

FCC Part 15C and RSS-210  
Measurement and Test Report

For

**Sanwa Electronic Instrument Co., Ltd**

1-2-50, Yoshida Honmachi, Higashi-Osaka, Osaka 578-0982, Japan

**FCC ID: L73ATX93824**  
**IC: 7377A-93824**

July 23, 2008

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> 2.4GHz Radio Module
<b>Test Engineer:</b>	Joey Du
<b>Report Number:</b>	SE08F-077FI
<b>Test Date:</b>	June 25 ~ July 12, 2008
<b>Reviewed By:</b>	
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**Note:** This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of S&E Technologies Laboratory Ltd.

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# 1-Test Result Certification

Applicant: **Sanwa Electronic Instrument Co., Ltd**  
 1-2-50, Yoshida Honmachi, Higashi-Osaka,  
 Osaka 578-0982, Japan

Equipment Under Test: 2.4 GHz Radio Module

Trade Name: SANWA

Model: ATX-93824

Type of Modulation: FHSS

Number of Channels: 51

Channel Separation: 1MHz

Operation Frequency: 2415 ~2465MHz

Antenna Designation: Non-user replaceable (fixed)

Battery Voltage: 12V DC

Date of Test: June 25~ July 12, 2008

Applicable Standards	
Standard	Test Result
FCC 47 CFR Part 15 Subpart C & RSS-210	No non-compliance noted

## We hereby certify that:

The above equipment was tested at Shenzhen Huatongwei International Inspection 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 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 15.207, 15.209, Part 15.247 and RSS-210 Issue 7.

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

## 2- EUT Description

Product	2.4 GHz Radio Modules
Trade Name	SANWA
Model Number	ATX-93824
Model Difference	N/A
Type of Modulation:	FHSS
Number of Channels:	51
Channel Separation:	1MHz
Power Supply	12V DC Power from Battery
Frequency Range	2415 ~2465 MHz
Antenna Designation	Non-user replaceable (fixed)

**Remark:** This submittal(s) test report is intended for FCC ID: L73ATX93824, IC: 7377A-93824 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules and RSS-210 Issue 7.

## 3-Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.4 (2003) and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209, 15.247 and RSS-210 Issue 7.

### 3.1 EUT Configuration

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

### 3.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

### 3.3 General Test Procedures

#### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

#### Radiated Emissions

The EUT is placed on a turntable, which is 0.8 m above ground plane. The turntable 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 maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

**3.4 FCC Part 15.205 and RSS-210 Issue 7 Restricted Bands of Operations**

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	-156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(2)
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

**3.5 Description of Test Modes**

The EUT has been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

## **4- Instrument Calibration**

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

## **5- Facilities and Accreditations**

### **5.1 Facilities**

All measurement facilities used to collect the measurement data are located on the address of Shenzhen Huatongwei International Inspection Co., Ltd at Huatongwei Building, Keji Rd. 12 S., High-tech Park, Nanshan District, Shenzhen, Guangdong, P.R.China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **5.2 Equipment**

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### **5.3 Laboratory Accreditation and Listing**

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: August 02, 2007. Valid time is until March 04, 2009.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 1999 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is from Aug 24, 2005 to Sept 30, 2009

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection 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 662850, Renewal date September 12, 2006.



IC-Registration No.: 5377

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377 on November 28th, 2005.

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: December 20, 2006. Valid time is until December 19, 2009.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: December 20, 2006. Valid time is until December 19, 2009.

IECEE CB

Shenzhen Huatongwei International Inspection Co Ltd has been assessed and determined to fully comply with the requirements of ISO/IEC 17025: 2005-05, The Basic Rules, IECEE 01: 2006-10 and Rules of Procedure IECEE 02: 2006-10, and the relevant IECEE CB-Scheme Operational Documents.

It is therefore entitled to operate as a CB Testing Laboratory under the responsibility of Nemko A/S. This certificate remains valid until May 25th 2009 at which time it will be reissued by the IECEE Executive Secretary upon successful completion of the normally scheduled 3-year Reassessment Program administered by the IECEE CB Scheme.

## 6- Setup of Equipment Under Test

### 6.1 Setup Configuration of EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### 6.2 Support Equipment

Device Type	Brand	Model	FCC ID	Series No.	Data Cable	Power Cord
N/A						

**Remark:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 7- FCC Part 15.247 and RSS-210 Issue 7 Requirements

### 7.1 Radiated Emissions

#### Limit

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.247 and 15.241.

2. In the above emission table, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength ( $\mu$ V/m at 3-meter)	Field Strength (dB $\mu$ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

3. Fundamental and Harmonics Emission Limits

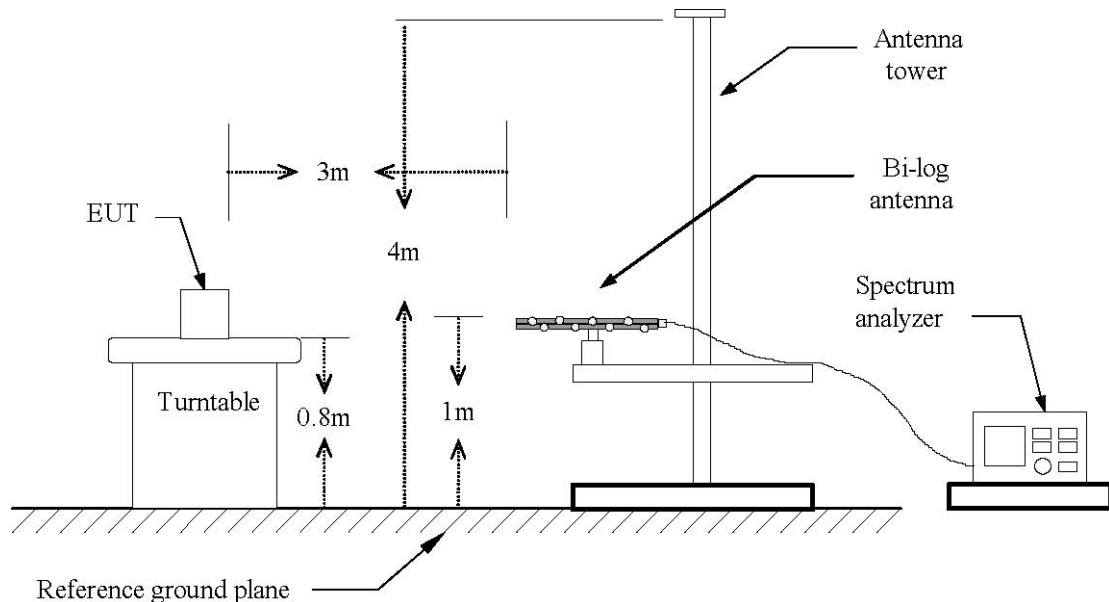
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	mV/m@3m	dBuV/m@3m	mV/m@3m	dBuV/m@3m
2400-2483.5	50	94 (Average)	500	54 (Average)
		114 (Peak)		74 (Peak)

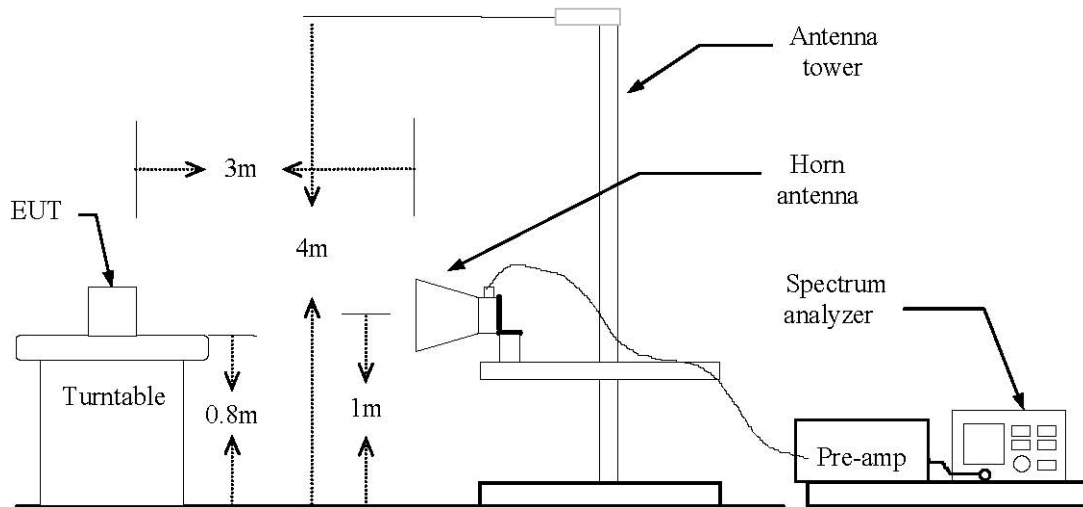
Measurement Equipment Used

3/5 Anechoic Chamber Radiation Test Site # 4				
Equipment type	Manufacturer	Model	Serial Number	Calibration Due
Ultra-Broadband Antenna	ROHDE & SCHWARZ	HL562	100015	10/2008
EMI Test Receiver	ROHDE & SCHWARZ	ESI 26	100009	10/2008
Double-Ridged-Waveguide Horn Antenna	ROHDE & SCHWARZ	HF906	100039	10/2008
Turntable	ETS	2088	2149	N/A
RF Test Panel	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	N/A
Antenna Mast	ETS	2075	2346	N/A
EMI Test Software	ROHDE & SCHWARZ	ES-K1 V1.71	N/A	10/2008

**Remark:** Each piece of equipment is scheduled for calibration once a year.

Test Configuration Below 1 GHz



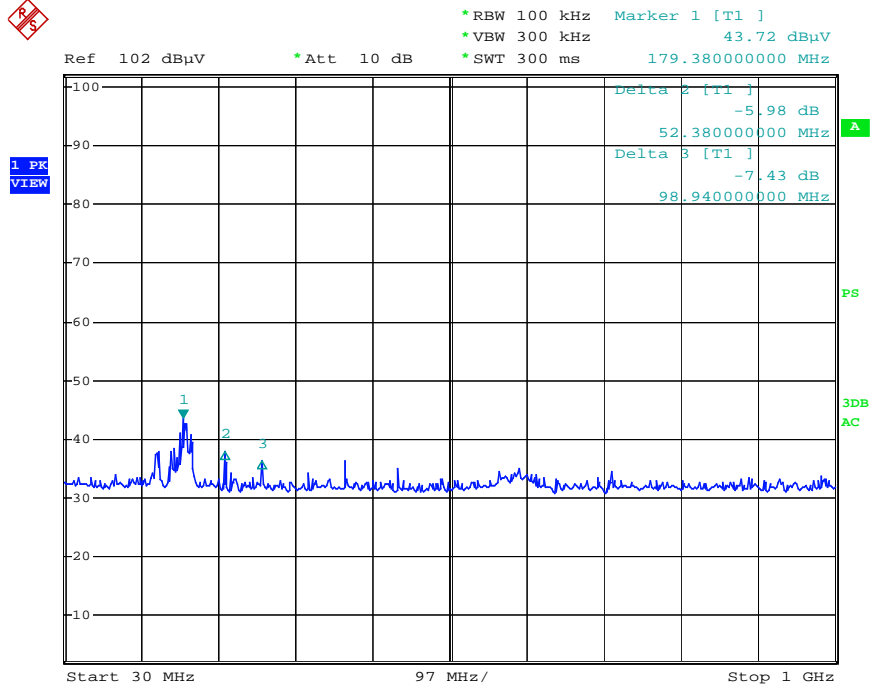
**Above 1 GHz****Test Procedure**

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 varied from 1m to 4m to find out the highest 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.

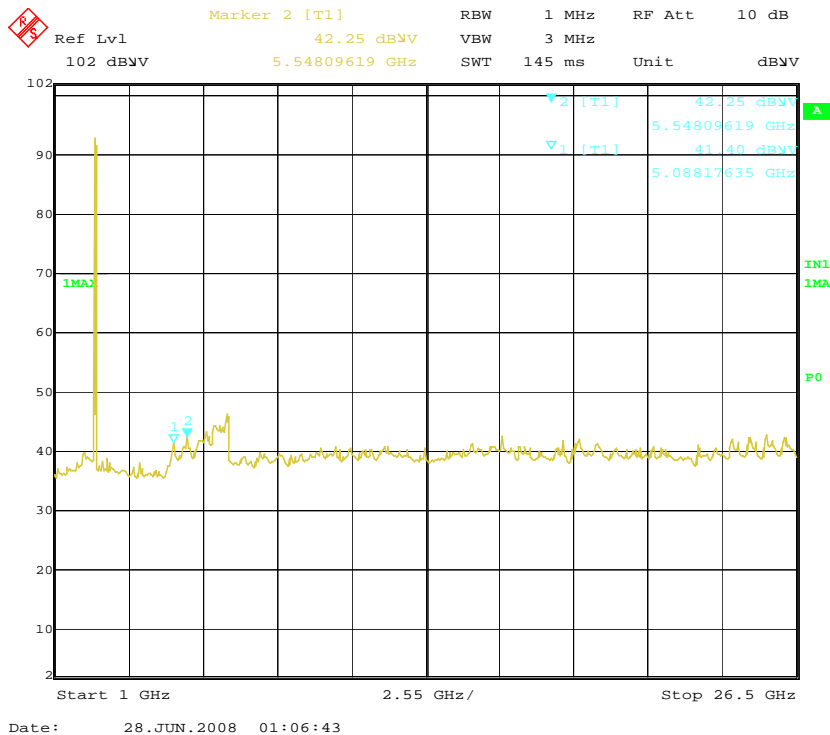
Test Results

Conducted Spurious Emission Measurement Results

Channel Low

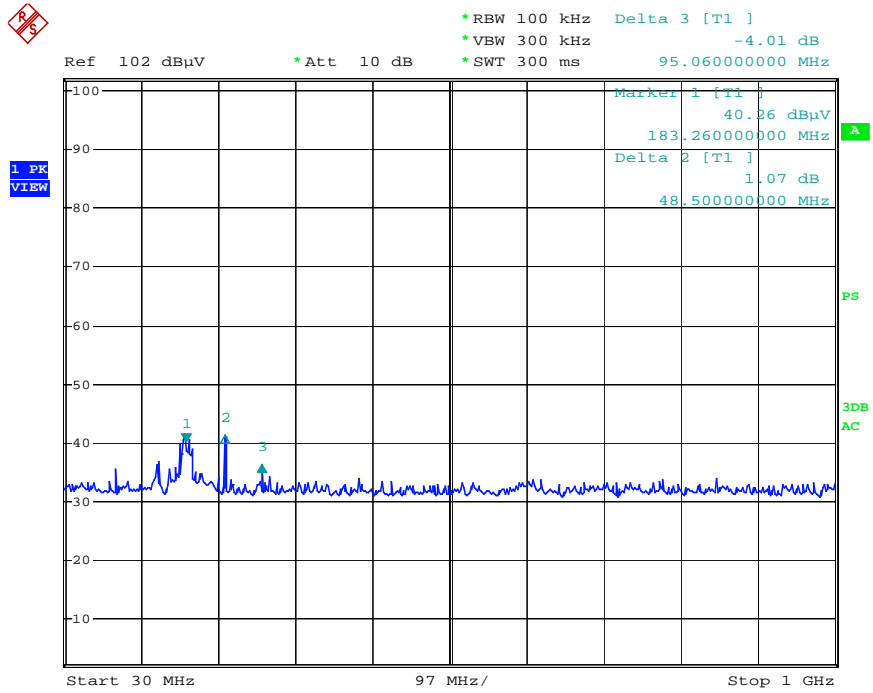


Date: 28.JUN.2008 01:14:36

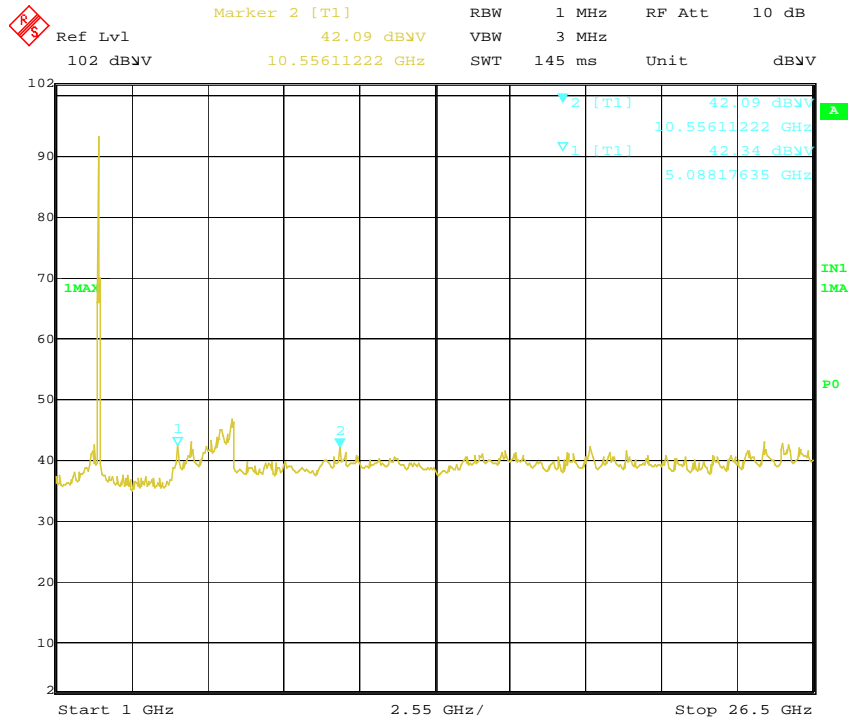


Date: 28.JUN.2008 01:06:43

Channel Mid

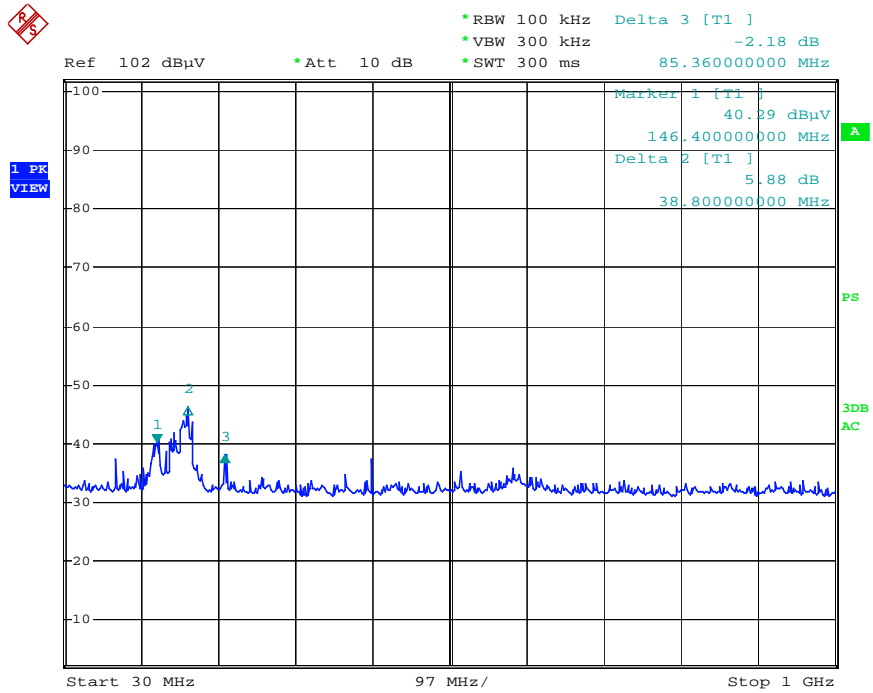


Date: 28.JUN.2008 01:15:28

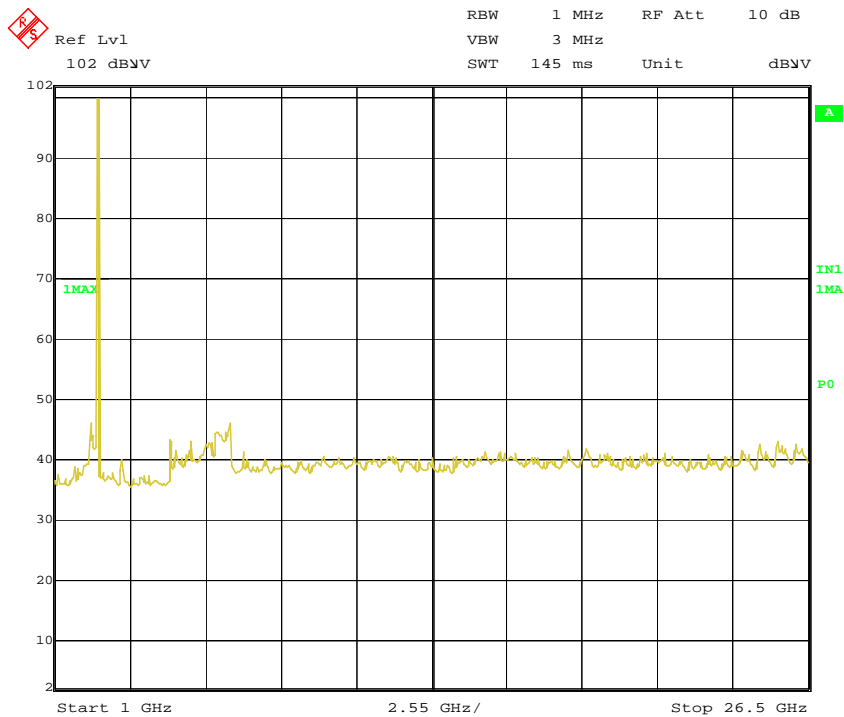


Date: 28.JUN.2008 01:05:12

Channel High



Date: 28.JUN.2008 01:16:21



Date: 28.JUN.2008 01:03:18



**Radiated Spurious Emission Measurement Result (below 1GHz)**

Operation Mode: TX CH Low  
 Fundamental Frequency: 2415 MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol: Ver. /Hor.

Freq. (MHz)	Ant.Pol. (H/V)	Detector Mode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
30.00	V	Peak	1.40	21.20	22.60	40.00	-17.40
76.11	V	Peak	5.60	11.60	17.20	40.00	-22.80
171.90	V	Peak	20.60	10.70	31.30	43.50	-12.20
525.69	V	Peak	5.30	20.80	26.10	46.00	-19.90
935.85	V	Peak	5.90	25.50	31.40	46.00	-14.60
-							
30.00	H	Peak	1.40	21.20	22.60	40.00	-17.40
86.37	H	Peak	5.70	11.80	17.50	40.00	-22.50
175.79	H	Peak	18.40	10.80	29.20	43.50	-14.30
549.02	H	Peak	4.50	21.50	26.00	46.00	-20.00
947.52	H	Peak	6.50	25.50	32.00	46.00	-14.00
-							

## Remark

- (1) Measuring frequencies from 30 MHz to the 1000MHz.
- (2) Radiated emissions measured in frequency range from 30MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (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.
- (4) The IF bandwidth of EMI Test Receiver was 120KHz for measuring from 30 MHz to 1000MHz.

Operation Mode: TX CH Mid  
 Fundamental Frequency: 2442 MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol: Ver. /Hor.

Freq. (MHz)	Ant.Pol. (H/V)	Detector Mode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
30.00	V	Peak	1.90	21.20	23.10	40.00	-16.90
77.21	V	Peak	5.10	11.50	16.60	40.00	-23.40
170.27	V	Peak	20.60	10.60	33.50	43.50	-10.00
531.22	V	Peak	3.30	20.90	24.20	46.00	-21.80
911.02	V	Peak	5.50	25.30	30.80	46.00	-15.20
-							
30.00	H	Peak	2.20	21.20	23.40	40.00	-16.60
79.80	H	Peak	7.40	12.10	19.50	40.00	-20.50
174.58	H	Peak	16.00	10.80	26.80	43.50	-14.30
548.25	H	Peak	6.80	21.50	28.30	46.00	-20.00
927.24	H	Peak	6.70	25.40	32.10	46.00	-14.00
-							

Remark

- (1) Measuring frequencies from 30 MHz to the 1000MHz.
- (2) Radiated emissions measured in frequency range from 30MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (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.
- (4) The IF bandwidth of EMI Test Receiver was 120KHz for measuring from 30 MHz to 1000MHz.

Operation Mode: TX CH High  
 Fundamental Frequency: 2465 MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol: Ver. /Hor.

Freq. (MHz)	Ant.Pol. (H/V)	Detector Mode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
30.00	V	Peak	5.00	21.20	26.20	40.00	-13.80
81.25	V	Peak	7.00	11.80	18.80	40.00	-21.20
170.33	V	Peak	24.50	10.70	35.20	43.50	-8.30
542.12	V	Peak	5.70	21.40	27.10	46.00	-18.90
915.38	V	Peak	5.80	25.30	31.10	46.00	-14.90
-							
30.00	H	Peak	3.50	21.20	24.70	40.00	-15.30
74.31	H	Peak	6.80	12.10	18.90	40.00	-21.10
171.28	H	Peak	18.70	10.70	29.40	43.50	-14.10
544.25	H	Peak	6.10	21.40	27.50	46.00	-18.50
925.33	H	Peak	6.20	25.40	31.60	46.00	-14.40
-							

**Remark**

- (1) Measuring frequencies from 30 MHz to the 1000MHz.
- (2) Radiated emissions measured in frequency range from 30MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (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.
- (4) The IF bandwidth of EMI Test Receiver was 120KHz for measuring from 30 MHz to 1000MHz.

**Radiated Spurious Emission Measurement Result (above 1GHz)**

Operation Mode: TX CH Low  
 Fundamental Frequency: 2415 MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol : Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
				Peak (dBuV/m)	AV (dBuV/m)			
1579.16	50.10	-	-7.40	42.70	-	74.00	54.00	-31.30
3997.99	39.40	-	2.10	41.50	-	74.00	54.00	-32.50
4830.00	47.70	-	3.50	51.20	-	74.00	54.00	-22.80
7245.00	40.90	-	9.50	50.40	-	74.00	54.00	-23.60
9660.00	-							
12075.00	-							
14490.00	-							
16905.00	-							
19320.00	-							
21735.00	-							
24150.00	-							

*Remark:*

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
- (3) Data of measurement within this peak reading 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.
- (4) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.  
 Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Operation Mode: TX CH Low  
 Fundamental Frequency: 2415 MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol : Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
				Peak (dBuV/m)	AV (dBuV/m)			
4124.00	38.60	-	2.10	40.70	-	74.00	54.00	-33.30
4830.00	48.20	-	3.50	51.70	-	74.00	54.00	-22.30
7245.00	41.80	-	9.30	51.10	-	74.00	54.00	-22.90
9660.00	-							
12075.00	-							
14490.00	-							
16905.00	-							
19320.00	-							
21735.00	-							
24150.00	-							

*Remark:*

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
- (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.
- (4) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.  
 Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Operation Mode: TX CH Mid  
 Fundamental Frequency: 2442MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol : Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
				Peak (dBuV/m)	AV (dBuV/m)			
3997.00	41.70	-	2.10	43.80	-	74.00	54.00	-30.20
4884.00	47.60	-	3.70	51.30	-	74.00	54.00	-22.70
7326.00	40.30	-	9.50	49.80	-	74.00	54.00	-24.20
9768.00	-							
12210.00	-							
14652.00	-							
17094.00	-							
19536.00	-							
21978.00	-							
2442.00	-							

*Remark:*

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
- (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.
- (4) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.  
 Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Operation Mode: TX CH Mid  
 Fundamental Frequency: 2442MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol : Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
				Peak (dBuV/m)	AV (dBuV/m)			
1613.23	26.70	-	-7.20	19.50	-	74.00	54.00	-54.50
3986.50	37.50	-	2.10	39.60	-	74.00	54.00	-34.40
4884.00	47.90	-	3.70	51.60	-	74.00	54.00	-22.40
7326.00	41.40	-	9.50	50.90	-	74.00	54.00	-23.10
9768.00	-							
12210.00	-							
14652.00	-							
17094.00	-							
19536.00	-							
21978.00	-							
24420.00	-							

*Remark:*

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
- (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.
- (4) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.  
 Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Operation Mode: TX CH High  
 Fundamental Frequency: 2465MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol : Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
				Peak (dBuV/m)	AV (dBuV/m)			
1647.29	28.20	-	-7.00	21.20	-	74.00	54.00	-52.80
4202.00	39.70	-	2.20	41.90	-	74.00	54.00	-32.10
4930.00	46.90	-	3.90	50.80	-	74.00	54.00	-23.20
7395.00	40.20	-	9.70	49.90	-	74.00	54.00	-24.10
9860.00	-							
12325.00	-							
14790.00	-							
17255.00	-							
19720.00	-							
22185.00	-							
24650.00	-							

*Remark:*

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
- (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.
- (4) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.  
 Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Operation Mode: TX CH High  
 Fundamental Frequency: 2465MHz  
 Temperature: 25 °C

Test Date: June 27, 2008  
 Humidity: 55%  
 Pol : Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL/ Amp.CF (dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
				Peak (dBuV/m)	AV (dBuV/m)			
1467.29	29.40	-	-7.00	22.40	-	74.00	54.00	-51.60
4066.00	39.40	-	2.10	41.50	-	74.00	54.00	-32.50
4930.00	47.80	-	3.90	51.70	-	74.00	54.00	-22.30
7395.00	40.60	-	9.70	50.30	-	74.00	54.00	-23.70
9860.00	-							
12325.00	-							
14790.00	-							
17255.00	-							
19720.00	-							
22185.00	-							
24650.00	-							

*Remark:*

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode of the emission shown in Actual FS column.
- (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.
- (4) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.  
 Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

## 7.2 Power line Conducted Emission

### Limit

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Measurement Equipment Used

Conducted Emission Test Site # 3				
Equipment type	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	10/2008
Artificial Mains	ROHDE & SCHWARZ	ESH2-Z5	100028	10/2008
Pulse Limiter	ROHDE & SCHWARZ	ESHSZ2	100044	10/2008
EMI Test Software	ROHDE & SCHWARZ	ES-K1 V1.71	N/A	10/2008

**Remark:** Each piece of equipment is scheduled for calibration once a year.

### Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### Test Procedure

Not applicable (Since the EUT is powered by battery)

### Test Results

Not applicable (Since the EUT is powered by battery)

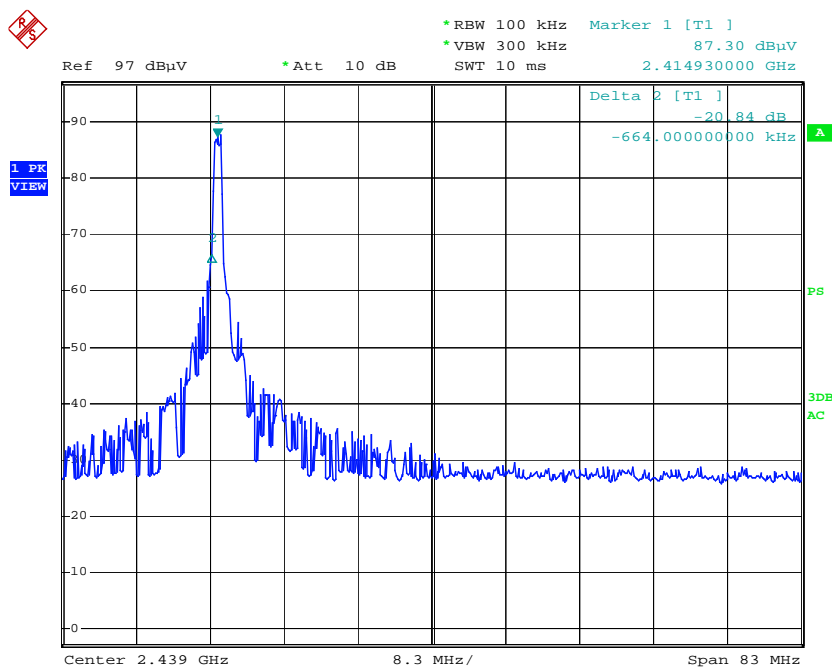
### 7.3 Band Edge

#### Band Edge limit

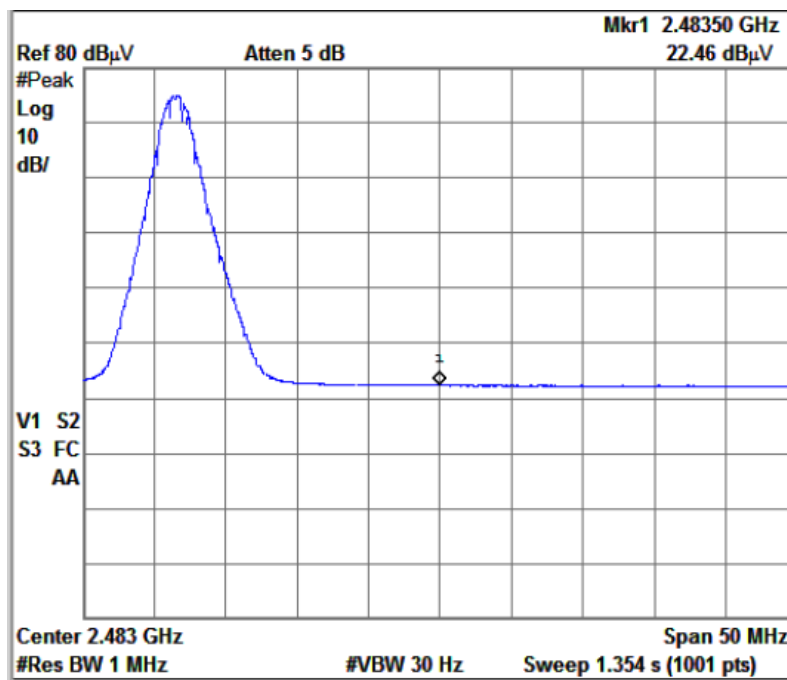
FCC PART 15.247(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

#### Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW, VBW=300 KHz, Sweep=auto
4. Set center frequency of spectrum analyzer = operating frequency.
6. Repeat above procedures until all frequency measured was complete.



Date: 27.JUN.2008 21:37:17



Note:

1. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.
2. The average measurement was not performed when the peak measured data under the limit of average detection.

### 7.4 20dB Bandwidth Measurement

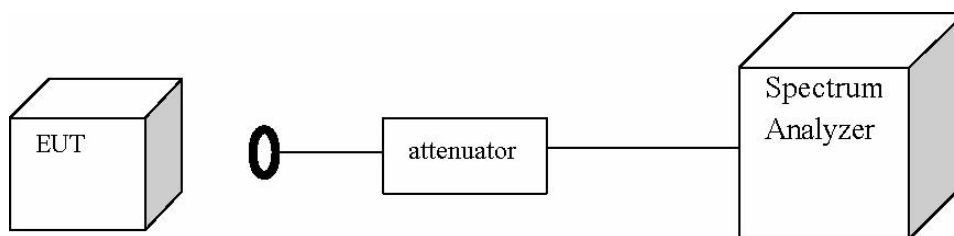
#### Limit

RSS-210 A1.1.3, For the purpose of Section A1.1, the 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

#### Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	10/2008

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW is set to 10 KHz and VBW is set 30 KHz.

#### Test Results

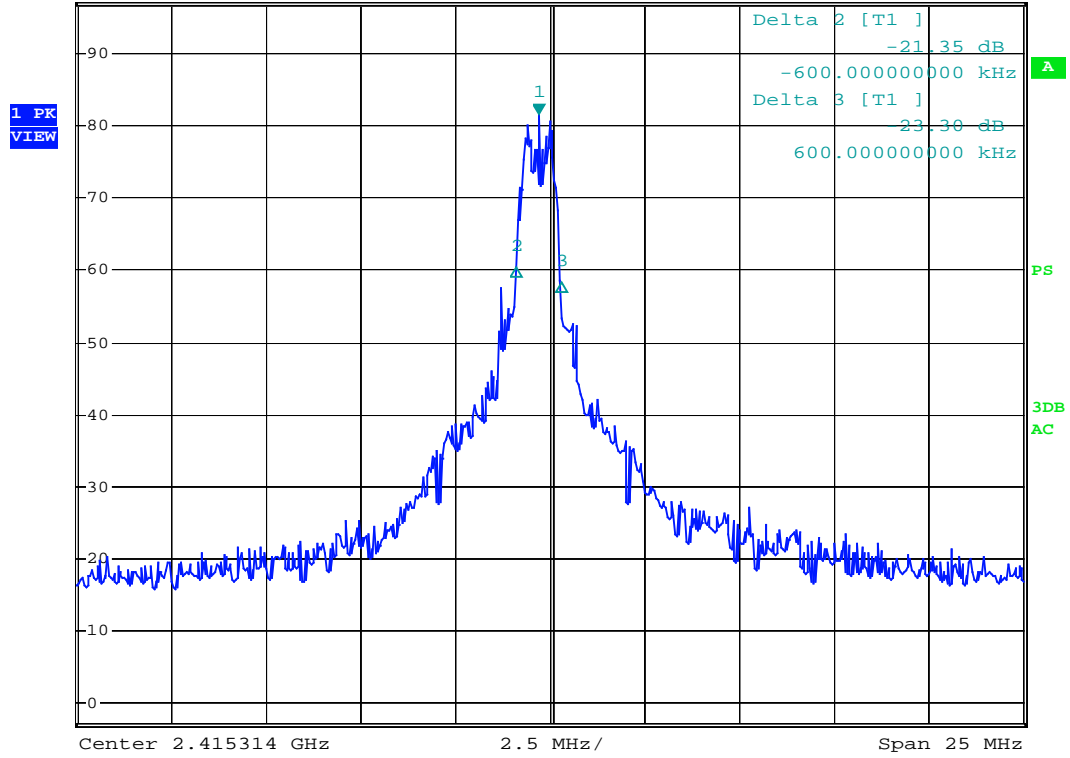
*No non-compliance noted.*

Test Plot:

Low Channel

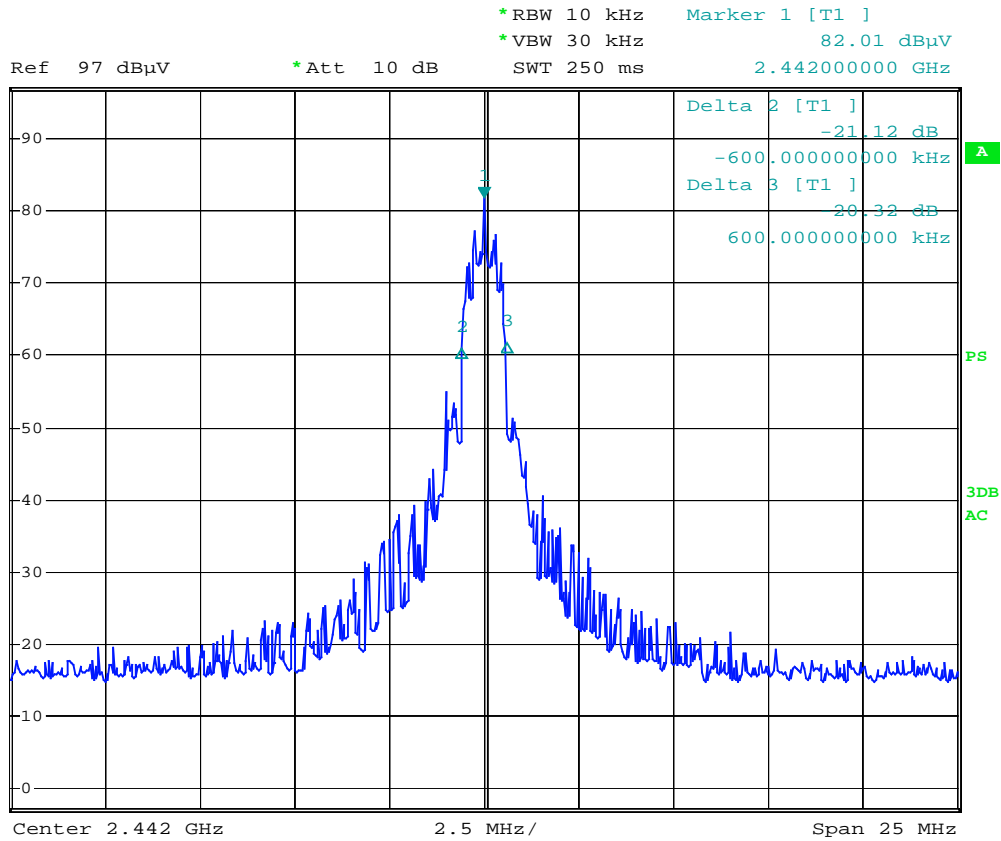


Ref 97 dB $\mu$ V \*Att 10 dB \*RBW 10 kHz Marker 1 [T1 ]  
\*VBW 30 kHz 81.66 dB $\mu$ V  
SWT 250 ms 2.415014000 GHz



Date: 27.JUN.2008 21:38:54

Mid Channel



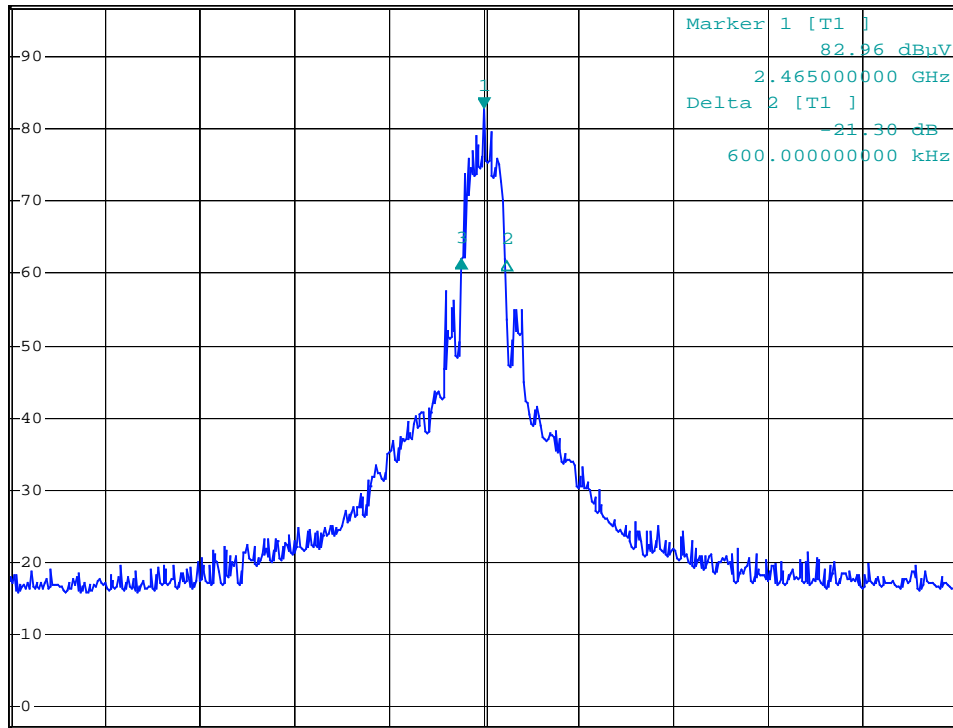
Date: 27.JUN.2008 21:40:44

### High Channel



Ref 97 dBuV      \*Att 10 dB      \*RBW 10 kHz      Delta 3 [T1 ]      -20.94 dB  
\*VBW 30 kHz      -600.00000000 kHz  
SWT 250 ms

1 PK  
VIEW



Center 2.465 GHz      2.5 MHz/      Span 25 MHz

Date: 27.JUN.2008 21:41:58



### 7.5 Peak Output Power Measurement

#### Limit

The Peak Output Power Measurement limits are 30dBm.

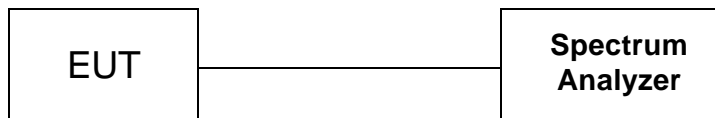
#### Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=1 MHz, VBW = 3MHz
4. Repeat above procedures until all frequency measured were complete

#### Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	10/2008

#### Test Configuration

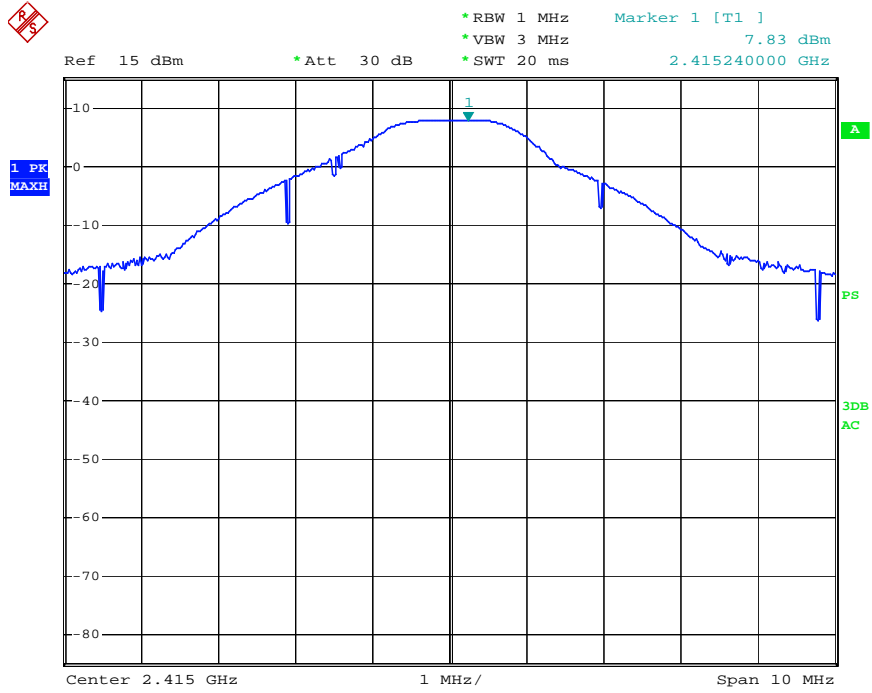


#### Test Results

Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
LOW	2415.00	7.83	30	Pass
MID	2442.00	7.55	30	Pass
HIGH	2465.00	7.28	30	Pass

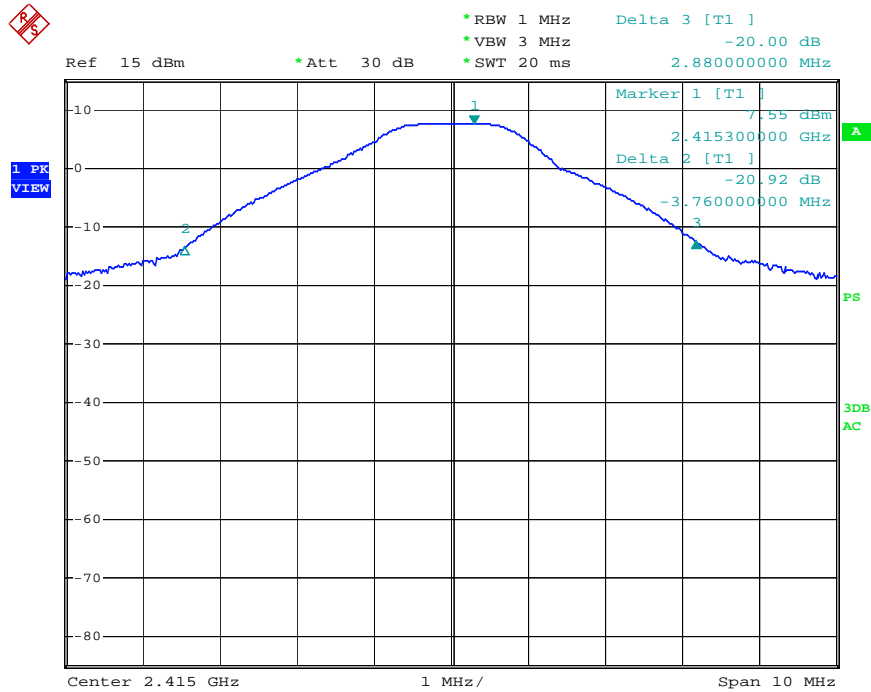
Photo of Peak Output Power Measurement:

Channel Low



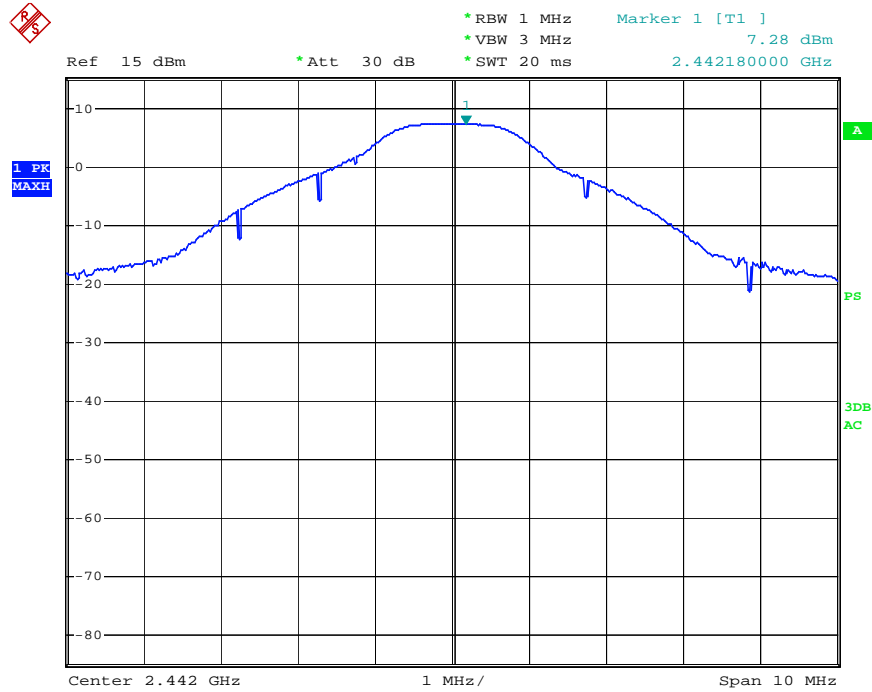
Date: 27.JUN.2008 22:13:08

Channel Mid



Date: 27.JUN.2008 22:16:17

### Channel High



Date: 27.JUN.2008 22:18:57

### 7.6 Frequency Separation Measurement

#### Limit

Per 15.247 (a)(1) and RSS-210 A8.1 at least 25 KHz or 20 dB bandwidth of the hopping Channel, whichever is greater

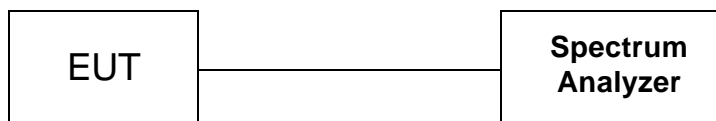
#### Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=100 KHz, VBW=100 KHz. Span=3MHz, Sweep=auto.
4. Set center frequency of spectrum analyzer = middle of hopping channel.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

#### Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	10/2008

#### Test Configuration





### 7.7 Number of Hopping Frequency Measurement

#### Limit

Per 15.247 (a)(1)(iii) and RSS-210 A8.1 At least 15 hopping Frequencies

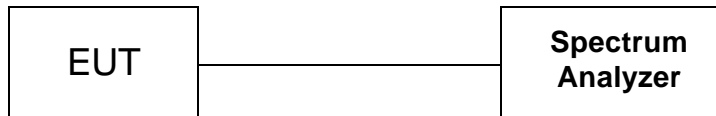
#### Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start=2410MHz, Stop=2470MHz, Sweep=auto.
4. Set the spectrum analyzer as RBW=100 KHz, VBW=300 KHz.
5. Max hold. view and count how many channel in the band.

#### Measurement Equipment Used

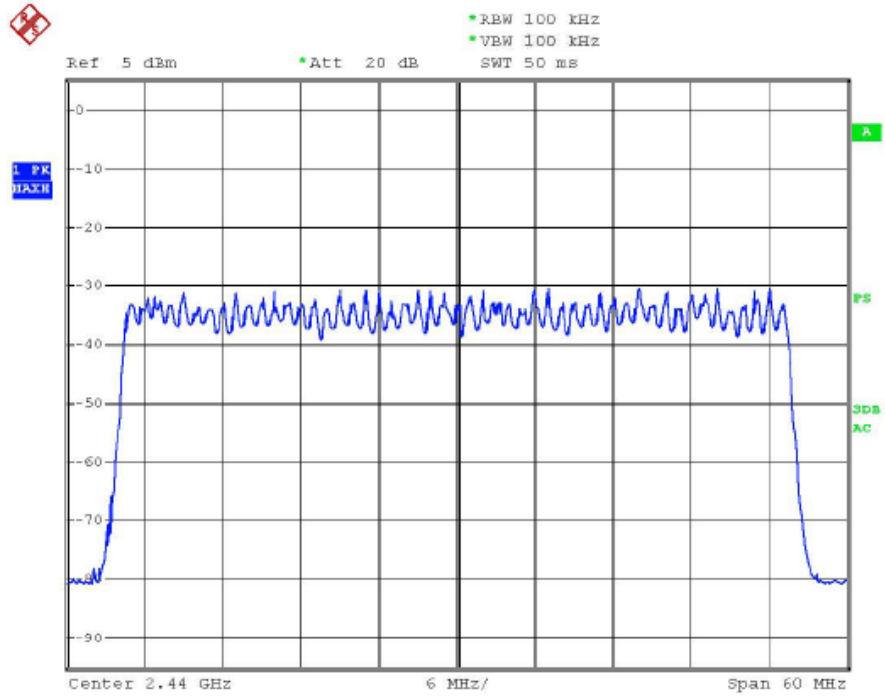
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	10/2008

#### Test Configuration



Test Results

Total 51 Channels—Pass



Date: 27.JUN.2008 23:44:03



**7.8 Dwell Time Measurement**

**Limit**

Per 15.247 (a)(1)(iii) and RSS-210 A8.1 At least 15 hopping Frequencies

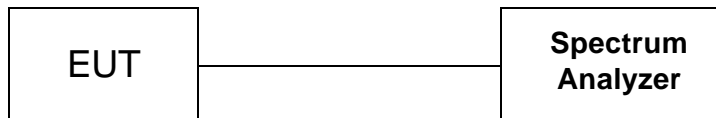
**Test Procedure**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW =1 MHz , VBW =3 MHz. Span=0Hz,
4. Set center frequency of spectrum analyzer = operating frequency.
5. Repeat above procedures until all frequency measured was complete.

**Measurement Equipment Used**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	10/2008

**Test Configuration**

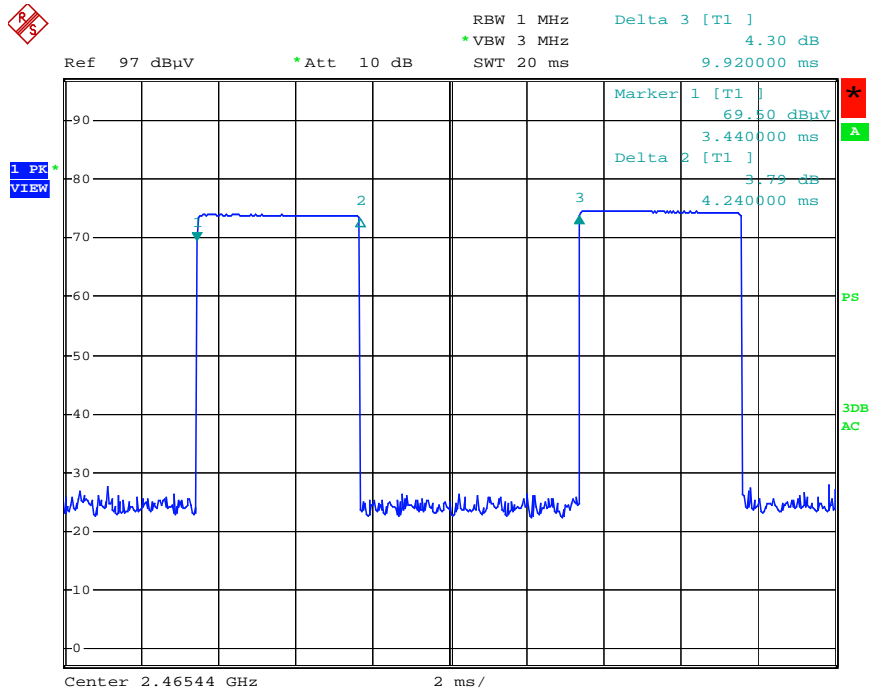


In measurement time of 20.4s, total 17 transmissions occurred.

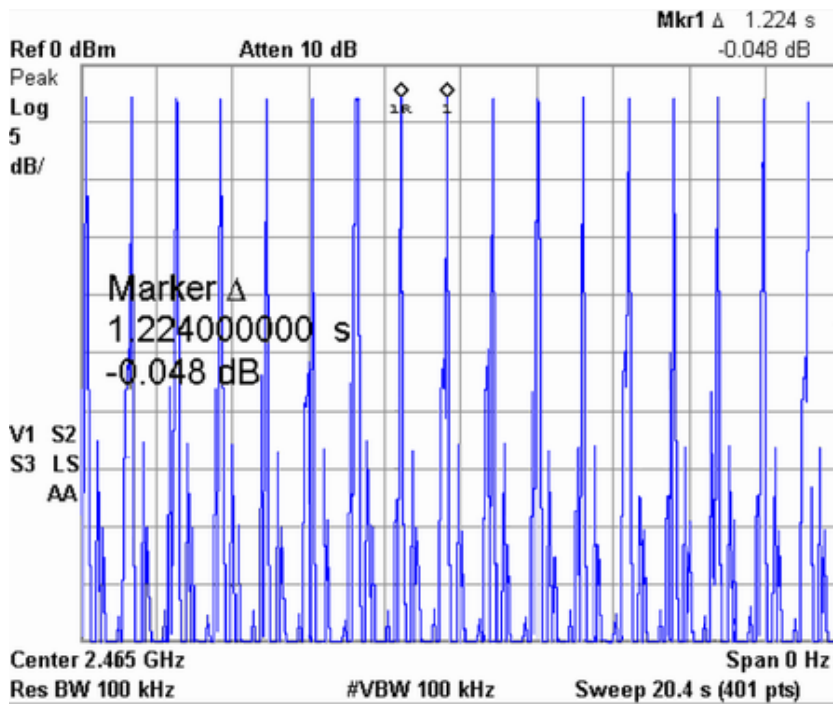
The duration of one transmission was 4.24ms.

Time of occupancy at 20.4s is obtained:  $17 \times 2.24\text{ms} = 38.08 \text{ ms} < 400 \text{ ms (Limit)}$

Test Results



Date: 27.JUN.2008 21:51:15



## **7.9 RF Exposure**

### **Standard Applicable**

According to §1.1307 (b)(1), system operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Portable device.

The maximum measured power output is 6.07 mW (7.83 dBm), the maximum antenna gain is +1.9 dBi = numeric gain 1.55

### **Measurement Result**

This is a portable device and the Max peak output power is 7.83dBm (6.07 mW) lower than low threshold 60/fGHz mW (24.48 mW),  $d < 2.5\text{cm}$  in general population category.

The SAR measurement is not necessary.

## Appendix 1 Photographs of Test Setup

### Radiated Emission Set up Photos



## Appendix 2 Photographs of Constructional Details

### EUT – External View



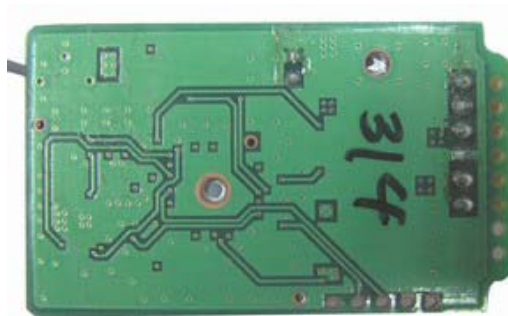
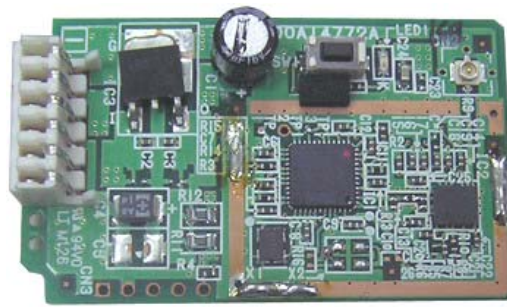
### EUT – Front View



**EUT – Rear View**



EUT – PCB View



## Appendix 3 FCC/IC Label

**FCC ID: L73ATX93824**

**IC: 7377A-93824  
Model Number: ATX-93824  
Sanwa Electronic Instrumetn Co., Ltd**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation

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.

### **EUT Front View/Proposed FCC/IC Mark Location**

