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

Test Report No.	**: E146R-068**
AGR No.	**: A145A-146**
Applicant	**: Steelcase, Inc.**
Address	**: 901 44th Street SE Grand Rapids, Michigan 49508**
Manufacturer	**: Pen Generations, Inc.**
Address	**: 8th Fl., Pangyotechnovalley SOLID Space, 673 Sampyeong-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea 463-400**
Type of Equipment	**: Digital Pen**
FCC ID.	**: ROMADP-601**
Model Name	**: ADP-601**
Serial number	**: N/A**
Total page of Report	**: 42 pages (including this page)**
Date of Incoming	**: May 15, 2014**
Date of issue	**: June 20, 2014**

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.

Reviewed by: Ki-Hong, Nam / Senior Engineer, ONETECH Corp.

Approved by: Gea-Won, Lee / Managing Director, ONETECH Corp.

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EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E146R-068	June 20, 2014	Initial Issue	All

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1. VERIFICATION OF COMPLIANCE

APPLICANT	: Steelcase, Inc.
ADDRESS	: 901 44th Street SE Grand Rapids, Michigan 49508
CONTACT PERSON	: David Behner / Senior Consultant
TELEPHONE NO	: +503-523-2006
FCC ID	: ROMADP-601
MODEL NAME	: ADP-601
SERIAL NUMBER	: N/A
DATE	: June 20, 2014

EQUIPMENT CLASS	***DSS – PART 15 SPREAD SPECTRUM TRANSMITTER***
KIND OF EQUIPMENT	Digital Pen
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.

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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 (b) (1)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (b) (4)	Antenna Gain	Met requirement / 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 Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842 IC (Industry Canada) – Registration No. Site# 3736-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation No. 85

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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3. GENERAL INFORMATION

3.1 Product Description

The Steelcase, Inc., Model ADP-601 (referred to as the EUT in this report) is a Digital Pen which has a function of Bluetooth. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Portable Device
OPERATING FREQUENCY	2 402 MHz ~ 2 480 MHz
RATED RF OUTPUT POWER	0.20 dBm
ANTENNA TYPE	Inverted-F type antenna
ANTENNA GAIN	0.69 dBi
MODULATION METHOD	GFSK
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	26 MHz
NUMBER OF LAYER	4 Layers
POWER REQUIREMENT	DC 3.7 V from a rechargeable battery
EXTERNAL CONNECTOR	USB

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

-. None

4. EUT MODIFICATIONS

-. None

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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	N/A	N/A
Power Board	N/A	ADP-601 PWR	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
ADP-601	Steelcase, Inc.	ROMADP-601	Digital Pen (EUT)	-
R501	LG	DoC	Notebook PC	EUT
N/A	N/A	DoC	Mouse	Notebook PC
N/A	N/A	N/A	Dongle	Notebook PC
WTP-200H	Sewoo Tech	DoC	Printer	Notebook PC
CBT 32	R/S	N/A	Bluetooth tester,	-
CS20-23-436/20	Pulsaer Microwave Corp.	N/A	Broadband Directional Coupler	-

5.3 Mode of operation during the test

For the testing Bluetooth tester, Model: CBT 32 was used for making continuous transmission at below channel and inquiry mode.

The EUT was set at Low Channel (2 402 MHz), Middle Channel (2 441 MHz), and High Channel (2 480 MHz). To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and worst case is “XY”

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5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to notebook PC and power of notebook PC 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 13.4.1 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.

5.5 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 antenna of the EUT is a Inverted-F type antenna on the main board in the EUT, 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)
Charging and 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

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7. CARRIER FREQUENCY SEPARATION

7.1 20 dB BANDWIDTH

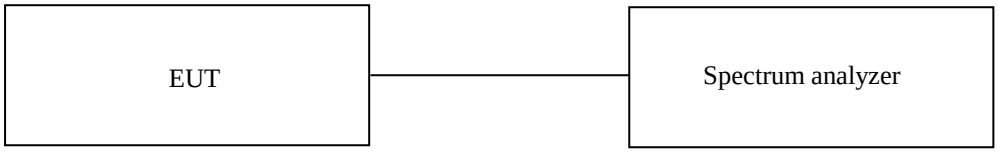
7.1.1 Operating environment

Temperature : 26 ℃

Relative humidity : 47 % 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)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

All test equipment used is calibrated on a regular basis.

7.1.4 Test data

-. Test Date : June 14, 2014

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (kHz)
Low	2 402	962.4
Middle	2 441	984.1
High	2 480	969.6

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

Tested by: Tae-Ho, Kim / Project Engineer

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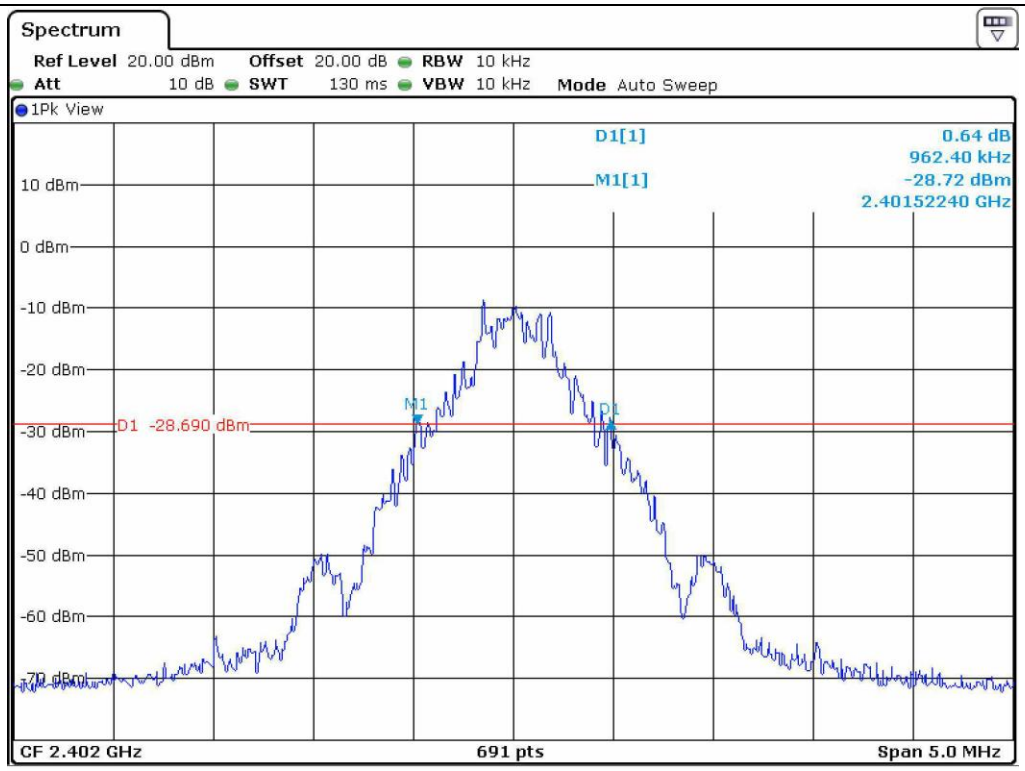
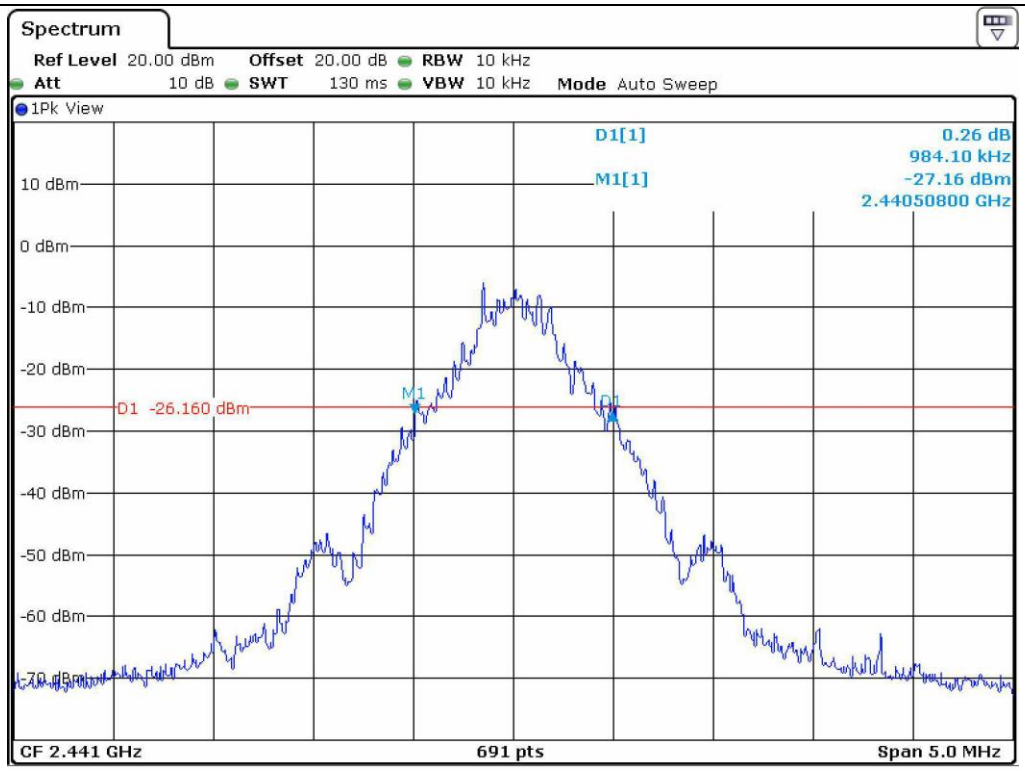


Low Channel



Middle Channel

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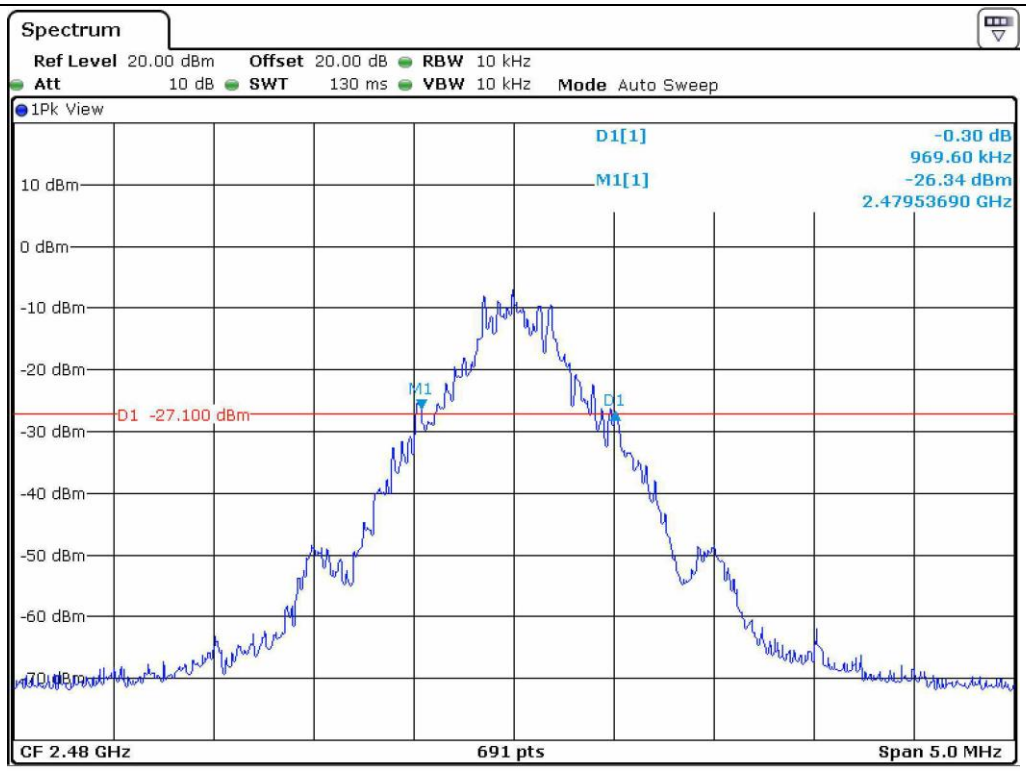

High Channel

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7.2 HOPPING FREQUENCY SEPARATION

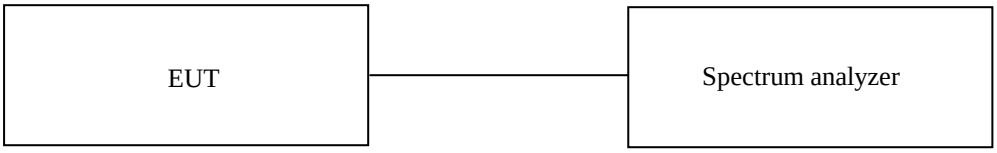
7.2.1 Operating environment

Temperature : 26 ℃

Relative humidity : 47 % 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)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

All test equipment used is calibrated on a regular basis.

7.2.4 Test data

-. Test Date : June 14, 2014

-. Test Result : Pass

MEASURED VLAUE (kHz)	LIMIT, 20 dB Bandwidth (kHz)	MARGIN (kHz)
999	984	-15

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

Tested by: Tae-Ho, Kim / Project Engineer

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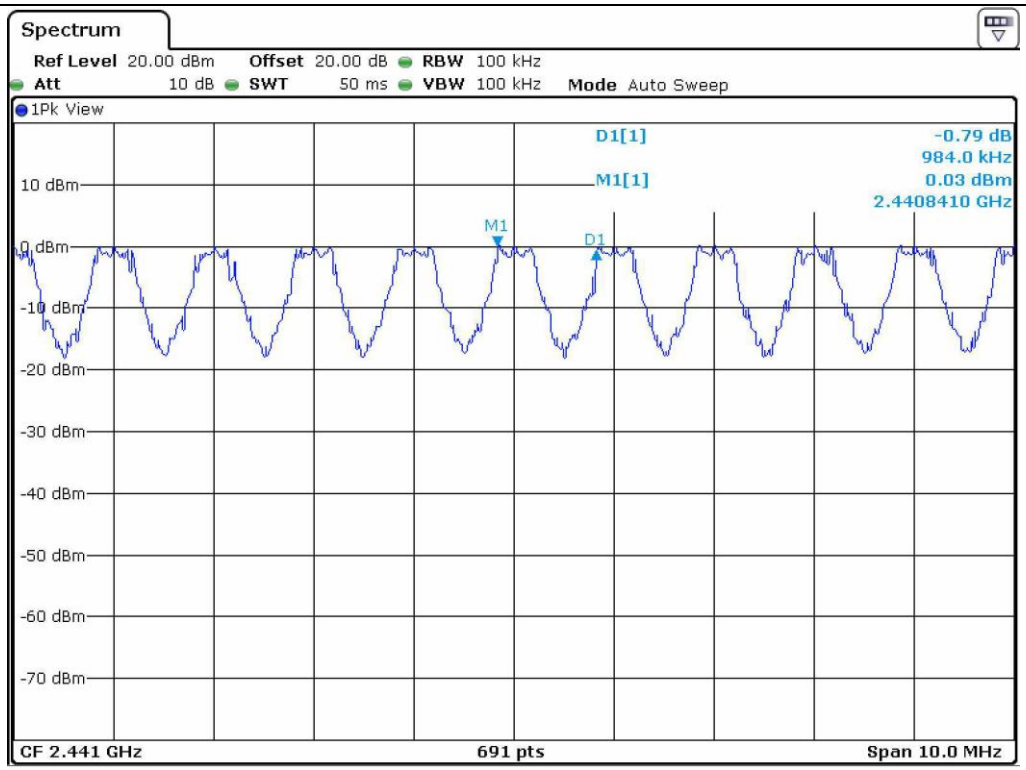

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7.3. NUMBER OF HOPPING CHANNELS

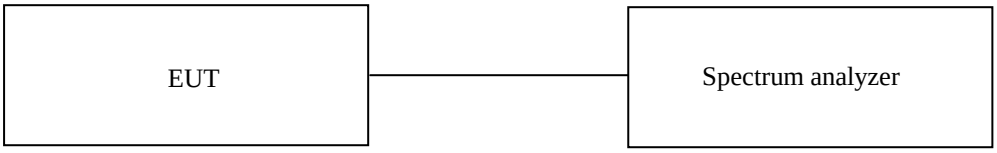
7.3.1 Operating environment

Temperature : 26 ℃

Relative humidity : 47 % 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)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

All test equipment used is calibrated on a regular basis.

7.3.4 Test data

-. Test Date : June 14, 2014

-. Test Result : Pass

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

Tested by: Tae-Ho, Kim / Project Engineer

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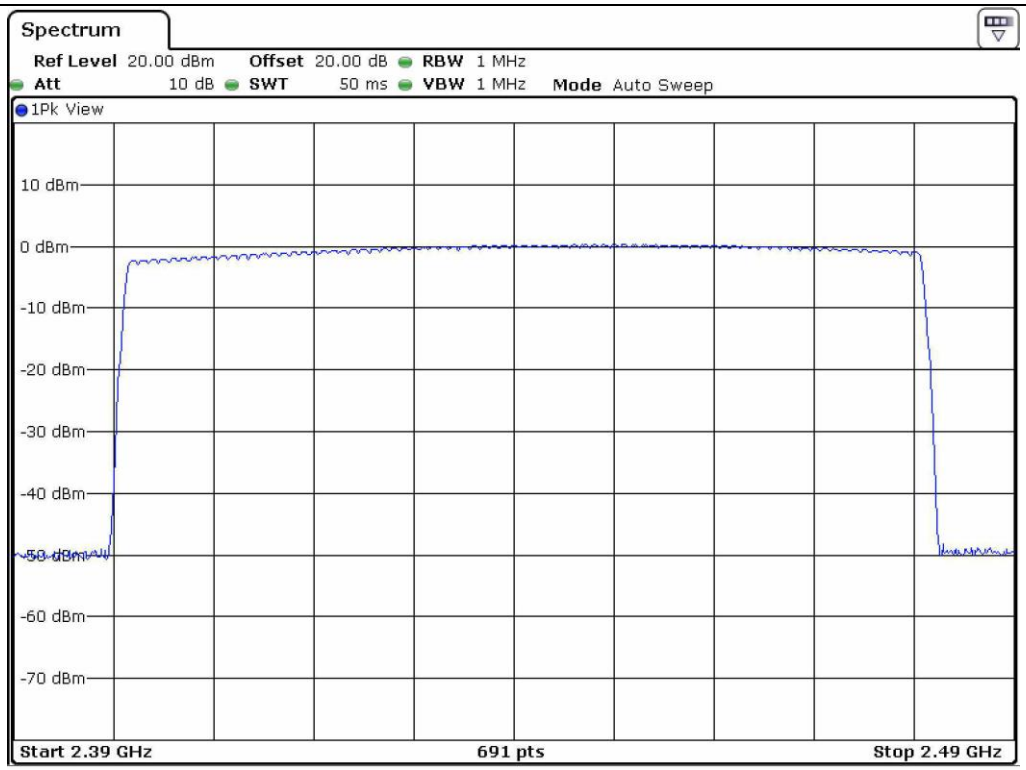

Total number of hopping channel: 28+30+21 = 79

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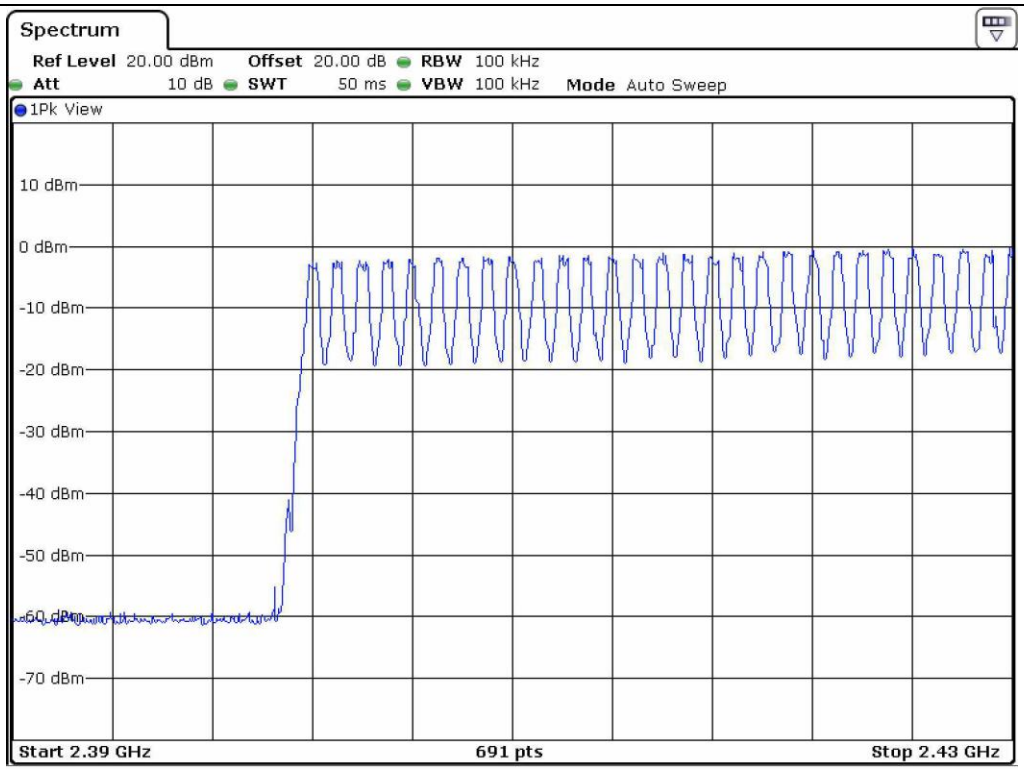
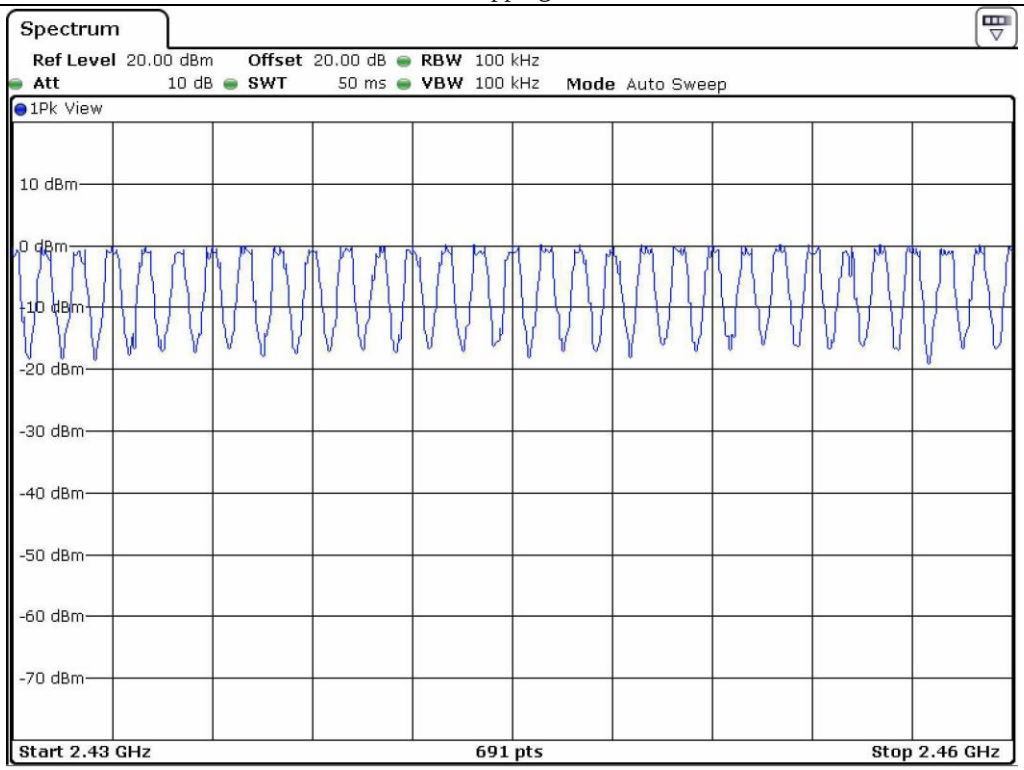


Number of hopping channel: 28



Number of hopping channel: 30

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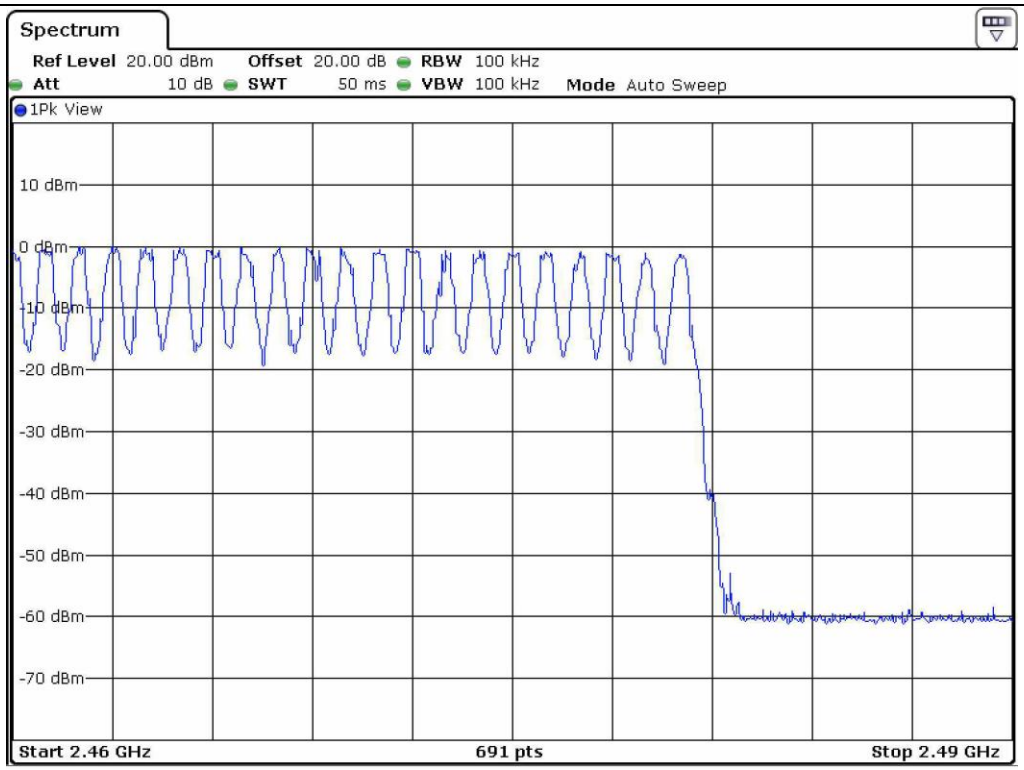

Number of hopping channel: 21

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7.4 TIME OF OCCUPANCY

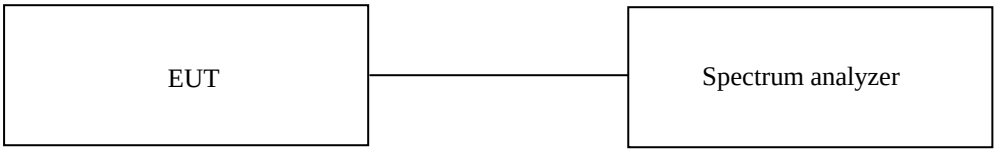
7.4.1 Operating environment

Temperature : 26 ℃

Relative humidity : 47 % 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)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

All test equipment used is calibrated on a regular basis.

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7.4.4 Test data

-. Test Date : June 14, 2014

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625 μs 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	0.391 3	10.13	31.6	125.26	400	PASS
DH3	1.652 2	5.06	31.6	257.22	400	PASS
DH5	2.898 6	3.38	31.6	309.59	400	PASS

Total dwell time is calculated as following.

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

Tested by: Tae-Ho, Kim / Project Engineer

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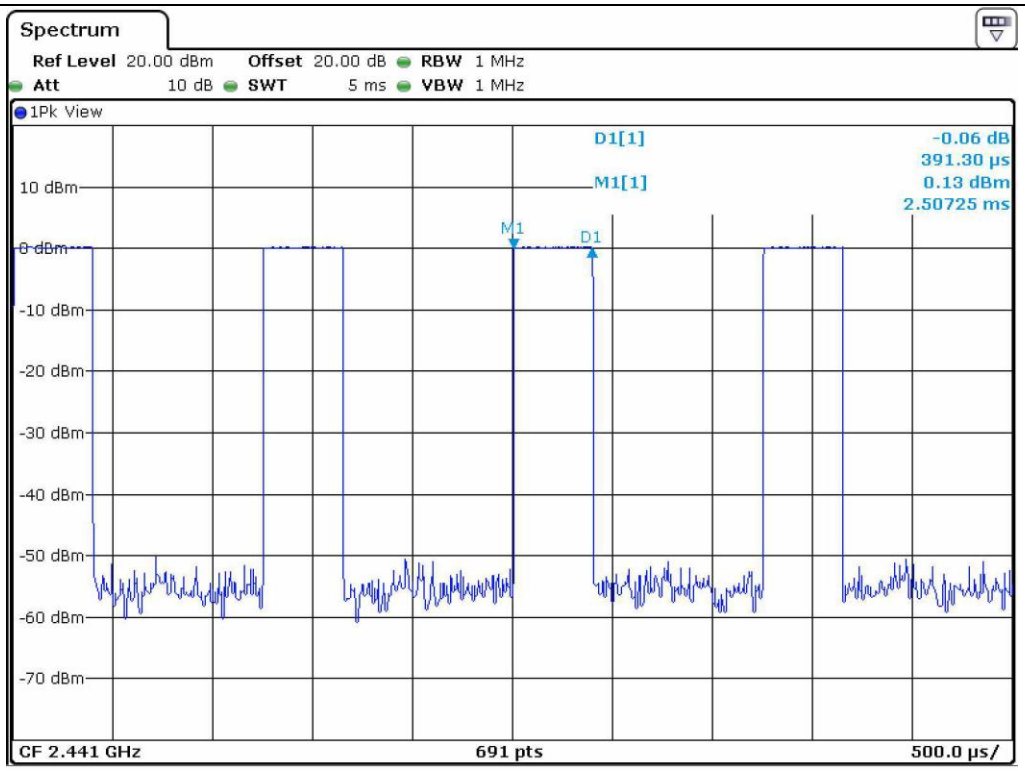
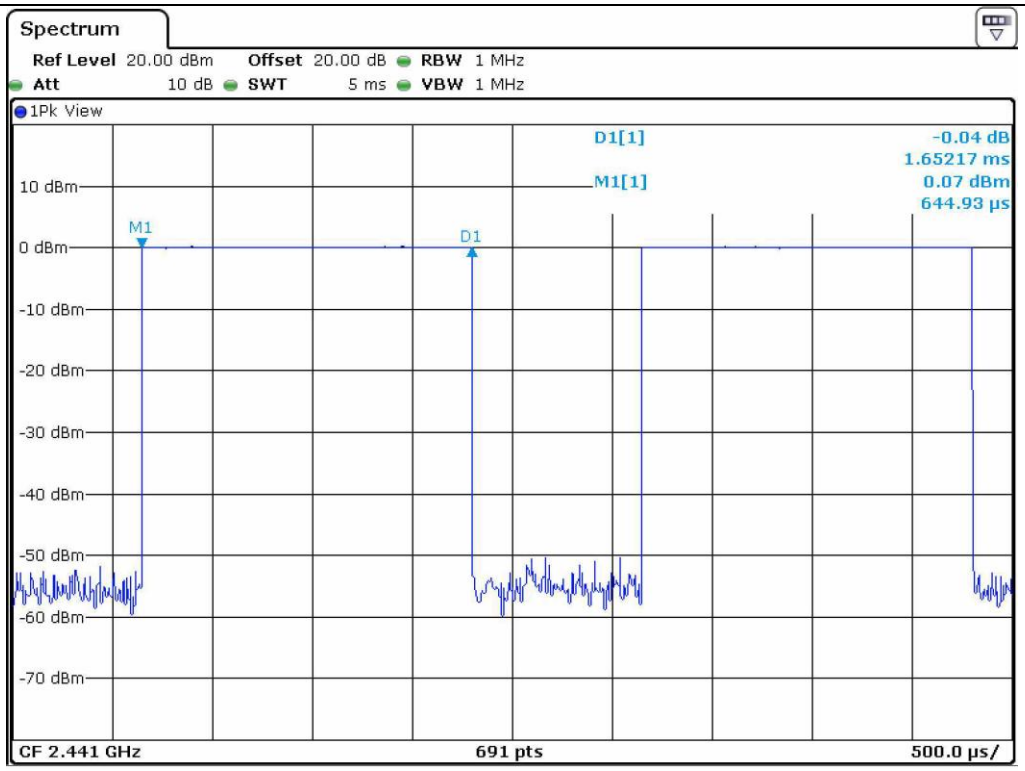


DH1



DH3

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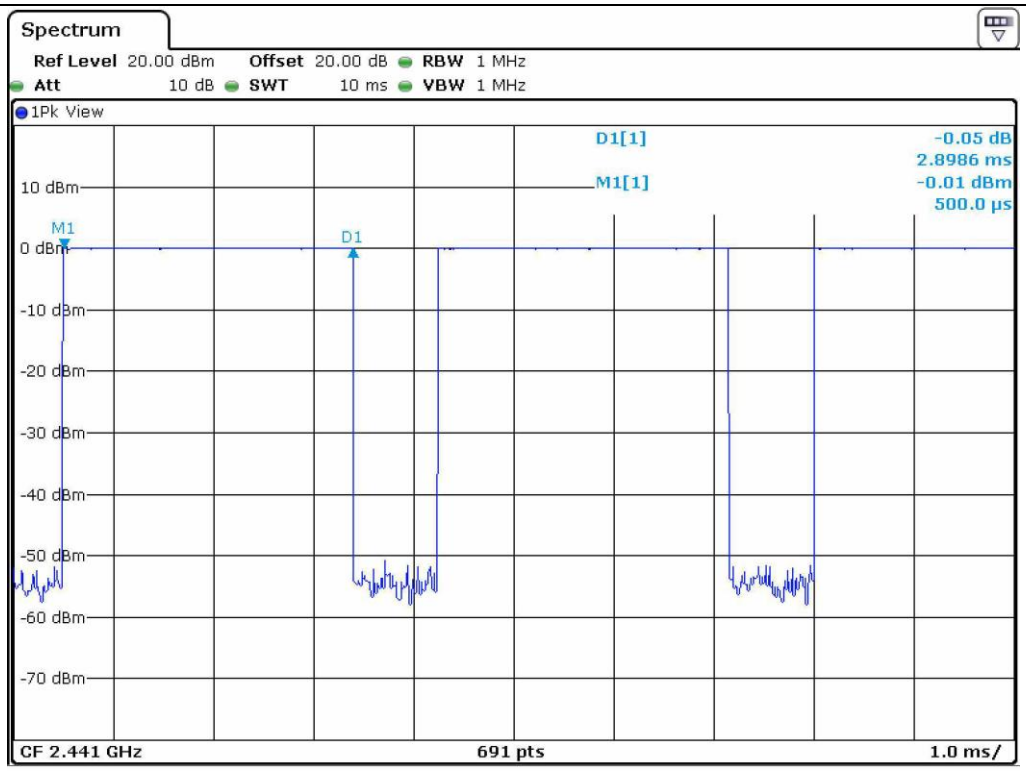

DH5

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7.5 MAXIMUM PEAK OUTPUT POWER

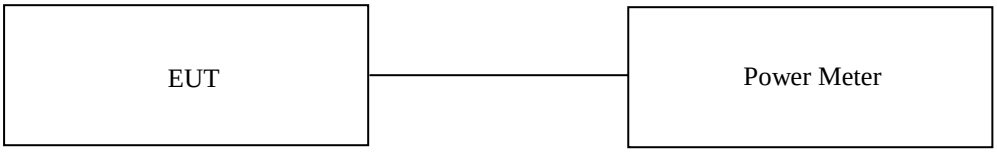
7.5.1 Operating environment

Temperature : 26 ℃

Relative humidity : 47 % 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)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

All test equipment used is calibrated on a regular basis.

7.5.4 Test data

-. Test Date : June 14, 2014

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402	-2.27	30.00	-32.27
Middle	2 441	0.20	30.00	-29.80
High	2 480	-0.86	30.00	-30.86

Tested by: Tae-Ho, Kim / Project Engineer

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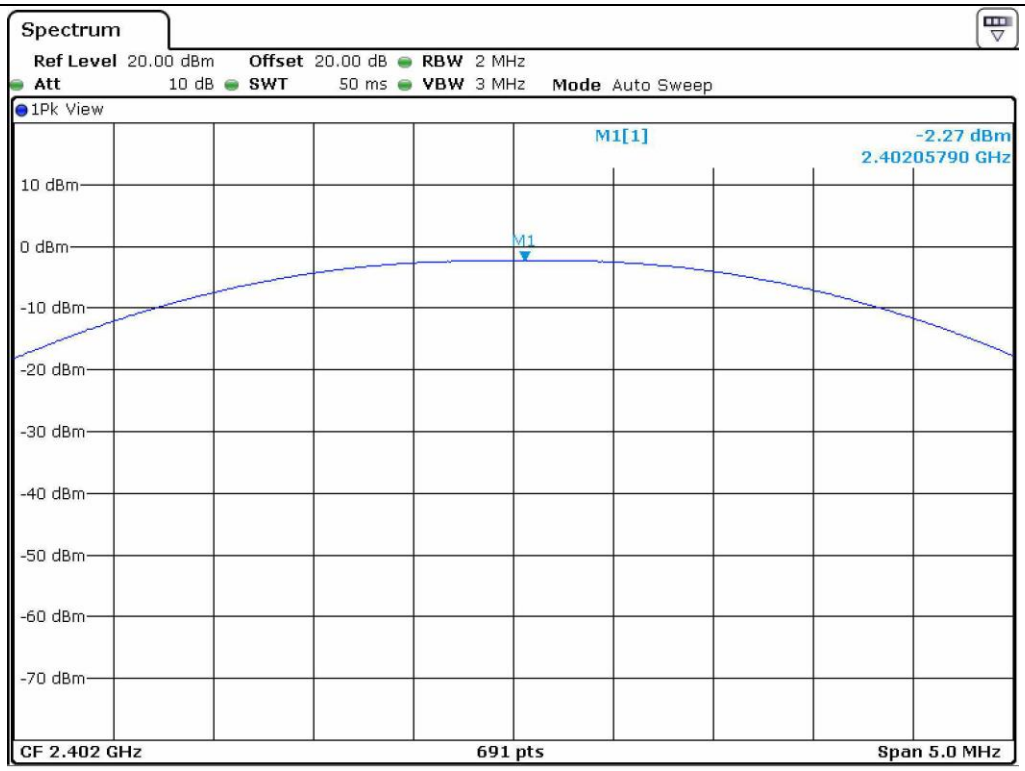
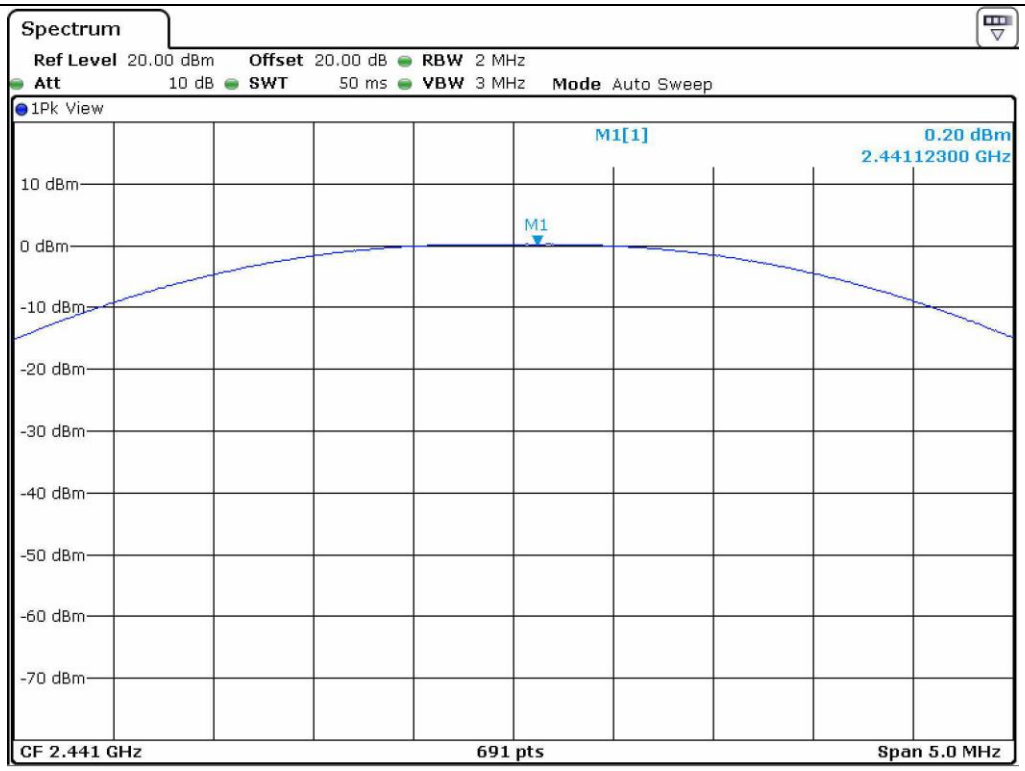


Low Channel



Middle Channel

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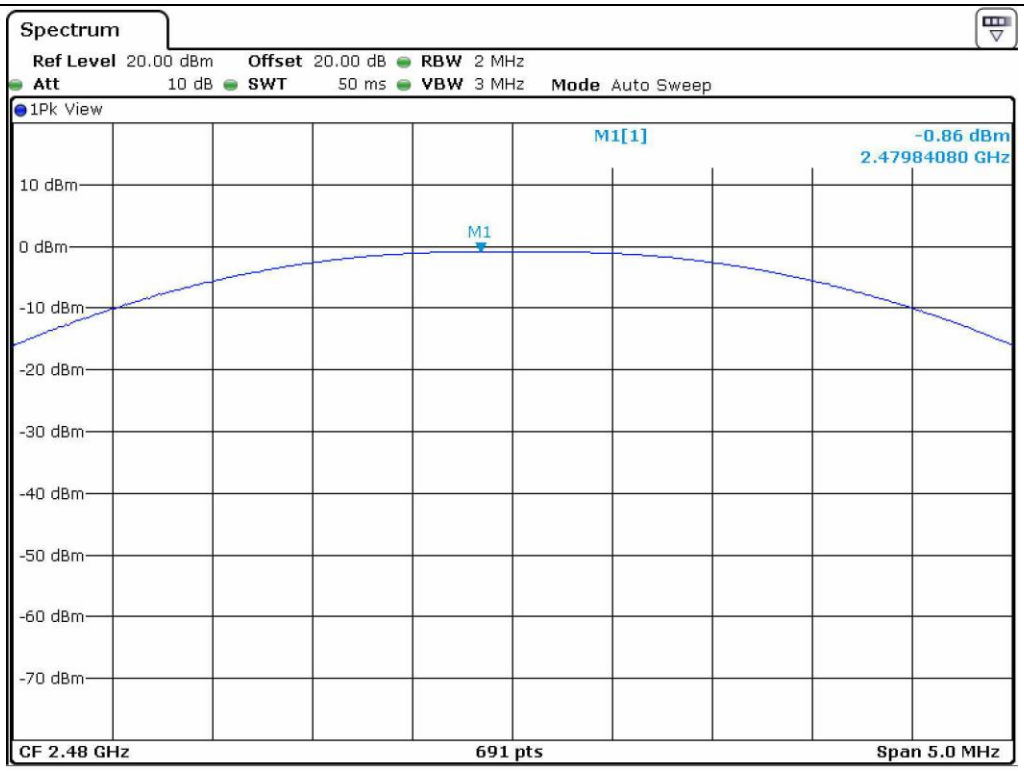

High Channel

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7.6 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

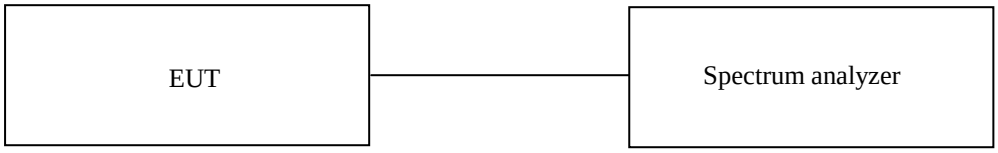
7.6.1 Operating environment

Temperature : 18 ℃

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 m, open-field test site. The EUT was placed on a non-conductive turntable approximately 0.8 m 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 m and 4.0 ms 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)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)
■ -	8447D	Hewlett-Packard	Amplifier	2944A07777	Jun. 27, 2013(1Y)
■ -	83051A	Agilent	Preamplifier	3950M00201	Apr. 30, 2014(1Y)
■ -	F-40-5000-RF	RLC Electronics	Highpass Filter	0425	May 07, 2014(1Y)
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Sep. 05, 2013(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.

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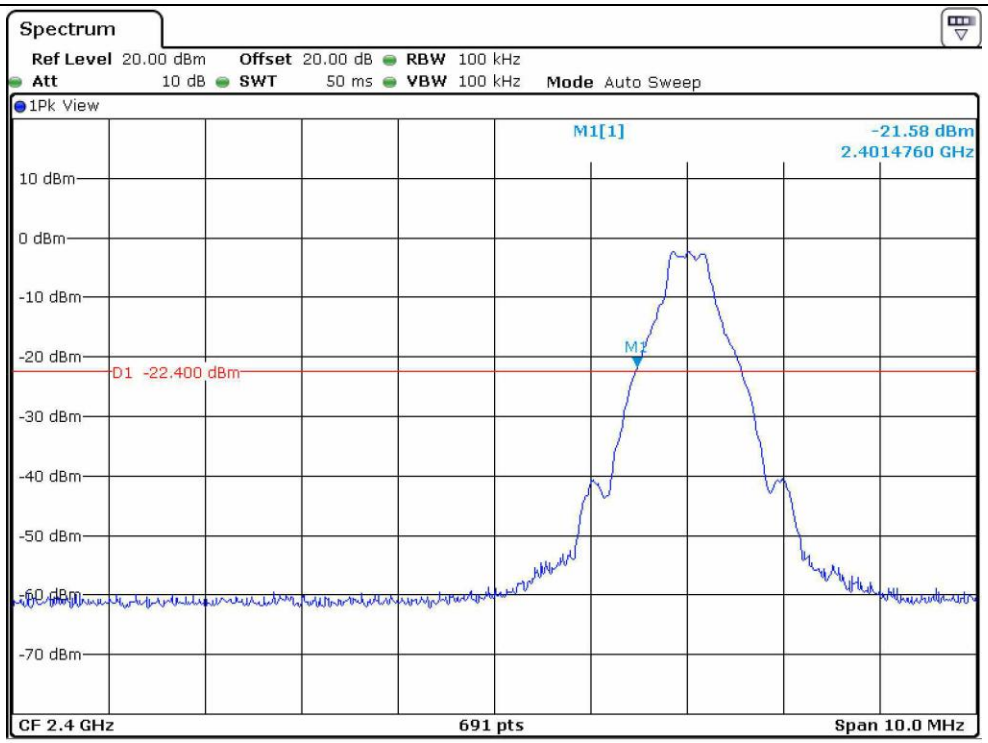
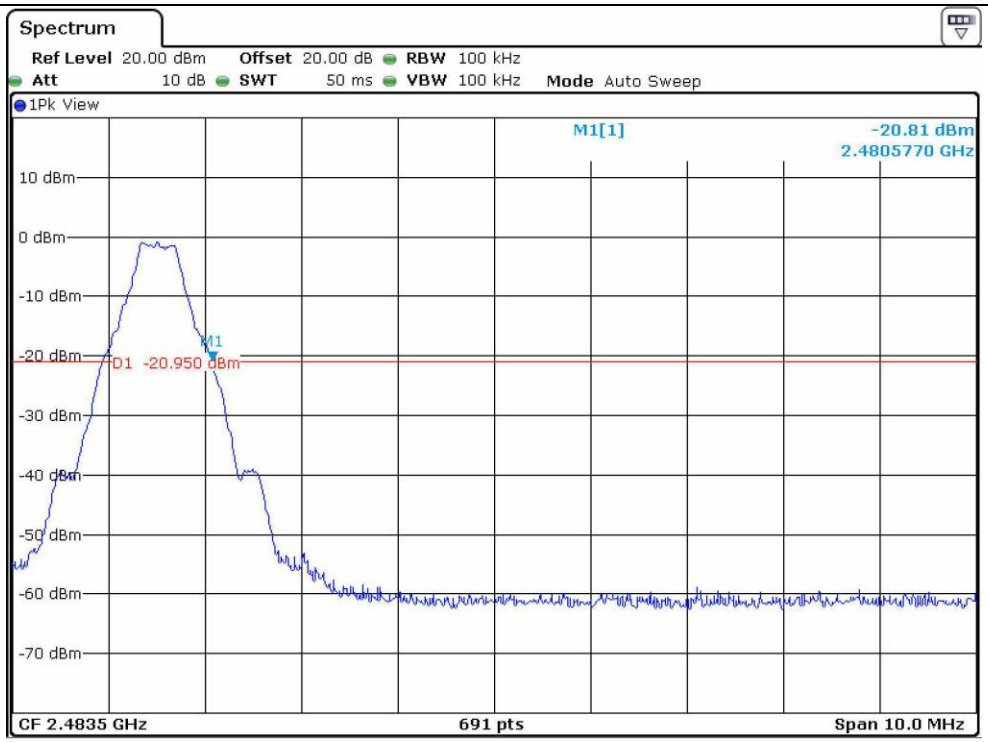
7.6.5. Test data

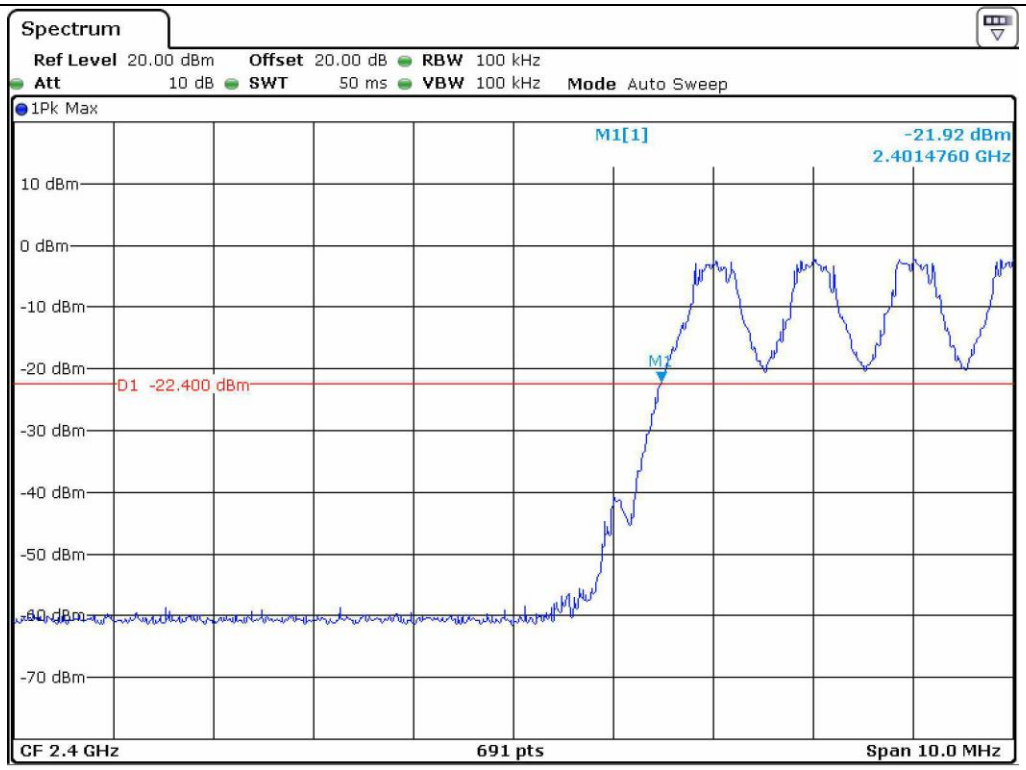
7.6.5.1. Test data for conducted emission



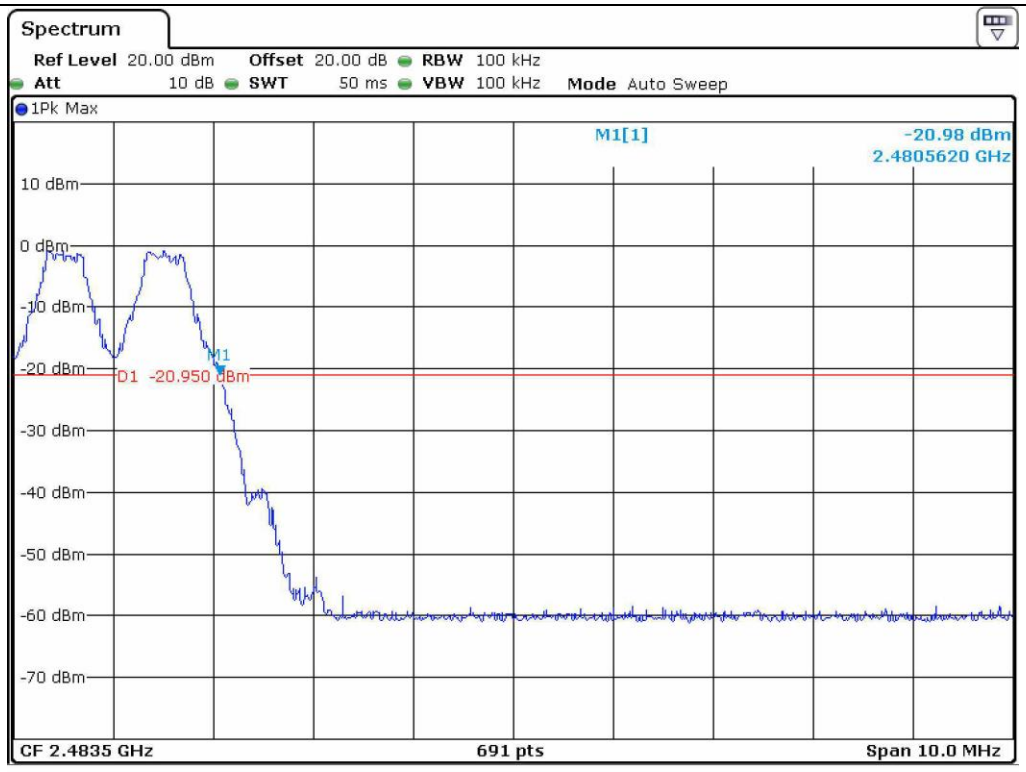
Low Channel



High Channel



Low Channel



Low Channel

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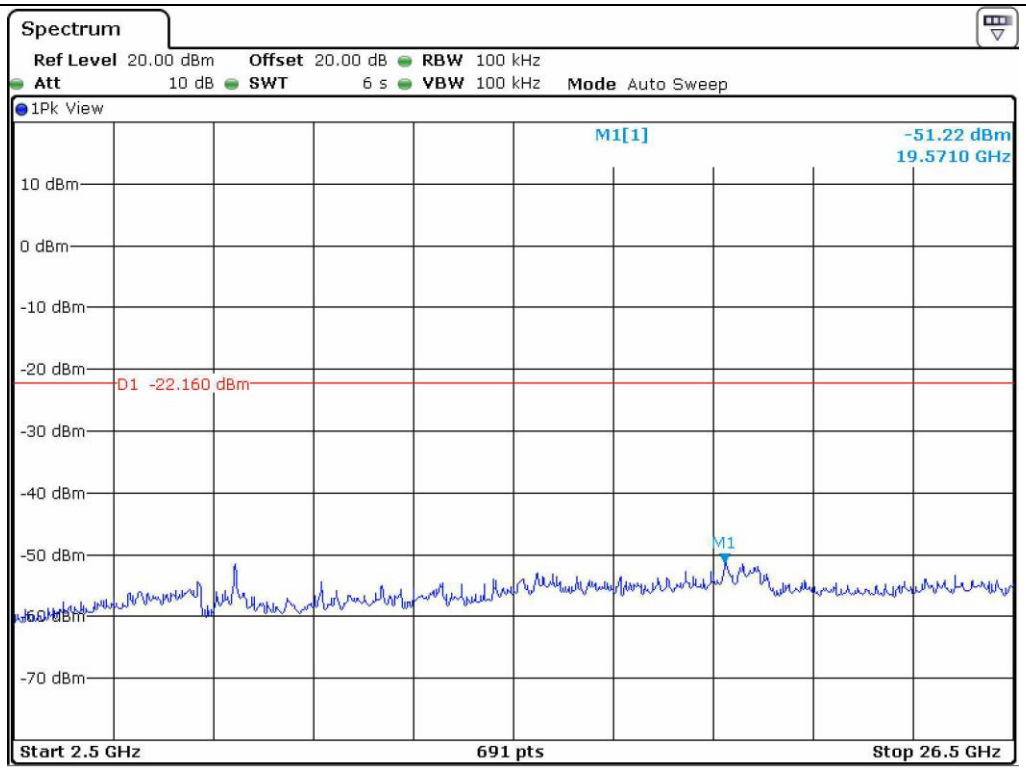
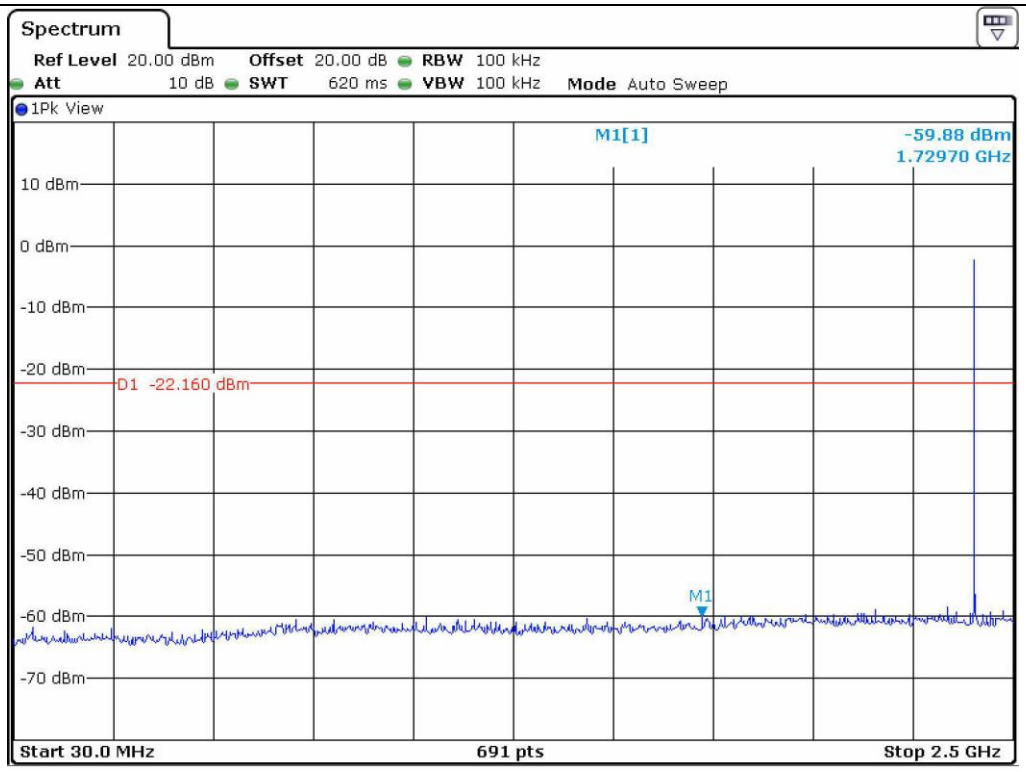
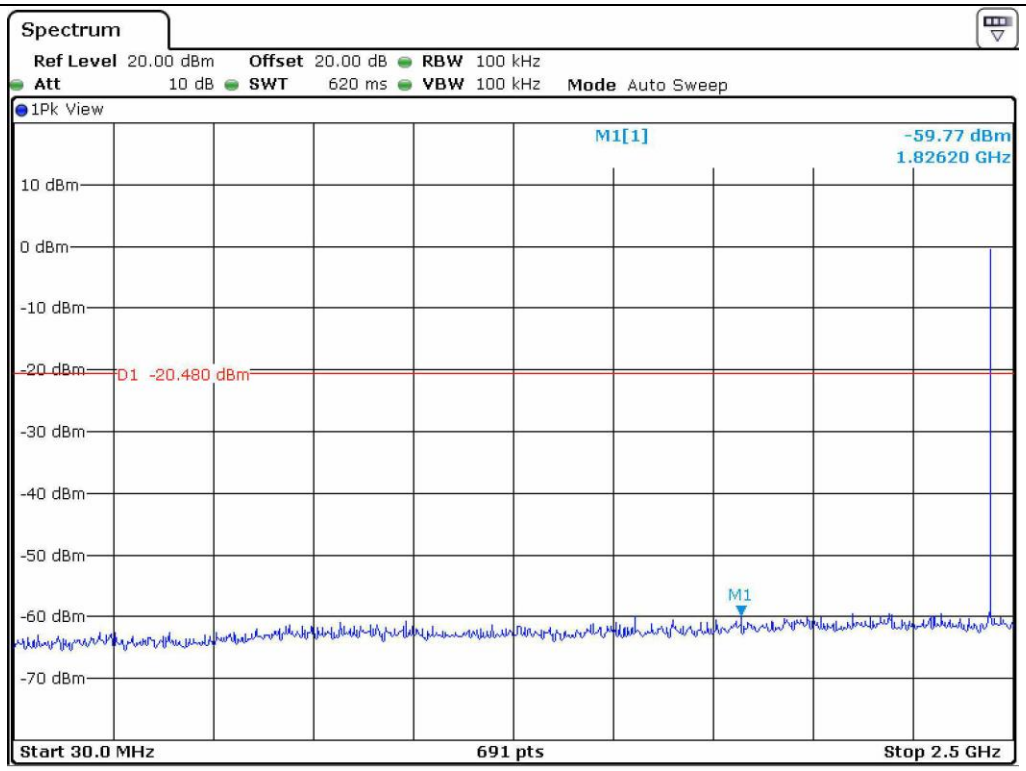


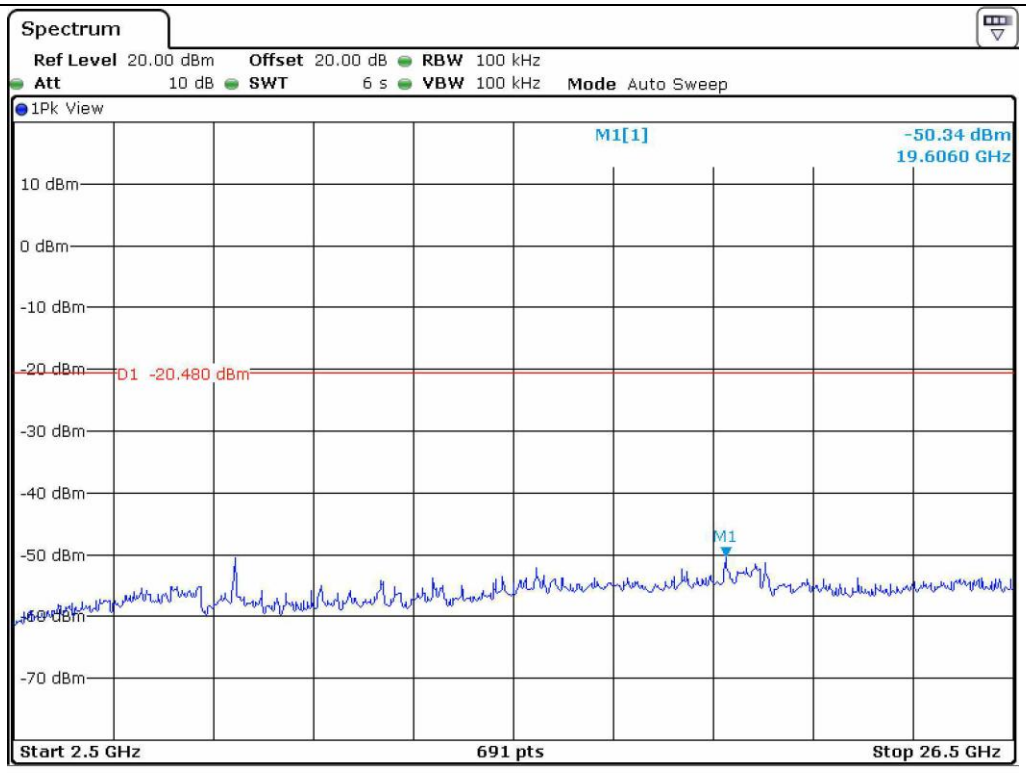
Low Channel



Low Channel



Middle Channel



Middle Channel

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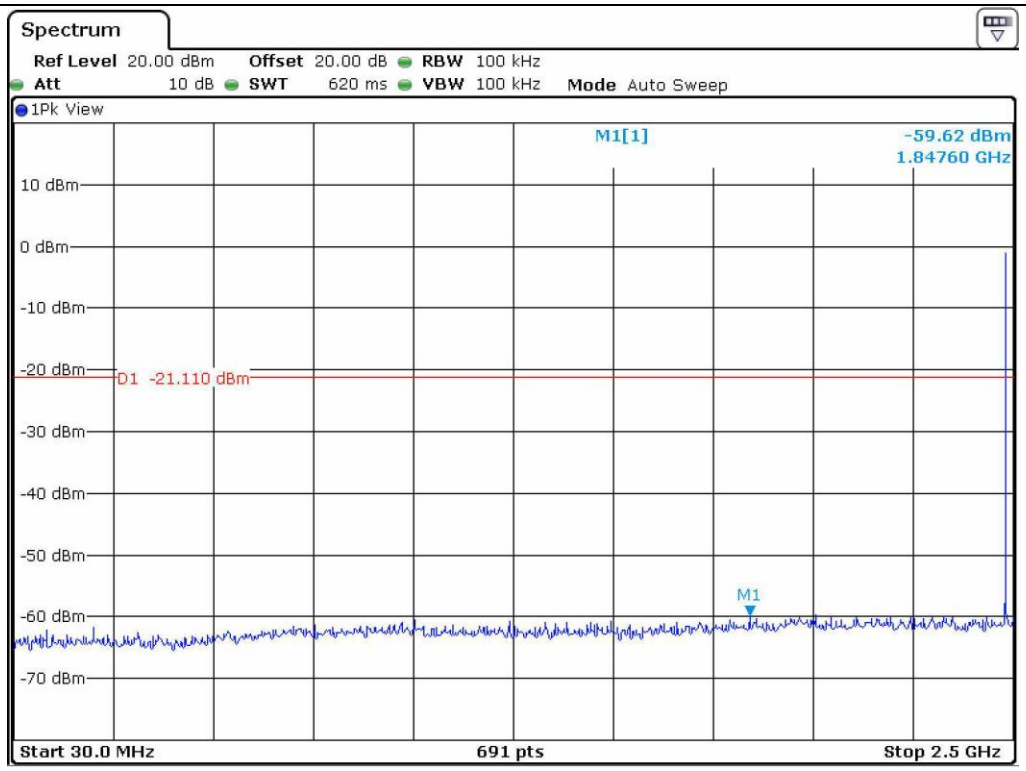
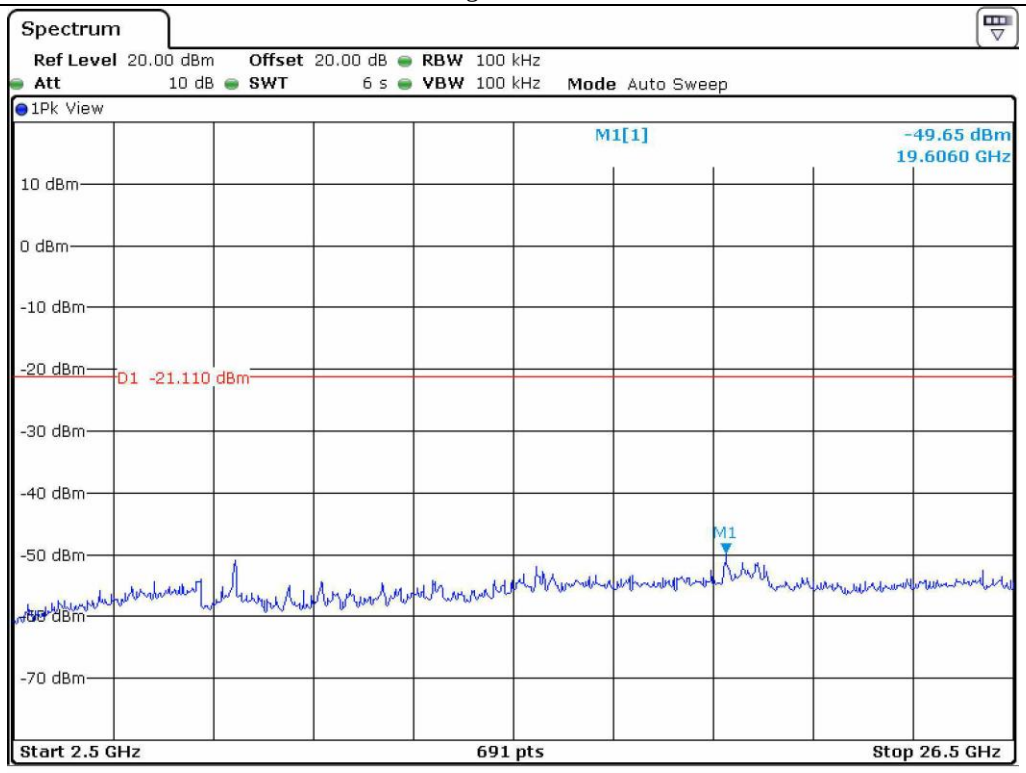


High Channel



High Channel

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7.6.5.2. Test data for radiated emission

7.6.5.2.1. Radiated Emission which fall in the Restricted Band

-. Test Date : June 14, 2014

-. 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								
2 390.00	23.37	Peak	H	27.04	3.16	53.57	74.00	-20.43
	12.54	Average	H			42.74	54.00	-11.26
	24.25	Peak	V			54.45	74.00	-19.55
	12.55	Average	V			42.75	54.00	-11.25
Test Data for High Channel								
2 483.50	22.39	Peak	H	27.31	3.16	52.86	74.00	-21.14
	12.77	Average	H			43.24	54.00	-10.76
	21.77	Peak	V			52.24	74.00	-21.76
	12.77	Average	V			43.24	54.00	-10.76

Tabulated test data for Restricted Band

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

Tested by: Tae-Ho, Kim / Project Engineer

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7.6.5.2.2. Spurious & Harmonic Radiated Emission

-. Test Date : June 14, 2014

-. 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	71.45	Peak	H	27.09	3.16	-	101.70	-	-
	67.25	Peak	V				97.50	-	-
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	73.44	Peak	H	27.19	3.16	-	103.79	-	-
	70.85	Peak	V				101.20	-	-
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

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-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	72.14	Peak	H	27.30	3.16	-	102.60	-	-
	98.95	Peak	V				129.14	-	-
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

Tested by: Tae-Ho, Kim / Project Engineer

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8. RADIO FREQUENCY EXPOSURE

8.1 RF Exposure Limit

According to the FCC rule §1.1310, the limit for General Population/Uncontrolled exposure is 1 mW/cm² for the device operating 1 500 ~ 100 000 MHz.

8.2 EUT Description

Kind of EUT	Digital Pen
Operating Frequency Band	☐ Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz ☐ WLAN: 2 412 MHz ~ 2 462 MHz ☐ WLAN: 5 180 MHz ~ 5 320 MHz / 5 500 MHz ~ 5 700 MHz ☐ WLAN: 5 745 MHz ~ 5 825 MHz ■ Bluetooth: 2 402 MHz ~ 2 480 MHz
Device Category	■ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ☐ Others
Max. Output Power	0.20 dBm (1.047 mW)
Used Antenna	Inverted-F type antenna
Used Antenna Gain	0.69 dBi
Exposure Evaluation Applied	☐ MPE ☐ SAR ■ N/A

8.3 Test Result

According to the procedure, KDB 447498 D01, the standalone SAR test exclusion threshold is

[(Max. Power of channel, including tune-up tolerance, mW)/(Mim. test separation distance, mm)] X [√ f(GHz)] < 3

= [1.047/5)] X √ 2.441 = 0.327

Conclusion: The SAR test exclusion threshold is less than 3, so the device meets the RF Exposure Requirement and excluded SAR Test.

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9. RADIATED EMISSION TEST

9.1 Operating environment

Temperature : (24 ~ 25) ℃

Relative humidity : (44 ~ 45) % 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	Jan. 13, 2014(1Y)
■ -	8568B	HP	Spectrum Analyzer	3001A04955	Apr. 29, 2014(1Y)
■ -	8447D	Hewlett Packard	Amplifier	2944A07777	Jun. 27, 2013(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	N/A
☐ -	HL046	Schwarzbeck	Rohde & Schwarz	62281001	Jan. 28, 2014(1Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	VULB9163-202	Oct. 12, 2012(2Y)

All test equipment used is calibrated on a regular basis.

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9.4 Test data

-. Test Date : June 04, 2014

-. 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)
85.22	23.60	H	1.50	234.00	8.55	2.10	34.25	40.00	-5.75
95.73	22.40	V	1.50	296.00	11.13	2.21	35.74	43.52	-7.78
167.47	14.70	V	1.60	90.00	8.44	2.85	25.99	43.52	-17.53
224.34	22.90	H	1.50	40.00	11.28	3.29	37.47	46.02	-8.55
328.48	15.80	V	1.50	110.00	14.03	3.56	33.39	46.02	-12.63
487.39	17.50	V	1.50	80.00	17.17	4.57	39.24	46.02	-6.78

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)
85.36	23.50	H	1.50	234.00	8.60	2.11	34.21	40.00	-5.79
95.43	21.00	V	1.50	295.00	11.08	2.21	34.29	43.52	-9.23
168.05	16.20	V	1.60	85.00	8.46	2.84	27.50	43.52	-16.02
226.35	21.70	H	1.50	50.00	11.38	3.31	36.39	46.02	-9.63
327.14	16.40	V	1.50	110.00	14.00	3.55	33.95	46.02	-12.07
486.36	18.20	V	1.50	70.00	17.15	4.57	39.92	46.02	-6.10

Tabulated test data for Radiated Electromagnetic Field

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-. 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)
95.45	23.70	H	1.50	234.00	11.08	2.21	36.99	43.52	-6.53
95.73	22.30	V	1.50	285.00	11.13	2.21	35.64	43.52	-7.88
167.43	17.30	V	1.60	95.00	8.44	2.85	28.59	43.52	-14.93
223.85	22.90	H	1.50	40.00	11.25	3.29	37.44	46.02	-8.58
328.29	15.50	V	1.50	120.00	14.03	3.56	33.09	46.02	-12.93
487.54	18.30	V	1.50	90.00	17.17	4.58	40.05	46.02	-5.97

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 : (25 ~ 26) ℃

Relative humidity : (45 ~ 46) % R.H.

10.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. The EUT was connected to notebook PC and power of notebook PC was fed to the EUT through a 50 Ω / 50 μH + 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)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 18, 2013 (1Y)
☐ -	ESHS10	Rohde & Schwarz	Test Receiver	834467/007	Jul. 02, 2013 (1Y)
■ -	NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 11, 2014 (1Y)
☐ -	NSLK 8126	Schwarzbeck	AMN	8126-404	Apr. 29, 2014 (1Y)
☐ -	3825/2	EMCO	AMN	9109-1869	Apr. 29, 2014 (1Y)
☐ -	3825/2	EMCO	AMN	9109-1867	Apr 29, 2014 (1Y)

All test equipment used is calibrated on a regular basis.

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10.4 Test data

-. Test Date : June 02, 2014

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Test Result : PASSED BY -10.72 dB at 16.48 MHz

Frequency (MHz)	Line	Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
0.50	N	44.11	56.00	-11.89
0.68	N	43.37	56.00	-12.63
11.80	N	46.03	60.00	-13.97
15.46	H	48.81	60.00	-11.19
16.38	N	48.20	60.00	-13.97
16.48	H	49.28	60.00	-10.72
Frequency (MHz)	**Line**	**Average (dBµV)**		**Margin (dB)**
		Emission level	**Limits**	
-				
-				

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

Average mode was not measured, because peak values were under the average limit.

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

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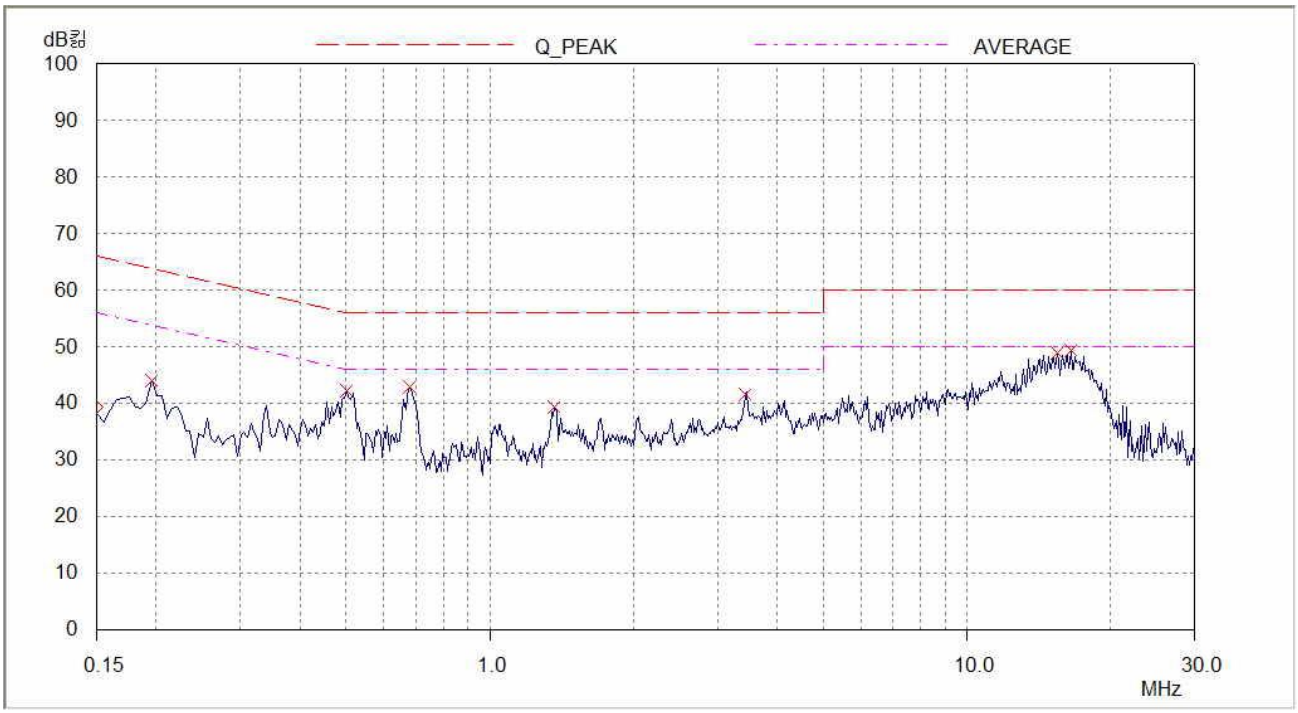
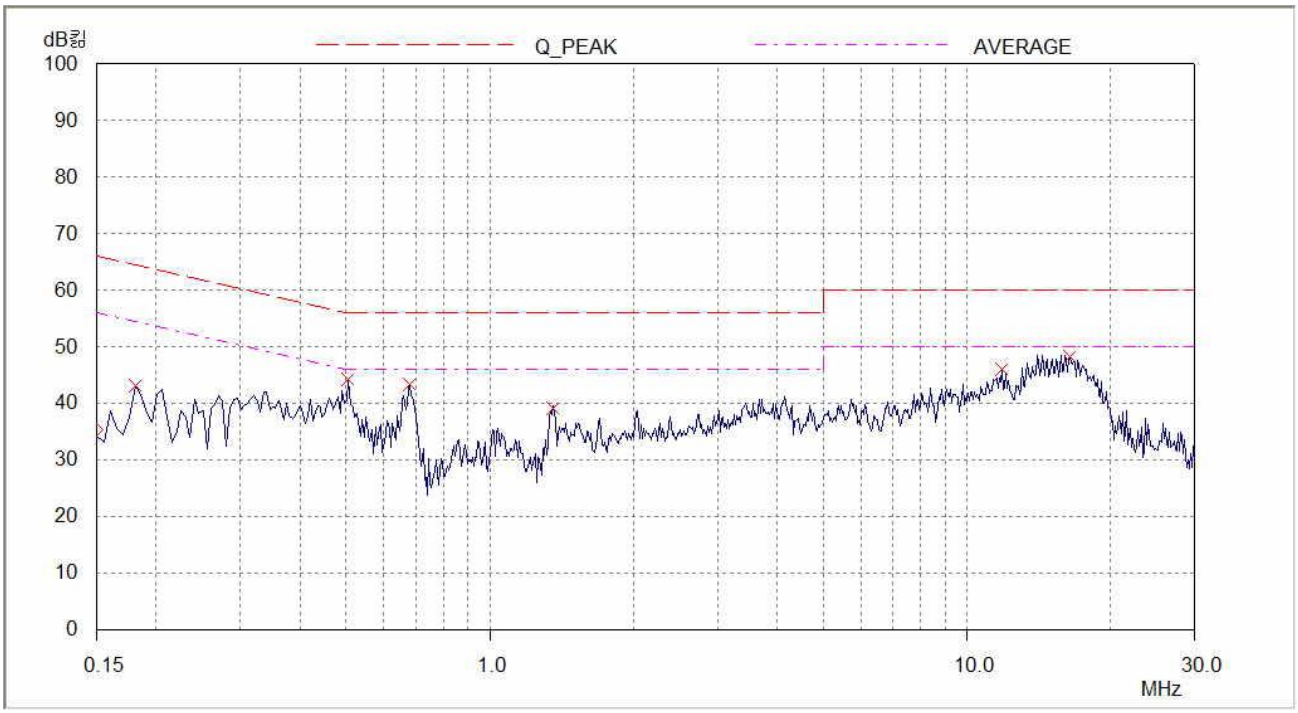


HOT LINE



NEUTRAL LINE

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