

# FCC TEST REPORT

**FCC ID** : LE2G4  
**Applicant** : JSW Pacific Corporation  
**Address** : 3F-3, No 700, Chung-Zweng Road Chung Ho City, Taipei, Hsien, Taiwan

**Equipment Under Test (EUT) :**

Product Name : Digital Wireless Surveillance System  
Model No. : G4

**Standards** : FCC CFR47 Part 15 Section 15.247:2010

**Date of Test** : May 7, 2012 ~ May 13, 2012  
**Date of Issue** : May 14, 2012

**Test Engineer** : Hunk yan / Engineer



**Reviewed By** : Philo zhong / Manager



<b>Test Result</b>	: PASS
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**Prepared By:**

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## 2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions (9kHz to 25GHz)	15.205(a) 15.209 15.247(d)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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## 4 General Information

### 4.1 Client Information

**Applicant** : JSW Pacific Corporation  
**Address of Applicant** : 3F-3, No 700, Chung-Zweng Road Chung Ho City, Taipei, Hsien, Taiwan

**Manufacturer** : JSW Pacific Corporation  
**Address of Manufacturer** : 3F-3, No 700, Chung-Zweng Road Chung Ho City, Taipei, Hsien, Taiwan

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

**Product Name** : Digital Wireless Surveillance System  
**Model No.** : G4

### 4.3 Details of E.U.T.

**Technical Data** : 5.0V DC or 3.7V 1800mAh Li-ion Rechargeable Battery.  
 Three kind of adapters can be used for diffent market.The full test were performed with these three adapters separately and battery, the worst case is the sample going with adapter 1, so the worst data were shown as follow.We confirm that all conditions had been considered during the test and full tests are passed.

**Adapter 1** : KSAS0060500100VUD (Ktec)  
 Input: 100 – 240VAC, 50/60Hz, 0.18A  
 Output: 5.0VDC, 1.0A

**Adapter 2** : SYS1421-0505-W2 (Sunny)  
 Input: 100 – 240VAC, 50/60Hz, 0.5A MAX  
 Output: 5.0VDC, 1.0A, 5W MAX

**Adapter 3** : SSA051F050100USD (KUANTEN)  
 Input: 100 – 240VAC, 50/60Hz, 0.2A  
 Output: 5.0VDC, 1.0A

**Operation Frequency** : 2414.25MHz ~ 2461.50MHz  
**Antenna Gain** : 2 dBi

### 4.4 Description of Support Units

The EUT has been tested as an independent unit.

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#### 4.5 Standards Applicable for Testing

The customer requested FCC tests for a Digital Wireless Surveillance System. The standards used were FCC CFR47 Part 15 Section 15.203, Section 15.207, Section 15.209 and Section 15.247.

#### 4.6 Test Facility

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

- **IC – Registration No.: IC7760A**

Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A, August 3, 2010.

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

#### 4.7 Test Location

All the tests were performed at:

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

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## 5 Equipment Used during Test

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY45114943	W2008001	9k-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Trilog Broadband Antenne	SCHWARZB ECK MESS-ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Broad-band Horn Antenna	SCHWARZB ECK MESS-ELEKTROM / BBHA 9120D(1201)	667	W2008003	1-18GHz	Aug. 2, 2011	Aug. 1, 2012	f < 10 GHz : ±1dB 10GHz < f < 18 GHz : ±1.5dB
Broadband Preamplifier	SCHWARZB ECK MESS-ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	Aug. 2, 2011	Aug. 1, 2012	±1.2dB
Broad-band Horn Antenna	SCHWARZB ECK MESS-ELEKTROM / BBHA 9170	399	W2008005	15-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1.5dB
Broadband Preamplifier	SCHWARZB ECK MESS-ELEKTROM / BBV 9719	9719-254	W2008006	18-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1.2dB
10m Coaxial Cable with N-male Connectors	SCHWARZB ECK MESS-ELEKTROM / AK 9515 H	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
10m 50 Ohm Coaxial Cable	SCHWARZB ECK MESS-ELEKTROM / AK 9513	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
Positioning Controller	C&C LAB/ CC-C-IF	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
Color Monitor	SUNSPO/ SP-14C	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-

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Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
Test Receiver	ROHDE&SC HWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Two-Line V-Network	ROHDE&SC HWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug. 2, 2011	Aug. 1, 2012	±10%
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range : 9K-1GHz RF voltage : -60 dBm- +10dBm	Aug. 2, 2011	Aug. 1, 2012	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1B
Active Loop Antenna	Beijing Dazhi / ZN30900A	-	-	-	Aug. 2, 2011	Aug. 1, 2012	±1dB
AC Power Supply	TONGYUN/ DTDGC-4	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-

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## 6 Conducted Emission

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

### 6.1 E.U.T. Operation

#### Operating Environment:

Temperature: 25.5 °C  
Humidity: 51 % RH  
Atmospheric Pressure: 1012 mbar

#### EUT Operation:

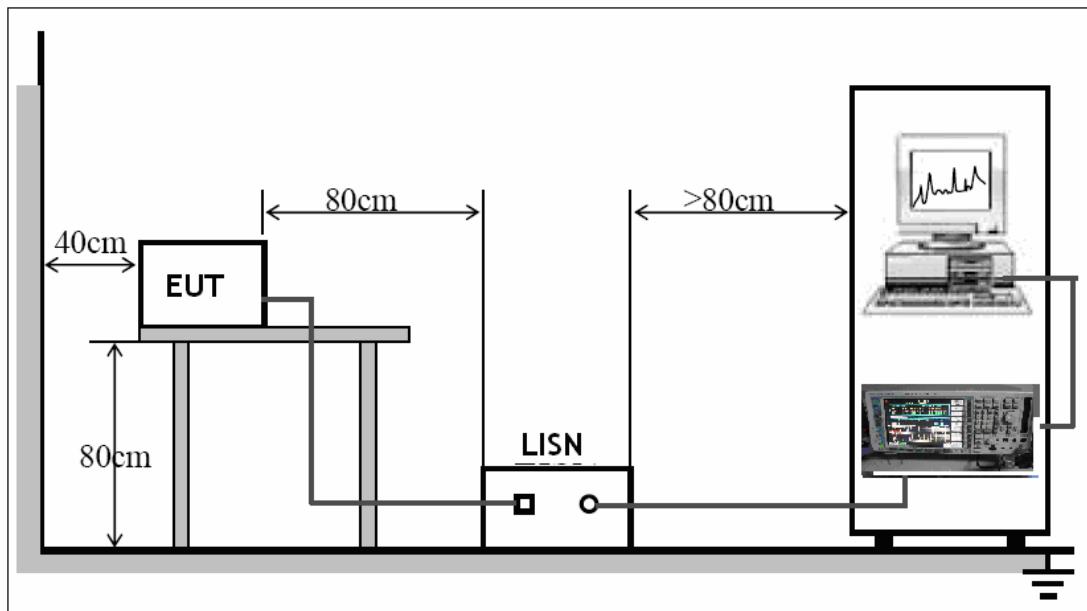
The pre-test was performance on three modes: 1. normal link and display, 2. normal link and record, 3. normal link and connect to internet. The worst mode is mode 1, so the data show in the report is that mode's only.

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

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

## 6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15.207 limits.



The EUT was placed on the test table in shielding room

## 6.3 Conducted Emission Test Result

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

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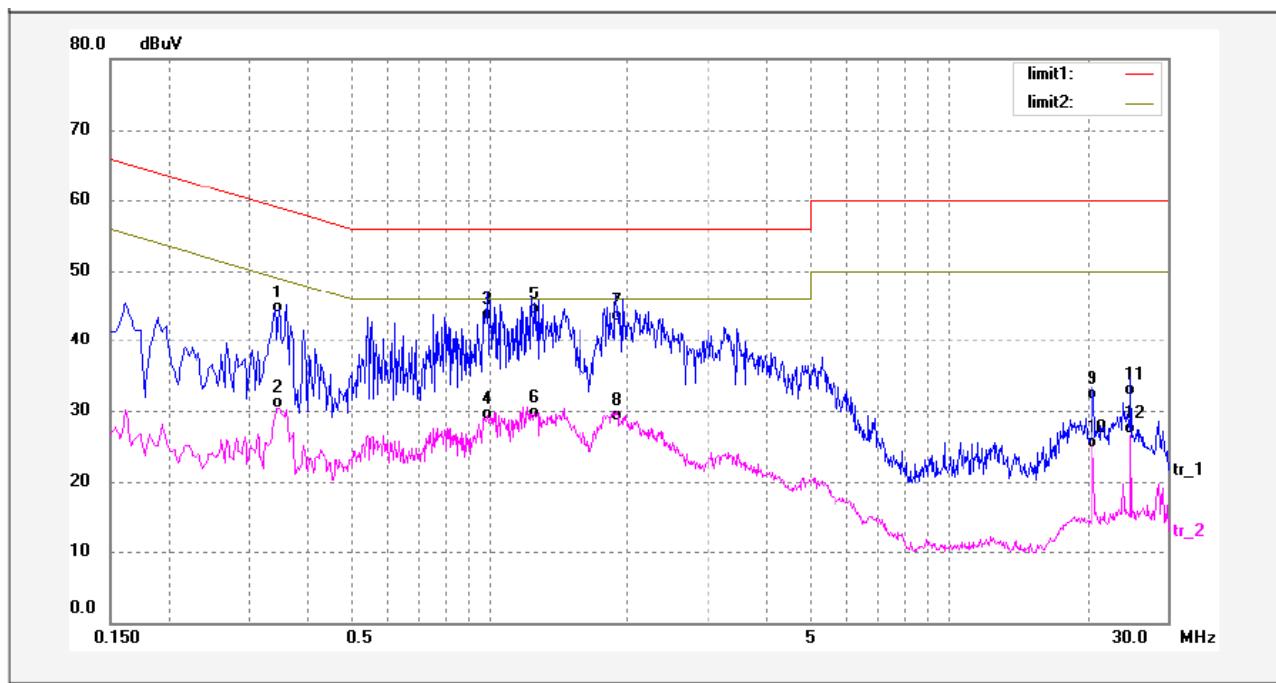
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Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3500	33.47	10.34	43.81	58.96	-15.15	QP	
2	0.3500	19.88	10.34	30.22	48.96	-18.74	AVG	
3	0.9980	32.38	10.45	42.83	56.00	-13.17	QP	
4	0.9980	18.30	10.45	28.75	46.00	-17.25	AVG	
5	1.2380	33.12	10.51	43.63	56.00	-12.37	QP	
6	1.2380	18.41	10.51	28.92	46.00	-17.08	AVG	
7	1.8900	32.10	10.67	42.77	56.00	-13.23	QP	
8	1.8900	17.91	10.67	28.58	46.00	-17.42	AVG	
9	20.7020	20.36	11.16	31.52	60.00	-28.48	QP	
10	20.7020	13.55	11.16	24.71	50.00	-25.29	AVG	
11	24.9980	20.92	11.22	32.14	60.00	-27.86	QP	
12	24.9980	15.50	11.22	26.72	50.00	-23.28	AVG	

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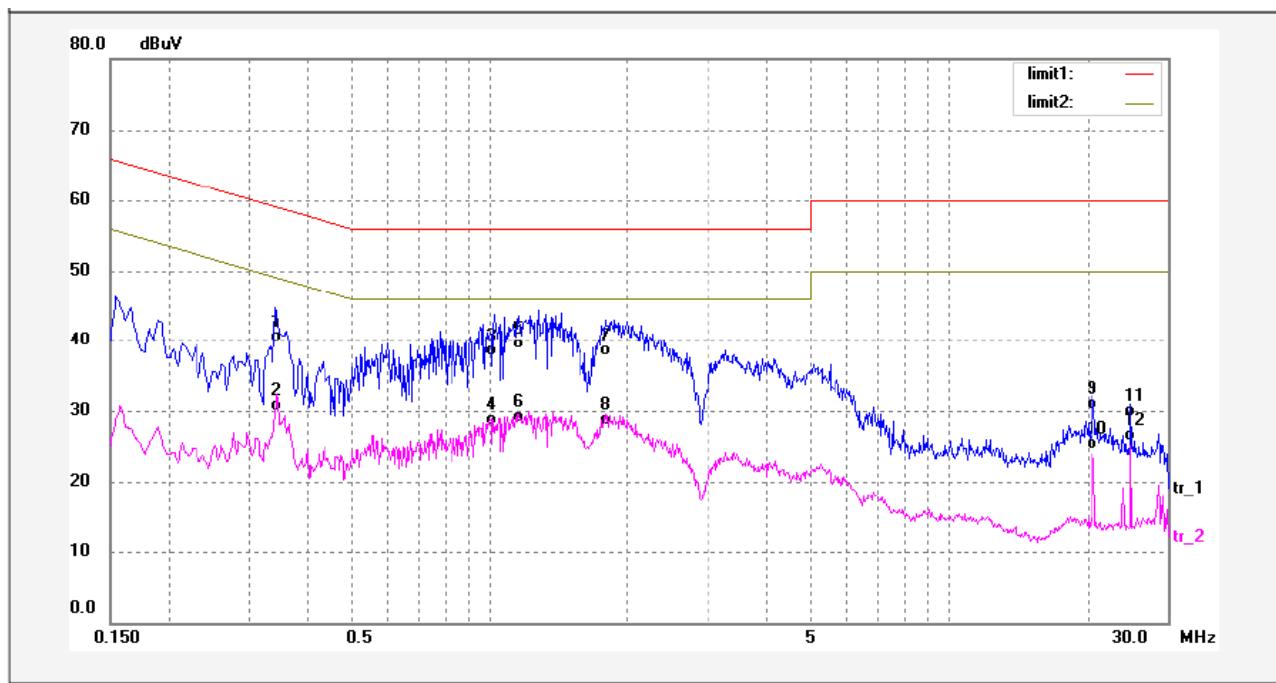
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FCC ID: LE2G4

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3420	29.38	10.34	39.72	59.15	-19.43	QP	
2	0.3420	19.54	10.34	29.88	49.15	-19.27	AVG	
3	0.9980	27.33	10.45	37.78	56.00	-18.22	QP	
4	0.9980	17.36	10.45	27.81	46.00	-18.19	AVG	
5	1.1620	28.30	10.49	38.79	56.00	-17.21	QP	
6	1.1620	17.87	10.49	28.36	46.00	-17.64	AVG	
7	1.7940	27.11	10.65	37.76	56.00	-18.24	QP	
8	1.7940	17.30	10.65	27.95	46.00	-18.05	AVG	
9	20.7020	18.92	11.16	30.08	60.00	-29.92	QP	
10	20.7020	13.40	11.16	24.56	50.00	-25.44	AVG	
11	24.9980	17.90	11.22	29.12	60.00	-30.88	QP	
12	24.9980	14.41	11.22	25.63	50.00	-24.37	AVG	

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#### 6.4 Photograph – Conducted Emission Test Setup



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## 7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: Based on DA 00-705

Test Result: PASS

Frequency Range: 9kHz to 25GHz

Measurement Distance: 3m

Limit:

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

Test mode: The EUT was tested in continuously Transmit mode.

### 7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

### 7.2 Measurement Uncertainty

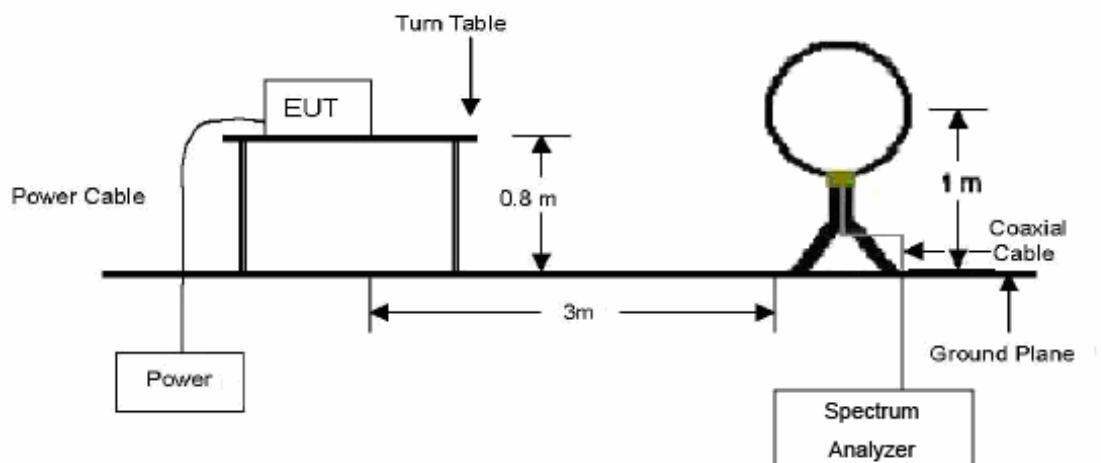
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is  $\pm 5.03\text{dB}$ .

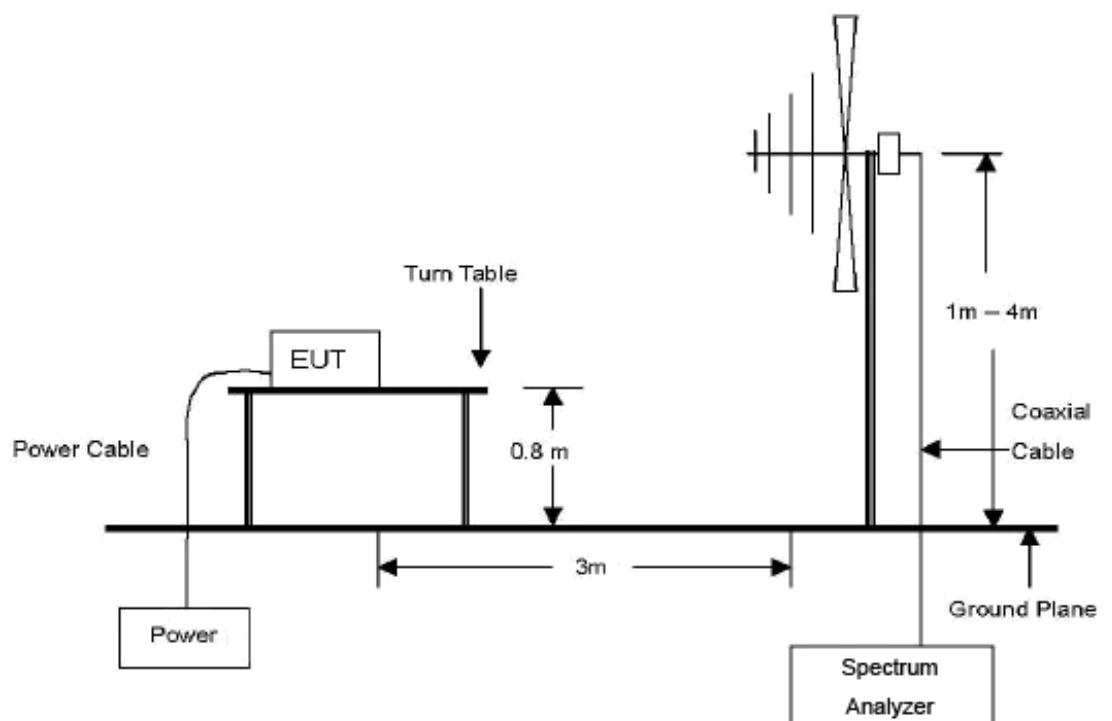
### 7.3 Test Setup

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

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 KHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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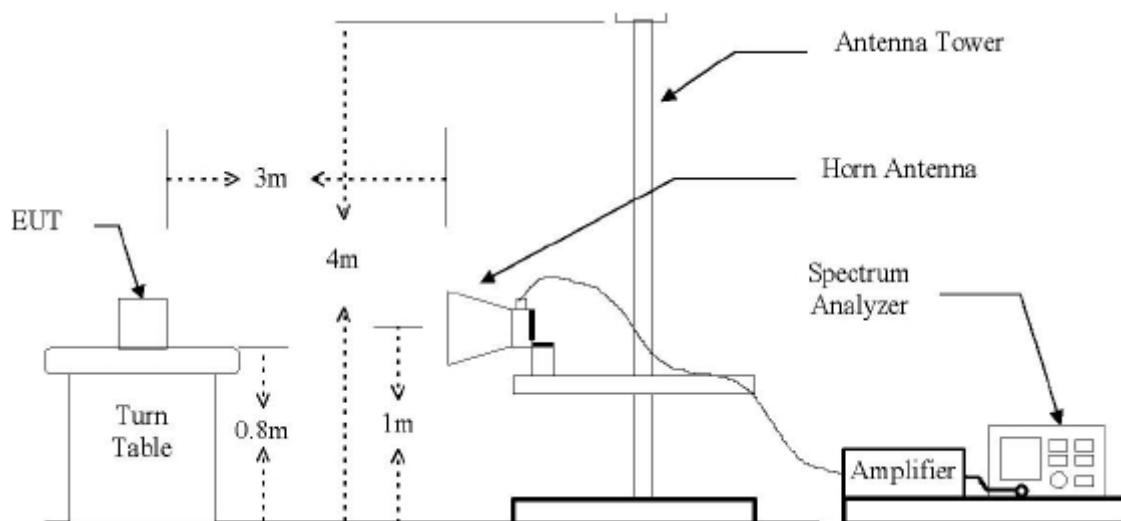
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The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 25 GHz Emissions.



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## 7.4 Spectrum Analyzer Setup

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

9kHz ~ 30MHz

Start Frequency .....	9kHz
Stop Frequency .....	30MHz
Sweep Speed.....	Auto
IF Bandwidth.....	10KHz
Video Bandwidth.....	10KHz
Resolution Bandwidth.....	10KHz

30MHz ~ 1GHz

Start Frequency .....	30 MHz
Stop Frequency .....	1000MHz
Sweep Speed.....	Auto
IF Bandwidth.....	120 KHz
Video Bandwidth.....	100KHz
Quasi-Peak Adapter Bandwidth .....	120 KHz
Quasi-Peak Adapter Mode .....	Normal
Resolution Bandwidth .....	100KHz

Above 1GHz

Start Frequency .....	1000 MHz
Stop Frequency .....	25000MHz
Sweep Speed.....	Auto
IF Bandwidth.....	120 KHz
Video Bandwidth.....	3MHz
Quasi-Peak Adapter Bandwidth .....	120 KHz
Quasi-Peak Adapter Mode .....	Normal
Resolution Bandwidth .....	1MHz

## 7.5 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X(normal uses) axis positioning. And all the modes was tested in the report. Only the worst case is shown in the report.

## 7.6 Corrected Amplitude & Margin Calculation

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

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

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

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

## 7.7 Summary of Test Results

According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 standards.

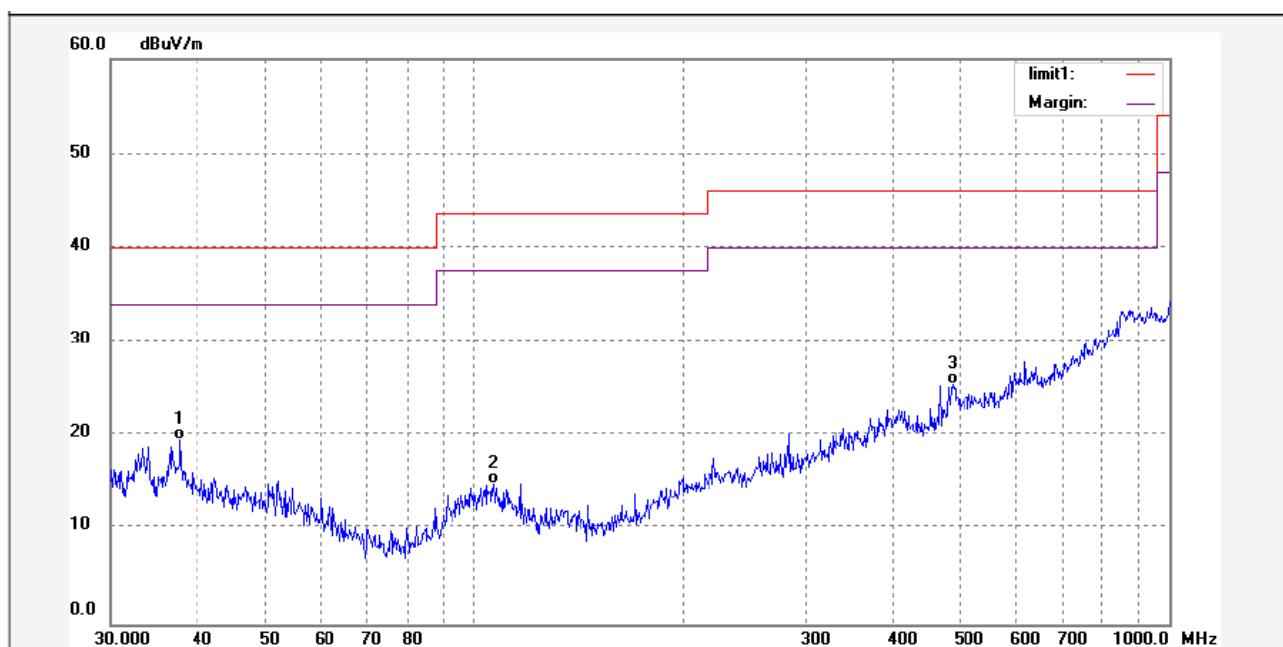
### Test mode: continuously recevie mode

Remark: the EUT was pretested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel only.

Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



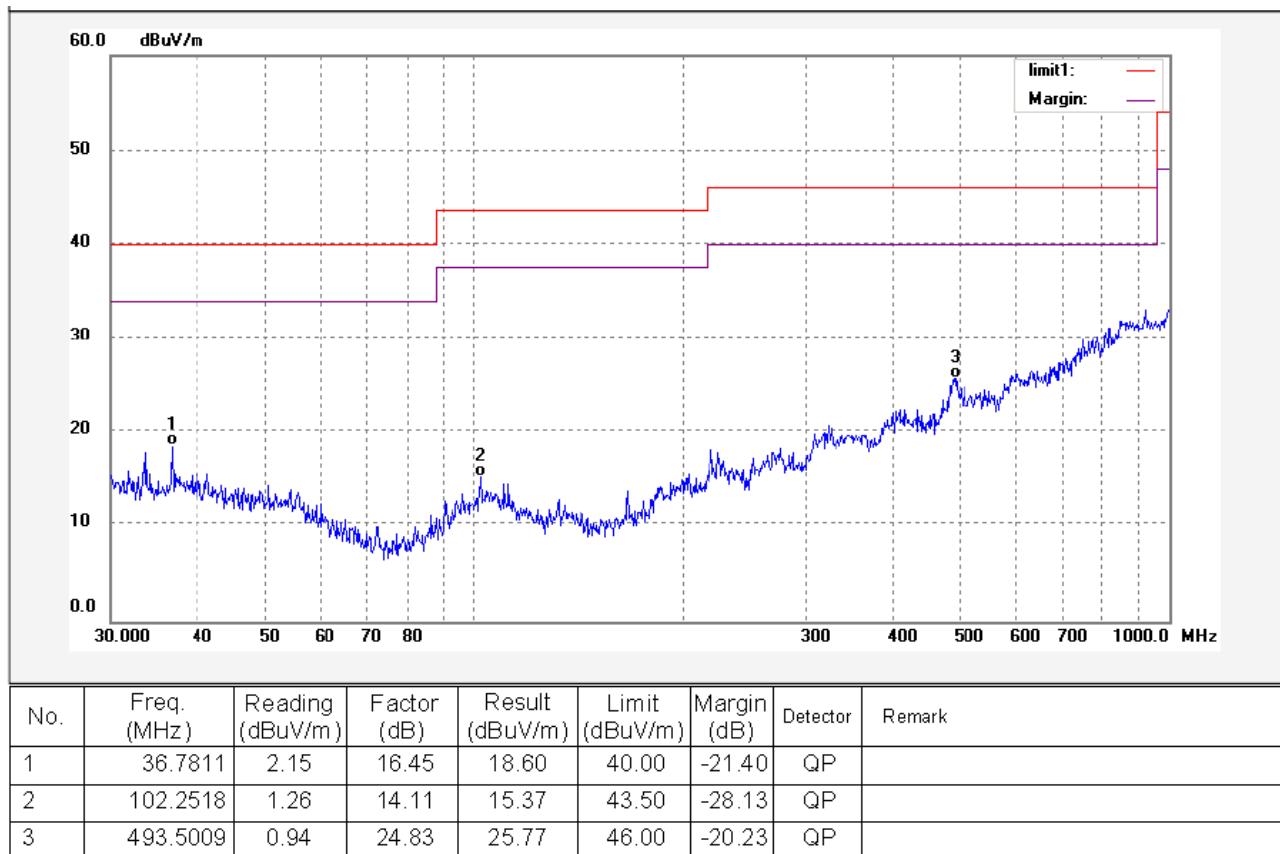
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.6970	3.01	16.64	19.65	40.00	-20.35	QP	
2	106.6551	0.80	14.09	14.89	43.50	-28.61	QP	
3	488.3263	0.22	25.25	25.47	46.00	-20.53	QP	

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Antenna polarization: Horizontal



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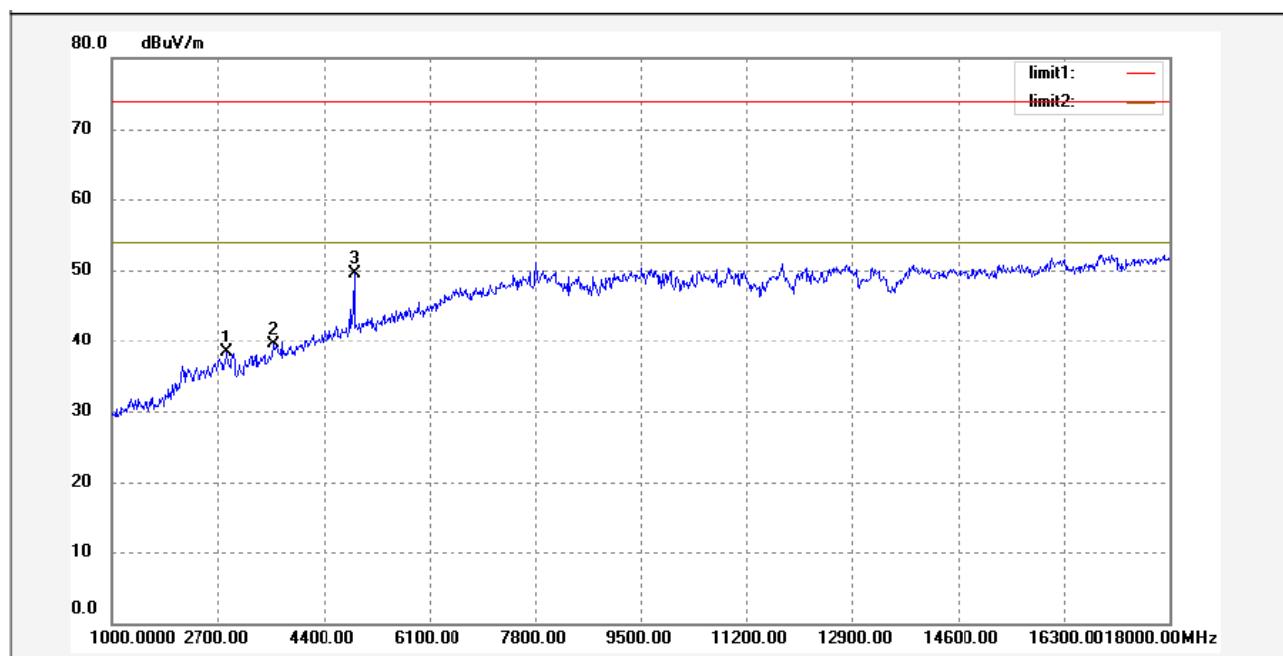
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Test Frequency: Above 1GHz radiation test data:

Remark: No any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2856.713	47.09	-8.85	38.24	74.00	-35.76	peak	
2	3589.178	47.06	-7.56	39.50	74.00	-34.50	peak	
3	4900.802	53.56	-4.08	49.48	74.00	-24.52	peak	

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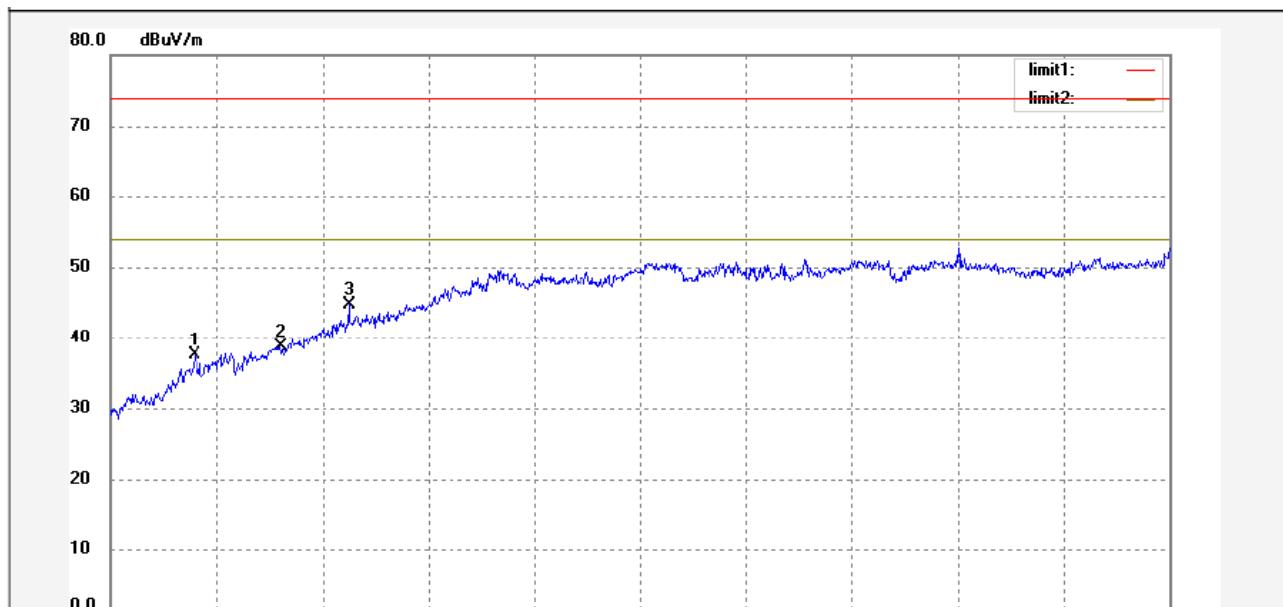
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FCC ID: LE2G4

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2345.691	47.44	-10.02	37.42	74.00	-36.58	peak	
2	3708.417	46.11	-7.32	38.79	74.00	-35.21	peak	
3	4832.665	48.99	-4.19	44.80	74.00	-29.20	peak	

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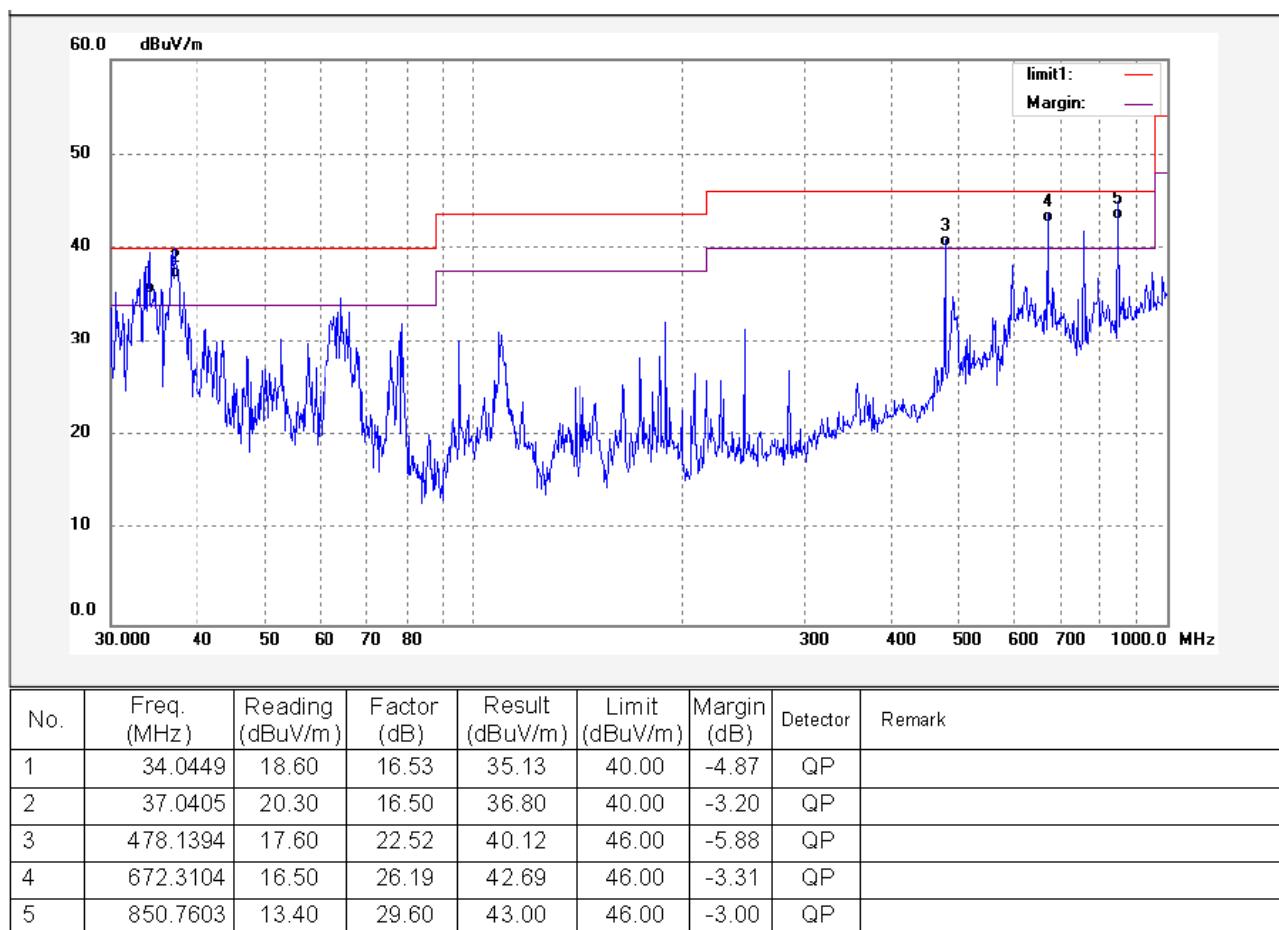
### Test mode: continuously transmit mode

Remark: The EUT was pretested on normal linking mode, normal linking and REC mode, normal linking and on line mode, and continuously transmit mode, the worst mode is normal linking and on line mode. the EUT was pretested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel only.

Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical

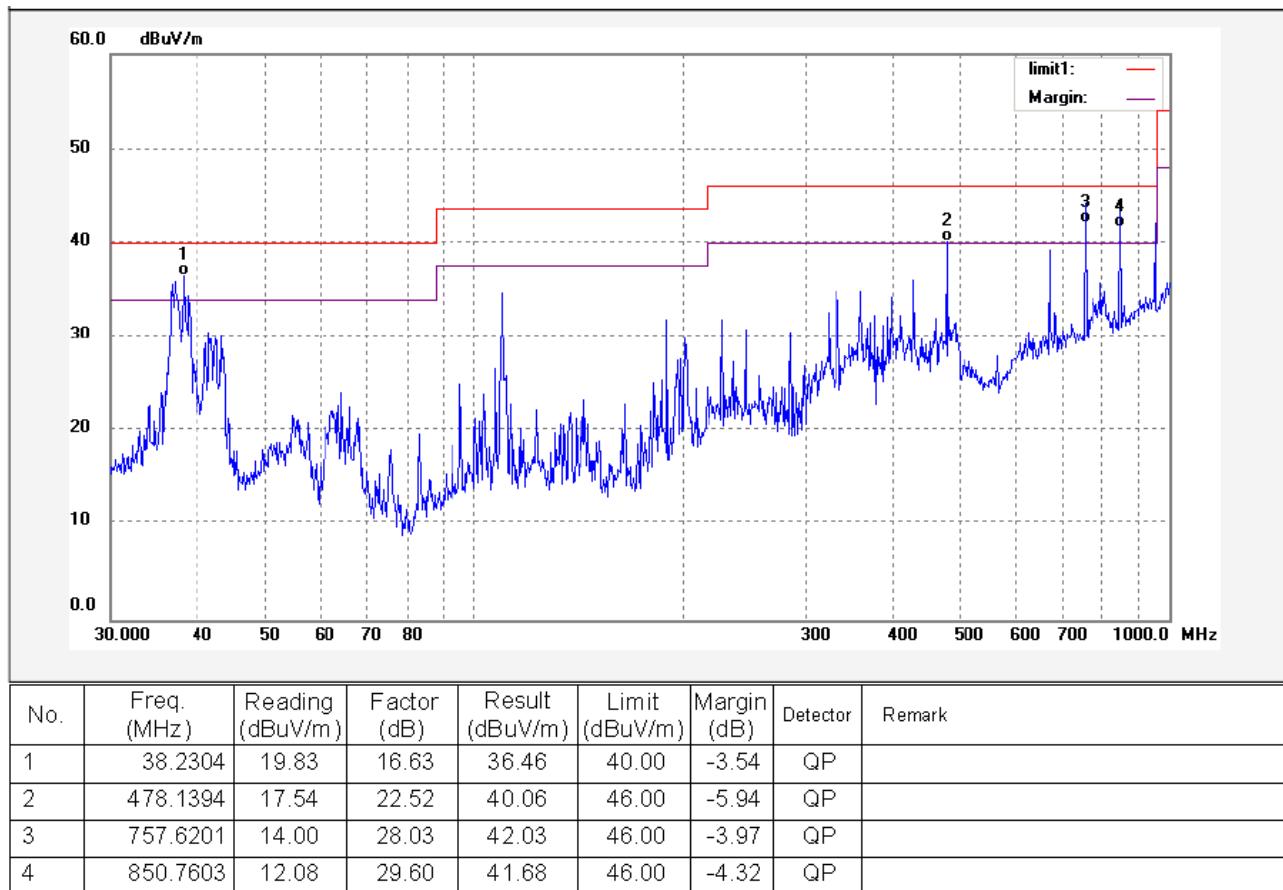


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FCC ID: LE2G4

Antenna polarization: Horizontal



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Reference No.: WT12052777-D-S-F

JSW Pacific Corporation

FCC ID: LE2G4

Test Frequency: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
<b>Low frequency</b>							
2414.25	AV	Vertical	103.64		(Fund.)	1.1	25
4828.50	AV	Vertical	44.21	54.00	-9.79	1.3	85
7242.75	AV	Vertical	47.24	54.00	-6.76	1.4	160
9657.00	AV	Vertical	43.21	54.00	-10.79	1.9	125
12071.25	AV	Vertical	38.15	54.00	-15.85	1.5	180
14485.50	AV	Vertical	39.44	54.00	-14.56	1.5	150
16899.75	AV	Vertical	40.15	54.00	-13.85	1.8	140
19314.00	AV	Vertical	39.85	54.00	-14.15	1.6	100
21728.25	AV	Vertical	34.16	54.00	-19.84	1.7	25
24142.50	AV	Vertical	37.89	54.00	-16.11	1.5	125
2414.25	AV	Horizontal	98.22		(Fund.)	1.3	55
4828.50	AV	Horizontal	42.15	54.00	-11.85	1.5	180
7242.75	AV	Horizontal	40.15	54.00	-13.85	1.5	120
9657.00	AV	Horizontal	40.25	54.00	-13.75	1.4	150
12071.25	AV	Horizontal	36.15	54.00	-17.85	1.5	125
14485.50	AV	Horizontal	37.15	54.00	-16.85	1.4	170
16899.75	AV	Horizontal	40.28	54.00	-13.72	1.5	160
19314.00	AV	Horizontal	34.15	54.00	-19.85	2.0	160
21728.25	AV	Horizontal	32.51	54.00	-21.49	1.2	145
24142.50	AV	Horizontal	30.25	54.00	-23.75	1.7	65
2414.25	PK	Vertical	116.15		(Fund.)	1.2	40
4828.50	PK	Vertical	57.34	74.00	-16.66	2.0	110
7242.75	PK	Vertical	58.15	74.00	-15.85	1.6	140
9657.00	PK	Vertical	54.12	74.00	-19.88	1.6	220
12071.25	PK	Vertical	50.26	74.00	-23.74	1.1	135
14485.50	PK	Vertical	53.54	74.00	-20.46	1.3	115
16899.75	PK	Vertical	47.58	74.00	-26.42	1.3	200
19314.00	PK	Vertical	47.02	74.00	-26.98	1.3	185
21728.25	PK	Vertical	45.45	74.00	-28.55	1.6	125
24142.50	PK	Vertical	49.45	74.00	-24.55	1.5	185
2414.25	PK	Horizontal	106.15		(Fund.)	1.9	125
4828.50	PK	Horizontal	40.12	74.00	-33.88	2.5	165
7242.75	PK	Horizontal	39.25	74.00	-34.75	1.9	145
9657.00	PK	Horizontal	42.88	74.00	-31.12	1.5	75
12071.25	PK	Horizontal	31.15	74.00	-42.85	1.3	225
14485.50	PK	Horizontal	36.48	74.00	-37.52	1.8	75
16899.75	PK	Horizontal	39.48	74.00	-34.52	1.9	255

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JSW Pacific Corporation

FCC ID: LE2G4

19314.00	PK	Horizontal	34.15	74.00	-39.85	1.8	135
21728.25	PK	Horizontal	32.18	74.00	-41.82	1.3	185
24142.50	PK	Horizontal	36.55	74.00	-37.45	1.5	135

**Middle frequency**

2437.88	AV	Vertical	102.56		(Fund.)	1.3	55
4875.76	AV	Vertical	46.24	54.00	-7.76	1.2	130
7313.64	AV	Vertical	45.02	54.00	-8.98	1.2	140
9751.52	AV	Vertical	44.24	54.00	-9.76	1.2	85
12189.40	AV	Vertical	43.15	54.00	-10.85	1.1	45
14627.28	AV	Vertical	37.21	54.00	-16.79	1.2	180
17065.16	AV	Vertical	38.48	54.00	-15.52	1.5	40
19503.04	AV	Vertical	39.41	54.00	-14.59	1.7	70
21940.92	AV	Vertical	39.64	54.00	-14.36	1.6	235
24378.80	AV	Vertical	37.64	54.00	-16.36	1.4	150
2437.88	AV	Horizontal	96.24		(Fund.)	1.5	195
4875.76	AV	Horizontal	44.24	54.00	-9.76	1.3	160
7313.64	AV	Horizontal	42.57	54.00	-11.43	1.4	335
9751.52	AV	Horizontal	40.97	54.00	-13.03	1.3	170
12189.40	AV	Horizontal	37.45	54.00	-16.55	1.1	210
14627.28	AV	Horizontal	37.34	54.00	-16.66	1.5	270
17065.16	AV	Horizontal	33.85	54.00	-20.15	1.6	215
19503.04	AV	Horizontal	36.54	54.00	-17.46	1.5	150
21940.92	AV	Horizontal	37.46	54.00	-16.54	1.2	215
24378.80	AV	Horizontal	32.45	54.00	-21.55	1.8	180
2437.88	PK	Vertical	114.75		(Fund.)	1.3	55
4875.76	PK	Vertical	61.42	74.00	-12.58	1.2	130
7313.64	PK	Vertical	59.54	74.00	-14.46	1.3	150
9751.52	PK	Vertical	57.24	74.00	-16.76	1.3	200
12189.40	PK	Vertical	55.48	74.00	-18.52	1.5	270
14627.28	PK	Vertical	47.95	74.00	-26.05	1.2	65
17065.16	PK	Vertical	54.12	74.00	-19.88	1.2	75
19503.04	PK	Vertical	49.64	74.00	-24.36	1.5	195
21940.92	PK	Vertical	53.24	74.00	-20.76	1.3	215
24378.80	PK	Vertical	46.15	74.00	-27.85	1.2	200
2437.88	PK	Horizontal	108.95		(Fund.)	1.5	75
4875.76	PK	Horizontal	56.87	74.00	-17.13	2.0	150
7313.64	PK	Horizontal	54.95	74.00	-19.05	1.6	195
9751.52	PK	Horizontal	53.67	74.00	-20.33	1.7	145
12189.40	PK	Horizontal	50.15	74.00	-23.85	1.4	245
14627.28	PK	Horizontal	48.54	74.00	-25.46	1.4	245
17065.16	PK	Horizontal	50.13	74.00	-23.87	1.4	200
19503.04	PK	Horizontal	47.23	74.00	-26.77	1.7	215
21940.92	PK	Horizontal	43.25	74.00	-30.75	1.3	75
24378.80	PK	Horizontal	44.21	74.00	-29.79	2.0	235

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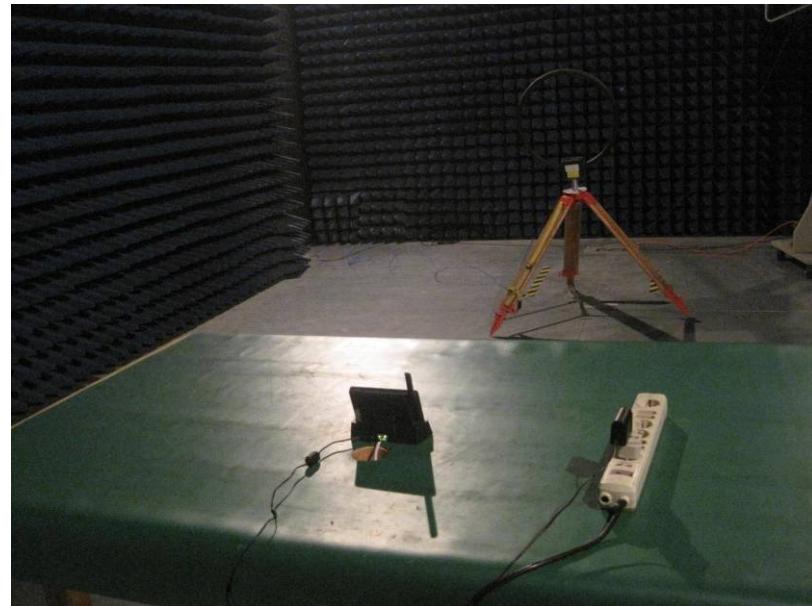
Reference No.: WT12052777-D-S-F

High frequency							
Frequency	Modulation	Polarization	Power (dBm)	Bandwidth (MHz)	Phase (degrees)	Group Delay (ns)	Antenna Gain (dBi)
2461.50	AV	Vertical	102.98		(Fund.)	1.3	205
4923.00	AV	Vertical	41.26	54.00	-12.74	1.2	40
7384.50	AV	Vertical	44.21	54.00	-9.79	1.4	170
9846.00	AV	Vertical	44.02	54.00	-9.98	1.4	145
12307.50	AV	Vertical	39.37	54.00	-14.63	1.3	135
14769.00	AV	Vertical	43.24	54.00	-10.76	1.8	150
17230.50	AV	Vertical	40.15	54.00	-13.85	1.3	140
19692.00	AV	Vertical	44.85	54.00	-9.15	1.3	250
22153.50	AV	Vertical	39.48	54.00	-14.52	1.3	175
24615.00	AV	Vertical	36.15	54.00	-17.85	1.7	195
2461.50	AV	Horizontal	96.98		(Fund.)	1.5	195
4923.00	AV	Horizontal	42.32	54.00	-11.68	2.0	220
7384.50	AV	Horizontal	39.15	54.00	-14.85	1.2	185
9846.00	AV	Horizontal	42.21	54.00	-11.79	1.6	230
12307.50	AV	Horizontal	40.15	54.00	-13.85	1.1	195
14769.00	AV	Horizontal	34.98	54.00	-19.02	1.3	210
17230.50	AV	Horizontal	36.94	54.00	-17.06	1.4	260
19692.00	AV	Horizontal	32.54	54.00	-21.46	1.9	120
22153.50	AV	Horizontal	36.45	54.00	-17.55	1.2	155
24615.00	AV	Horizontal	30.15	54.00	-23.85	1.7	150
2461.50	PK	Vertical	113.56		(Fund.)	1.3	235
4923.00	PK	Vertical	58.24	74.00	-15.76	1.3	70
7384.50	PK	Vertical	55.02	74.00	-18.98	1.7	160
9846.00	PK	Vertical	55.26	74.00	-18.74	1.5	180
12307.50	PK	Vertical	50.32	74.00	-23.68	1.2	180
14769.00	PK	Vertical	60.21	74.00	-13.79	1.2	125
17230.50	PK	Vertical	53.21	74.00	-20.79	1.1	165
19692.00	PK	Vertical	55.05	74.00	-18.95	1.2	195
22153.50	PK	Vertical	53.16	74.00	-20.84	1.4	200
24615.00	PK	Vertical	47.45	74.00	-26.55	1.4	215
2461.50	PK	Horizontal	106.31		(Fund.)	1.6	255
4923.00	PK	Horizontal	55.32	74.00	-18.68	1.7	165
7384.50	PK	Horizontal	52.34	74.00	-21.66	1.5	225
9846.00	PK	Horizontal	51.39	74.00	-22.61	1.5	265
12307.50	PK	Horizontal	49.59	74.00	-24.41	1.3	185
14769.00	PK	Horizontal	43.26	74.00	-30.74	1.9	185
17230.50	PK	Horizontal	50.24	74.00	-23.76	1.8	230
19692.00	PK	Horizontal	48.26	74.00	-25.74	1.7	215
22153.50	PK	Horizontal	48.56	74.00	-25.44	1.8	195
24615.00	PK	Horizontal	42.31	74.00	-31.69	1.4	280

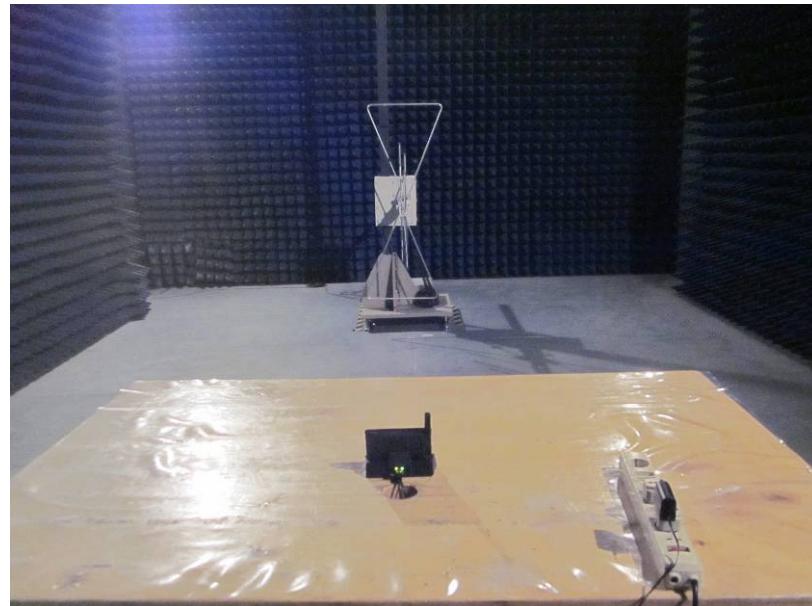
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## 7.8 Photograph – Radiation Spurious Emission Test Setup

Below 30 MHz



30 MHz-1GHz



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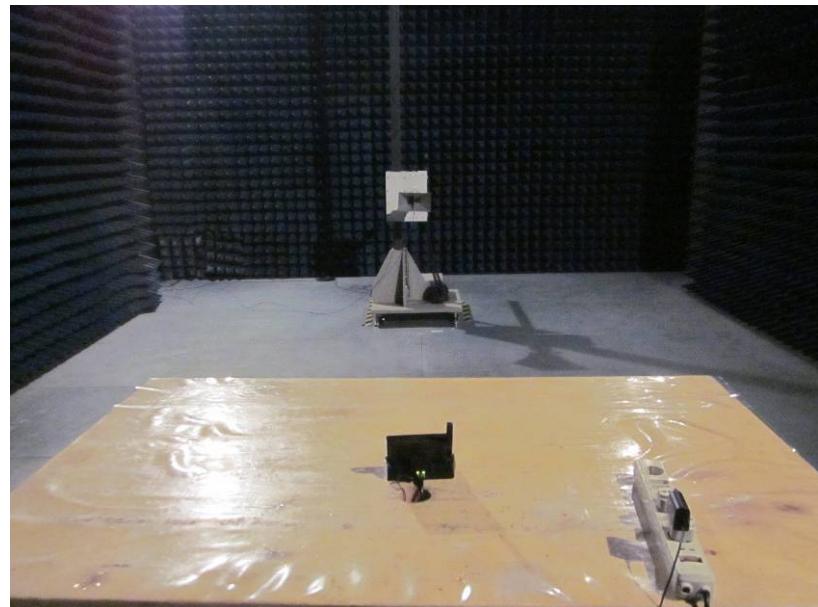
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FCC ID: LE2G4

Above 1GHz



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## 8 Band Edge Measurement

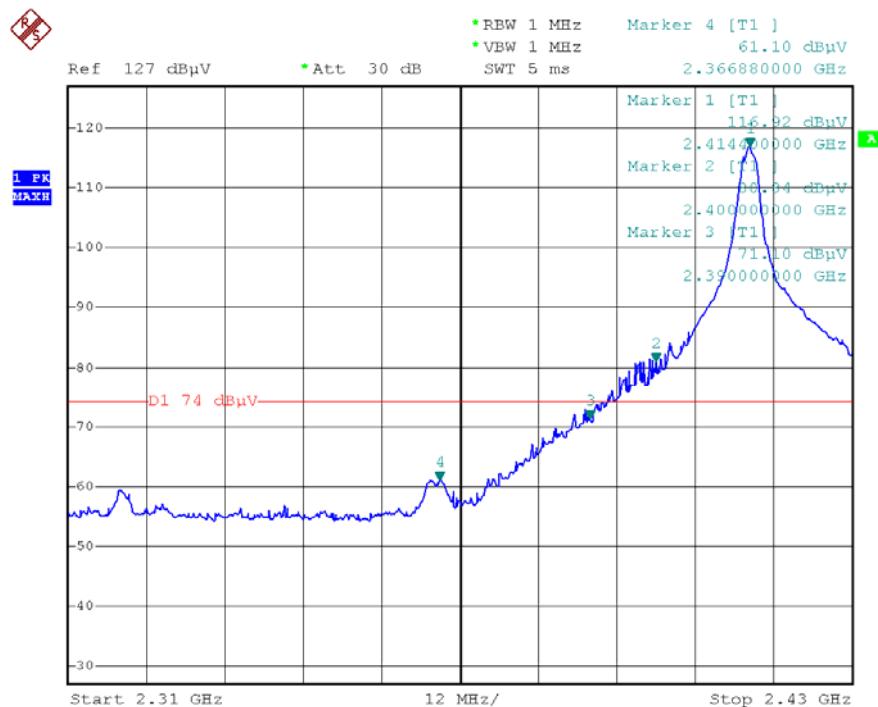
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	Based on DA 00-705
Measurement Distance:	3m
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz
Detector:	<p>For Peak value:</p> <p>RBW = 1 MHz for <math>f \geq 1</math> GHz  <math>VBW \geq RBW</math>; Sweep = auto  Detector function = peak  Trace = max hold</p> <p>For AVG value:</p> <p>RBW = 1 MHz for <math>f \geq 1</math> GHz  <math>VBW = 10\text{Hz}</math>; Sweep = auto  Detector function = AVG  Trace = max hold</p>

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FCC ID: LE2G4

## 8.1 Test Result:

### Low Channel – Peak



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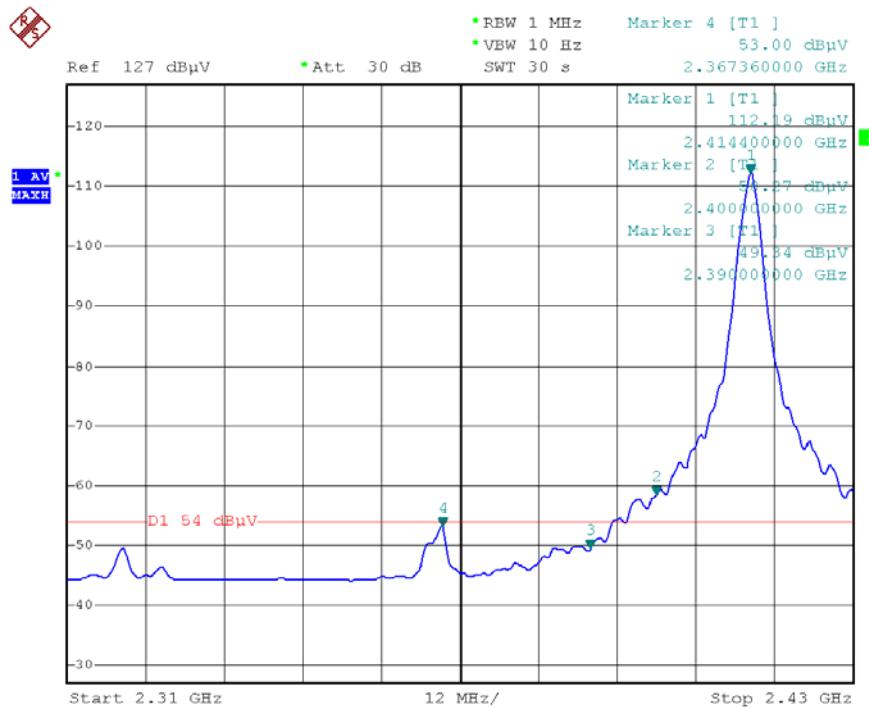
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JSW Pacific Corporation

FCC ID: LE2G4

## Low Channel – AV



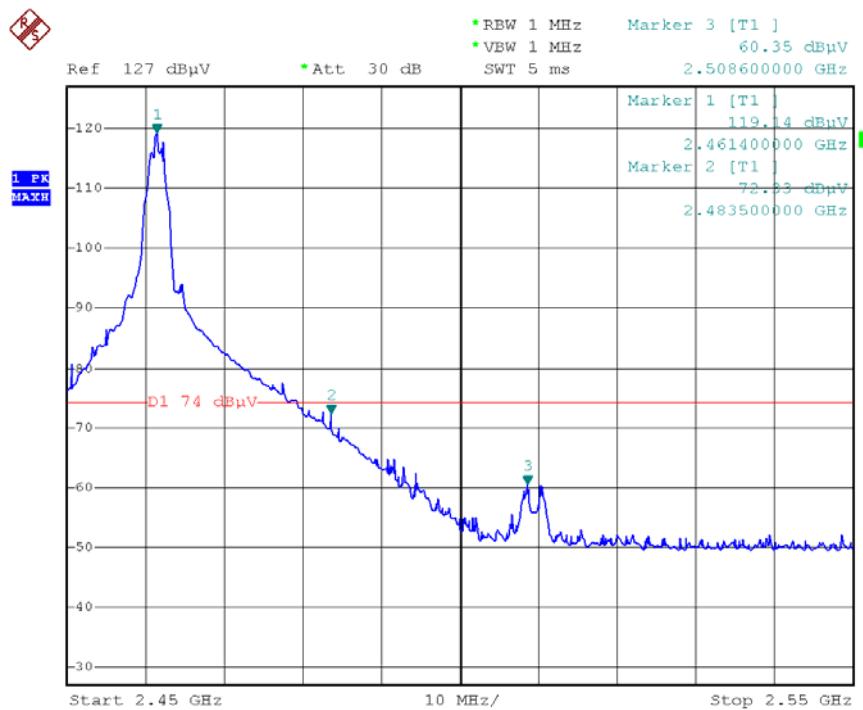
The results shown in this test report refer only to the sample(s) tested , This Test report cannot be reproduced, except in full, without prior written permission of the Company.

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FCC ID: LE2G4

**High Channel – Peak**

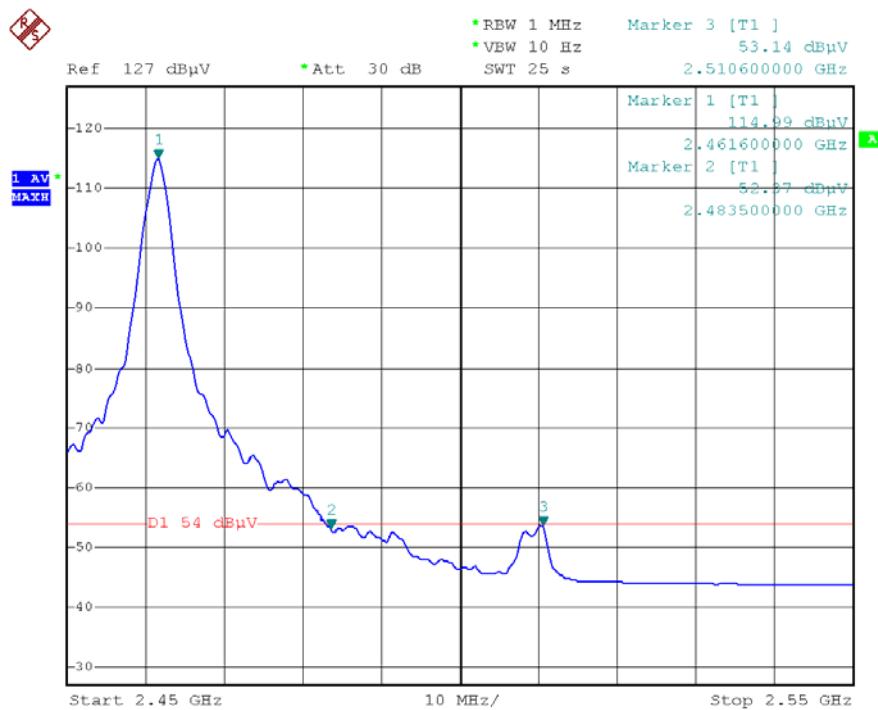
The results shown in this test report refer only to the sample(s) tested , This Test report cannot be reproduced, except in full, without prior written permission of the Company.

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FCC ID: LE2G4

**High Channel – AV**

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## 9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: Based on DA 00-705

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

### 9.1 Test Procedure:

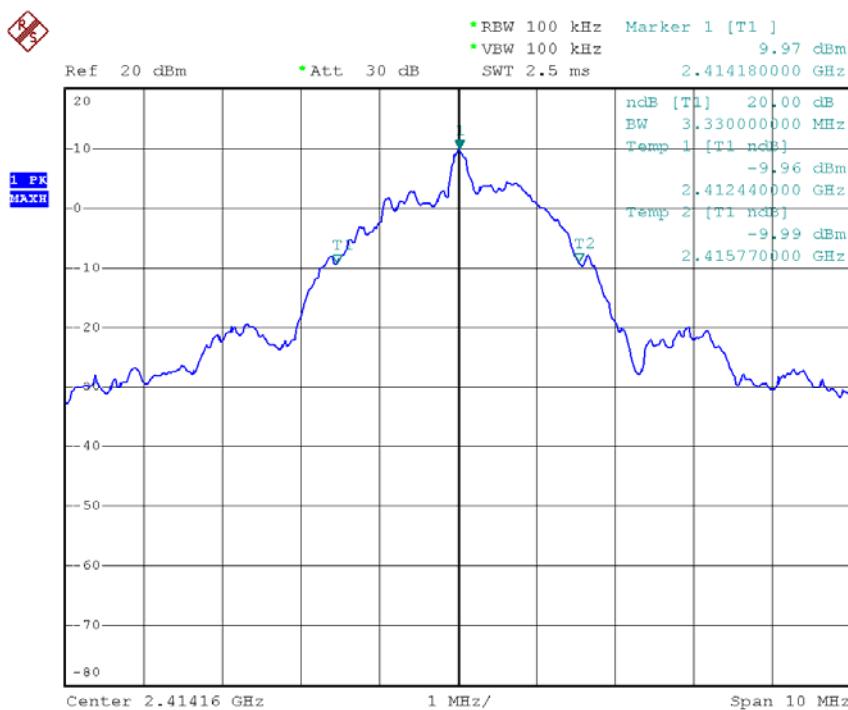
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

### 9.2 Test Result:

Test Channel	Bandwidth
Low	3.33MHz
Middle	3.24MHz
High	3.38MHz

Test result plot as follows:

Low Channel

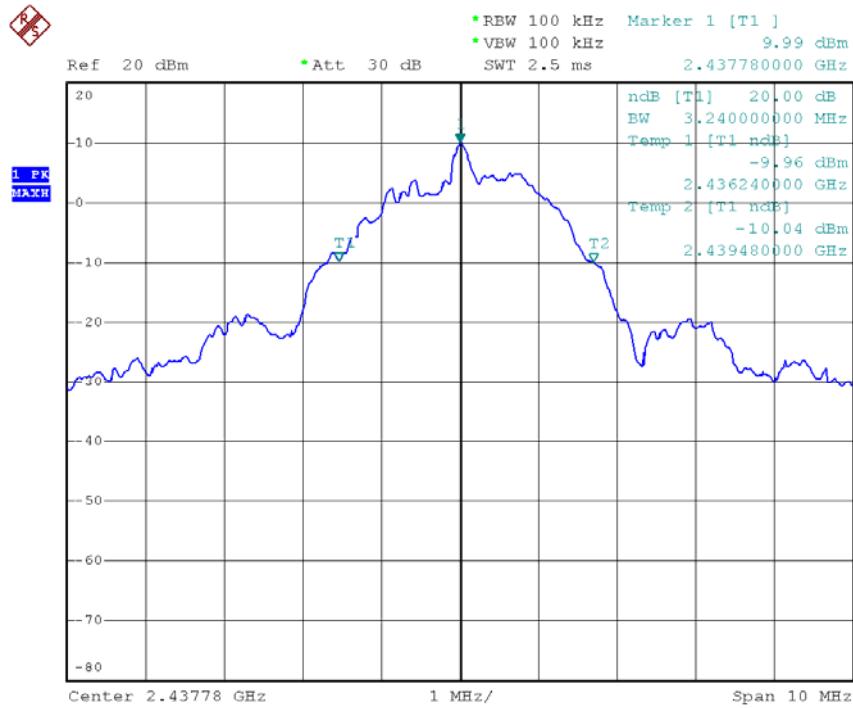


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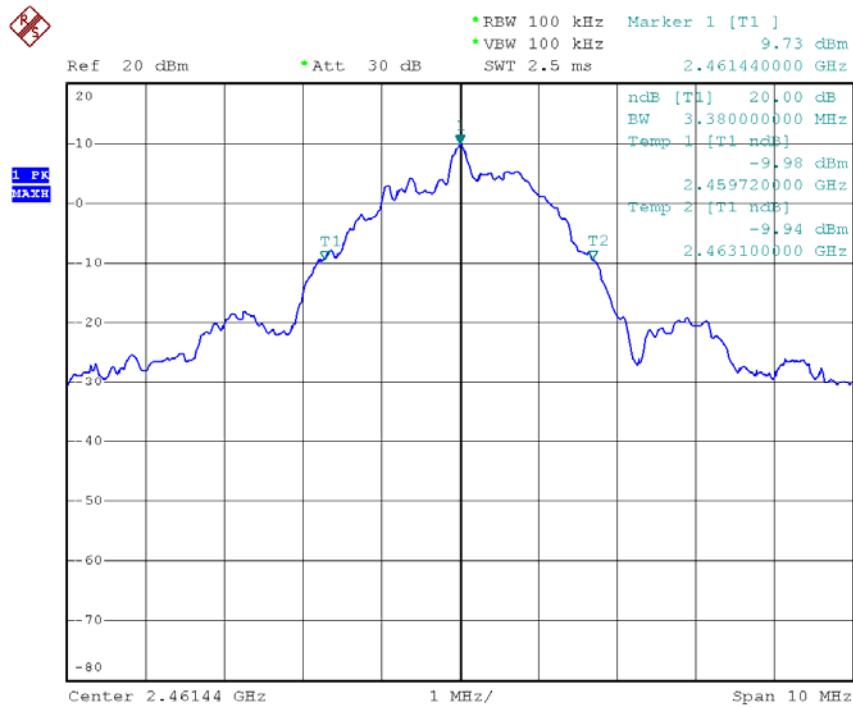
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## Middle Channel



## High Channel



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## 10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on ANSI C63.4:2003
Test Limit:	Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result “Number of Hopping Frequency” of this document. The 0.125watts (20.97 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

### 10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 10 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

### 10.2 Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	9.98	20.97
Middle	9.99	20.97
High	9.80	20.97

## 11 Hopping Channel Separation

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 1W.
Test Mode:	Test in hopping transmitting operating mode.

### 11.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 7MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

### 11.2 Test Result:

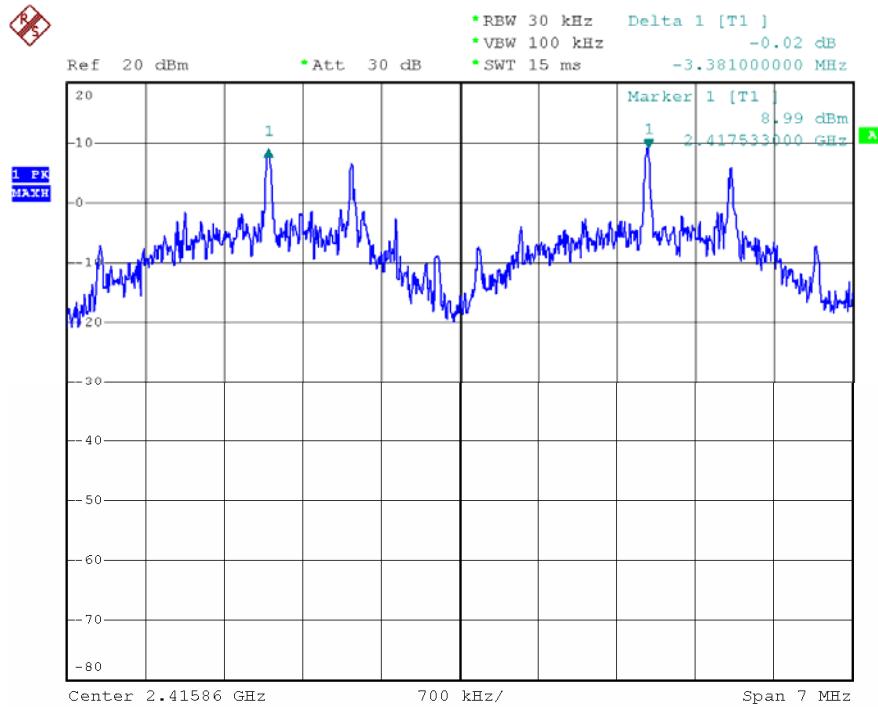
Test Channel	Separation (MHz)	Result
Low	3.381	PASS
Middle	3.381	PASS
High	3.374	PASS

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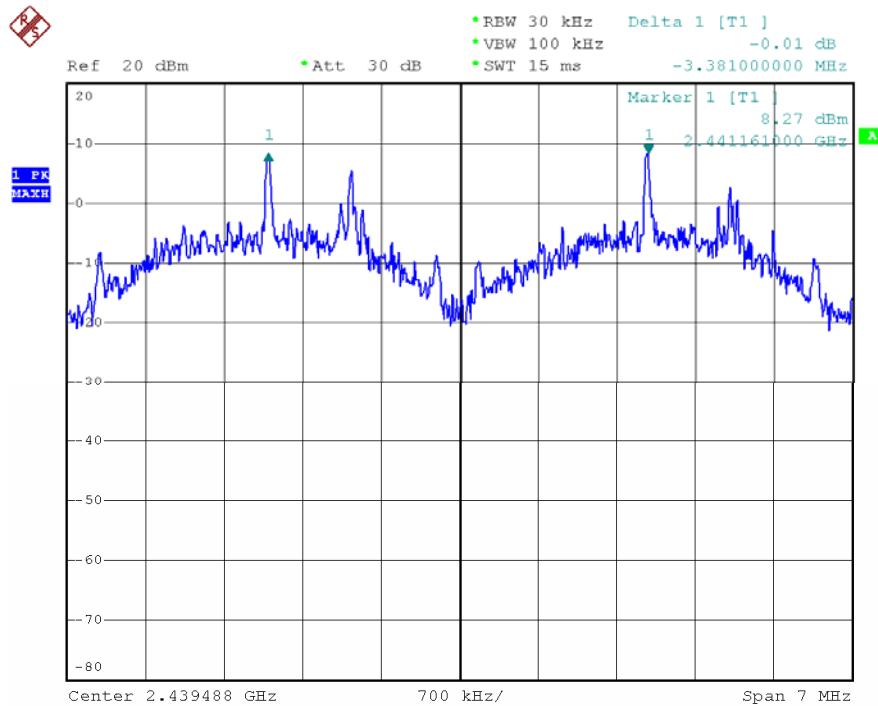
FCC ID: LE2G4

Test result plot as follows:

Low Channel:



Middle Channel



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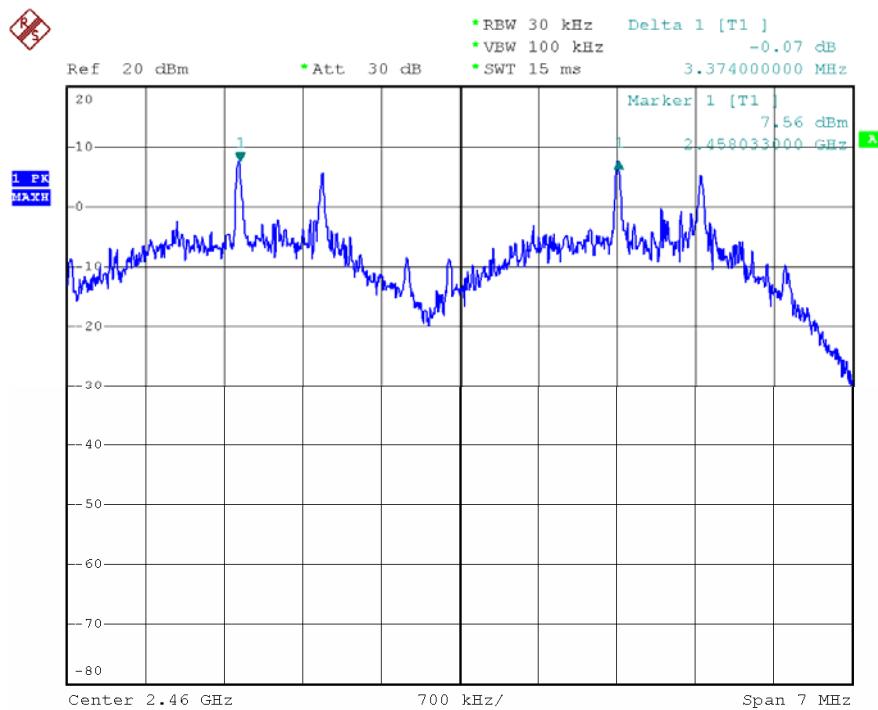
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FCC ID: LE2G4

High Channel



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Reference No.: WT12052777-D-S-F

## 12 Number of Hopping Frequency

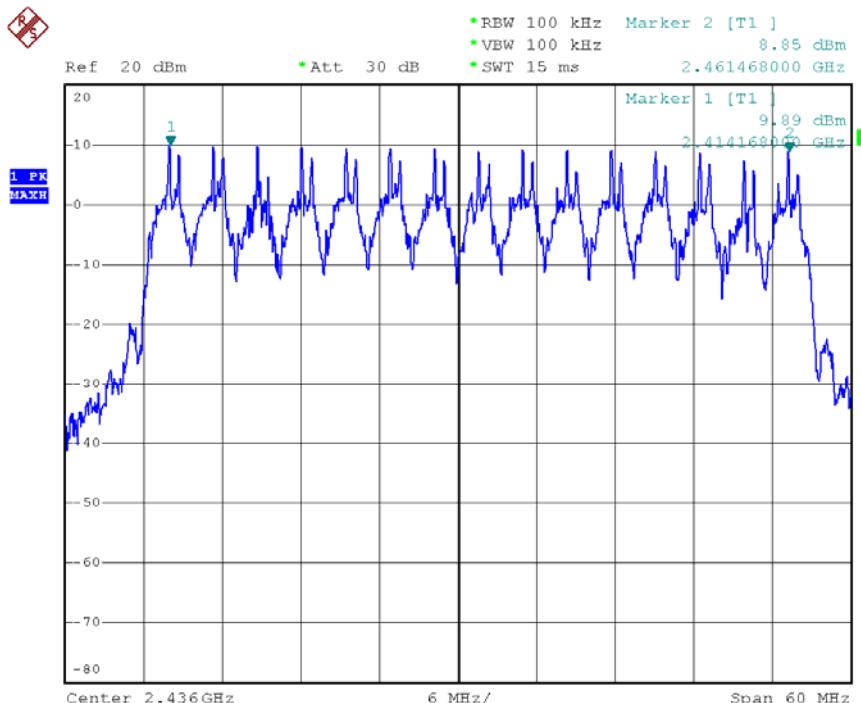
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

### 12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Center Frequency = 2436MHz, Span = 60MHz. Submit the test result graph.

### 12.2 Test Result:

**Total Channels are 15 Channels.**



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## 13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Mode:	Test in hopping transmitting operating mode.

### 13.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. centered on a hopping channel;
3. Set RBW = 1MHz and VBW = 1MHz. Sweep = as necessary to capture the entire dwell time per hopping channel.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

### 13.2 Test Result:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period

The test period:  $T = 0.4(s) * 15 = 6 (s)$

So, the Dwell Time can be calculated as follows:

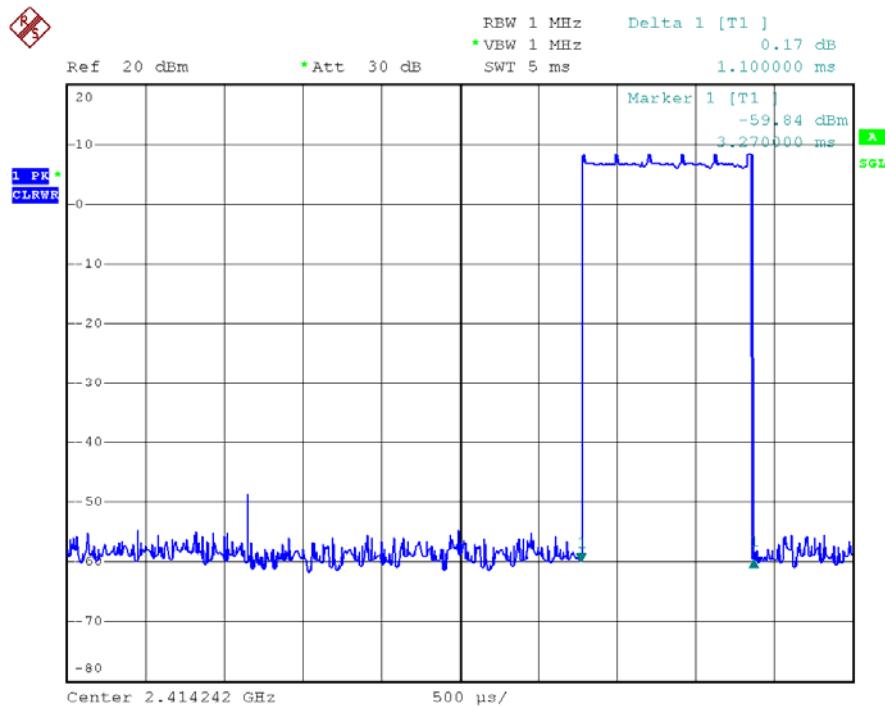
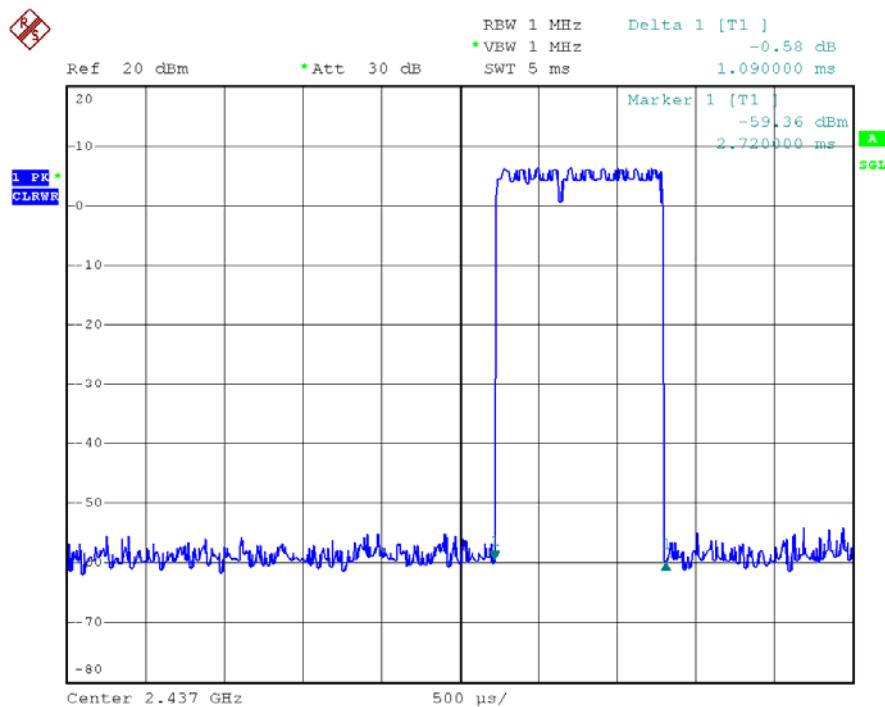
Dwell time =  $10 * 6 * (MkrDelta) / 1000$

Note : Mkr Delta is once pulse time.

Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
2414 MHz	1.10	0.0600	0.400	Pass
2437 MHz	1.09	0.0654	0.400	Pass
2461 MHz	1.06	0.0636	0.400	Pass

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**Low Channel****Middle Channel**

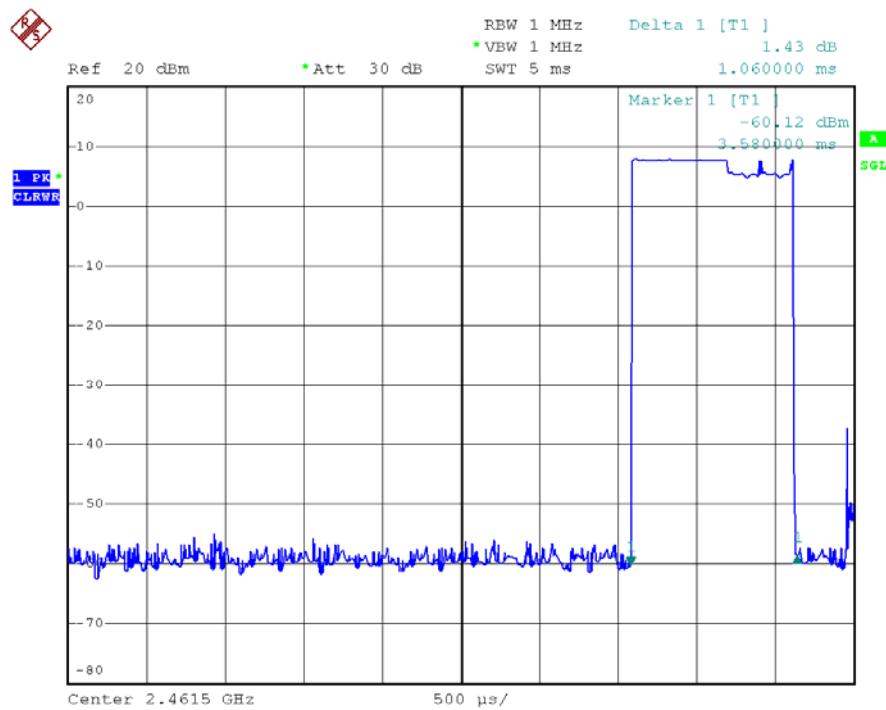
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**High Channel**

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## 14 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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. This product has a permanent antenna, fulfill the requirement of this section.

## 15 RF Exposure

Test Requirement: FCC Part 1.1307

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

### 15.1 Requirements:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

### 15.2 The procedures / limit

#### (A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

#### (B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

### 15.3 MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = Peak RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
2	1.585	9.98	9.954	0.003147	1	Complies
2	1.585	9.99	9.977	0.003150	1	Complies
2	1.585	9.80	9.550	0.003090	1	Complies

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## 16 Photographs - Constructional Details

### 16.1 Product View



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## 16.2 EUT – Appearance View



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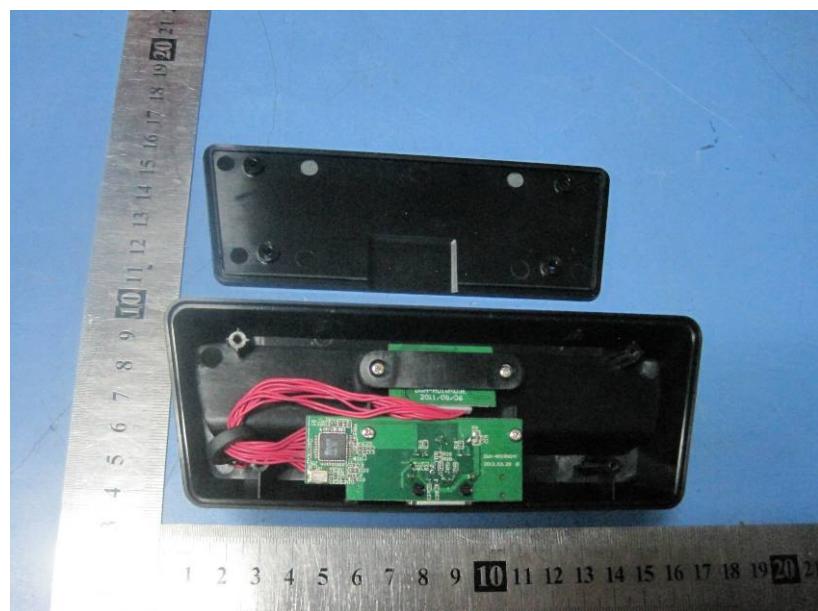
### 16.3 EUT – Open View



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#### 16.4 EUT – PCB View



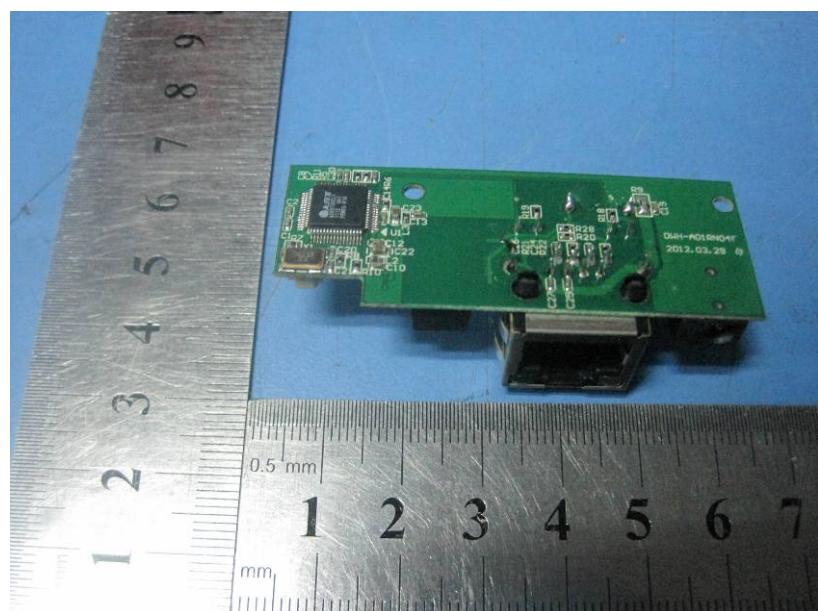
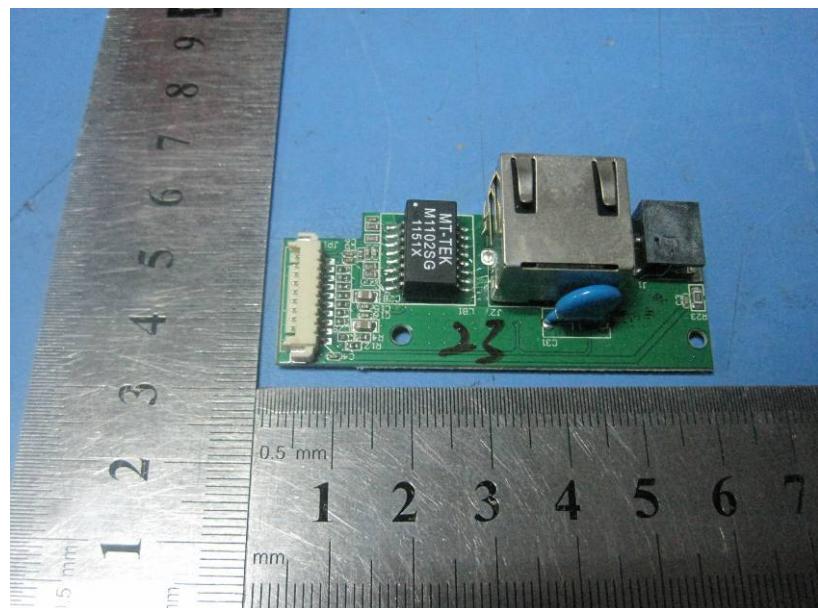
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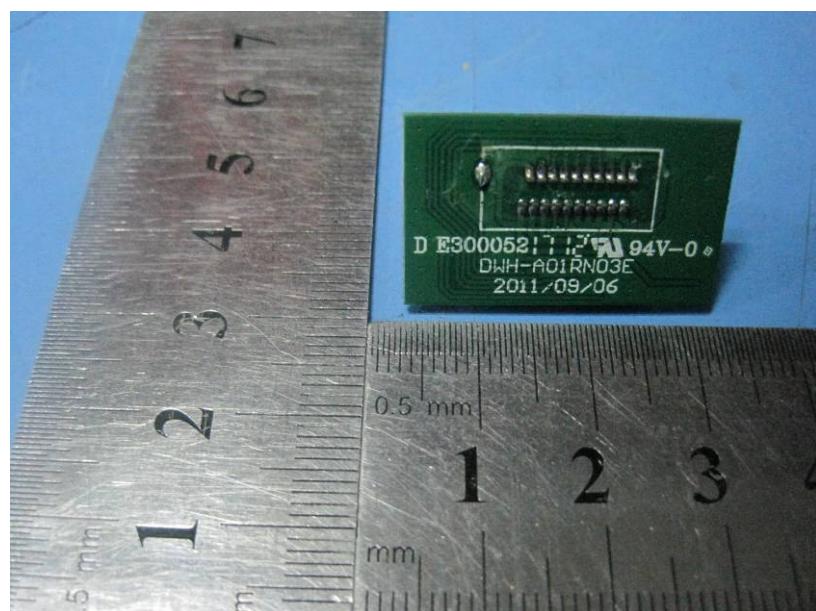
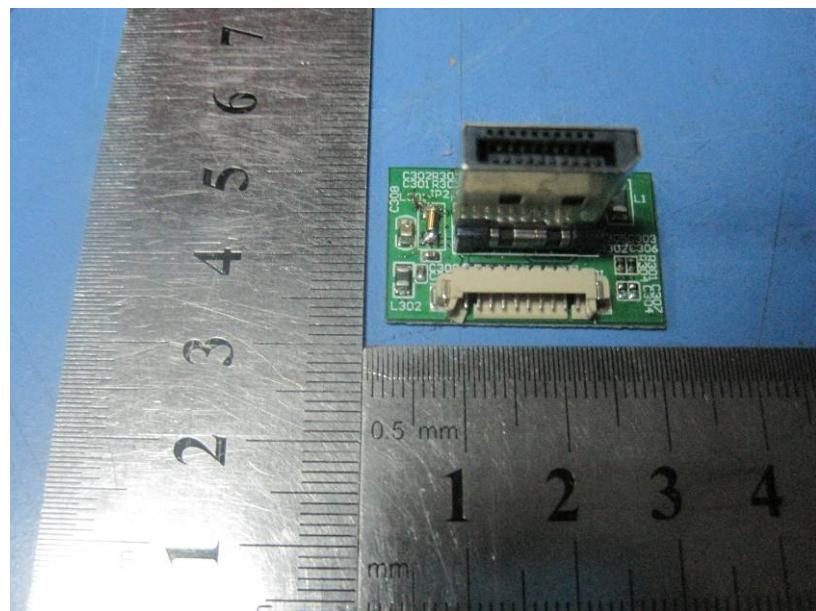
FCC ID: LE2G4



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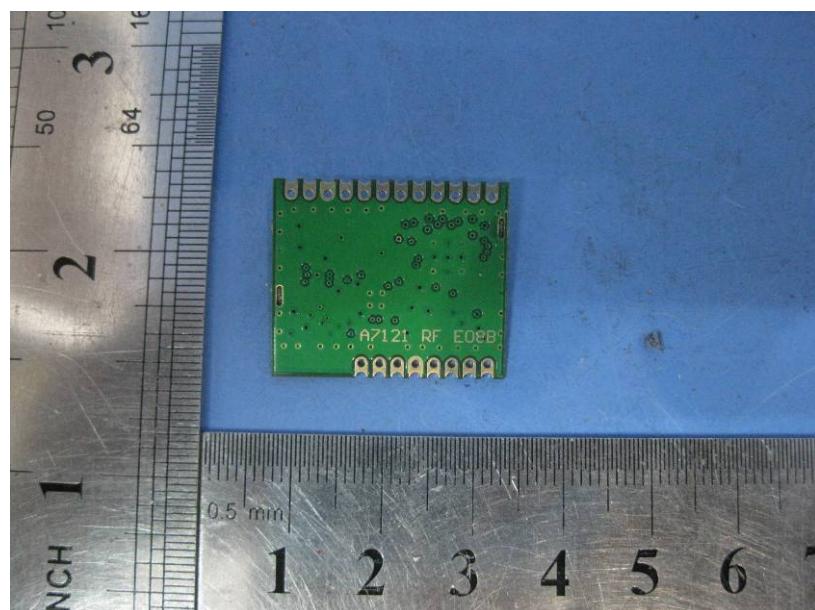
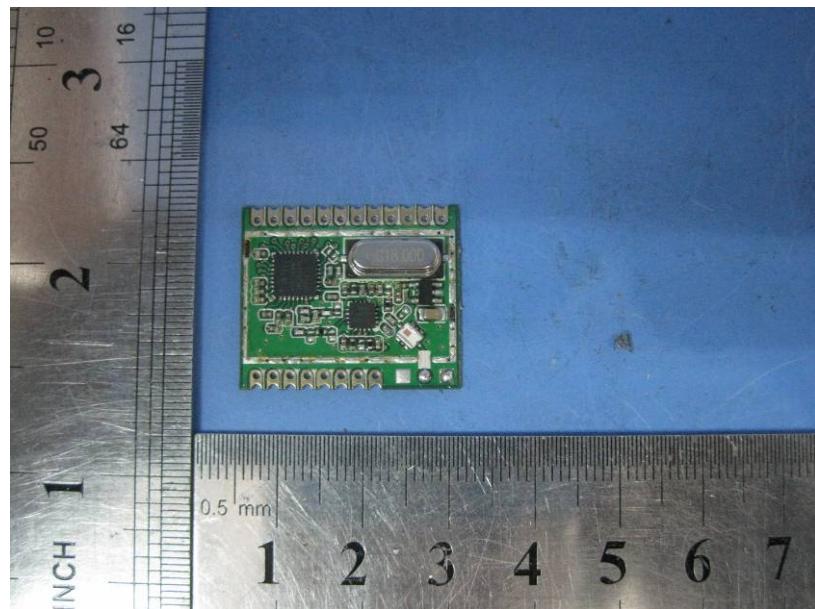
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## 16.5 RF Module - View



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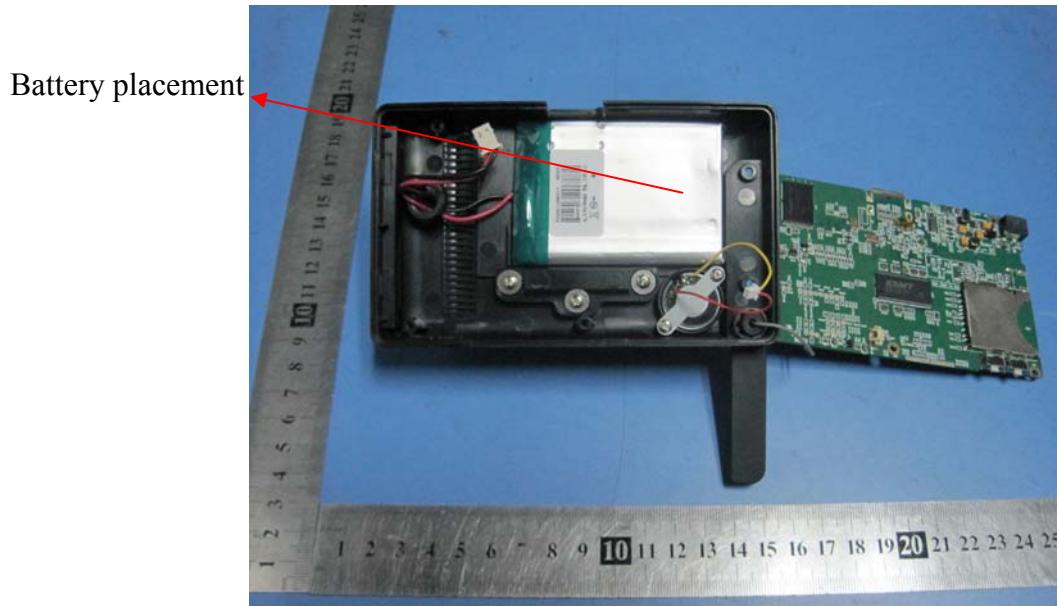
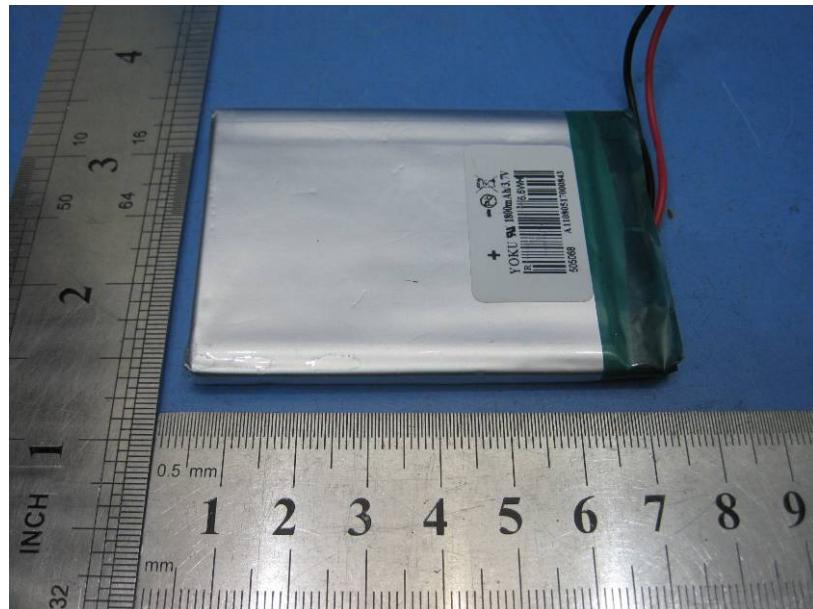
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## 16.6Battery View



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## 17 FCC Label

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

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT  
EUT Top View/ proposed FCC Label Location



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