

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

Test Report No. : W172R-D018

AGR No. : A168A-287

Applicant : UNIQON Inc.

Address : 22-7, Bugok-dong, Geumjeong-gu, Busan, 46253, South Korea

Manufacturer : UNIQON Inc.

Address : 22-7, Bugok-dong, Geumjeong-gu, Busan, 46253, South Korea

Type of Equipment : Bluetooth LE Module

FCC ID. : 2AJNABITLE1

Model Name : BITLE1

Serial number : N/A

Total page of Report : 36 pages (including this page)

Date of Incoming : February 02, 2017

Date of issue : February 16, 2017

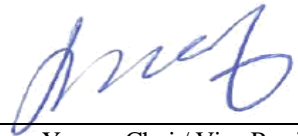
SUMMARY

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: 
Keun-Young, Choi / Vice President
ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W172R-D018	February 16, 2017	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : UNIQON Inc.
 Address : 22-7, Bugok-dong, Geumjeong-gu, Busan, 46253, South Korea
 Contact Person : Sungmyung, Lee / Co-president
 Telephone No. : +82-10-5550-5849
 FCC ID : 2AJNABITLE1
 Model Name : BITLE1
 Brand Name : -
 Serial Number : N/A
 Date : February 16, 2017

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Bluetooth LE Module
KIND OF EQUIPMENT	Modular Transmitter
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-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-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 UNIQON Inc., Model BITLE1 (referred to as the EUT in this report) is a Bluetooth LE Module. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Bluetooth LE Module
Temperature Range	-20 °C to 75 °C
Operating Frequency	2 402 MHz ~ 2 480 MHz
RF Output Power	5.12 dBm
Number of Channel	40 Channel
Modulation Type	GFSK
Antenna Type	PCB Antenna
USED RF CHIP	Marker: Qualcomm Technologies International, Ltd. Model Name: CSR1012
Antenna Gain	1.67 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 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	UNIQON 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
BITLE1	UNIQON Inc.	Bluetooth LE Module (EUT)	TEST Jig
N/A	N/A	TEST Jig	EUT
Lenovo IdeaPad Z560	Lenovo	Notebook PC	TEST Jig

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 Jig Board 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

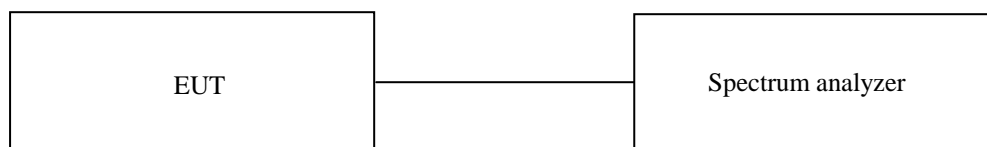
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 24.3 °C
Relative humidity : 43.9 % 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

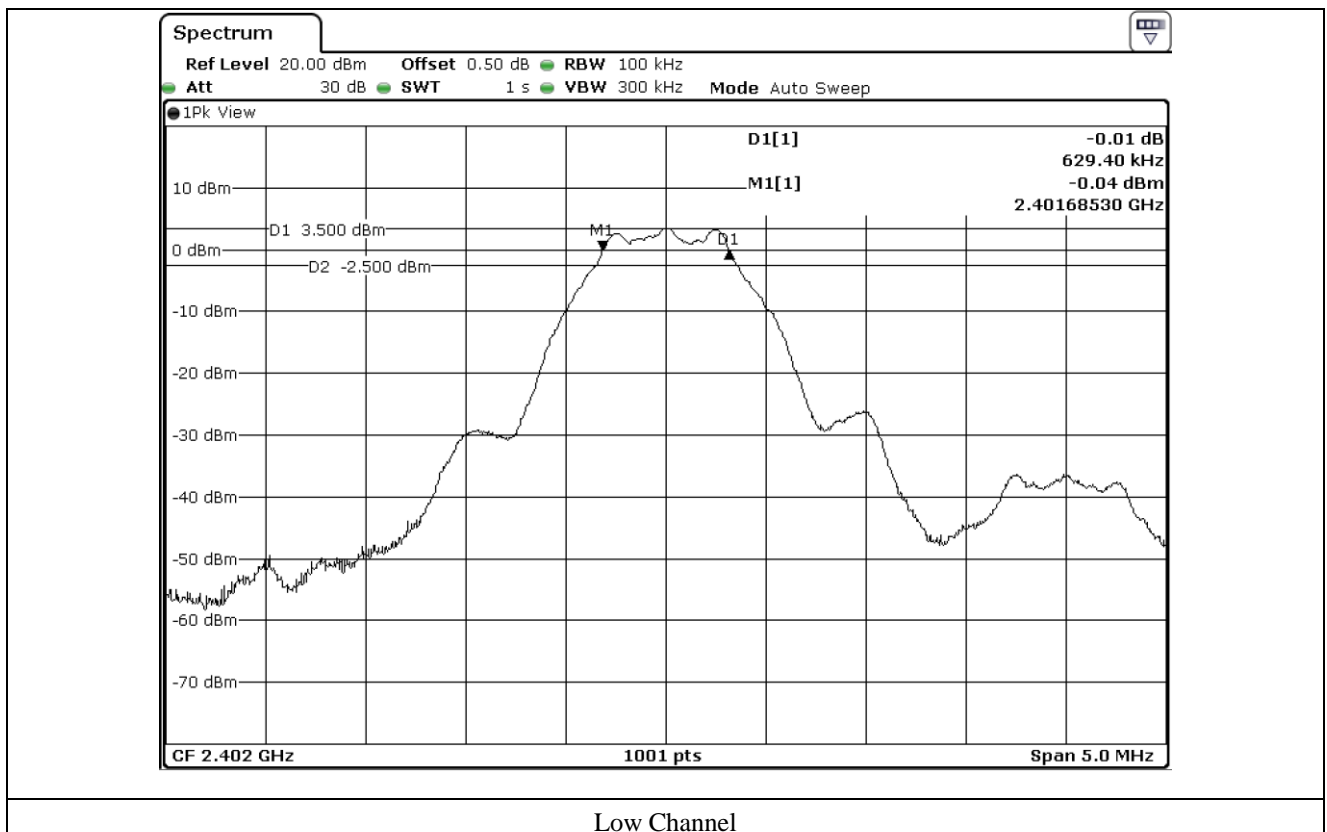
-. Test Date : February 08, 2017 ~ February 10, 2017

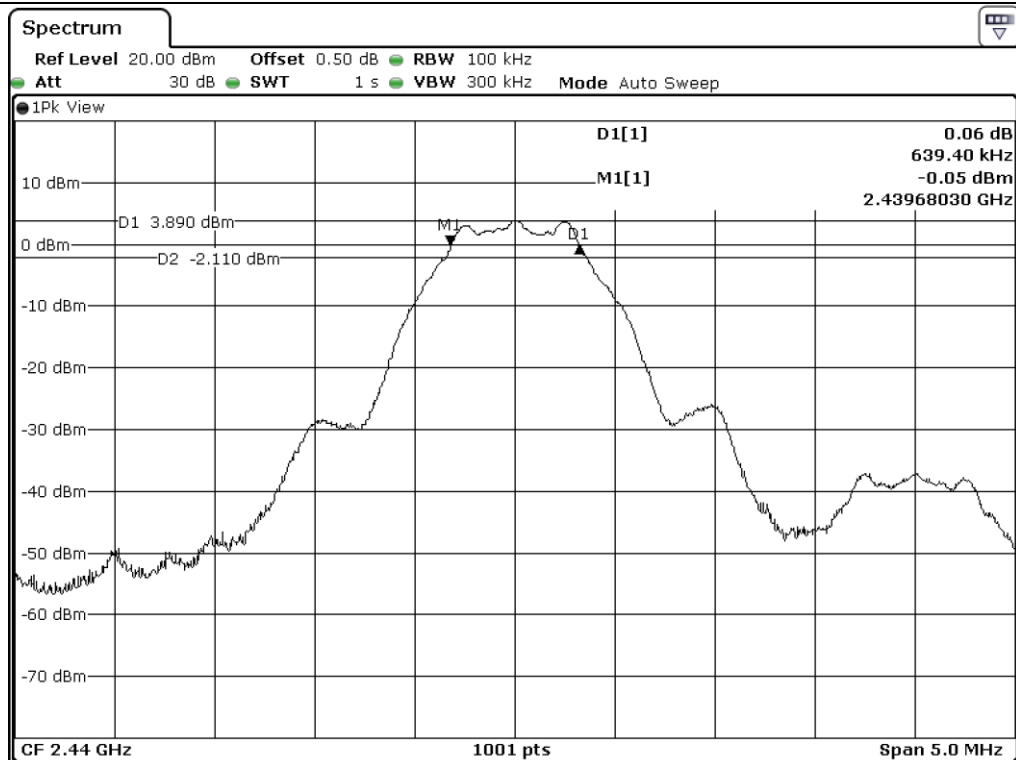
-. Test Result : Pass

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402	629.40	500	129.40
Middle	2 440	639.40	500	139.40
High	2 480	744.30	500	244.30

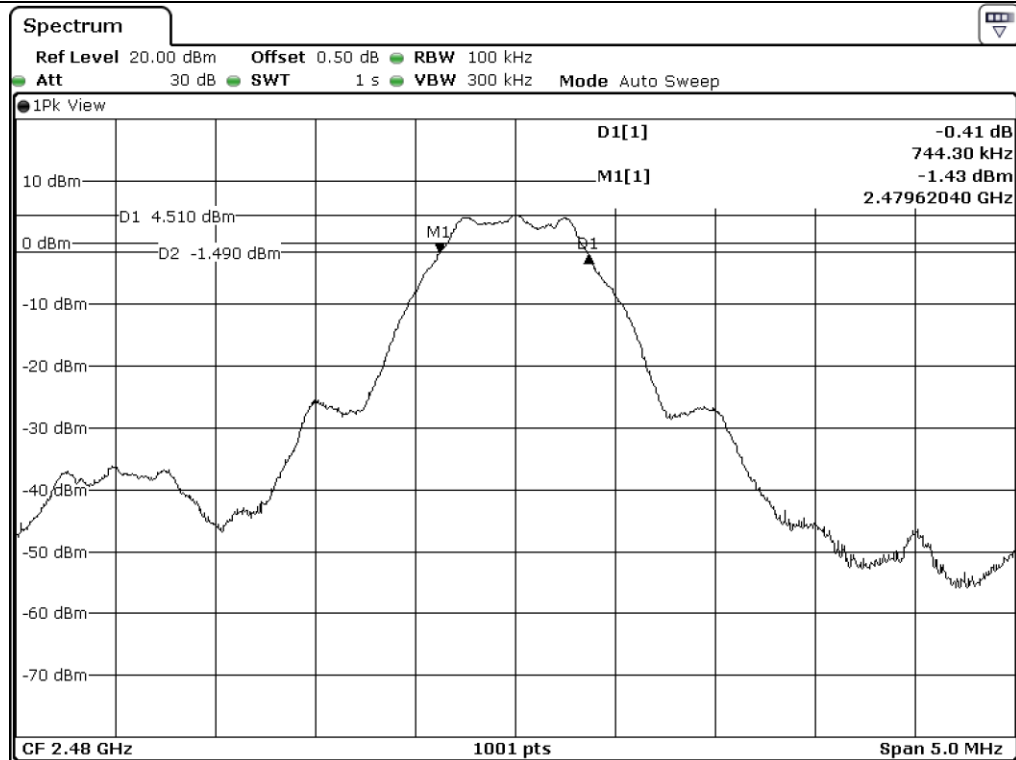
Remark. Margin = Measured Value - Limit


Tested by: Hyung-Kwon, Oh / Engineer





Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

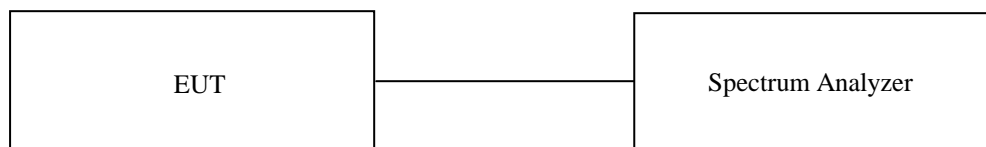
8.1 Operating environment

Temperature : 24.3 °C
Relative humidity : 43.9 % 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 : February 08, 2017 ~ February 10, 2017

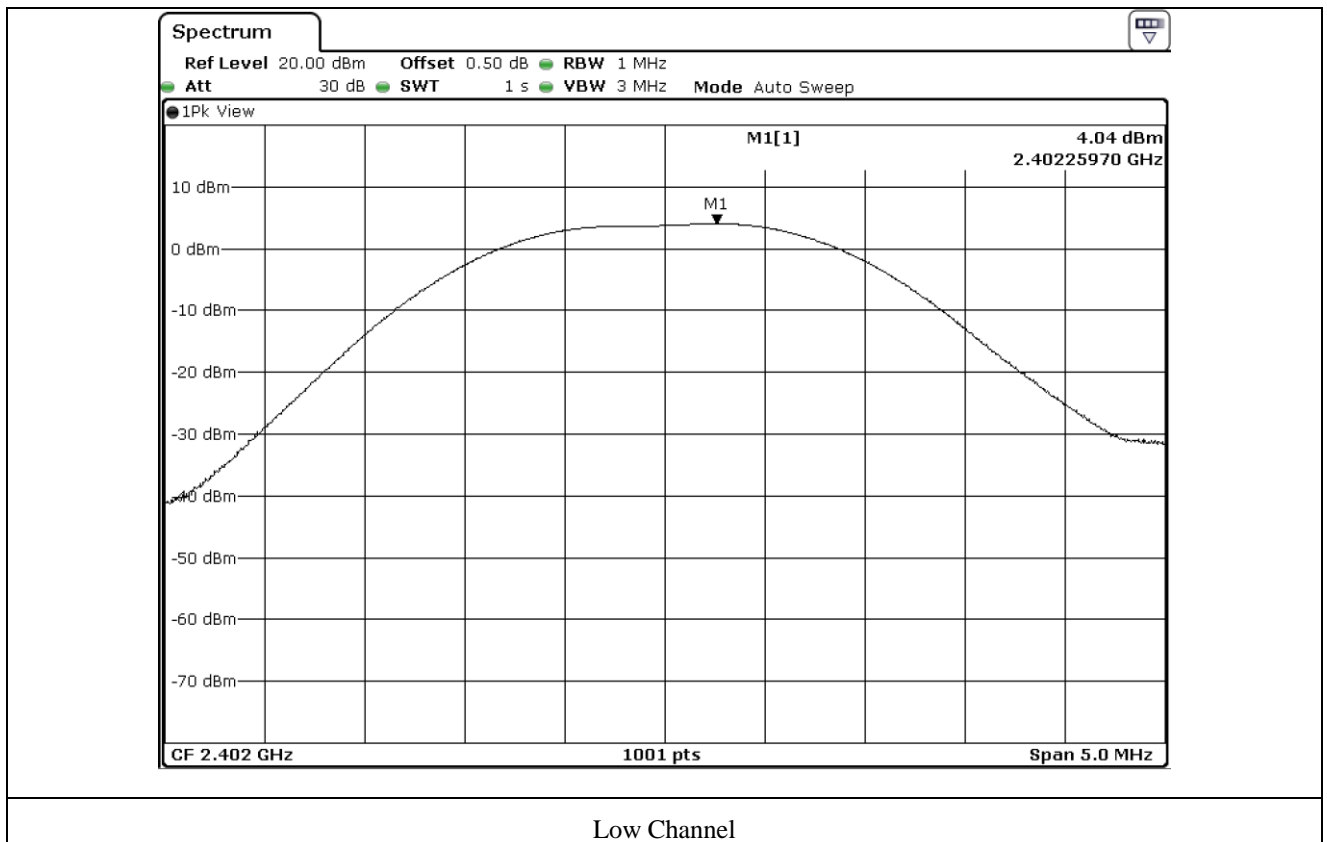
-. Test Result : Pass

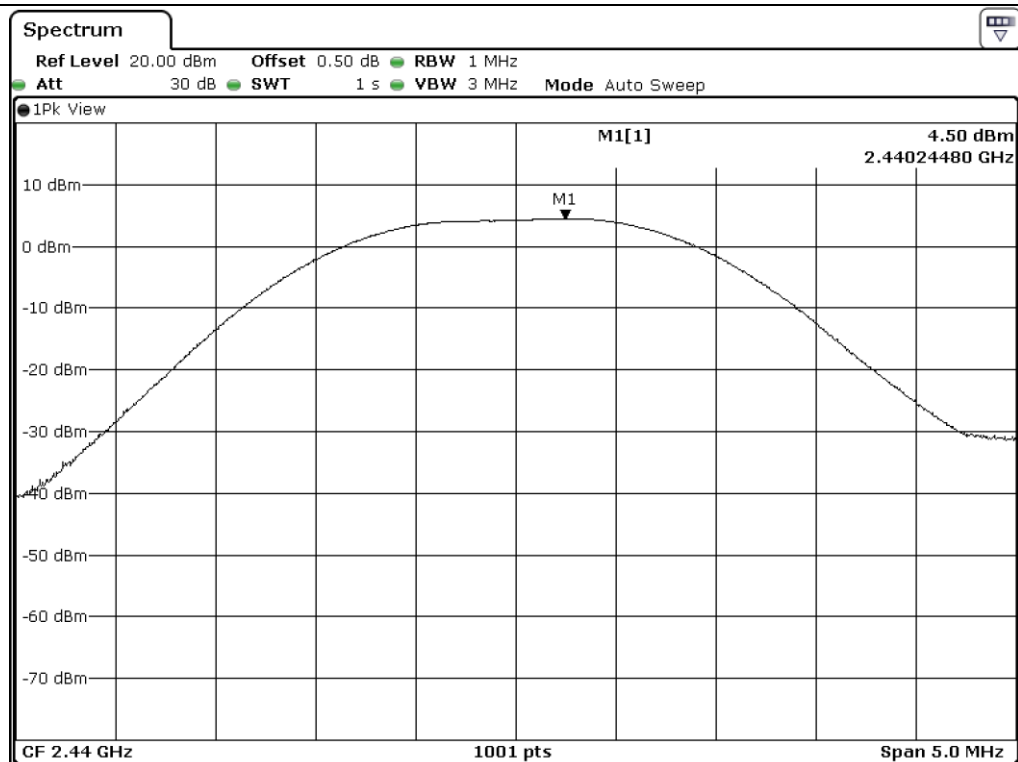
CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	4.04	30.00	25.96
MIDDLE	2 440	4.50	30.00	25.50
HIGH	2 480	5.12	30.00	24.88

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

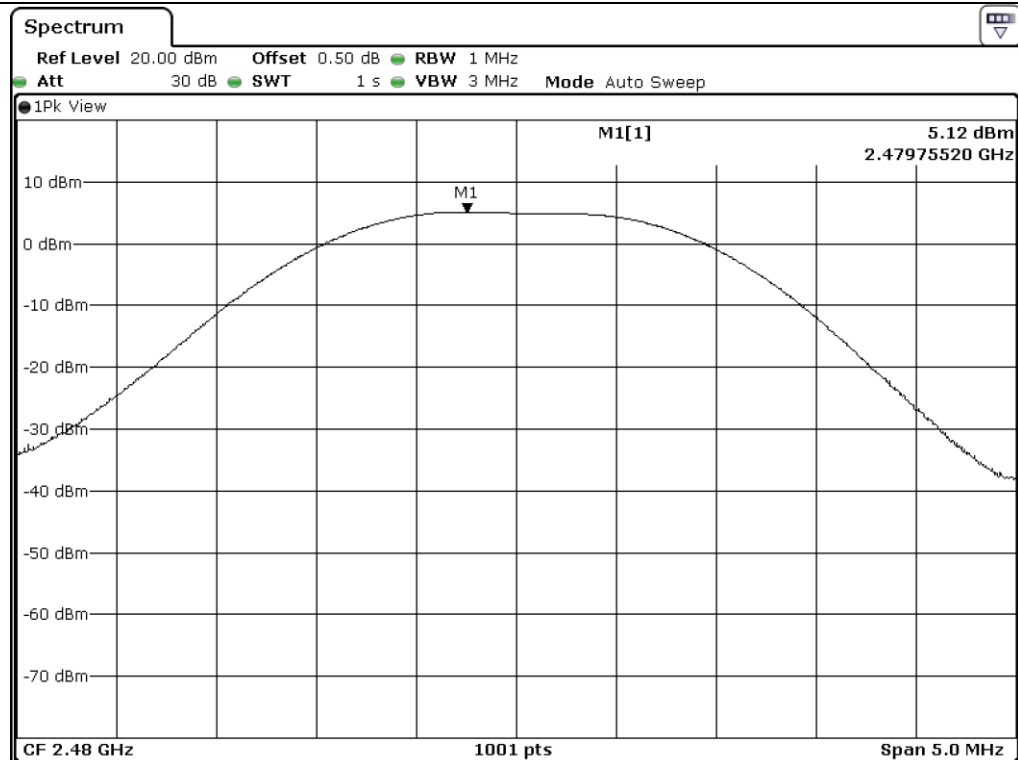


Tested by: Hyung-Kwon, Oh / Engineer





Middle Channel



High Channel

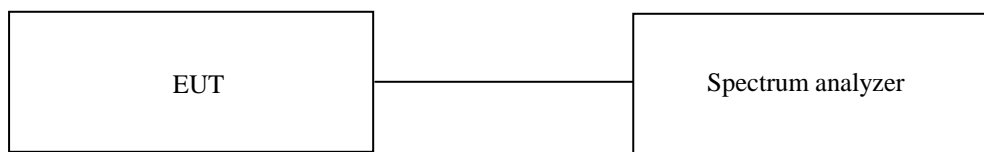
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 24.3 °C
Relative humidity : 43.9 % 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.

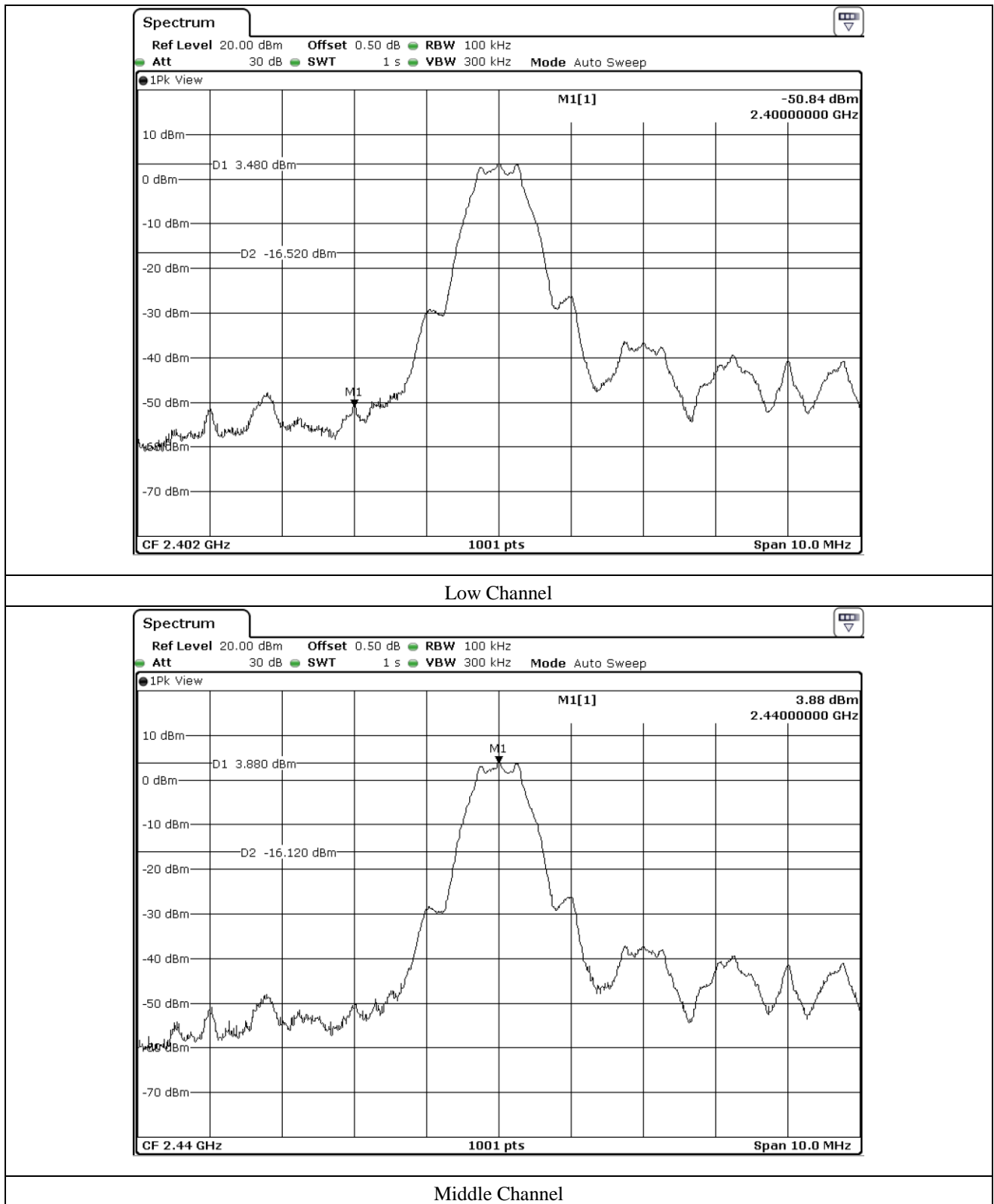
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal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

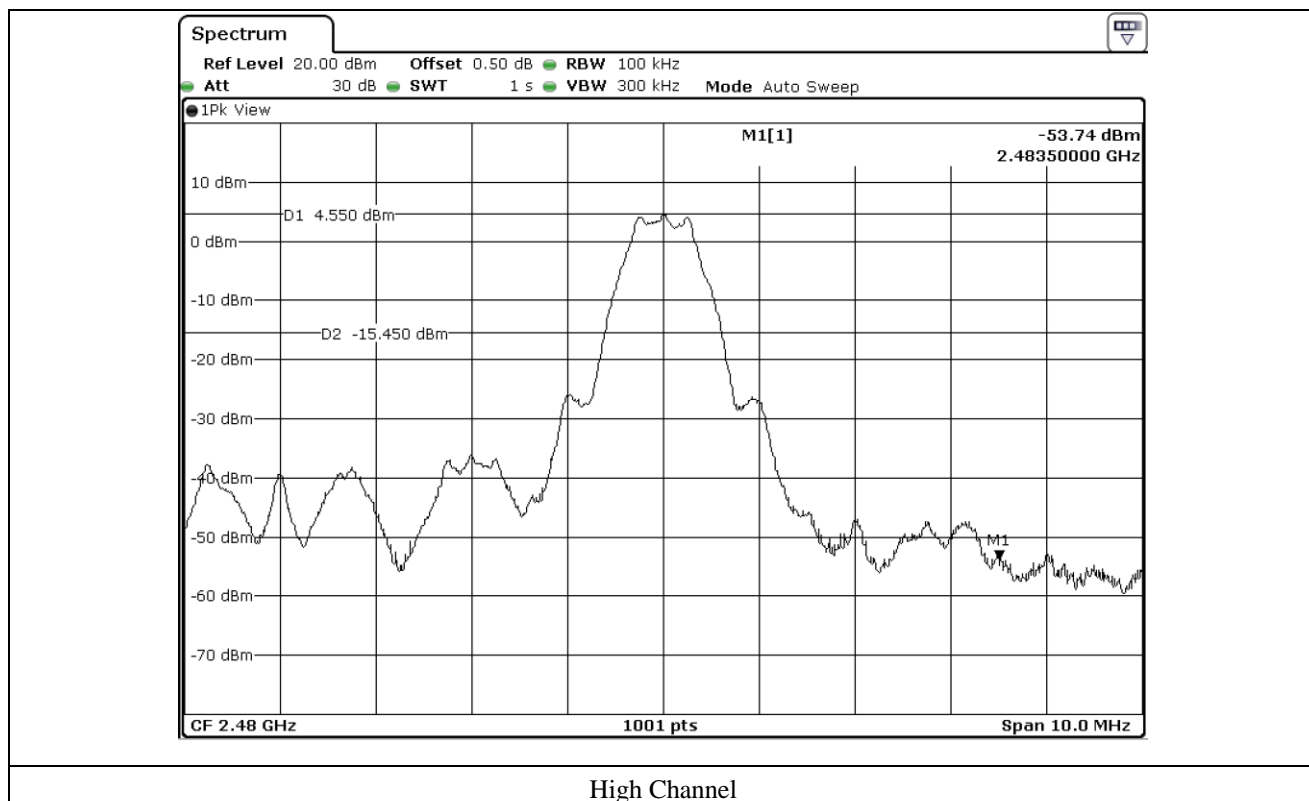
9.4 Test equipment used

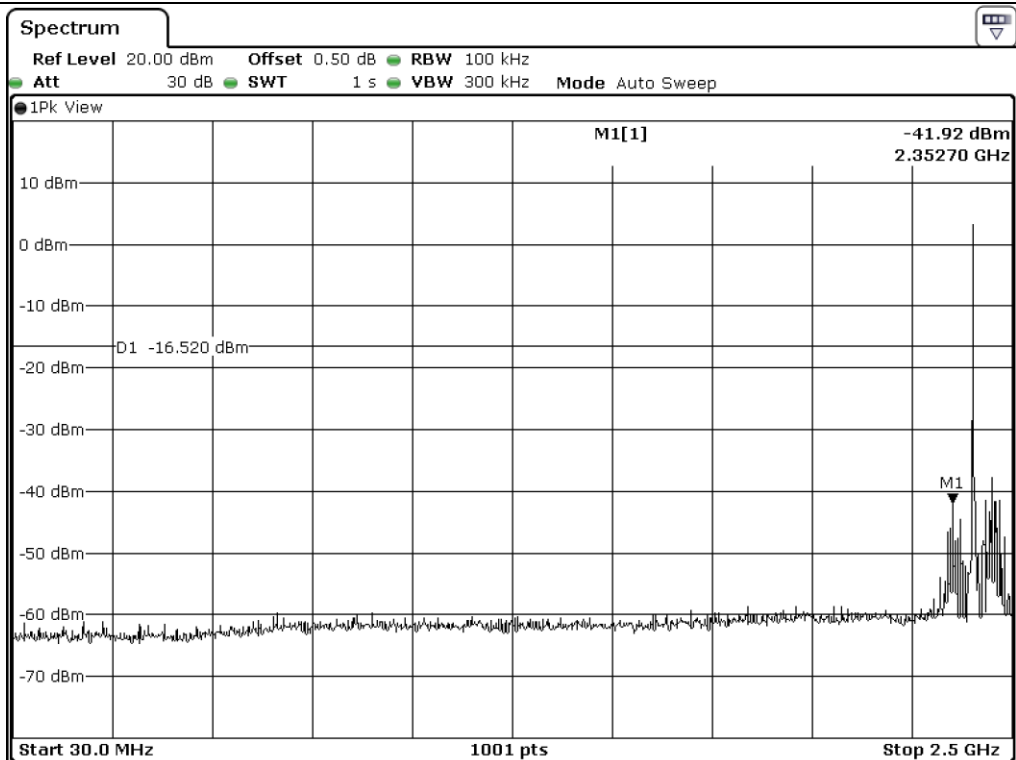
	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	May 31, 2016 (1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 06, 2016 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2016 (1Y)
■ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	102209	May 31, 2016 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	May 31, 2016 (1Y)
■ -	DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
■ -	MA-4000XPET	Innco System	Antenna Master	MA4000/509	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.

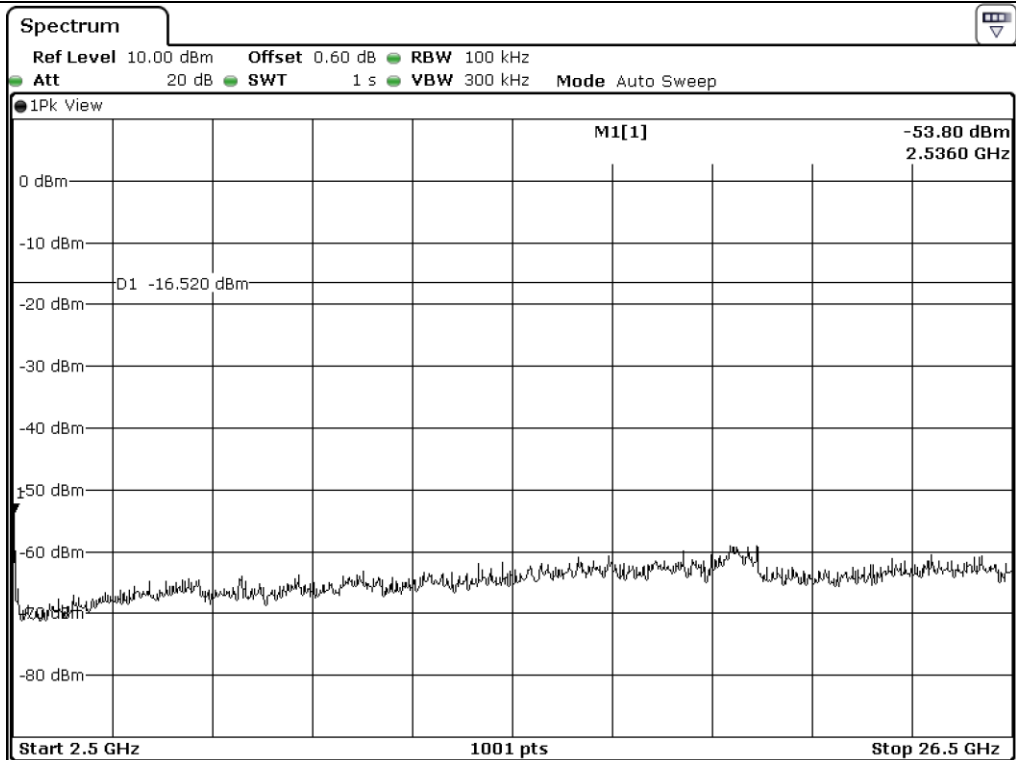
9.5 Test data for conducted emission



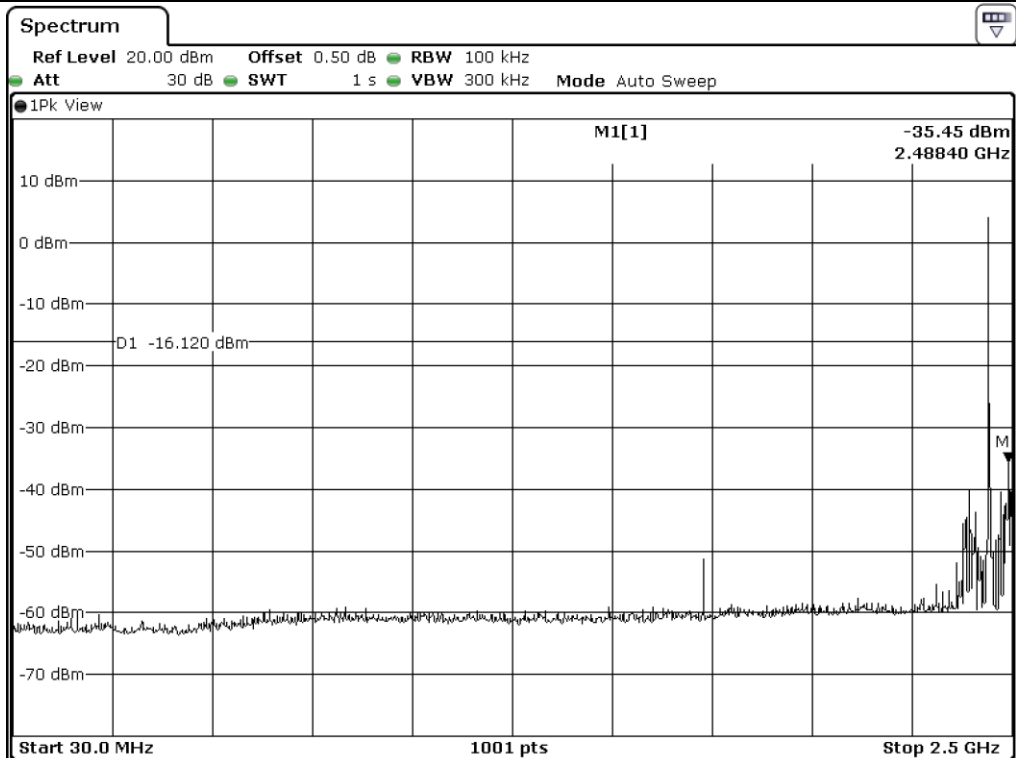




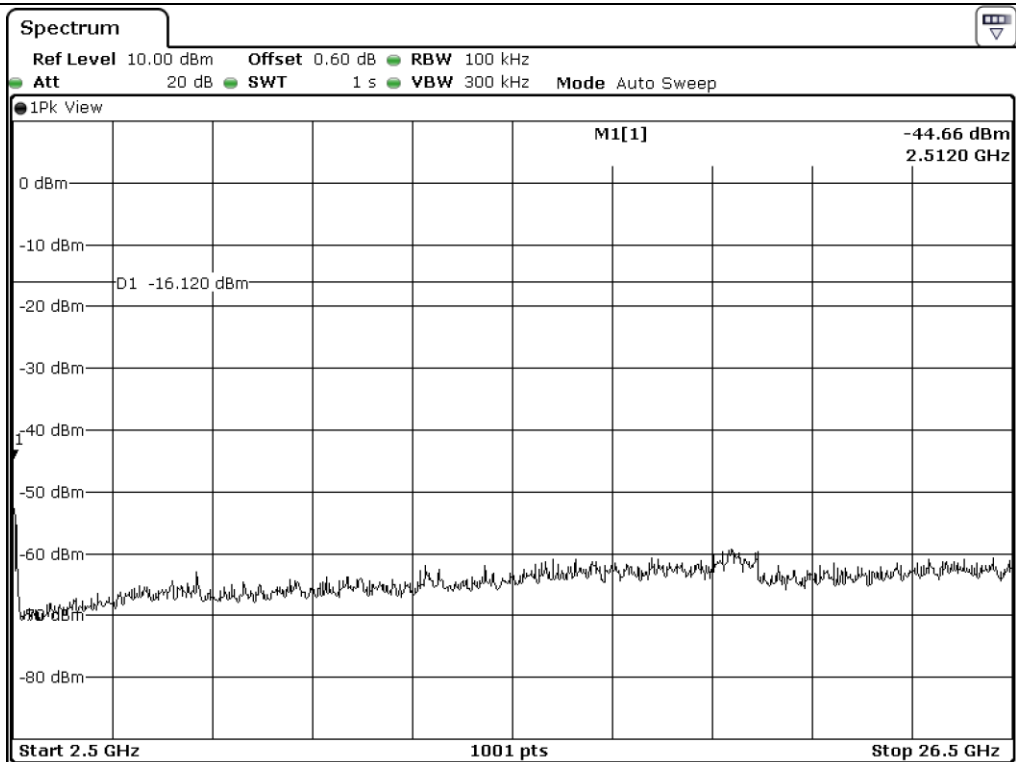
Low Channel



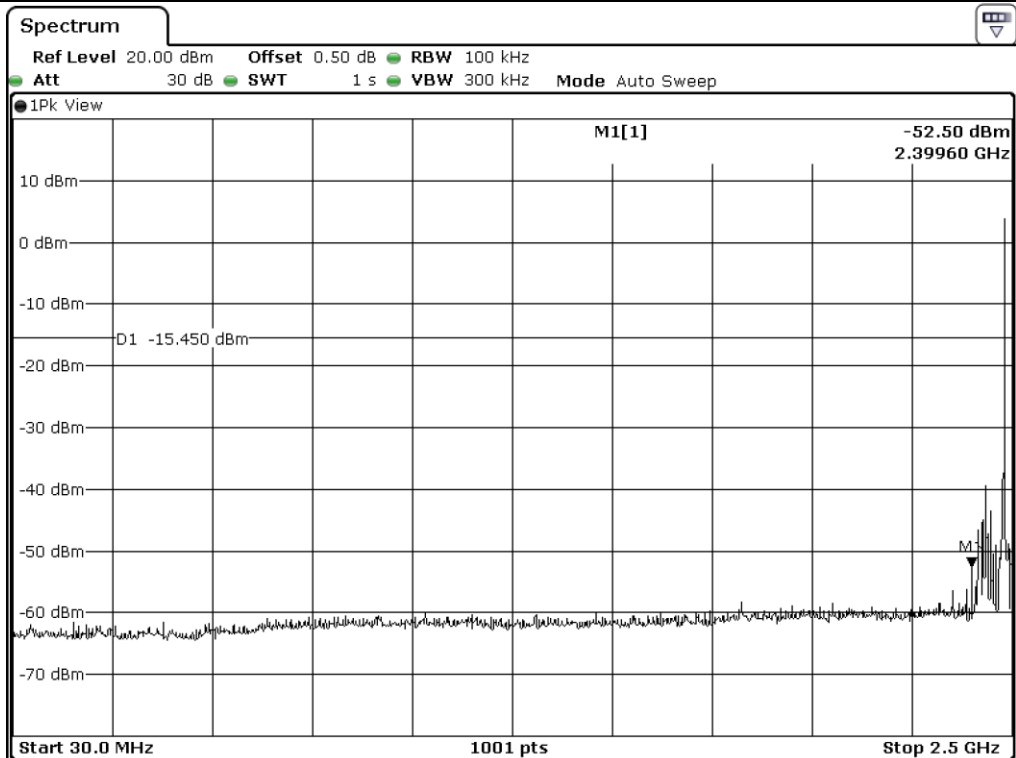
Low Channel



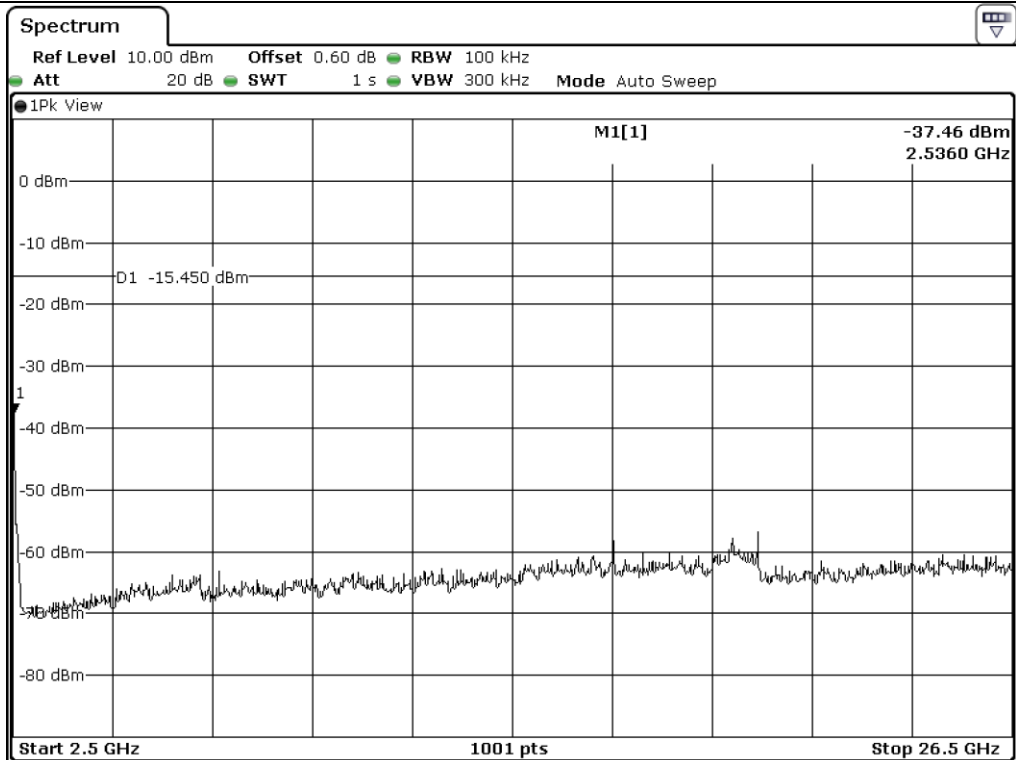
Middle Channel



Middle Channel



High Channel



High Channel

9.6 Test data for radiated emission

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.

9.6.1 Radiated Emission which fall in the Restricted Band and Band Edge

- . Test Date : February 08, 2017 ~ February 10, 2017
- . 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
- . Duty Cycle : 100 %
- . 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									
2 354.240 0	40.44	Peak	H	27.06	11.25	40.19	38.56	74.00	35.44
	31.78	Average	H				29.90	54.00	24.10
	39.75	Peak	V				37.87	74.00	36.13
	31.07	Average	V				29.19	54.00	24.81
Test Data for Low Channel									
2 400.000 0	47.56	Peak	H	27.24	11.36	40.18	45.98	74.00	28.02
	40.08	Average	H				38.50	54.00	15.50
	45.18	Peak	V				43.60	74.00	30.40
	38.56	Average	V				36.98	54.00	17.02
Test Data for High Channel									
2 483.516 5	42.89	Peak	H	27.57	11.49	40.16	41.79	74.00	32.21
	35.52	Average	H				34.42	54.00	19.58
	41.52	Peak	V				40.42	74.00	33.58
	34.56	Average	V				33.46	54.00	20.54

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: Hyung-Kwon, Oh / Engineer

9.6.2 Spurious & Harmonic Radiated Emission

- Test Date : February 08, 2017 ~ February 10, 2017
- 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
- Duty Cycle : 100 %
- 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									
4 804.00	40.83	Peak	H	30.70	16.10	40.64	46.99	74.00	27.01
	33.52	Average	H				39.68	54.00	14.32
	42.59	Peak	V				48.75	74.00	25.25
	35.18	Average	V				41.34	54.00	12.66
Test Data for Middle Channel									
4 880.00	40.25	Peak	H	30.90	16.30	40.63	46.82	74.00	27.18
	32.89	Average	H				39.46	54.00	14.54
	40.98	Peak	V				47.55	74.00	26.45
	32.07	Average	V				38.64	54.00	15.36
Test Data for High Channel									
4 960.00	41.29	Peak	H	31.00	16.50	40.62	48.17	74.00	25.83
	33.92	Average	H				40.80	54.00	13.20
	43.07	Peak	V				49.95	74.00	24.05
	35.26	Average	V				42.14	54.00	11.86

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: Hyung-Kwon, Oh / Engineer

10. PEAK POWER SPECTRAL DENSITY

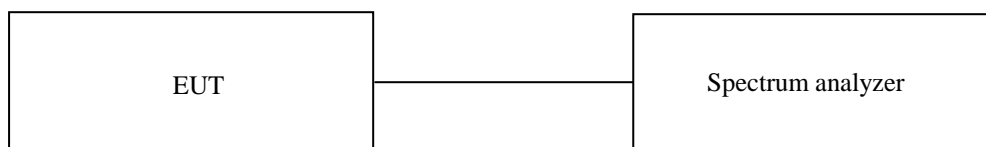
10.1 Operating environment

Temperature : 24.3 °C
Relative humidity : 43.9 % 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 : February 08, 2017 ~ February 10, 2017

-. Test Result : Pass

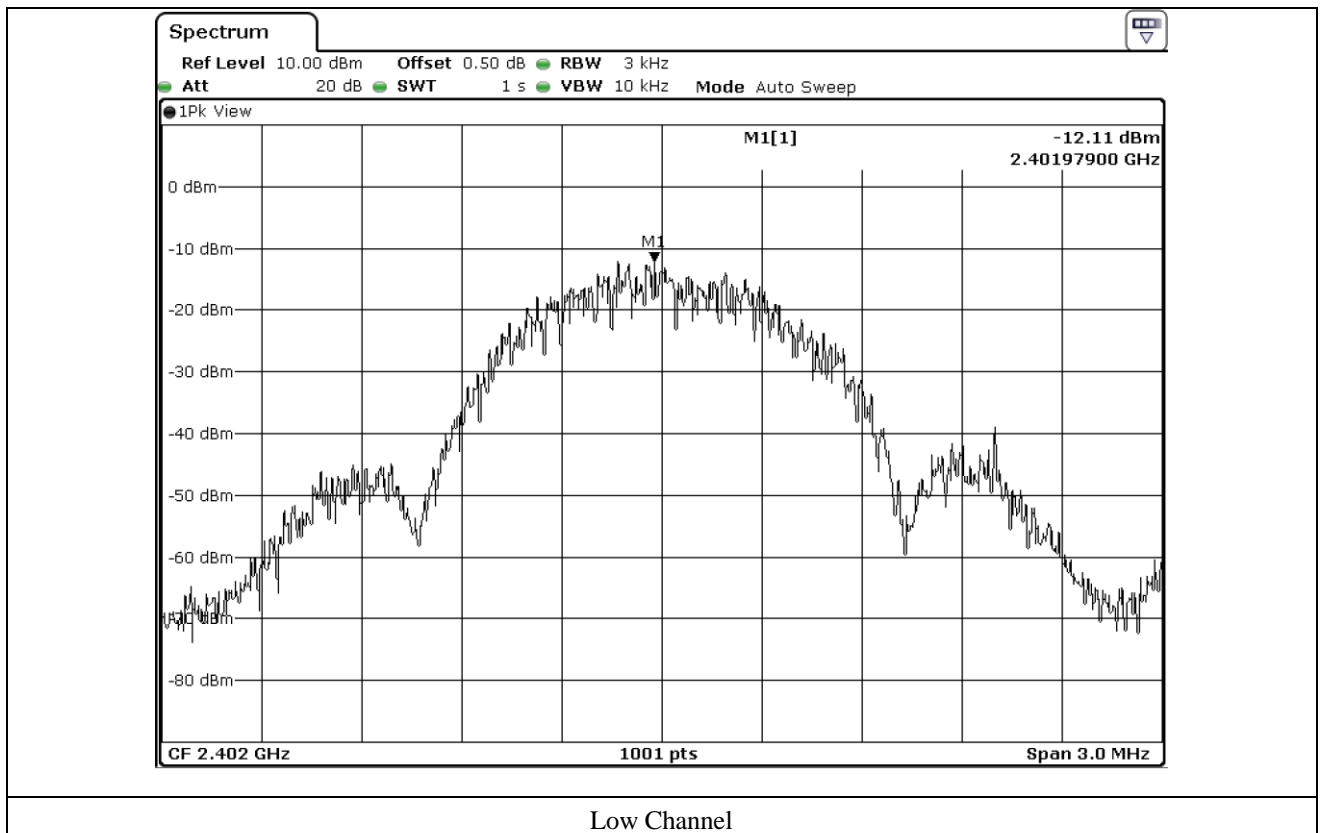
-. Operating Condition : Continuous transmitting mode

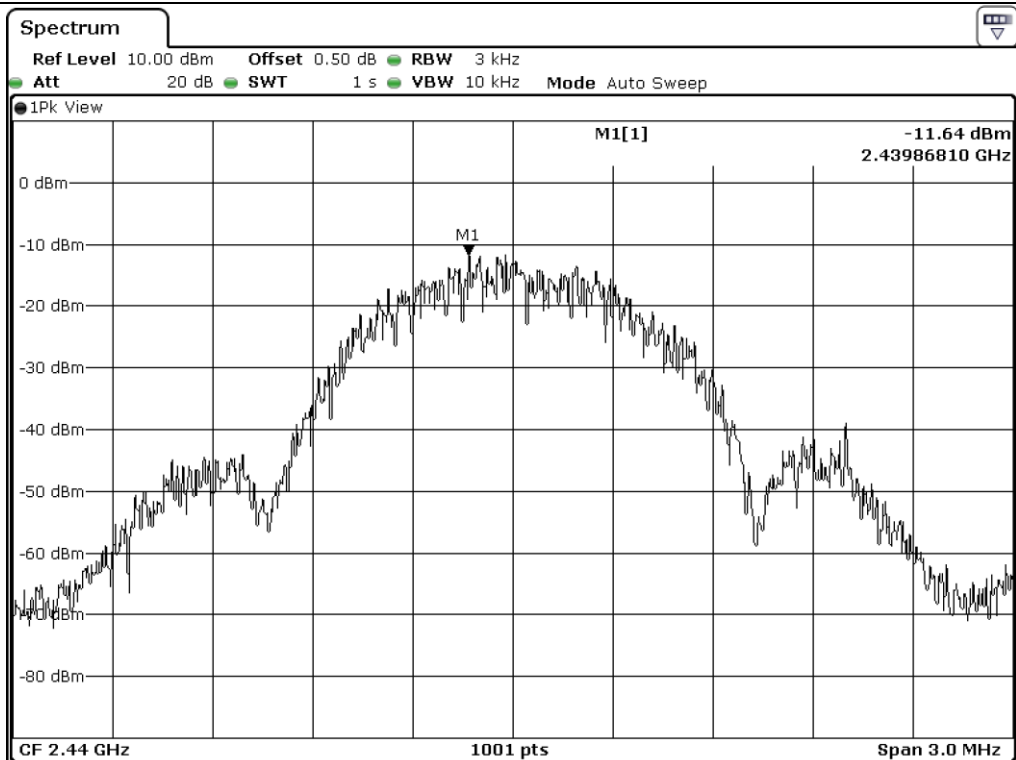
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402	-12.11	8.00	20.11
Middle	2 440	-11.64	8.00	19.64
High	2 480	-10.74	8.00	18.74

Remark. Margin = Limit – Measured value

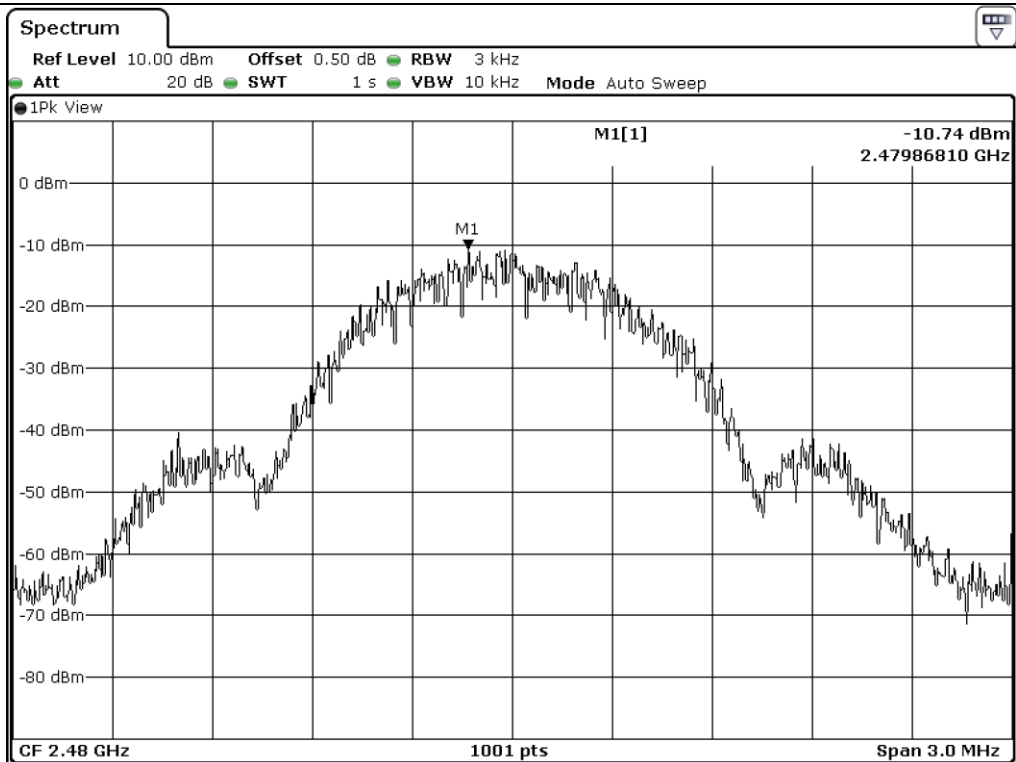


Tested by: Hyung-Kwon, Oh / Engineer





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : (21 ~ 22) °C
Relative humidity : (47 ~ 48) % 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	102209	May 31, 2016 (1Y)
■ - DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
■ - MA-4000XPET	Innco System	Antenna Master	MA4000/509	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 ~ 46) % R.H.

Temperature: (23 ~ 24) °C

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

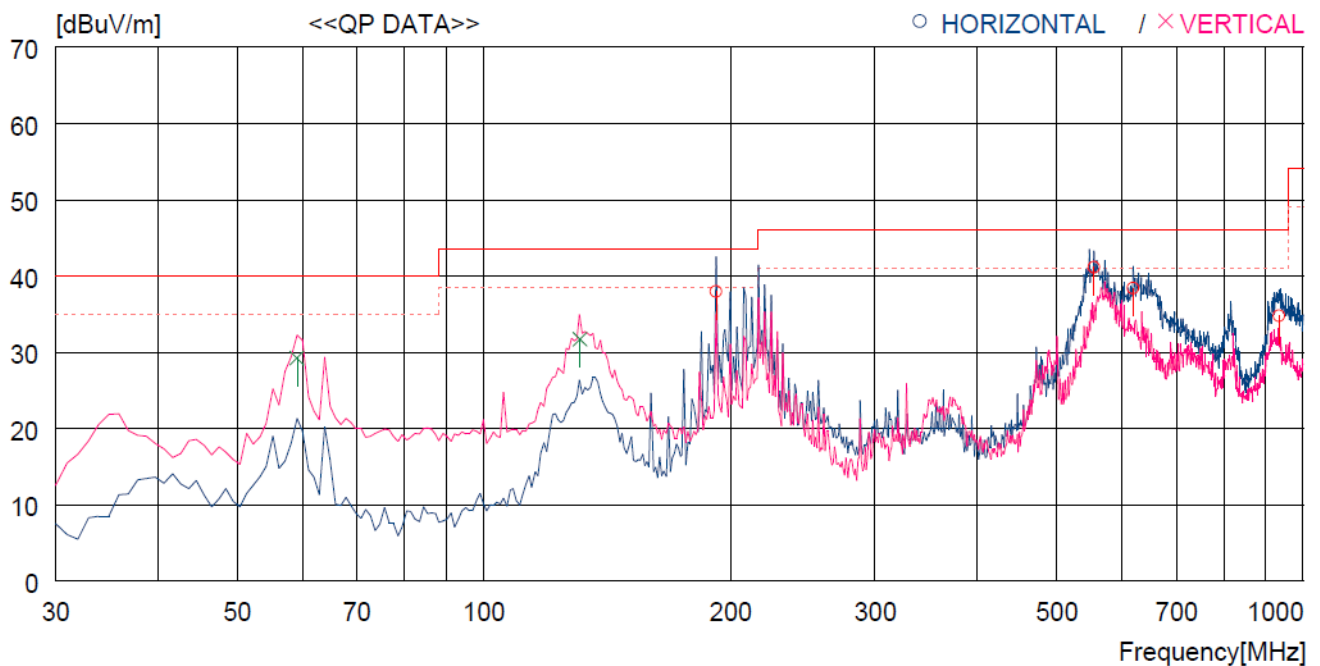
Result : PASSED

EUT : Bluetooth LE Module

Date: February 09, 2017

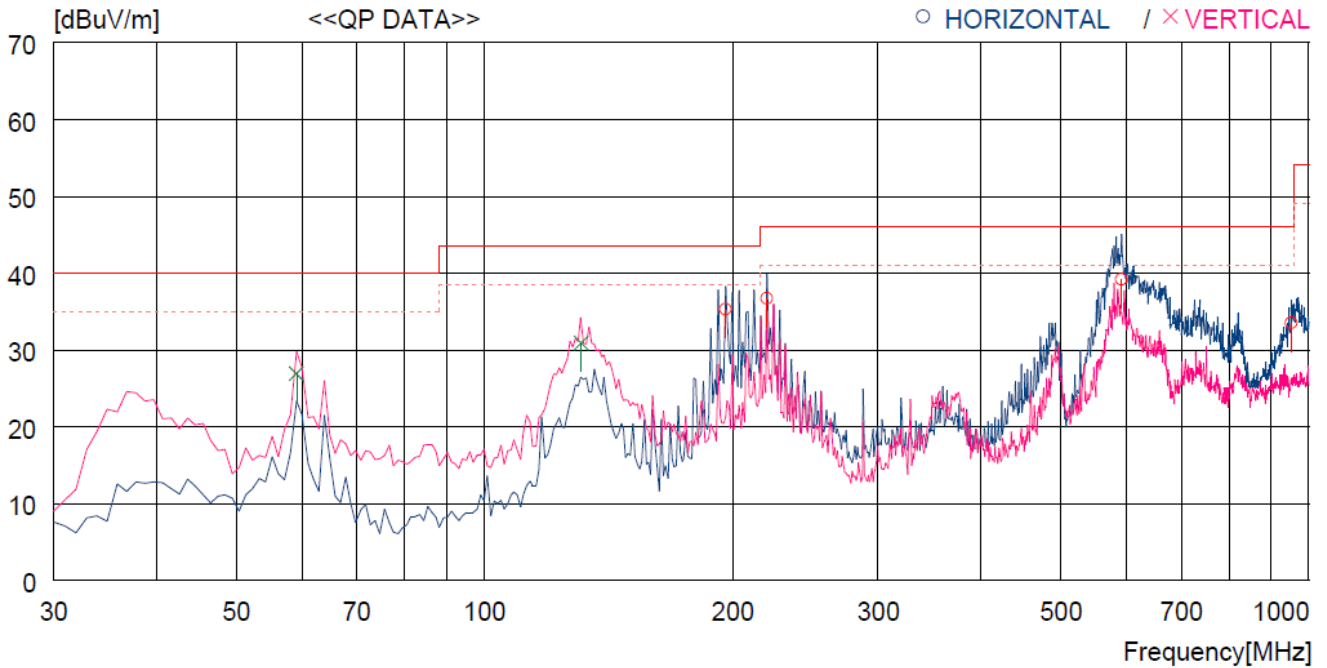
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Operating condition : Low Channel



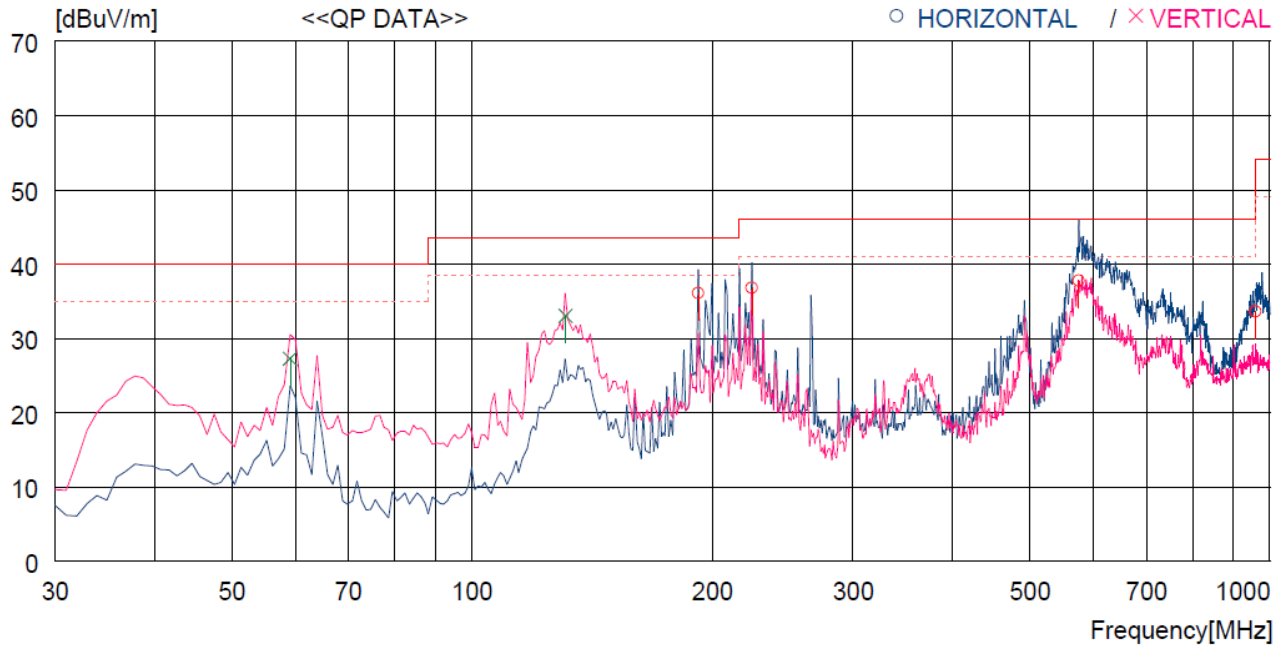
No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	191.990	57.1	10.1	3.7	33.0	37.9	43.5	5.6	100	0
2	555.739	49.5	18.2	6.8	33.4	41.1	46.0	4.9	100	301
3	619.757	46.1	19.1	6.7	33.5	38.4	46.0	7.6	100	162
4	934.028	36.4	22.1	8.6	32.4	34.7	46.0	11.3	100	0
----- Vertical -----										
5	59.100	46.8	13.3	2.1	33.0	29.2	40.0	10.8	100	77
6	130.880	52.7	9.0	3.1	33.1	31.7	43.5	11.8	100	359

Operating condition : Middle Channel




No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA TABLE	
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	592.598	47.2	18.9	6.6	33.5	39.2	46.0	6.8	100	161
2	195.870	53.8	10.8	3.7	33.0	35.3	43.5	8.2	100	161
3	220.120	54.3	11.4	4.0	33.0	36.7	46.0	9.3	100	154
4	952.457	34.6	22.4	8.7	32.2	33.5	46.0	12.5	100	265
----- Vertical -----										
5	59.100	44.5	13.3	2.1	33.0	26.9	40.0	13.1	100	358
6	130.880	51.9	9.0	3.1	33.1	30.9	43.5	12.6	100	166

Operating condition : High Channel



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	576.109	45.9	18.5	6.7	33.4	37.7	46.0	8.3	100	153
2	191.990	54.5	10.9	3.7	33.0	36.1	43.5	7.4	100	174
3	224.000	54.3	11.5	4.0	33.0	36.8	46.0	9.2	100	153
4	959.247	34.6	22.4	8.7	32.1	33.6	46.0	12.4	100	266
----- Vertical -----										
5	59.100	44.9	13.3	2.1	33.0	27.3	40.0	12.7	100	72
6	130.880	54.0	9.0	3.1	33.1	33.0	43.5	10.5	100	159


 Tested by: Hyung-Kwon, Oh / Engineer

11.4.2 Test data for Below 30 MHz

- Test Date : February 09, 2017
- 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

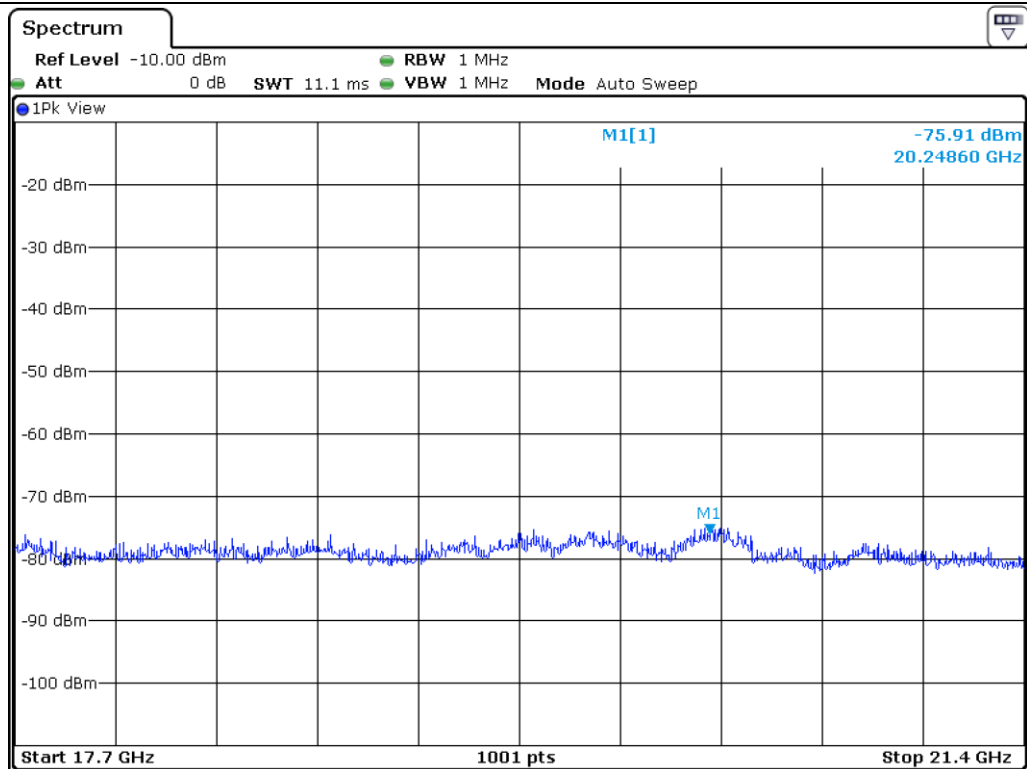
Frequency (MHz)	Reading (dB μ V)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
It was not observed any emissions from the EUT.									

11.4.3 Test data for above 1 GHz

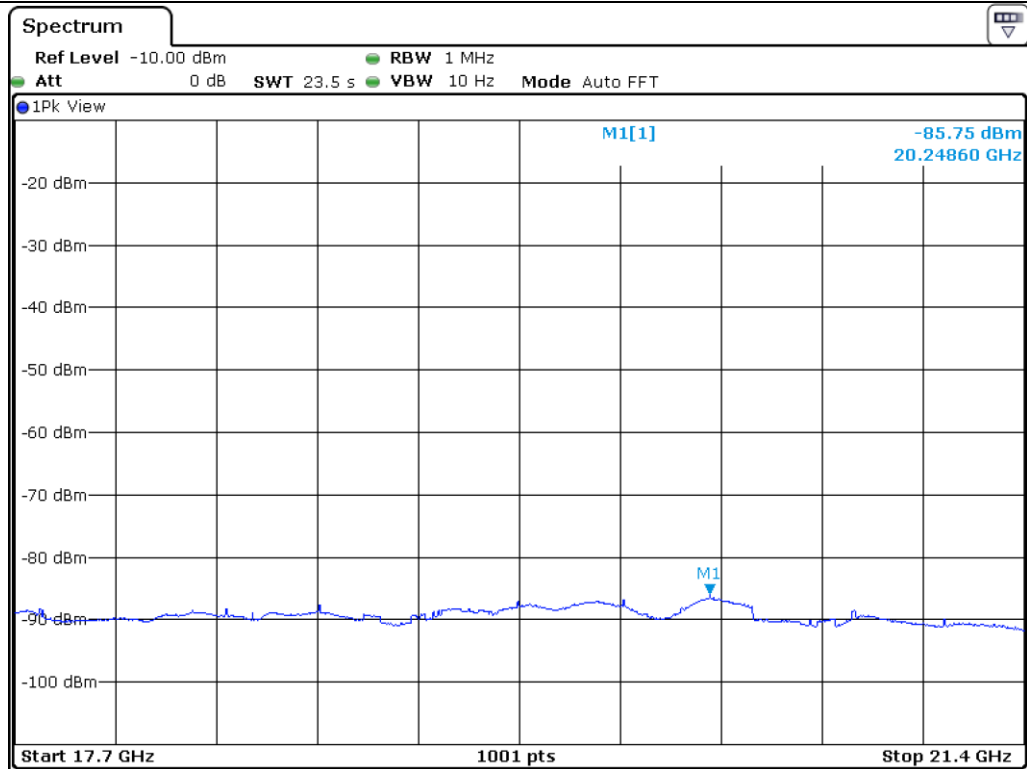
- Test Date : February 08, 2017 ~ February 10, 2017
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Duty Cycle : 100 %
- Result : PASSED

Frequency (MHz)	Reading (dB μ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
20 248.600	31.09	Peak	H	37.54	25.50	52.49	41.64	74.00	32.36
	21.25	Average	H				31.80	54.00	22.20


Tested by: Hyung-Kwon, Oh / Engineer



Peak Data_H



Average Data_H

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : (21 ~ 22) °C
Relative humidity : (47 ~ 48) % 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.

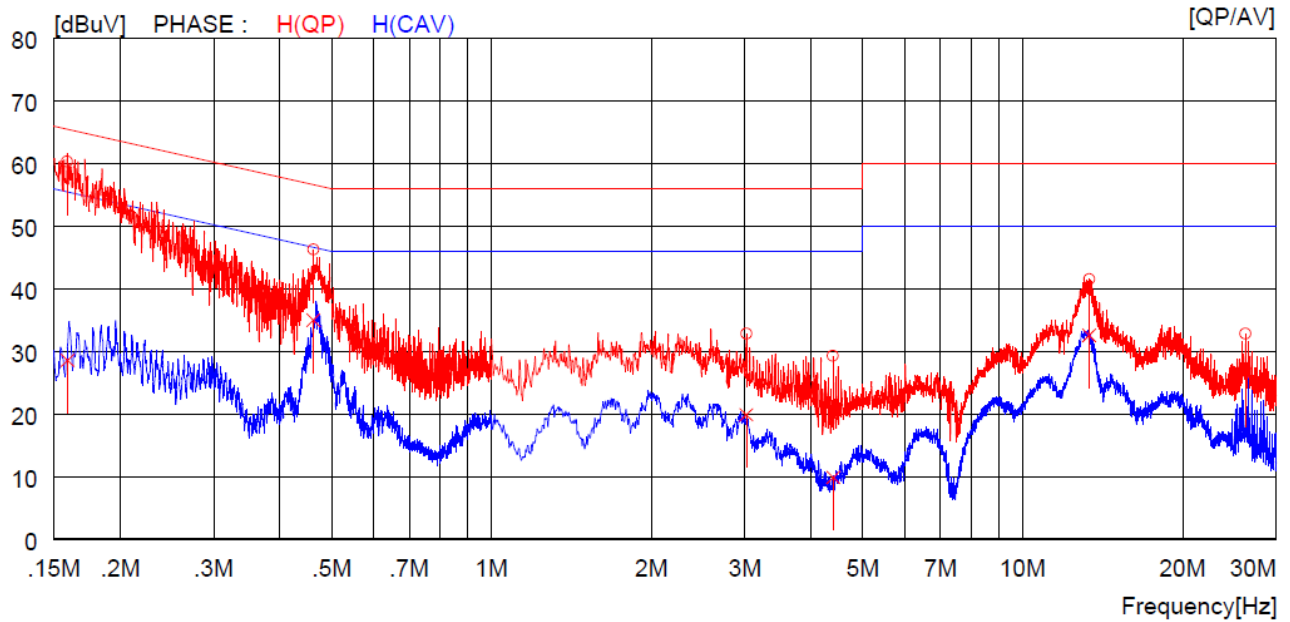
12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESPI	Rohde & Schwarz	EMI Test Receiver	101278	Nov. 01, 2016 (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.

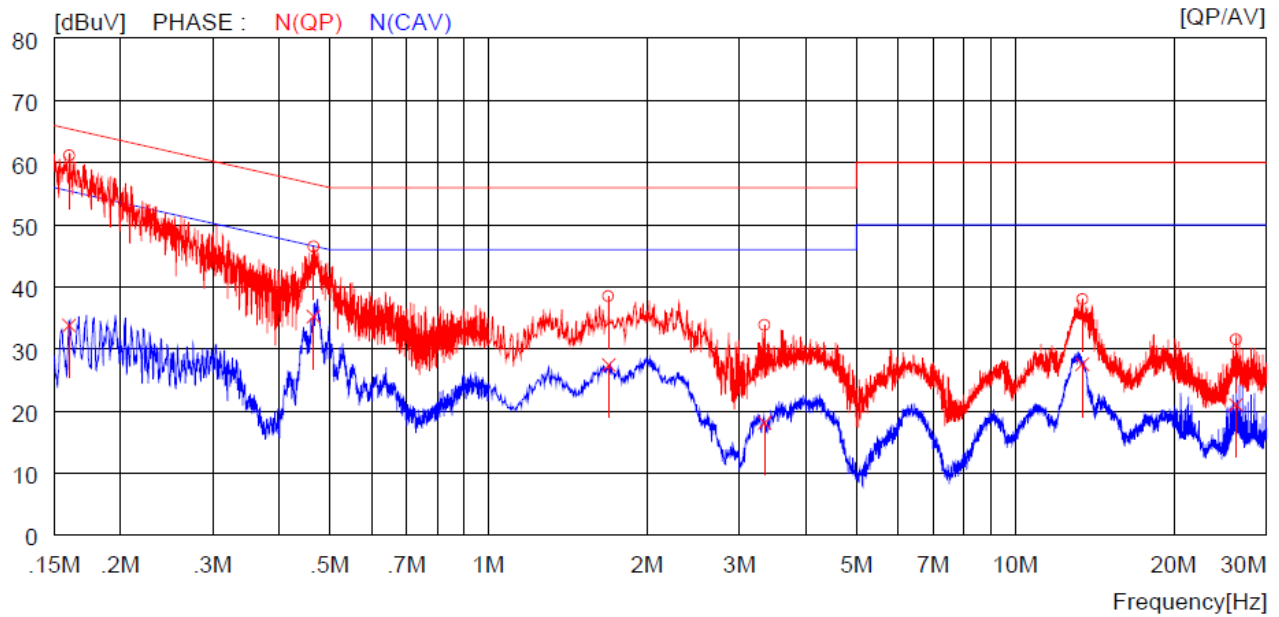
12.4 Test data

- Test Date : February 09, 2017
- 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	0.15900	60.2	----	0.1	60.3	----	65.5	----	5.2	----	H (QP)
2	0.46200	46.2	----	0.1	46.3	----	56.7	----	10.4	----	H (QP)
3	3.02000	32.6	----	0.2	32.8	----	56.0	----	23.2	----	H (QP)
4	4.39600	29.1	----	0.2	29.3	----	56.0	----	26.7	----	H (QP)
5	13.34000	40.9	----	0.6	41.5	----	60.0	----	18.5	----	H (QP)
6	26.27000	32.1	----	0.7	32.8	----	60.0	----	27.2	----	H (QP)
7	0.15900	----	28.5	0.1	----	28.6	----	55.5	----	26.9	H (CAV)
8	0.46200	----	34.9	0.1	----	35.0	----	46.7	----	11.7	H (CAV)
9	3.02000	----	19.7	0.2	----	19.9	----	46.0	----	26.1	H (CAV)
10	4.39600	----	9.7	0.2	----	9.9	----	46.0	----	36.1	H (CAV)
11	13.34000	----	32.0	0.6	----	32.6	----	50.0	----	17.4	H (CAV)
12	26.27000	----	25.7	0.7	----	26.4	----	50.0	----	23.6	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	0.16000	61.0	----	0.1	61.1	----	65.5	----	4.4	----	N (QP)
2	0.46600	46.4	----	0.1	46.5	----	56.6	----	10.1	----	N (QP)
3	1.69200	38.4	----	0.1	38.5	----	56.0	----	17.5	----	N (QP)
4	3.34400	33.7	----	0.2	33.9	----	56.0	----	22.1	----	N (QP)
5	13.41000	37.4	----	0.6	38.0	----	60.0	----	22.0	----	N (QP)
6	26.27000	30.8	----	0.7	31.5	----	60.0	----	28.5	----	N (QP)
7	0.16000	----	33.7	0.1	----	33.8	----	55.5	----	21.7	N (CAV)
8	0.46600	----	35.1	0.1	----	35.2	----	46.6	----	11.4	N (CAV)
9	1.69200	----	27.3	0.1	----	27.4	----	46.0	----	18.6	N (CAV)
10	3.34400	----	17.9	0.2	----	18.1	----	46.0	----	27.9	N (CAV)
11	13.41000	----	26.9	0.6	----	27.5	----	50.0	----	22.5	N (CAV)
12	26.27000	----	20.3	0.7	----	21.0	----	50.0	----	29.0	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: Hyung-Kwon, Oh / Engineer