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

Test Report No.	**: OT-19O-RWD-052**
AGR No.	**: A195A-256**
Applicant	**: Bloomengine Inc.**
Address	**: Seoul Startup Didimteo #302, Dongil-ro 174-gil 27, Nowon-gu, 01849, Seoul, Korea**
Manufacturer	**: Bloomengine Inc.**
Address	**: Seoul Startup Didimteo #302, Dongil-ro 174-gil 27, Nowon-gu, 01849, Seoul, Korea**
Type of Equipment	**: Smart Indoor Planter**
FCC ID.	**: 2AUU9-B100KHB**
Model Name	**: B100KHB**
Multiple Model Name	**: B100KHC**
Serial number	**: N/A**
Total page of Report	**: 56 pages (including this page)**
Date of Incoming	**: October 01, 2019**
Date of issue	**: October 22, 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.

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

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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)

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-19O-RWD-052	October 22, 2019	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : Bloomengine Inc.

Address : Seoul Startup Didimteo #302, Dongil-ro 174-gil 27, Nowon-gu, 01849, Seoul, Korea

Contact Person : Seulki, Park / CEO

Telephone No. : +82-70-5129-5177

FCC ID : 2AUU9-B100KHB

Model Name : B100KHB

Brand Name : -

Serial Number : N/A

Date : October 22, 2019

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Smart Indoor Planter
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	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

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3. GENERAL INFORMATION

3.1 Product Description

The Bloomengine Inc., Model B100KHB (referred to as the EUT in this report) is an Smart Indoor Planter, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Smart Indoor Planter
Temperature Range	0 ℃ ~ 70 ℃
Operating Frequency	2 412 MHz ~ 2 462 MHz (802.11b/g)
Modulation Type	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g: OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
RF Output Power	15.66 dBm(802.11b) 12.06 dBm(802.11g)
ANTENNA TYPE	Chip Antenna
ANTENNA GAIN	1.50 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 24 MHz
RATED SUPPLY VOLTAGE	AC 120 V

3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
B100KHB	Basic model.	☑
B100KHC	The model does not have a camera module.	☐

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

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.

-. Basic model: B100KHB

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Bloomengine Inc.	QY_DEWY_PR_V02	N/A
Power Board	Bloomengine Inc.	B100KHA Power Supply BRD Rev. MP	N/A
LED Board	Bloomengine Inc.	B100KHA REV. MP10	N/A
Water Sensor	Bloomengine Inc.	C10CKHA MP01	N/A
Camera	N/A	N/A	N/A
Pump	Qingdao Ahead Electric Co., Ltd.	AW100	N/A
Adapter	Dongguan Yinli Electronics Co., Ltd.	YLS0241A-K120200	N/A

-. Multiple Model: B100KHC

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Bloomengine Inc.	QY_DEWY_PR_V02	N/A
Power Board	Bloomengine Inc.	B100KHA Power Supply BRD Rev. MP	N/A
LED Board	Bloomengine Inc.	B100KHA REV. MP10	N/A
Water Sensor	Bloomengine Inc.	C10CKHA MP01	N/A
Pump	Qingdao Ahead Electric Co., Ltd.	AW100	N/A
Adapter	Dongguan Yinli Electronics Co., Ltd.	YLS0241A-K120200	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
B100KHB	Bloomengine Inc.	Smart Indoor Planter(EUT)	-
N/A	N/A	Jig Board	EUT / Notebook PC
Ideapad 100-15IBD	LENOVO	Notebook PC	Jig Board

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5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting mode is programmed.

Modulation	DATA RATE	OUTPUT POWER[dBm]
802.11 b (Middle Channel)	1 Mbps	15.13
	2 Mbps	15.11
	5.5 Mbps	15.07
	11 Mbps	15.05
802.11g (Middle Channel)	6 Mbps	11.84
	9 Mbps	11.83
	12 Mbps	11.80
	18 Mbps	11.79
	24 Mbps	11.76
	36 Mbps	11.74
	48 Mbps	11.72
	54 Mbps	11.68

-. The worse case data rate for each modulation is determined 1 Mbps for IEEE 802.11b, 6 Mbps for IEEE 802.11g.

-. 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.

-. The worst case for each modulation is in IEEE 802.11b. So the plot for Radiated Emission which fall in the Restricted Band is provided only in IEEE 802.11b.

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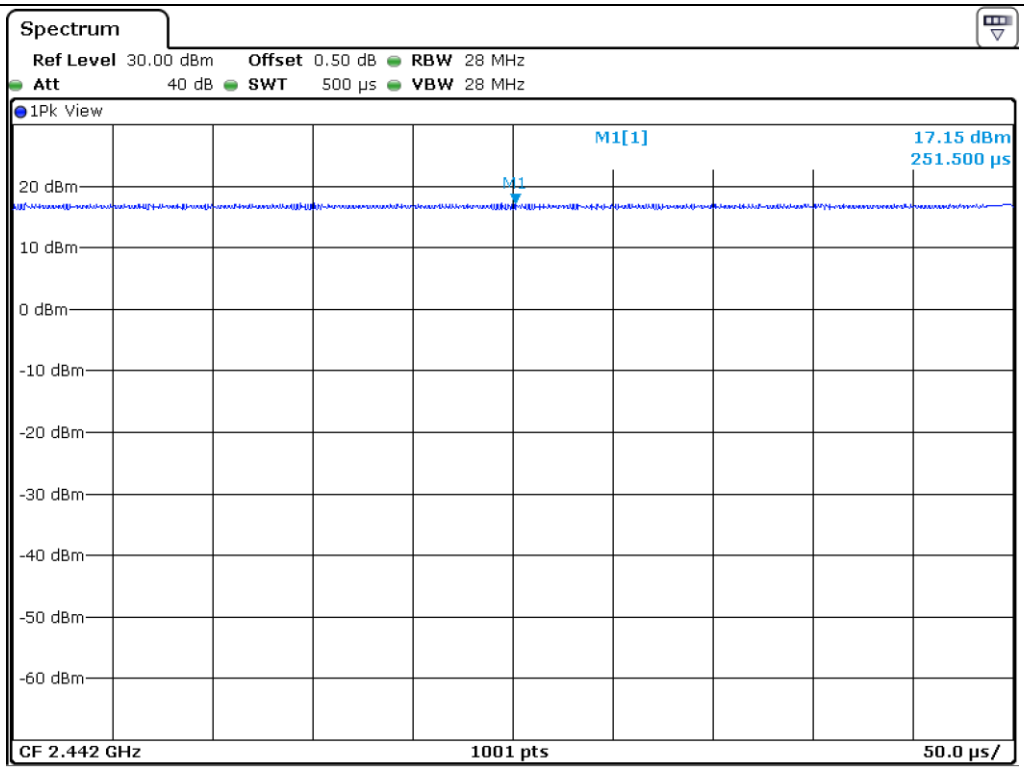
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
802.11 b	-	-	100.00	-
802.11 g	-	-	100.00	-

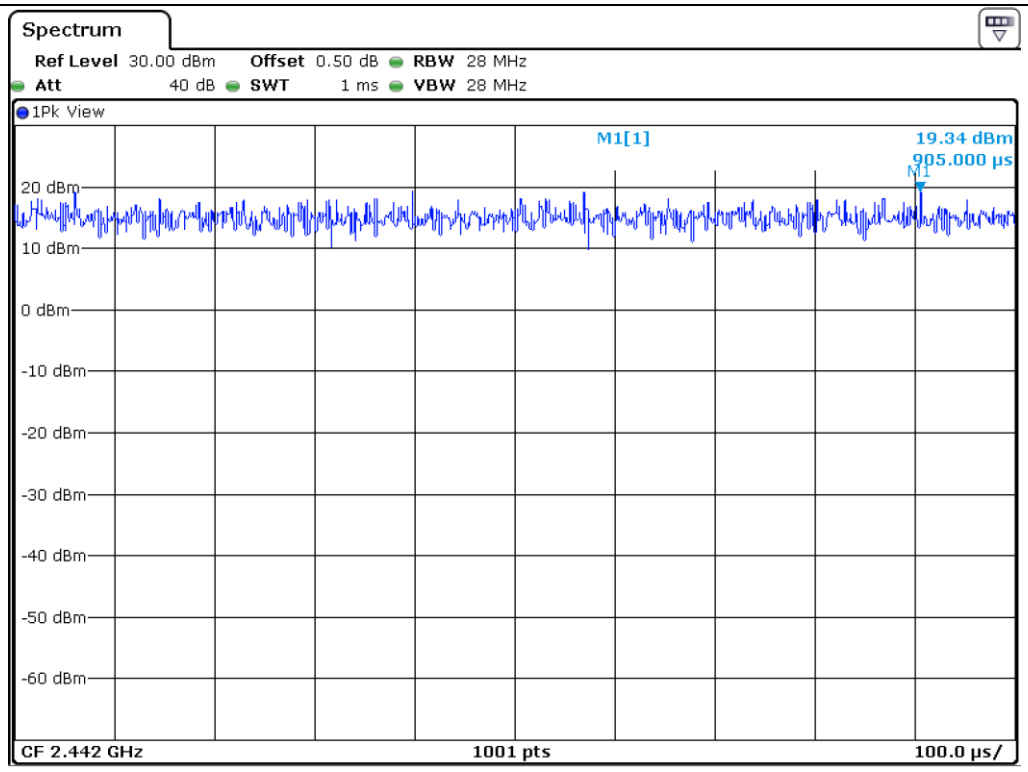
Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

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

-. Test Plot



802.11 b



802.11 g

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5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to LISN. 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 Chip Antenna on the main board in the EUT, so no consideration of replacement by the user.

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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)
Transmitting 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

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7. MIMIMUM 6 dB BANDWIDTH

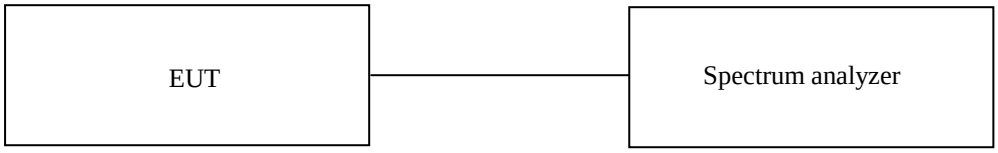
7.1 Operating environment

Temperature : 23 ℃

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 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



7.3 Test equipment used

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

All test equipment used is calibrated on a regular basis.

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7.4 Test data for 802.11b WLAN Mode

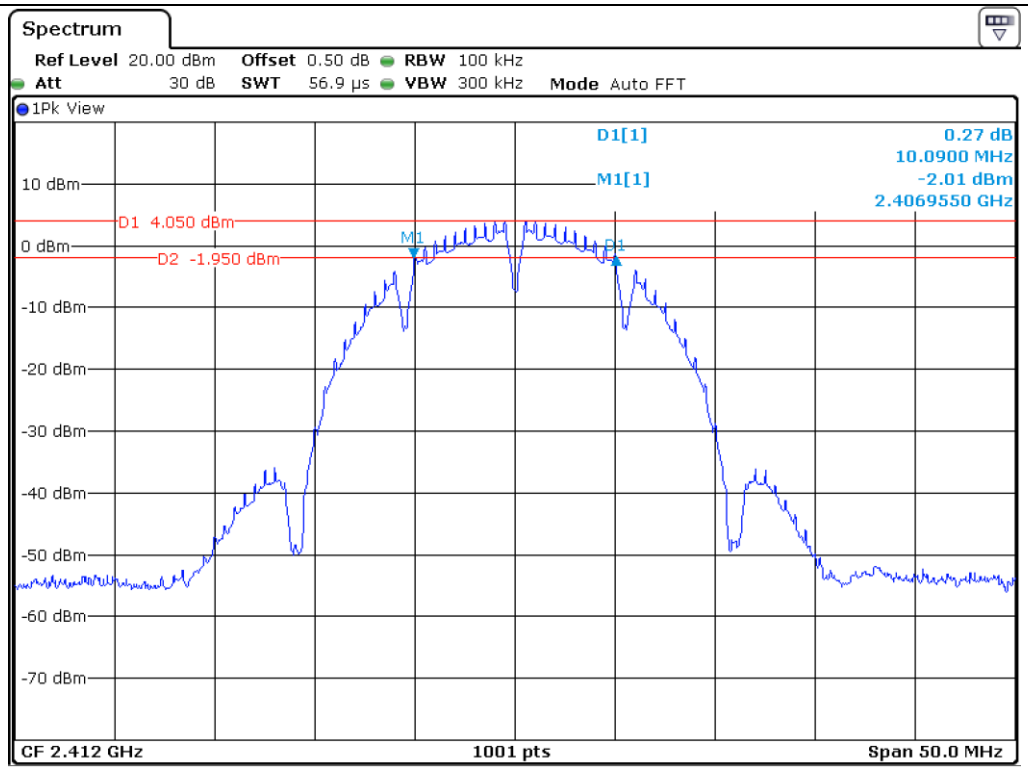
-. Test Date : October 07, 2019 ~ October 14, 2019

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
LOW	2 412.00	10.09	0.50	9.59
MIDDLE	2 442.00	10.09	0.50	9.59
HIGH	2 462.00	10.09	0.50	9.59

Remark. Margin = Measured Value - Limit

Tested by: Hyung-Kwon, Oh / Assistant Manager



Low Channel

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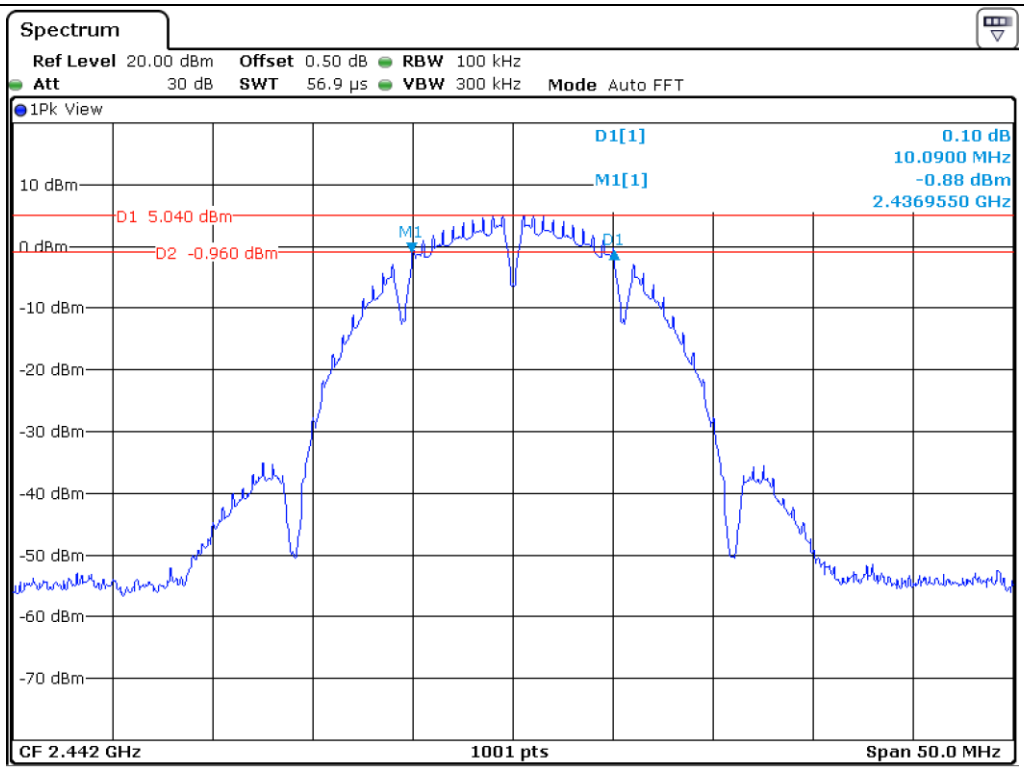
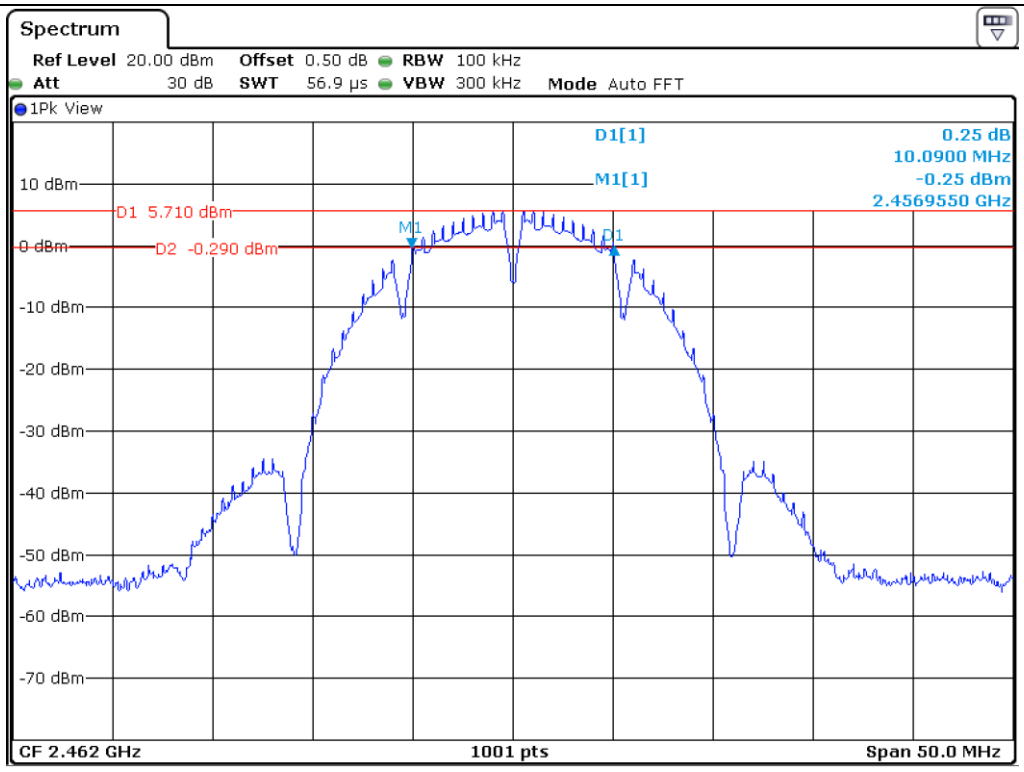


Middle Channel



High Channel

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7.5 Test data for 802.11g WLAN Mode

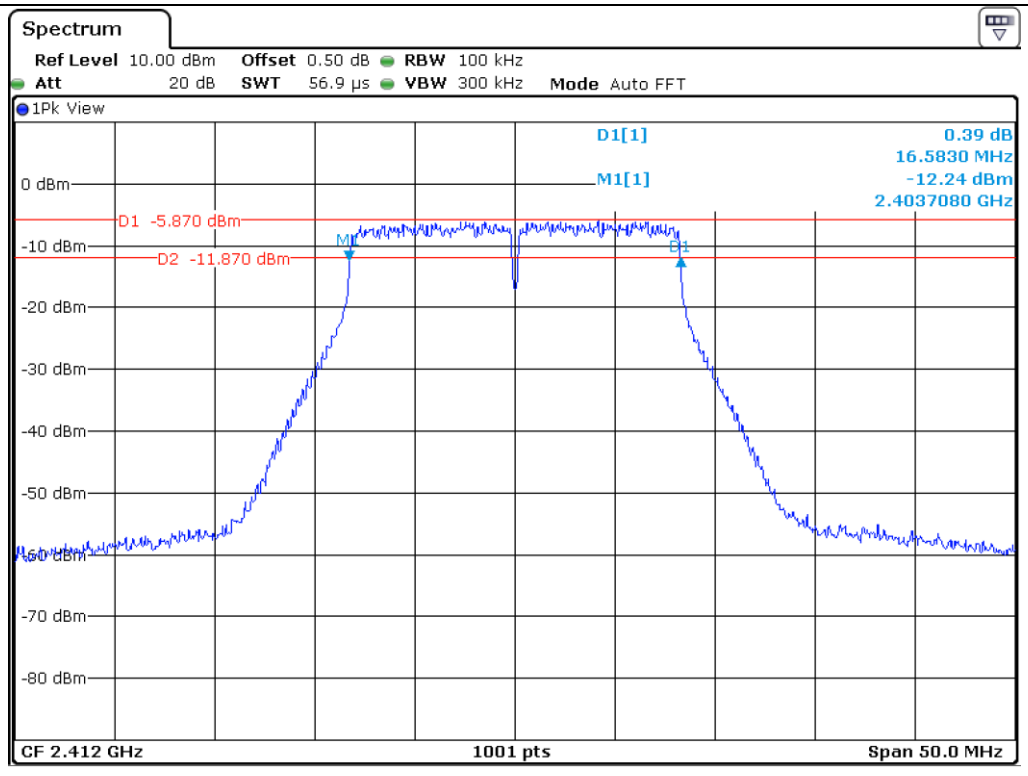
-. Test Date : October 07, 2019 ~ October 14, 2019

-. Test Result : Pass

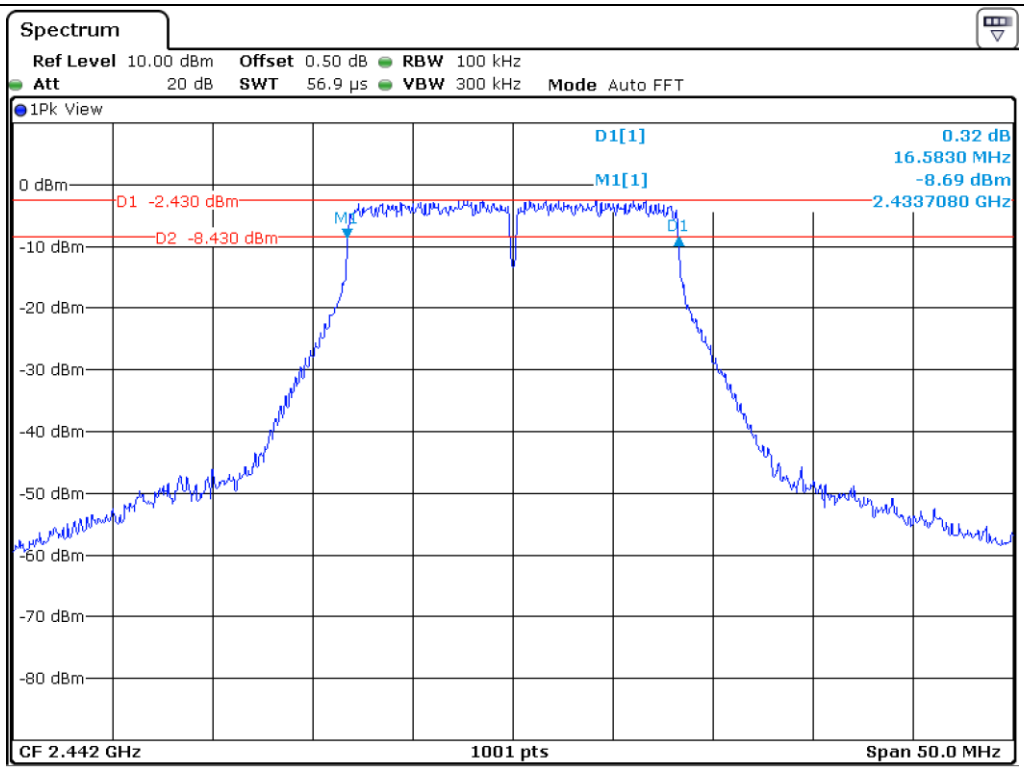
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
LOW	2 412.00	16.58	0.50	16.08
MIDDLE	2 442.00	16.58	0.50	16.08
HIGH	2 462.00	16.58	0.50	16.08

Remark. Margin = Measured Value - Limit

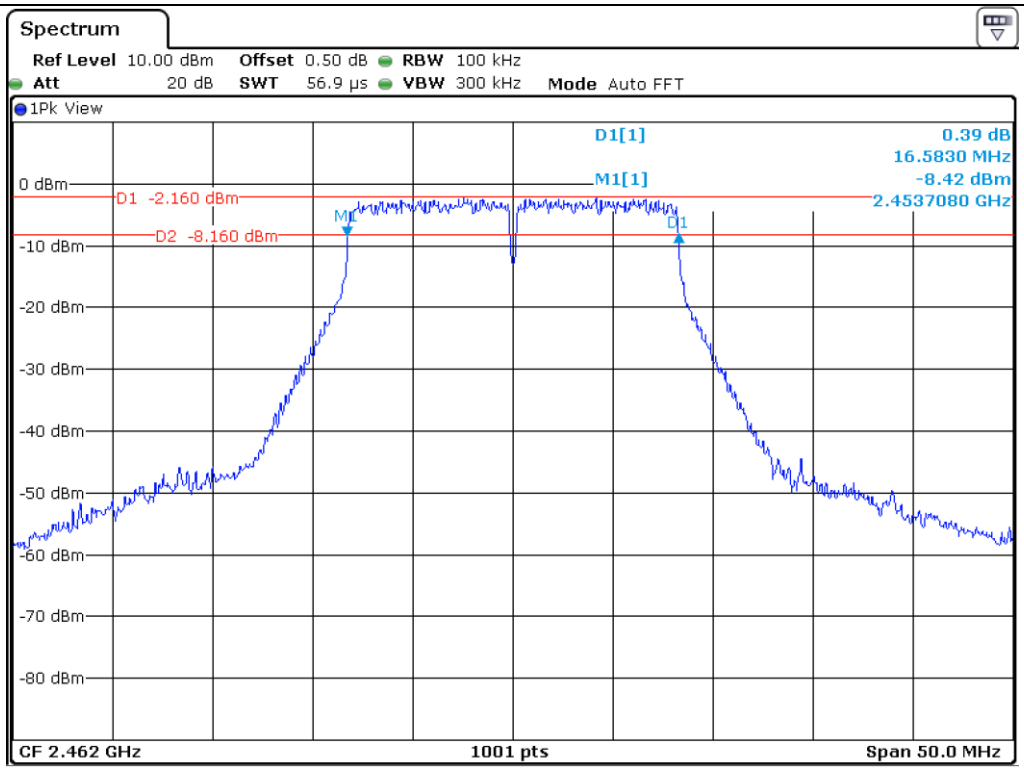
Tested by: Hyung-Kwon, Oh / Assistant Manager



Low Channel



Middle Channel



High Channel

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8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

Temperature : 23 ℃

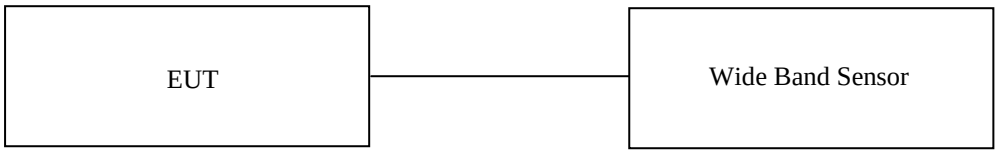
Relative humidity : 45 % R.H.

8.2 Test set-up

The maximum peak output power was measured with the wide band sensor connected to the antenna output of the EUT.

The Wide Band Sensor is measured when the EUT is transmitting at the appropriate center frequency its maximum power control level as described in Section 8.3.2(558074 D01 15.247 Meas Guidance v05r02).

Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	NRP-Z81	Rohde & Schwarz	Wide Band Sensor	101975	Mar. 12, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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8.4 Test data for 802.11b WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 2019

-. Test Result : Pass

-. Duty Cycle : 100.00 %

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	14.37	30.00	15.63
MIDDLE	2 442.00	15.13	30.00	14.87
HIGH	2 462.00	15.66	30.00	14.34

Remark : Margin = Limit – Measured Vlaue

8.5 Test data for 802.11g WLAN Mode

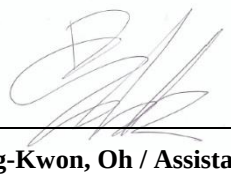
-. Test Date : October 07, 2019 ~ October 14, 2019

-. Test Result : Pass

-. Duty Cycle : 100.00 %

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	8.50	30.00	21.50
MIDDLE	2 442.00	11.84	30.00	18.16
HIGH	2 462.00	12.06	30.00	17.94

Remark : Margin = Limit – Measured Vlaue



Tested by: Hyung-Kwon, Oh / Assistant Manager

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9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

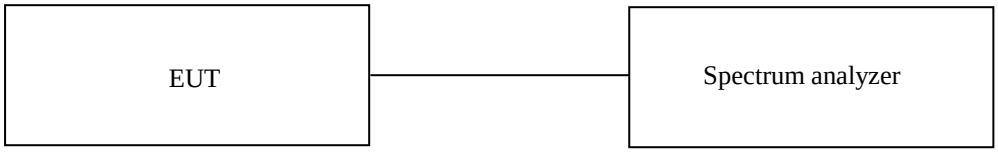
9.1 Operating environment

Temperature : 23 ℃

Relative humidity : 45 % R.H.

9.2 Test set-up for conducted measurement

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



9.3 Test set-up for radiated measurement

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

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

9.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	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.

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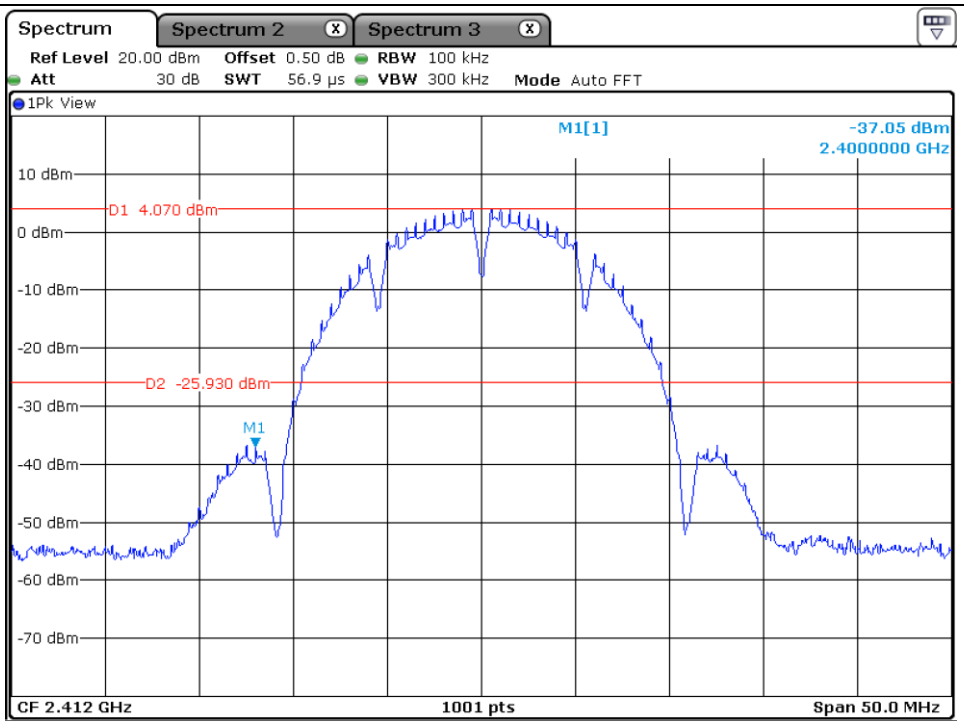
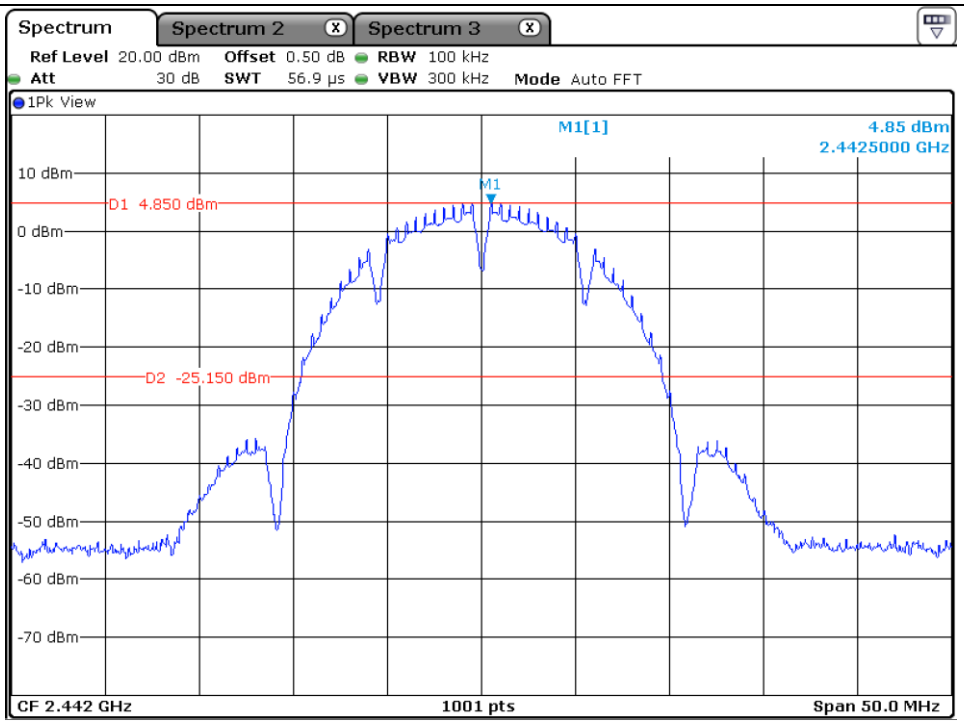
9.5 Test data for conducted emission

9.5.1 Test data for 802.11b WLAN Mode



Low Channel



Middle Channel

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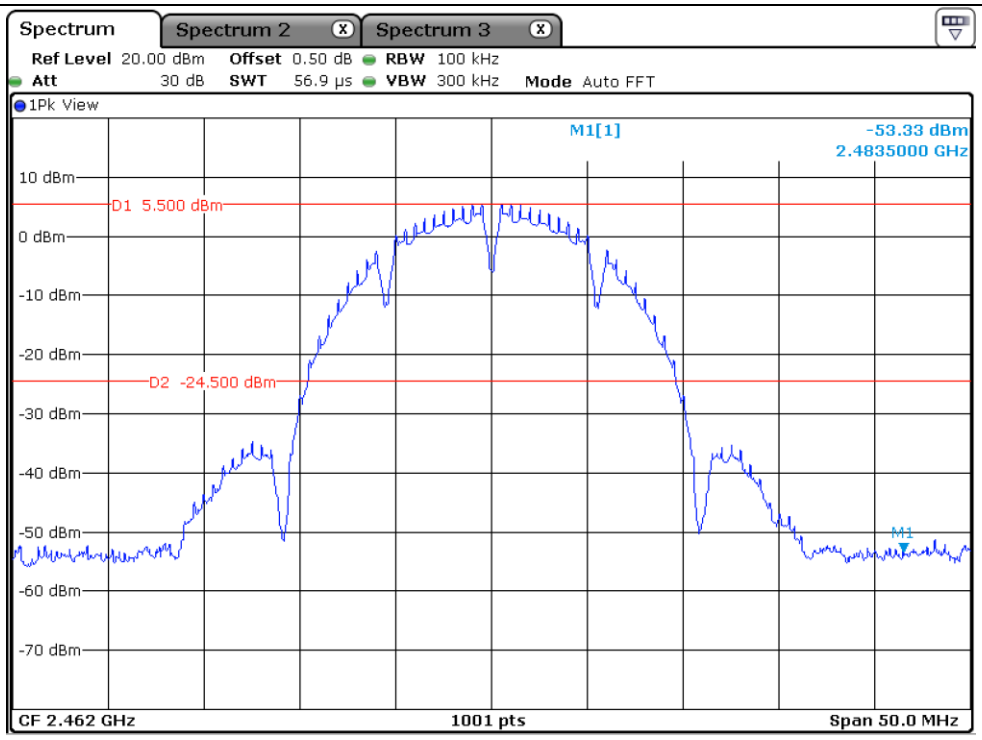
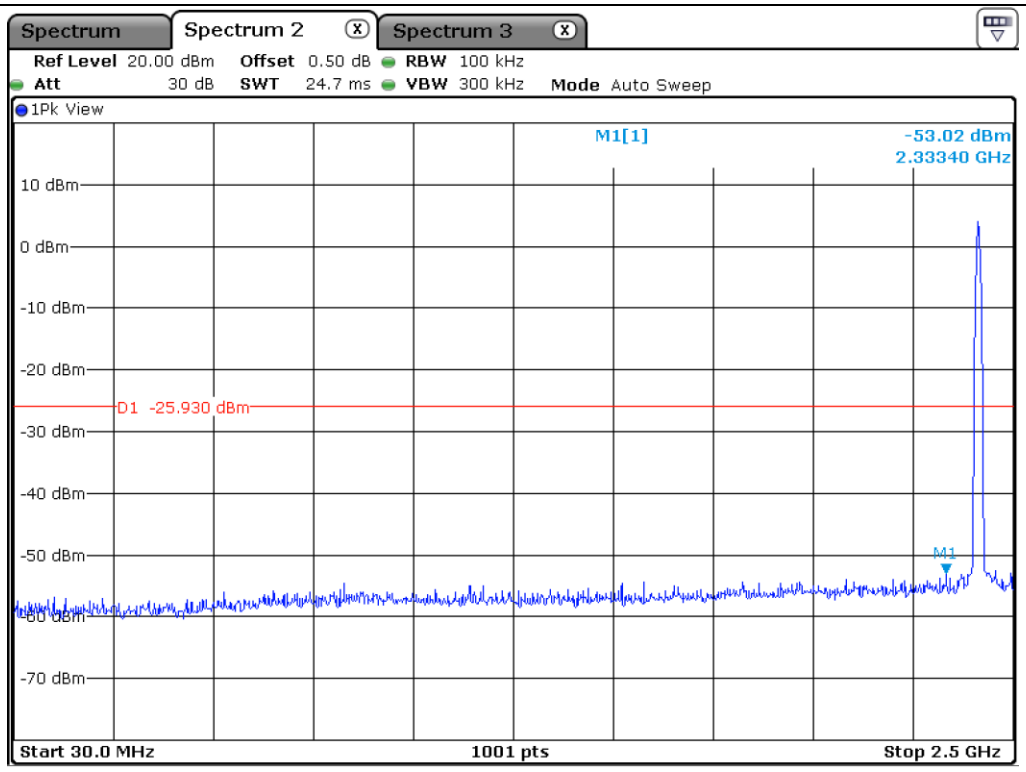
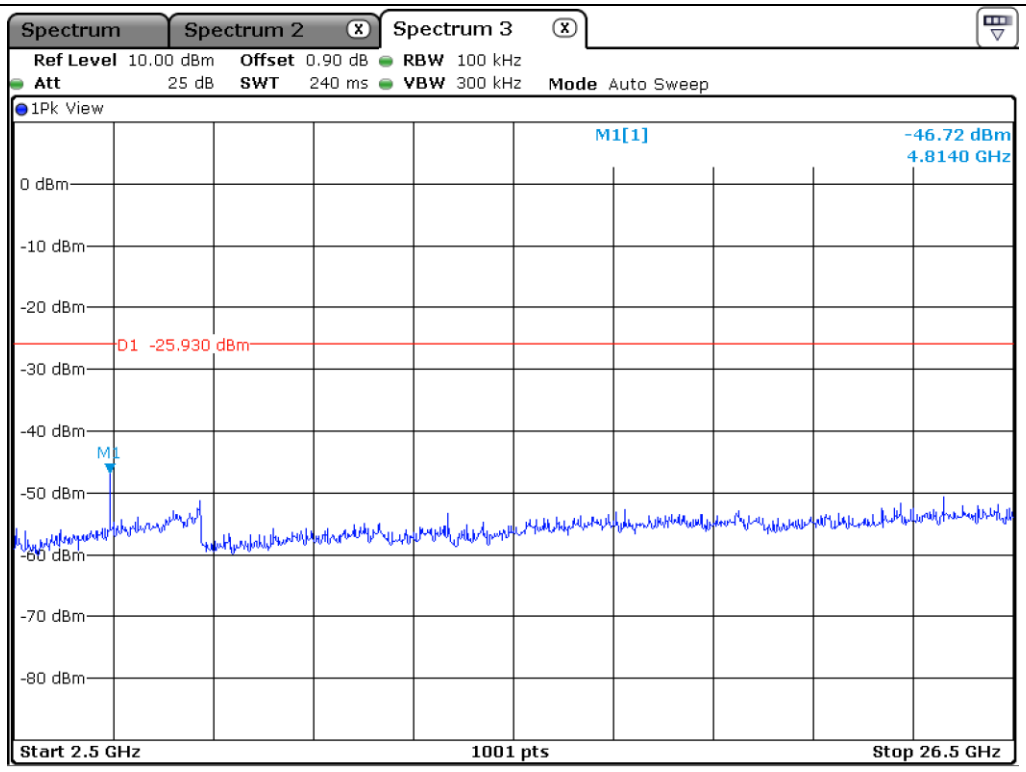


High Channel

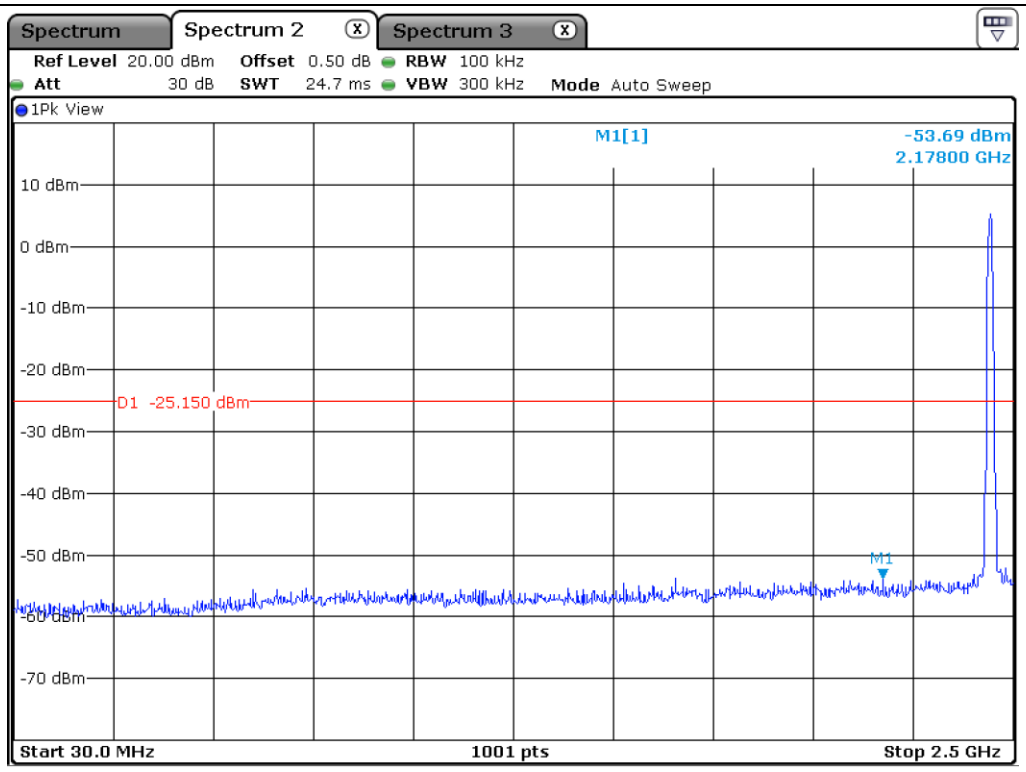


Low Channel

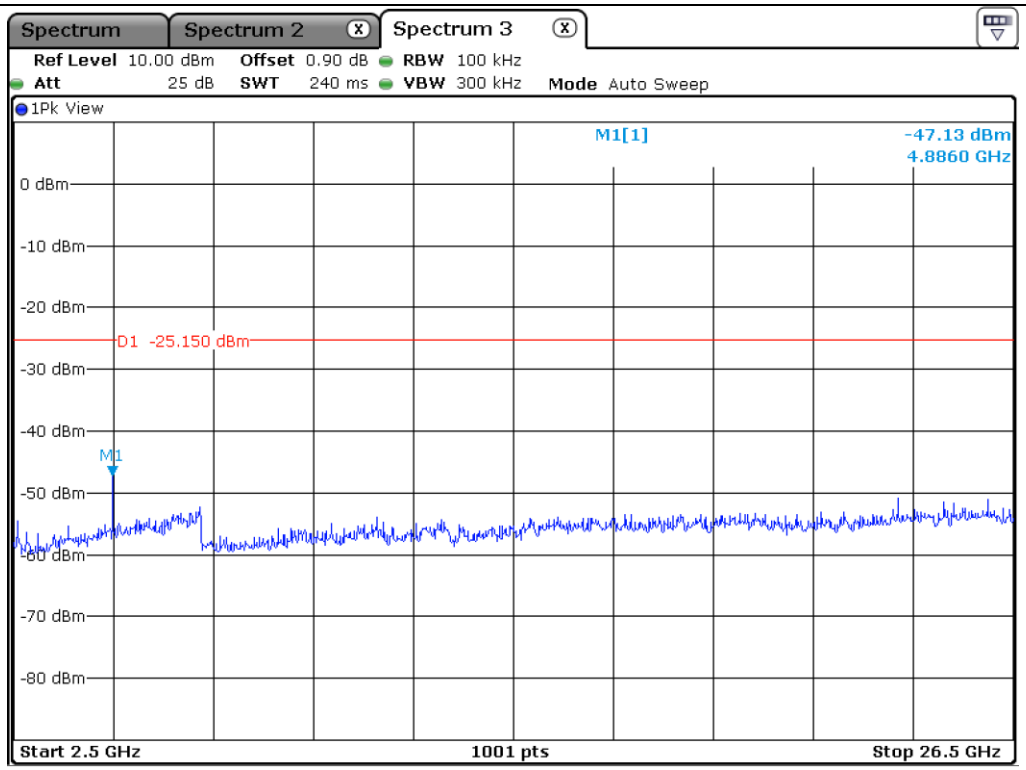


Low Channel

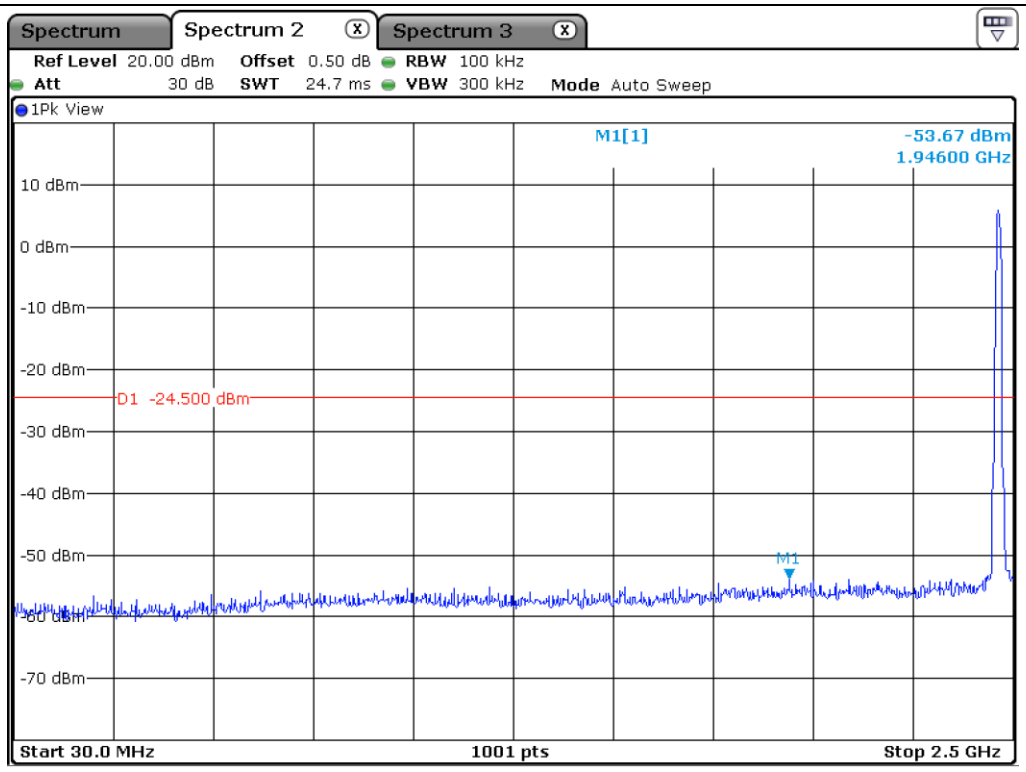
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



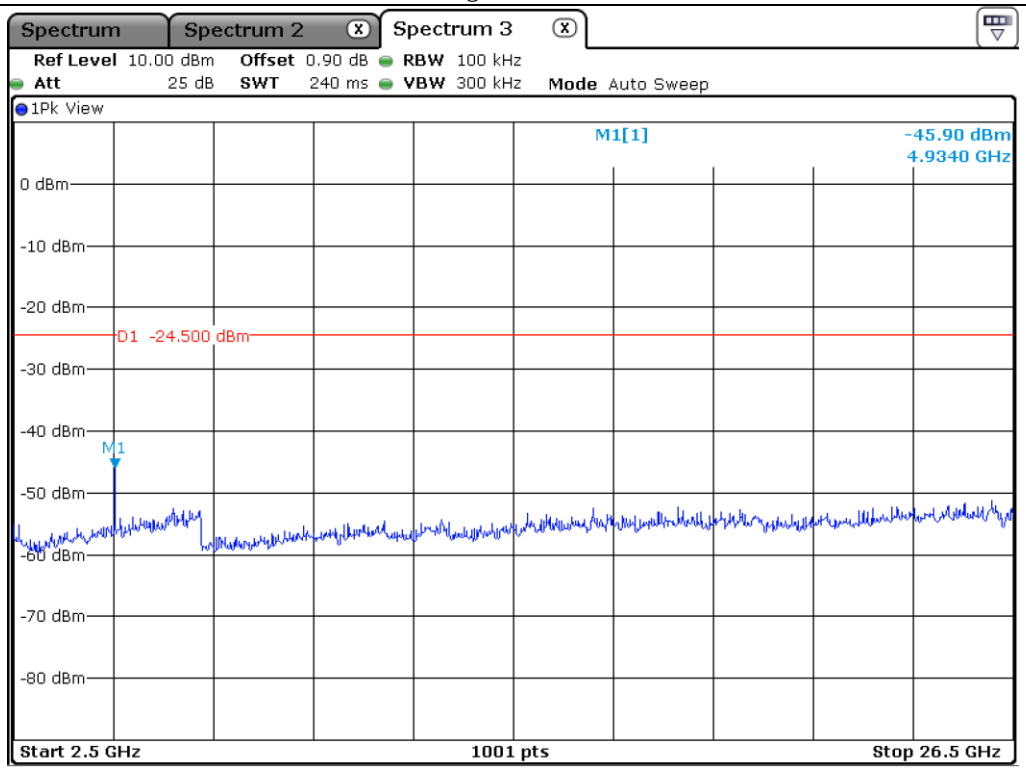
Middle Channel



Middle Channel



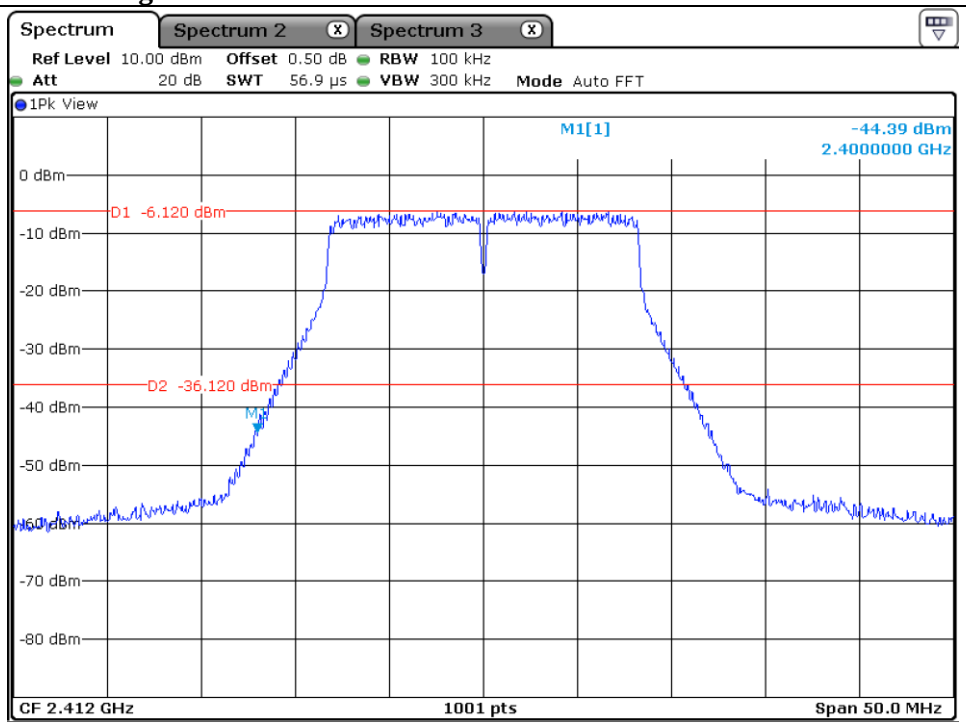
High Channel



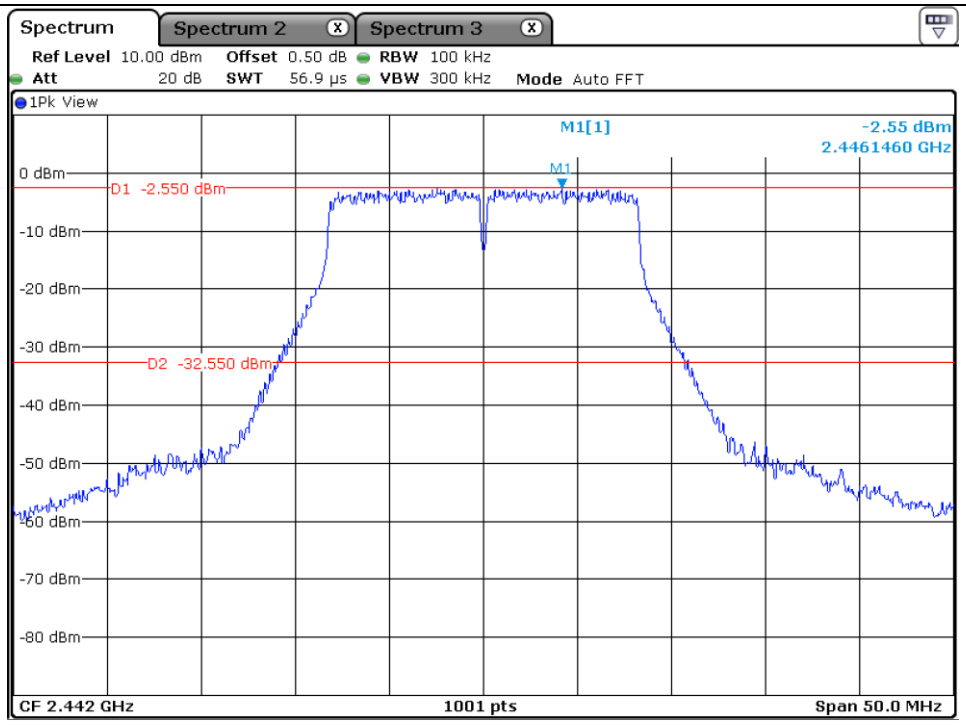
High Channel

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

9.5.2 Test data for 802.11g WLAN Mode

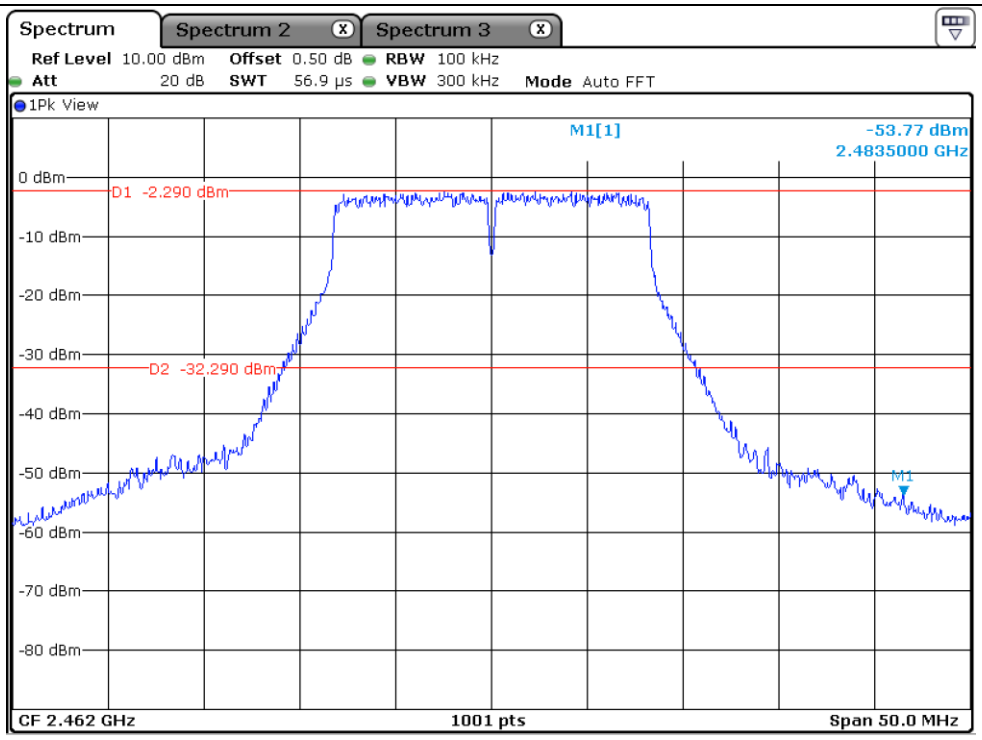


Low Channel



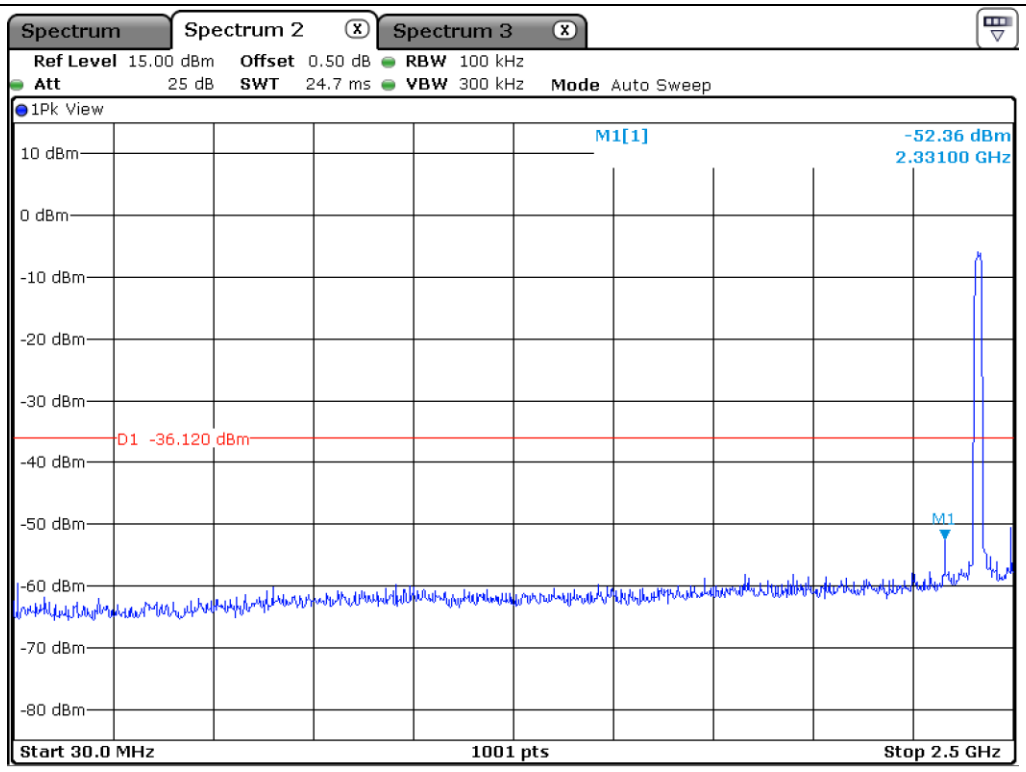
Middle Channel

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

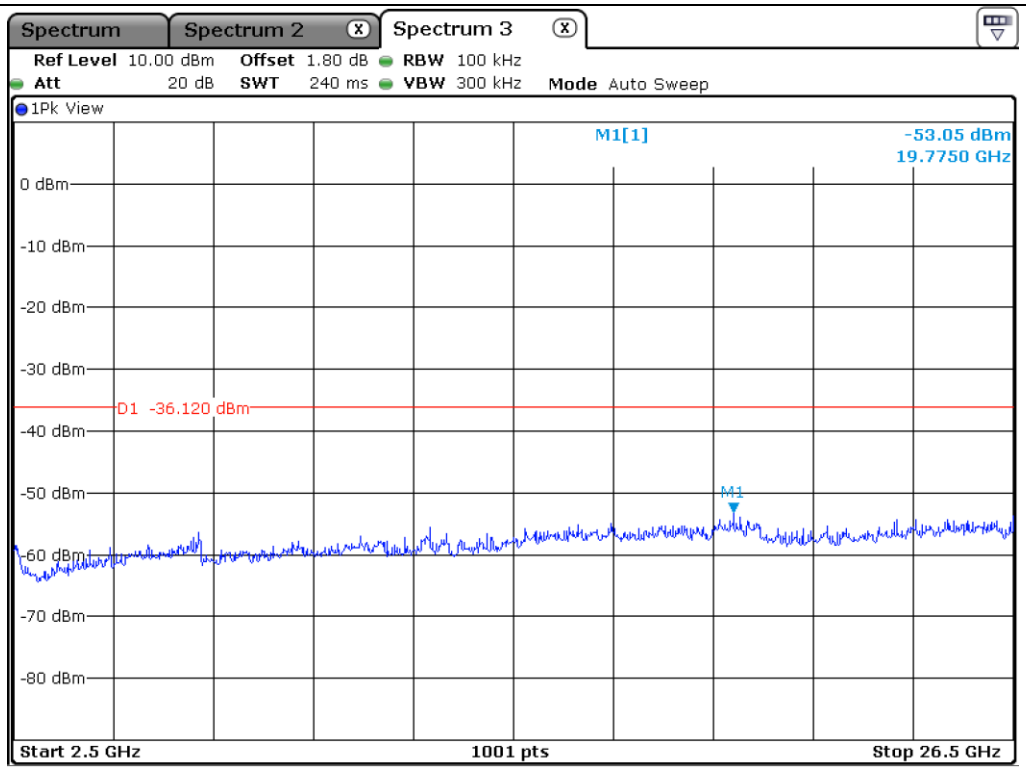


High Channel

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

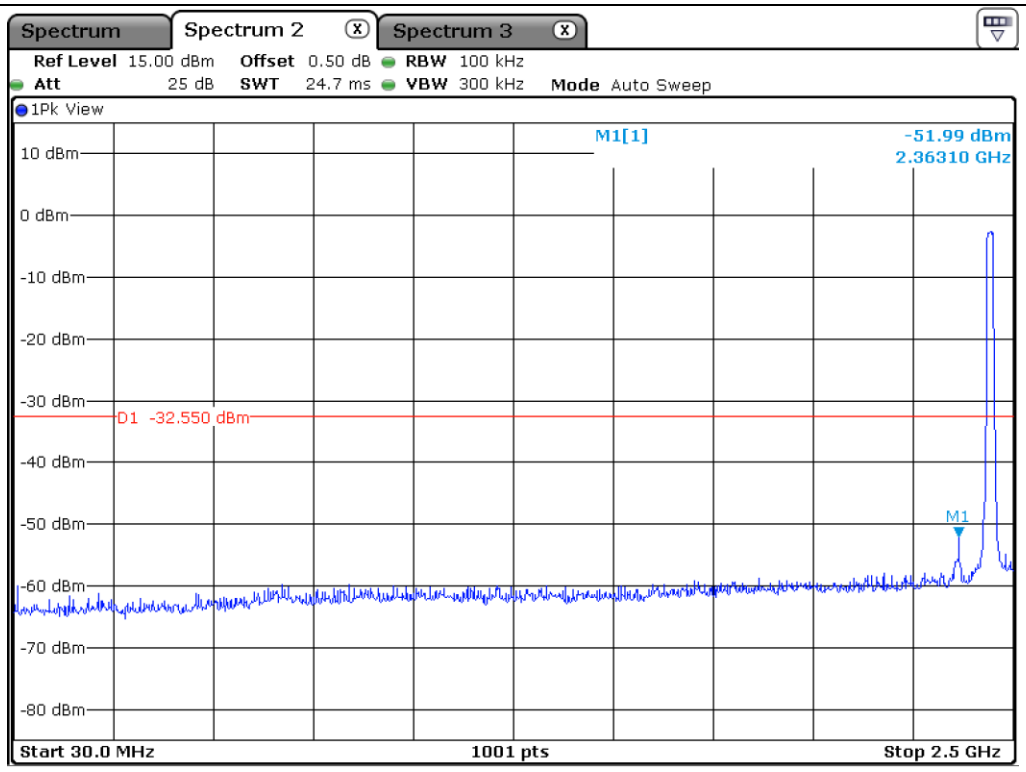


Low Channel

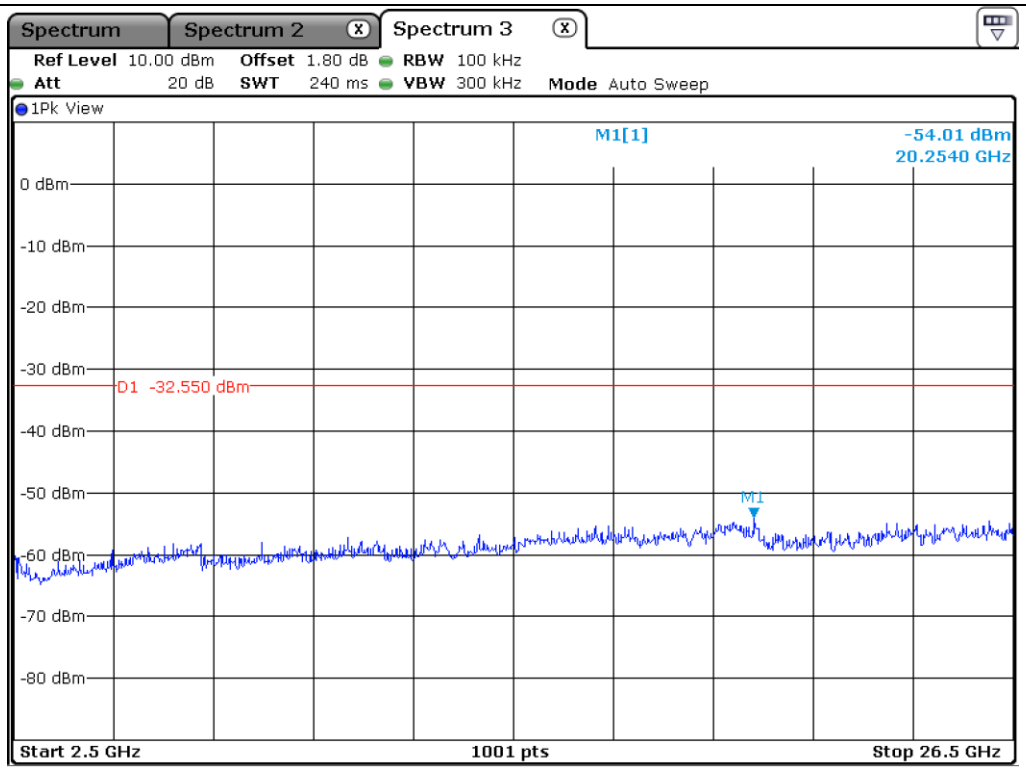


Low Channel

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

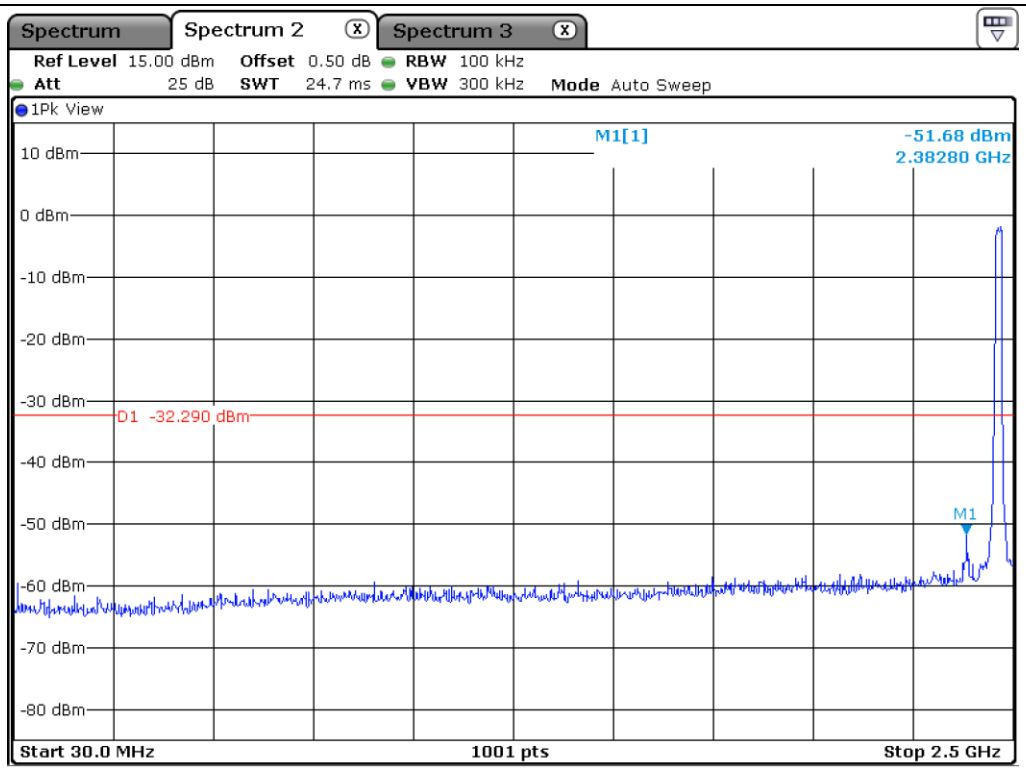


Middle Channel

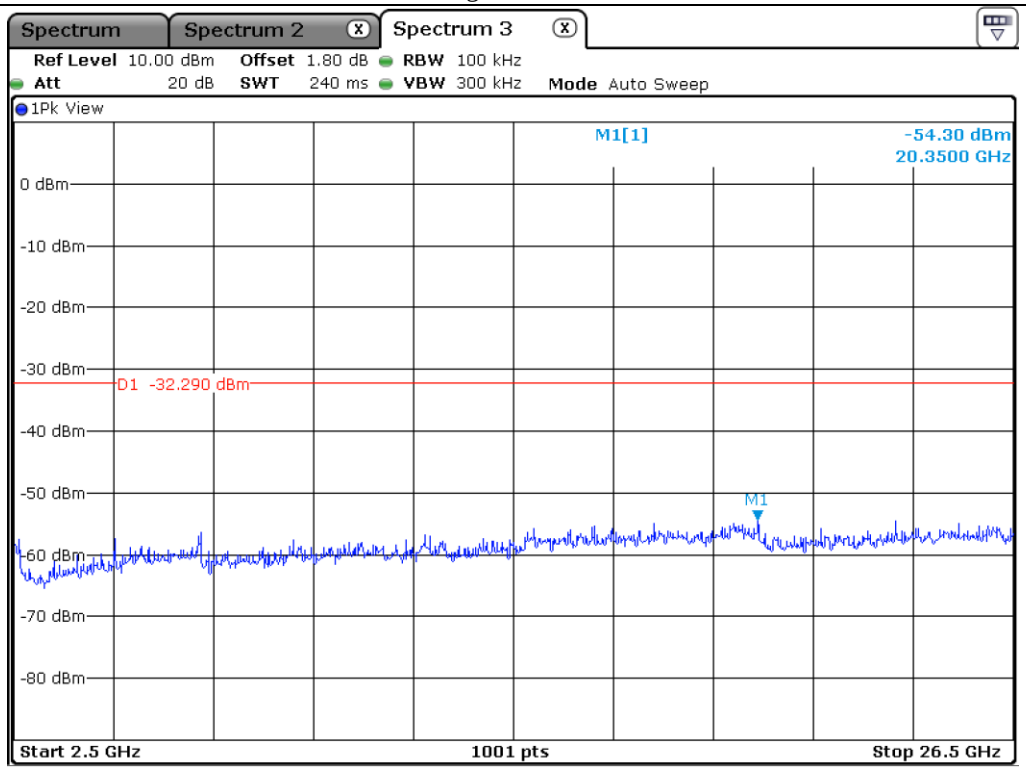


Middle Channel

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



High Channel



High Channel

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

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

9.6.1.1 Test data for 802.11b WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 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

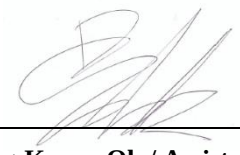
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
2 321.708	18.05	Peak	H	25.94	2.75	46.74	74.00	27.26
2 331.938	7.48	Average	H			36.17	54.00	17.83
2 389.960	19.07	Peak	V			47.76	74.00	26.24
2 322.108	7.07	Average	V			35.76	54.00	18.24
Test Data for High Channel								
2 493.745	18.88	Peak	H	26.47	2.39	47.74	74.00	26.26
2 484.481	7.12	Average	H			35.98	54.00	18.02
2 489.459	18.26	Peak	V			47.12	74.00	26.88
2 490.299	6.61	Average	V			35.47	54.00	18.53

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

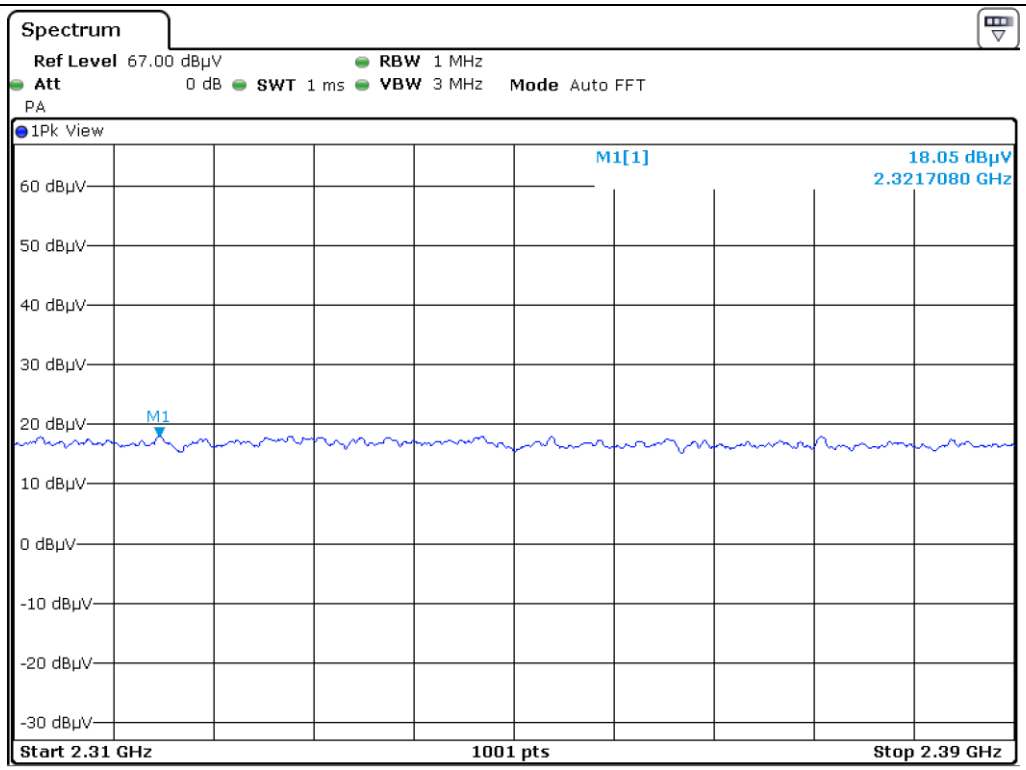
Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss

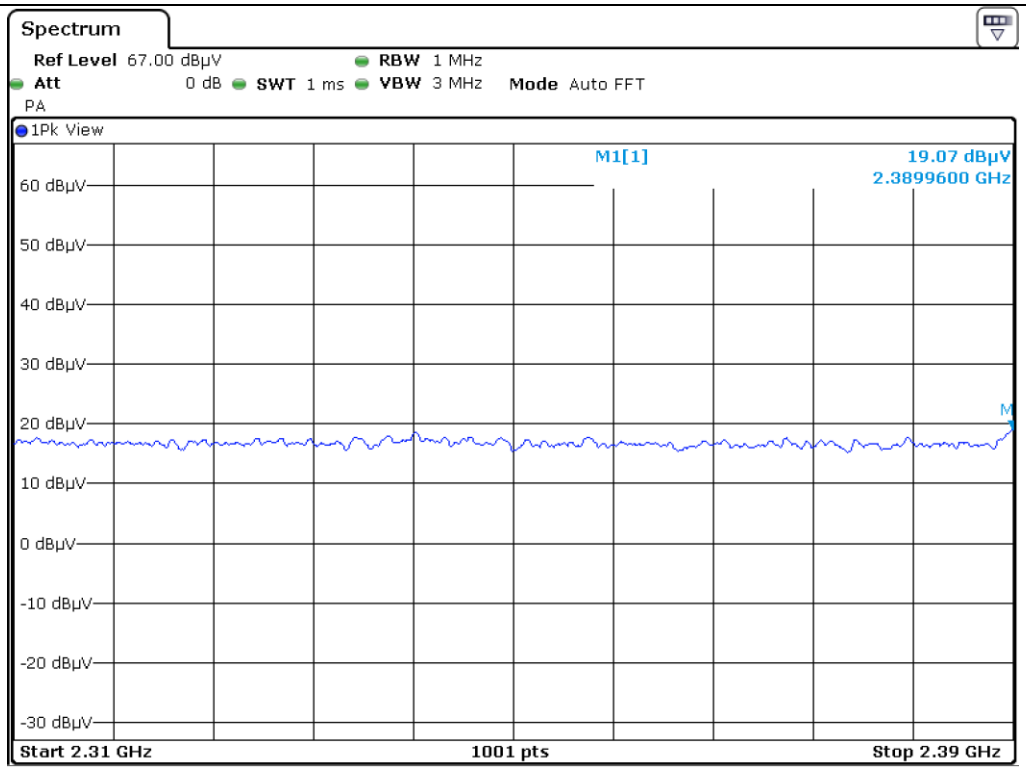


Tested by: Hyung-Kwon, Oh / Assistant Manager

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

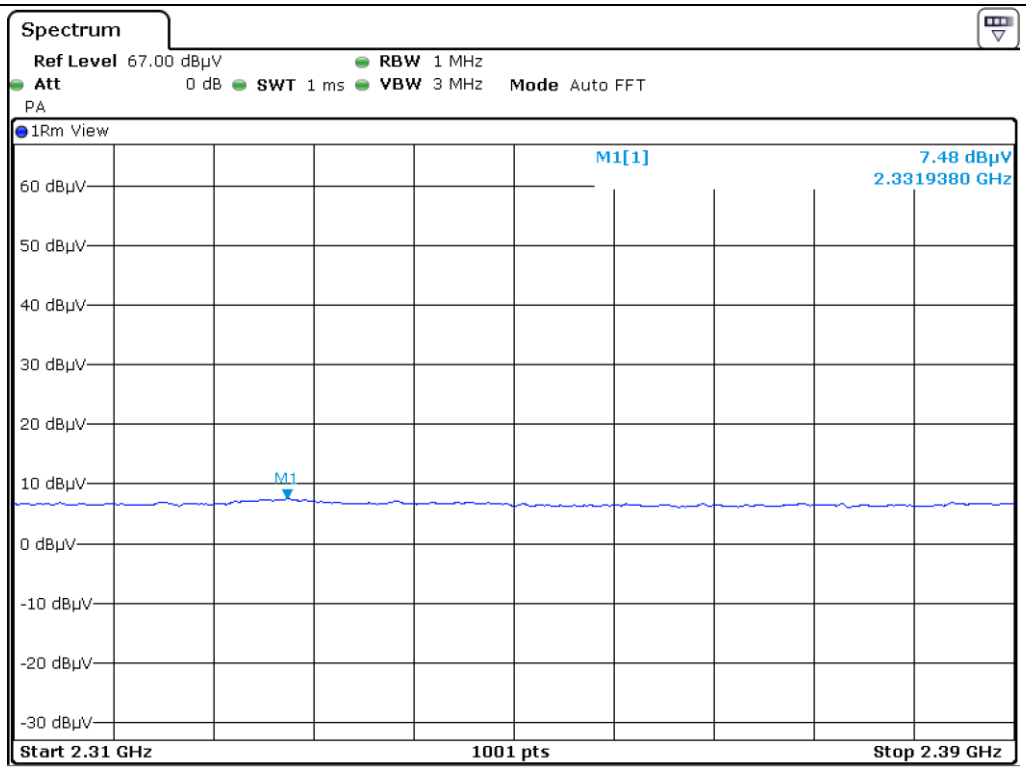


Low Channel_Peak_H

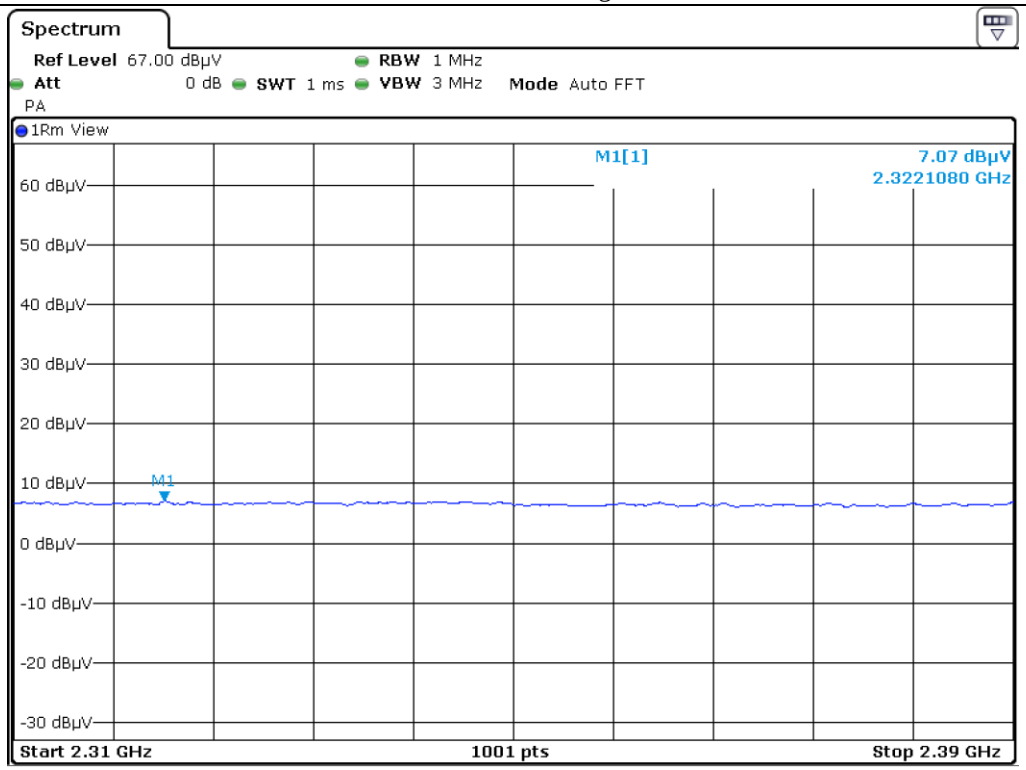


Low Channel_Peak_V

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

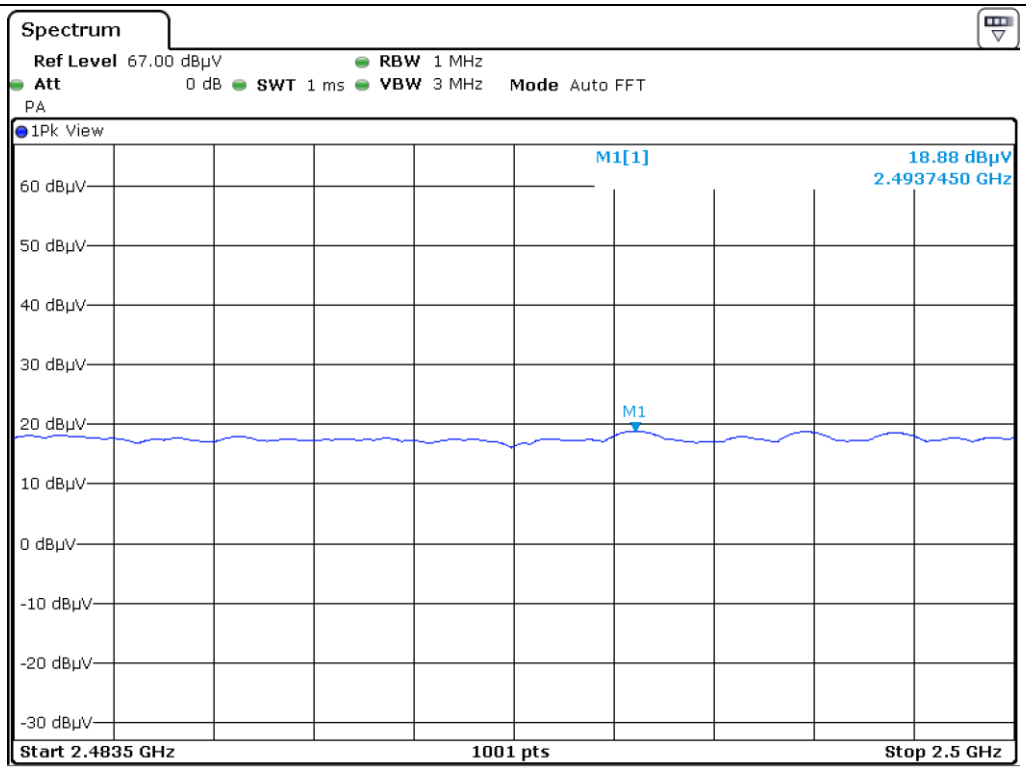


Low Channel_ Average_H

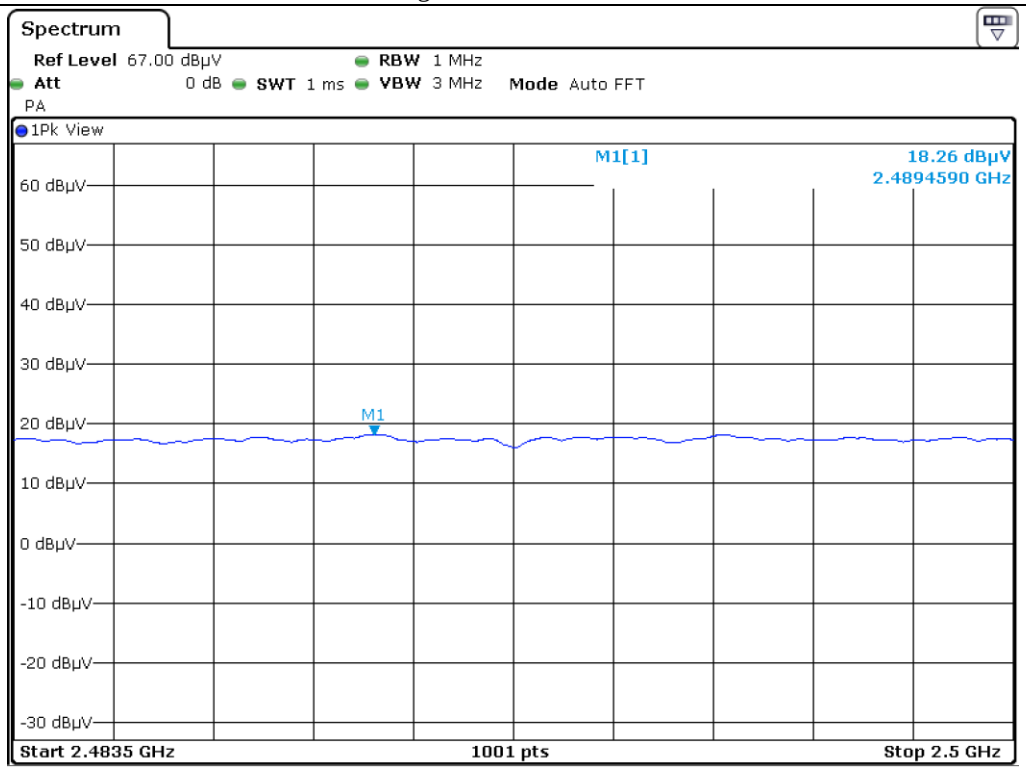


Low Channel_ Average_V

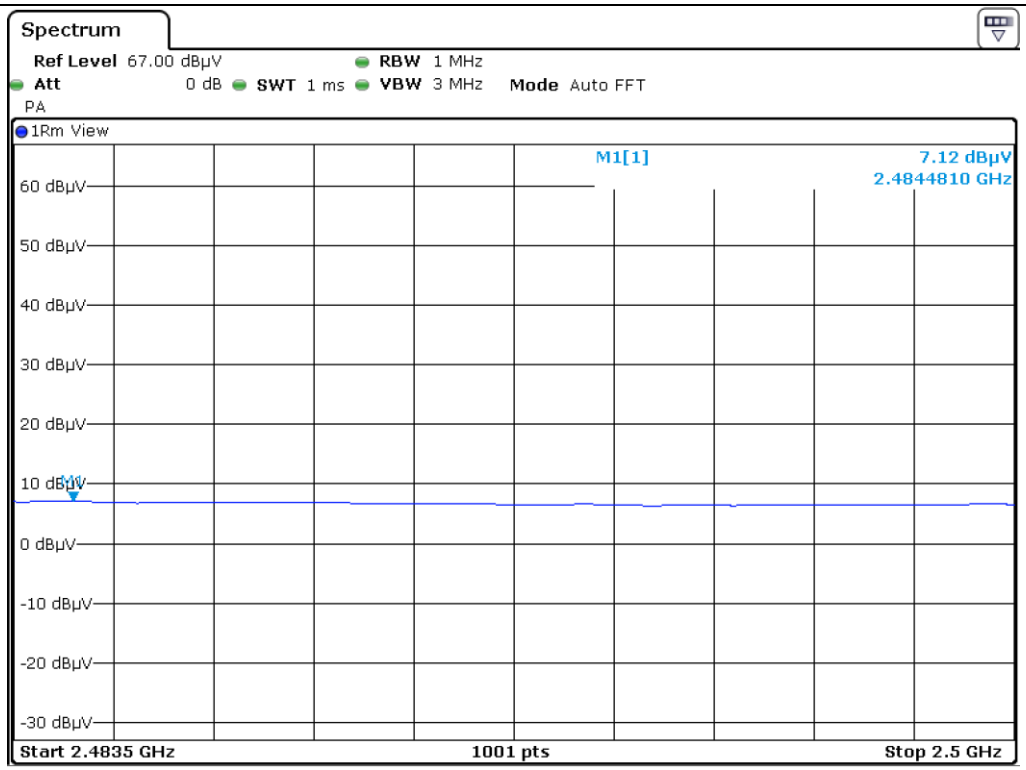
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



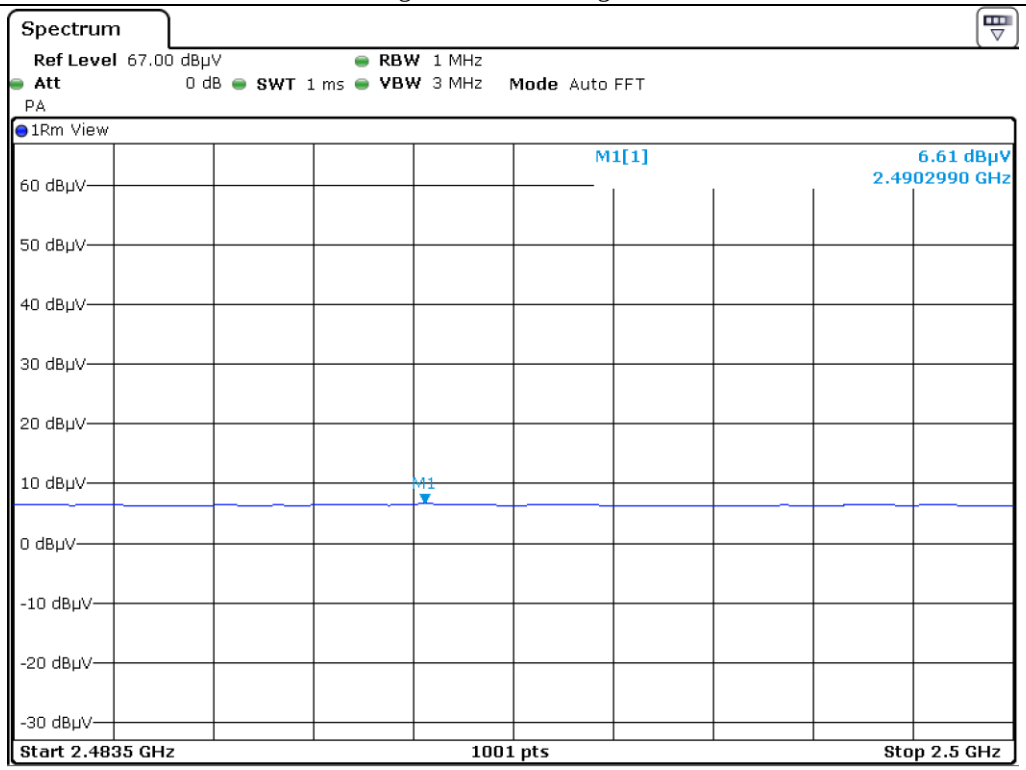
High Channel_Peak_H



High Channel_Peak_V



High Channel_Average_H



High Channel_ Average_V

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

9.6.1.2 Test data for 802.11g WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 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								
2 339.530	18.21	Peak	H	25.94	2.75	46.90	74.00	27.10
2 327.063	7.11	Average	H			35.80	54.00	18.20
2 369.580	18.32	Peak	V			47.01	74.00	26.99
2 347.363	7.10	Average	V			35.79	54.00	18.21
Test Data for High Channel								
2 483.508	23.63	Peak	H	26.47	2.39	52.49	74.00	21.51
2 483.508	11.83	Average	H			40.69	54.00	13.31
2 483.508	20.39	Peak	V			49.25	74.00	24.75
2 490.860	9.64	Average	V			38.50	54.00	15.50

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

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)

9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 802.11b WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 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								
4 824.00	21.12	Peak	H	27.84	5.28	54.24	74.00	19.76
4 824.00	9.59	Average	H			42.71	54.00	11.29
4 824.00	20.48	Peak	V			53.60	74.00	20.40
4 824.00	9.26	Average	V			39.38	54.00	14.62
Test Data for Middle Channel								
4 884.00	20.08	Peak	H	27.01	5.42	52.51	74.00	21.49
4 884.00	9.10	Average	H			41.53	54.00	12.47
4 884.00	19.99	Peak	V			52.42	74.00	21.58
4 884.00	8.67	Average	V			41.10	54.00	12.90
Test Data for High Channel								
4 924.00	20.39	Peak	H	28.15	5.40	53.94	74.00	20.06
4 924.00	9.25	Average	H			42.80	54.00	11.20
4 924.00	20.19	Peak	V			53.74	74.00	20.26
4 924.00	9.24	Average	V			42.79	54.00	11.21

Tabulated test data for Restricted Band

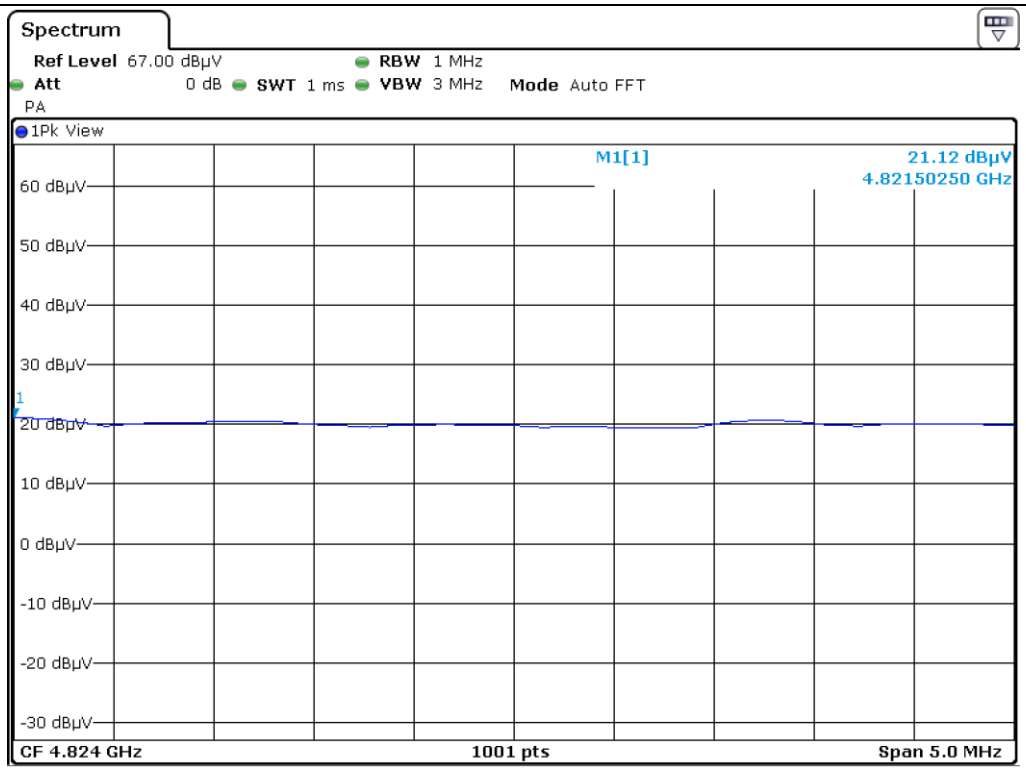
Remark: “H”: Horizontal, “V”: Vertical

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

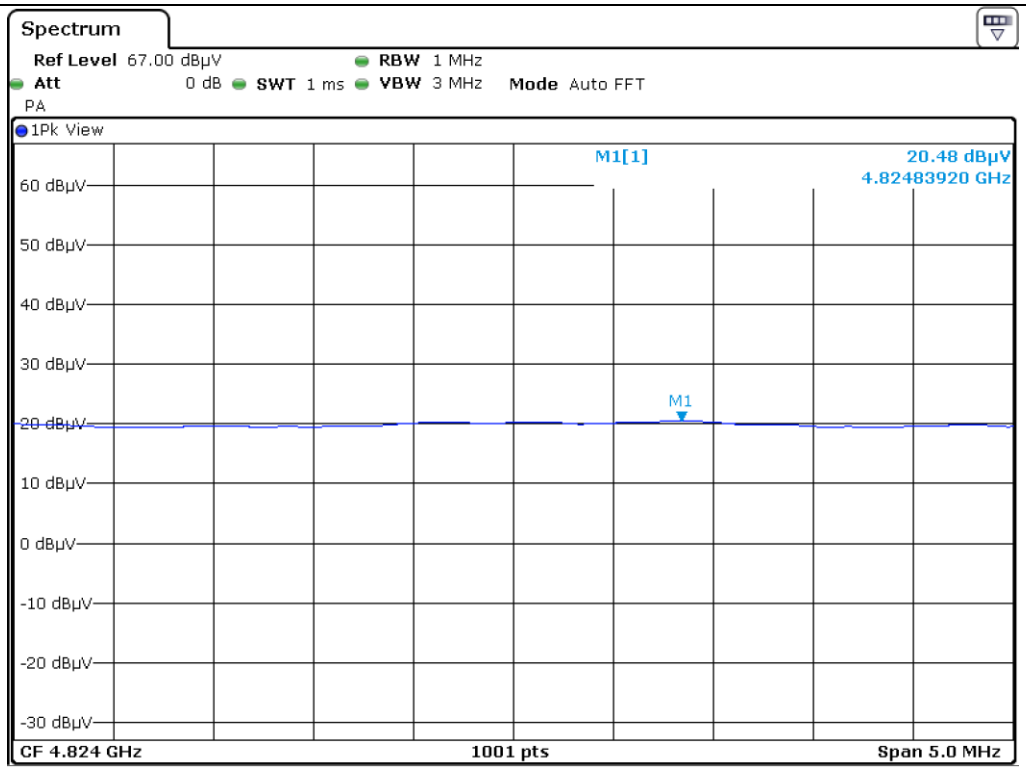
Total Level = Reading + Antenna Factor + Cable Loss

Tested by: Hyung-Kwon, Oh / Assistant Manager

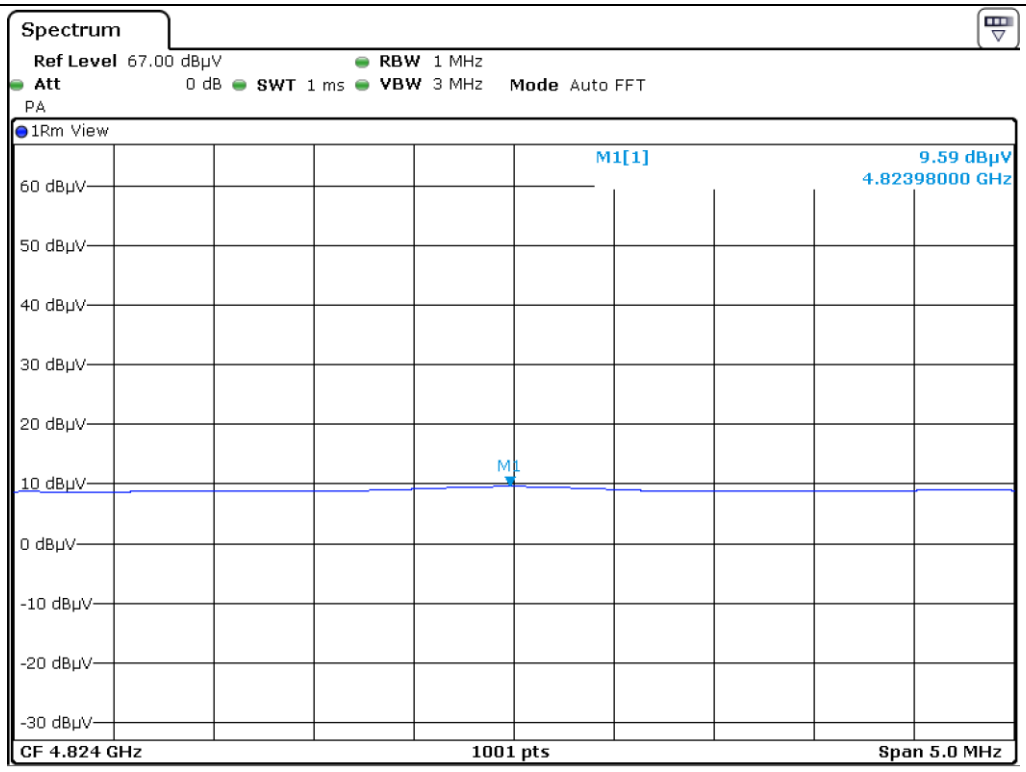
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



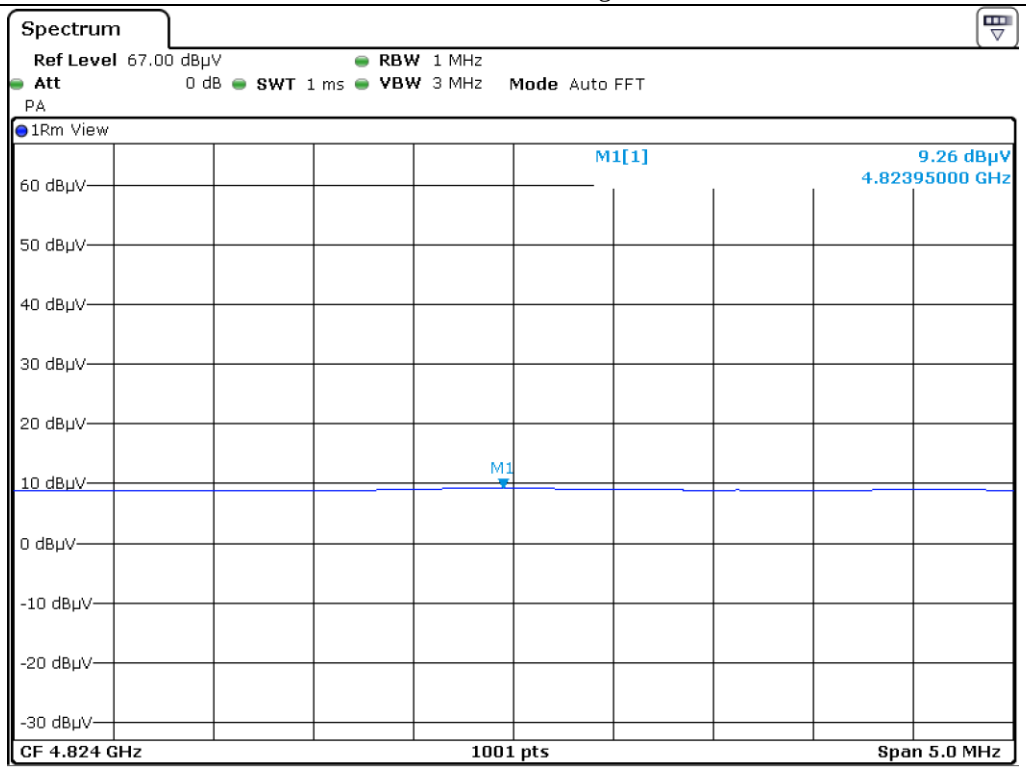
Low Channel_Peak_H



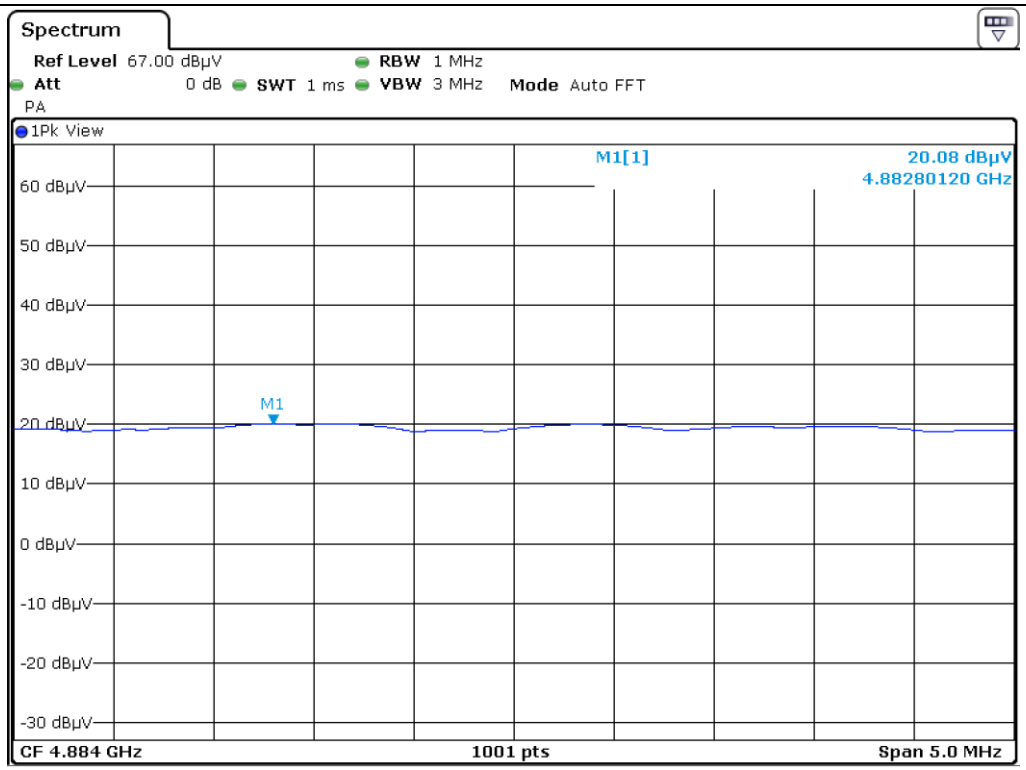
Low Channel_Peak_V



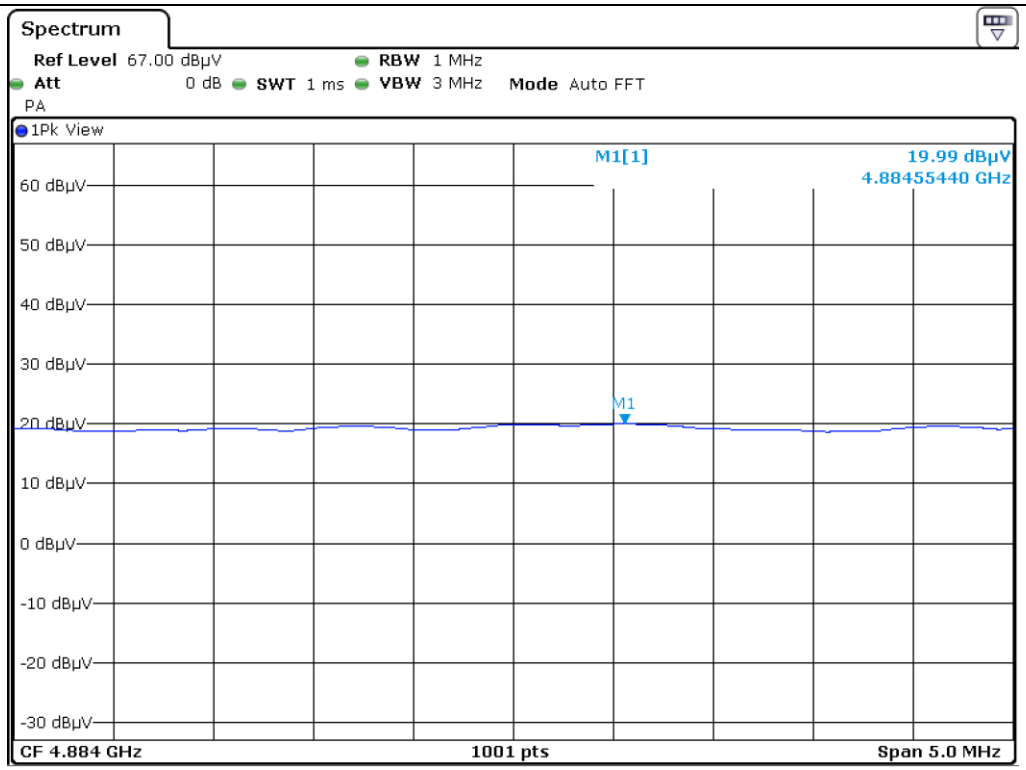
Low Channel_ Average_H



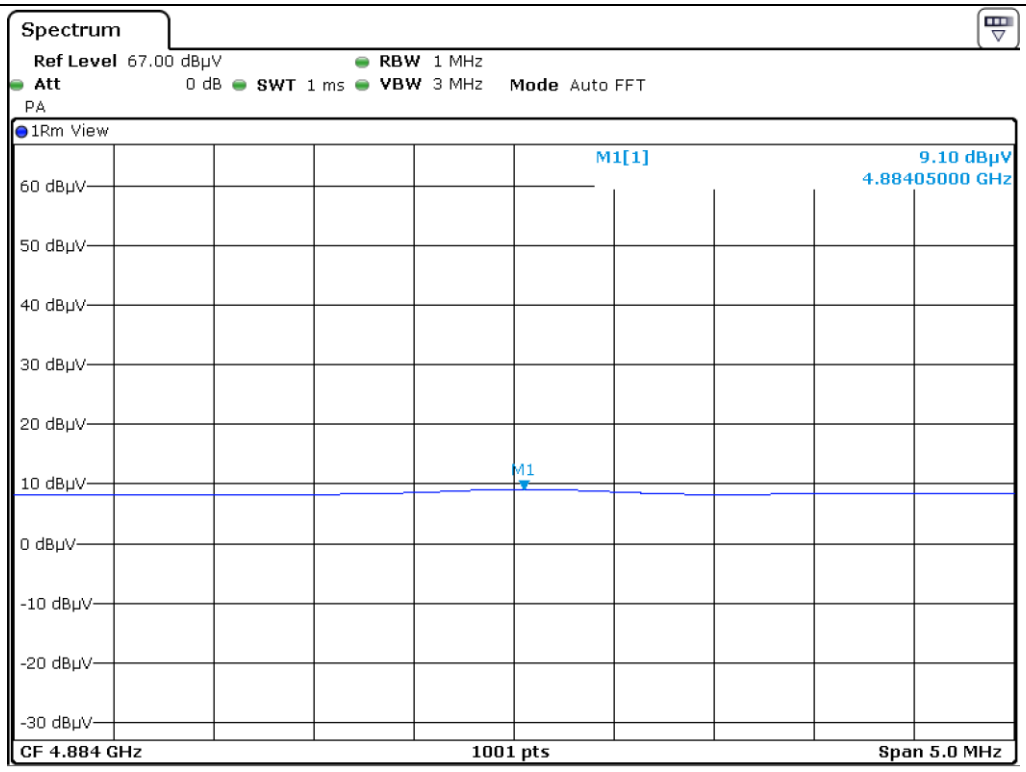
Low Channel_ Average_V



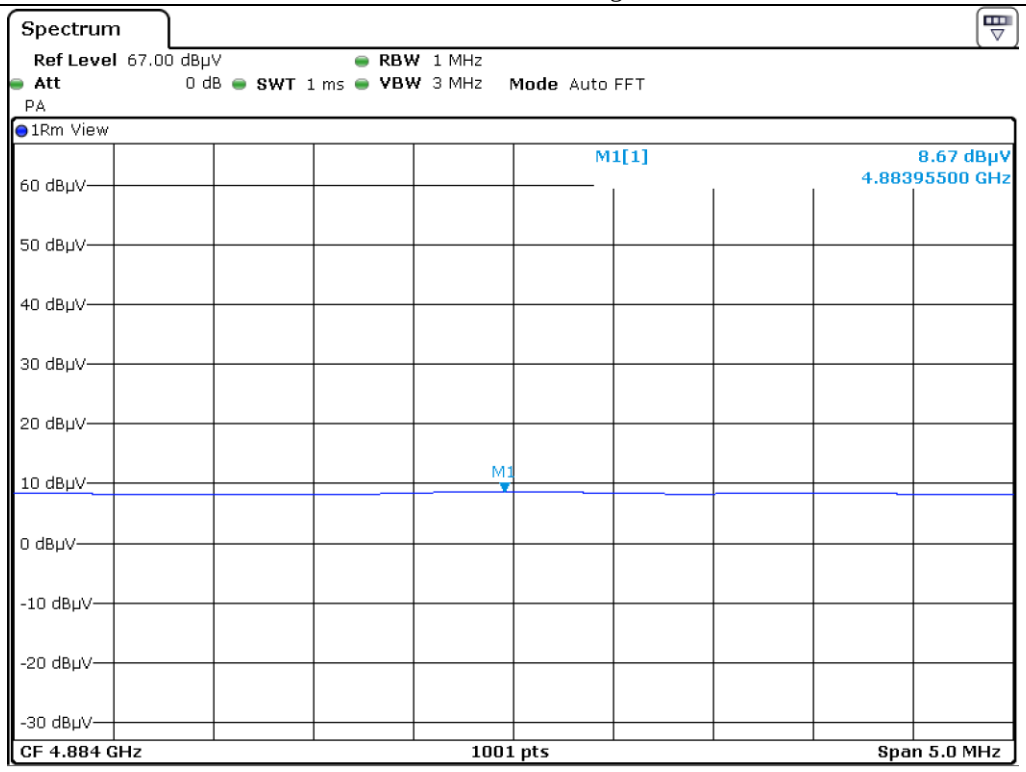
Middle Channel_Peak_H



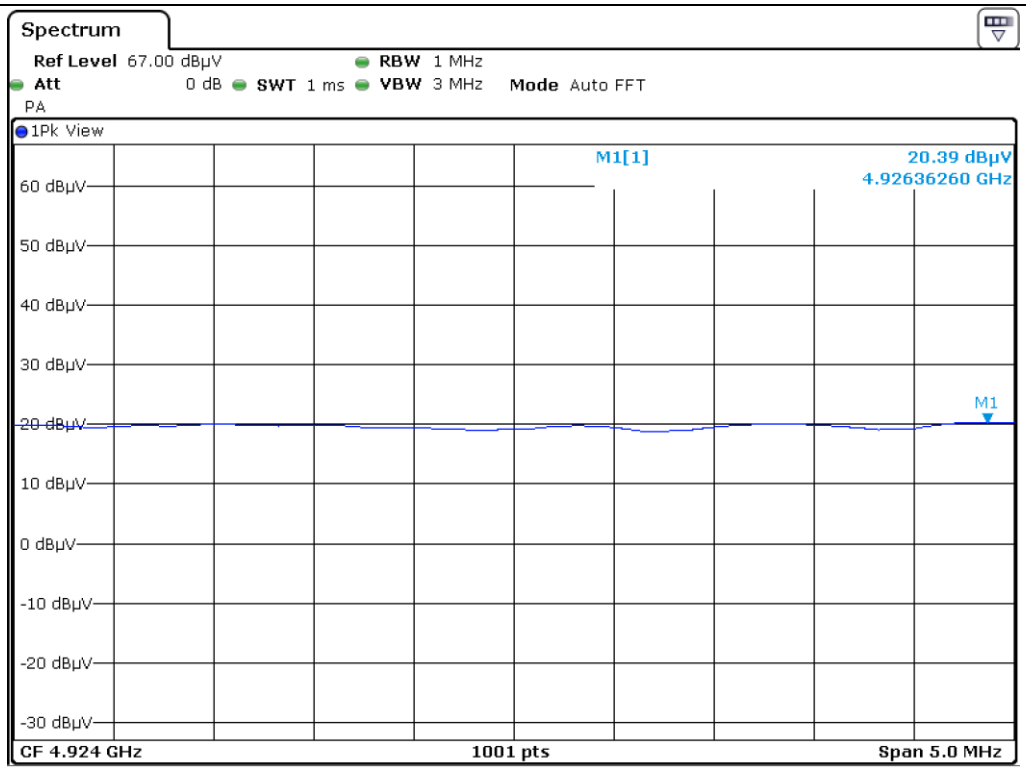
Middle Channel_Peak_V



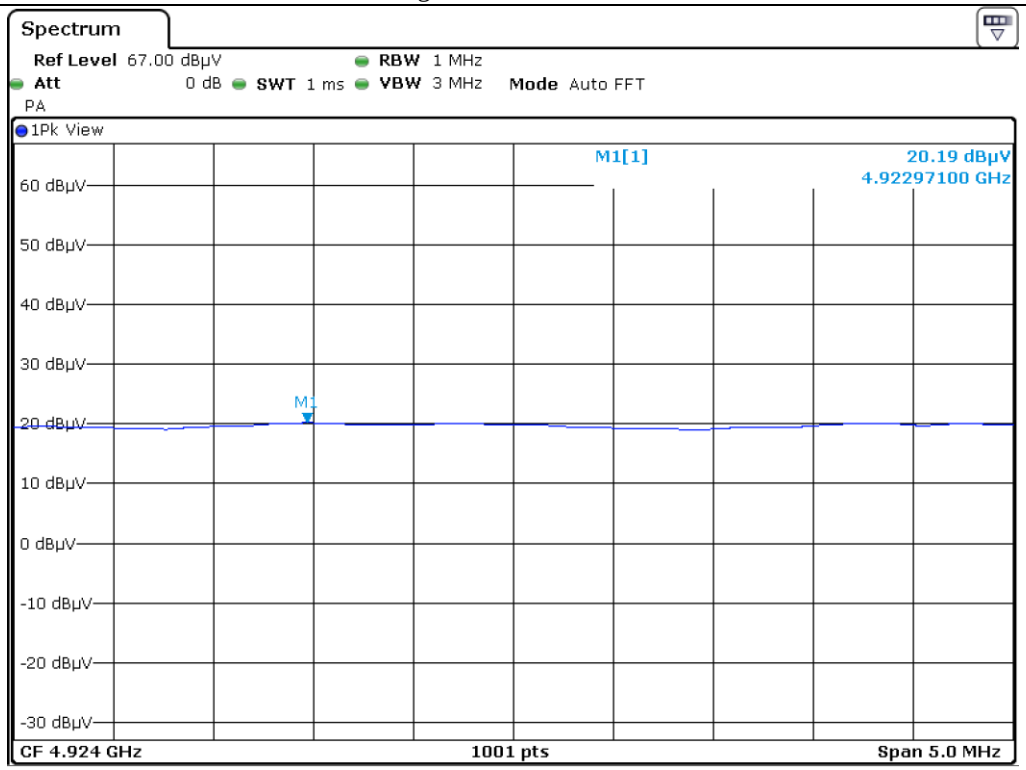
Middle Channel_Average_H



Middle Channel_ Average_V

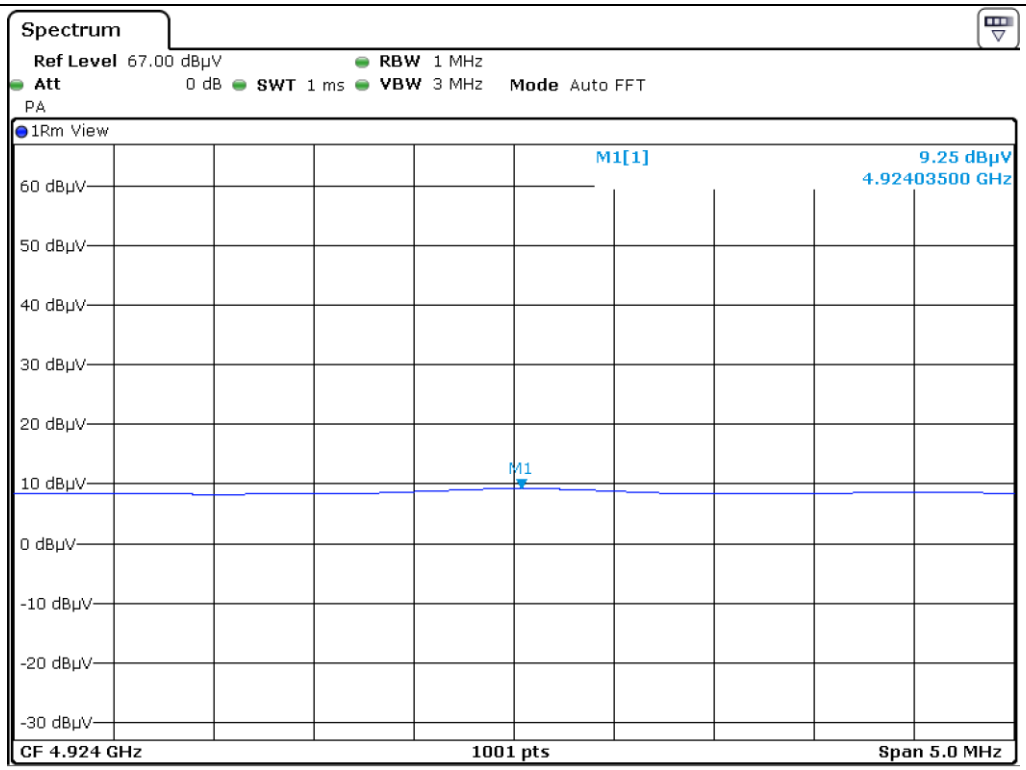


High Channel_Peak_H

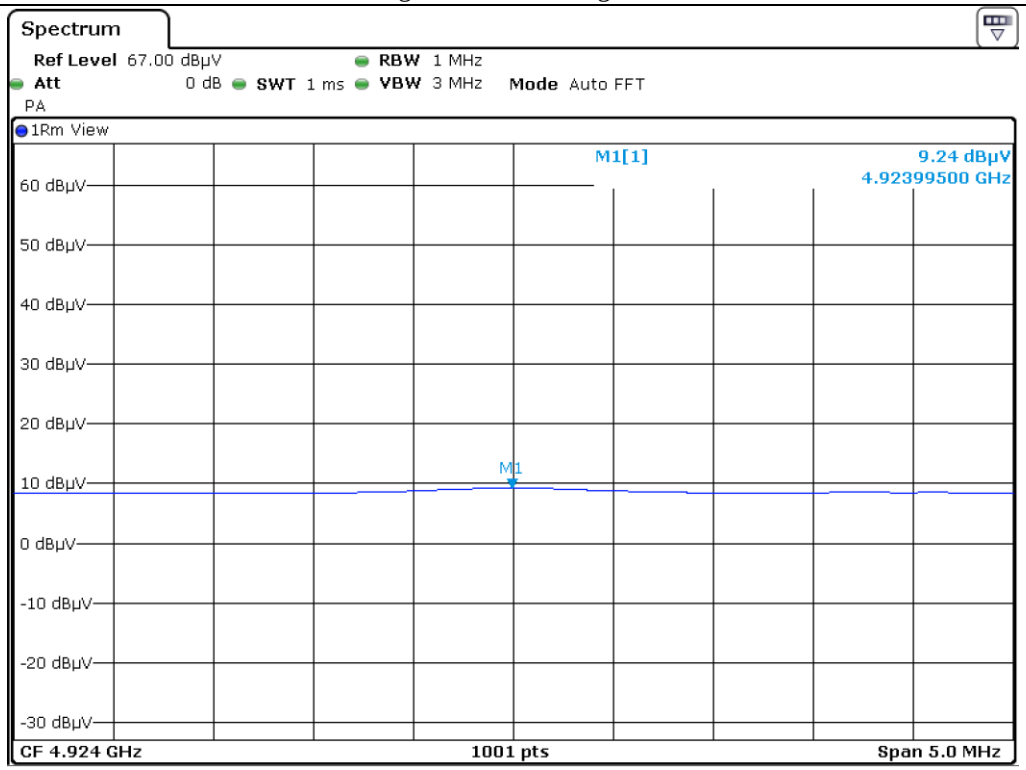


High Channel_Peak_V

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



High Channel_Average_H



High Channel_ Average_V

9.6.2.2 Test data for 802.11g WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 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								
4 824.00	20.67	Peak	H	27.84	5.28	53.79	74.00	20.21
4 824.00	9.64	Average	H			42.76	54.00	11.24
4 824.00	19.70	Peak	V			52.82	74.00	21.18
4 824.00	8.84	Average	V			38.96	54.00	15.04
Test Data for Middle Channel								
4 884.00	20.84	Peak	H	27.01	5.42	53.27	74.00	20.73
4 884.00	8.13	Average	H			40.56	54.00	13.44
4 884.00	19.65	Peak	V			52.08	74.00	21.92
4 884.00	9.02	Average	V			41.45	54.00	12.55
Test Data for High Channel								
4 924.00	20.43	Peak	H	28.15	5.40	53.98	74.00	20.02
4 924.00	10.13	Average	H			43.68	54.00	10.32
4 924.00	20.33	Peak	V			53.88	74.00	20.12
4 924.00	9.15	Average	V			42.70	54.00	11.30

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

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10. PEAK POWER SPECTRUL DENSITY

10.1 Operating environment

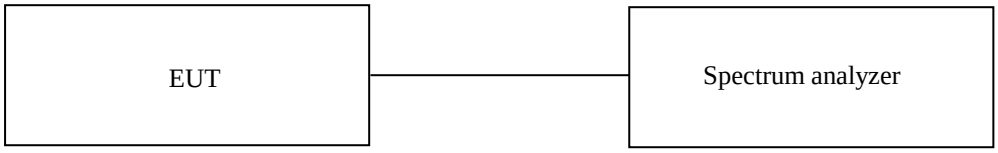
Temperature : 23 ℃

Relative humidity : 45 % 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.



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 for 802.11b WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 2019

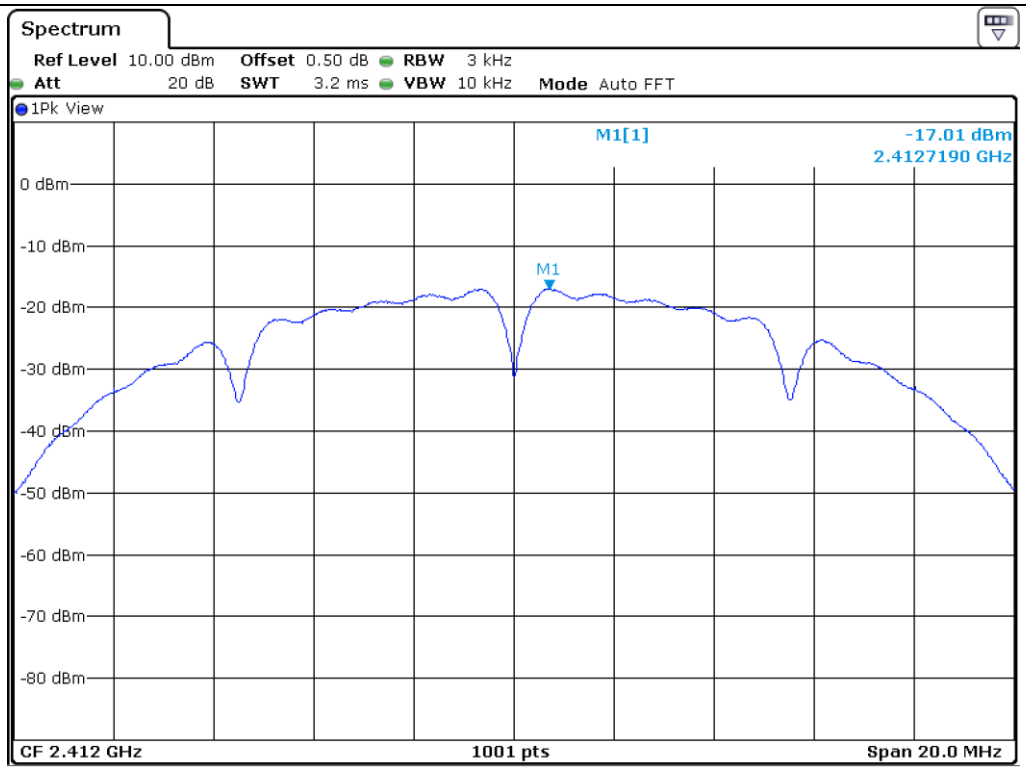
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-17.01	8.00	25.01
Middle	2 442.00	-15.61	8.00	23.61
High	2 462.00	-14.80	8.00	22.80

Remark. Margin = Limit – Measured value

Tested by: Hyung-Kwon, Oh / Assistant Manager



Low Channel

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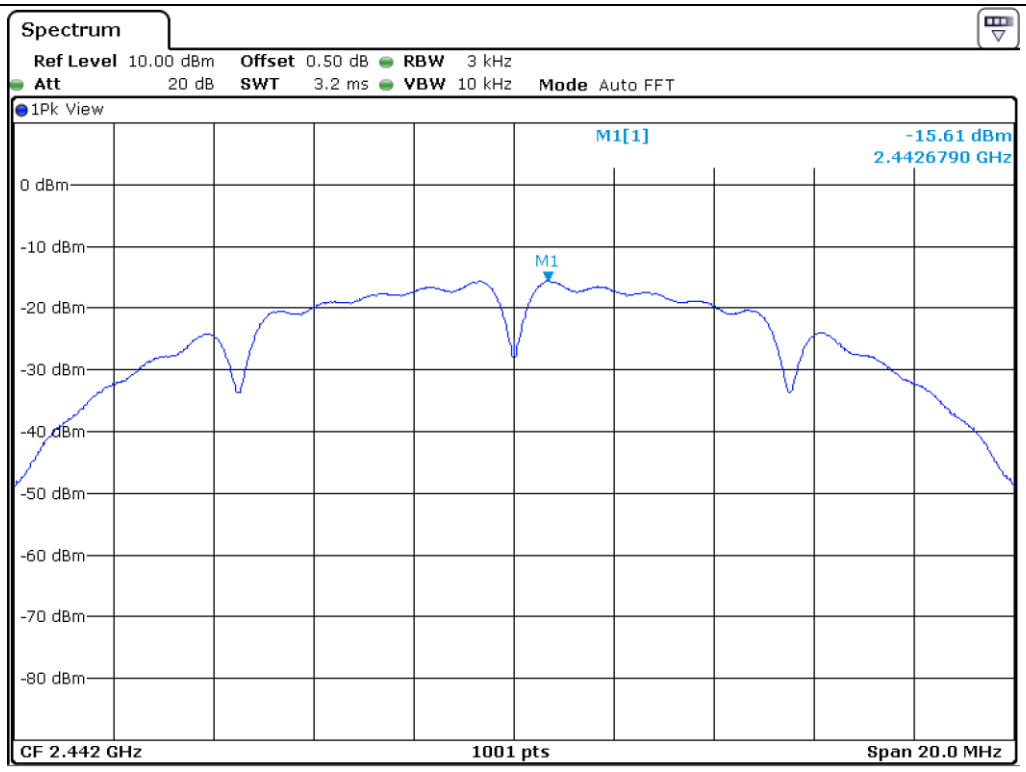
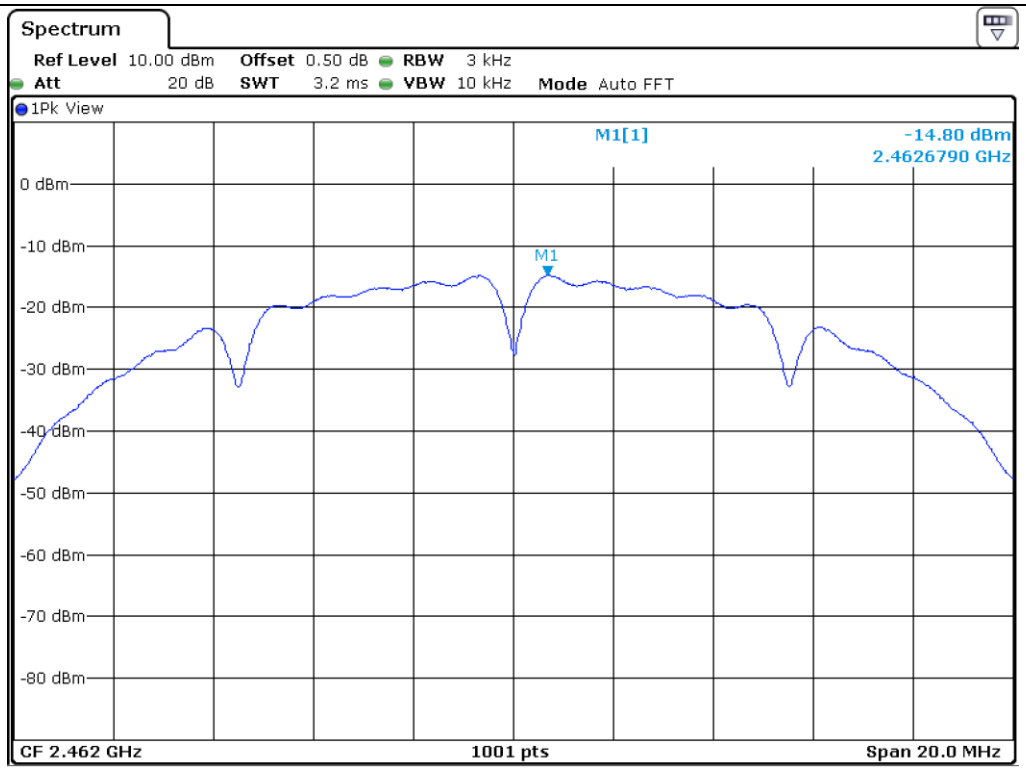


Middle Channel



High Channel

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10.5 Test data for 802.11g WLAN Mode

-. Test Date : October 07, 2019 ~ October 14, 2019

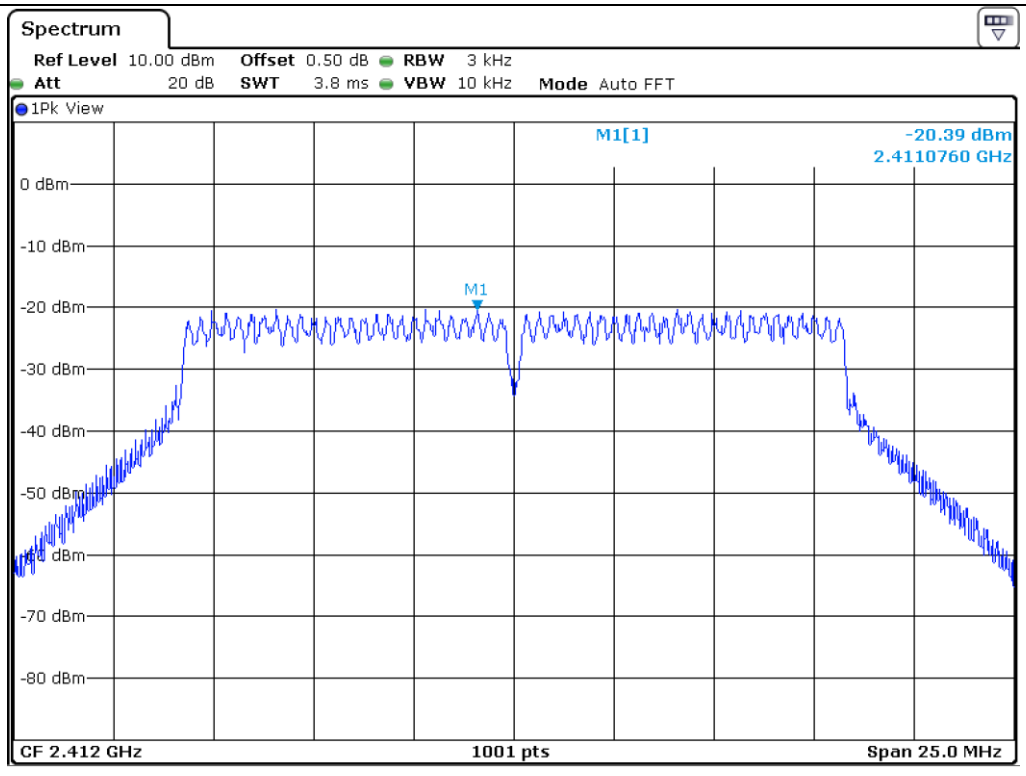
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-20.39	8.00	28.39
Middle	2 442.00	-16.91	8.00	24.91
High	2 462.00	-16.69	8.00	24.69

Remark. Margin = Limit – Measured value

Tested by: Hyung-Kwon, Oh / Assistant Manager



Low Channel

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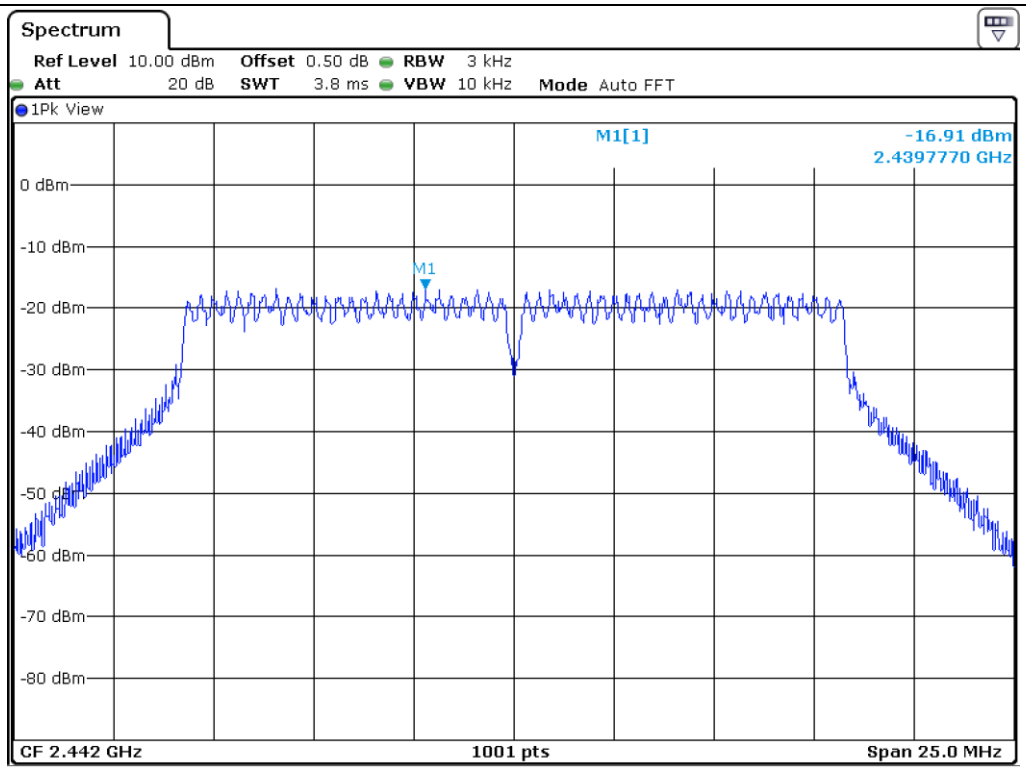
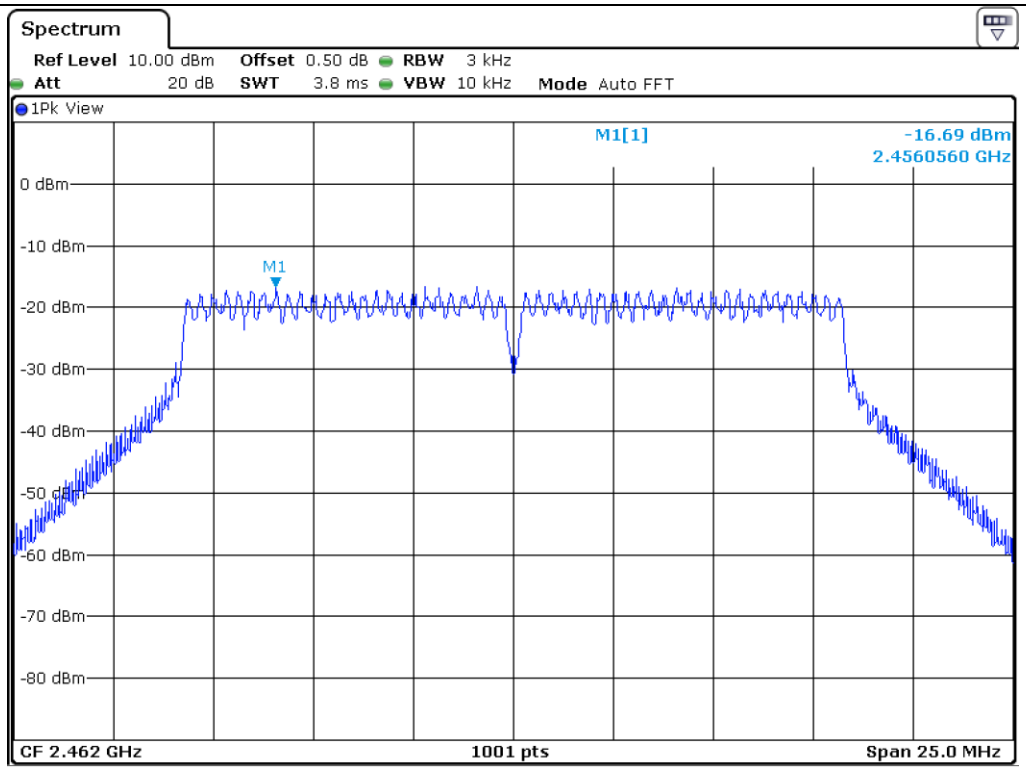


Middle Channel



High Channel

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11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 ℃

Relative humidity : 45 % 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 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	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.

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11.4 Test data

11.4.1 Test data for 30 MHz ~ 1 GHz

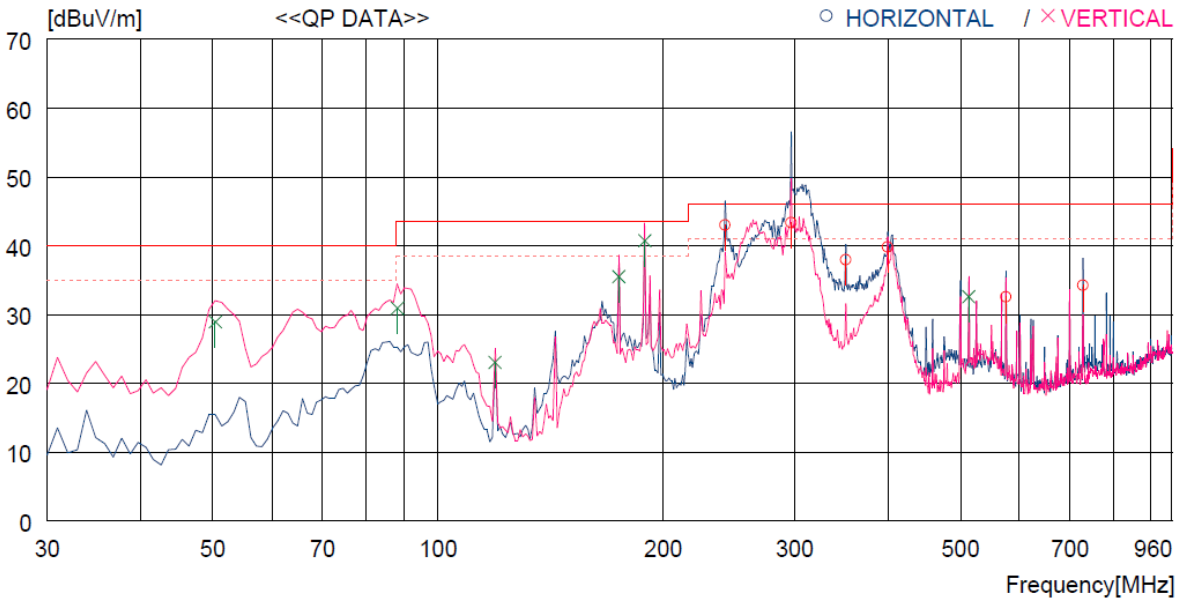
Humidity Level : 45 % R.H. Temperature: 23 ℃

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

Result : PASSED

EUT : Smart Indoor Planter Date: October 07, 2019 ~ October 14, 2019

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



No.	FREQ	READING QP	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	242.430	59.9	12.4	3.6	32.9	43.0	46.0	3.0	100	5
2	296.750	58.9	13.4	4.0	33.0	43.3	46.0	2.7	100	110
3	351.070	51.7	14.8	4.4	33.0	37.9	46.0	8.1	100	125
4	399.570	52.4	15.9	4.6	33.1	39.8	46.0	6.2	100	118
5	575.139	41.3	19.0	5.5	33.3	32.5	46.0	13.5	300	0
6	729.364	40.8	20.4	6.2	33.2	34.2	46.0	11.8	100	141
----- Vertical ------										
7	50.370	46.2	14.1	1.7	33.1	28.9	40.0	11.1	100	151
8	88.200	51.2	10.5	2.2	33.0	30.9	43.5	12.6	100	293
9	119.240	43.0	10.5	2.5	33.0	23.0	43.5	20.5	100	166
10	174.530	56.1	9.4	3.0	33.0	35.5	43.5	8.0	100	359
11	189.080	59.6	10.9	3.2	33.0	40.7	43.5	2.8	100	359
12	513.061	42.7	17.8	5.3	33.2	32.6	46.0	13.4	100	359

Tested by: Hyung-Kwon, Oh / Assistant Manager

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11.4.2 Test data for Below 30 MHz

-. Test Date : October 07, 2019 ~ October 14, 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 : October 07, 2019 ~ October 14, 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

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12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 23 ℃

Relative humidity : 45 % 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 μH + 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)
■ -	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.

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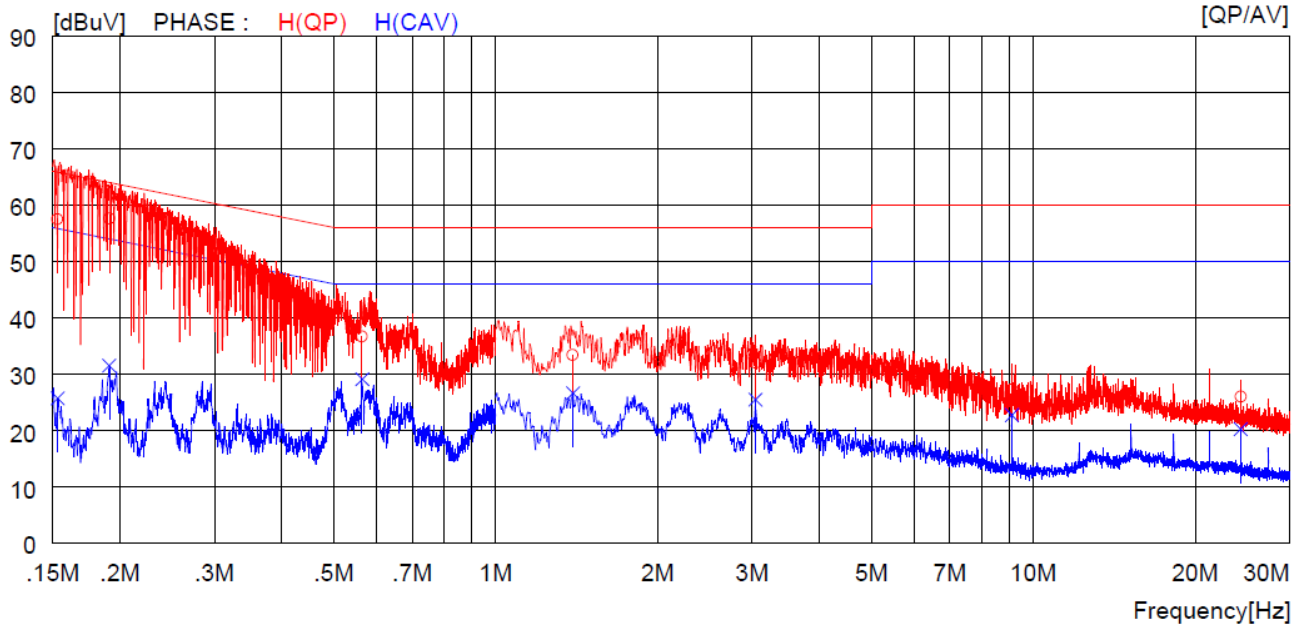
12.4 Test data

-. Test Date : October 07, 2019 ~ October 14, 2019

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15300	47.5	----	10.0	57.5	----	65.8	----	8.3	----	H(QP)
2	0.19100	47.6	----	10.0	57.6	----	64.0	----	6.4	----	H(QP)
3	0.56400	26.7	----	10.0	36.7	----	56.0	----	19.3	----	H(QP)
4	1.39200	23.3	----	10.1	33.4	----	56.0	----	22.6	----	H(QP)
5	3.04400	21.9	----	10.1	32.0	----	56.0	----	24.0	----	H(QP)
6	9.12500	17.0	----	10.3	27.3	----	60.0	----	32.7	----	H(QP)
7	24.32000	15.3	----	10.7	26.0	----	60.0	----	34.0	----	H(QP)
8	0.15300	----	15.7	10.0	----	25.7	----	55.8	----	30.1	H(CAV)
9	0.19100	----	21.5	10.0	----	31.5	----	54.0	----	22.5	H(CAV)
10	0.56400	----	19.1	10.0	----	29.1	----	46.0	----	16.9	H(CAV)
11	1.39200	----	16.6	10.1	----	26.7	----	46.0	----	19.3	H(CAV)
12	3.04400	----	15.4	10.1	----	25.5	----	46.0	----	20.5	H(CAV)
13	9.12500	----	12.5	10.3	----	22.8	----	50.0	----	27.2	H(CAV)
14	24.32000	----	9.6	10.7	----	20.3	----	50.0	----	29.7	H(CAV)

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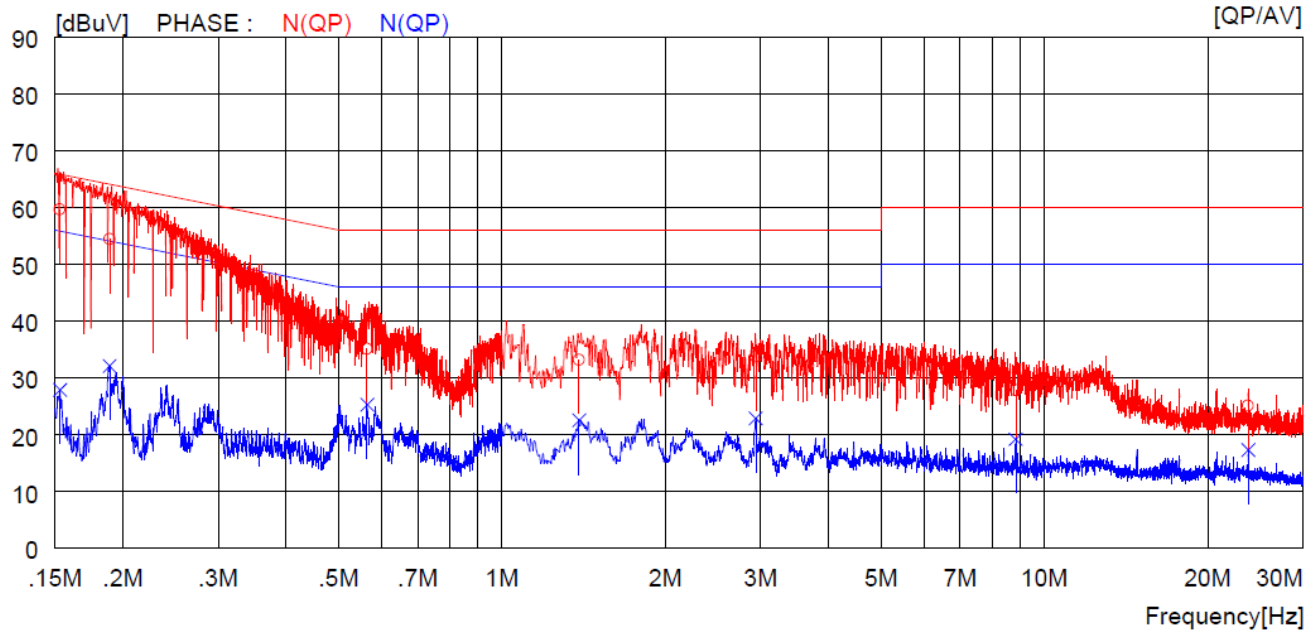
-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15300	49.7	----	10.0	59.7	----	65.8	----	6.1	----	N(QP)
2	0.18900	44.5	----	10.0	54.5	----	64.1	----	9.6	----	N(QP)
3	0.56400	25.1	----	10.0	35.1	----	56.0	----	20.9	----	N(QP)
4	1.38800	23.1	----	10.1	33.2	----	56.0	----	22.8	----	N(QP)
5	2.93600	23.7	----	10.1	33.8	----	56.0	----	22.2	----	N(QP)
6	8.86000	17.5	----	10.3	27.8	----	60.0	----	32.2	----	N(QP)
7	23.76000	14.4	----	10.7	25.1	----	60.0	----	34.9	----	N(QP)
8	0.15300	----	17.9	10.0	----	27.9	----	55.8	----	27.9	N(CAV)
9	0.18900	----	22.1	10.0	----	32.1	----	54.1	----	22.0	N(CAV)
10	0.56400	----	15.3	10.0	----	25.3	----	46.0	----	20.7	N(CAV)
11	1.38800	----	12.5	10.1	----	22.6	----	46.0	----	23.4	N(CAV)
12	2.93600	----	12.8	10.1	----	22.9	----	46.0	----	23.1	N(CAV)
13	8.86000	----	8.9	10.3	----	19.2	----	50.0	----	30.8	N(CAV)
14	23.76000	----	6.6	10.7	----	17.3	----	50.0	----	32.7	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

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