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

Test Report No.	**: OT-209-RWD-062**
Reception No.	**: 2008003233**
Applicant	**: Samsung Electronics Co Ltd**
Address	**: 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States**
Manufacturer	**: Samsung Electronics Co Ltd**
Address	**: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea**
Type of Equipment	**: Wi-Fi/BT Transceiver**
FCC ID.	**: A3LWCA732M**
Model Name	**: WCA732M**
Serial number	**: N/A**
Total page of Report	**: 56 pages (including this page)**
Date of Incoming	**: August 20, 2020**
Date of issue	**: September 21, 2020**

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 / Assistant Manager	Tae-Ho, Kim / Senior 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-209-RWD-062	September 21, 2020	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : Samsung Electronics Co Ltd

Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States

Contact Person : Youngjoong Noh / Principal Engineer

Telephone No. : +82-31-277-0598

FCC ID : A3LWCA732M

Model Name : WCA732M

Brand Name :

Serial Number : N/A

Date : September 21, 2020

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Modular Transmitter, Wi-Fi/BT Transceiver
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 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 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-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

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

3. GENERAL INFORMATION

3.1 Product Description

The Samsung Electronics Co Ltd, Model WCA732M (referred to as the EUT in this report) is a Wi-Fi/BT Transceiver. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Wi-Fi/BT Transceiver	
Temperature Range	-20 °C ~ 50 °C	
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	Bluetooth	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))
		2 422 MHz ~ 2 462 MHz (802.11n(HT40))
	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))
	5 250 MHz ~ 5 350 MHz Band	5 260 MHz ~ 5 320 MHz (802.11a/n(HT20)/ac(VHT20))
		5 270 MHz ~ 5 310 MHz (802.11n(HT40)/ac(VHT40))
		5 290 MHz (802.11ac(VHT80))
	5 470 MHz ~ 5 725 MHz Band	5 500 MHz ~ 5 700 MHz (802.11a/n(HT20)/ac(VHT20))
		5 510 MHz ~ 5 670 MHz (802.11n(HT40)/ac(VHT40))
		5 530 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 LE	GFSK for 1 Mbps / 2 Mbps
	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)/n(HT40): 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 LE	1 Mbps	9.85 dBm
		2 Mbps	9.82 dBm
	Bluetooth	1 Mbps	9.93 dBm
		2 Mbps	9.60 dBm
		3 Mbps	9.67 dBm
	WLAN 2.4 GHz	Antenna 0	18.65 dBm(802.11b) 15.81 dBm(802.11g) 15.71 dBm(802.11n_HT20) 13.39 dBm(802.11n_HT40)
		Antenna 1	18.55 dBm(802.11b) 15.40 dBm(802.11g) 15.14 dBm(802.11n_HT20) 13.25 dBm(802.11n_HT40)
		Multiple Antenna	18.41 dBm(802.11g) 18.21 dBm(802.11n_HT20) 16.31 dBm(802.11n_HT40)

RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	Antenna 0	12.21 dBm(802.11a) 11.95 dBm(802.11n_HT20) 10.15 dBm(802.11n_HT40) 9.97 dBm(802.11ac_VHT80)
		Antenna 1	12.42 dBm(802.11a) 12.11 dBm(802.11n_HT20) 10.14 dBm(802.11n_HT40) 9.84 dBm(802.11ac_VHT80)
		Multiple Antenna	15.33 dBm(802.11a) 15.01 dBm(802.11n_HT20) 13.16 dBm(802.11n_HT40) 12.92 dBm(802.11ac_VHT80)
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	13.65 dBm(802.11a) 13.57 dBm(802.11n_HT20) 11.60 dBm(802.11n_HT40) 11.17 dBm(802.11ac_VHT80)
		Antenna 1	12.18 dBm(802.11a) 11.88 dBm(802.11n_HT20) 10.35 dBm(802.11n_HT40) 9.71 dBm(802.11ac_VHT80)
		Multiple Antenna	15.83 dBm(802.11a) 15.64 dBm(802.11n_HT20) 13.81 dBm(802.11n_HT40) 13.51 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 470 MHz ~ 5 725 MHz Band	Antenna 0	14.11 dBm(802.11a) 13.95 dBm(802.11n_HT20) 12.16 dBm(802.11n_HT40) 11.80 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	12.10 dBm(802.11a) 12.27 dBm(802.11n_HT20) 10.69 dBm(802.11n_HT40) 11.65 dBm(802.11ac_VHT80)
		Antenna 1	11.16 dBm(802.11a) 10.89 dBm(802.11n_HT20) 11.38 dBm(802.11n_HT40) 10.95 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	13.12 dBm(802.11a) 13.00 dBm(802.11n_HT20) 10.79 dBm(802.11n_HT40) 12.23 dBm(802.11ac_VHT80)
		Multiple Antenna	15.89 dBm(802.11a) 15.69 dBm(802.11n_HT20) 14.66 dBm(802.11n_HT40) 14.41 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	15.65 dBm(802.11a) 15.66 dBm(802.11n_HT20) 13.75 dBm(802.11n_HT40) 14.96 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 725 MHz ~ 5 850 MHz Band	Antenna 0	13.21 dBm(802.11a) 12.93 dBm(802.11n_HT20) 11.03 dBm(802.11n_HT40) 10.95 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	4.04 dBm(802.11a) 4.66 dBm(802.11n_HT20) -1.44 dBm(802.11n_HT40) -3.22 dBm(802.11ac_VHT80)
		Antenna 1	10.11 dBm(802.11a) 9.58 dBm(802.11n_HT20) 11.07 dBm(802.11n_HT40) 10.91 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	5.07 dBm(802.11a) 5.45 dBm(802.11n_HT20) -1.40 dBm(802.11n_HT40) -2.70 dBm(802.11ac_VHT80)
		Multiple Antenna	14.88 dBm(802.11a) 14.58 dBm(802.11n_HT20) 14.06 dBm(802.11n_HT40) 13.94 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	7.60 dBm(802.11a) 8.08 dBm(802.11n_HT20) 1.59 dBm(802.11n_HT40) 0.06 dBm(802.11ac_VHT80)

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ANTENNA TYPE	Chip Antenna		
ANTENNA GAIN	Bluetooth LE	0.28 dBi	
	Bluetooth	0.28 dBi	
	WLAN 2.4 GHz	Antenna 0	1.80 dBi
		Antenna 1	1.83 dBi
		Multiple Antenna	4.83 dBi
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	-0.54 dBi
		Antenna 1	-3.09 dBi
		Multiple Antenna	1.38 dBi
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	0.00 dBi
		Antenna 1	-1.42 dBi
		Multiple Antenna	2.36 dBi
	5 470 MHz ~ 5 725 MHz Band	Antenna 0	2.34 dBi
		Antenna 1	0.37 dBi
		Multiple Antenna	4.48 dBi
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	-0.30 dBi
		Antenna 1	-1.37 dBi
		Multiple Antenna	2.21 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	40 MHz		

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

-. None

4. EUT MODIFICATIONS

-. None

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5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Samsung Electronics Co Ltd	WCA732M	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
WCA732M	Samsung Electronics Co Ltd	Wi-Fi/BT Transceiver (EUT)	
HP Probook	HP	Notebook PC	EUT
PPP009L-E	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	

5.3 Mode of operation during the test

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

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

Channel	Frequency
0	2 402
19	2 440
39	2 480

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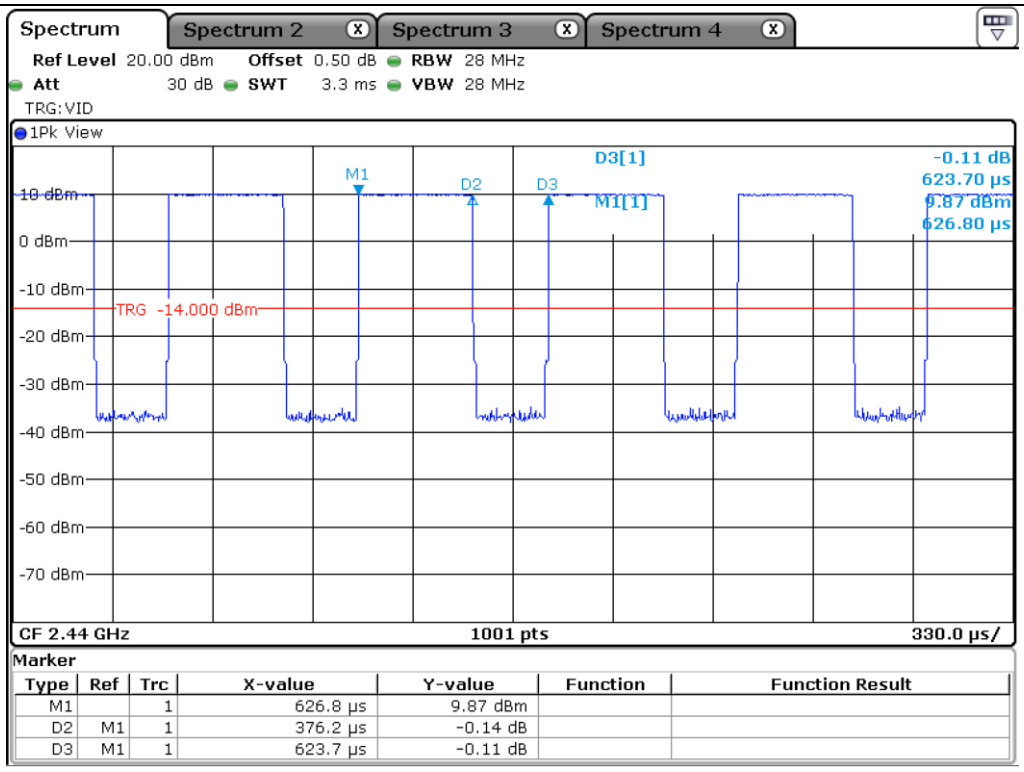
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE [1 Mbps]	0.376 2	0.247 5	60.32	2.20
Bluetooth LE [2 Mbps]	0.191 4	0.432 3	30.69	5.13

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

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

-. Test Plot



Bluetooth LE_1 Mbps

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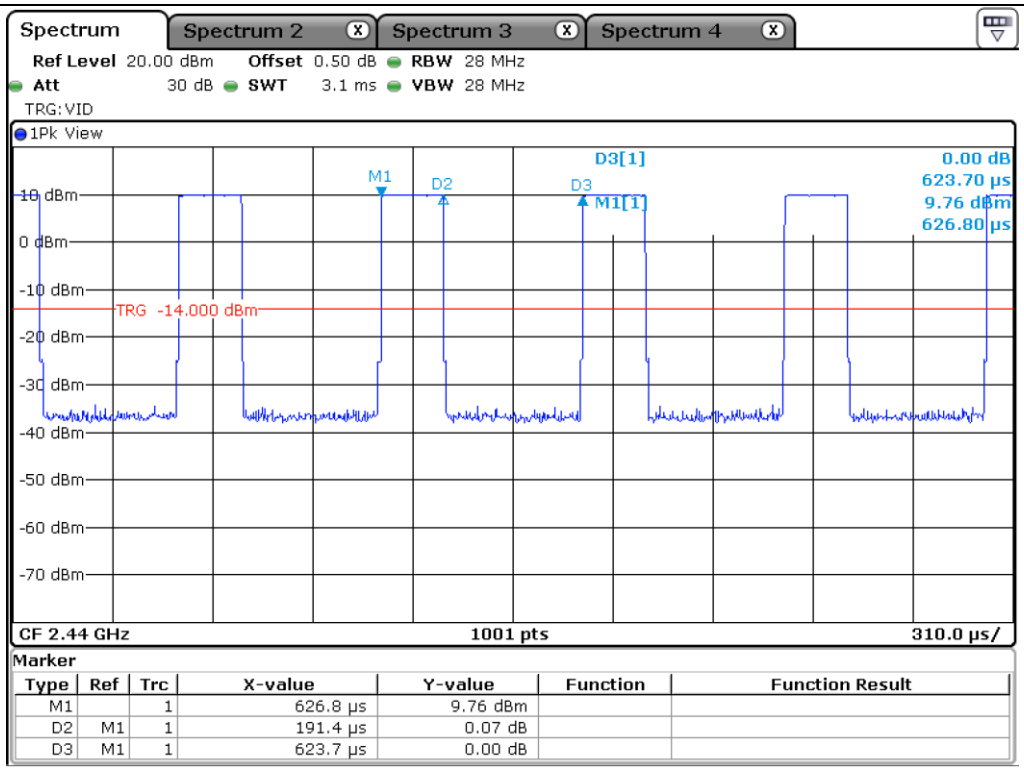

Bluetooth LE_2 Mbps

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5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to USB and the power of USB was connected to Notebook PC. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The antenna of the EUT is a Chip Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

7. MINIMUM 6 dB BANDWIDTH

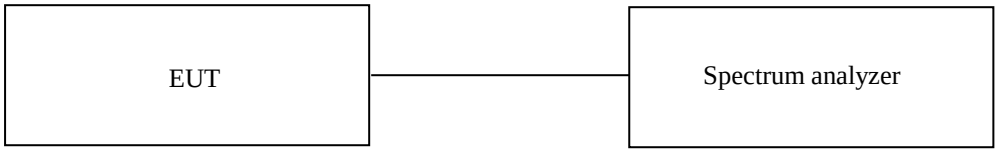
7.1 Operating environment

Temperature : 23 °C

Relative humidity : 41 % 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

August 21, 2020 ~ September 08, 2020

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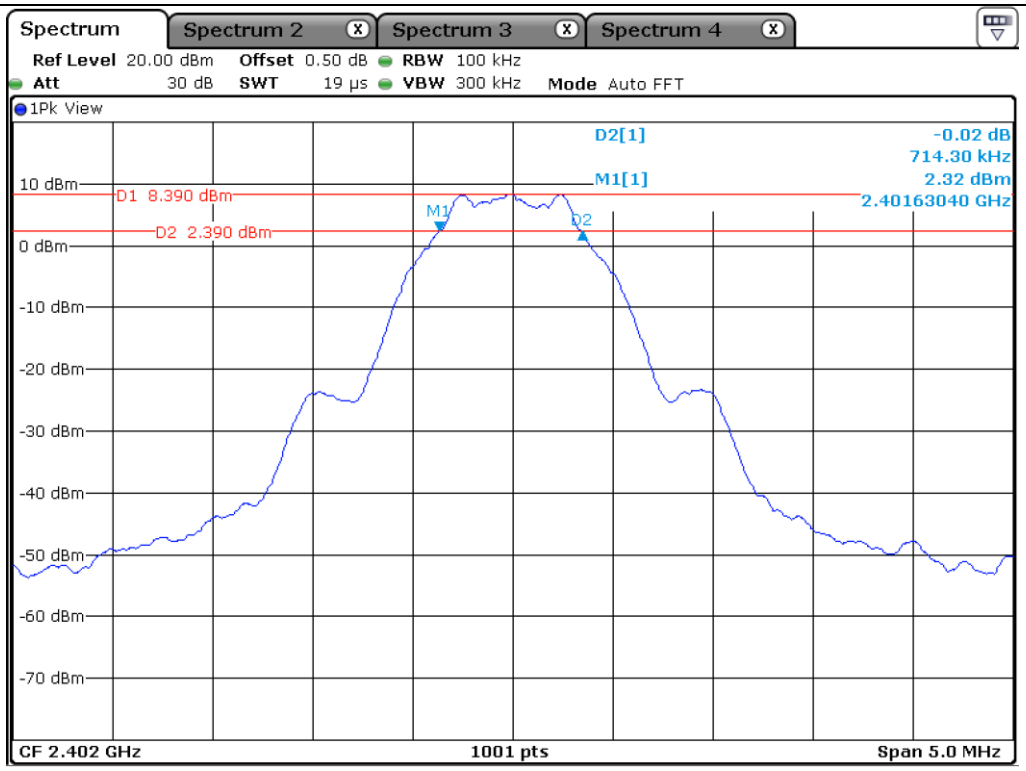
7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	714.30	500.00	214.30
Middle	2 440.00	714.30	500.00	214.30
High	2 480.00	714.30	500.00	214.30

Remark. Margin = Measured Value - Limit



Low Channel

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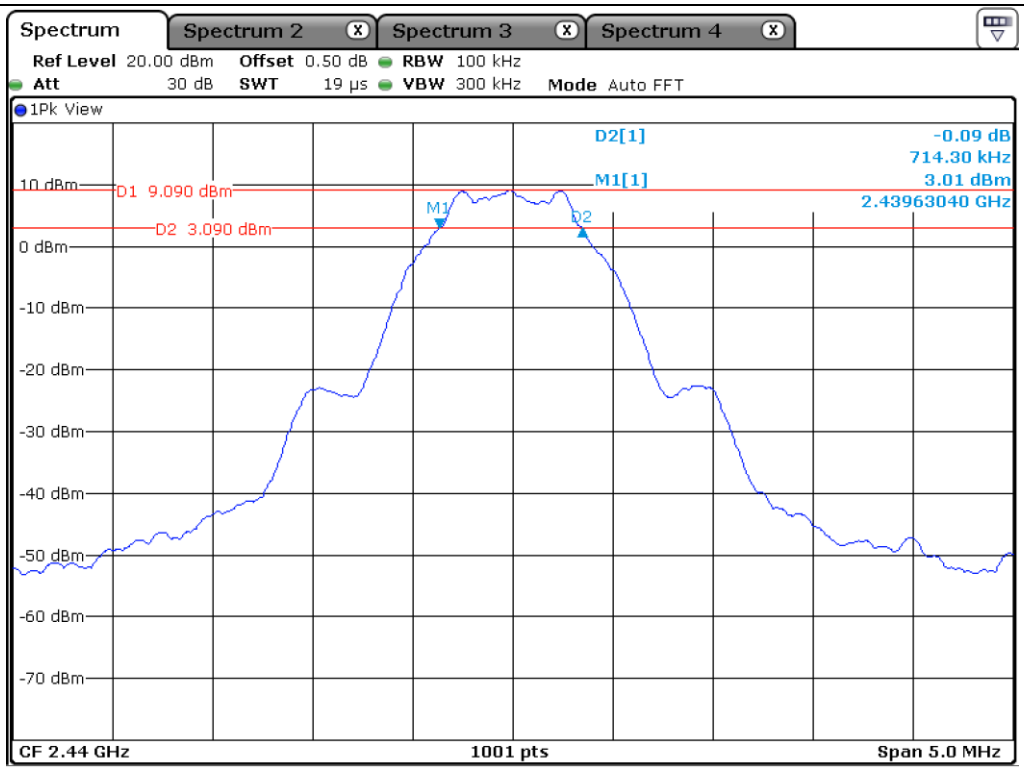
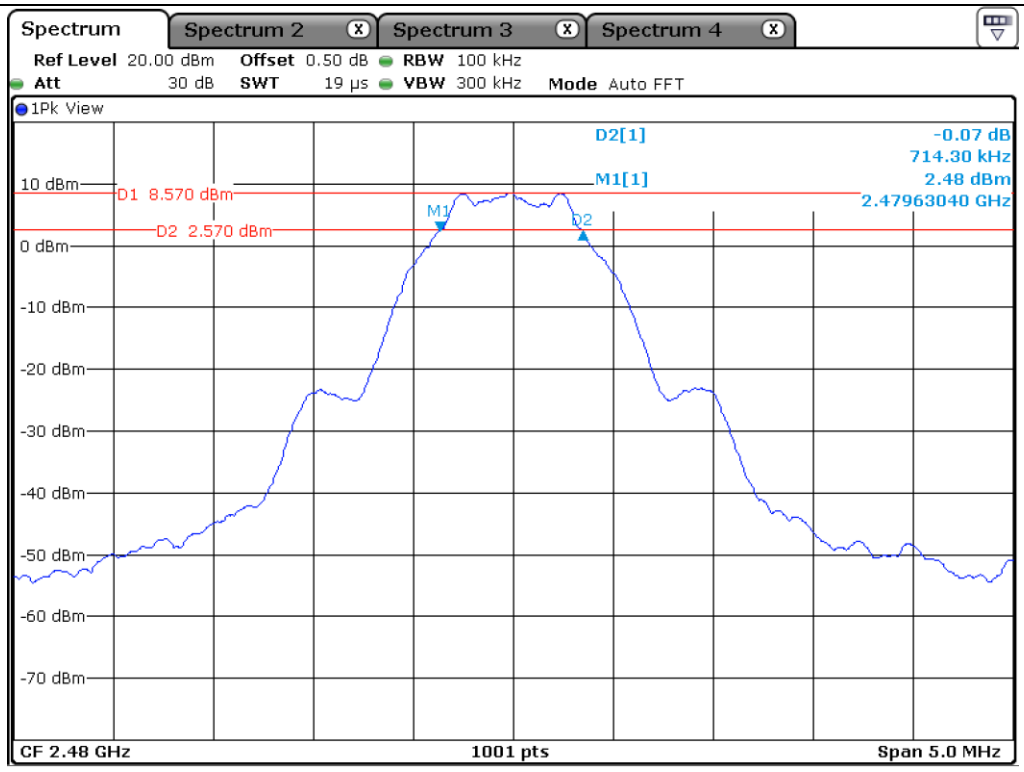


Middle Channel



High Channel

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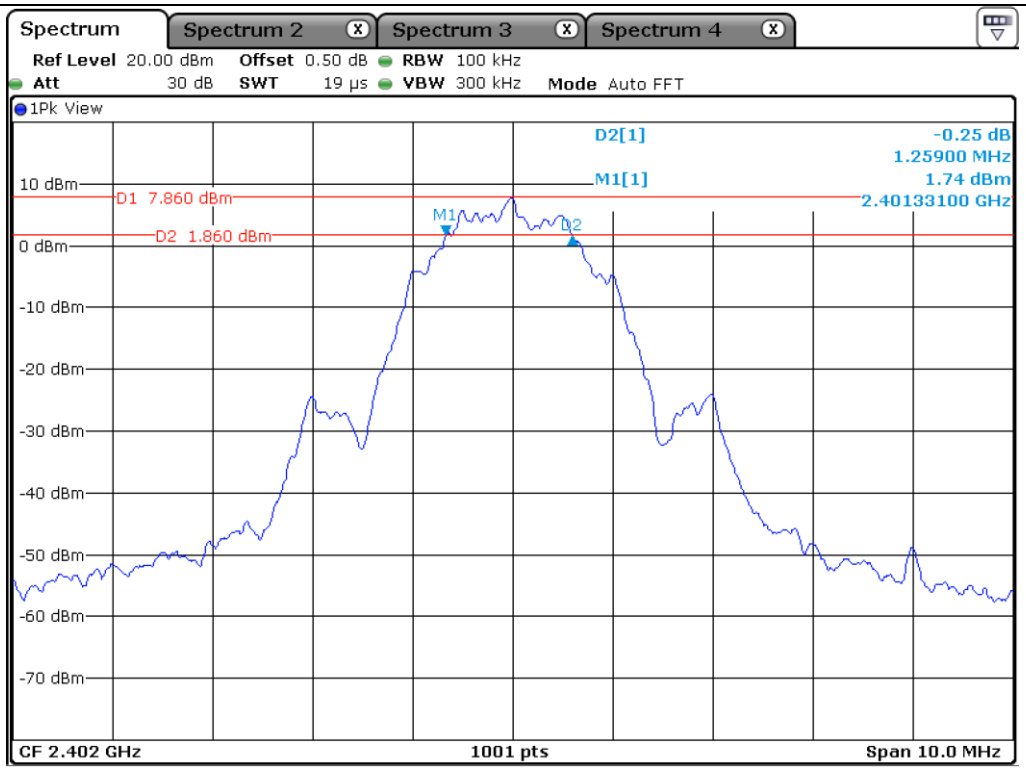
7.5 Test data for 2 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	1 259.00	500.00	759.00
Middle	2 440.00	1 259.00	500.00	759.00
High	2 480.00	1 263.00	500.00	763.00

Remark. Margin = Measured Value - Limit



Low Channel

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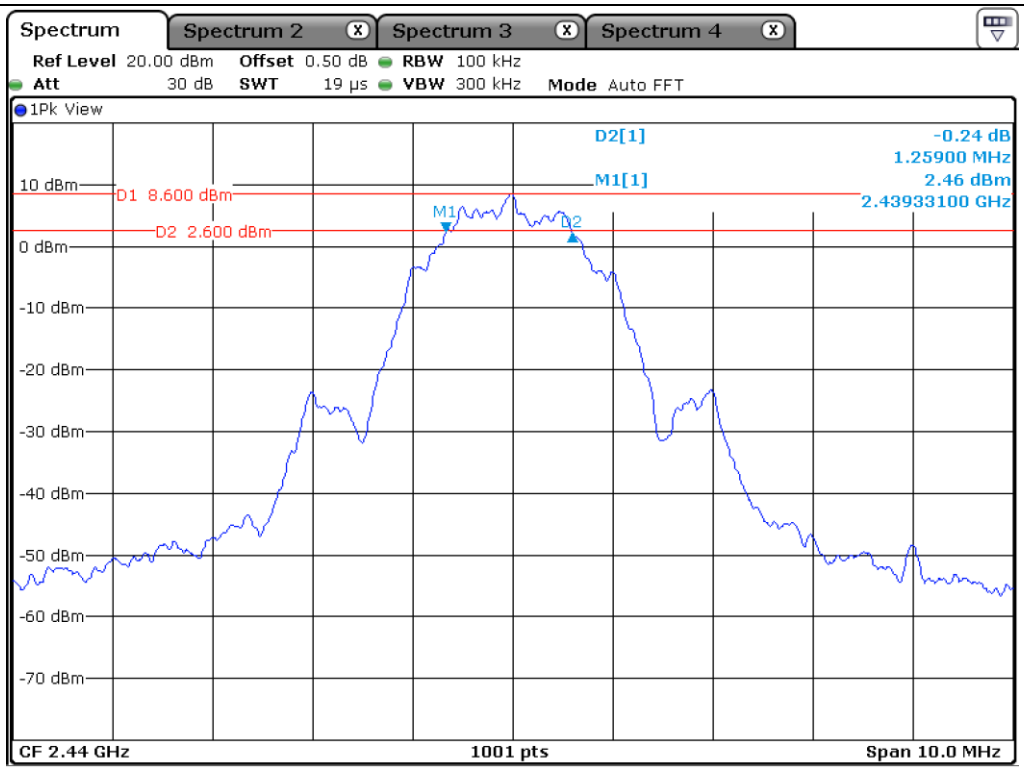
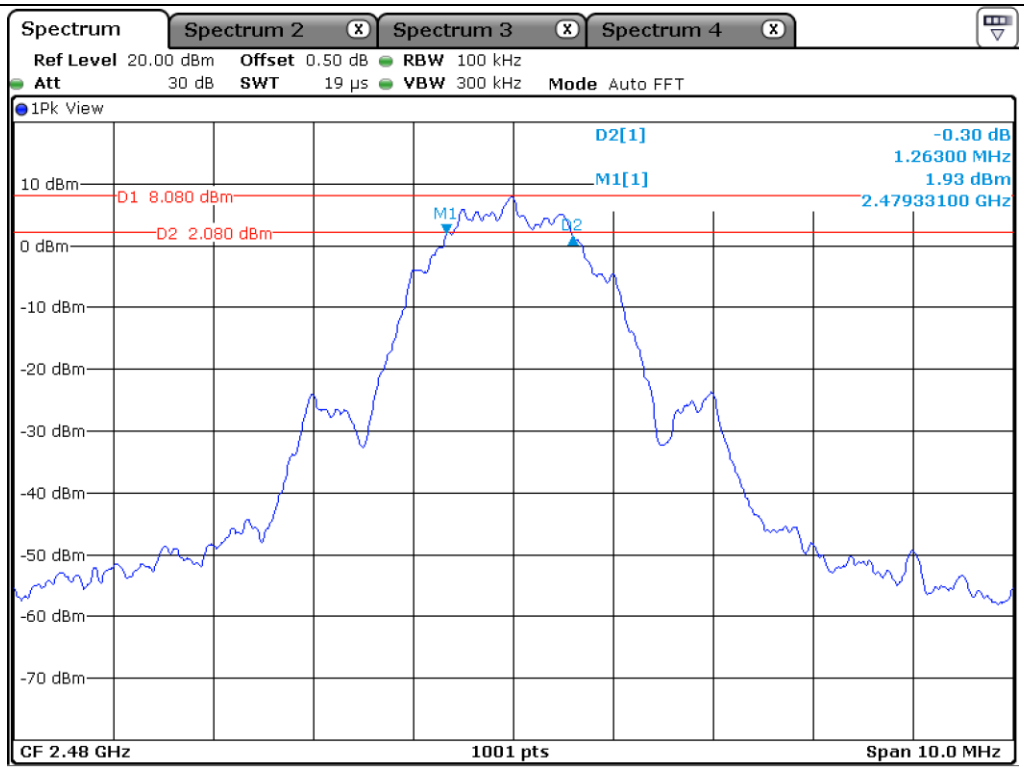


Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

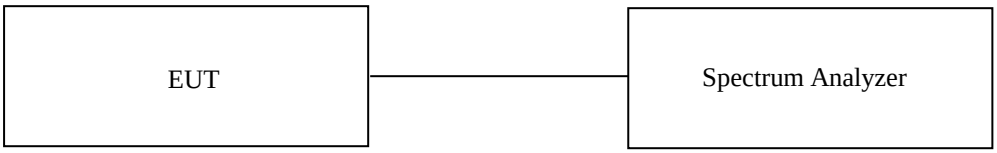
Temperature : 23 °C

Relative humidity : 41 % R.H.

8.2 Test set-up

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

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



8.3 Test Date

August 21, 2020 ~ September 08, 2020

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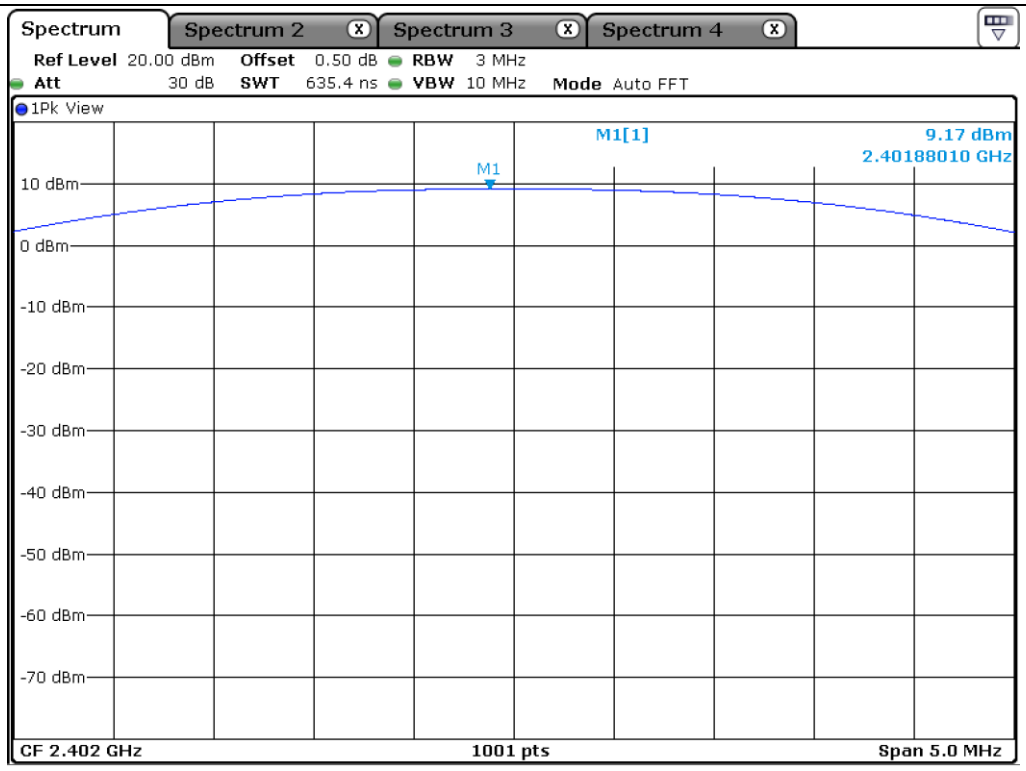
8.4 Test data for 1 Mbps

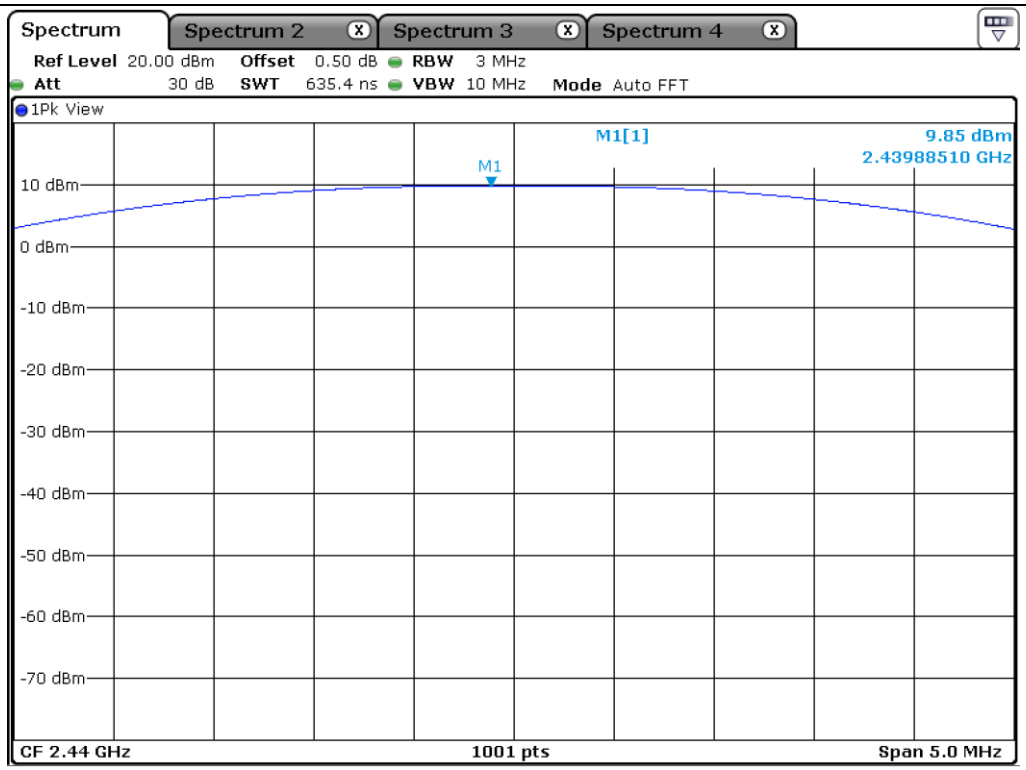
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.17	30.00	20.83
MIDDLE	2 440.00	9.85	30.00	20.15
HIGH	2 480.00	9.34	30.00	20.66

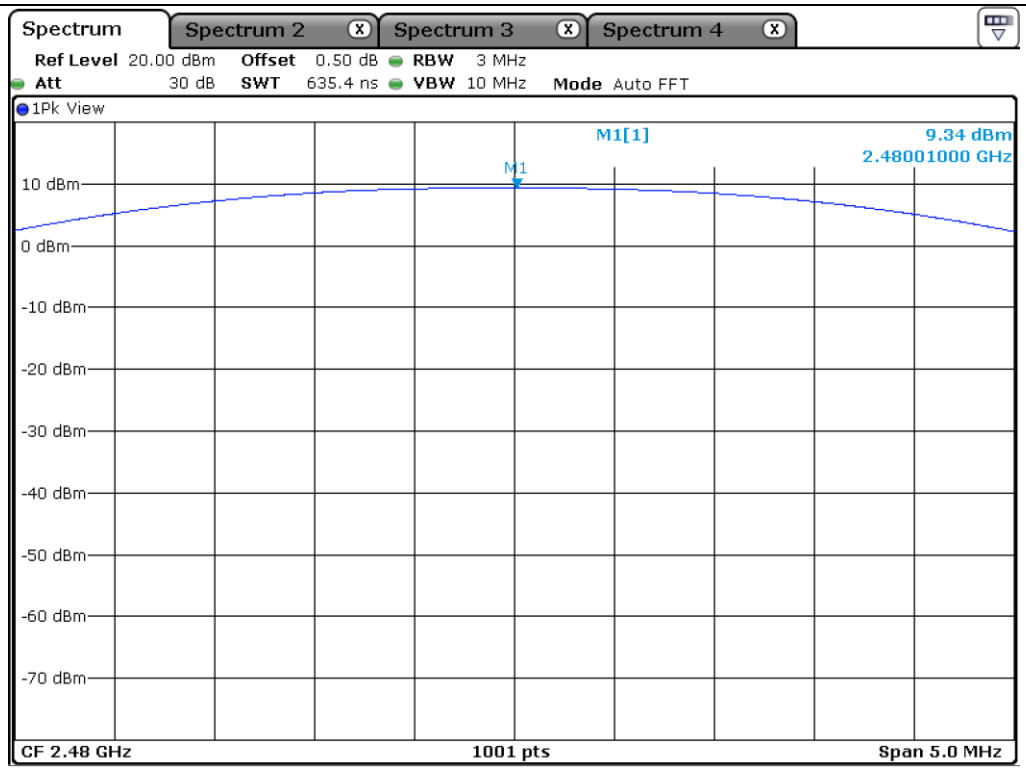
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel



High Channel

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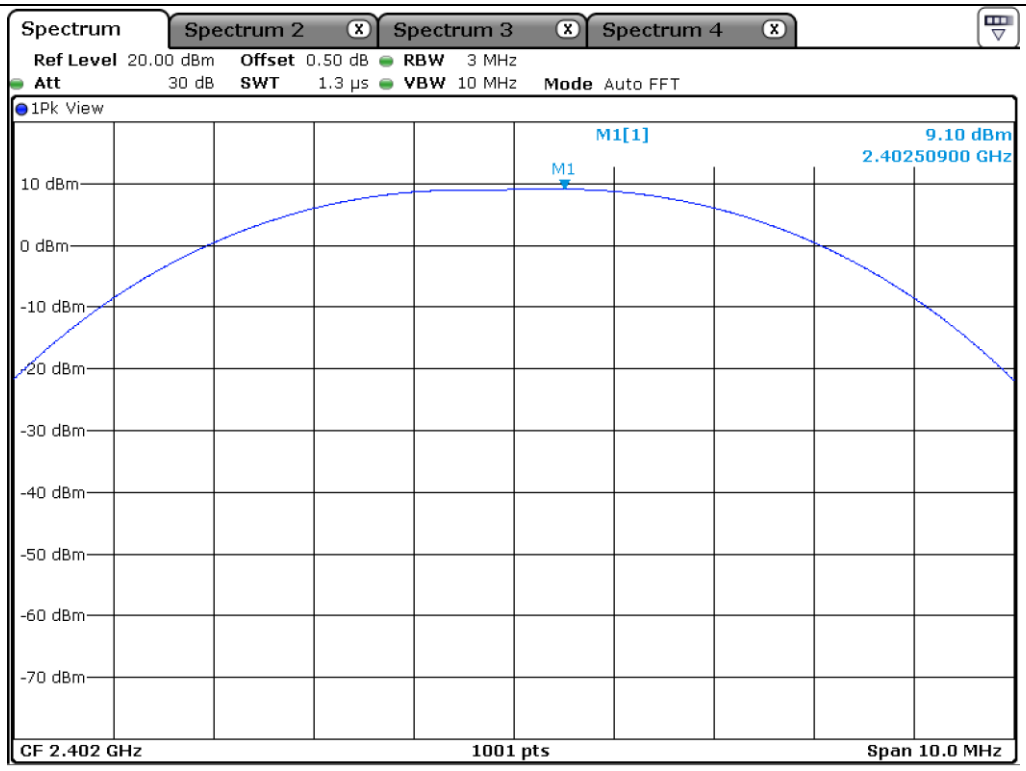
8.5 Test data for 2 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.10	30.00	20.90
MIDDLE	2 440.00	9.82	30.00	20.18
HIGH	2 480.00	9.32	30.00	20.68

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



Low Channel

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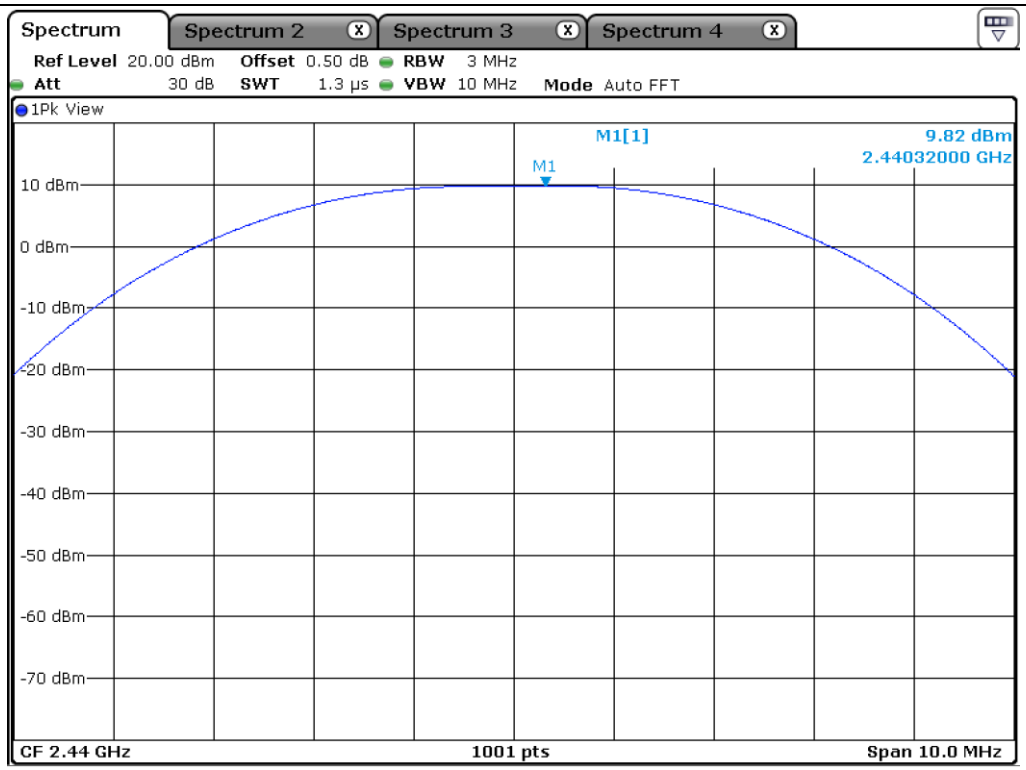
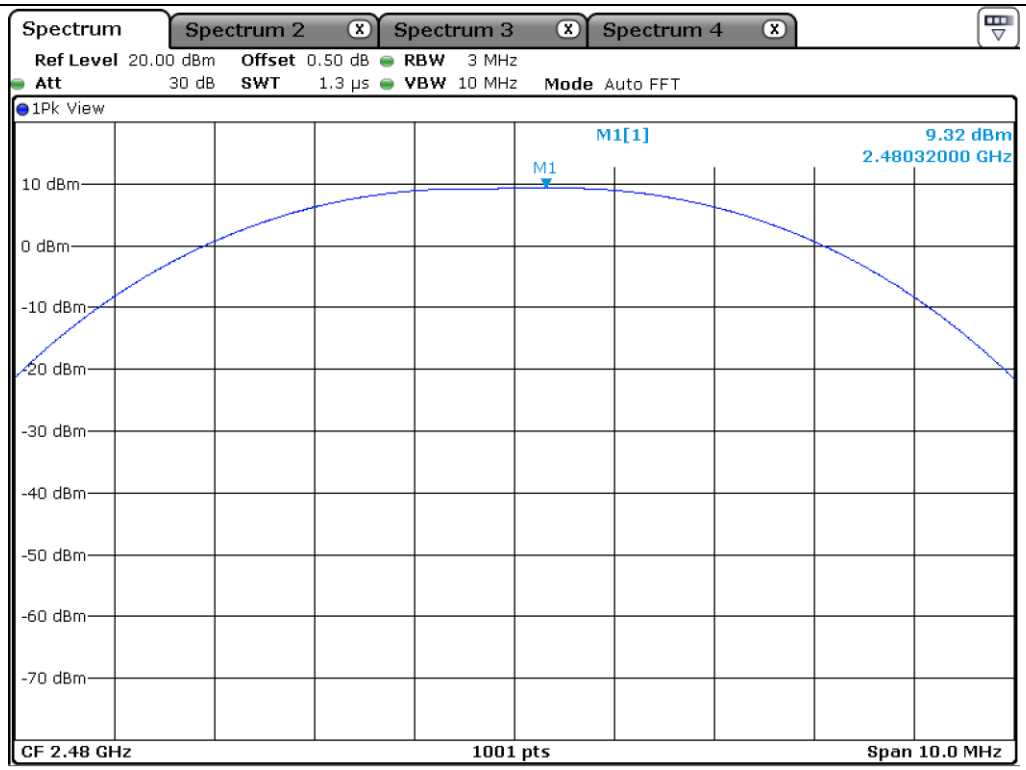


Middle Channel



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)

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

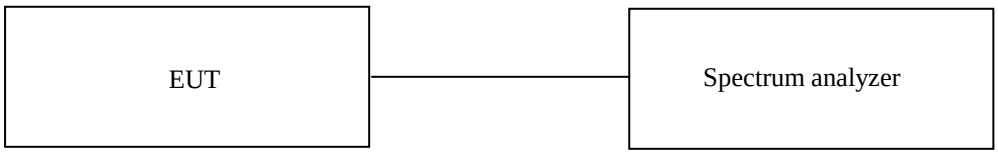
9.1 Operating environment

Temperature : 23 °C

Relative humidity : 41 % R.H.

9.2 Test set-up for conducted measurement

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



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

August 21, 2020 ~ September 08, 2020

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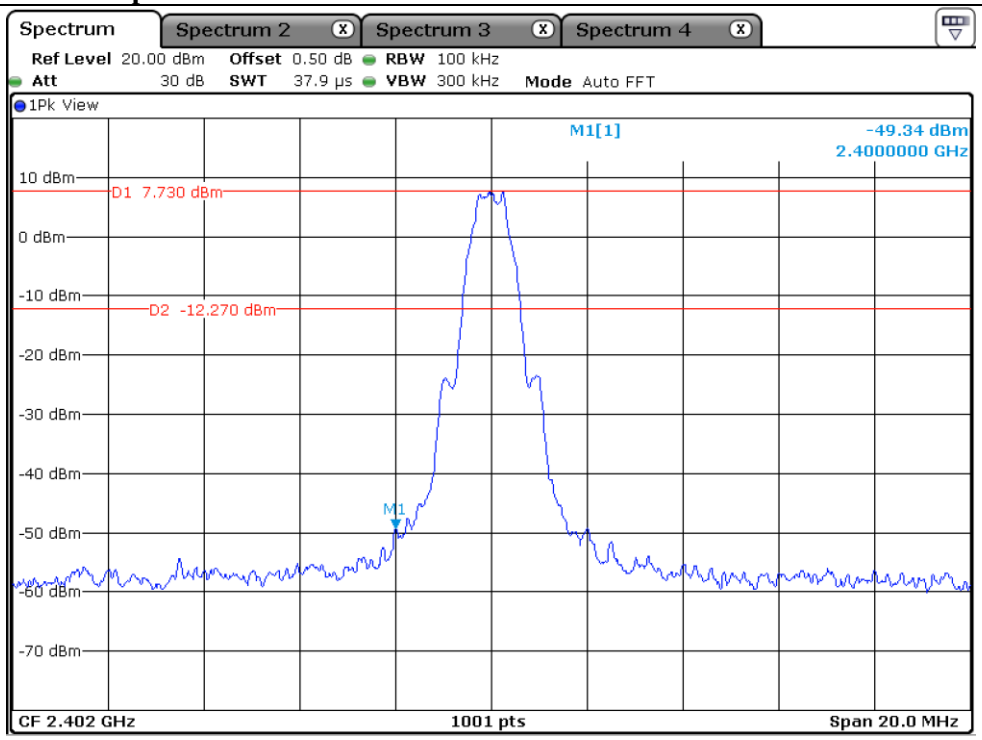
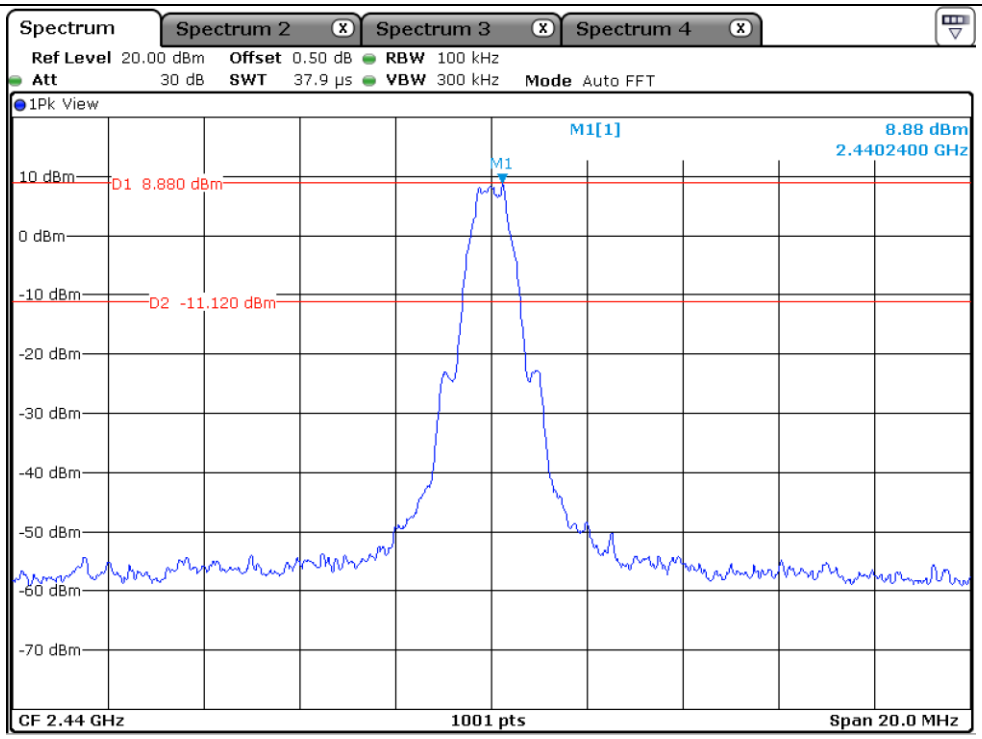
9.5 Test data for conducted emission

9.5.1 Test data for 1 Mbps

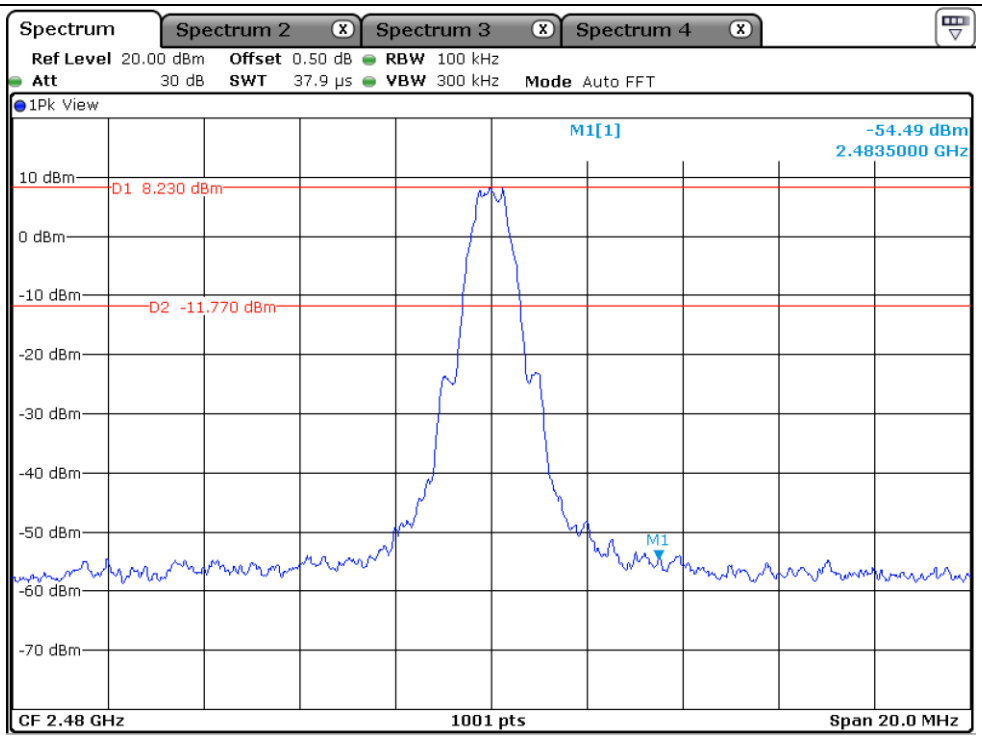


Low Channel

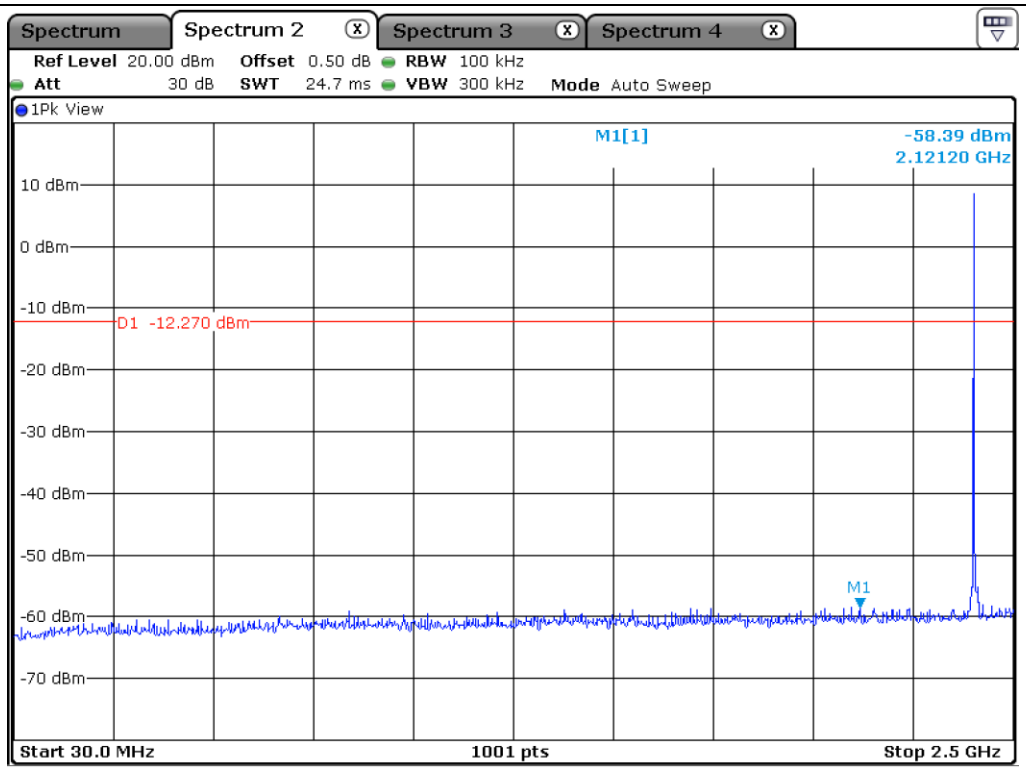


Middle Channel

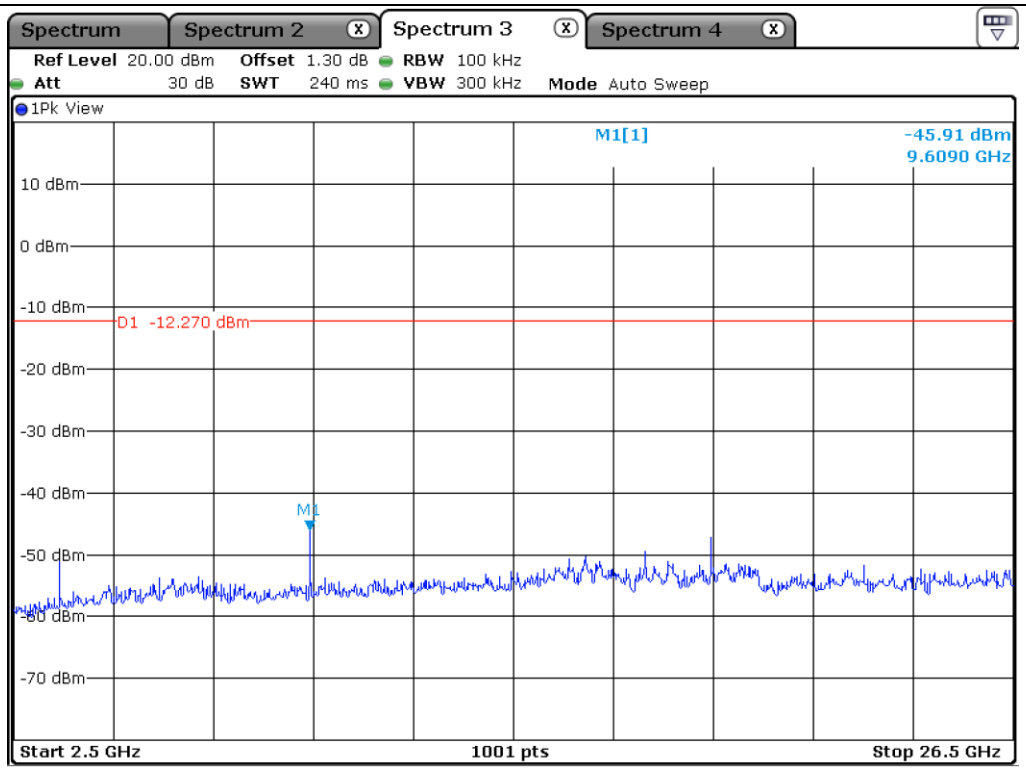
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel

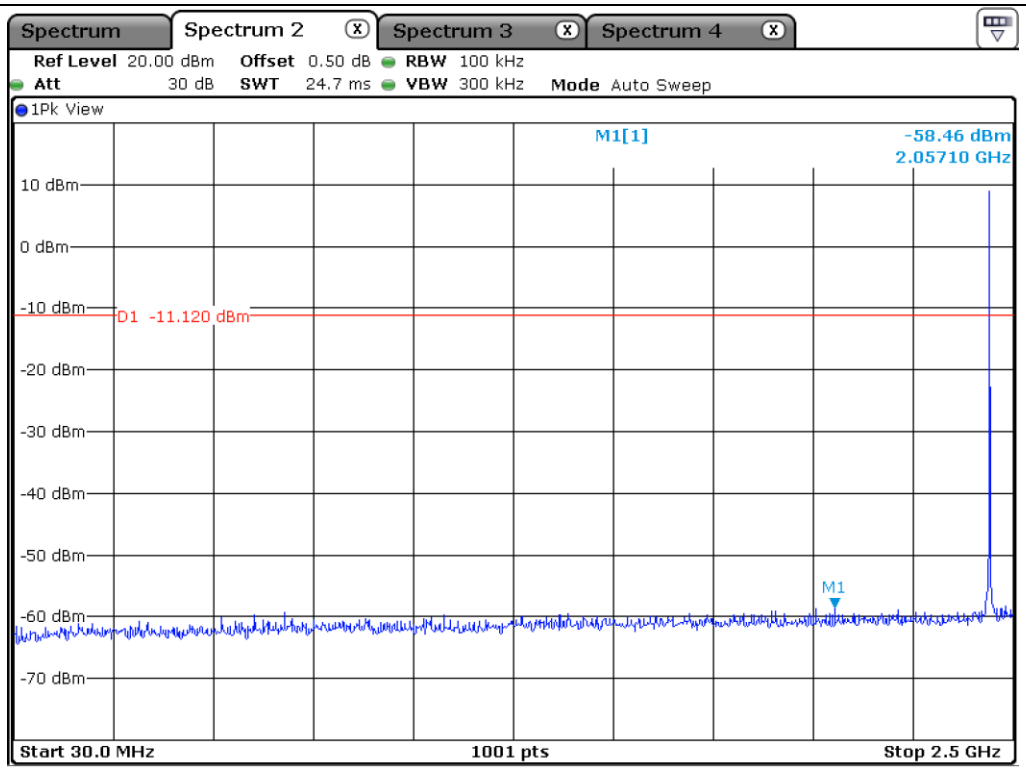


Low Channel

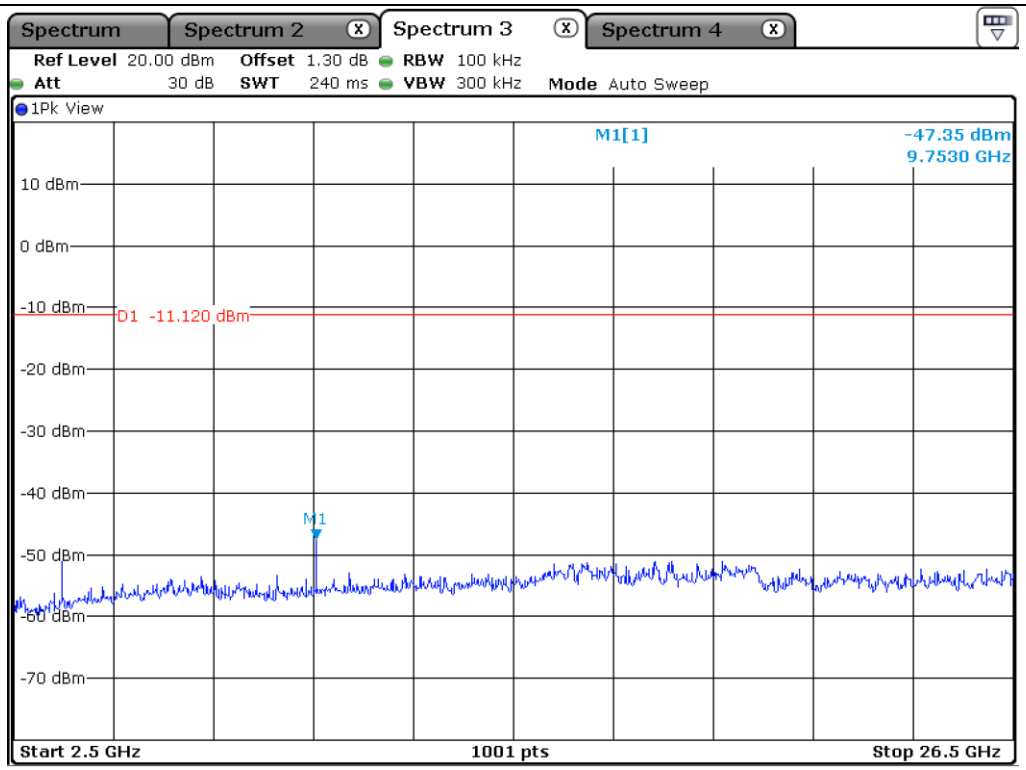


Low Channel

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

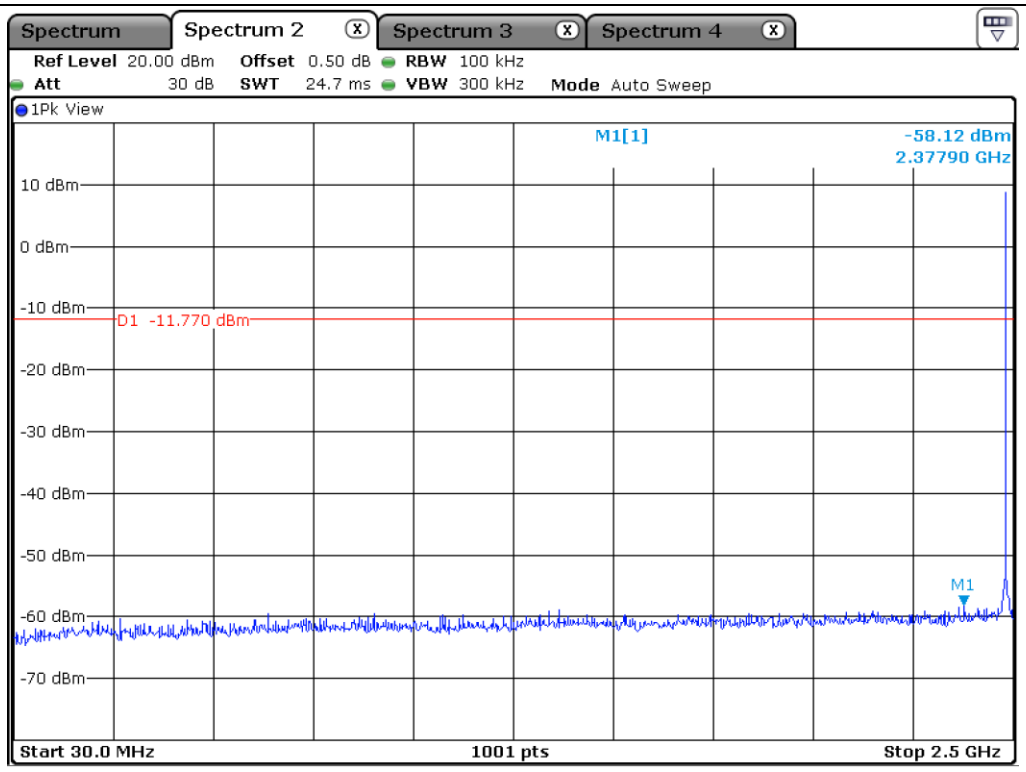


Middle Channel

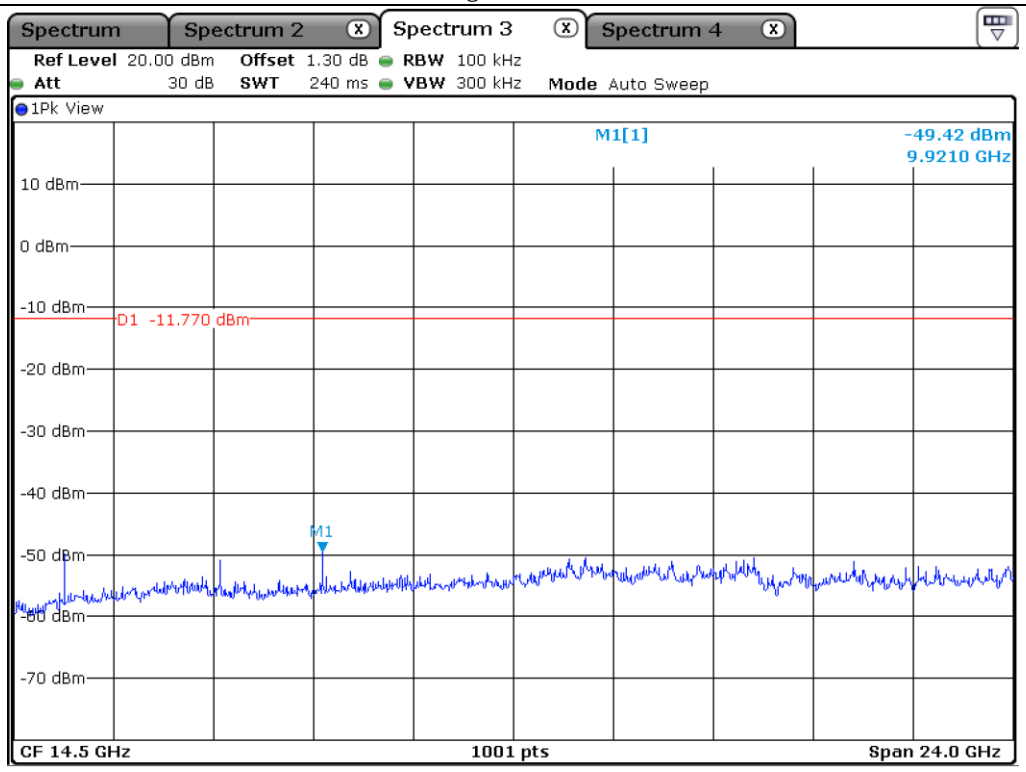


Middle Channel

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



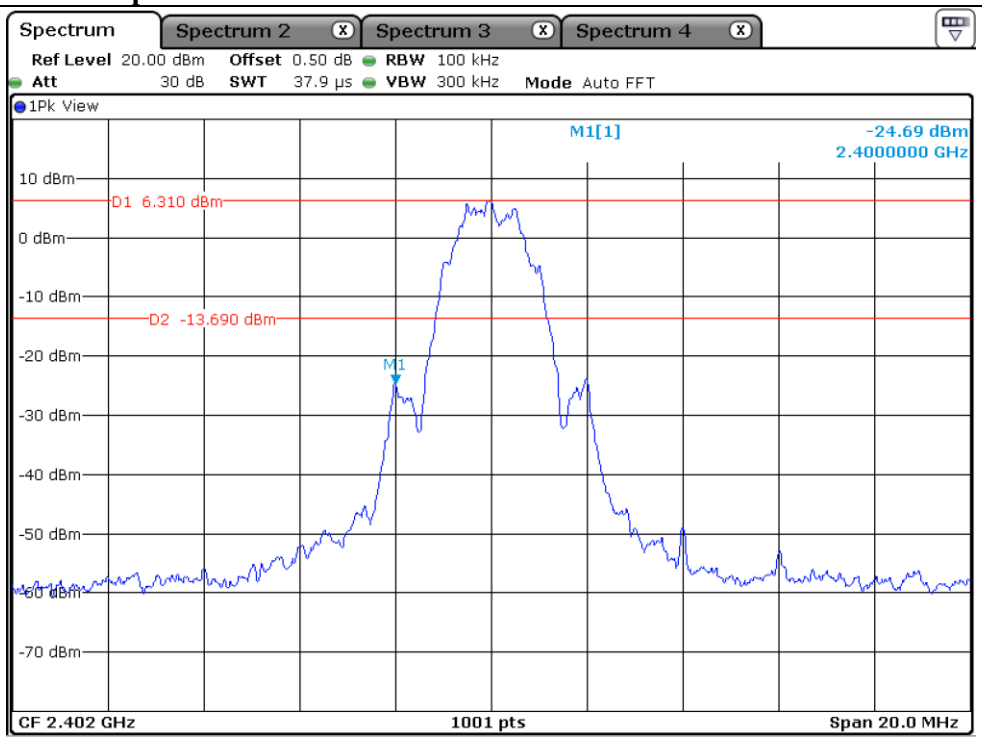
High Channel



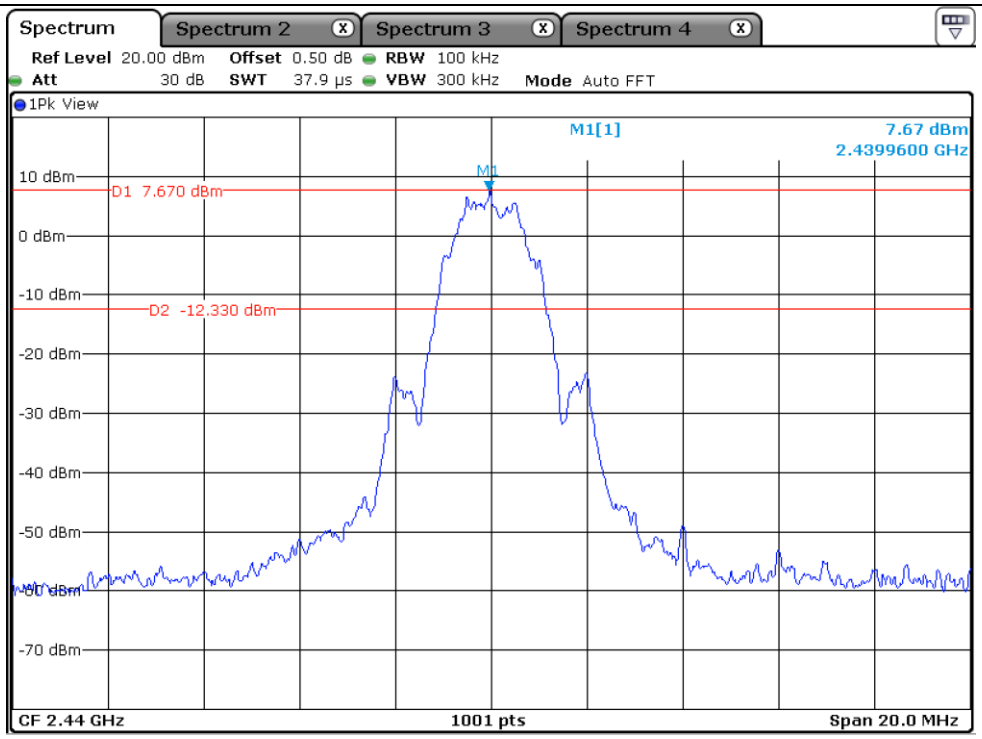
High Channel

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 2 Mbps

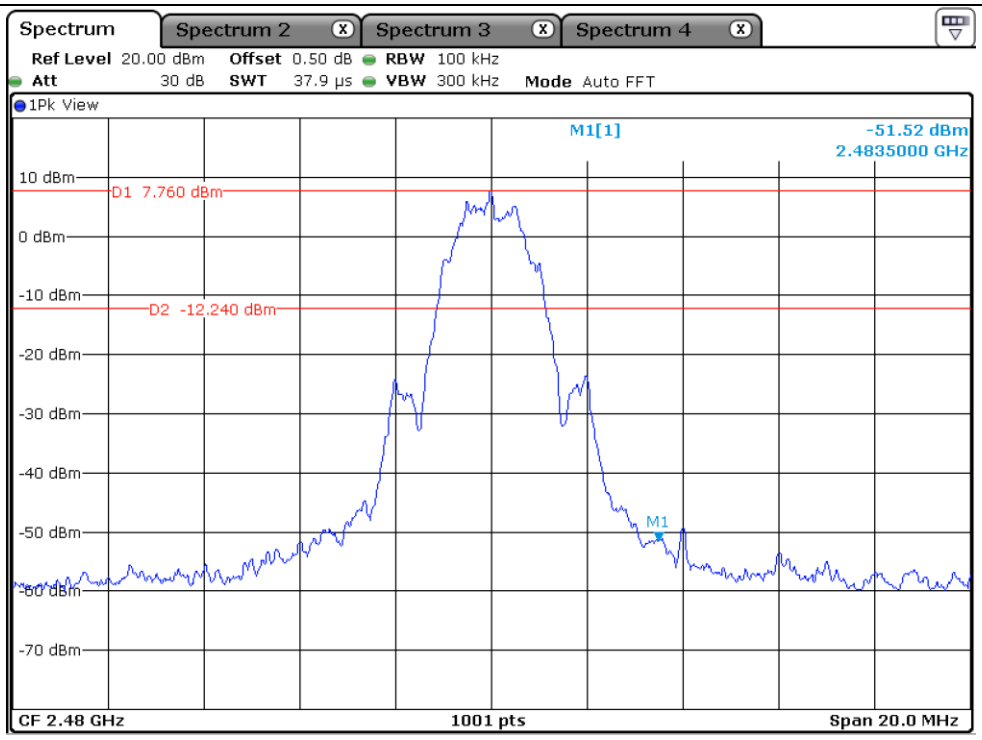


Low Channel



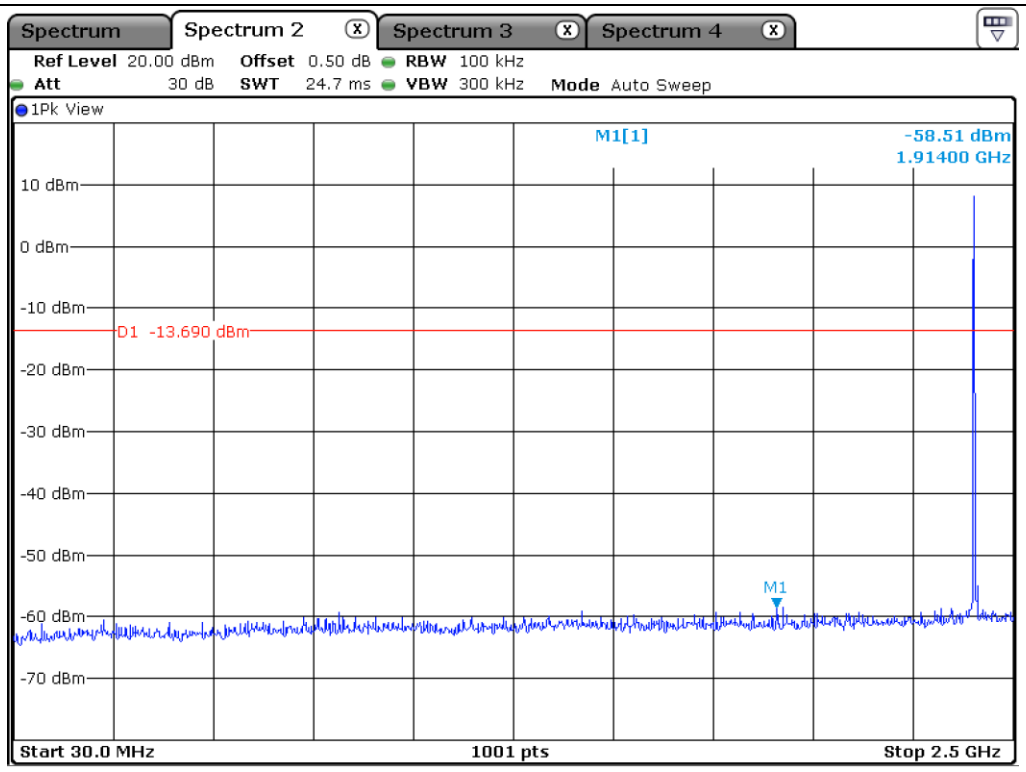
Middle Channel

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

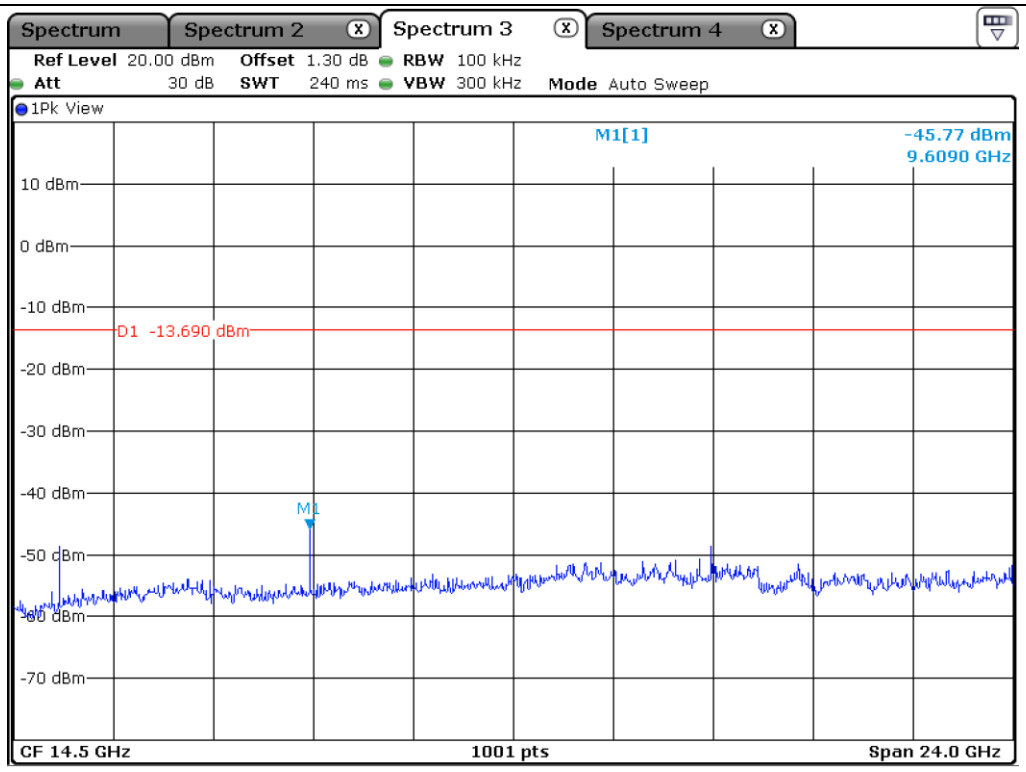


High Channel

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

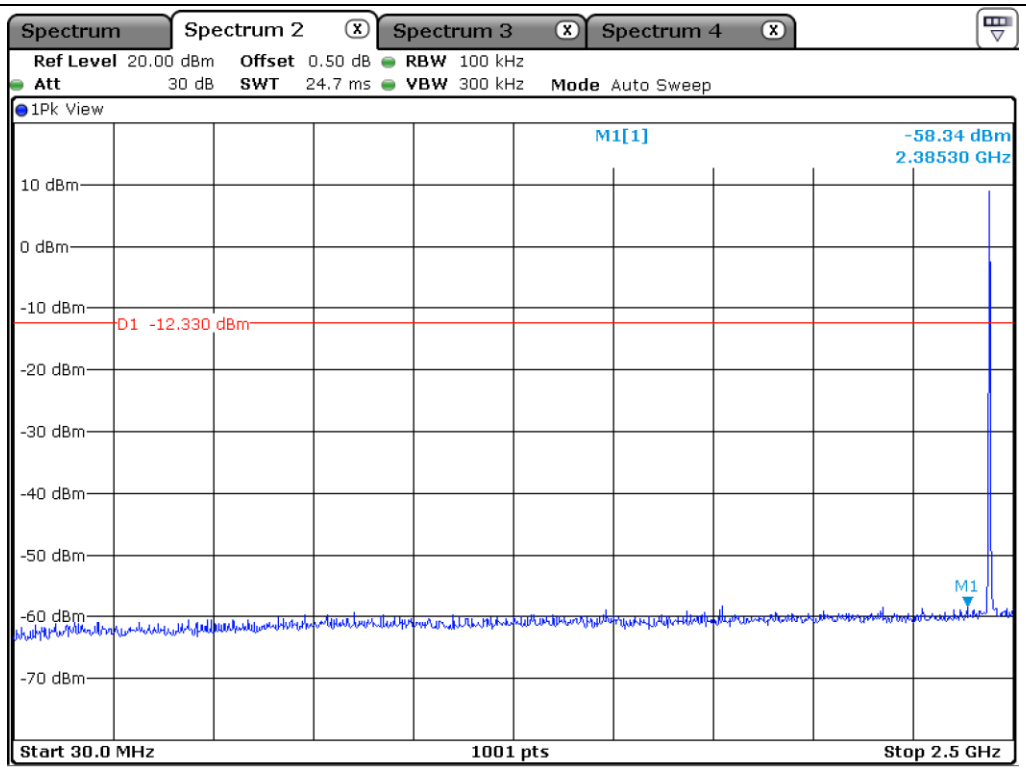


Low Channel

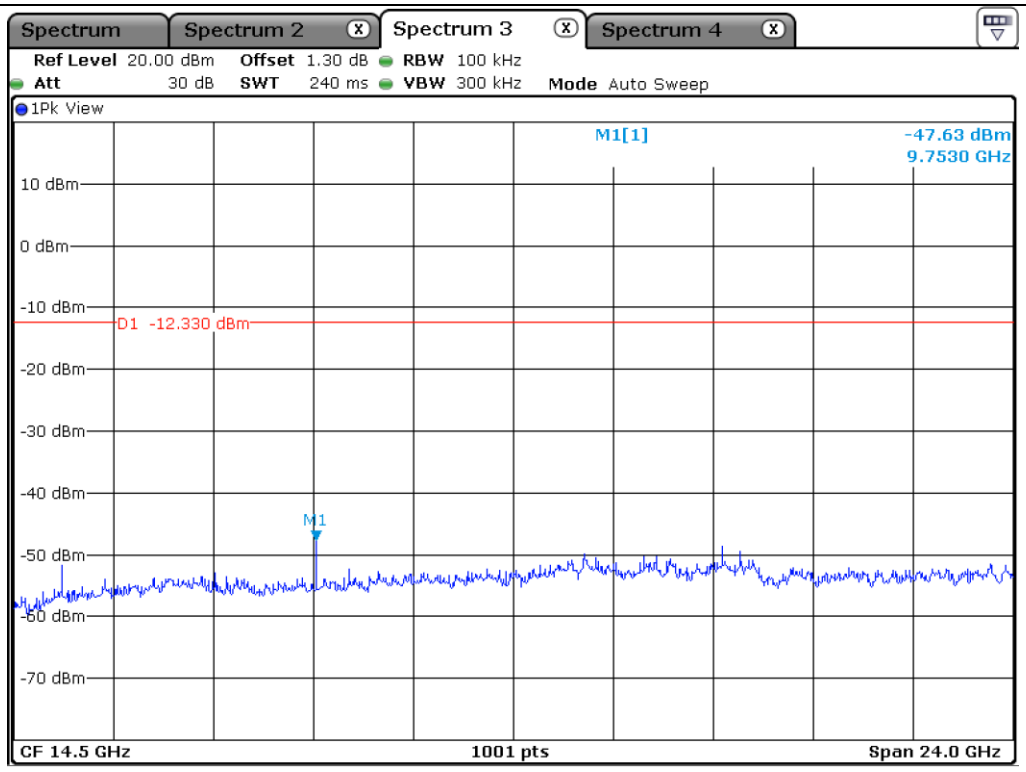


Low Channel

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

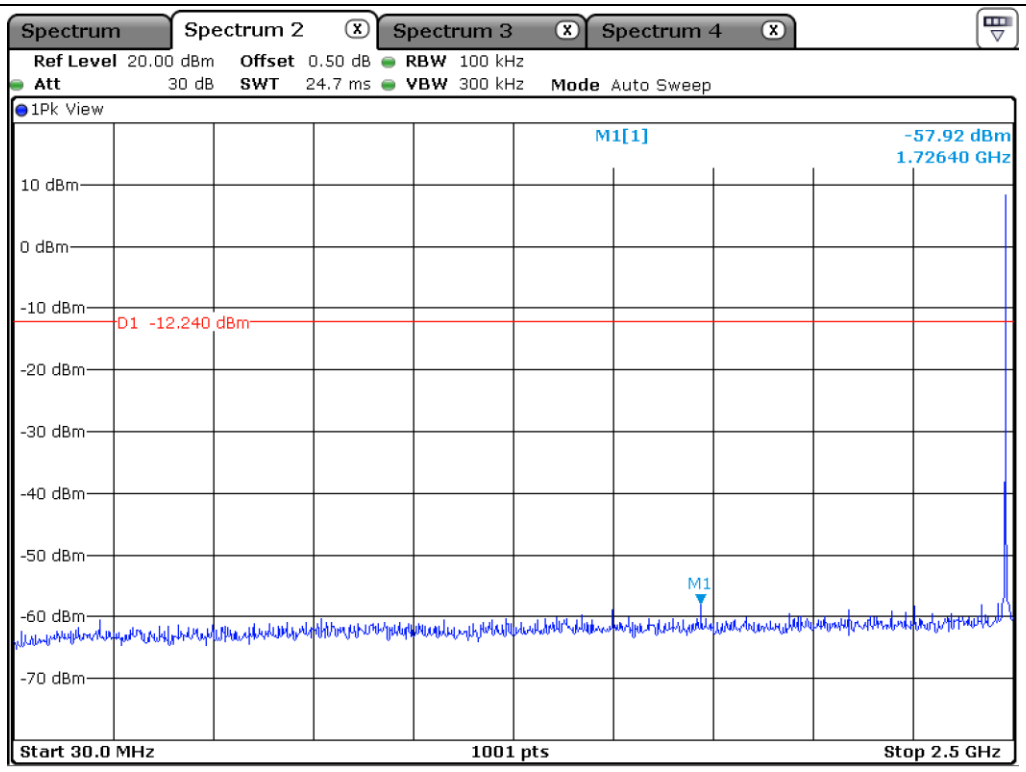


Middle Channel

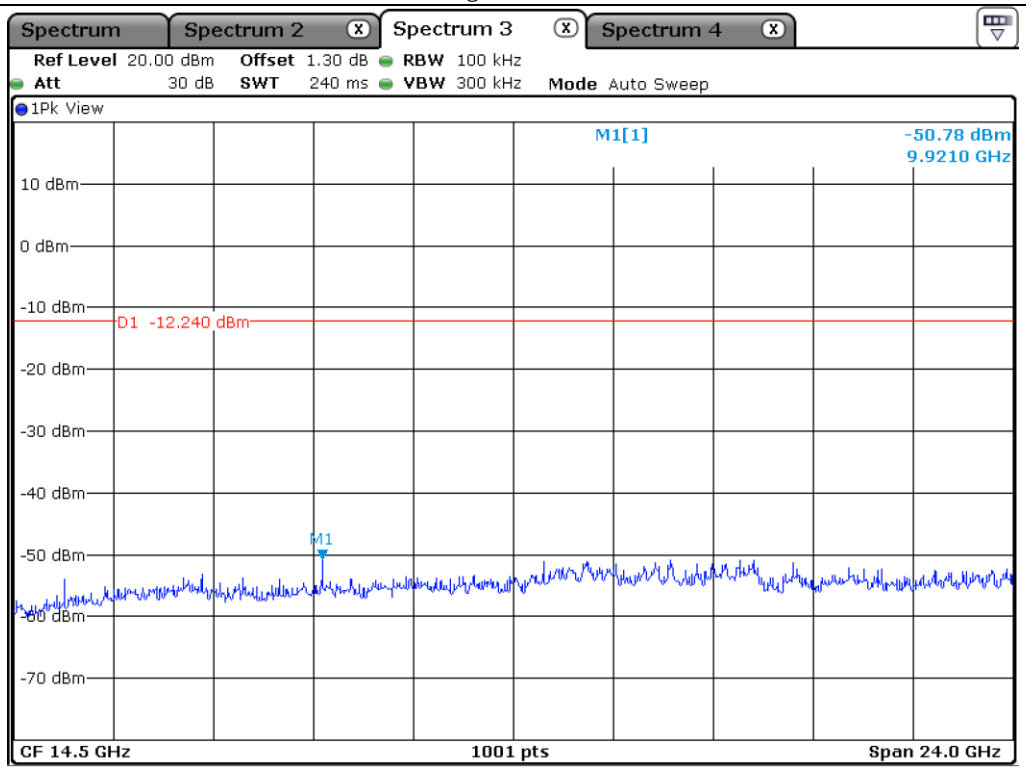


Middle Channel

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

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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 1 Mbps

-. 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 : 60.32 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 343.487	17.94	Peak	H	26.90	3.07	-	47.91	74.00	26.09
2 340.271	5.75	Average	H	26.90	3.07	2.20	37.92	54.00	16.08
2 343.289	15.86	Peak	V	26.90	3.07	-	45.83	74.00	28.17
2 338.117	7.36	Average	V	26.90	3.07	2.20	39.53	54.00	14.47
Test Data for High Channel									
2 483.749	18.44	Peak	H	26.60	3.16	-	48.20	74.00	25.80
2 484.426	8.24	Average	H	26.60	3.16	2.20	40.20	54.00	13.80
2 494.584	18.80	Peak	V	26.60	3.16	-	48.56	74.00	25.44
2 484.471	5.06	Average	V	26.60	3.16	2.20	37.02	54.00	16.98

Tabulated test data for Restricted Band

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor

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9.6.1.2 Test data for 2 Mbps

-. 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 : 30.69 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 343.736	16.92	Peak	H	26.90	3.07	-	46.89	74.00	27.11
2 340.309	6.53	Average	H	26.90	3.07	5.13	41.63	54.00	12.37
2 337.605	17.20	Peak	V	26.90	3.07	-	47.17	74.00	26.83
2 337.424	5.78	Average	V	26.90	3.07	5.13	40.88	54.00	13.12
Test Data for High Channel									
2 483.947	22.43	Peak	H	26.60	3.16	-	52.19	74.00	21.81
2 483.603	13.81	Average	H	26.60	3.16	5.13	48.70	54.00	5.30
2 483.550	16.71	Peak	V	26.60	3.16	-	46.47	74.00	27.53
2 483.508	5.51	Average	V	26.60	3.16	5.13	40.40	54.00	13.60

Tabulated test data for Restricted Band

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor

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9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 1 Mbps

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

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

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Duty Cycle : 60.32 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	17.91	Peak	H	28.20	4.85	-	50.96	74.00	23.04
4 804.000	6.81	Average	H	28.20	4.85	2.20	42.06	54.00	11.94
4 804.000	18.01	Peak	V	28.20	4.85	-	51.06	74.00	22.94
4 804.000	7.09	Average	V	28.20	4.85	2.20	42.34	54.00	11.66
Test Data for Middle Channel									
4 880.000	17.74	Peak	H	28.30	4.91	-	50.95	74.00	23.05
4 880.000	7.32	Average	H	28.30	4.91	2.20	42.73	54.00	11.27
4 880.000	17.41	Peak	V	28.30	4.91	-	50.62	74.00	23.38
4 880.000	7.76	Average	V	28.30	4.91	2.20	43.17	54.00	10.83
Test Data for High Channel									
4 960.000	17.65	Peak	H	28.60	5.04	-	51.29	74.00	22.71
4 960.000	7.62	Average	H	28.60	5.04	2.20	43.46	54.00	10.54
4 960.000	17.67	Peak	V	28.60	5.04	-	51.31	74.00	22.69
4 960.000	7.19	Average	V	28.60	5.04	2.20	43.03	54.00	10.97

Tabulated test data for Restricted Band

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor

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9.6.2.2 Test data for 2 Mbps

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

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

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Duty Cycle : 30.69 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	18.04	Peak	H	28.20	4.85	-	51.09	74.00	22.91
4 804.000	6.97	Average	H	28.20	4.85	5.13	45.15	54.00	8.85
4 804.000	18.19	Peak	V	28.20	4.85	-	51.24	74.00	22.76
4 804.000	6.52	Average	V	28.20	4.85	5.13	44.70	54.00	9.30
Test Data for Middle Channel									
4 880.000	18.00	Peak	H	28.30	4.91	-	51.21	74.00	22.79
4 880.000	7.28	Average	H	28.30	4.91	5.13	45.62	54.00	8.38
4 880.000	18.54	Peak	V	28.30	4.91	-	51.75	74.00	22.25
4 880.000	6.90	Average	V	28.30	4.91	5.13	45.24	54.00	8.76
Test Data for High Channel									
4 960.000	18.76	Peak	H	28.60	5.04	-	52.40	74.00	21.60
4 960.000	6.97	Average	H	28.60	5.04	5.13	45.74	54.00	8.26
4 960.000	18.45	Peak	V	28.60	5.04	-	52.09	74.00	21.91
4 960.000	7.16	Average	V	28.60	5.04	5.13	45.93	54.00	8.07

Tabulated test data for Restricted Band

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

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

Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor

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10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

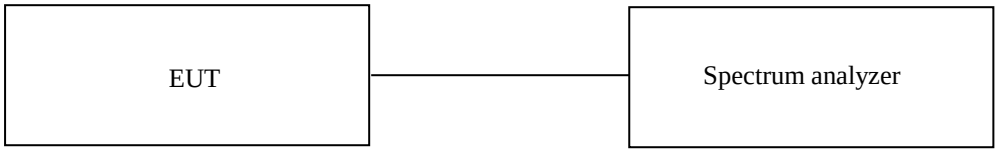
Temperature : 23 °C

Relative humidity : 41 % 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

August 21, 2020 ~ September 08, 2020

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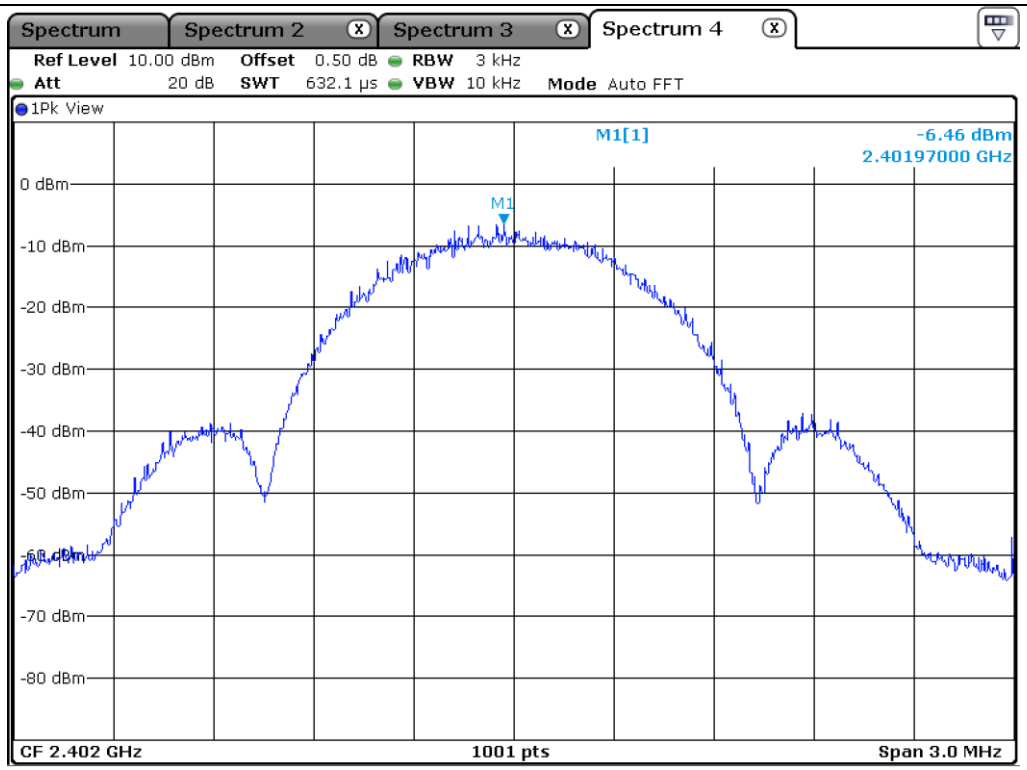
10.4 Test data for 1 Mbps

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

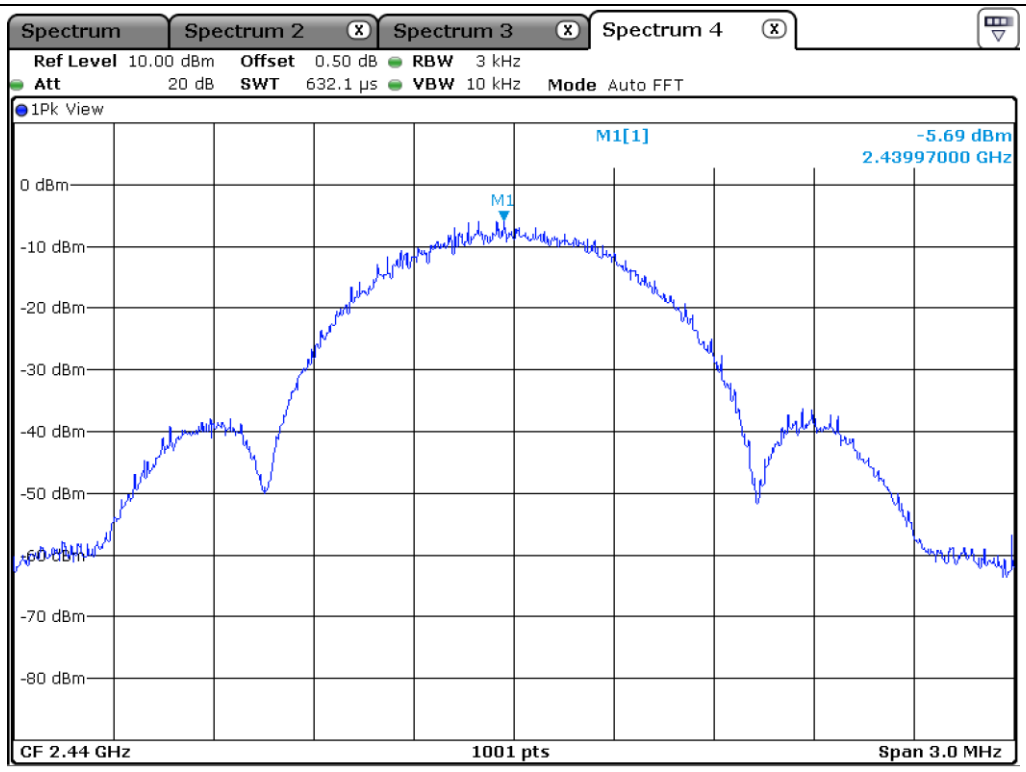
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-6.46	8.00	14.46
Middle	2 440.00	-5.69	8.00	13.69
High	2 480.00	-6.21	8.00	14.21

Remark. Margin = Limit – Measured value

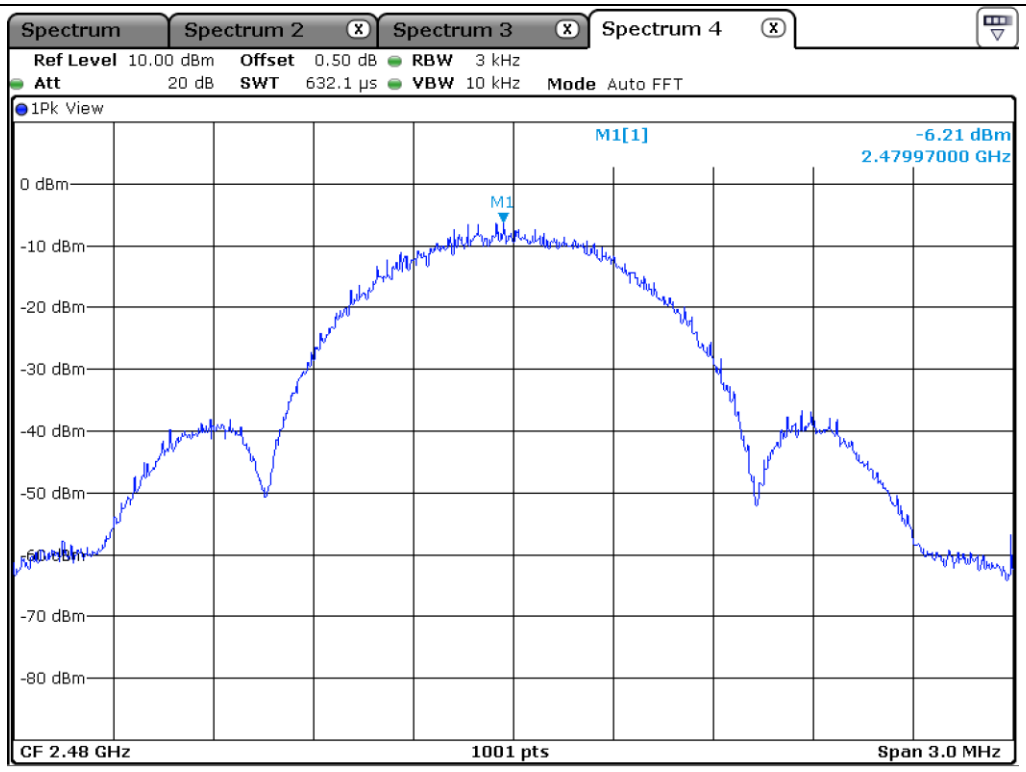


Low Channel

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

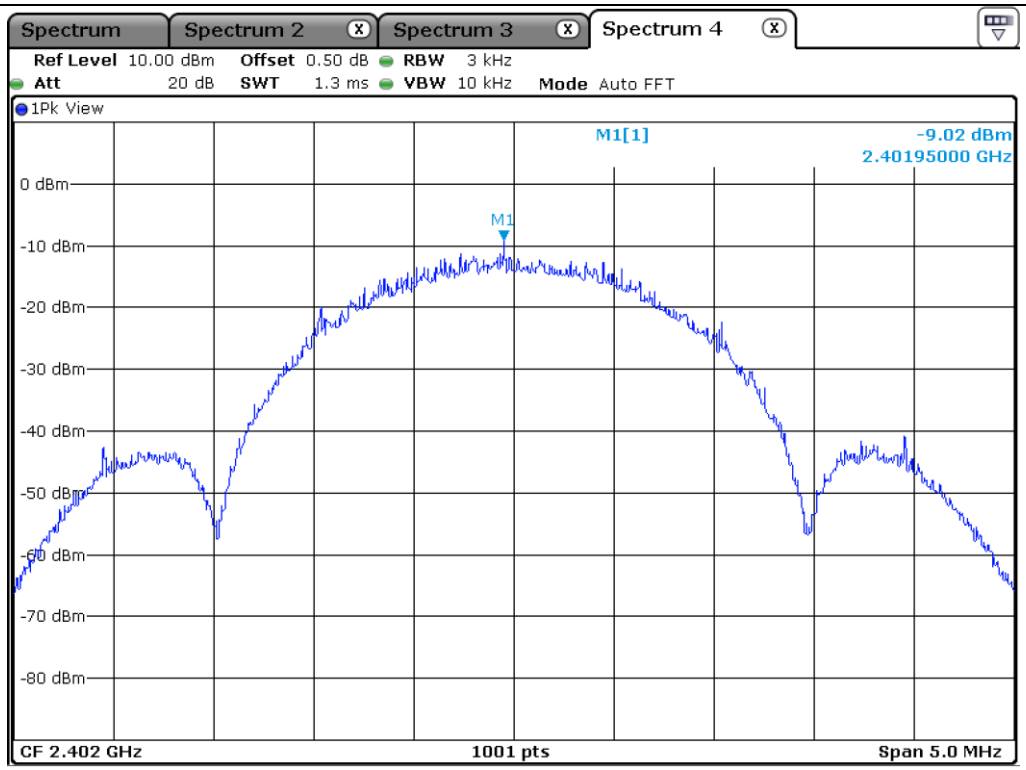
10.5 Test data for 2 Mbps

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

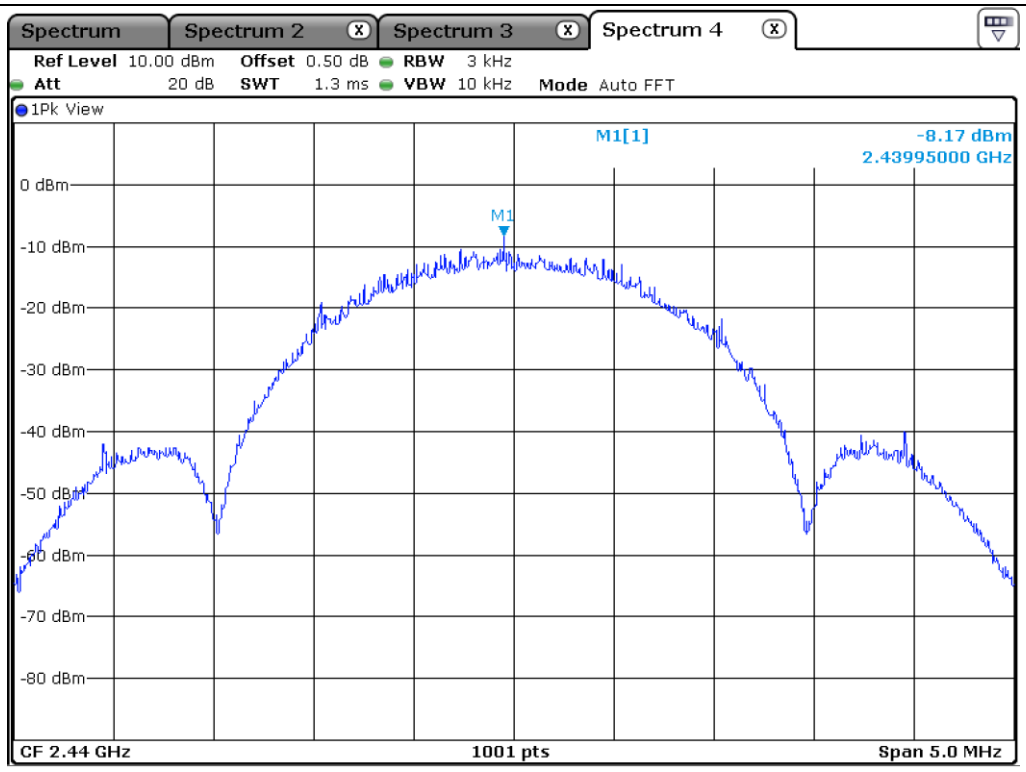
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-9.02	8.00	17.02
Middle	2 440.00	-8.17	8.00	16.17
High	2 480.00	-8.62	8.00	16.62

Remark. Margin = Limit – Measured value

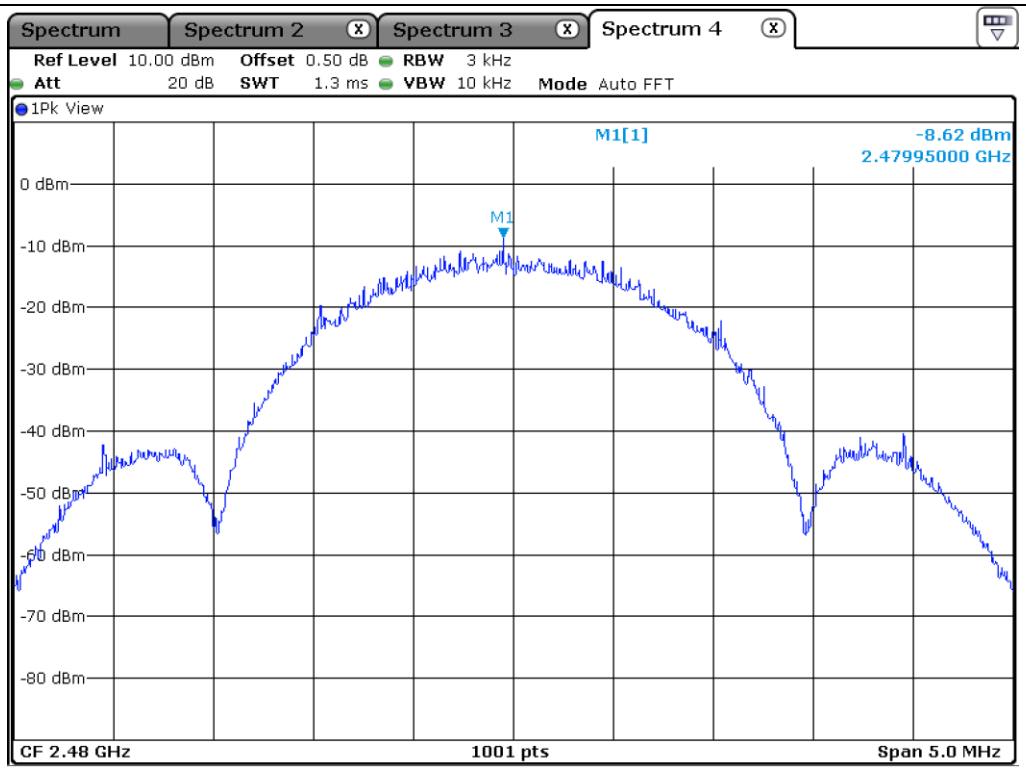


Low Channel

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)

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 23 °C

Relative humidity : 41 % R.H.

11.2 Test set-up

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

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

11.3 Test Date

August 21, 2020 ~ September 08, 2020

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

11.4 Test data for 30 MHz ~ 960 MHz

11.4.1 Test data for Bluetooth LE

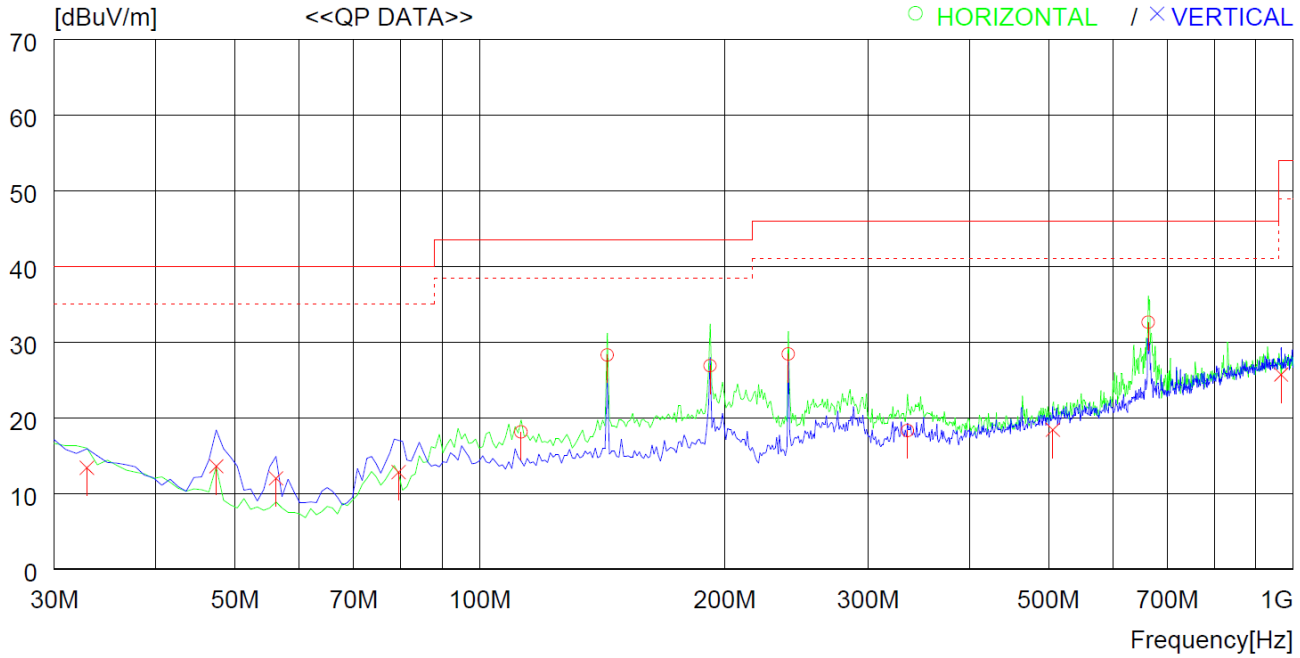
Humidity Level : 41 % R.H. Temperature: 23 °C

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

Result : PASSED

EUT : Wi-Fi/BT Transceiver

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



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	112.450	39.5	10.3	1.0	32.7	18.1	43.5	25.4	389	359
2	143.490	48.8	11.1	1.1	32.7	28.3	43.5	15.2	389	359
3	191.990	45.4	12.8	1.3	32.6	26.9	43.5	16.6	400	359
4	239.520	48.9	10.6	1.5	32.6	28.4	46.0	17.6	400	27
5	335.550	34.6	14.6	1.8	32.7	18.3	46.0	27.7	389	359
6	663.406	42.5	20.5	2.5	32.9	32.6	46.0	13.4	400	325
----- Vertical ------										
7	32.910	34.5	11.0	0.5	32.6	13.4	40.0	26.6	400	50
8	47.460	35.6	10.1	0.6	32.7	13.6	40.0	26.4	400	7
9	56.190	34.5	9.5	0.7	32.7	12.0	40.0	28.0	400	257
10	79.470	36.9	7.8	0.8	32.7	12.8	40.0	27.2	400	7
11	506.271	31.2	17.9	2.2	32.9	18.4	46.0	27.6	400	7
12	966.037	30.8	23.6	3.0	31.7	25.7	54.0	28.3	400	223

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11.4.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

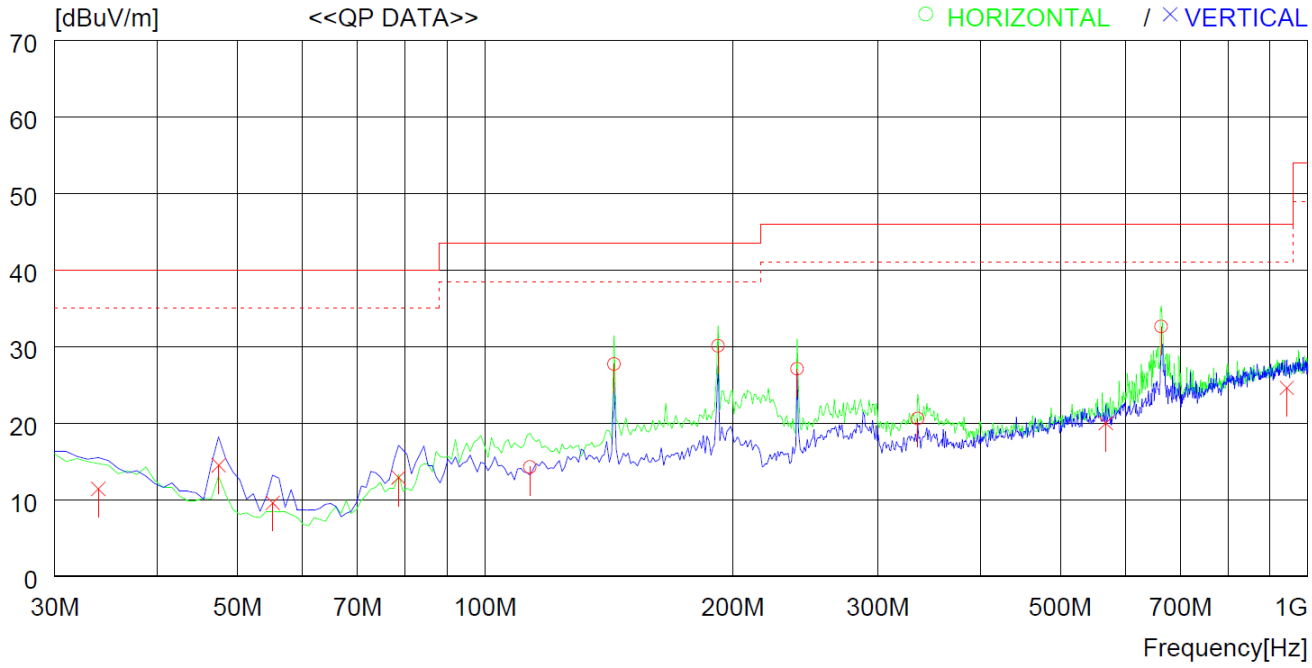
Humidity Level : 41 % R.H. Temperature: 23 °C

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

Result : PASSED

EUT : Wi-Fi/BT Transceiver

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



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	113.420	35.7	10.3	1.0	32.7	14.3	43.5	29.2	400	359
2	143.490	48.2	11.1	1.1	32.7	27.7	43.5	15.8	400	359
3	191.990	48.6	12.8	1.3	32.6	30.1	43.5	13.4	400	344
4	239.520	47.6	10.6	1.5	32.6	27.1	46.0	18.9	400	359
5	335.550	36.9	14.6	1.8	32.7	20.6	46.0	25.4	400	359
6	663.406	42.5	20.5	2.5	32.9	32.6	46.0	13.4	400	310
----- Vertical ------										
7	33.880	32.5	11.0	0.5	32.6	11.4	40.0	28.6	400	157
8	47.460	36.5	10.1	0.6	32.7	14.5	40.0	25.5	400	346
9	55.220	32.0	9.6	0.7	32.7	9.6	40.0	30.4	400	4
10	78.500	36.9	7.9	0.8	32.7	12.9	40.0	27.1	400	4
11	568.349	31.5	19.2	2.3	33.0	20.0	46.0	26.0	400	4
12	942.758	29.9	23.5	3.0	31.8	24.6	46.0	21.4	400	4

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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)
It was not observed any emissions from the EUT.									

11.6 Test data for above 1 GHz

-. 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.									

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12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 23 °C

Relative humidity : 41 % 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 Date

August 21, 2020 ~ September 08, 2020

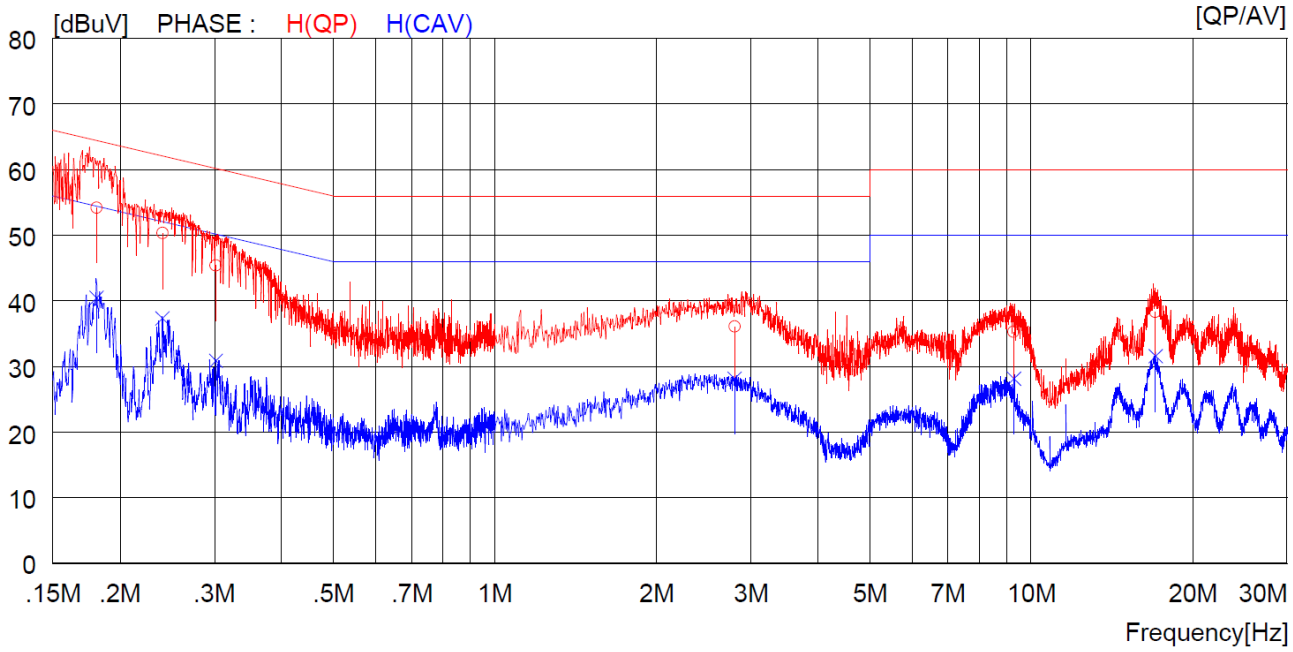
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

12.4 Test data for Bluetooth LE

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

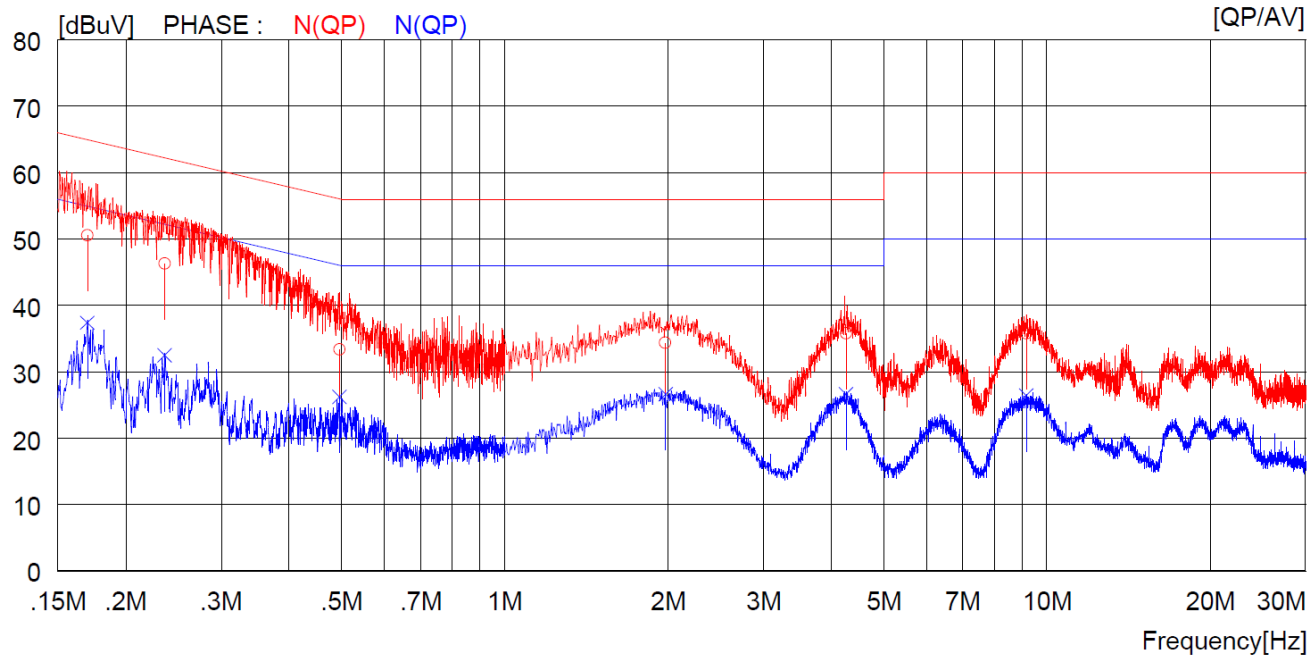
-. Tested Line : HOT LINE



NO	FREQ	READING QP	READING AV	C.FACTOR QP	C.FACTOR AV	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]			
1	0.18100	44.2	----	10.0		54.2	----	64.4	----	10.2	----	H(QP)
2	0.24000	40.4	----	9.9		50.3	----	62.1	----	11.8	----	H(QP)
3	0.30200	35.5	----	9.9		45.4	----	60.2	----	14.8	----	H(QP)
4	2.80000	26.0	----	10.1		36.1	----	56.0	----	19.9	----	H(QP)
5	9.28500	25.1	----	10.2		35.3	----	60.0	----	24.7	----	H(QP)
6	17.06000	28.0	----	10.3		38.3	----	60.0	----	21.7	----	H(QP)
7	0.18100	----	30.5	10.0		----	40.5	----	54.4	----	13.9	H(CAV)
8	0.24000	----	27.4	9.9		----	37.3	----	52.1	----	14.8	H(CAV)
9	0.30200	----	21.0	9.9		----	30.9	----	50.2	----	19.3	H(CAV)
10	2.80000	----	18.0	10.1		----	28.1	----	46.0	----	17.9	H(CAV)
11	9.28500	----	17.9	10.2		----	28.1	----	50.0	----	21.9	H(CAV)
12	17.06000	----	21.3	10.3		----	31.6	----	50.0	----	18.4	H(CAV)

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

-. Tested Line : NEUTRAL LINE



NO	FREQ	READING QP	READING AV	C.FACTOR QP	C.FACTOR AV	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]			
1	0.17000	40.5	----	10.0		50.5	----	65.0	----	14.5	----	N(QP)
2	0.23600	36.4	----	9.9		46.3	----	62.2	----	15.9	----	N(QP)
3	0.49600	23.5	----	9.9		33.4	----	56.1	----	22.7	----	N(QP)
4	1.98000	24.3	----	10.1		34.4	----	56.0	----	21.6	----	N(QP)
5	4.26400	25.7	----	10.1		35.8	----	56.0	----	20.2	----	N(QP)
6	9.16500	25.6	----	10.2		35.8	----	60.0	----	24.2	----	N(QP)
7	0.17000	----	27.4	10.0		----	37.4	----	55.0	----	17.6	N(CAV)
8	0.23600	----	22.6	9.9		----	32.5	----	52.2	----	19.7	N(CAV)
9	0.49600	----	16.3	9.9		----	26.2	----	46.1	----	19.9	N(CAV)
10	1.98000	----	16.5	10.1		----	26.6	----	46.0	----	19.4	N(CAV)
11	4.26400	----	16.5	10.1		----	26.6	----	46.0	----	19.4	N(CAV)
12	9.16500	----	16.2	10.2		----	26.4	----	50.0	----	23.6	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.

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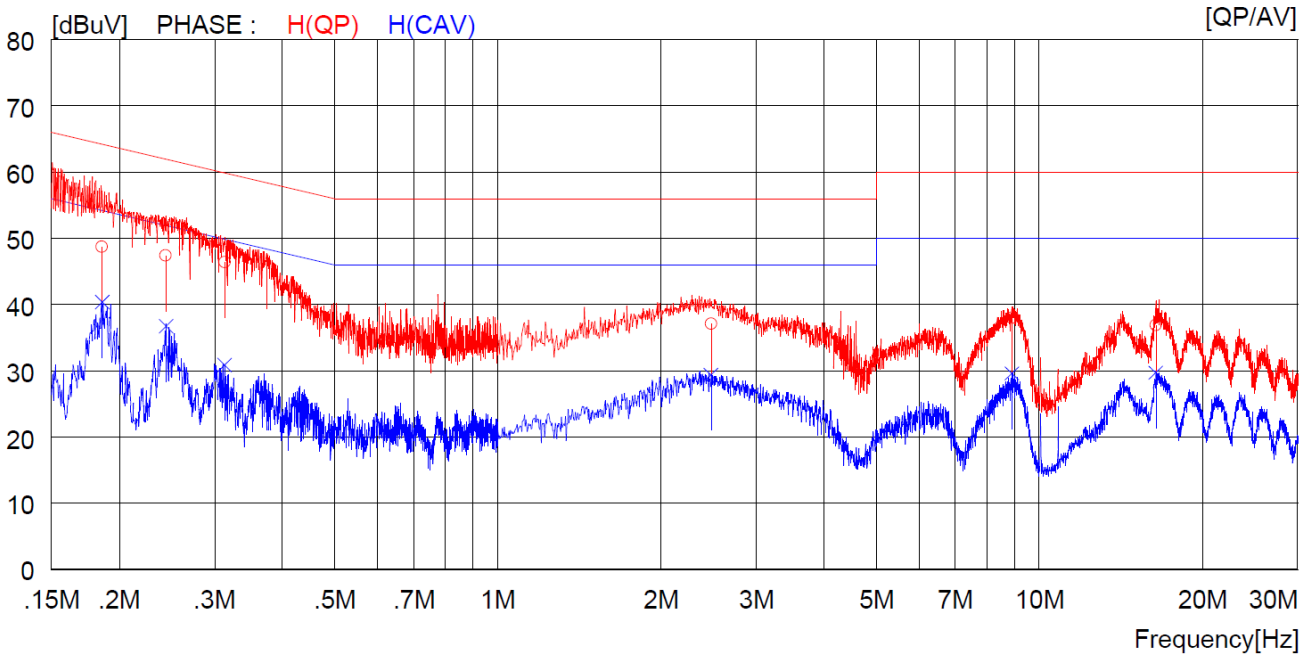
12.5 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ	READING QP	READING AV	C.FACTOR QP	C.FACTOR AV	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]			
1	0.18600	38.7	----	10.0		48.7	----	64.2	----	15.5	----	H(QP)
2	0.24400	37.5	----	9.9		47.4	----	62.0	----	14.6	----	H(QP)
3	0.31300	36.5	----	9.9		46.4	----	59.9	----	13.5	----	H(QP)
4	2.47600	27.0	----	10.1		37.1	----	56.0	----	18.9	----	H(QP)
5	8.90500	27.8	----	10.2		38.0	----	60.0	----	22.0	----	H(QP)
6	16.40000	26.6	----	10.3		36.9	----	60.0	----	23.1	----	H(QP)
7	0.18600	----	30.4	10.0		----	40.4	----	54.2	----	13.8	H(CAV)
8	0.24400	----	26.8	9.9		----	36.7	----	52.0	----	15.3	H(CAV)
9	0.31300	----	21.0	9.9		----	30.9	----	49.9	----	19.0	H(CAV)
10	2.47600	----	19.3	10.1		----	29.4	----	46.0	----	16.6	H(CAV)
11	8.90500	----	19.4	10.2		----	29.6	----	50.0	----	20.4	H(CAV)
12	16.40000	----	19.4	10.3		----	29.7	----	50.0	----	20.3	H(CAV)

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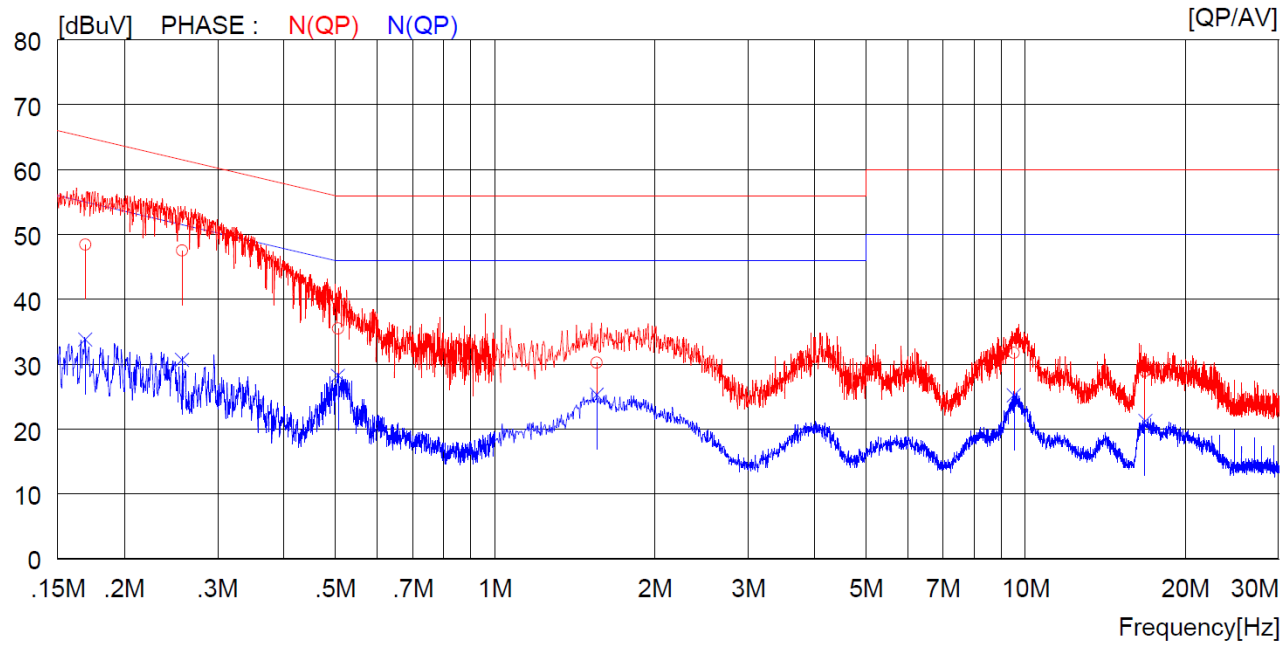
-. Tested Line : NEUTRAL LINE



NO	FREQ	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR QP [dB]	C.FACTOR AV [dBuV]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.16900	38.4	----	10.0		48.4	----	65.0	----	16.6	----	N(QP)
2	0.25700	37.6	----	9.9		47.5	----	61.5	----	14.0	----	N(QP)
3	0.50600	25.5	----	10.0		35.5	----	56.0	----	20.5	----	N(QP)
4	1.55600	20.1	----	10.1		30.2	----	56.0	----	25.8	----	N(QP)
5	9.50500	21.5	----	10.2		31.7	----	60.0	----	28.3	----	N(QP)
6	16.80000	18.6	----	10.3		28.9	----	60.0	----	31.1	----	N(QP)
7	0.16900	----	23.8	10.0		----	33.8	----	55.0	----	21.2	N(CAV)
8	0.25700	----	20.8	9.9		----	30.7	----	51.5	----	20.8	N(CAV)
9	0.50600	----	18.3	10.0		----	28.3	----	46.0	----	17.7	N(CAV)
10	1.55600	----	15.2	10.1		----	25.3	----	46.0	----	20.7	N(CAV)
11	9.50500	----	15.0	10.2		----	25.2	----	50.0	----	24.8	N(CAV)
12	16.80000	----	11.0	10.3		----	21.3	----	50.0	----	28.7	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.

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13. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	102177	Apr. 20, 2020 (1Y)
ESW	Rohde & Schwarz	EMI Test Receiver	101851	Mar. 27, 2020 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 16, 2020 (1Y)
BBV 9718 B	Schwarzbeck	Broadband Preamplifier	00009	Mar. 16, 2020 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Feb. 20, 2020 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 15, 2020 (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. 08, 2020 (2Y)
BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020(1Y)
ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2019 (1Y)
NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 16, 2020 (1Y)
3825/2	EMCO	AMN	9109-1869	Mar. 16, 2020 (1Y)

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