

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

Test Report No. : E114R-027

AGR No. : A10DA-093

Applicant : HWH CO., LTD.

Address : 102-708, Digital Empire2, Sin-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea

Manufacturer : SERONICS CO., LTD.

Address : 169 Goangdan-dong, Gumi-shi, Kyungbuk, 730-030, Korea

Type of Equipment : LCD Television with Bluetooth Module

FCC ID. : ZDA-PDI-P23LCDE

Model Name : PDI-P23LCDE

Serial number : N/A

Total page of Report : 42 pages (including this page)

Date of Incoming : March 02, 2011

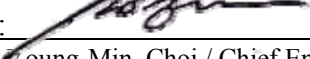
Date of issue : April 12, 2011


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.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E114R-027	April 12, 2011	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

APPLICANT : HWH CO., LTD.
 ADDRESS : 102-708, Digital Empire2, Sin-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
 CONTACT PERSON : Mr. Seungsek, Park / Chief Engineer
 TELEPHONE NO : +82-31-695-8317
 FCC ID : ZDA-PDI-P23LCDE
 MODEL NAME : PDI-P23LCDE
 SERIAL NUMBER : N/A
 DATE : April 12, 2011

EQUIPMENT CLASS	<i>DSS – PART 15 SPREAD SPECTRUM TRANSMITTER</i>
KIND OF EQUIPMENT	LCD Television
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.4: 2009
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	None
FINAL TEST WAS CONDUCTED ON	3 m open area test site

-. 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.

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 (b) (1)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (b) (4)	Antenna Gain	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 (i)	Radio Frequency Exposure Level	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	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

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2009. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. Description details of test facilities were submitted to the Commission on August 21, 2008. (Registration Number: 340658)

3. GENERAL INFORMATION

3.1 Product Description

The HWH CO., LTD., Model PDI-P23LCDE (referred to as the EUT in this report) is a LCD Television which has a function of Bluetooth module. The port for computing peripheral device shall be subject to DoC procedure and issued by another test report no. E114R-028. And the function of TV broadcast receiver shall be subject to verification procedure and issued by another test report no. E114R-029. This report is for Bluetooth function. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	LCD Television with Bluetooth module
TEMPERATURE RANGE	-20 °C ~ +50 °C
OPERATING FREQUENCY	2 402 MHz ~ 2 480 MHz
RF OUTPUT POWER	12 dBm
NUMBER OF CHANNEL	79 Channels
MODULATION TYPE	GFSK
USED RF MODULE	MFR.: Hana Micron, Model No.: HBM1X1M
ANTENNA CONNECTOR TYPE	Chip Antenna
ANTENNA GAIN	0.758 dBi
LIST OF EACH OSC. OR CRYSTAL. FREQ.(FREQ. >= 1 MHz)	25 MHz, 24.69 MHz and 27 MHz on the main board 8 MHz on the OBD board
NUMBER OF LAYER	1 Layer: SMPS board 2 Layers: AV board, Front board, Pillow board and Bluetooth Board, 4 Layers: Main board and Ext module board
EXRERNAL CONNECTOR	RF In, Pillow, MTI, CCI, USB, PC In(Video, Audio), Component In, A/V In, S-VHS Video In, HDMI In 1/2, SVC

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

-. None

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	N/A	DM-923PB_V_1_0	N/A
Bluetooth Board	N/A	DM-923PB4 BLUETOOTH V1.0	N/A
Inverter Board	DS-Plus	DS-1308EC	N/A
Interface Board	N/A	DM-923PB1 V1.0	N/A
Tuner	Samsung	DTVA50FVH1019A	N/A
AV Board	N/A	DM-923PB2 V1.0	N/A
Front Board	N/A	N/A	N/A
OBD Board	N/A	DM-923PB5 V1.0	N/A
LCD Panel	LG Display	LM230WF1(TL)(A3)	N/A
SMPS Board	FiNEL TECH	TSL-23LP	N/A

5.2 Peripheral equipment

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

Model	Manufacturer	FCC ID	Description	Connected to
PDI-P23LCDE	HWH CO., LTD.	ZDA-PDI-P23LCDE	LCD Television (EUT)	-
N/A	Curbeli	N/A	Wired Remote Controller	EUT
PP04X	Dell Computer	DoC	Notebook PC	EUT
RX3041	Asus	DoC	Router	EUT
DVP-NS92V	Sony	N/A	DVD Player 1	EUT
N/A	LG	N/A	DVD Player 2	EUT

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting and receiving mode is programmed. For final testing, Bluetooth was set at Low Channel (2 402 MHz), Middle Channel (2 441 MHz), and High Channel (2 480 MHz).

5.4 Cable Description for the EUT

Ports Name	Shielded	Ferrite Bead	Metal Shell	Length (m)	Connected to
AC In	N	N	-	1.5	-
Pillow	Y	N	EUT END	2.0	Pillow Speaker
MTI / CCI	N	N	EUT END	1.5	Router
SPDIF	Y	N	BOTH END	1.5	DVD Player
A/V In	Y	N	BOTH END	1.5	DVD Player
Component In	Y	N	BOTH END	1.5	DVD Player
S-Video In	Y	N	BOTH END	2.0	DVD Player
HDMI In	Y	N	BOTH END	1.5	DVD Player

5.5 Configuration of Test System

Line Conducted Test: The power of EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4: 2009 7.3.3 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4: 2009 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m 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

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 a chip type, so no consideration of replacement by the user.

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)
Transmitter 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)
Transmitter Mode	X

7. CARRIER FREQUENCY SEPARATION

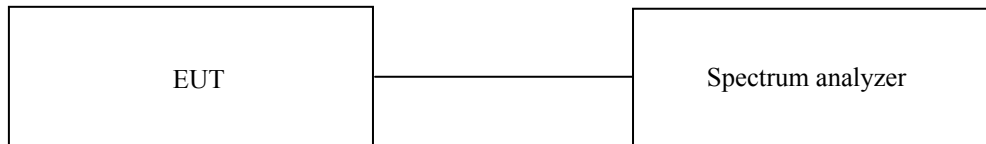
7.1 20 dB BANDWIDTH

7.1.1 Operating environment

Temperature : 23 °C
Relative humidity : 52 % R.H.

7.1.2 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 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



7.1.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun 10, 2010 (1Y)

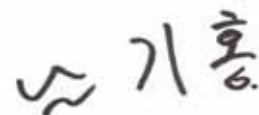
All test equipment used is calibrated on a regular basis.

7.1.4 Test data

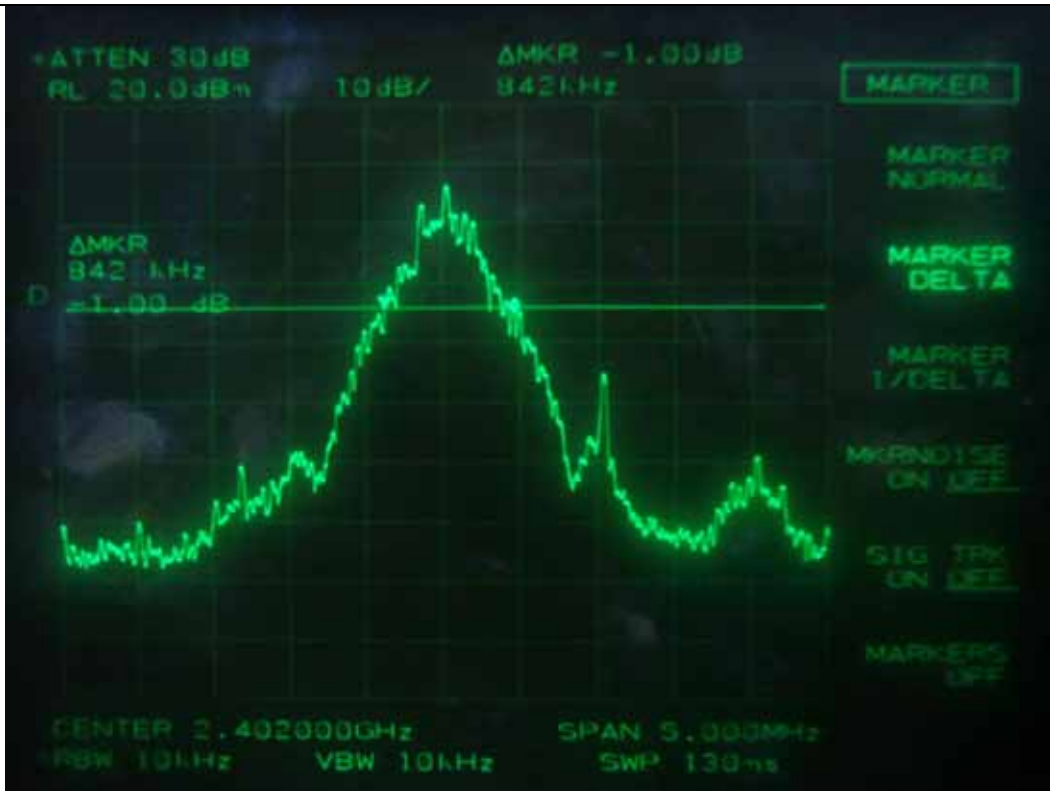
-. Test Date : March 16, 2011

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (kHz)
Low	2 402	842
Middle	2 441	833
High	2 480	833

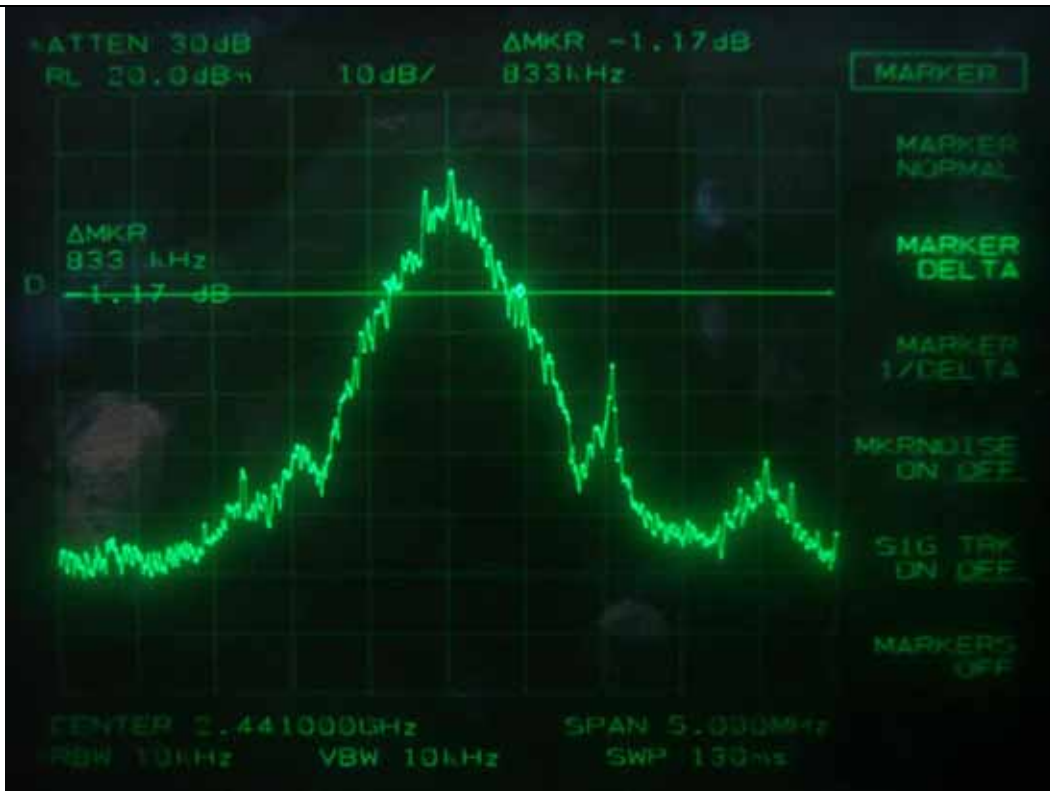
Remark: See next page for an overview sweep performed with peak detector.



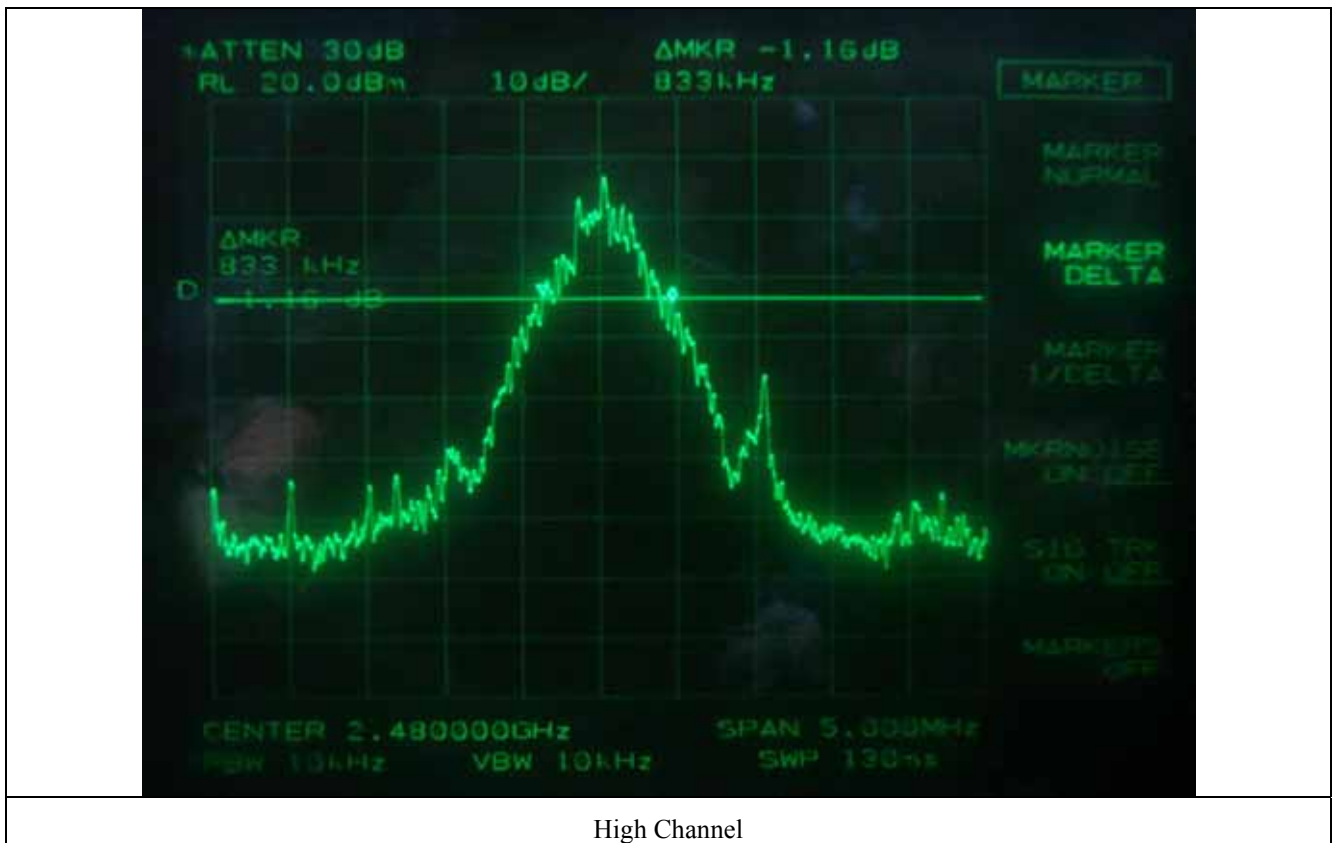
Tested by: Ki-Hong, Nam / Senior Engineer



Low Channel



Middle Channel



High Channel

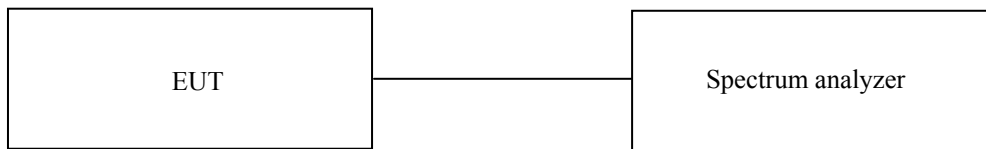
7.2 HOPPING FREQUENCY SEPARATION

7.2.1 Operating environment

Temperature : 23 °C
Relative humidity : 52 % R.H.

7.2.2 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.



7.2.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)

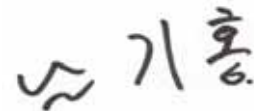
All test equipment used is calibrated on a regular basis.

7.2.4 Test data

-. Test Date : March 16, 2011
-. Test Result : Pass

MEASURED VLAUE (kHz)	LIMIT, 20 dB Bandwidth (kHz)	MARGIN (kHz)
1 000	842	-158

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



Tested by: Ki-Hong, Nam / Senior Engineer



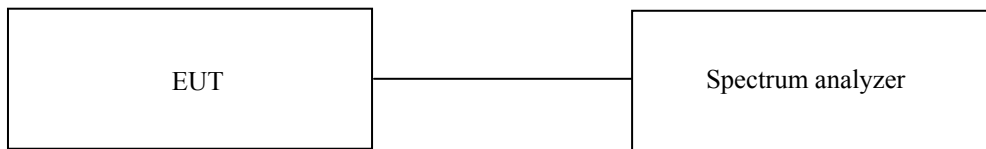
7.3. NUMBER OF HOPPING CHANNELS

7.3.1 Operating environment

Temperature : 23 °C
Relative humidity : 52 % R.H.

7.3.2 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 100 kHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



7.3.3 Test equipment used

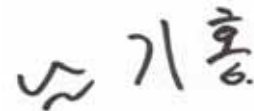
Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

7.3.4 Test data

-. Test Date : March 16, 2010
-. Test Result : Pass

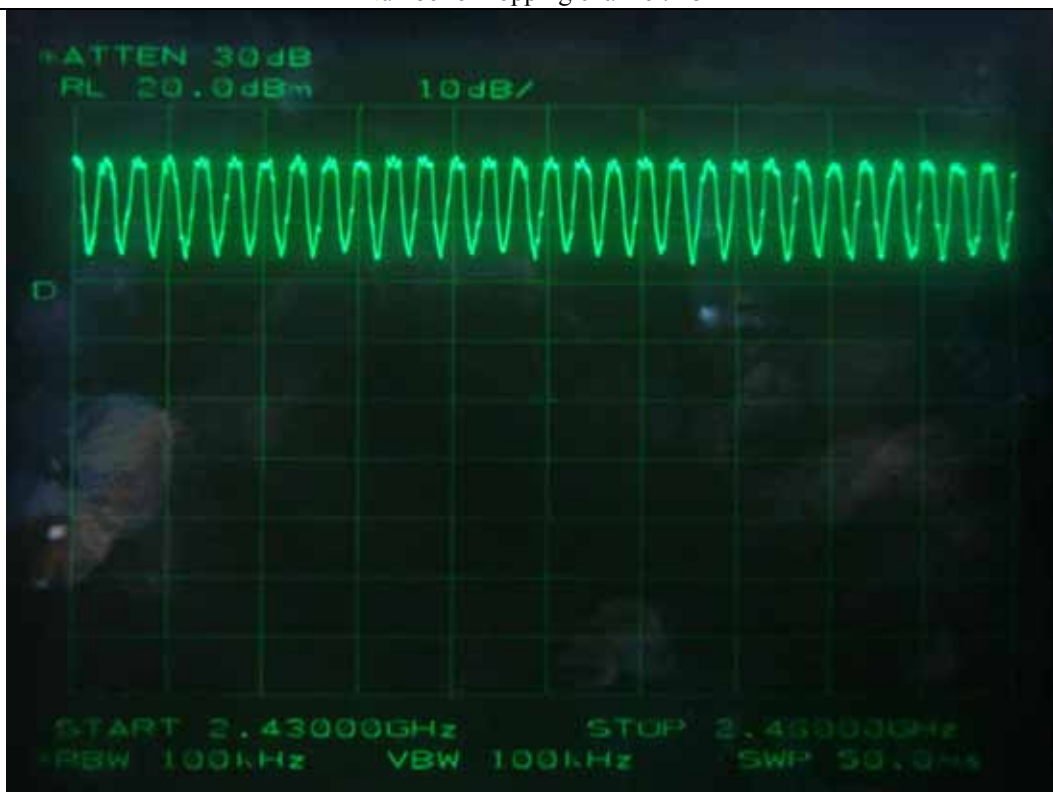
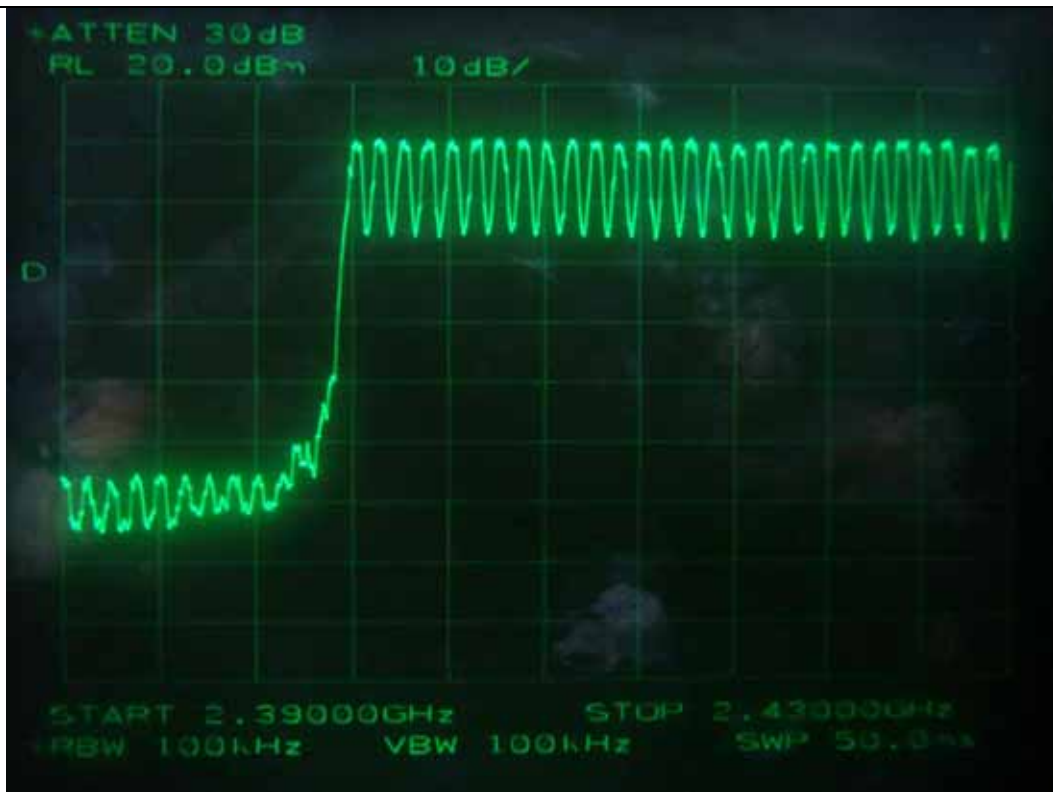
MEASURED VLAUE (Number)	LIMIT (Number)	MARGIN (Number)
79	At least 15	64

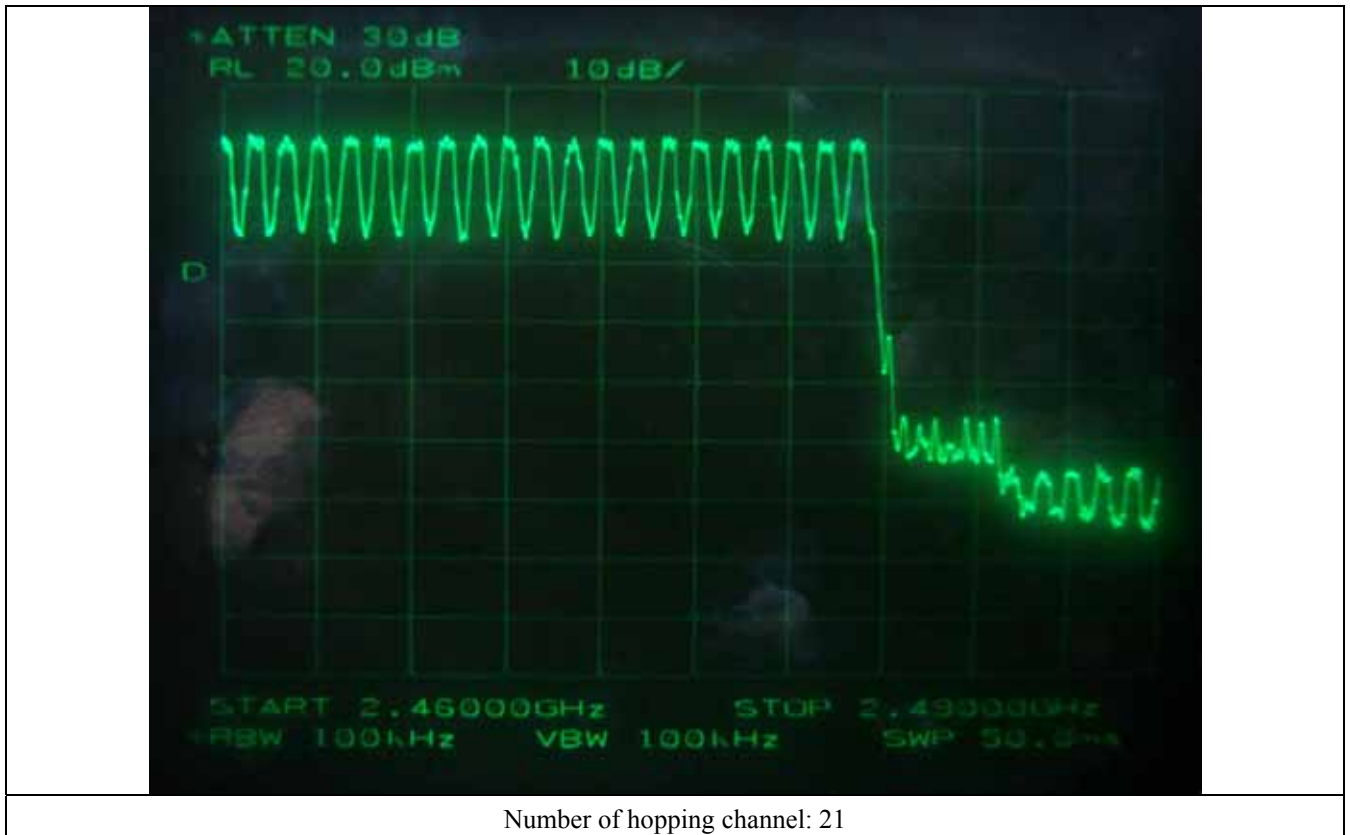


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Total number of hopping channel: $28+30+21 = 79$





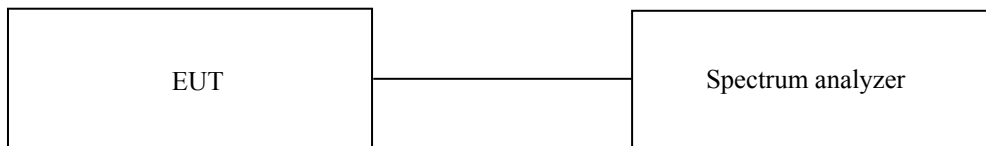
7.4 TIME OF OCCUPANCY

7.4.1 Operating environment

Temperature : 23 °C
Relative humidity : 52 % R.H.

7.4.2 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.



7.4.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

7.4.4 Test data

-. Test Date : March 16, 2011

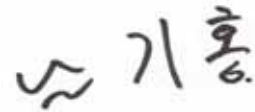
The system makes worst case 1 600 hops per second or 1 time slot has a length of 625 μ s with 79 channels.

For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel for 10.13 times per second ($= 1\,600/2/79$) for DH1, and 5.06 times ($= 1\,600/4/79$) for DH3, and 3.38 times ($= 1\,600/6/79$) for DH5.

Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.416 7	10.13	31.6	133.39	400	PASS
DH3	1.650 0	5.06	31.6	263.83	400	PASS
DH5	2.933 0	3.38	31.6	313.27	400	PASS

Total dwell time is calculated as following.

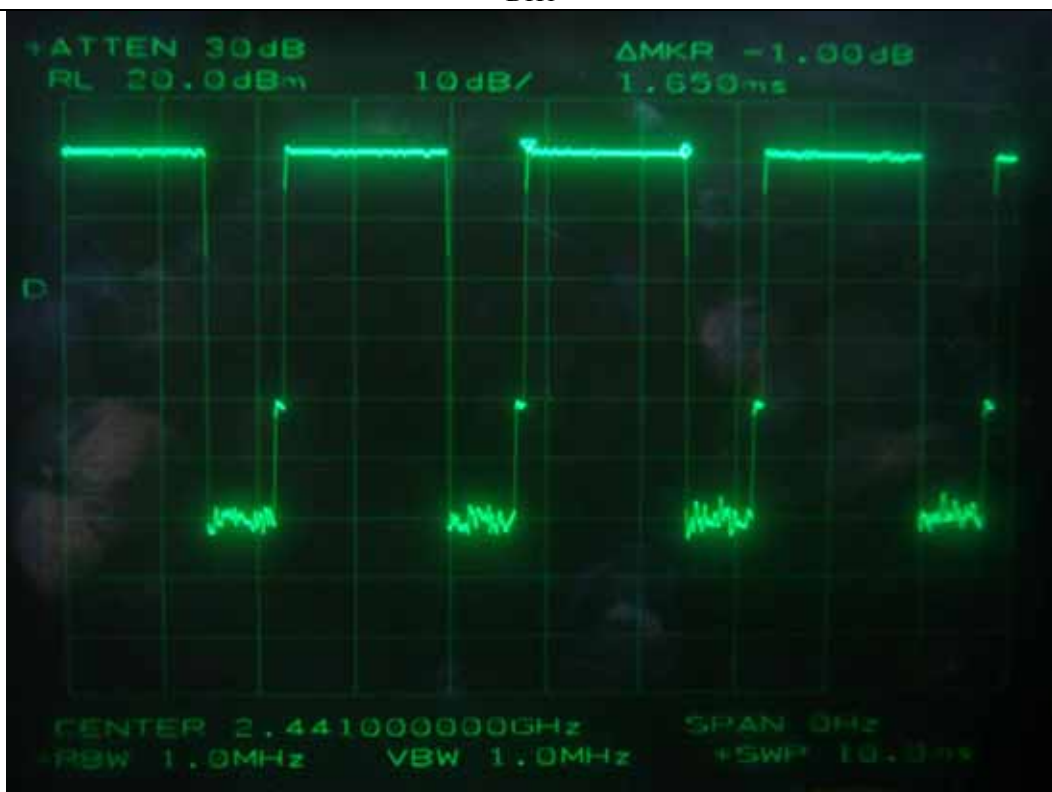
Total Dwell Time = Pulse time * Hops per second with channels * period time



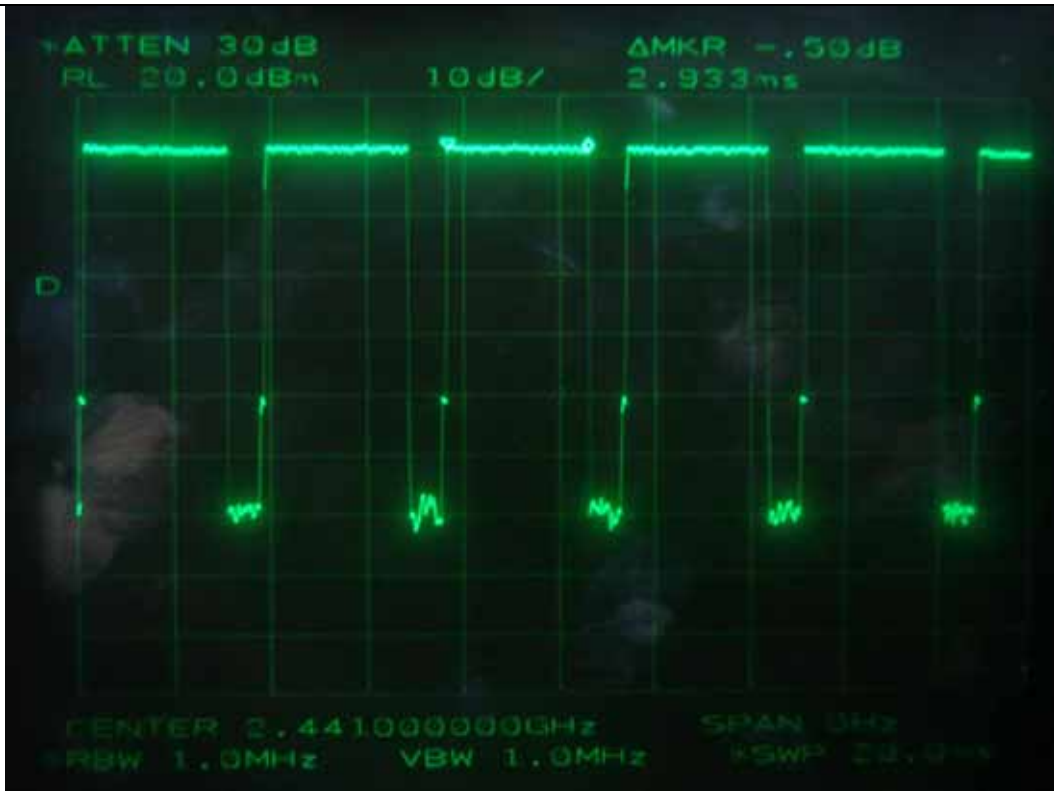
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DH1



DH3



DH5

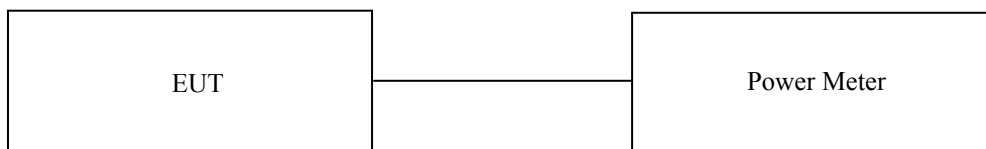
7.5 MAXIMUM PEAK OUTPUT POWER

7.5.1 Operating environment

Temperature : 23 °C
Relative humidity : 52 % R.H.

7.5.2 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.



7.5.3 Test equipment used

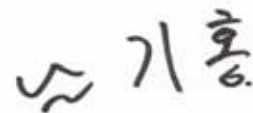
Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - 8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

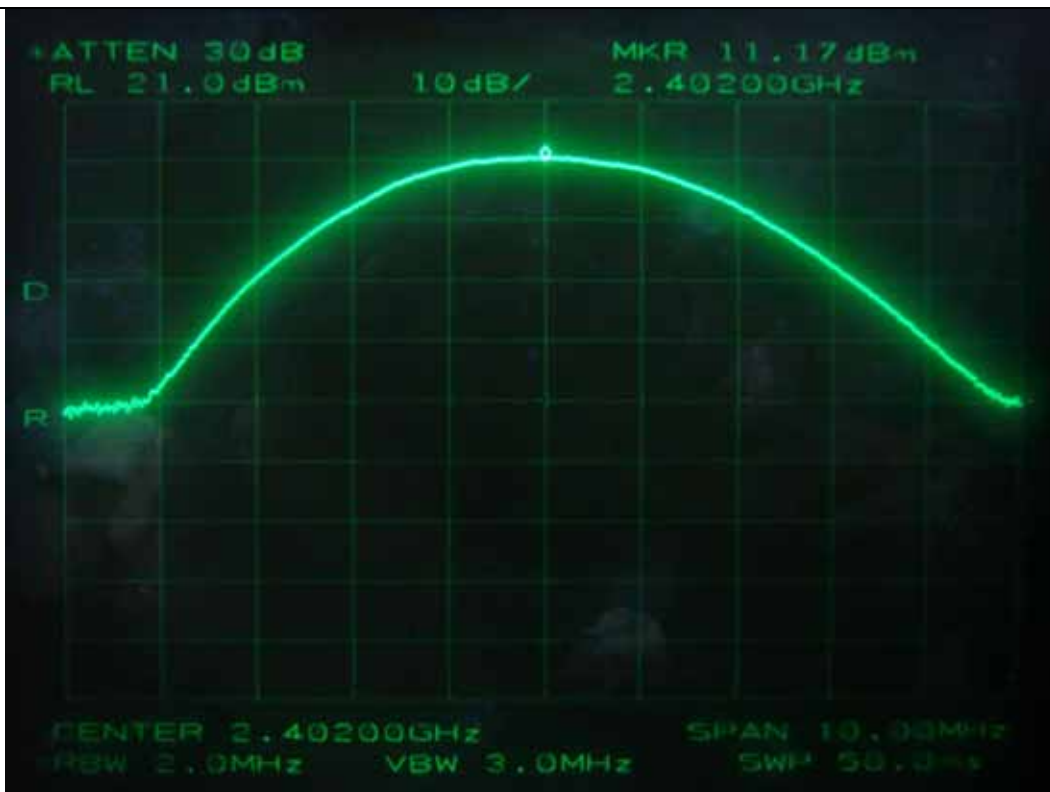
7.5.4 Test data

-. Test Date : March 16, 2011
-. Test Result : Pass

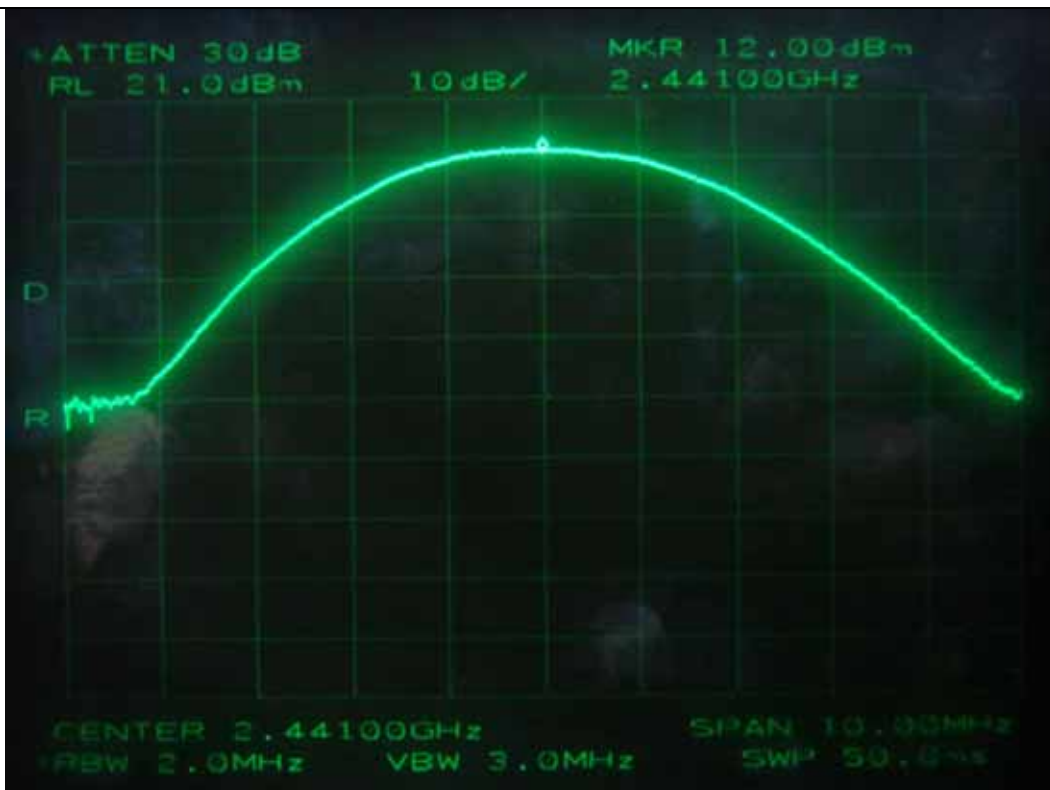
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402	11.17	30.00	-18.83
Middle	2 441	12.00	30.00	-18.00
High	2 480	12.00	30.00	-18.00



Tested by: Ki-Hong, Nam / Senior Engineer



Low Channel



Middle Channel



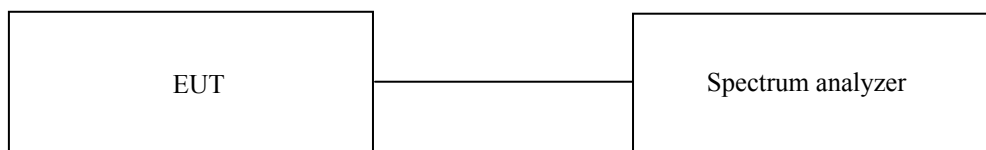
7.6 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

7.6.1 Operating environment

Temperature : 18 °C
Relative humidity : 49 % R.H.

7.6.2 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.



7.6.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 meters, 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 30 MHz to 26.5 GHz 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.

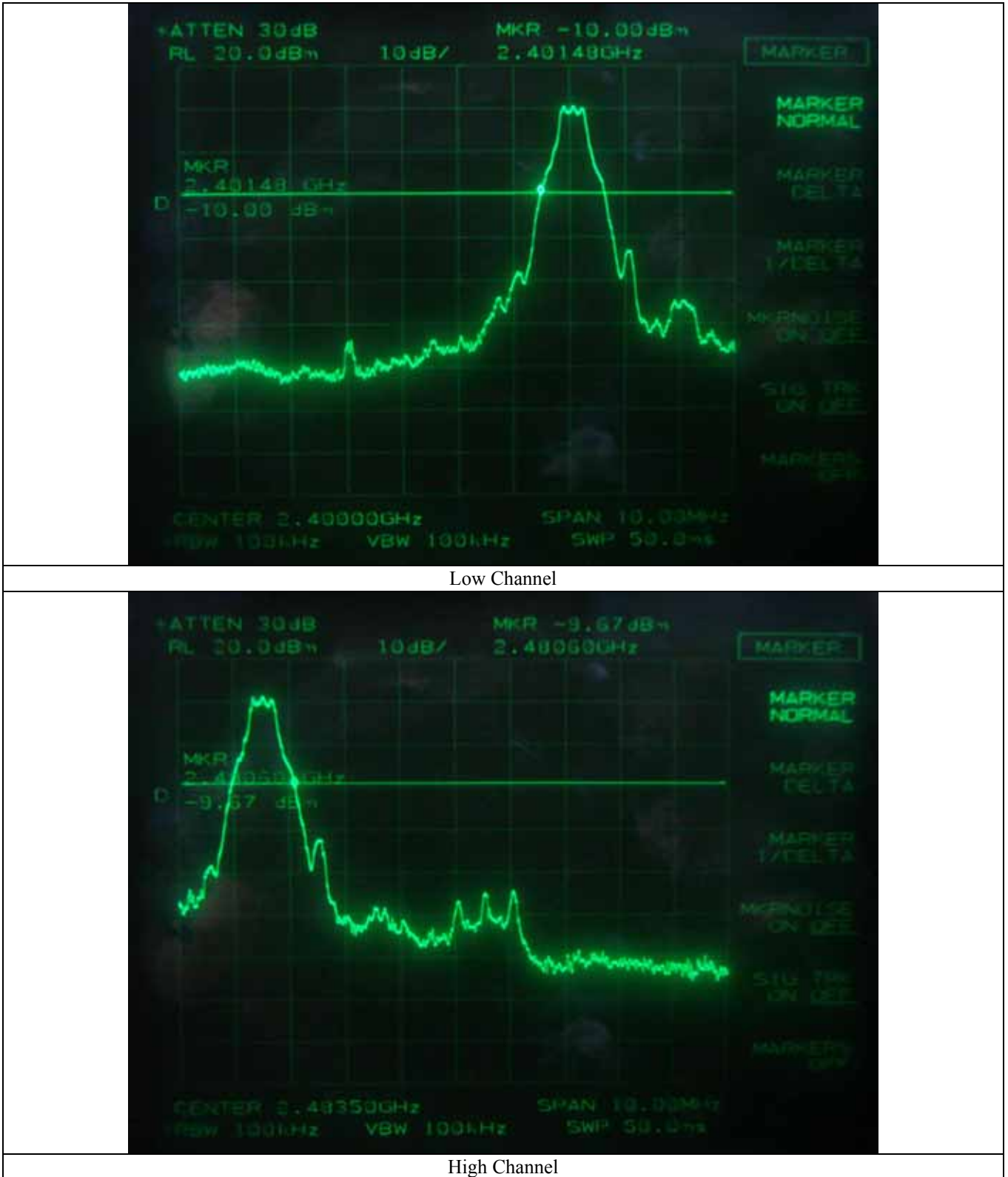
7.6.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	8447D	Hewlett-Packard	Amplifier	2727A04987	Jun. 11, 2010 (1Y)
■ -	83051A	Agilent	Preamplifier	3950M00201	Jun. 11, 2010 (1Y)
■ -	F-40-5000-RF	RLC Electronics	Highpass Filter	0425	Jul. 09, 2010 (1Y)
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Jun. 17, 2009 (2Y)
■ -	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.

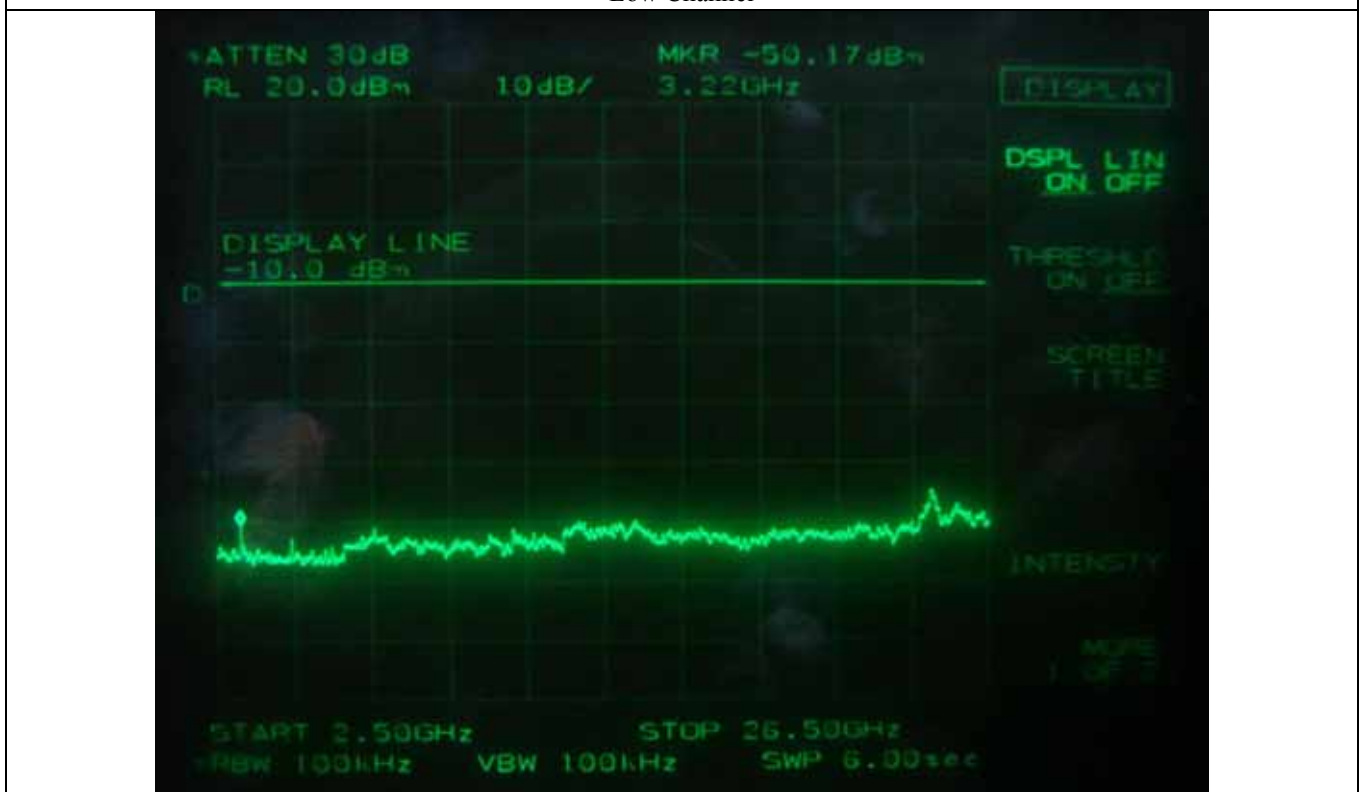
7.6.5. Test data

7.6.5.1. Test data for conducted emission

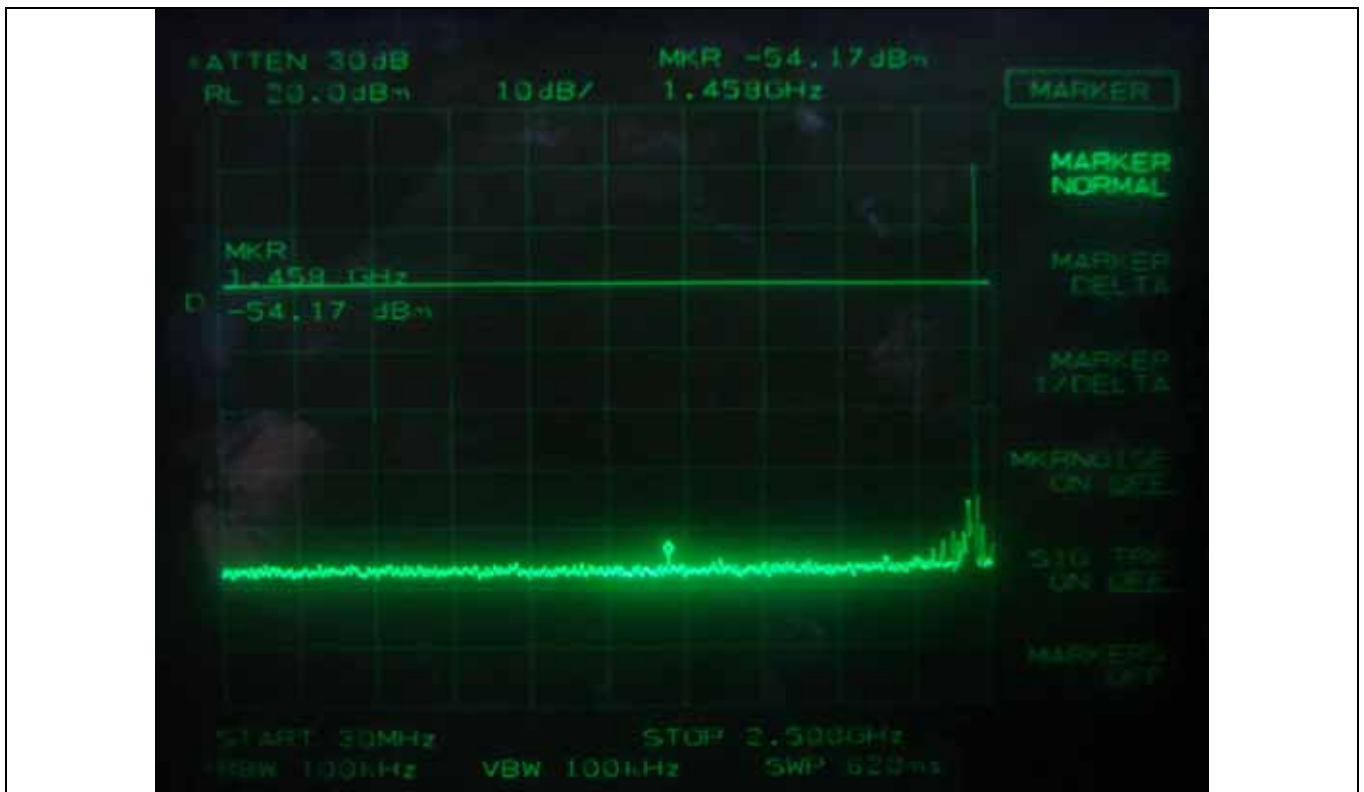




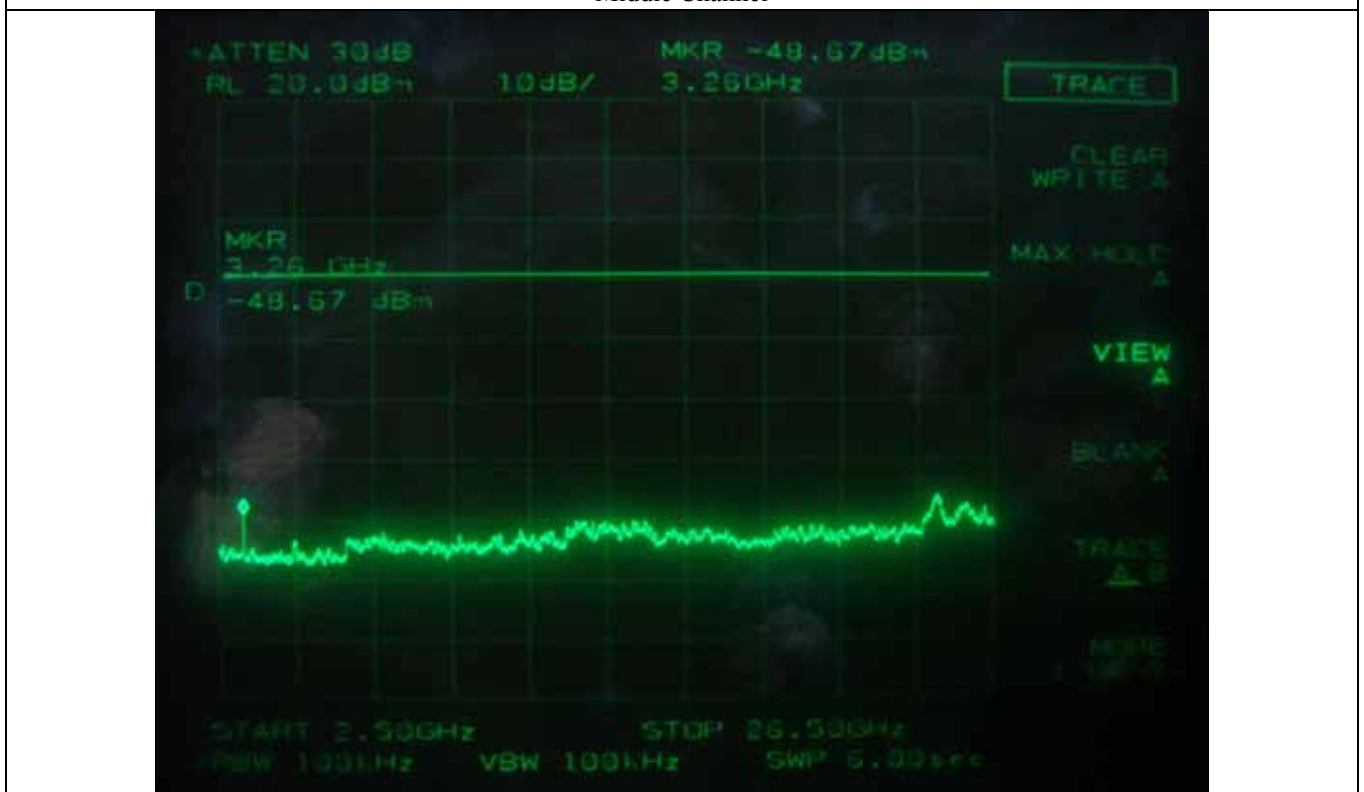
Low Channel



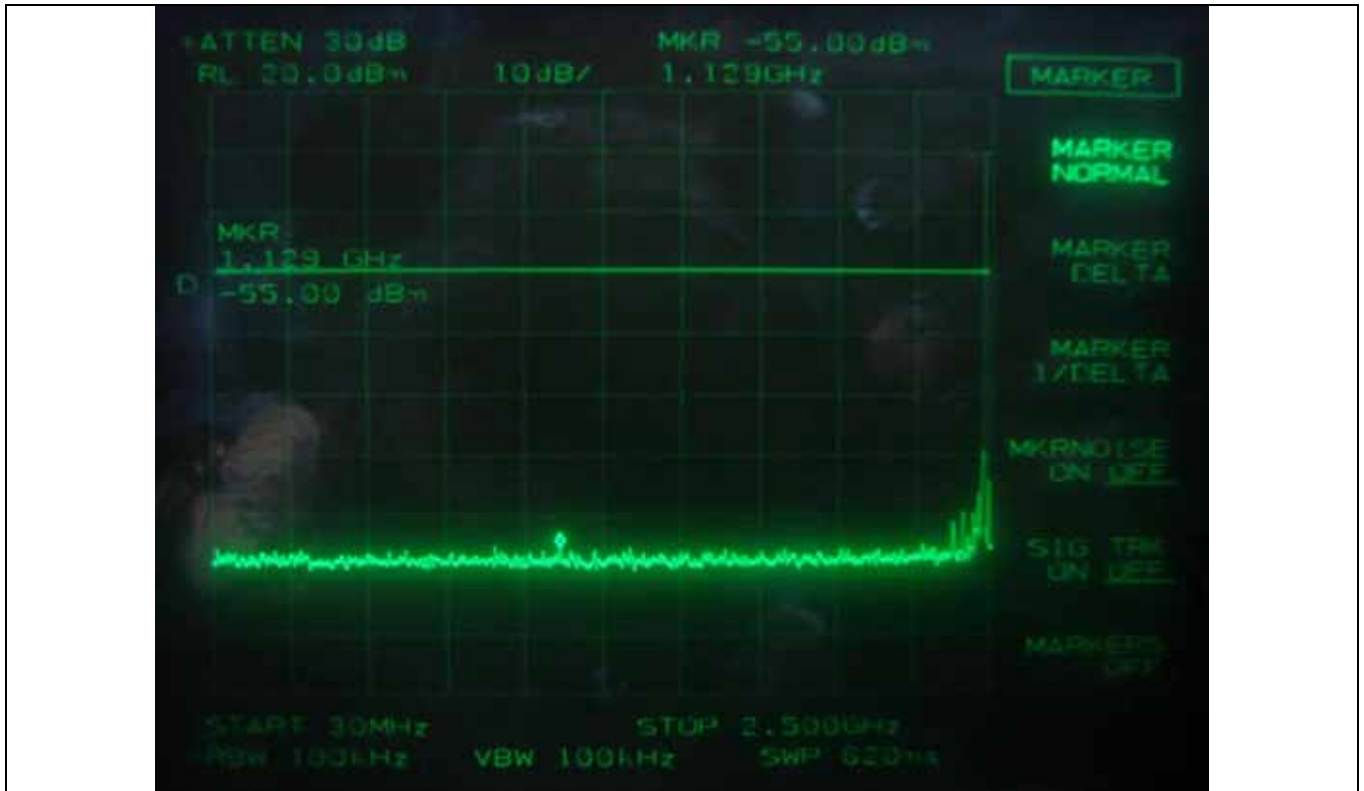
Low Channel



Middle Channel



Middle Channel



High Channel



High Channel

7.6.5.2. Test data for radiated emission

7.6.5.2.1. Radiated Emission which fall in the Restricted Band

- Test Date : March 18, 2011
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 25 GHz
- Measurement distance : 1 m
- Operating Condition : Low / High Channel
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
2 386.16	25.41	Peak	H	27.04	3.16	55.61	74.00	-18.39
	13.35	Average	H			43.55	54.00	-10.45
	24.09	Peak	V			54.29	74.00	-19.71
	12.62	Average	V			42.82	54.00	-11.18
Test Data for High Channel								
2 483.50	32.43	Peak	H	27.31	3.16	62.90	74.00	-11.10
	17.80	Average	H			48.27	54.00	-5.73
	24.93	Peak	V			55.40	74.00	-18.60
	14.89	Average	V			45.36	54.00	-8.64

Tabulated test data for Restricted Band

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

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7.6.5.2.2. Spurious & Harmonic Radiated Emission

- Test Date : March 18, 2011
- 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, 10 Hz for Average Mode
- Frequency range : 1 GHz ~ 25 GHz
- Measurement distance : 1 m
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 402.00	72.88	Peak	H	27.09	3.16	-	103.13	-	-
	68.25	Peak	V				98.50	-	-
4 804.00*	34.50	Peak	H	31.07	4.10	28.80	40.87	74.00	-33.13
	24.67	Average	H				31.04	54.00	-22.96
	34.83	Peak	V				41.20	74.00	-32.80
	25.00	Average	V				31.37	54.00	-22.63
Test Data for Middle Channel									
2 441.00	75.43	Peak	H	27.19	3.16	-	105.78	-	-
	71.97	Peak	V				102.32	-	-
4 882.00*	35.00	Peak	H	31.19	4.12	28.73	41.58	74.00	-32.42
	24.67	Average	H				31.25	54.00	-22.75
	35.83	Peak	V				42.41	74.00	-31.59
	25.33	Average	V				31.91	54.00	-22.09

Tabulated test data for Restricted Band

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

-Continued

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for High Channel									
2 480.00	73.61	Peak	H	27.30	3.16	-	104.70	-	-
	69.53	Peak	V				99.99	-	-
4 960.00*	34.67	Peak	H	31.32	4.15	28.67	41.47	74.00	-32.53
	24.17	Average	H				30.97	54.00	-23.03
	34.50	Peak	V				41.30	74.00	-32.70
	24.33	Average	V				31.13	54.00	-22.87

Tabulated test data for Restricted Band

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



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8. MAXIMUM PERMISSIBLE EXPOSURE

8.1 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 1 mW/cm²

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

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

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

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

$$d = \sqrt{(30 * P * G) / (377 * S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, 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

8.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain		Safe Distance	Power Density (mW/cm ²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 20 cm Separation	(mW/cm ²)
12.00	15.85	0.758	1.19	1.225	0.003 8	1

According to above table, safe distance, $D = 0.282 * \sqrt{(15.85 * 1.19)} = 1.225 \text{ cm}$.

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 15.85 * 1.19 / (4 * 3.14 * 20^2) = 0.003 8$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

9. RADIATED EMISSION TEST

9.1 Operating environment

Temperature : 16 °C
Relative humidity : 38 % R.H.

9.2 Test set-up

The radiated emissions measurements were on the 3 m, 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 30 MHz to 1 000 MHz 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 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESVD	Rohde & Schwarz	Test Receiver	838453/018	Oct. 05, 2010 (1Y)
■ -	8566B	HP	Spectrum Analyzer	3407A08547	Jun. 11, 2010 (1Y)
■ -	8447D	Hewlett Packard	Amplifier	2727A04987	Jun. 11, 2010 (1Y)
■ -	MA240	HD GmbH	Antenna Master	N/A	N/A
■ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DS420S	HD GmbH	Turn Table	N/A	N/A
■ -	VHA9103	Schwarzbeck	Biconical Antenna	91031852	Mar. 30, 2010 (2Y)
■ -	9108-A(494)	Schwarzbeck	Log Periodic Antenna	62281001	Mar. 30, 2010 (2Y)

All test equipment used is calibrated on a regular basis.

9.4 Test data

- Test Date : March 08, 2011
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 3 m
- Channel : Low

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
65.32	20.80	V	1.00	200.00	7.98	2.00	30.78	40.00	-9.22
72.17	25.00	V	1.00	120.00	6.62	2.04	33.66	40.00	-6.34
131.98	15.60	H	2.00	280.00	14.24	2.52	32.36	43.52	-11.16
319.99	20.00	V	1.50	150.00	14.70	3.54	38.24	46.02	-7.78
425.01	15.90	H	1.00	240.00	17.94	4.30	38.14	46.02	-7.88
638.31	15.00	H	1.00	150.00	20.87	5.18	41.05	46.02	-4.97

Tabulated test data for Radiated Electromagnetic Field

- Channel : Middle

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
65.33	19.00	V	1.00	230.00	7.97	2.00	28.97	40.00	-11.03
72.20	24.00	V	1.00	150.00	6.62	2.04	32.66	40.00	-7.34
131.99	15.50	H	1.80	260.00	14.24	2.52	32.26	43.52	-11.26
319.99	19.80	V	1.40	160.00	14.70	3.54	38.04	46.02	-7.98
425.01	16.00	H	1.00	260.00	17.94	4.30	38.24	46.02	-7.78
638.30	15.17	H	1.00	180.00	20.87	5.18	41.22	46.02	-4.80

Tabulated test data for Radiated Electromagnetic Field

-. Channel : High

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
65.33	18.75	V	1.20	220.00	7.97	2.00	28.72	40.00	-11.28
72.19	23.40	V	1.00	150.00	6.62	2.04	32.06	40.00	-7.94
131.99	15.70	H	1.50	250.00	14.24	2.52	32.46	43.52	-11.06
319.99	19.70	V	1.50	190.00	14.70	3.54	37.94	46.02	-8.08
425.02	17.00	H	1.00	280.00	17.94	4.30	39.24	46.02	-6.78
638.30	15.31	H	1.00	170.00	20.87	5.18	41.36	46.02	-4.66

Tabulated test data for Radiated Electromagnetic Field

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

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10. CONDUCTED EMISSION TEST

10.1 Operating environment

Temperature : 20 °C
Relative humidity : 41 % R.H.

10.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESiB26	Rohde & Schwarz	EMI Test Receiver	100296	Apr. 14, 2010 (1Y)
■ -	NSLK 8126	Schwarzbeck	AMN	8126-404	Jun. 10, 2010 (1Y)
■ -	3825/2	EMCO	AMN	9109-1867	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data

- . Test Date : March 11, 2011
-. Resolution bandwidth : 9 kHz
-. Frequency range : 0.15 MHz ~ 30 MHz
-. Test Result : PASSED BY -5.10 dB at 6.27 MHz under average detector mode

Frequency (MHz)	Line	Quasi-Peak (dBμV)		Margin (dB)
		Emission level	Q.P Limits	
1.55	N	41.10	56.00	-14.90
3.31	N	41.10	56.00	-14.90
6.27	H	48.00	60.00	-12.00
16.62	H	47.00	60.00	-13.00
17.04	H	48.80	60.00	-11.20
20.35	N	45.80	60.00	-14.20
Frequency (MHz)	Line	Average (dBμV)		Margin (dB)
		Emission level	Limits	
1.55	N	38.80	46.00	-7.20
1.76	N	39.10	46.00	-6.90
6.27	H	44.90	50.00	-5.10
20.06	H	43.30	50.00	-6.70

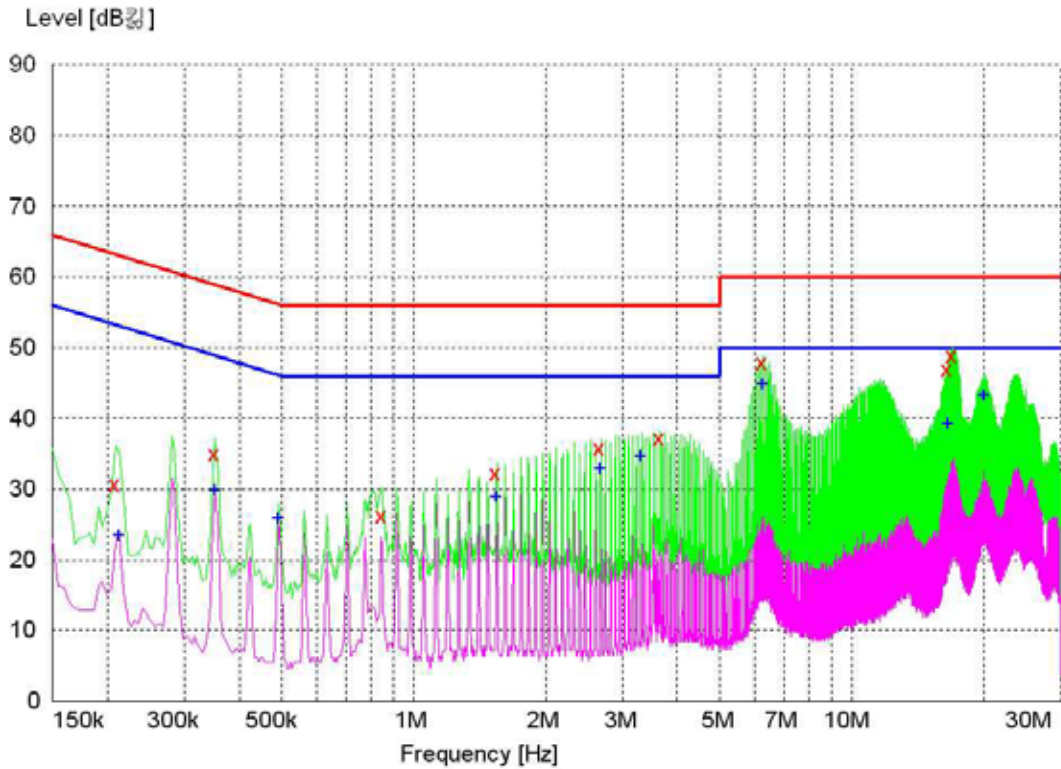
Line Conducted Emissions Tabulated Data

Remark : “H”: Hot Line, “N”: Neutral Line

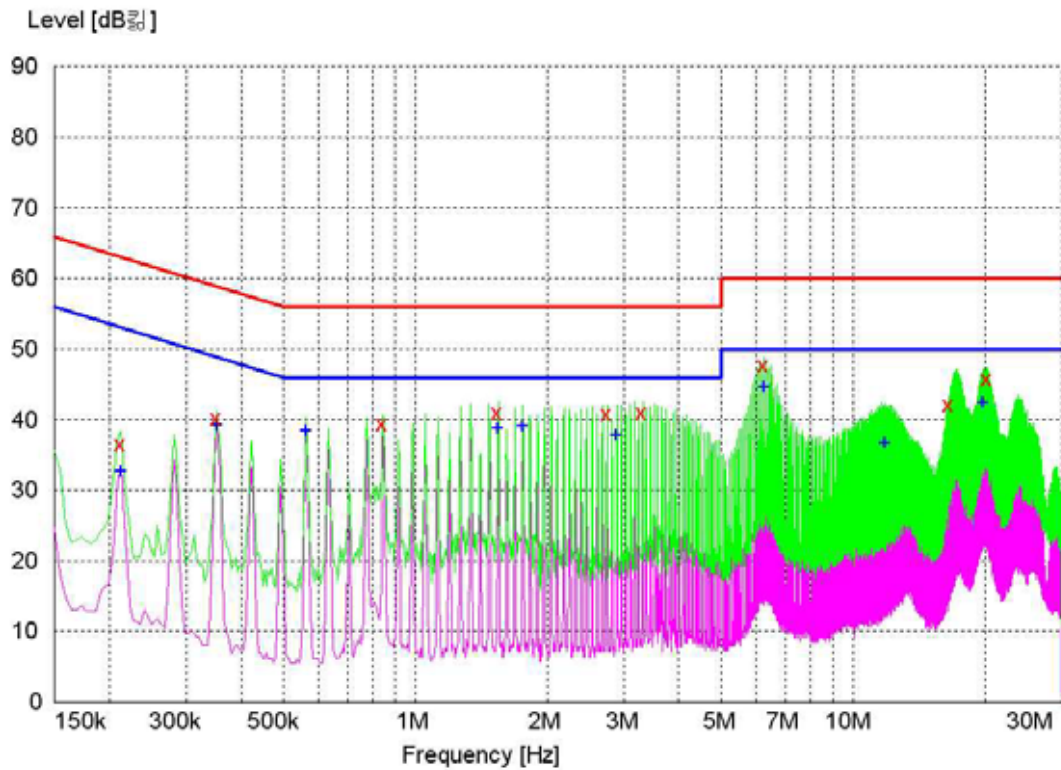
See next page for an overview sweep performed with quasi-peak and average detector modes.

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HOT LINE



NEUTRAL LINE