View of the EUT

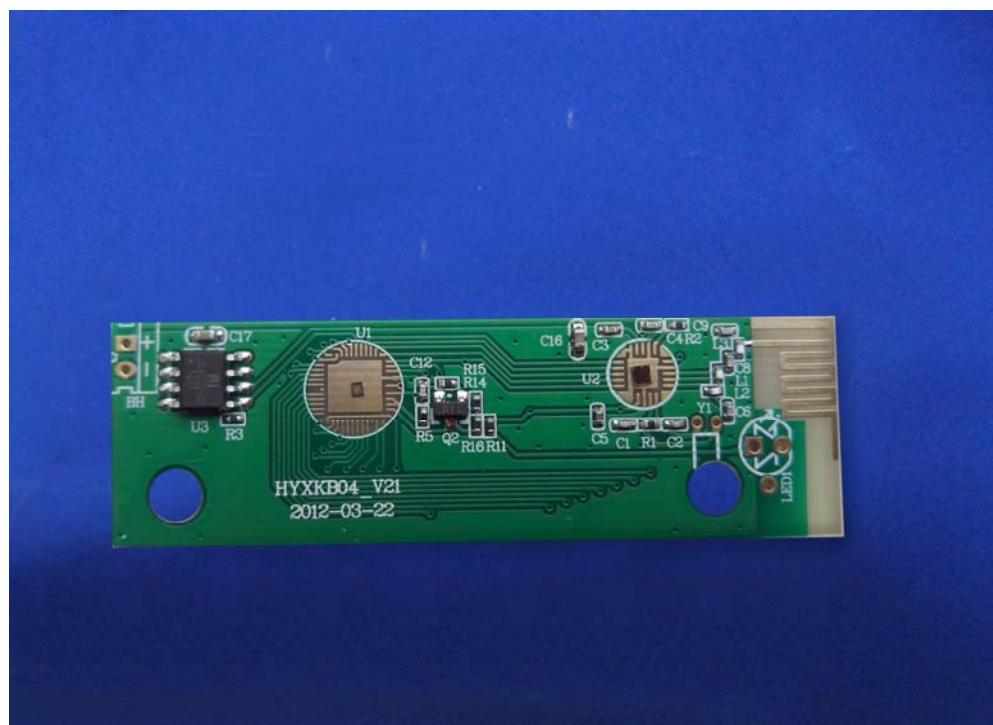
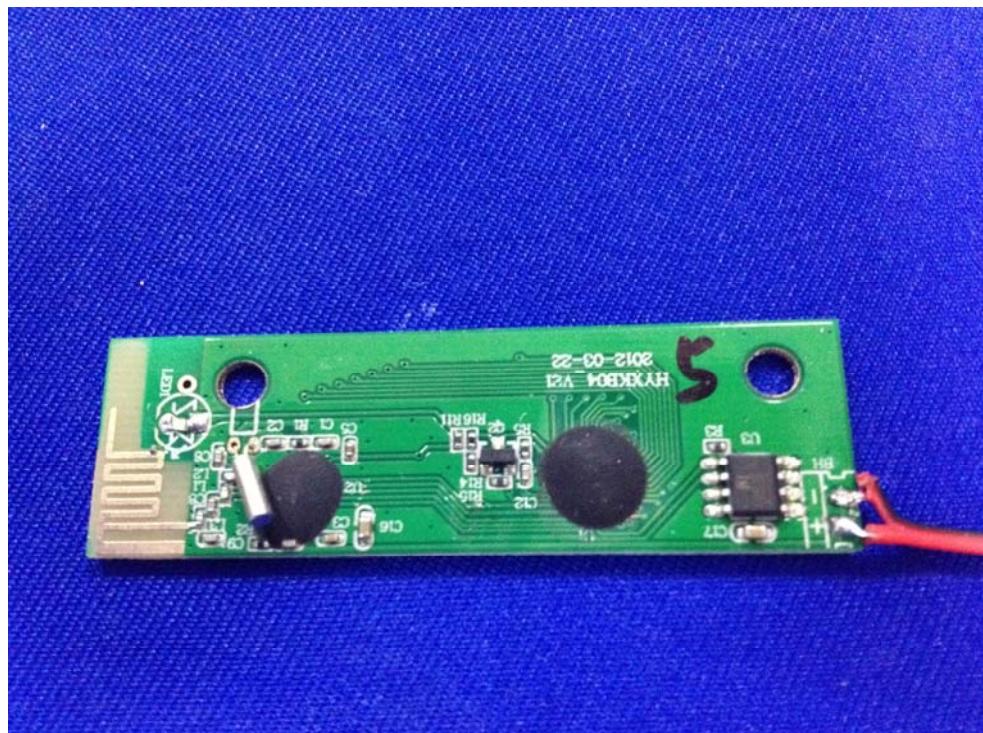




Inside View of the EUT



Inside View of the EUT



--End of the report--