ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test report file number	**: E045R-072**
Applicant	**: Eastern Mastec Corp.**
Address	**: 5F Olympia Bldg., 196, Jamsil Bon-dong, Songpa-gu, Seoul Korea**
Manufacturer 1st	**: Eastern Mastec Corp.**
Address	**: 308-12, Osan-ri, Chori-myun, Paju-shi, Gyeonggi-do, 413-521 Korea**
Manufacturer 2nd	**: Eastern Acoustic Manufactory Co., Ltd**
Address	**: Huangpu Village Shajing Town, Boa'an, Shenzhen, China**
Type of Equipment	**: 2.4GHz Digital Wireless System for Audio**
FCC ID.	**: OSRWL-R1000**
Model Name	**: WL-R1000**
Serial number	**: None**
Total page of Report	**: 40 pages (including this page)**
Date of Incoming	**: January 16, 2004**
Date of issue	**: May 31, 2004**

SUMMARY

The equipment complies with the regulation; **FCC Part 15 Subpart C Section 15.247.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by: G. W. Lee/ Chief Engineer
EMC & Telecom Div.
ONETECH Corp.

Reviewed by: Y. K. Kwon/ Director
EMC & Telecom Div.
ONETECH Corp.

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EMC Testing Dept : 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-860 Korea. (TEL: 82-31-765-8289 FAX: 82-31-766-2904)

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1. VERIFICATION OF COMPLIANCE

APPLICANT	: Eastern Mastec Corp.
ADDRESS	: 5F Olympia Bldg., 196, Jamsil Bon-dong, Songpa-gu, Seoul Korea
CONTACT PERSON	: Y. R. Song / Manager
TELEPHONE NO	: +82-2-418-4615
FCC ID	: OSRWL-R1000
MODEL NO/NAME	: WL-R1000
SERIAL NUMBER	: N/A
DATE	: May 31, 2004

DEVICE TYPE	2.4GHz Digital Wireless System for Audio ***- Frequency Hopping Spread Spectrum System***
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4/2001
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	Yes
FINAL TEST WAS CONDUCTED ON	3/1 METER(S) OPEN AREA TEST SITE

-. This device has shown compliance with the conducted emissions limits in 15.207 adopted under FCC 02-107 (ET Docket 98-80). The device may be marketed after July 11, 2005 and is not affected by the 15.37(j) transition provisions.

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

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2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (1)	Carrier Frequency Separation	Met the Limit / PASS
15.247 (a) (1) (iii)	Minimum Number of Hopping Channels	Met the Limit / PASS
15.247 (a) (1) (iii)	Average Time of Occupancy	Met the Limit / PASS
15.247 (a) (2)	Minimum 6dB Bandwidth	Met the Limit / PASS
15.247 (b) (1)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (b) (5)	Radio Frequency Exposure Level	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (d)	Peak Power Spectral Density	Met the Limit / PASS
15.209 and 15.109	Radiated Emission Limits, General Requirement	Met the Limit / PASS
15.207 and 15.107	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4/2001. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

2.6 Test Facility

The Electromagnetic compatibility measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myeon, Gwangju-Si, Gyeonggi-Do 464-080 Korea. Description details of test facilities were submitted to the Federal Communications Commission on January 18, 2002 (Registration Number: 92819 and 340658), accredited by KOLAS (Korea Laboratory Accreditation Scheme, No: 85) and approved by TUV, DNV, SEMKO and MIC (Ministry of Information and Communications in Korea) according to the requirement of ISO17025.

3. GENERAL INFORMATION

3.1 Product Description

The Eastern Mastec Corp., this equipment (referred to as the EUT in this report) is a 2.4GHz Digital Wireless System for Audio. The transmitter and receiver is a transceiver, but the transmitter has audio input and receiver has audio output, so we called transmitter means the device has audio input port and receiver has audio output port. The EUT, Transmitter and Receiver use same FHSS RF module for sending digital data to receiver and/or transmitter. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Fixed Station
OPERATING FREQUENCY	2.402 ~ 2.480 GHz
OUTPUT POWER	Typ. 7dBm
ANTENNA	Inserted into the EUT
ANTENNA GAIN	4 dBi
DATA TRANSFER RATE	400 Kbps (Stereo Audio data: 384 Kbps + Digital Data: 16Kbps)
CHANNEL	79 Channels
MODULATION TYPE	GFSK
SPREAD SPECTRUM TYPE	FHSS
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	FHHS RF Module: 32, 12.288, 10 MHz
USED BOARD NAME	Main Board, Control Board, Power Board, RF Module
NUMBER OF LAYER	Main Board: 2 Layers, Control Board: 1 Layer, Power Board: 1 Layer, RF Module: 4 Layers
USED RF MODULE	Manufacturer: Zenocom Co., Ltd, Model: EAT-100-Tx, Rx
POWER REQUIREMENT	AC 100 -240 V~; 50/60Hz; 0.4A
TEMPERATURE CONDITION	Operation: 0˚C ~ 50˚C
EXTERNAL CONNECTOR	Line Output (RCA), Speaker Output

3.2 Alternative type(s)/model(s); also covered by this test report.

No other model differences have been mentioned.

4. EUT MODIFICATIONS

None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MAIN BOARD	Eastern Mastec Corp.	N/A	N/A
RF MODULE	Zenocom Co., Ltd	EAT-100-Tx, Rx	N/A

5.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	FCC ID	Description	Connected to
WL-R1000	Eastern Mastec Corp.	OSRWL-R1000	2.4GHz Digital Wireless System for Audio (EUT)	HOST
PLL011	Dell Computer Corp.	DoC	Laptop PC (HOST)	EUT
AG-203D	Kenwood	N/A	Audio Generator	EUT
SAS-S200	N/A	N/A	Speaker	EUT
X-1D	Eastern Mastec Corp.	N/A	Amplifier	EUT

5.4 Mode of operation during the test

The EUT was connected with a laptop PC and then the PC controlled channel changed only. The EUT received audio signal from the generator and then transmitted the signal continuously during the testing.

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5.5 Configuration of Test System

Line Conducted Test: The power cord of the EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power lines Conducted Emission tests were performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4/2001 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3meter open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.6 Antenna Requirement

For intentional device, according to section 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.

Antenna Construction:

The transmitter antenna of the EUT is inserted into the EUT, so no consideration of replacement by the user.

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6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Stand-by mode	
Receiving and Transmitting mode	X

6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Stand-by mode	
Receiving and Transmitting mode	X

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7. 20dB BANDWIDTH

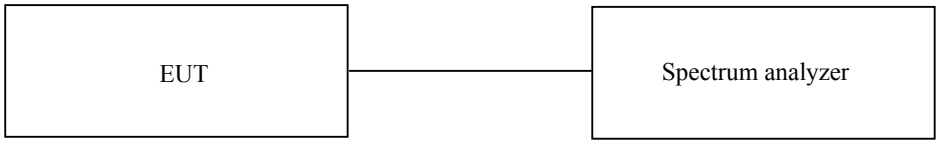
7.1 Operating environment

Temperature : 19°C

Relative humidity : 35 %

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal
■ -	8564E	HP	Spectrum Analyzer	3650A00756	September 23, 2004

All test equipment used is calibrated on a regular basis.

7.4 Test data

-. Test Date : March 23, 2004

-. Test Result : Pass

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2402	708	1000	-292
Middle	2441	692	1000	-308
High	2480	700	1000	-300

Remark: See next page for an overview sweep performed with peak detector.

Tested by: Dan-Gi Lee / Project Engineer

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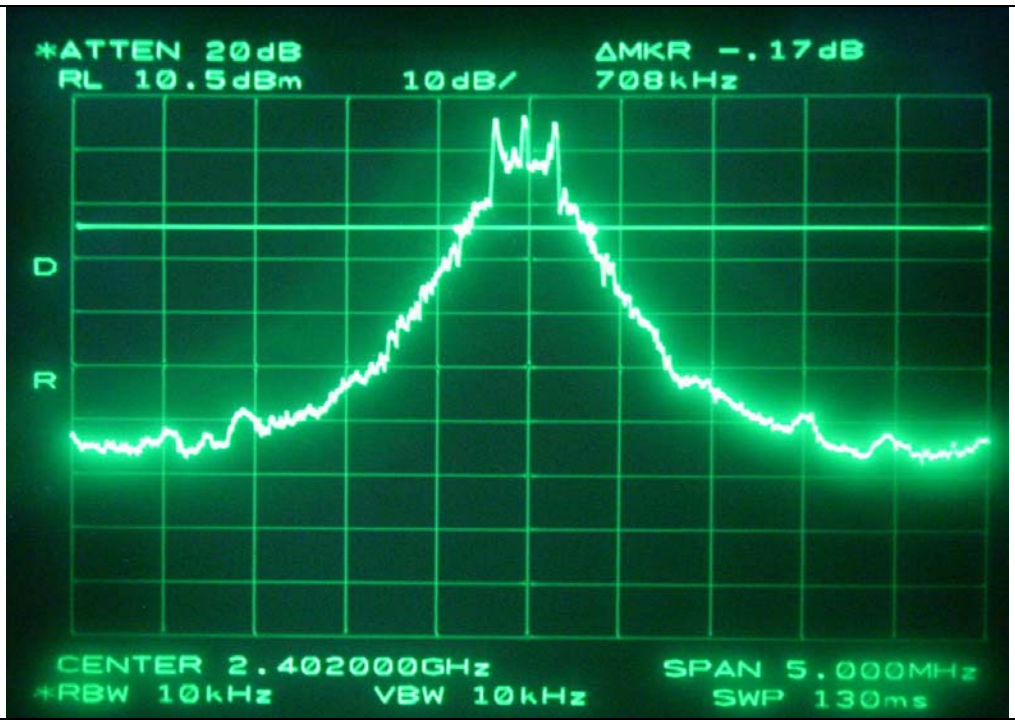
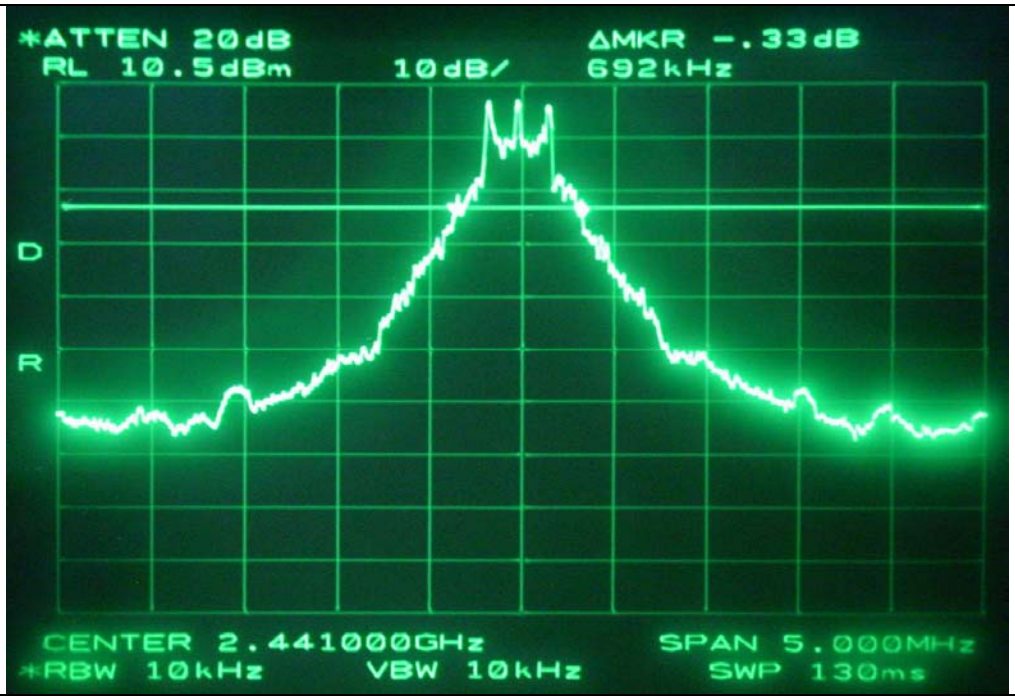


Low Channel



Middle Channel

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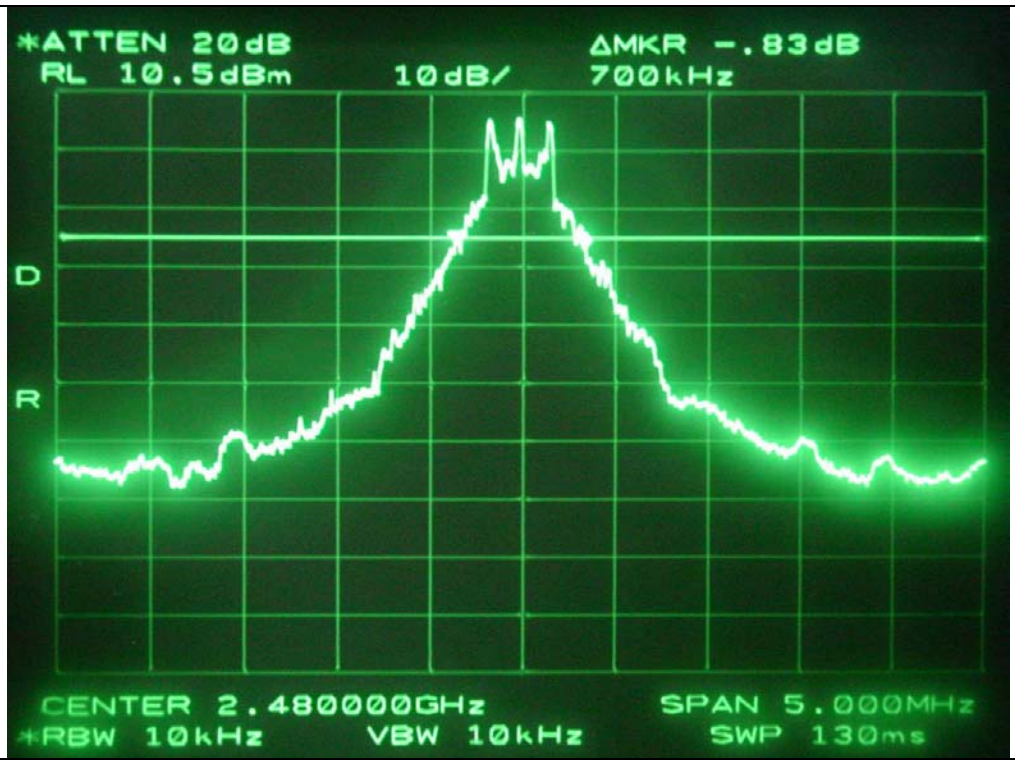

High Channel

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8. HOPPING FREQUENCY SEPARATION

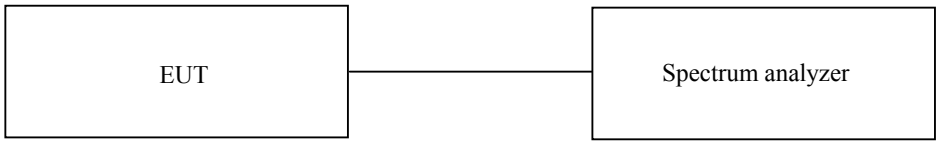
8.1 Operating environment

Temperature : 19°C

Relative humidity : 35 %

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 10 MHz. The analyzer is set to peak hold, then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal
■ -	8564E	HP	Spectrum Analyzer	3650A00756	September 23, 2004

All test equipment used is calibrated on a regular basis.

8.4 Test data

-. Test Date : March 23, 2004

-. Test Result : Pass

MEASURED VLAUE (kHz)	LIMIT, 20dB Bandwidth (kHz)	MARGIN (kHz)
1020	708	-312

Tested by: Dan-Gi Lee / Project Engineer

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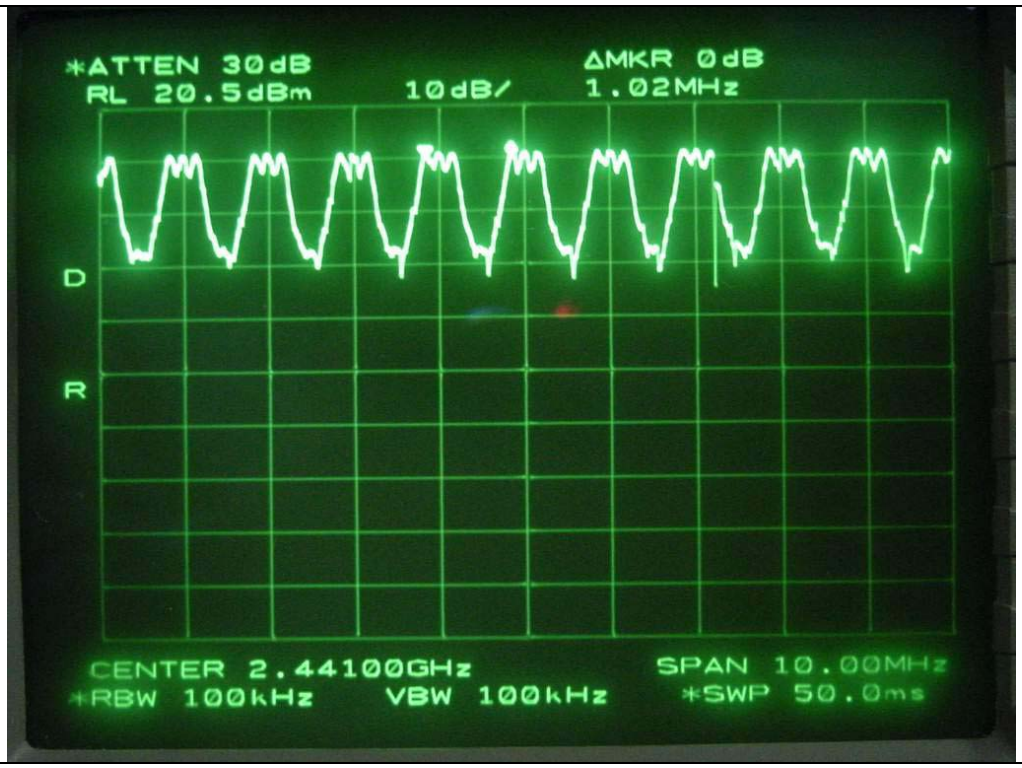

*ATTEN 30dB
RL 20.5dBm
10dB/
ΔMKR 0dB
1.02MHz
D
R
CENTER 2.44100GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms

9. NUMBER OF HOPPING CHANNELS

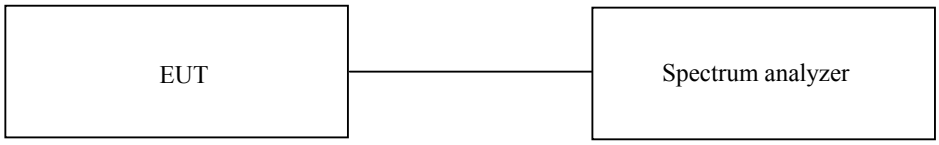
9.1 Operating environment

Temperature : 19°C

Relative humidity : 35 %

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 100 MHz and the resolution bandwidth is set to 1 MHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal
■ -	8564E	HP	Spectrum Analyzer	3650A00756	September 23, 2004

All test equipment used is calibrated on a regular basis.

9.4 Test data

-. Test Date : March 23, 2004

-. Test Result : Pass

MEASURED VLAUE (Number)	LIMIT (Number)	MARGIN (Number)
79	Minimum of 75	4

Tested by: Dan-Gi Lee / Project Engineer

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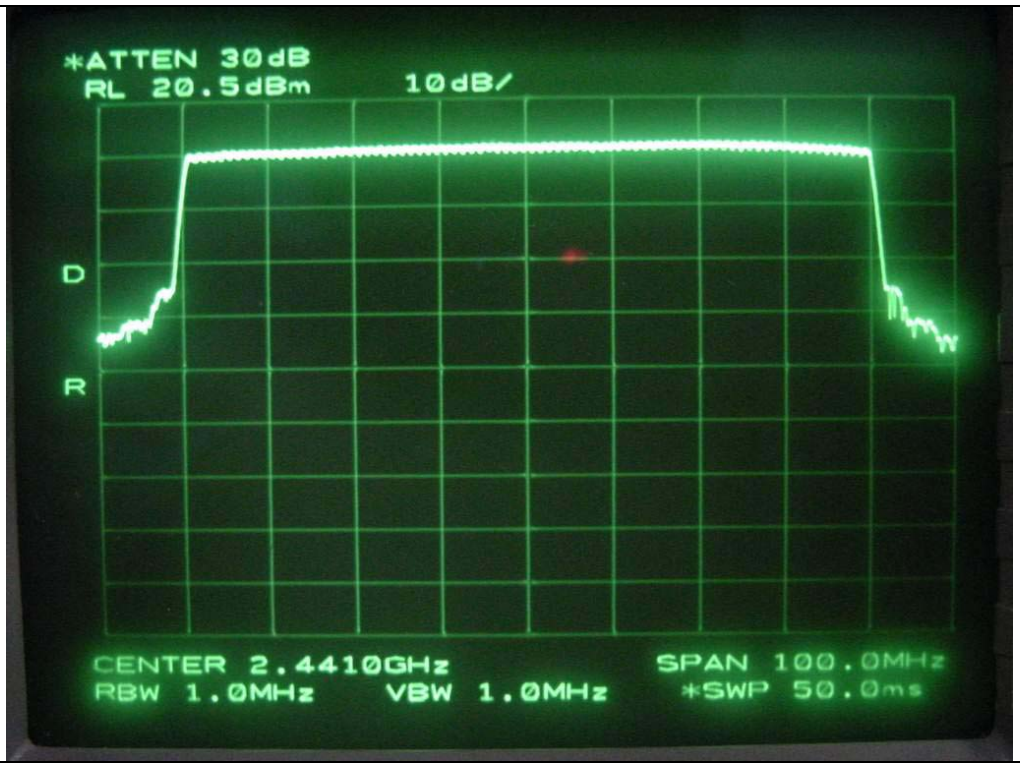

Total number of hopping channel: 79

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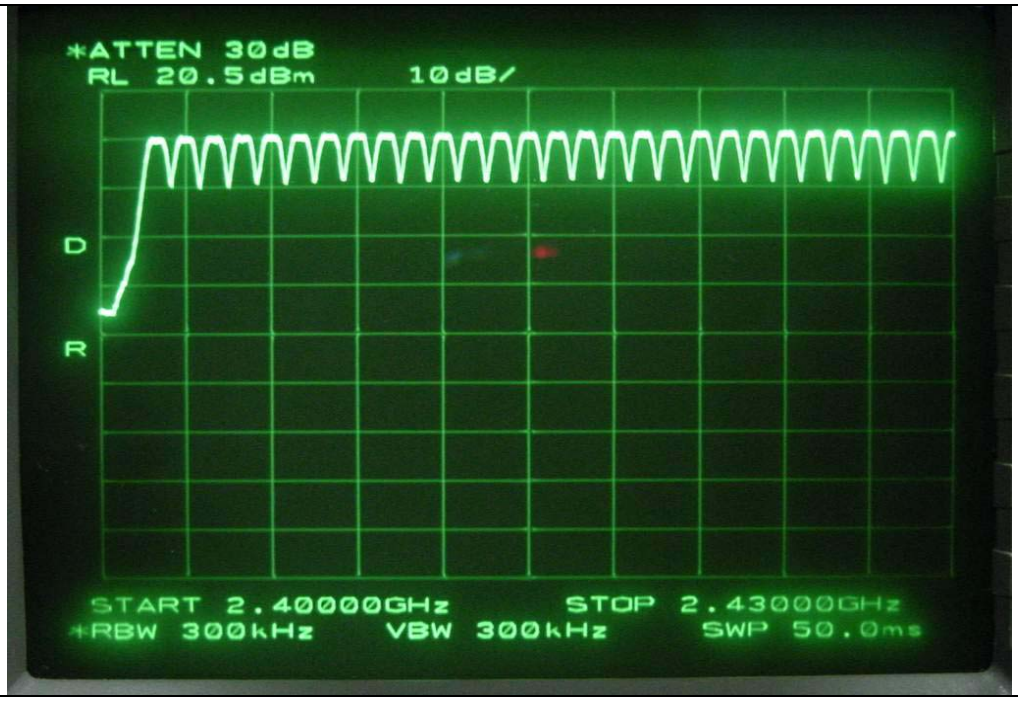
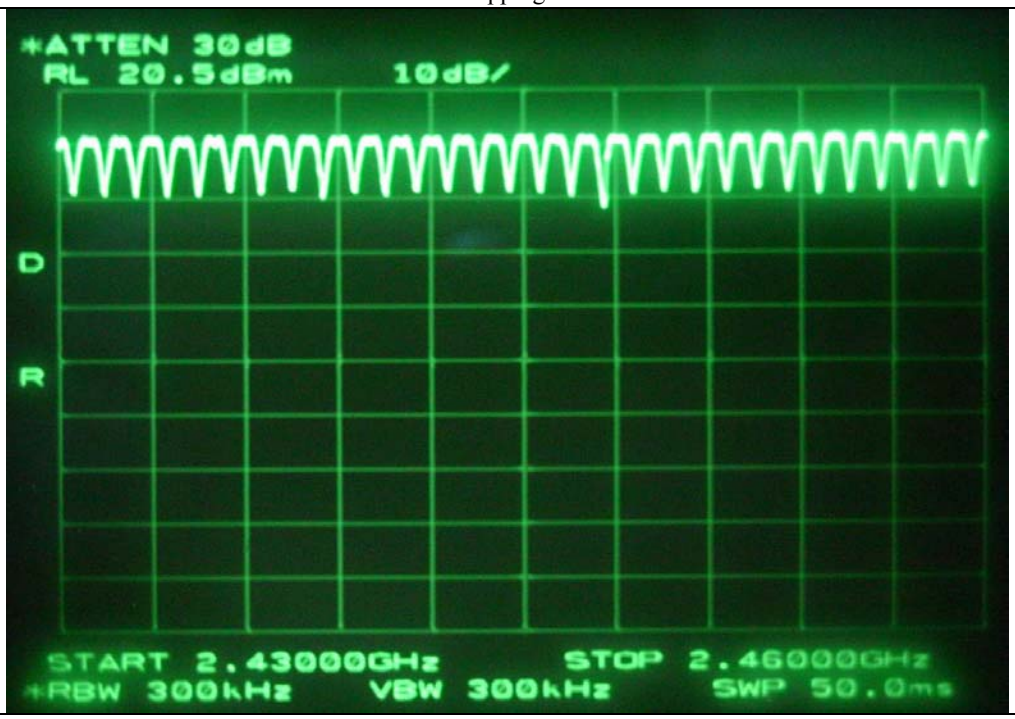


Number of hopping channel: 28



Number of hopping channel: 30

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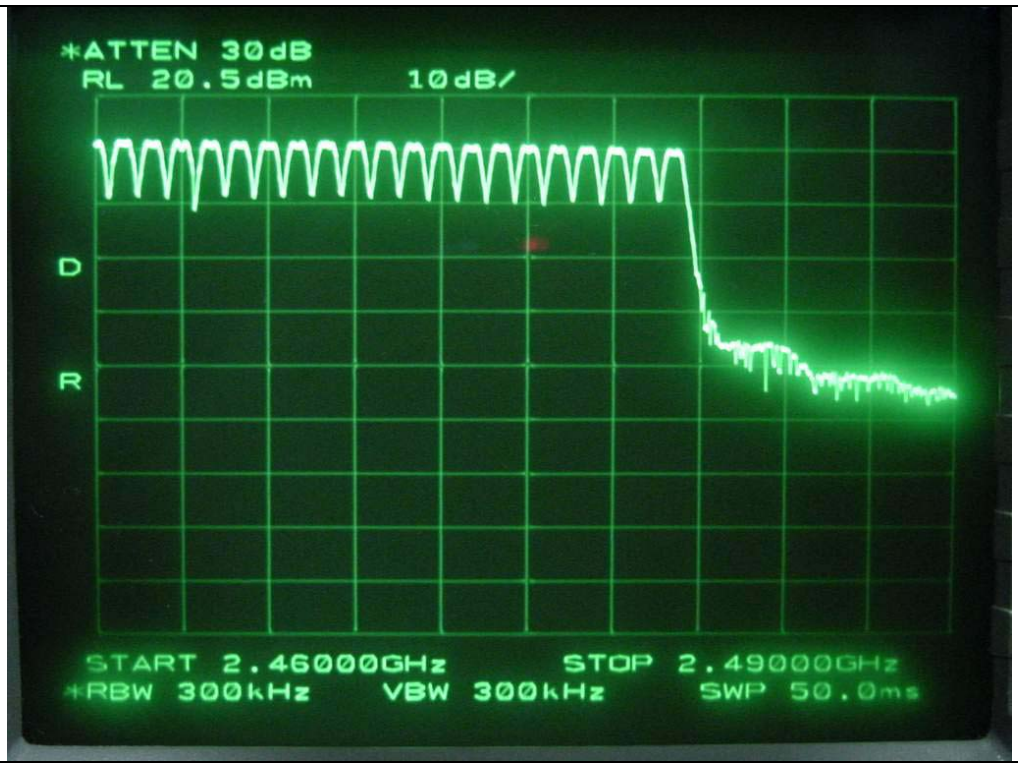

Number of hopping channel: 21

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10. TIME OF OCCUPANCY

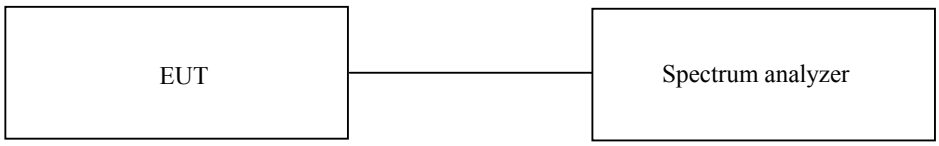
10.1 Operating environment

Temperature : 19°C

Relative humidity : 35 %

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The transmitter is set to operate in its normal frequency hopping mode. The center frequency of the spectrum analyzer is set to one of hopping channels near the center of the operating band and span is set to zero Hz. The sweep time is set to display one complete pulse. The mark delta function is used to measure the duration of the pulses.



10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal
■ -	8564E	HP	Spectrum Analyzer	3650A00756	September 23, 2004

All test equipment used is calibrated on a regular basis.

10.4 Test data

-. Test Date : March 23, 2004

-. Limit : < 400ms

-. Test Result : Pass

The system makes worst case 1600 hops per second or 1 time slot has a length of 625us with 79 channels. The system needs 1 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 800 hops per second with 79 channels. So The EUT has each channel for 10.13 times per second.

Time of Occupancy: 10.13 * 423.3 us * 31.6 = 135.5 ms per 30 seconds

Tested by: Dan-Gi Lee / Project Engineer

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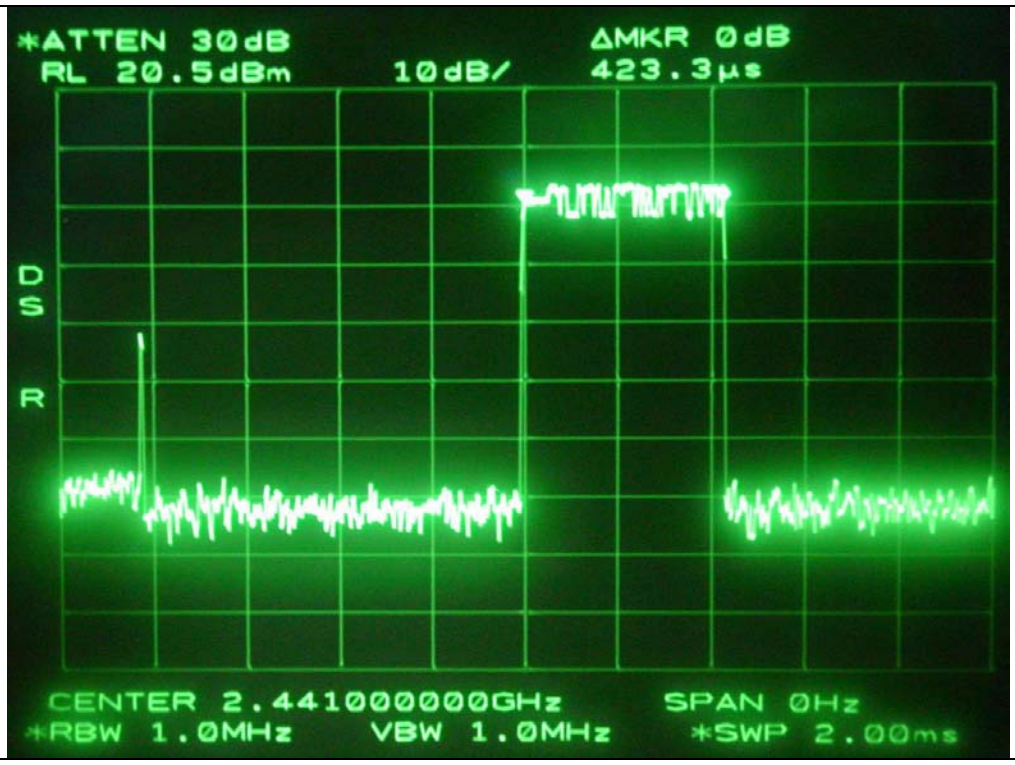

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11. MAXIMUM PEAK OUTPUT POWER

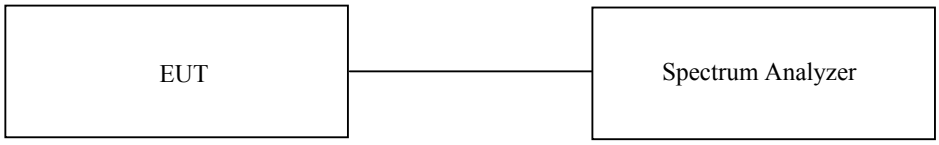
11.1 Operating environment

Temperature : 19°C

Relative humidity : 35 %

11.2 Test set-up

The maximum peak output power was measured with the power meter connected to the antenna output of the EUT. The EUT was operating in transmit mode at the appropriate center frequency.



11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal
■ -	8564E	HP	Spectrum Analyzer	3650A00756	September 23, 2004

All test equipment used is calibrated on a regular basis.

8.4 Test data

-. Test Date : March 23, 2004

-. Test Result : Pass

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2402	10.17	30.0	-19.83
Middle	2441	11.17	30.0	-18.83
High	2480	10.50	30.0	-19.50

Tested by: Dan-Gi Lee / Project Engineer

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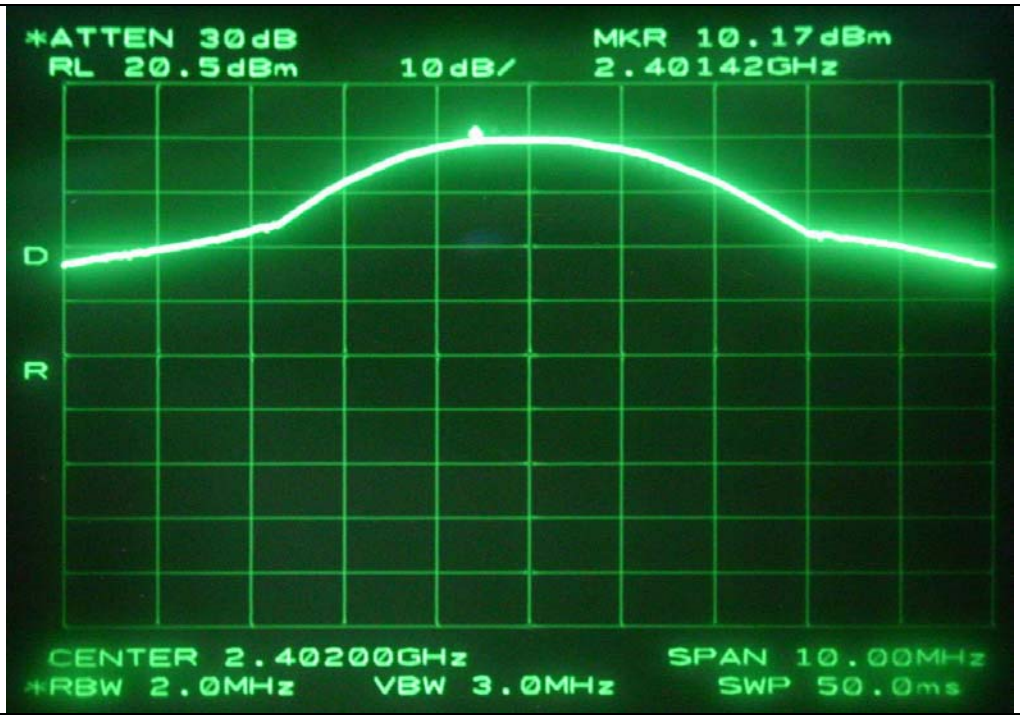
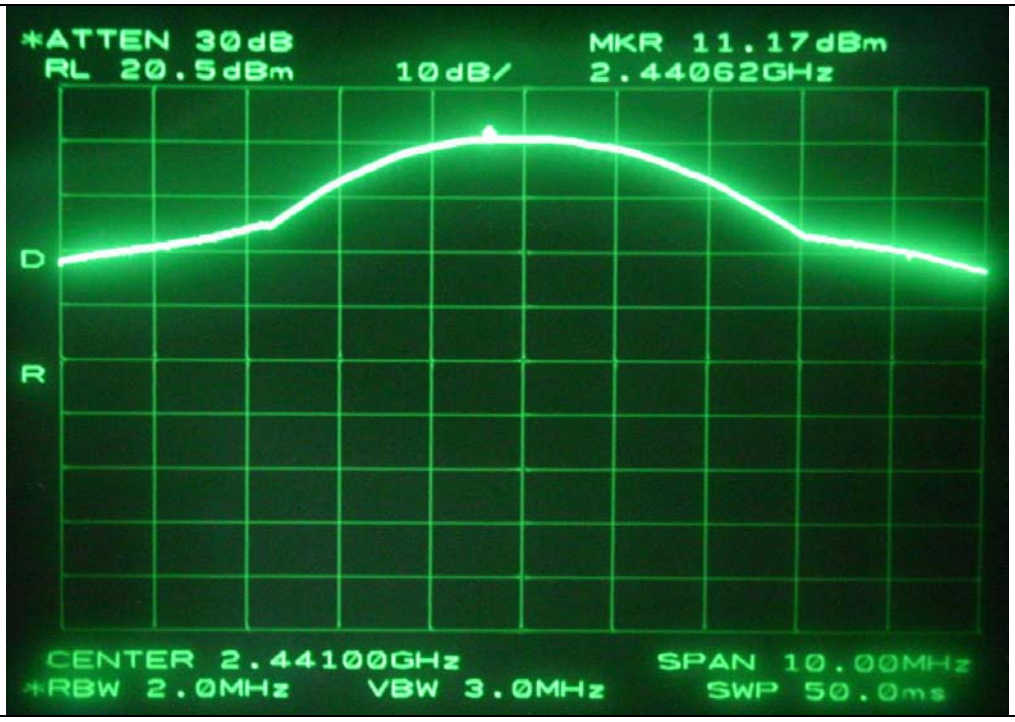
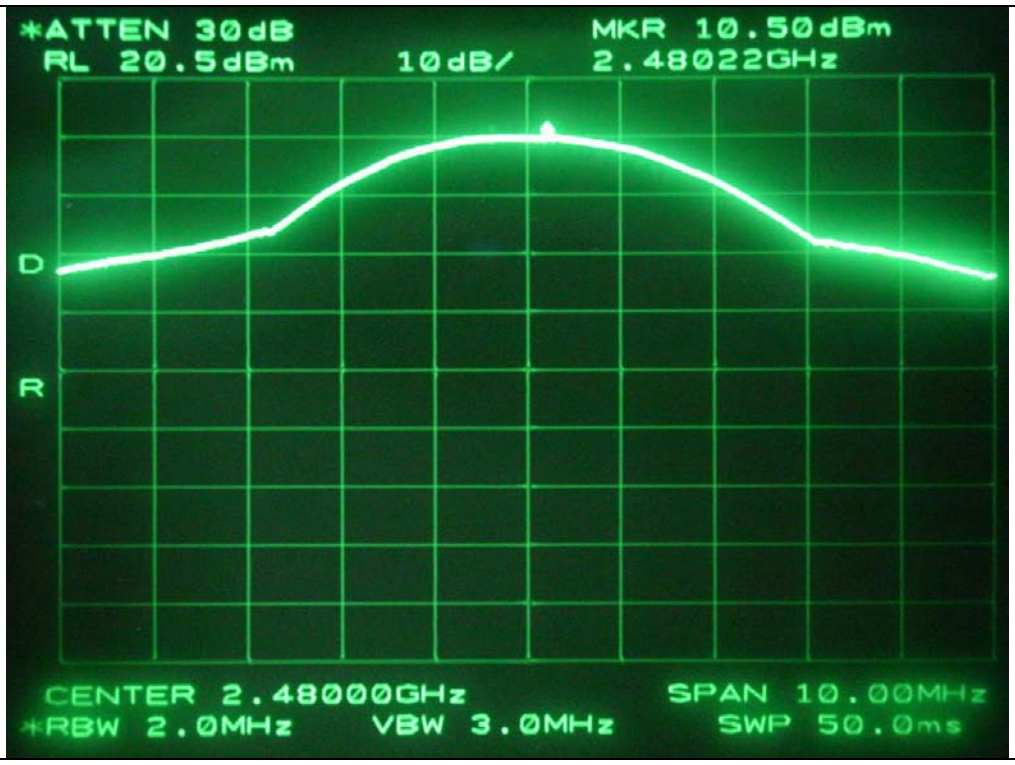


Low Channel



Middle Channel



High Channel

12. MAXIMUM PERMISSIBLE EXPOSURE

12.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 1mW/cm².

The electric field generated for a 1mW/cm²exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 3770$, because 1mW/ cm² = 10W/m²

Where

S = Power density in mW/cm², Z = Impedance of free space, 377Ω

E = Electric filed strength in Volts/m, G = Numeric antenna gain, and d = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$d = \sqrt{(30*P*G) / (3770 *S)}$

Changing to units of mW and cm, using P (mW) = P (W) / 1000, d (cm) = 100 * d (m)

$d = 0.282 * \sqrt{(P*G) / S}$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

12.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain	Calculated RF Exposure
(dBm)	(mW)	dBi	Separation Distance (cm)
11.17	14.79	4.0	2.17

Following Caution on the manual will be described.

"CAUTION: Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit."

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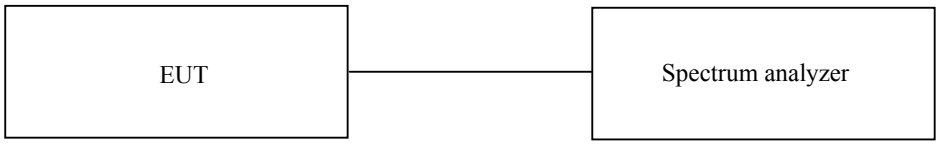
13. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

13.1 Operating environment

Temperature	:	19°C
Relative humidity	:	35 %

13.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



13.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3meters, open-field test site. The EUT was placed on a non-conductive turntable approximately 0.8 meters above the ground plane.

The frequency spectrum from 30MHz to 25GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 and 4.0 meters in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

13.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal.
■ -	8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	September 23, 2004
■ -	8449B	Hewlett-Packard	Preamplifier	3008A00833	June 10, 2004
□ -	83051A	Agilent	Preamplifier	3950M00201	June 10, 2004
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	June 6, 2004
■ -	YSE 500B	YoungShin Eng.	Frequency Converter	950413001	N/A
■ -	ETCR-10	DaeHa	Automatic Voltage Com.	N/A	N/A

All test equipment used is calibrated on a regular basis.

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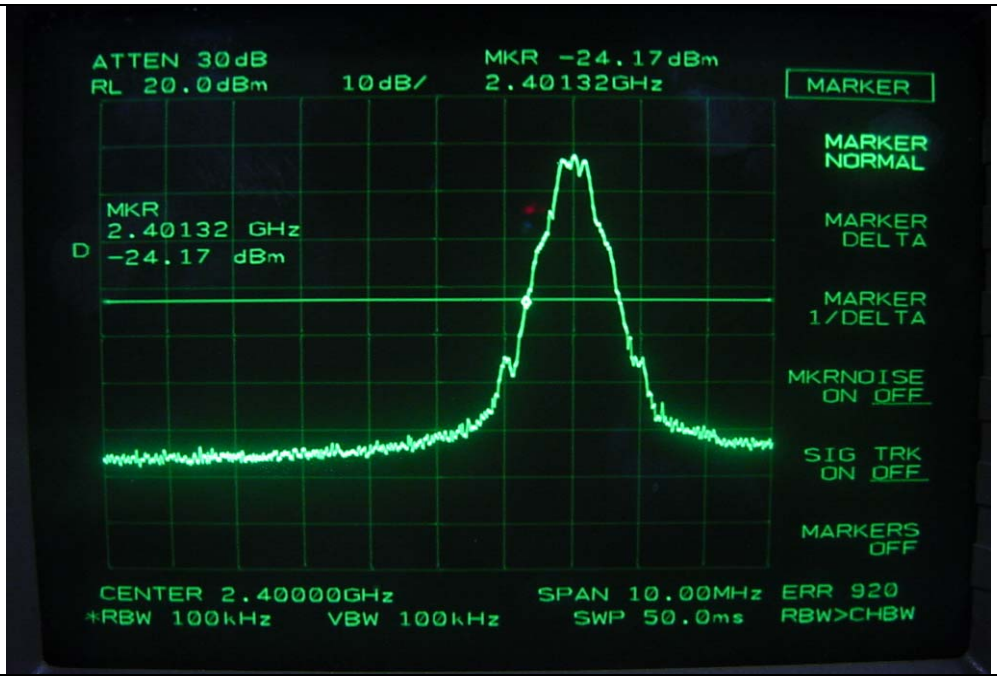
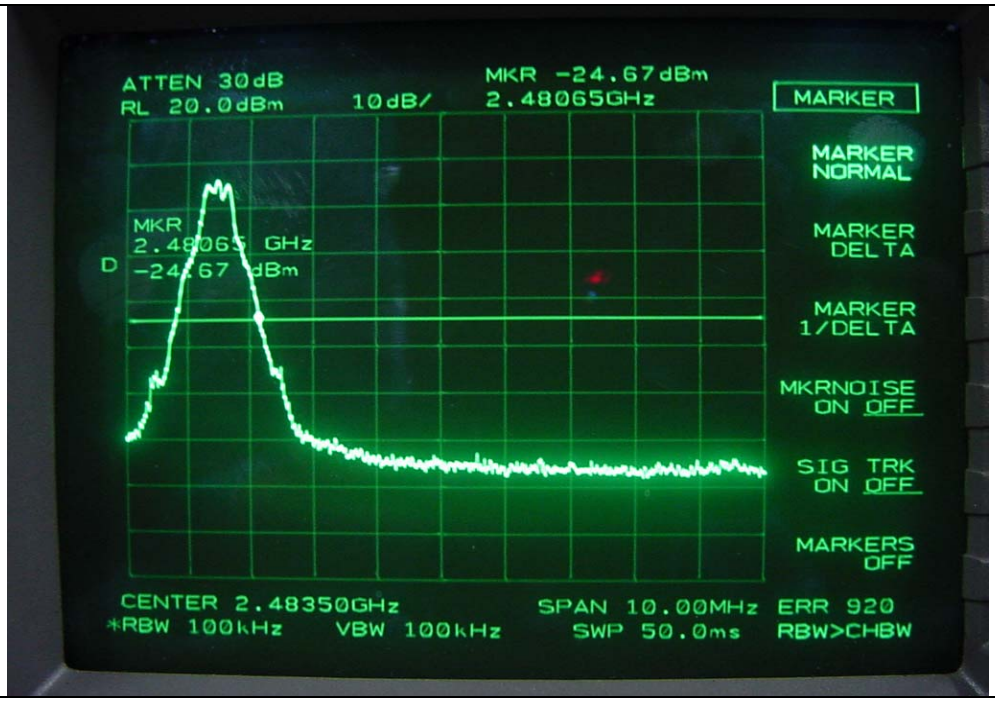
13.5. Test data

13.5.1. Test data for conducted emission



Low Channel



High Channel

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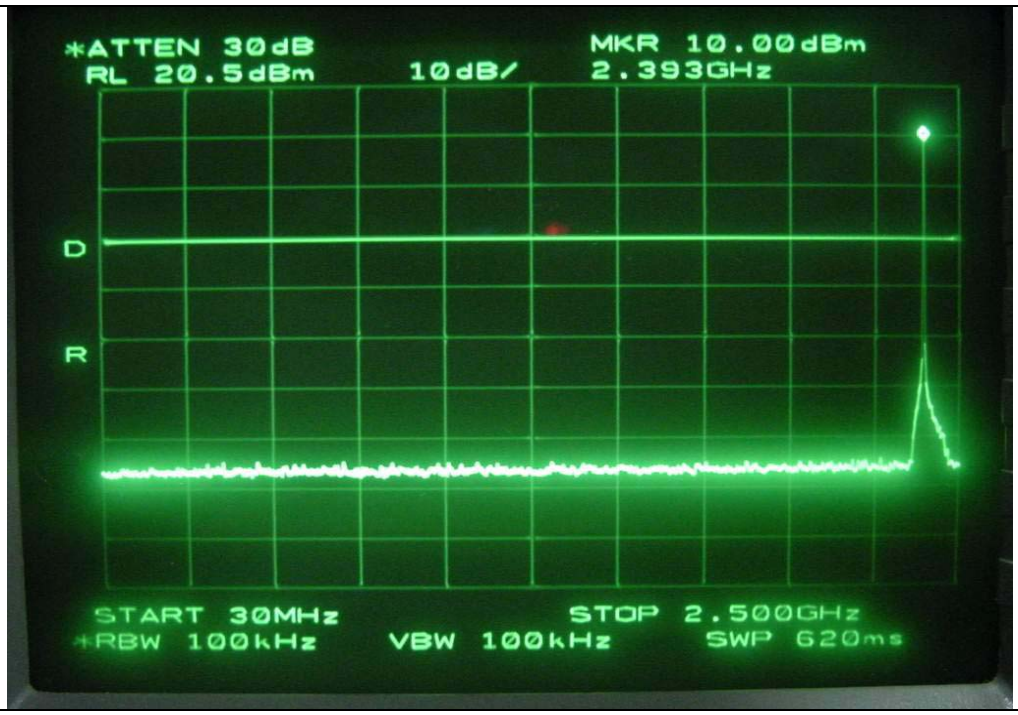
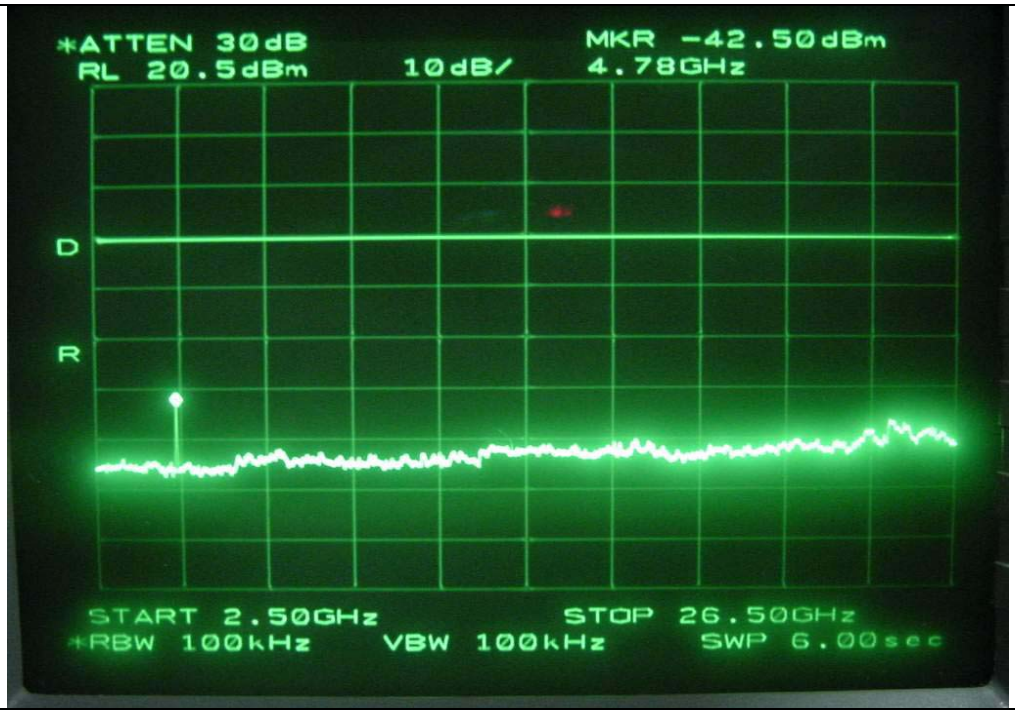
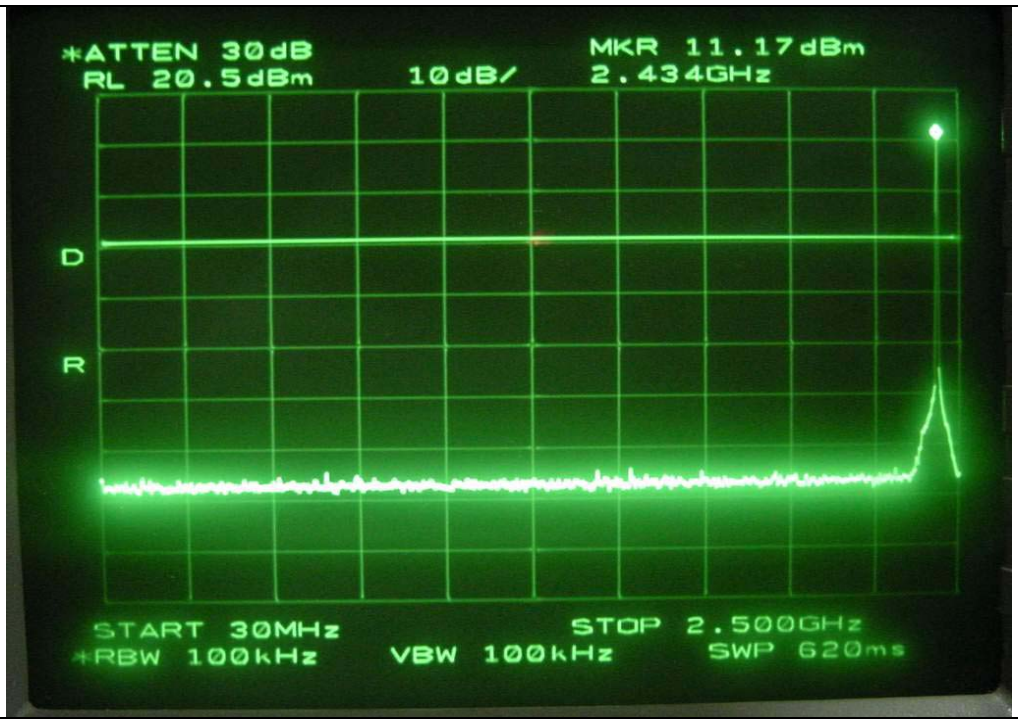


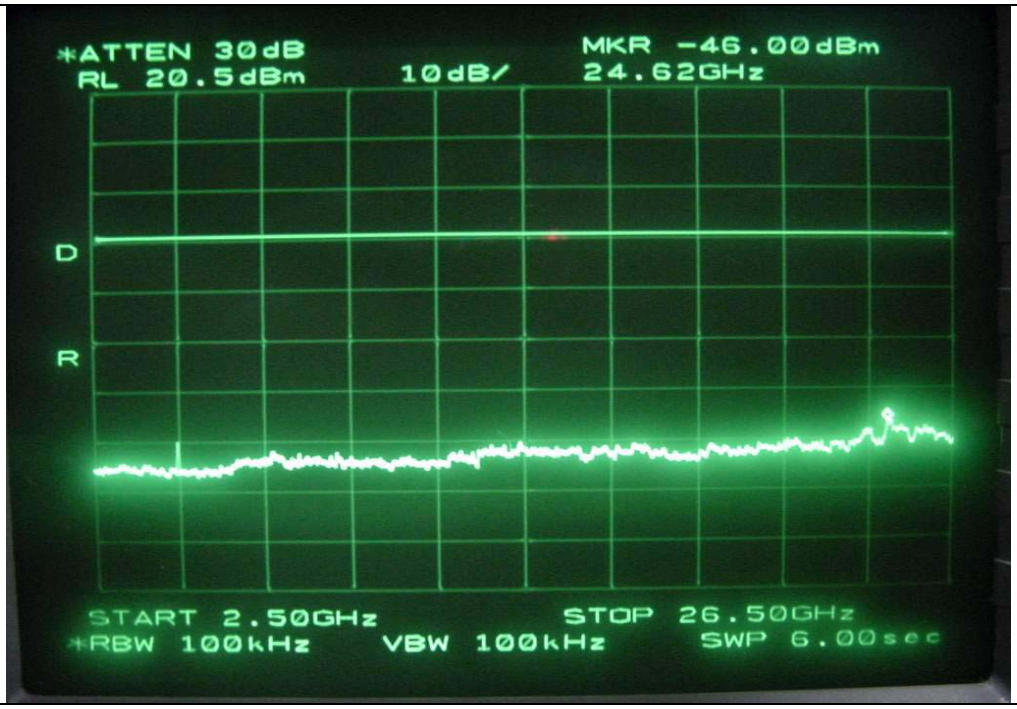
Low Channel



Low Channel



Middle Channel



Middle Channel

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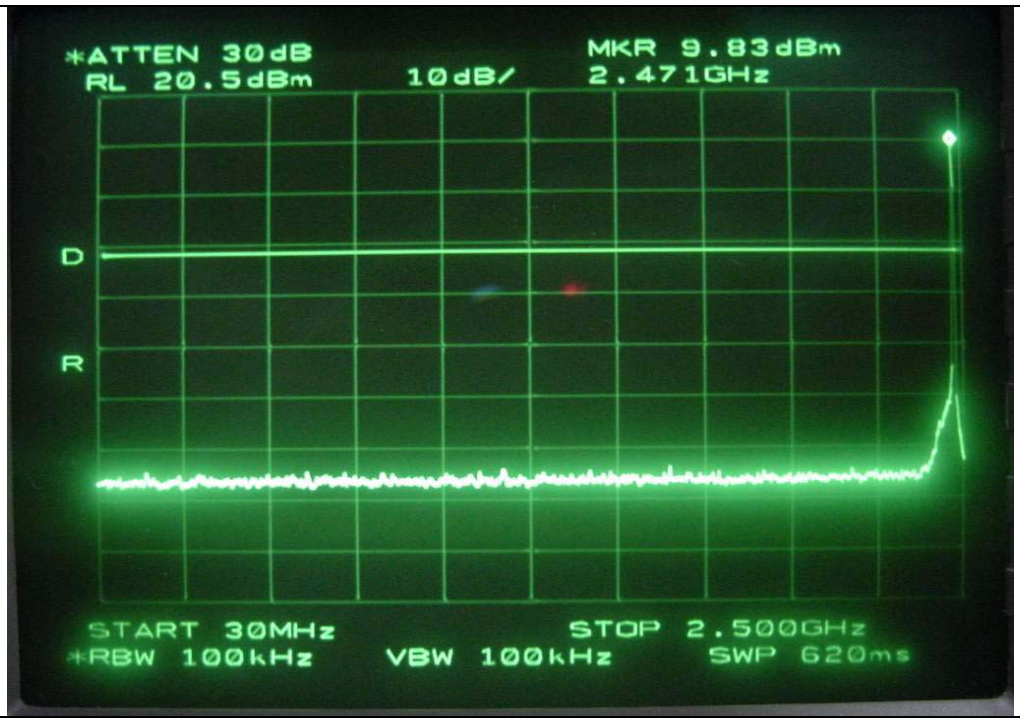
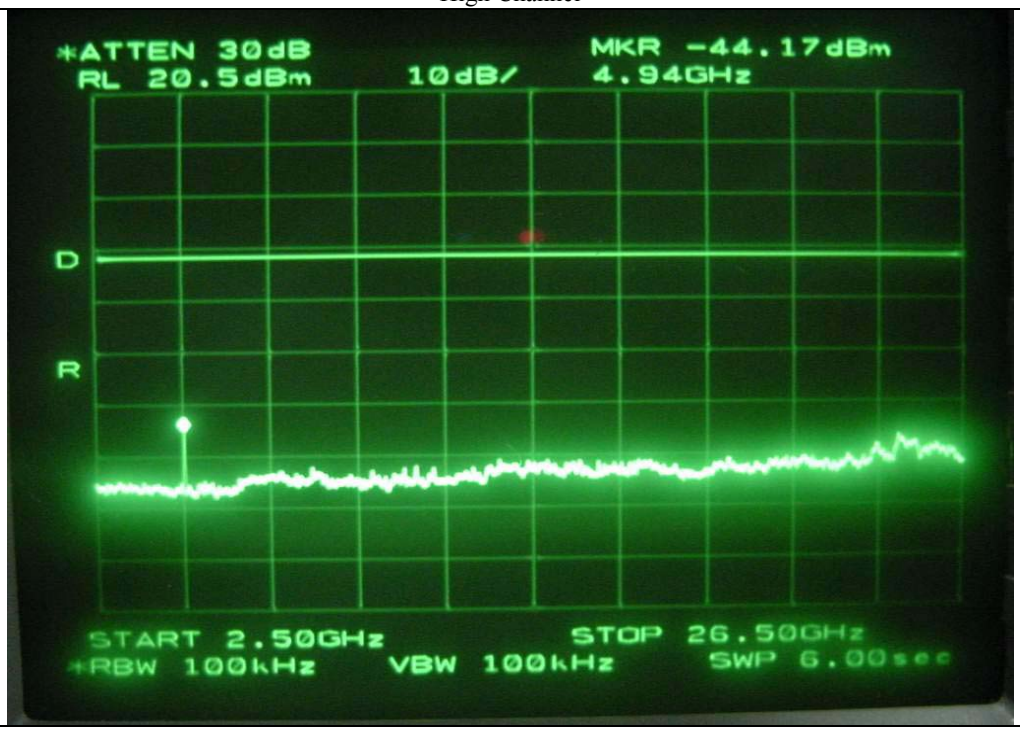


High Channel



High Channel

13.5.2. Test data for radiated emission

13.5.2.1. Radiated Emission which fall in the Restricted Band

-. Test Date : March 26, 2004
-. Resolution bandwidth : 1 MHz for Peak and Average Mode
-. Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
-. Frequency range : 1 GHz ~ 25GHz
-. Measurement distance : 1m
-. Operating Condition : Low / High Channel
-. Result : PASSED

Frequency (MHz)	Reading (dBuV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Total (dBuV/m)	Limits (dBuV/m)	Margin (dB)
Test Data for Low Channel									
2310~2390	It was not observed any emission from the EUT.								
Test Data for High Channel									
2483.5~2500	It was not observed any emissions from the EUT.								

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

Tested by: Dan-Gi Lee / Project Engineer

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13.5.2.2. Spurious & Harmonic Radiated Emission

-. Test Date : March 26, 2004
-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band, 100 kHz for Peak Mode for the emissions outside restricted band
-. Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
-. Frequency range : 1 GHz ~ 25 GHz
-. Measurement distance : 1m
-. Result : PASSED BY –6.48 dB at Low Channel

Frequency (GHz)	Reading (dBuV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Total (dBuV/m)	Limits (dBuV/m)	Margin (dB)
Test Data for Low Channel									
4.804	53.50	Peak	H	31.26	2.66	25.5	61.92	74.00	-12.08
	39.10	Average	H				47.52	54.00	-6.48
Other emissions up to 25GHz ware not observed.									
Test Data for Middle Channel									
4.882	48.20	Peak	H	31.38	2.67	25.5	56.75	74.00	-17.25
	33.90	Average	H				42.45	54.00	-11.55
Other emissions up to 25GHz ware not observed.									
Test Data for High Channel									
4.960	51.30	Peak	H	31.49	2.67	25.5	59.96	74.00	-14.04
	36.50	Average	H				45.16	54.00	-8.84
Other emissions up to 25GHz ware not observed.									

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band

Tested by: Dan-Gi Lee / Project Engineer

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14. PEAK POWER SPECTRUL DENSITY

14.1 Operating environment

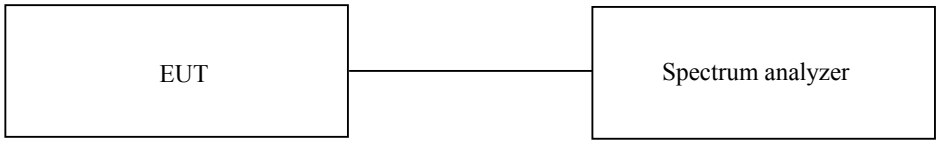
Temperature : 26°C

Relative humidity : 43 %

14.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is same as above resolution, and sweep time was set to span / 3 kHz. The sweep time was allowed to be longer than span / 3 kHz for a full response of the mixer in the spectrum analyzer.

The maximum level from the EUT in a 3 kHz bandwidth was measured with above condition.



14.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal
■ -	8564E	HP	Spectrum Analyzer	3650A00756	September 23, 2004

All test equipment used is calibrated on a regular basis.

14.4 Test data

-. Test Date : March 23, 2004

-. Result : PASSED BY –6.00 dB at Middle Channel

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2402	1.67	8.0	-6.33
Middle	2441	2.00	8.0	-6.00
High	2480	1.67	8.0	-6.33

Tabulated test data for Peak Power Spectral Density.

Remark: See next page for measurement data.

Tested by: Dan-Gi Lee / Project Engineer

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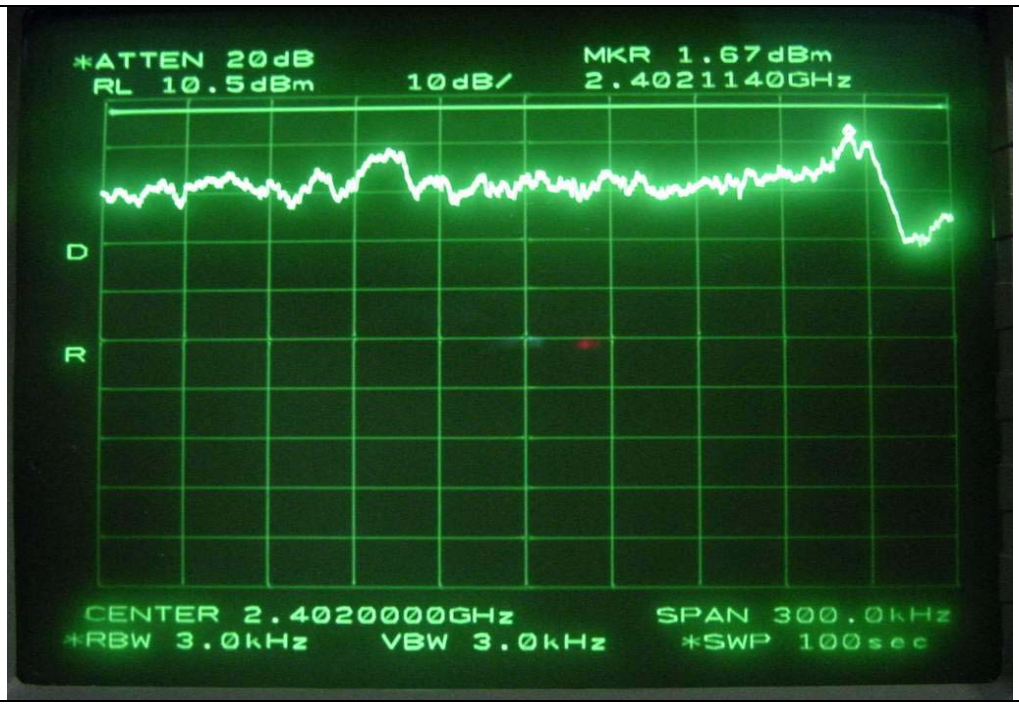
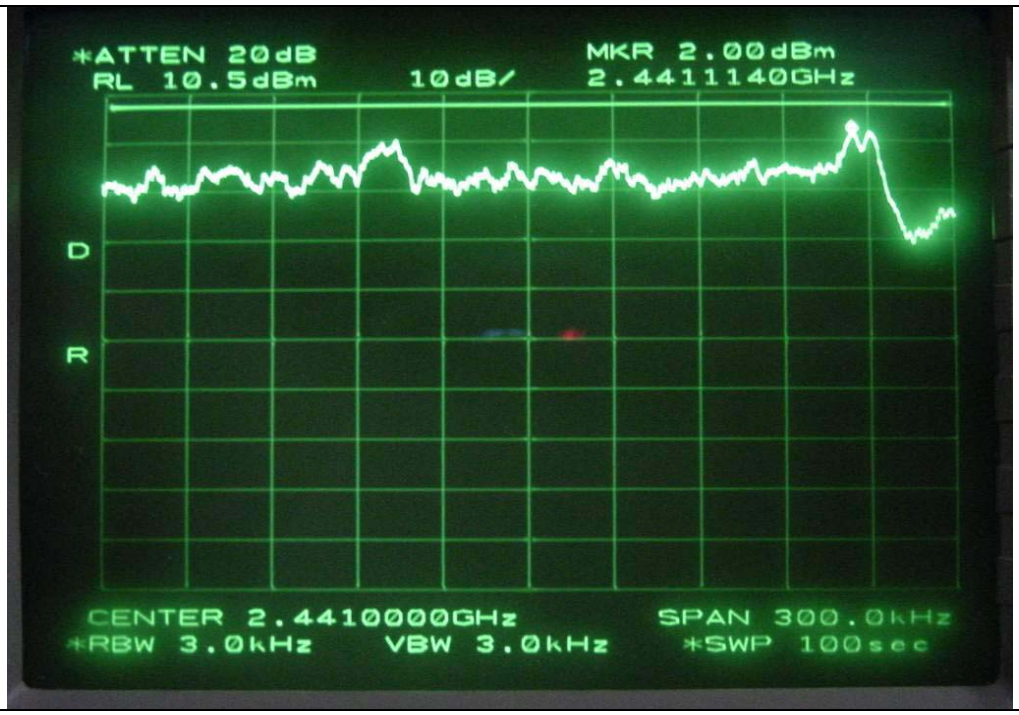
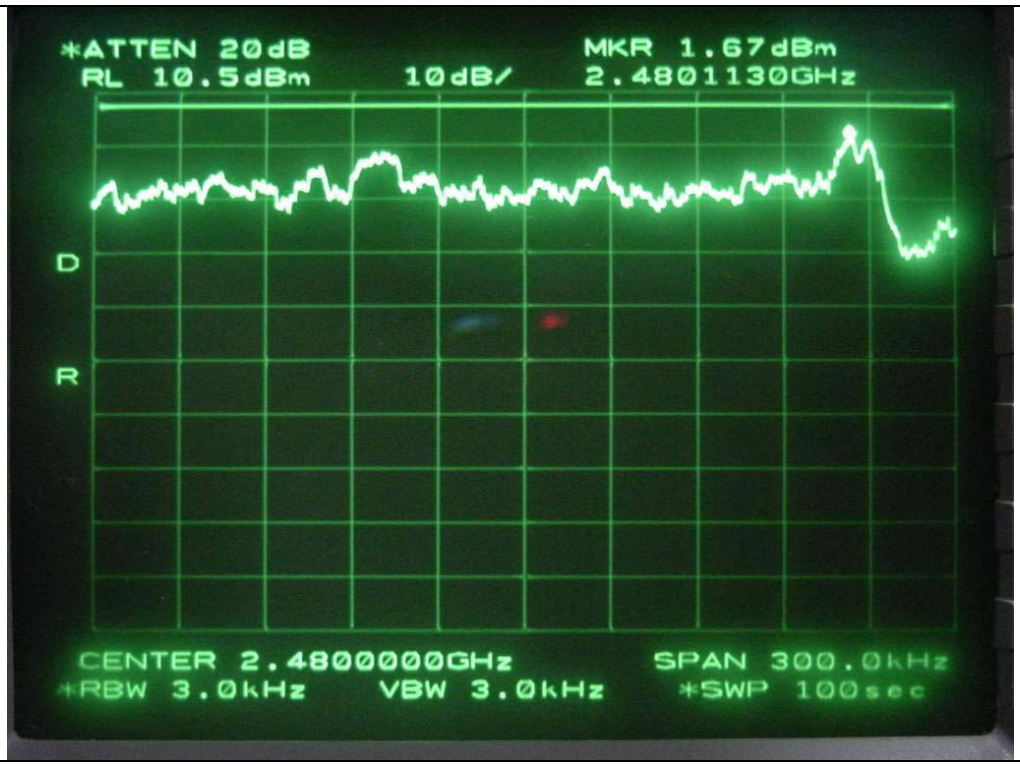


Low Channel



Middle Channel



High Channel

12. RADIATED EMISSION TEST, GENERAL REQUIREMENT

12.1 Operating environment

Temperature : 14°C

Relative humidity : 39 %

12.2 Test set-up

The radiated emissions measurements were on the 3 meters, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30MHz to 1000MHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 and 4.0 meters in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

Test set-up photos are included in appendix VI.

12.3 Measurement uncertainty

Radiated emission electric field intensity, 30 MHz ~ 200 MHz : ±4.3 dB

Radiated emission electric field intensity, 200 MHz ~ 1000 MHz : ±4.1 dB

12.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal.
■ -	ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005	Nov. 01, 2004
■ -	85650A	Hewlett Packard	Quasi-Peak Adapter	3107A01542	July 10, 2004
■ -	8568B	Hewlett-Packard	Spectrum Analyzer	3109A05456	July 10, 2004
■ -	85685A	Hewlett-Packard	RF Preselector	3107A01264	July 10, 2004
□ -	8449B	Hewlett-Packard	RF Amplifier	3008A00833	June 10, 2004
□-	8447F	Hewlett-Packard	RF Amplifier	3113A04554	June 10, 2004
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	3104C	EMCO	Biconical Antenna	9109-4441	July 11, 2004
■ -	3146	EMCO	Log Periodic Antenna	9109-3214	July 11, 2004
■ -	YSE 500B	YoungShin Eng.	Frequency Converter	950413001	N/A
■ -	ETCR-10	DaeHa	Automatic Voltage Com.	N/A	N/A

All test equipment used is calibrated on a regular basis.

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12.5 Test data

-. Test Date : March 26, 2003
-. Resolution bandwidth : 120 kHz
-. Frequency range : 30MHz ~ 1000MHz
-. Measurement distance : 3m
-. Operating Condition : Max Transmitting Mode at Low / Middle / High Channel
-. Result : PASSED BY –4.94 dB at 81.61 MHz

Frequency (MHz)	Reading (dBuV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
79.81	26.50	H	6.55	1.00	34.05	40.00	-5.86
81.61	27.10	H	6.85	1.03	34.98	40.00	-4.94
138.89	20.46	H	12.60	1.31	34.37	43.50	-9.28
141.59	20.86	H	12.70	1.32	34.88	43.50	-8.57
149.15	19.46	H	13.40	1.35	34.21	43.50	-8.72
164.27	14.73	H	15.70	1.41	31.84	43.50	-11.92

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Tested by: Dan-Gi Lee / Project Engineer

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EMC Testing Dept : 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-860 Korea. (TEL: 82-31-765-8289 FAX: 82-31-766-2904)

13. CONDUCTED EMISSION TEST

13.1 Operating environment

Temperature : 20°C

Relative humidity : 34 %

13.2 Test set-up

The conducted emission measurements of power line were performed in a shielded room. The EUT was placed on a wooden table, 0.8 meters height above the floor. Power was fed to the EUT through a 50 ohm/ 50 microhenry Line Impedance Stabilization Network (LISN). The ground plane was electrically bonded to the shield room ground system and all power lines entering the shield room were filtered.

13.3 Measurement uncertainty

Conducted emission, quasi-peak detect : ±3.0 dB

Conducted emission, average detect : ±3.0 dB

13.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Due Cal.
■ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	Apr. 29, 2004
■ -	3825/2	EMCO	AMN	9109-1869	Oct. 20, 2004
■ -	N/A	HanKook Shield room	Shield Room	N/A	N/A
■ -	YSE 500B	YoungShin Eng.	Frequency Converter	950413001	N/A
■ -	ETCR-10	DaeHa	Automatic Voltage Com.	N/A	N/A

All test equipment used is calibrated on a regular basis.

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13.5 Test data

-. Test Date : March 25, 2004

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15MHz ~ 30MHz

-. Operating Condition : Max Transmitting Mode at Low / Middle / High Channel

-. Result : PASSED BY –3.35 dB at 0.53 MHz with Average Detector

Frequency (MHz)	Line	Quasi-Peak (dBuV)			Margin (dB)	Average (dBuV)		Margin (dB)
		Emission level	Detect Mode	Limits		Emission level	Limits	
0.195	N	50.80	P	63.82	-13.02			
0.26	N	45.85	P	61.43	-15.58			
0.33	N	42.22	P	59.58	-17.36			
23.73	H	41.79	P	60.00	-18.21			
27.65	H	42.90	P	60.00	-17.10			
28.43	H	42.96	P	60.00	-17.04			

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral line, "P": Peak detect.

See next page for an overview sweep performed with peak and average detector.

Tested by: Dan-Gi Lee / Project Engineer

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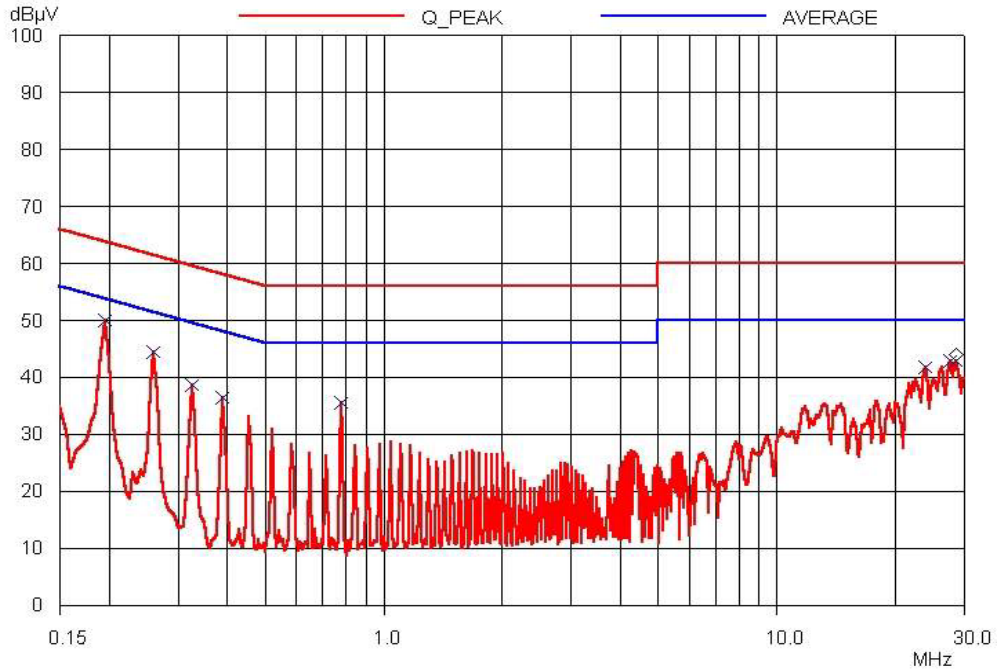
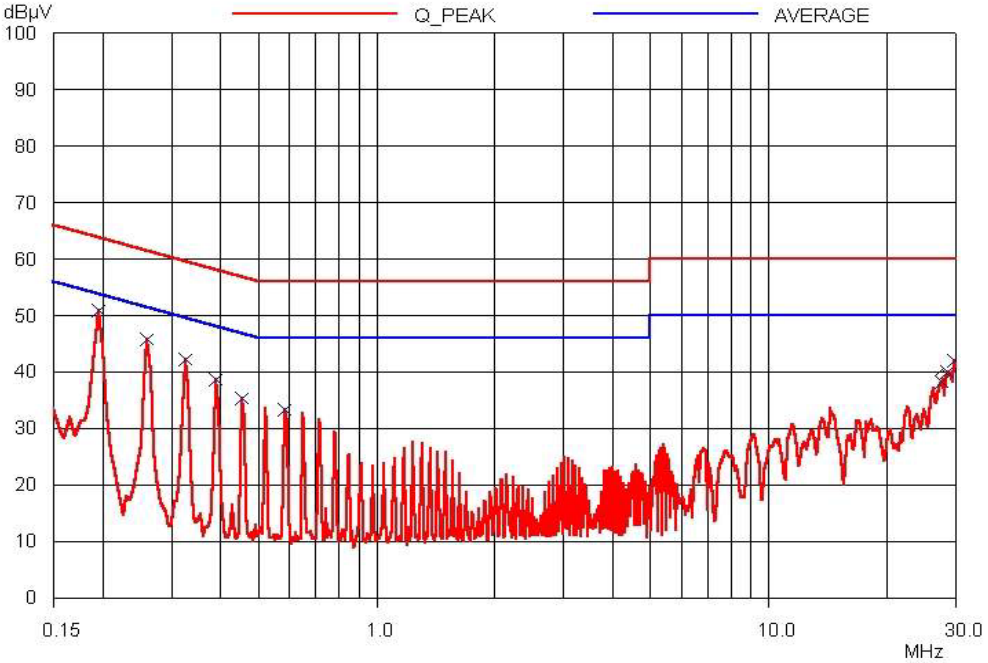


HOT LINE



NEUTRAL LINE

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