

# TEST REPORT

**FCC ID** : YY9-HE406LLA  
**Applicant** : Bretford Manufacturing, Inc.  
**Address** : 11000 Seymour Ave Franklin Park IL 60131 USA  
**Manufacturer** : BCD China Electronics Manufacturing (Shenzhen) Ltd  
**Address** : 3/F&5/F, Bldg B2, Xin An No. 3 Industrial Park, Hang Cheng Industrial Zone, Qian Jin Road, Xi Xiang, Bao An District, Shenzhen, Guangdong,

**Equipment Under Test (EUT) :**

Product Name : PowerSync Station 20 for iPad and iPad mini  
Model No. : HE406LL/A  
**Standards** : FCC CFR47 Part 15 C Section 15.247:2012

**Date of Test** : Sep 05~25, 2013

**Date of Issue** : Nov 13, 2013

**Test Result** : **PASS\***

Remark:

\* The sample described above has been tested to be in compliance with the requirements of RSS-Gen Issue 3:2010. The test results have been reviewed and comply with the rules listed above and found to meet their essential requirements.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without Sepcific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

**Waltek Services (Shenzhen) Co., Ltd.**

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

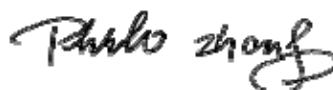
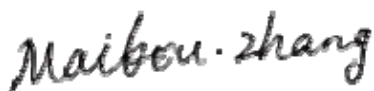
Testing location: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

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Compiled by:

Approved by:



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Maikou Zhang / Project Engineer

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Philo Zhong / Manager

## 2 Test Summary

Test Items	Test Requirement	Result
Radiated Emissions	15.205(a) 15.209(a)	PASS
Conducted Emissions	15.207(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Emissions from out of band	15.247(d)	PASS
Antenna Requirement	15.247(d)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	15.203	PASS

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## 4 General Information

### 4.1 General Description of E.U.T.

<b>Product Name</b>	: PowerSync Station 20 for iPad and iPad mini
<b>Model No.</b>	: HE406LL/A
<b>Model Difference</b>	: N/A
<b>Operation Frequency</b>	: 2404MHz ~ 2478MHz, 37 channels in total
<b>Type of modulation</b>	: Bluetooth 4.0
<b>Antenna Gain</b>	: 2.5dBi

### 4.2 Details of E.U.T.

<b>Technical Data</b>	: Input: 125 VAC, 3A (Max), 60Hz Output: 5V, 2.4A for per USB port
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### 4.3 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

Waltek Services(Shenzhen) Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.  
Registration number 7760A, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. 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. Registration 880581, May 26, 2011.

### 4.4 Test Location

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen, China

## 5 Equipment Used during Test

### 5.1 Equipments List

Conducted Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	100947	Sep.21,2013	Sep.20,2014
2.	LISN	R&S	ENV216	101215	Sep.21,2013	Sep.20,2014
3.	Cable	Top	TYPE16(3.5M)	-	Sep.21,2013	Sep.20,2014
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.21,2013	Sep.20,2014
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.21,2013	Sep.20,2014
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Sep.21,2013	Sep.20,2014
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Sep.21,2013	Sep.20,2014
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Sep.21,2013	Sep.20,2014
6.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Sep.21,2013	Sep.20,2014
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Sep.21,2013	Sep.20,2014
8.	Cable	Top	EWO2014-7	-	Sep.21,2013	Sep.20,2014
9.	Cable	Top	TYPE16(13M)	-	Sep.21,2013	Sep.20,2014
10.	DC POWER SUPPLY	LWDQGS	PS-303D		Sep.21,2013	Sep.20,2014
11.	Humidity Chamber	GTH-225-40-1P	IAA061213		Sep.21,2013	Sep.20,2014
12.	Spectrum Analyzer	ROHDE & SCHWARZ	FSL6	100959	Sep. 21, 2013	Sep. 20, 2014

### 5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	$\pm 1.0$ dB
RF Power Density	$\pm 2.2$ dB
Radiated Spurious Emissions test	$\pm 5.03$ dB (Bilog antenna 30M~1000MHz)
	$\pm 4.74$ dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	$\pm 3.64$ dB (AC mains 150KHz~30MHz)

### 5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

## 6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dB $\mu$ V between 0.15MHz & 0.5MHz 56 dB $\mu$ V between 0.5MHz & 5MHz 60 dB $\mu$ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

### 6.1 E.U.T. Operation

#### Operating Environment:

Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	1013 mbar

#### EUT Operation:

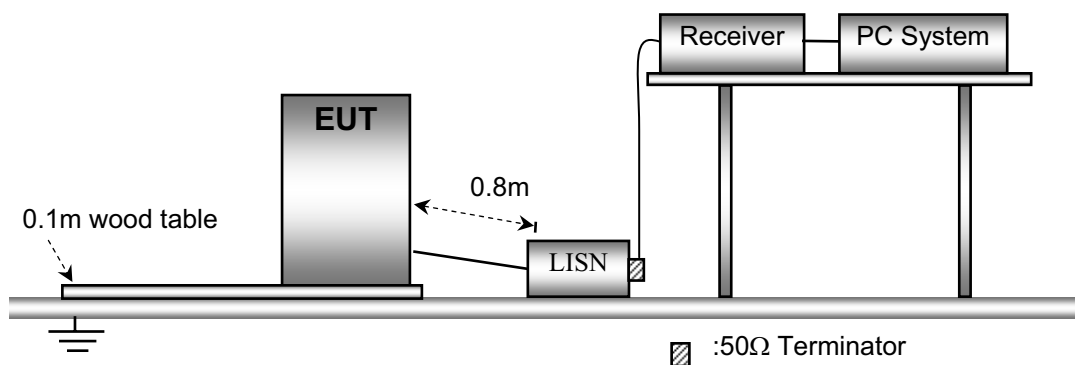
The EUT was tested in bluetooth transmission mode.

The EUT was tested according to ANSI C63.4:2003. The frequency Sepctrum from 150kHz to 30MHz was investigated.

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

### 6.2 EUT Setup

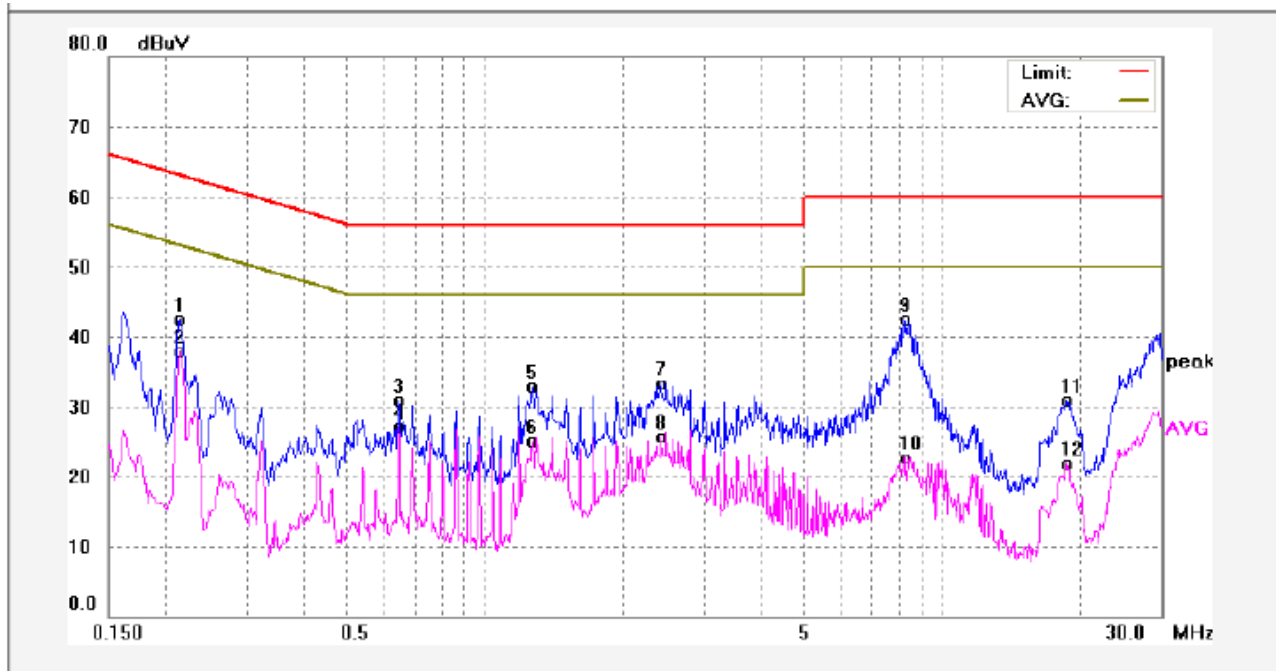
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003.



### 6.3 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

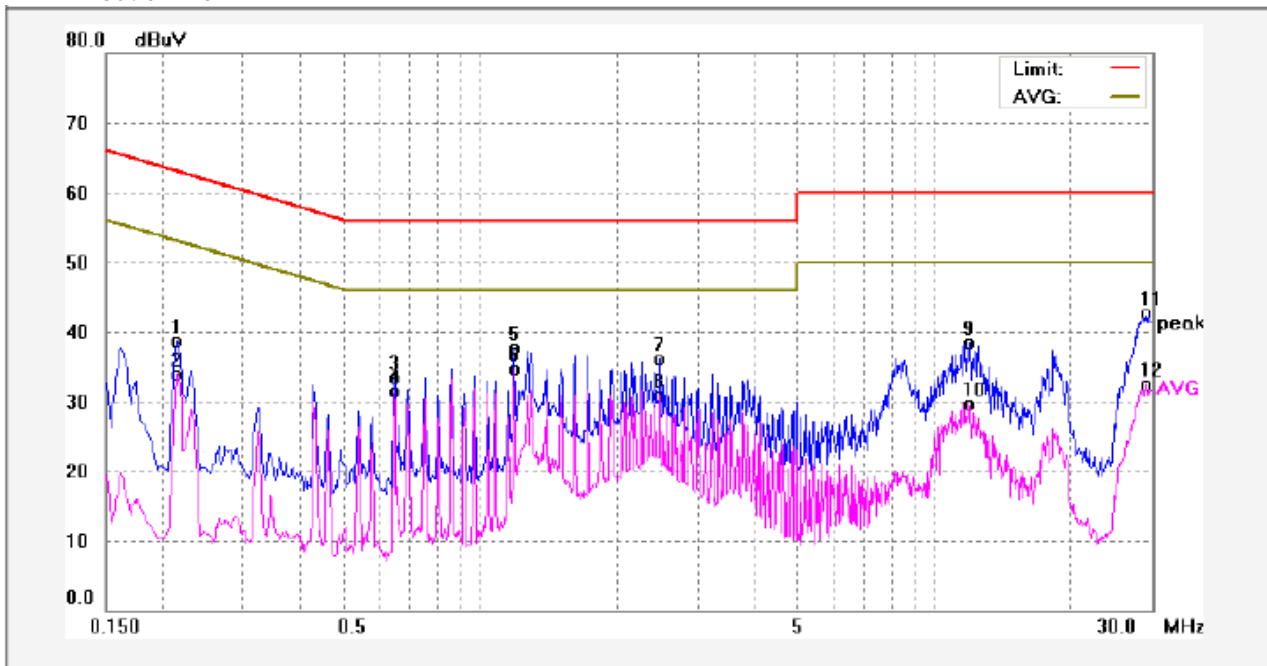
Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2139	32.68	9.84	42.52	63.05	-20.53	QP	
2	0.2139	27.99	9.84	37.83	53.05	-15.22	AVG	
3	0.6460	20.92	9.94	30.86	56.00	-25.14	QP	
4	0.6460	17.21	9.94	27.15	46.00	-18.85	AVG	
5	1.2660	22.81	10.00	32.81	56.00	-23.19	QP	
6	1.2660	15.08	10.00	25.08	46.00	-20.92	AVG	
7	2.4180	23.35	10.01	33.36	56.00	-22.64	QP	
8	2.4180	15.72	10.01	25.73	46.00	-20.27	AVG	
9	8.1499	32.19	10.38	42.57	60.00	-17.43	QP	
10	8.1499	12.23	10.38	22.61	50.00	-27.39	AVG	
11	18.6417	19.81	11.12	30.93	60.00	-29.07	QP	
12	18.6417	10.87	11.12	21.99	50.00	-28.01	AVG	



Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2139	28.90	9.84	38.74	63.05	-24.31	QP	
2	0.2139	24.09	9.84	33.93	53.05	-19.12	AVG	
3	0.6460	23.52	9.94	33.46	56.00	-22.54	QP	
4	0.6460	21.60	9.94	31.54	46.00	-14.46	AVG	
5	1.1855	27.67	10.00	37.67	56.00	-18.33	QP	
6	1.1855	24.68	10.00	34.68	46.00	-11.32	AVG	
7	2.4780	26.12	10.02	36.14	56.00	-19.86	QP	
8	2.4780	20.89	10.02	30.91	46.00	-15.09	AVG	
9	11.9539	27.80	10.66	38.46	60.00	-21.54	QP	
10	11.9539	19.11	10.66	29.77	50.00	-20.23	AVG	
11	29.1020	30.61	12.18	42.79	60.00	-17.21	QP	
12	29.1020	20.25	12.18	32.43	50.00	-17.57	AVG	

## 7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209  
& 15.247

Test Method: ANSI C63.4:2003

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

### 7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1004 mbar

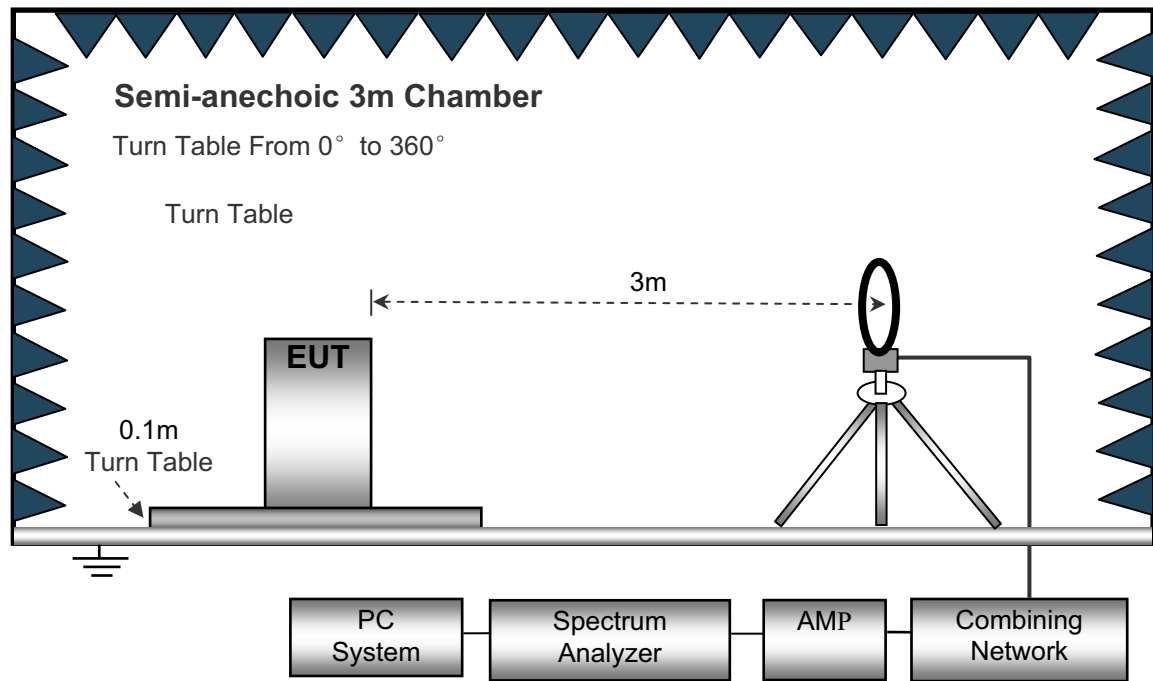
EUT Operation:

The EUT was tested in bluetooth transmission mode, and test data were shown as follow.

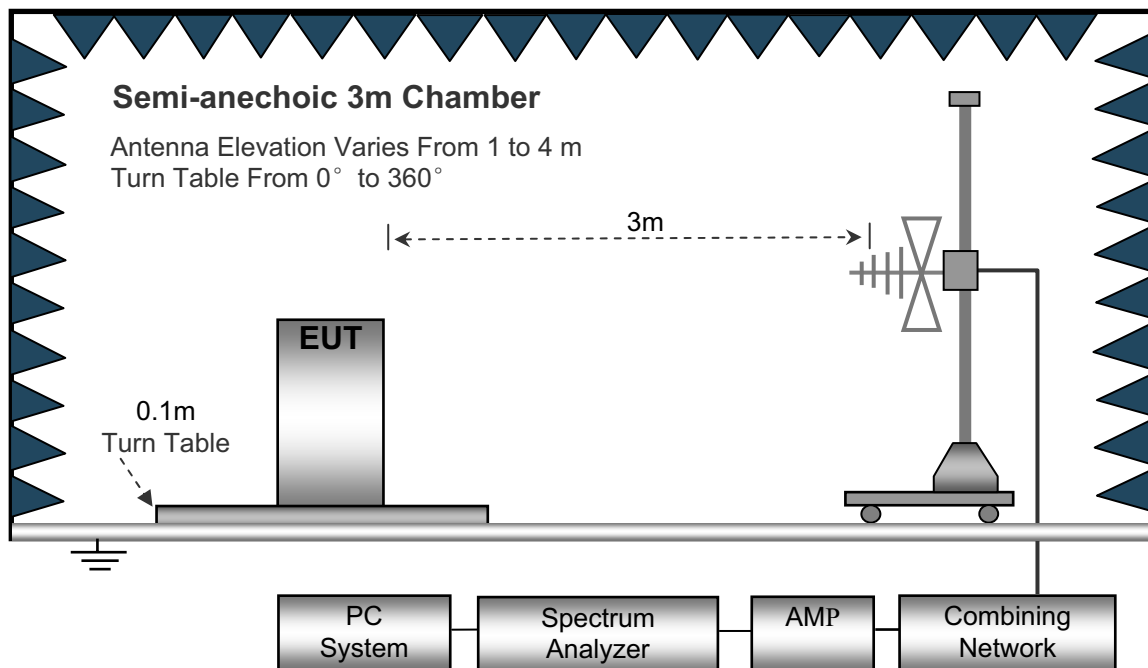
## 7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

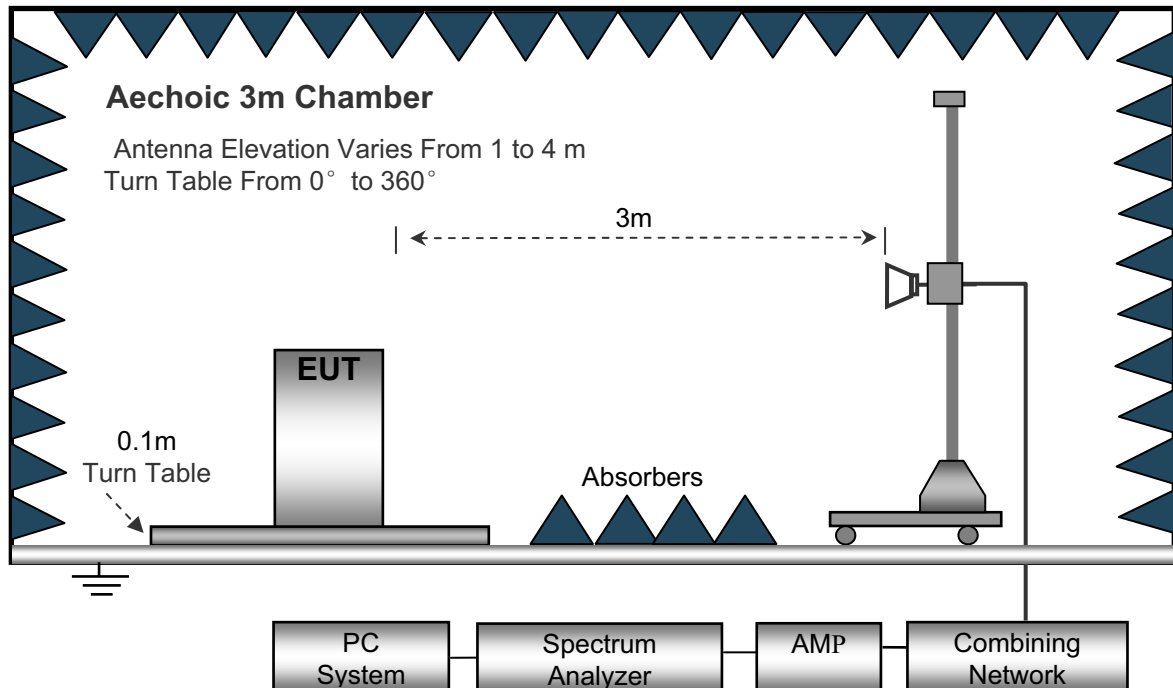
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



### 7.3 Sepctrum Analyzer Setup

According to FCC Part15 Rules, the system was tested from 9kHz to 25000MHz.

Below 30MHz

Sweep Seped .....Auto  
 IF Bandwidth .....10KHz  
 Video Bandwidth .....10KHz  
 Resolution Bandwidth .....10KHz

30MHz ~ 1GHz

Sweep Seped .....Auto  
 IF Bandwidth .....120 KHz  
 Video Bandwidth .....100KHz  
 Quasi-Peak Adapter Bandwidth .....120 KHz  
 Quasi-Peak Adapter Mode .....Normal  
 Resolution Bandwidth .....100KHz

Above 1GHz

Sweep Seped .....Auto  
 IF Bandwidth .....120 KHz  
 Video Bandwidth .....3MHz  
 Quasi-Peak Adapter Bandwidth .....120 KHz  
 Quasi-Peak Adapter Mode .....Normal  
 Resolution Bandwidth .....1MHz

## 7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.

## 7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

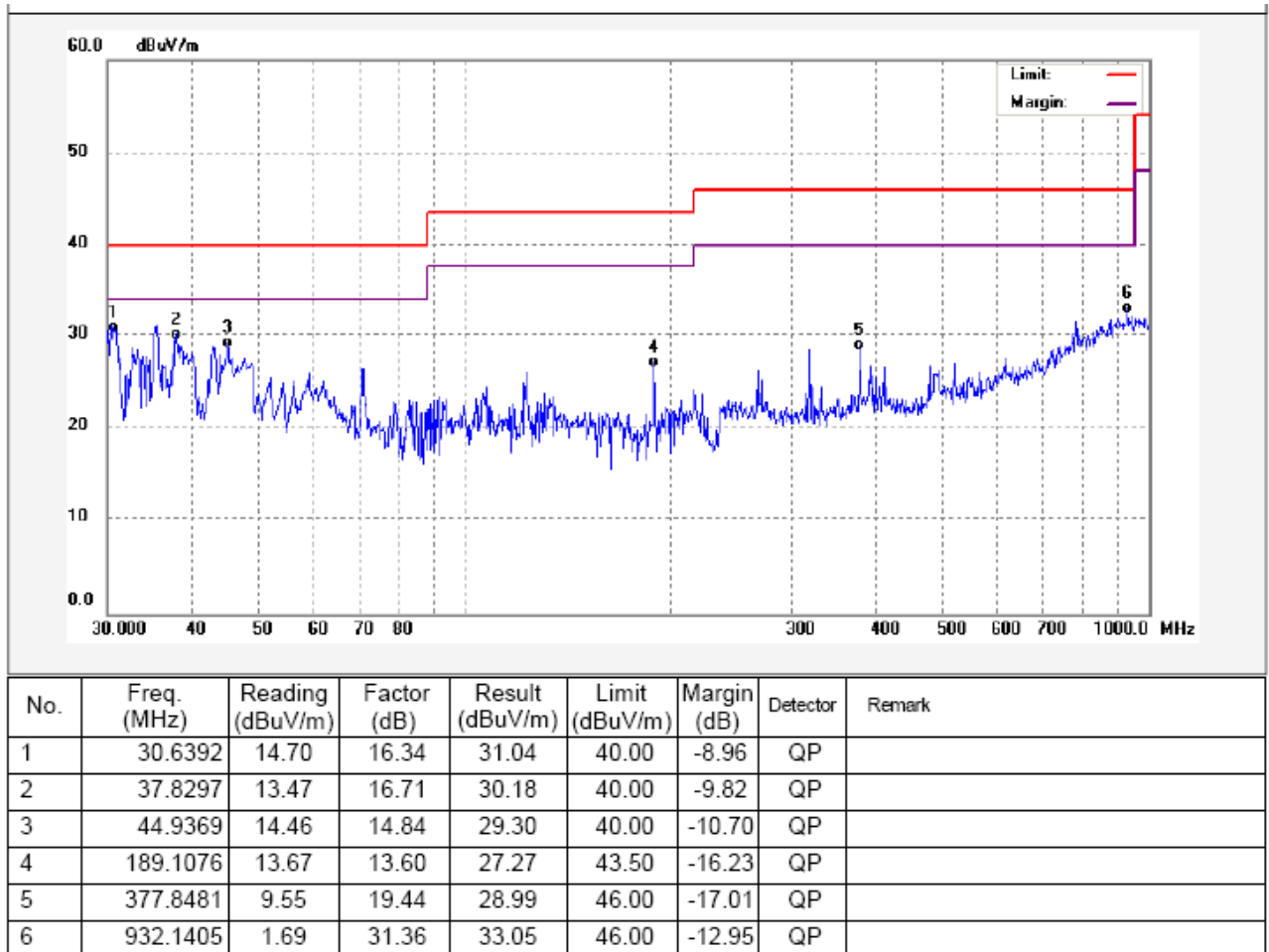
## 7.6 Summary of Test Results

### Test Frequency : Below 30MHz

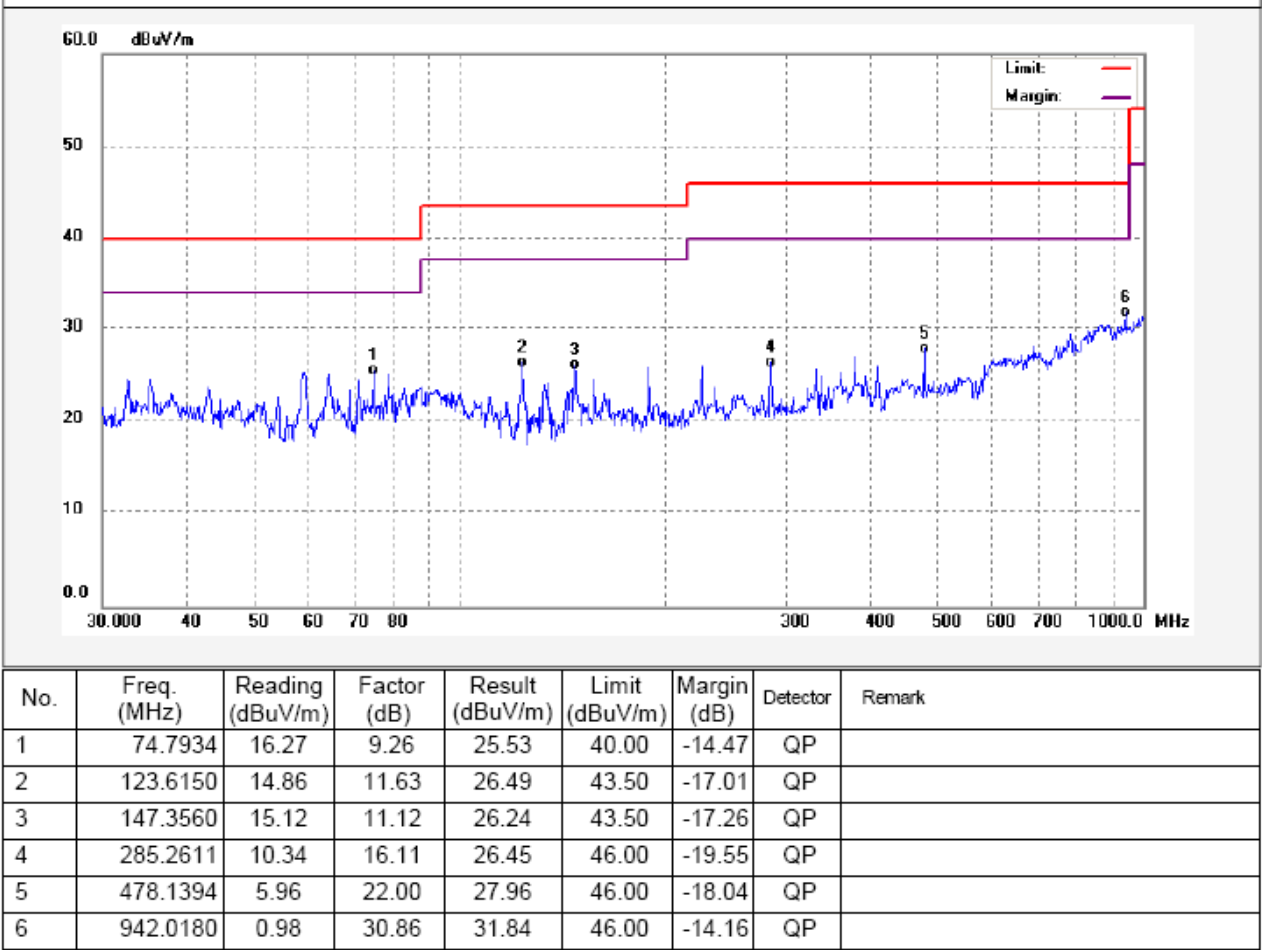
All emissions were more than 20 dB below the limit and therefore not reported.

### Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



Antenna polarization: Horizontal

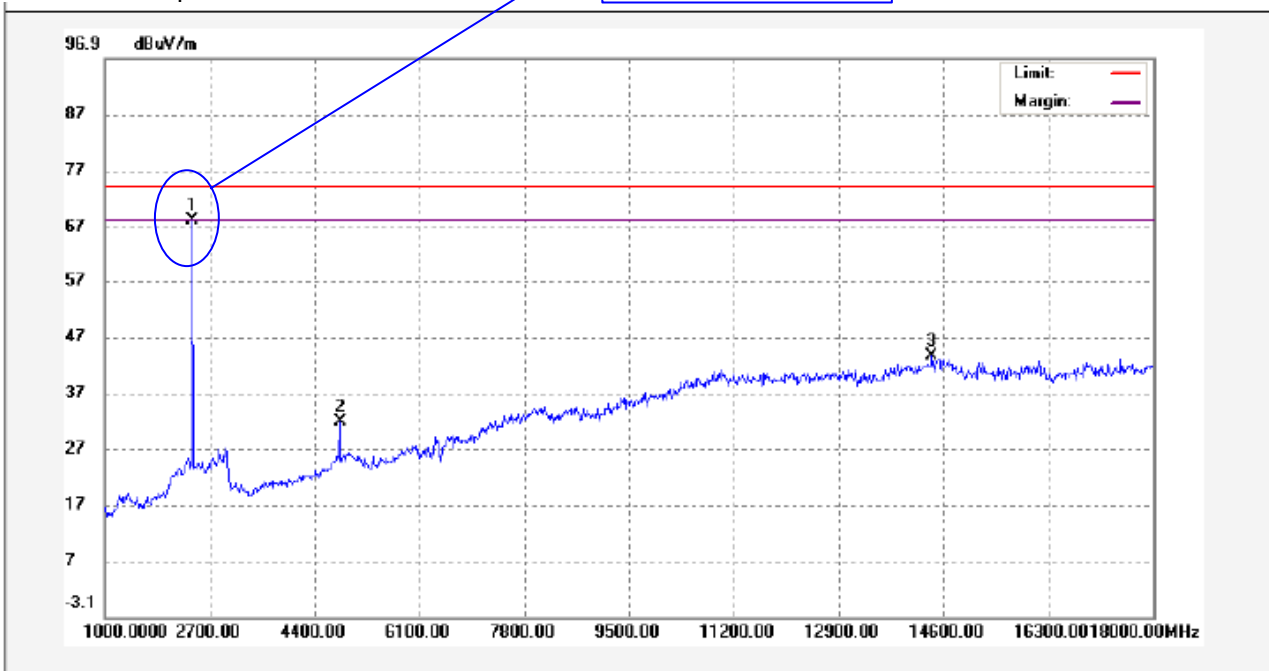


**Test Frequency: 1GHz ~ 18GHz**

Test mode: transmitting at lower channel

Antenna polarization: Vertical

Fundamental wave

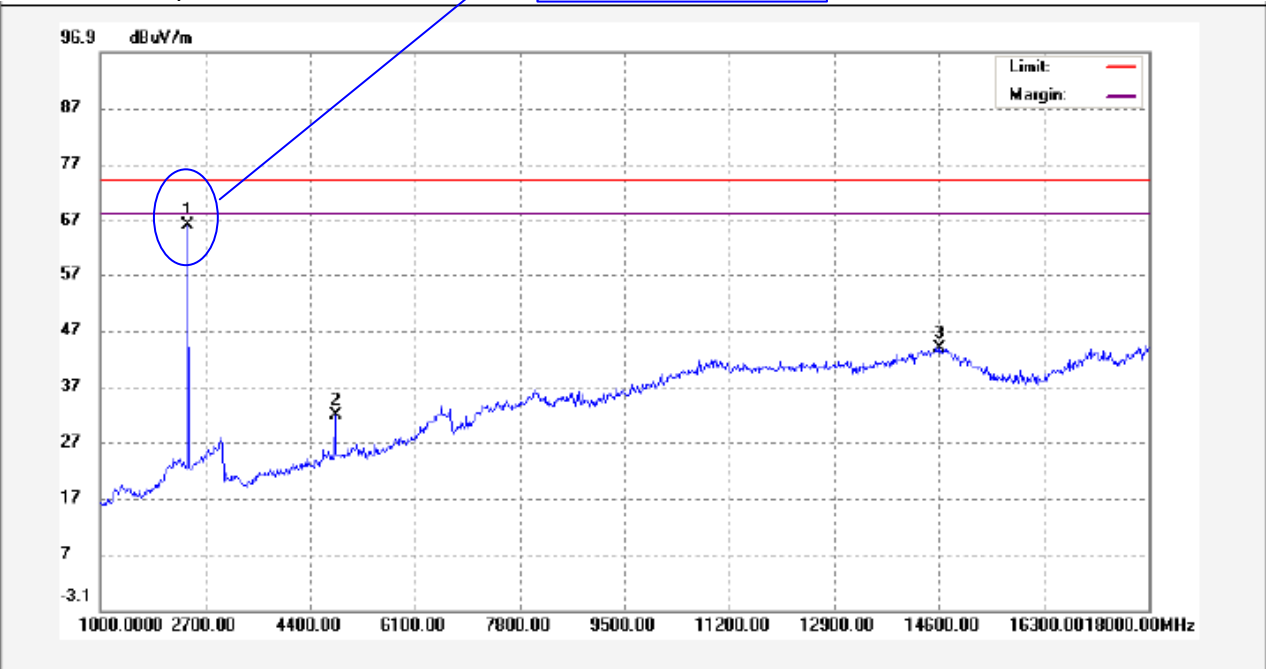


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2402.000	83.54	-15.58	67.96	74.00	-6.04	peak	
2	4804.000	43.75	-11.97	31.78	74.00	-42.22	peak	
3	14413.000	43.10	0.41	43.51	74.00	-30.49	peak	



Antenna polarization: Horizontal

Fundamental wave

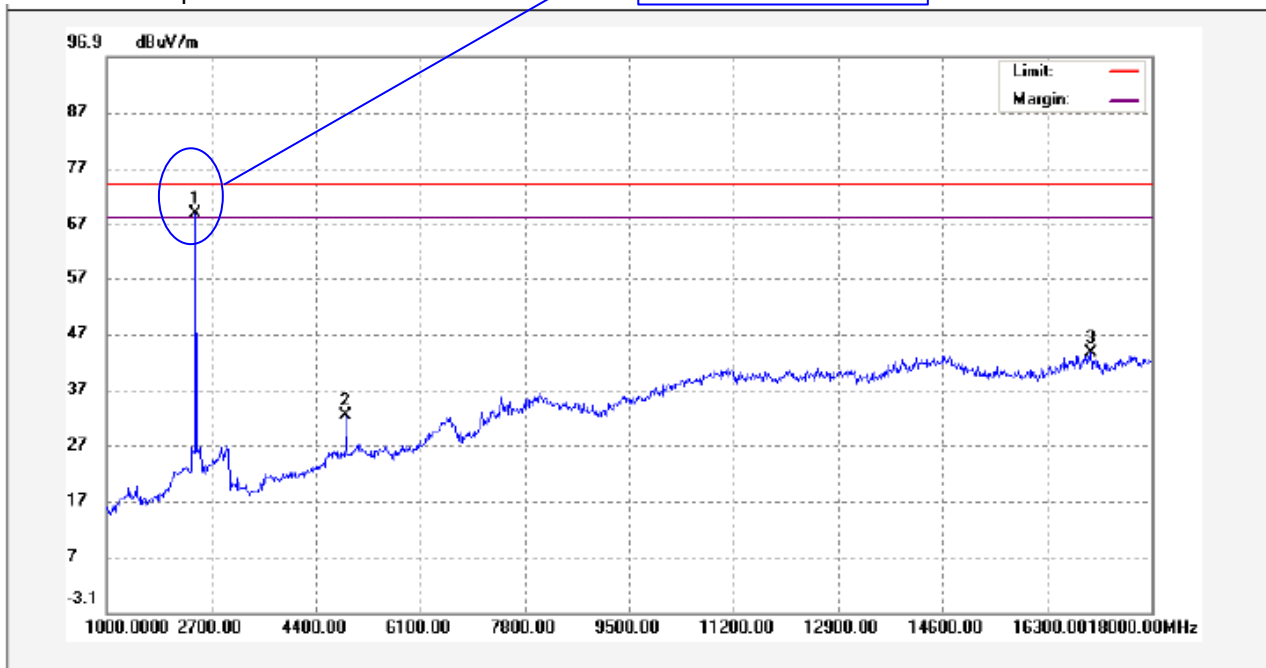


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2402.000	81.66	-15.58	66.08	74.00	-7.92	peak	
2	4804.000	43.76	-11.97	31.79	74.00	-42.21	peak	
3	14600.000	43.28	0.43	43.71	74.00	-30.29	peak	

Test mode: transmitting at middle channel

Antenna polarization: Vertical

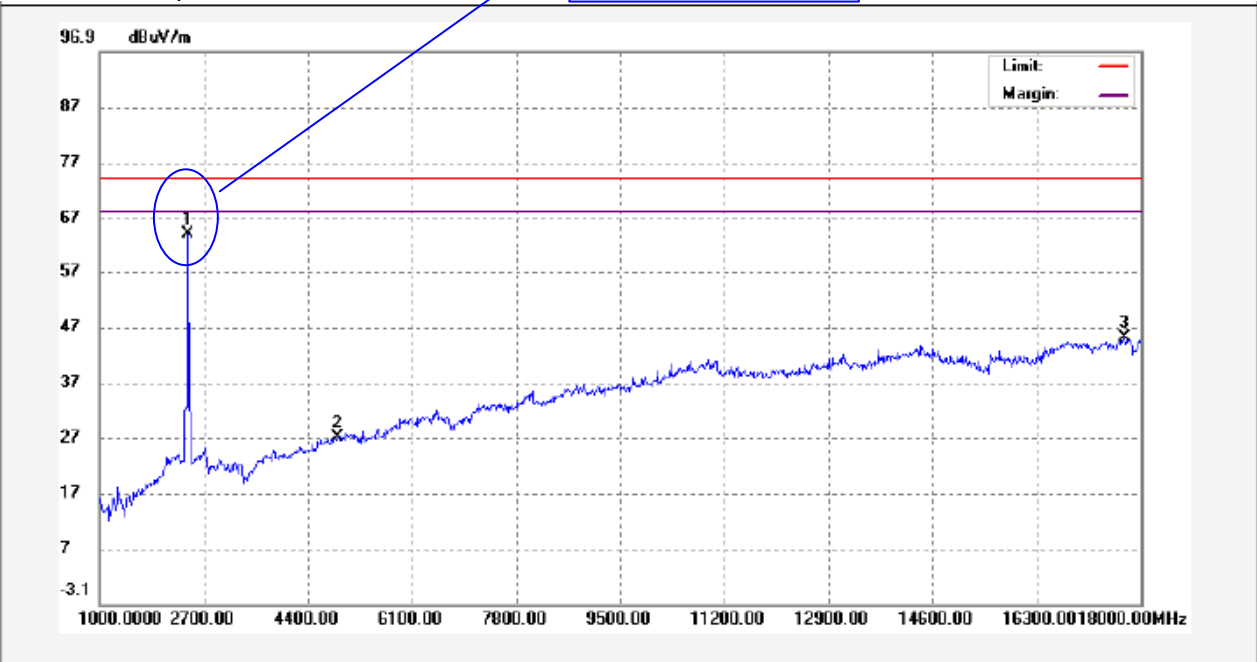
Fundamental wave



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2441.000	84.43	-15.70	68.73	74.00	-5.27	peak	
2	4882.000	44.11	-11.92	32.19	74.00	-41.81	peak	
3	17014.000	43.04	0.45	43.49	74.00	-30.51	peak	

Antenna polarization: Horizontal

Fundamental wave

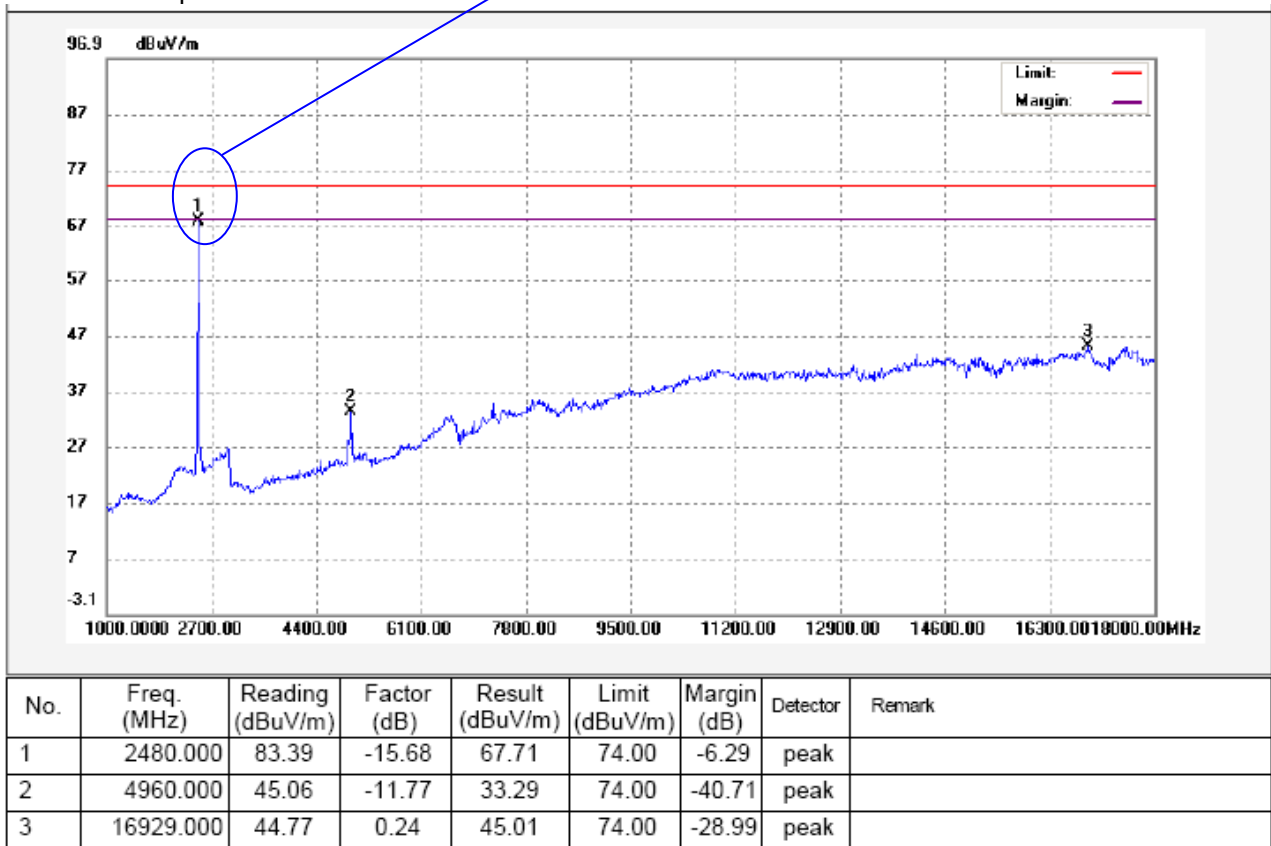


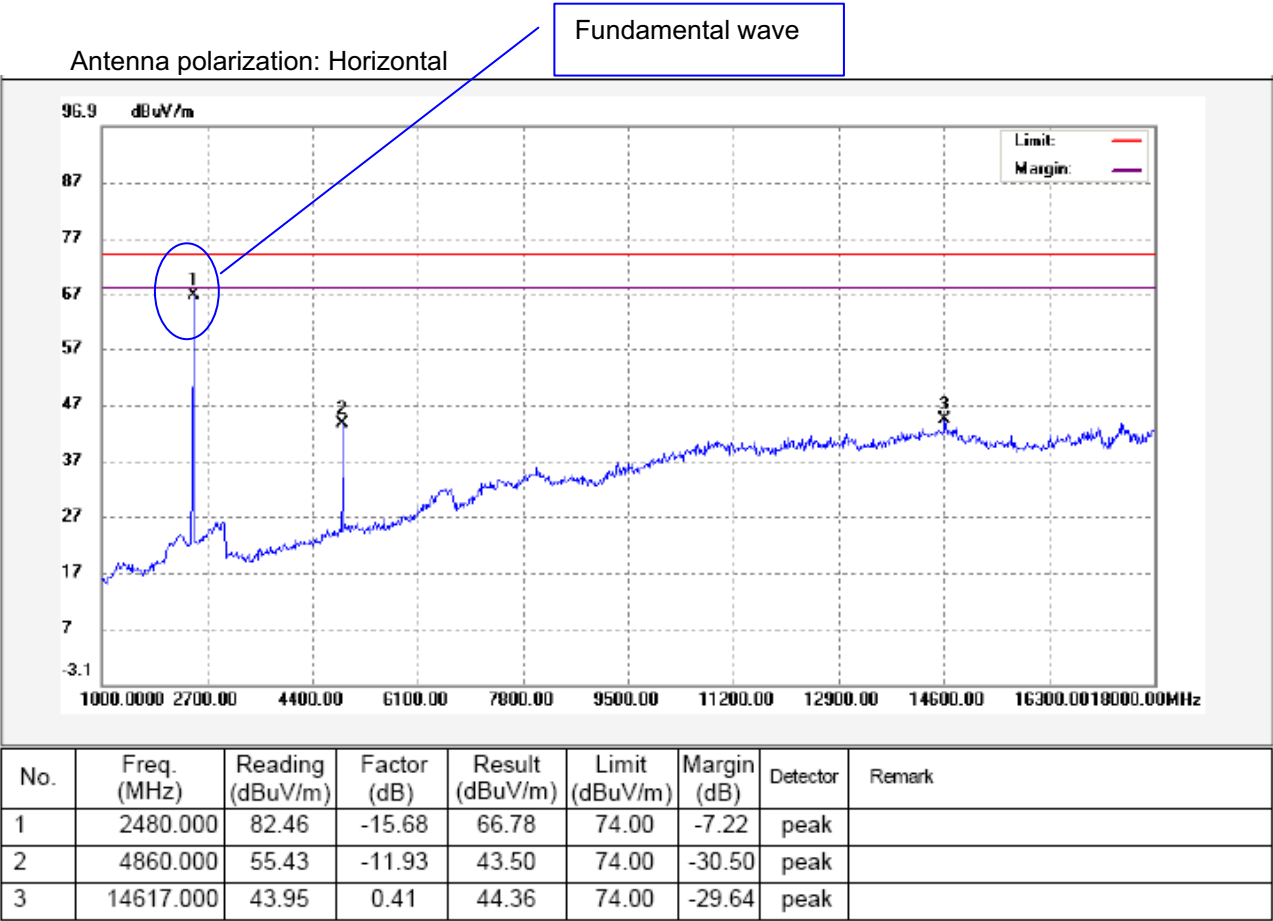
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2445.000	79.74	-15.71	64.03	74.00	-9.97	peak	
2	4882.000	39.04	-11.92	27.12	74.00	-46.88	peak	
3	17745.000	41.17	3.95	45.12	74.00	-28.88	peak	

Test mode: transmitting at upper channel

Antenna polarization: Vertical

Fundamental wave





**Test Frequency :Above 18GHz**  
The measurements were more than 20 dB below the limit and not reported.

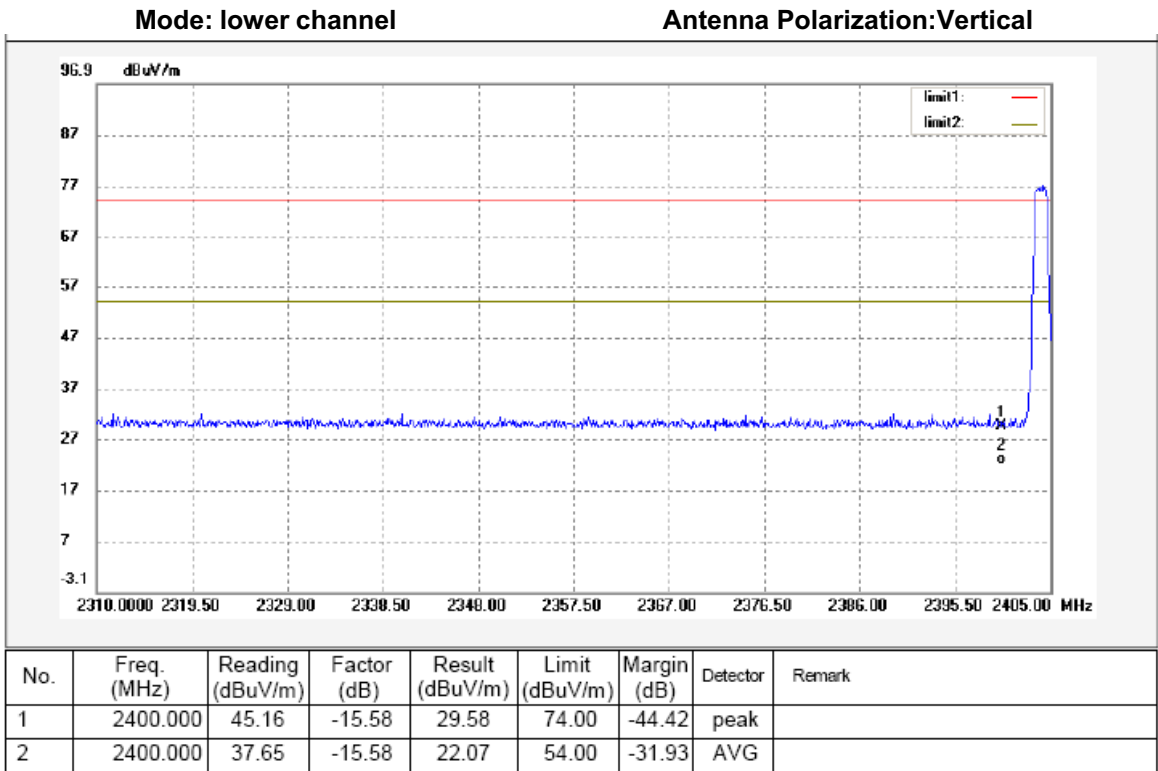
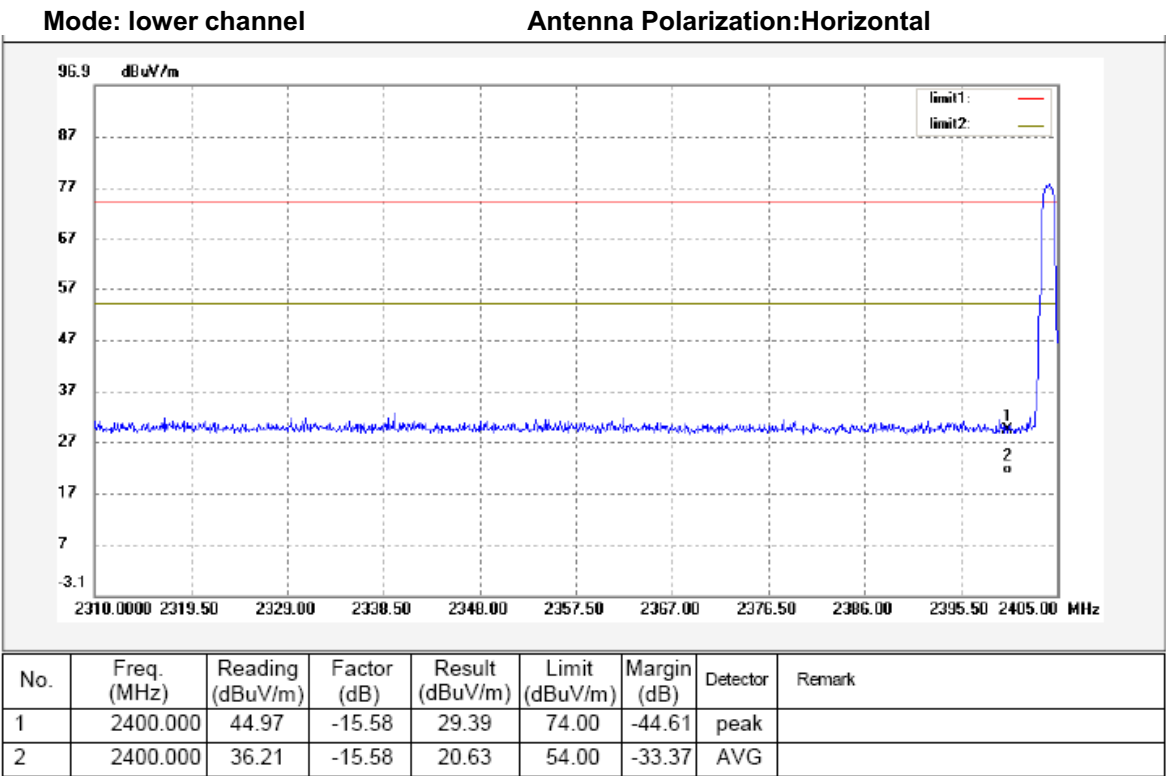
## 8 Band Edge Measurement

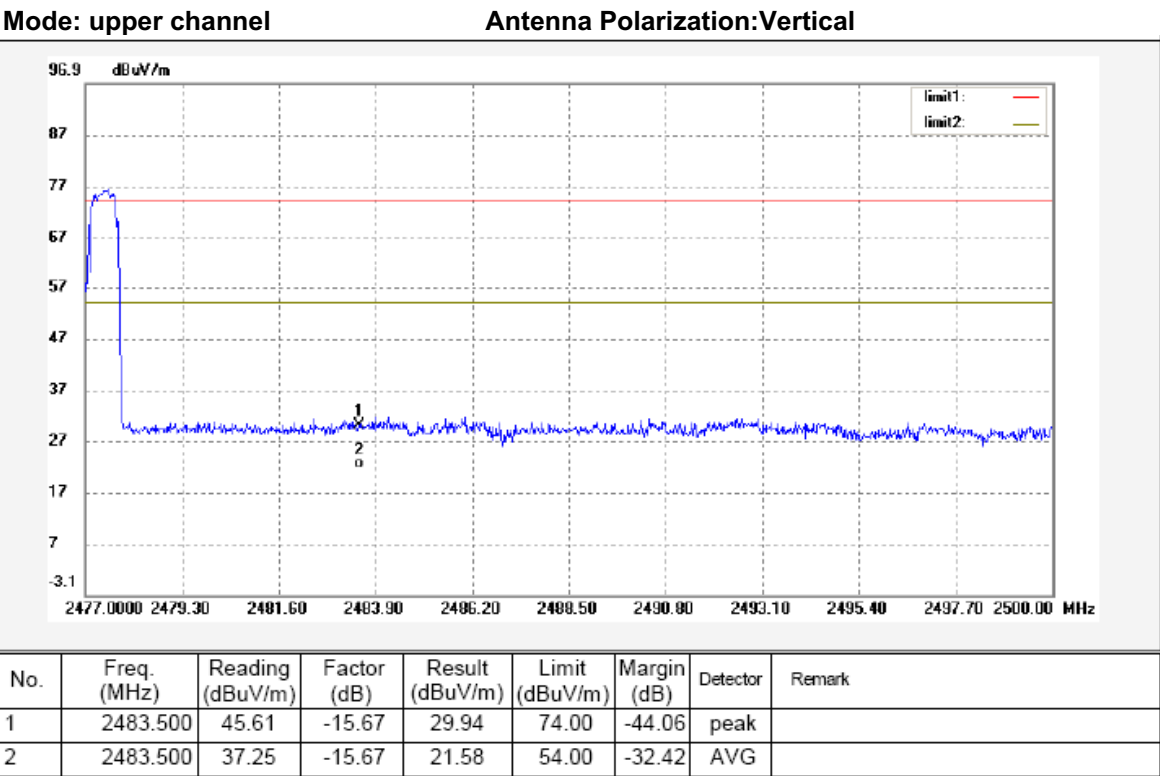
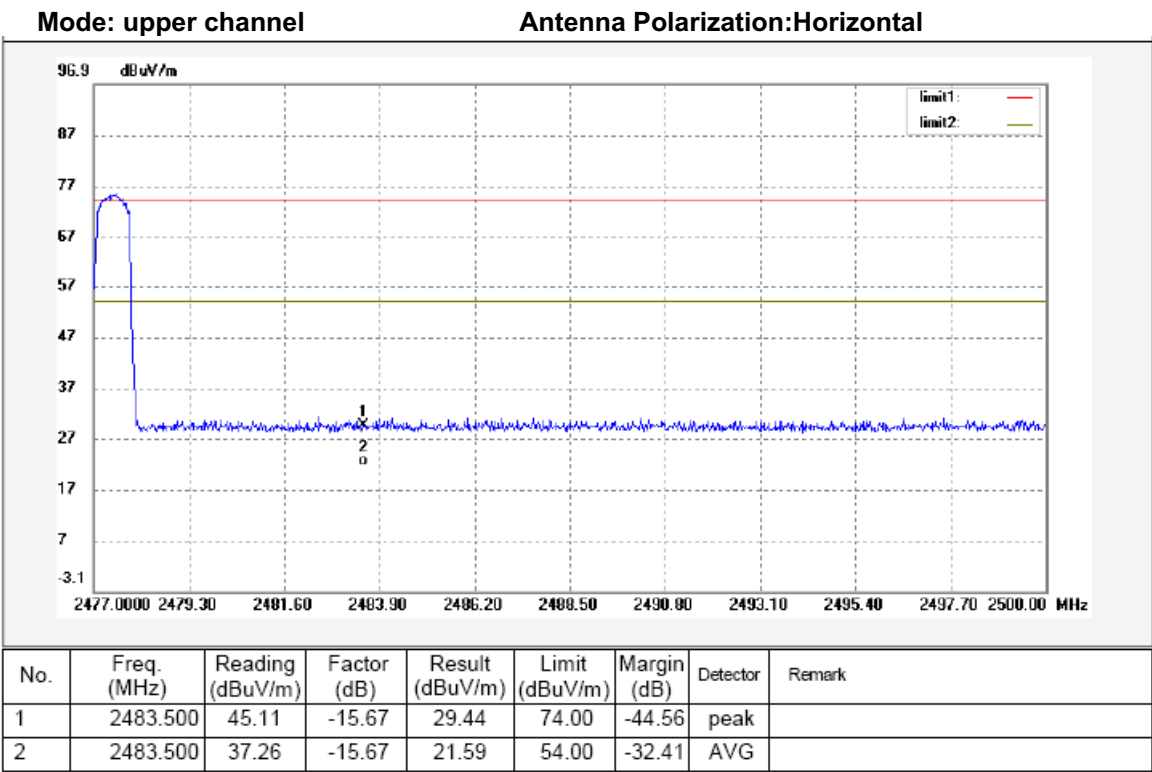
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits Sepcified in Section 15.209(a) and 15.205(c).
Test Method:	KDB558074 D01 V02 10/04/2012
Measurement Distance:	3m
Detector:	For Peak value: RBW = 1MHz VBW =3MHz; Sweep = auto Detector function = peak Trace = max hold For Average value: RBW = 1MHz VBW=10Hz; Sweep = auto Detector function = Average Trace = max hold

### 8.1 Test Produce

1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

8.2 Test Result







## 9 6 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB558074 D01 V02 10/04/2012

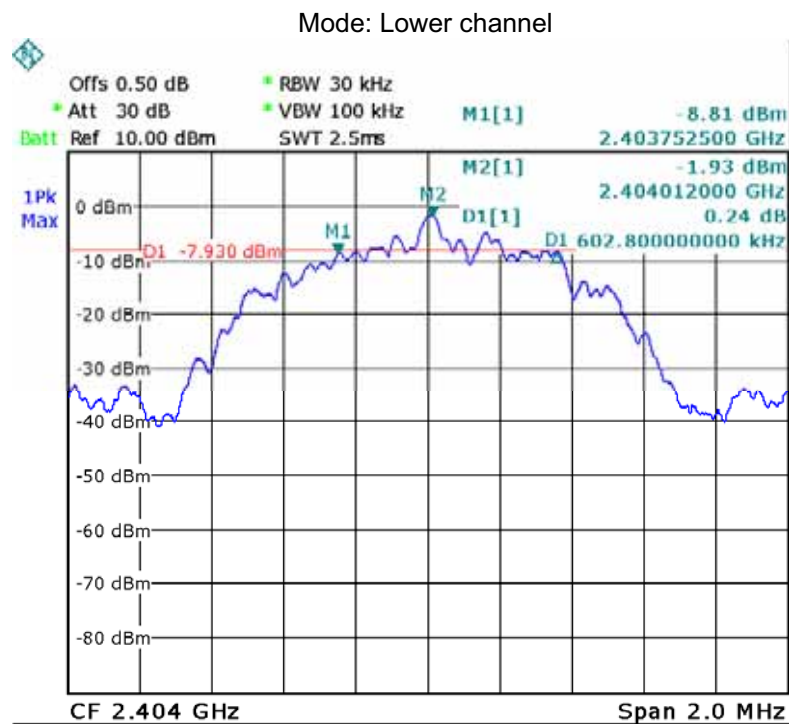
### 9.1 Test Procedure:

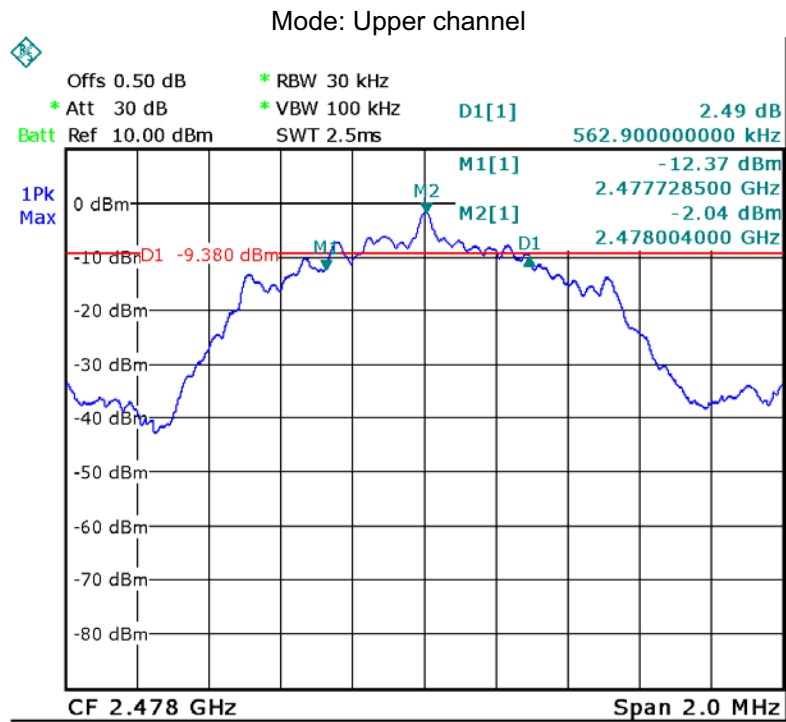
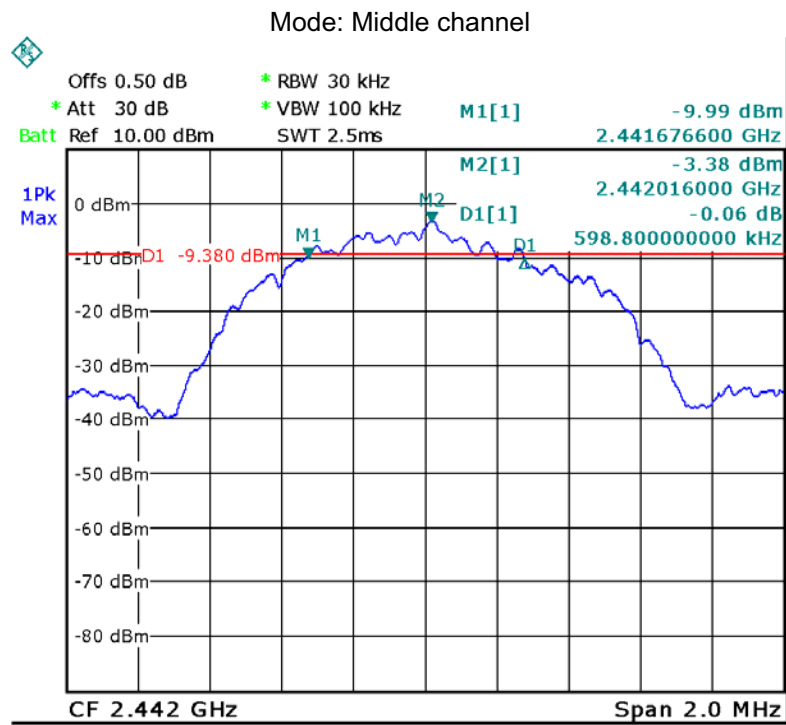
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the Sepctrum;
2. Set the Sepctrum analyzer: RBW = 30kHz, VBW = 100kHz

### 9.2 Test Result:

Operation mode	Bandwidth (MHz)
Lower channel	0.603
Middle channel	0.599
Upper channel	0.563

Test result plot as follows:





## 10 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB558074 D01 V02 10/04/2012

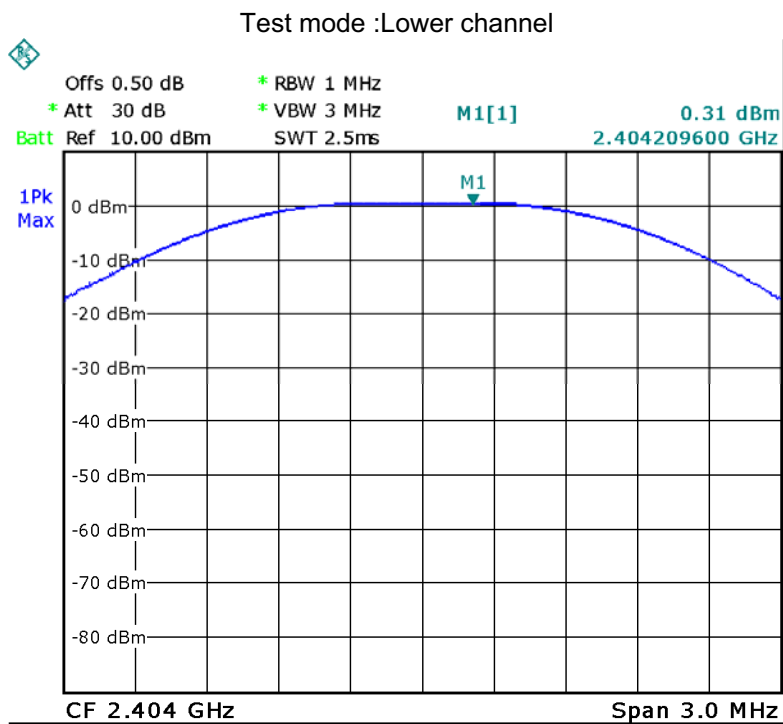
### 10.1 Test Procedure:

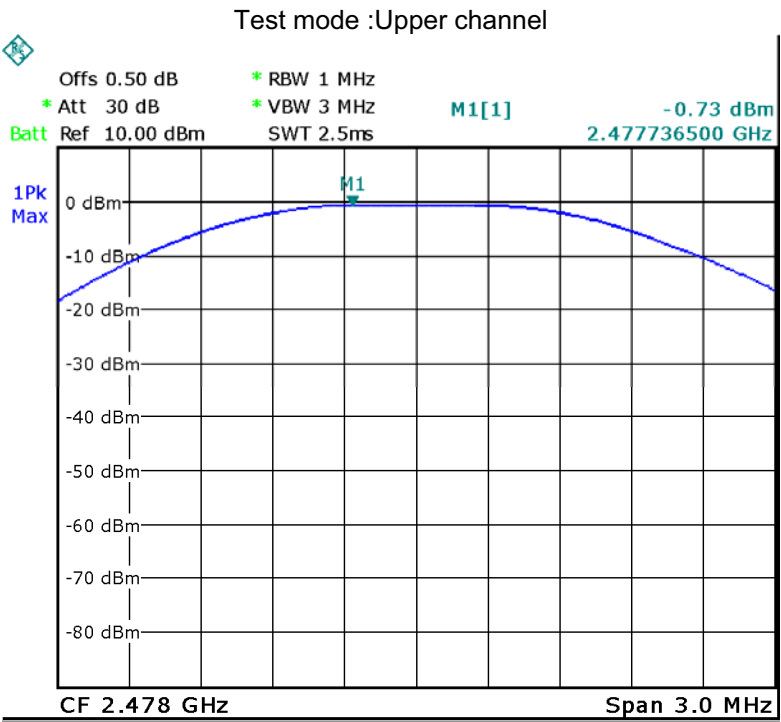
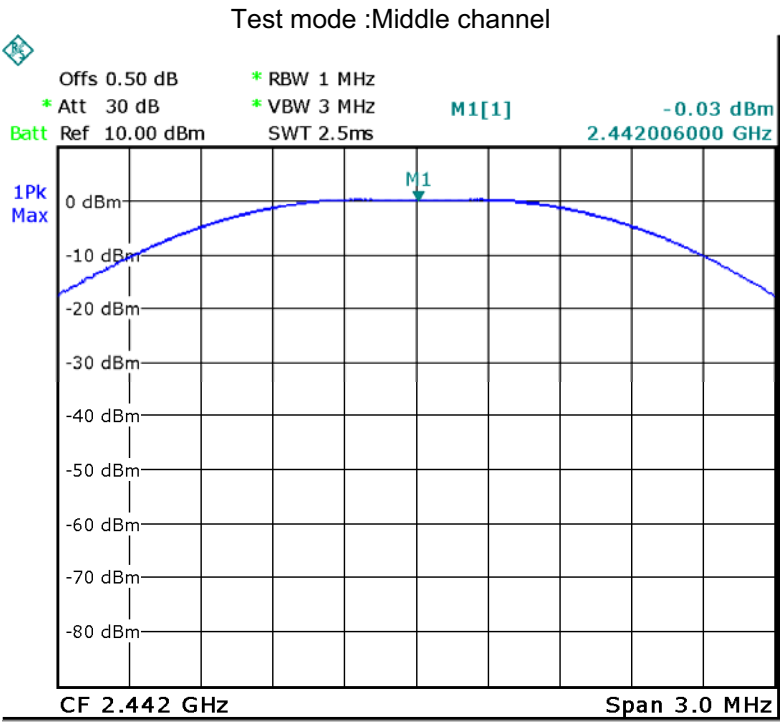
KDB558074 D01 V02 10/04/2012 section 8.1.2 Option 2

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the Sepctrum.
2. Set the Sepctrum analyzer: RBW = 1MHz. VBW = 3MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

### 10.2 Test Result:

Maximum Peak Output Power (dBm)		
Lower channel	Middle channel	Upper channel
-0.31	-0.03	-0.73
Limit		
1W/30dBm		





## 11 Power Sepctral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB558074 D01 V02 10/04/2012

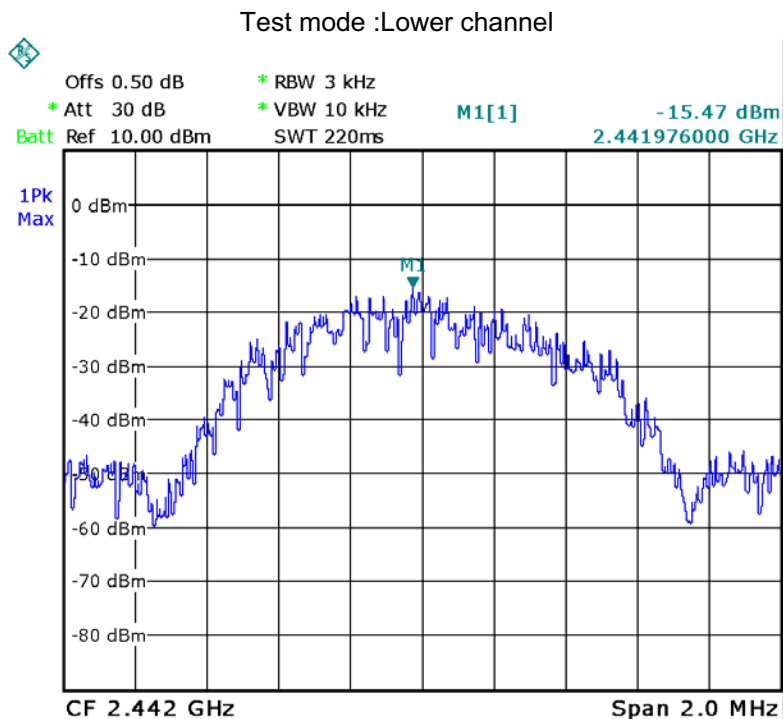
### 11.1 Test Procedure:

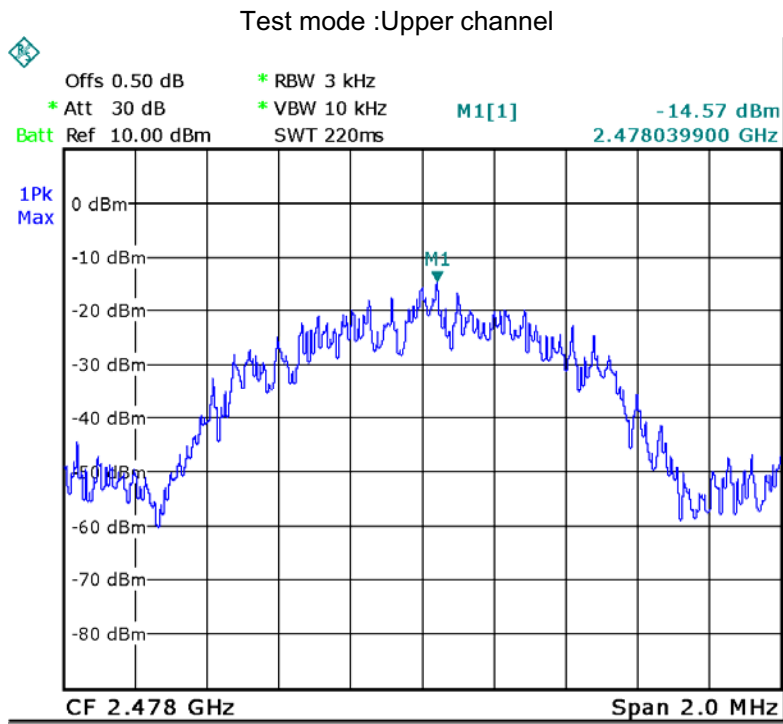
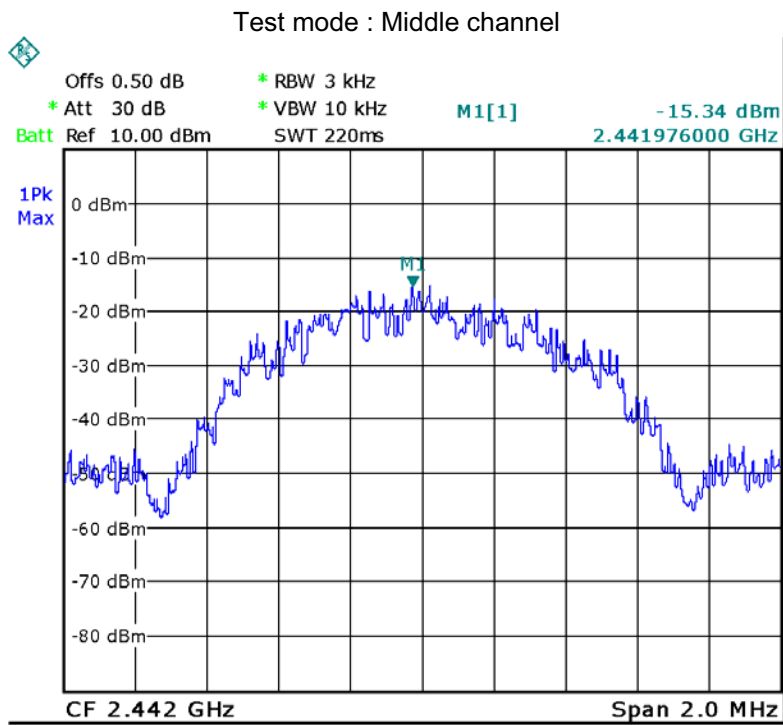
KDB558074 D01 V02 10/04/2012 section 9.1 Option 1

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the Sepctrum.
2. Set the Sepctrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is Sepcified in one of the subparagraphs of this Section  
Submit this plot.

### 11.2 Test Result:

Test mode :TX 11b		
10 Maximum Peak Output Power (dBm per 3kHz)		
Lower channel	Middle channel	Upper channel
-15.47	-15.34	-14.57
Limit		
8dBm per 3kHz		





## 12 Emissions from out of band

Test Requirement:	FCC CFR47 Part 15 Section 15.247(d)
Test Method:	KDB558074 D01 V02 10/04/2012
Test Limit:	Emissions produced by the device outside the authorized frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the fundamental.
Test Mode:	Test in fixing operating frequency at lower, middle, upper channel.

### 12.1 Test Procedure:

KDB558074 D01 V02 10/04/2012 section 10.1 clause1

The maximum peak conducted output power procedure was used to demonstrate compliance to 15.247(b)(3) requirements, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz. This measurement was performed over a frequency range that spans from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency.

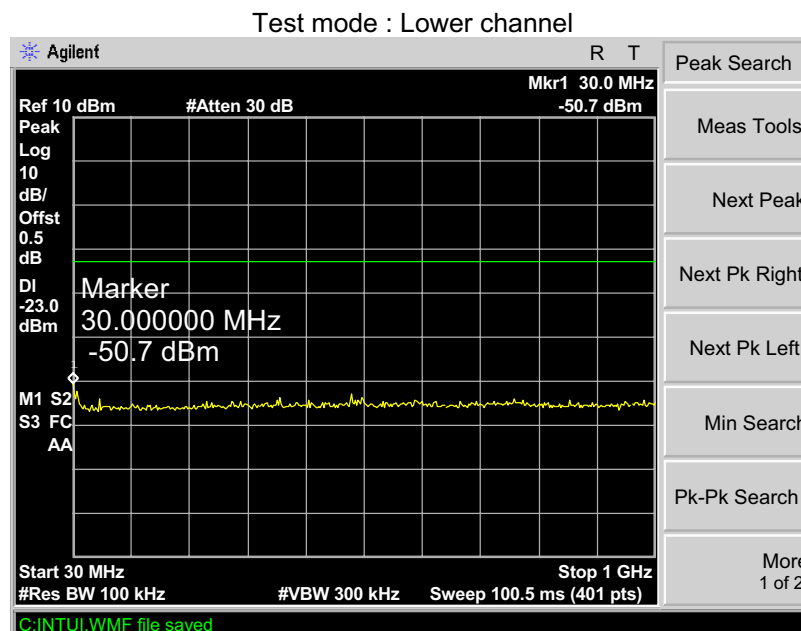
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the Sepctrum.
2. Set to span from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency
3. For below 1GHz,Set RBW = 100kHz and VBW = 300kHz.Sweep =auto. For above1GHz,Set RBW = 100kHz and VBW = 300kHz.Sweep =auto.
4. mark the worst point and record.

### 12.2 Test Result:

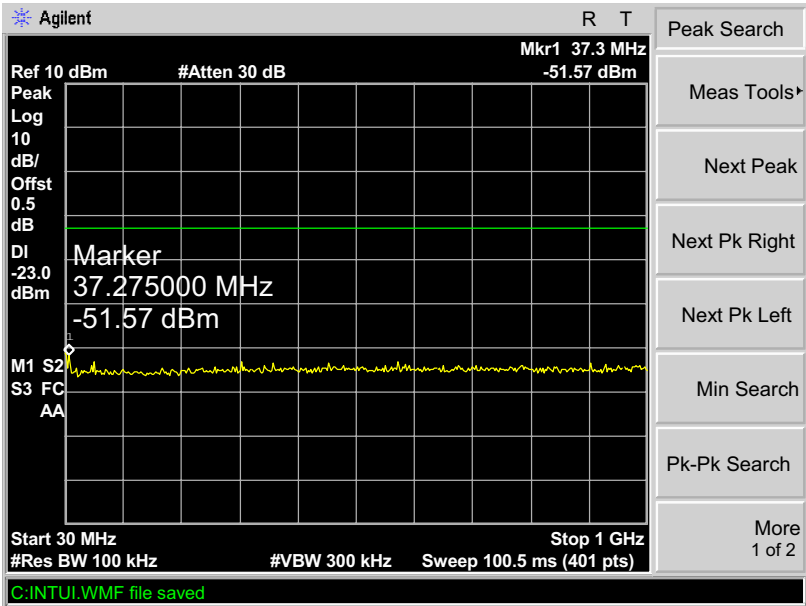
#### Test Frequency : Below 30MHz

Remark:For emissions below 30MHz,no emission higher than background level,so the data does not show in the report.

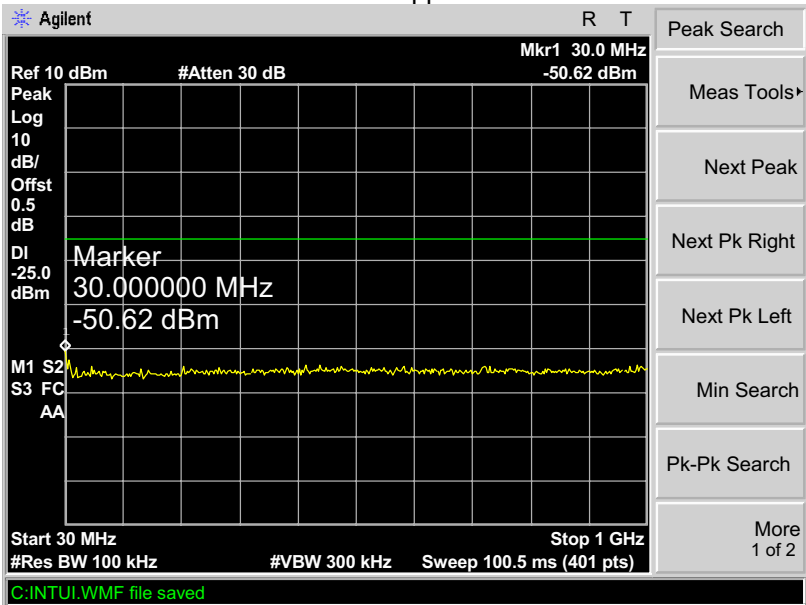
#### Test Frequency : 30MHz ~ 1GHz



Test mode : Middle channel



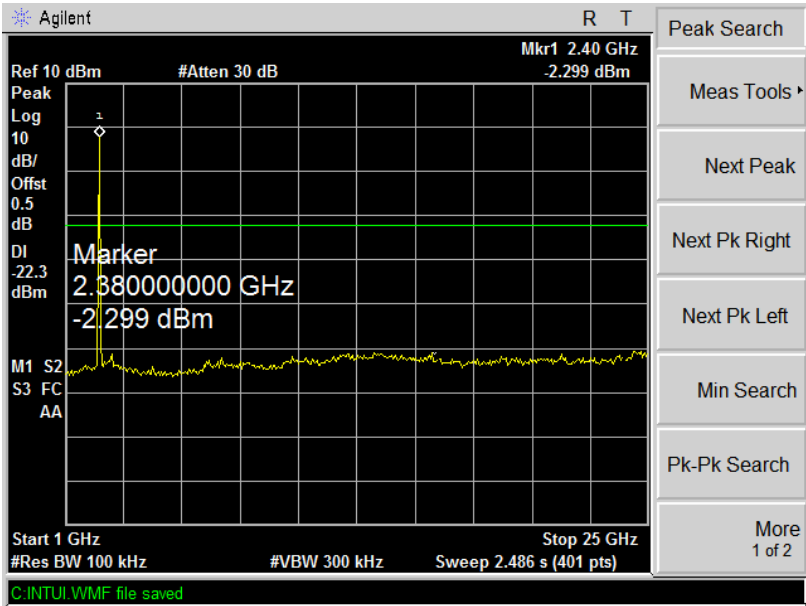
Test mode : Upper channel



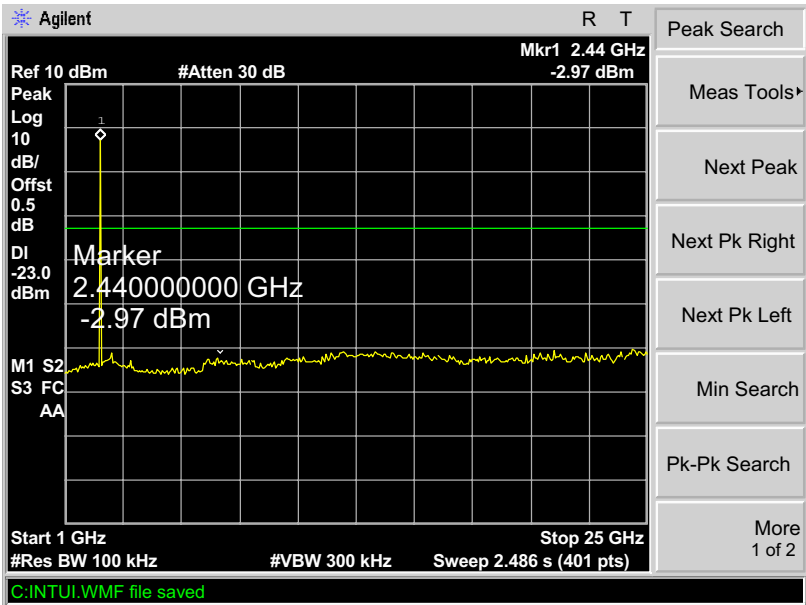


Test Frequency : 1GHz ~ 25GHz

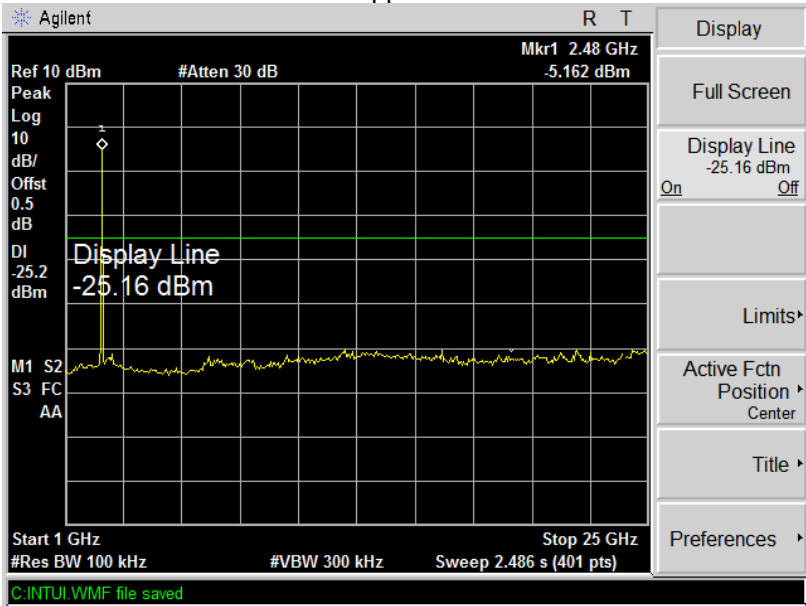
Test mode : Lower channel



Test mode : Middle channel



Test mode : Upper channel



### **13 Antenna Requirement**

According to the FCC Part 15 Paragraph 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. This product has a Ceramic antenna, fulfill the requirement of this section.

## 14 RF Exposure

Test Requirement: FCC Part 1.1307

Test Mode: The EUT work in test mode(Tx).

### 14.1 Requirments:

RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;

at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

### 14.2 Result

Antenna Gain (dBi)	Peak Output Power (dBm)	e.i.r.p. (W)	Limit (W)	Test Result
2.5	0.31	0.0019	5	Complies

Remark: dBm=10lgmw,e.i.r.p.=Antenna gain+conducted power

## 15 Photographs – Test Setup

### 15.1 Conducted Emission



### 15.2 Radiated Emission

Test frequency below 30MHz



Test frequency from 30MHz to 1GHz



Test frequency above 1GHz



## 16 Photographs - Constructional Details

### 16.1 EUT – External View

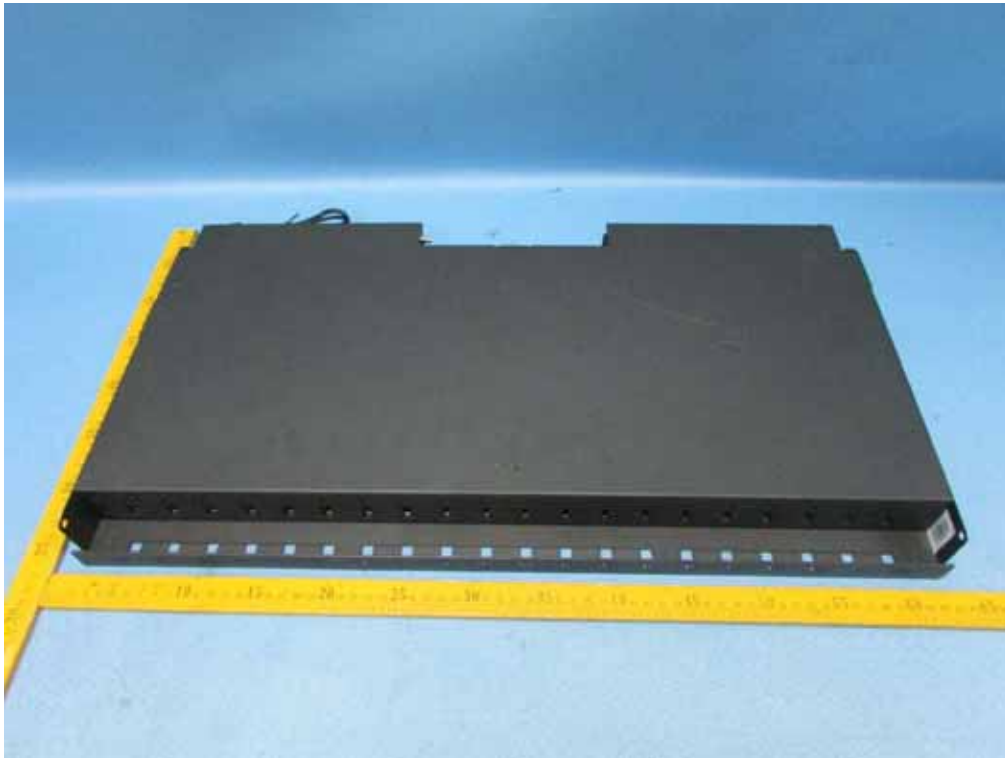








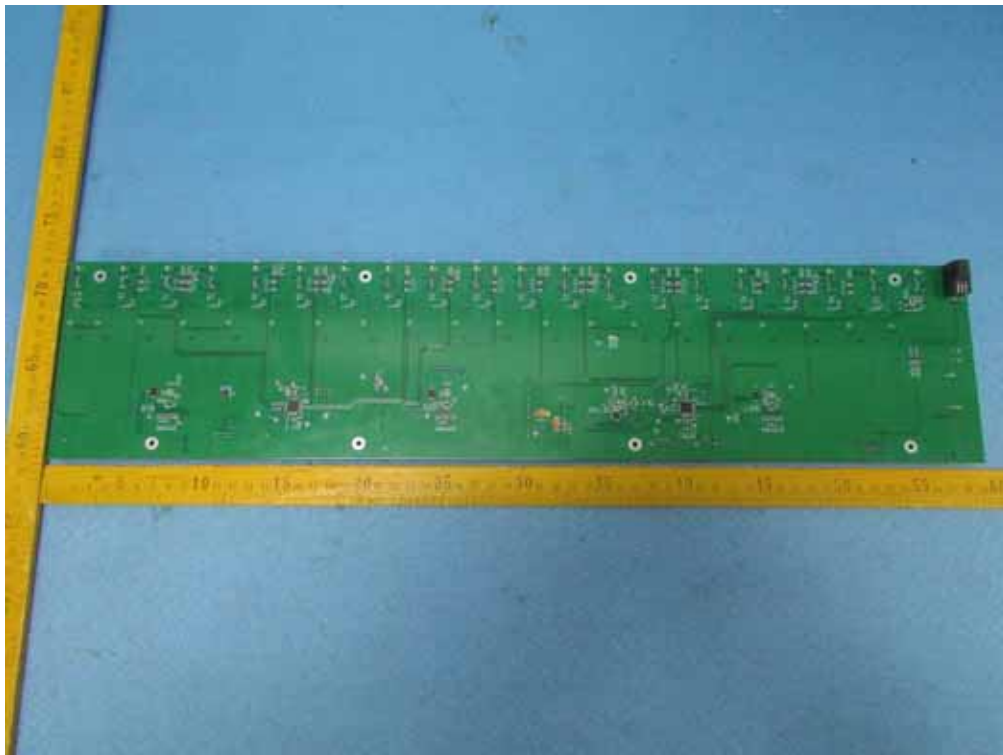
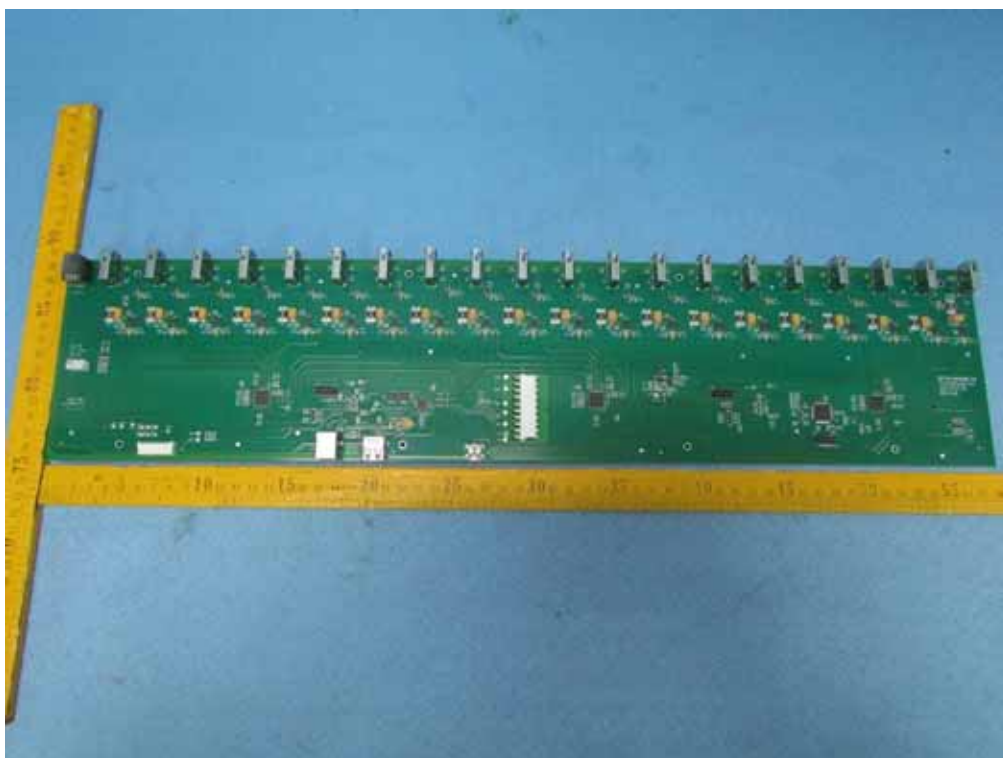
## 16.2 EUT- Internal View

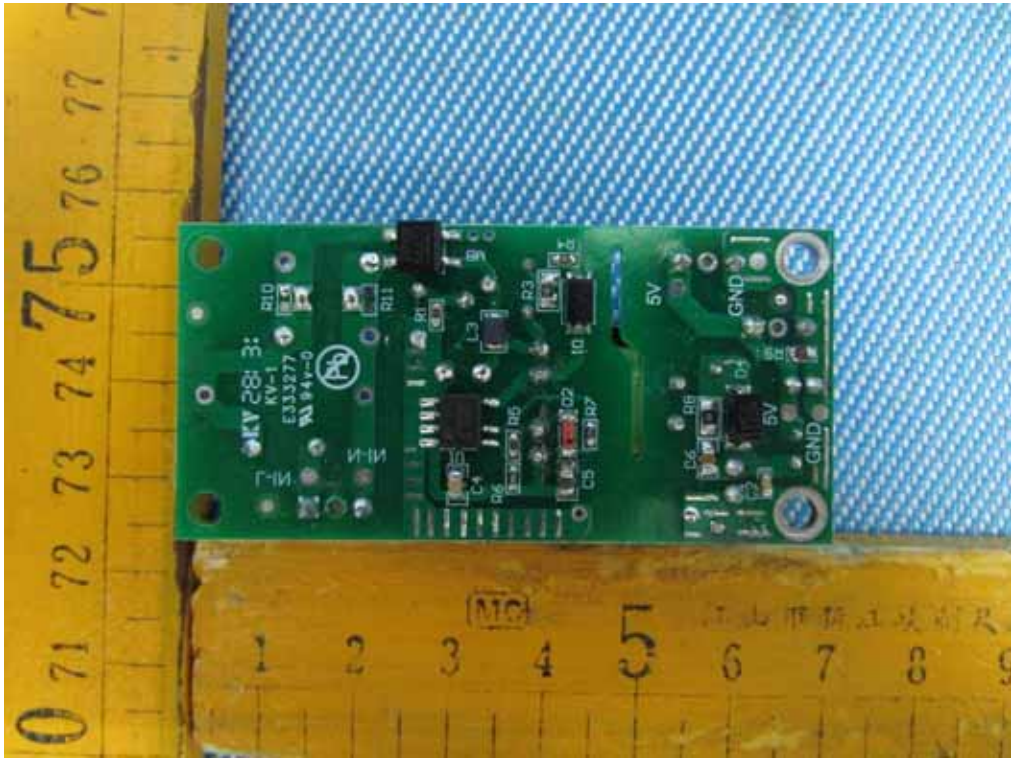
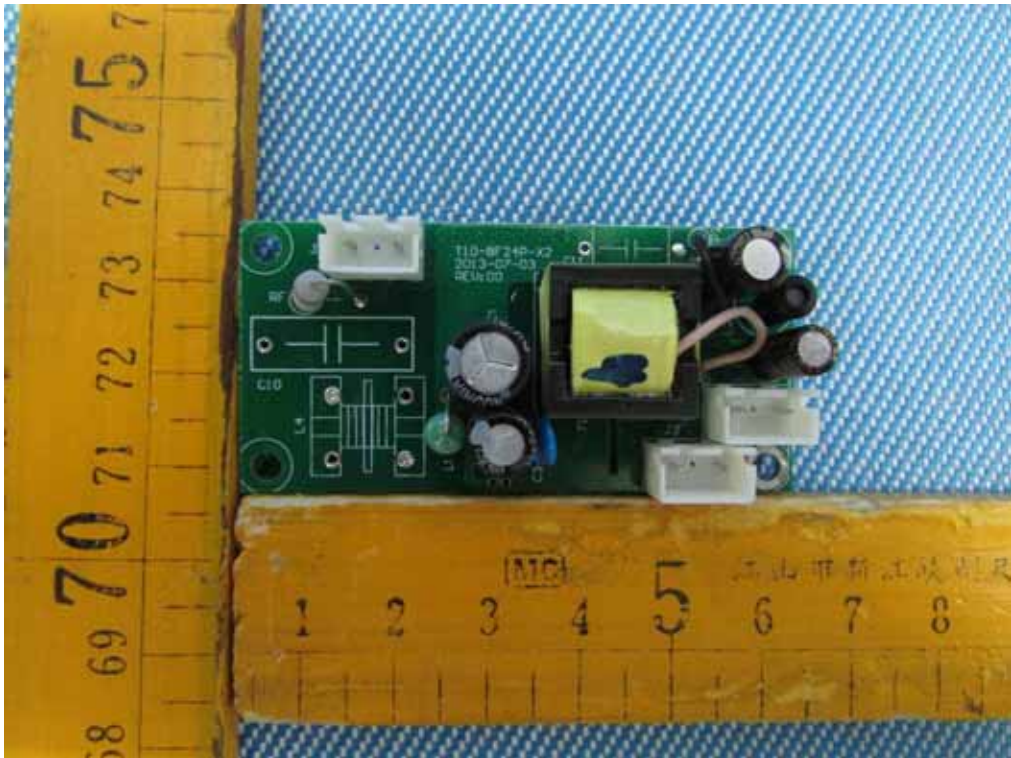




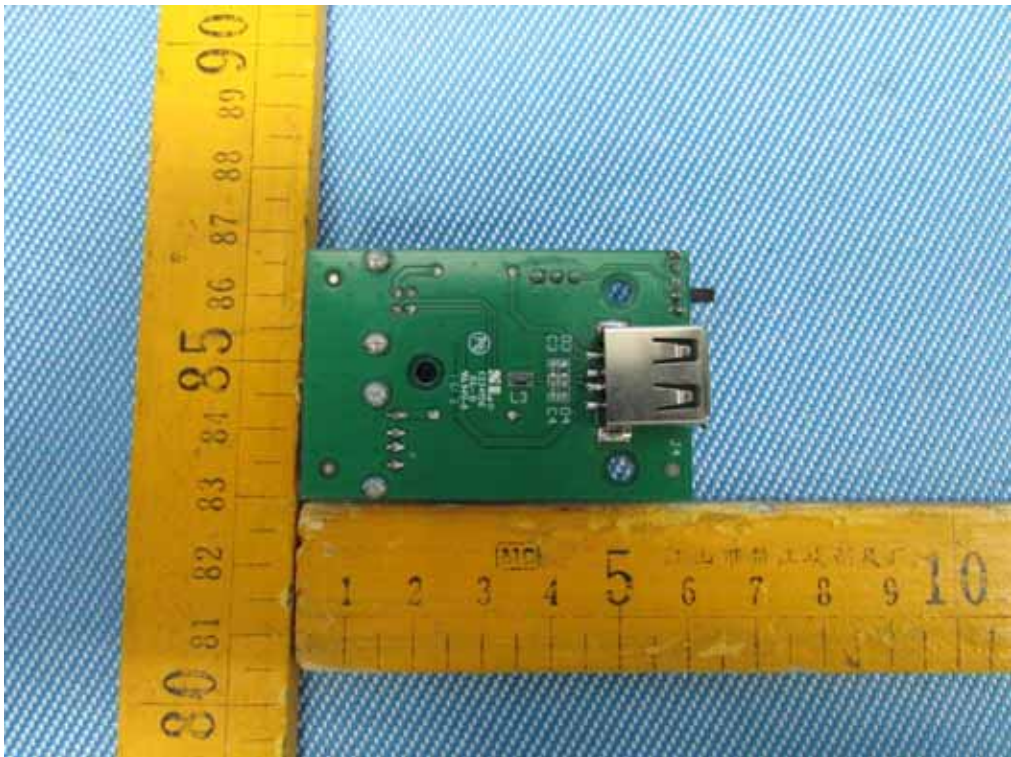
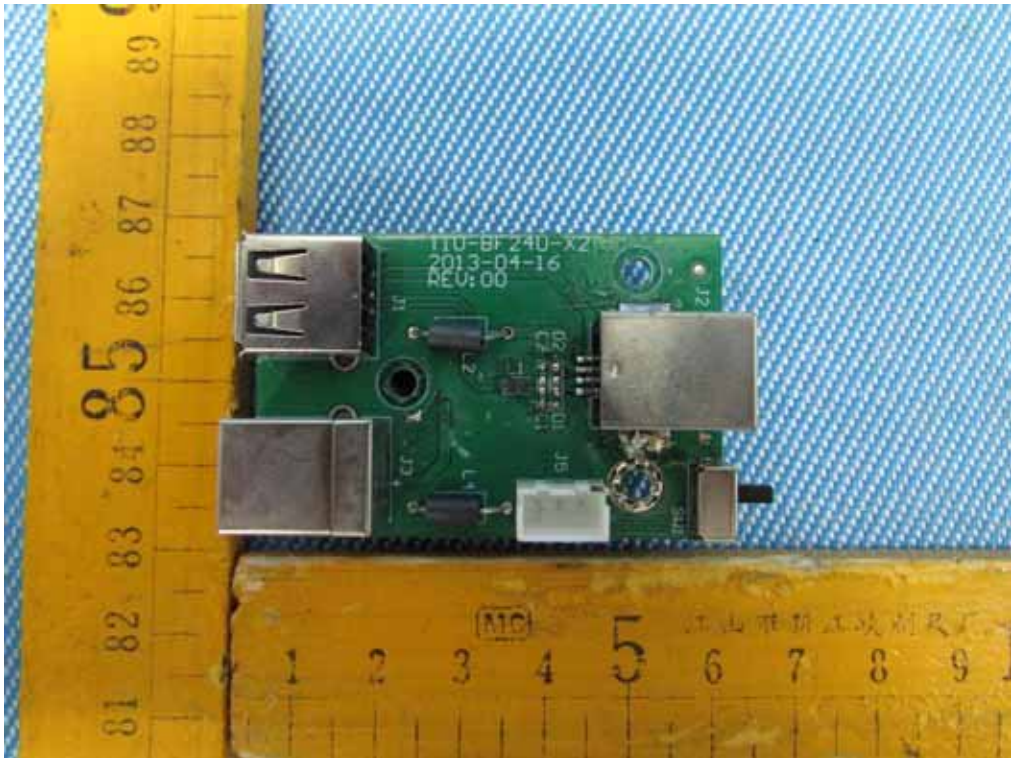


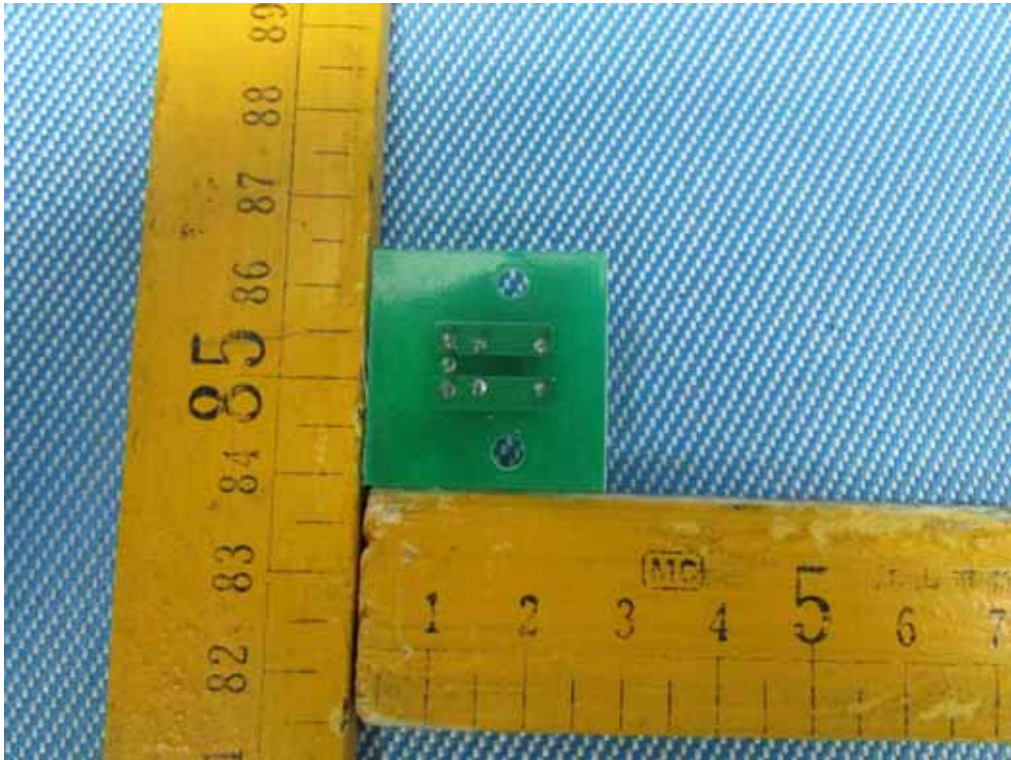
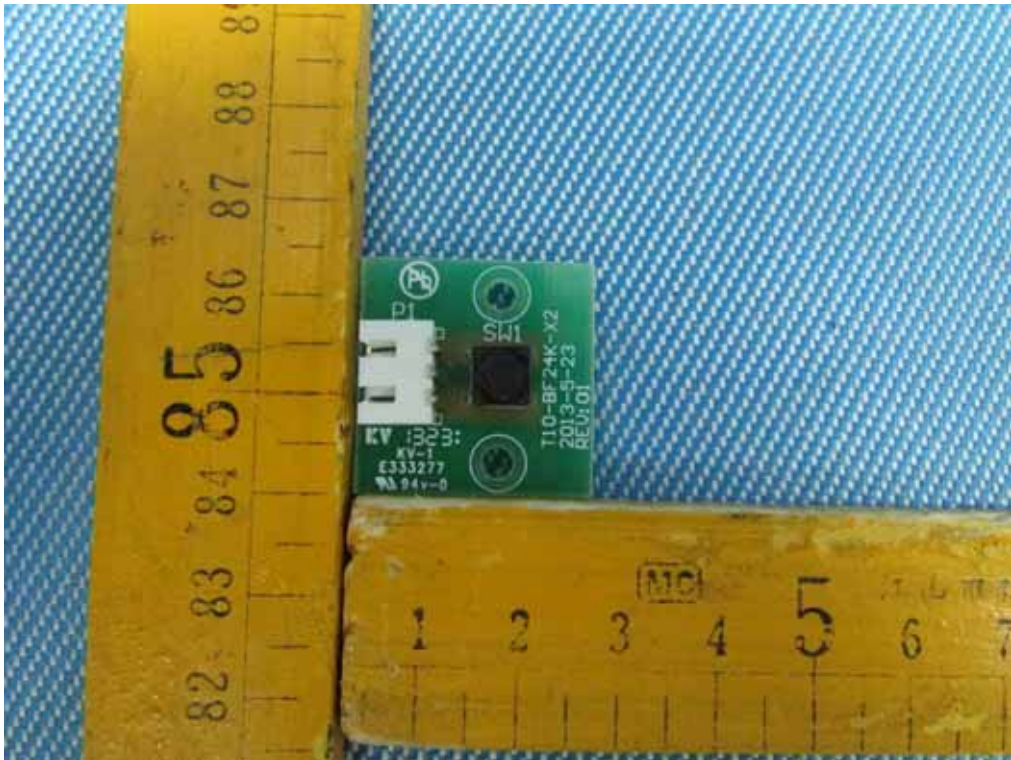




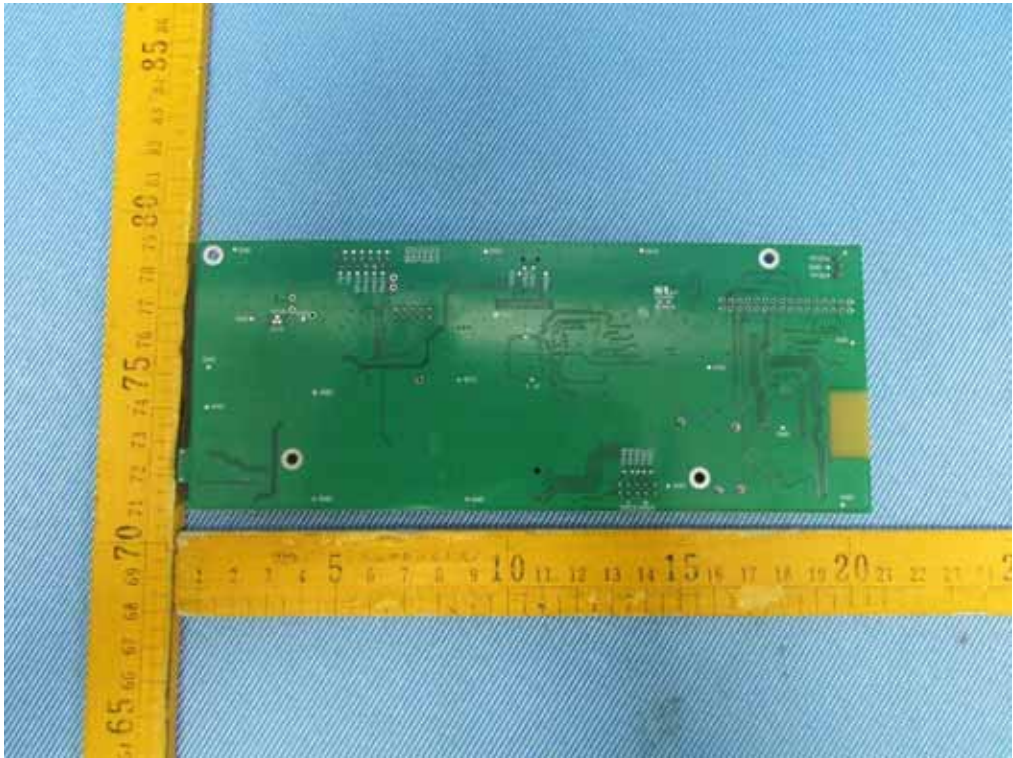
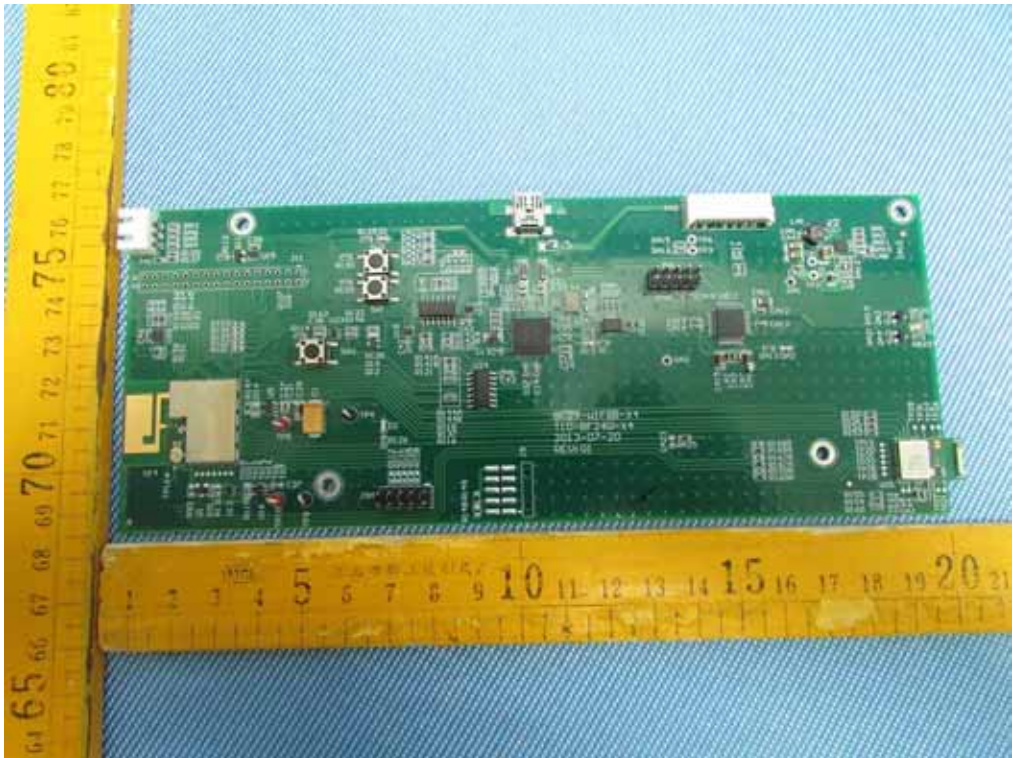






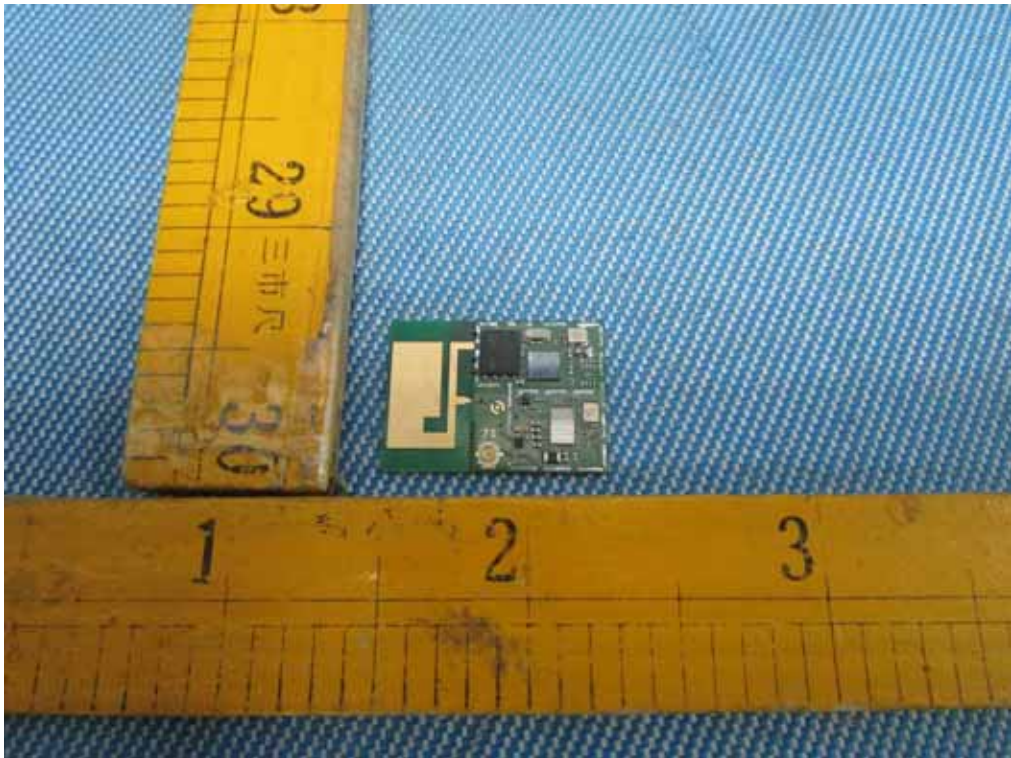
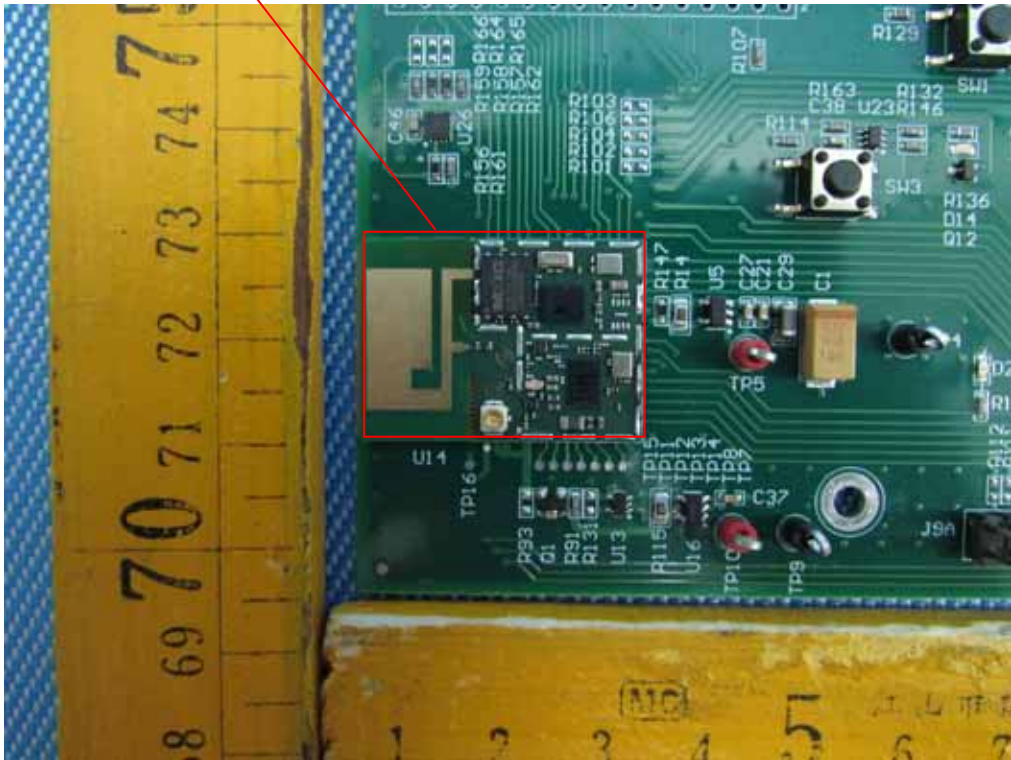




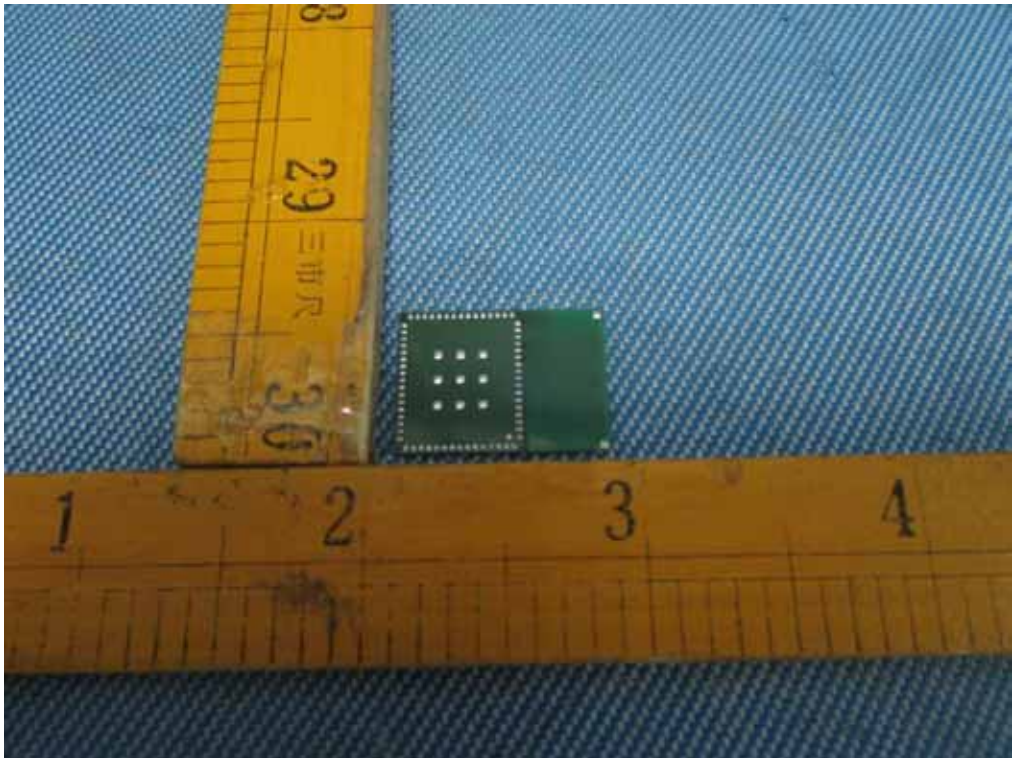


16.3 WIFI Module View

Wifi Module



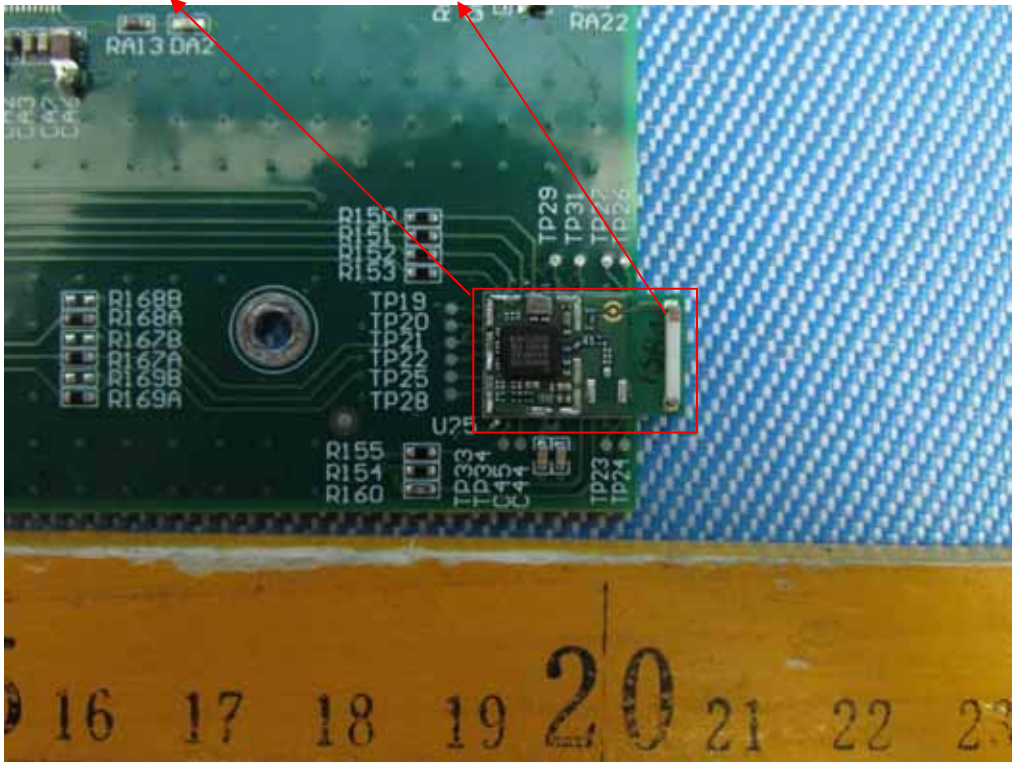


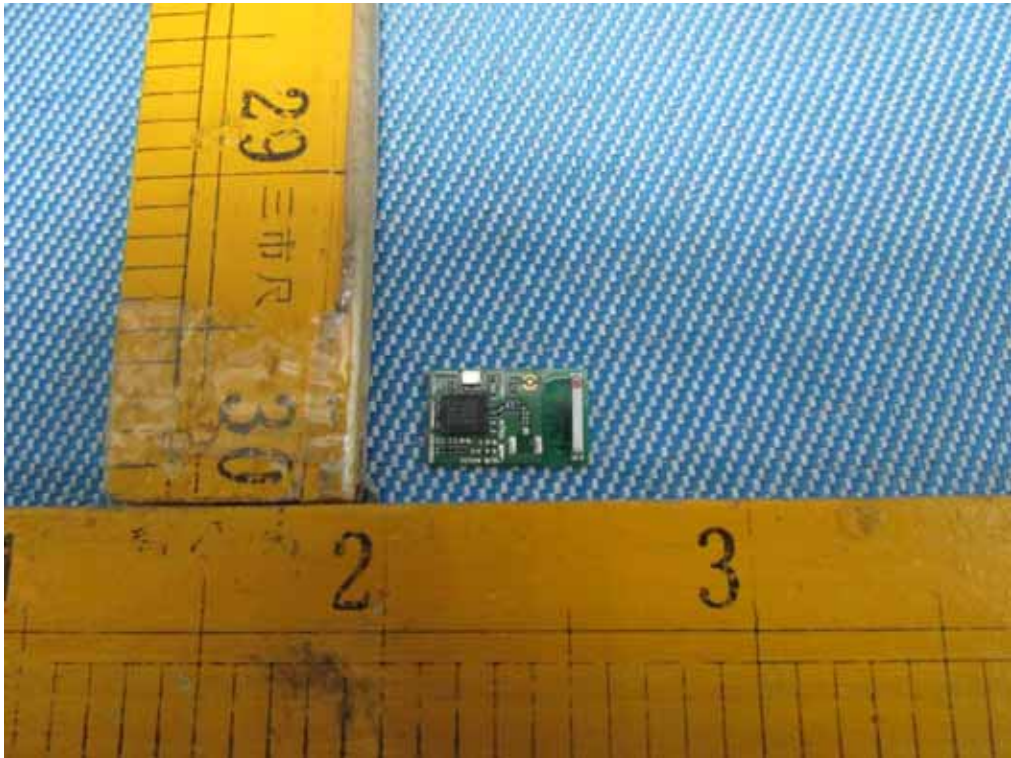
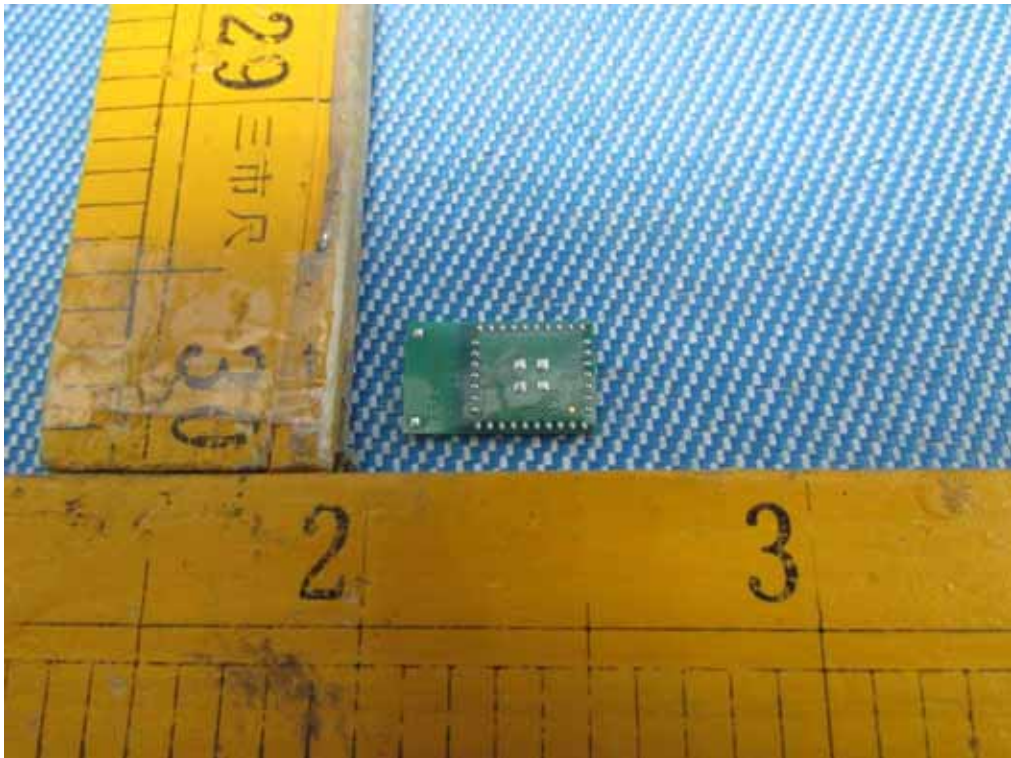


16.4 BT Module View

Bluetooth Module

RF ceramic antenna





=====End of Test Report=====