

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**

OF

Digital Wireless Camera

MODEL No.: CM219(A-Z)

BRAND NAME: LYD

FCC ID: XZFCM219A-Z

REPORT NO.: KAD110630082F

ISSUE DATE: August 08, 2011

Prepared for

SHENZHEN LYD TECHNOLOGY CO., LTD.

**Building A, Cunnan Industrial Estate, Shuidou Laowei, Longhua Town, Bao'an
District, Shenzhen, China.**

Prepared by

DONGGUAN EMTEK CO., LTD.

**No.281, Guantai Road, Nancheng District,
Dongguan, Guangdong, China**

TEL: 86-769-22807078

FAX: 86-769-22807079

VERIFICATION OF COMPLIANCE

Applicant:	SHENZHEN LYD TECHNOLOGY CO., LTD. Building A, Cunnan Industrial Estate, Shuidou Laowei, Longhua Town, Bao'an District, Shenzhen, China.
Product Description:	Digital Wireless Camera
Brand Name:	LYD
Model Number:	CM219(A-Z)
Serial Number:	N/A
File Number:	KAD110630082F
Date of Test:	July 05, 2011 to August 08, 2011

We hereby certify that:

The above equipment was tested by DONGGUAN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Approved By



Sam Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.

Table of Contents

1.	GENERAL INFORMATION	5
1.1	PRODUCT DESCRIPTION.....	5
1.2	RELATED SUBMITTAL(S) / GRANT (S)	6
1.3	TEST METHODOLOGY	6
1.4	SPECIAL ACCESSORIES	6
1.5	EQUIPMENT MODIFICATIONS	6
1.6	TEST FACILITY	7
2.	SYSTEM TEST CONFIGURATION	8
2.1	EUT CONFIGURATION	8
2.2	EUT EXERCISE	8
2.3	TEST PROCEDURE	8
2.4	LIMITATION	8
2.5	CONFIGURATION OF TESTED SYSTEM	12
3.	DESCRIPTION OF TEST MODES	13
4.	CONDUCTED EMISSIONS TEST	14
4.1	MEASUREMENT PROCEDURE:.....	14
4.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	14
4.3	MEASUREMENT EQUIPMENT USED:	14
4.4	MEASUREMENT RESULT:.....	14
4.5	CONDUCTED MEASUREMENT PHOTOS:	17
5.	RADIATED EMISSION TEST	18
5.1	MEASUREMENT PROCEDURE	18
5.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	18
5.3	MEASUREMENT EQUIPMENT USED:	19
5.4	MEASUREMENT RESULT	20
5.5	RADIATED MEASUREMENT PHOTOS:.....	24
6.	CHANNEL SEPARATION TEST	25
6.1	MEASUREMENT PROCEDURE	25
6.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	25
6.3	MEASUREMENT EQUIPMENT USED:	25
6.4	MEASUREMENT RESULTS:.....	25
7.	20DB BANDWIDTH TEST	28
7.1	MEASUREMENT PROCEDURE	28
7.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	28
7.3	MEASUREMENT EQUIPMENT USED:	28
7.4	MEASUREMENT RESULTS:.....	28

8.	QUANTITY OF HOPPING CHANNEL TEST.....	31
8.1	MEASUREMENT PROCEDURE.....	31
8.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	31
8.3	MEASUREMENT EQUIPMENT USED:	31
8.4	MEASUREMENT RESULTS:.....	31
9.	TIME OF OCCUPANCY (DWELL TIME) TEST	33
9.1	MEASUREMENT PROCEDURE.....	33
9.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	33
9.3	MEASUREMENT EQUIPMENT USED:	33
9.4	MEASUREMENT RESULTS:.....	34
10.	MAXIMUM PEAK OUTPUT POWER TEST	37
10.1	MEASUREMENT PROCEDURE.....	37
10.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	37
10.3	MEASUREMENT EQUIPMENT USED:	37
10.4	MEASUREMENT RESULTS:.....	37
11.	BAND EDGE TEST.....	38
11.1	MEASUREMENT PROCEDURE.....	38
11.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	38
11.3	MEASUREMENT EQUIPMENT USED:	38
11.4	MEASUREMENT RESULTS:.....	38
12.	ANTENNA APPLICATION.....	40
12.1	ANTENNA REQUIREMENT	40
12.2	RESULT.....	40
13.	ANTENNA PORT EMISSION.....	41
13.1	TEST EQUIPMENT	41
13.2	MEASURING INSTRUMENTS AND SETTING.....	41
13.3	TEST PROCEDURES	41
13.4	BLOCK DIAGRAM OF TEST SETUP.....	41
13.5	TEST RESULT	41
14.	RF EXPOSURE EVALUATION	45
14.1	FRIIS TRANSMISSION FORMULA: $P_D=(P_{OUT}*G)/(4*\pi*R^2)$	45
14.2	MEASUREMENT RESULT	45

1. GENERAL INFORMATION

1.1 Product Description

The SHENZHEN LYD TECHNOLOGY CO., LTD. Model: CM219(A-Z) (referred to as the EUT in this report) The EUT is an short range, lower power, Digital Wireless Camera designed as an " Input Device. It is designed by way of utilizing the GFSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 2402-2480MHz
- B). Modulation: GFSK
- C). Number of Channel: 40
- D). Channel space: 2MHz
- E). Rated RF Output Power: 15dbm
- F). BIT Rate of Transmission: 100kbps
- G). Antenna Type: Whip Antenna
- H). Antenna GAIN: 0dBi(Peak)
- I). Power Supply: AC 100-240V 50/60Hz Come from Adapter

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH01	2402	CH15	2430	CH29	2458
CH02	2404	CH16	2432	CH30	2460
CH03	2406	CH17	2434	CH31	2462
CH04	2408	CH18	2436	CH32	2464
CH05	2410	CH19	2438	CH33	2466
CH06	2412	CH20	2440	CH34	2468
CH07	2414	CH21	2442	CH35	2470
CH08	2416	CH22	2444	CH36	2472
CH09	2418	CH23	2446	CH37	2474
CH10	2420	CH24	2448	CH38	2476
CH11	2422	CH25	2450	CH39	2478
CH12	2424	CH26	2452	CH40	2480
CH13	2426	CH27	2454		
CH14	2428	CH28	2456		

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: XZFCM219A-Z filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

1.6 Test Facility

Site Description

EMC Lab.

: Accredited by CNAS, 2007.07.27
The certificate is valid until 2012.07.26
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01:2006
The Certificate Registration Number is L3150

Accredited by TUV Product Service Group 2011.07.05
The certificate is valid until 2012.07.05
The Laboratory has been assessed according to the requirements ISO/IEC 17025: 2005

Accredited by FCC, Nov. 05, 2008
The Certificate Number is 247565.

Accredited by Industry Canada, January 13, 2011
The Certificate Registration Number. is 46405-9444

Name of Firm

: DONGGUAN EMTEK CO., LTD

Site Location

: No.281, Guantai Road, Nancheng District,
Dongguan, Guangdong, China

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions(Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** using **CISPR Quasi-Peak and average detector mode**.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Limitation

(1) Channel Separation test

FCC Part 15, Subpart C Section 15.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 Bandwidth of the hopping channel, whichever is greater.

Frequency Range (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

(2) 20dB Bandwidth		Limit(kHz)			
Frequency Range(MHz)	Quantity of Hopping Channel	50	25	15	75
	902-928	<250	>250	NA	NA
	2400-2483.5	NA	NA	>1000	<1000

(3) Quantity of Hopping Channel

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Limit(Quantity of Hopping Channel)			
	20dB bandwidth <250kHz	20dB bandwidth >250kHz	20dB bandwidth <1MHz	20dB bandwidth >1MHz
902-928	50	25	NA	NA
2400-2483.5	NA	NA	15	15
5725-5850	NA	NA	75	NA

(4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	LIMIT(rms)		
	20dB bandwidth <250kHz(50Channel)	20dB bandwidth >250kHz(25Channel)	20dB bandwidth <1MHz(75Channel)
902-928	400(20S)	400(10S)	NA
2400-2483.5	NA	NA	400(30S)
5725-5850	NA	NA	400(30S)

Note: The “()” is all channel’s average time of occupancy.

(5) Maximum Peak Output Power

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Quantity of Hopping Channel	LIMIT(W)			
		50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

(6) Band edge

FCC Part15, Subpart C Section 15.247, In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, attenuation below the general limits specified in section 15.209(a) is not required. 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 specified in section 15.209(a).

Operating Frequency Range(MHz)	Spurious emission frequency	Limit Peak power ration to emission(dBc)	Emission level(dBuV/m)
902-928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400-2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725-5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

(8) Radiated Emission

FCC Part 15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000GHz. The emissions from an intentional radiator shall not exceed the field strength level specified in the following table:

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance(m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark: 1. Emission level in $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$
 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

FCC Part 15, Section 15.35(b) limit of radiated emission for frequency above 1000MHz

Frequency(MHz)	Class A($\text{dB}\mu\text{V/m}$)(at 3m)		Class B($\text{dB}\mu\text{V/m}$)(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency(MHz)	Filed Strength of Fundamental(at 3m)		Filed Strength of Harmonics(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
902-928	114	94	74.0	54.0
2400-2483.5	114	94	74.0	54.0
5725-5875	114	94	74.0	54.0
24000-24250	128	108	88.0	68.0

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	Digital Wireless Camera	LYD	CM219(A-Z)	XZFCM219A-Z	N/A	EUT

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.

3. Description of test modes

The EUT (Baby monitor) has been tested under normal operating condition.

This EUT is a FHSS system, we use blue test to control the EUT with LPT1, Let EUT hopping on and transmit at every channel with highest power, Only output power use conducted method, others are using radiated method. After sirfdemo330R1 send the command to EUT, it can be removed, and the EUT keep hopping. 40 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for best.

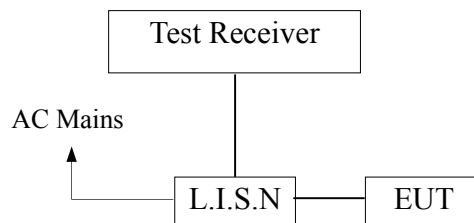
Channel	Frequency(MHz)
01	2402
20	2440
40	2480

4. Conducted Emissions Test

4.1 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

4.2 Test SET-UP (Block Diagram of Configuration)



4.3 Measurement Equipment Used:

Conducted Emission Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2011	05/29/2012
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2011	05/29/2012
50ΩCoaxial Switch	Anritsu	MP59B	M20531	05/29/2011	05/29/2012

4.4 Measurement Result:

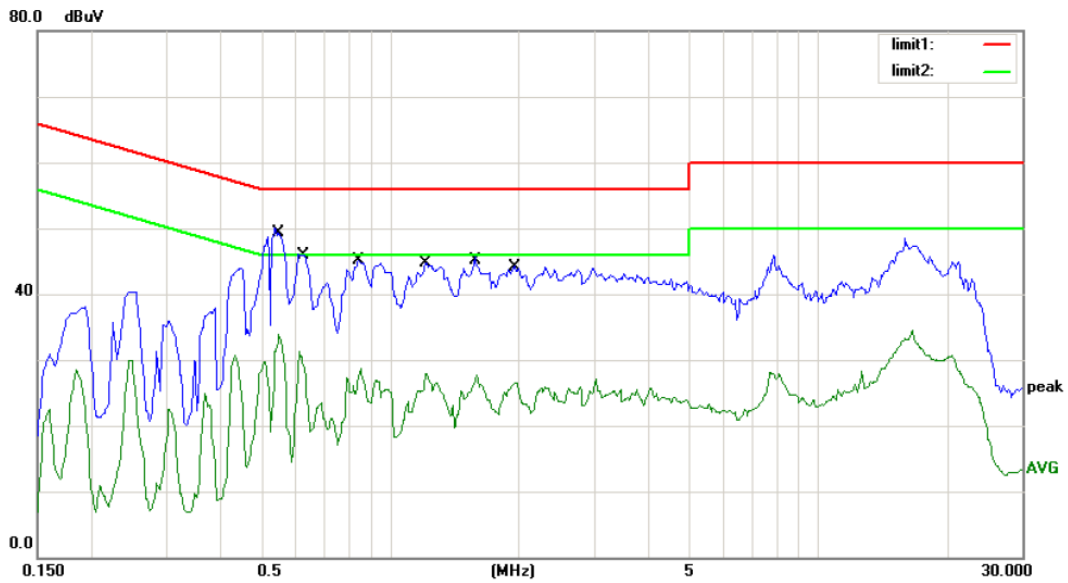
Conducted Emission Measurement

File :RC451(A-Z)CM219(A-Z)

Data :#1

Date: 11/07/08/

Time: 10/15/27



Site site #1

Phase: L1

Temperature: 25

Limit: (CE)FCC PART 15 class C_QP

Power: AC 120V/60Hz

Humidity: 50 %

EUT: Digital Wireless Camera

M/N: CM219(A-Z)

Mode: TX

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.5500	48.01	0.00	48.01	56.00	-7.99	QP	
2		0.5500	33.92	0.00	33.92	46.00	-12.08	AVG	
3		0.6300	45.95	0.00	45.95	56.00	-10.05	QP	
4		0.6300	31.31	0.00	31.31	46.00	-14.69	AVG	
5		0.8450	45.15	0.00	45.15	56.00	-10.85	QP	
6		0.8450	28.68	0.00	28.68	46.00	-17.32	AVG	
7		1.2150	44.75	0.00	44.75	56.00	-11.25	QP	
8		1.2150	27.91	0.00	27.91	46.00	-18.09	AVG	
9		1.5950	45.68	0.00	45.68	56.00	-10.32	QP	
10		1.5950	27.76	0.00	27.76	46.00	-18.24	AVG	
11		1.9800	44.38	0.00	44.38	56.00	-11.62	QP	
12		1.9800	26.55	0.00	26.55	46.00	-19.45	AVG	

Conducted Emission Measurement

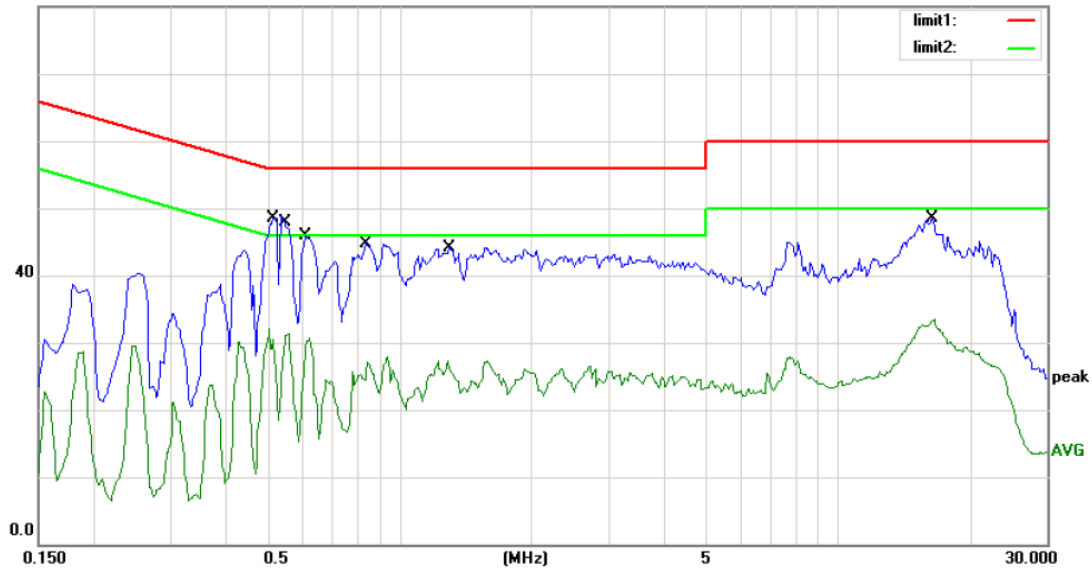
File :RC451(A-Z)CM219(A-Z)

Data :#2

Date: 11/07/08/

Time: 10/17/44

80.0 dBuV



Site site #1

Phase: **N**

Temperature: 25

Limit: (CE)FCC PART 15 class C_QP

Power: AC 120V/60Hz

Humidity: 50 %

EUT: Digital Wireless Camera

M/N: CM219(A-Z)

Mode: TX

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.5050	46.51	0.00	46.51	56.00	-9.49	QP	
2		0.5050	32.08	0.00	32.08	46.00	-13.92	AVG	
3		0.5500	45.23	0.00	45.23	56.00	-10.77	QP	
4		0.5500	31.22	0.00	31.22	46.00	-14.78	AVG	
5		0.6100	45.84	0.00	45.84	56.00	-10.16	QP	
6		0.6100	30.62	0.00	30.62	46.00	-15.38	AVG	
7		0.8483	44.44	0.00	44.44	56.00	-11.56	QP	
8		0.8483	27.11	0.00	27.11	46.00	-18.89	AVG	
9		1.2900	44.08	0.00	44.08	56.00	-11.92	QP	
10		1.2900	27.40	0.00	27.40	46.00	-18.60	AVG	
11		16.4500	48.47	0.00	48.47	60.00	-11.53	QP	
12		16.4500	33.42	0.00	33.42	50.00	-16.58	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Chris

4.5 Conducted Measurement Photos:



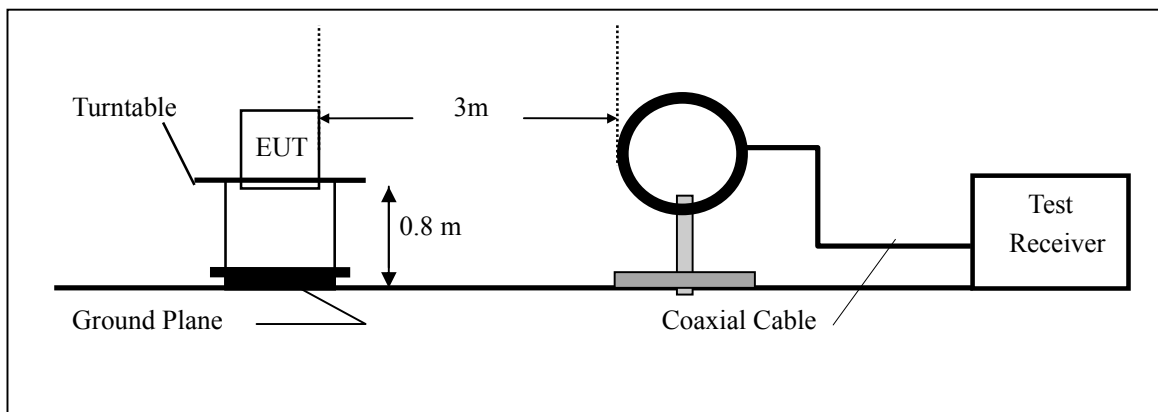
5. Radiated Emission Test

5.1 Measurement Procedure

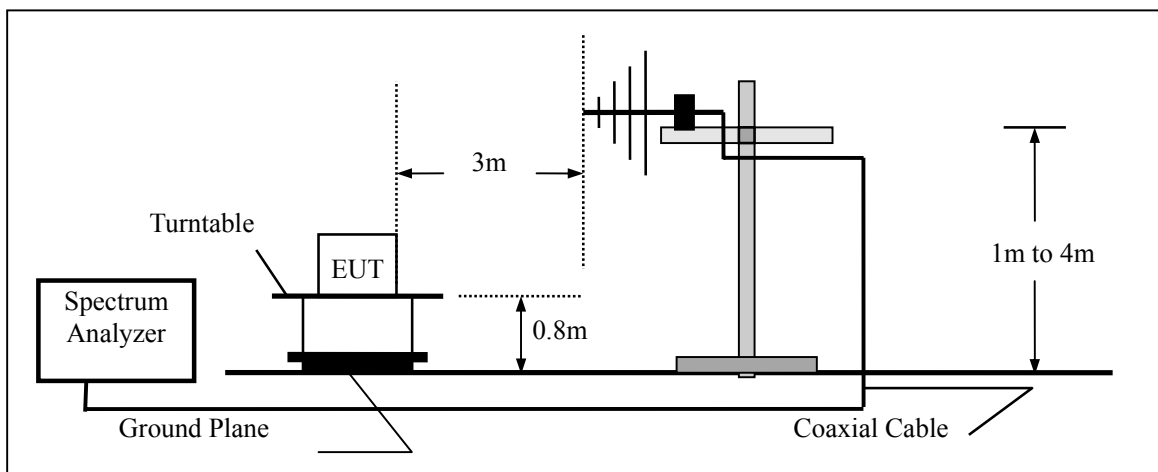
- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

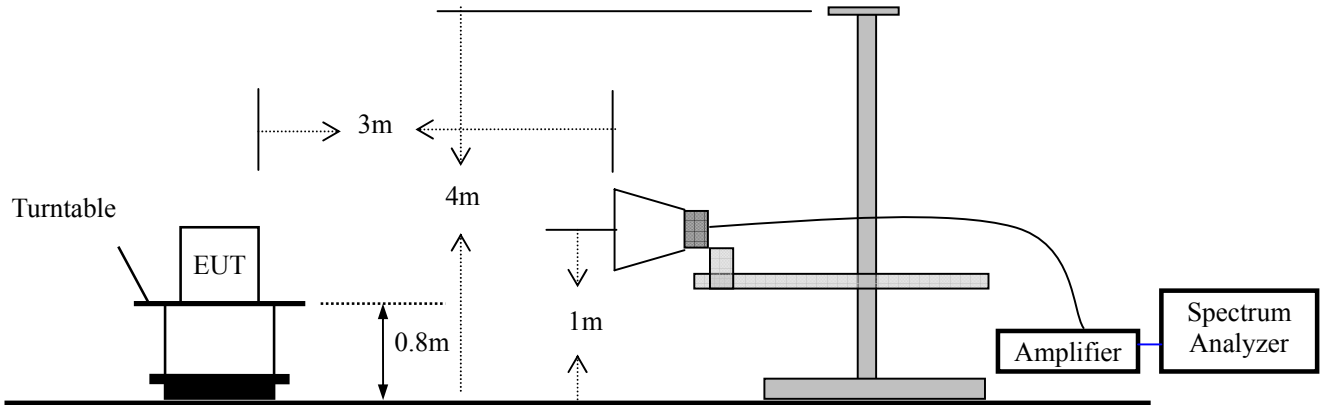
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2011	05/29/2012
Spectrum Analyzer	HP	E4407B	839840481	05/29/2011	05/29/2012
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2011	05/29/2012
Pre-Amplifier	HP	8447D	2944A07999	05/29/2011	05/29/2012
Bilog Antenna	Schwarzbeck	VULB9163	142	05/29/2011	05/29/2012
Loop Antenna	ARA	PLA-1030/B	1029	05/29/2011	05/29/2012
Horn Antenna	Electro-Metrics	EM-6961	103314	05/29/2011	05/29/2012
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/29/2011	05/29/2012

5.4 Measurement Result

Operation Mode: TX Mode Test Date : August 03, 2011
Frequency Range: 30~1000MHz Temperature : 28 °C
Test Result: PASS Humidity : 65 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)	Limit 3m (dBuV/m)	Margin (dB)	Note
32.65	V	34.68	40.00	-5.32	PK
114.67	V	38.62	43.50	-4.88	PK
238.84	V	41.58	46.00	-4.42	PK
365.25	V	41.18	46.00	-4.82	PK
479.68	V	40.51	46.00	-5.49	PK
698.35	V	37.54	46.00	-8.46	PK
38.68	H	34.62	40.00	-5.38	PK
141.81	H	38.61	43.50	-4.89	PK
250.49	H	40.51	46.00	-5.49	PK
380.52	H	41.25	46.00	-4.75	PK
523.50	H	40.32	46.00	-5.68	PK
667.86	H	40.15	46.00	-5.85	PK

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.209.

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: CH01: 2402Hz Test Date : August 03, 2011
Frequency Range: 1-25GHz Temperature : 28 °C
Test Result: PASS Humidity : 65 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2400.000	V	51.35	44.57	74.00	54.00	-22.65	-9.43
4804.00	V	45.61	41.33	74.00	54.00	-28.39	-12.67
7206.00	V	42.35	38.63	74.00	54.00	-31.65	-15.37
9608.00	V	40.63	37.25	74.00	54.00	-33.37	-16.75
12010.00	V	37.31	32.47	74.00	54.00	-36.69	-21.53
2400.000	H	52.64	46.35	74.00	54.00	-21.36	-7.65
4804.00	H	45.93	40.69	74.00	54.00	-28.07	-13.31
7206.00	H	43.54	38.60	74.00	54.00	-30.46	-15.40
9608.00	H	41.37	37.32	74.00	54.00	-32.63	-16.68
12010.00	H	39.68	34.36	74.00	54.00	-34.32	-19.64

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

Note: (1) All Readings are Peak Value and AV.
(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:	CH20: 2440Hz	Test Date :	August 03, 2011
Frequency Range:	1-25GHz	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4880.00	V	51.23	44.35	74.00	54.00	-22.77	-9.65
7320.00	V	48.31	42.69	74.00	54.00	-25.69	-11.31
9760.00	V	47.35	40.35	74.00	54.00	-26.65	-13.65
12200.00	V	44.31	40.14	74.00	54.00	-29.69	-13.86
4880.00	H	52.47	46.44	74.00	54.00	-21.53	-7.56
7320.00	H	49.47	43.47	74.00	54.00	-24.53	-10.53
9760.00	H	45.63	39.62	74.00	54.00	-28.37	-14.38
12200.00	H	43.61	36.35	74.00	54.00	-30.39	-17.65

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

Note: (1) All Readings are Peak Value and AV.
(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.

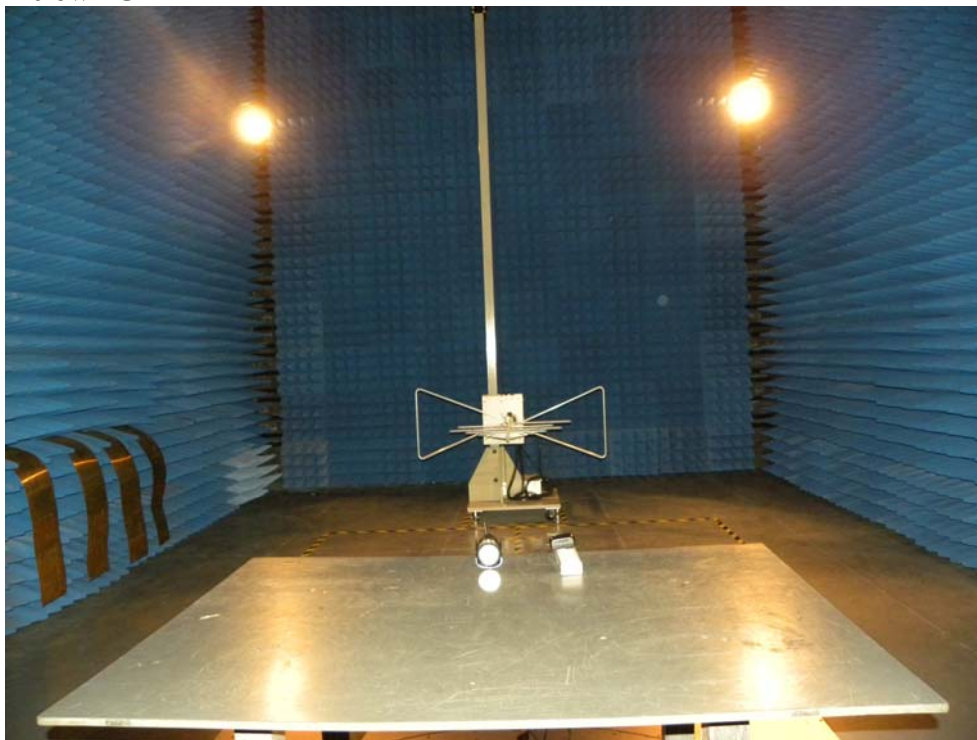
Operation Mode: CH40: 2480MHz Test Date : August 03, 2011
Frequency Range: 1-25GHz Temperature : 28 °C
Test Result: PASS Humidity : 65 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2483.500	V	51.42	44.53	74.00	54.00	-22.58	-9.47
4960.00	V	49.35	43.57	74.00	54.00	-24.65	-10.43
7440.00	V	47.35	42.36	74.00	54.00	-26.65	-11.64
9920.00	V	45.93	37.61	74.00	54.00	-28.07	-16.39
12400.00	V	42.63	36.90	74.00	54.00	-31.37	-17.10
2483.500	H	50.66	44.69	74.00	54.00	-23.34	-9.31
4960.00	H	46.69	41.63	74.00	54.00	-27.31	-12.37
7440.00	H	47.61	41.47	74.00	54.00	-26.39	-12.53
9920.00	H	44.98	39.65	74.00	54.00	-29.02	-14.35
12400.00	H	43.55	38.37	74.00	54.00	-30.45	-15.63

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

Note: (1) All Readings are Peak Value and AV.
(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.

5.5 Radiated Measurement Photos:
Below 1GHz



Above 1GHz

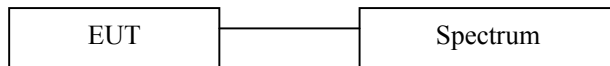


6. Channel Separation test

6.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

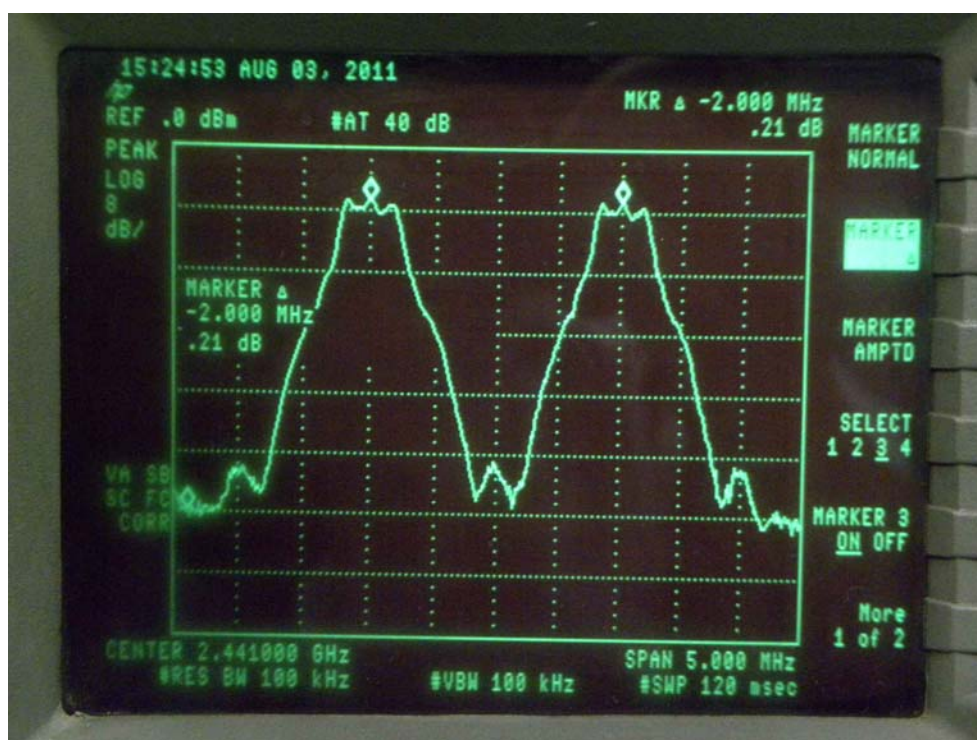
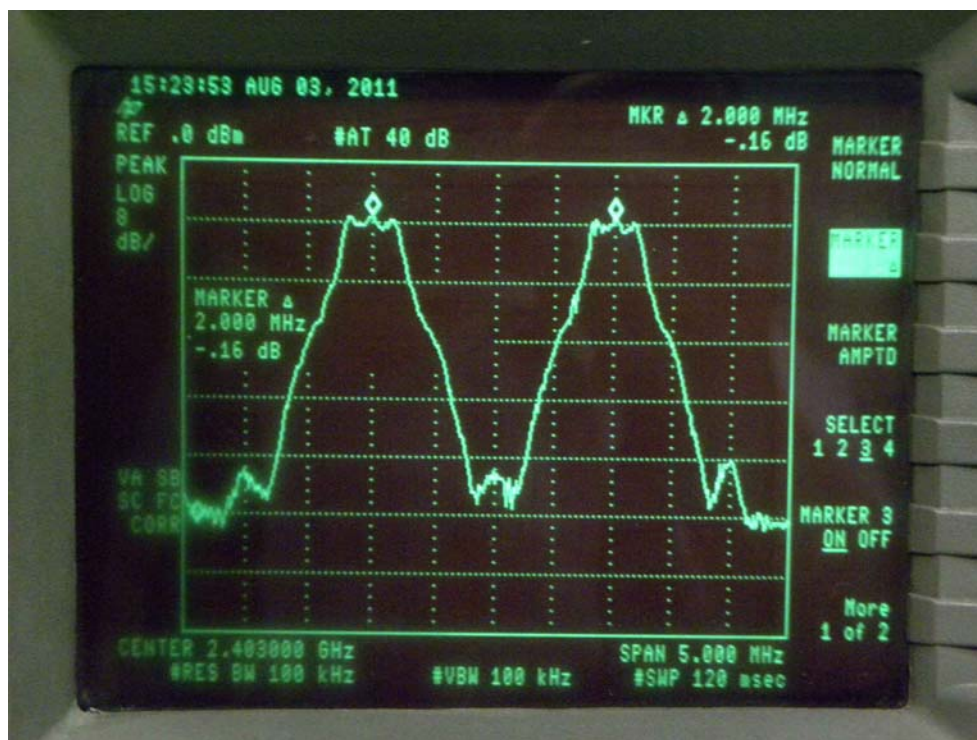
Same as 5.3 Radiated Emission Measurement.

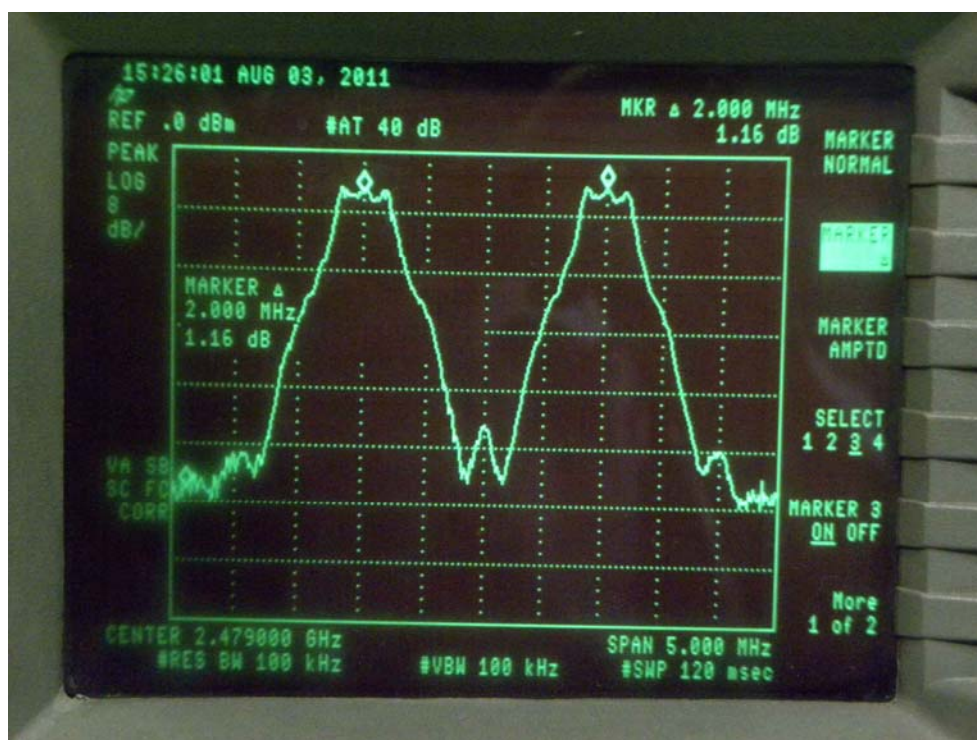
6.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 03, 2011
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

Channel number	Channel frequency (MHz)	Separation Read Value (MHz)	20dB Down BW(MHz)	Separation Limit 2/3 20dB Down BW(MHz)
00	2402	2	>1.125	>0.75
33	2440	2	>1.103	>0.73
64	2480	2	>1.1103	>0.73



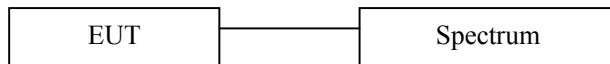


7. 20dB Bandwidth test

7.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

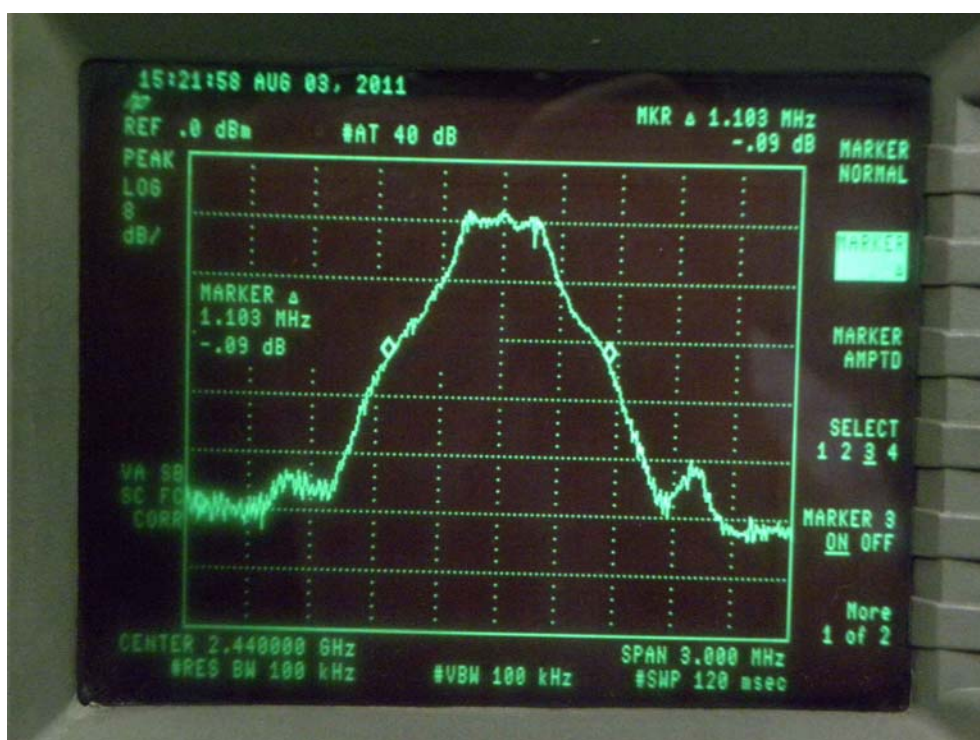
Same as 5.3 Radiated Emission Measurement.

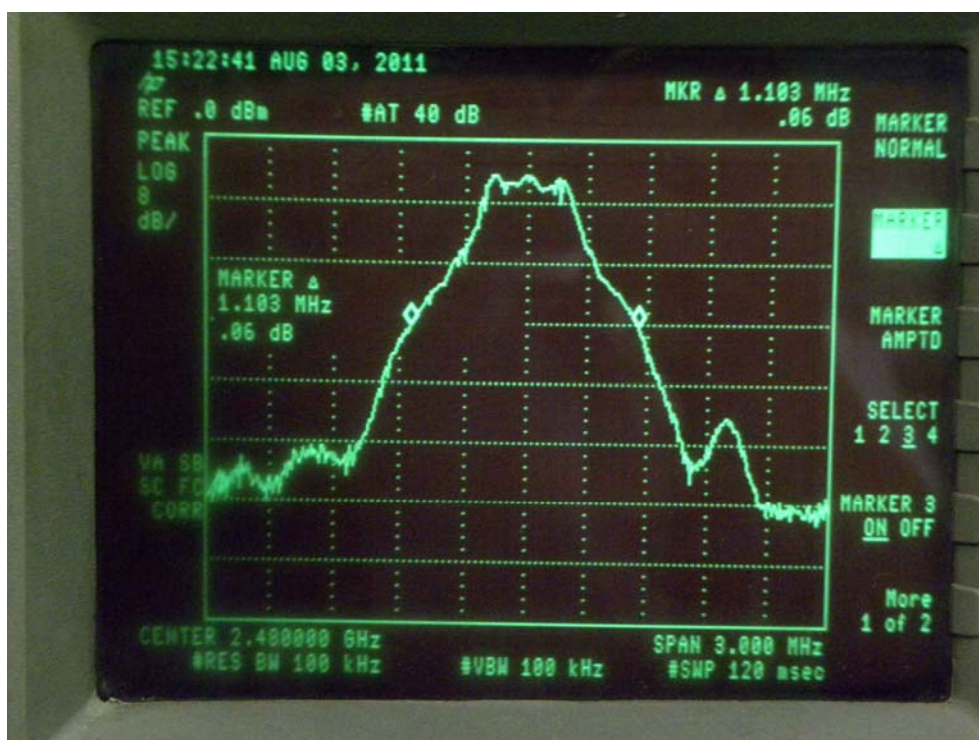
7.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 03, 2011
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
01	2402	1125
20	2440	1103
40	2480	1103



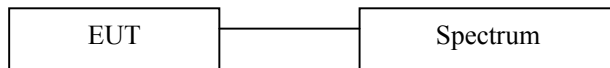


8. Quantity of Hopping Channel Test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used:

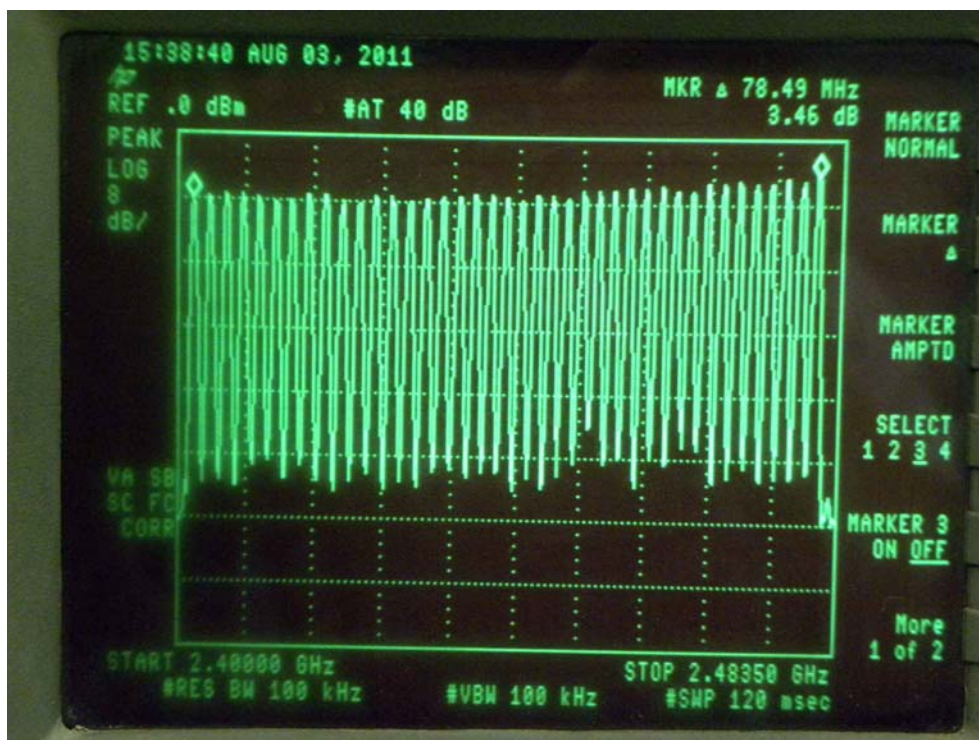
Same as 5.3 Radiated Emission Measurement.

8.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 03, 2011
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel(Limit)
2402-2480MHz	40	>15

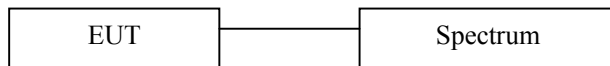


9. Time of Occupancy (Dwell Time) test

9.1 Measurement Procedure

- Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

Same as 5.3 Radiated Emission Measurement.

9.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 03, 2011
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

Mode	Number of transmission in a 16 (40 Hopping*0.4)	Length of transmissions time(msec)	Result (msec)	Limit (msec)
DH1	20 x 16 = 320	0.491	157.12	400
DH3	10 x 16 = 160	0.496	79.36	400
DH5	6.67 x 31.6 = 106.6	0.494	52.66	400

DH5 Packet permit maximum $1600 / 40 / 6 = 6.67$ hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times $6.67 \times 31.6 = 106.6$ within 16 seconds.

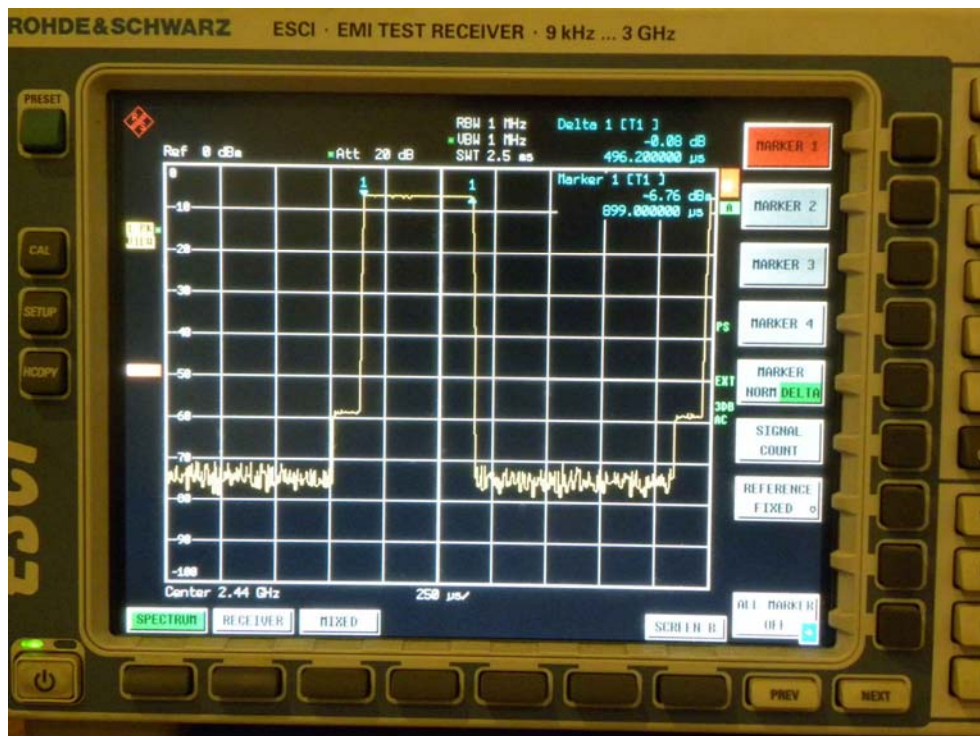
DH3 Packet permit maximum $1600 / 40 / 4 = 10$ hops per second in each channel (3 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times $10 \times 16 = 160$ within 16 seconds.

DH1 Packet permit maximum $1600 / 40 / 2 = 20$ hops per second in each channel (1 time slot RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times $20 \times 16 = 320$ within 16 seconds.

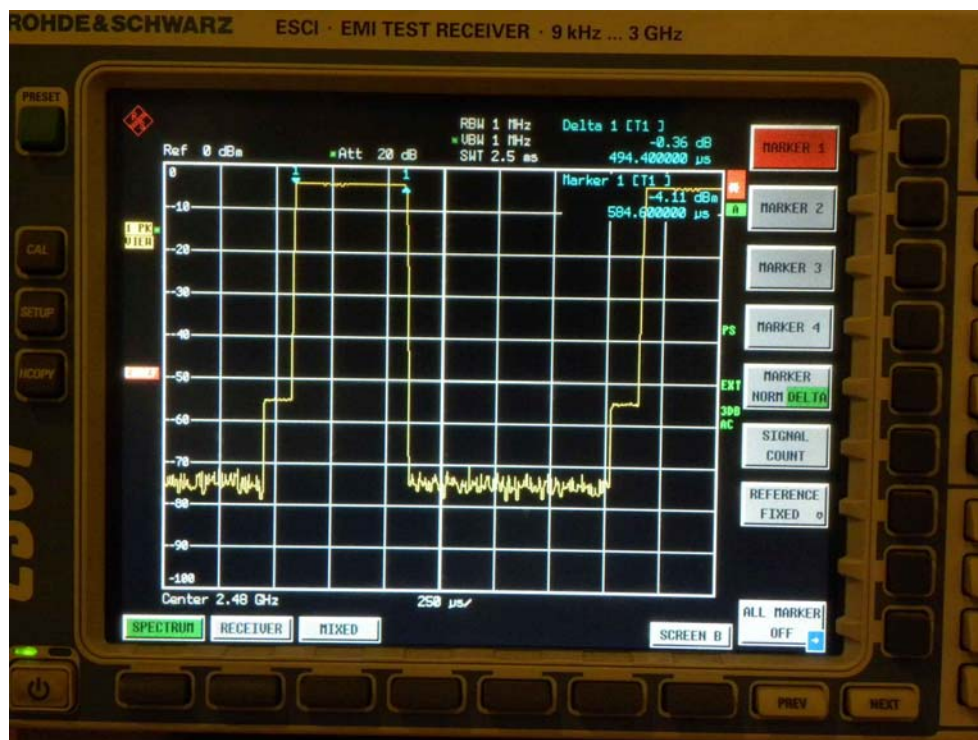
DH1



DH3



DH5

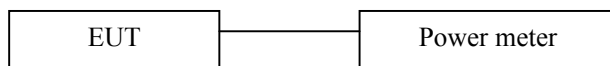


10. MAXIMUM PEAK OUTPUT POWER TEST

10.1 Measurement Procedure

- Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power meter	Boonton	4232A	29001	05/29/2011	05/29/2012
Power sensor	Boonton	51011-EMC	31184	05/29/2011	05/29/2012

10.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 03, 2011
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

Channel number	Channel Frequency (MHz)	Peak Power output(mW)	Peak Power output(dBm)	Limit (mW)	Pass/Fail
01	2402	9.23	9.65	125	PASS
20	2440	9.38	9.72	125	PASS
40	2480	9.68	9.86	125	PASS

11. Band EDGE test

11.1 Measurement Procedure

1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measured were complete.

11.2 Test SET-UP (Block Diagram of Configuration)

Same as 5.2 Radiated Emission Set-up.

11.3 Measurement Equipment Used:

Same as 5.3 Radiated Emission Measurement.

11.4 Measurement Results:

Refer to attached data chart.

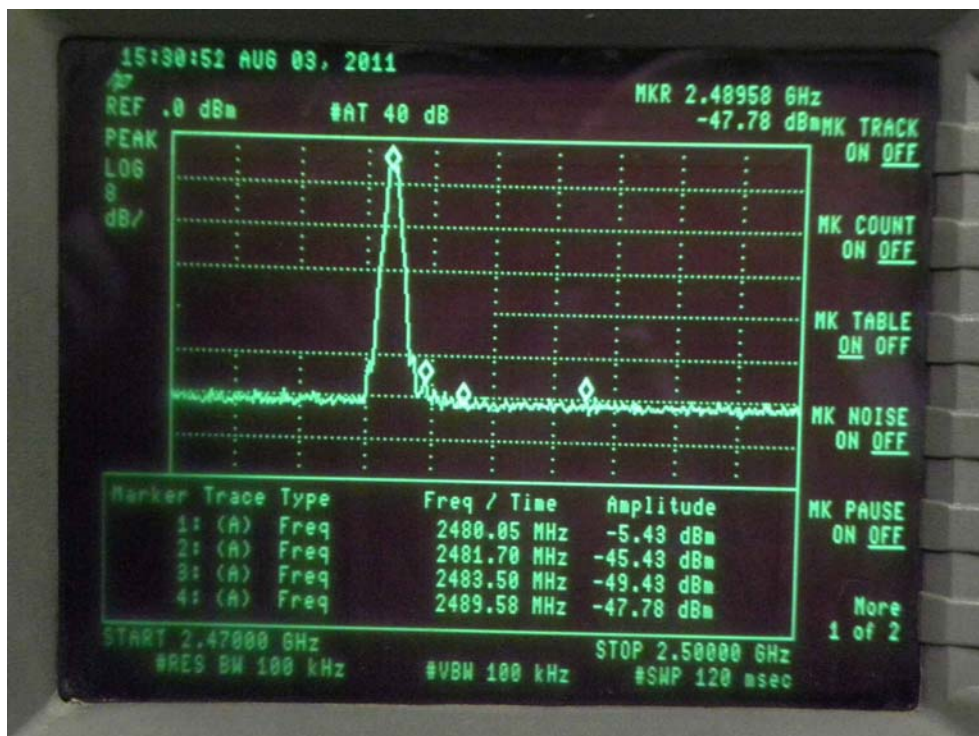
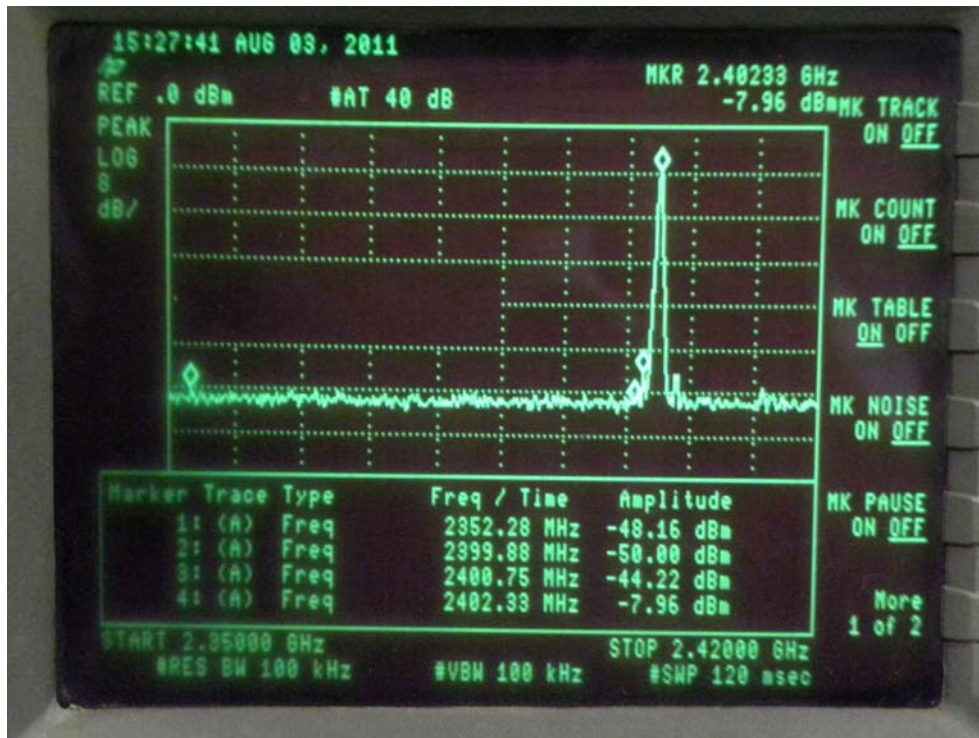
Spectrum Detector:	PK	Test Date :	August 03, 2011
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

1. Conducted Test

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	-7.96	-50.00	42.04	>20dBc
>2483.5	-5.43	-49.43	44.00	>20dBc

2. Radiated emission test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		QP	AV	QP	AV
<2400	V	57.97	48.76	74.00	54.00
>2483.5	V	58.23	49.01	74.00	54.00



12. Antenna Application

12.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.240.

FCC part 15C section 15.247 requirements:

Systems operating in the 2.4GHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

12.2. Result

The unit is produced with a unique coupling from the transmitter to the whip antenna. The antenna is not replaceable or user serviceable. The requirements of 15.203 are met; there are no deviations or exceptions to the specification.

13. Antenna Port Emission

13.1 Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/29/2011	05/29/2012

13.2 Measuring Instruments and setting

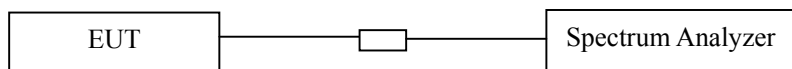
The following table is the setting of spectrum analyzer.

Spectrum analyzer	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

13.3 Test Procedures

The conducted spurious emissions were measured conducted using a spectrum analyzer at low, mid, and hi channels, The limit was determined by attenuation 20dB of the RF peak power output.

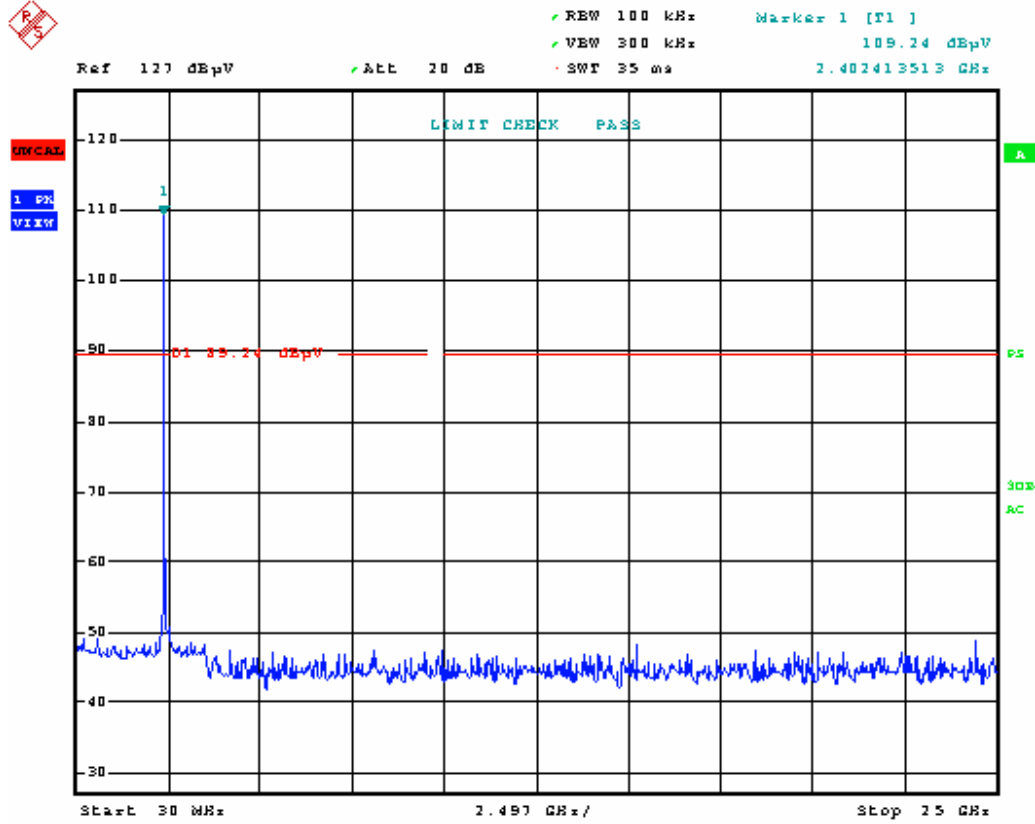
13.4 Block Diagram of Test setup



13.5. Test Result

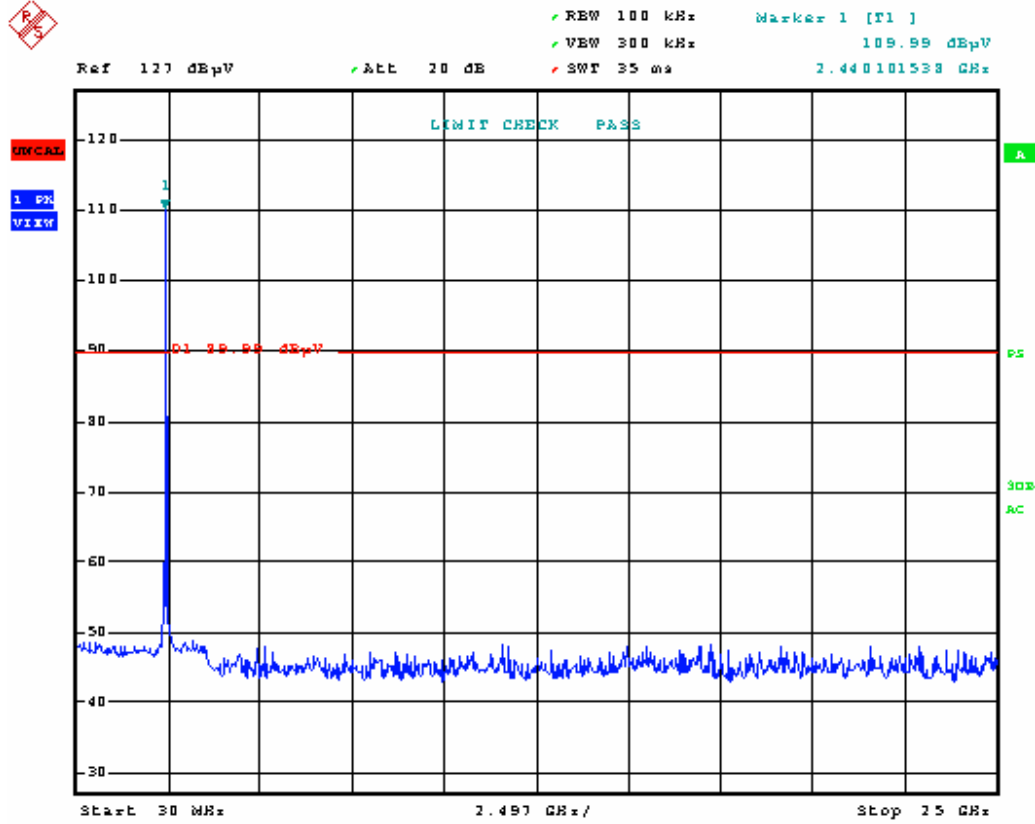
PASS.

Low Channel 1



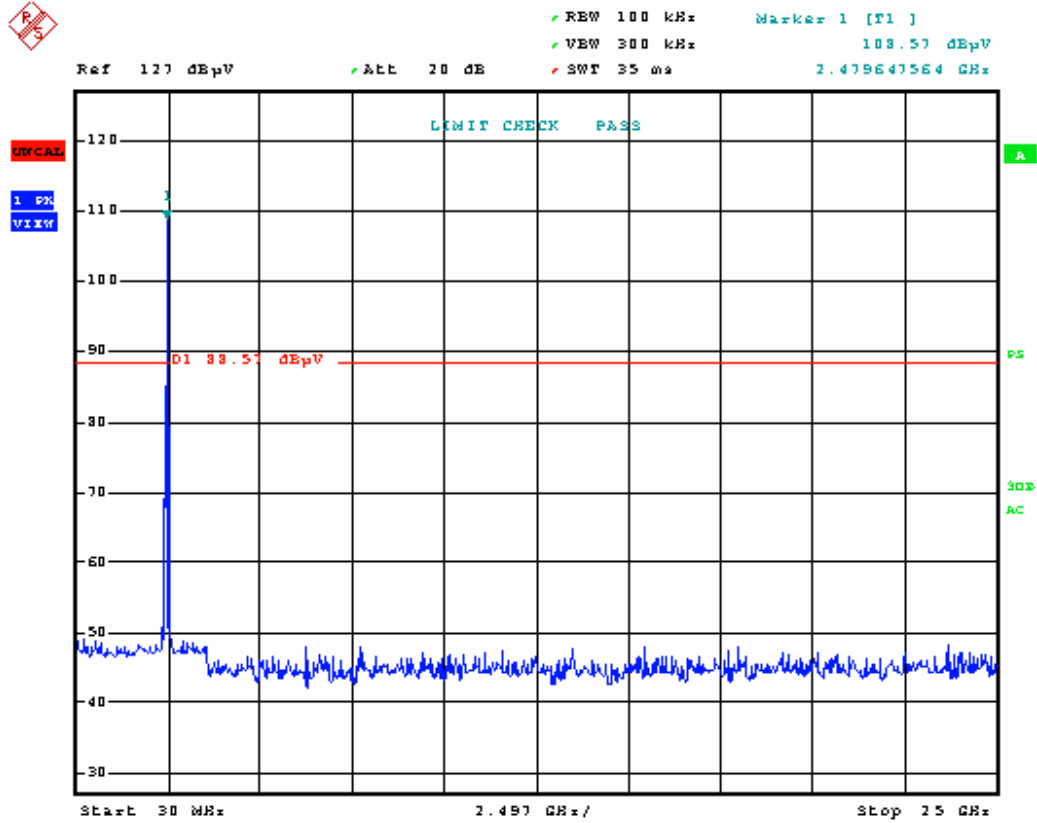
Date: 3.AUG.2011 09:53:52

Mid Channel 20



Date: 3.AUG.2011 09:55:06

High Channel 40



Date: 3.AUG.2011 09:55:31

14. RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in § 1.1307(b)

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

14.1 Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} =output power to antenna in Mw

G= gain of antenna in linear scale

π =3.1416

R= distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

14.2 Measurement Result

Channel	Channel Frequency (MHz)	Output Peak power (mW)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm ²)	Power density Limits (mW/cm ²)
Low	2402	9.23	0	0.00184	1
Middle	2440	9.38	0	0.00187	1
High	2480	9.68	0	0.00193	1