

FCC Radio Test Report

FCC ID: R36-SB65S**Report No.** : TB-FCC125550**Applicant** : CURRENT AUDIO**Equipment Under Test (EUT)****EUT Name** : Soundbar**Model No.** : SB65**Serial No.** : SB80, SB90, SB100, SP-601, SP-602, SP-603, SP-604, SP-605,
SP-606, SP-607, SP-608, SP-609**Brand Name** : N/A**Receipt Date** : 2012-10-29**Test Date** : 2012-10-30 to 2012-11-08**Issue Date** : 2012-11-09**Standards** : FCC Part 15, Subpart C(15.247)**Test Method** : ANSI C63.4:2003**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 :**Approved& Authorized** :

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.

Contents

CONTENTS.....	2
1. GENERAL INFORMATION ABOUT EUT	4
1.1 Client Information.....	4
1.2 General Description of EUT (Equipment Under Test)	4
1.3 Block Diagram Showing The Configuration of System Tested.....	5
1.4 Description of Support Units	5
1.5 Description of Test Mode.....	6
1.6 Description of Test Software Setting	6
1.7 Test Facility.....	7
2. TEST SUMMARY.....	8
3. CONDUCTED EMISSION TEST	9
3.1 Test Standard and Limit.....	9
3.2 Test Setup.....	9
3.3 Test Procedure.....	9
3.4 Test Equipment Used.....	10
3.5 EUT Operating Mode	10
3.6 Test Data.....	10
4. RADIATED EMISSION TEST	15
4.1 Test Standard and Limit.....	15
4.2 Test Setup.....	16
4.3 Test Procedure.....	17
4.4 EUT Operating Condition	17
4.5 Test Equipment	17
5. RESTRICTED BANDS REQUIREMENT	23
5.1 Test Standard and Limit.....	23
5.2 Test Setup.....	23
5.3 Test Procedure.....	23
5.4 EUT Operating Condition	24
5.5 Test Equipment	24
6. NUMBER OF HOPPING CHANNEL	27
6.1 Test Standard and Limit.....	27
6.2 Test Setup.....	27
6.3 Test Procedure.....	27
6.4 EUT Operating Condition	27
6.5 Test Equipment	27
7. AVERAGE TIME OF OCCUPANCY.....	29
7.1 Test Standard and Limit.....	29
7.2 Test Setup.....	29
7.3 Test Procedure.....	29
7.4 EUT Operating Condition	29

	7.5 Test Equipment	29
8.	CHANNEL SEPARATION AND BANDWIDTH TEST	32
	8.1 Test Standard and Limit.....	32
	8.2 Test Setup.....	32
	8.3 Test Procedure.....	32
	8.4 EUT Operating Condition	32
	8.5 Test Equipment	32
	8.6 Test Data.....	33
9.	PEAK OUTPUT POWER TEST.....	37
	9.1 Test Standard and Limit.....	37
	9.2 Test Setup.....	37
	9.3 Test Procedure.....	37
	9.4 EUT Operating Condition	37
	9.5 Test Equipment	37
	8.6 Test Data.....	37
10.	ANTENNA CONDUCTED SPURIOUS EMISSION	40
	10.1 Test Standard and Limit	40
	10.2 Test Setup.....	40
	10.3 Test Procedure.....	40
	10.4 EUT Operating Condition	41
	10.5 Test Equipment.....	41
	10.6 Test Data.....	41
11.	ANTENNA REQUIREMENT.....	45
	11.1 Standard Requirement.....	45
	11.2 Antenna Connected Construction	45
	11.2 Result.....	45

1. General Information About EUT

1.1 Client Information

Applicant	:	CURRENT AUDIO
Address	:	1830 John Towers Ave., El Cajon, San Diego City, CA 92020, USA
Manufacturer	:	ShenZhen Ailipu Electronic Co., Ltd.
Address	:	Block A2, Lanbao Industrial Park, Ditang Road, Shasan Village, Shajing Town, Baoan District, Shenzhen, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Soundbar
Models No.	:	SB65, SB80, SB90, SB100, SP-601, SP-602, SP-603, SP-604, SP-605, SP-606, SP-607, SP-608, SP-609
Model Difference	:	The different models are identical in schematic, structure and critical component, the only different is the appearance.
Product Description	:	Operation Frequency: RF(2.4G):2404~2479MHz
		Number of Channel: RF(2.4G): 16 channels Note (3)
		Out Power 0.817mW Conducted Power
		Antenna Gain: 2 dBi PIFA Antenna Note(4)
		Modulation Type: FHSS(FSK)
Power Supply	:	AC Voltage supplied from AC power cable.
Power Rating	:	Input: AC 100~240V 50/60Hz
Connecting I/O Port(S)	:	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) This Test Report is FCC Part 15.247 for FHSS RF 2.4G.
- (3) Channel List:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	2404	08	2444
01	2409	09	2449
02	2414	10	2454
03	2419	11	2459

04	2424	12	2464
05	2429	13	2469
06	2434	14	2474
07	2439	15	2479

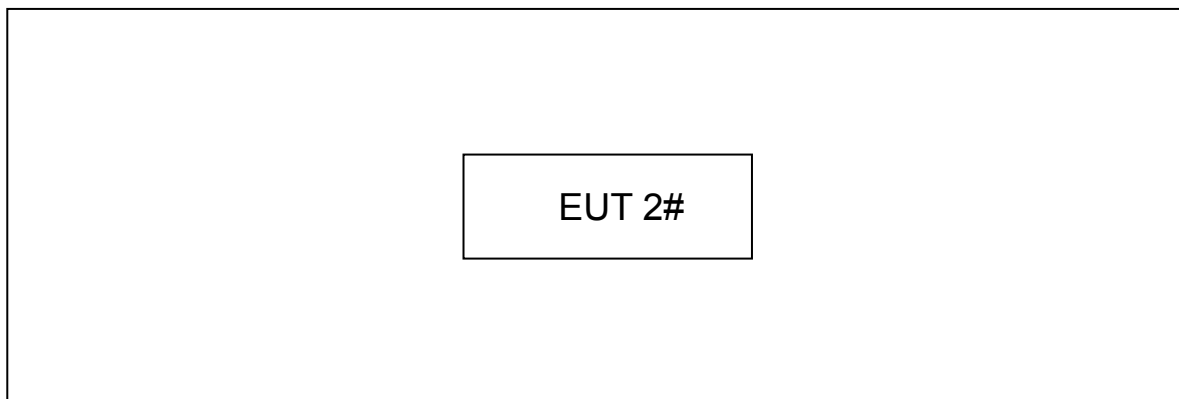
(4) The antenna information provided by the manufacturer.

1.3 Block Diagram Showing The Configuration of System Tested

Mode 1: RF Link



Mode 2: TX Mode



EUT 1#: Soundbar (Host system) FCC ID: R36-SB65H

EUT 2#: Soundbar (Subwoofer) FCC ID: R36-SB65S

1.4 Description of Support Units

No support unit have used during testing.

Name	Model	S/N	Manufacturer	Used “√”
/	/	/	/	/

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	RF Link Mode
Mode 2	TX Mode

For Radiated Test	
Final Test Mode	Description
Mode 2	TX Mode(1Mbps) Channel 00/08/15

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:
TX Mode: FSK Channel 00/08/15
- (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; it was pre-tested on the positioned of normal use. Therefore only the test data of this X-plane was used for radiated emission measurement test.

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 transmitting.

1.7 Test Facility

The tests were performed at:

Bontek Compliance Testing Laboratory Ltd

1/F., Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, 518055 China

Tel: 86-755-86337020 Fax: 86-755-86337028

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 338263.

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)(1)	Hopping Channel Separation	PASS	N/A
15.247(a)(1)	Dwell Time	PASS	N/A
15.247(b)(1)	Peak Output Power	PASS	N/A
15.247(b)(1)	Number of Hopping Frequency	PASS	N/A
15.247(c)	Radiated Spurious Emission	PASS	N/A
15.247(c)	Antenna Conducted Spurious Emission	PASS	N/A
15.247(a)	20dB Bandwidth	PASS	N/A
Note: 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 μ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

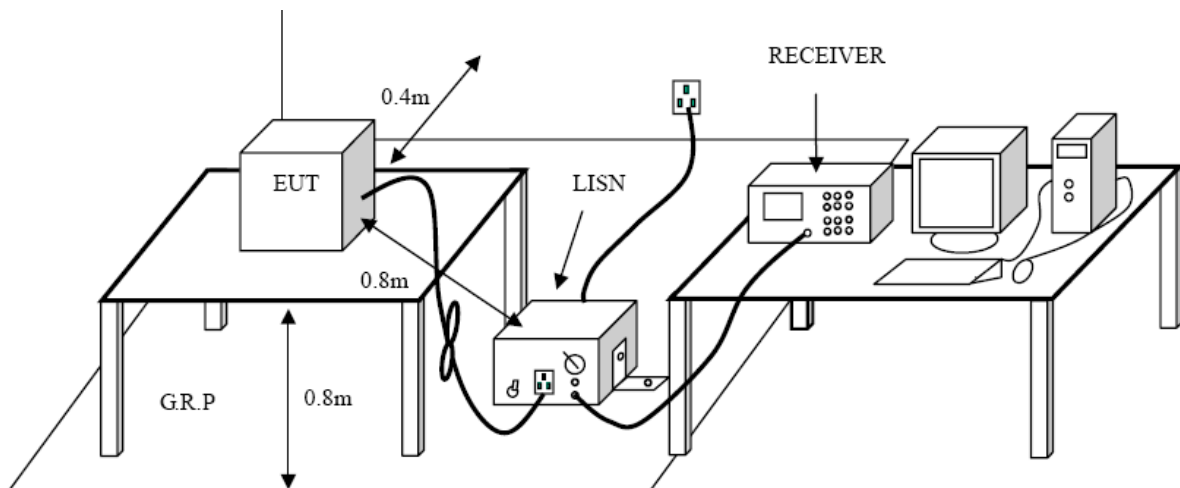
Notes:

(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 nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

3.4 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
EMI Test Receiver	ROHDE& SCHWARZ	ESC30	DE25181	2012-08-07	2013-08-06
50ΩCoaxial Switch	Anritsu	MP59B	X10321	2012-08-07	2013-08-06
L.I.S.N	EMCO	3624/1	00063417	2012-08-07	2013-08-06
L.I.S.N	EMCO	3624/1	00063417	2012-08-07	2013-08-06

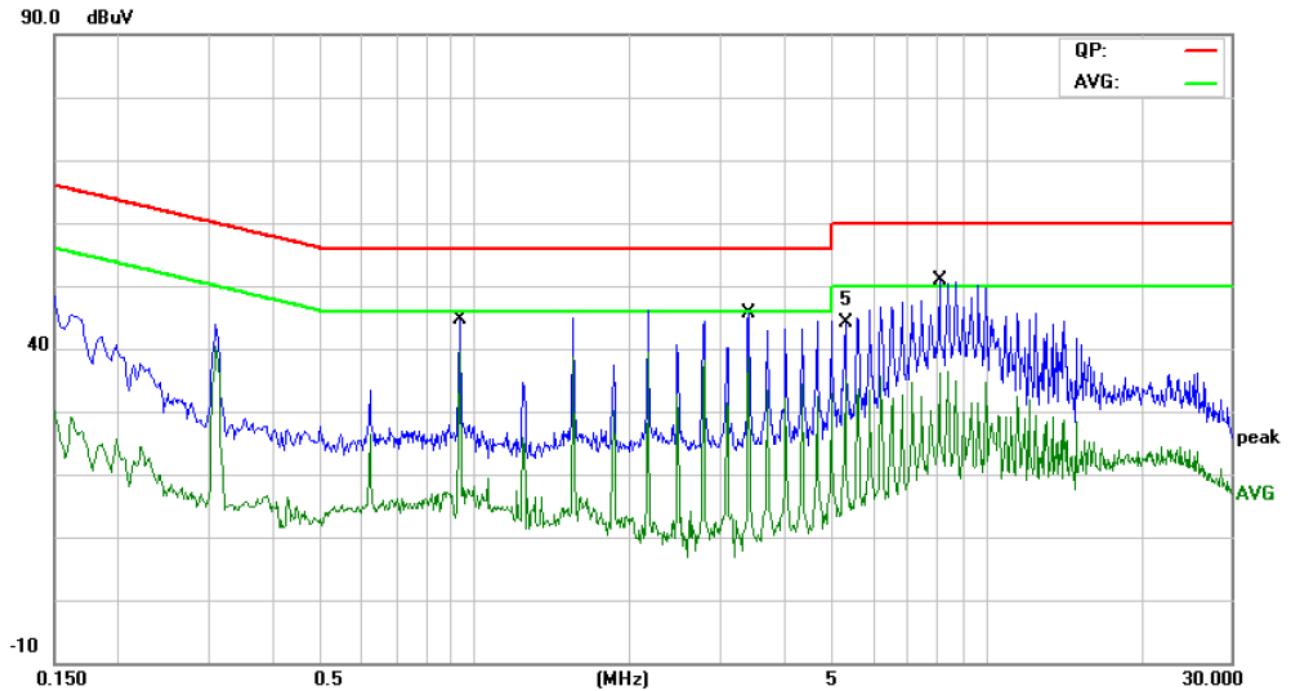
3.5 EUT Operating Mode

Please refer to the description of test mode.

3.6 Test Data

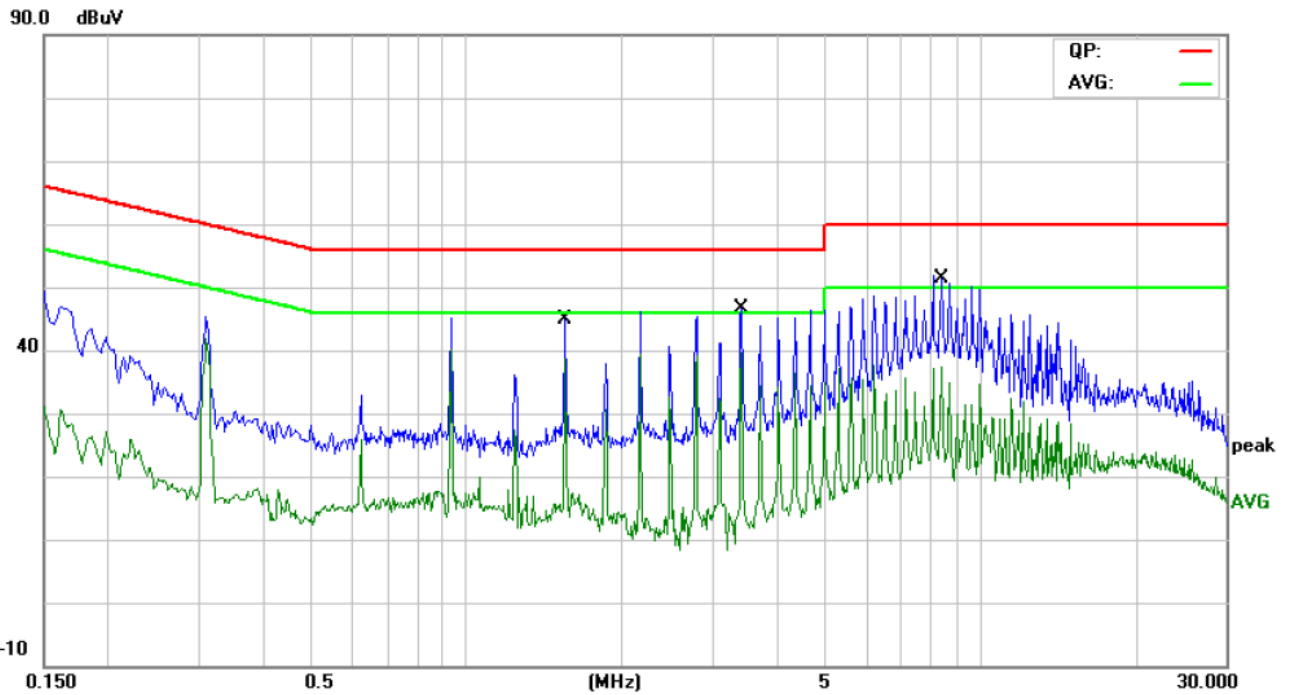
Please see the next page.

E.U.T :	Soundbar	Model Name :	SB65
Temperature :	25°C	Relative Humidity :	52 %
Terminal	Line		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	RF Link Mode		



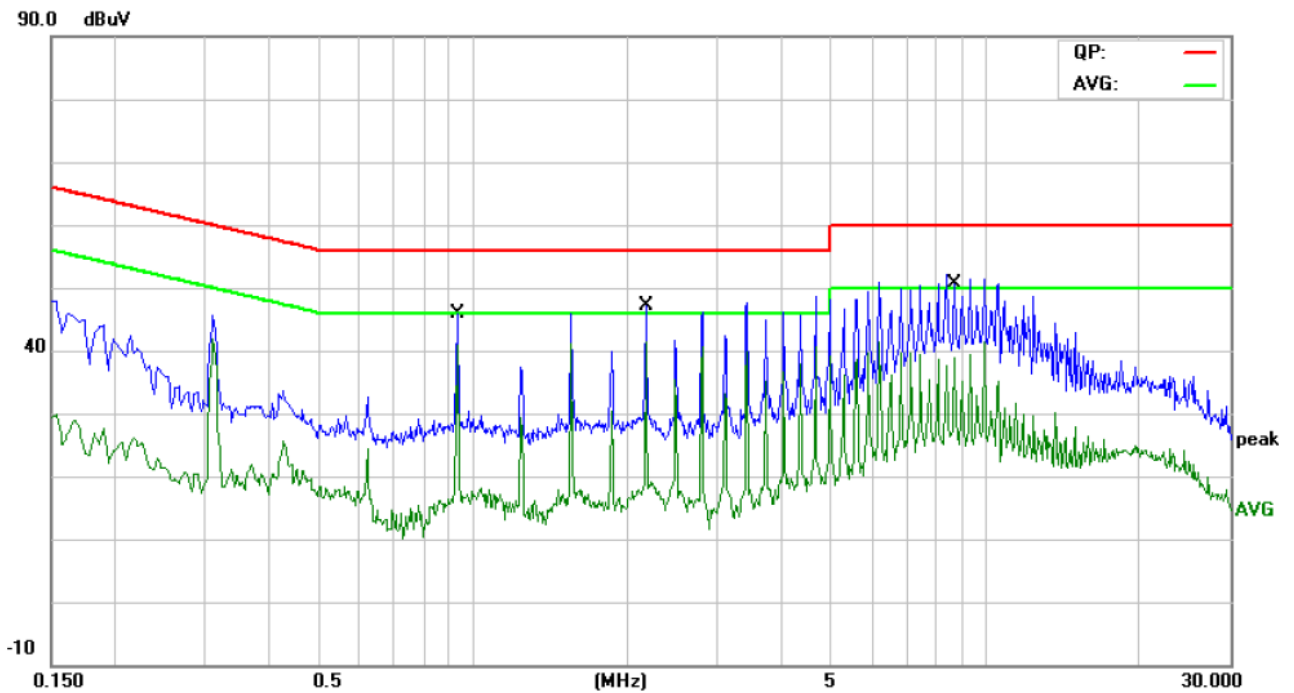
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.9340	35.36	9.38	44.74	56.00	-11.26	QP	
2 *	0.9340	30.22	9.38	39.60	46.00	-6.40	AVG	
3	3.4180	36.09	9.43	45.52	56.00	-10.48	QP	
4	3.4180	29.31	9.43	38.74	46.00	-7.26	AVG	
5	5.2819	34.63	9.57	44.20	60.00	-15.80	peak	
6	8.0819	40.95	9.84	50.79	60.00	-9.21	QP	
7	8.0819	26.28	9.84	36.12	50.00	-13.88	AVG	

E.U.T :	Soundbar	Model Name :	SB65
Temperature :	25°C	Relative Humidity :	52 %
Terminal	Neutral		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	RF Link Mode		



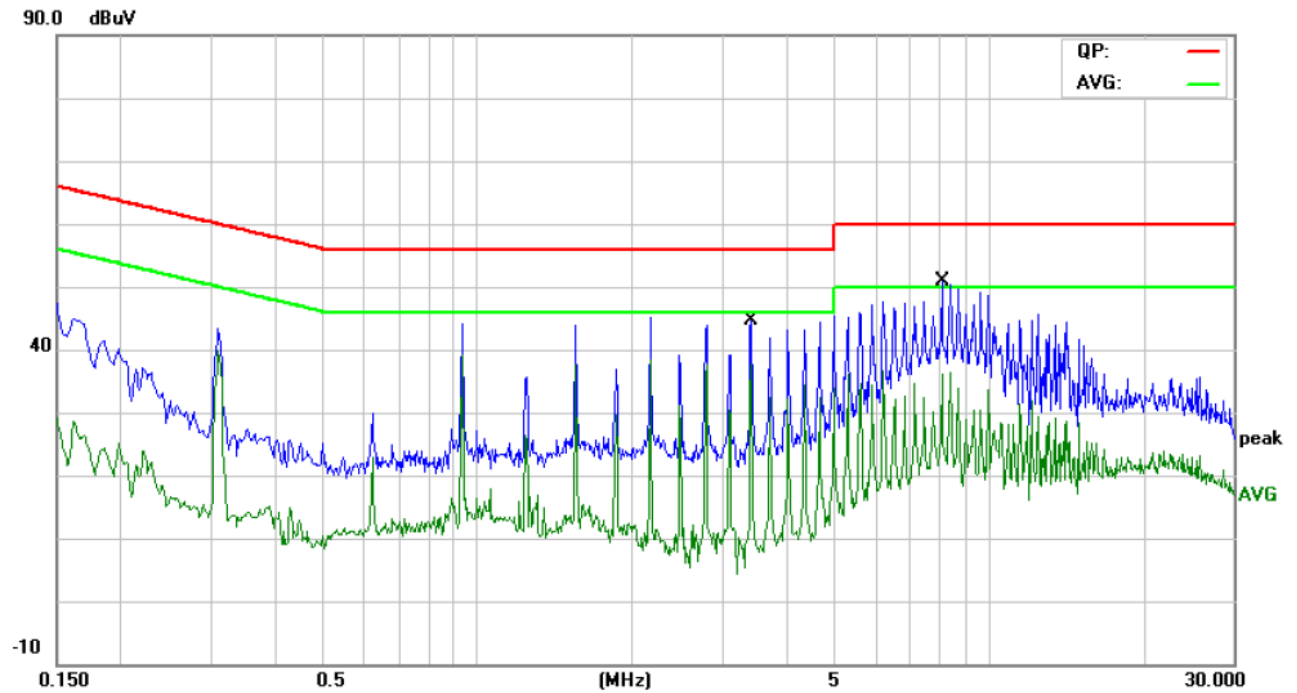
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		1.5540	35.53	9.35	44.88	56.00	-11.12	QP	
2		1.5540	29.22	9.35	38.57	46.00	-7.43	AVG	
3		3.4180	37.09	9.43	46.52	56.00	-9.48	QP	
4	*	3.4180	30.31	9.43	39.74	46.00	-6.26	AVG	
5		8.3899	41.38	9.88	51.26	60.00	-8.74	QP	
6		8.3899	27.45	9.88	37.33	50.00	-12.67	AVG	

E.U.T :	Soundbar	Model Name :	SB65
Temperature :	25°C	Relative Humidity :	52 %
Terminal	Line		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	TX Mode		



No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.9340	36.60	9.38	45.98	56.00	-10.02	QP	
2	0.9340	31.55	9.38	40.93	46.00	-5.07	AVG	
3	2.1740	37.74	9.37	47.11	56.00	-8.89	QP	
4 *	2.1740	32.02	9.37	41.39	46.00	-4.61	AVG	
5	8.6979	40.62	9.91	50.53	60.00	-9.47	QP	
6	8.6979	29.03	9.91	38.94	50.00	-11.06	AVG	

E.U.T :	Soundbar	Model Name :	SB65
Temperature :	25°C	Relative Humidity :	52 %
Terminal	Neutral		
Test Voltage :	AC 120 V / 60Hz		
Test Mode :	TX Mode		



No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	3.4180	35.09	9.43	44.52	56.00	-11.48	QP	
2 *	3.4180	28.31	9.43	37.74	46.00	-8.26	AVG	
3	8.0819	40.95	9.84	50.79	60.00	-9.21	QP	
4	8.0819	26.28	9.84	36.12	50.00	-13.88	AVG	

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 Limit (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)

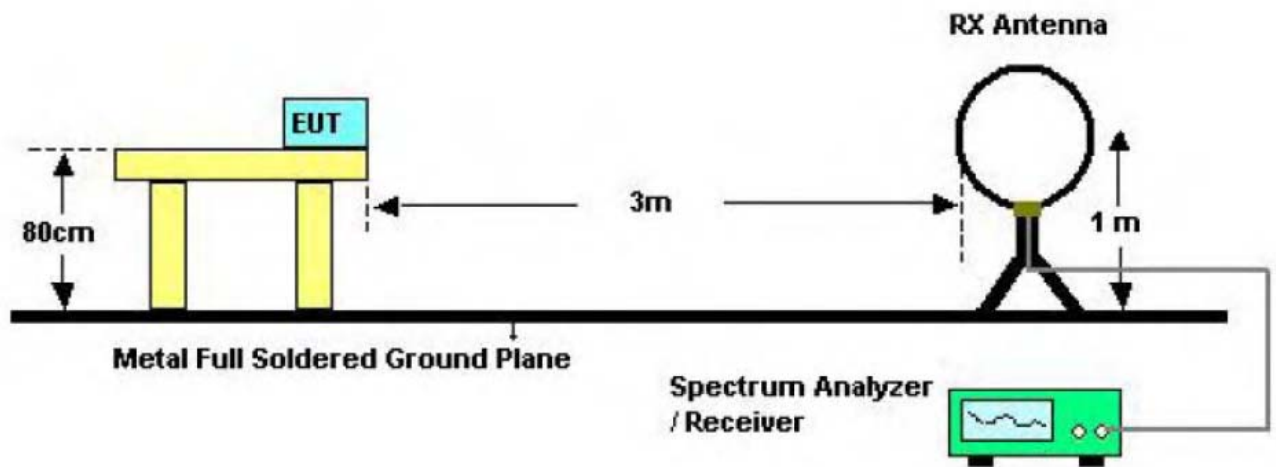
Frequency (MHz)	Class A (dBuV/m)(at 3m)		Class B (dBuV/m)(at 3m)	
	Peak	Average	Peak	Average
Above 1000	80	60	74	54

Note:

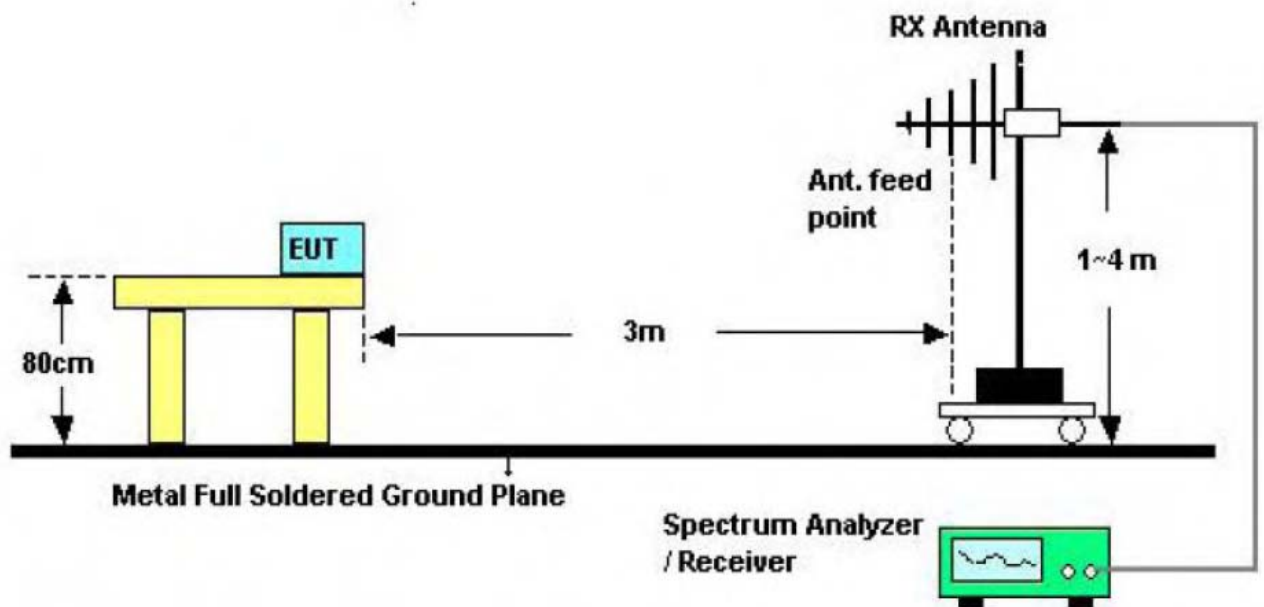
(1) The tighter limit applies at the band edges.

(2) Emission Level(dBuV/m)=20log Emission Level(uV/m)

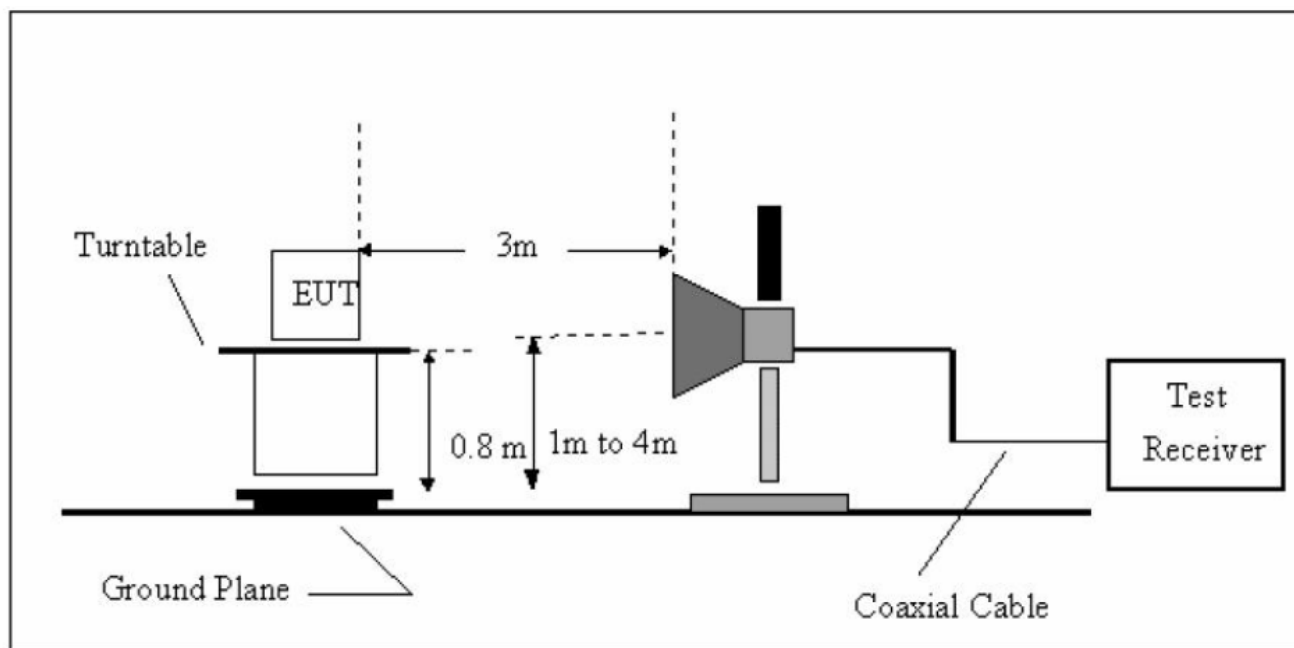
4.2 Test Setup



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 in TX mode.

4.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06
Positioning	C&C	CC-C-1F	N/A	2012-08-07	2013-08-06

Controller					
Trilog Broadband Antenna	SCHWARZBEC K	VULB9163	9163-333	2012-07-13	2013-07-12
Horn Antenna	SCHWARZBEC K	BBHX 9120	9120-426	2012-07-13	2013-07-12
RF Switch	EM	EMSW18	SW060023	2012-08-07	2013-08-06
Amplifier	Agilent	8447F	3113A06717	2012-08-07	2013-08-06
Coaxial Cable	SCHWARZBEC K	AK9513	9513-10	2012-08-07	2013-08-06
EMI Test Receiver	ROHDE& SCHWARZ	ESPI	25498514	2012-08-07	2013-08-06
EMI Test Receiver	ROHDE& SCHWARZ	ESI26	838786/103	2012-08-07	2013-08-06
Receiver Horn Antenna	ROHDE& SCHWARZ	HF906	100013	2012-08-07	2013-08-06

4.6 Test Data

Please see the next page.

Operation Mode: TX 2404MHz Test Date : November 06, 2012
 Frequency Range: 30~1000MHz Temperature : 28 °C
 Measured Distance: 3m Humidity : 65 %
 Test Voltage: AC 120V/60 Hz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit (3m) (dBuV/m)	Margin (dB)	Note
70.740	H	29.10	40.00	10.90	PK
121.180	H	34.13	43.50	9.37	PK
245.340	H	41.25	46.00	4.75	PK
491.720	H	32.80	46.00	13.20	PK
553.800	H	34.71	46.00	11.29	PK
860.320	H	36.30	46.00	9.70	PK
35.820	V	35.90	40.00	4.10	PK
70.740	V	31.16	40.00	8.84	PK
103.720	V	32.85	43.50	10.65	PK
245.340	V	40.70	46.00	5.30	PK
491.720	V	33.92	46.00	12.08	PK
955.380	V	36.10	46.00	9.90	PK

Note: (1) All Readings are Peak Value.
 (2) Emission Level= Reading Level+ Probe Factor +Cable Loss
 (3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode:	TX 2404MHz	Test Date :	November 06, 2012
Frequency Range:	1-25GHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Test Voltage:	AC 120V/60 Hz		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)		Limit3m (dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4808.760	V	48.29	43.61	74.00	54.00	25.71	10.39
7212.870	V	41.92	35.79	74.00	54.00	32.08	18.21
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4808.760	H	49.66	44.83	74.00	54.00	24.34	9.17
7212.870	H	42.17	36.50	74.00	54.00	31.83	17.50
--	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:	TX 2444MHz	Test Date :	November 06, 2012
Frequency Range:	1-25GHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Test Voltage:	AC 120V/60 Hz		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBUV/m)		Limit3m (dBUV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4888.790	V	47.91	42.58	74.00	54.00	26.09	11.15
7332.910	V	40.39	34.84.	74.00	54.00	33.61	19.16
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4888.790	H	48.90	43.71	74.00	54.00	25.10	10.29
7332.910	H	41.52	35.80	74.00	54.00	32.48	18.20
--	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:	TX 2479MHz	Test Date :	November 06, 2012
Frequency Range:	1-25GHz	Temperature :	28 °C
Measured Distance:	3m	Humidity :	65 %
Test Voltage:	AC 120V/60 Hz		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBUV/m)		Limit3m (dBUV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4958.750	V	47.04	41.78	74.00	54.00	26.96	12.22
7437.900	V	40.24	34.11	74.00	54.00	33.76	19.89
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
--	V	--	--	74.00	54.00	--	--
4958.760	H	48.24	43.01	74.00	54.00	25.76	10.99
7437.900	H	40.96	33.71	74.00	54.00	33.04	20.29
--	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

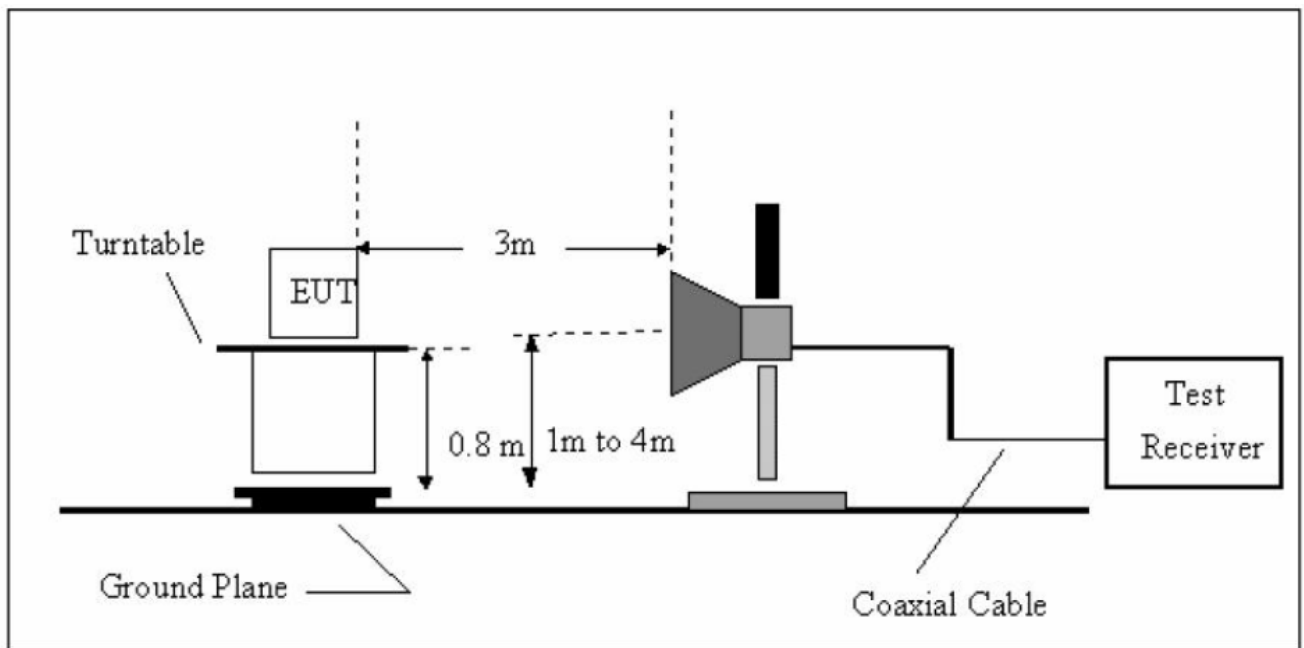
FCC Part 15.209

FCC Part 15.205

5.1.2 Test Limit

Restricted Frequency Band (MHz)	Class B (dBUV/m)(at 3m)	
	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.
- (5) 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. Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06
Positioning Controller	C&C	CC-C-1F	N/A	2012-08-07	2013-08-06
Trilog Broadband Antenna	SCHWARZBEC K	VULB9163	9163-333	2012-07-13	2013-07-12
Horn Antenna	SCHWARZBEC K	BBHX 9120	9120-426	2012-07-13	2013-07-12
RF Switch	EM	EMSW18	SW060023	2012-08-07	2013-08-06
Amplifier	Agilent	8447F	3113A06717	2012-08-07	2013-08-06
Coaxial Cable	SCHWARZBEC K	AK9513	9513-10	2012-08-07	2013-08-06
EMI Test Receiver	ROHDE& SCHWARZ	ESPI	25498514	2012-08-07	2013-08-06
EMI Test Receiver	ROHDE& SCHWARZ	ESI26	838786/103	2012-08-07	2013-08-06
Receiver Horn Antenna	ROHDE& SCHWARZ	HF906	100013	2012-08-07	2013-08-06

5.6 Test Data

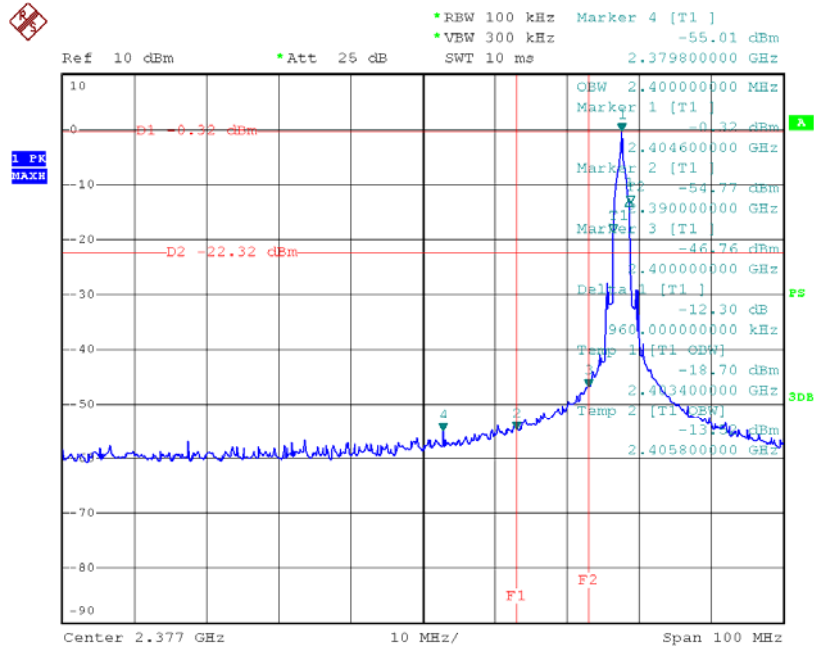
Spectrum Detector: PK Test Date : November 07, 2012
Temperature : 28 °C Humidity : 65 %

1. Conducted Test

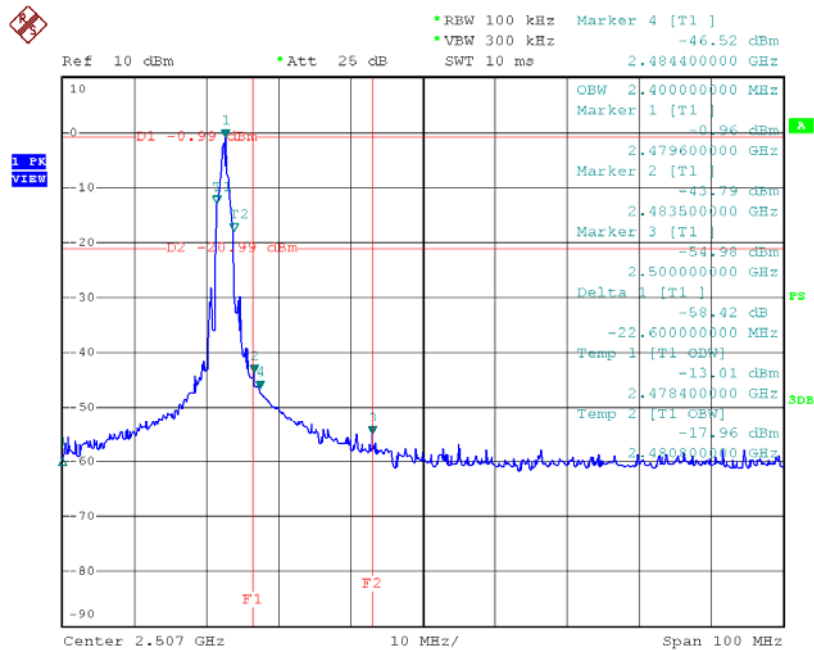
Frequency (MHz)	Peak Power Output(dBm)	Emission Read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	-0.32	-55.01	54.69	>20dBc
>2483.5	-0.99	-46.52	45.53	>20dBc

2. Radiated emission test

Frequency (MH)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PEAK	AV	PEAK	AV
2390.0	H	52.10	43.21	74.00	54.00
2390.0	V	51.37	42.49	74.00	54.00
2483.5	H	56.74	46.28	74.00	54.00
2483.5	V	54.78	44.80	74.00	54.00



Date: 7.NOV.2012 17:27:51



Date: 7.NOV.2012 17:28:55

6. Number of Hopping Channel

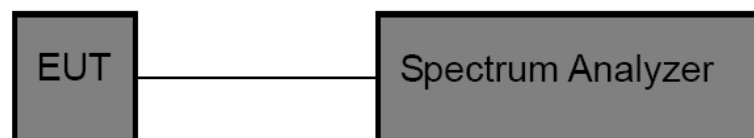
6.1 Test Standard and Limit

5.1.1 Test Standard
FCC Part 15.247 (a)(1)

5.1.2 Test Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

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) Spectrum Setting:RBW=100 KHz, VBW=100 KHz, Sweep time= Auto.

6.4 EUT Operating Condition

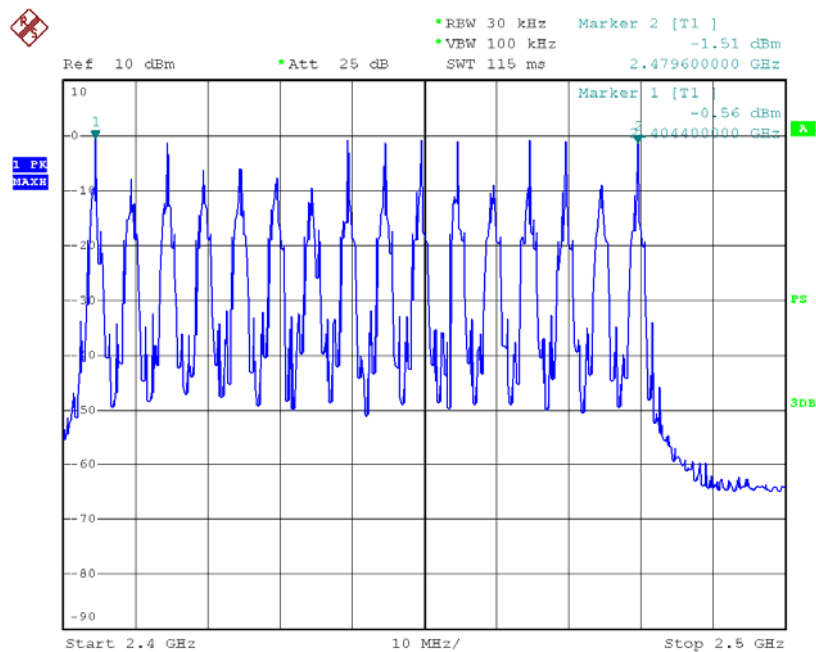
The EUT was set to the Hopping Mode by the Customer.

6.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06

6.6 Test Data

Hopping Mode		
Hopping Channel Frequency Range	Quantity of Hopping Channel	Limit
2404~2479	16	>15



Date: 7.NOV.2012 17:19:57

7. Average Time of Occupancy

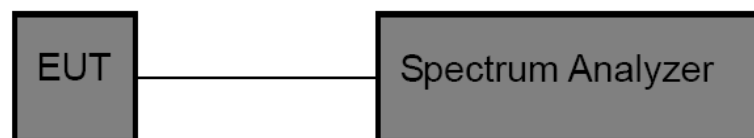
7.1 Test Standard and Limit

5.1.1 Test Standard
FCC Part 15.247 (a)(1)

5.1.2 Test Limit

Section	Test Item	Limit
15.247(a)(1)	Average Time of Occupancy	0.4 sec

7.2 Test Setup



7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=1MHz.
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.

7.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

7.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06

7.6 Test Data

Mode: Hopping Mode

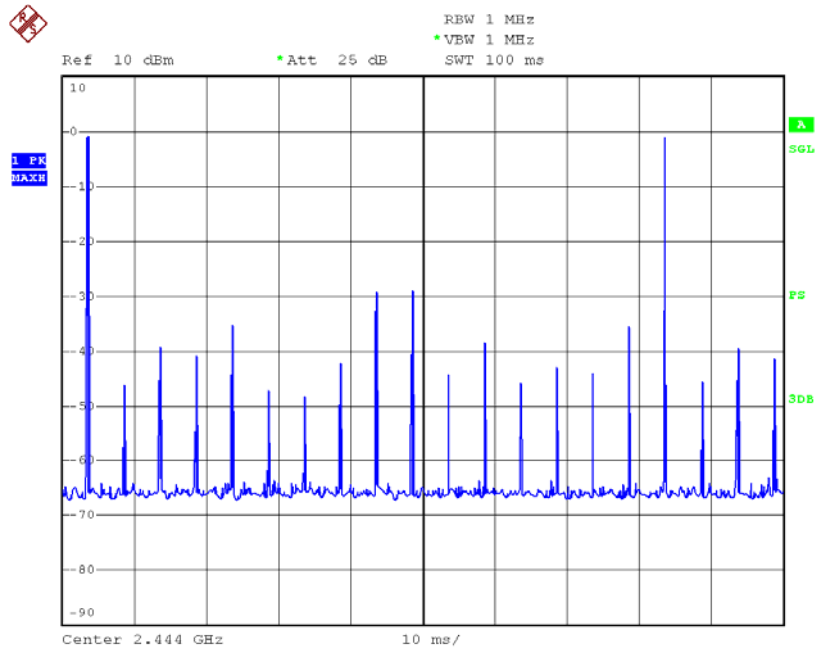
Mode	Number of transmission in a cycle	Length of transmission time (ms)	Result (msec)	Limit (ms)
2404 MHz	$(2/0.1)*6.4=128$ times	0.16	20.48	400

Note: More detailed information please see following:

	Result
One cycle time (Seconds)	$16\text{ CH} * 0.4 = 6.4$
The total number of frequency-hopping per second	$(2/0.1) * 16 = 320$
The number of occupied channels per second	$320/16 = 20$ (number per sec)
Occupied time for each channel (A)	0.16 ms
The total number of channels occupied within on cycle (B)	$(2/0.1) * 6.4 = 128$ times
The average time of occupancy within one cycle (A)*(B)	20.48 ms
Limit	400 ms

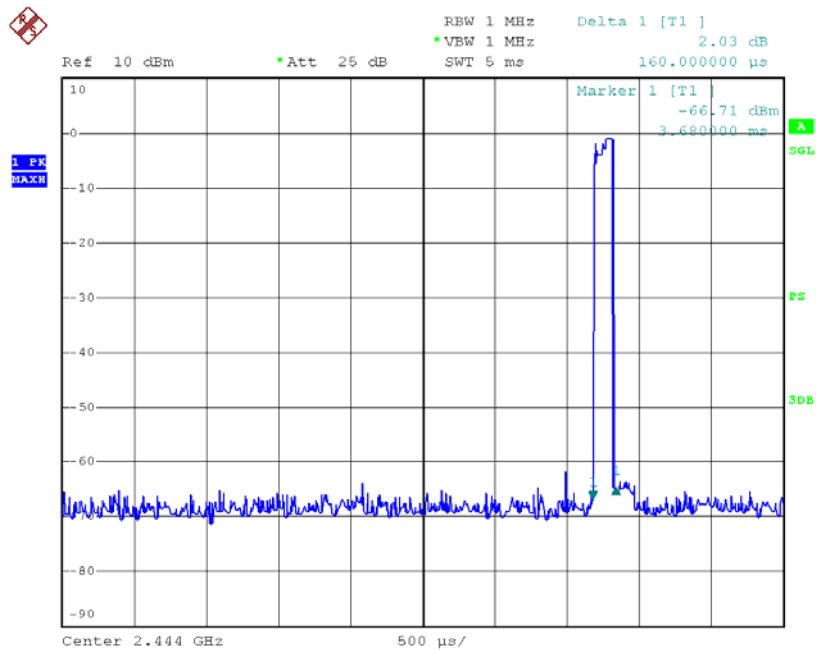
Please refer to the following data:

Hopping Mode(2 times per 100ms)



Date: 7.NOV.2012 17:20:54

Occupied time of each pulse



Date: 7.NOV.2012 17:21:41

8. Channel Separation and Bandwidth Test

8.1 Test Standard and Limit

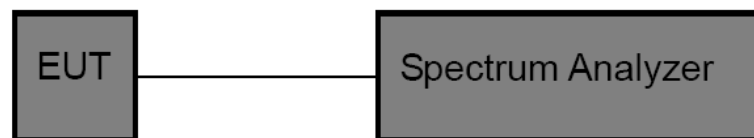
8.1.1 Test Standard

FCC Part 15.247

8.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	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) Spectrum Setting:
Channel Separation: RBW=30 kHz, VBW=100 kHz.
Bandwidth: RBW=10 kHz, VBW=30 kHz.
- (3) The bandwidth is measured at an amplitude level reduced 20dB 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.
- (4) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:30 kHz, and Video Bandwidth:100 kHz. Sweep Time set auto.

8.4 EUT Operating Condition

The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Bandwidth Test.

8.5 Test Equipment

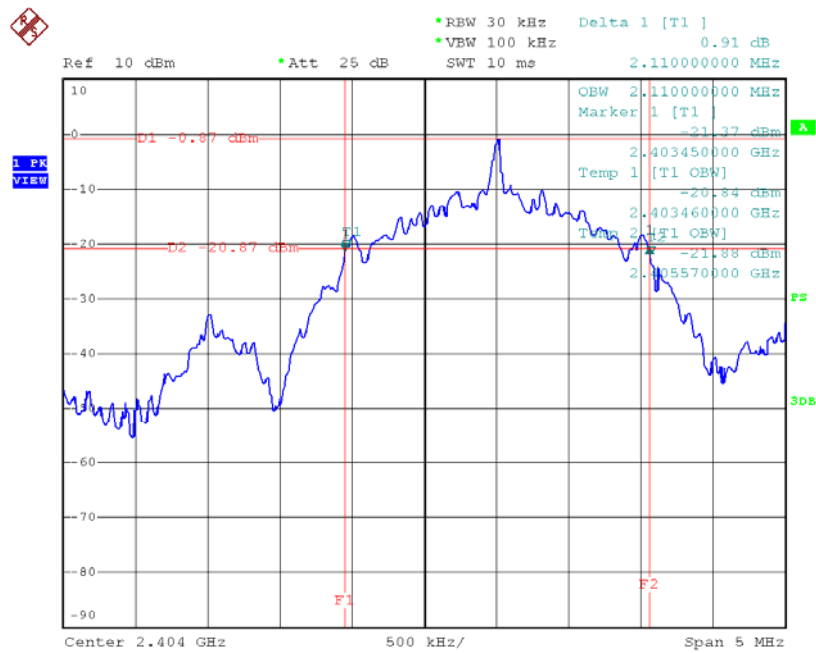
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
-------------	--------------	-----------	------------	-----------	-----------

Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06
-------------------	----------------	--------	---------	------------	------------

8.6 Test Data

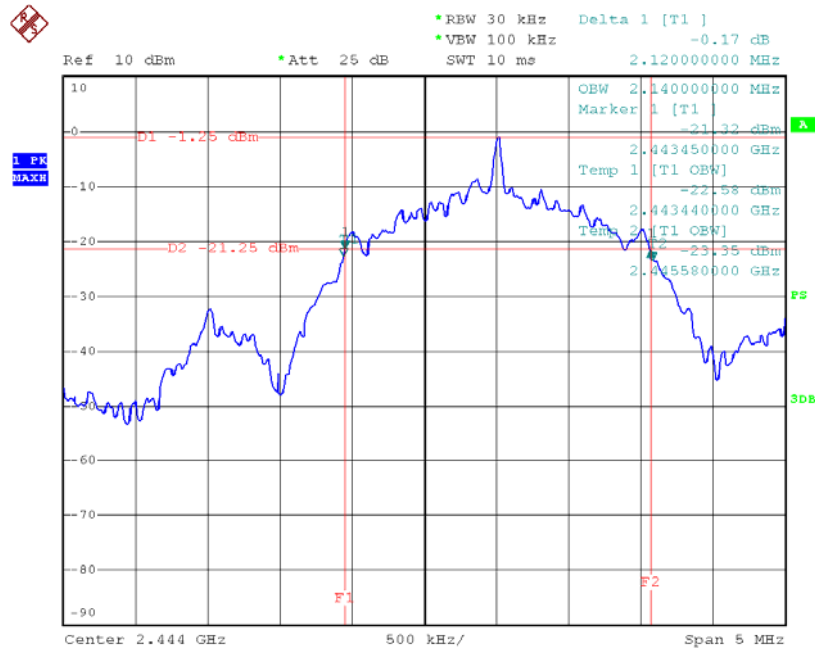
TX Mode			
Channel frequency (MHz)	99% OBW (kHz)	20dB Bandwidth (kHz)	Read Value*2/3 (kHz)
2404	2110.00	2110.00	1406.67
2444	2140.00	2120.00	1413.33
2479	2110.00	2090.00	1393.33

2404 MHz



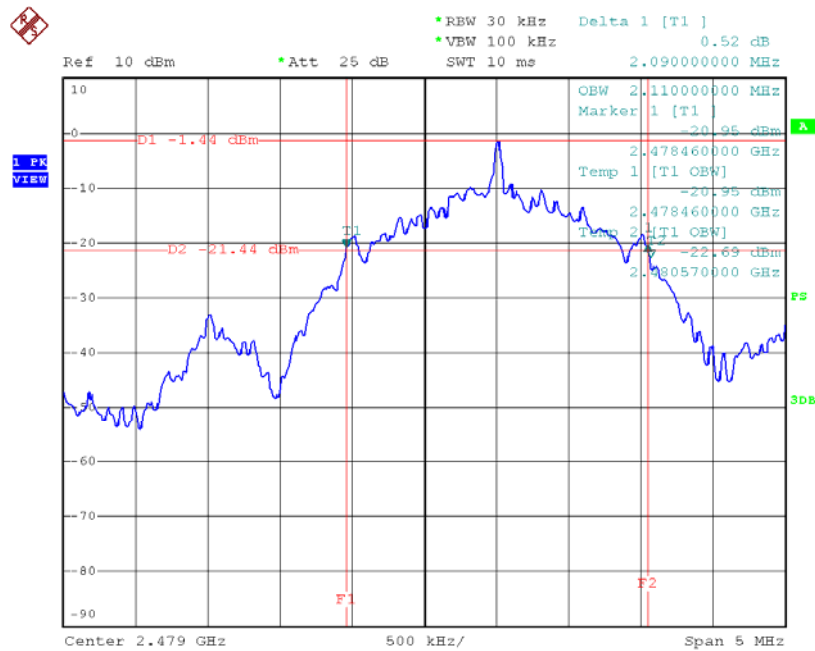
Date: 7.NOV.2012 17:25:59

2444 MHz



Date: 7.NOV.2012 17:23:45

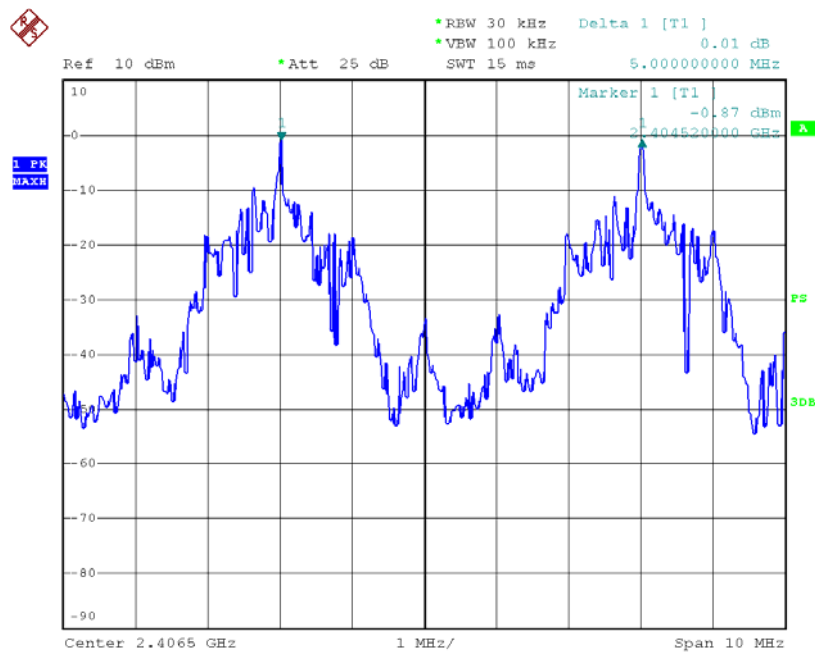
2479 MHz



Date: 7.NOV.2012 17:24:40

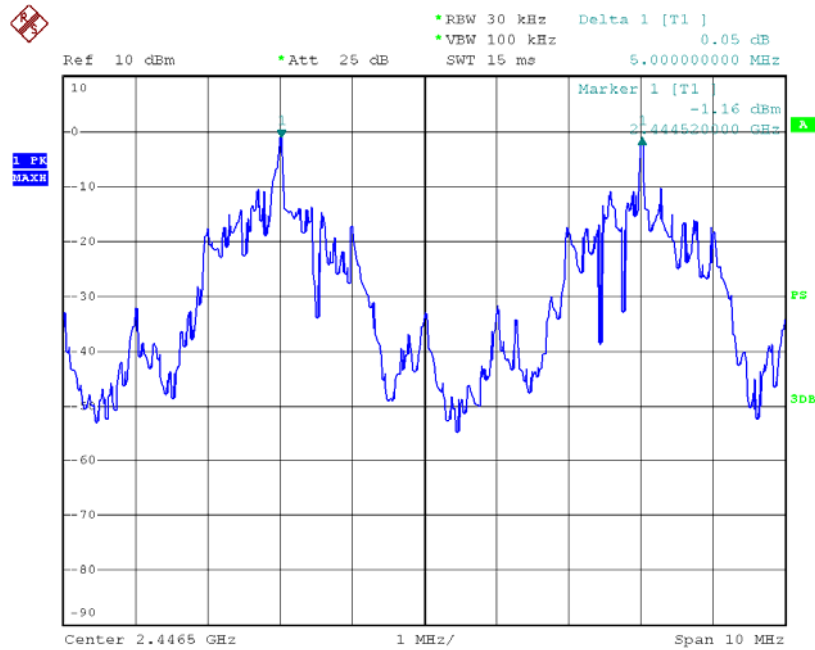
Hopping Mode			
Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit (kHz)
CH 00	2404	5000.00	>1406.67
CH 08	2444	5000.00	>1413.33
CH 15	2479	5020.00	>1393.33

2404 MHz



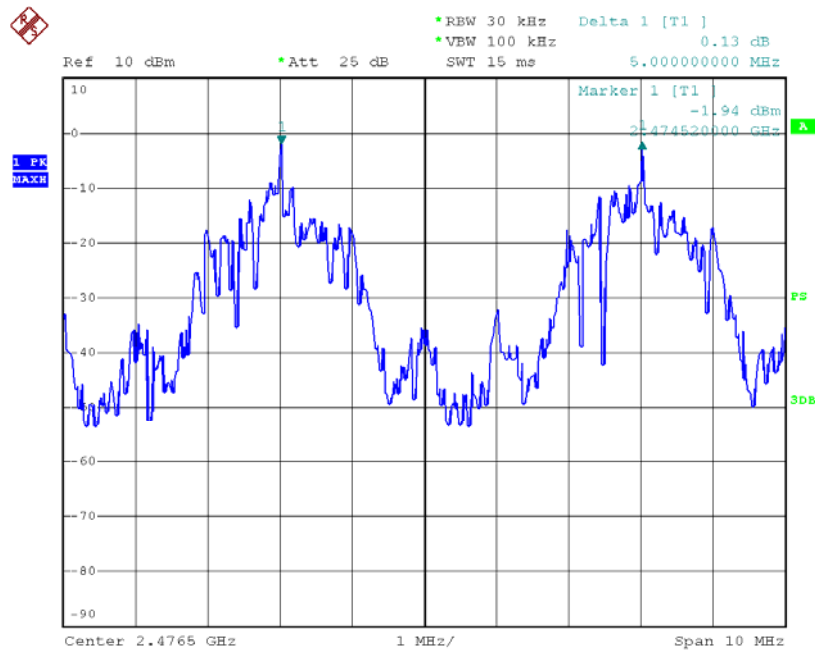
Date: 7.NOV.2012 17:36:14

2444 MHz



Date: 7.NOV.2012 17:33:55

2479 MHz



Date: 7.NOV.2012 17:38:43

9. Peak Output Power Test

9.1 Test Standard and Limit

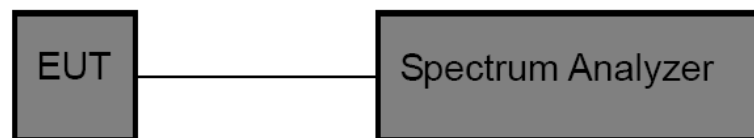
9.1.1 Test Standard

FCC Part 15.247 (b) (1)

9.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125 mW(21dBm)	2400~2483.5

9.2 Test Setup



9.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:
Channel Separation: RBW=1 MHz, VBW=1 MHz.

9.4 EUT Operating Condition

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

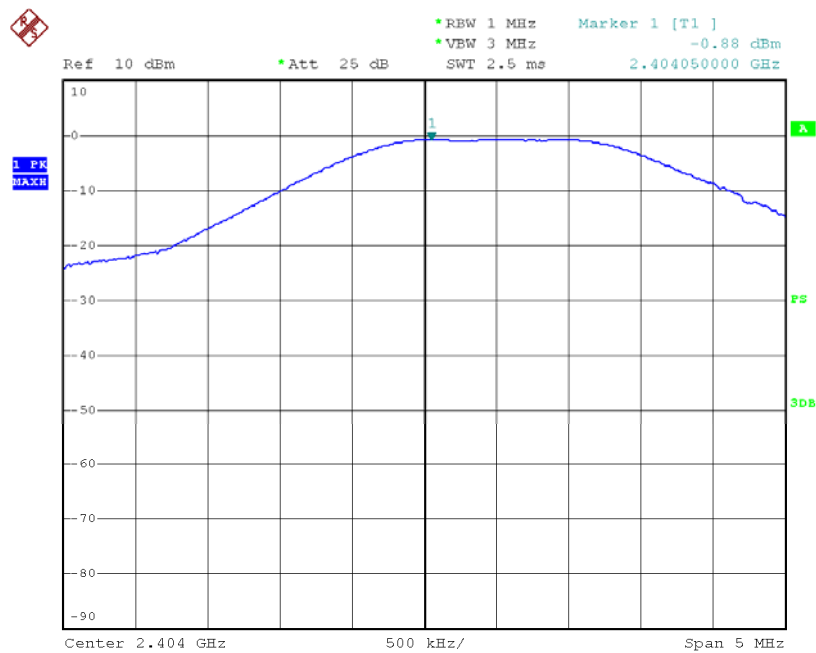
9.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06

8.6 Test Data

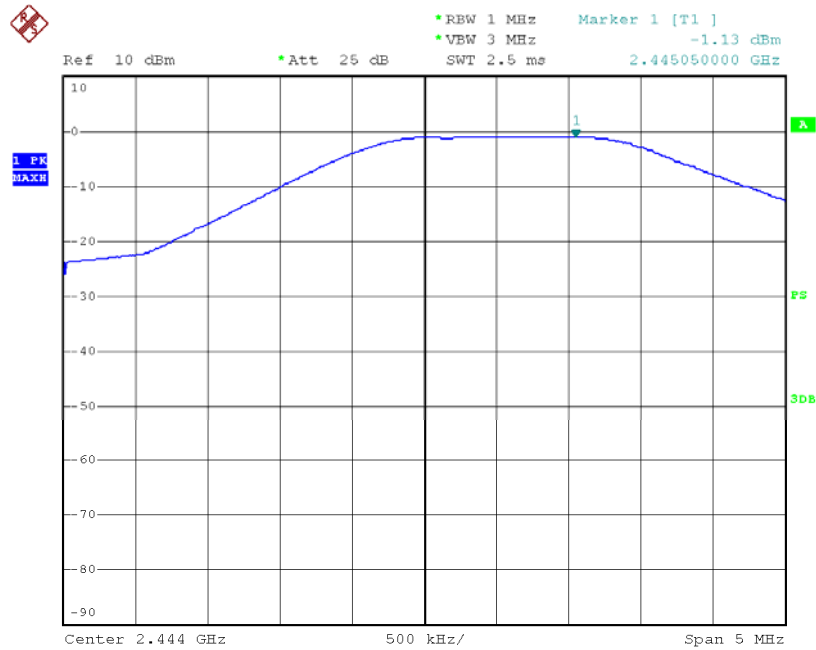
TX Mode			
Channel number	Channel frequency (MHz)	Test Result (dBm)	Limit
CH 00	2404	-0.88	0.125W(21dBm)
CH 08	2444	-1.13	0.125W(21dBm)
CH 15	2479	-1.39	0.125W(21dBm))

2404 Power



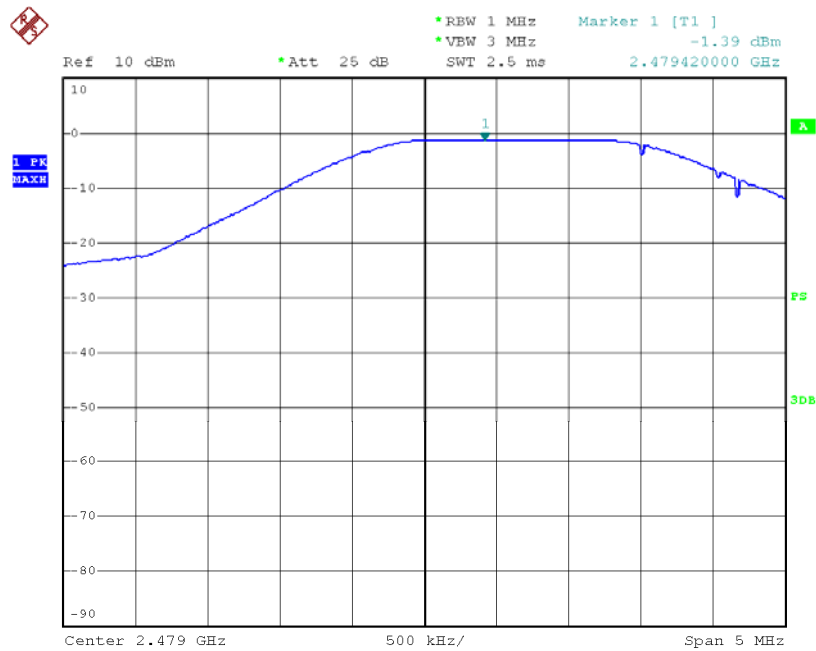
Date: 7.NOV.2012 17:30:13

2444 Power



Date: 7.NOV.2012 17:22:45

2479 Power



Date: 7.NOV.2012 17:29:53

10. Antenna Conducted Spurious Emission

10.1 Test Standard and Limit

10.1.1 Test Standard

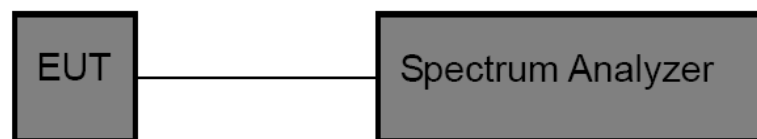
FCC Part 15.247 (d)

10.1.2 Test Limit

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

10.2 Test Setup



10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:
 RBW=100 KHz, VBW=100 KHz.
 Frequency range from 30MHz to 25 GHz.

10.4 EUT Operating Condition

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

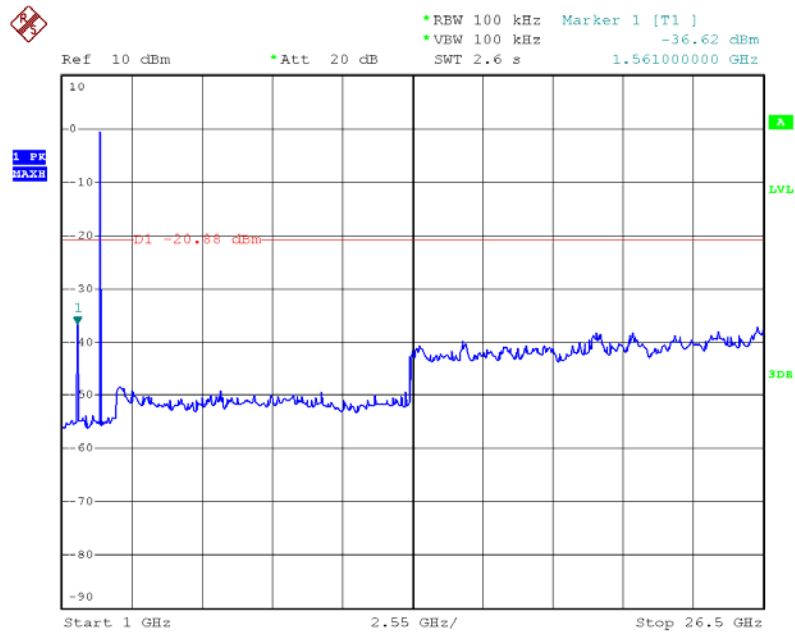
10.5 Test Equipment

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Spectrum Analyzer	ROHDE& SCHWARZ	FSEA20	DE25181	2012-08-07	2013-08-06

10.6 Test Data

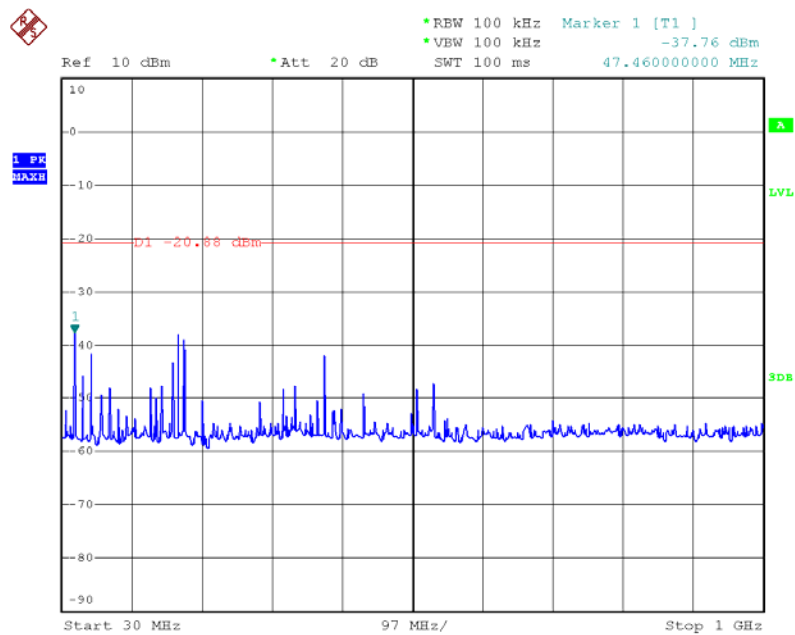
TX CH 00 2404MHz

Above 1 GHz



Date: 7.NOV.2012 14:40:21

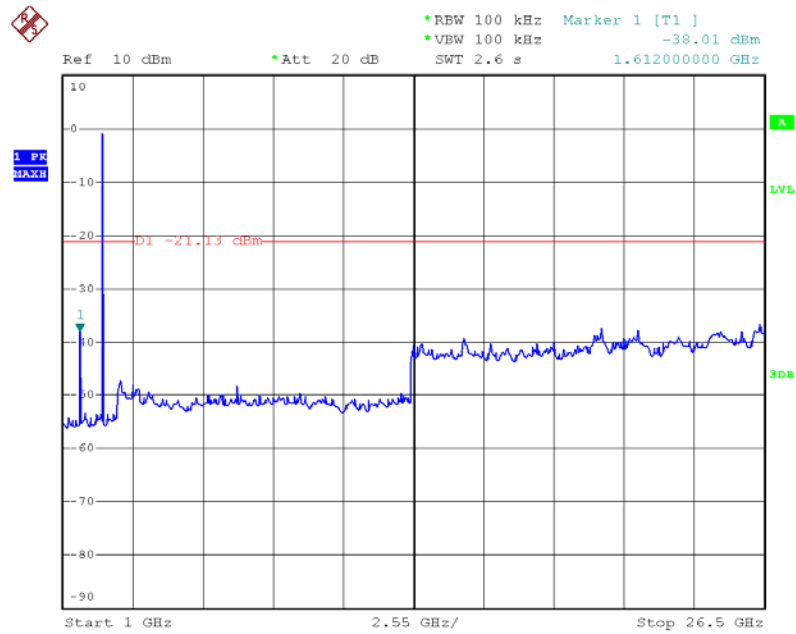
Bellow 1 GHz



Date: 7.NOV.2012 14:39:57

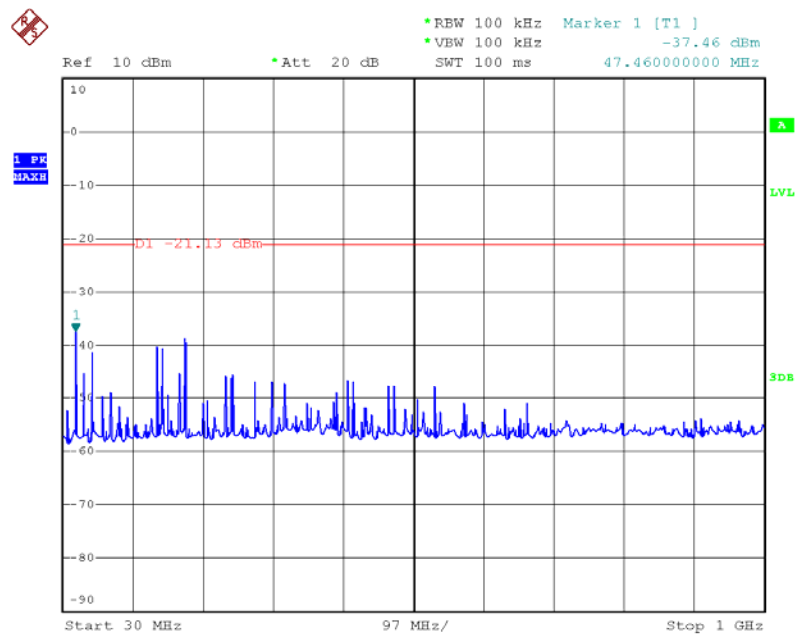
TX CH 08 2444MHz

Above 1 GHz



Date: 7.NOV.2012 14:50:19

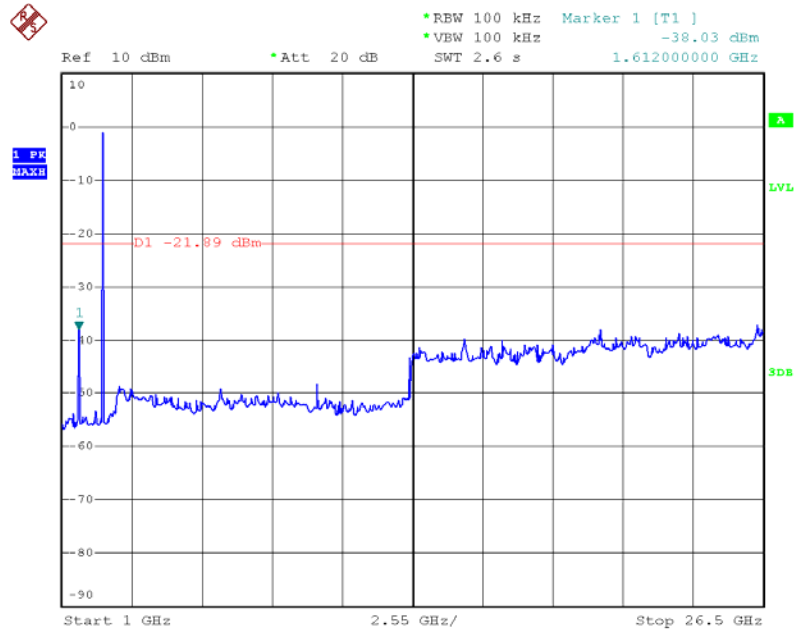
Bellow 1 GHz



Date: 7.NOV.2012 14:50:32

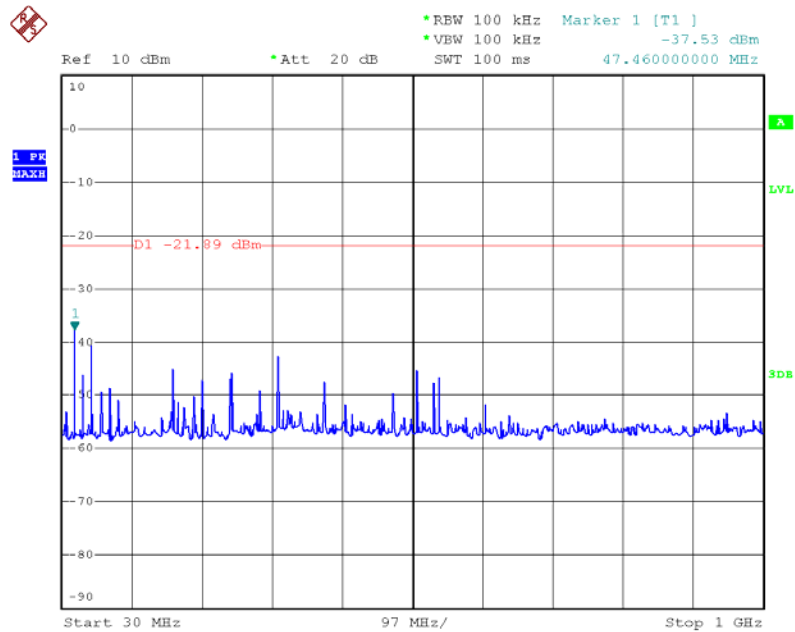
TX CH 15 2479MHz

Above 1 GHz



Date: 7.NOV.2012 15:15:35

Bellow 1 GHz



Date: 7.NOV.2012 15:15:20

11. Antenna Requirement

11.1 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.

11.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 2 dBi, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

11.2 Result

The EUT antenna is an PIFA Antenna. It complies with the standard requirement.