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

Test Report No.	**: OT-182-RWD-020**
AGR No.	**: A181A-388**
Applicant	**: LG Innotek Co., Ltd.**
Address	**: 26, Hanamsandan 5beon-ro Gwangsan-gu, Gwangju, 506-731, South Korea**
Manufacturer	**: LG Innotek Co., Ltd.**
Address	**: 26, Hanamsandan 5beon-ro Gwangsan-gu, Gwangju, 506-731, South Korea**
Type of Equipment	**: 802.11 a/b/g/n/ac WiFi Module**
FCC ID.	**: YZP-TWFMR003D**
Model Name	**: TWFM-R003D**
Multiple Model Name	**: TWFM-R003D(A), TWFM-R003D(B)**
Serial number	**: N/A**
Total page of Report	**: 171 pages (including this page)**
Date of Incoming	**: February 02, 2018**
Date of issue	**: February 12, 2018**

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: Ki-Hong, Nam / Asst, Chief Engineer
ONETECH Corp.

Approved by: Keun-Young, Choi / Vice President
ONETECH Corp.

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

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

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REVISION HISTORY

Issued Report No.	Issued Date	Revisions	Effect Section
W178R-D011	August 07, 2017	Initial Issue	All
OT-182-RWD-020	February 12, 2018	Added the multiple model.	All

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1. VERIFICATION OF COMPLIANCE

Applicant	: LG Innotek Co., Ltd.
Address	: 26, Hanamsandan 5beon-ro Gwangsan-gu, Gwangju, 506-731, South Korea
Contact Person	: Jeong Inchang / Senior Research Engineer
Telephone No.	: +82-62-950-0332
FCC ID	: YZP-TWFMR003D
Model Name	: TWFM-R003D
Serial Number	: N/A
Date	: February 12, 2018

EQUIPMENT CLASS	Unlicensed National Information infrastructure(UNII)
E.U.T. DESCRIPTION	Modular Transmitter, 802.11 a/b/g/n/ac WiFi Module
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 E Section 15.407 KDB 789033 D02 General UNII Test Procedures New Rules V02r01
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
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 Bands and Radiated Emission Limits)	Met the Limit / PASS
15.207	AC Conducted Emissions 150 kHz-30 MHz	Met the Limit / 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.

2.6 Test Facility

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

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

-. Site Filing:

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

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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3. GENERAL INFORMATION

3.1 Product Description

The LG Innotek Co., Ltd., Model TWFM-R003D (referred to as the EUT in this report) is a 802.11 a/b/g/n/ac WiFi Module. Product specification information described herein was obtained from product data sheet or user's manual.

<table>
<tr><td>DEVICE TYPE</td><td colspan="3">802.11 a/b/g/n/ac WiFi Module</td></tr>
<tr><td rowspan="8">Operating Frequency</td><td rowspan="2">WLAN
2.4 GHz Band</td><td colspan="2">2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))</td></tr>
<tr><td colspan="2">2 422 MHz ~ 2 452 MHz (802.11n(HT40))</td></tr>
<tr><td rowspan="6">WLAN
5 GHz Band</td><td rowspan="3">5 150 MHz ~
5 250 MHz Band</td><td>5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))</td></tr>
<tr><td>5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))</td></tr>
<tr><td>5 210 MHz (802.11ac(VHT80))</td></tr>
<tr><td rowspan="3">5 725 MHz ~
5 850 MHz Band</td><td>5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))</td></tr>
<tr><td>5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))</td></tr>
<tr><td>5 775 MHz (802.11ac(VHT80))</td></tr>
<tr><td rowspan="3">RF Output Power</td><td rowspan="3">WLAN
2.4 GHz Band</td><td>Antenna 0</td><td>Wi-Fi 802.11b (12.78 dBm)
Wi-Fi 802.11g (11.73 dBm)
Wi-Fi 802.11n(HT20) (10.96 dBm)
Wi-Fi 802.11n(HT40) (10.16 dBm)</td></tr>
<tr><td>Antenna 1</td><td>Wi-Fi 802.11b (14.32 dBm)
Wi-Fi 802.11g (12.84 dBm)
Wi-Fi 802.11n(HT20) (10.83 dBm)
Wi-Fi 802.11n(HT40) (10.77 dBm)</td></tr>
<tr><td>Antenna 0
+ Antenna 1</td><td>Wi-Fi 802.11b (16.63 dBm)
Wi-Fi 802.11g (15.33 dBm)
Wi-Fi 802.11n(HT20) (13.86 dBm)
Wi-Fi 802.11n(HT40) (13.49 dBm)</td></tr>
</table>

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RF Output Power	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	Antenna 0	Wi-Fi 802.11a (9.37 dBm) Wi-Fi 802.11n(HT20) (7.49 dBm) Wi-Fi 802.11n(HT40) (7.58 dBm) Wi-Fi 802.11ac(HT80) (6.30 dBm)
			Antenna 1	Wi-Fi 802.11a (10.14 dBm) Wi-Fi 802.11n(HT20) (8.00 dBm) Wi-Fi 802.11n(HT40) (8.43 dBm) Wi-Fi 802.11ac(HT80) (6.10 dBm)
			Antenna 0 + Antenna 1	Wi-Fi 802.11a (12.78 dBm) Wi-Fi 802.11n(HT20) (10.76 dBm) Wi-Fi 802.11n(HT40) (11.04 dBm) Wi-Fi 802.11ac(HT80) (9.21 dBm)
		5 725 MHz ~ 5 850 MHz Band	Antenna 0	Wi-Fi 802.11a (9.83 dBm) Wi-Fi 802.11n(HT20) (7.76 dBm) Wi-Fi 802.11n(HT40) (7.62 dBm) Wi-Fi 802.11ac(HT80) (5.74 dBm)
			Antenna 1	Wi-Fi 802.11a (9.80 dBm) Wi-Fi 802.11n(HT20) (7.71 dBm) Wi-Fi 802.11n(HT40) (7.72 dBm) Wi-Fi 802.11ac(HT80) (5.84 dBm)
			Antenna 0 + Antenna 1	Wi-Fi 802.11a (12.83 dBm) Wi-Fi 802.11n(HT20) (10.75 dBm) Wi-Fi 802.11n(HT40) (10.57 dBm) Wi-Fi 802.11ac(HT80) (8.80 dBm)

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Modulation Type	WLAN 2.4 GHz Band	DSSS Modulation(DBPSK/DQPSK/CCK) OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
	WLAN 5 GHz Band	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
Antenna Type	WLAN 2.4 GHz Band	Antenna 0	UANZZZWHA002 : 1.30 dBi UANZZZWHA003 : 1.20 dBi
		Antenna 1	2.13 dBi
		Antenna 0 + Antenna 1	UANZZZWHA002 + Antenna 1 : 4.75 dBi UANZZZWHA003 + Antenna 1 : 4.70 dBi
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	UANZZZWHA002 : 1.00 dBi UANZZZWHA003 : 1.30 dBi
		Antenna 1	1.01 dBi
		Antenna 0 + Antenna 1	UANZZZWHA002 + Antenna 1 : 4.02 dBi UANZZZWHA003 + Antenna 1 : 4.17 dBi
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	UANZZZWHA002 : 1.30 dBi UANZZZWHA003 : 1.20 dBi
		Antenna 1	2.04 dBi
		Antenna 0 + Antenna 1	UANZZZWHA002 + Antenna 1 : 4.70 dBi UANZZZWHA003 + Antenna 1 : 4.65 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.

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

Model Name	Differences	Tested
TWFM-R003D	Basic Model	☐
TWFM-R003D(A)	The difference between this model and the basic model is the PDN function added (Main IC Wake-up) and resistance component R6 added.	☐
TWFM-R003D(B)	The difference between this model and the basic model is the Antenna.	☑

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

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

4. EUT MODIFICATIONS

-. None

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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	LG Innotek Co., Ltd.	TWFM-R003D	-

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
TWFM-R003D	LG Innotek Co., Ltd.	802.11 a/b/g/n/ac WiFi Module (EUT)	Notebook PC
PP11L	DELL	Notebook PC	EUT

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5.3 Mode of operation during the test

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

UNII 1

Modulation	DATA RATE	OUTPUT POWER[dBm]	
		Antenna 0	Antenna 1
802.11 a (Middle Channel)	6 Mbps	9.37	10.14
	9 Mbps	9.14	9.94
	12 Mbps	8.98	9.84
	18 Mbps	8.77	9.67
	24 Mbps	8.63	9.56
	36 Mbps	8.53	9.39
	48 Mbps	8.28	9.21
	54 Mbps	8.23	9.09
HT 20 (Middle Channel)	6.5 Mbps	7.49	8.00
	13 Mbps	7.42	7.81
	19.5 Mbps	7.19	7.64
	26 Mbps	6.96	7.46
	39 Mbps	6.79	7.36
	52 Mbps	6.61	7.18
	58.5 Mbps	6.40	7.03
	65 Mbps	6.26	6.88
HT 40 (Middle Channel)	13.5 Mbps	7.58	8.43
	27 Mbps	7.49	8.32
	40.5 Mbps	7.32	8.22
	54 Mbps	7.08	8.02
	81 Mbps	6.94	7.83
	108 Mbps	6.72	7.70
	121.5 Mbps	6.51	7.51
	135 Mbps	6.35	7.38

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VHT80 (Middle Channel)	29.3 Mbps	6.30	6.10
	58.5 Mbps	6.21	5.98
	87.8 Mbps	5.97	5.79
	117 Mbps	5.88	5.66
	175.5 Mbps	5.77	5.49
	234 Mbps	5.59	5.36
	263.3 Mbps	5.41	5.26
	292.5 Mbps	5.32	5.07
	351 Mbps	5.29	4.87
	390 Mbps	5.21	4.76

-. The worse case data rate for each modulation is determined 6 Mbps(Ant.0/Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40, 29.3 Mbps(Ant.0/Ant.1) for VHT80.

-. To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

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UNII 3

Modulation	DATA RATE	OUTPUT POWER[dBm]	
		Antenna 0	Antenna 1
802.11 a (Low Channel)	6 Mbps	9.83	9.80
	9 Mbps	9.64	9.65
	12 Mbps	9.45	9.47
	18 Mbps	9.39	9.30
	24 Mbps	9.17	9.15
	36 Mbps	9.04	9.00
	48 Mbps	8.99	8.88
	54 Mbps	8.92	8.75
HT 20 (Low Channel)	6.5 Mbps	7.76	7.71
	13 Mbps	7.54	7.53
	19.5 Mbps	7.30	7.40
	26 Mbps	7.17	7.26
	39 Mbps	7.03	7.15
	52 Mbps	6.91	6.96
	58.5 Mbps	6.75	6.79
	65 Mbps	6.64	6.59
HT 40 (Low Channel)	13.5 Mbps	7.35	7.72
	27 Mbps	7.28	7.60
	40.5 Mbps	7.04	7.44
	54 Mbps	6.98	7.32
	81 Mbps	6.80	7.13
	108 Mbps	6.57	7.03
	121.5 Mbps	6.43	6.85
	135 Mbps	6.21	6.68

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VHT80 (Low Channel)	29.3 Mbps	5.74	5.84
	58.5 Mbps	5.56	5.70
	87.8 Mbps	5.47	5.51
	117 Mbps	5.35	5.38
	175.5 Mbps	5.12	5.19
	234 Mbps	5.04	5.09
	263.3 Mbps	4.94	4.89
	292.5 Mbps	4.76	4.71
	351 Mbps	4.70	4.57
	390 Mbps	4.68	4.44

-. The worse case data rate for each modulation is determined 6 Mbps(Ant.0/Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40, 29.3 Mbps(Ant.0/Ant.1) for VHT80.

-. To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

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5.4 Configuration of Test System

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

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

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

5.5 Antenna Requirement

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

Antenna Construction:

The transmitter antenna of the EUT is WLAN 2.4 GHz Band & 5 GHz Band is PCB Antenna & External Antenna (Two kinds of PCB Antenna).

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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. MIMIMUM 26 dB BANDWIDTH

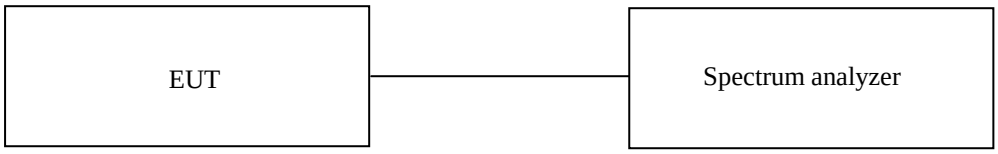
7.1 Operating environment

Temperature : 22 ℃

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 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.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

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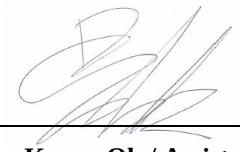
7.4 Test data for 802.11a RLAN Mode

7.4.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	20.38
	Middle	5 220.00	20.88
	High	5 240.00	20.13
5 725 ~ 5 850	Low	5 745.00	20.23
	Middle	5 785.00	20.83
	High	5 825.00	20.98



Tested by: Hyung-Kwon, Oh / Assistant Manager

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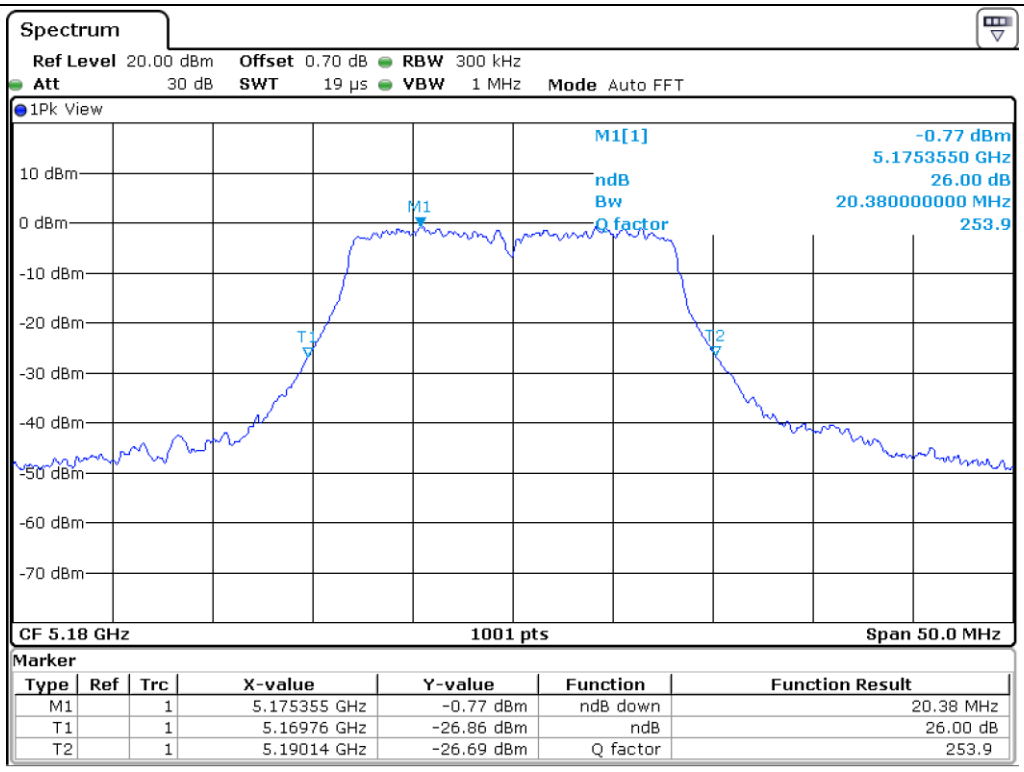
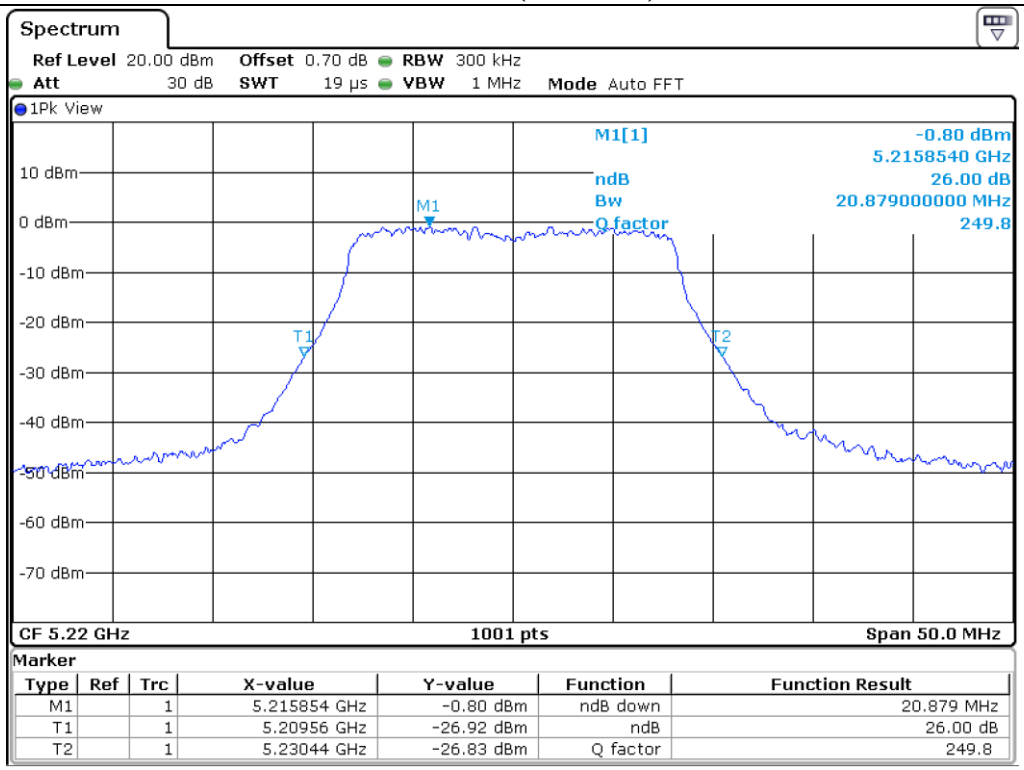


Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)

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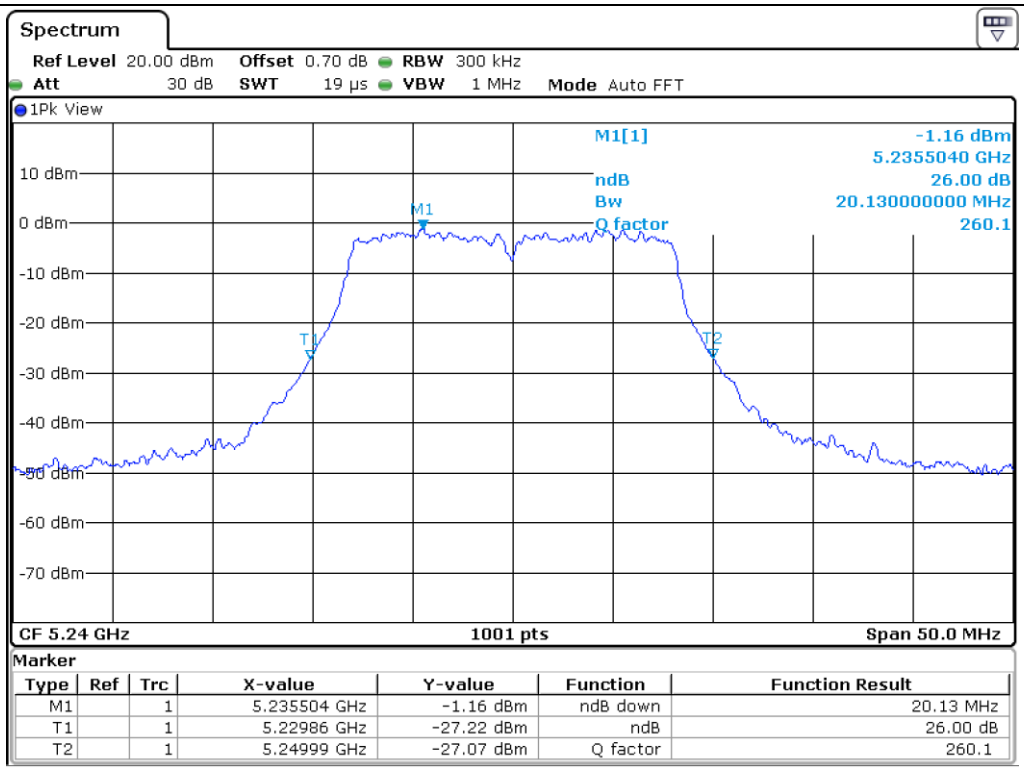

High Channel (5 240 MHz)

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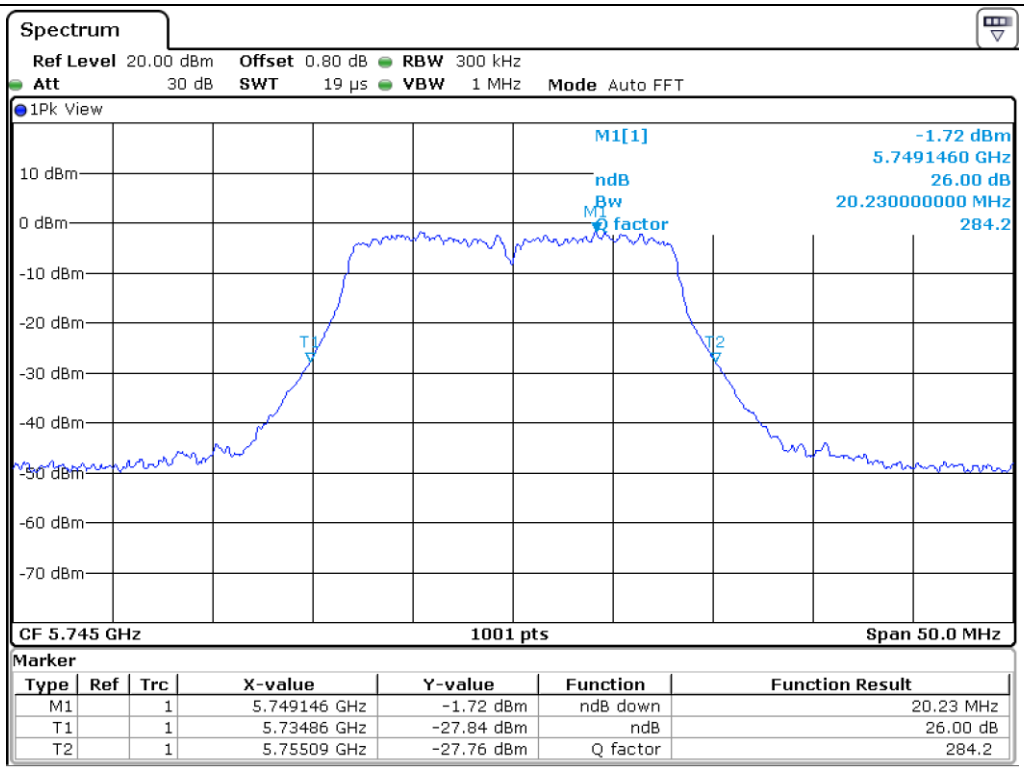
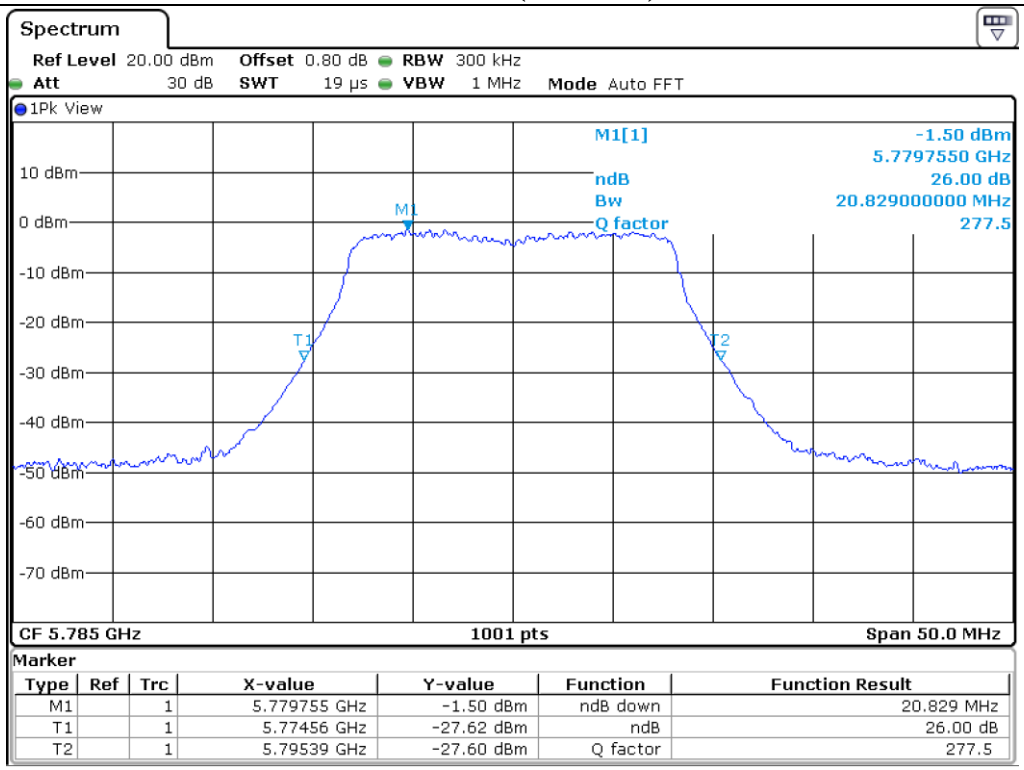
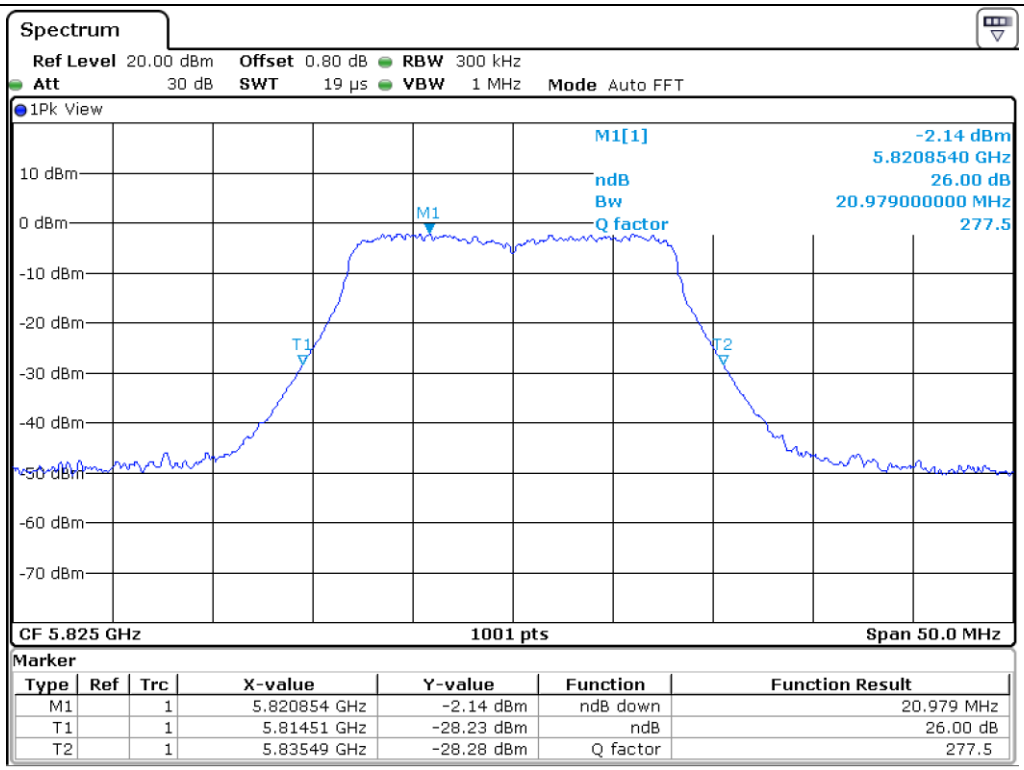


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 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)

7.4.2 Test data for Antenna 1

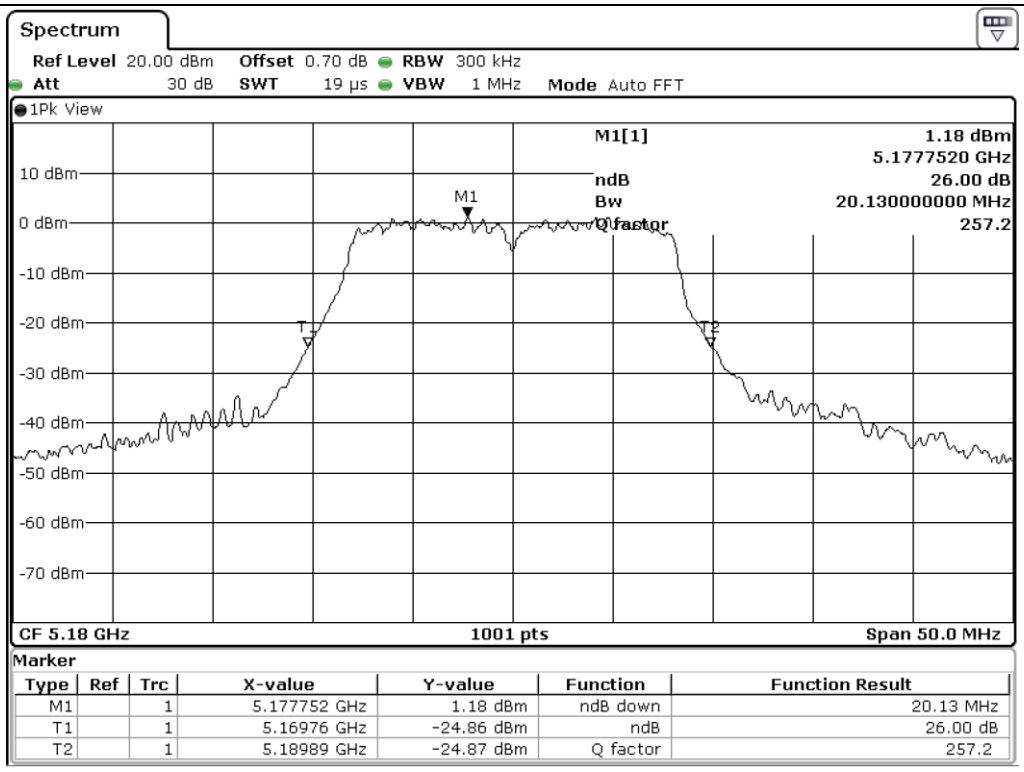
-. Test Date : July 18, 2017

-. Test Result : Pass

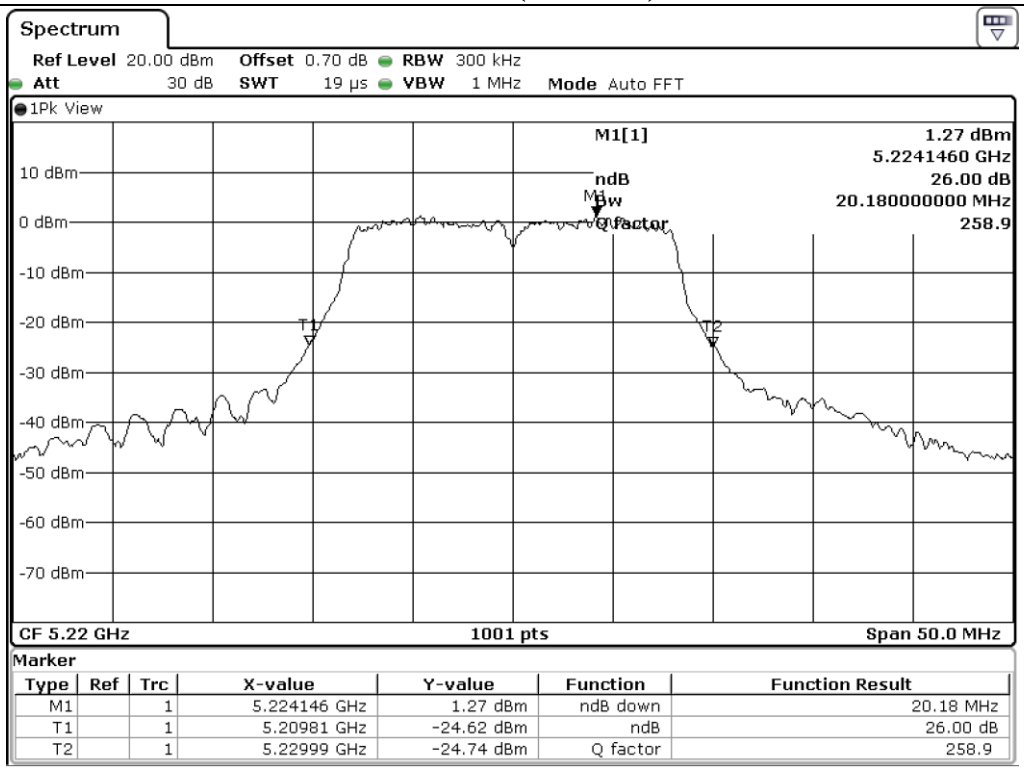
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	20.13
	Middle	5 220.00	20.18
	High	5 240.00	20.03
5 725 ~ 5 850	Low	5 745.00	20.08
	Middle	5 785.00	19.98
	High	5 825.00	20.13

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

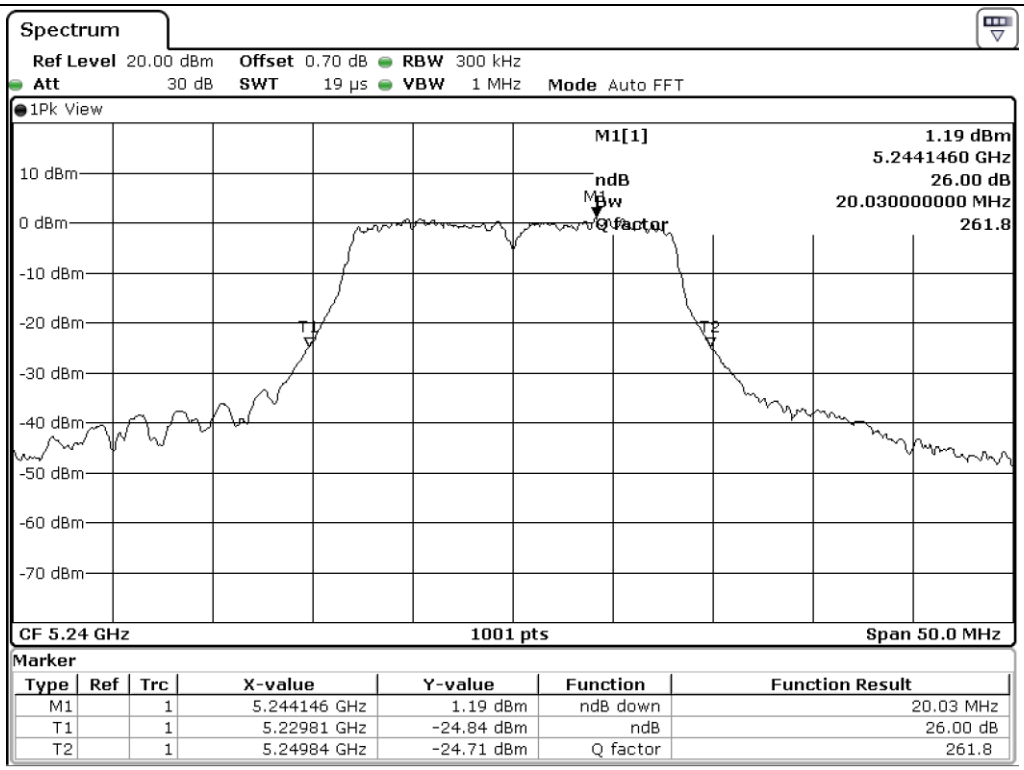


Low Channel (5 180 MHz)



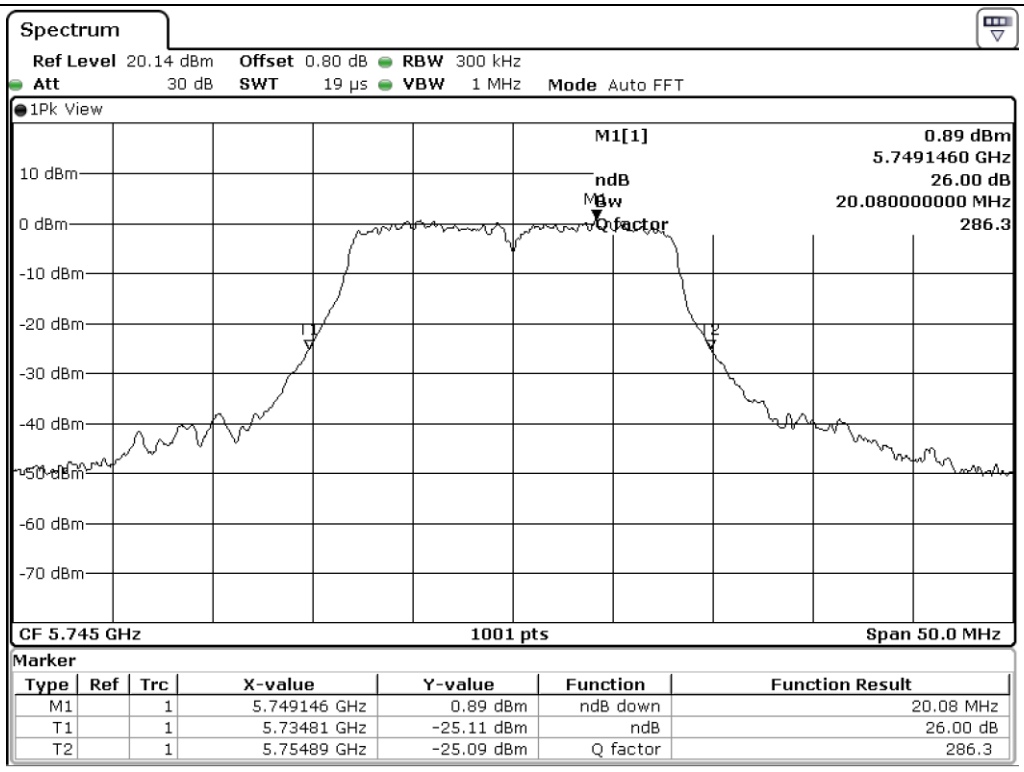
Middle Channel (5 220 MHz)

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

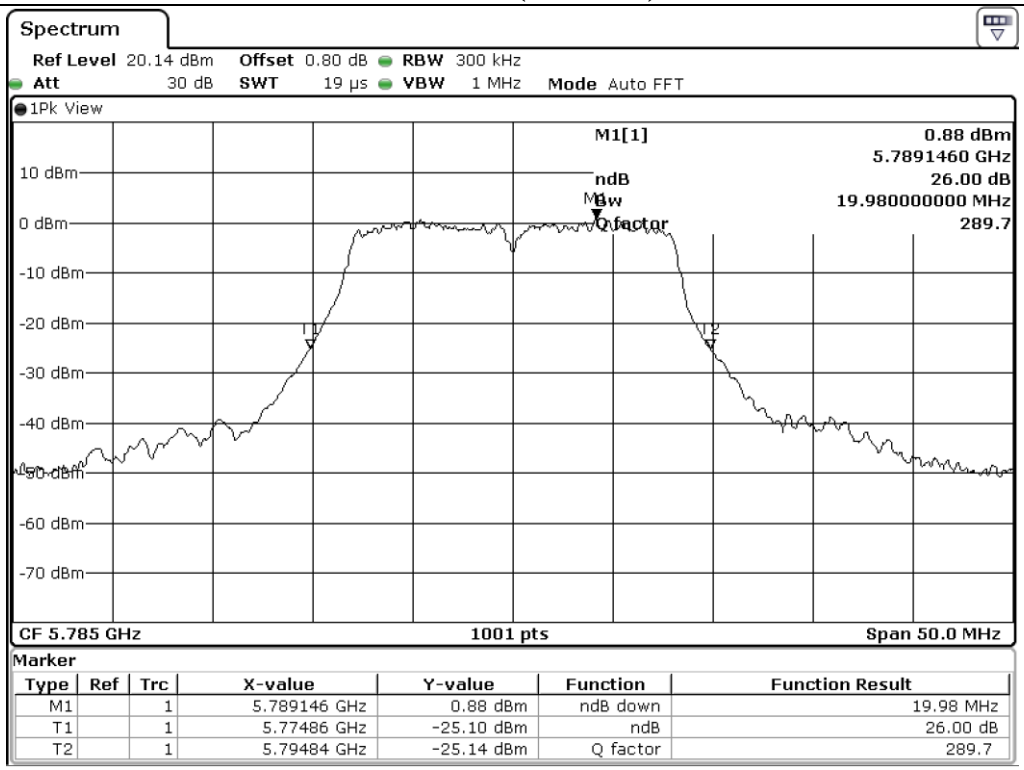


High Channel (5 240 MHz)

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

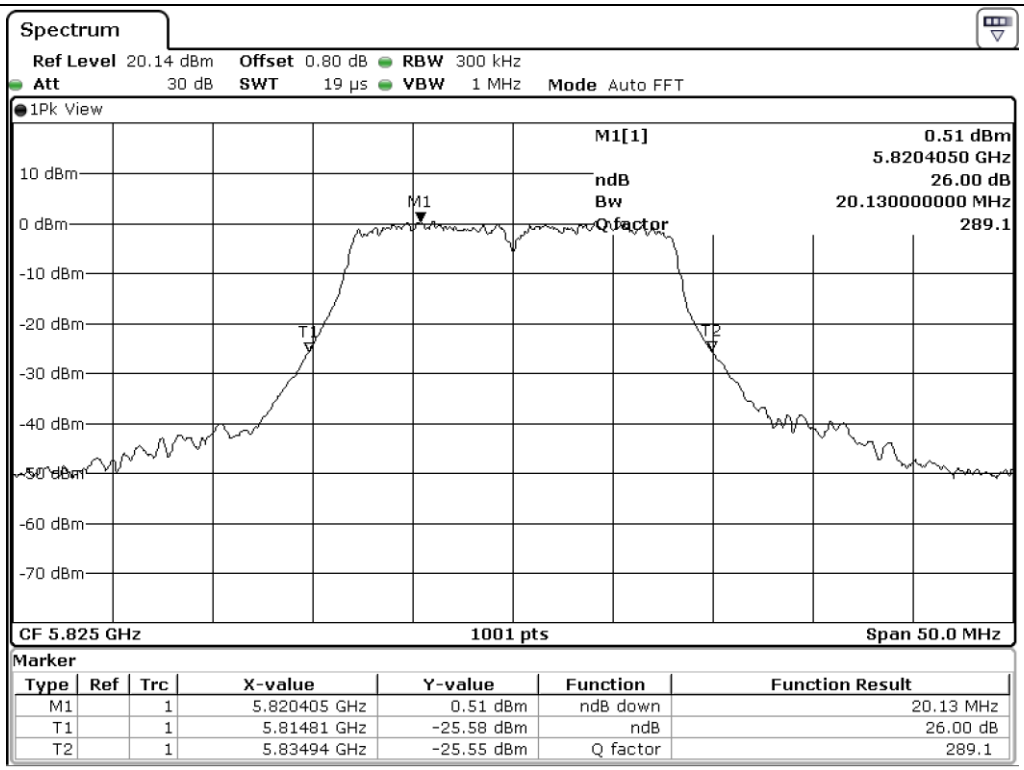


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 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)

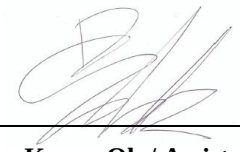
7.5 Test data for 802.11n_HT20 RLAN Mode

7.5.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

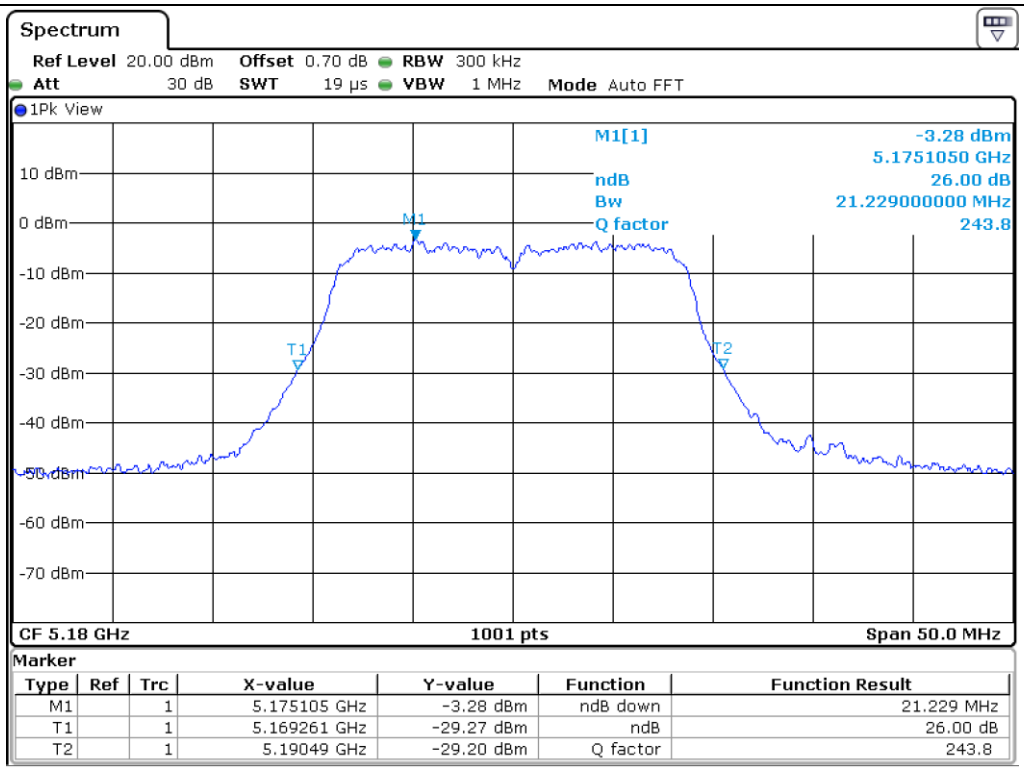
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	21.23
	Middle	5 220.00	21.08
	High	5 240.00	20.83
5 725 ~ 5 850	Low	5 745.00	21.13
	Middle	5 785.00	21.23
	High	5 825.00	21.23

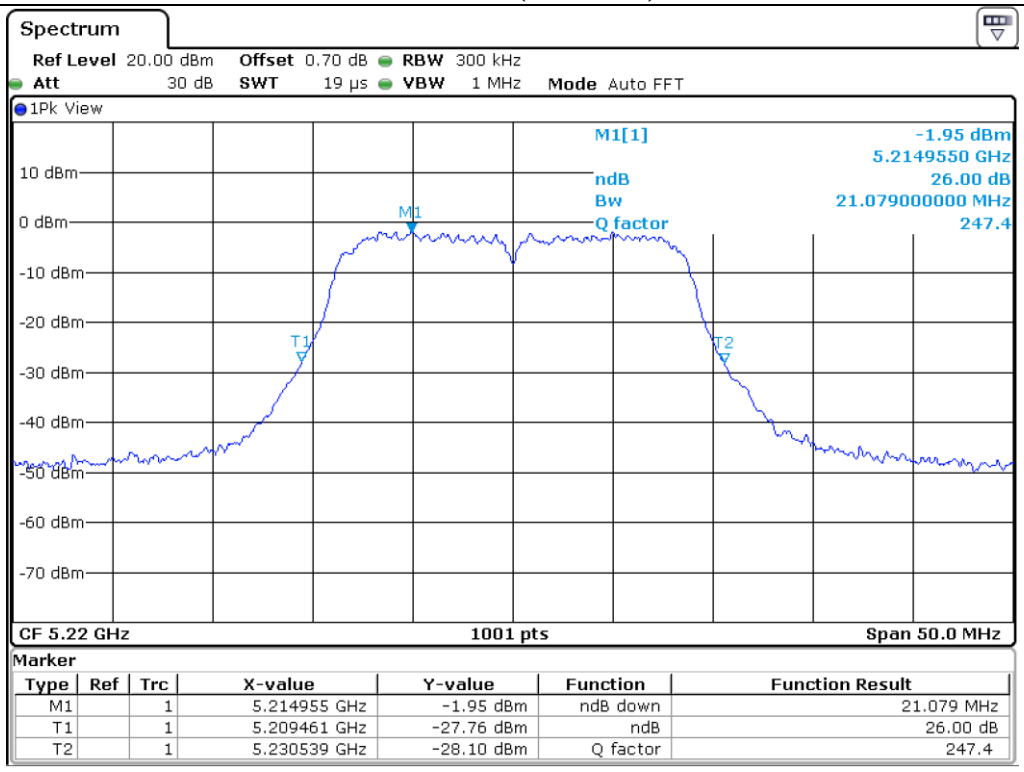


Tested by: Hyung-Kwon, Oh / Assistant Manager

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

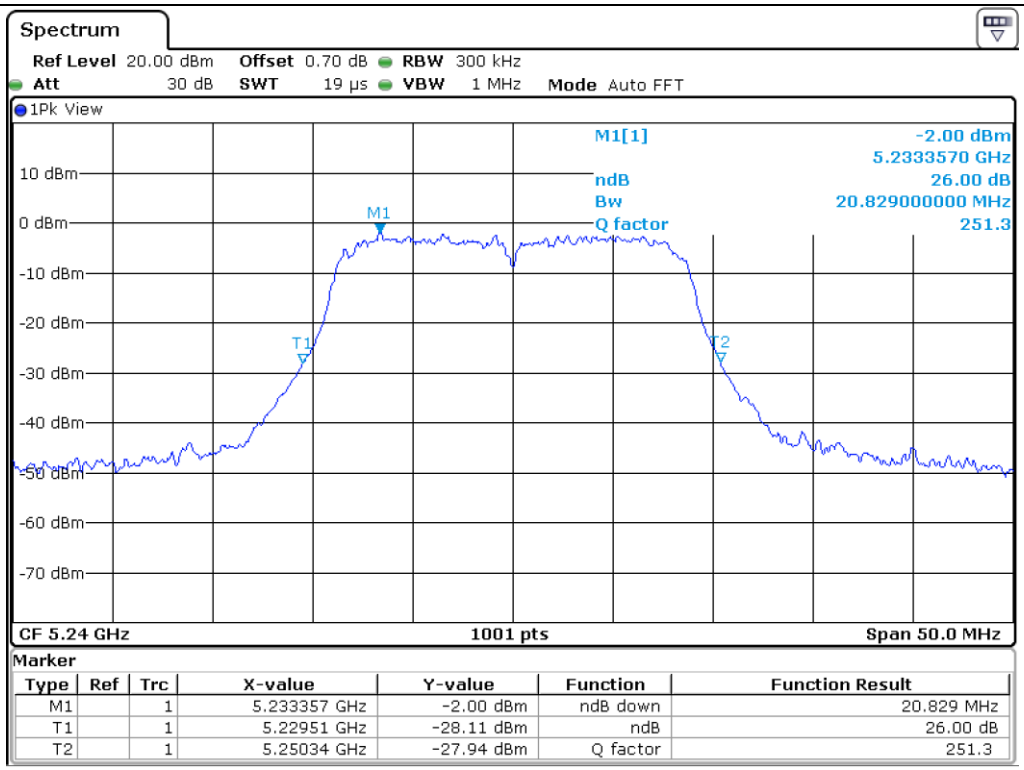


Low Channel (5 180 MHz)



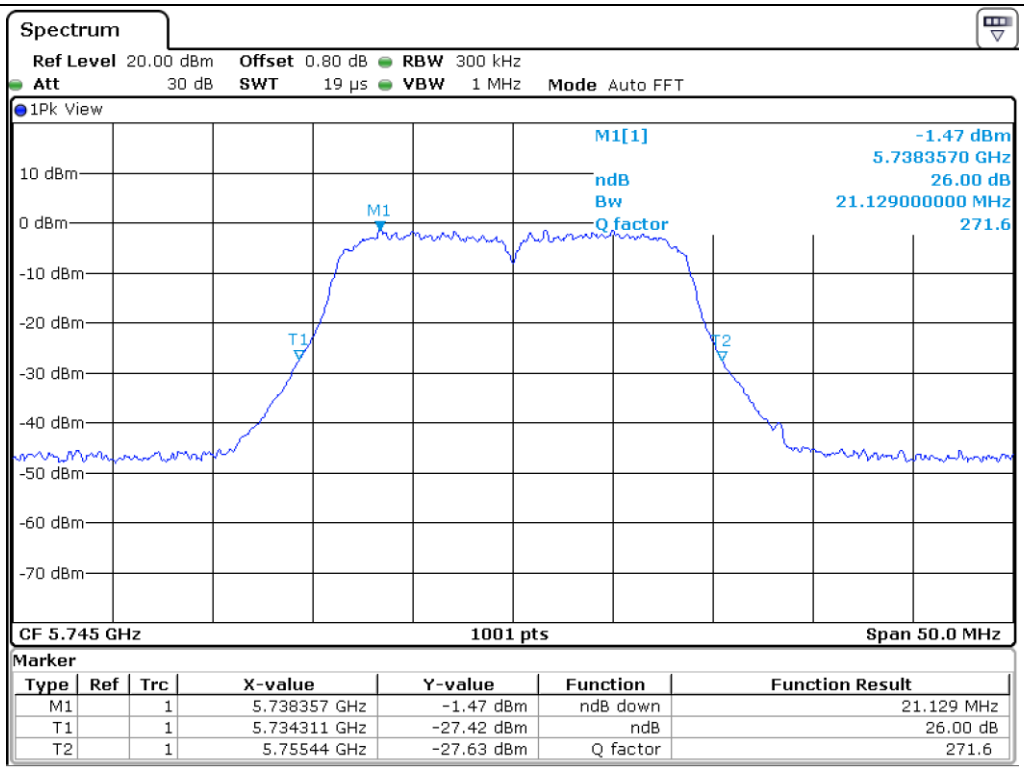
Middle Channel (5 220 MHz)

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

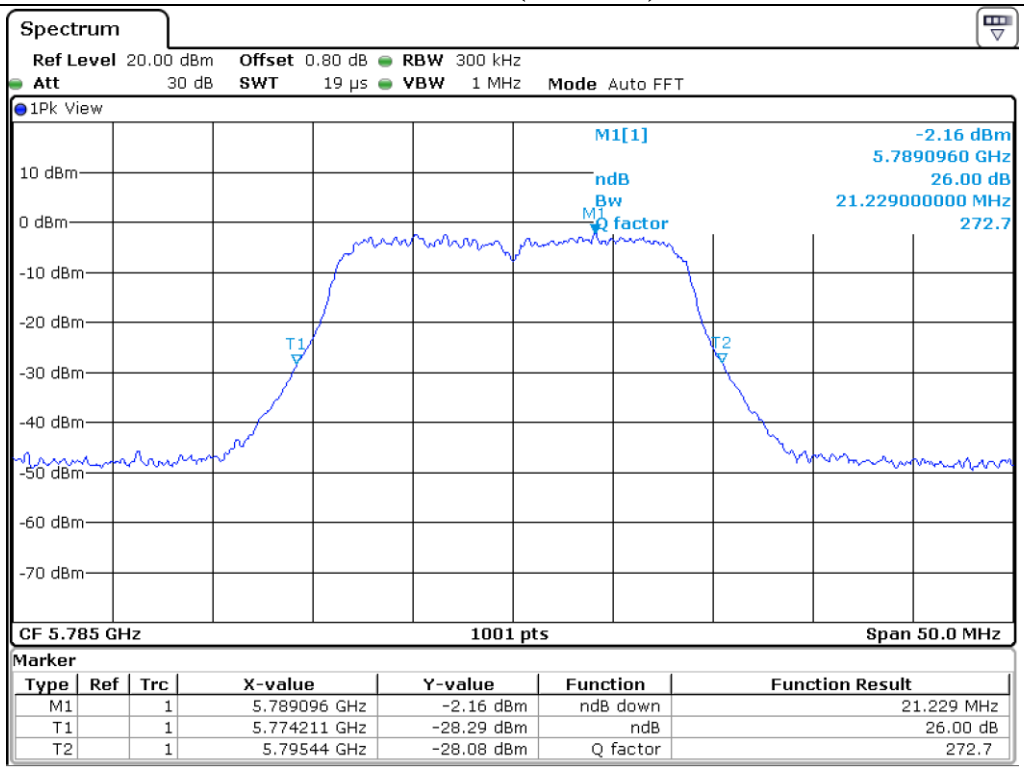


High Channel (5 240 MHz)

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

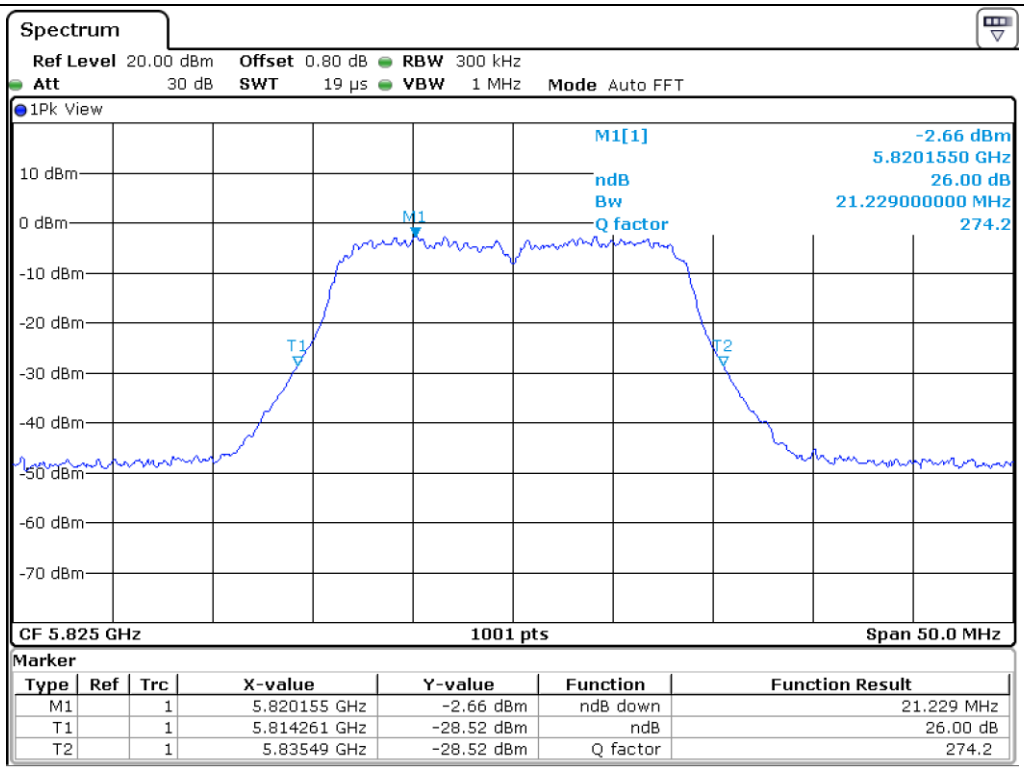


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 MHz)

7.5.2 Test data for Antenna 1

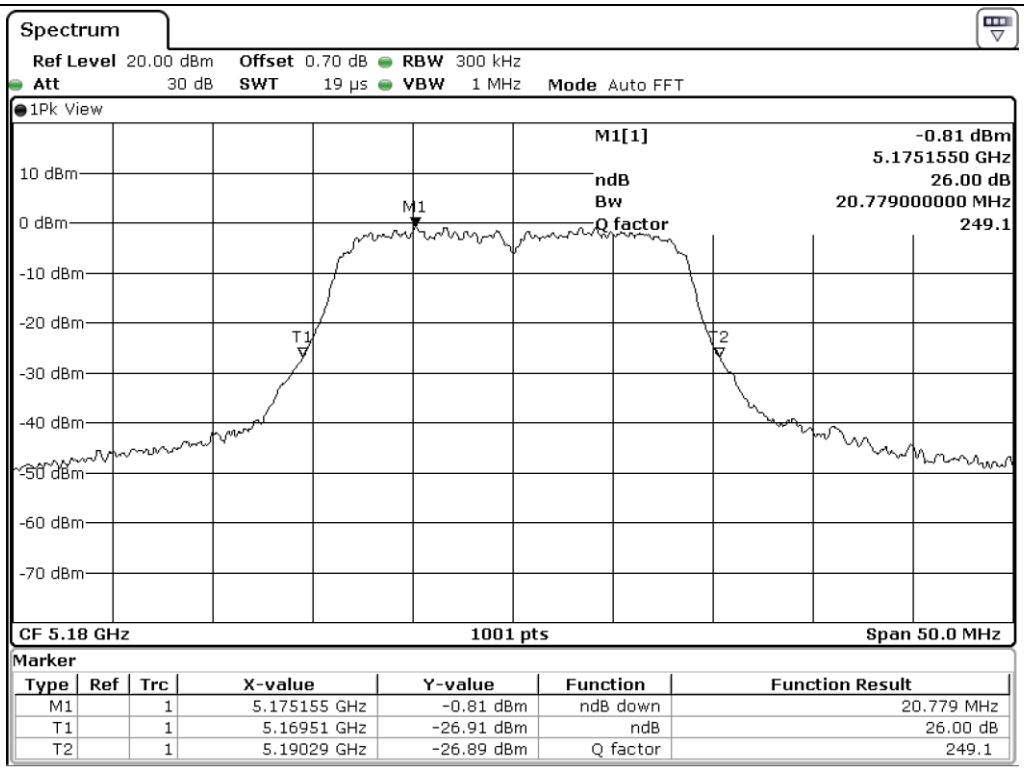
-. Test Date : July 18, 2017

-. Test Result : Pass

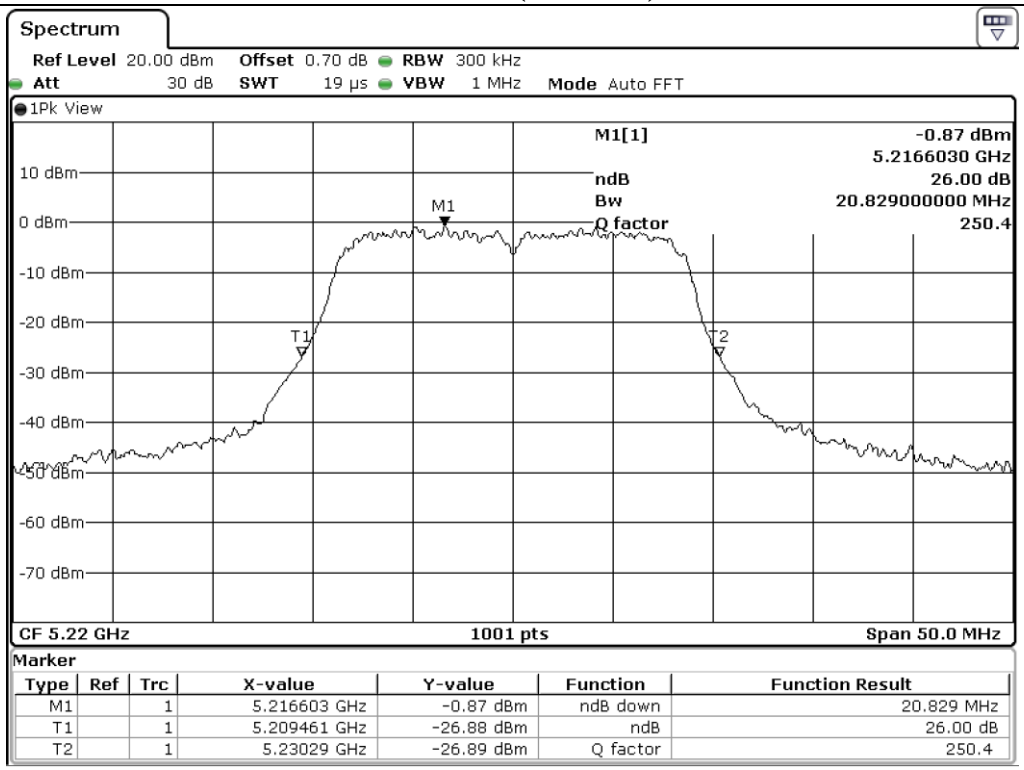
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	20.78
	Middle	5 220.00	20.83
	High	5 240.00	20.78
5 725 ~ 5 850	Low	5 745.00	20.78
	Middle	5 785.00	20.93
	High	5 825.00	20.88

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

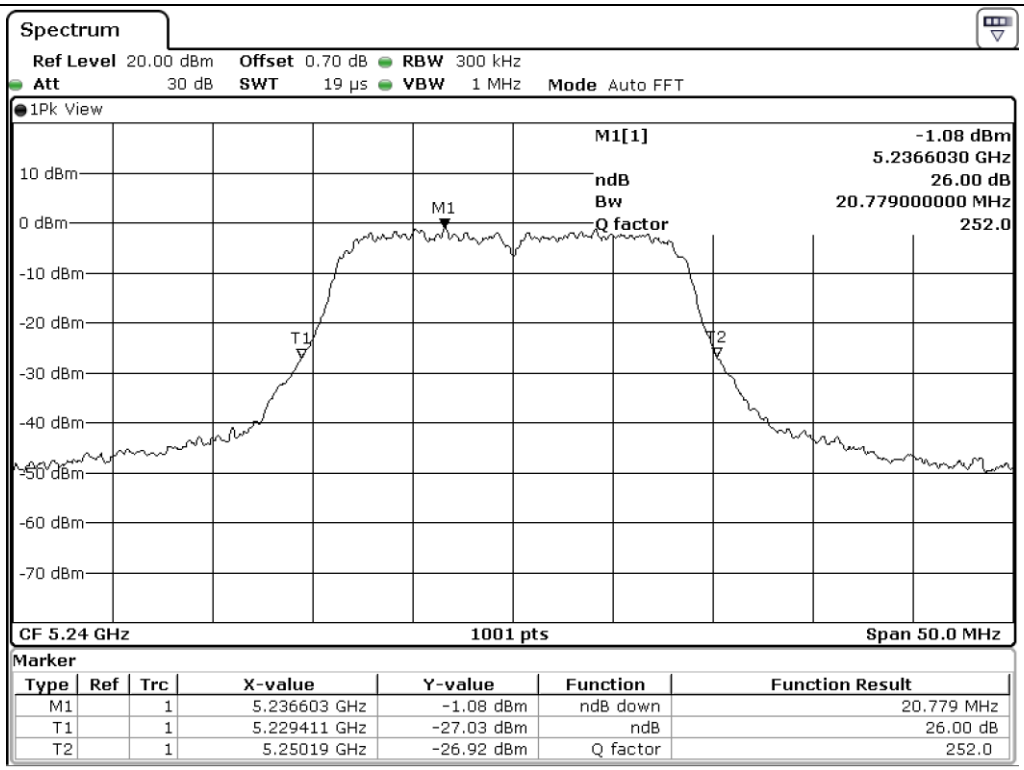


Low Channel (5 180 MHz)



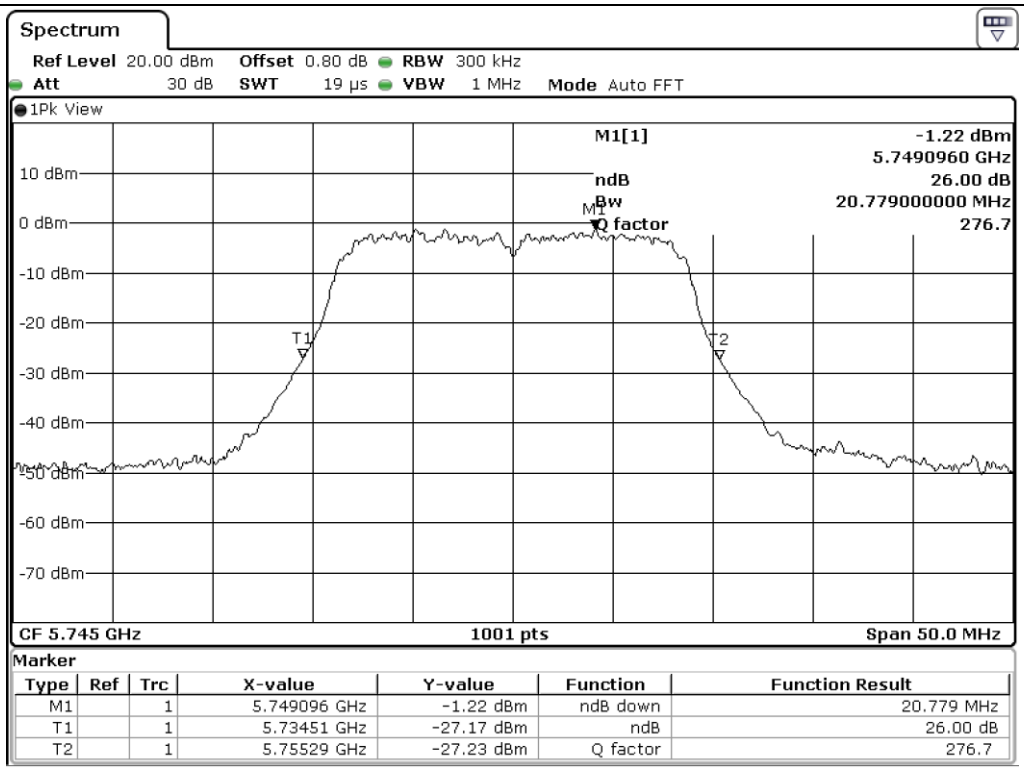
Middle Channel (5 220 MHz)

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

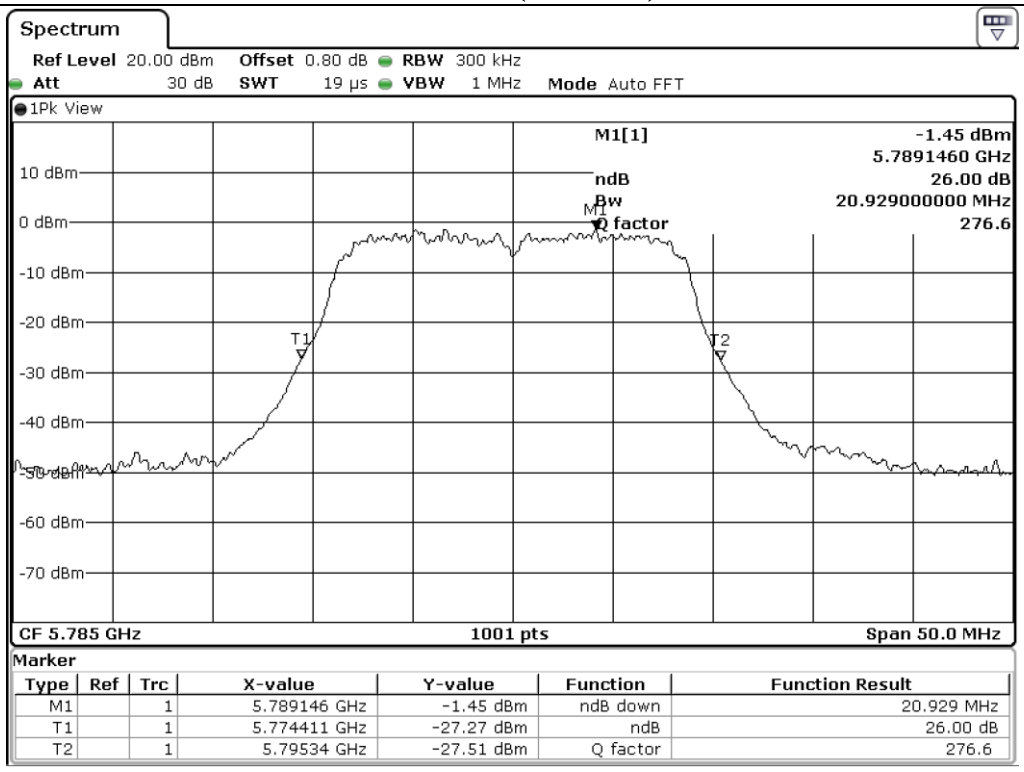


High Channel (5 240 MHz)

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

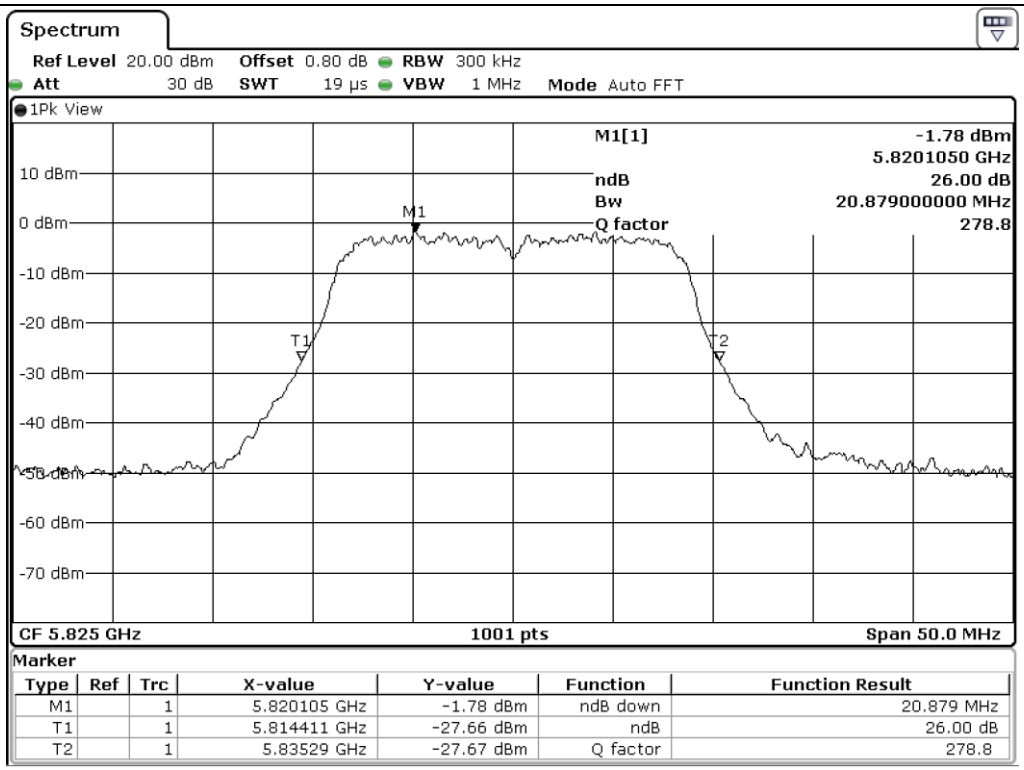


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 MHz)

7.6 Test data for 802.11n_HT40 RLAN Mode

7.6.1 Test data for Antenna 0

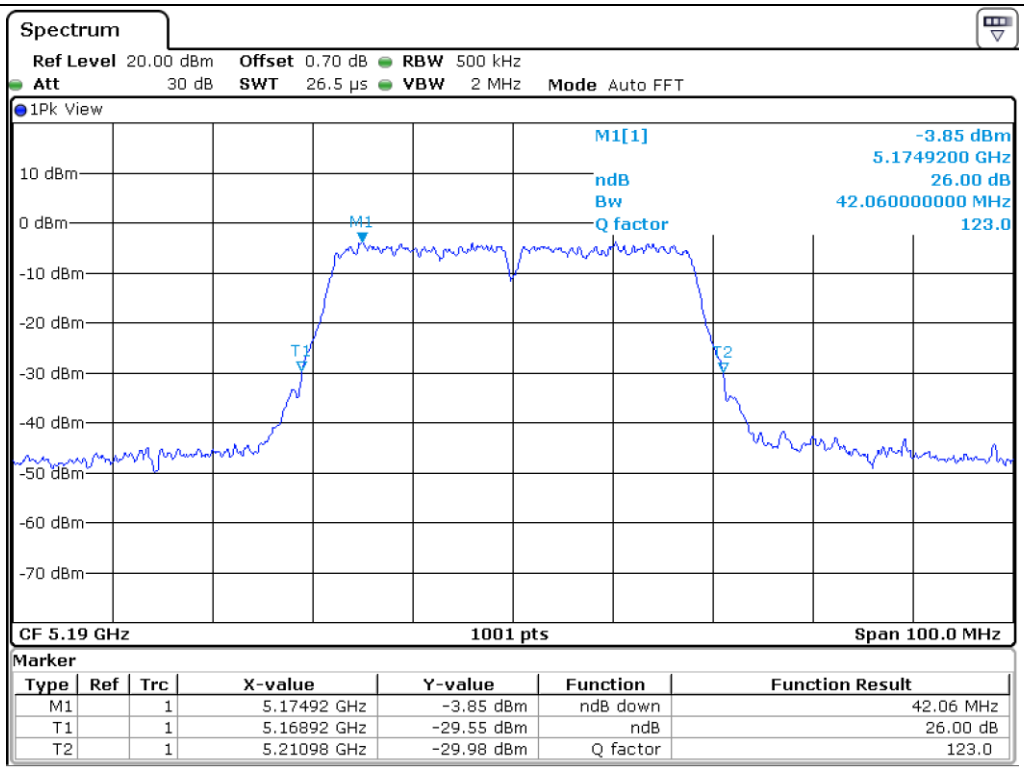
-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

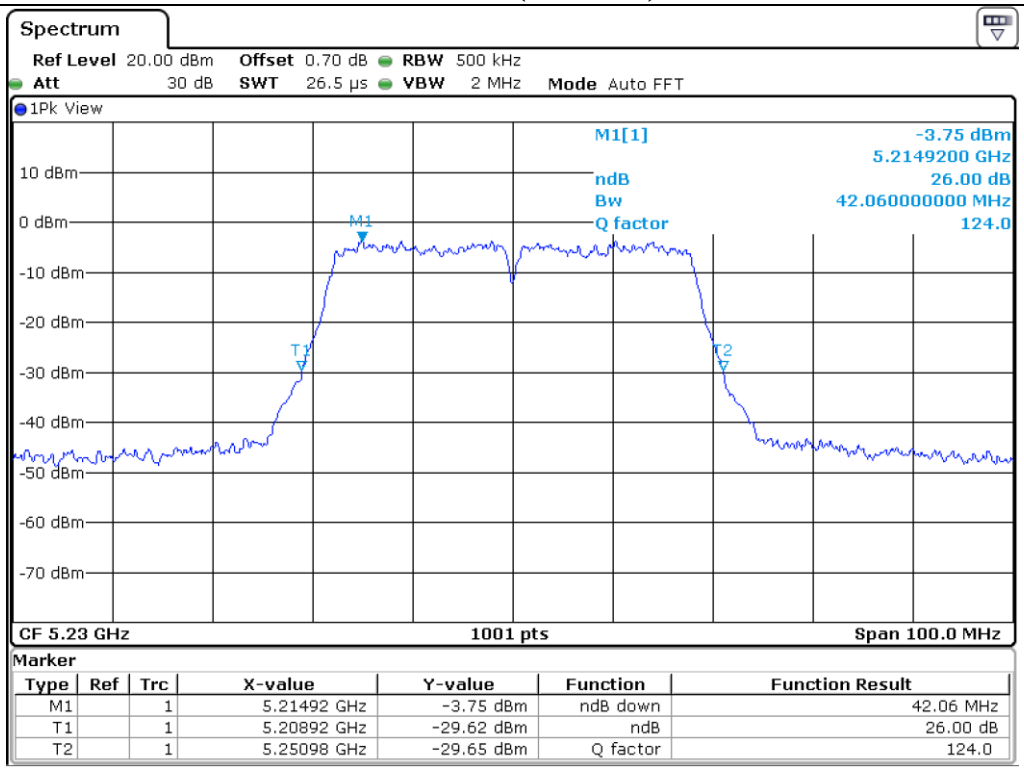
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190.00	42.06
	High	5 230.00	42.06
5 725 ~ 5 850	Low	5 755.00	41.76
	High	5 795.00	41.76

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

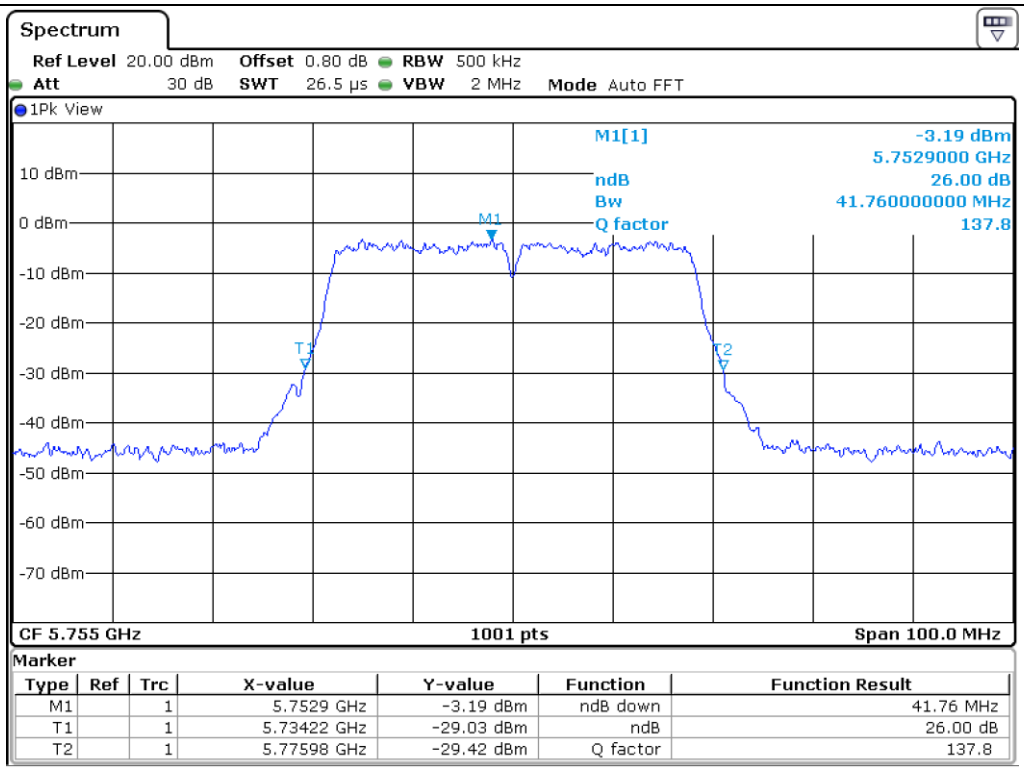


Low Channel (5 190 MHz)

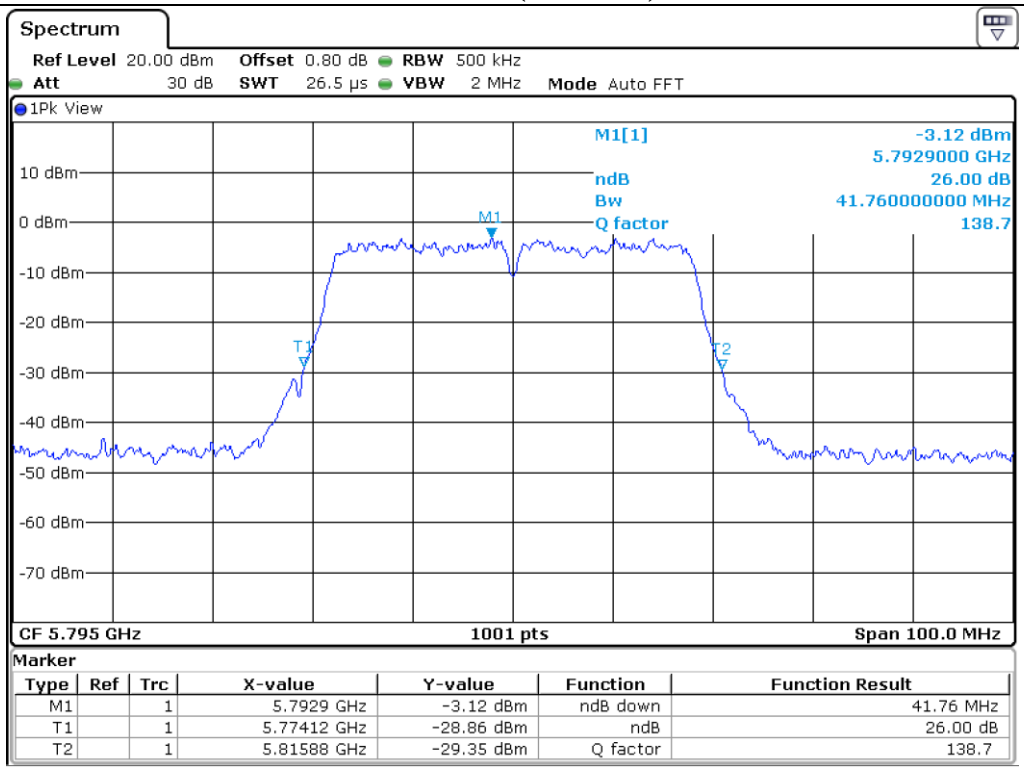


High Channel (5 230 MHz)

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 (5 755 MHz)



High Channel (5 795 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)

7.6.2 Test data for Antenna 1

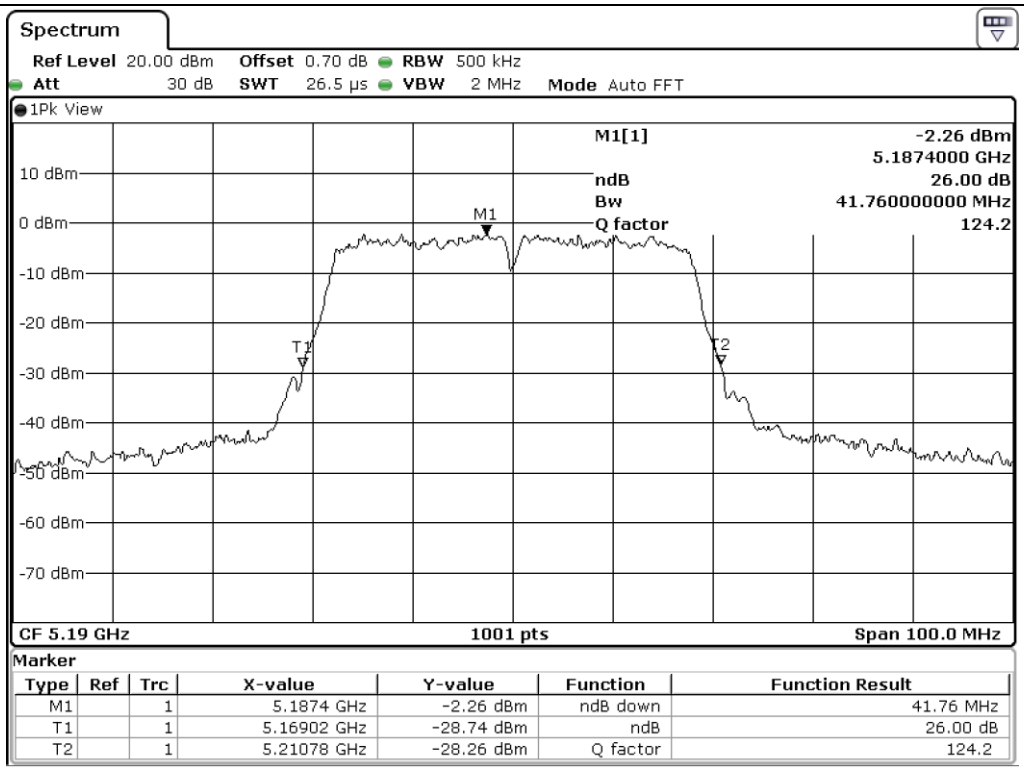
-. Test Date : July 18, 2017

-. Test Result : Pass

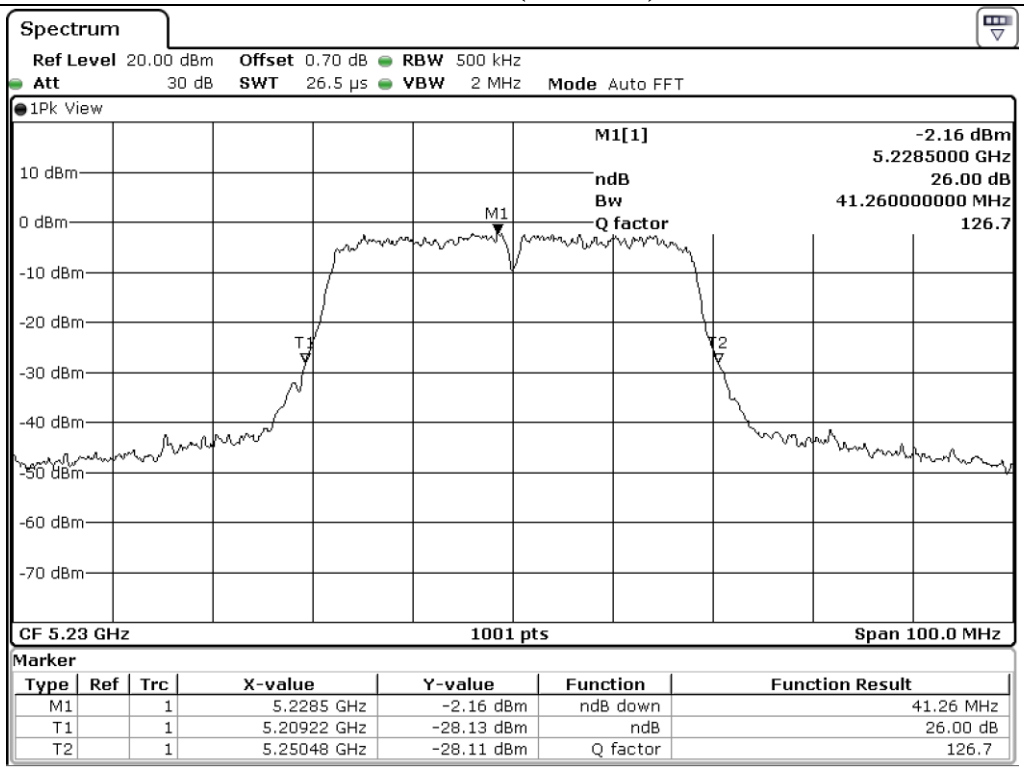
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190.00	41.76
	High	5 230.00	41.26
5 725 ~ 5 850	Low	5 755.00	41.86
	High	5 795.00	41.86

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

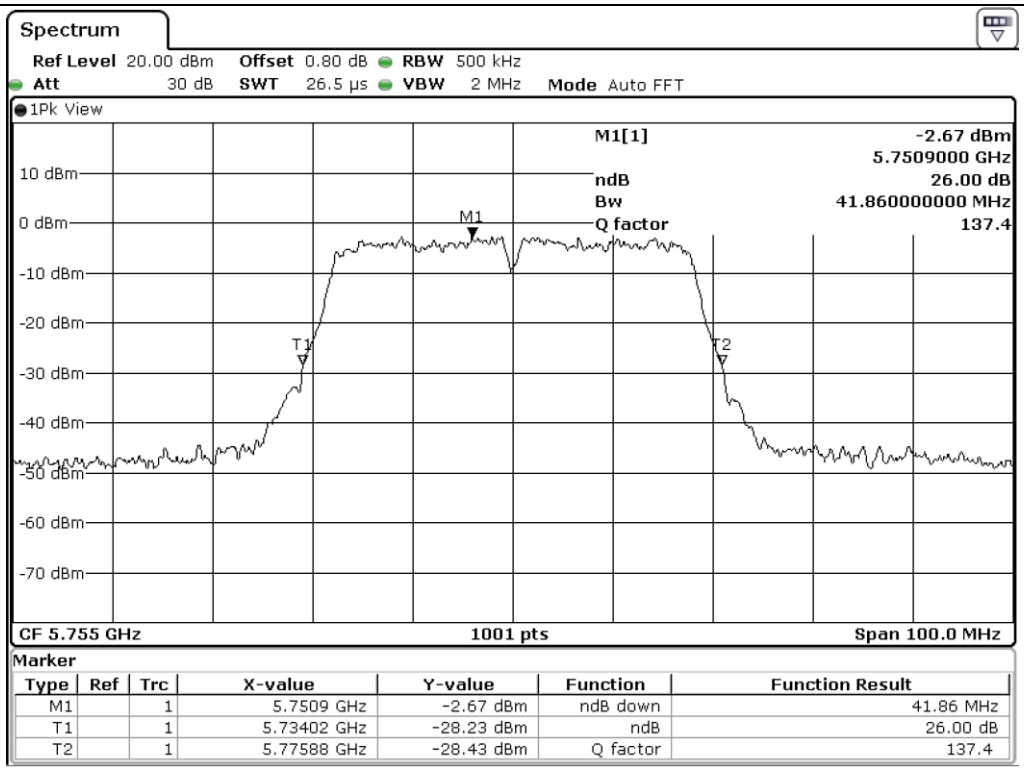


Low Channel (5 190 MHz)

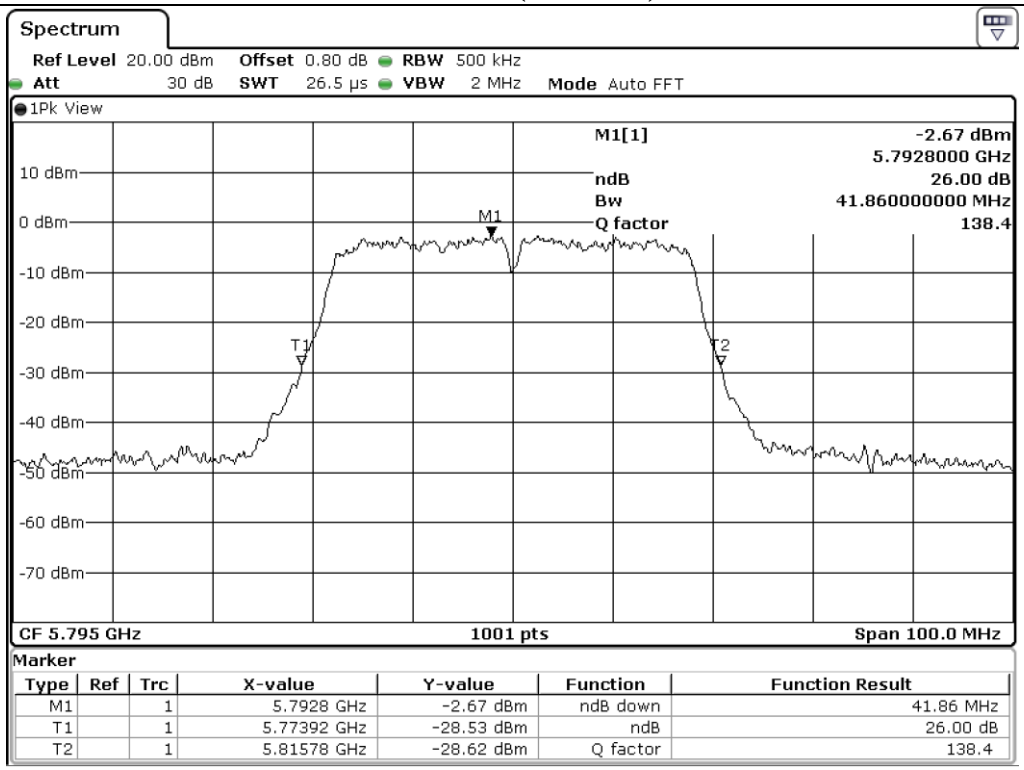


High Channel (5 230 MHz)

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 (5 755 MHz)



High Channel (5 795 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)

7.7 Test data for 802.11ac_VHT80 RLAN Mode

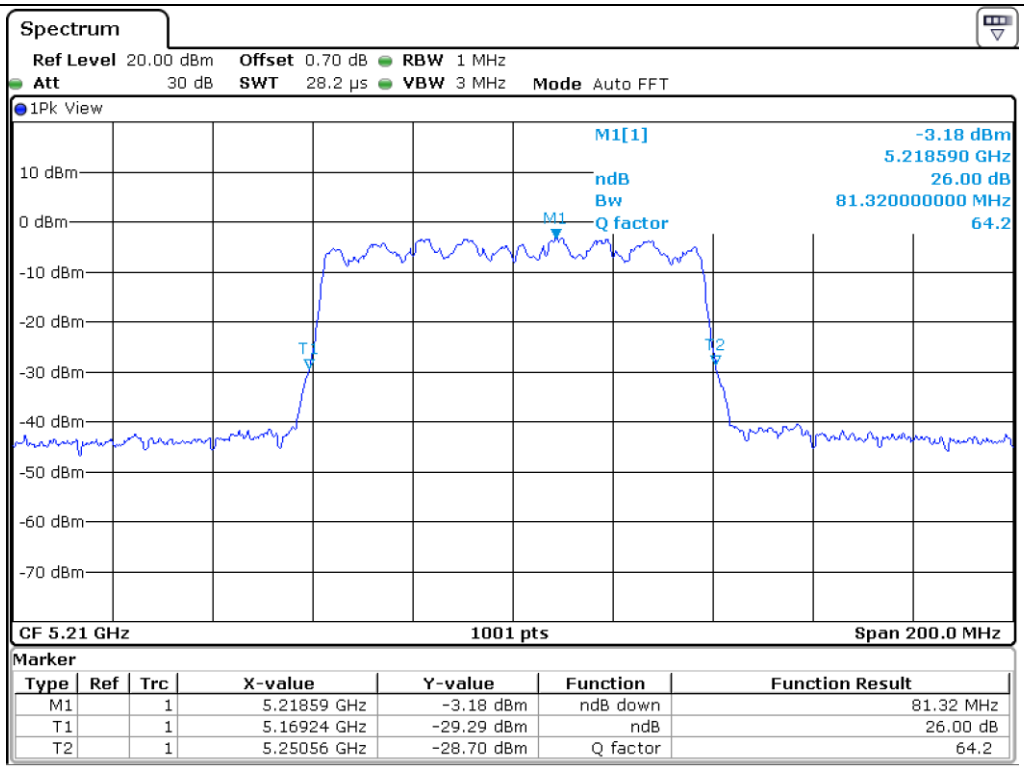
7.7.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

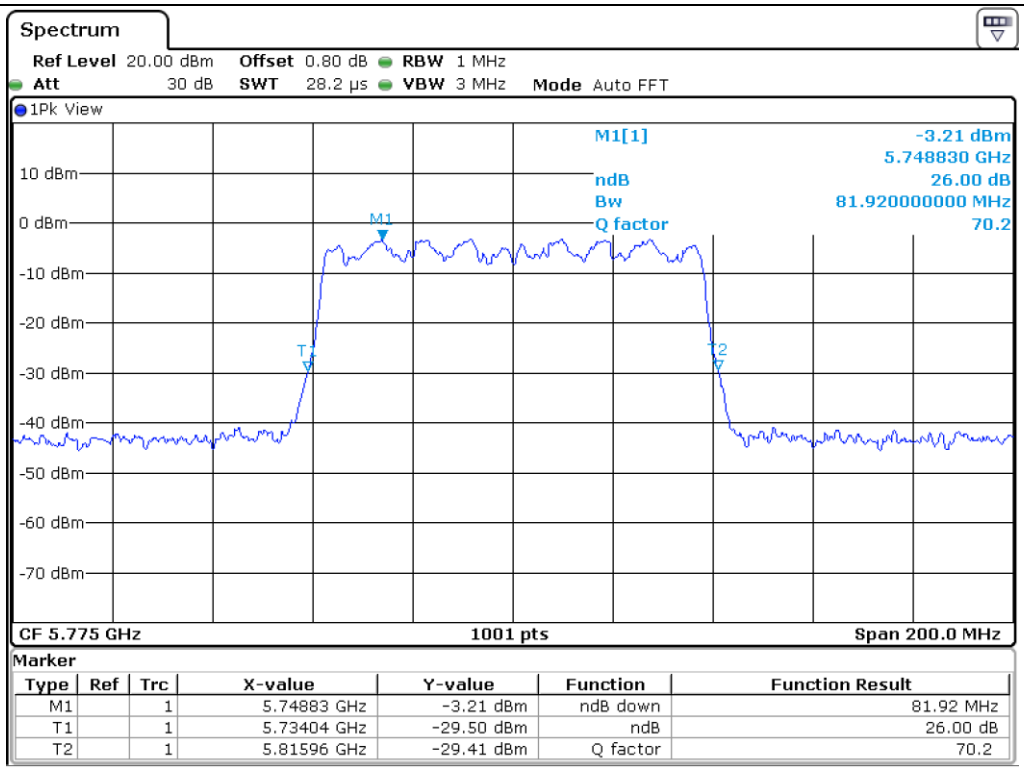
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Middle	5 210.00	81.32
5 725 ~ 5 850	Middle	5 775.00	81.92

Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 210 MHz)



Middle Channel (5 775 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)

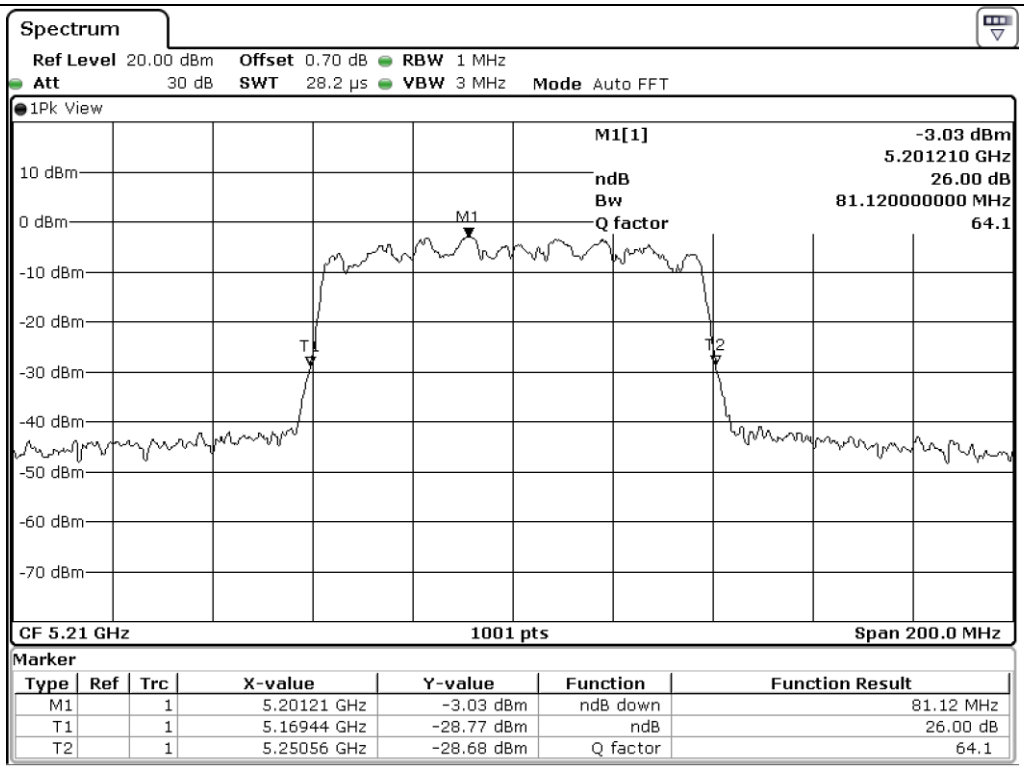
7.7.2 Test data for Antenna 1

-. Test Date : July 18, 2017

-. Test Result : Pass

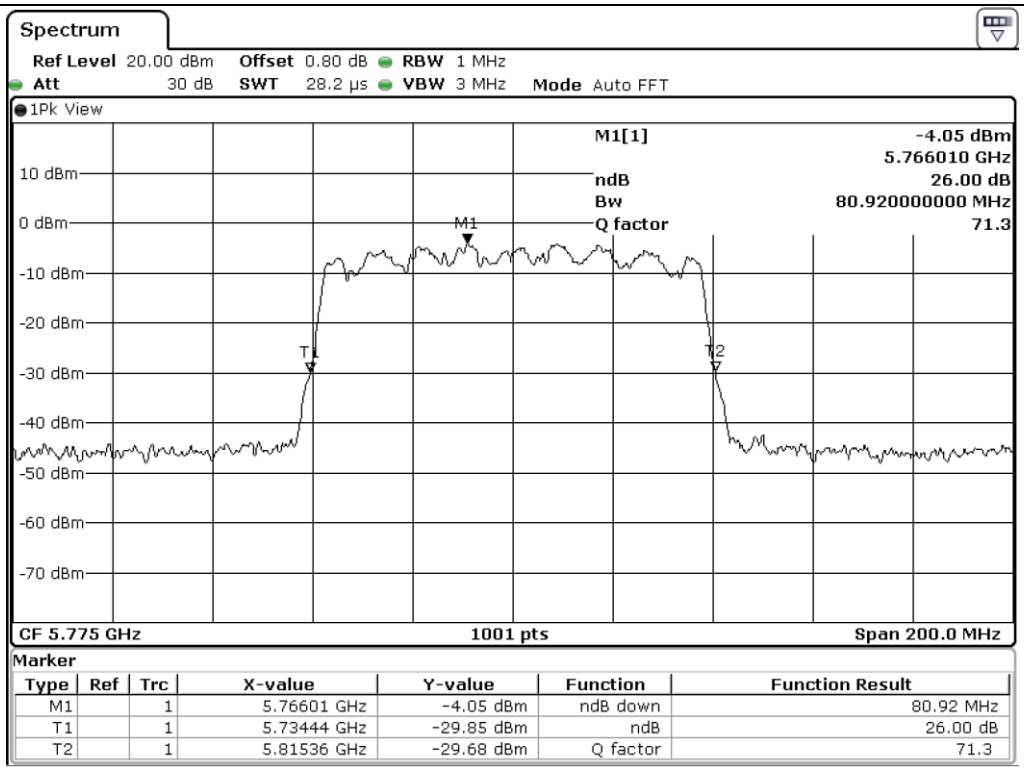
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Middle	5 210.00	81.12
5 725 ~ 5 850	Middle	5 775.00	80.92

Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 210 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)



Middle Channel (5 775 MHz)

8. 6 dB BANDWIDTH

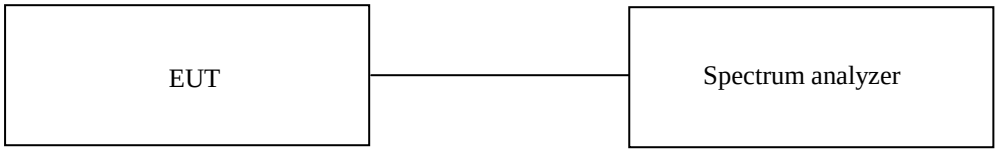
8.1 Operating environment

Temperature : 22 ℃

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 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.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (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)

8.4 Test data for 802.11a RLAN Mode

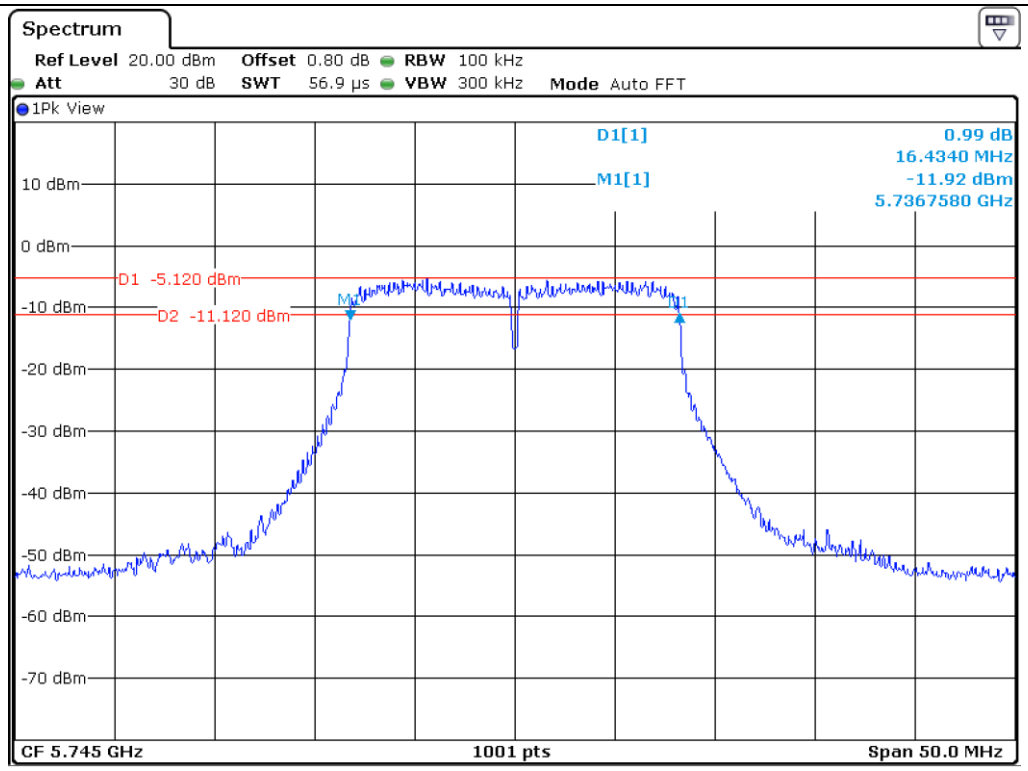
8.4.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

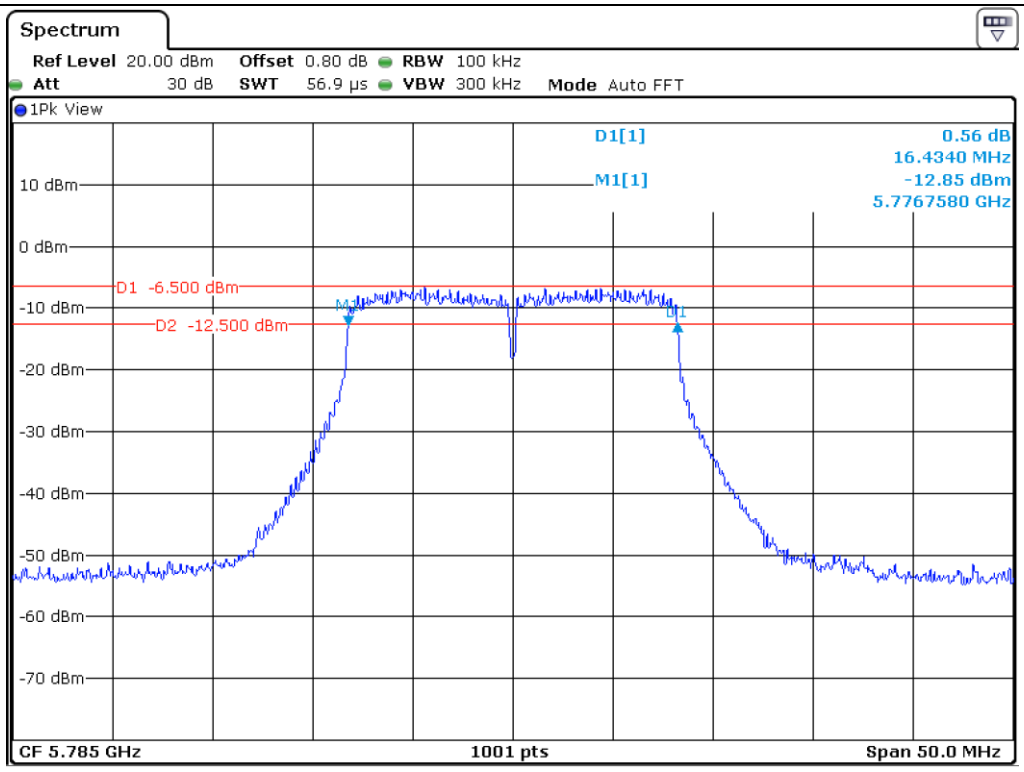
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 745.00	16.43
	Middle	5 785.00	16.43
	High	5 825.00	16.43

Tested by: Hyung-Kwon, Oh / Engineer

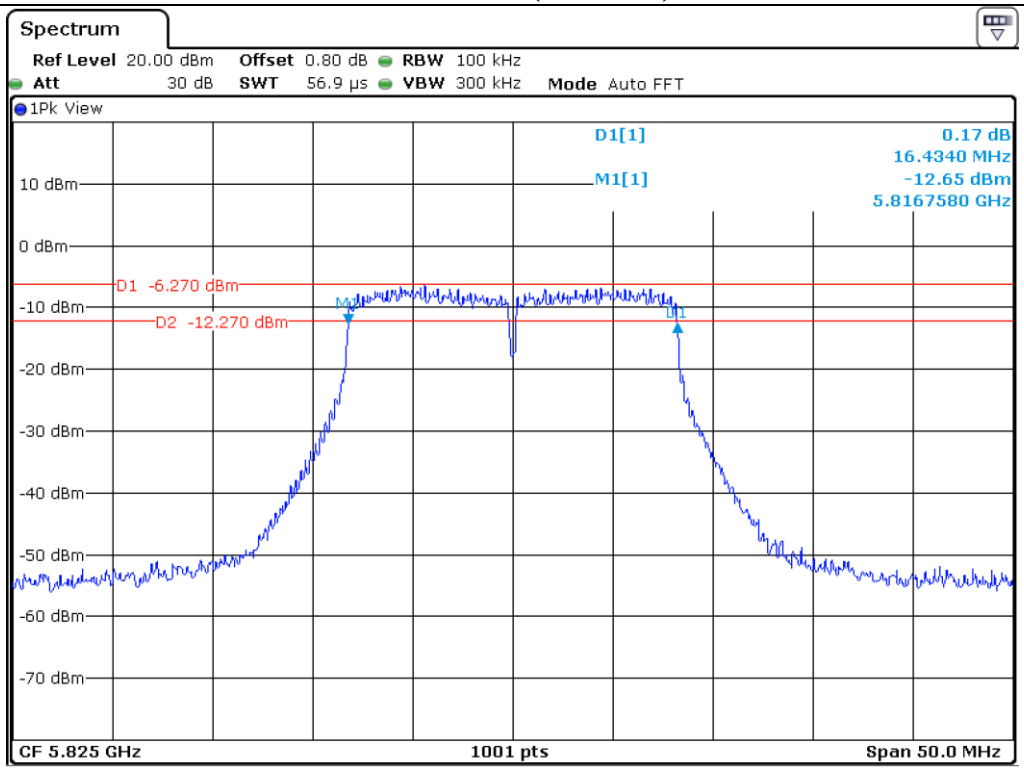


Low Channel (5 745 MHz)

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



Middle Channel (5 785 MHz)



High Channel (5 825 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)

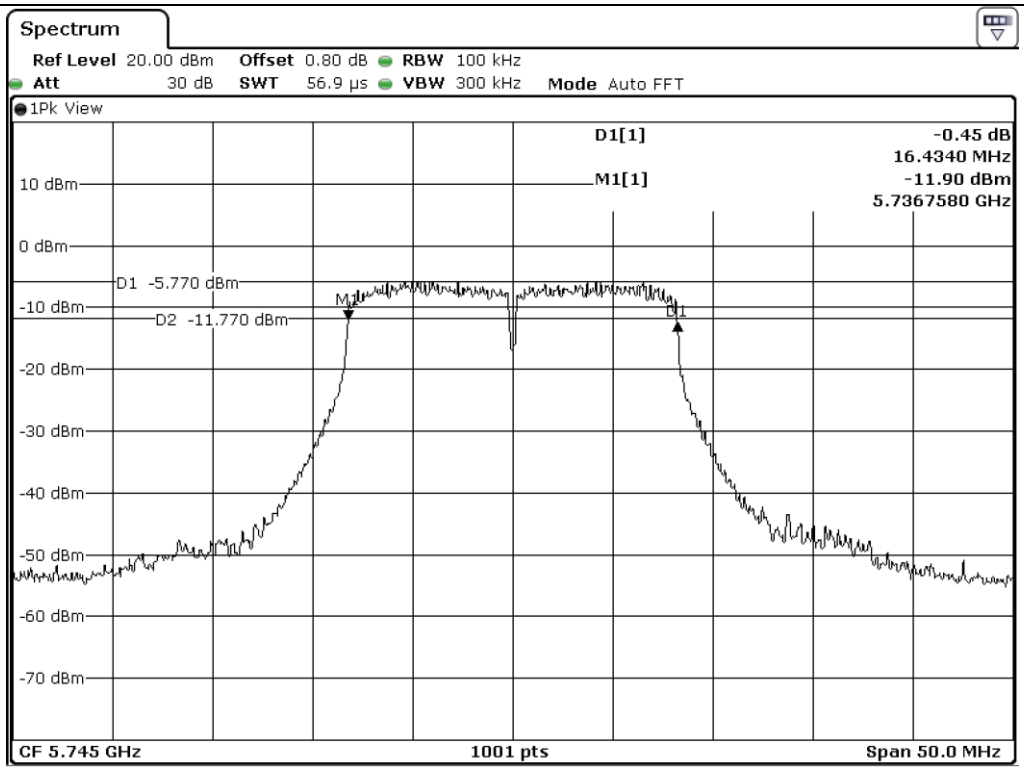
8.4.2 Test data for Antenna 1

-. Test Date : July 18, 2017

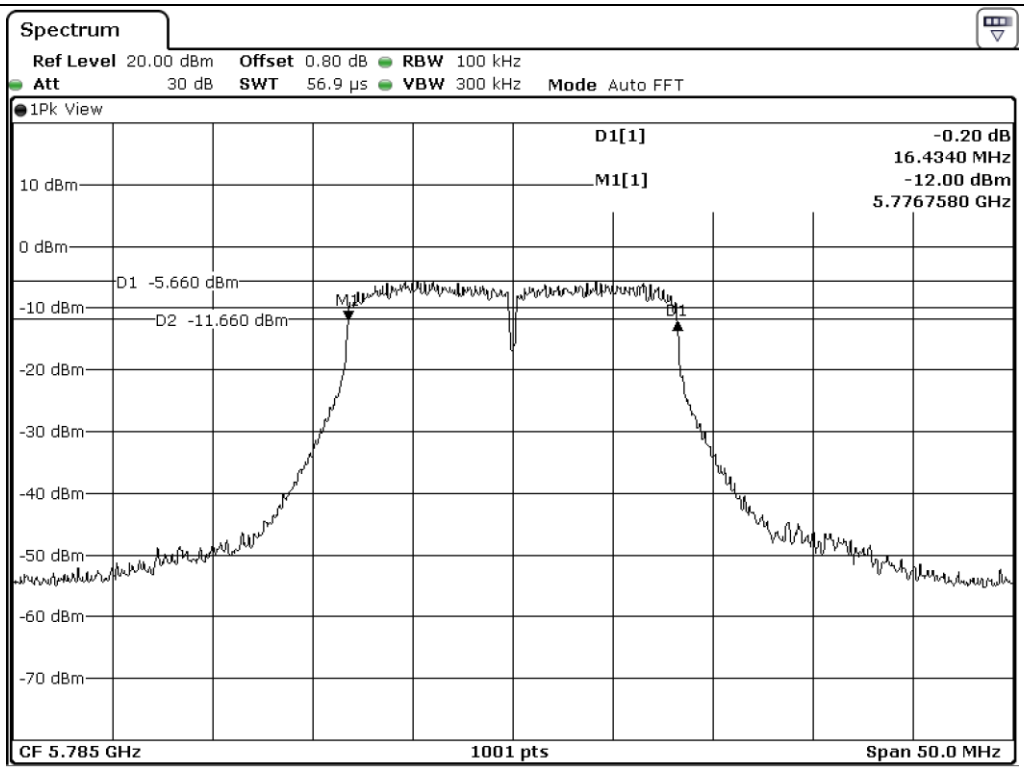
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 745.00	16.43
	Middle	5 785.00	16.43
	High	5 825.00	16.43

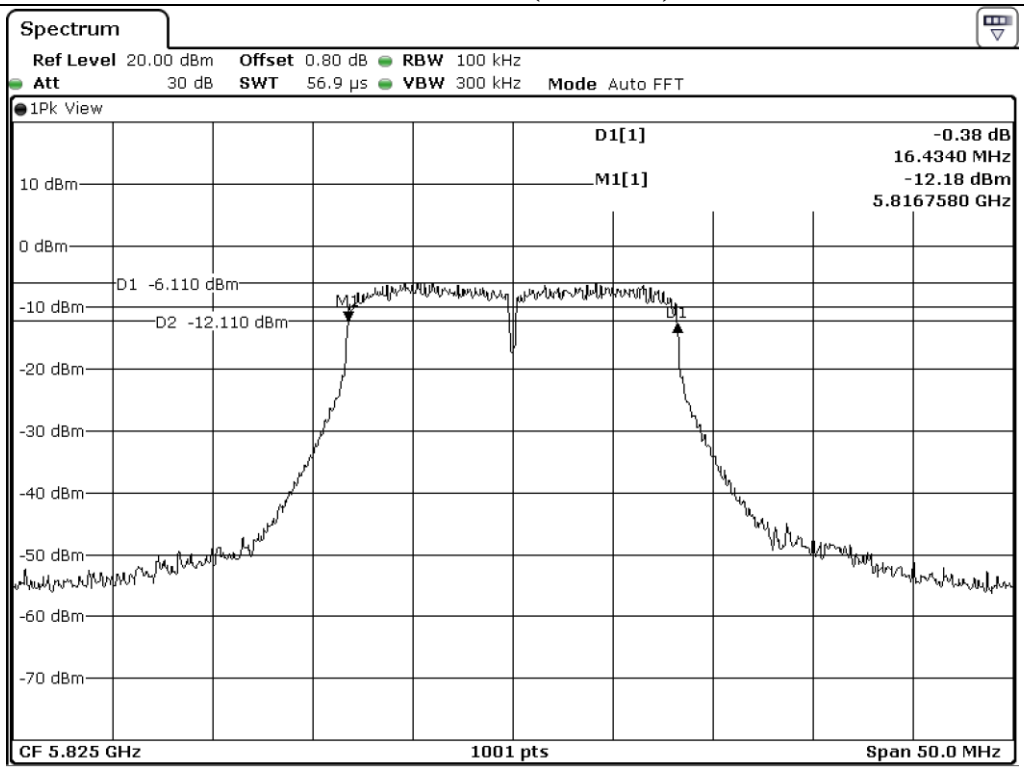
Tested by: Hyung-Kwon, Oh / Engineer



Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



High Channel (5 825 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)

8.5 Test data for 802.11n_HT20 RLAN Mode

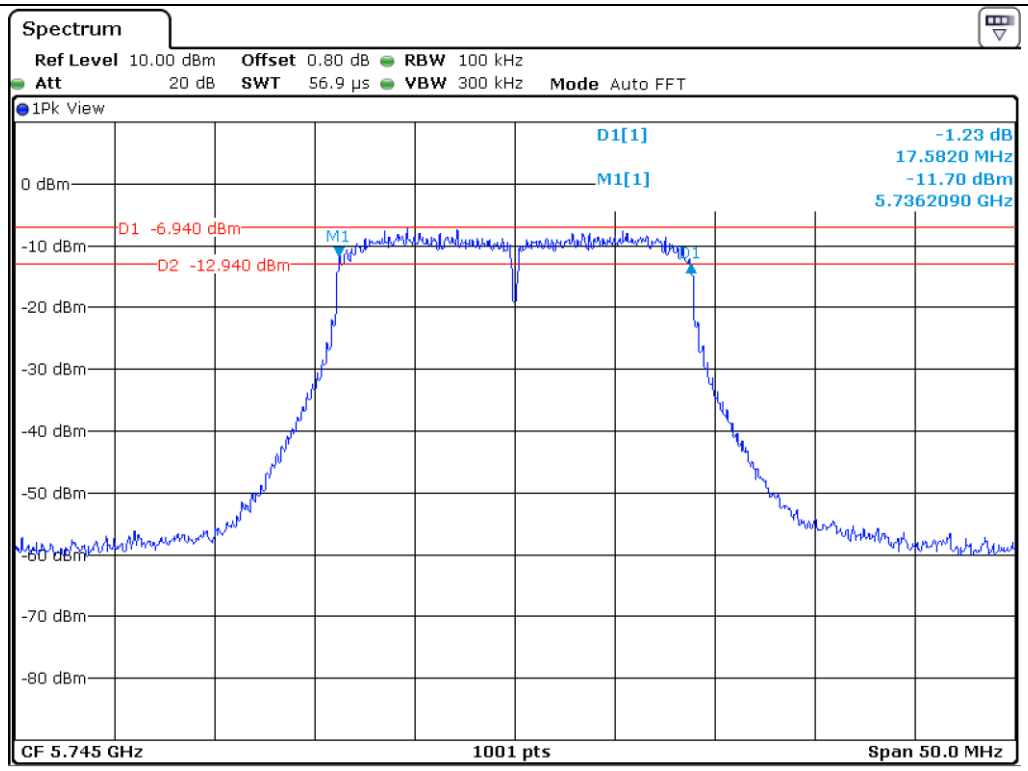
8.5.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

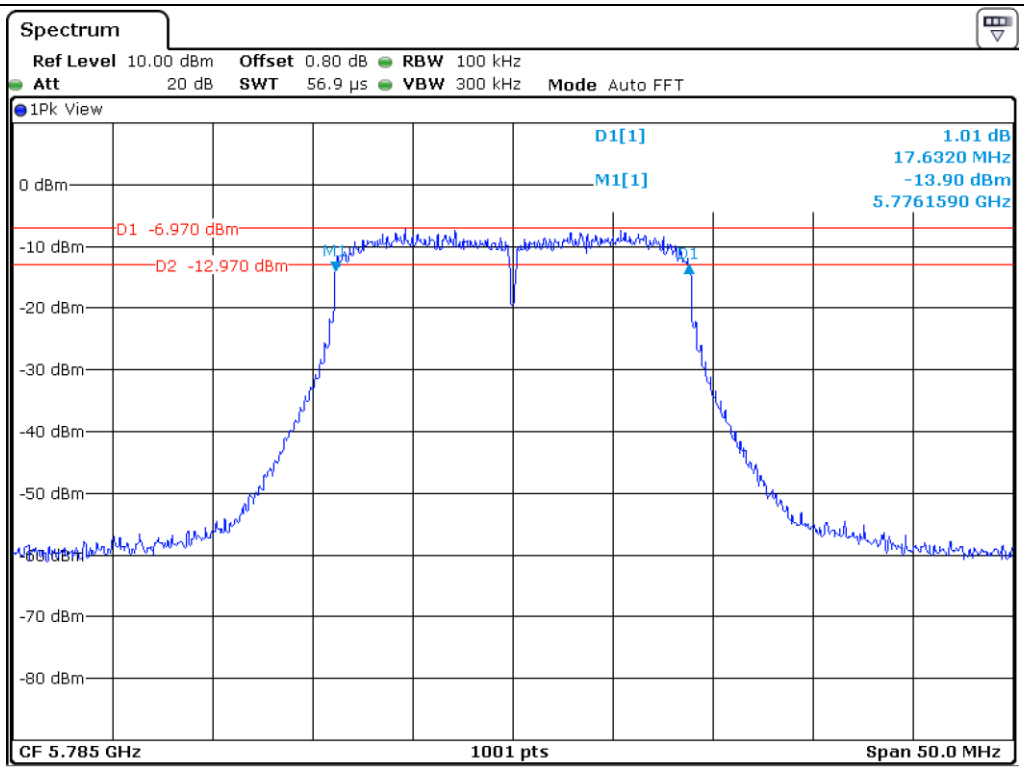
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 745.00	17.58
	Middle	5 785.00	17.63
	High	5 825.00	17.58

Tested by: Hyung-Kwon, Oh / Engineer

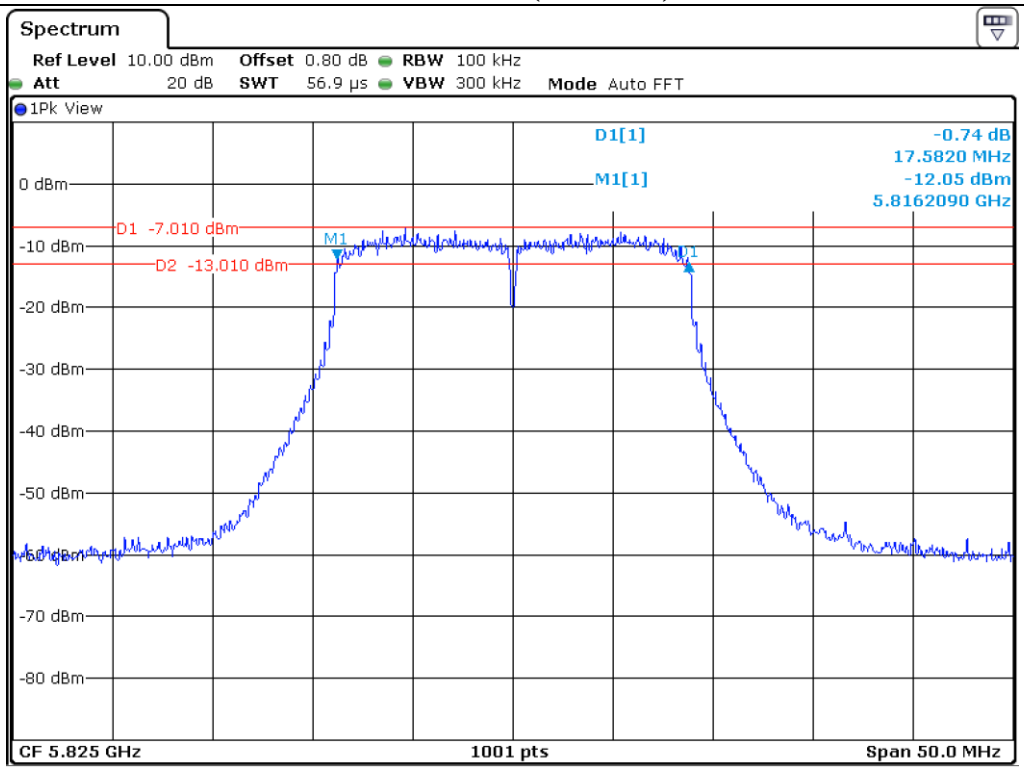


Low Channel (5 745 MHz)

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



Middle Channel (5 785 MHz)



High Channel (5 825 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)

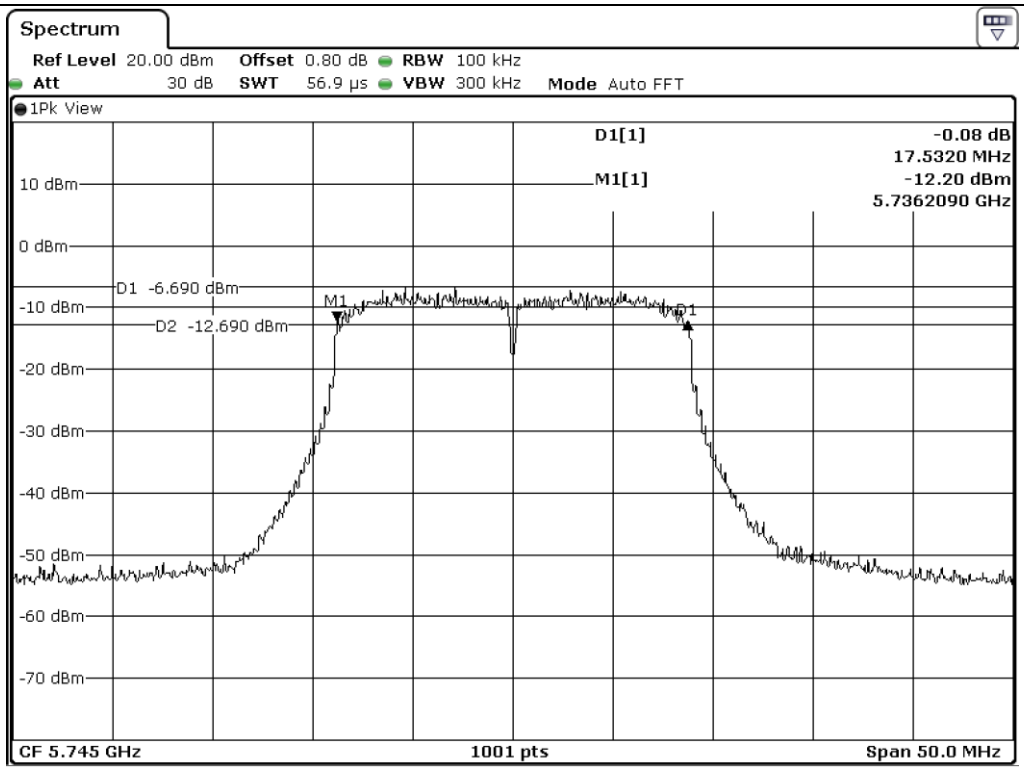
8.5.2 Test data for Antenna 1

-. Test Date : July 18, 2017

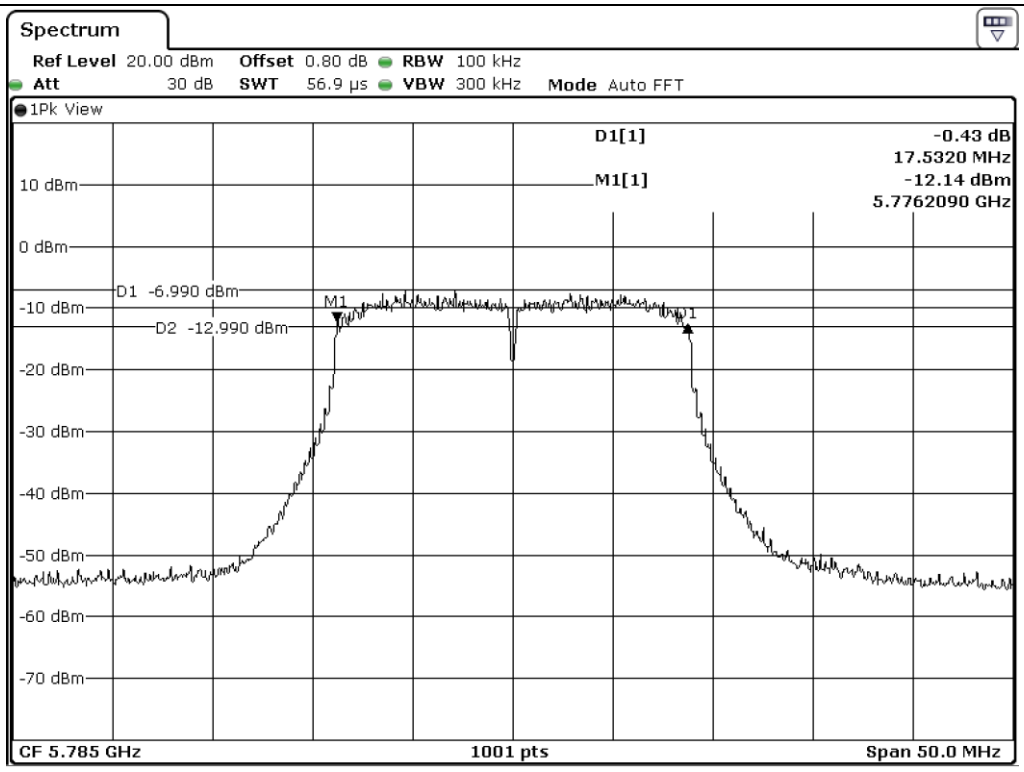
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 745.00	17.53
	Middle	5 785.00	17.53
	High	5 825.00	17.53

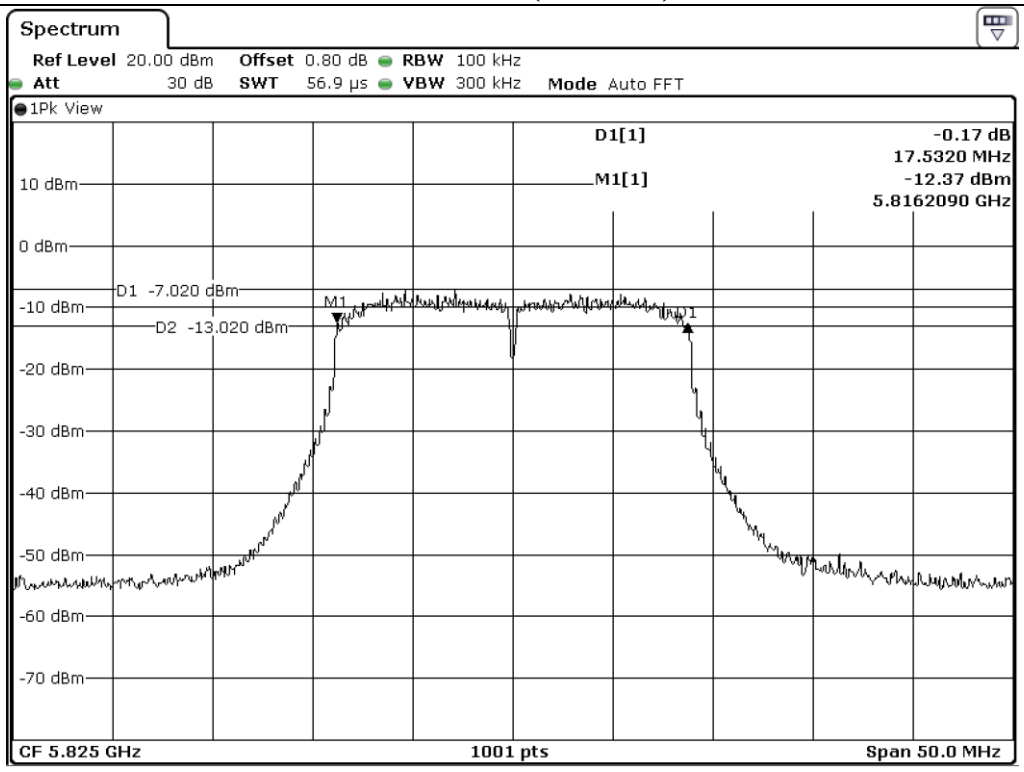
Tested by: Hyung-Kwon, Oh / Engineer



Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



High Channel (5 825 MHz)

8.6 Test data for 802.11n_HT40 RLAN Mode

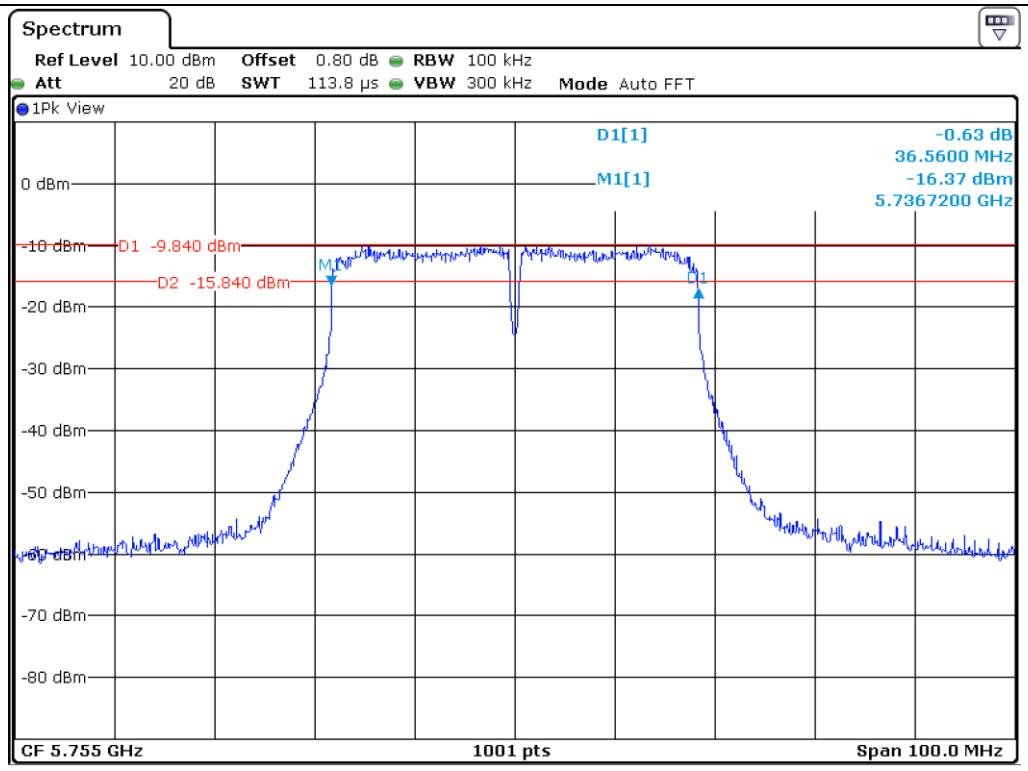
8.6.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

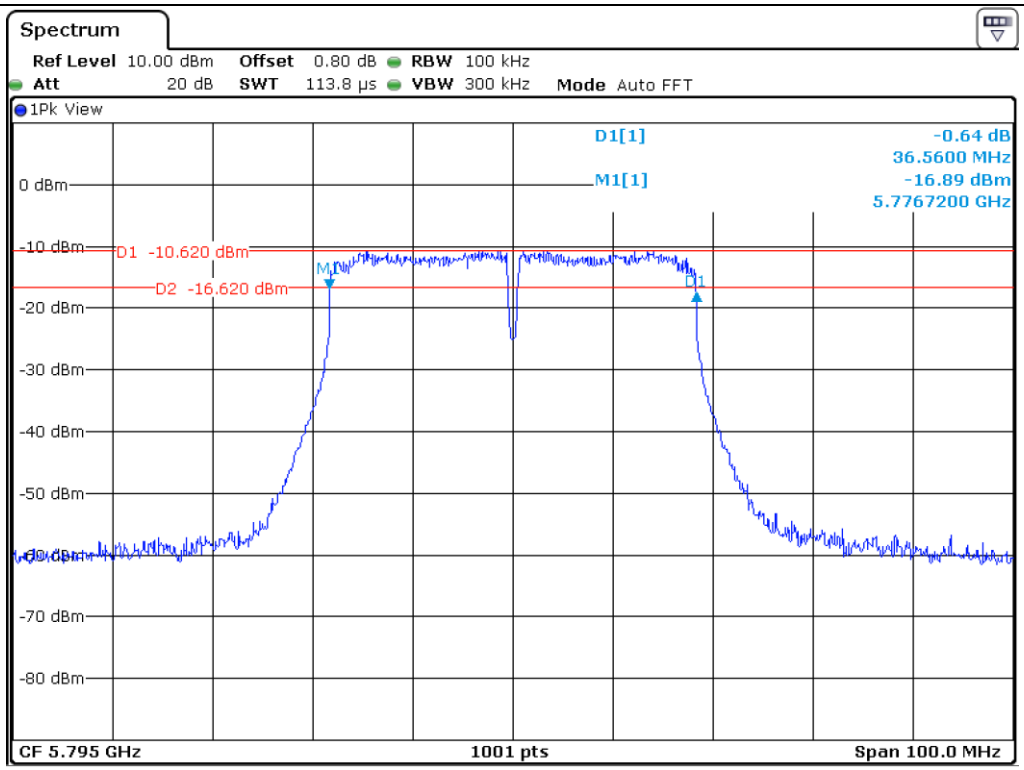
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 755.00	36.56
	High	5 795.00	36.56

Tested by: Hyung-Kwon, Oh / Engineer



Low Channel (5 755 MHz)



High Channel (5 795 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)

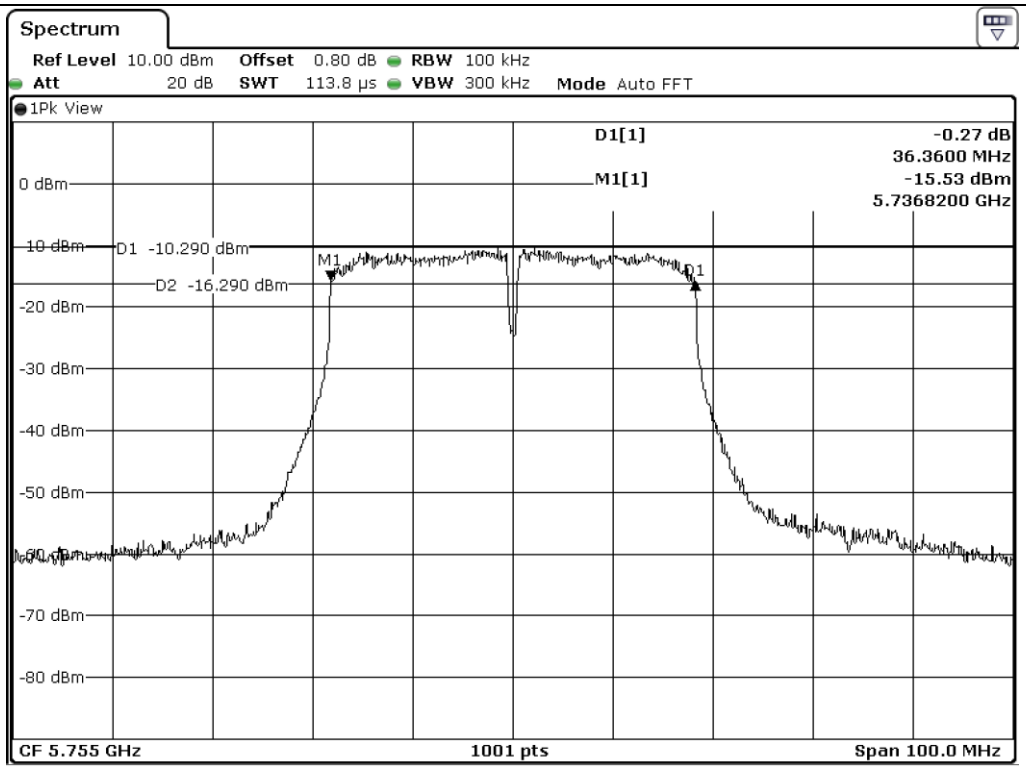
8.6.2 Test data for Antenna 1

-. Test Date : July 18, 2017

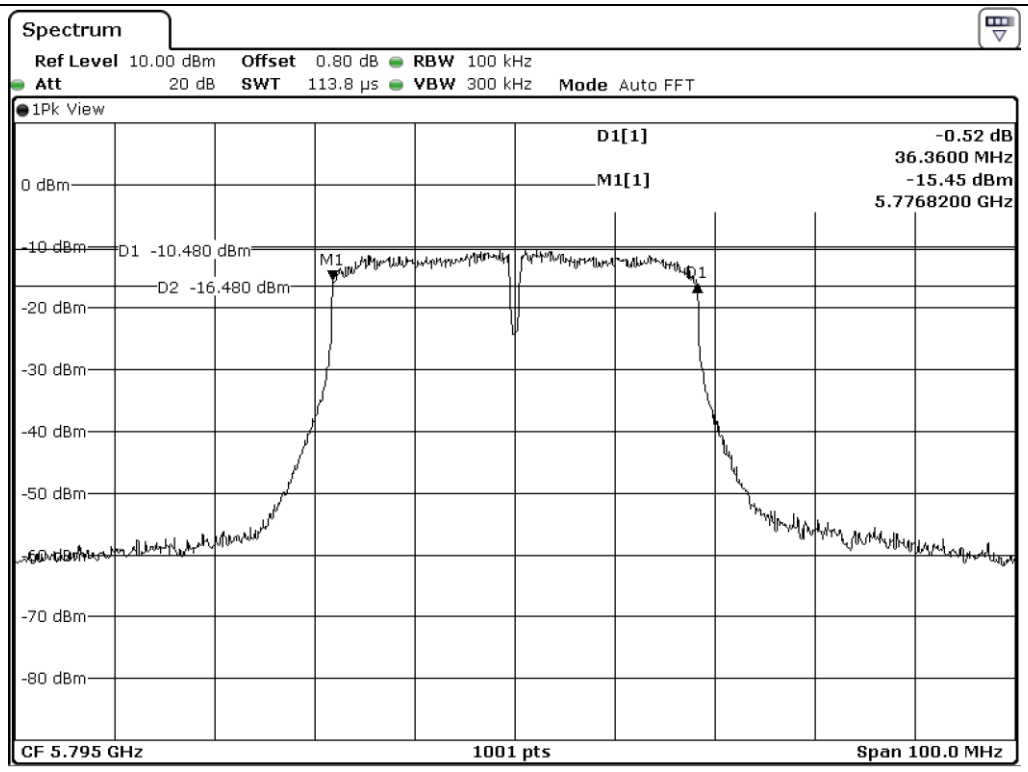
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 755.00	36.36
	High	5 795.00	36.36

Tested by: Hyung-Kwon, Oh / Engineer



Low Channel (5 755 MHz)



High Channel (5 795 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)

8.7 Test data for 802.11ac_VHT80 RLAN Mode

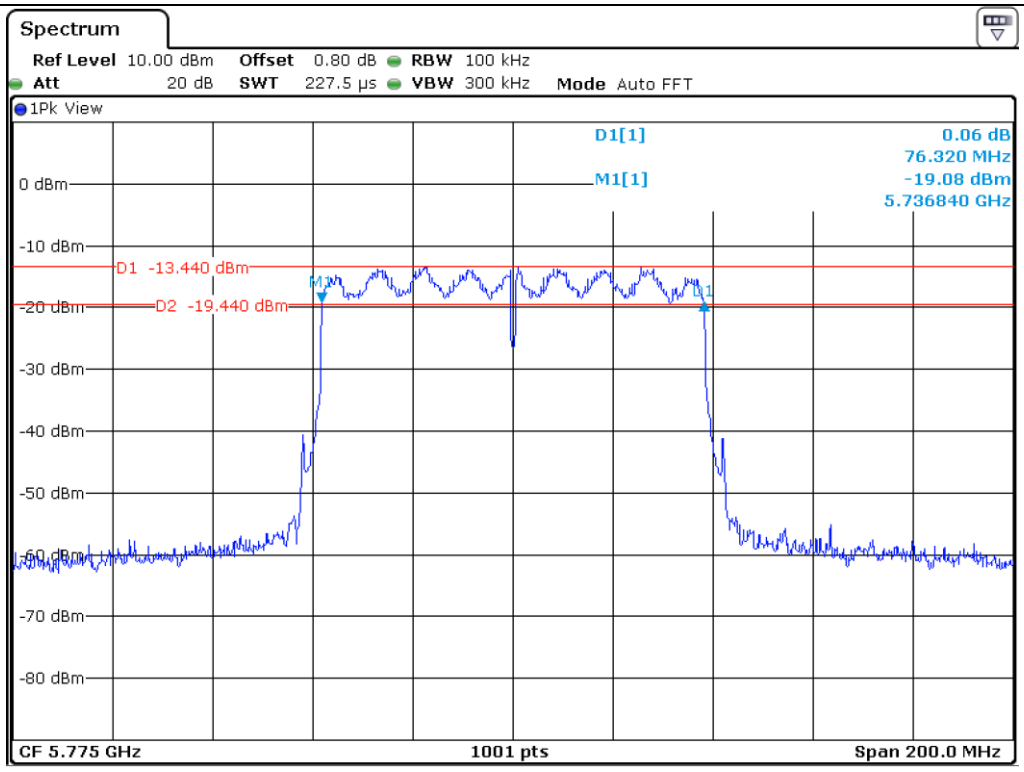
8.7.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Middle	5 775.00	76.32

Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 775 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)

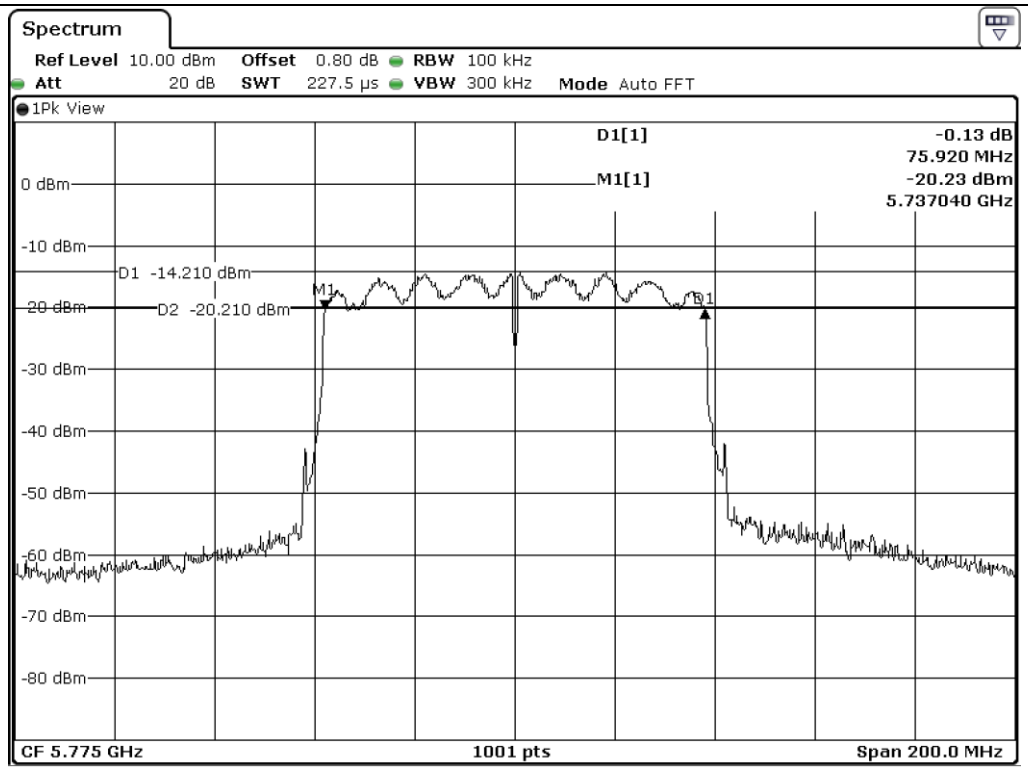
8.7.2 Test data for Antenna 1

-. Test Date : July 18, 2017

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Middle	5 775.00	75.92

Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 775 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)

9. MAXIMUM PEAK OUTPUT POWER

9.1 Operating environment

Temperature : 22 ℃

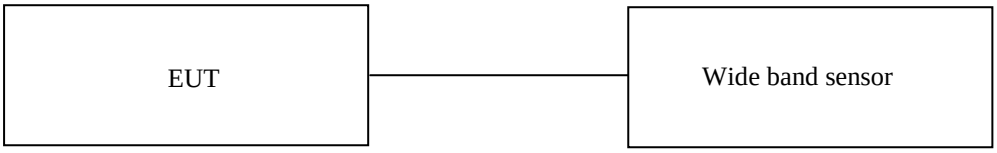
Relative humidity : 41 % R.H.

9.2 Test set-up

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

The Wide Band Sensor is measured when the EUT is transmitting at the appropriate center frequency its maximum power control level as described in Section E. 3.(KDB 789033 D02 General UNII Test Procedures New Rules v02r01).

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.
■ -	NRP-Z81	Rohde & Schwarz	Wide band Sensor	101975	Apr. 04, 2017 (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 802.11a RLAN Mode

9.4.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	9.27	30.00	20.73
	Middle	5 220.00	9.37	30.00	20.63
	High	5 240.00	9.07	30.00	20.93
5 725 ~ 5 850	Low	5 745.00	9.83	30.00	20.17
	Middle	5 785.00	9.49	30.00	20.51
	High	5 825.00	9.06	30.00	20.94

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

9.4.2 Test data for Antenna 1

-. Test Date : July 19, 2017

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	9.95	30.00	20.05
	Middle	5 220.00	10.14	30.00	19.86
	High	5 240.00	10.07	30.00	19.93
5 725 ~ 5 850	Low	5 745.00	9.80	30.00	20.20
	Middle	5 785.00	9.62	30.00	20.38
	High	5 825.00	9.34	30.00	20.66

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

9.4.3 Test data for Multiple Transmit

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	12.63	30.00	17.37
	Middle	5 220.00	12.78	30.00	17.22
	High	5 240.00	12.61	30.00	17.39
5 725 ~ 5 850	Low	5 745.00	12.83	30.00	17.17
	Middle	5 785.00	12.57	30.00	17.43
	High	5 825.00	12.21	30.00	17.79

Remark 1: Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Remark 2: Calculated Output Power= $10\log (10^{(\text{Antenna0 Output Power}/10)} + 10^{(\text{Antenna1 Output Power}/10)})$

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

9.5 Test data for 802.11n_HT20 RLAN Mode

9.5.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	7.27	30.00	22.73
	Middle	5 220.00	7.49	30.00	22.51
	High	5 240.00	7.44	30.00	22.56
5 725 ~ 5 850	Low	5 745.00	7.76	30.00	22.24
	Middle	5 785.00	7.14	30.00	22.86
	High	5 825.00	7.19	30.00	22.81

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

9.5.2 Test data for Antenna 1

-. Test Date : July 19, 2017

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	7.71	30.00	22.29
	Middle	5 220.00	8.00	30.00	22.00
	High	5 240.00	7.90	30.00	22.10
5 725 ~ 5 850	Low	5 745.00	7.71	30.00	22.29
	Middle	5 785.00	7.58	30.00	22.42
	High	5 825.00	7.19	30.00	22.81

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

9.5.3 Test data for Multiple Transmit

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	10.51	30.00	19.49
	Middle	5 220.00	10.76	30.00	19.24
	High	5 240.00	10.69	30.00	19.31
5 725 ~ 5 850	Low	5 745.00	10.75	30.00	19.25
	Middle	5 785.00	10.38	30.00	19.62
	High	5 825.00	10.20	30.00	19.80

Remark 1: Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Remark 2: Calculated Output Power= $10\log (10^{(\text{Antenna0 Output Power}/10)} + 10^{(\text{Antenna1 Output Power}/10)})$

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

9.6 Test data for 802.11n_HT40 RLAN Mode

9.6.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	7.58	30.00	22.42
	High	5 230.00	7.35	30.00	22.65
5 725 ~ 5 850	Low	5 755.00	7.35	30.00	22.65
	High	5 795.00	7.62	30.00	22.38

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

9.6.2 Test data for Antenna 1

-. Test Date : July 19, 2017

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	8.43	30.00	21.57
	High	5 230.00	8.24	30.00	21.76
5 725 ~ 5 850	Low	5 755.00	7.72	30.00	22.28
	High	5 795.00	7.50	30.00	22.50

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Tested by: Hyung-Kwon, Oh / Engineer

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

9.6.3 Test data for Multiple Transmit

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	11.04	30.00	18.96
	High	5 230.00	10.83	30.00	19.17
5 725 ~ 5 850	Low	5 755.00	10.55	30.00	19.45
	High	5 795.00	10.57	30.00	19.43

Remark 1: Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Remark 2: Calculated Output Power= $10\log(10^{(\text{Antenna0 Output Power}/10)} + 10^{(\text{Antenna1 Output Power}/10)})$

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

9.7 Test data for 802.11ac_HT80 RLAN Mode

9.7.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	6.30	30.00	23.70
5 725 ~ 5 850	Middle	5 775.00	5.74	30.00	24.26

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

9.7.2 Test data for Antenna 1

-. Test Date : July 19, 2017

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	6.10	30.00	23.90
5 725 ~ 5 850	Middle	5 775.00	5.84	30.00	24.16

Remark : Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

9.7.3 Test data for Multiple Transmit

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	9.21	30.00	20.79
5 725 ~ 5 850	Middle	5 775.00	8.80	30.00	21.20

Remark 1: Margin = Limit – Measured Value (=Power Sensor Reading - Cable Loss)

Remark 2: Calculated Output Power= $10\log(10^{(\text{Antenna0 Output Power}/10)} + 10^{(\text{Antenna1 Output Power}/10)})$

Tested by: Hyung-Kwon, Oh / Assistant Manager

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

10. PEAK POWER SPECTRUL DENSITY

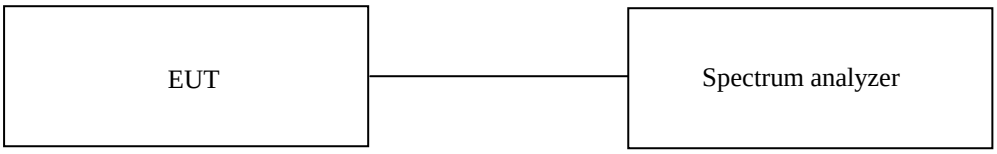
10.1 Operating environment

Temperature : 22 ℃

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 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.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (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 802.11a RLAN Mode

10.4.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Operating condition : Highest Output Power Transmitting Mode

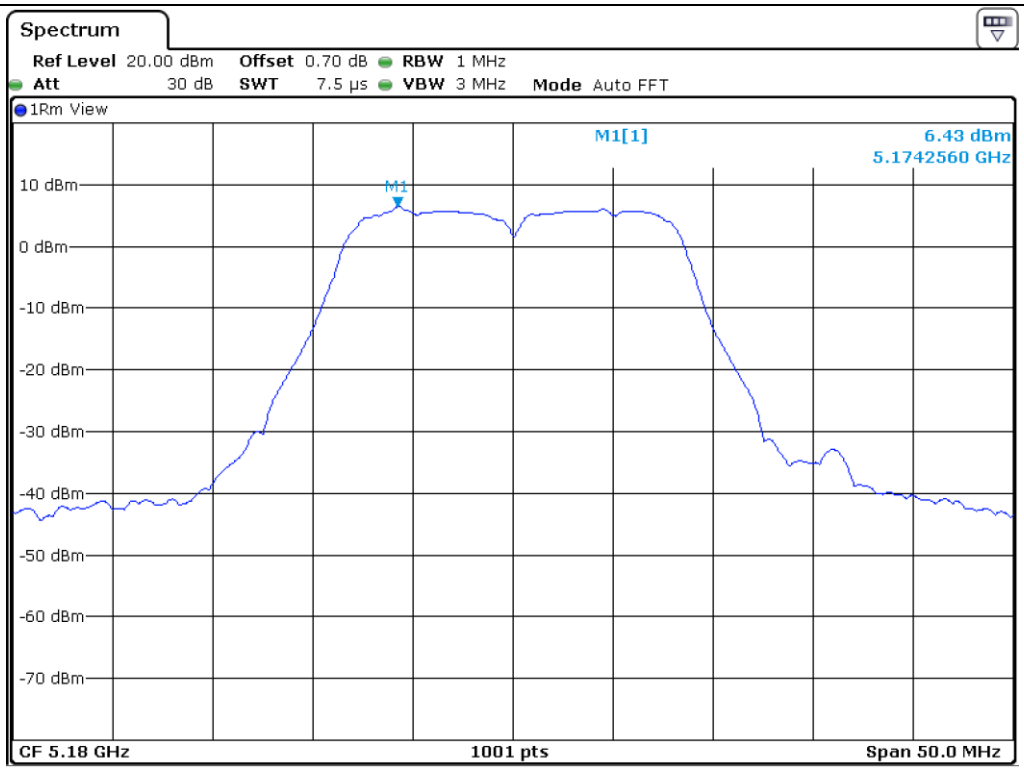
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	6.43	17.00	10.57
	Middle	5 220.00	6.01	17.00	10.99
	High	5 240.00	5.64	17.00	11.36
5 725 ~ 5 850	Low	5 745.00	3.71	30.00	26.29
	Middle	5 785.00	3.50	30.00	26.50
	High	5 825.00	2.92	30.00	27.08

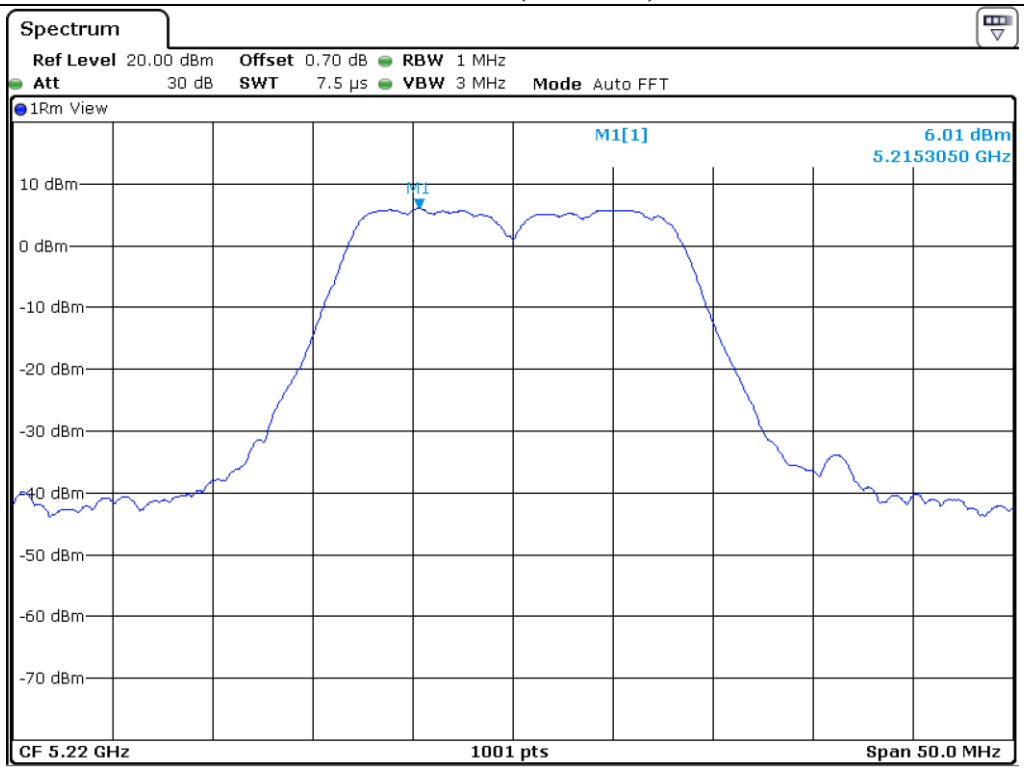
Remark: See next page for measurement data.

Tested by: Hyung-Kwon, Oh / Engineer

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

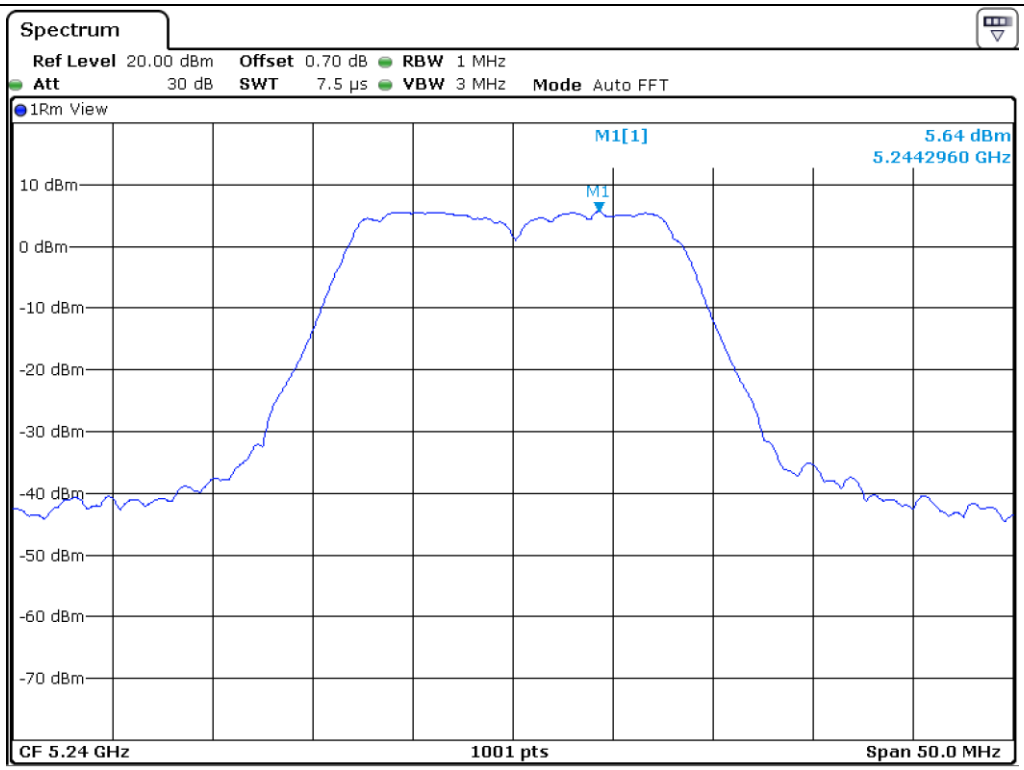


Low Channel (5 180 MHz)

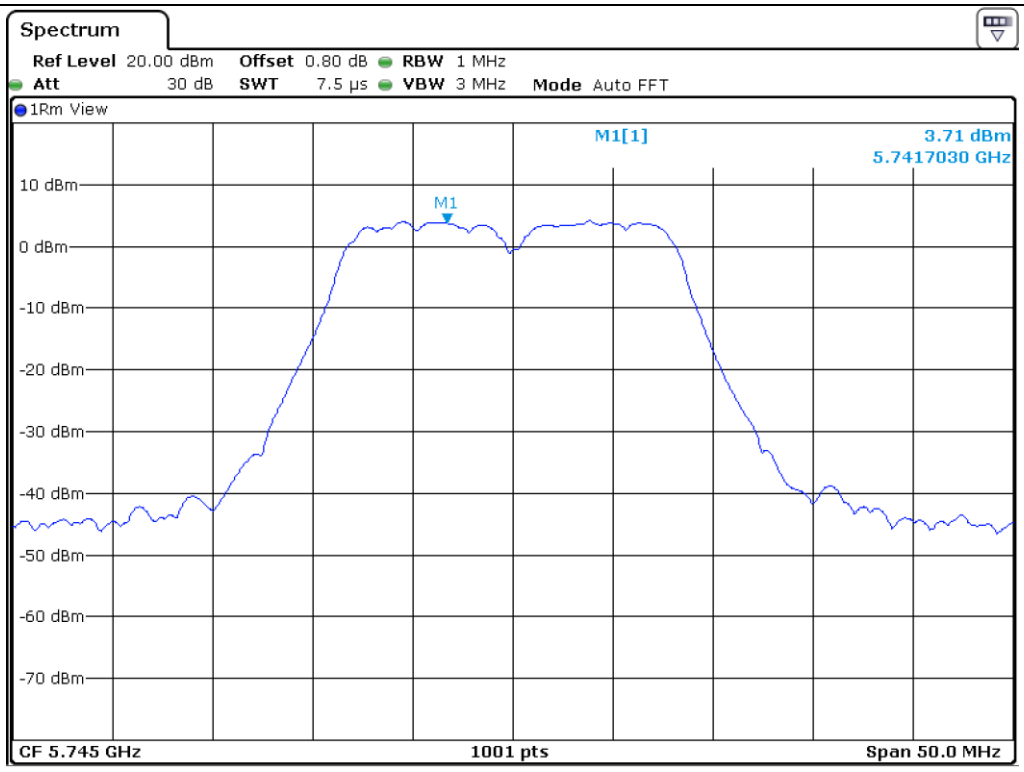


Middle Channel (5 220 MHz)

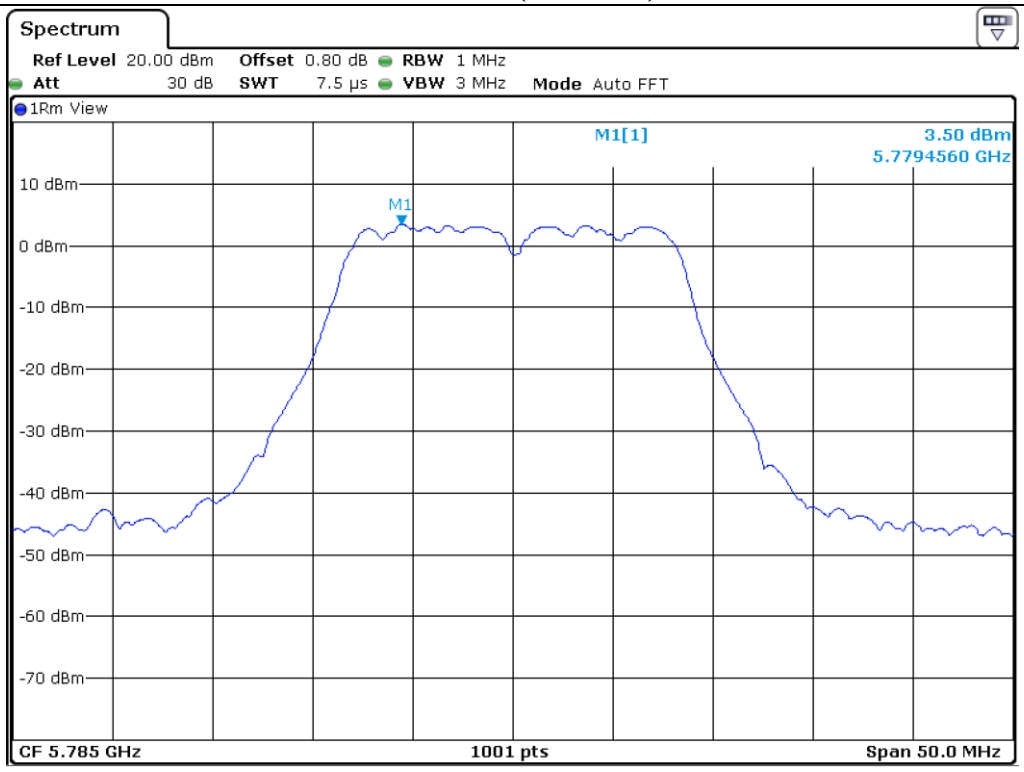
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



High Channel (5 240 MHz)

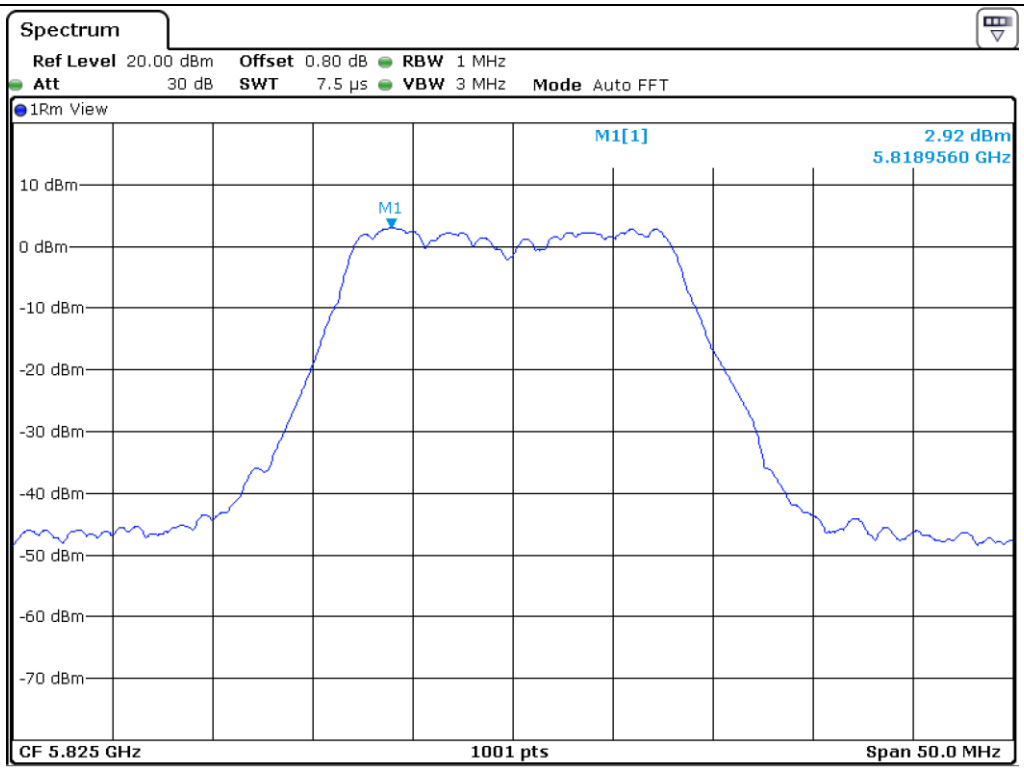


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 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)

10.4.2 Test data for Antenna 1

-. Test Date : July 19, 2017

-. Operating condition : Highest Output Power Transmitting Mode

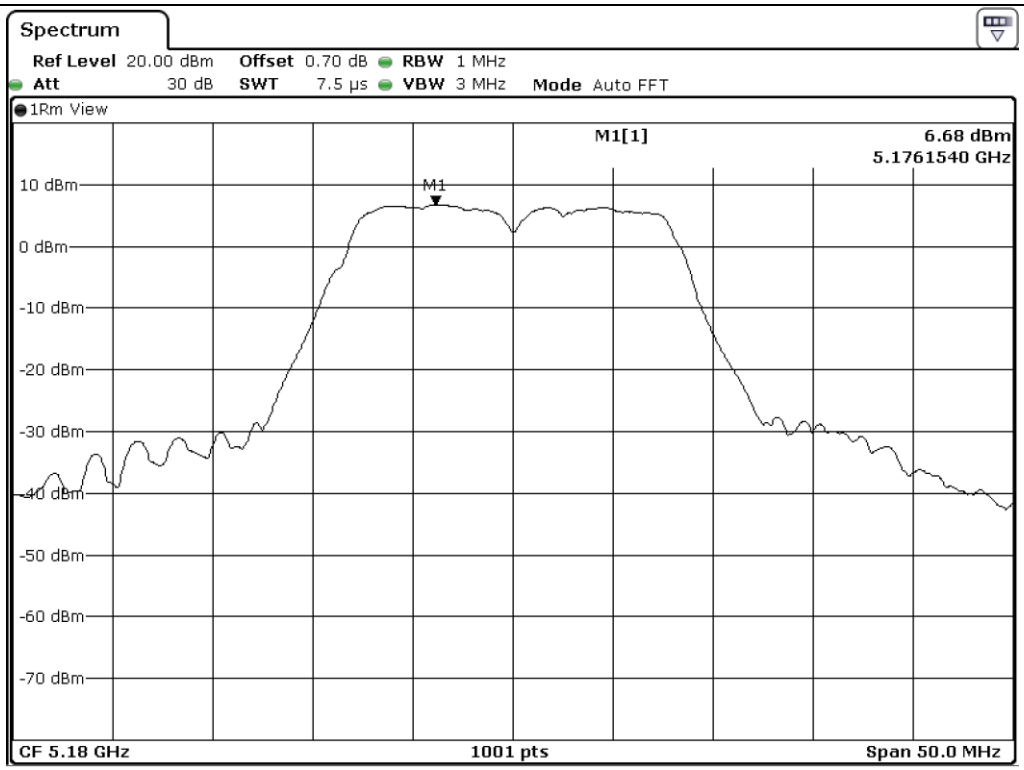
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	6.68	17.00	10.32
	Middle	5 220.00	6.40	17.00	10.60
	High	5 240.00	6.39	17.00	10.61
5 725 ~ 5 850	Low	5 745.00	2.86	30.00	27.14
	Middle	5 785.00	2.24	30.00	27.76
	High	5 825.00	2.10	30.00	27.90

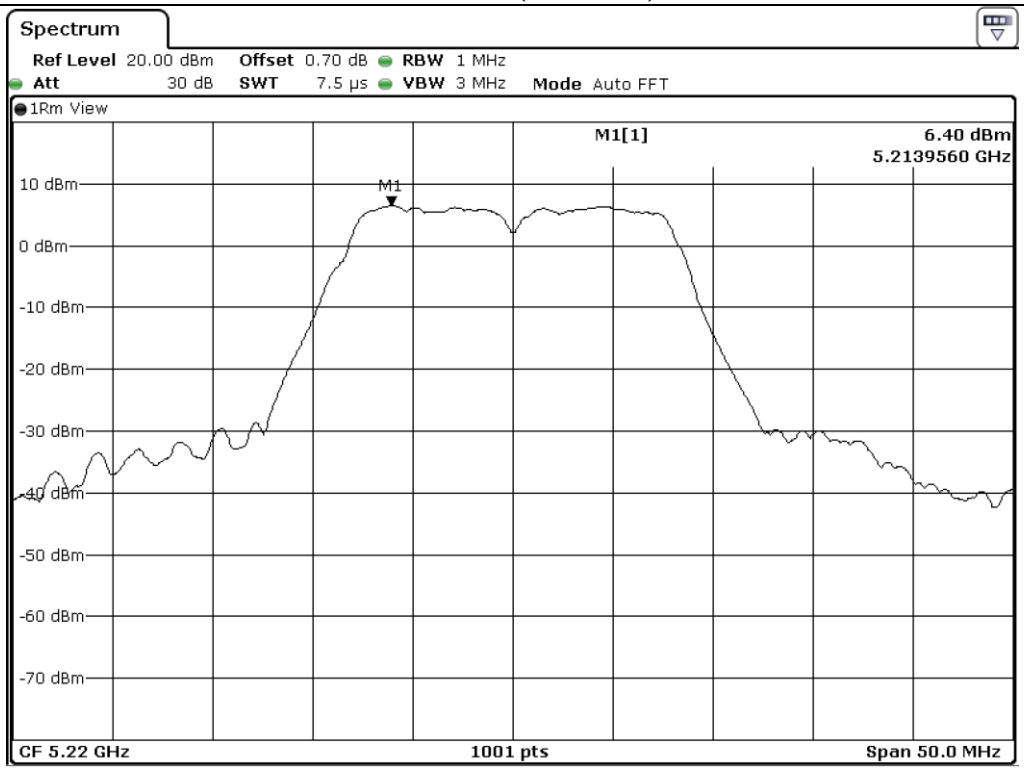
Remark: See next page for measurement data.

Tested by: Hyung-Kwon, Oh / Engineer

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

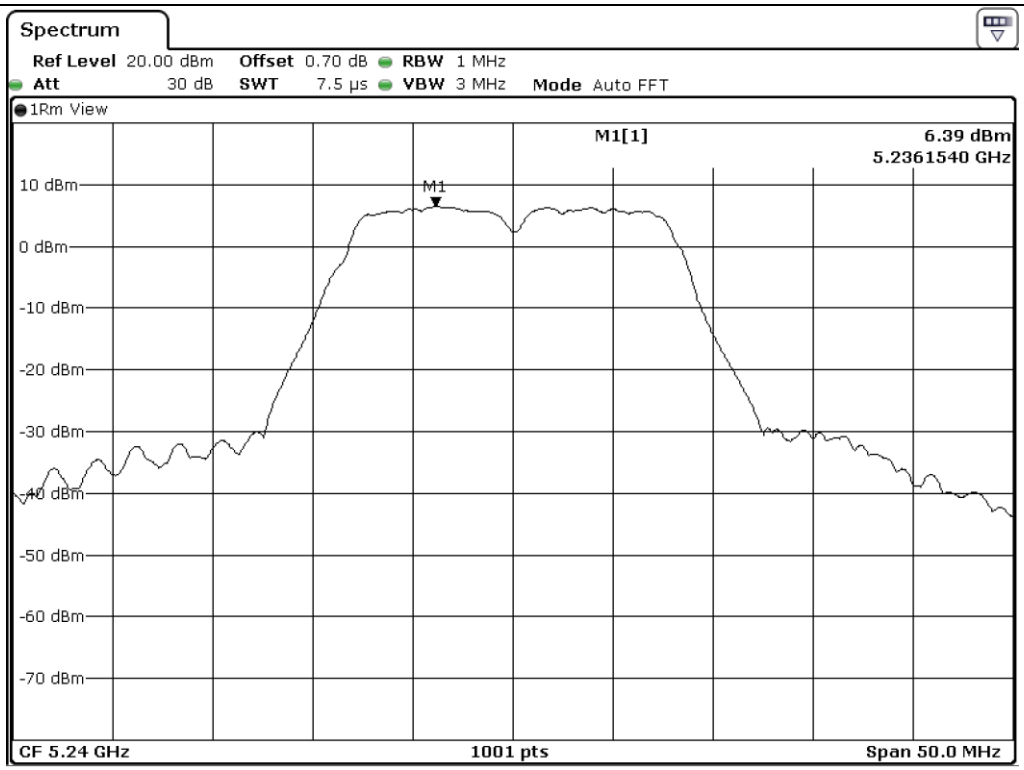


Low Channel (5 180 MHz)



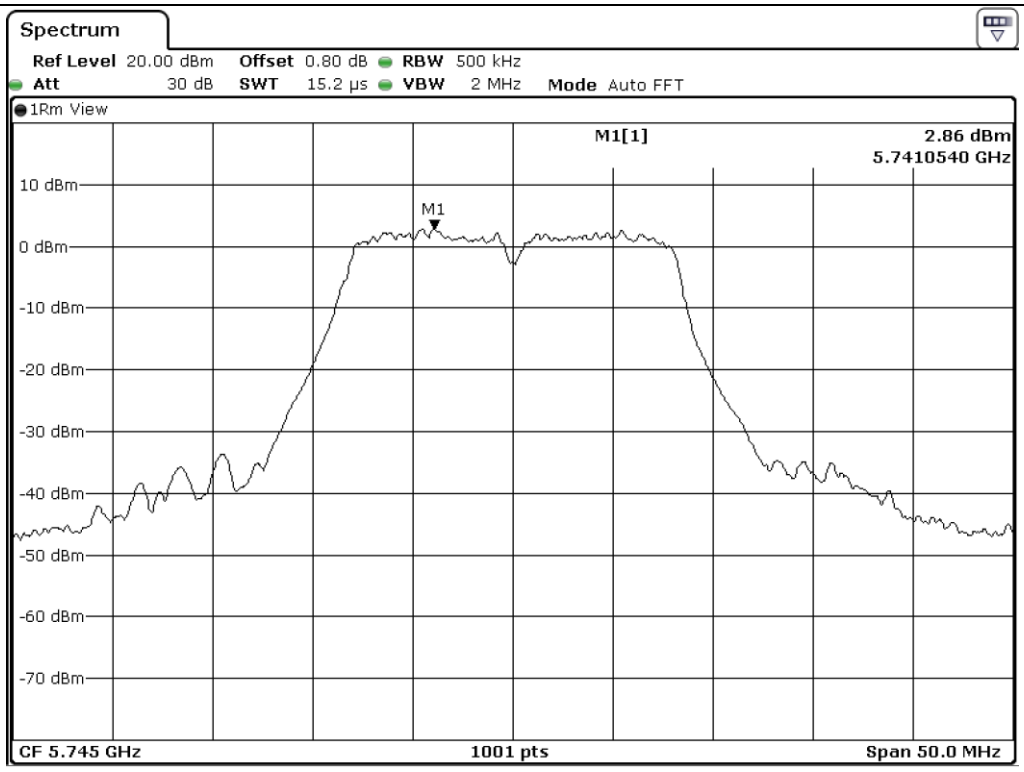
Middle Channel (5 220 MHz)

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

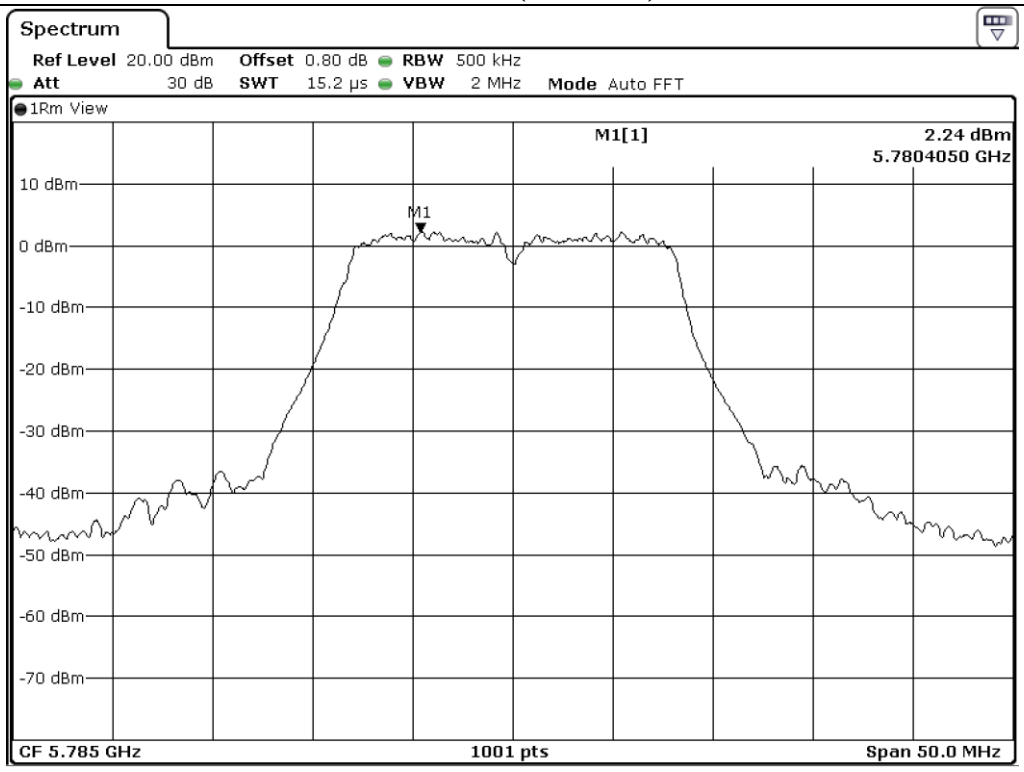


High Channel (5 240 MHz)

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

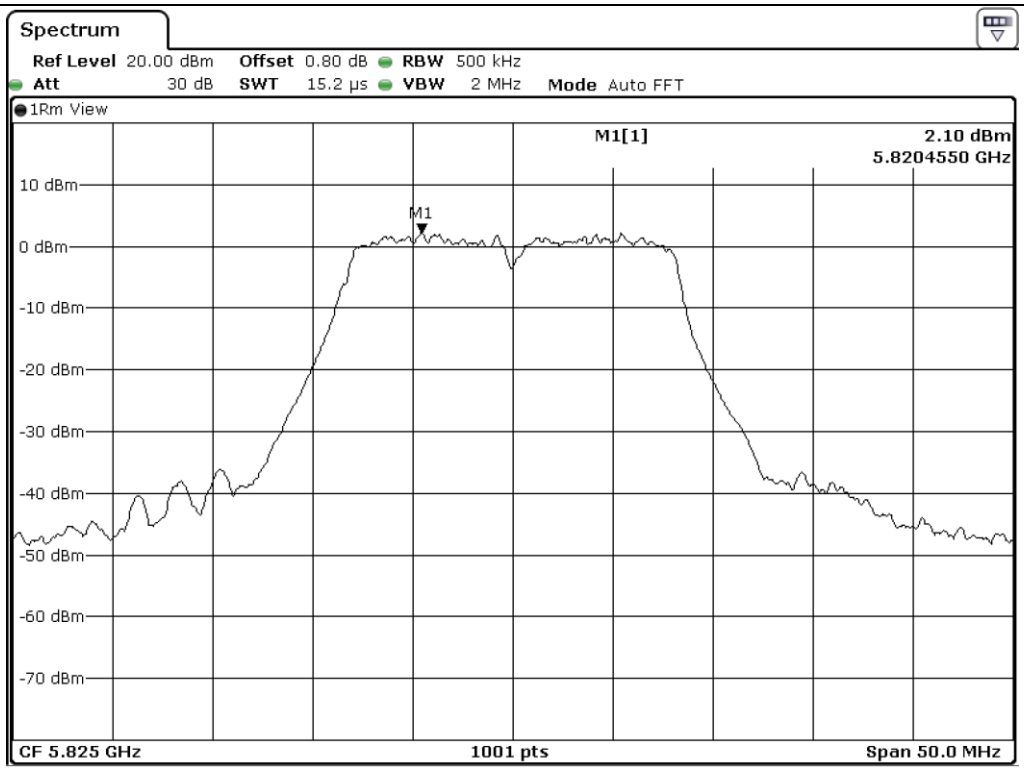


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 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)

10.4.3 Test data for Multiple Transmit

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Operating condition : Highest Output Power Transmitting Mode

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	9.57	17.00	7.43
	Middle	5 220.00	9.22	17.00	7.78
	High	5 240.00	9.04	17.00	7.96
5 725 ~ 5 850	Low	5 745.00	6.32	30.00	23.68
	Middle	5 785.00	5.93	30.00	24.07
	High	5 825.00	5.54	30.00	24.46

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna0 Power Density}/10)}+10^{(\text{Antenna1 Power Density}/10)})$

Tested by: Hyung-Kwon, Oh / Engineer

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

10.5 Test data for 802.11n_HT20 RLAN Mode

10.5.1 Test data for Antenna 0

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Operating condition : Highest Output Power Transmitting Mode

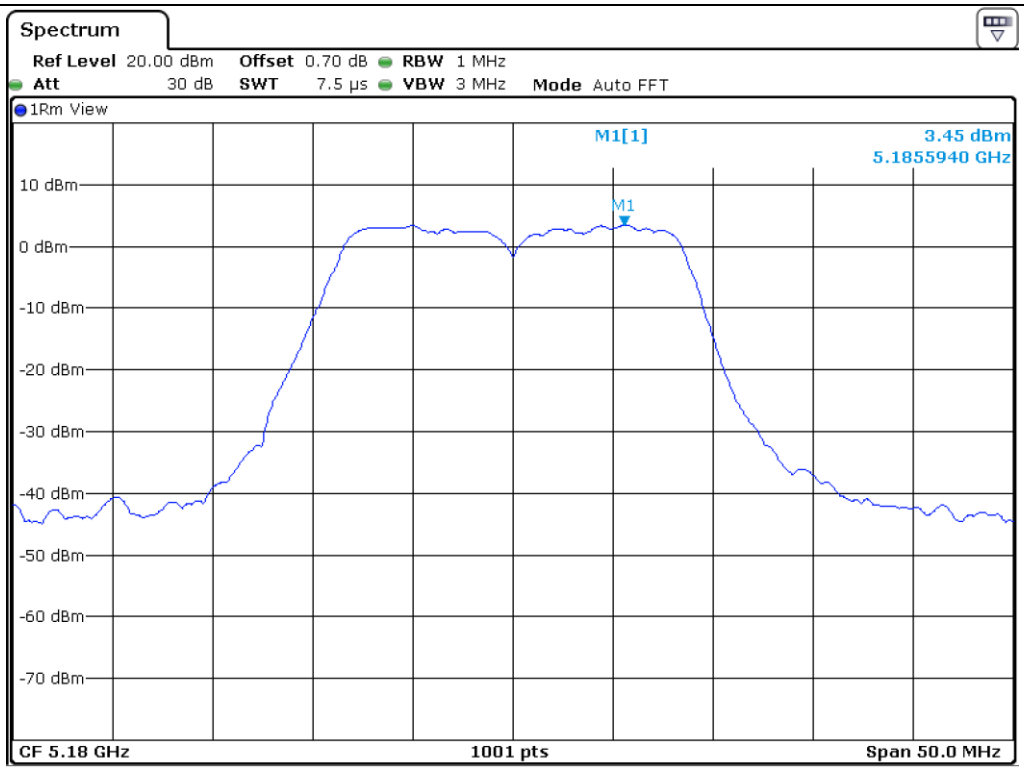
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	3.45	17.00	13.55
	Middle	5 220.00	3.68	17.00	13.32
	High	5 240.00	3.61	17.00	13.39
5 725 ~ 5 850	Low	5 745.00	2.57	30.00	27.43
	Middle	5 785.00	1.92	30.00	28.08
	High	5 825.00	1.44	30.00	28.56

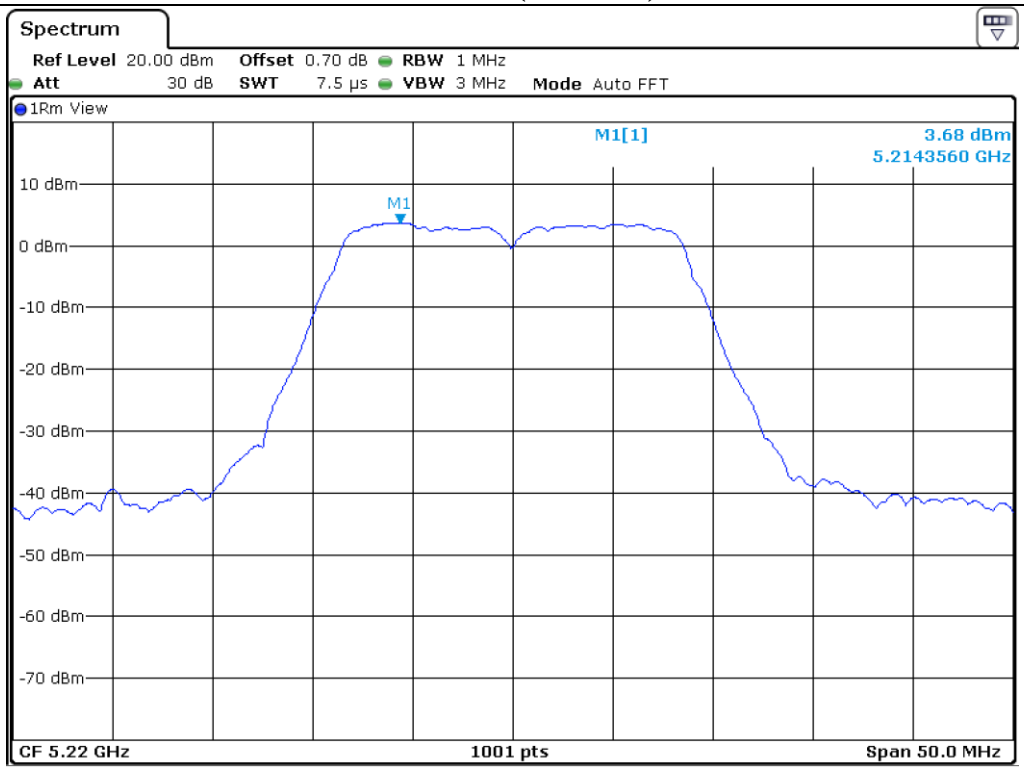
Remark: See next page for measurement data.

Tested by: Hyung-Kwon, Oh / Engineer

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

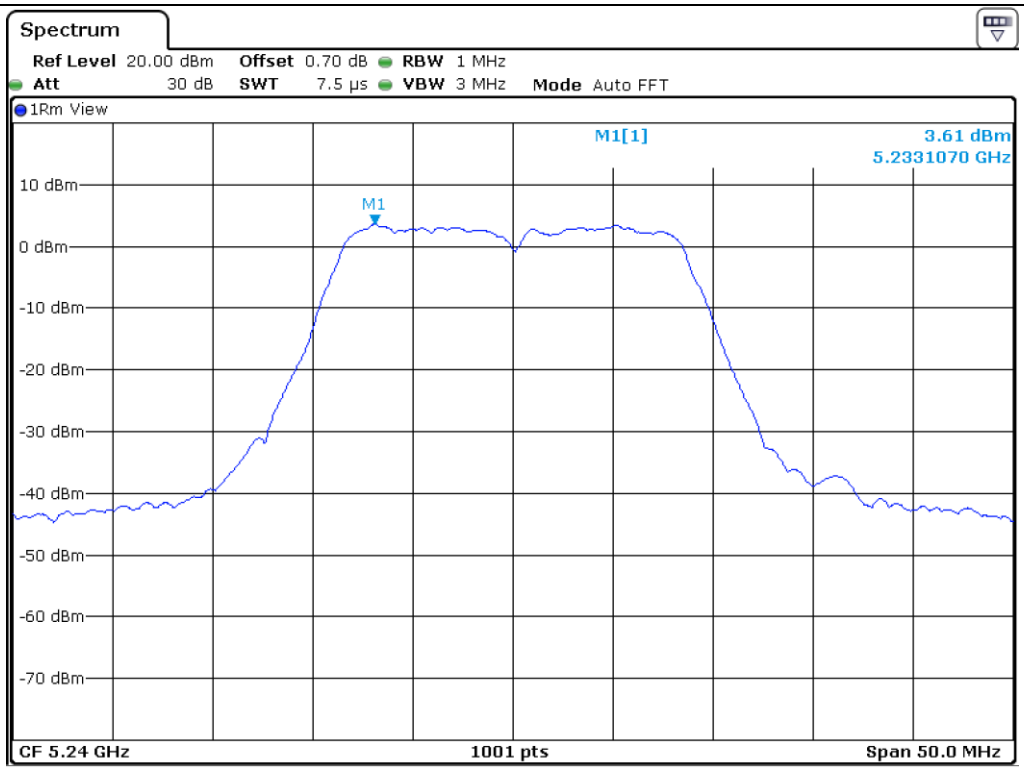


Low Channel (5 180 MHz)



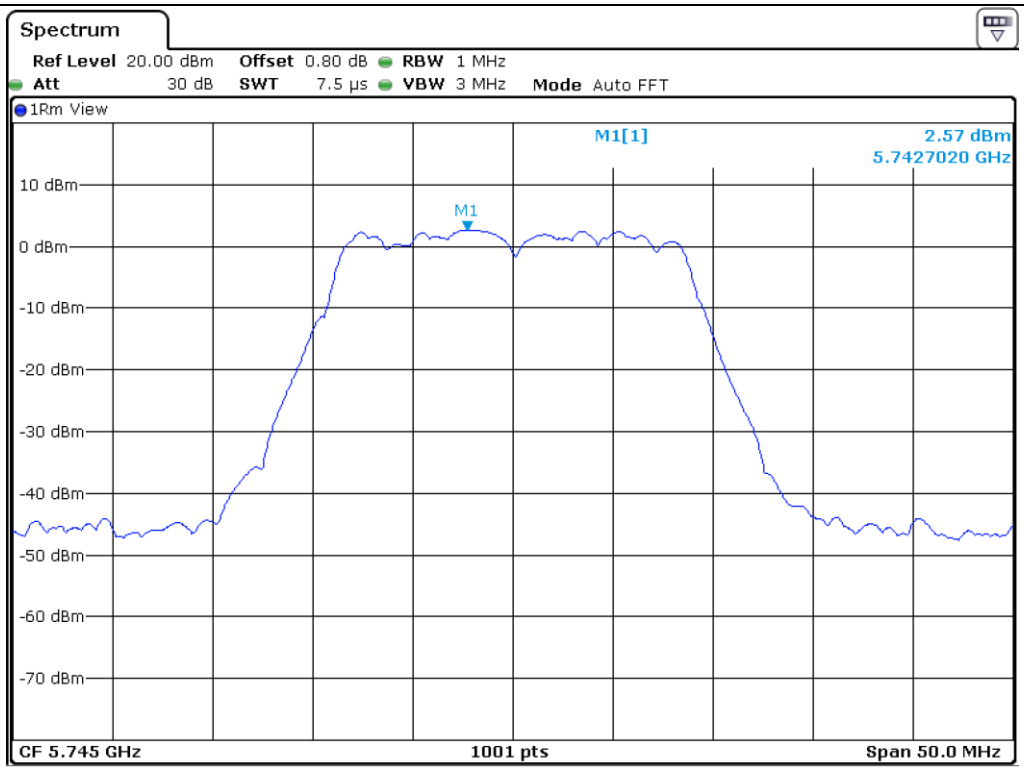
Middle Channel (5 220 MHz)

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

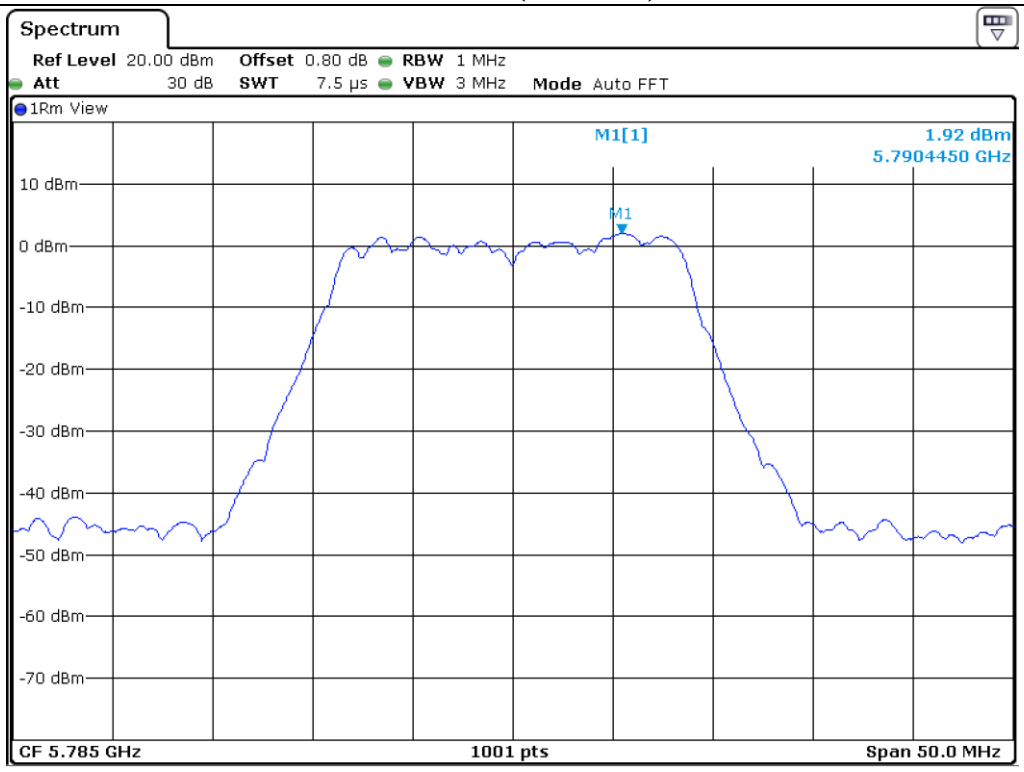


High Channel (5 240 MHz)

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

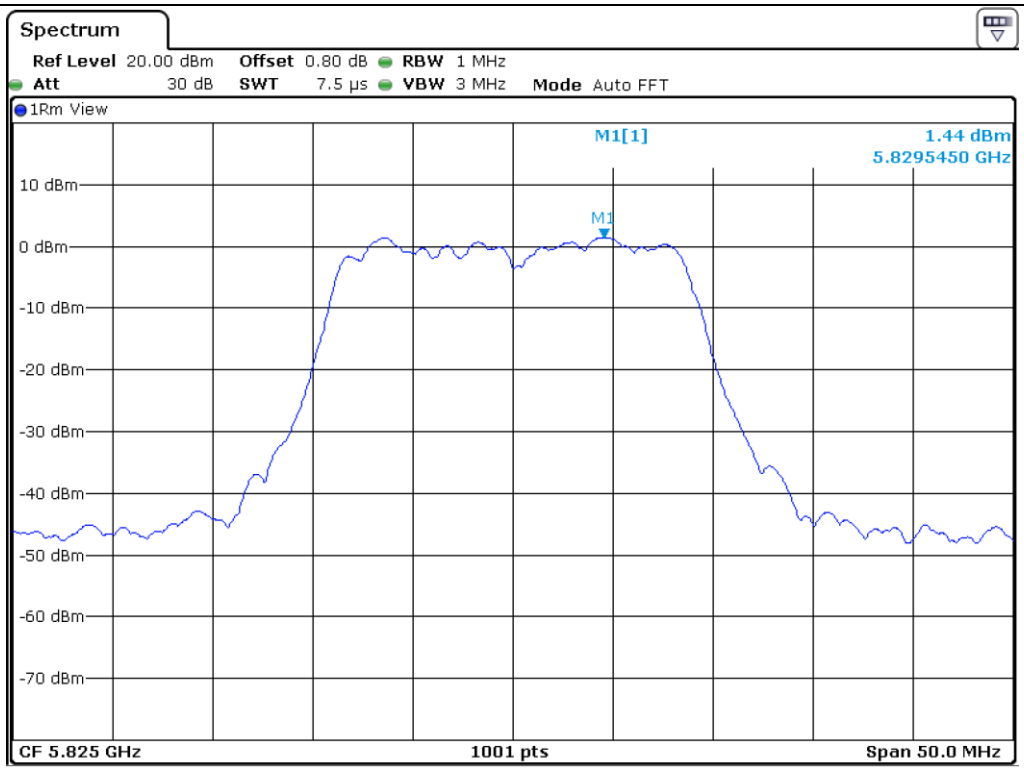


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 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)

10.5.2 Test data for Antenna 1

-. Test Date : July 19, 2017

-. Operating condition : Highest Output Power Transmitting Mode

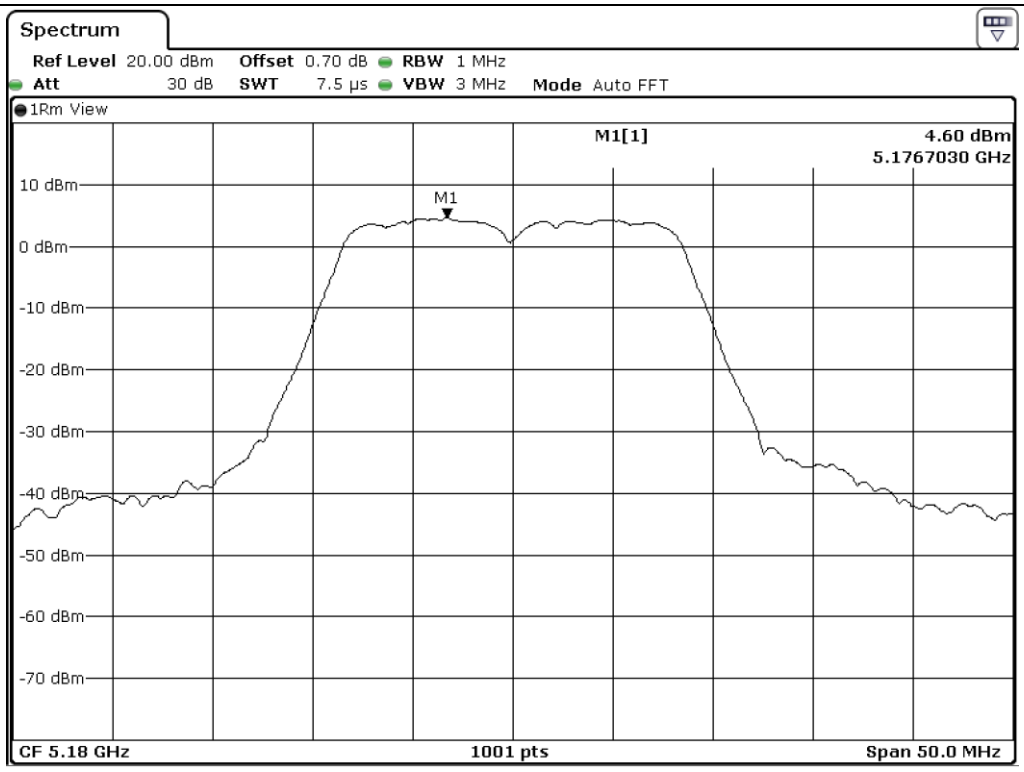
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	4.60	17.00	12.40
	Middle	5 220.00	4.52	17.00	12.48
	High	5 240.00	4.46	17.00	12.54
5 725 ~ 5 850	Low	5 745.00	1.17	30.00	28.83
	Middle	5 785.00	0.90	30.00	29.10
	High	5 825.00	0.40	30.00	29.60

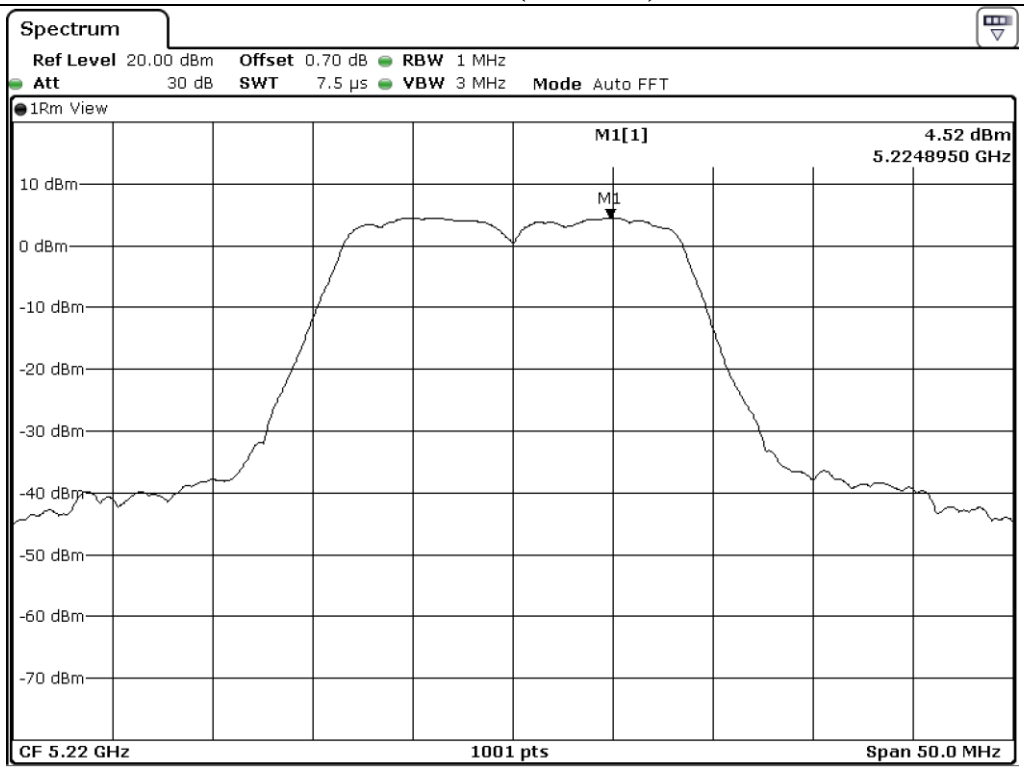
Remark: See next page for measurement data.

Tested by: Hyung-Kwon, Oh / Engineer

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

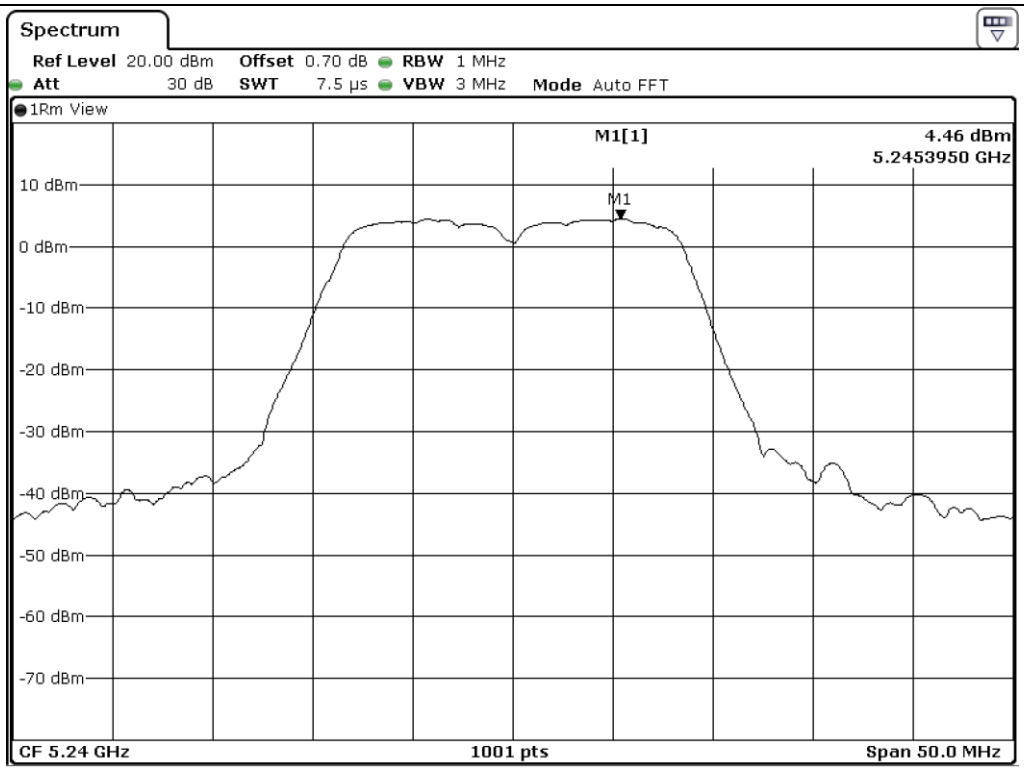


Low Channel (5 180 MHz)



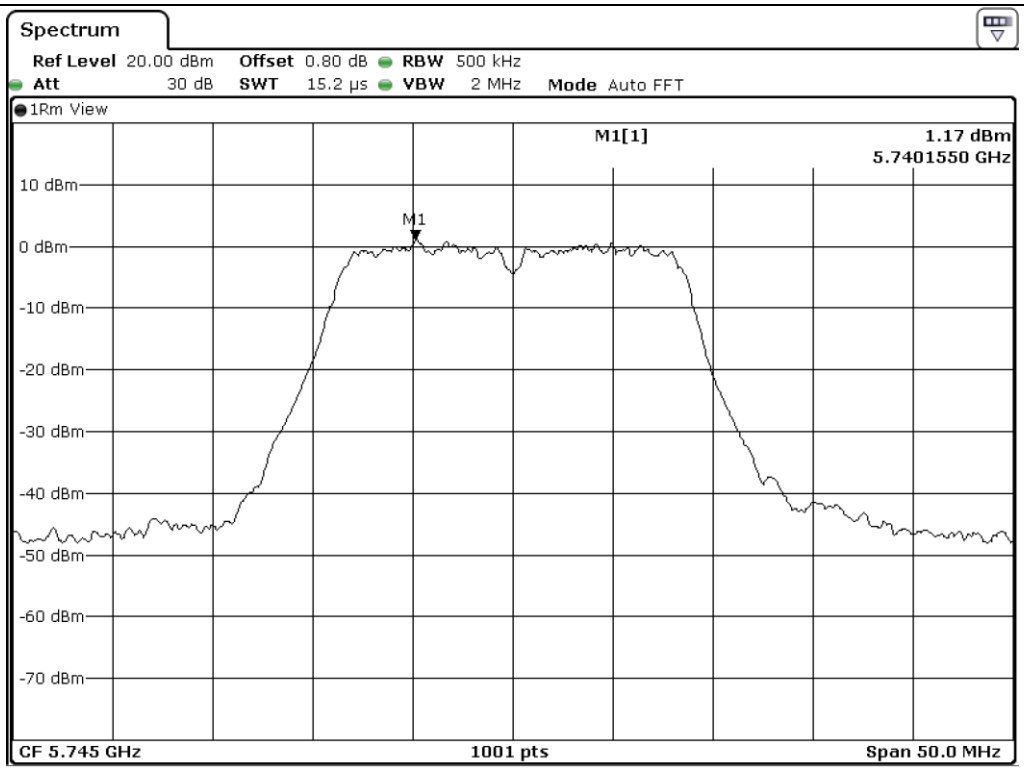
Middle Channel (5 220 MHz)

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

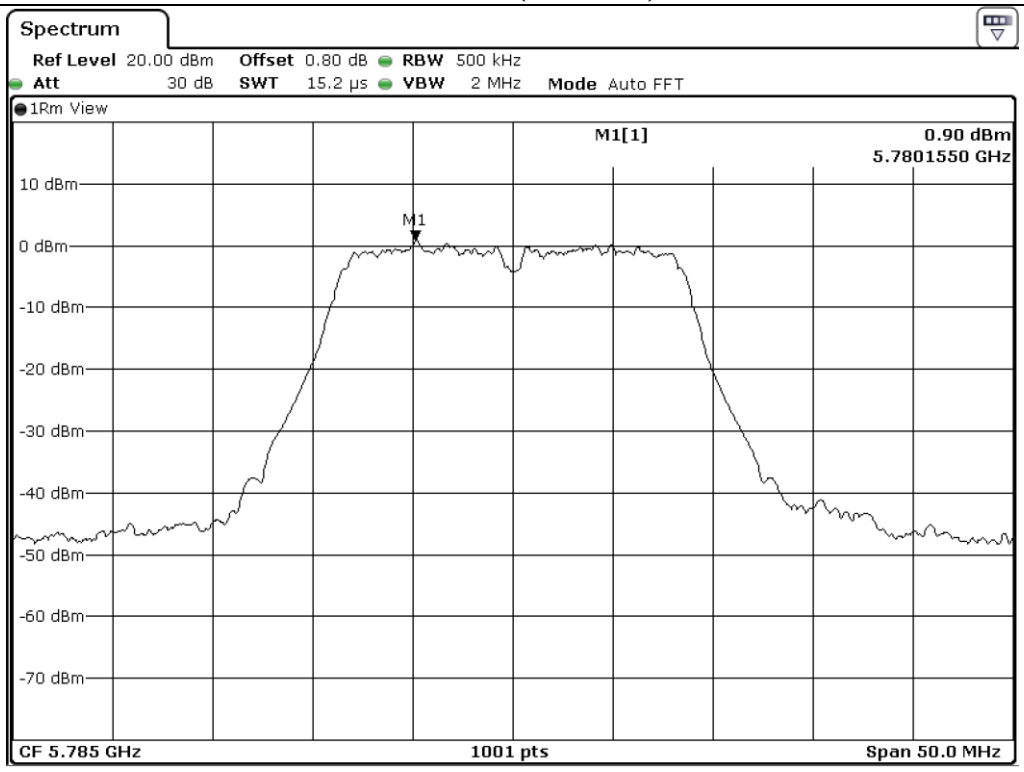


High Channel (5 240 MHz)

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

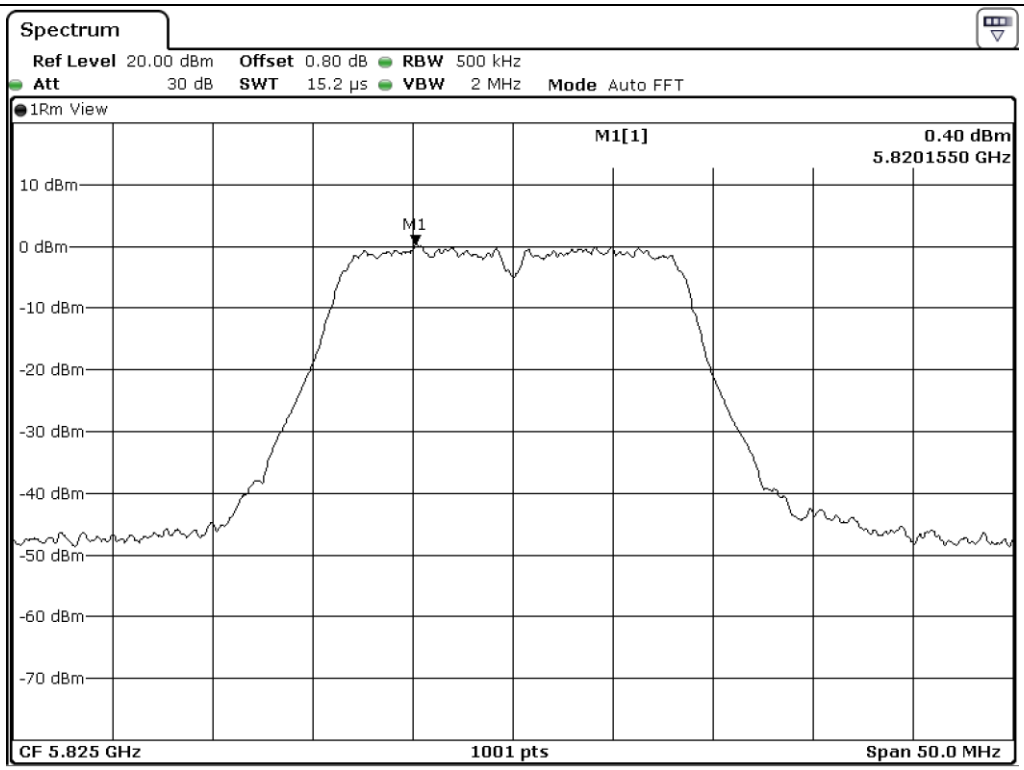


Low Channel (5 745 MHz)



Middle Channel (5 785 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 (5 825 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)

10.5.3 Test data for Multiple Transmit

-. Test Date : February 05, 2018 ~ February 09, 2018

-. Operating condition : Highest Output Power Transmitting Mode

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	7.07	17.00	9.93
	Middle	5 220.00	7.13	17.00	9.87
	High	5 240.00	7.07	17.00	9.93
5 725 ~ 5 850	Low	5 745.00	4.94	30.00	25.06
	Middle	5 785.00	4.45	30.00	25.55
	High	5 825.00	3.96	30.00	26.04

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna0 Power Density}/10)}+10^{(\text{Antenna1 Power Density}/10)})$

Tested by: Hyung-Kwon, Oh / Engineer

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