

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

Test Report No. : W156R-D001

AGR No. : A155A-208

Applicant : PROCHILD INC.
Address : RM.806, 8FL, KURO ACE TECHNO TOWER #197-48, KURO, KURO-GU,
SEOUL, 152-053, Korea

Manufacturer : PROCHILD INC.
Address : RM.806, 8FL, KURO ACE TECHNO TOWER #197-48, KURO, KURO-GU,
SEOUL, 152-053, Korea

Type of Equipment : Bluetooth LE Module

FCC ID. : 2AEEY-PBLN51822M

Model Name : PBLN51822m

Serial number : N/A

Total page of Report : 35 pages (including this page)

Date of Incoming : May 25, 2015

Date of issue : June 03, 2015

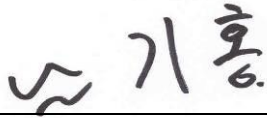
SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

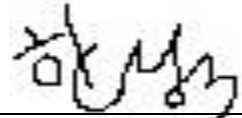
This test report only contains the result of a single test of the sample supplied for the examination.

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.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	5
2. TEST SUMMARY	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	6
2.5 TEST METHODOLOGY.....	6
2.6 TEST FACILITY.....	6
3. GENERAL INFORMATION	7
3.1 PRODUCT DESCRIPTION.....	7
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	7
4. EUT MODIFICATIONS.....	7
5. SYSTEM TEST CONFIGURATION	8
5.1 JUSTIFICATION.....	8
5.2 PERIPHERAL EQUIPMENT	8
5.3 MODE OF OPERATION DURING THE TEST	8
5.4 CONFIGURATION OF TEST SYSTEM.....	9
5.5 ANTENNA REQUIREMENT	9
6. PRELIMINARY TEST	9
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	9
6.2 GENERAL RADIATED EMISSIONS TESTS	9
7. MIMIMUM 6 DB BANDWIDTH	10
7.1 OPERATING ENVIRONMENT	10
7.2 TEST SET-UP	10
7.3 TEST EQUIPMENT USED.....	10
7.4 TEST DATA.....	11
8. MAXIMUM PEAK OUTPUT POWER	13
8.1 OPERATING ENVIRONMENT	13
8.2 TEST SET-UP	13
8.3 TEST EQUIPMENT USED.....	13
8.4 TEST DATA.....	14

9. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....	16
9.1 OPERATING ENVIRONMENT	16
9.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	16
9.3 TEST SET-UP FOR RADIATED MEASUREMENT.....	16
9.4 TEST EQUIPMENT USED	16
9.5 TEST DATA FOR CONDUCTED EMISSION	17
9.6 TEST DATA FOR RADIATED EMISSION.....	22
<i>9.6.1 Radiated Emission which fall in the Restricted Band.....</i>	<i>22</i>
<i>9.6.2 Spurious & Harmonic Radiated Emission.....</i>	<i>23</i>
10. PEAK POWER SPECTRAL DENSITY	25
10.1 OPERATING ENVIRONMENT	25
10.2 TEST SET-UP	25
10.3 TEST EQUIPMENT USED	25
10.4 TEST DATA.....	26
11. RADIATED EMISSION TEST	28
11.1 OPERATING ENVIRONMENT	28
11.2 TEST SET-UP	28
11.3 TEST EQUIPMENT USED	28
11.4 TEST DATA FOR TRANSMITTING MODE	29
<i>11.4.1 Test data for 30 MHz ~ 1 GHz</i>	<i>29</i>
<i>11.4.2 Test data for Below 30 MHz</i>	<i>32</i>
<i>11.4.3 Test data for above 1 GHz</i>	<i>32</i>
12. CONDUCTED EMISSION TEST.....	33
12.1 OPERATING ENVIRONMENT	33
12.2 TEST SET-UP	33
12.3 TEST EQUIPMENT USED	33
12.4 TEST DATA.....	34

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W156R-D001	June 03, 2015	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : PROCHILD INC.

Address : RM.806, 8FL, KURO ACE TECHNO TOWER #197-48, KURO, KURO-GU, SEOUL, 152-053, Korea

Contact Person : Se-Wook Shin / Manager

Telephone No. : +82-2-2619-9662

FCC ID : 2AEEY-PBLN51822M

Model Name : PBLN51822m

Brand Name : 

Serial Number : N/A

Date : June 03, 2015

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
KIND OF EQUIPMENT	Modular Transmitter
E.U.T. DESCRIPTION	Bluetooth LE Module
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 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

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

-. Site Accreditation:

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The PROCHILD INC., Model PBLN51822m (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	-25 °C ~ +75 °C
Operating Frequency	2 402 MHz ~ 2 480 MHz
RF Output Power	-9.91 dBm
Number of Channel	40 Channel
Modulation Type	GFSK
Antenna Type	Chip Antenna
USED RF CHIP	Marker: Nordic Semiconductor Model Name: nRF51822
Antenna Gain	-3.81 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32 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	PROCHILD INC.	PBLN51822m	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
PBLN51822m	PROCHILD INC.	Bluetooth LE Module (EUT)	Jig Board
EK Extension Board	PROCHILD INC.	Jig Board	Notebook PC
R510	LG	Notebook PC	Jig Board
PA-1900-08	Dongguang Lite Power 2nd Plant	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 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 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 Chip 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

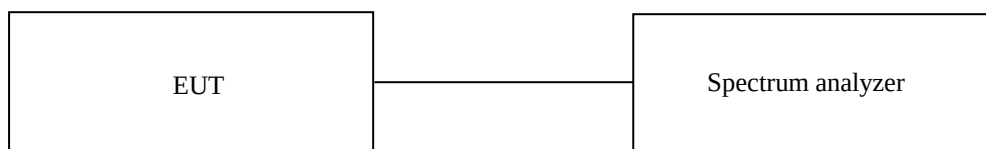
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % 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. (Interval)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 29, 2015(1Y)

All test equipment used is calibrated on a regular basis.

7.4 Test data

-. Test Date : May 27, 2015

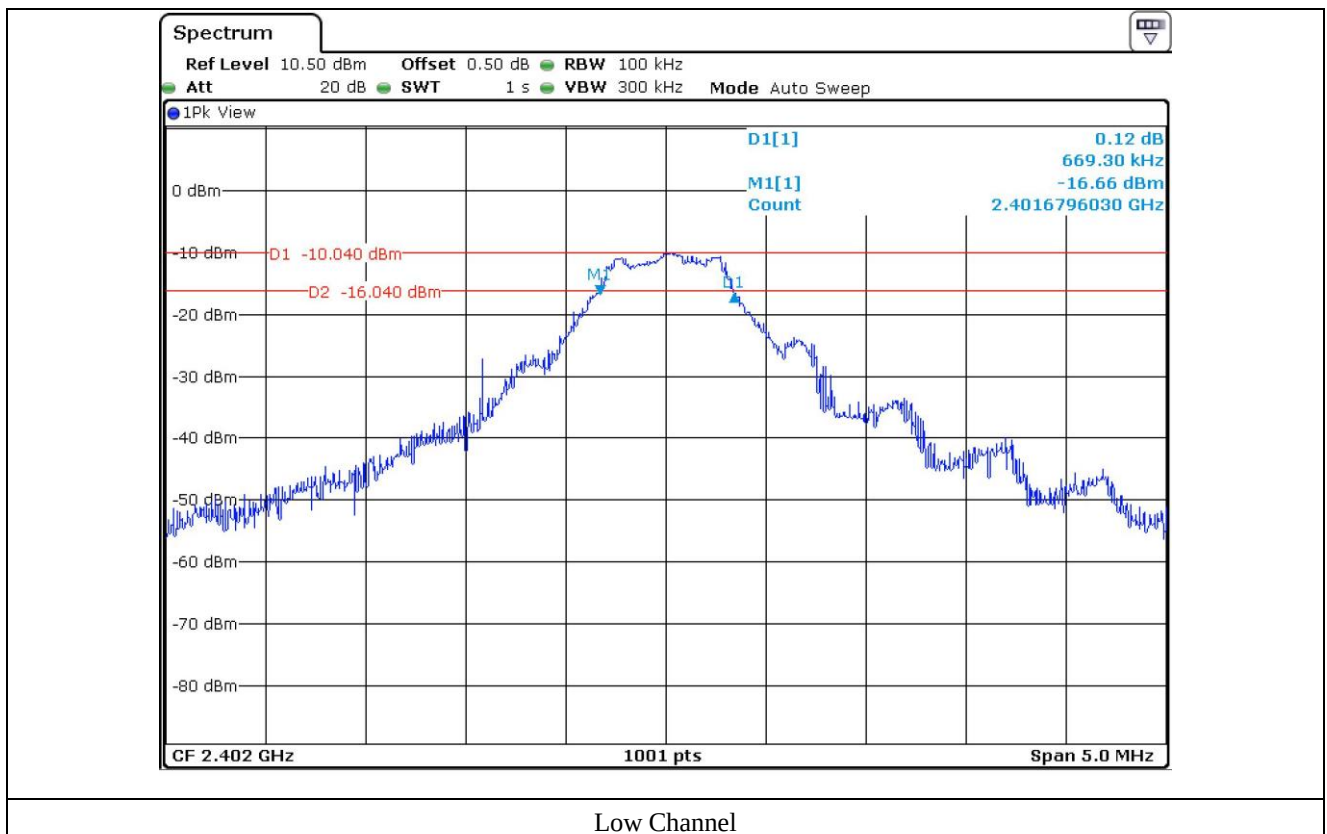
-. Test Result : Pass

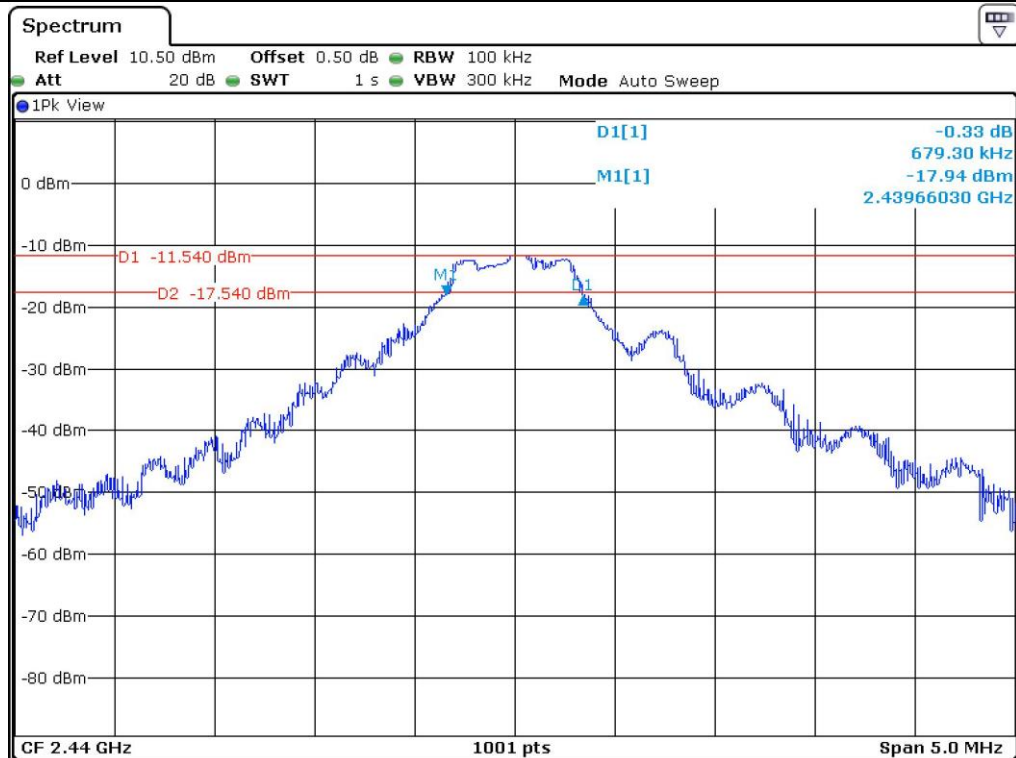
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402	669.30	500	169.30
Middle	2 440	679.30	500	179.30
High	2 480	694.30	500	194.30

Remark. Margin = Measured Value - Limit

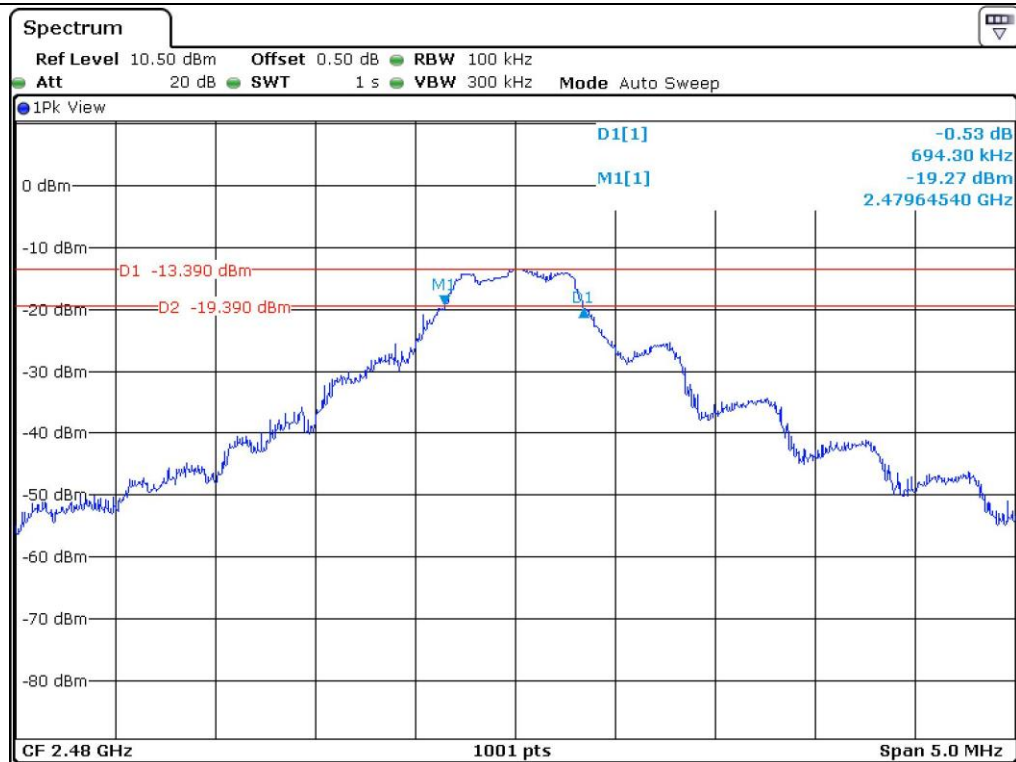


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

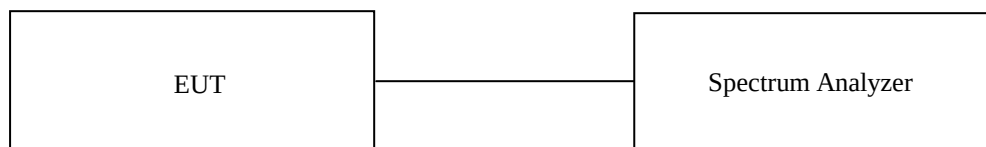
8.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % 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. (Interval)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 29, 2015(1Y)

All test equipment used is calibrated on a regular basis.

8.4 Test data

-. Test Date : May 27, 2015

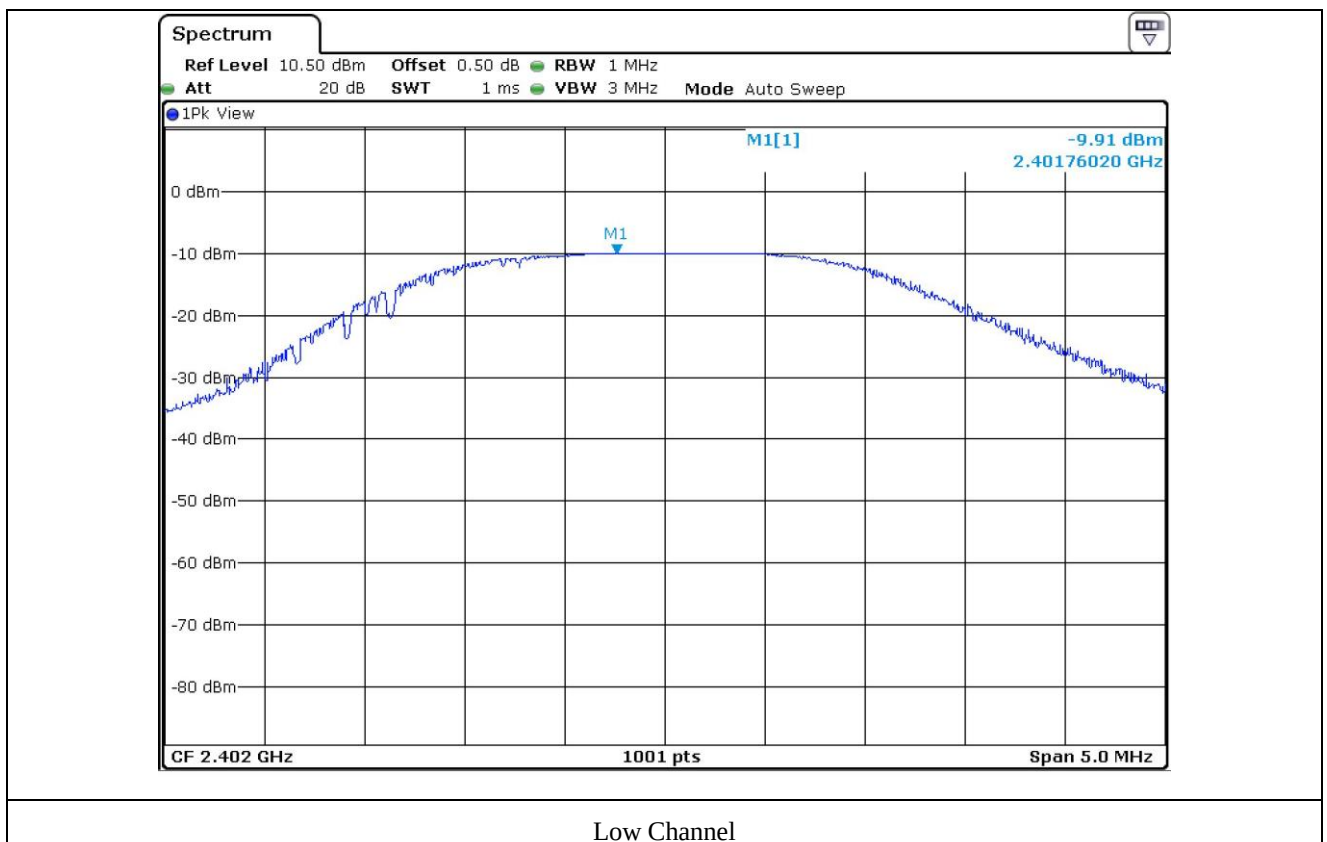
-. Test Result : Pass

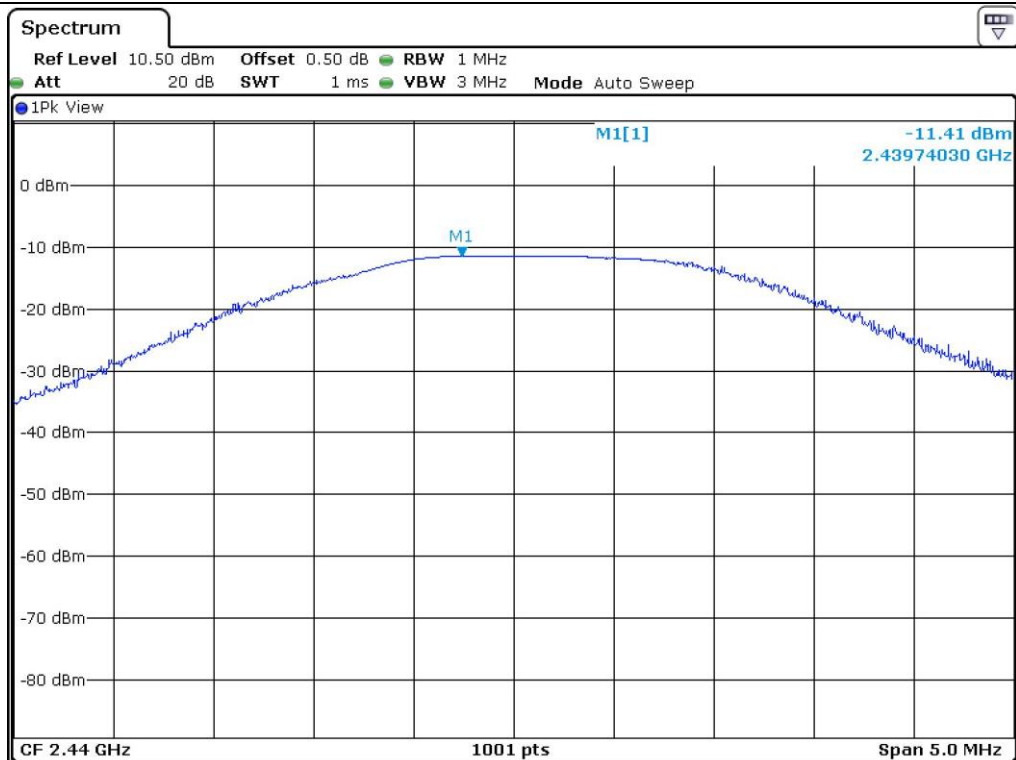
CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	-9.91	30	39.91
MIDDLE	2 440	-11.41	30	41.41
HIGH	2 480	-13.24	30	43.24

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

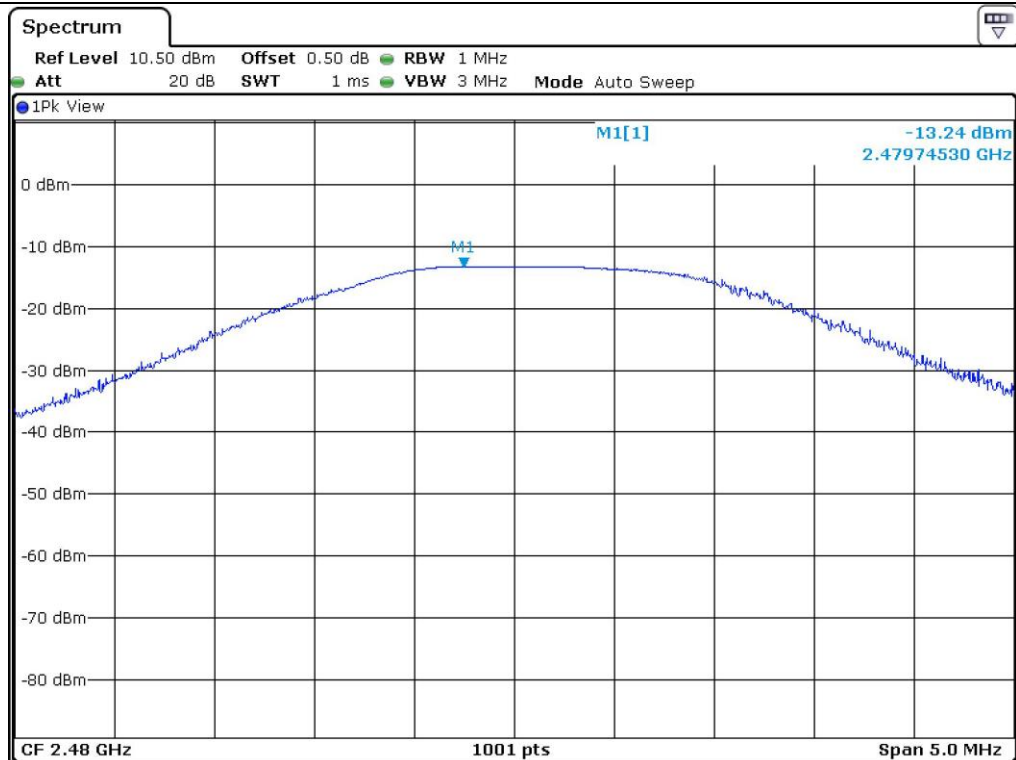


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % 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.

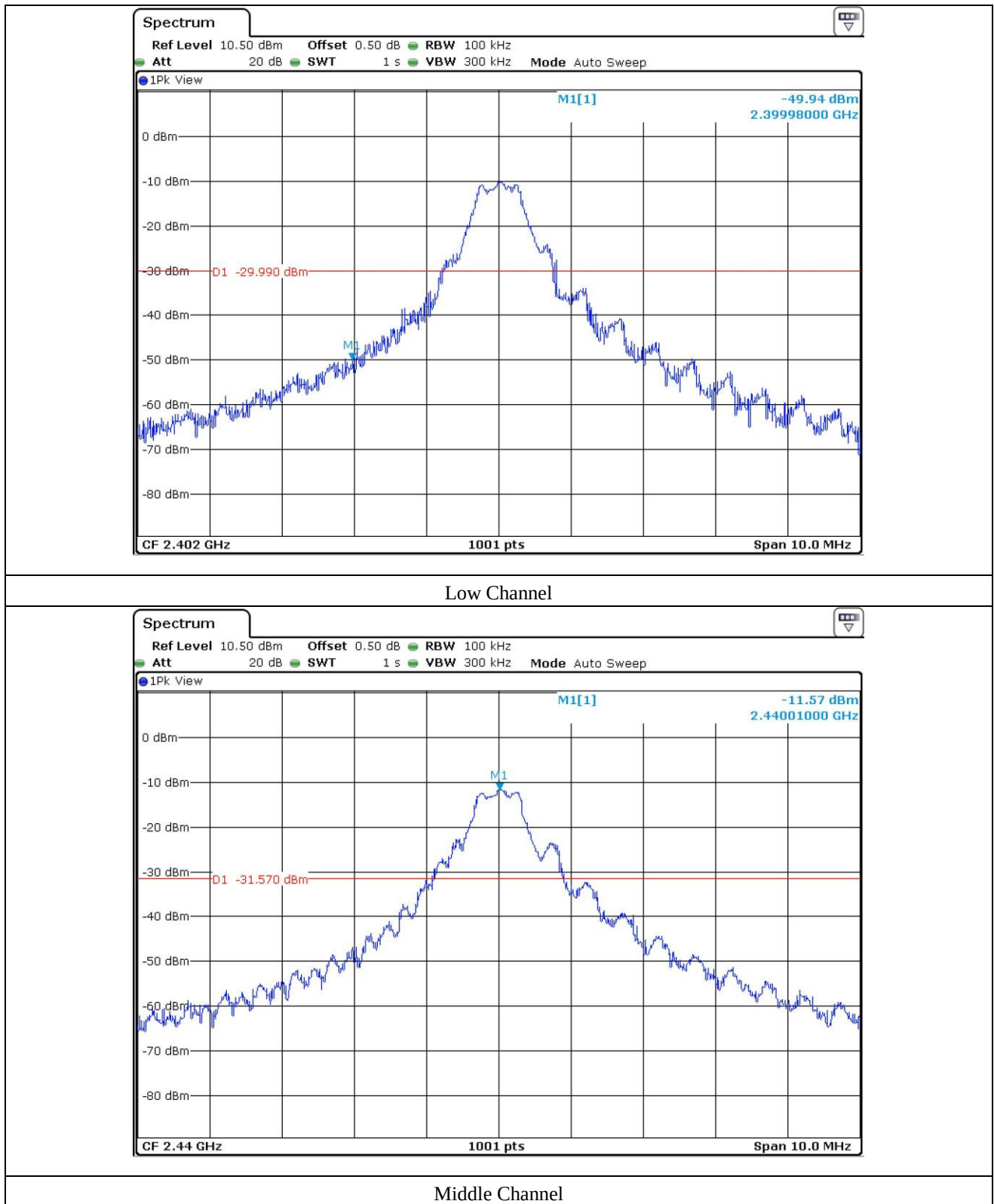
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal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

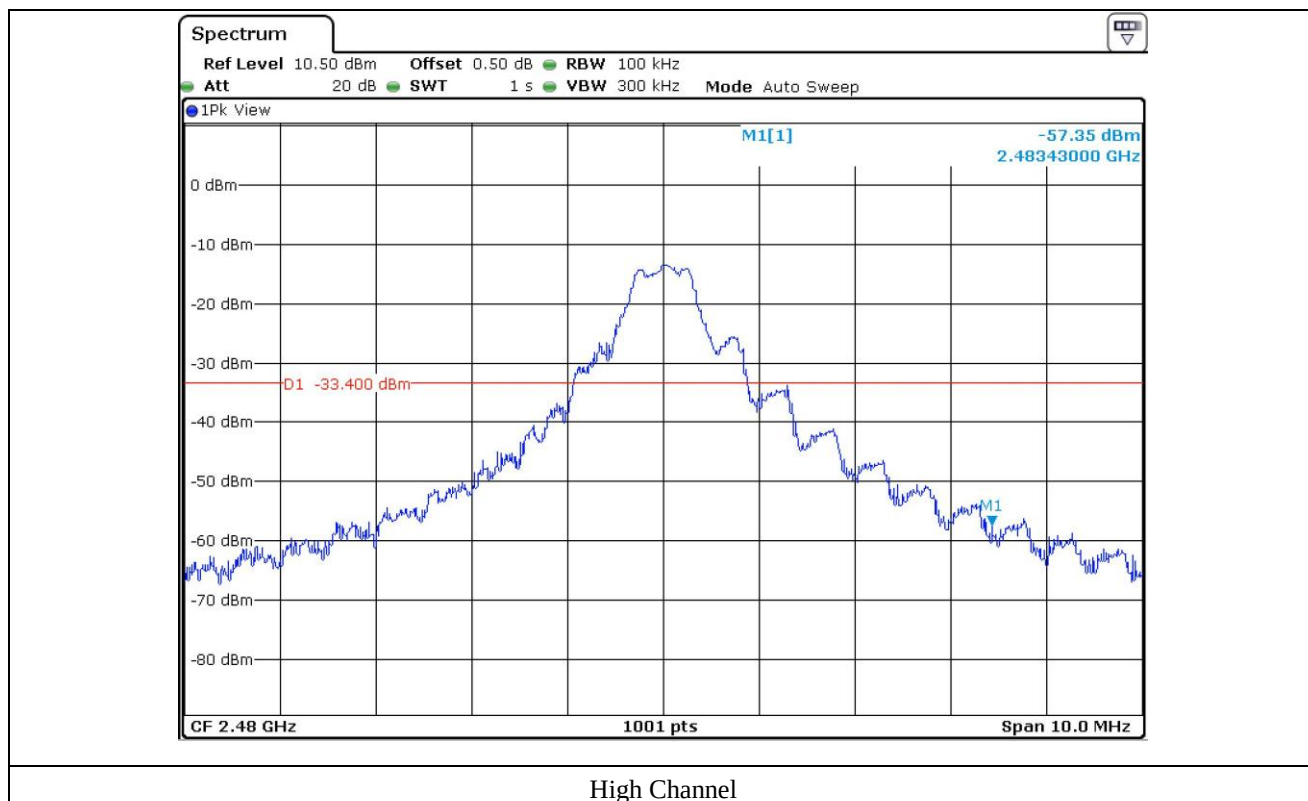
9.4 Test equipment used

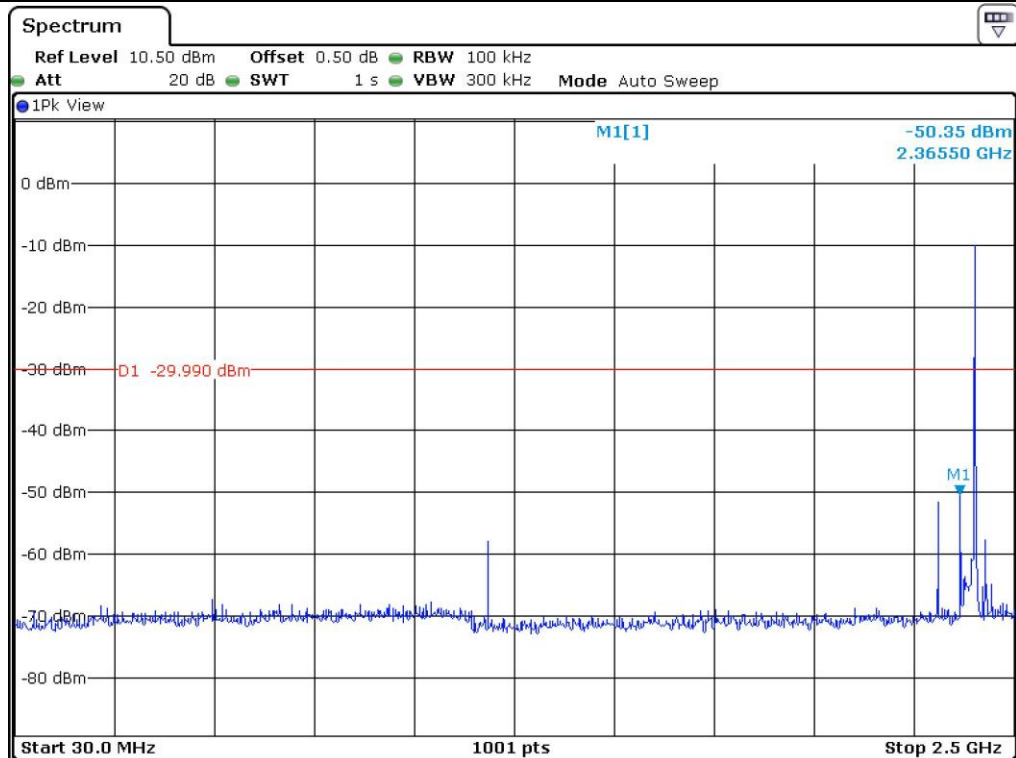
	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
□ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Nov. 03, 2014(1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 29, 2015(1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Apr. 28, 2015(1Y)
□ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Oct. 08, 2014(1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 29, 2015(1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2015(1Y)
■ -	SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Nov. 25, 2014(1Y)
■ -	MA240	HD GmbH	Antenna Master	N/A	N/A
■ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DS420S	HD GmbH	Turn Table	N/A	N/A
■ -	HFH2-Z2	Rohde & Schwarz	Loop Antenna	879 285/26	Dec. 09, 2014(2Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May 02, 2014(2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Sep. 05, 2013(2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Apr. 30, 2015(2Y)
■ -	83051A	Agilent	Microwave System Preamplifier	3950M00201	Apr. 30, 2015(2Y)

All test equipment used is calibrated on a regular basis.

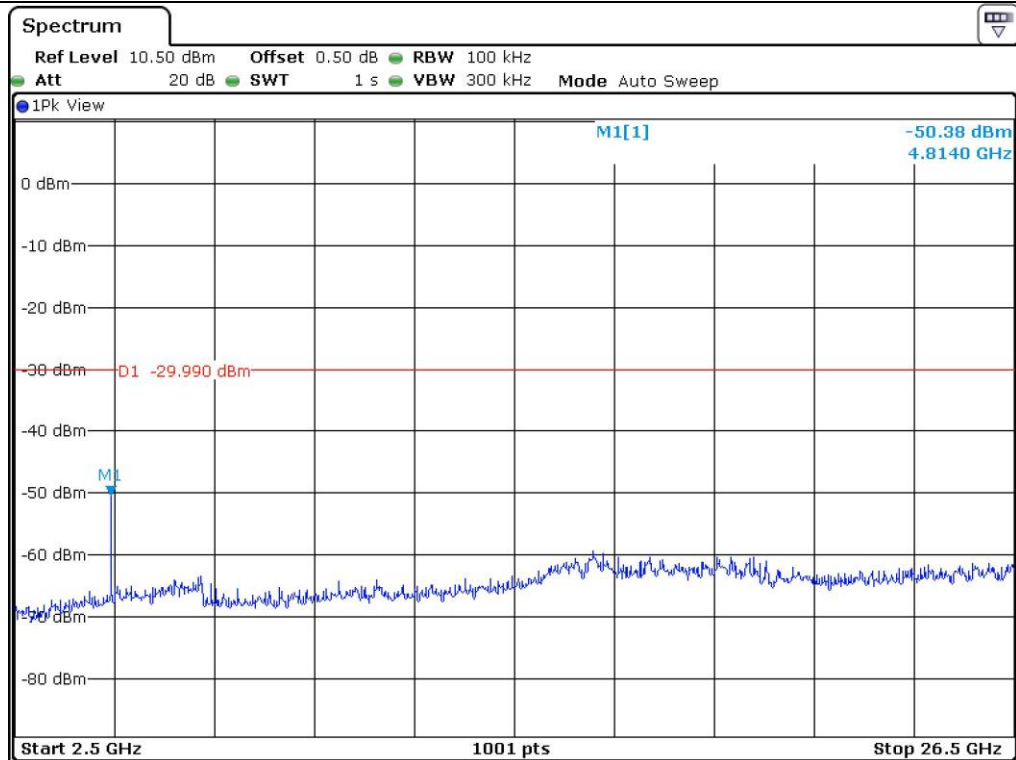
9.5 Test data for conducted emission



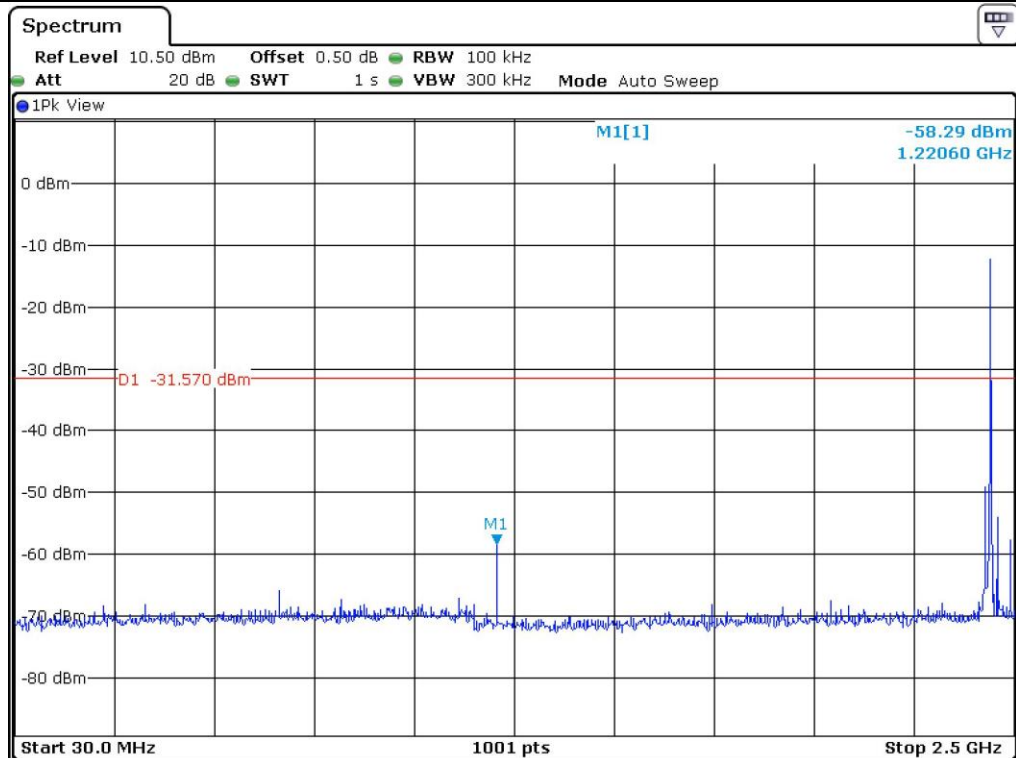




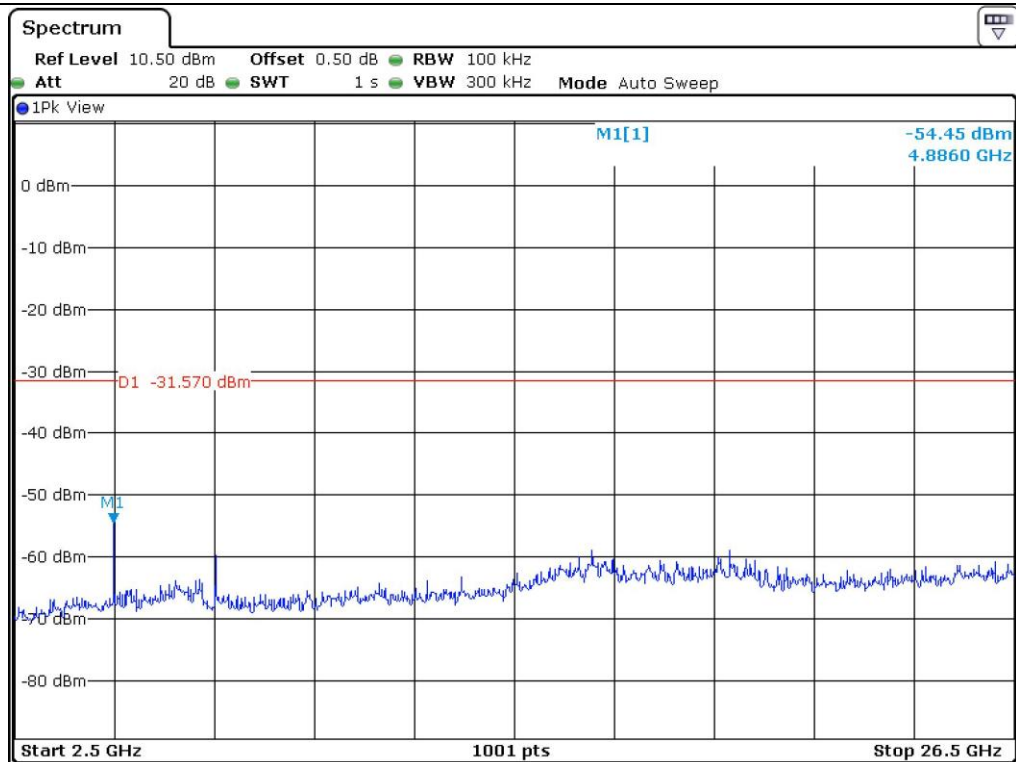
Low Channel



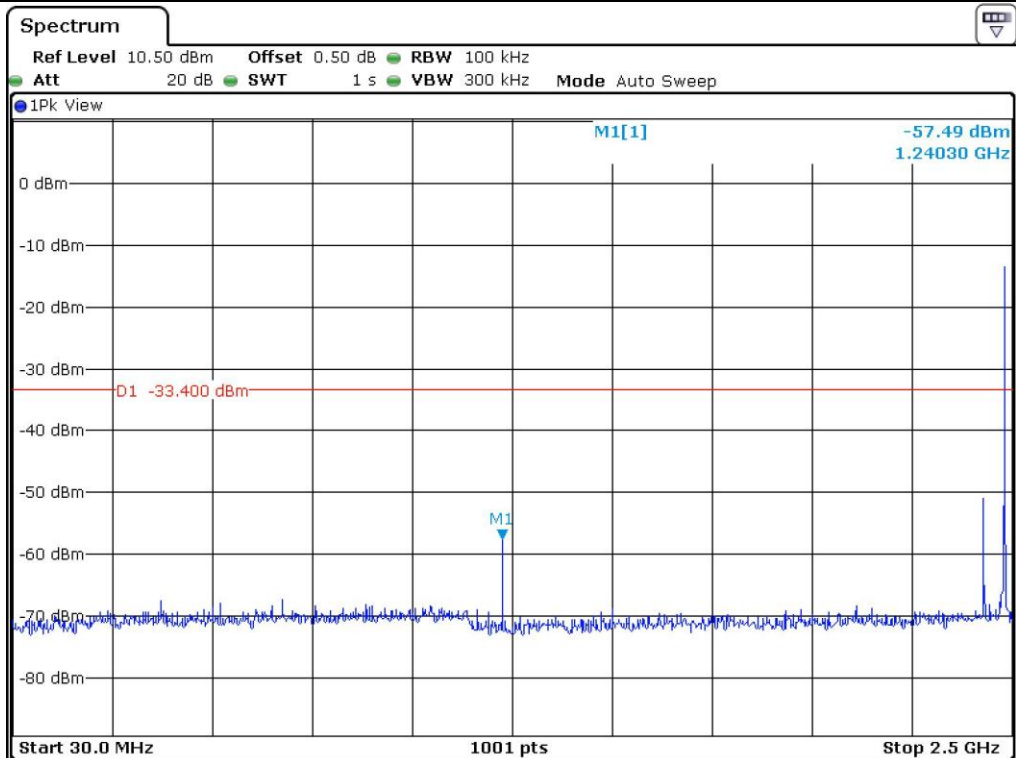
Low Channel



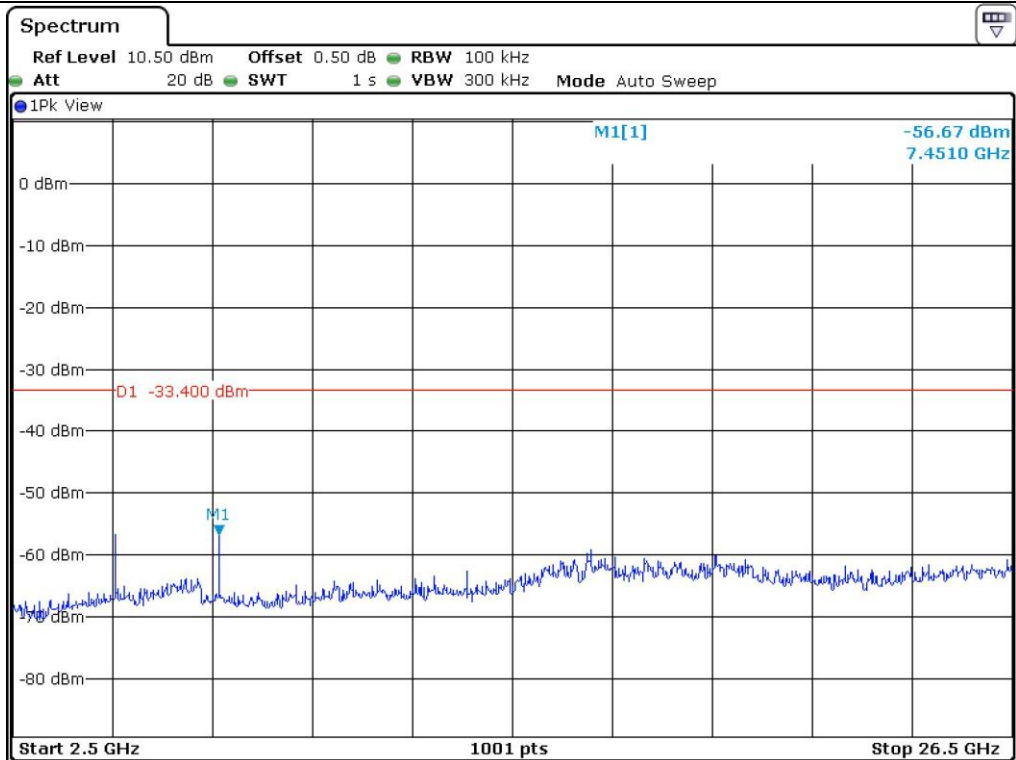
Middle Channel



Middle Channel



High Channel



High Channel

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

- Test Date : May 28, 2015
- 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 (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									
2 388.64	54.15	Peak	H	27.10	7.50	43.00	45.75	74.00	28.25
	34.83	Average	H				26.43	54.00	27.57
2 388.64	52.08	Peak	V				43.68	74.00	30.32
	34.76	Average	V				26.36	54.00	27.64
Test Data for Low Channel									
2 400.00	53.78	Peak	H	27.11	7.51	43.00	45.40	74.00	28.60
	34.64	Average	H				26.26	54.00	27.74
	53.83	Peak	V				45.45	74.00	28.55
	34.70	Average	V				26.32	54.00	27.68
Test Data for High Channel									
2 490.64	53.73	Peak	H	27.20	7.60	43.10	45.43	74.00	28.57
	34.67	Average	H				26.37	54.00	27.63
2 487.65	52.11	Peak	V				43.81	74.00	30.19
	34.70	Average	V				26.40	54.00	27.60

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: Tae-Ho, Kim / Senior Engineer

9.6.2 Spurious & Harmonic Radiated Emission

- Test Date : May 28, 2015
- 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									
2 402.00	88.47	Peak	H	27.00	7.50	42.80	80.17	-	-
	86.85	Peak	V				78.55	-	-
4 804.00	48.24	Peak	H	30.60	11.10	42.50	47.44	74.00	26.56
	34.74	Average	H				33.94	54.00	20.06
	47.98	Peak	V				47.18	74.00	26.82
	34.64	Average	V				33.84	54.00	20.16
Test Data for Middle Channel									
2 440.00	84.55	Peak	H	27.20	7.60	42.80	76.55	-	-
	85.50	Peak	V				77.50	-	-
4 880.00	47.58	Peak	H	30.70	11.20	42.50	46.98	74.00	27.02
	34.58	Average	H				33.98	54.00	20.02
	47.33	Peak	V				46.73	74.00	27.27
	34.87	Average	V				34.27	54.00	19.73

Test Data for High Channel									
2 480.00	82.94	Peak	H	27.40	7.70	42.90	75.14	-	-
	83.86	Peak	V				76.06	-	-
4 960.00	48.02	Peak	H	30.80	11.30	42.50	47.62	74.00	26.38
	34.59	Average	H				34.19	54.00	19.81
	47.84	Peak	V				47.44	74.00	26.56
	34.71	Average	V				34.31	54.00	19.69

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: Tae-Ho, Kim / Senior Engineer

10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % 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. (Interval)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 29, 2015(1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data

-. Test Date : May 27, 2015

-. Test Result : Pass

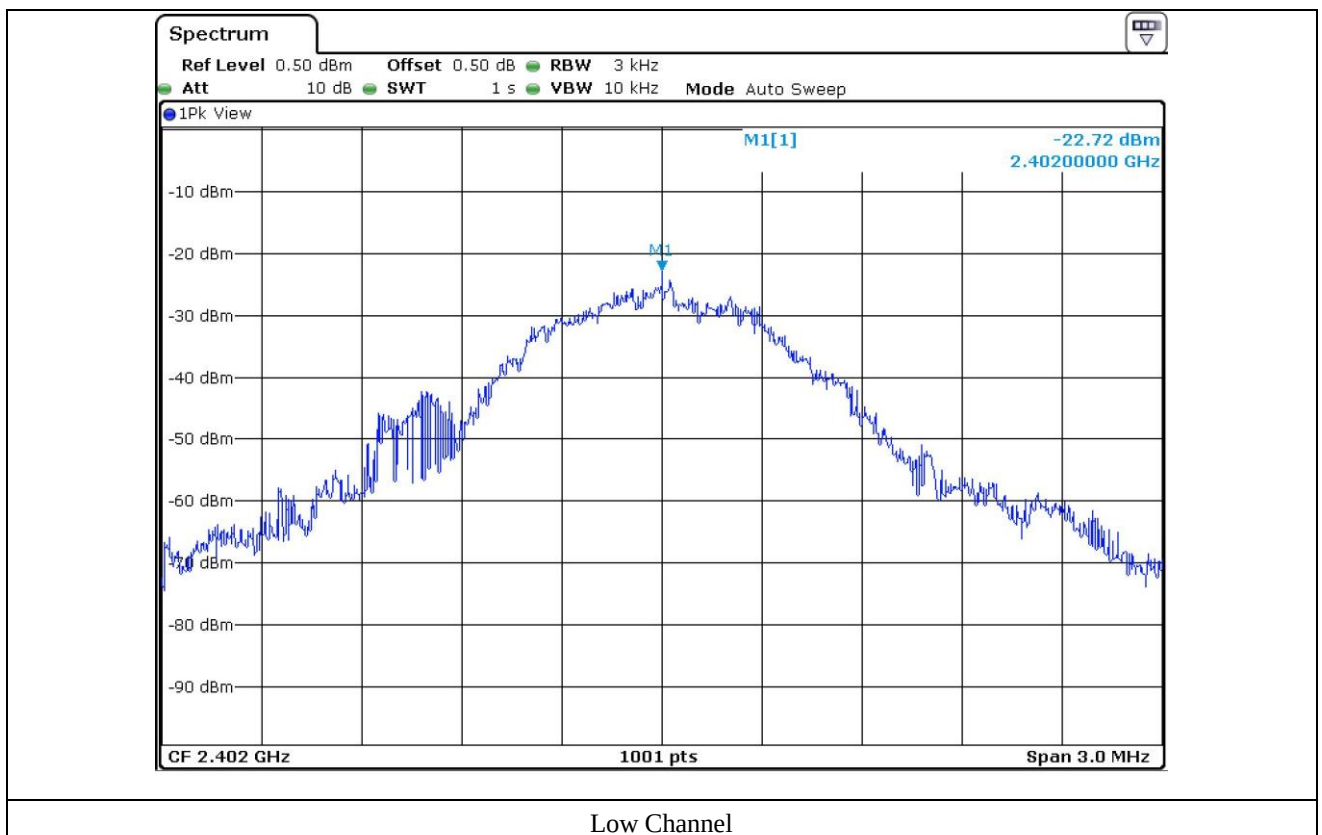
-. Operating Condition : Continuous transmitting mode

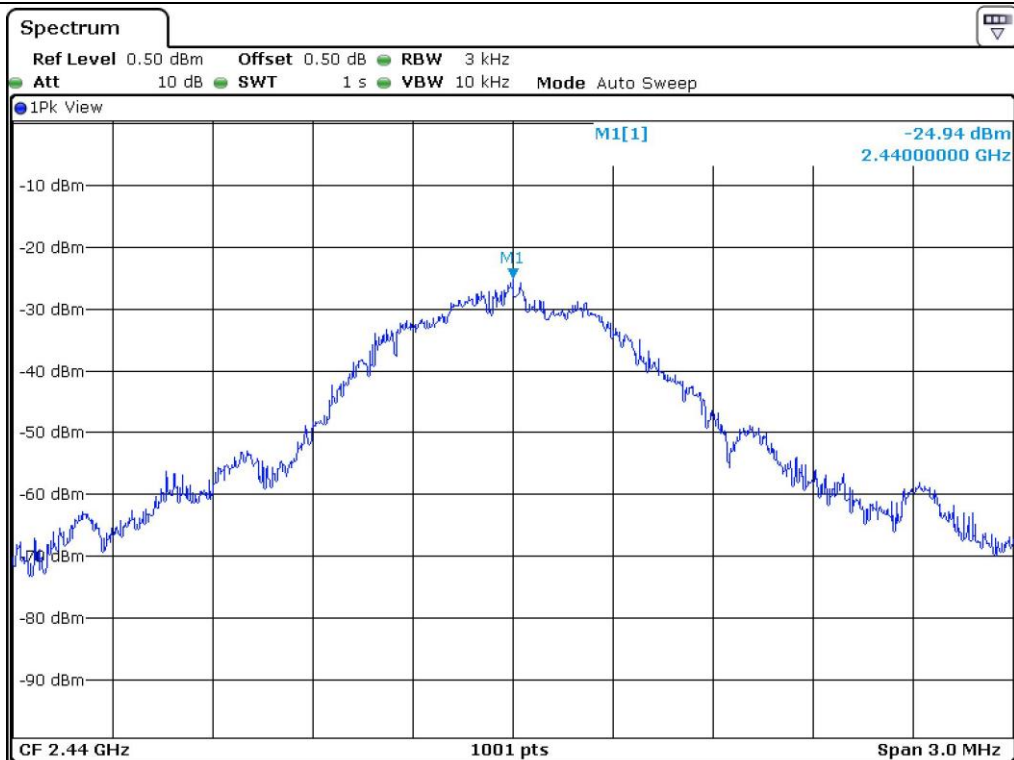
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402	-22.72	8.00	30.72
Middle	2 440	-24.94	8.00	32.94
High	2 480	-27.14	8.00	35.14

Remark. Margin = Limit – Measured value

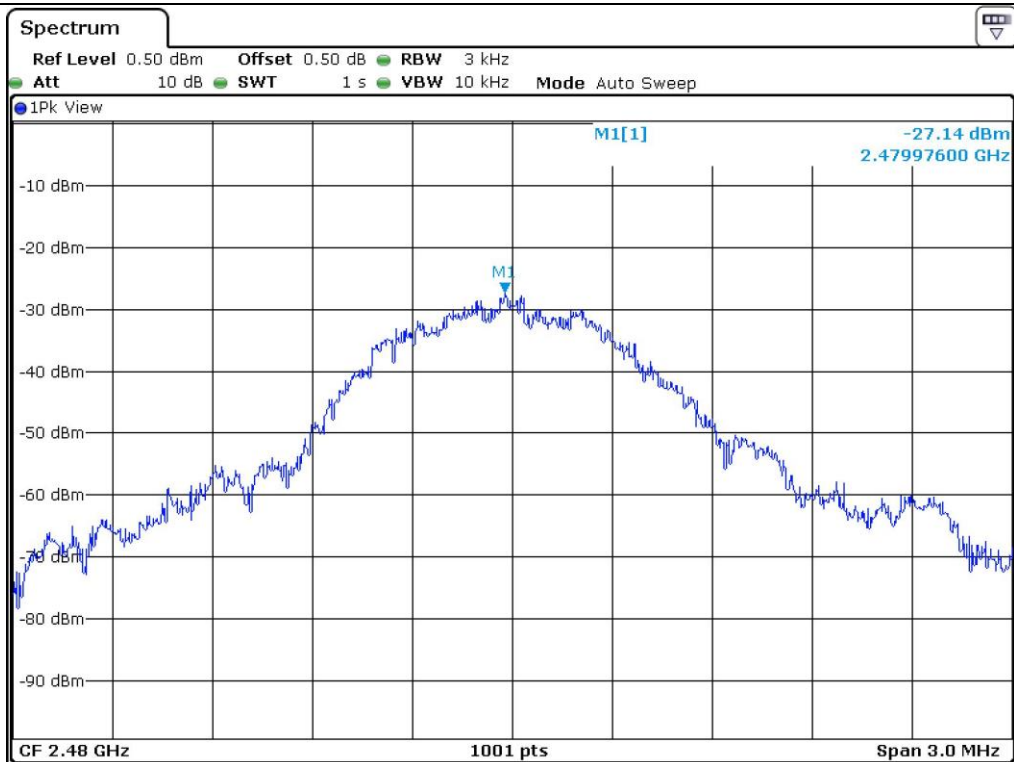


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % 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	Nov. 03, 2014(1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 29, 2015(1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Apr. 28, 2015(1Y)
□ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Oct. 08, 2014(1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 29, 2015(1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2015(1Y)
■ -	SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Nov. 25, 2014(1Y)
■ -	MA240	HD GmbH	Antenna Master	N/A	N/A
■ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DS420S	HD GmbH	Turn Table	N/A	N/A
■ -	HFH2-Z2	Rohde & Schwarz	Loop Antenna	879 285/26	Dec. 09, 2014(2Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May 02, 2014(2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Sep. 05, 2013(2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Apr. 30, 2015(2Y)
■ -	83051A	Agilent	Microwave System Preamplifier	3950M00201	Apr. 30, 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 : 43.0 % R.H.

Temperature: 21.6 °C

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

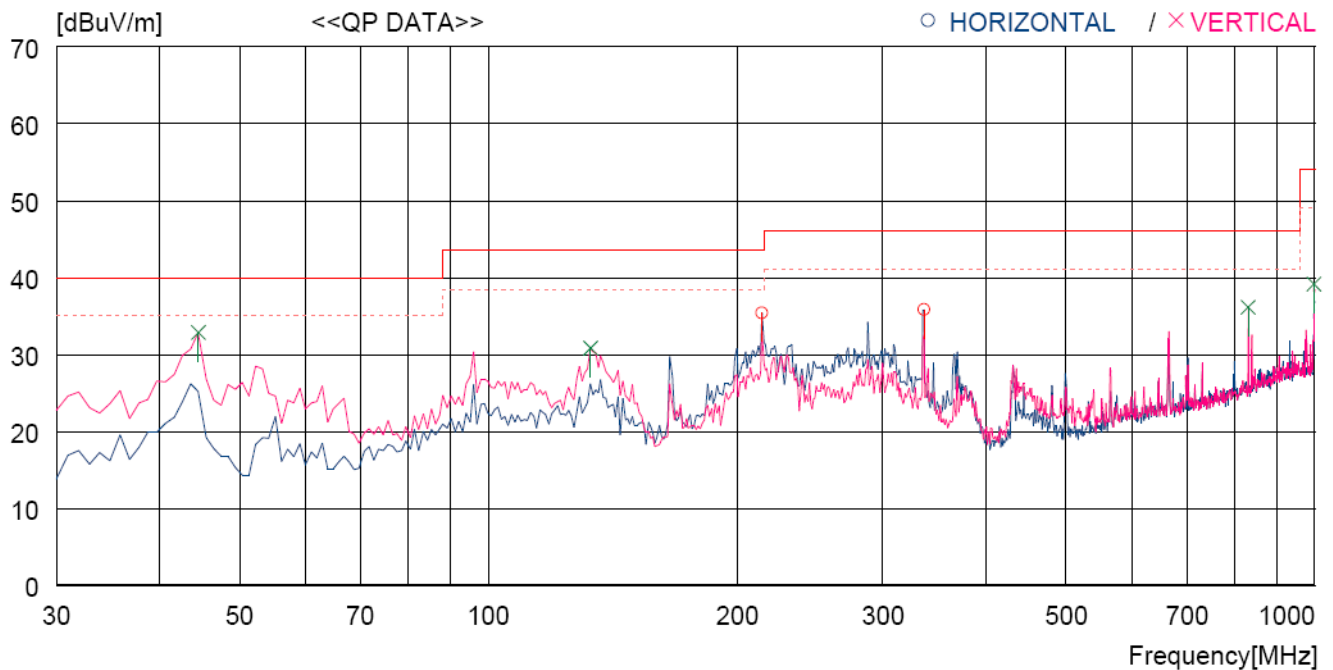
Result : PASSED

EUT : Bluetooth LE Module

Date: May 27, 2015

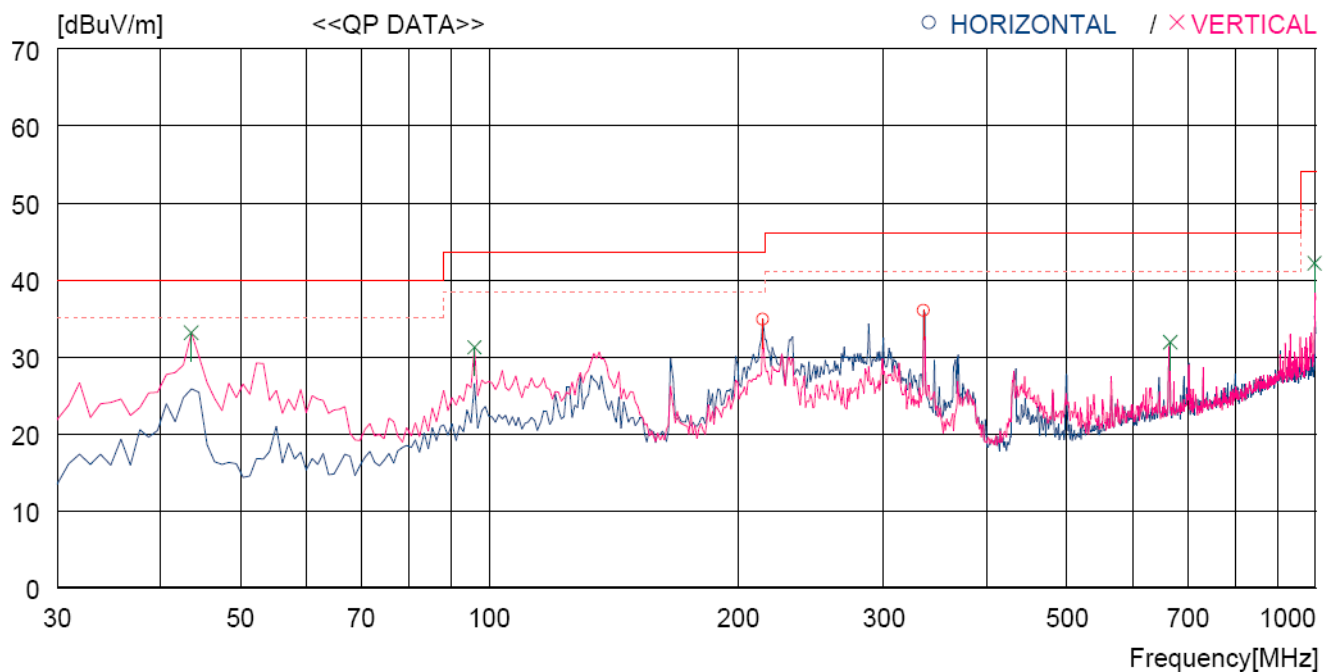
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Operating condition : Low Channel



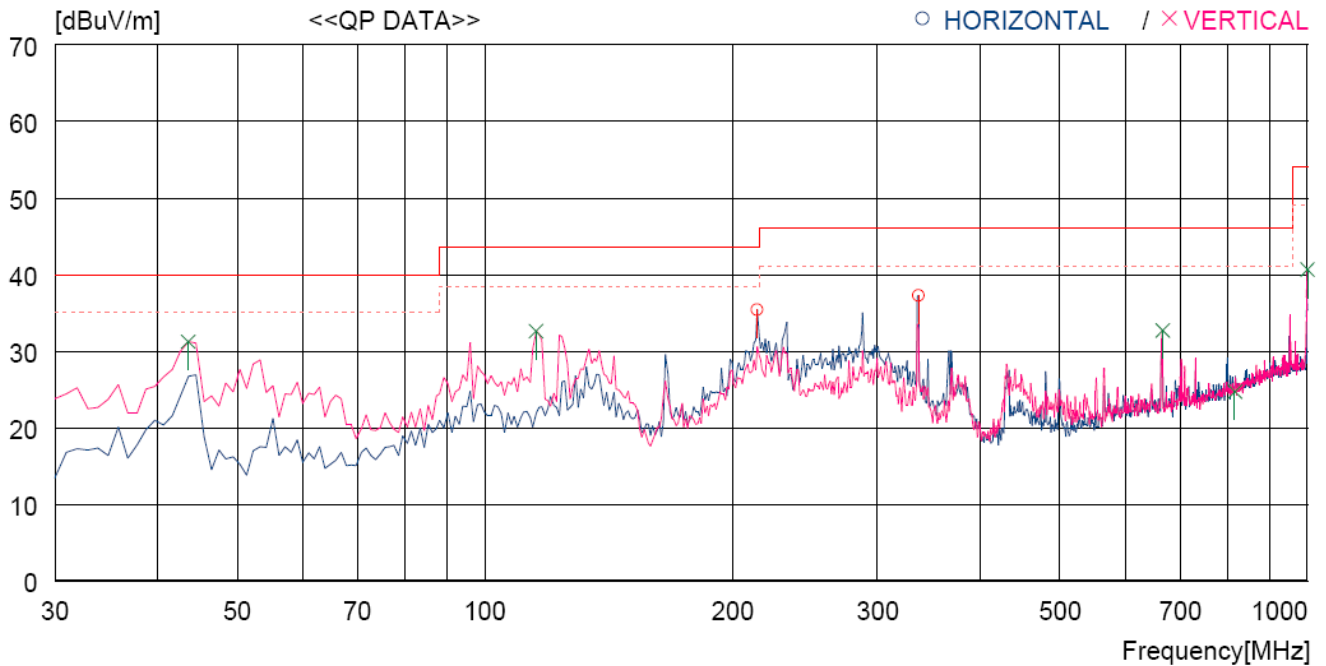
No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	214.300	47.8	11.6	8.9	32.9	35.4	43.5	8.1	100	0
2	336.520	44.9	14.1	9.7	32.9	35.8	46.0	10.2	100	0
----- Vertical -----										
3	44.550	44.3	14.2	7.3	33.0	32.8	40.0	7.2	100	55
4	132.820	46.9	8.7	8.2	33.0	30.8	43.5	12.7	100	7
5	830.241	35.9	20.9	12.1	32.8	36.1	46.0	9.9	200	284
6	997.076	35.5	22.4	12.8	31.6	39.1	54.0	14.9	100	335

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	214.300	47.2	11.6	8.9	32.9	34.8	43.5	8.7	100	36
2	335.550	45.1	14.1	9.7	32.9	36.0	46.0	10.0	100	0
----- Vertical -----										
3	43.580	44.7	14.1	7.3	33.0	33.1	40.0	6.9	100	359
4	95.960	45.4	11.0	7.9	33.1	31.2	43.5	12.3	100	359
5	666.316	34.5	19.3	11.4	33.3	31.9	46.0	14.1	100	216
6	996.106	38.6	22.3	12.8	31.6	42.1	54.0	11.9	100	335

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	214.300	47.8	11.6	8.9	32.9	35.4	43.5	8.1	100	0
2	336.520	46.3	14.1	9.7	32.9	37.2	46.0	8.8	100	0
----- Vertical -----										
3	43.580	42.8	14.1	7.3	33.0	31.2	40.0	8.8	100	359
4	115.360	47.2	10.4	8.1	33.1	32.6	43.5	10.9	200	263
5	666.316	35.3	19.3	11.4	33.3	32.7	46.0	13.3	100	359
6	815.691	24.8	20.7	12.1	32.9	24.7	46.0	21.3	100	359
7	1000.000	37.0	22.4	12.8	31.6	40.6	54.0	13.4	100	347

Tested by: Tae-Ho, Kim / Senior Engineer

11.4.2 Test data for Below 30 MHz

- . Test Date : May 27, 2015
- . 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 : May 27, 2015
- . 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 : 21.6 °C
Relative humidity : 43.0 % 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.

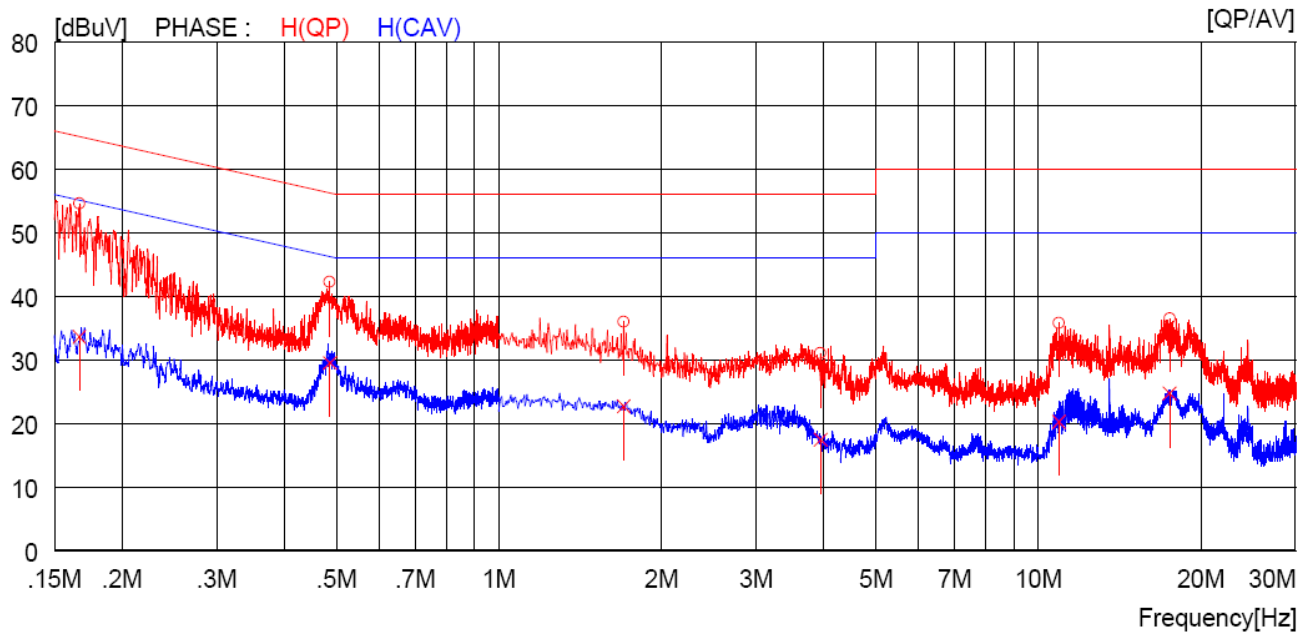
12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESPI	Rohde & Schwarz	EMI Test Receiver	101278	Nov. 03, 2014 (1Y)
□ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	Apr. 29, 2015 (1Y)
□	NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 06, 2015 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 29, 2015 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Apr. 29, 2015 (1Y)
■ --	3825/2	EMCO	AMN	9109-1867	Apr. 29, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

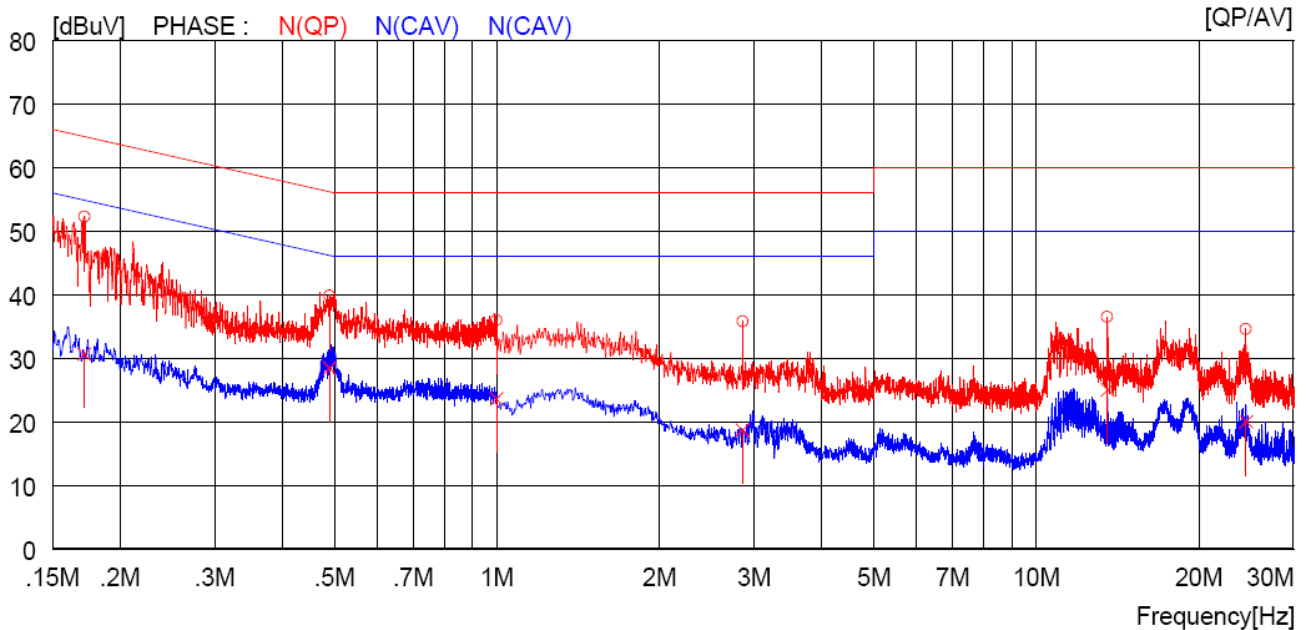
12.4 Test data

- Test Date : May 27, 2015
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ		READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16700	44.6	----	10.0	54.6	----	65.1	----	10.5	----	H(QP)		
2	0.48600	32.2	----	10.0	42.2	----	56.2	----	14.0	----	H(QP)		
3	1.70400	25.9	----	10.1	36.0	----	56.0	----	20.0	----	H(QP)		
4	3.94800	20.9	----	10.1	31.0	----	56.0	----	25.0	----	H(QP)		
5	10.92000	25.5	----	10.3	35.8	----	60.0	----	24.2	----	H(QP)		
6	17.52000	25.8	----	10.7	36.5	----	60.0	----	23.5	----	H(QP)		
7	0.16700	----	23.6	10.0	----	33.6	----	55.1	----	21.5	H(CAV)		
8	0.48600	----	19.5	10.0	----	29.5	----	46.2	----	16.7	H(CAV)		
9	1.70400	----	12.6	10.1	----	22.7	----	46.0	----	23.3	H(CAV)		
10	3.94800	----	7.3	10.1	----	17.4	----	46.0	----	28.6	H(CAV)		
11	10.92000	----	10.0	10.3	----	20.3	----	50.0	----	29.7	H(CAV)		
12	17.52000	----	14.0	10.7	----	24.7	----	50.0	----	25.3	H(CAV)		

-. Tested Line : NEUTRAL LINE



NO	FREQ		READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.17200	42.2	----	10.0	52.2	----	64.9	----	12.7	----	N(QP)		
2	0.49000	29.8	----	10.0	39.8	----	56.2	----	16.4	----	N(QP)		
3	0.99900	25.9	----	10.1	36.0	----	56.0	----	20.0	----	N(QP)		
4	2.85600	25.7	----	10.1	35.8	----	56.0	----	20.2	----	N(QP)		
5	13.56000	26.1	----	10.4	36.5	----	60.0	----	23.5	----	N(QP)		
6	24.49000	23.7	----	10.8	34.5	----	60.0	----	25.5	----	N(QP)		
7	0.17200	----	20.6	10.0	----	30.6	----	54.9	----	24.3	N(CAV)		
8	0.49000	----	18.4	10.0	----	28.4	----	46.2	----	17.8	N(CAV)		
9	0.99900	----	13.5	10.1	----	23.6	----	46.0	----	22.4	N(CAV)		
10	2.85600	----	8.6	10.1	----	18.7	----	46.0	----	27.3	N(CAV)		
11	13.56000	----	14.6	10.4	----	25.0	----	50.0	----	25.0	N(CAV)		
12	24.49000	----	9.2	10.8	----	20.0	----	50.0	----	30.0	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: Tae-Ho, Kim / Senior Engineer