

# FCC Radio Test Report

## ***FCC ID: 2ABES-AIR***

**Report No.** : TB-FCC138613  
**Applicant** : Pathway Innovations and Technologies, Inc.

### Equipment Under Test (EUT)

**EUT Name** : AirStation  
**Model No.** : AirStation  
**Serial No.** : KR119  
**Brand Name** : HoverCam  
**Receipt Date** : 2013-11-12  
**Test Date** : 2013-11-13 to 2013-11-25  
**Issue Date** : 2013-11-26  
**Standards** : FCC Part 15, Subpart C (15.247:2011)  
**Test Method** : ANSI C63.4:2003  
KDB 558074 D01 v03r01  
**Conclusions** : **PASS**

In the configuration tested, the EUT complied with the standards specified above,  
The EUT technically complies with the FCC requirements

**Test/Witness Engineer** : *IWAN SU*

**Approved & Authorized** : *Roy Lai*

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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## 1. General Information about EUT

### 1.1 Client Information

<b>Applicant</b>	:	Pathway Innovations and Technologies, Inc.
<b>Address</b>	:	9833 Pacific Heights Blvd., Suite D, San Diego, CA 92121
<b>Manufacturer</b>	:	ShenZhen KerunVisual Technology Co., LTD.
<b>Address</b>	:	6/F, Building2, Zone S2, 1213 Liuxian Blvd., Honghualing Industrial Park, Nanshan District, Shenzhen, China

### 1.2 General Description of EUT (Equipment Under Test)

<b>EUT Name</b>	:	AirStation	
<b>Models No.</b>	:	AirStation, KR119	
<b>Model Difference</b>	:	The different models are identical in schematic, structure and critical component, the only different is the appearance.	
<b>Product Description</b>	:	Operation Frequency: 802.11b/g: 2412MHz~2462MHz	
		Number of Channel:	802.11b/g:11 channels
		Out Power:	802.11b: 17.39 dBm 802.11g: 17.65 dBm
		Antenna Gain:	2.5 dBi (Dipole Antenna)
		Modulation Type:	802.11b: DSSS (CCK, QPSK, BPSK) 802.11g: OFDM
		Bit Rate of Transmitter:	802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6 Mbps
<b>Power Supply</b>	:	DC power from AC/DC Adapter. DC power from Li-ion Battery.	
<b>Power Rating</b>	:	AC/DC Adapter: Input: AC 100~240V 50/60 Hz 0.45A Max Output: DC 5V 2A DC 3.7V 5000mAh	
<b>Connecting I/O Port(S)</b>	:	Please refer to the User's Manual	

#### Note:

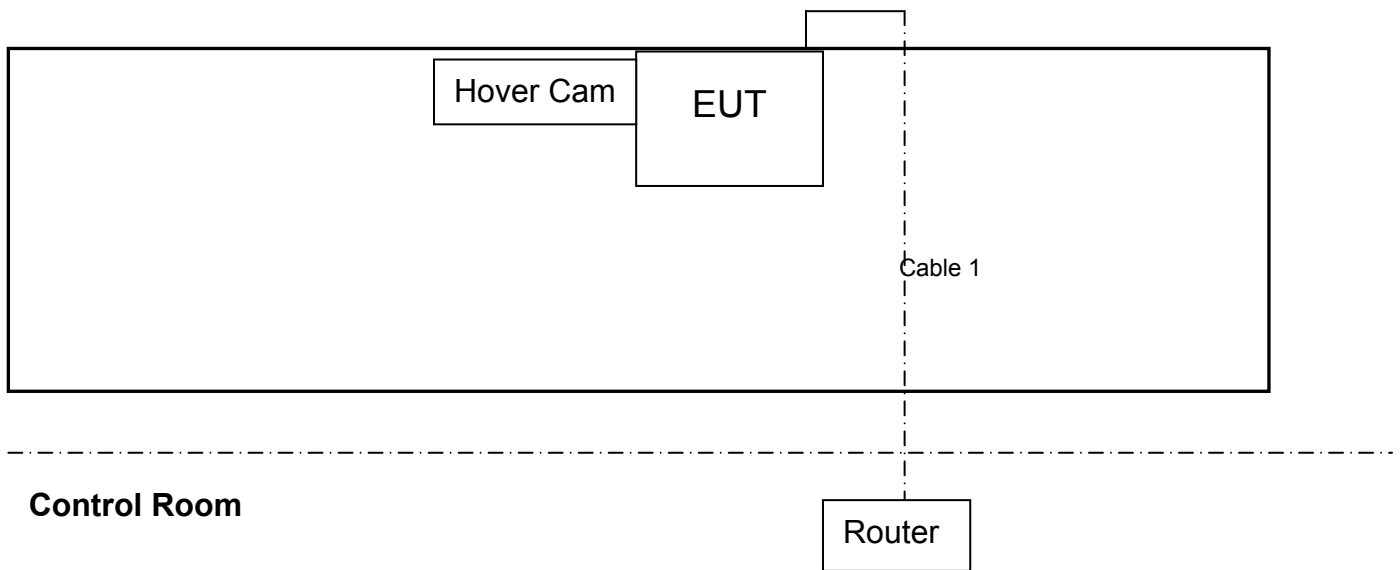
- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (2) Antenna information provided by the applicant.
- (3) Channel List:  
CH 01~CH 11 for 802.11b/g

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
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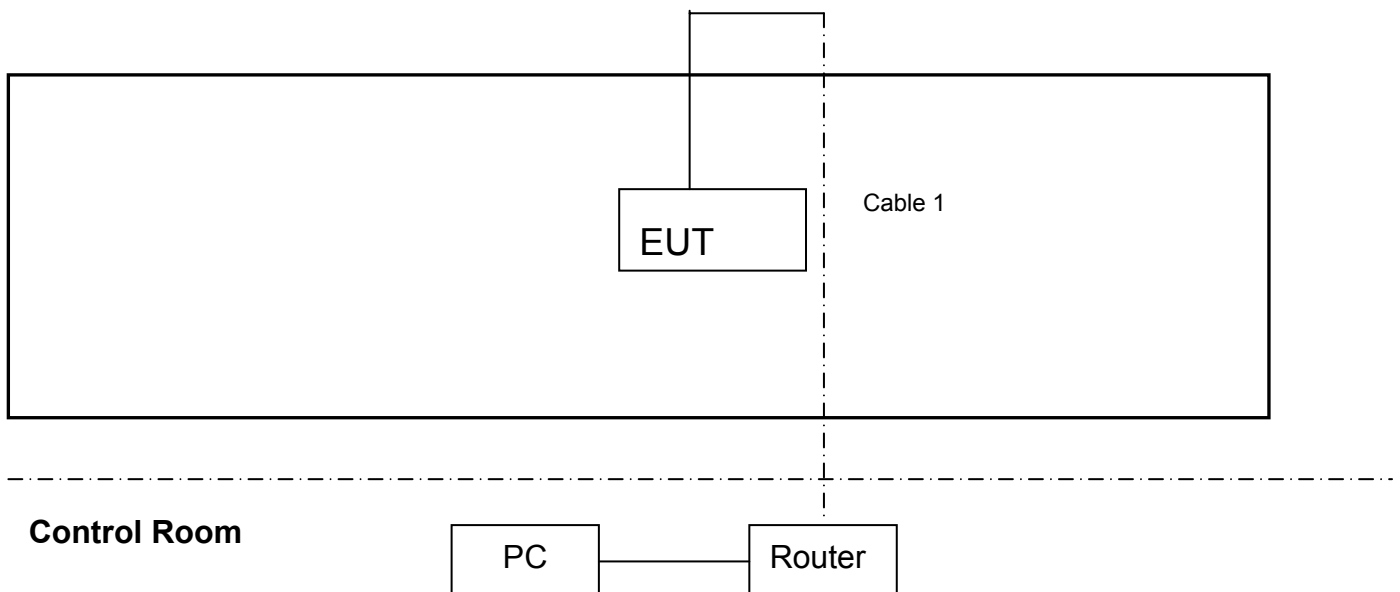
01	2412	05	2432	09	2452
02	2417	06	2437	10	2457
03	2422	07	2442	11	2462
04	2427	08	2447		

### 1.3 Block Diagram Showing the Configuration of System Tested

#### Mode 1: Normal Mode



#### Mode 2: TX Mode



## 1.4 Description of Support Units

Support Equipment					
Name	Model	S/N	Manufacturer	Used “√”	
Hover Cam	Mini 5	----	T	Provided by the applicant.	
Wireless Router	TL-WR841N	----	TP-Link	√	
PC	OPTIPLEX380	----	Dell	√	
Cable Information					
Cable No.	Description	Shielded Type	Ferrite Core	Length	Note
C-1	RJ45 Cable	Yes	No	10m	

## 1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test	
Final Test Mode	Description
Mode 1	Normal Mode
Mode 2	TX Mode

For Radiated Test	
Final Test Mode	Description
Mode 1	Normal Mode
Mode 2	TX Mode (b/g Mode)

### Note:

- (1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.4 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

802.11b Mode: CCK (1 Mbps)

802.11g Mode: OFDM (6 Mbps)

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a mobile unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test. The Dipole Antenna positioned in vertical way.

## 1.6 Description of Test Software Setting

During testing channel & Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of WLAN.

Test Software Version	Test Program: QA.exe		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b DSSS	0F	11	11
IEEE 802.11g OFDM	08	06	06

## 1.7 Test Facility

The tests were performed at:

Shenzhen Certification Technology Service Co., Ltd

2F, Building B, East Area of Nanchang Second Industrial Zone, Gushu 2nd Road, Bao'an District, Shenzhen, 518126, China

Tel: 86-755-86375552 Fax: 86-755-26736857

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 197647.

The test report was fulfilled by Shenzhen Toby Technology Co., Ltd. Shenzhen Toby Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements results.



## 2. Test Summary

FCC Part 15 Subpart C(15.247)			
Standard Section	Test Item	Judgment	Remark
15.203	Antenna Requirement	PASS	N/A
15.207	Conducted Emission	PASS	N/A
15.205	Restricted Bands	PASS	N/A
15.247(a)(2)	6dB Bandwidth	PASS	N/A
15.247(b)	Peak Output Power	PASS	N/A
15.247(e)	Power Spectral Density	PASS	N/A
15.247(d)	Radiated Spurious Emission	PASS	N/A
15.247(d)	Antenna Conducted Spurious Emission	PASS	N/A
<b>Note:</b> N/A is an abbreviation for Not Applicable.			

### 3. Conducted Emission Test

#### 3.1 Test Standard and Limit

##### 3.1.1 Test Standard

FCC Part 15.207

##### 3.1.2 Test Limit

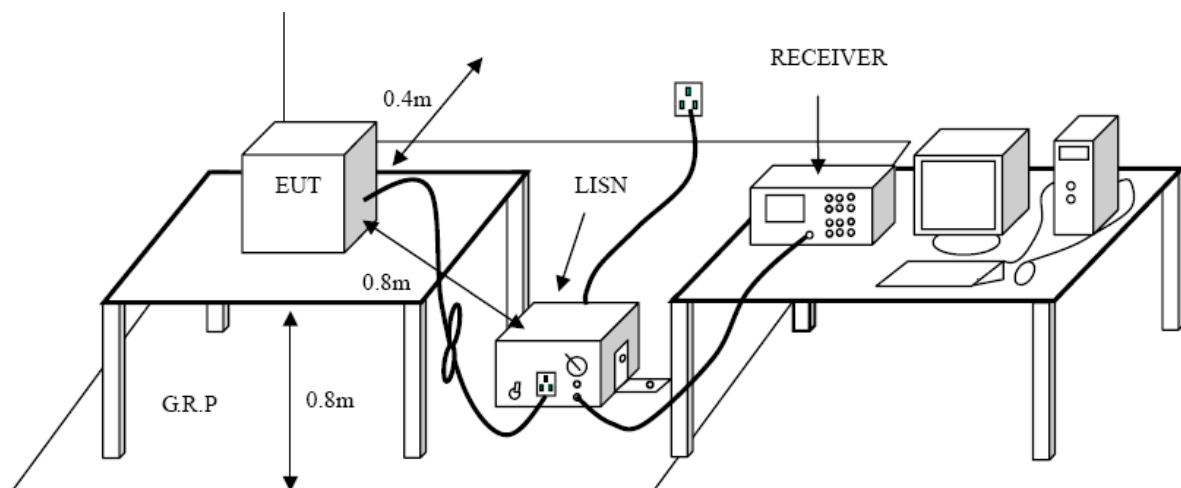
**Conducted Emission Test Limit**

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.

#### 3.2 Test Setup



#### 3.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from the nearest part of EUT chassis.

The setting of IF Bandwidth of EMI test receiver is set 9 kHz, and the test frequency range is from 0.15MHz to 30MHz.

### 3.4 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	100321	2013-08-10	2014-08-09
50ΩCoaxial Switch	Anritsu	MP59B	X10321	2013-08-10	2014-08-09
L.I.S.N	Rohde & Schwarz	ENV216	101131	2013-08-10	2014-08-09
L.I.S.N	SCHWARZBECK	NNBL 8226-2	8226-2/164	2013-08-10	2014-08-09

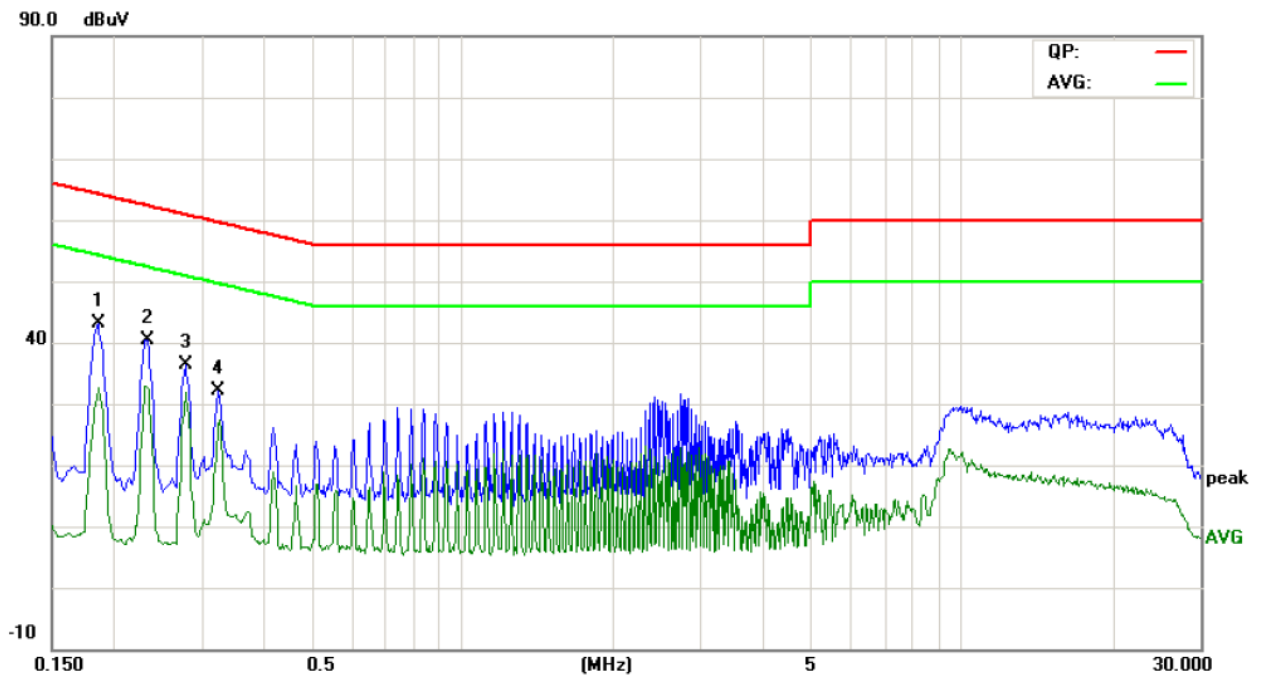
### 3.5 EUT Operating Mode

Please refer to the description of test mode.

### 3.6 Test Data

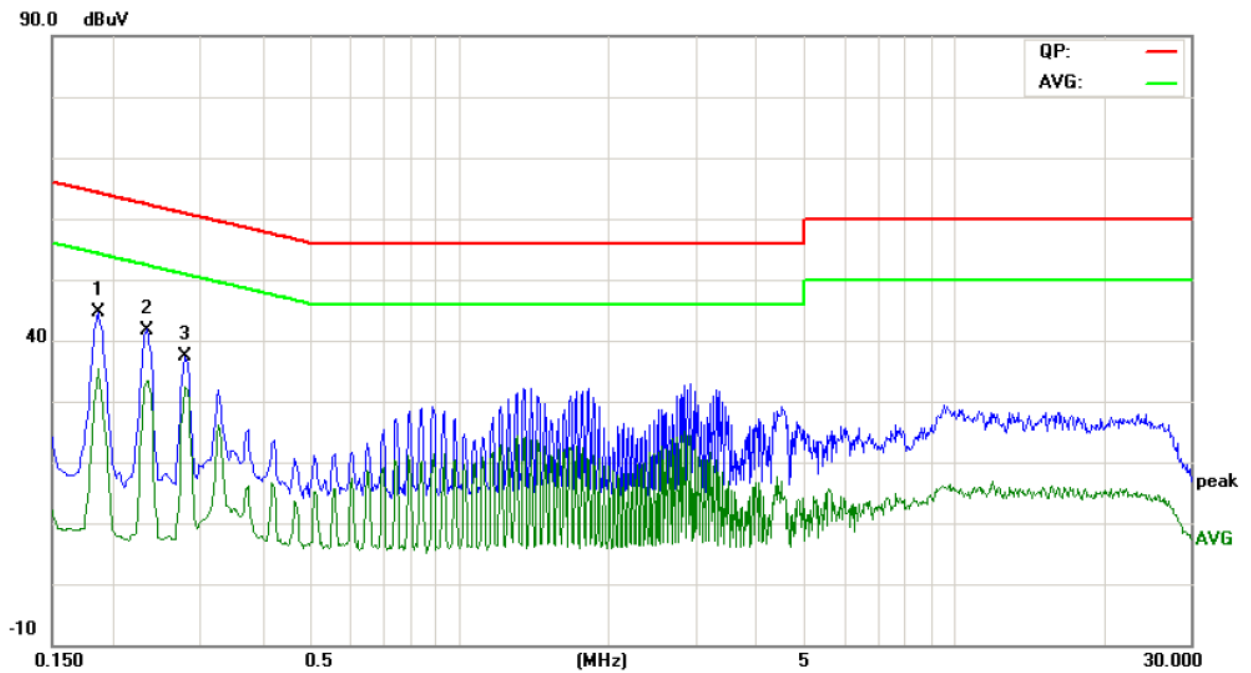
Please see the next page.

E.U.T :	AirStation	Model Name :	AirStation
Temperature :	23°C	Relative Humidity :	51 %
Terminal	Line		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	Mode 1: Normal Mode		



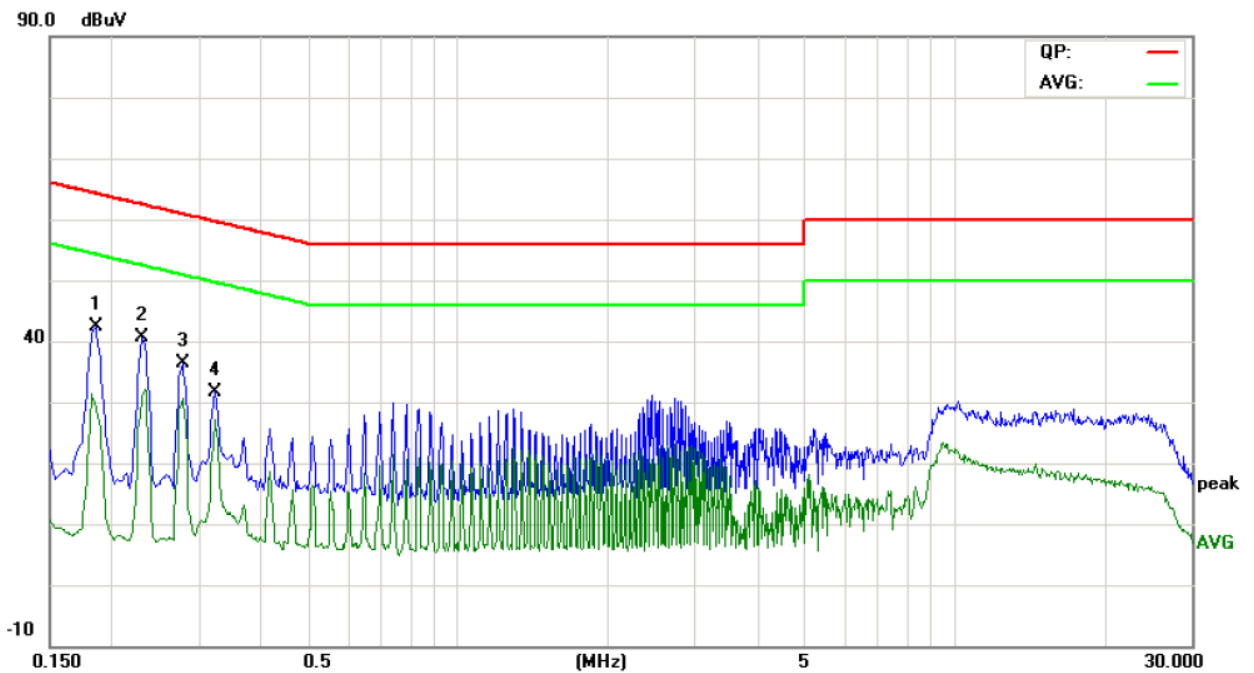
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1860	33.24	9.99	43.23	64.21	-20.98	peak	
2		0.2340	30.38	10.02	40.40	62.30	-21.90	peak	
3		0.2779	26.38	10.02	36.40	60.88	-24.48	peak	
4		0.3220	21.99	10.02	32.01	59.65	-27.64	peak	

E.U.T :	AirStation	Model Name :	AirStation
Temperature :	23°C	Relative Humidity :	51 %
Terminal	Neutral		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	Mode 1: Normal Mode		



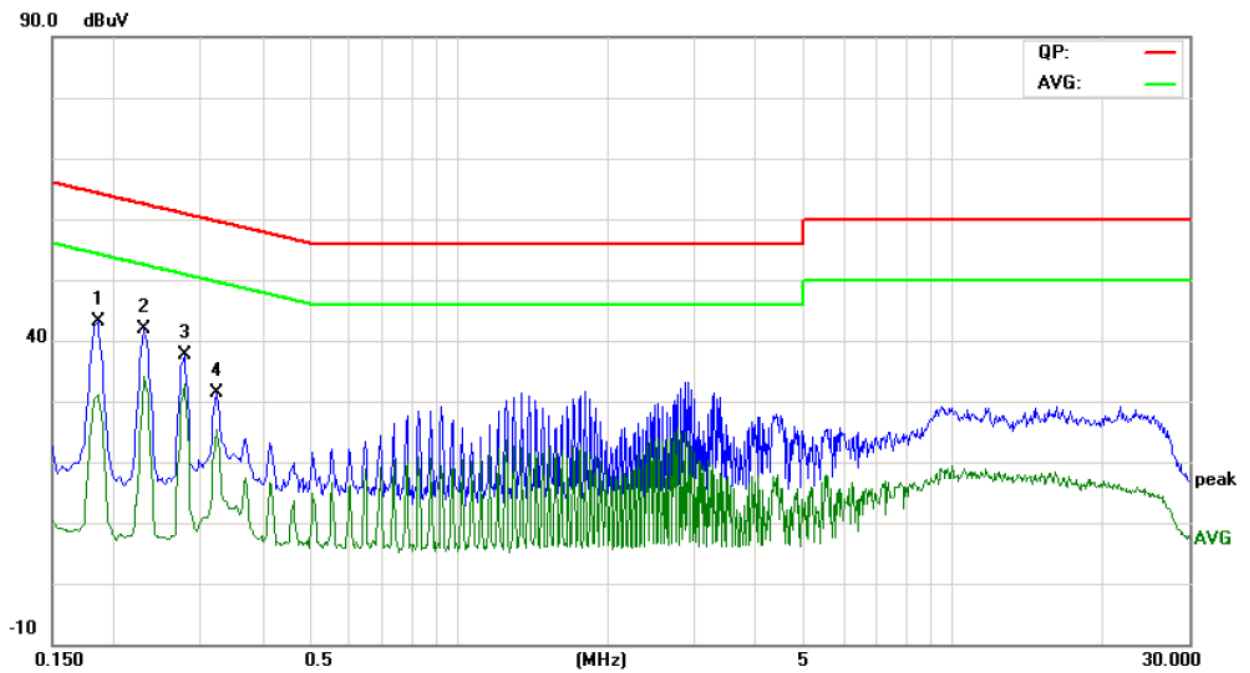
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1860	34.60	10.12	44.72	64.21	-19.49	peak	
2		0.2340	31.64	10.11	41.75	62.30	-20.55	peak	
3		0.2779	27.23	10.09	37.32	60.88	-23.56	peak	

E.U.T :	AirStation	Model Name :	AirStation
Temperature :	23°C	Relative Humidity :	51 %
Terminal	Line		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	Mode 2: TX Mode		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1860	32.44	9.99	42.43	64.21	-21.78	peak	
2	*	0.2300	30.67	10.02	40.69	62.45	-21.76	peak	
3		0.2779	26.43	10.02	36.45	60.88	-24.43	peak	
4		0.3220	21.73	10.02	31.75	59.65	-27.90	peak	

E.U.T :	AirStation	Model Name :	AirStation
Temperature :	23°C	Relative Humidity :	51 %
Terminal	Neutral		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	Mode 2: TX Mode		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1860	33.09	10.12	43.21	64.21	-21.00	peak	
2	*	0.2300	31.86	10.11	41.97	62.45	-20.48	peak	
3		0.2779	27.44	10.09	37.53	60.88	-23.35	peak	
4		0.3220	21.24	10.08	31.32	59.65	-28.33	peak	

## 4. Radiated Emission Test

### 4.1 Test Standard and Limit

#### 4.1.1 Test Standard

FCC Part 15.209

#### 4.1.2 Test Limit

**Radiated Emission Limits (9kHz~1000MHz)**

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

**Radiated Emission Limit (Above 1000MHz)**

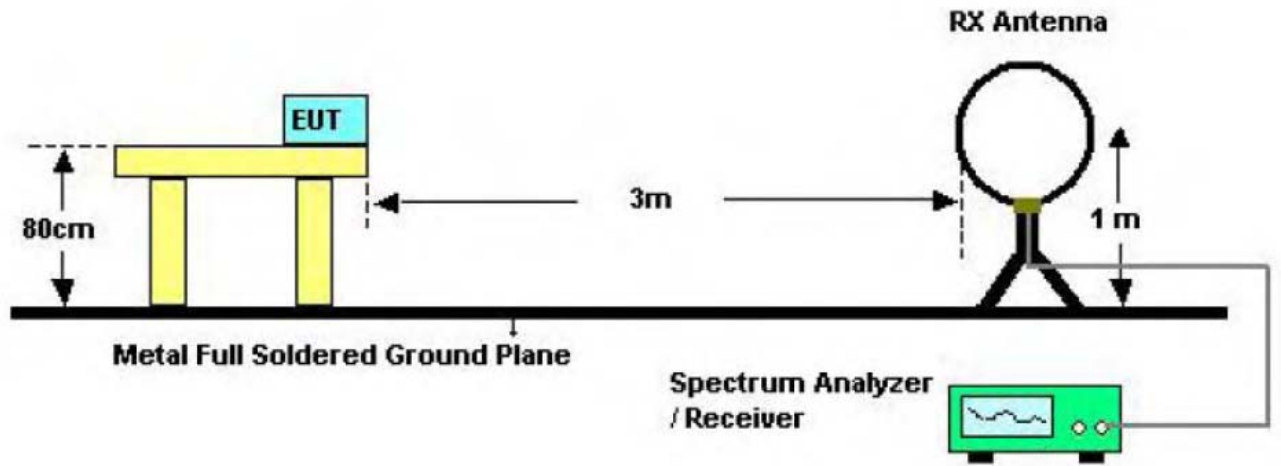
Frequency (MHz)	Class A (dBuV/m)(at 3 M)		Class B (dBuV/m)(at 3 M)	
	Peak	Average	Peak	Average
Above 1000	80	60	74	54

**Note:**

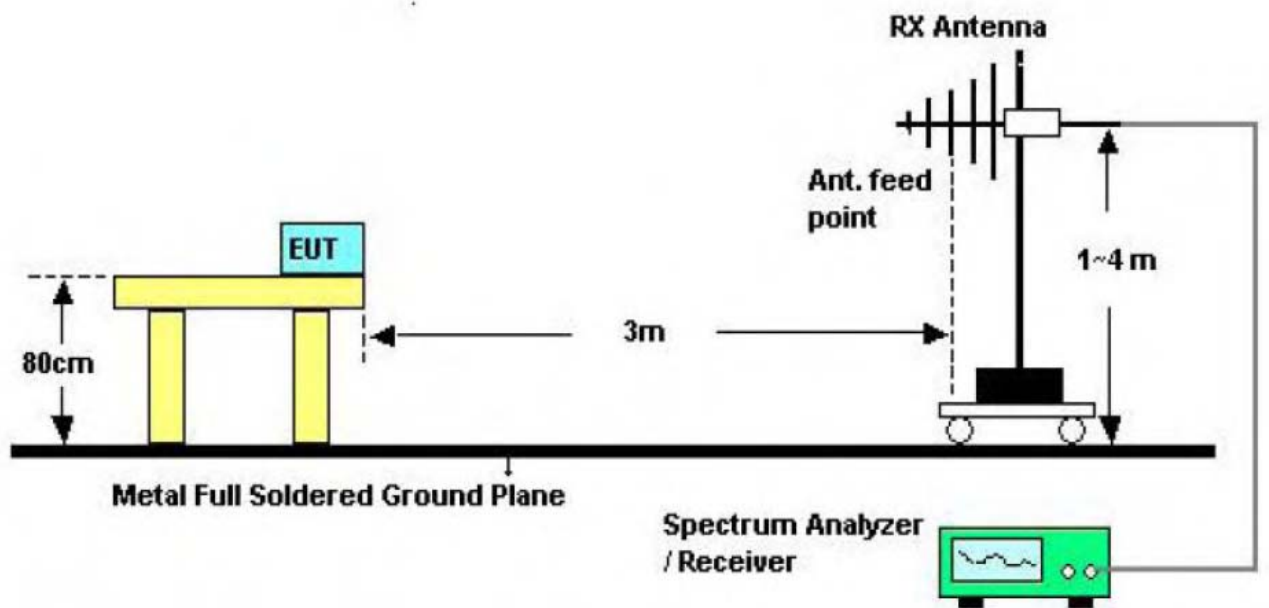
- (1) The tighter limit applies at the band edges.
- (2) Emission Level(dBuV/m)=20log Emission Level(uV/m)



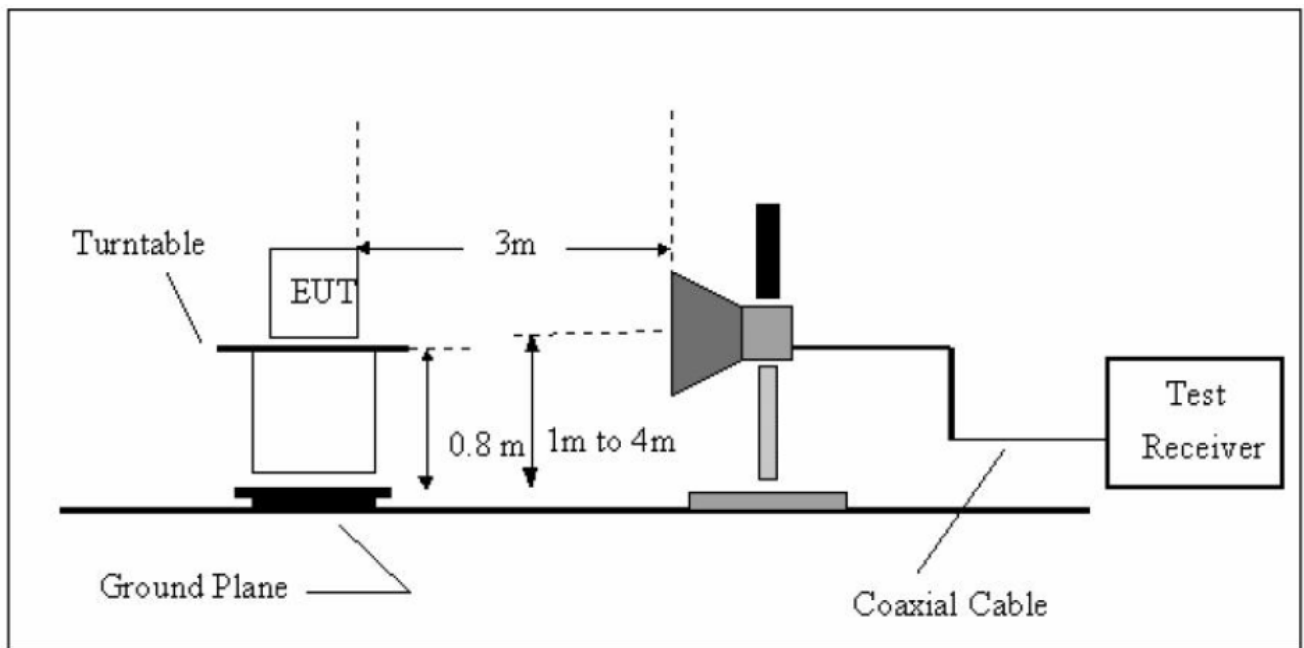
### 4.2 Test Setup



Bellow 30MHz Test Setup



Bellow 1000MHz Test Setup



Above 1GHz Test Setup

#### 4.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (5) For the actual test configuration, please see the test setup photo.

#### 4.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

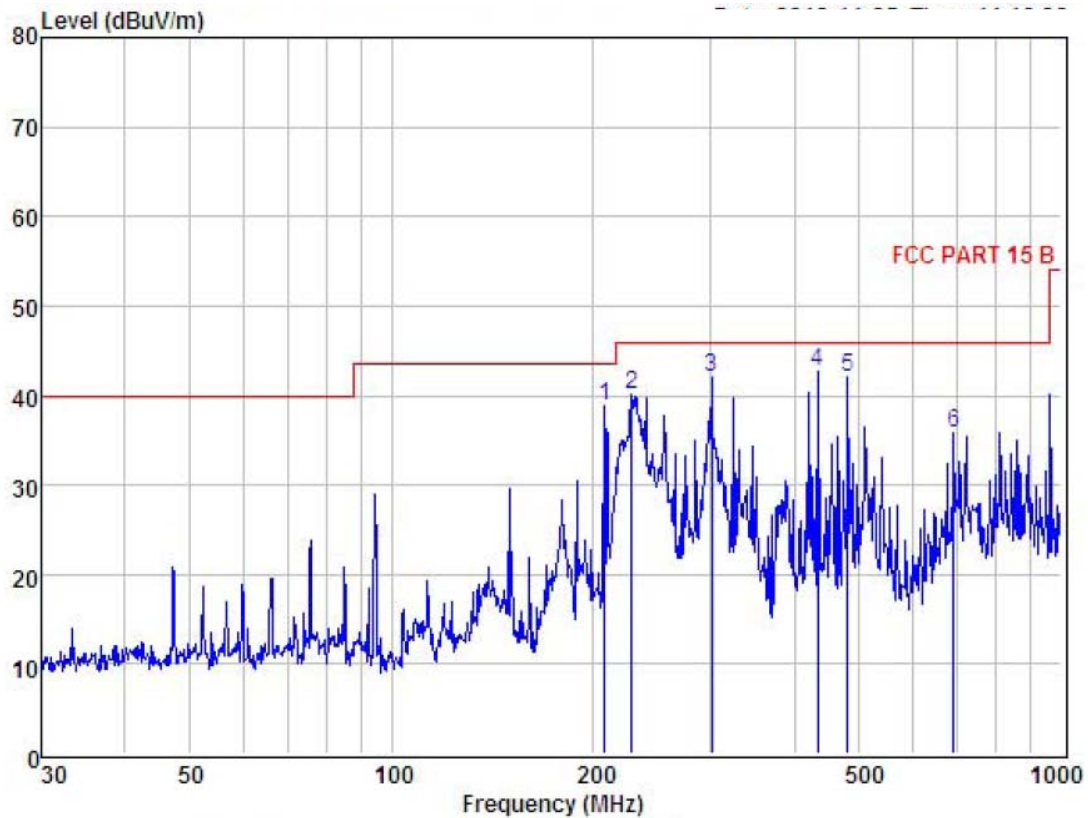
#### 4.5 Test Equipment

<b>Description</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Cal. Due Date</b>
Spectrum Analyzer	ROHDE& SCHWARZ	FSP30	DE25181	2012-12-31	2013-12-30
Spectrum Analyzer	Agilent	E4407B	MY49510055	2012-12-31	2013-12-30
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	101165	2012-12-31	2013-12-30
Bilog Antenna	SCHWARZBECK	VULB9168	9168-438	2013-02-12	2014-02-11
Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA9120D	2013-02-12	2014-02-11
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170D	2013-02-12	2014-02-11
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2013-02-12	2014-02-11
Pre-amplifier	SCHWARZBECK	BBV9743	9743-019	2013-10-28	2014-10-27
Pre-amplifier	Quietek	AP-180C	CHM-0602012	2013-10-28	2014-10-27

#### 4.6 Test Data

Please see the next page.

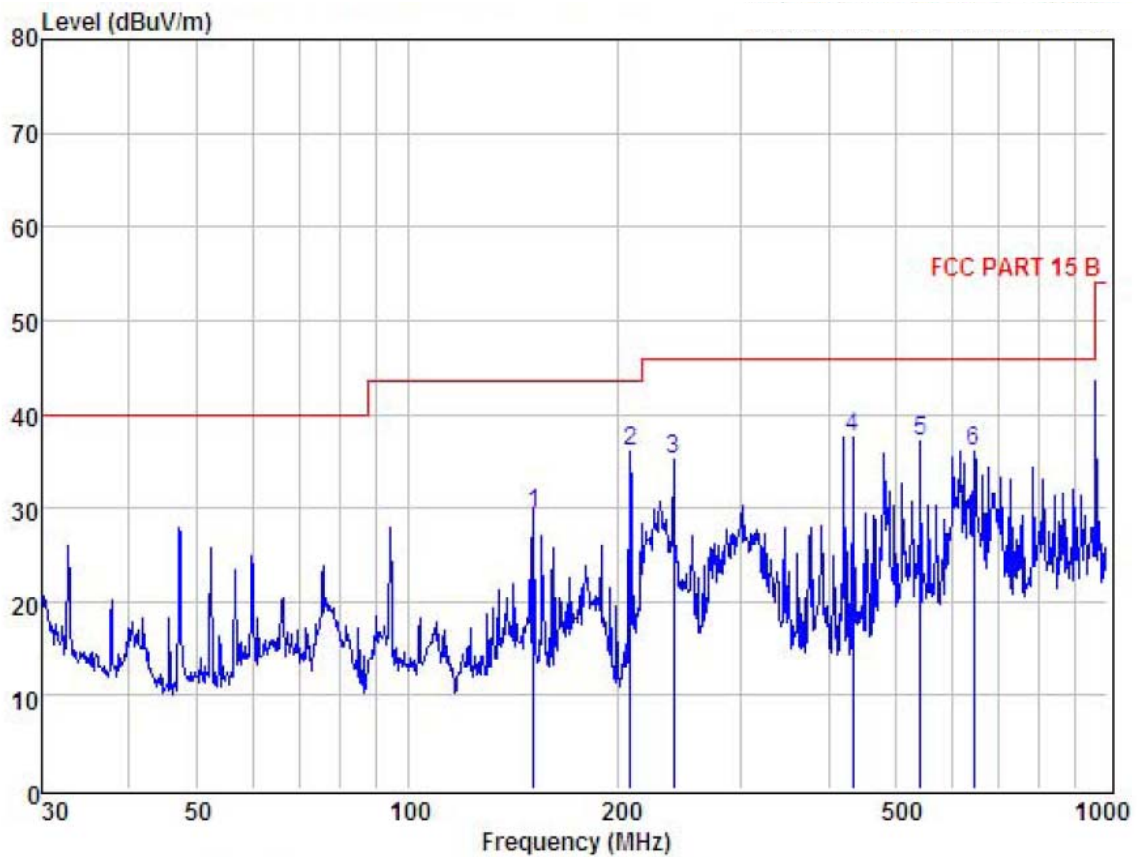
Operation Mode:	Normal Mode	Test Date :	November 22, 2013
Frequency Range:	30~1000MHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Ant. Pol.	Horizontal		
Test Voltage:	AC 120V/50 Hz		



Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	207.85	55.20	10.04	27.01	0.49	38.72	43.50	-4.78	Peak
2	228.49	55.59	11.10	27.08	0.55	40.16	46.00	-5.84	Peak
3	300.37	55.79	12.85	27.19	0.64	42.09	46.00	-3.91	Peak
4	432.55	53.92	15.53	27.46	0.74	42.73	46.00	-3.27	Peak
5	480.53	52.58	16.28	27.57	0.81	42.10	46.00	-3.90	Peak
6	691.99	42.88	19.56	27.77	1.19	35.86	46.00	-10.14	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

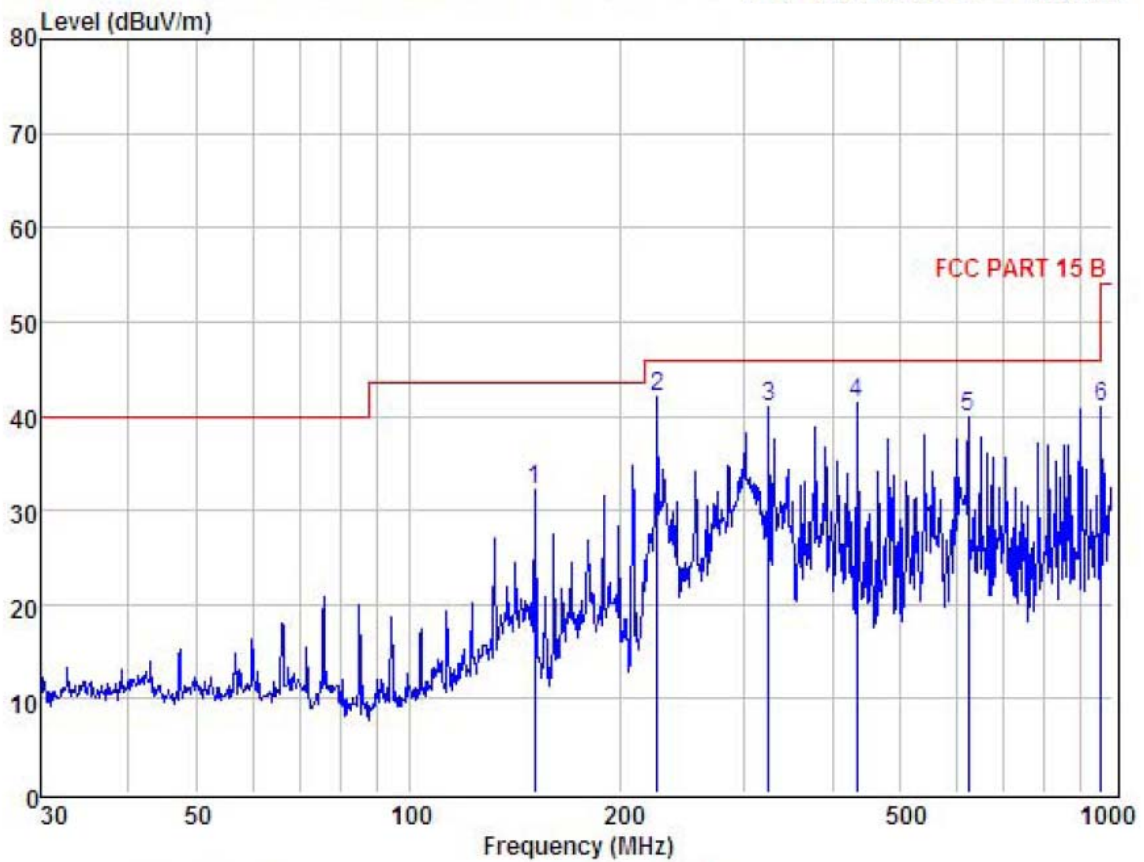
Operation Mode:	Normal Mode	Test Date :	November 22, 2013
Frequency Range:	30~1000MHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Ant. Pol.	Vertical		
Test Voltage:	AC 120V/50 Hz		



Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	151.60	41.81	14.16	26.91	0.42	29.48	43.50	-14.02	
2	207.85	52.61	10.04	27.01	0.49	36.13	43.50	-7.37	
3	239.99	50.35	11.45	27.09	0.53	35.24	46.00	-10.76	
4	432.55	48.81	15.53	27.46	0.74	37.62	46.00	-8.38	
5	541.37	46.52	17.22	27.69	1.01	37.06	46.00	-8.94	
6	645.12	43.71	19.04	27.80	1.13	36.08	46.00	-9.92	

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

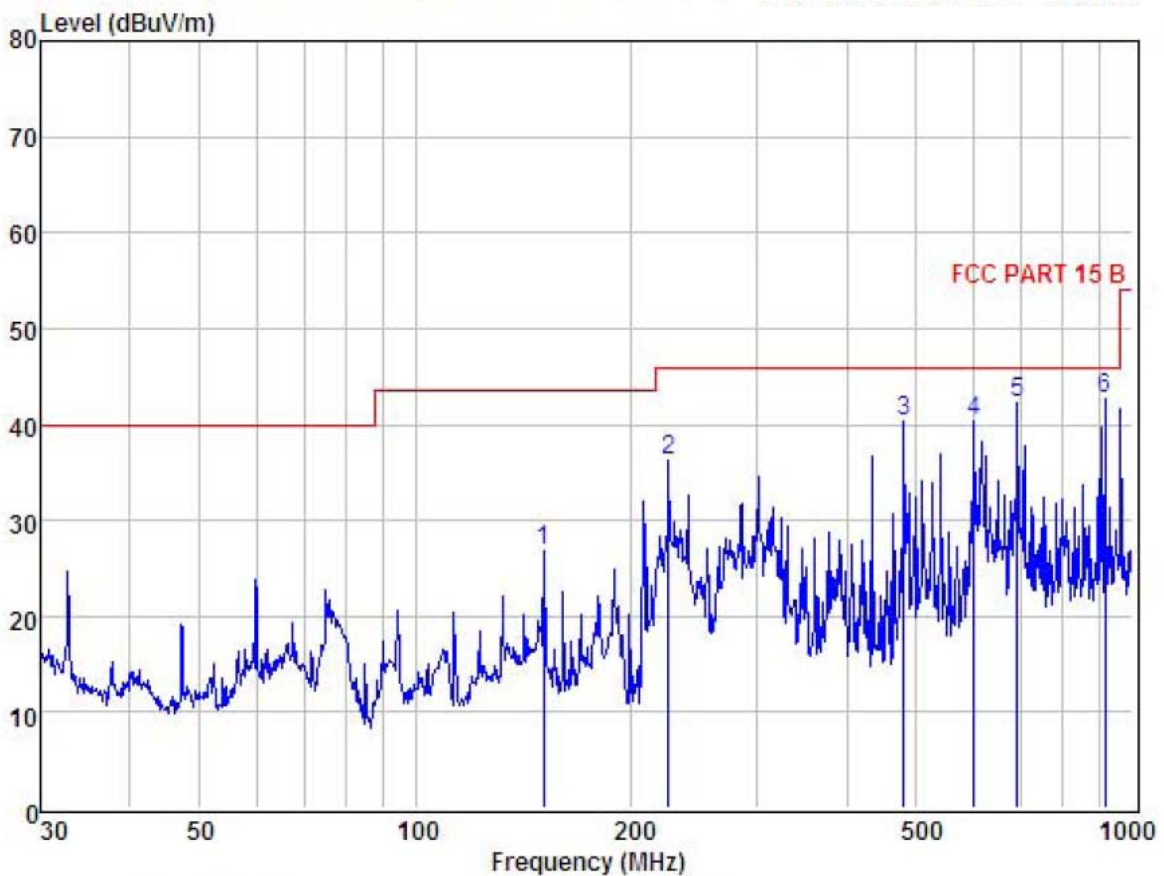
Operation Mode:	TX Mode	Test Date :	November 22, 2013
Frequency Range:	30~1000MHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Ant. Pol.	Horizontal		
Test Voltage:	AC 120V/50 Hz		



Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	151.07	44.41	14.16	26.91	0.42	32.08	43.50	-11.42	Peak
2	225.31	57.56	10.98	27.08	0.55	42.01	46.00	-3.99	Peak
3	324.46	54.11	13.43	27.23	0.74	41.05	46.00	-4.95	Peak
4	432.55	52.69	15.53	27.46	0.74	41.50	46.00	-4.50	Peak
5	622.89	47.94	18.73	27.81	1.11	39.97	46.00	-6.03	Peak
6	962.16	44.68	22.17	27.61	1.77	41.01	54.00	-12.99	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Operation Mode:	TX Mode	Test Date :	November 22, 2013
Frequency Range:	30~1000MHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Ant. Pol.	Vertical		
Test Voltage:	AC 120V/50 Hz		



Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	151.07	39.08	14.16	26.91	0.42	26.75	43.50	-16.75	Peak
2	225.31	51.78	10.98	27.08	0.55	36.23	46.00	-9.77	Peak
3	480.53	50.89	16.28	27.57	0.81	40.41	46.00	-5.59	Peak
4	601.43	48.70	18.36	27.82	1.07	40.31	46.00	-5.69	Peak
5	691.99	49.27	19.56	27.77	1.19	42.25	46.00	-3.75	Peak
6	916.07	46.53	21.87	27.63	1.82	42.59	46.00	-3.41	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Operation Mode: 802.11b TX 2412MHz Test Date : November 22, 2013  
 Frequency Range: 1-25GHz Temperature : 28 °C  
 Measured Distance: 3m Humidity : 65 %  
 Test Voltage: AC 120V/60Hz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4824.360	V	56.11	49.73	74.00	54.00	17.89	4.27
7236.400	V	50.36	44.09	74.00	54.00	23.64	9.91
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4824.360	H	54.39	48.25	74.00	54.00	19.61	5.75
7236.400	H	48.72	43.10	74.00	54.00	25.28	10.90
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--

**Other harmonics emissions are lower than 20dB below the allowable limit.**

- Note:**
- (1) All Readings are Peak Value and AV.
  - (2) Emission Level= Reading Level + Probe Factor +Cable Loss
  - (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



Operation Mode: 802.11b TX 2437MHz Test Date : November 22, 2013  
 Frequency Range: 1-25GHz Temperature : 28 °C  
 Measured Distance: 3m Humidity : 65 %  
 Test Voltage: AC 120V/60Hz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4874.210	V	55.48	48.62	74.00	54.00	48.52	5.38
7311.300	V	49.66	44.58	74.00	54.00	24.34	9.42
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4874.210	H	53.62	47.92	74.00	54.00	20.38	6.08
7311.300	H	48.25	43.09	74.00	54.00	25.75	10.91
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--

**Other harmonics emissions are lower than 20dB below the allowable limit.**

- Note:**
- (1) All Readings are Peak Value and AV.
  - (2) Emission Level= Reading Level + Probe Factor +Cable Loss
  - (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Operation Mode: 802.11b TX 2462MHz Test Date : November 22, 2013  
 Frequency Range: 1-25GHz Temperature : 28 °C  
 Measured Distance: 3m Humidity : 65 %  
 Test Voltage: AC 120V/60Hz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4924.110	V	55.36	48.25	74.00	54.00	18.64	5.75
7386.430	V	48.79	44.38	74.00	54.00	25.21	9.62
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4924.110	H	53.41	48.05	74.00	54.00	20.59	5.95
7386.430	H	47.31	42.76	74.00	54.00	26.69	11.24
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--

**Other harmonics emissions are lower than 20dB below the allowable limit.**

- Note:**
- (1) All Readings are Peak Value and AV.
  - (2) Emission Level= Reading Level + Probe Factor +Cable Loss
  - (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Operation Mode:	802.11g TX 2412MHz	Test Date :	November 22, 2013
Frequency Range:	1-25GHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Test Voltage:	AC 120V/60Hz		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4824.250	V	53.51	47.28	74.00	54.00	20.49	6.72
7236.480	V	46.14	40.34	74.00	54.00	27.86	13.66
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4824.250	H	52.08	46.47	74.00	54.00	21.92	7.26
7236.480	H	44.50	38.51	74.00	54.00	29.50	15.49
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--

**Other harmonics emissions are lower than 20dB below the allowable limit.**

- Note:**
- (1) All Readings are Peak Value and AV.
  - (2) Emission Level= Reading Level + Probe Factor +Cable Loss
  - (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Operation Mode:	802.11g TX 2437MHz	Test Date :	November 22, 2013
Frequency Range:	1-25GHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Test Voltage:	AC 120V/60Hz		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4874.420	V	52.76	46.91	74.00	54.00	21.24	7.09
7311.560	V	45.67	40.08	74.00	54.00	28.33	13.92
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4874.420	H	50.33	44.61	74.00	54.00	23.67	9.39
7311.560	H	44.19	37.69	74.00	54.00	29.81	16.31
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--

**Other harmonics emissions are lower than 20dB below the allowable limit.**

**Note:**

- (1) All Readings are Peak Value and AV.
- (2) Emission Level= Reading Level + Probe Factor +Cable Loss
- (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Operation Mode:	802.11g TX 2462MHz	Test Date :	November 22, 2013
Frequency Range:	1-25GHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Test Voltage:	AC 120V/60Hz		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4924.310	V	52.68	46.11	74.00	54.00	21.32	7.89
7386.500	V	45.19	40.03	74.00	54.00	28.81	13.97
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4924.310	H	49.86	45.32	74.00	54.00	24.14	8.68
7386.500	H	45.06	39.44	74.00	54.00	28.94	14.56
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--
--	H	--	--	74.00	54.00	--	--

**Other harmonics emissions are lower than 20dB below the allowable limit.**

- Note:**
- (1) All Readings are Peak Value and AV.
  - (2) Emission Level= Reading Level + Probe Factor +Cable Loss
  - (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 5. Restricted Bands Requirement

### 5.1 Test Standard and Limit

#### 5.1.1 Test Standard

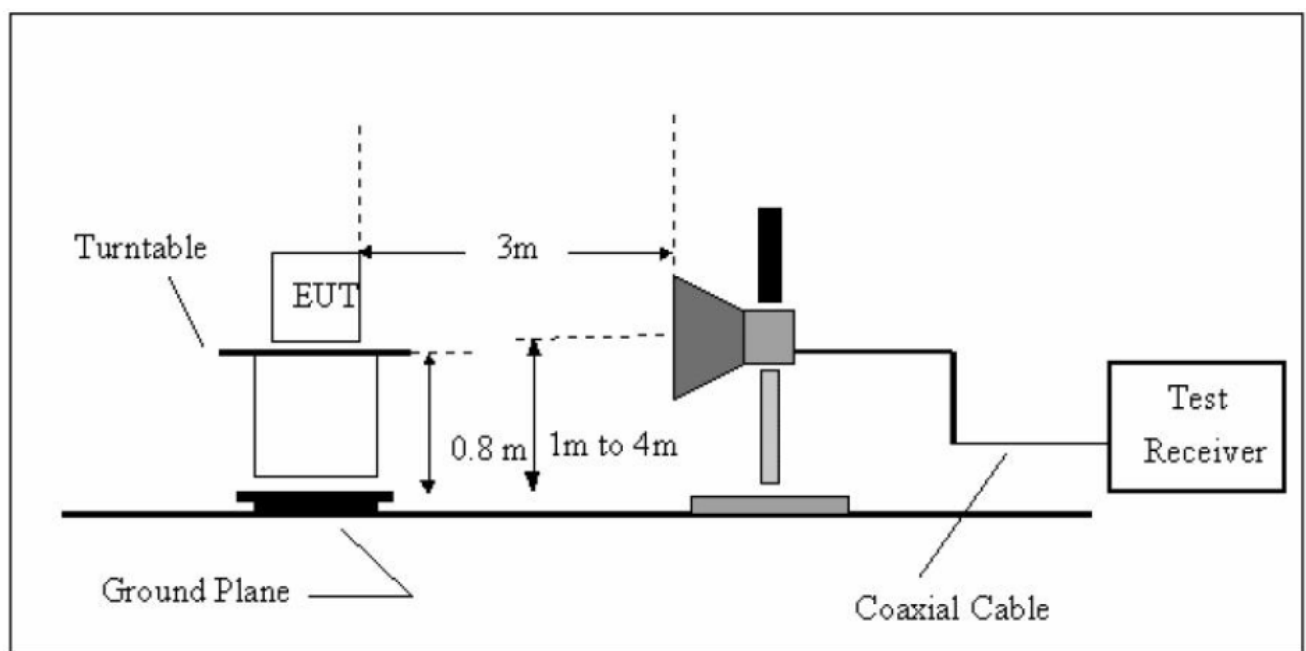
FCC Part 15.209

FCC Part 15.205

#### 5.1.2 Test Limit

Restricted Frequency Band (MHz)	Class B (dBuV/m)(at 3 M)	
	Peak	Average
2310 ~2390	74	54
2483.5 ~2500	74	54

### 5.2 Test Setup



### 5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

(4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for Peak reading, then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.  
Peak Detection:

(5) Band-edge Measurements:

Radiated Method: Set the center frequency of the emission to be measured (within 2 MHz of the authorized band edge), set span to 2 MHz, with RBW/VBW=100 kHz/300 kHz, detector mode is Peak, then use band power function to measure the Bandwidth of 1 MHz.

Average Detection (EUT transmitting continuously and duty cycle $\geq$ 98 percent):

Set the center frequency of the emission to be measured (within 2 MHz of the authorized band edge), set span to 2 MHz, with RBW/VBW=100 kHz/300 kHz, detector mode is RMS or Average, then use band power function to measure the Bandwidth of 1 MHz.

Conducted Method:

- a. The EUT connect its antenna terminal to measurement via a low loss cable.
- b. Then set spectrum analyzer RBW/VBW=100 kHz/300 kHz, with a span including restricted frequency band.
- c. Measure the highest amplitude appearing on spectral display and set it as a reference level. Then measure the restricted frequency band maximum emissions.

(6) For the actual test configuration, please see the test setup photo.

## 5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

## 5.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSP30	DE25181	2012-12-31	2013-12-30
Spectrum Analyzer	Agilent	E4407B	MY49510055	2012-12-31	2013-12-30
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	101165	2012-12-31	2013-12-30
Bilog Antenna	SCHWARZBECK	VULB9168	9168-438	2013-02-12	2014-02-11
Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA9120D	2013-02-12	2014-02-11
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170D	2013-02-12	2014-02-11
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2013-02-12	2014-02-11
Pre-amplifier	SCHWARZBECK	BBV9743	9743-019	2013-10-28	2014-10-27

Pre-amplifier	Quietek	AP-180C	CHM-0602012	2013-10-28	2014-10-27
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## 5.6 Test Data

Please see the next page.



Spectrum Detector: PK  
 Temperature : 28 °C

Test Date : November 26, 2013  
 Humidity : 65 %

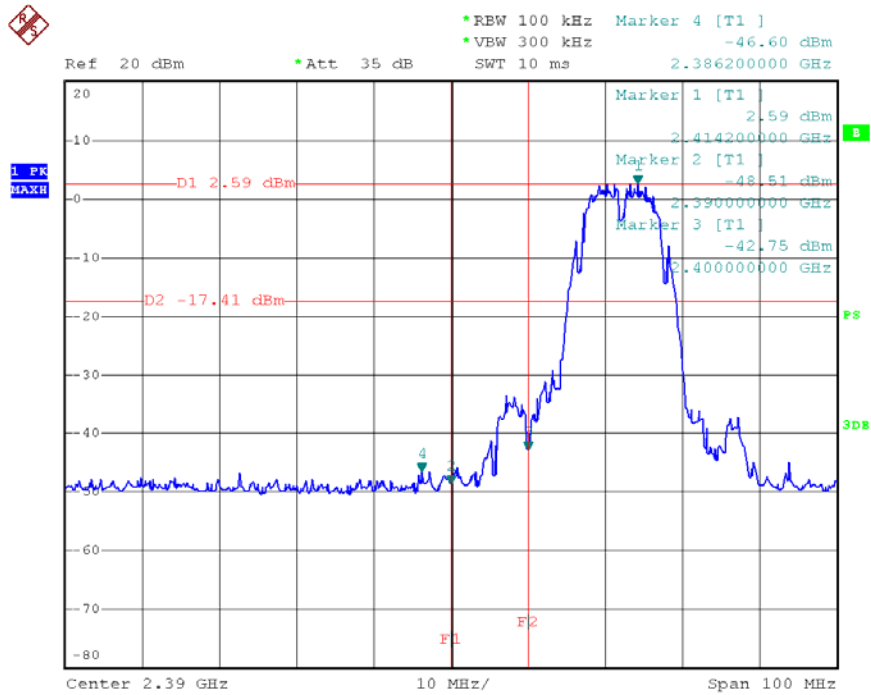
## 802.11b Mode

### 1. Conducted Test

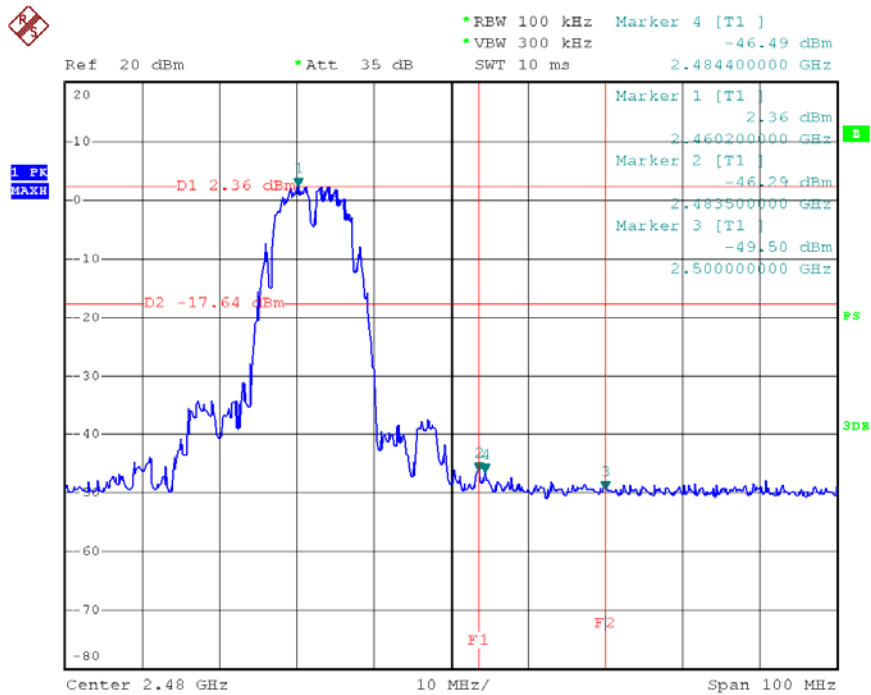
Frequency (MHz)	Peak Power Output(dBm)	Emission Read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	2.59	-46.60	49.19	>20dBc
>2483.5	2.36	-46.49	48.85	>20dBc

### 2. Radiated emission test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PEAK	AV	PEAK	AV
<2400	H	58.45	47.16	74.00	54.00
<2400	V	55.49	44.37	74.00	54.00
>2483.5	H	57.70	46.55	74.00	54.00
>2483.5	V	56.82	45.48	74.00	54.00



Date: 26.NOV.2013 09:46:07



Date: 26.NOV.2013 09:47:26

Spectrum Detector: PK  
 Temperature : 28 °C

Test Date : November 26, 2013  
 Humidity : 65 %

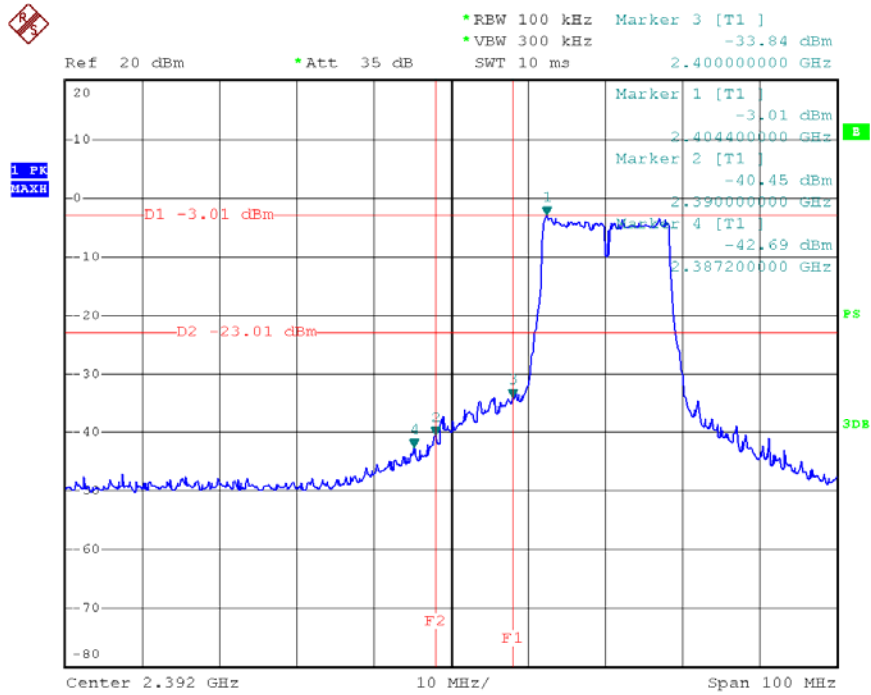
## 802.11g Mode

### 1. Conducted Test

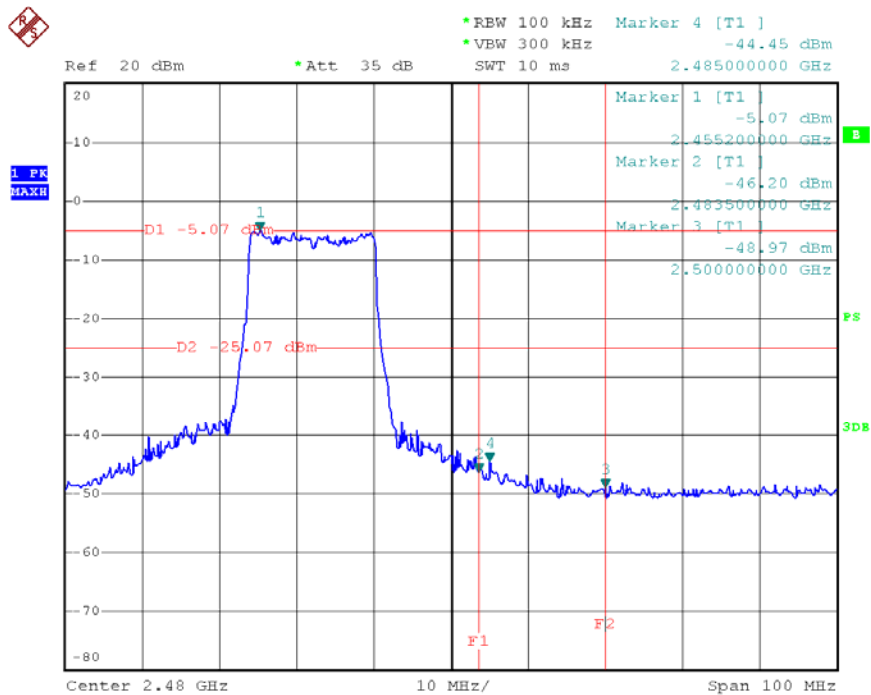
Frequency (MHz)	Peak Power Output(dBm)	Emission Read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	-3.01	-42.69	39.68	>20dBc
>2483.5	-5.07	-44.45	39.38	>20dBc

### 2. Radiated emission test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PEAK	AV	PEAK	AV
<2400	H	58.62	46.15	74.00	54.00
<2400	V	56.17	45.36	74.00	54.00
>2483.5	H	56.39	45.74	74.00	54.00
>2483.5	V	54.71	45.33	74.00	54.00



Date: 26.NOV.2013 10:01:09



Date: 26.NOV.2013 09:49:48

## 6. Bandwidth Test

### 6.1 Test Standard and Limit

8.1.1 Test Standard  
FCC Part 15.247 (a)(2)

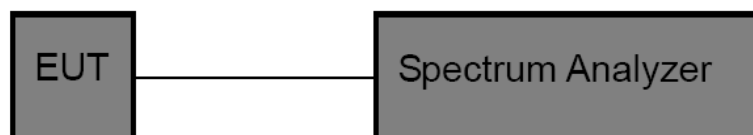
8.1.2 Test Method

Test Method	
<b>KDB 558074 D01 V03R01</b>	Section 8.0 DTS Bandwidth 8.1 Option 1

8.1.3 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range(MHz)
Bandwidth	$\geq 500$ KHz (6dB bandwidth)	2400~2483.5

### 6.2 Test Setup



### 6.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
- (3) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:100 kHz, and Video Bandwidth:300 kHz, Detector: Peak, Sweep Time set auto.

### 6.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

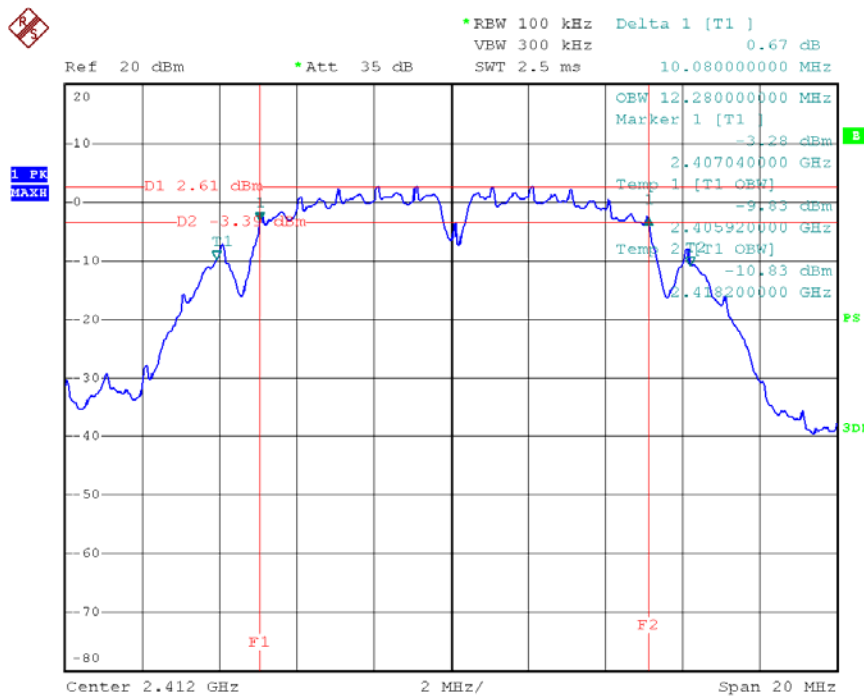
### 6.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	ROHDE&SCHWARZ	FSP30	DE25181	2012-12-31	2013-12-30

### 6.6 Test Data

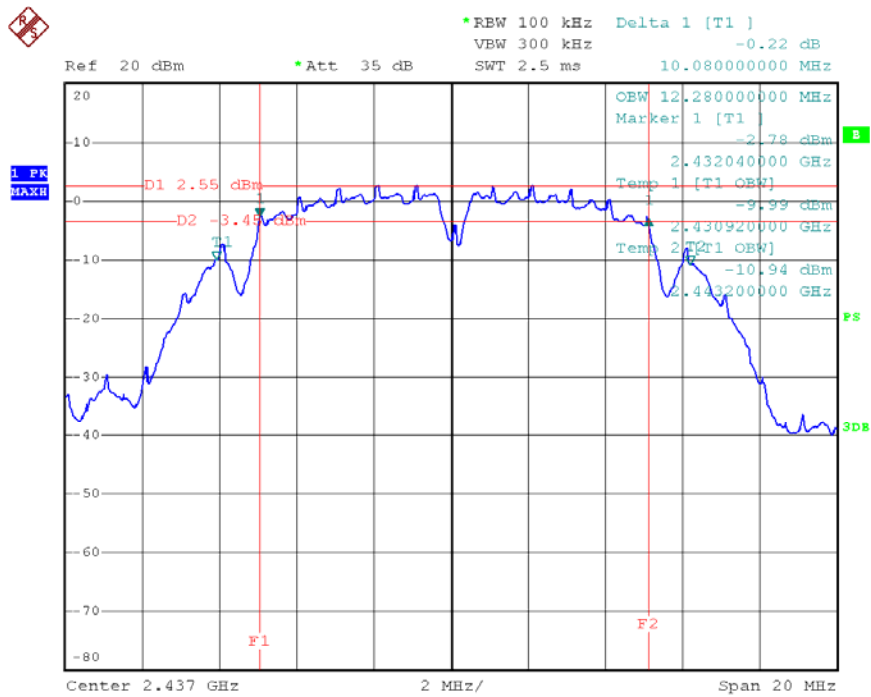
802.11b			
Channel frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit
2412	10.08	12.28	>=500 kHz
2437	10.08	12.28	>=500 kHz
2462	10.12	12.36	>=500 kHz

#### 2412 MHz



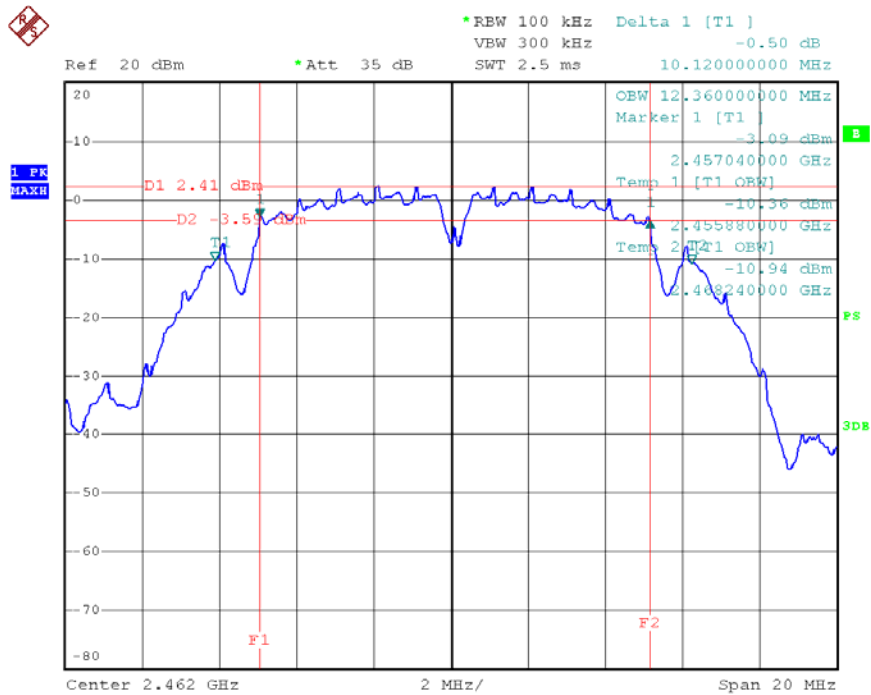
Date: 26.NOV.2013 09:37:54

## 2437 MHz



Date: 26.NOV.2013 09:40:35

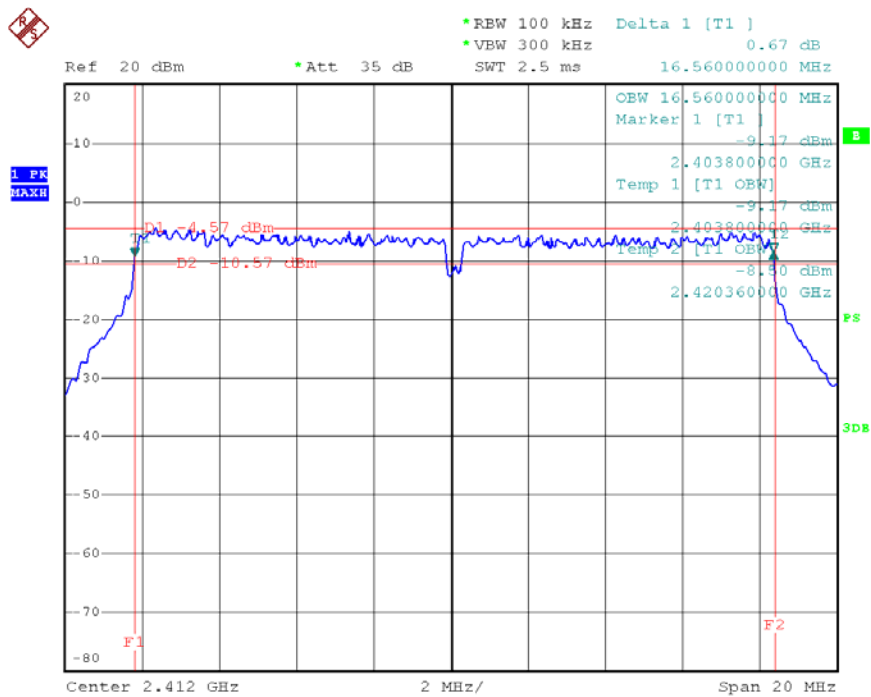
## 2462 MHz



Date: 26.NOV.2013 09:42:46

802.11g			
Channel frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit
2412	16.56	16.56	>=500 kHz
2437	16.64	16.52	>=500 kHz
2462	16.60	16.52	>=500 kHz

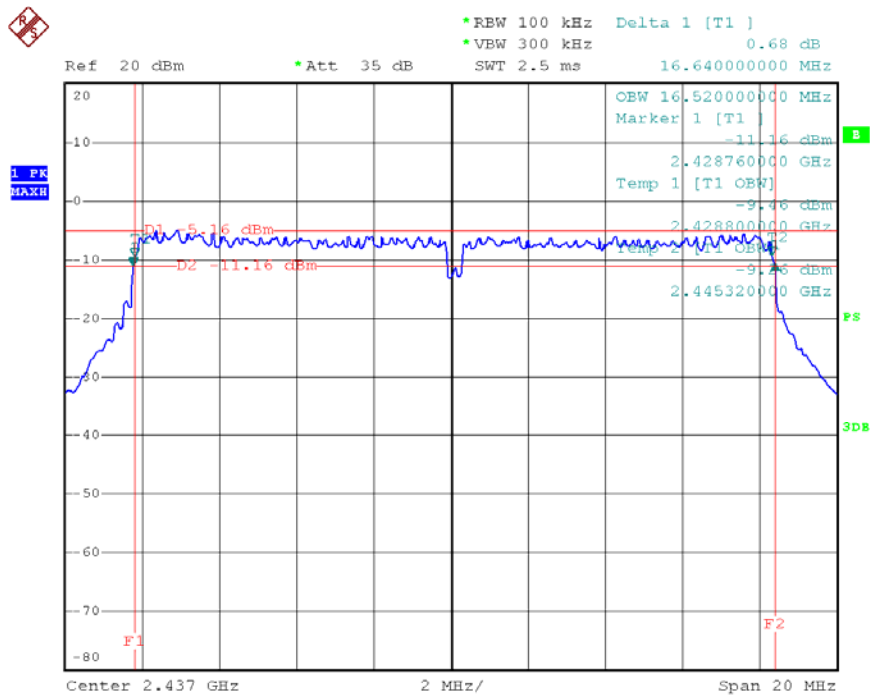
2412 MHz



Date: 26.NOV.2013 09:56:18

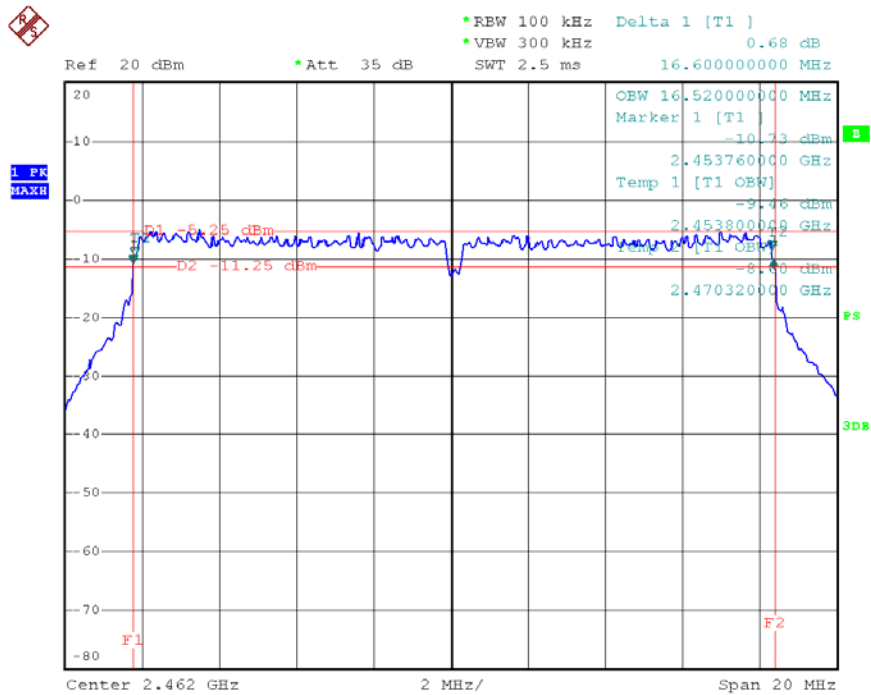


### 2437 MHz



Date: 26.NOV.2013 09:53:10

### 2462 MHz



Date: 26.NOV.2013 09:50:51

## 7. Peak Output Power Test

### 7.1 Test Standard and Limit

#### 9.1.1 Test Standard

FCC Part 15.247 (b)

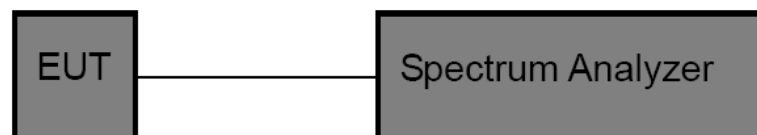
#### 9.1.2 Test Method

Test Method	
<b>KDB 558074 D01 V03R01</b>	Section 9.0 Fundamental Emission Output Power 9.1.2 Integrated band power method

#### 9.1.3 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range(MHz)
Peak Output Power	1 Watt or 30 dBm	2400~2483.5

### 7.2 Test Setup



### 7.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above.

### 7.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

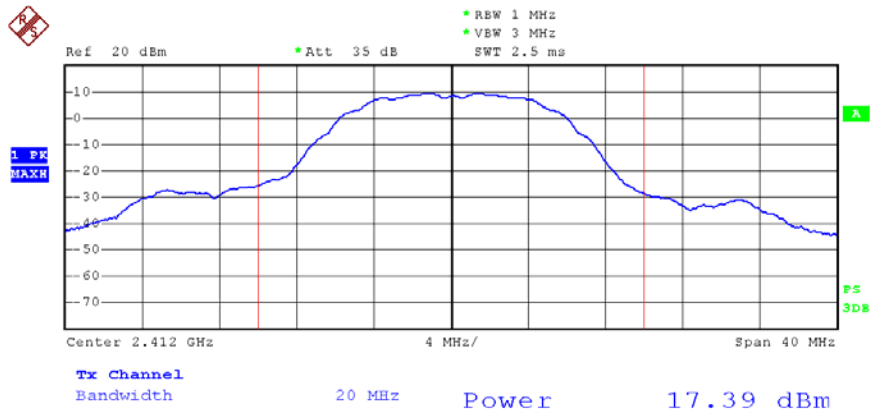
### 7.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSP30	DE25181	2012-12-31	2013-12-30

### 7.6 Test Data

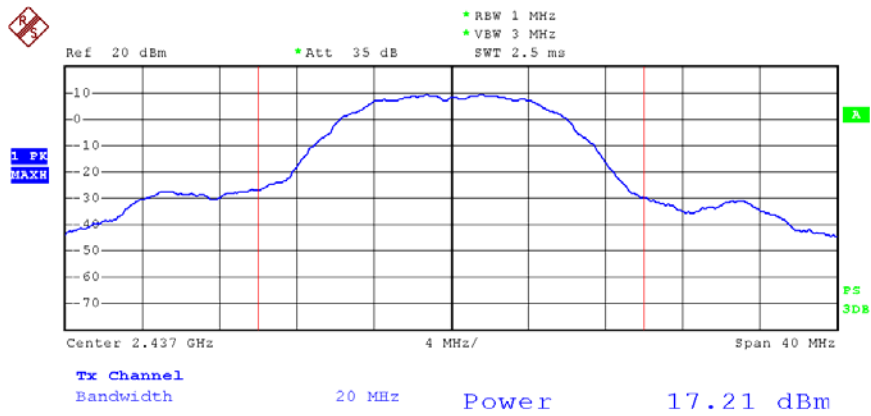
801.11b Mode			
Test Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
CH01	2412	17.39	30
CH 06	2437	17.21	30
CH11	2462	17.15	30

### 2412 MHz



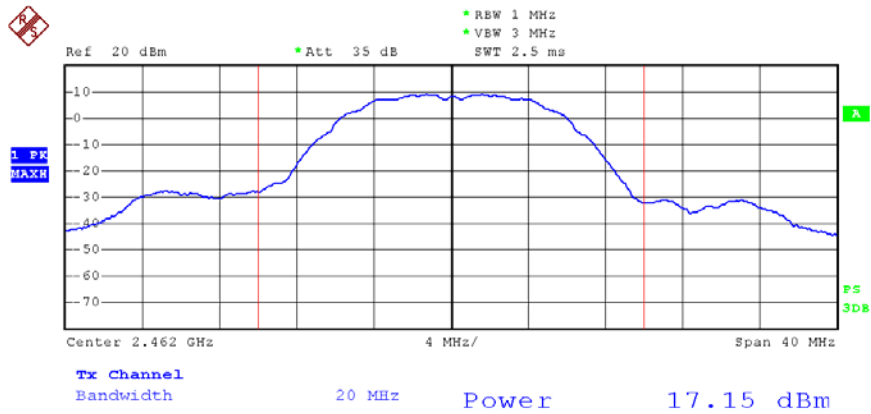
Date: 26.NOV.2013 09:35:15

## 2437 MHz



Date: 26.NOV.2013 09:39:45

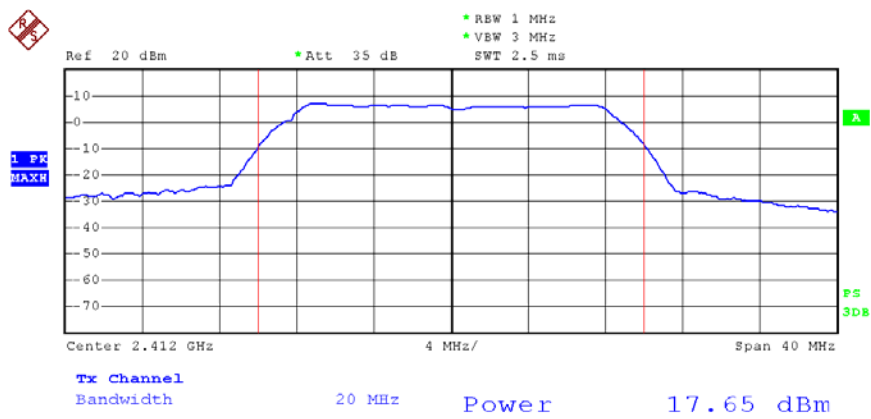
## 2462 MHz



Date: 26.NOV.2013 09:41:58

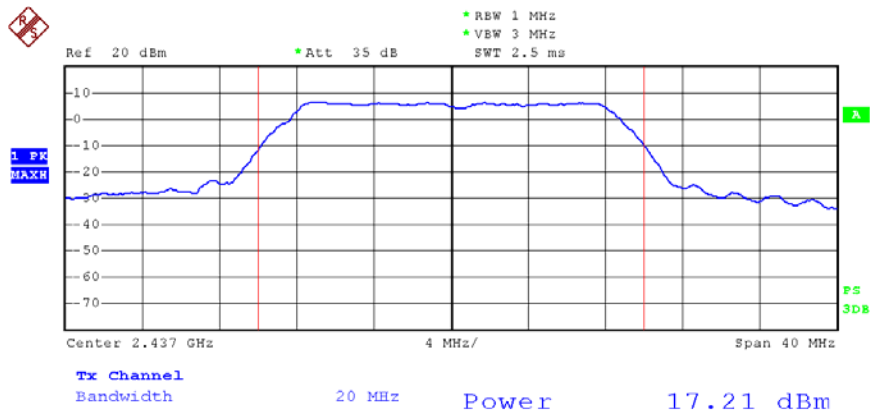
801.11g Mode			
Test Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
CH01	2412	17.65	30
CH 06	2437	17.21	30
CH11	2462	17.29	30

### 2412 MHz



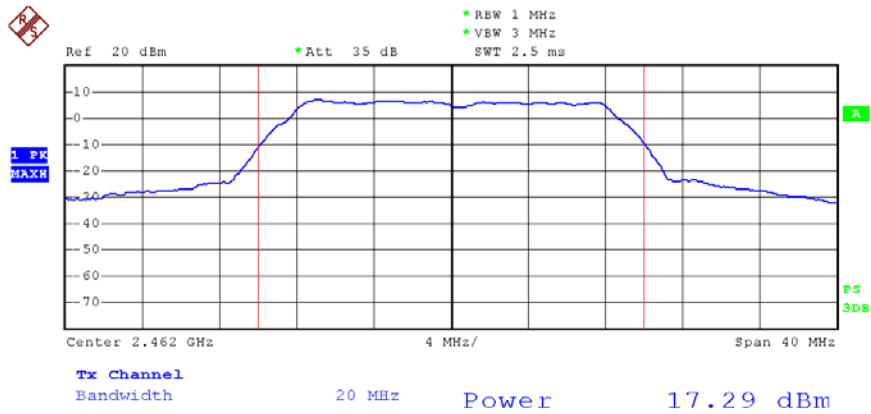
Date: 26.NOV.2013 09:54:42

## 2437 MHz



Date: 26.NOV.2013 09:51:45

## 2462 MHz



Date: 26.NOV.2013 09:48:50

## 8. Power Spectral Density Test

### 8.1 Test Standard and Limit

#### 8.1.1 Test Standard

FCC Part 15.247 (e)

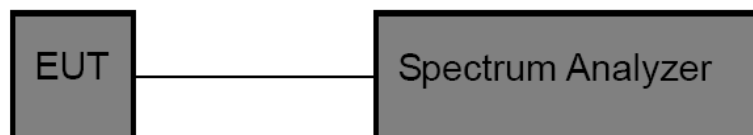
#### 8.1.2 Test Method

Test Method	
<b>KDB 558074 D01 V03R01</b>	Section 10.0 Maximum power spectral density level in the fundamental emission 10.2 Peak PSD

#### 8.1.3 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range(MHz)
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5

### 8.2 Test Setup



### 8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Measure the spectral power density the spectrum analyzer was set to Resolution Bandwidth=3 kHz, and Video Bandwidth $\geq$ 10 kHz, Detector: Peak, Span to 5%~30% greater than EBW, Sweep time auto.
- (3) Scale the observed power level and use the peak marker function to determine the maximum level in 3 kHz.

### 8.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

## 8.5 Test Equipment

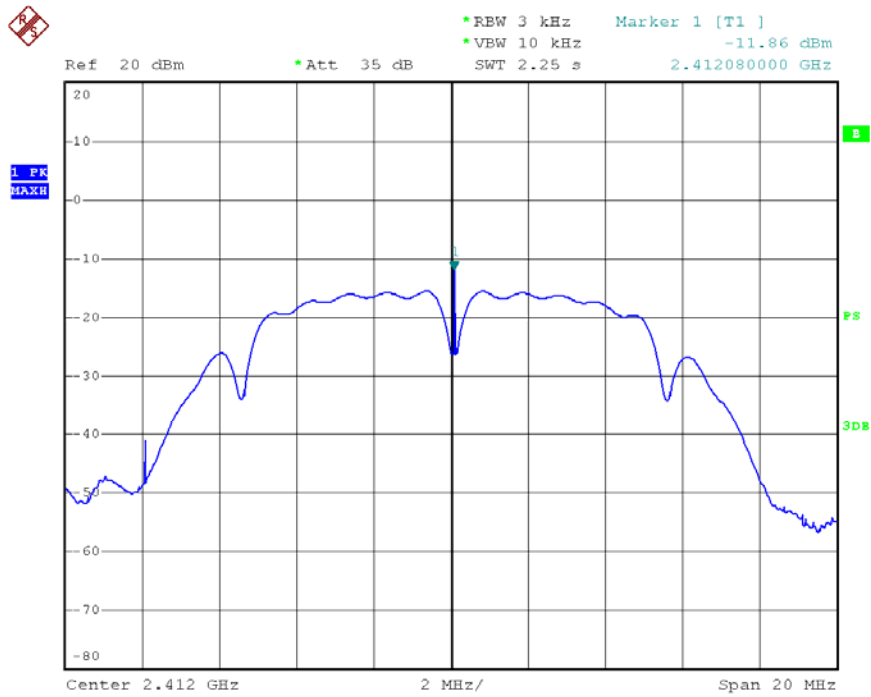
<b>Description</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Cal. Due Date</b>
Spectrum Analyzer	ROHDE& SCHWARZ	FSP30	DE25181	2012-12-31	2013-12-30

## 8.6 Test Data



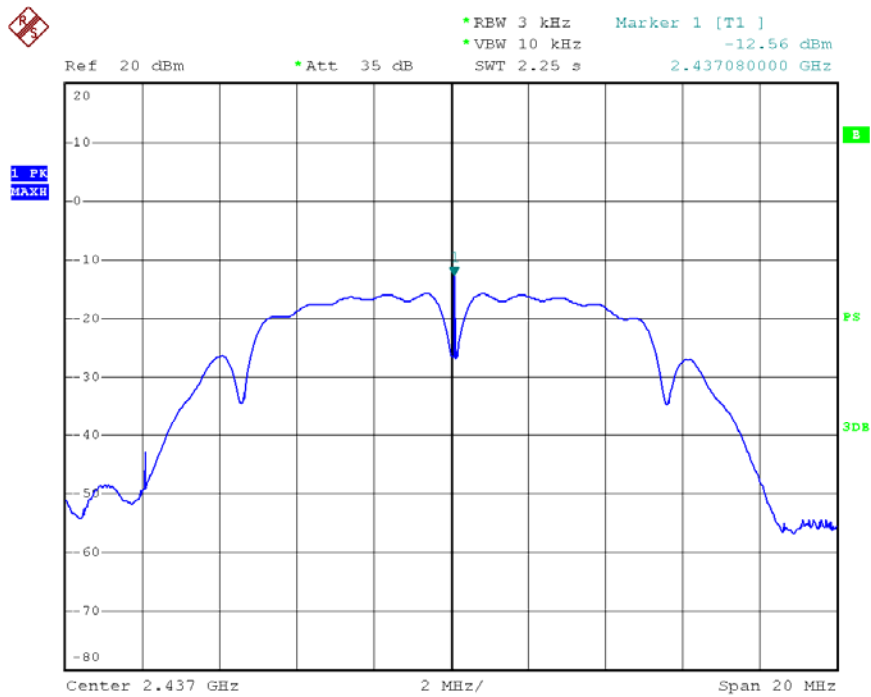
801.11b Mode			
Test Channel	Frequency (MHz)	Power Density (3 kHz/dBm)	Limit (dBm)
CH 01	2412	-11.86	8
CH 06	2437	-12.56	8
CH 11	2462	-14.08	8

### 2412 MHz



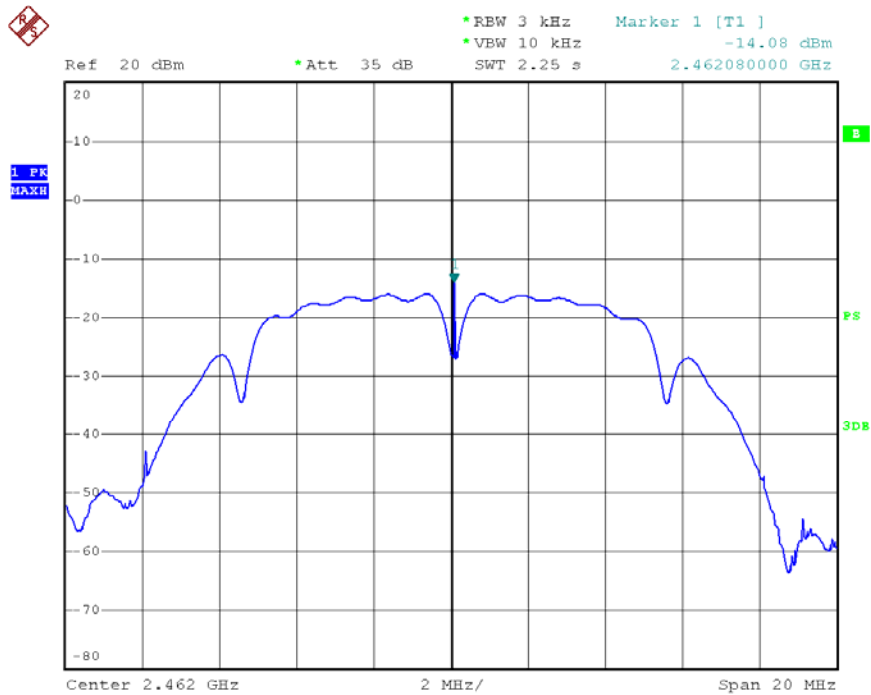
Date: 26.NOV.2013 09:44:59

## 2437 MHz



Date: 26.NOV.2013 09:44:16

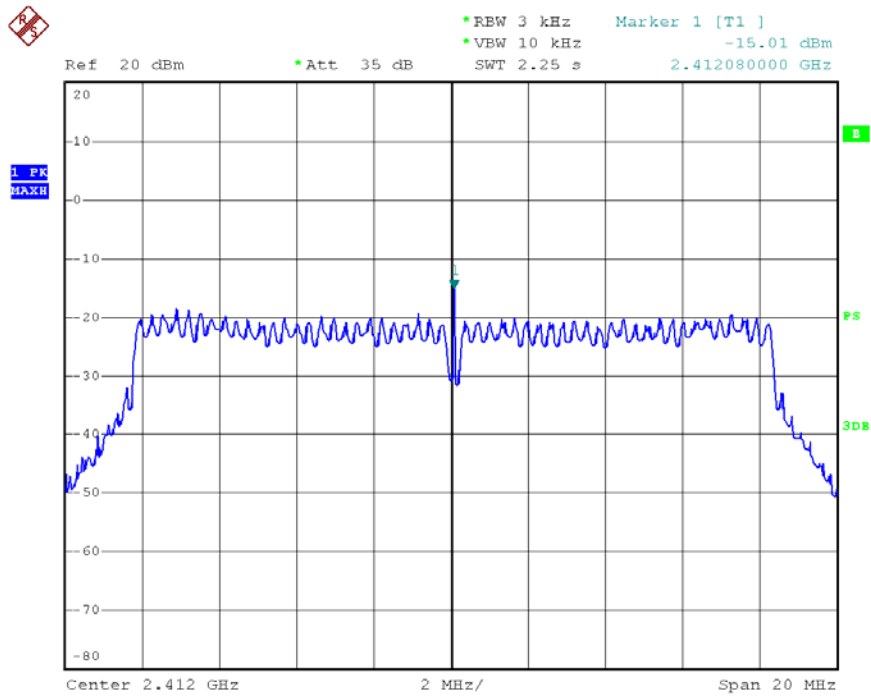
## 2462 MHz



Date: 26.NOV.2013 09:43:23

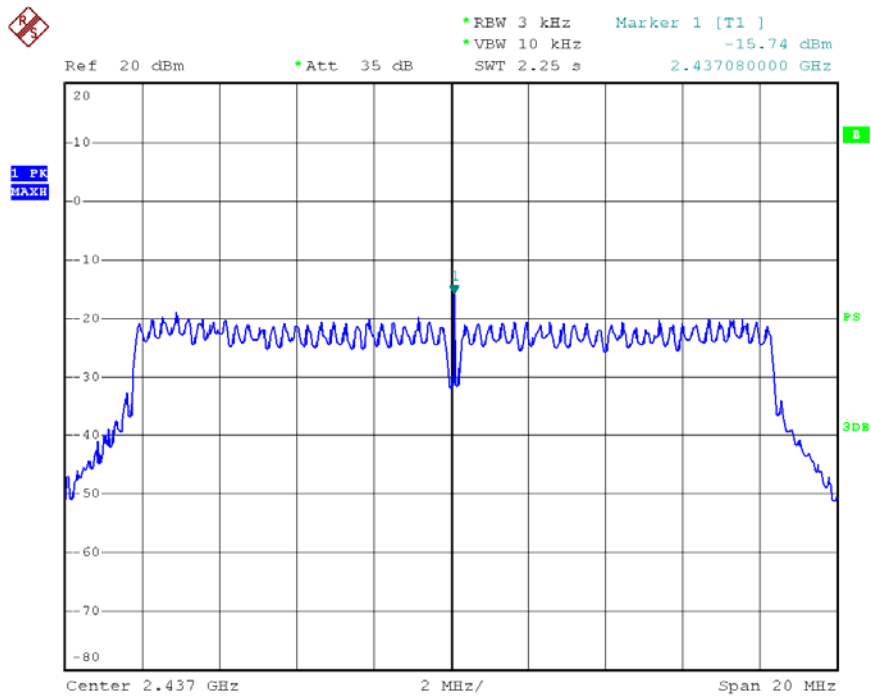
801.11g Mode			
Test Channel	Frequency (MHz)	Power Density (3 kHz/dBm)	Limit (dBm)
CH 01	2412	-15.01	8
CH 06	2437	-15.74	8
CH 11	2462	-16.19	8

2412 MHz



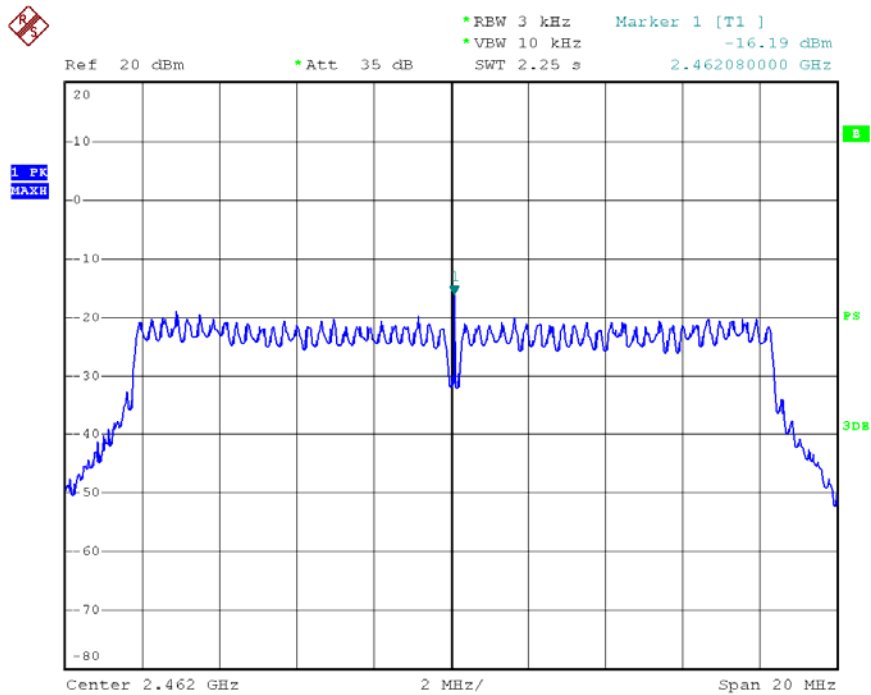
Date: 26.NOV.2013 09:57:16

## 2437 MHz



Date: 26.NOV.2013 09:58:06

## 2462 MHz



Date: 26.NOV.2013 09:59:00

## 9. Antenna Conducted Spurious Emission

### 9.1 Test Standard and Limit

#### 10.1.1 Test Standard

FCC Part 15.247 (c)

#### 10.1.2 Test Limit

(1) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

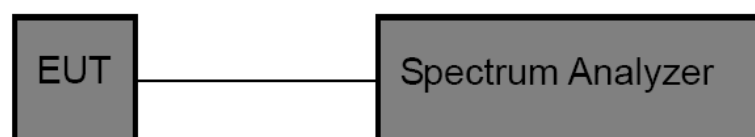
Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above~960	500	3

(2) In accordance with KDB 558074 D01 v03r01 for performing compliance measurements on Digital Transmission Systems (DTS) Emissions in non-restricted frequency bands, section 11.1 General:

a) if the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, 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 (i.e, 20 dBC).

Test procedure follow the section 11.0 measure procedure.

### 9.2 Test Setup



### 9.3 Test Procedure

- (1) Establish a Reference level by using the procedure follow the DTS bandwidth test.
- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:  
RBW=100 KHz, VBW=300 KHz.  
Frequency range: from 30MHz to 26.5 GHz.

### 9.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

### 9.5 Test Equipment

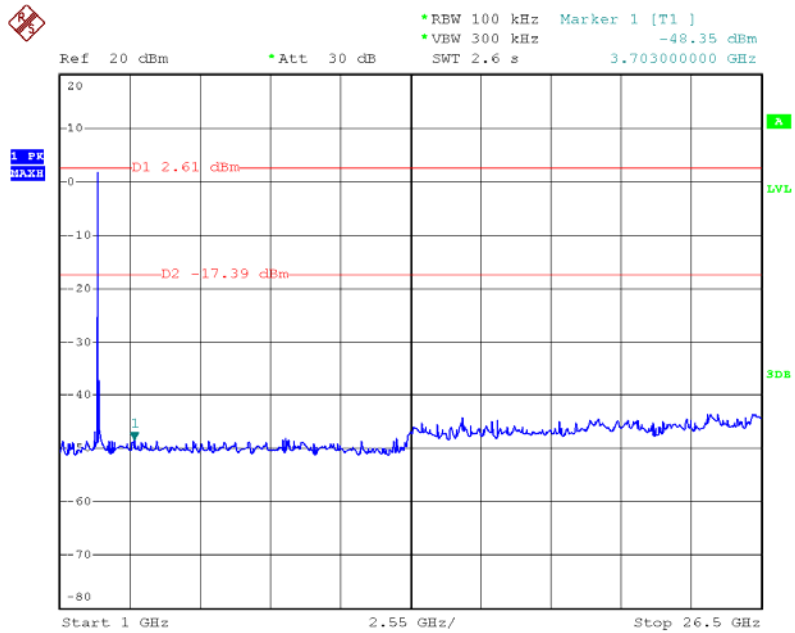
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSP30	DE25181	2012-12-31	2013-12-30

### 9.6 Test Data

Only the worst case data have been showed.

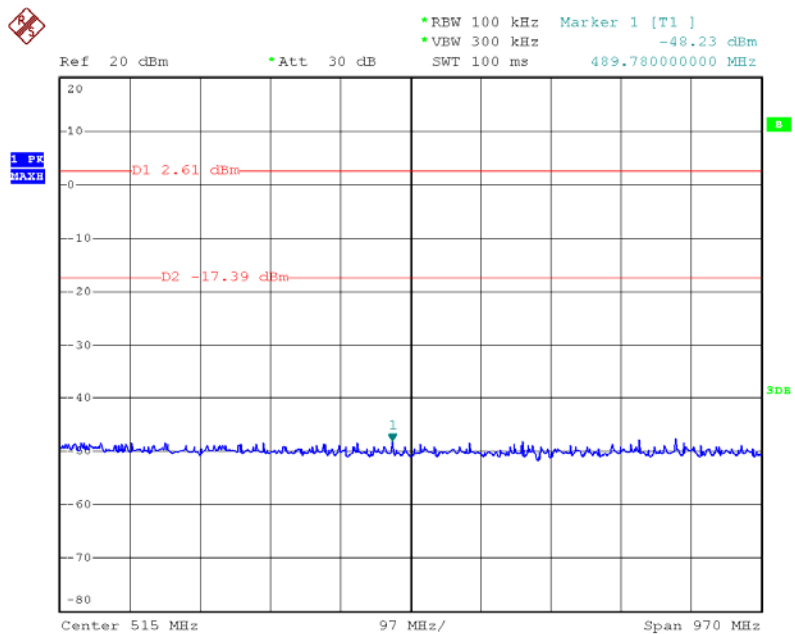
802.11b Mode TX CH 01 2412MHz

Above 1 GHz



Date: 26.NOV.2013 14:18:08

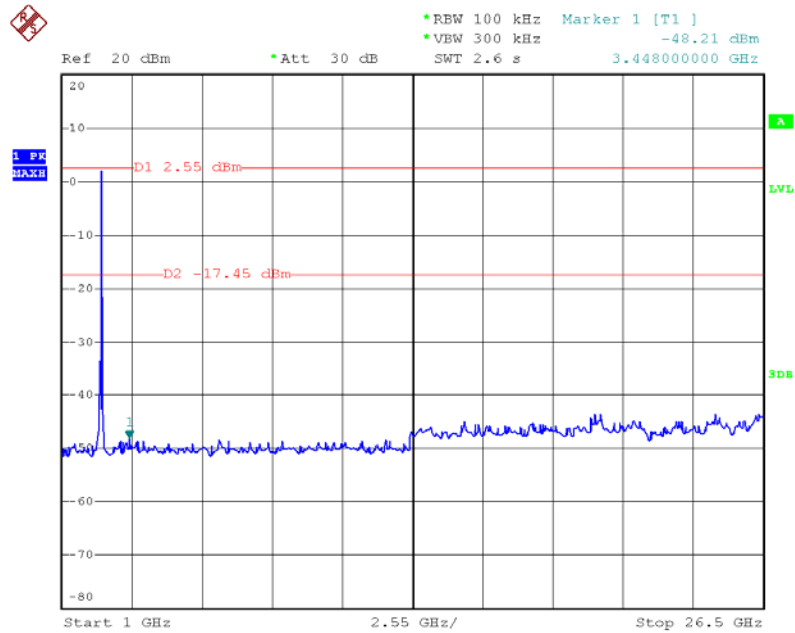
Bellow 1 GHz



Date: 26.NOV.2013 12:12:19

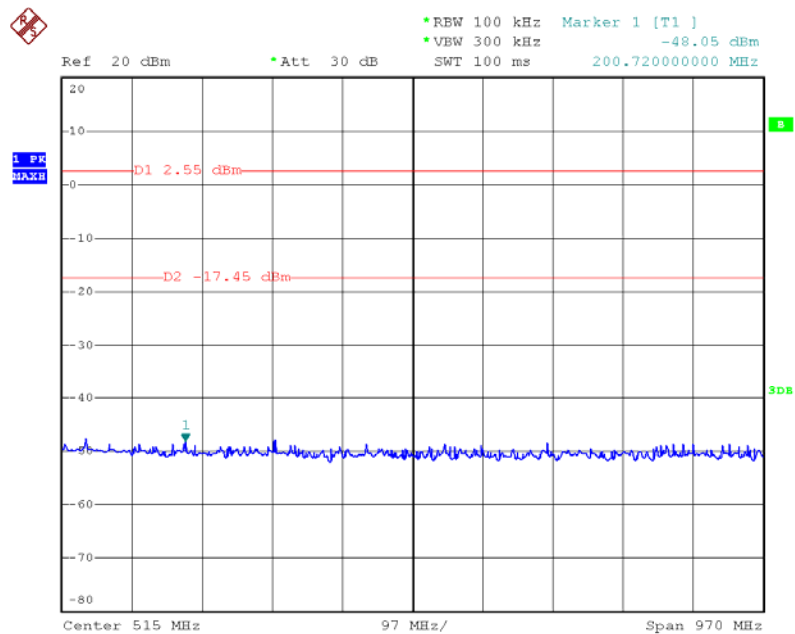
802.11b Mode TX CH 06 2437MHz

Above 1 GHz



Date: 26.NOV.2013 14:14:12

Bellow 1 GHz



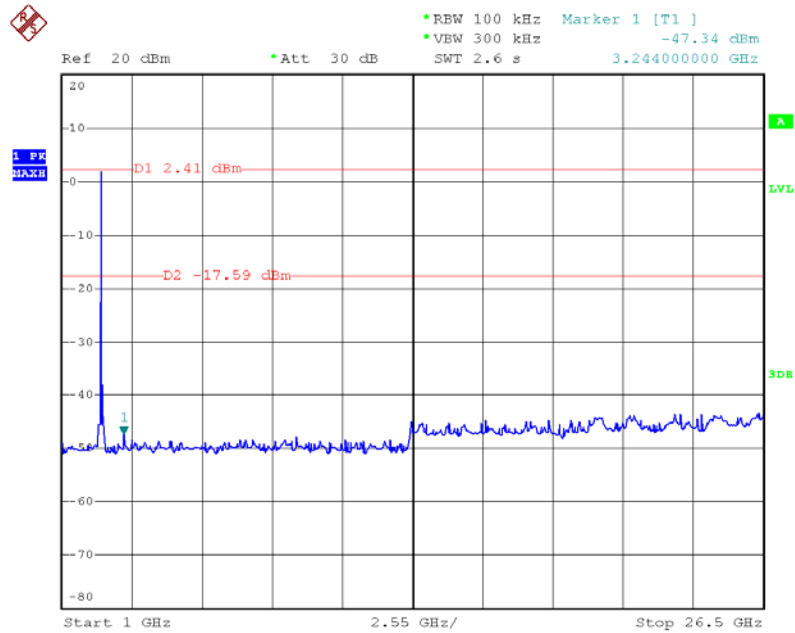
Date: 26.NOV.2013 12:13:02



802.11b Mode

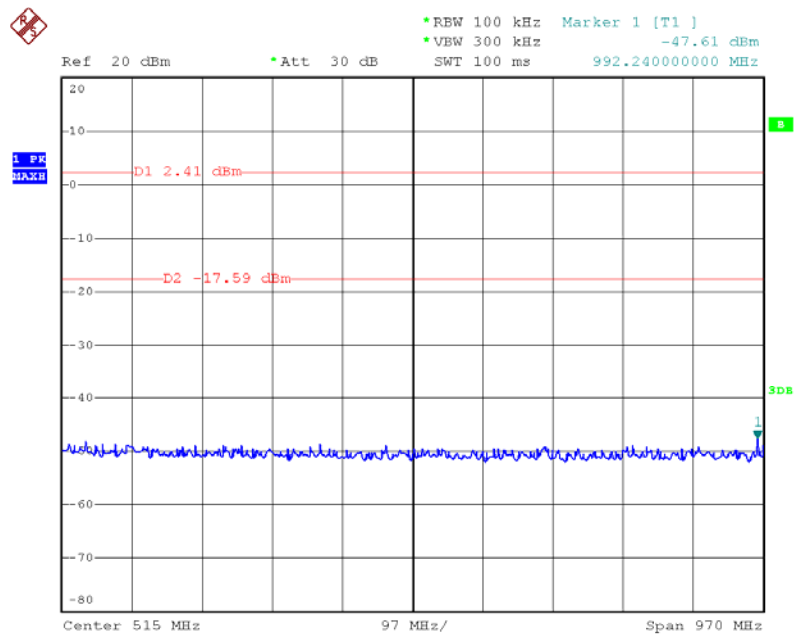
TX CH 11 2462MHz

Above 1 GHz



Date: 26.NOV.2013 14:11:42

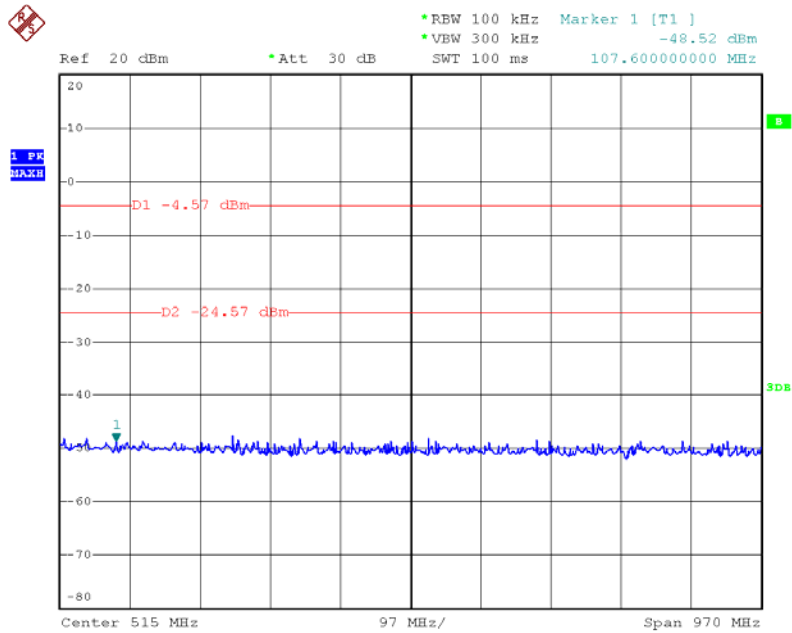
Bellow 1 GHz



Date: 26.NOV.2013 12:13:33

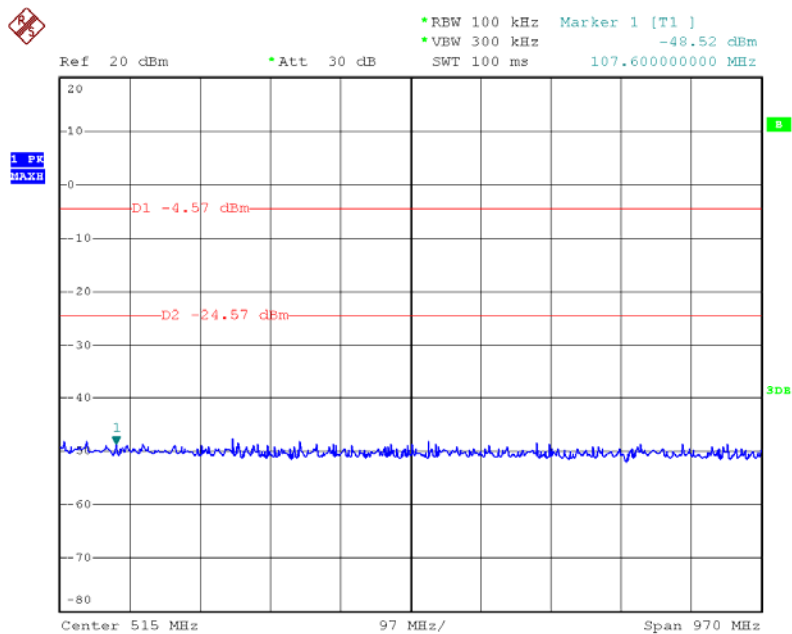
802.11g Mode TX CH 01 2412MHz

Above 1 GHz



Date: 26.NOV.2013 12:17:00

Bellow 1 GHz

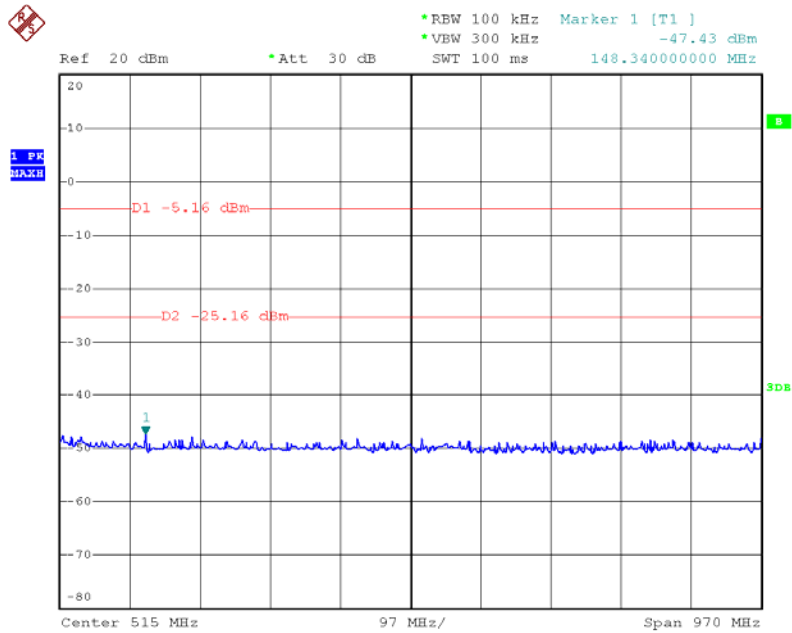


Date: 26.NOV.2013 12:17:00

802.11g Mode

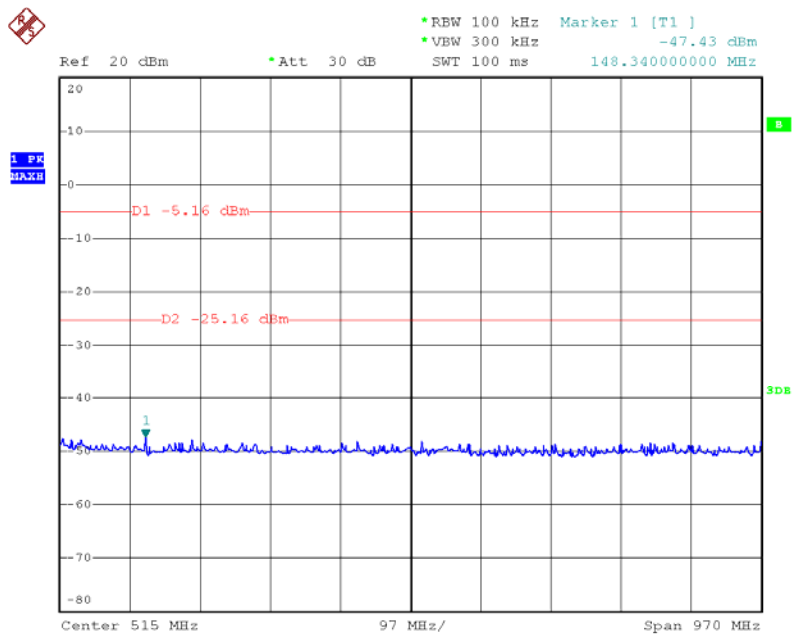
TX CH 06 2437MHz

Above 1 GHz



Date: 26.NOV.2013 12:15:28

Bellow 1 GHz

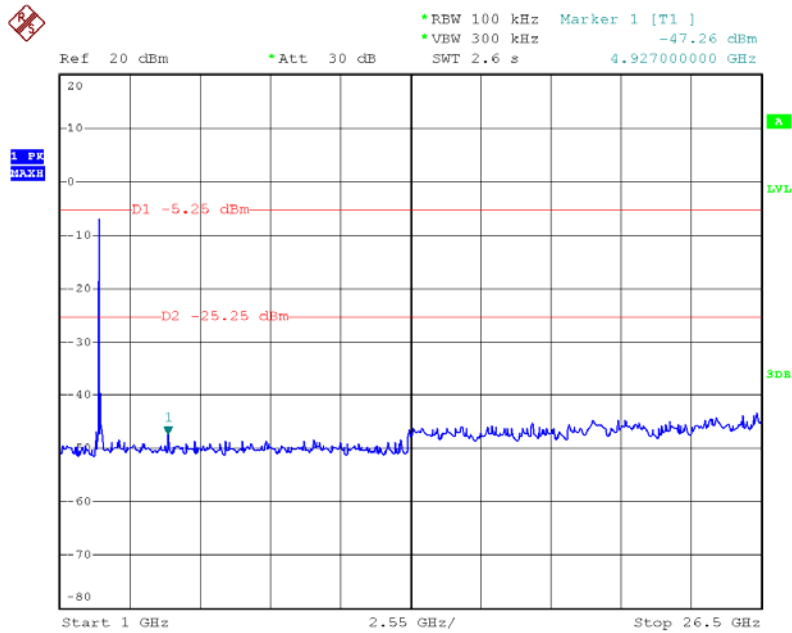


Date: 26.NOV.2013 12:15:28

802.11g Mode

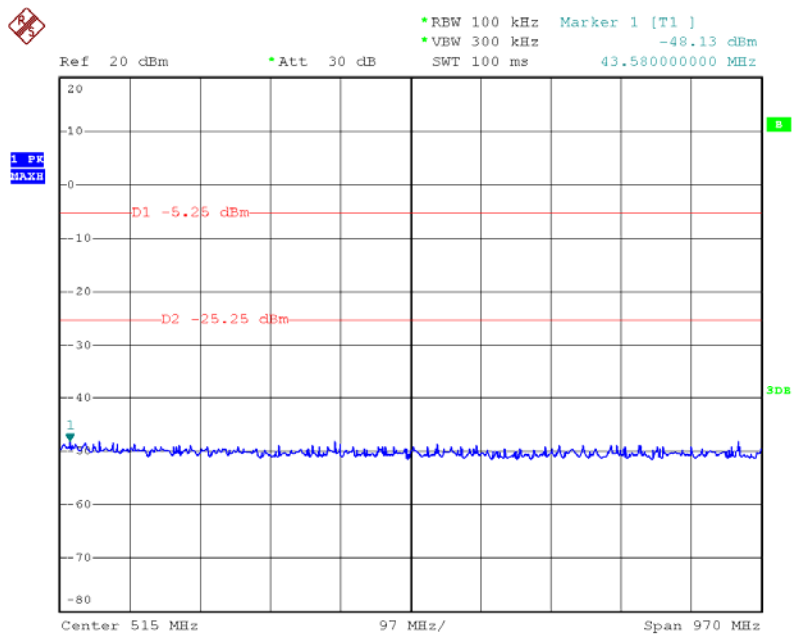
TX CH 11 2462MHz

Above 1 GHz



Date: 26.NOV.2013 14:21:31

Bellow 1 GHz



Date: 26.NOV.2013 12:16:13

## 10. Antenna Requirement

### 10.1 Standard Requirement

#### 11.1.1 Standard

FCC Part 15.203

#### 11.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. 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.

### 10.2 Antenna Connected Construction

The maximum directional gains of the antenna used for transmitting is 2.5 dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

### 10.2 Result

The EUT equipped with one dipole Antennas, and Antenna with IPEX-type Connector. It complies with the standard requirement.