

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

Test Report No. : OT-198-RWD-045
AGR No. : A197A-024R
Applicant : Williams Sound, LLC
Address : 10300 Valley View Road, Eden Prairie, Minnesota, 55344, United States
Manufacturer : Williams Sound, LLC
Address : 10300 Valley View Road, Eden Prairie, Minnesota, 55344, United States
Type of Equipment : Portable Conference Transceiver
FCC ID. : CNMDLT400
Model Name : DLT 400
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 51 pages (including this page)
Date of Incoming : August 19, 2019
Date of issue : August 23, 2019

SUMMARY

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

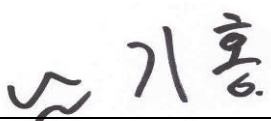
This test report only contains the result of a single test of the sample supplied for the examination.

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

Reviewed by:


 Tae-Ho, Kim / Senior Manager
 ONETECH Corp.

Approved by:


 Ki-Hong, Nam / Chief Engineer
 ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-198-RWD-045	August 23, 2019	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Williams Sound, LLC
Address : 10300 Valley View Road, Eden Prairie, Minnesota, 55344, United States
Contact Person : Greg. Abram / Vice President
Telephone No. : +1-952-943-2252
FCC ID : CNMDLT400
Model Name : DLT 400
Brand Name : N/A
Serial Number : N/A
Date : August 23, 2019

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Portable Conference Transceiver
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 558074 D01 15.247 Meas Guidance v05r02
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) (1)	Carrier Frequency Separation	Met the Limit / PASS
15.247 (a) (1) (iii)	Minimum Number of Hopping Channels	Met the Limit / PASS
15.247 (a) (1) (iii)	Average Time of Occupancy	Met the Limit / PASS
15.247 (b) (1)	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
15.209	Radiated Emission Limits, General Requirement	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 Williams Sound, LLC, Model DLT 400 (referred to as the EUT in this report) is a Portable Conference Transceiver. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Portable Conference Transceiver
Temperature Range	-10 °C ~ 45 °C
OPERATING FREQUENCY	2 402 MHz ~ 2 476 MHz
MODULATION TYPE	FSK
RF OUTPUT POWER	17.35 dBm
Antenna Type	PCB Antenna
ANTENNA GAIN	-11.04 dBi
List of each Osc. or crystal Freq. (Freq. >= 1 MHz)	32.768 kHz, 12 MHz, 16 MHz
RATED SUPPLY VOLTAGE	DC 3.70 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	Williams Sound, LLC	DIGIWAVE4	-
LCD	N/A	N/A	-
BATTERY	Shenzhen Hypercell CO., LTD	HPL554759	-

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested: None

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 2 476 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.

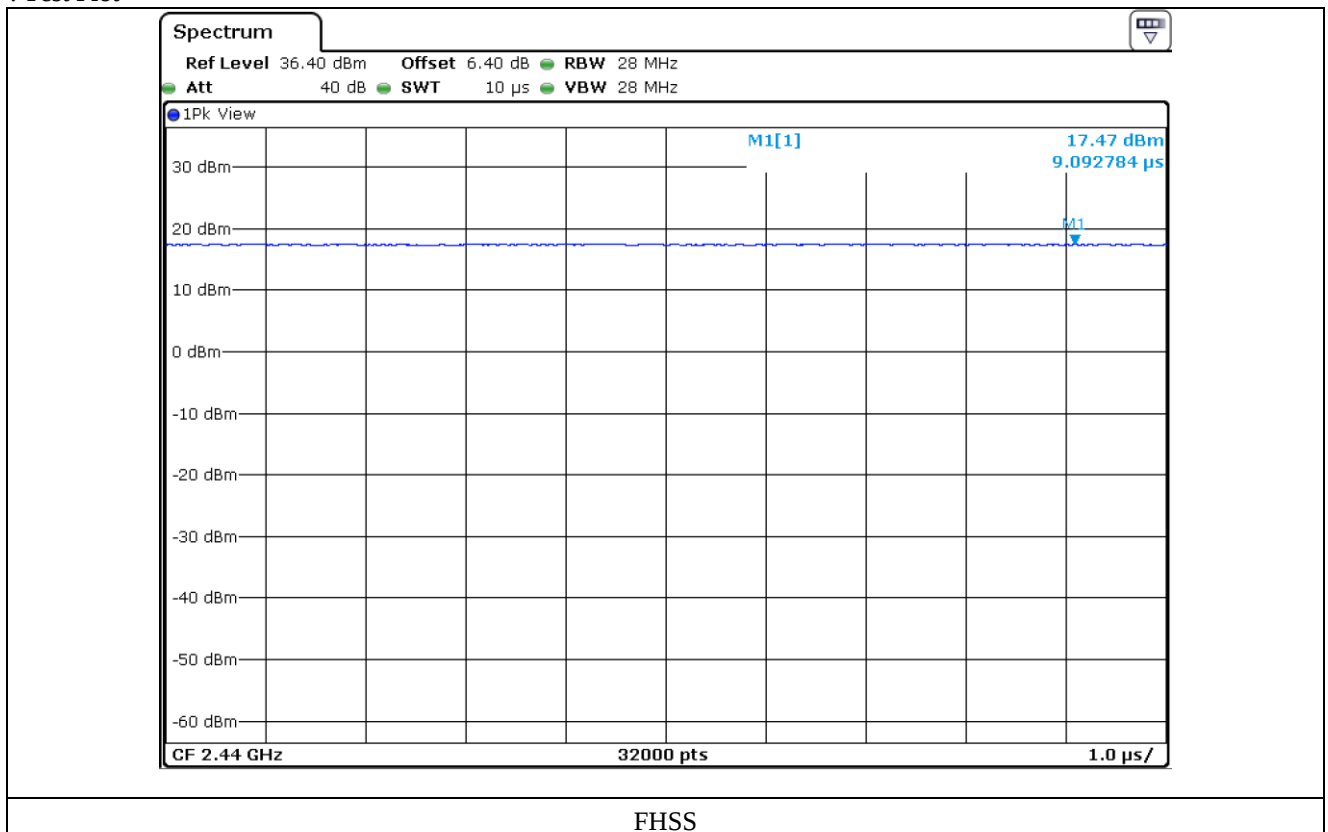
-. Duty Cycle

Mode	Duty Cycle [%]	Correction Factor [dB]
FHSS	100.00	0.00

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : $10 * \log(1 / (\text{Duty Cycle} / 100))$

-. Test Plot



5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in a Charging mode. The EUT was connected to USB and the power of USB was connected to Adaptor. 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 Test, the following operating mode was investigated.

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

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

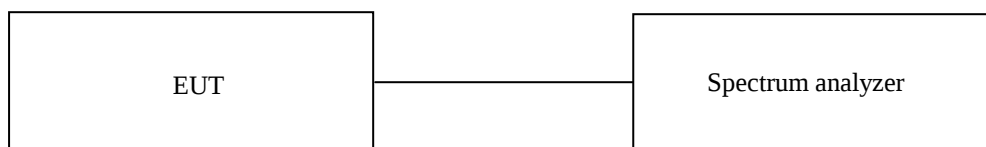
7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % 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 300 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

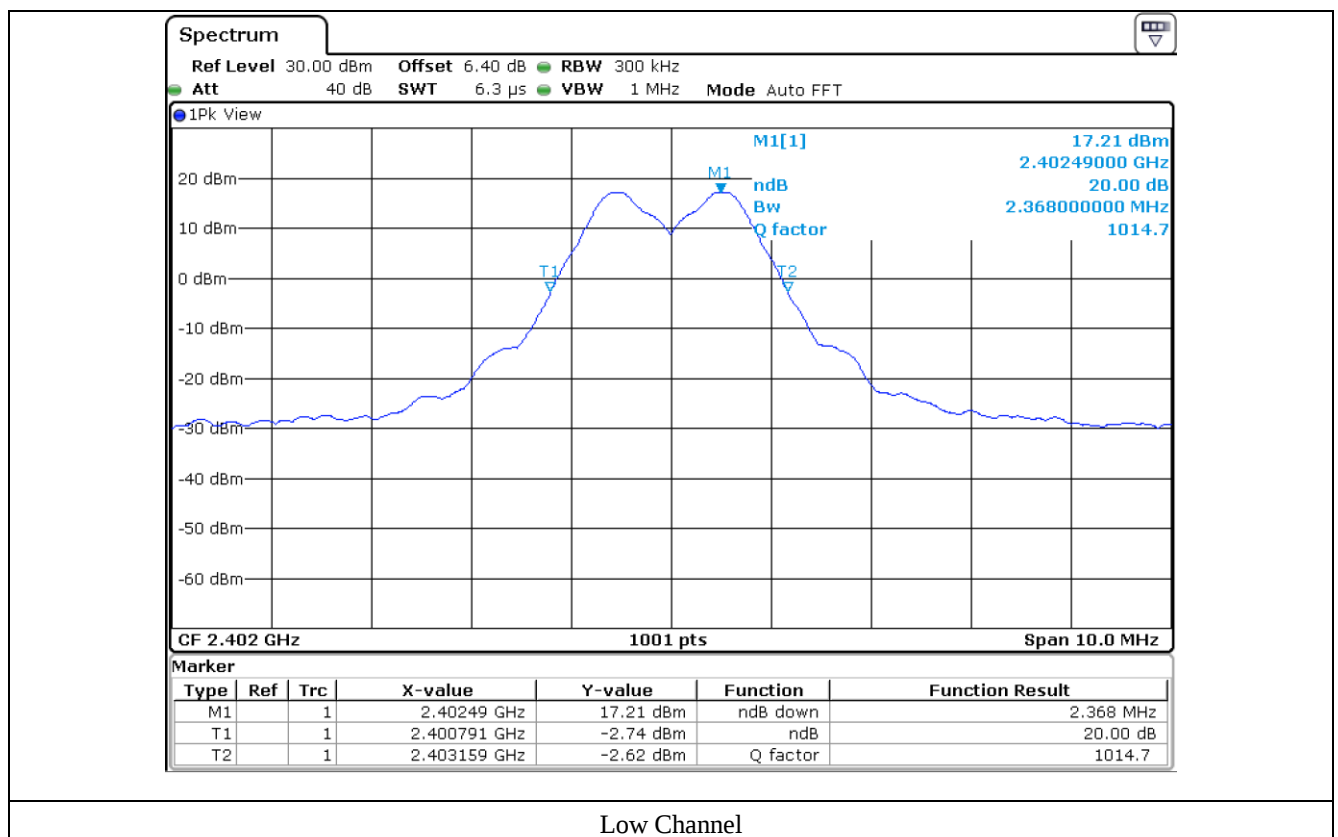
7.4 Test data

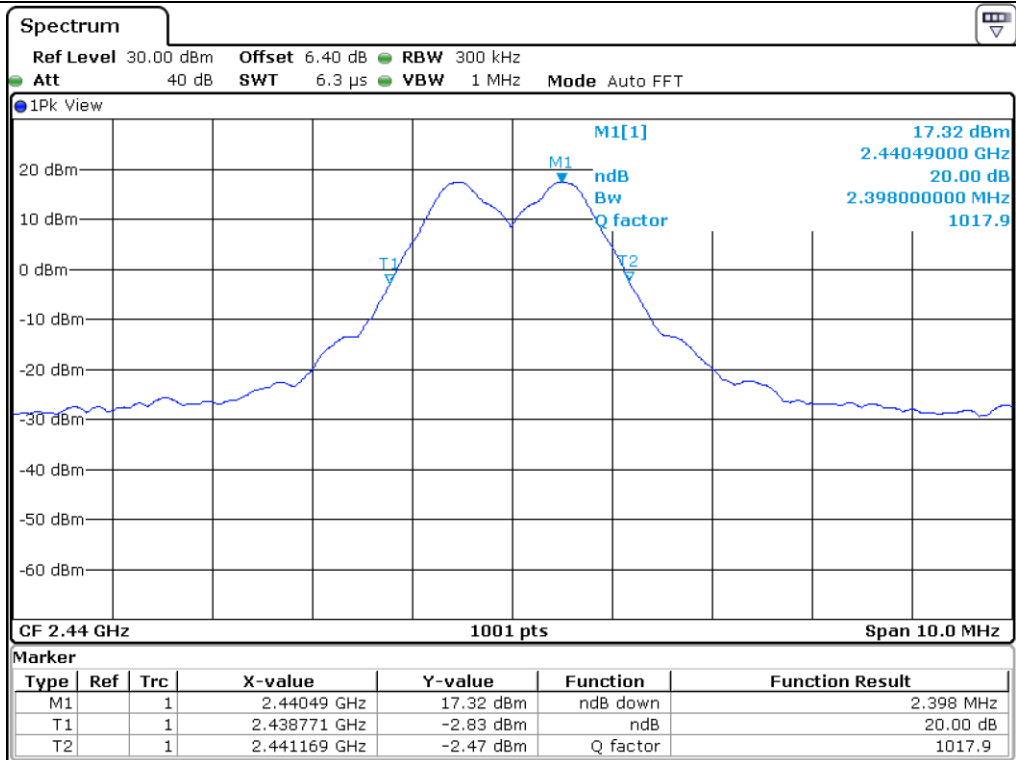
-. Test Date : August 19, 2019 ~ August 22, 2019

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	2 368.00
Middle	2 440.00	2 398.00
High	2 476.00	2 408.00

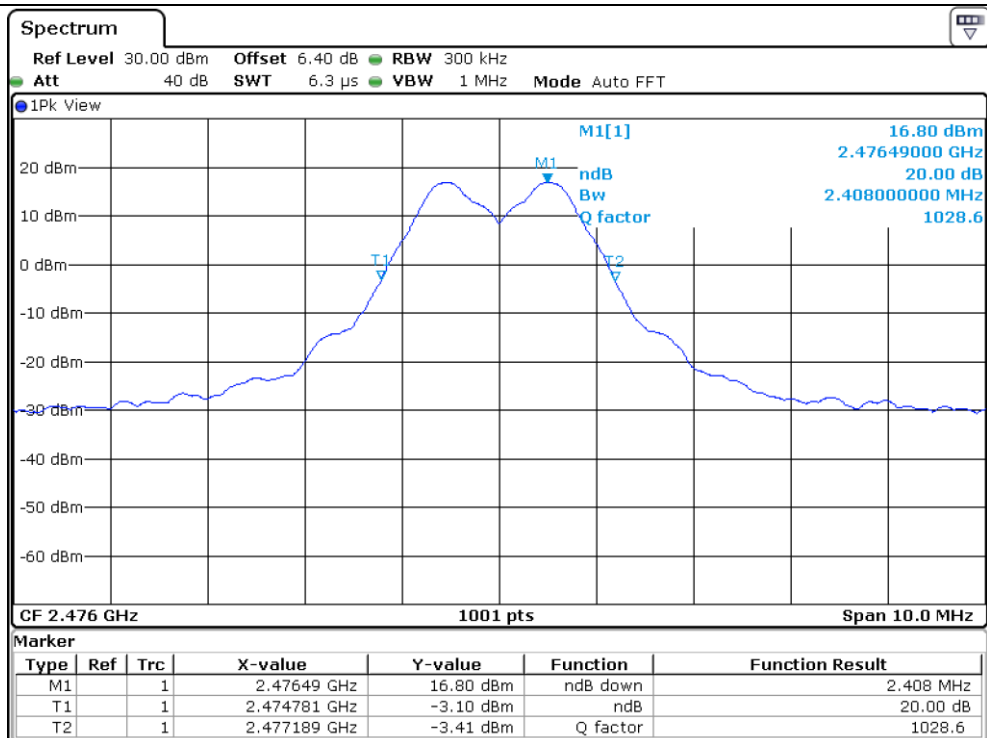


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

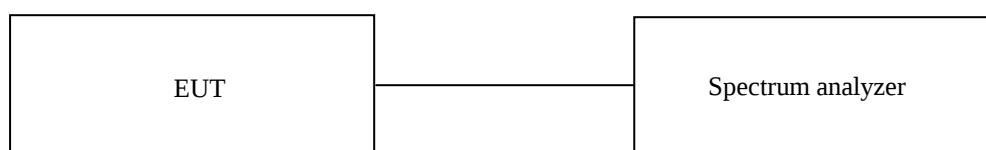
8. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 10 MHz. The analyzer is set to peak hold then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

8.4 Test data

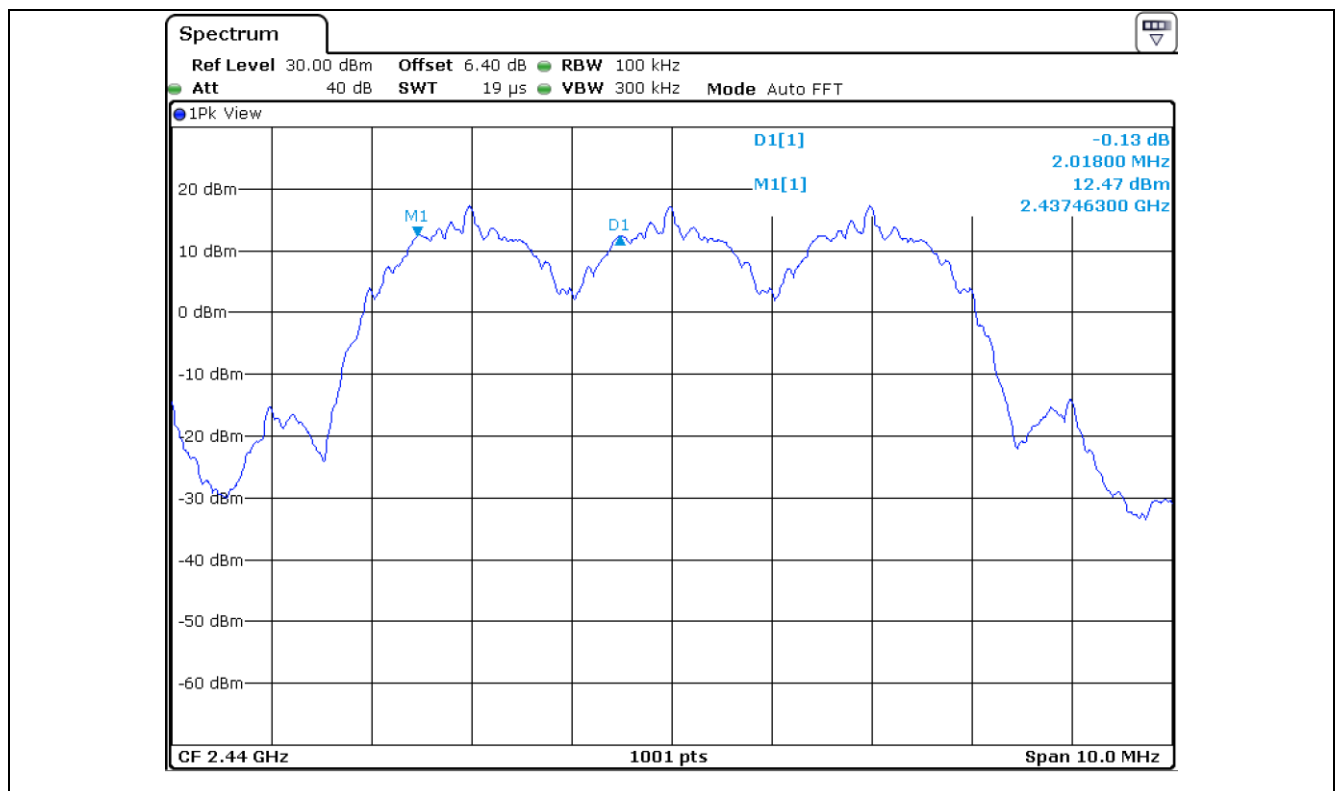
-. Test Date : August 19, 2019 ~ August 22, 2019

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
2 018.00	1 598.67	Separated by a minimum of 25 kHz



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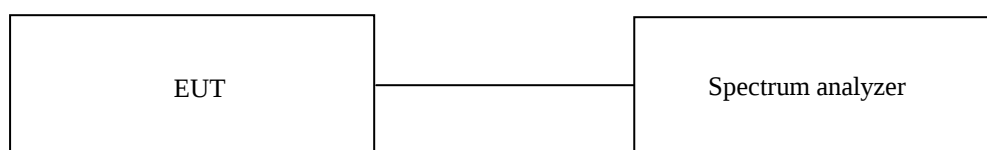
9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 100 MHz and the resolution bandwidth is set to 100 kHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

9.4 Test data

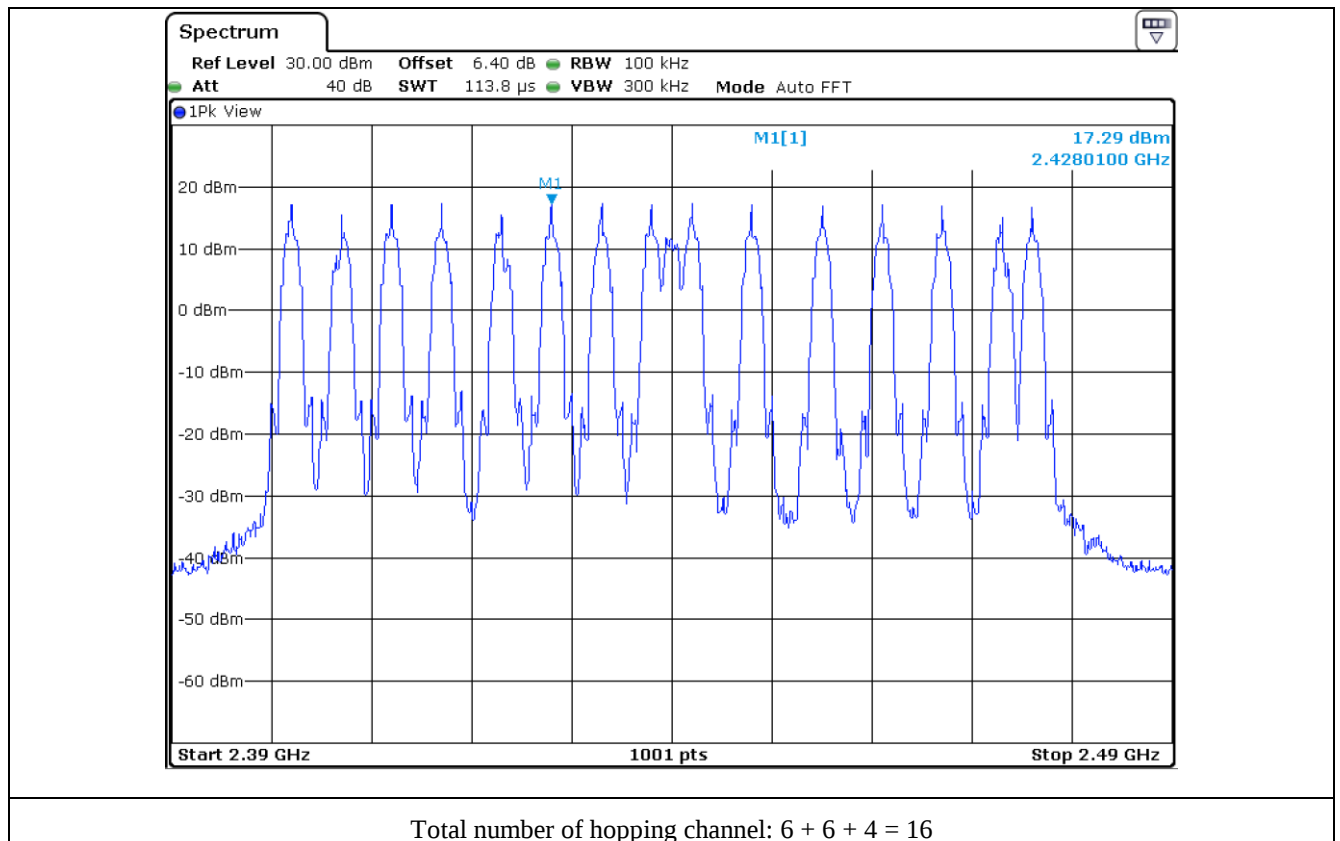
-. Test Date : August 19, 2019 ~ August 22, 2019

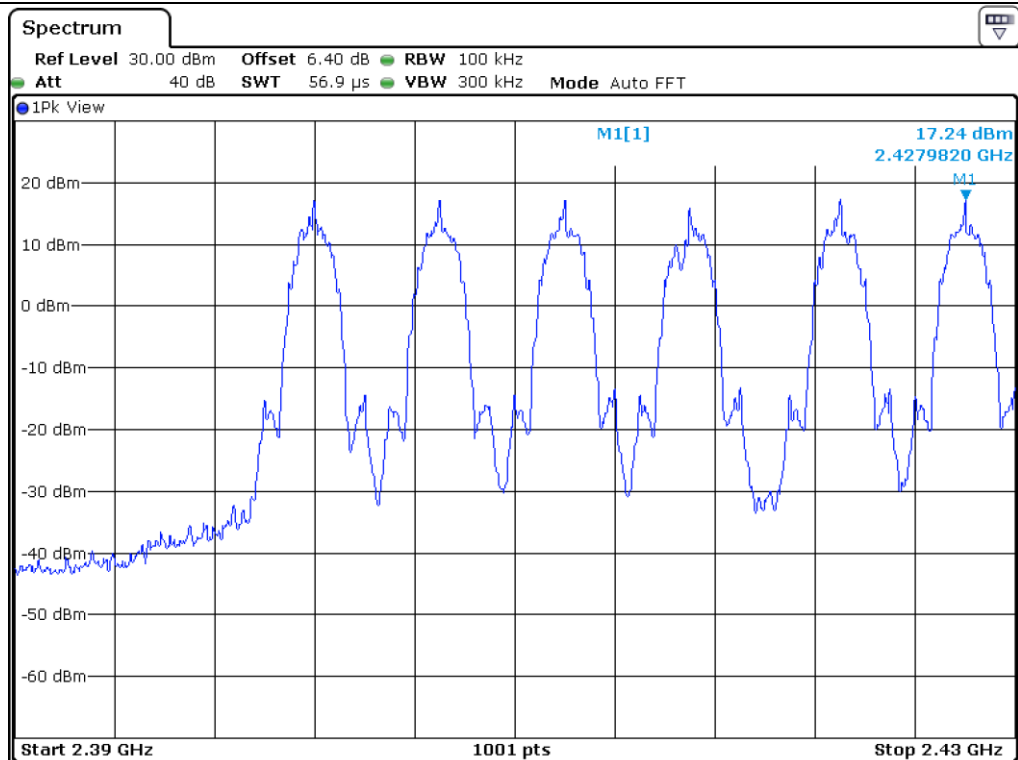
-. Test Result : Pass

Mode	Measured value (Number)	Limit (Number)	Margin (Number)
FHSS	16	Minimum of 15	1.0

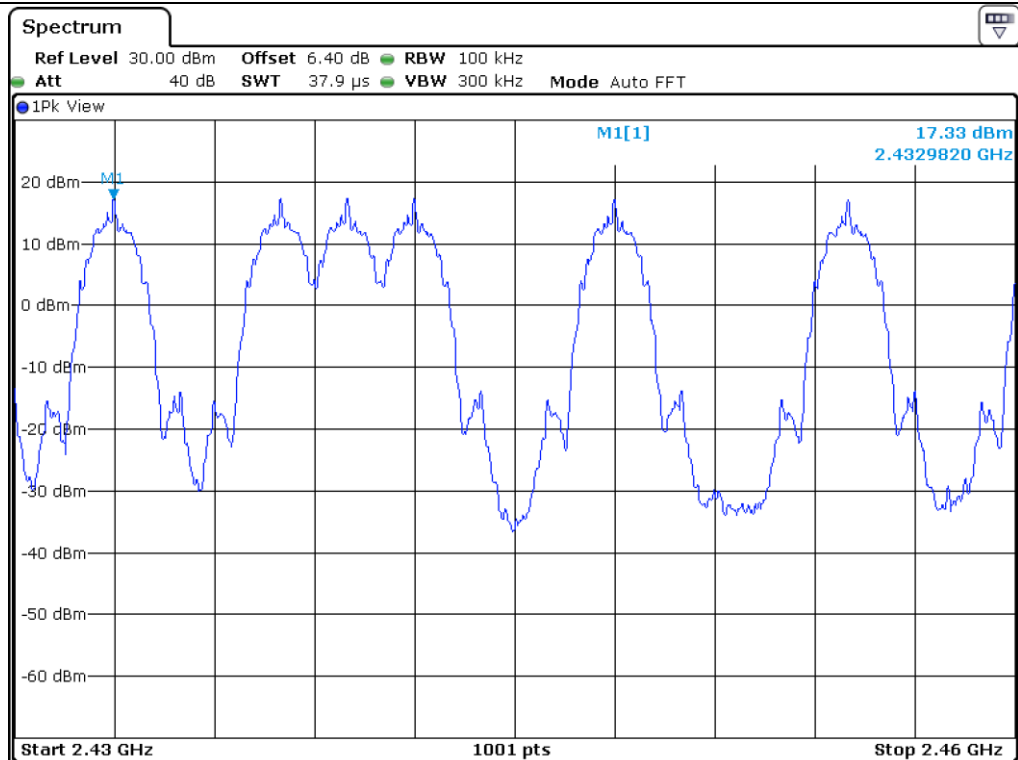


Tested by: Hyung-Kwon, Oh / Assistant Manager

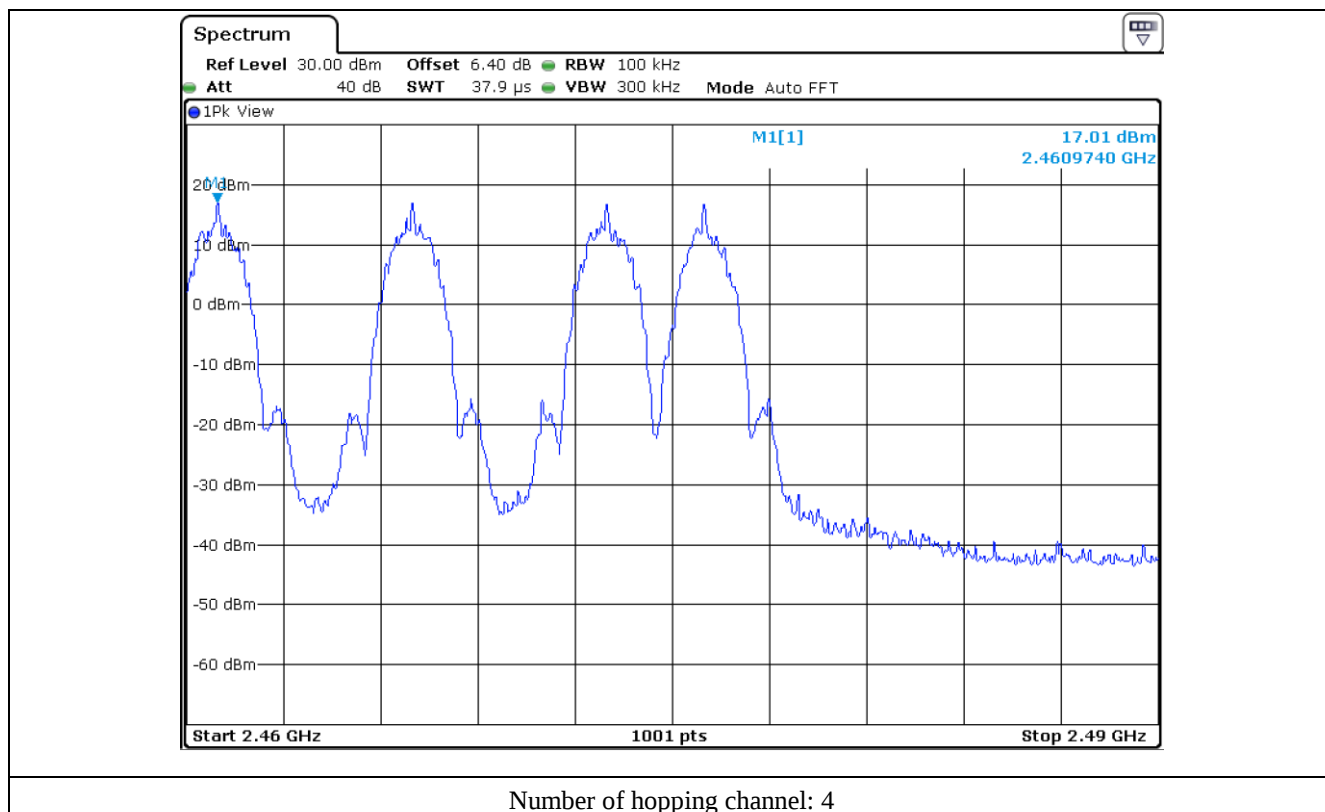




Number of hopping channel: 6



Number of hopping channel: 6



10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The transmitter is set to operate in its normal frequency hopping mode. The center frequency of the spectrum analyzer is set to one of hopping channels near the center of the operating band and span is set to zero Hz. The sweep time is set to display one complete pulse. The mark delta function is used to measure the duration of the pulses.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data

-. Test Date : August 19, 2019 ~ August 22, 2019

Mode	Pulse Time (ms)	Hopping rate (hop/s)	Number of channels	Actual (s)	Limit (s)	Test Result
FHSS	0.800	40.000	16	0.013	0.400	PASS

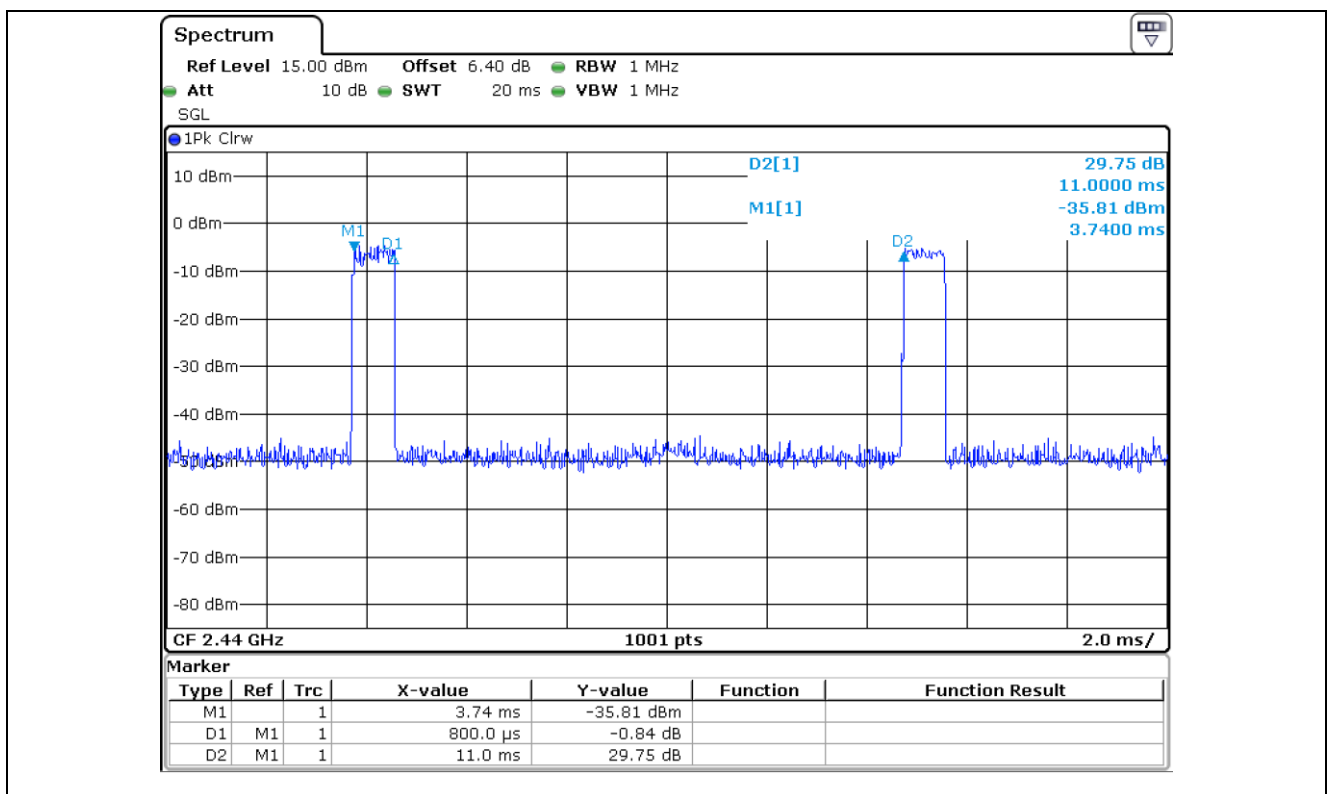
* Actual = Pulse Time x (Hopping rate / Number of channels) x Test period

* Test period = 0.4 (Seconds / channel) x 16 (channel) = 6.4 (seconds)

* Hopping rate: 2(Number of hopping during 20 ms) x 20 = 40



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11. MAXIMUM PEAK OUTPUT POWER

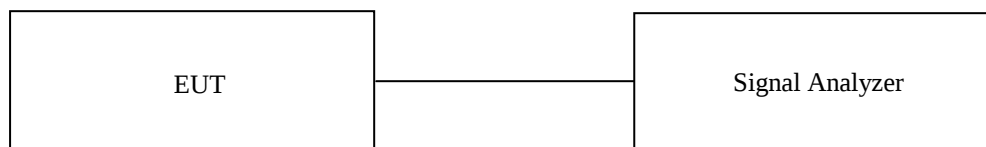
11.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

11.2 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.



11.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

11.4 Test data

-. Test Date : August 19, 2019 ~ August 22, 2019

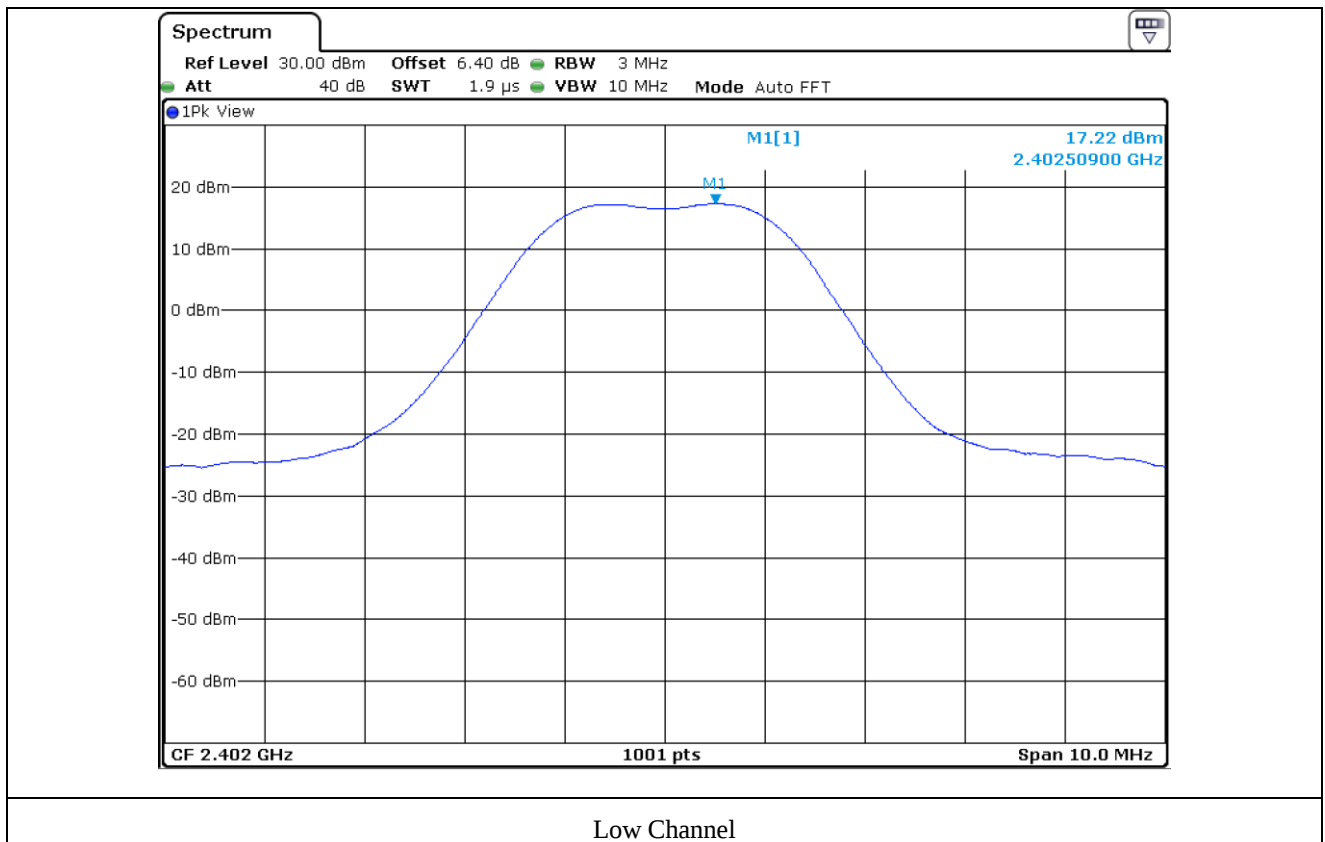
. Test Result : Pass

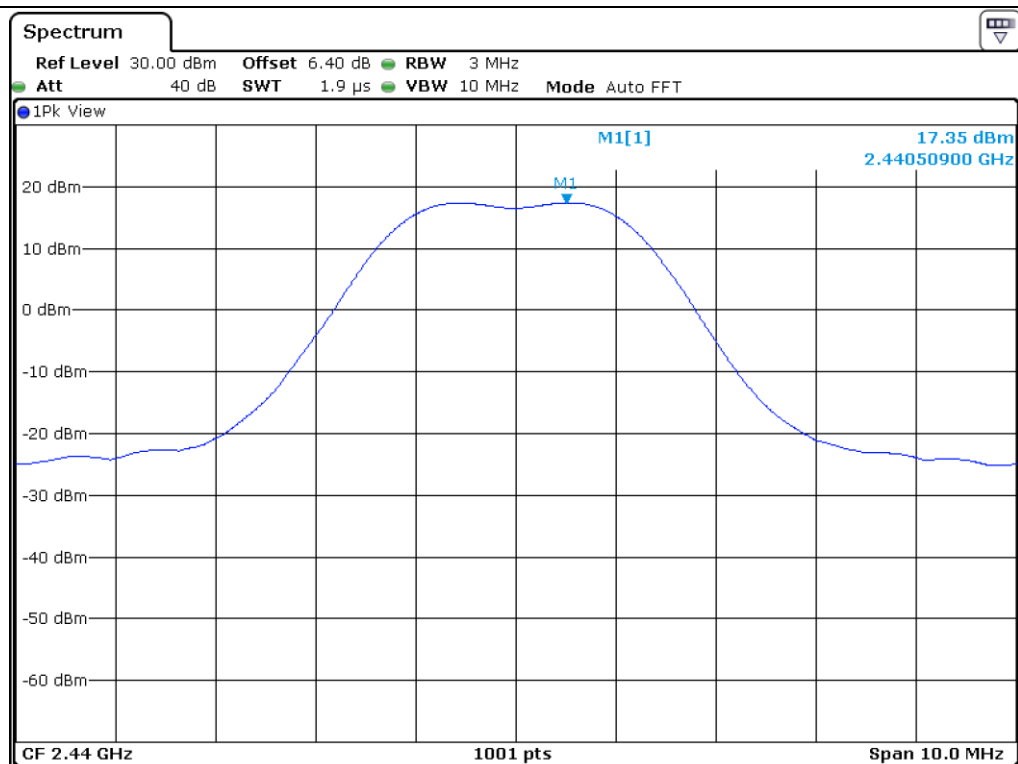
CHANNEL	FREQUENCY (MHz)	20 dB B.W (kHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	2 368.00	17.22	21.00	3.78
MIDDLE	2 440.00	2 398.00	17.35	21.00	3.65
HIGH	2 476.00	2 408.00	16.82	21.00	4.18

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

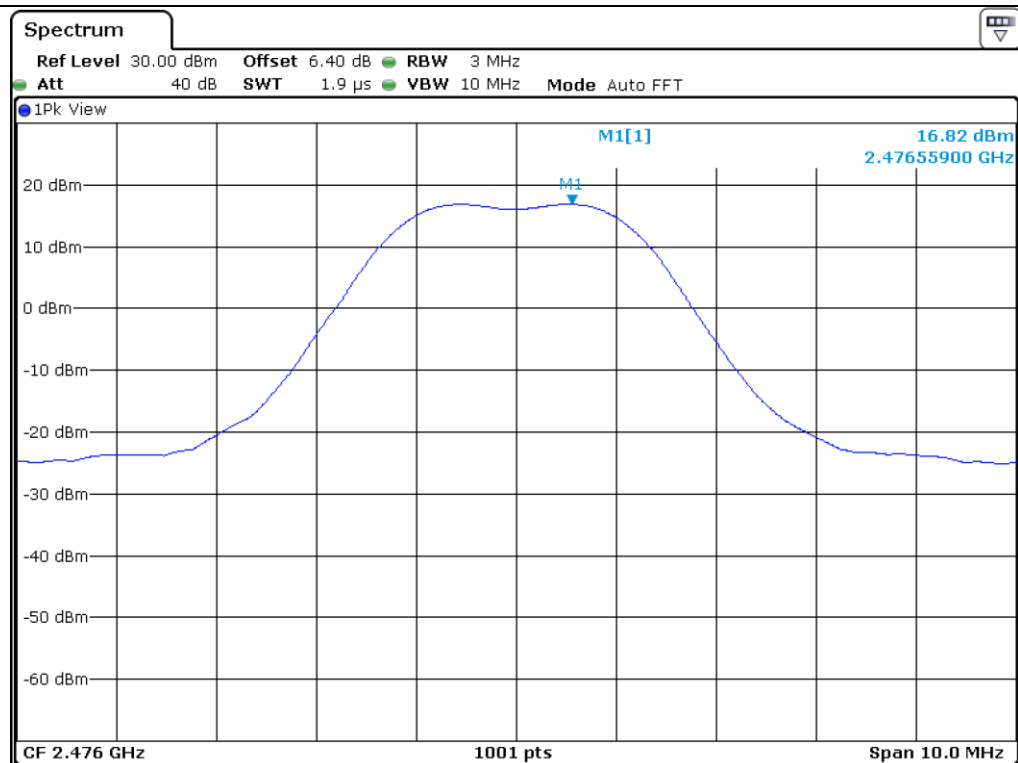


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

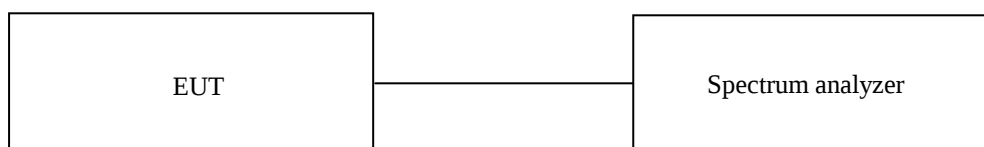
12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

12.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

12.2 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.



12.3 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.

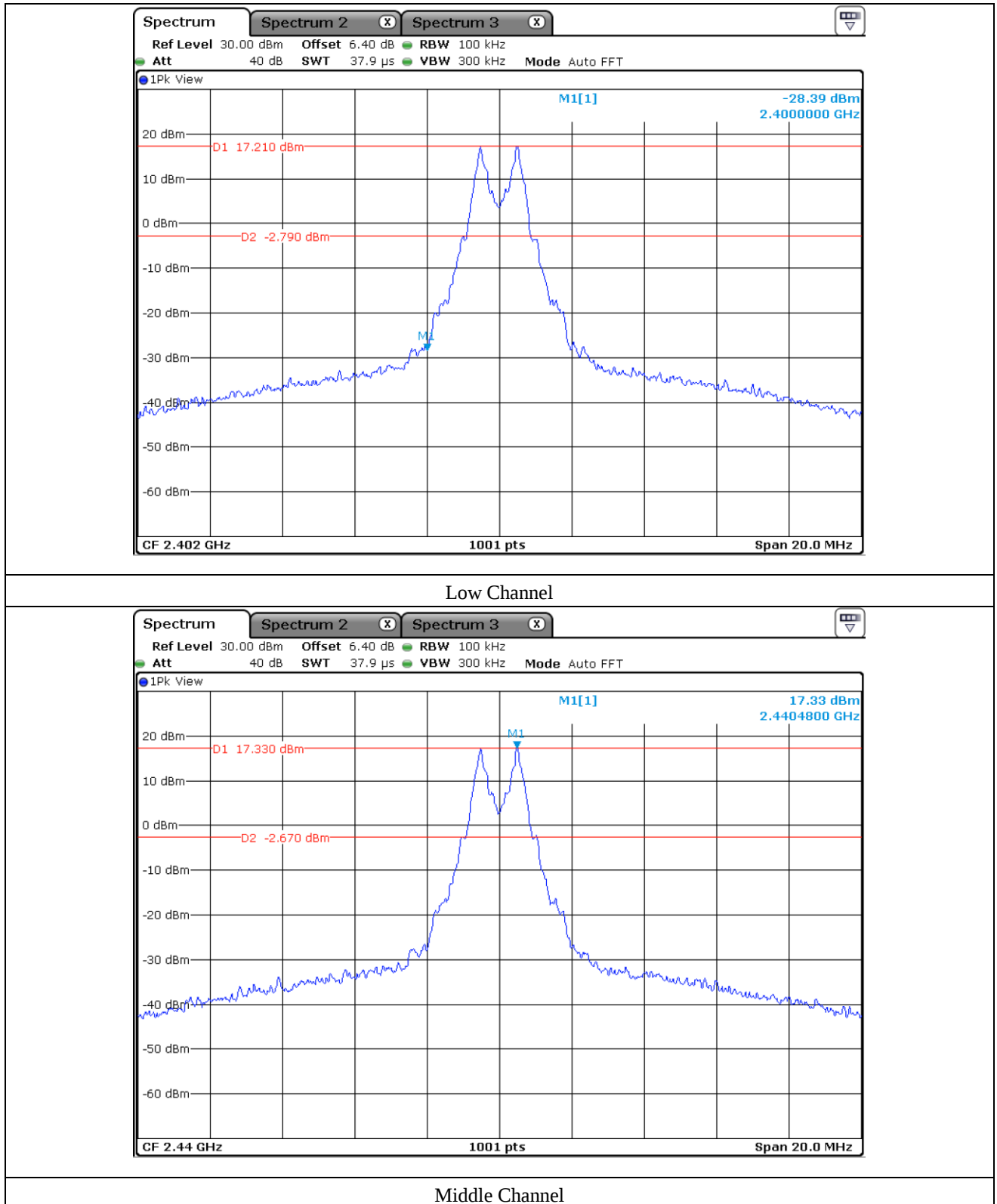
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal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

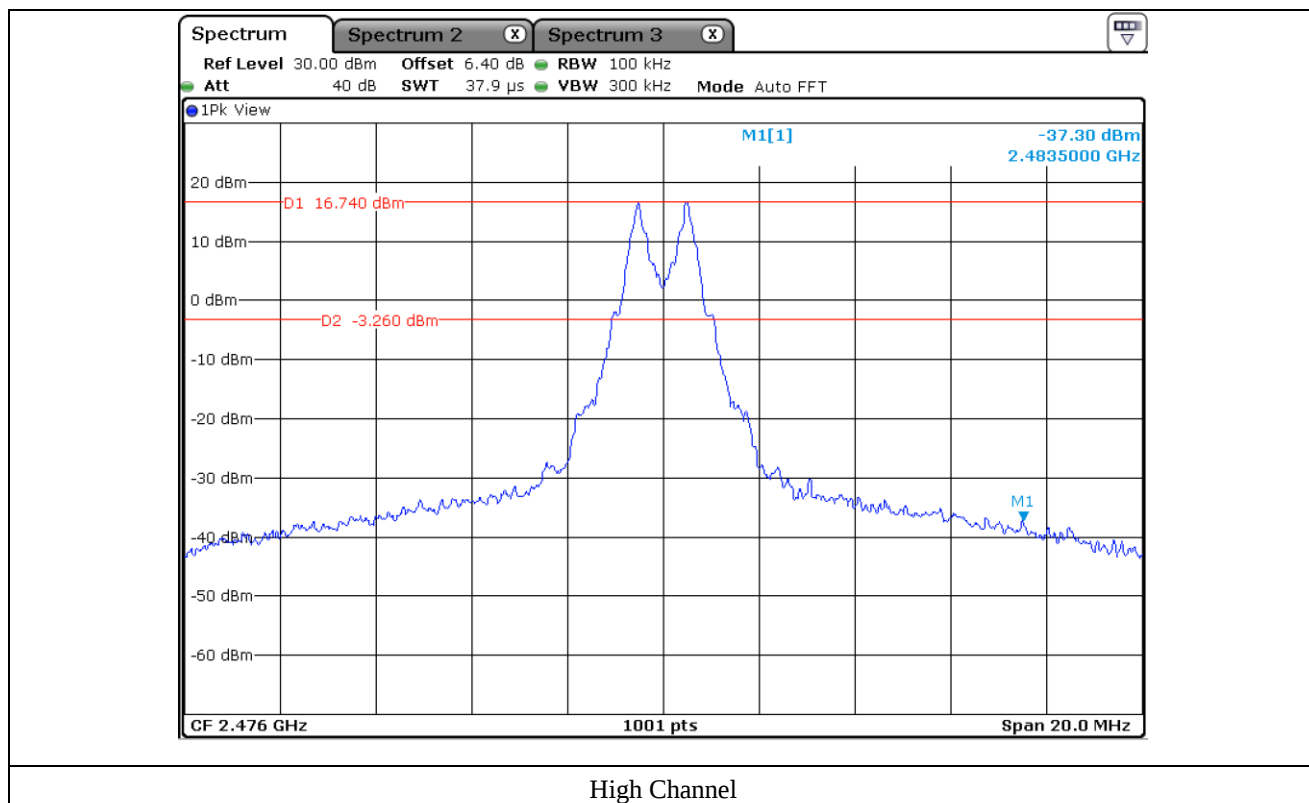
12.4 Test equipment used

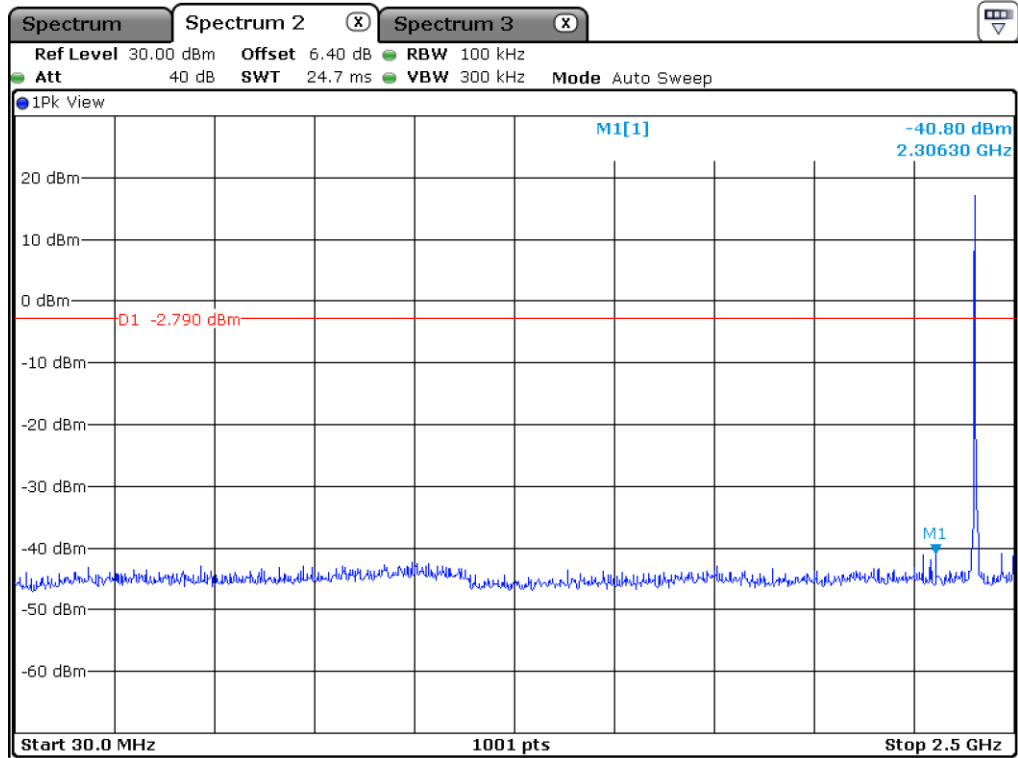
	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 28, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718B	Schwarzbeck	Amplifier	009	Mar. 20, 2019 (1Y)
■ -	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 2019 (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	777	Apr. 13, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)
■ -	VAMP9243	Schwarzbeck	ROD ANTENNA	VAMP9243	Mar. 14, 2019 (2Y)

All test equipment used is calibrated on a regular basis.

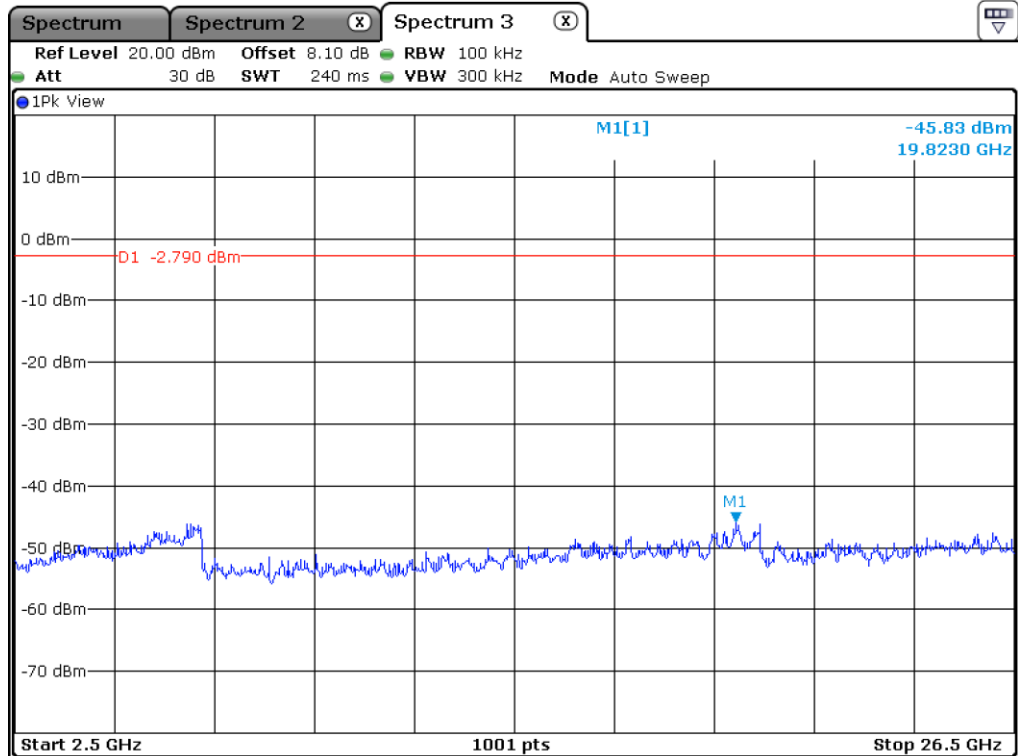
12.5 Test data for conducted emission



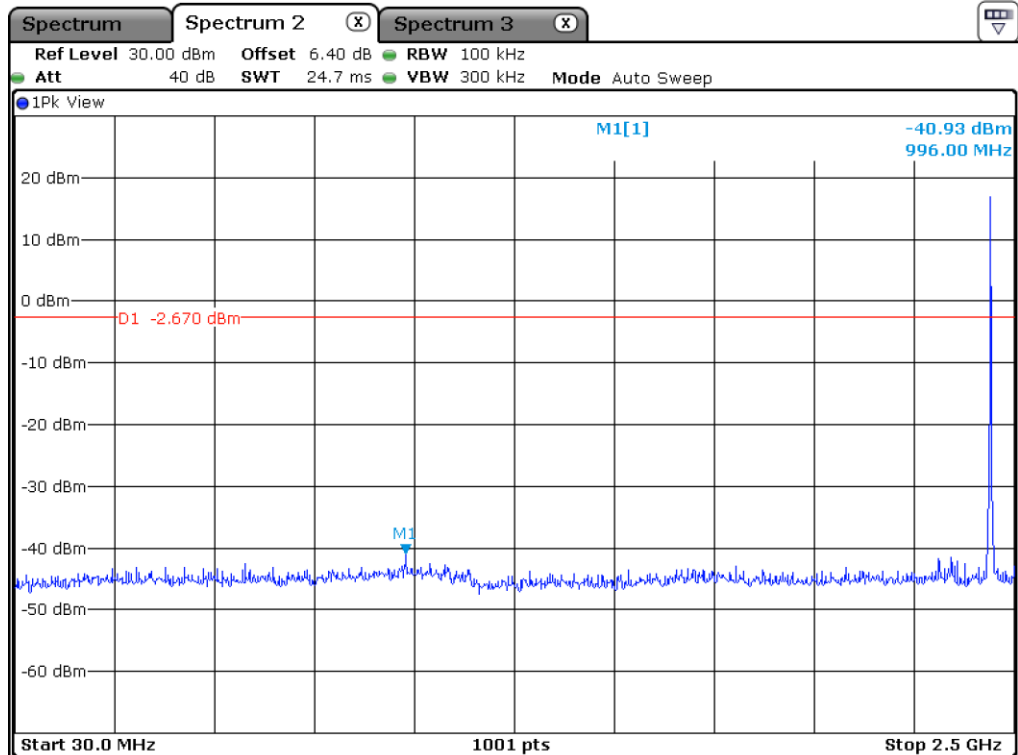




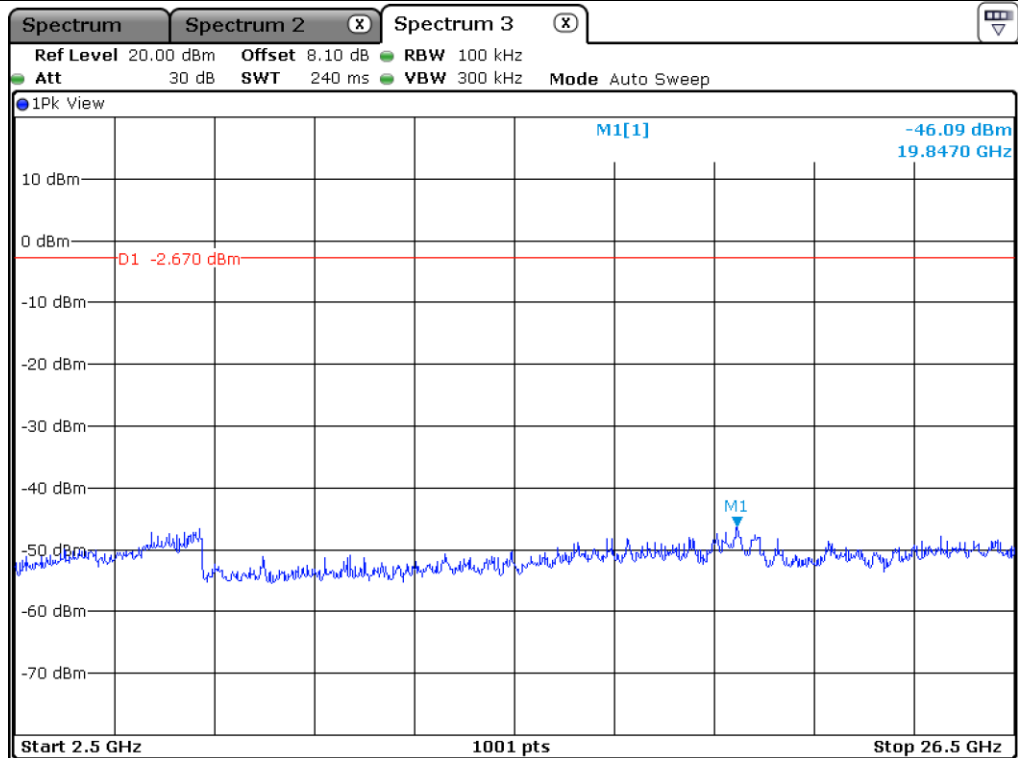
Low Channel



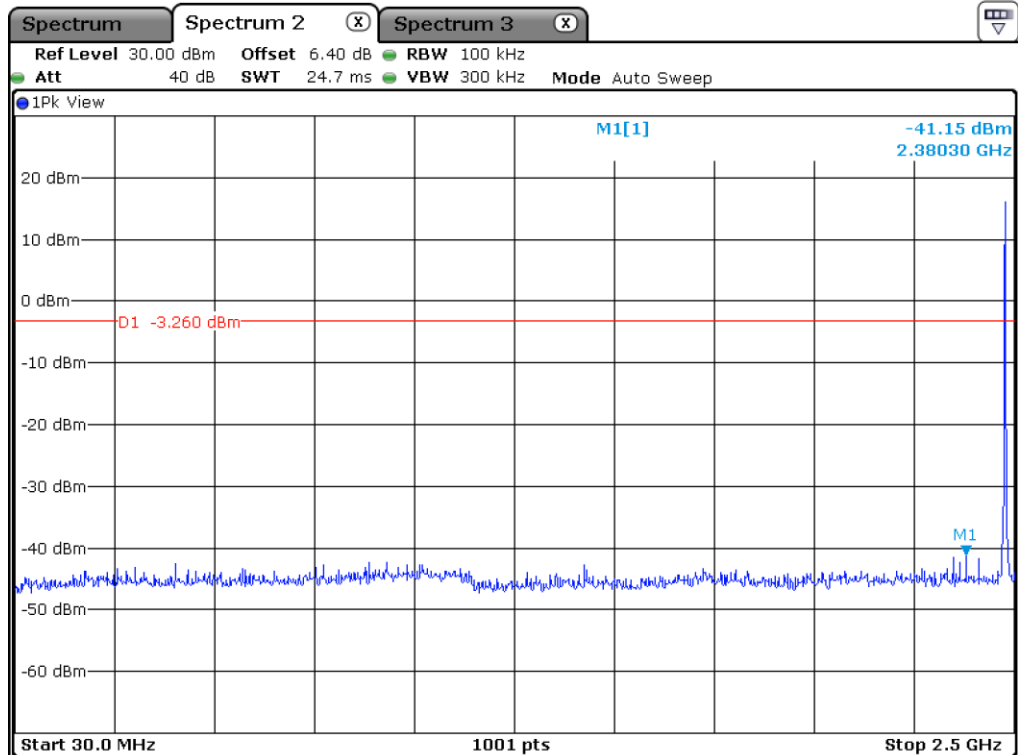
Low Channel



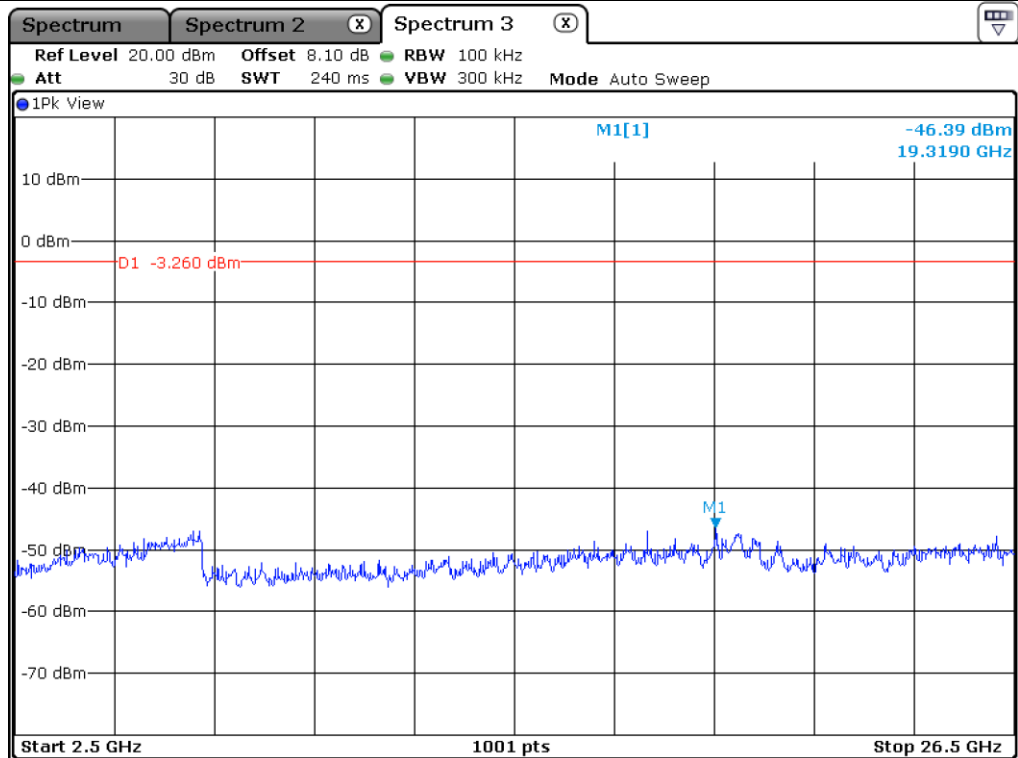
Middle Channel



Middle Channel



High Channel



High Channel

12.6 Test data for Transmitting mode radiated emission

12.6.1 Radiated Emission which fall in the Restricted Band

- . Test Date : August 19, 2019 ~ August 22, 2019
- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : 100.00 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
2 324.825	17.20	Peak	H	25.94	2.75	45.89	74.00	28.11
2 339.770	6.15	Average	H	25.94	2.75	34.84	54.00	19.16
2 344.326	17.41	Peak	V	25.94	2.75	46.10	74.00	27.90
2 342.727	6.03	Average	V	25.94	2.75	34.72	54.00	19.28
Test Data for High Channel								
2 484.464	18.04	Peak	H	26.47	2.39	46.90	74.00	27.10
2 483.508	7.03	Average	H	26.47	2.39	35.89	54.00	18.11
2 493.563	17.07	Peak	V	26.47	2.39	45.93	74.00	28.07
2 492.080	5.30	Average	V	26.47	2.39	34.16	54.00	19.84

Tabulated test data for Restricted Band

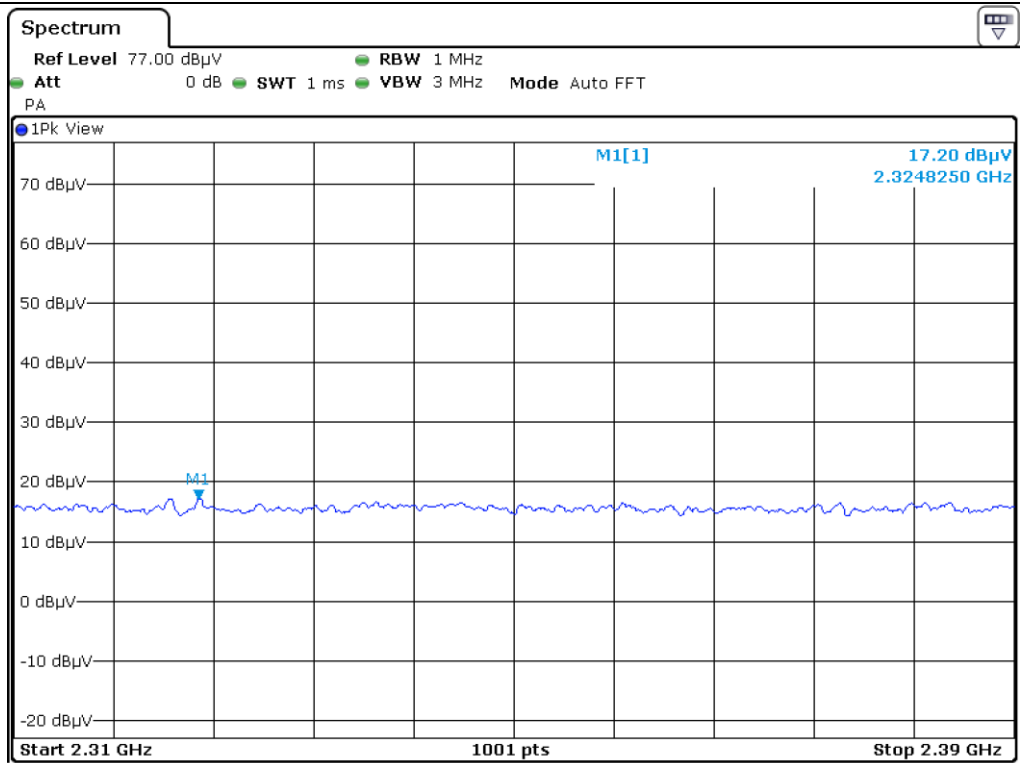
Remark: "H": Horizontal, "V": Vertical

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

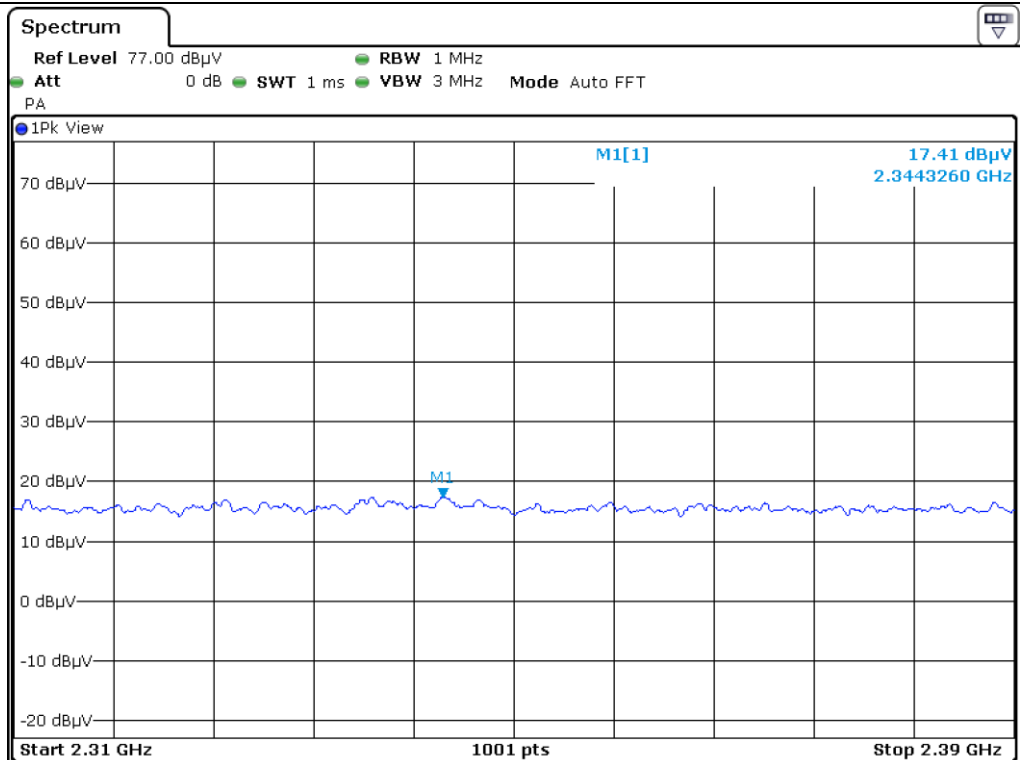
$$\text{Total Level} = \text{Reading} + \text{Ant. Factor} + \text{Cable Loss}$$



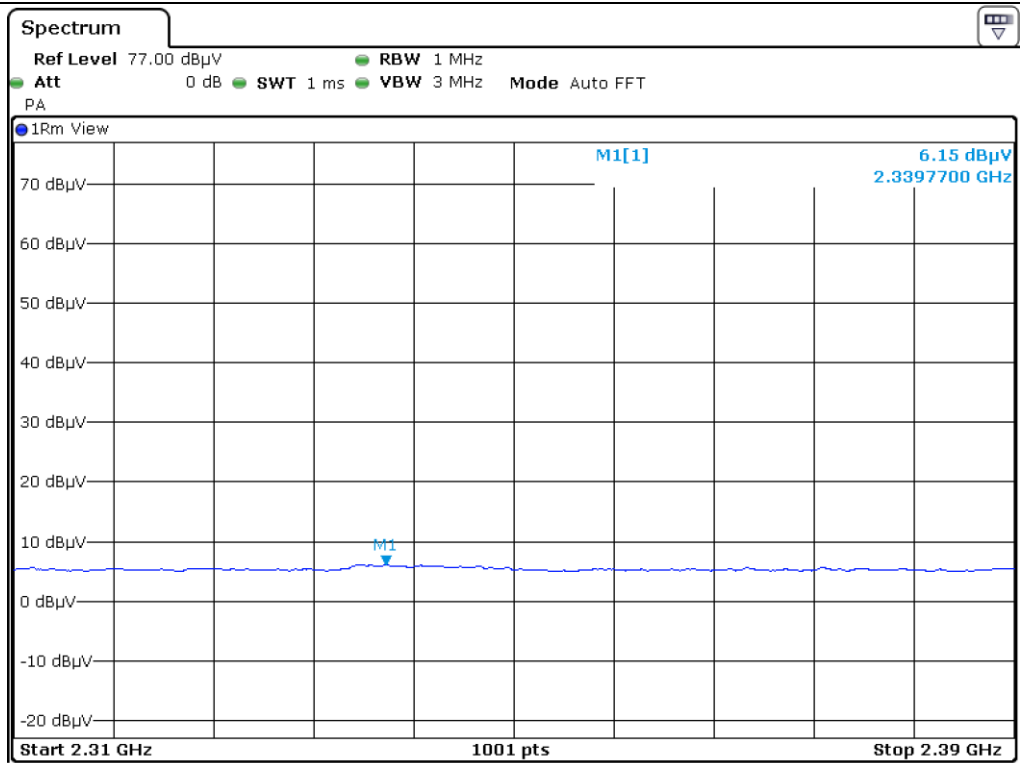
Tested by: Hyung-Kwon, Oh / Assistant Manager



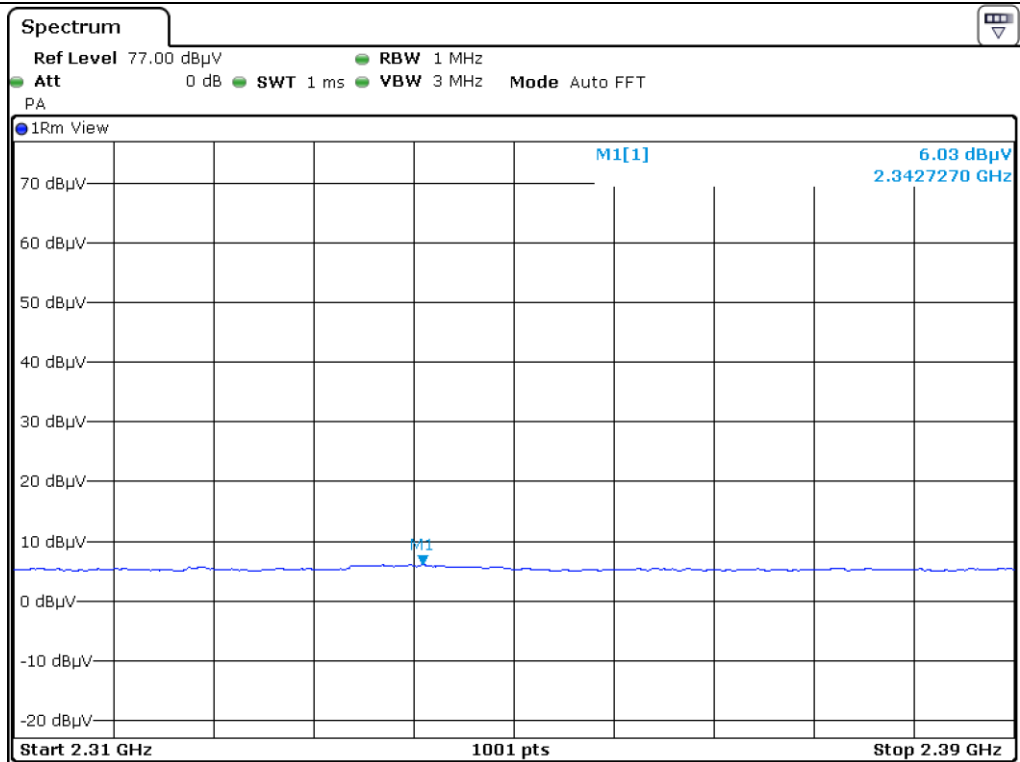
Low Channel_H_Peak



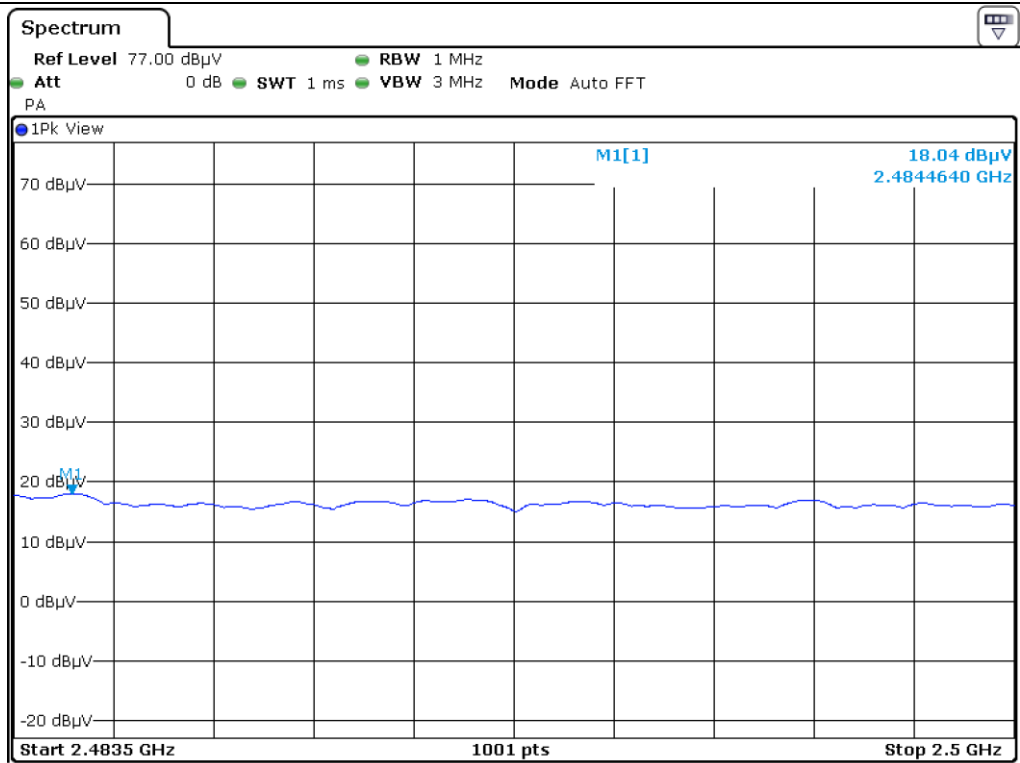
Low Channel_V_Peak



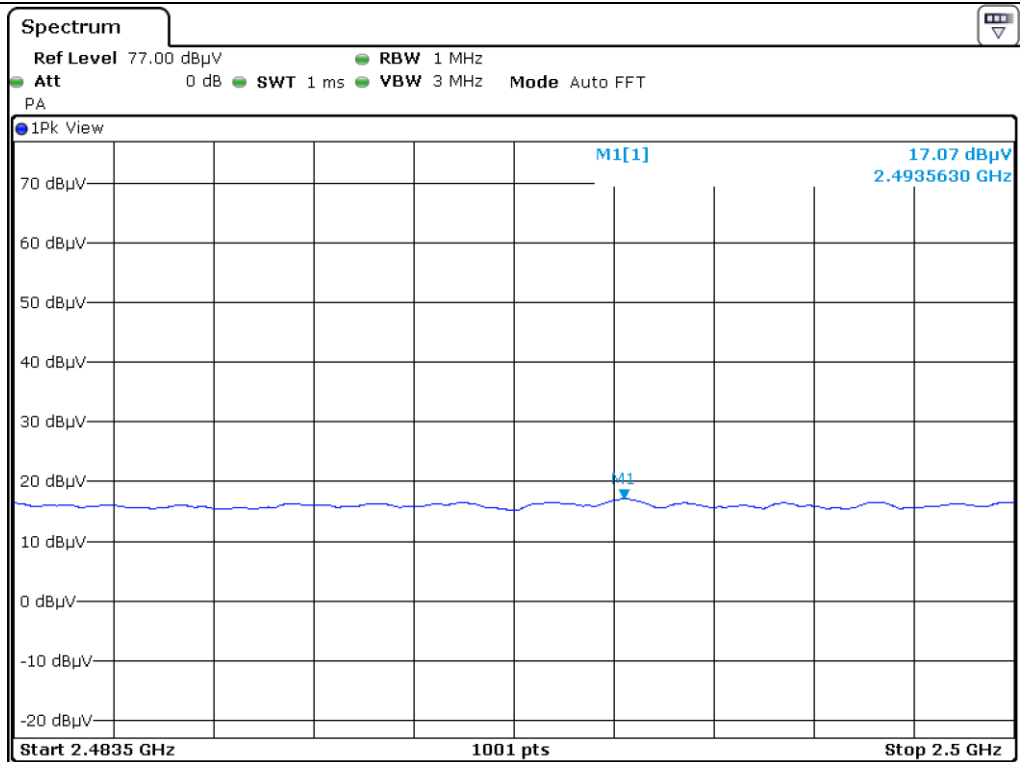
Low Channel_H_Average



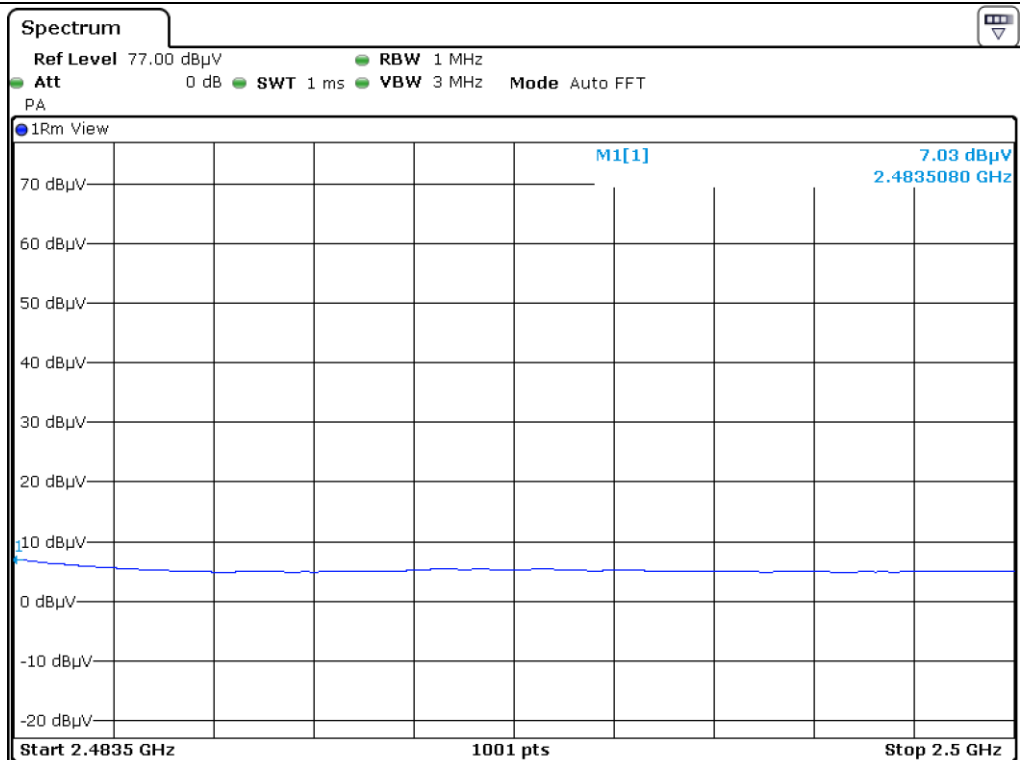
Low Channel_V_Average



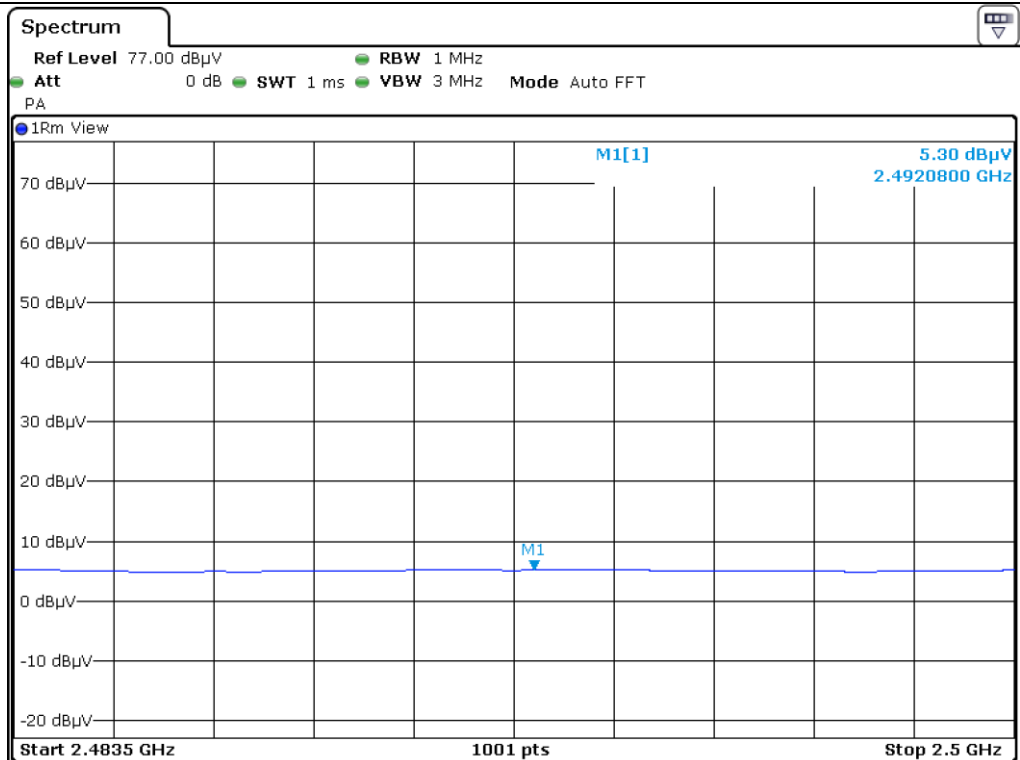
High Channel_H_Peak



High Channel_V_Peak



High Channel_H_Average



High Channel_V_Average

12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

- . Test Date : August 19, 2019 ~ August 22, 2019
- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : 100.00 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
4 804.000	18.57	Peak	H	27.84	5.28	51.69	74.00	22.31
4 804.000	6.75	Average	H	27.84	5.28	39.87	54.00	14.13
4 804.000	18.89	Peak	V	27.84	5.28	52.01	74.00	21.99
4 804.000	6.73	Average	V	24.84	5.28	36.85	54.00	17.15
Test Data for Middle Channel								
4 880.000	18.86	Peak	H	27.01	5.42	51.29	74.00	22.71
4 880.000	6.84	Average	H	27.01	5.42	39.27	54.00	14.73
4 880.000	18.92	Peak	V	27.01	5.42	51.35	74.00	22.65
4 880.000	6.85	Average	V	27.01	5.42	39.28	54.00	14.72
Test Data for High Channel								
4 952.000	19.29	Peak	H	28.15	5.40	52.84	74.00	21.16
4 952.000	7.10	Average	H	28.15	5.40	40.65	54.00	13.35
4 952.000	19.04	Peak	V	28.15	5.40	52.59	74.00	21.41
4 952.000	7.14	Average	V	28.15	5.40	40.69	54.00	13.31

Tabulated test data for Restricted Band

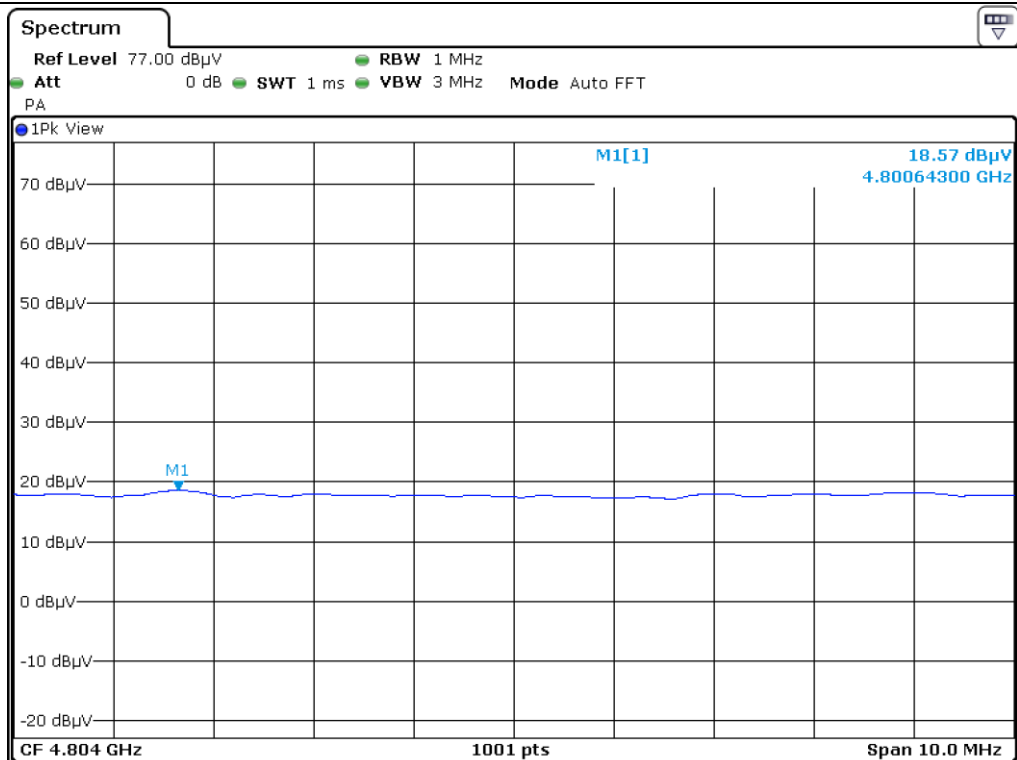
Remark: "H": Horizontal, "V": Vertical

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

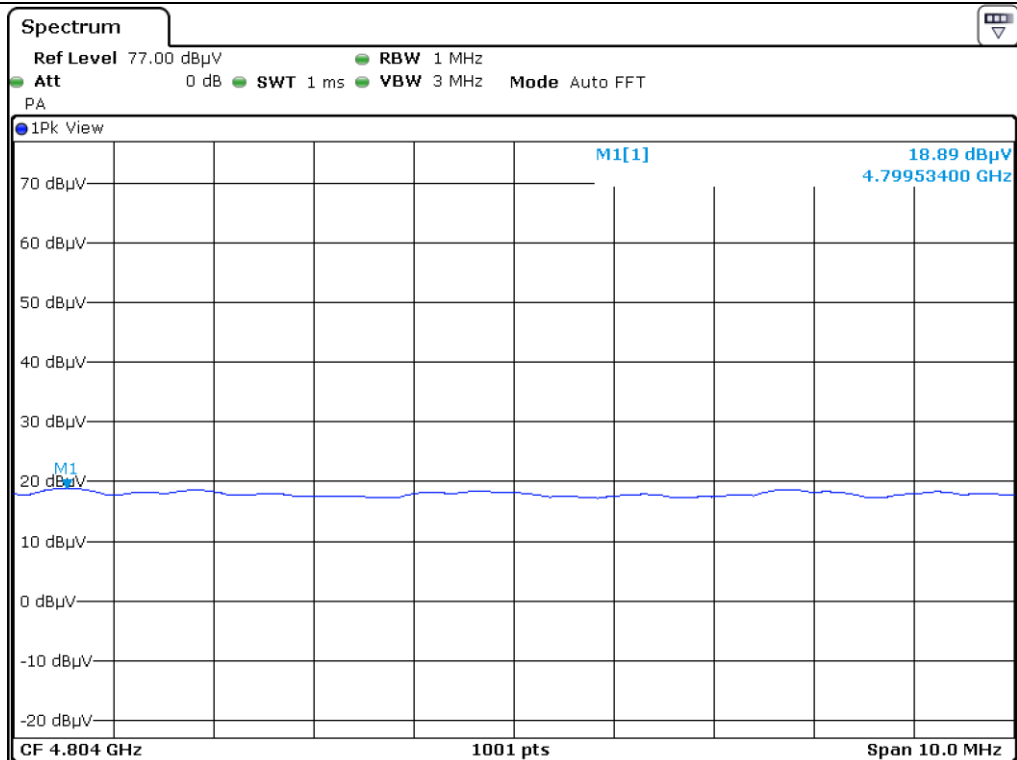
Total Level = Reading + Ant. Factor + Cable Loss



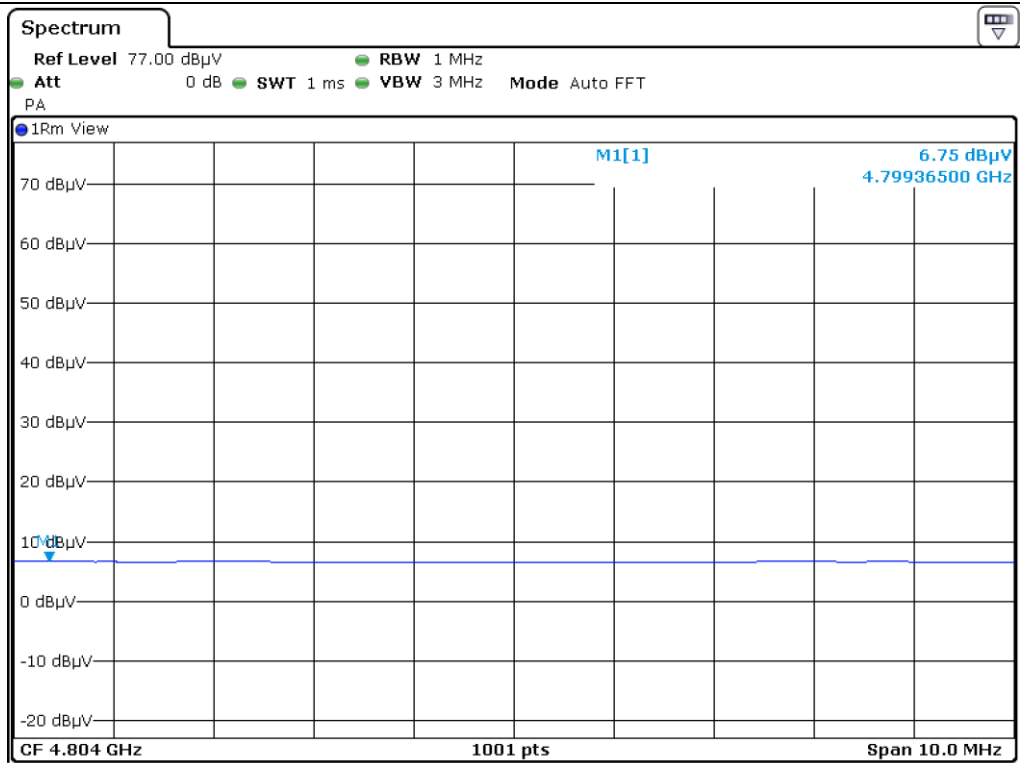
Tested by: Hyung-Kwon, Oh / Assistant Manager



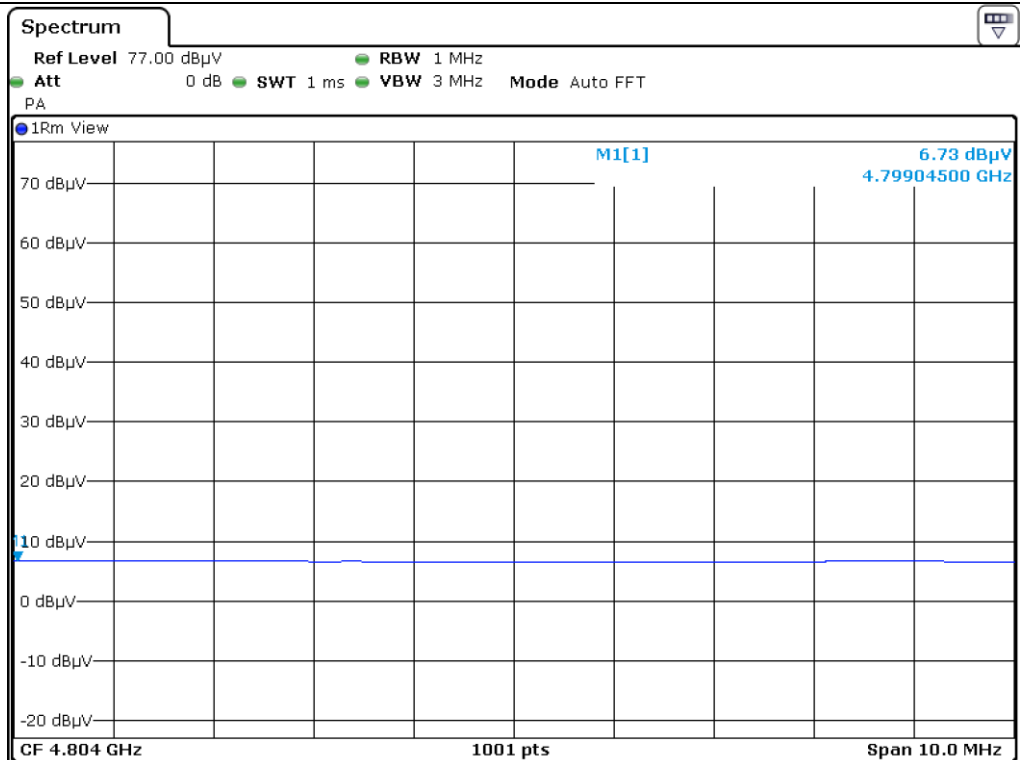
Low Channel_H_Peak



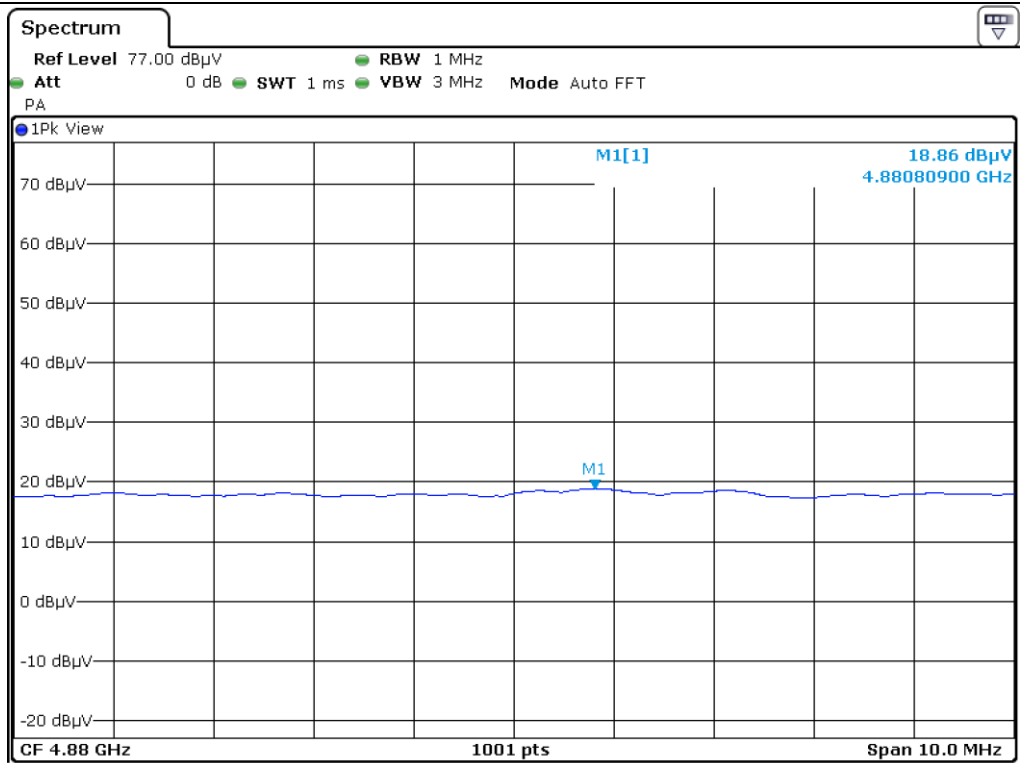
Low Channel_V_Peak



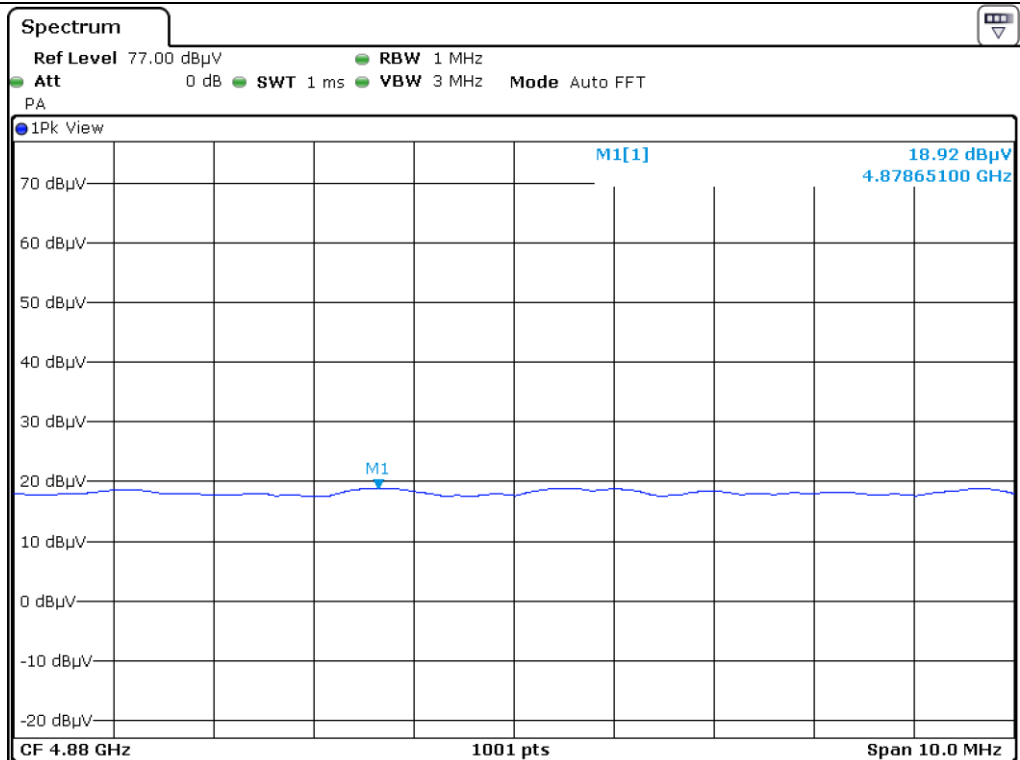
Low Channel_H_Average



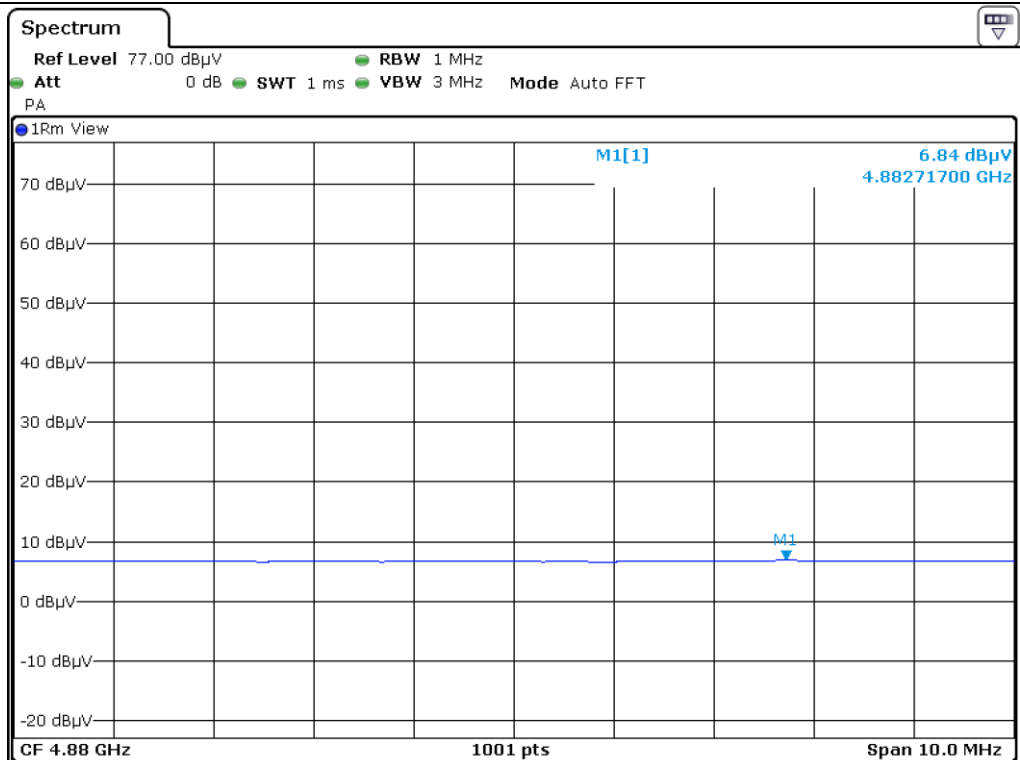
Low Channel_V_Average



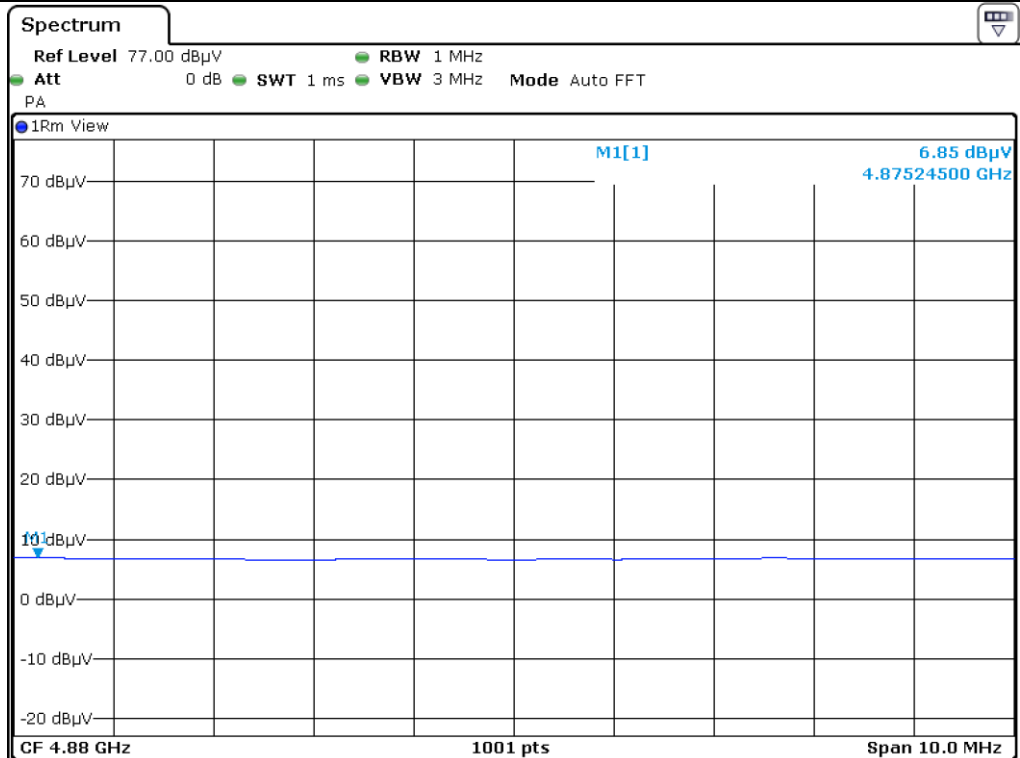
Middle Channel_H_Peak



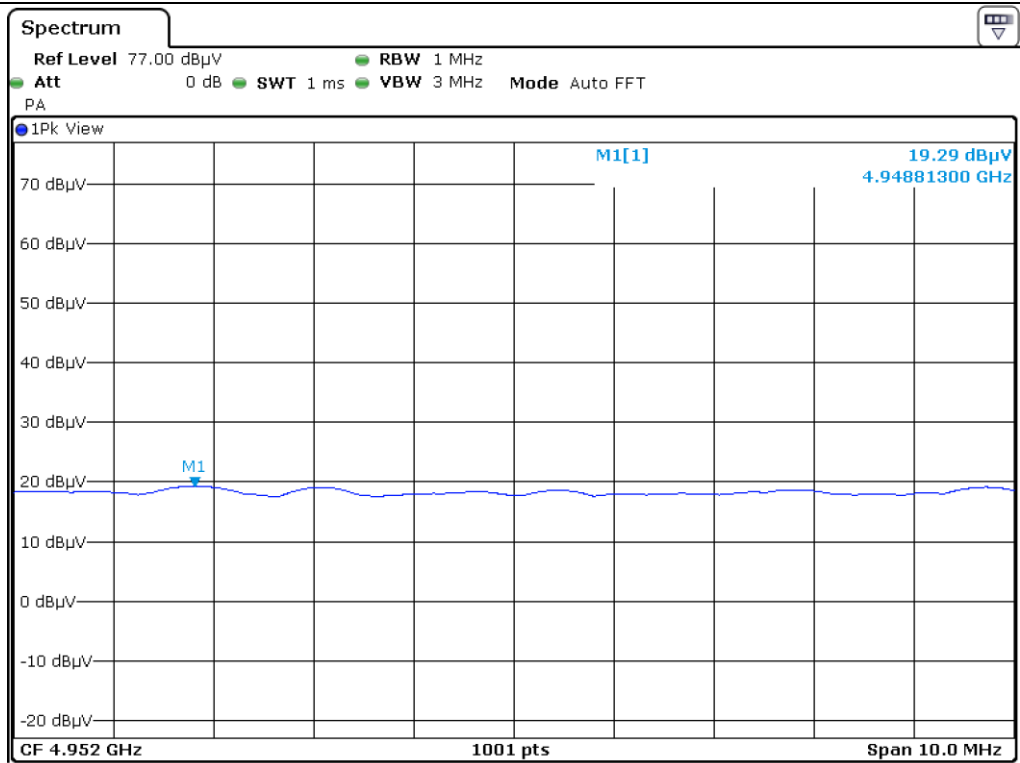
Middle Channel_V_Peak



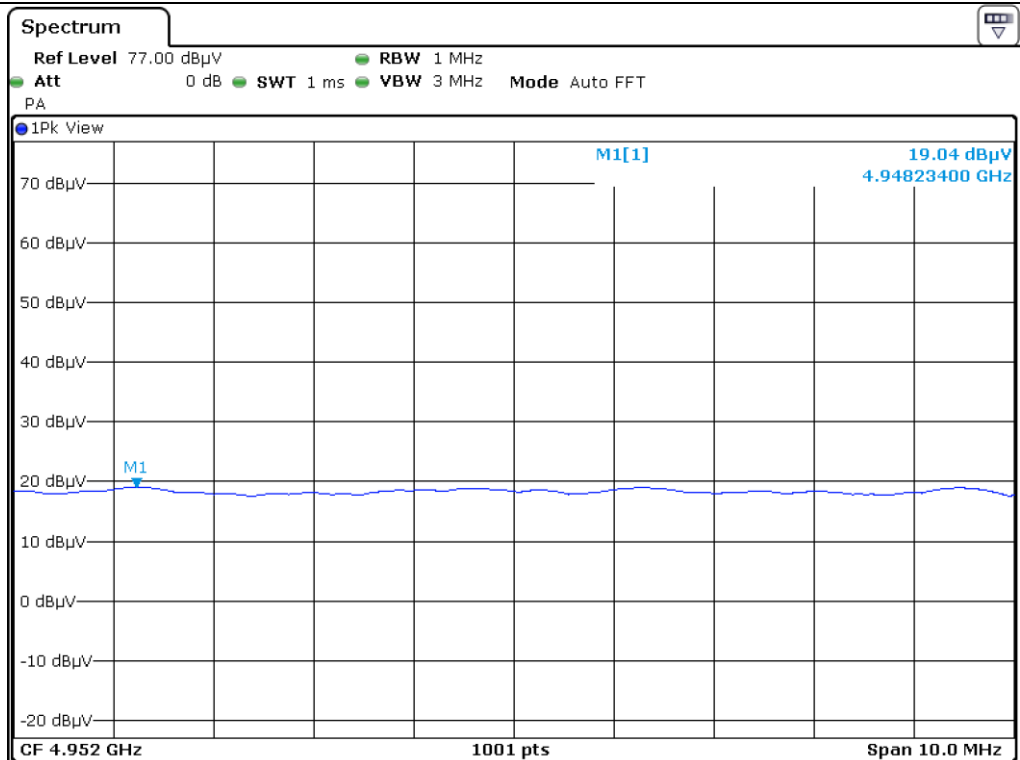
Middle Channel_H_Average



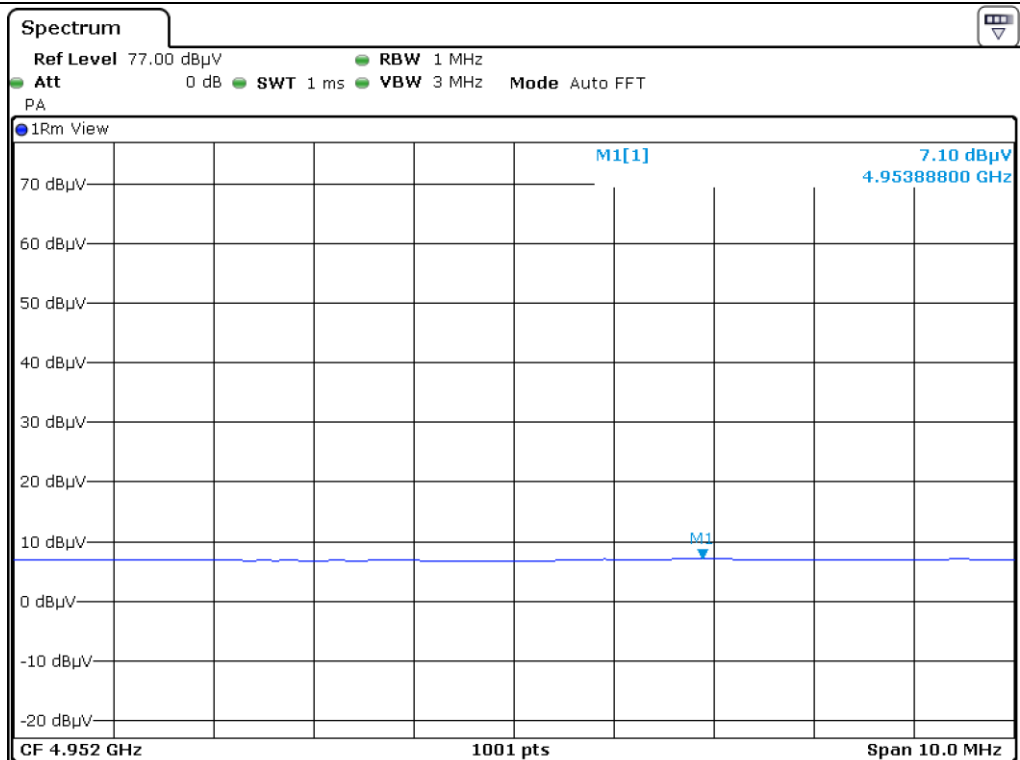
Middle Channel_V_Average



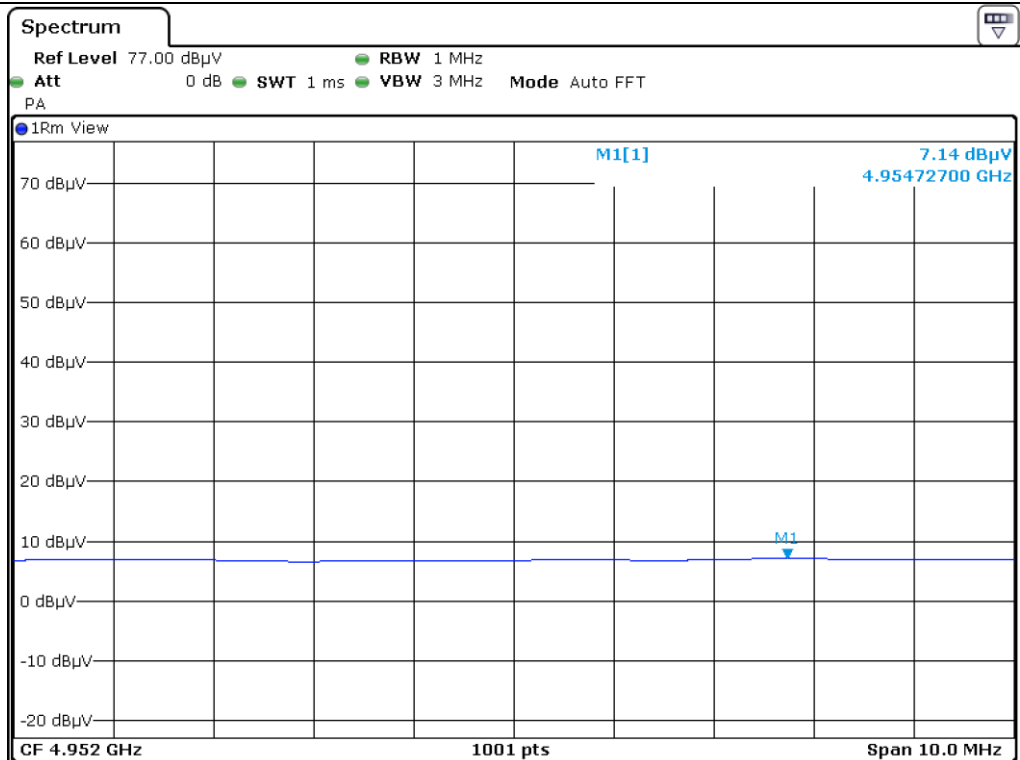
High Channel_H_Peak



High Channel_V_Peak



High Channel_H_Average



High Channel_V_Average

13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

13.2 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.

13.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 28, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718B	Schwarzbeck	Amplifier	009	Mar. 20, 2019 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 2019 (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	777	Apr. 13, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)
■ -	VAMP9243	Schwarzbeck	ROD ANTENNA	VAMP9243	Mar. 14, 2019 (2Y)

All test equipment used is calibrated on a regular basis.

13.5 Test data for Transmitting Mode

13.5.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 45 % R.H.

Temperature: 23 °C

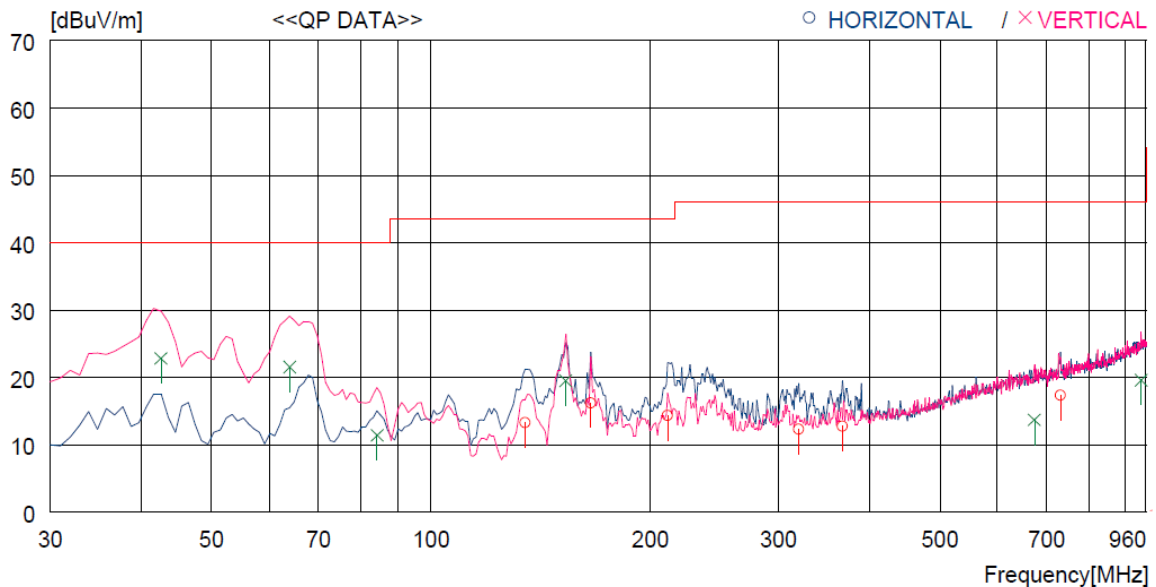
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Portable Conference Transceiver

Date: August 19, 2019 ~ August 22, 2019

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



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	134.760	35.3	8.8	2.2	33.0	13.3	43.5	30.2	200	90
2	165.800	37.8	8.9	2.5	33.0	16.2	43.5	27.3	200	80
3	211.390	33.4	11.1	2.8	33.0	14.3	43.5	29.2	100	240
4	320.030	27.9	14.0	3.4	33.0	12.3	46.0	33.7	100	297
5	367.560	26.8	15.2	3.7	33.0	12.7	46.0	33.3	100	116
6	732.274	24.8	20.4	5.3	33.2	17.3	46.0	28.7	100	359
----- Vertical -----										
7	42.610	40.0	14.4	1.5	33.1	22.8	40.0	17.2	100	141
8	63.950	41.2	11.7	1.7	33.1	21.5	40.0	18.5	100	0
9	84.320	33.4	9.1	1.9	33.0	11.4	40.0	28.6	100	0
10	153.190	41.5	8.6	2.4	33.0	19.5	43.5	24.0	100	249
11	674.076	22.0	19.9	5.1	33.3	13.7	46.0	32.3	400	96
12	944.698	22.1	23.2	6.2	31.9	19.6	46.0	26.4	400	359

Tested by: Hyung-Kwon, Oh / Assistant Manager

13.5.2 Test data for Below 30 MHz

- . Test Date : August 19, 2019 ~ August 22, 2019
- . 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.									

13.5.3 Test data for above 1 GHz

- . Test Date : August 19, 2019 ~ August 22, 2019
- . 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: Hyung-Kwon, Oh / Assistant Manager

13.6 Test data for Charging Mode

13.6.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 45 % R.H.

Temperature: 23 °C

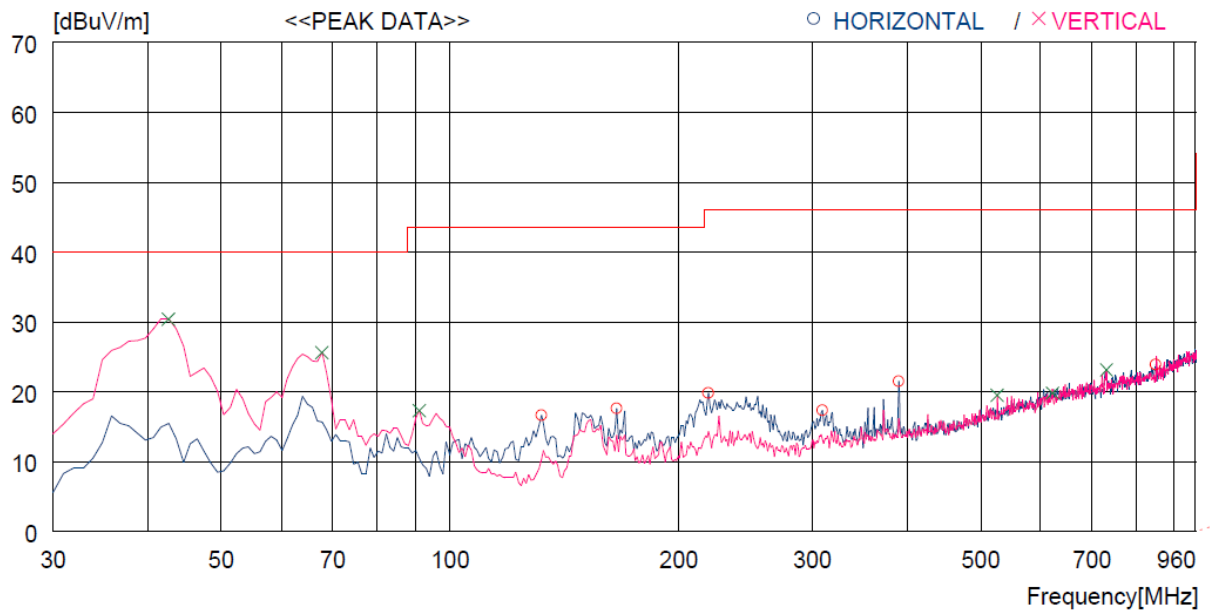
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Portable Conference Transceiver

Date: August 19, 2019 ~ August 22, 2019

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



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	131.850	38.4	9.0	2.2	33.0	16.6	43.5	26.9	300	359
2	165.800	39.2	8.9	2.5	33.0	17.6	43.5	25.9	200	73
3	219.150	38.4	11.5	2.8	32.9	19.8	46.0	26.2	100	110
4	309.360	33.3	13.7	3.3	33.0	17.3	46.0	28.7	100	292
5	389.870	35.2	15.6	3.8	33.1	21.5	46.0	24.5	100	359
6	850.610	29.6	21.5	5.6	32.8	23.9	46.0	22.1	100	234
----- Vertical -----										
7	42.610	47.6	14.4	1.5	33.1	30.4	40.0	9.6	100	107
8	67.830	46.8	10.1	1.8	33.1	25.6	40.0	14.4	200	359
9	91.110	37.0	11.3	2.0	33.0	17.3	43.5	26.2	100	189
10	525.670	30.5	18.0	4.3	33.3	19.5	46.0	26.5	100	0
11	621.697	28.7	19.6	4.8	33.3	19.8	46.0	26.2	100	7
12	732.274	30.6	20.4	5.3	33.2	23.1	46.0	22.9	300	2

Tested by: Hyung-Kwon, Oh / Assistant Manager

13.6.2 Test data for Below 30 MHz

- . Test Date : August 19, 2019 ~ August 22, 2019
- . 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.									

13.6.3 Test data for above 1 GHz

- . Test Date : August 19, 2019 ~ August 22, 2019
- . 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: Hyung-Kwon, Oh / Assistant Manager

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 23 °C
Relative humidity : 45 % R.H.

14.2 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.

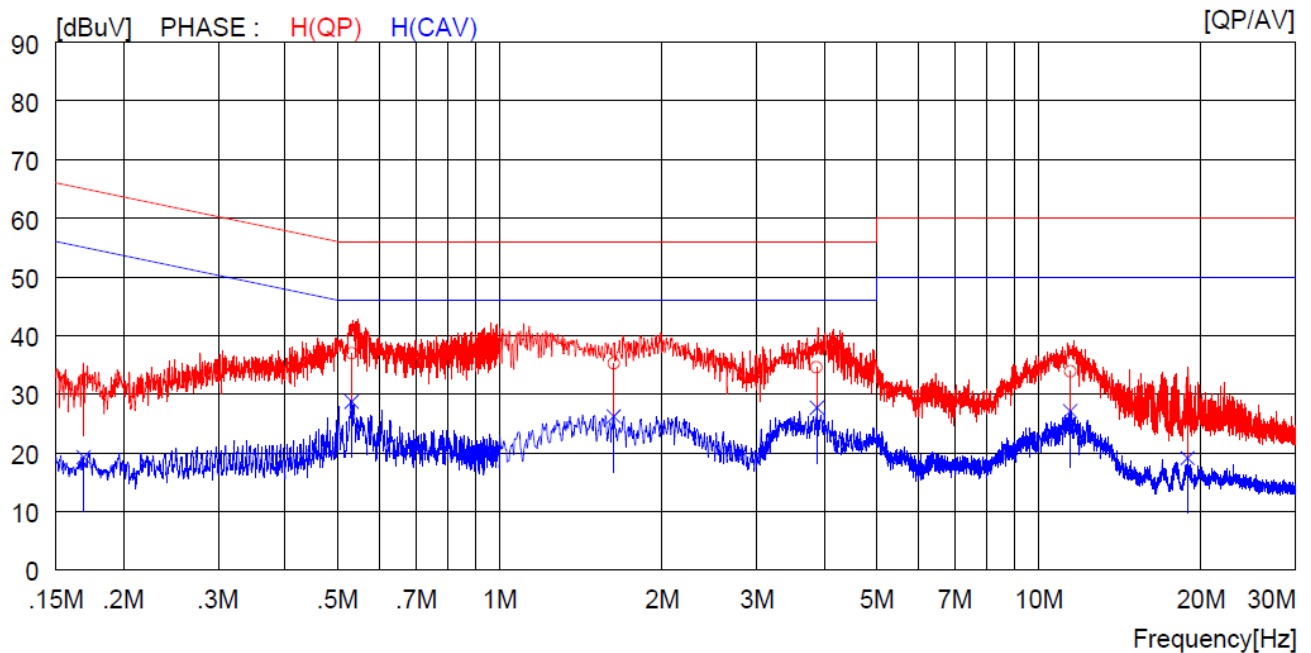
14.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2018 (1Y)
□ -	NSLK8128	Schwarzbeck	AMN	8128-216	Mar. 20, 2019 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 19, 2019 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Mar. 19, 2019 (1Y)
■ -	3825/2	EMCO	AMN	9109-1867	Mar. 27, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

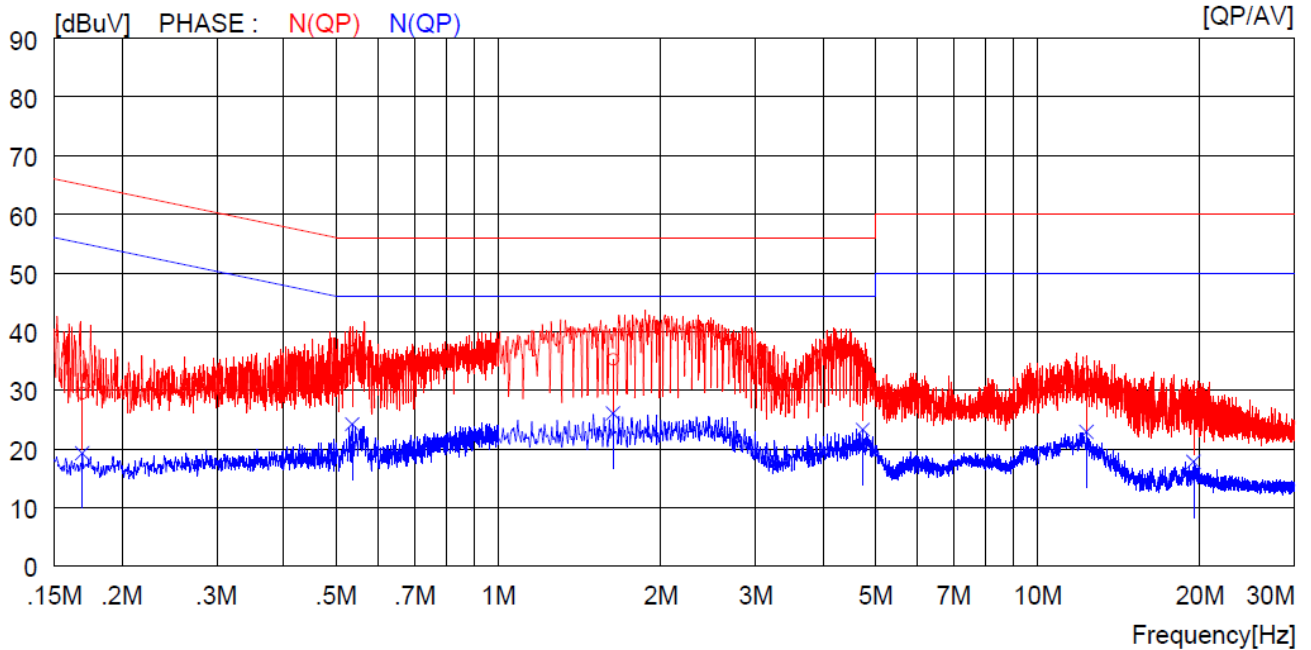
14.4 Test data For Charging Mode

- Test Date : August 19, 2019 ~ August 22, 2019
- 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	0.16900	22.3	----	10.1	32.4	----	65.0	----	32.6	----	H (QP)
2	0.53100	26.9	----	10.1	37.0	----	56.0	----	19.0	----	H (QP)
3	1.62800	25.1	----	10.1	35.2	----	56.0	----	20.8	----	H (QP)
4	3.87200	24.5	----	10.1	34.6	----	56.0	----	21.4	----	H (QP)
5	11.44000	23.6	----	10.3	33.9	----	60.0	----	26.1	----	H (QP)
6	18.88000	15.1	----	10.4	25.5	----	60.0	----	34.5	----	H (QP)
7	0.16900	----	9.2	10.1	----	19.3	----	55.0	----	35.7	H (CAV)
8	0.53100	----	18.6	10.1	----	28.7	----	46.0	----	17.3	H (CAV)
9	1.62800	----	16.1	10.1	----	26.2	----	46.0	----	19.8	H (CAV)
10	3.87200	----	17.6	10.1	----	27.7	----	46.0	----	18.3	H (CAV)
11	11.44000	----	16.8	10.3	----	27.1	----	50.0	----	22.9	H (CAV)
12	18.88000	----	8.7	10.4	----	19.1	----	50.0	----	30.9	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	0.16900	19.3	----	10.1	29.4	----	65.0	----	35.6	----	N (QP)
2	0.53600	26.5	----	10.1	36.6	----	56.0	----	19.4	----	N (QP)
3	1.63200	25.1	----	10.1	35.2	----	56.0	----	20.8	----	N (QP)
4	4.74000	24.1	----	10.1	34.2	----	56.0	----	21.8	----	N (QP)
5	12.32000	22.4	----	10.3	32.7	----	60.0	----	27.3	----	N (QP)
6	19.48000	18.2	----	10.4	28.6	----	60.0	----	31.4	----	N (QP)
7	0.16900	----	9.2	10.1	----	19.3	----	55.0	----	35.7	N (CAV)
8	0.53600	----	14.1	10.1	----	24.2	----	46.0	----	21.8	N (CAV)
9	1.63200	----	16.0	10.1	----	26.1	----	46.0	----	19.9	N (CAV)
10	4.74000	----	13.2	10.1	----	23.3	----	46.0	----	22.7	N (CAV)
11	12.32000	----	12.6	10.3	----	22.9	----	50.0	----	27.1	N (CAV)
12	19.48000	----	7.4	10.4	----	17.8	----	50.0	----	32.2	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 / Assistant Manager