

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

Test Report No. : W161R-D017

AGR No. : A15DA-264

Applicant : LG Innotek Co., Ltd.

Address : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, Korea. 506-731

Manufacturer : LG Innotek Co., Ltd.

Address : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, Korea. 506-731

Type of Equipment : Wi-Fi/BT Combo module

FCC ID. : YZP-TWCMK007D

Model Name : TWCM-K007D

Serial number : N/A

Total page of Report : 229 pages (including this page)

Date of Incoming : December 28, 2015

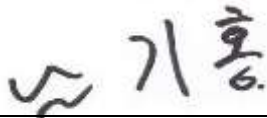
Date of issue : January 25, 2016

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: 
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ONETECH Corp.

Approved by: 
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ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	7
2. TEST SUMMARY	8
2.1 TEST ITEMS AND RESULTS	8
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	8
2.3 RELATED SUBMITTAL(S) / GRANT(S)	8
2.4 PURPOSE OF THE TEST	8
2.5 TEST METHODOLOGY.....	8
2.6 TEST FACILITY.....	8
3. GENERAL INFORMATION	9
3.1 PRODUCT DESCRIPTION.....	9
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	11
4. EUT MODIFICATIONS.....	11
5. SYSTEM TEST CONFIGURATION	12
5.1 JUSTIFICATION.....	12
5.2 PERIPHERAL EQUIPMENT	12
5.3 MODE OF OPERATION DURING THE TEST	13
5.4 CONFIGURATION OF TEST SYSTEM	17
5.5 ANTENNA REQUIREMENT	17
6. PRELIMINARY TEST	18
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	18
6.2 GENERAL RADIATED EMISSIONS TESTS	18
7. MINIMUM 26 DB BANDWIDTH	19
7.1 OPERATING ENVIRONMENT	19
7.2 TEST SET-UP	19
7.3 TEST EQUIPMENT USED	19
7.4.1 Test data for 802.11a RLAN Mode	20
7.4.2 Test data for 802.11n_HT20 RLAN Mode.....	30
7.4.3 Test data for 802.11n_HT40 RLAN Mode.....	40
7.4.4 Test data for 802.11ac20 RLAN Mode.....	46
7.4.5 Test data for 802.11ac40 RLAN Mode.....	56
8. MAXIMUM PEAK OUTPUT POWER	66
8.1 OPERATING ENVIRONMENT	66
8.2 TEST SET-UP	66

8.3 TEST EQUIPMENT USED	66
8.4 TEST DATA FOR 802.11A RLAN MODE.....	67
8.4.1 Test data for Antenna 0	67
8.4.2 Test data for Antenna 1	72
8.4.3 Test data for Multiple Transmit	77
8.5 TEST DATA FOR 802.11N_HT20 RLAN MODE	78
8.5.1 Test data for Antenna 0	78
8.5.2 Test data for Antenna 1	83
8.5.3 Test data for Multiple transmit.....	88
8.6 TEST DATA FOR 802.11N_HT40 RLAN MODE	89
8.6.1 Test data for Antenna 0	89
8.6.2 Test data for Antenna 1	92
8.6.3 Test data for Multiple transmit.....	95
8.7 TEST DATA FOR 802.11AC20 RLAN MODE	96
8.7.1 Test data for Antenna 0	96
8.7.2 Test data for Antenna 1	101
8.7.3 Test data for Multiple Transmit	106
8.8 TEST DATA FOR 802.11AC40 RLAN MODE	107
8.8.1 Test data for Antenna 0	107
8.8.2 Test data for Antenna 1	110
8.9 TEST DATA FOR 802.11AC80 RLAN MODE	114
8.9.1 Test data for Antenna 0	114
8.9.2 Test data for Antenna 1	116
8.9.3 Test data for Multiple transmit.....	118
9. PEAK POWER SPECTRUL DENSITY	119
9.1 OPERATING ENVIRONMENT	119
9.2 TEST SET-UP	119
9.3 TEST EQUIPMENT USED	119
9.4 TEST DATA FOR 802.11A RLAN MODE.....	120
9.4.1 Test data for Antenna 0	120
9.4.2 Test data for Antenna 1	125
9.4.3 Test data for Multiple Transmit	130
9.5 TEST DATA FOR 802.11N_HT20 RLAN MODE	131
9.5.1 Test data for Antenna 0	131
9.5.2 Test data for Antenna 1	136
9.5.3 Test data for Multiple transmit.....	141
9.6 TEST DATA FOR 802.11N_HT40 RLAN MODE	142

9.6.1 Test data for Antenna 0	142
9.6.2 Test data for Antenna 1	145
9.6.3 Test data for Multiple transmit.....	148
9.7 TEST DATA FOR 802.11AC20 RLAN MODE	149
9.7.1 Test data for Antenna 0	149
9.7.2 Test data for Antenna 1	154
9.7.3 Test data for Multiple Transmit	159
9.8 TEST DATA FOR 802.11AC40 RLAN MODE	160
9.8.1 Test data for Antenna 0	160
9.8.2 Test data for Antenna 1	163
9.8.3 Test data for Multiple transmit.....	166
9.9 TEST DATA FOR 802.11AC80 RLAN MODE	167
9.9.1 Test data for Antenna 0	167
9.9.2 Test data for Antenna 1	169
9.9.3 Test data for Multiple transmit.....	171
10. FREQUENCY STABILITY WITH TEMPERATURE VARIATION.....	172
10.1 OPERATING ENVIRONMENT	172
10.2 TEST SET-UP	172
10.3 TEST EQUIPMENT USED	172
10.4 TEST DATA FOR 5 150 MHz ~ 5 250 MHz BAND.....	173
10.5 TEST DATA FOR 5 725 MHz ~ 5 850 MHz BAND.....	174
11. FREQUENCY STABILITY WITH VOLTAGE VARIATION.....	175
11.1 OPERATING ENVIRONMENT	175
11.2 TEST SET-UP	175
11.3 TEST EQUIPMENT USED	175
11.4 TEST DATA FOR 5 150 MHz ~ 5 250 MHz BAND.....	176
11.6 TEST DATA FOR 5 725 MHz ~ 5 850 MHz BAND.....	176
12. RADIATED SPURIOUS EMISSIONS	177
12.1 OPERATING ENVIRONMENT	177
12.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	177
12.3 TEST EQUIPMENT USED	177
12.4 TEST DATA FOR 802.11A RLAN MODE.....	178
12.4.1 Test data	178
12.5 TEST DATA FOR 802.11N_HT20 RLAN MODE	180
12.5.1 Test data	180
12.6 TEST DATA FOR 802.11N_HT40 RLAN MODE	182
12.6.1 Test data	182

12.7 TEST DATA FOR 802.11AC20 RLAN MODE	184
12.7.1 Test data	184
12.8 TEST DATA FOR 802.11AC40 RLAN MODE	186
12.8.1 Test data	186
12.9 TEST DATA FOR 802.11AC80 RLAN MODE	188
12.9.1 Test data	188
13. RADIATED RESTRICTED BAND EDGE MEASUREMENTS	190
13.1 OPERATING ENVIRONMENT	190
13.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	190
13.3 TEST EQUIPMENT USED	190
13.4 TEST DATA FOR FREQUENCY 5 150 BAND	191
13.4.1 Test data for 802.11a RLAN Mode	191
13.4.2 Test data for 802.11n_HT20 RLAN Mode	194
13.4.3 Test data for 802.11n_HT40 RLAN Mode	197
13.4.4 Test data for 802.11ac20 RLAN Mode	200
13.4.5 Test data for 802.11ac40 RLAN Mode	203
13.4.6 Test data for 802.11ac80 RLAN Mode	206
13.5 TEST DATA FOR FREQUENCY 5 725 MHz BAND	209
13.5.1 Test data for 802.11a RLAN Mode	209
13.5.2 Test data for 802.11n_HT20 RLAN Mode	212
13.5.3 Test data for 802.11n_HT40 RLAN Mode	215
13.5.4 Test data for 802.11ac20 RLAN Mode	218
13.5.5 Test data for 802.11ac40 RLAN Mode	221
13.5.6 Test data for 802.11ac80 RLAN Mode	224
14. CONDUCTED EMISSION TEST	227
14.1 OPERATING ENVIRONMENT	227
14.2 TEST SET-UP	227
14.3 TEST EQUIPMENT USED	227
14.4 TEST DATA	228

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W161R-D017	January 25, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : LG Innotek Co., Ltd.
 Address : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, Korea. 506-731
 Contact Person : IC Jeong / Senior engineer
 Telephone No. : +82-62-950-0332
 FCC ID : YZP-TWCMK007D
 Model Name : TWCM-K007D
 Serial Number : N/A
 Date : January 25, 2016

EQUIPMENT CLASS	Unlicensed National Information infrastructure(UNII)
E.U.T. DESCRIPTION	Modular Transmitter, Wi-Fi/BT Combo 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
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.

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
15.407(h)	Dynamic frequency Selection	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 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842 IC (Industry Canada) – Registration No. Site# 3736-3

-. 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 LG Innotek Co., Ltd., Model TWCM-K007D (referred to as the EUT in this report) is a Wi-Fi/BT Combo module. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Wi-Fi/BT Combo module		
FREQUENCY RANGE	Bluetooth	2 402 MHz ~ 2 480 MHz	
	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	WLAN 2.4 GHz Band	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20)) 2 422 MHz ~ 2 452 MHz (802.11n(HT40))	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11n(HT20)/ac20)
			5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac40)
			5 210 MHz (802.11ac80)
		5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11n(HT20)/ac20)
			5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac40)
			5 775 MHz (802.11ac80)

MAX. RF OUTPUT POWER	Bluetooth		1 Mbps	5.94 dBm
			2 Mbps	6.77 dBm
			3 Mbps	7.07 dBm
	Bluetooth LE		1.43 dBm	
	WLAN 2.4 GHz Band	Ant.0	Wi-Fi 802.11b (12.72 dBm) Wi-Fi 802.11g (11.75 dBm) Wi-Fi 802.11n_20 MHz (10.54 dBm) Wi-Fi 802.11n_40 MHz (8.69 dBm)	
		Ant.1	Wi-Fi 802.11b (12.92 dBm) Wi-Fi 802.11g (11.75 dBm) Wi-Fi 802.11n_20 MHz (10.82 dBm) Wi-Fi 802.11n_40 MHz (8.50 dBm)	
	WLAN 5 GHz Band	Ant.0	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (10.00 dBm) Wi-Fi 802.11n_20 MHz (9.87 dBm) Wi-Fi 802.11n_40 MHz (8.56 dBm) Wi-Fi 802.11ac20 MHz (9.77 dBm) Wi-Fi 802.11ac40 MHz (9.49 dBm) Wi-Fi 802.11ac80 MHz (8.04 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (9.22 dBm) Wi-Fi 802.11n_20 MHz (9.09 dBm) Wi-Fi 802.11n_40 MHz (7.00 dBm) Wi-Fi 802.11ac20 MHz (9.31 dBm) Wi-Fi 802.11ac40 MHz (8.12 dBm) Wi-Fi 802.11ac80 MHz (7.40 dBm)
		Ant.1	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (9.32 dBm) Wi-Fi 802.11n_20 MHz (9.01 dBm) Wi-Fi 802.11n_40 MHz (7.57 dBm) Wi-Fi 802.11ac20 MHz (9.18 dBm) Wi-Fi 802.11ac40 MHz (8.83 dBm) Wi-Fi 802.11ac80 MHz (7.16 dBm)
			5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (8.49 dBm) Wi-Fi 802.11n_20 MHz (8.45 dBm) Wi-Fi 802.11n_40 MHz (7.12 dBm) Wi-Fi 802.11ac20 MHz (8.49 dBm) Wi-Fi 802.11ac40 MHz (7.39 dBm) Wi-Fi 802.11ac80 MHz (6.54 dBm)

MODULATION TYPE	Bluetooth	GFSK for 1 Mbps, DQPSK for 2 Mbps, 8-DPSK for 3 Mbps
	Bluetooth LE	GFSK
	WLAN 2.4 GHz Band	DSSS Modulation(DBPSK/DQPSK/CCK)
	WLAN 5 GHz Band	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
Antenna Gain	2.4 GHz Band [BT(BDR / EDR / LE)]	0.42 dBi
	2.4 GHz Band [WLAN]	Antenna 0 : 1.23 dBi
		Antenna 1 : 1.21 dBi
	5 GHz Band [5 150 MHz ~ 5 250 MHz Band]	Antenna 0 : 1.71 dBi
		Antenna 1 : 1.39 dBi
	5 GHz Band [5 725 MHz ~ 5 850 MHz Band]	Antenna 0 : 1.10 dBi
		Antenna 1 : 0.71 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	40 MHz	

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

-. None

4. EUT MODIFICATIONS

-. None

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.	WiFi+BT MODULE	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
TWCM-K007D	LG Innotek Co., Ltd.	Wi-Fi/BT Combo module (EUT)	Notebook PC
PP11L	DELL	Notebook PC	EUT

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.

5 150 MHz ~ 5 250 MHz Band

Modulation & Channel selected	DATA RATE	OUTPUT POWER	
		Ant 0	Ant 1
802.11 a (Low Channel)	6 Mbps	9.64	9.32
	9 Mbps	9.51	9.29
	12 Mbps	9.55	9.11
	18 Mbps	9.49	9.09
	24 Mbps	9.33	8.96
	36 Mbps	9.40	9.03
	48 Mbps	9.23	8.85
	54 Mbps	9.09	8.75
HT 20 (Low Channel)	6.5 Mbps	9.87	8.67
	13 Mbps	9.75	8.66
	19.5 Mbps	9.65	8.57
	26 Mbps	9.64	8.42
	39 Mbps	9.48	8.33
	52 Mbps	9.30	8.39
	58.5 Mbps	9.56	8.23
	65 Mbps	9.67	8.26
HT 40 (Low Channel)	13.5 Mbps	8.33	7.57
	27 Mbps	8.30	7.43
	40.5 Mbps	8.23	7.44
	54 Mbps	8.16	7.52
	81 Mbps	8.22	7.36
	108 Mbps	8.12	7.22
	121.5 Mbps	8.06	7.06
	135 Mbps	7.88	7.26

VHT20 (Low Channel)	6.5 Mbps	9.73	8.94
	13 Mbps	9.70	8.92
	19.5 Mbps	9.54	8.87
	26 Mbps	9.62	8.75
	39 Mbps	9.57	8.80
	52 Mbps	9.50	8.63
	58.5 Mbps	9.42	8.61
	65 Mbps	9.43	8.49
	78 Mbps	9.33	8.52
VHT40 (Low Channel)	13.5 Mbps	9.38	8.57
	27 Mbps	9.32	8.52
	40.5 Mbps	9.27	8.36
	54 Mbps	9.22	8.41
	81 Mbps	9.25	8.32
	108 Mbps	9.13	8.22
	121.5 Mbps	9.06	8.09
	135 Mbps	8.97	8.13
	162 Mbps	8.92	8.26
	180 Mbps	8.79	8.25
VHT80 (Low Channel)	29.3 Mbps	8.04	7.16
	58.5 Mbps	8.00	7.15
	87.8 Mbps	7.92	7.13
	117 Mbps	7.88	7.09
	175.5 Mbps	7.90	6.84
	234 Mbps	7.81	6.92
	263.3 Mbps	7.69	6.88
	292.5 Mbps	7.63	6.72
	351 Mbps	7.52	6.70
	390 Mbps	7.44	6.59

The worse case data rate for each modulation is determined 6 Mbps(Ant.0) / 6 Mbps(Ant.1) for IEEE 802.11a,
6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) for HT20, 13.5 Mbps(Ant.0) / 13.5 Mbps(Ant.1) for HT40,
6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) for VHT20, 13.5 Mbps(Ant.0) / 13.5 Mbps(Ant.1) for VHT40,
29.3 Mbps(Ant.0) / 29.3 Mbps(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.

5 725 MHz ~ 5 850 MHz Band

Modulation & Channel selected	DATA RATE	OUTPUT POWER	
		Ant 0	Ant 1
802.11 a (Low Channel)	6 Mbps	9.22	8.49
	9 Mbps	9.21	8.42
	12 Mbps	9.17	8.36
	18 Mbps	9.17	8.40
	24 Mbps	9.09	8.31
	36 Mbps	9.03	8.22
	48 Mbps	8.88	8.03
	54 Mbps	9.01	8.16
HT 20 (Low Channel)	6.5 Mbps	9.09	8.45
	13 Mbps	8.95	8.35
	19.5 Mbps	8.92	8.39
	26 Mbps	8.88	8.32
	39 Mbps	8.69	8.16
	52 Mbps	8.61	8.20
	58.5 Mbps	8.57	8.18
	65 Mbps	8.63	8.22
HT 40 (Low Channel)	13.5 Mbps	7.00	7.03
	27 Mbps	6.84	6.88
	40.5 Mbps	6.91	6.89
	54 Mbps	6.77	6.75
	81 Mbps	6.76	6.70
	108 Mbps	6.43	6.67
	121.5 Mbps	6.57	6.53
	135 Mbps	6.60	6.55

VHT20 (Low Channel)	6.5 Mbps	9.31	8.10
	13 Mbps	9.27	8.06
	19.5 Mbps	9.20	7.89
	26 Mbps	9.14	7.91
	39 Mbps	9.03	7.93
	52 Mbps	9.08	7.85
	58.5 Mbps	8.86	7.69
	65 Mbps	8.91	7.77
	78 Mbps	8.80	7.62
VHT40 (Low Channel)	13.5 Mbps	8.12	7.39
	27 Mbps	8.11	7.32
	40.5 Mbps	8.03	7.30
	54 Mbps	8.04	7.25
	81 Mbps	7.84	7.20
	108 Mbps	7.85	7.31
	121.5 Mbps	7.66	7.06
	135 Mbps	7.73	7.09
	162 Mbps	7.60	6.95
	180 Mbps	7.63	7.00
VHT80 (Low Channel)	29.3 Mbps	7.40	6.54
	58.5 Mbps	7.38	6.54
	87.8 Mbps	7.22	6.49
	117 Mbps	7.30	6.44
	175.5 Mbps	7.23	6.30
	234 Mbps	7.14	6.35
	263.3 Mbps	7.06	6.19
	292.5 Mbps	7.01	6.17
	351 Mbps	6.95	6.06
	390 Mbps	6.87	6.11

The worse case data rate for each modulation is determined 6 Mbps(Ant.0) / 6 Mbps(Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) for HT20, 13.5 Mbps(Ant.0) / 13.5 Mbps(Ant.1) for HT40, 6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) for VHT20, 13.5 Mbps(Ant.0) / 13.5 Mbps(Ant.1) for VHT40, 29.3 Mbps(Ant.0) / 29.3 Mbps(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.

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 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 transmitter antenna of the EUT is WLAN PIFA antenna and Bluetooth/BLE PIFA antenna, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

7. MINIMUM 26 dB BANDWIDTH

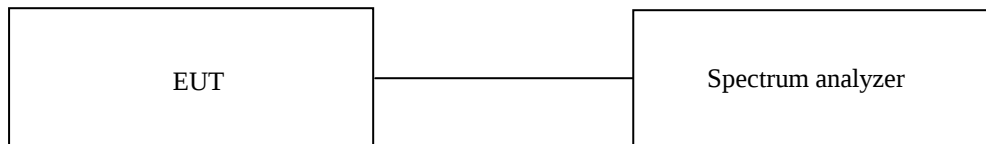
7.1 Operating environment

Temperature : 21.4 °C

Relative humidity : 45.1 % 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	Jul. 22, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

7.4.1 Test data for 802.11a RLAN Mode

7.4.1.1 Test data for Antenna 0

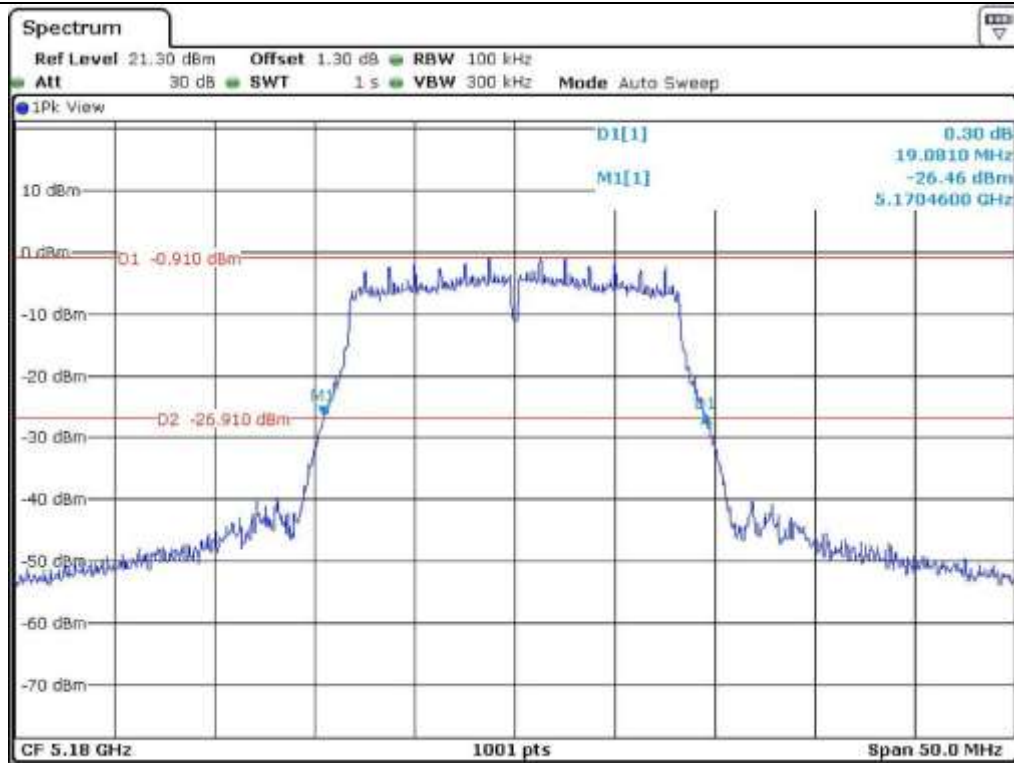
-. Test Date : January 18, 2016

-. Test Result : Pass

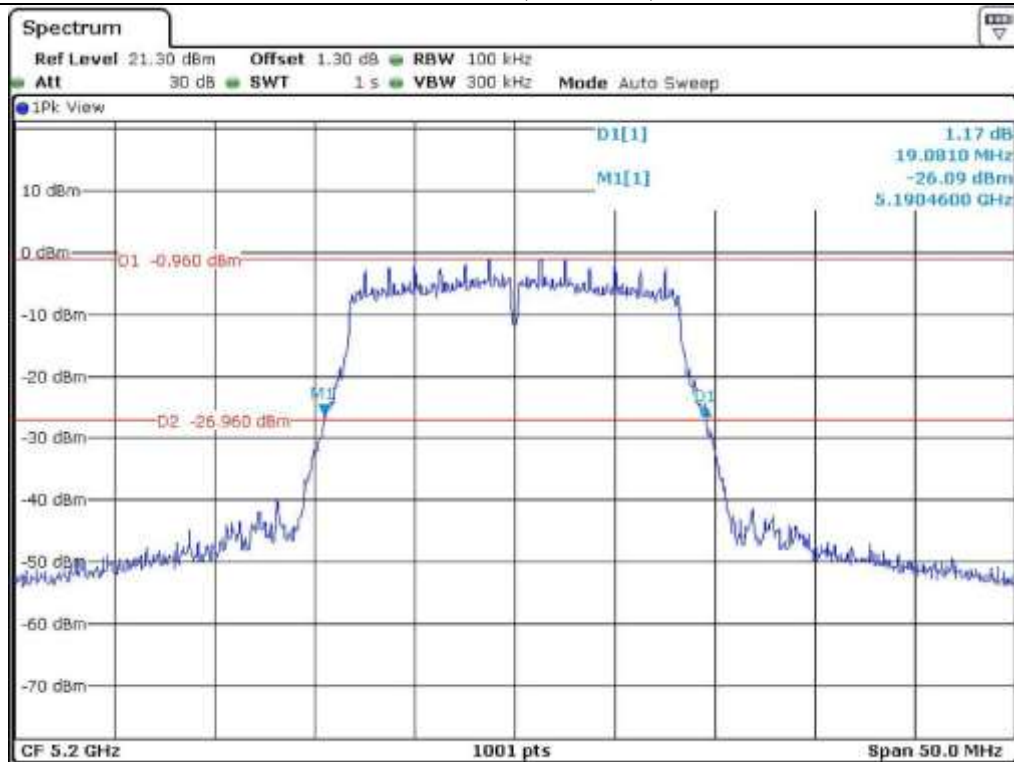
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180	19.08
	Middle	5 200	19.08
	High	5 240	19.08
5 725 ~ 5 850	Low	5 745	19.13
	Middle	5 785	19.08
	High	5 825	19.08



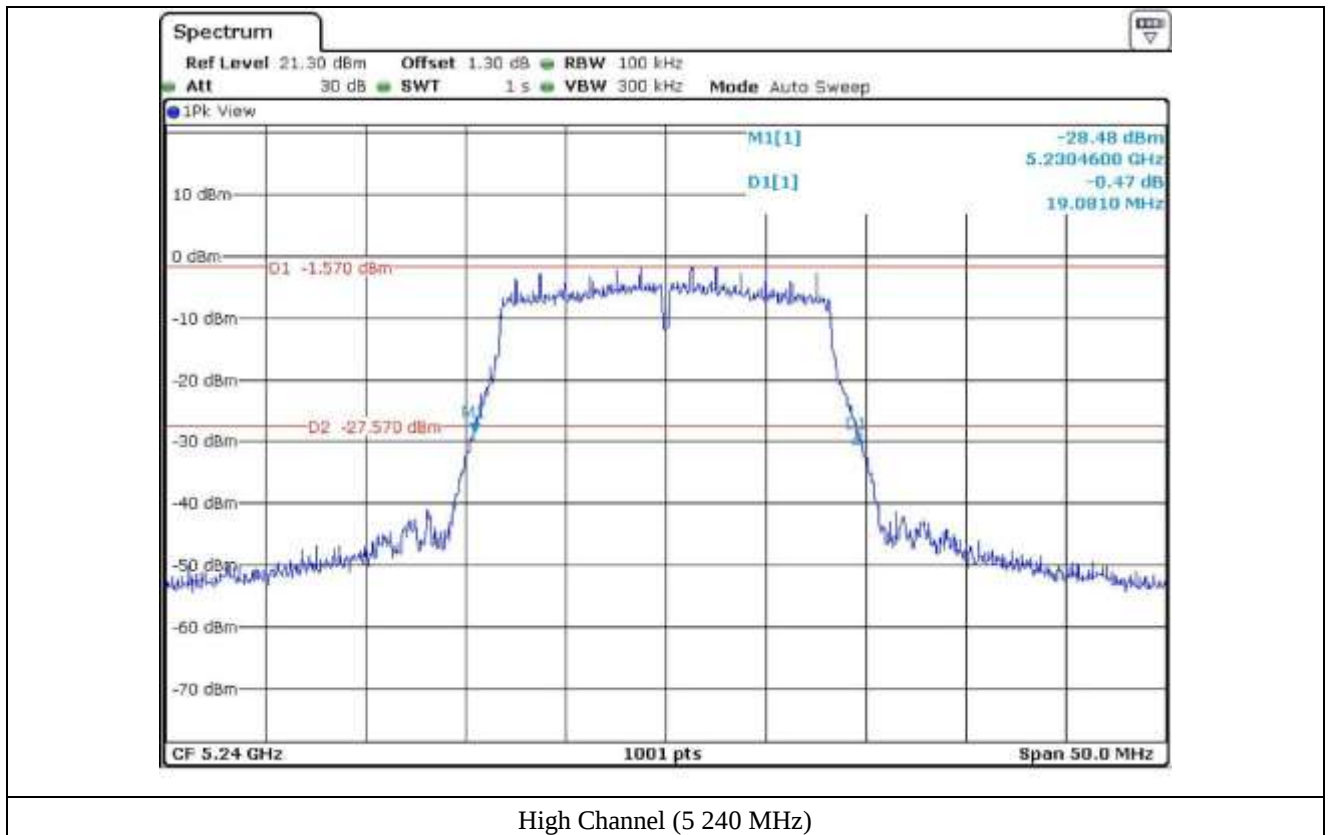
Tested by: Tae-Ho, Kim / Senior Engineer

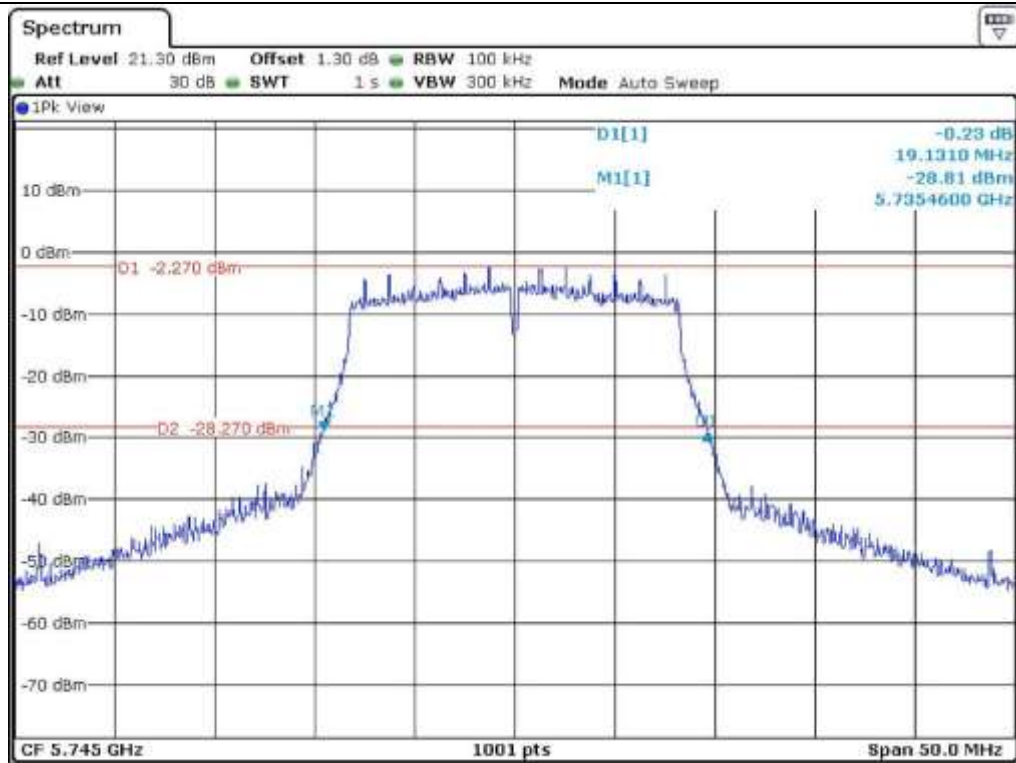


Low Channel (5 180 MHz)

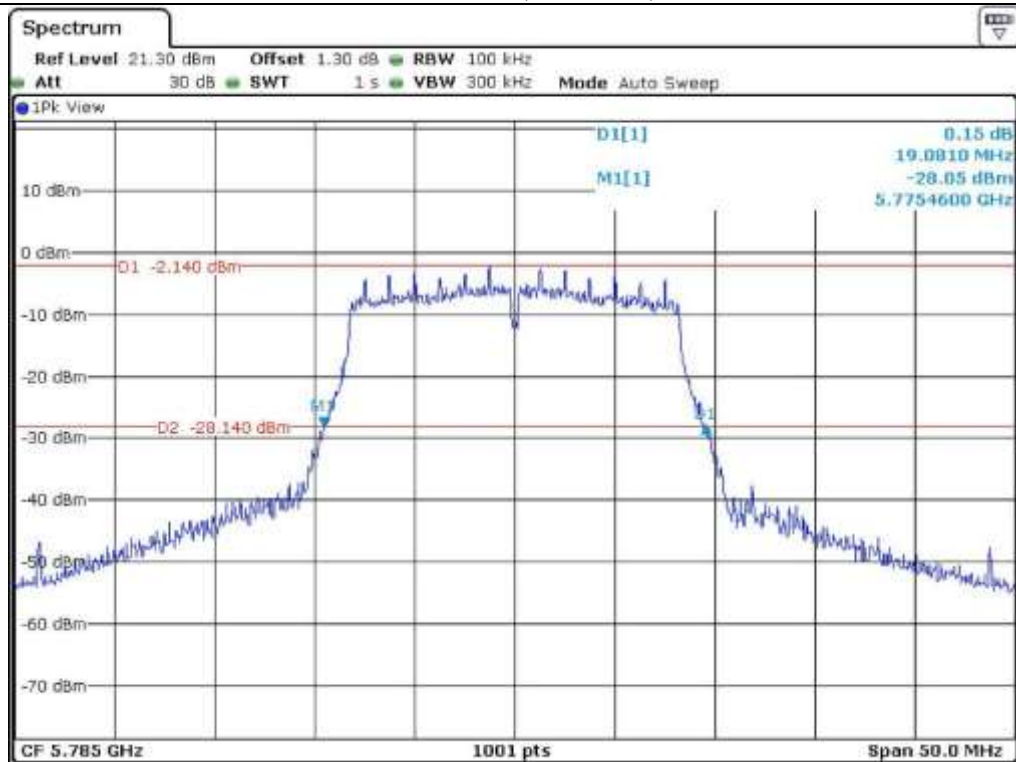


Middle Channel (5 200 MHz)

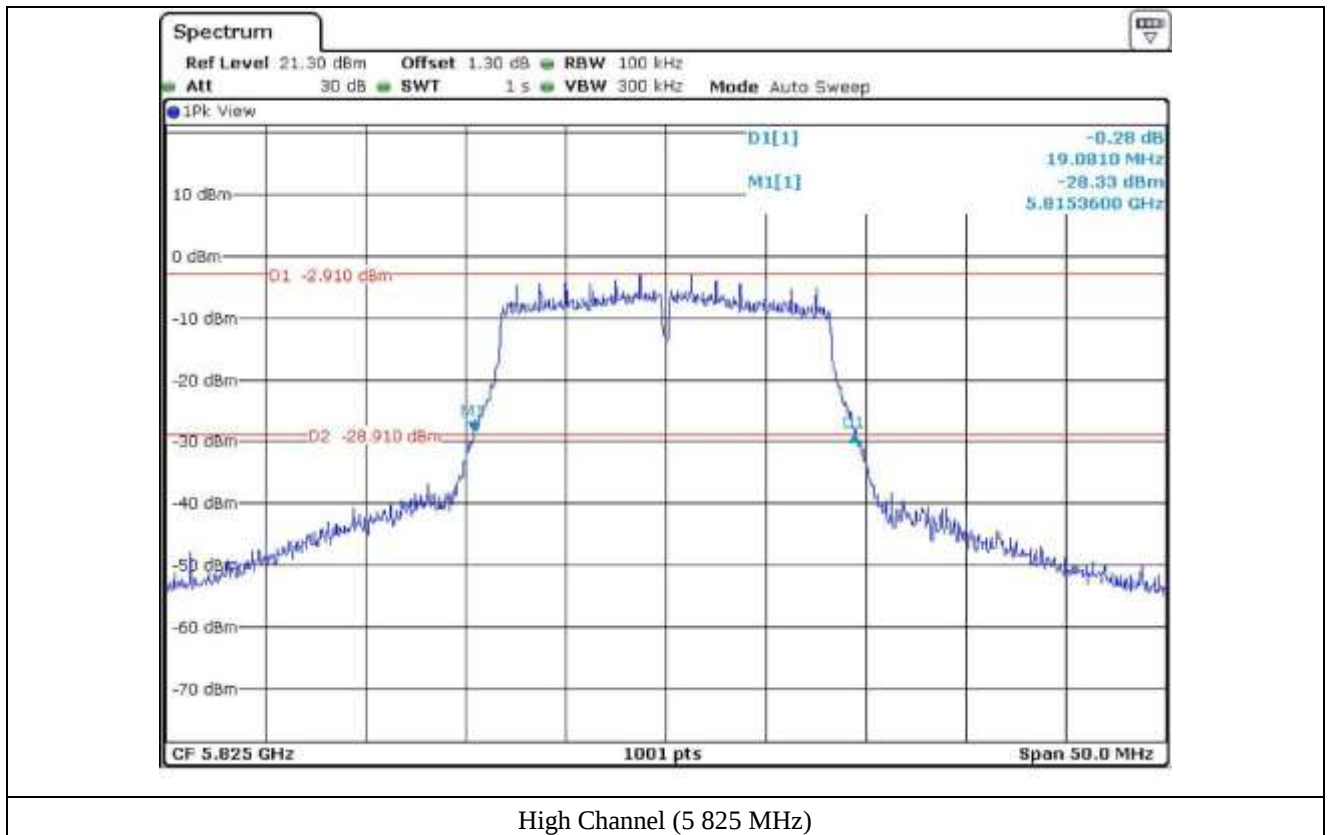




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



7.4.1.2 Test data for Antenna 1

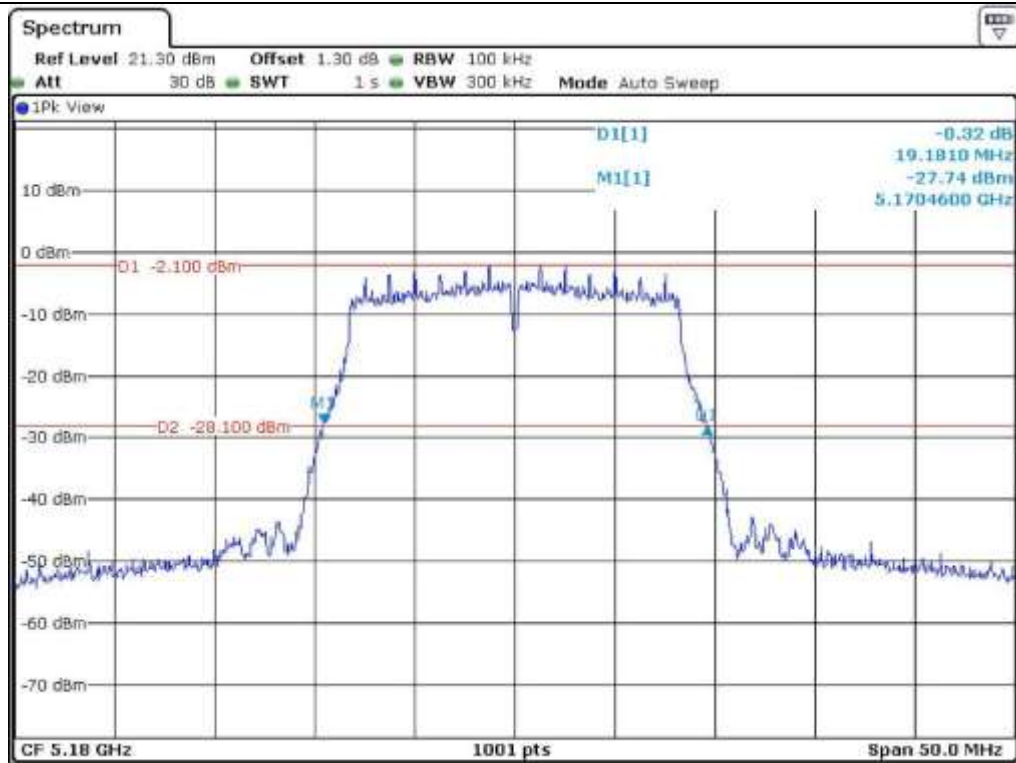
-. Test Date : January 18, 2016

-. Test Result : Pass

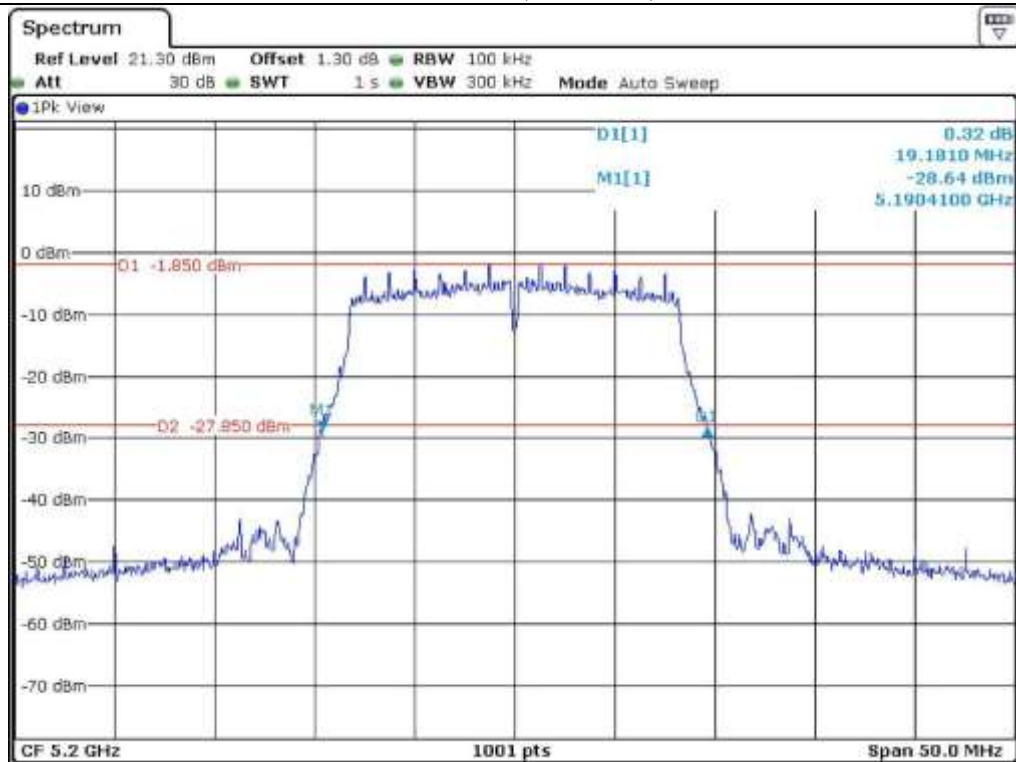
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180	19.18
	Middle	5 200	19.18
	High	5 240	19.18
5 725 ~ 5 850	Low	5 745	19.28
	Middle	5 785	19.33
	High	5 825	19.58



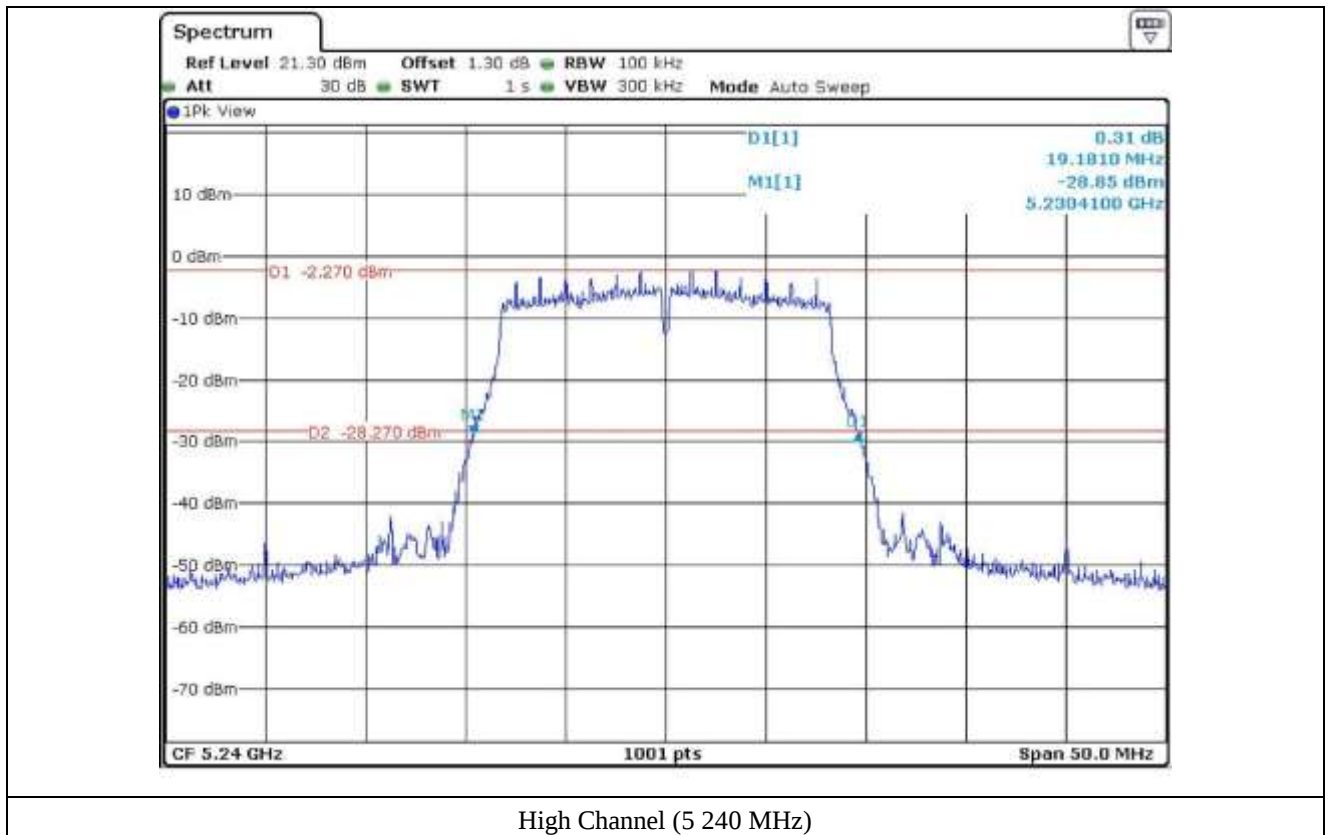
Tested by: Tae-Ho, Kim / Senior Engineer

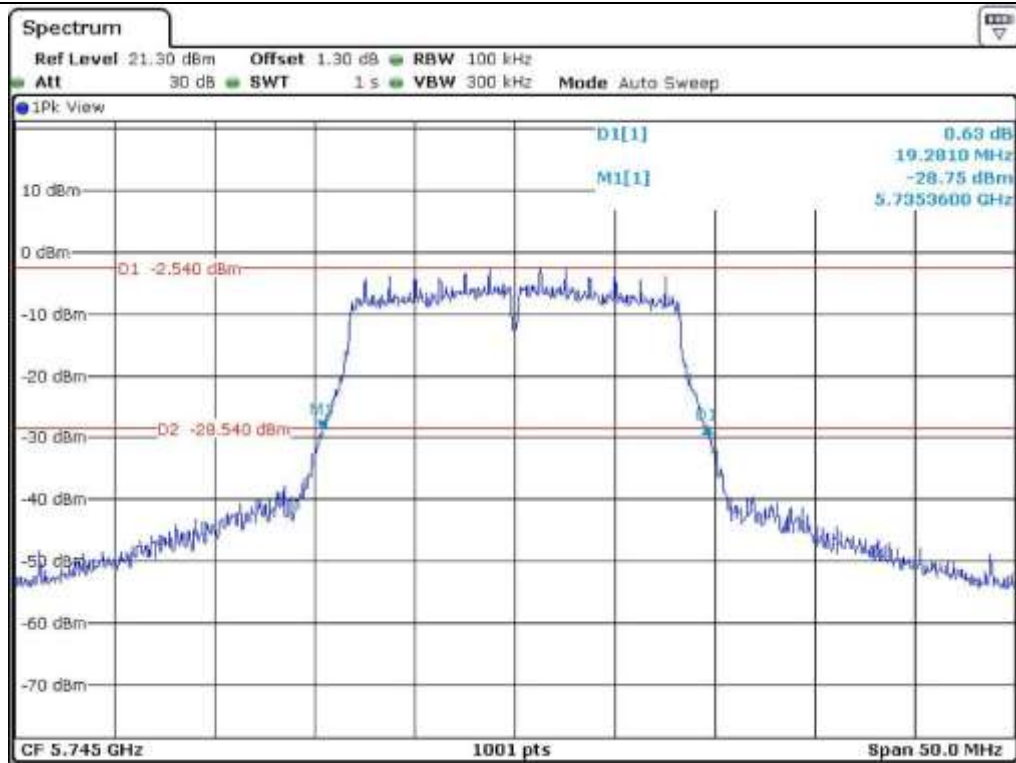


Low Channel (5 180 MHz)

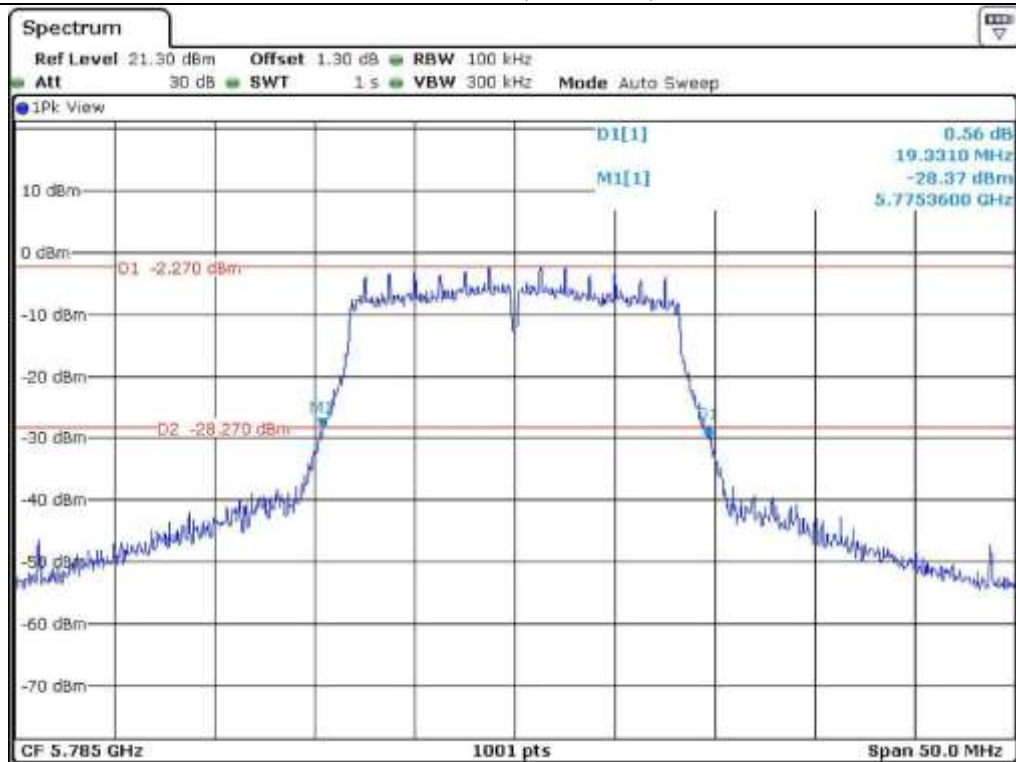


Middle Channel (5 200 MHz)

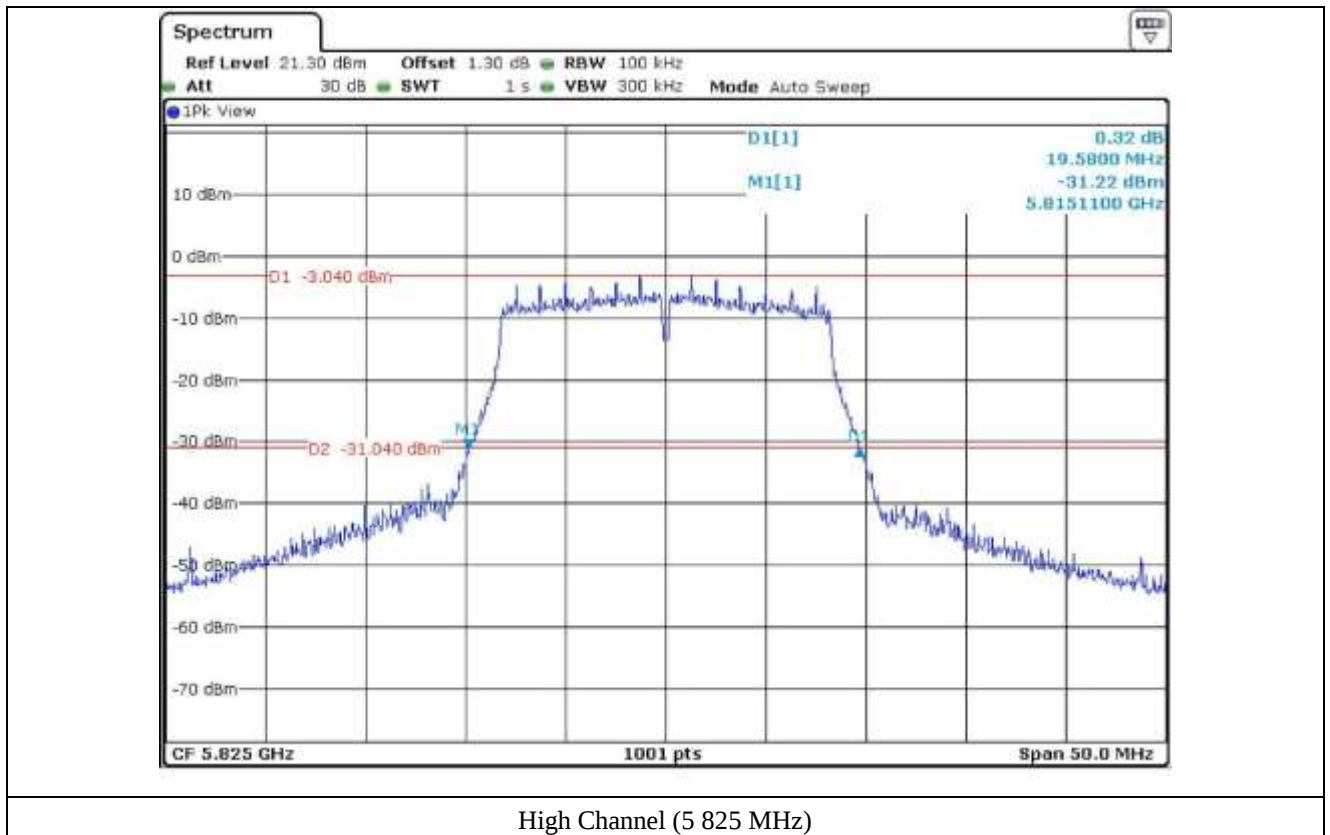




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



7.4.2 Test data for 802.11n_HT20 RLAN Mode

7.4.2.1 Test data for Antenna 0

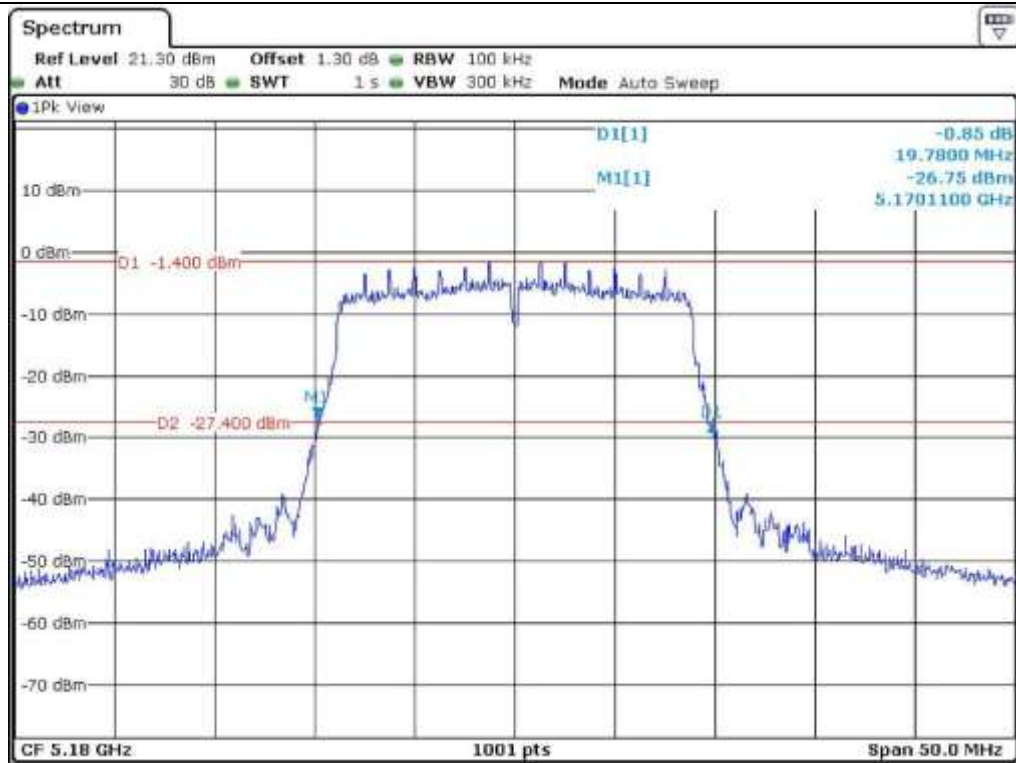
-. Test Date : January 18, 2016

-. Test Result : Pass

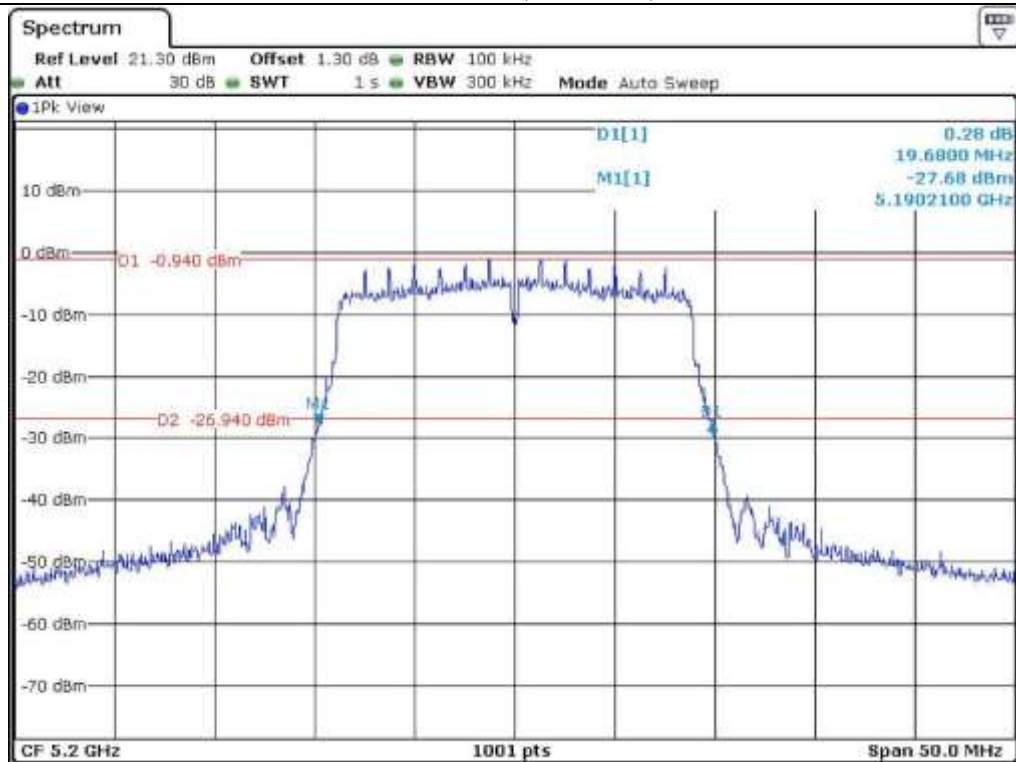
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180	19.78
	Middle	5 200	19.68
	High	5 240	19.63
5 725 ~ 5 850	Low	5 745	19.68
	Middle	5 785	19.58
	High	5 825	19.83



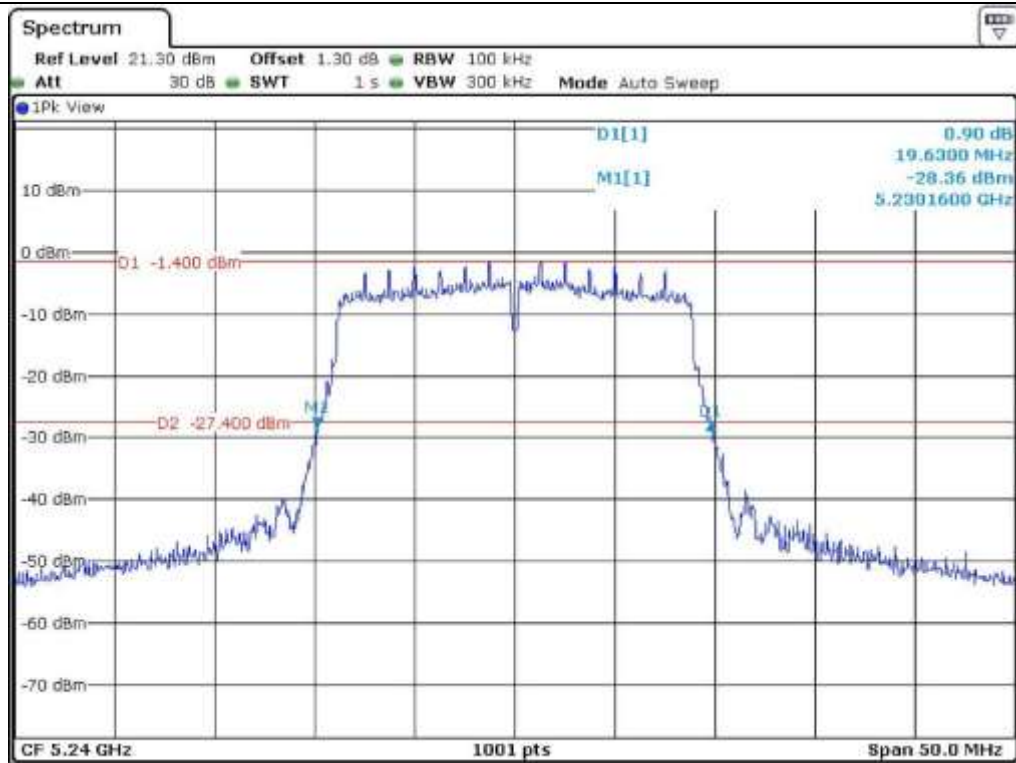
Tested by: Tae-Ho, Kim / Senior Engineer



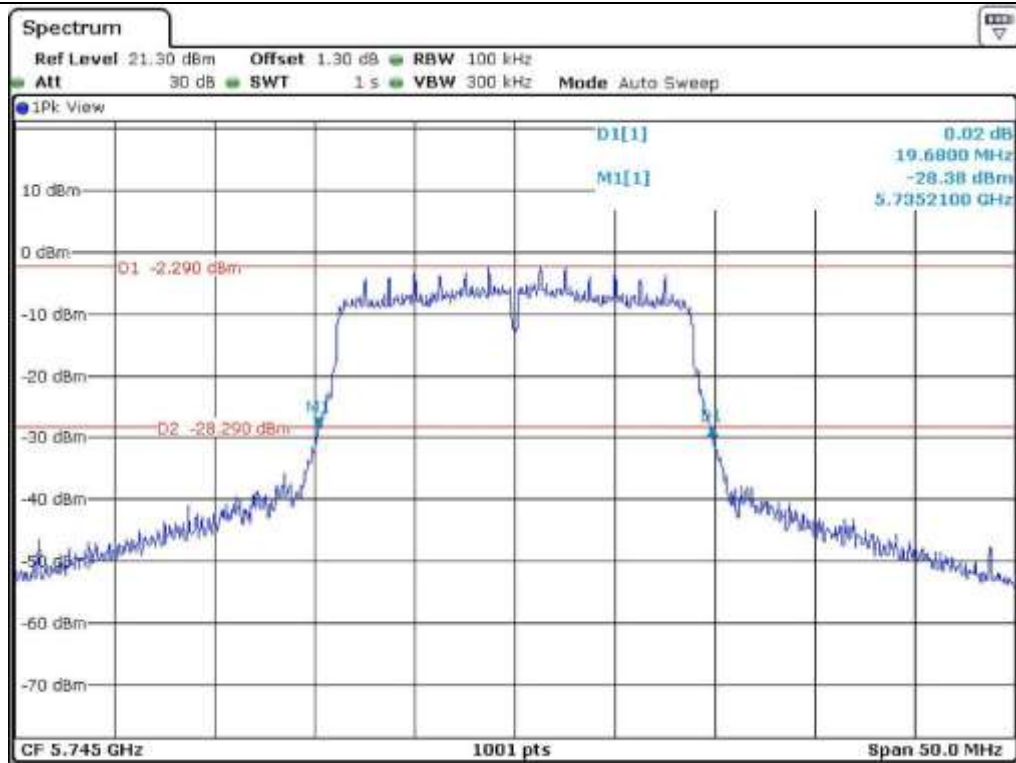
Low Channel (5 180 MHz)



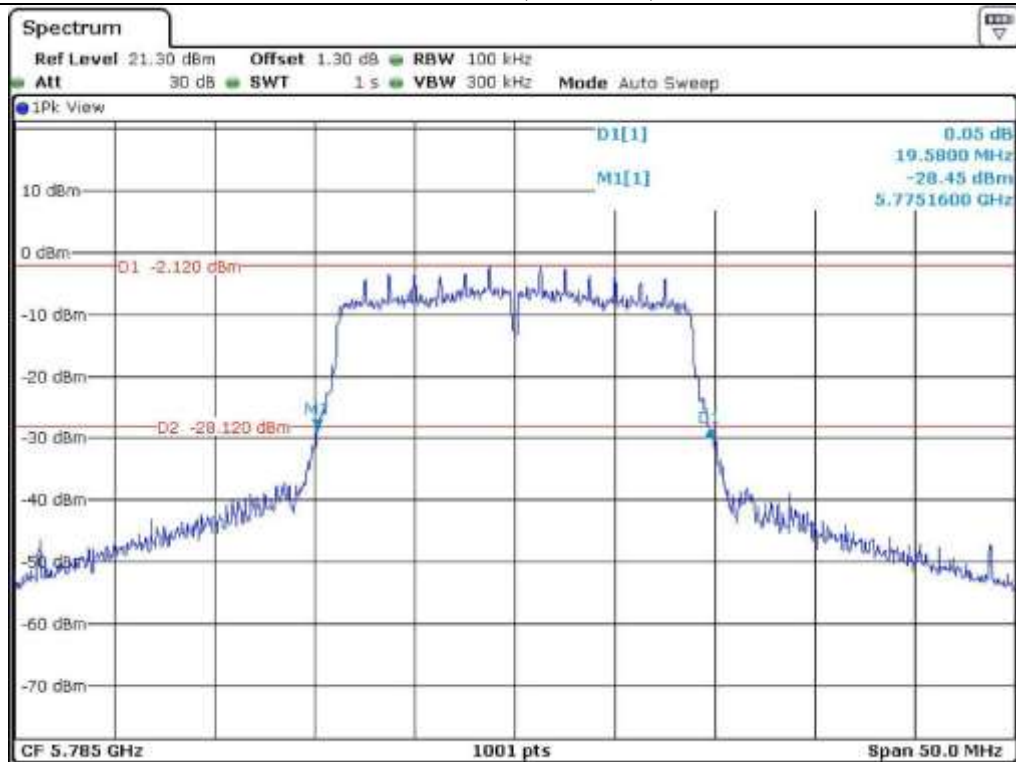
Middle Channel (5 200 MHz)



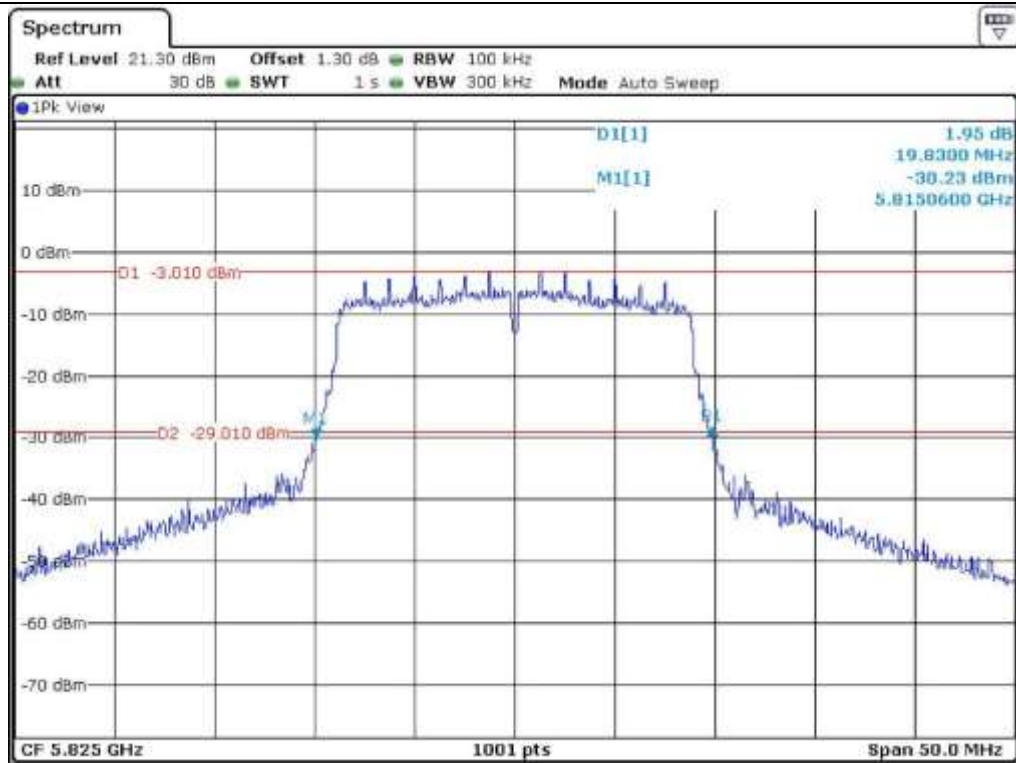
High Channel (5 240 MHz)



Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



High Channel (5 825 MHz)

7.4.2.2 Test data for Antenna 1

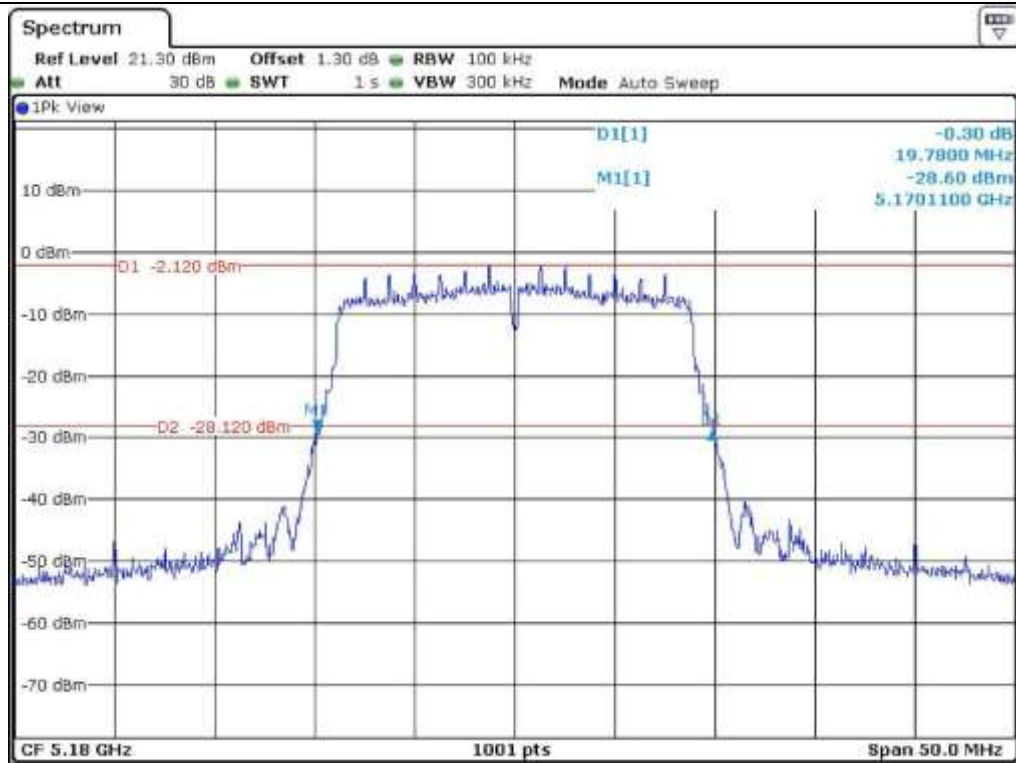
-. Test Date : January 18, 2016

-. Test Result : Pass

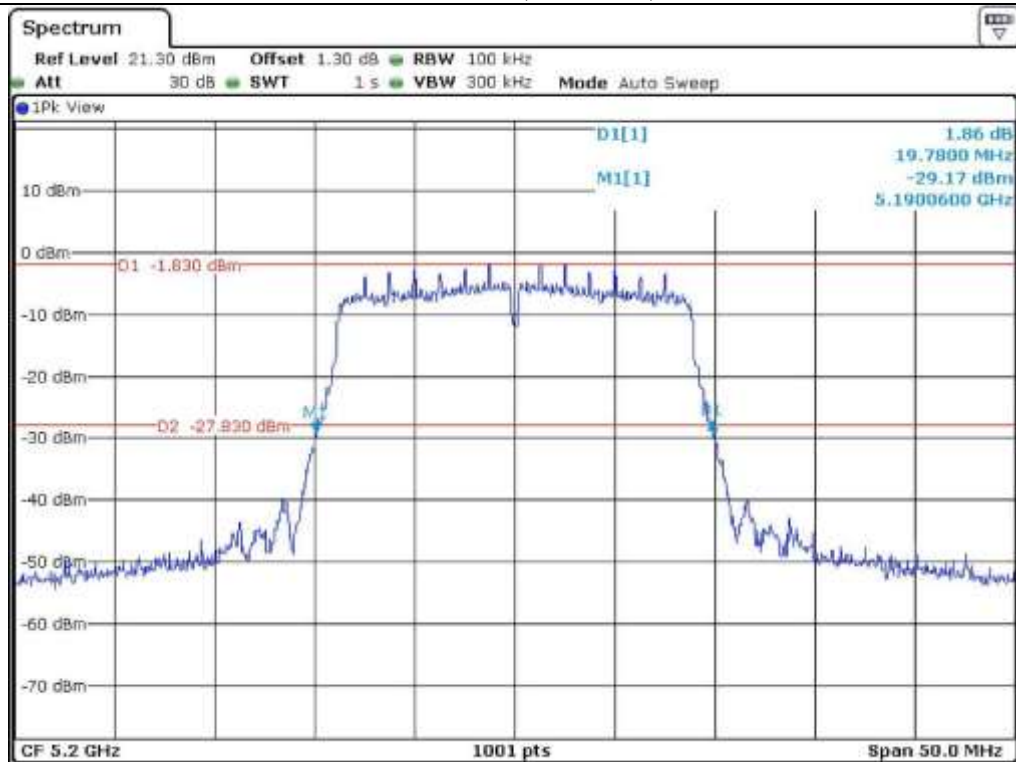
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180	19.78
	Middle	5 200	19.78
	High	5 240	19.78
5 725 ~ 5 850	Low	5 745	19.58
	Middle	5 785	19.63
	High	5 825	19.73



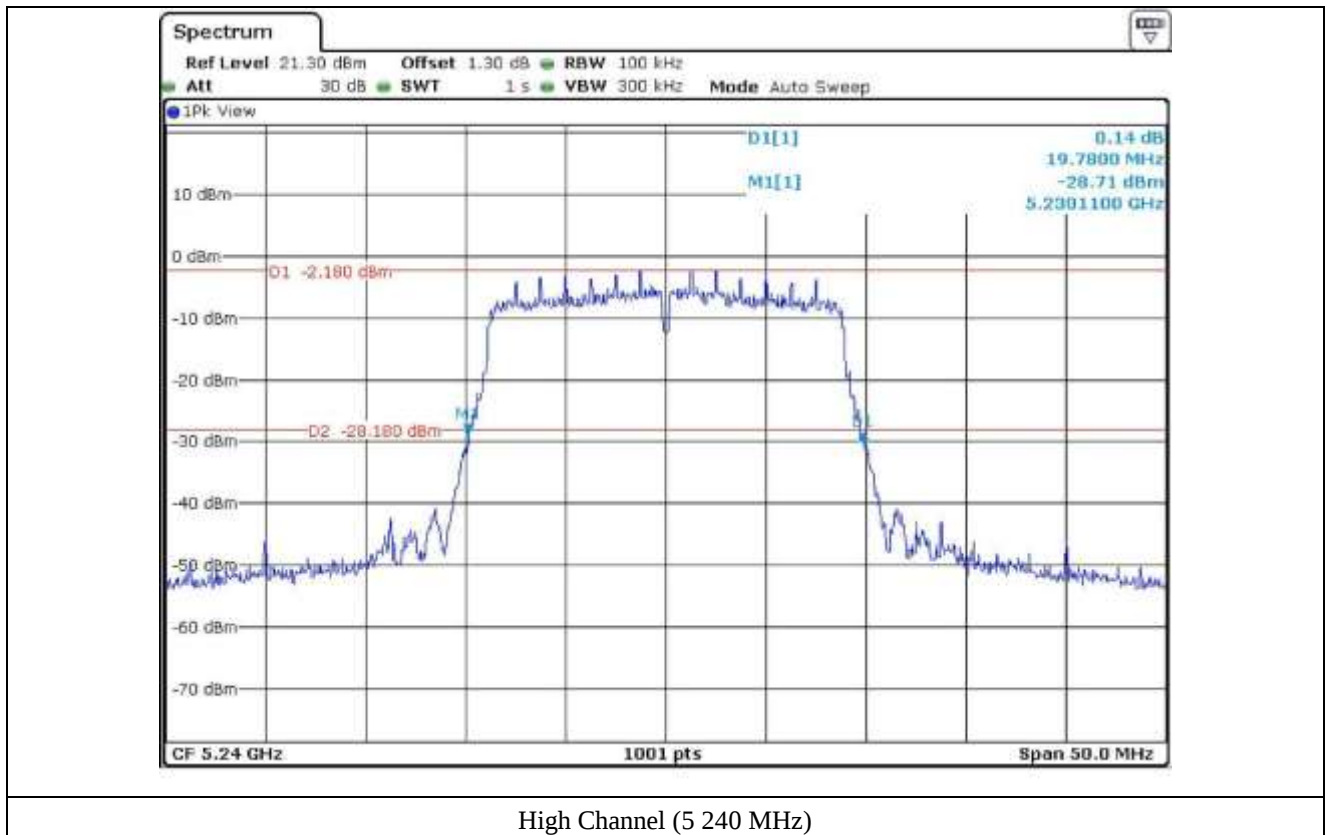
Tested by: Tae-Ho, Kim / Senior Engineer

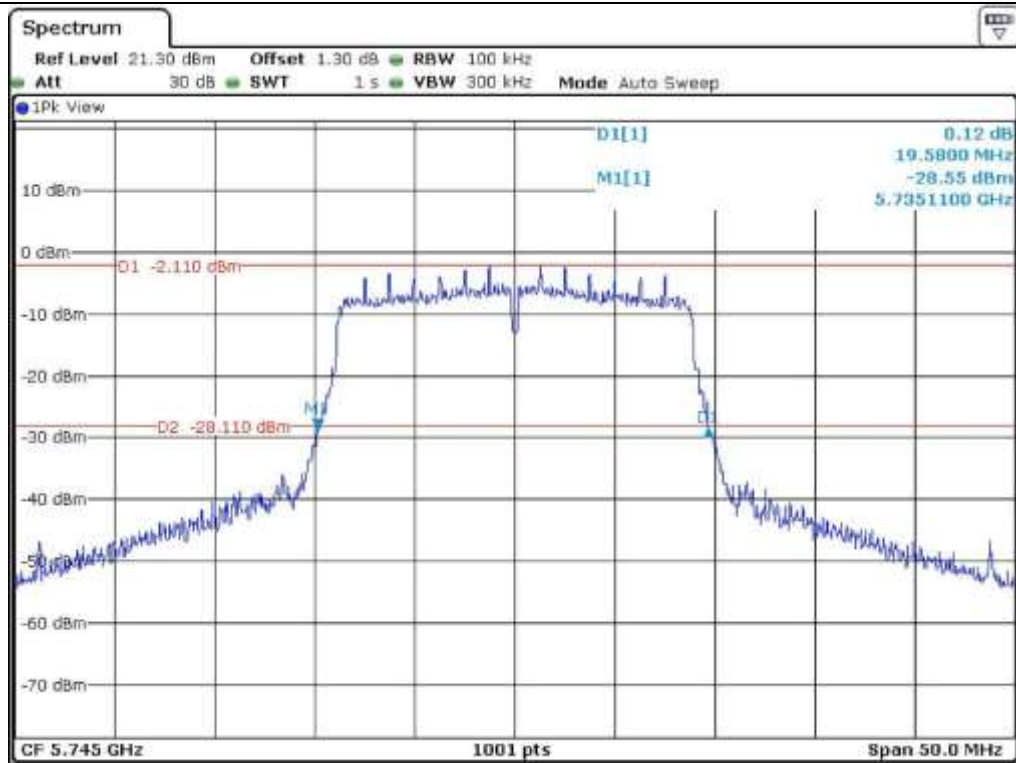


Low Channel (5 180 MHz)

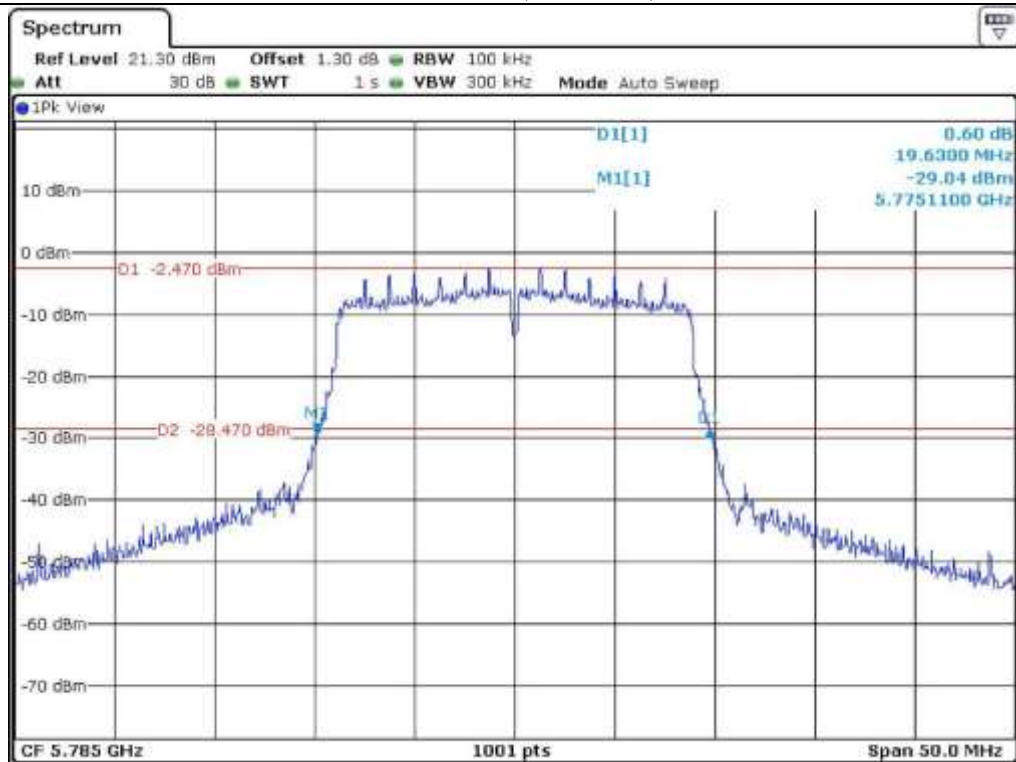


Middle Channel (5 200 MHz)





Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)

7.4.3 Test data for 802.11n_HT40 RLAN Mode

7.4.3.1 Test data for Antenna 0

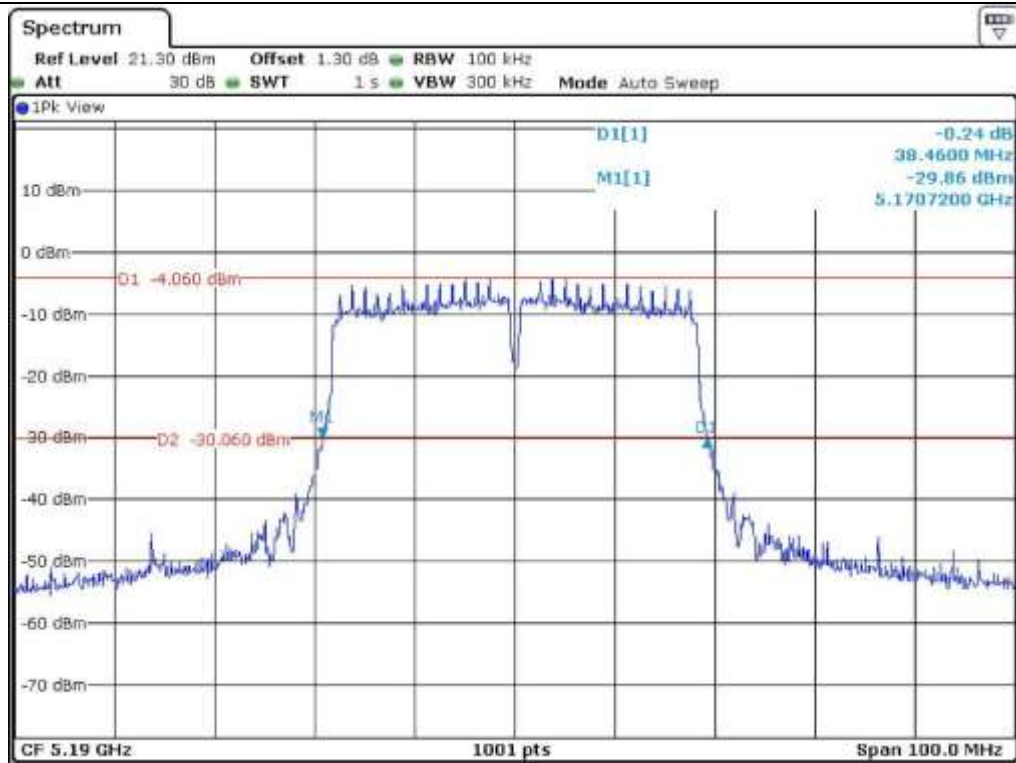
-. Test Date : January 18, 2016

-. Test Result : Pass

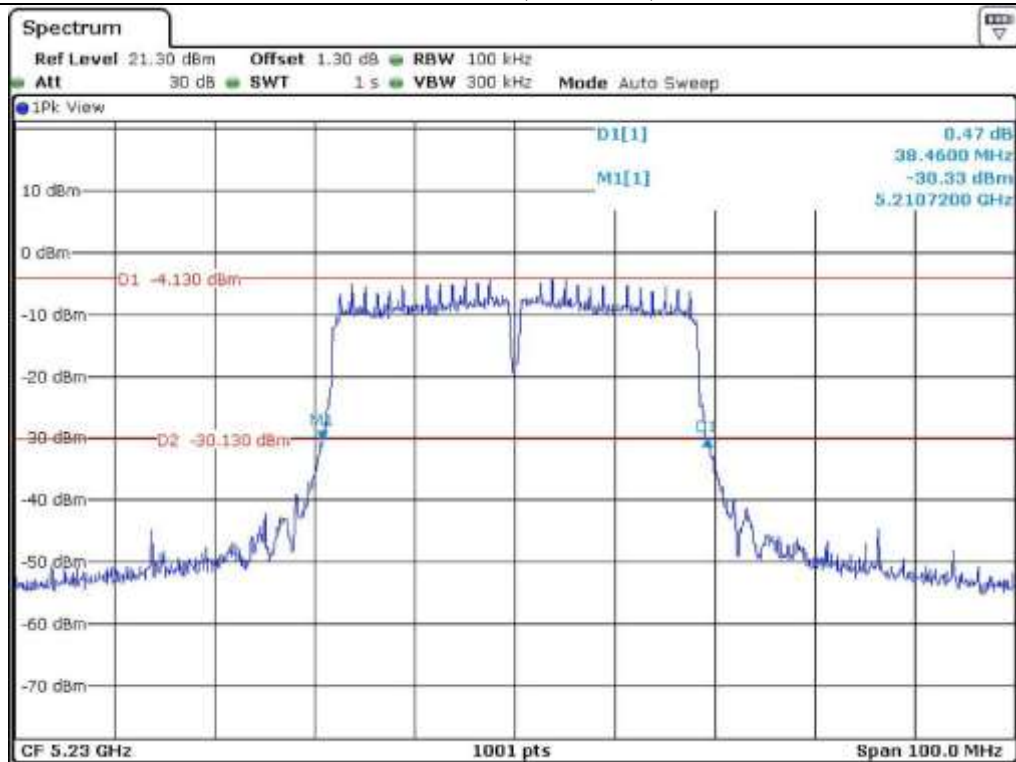
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190	38.46
	High	5 230	38.46
5 725 ~ 5 850	Low	5 755	38.36
	High	5 795	38.66



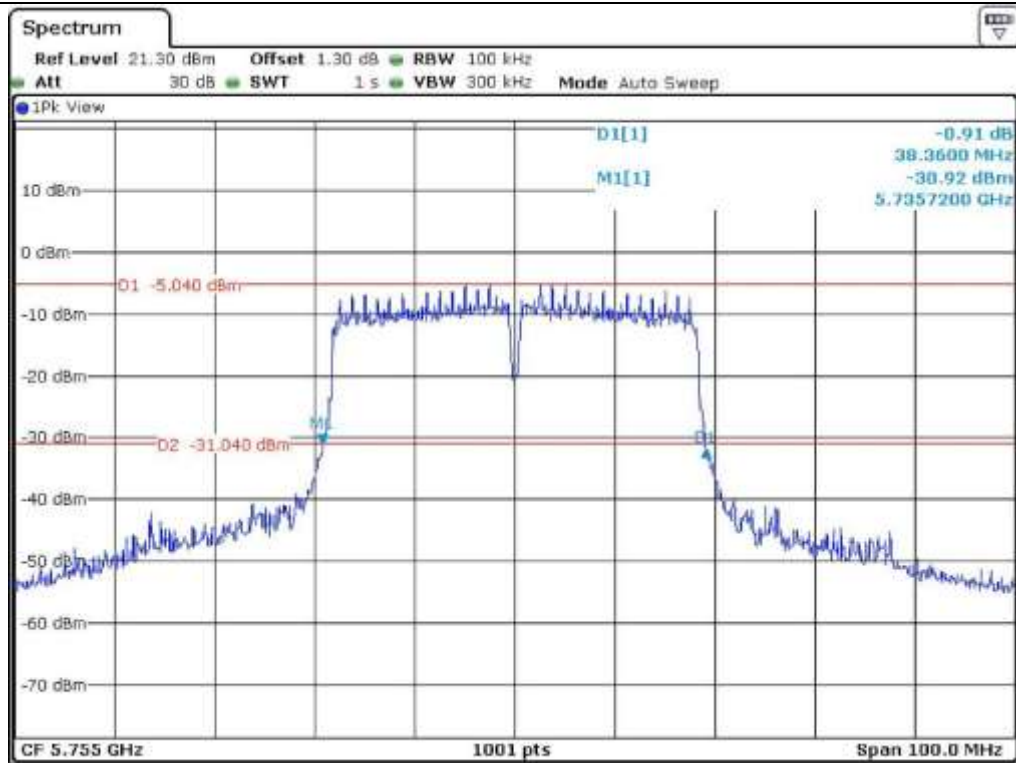
Tested by: Tae-Ho, Kim / Senior Engineer



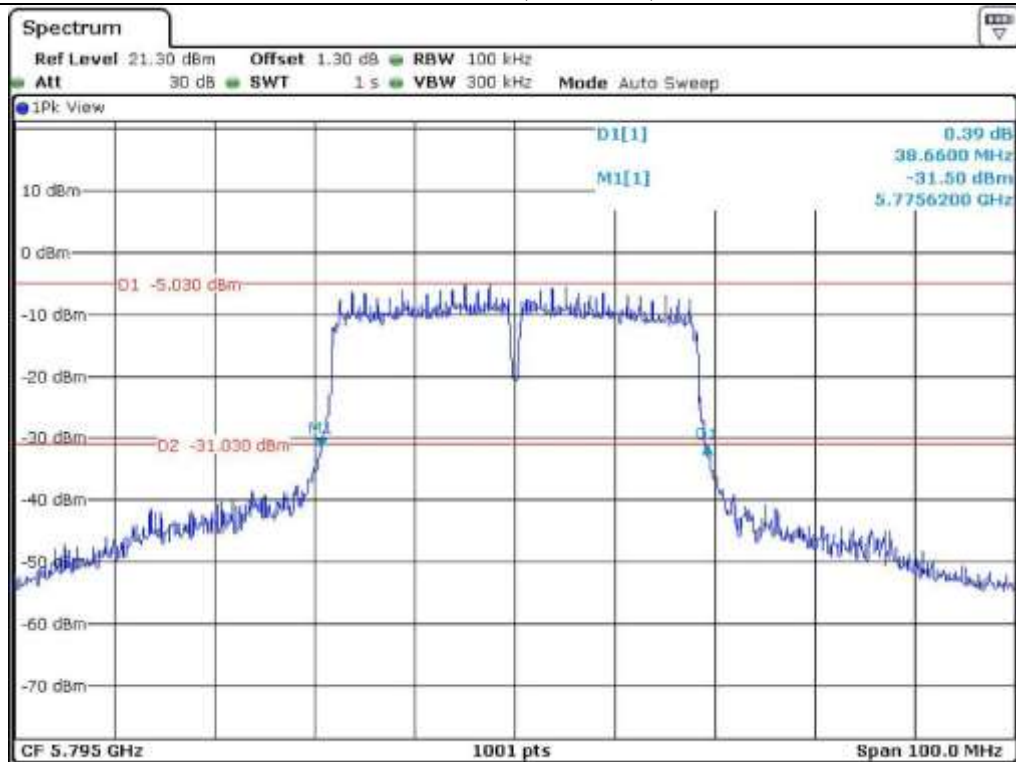
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

7.4.3.2 Test data for Antenna 1

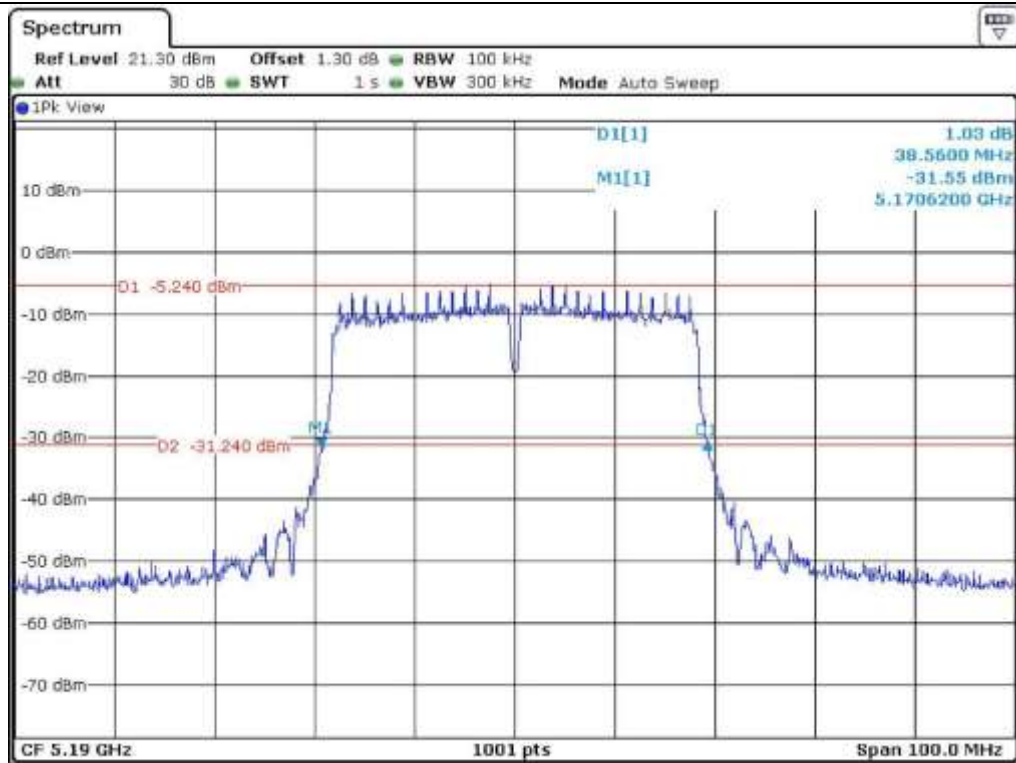
-. Test Date : January 18, 2016

-. Test Result : Pass

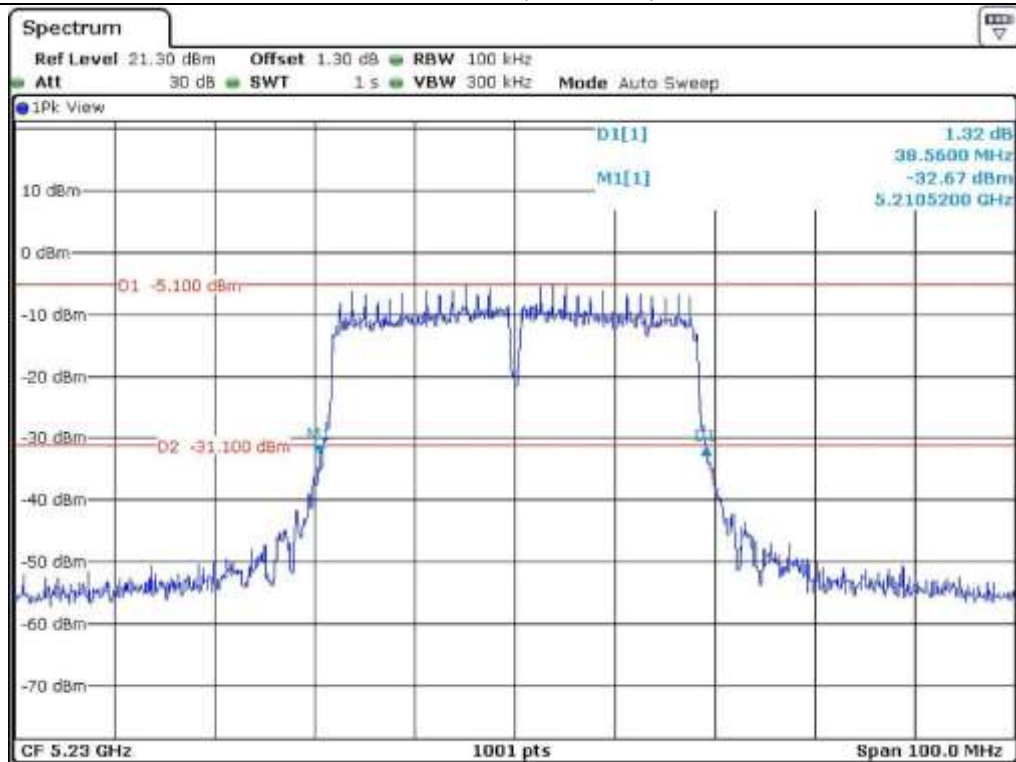
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190	38.56
	High	5 230	38.56
5 725 ~ 5 850	Low	5 755	38.36
	High	5 795	38.36



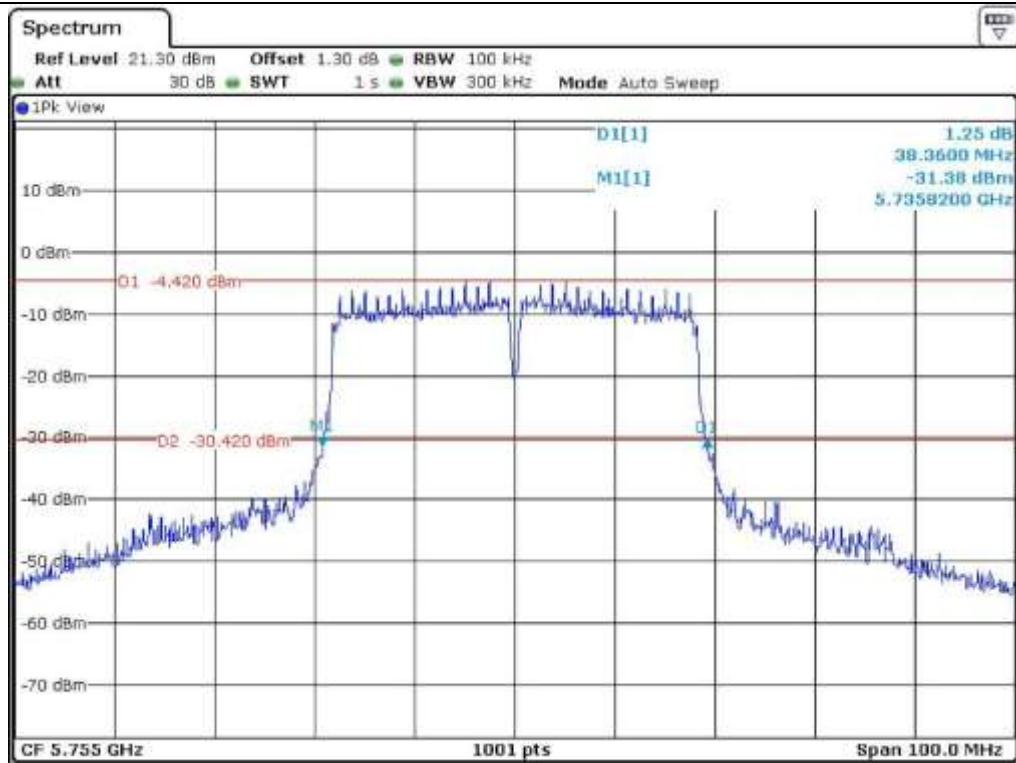
Tested by: Tae-Ho, Kim / Senior Engineer



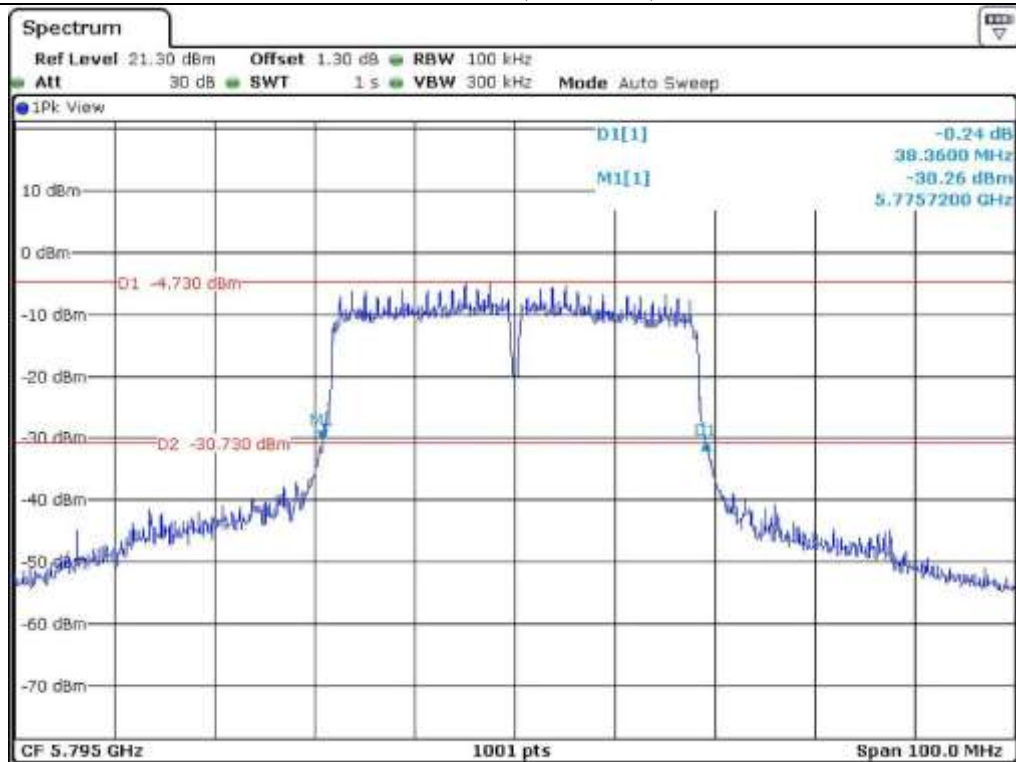
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

7.4.4 Test data for 802.11ac20 RLAN Mode

7.4.4.1 Test data for Antenna 0

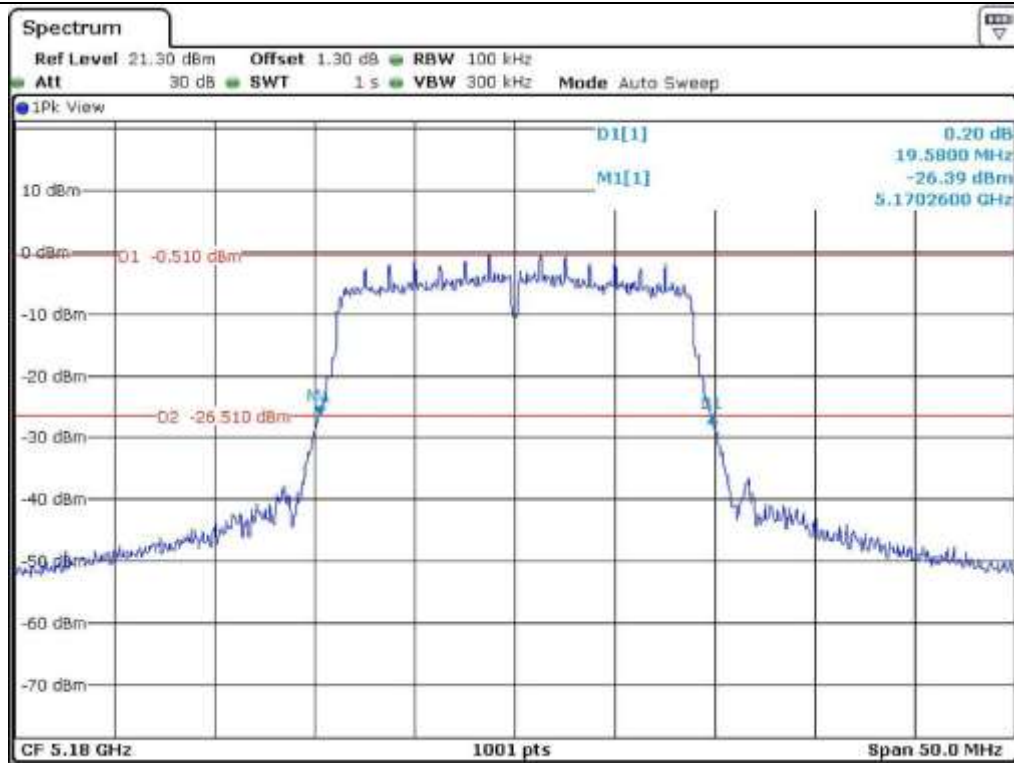
-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180	19.58
	Middle	5 200	19.58
	High	5 240	19.58
5 725 ~ 5 850	Low	5 745	19.68
	Middle	5 785	19.63
	High	5 825	19.53



Tested by: Tae-Ho, Kim / Senior Engineer



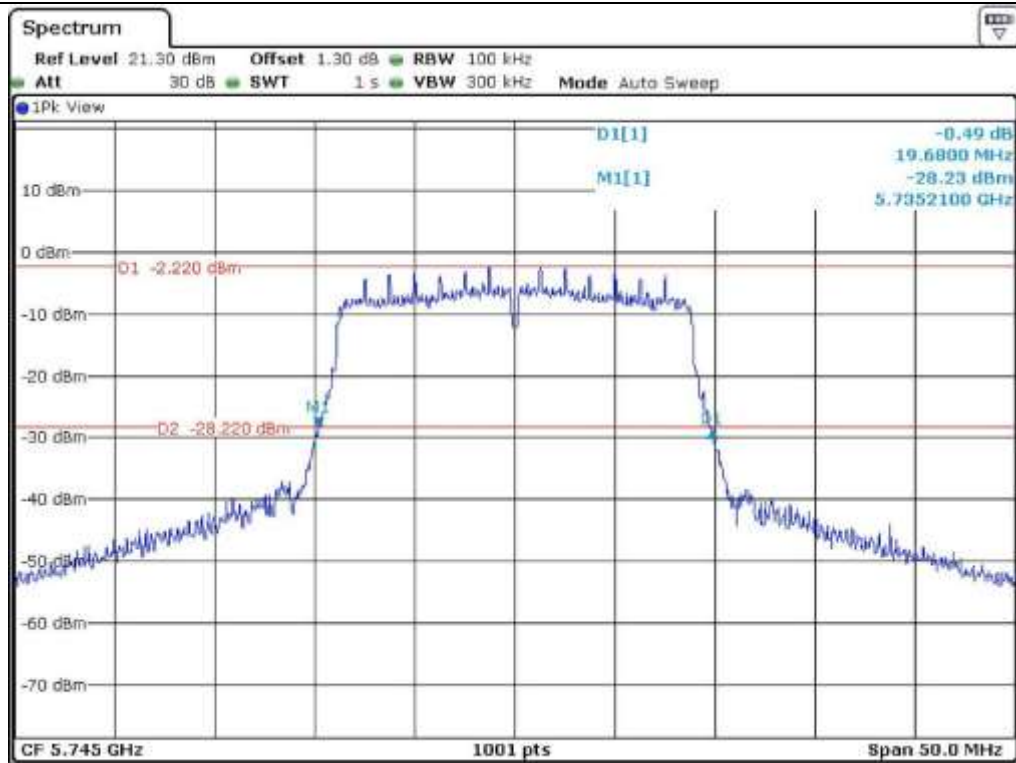
Low Channel (5 180 MHz)



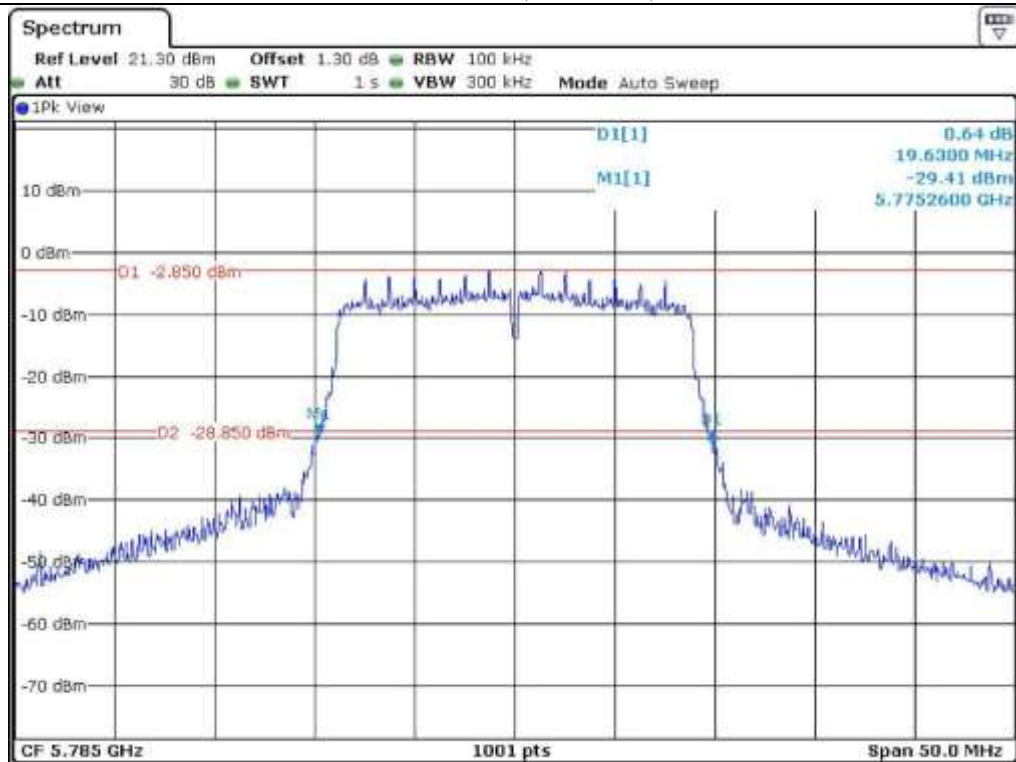
Middle Channel (5 200 MHz)



High Channel (5 240 MHz)



Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)

EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

7.4.4.2 Test data for Antenna 1

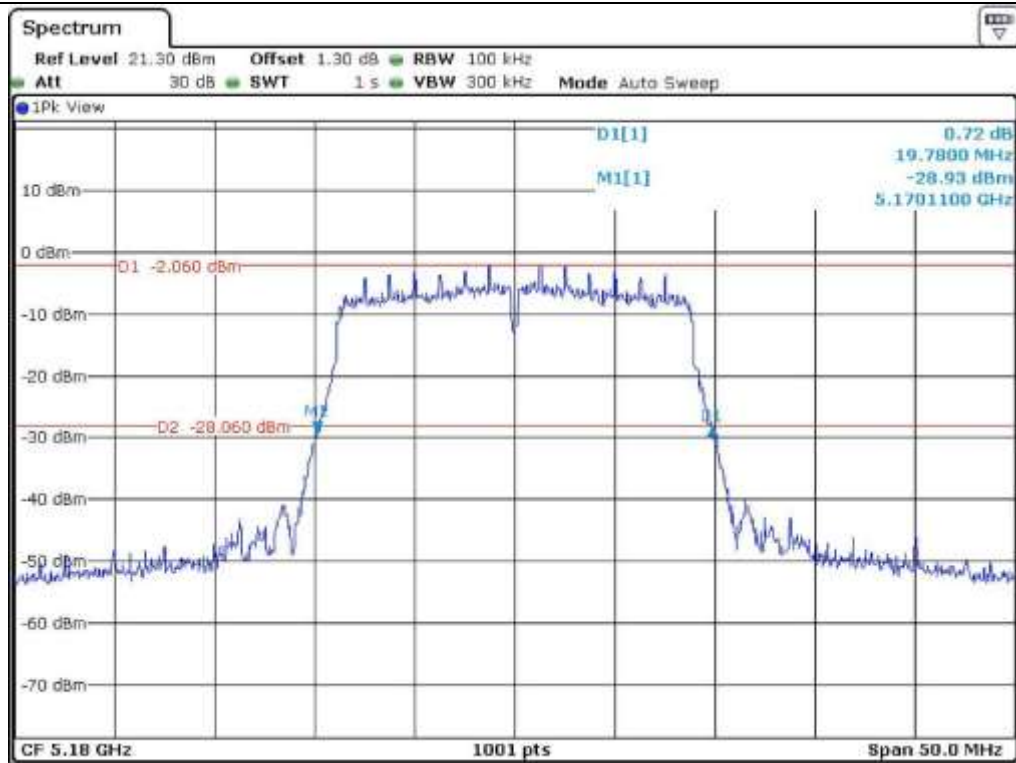
-. Test Date : January 18, 2016

-. Test Result : Pass

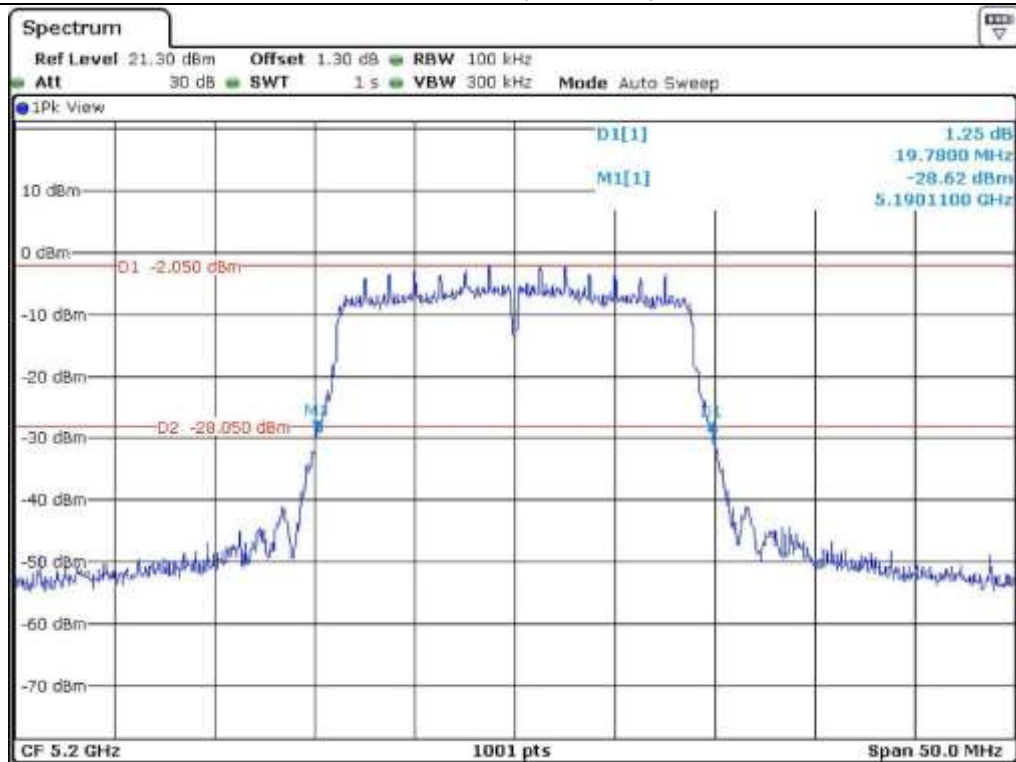
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180	19.78
	Middle	5 200	19.78
	High	5 240	19.78
5 725 ~ 5 850	Low	5 745	19.63
	Middle	5 785	19.58
	High	5 825	19.63



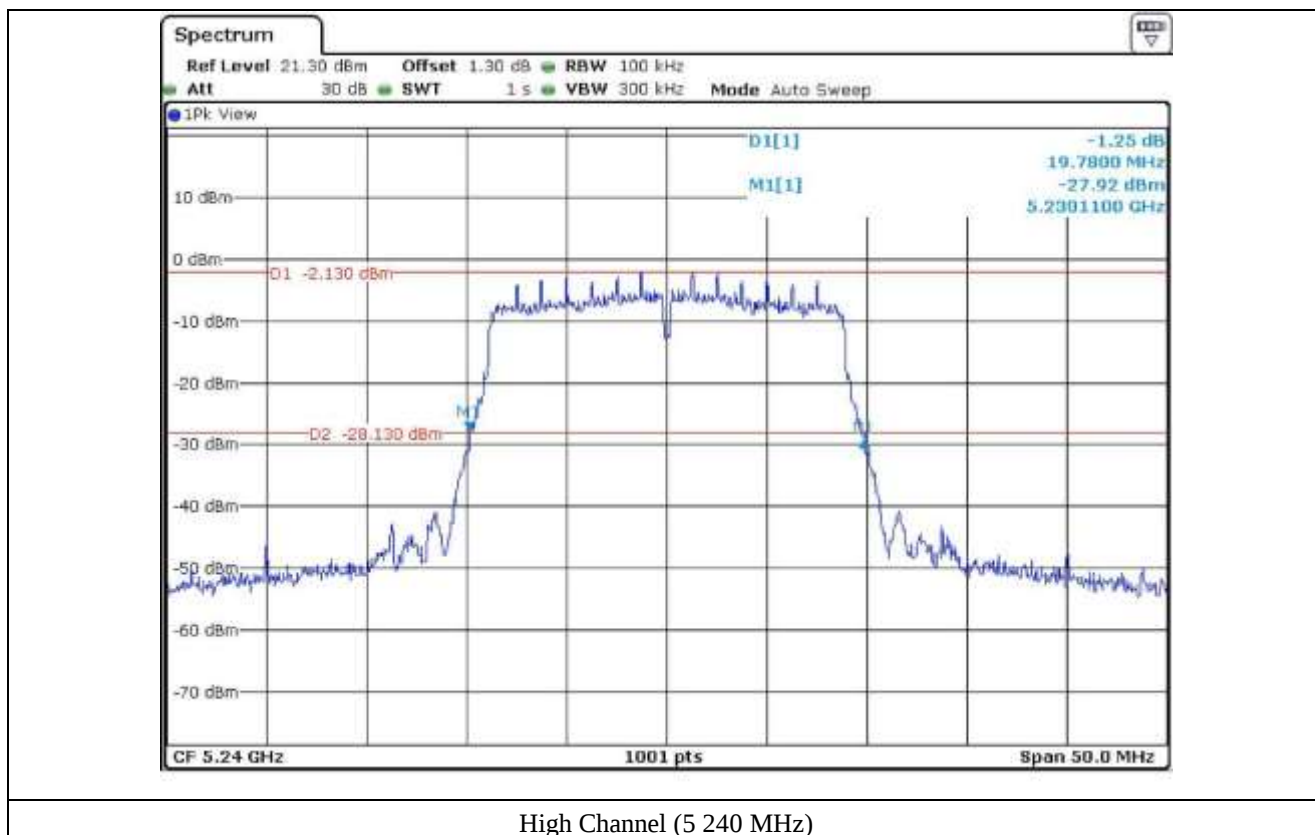
Tested by: Tae-Ho, Kim / Senior Engineer

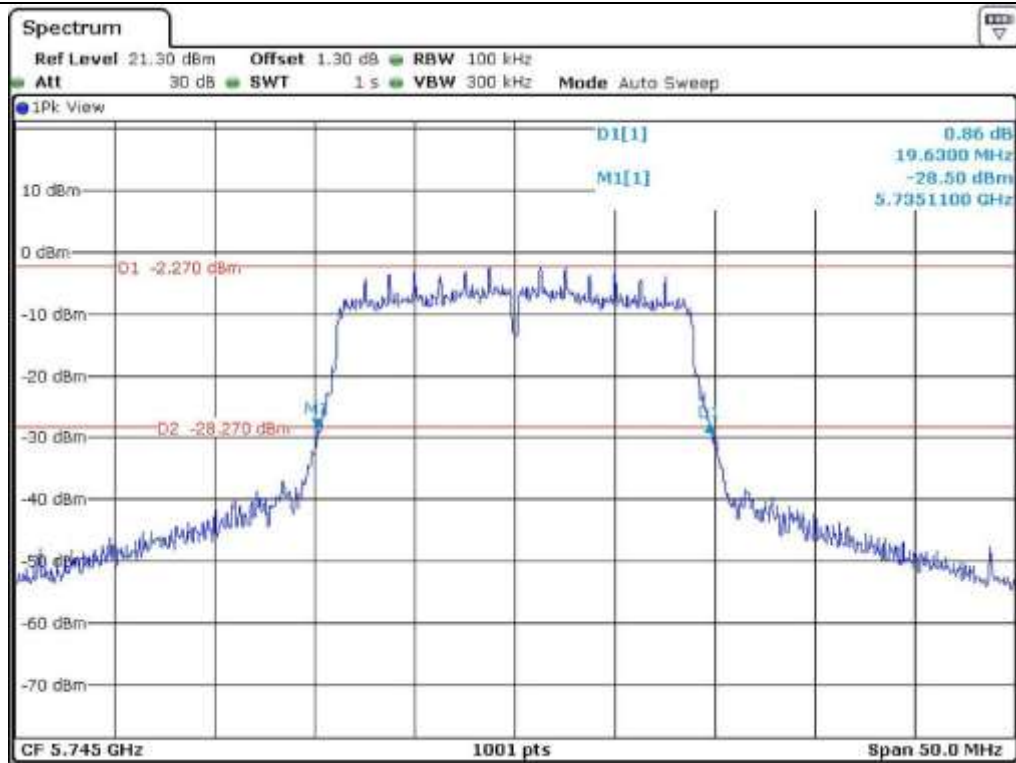


Low Channel (5 180 MHz)

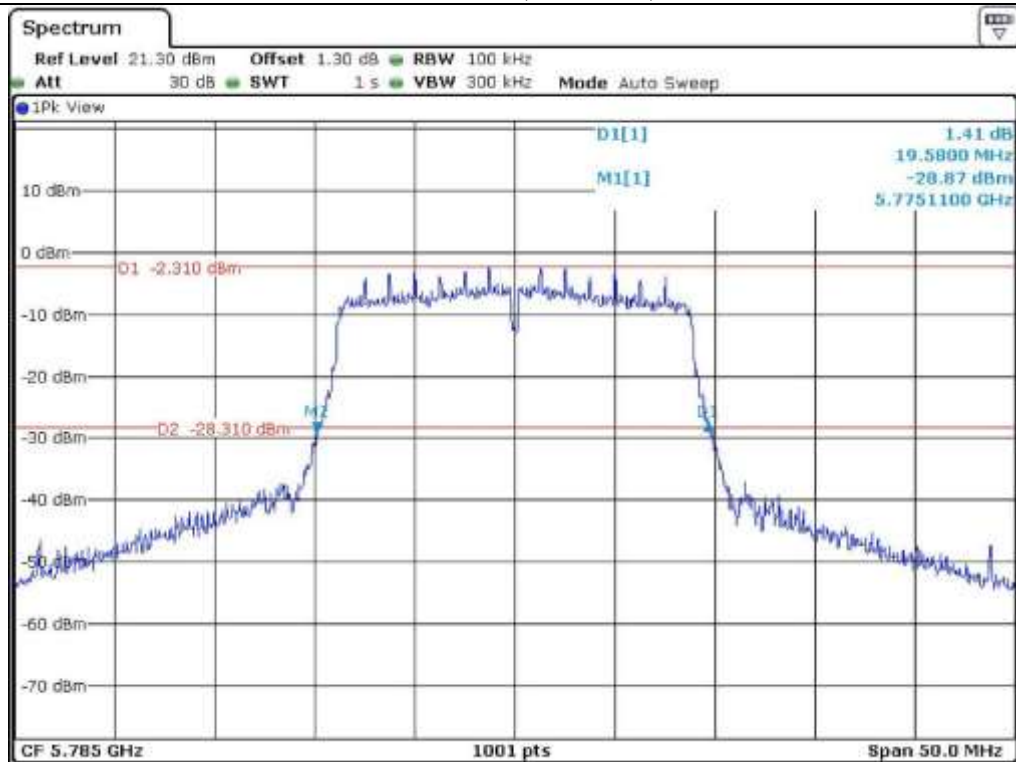


Middle Channel (5 200 MHz)

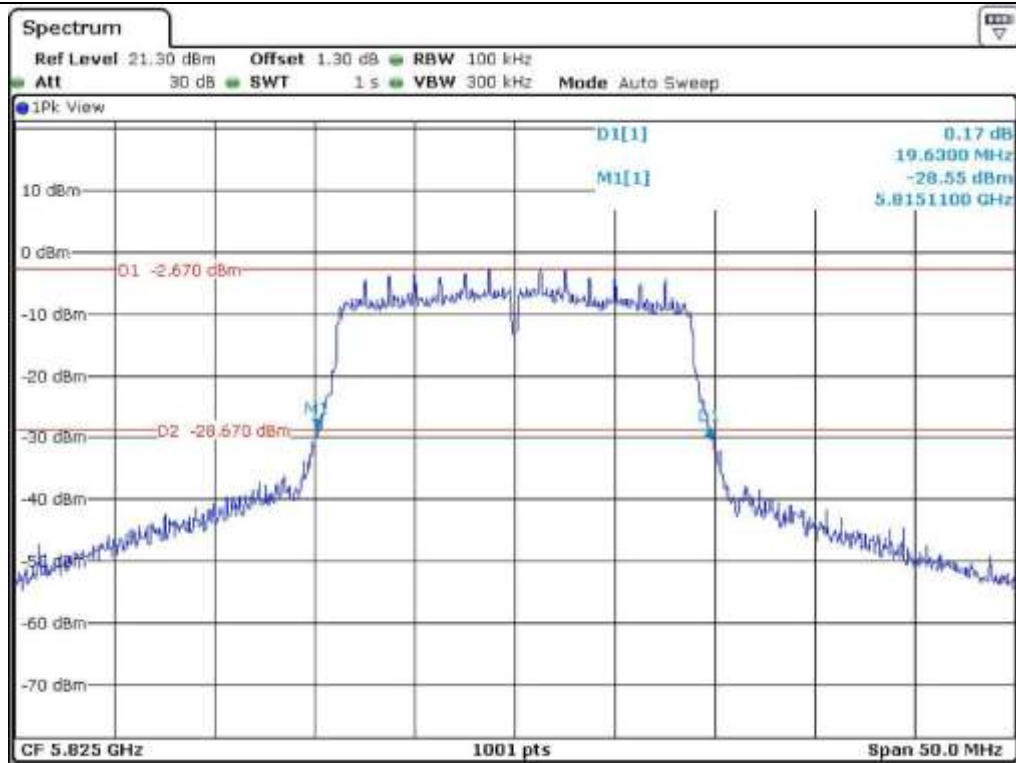




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



High Channel (5 825 MHz)

7.4.5 Test data for 802.11ac40 RLAN Mode

7.4.5.1 Test data for Antenna 0

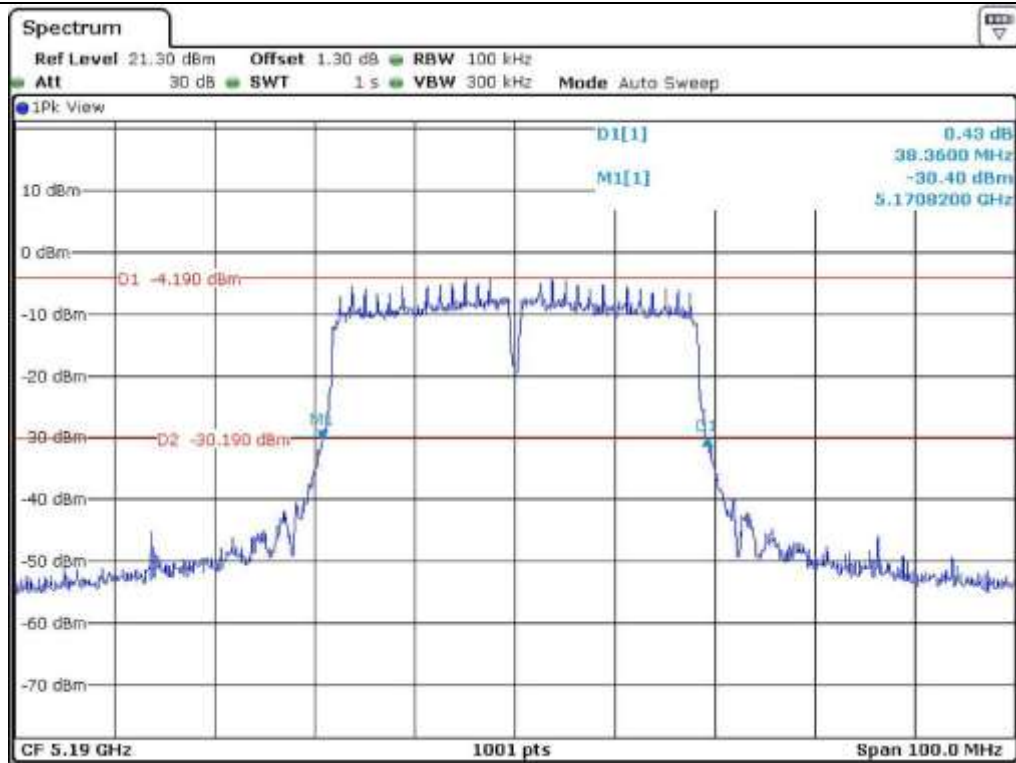
-. Test Date : January 18, 2016

-. Test Result : Pass

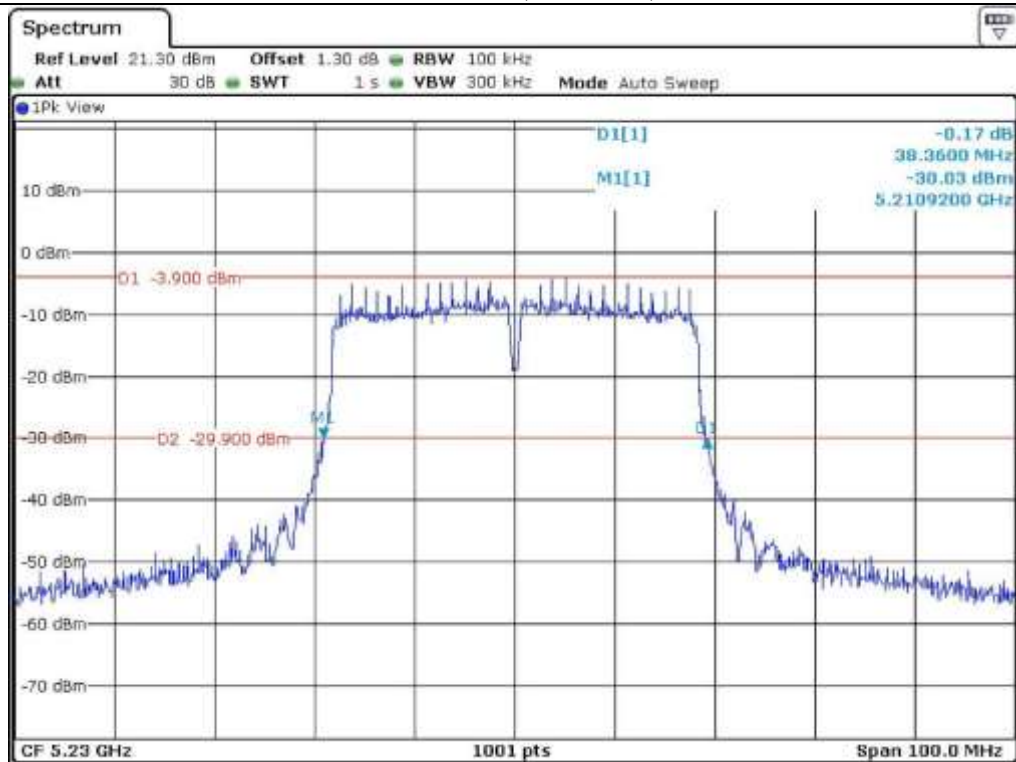
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190	38.36
	High	5 230	38.36
5 725 ~ 5 850	Low	5 755	38.56
	High	5 795	38.36



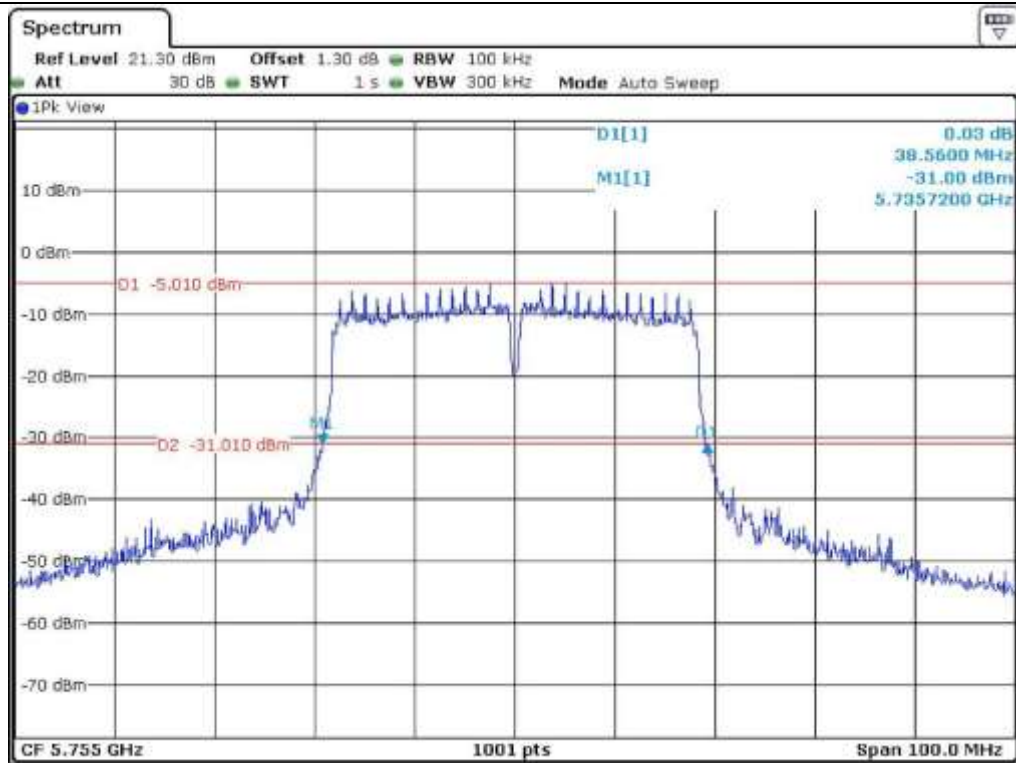
Tested by: Tae-Ho, Kim / Senior Engineer



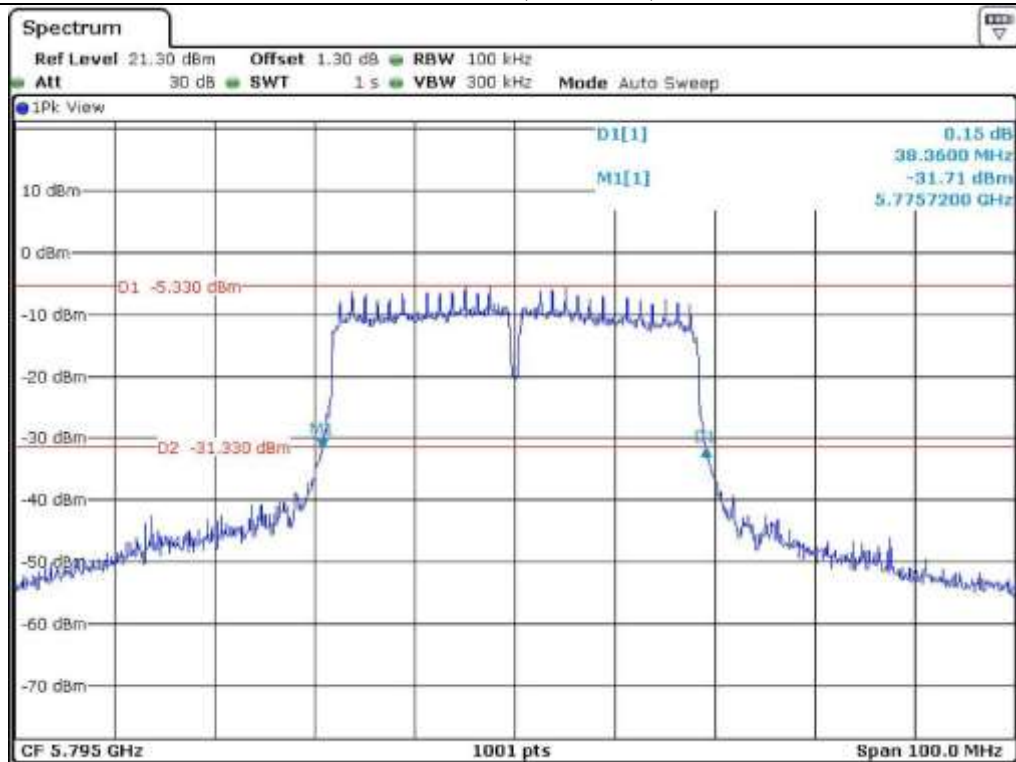
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

7.4.5.2 Test data for Antenna 1

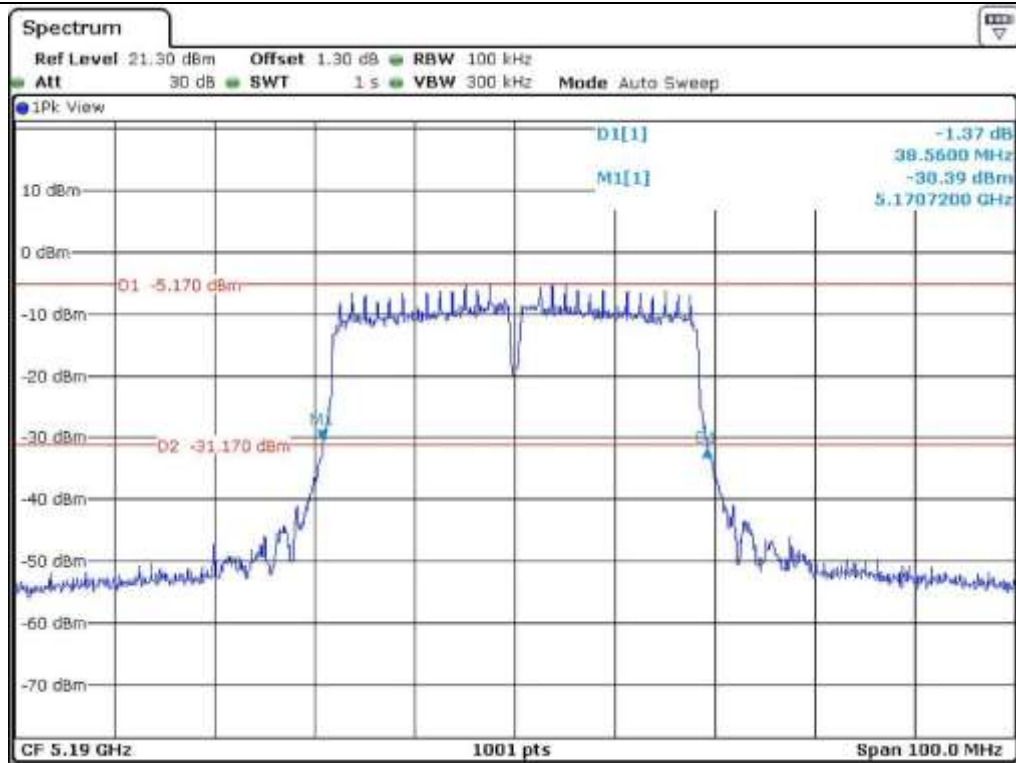
-. Test Date : January 18, 2016

-. Test Result : Pass

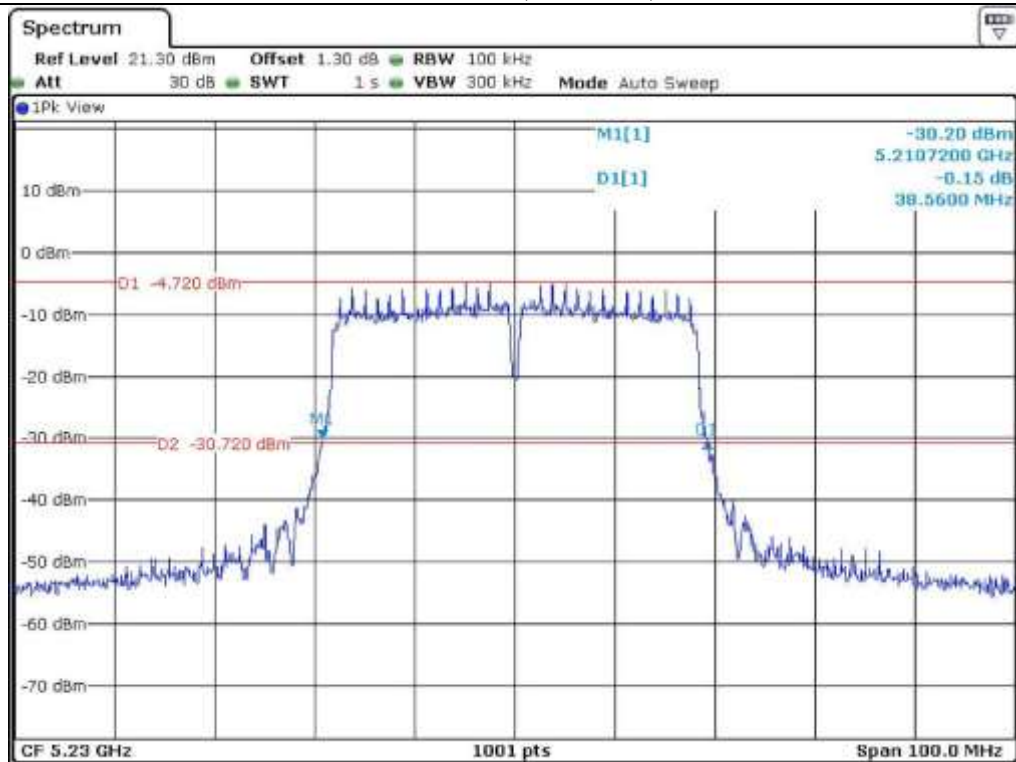
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190	38.56
	High	5 230	38.56
5 725 ~ 5 850	Low	5 755	38.66
	High	5 795	38.76



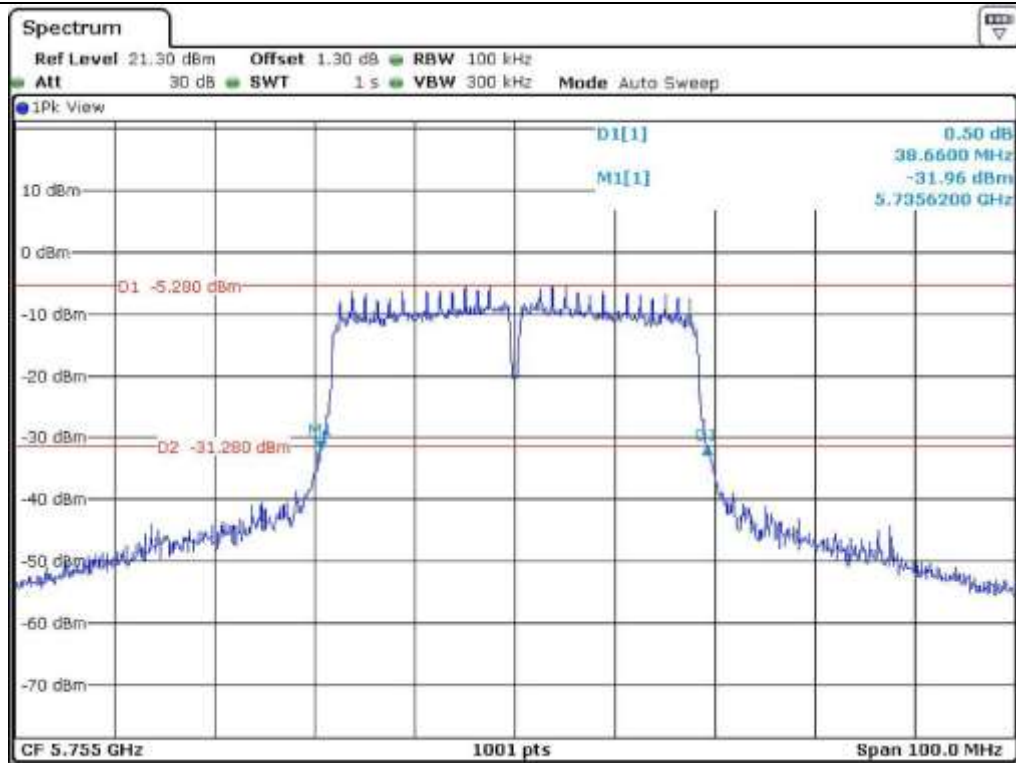
Tested by: Tae-Ho, Kim / Senior Engineer



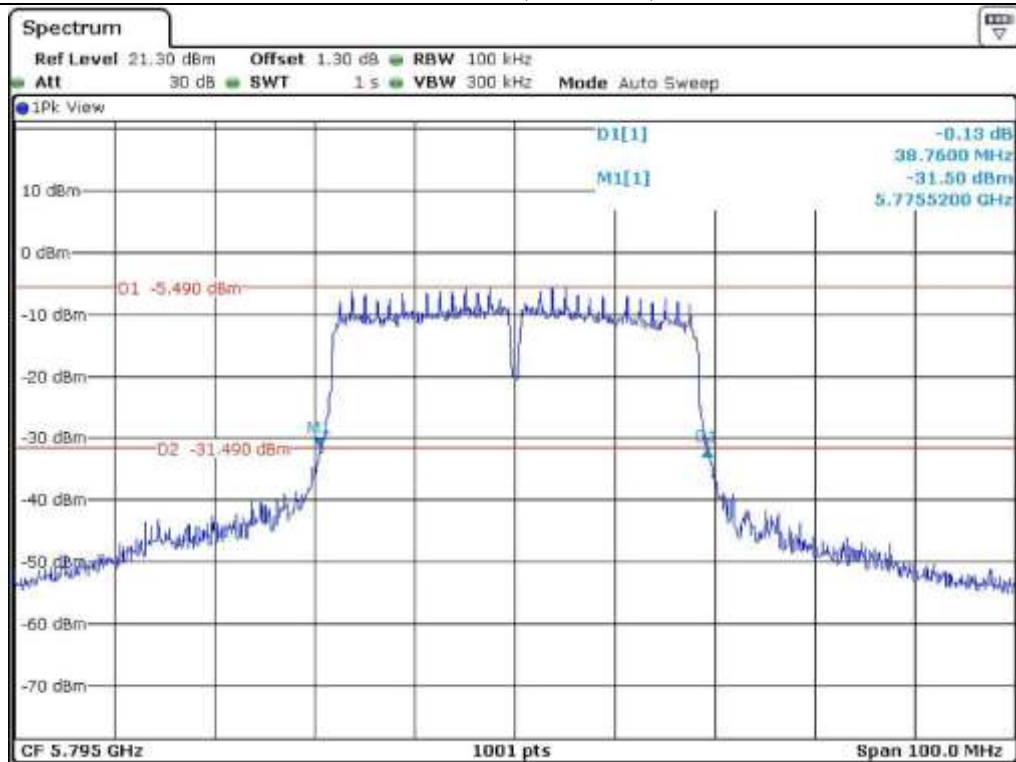
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

7.4.6 Test data for 802.11ac80 RLAN Mode

7.4.6.1 Test data for Antenna 0

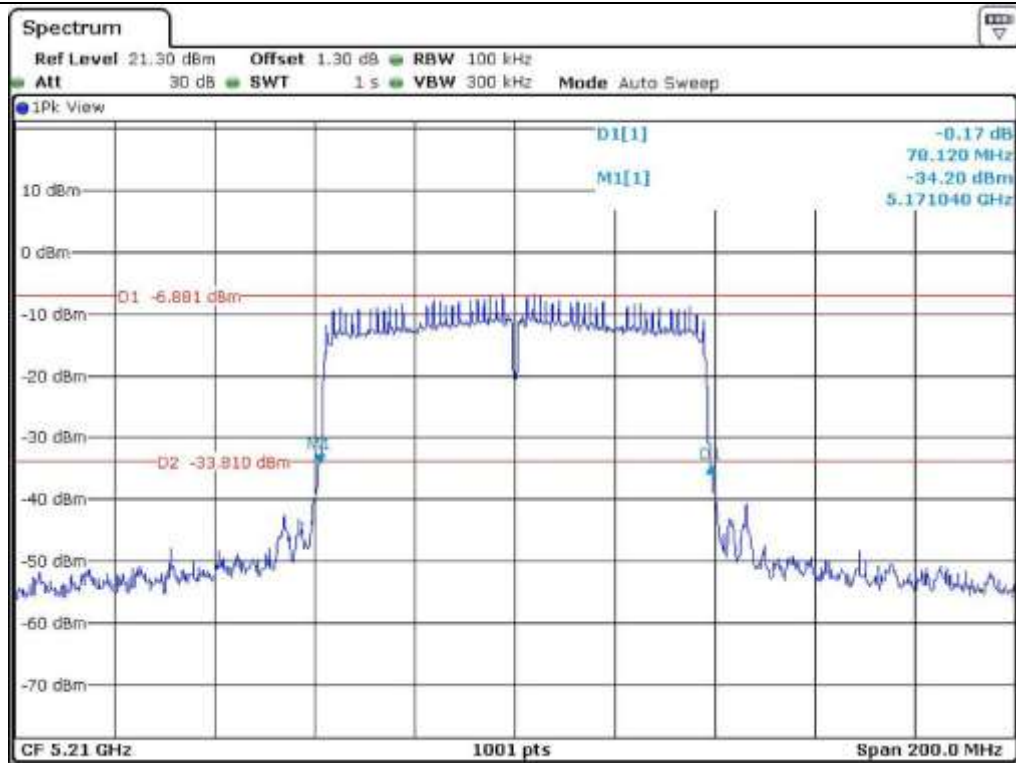
-. Test Date : January 18, 2016

-. Test Result : Pass

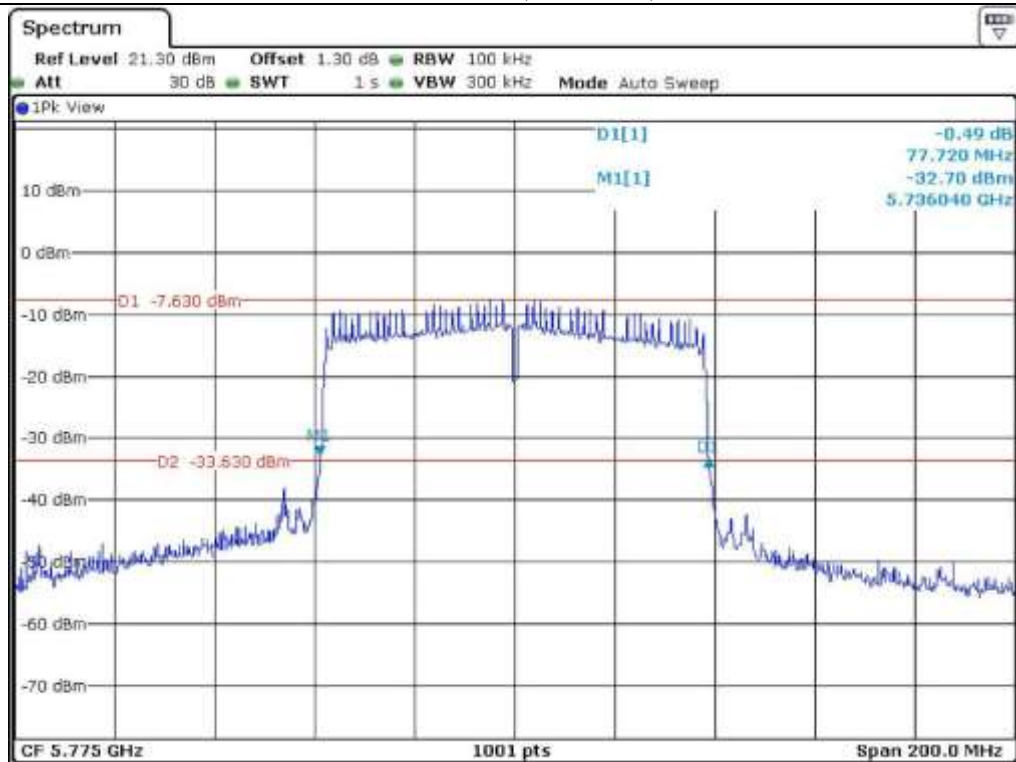
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 210	78.12
5 725 ~ 5 850	Low	5 775	77.72



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 210 MHz)



Low Channel (5 775 MHz)

7.4.6.2 Test data for Antenna 1

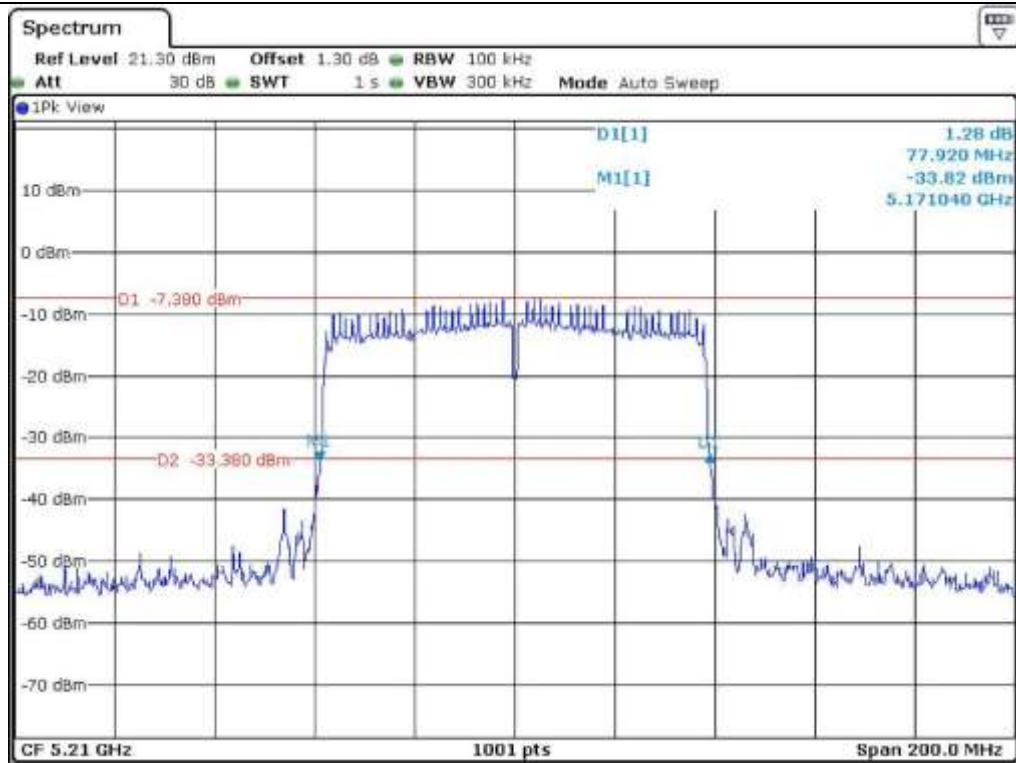
-. Test Date : January 18, 2016

-. Test Result : Pass

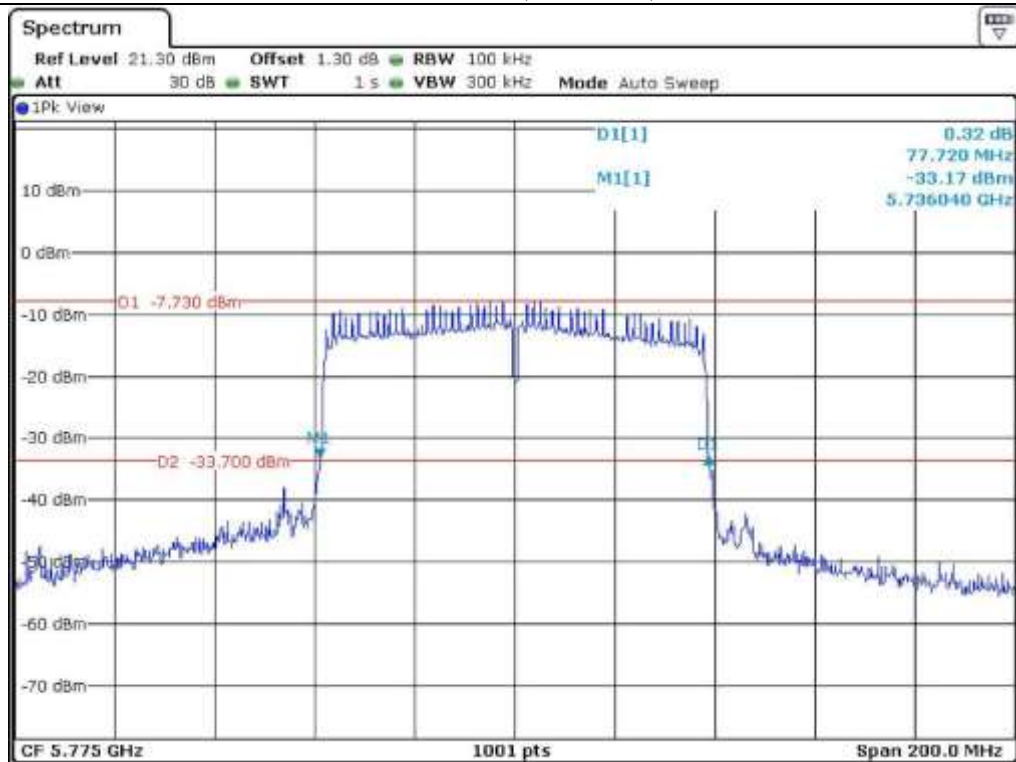
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 210	77.92
5 725 ~ 5 850	Low	5 775	77.72



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 210 MHz)



Low Channel (5 775 MHz)

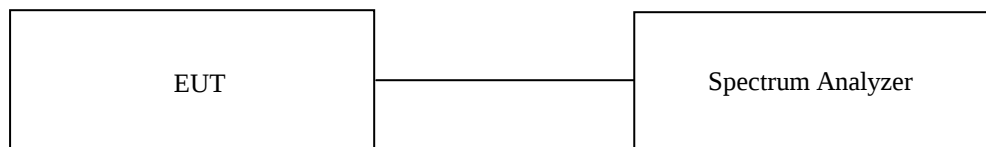
8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

Temperature : 21.4°C
Relative humidity : 45.1 % R.H.

8.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99 % bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.



8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 22, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

8.4 Test data for 802.11a RLAN Mode

8.4.1 Test data for Antenna 0

-. Test Date : January 18, 2016

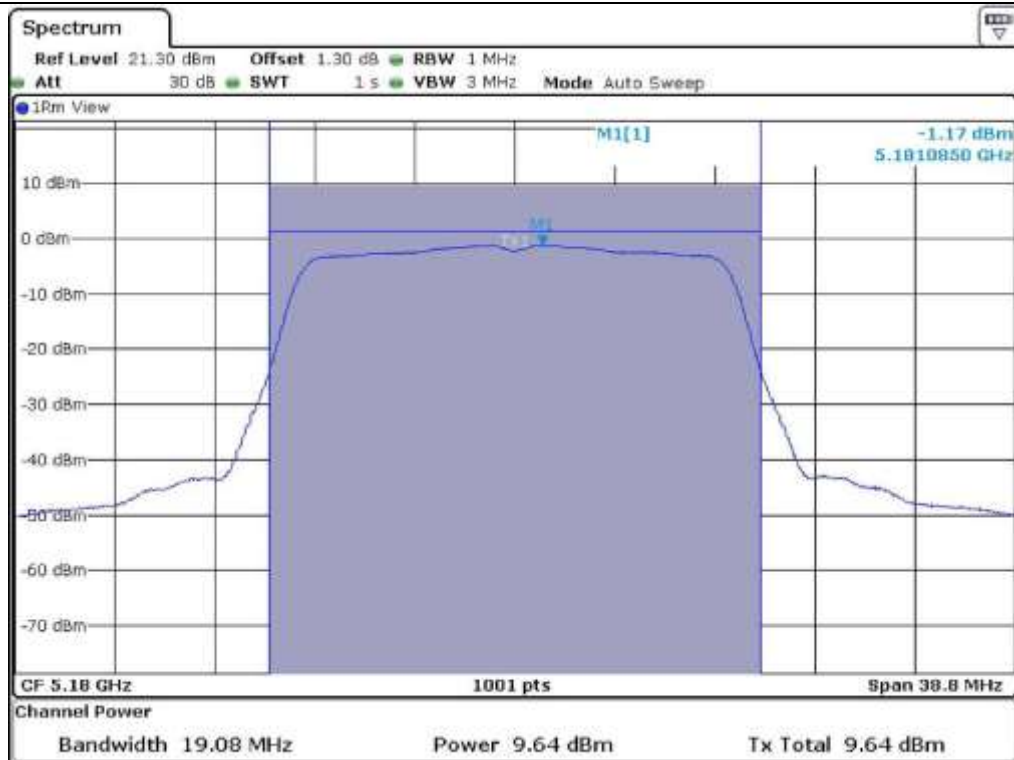
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	19.08	9.64	23.98	14.34
	Middle	5 200	19.08	10.00	23.98	13.98
	High	5 240	19.08	9.95	23.98	14.03
5 725 ~ 5 850	Low	5 745	19.13	9.22	23.98	14.76
	Middle	5 785	19.08	8.39	23.98	15.59
	High	5 825	19.08	8.00	23.98	15.98

Remark: See next page for measurement data.



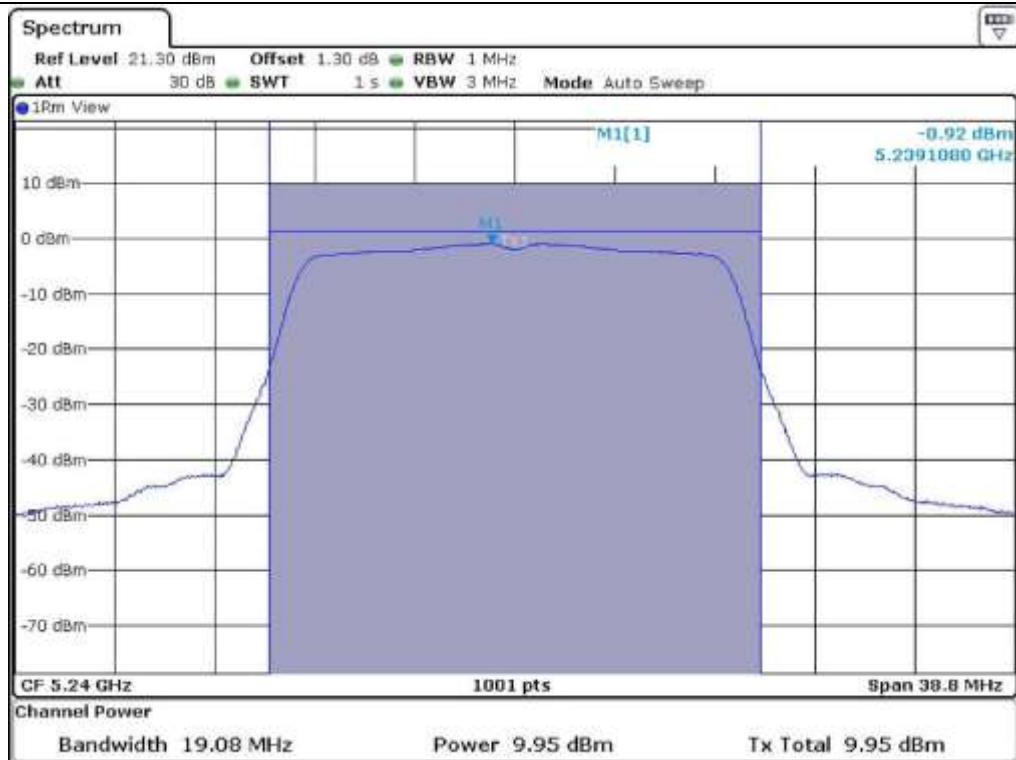
Tested by: Tae-Ho, Kim / Senior Engineer



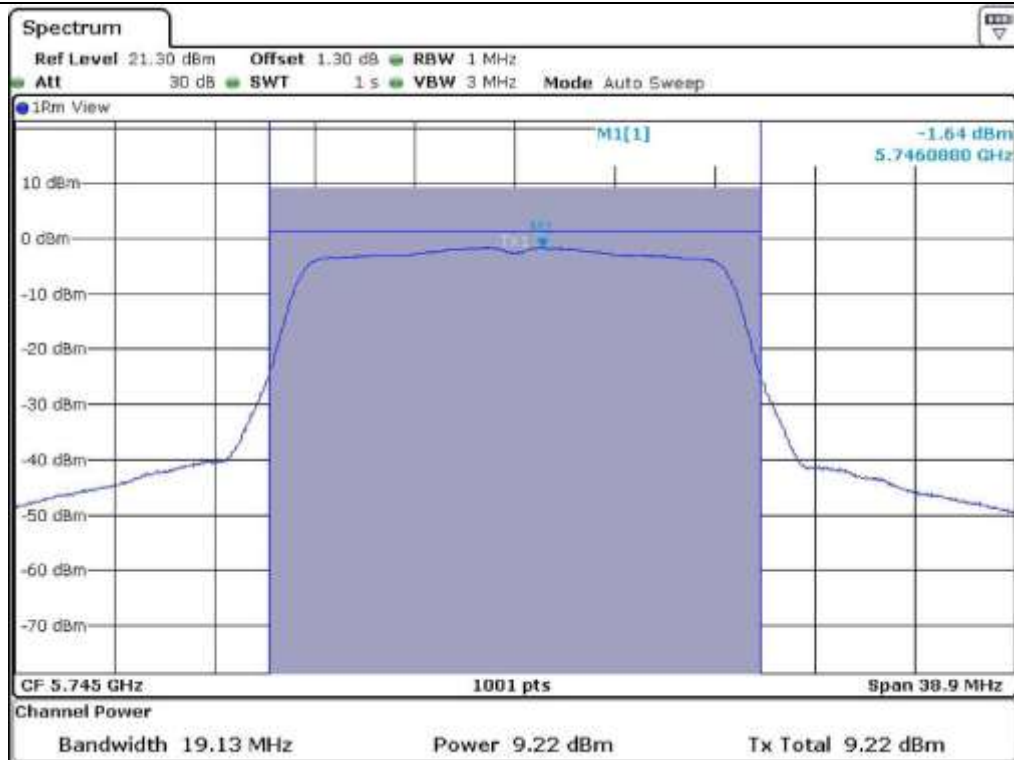
Low Channel @ 5 180 MHz (26 dB Bandwidth)



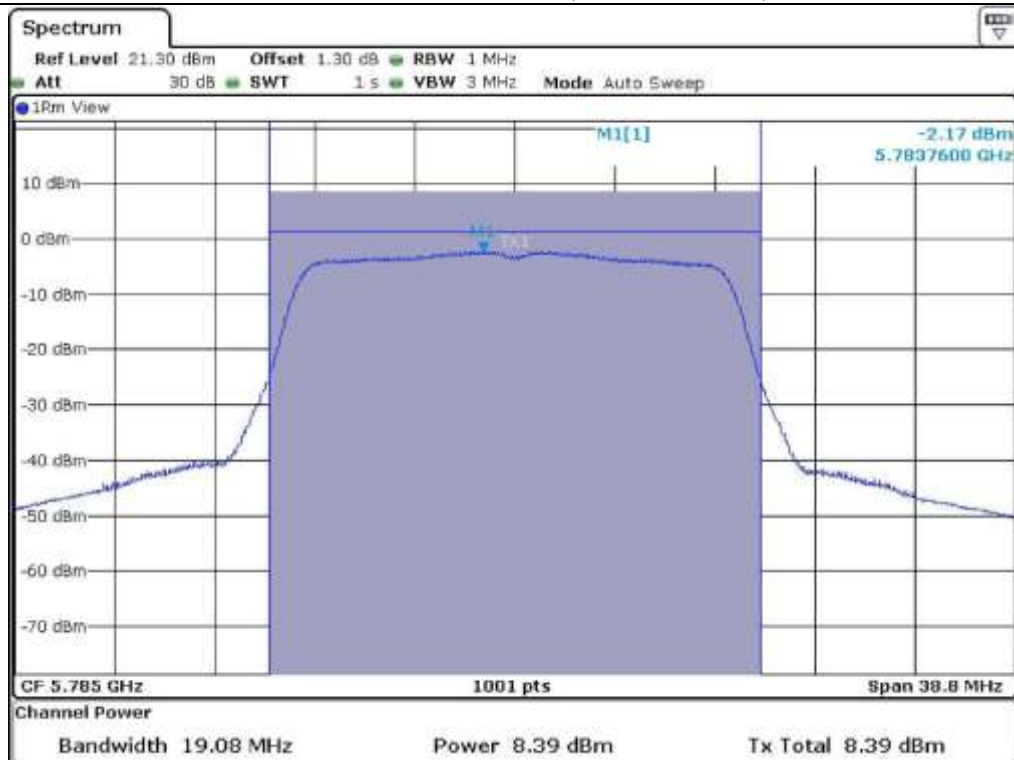
Middle Channel @ 5 200 MHz (26 dB Bandwidth)



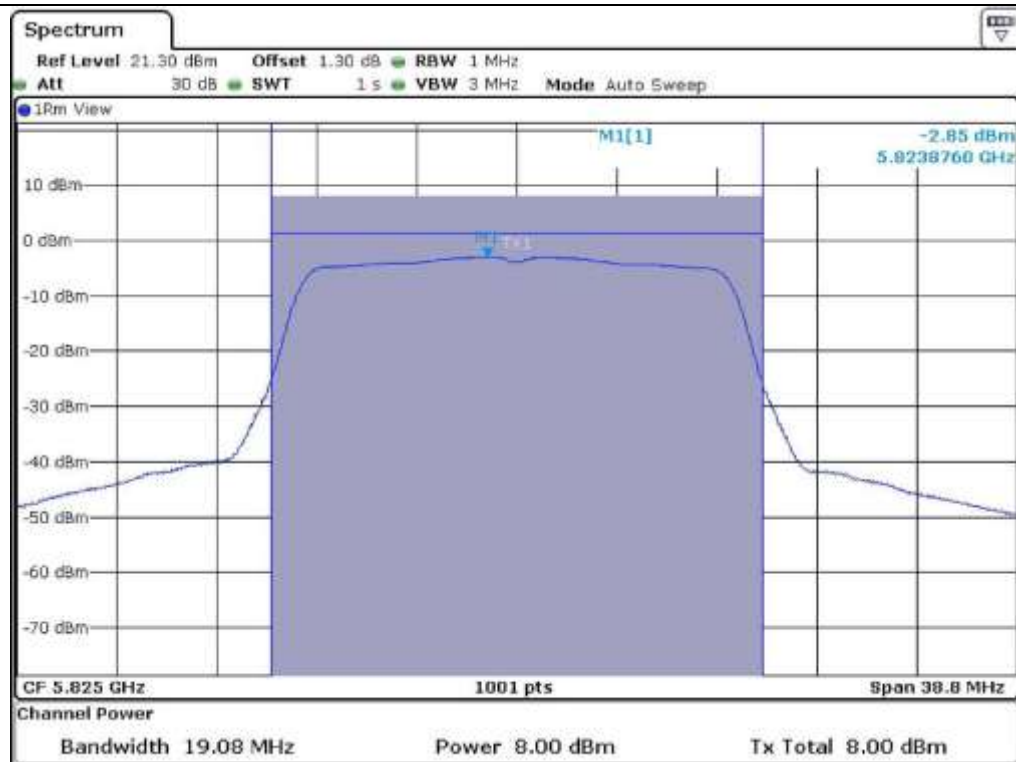
High Channel @ 5 240 MHz (26 dB Bandwidth)



Low Channel @ 5.745 MHz (26 dB Bandwidth)



Middle Channel @ 5.785 MHz (26 dB Bandwidth)



High Channel @ 5 825 MHz (26 dB Bandwidth)

8.4.2 Test data for Antenna 1

-. Test Date : January 18, 2016

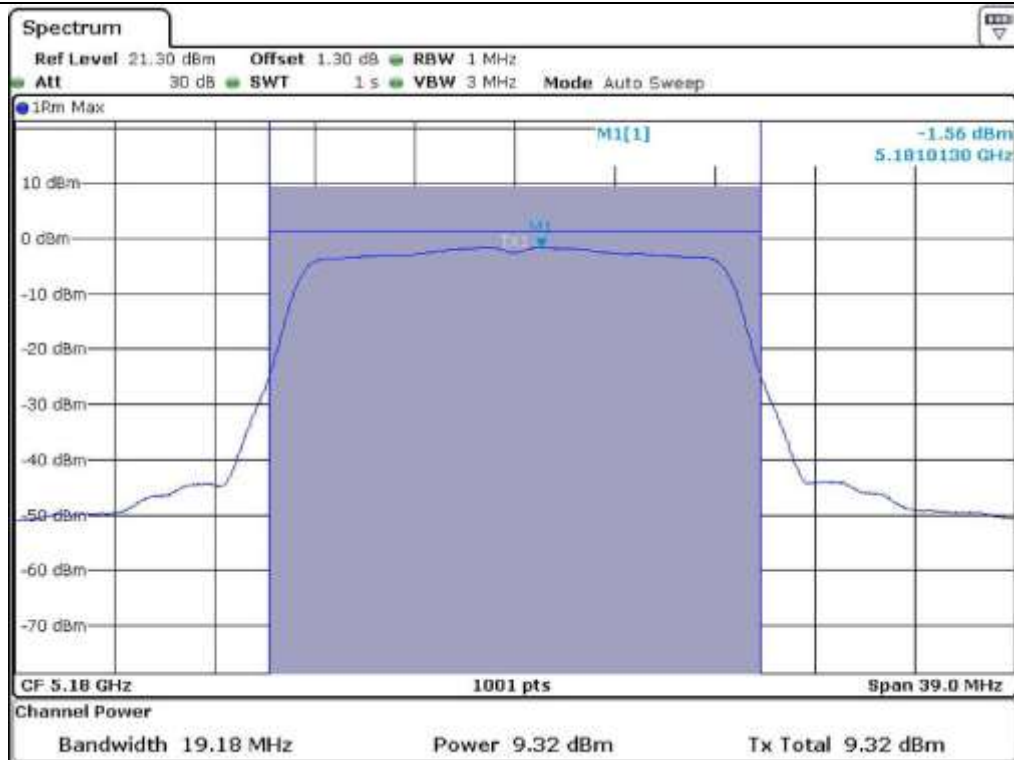
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	19.18	9.32	23.98	14.66
	Middle	5 200	19.18	9.09	23.98	14.89
	High	5 240	19.18	9.22	23.98	14.76
5 725 ~ 5 850	Low	5 745	19.28	8.49	23.98	15.49
	Middle	5 785	19.33	8.23	23.98	15.75
	High	5 825	19.58	7.85	23.98	16.13

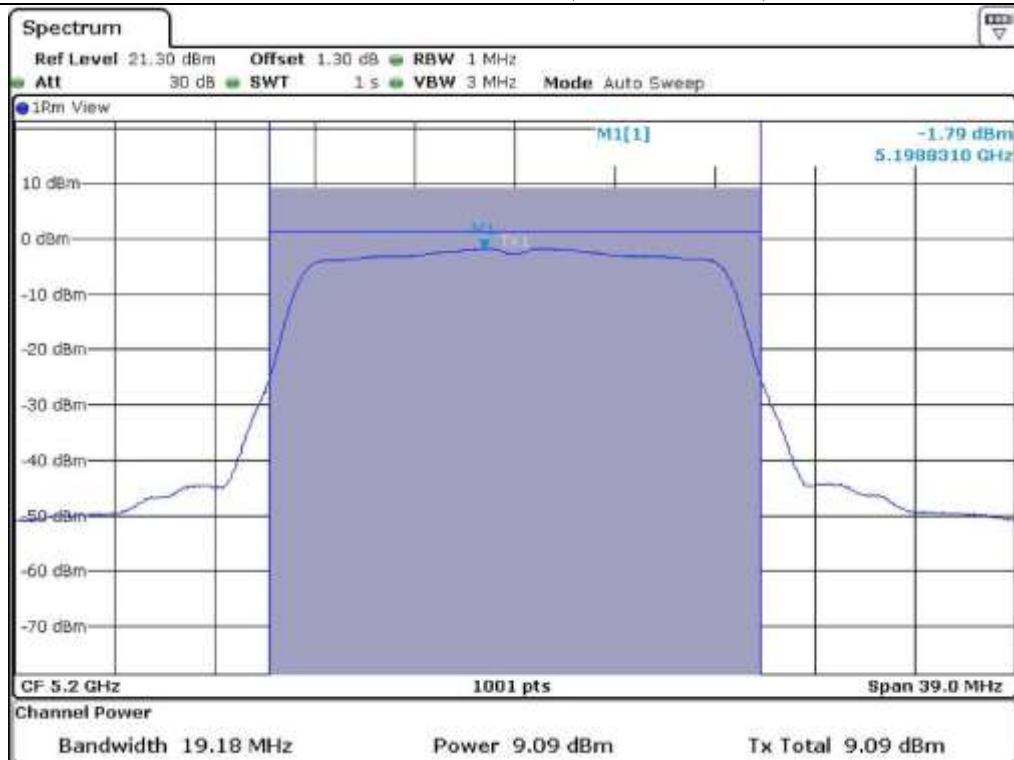
Remark: See next page for measurement data.



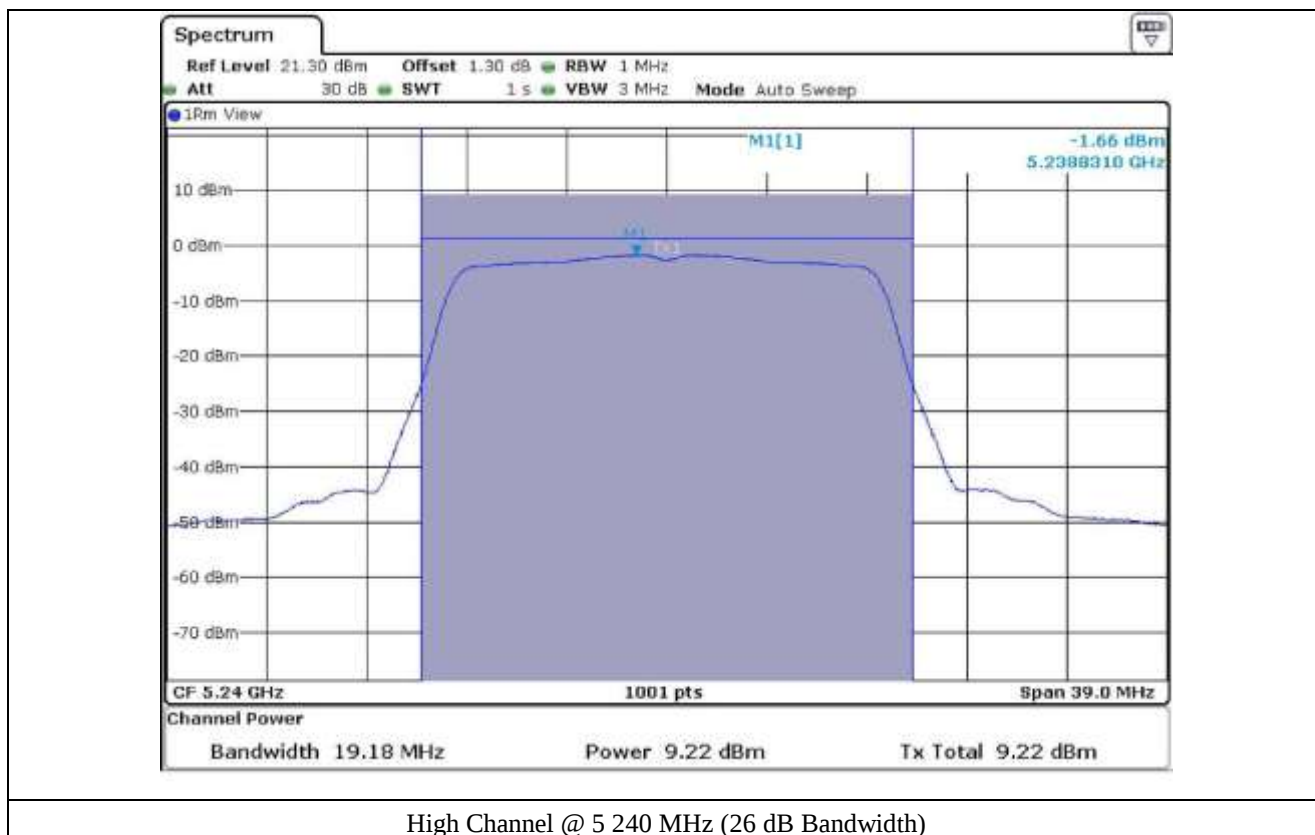
Tested by: Tae-Ho, Kim / Senior Engineer

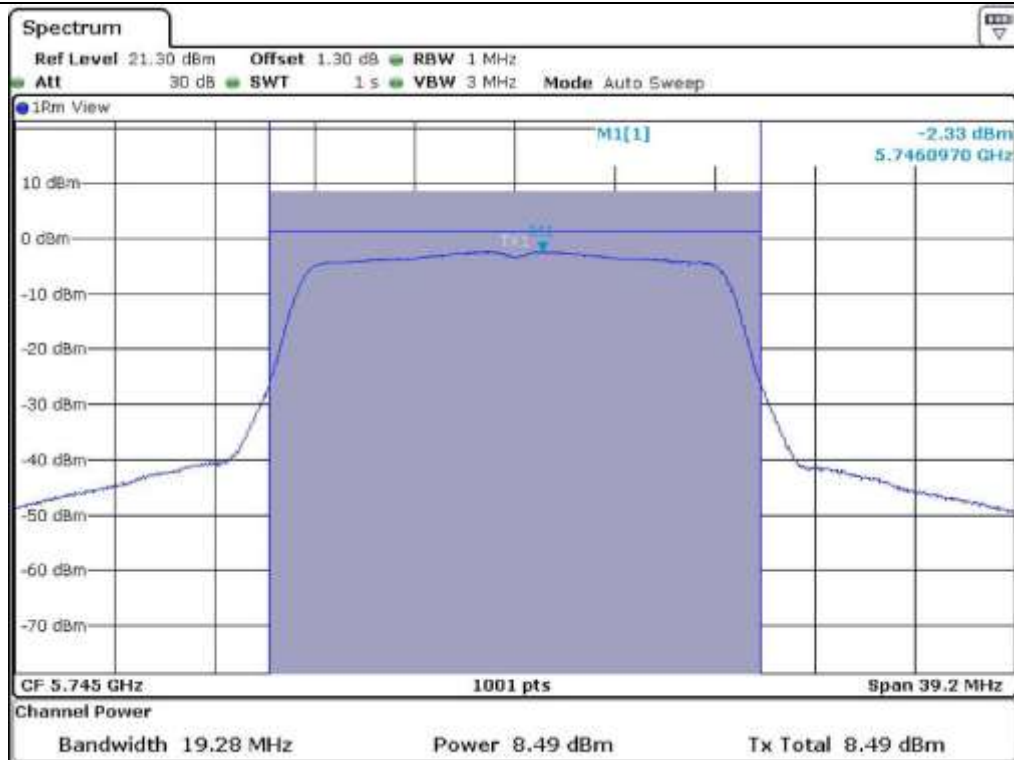


Low Channel @ 5 180 MHz (26 dB Bandwidth)

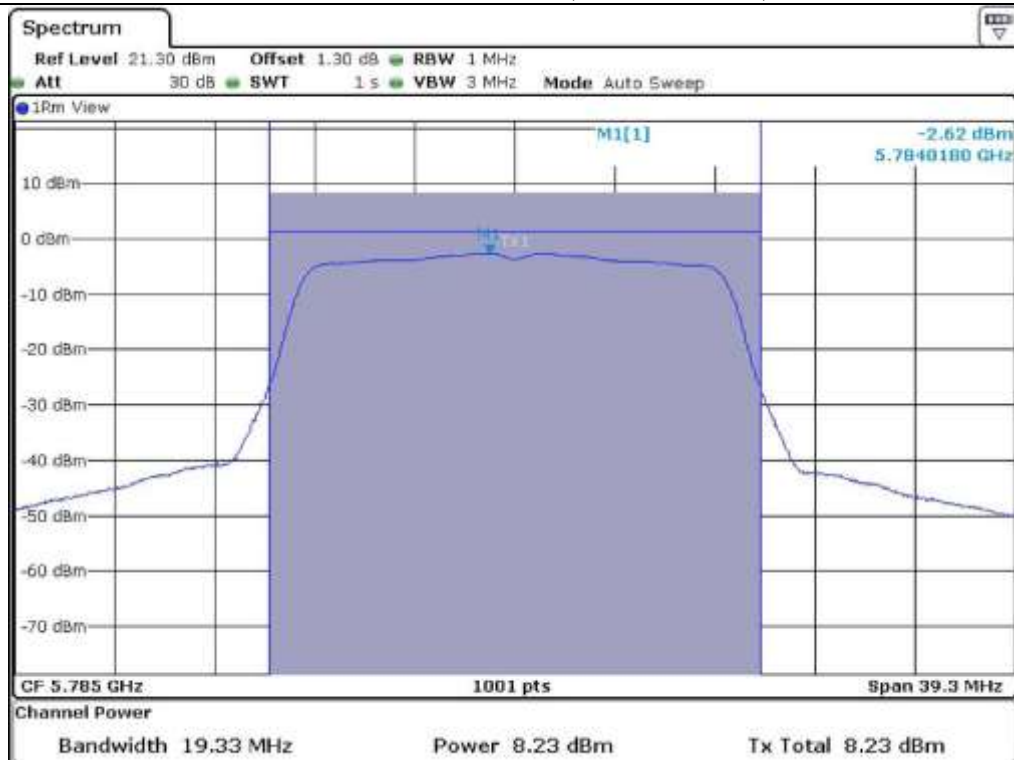


Middle Channel @ 5 200 MHz (26 dB Bandwidth)

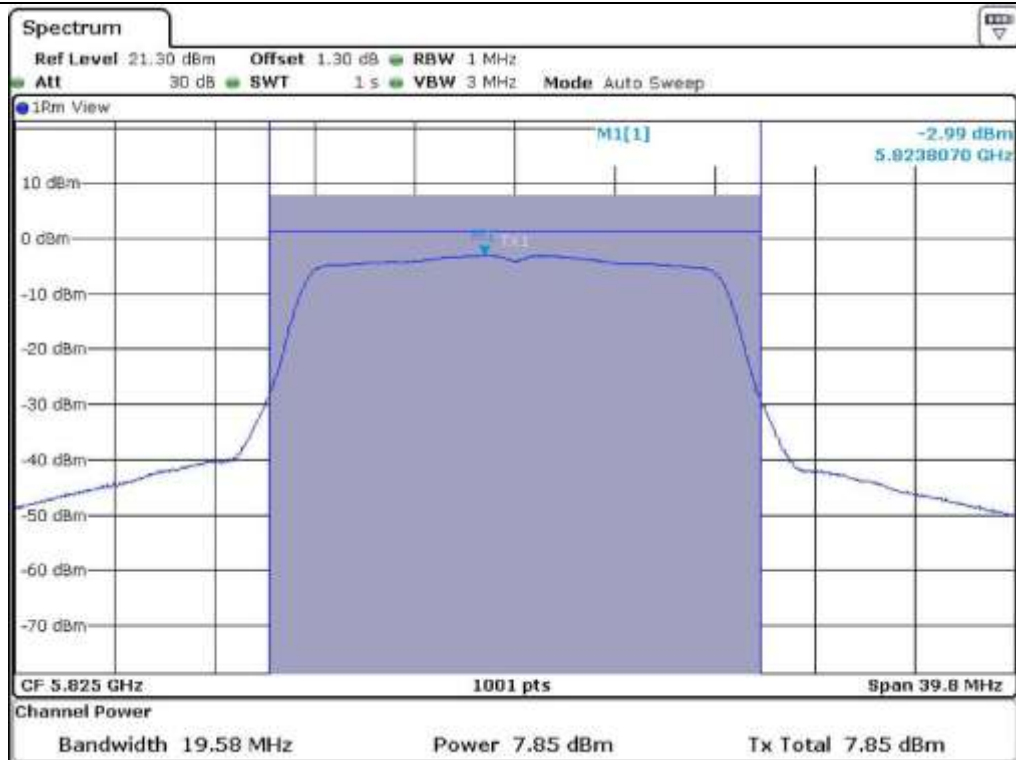




Low Channel @ 5.745 MHz (26 dB Bandwidth)



Middle Channel @ 5.785 MHz (26 dB Bandwidth)



High Channel @ 5 825 MHz (26 dB Bandwidth)

8.4.3 Test data for Multiple Transmit

-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	12.49	23.98	11.49
	Middle	5 200	12.58	23.98	11.40
	High	5 240	12.61	23.98	11.37
5 725 ~ 5 850	Low	5 745	11.88	23.98	12.10
	Middle	5 785	11.32	23.98	12.66
	High	5 825	10.94	23.98	13.04

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 : Calculated Output Power= $10\log (10^{(\text{Antenna1 Output Power}/10)} + 10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

8.5 Test data for 802.11n_HT20 RLAN Mode

8.5.1 Test data for Antenna 0

-. Test Date : January 18, 2016

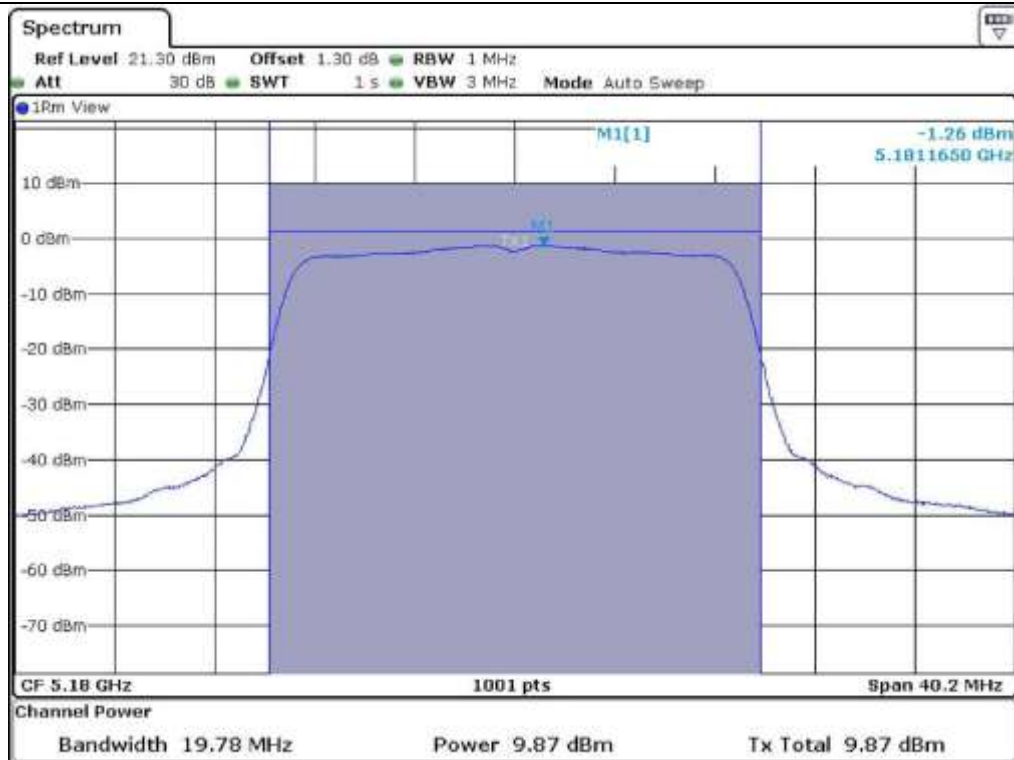
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	19.78	9.87	30.00	20.13
	Middle	5 200	19.68	9.87	30.00	20.13
	High	5 240	19.63	9.86	30.00	20.14
5 725 ~ 5 850	Low	5 745	19.68	9.09	30.00	20.91
	Middle	5 785	19.58	8.42	30.00	21.58
	High	5 825	19.83	7.95	30.00	22.05

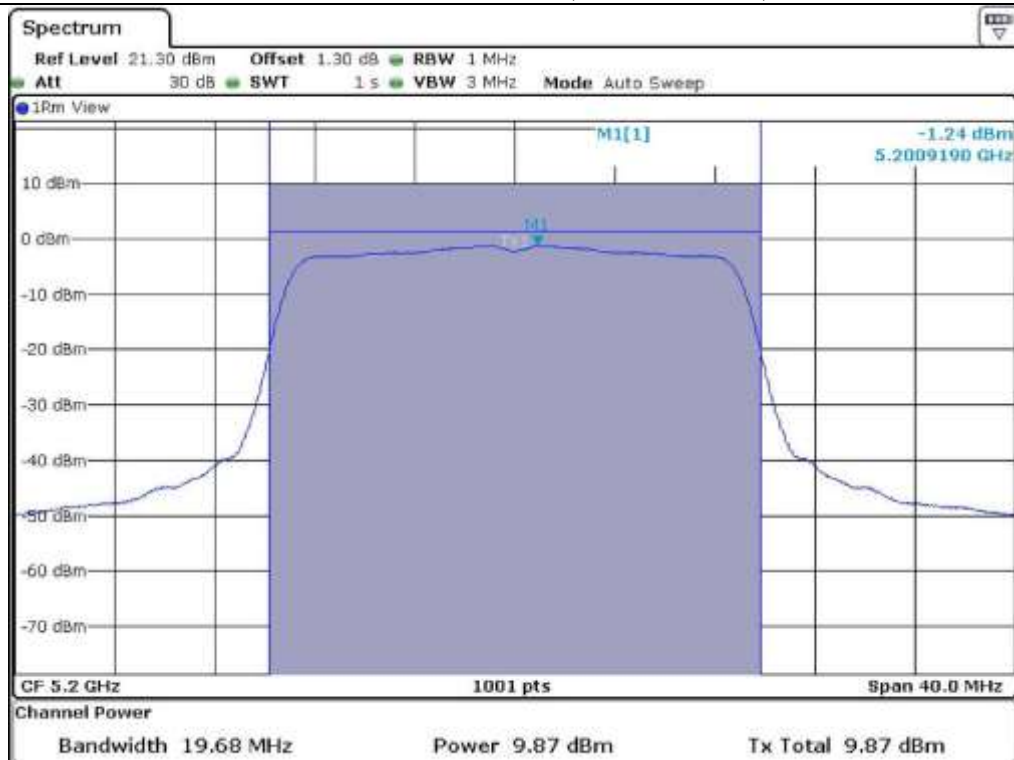
Remark: See next page for measurement data.



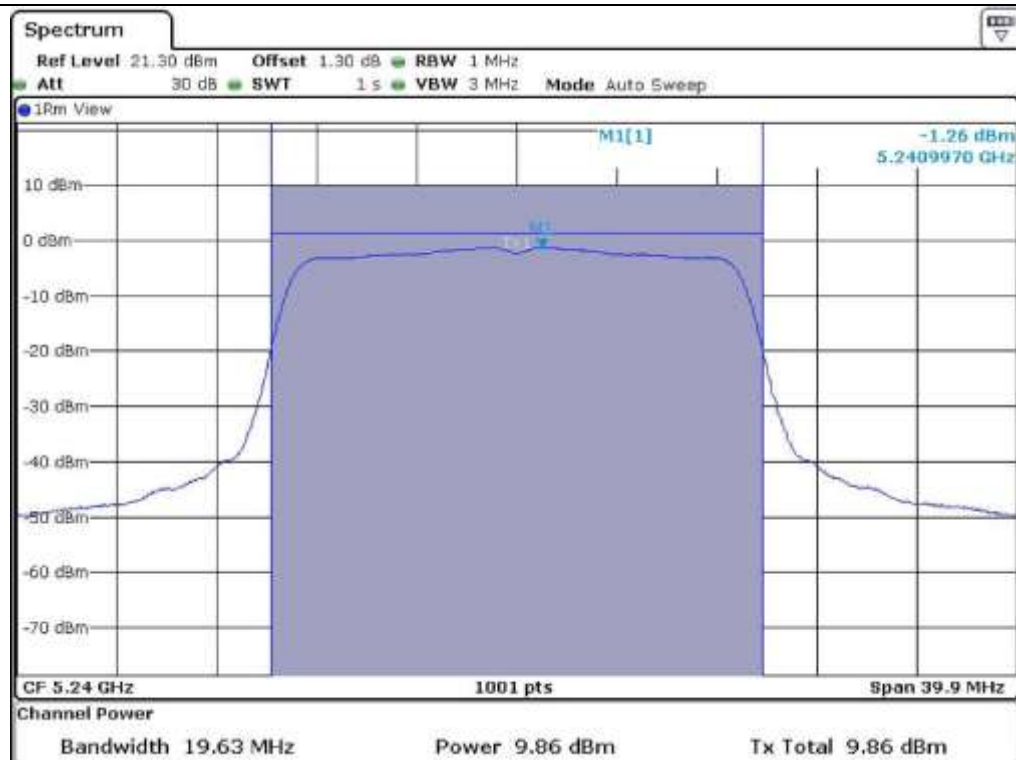
Tested by: Tae-Ho, Kim / Senior Engineer



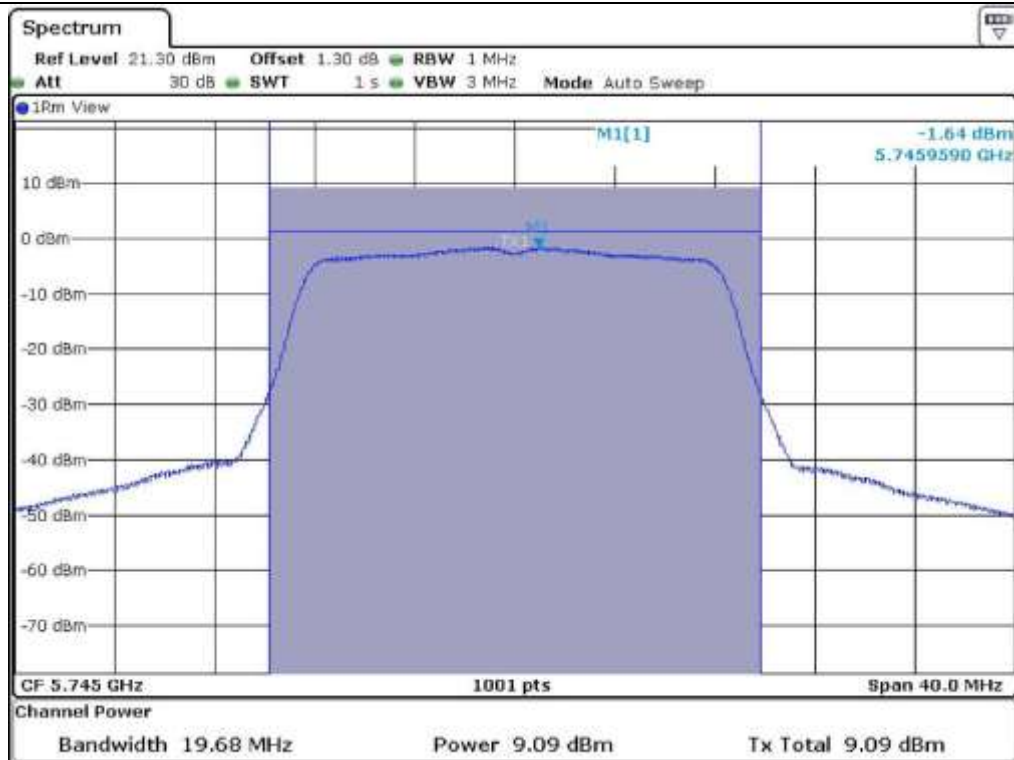
Low Channel @ 5 180 MHz (26 dB Bandwidth)



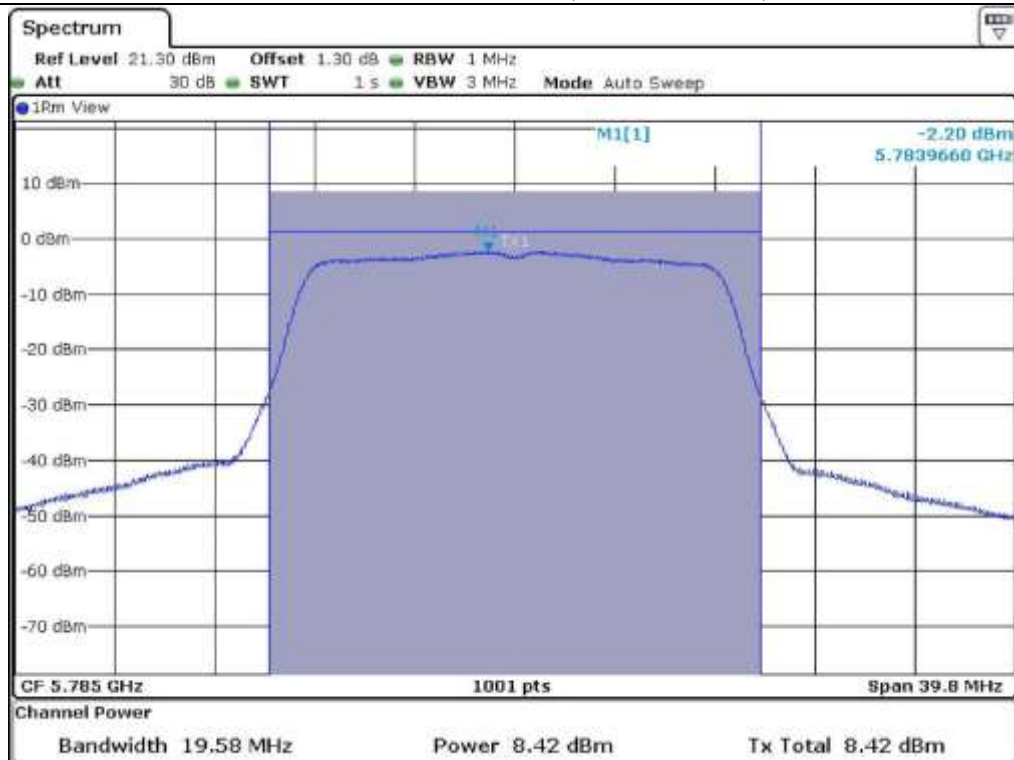
Middle Channel @ 5 200 MHz (26 dB Bandwidth)



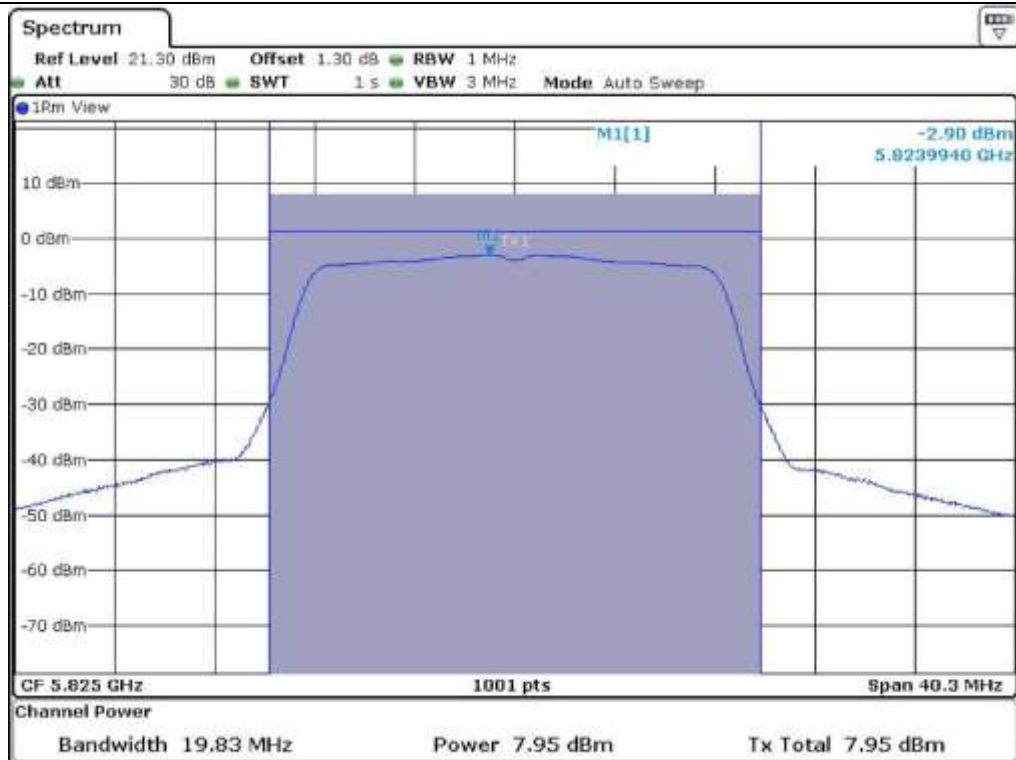
High Channel @ 5 240 MHz (26 dB Bandwidth)



Low Channel @ 5.745 MHz (26 dB Bandwidth)



Middle Channel @ 5.785 MHz (26 dB Bandwidth)



High Channel @ 5 825 MHz (26 dB Bandwidth)

8.5.2 Test data for Antenna 1

-. Test Date : January 18, 2016

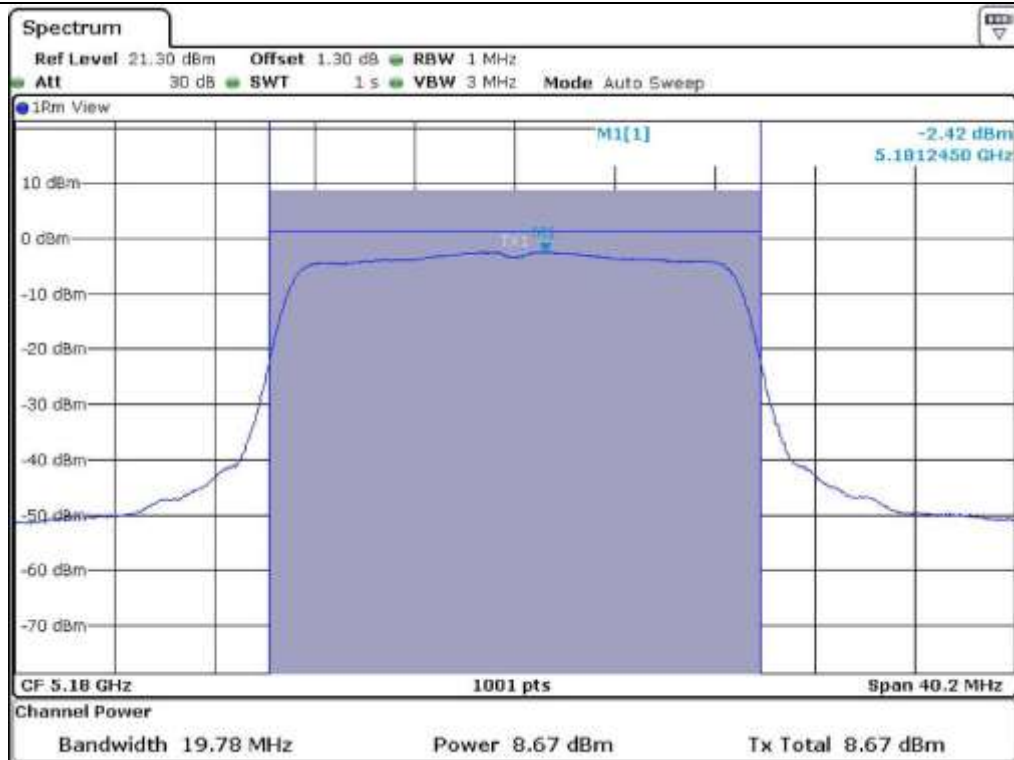
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	19.78	8.67	30.00	21.33
	Middle	5 200	19.78	8.49	30.00	21.51
	High	5 240	19.78	9.01	30.00	20.99
5 725 ~ 5 850	Low	5 745	19.58	8.45	30.00	21.55
	Middle	5 785	19.63	8.13	30.00	21.87
	High	5 825	19.73	7.83	30.00	22.17

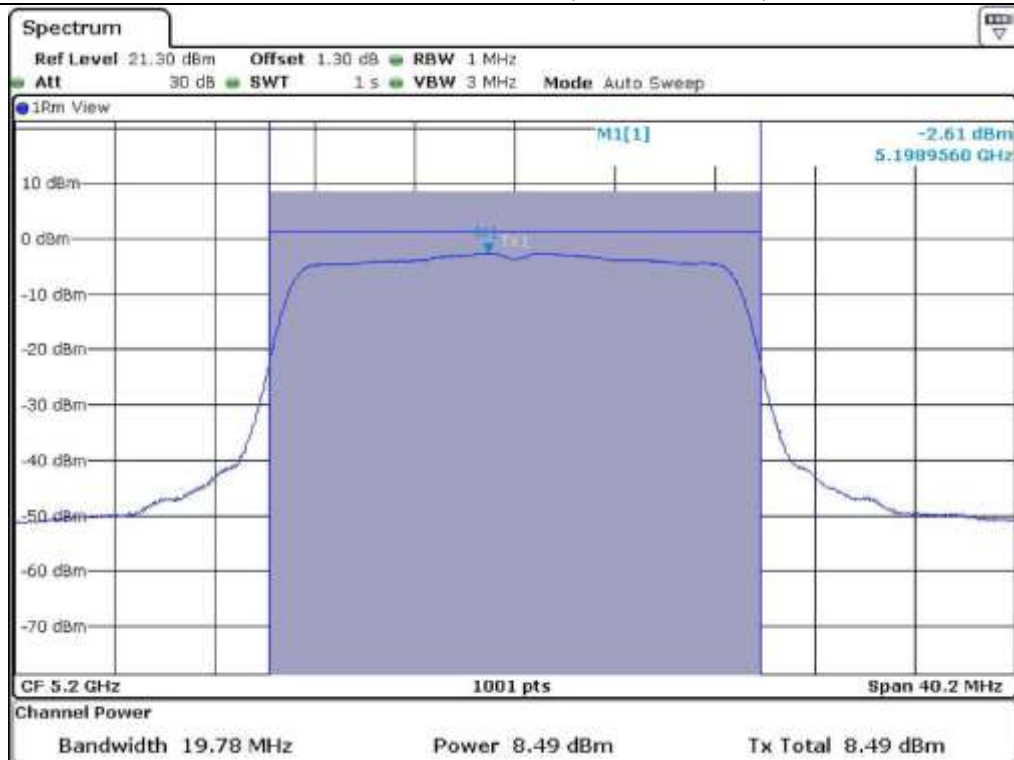
Remark: See next page for measurement data.



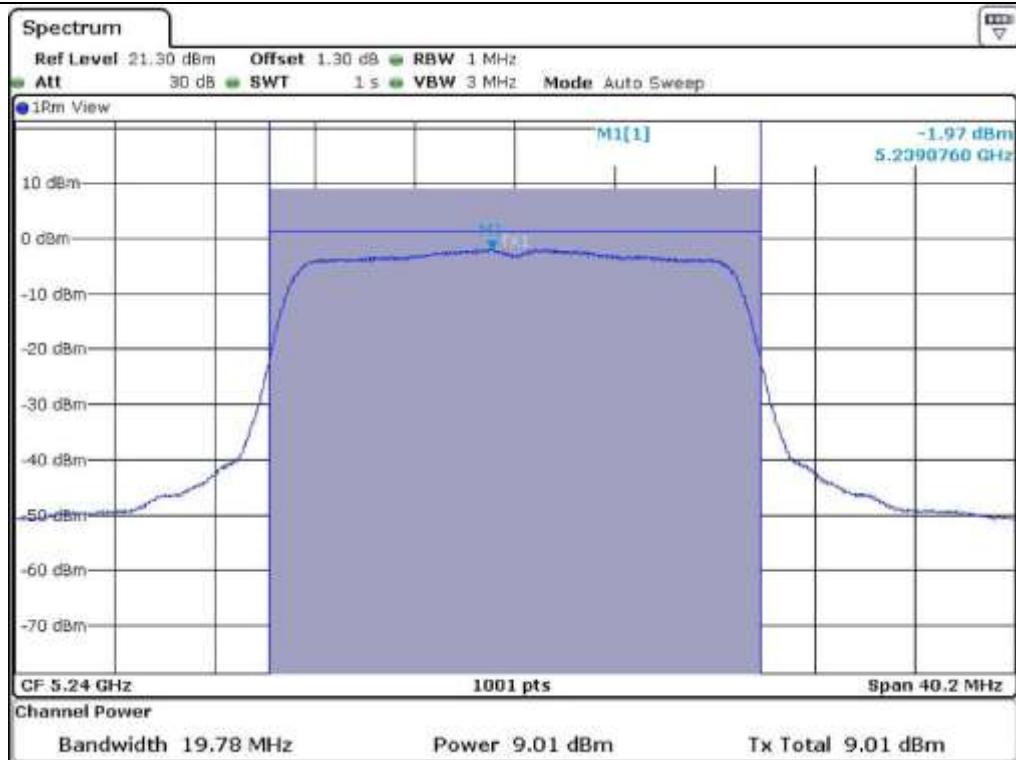
Tested by: Tae-Ho, Kim / Senior Engineer



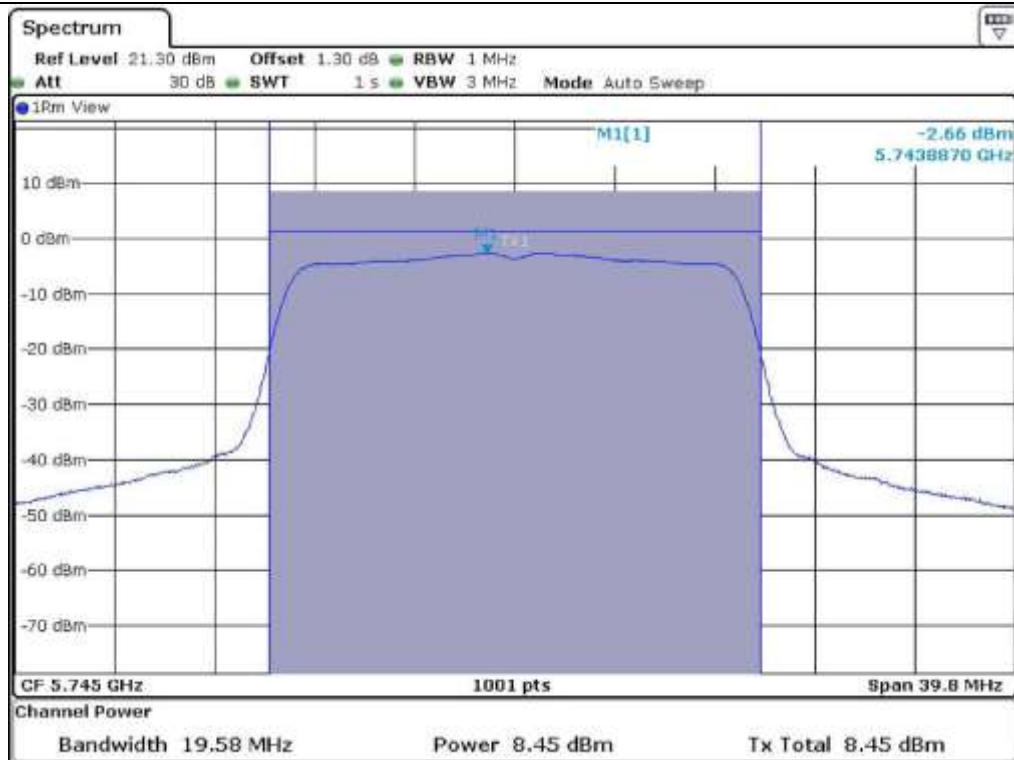
Low Channel @ 5 180 MHz (26 dB Bandwidth)



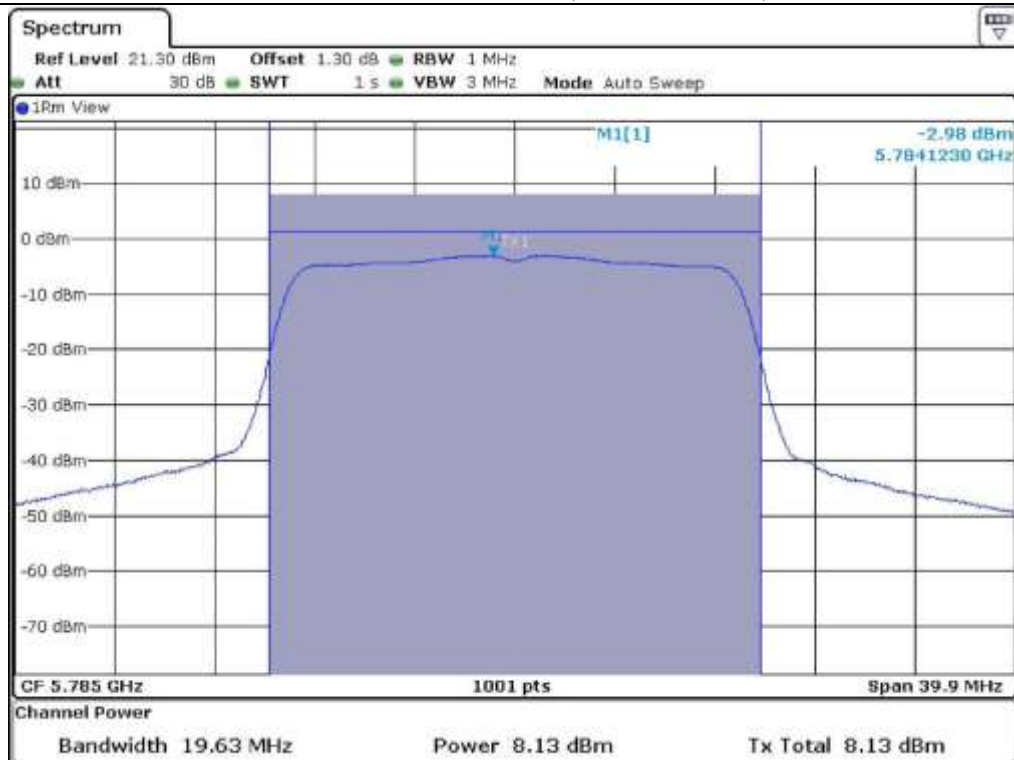
Middle Channel @ 5 200 MHz (26 dB Bandwidth)



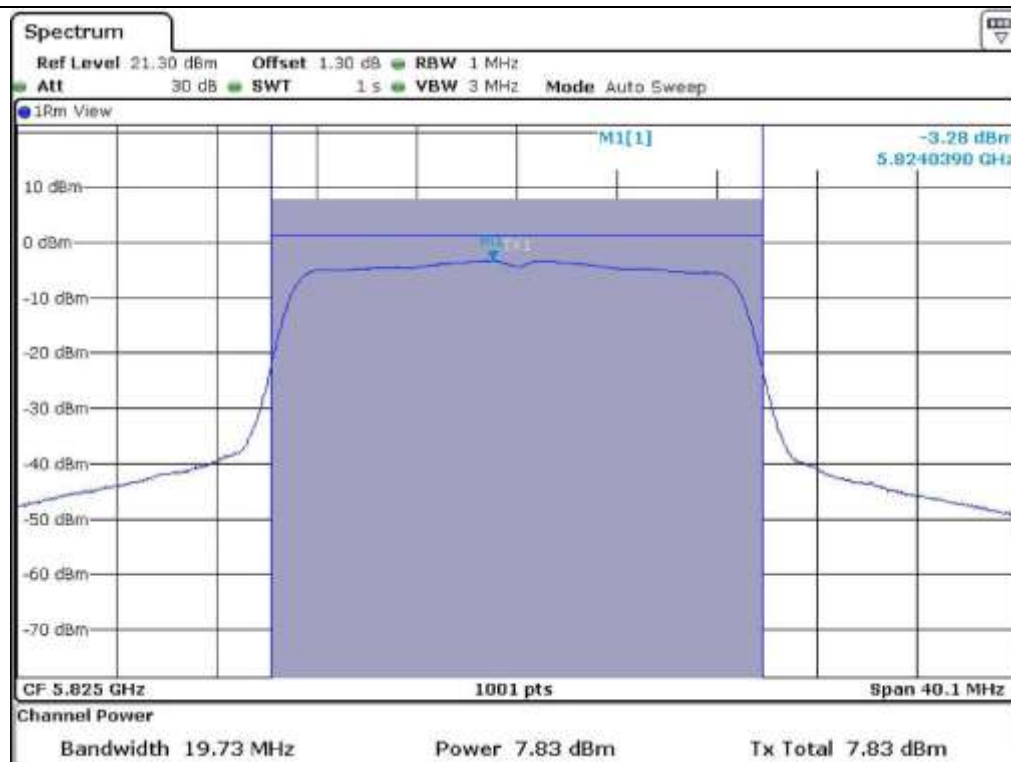
High Channel @ 5 240 MHz (26 dB Bandwidth)



Low Channel @ 5.745 MHz (26 dB Bandwidth)



Middle Channel @ 5.785 MHz (26 dB Bandwidth)



High Channel @ 5 825 MHz (26 dB Bandwidth)

8.5.3 Test data for Multiple transmit

-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	12.32	30.00	17.68
	Middle	5 200	12.24	30.00	17.76
	High	5 240	12.47	30.00	17.53
5 725 ~ 5 850	Low	5 745	11.79	30.00	18.21
	Middle	5 785	11.29	30.00	18.71
	High	5 825	10.90	30.00	19.10

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 : Calculated Output Power= $10\log (10^{(\text{Antenna1 Output Power}/10)} + 10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

8.6 Test data for 802.11n_HT40 RLAN Mode

8.6.1 Test data for Antenna 0

-. Test Date : January 18, 2016

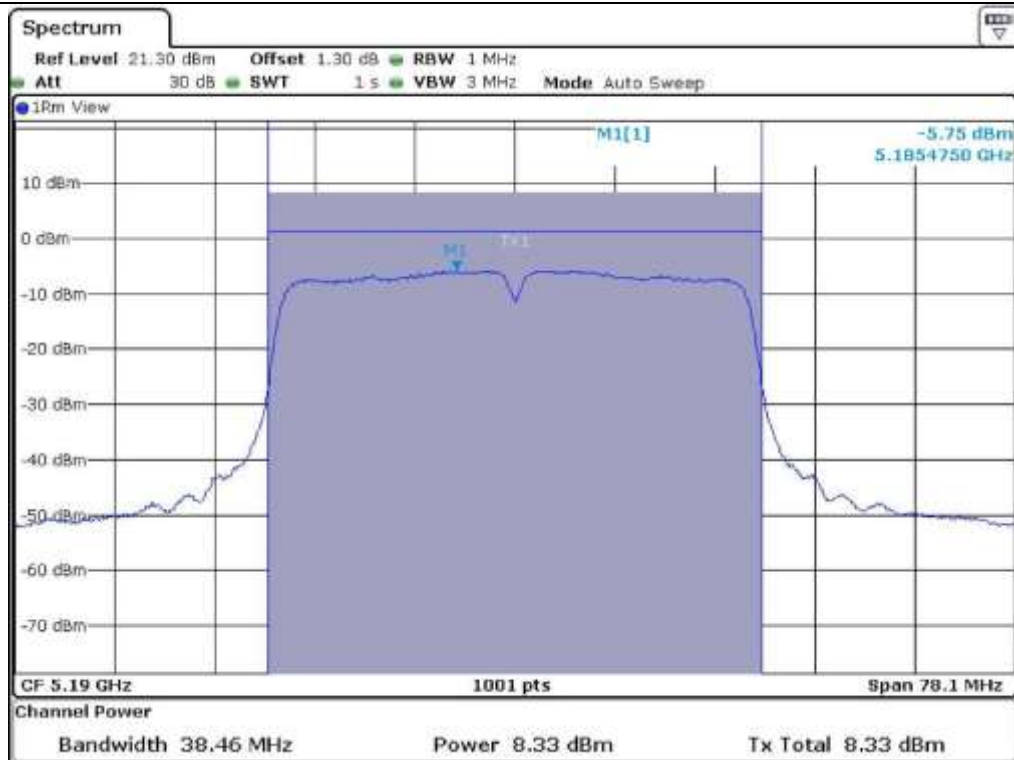
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	38.46	8.33	30.00	21.67
	High	5 230	38.46	8.56	30.00	21.44
5 725 ~ 5 850	Low	5 755	38.36	7.00	30.00	23.00
	High	5 795	38.66	6.78	30.00	23.22

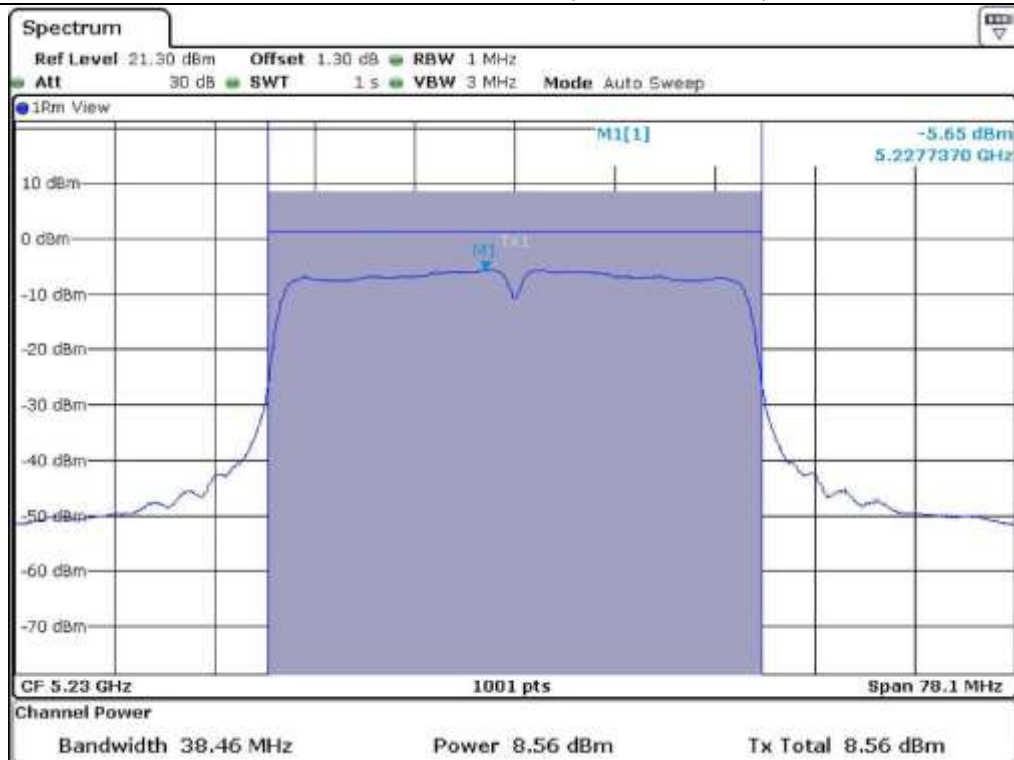
Remark: See next page for measurement data.



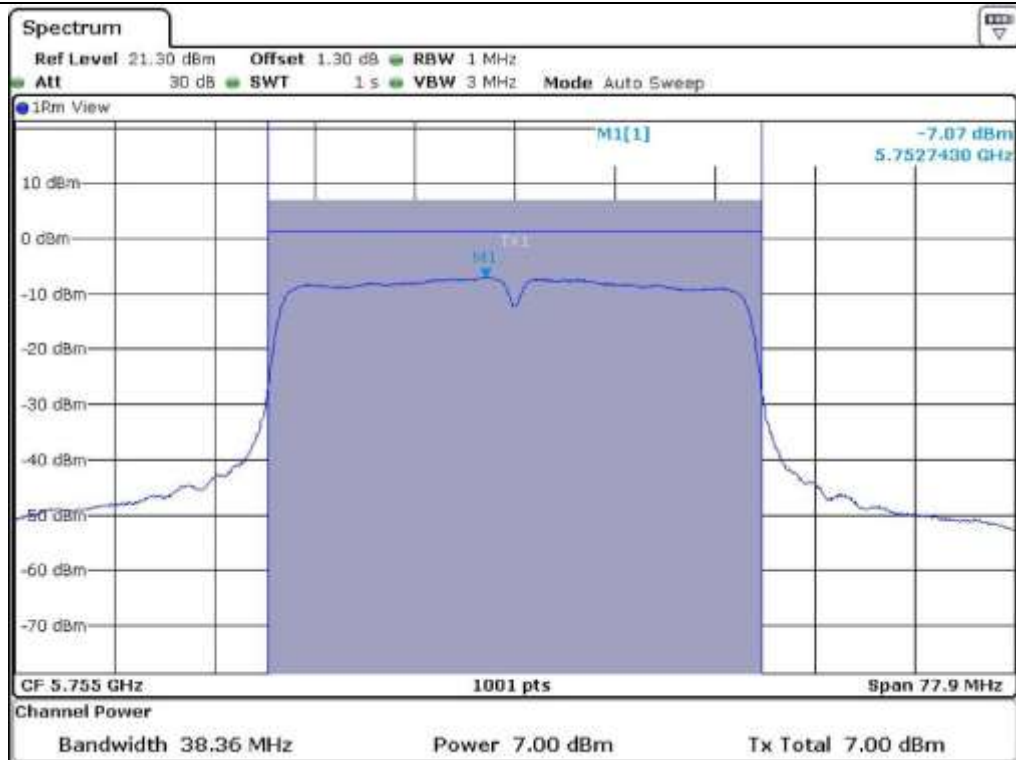
Tested by: Tae-Ho, Kim / Senior Engineer



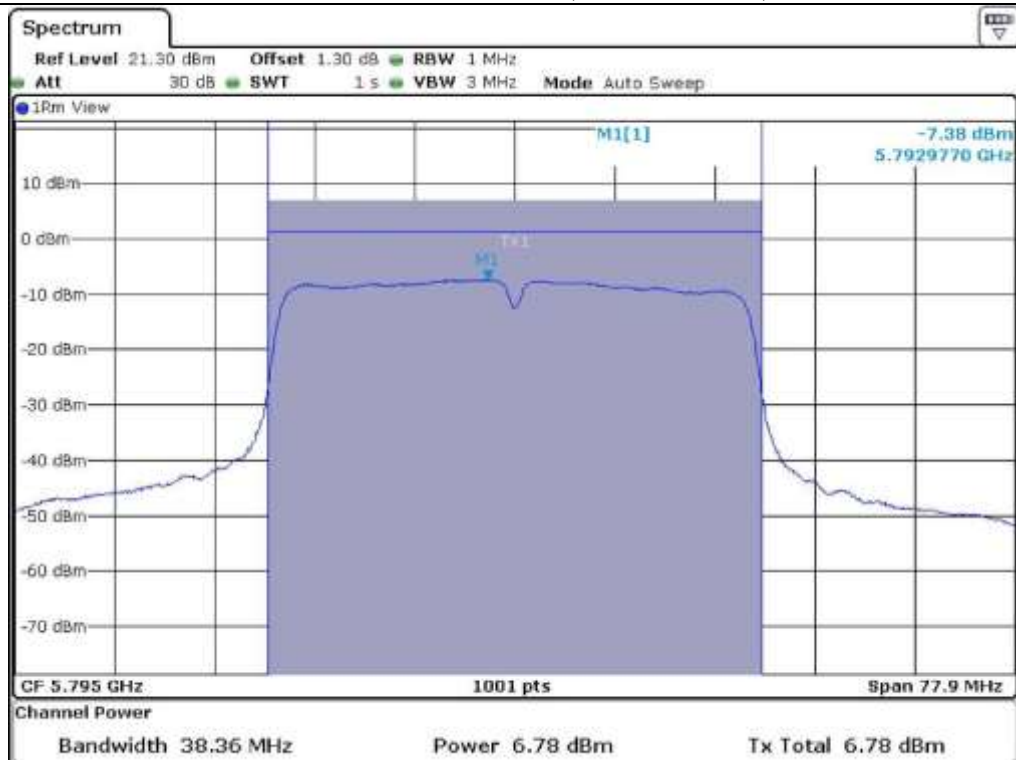
Low Channel @ 5 190 MHz (26 dB Bandwidth)



High Channel @ 5 230 MHz (26 dB Bandwidth)



Low Channel @ 5.755 MHz (26 dB Bandwidth)



Middle Channel @ 5.795 MHz (26 dB Bandwidth)

8.6.2 Test data for Antenna 1

-. Test Date : January 18, 2016

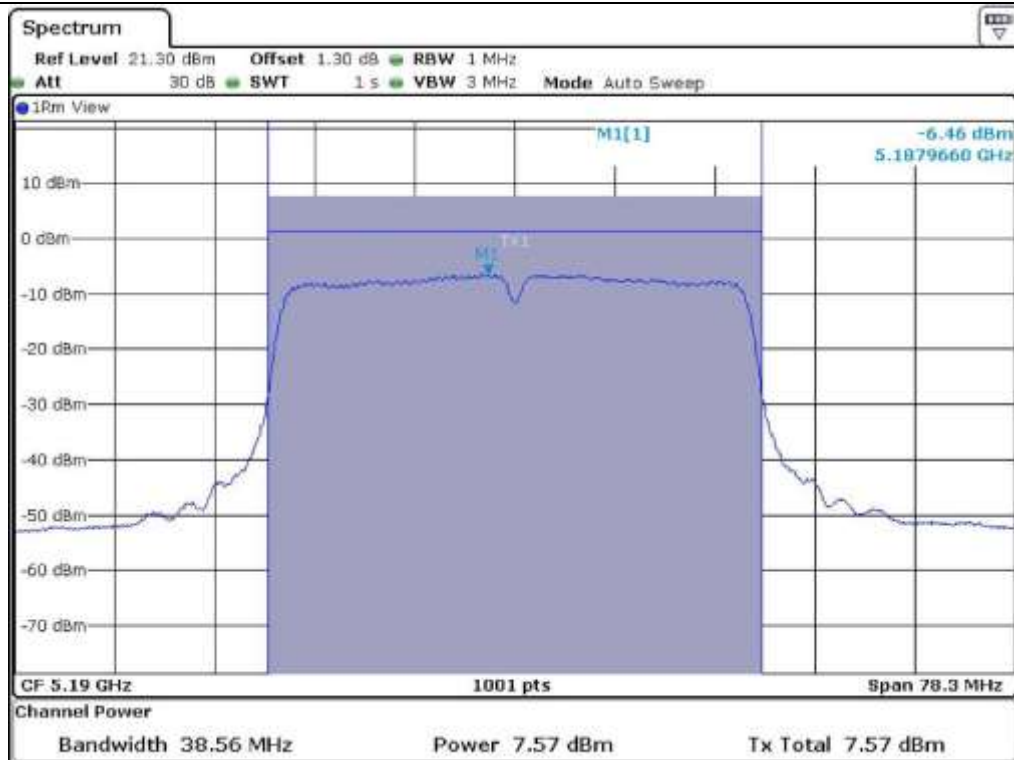
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	38.56	7.57	30.00	22.43
	High	5 230	38.56	7.32	30.00	22.68
5 725 ~ 5 850	Low	5 755	38.36	7.03	30.00	22.97
	High	5 795	38.36	7.12	30.00	22.88

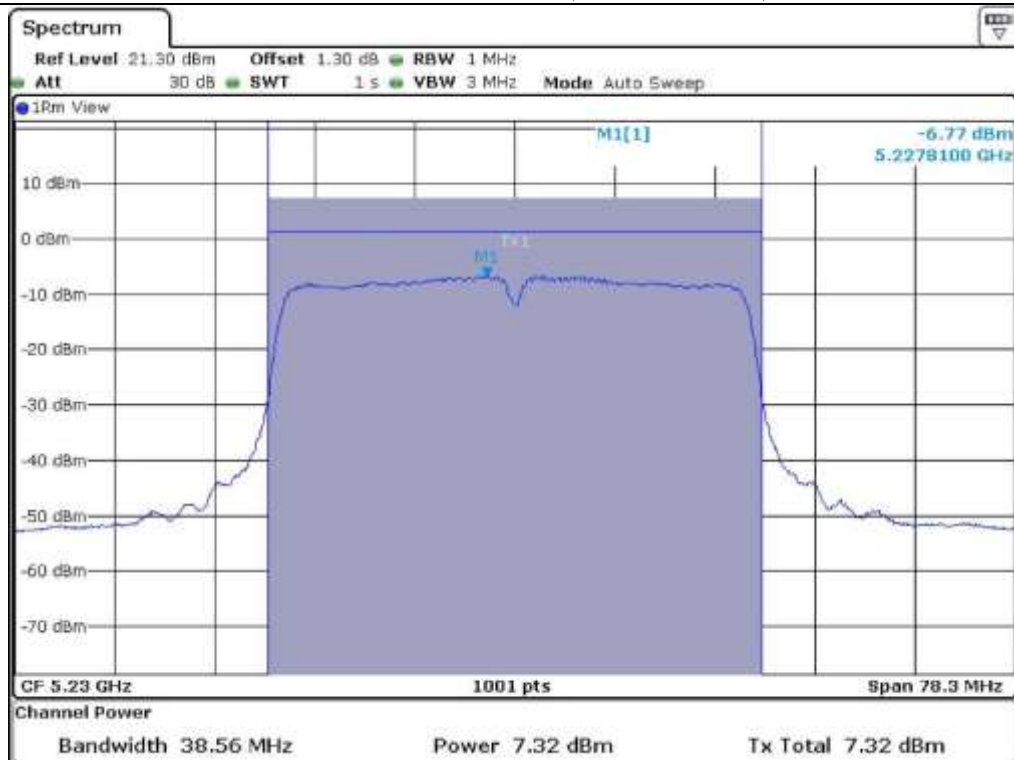
Remark: See next page for measurement data.



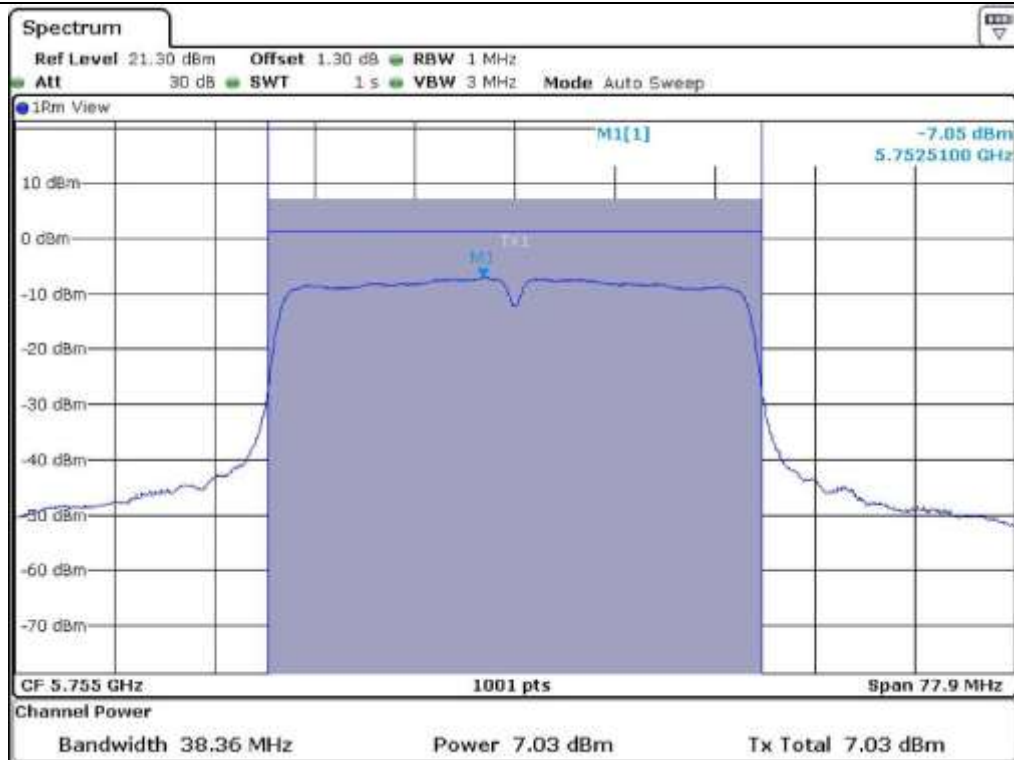
Tested by: Tae-Ho, Kim / Senior Engineer



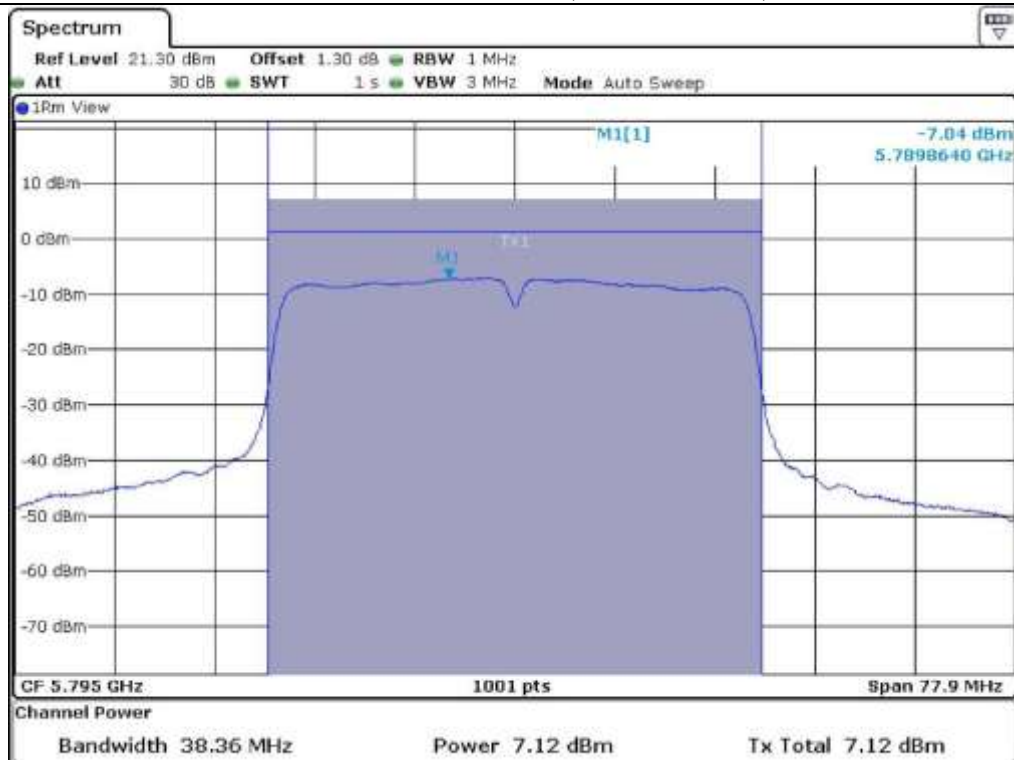
Low Channel @ 5 190 MHz (26 dB Bandwidth)



High Channel @ 5 230 MHz (26 dB Bandwidth)



Low Channel @ 5.755 MHz (26 dB Bandwidth)



Middle Channel @ 5.795 MHz (26 dB Bandwidth)

8.6.3 Test data for Multiple transmit

-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	10.98	30.00	19.02
	High	5 230	10.99	30.00	19.01
5 725 ~ 5 850	Low	5 755	10.03	30.00	19.97
	High	5 795	9.96	30.00	20.04

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 :Calculated Output Power= $10\log (10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

8.7 Test data for 802.11ac20 RLAN Mode

8.7.1 Test data for Antenna 0

-. Test Date : January 18, 2016

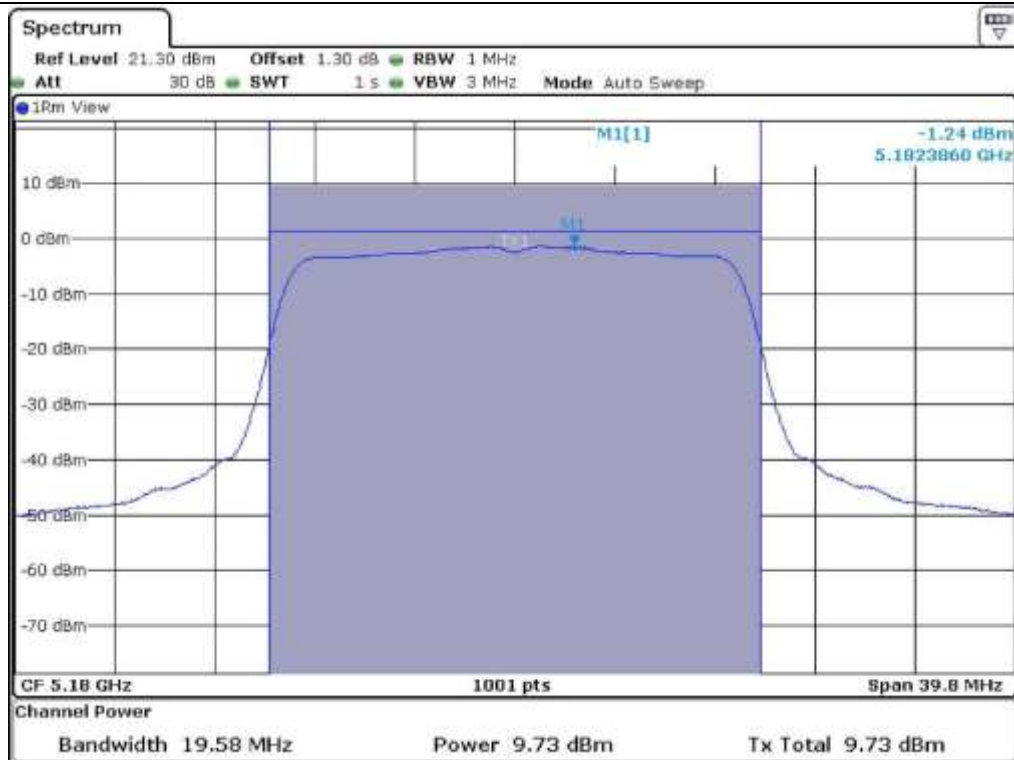
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	19.58	9.73	23.98	14.25
	Middle	5 200	19.58	9.77	23.98	14.21
	High	5 240	19.58	9.73	23.98	14.25
5 725 ~ 5 850	Low	5 745	19.68	9.31	23.98	14.67
	Middle	5 785	19.63	8.39	23.98	15.59
	High	5 825	19.53	8.18	23.98	15.80

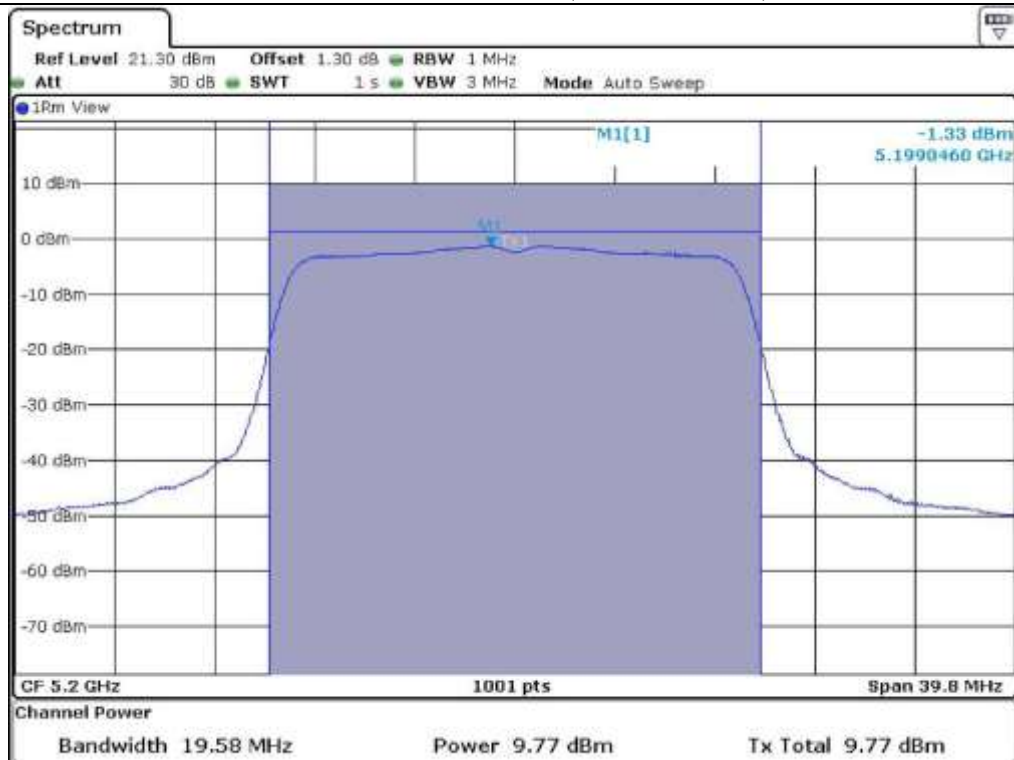
Remark: See next page for measurement data.



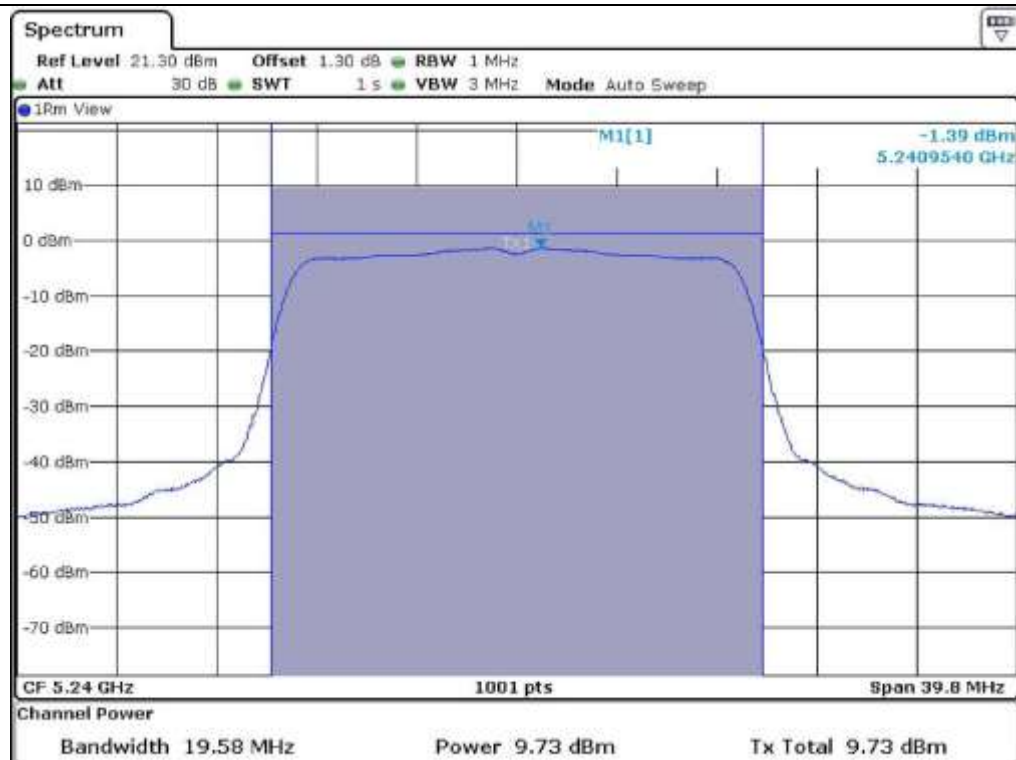
Tested by: Tae-Ho, Kim / Senior Engineer



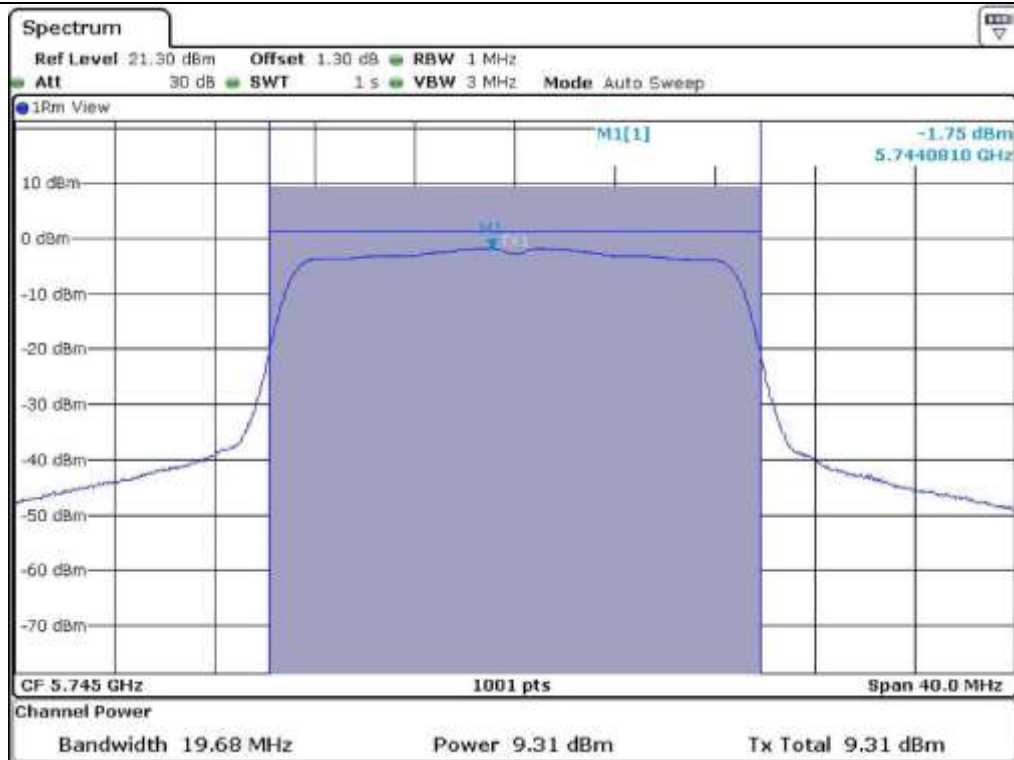
Low Channel @ 5 180 MHz (26 dB Bandwidth)



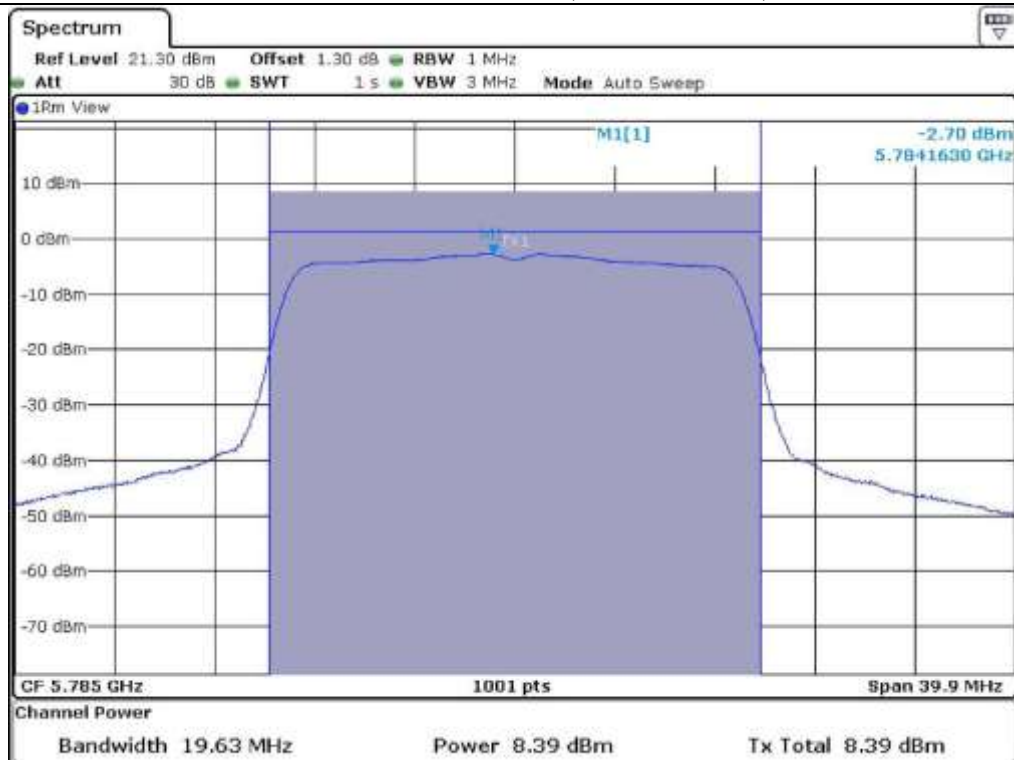
Middle Channel @ 5 200 MHz (26 dB Bandwidth)



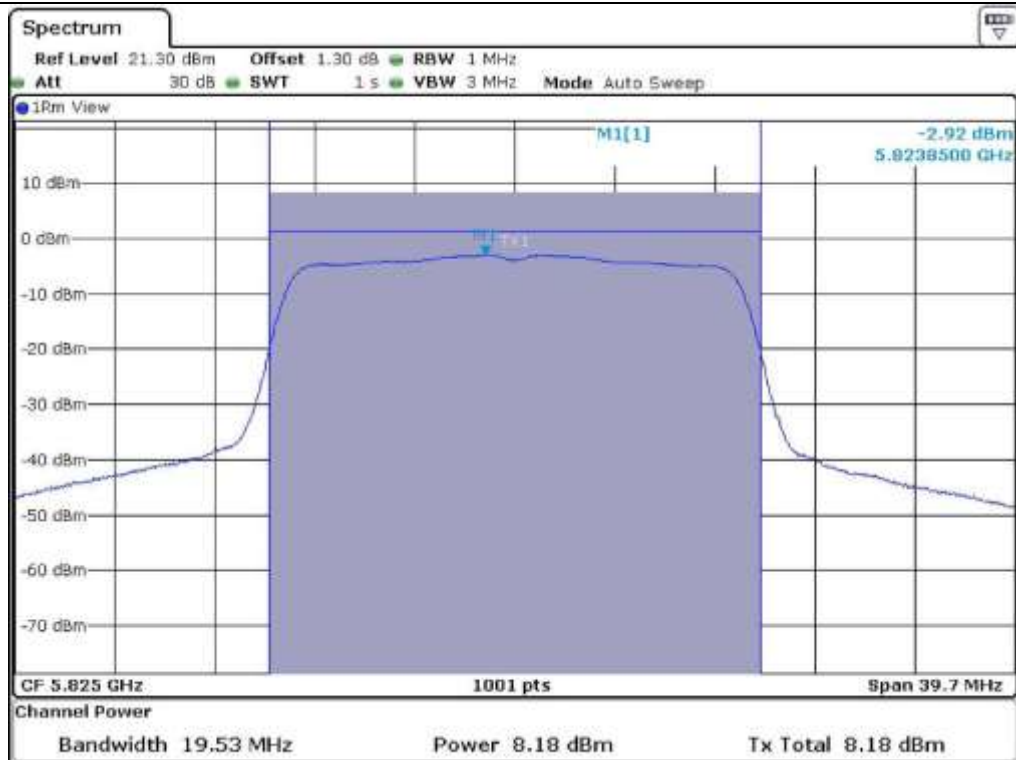
High Channel @ 5 240 MHz (26 dB Bandwidth)



Low Channel @ 5 745 MHz (26 dB Bandwidth)



Middle Channel @ 5 785 MHz (26 dB Bandwidth)



High Channel @ 5 825 MHz (26 dB Bandwidth)

8.7.2 Test data for Antenna 1

-. Test Date : January 18, 2016

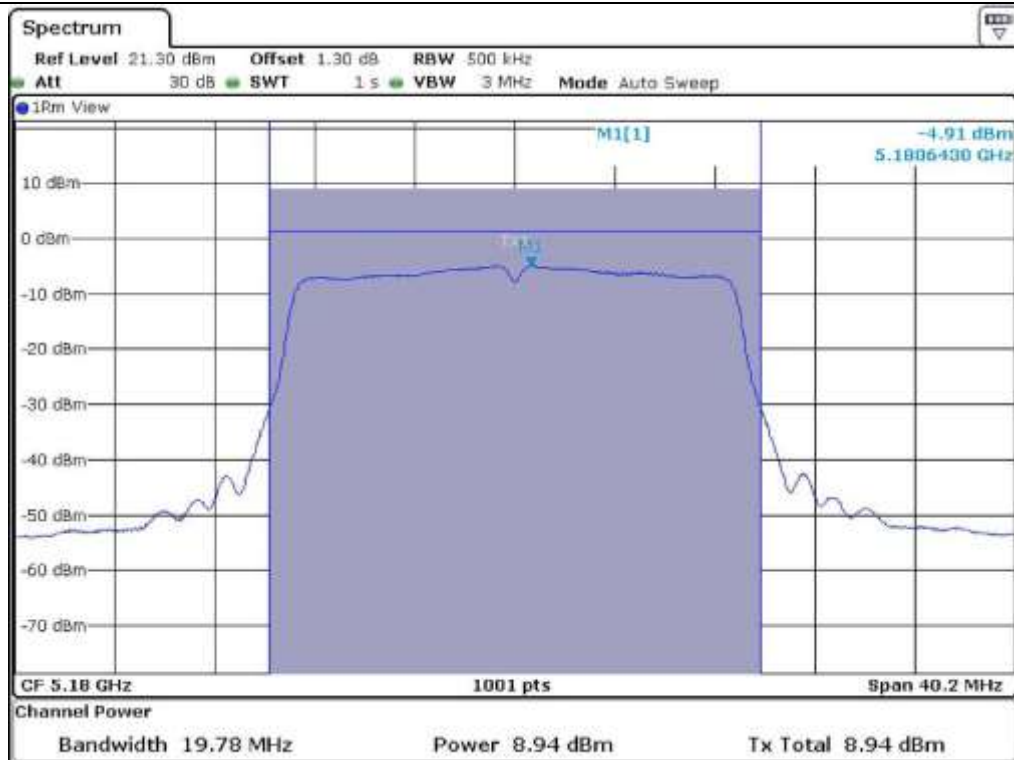
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	19.78	8.94	23.98	15.04
	Middle	5 200	19.78	9.02	23.98	14.96
	High	5 240	19.78	9.18	23.98	14.80
5 725 ~ 5 850	Low	5 745	19.63	8.10	23.98	15.88
	Middle	5 785	19.58	8.49	23.98	15.49
	High	5 825	19.63	7.71	23.98	16.27

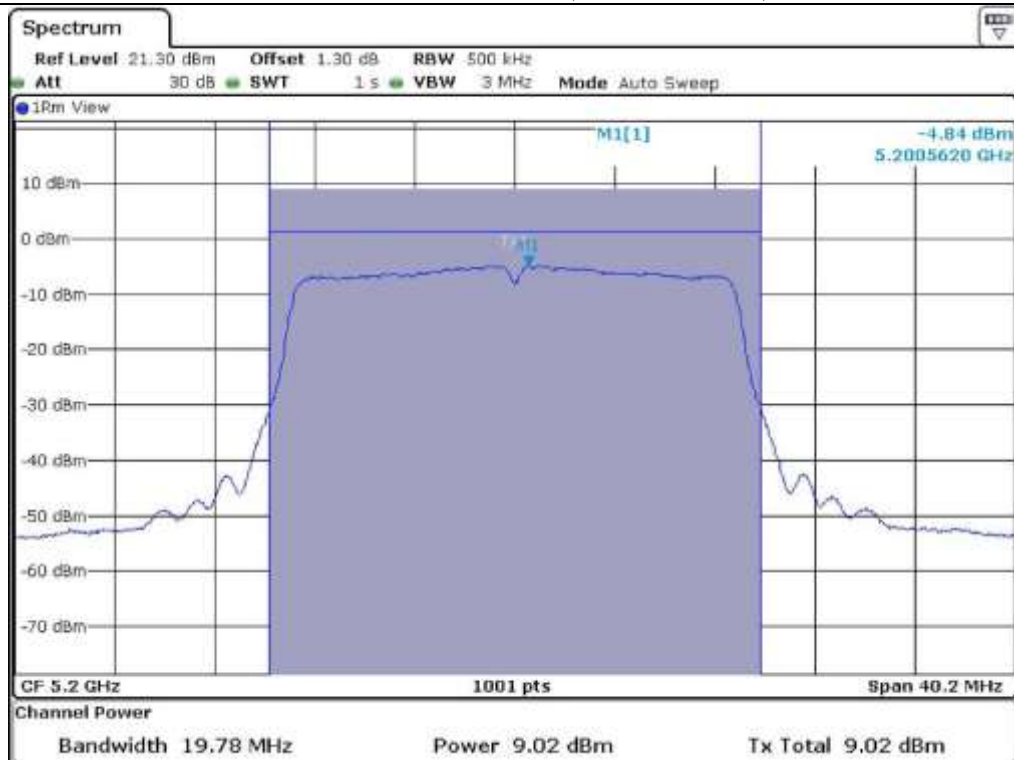
Remark: See next page for measurement data.



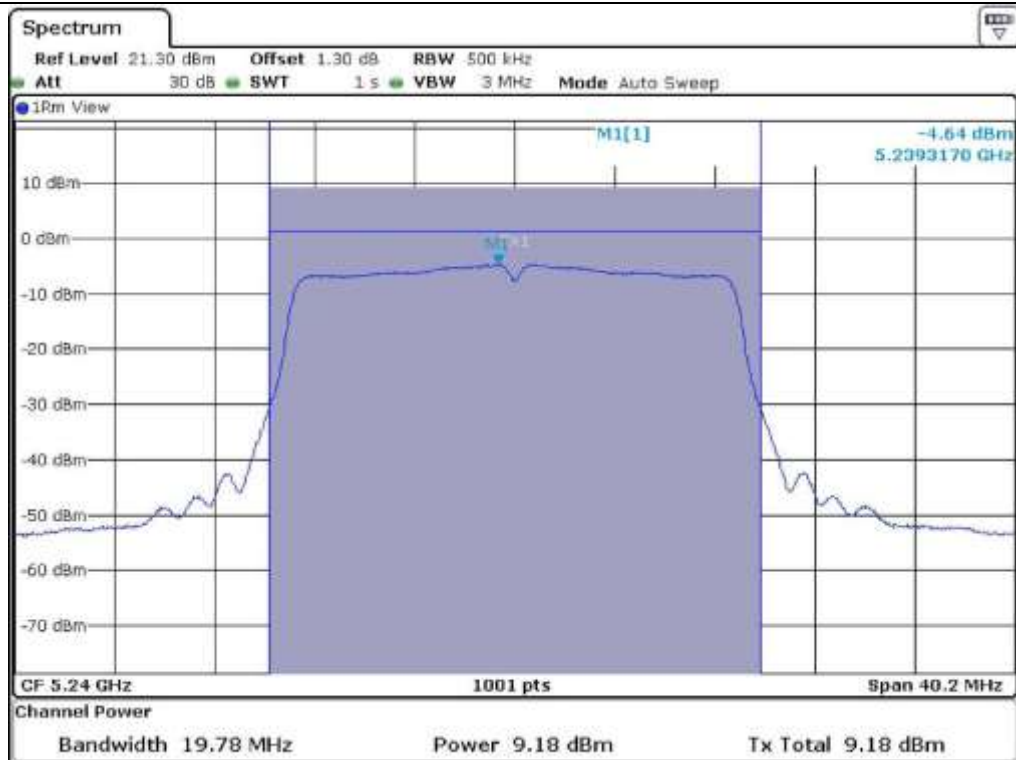
Tested by: Tae-Ho, Kim / Senior Engineer



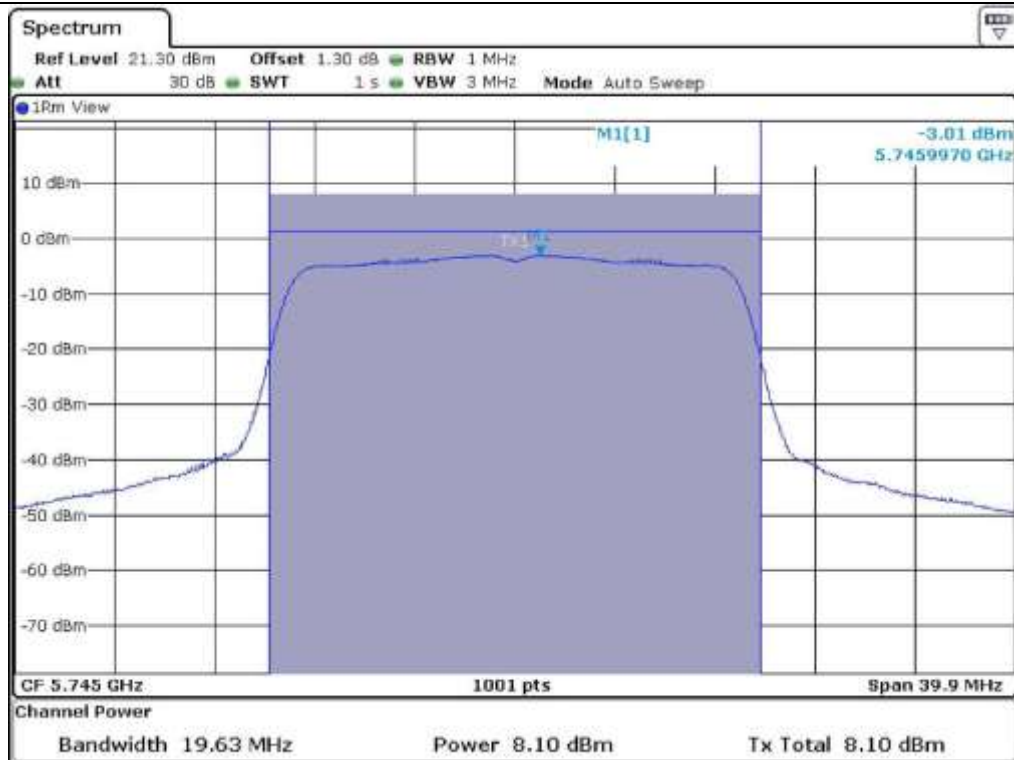
Low Channel @ 5 180 MHz (26 dB Bandwidth)



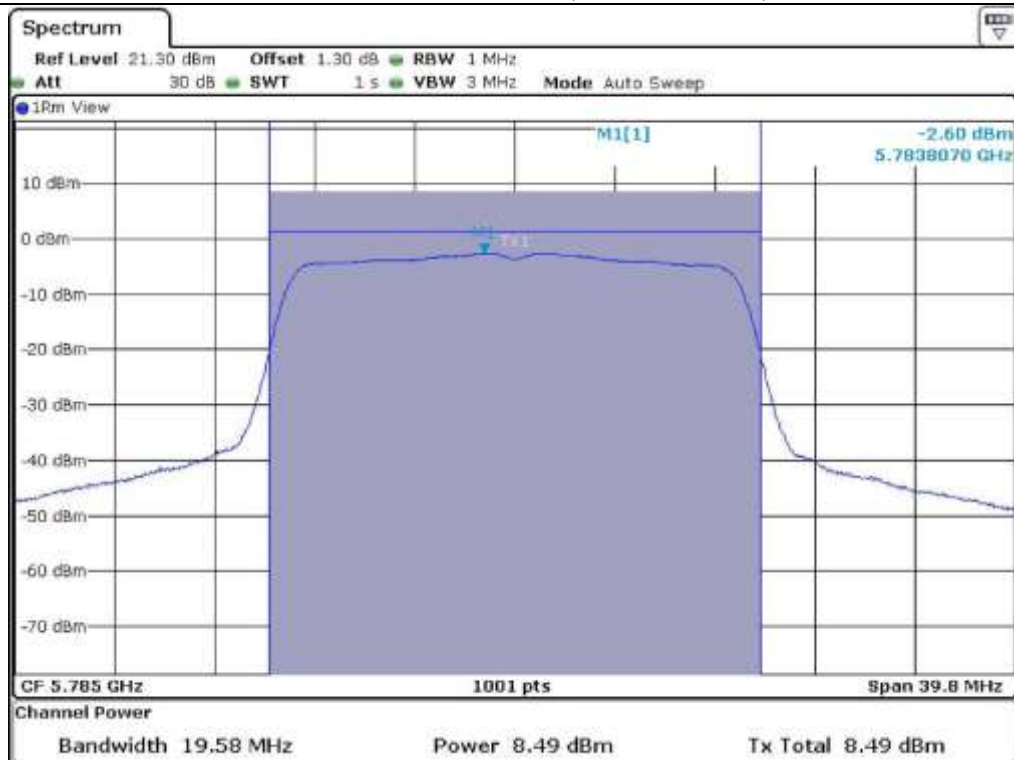
Middle Channel @ 5 200 MHz (26 dB Bandwidth)



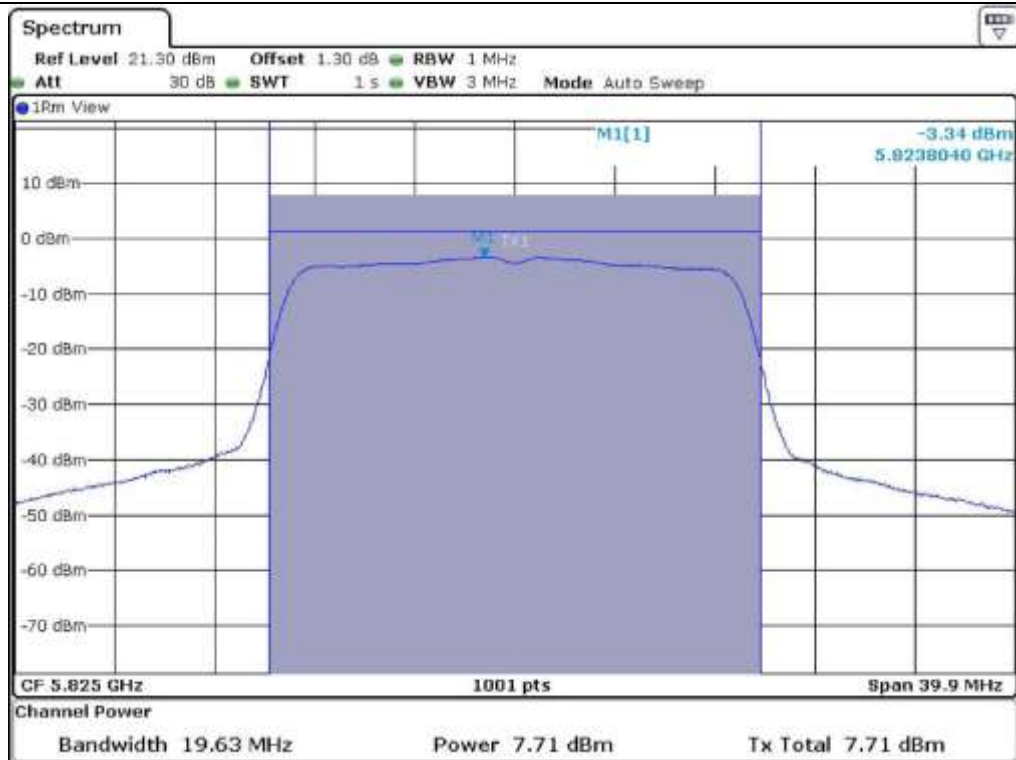
High Channel @ 5 240 MHz (26 dB Bandwidth)



Low Channel @ 5.745 MHz (26 dB Bandwidth)



Middle Channel @ 5.785 MHz (26 dB Bandwidth)



High Channel @ 5 825 MHz (26 dB Bandwidth)

8.7.3 Test data for Multiple Transmit

-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	12.36	23.98	11.62
	Middle	5 200	12.42	23.98	11.56
	High	5 240	12.47	23.98	11.51
5 725 ~ 5 850	Low	5 745	11.76	23.98	12.22
	Middle	5 785	11.45	23.98	12.53
	High	5 825	10.96	23.98	13.02

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 : Calculated Output Power= $10\log (10^{(\text{Antenna1 Output Power}/10)} + 10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

8.8 Test data for 802.11ac40 RLAN Mode

8.8.1 Test data for Antenna 0

-. Test Date : January 18, 2016

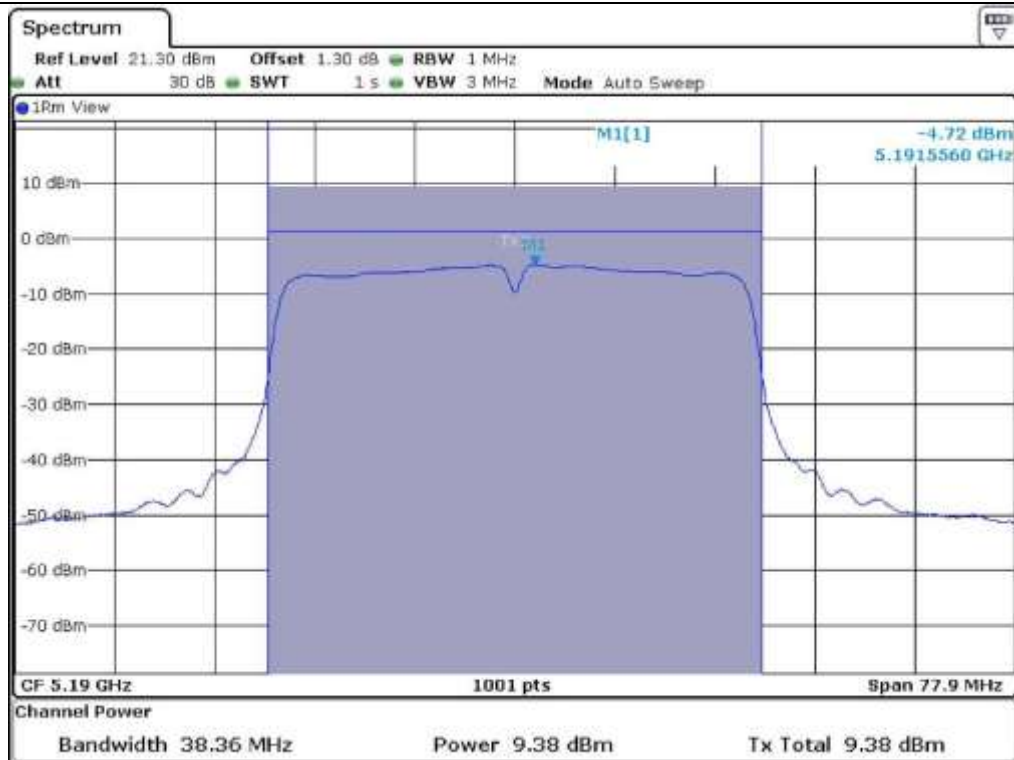
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	38.36	9.38	30.00	20.62
	High	5 230	38.36	9.49	30.00	20.51
5 725 ~ 5 850	Low	5 755	38.56	8.12	30.00	21.88
	High	5 795	38.36	7.85	30.00	22.15

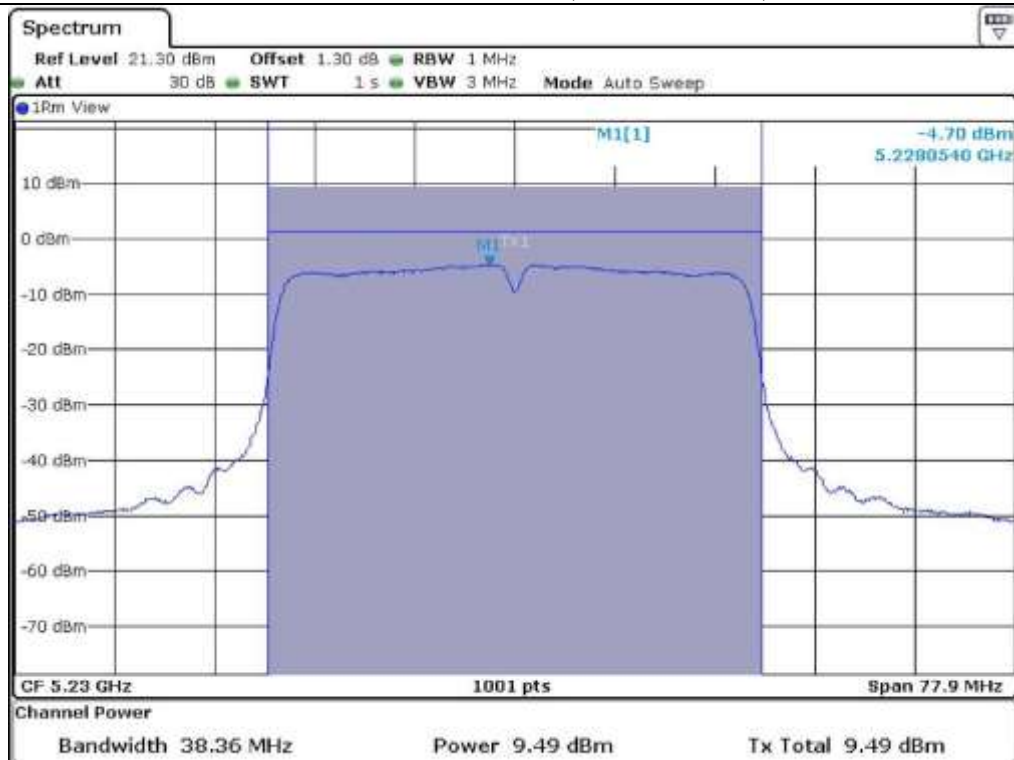
Remark: See next page for measurement data.



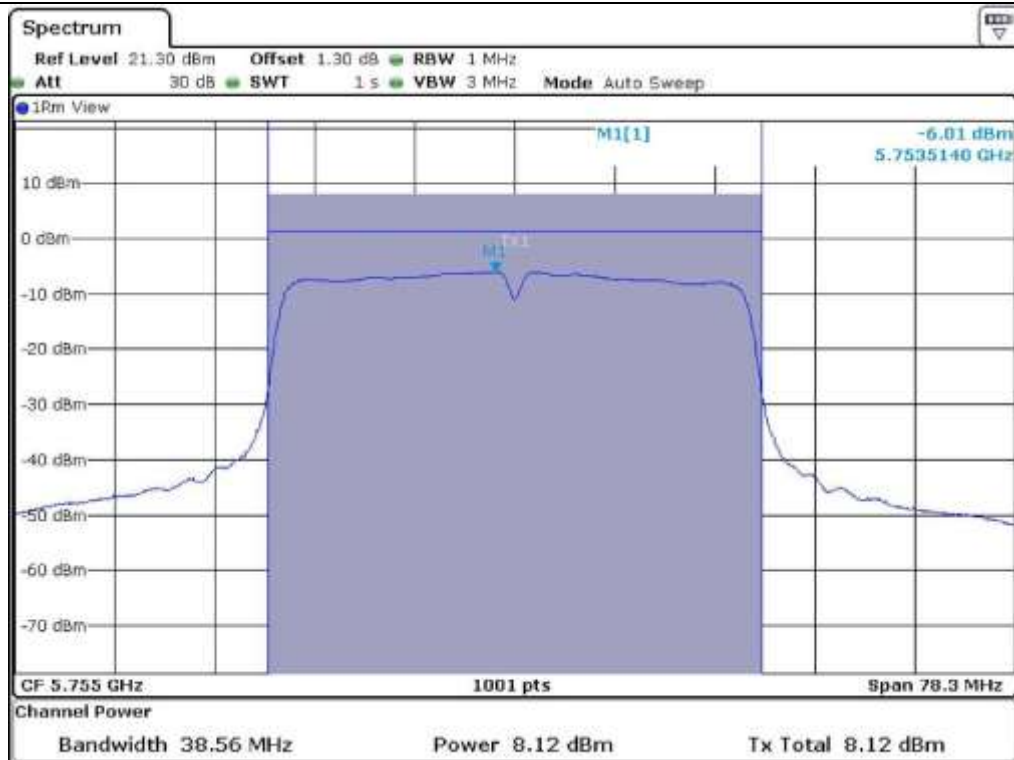
Tested by: Tae-Ho, Kim / Senior Engineer



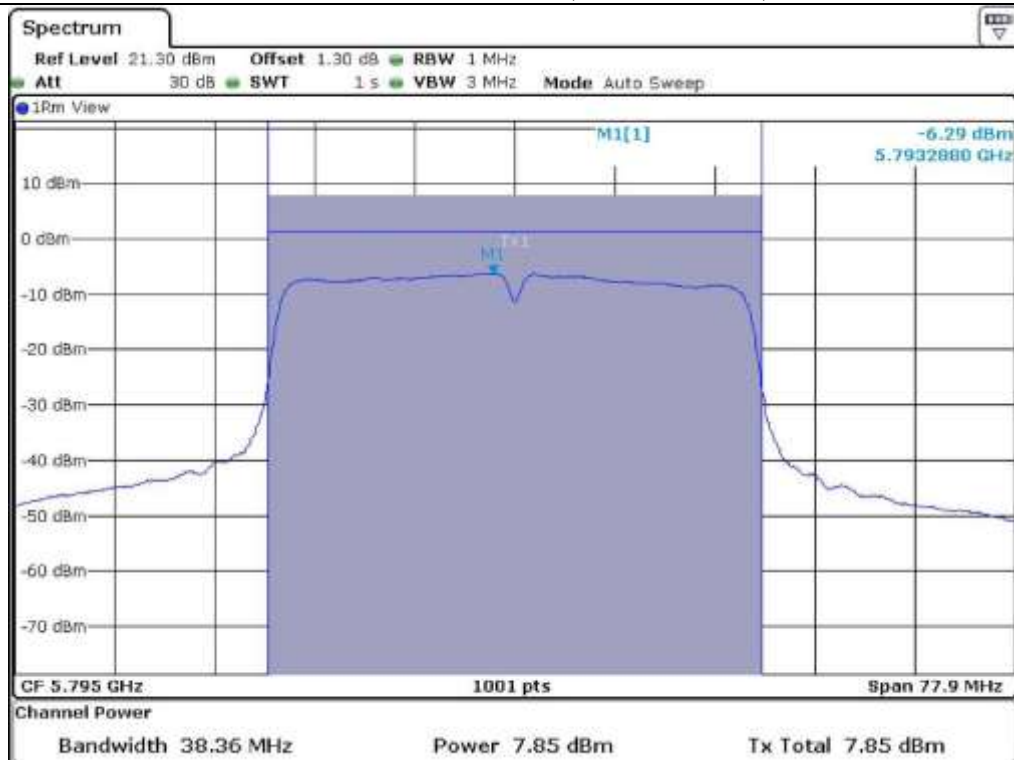
Low Channel @ 5 190 MHz (26 dB Bandwidth)



High Channel @ 5 230 MHz (26 dB Bandwidth)



Low Channel @ 5.755 MHz (26 dB Bandwidth)



High Channel @ 5.795 MHz (26 dB Bandwidth)

8.8.2 Test data for Antenna 1

-. Test Date : January 18, 2016

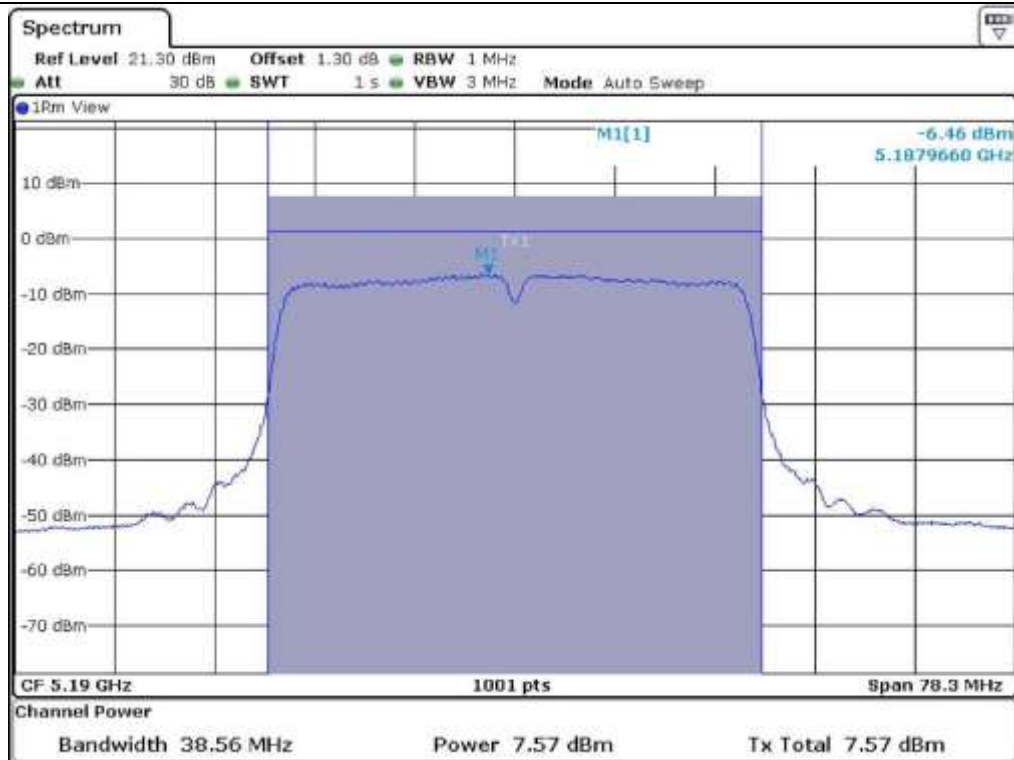
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	38.56	8.57	30.00	21.43
	High	5 230	38.56	8.83	30.00	21.17
5 725 ~ 5 850	Low	5 755	38.66	7.39	30.00	22.61
	High	5 795	38.76	7.04	30.00	22.96

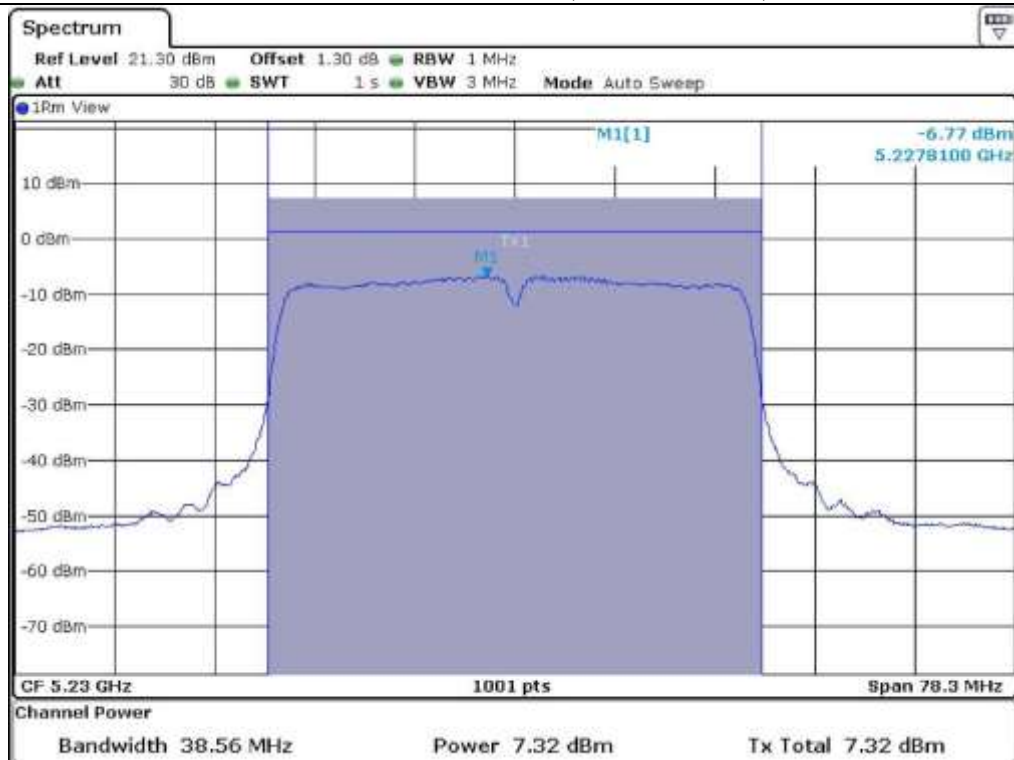
Remark: See next page for measurement data.



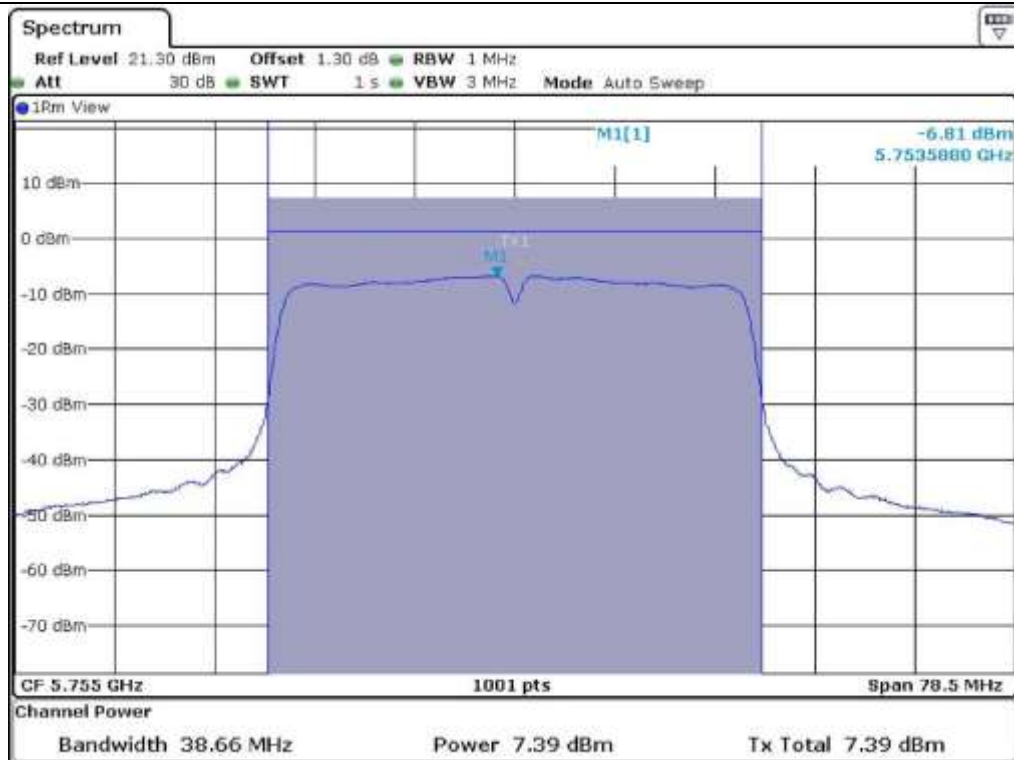
Tested by: Tae-Ho, Kim / Senior Engineer



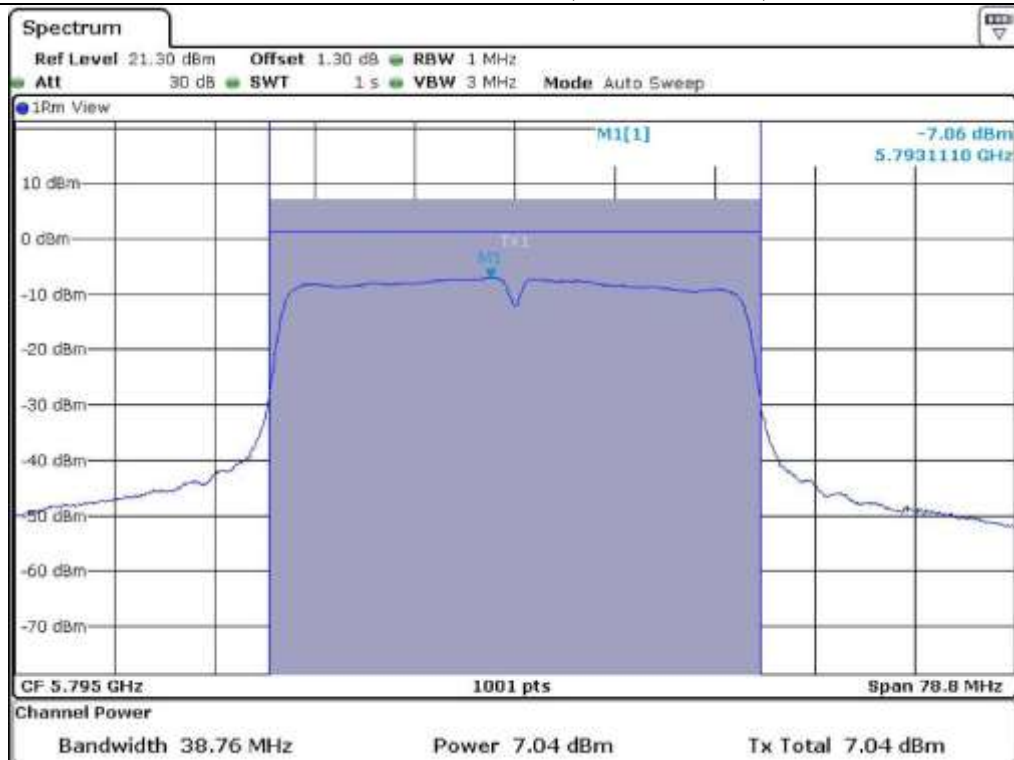
Low Channel @ 5 190 MHz (26 dB Bandwidth)



High Channel @ 5 230 MHz (26 dB Bandwidth)



Low Channel @ 5.755 MHz (26 dB Bandwidth)



High Channel @ 5.795 MHz (26 dB Bandwidth)

8.8.3 Test data for Multiple transmit

-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	12.00	30.00	18.00
	High	5 230	12.18	30.00	17.82
5 725 ~ 5 850	Low	5 755	10.78	30.00	19.22
	High	5 795	10.47	30.00	19.53

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 :Calculated Output Power= $10\log (10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

8.9 Test data for 802.11ac80 RLAN Mode

8.9.1 Test data for Antenna 0

-. Test Date : January 18, 2016

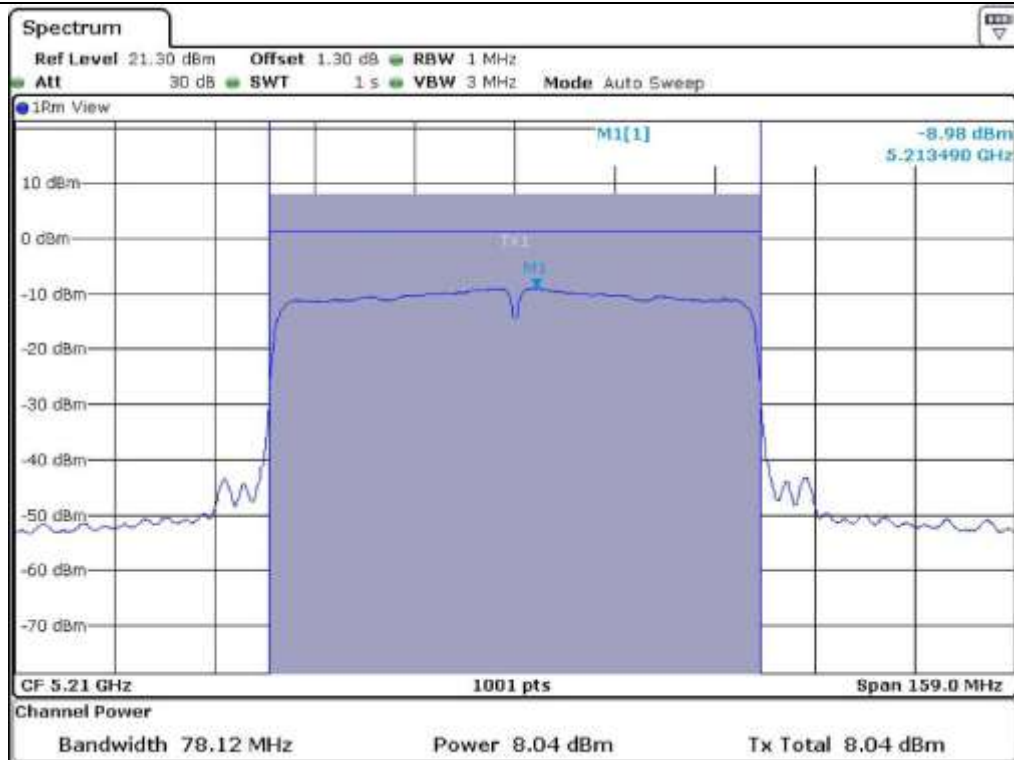
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 210	78.12	8.04	30.00	21.96
5 725 ~ 5 850	Low	5 775	77.72	7.40	30.00	22.60

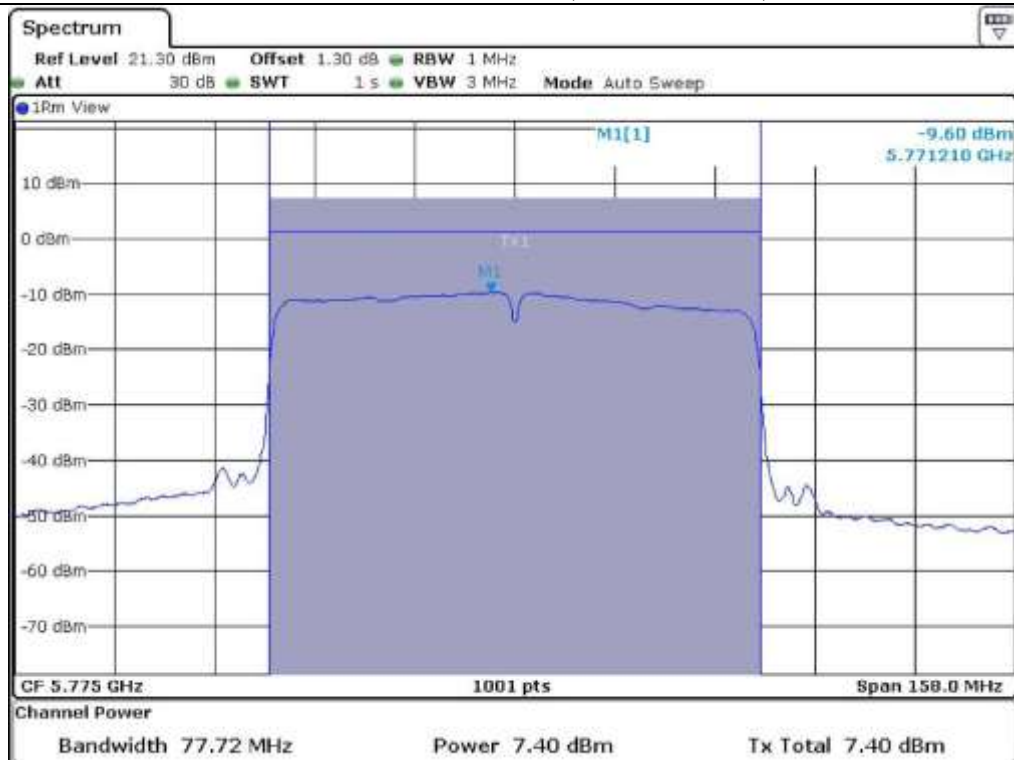
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel @ 5 210 MHz (26 dB Bandwidth)



Low Channel @ 5 775 MHz (26 dB Bandwidth)

8.9.2 Test data for Antenna 1

-. Test Date : January 18, 2016

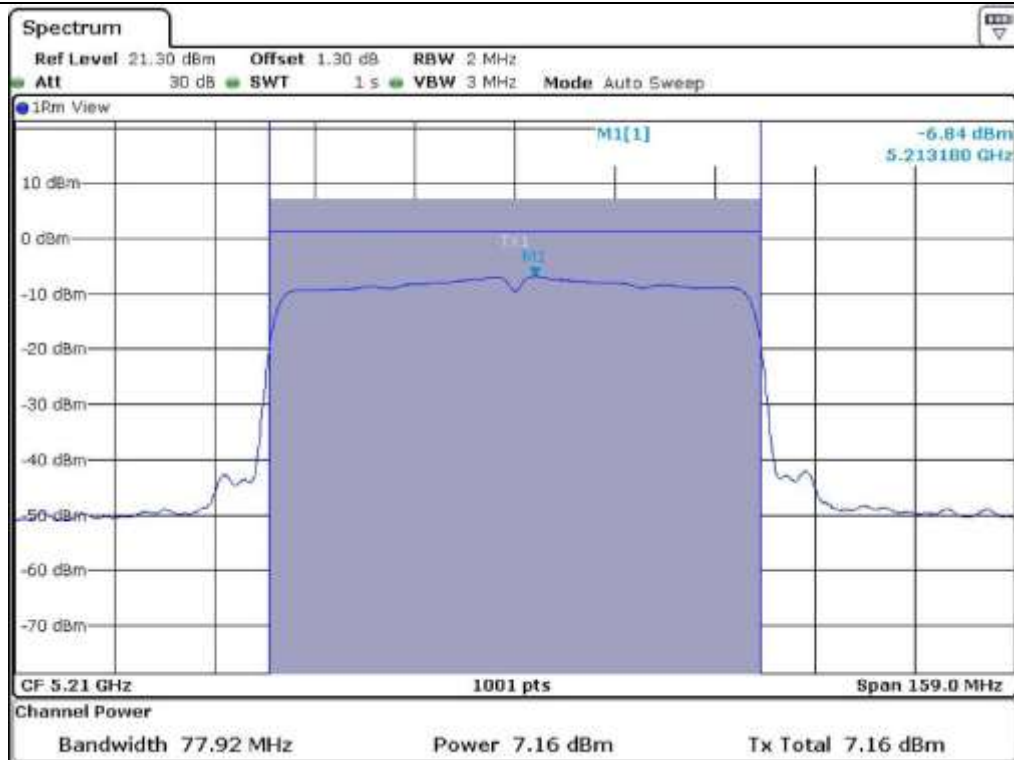
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 210	77.92	7.16	30.00	22.84
5 725 ~ 5 850	Low	5 775	77.72	6.54	30.00	23.46

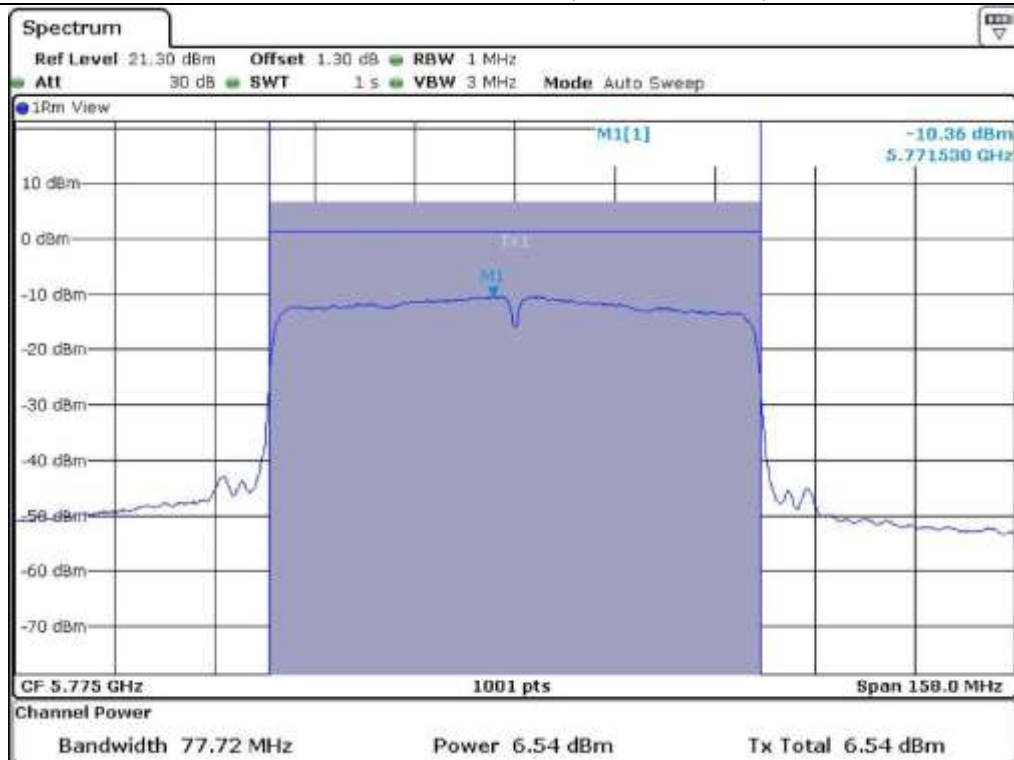
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel @ 5 210 MHz (26 dB Bandwidth)



Low Channel @ 5 775 MHz (26 dB Bandwidth)

8.9.3 Test data for Multiple transmit

-. Test Date : January 18, 2016

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 210	10.63	30.00	19.37
5 725 ~ 5 850	Low	5 775	10.00	30.00	20.00

Remark 1 : Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2 : Calculated Output Power= $10\log(10^{(\text{Antenna1 Output Power}/10)} + 10^{(\text{Antenna2 Output Power}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

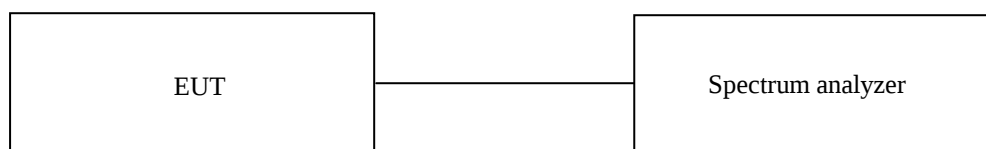
9. PEAK POWER SPECTRUL DENSITY

9.1 Operating environment

Temperature : 21.4 °C
Relative humidity : 45.1 % R.H.

9.2 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 from the EUT in 1 MHz bandwidth was measured with above condition.



9.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 22, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

9.4 Test data for 802.11a RLAN Mode

9.4.1 Test data for Antenna 0

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-0.63	10.00	10.63
	Middle	5 200	-0.29	10.00	10.29
	High	5 240	-0.90	10.00	10.90
5 725 ~ 5 850	Low	5 745	-1.85	10.00	11.85
	Middle	5 785	-2.10	10.00	12.10
	High	5 825	-2.00	10.00	12.00

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 180 MHz)



Middle Channel (5 200 MHz)





Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



9.4.2 Test data for Antenna 1

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-1.96	10.00	11.96
	Middle	5 200	-1.60	10.00	11.60
	High	5 240	-1.56	10.00	11.56
5 725 ~ 5 850	Low	5 745	-1.20	10.00	11.20
	Middle	5 785	-2.41	10.00	12.41
	High	5 825	-2.13	10.00	12.13

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 180 MHz)



Middle Channel (5 200 MHz)





Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



9.4.3 Test data for Multiple Transmit

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	1.77	10.00	8.23
	Middle	5 200	2.11	10.00	7.89
	High	5 240	1.79	10.00	8.21
5 725 ~ 5 850	Low	5 745	1.50	10.00	8.50
	Middle	5 785	0.76	10.00	9.24
	High	5 825	0.95	10.00	9.05

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

9.5 Test data for 802.11n_HT20 RLAN Mode

9.5.1 Test data for Antenna 0

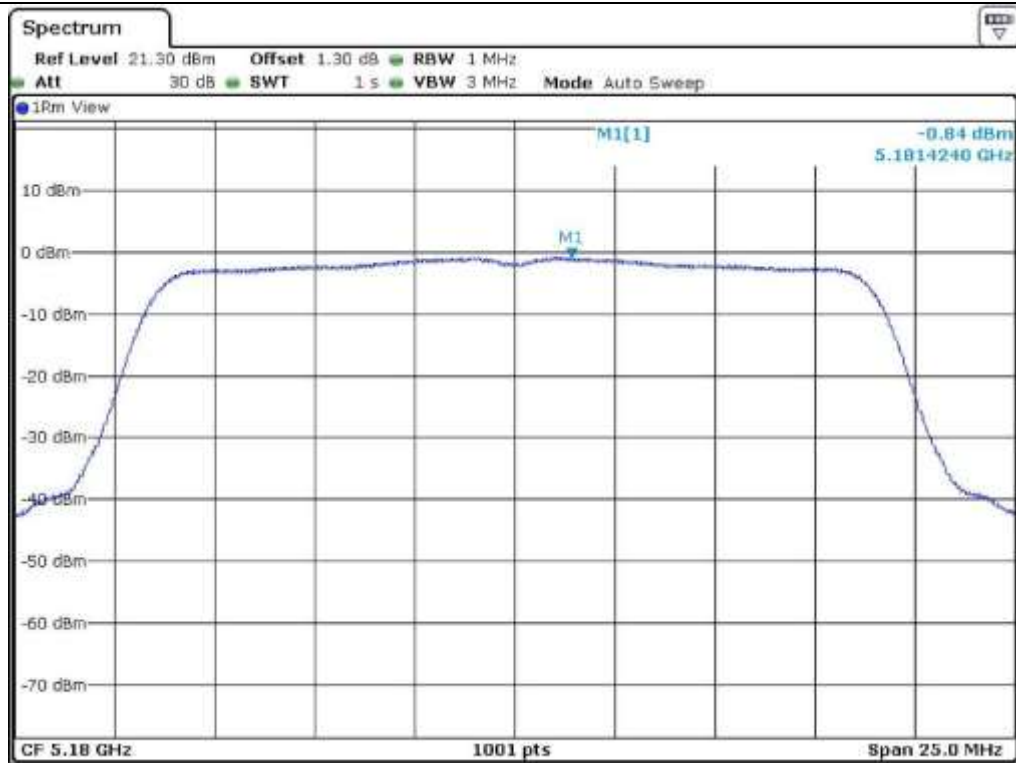
- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-0.84	10.00	10.84
	Middle	5 200	-0.42	10.00	10.42
	High	5 240	-0.80	10.00	10.80
5 725 ~ 5 850	Low	5 745	-2.06	10.00	12.06
	Middle	5 785	-2.15	10.00	12.15
	High	5 825	-2.47	10.00	12.47

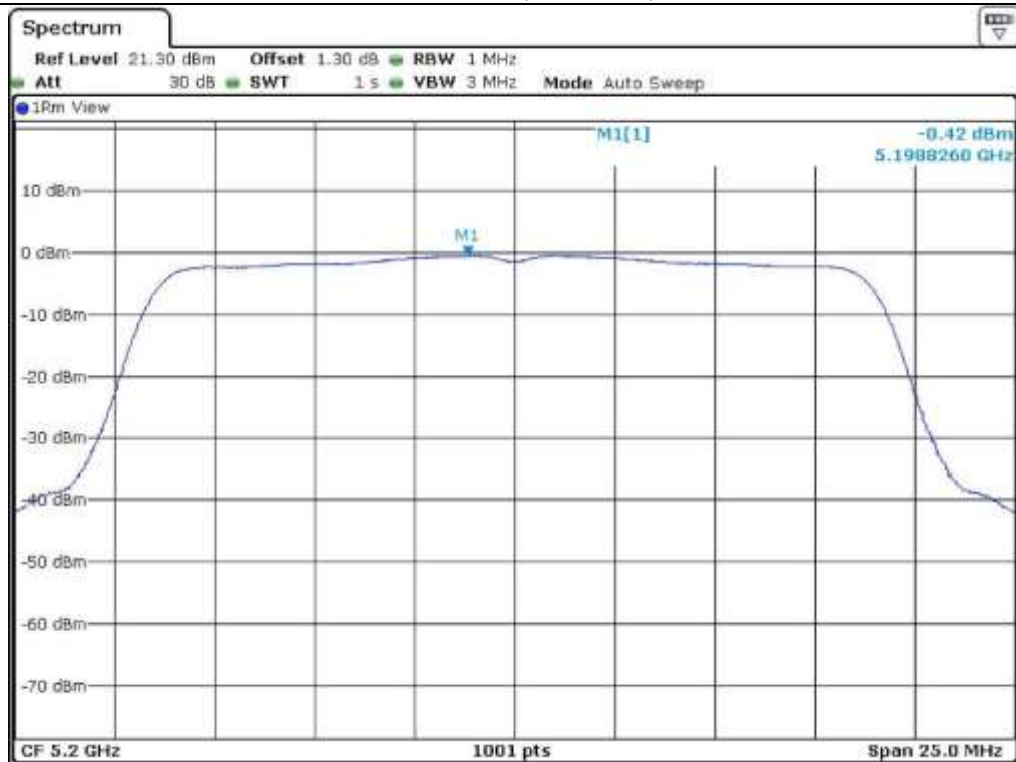
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



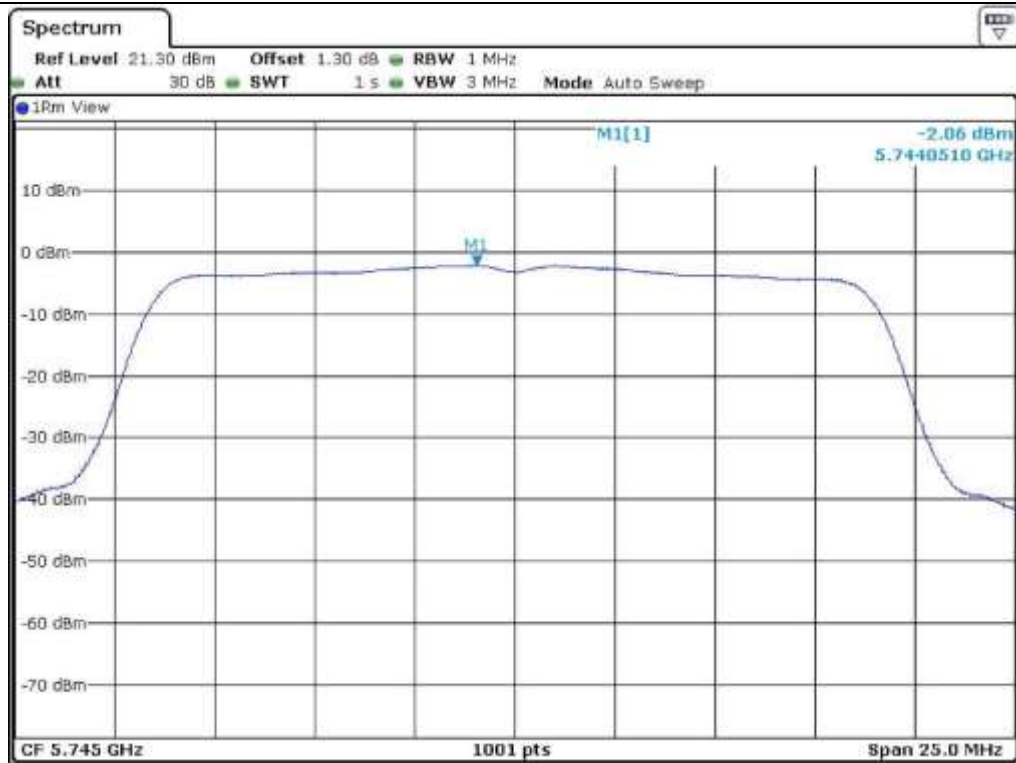
Low Channel (5 180 MHz)



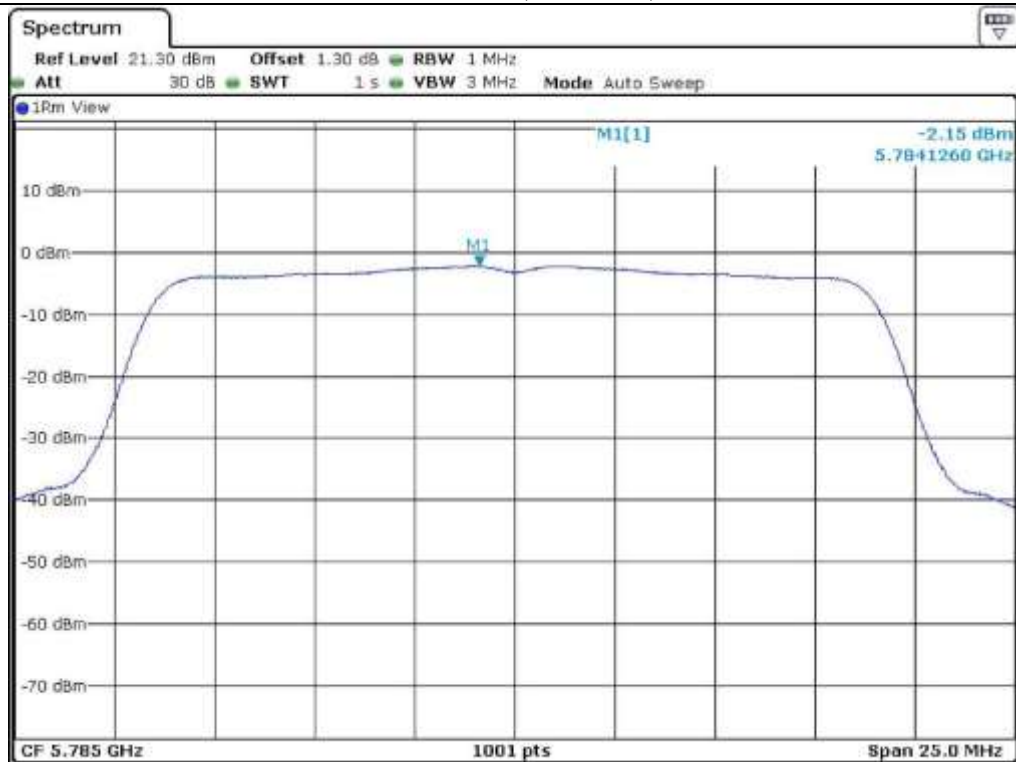
Middle Channel (5 200 MHz)



High Channel (5 240 MHz)



Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



9.5.2 Test data for Antenna 1

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-1.72	10.00	11.72
	Middle	5 200	-1.53	10.00	11.53
	High	5 240	-1.49	10.00	11.49
5 725 ~ 5 850	Low	5 745	-2.41	10.00	12.41
	Middle	5 785	-2.63	10.00	12.63
	High	5 825	-2.83	10.00	12.83

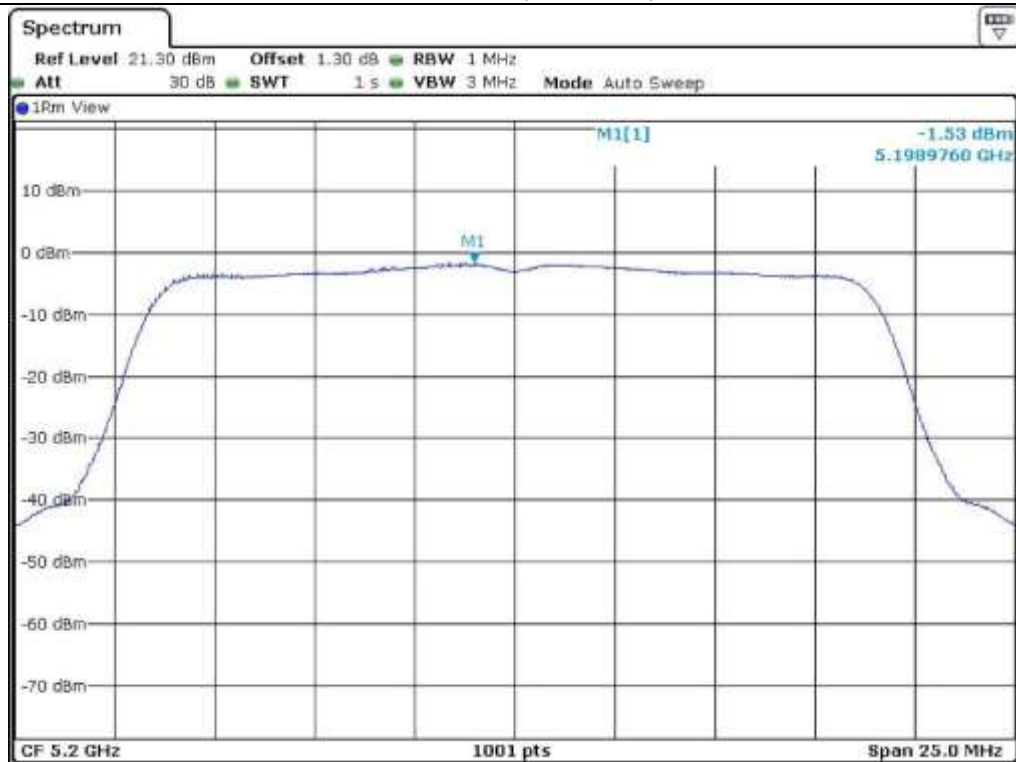
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer

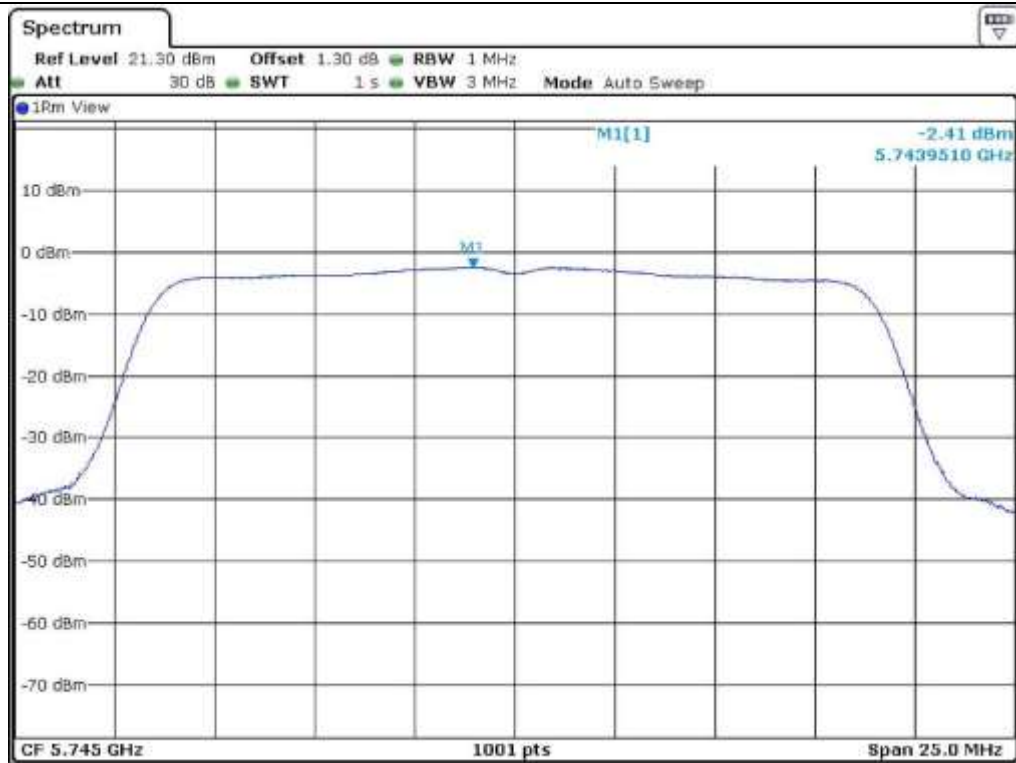


Low Channel (5 180 MHz)

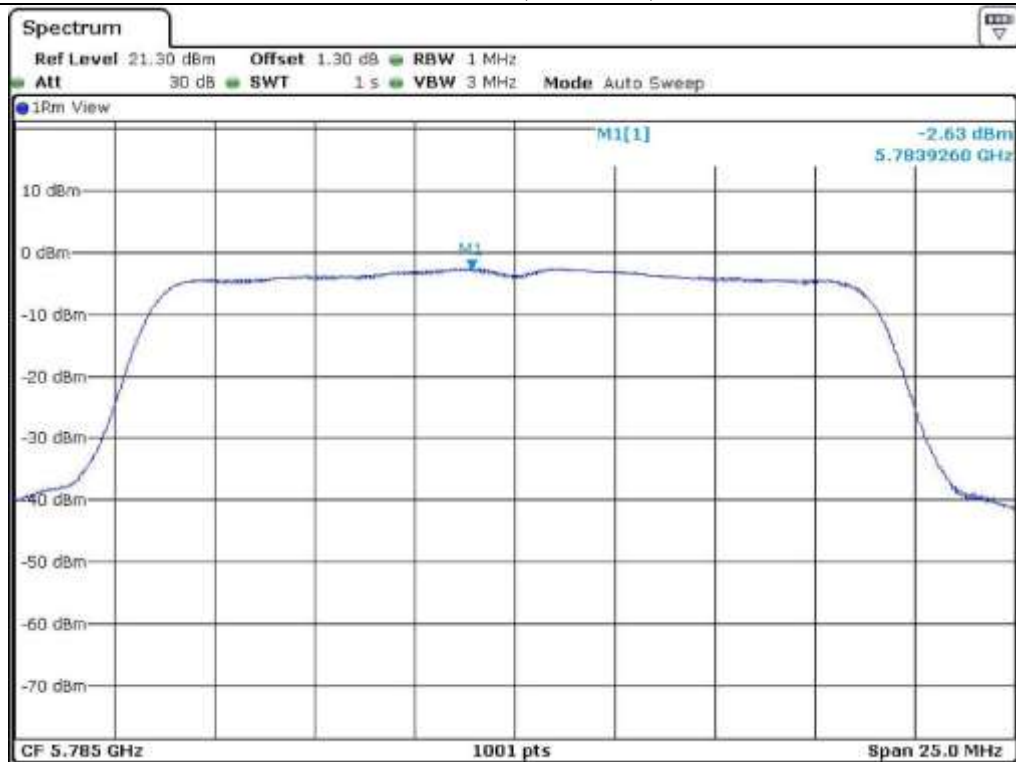


Middle Channel (5 200 MHz)





Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



9.5.3 Test data for Multiple transmit

- Test Date : January 18, 2016
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	1.75	10.00	8.25
	Middle	5 200	2.07	10.00	7.93
	High	5 240	1.88	10.00	8.12
5 725 ~ 5 850	Low	5 745	0.78	10.00	9.22
	Middle	5 785	0.63	10.00	9.37
	High	5 825	0.36	10.00	9.64

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

9.6 Test data for 802.11n_HT40 RLAN Mode

9.6.1 Test data for Antenna 0

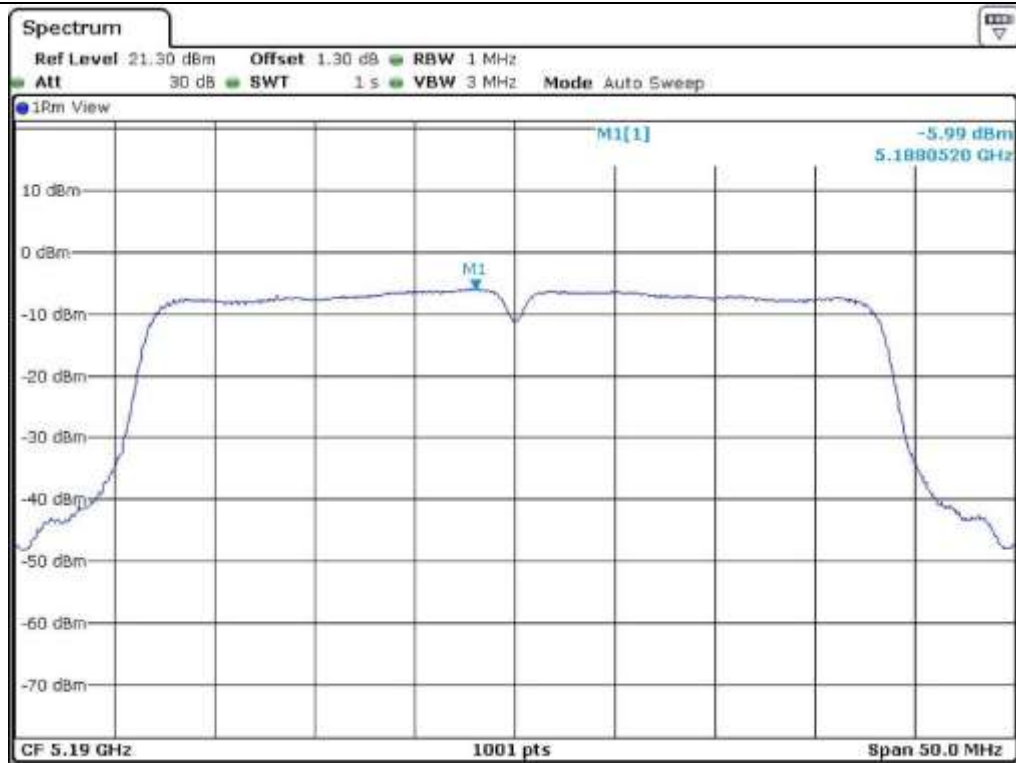
- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-5.99	10.00	15.99
	High	5 230	-6.12	10.00	16.12
5 725 ~ 5 850	Low	5 755	-6.53	10.00	16.53
	High	5 795	-6.63	10.00	16.63

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

9.6.2 Test data for Antenna 1

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-5.92	10.00	15.92
	High	5 230	-5.51	10.00	15.51
5 725 ~ 5 850	Low	5 755	-6.69	10.00	16.69
	High	5 795	-7.06	10.00	17.06

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5 755 MHz)



High Channel (5 795 MHz)

9.6.3 Test data for Multiple transmit

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-2.94	10.00	12.94
	High	5 230	-2.79	10.00	12.79
5 725 ~ 5 850	Low	5 755	-3.60	10.00	13.60
	High	5 795	-3.83	10.00	13.83

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10 \log (10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

9.7 Test data for 802.11ac20 RLAN Mode

9.7.1 Test data for Antenna 0

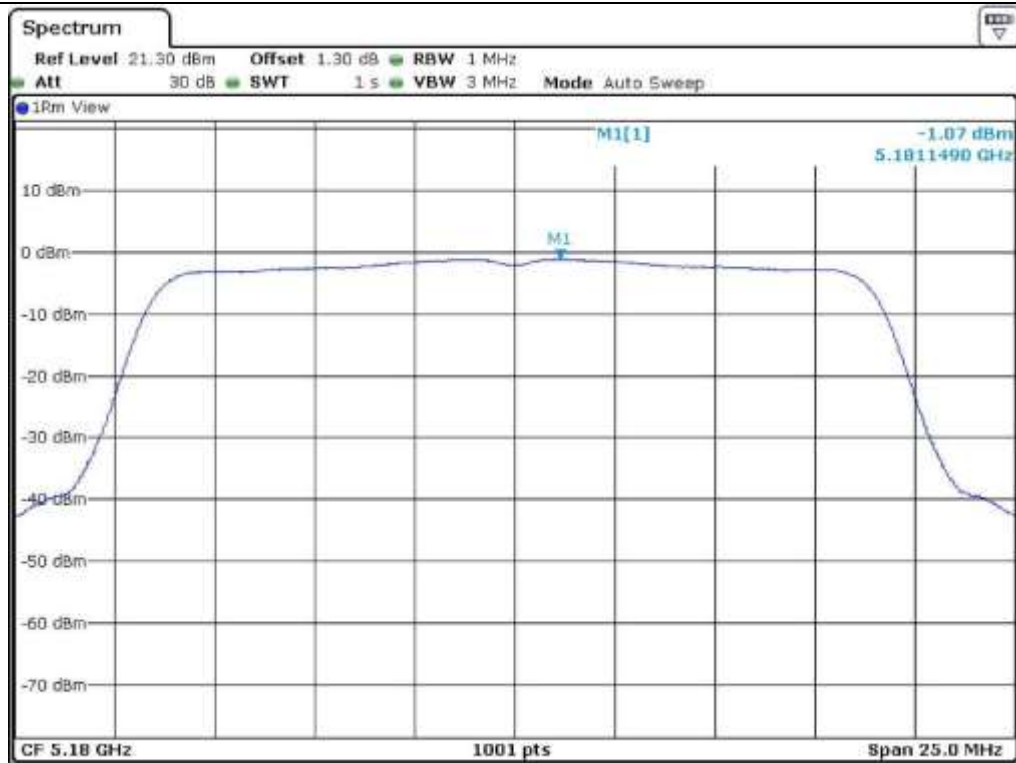
- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-1.07	10.00	11.07
	Middle	5 200	-1.21	10.00	11.21
	High	5 240	-0.89	10.00	10.89
5 725 ~ 5 850	Low	5 745	-2.15	10.00	12.15
	Middle	5 785	-2.43	10.00	12.43
	High	5 825	-2.29	10.00	12.29

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer

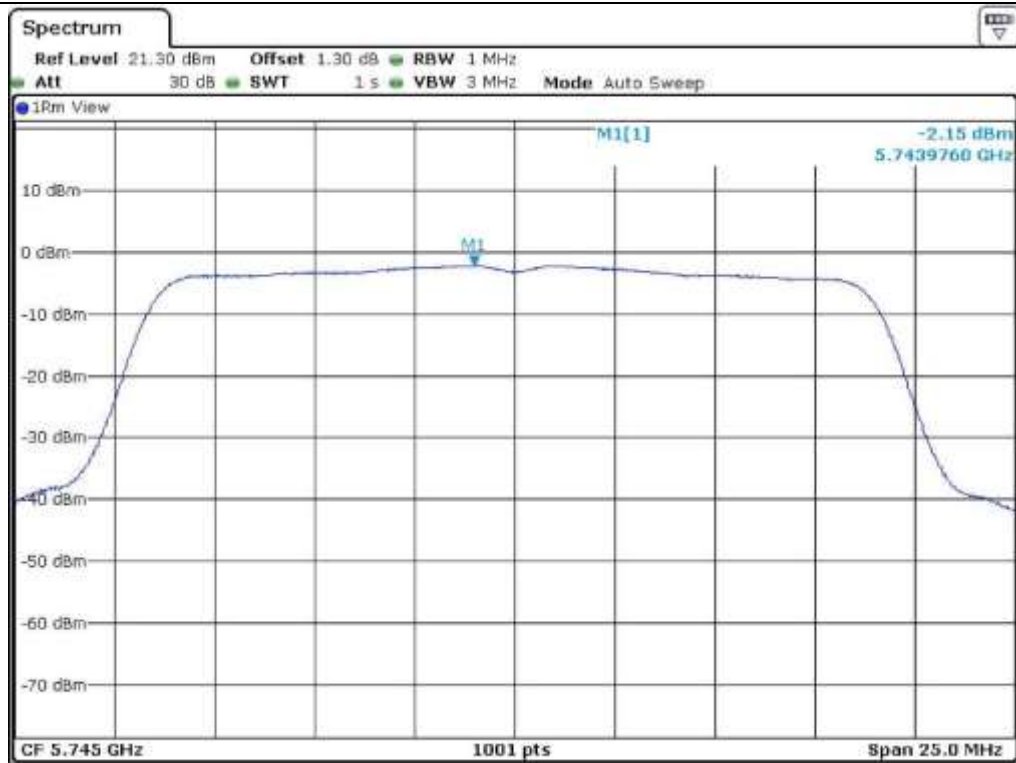


Low Channel (5 180 MHz)

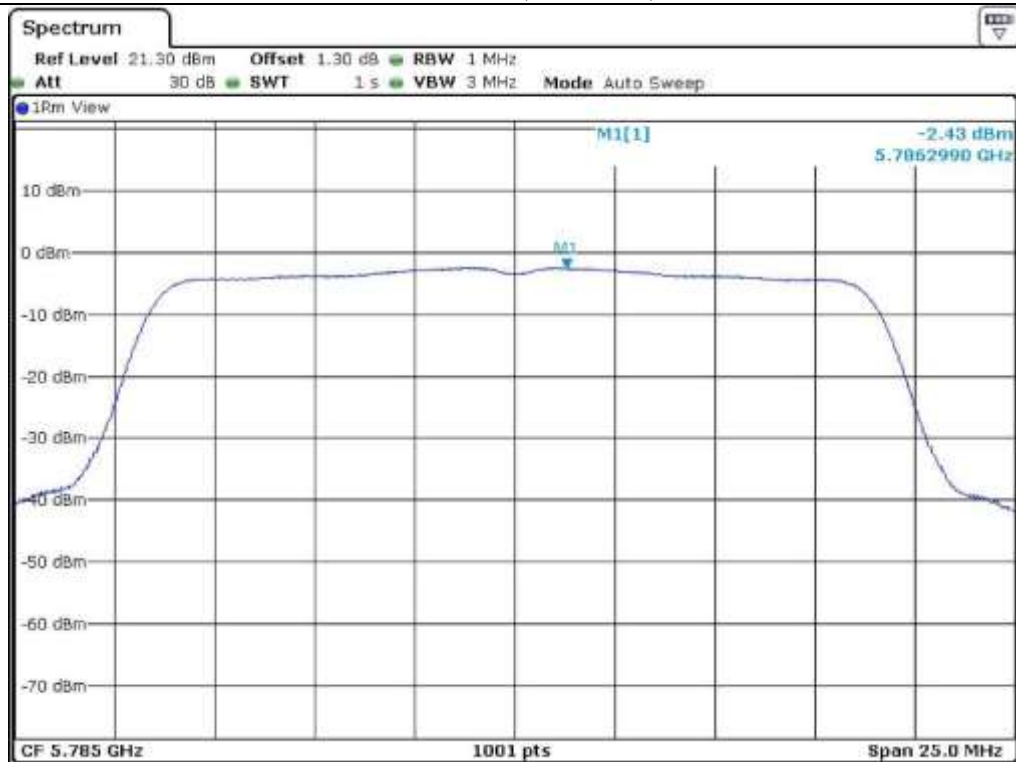


Middle Channel (5 200 MHz)

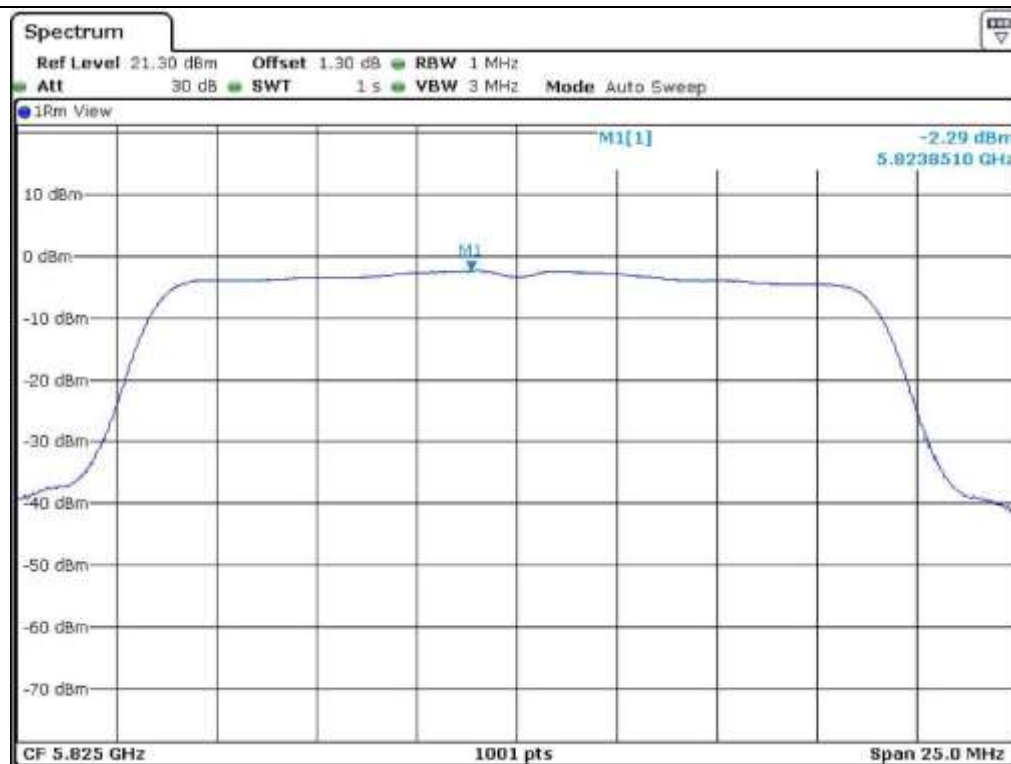




Low Channel (5.745 GHz)



Middle Channel (5.785 GHz)



High Channel (5 825 MHz)

9.7.2 Test data for Antenna 1

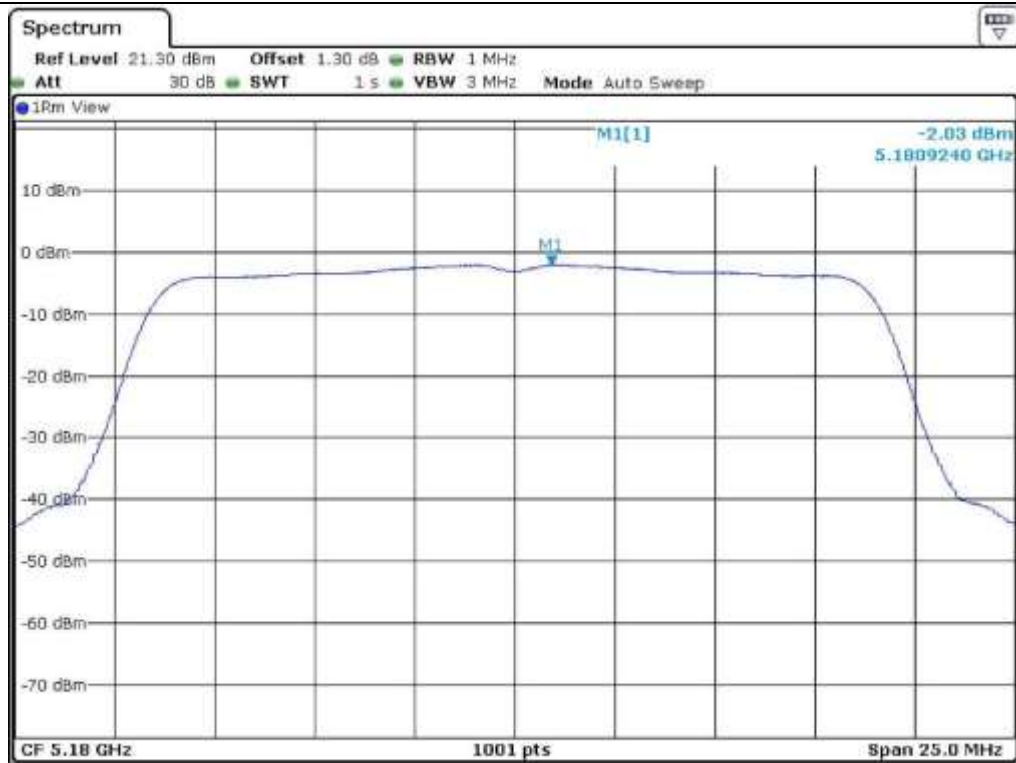
- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	-2.03	10.00	12.03
	Middle	5 200	-2.16	10.00	12.16
	High	5 240	-1.98	10.00	11.98
5 725 ~ 5 850	Low	5 745	-2.20	10.00	12.20
	Middle	5 785	-2.57	10.00	12.57
	High	5 825	-2.40	10.00	12.40

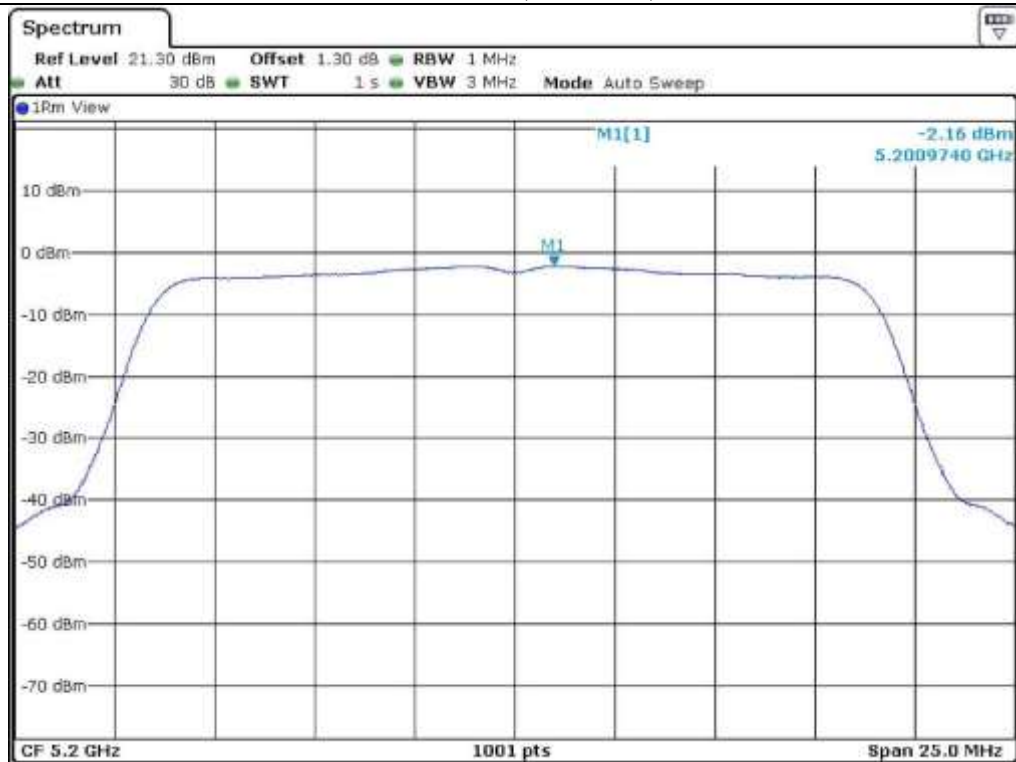
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer

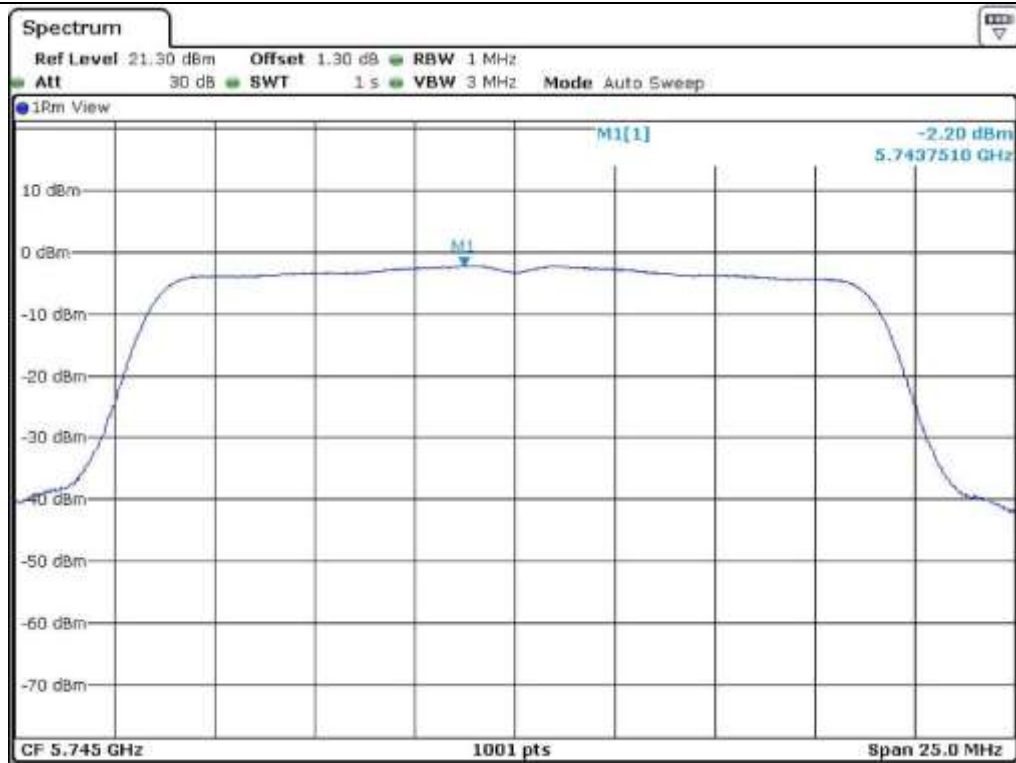


Low Channel (5 180 MHz)

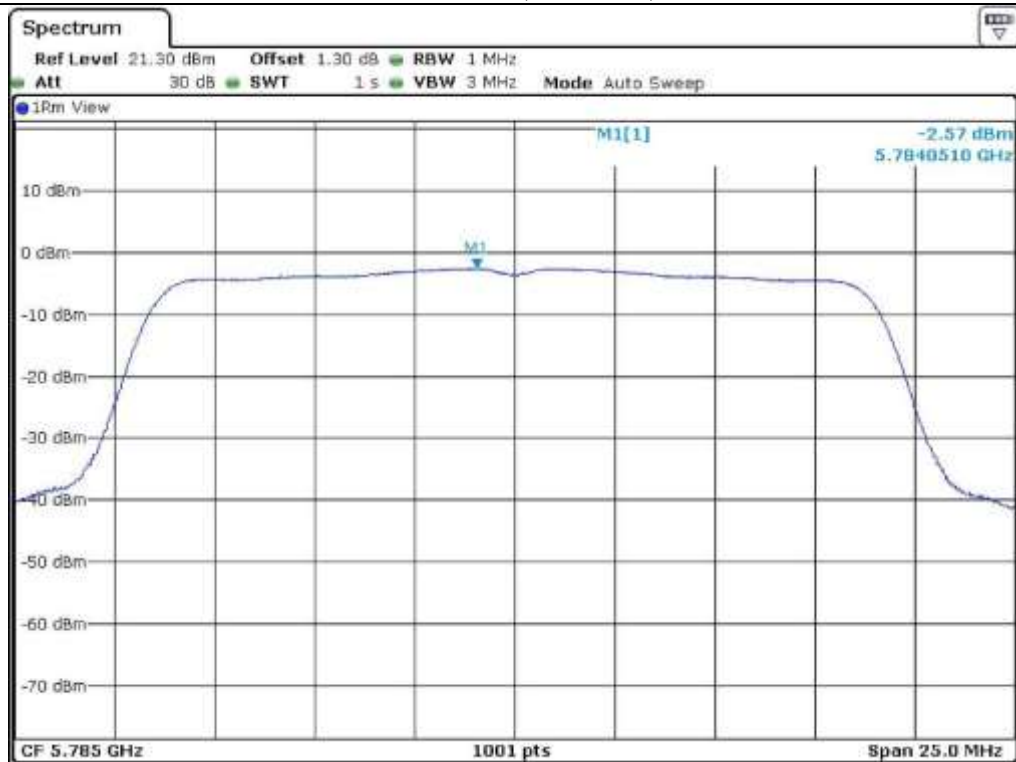


Middle Channel (5 200 MHz)

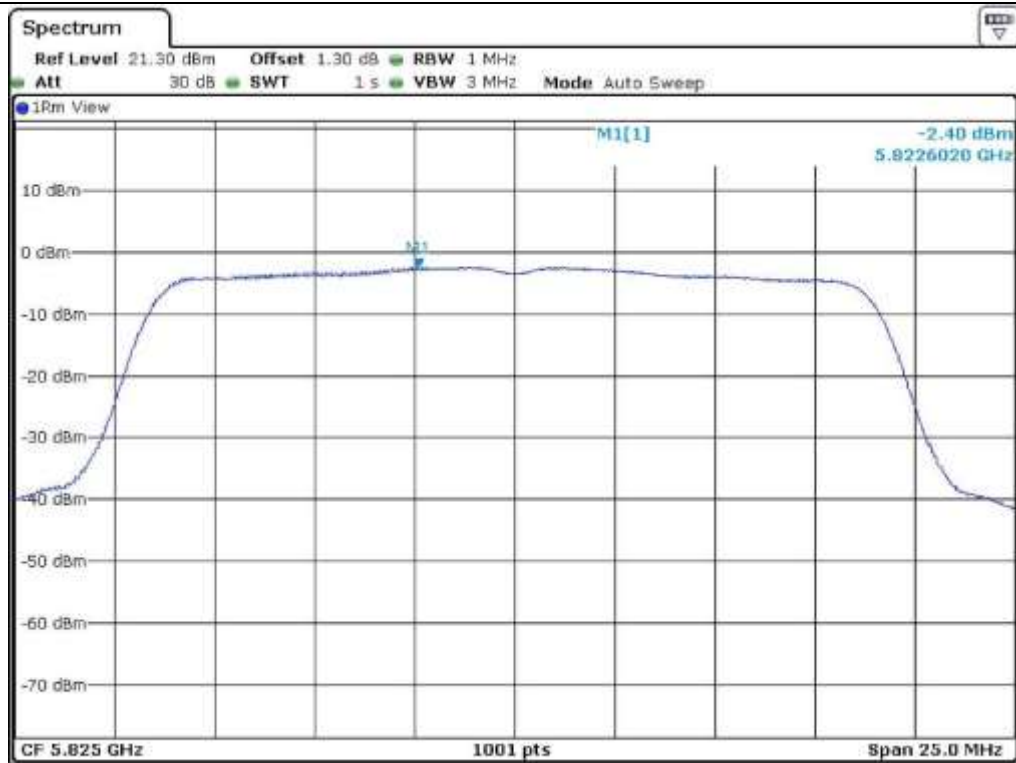




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



High Channel (5 825 MHz)

9.7.3 Test data for Multiple Transmit

- Test Date : January 18, 2016
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180	1.49	10.00	8.51
	Middle	5 200	1.35	10.00	8.65
	High	5 240	1.61	10.00	8.39
5 725 ~ 5 850	Low	5 745	0.84	10.00	9.16
	Middle	5 785	0.51	10.00	9.49
	High	5 825	0.67	10.00	9.33

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

9.8 Test data for 802.11ac40 RLAN Mode

9.8.1 Test data for Antenna 0

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-4.77	10.00	14.77
	High	5 230	-4.80	10.00	14.80
5 725 ~ 5 850	Low	5 755	-5.80	10.00	15.80
	High	5 795	-6.32	10.00	16.32

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

9.8.2 Test data for Antenna 1

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-6.09	10.00	16.09
	High	5 230	-5.84	10.00	15.84
5 725 ~ 5 850	Low	5 755	-5.82	10.00	15.82
	High	5 795	-6.76	10.00	16.76

Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5 755 MHz)



High Channel (5 795 MHz)

9.8.3 Test data for Multiple transmit

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190	-2.37	10.00	12.37
	High	5 230	1.24	10.00	8.76
5 725 ~ 5 850	Low	5 755	-2.80	10.00	12.80
	High	5 795	0.91	10.00	9.09

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10 \log (10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

9.9 Test data for 802.11ac80 RLAN Mode

9.9.1 Test data for Antenna 0

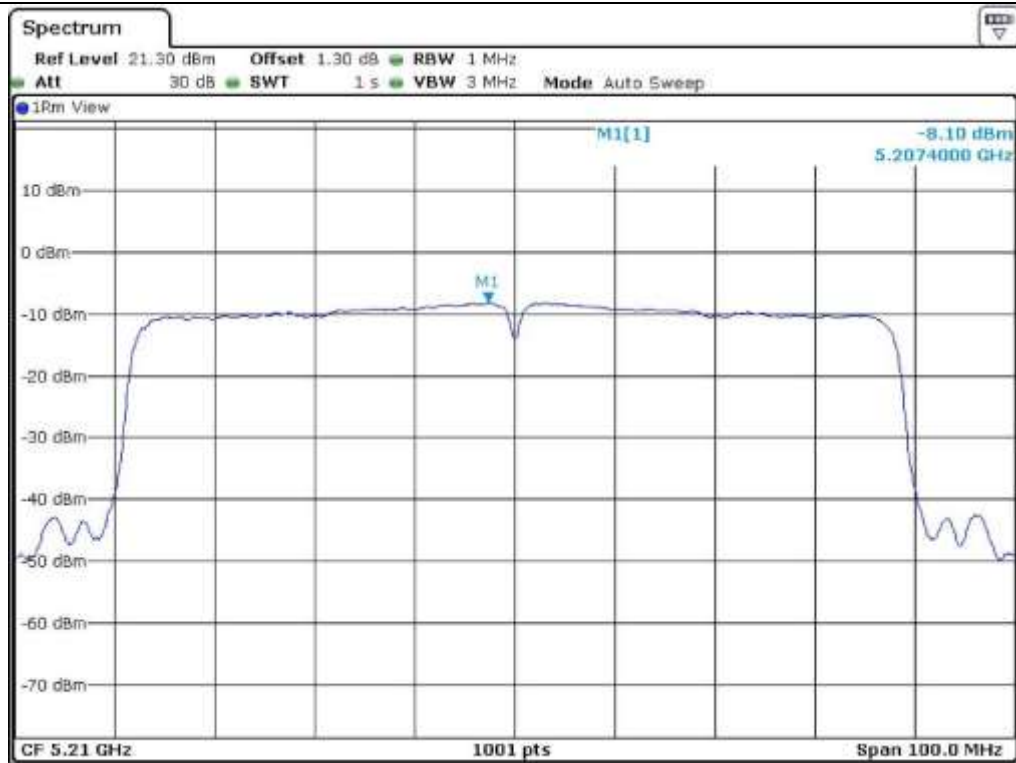
- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 210	-8.10	10.00	18.10
5 725 ~ 5 850	Low	5 775	-9.88	10.00	19.88

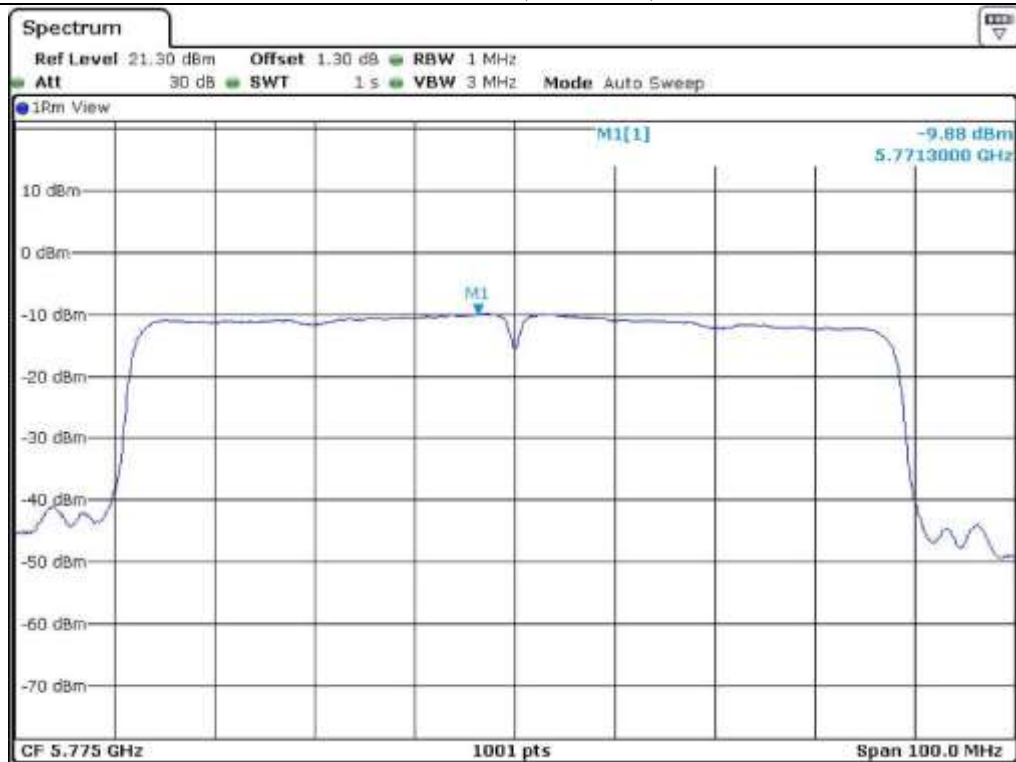
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 210 MHz)



Low Channel (5 775 MHz)

9.9.2 Test data for Antenna 1

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 210	-9.59	10.00	19.59
5 725 ~ 5 850	Low	5 775	-9.84	10.00	19.84

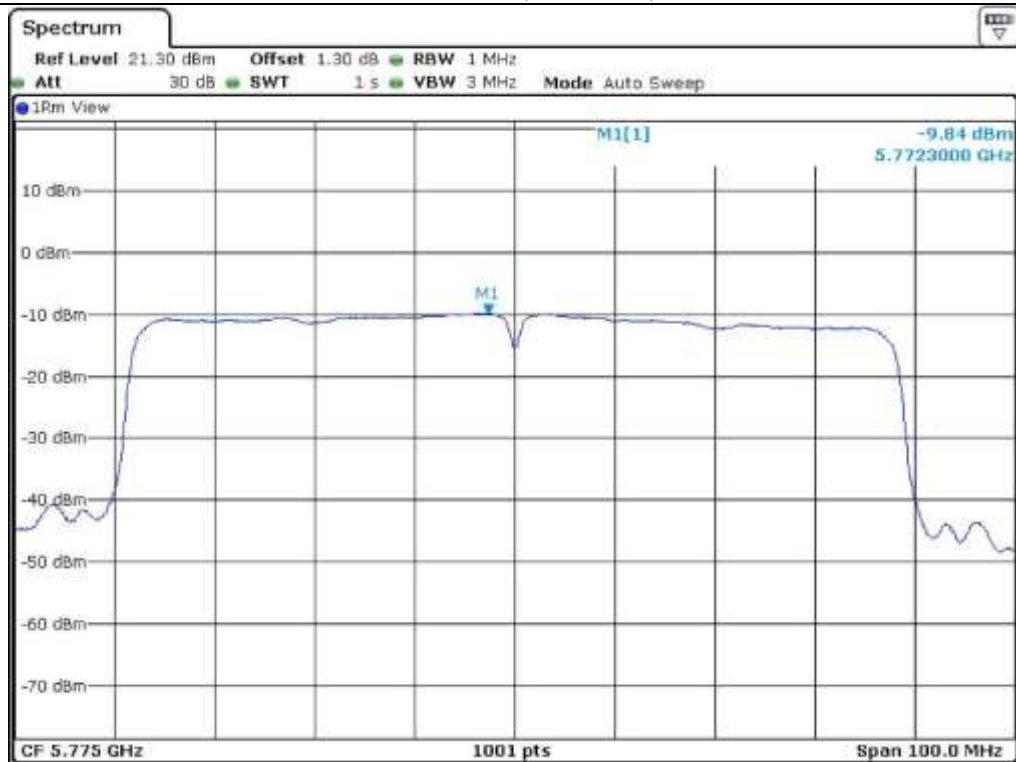
Remark: See next page for measurement data.



Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (5 210 MHz)



Low Channel (5 775 MHz)

9.9.3 Test data for Multiple transmit

- . Test Date : January 18, 2016
- . Operating condition : Highest Output Power Transmitting Mode
- . Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 210	-5.77	10.00	15.77
5 725 ~ 5 850	Low	5 775	-6.85	10.00	16.85

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10 \log (10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)})$



Tested by: Tae-Ho, Kim / Senior Engineer

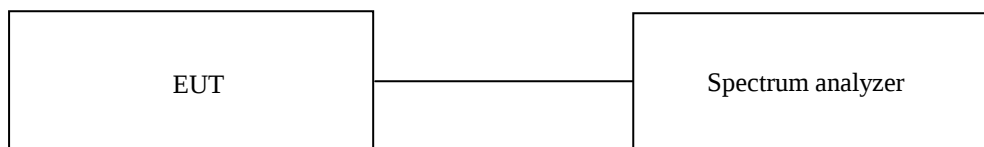
10. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

10.1 Operating environment

Temperature : 21.4 °C
Relative humidity : 45.1 % R.H.

10.2 Test set-up

Turn EUT off and set chamber temperature to -30 °C 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 °C step from 0 °C to +65 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 22, 2015 (1Y)
■ - SSE-43CI-A	Samkun Tech	Humidity Chamber	060712	May 15, 2015 (1Y)
■ - DRP-305DN	DIGITAL Elec.	DC Power supply	4030195	Sep. 03, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test Data for 5 150 MHz ~ 5 250 MHz Band

-. Test Date : January 20, 2016

-. Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
0	5 180 000 000	5 179 984 511	-15.489
10		5 180 000 700	0.700
20		5 179 971 804	-28.196
30		5 179 972 082	-27.918
40		5 179 982 981	-17.019
50		5 179 971 945	-28.055
60		5 179 983 992	-16.008
0	5 200 000 000	5 200 005 173	5.173
10		5 199 980 985	-19.015
20		5 199 976 473	-23.527
30		5 199 959 461	-40.539
40		5 199 976 104	-23.896
50		5 199 973 078	-26.922
60		5 199 985 843	-14.157
0	5 240 000 000	5 239 980 645	-19.355
10		5 239 979 176	-20.824
20		5 239 993 734	-6.266
30		5 239 956 730	-43.270
40		5 239 963 373	-36.627
50		5 239 982 173	-17.827
60		5 239 963 122	-36.878



Tested by: Tae-Ho, Kim / Senior Engineer

10.5 Test Data for 5 725 MHz ~ 5 850 MHz Band

-. Test Date : January 20, 2016

-. Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
0	5 745 000 000	5 744 999 650	-0.350
10		5 744 969 196	-30.804
20		5 744 979 400	-20.600
30		5 744 968 708	-31.292
40		5 744 974 542	-25.458
50		5 744 970 694	-29.306
60		5 744 966 850	-33.150
0	5 785 000 000	5 784 976 925	-23.075
10		5 784 980 116	-19.884
20		5 784 967 595	-32.405
30		5 784 979 615	-20.385
40		5 784 968 172	-31.828
50		5 784 974 338	-25.662
60		5 784 968 683	-31.317
0	5 825 000 000	5 824 996 019	-3.981
10		5 824 983 749	-16.251
20		5 824 965 788	-34.212
30		5 824 974 176	-25.824
40		5 824 966 355	-33.645
50		5 824 958 899	-41.101
60		5 824 972 326	-27.674



Tested by: Tae-Ho, Kim / Senior Engineer

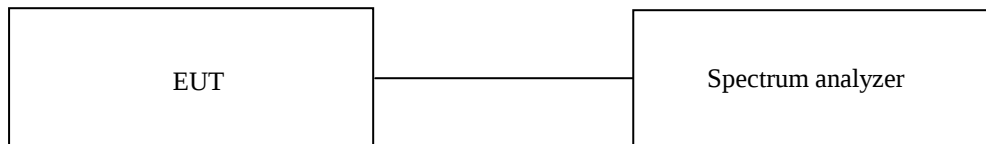
11. FREQUENCY STABILITY WITH VOLTAGE VARIATION

11.1 Operating environment

Temperature : 21.4 °C
Relative humidity : 45.1 % R.H.

11.2 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.



11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul 22, 2015 (1Y)
■ -	DRP-305DN	DIGITAL Elec.	DC Power supply	4030195	Sep. 03, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

11.4 Test Data for 5 150 MHz ~ 5 250 MHz Band

-. Test Date : January 20, 2016

-. Result : Pass

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
5.75	5 180 000 000	5 179 985 987	-14.013
5.00		5 179 985 572	-14.428
4.25		5 179 986 657	-13.343
5.75	5 200 000 000	5 199 972 254	-27.746
5.00		5 199 972 094	-27.906
4.25		5 199 971 884	-28.116
5.75	5 240 000 000	5 239 973 227	-26.773
5.00		5 239 973 085	-26.915
4.25		5 239 971 940	-28.060

11.6 Test Data for 5 725 MHz ~ 5 850 MHz Band

-. Test Date : January 20, 2016

-. Result : Pass

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
5.75	5 745 000 000	5 744 969 557	-30.443
5.00		5 744 969 662	-30.338
4.25		5 744 968 271	-31.729
5.75	5 785 000 000	5 784 977 516	-22.484
5.00		5 784 975 524	-24.476
4.25		5 784 970 885	-29.115
5.75	5 825 000 000	5 824 976 954	-23.046
5.00		5 824 972 258	-27.742
4.25		5 824 975 514	-24.486



Tested by: Tae-Ho, Kim / Senior Engineer

12. RADIATED SPURIOUS EMISSIONS

12.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % R.H.

12.2 Test set-up for conducted measurement

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable above the ground plane.

The frequency spectrum from 30 MHz to 40 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.



12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 22, 2015 (1Y)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 02, 2015 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 29, 2015 (1Y)
■ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 23, 2015 (1Y)
■ -	DT3000	Innco System	Turn Table	930611	N/A
■ -	MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Jul. 10, 2014 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 31, 2015 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Apr. 30, 2015 (2Y)

All test equipment used is calibrated on a regular basis.

12.4 Test data for 802.11a RLAN Mode

12.4.1 Test data

12.4.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 43.0 % R.H. Temperature: 21.6 °C

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

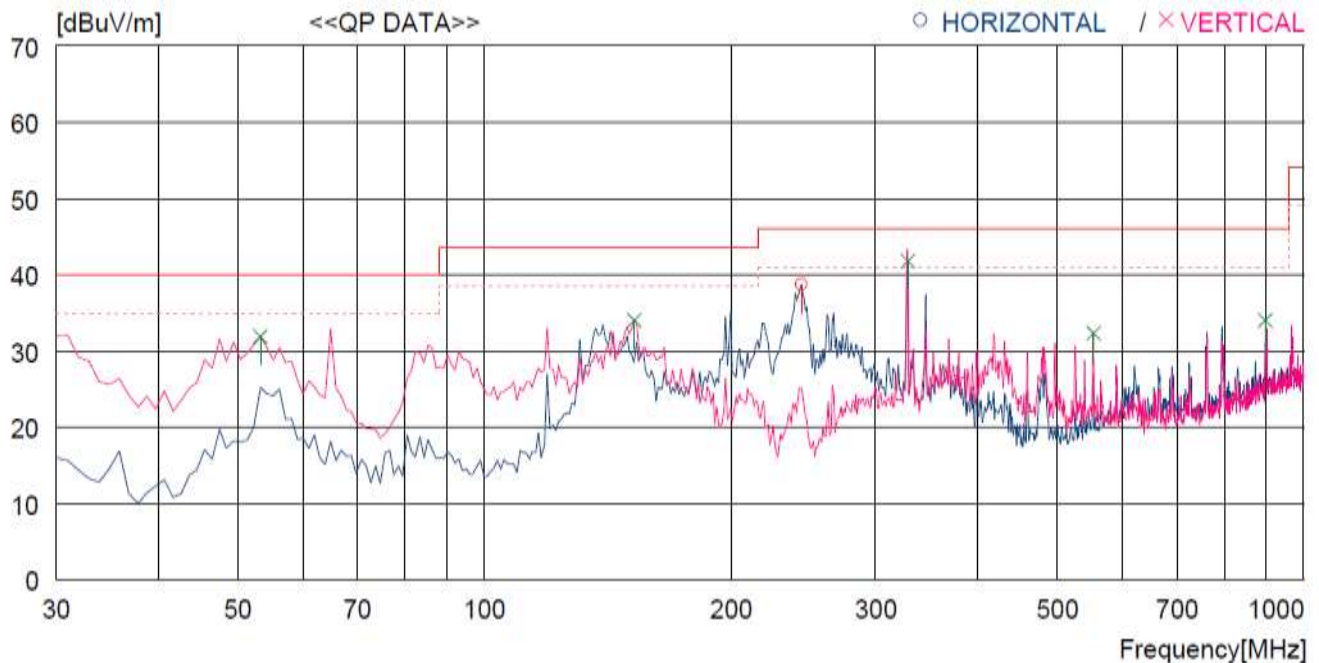
Result : PASSED

EUT : Wi-Fi/BT Combo module

Date: January 20, 2016

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

-.Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA TABLE	
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
		[dBuV]	[dB]							
----- Horizontal -----										
1	243.400	55.1	12.2	4.2	32.8	38.7	46.0	7.3	100	335
----- Vertical -----										
2	53.280	49.2	13.6	2.1	33.0	31.9	40.0	8.1	100	313
3	152.220	55.3	8.4	3.3	33.0	34.0	43.5	9.5	100	298
4	328.760	55.4	14.2	4.8	32.6	41.8	46.0	4.2	100	313
5	553.799	40.8	18.3	6.3	33.1	32.3	46.0	13.7	100	319
6	897.169	36.1	22.3	8.4	32.8	34.0	46.0	12.0	100	298

12.4.1.2 Test data for Below 30 MHz

- Test Date : January 20, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

12.4.1.3 Test data for above 1 GHz

- Test Date : January 20, 2016
- 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

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Senior Engineer

12.5 Test data for 802.11n_HT20 RLAN Mode

12.5.1 Test data

12.5.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 43.0 % R.H.

Temperature: 21.6 °C

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

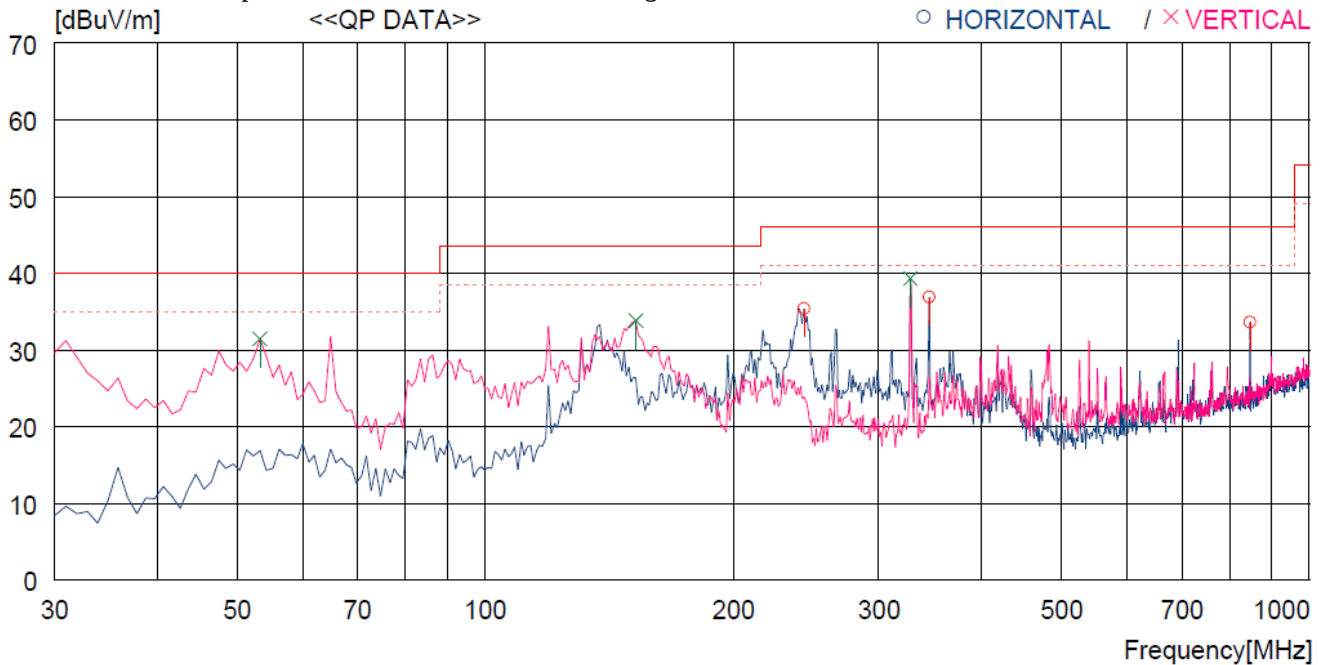
Result : PASSED

EUT : Wi-Fi/BT Combo module

Date: January 20, 2016

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

-.Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
		[dBuV]	[dB]							
----- Horizontal -----										
1	243.400	51.8	12.2	4.2	32.8	35.4	46.0	10.6	100	2
2	345.250	49.9	14.6	5.0	32.6	36.9	46.0	9.1	100	75
3	846.731	37.5	21.5	8.1	33.5	33.6	46.0	12.4	100	75
----- Vertical -----										
4	53.280	48.7	13.6	2.1	33.0	31.4	40.0	8.6	100	187
5	152.220	55.1	8.4	3.3	33.0	33.8	43.5	9.7	100	2
6	327.790	52.9	14.2	4.8	32.6	39.3	46.0	6.7	100	187

12.5.2.1 Test data for Below 30 MHz

- Test Date : January 20, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

12.5.2.3 Test data for above 1 GHz

- Test Date : January 20, 2016
- 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

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Senior Engineer

12.6 Test data for 802.11n_HT40 RLAN Mode

12.6.1 Test data

12.6.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 43.0 % R.H. Temperature: 21.6 °C

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

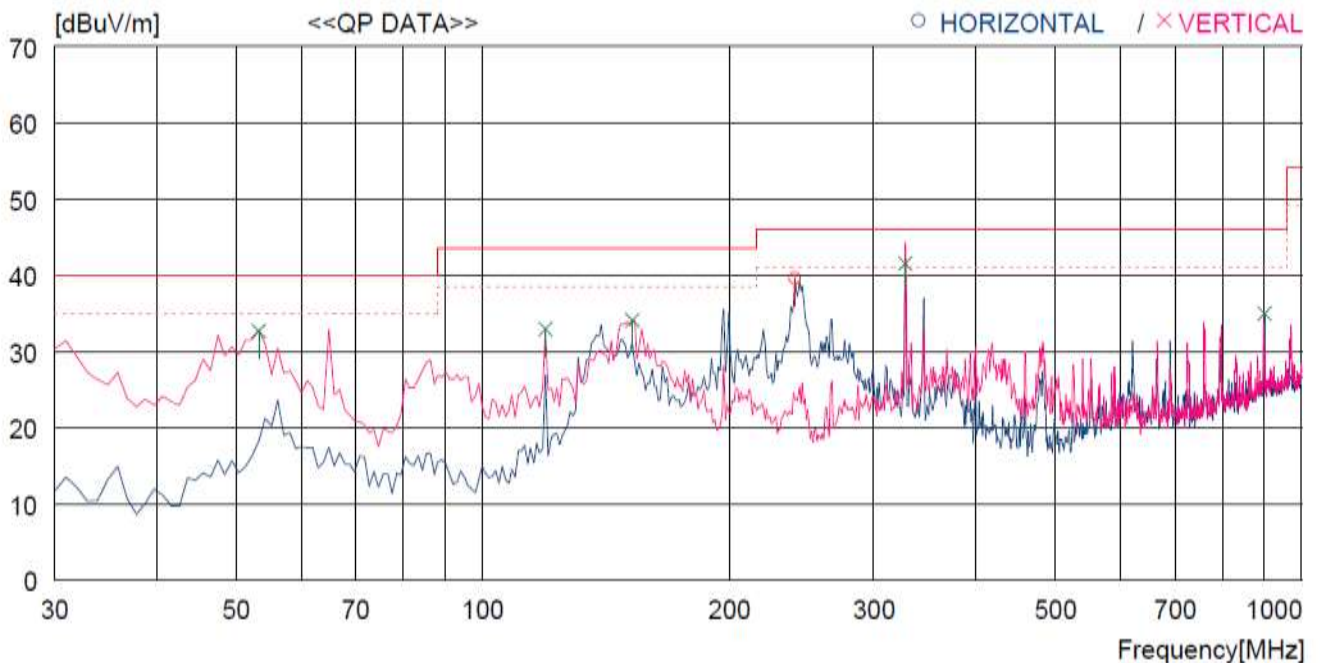
Result : PASSED

EUT : Wi-Fi/BT Combo module

Date: January 20, 2016

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

-Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	240.490	56.2	12.1	4.1	32.8	39.6	46.0	6.4	100	320
----- Vertical -----										
2	53.280	50.0	13.6	2.1	33.0	32.7	40.0	7.3	100	305
3	119.240	52.3	10.3	3.5	33.2	32.9	43.5	10.6	100	358
4	152.220	55.4	8.4	3.3	33.0	34.1	43.5	9.4	100	277
5	327.790	55.1	14.2	4.8	32.6	41.5	46.0	4.5	100	320
6	901.049	37.1	22.3	8.4	32.8	35.0	46.0	11.0	100	305

12.6.3.2 Test data for Below 30 MHz

- Test Date : January 20, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

12.6.3.3 Test data for above 1 GHz

- Test Date : January 20, 2016
- 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

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Senior Engineer

12.7 Test data for 802.11ac20 RLAN Mode

12.7.1 Test data

12.7.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 43.0 % R.H.

Temperature: 21.6 °C

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

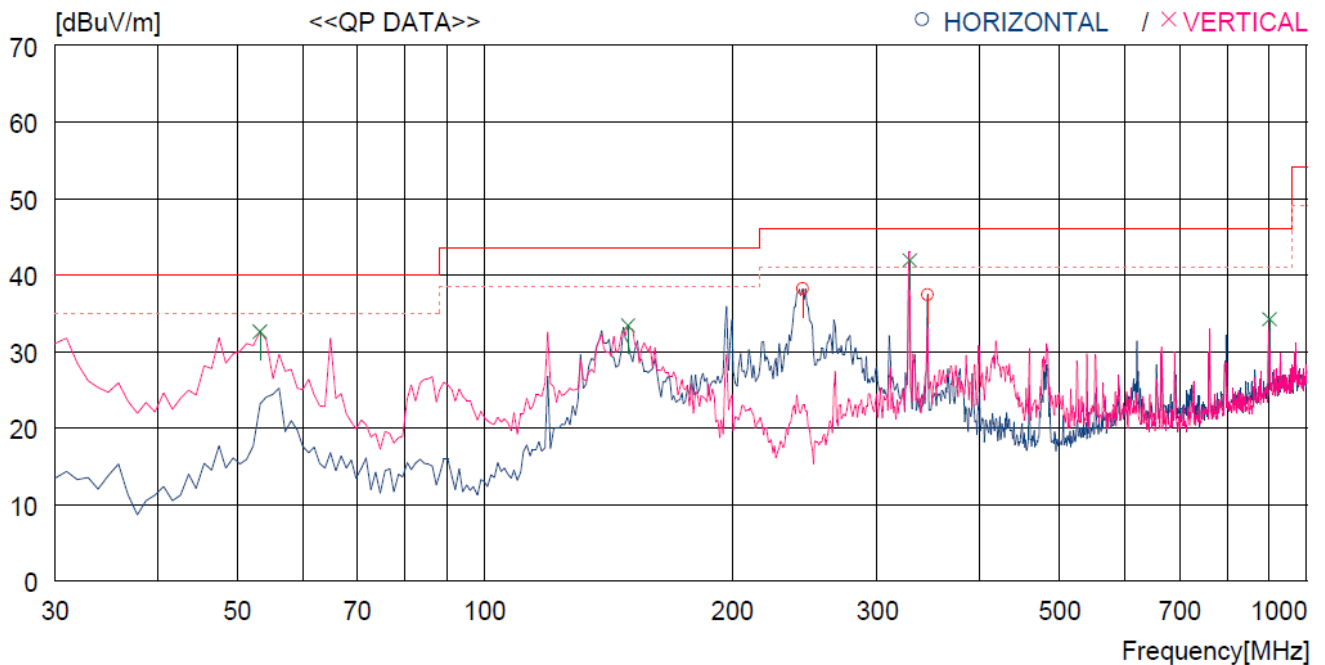
Result : PASSED

EUT : Wi-Fi/BT Combo module

Date: January 20, 2016

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

-.Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	243.400	54.6	12.2	4.2	32.8	38.2	46.0	7.8	100	333
2	345.250	50.4	14.6	5.0	32.6	37.4	46.0	8.6	100	347
----- Vertical -----										
3	53.280	49.9	13.6	2.1	33.0	32.6	40.0	7.4	100	320
4	149.310	54.8	8.3	3.3	33.0	33.4	43.5	10.1	100	353
5	328.760	55.5	14.2	4.8	32.6	41.9	46.0	4.1	100	320
6	901.049	36.3	22.3	8.4	32.8	34.2	46.0	11.8	100	313

12.7.1.2 Test data for Below 30 MHz

- Test Date : January 20, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

12.7.1.3 Test data for above 1 GHz

- Test Date : January 20, 2016
- 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

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Senior Engineer

12.8 Test data for 802.11ac40 RLAN Mode

12.8.1 Test data

12.8.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 43.0 % R.H. Temperature: 21.6 °C

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

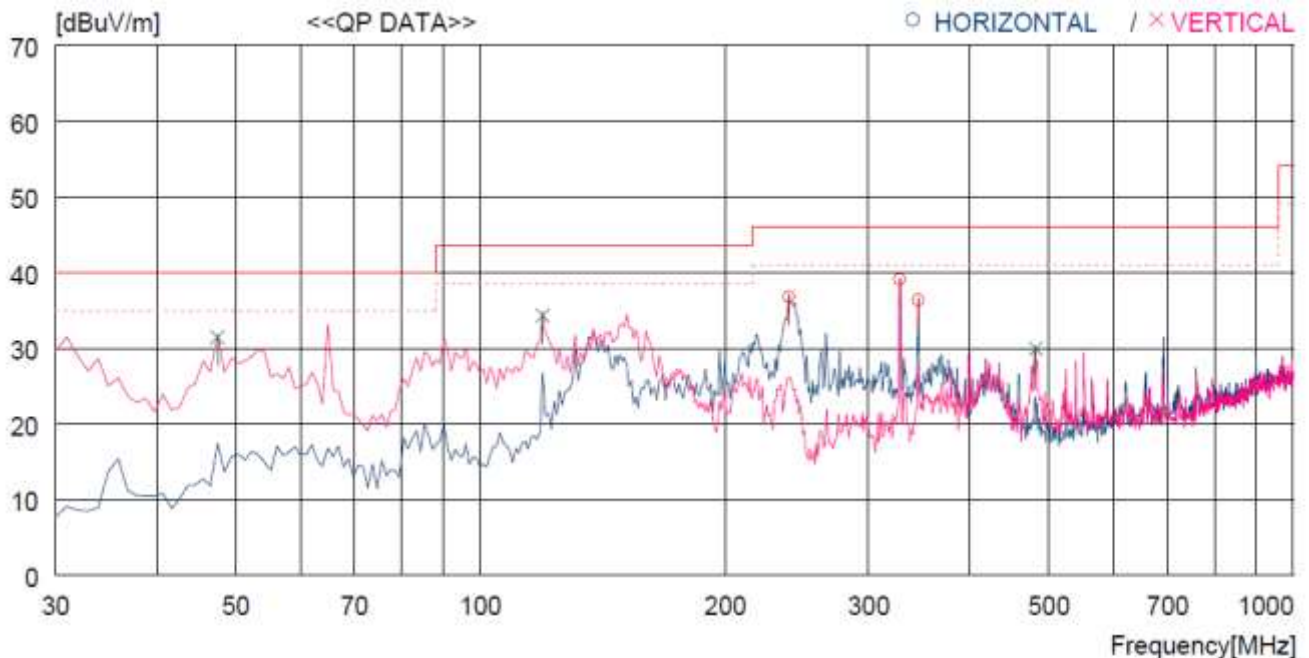
Result : PASSED

EUT : Wi-Fi/BT Combo module

Date: January 20, 2016

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

-.Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA TABLE	
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	239.520	53.4	12.1	4.1	32.8	36.8	46.0	9.2	100	97
2	327.790	52.7	14.2	4.8	32.6	39.1	46.0	6.9	100	75
3	345.250	49.3	14.6	5.0	32.6	36.3	46.0	9.7	100	97
----- Vertical -----										
4	47.460	48.5	13.8	2.0	32.9	31.4	40.0	8.6	100	2
5	119.240	53.7	10.3	3.5	33.2	34.3	43.5	9.2	100	26
6	482.021	39.8	17.0	5.9	32.8	29.9	46.0	16.1	100	12

12.8.2.1 Test data for Below 30 MHz

- Test Date : January 20, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

12.8.2.3 Test data for above 1 GHz

- Test Date : January 20, 2016
- 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

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Senior Engineer

12.9 Test data for 802.11ac80 RLAN Mode

12.9.1 Test data

12.9.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 43.0 % R.H.

Temperature: 21.6 °C

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

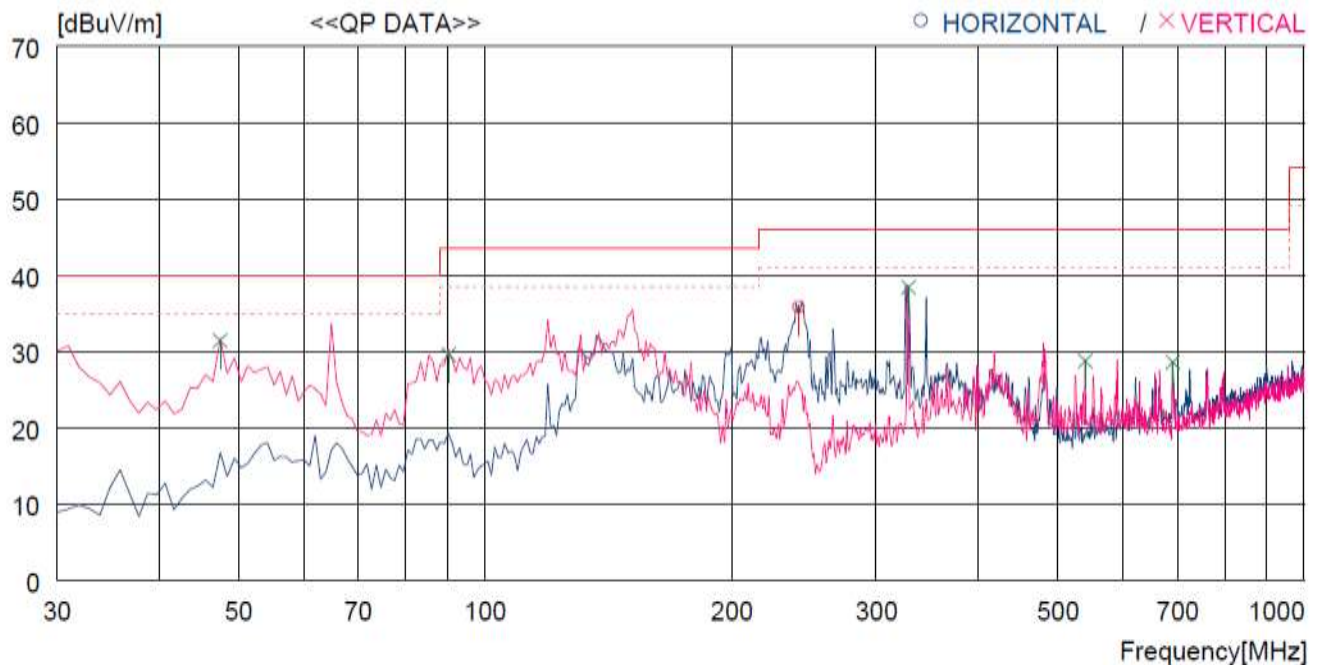
Result : PASSED

EUT : Wi-Fi/BT Combo module

Date: January 20, 2016

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

-.Ant0, Ant1 and Multiple transmit with Low, Middle and High Channels were tested, but the worst data were recorded.



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
		[dBuV]	[dB]							
----- Horizontal -----										
1	241.460	52.4	12.1	4.1	32.8	35.8	46.0	10.2	100	7
----- Vertical -----										
2	47.460	48.5	13.8	2.0	32.9	31.4	40.0	8.6	100	2
3	90.140	50.2	10.1	2.6	33.3	29.6	43.5	13.9	100	26
4	328.760	52.0	14.2	4.8	32.6	38.4	46.0	7.6	100	2
5	540.220	37.4	18.1	6.3	33.0	28.8	46.0	17.2	100	2
6	690.565	35.4	19.6	7.2	33.6	28.6	46.0	17.4	100	26

12.9.3.2 Test data for Below 30 MHz

- Test Date : January 20, 2016
- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

12.9.3.3 Test data for above 1 GHz

- Test Date : January 20, 2016
- 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

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Senior Engineer

13. RADIATED RESTRICTED BAND EDGE MEASUREMENTS

13.1 Operating environment

Temperature : 21.4 °C
Relative humidity : 45.1 % R.H.

13.2 Test set-up for conducted measurement

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable above the ground plane.

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.



13.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 22, 2015 (1Y)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 02, 2015 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 29, 2015 (1Y)
■ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 23, 2015 (1Y)
■ -	DT3000	Innco System	Turn Table	930611	N/A
■ -	MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Jul. 10, 2014 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 31, 2015 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Apr. 30, 2015 (2Y)

All test equipment used is calibrated on a regular basis.

13.4 Test data for Frequency 5 150 band

13.4.1 Test data for 802.11a RLAN Mode

13.4.1.1 Test data for Antenna 0

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	50.50	Peak	H	31.00	11.50	42.20	50.80	74.00	23.20
	40.32	Average	H				40.62	54.00	13.38
	46.59	Peak	V				46.89	74.00	27.11
	34.35	Average	V				34.65	54.00	19.35

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.1.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	48.80	Peak	H	31.00	11.50	42.20	49.10	74.00	24.90
	38.42	Average	H				38.72	54.00	15.28
	43.99	Peak	V				44.29	74.00	29.71
	33.45	Average	V				33.75	54.00	20.25

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.1.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	50.20	Peak	H	31.00	11.50	42.20	50.50	74.00	23.50
	39.72	Average	H				40.02	54.00	13.98
	44.29	Peak	V				44.59	74.00	29.41
	33.95	Average	V				34.25	54.00	19.75

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Emission Level (dBμV/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.2 Test data for 802.11n_HT20 RLAN Mode

13.4.2.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	50.15	Peak	H	31.00	11.50	42.20	50.45	74.00	23.55
	39.98	Average	H				40.28	54.00	13.72
	46.34	Peak	V				46.64	74.00	27.36
	34.42	Average	V				34.72	54.00	19.28

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.2.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	51.55	Peak	H	31.00	11.50	42.20	51.85	74.00	22.15
	39.58	Average	H				39.88	54.00	14.12
	45.04	Peak	V				45.34	74.00	28.66
	34.12	Average	V				34.42	54.00	19.58

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Emission Level (dBμV/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.2.3 Test data for Multiple transmit

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	50.35	Peak	H	31.00	11.50	42.20	50.65	74.00	23.35
	38.68	Average	H				38.98	54.00	15.02
	44.24	Peak	V				44.54	74.00	29.46
	33.62	Average	V				33.92	54.00	20.08

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.3 Test data for 802.11n_HT40 RLAN Mode

13.4.3.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	59.28	Peak	H	31.00	11.50	42.20	59.58	74.00	14.42
	45.13	Average	H				45.43	54.00	8.57
	46.38	Peak	V				46.68	74.00	27.32
	36.13	Average	V				36.43	54.00	17.57

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.3.2 Test data for Antenna 1

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	58.38	Peak	H	31.00	11.50	42.20	58.68	74.00	15.32
	44.43	Average	H				44.73	54.00	9.27
	45.18	Peak	V				45.48	74.00	28.52
	36.33	Average	V				36.63	54.00	17.37

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.3.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	57.58	Peak	H	31.00	11.50	42.20	57.88	74.00	16.12
	43.93	Average	H				44.23	54.00	9.77
	46.18	Peak	V				46.48	74.00	27.52
	35.53	Average	V				35.83	54.00	18.17

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Emission Level (dBμV/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.4 Test data for 802.11ac20 RLAN Mode

13.4.4.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5150.00	51.36	Peak	H	31.00	11.50	42.20	51.66	74.00	22.34
	44.25	Average	H				44.55	54.00	9.45
	46.19	Peak	V				46.49	74.00	27.51
	36.08	Average	V				36.38	54.00	17.62

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.4.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	51.56	Peak	H	31.00	11.50	42.20	51.86	74.00	22.14
	45.75	Average	H				46.05	54.00	7.95
	44.89	Peak	V				45.19	74.00	28.81
	33.68	Average	V				33.98	54.00	20.02

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Emission Level (dBμV/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.4.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	49.86	Peak	H	31.00	11.50	42.20	50.16	74.00	23.84
	45.35	Average	H				45.65	54.00	8.35
	47.09	Peak	V				47.39	74.00	26.61
	33.48	Average	V				33.78	54.00	20.22

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.5 Test data for 802.11ac40 RLAN Mode

13.4.5.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	57.45	Peak	H	31.00	11.50	42.20	57.75	74.00	16.25
	44.72	Average	H				45.02	54.00	8.98
	45.15	Peak	V				45.45	74.00	28.55
	36.39	Average	V				36.69	54.00	17.31

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.5.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	56.25	Peak	H	31.00	11.50	42.20	56.55	74.00	17.45
	43.72	Average	H				44.02	54.00	9.98
	46.95	Peak	V				47.25	74.00	26.75
	35.69	Average	V				35.99	54.00	18.01

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.5.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	55.75	Peak	H	31.00	11.50	42.20	56.05	74.00	17.95
	42.62	Average	H				42.92	54.00	11.08
	45.75	Peak	V				46.05	74.00	27.95
	34.49	Average	V				34.79	54.00	19.21

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Emission Level (dBμV/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.6 Test data for 802.11ac80 RLAN Mode

13.4.6.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	58.96	Peak	H	31.00	11.50	42.20	59.26	74.00	14.74
	45.94	Average	H				46.24	54.00	7.76
	47.24	Peak	V				47.54	74.00	26.46
	36.03	Average	V				36.33	54.00	17.67

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.6.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	59.26	Peak	H	31.00	11.50	42.20	59.56	74.00	14.44
	44.84	Average	H				45.14	54.00	8.86
	44.64	Peak	V				44.94	74.00	29.06
	33.83	Average	V				34.13	54.00	19.87

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.4.6.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	58.96	Peak	H	31.00	11.50	42.20	59.26	74.00	14.74
	44.94	Average	H				45.24	54.00	8.76
	47.04	Peak	V				47.34	74.00	26.66
	35.03	Average	V				35.33	54.00	18.67

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Emission Level (dBμV/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

13.5 Test data for Frequency 5 725 MHz Band

13.5.1 Test data for 802.11a RLAN Mode

13.5.1.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

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									
5 725.00	43.61	Peak	H	31.90	12.10	42.20	45.41	74.00	28.59
	34.45	Average	H				36.25	54.00	17.75
	46.24	Peak	V				48.04	74.00	25.96
	33.57	Average	V				35.37	54.00	18.63
High Channel									
5 850.00	45.65	Peak	H	31.90	12.10	42.20	47.45	74.00	26.55
	33.36	Average	H				35.16	54.00	18.84
	45.21	Peak	V				47.01	74.00	26.99
	35.52	Average	V				37.32	54.00	16.68

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.5.1.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	43.11	Peak	H	31.90	12.10	42.20	44.91	74.00	29.09
	35.55	Average	H				37.35	54.00	16.65
	46.34	Peak	V				48.14	74.00	25.86
	33.37	Average	V				35.17	54.00	18.83
High Channel									
5 850.00	43.05	Peak	H	31.90	12.10	42.20	44.85	74.00	29.15
	35.66	Average	H				37.46	54.00	16.54
	43.51	Peak	V				45.31	74.00	28.69
	33.72	Average	V				35.52	54.00	18.48

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.1.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	44.61	Peak	H	31.90	12.10	42.20	46.41	74.00	27.59
	33.35	Average	H				35.15	54.00	18.85
	45.24	Peak	V				47.04	74.00	26.96
	34.27	Average	V				36.07	54.00	17.93
High Channel									
5 850.00	43.55	Peak	H	31.90	12.10	42.20	45.35	74.00	28.65
	35.96	Average	H				37.76	54.00	16.24
	45.01	Peak	V				46.81	74.00	27.19
	35.52	Average	V				37.32	54.00	16.68

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Emission Level (dB}\mu\text{V/m)}$$



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.2 Test data for 802.11n_HT20 RLAN Mode

15.5.2.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

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									
5 725.00	44.51	Peak	H	31.90	12.10	42.20	46.31	74.00	27.69
	34.75	Average	H				36.55	54.00	17.45
	45.94	Peak	V				47.74	74.00	26.26
	35.67	Average	V				37.47	54.00	16.53
High Channel									
5 850.00	45.55	Peak	H	31.90	12.10	42.20	47.35	74.00	26.65
	33.66	Average	H				35.46	54.00	18.54
	45.01	Peak	V				46.81	74.00	27.19
	35.82	Average	V				37.62	54.00	16.38

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.2.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	45.71	Peak	H	31.90	12.10	42.20	47.51	74.00	26.49
	34.45	Average	H				36.25	54.00	17.75
	45.84	Peak	V				47.64	74.00	26.36
	34.07	Average	V				35.87	54.00	18.13
High Channel									
5 850.00	42.95	Peak	H	31.90	12.10	42.20	44.75	74.00	29.25
	36.26	Average	H				38.06	54.00	15.94
	43.81	Peak	V				45.61	74.00	28.39
	34.82	Average	V				36.62	54.00	17.38

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.2.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	45.11	Peak	H	31.90	12.10	42.20	46.91	74.00	27.09
	35.05	Average	H				36.85	54.00	17.15
	44.24	Peak	V				46.04	74.00	27.96
	35.47	Average	V				37.27	54.00	16.73
High Channel									
5 850.00	43.65	Peak	H	31.90	12.10	42.20	45.45	74.00	28.55
	33.46	Average	H				35.26	54.00	18.74
	43.21	Peak	V				45.01	74.00	28.99
	35.42	Average	V				37.22	54.00	16.78

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.3 Test data for 802.11n_HT40 RLAN Mode

15.5.3.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

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									
5 725.00	45.51	Peak	H	31.90	12.10	42.20	47.31	74.00	26.69
	34.35	Average	H				36.15	54.00	17.85
	46.34	Peak	V				48.14	74.00	25.86
	36.07	Average	V				37.87	54.00	16.13
High Channel									
5 850.00	43.95	Peak	H	31.90	12.10	42.20	45.75	74.00	28.25
	33.46	Average	H				35.26	54.00	18.74
	43.61	Peak	V				45.41	74.00	28.59
	35.12	Average	V				36.92	54.00	17.08

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.3.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	44.81	Peak	H	31.90	12.10	42.20	46.61	74.00	27.39
	33.95	Average	H				35.75	54.00	18.25
	44.64	Peak	V				46.44	74.00	27.56
	34.97	Average	V				36.77	54.00	17.23
High Channel									
5 850.00	45.25	Peak	H	31.90	12.10	42.20	47.05	74.00	26.95
	34.46	Average	H				36.26	54.00	17.74
	44.51	Peak	V				46.31	74.00	27.69
	35.42	Average	V				37.22	54.00	16.78

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.3.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	45.21	Peak	H	31.90	12.10	42.20	47.01	74.00	26.99
	34.45	Average	H				36.25	54.00	17.75
	46.04	Peak	V				47.84	74.00	26.16
	33.87	Average	V				35.67	54.00	18.33
High Channel									
5 850.00	45.05	Peak	H	31.90	12.10	42.20	46.85	74.00	27.15
	35.66	Average	H				37.46	54.00	16.54
	45.41	Peak	V				47.21	74.00	26.79
	35.52	Average	V				37.32	54.00	16.68

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.5.4 Test data for 802.11ac20 RLAN Mode

13.5.4.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

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									
5 725.00	44.51	Peak	H	31.90	12.10	42.20	46.31	74.00	27.69
	33.25	Average	H				35.05	54.00	18.95
	46.54	Peak	V				48.34	74.00	25.66
	32.87	Average	V				34.67	54.00	19.33
High Channel									
5 850.00	45.15	Peak	H	31.90	12.10	42.20	46.95	74.00	27.05
	31.96	Average	H				33.76	54.00	20.24
	44.61	Peak	V				46.41	74.00	27.59
	34.32	Average	V				36.12	54.00	17.88

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

13.5.4.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	42.71	Peak	H	31.90	12.10	42.20	44.51	74.00	29.49
	33.05	Average	H				34.85	54.00	19.15
	46.14	Peak	V				47.94	74.00	26.06
	33.87	Average	V				35.67	54.00	18.33
High Channel									
5 850.00	46.95	Peak	H	31.90	12.10	42.20	48.75	74.00	25.25
	31.86	Average	H				33.66	54.00	20.34
	45.21	Peak	V				47.01	74.00	26.99
	34.22	Average	V				36.02	54.00	17.98

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.4.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	42.81	Peak	H	31.90	12.10	42.20	44.61	74.00	29.39
	33.75	Average	H				35.55	54.00	18.45
	45.84	Peak	V				47.64	74.00	26.36
	32.27	Average	V				34.07	54.00	19.93
	High Channel								
5 850.00	44.55	Peak	H	31.90	12.10	42.20	46.35	74.00	27.65
	33.86	Average	H				35.66	54.00	18.34
	45.31	Peak	V				47.11	74.00	26.89
	34.52	Average	V				36.32	54.00	17.68

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.5 Test data for 802.11ac40 RLAN Mode

15.5.5.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

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									
5 725.00	43.61	Peak	H	31.90	12.10	42.20	45.41	74.00	28.59
	33.65	Average	H				36.55	54.00	17.45
	47.04	Peak	V				47.74	74.00	26.26
	34.47	Average	V				37.47	54.00	16.53
High Channel									
5 850.00	47.05	Peak	H	31.90	12.10	42.20	47.35	74.00	26.65
	34.76	Average	H				35.46	54.00	18.54
	44.51	Peak	V				46.81	74.00	27.19
	35.92	Average	V				37.62	54.00	16.38

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.5.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	44.71	Peak	H	31.90	12.10	42.20	46.51	74.00	27.49
	32.95	Average	H				34.75	54.00	19.25
	44.74	Peak	V				46.54	74.00	27.46
	33.97	Average	V				35.77	54.00	18.23
High Channel									
5 850.00	44.95	Peak	H	31.90	12.10	42.20	46.75	74.00	27.25
	33.96	Average	H				35.76	54.00	18.24
	44.41	Peak	V				46.21	74.00	27.79
	34.12	Average	V				35.92	54.00	18.08

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.5.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	42.41	Peak	H	31.90	12.10	42.20	44.21	74.00	29.79
	32.95	Average	H				34.75	54.00	19.25
	46.34	Peak	V				48.14	74.00	25.86
	33.97	Average	V				35.77	54.00	18.23
High Channel									
5 850.00	46.35	Peak	H	31.90	12.10	42.20	48.15	74.00	25.85
	33.36	Average	H				35.16	54.00	18.84
	44.01	Peak	V				45.81	74.00	28.19
	34.42	Average	V				36.22	54.00	17.78

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.6 Test data for 802.11ac80 RLAN Mode

15.5.6.1 Test data for Antenna 0

- . Test Date : January 20, 2016
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Measurement distance : 3 m
- . Result : Pass

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									
5 725.00	44.11	Peak	H	31.90	12.10	42.20	45.91	74.00	28.09
	34.85	Average	H				36.15	54.00	17.85
	45.24	Peak	V				48.14	74.00	25.86
	33.87	Average	V				37.87	54.00	16.13
High Channel									
5 850.00	44.55	Peak	H	31.90	12.10	42.20	45.75	74.00	28.25
	32.76	Average	H				35.26	54.00	18.74
	46.41	Peak	V				45.41	74.00	28.59
	34.82	Average	V				36.92	54.00	17.08

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.6.2 Test data for Antenna 1

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	43.71	Peak	H	31.90	12.10	42.20	45.51	74.00	28.49
	34.85	Average	H				36.65	54.00	17.35
	46.94	Peak	V				48.74	74.00	25.26
	32.77	Average	V				34.57	54.00	19.43
High Channel									
5 850.00	45.15	Peak	H	31.90	12.10	42.20	46.95	74.00	27.05
	32.06	Average	H				33.86	54.00	20.14
	44.01	Peak	V				45.81	74.00	28.19
	36.12	Average	V				37.92	54.00	16.08

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

15.5.6.3 Test data for Multiple transmit

- Test Date : January 20, 2016
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- Measurement distance : 3 m
- Result : Pass

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									
5 725.00	43.51	Peak	H	31.90	12.10	42.20	45.31	74.00	28.69
	34.35	Average	H				36.15	54.00	17.85
	44.84	Peak	V				46.64	74.00	27.36
	32.27	Average	V				34.07	54.00	19.93
High Channel									
5 850.00	45.75	Peak	H	31.90	12.10	42.20	47.55	74.00	26.45
	34.56	Average	H				36.36	54.00	17.64
	46.51	Peak	V				48.31	74.00	25.69
	35.22	Average	V				37.02	54.00	16.98

Tabulated test data for Restricted Band

Remark - "H": Horizontal, "V": Vertical

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



Tested by: Tae-Ho, Kim / Senior Engineer

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 21.6 °C
Relative humidity : 43.0 % R.H.

14.2 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 μ H + 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.

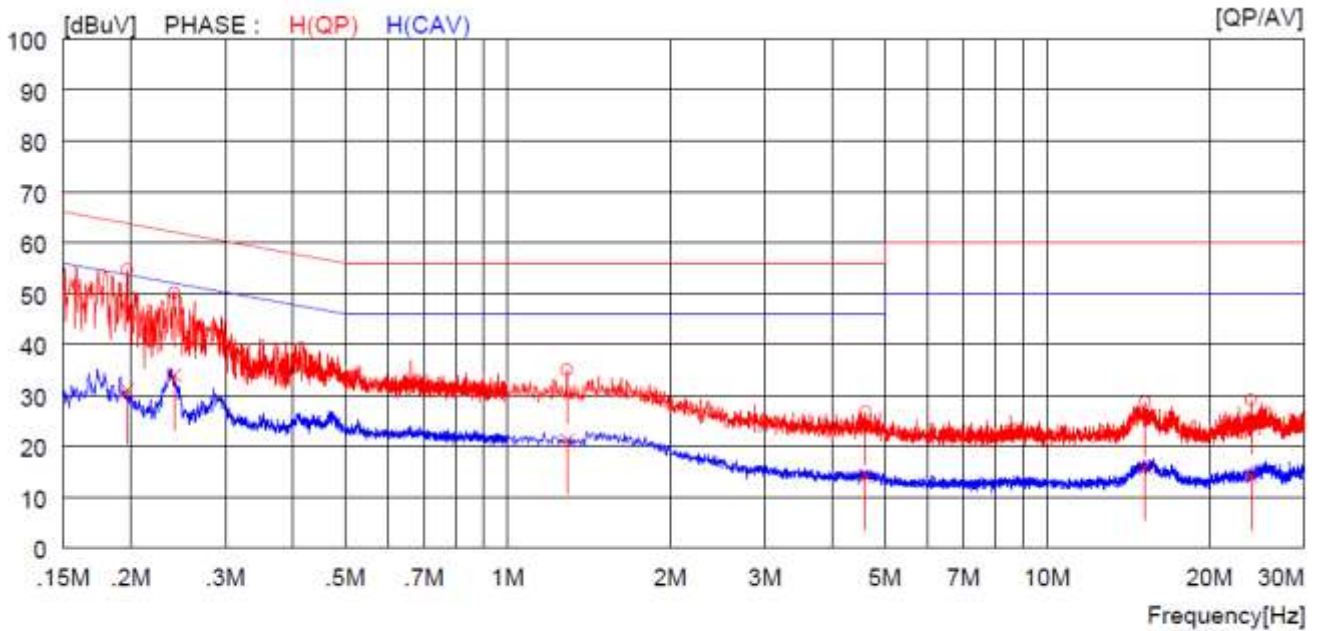
14.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESPI	Rohde & Schwarz	Test Receiver	101012	Nov. 02, 2015 (1Y)
□ -	ESHS10	Rohde & Schwarz	Test Receiver	834467/007	Apr. 29, 2015 (1Y)
□ -	NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 06, 2015 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 29, 2015 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Apr. 29, 2015 (1Y)
■ -	3825/2	EMCO	AMN	9109-1867	Apr. 29, 2015 (1Y)

All test equipment used is calibrated on a regular basis.

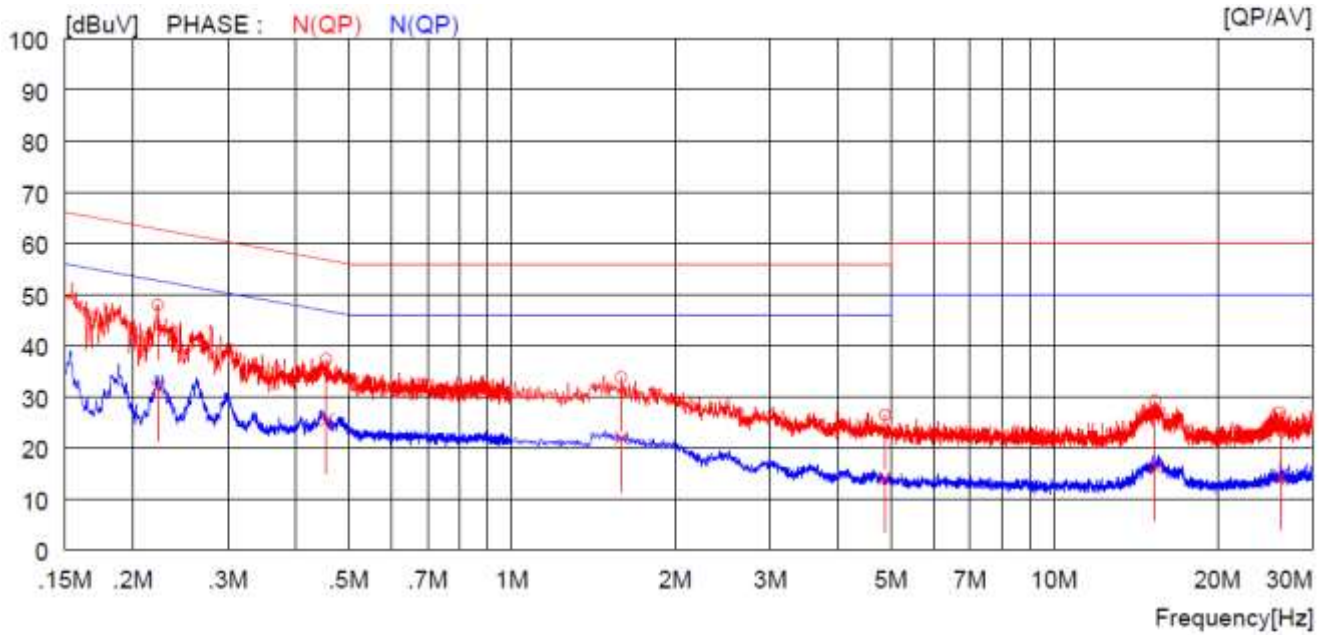
14.4 Test data

- Test Date : January 20, 2016
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.19700	44.8	----	9.9	54.7	----	63.7	----	9.0	----	H (QP)
2	0.24100	40.1	----	10.0	50.1	----	62.1	----	12.0	----	H (QP)
3	1.28800	24.9	----	10.1	35.0	----	56.0	----	21.0	----	H (QP)
4	4.60000	16.7	----	10.1	26.8	----	56.0	----	29.2	----	H (QP)
5	15.18000	18.1	----	10.5	28.6	----	60.0	----	31.4	----	H (QP)
6	23.85000	18.6	----	10.5	29.1	----	60.0	----	30.9	----	H (QP)
7	0.19700	----	21.1	9.9	----	31.0	----	53.7	----	22.7	H (CAV)
8	0.24100	----	23.9	10.0	----	33.9	----	52.1	----	18.2	H (CAV)
9	1.28800	----	11.0	10.1	----	21.1	----	46.0	----	24.9	H (CAV)
10	4.60000	----	4.0	10.1	----	14.1	----	46.0	----	31.9	H (CAV)
11	15.18000	----	5.4	10.5	----	15.9	----	50.0	----	34.1	H (CAV)
12	23.85000	----	3.6	10.5	----	14.1	----	50.0	----	35.9	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.22200	37.9	----	10.0	47.9	----	62.7	----	14.8	----	N(QP)
2	0.45500	27.3	----	10.0	37.3	----	56.8	----	19.5	----	N(QP)
3	1.59200	23.6	----	10.1	33.7	----	56.0	----	22.3	----	N(QP)
4	4.87200	16.3	----	10.1	26.4	----	56.0	----	29.6	----	N(QP)
5	15.37000	18.7	----	10.5	29.2	----	60.0	----	30.8	----	N(QP)
6	26.17000	16.4	----	10.5	26.9	----	60.0	----	33.1	----	N(QP)
7	0.22200	----	21.8	10.0	----	31.8	----	52.7	----	20.9	N(CAV)
8	0.45500	----	15.4	10.0	----	25.4	----	46.8	----	21.4	N(CAV)
9	1.59200	----	11.8	10.1	----	21.9	----	46.0	----	24.1	N(CAV)
10	4.87200	----	3.9	10.1	----	14.0	----	46.0	----	32.0	N(CAV)
11	15.37000	----	5.7	10.5	----	16.2	----	50.0	----	33.8	N(CAV)
12	26.17000	----	3.9	10.5	----	14.4	----	50.0	----	35.6	N(CAV)

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

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

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