RADIO PERFORMANCE TEST REPORT

Test Report No.	**: OT-204-RWD-073**
AGR No.	**: A19DA-464**
Applicant	**: LAON Technology**
Address	**: #1212, Biz Center, SK-N Technopark, 124, Sagimakgol-ro, Jungwon-Gu, Seongnam-Si, Gyeonggi-Do, Korea**
Manufacturer	**: LAON Technology**
Address	**: #1212, Biz Center, SK-N Technopark, 124, Sagimakgol-ro, Jungwon-Gu, Seongnam-Si, Gyeonggi-Do, Korea**
Type of Equipment	**: Wireless Audio RF Module**
FCC ID.	**: 2AU4Y-LAON-INTERCOM**
Model Name	**: KUM1000-MA0-03**
Serial number	**: N/A**
Total page of Report	**: 95 pages (including this page)**
Date of Incoming	**: February 21, 2020**
Date of issue	**: April 22, 2020**

SUMMARY

The equipment complies with the regulation; ***FCC PART 15 SUBPART E Section 15.407***

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

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

Reviewed by: Ha-Ram Lee / Manager, ONETECH Corp.

Approved by: Jae-Ho Lee / Chief Engineer, ONETECH Corp.

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

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REVISION HISTORY

Rev. No.	Issued Report No.	Issued Date	Revisions	Effect Section
0	OT-19O-RWD-023	October 11, 2019	Initial Issue	All
1	OT-201-RWD-019	March 10, 2020	Added Spurious emission test for added antennas Added Duty Factor and AC Conducted esmission test	13. RADIATED SPURIOUS EMISSIONS & 14. RADIATED RESTRICTED BAND EDGE MEASUREMENTS 5.3 Mode of operation during the test & 15. CONDUCTED EMISSION TEST
2	OT-201-RWD-035	January 29, 2020	Added Client mode test	7. MINIMUM 26 dB BANDWIDTH & 8. 6 dB BANDWIDTH & 9. MAXIMUM PEAK OUTPUT POWER & 10. PEAK POWER SPECTRAL DENSITY
3	OT-204-RWD-073	April 22, 2020	FCC C2PC (Adding data due to the addition of band. Addition of band is U-NII2A, UNII-2C.)	All

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1. VERIFICATION OF COMPLIANCE

Applicant : LAON Technology

Address : #1212, Biz Center, SK-N Technopark, 124, Sagimakgol-ro, Jungwon-Gu, Seongnam-Si, Gyeonggi-Do, Korea

Contact Person : Kwon Hyukjin / General Manager

Telephone No. : 82-70-8766-9396

FCC ID : 2AU4Y-LAON-INTERCOM

Model Name : KUM1000-MA0-03

Brand Name : N/A

Serial Number : N/A

Date : April 22, 2020

EQUIPMENT CLASS	NII - Unlicensed National Information Infrastructure(UNII)
E.U.T. DESCRIPTION	Wireless Audio RF Module
THIS REPORT CONCERNS	Adding data due to the addition of band. (Addition of band is U-NII2A, UNII-2C.)
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 E Section 15.407 KDB 789033 D01 General UNII Test Procedures
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
15.407(a)	26 dB Bandwidth	PASS
	99 % Occupied Bandwidth	PASS
15.407(a)	Maximum Conducted Output Power	Met the Limit / PASS
15.407(a)	Peak Power Spectral Density	Met the Limit / PASS
15.407(a)	Peak Excursion	Met the Limit / PASS
15.407(g)	Frequency Stability	Met the Limit / PASS
15.407(b)	Undesirable Emissions	Met the Limit / PASS
15.205, 15.407(b)	General Field Strength Limits (Restricted Bandsand Radiated Emission Limits)	Met the Limit / PASS
15.207	AC Conducted Emissions	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 E Section 15.407

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.

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2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

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

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The LAON Technology, Model KUM1000-MA0-03 (referred to as the EUT in this report) is a Wireless Audio RF Module. Product specification information described herein was obtained from product data sheet or user's manual.

<table>
<tr><td>DEVICE TYPE</td><td colspan="5">Wireless Audio RF Module</td></tr>
<tr><td rowspan="10">FREQUENCY RANGE</td><td rowspan="10">WLAN
5 GHz Band
(802.11n(HT20))</td><td rowspan="2">U-NII 1</td><td>Master</td><td colspan="2">5 150 MHz ~ 5 250 MHz Band</td></tr>
<tr><td>Client</td><td colspan="2">5 150 MHz ~ 5 250 MHz Band</td></tr>
<tr><td rowspan="2">U-NII 2A</td><td>Master</td><td colspan="2">5 250 MHz ~ 5 350 MHz Band</td></tr>
<tr><td>Client</td><td colspan="2">5 250 MHz ~ 5 350 MHz Band</td></tr>
<tr><td rowspan="2">U-NII 2C</td><td>Master</td><td colspan="2">5 470 MHz ~ 5 725 MHz Band</td></tr>
<tr><td>Client</td><td colspan="2">5 470 MHz ~ 5 725 MHz Band</td></tr>
<tr><td rowspan="2">U-NII 3</td><td>Master</td><td colspan="2">5 725 MHz ~ 5 825 MHz Band</td></tr>
<tr><td>Client</td><td colspan="2">5 725 MHz ~ 5 825 MHz Band</td></tr>
<tr><td rowspan="4">MAX. RF OUTPUT POWER</td><td rowspan="4">WLAN
5 GHz Band
(802.11n(HT20))</td><td rowspan="2">U-NII 2A</td><td>Master</td><td colspan="2">18.94 dBm</td></tr>
<tr><td>Client</td><td colspan="2">18.88 dBm</td></tr>
<tr><td rowspan="2">U-NII 2C</td><td>Master</td><td colspan="2">19.62 dBm</td></tr>
<tr><td>Client</td><td colspan="2">18.36 dBm</td></tr>
<tr><td colspan="3">MODULATION TYPE</td><td colspan="3">OFDM Modulation(BPSK/QPSK/16QAM/64QAM)</td></tr>
<tr><td rowspan="5">ANTENNA TYPE</td><td colspan="2">Antenna 1 (Basic)</td><td colspan="3">Dipole Antenna [Model name: AE-T2450/5500DP5-RSMA]</td></tr>
<tr><td colspan="2">Antenna 2 (Additional)</td><td colspan="3">PCB Antenna [Model name: AEi-2450/5500P-IPEX35]</td></tr>
<tr><td colspan="2">Antenna 3 (Additional)</td><td colspan="3">PCB Antenna [Model name: AEi-5500DP5-IPEX100[Bottom]]</td></tr>
<tr><td colspan="2">Antenna 4 (Additional)</td><td colspan="3">PCB Antenna [Model name: AEi-RO-5500DP4-IPEX160]</td></tr>
<tr><td colspan="2">Antenna 5 (Additional)</td><td colspan="3">PCB Antenna [Model name: AEi-RO-5500DP4-IPEX250]</td></tr>
<tr><td rowspan="12">ANTENNA GAIN</td><td rowspan="4">Antenna 1</td><td rowspan="12">WLAN
5 GHz
Band</td><td>5 150 MHz ~ 5 250 MHz Band</td><td>4.299 dBi</td></tr>
<tr><td>5 250 MHz ~ 5 350 MHz Band</td><td>5.309 dBi</td></tr>
<tr><td>5 470 MHz ~ 5 725 MHz Band</td><td>5.928 dBi</td></tr>
<tr><td>5 725 MHz ~ 5 825 MHz Band</td><td>5.634 dBi</td></tr>
<tr><td rowspan="4">Antenna 2</td><td>5 150 MHz ~ 5 250 MHz Band</td><td>3.967 dBi</td></tr>
<tr><td>5 250 MHz ~ 5 350 MHz Band</td><td>3.624 dBi</td></tr>
<tr><td>5 470 MHz ~ 5 725 MHz Band</td><td>3.312dBi</td></tr>
<tr><td>5 725 MHz ~ 5 825 MHz Band</td><td>1.119 dBi</td></tr>
<tr><td rowspan="4">Antenna 3</td><td>5 150 MHz ~ 5 250 MHz Band</td><td>1.169 dBi</td></tr>
<tr><td>5 250 MHz ~ 5 350 MHz Band</td><td>3.637dBi</td></tr>
<tr><td>5 470 MHz ~ 5 725 MHz Band</td><td>3.412 dBi</td></tr>
<tr><td>5 725 MHz ~ 5 825 MHz Band</td><td>4.358 dBi</td></tr>
</table>

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ANTENNA GAIN	Antenna 4	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	3.719 dBi
			5 250 MHz ~ 5 350 MHz Band	6.134 dBi
			5 470 MHz ~ 5 725 MHz Band	7.044 dBi
			5 725 MHz ~ 5 825 MHz Band	6.861 dBi
	Antenna 5		5 150 MHz ~ 5 250 MHz Band	4.290 dBi
			5 250 MHz ~ 5 350 MHz Band	5.248 dBi
			5 470 MHz ~ 5 725 MHz Band	6.330 dBi
			5 725 MHz ~ 5 825 MHz Band	5.904 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		40 MHz		
RATED SUPPLY VOLTAGE		DC 3.3 V		

Note. - This EUT operates only in 802.11n (HT20) mode.

- This EUT operates one port and the other port is Diversity Port.
- This EUT operates master mode or client mode.

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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	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
BP_JIG(FPGA)_Rev01	LAON Technology	Jigboard	-
AC Adapter	LITE-ON Technology	AC Adapter	-

5.3 Mode of operation during the test.

-. Duty Cycle

Band	Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
U-NII 2A	802.11n HT 20	0.72	3.98	15.32	8.15
U-NII 2C	802.11n HT 20	0.72	3.98	15.32	8.15

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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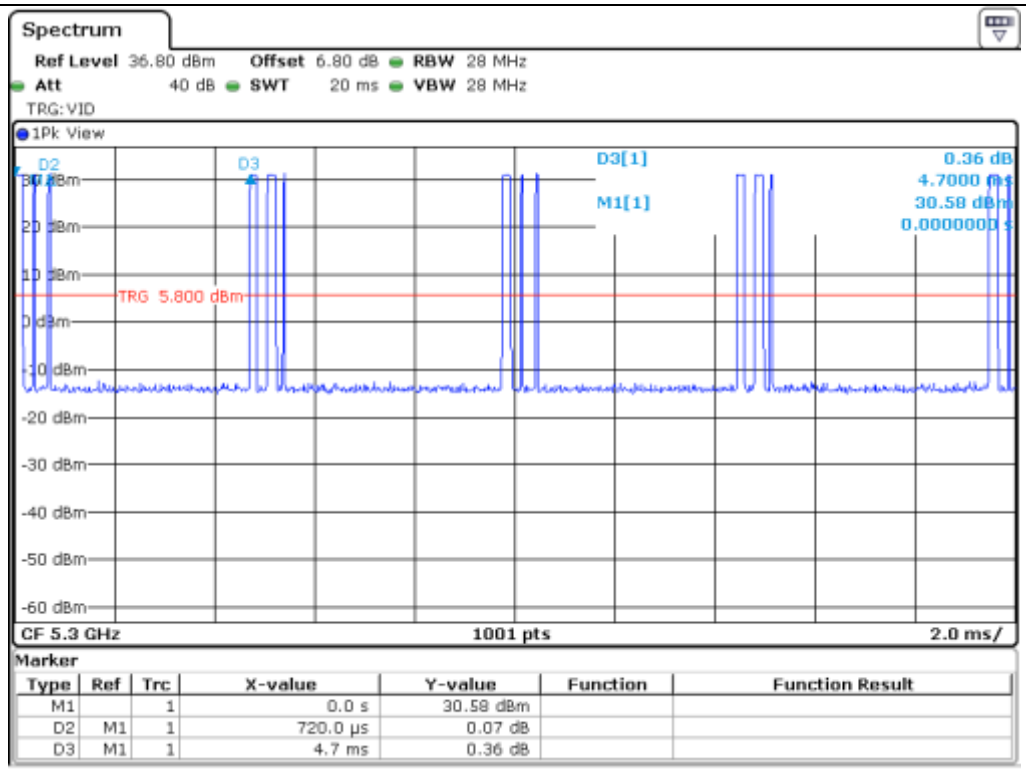
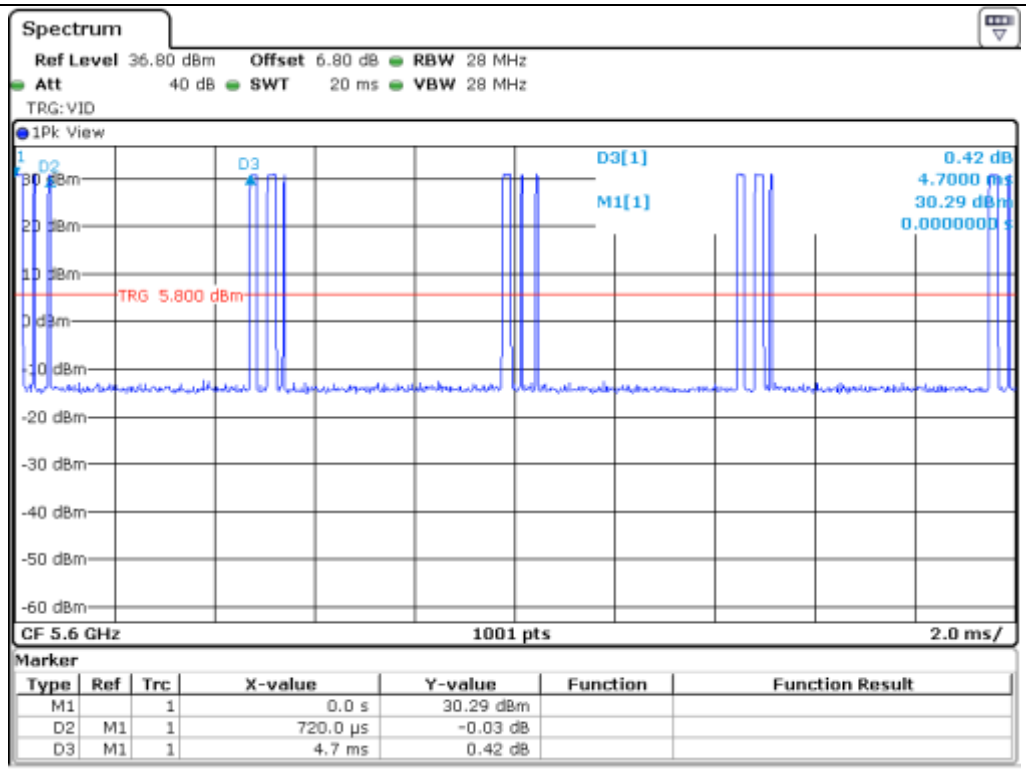
-. Test Plot



U-NII 2A_802.11n HT 20



U-NII 2C_802.11n HT 20

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5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to Jig Board and the power of Zig Board was connected to AC Adpater. 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 open area test site.

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 Dipole and PCB Antenna on the main board in the EUT.

Antenna connectors for each antenna are as below.

Antenna	Antenna Type	Model Name	Connector
Antenna 1 (Basic)	Dipole Antenna	AE-T2450/5500DP5-RSMA	IPEX
Antenna 2 (Additional)	PCB Antenna	AEi-2450/5500P-IPEX35	IPEX
Antenna 3 (Additional)	PCB Antenna	AEi-5500DP5-IPEX100[Bottom]	IPEX
Antenna 4 (Additional)	PCB Antenna	AEi-RO-5500DP4-IPEX160	IPEX
Antenna 5 (Additional)	PCB Antenna	AEi-RO-5500DP4-IPEX250	IPEX

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6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

7. MINIMUM 26 dB BANDWIDTH

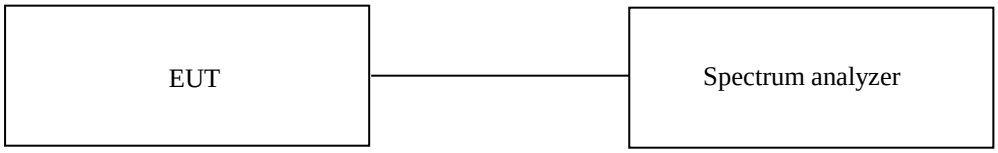
7.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % 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 26 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 26 dB.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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7.4 Test data for 802.11n (HT 20) WLAN Mode (Master mode)

-. Test Date : March 10, 2020

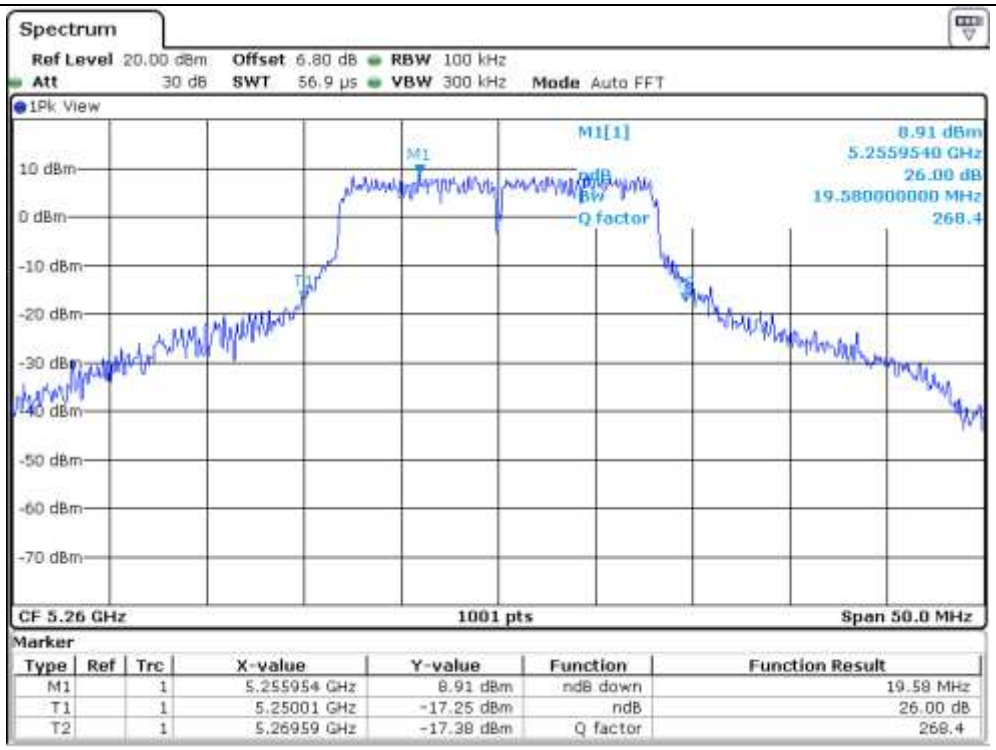
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 250 ~ 5 350	Low	5 260.00	19.58
	Middle	5 300.00	18.78
	High	5 320.00	19.53
5 470 ~ 5 725	Low	5 500.00	18.73
	Middle	5 600.00	19.33
	High	5 700.00	19.13

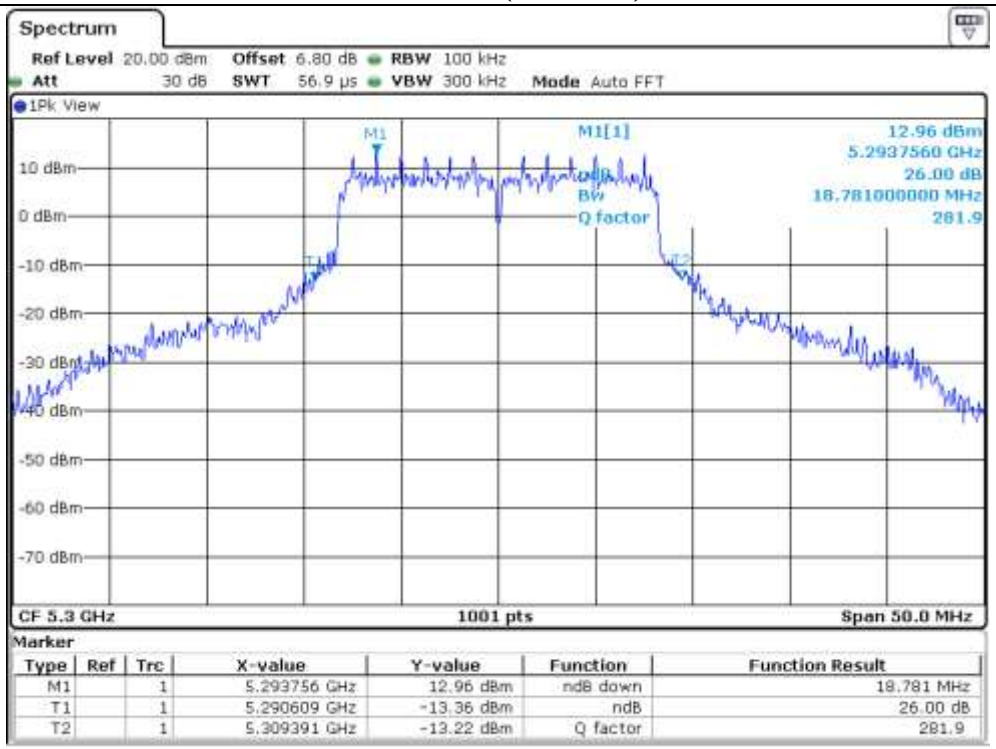
Remark: See next page for measurement data.

Tested by: Haram Lee / Manager

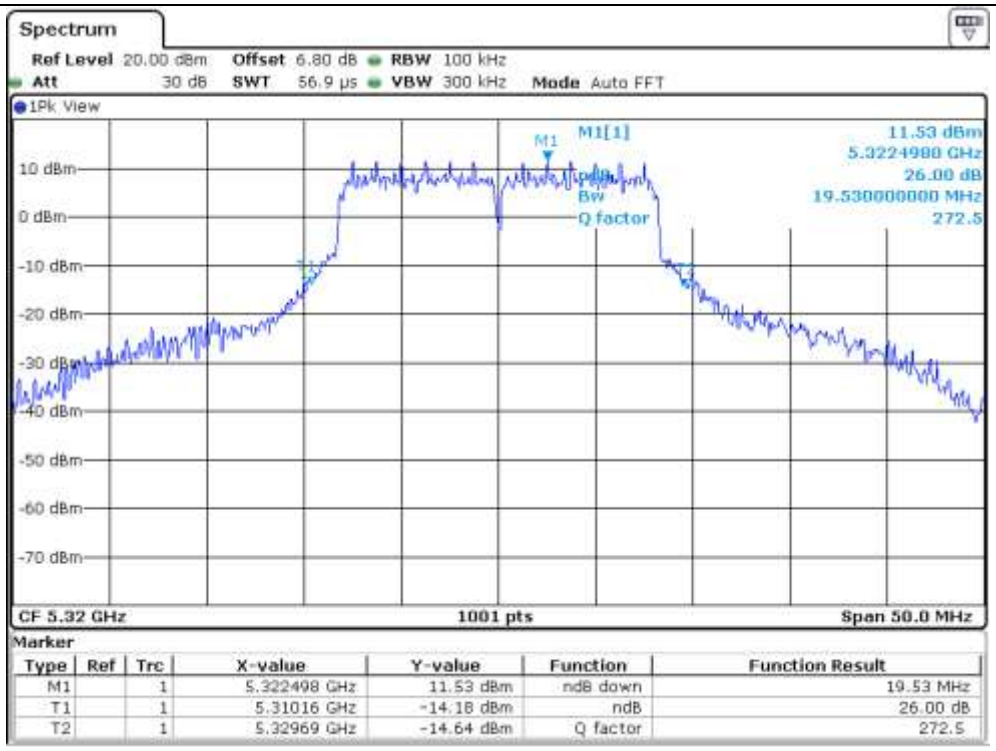
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



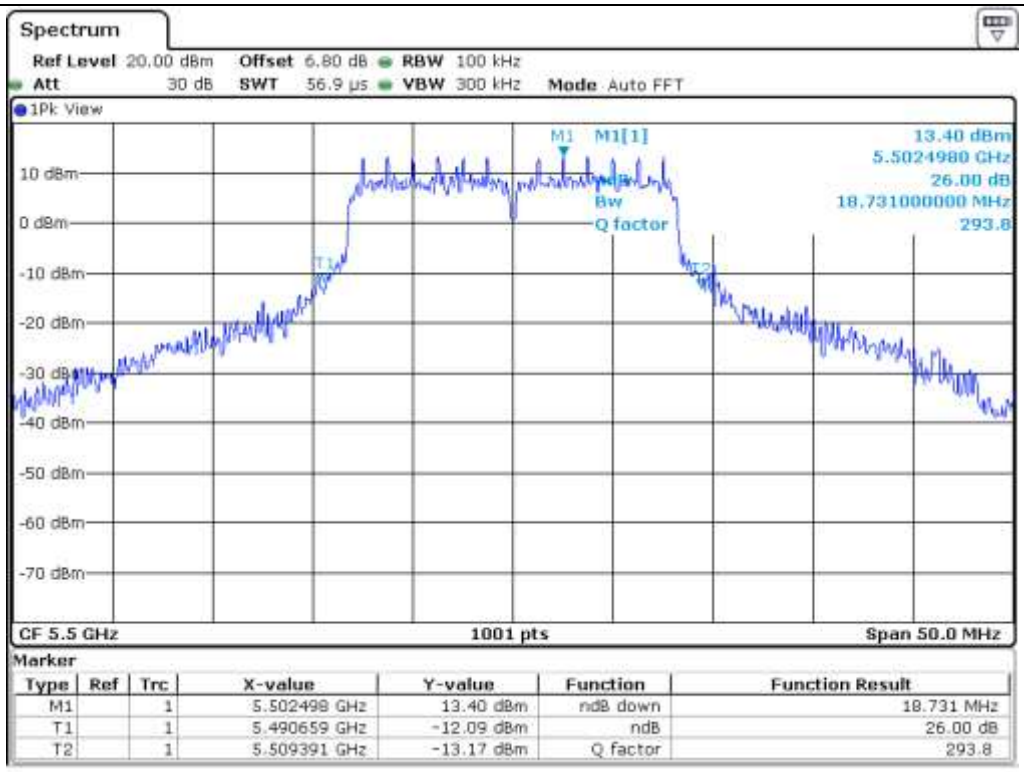
Low Channel (5 260 MHz)



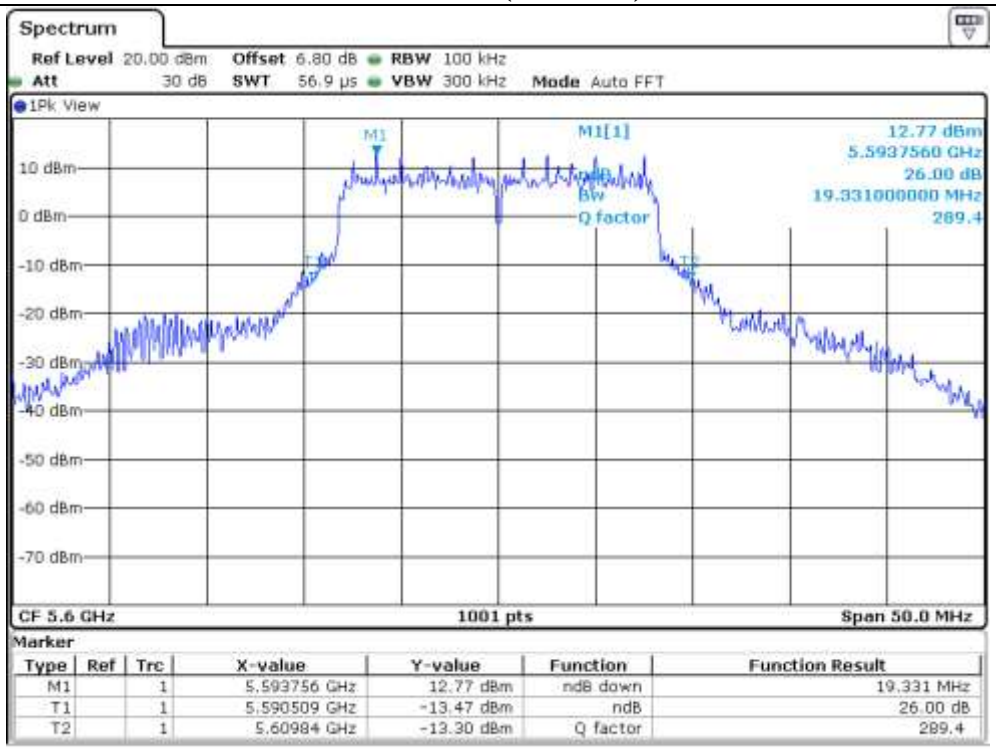
Middle Channel (5 300 MHz)



High Channel (5 320 MHz)

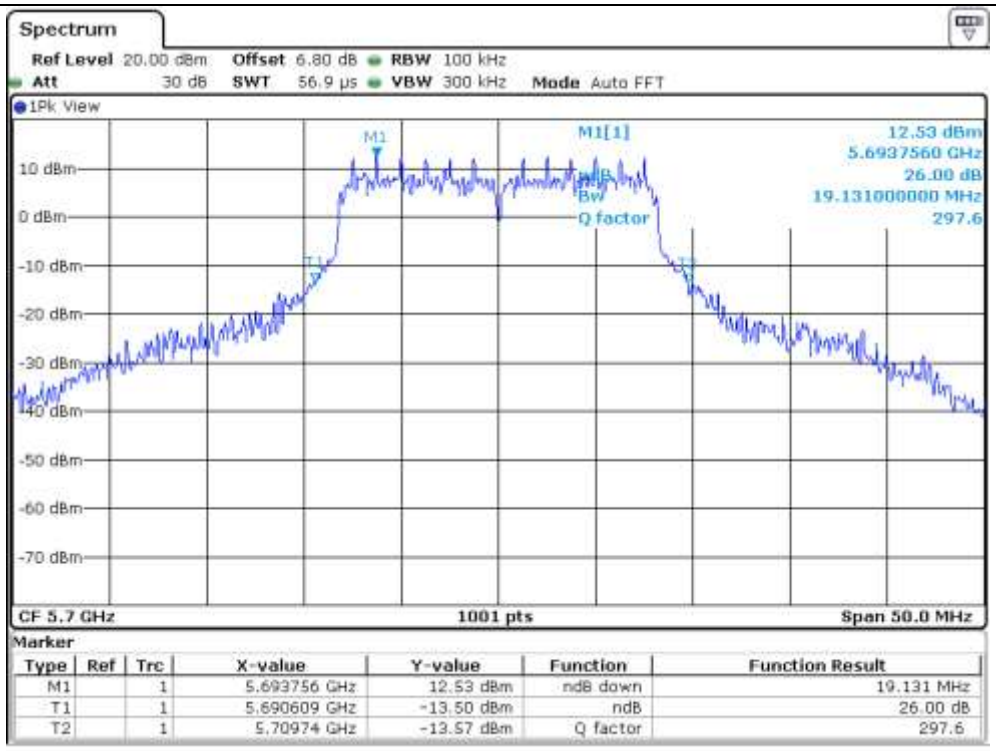


Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)

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 (5 700 MHz)

7.5 Test data for 802.11n (HT 20) WLAN Mode (Client mode)

-. Test Date : March 11, 2020

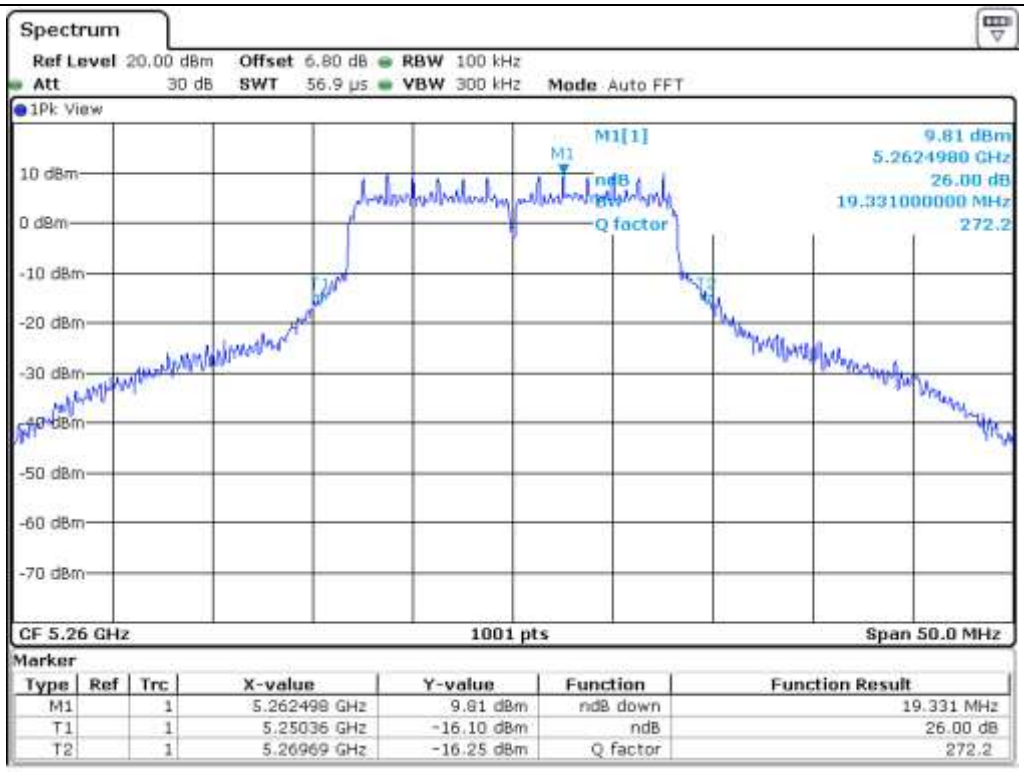
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 250 ~ 5 350	Low	5 260.00	19.33
	Middle	5 300.00	19.63
	High	5 320.00	19.58
5 470 ~ 5 725	Low	5 500.00	19.58
	Middle	5 600.00	19.33
	High	5 700.00	19.88

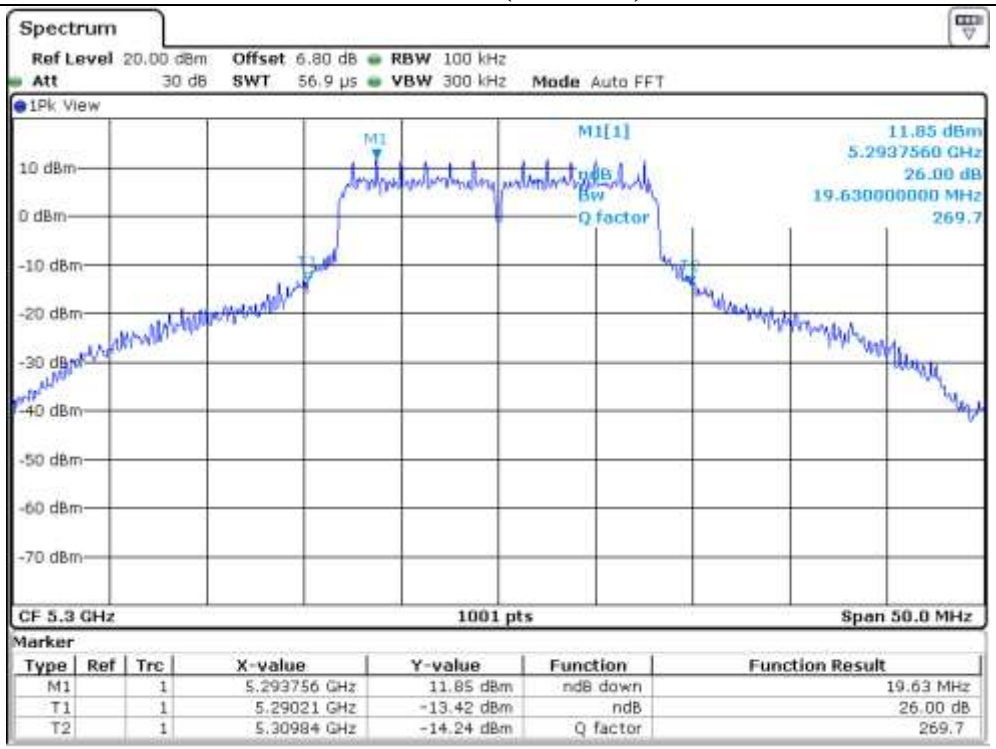
Remark: See next page for measurement data.

Tested by: Haram Lee / Manager

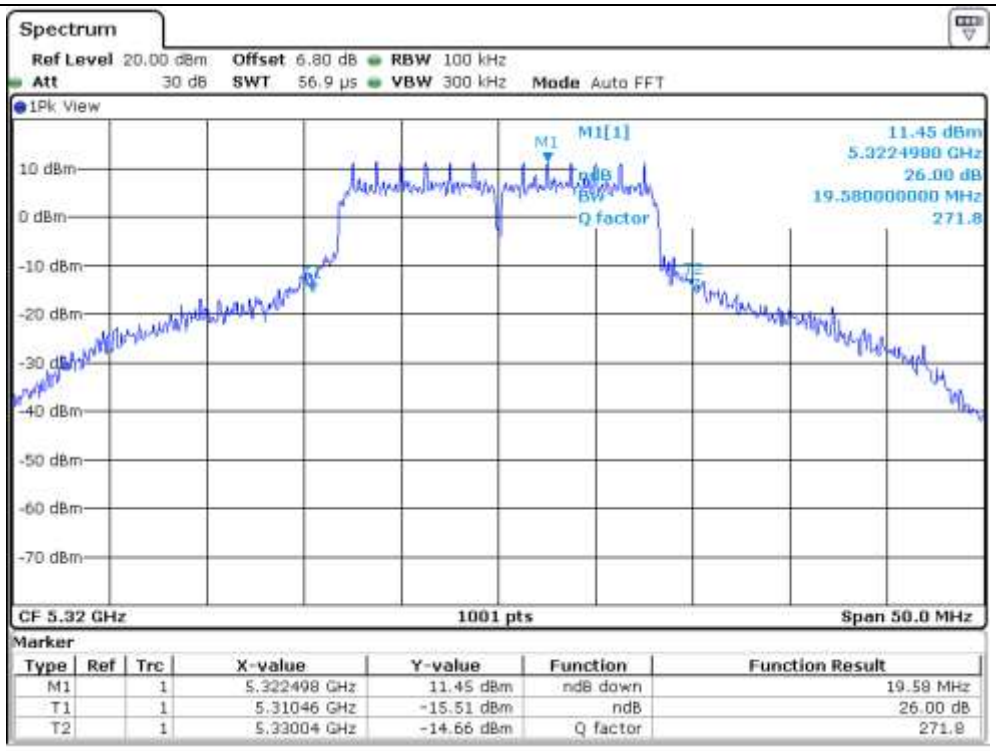
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



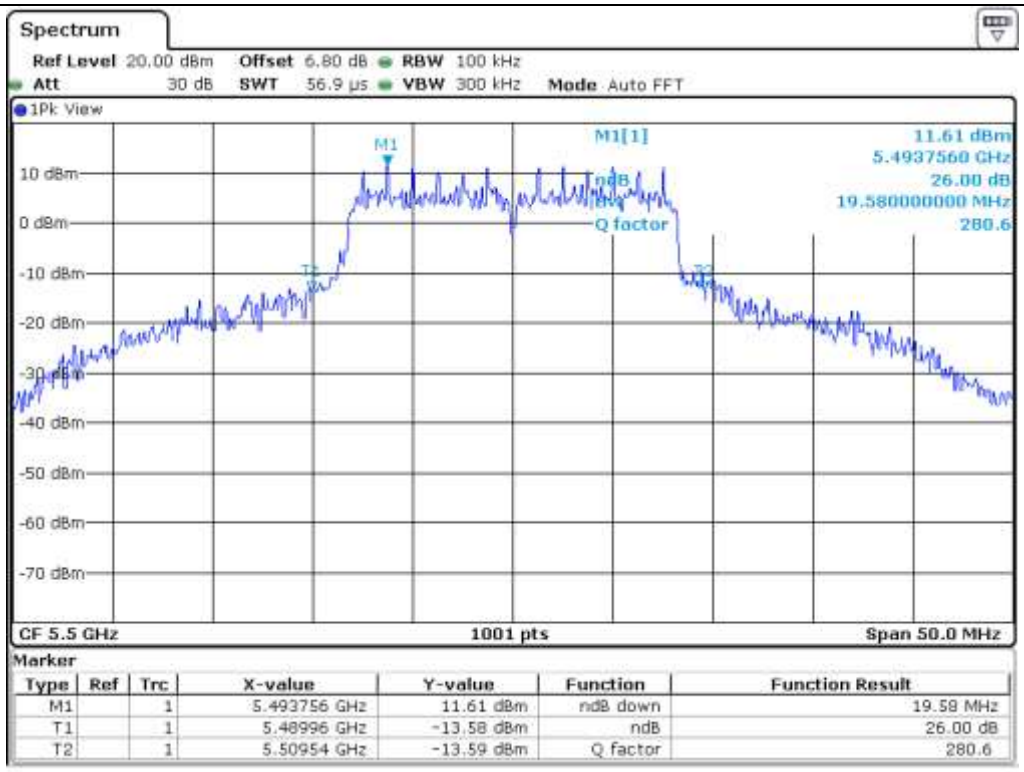
Low Channel (5 260 MHz)



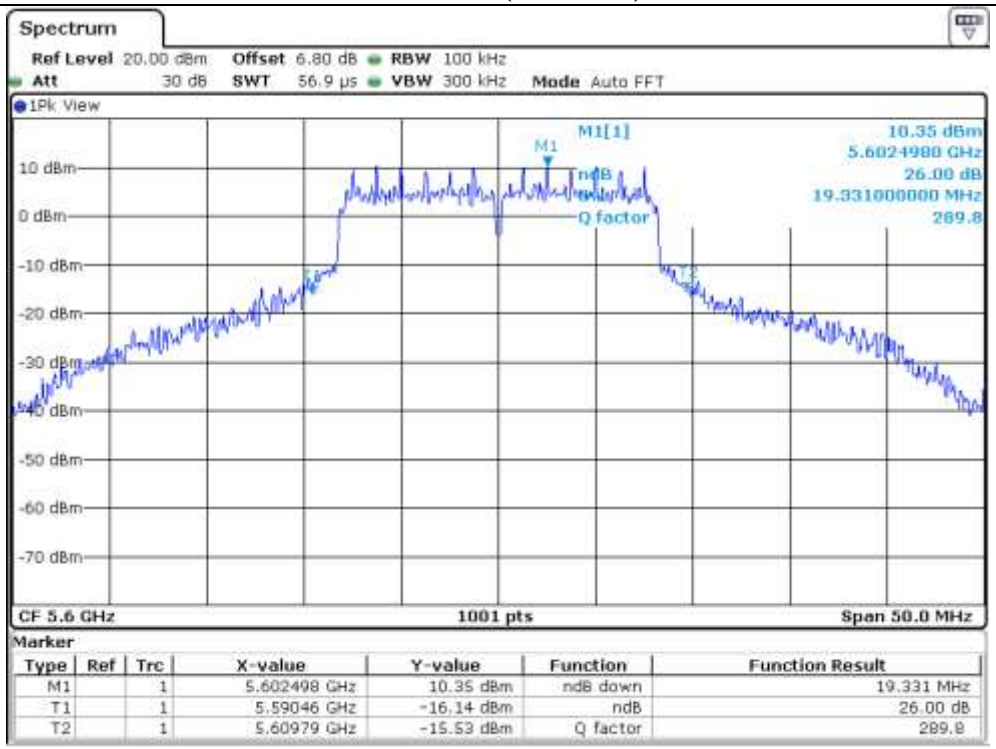
Middle Channel (5 300 MHz)



High Channel (5 320 MHz)

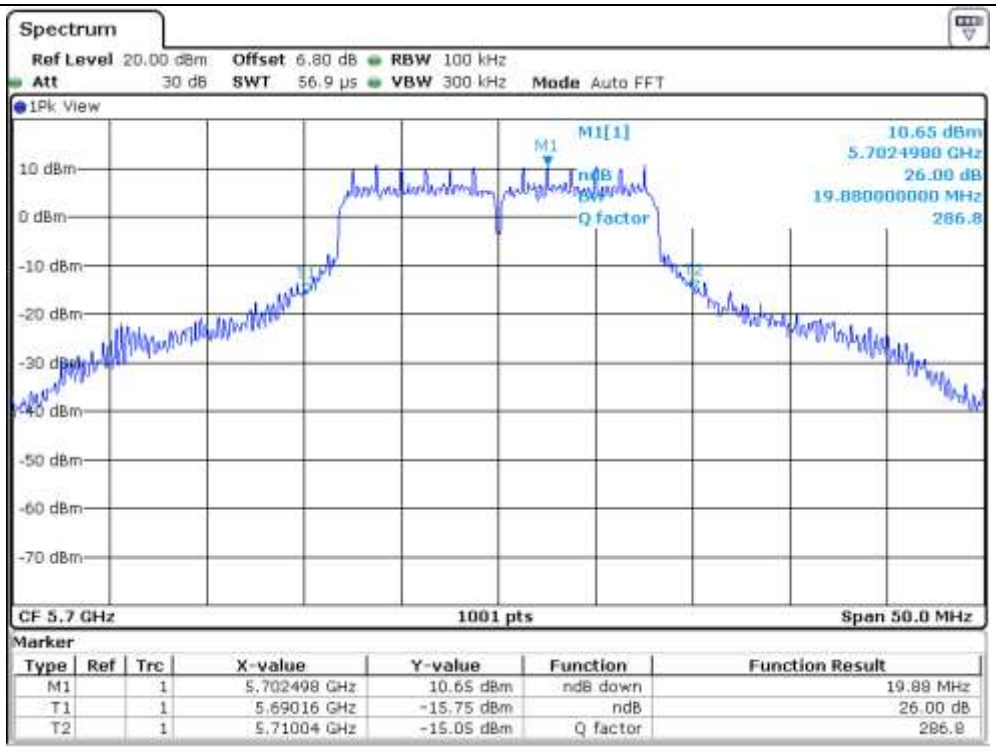


Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)

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 (5 700 MHz)

8. 99% OCCUPIED BANDWIDTH

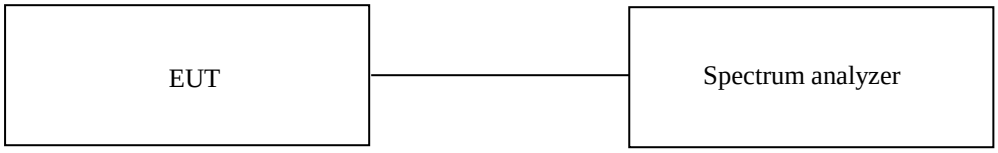
8.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % 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 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.



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

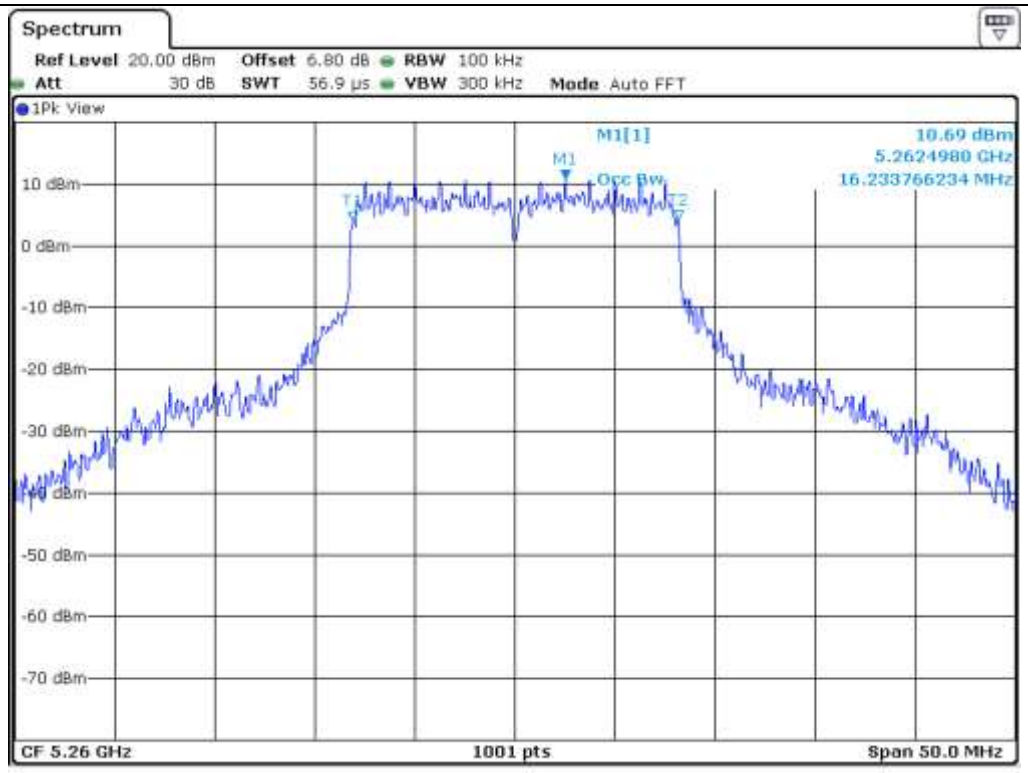
8.4 Test data for 802.11n (HT20) WLAN Mode (Master mode)

-. Test Date : March 10, 2020

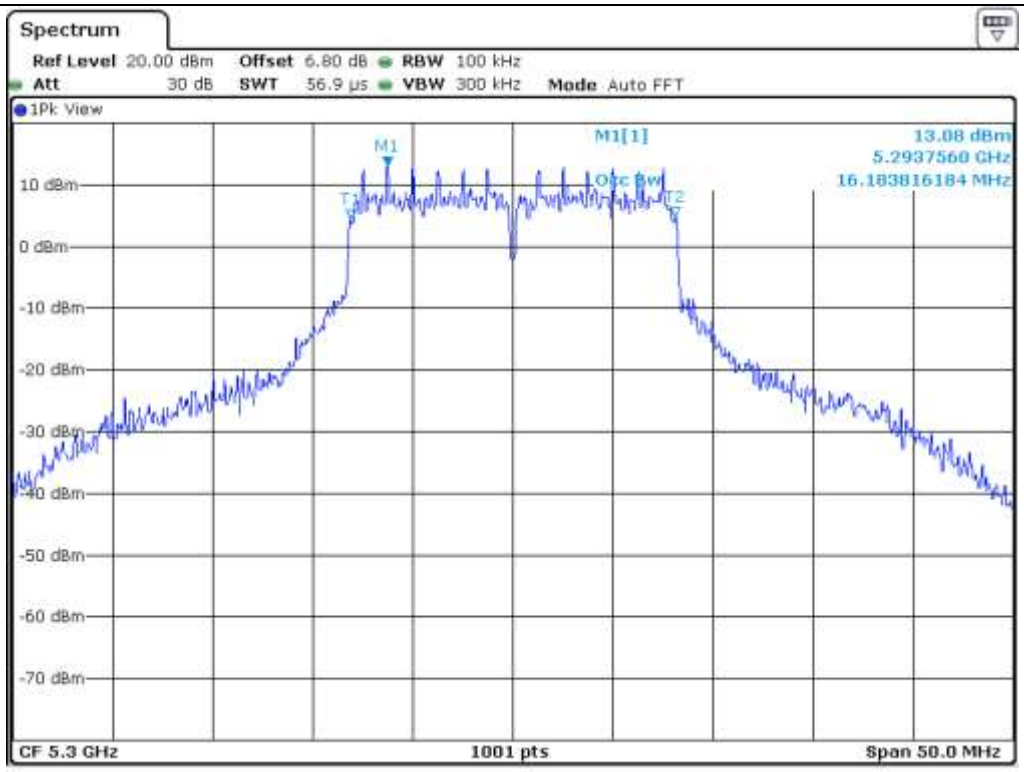
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	99 % Bandwidth (MHz)
5 250 ~ 5 350	Low	5 260.00	16.23
	Middle	5 300.00	16.18
	High	5 320.00	16.23
5 470 ~ 5 725	Low	5 500.00	16.23
	Middle	5 600.00	16.18
	High	5 700.00	16.28

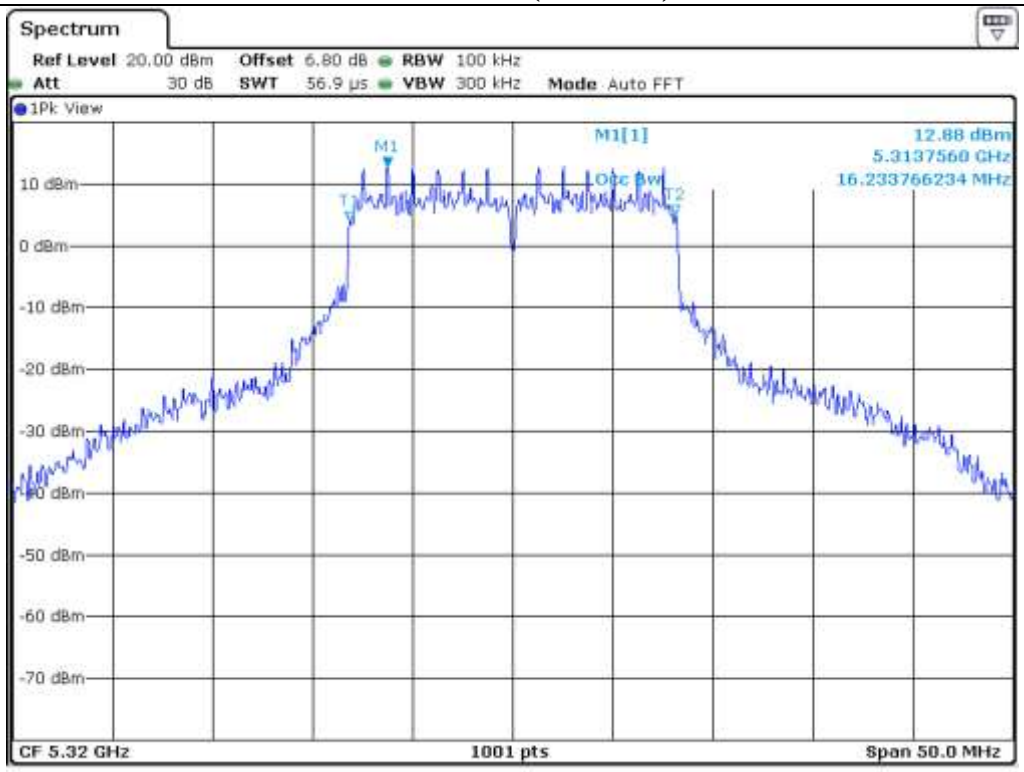
Tested by: Haram Lee / Manager



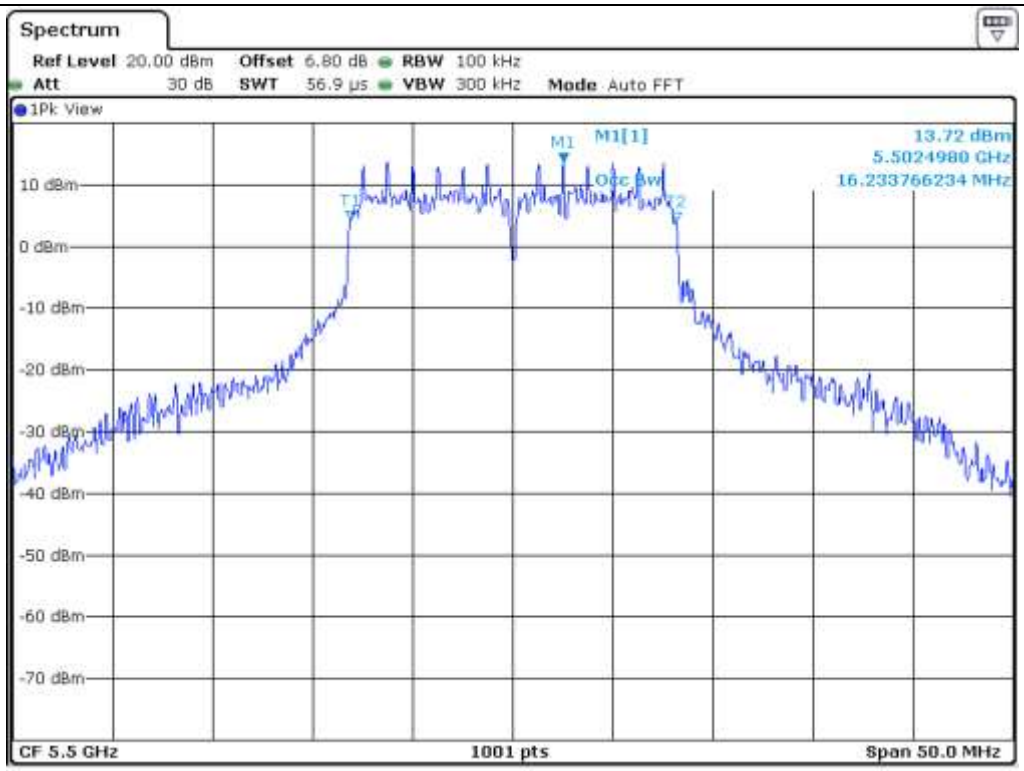
Low Channel (5 260 MHz)



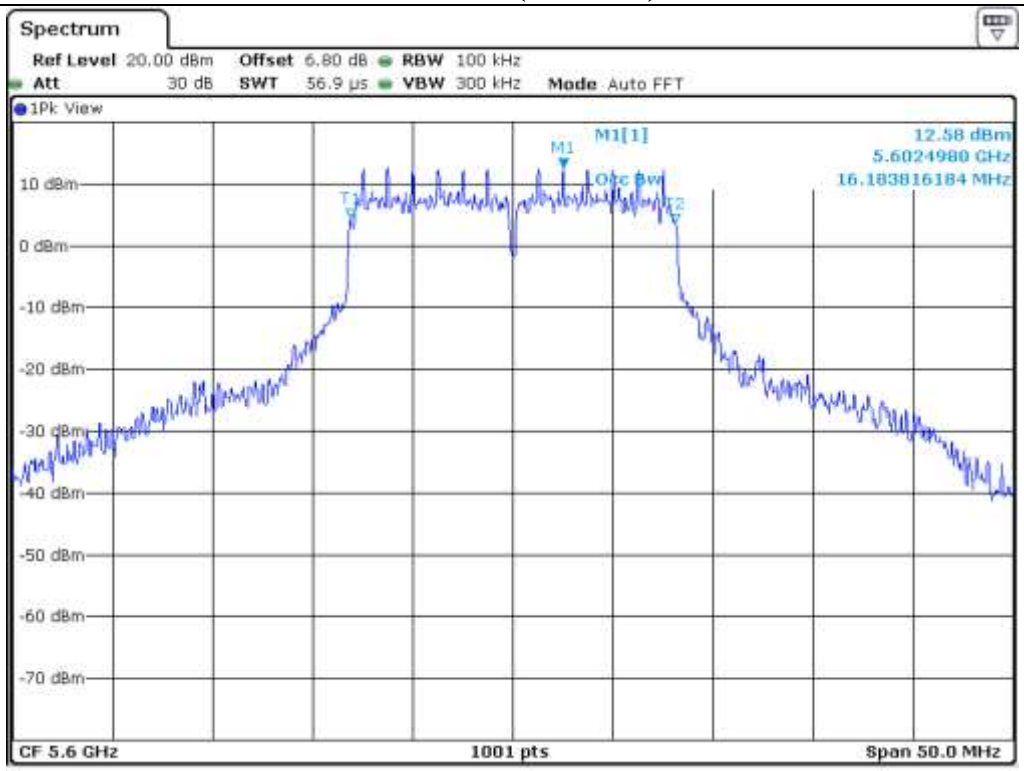
Middle Channel (5 300 MHz)



High Channel (5 320 MHz)

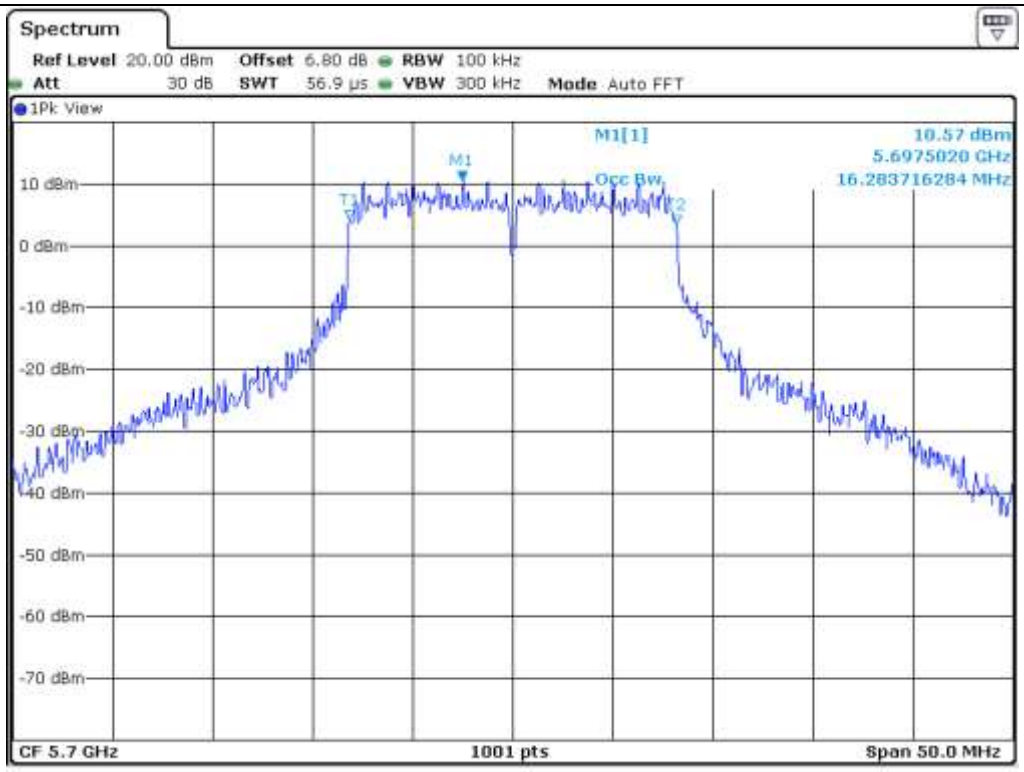


Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)

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 (5 700 MHz)

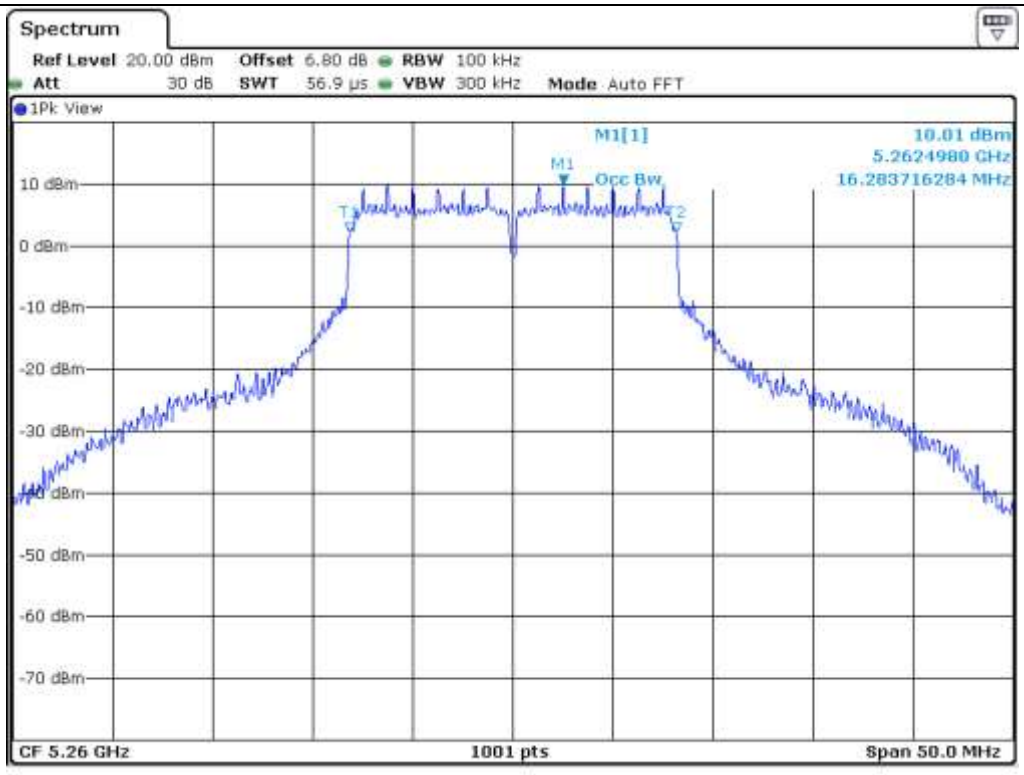
8.5 Test data for 802.11n (HT20) WLAN Mode (Client mode)

-. Test Date : March 11, 2020

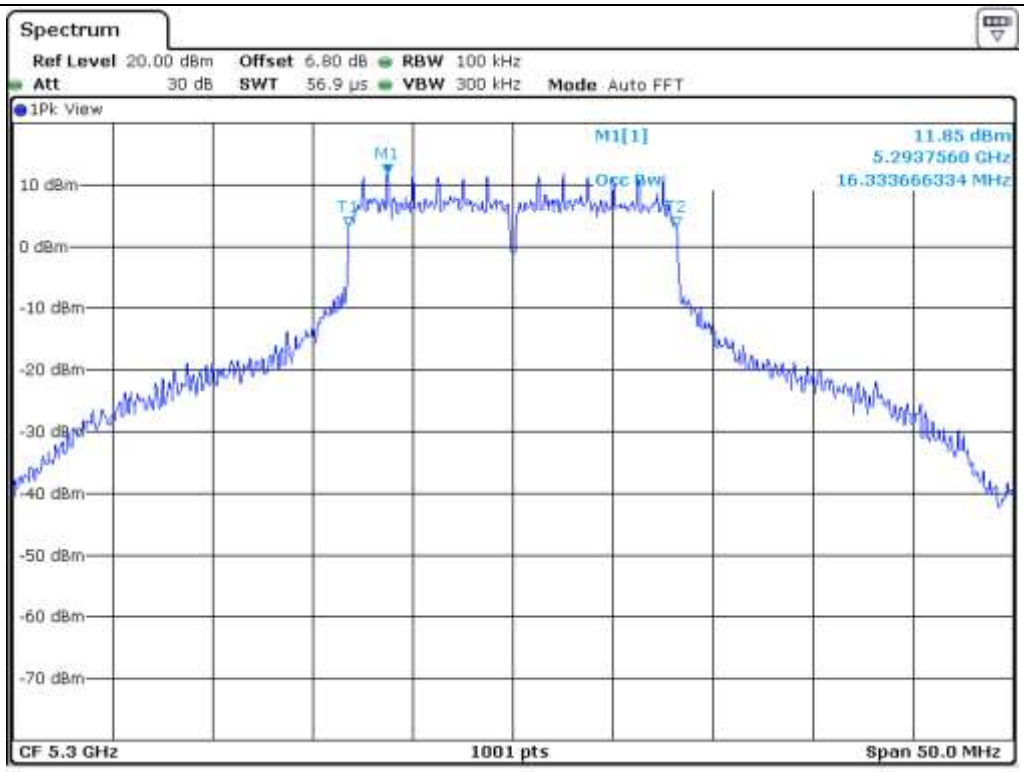
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	99 % Bandwidth (MHz)
5 250 ~ 5 350	Low	5 260.00	16.28
	Middle	5 300.00	16.33
	High	5 320.00	16.33
5 470 ~ 5 725	Low	5 500.00	16.43
	Middle	5 600.00	16.38
	High	5 700.00	16.28

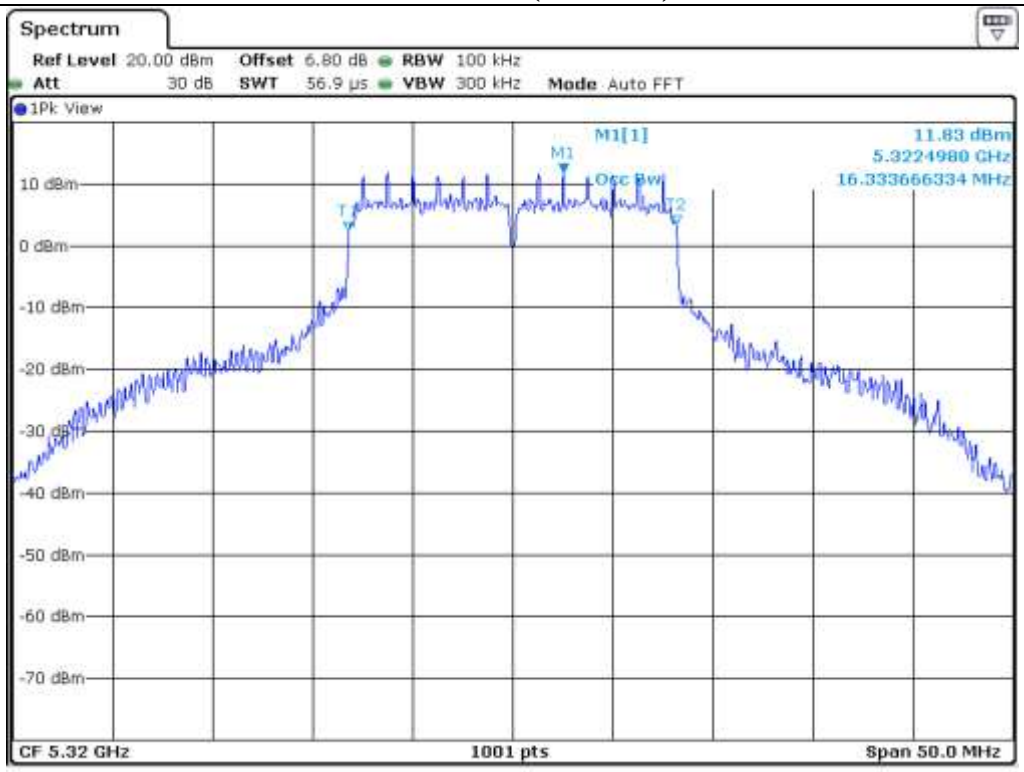
Tested by: Haram Lee / Manager



Low Channel (5 260 MHz)

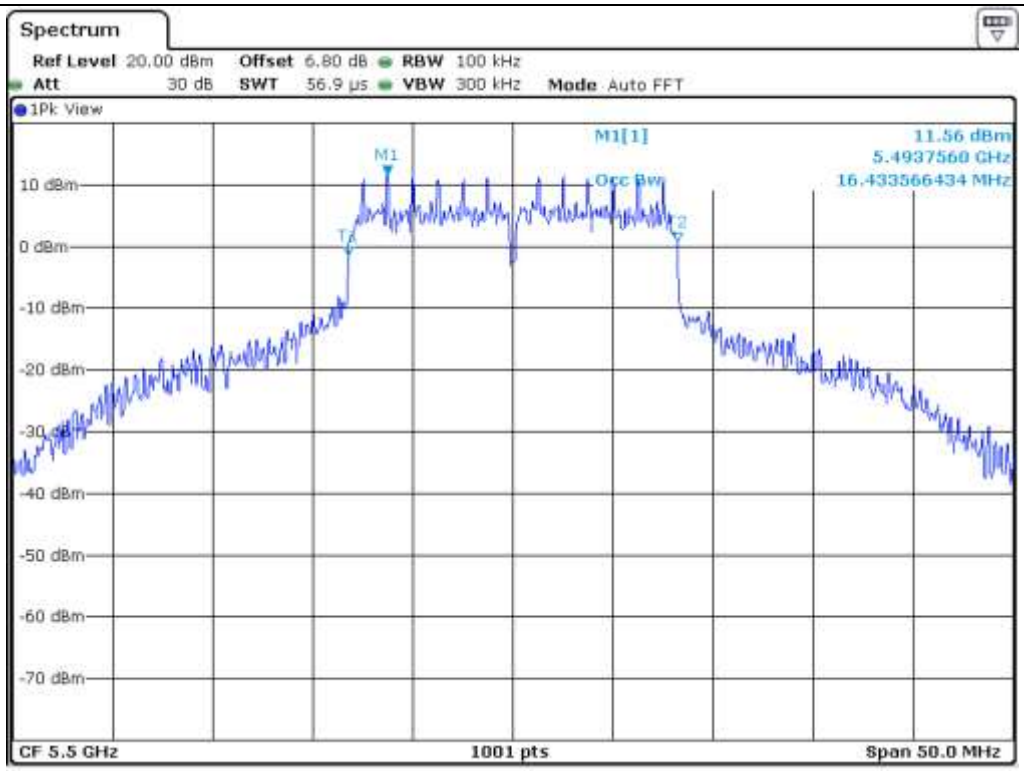


Middle Channel (5 300 MHz)

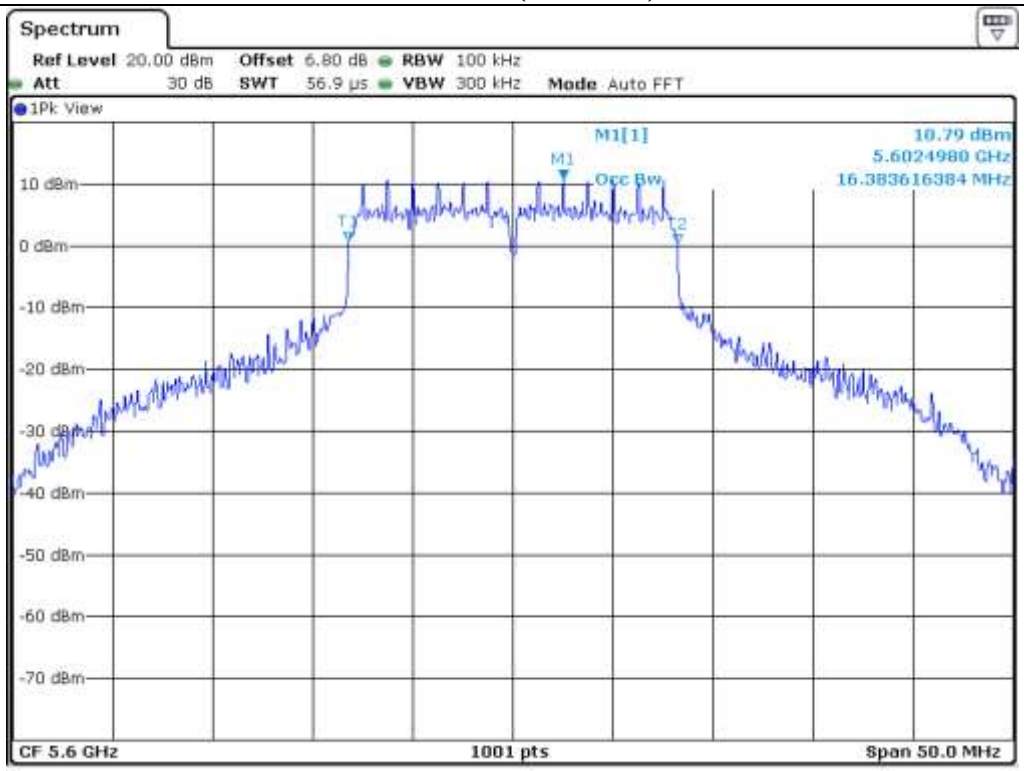


High Channel (5 320 MHz)

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

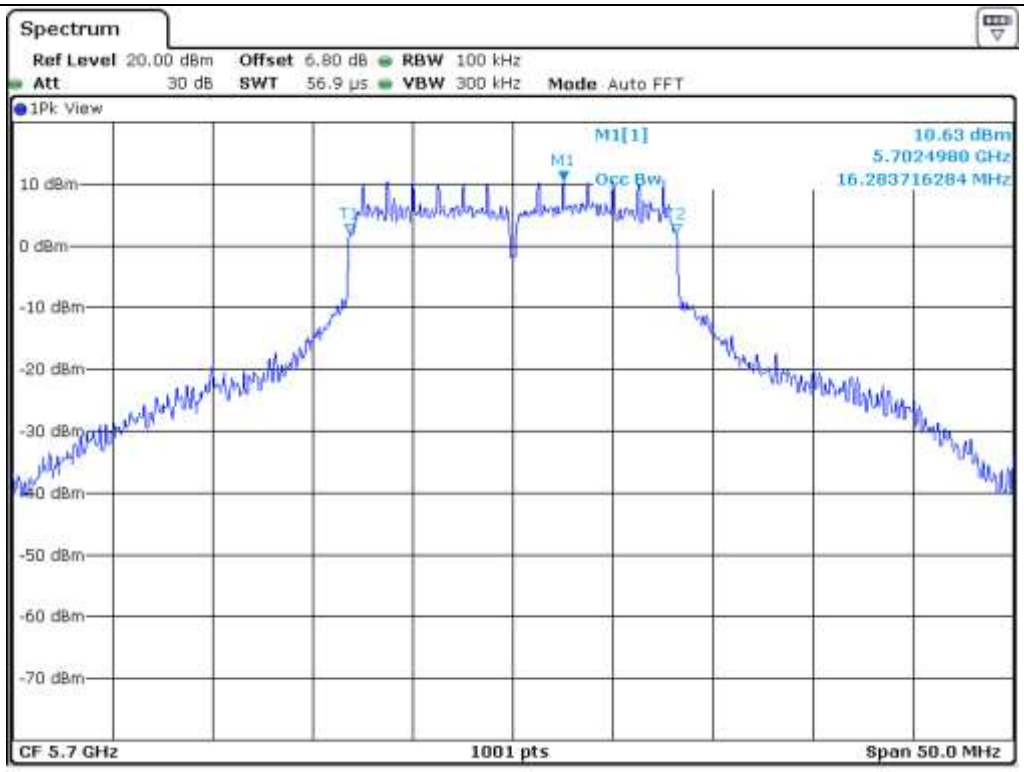


Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)

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 (5 700 MHz)

9. MAXIMUM PEAK OUTPUT POWER

9.1 Operating environment

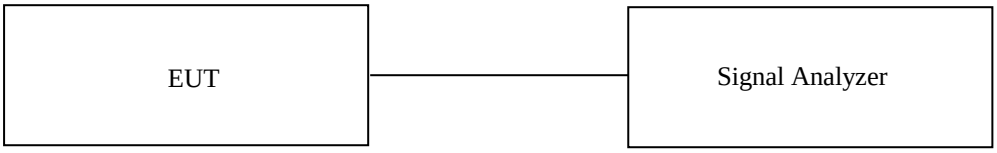
Temperature : 23 ℃

Relative humidity : 46 % R.H.

9.2 Test set-up

The maximum peak output power was measured with the Signal Analyzer connected to the antenna output of the EUT. The Signal Analyzer is measured when the EUT is transmitting at the appropriate center frequency its maximum power control level as described in Section E. 3. (KDB 789033 D02 General UNII Test Procedures New Rules v01r04).

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



9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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

9.4 Test data for 802.11n (HT 20) WLAN Mode (Master mode)

-. Test Date : March 10, 2020

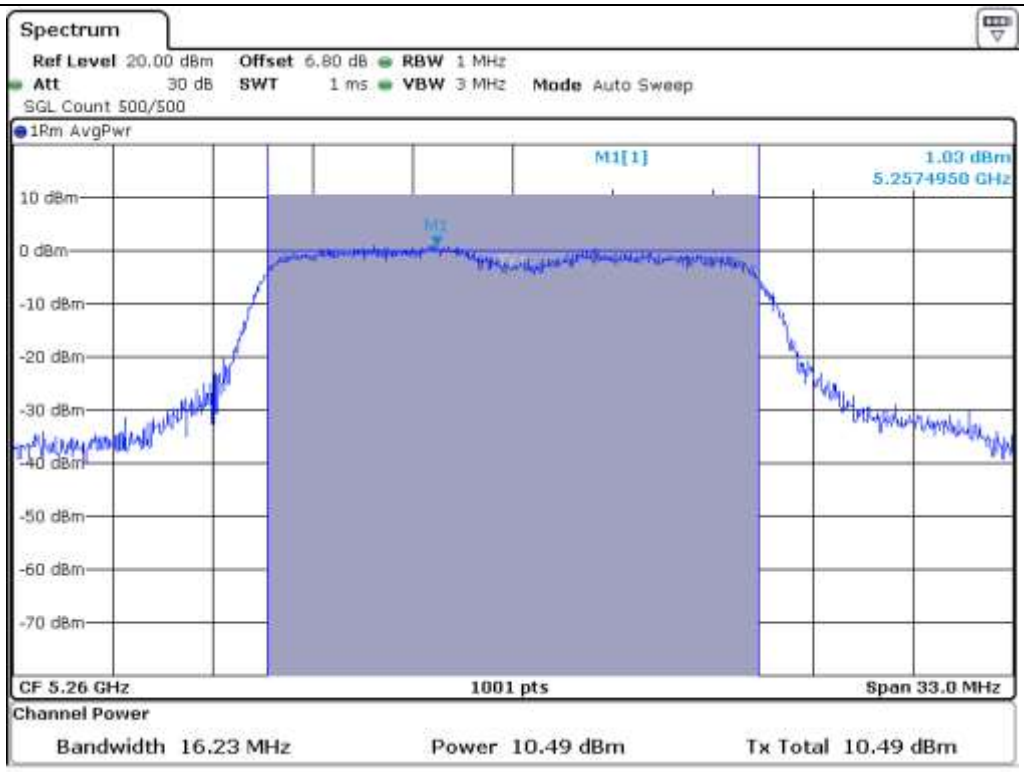
-. Test Result : Pass

Frequency Range (MHz)	Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
5 250 ~ 5 350	Low	5 260.00	10.49	8.15	18.64	23.92	5.28
	Middle	5 300.00	10.79	8.15	18.94	23.74	4.80
	High	5 320.00	10.55	8.15	18.70	23.91	5.21
5 470 ~ 5 725	Low	5 500.00	11.47	8.15	19.62	23.73	4.11
	Middle	5 600.00	10.45	8.15	18.60	23.86	5.26
	High	5 700.00	10.65	8.15	18.80	23.82	5.02

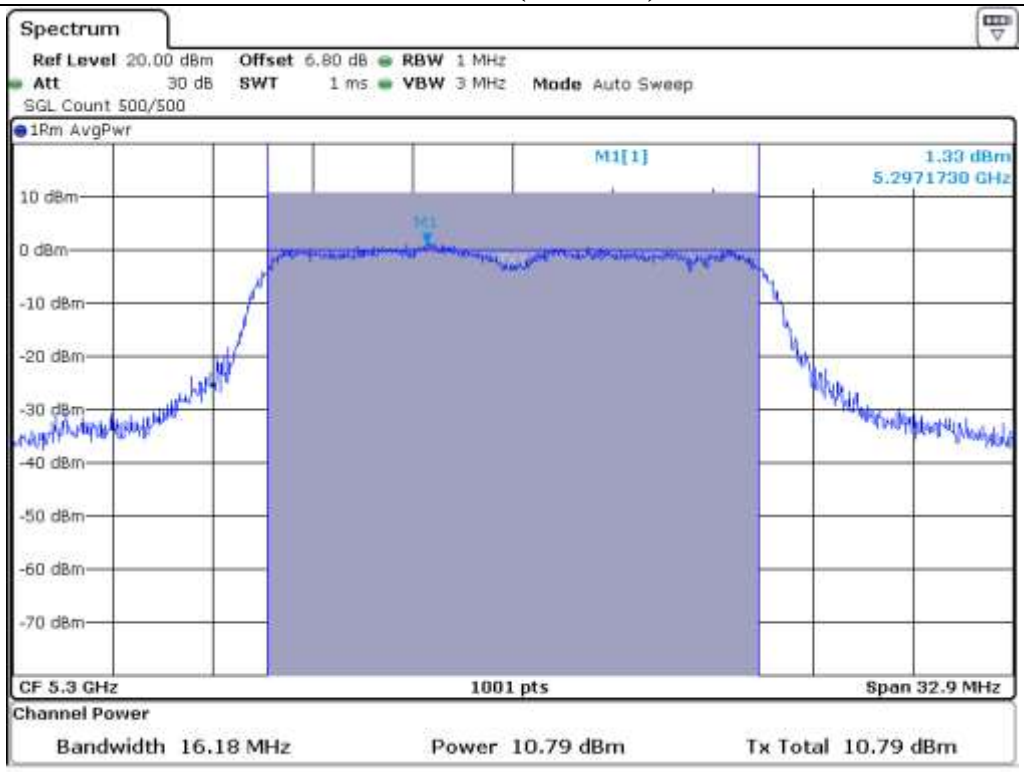
Remark : Result = Measured Value + Duty Fator

Tested by: Haram Lee / Manager

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

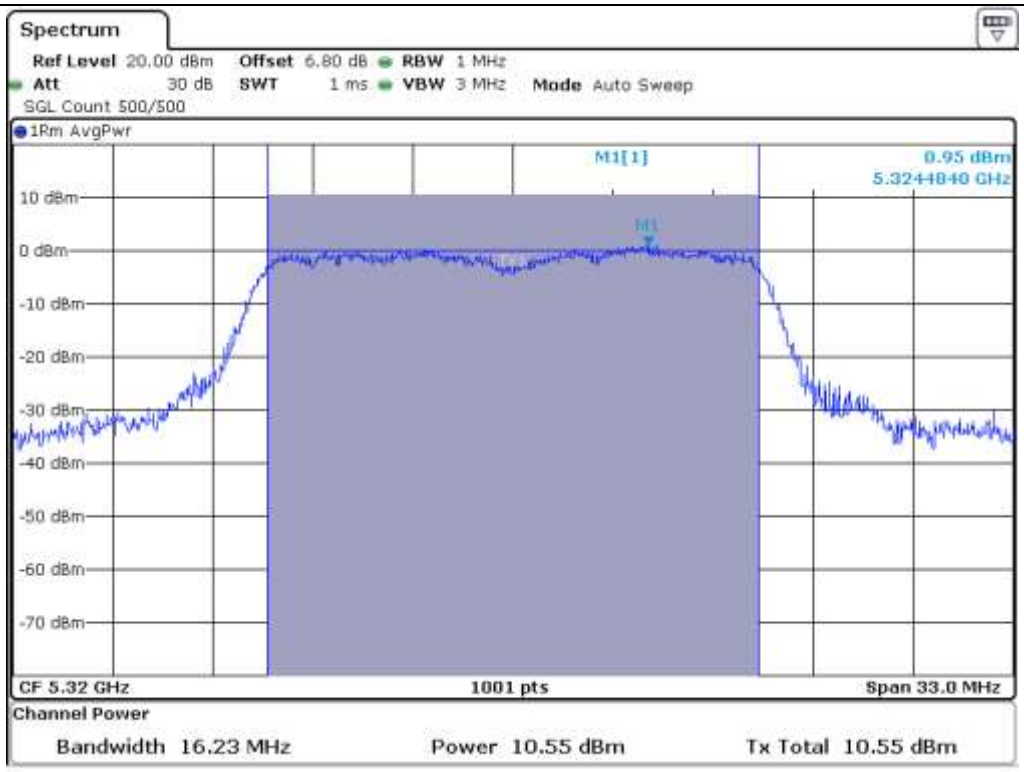


Low Channel (5 260 MHz)



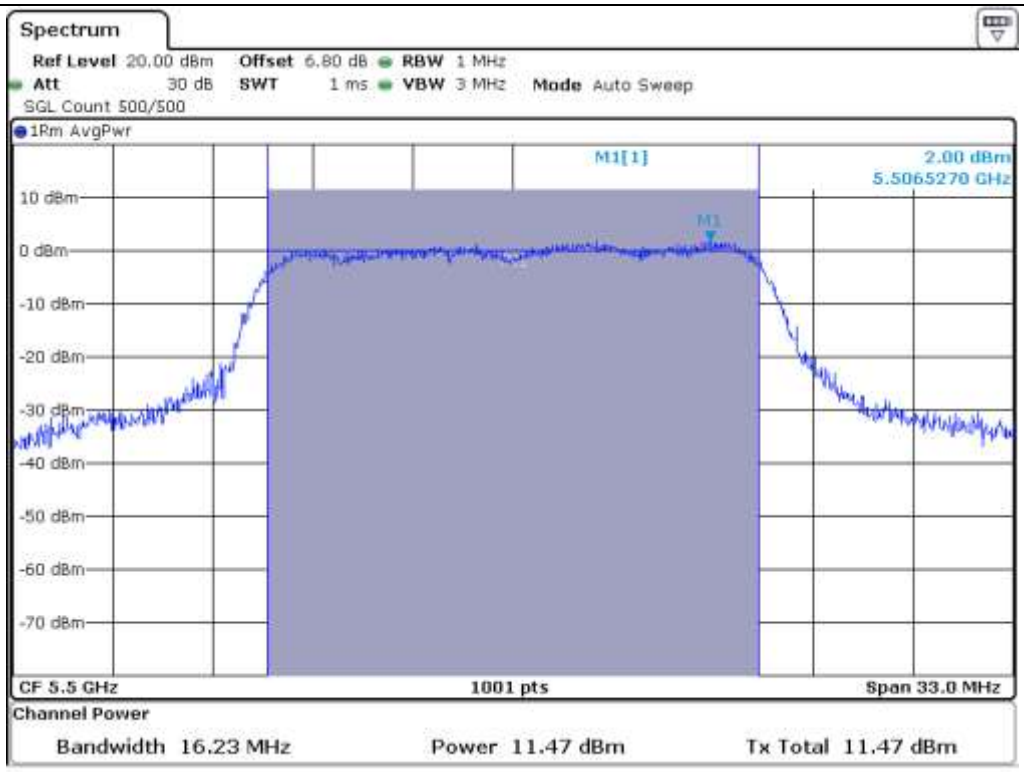
Middle Channel (5 300 MHz)

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

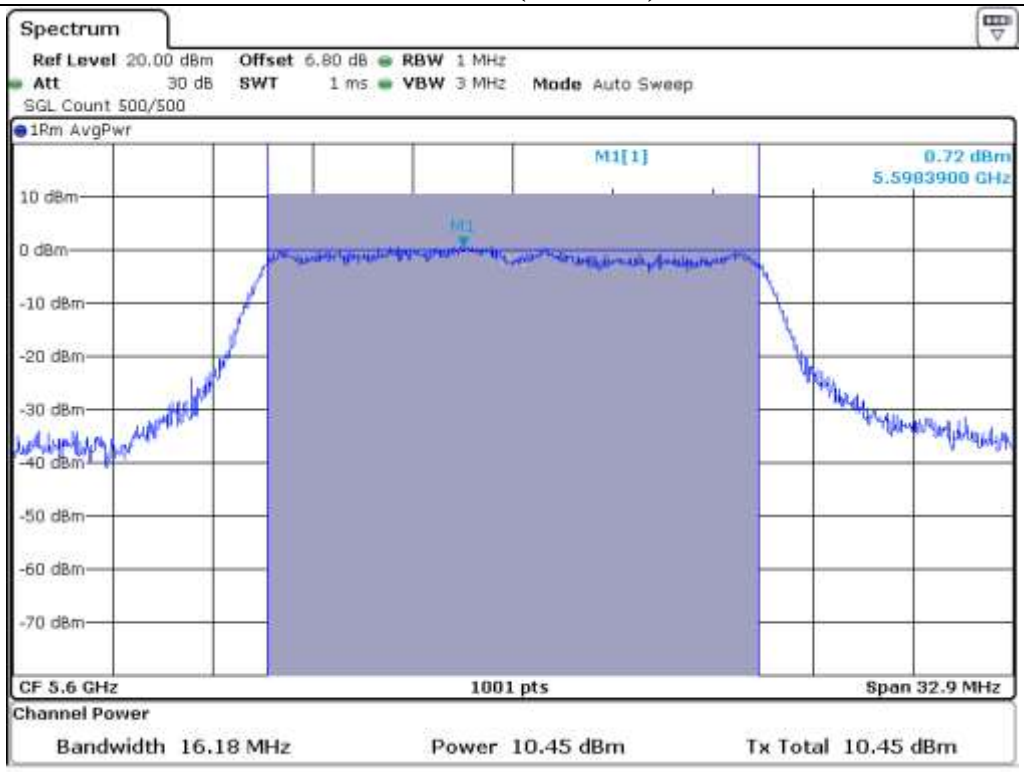


High Channel (5 320 MHz)

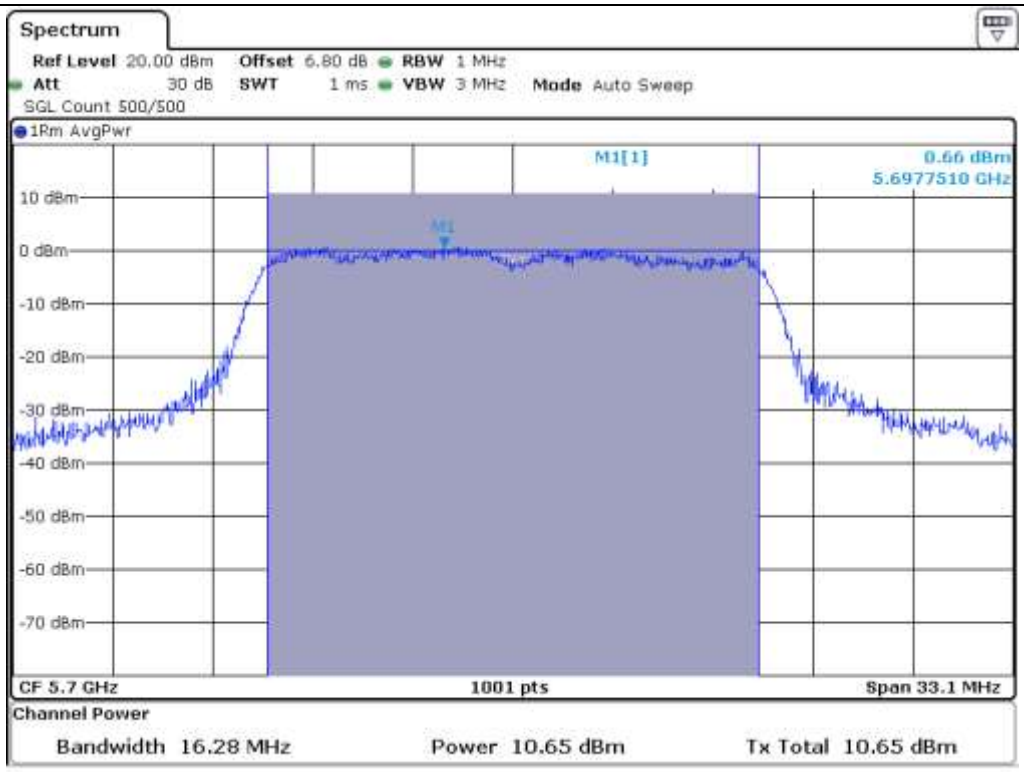
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



High Channel (5 700 MHz)

9.5 Test data for 802.11n (HT 20) WLAN Mode (Client mode)

-. Test Date : March 11, 2020

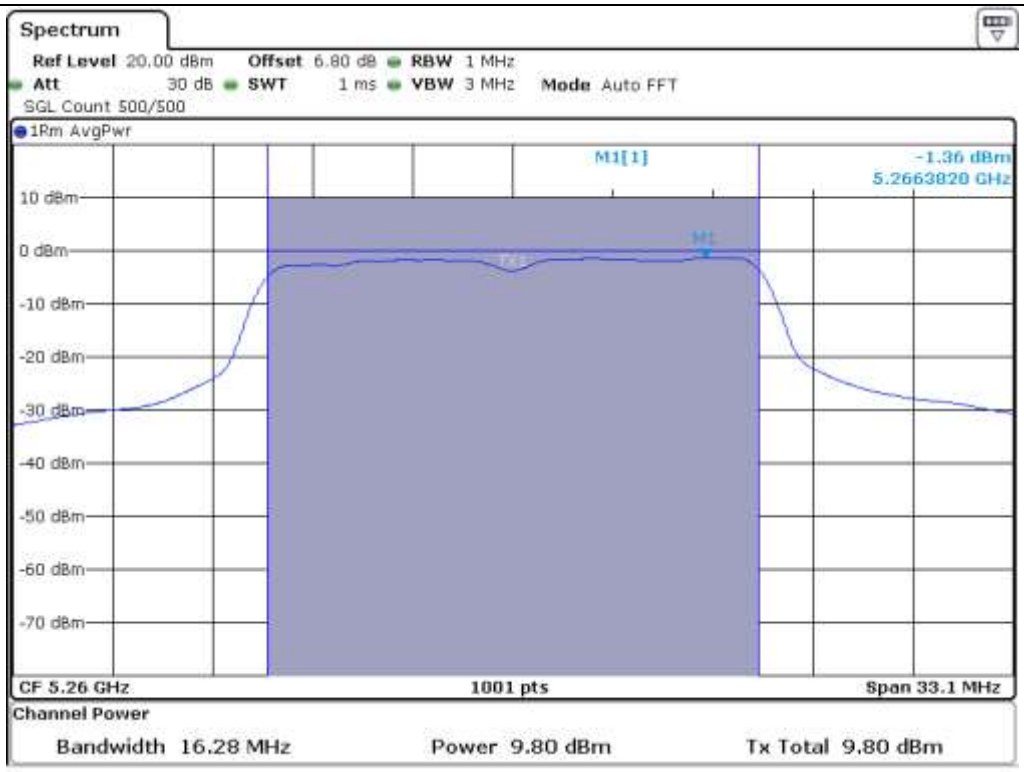
-. Test Result : Pass

Frequency Range (MHz)	Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
5 250 ~ 5 350	Low	5 260.00	9.80	8.15	17.95	23.92	5.97
	Middle	5 300.00	10.73	8.15	18.88	23.74	4.86
	High	5 320.00	10.17	8.15	18.32	23.91	5.59
5 470 ~ 5 725	Low	5 500.00	9.53	8.15	17.68	23.73	6.05
	Middle	5 600.00	9.90	8.15	18.05	23.86	5.81
	High	5 700.00	10.21	8.15	18.36	23.82	5.46

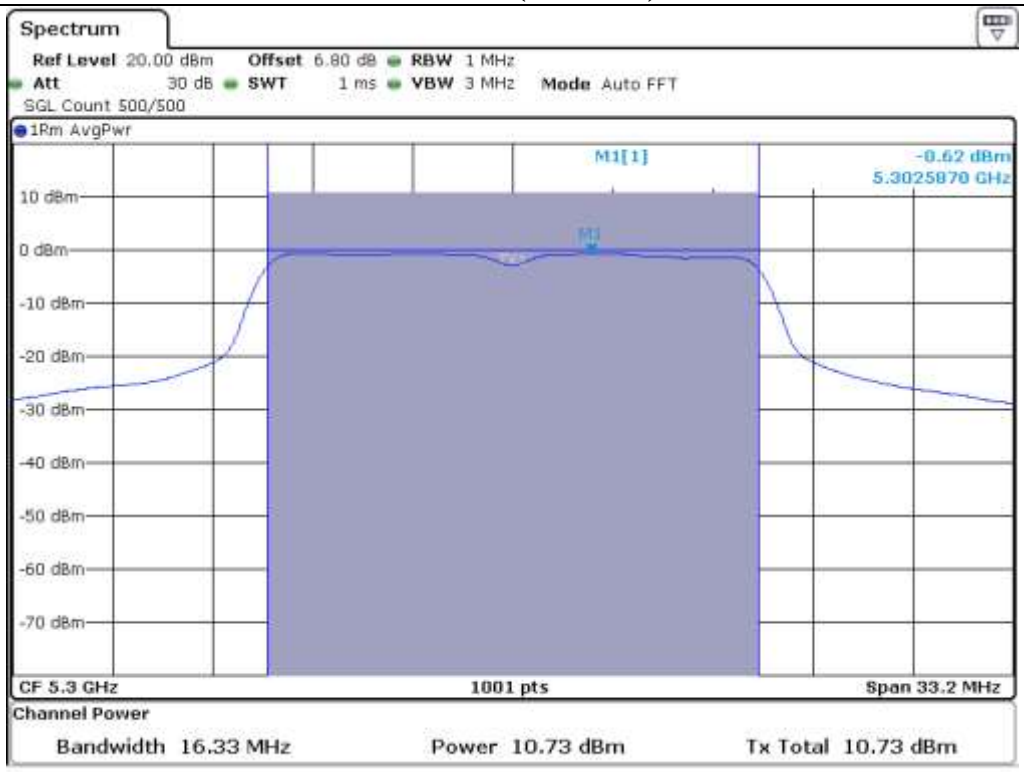
Remark : Result = Measured Value + Duty Fator

Tested by: Haram Lee / Manager

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

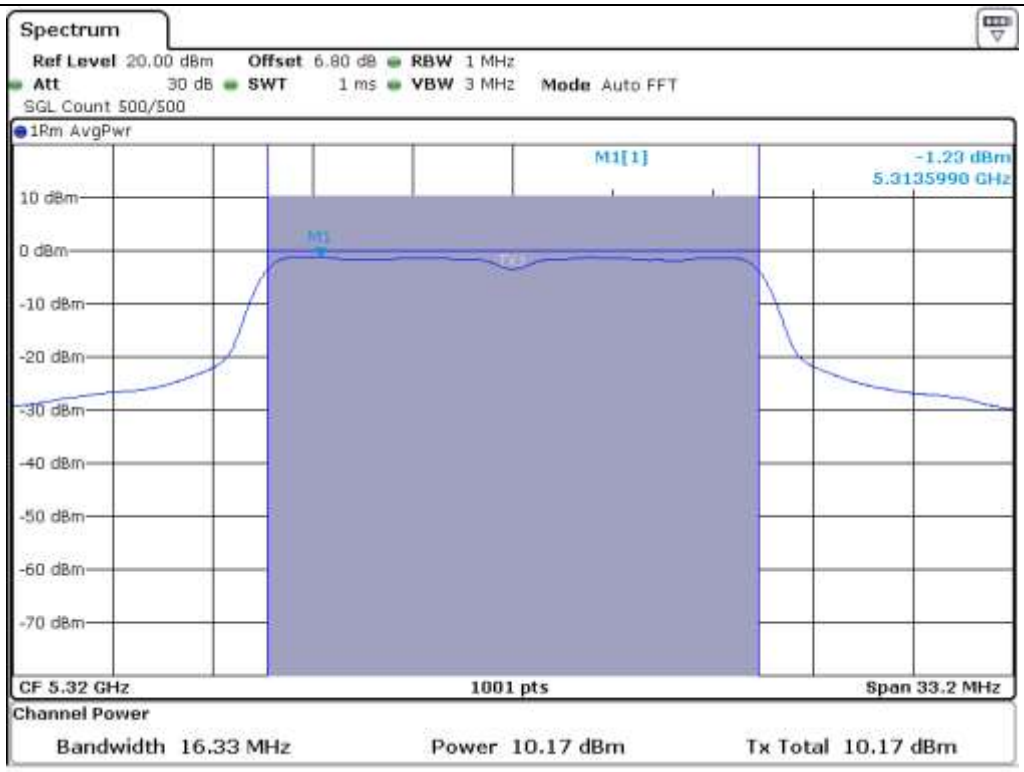


Low Channel (5 260 MHz)

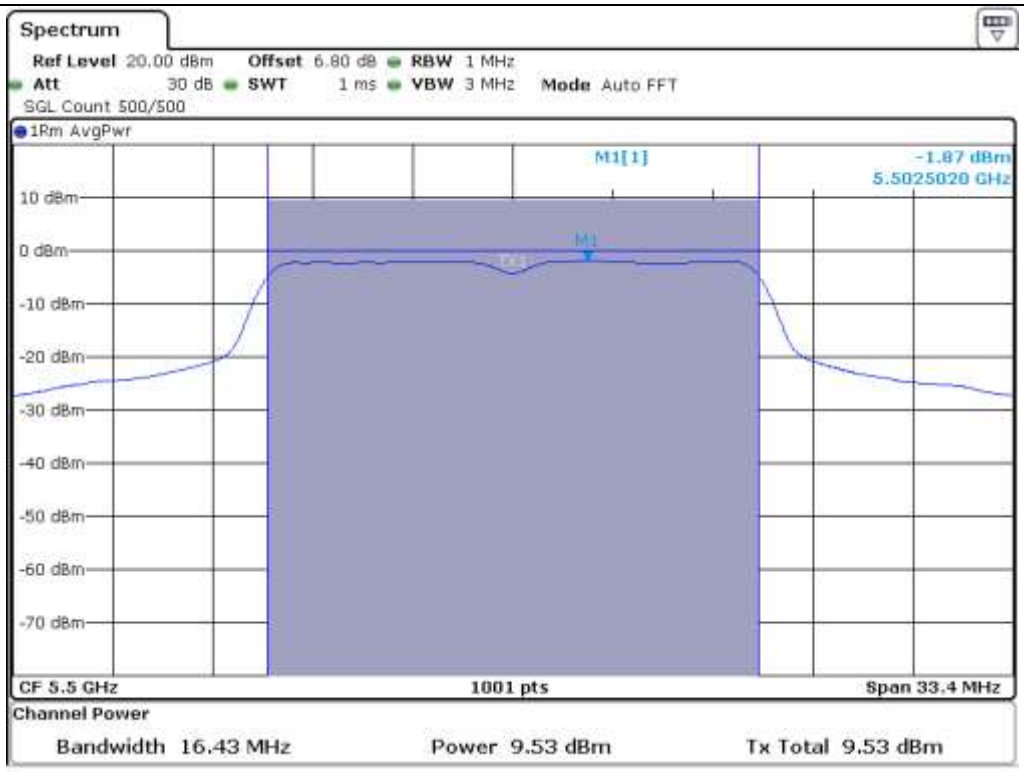


Middle Channel (5 300 MHz)

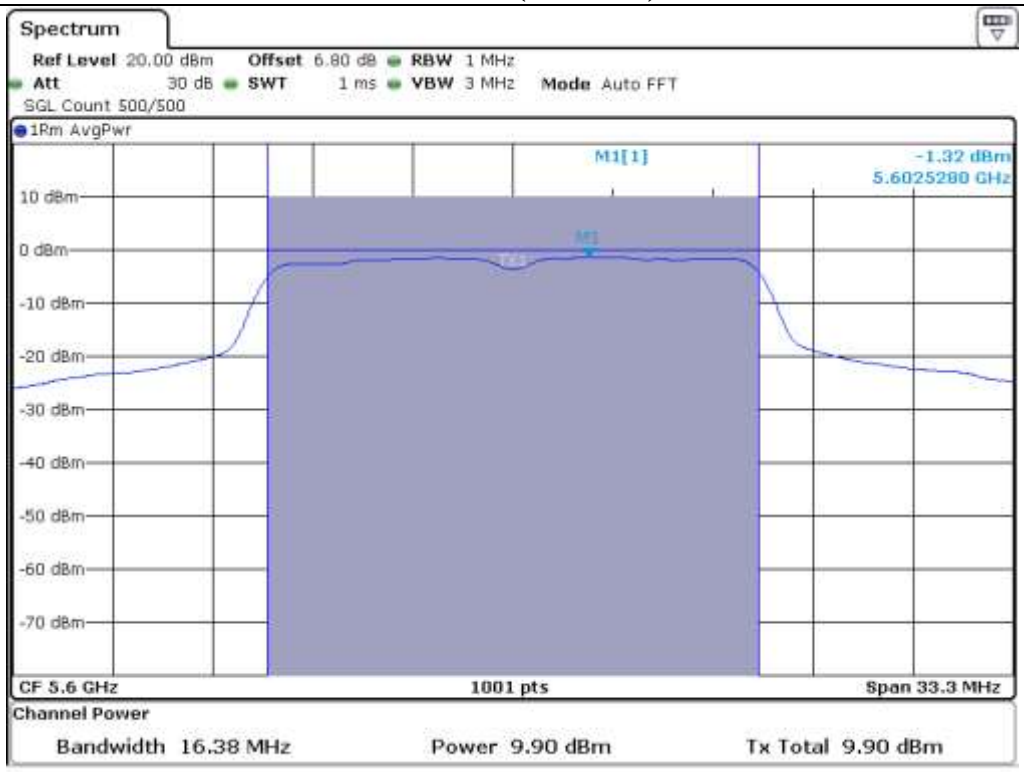
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel (5 320 MHz)

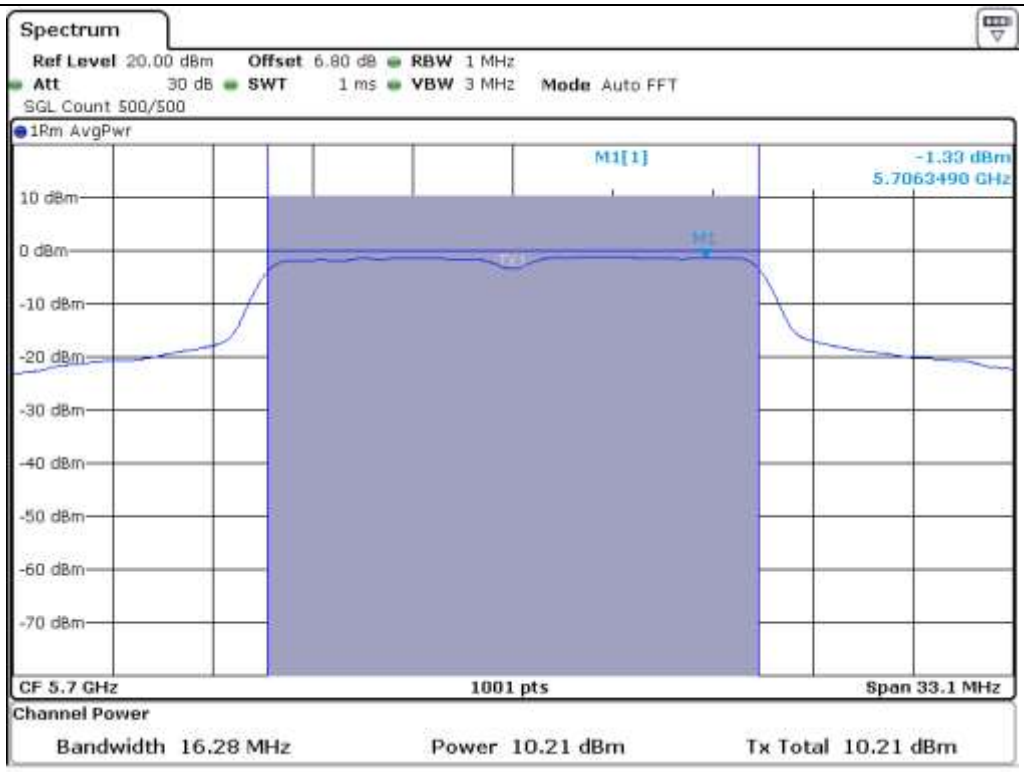


Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)

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 (5 700 MHz)

10. PEAK POWER SPECTRAL DENSITY

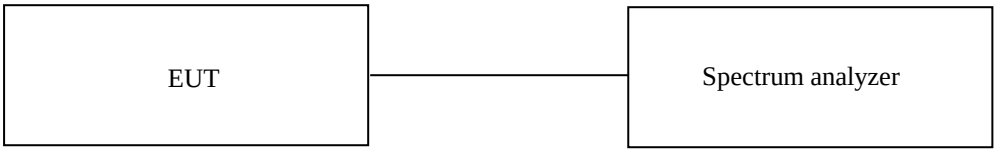
10.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % 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 1 MHz, the video bandwidth is set to 3 times the resolution bandwidth. The maximum level form the EUT in 1 MHz bandwidth was measured with above condition.



10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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

10.4 Test data for 802.11n_HT20 WLAN Mode (Master mode)

-. Test Date : March 10, 2020

-. Operating condition : Highest Output Power Transmitting Mode

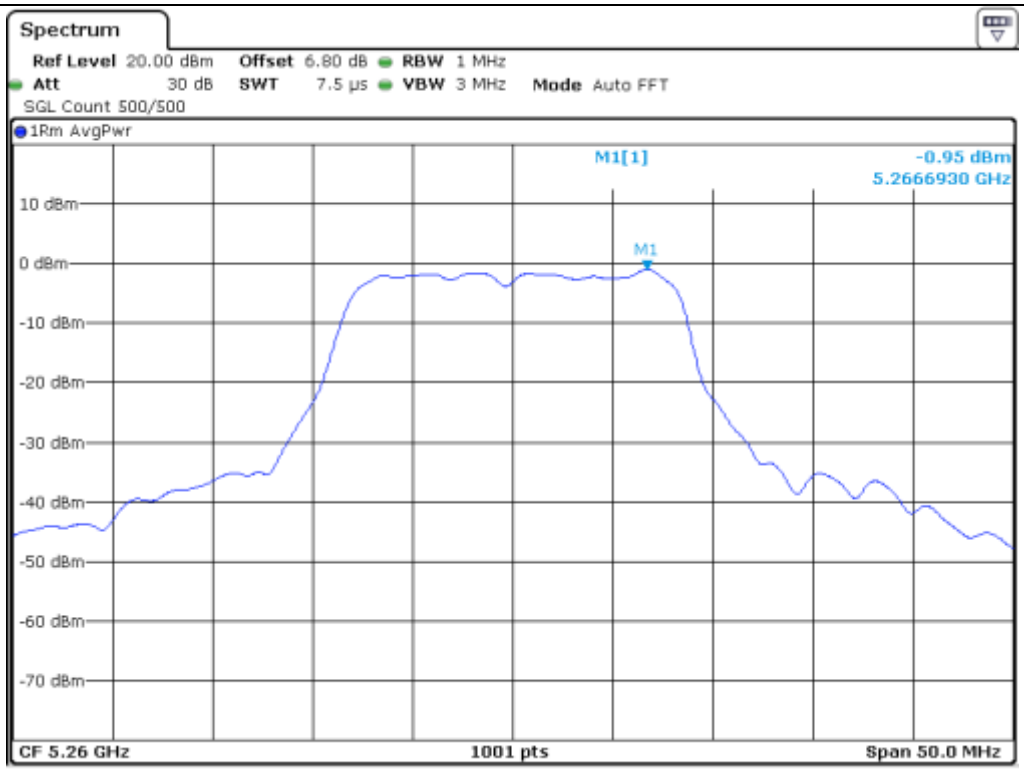
-. Test Result : Pass

Frequency Range (MHz)	Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
5 250 ~ 5 350	Low	5 260.00	-0.95	8.15	7.20	11.00	3.80
	Middle	5 300.00	-0.54	8.15	7.61	11.00	3.39
	High	5 320.00	-0.47	8.15	7.68	11.00	3.32
5 470 ~ 5 725	Low	5 500.00	1.06	8.15	9.21	11.00	1.79
	Middle	5 600.00	-0.40	8.15	7.75	11.00	3.25
	High	5 700.00	0.24	8.15	8.39	11.00	2.61

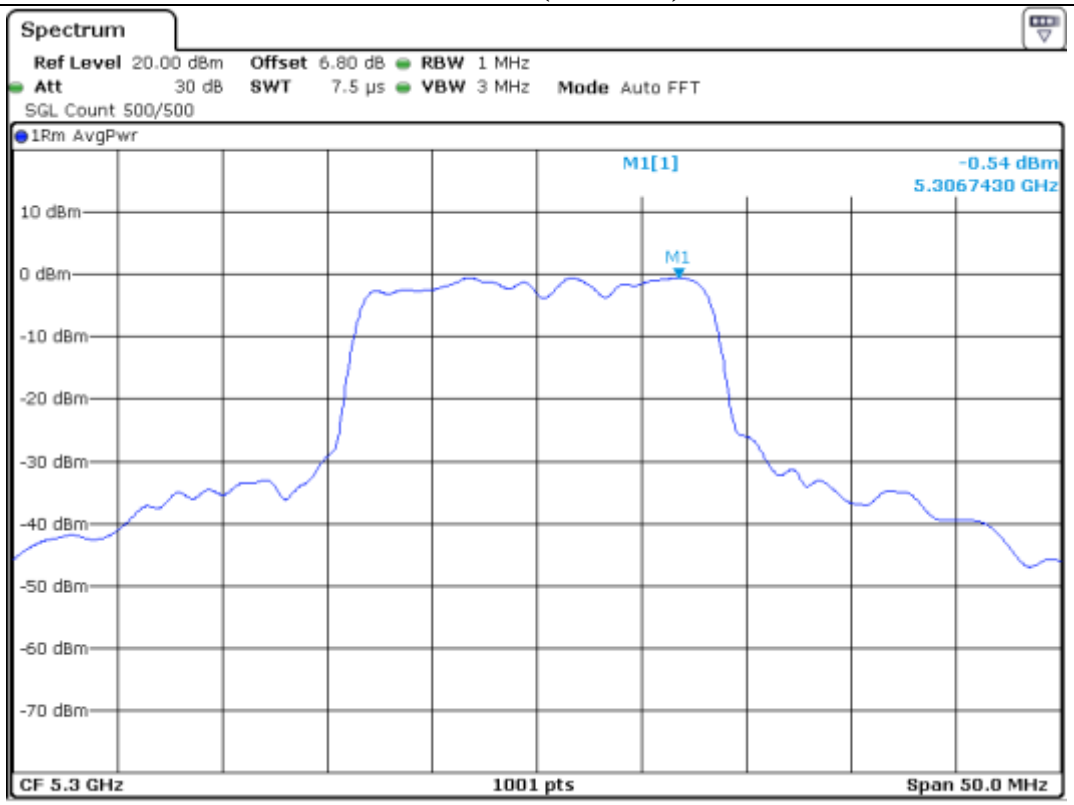
Remark: See next page for measurement data.

Tested by: Haram Lee / Manager

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

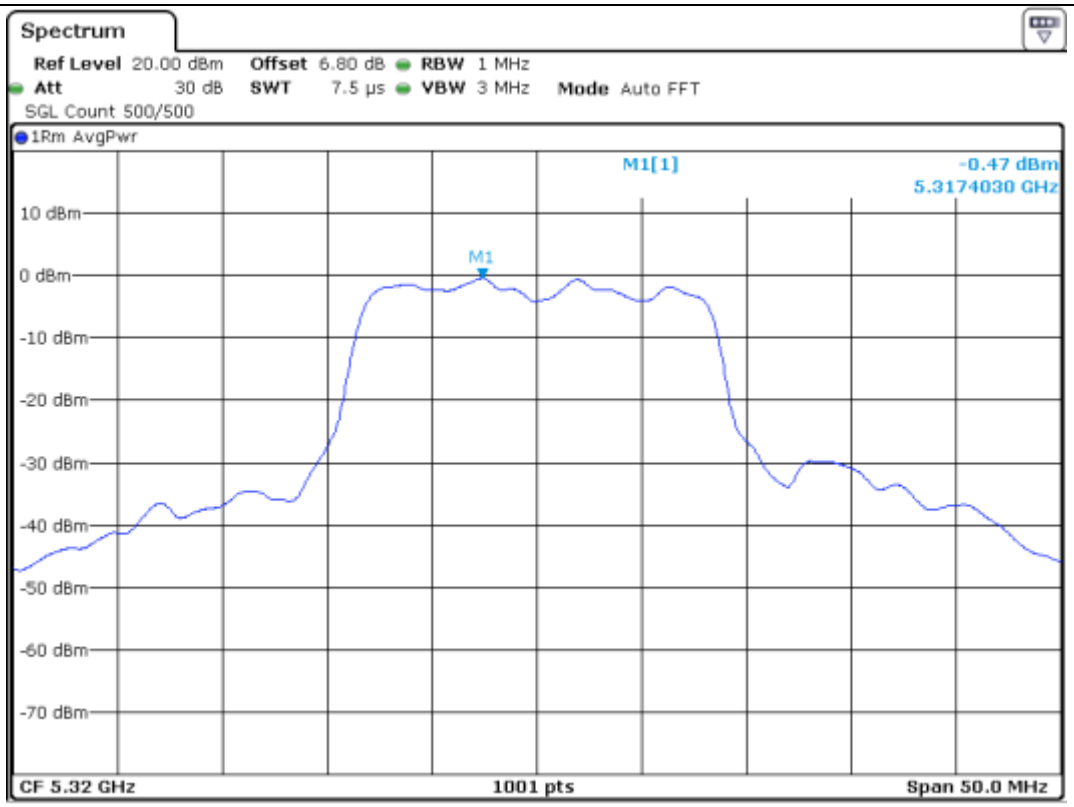


Low Channel (5 260 MHz)

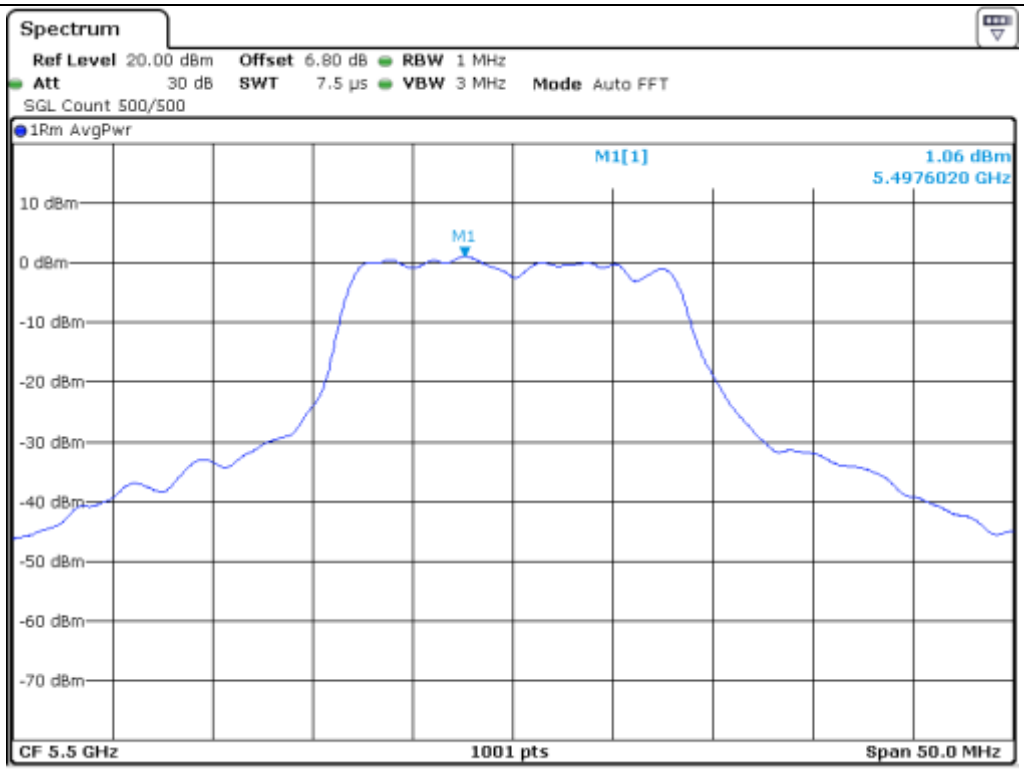


Middle Channel (5 300 MHz)

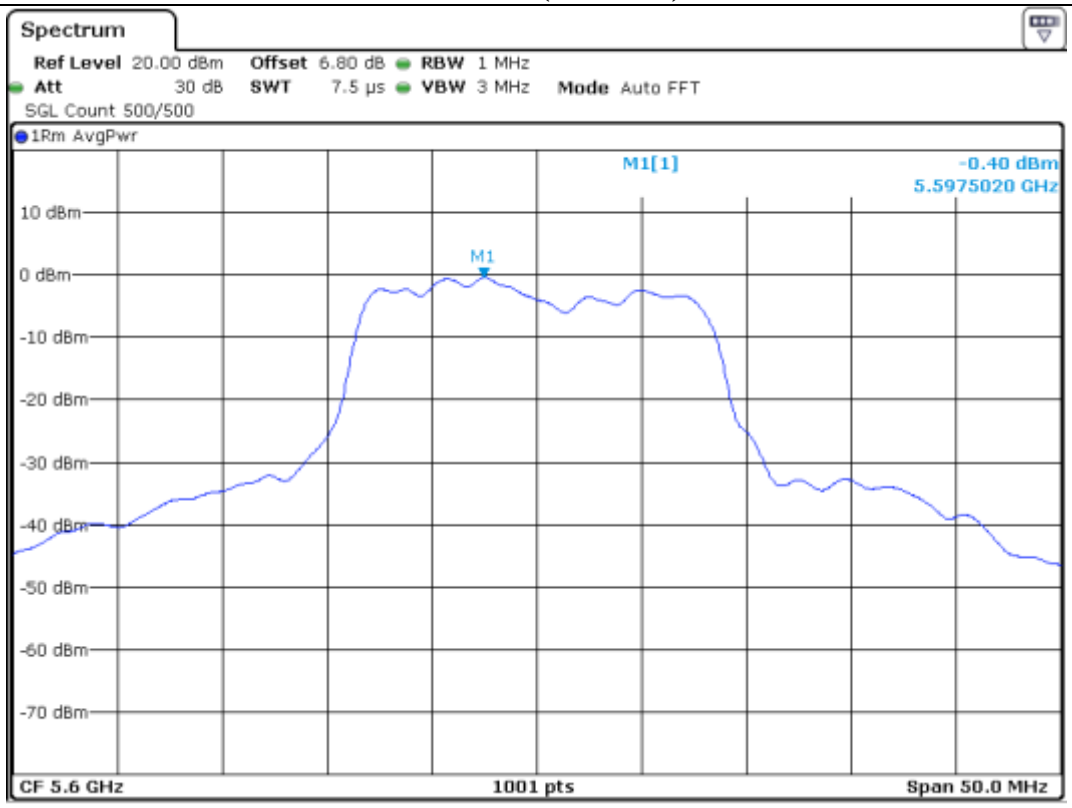
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



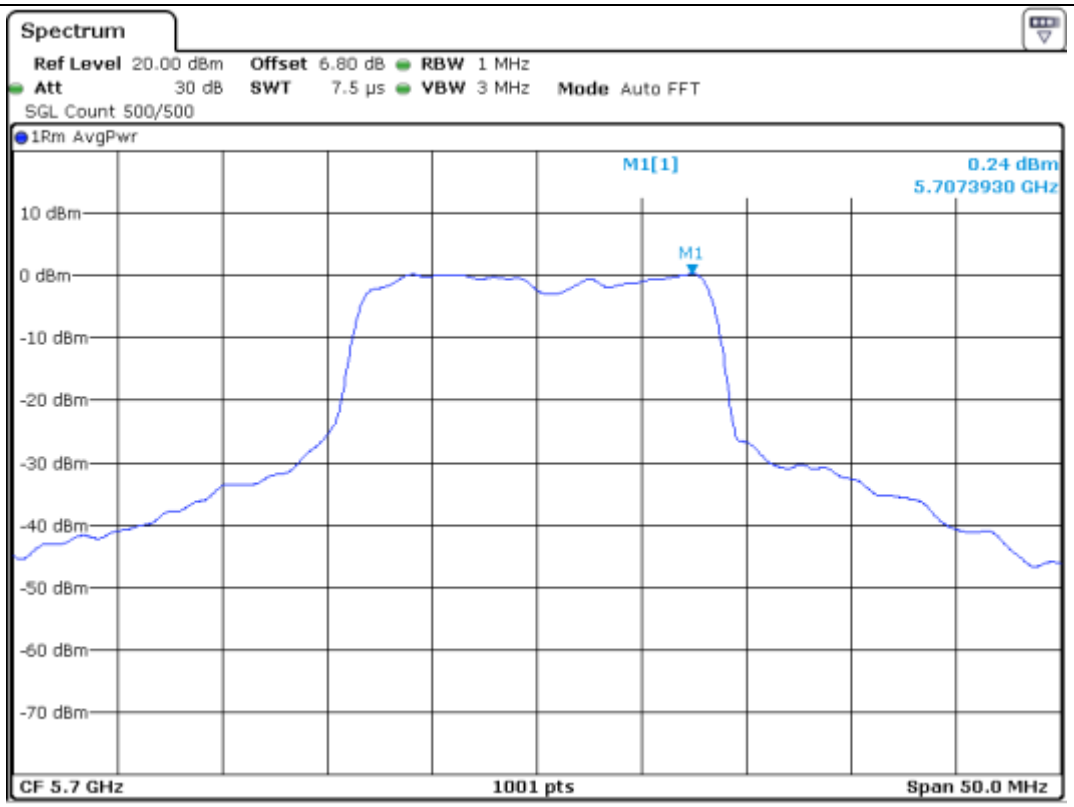
High Channel (5 320 MHz)



Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)



High Channel (5 700 MHz)

10.5 Test data for 802.11n_HT20 WLAN Mode (Client mode)

-. Test Date : March 11, 2020

-. Operating condition : Highest Output Power Transmitting Mode

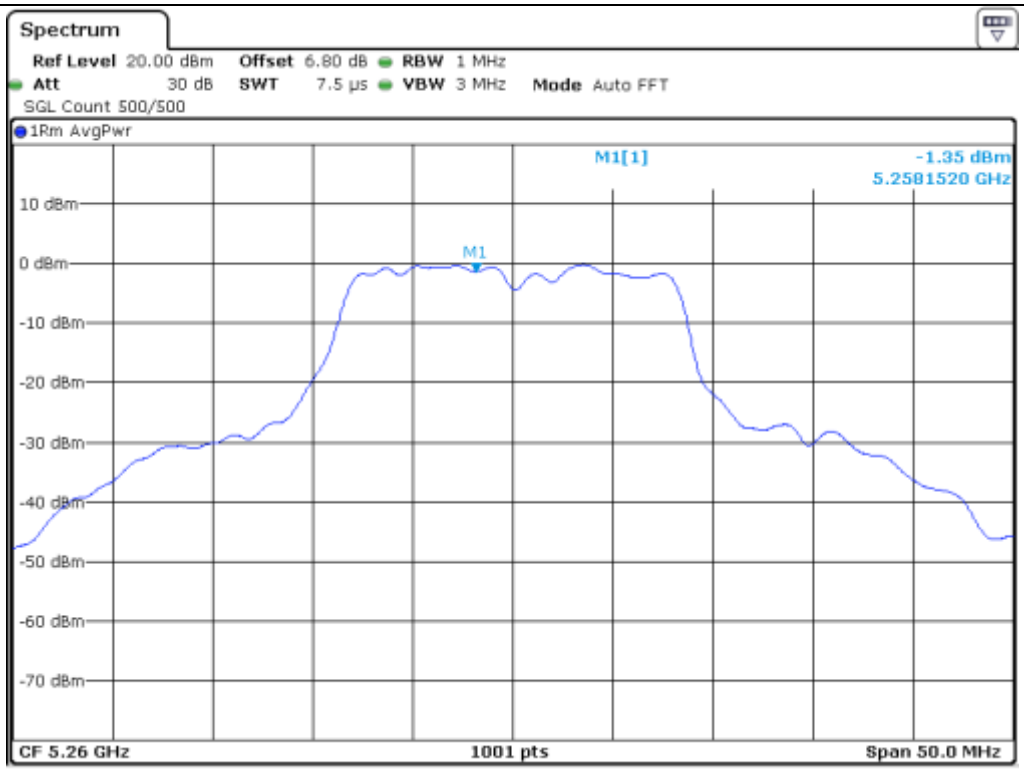
-. Test Result : Pass

Frequency Range (MHz)	Channel	Frequency (MHz)	Measured Value (dBm)	Duty Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
5 250 ~ 5 350	Low	5 260.00	-1.35	8.15	6.80	11.00	4.20
	Middle	5 300.00	-1.04	8.15	7.11	11.00	3.89
	High	5 320.00	-0.66	8.15	7.49	11.00	3.51
5 470 ~ 5 725	Low	5 500.00	-0.13	8.15	8.02	11.00	2.98
	Middle	5 600.00	-0.93	8.15	7.22	11.00	3.78
	High	5 700.00	-0.58	8.15	7.57	11.00	3.43

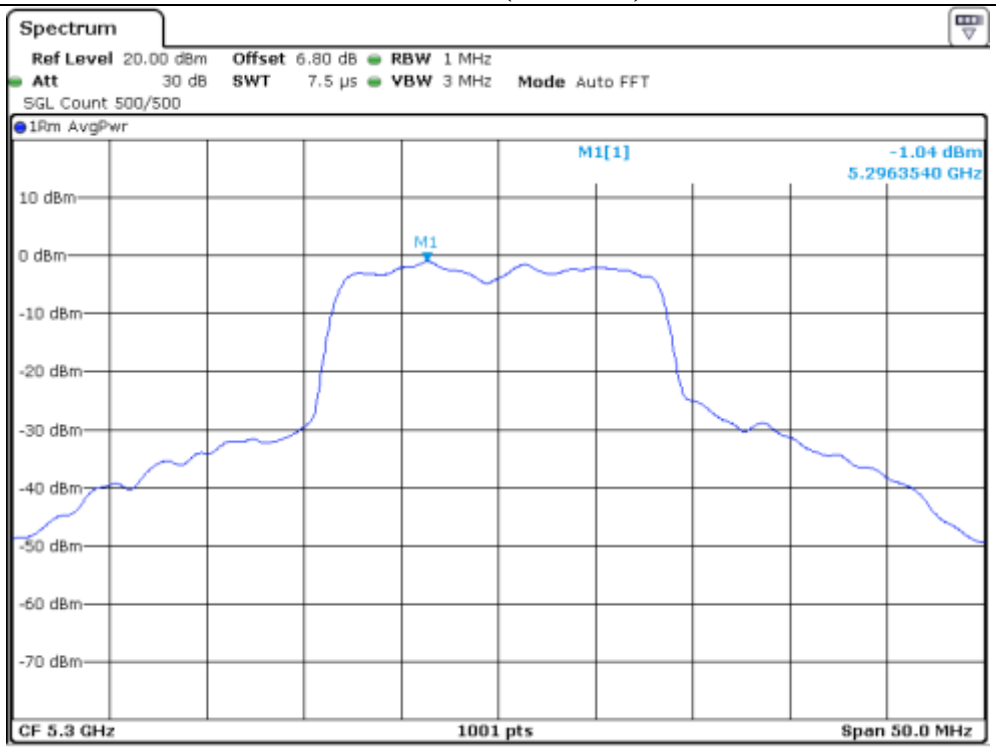
Remark: See next page for measurement data.

Tested by: Haram Lee / Manager

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

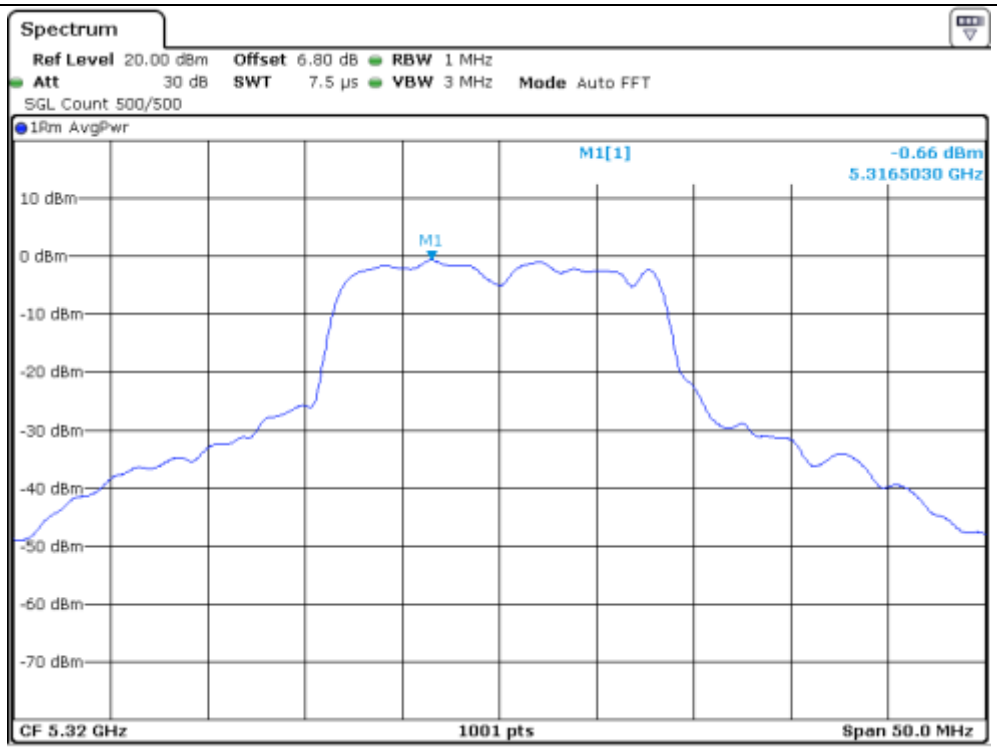


Low Channel (5 260 MHz)

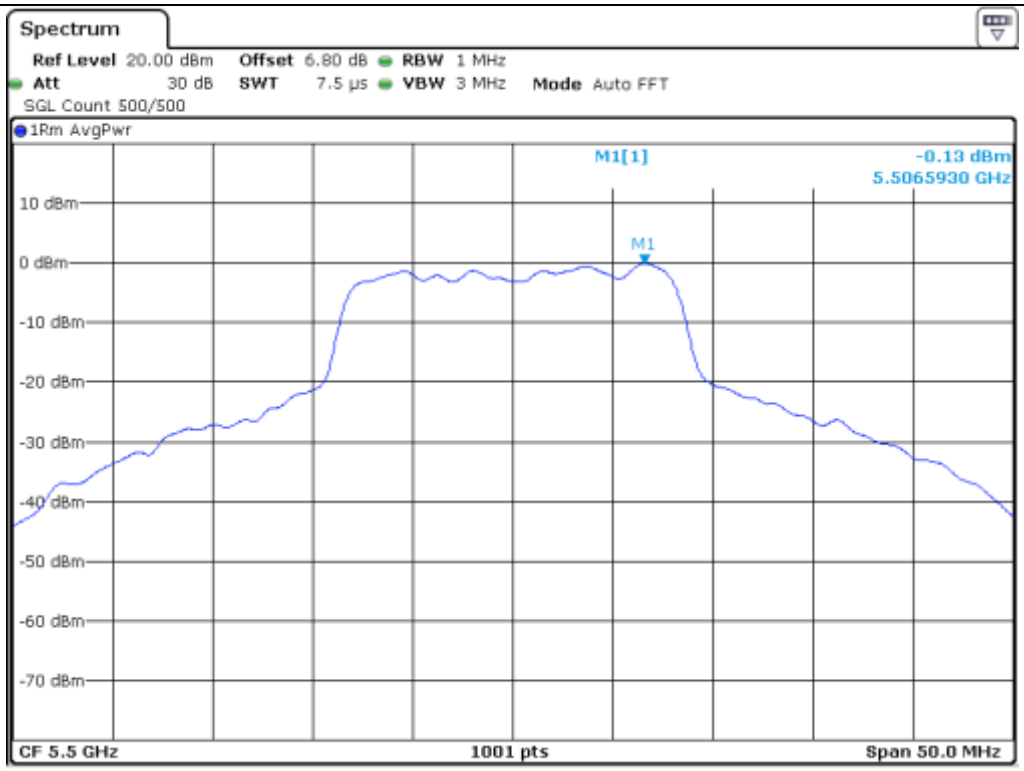


Middle Channel (5 300 MHz)

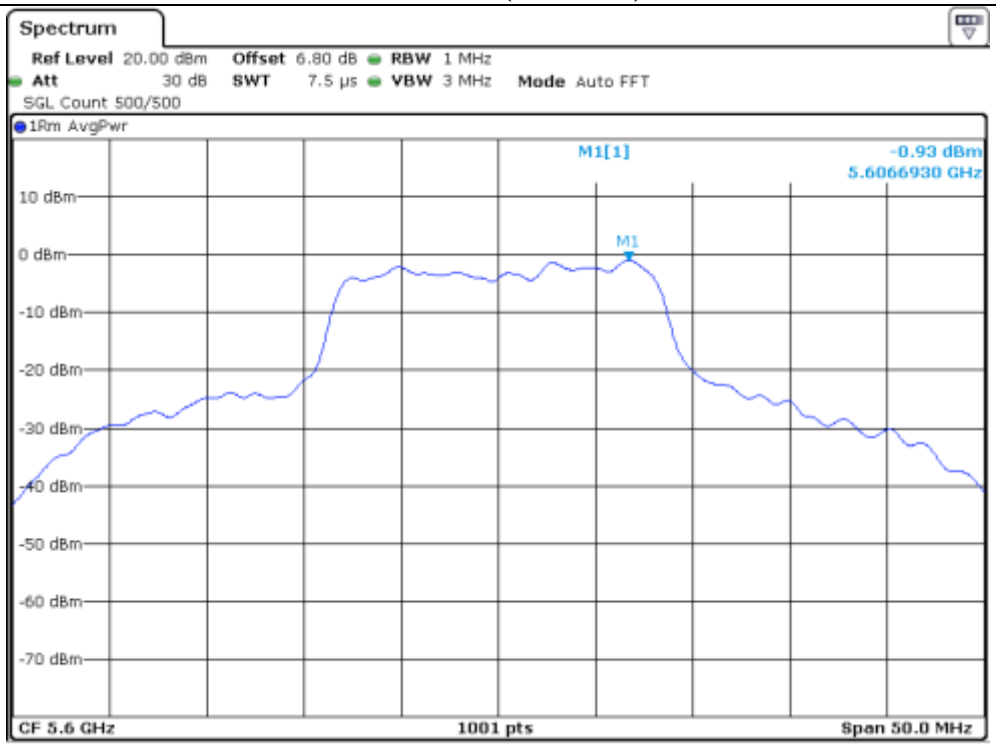
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel (5 320 MHz)

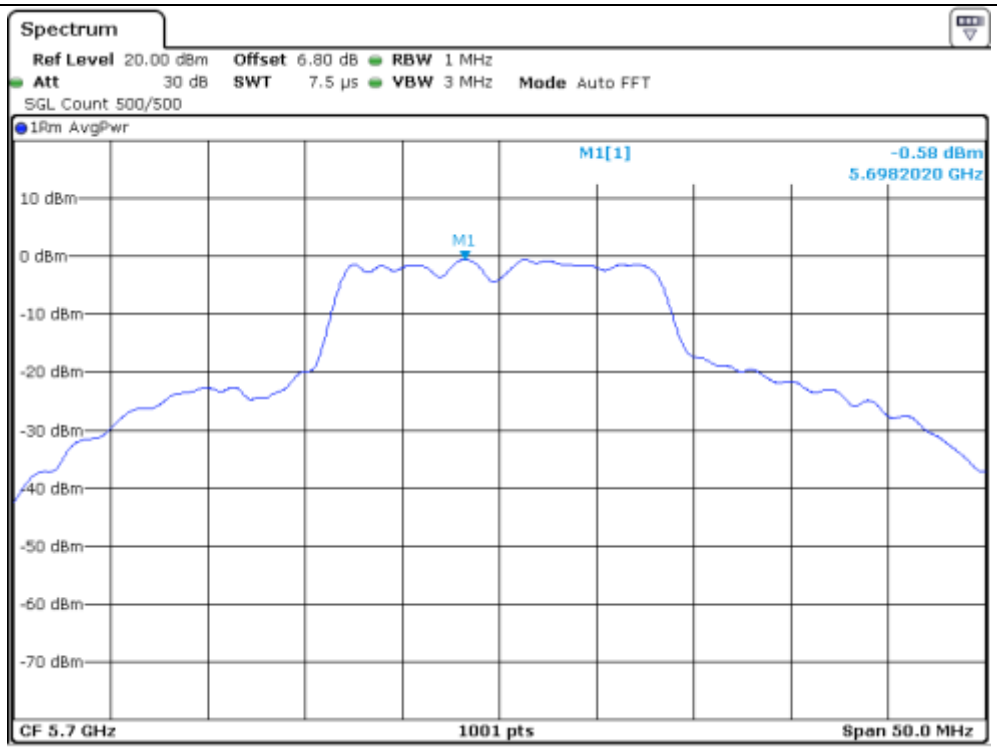


Low Channel (5 500 MHz)



Middle Channel (5 600 MHz)

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 (5 700 MHz)

11. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

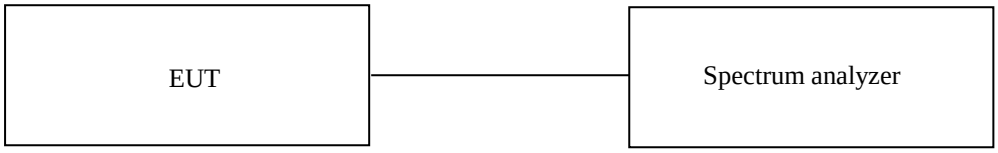
11.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % R.H.

11.2 Test set-up

Turn EUT off and set chamber temperature to -20 ℃ and then allow sufficient time (approximately 20 min to 30 min after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 ℃ step from -20 ℃ to +50 ℃. Repeat above method for frequency measurements every 10 ℃ step and then record all measured frequencies on each temperature step.



11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)
■ -	PSL-2KP	ESPEC	Humidity Chamber	14009407	Feb. 21, 2020 (1Y)
■ -	H-3005D	FinePower	DC Power supply	FP09092008	Feb. 19, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

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 Master mode

-. Test Date : March 10, 2020

-. Result : Pass

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
-20	5 260 000 000	5 259 984 577	-15.423
-10		5 259 984 438	-15.562
0		5 259 984 289	-15.711
10		5 259 984 180	-15.820
20		5 259 983 941	-16.059
30		5 259 983 864	-16.136
40		5 259 983 773	-16.227
50		5 259 983 659	-16.341
-20	5 300 000 000	5 299 984 678	-15.322
-10		5 299 984 514	-15.486
0		5 299 984 314	-15.686
10		5 299 984 147	-15.853
20		5 299 984 079	-15.921
30		5 299 983 917	-16.083
40		5 299 983 798	-16.202
50		5 299 983 704	-16.296
-20	5 320 000 000	5 320 000 000	-15.722
-10		5 320 000 000	-15.764
0		5 320 000 000	-15.812
10		5 320 000 000	-15.843
20		5 320 000 000	-15.932
30		5 320 000 000	-15.985
40		5 320 000 000	-16.044
50		5 320 000 000	-16.116

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

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
-20	5 500 000 000	5 499 984 565	-15.435
-10		5 499 984 328	-15.672
0		5 499 984 241	-15.759
10		5 499 984 178	-15.822
20		5 499 984 036	-15.964
30		5 499 983 868	-16.132
40		5 499 983 772	-16.228
50		5 499 983 700	-16.300
-20	5 600 000 000	5 599 984 416	-15.584
-10		5 599 984 310	-15.690
0		5 599 984 056	-15.944
10		5 599 983 978	-16.022
20		5 599 983 857	-16.143
30		5 599 983 712	-16.288
40		5 599 983 686	-16.314
50		5 599 983 635	-16.365
-20	5 700 000 000	5 699 984 528	-15.472
-10		5 699 984 315	-15.685
0		5 699 984 084	-15.916
10		5 699 983 925	-16.075
20		5 699 983 875	-16.125
30		5 699 983 729	-16.271
40		5 699 983 668	-16.332
50		5 699 983 643	-16.357

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10-2013)

Tested by: Haram Lee / Manager

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

11.5 Test Data for Client mode

-. Test Date : March 10, 2020

-. Result : Pass

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
-20	5 260 000 000	5 259 984 683	-15.317
-10		5 259 984 391	-15.609
0		5 259 984 183	-15.817
10		5 259 983 984	-16.016
20		5 259 983 690	-16.310
30		5 259 983 487	-16.513
40		5 259 983 323	-16.677
50		5 259 983 215	-16.785
-20	5 300 000 000	5 299 984 869	-15.131
-10		5 299 984 633	-15.367
0		5 299 984 355	-15.645
10		5 299 984 198	-15.802
20		5 299 983 981	-16.019
30		5 299 983 701	-16.299
40		5 299 983 420	-16.580
50		5 299 983 121	-16.879
-20	5 320 000 000	5 319 984 836	-15.164
-10		5 319 984 579	-15.421
0		5 319 984 302	-15.698
10		5 319 984 103	-15.897
20		5 319 983 959	-16.041
30		5 319 983 815	-16.185
40		5 319 983 538	-16.462
50		5 319 983 246	-16.754

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

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
-20	5 500 000 000	5 499 984 747	-15.253
-10		5 499 984 642	-15.358
0		5 499 984 343	-15.657
10		5 499 984 143	-15.857
20		5 499 983 933	-16.067
30		5 499 983 698	-16.302
40		5 499 983 574	-16.426
50		5 499 983 430	-16.570
-20	5 600 000 000	5 579 984 849	-20015.151
-10		5 579 984 697	-20015.303
0		5 579 984 489	-20015.511
10		5 579 984 268	-20015.732
20		5 579 984 037	-20015.963
30		5 579 983 918	-20016.082
40		5 579 983 626	-20016.374
50		5 579 983 381	-20016.619
-20	5 700 000 000	5 699 984 528	-15.472
-10		5 699 984 422	-15.578
0		5 699 984 220	-15.780
10		5 699 984 073	-15.927
20		5 699 983 888	-16.112
30		5 699 983 782	-16.218
40		5 699 983 620	-16.380
50		5 699 983 445	-16.555

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10-2013)

Tested by: Haram Lee / Manager

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

12. FREQUENCY STABILITY WITH VOLTAGE VARIATION

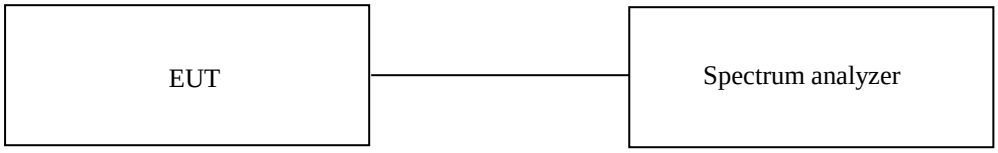
12.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % R.H.

12.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.



12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)
■ -	H-3005D	FinePower	DC Power supply	FP09092008	Feb. 19, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

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 Master mode

-. Test Date : March 10, 2020

-. Result : Pass

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
3.795	5 260 000 000	5 259 983 854	-16.146
3.300		5 259 984 128	-15.872
2.805		5 259 984 456	-15.544
3.795	5 300 000 000	5 299 983 888	-16.112
3.300		5 299 984 095	-15.905
2.805		5 299 984 352	-15.648
3.795	5 320 000 000	5 319 983 919	-16.081
3.300		5 319 984 147	-15.853
2.805		5 319 984 271	-15.729

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
3.795	5 500 000 000	5 499 983 880	-16.120
3.300		5 499 984 115	-15.885
2.805		5 499 984 441	-15.559
3.795	5 600 000 000	5 599 983 868	-16.132
3.300		5 599 984 088	-15.912
2.805		5 599 984 341	-15.659
3.795	5 700 000 000	5 699 983 901	-16.099
3.300		5 699 984 139	-15.861
2.805		5 699 984 287	-15.713

Tested by: Haram Lee / Manager

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

12.5 Test Data for Client mode

-. Test Date : March 10, 2020

-. Result : Pass

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
3.795	5 260 000 000	5 259 976 389	-23.611
3.300		5 259 976 465	-23.535
2.805		5 259 976 559	-23.441
3.795	5 300 000 000	5 299 976 778	-23.222
3.300		5 299 976 853	-23.147
2.805		5 299 976 924	-23.076
3.795	5 320 000 000	5 319 976 522	-23.478
3.300		5 319 976 595	-23.405
2.805		5 319 976 686	-23.314

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
3.795	5 500 000 000	5 499 975 919	-24.081
3.300		5 499 976 005	-23.995
2.805		5 499 976 089	-23.911
3.795	5 600 000 000	5 599 976 805	-23.195
3.300		5 599 976 882	-23.118
2.805		5 599 976 975	-23.025
3.795	5 700 000 000	5 699 976 084	-23.916
3.300		5 699 976 176	-23.824
2.805		5 699 976 254	-23.746

Tested by: Haram Lee / Manager

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

13. RADIATED SPURIOUS EMISSIONS

13.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % R.H.

13.2 Test set-up

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

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

13.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
☐ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 22, 2019 (1Y)
■ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 22, 2019 (1Y)
☐ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Jul. 25, 2019 (1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	Mar. 16, 2020 (1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)
■ -	FSW43	Rohde & Schwarz	Signal Analyzer	104544	Jul. 18, 2019 (1Y)
☐ -	BBV 9718 B	Schwarzbeck	Pre-Amplifier	00009	Mar. 16, 2020 (1Y)
■ -	MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509	N/A
☐ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DT3000-3t	Innco Systems GmbH	Turn Table	N/A	N/A
■ -	FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	May. 13, 2018 (2Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-419	Aug. 09, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA91700179	Jan. 16, 2019 (1Y)
☐ -	SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Feb. 20, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

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

13.4 Test data (Ant 1 : AE-T2450/5500DP5-RSMA)

13.4.1 Test data for 30 MHz ~ 1 GHz

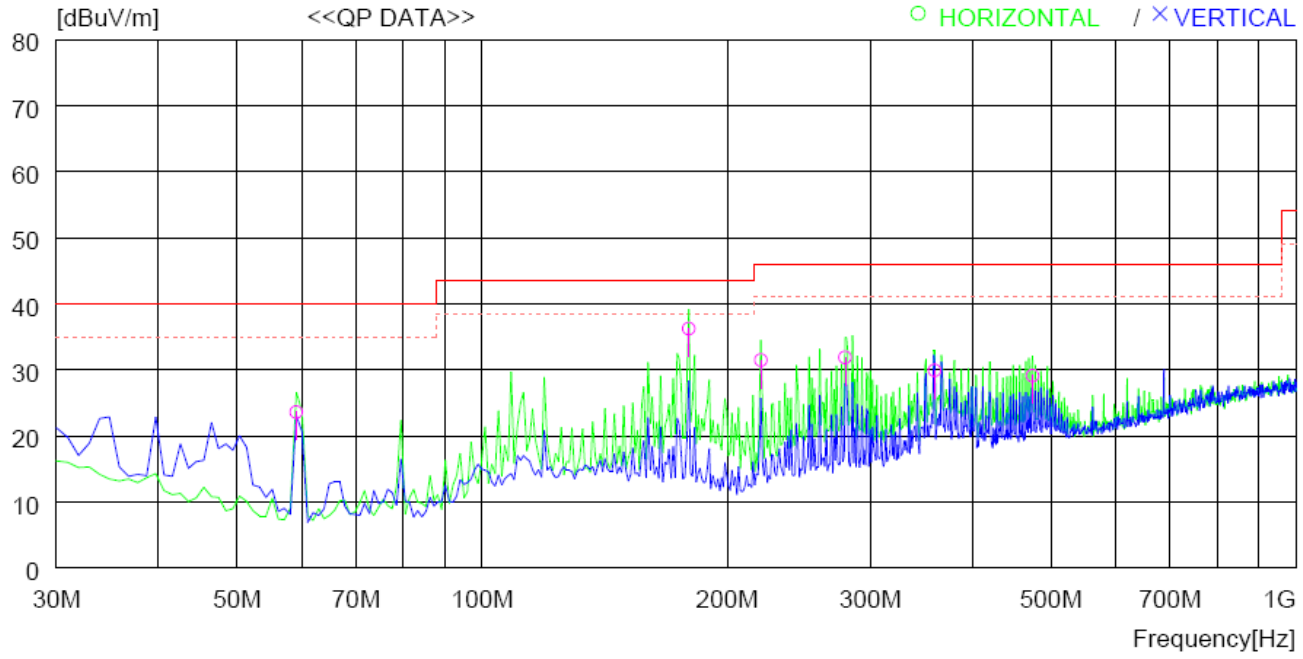
Humidity Level : 46 % R.H. Temperature: 23 ℃

Limits apply to : FCC CFR 47, PART 15, SUBPART E, SECTION 15.407

Result : PASSED

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz) Date: March 17, 2020

Note : 5 GHz operating mode were tested, (802.11n (HT20) WLAN Mode) (Worst Case)



No.	FREQ	READING QP	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	59.100	43.2	12.2	0.9	32.7	23.6	40.0	16.4	400	94
2	179.380	50.5	16.6	1.7	32.6	36.2	43.5	7.3	200	359
3	220.120	45.7	16.5	1.9	32.6	31.5	46.0	14.5	200	284
4	279.290	44.0	18.6	2.0	32.7	31.9	46.0	14.1	100	0
5	359.800	40.2	20.1	2.3	32.7	29.9	46.0	16.1	100	266
6	474.261	36.8	22.5	2.6	32.8	29.1	46.0	16.9	100	0

Tested by: Haram Lee / Manager

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

13.4.2 Test data for Below 30 MHz

-. Test Date : March 17, 2020

-. 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 (Worst Case)

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)
All emissions observed were 20dB below the limit and thus not reported.									

Tested by: Haram Lee / Manager

13.4.3 Test data for 802.11n (HT 20) WLAN Mode above 1 GHz

-. Test Date : March 17, 2020

-. 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 ~ 40 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode (Worst Case)

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Low Channel									
10 520.00	15.09	Peak	H	38.02	8.66	0.00	61.77	68.20	6.43
10 520.00	15.29	Peak	V	37.66	8.60	0.00	61.55	68.20	6.65
Middle Channel									
10 600.00	16.10	Peak	H	38.02	8.66	0.00	62.78	74.00	11.22
10 600.00	3.42	Average	H	38.02	8.66	0.00	50.10	54.00	3.90
10 600.00	15.83	Peak	V	37.84	8.63	0.00	62.30	74.00	11.70
10 600.00	3.46	Average	V	37.84	8.63	0.00	49.93	54.00	4.07
High Channel									
10 640.00	14.68	Peak	H	38.02	8.66	0.00	61.36	74.00	12.64
10 640.00	3.48	Average	H	38.02	8.66	0.00	50.16	54.00	3.84
10 640.00	15.48	Peak	V	38.02	8.66	0.00	62.16	74.00	11.84
10 640.00	3.42	Average	V	38.02	8.66	0.00	50.10	54.00	3.90

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

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 000.00	15.27	Peak	H	37.66	8.60	0.00	61.53	74.00	12.47
11 000.00	3.23	Average	H	37.66	8.60	0.00	49.49	54.00	4.51
11 000.00	15.09	Peak	V	37.66	8.60	0.00	61.35	74.00	12.65
11 000.00	3.16	Average	V	37.66	8.60	0.00	49.42	54.00	4.58
Middle Channel									
11 200.00	15.55	Peak	H	37.84	8.63	0.00	62.02	74.00	11.98
11 200.00	3.53	Average	H	37.84	8.63	0.00	50.00	54.00	4.00
11 200.00	15.65	Peak	V	37.84	8.63	0.00	62.12	74.00	11.88
11 200.00	3.35	Average	V	37.84	8.63	0.00	49.82	54.00	4.18
High Channel									
11 400.00	14.61	Peak	H	38.02	8.66	0.00	61.29	74.00	12.71
11 400.00	3.36	Average	H	38.02	8.66	0.00	50.04	54.00	3.96
11 400.00	14.47	Peak	V	38.02	8.66	0.00	61.15	74.00	12.85
11 400.00	3.23	Average	V	38.02	8.66	0.00	49.91	54.00	4.09

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

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

Tested by: Haram Lee / Manager

13.5 Test data (Ant 2 : AEi-2450/5500P-IPEX35)

13.5.1 Test data for 30 MHz ~ 1 GHz

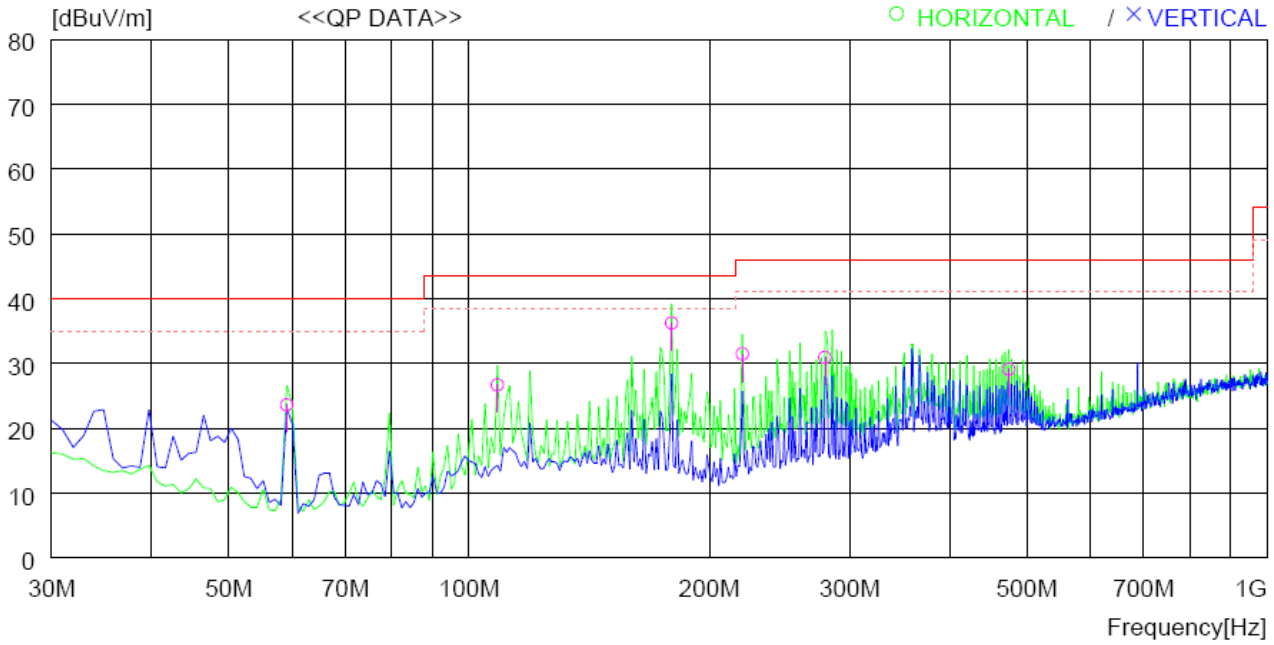
Humidity Level : 46 % R.H. Temperature: 23 ℃

Limits apply to : FCC CFR 47, PART 15, SUBPART E, SECTION 15.407

Result : PASSED

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz) Date: March 17, 2020

Note : 5 GHz operating mode were tested, (802.11n (HT20) WLAN Mode) (Worst Case)



No.	FREQ	READING QP	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	59.100	43.2	12.2	0.9	32.7	23.6	40.0	16.4	400	94
2	108.570	41.4	16.7	1.3	32.7	26.7	43.5	16.8	300	0
3	179.380	50.5	16.6	1.7	32.6	36.2	43.5	7.3	200	359
4	220.120	45.7	16.5	1.9	32.6	31.5	46.0	14.5	200	284
5	279.290	43.0	18.6	2.0	32.7	30.9	46.0	15.1	100	0
6	474.261	36.8	22.5	2.6	32.8	29.1	46.0	16.9	100	0

Tested by: Haram Lee / Manager

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

13.5.2 Test data for Below 30 MHz

-. Test Date : March 17, 2020

-. 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 (Worst Case)

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)
All emissions observed were 20dB below the limit and thus not reported.									

Tested by: Haram Lee / Manager

13.5.3 Test data for 802.11n (HT 20) WLAN Mode above 1 GHz

-. Test Date : March 17, 2020

-. 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 ~ 40 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode (Worst Case)

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Low Channel									
10 520.00	15.09	Peak	H	38.02	8.66	0.00	61.77	68.20	6.43
10 520.00	15.33	Peak	V	37.66	8.60	0.00	61.59	68.20	6.61
Middle Channel									
10 600.00	15.52	Peak	H	38.02	8.66	0.00	62.20	74.00	11.80
10 600.00	3.75	Average	H	38.02	8.66	0.00	50.43	54.00	3.57
10 600.00	15.75	Peak	V	37.84	8.63	0.00	62.22	74.00	11.78
10 600.00	3.62	Average	V	37.84	8.63	0.00	50.09	54.00	3.91
High Channel									
10 640.00	15.47	Peak	H	38.02	8.66	0.00	62.15	74.00	11.85
10 640.00	3.79	Average	H	38.02	8.66	0.00	50.47	54.00	3.53
10 640.00	15.57	Peak	V	38.02	8.66	0.00	62.25	74.00	11.75
10 640.00	3.90	Average	V	38.02	8.66	0.00	50.58	54.00	3.42

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

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 000.00	14.35	Peak	H	37.66	8.60	0.00	60.61	74.00	13.39
11 000.00	3.66	Average	H	37.66	8.60	0.00	49.92	54.00	4.08
11 000.00	15.33	Peak	V	37.66	8.60	0.00	61.59	74.00	12.41
11 000.00	3.65	Average	V	37.66	8.60	0.00	49.91	54.00	4.09
Middle Channel									
11 200.00	15.54	Peak	H	37.84	8.63	0.00	62.01	74.00	11.99
11 200.00	3.89	Average	H	37.84	8.63	0.00	50.36	54.00	3.64
11 200.00	15.59	Peak	V	37.84	8.63	0.00	62.06	74.00	11.94
11 200.00	3.36	Average	V	37.84	8.63	0.00	49.83	54.00	4.17
High Channel									
11 400.00	15.46	Peak	H	38.02	8.66	0.00	62.14	74.00	11.86
11 400.00	3.77	Average	H	38.02	8.66	0.00	50.45	54.00	3.55
11 400.00	15.28	Peak	V	38.02	8.66	0.00	61.96	74.00	12.04
11 400.00	3.34	Average	V	38.02	8.66	0.00	50.02	54.00	3.98

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

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

Tested by: Haram Lee / Manager

13.6 Test data (Ant 3 : AEi-5500DP5-IPEX100[Bottom]])

13.6.1 Test data for 30 MHz ~ 1 GHz

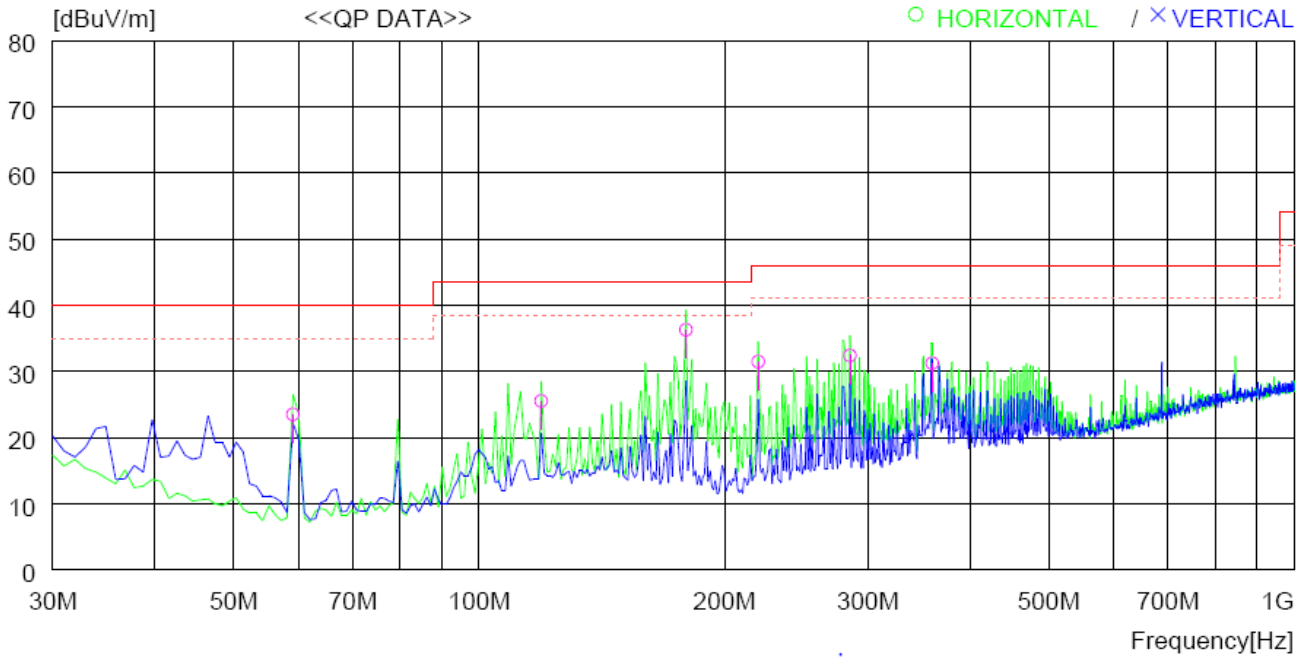
Humidity Level : 46 % R.H. Temperature: 23 ℃

Limits apply to : FCC CFR 47, PART 15, SUBPART E, SECTION 15.407

Result : PASSED

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz) Date: March 17, 2020

Note : 5 GHz operating mode were tested, (802.11n (HT20) WLAN Mode) (Worst Case)



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	59.100	43.1	12.2	0.9	32.7	23.5	40.0	16.5	400	85
2	119.240	38.3	18.5	1.4	32.7	25.5	43.5	18.0	400	101
3	179.380	50.6	16.6	1.7	32.6	36.3	43.5	7.2	200	108
4	220.120	45.7	16.5	1.9	32.6	31.5	46.0	14.5	200	0
5	285.110	44.2	18.8	2.1	32.7	32.4	46.0	13.6	100	359
6	359.800	41.5	20.1	2.3	32.7	31.2	46.0	14.8	100	359

Tested by: Haram Lee / Manager

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

13.6.2 Test data for Below 30 MHz

-. Test Date : March 17, 2020

-. 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 (Worst Case)

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)
All emissions observed were 20dB below the limit and thus not reported.									

Tested by: Haram Lee / Manager

13.6.3 Test data for 802.11n (HT 20) WLAN Mode above 1 GHz

-. Test Date : March 17, 2020

-. 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 ~ 40 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode (Worst Case)

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Low Channel									
10 520.00	14.91	Peak	H	38.02	8.66	0.00	61.59	68.20	6.61
10 520.00	15.59	Peak	V	37.66	8.60	0.00	61.85	68.20	6.35
Middle Channel									
10 600.00	15.95	Peak	H	38.02	8.66	0.00	62.63	74.00	11.37
10 600.00	3.88	Average	H	38.02	8.66	0.00	50.56	54.00	3.44
10 600.00	15.15	Peak	V	37.84	8.63	0.00	61.62	74.00	12.38
10 600.00	3.73	Average	V	37.84	8.63	0.00	50.20	54.00	3.80
High Channel									
10 640.00	15.08	Peak	H	38.02	8.66	0.00	61.76	74.00	12.24
10 640.00	3.80	Average	H	38.02	8.66	0.00	50.48	54.00	3.52
10 640.00	15.49	Peak	V	38.02	8.66	0.00	62.17	74.00	11.83
10 640.00	3.69	Average	V	38.02	8.66	0.00	50.37	54.00	3.63

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Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 000.00	15.23	Peak	H	37.66	8.60	0.00	61.49	74.00	12.51
11 000.00	3.61	Average	H	37.66	8.60	0.00	49.87	54.00	4.13
11 000.00	15.26	Peak	V	37.66	8.60	0.00	61.52	74.00	12.48
11 000.00	3.63	Average	V	37.66	8.60	0.00	49.89	54.00	4.11
Middle Channel									
11 200.00	15.41	Peak	H	37.84	8.63	0.00	61.88	74.00	12.12
11 200.00	3.69	Average	H	37.84	8.63	0.00	50.16	54.00	3.84
11 200.00	15.07	Peak	V	37.84	8.63	0.00	61.54	74.00	12.46
11 200.00	3.40	Average	V	37.84	8.63	0.00	49.87	54.00	4.13
High Channel									
11 400.00	15.46	Peak	H	38.02	8.66	0.00	62.14	74.00	11.86
11 400.00	3.18	Average	H	38.02	8.66	0.00	49.86	54.00	4.14
11 400.00	15.34	Peak	V	38.02	8.66	0.00	62.02	74.00	11.98
11 400.00	3.19	Average	V	38.02	8.66	0.00	49.87	54.00	4.13

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

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

Tested by: Haram Lee / Manager

13.7 Test data (Ant 4 : AEi-RO-5500DP4-IPEX160)

13.7.1 Test data for 30 MHz ~ 1 GHz

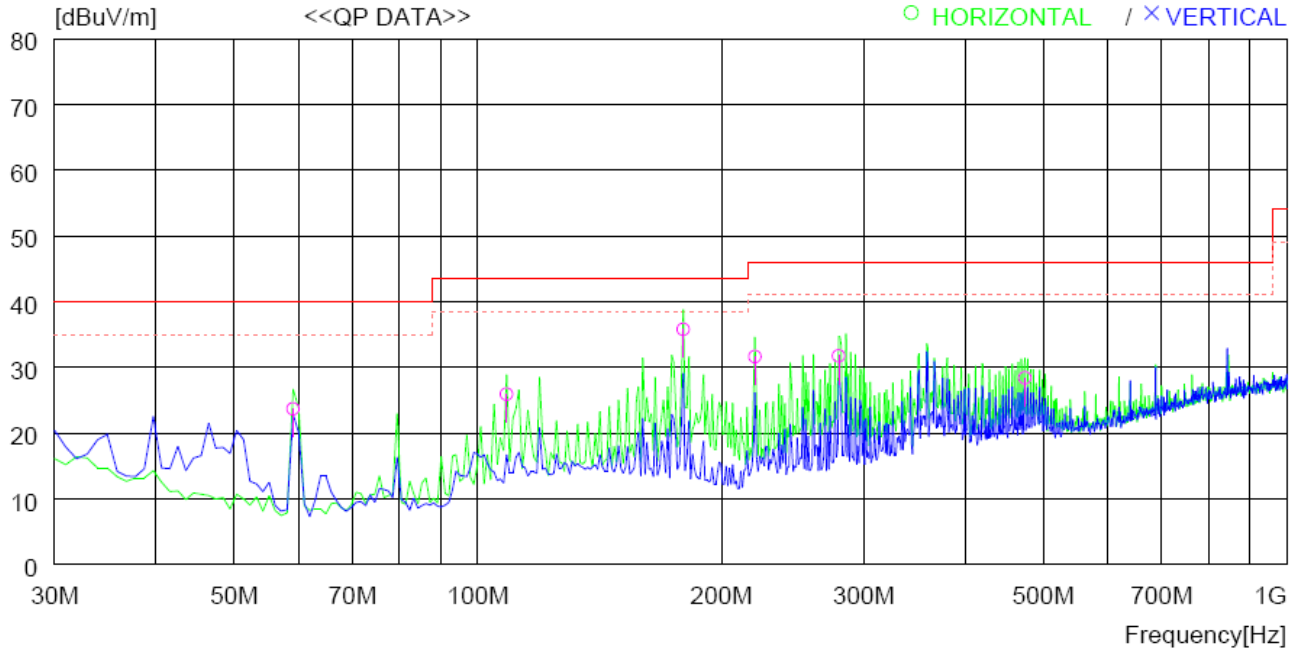
Humidity Level : 46 % R.H. Temperature: 23 ℃

Limits apply to : FCC CFR 47, PART 15, SUBPART E, SECTION 15.407

Result : PASSED

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz) Date: March 17, 2020

Note : 5 GHz operating mode were tested, (802.11n (HT20) WLAN Mode) (Worst Case)



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	59.100	43.3	12.2	0.9	32.7	23.7	40.0	16.3	400	92
2	108.570	40.6	16.7	1.3	32.7	25.9	43.5	17.6	300	359
3	179.380	50.1	16.6	1.7	32.6	35.8	43.5	7.7	200	0
4	220.120	45.8	16.5	1.9	32.6	31.6	46.0	14.4	200	296
5	279.290	43.8	18.6	2.0	32.7	31.7	46.0	14.3	100	359
6	474.261	36.1	22.5	2.6	32.8	28.4	46.0	17.6	100	359

Tested by: Haram Lee / Manager

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

13.7.2 Test data for Below 30 MHz

-. Test Date : March 17, 2020

-. 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 (Worst Case)

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)
All emissions observed were 20dB below the limit and thus not reported.									

Tested by: Haram Lee / Manager

13.7.3 Test data for 802.11n (HT 20) WLAN Mode above 1 GHz

-. Test Date : March 17, 2020

-. 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 ~ 40 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode (Worst Case)

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Low Channel									
10 520.00	15.01	Peak	H	38.02	8.66	0.00	61.69	68.20	6.51
10 520.00	15.18	Peak	V	37.66	8.60	0.00	61.44	68.20	6.76
Middle Channel									
10 600.00	15.31	Peak	H	38.02	8.66	0.00	61.99	74.00	12.01
10 600.00	3.74	Average	H	38.02	8.66	0.00	50.42	54.00	3.58
10 600.00	15.30	Peak	V	37.84	8.63	0.00	61.77	74.00	12.23
10 600.00	3.56	Average	V	37.84	8.63	0.00	50.03	54.00	3.97
High Channel									
10 640.00	15.66	Peak	H	38.02	8.66	0.00	62.34	74.00	11.66
10 640.00	3.90	Average	H	38.02	8.66	0.00	50.58	54.00	3.42
10 640.00	15.66	Peak	V	38.02	8.66	0.00	62.34	74.00	11.66
10 640.00	3.75	Average	V	38.02	8.66	0.00	50.43	54.00	3.57

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

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 000.00	14.63	Peak	H	37.66	8.60	0.00	60.89	74.00	13.11
11 000.00	3.47	Average	H	37.66	8.60	0.00	49.73	54.00	4.27
11 000.00	14.85	Peak	V	37.66	8.60	0.00	61.11	74.00	12.89
11 000.00	2.15	Average	V	37.66	8.60	0.00	48.41	54.00	5.59
Middle Channel									
11 200.00	15.14	Peak	H	37.84	8.63	0.00	61.61	74.00	12.39
11 200.00	3.72	Average	H	37.84	8.63	0.00	50.19	54.00	3.81
11 200.00	15.18	Peak	V	37.84	8.63	0.00	61.65	74.00	12.35
11 200.00	3.16	Average	V	37.84	8.63	0.00	49.63	54.00	4.37
High Channel									
11 400.00	15.28	Peak	H	38.02	8.66	0.00	61.96	74.00	12.04
11 400.00	3.41	Average	H	38.02	8.66	0.00	50.09	54.00	3.91
11 400.00	15.39	Peak	V	38.02	8.66	0.00	62.07	74.00	11.93
11 400.00	3.29	Average	V	38.02	8.66	0.00	49.97	54.00	4.03

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

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

Tested by: Haram Lee / Manager

13.8 Test data (Ant 5 : AEi-RO-5500DP4-IPEX250)

13.8.1 Test data for 30 MHz ~ 1 GHz

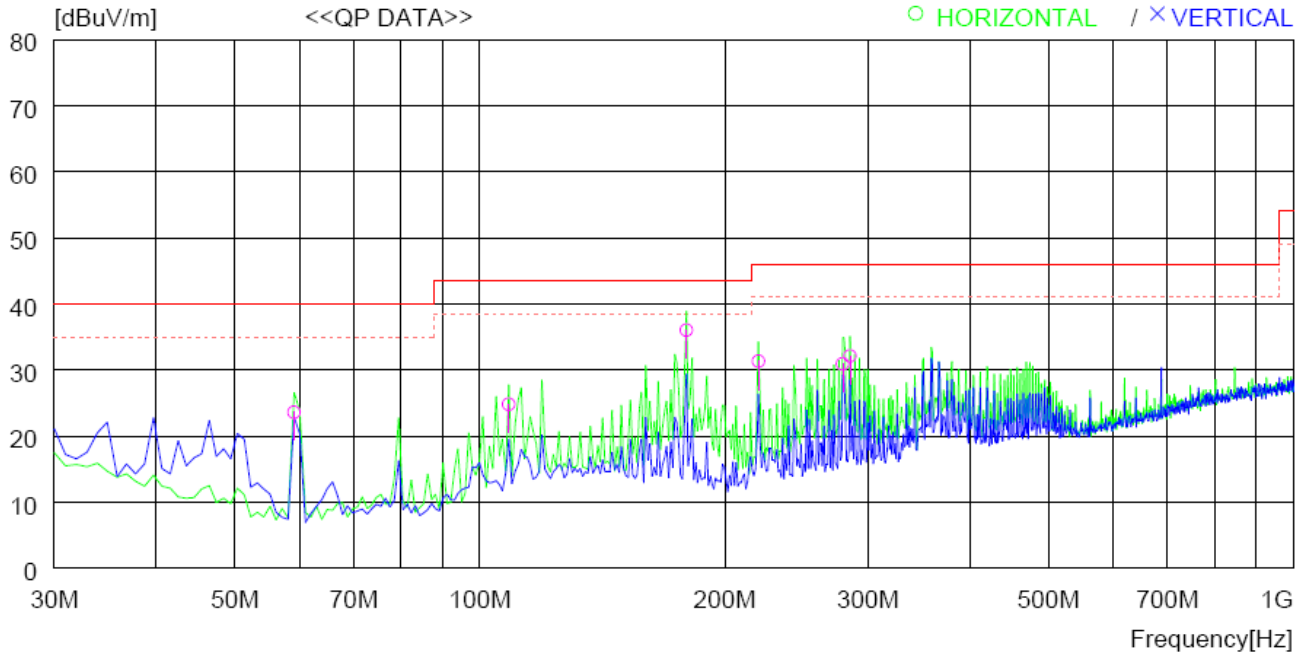
Humidity Level : 46 % R.H. Temperature: 23 ℃

Limits apply to : FCC CFR 47, PART 15, SUBPART E, SECTION 15.407

Result : PASSED

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz) Date: March 17, 2020

Note : 5 GHz operating mode were tested, (802.11n (HT20) WLAN Mode) (Worst Case)



No.	FREQ	READING QP	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	59.100	43.2	12.2	0.9	32.7	23.6	40.0	16.4	400	0
2	108.570	39.5	16.7	1.3	32.7	24.8	43.5	18.7	300	359
3	179.380	50.3	16.6	1.7	32.6	36.0	43.5	7.5	200	0
4	220.120	45.5	16.5	1.9	32.6	31.3	46.0	14.7	200	0
5	279.290	43.0	18.6	2.0	32.7	30.9	46.0	15.1	100	359
6	285.110	43.9	18.8	2.1	32.7	32.1	46.0	13.9	100	238

Tested by: Haram Lee / Manager

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

13.8.2 Test data for Below 30 MHz

-. Test Date : March 17, 2020

-. 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 (Worst Case)

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)
All emissions observed were 20dB below the limit and thus not reported.									

Tested by: Haram Lee / Manager

13.8.3 Test data for 802.11n (HT 20) WLAN Mode above 1 GHz

-. Test Date : March 17, 2020

-. 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 ~ 40 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode (Worst Case)

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Low Channel									
10 520.00	15.33	Peak	H	38.02	8.66	0.00	62.01	68.20	6.19
10 520.00	15.79	Peak	V	37.66	8.60	0.00	62.05	68.20	6.15
Middle Channel									
10 600.00	15.00	Peak	H	38.02	8.66	0.00	61.68	74.00	12.32
10 600.00	3.76	Average	H	38.02	8.66	0.00	50.44	54.00	3.56
10 600.00	15.59	Peak	V	37.84	8.63	0.00	62.06	74.00	11.94
10 600.00	3.79	Average	V	37.84	8.63	0.00	50.26	54.00	3.74
High Channel									
10 640.00	14.95	Peak	H	38.02	8.66	0.00	61.63	74.00	12.37
10 640.00	3.75	Average	H	38.02	8.66	0.00	50.43	54.00	3.57
10 640.00	15.21	Peak	V	38.02	8.66	0.00	61.89	74.00	12.11
10 640.00	3.01	Average	V	38.02	8.66	0.00	49.69	54.00	4.31

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Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 000.00	14.97	Peak	H	37.66	8.60	0.00	61.23	74.00	12.77
11 000.00	3.61	Average	H	37.66	8.60	0.00	49.87	54.00	4.13
11 000.00	14.91	Peak	V	37.66	8.60	0.00	61.17	74.00	12.83
11 000.00	3.55	Average	V	37.66	8.60	0.00	49.81	54.00	4.19
Middle Channel									
11 200.00	14.90	Peak	H	37.84	8.63	0.00	61.37	74.00	12.63
11 200.00	3.64	Average	H	37.84	8.63	0.00	50.11	54.00	3.89
11 200.00	15.55	Peak	V	37.84	8.63	0.00	62.02	74.00	11.98
11 200.00	3.49	Average	V	37.84	8.63	0.00	49.96	54.00	4.04
High Channel									
11 400.00	14.65	Peak	H	38.02	8.66	0.00	61.33	74.00	12.67
11 400.00	3.47	Average	H	38.02	8.66	0.00	50.15	54.00	3.85
11 400.00	15.50	Peak	V	38.02	8.66	0.00	62.18	74.00	11.82
11 400.00	3.59	Average	V	38.02	8.66	0.00	50.27	54.00	3.73

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

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

Tested by: Haram Lee / Manager

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14. RADIATED RESTRICTED BAND EDGE MEASUREMENTS

14.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % R.H.

14.2 Test set-up

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.

14.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
☐ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 22, 2019 (1Y)
■ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 22, 2019 (1Y)
☐ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Jul. 25, 2019 (1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	Mar. 16, 2020 (1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 24, 2019 (1Y)
■ -	FSW43	Rohde & Schwarz	Signal Analyzer	104544	Jul. 18, 2019 (1Y)
☐ -	BBV 9718 B	Schwarzbeck	Pre-Amplifier	00009	Mar. 16, 2020 (1Y)
■ -	MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509	N/A
☐ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DT3000-3t	Innco Systems GmbH	Turn Table	N/A	N/A
☐ -	FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	May. 13, 2018 (2Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-419	Aug. 09, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA91700179	Jan. 16, 2019 (1Y)
☐ -	SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Feb. 20, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

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14.4 Test data for Restricted Band (Ant 1 : AE-T2450/5500DP5-RSMA)

14.4.1 Test data for 802.11n (HT 20) WLAN Mode

-. Test Date : March 17, 2020

-. Resolution bandwidth : 1 MHz for Peak Mode

-. Video bandwidth : 3 MHz for Peak Mode

-. Detector : Peak Mode(Peak)

-. Measurement distance : 3 m

-. Result : Pass

-.Operating mode : Transmitting mode (Worst Case)

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 448.96	17.87	Peak	H	31.28	7.84	0.00	56.99	74.00	17.01
5 448.08	8.29	Average	H				47.41	54.00	6.59
5 351.15	28.06	Peak	V				67.18	74.00	6.82
5 350.05	9.24	Average	V				48.36	54.00	5.64

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 387.09	17.69	Peak	H	31.28	7.84	0.00	56.81	74.00	17.19
5 459.95	7.88	Average	H				47.00	54.00	7.00
5 458.96	24.70	Peak	V				63.82	74.00	10.18
5 457.75	9.20	Average	V				48.32	54.00	5.68

Tabulated test data for Restricted Band

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

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

Tested by: Haram Lee / Manager

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14.5 Test data for Restricted Band (Ant 2 : AEi-2450/5500P-IPEX35)

14.5.1 Test data for 802.11n (HT 20) WLAN Mode

-. Test Date : March 17, 2020

-. Resolution bandwidth : 1 MHz for Peak Mode

-. Video bandwidth : 3 MHz for Peak Mode

-. Detector : Peak Mode(Peak)

-. Measurement distance : 3 m

-. Result : Pass

-.Operating mode : Transmitting mode (Worst Case)

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 351.92	18.10	Peak	H	31.28	7.84	0.00	57.22	74.00	16.78
5 454.12	7.77	Average	H				46.89	54.00	7.11
5 350.60	25.60	Peak	V				64.72	74.00	9.28
5 355.11	8.42	Average	V				47.54	54.00	6.46

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 371.48	17.11	Peak	H	31.28	7.84	0.00	56.23	74.00	17.77
5 415.99	7.03	Average	H				46.15	54.00	7.85
5 459.18	23.47	Peak	V				62.59	74.00	11.41
5 454.67	8.18	Average	V				47.30	54.00	6.70

Tabulated test data for Restricted Band

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

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

Tested by: Haram Lee / Manager

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14.6 Test data for Restricted Band (Ant 3 : AEi-5500DP5-IPEX100[Bottom])

14.6.1 Test data for 802.11n (HT 20) WLAN Mode

-. Test Date : March 17, 2020

-. Resolution bandwidth : 1 MHz for Peak Mode

-. Video bandwidth : 3 MHz for Peak Mode

-. Detector : Peak Mode(Peak)

-. Measurement distance : 3 m

-. Result : Pass

-.Operating mode : Transmitting mode (Worst Case)

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 402.91	15.82	Peak	H	31.28	7.84	0.00	54.94	74.00	19.06
5 450.60	7.88	Average	H				47.00	54.00	7.00
5 350.05	25.70	Peak	V				64.82	74.00	9.18
5 351.26	7.89	Average	V				47.01	54.00	6.99

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 453.45	17.44	Peak	H	31.28	7.84	0.00	56.56	74.00	17.44
5 449.62	7.41	Average	H				46.53	54.00	7.47
5 459.95	24.12	Peak	V				63.24	74.00	10.76
5 459.95	8.78	Average	V				47.90	54.00	6.10

Tabulated test data for Restricted Band

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

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

Tested by: Haram Lee / Manager

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14.7 Test data for Restricted Band (Ant 4 : AEi-RO-5500DP4-IPEX160)

14.7.1 Test data for 802.11n (HT 20) WLAN Mode

-. Test Date : March 17, 2020

-. Resolution bandwidth : 1 MHz for Peak Mode

-. Video bandwidth : 3 MHz for Peak Mode

-. Detector : Peak Mode(Peak)

-. Measurement distance : 3 m

-. Result : Pass

-.Operating mode : Transmitting mode (Worst Case)

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 374.23	16.50	Peak	H	31.28	7.84	0.00	55.62	74.00	18.38
5 450.82	7.27	Average	H				46.39	54.00	7.61
5 350.38	26.04	Peak	V				65.16	74.00	8.84
5 350.16	8.05	Average	V				47.17	54.00	6.83

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 355.99	17.95	Peak	H	31.28	7.84	0.00	57.07	74.00	16.93
5 451.59	7.69	Average	H				46.81	54.00	7.19
5 454.23	24.42	Peak	V				63.54	74.00	10.46
5 454.67	8.76	Average	V				47.88	54.00	6.12

Tabulated test data for Restricted Band

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

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

Tested by: Haram Lee / Manager

14.8 Test data for Restricted Band (Ant 5 : AEi-RO-5500DP4-IPEX250)

14.8.1 Test data for 802.11n (HT 20) WLAN Mode

-. Test Date : March 17, 2020

-. Resolution bandwidth : 1 MHz for Peak Mode

-. Video bandwidth : 3 MHz for Peak Mode

-. Detector : Peak Mode(Peak)

-. Measurement distance : 3 m

-. Result : Pass

-.Operating mode : Transmitting mode (Worst Case)

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 379.40	15.59	Peak	H	31.28	7.84	0.00	54.71	74.00	19.29
5 453.02	7.41	Average	H				46.53	54.00	7.47
5 350.16	24.49	Peak	V				63.61	74.00	10.39
5 350.05	7.67	Average	V				46.79	54.00	7.21

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
5 449.07	17.35	Peak	H	31.28	7.84	0.00	56.47	74.00	17.53
5 451.37	7.55	Average	H				46.67	54.00	7.33
5 451.37	23.06	Peak	V				62.18	74.00	11.82
5 459.84	9.01	Average	V				48.13	54.00	5.87

Tabulated test data for Restricted Band

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

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

Tested by: Haram Lee / Manager

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15. CONDUCTED EMISSION TEST

15.1 Operating environment

Temperature : 23 ℃

Relative humidity : 46 % R.H.

15.2 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.

15.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESR	Rohde & Schwarz	Test Receiver	102602	Aug. 07, 2019 (1Y)
□ -	NSLK8126	Schwarzbeck	LISN	8128-404	Mar. 19, 2019 (1Y)
■ -	NSLK8126	Schwarzbeck	LISN	8126-479	Nov. 11, 2019 (1Y)
■ -	3825/2	EMCO	LISN	9109-1869	Mar. 19, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

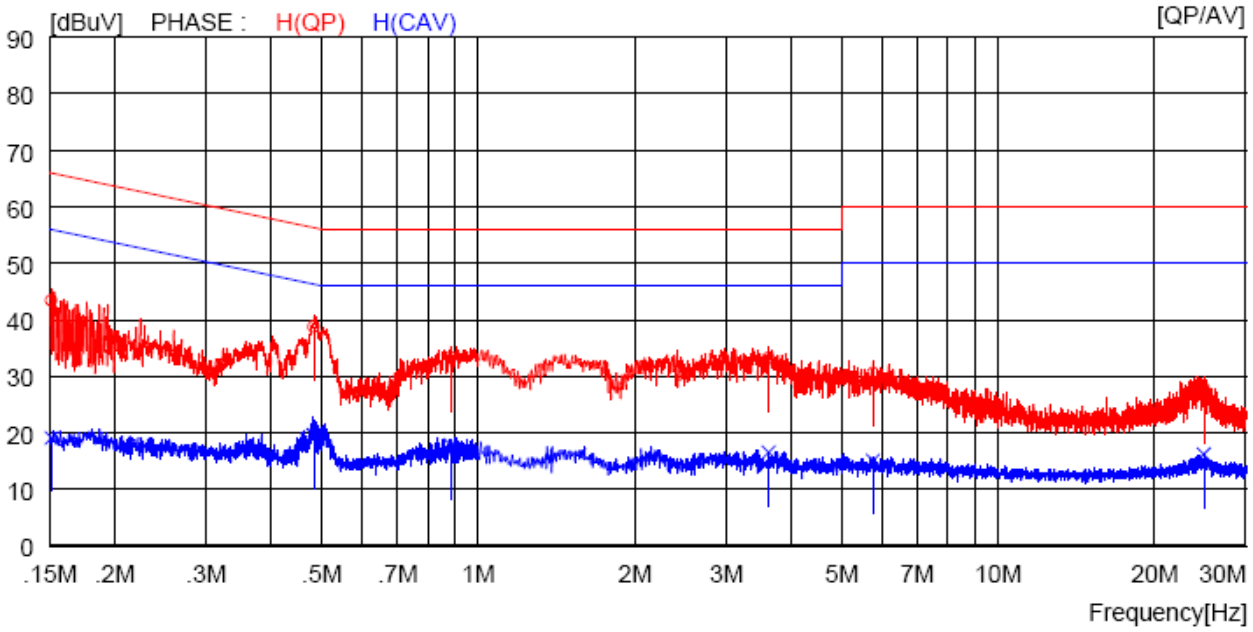
15.4 Test data

-. Test Date : March 10, 2020

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15100	33.4	----	10.0	43.4	----	65.9	----	22.5	----	H(QP)
2	0.48200	28.8	----	10.0	38.8	----	56.3	----	17.5	----	H(QP)
3	0.88600	23.3	----	10.0	33.3	----	56.0	----	22.7	----	H(QP)
4	3.61600	23.1	----	10.1	33.2	----	56.0	----	22.8	----	H(QP)
5	5.75000	20.4	----	10.2	30.6	----	60.0	----	29.4	----	H(QP)
6	24.90000	17.4	----	10.4	27.8	----	60.0	----	32.2	----	H(QP)
7	0.15100	----	9.1	10.0	----	19.1	----	55.9	----	36.8	H(CAV)
8	0.48200	----	9.6	10.0	----	19.6	----	46.3	----	26.7	H(CAV)
9	0.88600	----	7.8	10.0	----	17.8	----	46.0	----	28.2	H(CAV)
10	3.61600	----	6.4	10.1	----	16.5	----	46.0	----	29.5	H(CAV)
11	5.75000	----	4.9	10.2	----	15.1	----	50.0	----	34.9	H(CAV)
12	24.90000	----	5.8	10.4	----	16.2	----	50.0	----	33.8	H(CAV)

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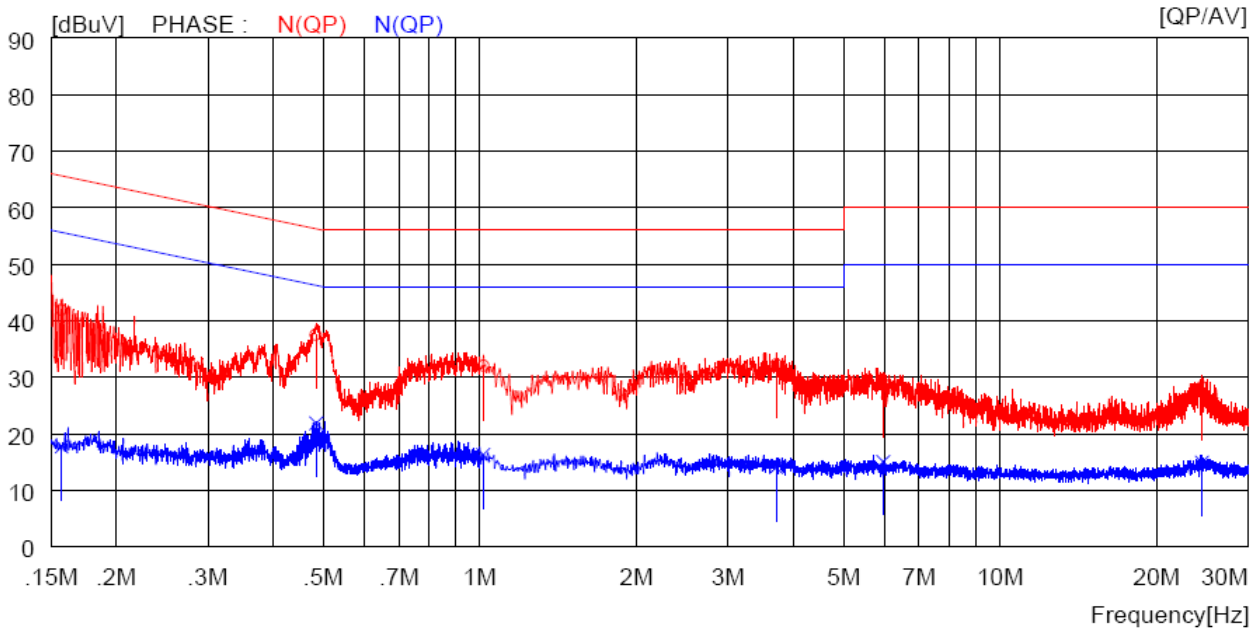
-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15700	31.9	----	10.0	41.9	----	65.6	----	23.7	----	N(QP)
2	0.48400	27.5	----	10.0	37.5	----	56.3	----	18.8	----	N(QP)
3	1.01600	21.9	----	10.1	32.0	----	56.0	----	24.0	----	N(QP)
4	3.71600	22.2	----	10.1	32.3	----	56.0	----	23.7	----	N(QP)
5	5.97000	18.7	----	10.2	28.9	----	60.0	----	31.1	----	N(QP)
6	24.47000	17.9	----	10.4	28.3	----	60.0	----	31.7	----	N(QP)
7	0.15700	----	7.8	10.0	----	17.8	----	55.6	----	37.8	N(CAV)
8	0.48400	----	11.9	10.0	----	21.9	----	46.3	----	24.4	N(CAV)
9	1.01600	----	6.2	10.1	----	16.3	----	46.0	----	29.7	N(CAV)
10	3.71600	----	4.0	10.1	----	14.1	----	46.0	----	31.9	N(CAV)
11	5.97000	----	4.9	10.2	----	15.1	----	50.0	----	34.9	N(CAV)
12	24.47000	----	4.6	10.4	----	15.0	----	50.0	----	35.0	N(CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Ha-Ram, Lee / Manager

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