

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

Test Report No. : W17NR-D085
AGR No. : A17OA-257
Applicant : Spacosa Corporation
Address : 11-41, Simin-daero 327beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea
Manufacturer : Spacosa Corporation
Address : 11-41, Simin-daero 327beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea
Type of Equipment : Gper
FCC ID. : 2AODFGPER-L200
Model Name : Gper-L200
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 33 pages (including this page)
Date of Incoming : October 26, 2017
Date of issue : November 30, 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.

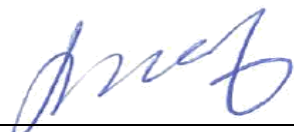
It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Jae-Ho Lee / Chief Engineer
ONETECH Corp.

Approved by:



Keun-Young, Choi / Vice President
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. MINIMUM 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.....	23
9.6.1 Radiated Emission which fall in the Restricted Band.....	23
9.6.2 Spurious & Harmonic Radiated Emission.....	24
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
11.4.1 Test data for 30 MHz ~ 1 GHz	29
11.4.2 Test data for Below 30 MHz	30
11.4.3 Test data for above 1 GHz	30
12. CONDUCTED EMISSION TEST	31
12.1 OPERATING ENVIRONMENT	31
12.2 TEST SET-UP	31
12.3 TEST EQUIPMENT USED	31
12.4 TEST DATA FOR CHARGING & TRANSMITTING MODE	32

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W17NR-D085	November 30, 2017	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : Spacosa Corporation
Address : 11-41, Simin-daero 327beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea
Contact Person : Byungjoo Jo
Telephone No. : +82-70-7016-2380
FCC ID : 2AODFGPER-L200
Model Name : Gper-L200
Serial Number : N/A
Date : November 30, 2017

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
KIND OF EQUIPMENT	Gper
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-14617/ 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 Spacosa Corporation, Model Gper-L200 (referred to as the EUT in this report) is a Gper. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Gper
Operating Frequency	LE: 2 402 MHz ~ 2 480 MHz LoRa: 903.0 ~ 914.2 MHz (500 kHz)
RF Output Power	LE: -2.31 dBm LoRa: 11.29 dBm
Number of Channel	LE: 40 Channels LoRa: 8 Channels
Modulation Type	LE: GFSK LoRa: CSS
Antenna Type	LE: Chip Antenna LoRa: Quarter wave-length Monopole Helical Antenna
Antenna Gain	LE: 2.51 dBi LoRa: 1.37 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	16 MHz
Rated Supply Voltage	DC 3.7 V

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	N/A	N/A	-
Battery	N/A	N/A	-
BT Antenna	MOBINUS CO., LTD.	MPWS-GL-xR	-
RFID Antenna	Taoglas	HA.31.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
N/A	N/A	N/A	N/A

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 “XY” axis, but the worst data was recorded in this report.

5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in a Charging & Transmitting Mode. The EUT was connected to Adapter. 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 Chip Antenna and Quarter wave-length Monopole Helical Antenna, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Charging & 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

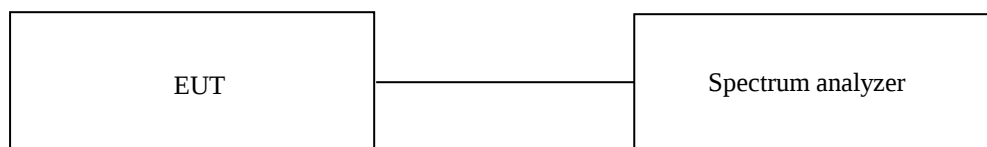
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 23 °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	Rohde & Schwarz	Signal Analyzer	101200	Oct.26, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

7.4 Test data

-. Test Date : November 20, 2017

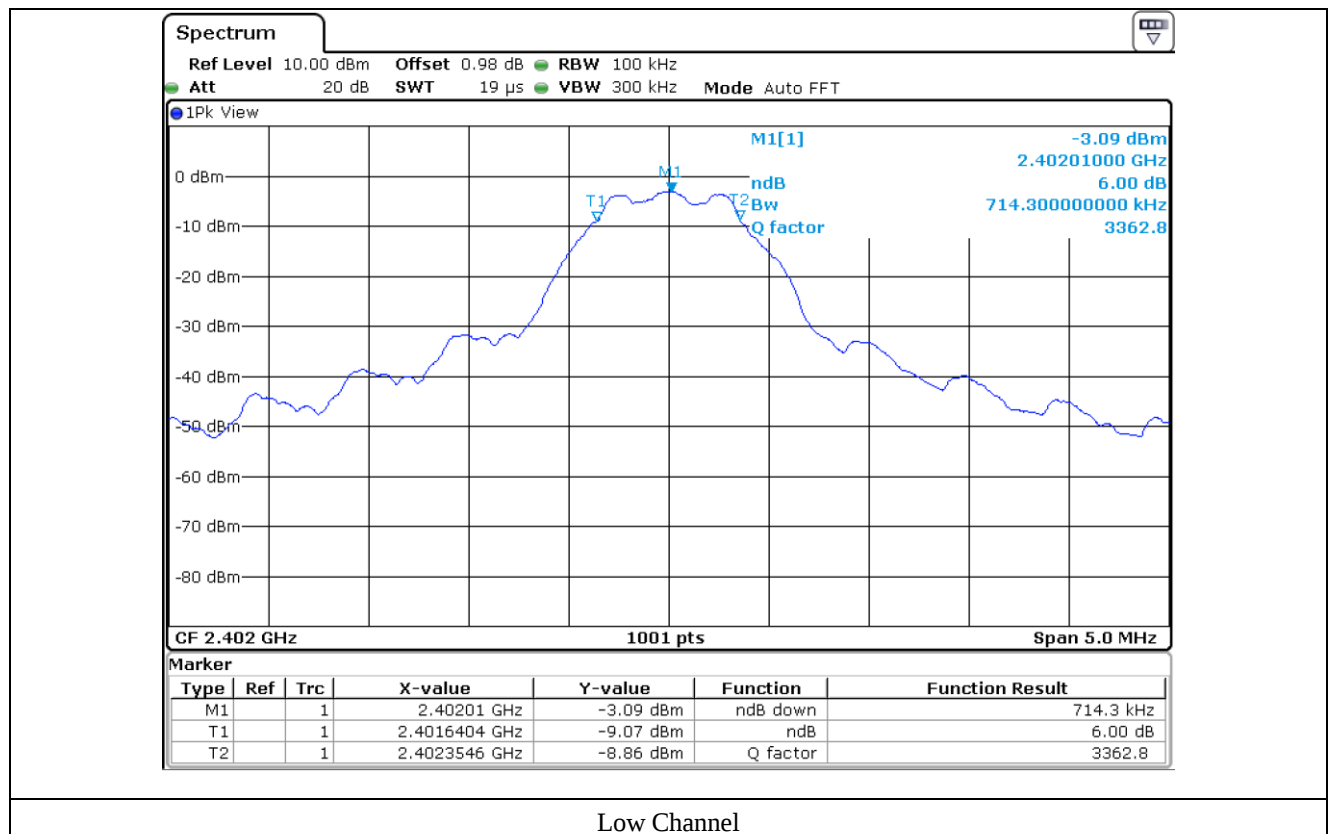
-. Test Result : Pass

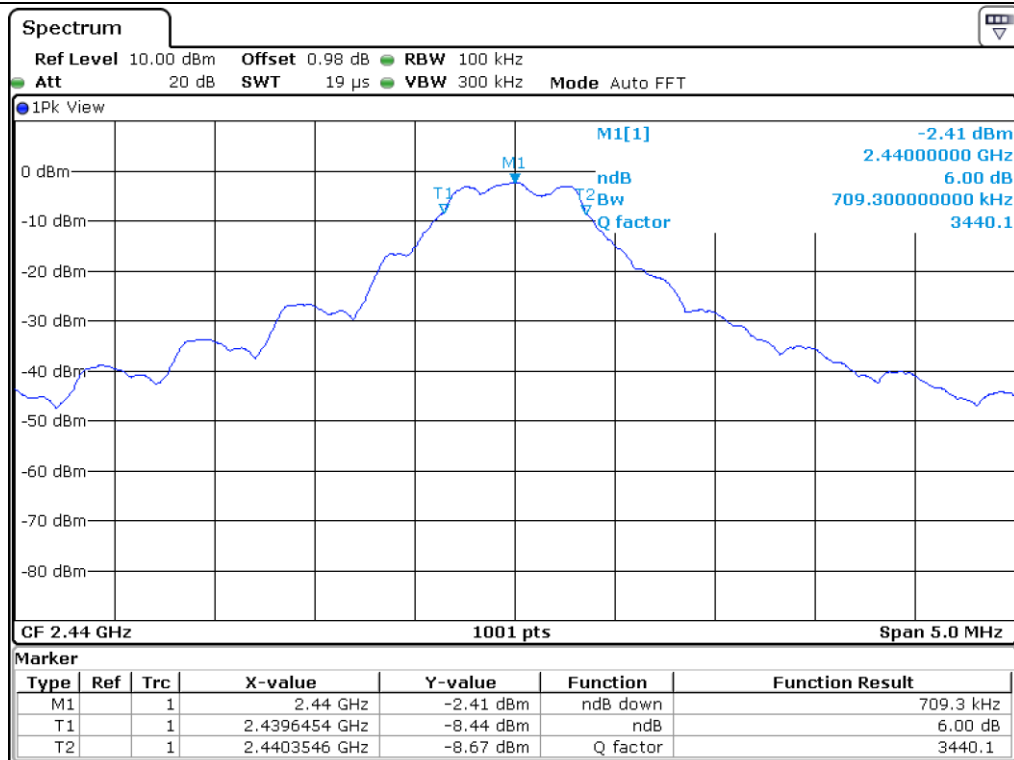
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402	714.30	500	214.30
Middle	2 440	709.30	500	209.30
High	2 480	699.30	500	199.30

Remark. Margin = Measured Value - Limit

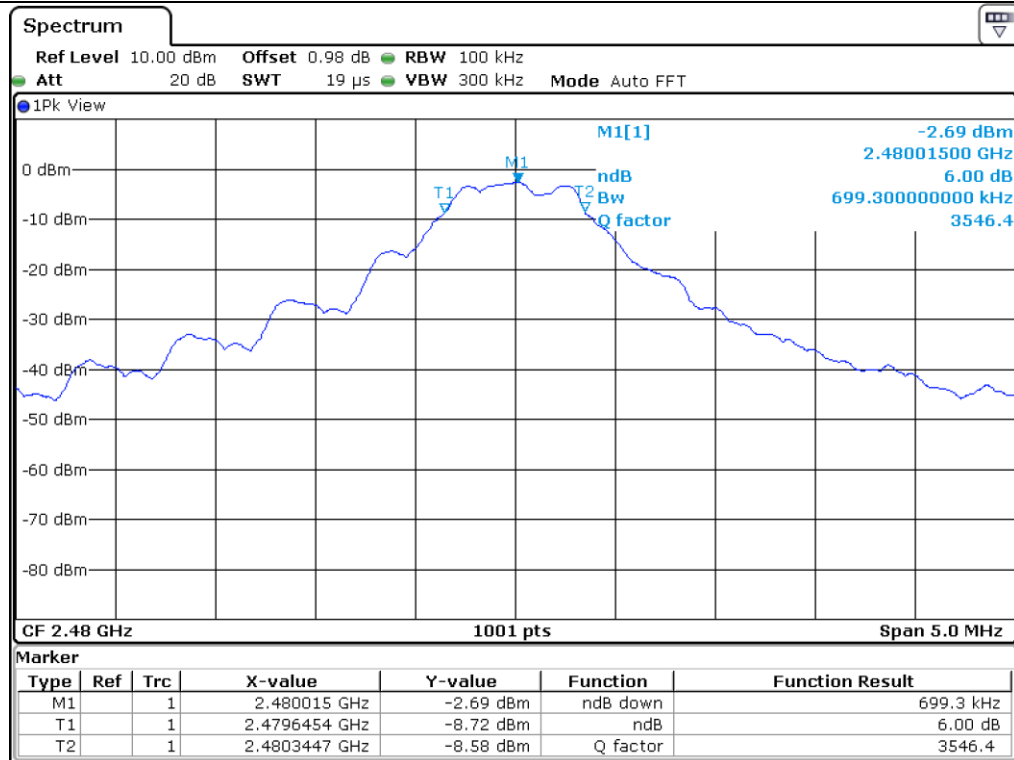


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

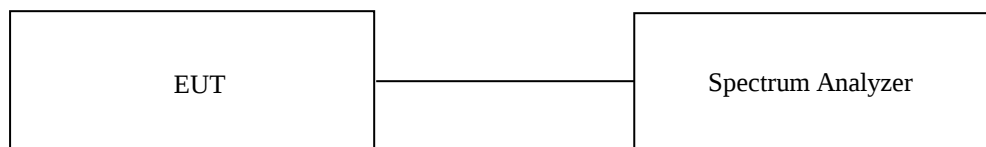
8.1 Operating environment

Temperature : 23 °C
Relative humidity : 44 % 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.
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct.26, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

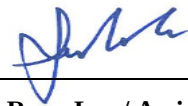
8.4 Test data

-. Test Date : November 20, 2017

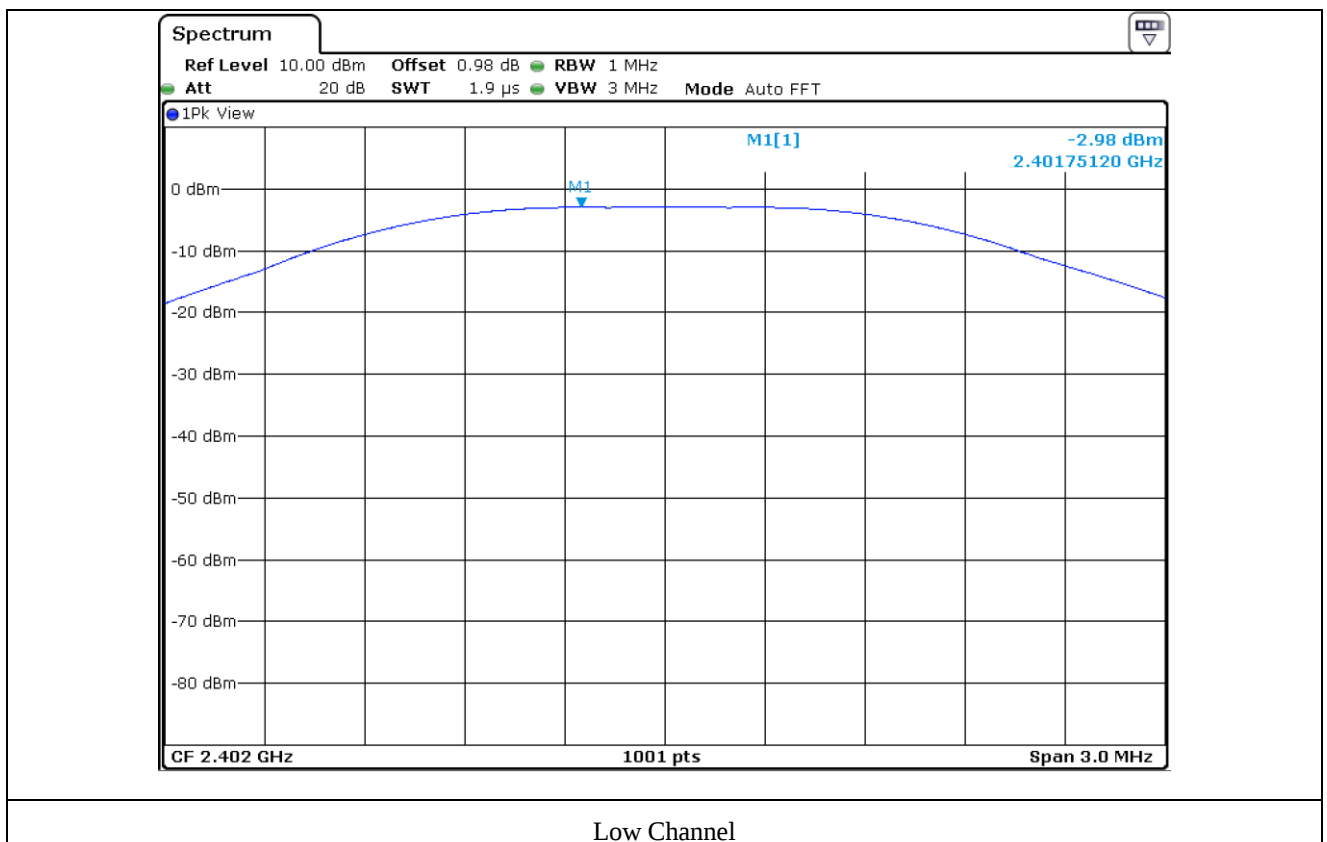
-. Test Result : Pass

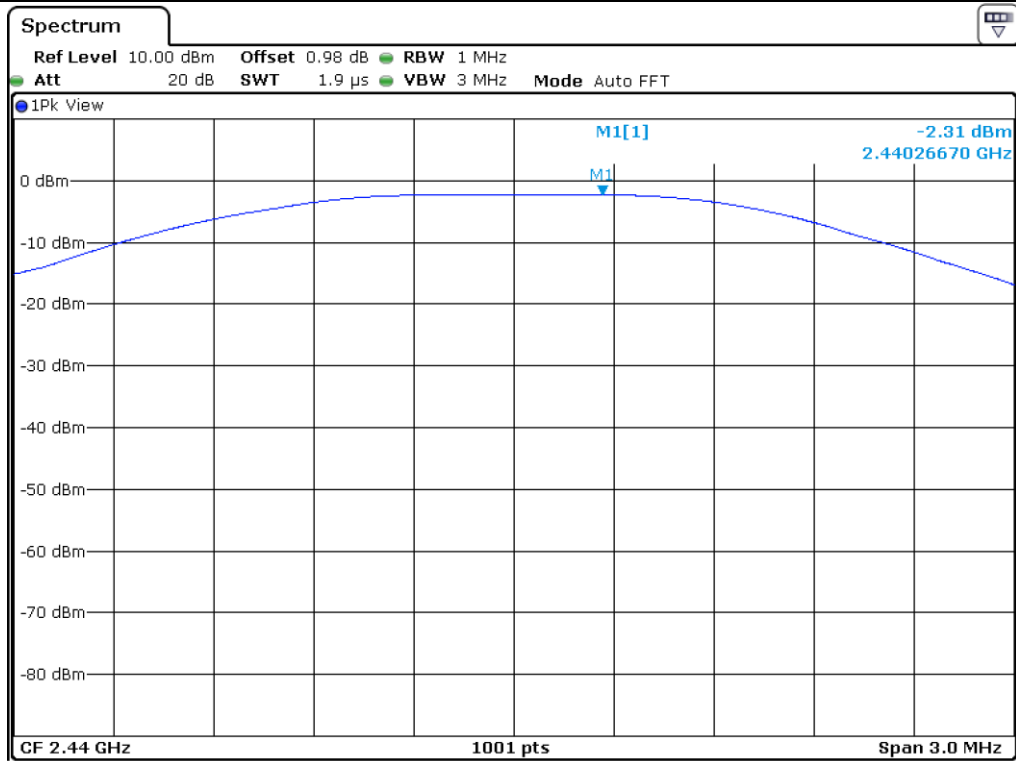
CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	-2.98	30.00	32.98
MIDDLE	2 440	-2.31	30.00	32.31
HIGH	2 480	-2.63	30.00	32.63

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

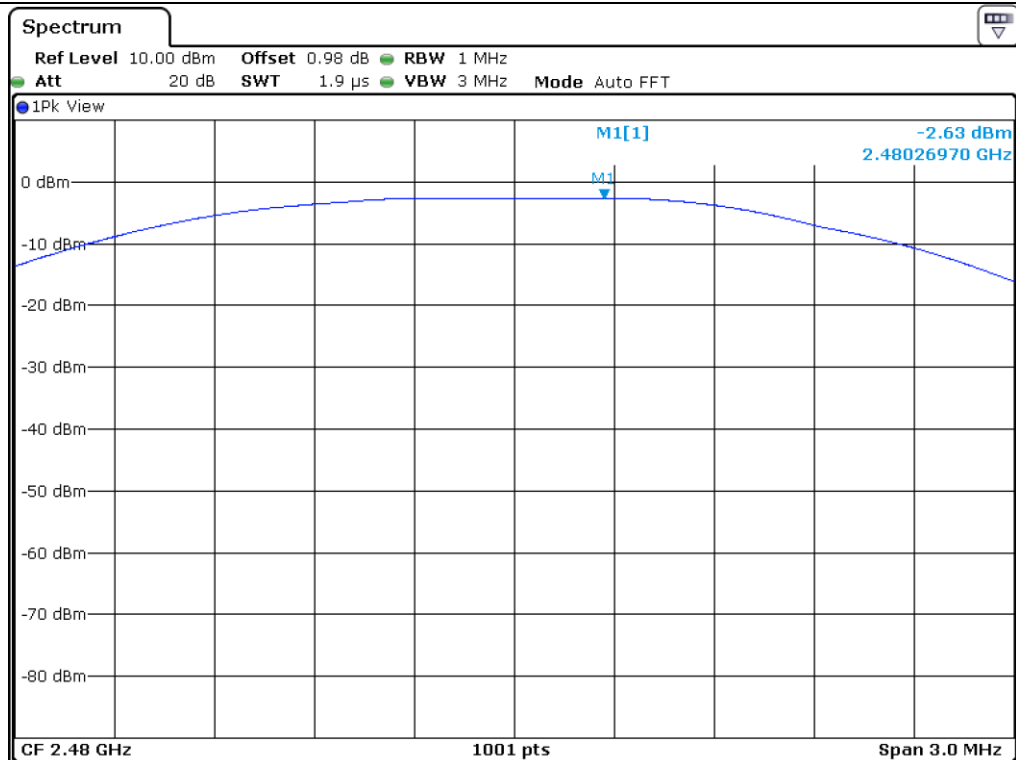


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 23 °C
Relative humidity : 44 % 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.

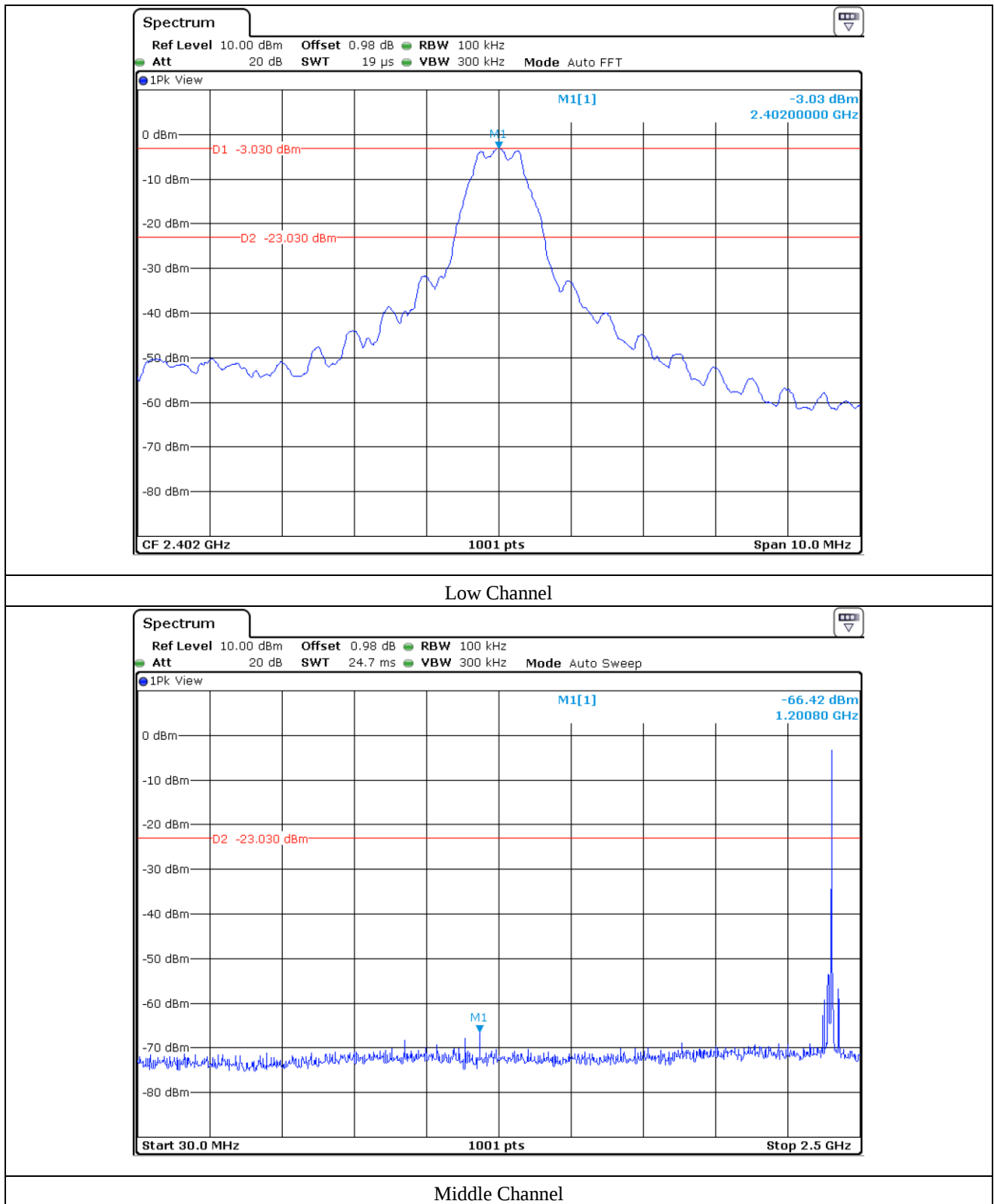
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal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

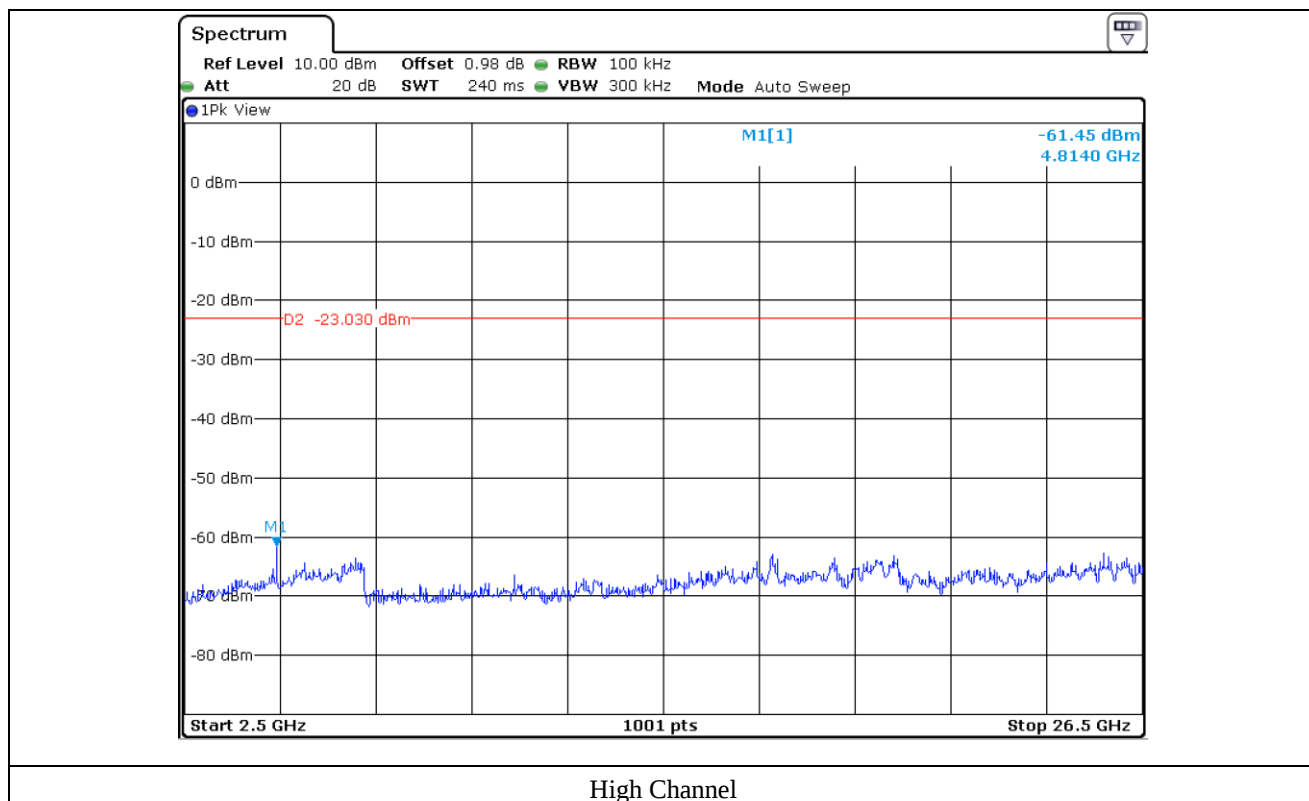
9.4 Test equipment used

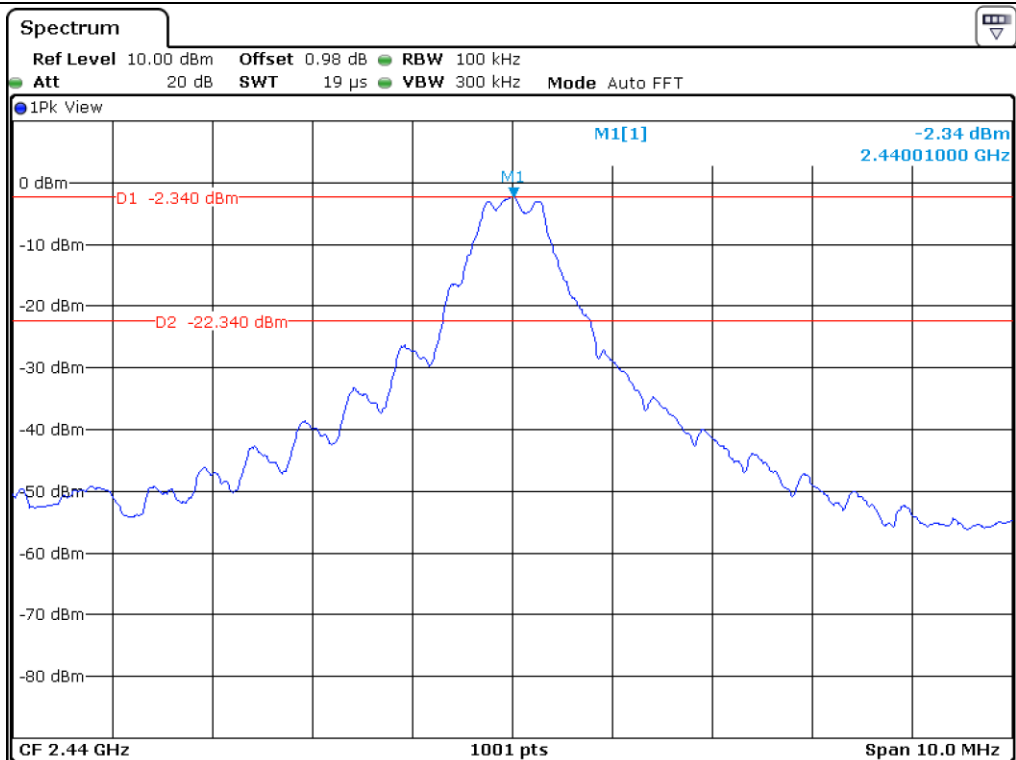
	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 27, 2017 (1Y)
☒ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 27, 2017 (1Y)
☐ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Sep. 04, 2017 (1Y)
☒ -	310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 04, 2017 (1Y)
☒ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct. 26, 2017 (1Y)
☒ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	102346	Oct. 24, 2017 (1Y)
☒ -	MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509	N/A
☐ -	HD100	HD GmbH	Position Controller	N/A	N/A
☒ -	DT3000-3t	Innco Systems GmbH	Turn Table	N/A	N/A
☐ -	FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	Jun. 10, 2016 (2Y)
☒ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May 20, 2016 (2Y)
☒ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2017 (2Y)
☒ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA91700179	Jul. 28, 2017 (2Y)
☒ -	BBV9718	Schwarzbeck	AMPLIFIER	310	Sep. 01, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

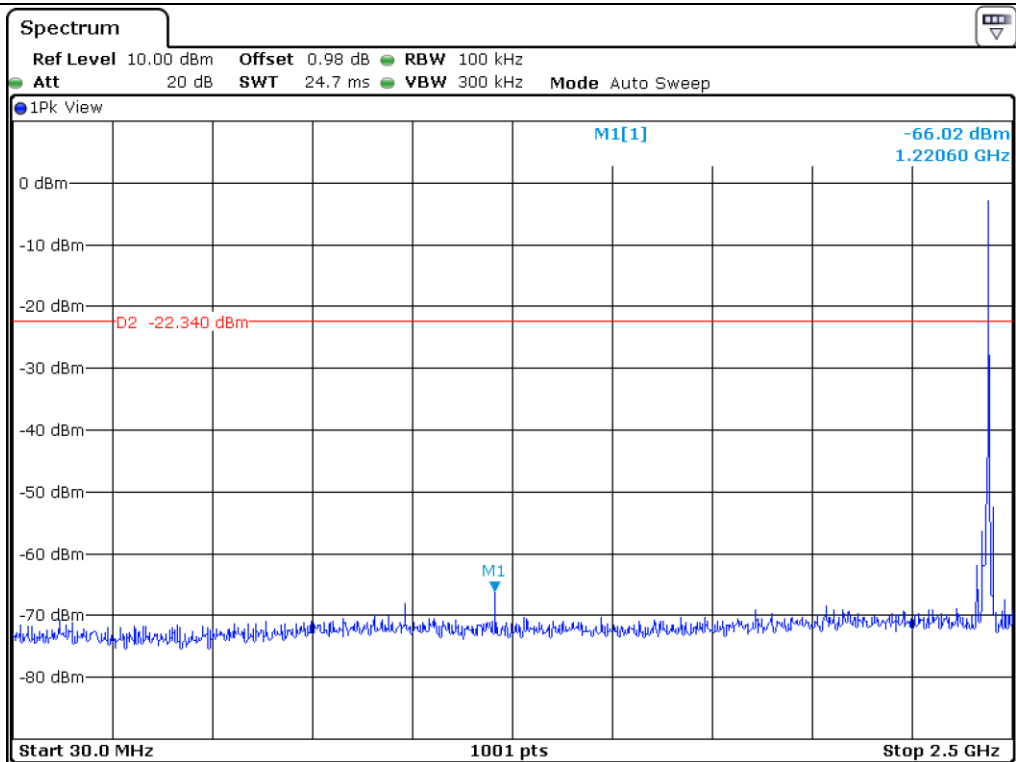
9.5 Test data for conducted emission



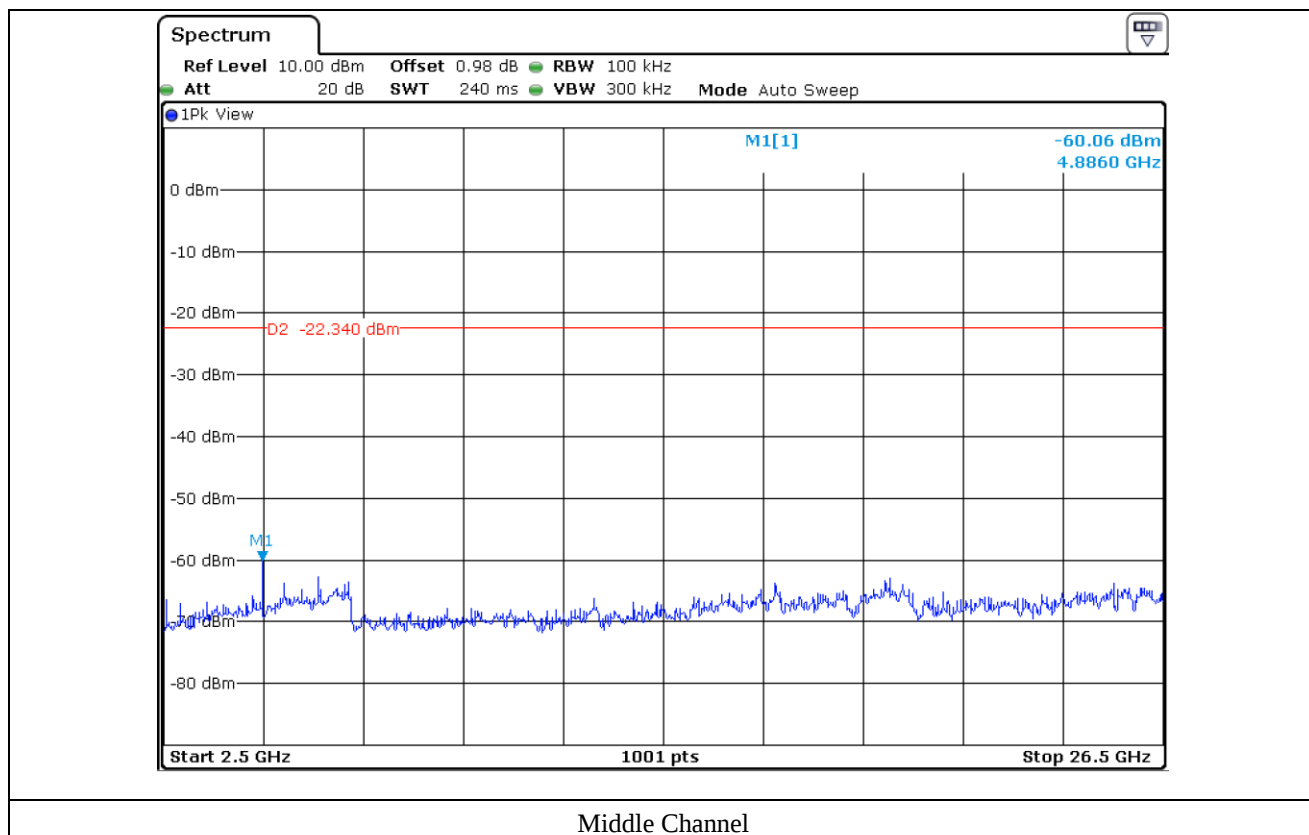


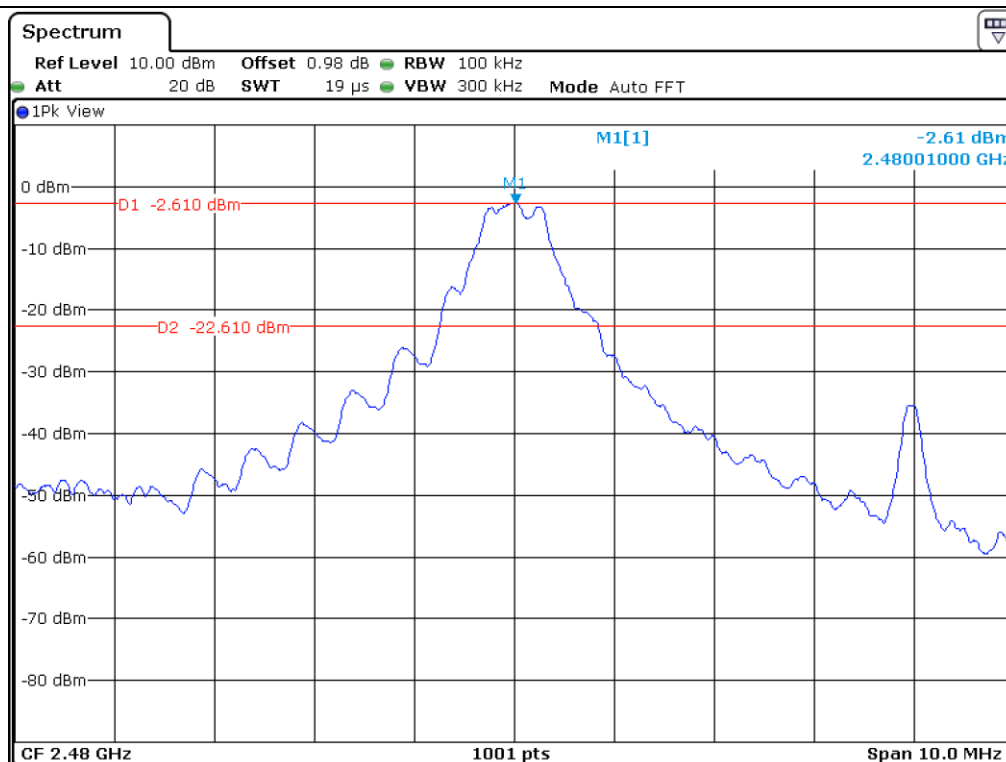


Low Channel

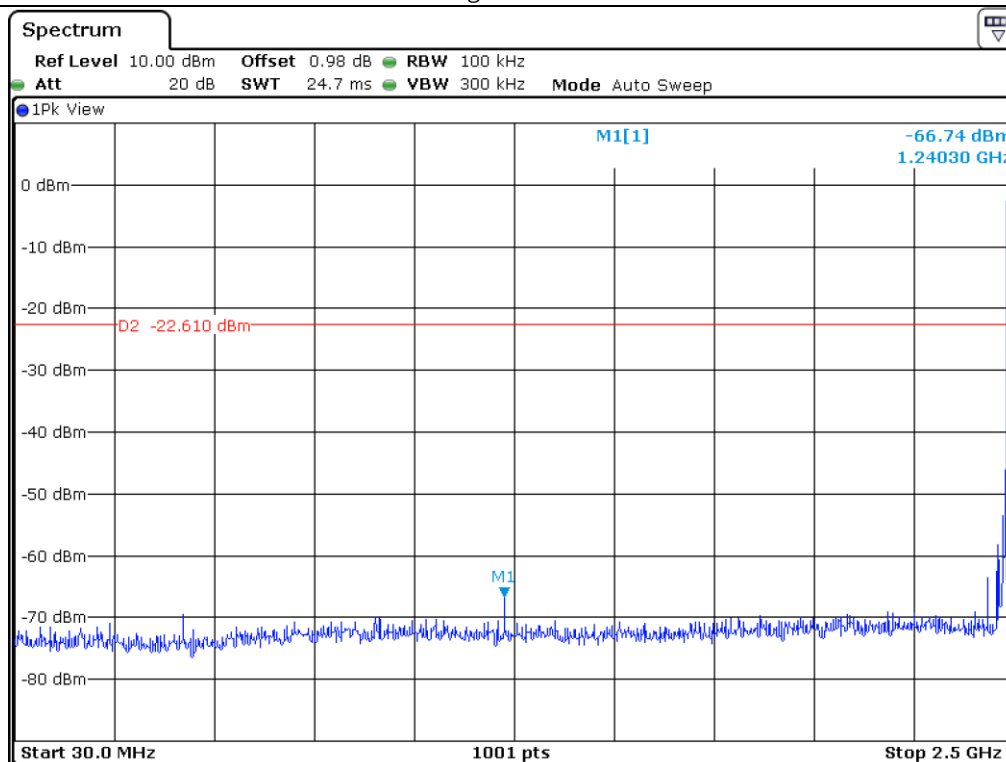


Low Channel

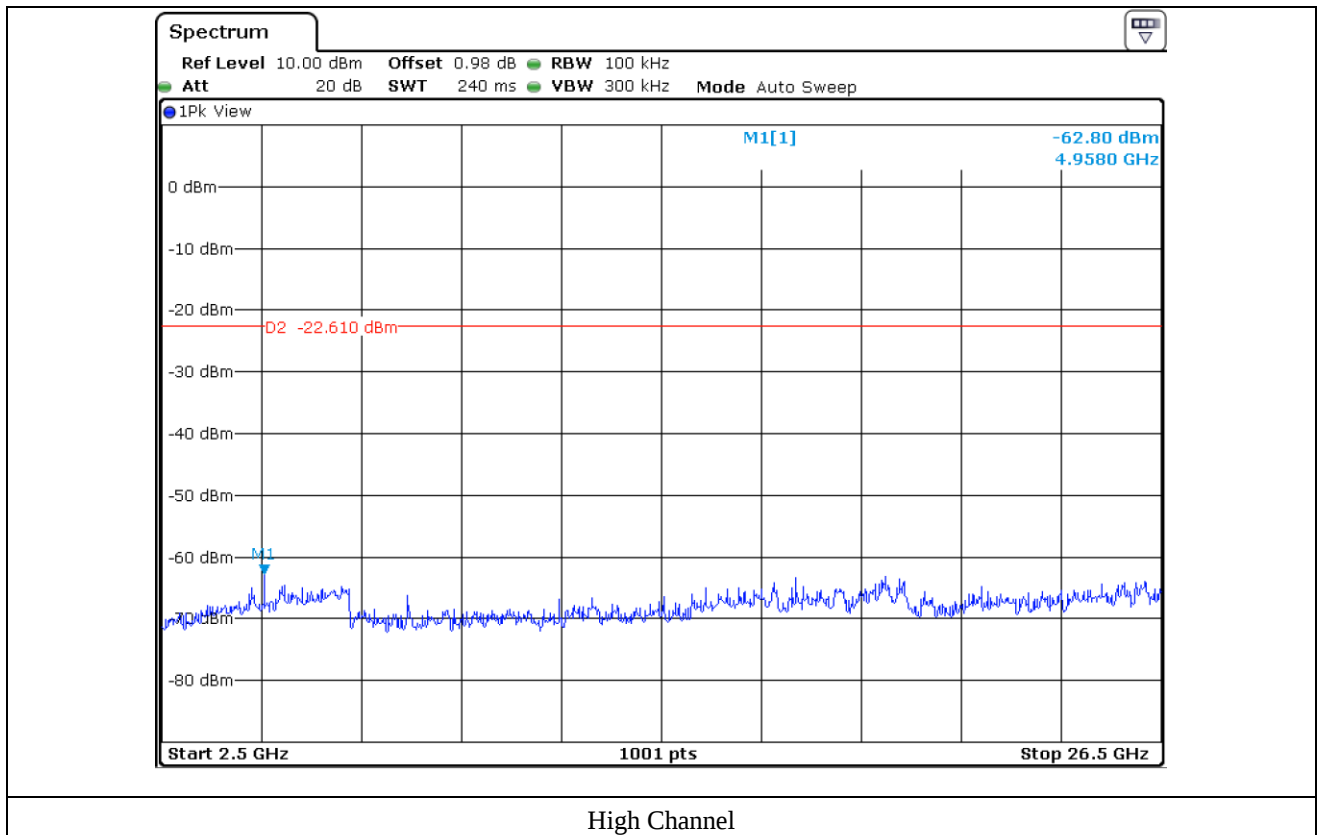




High Channel



High Channel



9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

- . Test Date : November 13, 2017
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . 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									
2 364.95	48.03	Peak	H	27.60	11.40	34.76	52.27	74.00	21.73
2 341.05	28.35	Average	H				32.59	54.00	21.41
2 342.41	39.45	Peak	V				43.69	74.00	30.31
2 343.13	28.08	Average	V				32.32	54.00	21.68
Test Data for High Channel									
2 487.02	54.12	Peak	H	27.80	11.40	35.47	57.85	74.00	16.15
2 483.64	27.55	Average	H				31.28	54.00	22.72
2 486.89	41.07	Peak	V				44.80	74.00	29.20
2 487.79	26.96	Average	V				30.69	54.00	23.31

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: Ha-Ram, Lee / Assistant Manager

9.6.2 Spurious & Harmonic Radiated Emission

- Test Date : November 13, 2017
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Detector : Peak Mode(Peak), Average Mode(RMS)
- 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									
4 804.00	40.29	Peak	H	31.00	16.10	35.84	51.55	74.00	22.45
	27.97	Average	H				39.23	54.00	14.77
	40.12	Peak	V				51.38	74.00	22.62
	27.89	Average	V				39.15	54.00	14.85
Test Data for Middle Channel									
4 880.00	41.32	Peak	H	31.10	16.10	35.92	52.60	74.00	21.40
	27.81	Average	H				39.09	54.00	14.91
	40.64	Peak	V				51.92	74.00	22.08
	28.05	Average	V				39.33	54.00	14.67
Test Data for High Channel									
4 960.00	40.46	Peak	H	31.20	16.10	36.01	51.75	74.00	22.25
	28.10	Average	H				39.39	54.00	14.61
	40.82	Peak	V				52.11	74.00	21.89
	28.22	Average	V				39.51	54.00	14.49

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: Ha-Ram, Lee / Assistant Manager

10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

Temperature : 23 °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 $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct.26, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data

-. Test Date : November 20, 2017

-. Test Result : Pass

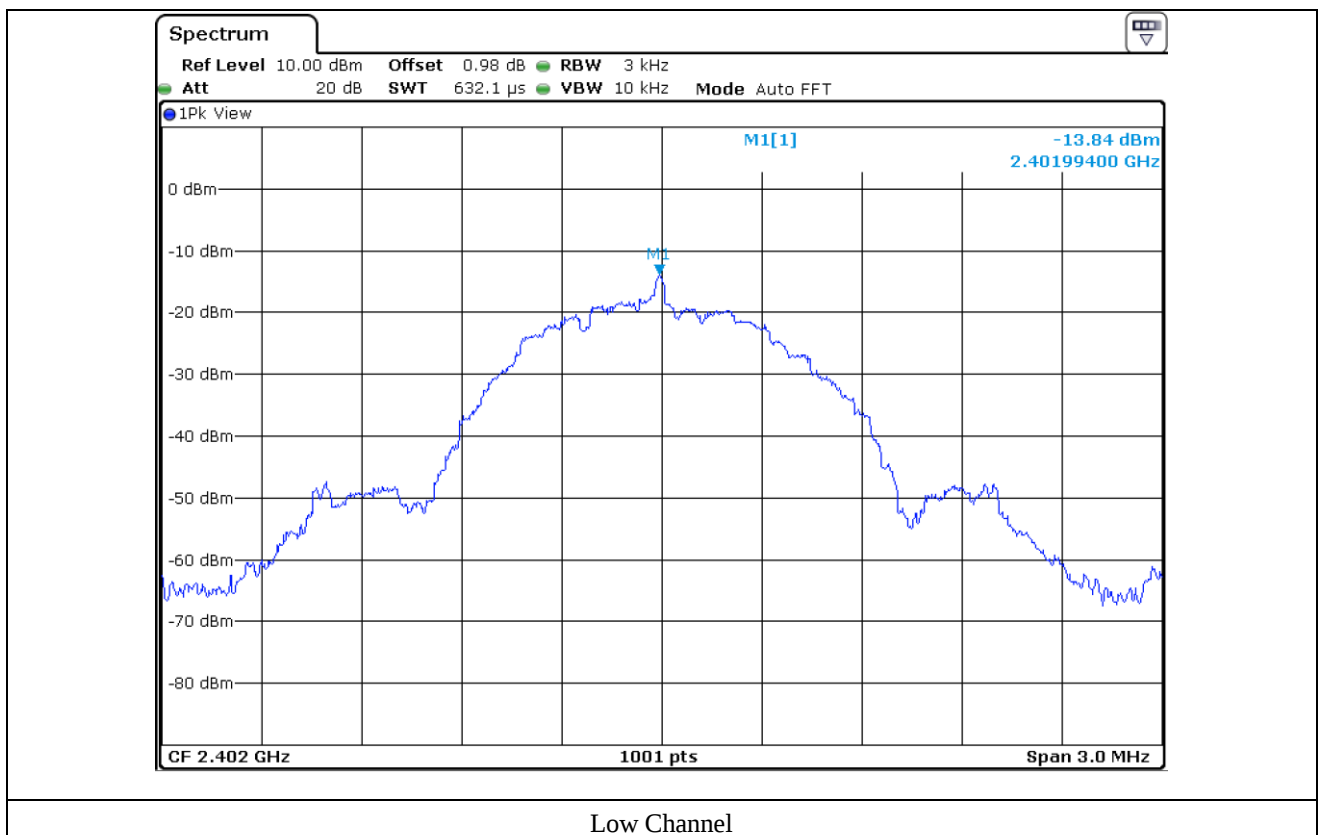
-. Operating Condition : Continuous transmitting mode

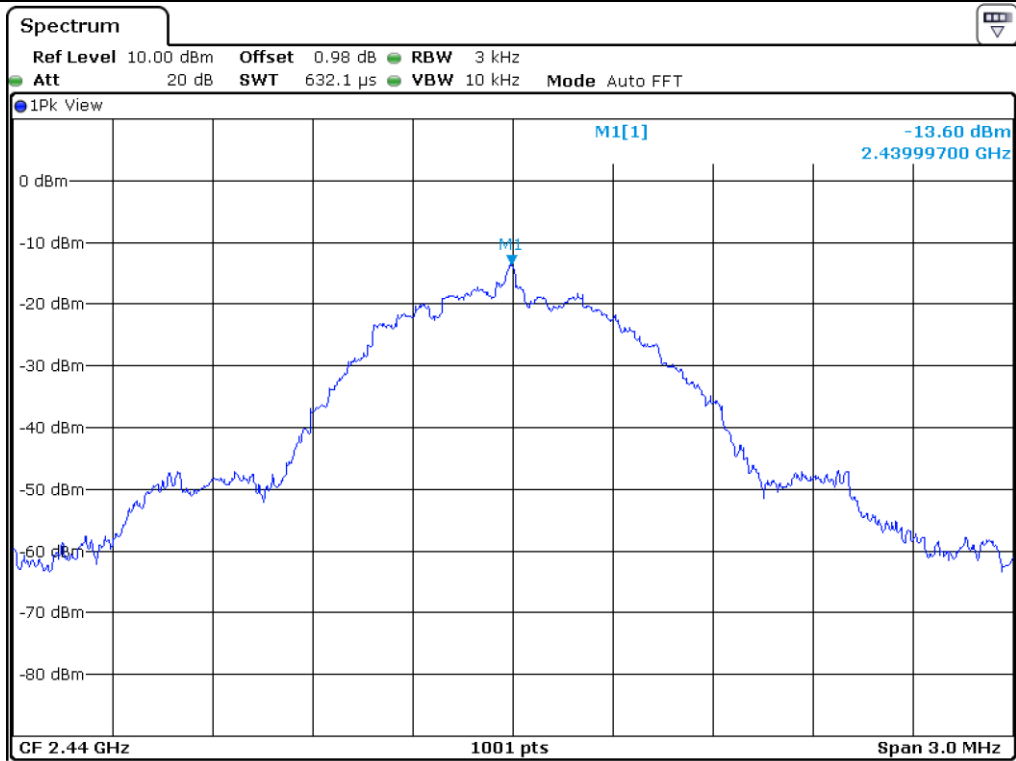
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402	-13.84	8.00	21.84
Middle	2 440	-13.60	8.00	21.60
High	2 480	-14.22	8.00	22.22

Remark. Margin = Limit – Measured value

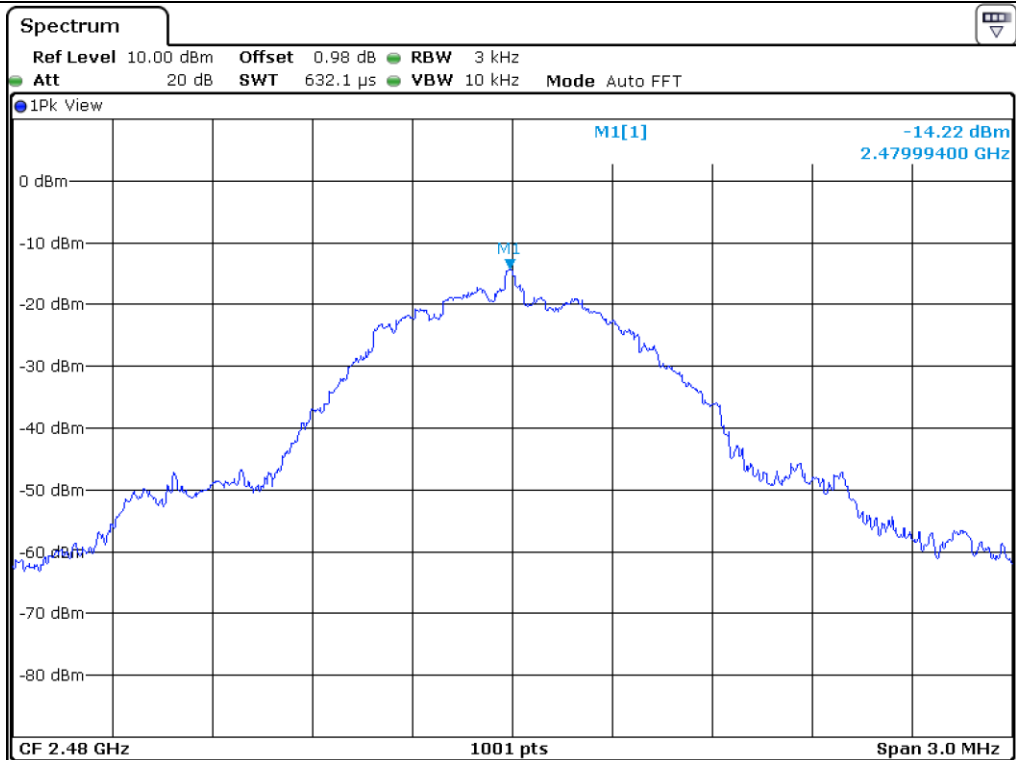


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 °C
Relative humidity : 44 % 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. (Interval)
□ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 27, 2017 (1Y)
■ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 27, 2017 (1Y)
□ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Sep. 04, 2017 (1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 04, 2017 (1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct. 26, 2017 (1Y)
■ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	102346	Oct. 24, 2017 (1Y)
■ -	MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509	N/A
□ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DT3000-3t	Innco Systems GmbH	Turn Table	N/A	N/A
□ -	FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	Jun. 10, 2016 (2Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May 20, 2016 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2017 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA91700179	Jul. 28, 2017 (2Y)
■ -	BBV9718	Schwarzbeck	AMPLIFIER	310	Sep. 01, 2017 (1Y)

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 : 44 % R.H.

Temperature: 23 °C

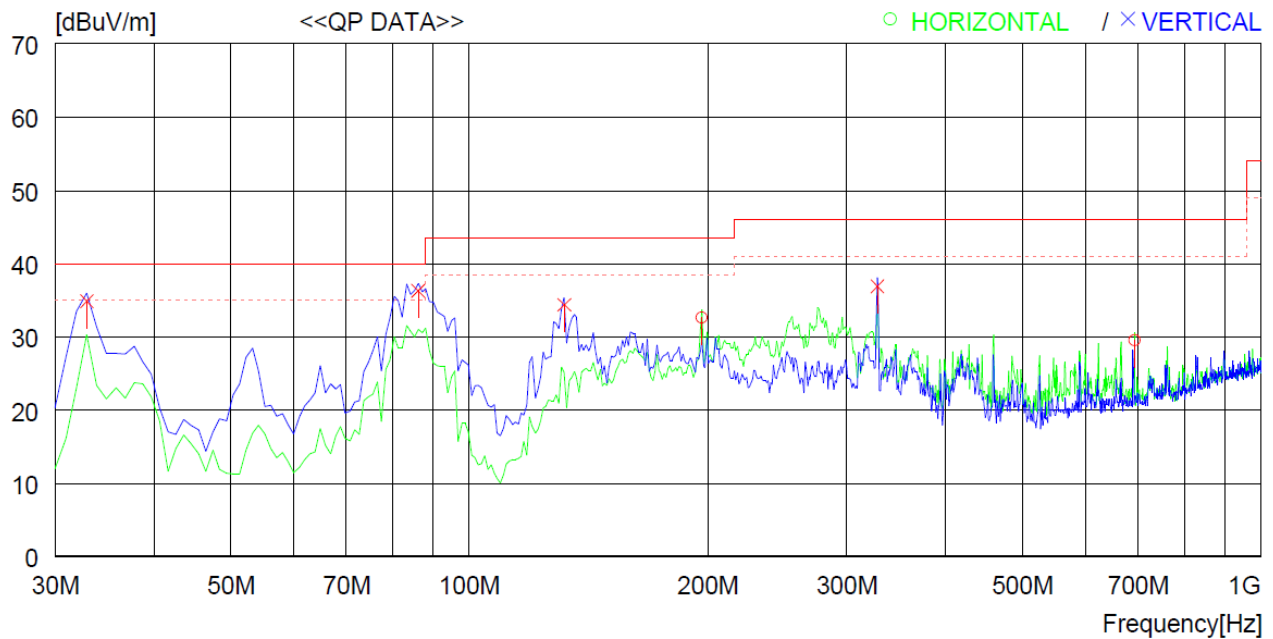
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Gper

Date: November 24, 2017

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



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	196.840	51.7	10.8	3.3	33.2	32.6	43.5	10.9	200	79
2	692.505	37.2	19.7	6.1	33.5	29.5	46.0	16.5	100	359
----- Vertical -----										
3	32.910	53.7	12.9	1.4	33.1	34.9	40.0	5.1	100	212
4	86.260	57.6	9.5	2.2	33.0	36.3	40.0	3.7	100	359
5	131.850	55.7	9.0	2.7	33.0	34.4	43.5	9.1	100	94
6	327.790	51.6	14.2	4.2	33.1	36.9	46.0	9.1	100	141

[Signature]

Tested by: Ha-Ram, Lee / Assistant Manager

11.4.2 Test data for Below 30 MHz

- . Test Date : November 24, 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 (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Any emissions less than 20 dB below the limit were not observed.									

11.4.3 Test data for above 1 GHz

- . Test Date : November 24, 2017
- . 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)
Any emissions less than 20 dB below the limit were not observed.									



Tested by: Ha-Ram, Lee / Assistant Manager

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 23 °C
Relative humidity : 44 % 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.

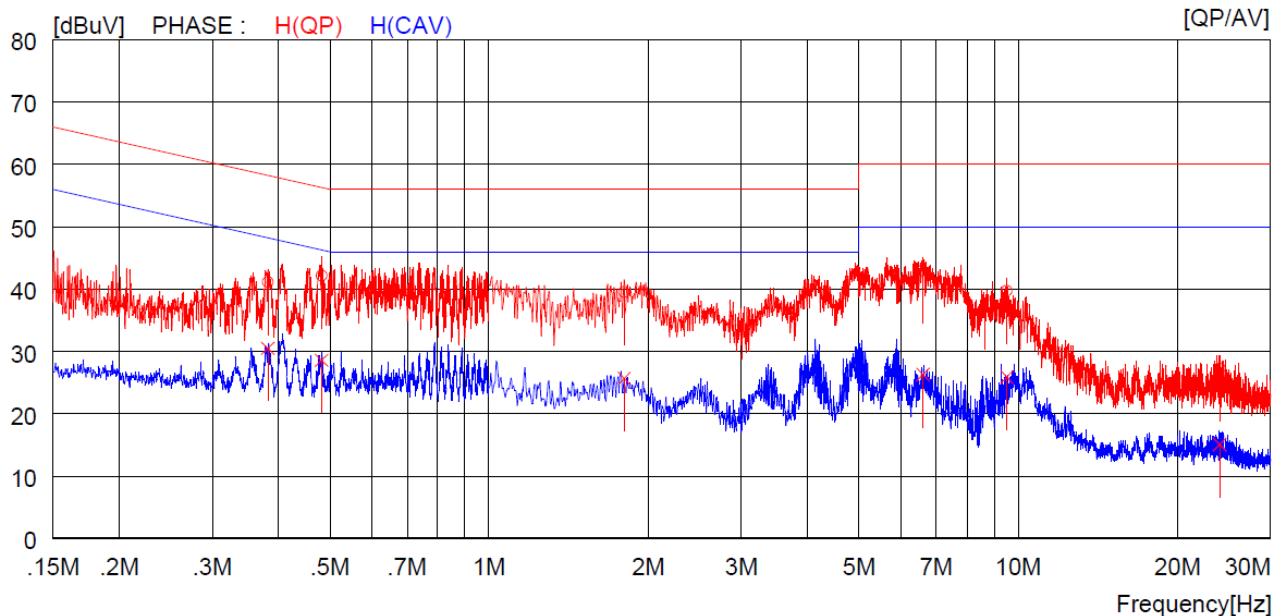
12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESPI	Rohde & Schwarz	EMI Test Receiver	101278	Oct. 26, 2017 (1Y)
□ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	Apr. 03, 2017 (1Y)
□	NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 05, 2017 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 03, 2017 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Apr. 06, 2017 (1Y)
■ --	NSLK8126	EMCO	AMN	8126-479	Nov. 02, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

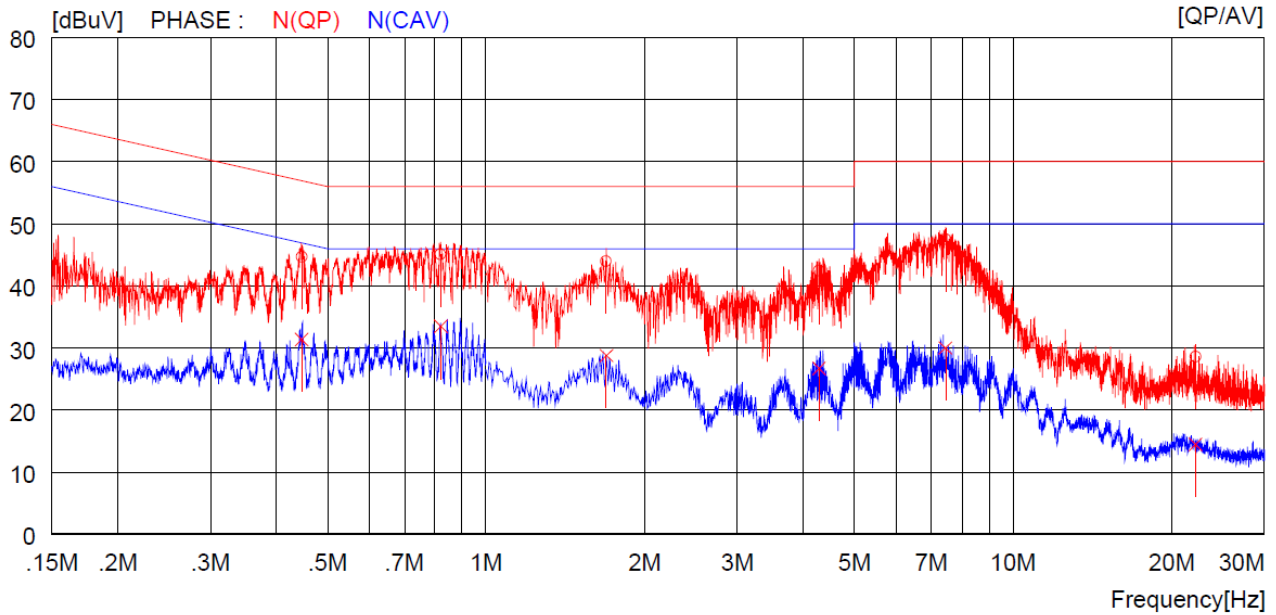
12.4 Test data for Charging & Transmitting Mode

- Test Date : November 21, 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	0.38200	31.1	----	10.0	41.1	----	58.2	----	17.1	----	H (QP)
2	0.48300	32.1	----	10.0	42.1	----	56.3	----	14.2	----	H (QP)
3	1.80000	29.4	----	10.1	39.5	----	56.0	----	16.5	----	H (QP)
4	6.60500	32.7	----	10.3	43.0	----	60.0	----	17.0	----	H (QP)
5	9.52000	29.3	----	10.4	39.7	----	60.0	----	20.3	----	H (QP)
6	24.06000	16.5	----	10.8	27.3	----	60.0	----	32.7	----	H (QP)
7	0.38200	----	20.5	10.0	----	30.5	----	48.2	----	17.7	H (CAV)
8	0.48300	----	18.6	10.0	----	28.6	----	46.3	----	17.7	H (CAV)
9	1.80000	----	15.6	10.1	----	25.7	----	46.0	----	20.3	H (CAV)
10	6.60500	----	16.0	10.3	----	26.3	----	50.0	----	23.7	H (CAV)
11	9.52000	----	15.5	10.4	----	25.9	----	50.0	----	24.1	H (CAV)
12	24.06000	----	4.3	10.8	----	15.1	----	50.0	----	34.9	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	0.44700	34.7	----	10.0	44.7	----	56.9	----	12.2	----	N (QP)
2	0.82000	35.0	----	10.1	45.1	----	56.0	----	10.9	----	N (QP)
3	1.69200	33.9	----	10.1	44.0	----	56.0	----	12.0	----	N (QP)
4	4.28400	32.2	----	10.2	42.4	----	56.0	----	13.6	----	N (QP)
5	7.44500	37.2	----	10.3	47.5	----	60.0	----	12.5	----	N (QP)
6	22.20000	17.8	----	10.8	28.6	----	60.0	----	31.4	----	N (QP)
7	0.44700	----	21.4	10.0	----	31.4	----	46.9	----	15.5	N (CAV)
8	0.82000	----	23.4	10.1	----	33.5	----	46.0	----	12.5	N (CAV)
9	1.69200	----	18.7	10.1	----	28.8	----	46.0	----	17.2	N (CAV)
10	4.28400	----	16.5	10.2	----	26.7	----	46.0	----	19.3	N (CAV)
11	7.44500	----	19.7	10.3	----	30.0	----	50.0	----	20.0	N (CAV)
12	22.20000	----	3.7	10.8	----	14.5	----	50.0	----	35.5	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: Ha-Ram, Lee / Assistant Manager