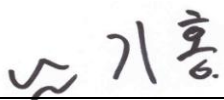


ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

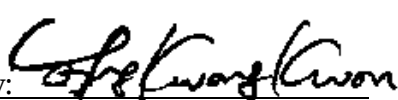
Test Report No. : E137R-002
AGR No. : A136A-028
Applicant : LG Electronics USA
Address : 1000 Sylvan Avenue Englewood Cliffs, NJ 07632, United States
Manufacturer : LG Electronics Inc.
Address : 19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea.
Type of Equipment : Wireless Adapter Card
FCC ID. : BEJ9QK-DMRS3
Model Name : RS3
Serial number : N/A
Total page of Report : 54 pages (including this page)
Date of Incoming : June 10, 2013
Date of issue : July 01, 2013

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: 

 Ki-Hong, Nam / Senior Engineer
 EMC/RF Center
 ONETECH Corp.

Reviewed by: 

 Y. K. Kwon / Managing Director
 EMC/RF Center
 ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E137R-002	July 01, 2013	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA
 Address : 1000 Sylvan Avenue Englewood Cliffs, NJ 07632, United States
 Contact Person : Yongduk Kwon / Research Engineer
 Telephone No. : +86-31-610-9606
 FCC ID : BEJ9QK-DMRS3
 Model Name : RS3
 Serial Number : N/A
 Date : July 01, 2013

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Modular Transmitter, Wireless Adapter Card
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2009, 558074 D01 DTS Meas Guidance v03r01
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification, Modular Approval
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.212 and 15.247
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3/10 m Semi Anechoic Chamber

-. 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) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	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 (e)	Peak Power Spectral Density	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 FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 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 301-14, Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. The Onetech Corp. has been accredited as a Conformity Assessment Body (CAB) with designation number KR0013 under MRA between the Korea and USA and was submitted to the Industry Canada on April 14, 2009.(Registration Number:IC3736A-2).

3. GENERAL INFORMATION

3.1 Product Description

The LG Electronics USA, Model RS3 (referred to as the EUT in this report) is a Wireless Adapter Card for the Compressed wireless digital audio transceiver operating in the 2.4 GHz bands. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Modular Transmitter, Wireless Adapter Card
Temperature Range	0 °C ~ +55 °C
Operating Frequency	2 403 MHz ~ 2 478 MHz
RF Output Power	Antenna1: 4.20 dBm Antenna2: 3.92 dBm
Number of Channel	39 Channel
Modulation Type	GFSK
Antenna Type	Inserted into the main board (PCB Pattern Antenna)
USED RF CHIP	Marker: SYNCOMM Technology Corp. Model Name:SYNIC-IA3S4
Antenna Gain	Antenna1: 1.56 dBi Antenna2: -0.07 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	16 MHz

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	LG Electronics Inc.	RS3 / IA3S4_NAM-SS01_L2	N/A

5.2 Peripheral equipment

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

Model	Manufacturer	Description	Connected to
RS3	LG Electronics Inc.	Wireless Adapter Card (EUT)	Jig board
N/A	N/A	Jig board	EUT
SW20-05004000-EK	SHENZHEN TOP-ASIA ELECTRONICS CO.,LTD	AC/DC Adapter	Jig board

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2403 MHz, 2443 MHz, and 2478 MHz to get a maximum emission levels from the EUT. Also the EUT has 2 antennas, so each transmitting mode per antenna was evaluated and recorded test results in this test report.

5.4 Configuration of Test System

Line Conducted Test: The jig board of the EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2009 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2009 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter 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 pattern 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)
Normal operating mode		
TX mode	Low Channel	X
	Middle Channel	
	High Channel	

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)
Normal operating mode		
TX mode	Low Channel	X
	Middle Channel	
	High Channel	

7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 24 °C
Relative humidity : 44 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	R/S	Spectrum Analyzer	101372	May 20, 2013

All test equipment used is calibrated on a regular basis.

7.4 Test data for Antenna 1

-. Test Date : June 10, 2013

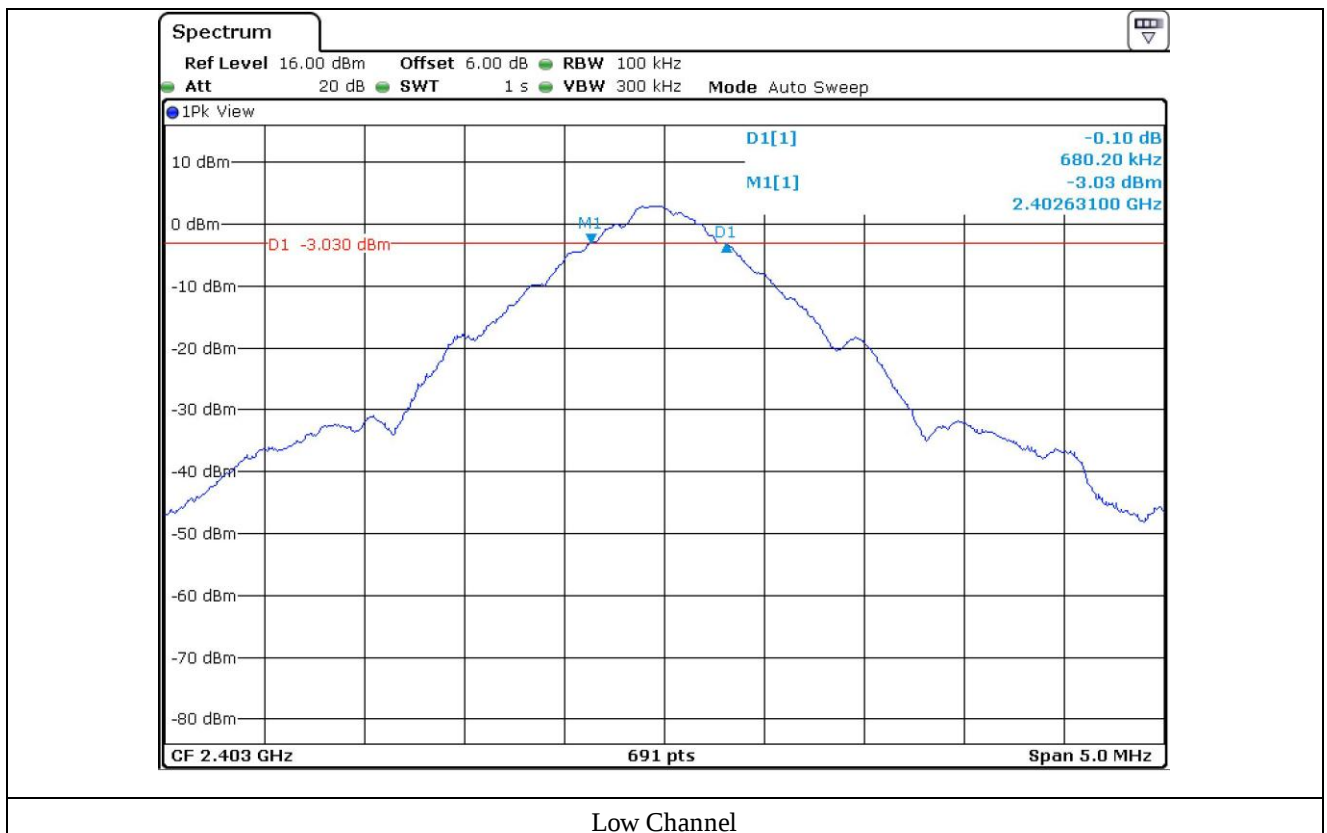
-. Test Result : Pass

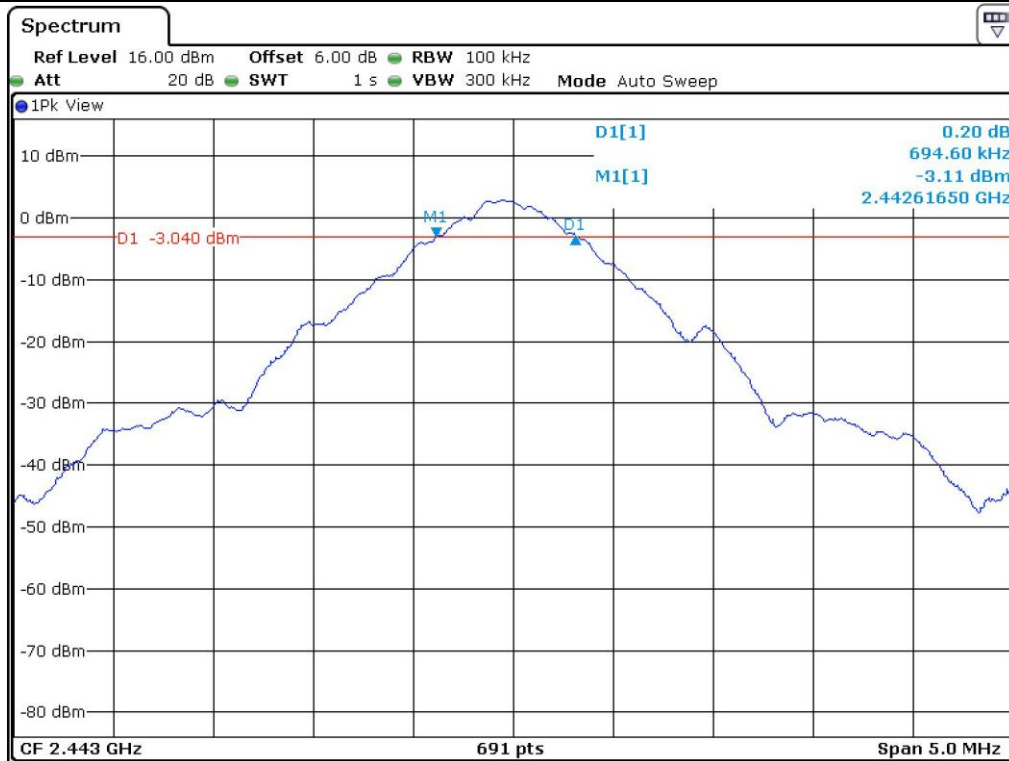
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 403	680.20	500	180.20
Middle	2 443	694.60	500	194.60
High	2 478	745.30	500	245.30

Remark. Margin = Measured Value - Limit

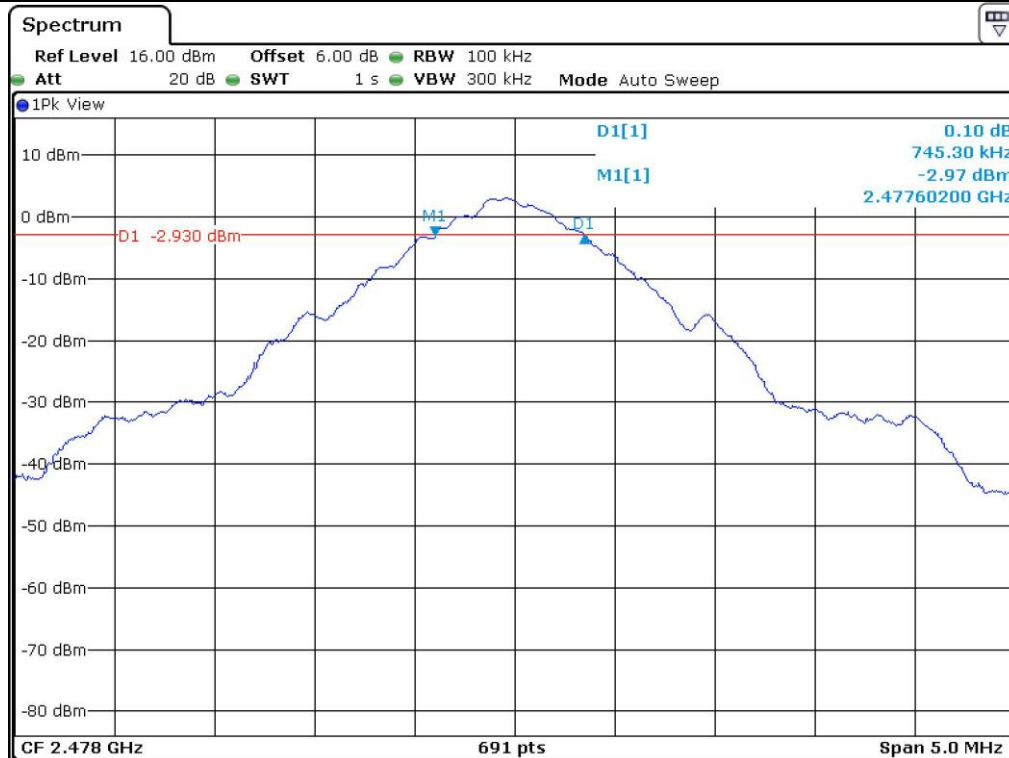
0 | 30 2.

Tested by: Hong-Kyu, Lee/ Engineer





Middle Channel



High Channel

7.5 Test data for Antenna 2

-. Test Date : June 10, 2013

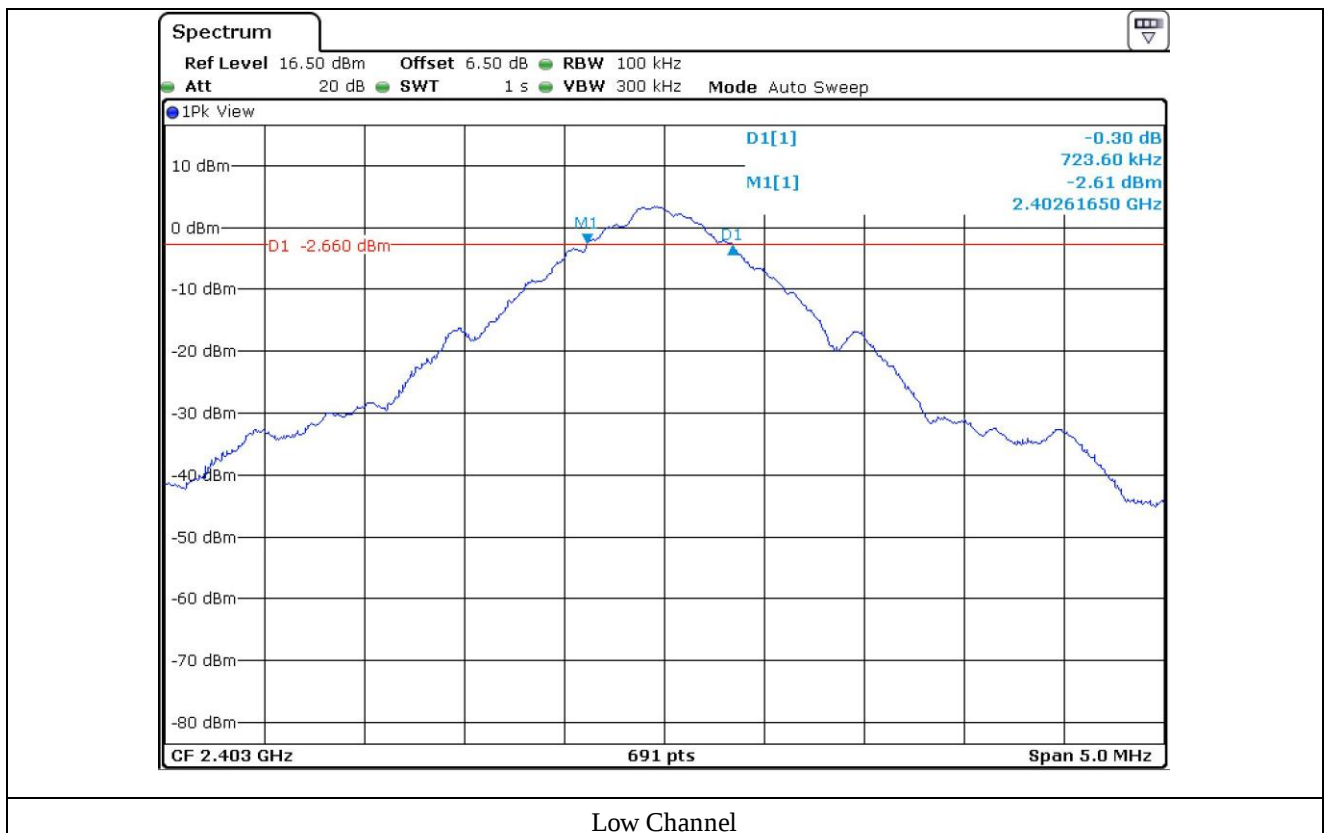
-. Test Result : Pass

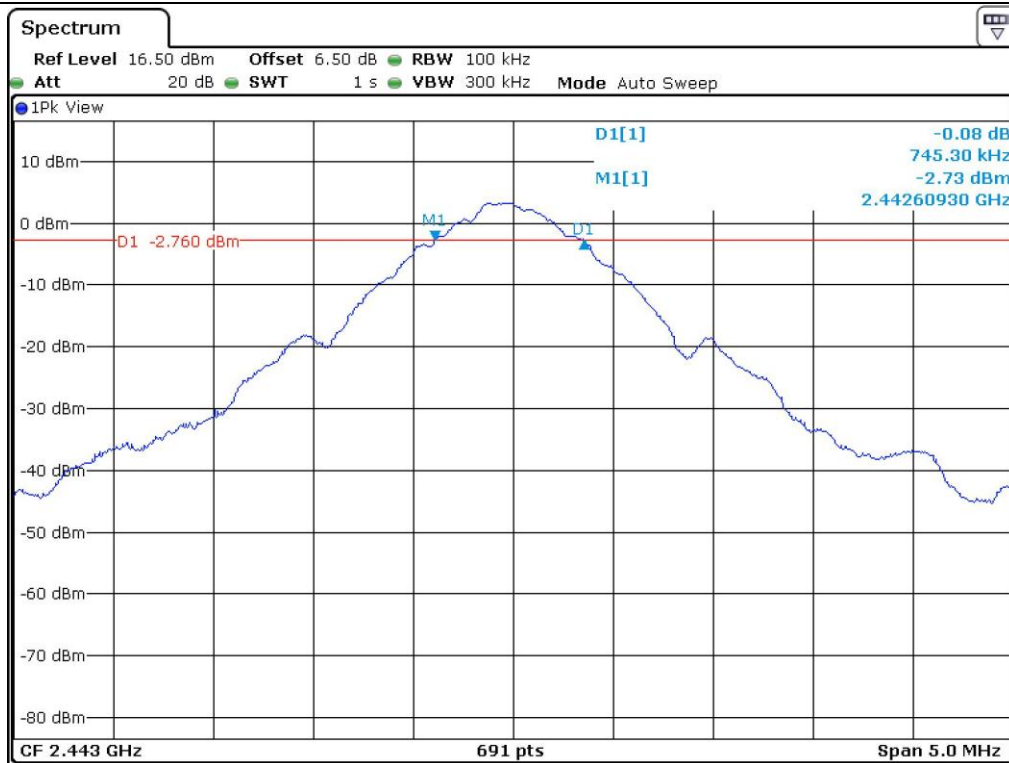
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 403	723.60	500	223.60
Middle	2 443	745.30	500	245.30
High	2 478	788.70	500	288.70

Remark. Margin = Measured Value - Limit

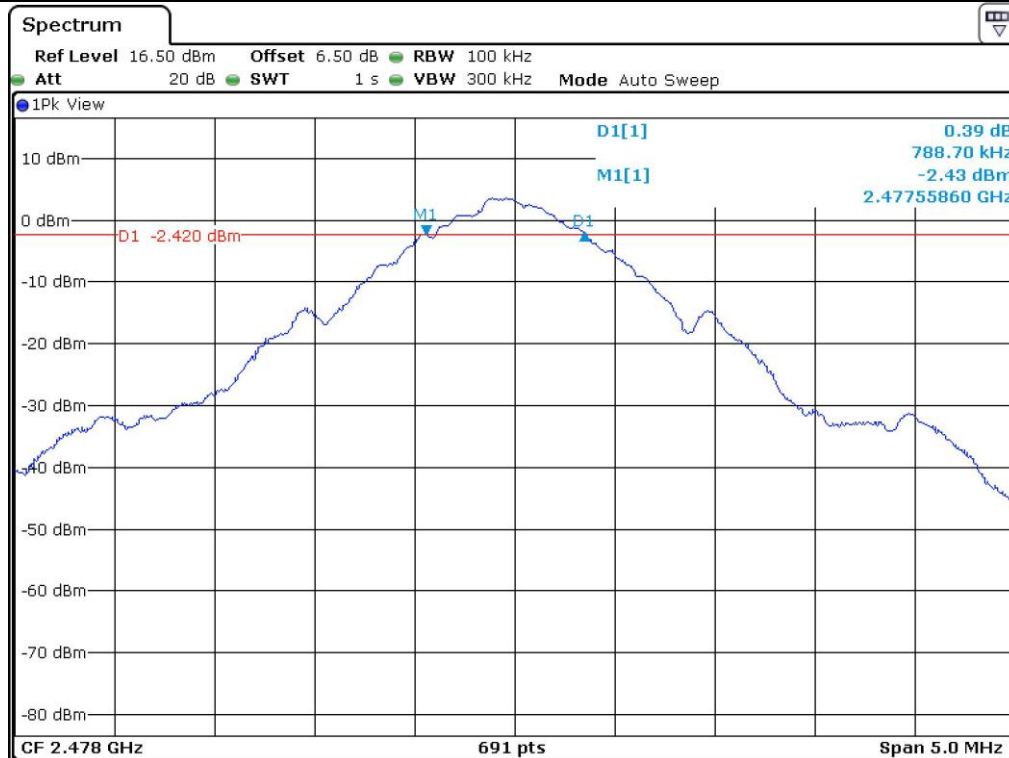
0 | 30 2.

Tested by: Hong-Kyu, Lee/ Engineer





Middle Channel



High Channel

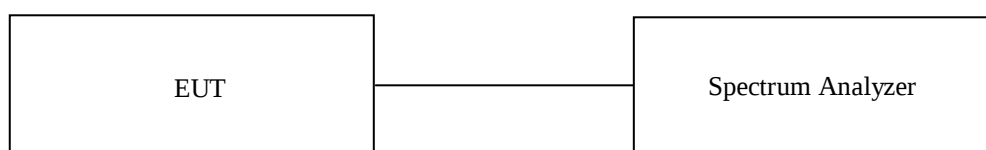
8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

Temperature : 24 °C
Relative humidity : 44 % R.H.

8.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 6 dB bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.



8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV30	R/S	Spectrum Analyzer	101372	May 30, 2013

All test equipment used is calibrated on a regular basis.

8.4 Test data for Antenna 1

-. Test Date : June 10, 2013

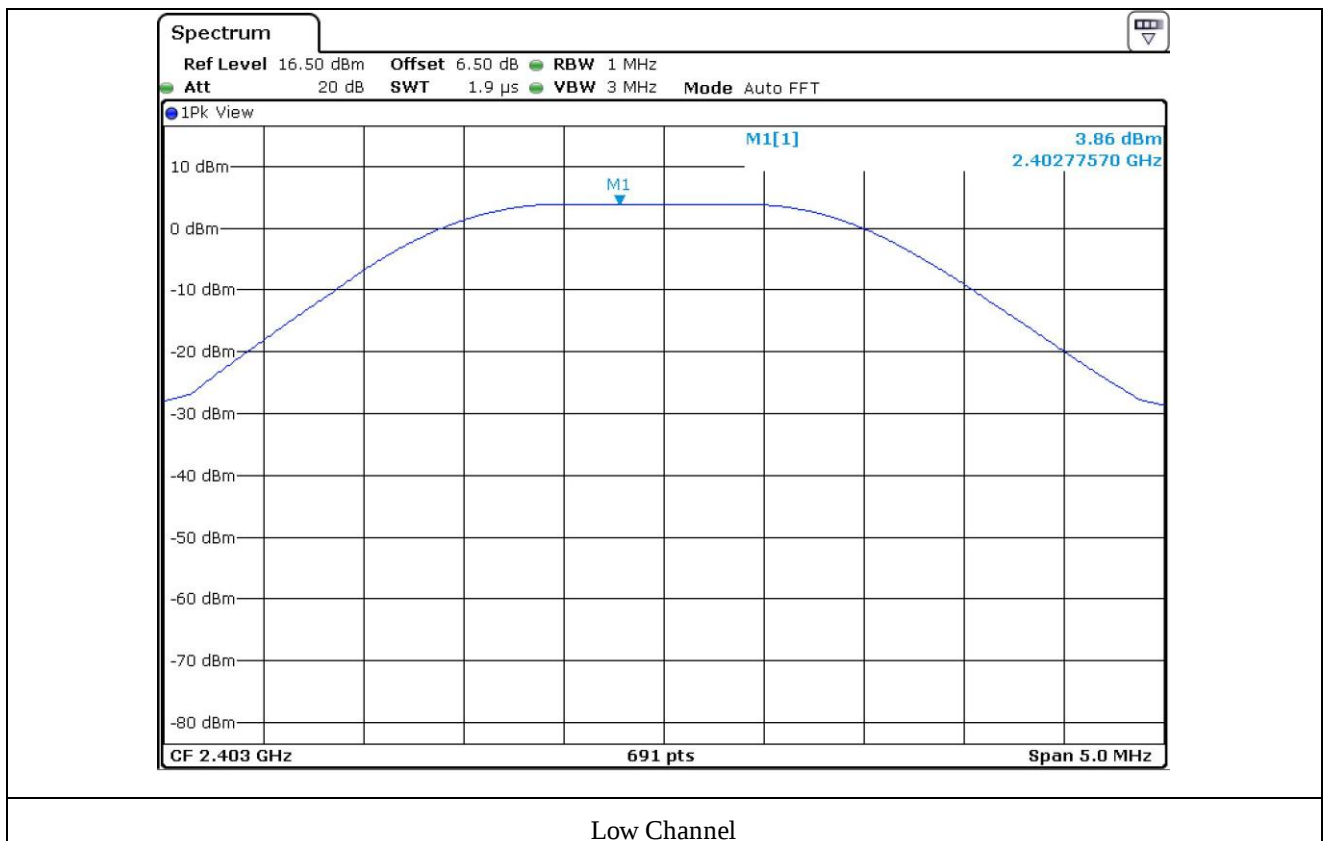
-. Test Result : Pass

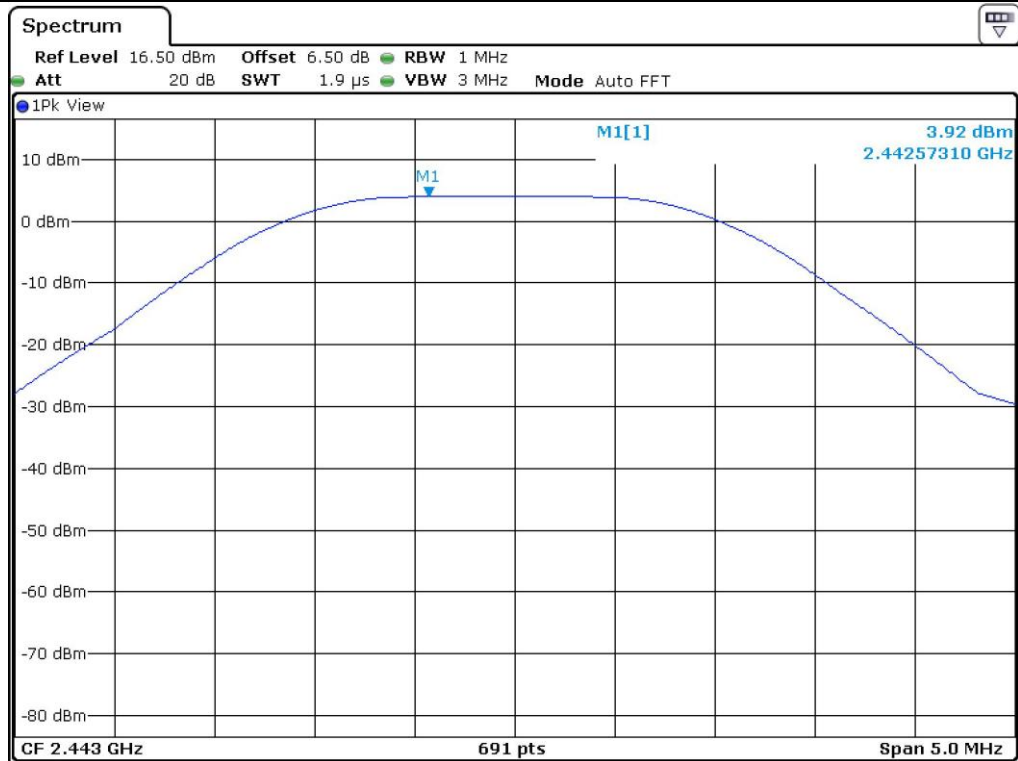
CHANNEL	FREQUENCY (MHz)	DTS (kHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 403	680.20	3.86	30	26.14
MIDDLE	2 443	694.60	3.92	30	26.08
HIGH	2 478	745.30	4.20	30	25.80

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

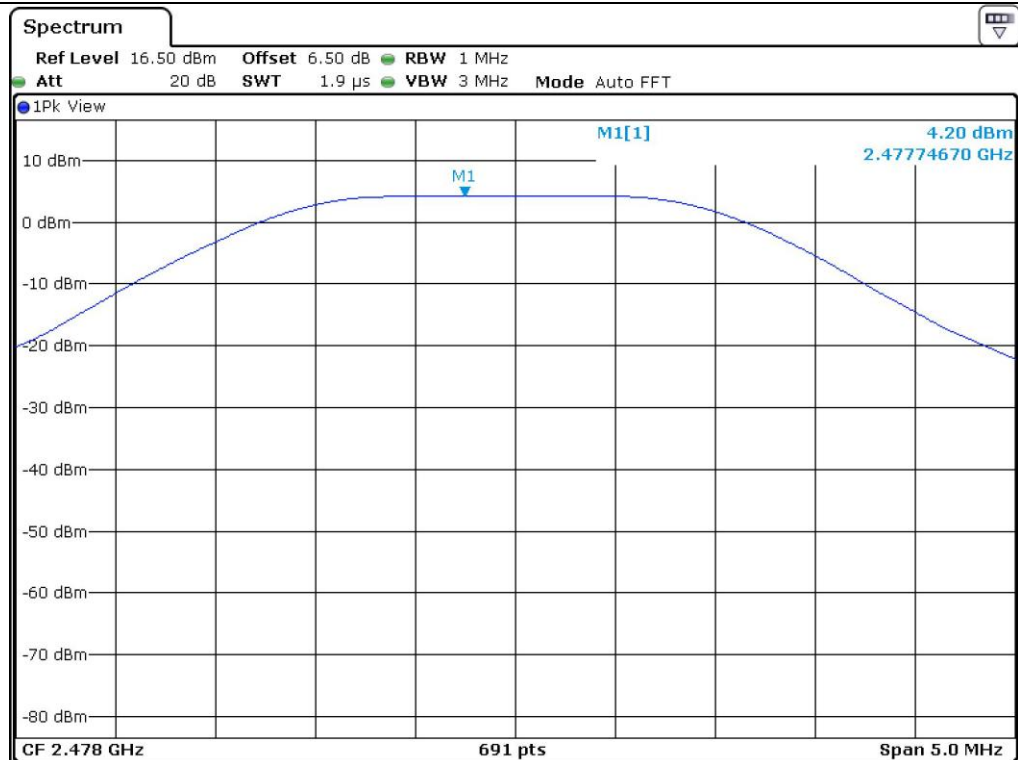
01 30 21

Tested by: Hong-Kyu, Lee/ Engineer





Middle Channel



High Channel

8.5 Test data for Antenna 2

-. Test Date : June 10, 2013

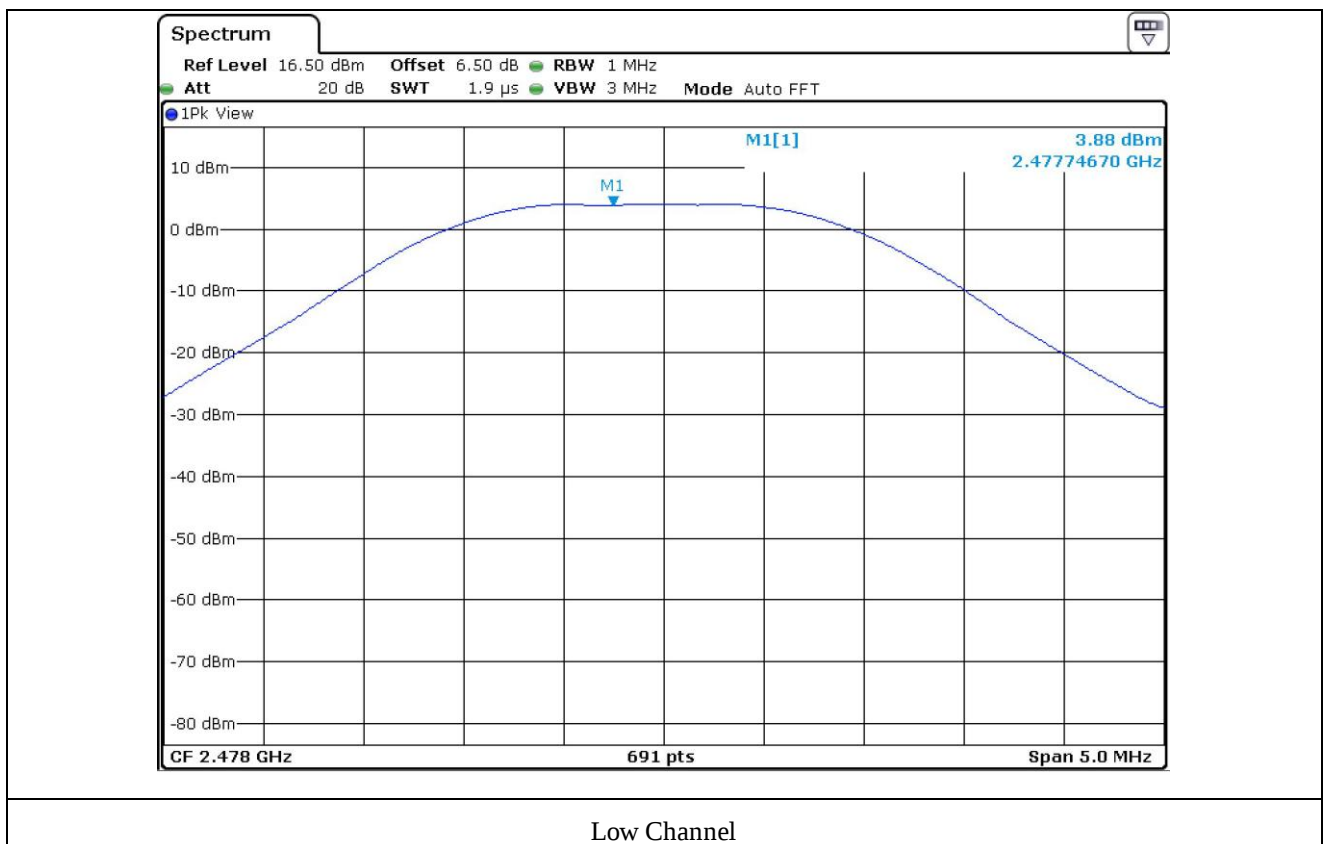
-. Test Result : Pass

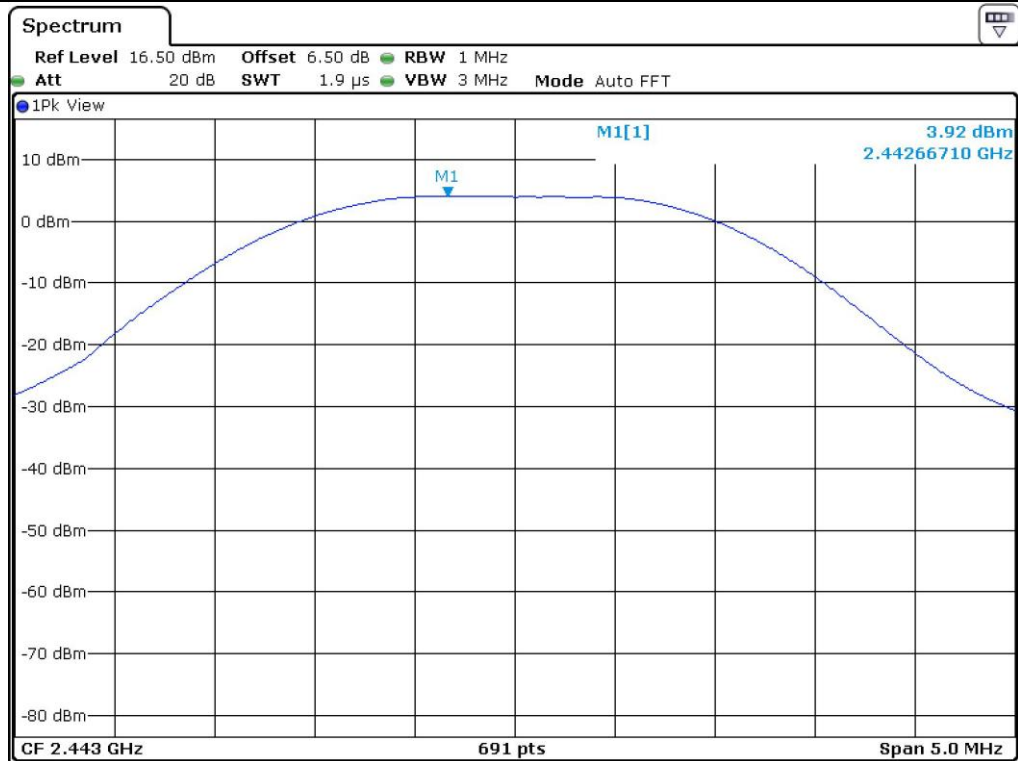
CHANNEL	FREQUENCY (MHz)	DTS (kHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 403	723.6	3.88	30	26.12
MIDDLE	2 443	745.3	3.92	30	26.08
HIGH	2 478	788.7	3.84	30	26.16

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

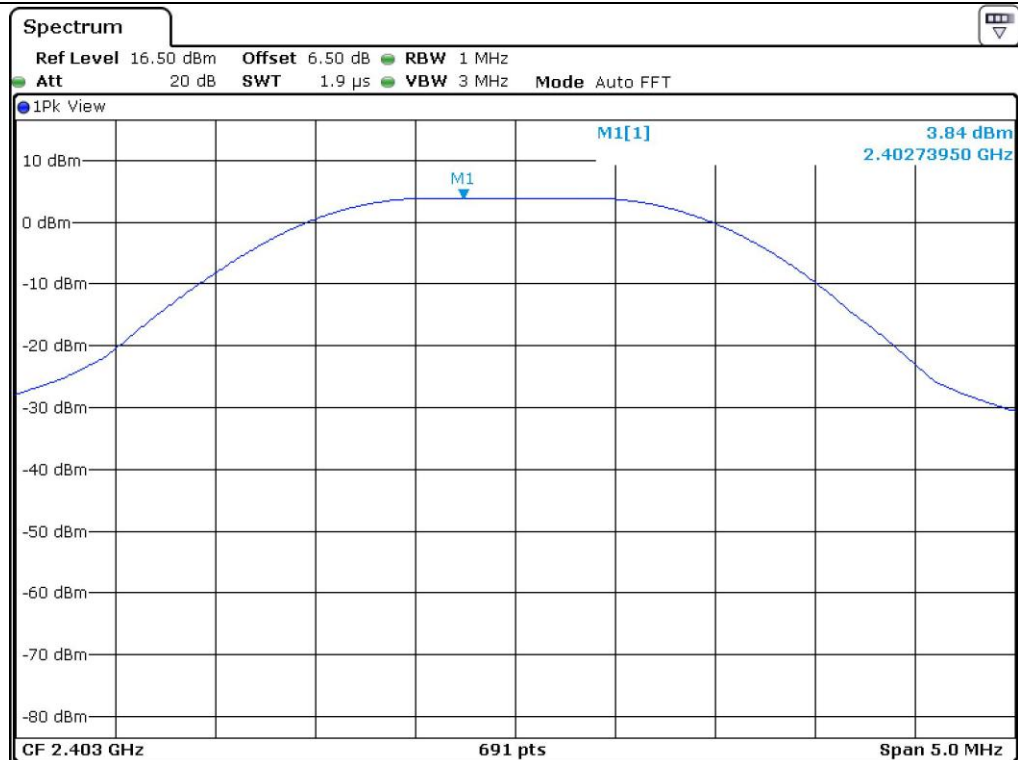
0 | 30 21.

Tested by: Hong-Kyu, Lee/ Engineer





Middle Channel



High Channel

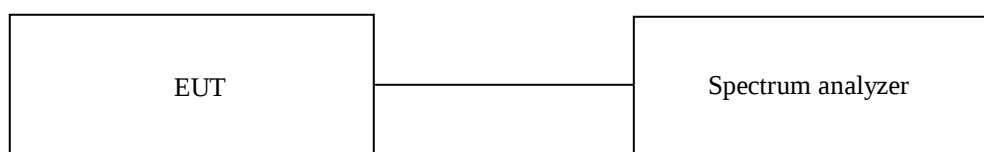
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 28 °C
Relative humidity : 45 % R.H.

9.2 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.



9.3 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 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

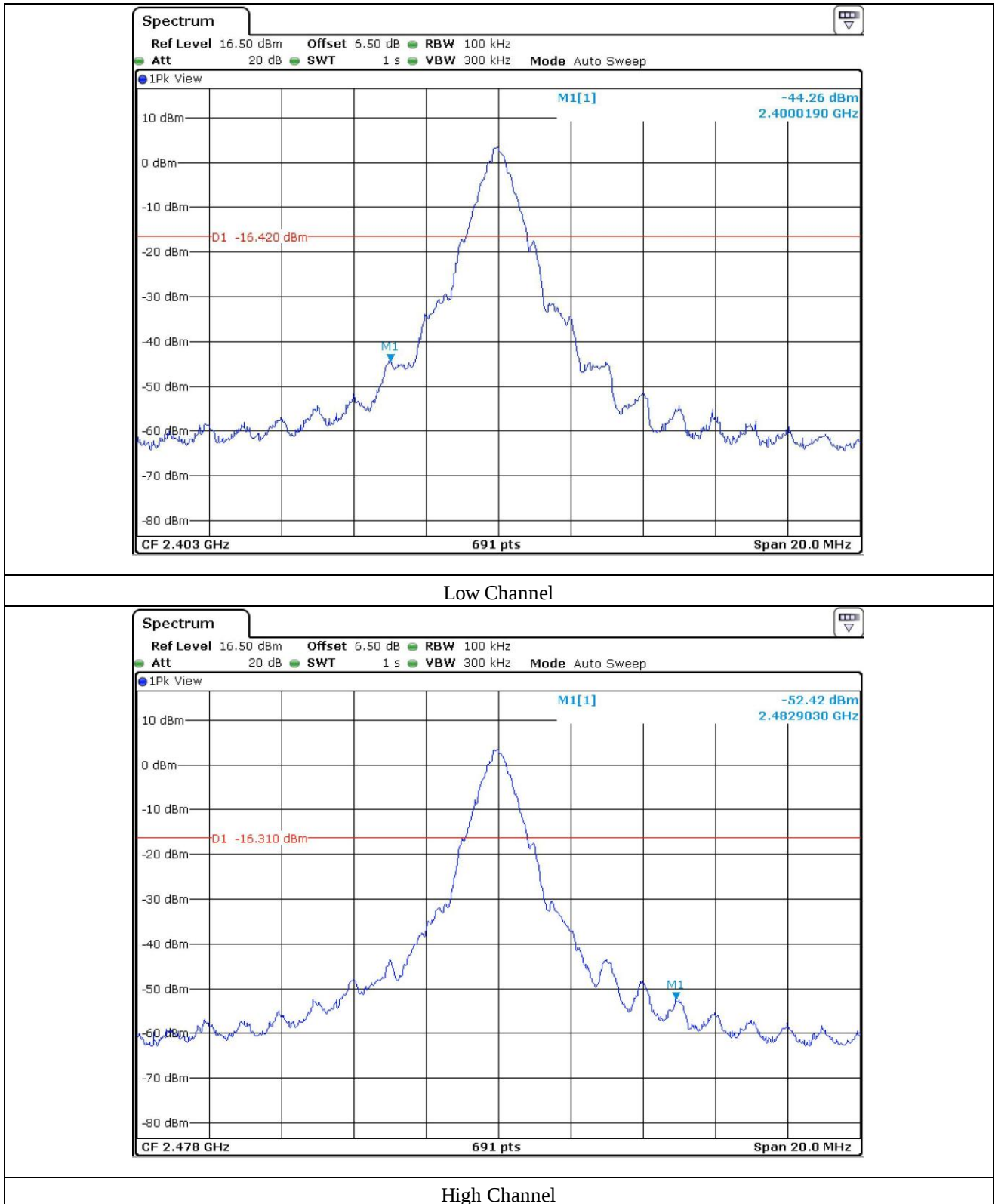
9.4 Test equipment used

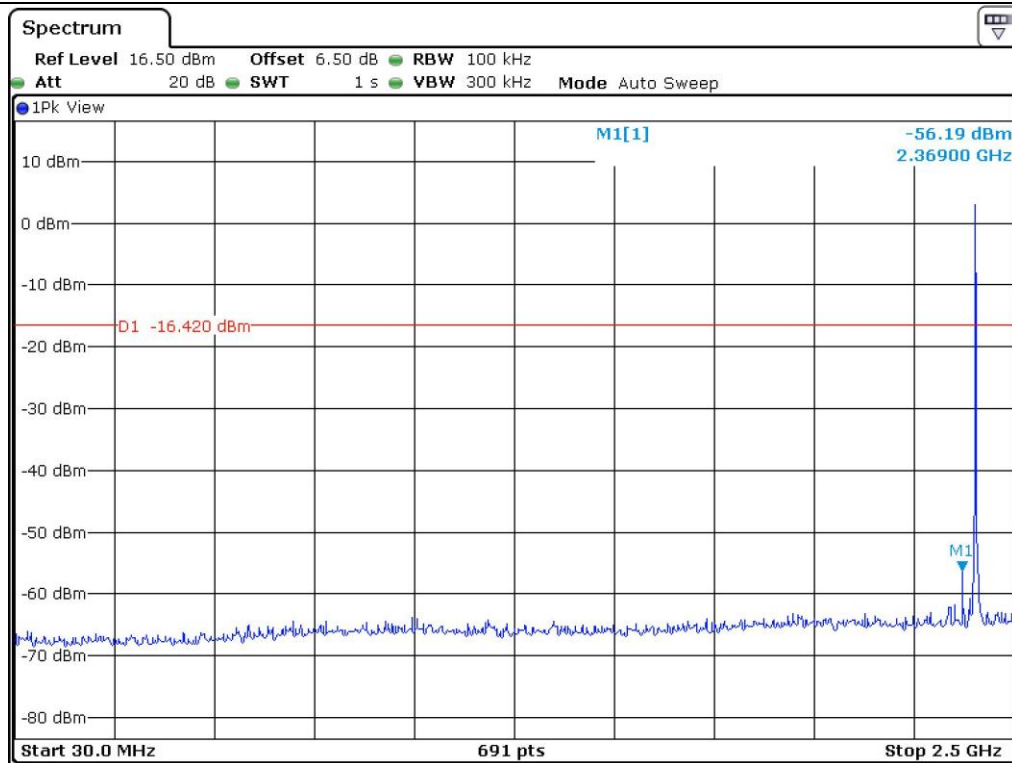
	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	May 03, 2013(1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	May 27, 2013(1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	May 21, 2013(1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 20, 2013(1Y)
■ -	SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Jan. 25, 2013(1Y)
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	VULB9163-255	Apr. 24, 2012(2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Jun. 17, 2013 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jun. 17, 2013 (2Y)

All test equipment used is calibrated on a regular basis.

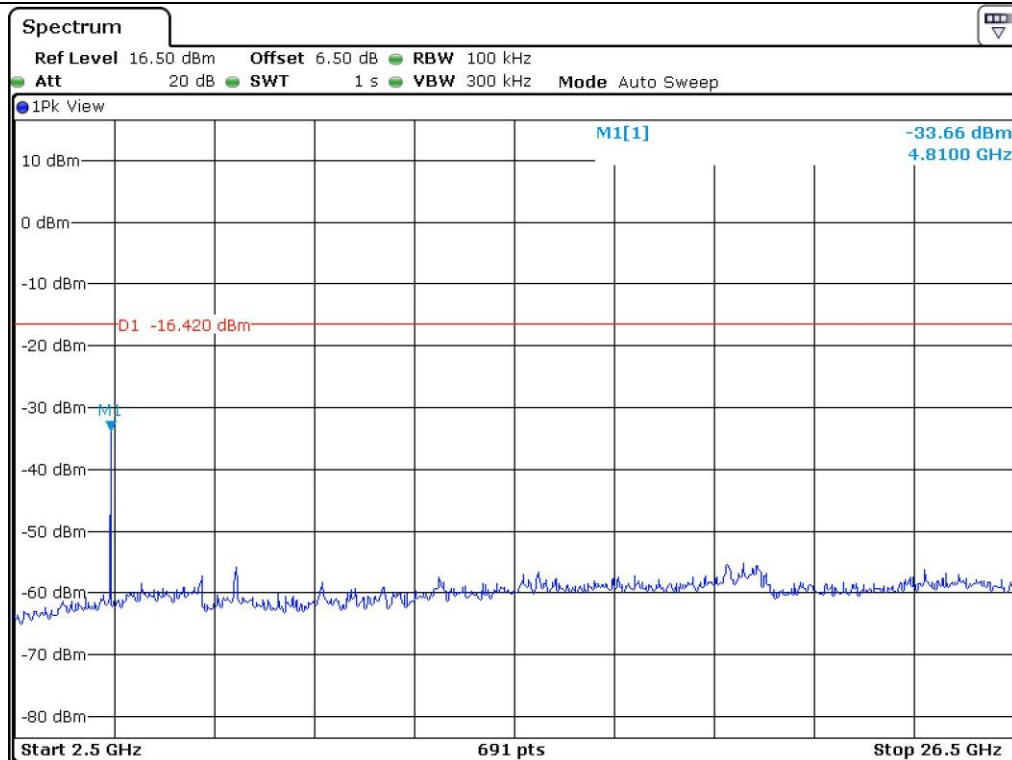
9.5 Test data for conducted emission

9.5.1 Test data for Antenna 1

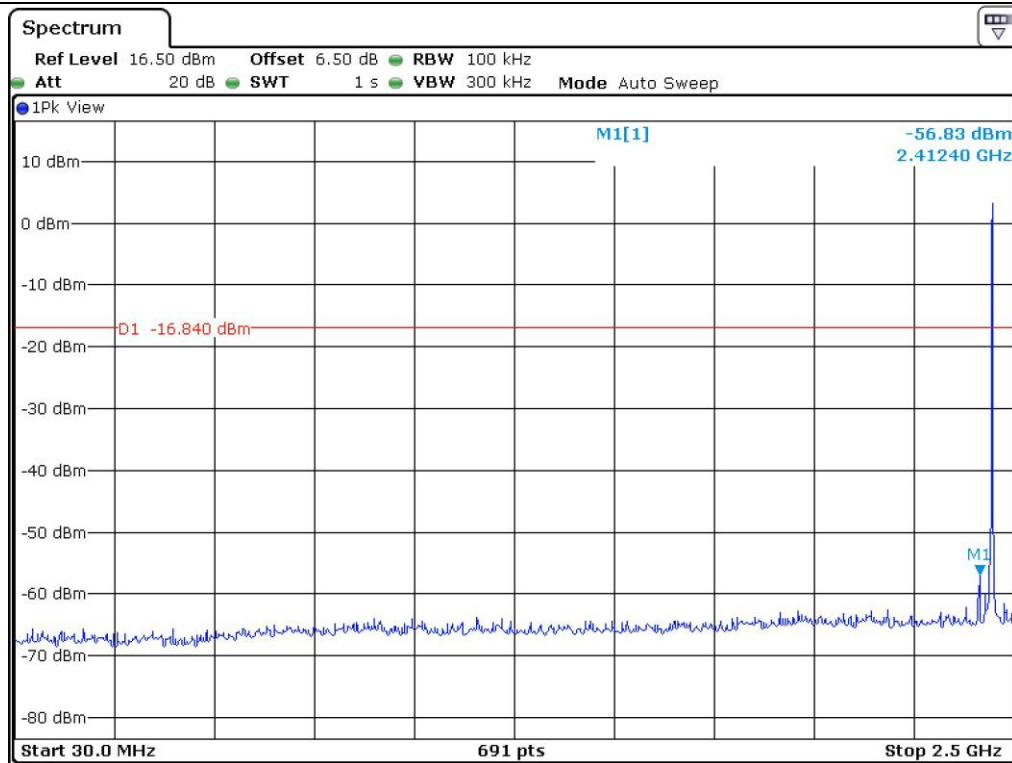




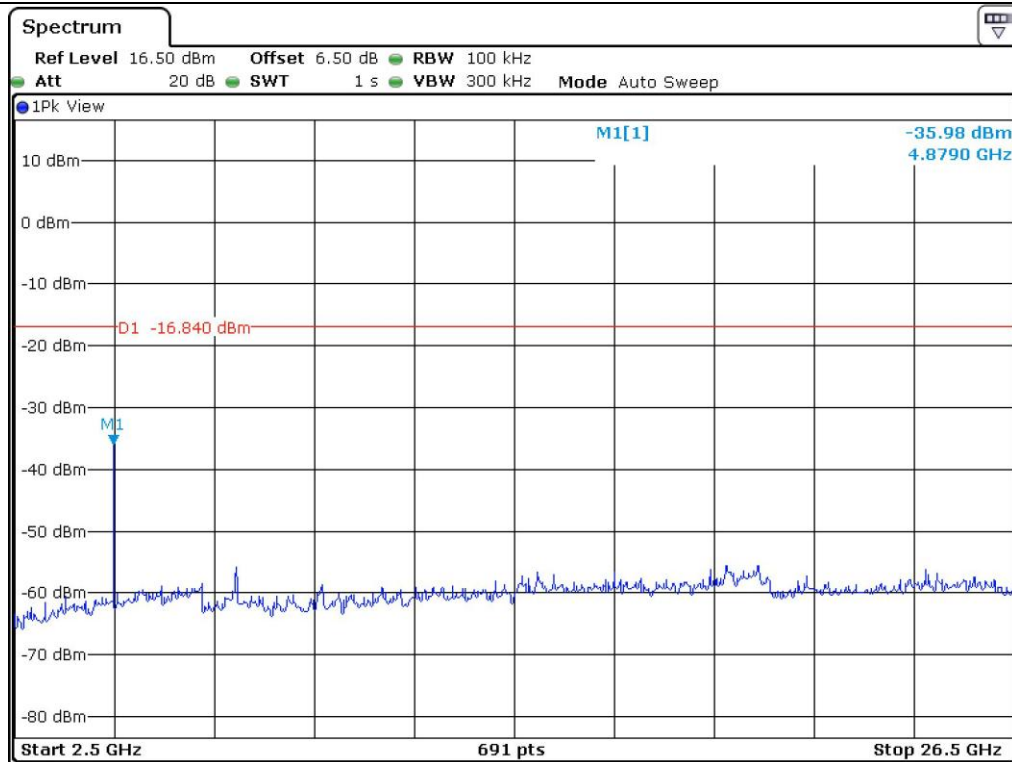
Low Channel



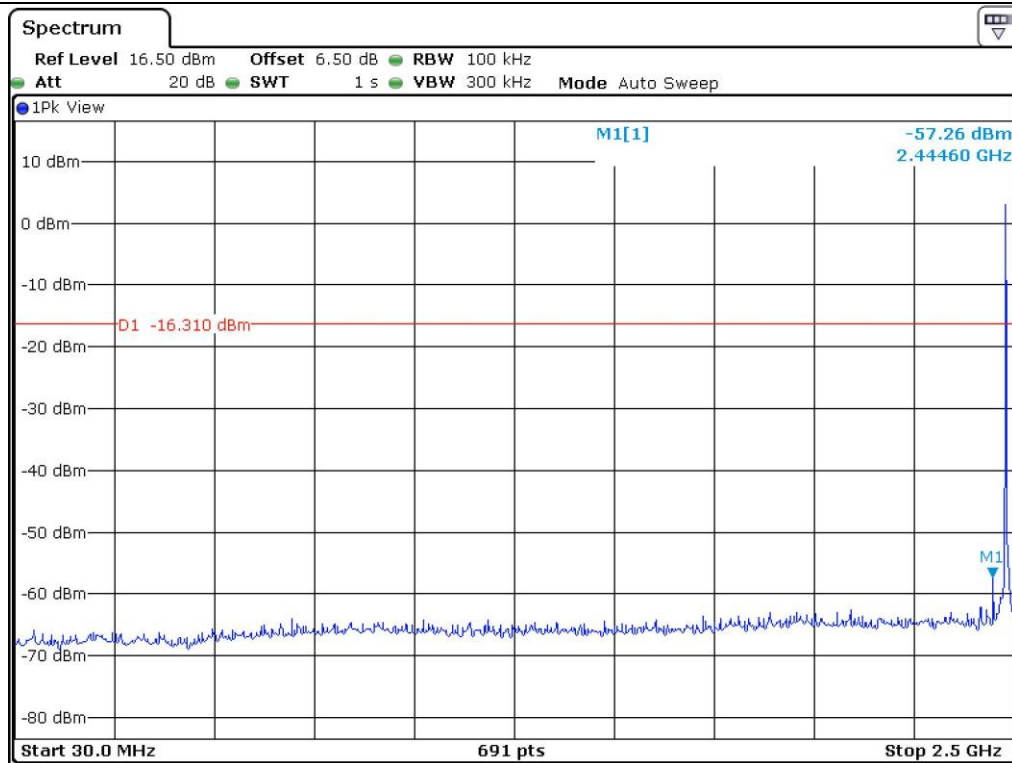
Low Channel



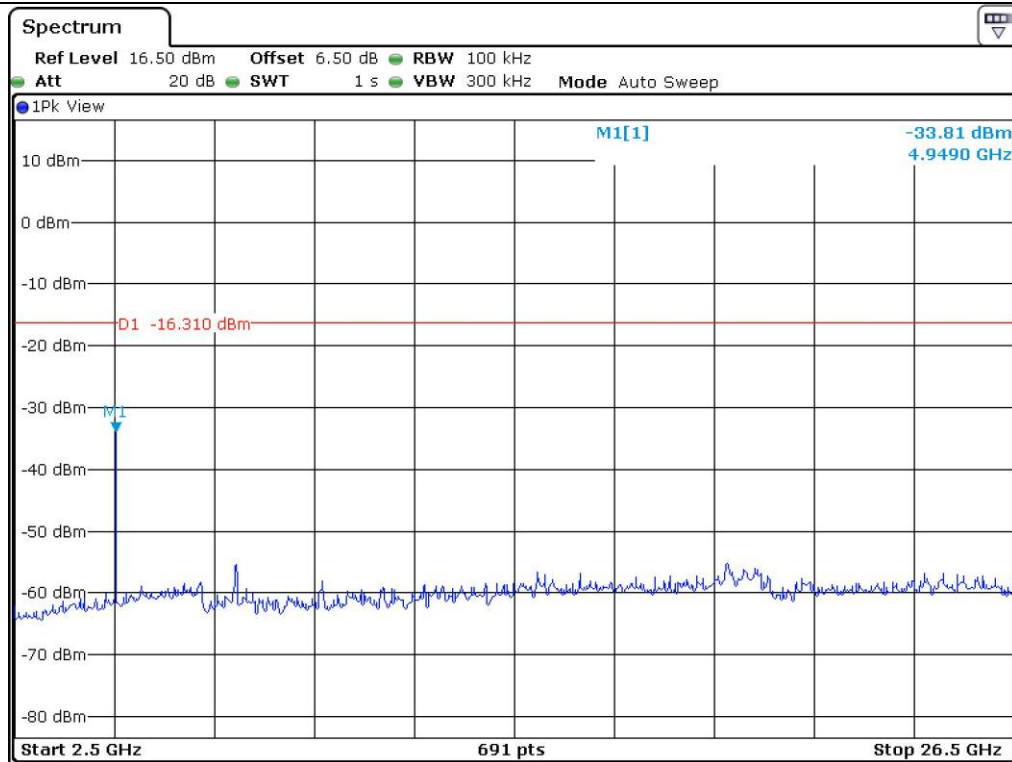
Middle Channel



Middle Channel

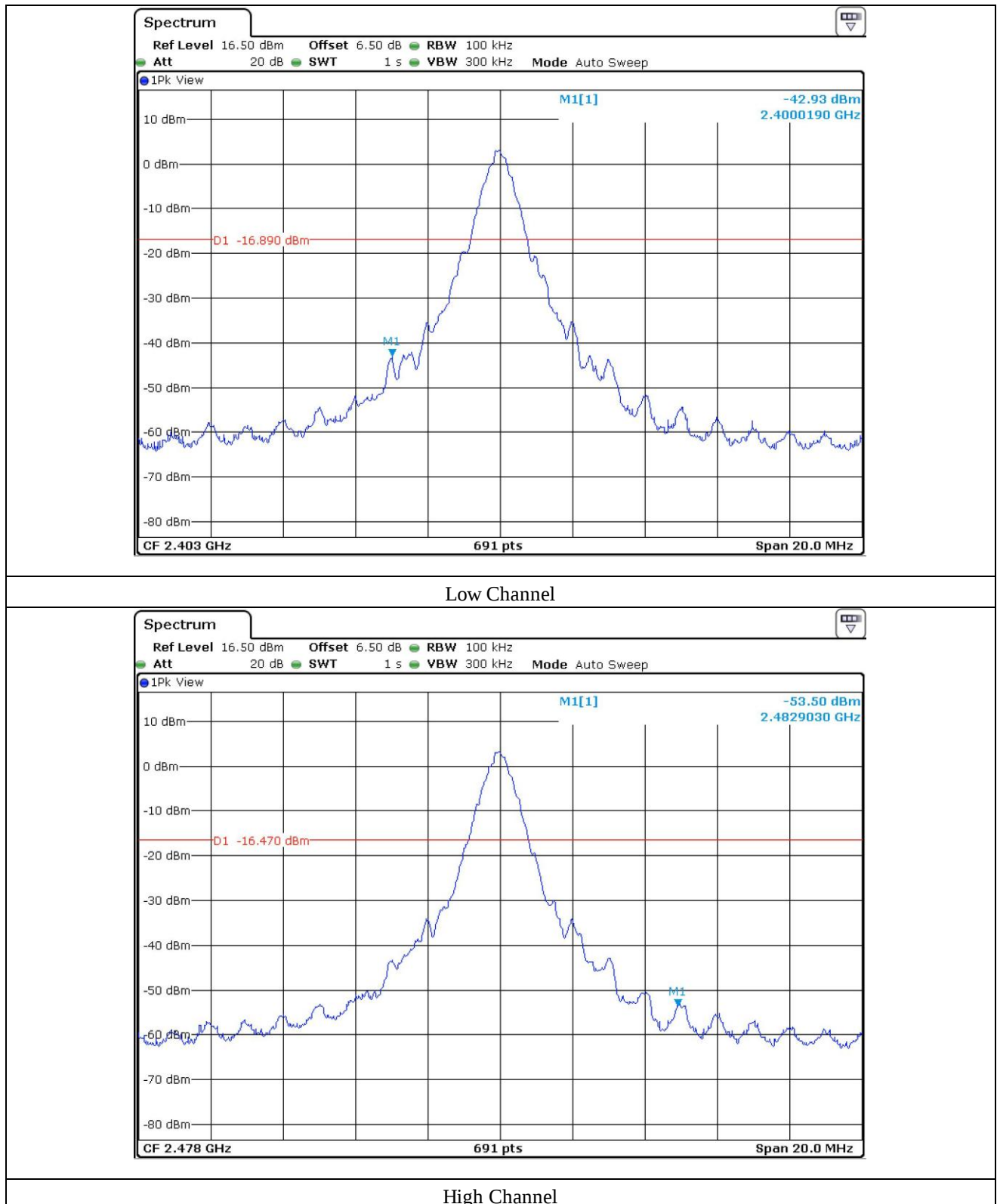


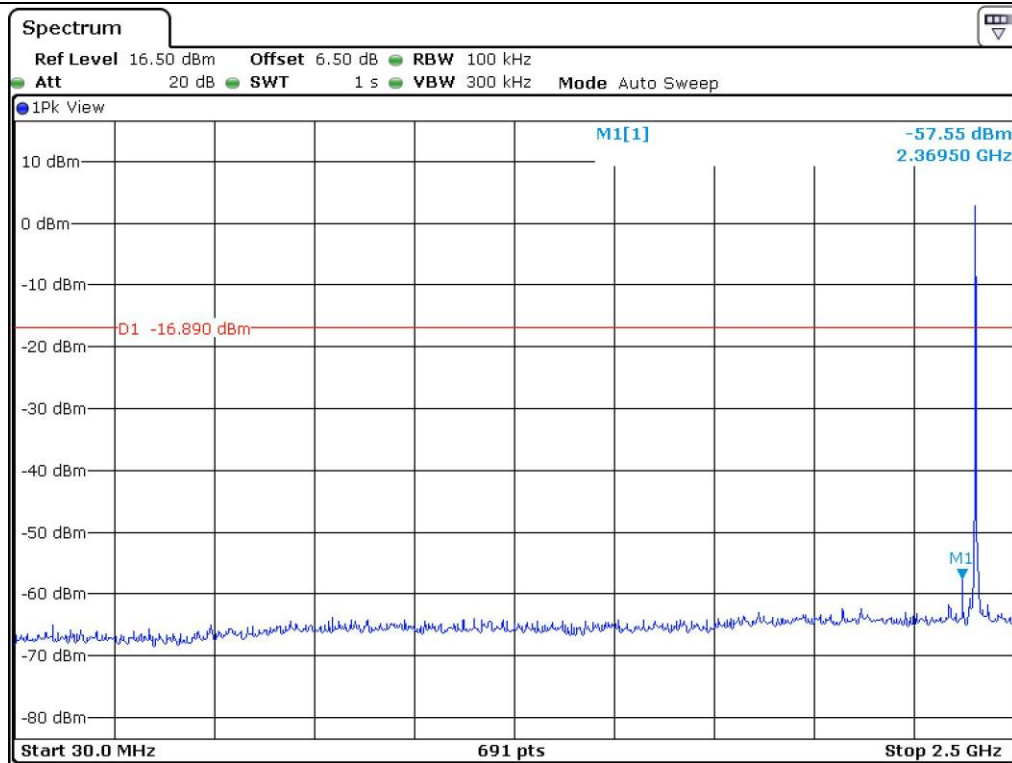
High Channel



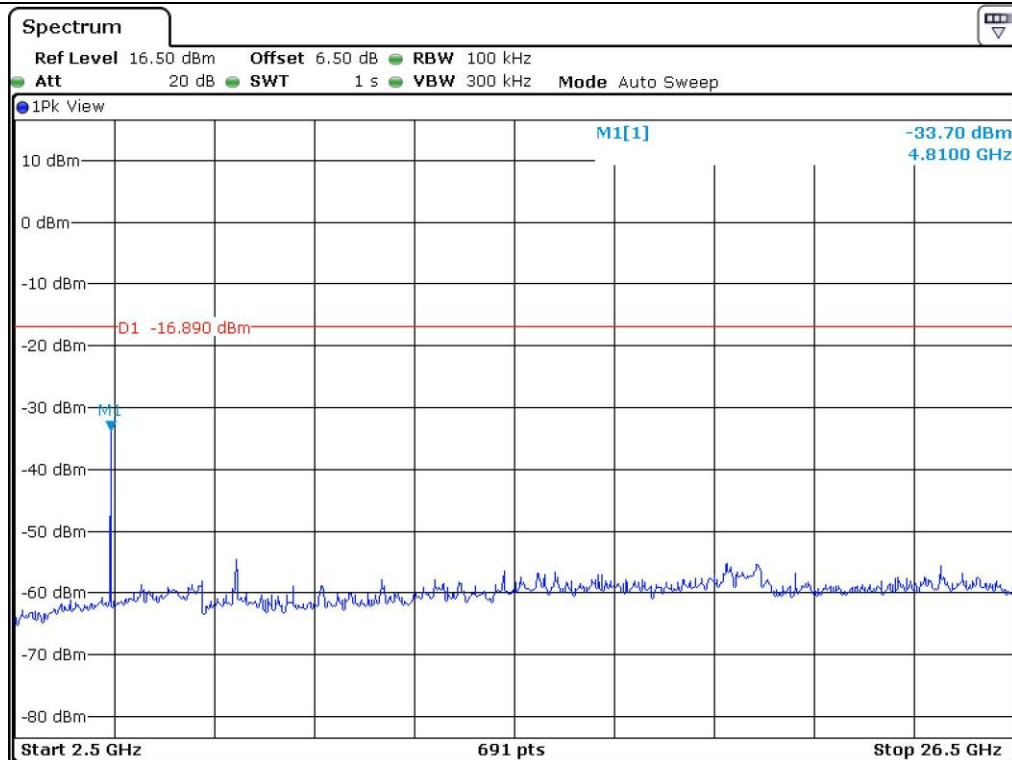
High Channel

9.5.2 Test data for Antenna 2

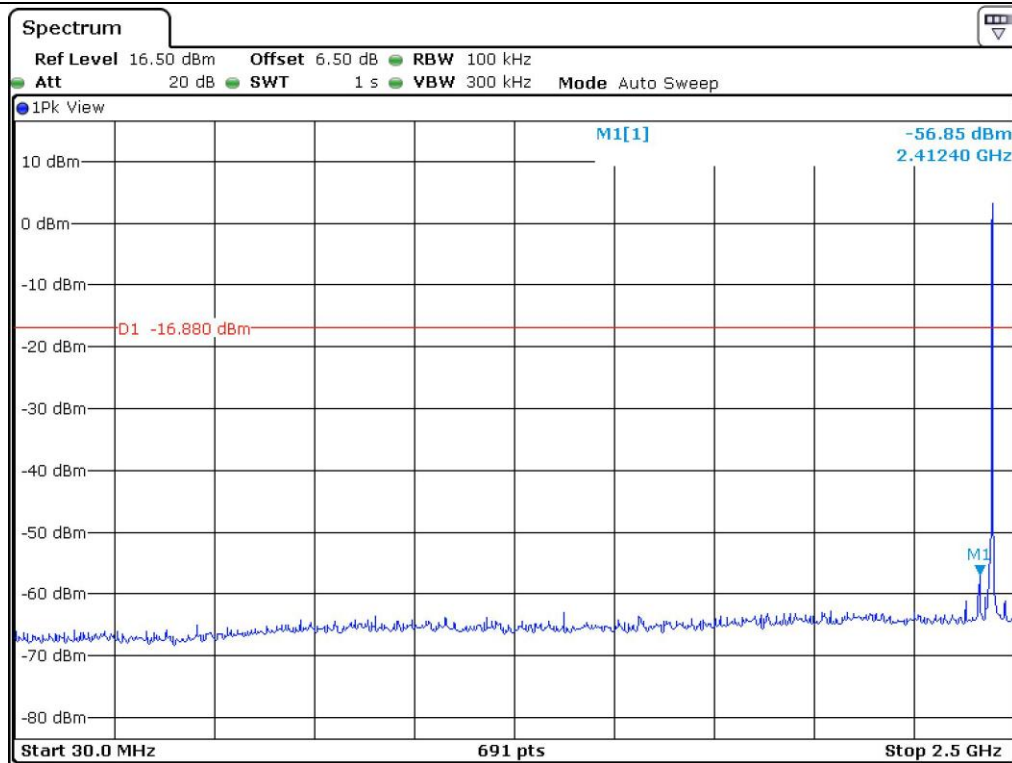




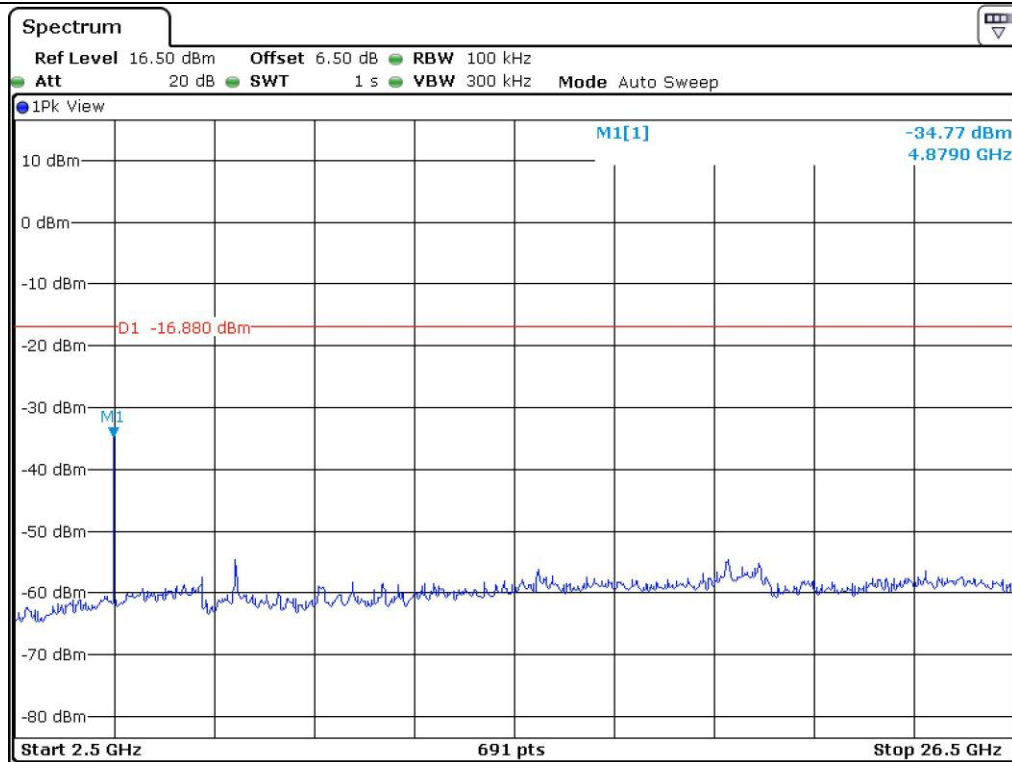
Low Channel



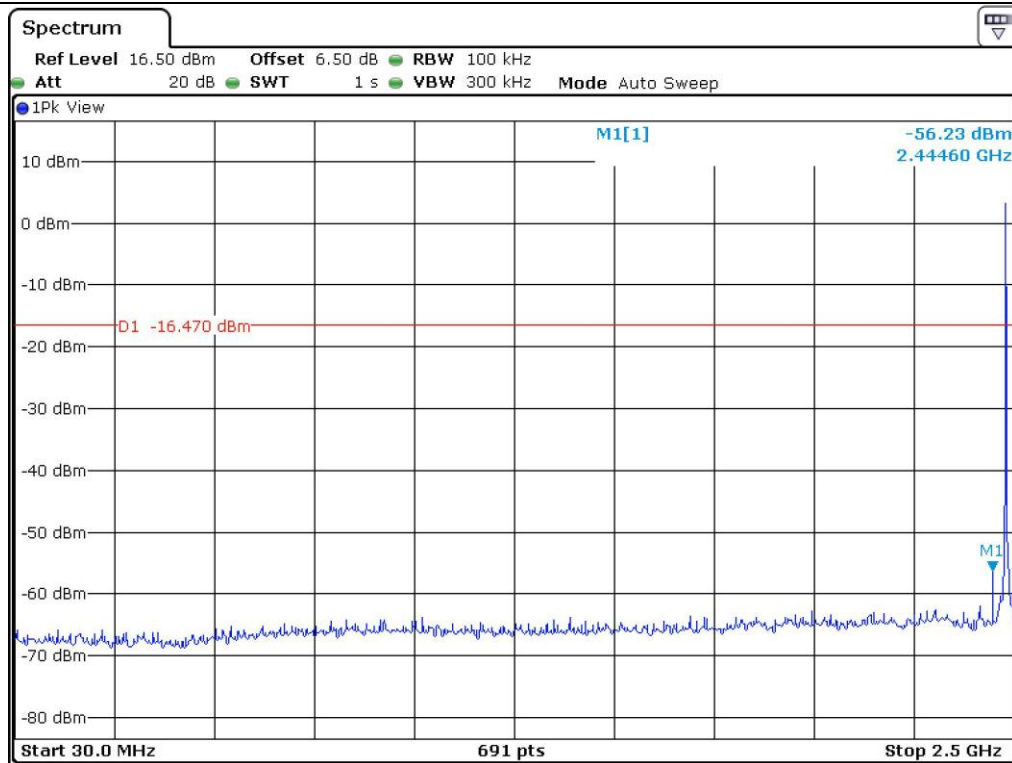
Low Channel



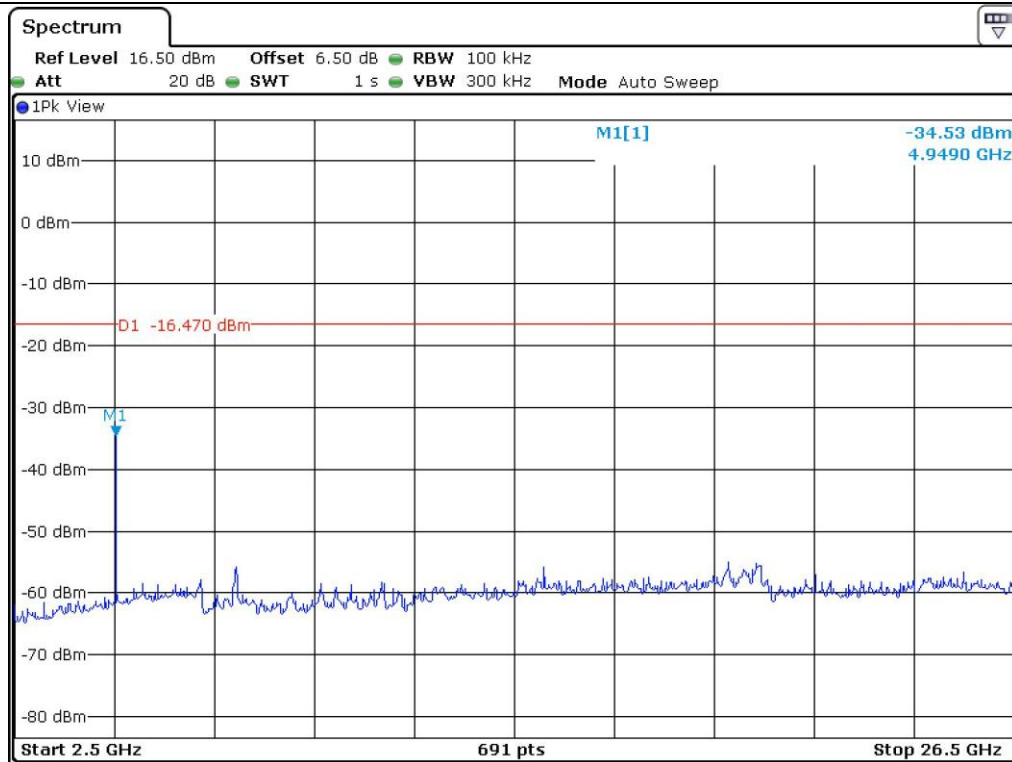
Middle Channel



Middle Channel



High Channel



High Channel

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

9.6.1.1 Test data for Antenna 1

- Test Date : June 11, 2013
- 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 ~ 26.5 GHz
- Measurement distance : 3 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									
2 390.00	61.30	Peak	H	27.05	3.14	43.10	48.39	73.98	25.59
	50.79	Average	H				37.88	53.98	16.10
2 390.00	63.20	Peak	V				50.29	73.98	23.69
	52.17	Average	V				39.26	53.98	14.72
Test Data for High Channel									
2 483.50	48.71	Peak	H	27.31	3.17	43.10	36.09	73.98	37.89
	39.49	Average	H				26.87	53.98	27.11
2 483.50	49.56	Peak	V				36.94	73.98	37.04
	38.41	Average	V				25.79	53.98	28.19

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Hong-Kyu, Lee/ Engineer

9.6.1.2 Test data for Antenna 2

- . Test Date : June 11, 2013
- . 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 ~ 26.5 GHz
- . Measurement distance : 3 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									
2 390.00	61.25	Peak	H	27.05	3.14	43.10	48.34	73.98	25.64
	50.58	Average	H				37.67	53.98	16.31
2 390.00	60.14	Peak	V				47.23	73.98	26.75
	50.21	Average	V				37.30	53.98	16.68
Test Data for High Channel									
2 483.50	49.56	Peak	H	27.31	3.17	43.10	36.94	73.98	37.04
	39.11	Average	H				26.49	53.98	27.49
2 483.50	48.21	Peak	V				35.59	73.98	38.39
	38.09	Average	V				25.47	53.98	28.51

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Hong-Kyu, Lee/ Engineer

9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for Antenna 1

- . Test Date : June 11, 2013
- . 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 ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	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									
2 403.00	103.79	Peak	H	27.28	5.06	43.10	93.03	-	-
	102.83	Average	H				92.07	-	-
	105.88	Peak	V				95.12	-	-
	104.82	Average	V				94.06	-	-
4 806.00	41.85	Peak	H	31.30	6.97	42.80	37.32	73.98	36.66
	31.78	Average	H				27.25	53.98	26.73
	43.09	Peak	V				38.56	73.98	35.42
	33.36	Average	V				28.83	53.98	25.15
Test Data for Middle Channel									
2 443.00	103.61	Peak	H	27.28	5.06	43.10	92.85	-	-
	102.77	Average	H				92.01	-	-
	105.03	Peak	V				94.27	-	-
	104.03	Average	V				93.27	-	-
4 886.00	41.74	Peak	H	31.30	6.97	42.80	37.21	73.98	36.77
	31.70	Average	H				27.17	53.98	26.81
	43.01	Peak	V				38.48	73.98	35.50
	33.15	Average	V				28.62	53.98	25.36

Test Data for High Channel									
2 478.00	103.08	Peak	H	27.28	5.06	43.10	92.32	-	-
	101.95	Average	H				91.19	-	-
	103.38	Peak	V				92.62	-	-
	101.58	Average	V				90.82	-	-
4 956.00	41.21	Peak	H	31.30	6.97	42.80	36.68	73.98	37.30
	31.38	Average	H				26.85	53.98	27.13
	43.14	Peak	V				38.61	73.98	35.37
	33.25	Average	V				28.72	53.98	25.26

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Hong-Kyu, Lee/ Engineer

9.6.2.2 Test data for Antenna 2

- . Test Date : June 11, 2013
- . 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 ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	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									
2 403.00	103.73	Peak	H	27.28	5.06	43.10	92.97	-	-
	102.35	Average	H				91.59	-	-
	102.21	Peak	V				91.45	-	-
	101.72	Average	V				90.96	-	-
4 806.00	42.78	Peak	H	31.30	6.97	42.80	38.25	73.98	35.73
	32.94	Average	H				28.41	53.98	25.57
	41.73	Peak	V				37.20	73.98	36.78
	31.96	Average	V				27.43	53.98	26.55
Test Data for Middle Channel									
2 443.00	103.59	Peak	H	27.28	5.06	43.10	92.83	-	-
	102.61	Average	H				91.85	-	-
	101.77	Peak	V				91.01	-	-
	101.78	Average	V				91.02	-	-
4 886.00	42.69	Peak	H	31.30	6.97	42.80	38.16	73.98	35.82
	32.84	Average	H				28.31	53.98	25.67
	41.25	Peak	V				36.72	73.98	37.26
	31.54	Average	V				27.01	53.98	26.97

Test Data for High Channel									
2 478.00	104.42	Peak	H	27.28	5.06	43.10	93.66	-	-
	103.38	Average	H				92.62	-	-
	102.14	Peak	V				91.38	-	-
	101.11	Average	V				90.35	-	-
4 956.00	43.53	Peak	H	31.30	6.97	42.80	39.00	73.98	34.98
	33.51	Average	H				28.98	53.98	25.00
	42.14	Peak	V				37.61	73.98	36.37
	32.05	Average	V				27.52	53.98	26.46

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Hong-Kyu, Lee/ Engineer

10 PEAK POWER SPECTRUL DENSITY

10.1 Operating environment

Temperature : 24 °C
Relative humidity : 44 % R.H.

10.2 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 set to 3 times the resolution bandwidth.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV30	R/S	Spectrum Analyzer	101372	May 20, 2013

All test equipment used is calibrated on a regular basis.

10.4 Test data for Antenna 1

-. Test Date : June 10, 2013

-. Test Result : Pass

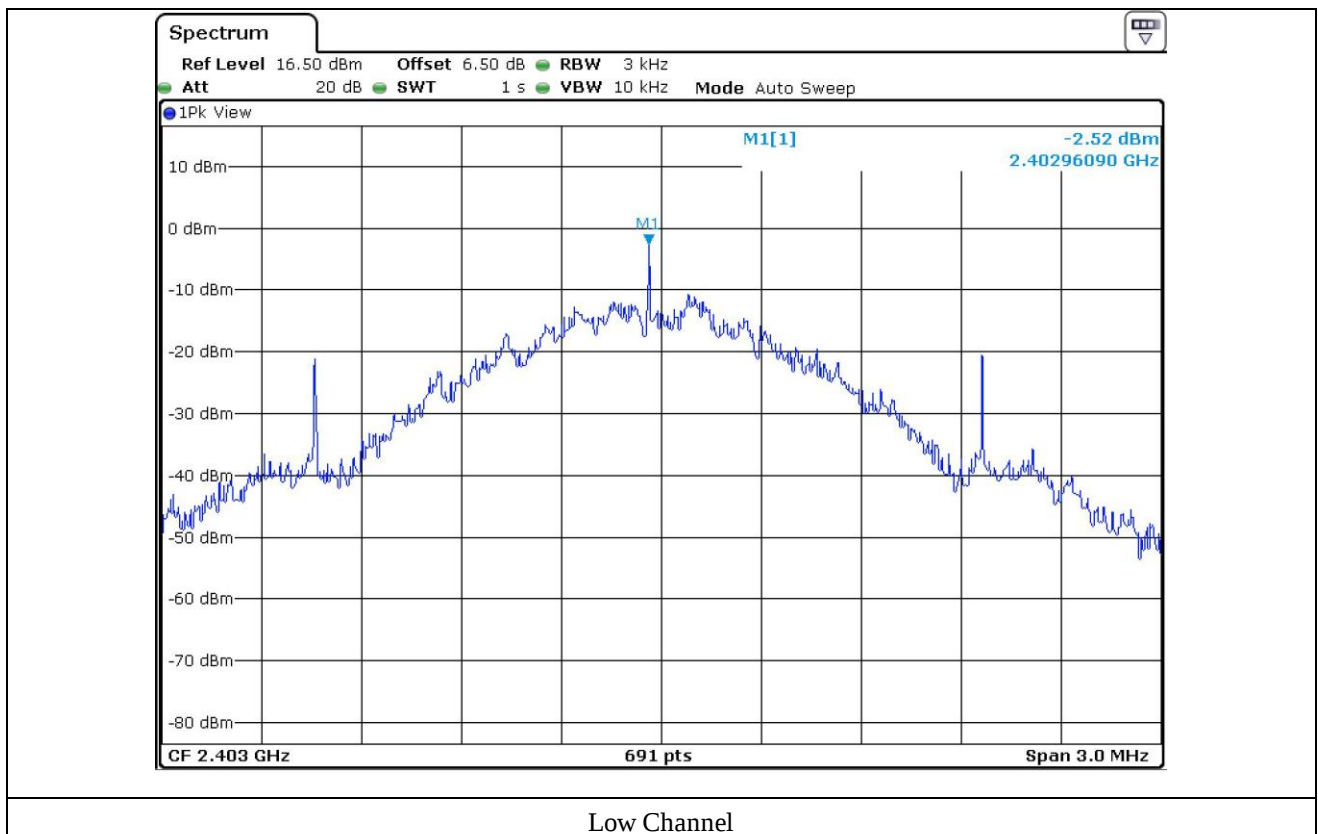
-. Operating Condition : Continuous transmitting mode

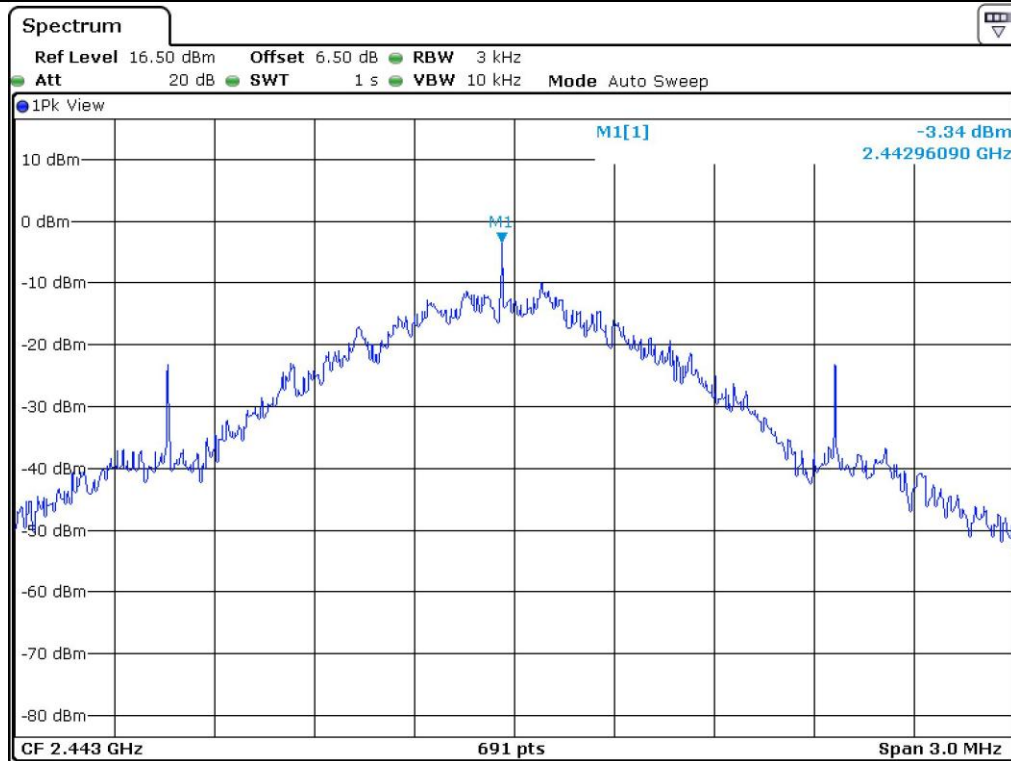
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 403	-2.52	8.00	10.52
Middle	2 443	-3.34	8.00	11.34
High	2 478	-2.71	8.00	10.71

Remark. Margin = Limit – Measured value

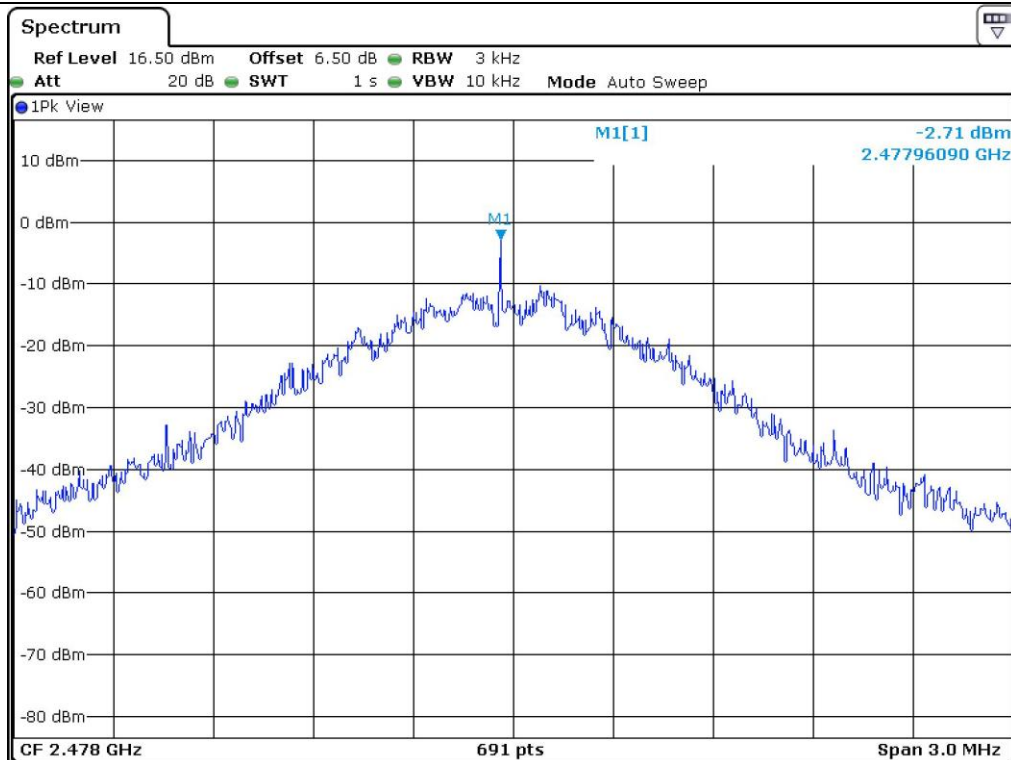
0 | 30 21.

Tested by: Hong-Kyu, Lee/ Engineer





Middle Channel



High Channel

10.5 Test data for Antenna 2

-. Test Date : June 10, 2013

-. Test Result : Pass

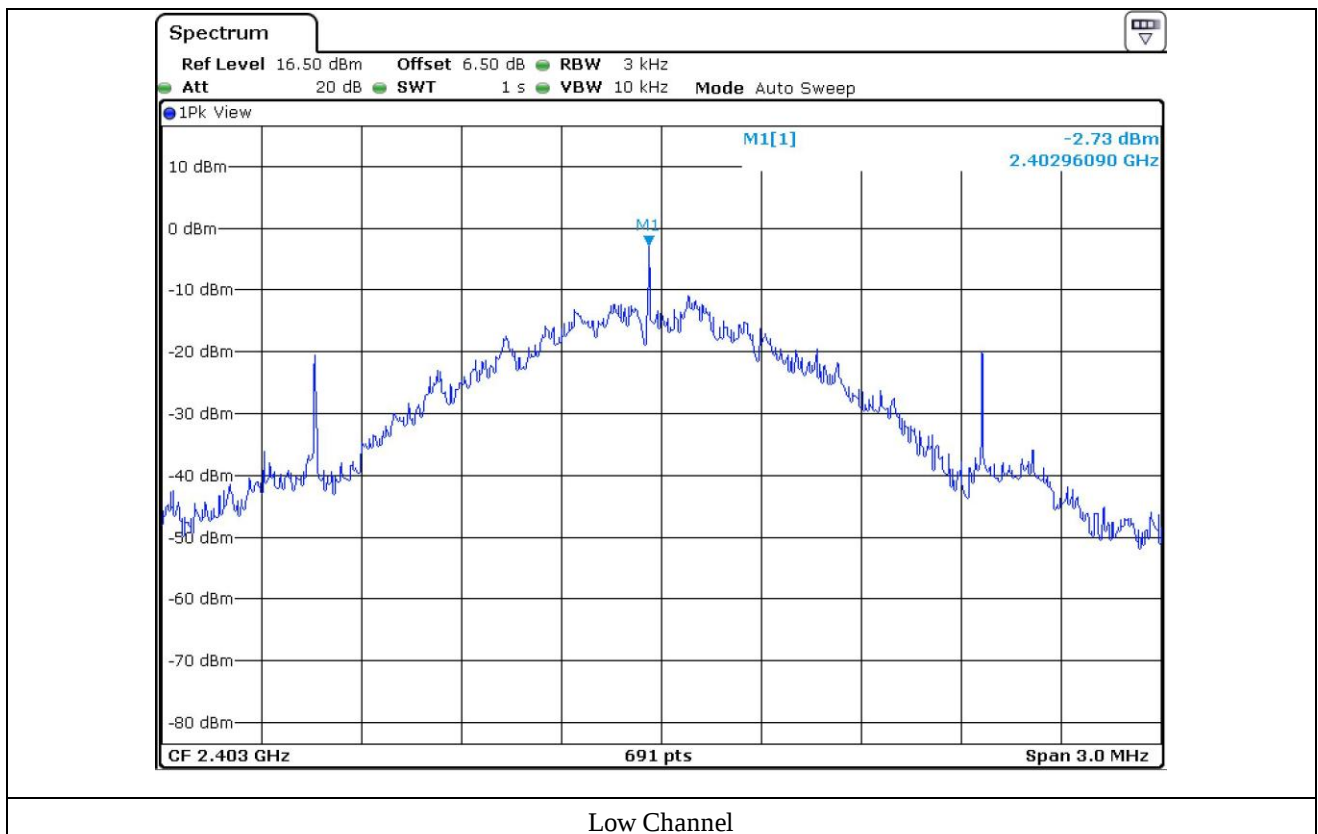
-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 403	-2.73	8.00	10.73
MIDDLE	2 443	-3.99	8.00	11.99
HIGH	2 478	-3.90	8.00	11.90

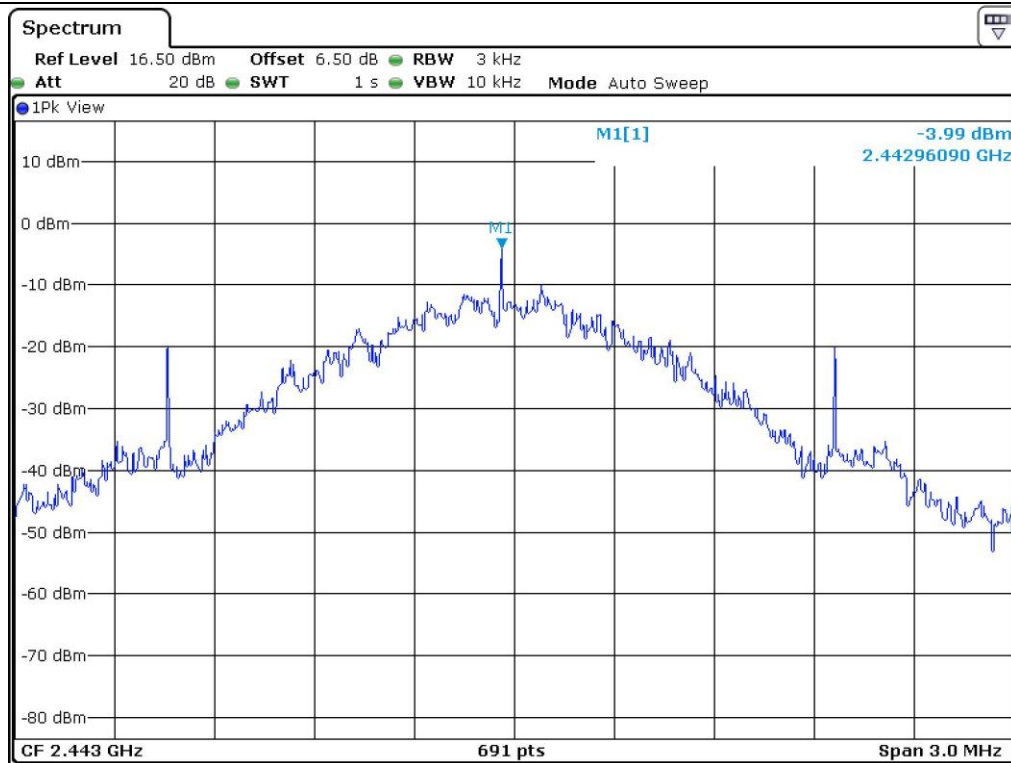
Remark. Margin = Limit – Measured value

0 | 30 21.

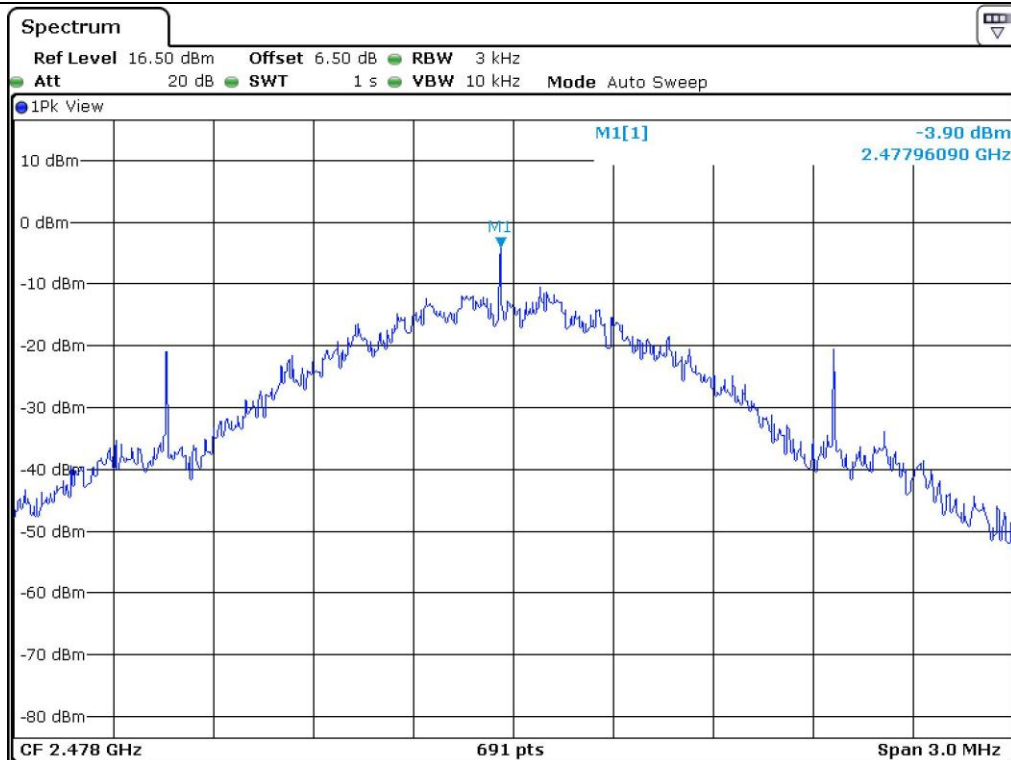
Tested by: Hong-Kyu, Lee/ Engineer



Low Channel



Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 28 °C
Relative humidity : 45 % R.H.

11.2 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 26.5 GHz 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.

11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
□ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Feb. 06, 2013(1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	May 27, 2013(1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	May 21, 2013(1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 20, 2013(1Y)
■ -	SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Apr. 19, 2013 (1Y)
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	VULB9163-255	Apr. 24, 2012(2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Aug. 23, 2011 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Aug. 23, 2011 (2Y)
■ -	HFH2-Z2	Rohde & Schwarz	Loop Antenna	889 285 / 26	Dec. 11, 2012 (2Y)

All test equipment used is calibrated on a regular basis.

11.4 Test data for Antenna 1

-. Test Date : June 11, 2013

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

-. Operating mode : Transmitting mode

-. 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)
53.28	20.50	V	1.00	360.00	12.69	1.57	34.76	40.00	5.24
74.62	25.20	V	2.00	230.00	7.80	2.09	35.09	40.00	4.91
94.99	24.20	V	1.00	230.00	11.00	2.20	37.40	43.52	6.12
256.01	10.90	H	1.00	90.00	12.65	3.40	26.95	46.02	19.07
271.53	13.20	H	1.00	80.00	12.90	3.40	29.50	46.02	16.52
859.34	10.40	V	3.00	80.00	21.76	7.07	39.23	46.02	6.79

-. 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)
53.28	20.30	V	1.00	360.00	12.69	1.57	34.56	40.00	5.44
74.62	25.70	V	1.00	230.00	7.80	2.09	35.59	40.00	4.41
94.99	24.90	V	1.00	230.00	11.00	2.20	38.10	43.52	5.42
256.01	10.40	H	1.50	90.00	12.65	3.40	26.45	46.02	19.57
271.53	12.90	H	1.00	80.00	12.90	3.40	29.20	46.02	16.82
859.34	10.10	V	1.00	80.00	21.76	7.07	38.93	46.02	7.09

-. 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)
53.28	20.90	V	1.00	360.00	12.69	1.57	35.16	40.00	4.84
74.62	25.10	V	1.00	230.00	7.80	2.09	34.99	40.00	5.01
94.99	24.20	V	1.00	230.00	11.00	2.20	37.40	43.52	6.12
256.01	10.40	H	1.50	90.00	12.65	3.40	26.45	46.02	19.57
271.53	13.90	H	1.00	80.00	12.90	3.40	30.20	46.02	15.82
859.34	10.20	V	1.00	80.00	21.76	7.07	39.03	46.02	6.99

Tabulated test data for Radiated Electromagnetic Field

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

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$

0 | 30 21.

Tested by: Hong-Kyu, Lee/ Engineer

11.4.1 Test data for Below 30 MHz

- . Test Date : June 11, 2013
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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)
It was not observed any emissions from the EUT.									

11.4.2 Test data for above 1 GHz

- . Test Date : June 11, 2013
- . 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 ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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)
It was not observed any emissions from the EUT.									



Tested by: Hong-Kyu, Lee/ Engineer

11.5 Test data for Antenna 2

-. Test Date : June 11, 2013
 -. Resolution bandwidth : 120 kHz
 -. Frequency range : 30 MHz ~ 1 000 MHz
 -. Measurement distance : 3 m
 -. Operating mode : Transmitting mode

-. 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)
53.28	19.60	V	1.00	360.00	12.69	1.57	33.86	40.00	6.14
74.62	25.50	V	2.00	230.00	7.80	2.09	35.39	40.00	4.61
94.99	24.80	V	1.00	230.00	11.00	2.20	38.00	43.52	5.52
124.09	22.60	V	1.00	70.00	8.77	2.56	33.93	43.52	9.59
256.01	10.40	H	1.00	90.00	12.65	3.40	26.45	46.02	19.57
271.53	13.90	H	1.00	80.00	12.90	3.40	30.20	46.02	15.82

-. 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)
53.28	19.70	V	1.00	360.00	12.69	1.57	33.96	40.00	6.04
74.62	25.40	V	2.00	230.00	7.80	2.09	35.29	40.00	4.71
94.99	24.60	V	1.00	230.00	11.00	2.20	37.80	43.52	5.72
124.09	22.40	V	1.00	70.00	8.77	2.56	33.73	43.52	9.79
256.01	10.80	H	1.00	90.00	12.65	3.40	26.85	46.02	19.17
271.53	13.50	H	1.00	80.00	12.90	3.40	29.80	46.02	16.22

-. 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)
53.28	19.90	V	1.00	360.00	12.69	1.57	34.16	40.00	5.84
74.62	25.20	V	2.00	230.00	7.80	2.09	35.09	40.00	4.91
94.99	24.40	V	1.00	230.00	11.00	2.20	37.60	43.52	5.92
124.09	22.90	V	1.00	70.00	8.77	2.56	34.23	43.52	9.29
256.01	10.50	H	1.00	90.00	12.65	3.40	26.55	46.02	19.47
271.53	13.10	H	1.00	80.00	12.90	3.40	29.40	46.02	16.62

Tabulated test data for Radiated Electromagnetic Field

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

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$

0 | 30 21.

Tested by: Hong-Kyu, Lee/ Engineer

11.5.1 Test data for Below 30 MHz

- . Test Date : June 11, 2013
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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)
It was not observed any emissions from the EUT.									

11.5.2 Test data for above 1 GHz

- . Test Date : June 11, 2013
- . 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 ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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)
It was not observed any emissions from the EUT.									



Tested by: Hong-Kyu, Lee/ Engineer

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 27 °C
Relative humidity : 46 % R.H.

12.2 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.

12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	ESiB26	Rohde & Schwarz	EMI Test Receiver	100296	Apr. 15, 2013(1Y)
■ -	NSLK 8126	Schwarzbeck	AMN	8126-404	May 29, 2013(1Y)
□ -	3825/2	EMCO	AMN	9109-1867	May 20, 2013(1Y)

All test equipment used is calibrated on a regular basis.

12.4 Test data for Antenna 1

- . Test Date : June 12, 2013
 -. Resolution bandwidth : 9 kHz
 -. Frequency range : 0.15 MHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-Peak (dBμV)		Margin (dB)
		Emission level	Q.P Limits	
0.16	H	49.60	65.50	15.90
0.30	H	45.80	60.30	14.50
0.49	H	37.40	56.10	18.70
1.83	N	40.00	56.00	16.00
2.16	H	40.80	56.00	15.20
2.18	N	44.90	56.00	11.10
Frequency (MHz)	Line	Average (dBμV)		Margin (dB)
		Emission level	Limits	
0.49	H	27.60	46.10	18.50
1.83	N	27.00	46.00	19.00
2.16	H	26.60	46.00	19.40
2.18	N	30.80	46.00	15.20

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.

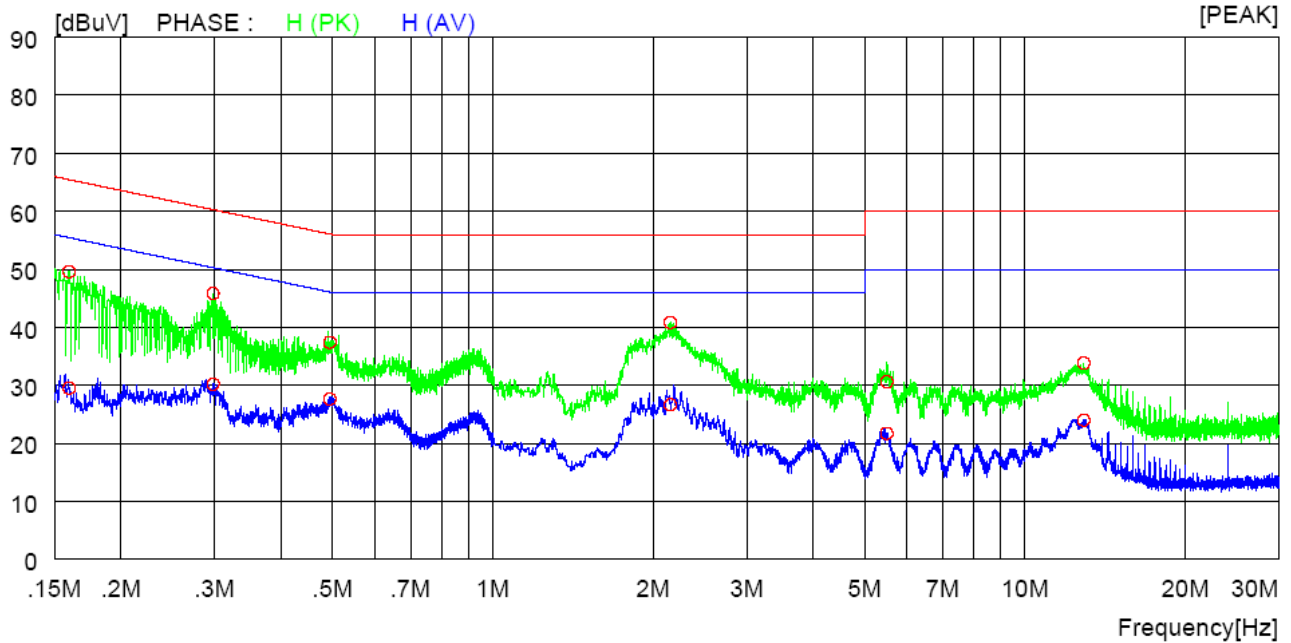
Margin (dB) = Limits (dBμV) – Emission Level (dBμV)

Emission Level = Receiver reading + Cable loss + Insertion loss of AMN

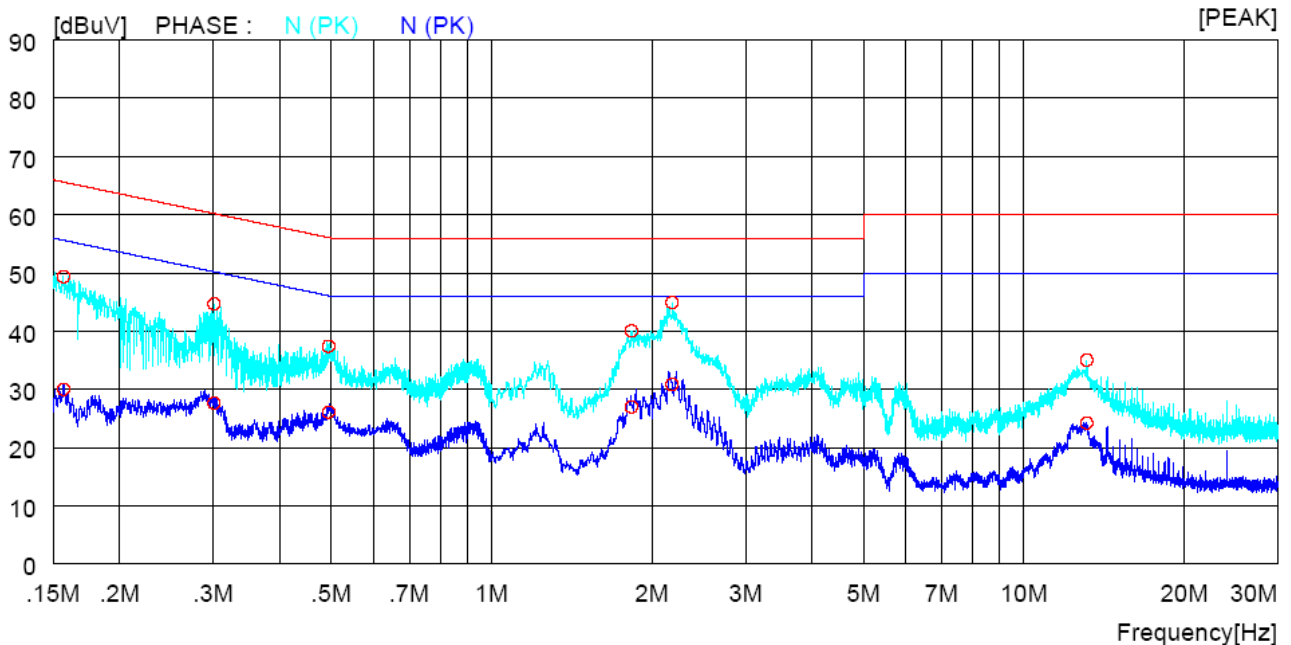


Tested by: Hong-Kyu, Lee/ Engineer

Graphical representation of Conducted Emission



HOT LINE



NEUTRAL LINE

12.5 Test data for Antenna 2

- . Test Date : June 12, 2013
 -. Resolution bandwidth : 9 kHz
 -. Frequency range : 0.15 MHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-Peak (dBμV)		Margin (dB)
		Emission level	Q.P Limits	
0.15	H	49.90	65.90	16.00
0.30	N	46.00	60.30	14.30
1.84	N	41.00	56.00	15.00
1.87	H	38.80	56.00	17.20
2.14	H	41.30	56.00	14.70
2.20	N	44.50	56.00	11.50
Frequency (MHz)	Line	Average (dBμV)		Margin (dB)
		Emission level	Limits	
1.84	N	29.80	46.00	16.20
1.87	H	28.00	46.00	18.00
2.14	H	26.00	46.00	20.00
2.20	N	30.30	46.00	15.70

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.

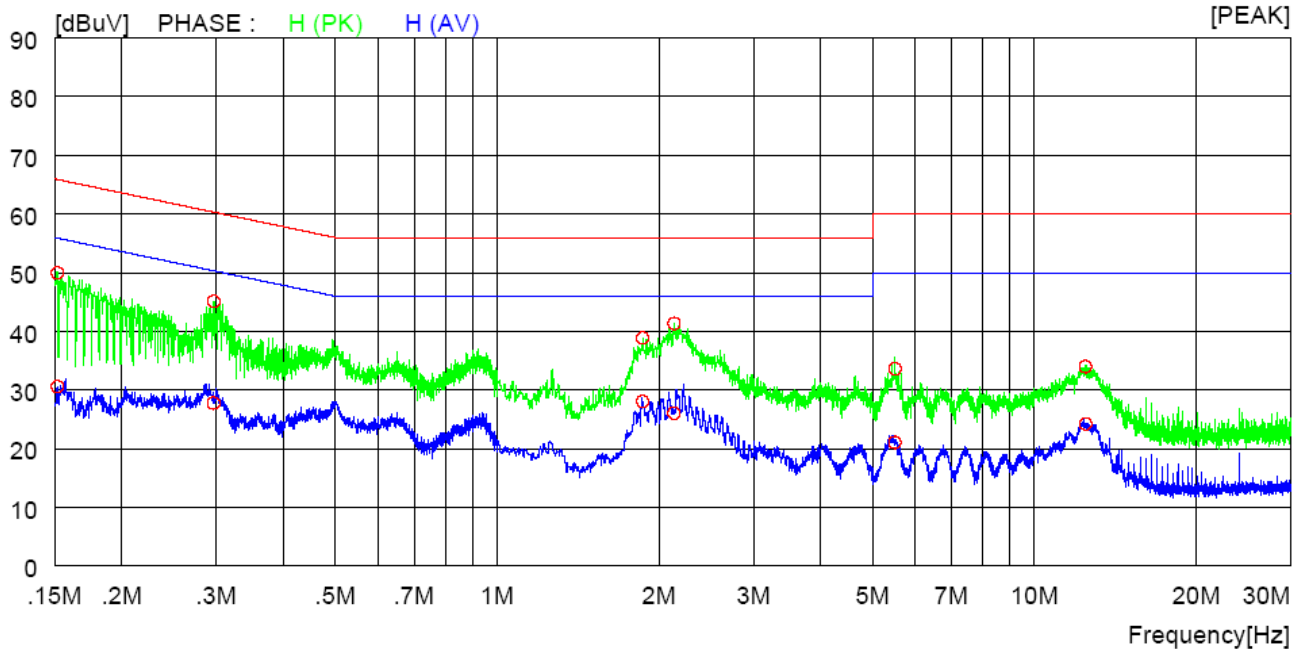
Margin (dB) = Limits (dBμV) – Emission Level (dBμV)

Emission Level = Receiver reading + Cable loss + Insertion loss of AMN

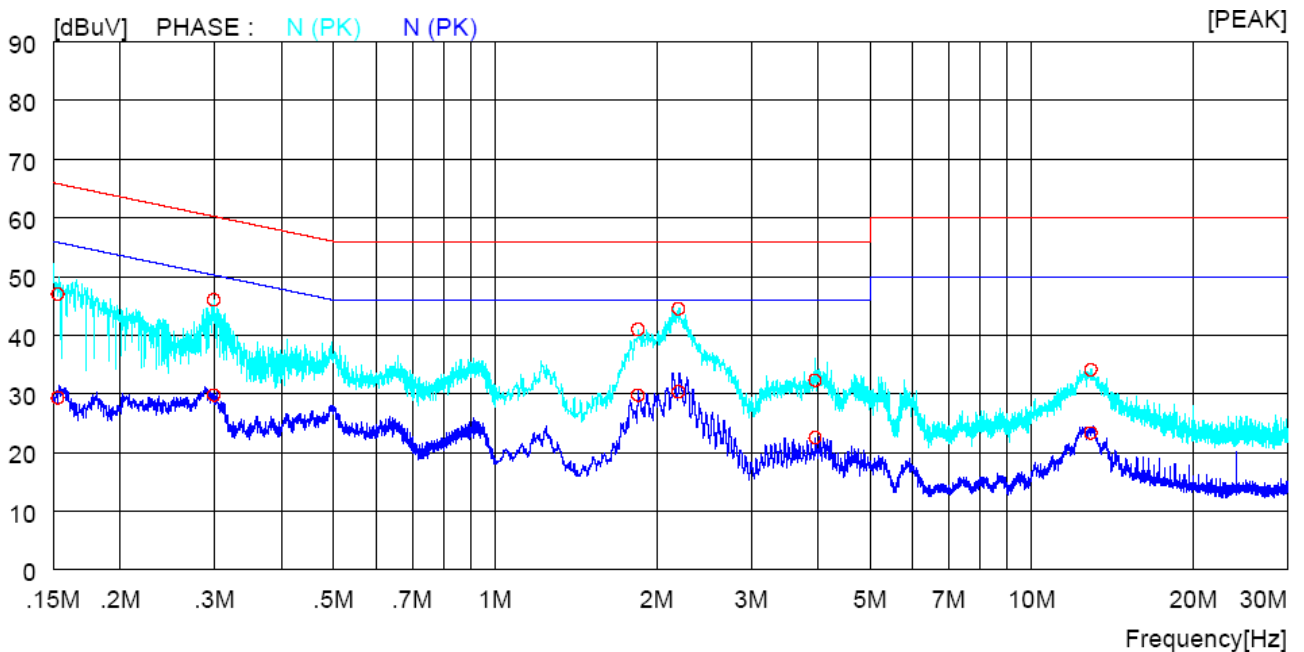


Tested by: Hong-Kyu, Lee/ Engineer

Graphical representation of Conducted Emission



HOT LINE



NEUTRAL LINE

13. RADIO FREQUENCY EXPOSURE

13.1 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.

13.2 EUT Description

Kind of EUT	Main Control Unit
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 ☒ GFSK Modulation: 2403 MHz , 2443 MHz , 2478 MHz
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ☒ Others
Max. Output Power	Antenna1: 4.20 dBm Antenna2: 3.92 dBm
Used Antenna	PCB Antenna
Used Antenna Gain	Antenna1: 1.56 dBi Antenna2: -0.07 dBi
Exposure Evaluation Applied	☒ MPE ☐ SAR ☐ N/A

13.3 Test Result

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

$$[(\text{Max. Power of channel, including tune-up tolerance, mW})/(\text{Mim. test separation distance, mm})] \times [\sqrt{f(\text{GHz})}] < 3$$

$$= [2.63/5)] \times \sqrt{2.478} = 0.8$$

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