

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

Test Report No. : W168R-D007
AGR No. : A167A-309
Applicant : RoboLink Inc
Address : 439, Dogok-ro, Gangnam-gu, Seoul, Korea
Manufacturer : RoboLink Inc
Address : 439, Dogok-ro, Gangnam-gu, Seoul, Korea
Type of Equipment : BLE Board
FCC ID. : 2AJDE-CODRONE
Model Name : Codrone
Serial number : N/A
Total page of Report : 34 pages (including this page)
Date of Incoming : July 26, 2016
Date of issue : August 03, 2016

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 / Asst, Chief Engineer
ONETECH Corp.

Approved by: 
Sung-Ik, Han / Managing Director
ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W168R-D007	August 03, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : RoboLink Inc
 Address : 439, Dogok-ro, Gangnam-gu, Seoul, Korea
 Contact Person : Do-Ryeul Lee / Robot Engineer
 Telephone No. : +82-02-554-8862
 FCC ID : 2AJDE-CODRONE
 Model Name : Codrone
 Brand Name : -
 Serial Number : N/A
 Date : August 03, 2016

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	BLE Board
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
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, 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: 2013. 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 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, 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. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The RoboLink Inc, Model Codrone (referred to as the EUT in this report) is a BLE Board. The product specification described herein was obtained from product data sheet or user’s manual.

Device Type	BLE Board
Temperature Range	-20 °C ~ + 60 °C
Operating Frequency	2 402 MHz ~ 2 480 MHz
RF Output Power	1.11 dBm
Number of Channel	40 Channel
Modulation Type	GFSK
Antenna Type	PCB Antenna
USED RF CHIP	Marker: TEXAS INSTRUMENTS Model Name: CC2541
Antenna Gain	3.3 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32 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	RoboLink Inc	N/A	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
Codrone	RoboLink Inc	BLE Board (EUT)	Notebook PC
650	HP	Notebook PC	EUT
PPP012D-S	HP	Adapter	-

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 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XZ” axis, but the worst data was recorded in this report.

5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to USB and the power of USB was connected to Notebook PC. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.
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 PCB 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)
Transmitting Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

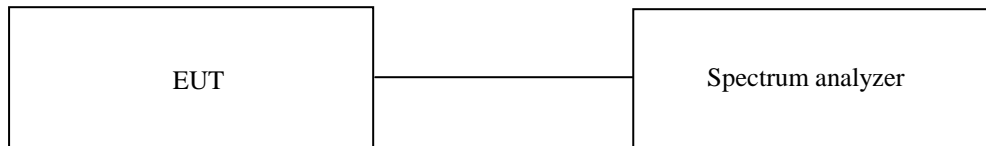
7. MIMIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 45.5 % 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.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May 31, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

7.4 Test data

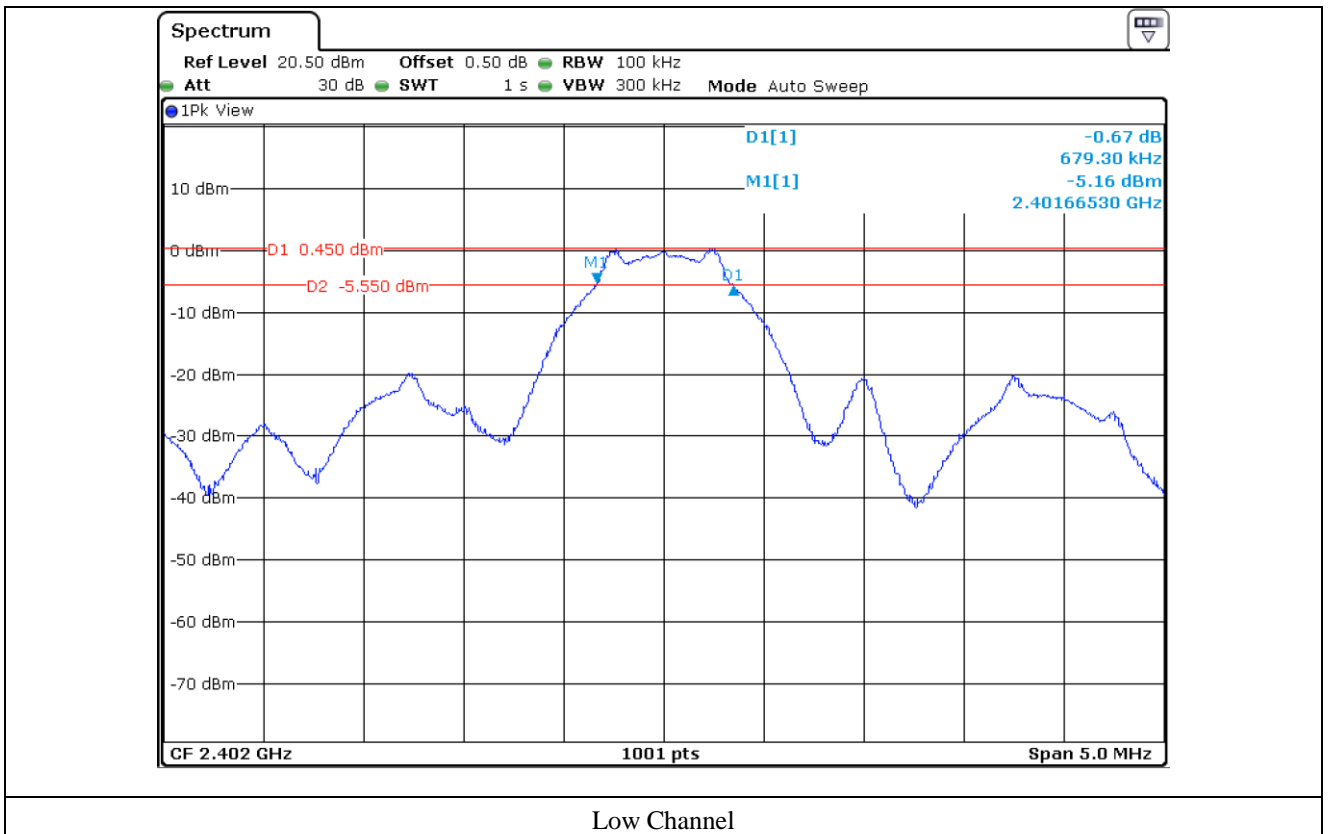
- Test Date : August 01, 2016
 - Test Result : Pass

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402	679.30	500	179.30
Middle	2 440	684.30	500	184.30
High	2 480	684.30	500	184.30

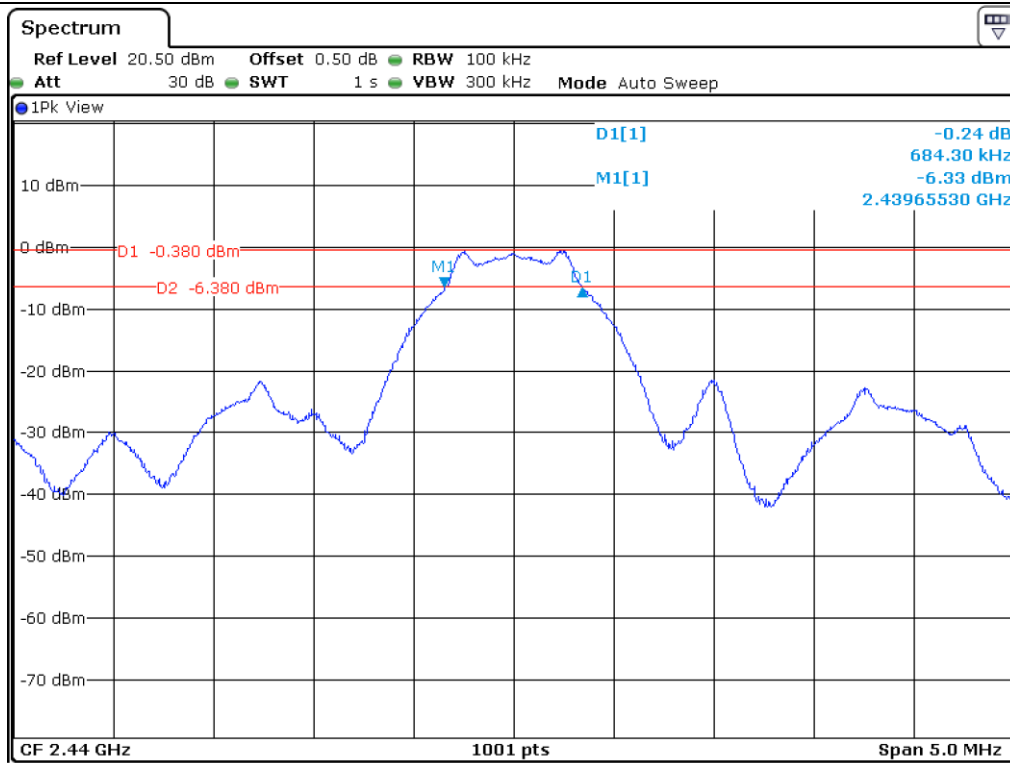
Remark. Margin = Measured Value - Limit



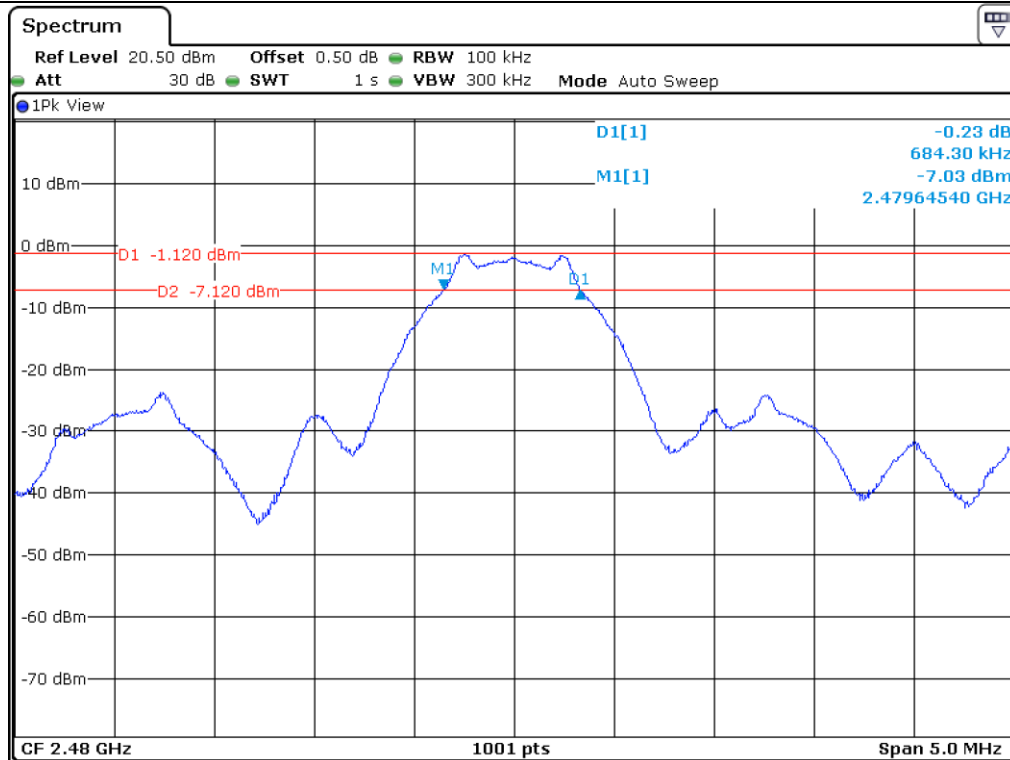
Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel



Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

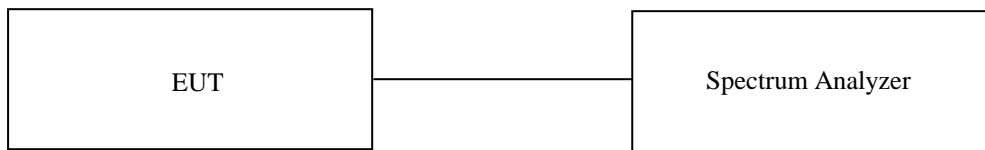
8.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 45.5 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to \geq DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May 31, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

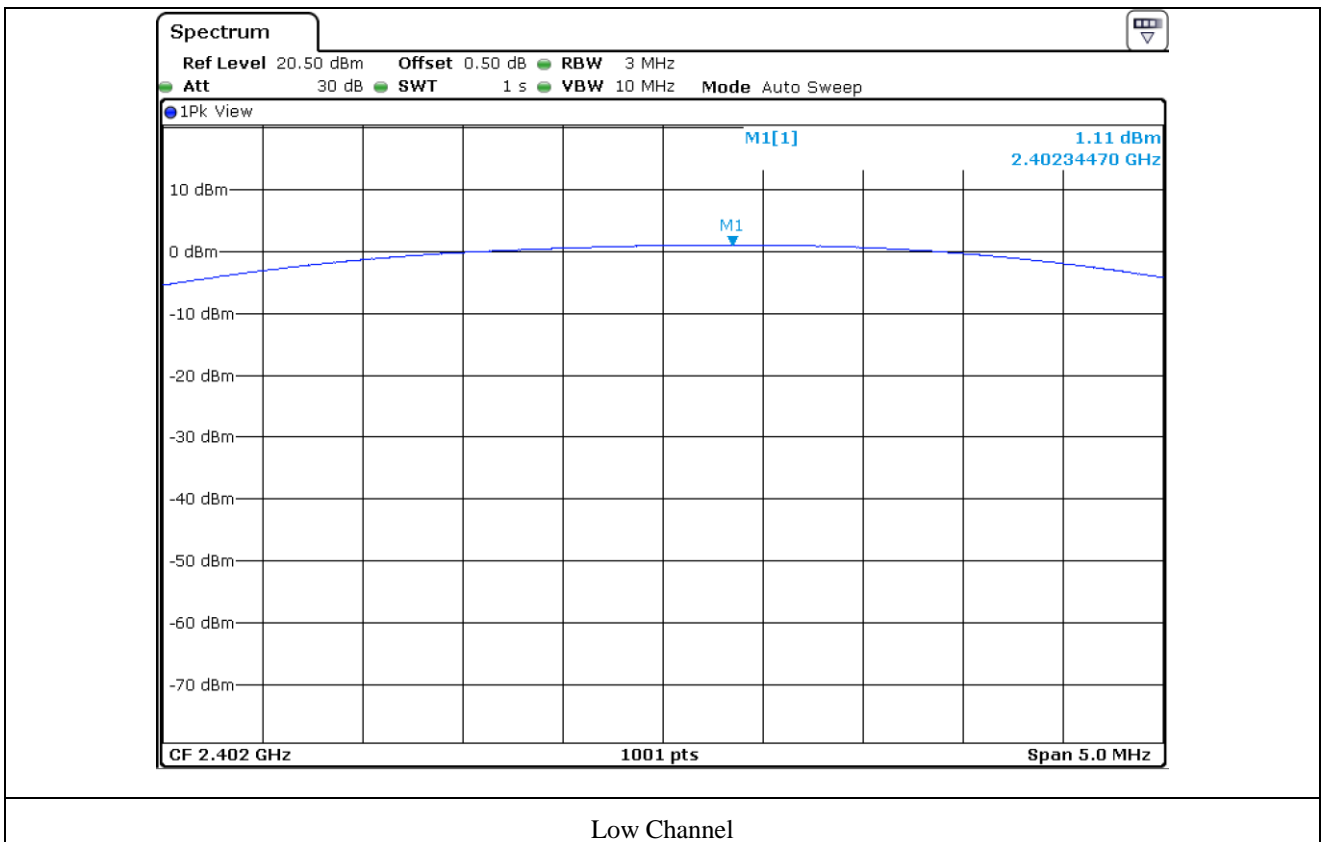
8.4 Test data

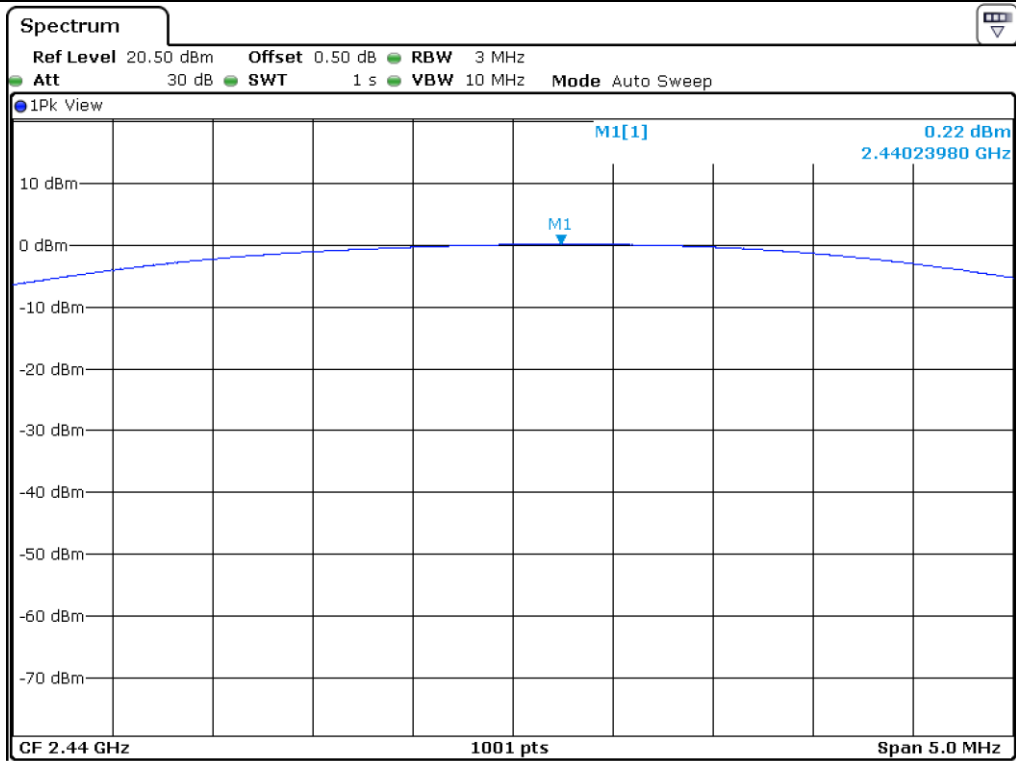
- Test Date : August 01, 2016
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	1.11	30	28.89
MIDDLE	2 440	0.22	30	29.78
HIGH	2 480	-0.55	30	30.55

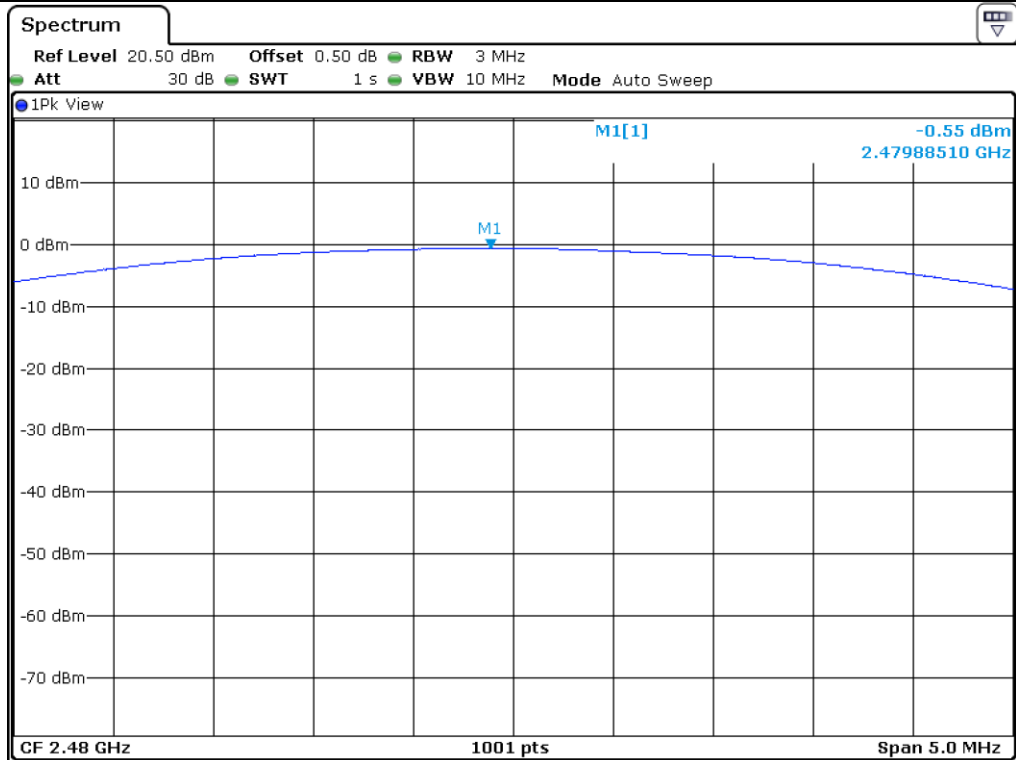
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

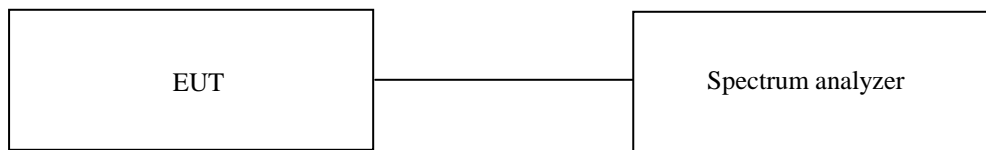
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 45.5 % 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 semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

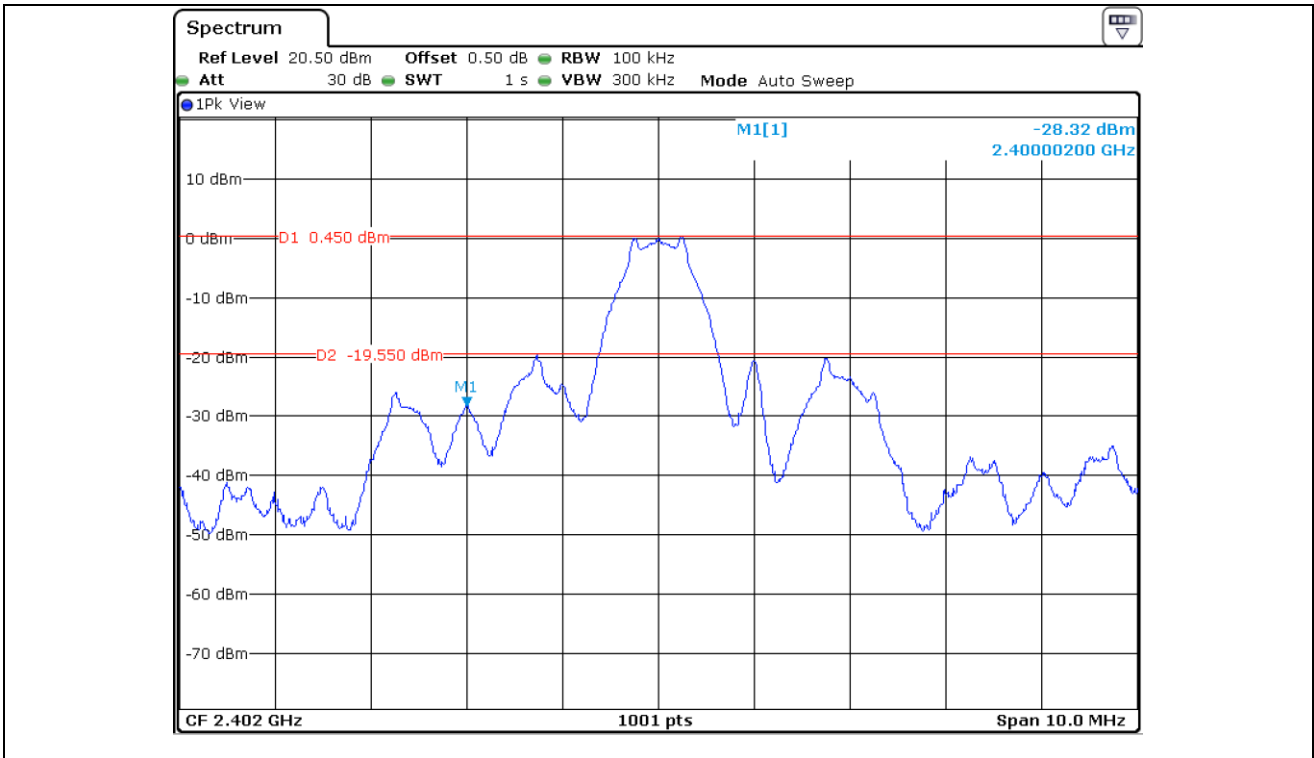
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

9.4 Test equipment used

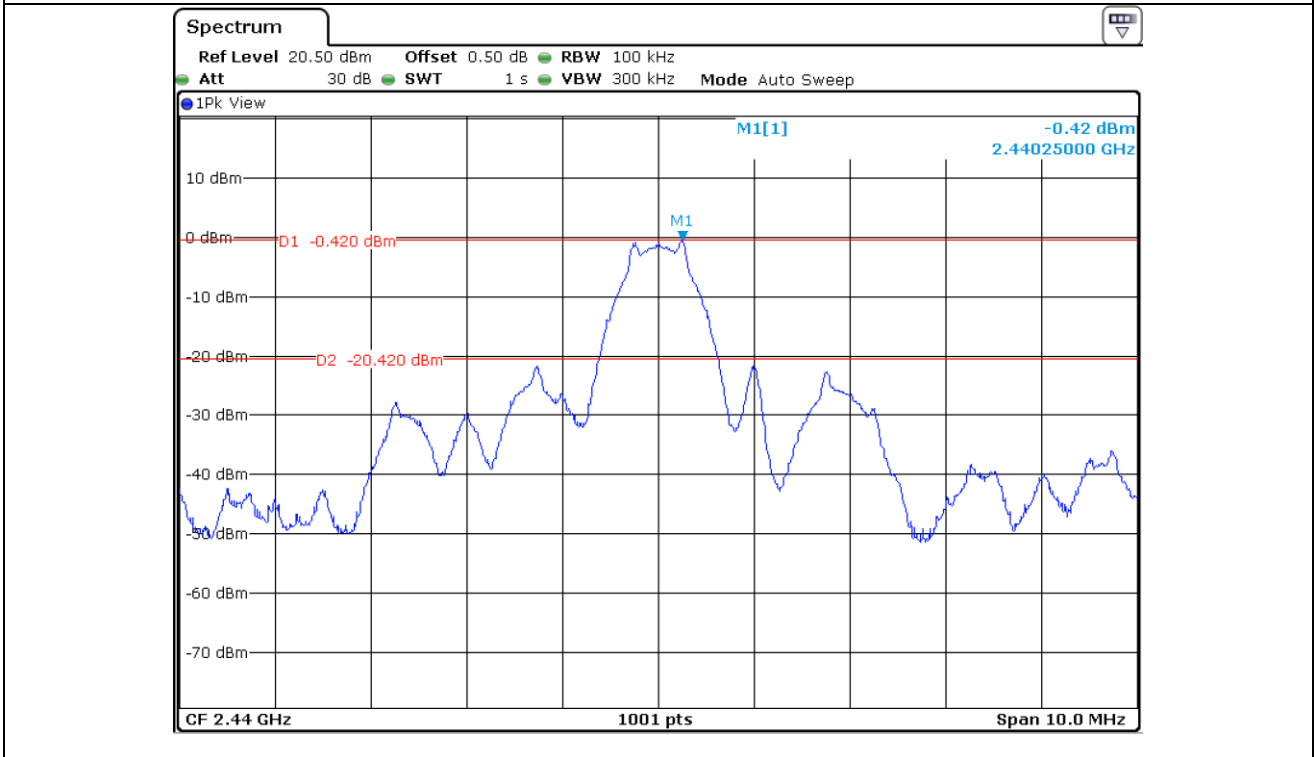
Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May 31, 2016 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 06, 2016 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2016 (1Y)
■ - SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 23, 2015 (1Y)
■ - DT3000	Innco System	Turn Table	930611	N/A
■ - MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Apr. 15, 2016 (1Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 31, 2015 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Aug. 31, 2015 (2Y)

All test equipment used is calibrated on a regular basis.

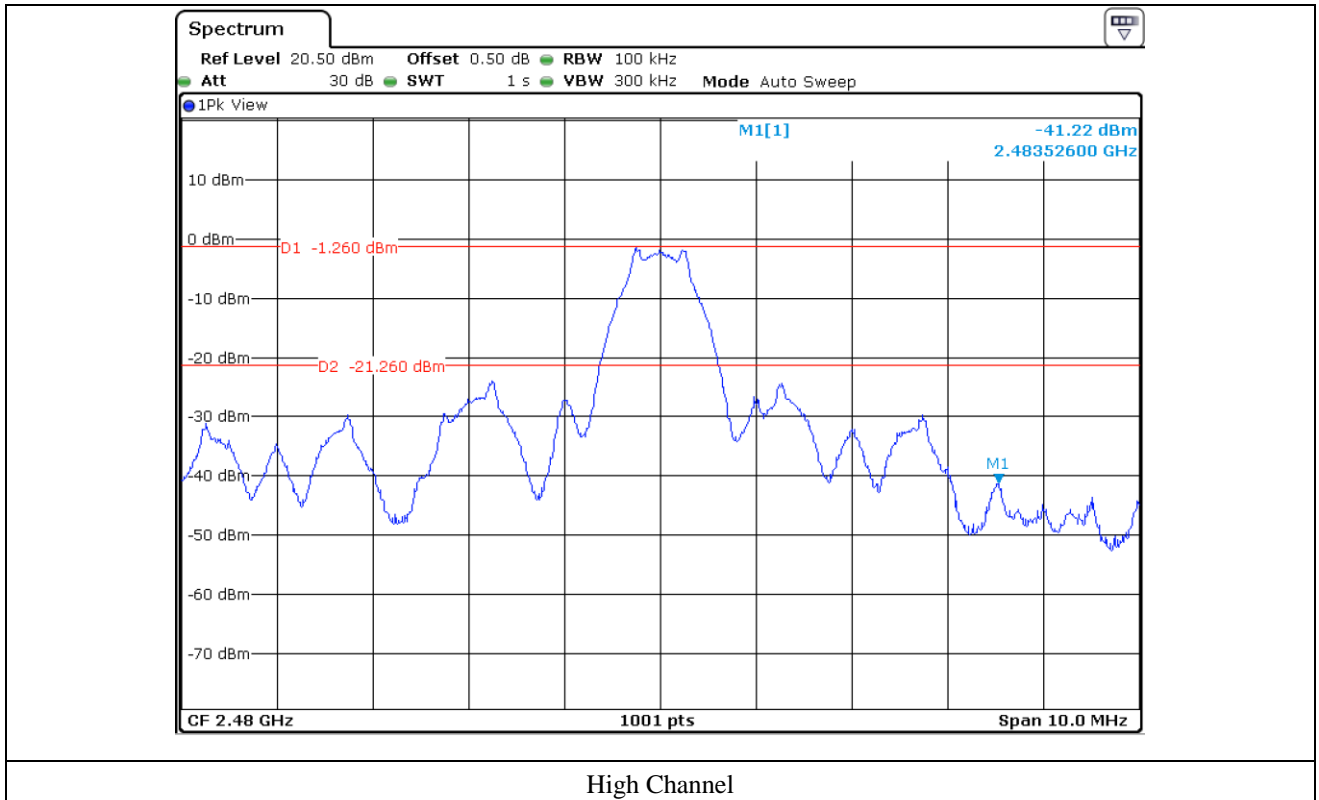
9.5 Test data for conducted emission

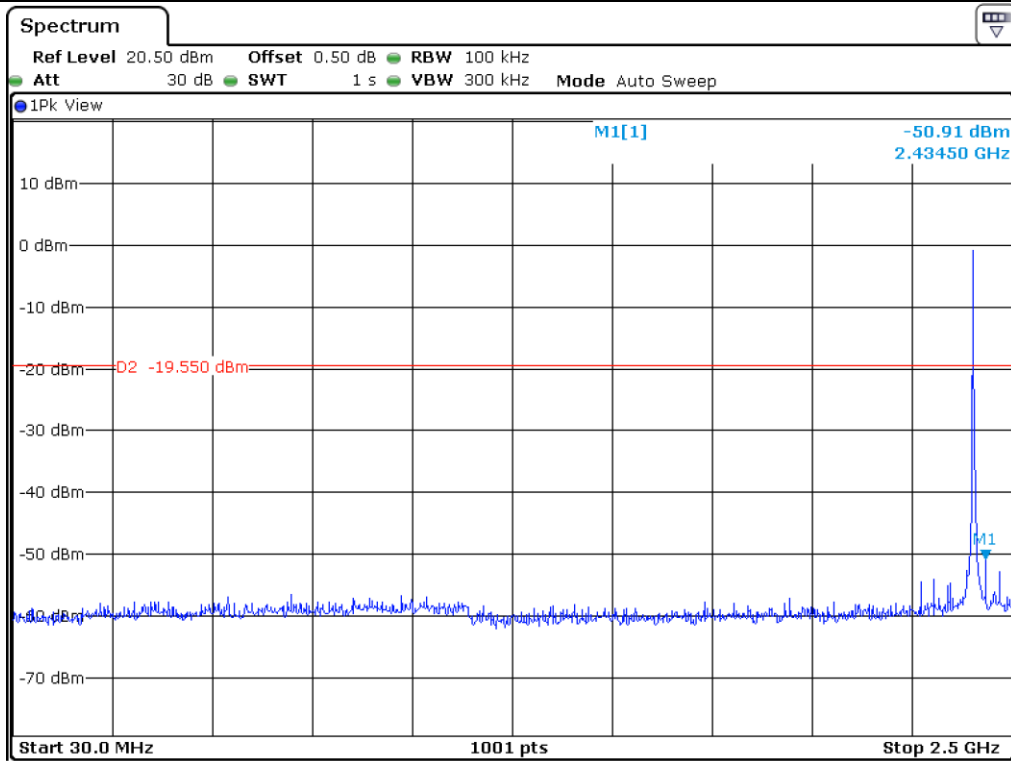


Low Channel

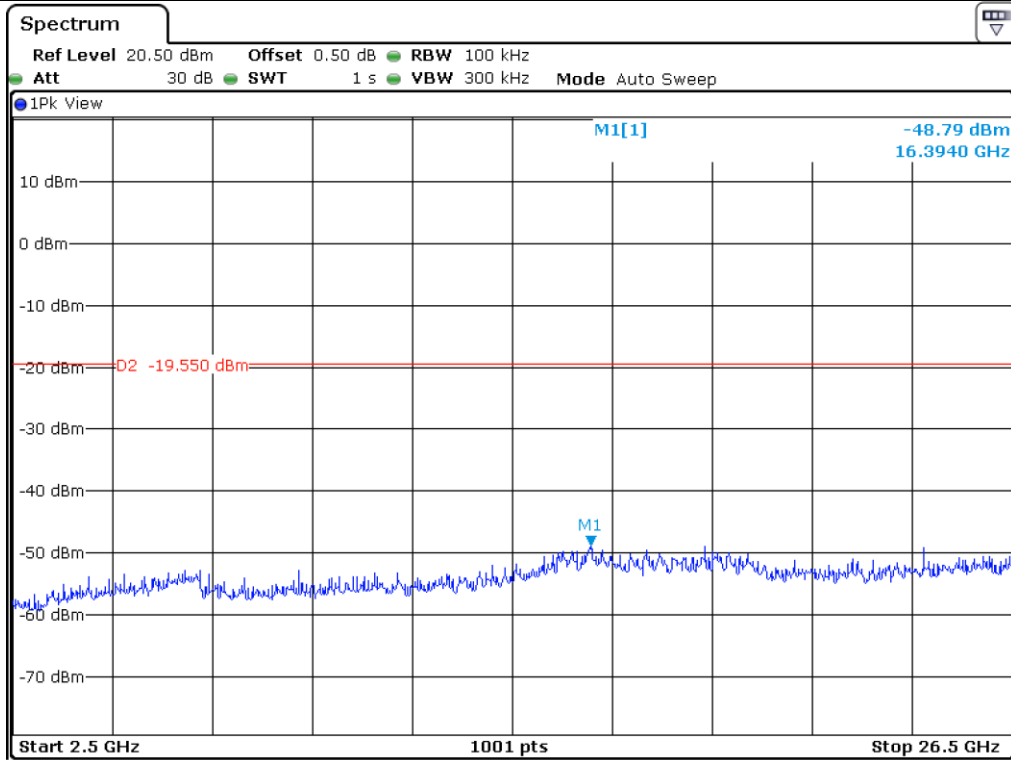


Middle Channel

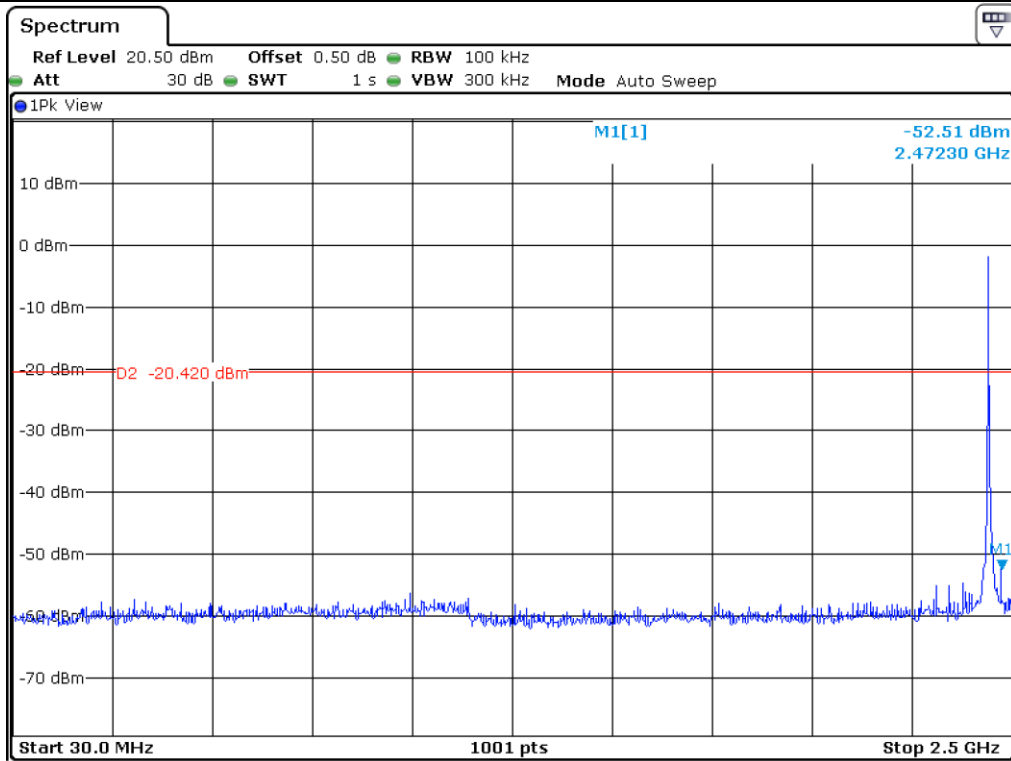




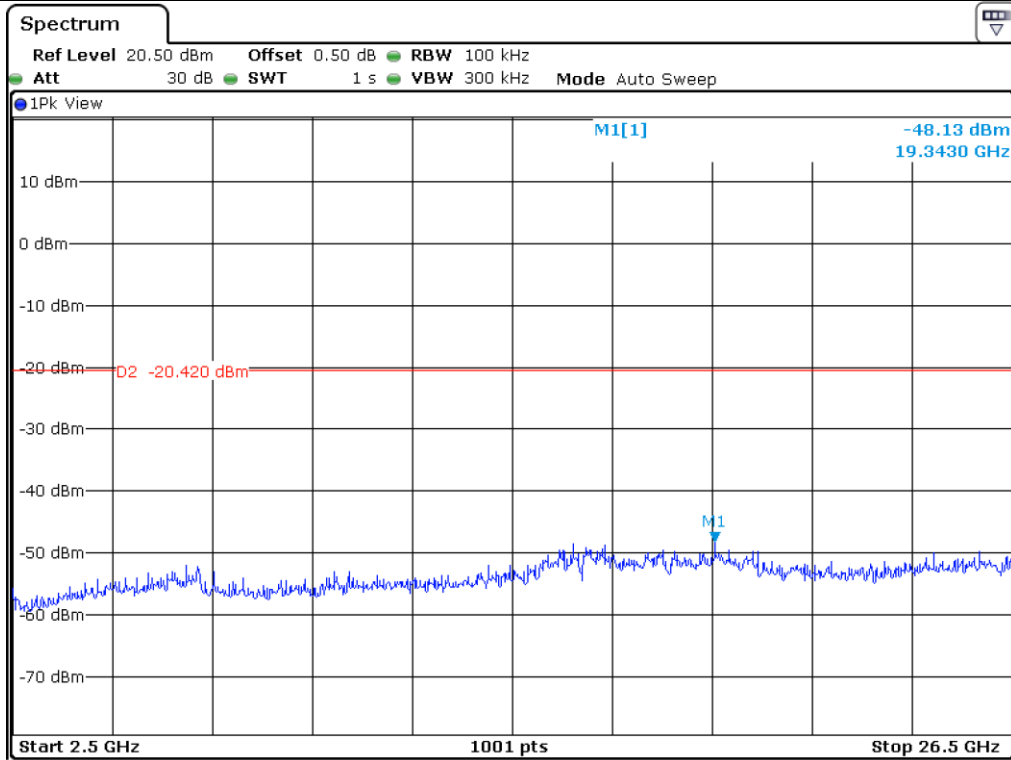
Low Channel



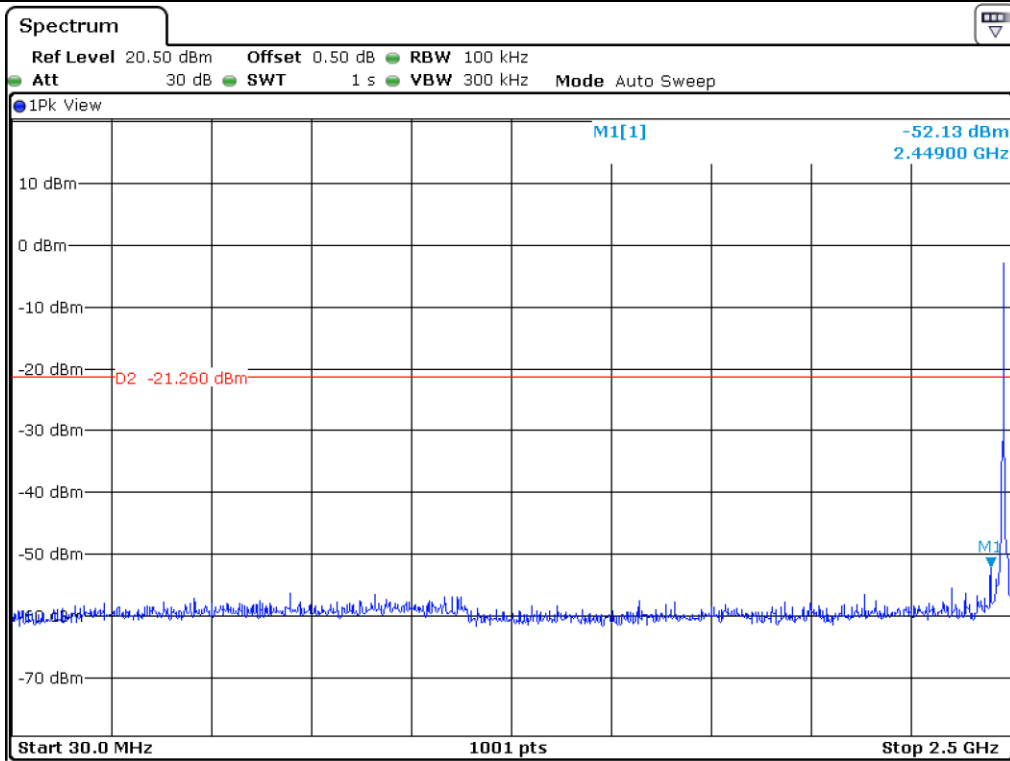
Low Channel



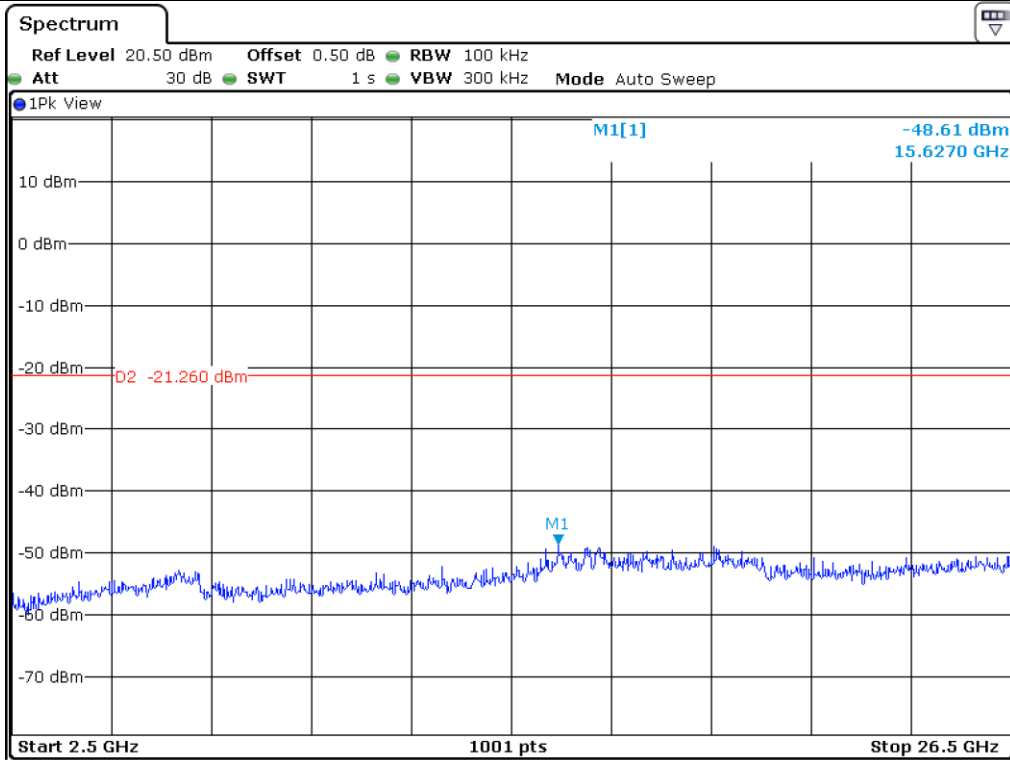
Middle Channel



Middle Channel



High Channel



High Channel

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

- Test Date : August 02, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- 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									
2.390 000	48.64	Peak	H	27.20	7.10	43.10	39.84	74.00	34.16
	38.21	Average	H				29.41	54.00	24.59
	47.86	Peak	V				39.06	74.00	34.94
	38.01	Average	V				29.21	54.00	24.79
Test Data for Low Channel									
2.400 000	51.26	Peak	H	27.20	7.10	43.10	42.46	74.00	31.54
	42.08	Average	H				33.28	54.00	20.72
	52.18	Peak	V				43.38	74.00	30.62
	42.33	Average	V				33.53	54.00	20.47
Test Data for High Channel									
2.483 500	50.39	Peak	H	27.40	7.10	43.10	41.79	74.00	32.21
	39.84	Average	H				31.24	54.00	22.76
	49.21	Peak	V				40.61	74.00	33.39
	39.15	Average	V				30.55	54.00	23.45

Tabulated test data for Restricted Band

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

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

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



Tested by: Tae-Ho, Kim / Senior Engineer

9.6.2 Spurious & Harmonic Radiated Emission

- Test Date : August 02, 2016
- 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									
4 810.00	46.51	Peak	H	31.10	9.60	42.40	44.81	73.98	29.17
	35.18	Average	H				33.48	53.98	20.50
	46.34	Peak	V				44.64	73.98	29.34
	35.38	Average	V				33.68	53.98	20.30
Test Data for Middle Channel									
4 880.00	46.31	Peak	H	31.30	9.80	42.40	45.01	73.98	28.97
	36.06	Average	H				34.76	53.98	19.22
	46.51	Peak	V				45.21	73.98	28.77
	35.64	Average	V				34.34	53.98	19.64
Test Data for High Channel									
4 960.00	45.95	Peak	H	31.30	9.90	42.30	44.85	73.98	29.13
	35.21	Average	H				34.11	53.98	19.87
	46.39	Peak	V				45.29	73.98	28.69
	35.69	Average	V				34.59	53.98	19.39

Tabulated test data for Restricted Band

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

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

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



Tested by: Tae-Ho, Kim / Senior Engineer

10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 45.5 % 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 $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May 31, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data

-. Test Date : August 01, 2016

-. Test Result : Pass

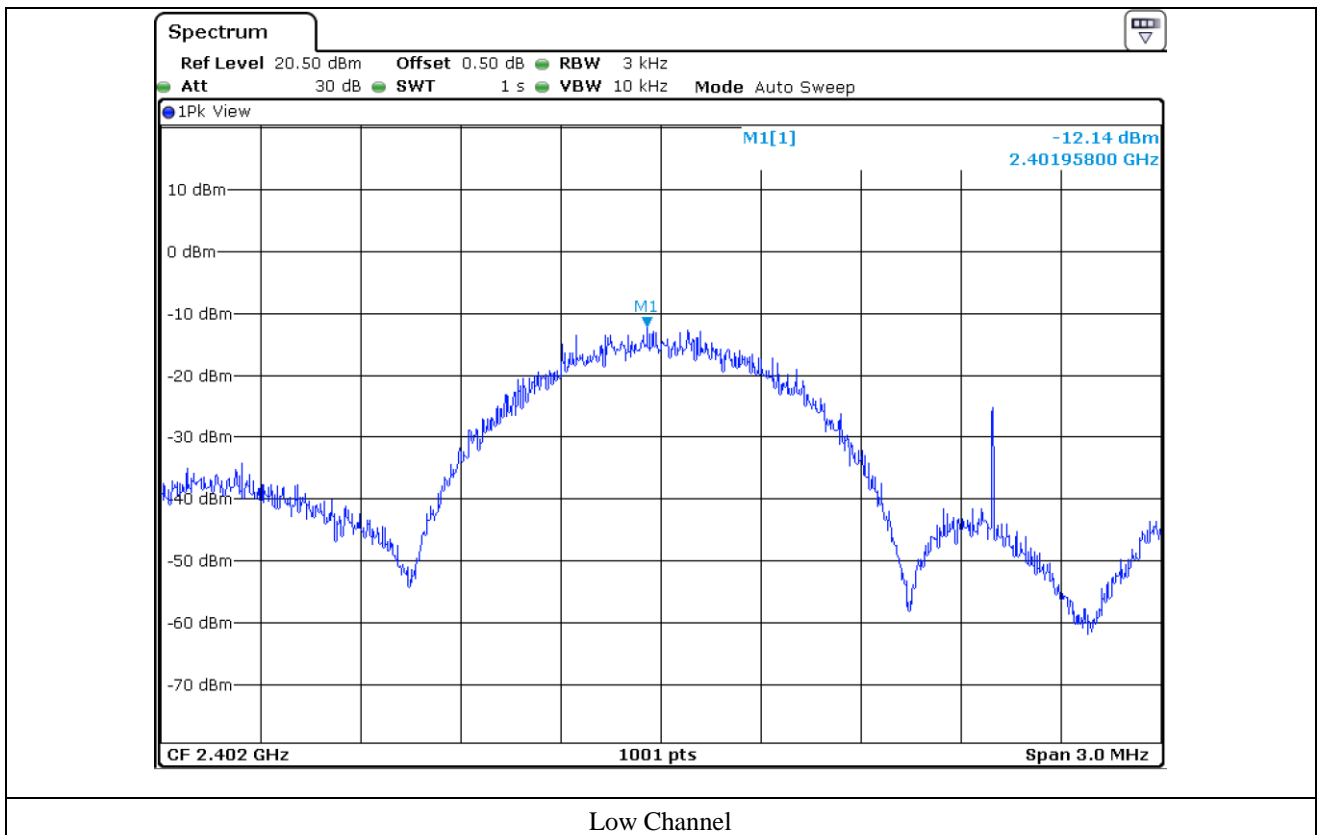
-. Operating Condition : Continuous transmitting mode

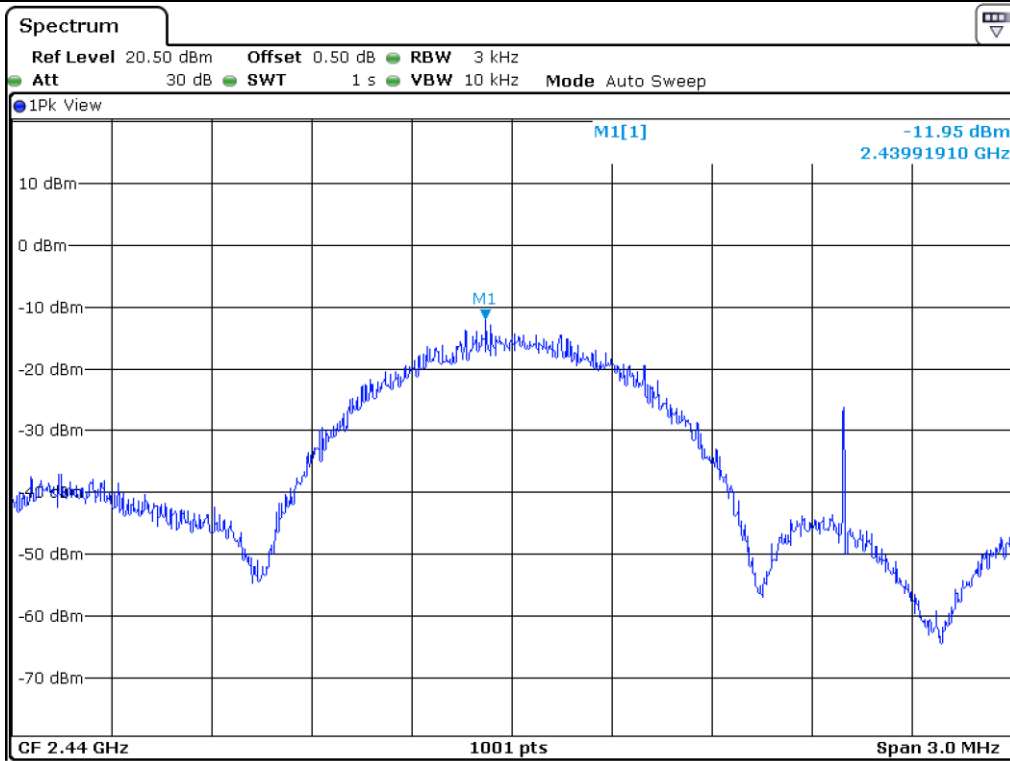
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402	-12.14	8.00	-20.14
Middle	2 440	-11.95	8.00	-19.95
High	2 480	-14.62	8.00	-22.62

Remark. Margin = Limit – Measured value

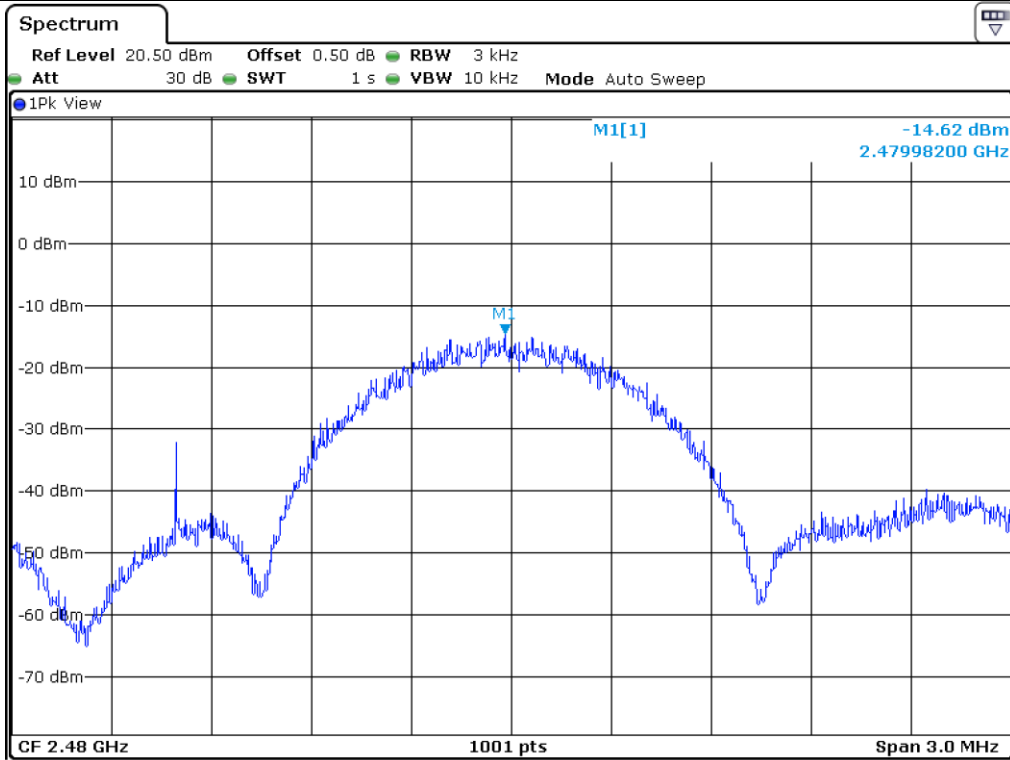


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 45.5 % R.H.

11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. 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.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	May 31, 2016 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 06, 2016 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2016 (1Y)
■ - SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 23, 2015 (1Y)
■ - DT3000	Innco System	Turn Table	930611	N/A
■ - MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Apr. 15, 2016 (1Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 31, 2015 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Aug. 31, 2015 (2Y)

All test equipment used is calibrated on a regular basis.

11.4 Test data for Transmitting Mode

11.4.1 Test data for 30 MHz ~ 1 GHz

Humidity Level : 45.5% R.H. Temperature: 24.1 °C

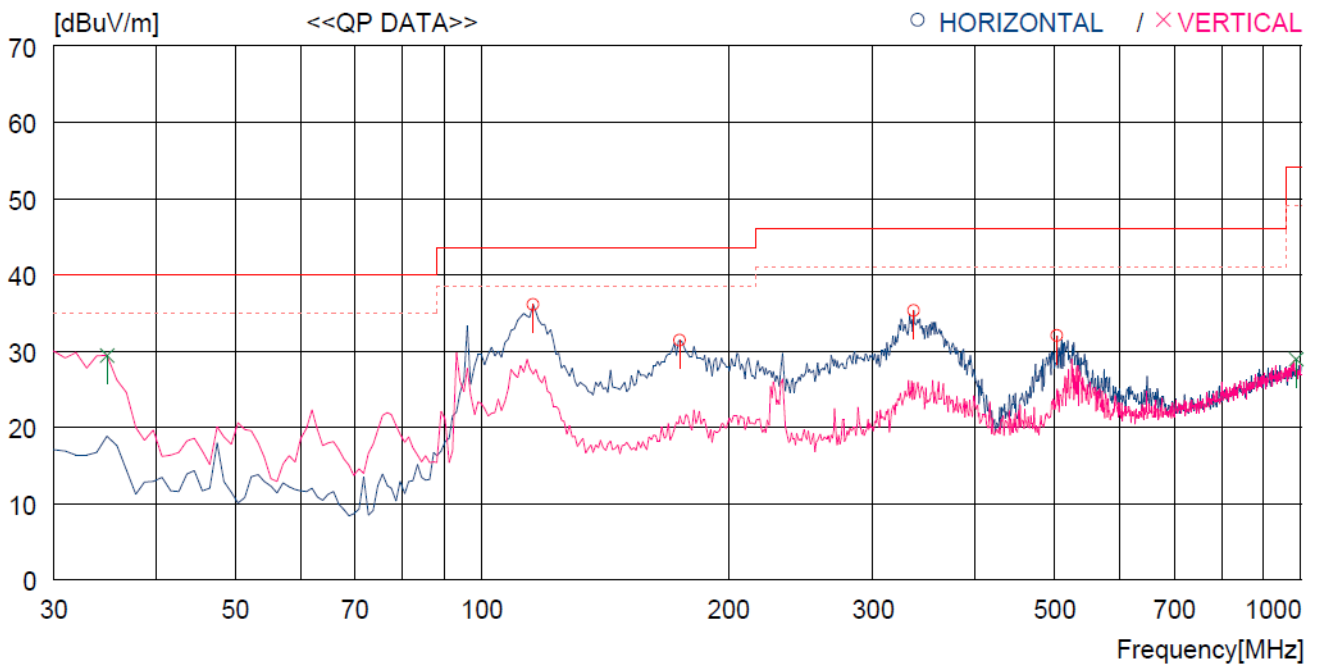
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : BLE Board Date: August 01, 2016

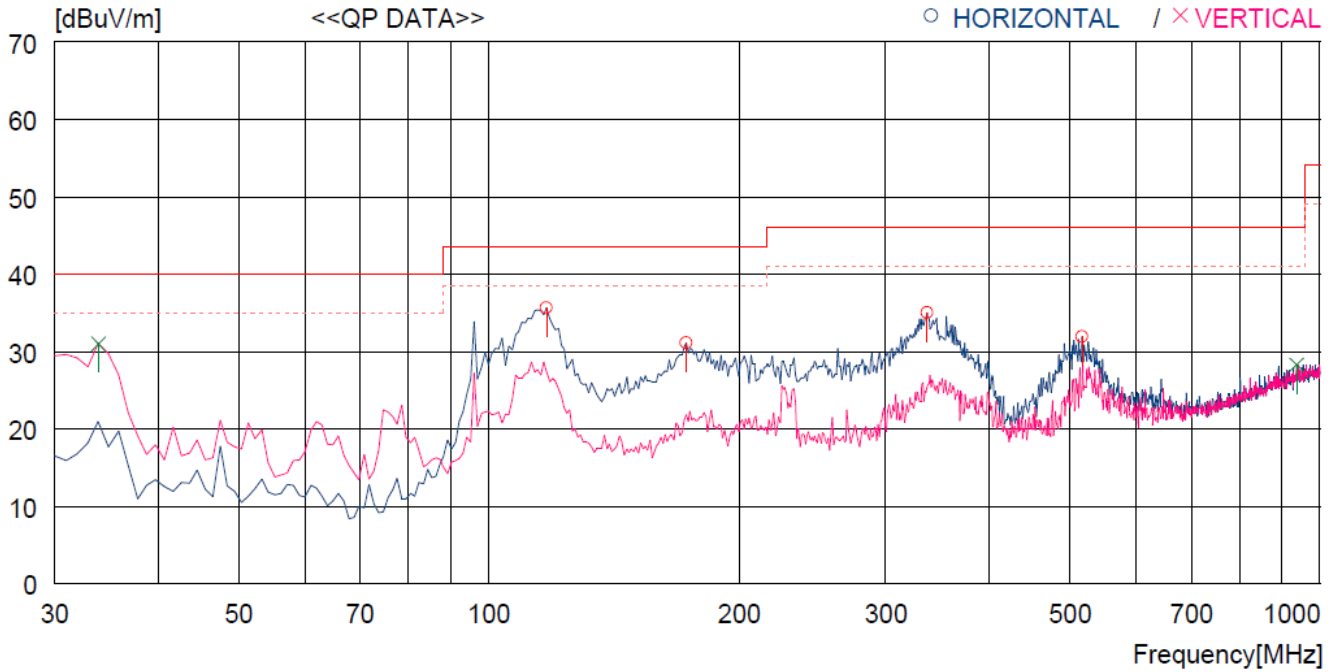
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Operating condition : Low Channel



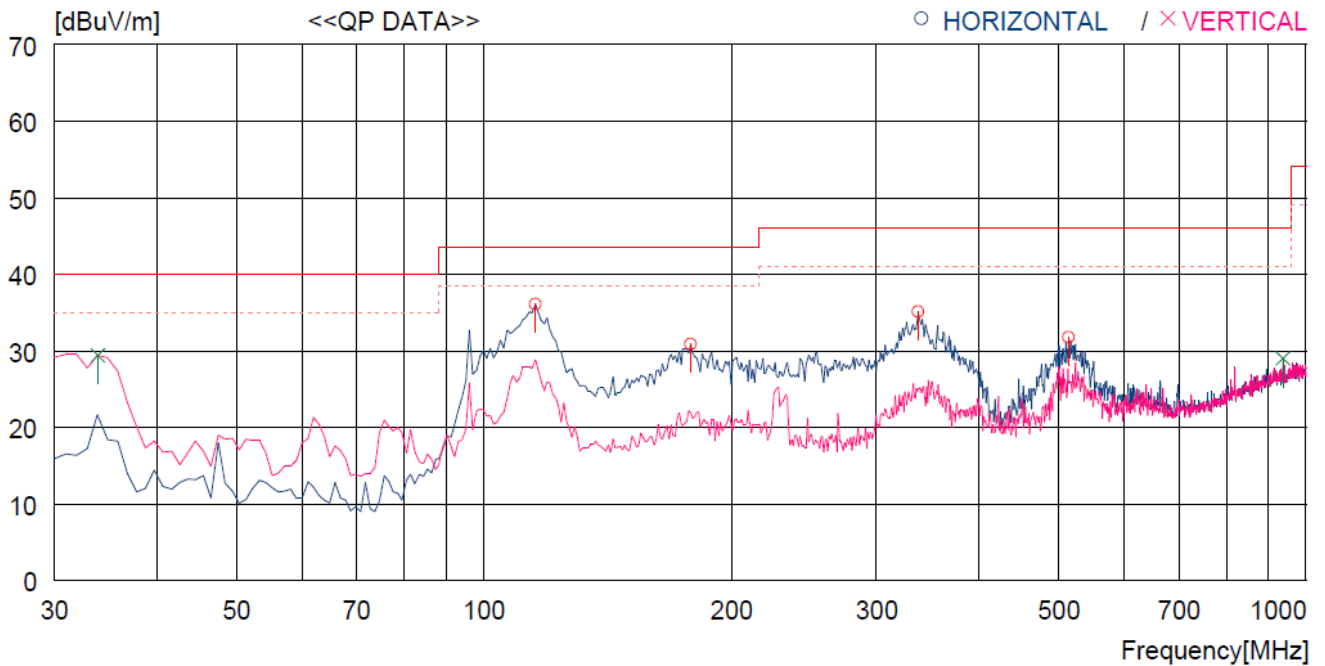
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
---- Horizontal ----										
1	115.360	55.2	10.9	3.2	33.2	36.1	43.5	7.4	300	1
2	174.530	52.0	8.8	3.5	32.9	31.4	43.5	12.1	100	137
3	336.520	48.8	14.2	4.9	32.6	35.3	46.0	10.7	100	359
4	503.361	41.1	16.8	7.0	32.9	32.0	46.0	14.0	200	0
---- Vertical ----										
5	34.850	47.7	12.7	1.8	32.8	29.4	40.0	10.6	100	0
6	986.406	29.9	22.1	8.8	31.9	28.9	54.0	25.1	100	152

Operating condition : Middle Channel



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	117.300	55.1	10.3	3.3	33.1	35.6	43.5	7.9	200	139
2	172.590	51.6	9.0	3.5	33.0	31.1	43.5	12.4	200	126
3	336.520	48.8	14.3	4.9	33.0	35.0	46.0	11.0	100	359
4	516.940	40.9	17.4	6.9	33.3	31.9	46.0	14.1	200	180
----- Vertical -----										
5	33.880	50.2	12.1	1.7	33.0	31.0	40.0	9.0	100	0
6	936.938	29.9	22.1	8.6	32.3	28.3	46.0	17.7	200	146

Operating condition : High Channel



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	115.360	55.2	10.9	3.2	33.2	36.1	43.5	7.4	300	359
2	178.410	51.2	9.1	3.5	32.9	30.9	43.5	12.6	100	359
3	337.490	48.5	14.3	4.9	32.6	35.1	46.0	10.9	100	107
4	514.031	40.7	17.0	6.9	32.9	31.7	46.0	14.3	200	0
----- Vertical -----										
5	33.880	48.0	12.5	1.7	32.8	29.4	40.0	10.6	100	90
6	936.938	31.0	21.8	8.6	32.4	29.0	46.0	17.0	400	359

Tested by: Tae-Ho, Kim / Senior Engineer

11.4.2 Test data for Below 30 MHz

- . Test Date : August 01, 2016
- . 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.									

11.4.3 Test data for above 1 GHz

- . Test Date : August 01, 2016
- . 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: Tae-Ho, Kim / Senior Engineer

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 24.1 °C
 Relative humidity : 45.5 % 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 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.

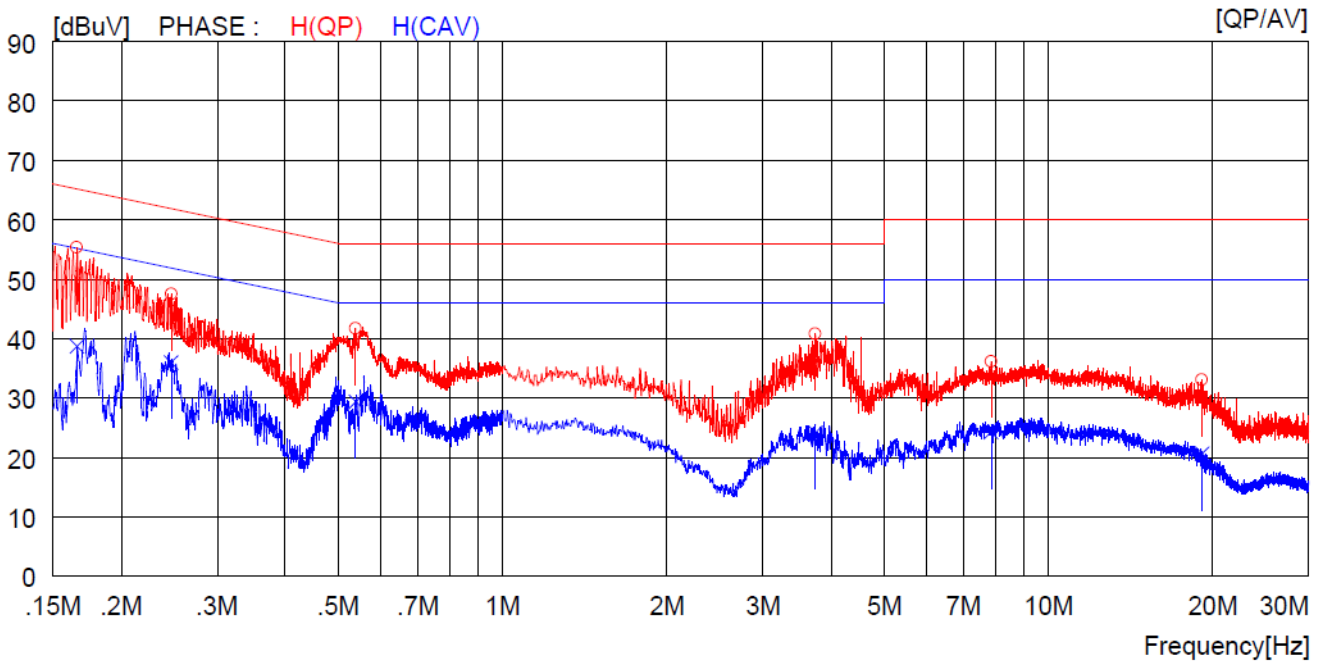
12.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESPI	Rohde & Schwarz	EMI Test Receiver	101278	Nov. 02, 2015 (1Y)
□ - ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	Apr. 05, 2016 (1Y)
□ - NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 06, 2016 (1Y)
■ - NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 05, 2016 (1Y)
□ - 3825/2	EMCO	AMN	9109-1869	Apr. 06, 2016 (1Y)
■ - 3825/2	EMCO	AMN	9109-1867	Apr. 06, 2016 (1Y)

All test equipment used is calibrated on a regular basis.

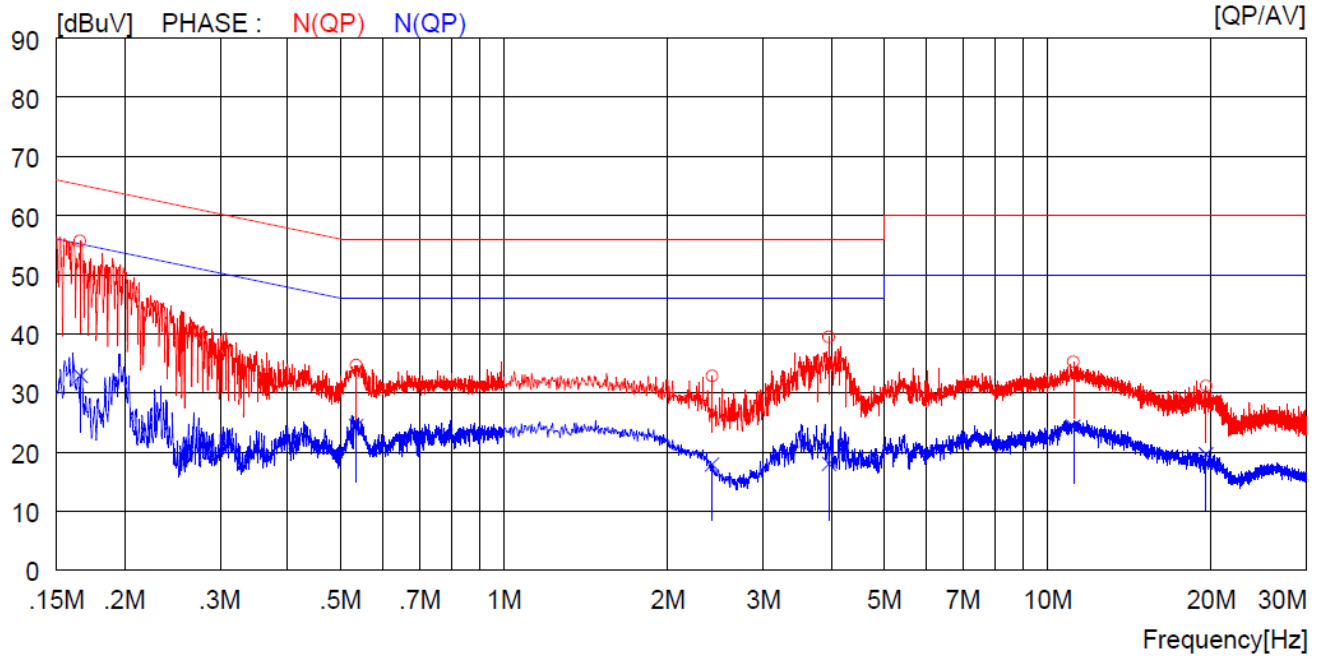
12.4 Test data

- Test Date : August 02, 2016
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16600	45.2	----	10.1	55.3	----	65.2	----	9.9	----	H (QP)
2	0.24700	37.4	----	10.1	47.5	----	61.9	----	14.4	----	H (QP)
3	0.53800	31.6	----	10.1	41.7	----	56.0	----	14.3	----	H (QP)
4	3.74400	30.7	----	10.1	40.8	----	56.0	----	15.2	----	H (QP)
5	7.85000	26.0	----	10.2	36.2	----	60.0	----	23.8	----	H (QP)
6	19.12000	22.6	----	10.5	33.1	----	60.0	----	26.9	----	H (QP)
7	0.16600	----	28.6	10.1	----	38.7	----	55.2	----	16.5	H (CAV)
8	0.24700	----	25.9	10.1	----	36.0	----	51.9	----	15.9	H (CAV)
9	0.53800	----	19.3	10.1	----	29.4	----	46.0	----	16.6	H (CAV)
10	3.74400	----	14.0	10.1	----	24.1	----	46.0	----	21.9	H (CAV)
11	7.85000	----	14.1	10.2	----	24.3	----	50.0	----	25.7	H (CAV)
12	19.12000	----	10.1	10.5	----	20.6	----	50.0	----	29.4	H (CAV)

- Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16600	45.6	----	10.1	55.7	----	65.2	----	9.5	----	N (QP)
2	0.53400	24.6	----	10.1	34.7	----	56.0	----	21.3	----	N (QP)
3	2.41200	22.7	----	10.1	32.8	----	56.0	----	23.2	----	N (QP)
4	3.96000	29.3	----	10.1	39.4	----	56.0	----	16.6	----	N (QP)
5	11.16000	24.9	----	10.4	35.3	----	60.0	----	24.7	----	N (QP)
6	19.58000	20.6	----	10.5	31.1	----	60.0	----	28.9	----	N (QP)
7	0.16600	----	22.8	10.1	----	32.9	----	55.2	----	22.3	N (CAV)
8	0.53400	----	14.3	10.1	----	24.4	----	46.0	----	21.6	N (CAV)
9	2.41200	----	7.8	10.1	----	17.9	----	46.0	----	28.1	N (CAV)
10	3.96000	----	7.9	10.1	----	18.0	----	46.0	----	28.0	N (CAV)
11	11.16000	----	13.9	10.4	----	24.3	----	50.0	----	25.7	N (CAV)
12	19.58000	----	9.1	10.5	----	19.6	----	50.0	----	30.4	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Tae-Ho, Kim / Senior Engineer