ONETECH

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

Test Report No.	: OT-19O-RWD-040
AGR No.	: A199A-269
Applicant	: AMOSENSE
Address	: 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea
Manufacturer	: AMOSENSE
Address	: 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea
Type of Equipment	: NOVO
FCC ID.	: 2AS9T-SB42SW
Model Name	: SB42-SW
Serial number	: N/A
Total page of Report	: 46 pages (including this page)
Date of Incoming	: September 23, 2019
Date of issue	: October 17, 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.

CONTENTS

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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-19O-RWD-040	October 17, 2019	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant　　　　　: AMOSENSE

Address　　　　　: 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea

Manufacturer　　　: AMOSENSE

Address　　　　　: 56 Naruteo-ro, Seocho-gu, SEOUL, South Korea

Factory　　　　　: AMO VINA CO,,LTD

Address　　　　　: Lot CN12, Khai Quang industrial Park, Khai Quang Ward, Vinh Yen City, Vinh Phuc Province, Vietnam

Contact Person　: UIHAN JEONG / Research Engineer

Telephone No.　: +82-010-4948-5676

FCC ID　　　　　: 2AS9T-SB42SW

Model Name　　　: SB42-SW

Brand Name　　　: -

Serial Number　: N/A

Date　　　　　　: October 17, 2019

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	NOVO
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.

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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	N/A (See Note)
15.203	Antenna Requirement	Met requirement / PASS

Note: This test is not applicable because the EUT use battery.

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

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3. GENERAL INFORMATION

3.1 Product Description

The AMOSENSE, Model SB42-SW (referred to as the EUT in this report) is a NOVO. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	NOVO	
Temperature Range	-20 ℃ ~ 50 ℃	
OPERATING FREQUENCY	NFC	13.56 MHz
	Sig Fox	902.137 5 MHz ~ 904.662 5 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
MODULATION TYPE	NFC	ASK
	Sig Fox	DBPSK
	Bluetooth LE	GFSK
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
RF OUTPUT POWER'	NFC	39.53 dBμV/m
	Sig Fox	22.26 dBm
	Bluetooth LE	-0.44 dBm
	WLAN 2.4 GHz	2.99 dBm(802.11b) 1.64 dBm(802.11g) 1.57 dBm(802.11n_HT20)
ANTENNA TYPE	NFC: FPCB Antenna Sig Fox : Chip Antenna WLAN 2.4 GHz / Bluetooth LE : Chip Antenna	
ANTENNA GAIN	WLAN 2.4 GHz / Bluetooth LE : 2.40 dBi Sig Fox : -0.59 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 26 MHz, 32 MHz, 50 MHz	

3.2 Alternative type(s)/model(s); also covered by this test report.
-. None

4. EUT MODIFICATIONS

-. None

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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	AMOSENSE	NOVO Rev04	N/A
NFC ANTENNA	N/A	ANFA150N526 NOVO	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
SB42-SW	AMOSENSE	NOVO(EUT)	-
N/A	N/A	Jig Board	EUT
Ideapad 100	LENOVO	Notebook PC	-
PA-1450-55LR	LITE-ON TECHNOLOGY	AC 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.

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-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE	390.00	236.00	62.30	2.06

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

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

-. Test Plot

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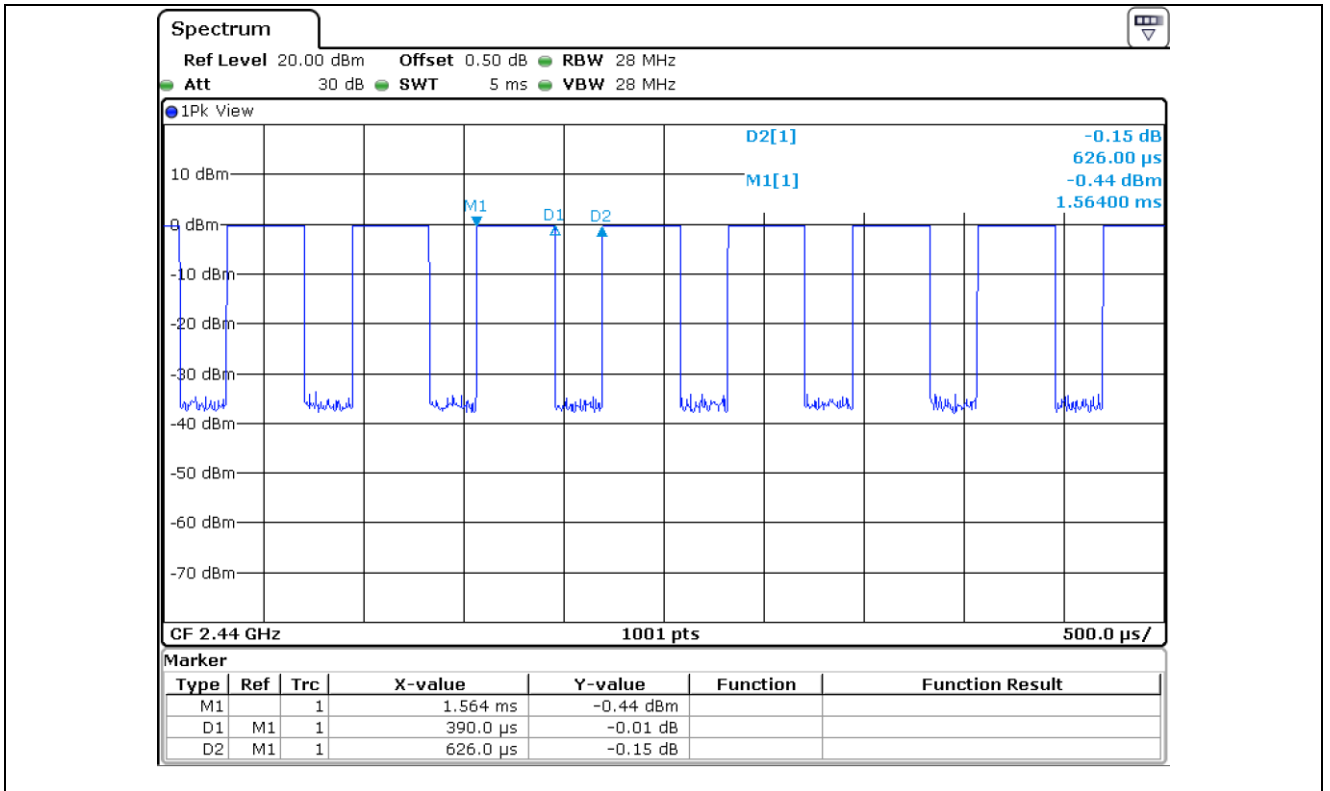
5.4 Configuration of Test System

Line Conducted Test: It is not need to test this requirement, because the EUT shall be operated by DC battery.

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 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 Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
It is not needed to test, because the power of the EUT is supplied from a DC battery.	

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

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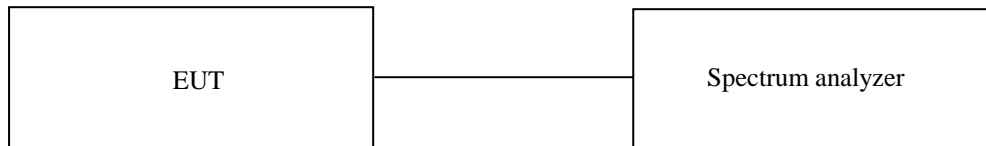
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature   :   24.3 ℃

Relative humidity   :   43.9 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.

```
┌─────────────────┐              ┌─────────────────────┐
│                 │              │                     │
│      EUT        │──────────────│  Spectrum analyzer  │
│                 │              │                     │
└─────────────────┘              └─────────────────────┘
```

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.

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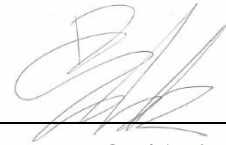
7.4 Test data

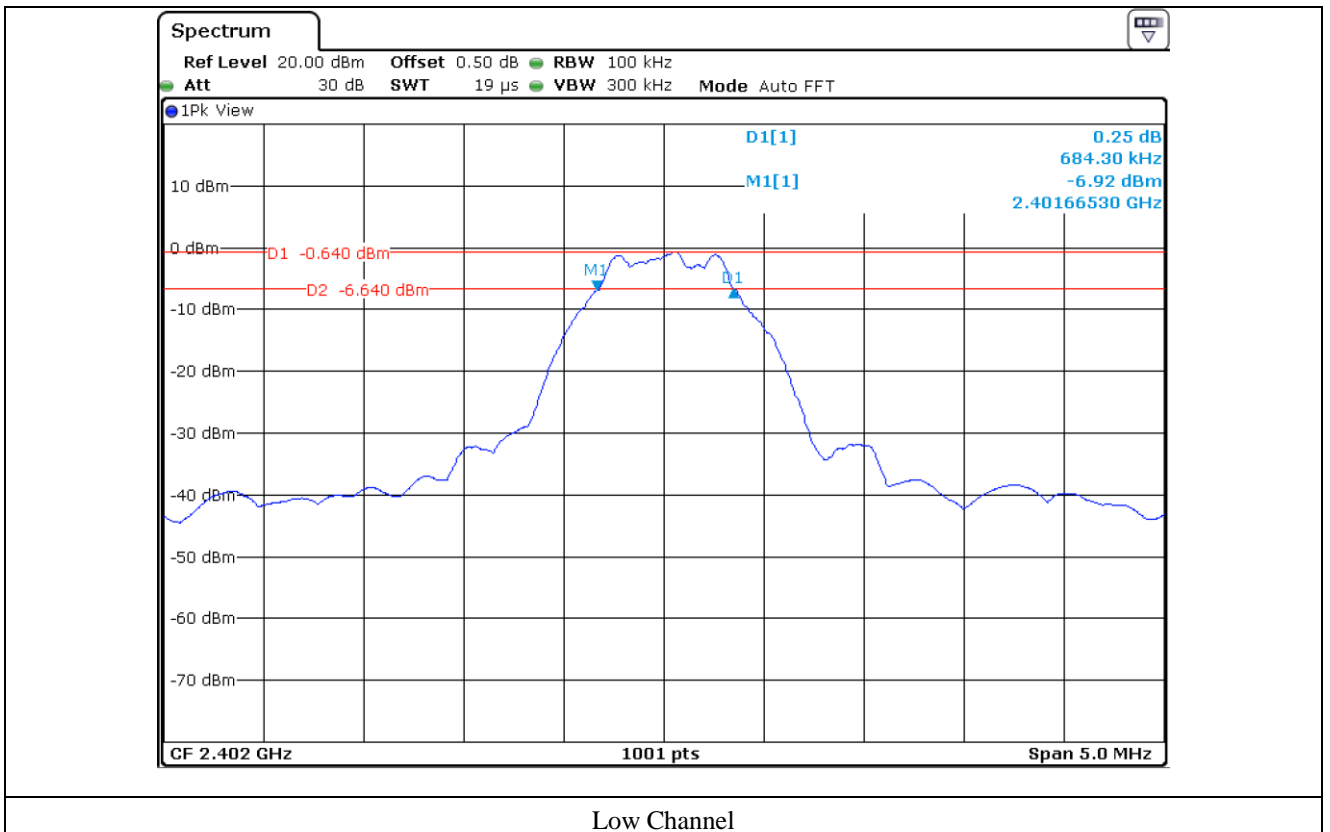-. Test Date   : September 24, 2019 ~ October 15, 2019

-. Test Result   : Pass

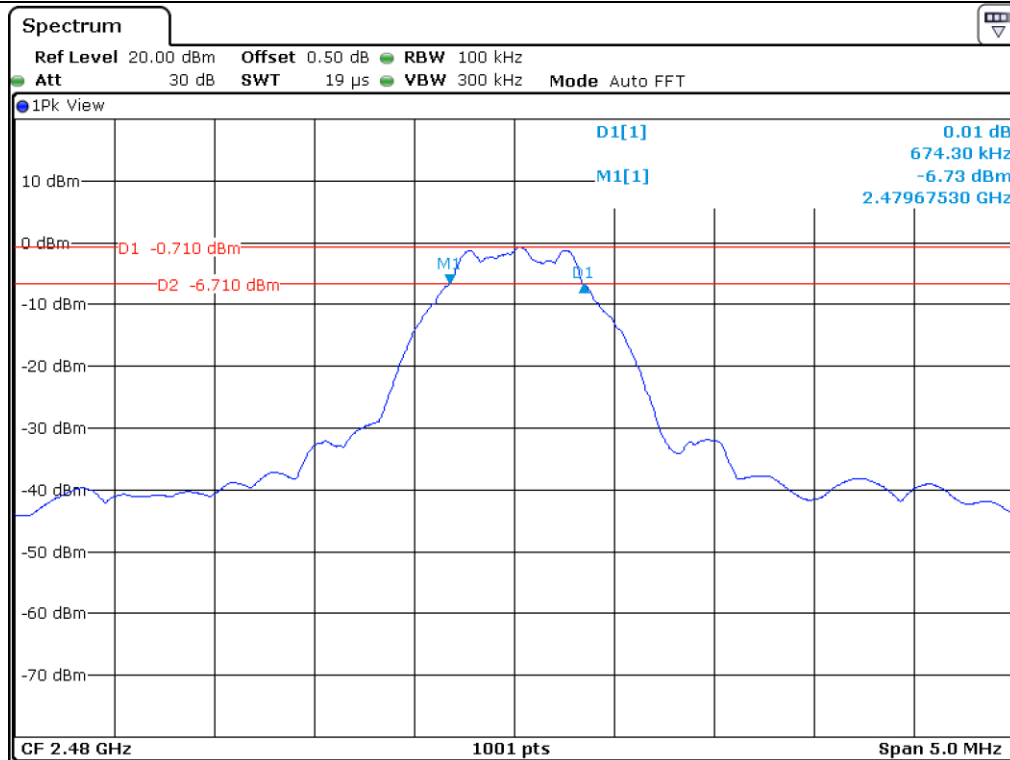| CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	684.30	500.00	184.30
Middle	2 440.00	674.30	500.00	174.30
High	2 480.00	674.30	500.00	174.30

Remark. Margin = Measured Value - Limit

Tested by: Hyung-Kwon, Oh / Assistant Manager

Low Channel

Spectrum

Ref Level 20.00 dBm   Offset 0.50 dB   RBW 100 kHz
Att   30 dB   SWT   19 μs   VBW 300 kHz   Mode Auto FFT

1Pk View

D1[1]   0.02 dB
674.30 kHz
M1[1]   -6.82 dBm
2.43967530 GHz

D1 -0.690 dBm
D2 -6.690 dBm

CF 2.44 GHz   1001 pts   Span 5.0 MHz

Middle Channel

Spectrum

Ref Level 20.00 dBm   Offset 0.50 dB   RBW 100 kHz
Att   30 dB   SWT   19 μs   VBW 300 kHz   Mode Auto FFT

1Pk View

D1[1]   0.01 dB
674.30 kHz
M1[1]   -6.73 dBm
2.47967530 GHz

D1 -0.710 dBm
D2 -6.710 dBm

CF 2.48 GHz   1001 pts   Span 5.0 MHz

High Channel

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8. MAXIMUM PEAK OUTPUT POWER
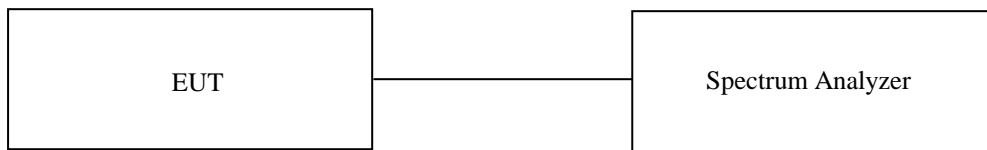
8.1 Operating environment

Temperature   :   24.3 ℃

Relative humidity   :   43.9 % R.H.

8.2 Test set-up

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

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

```
┌─────────────────┐              ┌─────────────────┐
│                 │              │                 │
│      EUT        │──────────────│ Spectrum Analyzer │
│                 │              │                 │
└─────────────────┘              └─────────────────┘
```

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.

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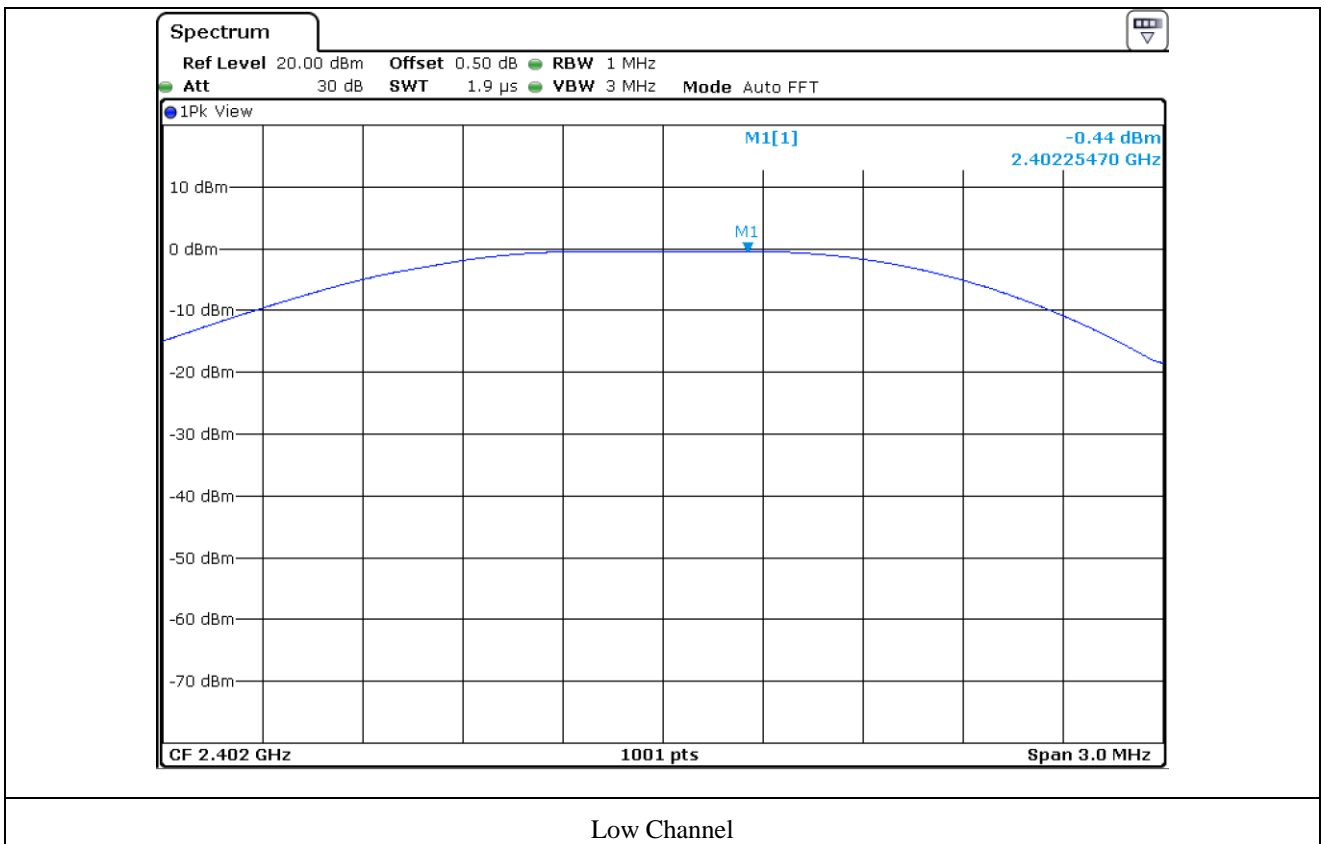
8.4 Test data

-. Test Date   : September 24, 2019 ~ October 15, 2019

-. Test Result   : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	-0.44	30.00	30.44
MIDDLE	2 440.00	-0.50	30.00	30.50
HIGH	2 480.00	-0.48	30.00	30.48

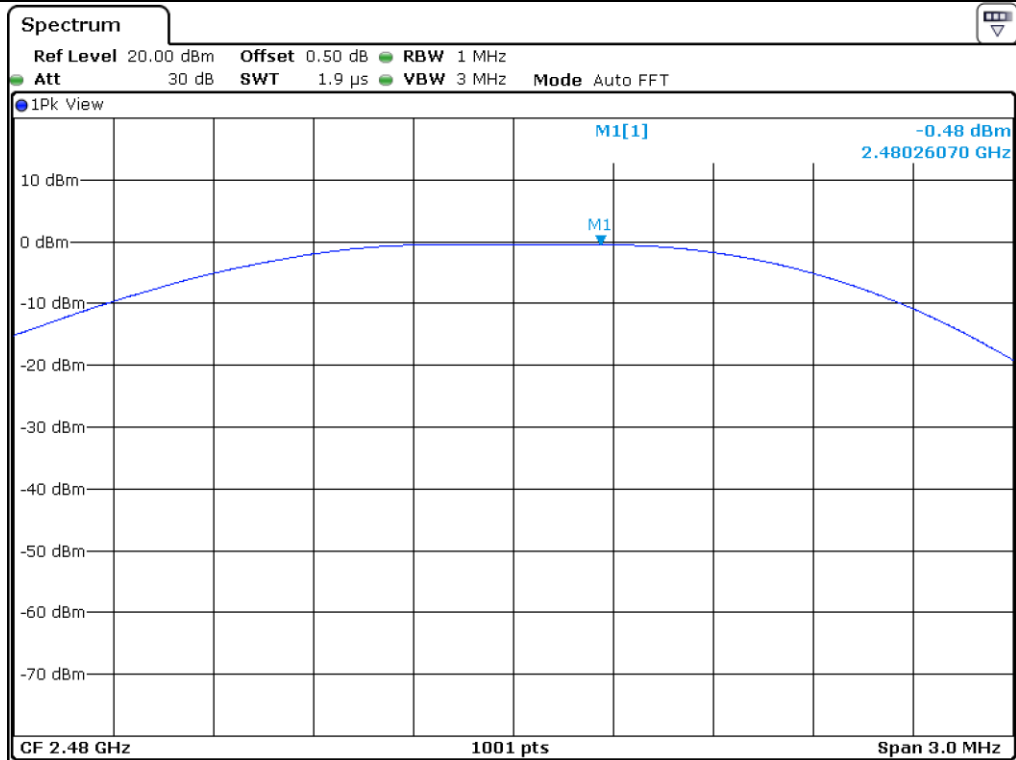Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

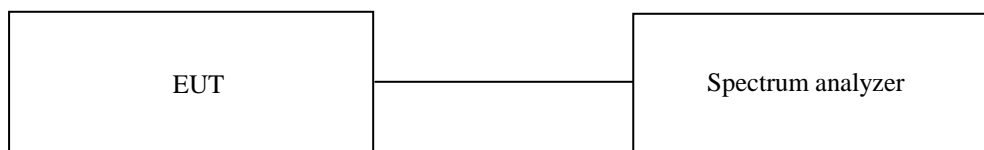**Tested by: Hyung-Kwon, Oh / Assistant Manager**

Low Channel

Spectrum

Ref Level 20.00 dBm   Offset 0.50 dB   RBW 1 MHz
Att   30 dB   SWT   1.9 μs   VBW 3 MHz   Mode Auto FFT
1Pk View

M1[1]   -0.50 dBm
                2.44026070 GHz

10 dBm
0 dBm — M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm

CF 2.44 GHz   1001 pts   Span 3.0 MHz

Middle Channel

Spectrum

Ref Level 20.00 dBm   Offset 0.50 dB   RBW 1 MHz
Att   30 dB   SWT   1.9 μs   VBW 3 MHz   Mode Auto FFT
1Pk View

M1[1]   -0.48 dBm
                2.48026070 GHz

10 dBm
0 dBm — M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm

CF 2.48 GHz   1001 pts   Span 3.0 MHz

High Channel

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9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature   :   24.3 ℃

Relative humidity   :   43.9 % R.H.

9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.

```
┌──────────────┐          ┌────────────────────┐
│              │          │                    │
│     EUT      │──────────│  Spectrum analyzer │
│              │          │                    │
└──────────────┘          └────────────────────┘
```

9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

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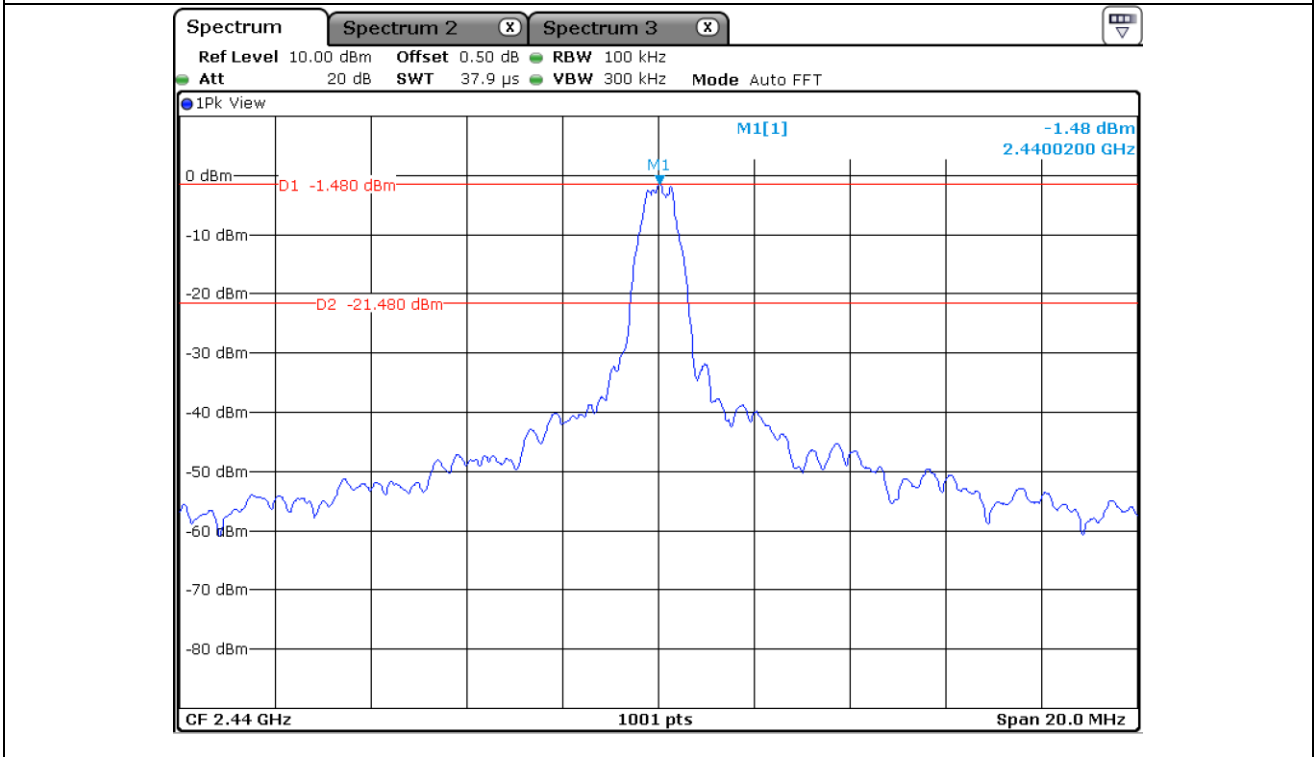
9.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 28, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312545	Mar. 18, 2019 (1Y)
■ -	BBV9718	Schwarzbeck	Amplifier	310	Mar. 28, 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)
■ -	BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA 9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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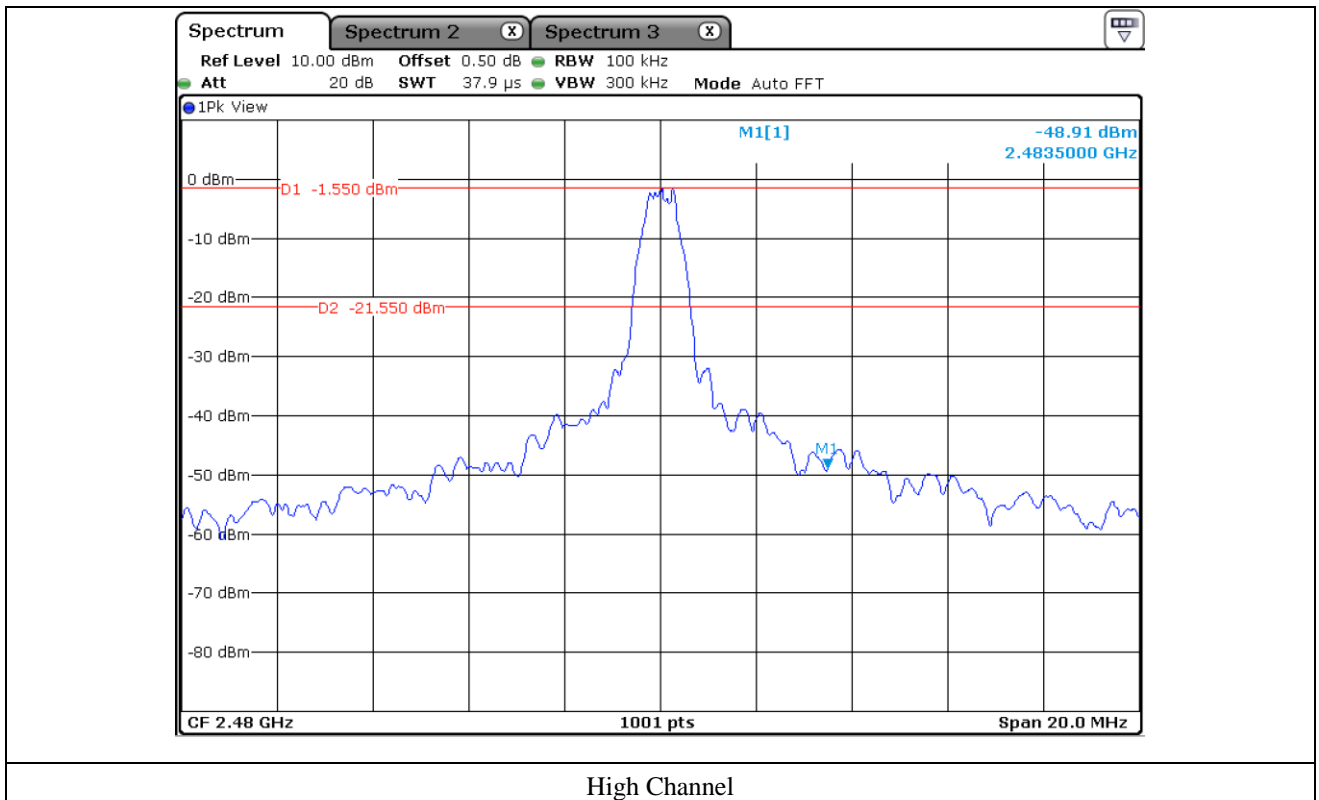
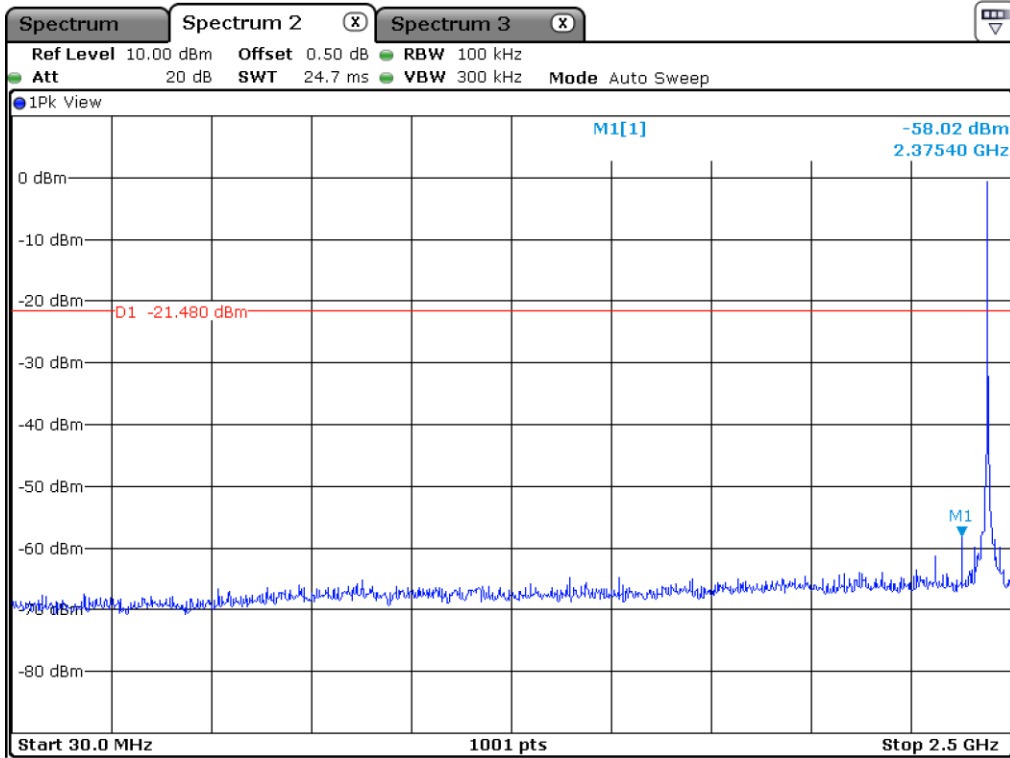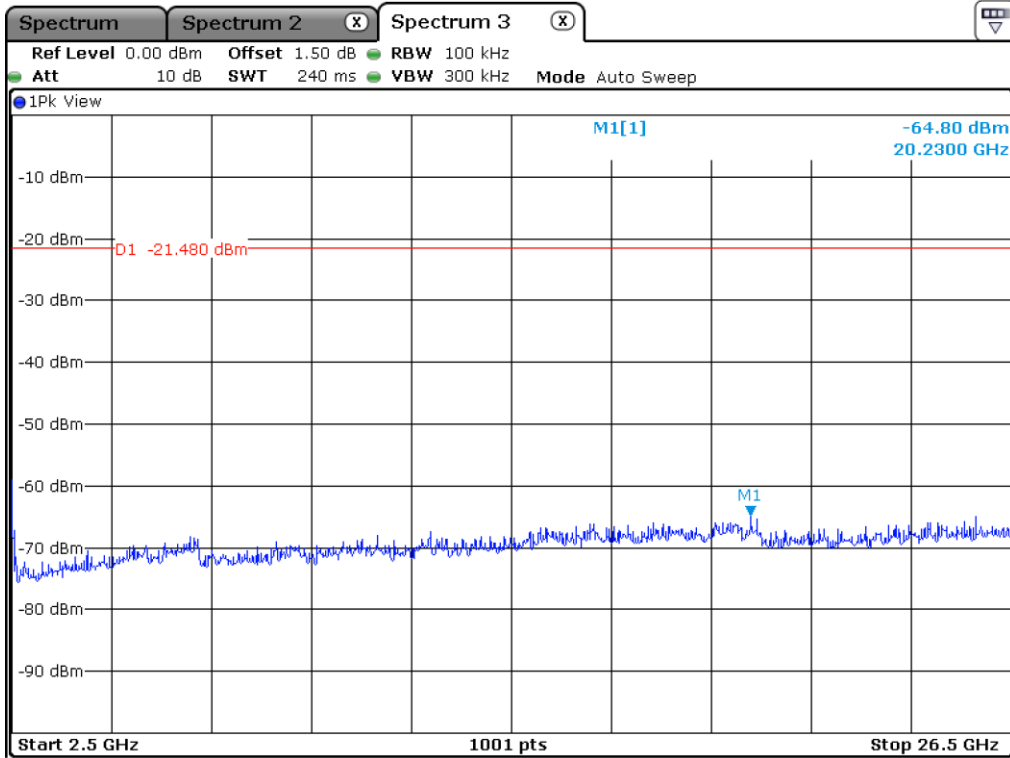## 9.5 Test data for conducted emission

Low Channel

Middle Channel

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Spectrum	Spectrum 2 (x)	Spectrum 3 (x)	

Ref Level 10.00 dBm   Offset 0.50 dB ● RBW 100 kHz
Att   20 dB   SWT 37.9 µs ● VBW 300 kHz   Mode Auto FFT

● 1Pk View

M1[1]   -48.91 dBm
                                        2.4835000 GHz

0 dBm — D1 -1.550 dBm

-10 dBm

-20 dBm — D2 -21.550 dBm

-30 dBm

-40 dBm

-50 dBm   M1

-60 dBm

-70 dBm

-80 dBm

CF 2.48 GHz   1001 pts   Span 20.0 MHz

High Channel

ONETECH
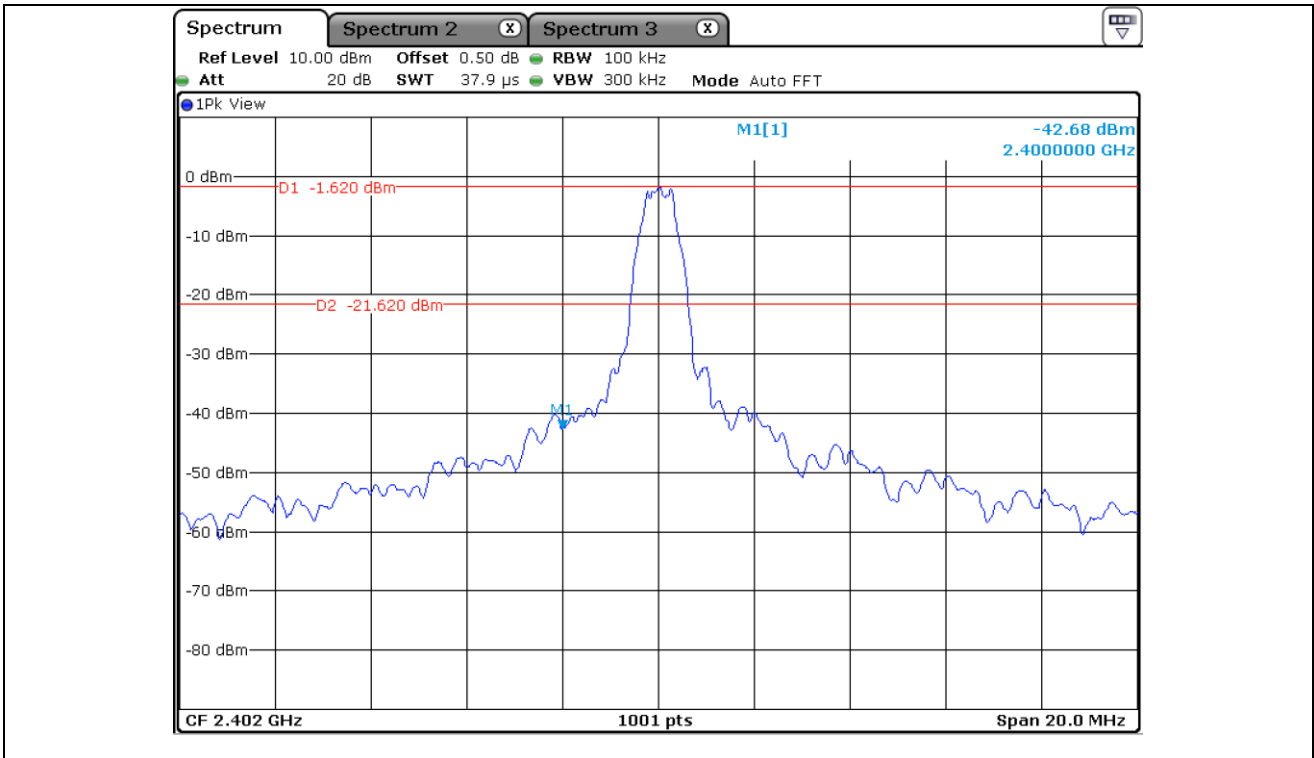
Low Channel

Low Channel

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Middle Channel

Middle Channel

High Channel

High Channel

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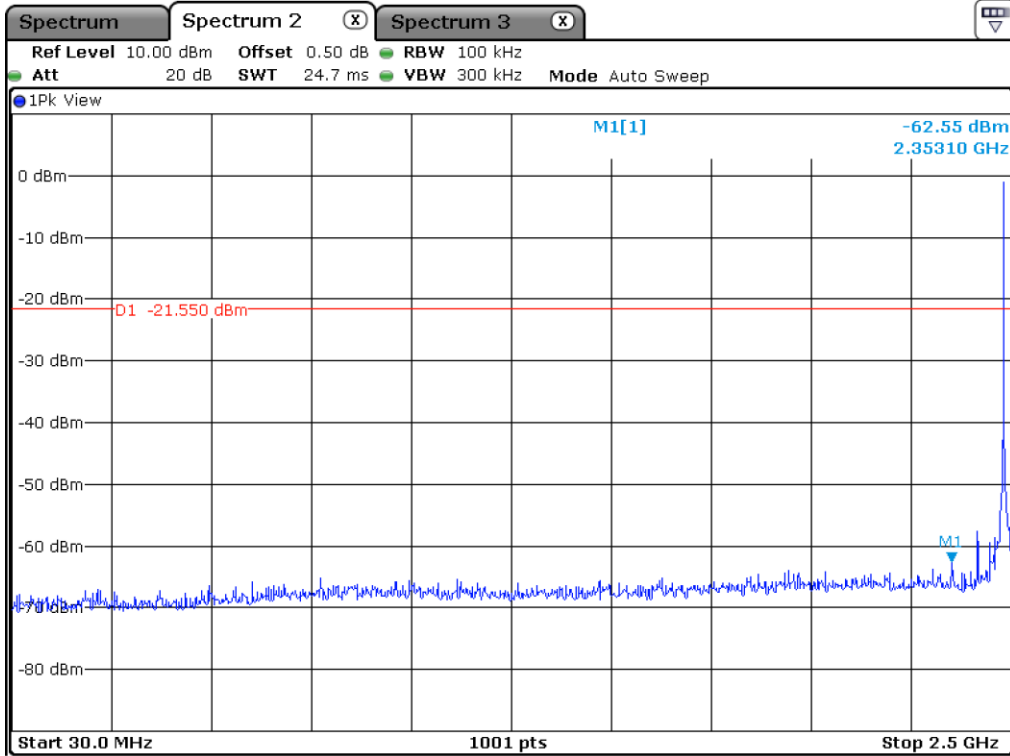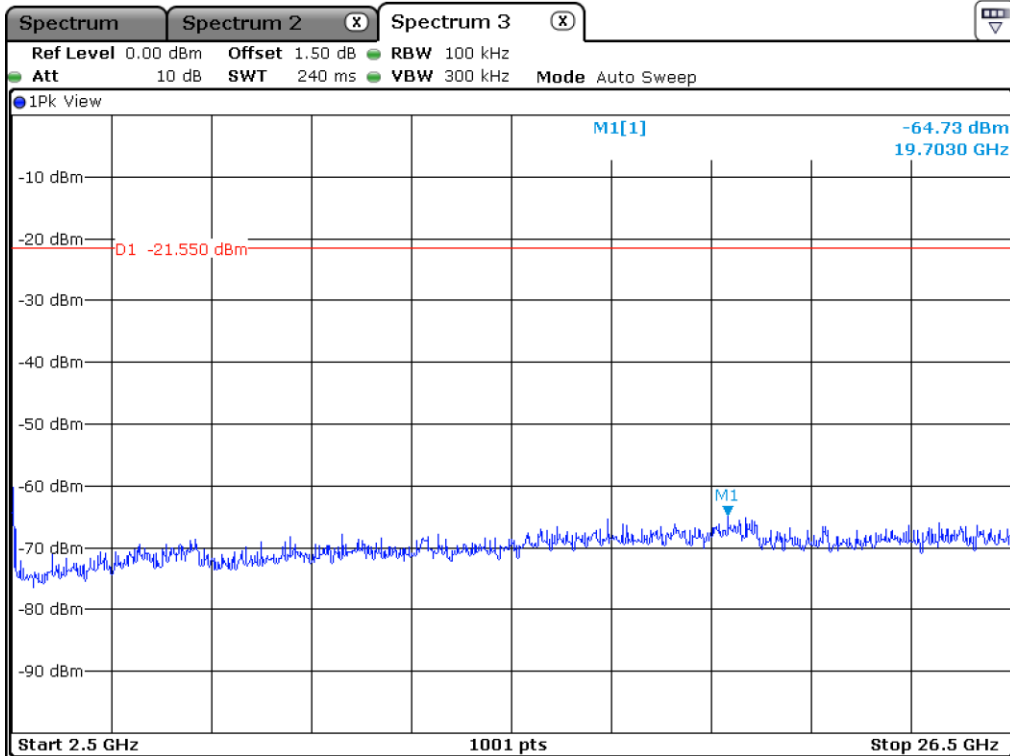
9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

-. Test Date   : September 24, 2019 ~ October 15, 2019

-. Resolution bandwidth   : 1 MHz for Peak and Average Mode

-. Video bandwidth   : 3 MHz for Peak and Average Mode

-. Measurement distance   : 3 m

-. Duty Cycle   : 62.30 %

-. Result   : <u>PASSED</u>

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.720	17.36	Peak	H			-	53.50	74.00	20.50
2 338.092	6.05	Average	H			2.06	44.25	54.00	9.75
2 389.960	18.61	Peak	V	26.94	9.20	-	54.75	74.00	19.25
2 338.332	6.04	Average	V			2.06	44.24	54.00	9.76
Test Data for Low Channel Edge									
2389.752	17.08	Peak	H			-	53.22	74.00	20.78
2389.997	4.30	Average	H			2.06	42.50	54.00	11.50
2389.617	20.00	Peak	V	26.94	9.20	-	56.14	74.00	17.86
2389.677	4.69	Average	V			2.06	42.89	54.00	11.11

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Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for High Channel Edge									
2 483.502	25.93	Peak	H			-	62.89	74.00	11.11
2 483.652	5.96	Average	H			2.06	44.98	54.00	9.02
2 483.502	29.57	Peak	V	27.47	9.49	-	66.53	74.00	7.47
2 483.822	8.26	Average	V			2.06	47.28	54.00	6.72
Test Data for High Channel									
2 483.508	25.87	Peak	H			-	62.83	74.00	11.17
2 483.821	6.51	Average	H			2.06	45.53	54.00	8.47
2 483.508	30.54	Peak	V	27.47	9.49	-	67.50	74.00	6.50
2 483.723	8.92	Average	V			2.06	47.94	54.00	6.06

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Assistant Manager

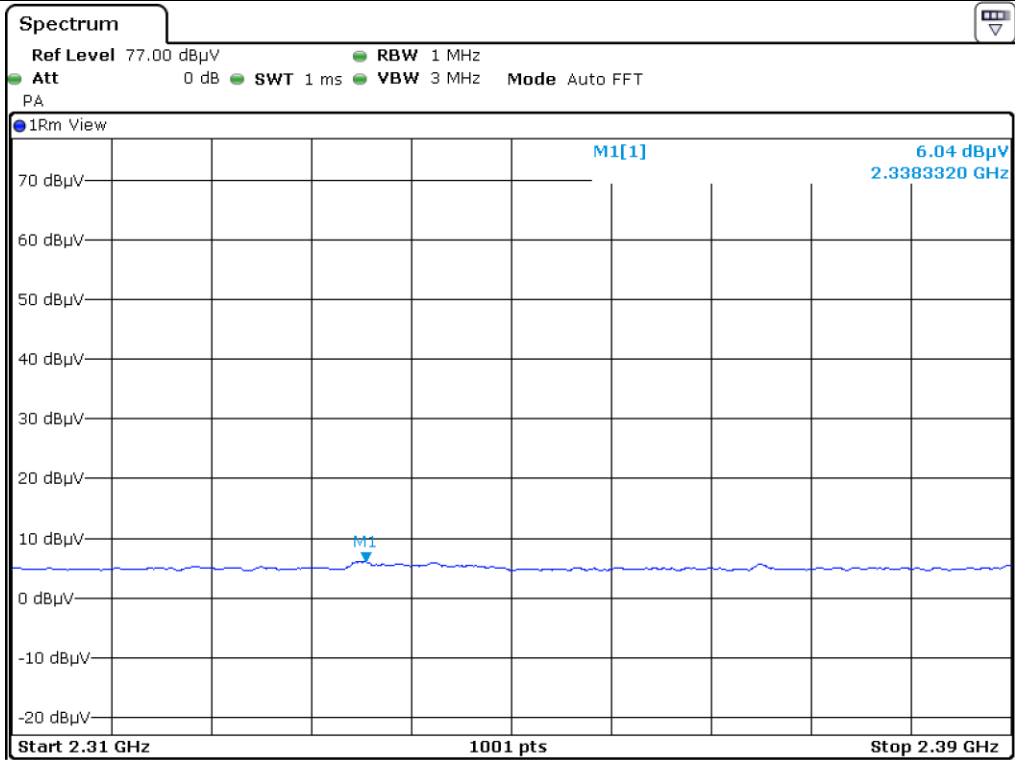It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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Spectrum

Ref Level 77.00 dBμV   ● RBW 1 MHz
● Att   0 dB ● SWT 1 ms ● VBW 3 MHz   Mode Auto FFT
PA
●1Pk View

M1[1]   17.36 dBμV
     2.3897200 GHz

70 dBμV
60 dBμV
50 dBμV
40 dBμV
30 dBμV
20 dBμV
10 dBμV
0 dBμV
-10 dBμV
-20 dBμV

Start 2.31 GHz   1001 pts   Stop 2.39 GHz

Low Channel_Peak_H

Spectrum

Ref Level 77.00 dBμV   ● RBW 1 MHz
● Att   0 dB ● SWT 1 ms ● VBW 3 MHz   Mode Auto FFT
PA
●1Pk View

M1[1]   18.61 dBμV
     2.3899600 GHz

70 dBμV
60 dBμV
50 dBμV
40 dBμV
30 dBμV
20 dBμV
10 dBμV
0 dBμV
-10 dBμV
-20 dBμV

Start 2.31 GHz   1001 pts   Stop 2.39 GHz

Low Channel_Peak_V

Low Channel_Average_H

Low Channel_Average_V
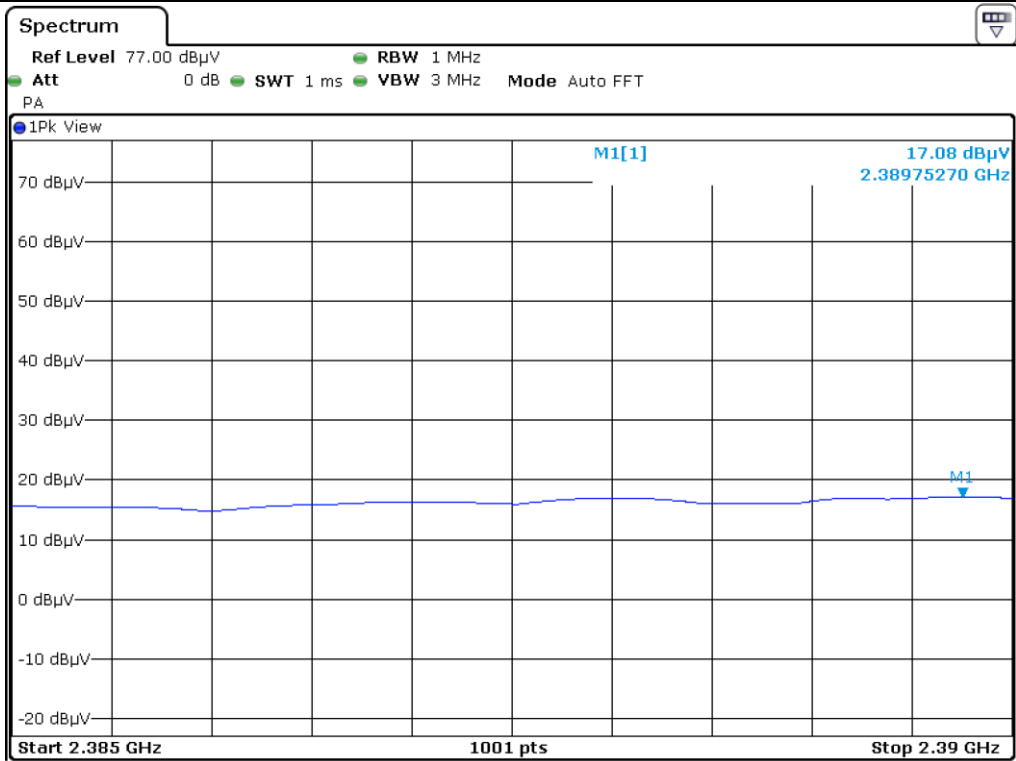
Low Channel Edge_Peak_H

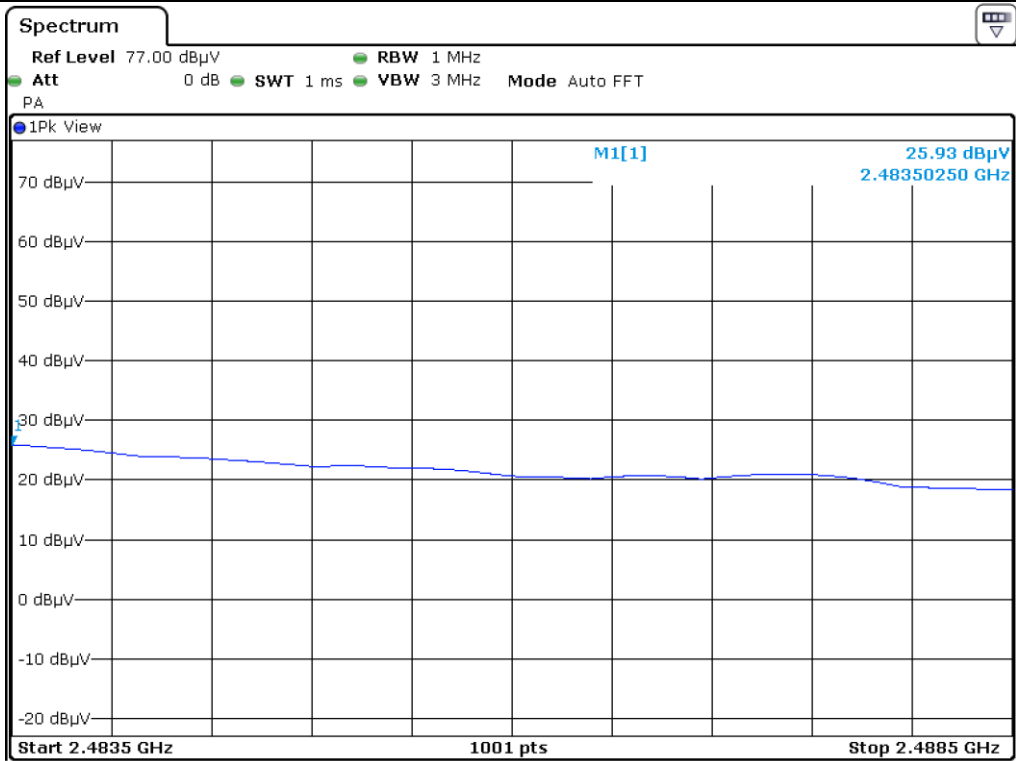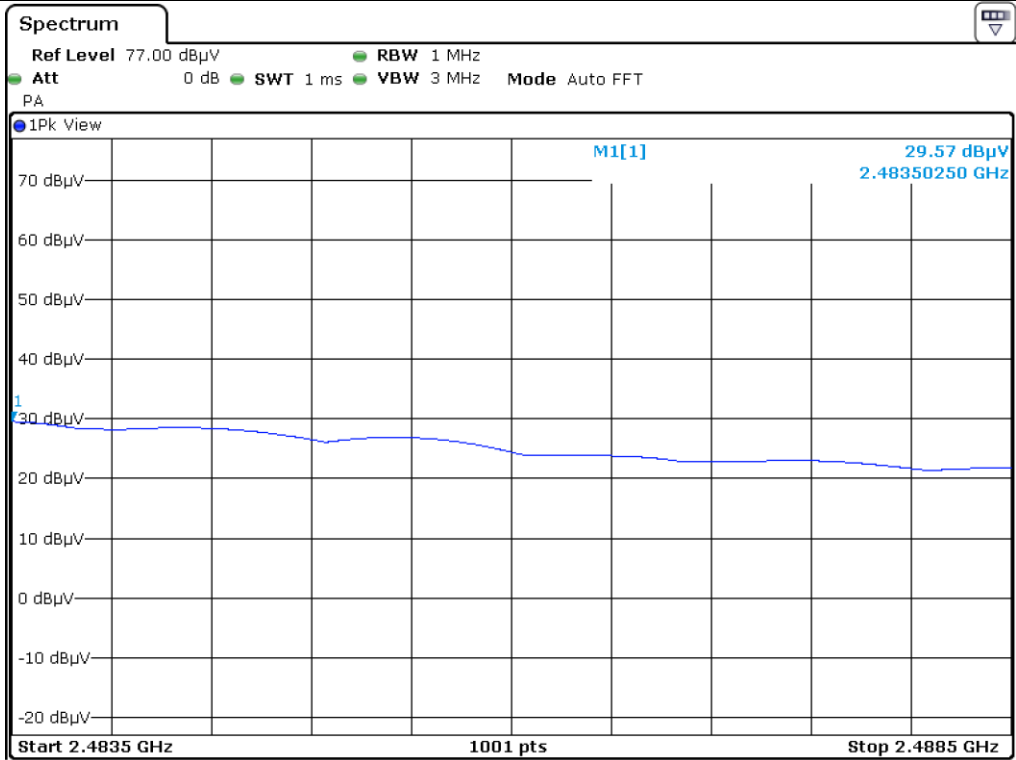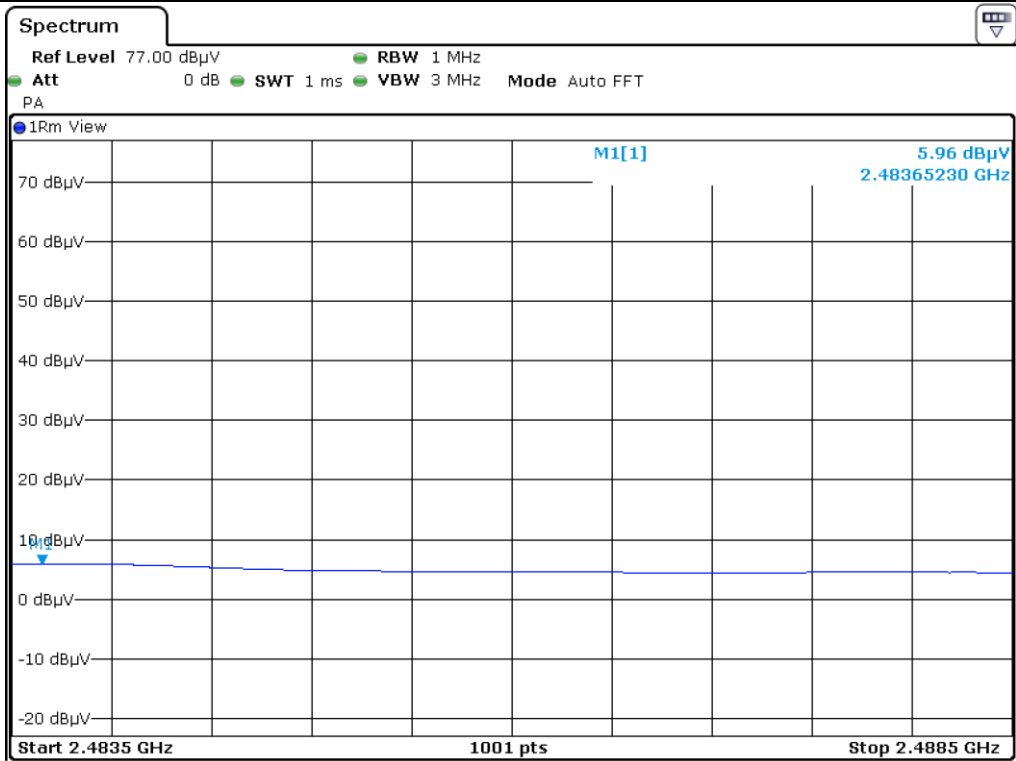
Low Channel Edge_Peak_V

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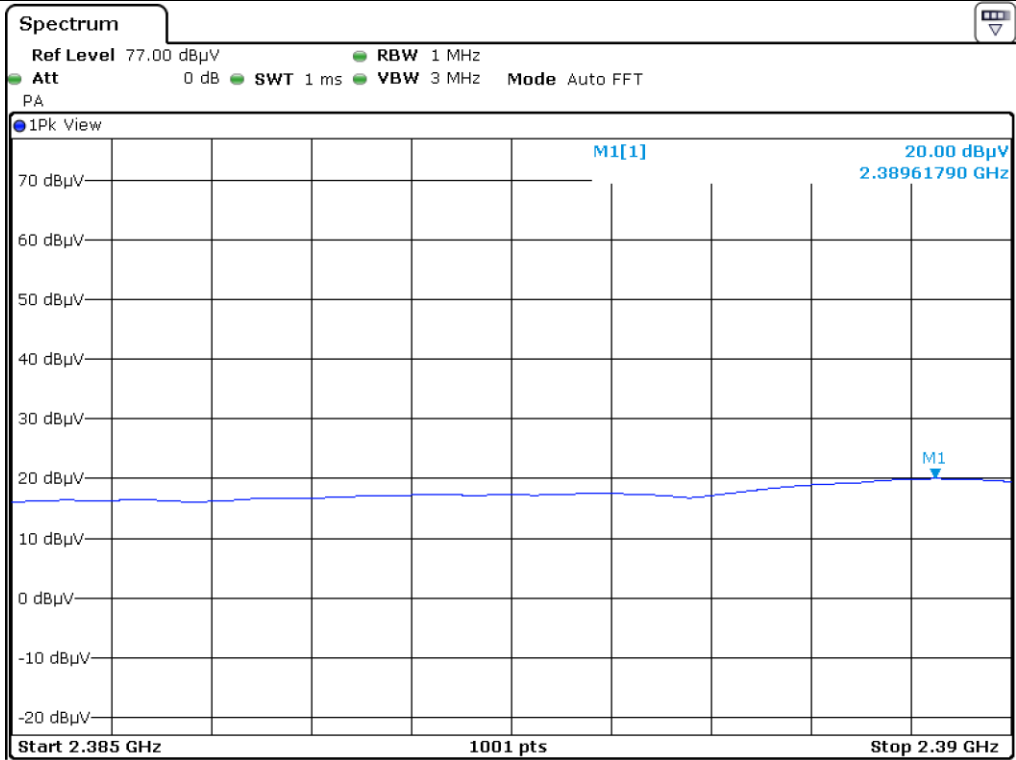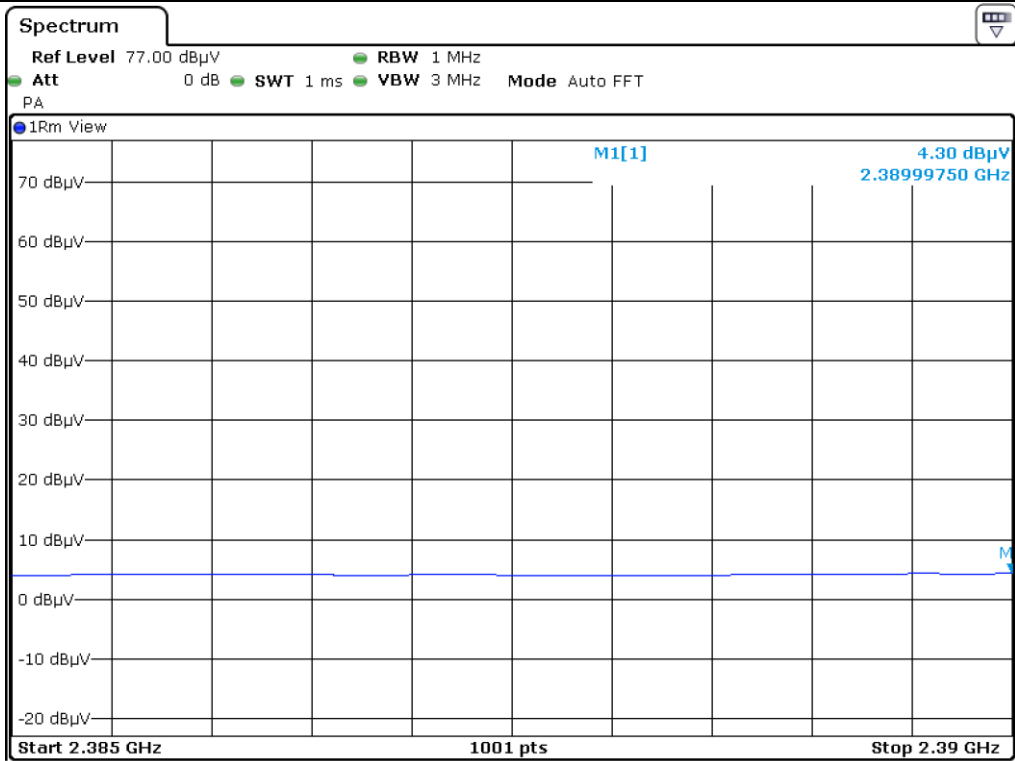
Low Channel Edge_Average_H

Low Channel Edge_Average_V

Spectrum

Ref Level 77.00 dBµV   ● RBW 1 MHz
● Att   0 dB ● SWT 1 ms ● VBW 3 MHz   Mode Auto FFT
PA
● 1Pk View

M1[1]   25.93 dBµV
2.48350250 GHz

Start 2.4835 GHz   1001 pts   Stop 2.4885 GHz

High Channel Edge_Peak_H

Spectrum

Ref Level 77.00 dBµV   ● RBW 1 MHz
● Att   0 dB ● SWT 1 ms ● VBW 3 MHz   Mode Auto FFT
PA
● 1Pk View

M1[1]   29.57 dBµV
2.48350250 GHz

Start 2.4835 GHz   1001 pts   Stop 2.4885 GHz

High Channel Edge_Peak_V

High Channel Edge_Average_H
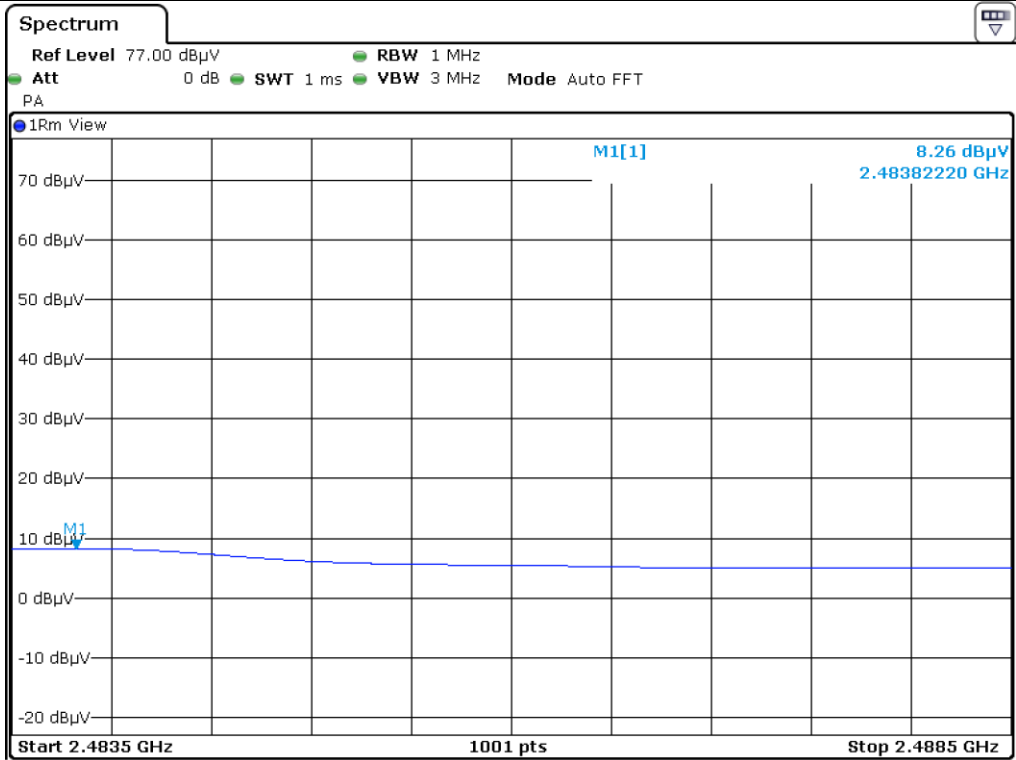
High Channel Edge_Average_V

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High Channel_Peak_H

High Channel_Peak_V

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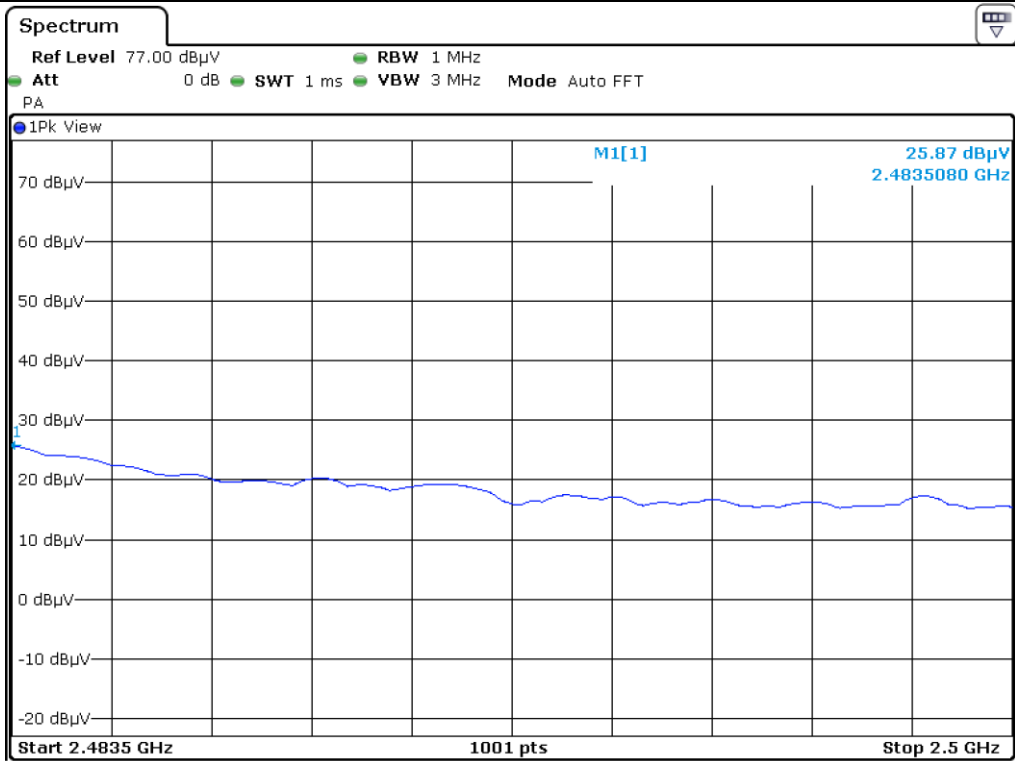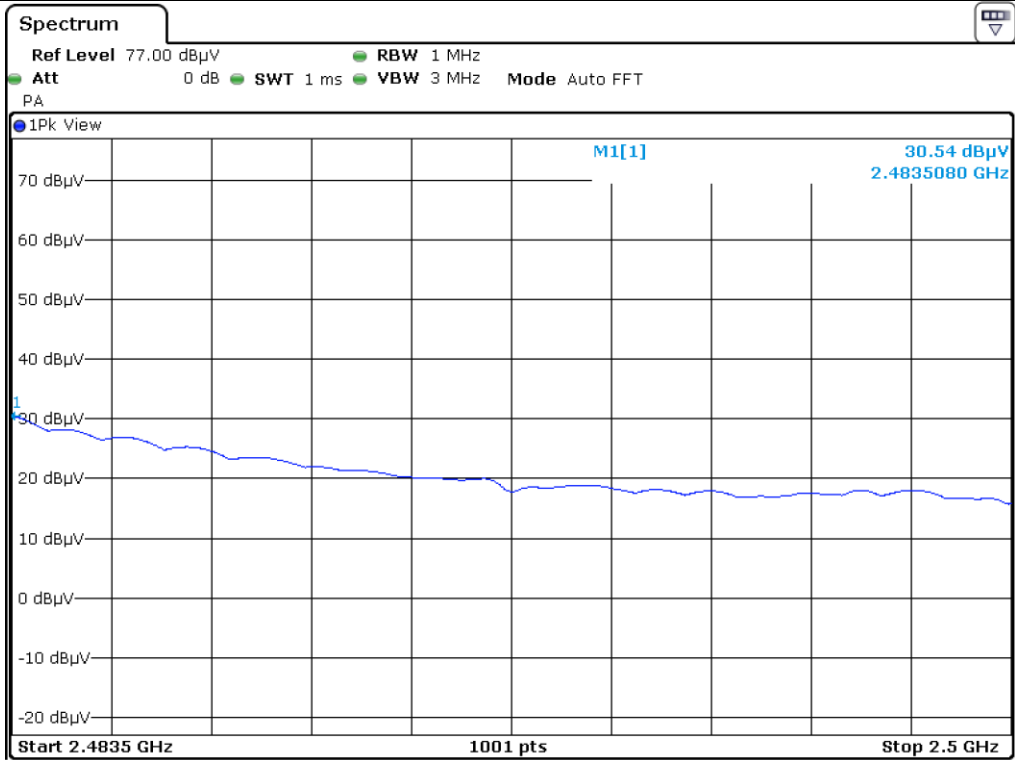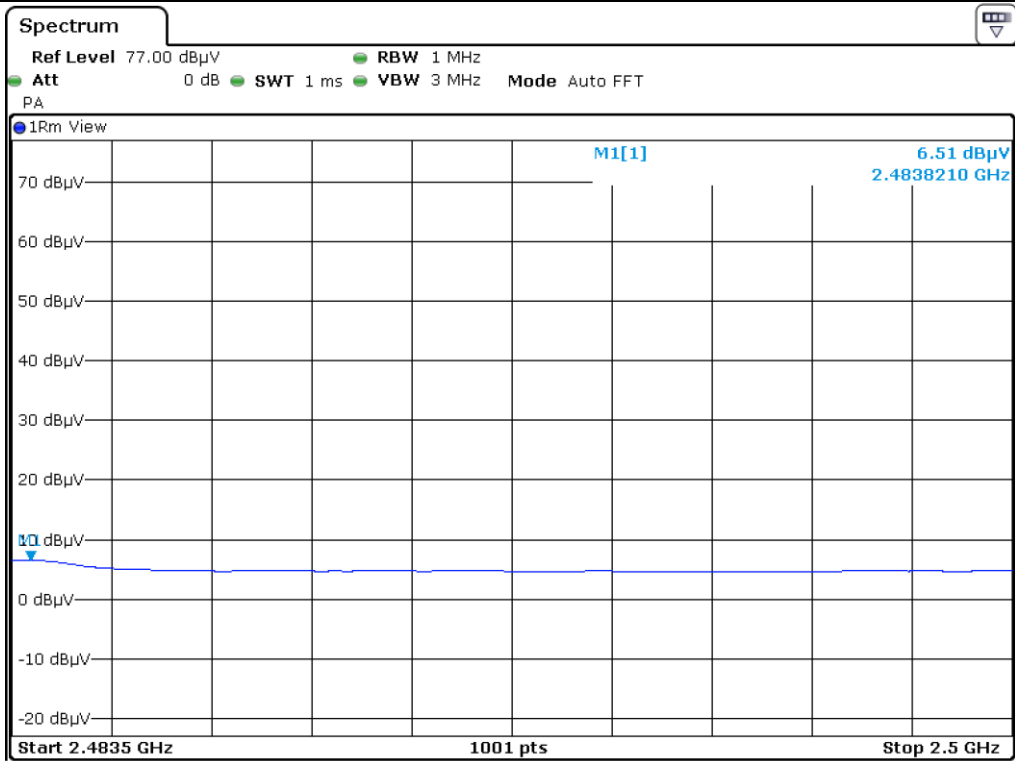
High Channel_Average_H
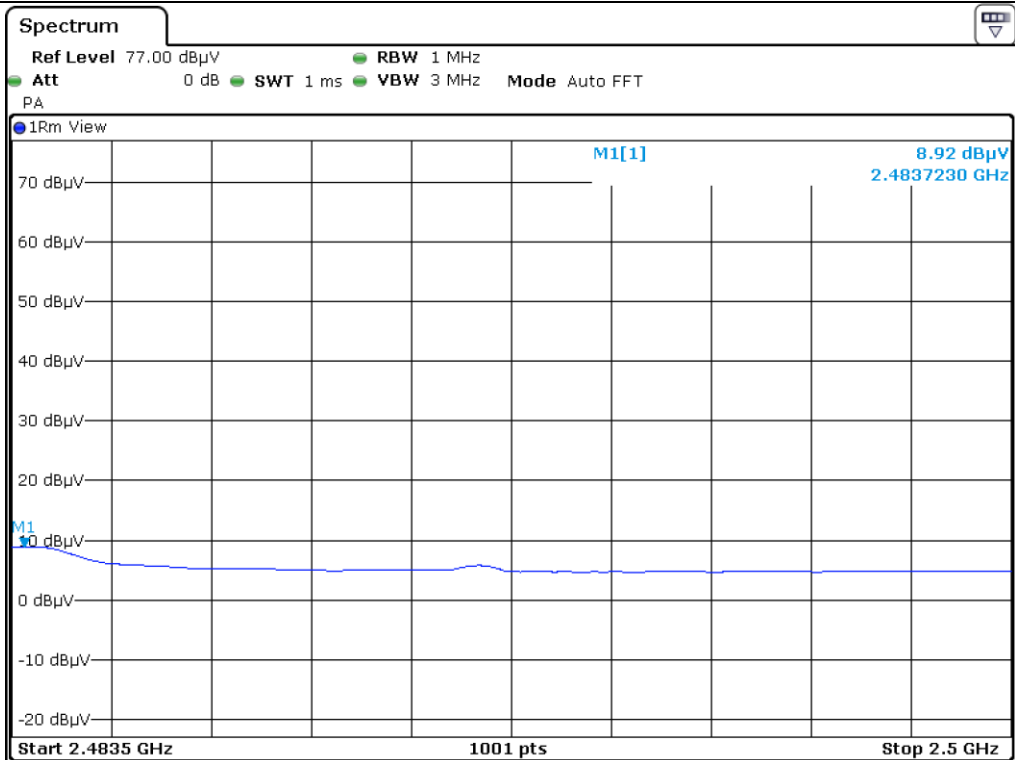
High Channel_Average_V

9.6.2 Spurious & Harmonic Radiated Emission

-. Test Date   : September 24, 2019 ~ October 15, 2019

-. Resolution bandwidth   : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,

                      1 MHz 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   : 62.30 %

-. Result   : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.00	17.58	Peak	H	28.84	10.31	-	56.73	74.00	17.27
	6.13	Average	H			2.06	47.34	54.00	6.66
	18.29	Peak	V			-	57.44	74.00	16.56
	6.20	Average	V			2.06	47.41	54.00	6.59
Test Data for Middle Channel									
4 880.00	18.05	Peak	H	28.01	10.43	-	56.49	74.00	17.51
	6.34	Average	H			2.06	46.84	54.00	7.16
	18.46	Peak	V			-	56.90	74.00	17.10
	6.38	Average	V			2.06	46.88	54.00	7.12
Test Data for High Channel									
4 960.00	18.46	Peak	H	29.15	10.81	-	58.42	74.00	15.58
	6.55	Average	H			2.06	48.57	54.00	5.43
	18.05	Peak	V			-	58.01	74.00	15.99
	6.69	Average	V			2.06	48.71	54.00	5.29

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 + Correction Factor
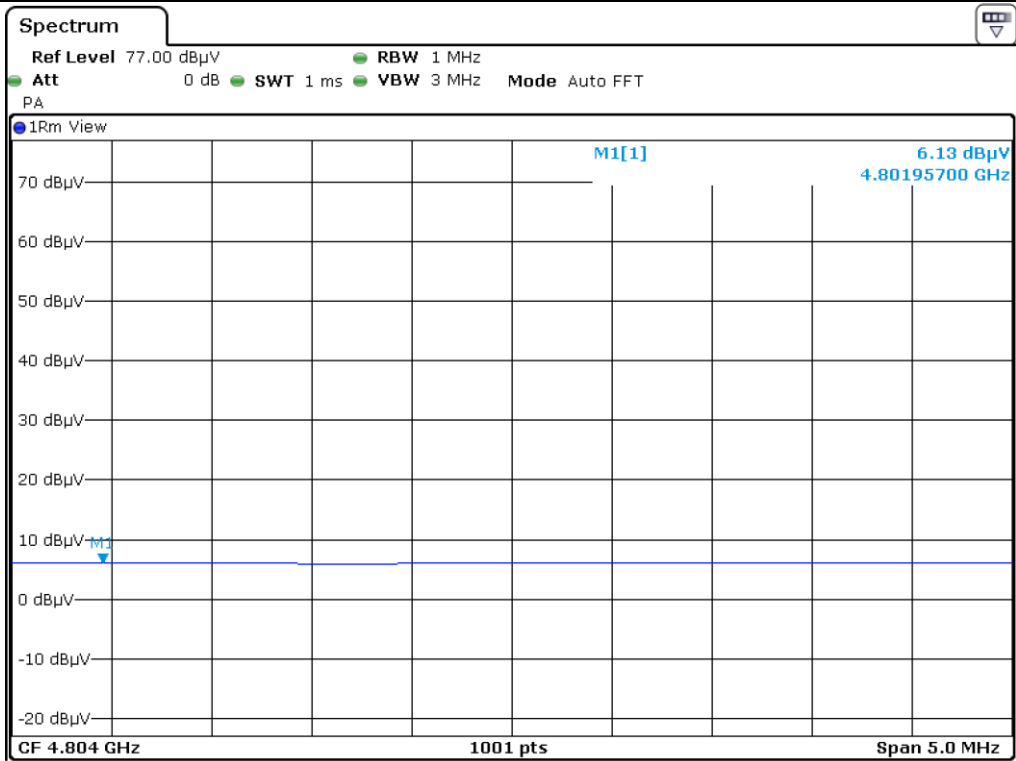
Tested by: Hyung-Kwon, Oh / Assistant Manager
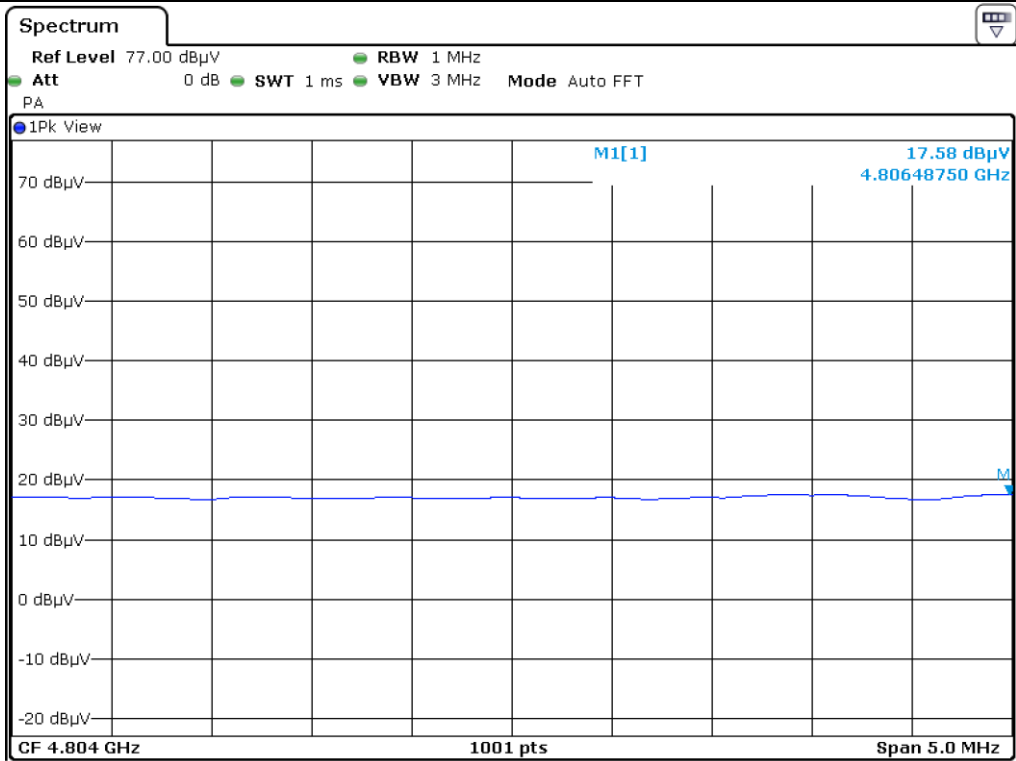
Low Channel_Peak_H

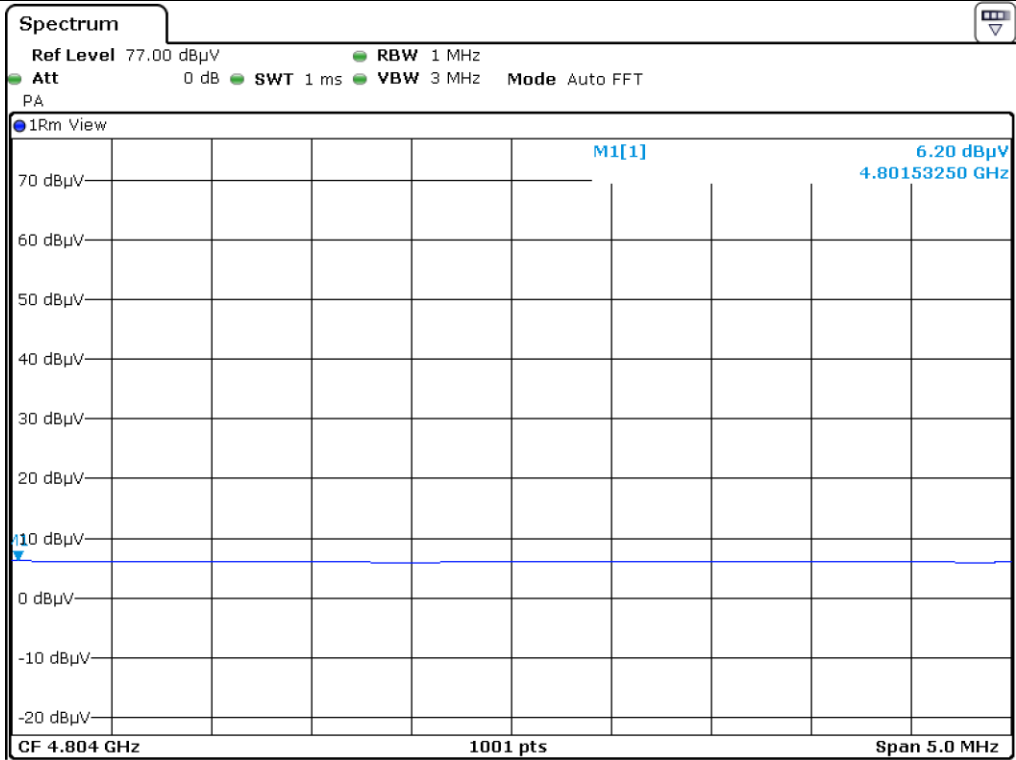
Low Channel_Peak_V

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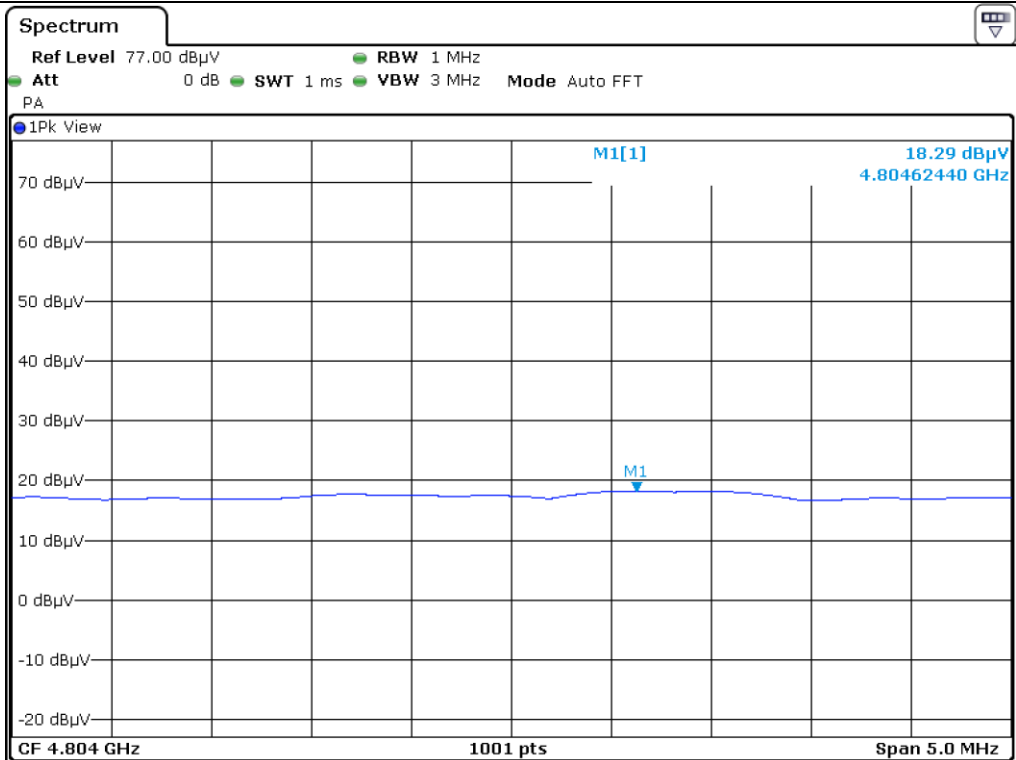
Low Channel_Average_H

Low Channel_Average_V

Middle Channel_Peak_H

Middle Channel_Peak_V

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Middle Channel_Average_H

Middle Channel_Average_V

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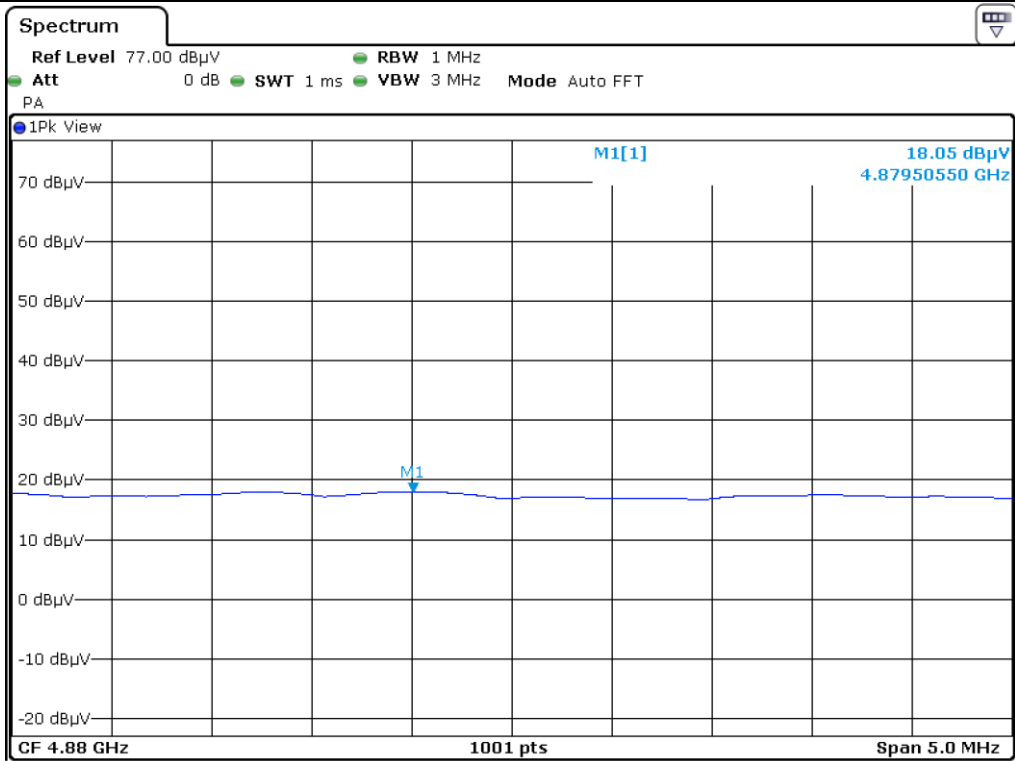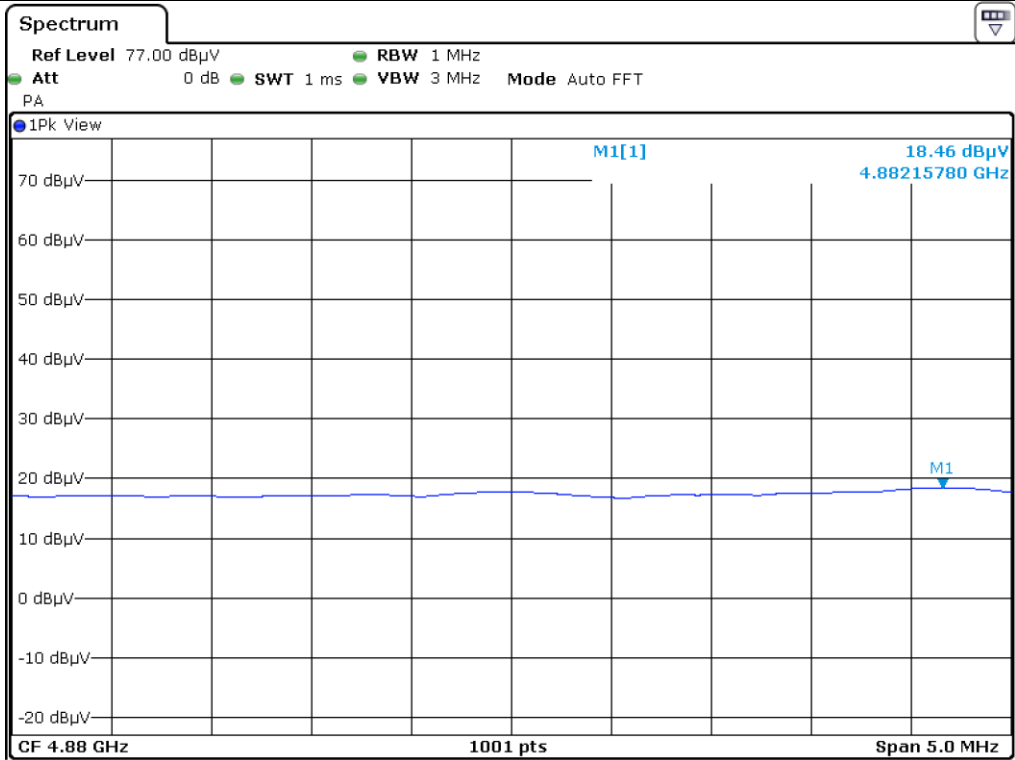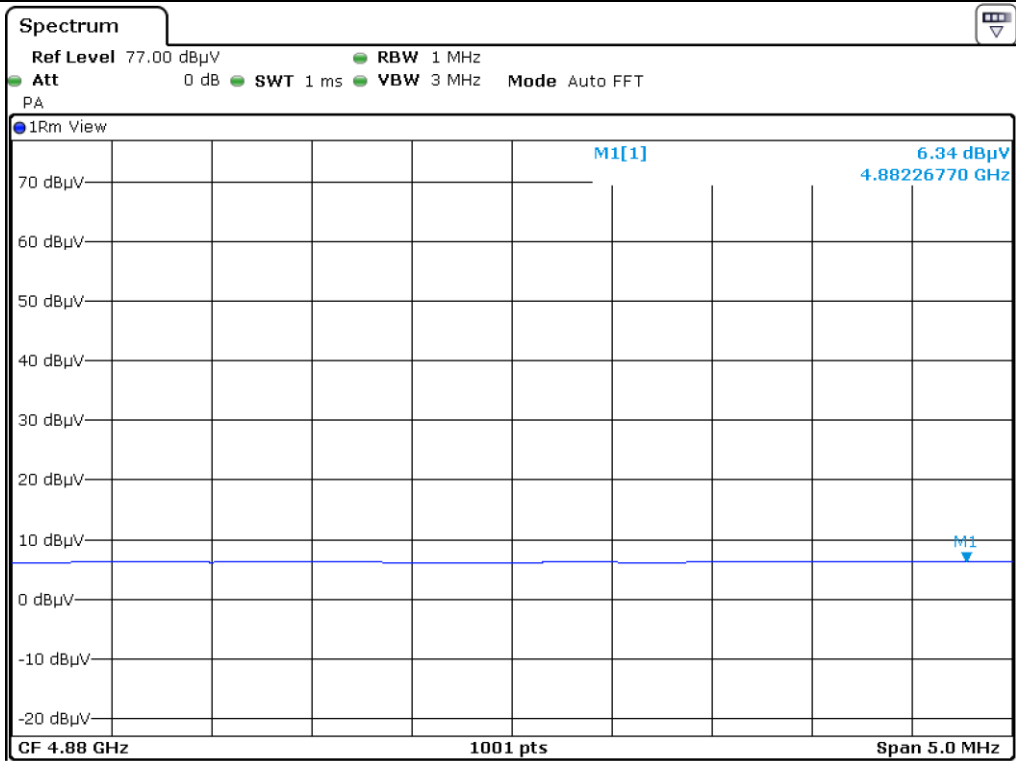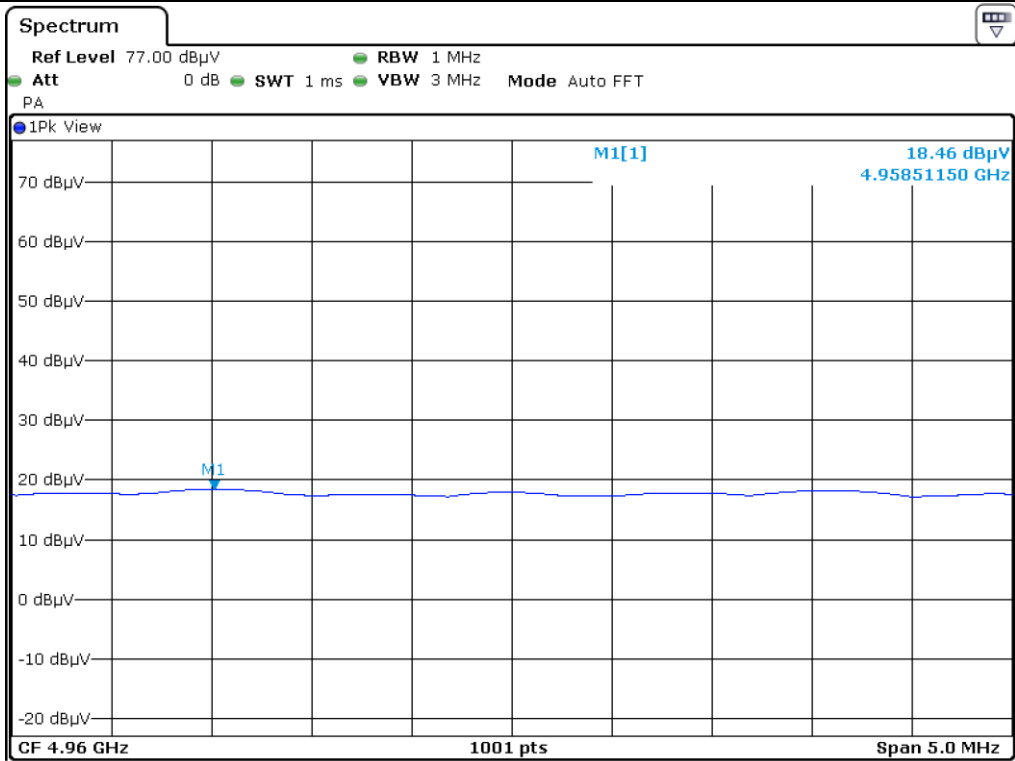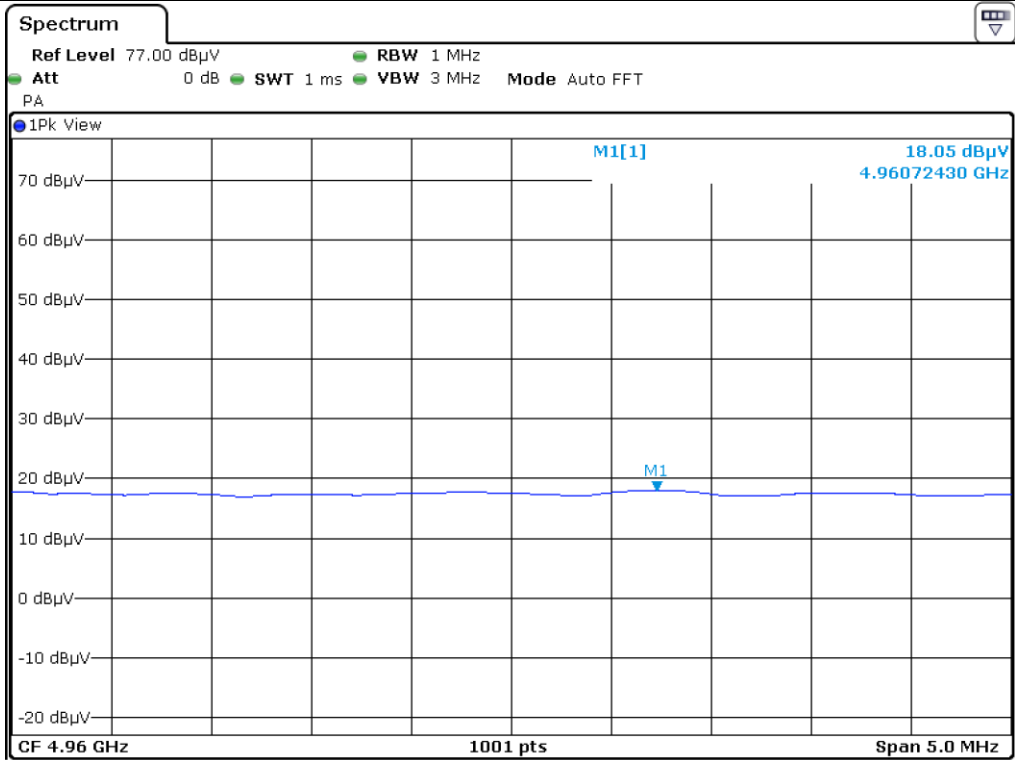
High Channel_Peak_H
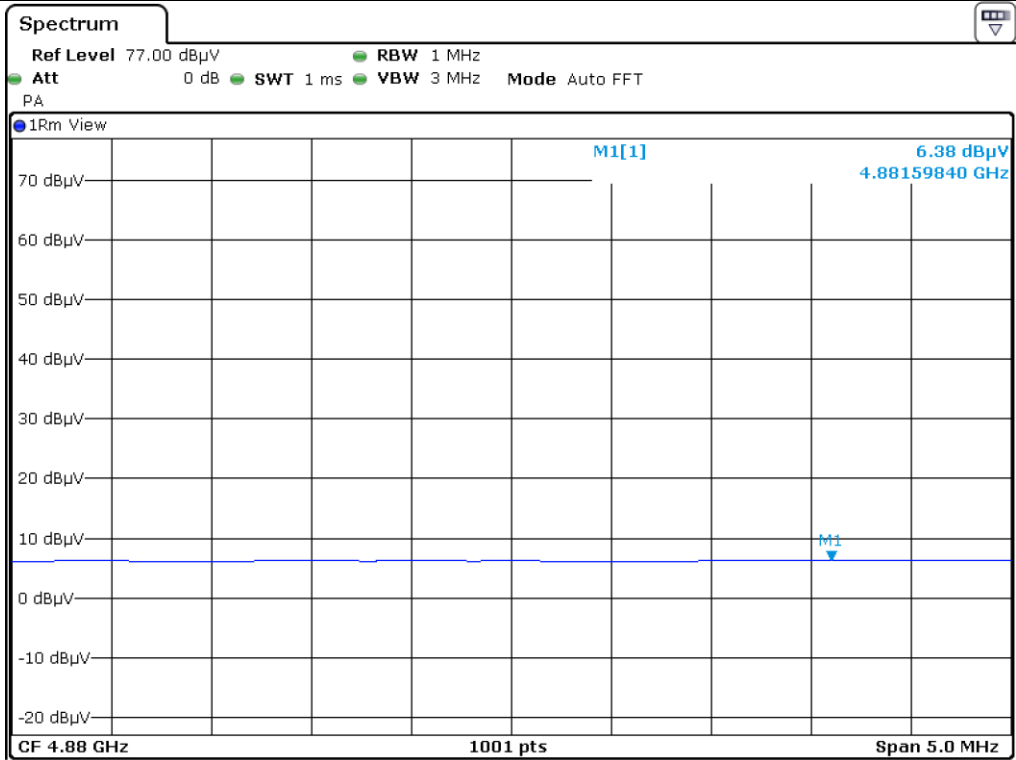

High Channel_Peak_V

High Channel_Average_H

High Channel_Average_V

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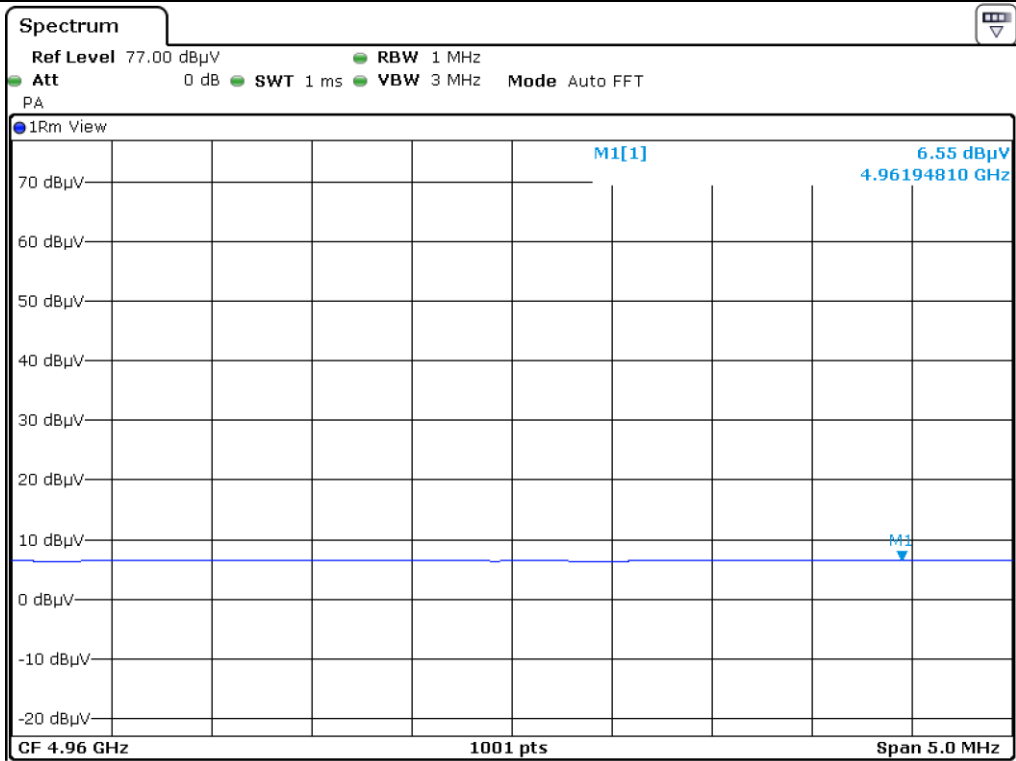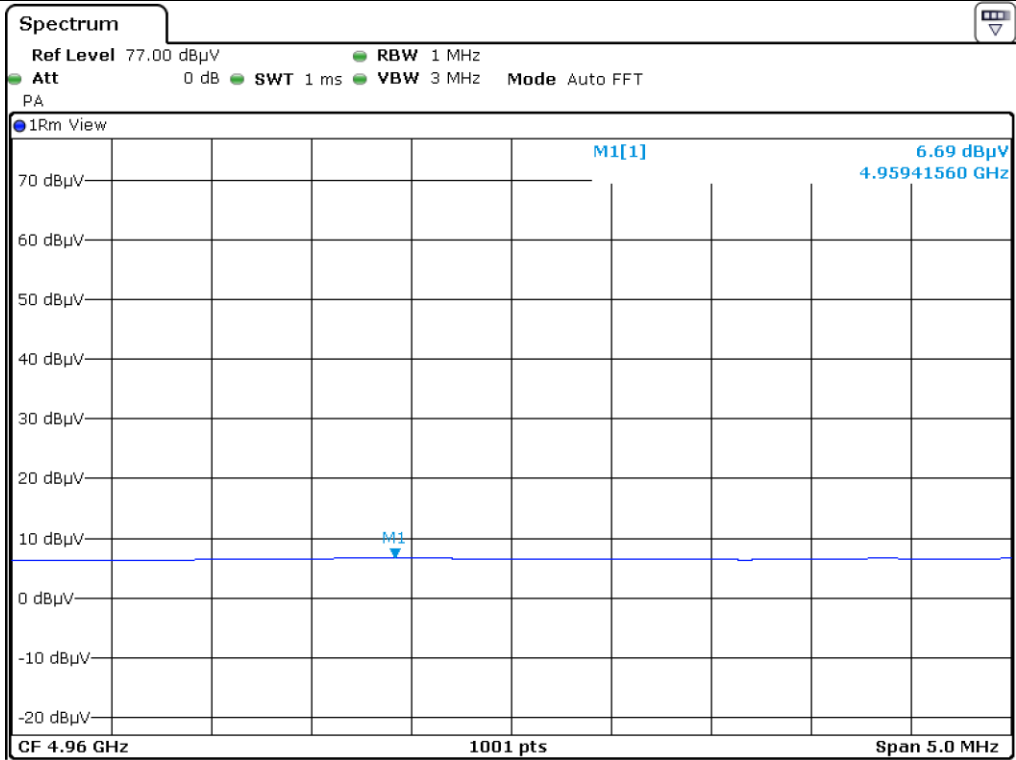
10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

Temperature   :   24.3 ℃

Relative humidity   :   43.9 % R.H.

10.2 Test set-up

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

The resolution bandwidth is set to 3 kHz ≤ RBW ≤100 kHz, the video bandwidth is set to 3 times the resolution bandwidth.

```
┌─────────────────┐              ┌─────────────────────┐
│                 │              │                     │
│      EUT        │──────────────│  Spectrum analyzer  │
│                 │              │                     │
└─────────────────┘              └─────────────────────┘
```

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.

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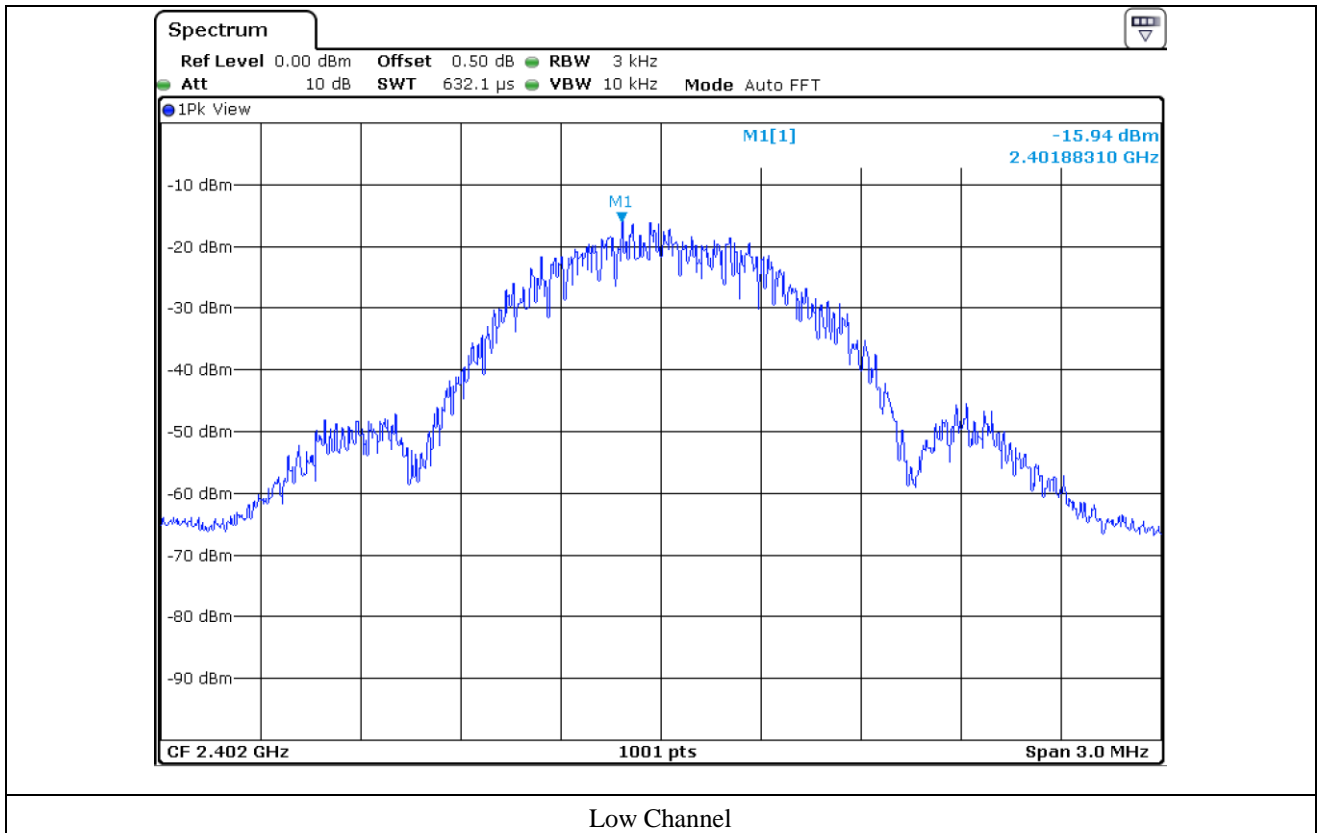
10.4 Test data

-. Test Date   : September 24, 2019 ~ October 15, 2019

-. Test Result   : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-15.94	8.00	23.94
Middle	2 440.00	-16.05	8.00	24.05
High	2 480.00	-15.77	8.00	23.77

Remark. Margin = Limit – Measured value

Tested by: Hyung-Kwon, Oh / Assistant Manager

Low Channel
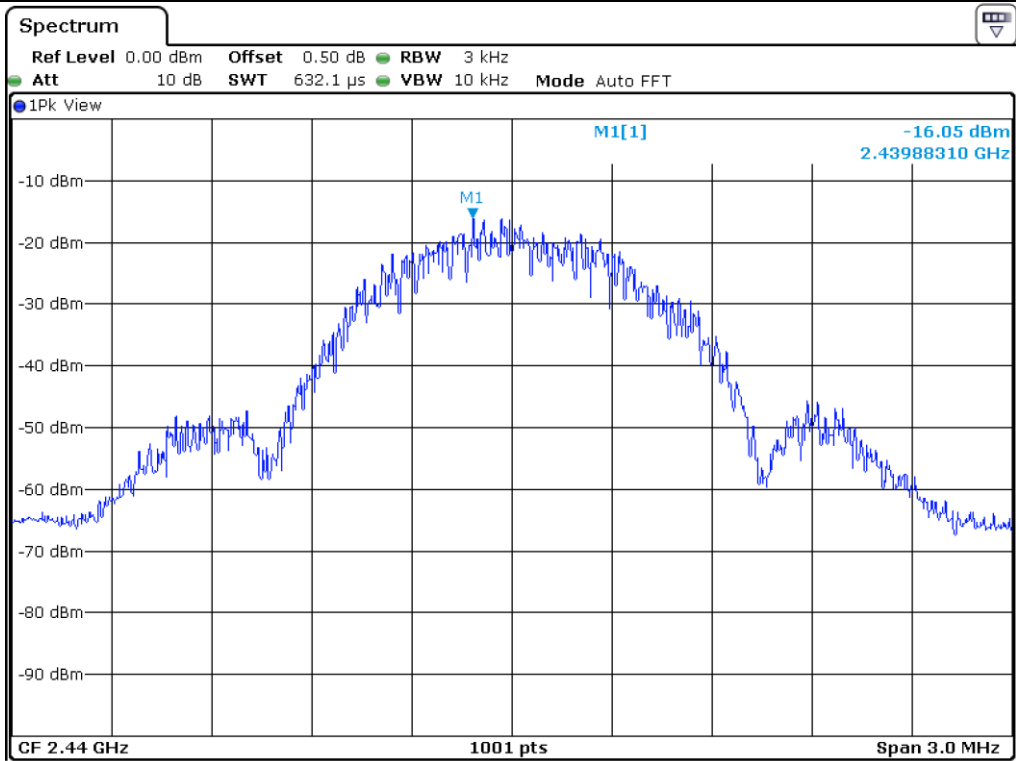
Middle Channel

High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature   :   24 ℃

Relative humidity   :   43 % R.H.

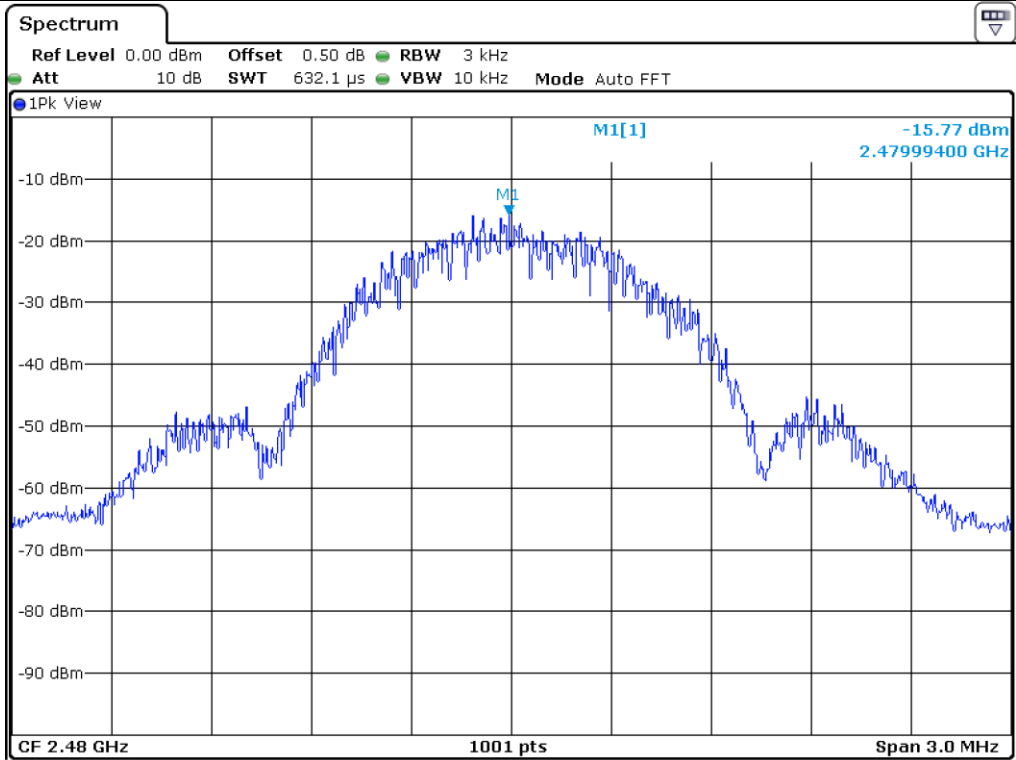## 11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

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

11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 28, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312545	Mar. 18, 2019 (1Y)
■ -	BBV9718	Schwarzbeck	Amplifier	310	Mar. 28, 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)
■ -	BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA 9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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11.4 Test data

11.4.1 Test data for 30 MHz ~ 1 GHz
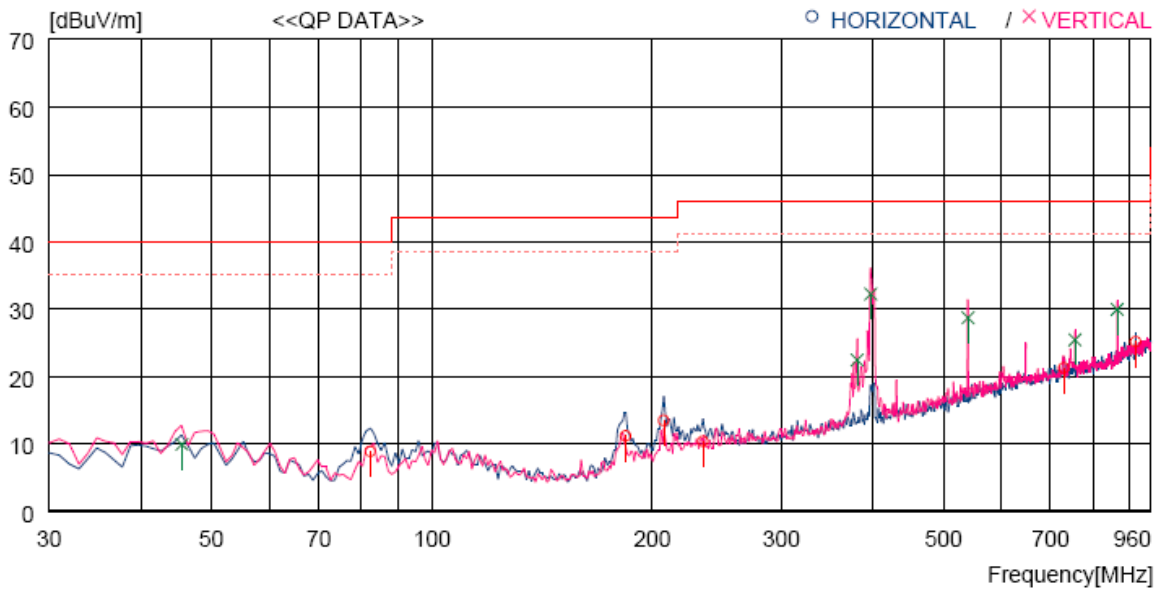
Humidity Level   : 43 % R.H.   Temperature: 24 ℃

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

Result   : PASSED

EUT   : NOVO   Date: September 24, 2019 ~ October 15, 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	82.380	31.4	8.4	2.0	33.0	8.8	40.0	31.2	300	240
2	184.230	30.8	10.2	3.1	33.0	11.1	43.5	32.4	400	359
3	207.510	32.1	11.0	3.3	33.0	13.4	43.5	30.1	300	232
4	234.670	27.6	12.1	3.5	32.9	10.3	46.0	35.7	400	147
5	731.304	27.7	20.4	6.3	33.2	21.2	46.0	24.8	400	107
6	915.598	27.3	22.9	7.1	32.2	25.1	46.0	20.9	400	359
----- Vertical ------										
7	45.520	27.0	14.5	1.5	33.1	9.9	40.0	30.1	100	359
8	381.140	35.4	15.5	4.5	33.0	22.4	46.0	23.6	100	359
9	397.630	44.9	15.8	4.6	33.1	32.2	46.0	13.8	200	222
10	540.220	38.3	18.3	5.4	33.3	28.7	46.0	17.3	200	198
11	756.523	31.5	20.7	6.4	33.2	25.4	46.0	20.6	100	359
12	864.190	33.8	21.9	6.9	32.7	29.9	46.0	16.1	100	130

Tested by: Hyung-Kwon, Oh / Assistant Manager

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

11.4.2 Test data for Below 30 MHz

-. Test Date   : September 24, 2019 ~ October 15, 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.					

11.4.3 Test data for above 1 GHz

-. Test Date   : September 24, 2019 ~ October 15, 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