RADIO PERFORMANCE TEST REPORT

Test Report No.	**: OT-212-RWD-057**
Reception No.	**: 2012005262**
Applicant	**: LG Electronics USA**
Address	**: 111 Sylvan Avenue North Building, Englewood Cliffs, New Jersey, United States**
Manufacturer	**: LG Electronics Inc.**
Address	**: 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Republic of Korea**
Type of Equipment	**: CAR NAVIGATION SYSTEM**
FCC ID.	**: BEJCCICUS**
Model Name	**: CCIC US**
Serial number	**: N/A**
Total page of Report	**: 66 pages (including this page)**
Date of Incoming	**: January 08, 2021**
Date of issue	**: February 16, 2021**

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.

Tested by	Reviewed by	Approved by
Ju Yun Park / Manager	Ha-Ram Lee / Manager	Ki-Hong, Nam / General Manager
ONETECH Corp.	ONETECH Corp.	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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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-212-RWD-057	February 16, 2021	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA

Address : 111 Sylvan Avenue North Building, Englewood Cliffs, New Jersey, United States

Contact Person : Dae Woong Kim / Director, Regulatory and Environmental Affairs

Telephone No. : 201-266-2215

FCC ID : BEJCCICUS

Model Name : CCIC US

Brand Name : LG

Serial Number : N/A

Date : February 16, 2021

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	CAR NAVIGATION SYSTEM
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 KDB 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 Conducted(average) 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 item is not required as this product is only using DC power

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-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

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 LG Electronics USA, Model CCIC US (referred to as the EUT in this report) is a CAR NAVIGATION SYSTEM. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	CAR NAVIGATION SYSTEM		
Temperature Range	-30 °C ~ 85 °C		
OPERATING FREQUENCY	Bluetooth	2 402 MHz ~ 2 480 MHz	
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))	
	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))	
		5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))	
		5 210 MHz (802.11ac(VHT80))	
	5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))	
		5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))	
		5 775 MHz (802.11ac(VHT80))	
MODULATION TYPE	Bluetooth	GFSK for 1Mbps, π/4-DQPSK for 2Mbps, 8-DPSK for 3Mbps	
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
	WLAN 5 GHz	802.11a/n(HT20)/n(HT40)/ac(VHT80): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
RF OUTPUT POWER	Bluetooth	1 Mbps	-0.05 dBm
		2 Mbps	-2.30 dBm
		3 Mbps	-1.87 dBm
	WLAN 2.4 GHz		15.15 dBm(802.11b) 11.58 dBm(802.11g) 11.54 dBm(802.11n_HT20)

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RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	Antenna 0	10.60 dBm(802.11a) 10.05 dBm(802.11n_HT20) 5.63 dBm(802.11ac_VHT20) 7.16 dBm(802.11n_HT40) 5.11 dBm(802.11ac_VHT40) 5.24 dBm(802.11ac_VHT80)
		Antenna 1	12.28 dBm(802.11a) 12.03 dBm(802.11n_HT20) 7.77 dBm(802.11ac_VHT20) 9.25 dBm(802.11n_HT40) 6.78 dBm(802.11ac_VHT40) 6.72 dBm(802.11ac_VHT80)
		Multiple Antenna	14.47 dBm(802.11a) 14.16 dBm(802.11n_HT20) 9.84 dBm(802.11ac_VHT20) 11.34 dBm(802.11n_HT40) 9.03 dBm(802.11ac_VHT40) 9.05 dBm(802.11ac_VHT80)
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	10.44 dBm(802.11a) 10.23 dBm(802.11n_HT20) 5.98 dBm(802.11ac_VHT20) 10.05 dBm(802.11n_HT40) 5.70 dBm(802.11ac_VHT40) 5.62 dBm(802.11ac_VHT80)
		Antenna 1	11.88 dBm(802.11a) 12.14 dBm(802.11n_HT20) 8.91 dBm(802.11ac_VHT20) 11.91 dBm(802.11n_HT40) 8.52 dBm(802.11ac_VHT40) 8.15 dBm(802.11ac_VHT80)
		Multiple Antenna	14.13 dBm(802.11a) 14.26 dBm(802.11n_HT20) 10.57 dBm(802.11ac_VHT20) 14.06 dBm(802.11n_HT40) 10.35 dBm(802.11ac_VHT40) 10.08 dBm(802.11ac_VHT80)

ANTENNA TYPE	PCB Antenna		
ANTENNA GAIN	Bluetooth	-1.59 dBi	
	WLAN 2.4 GHz	-1.45 dBi	
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	-1.15 dBi
		Antenna 1	-0.89 dBi
		Multiple Antenna	1.99 dBi
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	-1.08 dBi
		Antenna 1	-1.07 dBi
		Multiple Antenna	1.94 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		8 MHz, 24 MHz, 24.576 MHz, 25 MHz, 26 MHz, 32 MHz, 37.4 MHz, 38.4 MHz, 55.46667 MHz	
Rated Supply Voltage		DC 12.0 V	

Note. : - Bluetooth transmit simultaneously with 2.4 GHz or 5 GHz WiFi.

- Directional Gain Calculations
  Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

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	LG Electronics Inc.	N/A	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
CCIC US	LG Electronics Inc.	CAR NAVIGATION SYSTEM (EUT)	

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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.

-. Frequency / Channel Operations

Band	Channel	Frequency
802.11b 802.11g 802.11n(HT20)	1	2 412
	2	2 417
	3	2 422
	4	2 427
	5	2 432
	6	2 437
	7	2 442
	8	2 447
	9	2 452
	10	2 457
	11	2 462

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Modulation	Data Rate	Output Power [dBm]
802.11b (Low Channel)	1 Mbps	14.97
	2 Mbps	14.77
	5.5 Mbps	14.60
	11 Mbps	14.27
802.11g (Low Channel)	6 Mbps	11.49
	9 Mbps	11.39
	12 Mbps	11.31
	18 Mbps	10.43
	24 Mbps	10.17
	36 Mbps	9.83
	48 Mbps	9.53
	54 Mbps	9.26
802.11n(HT 20) (Low Channel)	6.5 Mbps	11.46
	13 Mbps	11.24
	19.5 Mbps	10.90
	26 Mbps	10.24
	39 Mbps	9.83
	52 Mbps	9.58
	58.5 Mbps	9.43
	65 Mbps	9.33

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.1) for 802.11b, 6 Mbps(Ant.1) for 802.11g, 6.5 Mbps(Ant.1) for 802.11n(HT20).

-. 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.

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Modulation	Data Rate	Output Power [dBm]
802.11b (Middle Channel)	1 Mbps	15.15
	2 Mbps	14.95
	5.5 Mbps	14.80
	11 Mbps	14.45
802.11g (Middle Channel)	6 Mbps	11.53
	9 Mbps	11.43
	12 Mbps	11.35
	18 Mbps	10.47
	24 Mbps	10.21
	36 Mbps	9.87
	48 Mbps	9.57
	54 Mbps	9.30
802.11n(HT 20) (Middle Channel)	6.5 Mbps	11.54
	13 Mbps	11.32
	19.5 Mbps	10.98
	26 Mbps	10.32
	39 Mbps	9.91
	52 Mbps	9.66
	58.5 Mbps	9.51
	65 Mbps	9.41

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.1) for 802.11b, 6 Mbps(Ant.1) for 802.11g, 6.5 Mbps(Ant.1) for 802.11n(HT20).

-. 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.

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Modulation	Data Rate	Output Power [dBm]
802.11b (High Channel)	1 Mbps	14.96
	2 Mbps	14.76
	5.5 Mbps	14.60
	11 Mbps	14.26
802.11g (High Channel)	6 Mbps	11.58
	9 Mbps	11.48
	12 Mbps	11.40
	18 Mbps	10.52
	24 Mbps	10.26
	36 Mbps	9.92
	48 Mbps	9.62
	54 Mbps	9.35
802.11n(HT 20) (High Channel)	6.5 Mbps	11.51
	13 Mbps	11.29
	19.5 Mbps	10.95
	26 Mbps	10.29
	39 Mbps	9.88
	52 Mbps	9.63
	58.5 Mbps	9.48
	65 Mbps	9.38

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.1) for 802.11b, 6 Mbps(Ant.1) for 802.11g, 6.5 Mbps(Ant.1) for 802.11n(HT20).

-. 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.

-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
802.11b	8.60	0.09	98.96	0.05
802.11g	1.41	0.12	92.16	0.35
802.11n(HT20)	1.32	0.12	91.67	0.38

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

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

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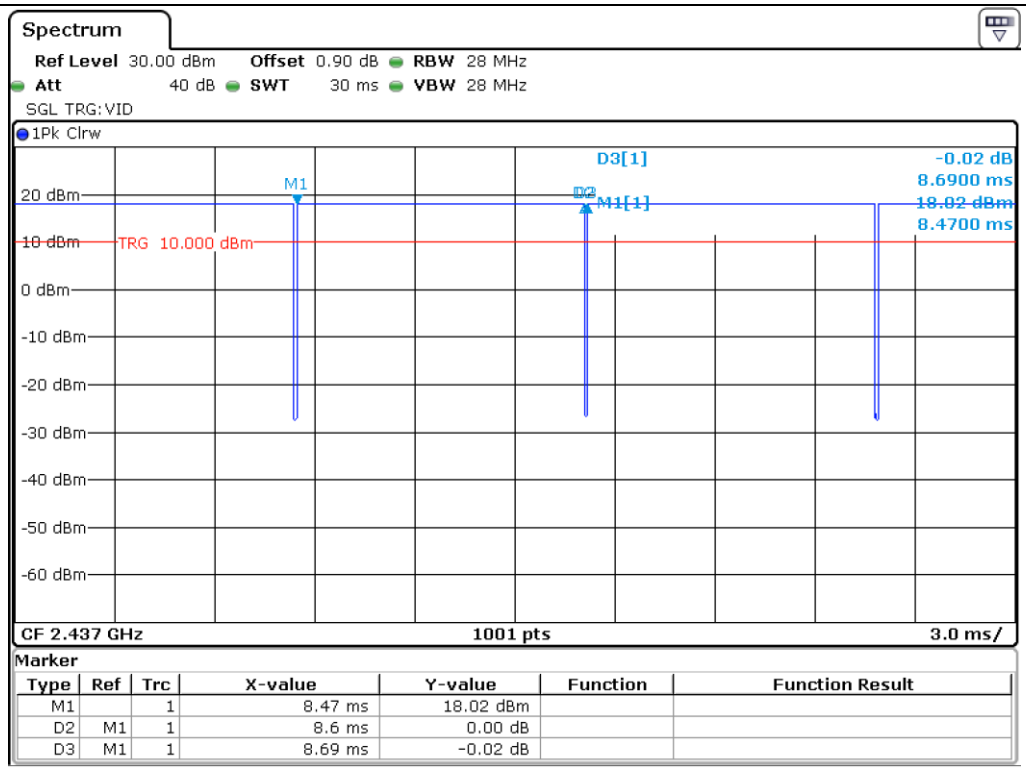
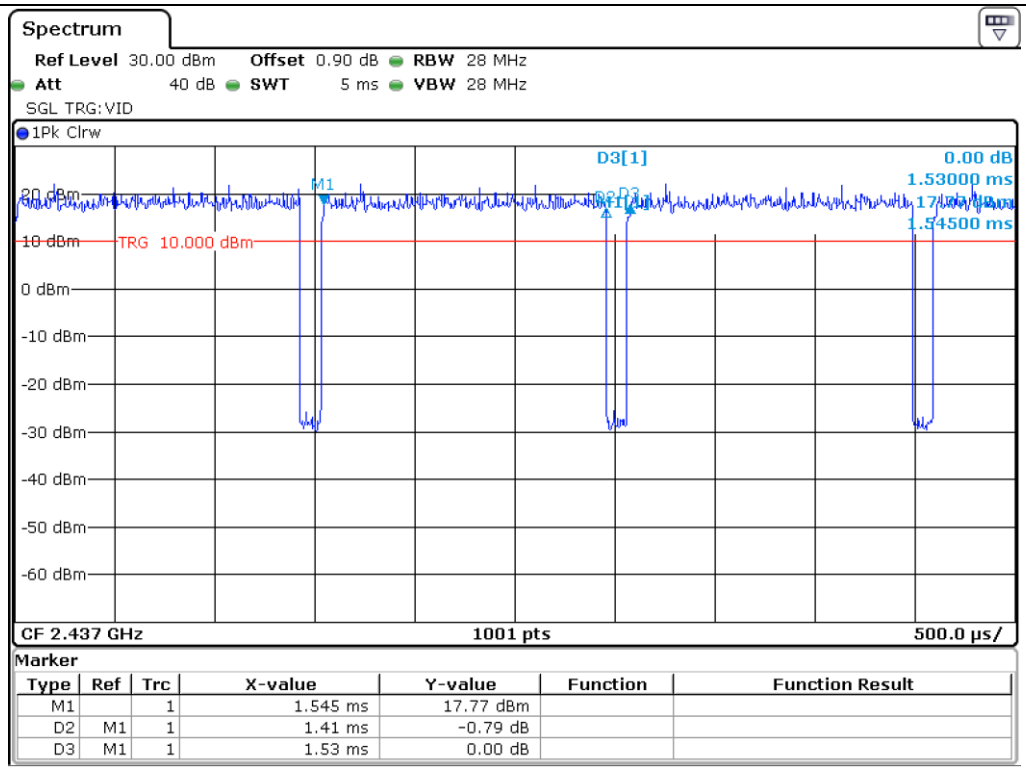
-. Test Plot



802.11 b



802.11 g

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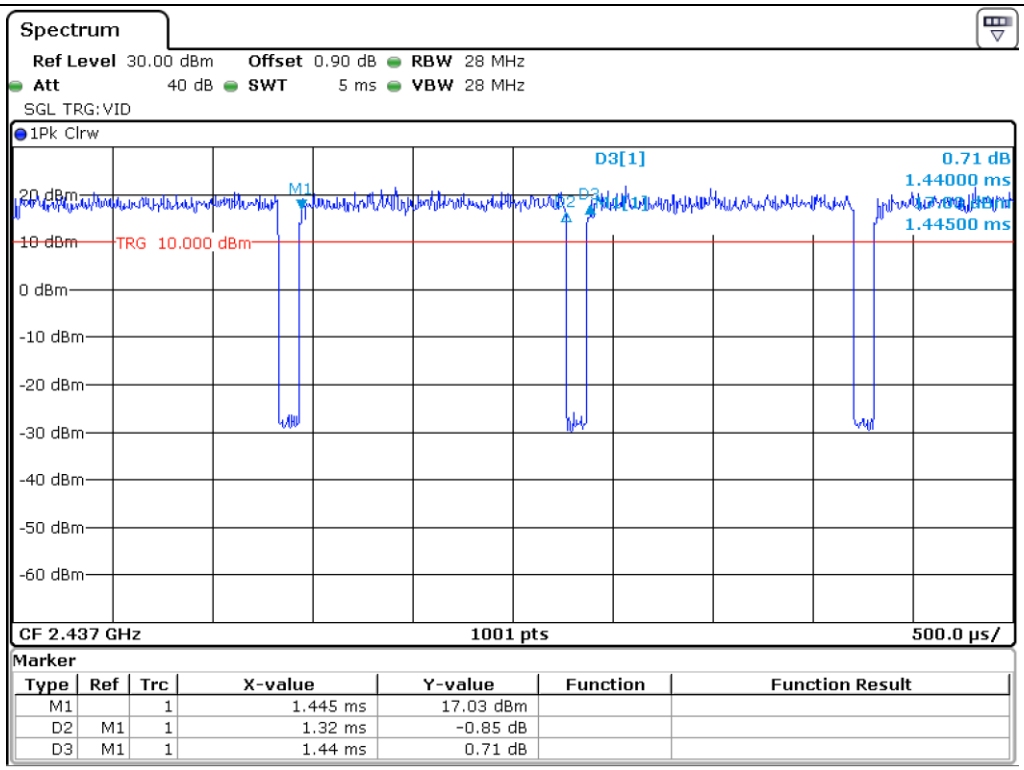

802.11 HT 20

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5.4 Configuration of Test System

Line Conducted Test: As This product is only using DC power, AC conducted emission test has not been performed

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 Left & Right sides PCB Antenna of the EUT is located the in the EUT internally, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

As This product is only using DC power, AC conducted emission test has not been performed

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. MIMIMUM 6 dB BANDWIDTH

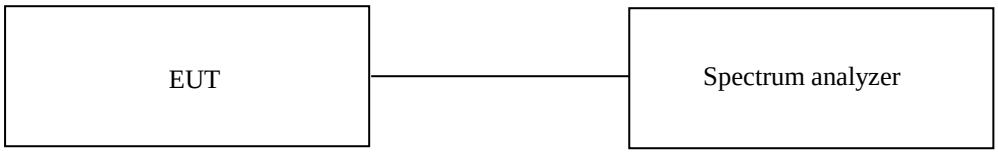
7.1 Operating environment

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 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 Date

January 07, 2021 ~ January 28, 2021

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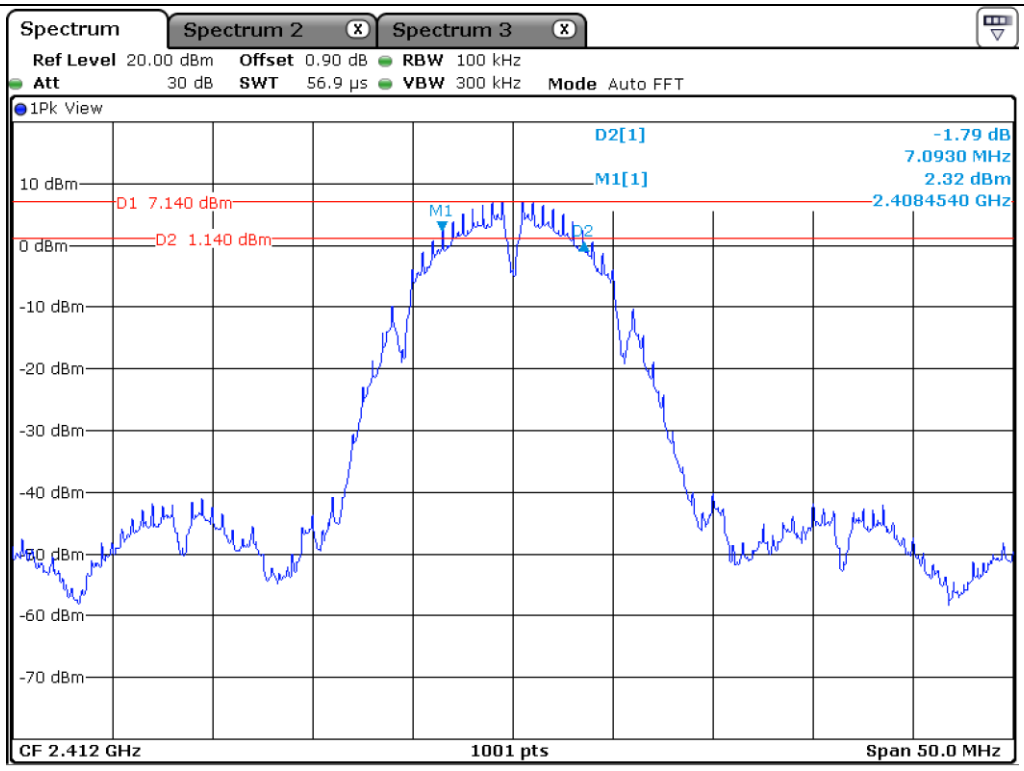
7.4 Test data for 802.11b WLAN Mode

-. Test Result : Pass

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
Low	2 412.00	7.09	0.50	6.59
Middle	2 437.00	7.09	0.50	6.59
High	2 462.00	7.09	0.50	6.59

Remark. Margin = Measured Value - Limit



Low Channel

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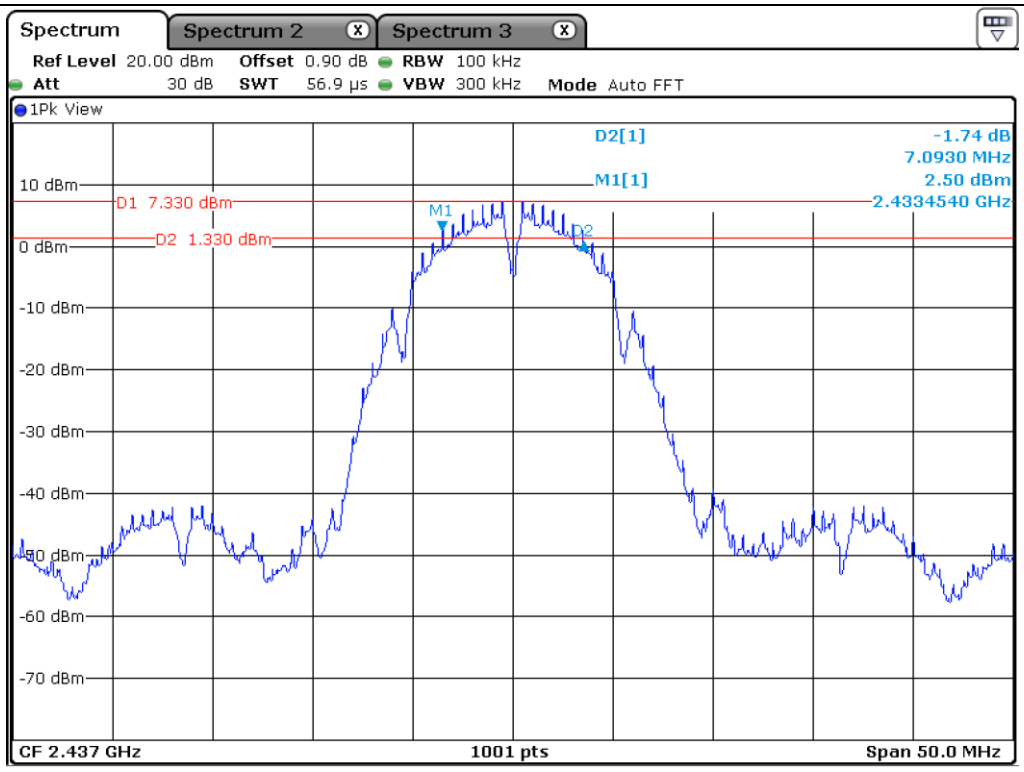
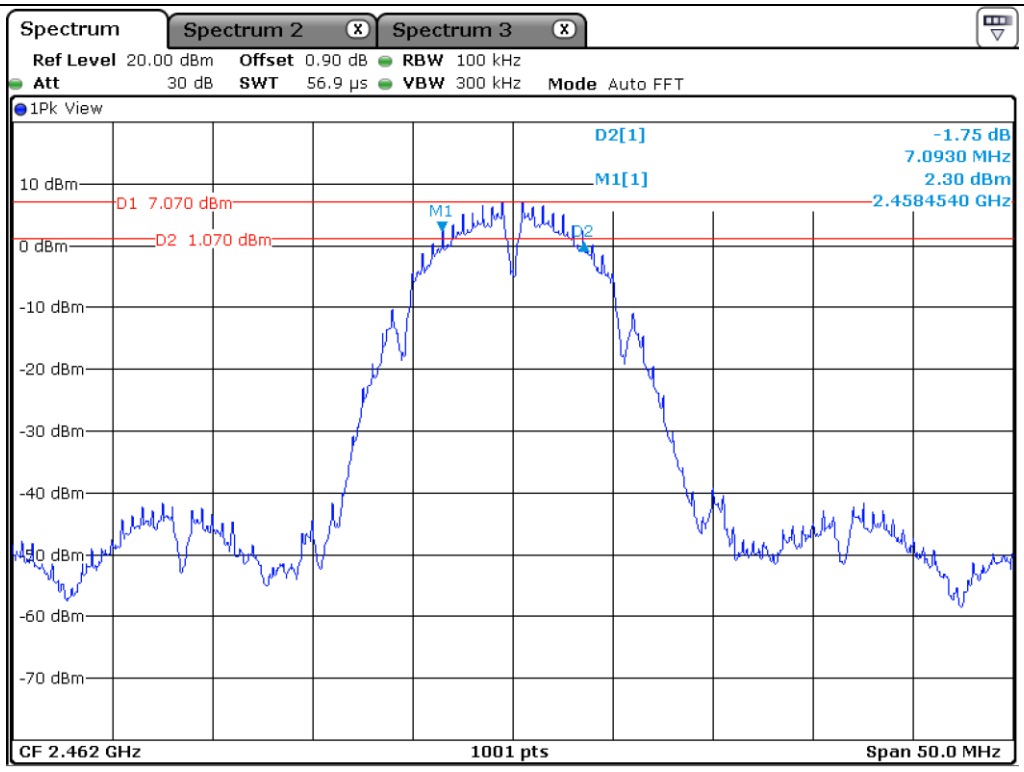


Middle Channel



High Channel

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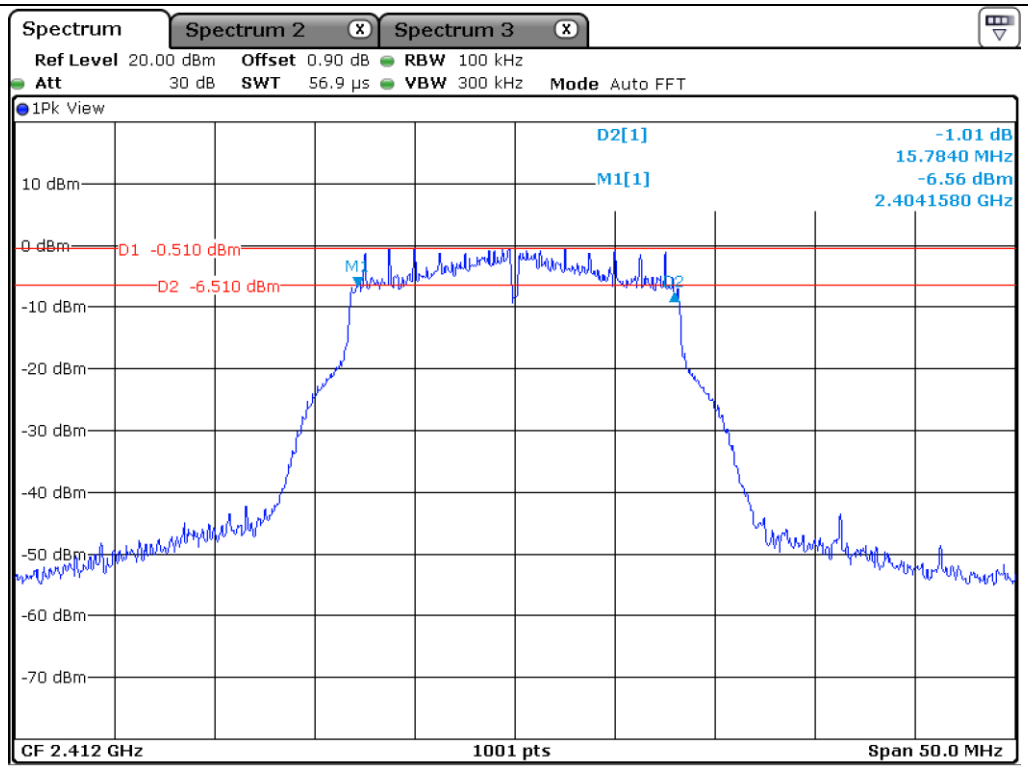
7.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
Low	2 412.00	15.78	0.50	15.28
Middle	2 437.00	16.23	0.50	15.73
High	2 462.00	16.23	0.50	15.73

Remark. Margin = Measured Value - Limit



Low Channel

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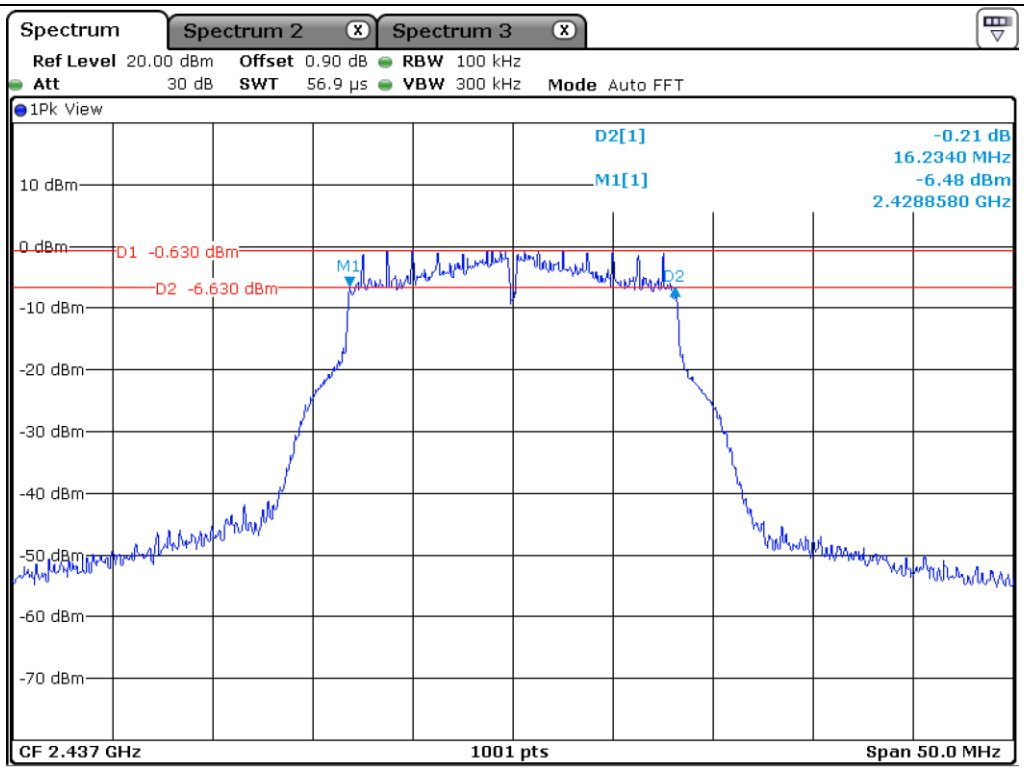
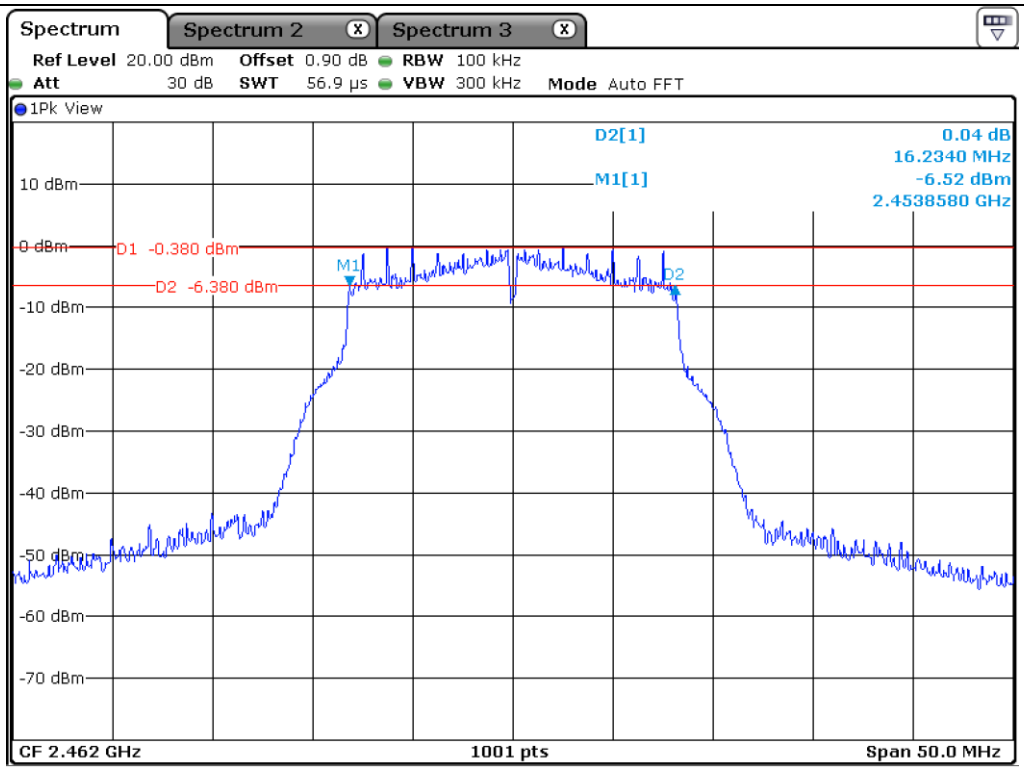


Middle Channel



High Channel

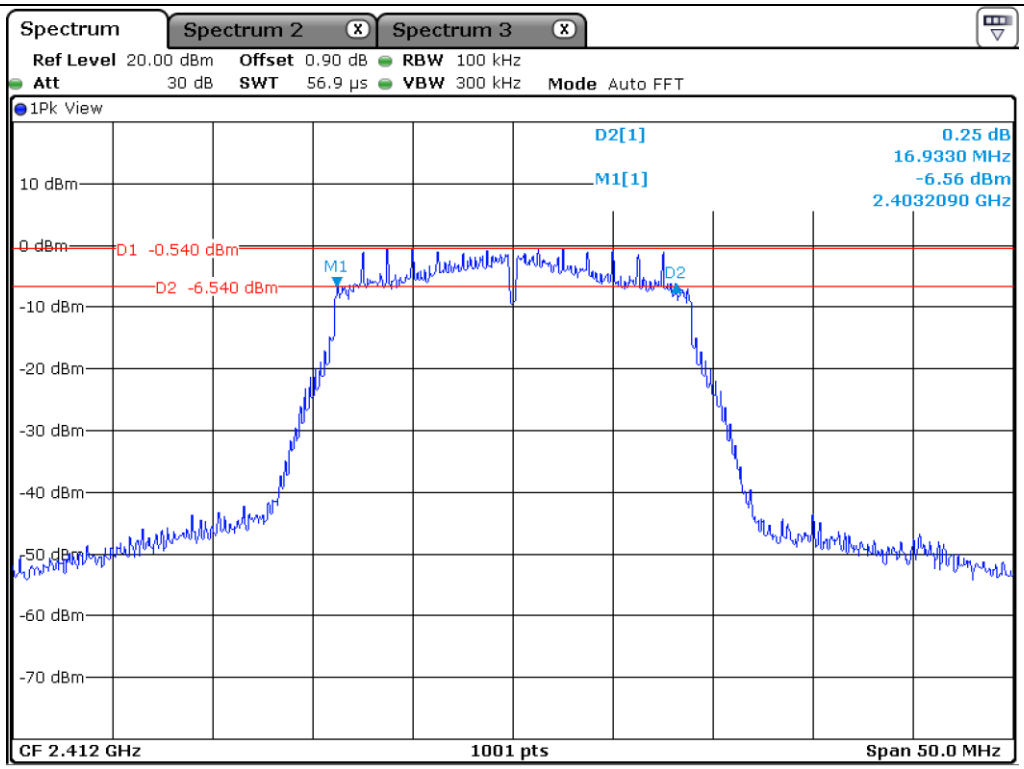
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

7.6 Test data for 802.11n_HT20 WLAN Mode

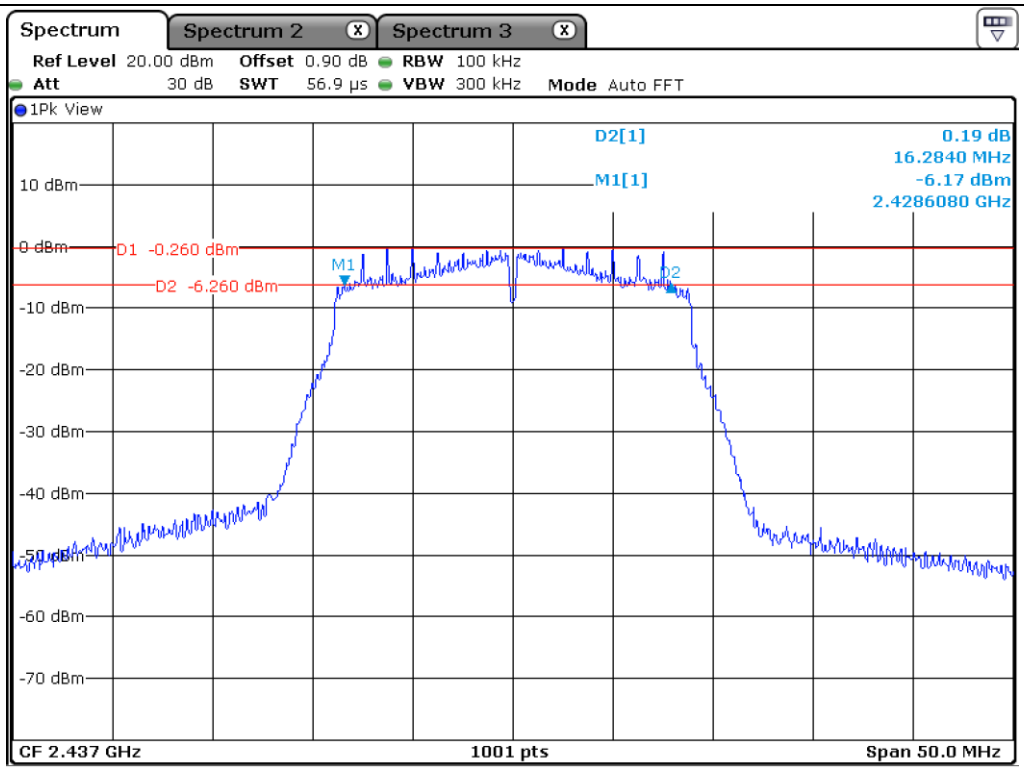
-. Test Result : Pass

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
Low	2 412.00	16.93	0.50	16.43
Middle	2 437.00	16.28	0.50	15.78
High	2 462.00	16.71	0.50	16.21

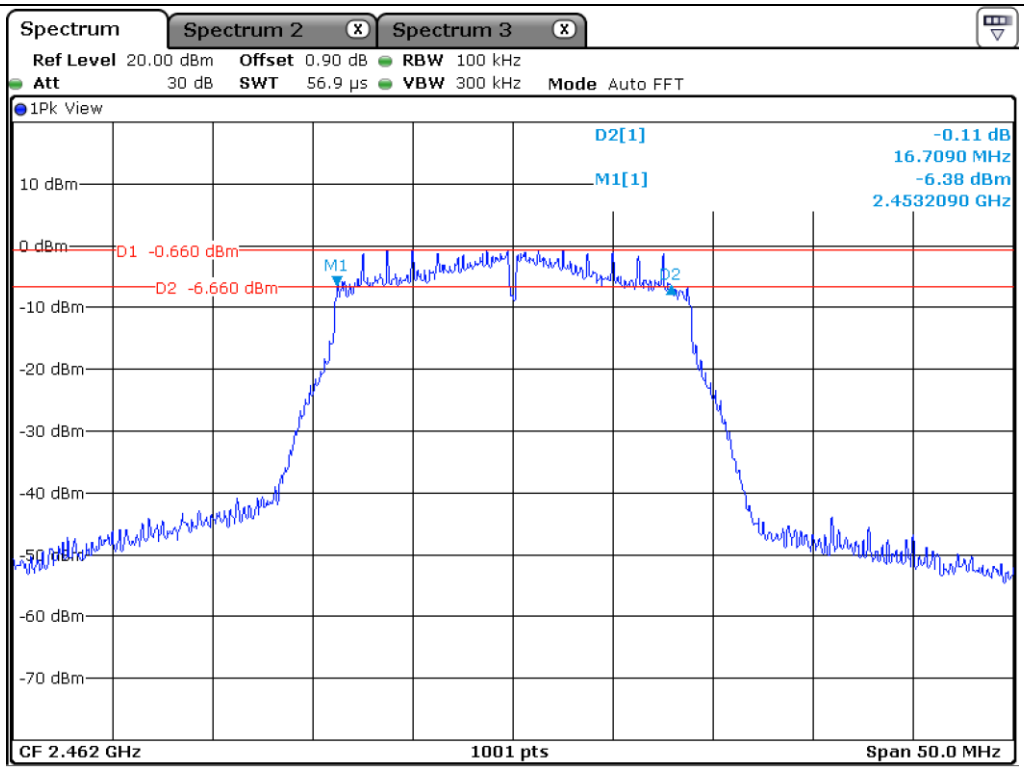
Remark. Margin = Measured Value - Limit



Low Channel



Middle 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)

8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

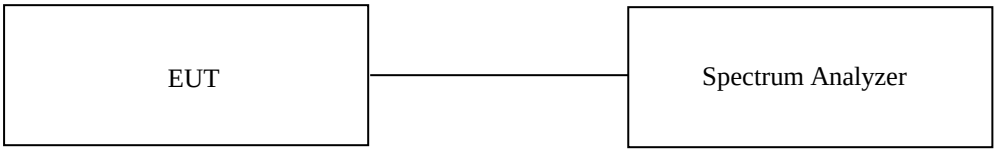
Temperature : 23 °C

Relative humidity : 45 % R.H.

8.2 Test set-up

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

The resolution bandwidth is set to 1 MHz, the video bandwidth is set to 3 times the resolution bandwidth.



8.3 Test Date

January 07, 2021 ~ January 28, 2021

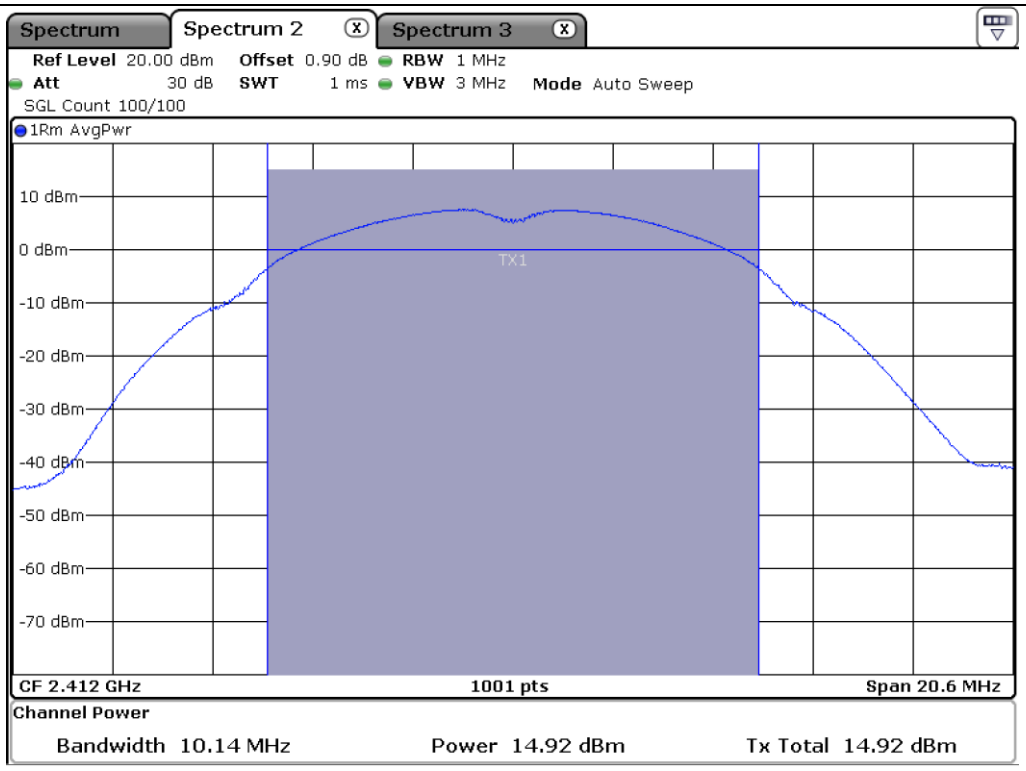
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

8.4 Test data for 802.11b WLAN Mode

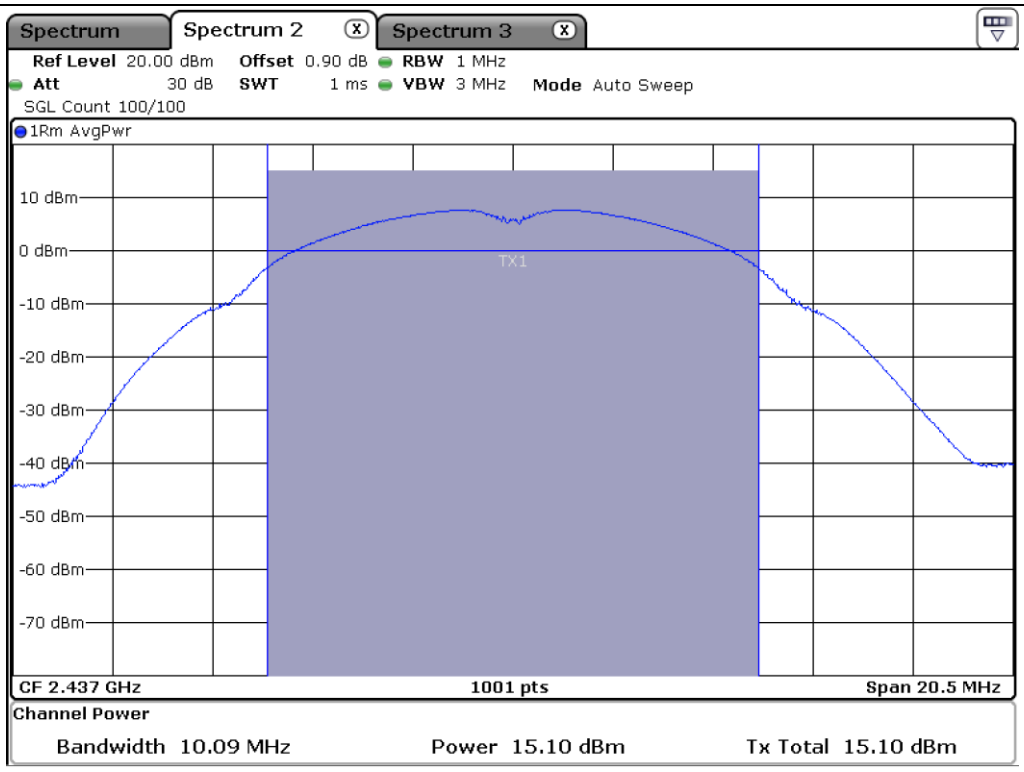
-. Test Result : Pass

Channel	Frequency (MHz)	Measured Value (dBm)	C.F (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412.00	14.92	0.05	14.97	30.00	15.04
Middle	2 437.00	15.10	0.05	15.15	30.00	14.86
High	2 462.00	14.91	0.05	14.96	30.00	15.05

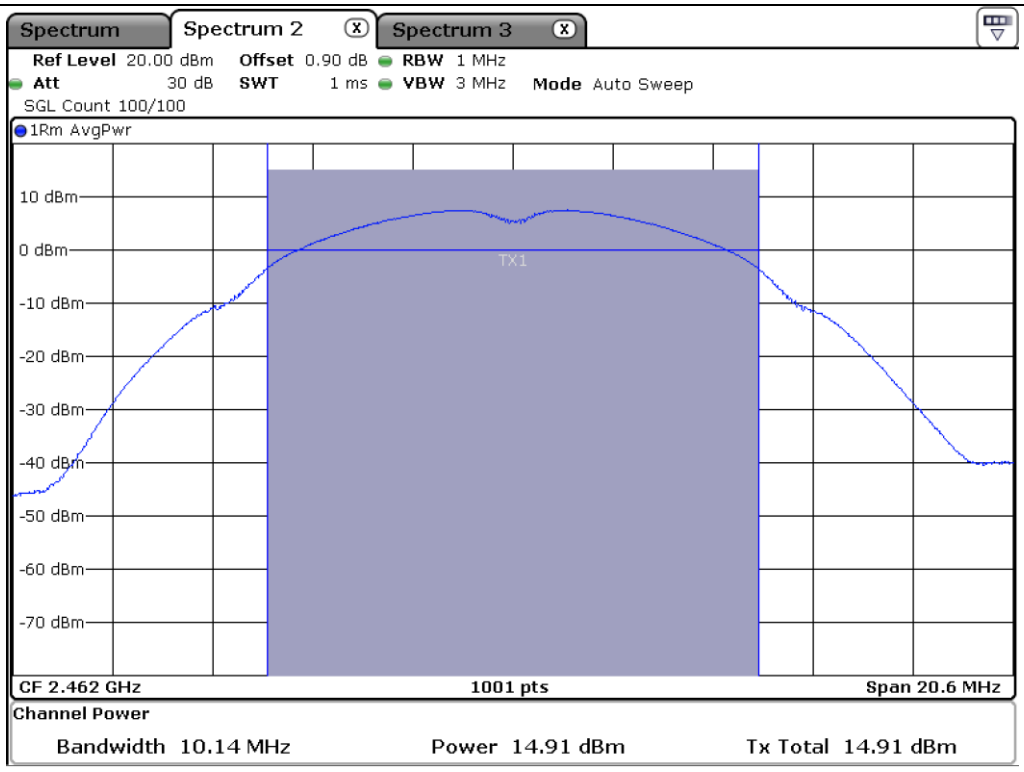
Remark : Margin = Limit – Result (Measured Value + Correction Factor)



Low Channel



Middle Channel



High Channel

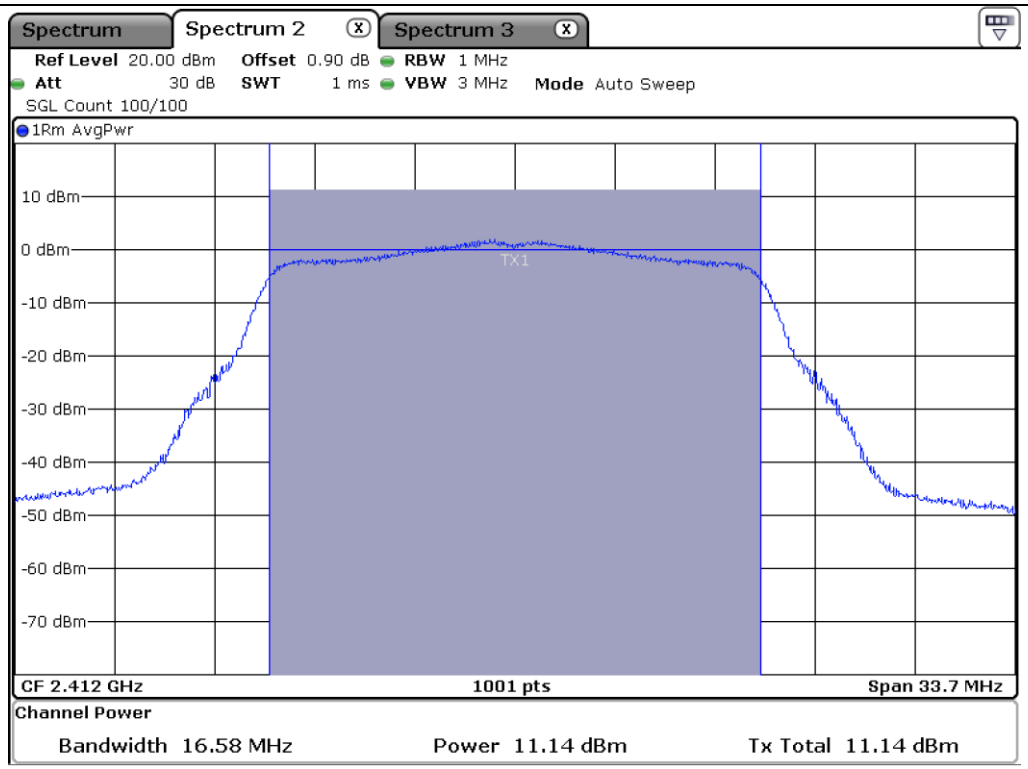
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

8.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

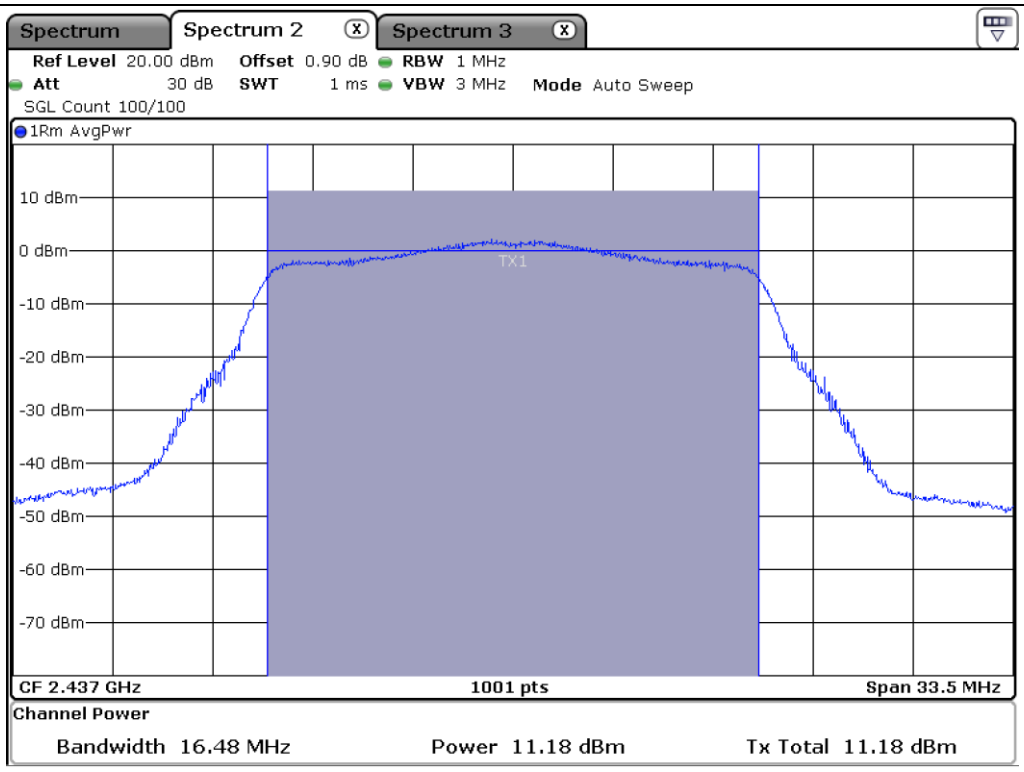
Channel	Frequency (MHz)	Measured Value (dBm)	C.F (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412.00	11.14	0.35	11.49	30.00	18.51
Middle	2 437.00	11.18	0.35	11.53	30.00	18.47
High	2 462.00	11.23	0.35	11.58	30.00	18.42

Remark : Margin = Limit – Result (Measured Value + Correction Factor)

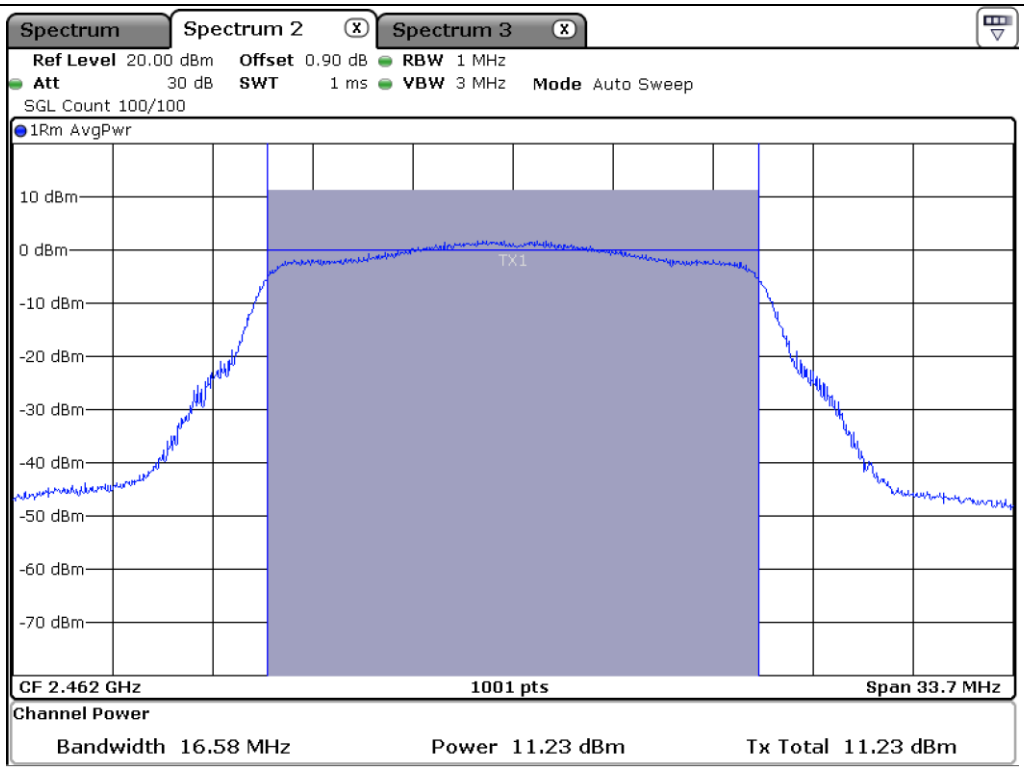


Low Channel

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



High Channel

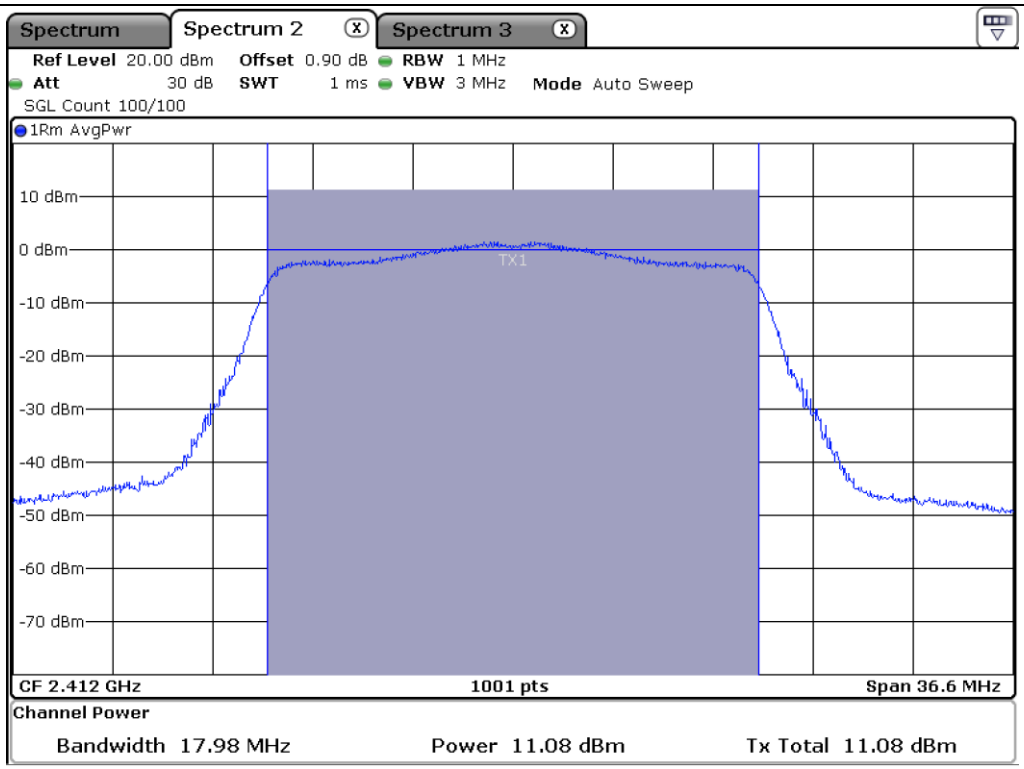
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

8.6 Test data for 802.11n_HT20 WLAN Mode

-. Test Result : Pass

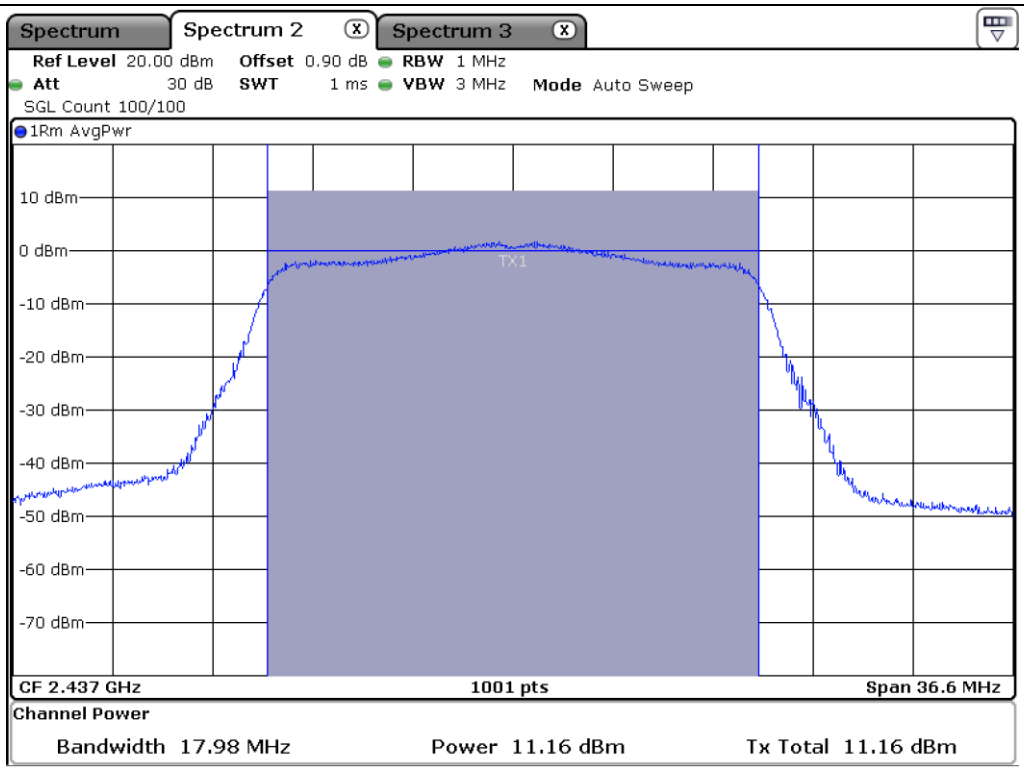
Channel	Frequency (MHz)	Measured Value (dBm)	C.F (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412.00	11.08	0.38	11.46	30.00	18.54
Middle	2 437.00	11.16	0.38	11.54	30.00	18.46
High	2 462.00	11.13	0.38	11.51	30.00	18.49

Remark : Margin = Limit – Result (Measured Value + Correction Factor)

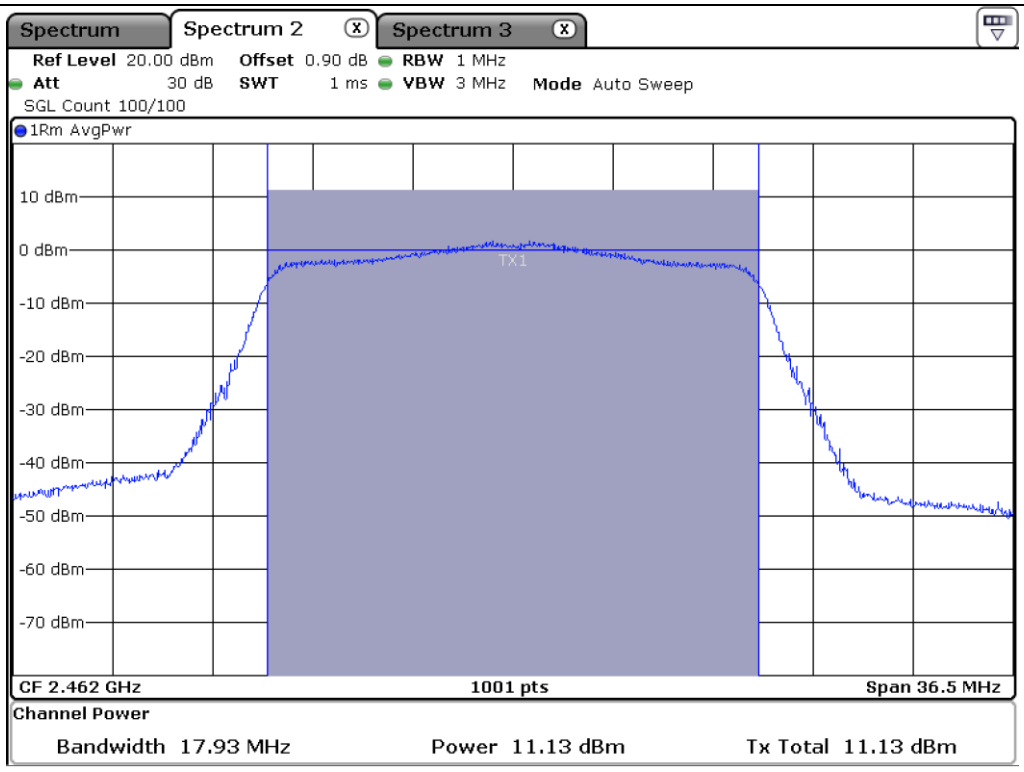


Low Channel

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



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. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

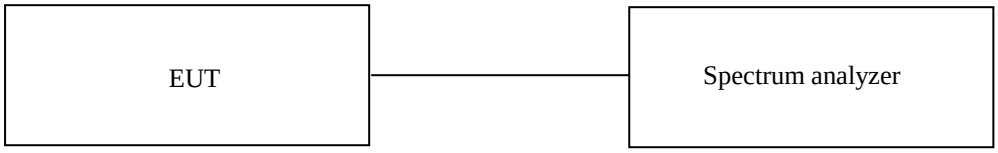
9.1 Operating environment

Temperature : 23 °C

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.

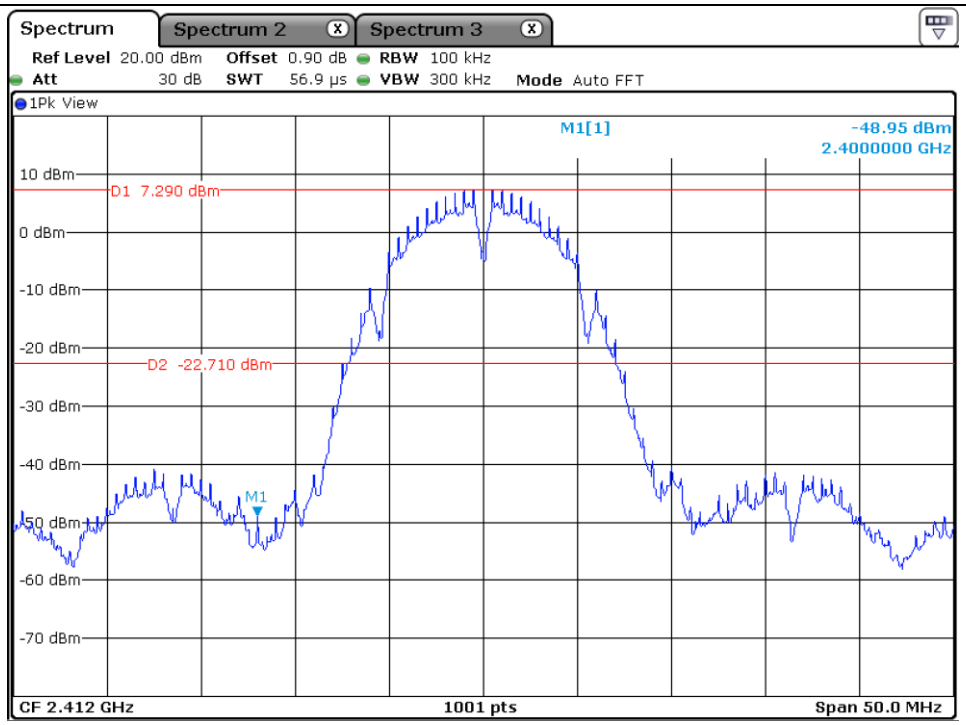
9.4 Test Date

January 07, 2021 ~ January 28, 2021

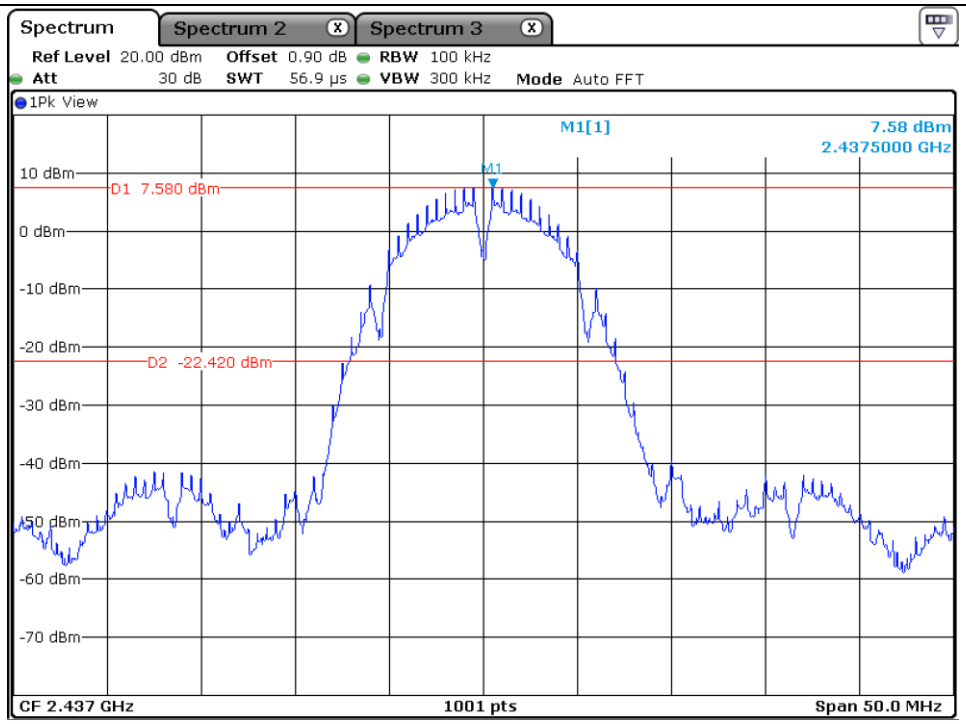
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

9.5 Test data for conducted emission

9.5.1 Test data for 802.11b WLAN Mode

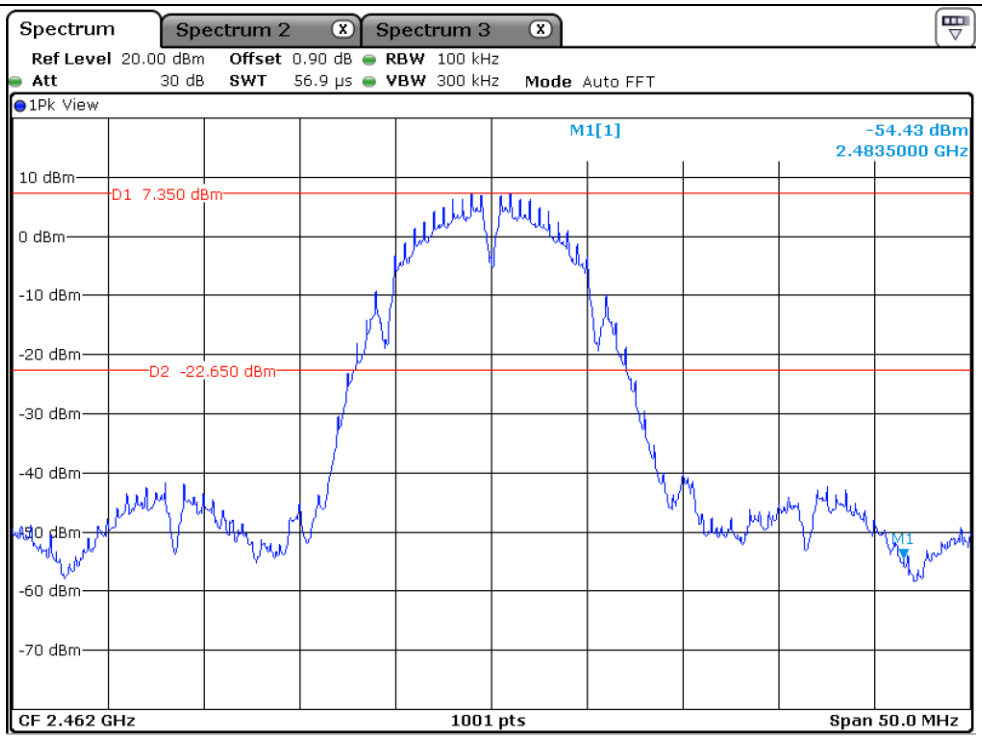


Low Channel

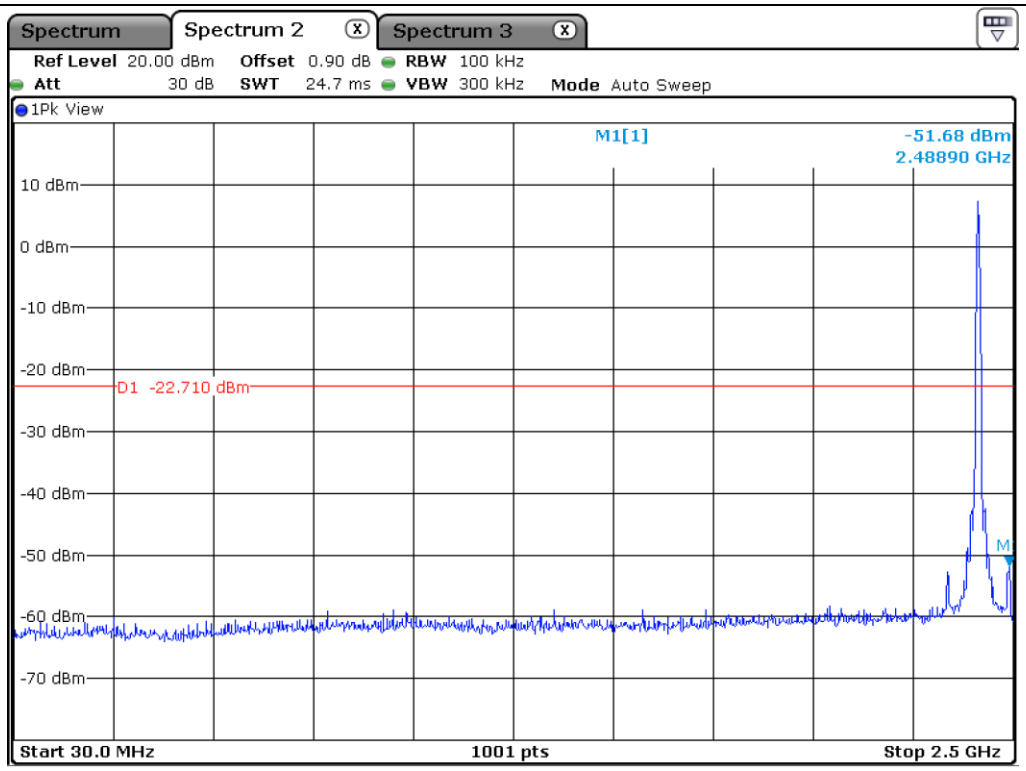


Middle Channel

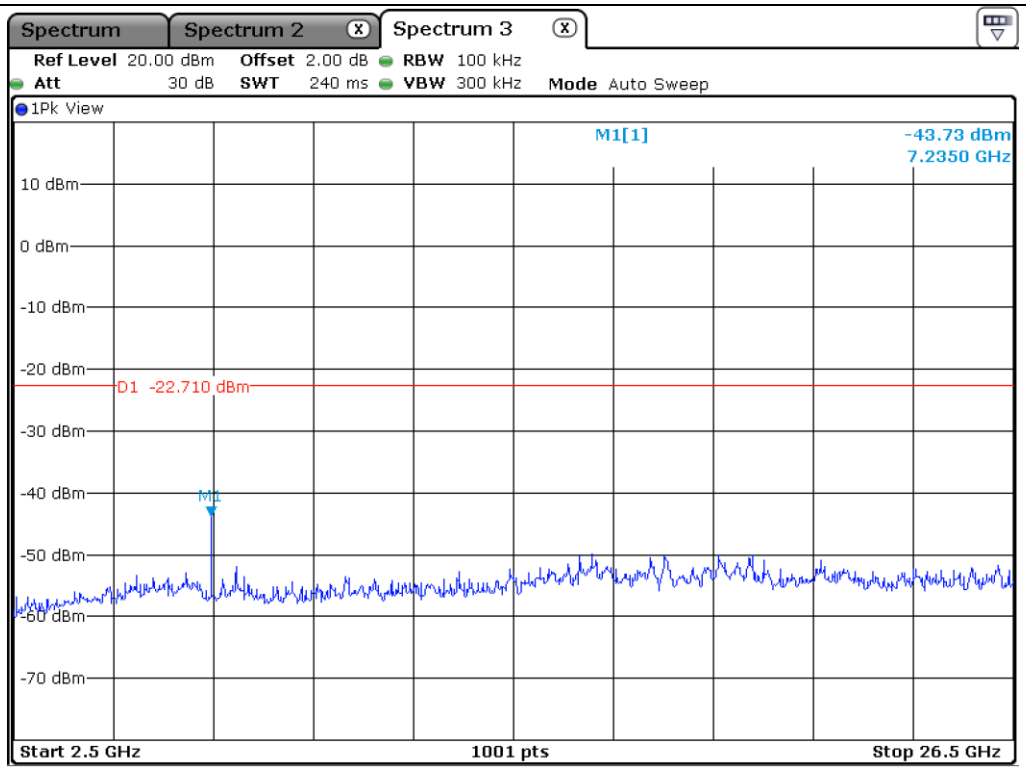
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel

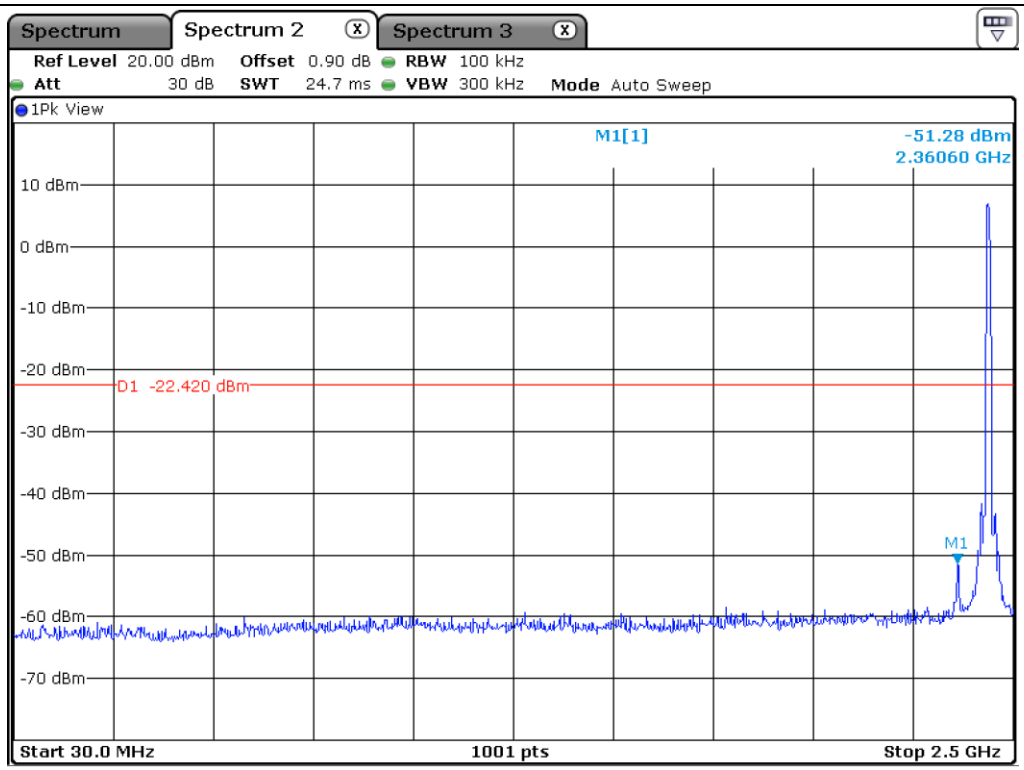


Low Channel

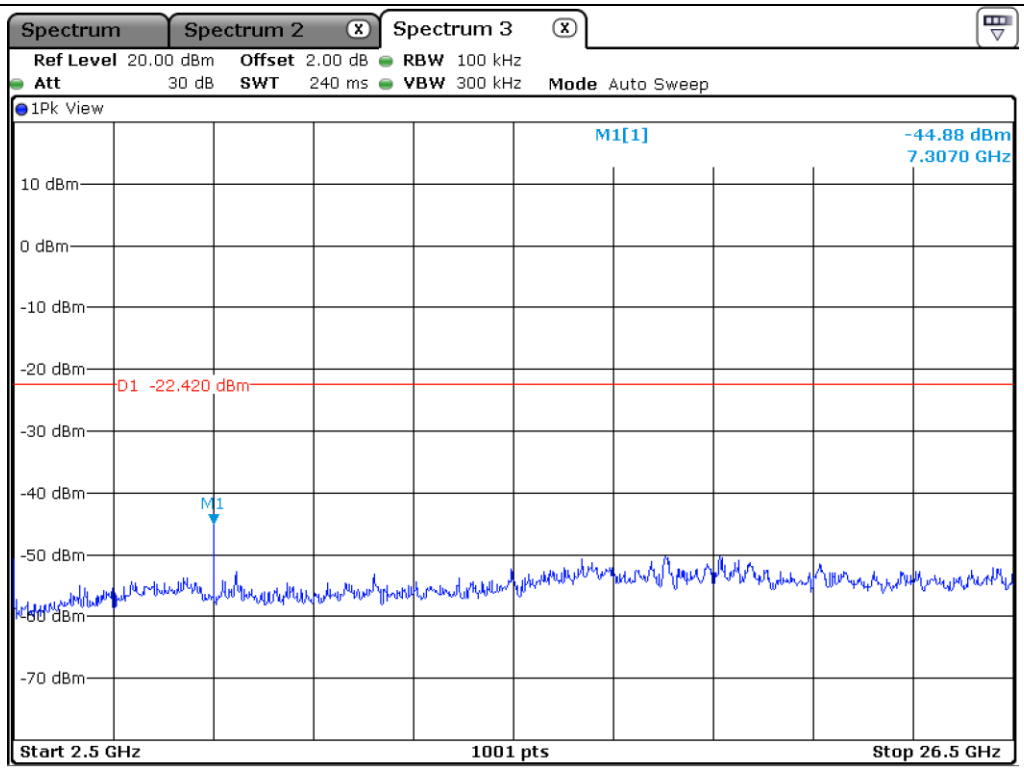


Low Channel

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

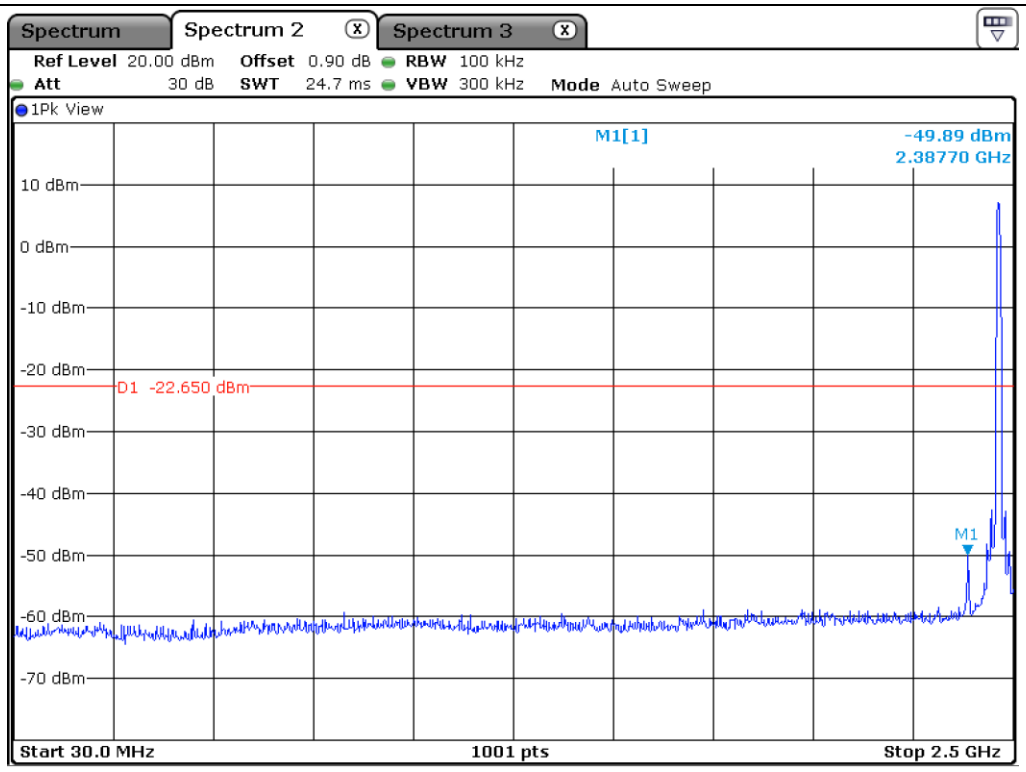


Middle Channel

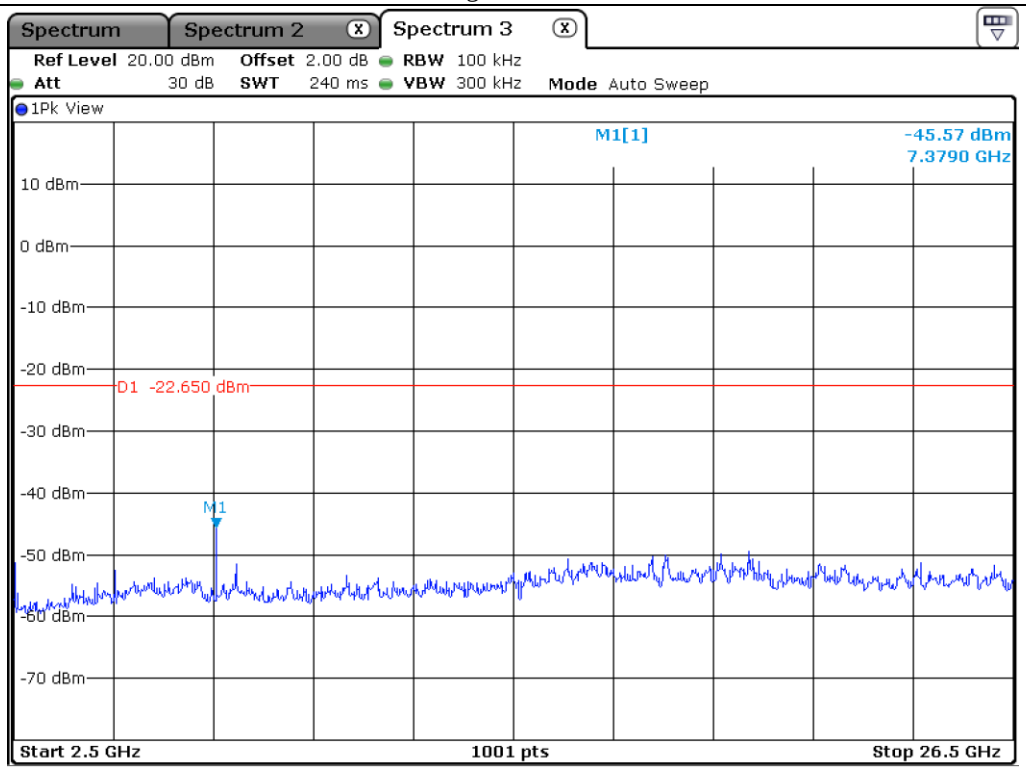


Middle Channel

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



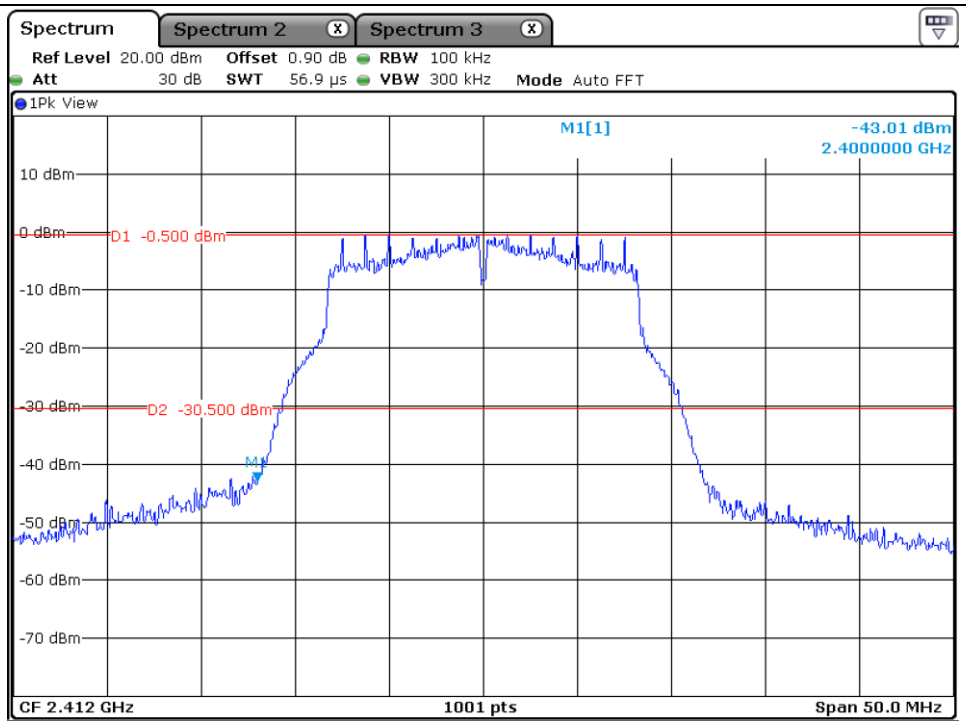
High Channel



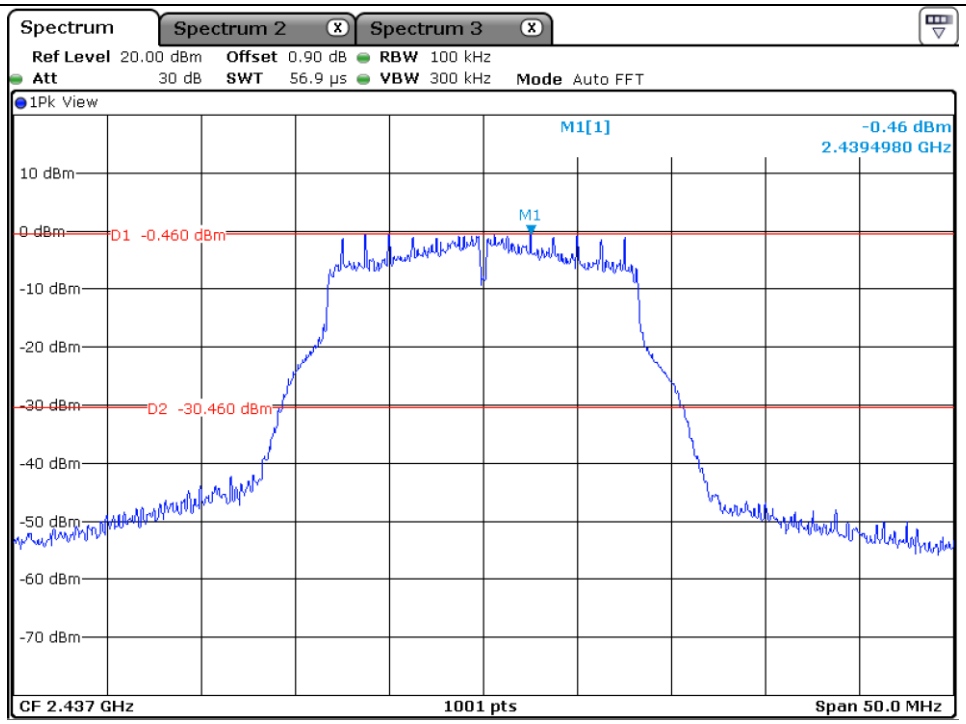
High Channel

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

9.5.2 Test data for 802.11g WLAN Mode

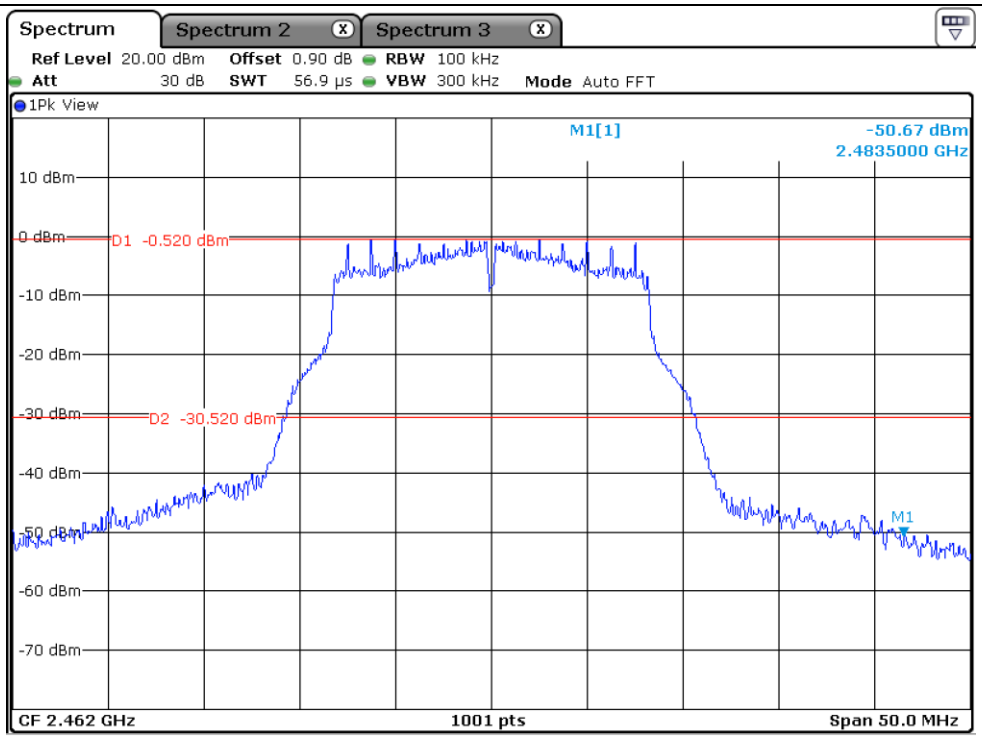


Low Channel

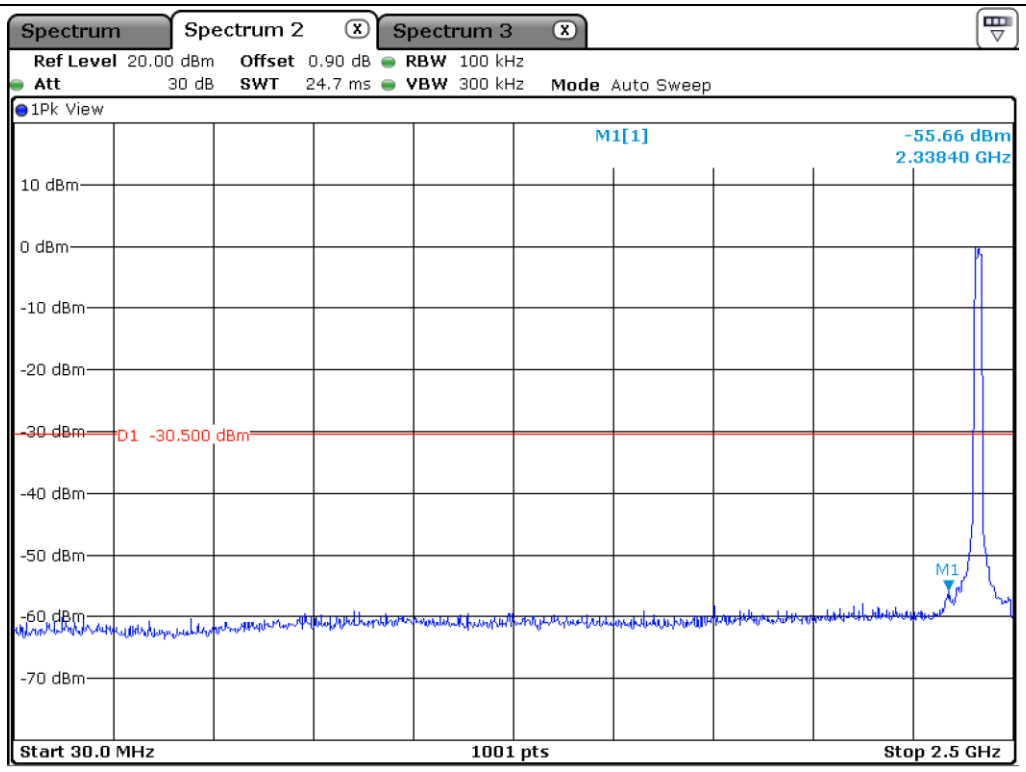


Middle Channel

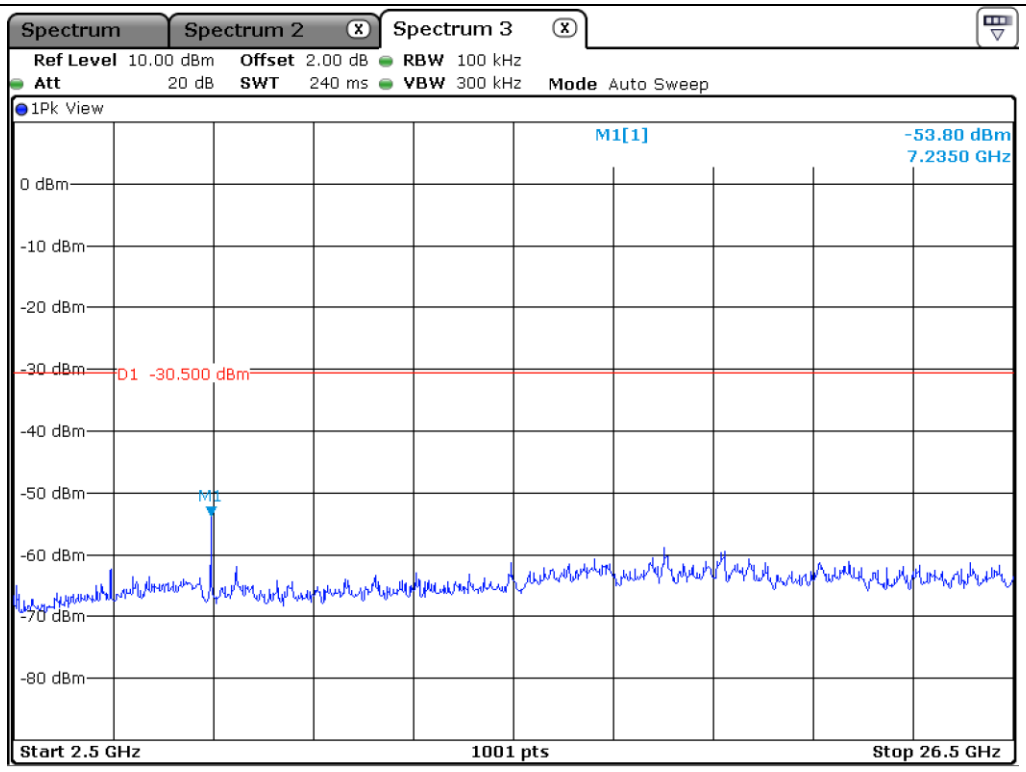
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel

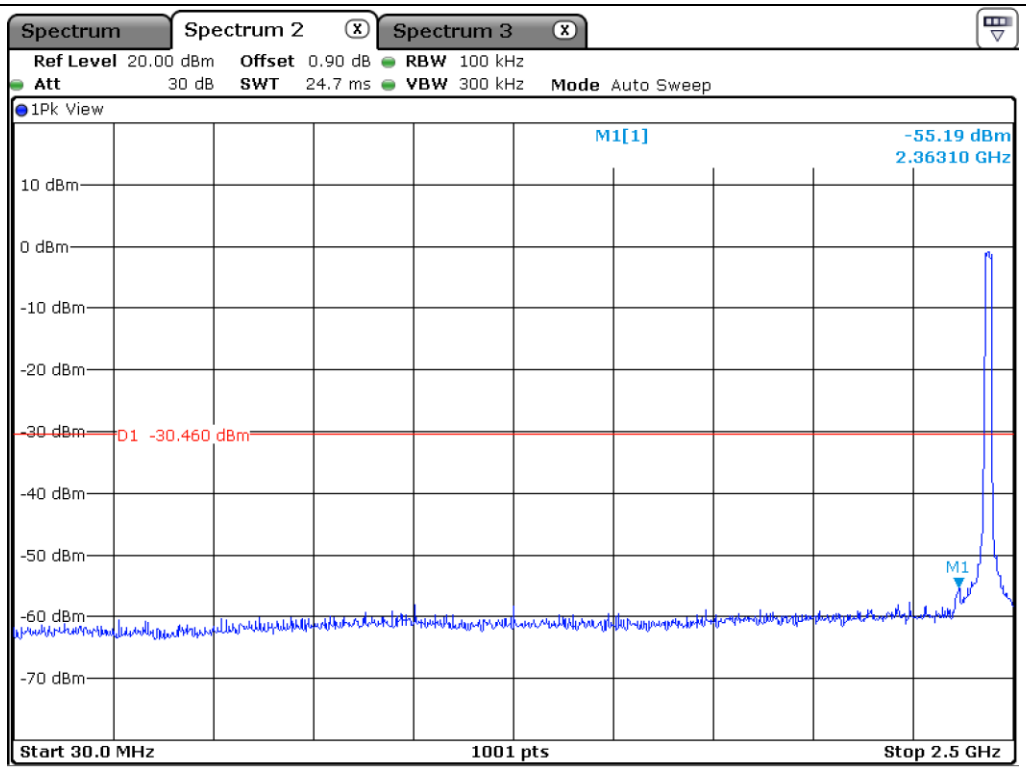


Low Channel

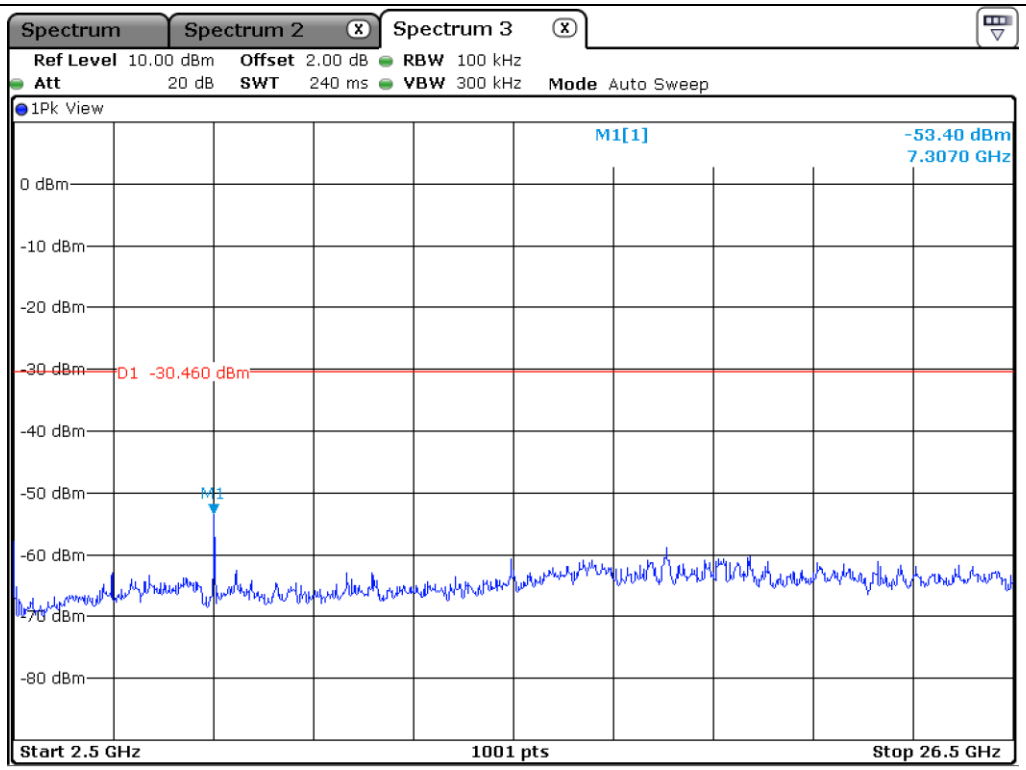


Low Channel

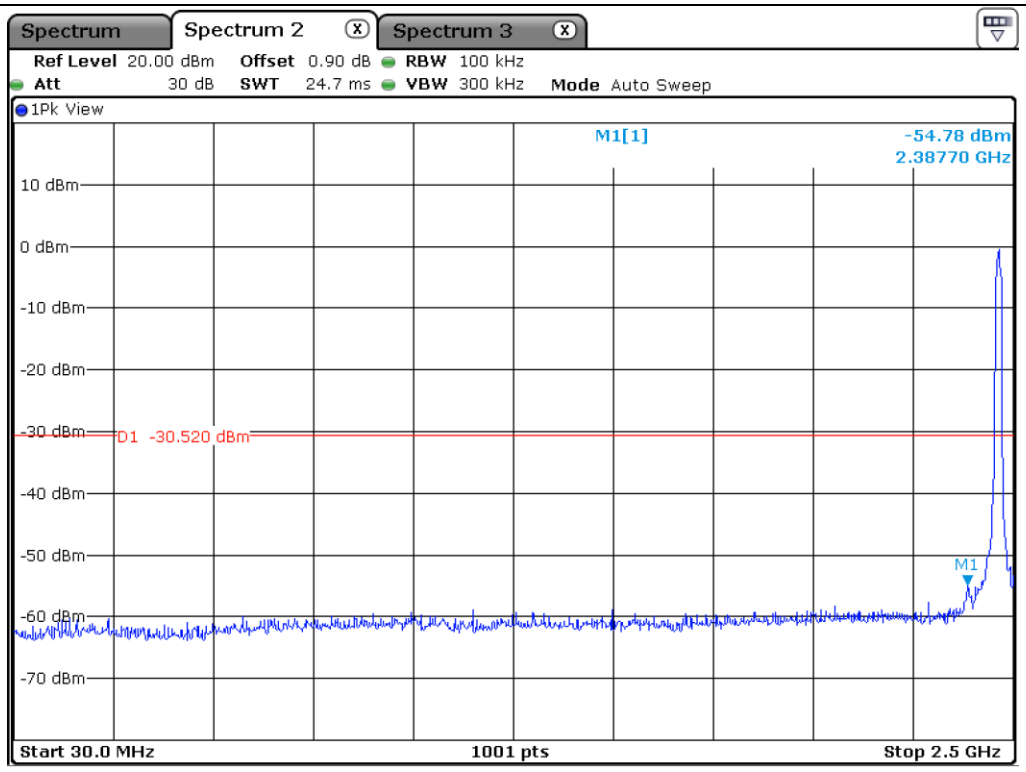
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



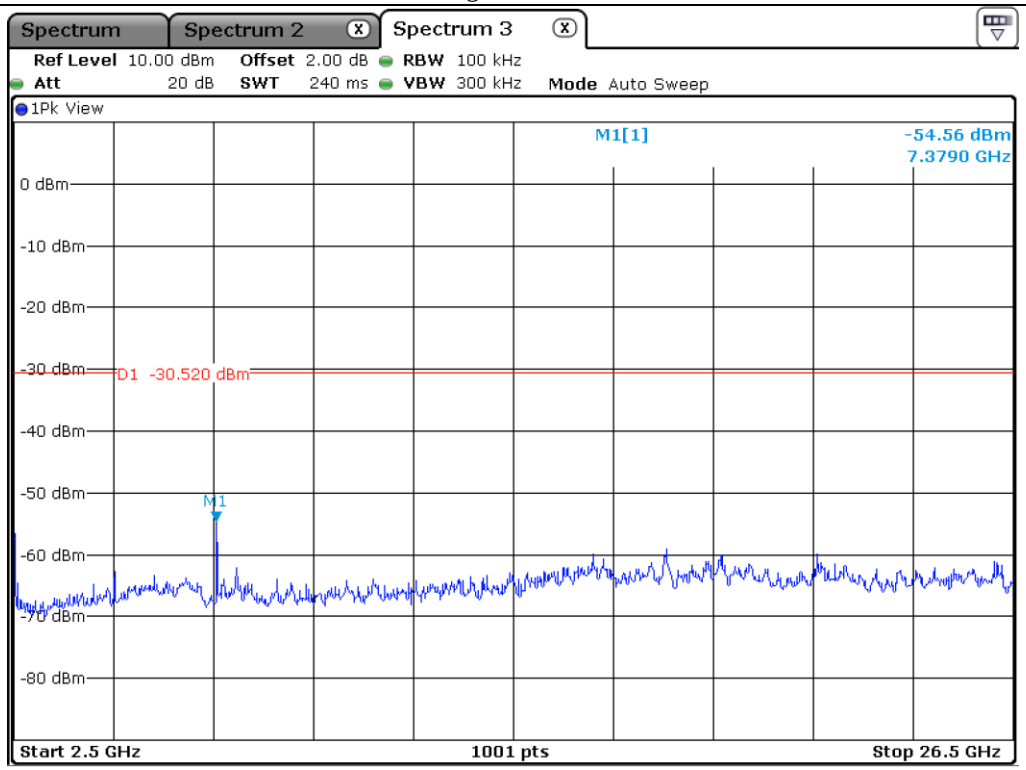
Middle Channel



Middle Channel



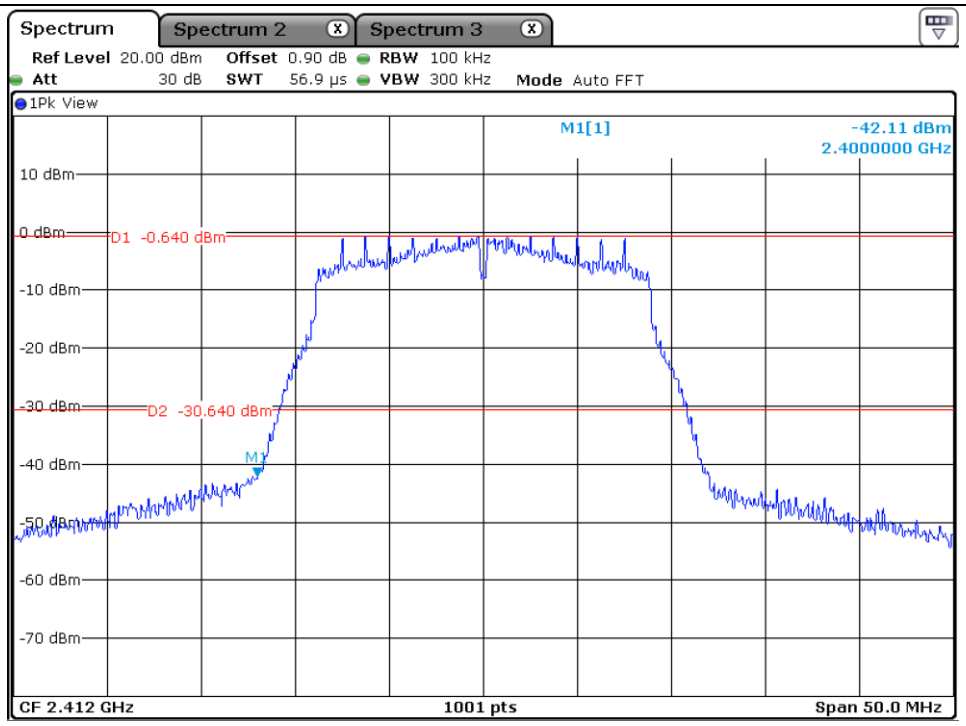
High Channel



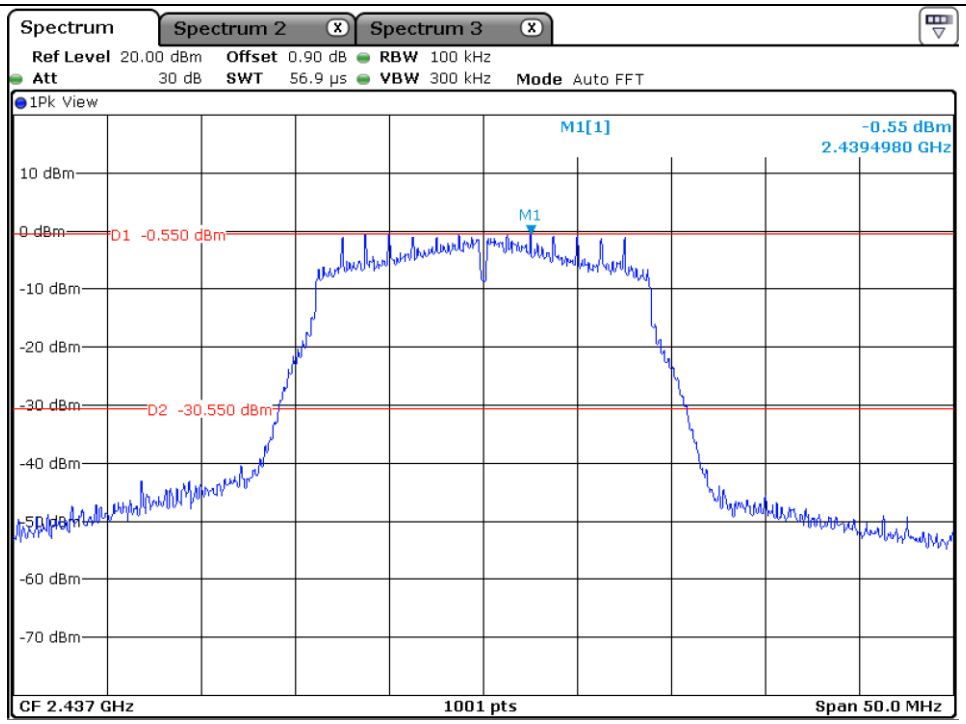
High Channel

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

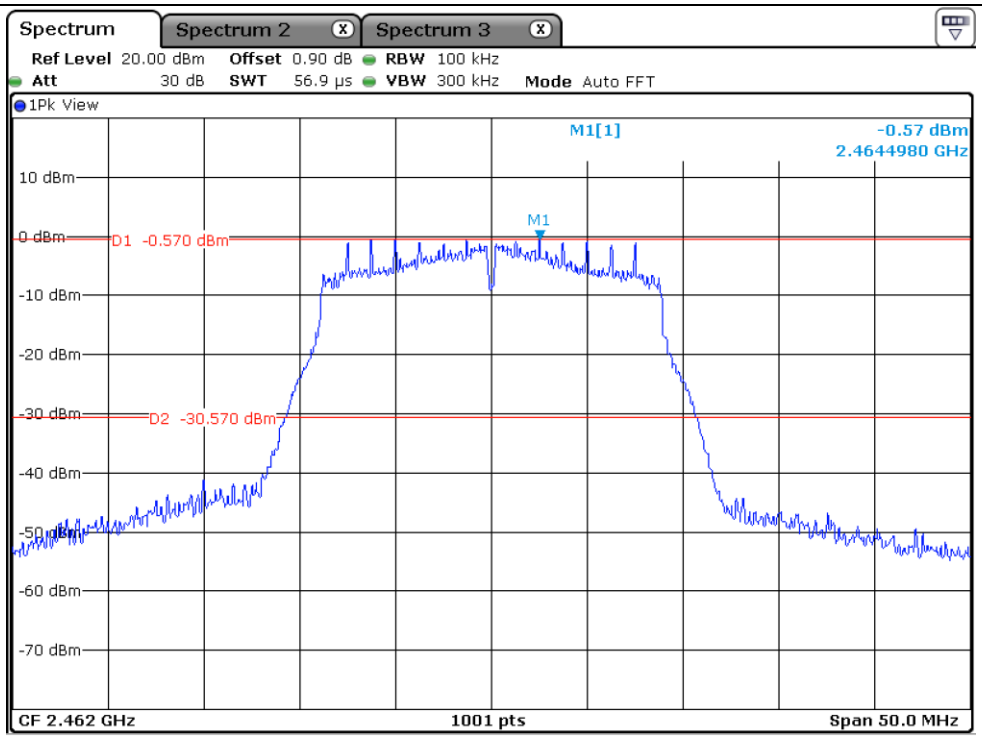
9.5.3 Test data for 802.11n_HT20 WLAN Mode



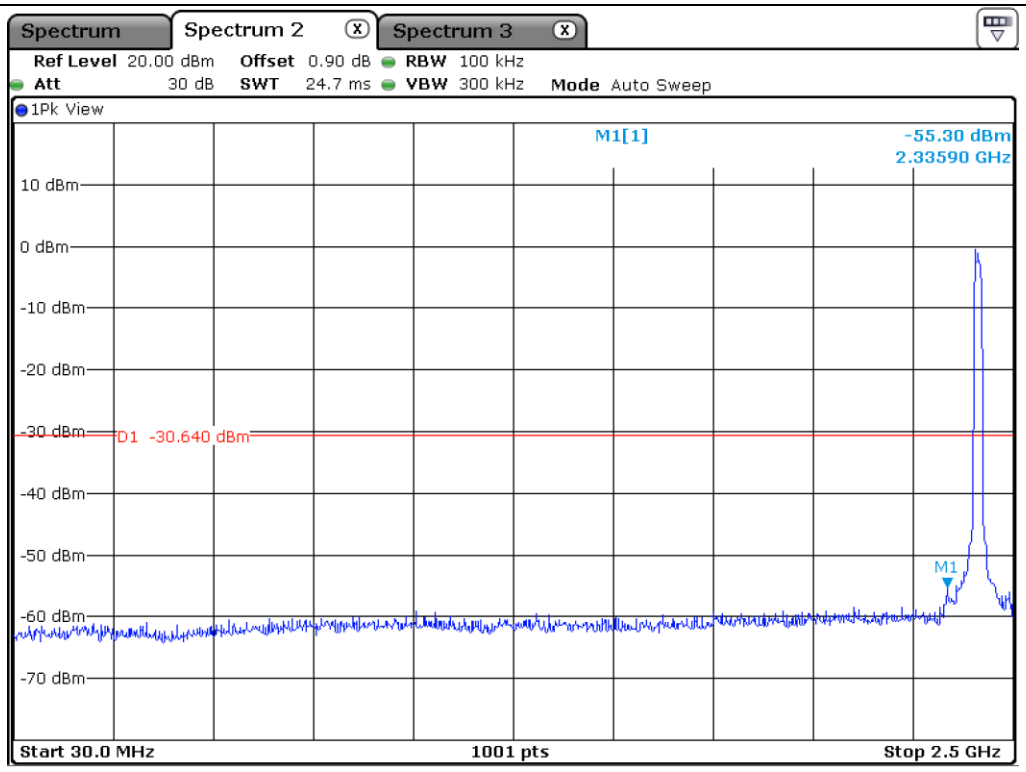
Low Channel



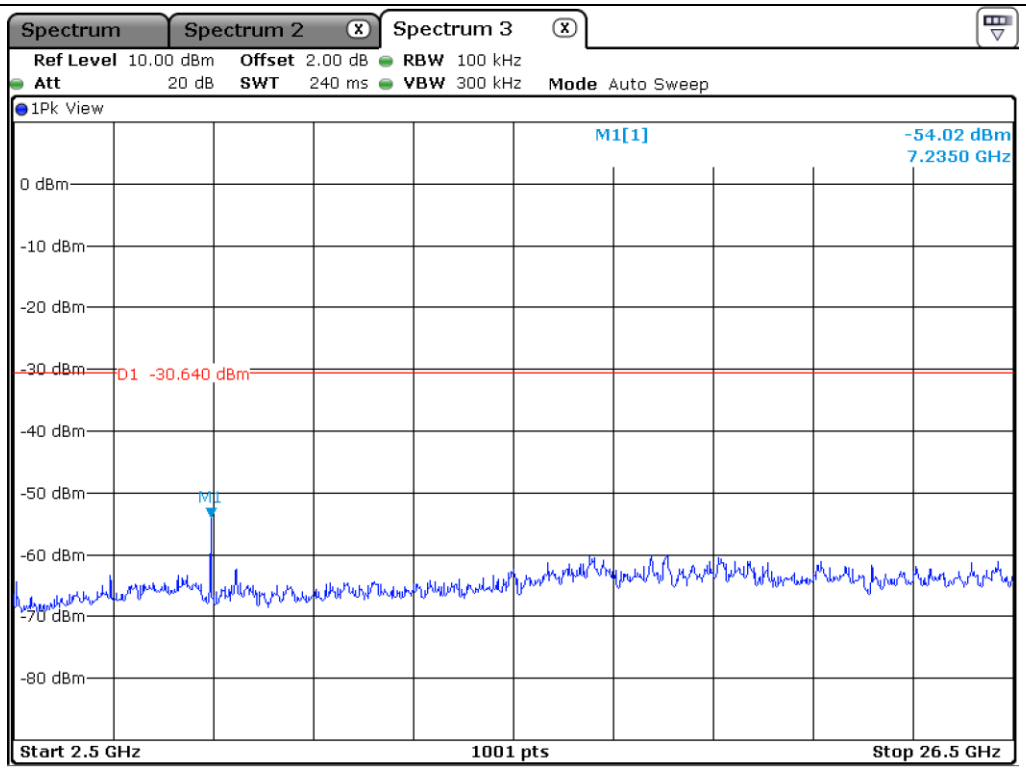
Middle Channel



High Channel

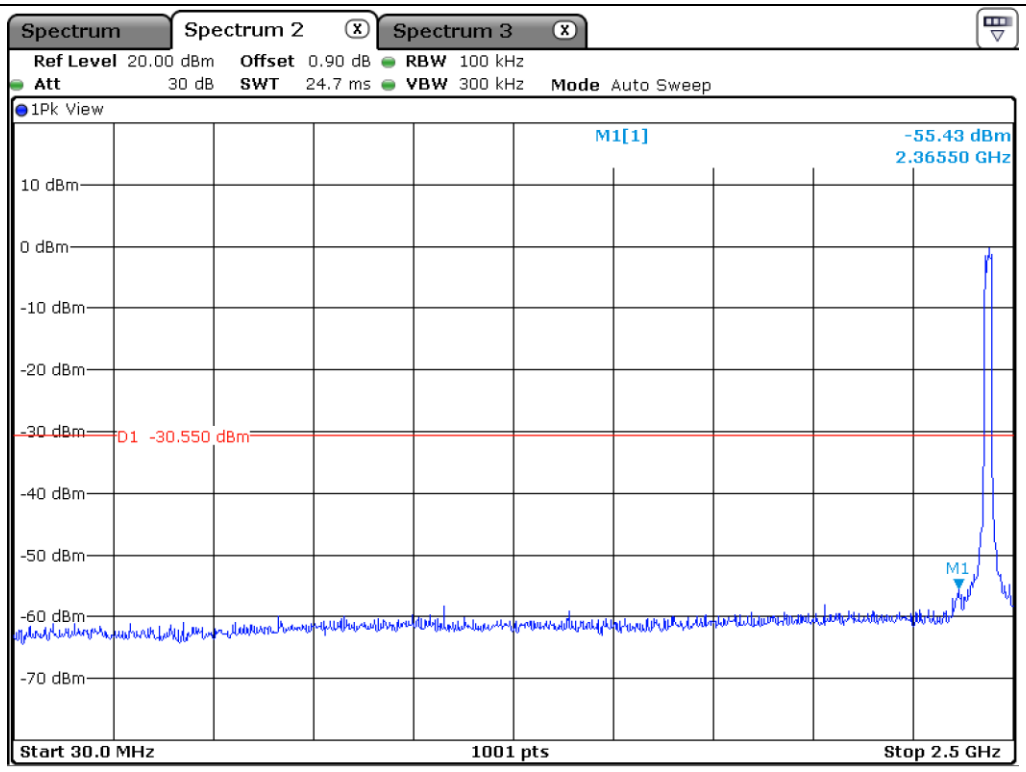


Low Channel

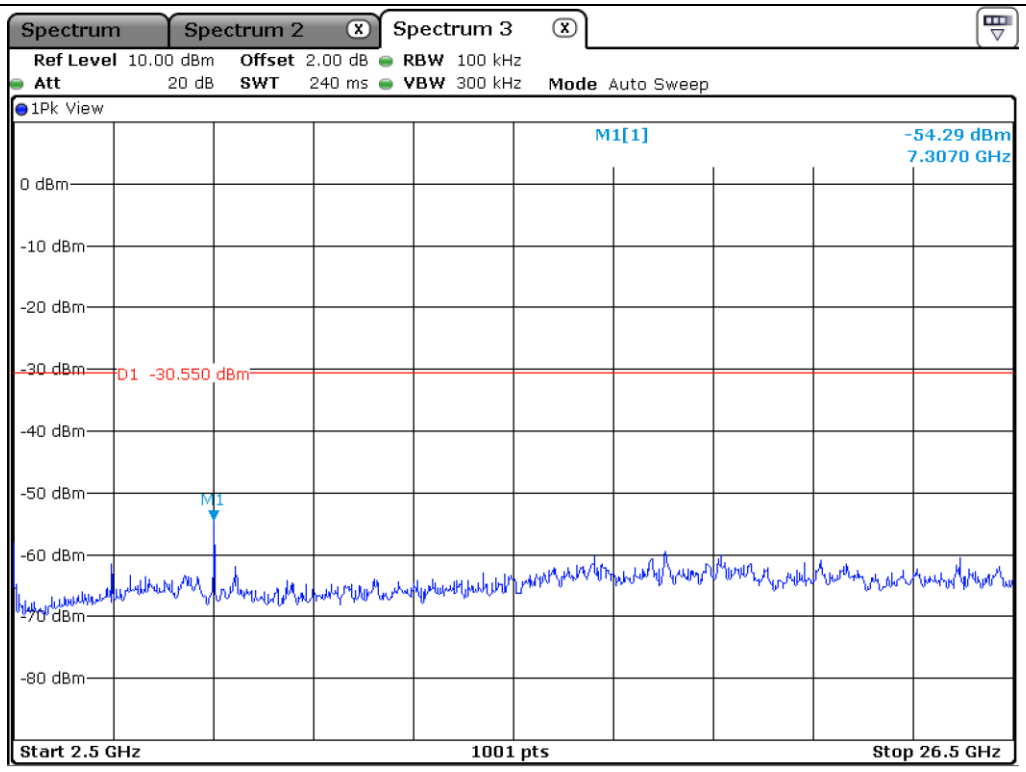


Low Channel

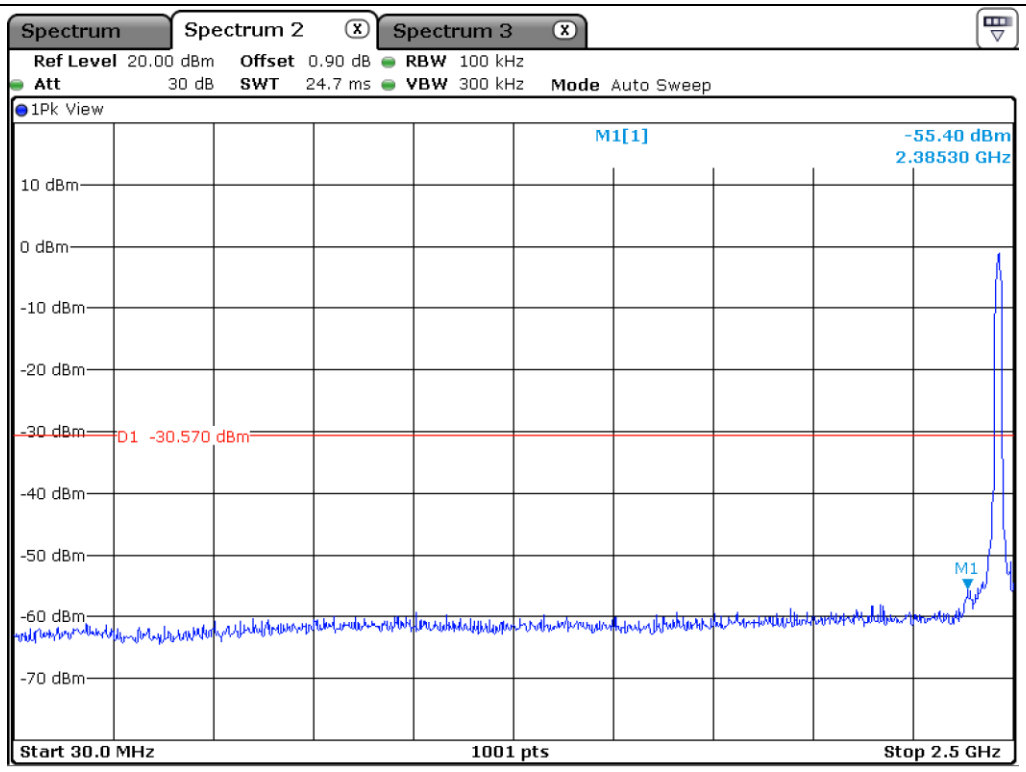
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



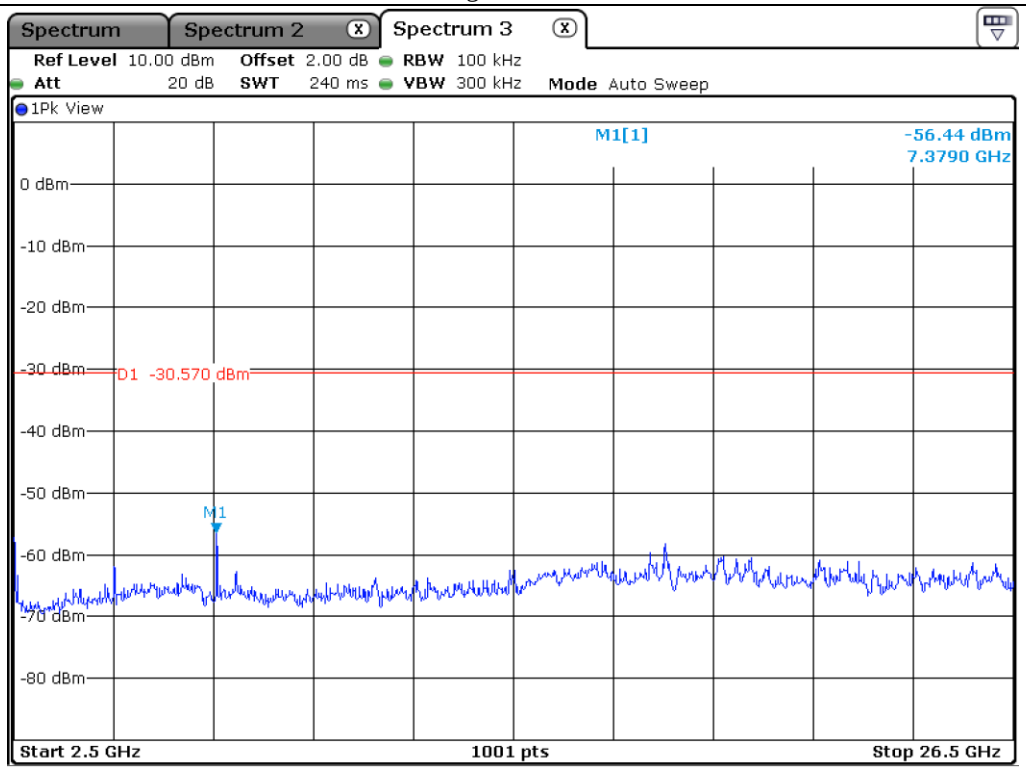
Middle Channel



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)

9.6 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

-. 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 : 98.96 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	DUTY Factor	AMP Factor	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
2 386.364	59.15	Peak	H	28.30	8.20	-	45.30	50.35	74.00	23.65
2 387.243	51.57	Average	H	28.30	8.20	0.05	45.30	42.82	54.00	11.18
2 387.802	60.95	Peak	V	28.30	8.20	-	45.30	52.15	74.00	21.85
2 387.483	55.67	Average	V	28.30	8.20	0.05	45.30	46.92	54.00	7.08
Test Data for High Channel										
2 488.684	52.65	Peak	H	28.70	8.23	-	45.50	44.08	74.00	29.92
2 488.503	44.25	Average	H	28.70	8.23	0.05	45.50	35.73	54.00	18.27
2 487.003	55.92	Peak	V	28.70	8.23	-	45.50	47.35	74.00	26.65
2 488.536	50.57	Average	V	28.70	8.23	0.05	45.50	42.05	54.00	11.95

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 + Duty Factor – AMP Factor

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9.6.1.2 Test data for 802.11g WLAN Mode

-. 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 : 92.16 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	DUTY Factor	AMP Factor	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
2 388.921	65.83	Peak	H	28.30	8.20	-	45.30	57.03	74.00	16.97
2 389.960	47.56	Average	H	28.30	8.20	0.35	45.30	39.11	54.00	14.89
2 388.761	71.65	Peak	V	28.30	8.20	-	45.30	62.85	74.00	11.15
2 389.960	56.18	Average	V	28.30	8.20	0.35	45.30	47.73	54.00	6.27
Test Data for High Channel										
2 483.558	60.51	Peak	H	28.70	8.23	-	45.50	51.94	74.00	22.06
2 489.920	41.41	Average	H	28.70	8.23	0.35	45.50	33.19	54.00	20.81
2 483.755	69.44	Peak	V	28.70	8.23	-	45.50	60.87	74.00	13.13
2 483.508	49.56	Average	V	28.70	8.23	0.35	45.50	41.34	54.00	12.66

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 + Duty Factor – AMP Factor

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9.6.1.3 Test data for 802.11n_HT20 WLAN Mode

-. 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 : 91.67 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	DUTY Factor	AMP Factor	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
2 389.720	68.01	Peak	H	28.30	8.20	-	45.30	59.21	74.00	14.79
2 389.960	47.20	Average	H	28.30	8.20	0.38	45.30	38.78	54.00	15.22
2 389.880	74.76	Peak	V	28.30	8.20	-	45.30	65.96	74.00	8.04
2 389.960	55.91	Average	V	28.30	8.20	0.38	45.30	47.49	54.00	6.51
Test Data for High Channel										
2 483.541	62.00	Peak	H	28.70	8.23	-	45.50	53.43	74.00	20.57
2 483.640	41.31	Average	H	28.70	8.23	0.38	45.50	33.12	54.00	20.88
2 483.624	71.91	Peak	V	28.70	8.23	-	45.50	63.34	74.00	10.66
2 483.508	50.81	Average	V	28.70	8.23	0.38	45.50	42.62	54.00	11.38

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 + Duty Factor – AMP Factor

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9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 802.11b WLAN Mode

-. 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 : 98.96 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	DUTY Factor	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 824.00	50.06	Peak	H	33.40	11.21	-	46.30	48.37	74.00	25.63
4 824.00	36.15	Average	H	33.40	11.21	0.05	46.30	34.51	54.00	19.49
4 824.00	50.11	Peak	V	33.40	11.21	-	46.30	48.42	74.00	25.58
4 824.00	36.16	Average	V	33.40	11.21	0.05	46.30	34.52	54.00	19.48
Test Data for Middle Channel										
4 874.00	50.13	Peak	H	33.50	11.23	-	46.33	48.53	74.00	25.47
4 874.00	36.83	Average	H	33.50	11.23	0.05	46.33	35.28	54.00	18.72
4 874.00	50.08	Peak	V	33.50	11.23	-	46.33	48.48	74.00	25.52
4 874.00	36.71	Average	V	33.50	11.23	0.05	46.33	35.16	54.00	18.84
Test Data for High Channel										
4 924.00	50.16	Peak	H	33.30	11.25	-	46.35	48.36	74.00	25.64
4 924.00	36.85	Average	H	33.30	11.25	0.05	46.35	35.10	54.00	18.90
4 924.00	50.09	Peak	V	33.30	11.25	-	46.35	48.29	74.00	25.71
4 924.00	36.83	Average	V	33.30	11.25	0.05	46.35	35.08	54.00	18.92

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – AMP Factor

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9.6.2.2 Test data for 802.11g WLAN Mode

-. 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 : 92.16 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	DUTY Factor	AMP Factor	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
4 824.00	50.06	Peak	H	33.40	11.21	-	46.30	48.37	74.00	25.63
4 824.00	37.38	Average	H	33.40	11.21	0.35	46.30	36.04	54.00	17.96
4 824.00	50.12	Peak	V	33.40	11.21	-	46.30	48.43	74.00	25.57
4 824.00	37.29	Average	V	33.40	11.21	0.35	46.30	35.95	54.00	18.05
Test Data for Middle Channel										
4 874.00	50.06	Peak	H	33.50	11.23	-	46.33	48.46	74.00	25.54
4 874.00	37.18	Average	H	33.50	11.23	0.35	46.33	35.93	54.00	18.07
4 874.00	49.98	Peak	V	33.50	11.23	-	46.33	48.38	74.00	25.62
4 874.00	37.17	Average	V	33.50	11.23	0.35	46.33	35.92	54.00	18.08
Test Data for High Channel										
4 924.00	50.15	Peak	H	33.30	11.25	-	46.35	48.35	74.00	25.65
4 924.00	37.13	Average	H	33.30	11.25	0.35	46.35	35.68	54.00	18.32
4 924.00	49.96	Peak	V	33.30	11.25	-	46.35	48.16	74.00	25.84
4 924.00	36.49	Average	V	33.30	11.25	0.35	46.35	35.04	54.00	18.96

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – AMP Factor

9.6.2.3 Test data for 802.11n_HT20 WLAN Mode

-. 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 : 91.67 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	DUTY Factor	AMP Factor	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
4 824.00	50.06	Peak	H	33.40	11.21	-	46.30	48.37	74.00	25.63
4 824.00	37.38	Average	H	33.40	11.21	0.38	46.30	36.07	54.00	17.93
4 824.00	49.88	Peak	V	33.40	11.21	-	46.30	48.19	74.00	25.81
4 824.00	36.71	Average	V	33.40	11.21	0.38	46.30	35.40	54.00	18.60
Test Data for Middle Channel										
4 874.00	50.33	Peak	H	33.50	11.23	-	46.33	48.73	74.00	25.27
4 874.00	37.18	Average	H	33.50	11.23	0.38	46.33	35.96	54.00	18.04
4 874.00	49.92	Peak	V	33.50	11.23	-	46.33	48.32	74.00	25.68
4 874.00	36.81	Average	V	33.50	11.23	0.38	46.33	35.59	54.00	18.41
Test Data for High Channel										
4 924.00	50.05	Peak	H	33.30	11.25	-	46.35	48.25	74.00	25.75
4 924.00	37.27	Average	H	33.30	11.25	0.38	46.35	35.85	54.00	18.15
4 924.00	50.09	Peak	V	33.30	11.25	-	46.35	48.29	74.00	25.71
4 924.00	37.12	Average	V	33.30	11.25	0.38	46.35	35.70	54.00	18.30

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – AMP Factor

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10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

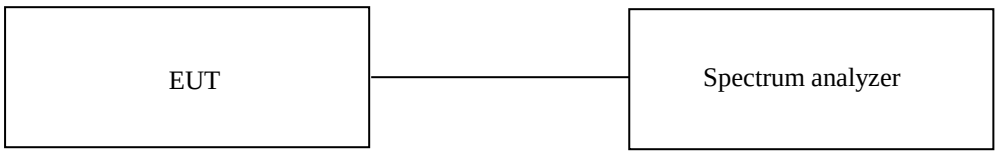
Temperature : 23 °C

Relative humidity : 45 % R.H.

10.2 Test set-up

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

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



10.3 Test Date

January 07, 2021 ~ January 28, 2021

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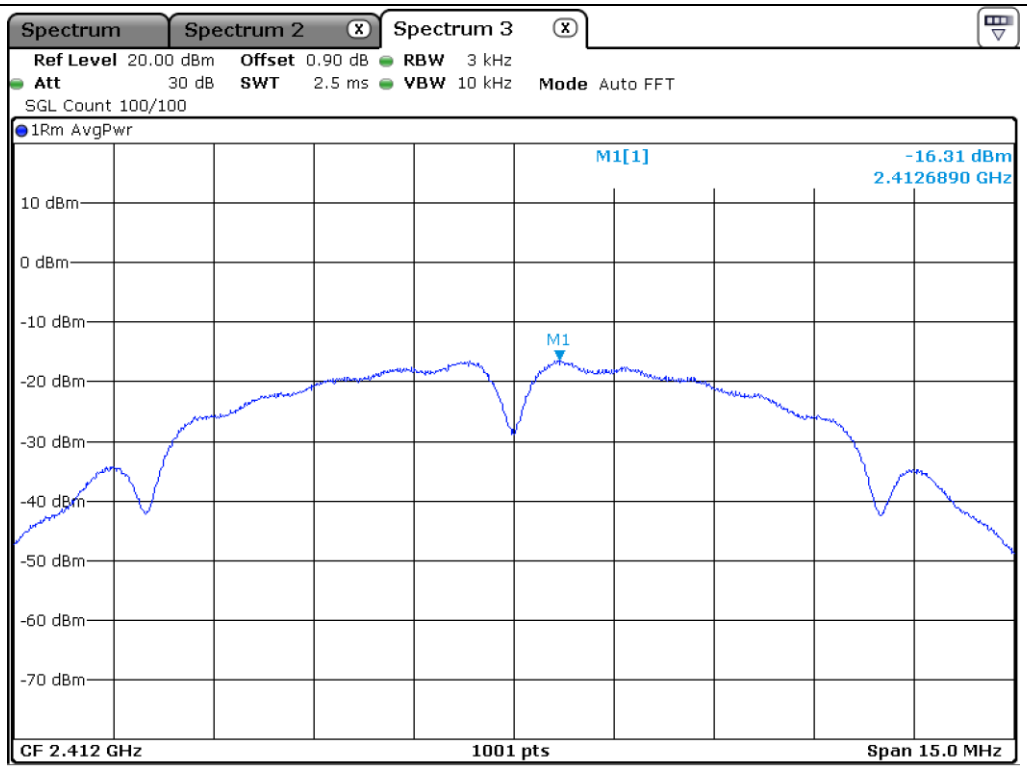
10.4 Test data for 802.11b WLAN Mode

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

Channel	Frequency (MHz)	Measured Value (dBm)	C.F (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412.00	-16.31	0.05	-16.27	8.00	24.27
Middle	2 437.00	-16.35	0.05	-16.31	8.00	24.31
High	2 462.00	-16.41	0.05	-16.37	8.00	24.37

Remark. Margin = Limit – Result (Measured Value + Correction Factor)



Low Channel

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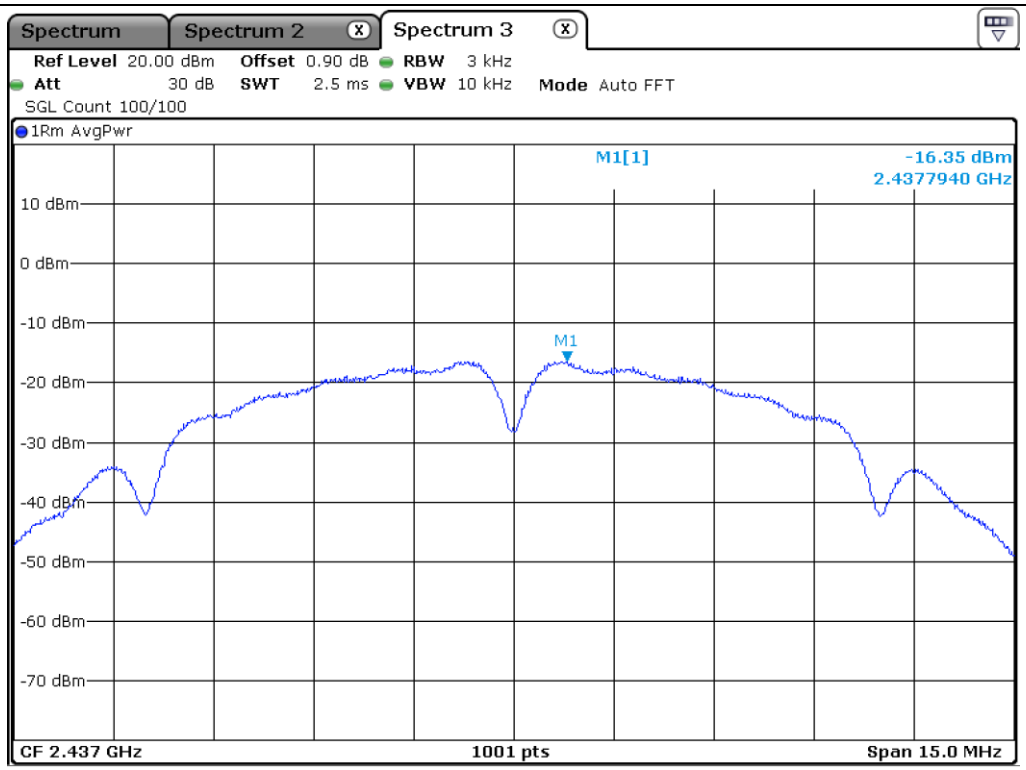
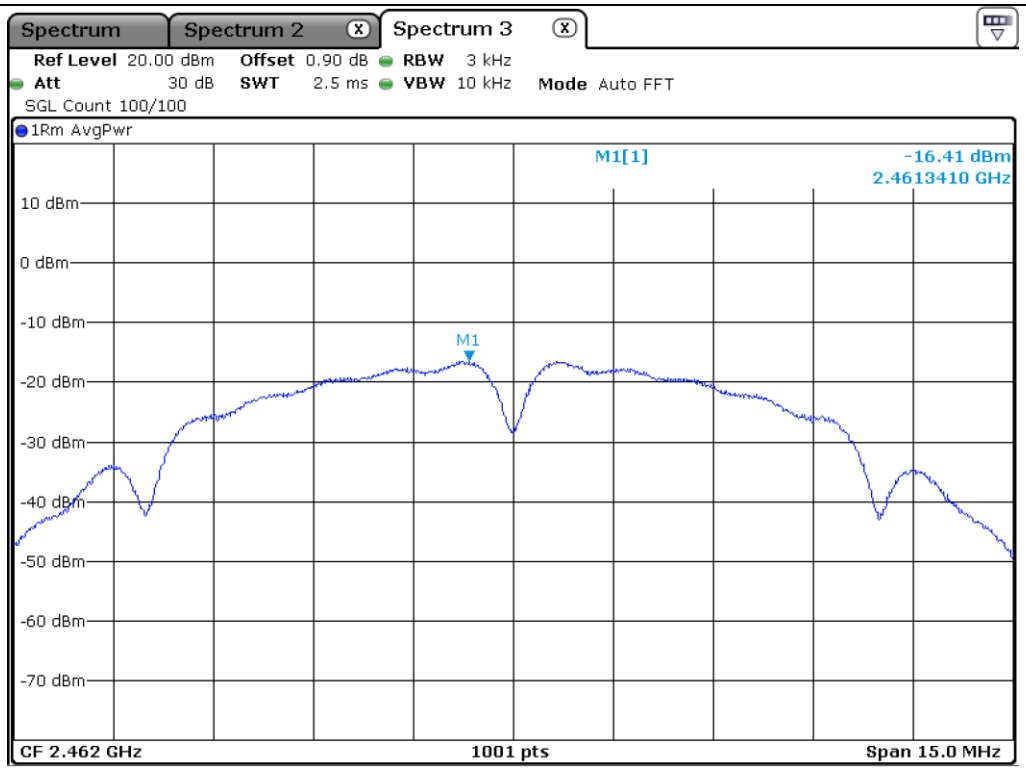


Middle Channel



High Channel

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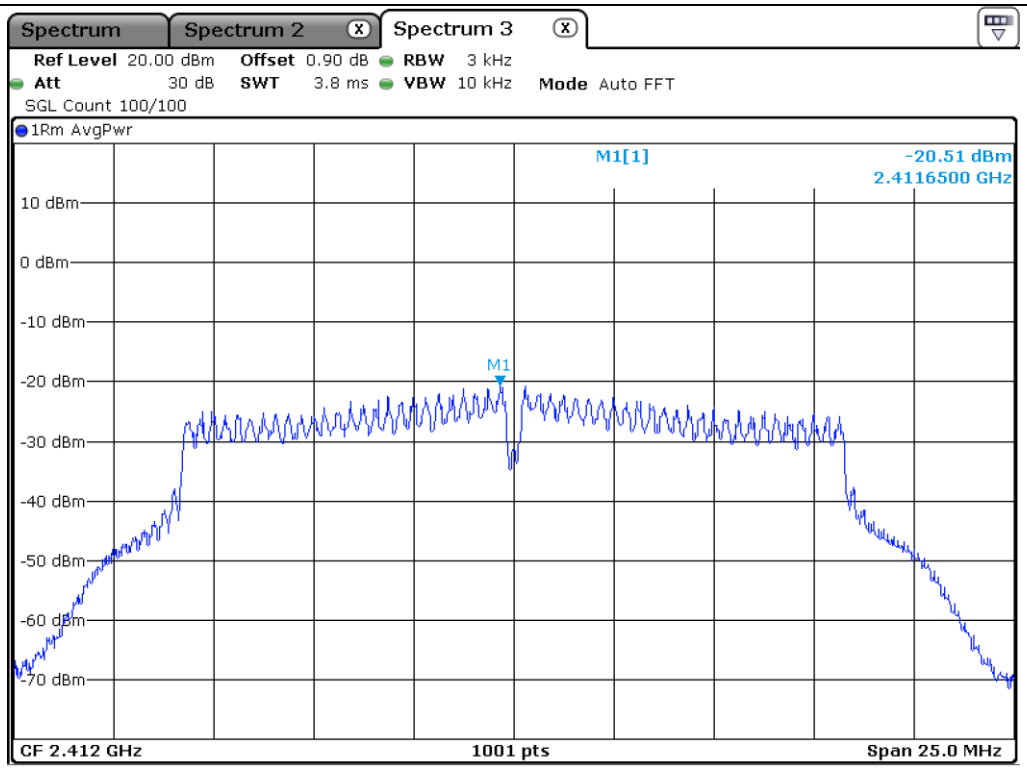
10.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

Channel	Frequency (MHz)	Measured Value (dBm)	C.F (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412.00	-20.51	0.35	-20.16	8.00	28.16
Middle	2 437.00	-20.43	0.35	-20.08	8.00	28.08
High	2 462.00	-20.60	0.35	-20.25	8.00	28.25

Remark. Margin = Limit – Result (Measured Value + Correction Factor)



Low Channel

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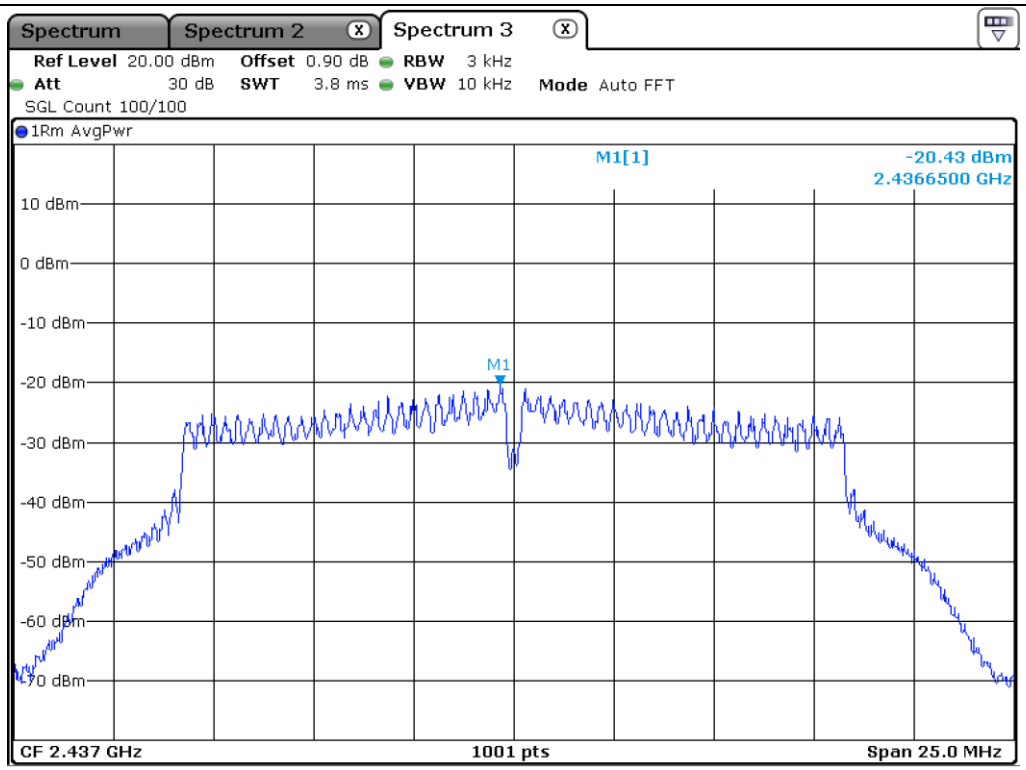
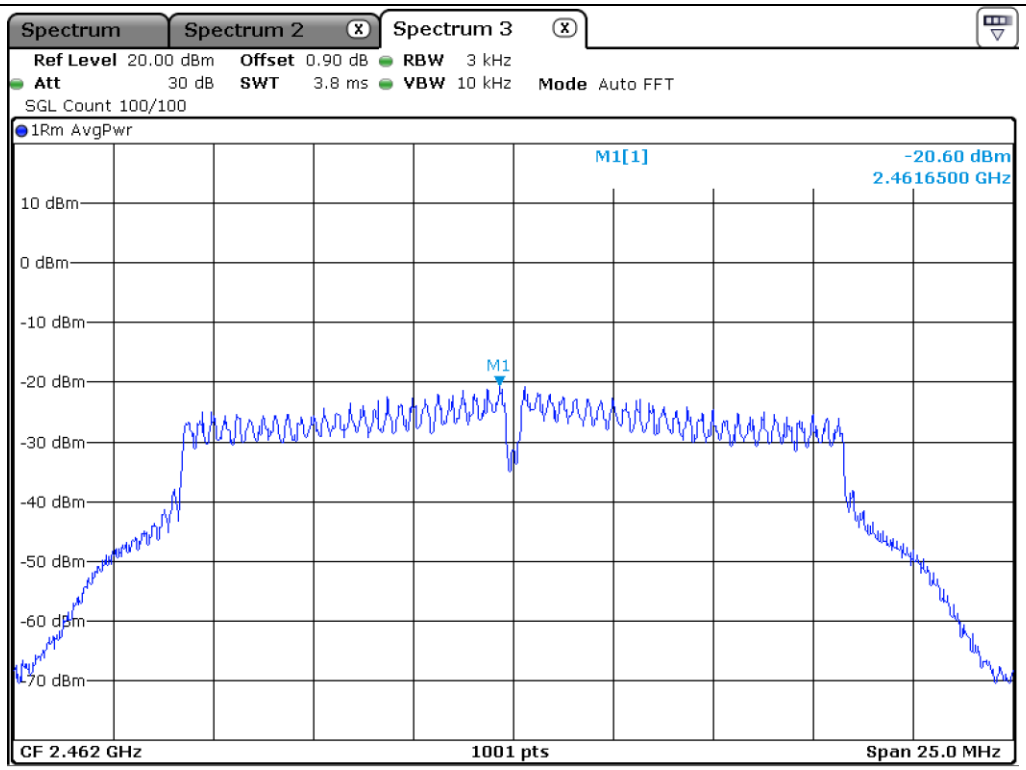


Middle Channel



High Channel

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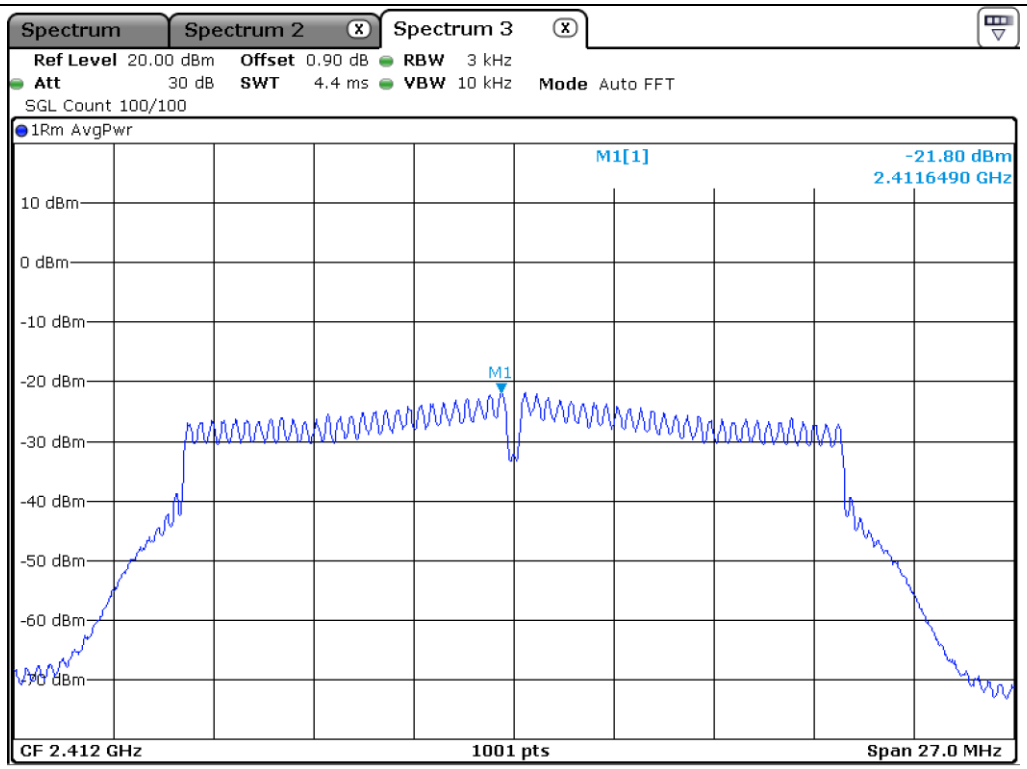
10.6 Test data for 802.11n_HT20 WLAN Mode

Channel	Frequency (MHz)	Measured Value (dBm)	C.F (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412.00	-21.80	0.38	-21.42	8.00	29.42
Middle	2 437.00	-21.59	0.38	-21.21	8.00	29.21
High	2 462.00	-21.43	0.38	-21.05	8.00	29.05

Remark. Margin = Limit – Result (Measured Value + Correction Factor)



Low Channel

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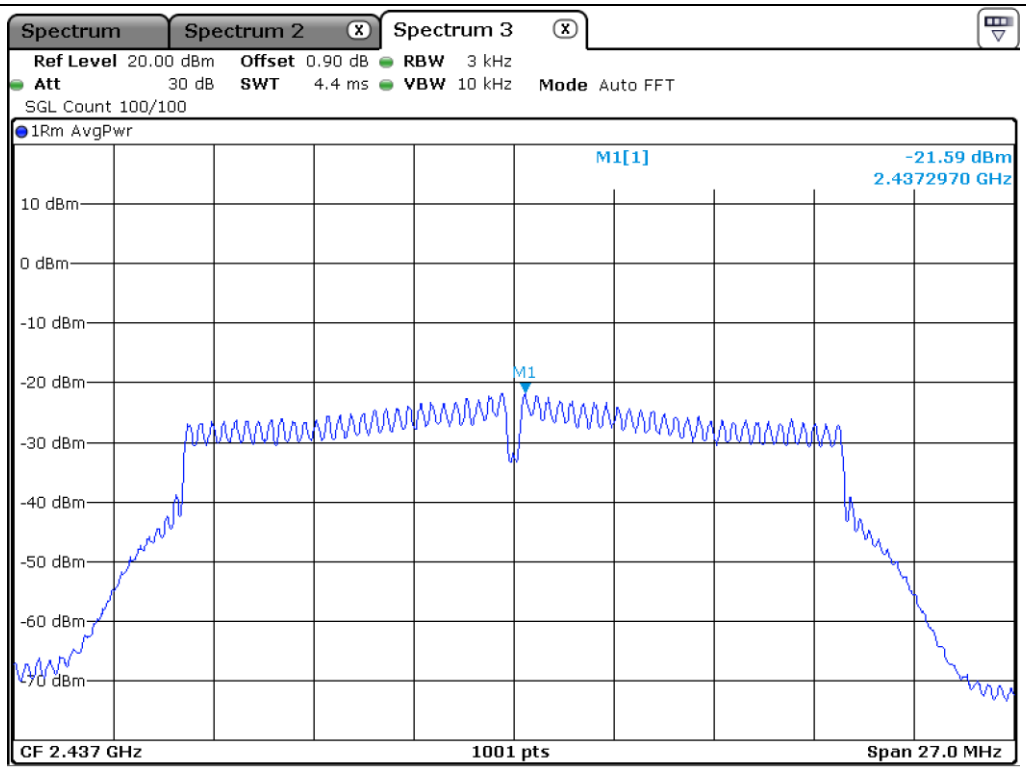
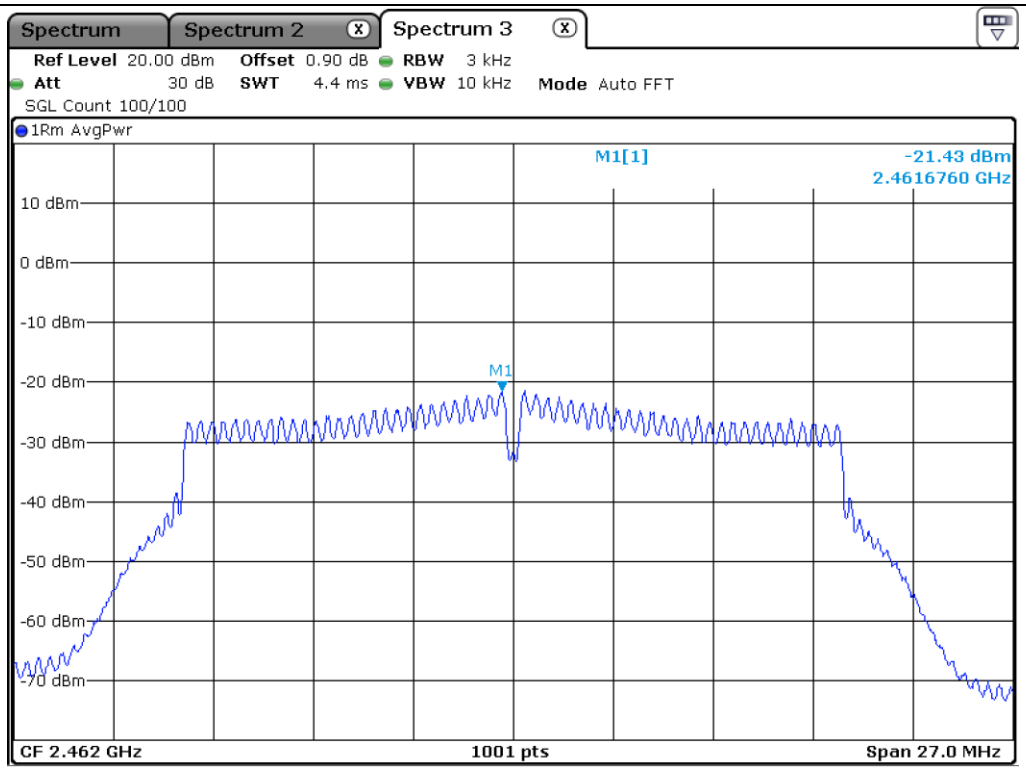


Middle Channel



High Channel

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11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature	:	23 °C
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 Date

January 07, 2021 ~ January 28, 2021

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11.4 Test data for 30 MHz ~ 1 000 MHz

11.4.1 Test data for WLAN 2.4 GHz

Humidity Level : 45 % R.H. Temperature: 23 °C

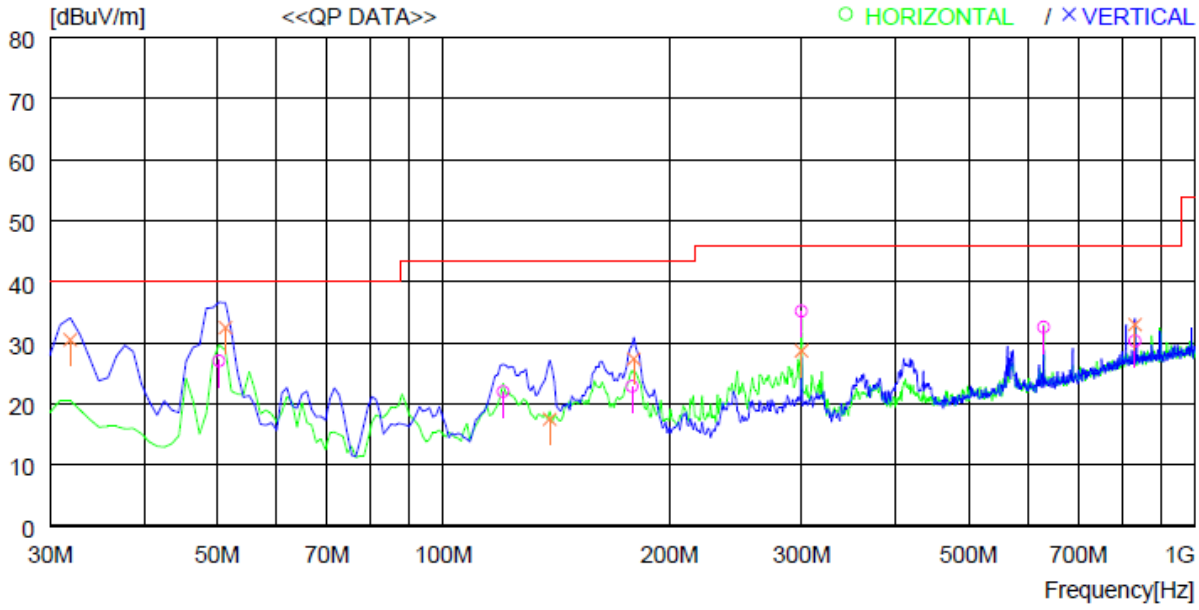
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : CAR NAVIGATION SYSTEM

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

-. Antenna 0, Antenna 1 and Multiple transmit tested, but the worst data were recorded.



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	50.370	45.2	13.1	0.9	32.1	27.1	40.0	12.9	400	0
2	120.210	34.0	18.6	1.4	32.0	22.0	43.5	21.5	400	336
3	178.410	36.5	16.7	1.7	32.0	22.9	43.5	20.6	200	0
4	299.660	45.9	19.2	2.1	32.0	35.2	46.0	10.8	100	290
5	629.457	37.3	24.6	3.1	32.4	32.6	46.0	13.4	200	0
6	832.181	30.9	27.2	4.1	31.9	30.3	46.0	15.7	400	0
----- Vertical ------										
7	31.940	41.4	20.3	0.8	32.0	30.5	40.0	9.5	100	321
8	51.340	50.7	13.0	0.9	32.1	32.5	40.0	7.5	100	0
9	138.640	28.7	19.4	1.4	32.0	17.5	43.5	26.0	100	0
10	179.380	41.1	16.6	1.7	32.0	27.4	43.5	16.1	100	4
11	299.660	39.4	19.2	2.1	32.0	28.7	46.0	17.3	100	134
12	832.181	33.6	27.2	4.1	31.9	33.0	46.0	13.0	400	46

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11.4.2 Test data for Intermodulation Mode(Bluetooth + WLAN 2.4 GHz)

Humidity Level : 45 % R.H. Temperature: 23 °C

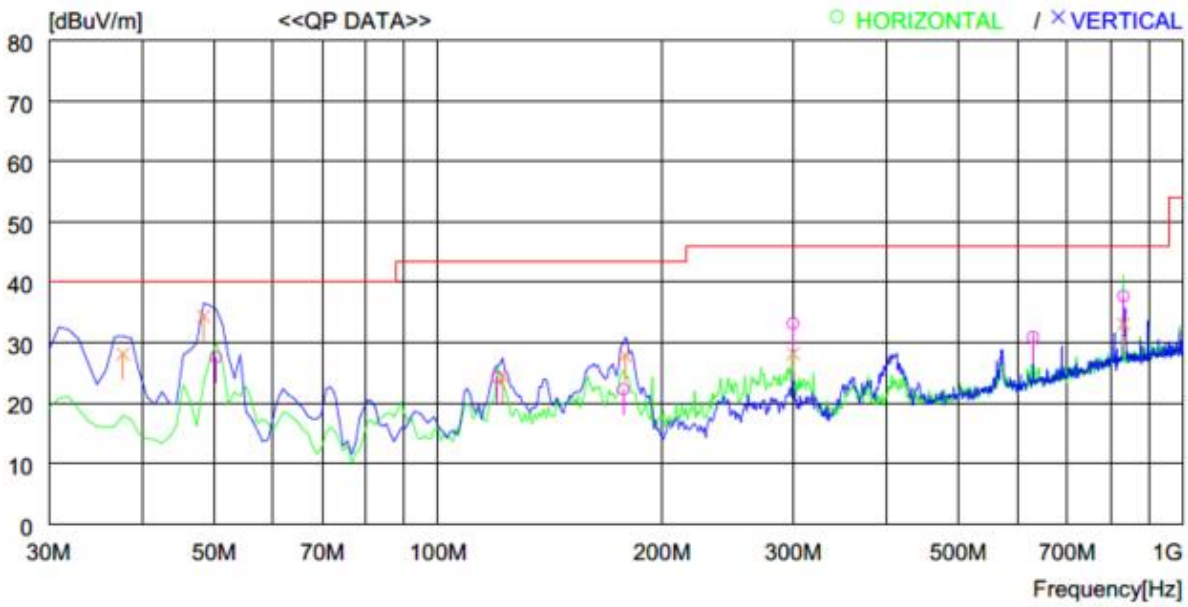
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : CAR NAVIGATION SYSTEM

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

-. Antenna 0, Antenna 1 and Multiple transmit tested, but the worst data were recorded.



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	50.370	45.7	13.1	0.9	32.1	27.6	40.0	12.4	400	359
2	120.210	36.3	18.6	1.4	32.0	24.3	43.5	19.2	300	0
3	177.440	35.8	16.8	1.7	32.0	22.3	43.5	21.2	300	0
4	299.660	43.9	19.2	2.1	32.0	33.2	46.0	12.8	100	10
5	629.457	35.6	24.6	3.1	32.4	30.9	46.0	15.1	200	137
6	832.181	38.3	27.2	4.1	31.9	37.7	46.0	8.3	100	156
----- Vertical ------										
7	37.760	41.1	18.1	0.9	32.0	28.1	40.0	11.9	100	359
8	48.430	51.8	13.8	0.9	32.1	34.4	40.0	5.6	100	359
9	122.150	36.3	18.7	1.4	32.0	24.4	43.5	19.1	100	99
10	178.410	41.5	16.7	1.7	32.0	27.9	43.5	15.6	100	359
11	299.660	38.9	19.2	2.1	32.0	28.2	46.0	17.8	100	359
12	832.181	33.7	27.2	4.1	31.9	33.1	46.0	12.9	300	359

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

11.5 Test data for Below 30 MHz

-. 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)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

11.6 Test data for above 1 GHz

-. 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

-. 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)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

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12. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	102177	Apr. 20, 2020 (1Y)
FSW43	Rohde & Schwarz	Signal Analyzer	104544	Jul. 15, 2020 (1Y)
ESW	Rohde & Schwarz	EMI Test Receiver	101851	Mar. 27, 2020 (1Y)
CMW500	Rohde & Schwarz	WIDEBAND RADIO COMMUNICATION TESTER	145762	Feb. 09, 2021 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 16, 2020 (1Y)
PAM-118A	Com-Power	Pre-Amplifier	18040081	Oct. 12, 2020 (1Y)
PAM-840A	Com-Power	Pre-Amplifier	461339	Oct. 16, 2020 (1Y)
DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2020 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Feb. 27, 2020 (2Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 15, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2021(1Y)