

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

Test Report No. : W165R-D032
AGR No. : A164A-183
Applicant : LG Innotek Co., Ltd.
Address : 26, Hanamsandan 5beon-ro Gwangsan-gu, 506-731, Gwangju, South Korea
Manufacturer : LG Innotek Co., Ltd.
Address : 26, Hanamsandan 5beon-ro Gwangsan-gu, 506-731, Gwangju, South Korea
Type of Equipment : Video Doorbell
FCC ID. : YZP-RNCDSW01A
Model Name : RNCD-SW01A
Multiple Model Name : RNCD-SW01B, RNCD-SW01C
Serial number : N/A
Total page of Report : 197 pages (including this page)
Date of Incoming : May 01, 2016
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SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*
 This test report only contains the result of a single test of the sample supplied for the examination.
 It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by: 

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

Approved by: 

 Sung-Ik, Han/ Managing Director
 ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W165R-D032	May 17, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : LG Innotek Co., Ltd.
 Address : 26, Hanamsandan 5beon-ro Gwangsan-gu, 506-731, Gwangju, South Korea
 Contact Person : Inchang, Jeong / Senior engineer
 Telephone No. : +82-62-950-0332
 FCC ID : YZP-RNCDSW01A
 Model Name : RNCD-SW01A
 Serial Number : N/A
 Date : May 17, 2016

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Video Doorbell
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
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
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

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

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

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-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 RNCD-SW01A (referred to as the EUT in this report) is a Video Doorbell. The product specification described herein was obtained from product data sheet or user’s manual.

Device Type	Video Doorbell		
Temperature Range	-10 °C ~ +60 °C		
Operating Frequency	2 412 MHz ~ 2 462 MHz		
RF Output Power	AC 12 V	Antenna 0	802.11b: 14.37 dBm
			802.11g: 13.48 dBm
			802.11n_HT20: 12.15 dBm
		Antenna 1	802.11b: 14.02 dBm
			802.11g: 13.07 dBm
			802.11n_HT20: 11.78 dBm
	Multiple Antenna	14.98 dBm	
	AC 24 V	Antenna 0	802.11b: 14.35 dBm
			802.11g: 13.44 dBm
			802.11n_HT20: 12.10 dBm
		Antenna 1	802.11b: 13.97 dBm
			802.11g: 13.04 dBm
			802.11n_HT20: 12.10 dBm
	Multiple Antenna	15.11 dBm	
Number of Channel	11 Channel		
Modulation Type	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)		
Antenna Gain	4.22 dBi		
Antenna Type	PCB Pattern Antenna		
List of each Osc.or crystal Freq.(Freq. >= 1 MHz)	32 MHz, 24 MHz, 32.768 kHz		
Electrical Rating	AC 12 ~ 24 V, 50 Hz		

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

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

Model Name	Differences	Tested
RNCD-SW01A	Basic Model	<input checked="" type="checkbox"/>
RNCD-SW01B, RNCD-SW01C	These models are identical to basic model except for the model color only.	<input type="checkbox"/>

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

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

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.	N/A	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested: None

5.3 Mode of operation during the test

Modulation & Channel selected	DATA RATE	OUTPUT POWER	
		ANT0	ANT1
802.11 b (Middle Channel)	1 Mbps	14.08	13.59
	2 Mbps	14.01	13.35
	5.5 Mbps	13.84	13.07
	11 Mbps	13.17	12.68
802.11g (Middle Channel))	6 Mbps	13.22	12.66
	9 Mbps	12.94	12.21
	12 Mbps	12.68	12.00
	18 Mbps	12.71	11.63
	24 Mbps	12.20	11.09
	36 Mbps	11.97	10.94
	48 Mbps	11.63	10.82
HT 20 (Middle Channel))	54 Mbps	11.37	10.48
	6.5 Mbps	12.00	11.56
	13 Mbps	11.84	11.21
	19.5 Mbps	11.39	10.89
	26 Mbps	10.99	10.62
	39 Mbps	10.84	10.47
	52 Mbps	10.62	10.49
	58.5 Mbps	10.32	10.23
65 Mbps	10.11	9.64	

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

The worse case data rate for each modulation is determined 1 Mbps(Ant.0) / 1 Mbps(Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0) / 6 Mbps(Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) for HT20.

5.4 Configuration of Test System

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

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

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

5.5 Antenna Requirement

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

Antenna Construction:

The transmitter antenna of the EUT is a PCB Pattern Antenna and Press 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. MIMIMUM 6 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 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



7.3 Test 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 Test data for AC 12 V

7.4.1 Test data for Antenna 0

7.4.1.1 Test data for 802.11b WLAN Mode

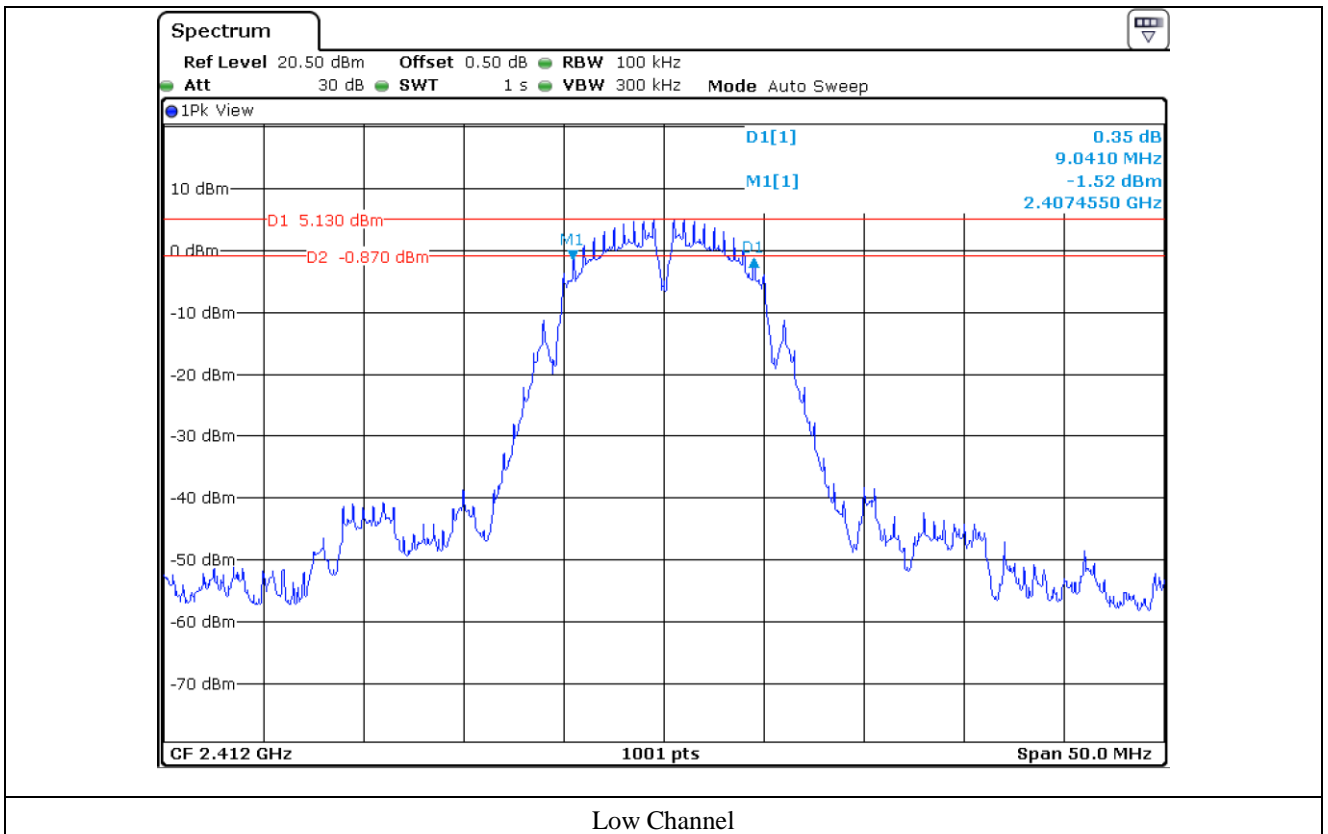
- Test Date : May 03, 2016
- Test Result : Pass

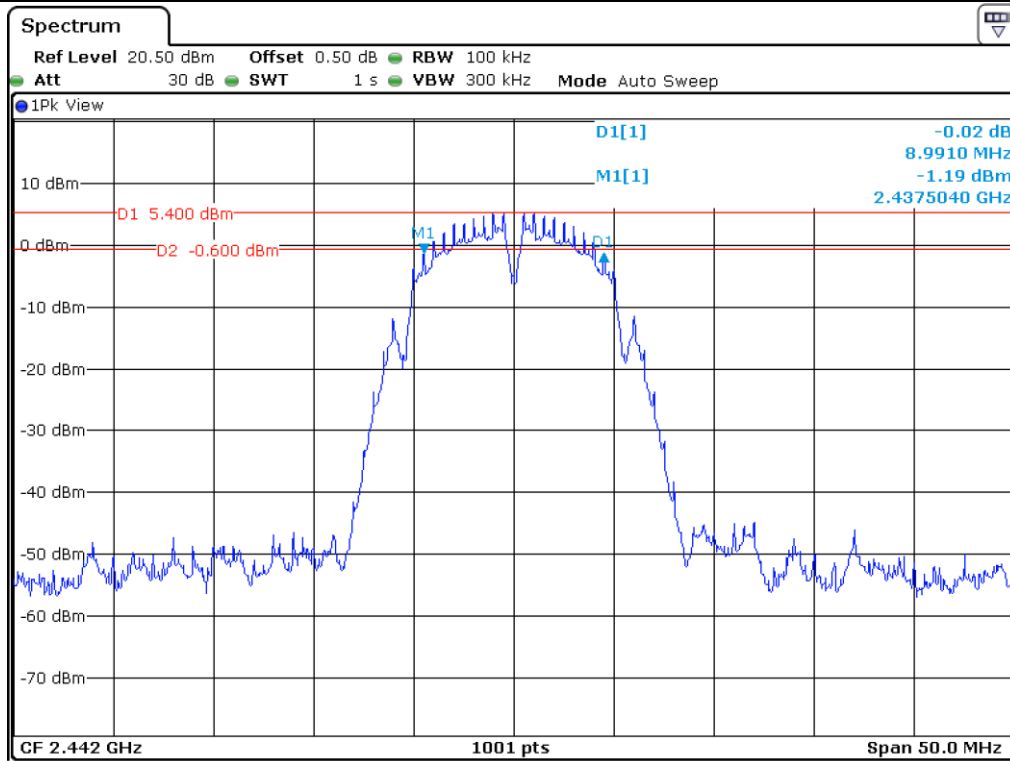
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	9.04	0.50	8.54
Middle	2 442	8.99	0.50	8.49
High	2 462	9.04	0.50	8.54

Remark. Margin = Measured Value - Limit

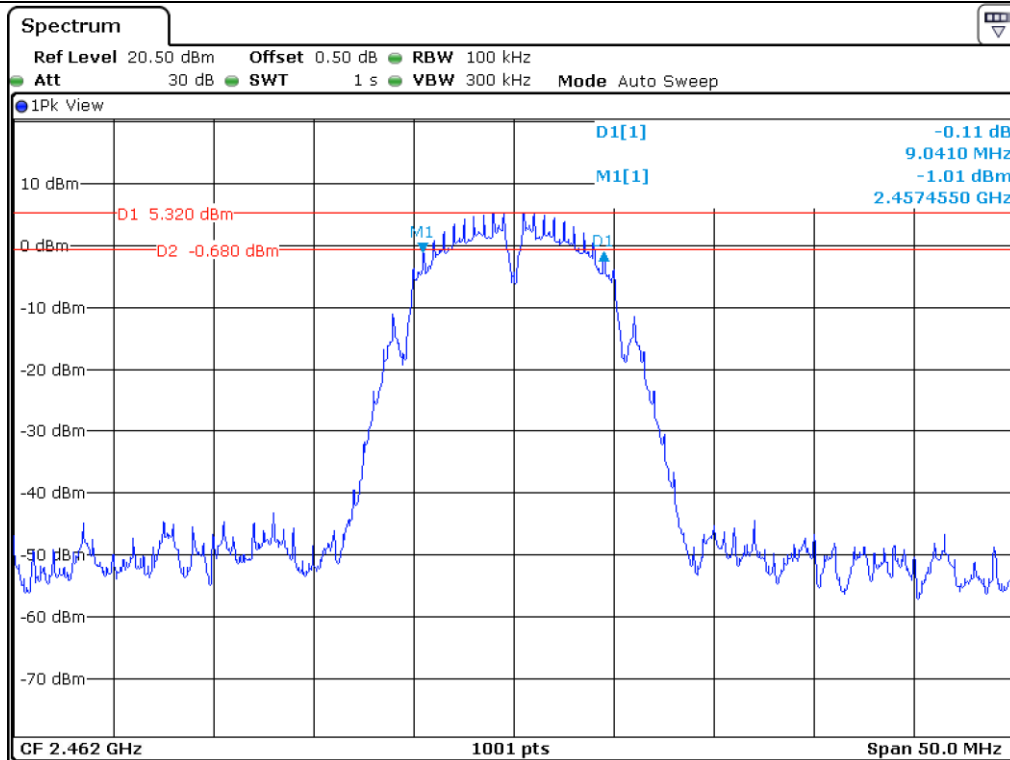


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.4.1.2 Test data for 802.11g WLAN Mode

- Test Date : May 03, 2016

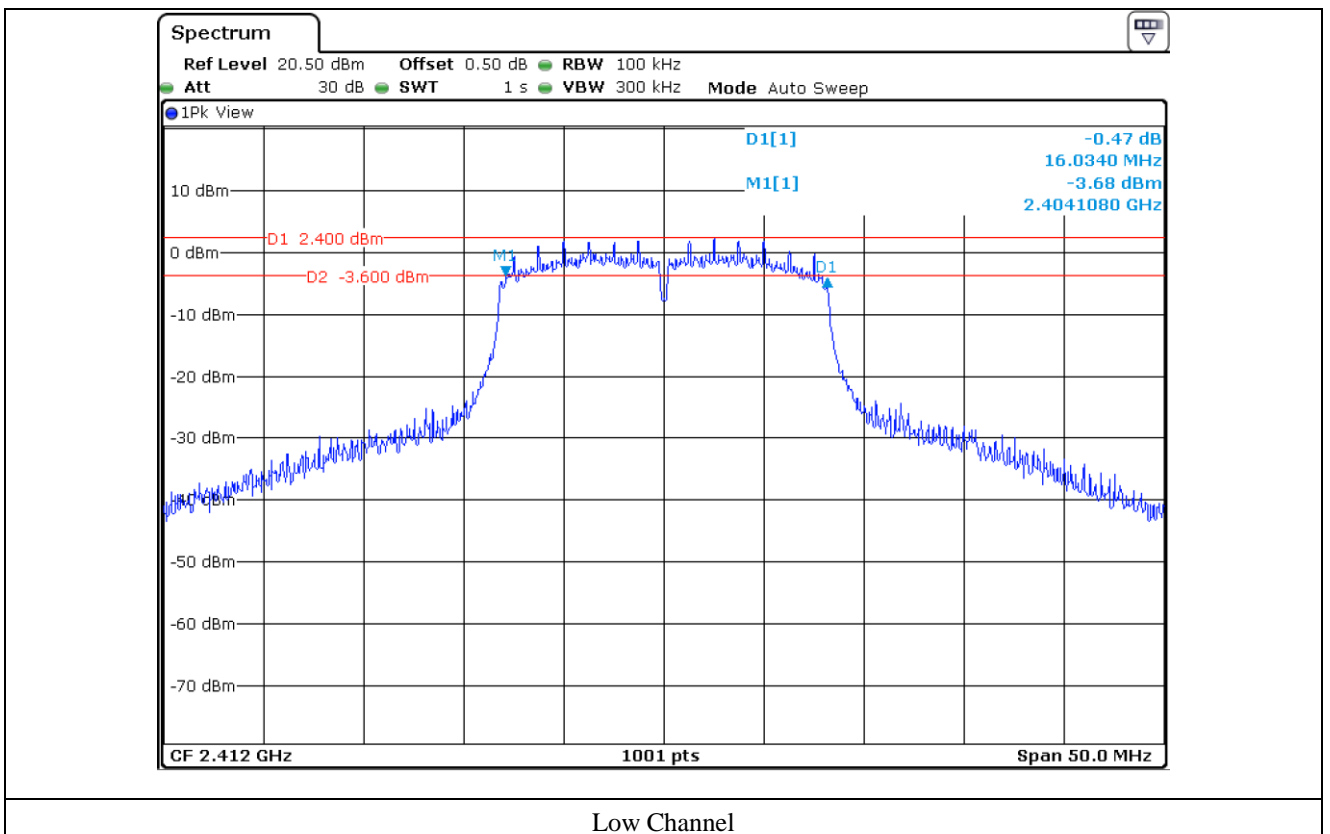
- Test Result : Pass

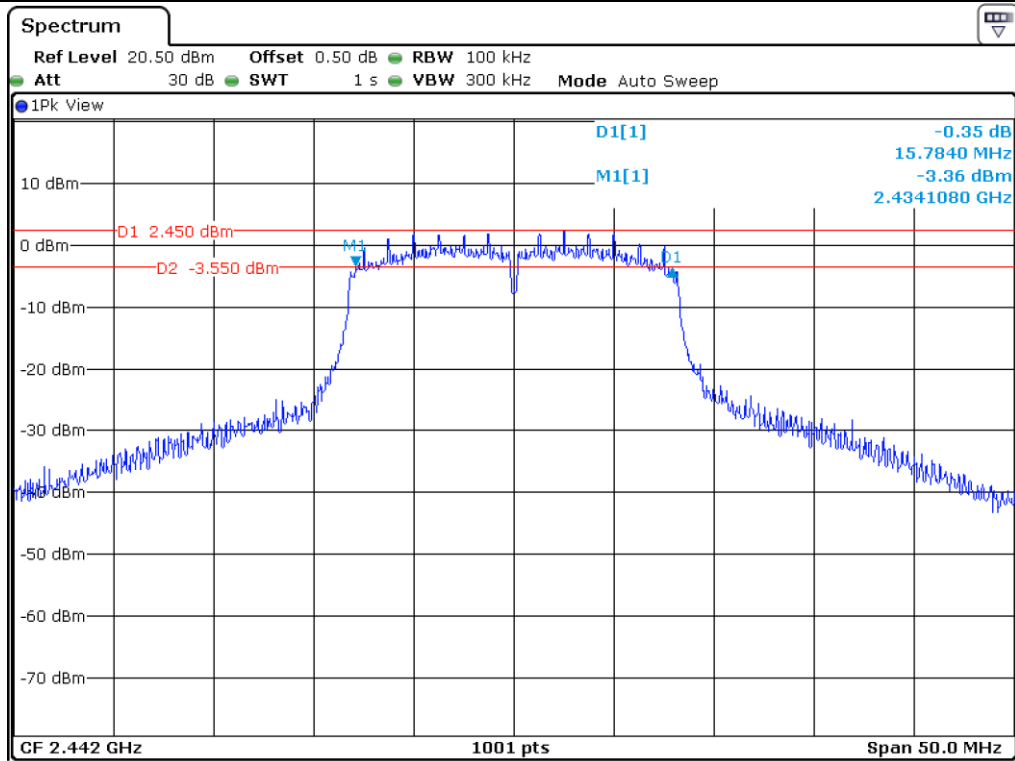
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	16.03	0.50	15.53
Middle	2 442	15.78	0.50	15.28
High	2 462	16.03	0.50	15.53

Remark. Margin = Measured Value - Limit

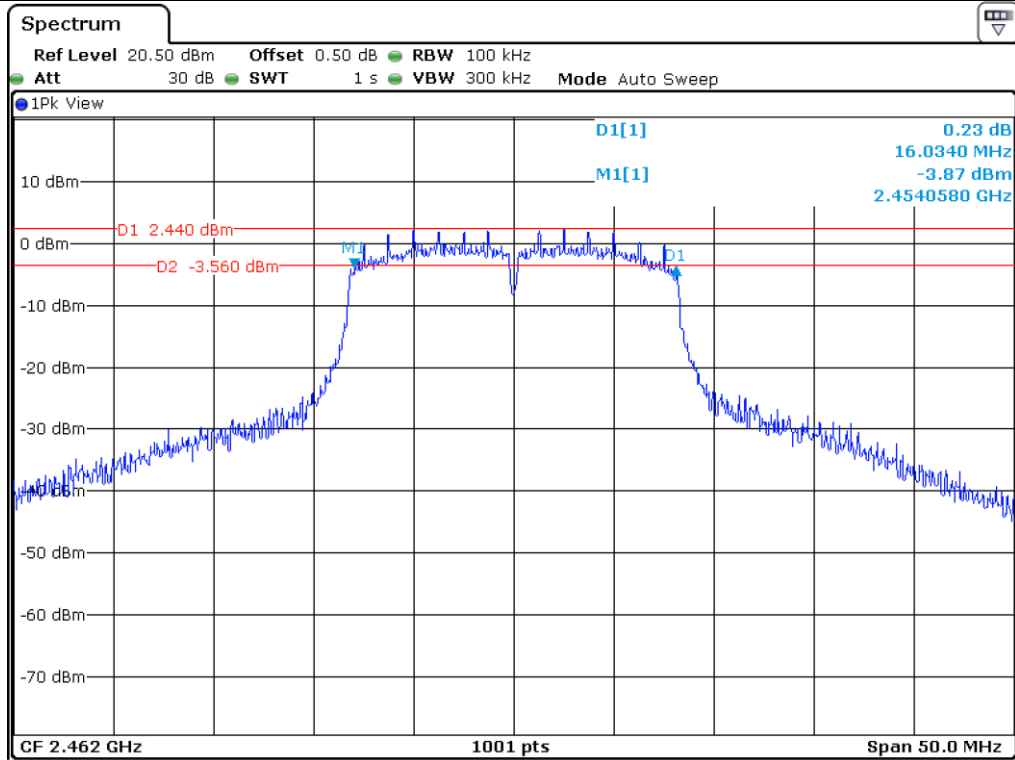


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.4.1.3 Test data for 802.11n_HT20 WLAN Mode

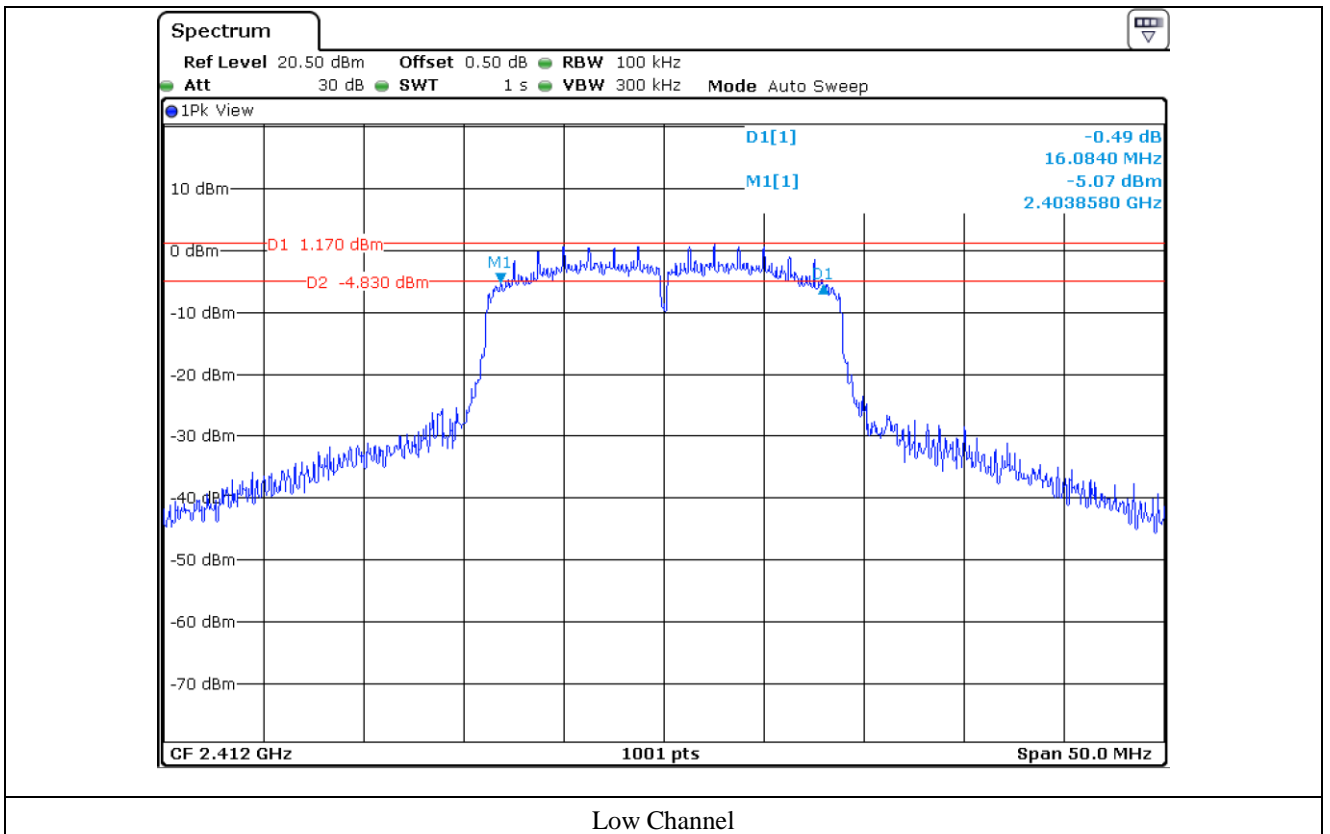
- Test Date : May 03, 2016
 - Test Result : Pass

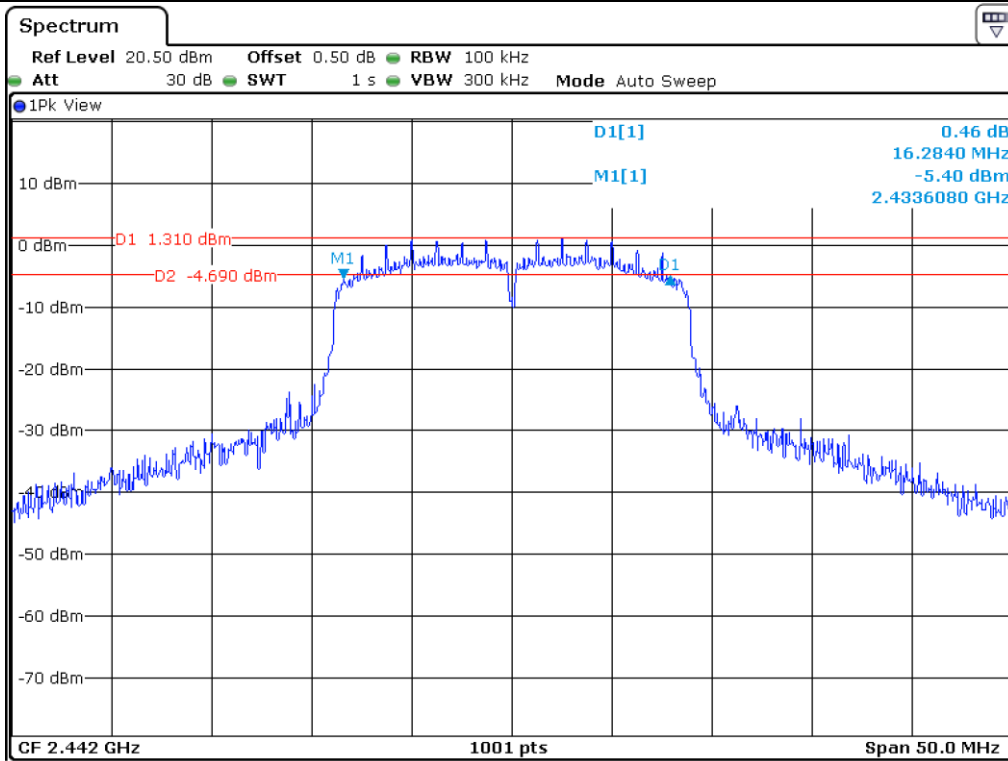
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	16.08	0.50	15.58
Middle	2 442	16.28	0.50	15.78
High	2 462	16.53	0.50	16.03

Remark. Margin = Measured Value - Limit

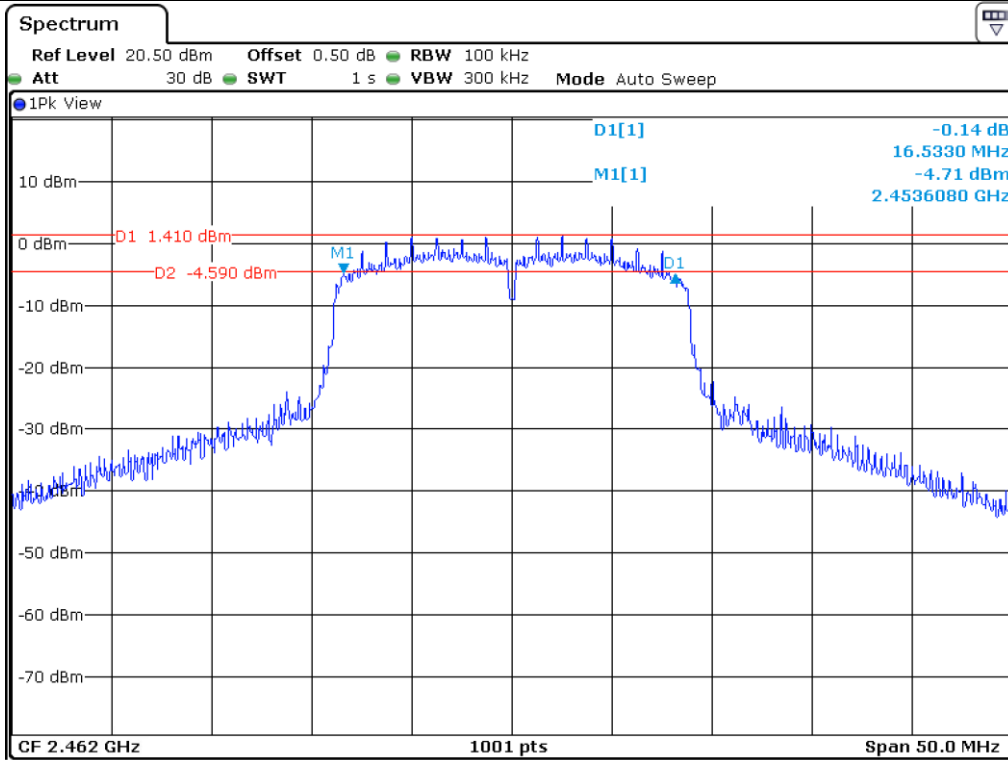


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.4.2 Test data for Antenna 1

7.4.2.1 Test data for 802.11b WLAN Mode

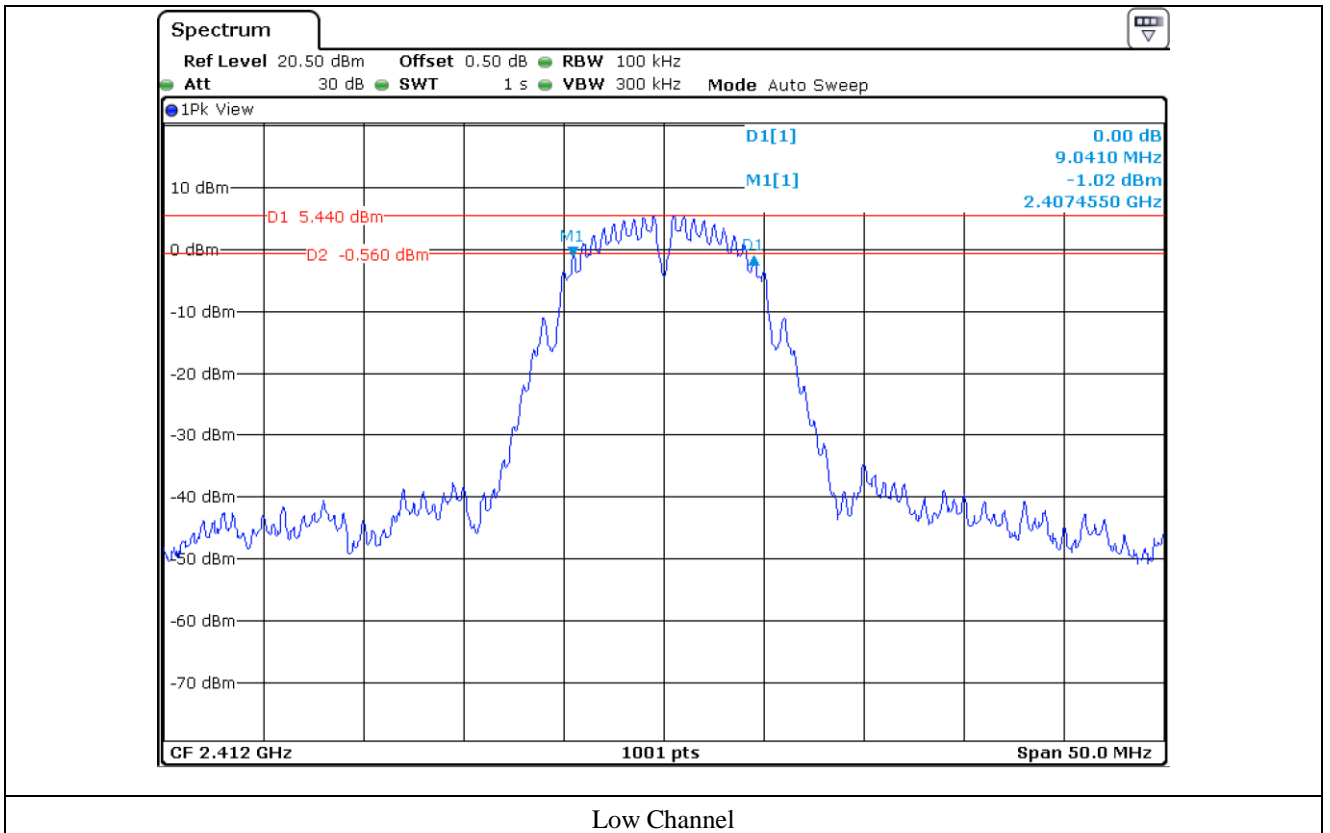
- Test Date : May 03, 2016
- Test Result : Pass

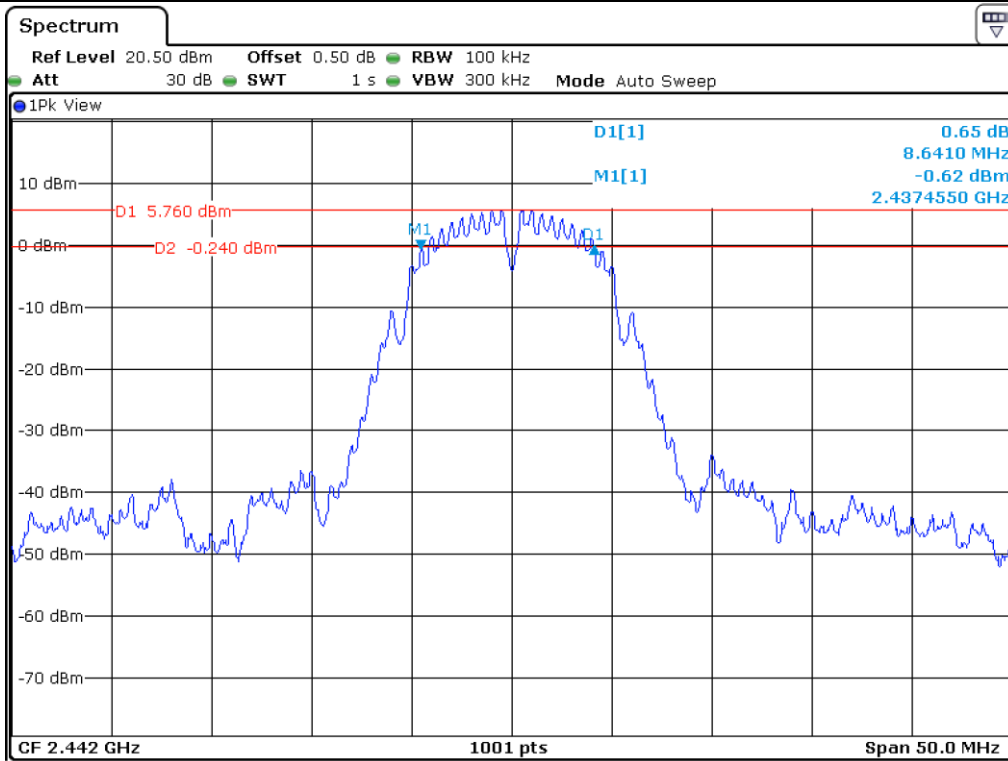
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	9.04	0.50	8.54
Middle	2 442	8.64	0.50	8.14
High	2 462	9.04	0.50	8.54

Remark. Margin = Measured Value - Limit

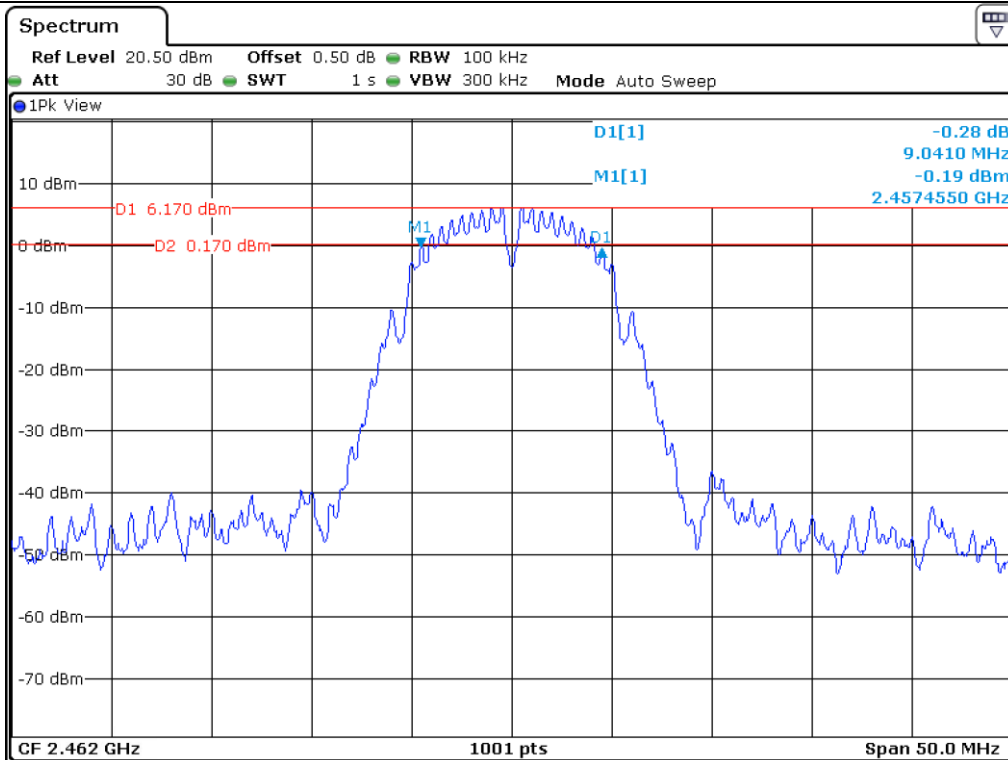


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.4.2.2 Test data for 802.11g WLAN Mode

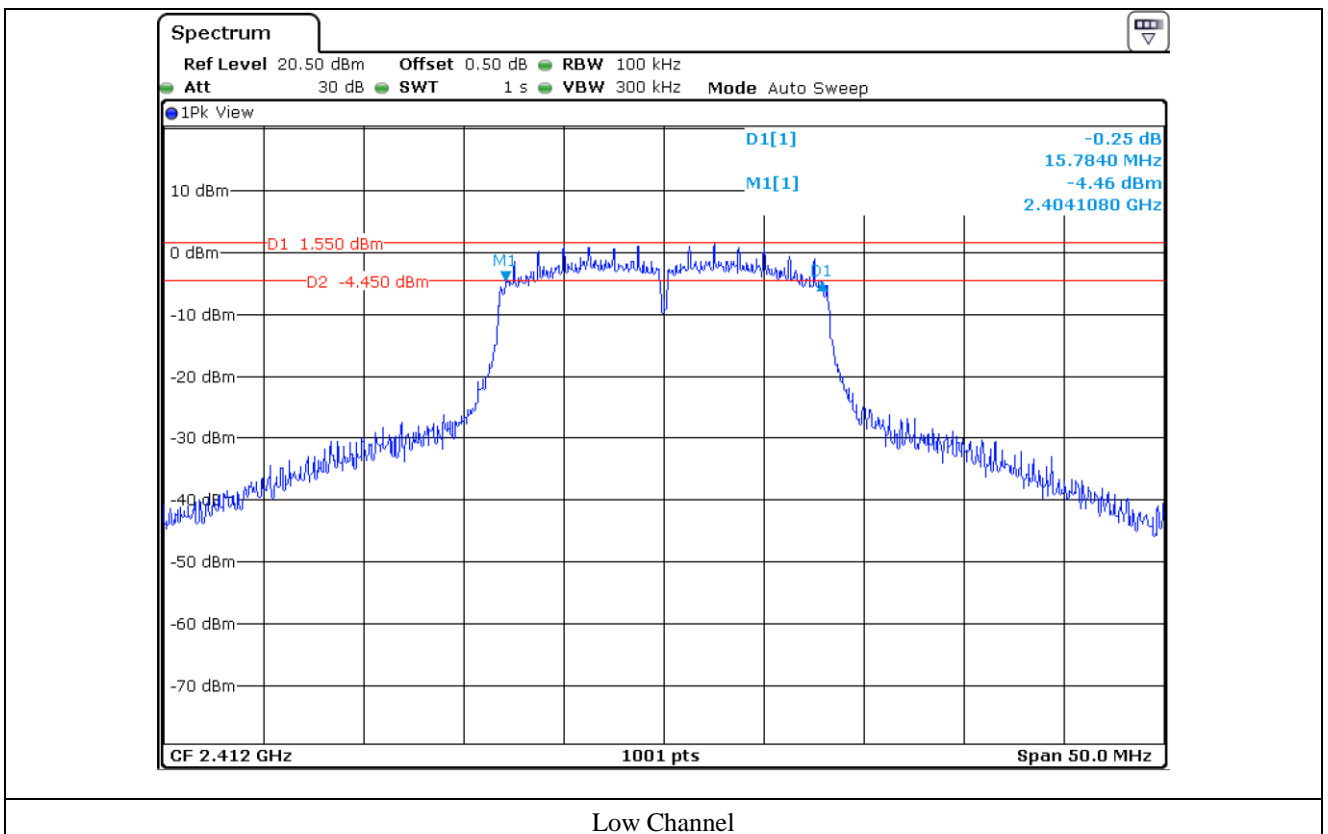
- Test Date : May 03, 2016
 - Test Result : Pass

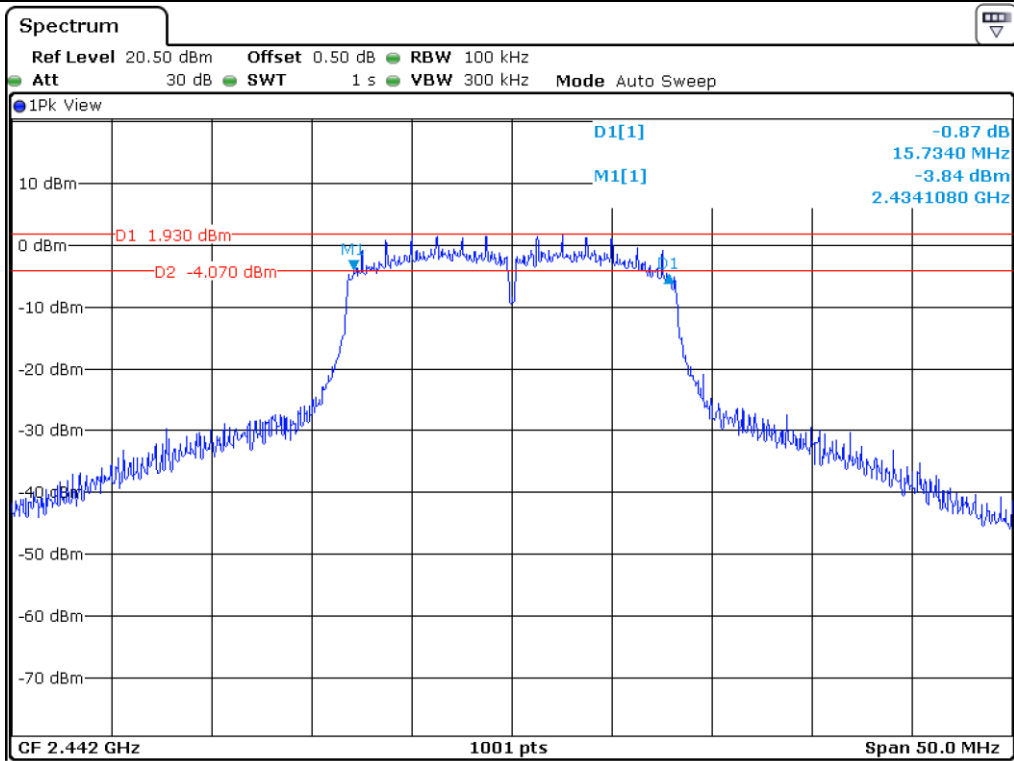
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	15.78	0.50	15.28
Middle	2 442	15.73	0.50	15.23
High	2 462	15.98	0.50	15.48

Remark. Margin = Measured Value - Limit

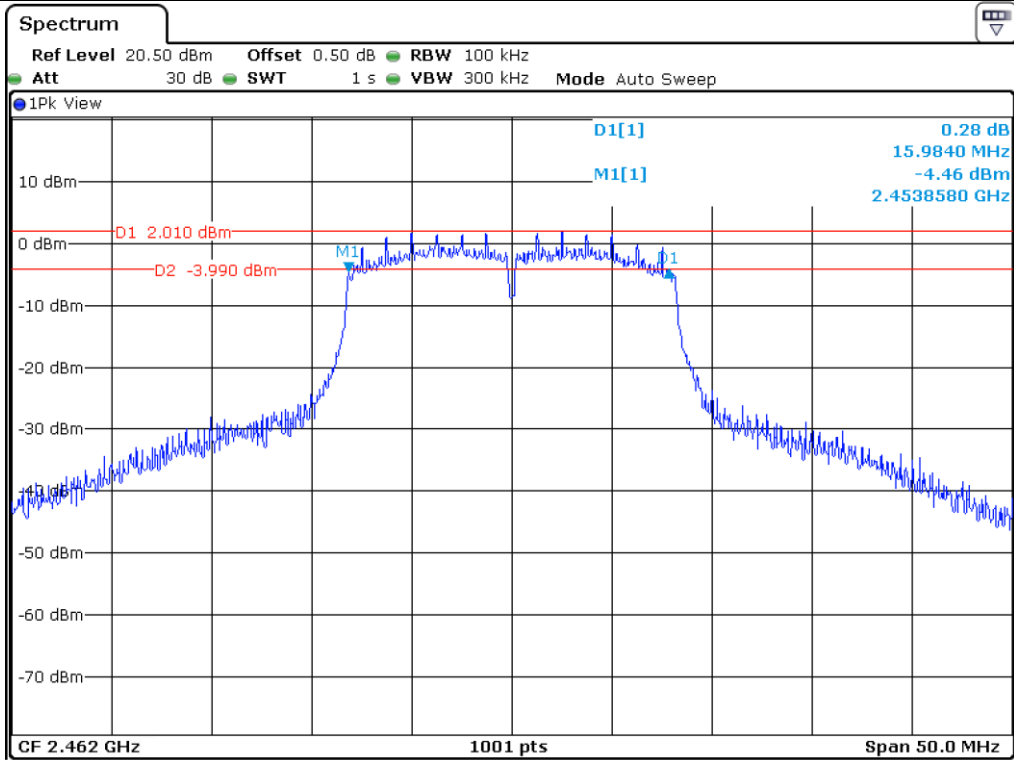


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.4.2.3 Test data for 802.11n_HT20 WLAN Mode

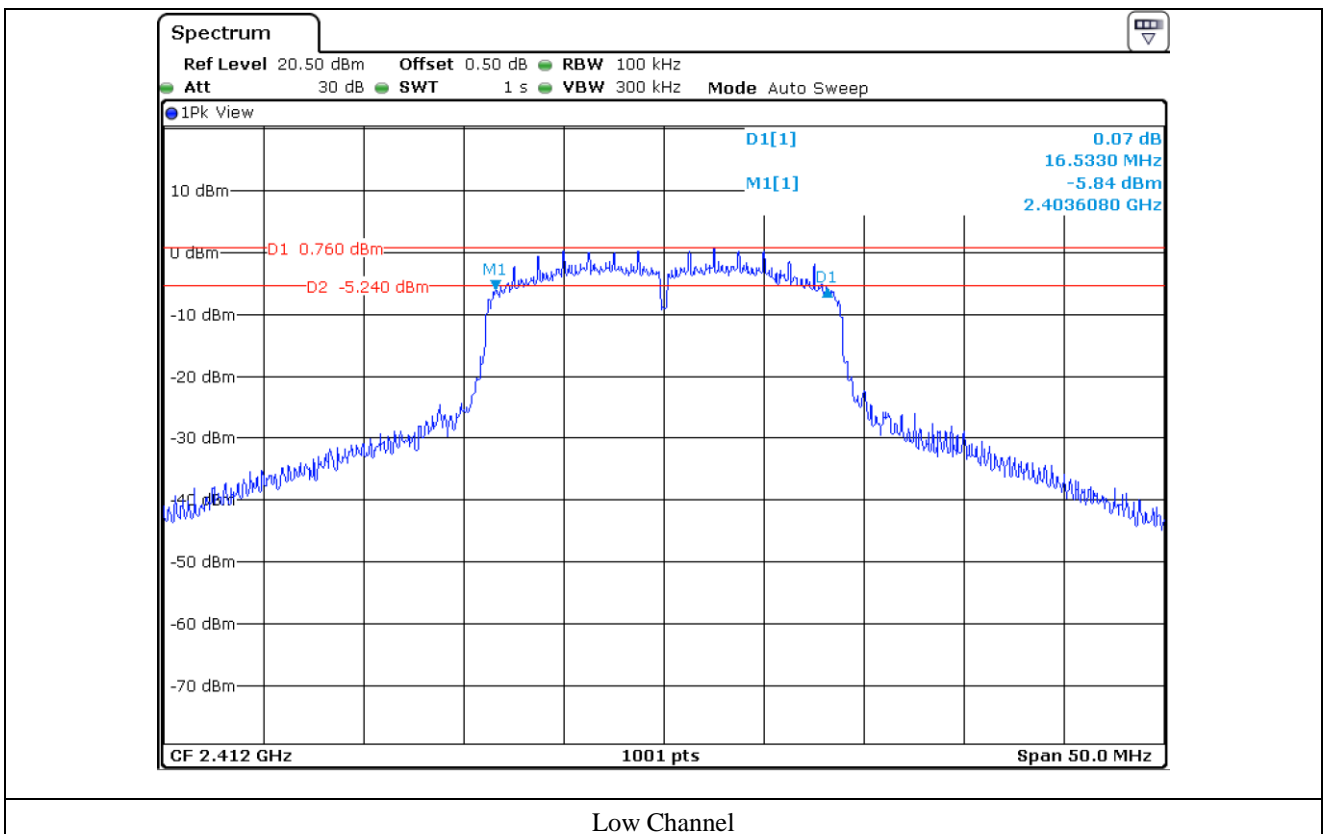
- Test Date : May 03, 2016
- Test Result : Pass

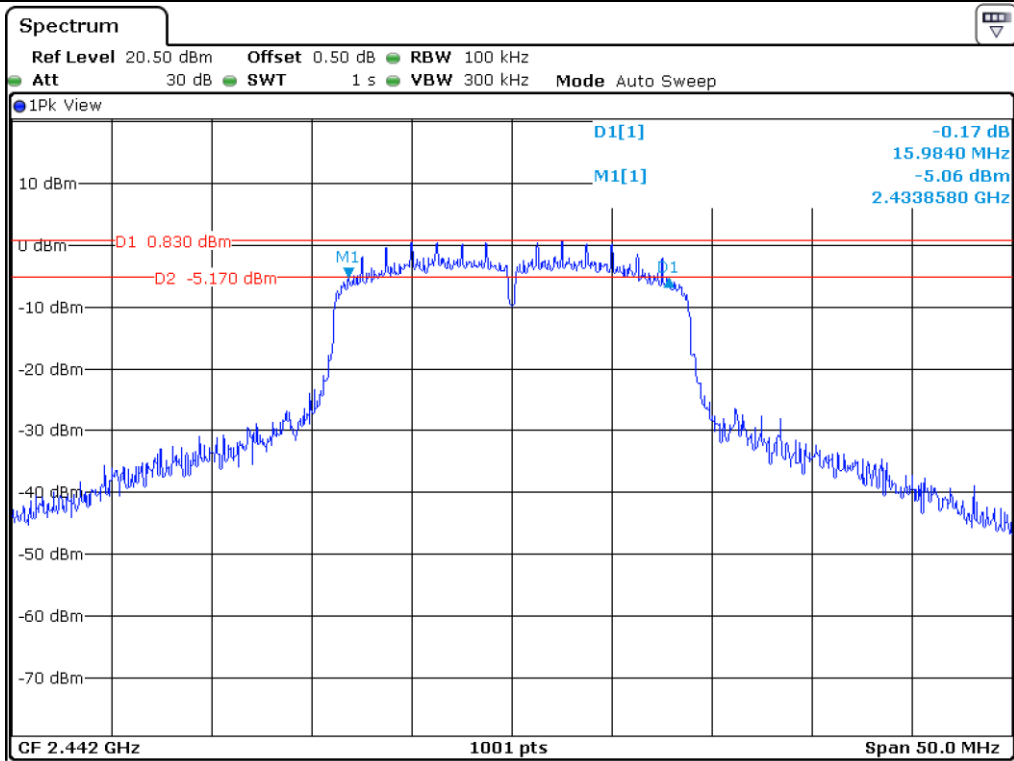
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	16.53	0.50	16.03
Middle	2 442	15.98	0.50	15.48
High	2 462	16.23	0.50	15.73

Remark. Margin = Measured Value - Limit

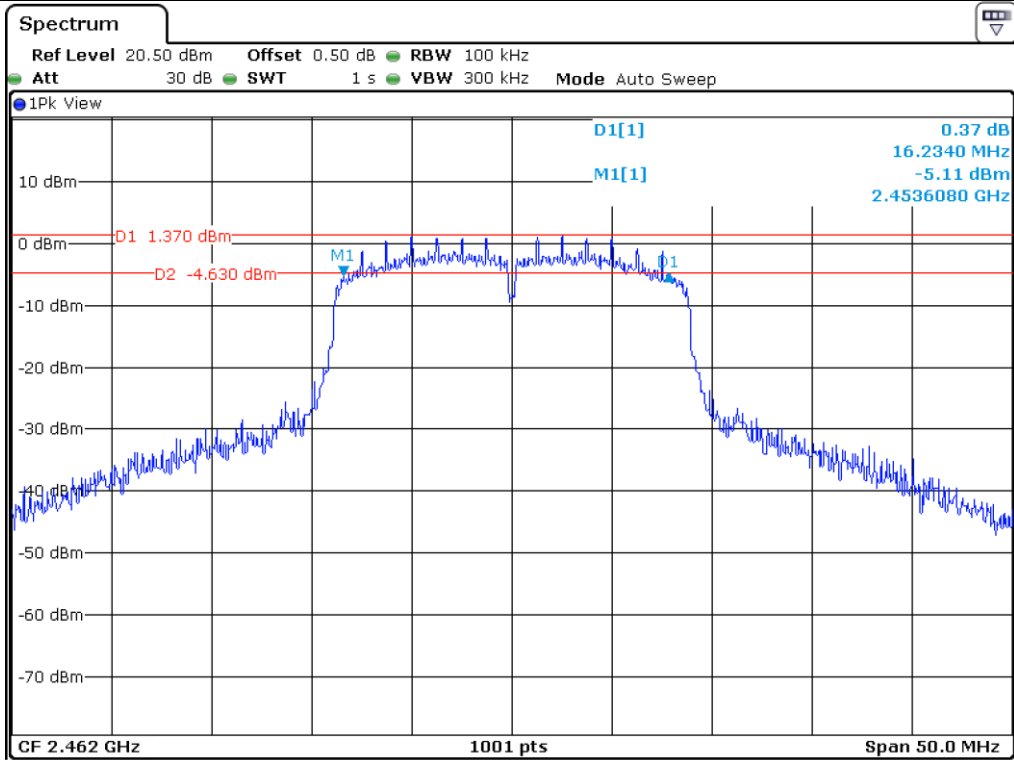


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.5 Test data for AC 24 V

7.5.1 Test data for Antenna 0

7.5.1.1 Test data for 802.11b WLAN Mode

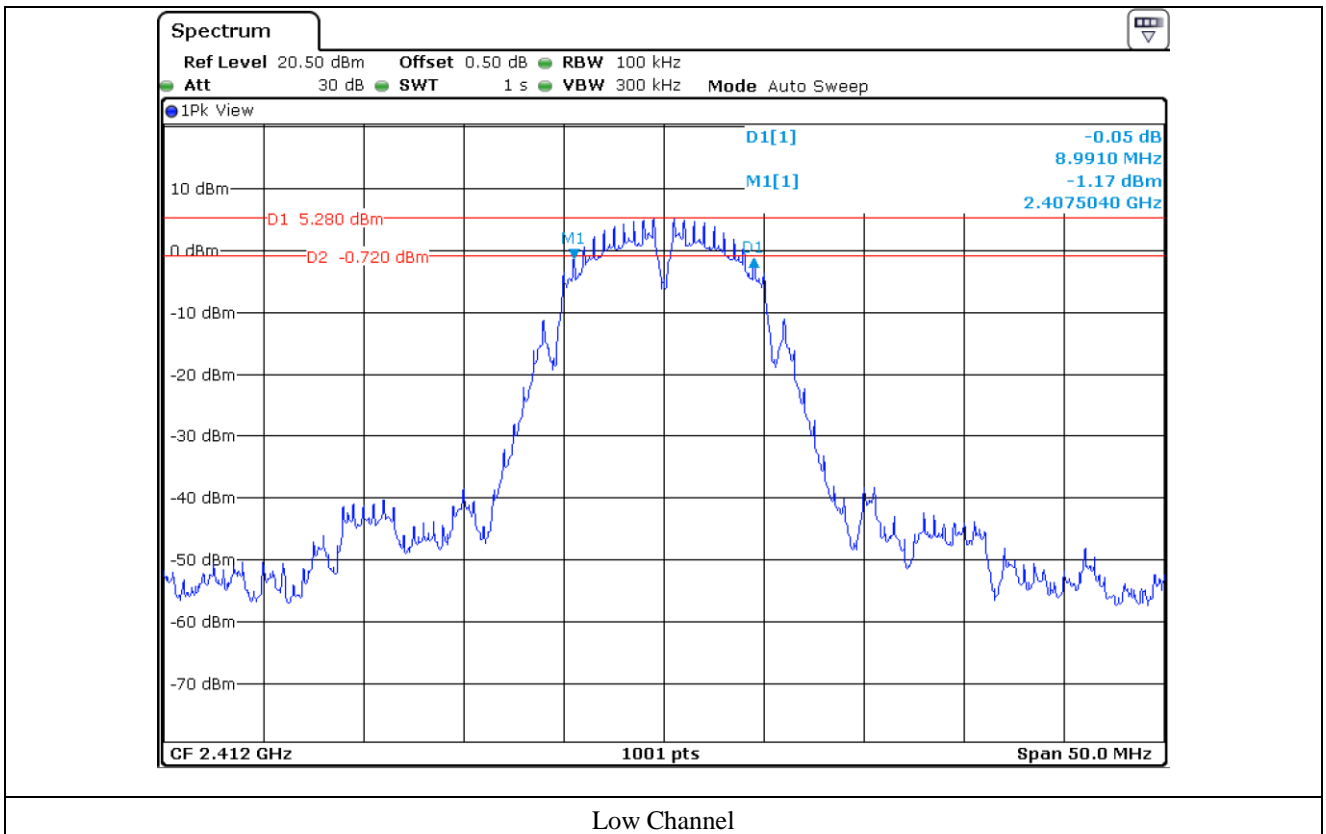
- Test Date : May 03, 2016
- Test Result : Pass

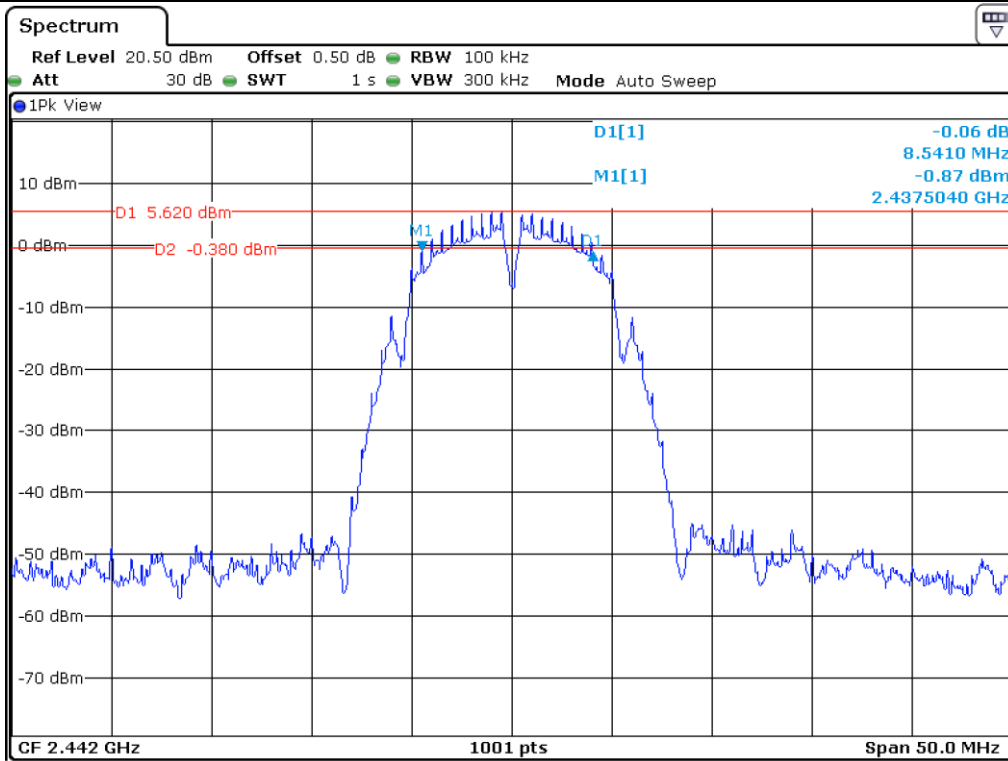
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	8.99	0.50	8.49
Middle	2 442	8.54	0.50	8.04
High	2 462	8.99	0.50	8.49

Remark. Margin = Measured Value - Limit

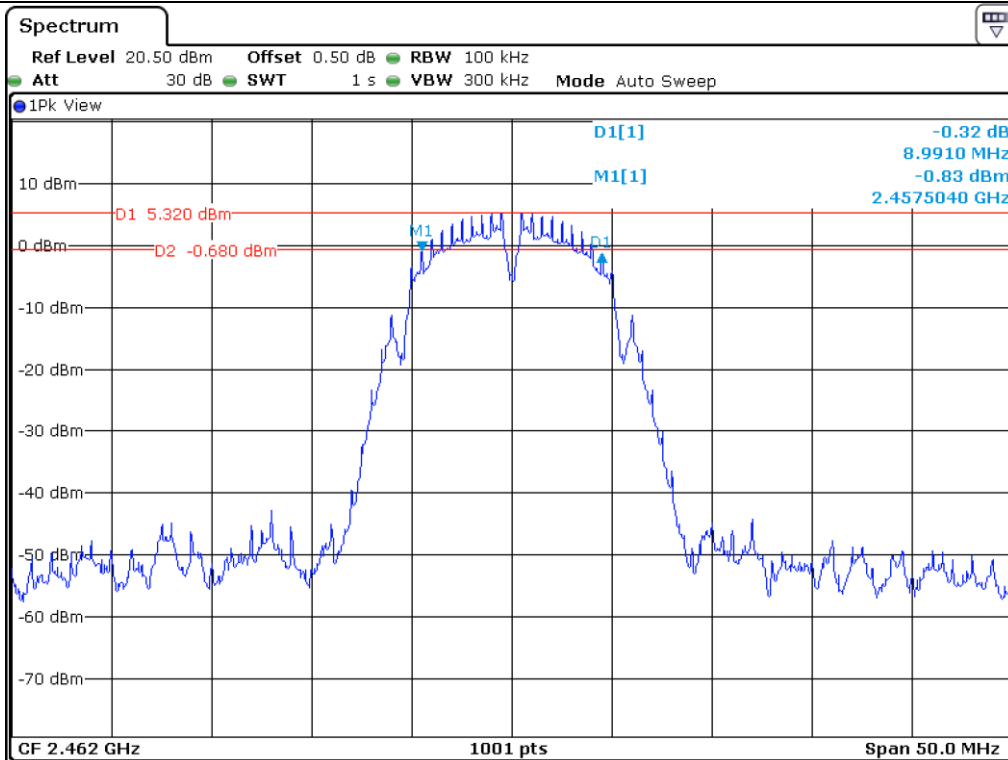


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.5.1.2 Test data for 802.11g WLAN Mode

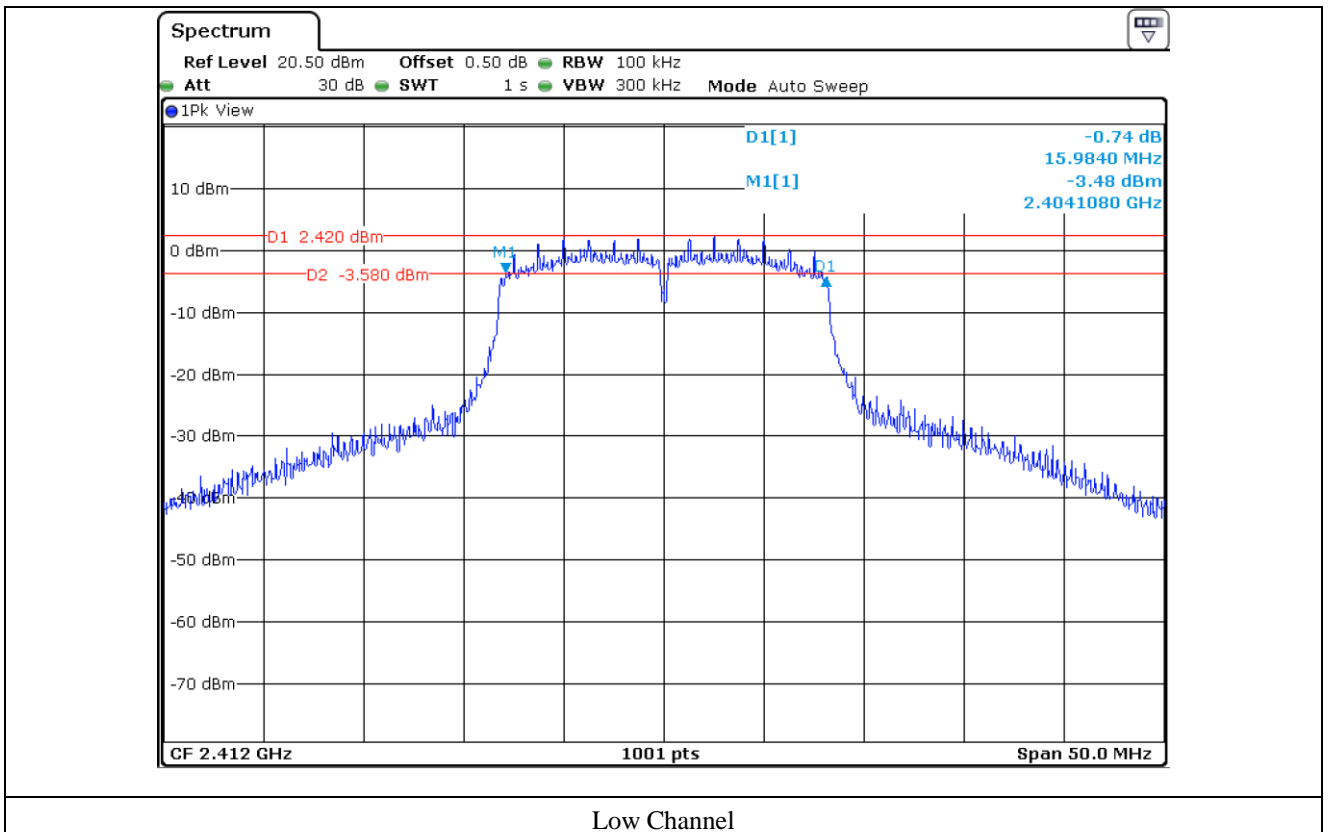
- Test Date : May 03, 2016
 - Test Result : Pass

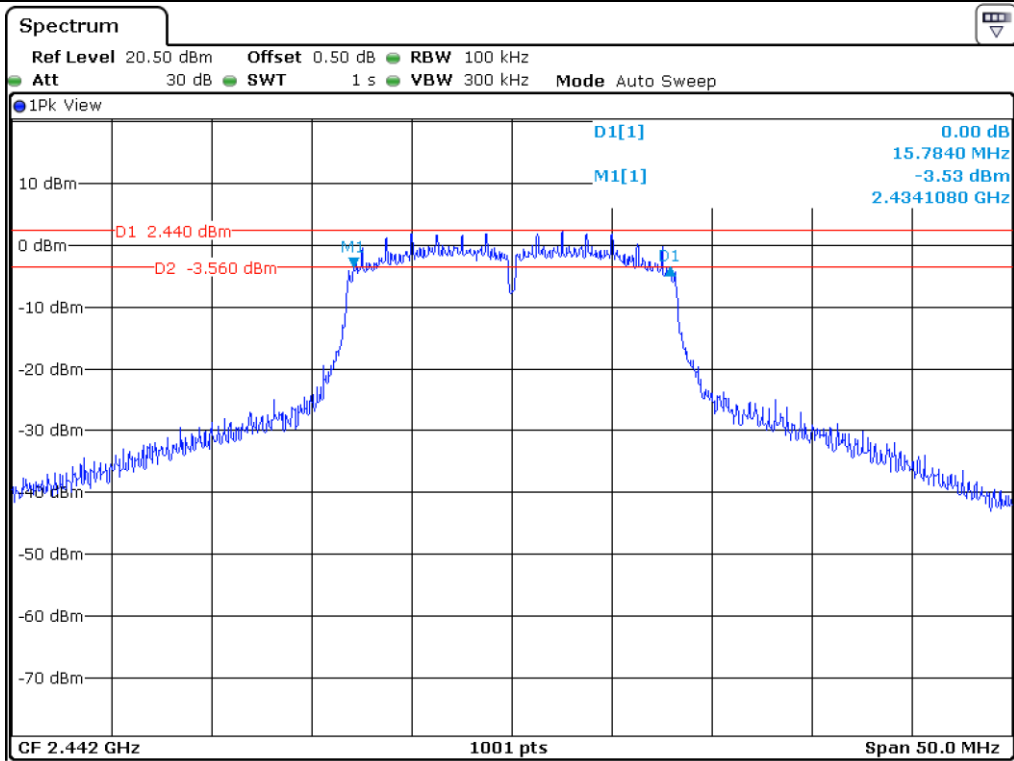
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	15.98	0.50	15.48
Middle	2 442	15.78	0.50	15.28
High	2 462	15.83	0.50	15.33

Remark. Margin = Measured Value - Limit

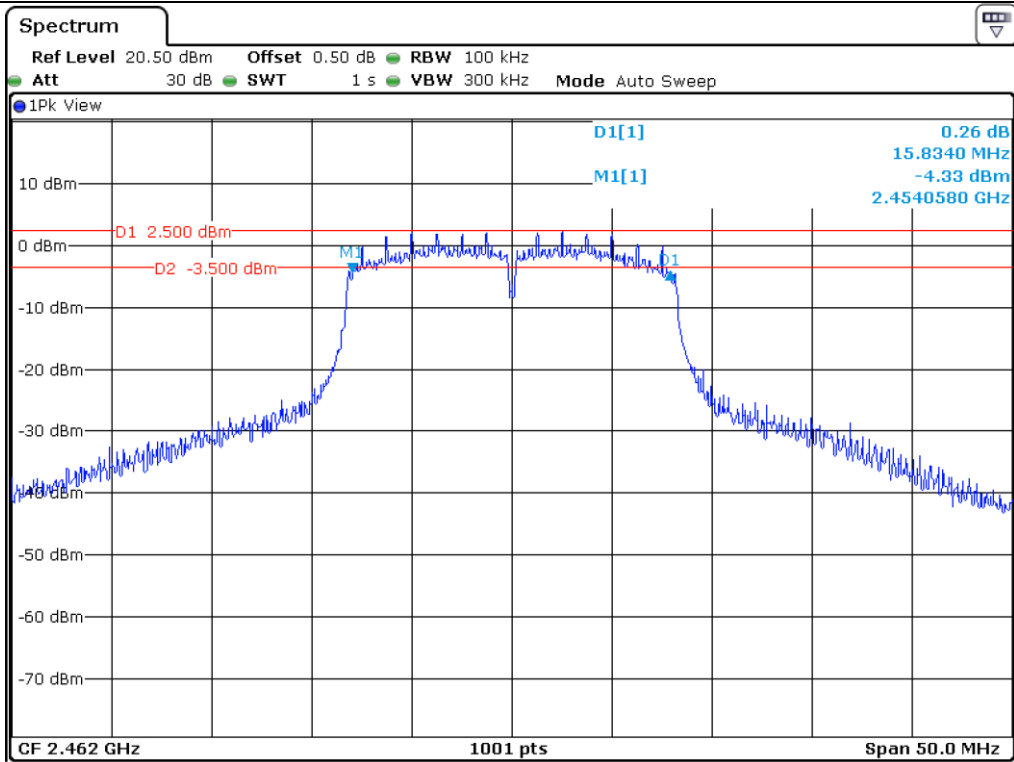


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

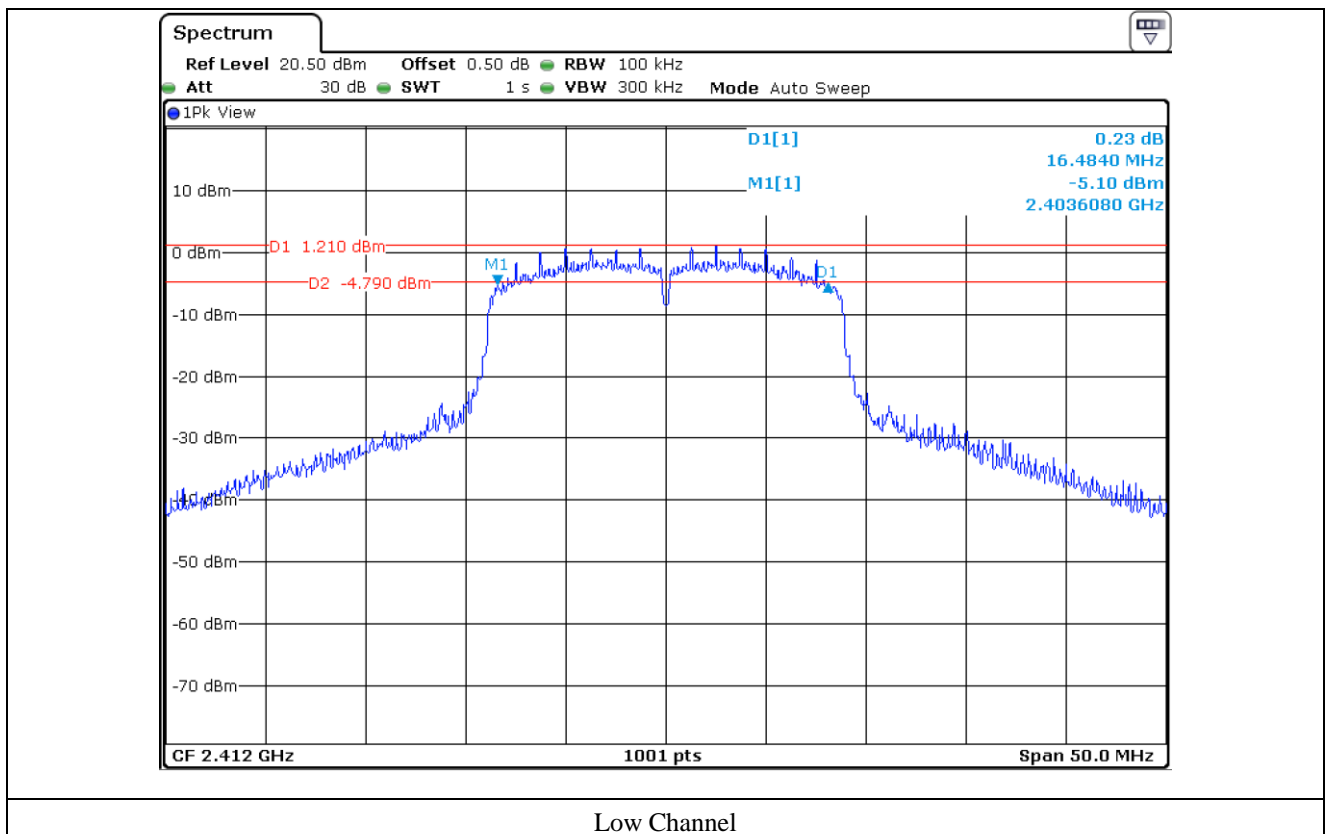
7.5.1.3 Test data for 802.11n_HT20 WLAN Mode

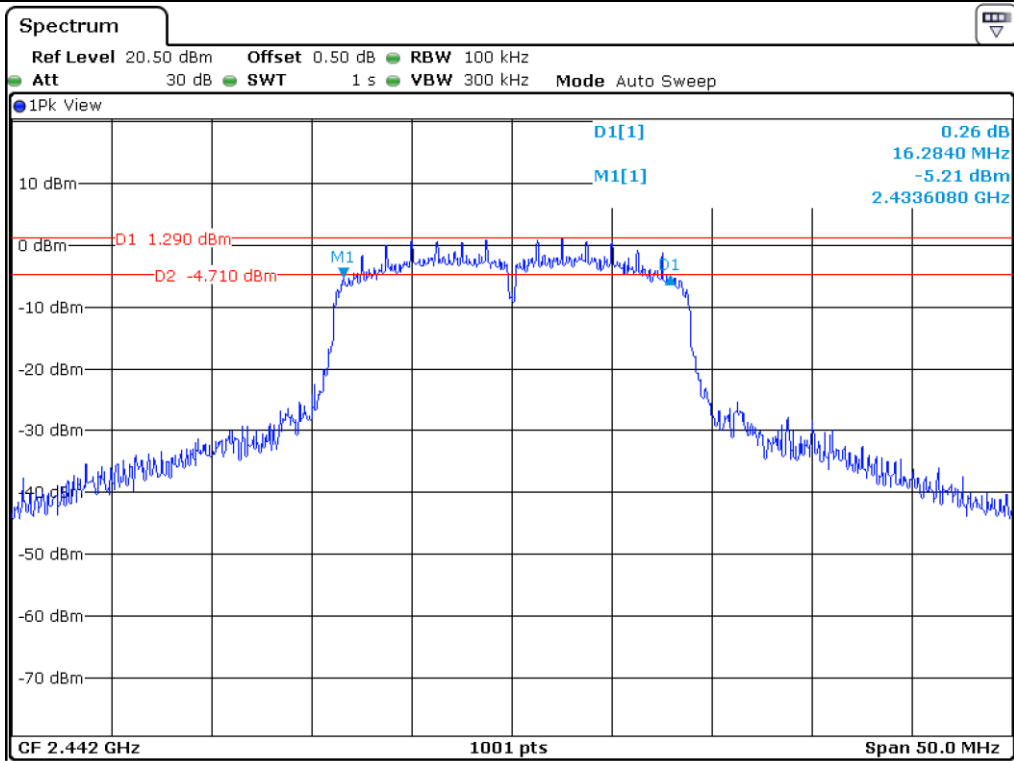
- Test Date : May 03, 2016
 - Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	16.48	0.50	15.98
Middle	2 442	16.28	0.50	15.78
High	2 462	16.28	0.50	15.78

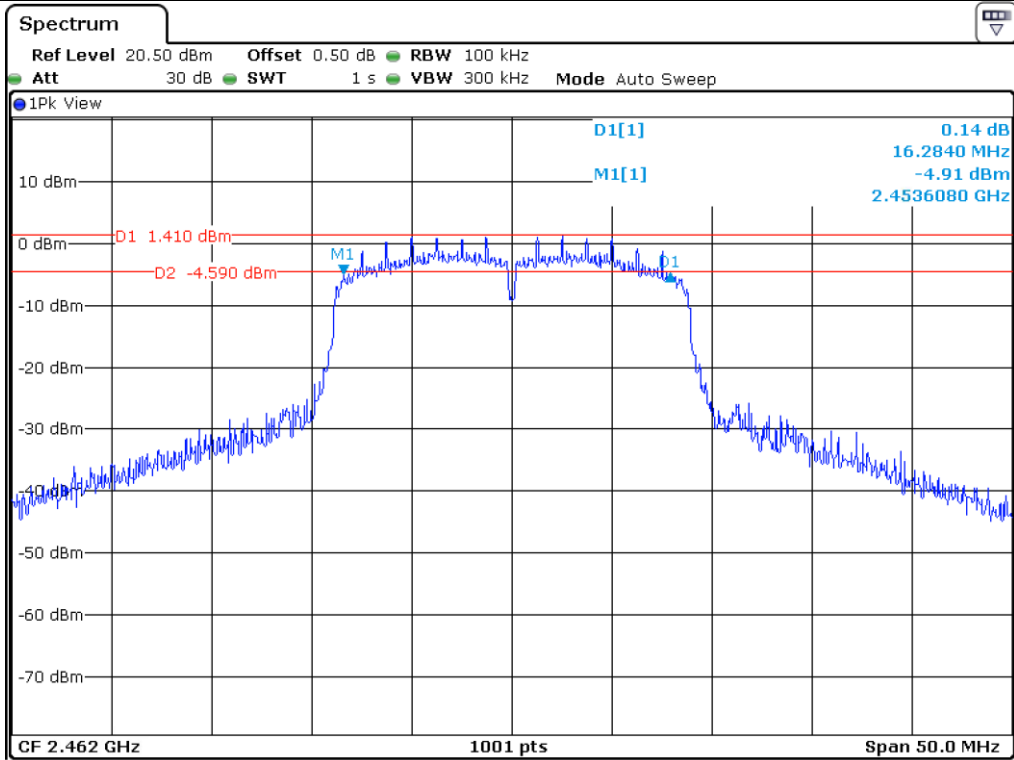
Remark. Margin = Measured Value - Limit

Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.5.2 Test data for Antenna 1

7.5.2.1 Test data for 802.11b WLAN Mode

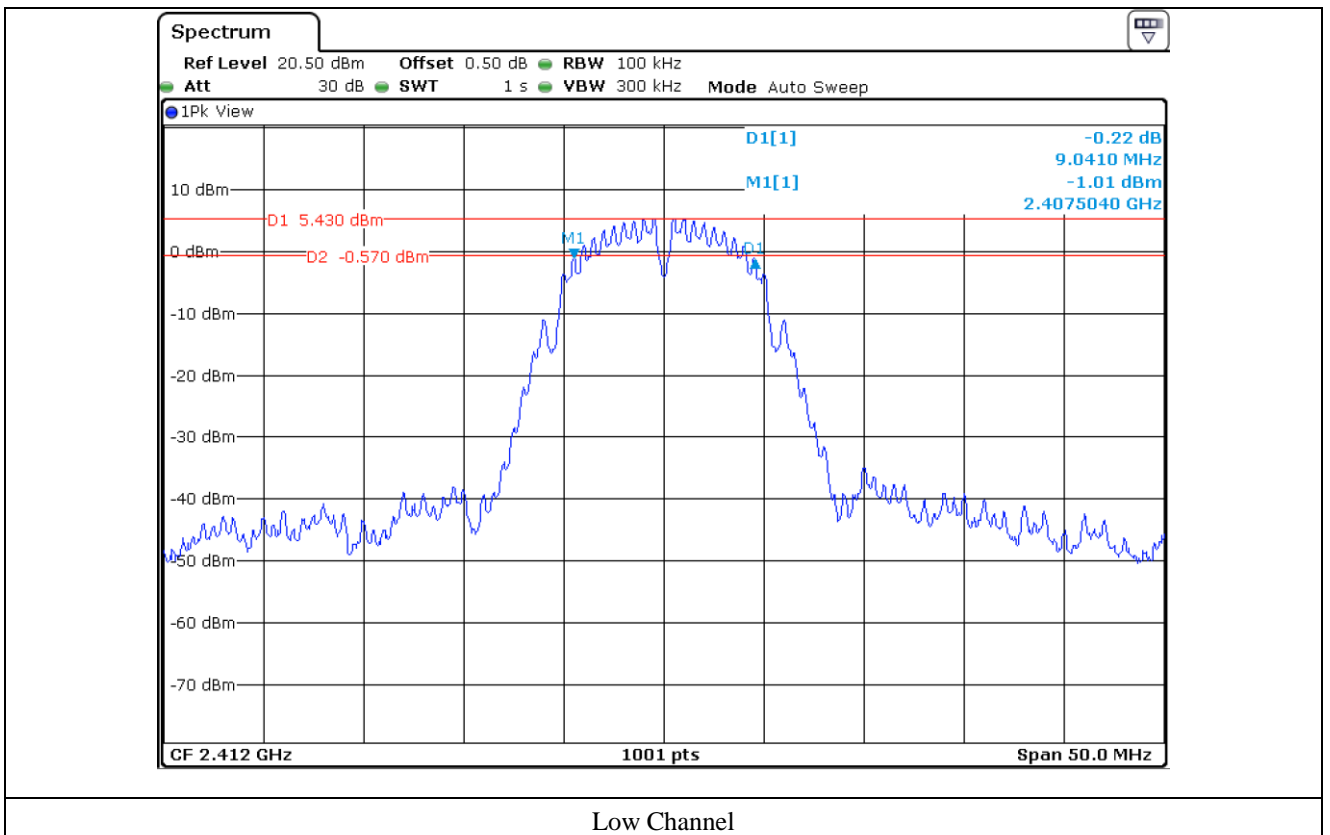
-. Test Date : May 03, 2016
 -. Test Result : Pass

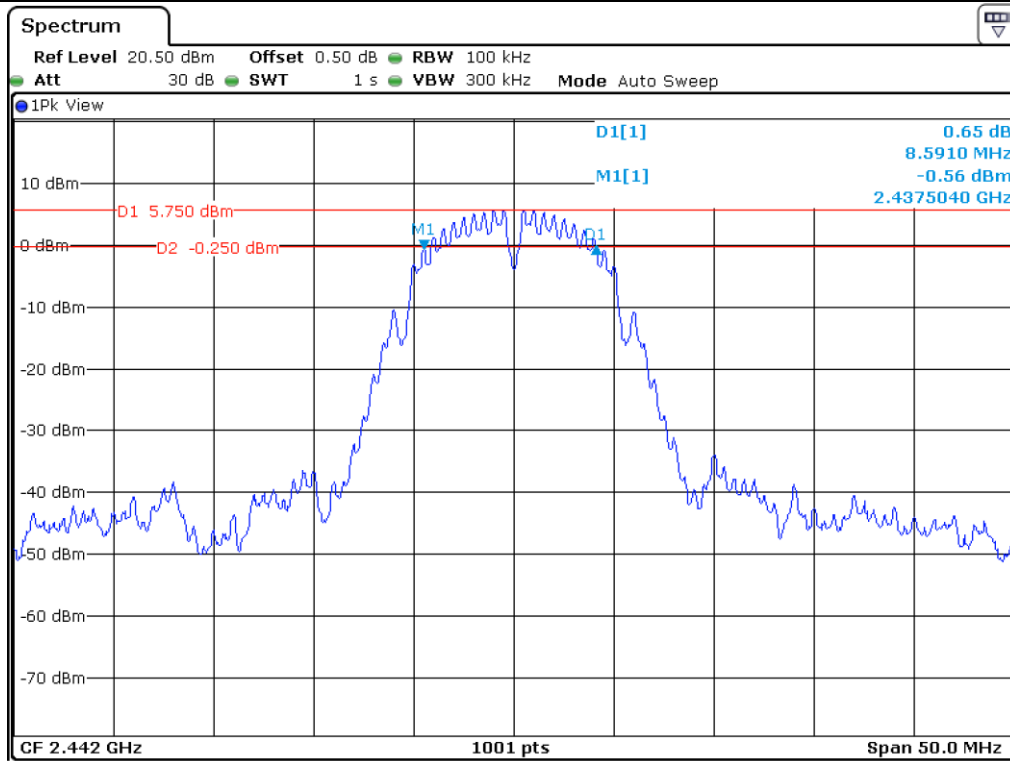
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	9.04	0.50	8.54
Middle	2 442	8.59	0.50	8.09
High	2 462	8.64	0.50	8.14

Remark. Margin = Measured Value - Limit

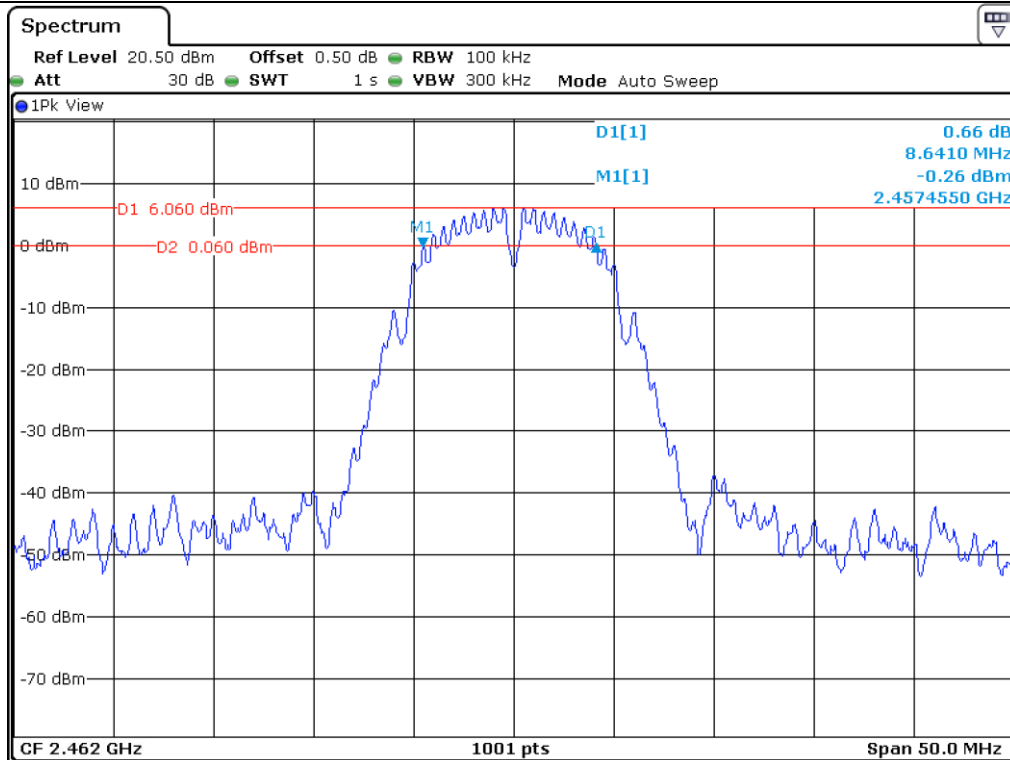


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.5.2.2 Test data for 802.11g WLAN Mode

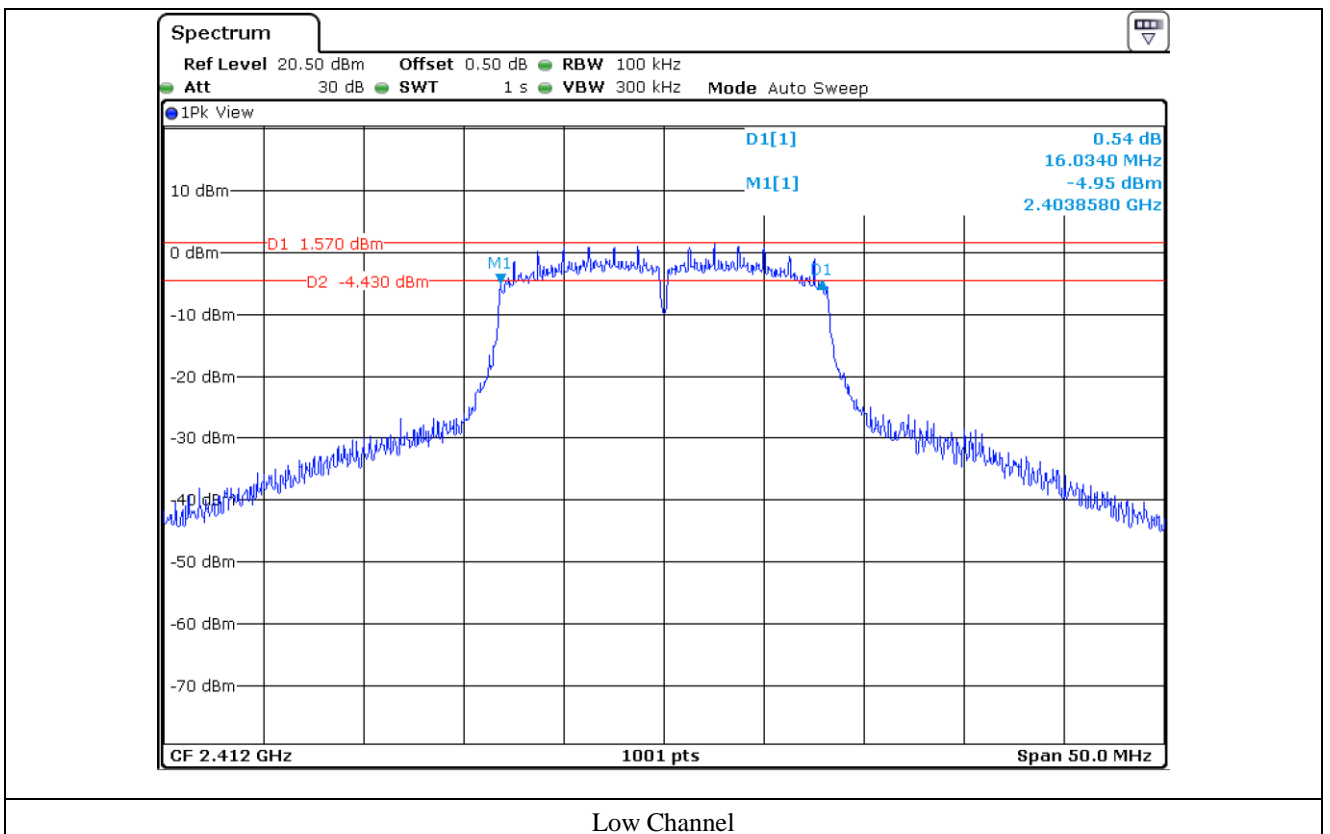
- Test Date : May 03, 2016
 - Test Result : Pass

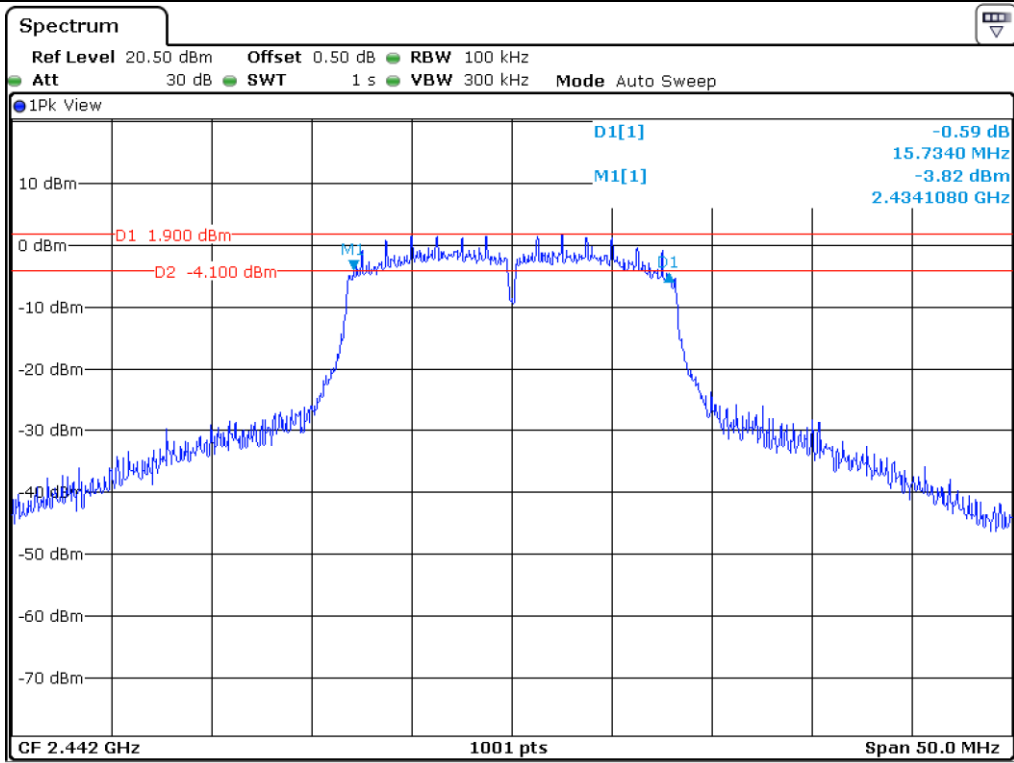
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	16.03	0.50	15.53
Middle	2 442	15.73	0.50	15.23
High	2 462	15.73	0.50	15.23

Remark. Margin = Measured Value - Limit

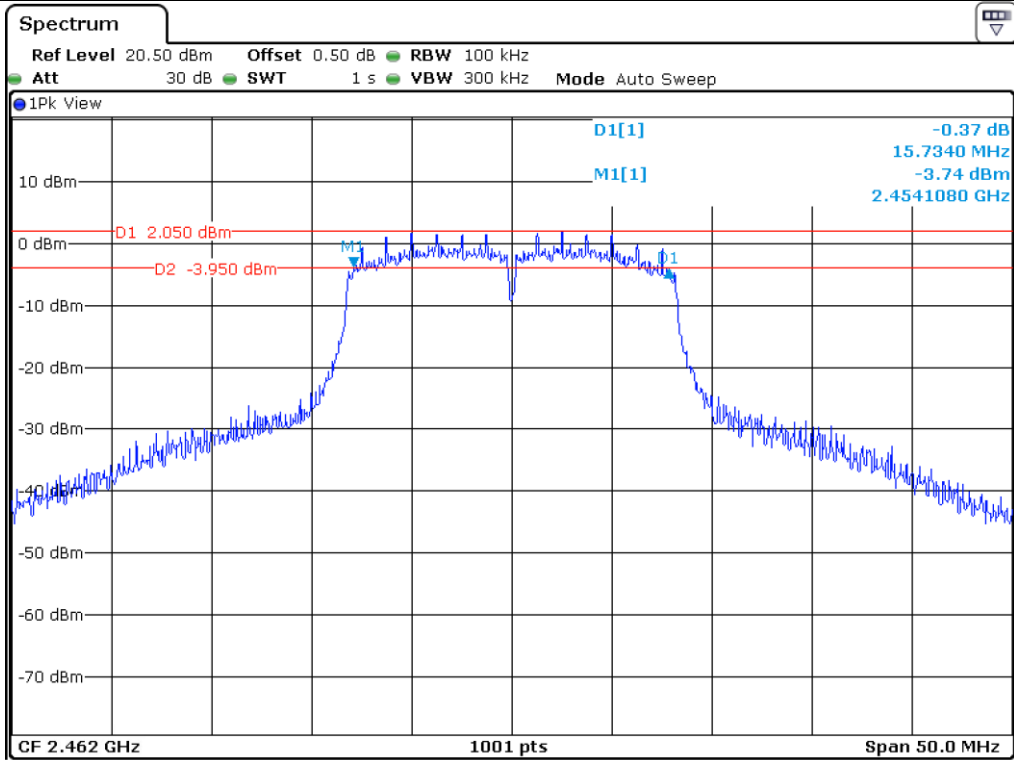


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel



High Channel

7.5.2.3 Test data for 802.11n_HT20 WLAN Mode

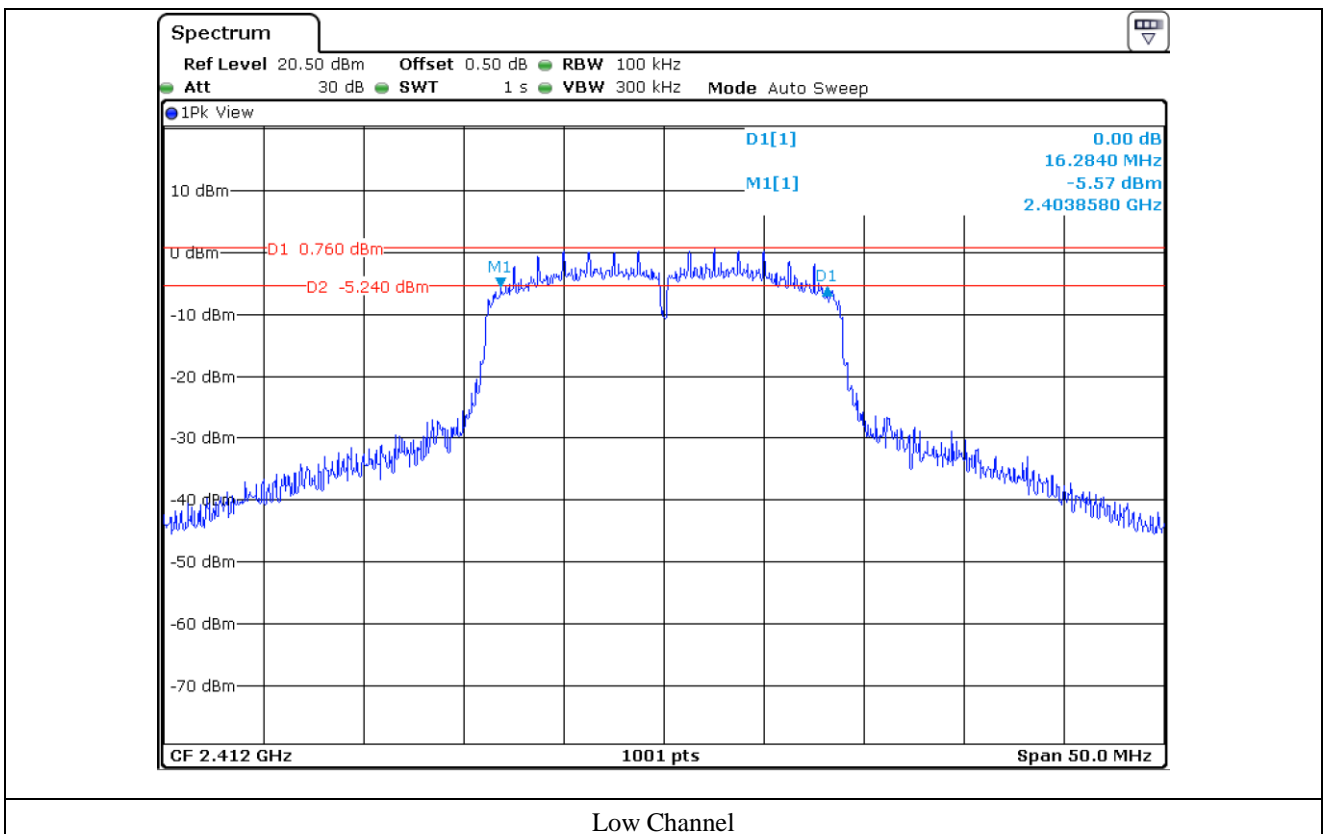
- Test Date : May 03, 2016
 - Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	LIMIT (MHz)	Margin (MHz)
Low	2 412	16.28	0.50	15.78
Middle	2 442	16.23	0.50	15.73
High	2 462	16.53	0.50	16.03

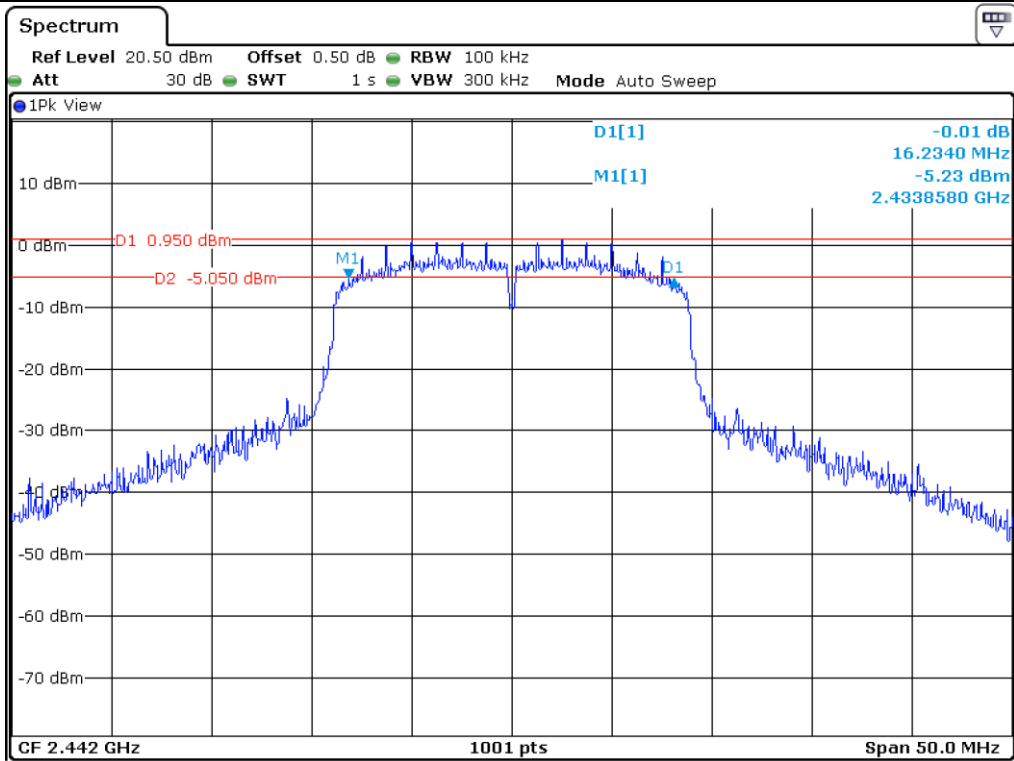
Remark. Margin = Measured Value - Limit



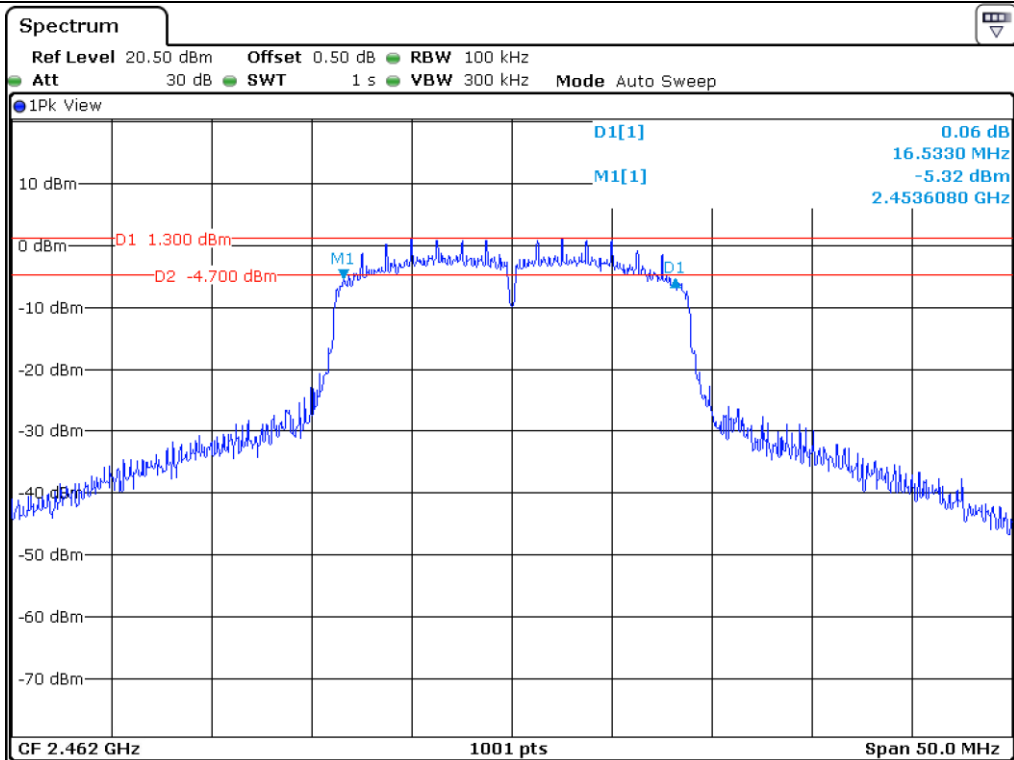
Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel



Middle Channel



High Channel

8. MAXIMUM PEAK OUTPUT POWER

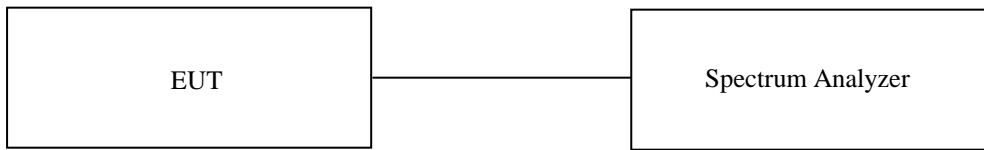
8.1 Operating environment

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

8.2 Test set-up

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

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



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 AC 12 V

8.4.1 Test data for Antenna 0

8.4.1.1 Test data for 802.11b WLAN Mode

-. Test Date : May 03, 2016

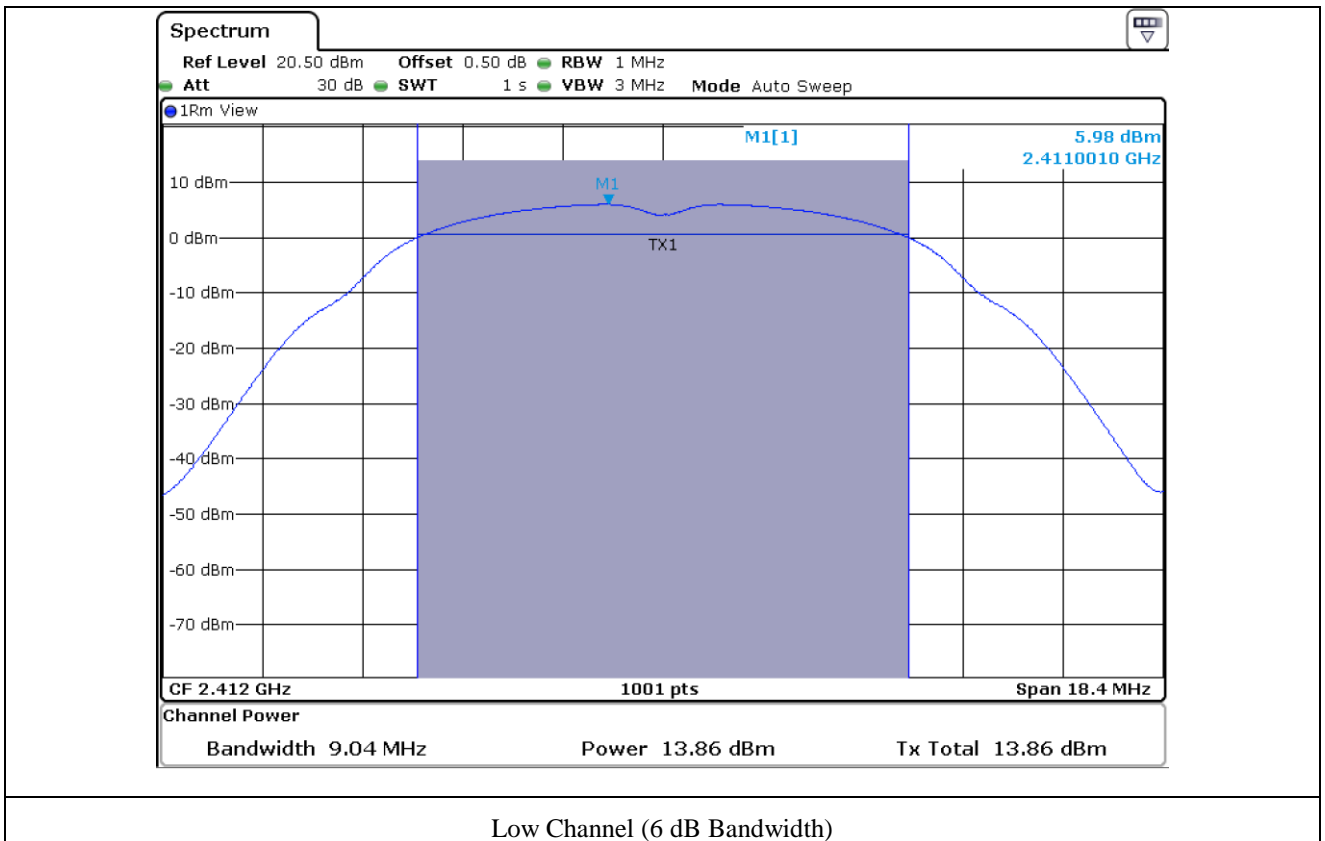
-. Test Result : Pass

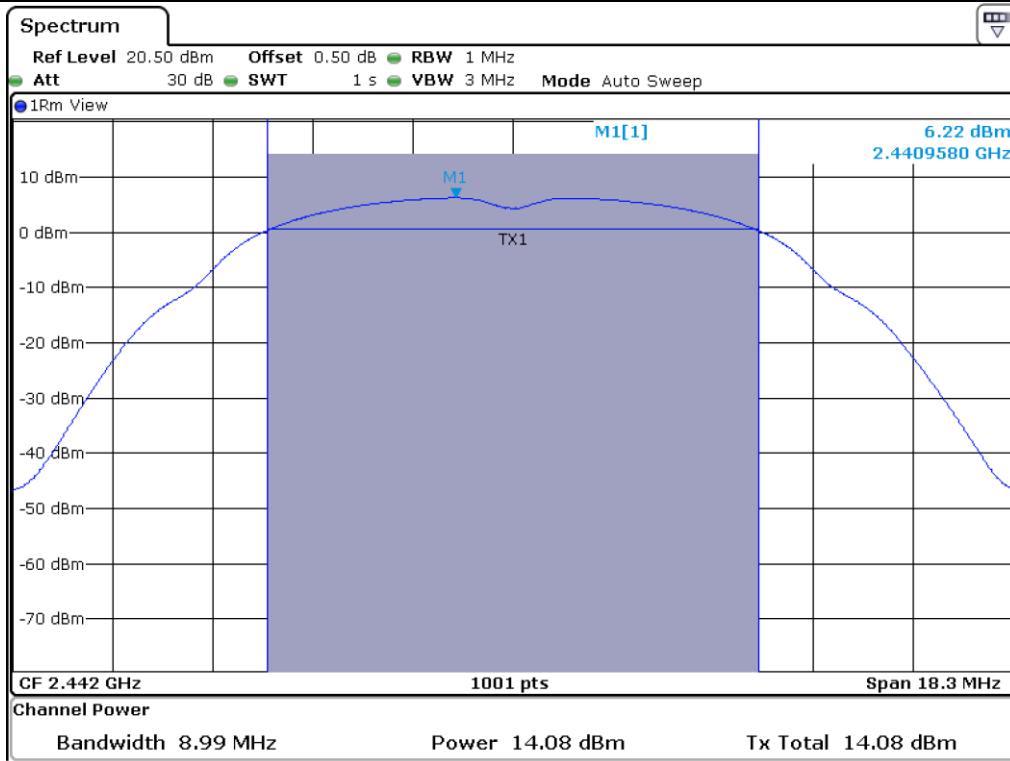
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	9.04	13.86	30.00	16.14
MIDDLE	2 442	8.99	14.08	30.00	15.92
HIGH	2 462	9.04	14.37	30.00	15.63

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

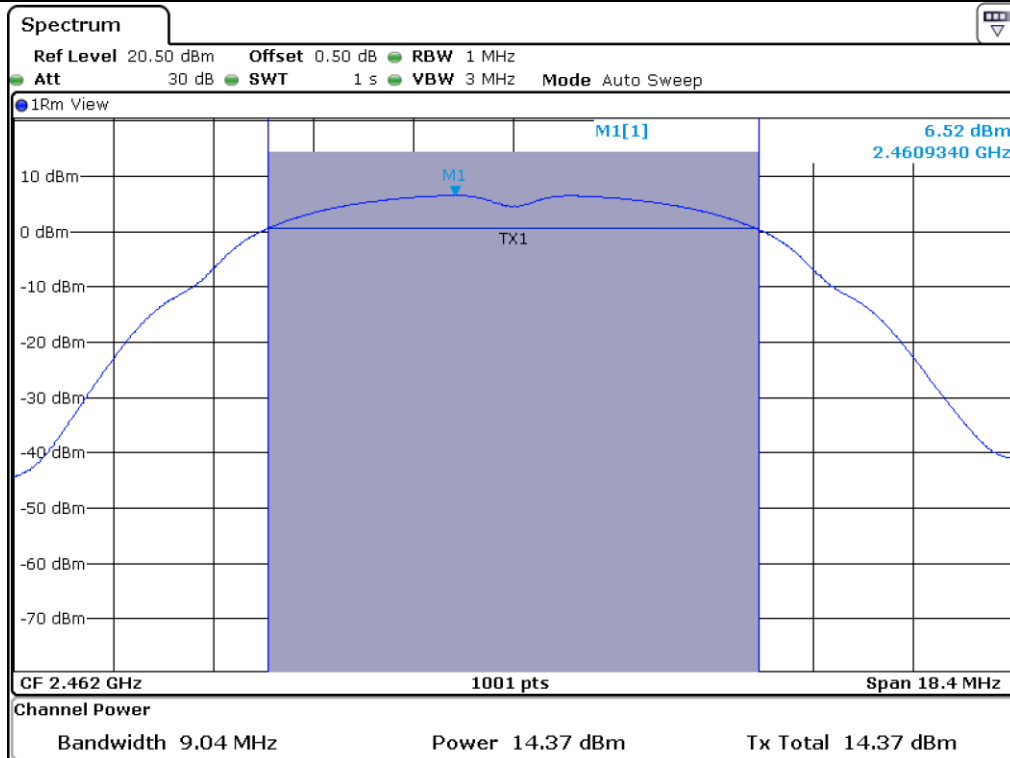


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.4.1.2 Test data for 802.11g WLAN Mode

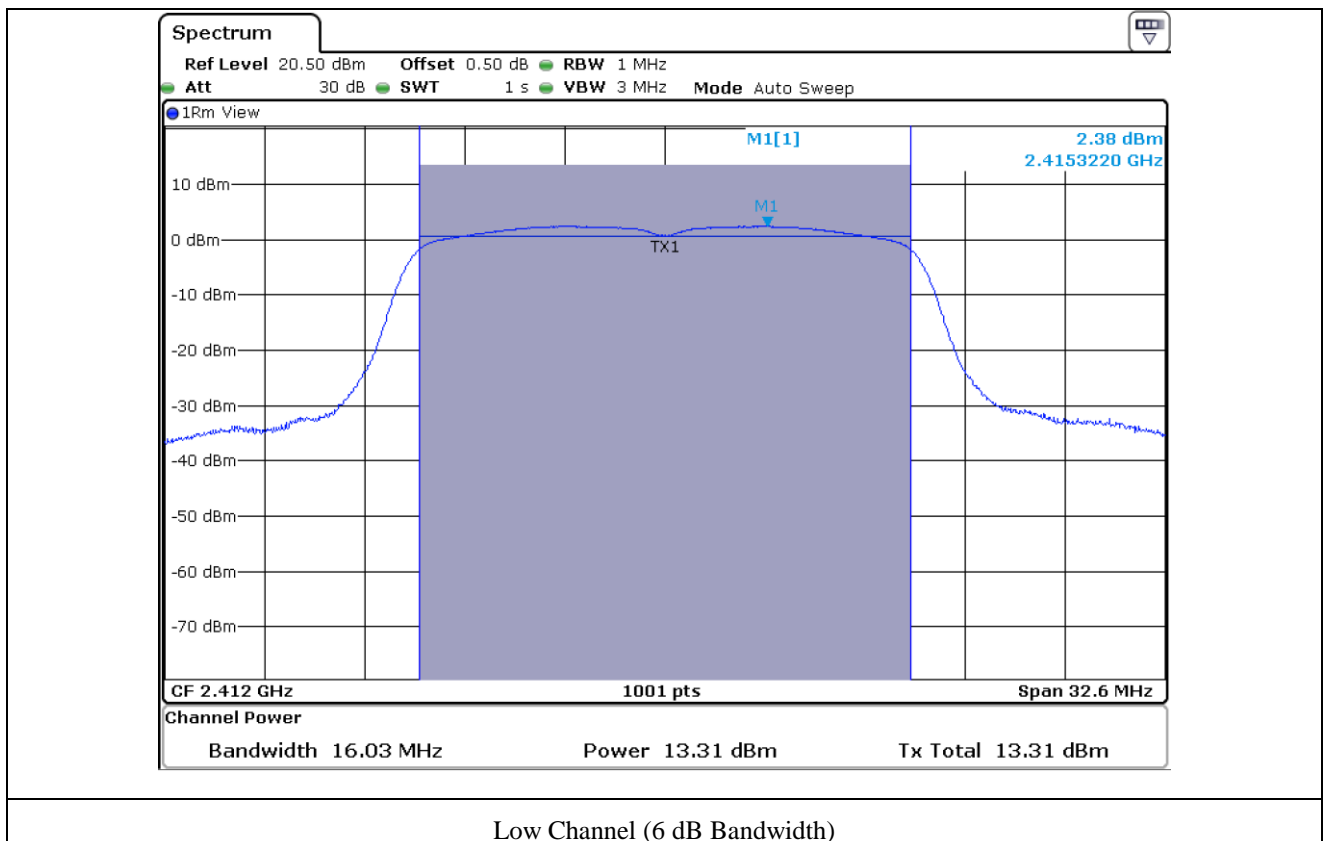
- Test Date : May 03, 2016

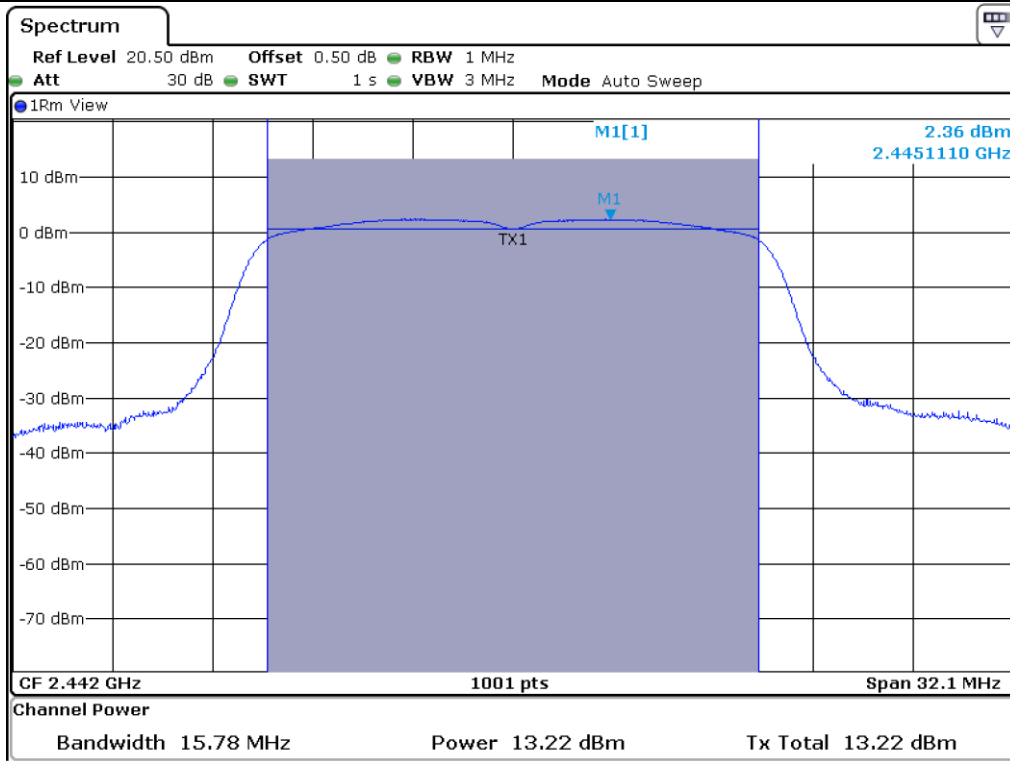
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.03	13.31	30.00	16.69
MIDDLE	2 442	15.78	13.22	30.00	16.78
HIGH	2 462	16.03	13.48	30.00	16.52

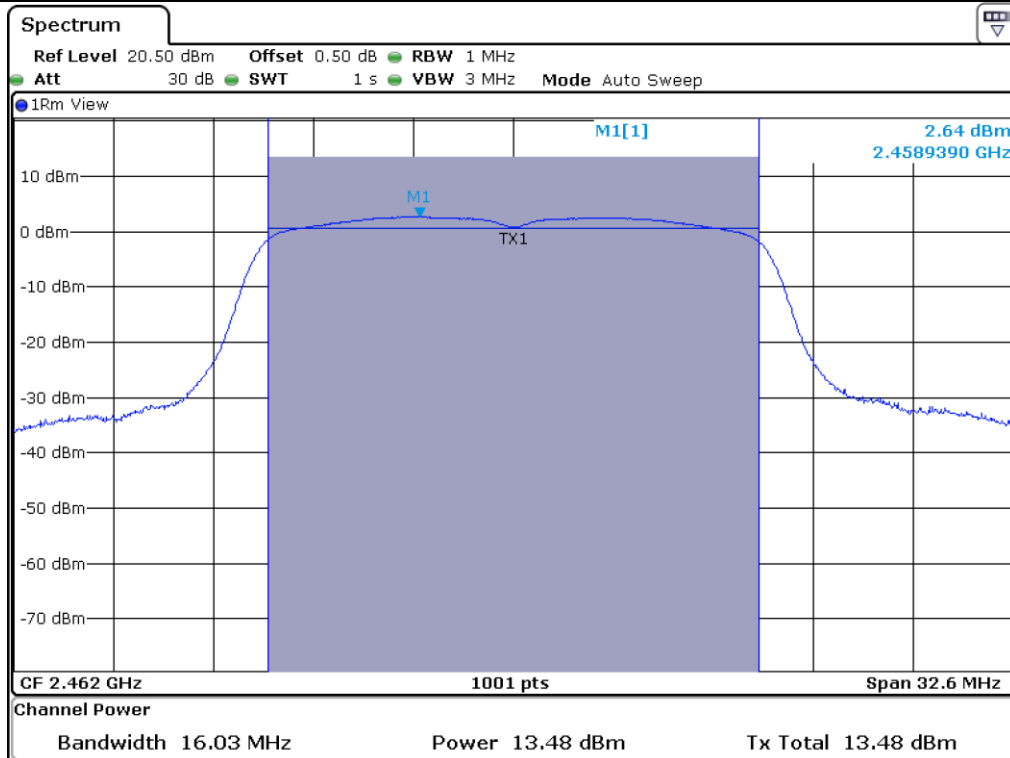
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.4.1.3 Test data for 802.11n_HT20 WLAN Mode

- Test Date : May 03, 2016

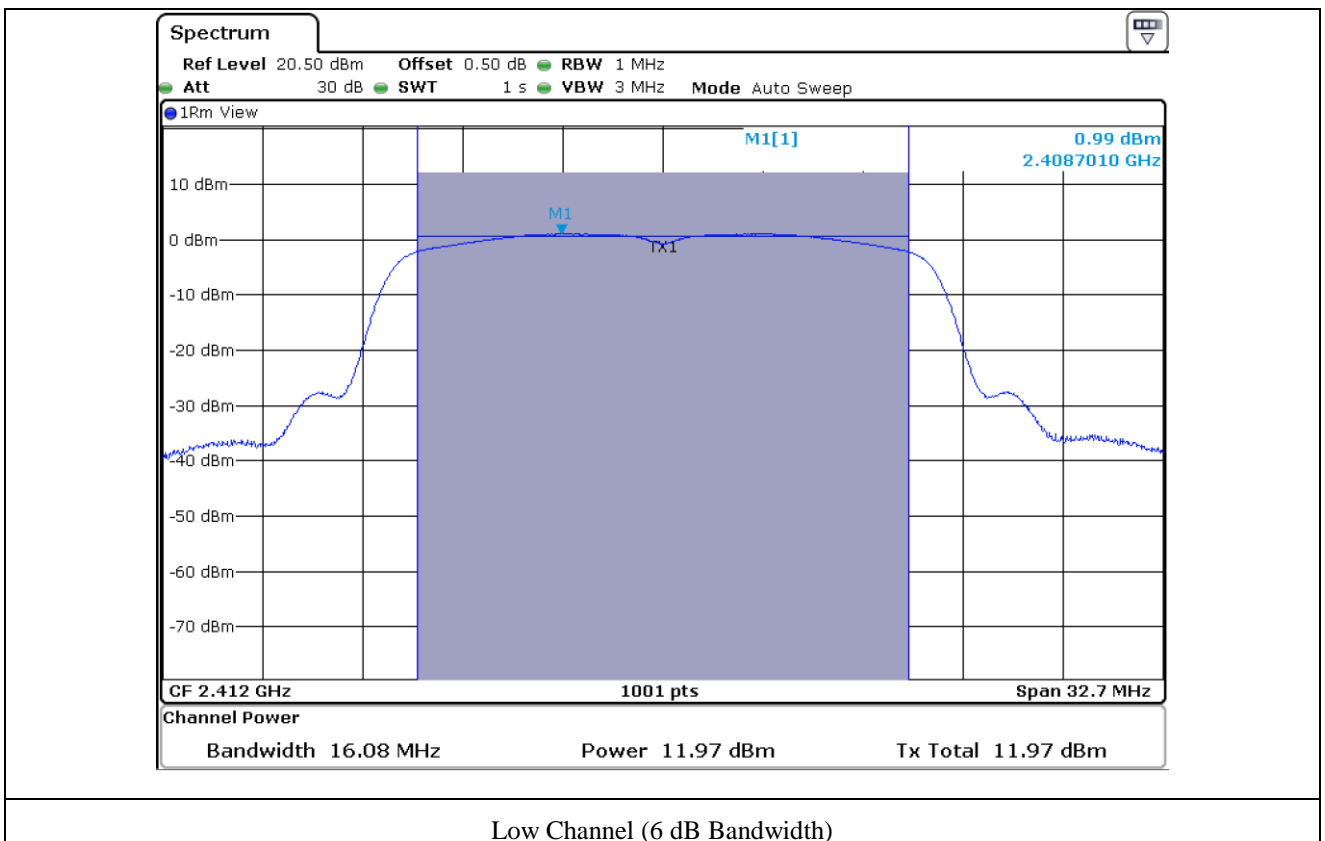
- Test Result : Pass

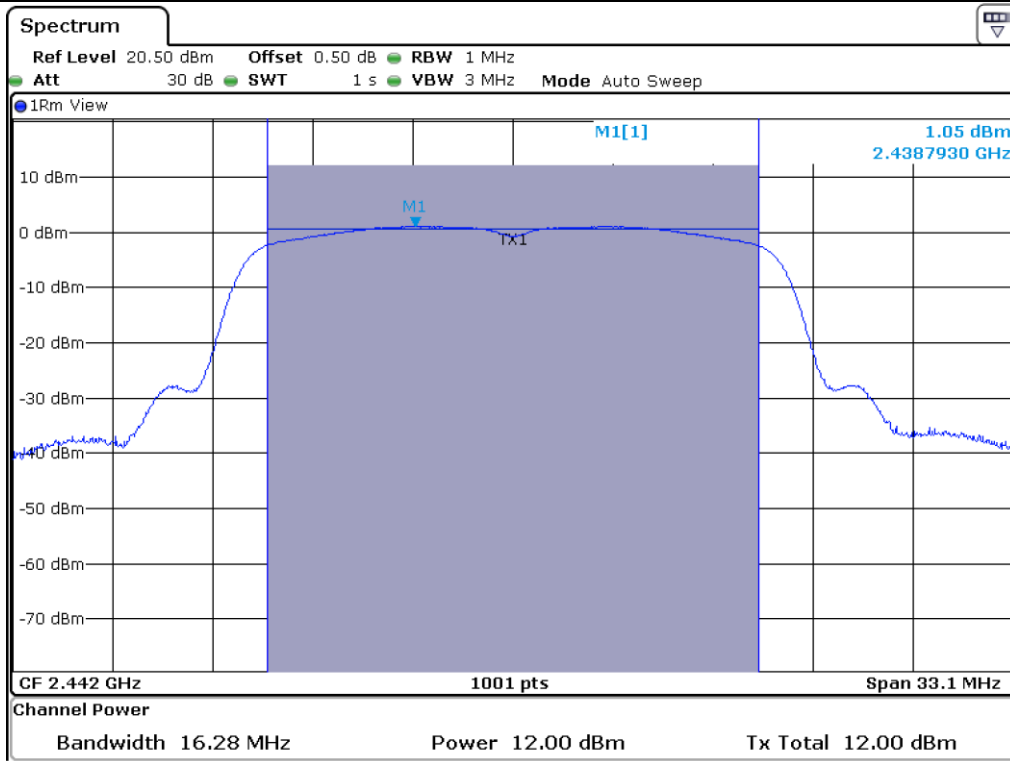
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.08	11.97	30.00	18.03
MIDDLE	2 442	16.28	12.00	30.00	18.00
HIGH	2 462	16.53	12.15	30.00	17.85

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

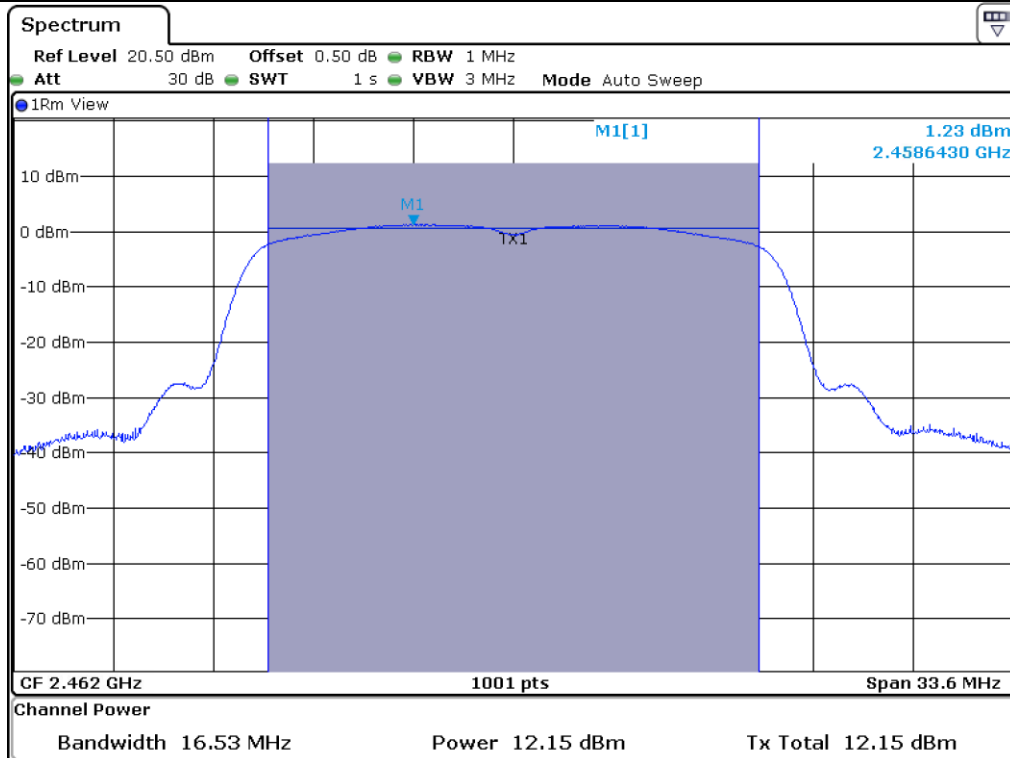


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.4.2 Test data for Antenna 1

8.4.2.1 Test data for 802.11b WLAN Mode

- Test Date : May 03, 2016

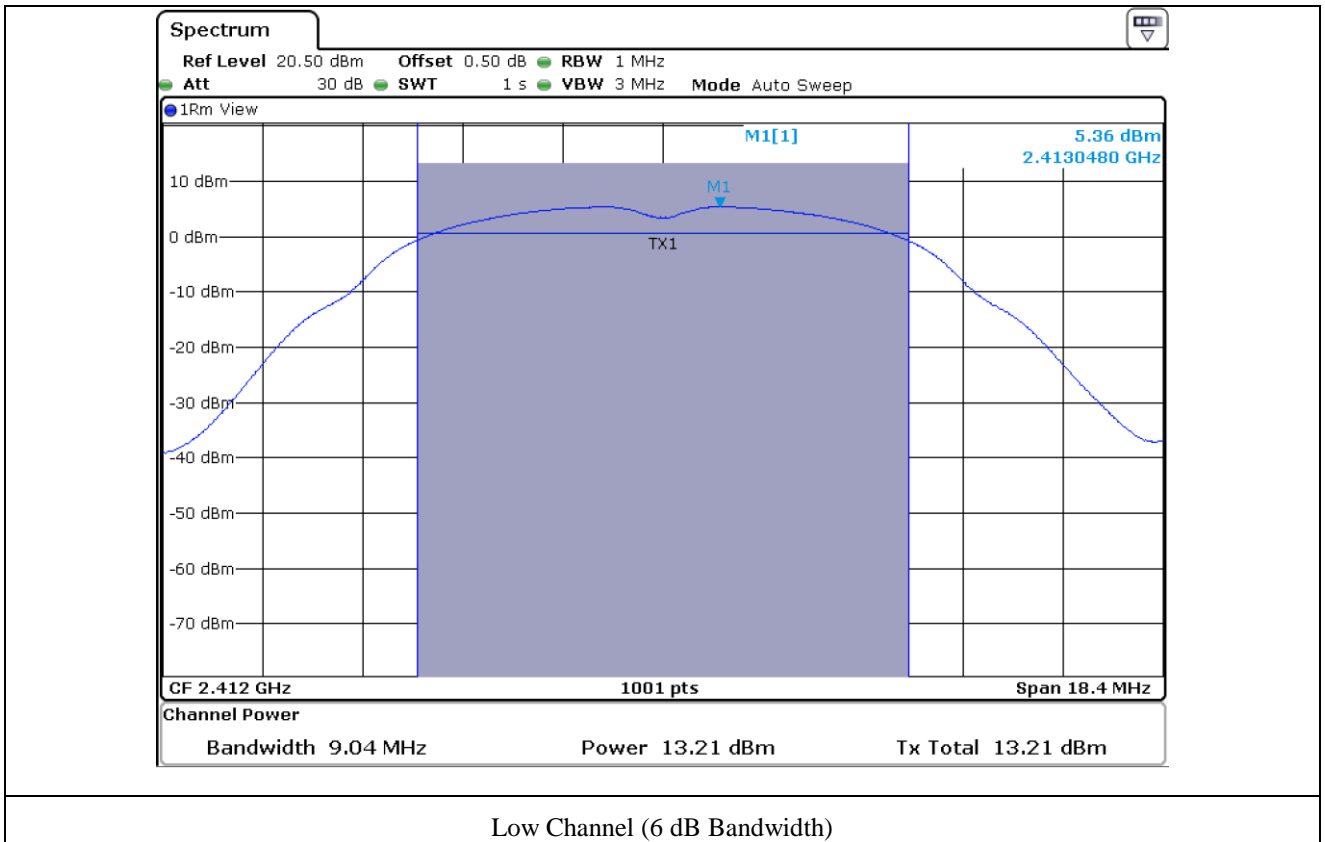
- Test Result : Pass

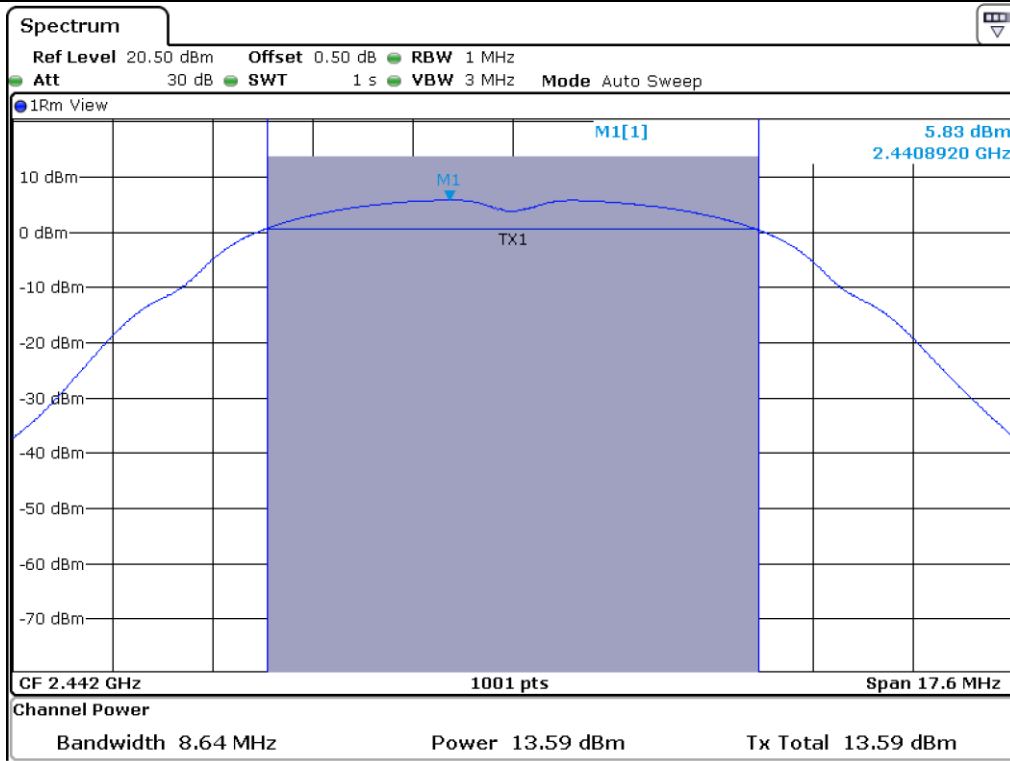
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	9.04	13.21	30.00	16.79
MIDDLE	2 442	8.64	13.59	30.00	16.41
HIGH	2 462	9.04	14.02	30.00	15.98

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

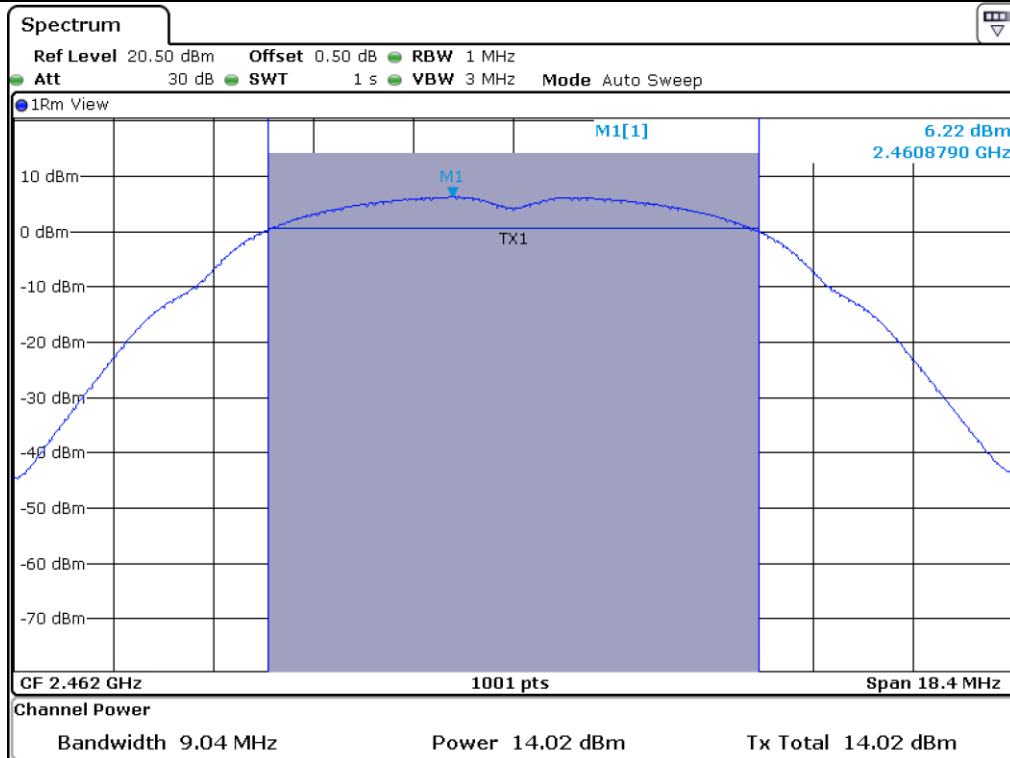


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.4.2.2 Test data for 802.11g WLAN Mode

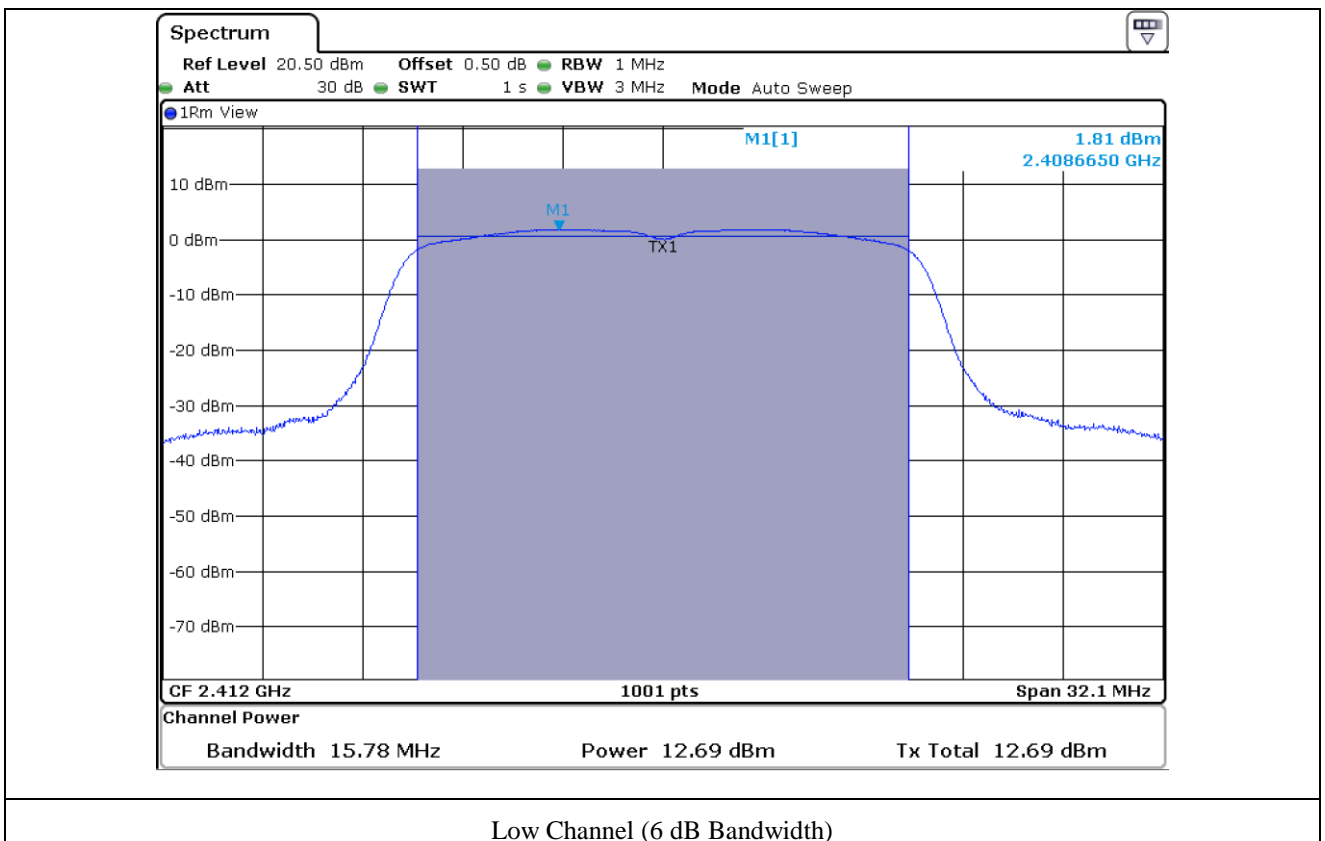
- Test Date : May 03, 2016
 - Test Result : Pass

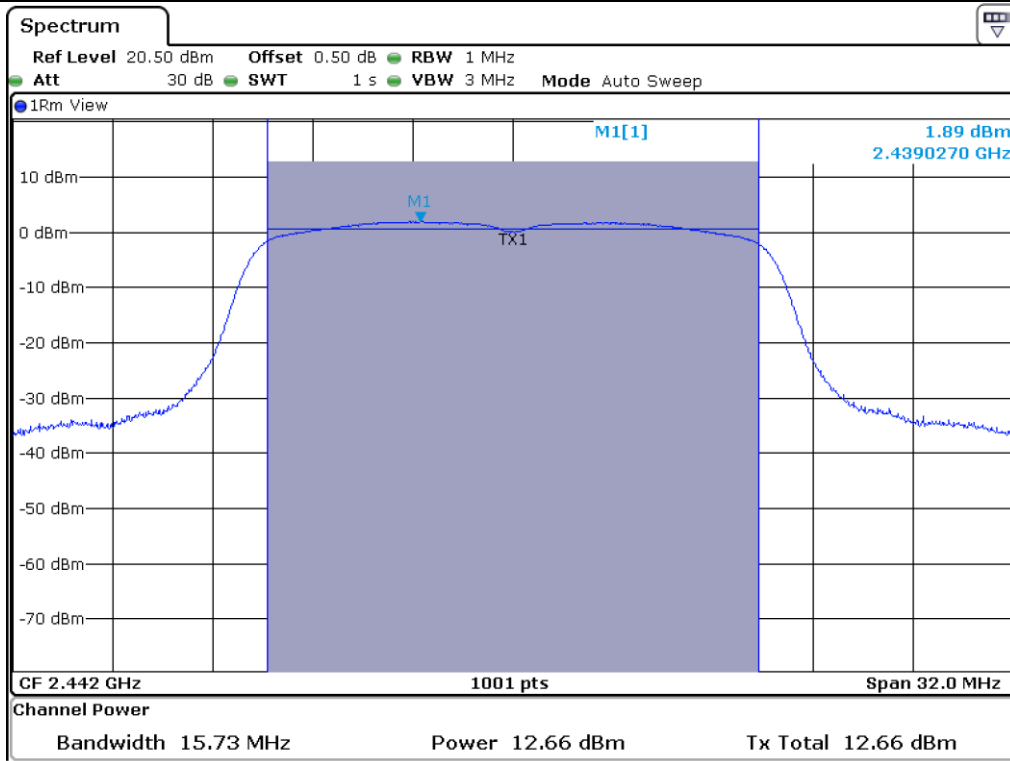
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	15.78	12.69	30.00	17.31
MIDDLE	2 442	15.73	12.66	30.00	17.34
HIGH	2 462	15.98	13.07	30.00	16.93

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

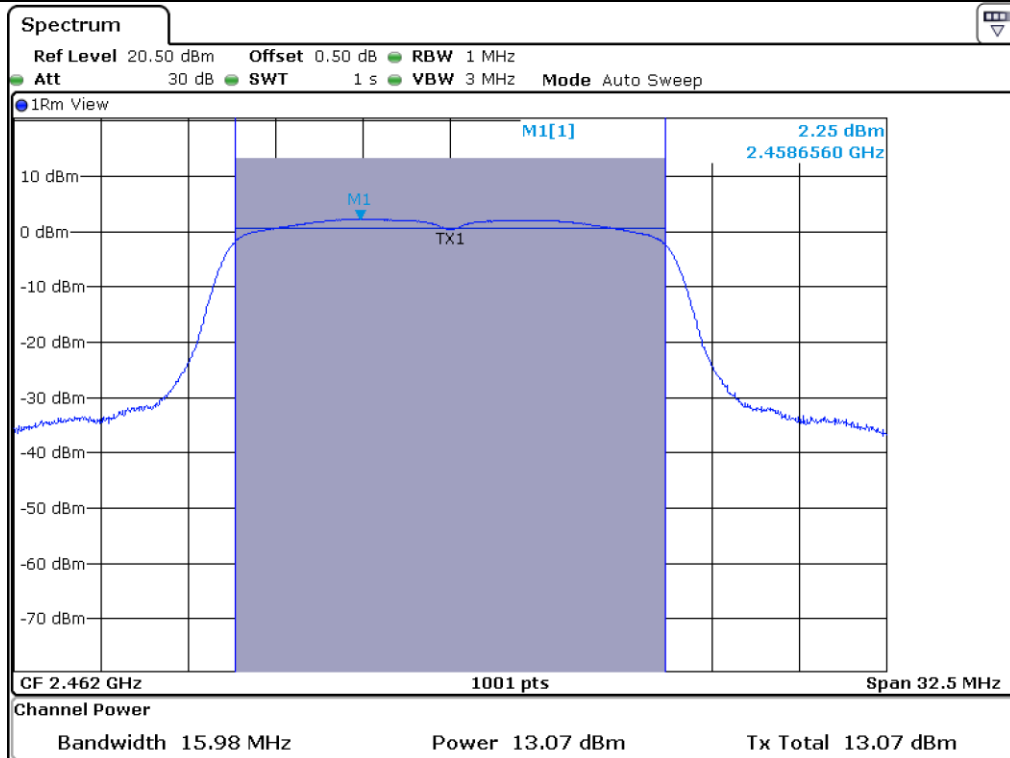


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.4.2.3 Test data for 802.11n_HT20 WLAN Mode

- Test Date : May 03, 2016

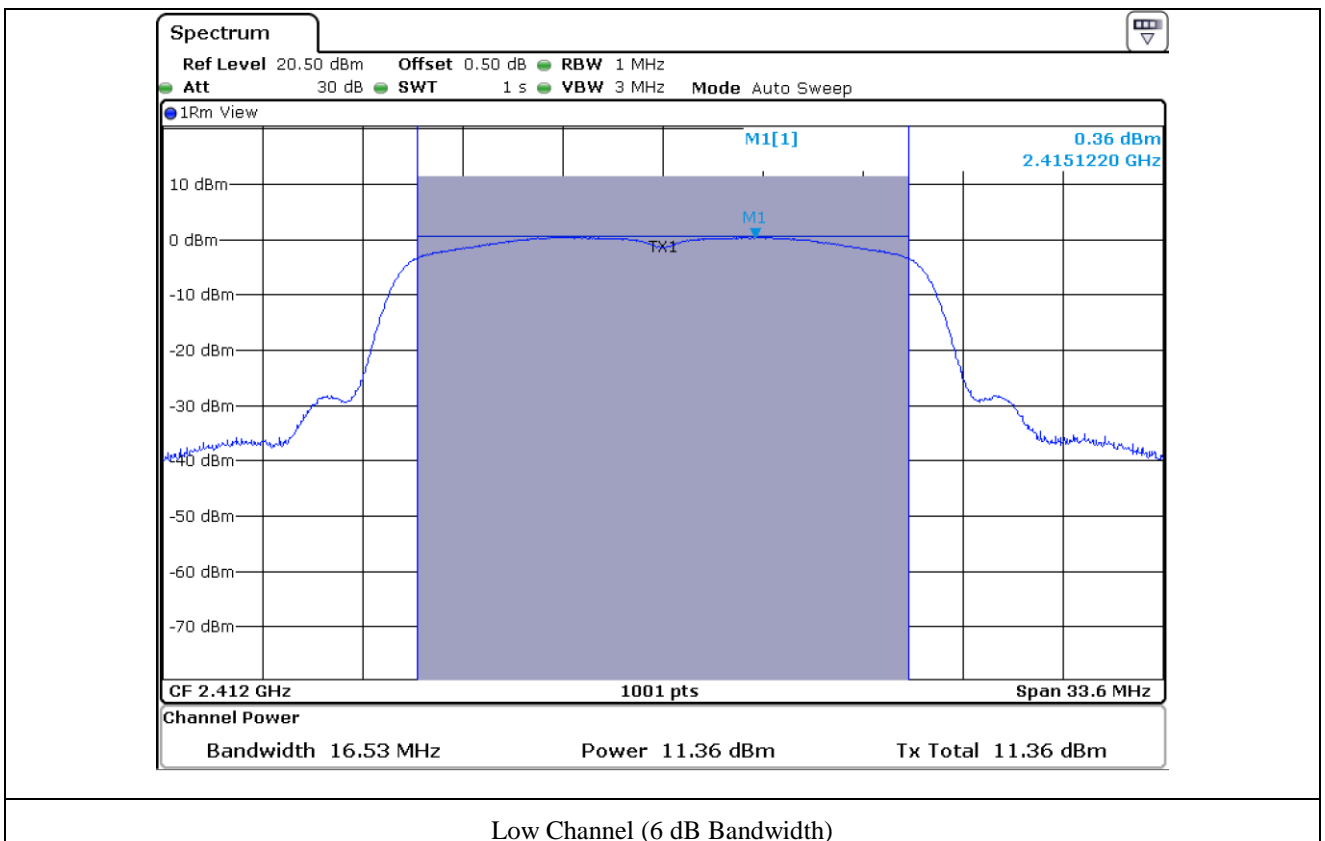
- Test Result : Pass

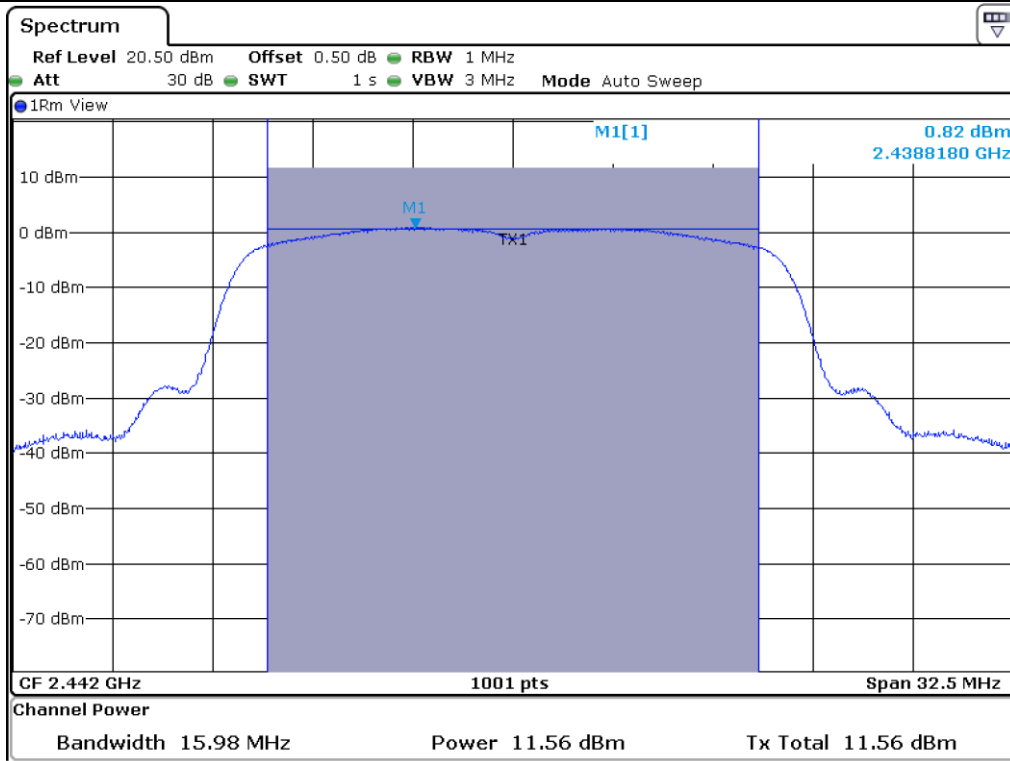
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.53	11.36	30.00	18.64
MIDDLE	2 442	15.98	11.56	30.00	18.44
HIGH	2 462	16.23	11.78	30.00	18.22

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

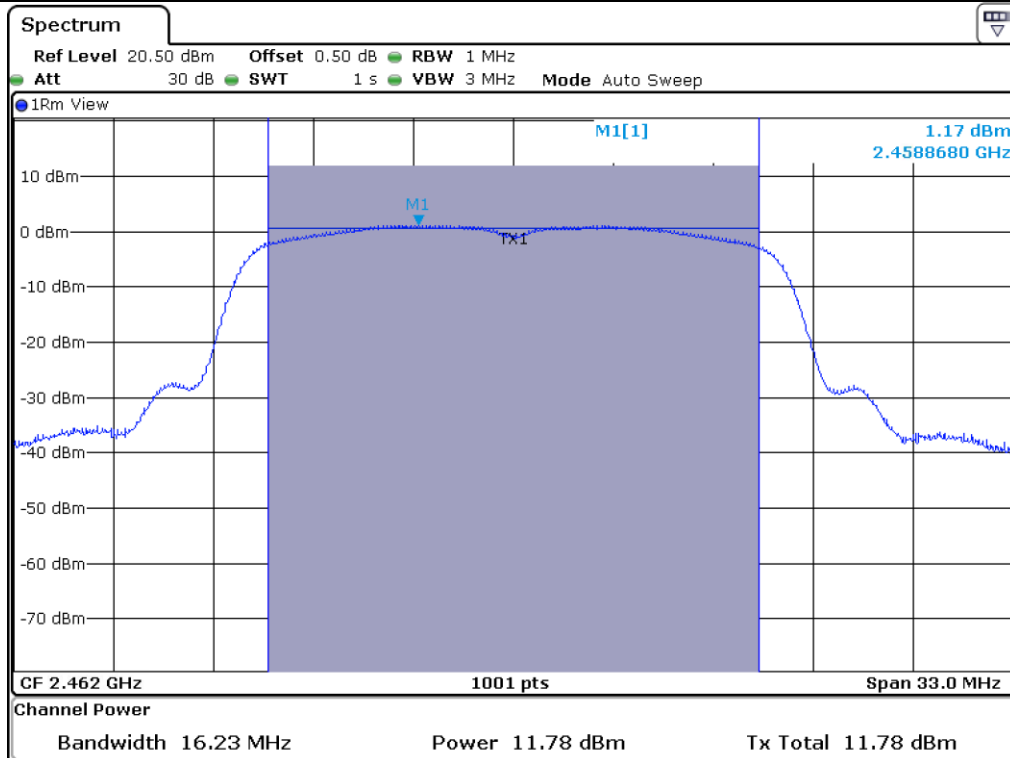


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.4.3 Test data for Multiple Antenna

- Test Date : May 03, 2016
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.08	14.69	28.77	14.08
MIDDLE	2 442	16.28	14.80	28.77	13.97
HIGH	2 462	16.53	14.98	28.77	13.79

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 AC 24 V

8.5.1 Test data for Antenna 0

8.5.1.1 Test data for 802.11b WLAN Mode

-. Test Date : May 03, 2016

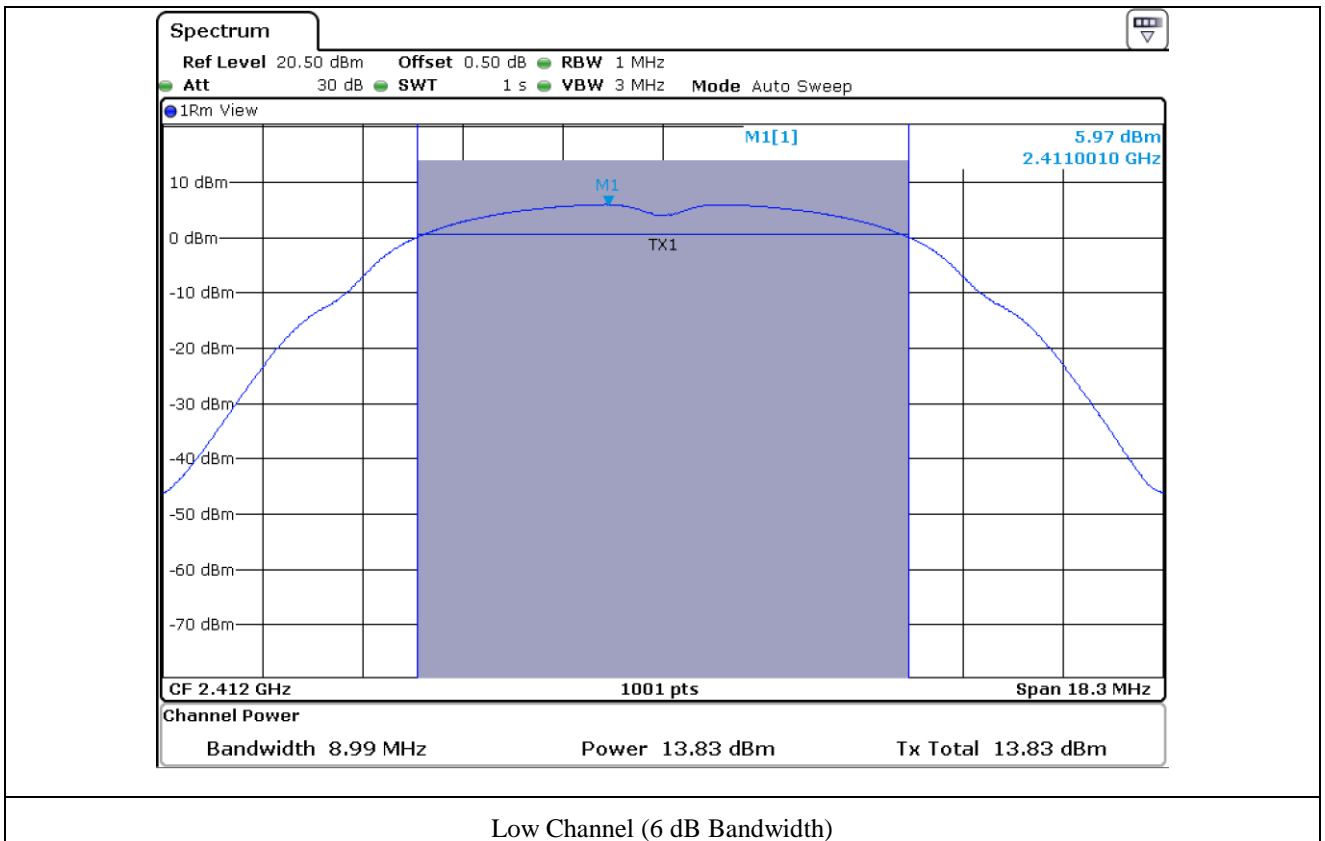
-. Test Result : Pass

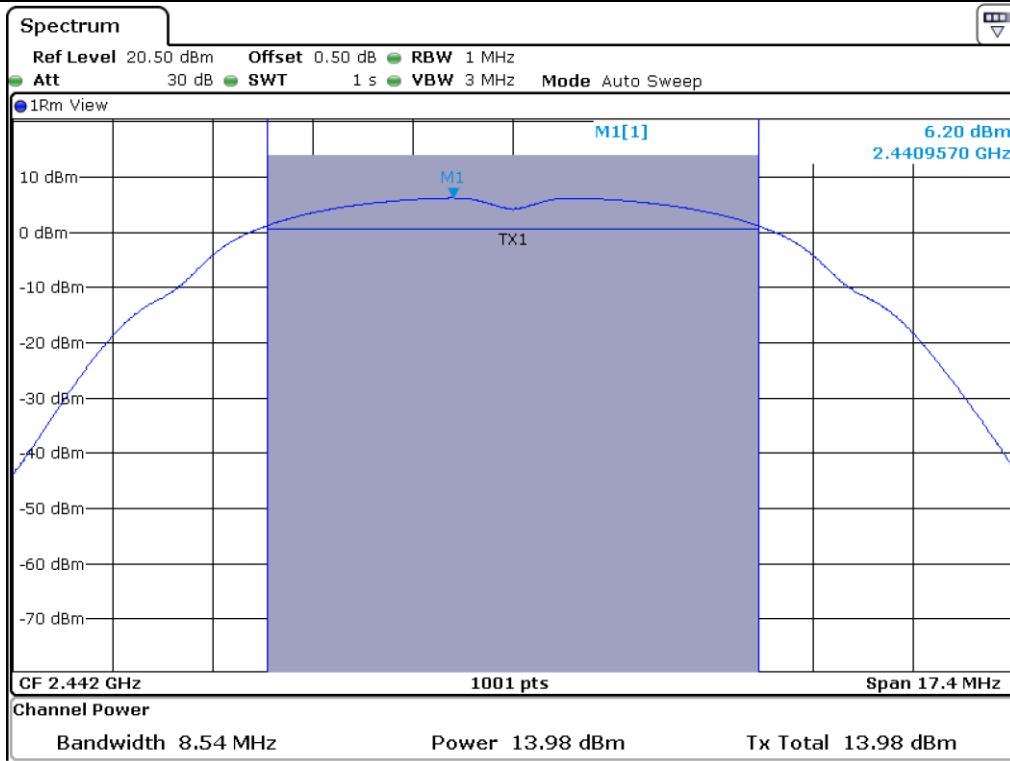
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	8.99	13.83	30.00	16.17
MIDDLE	2 442	8.54	13.98	30.00	16.02
HIGH	2 462	8.99	14.35	30.00	15.65

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

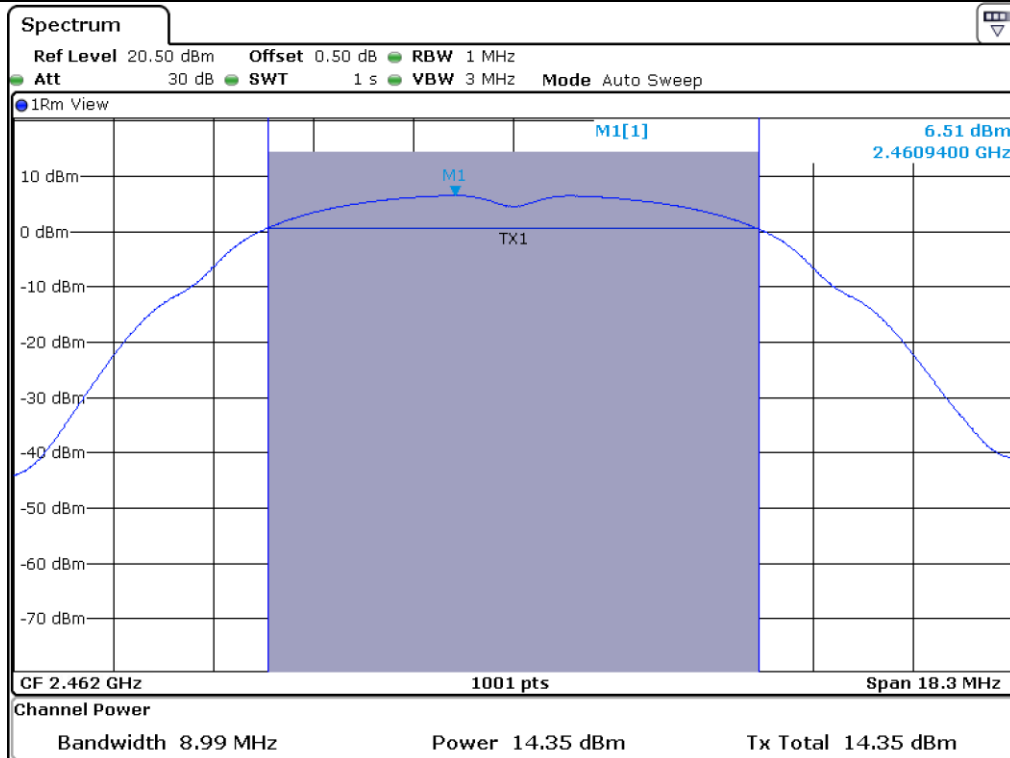


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.5.1.2 Test data for 802.11g WLAN Mode

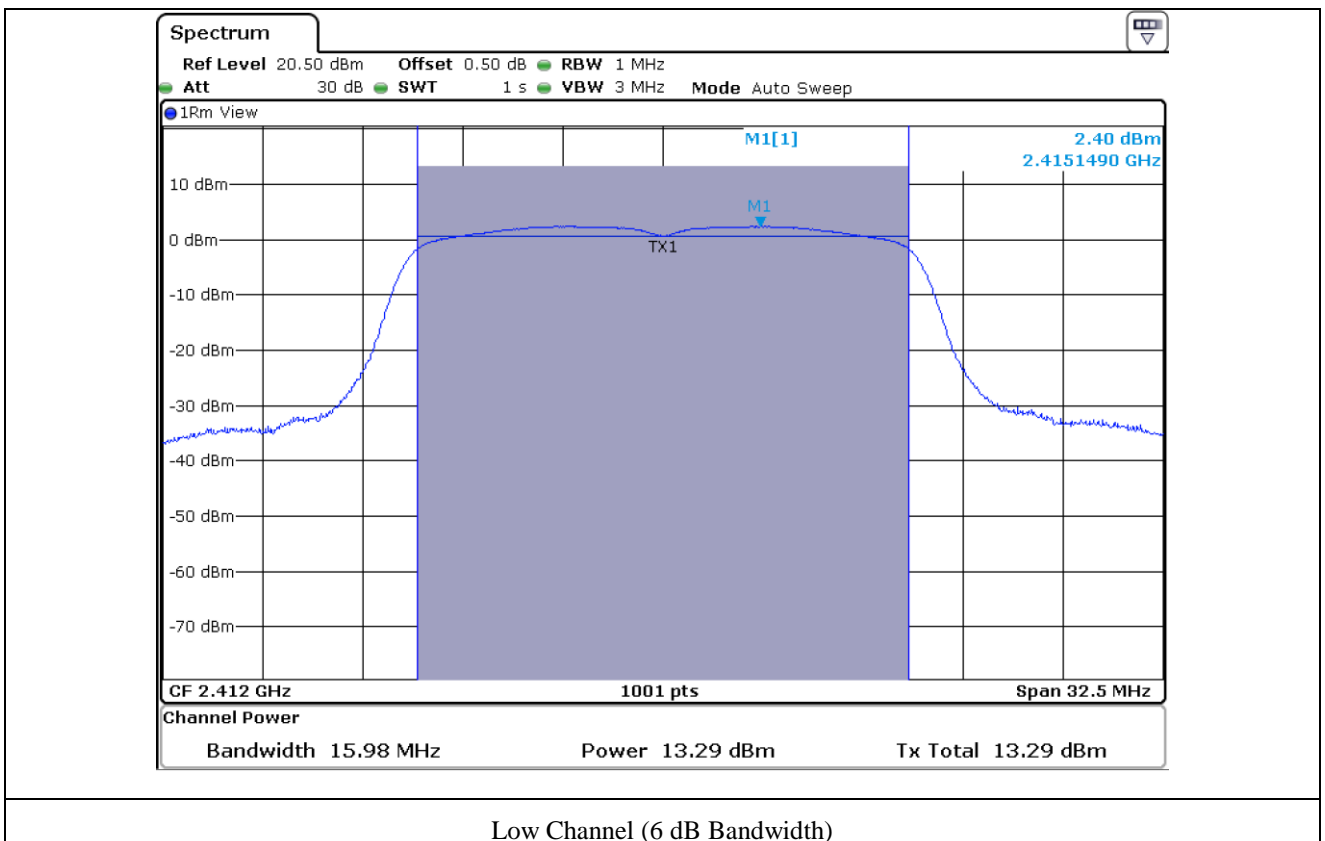
- Test Date : May 03, 2016
- Test Result : Pass

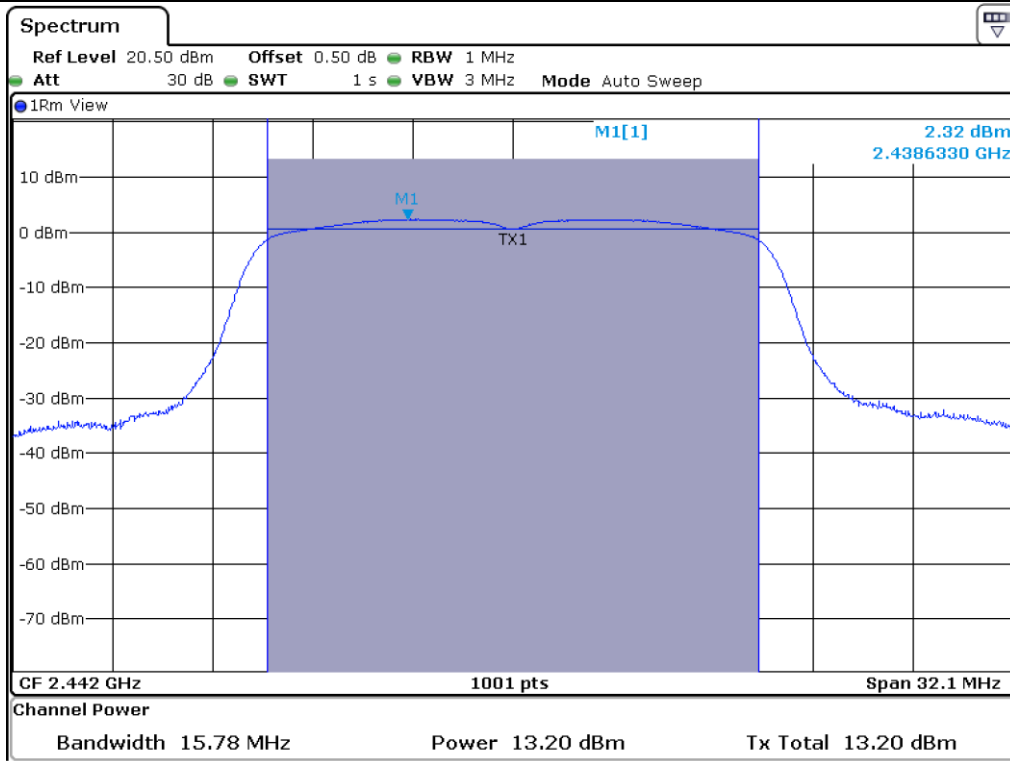
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	15.98	13.29	30.00	16.71
MIDDLE	2 442	15.78	13.20	30.00	16.80
HIGH	2 462	15.83	13.44	30.00	16.56

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

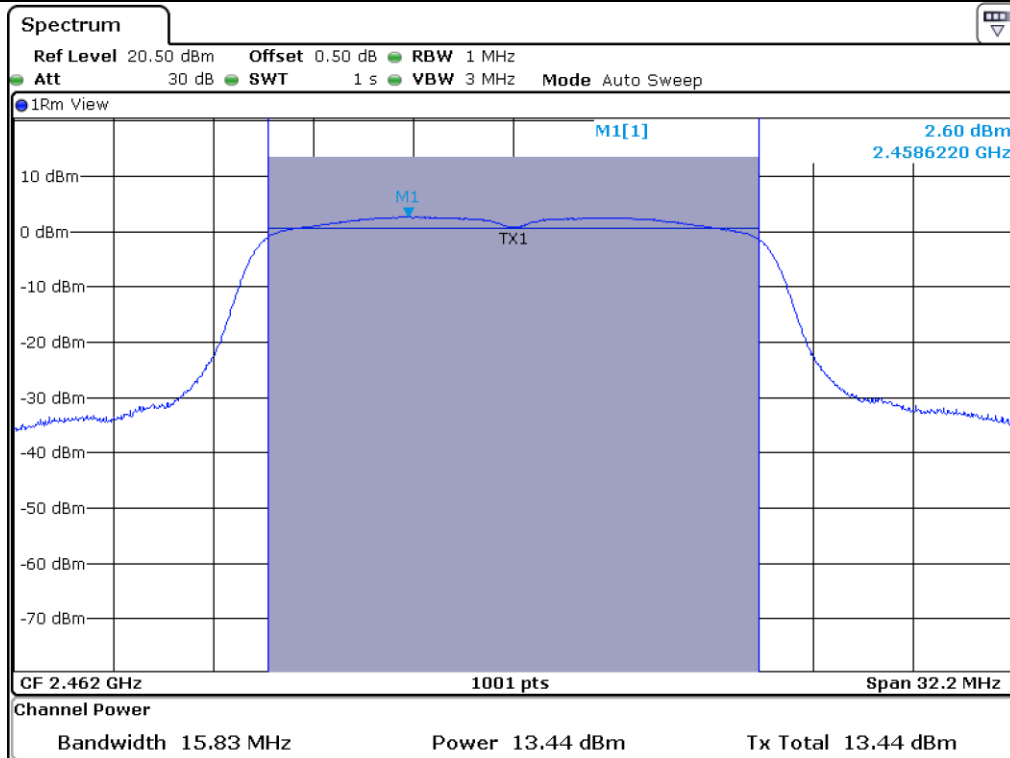


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.5.1.3 Test data for 802.11n_HT20 WLAN Mode

- Test Date : May 03, 2016

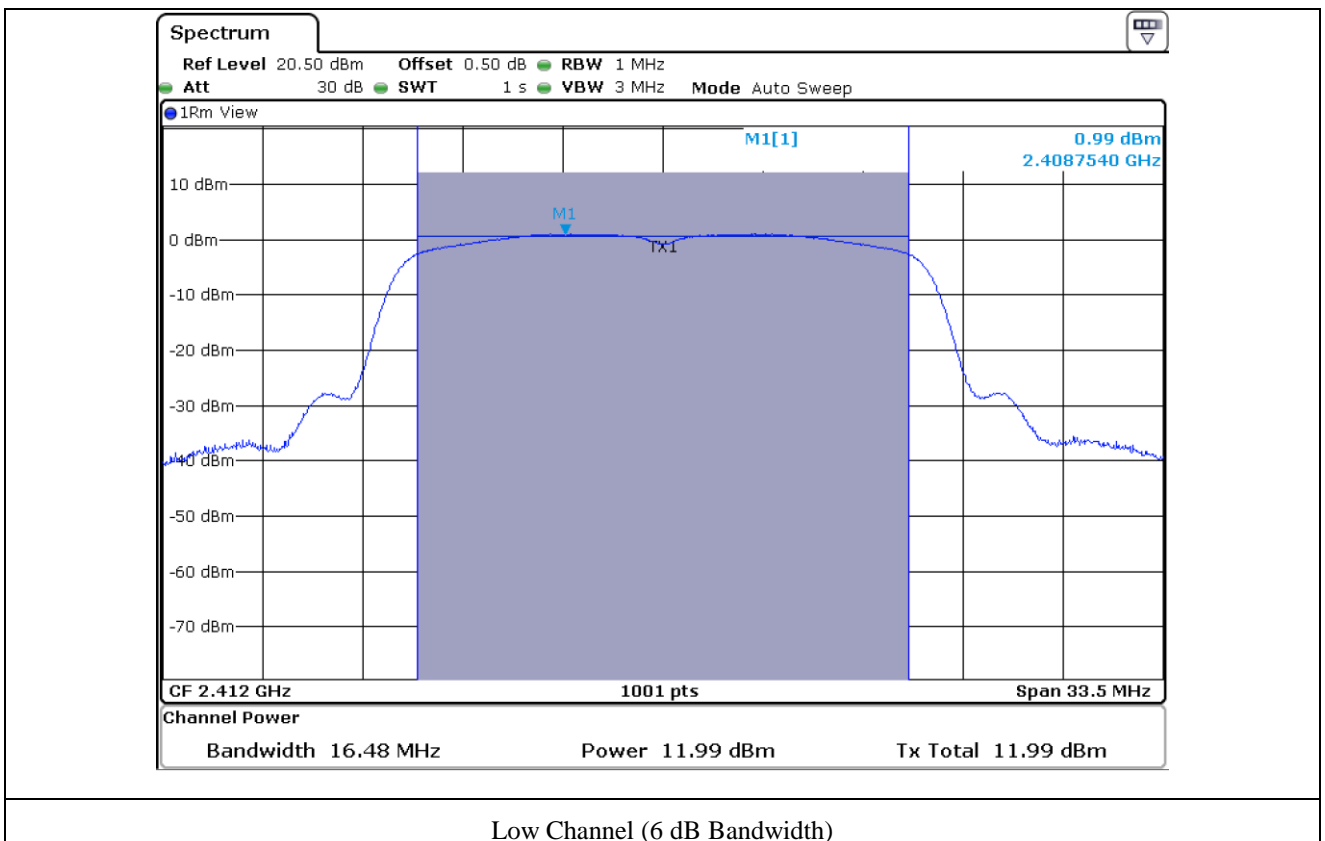
- Test Result : Pass

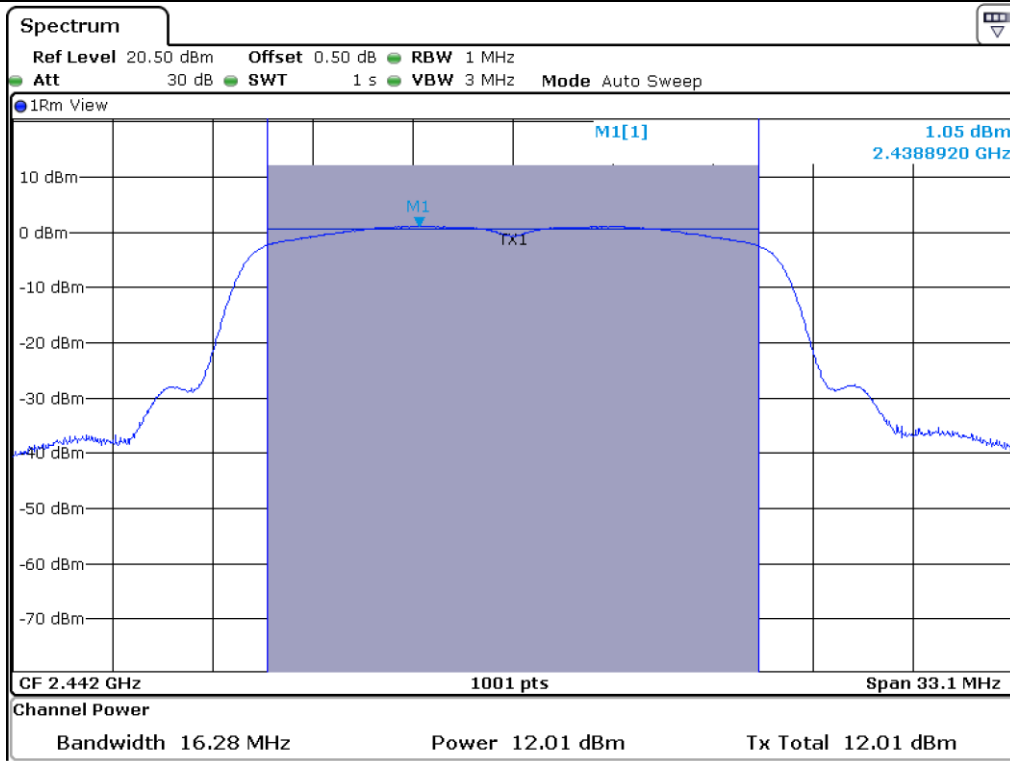
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.48	11.99	30.00	18.01
MIDDLE	2 442	16.28	12.01	30.00	17.99
HIGH	2 462	16.28	12.10	30.00	17.90

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

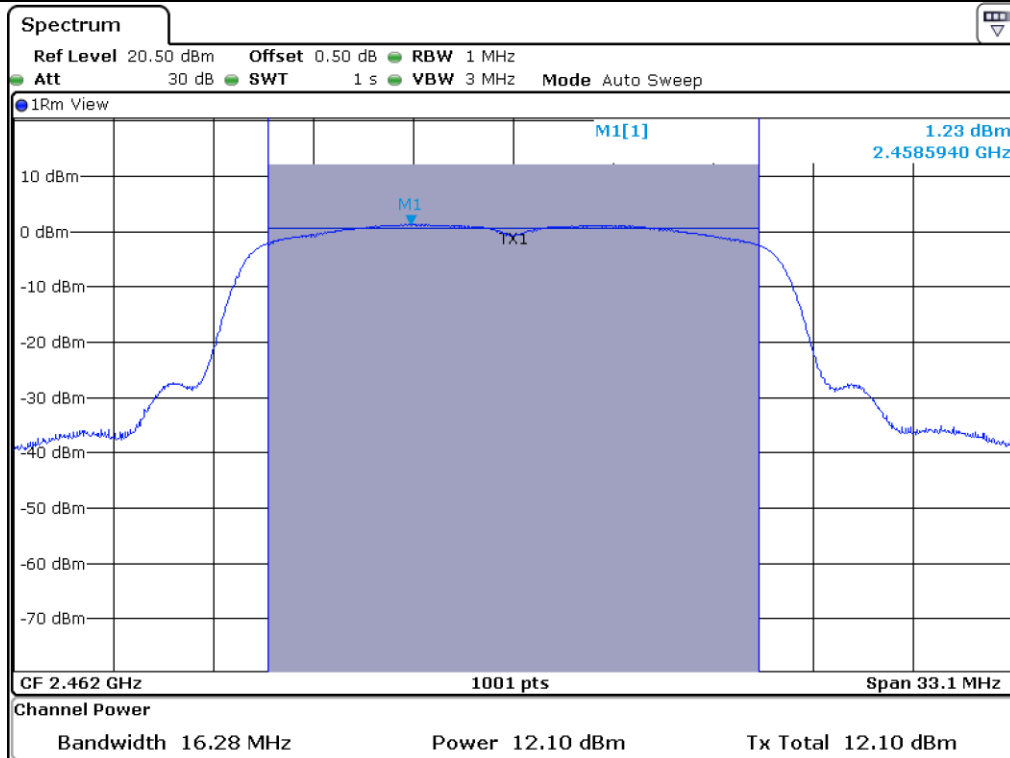


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.5.2 Test data for Antenna 1

8.5.2.1 Test data for 802.11b WLAN Mode

- Test Date : May 03, 2016

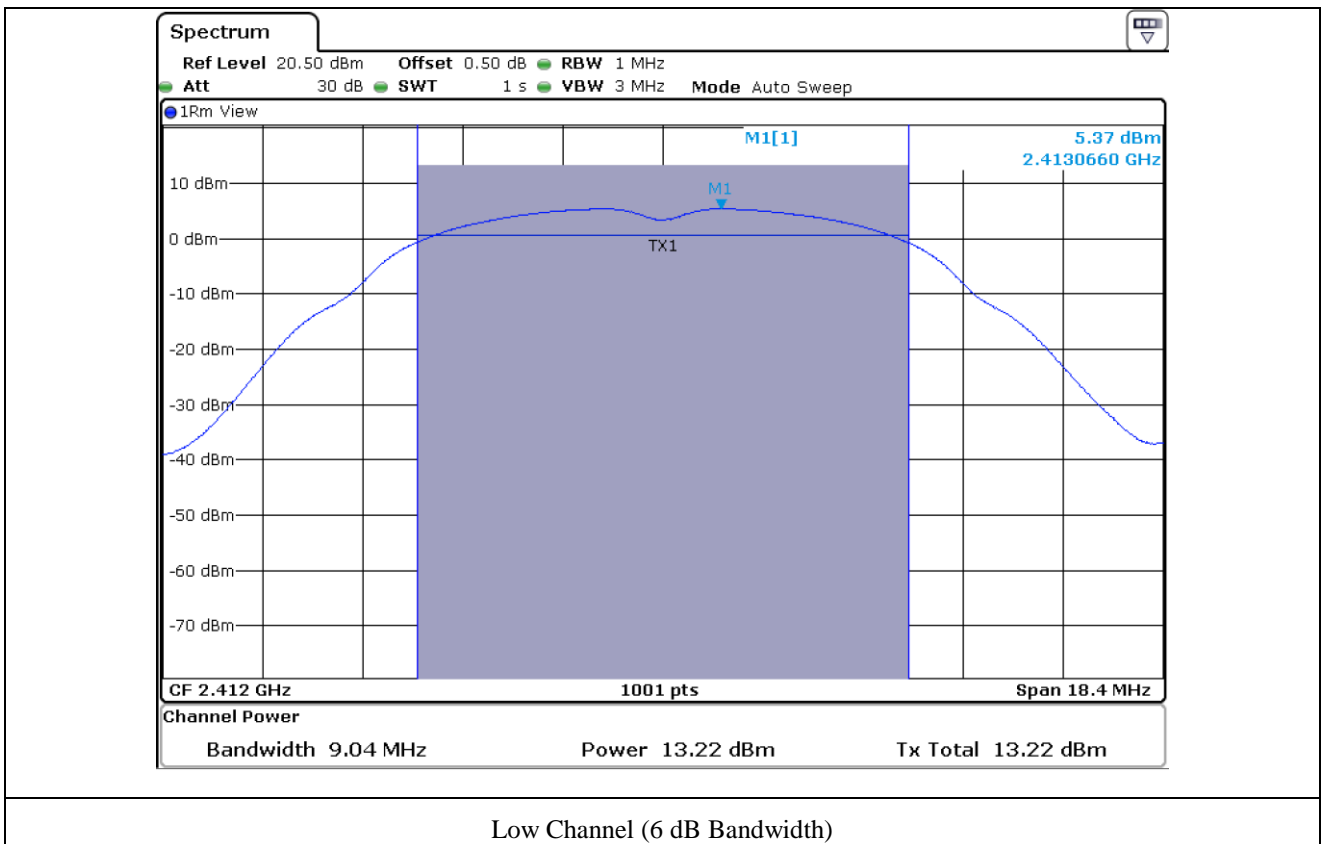
- Test Result : Pass

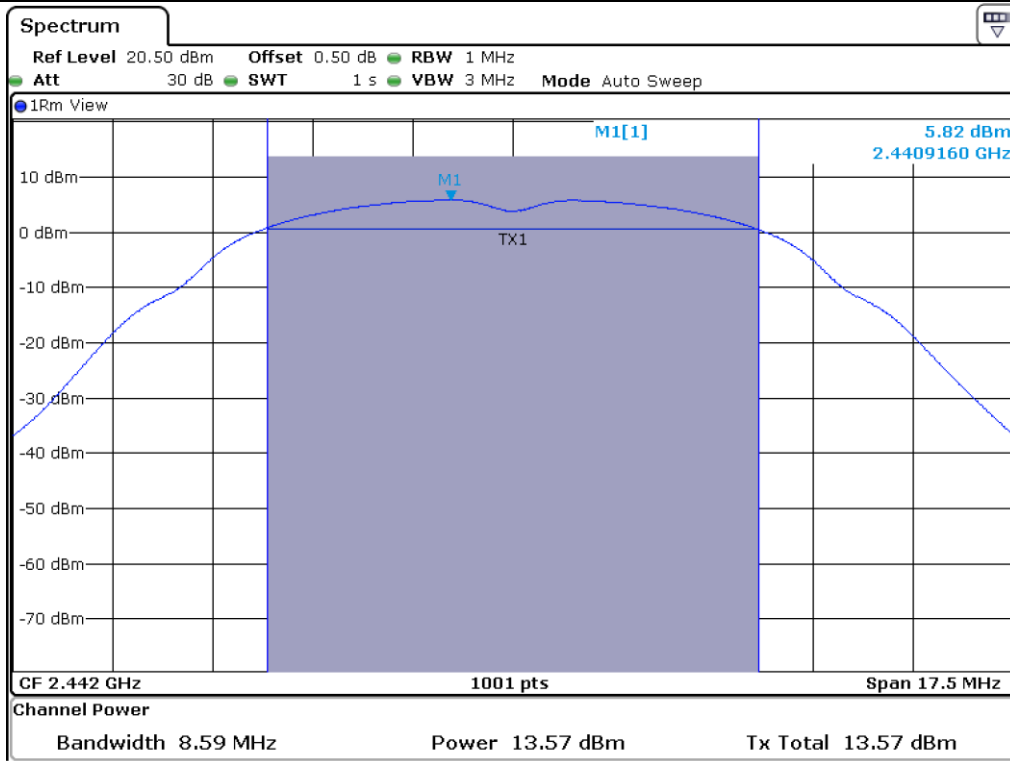
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	9.04	13.22	30.00	16.78
MIDDLE	2 442	8.59	13.57	30.00	16.43
HIGH	2 462	8.64	13.97	30.00	16.03

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

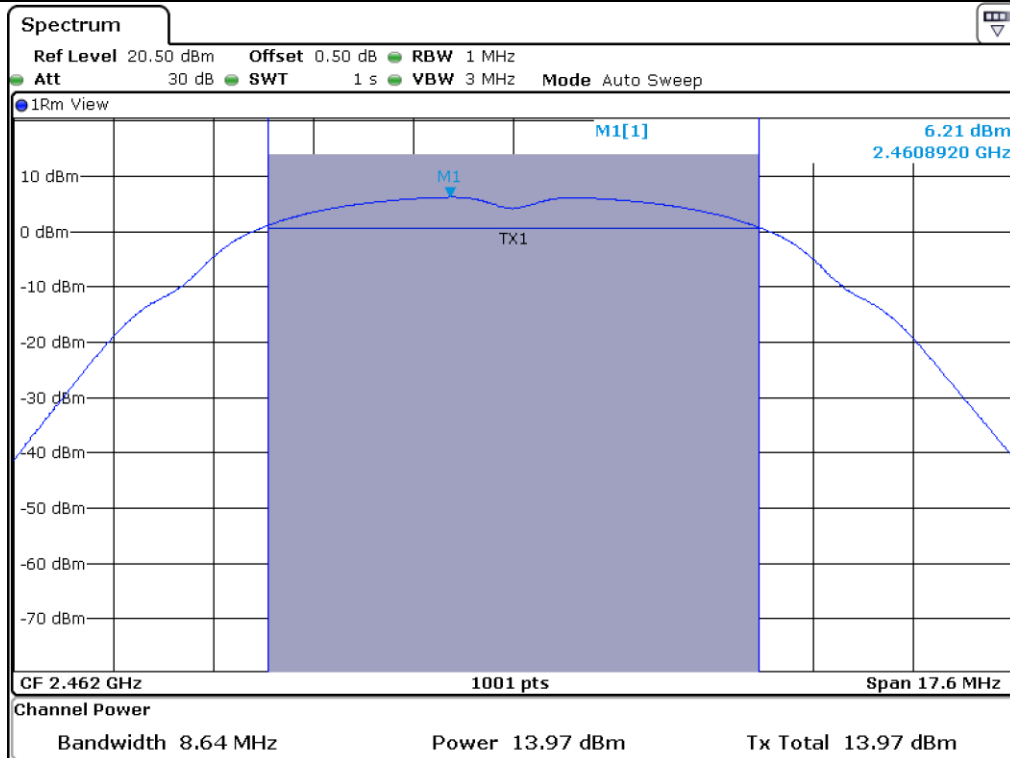


Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.5.2.2 Test data for 802.11g WLAN Mode

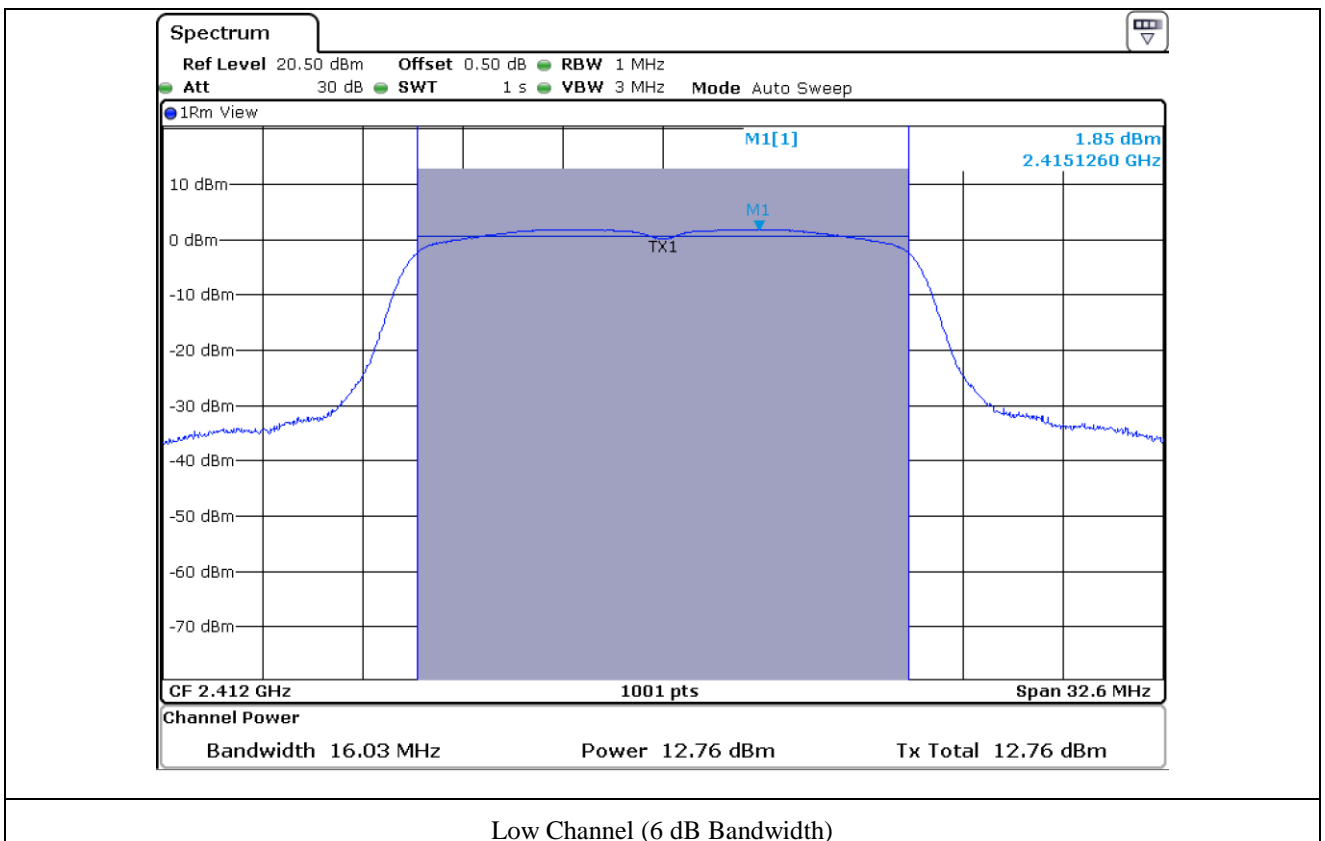
- Test Date : May 03, 2016
 - Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.03	12.76	30.00	17.24
MIDDLE	2 442	15.73	12.67	30.00	17.33
HIGH	2 462	15.73	13.04	30.00	16.96

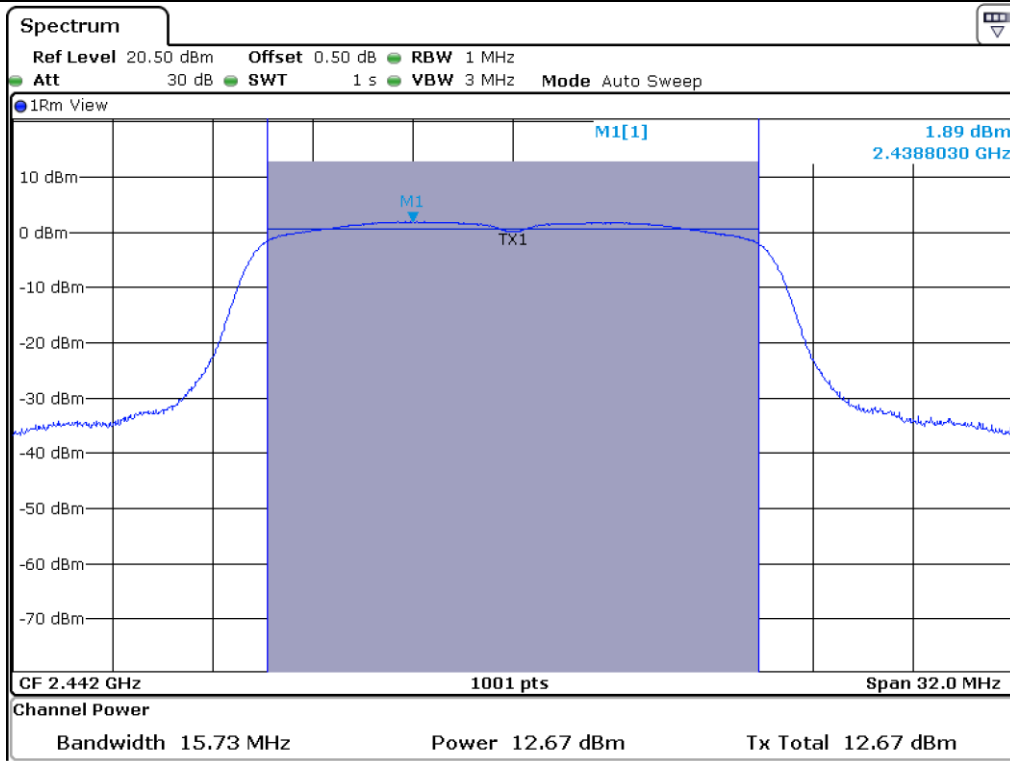
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



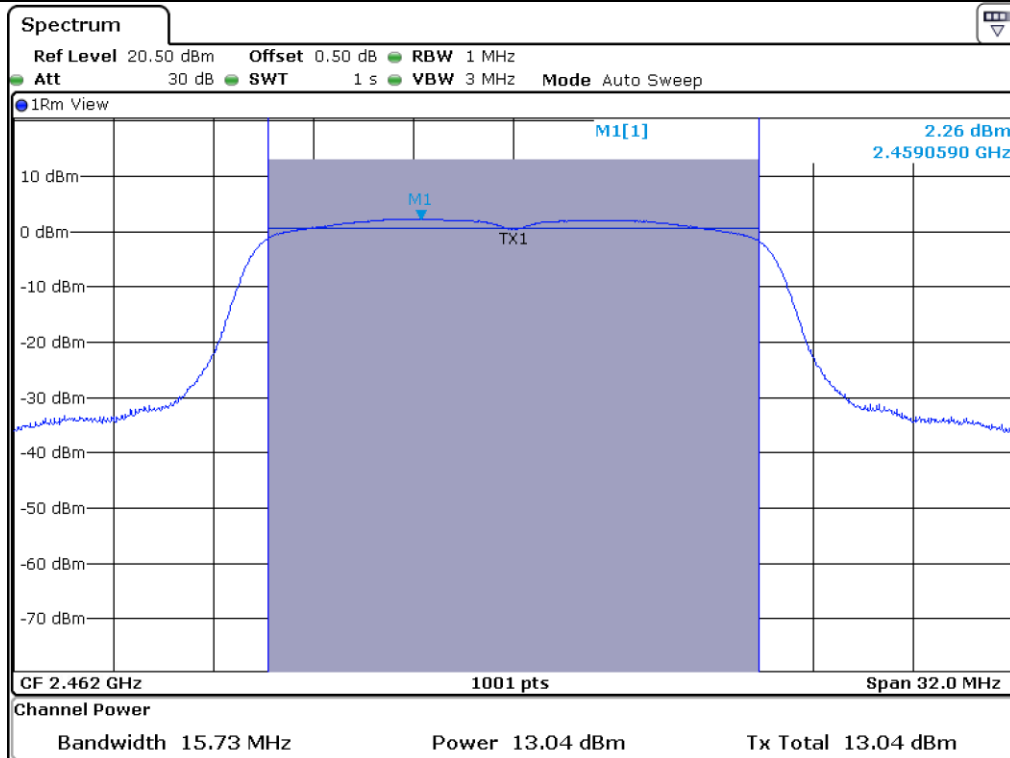
Tested by: Tae-Ho, Kim / Senior Engineer



Low Channel (6 dB Bandwidth)



Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.5.2.3 Test data for 802.11n_HT20 WLAN Mode

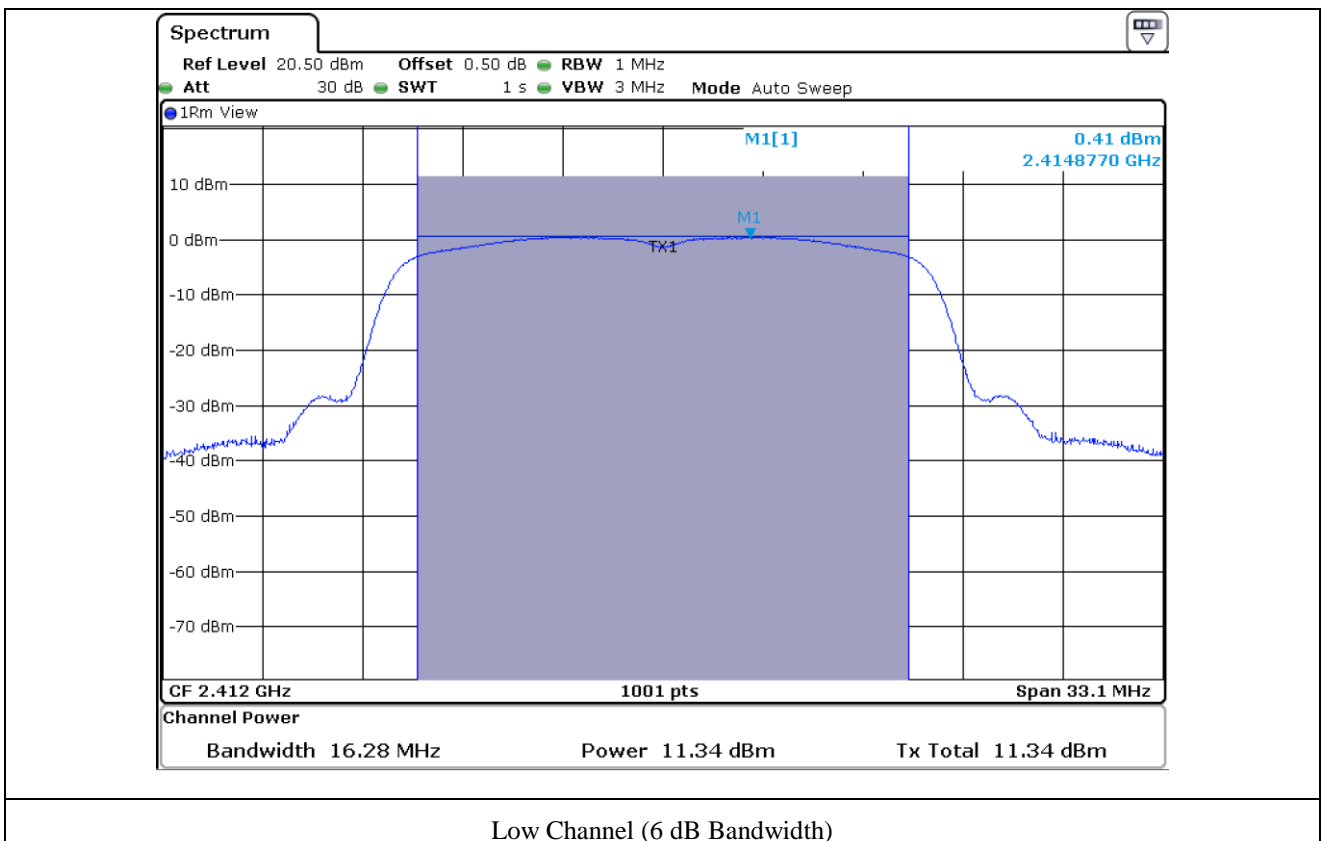
- Test Date : May 03, 2016

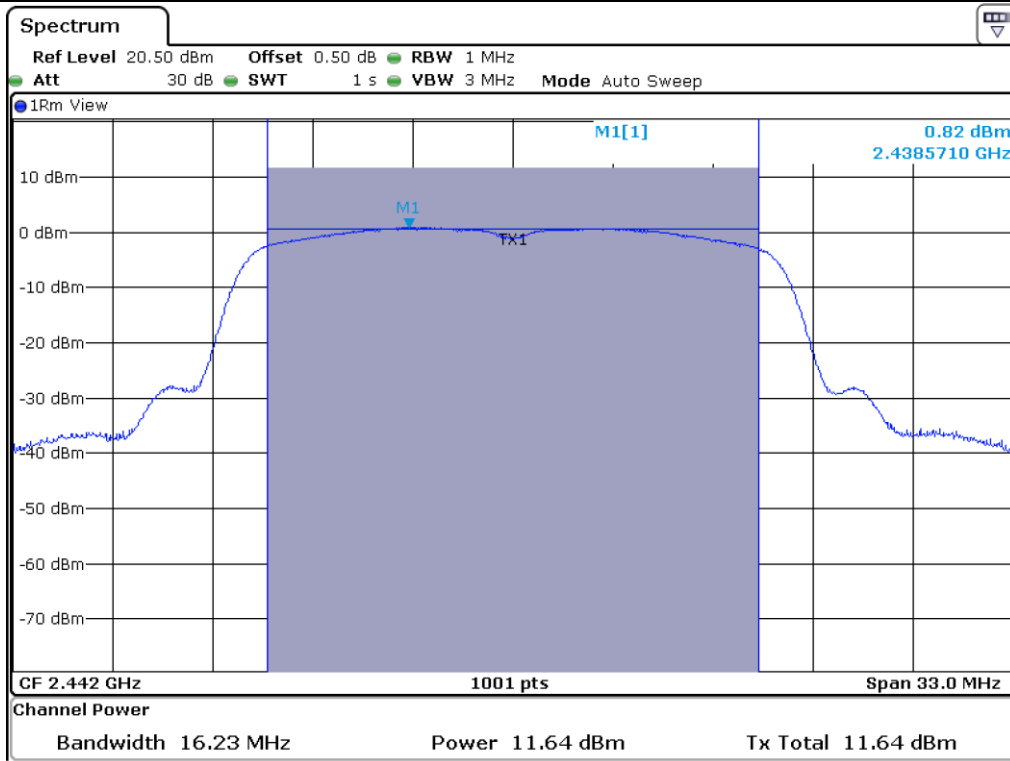
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.28	11.34	30.00	18.66
MIDDLE	2 442	16.23	11.64	30.00	18.36
HIGH	2 462	16.53	12.10	30.00	17.90

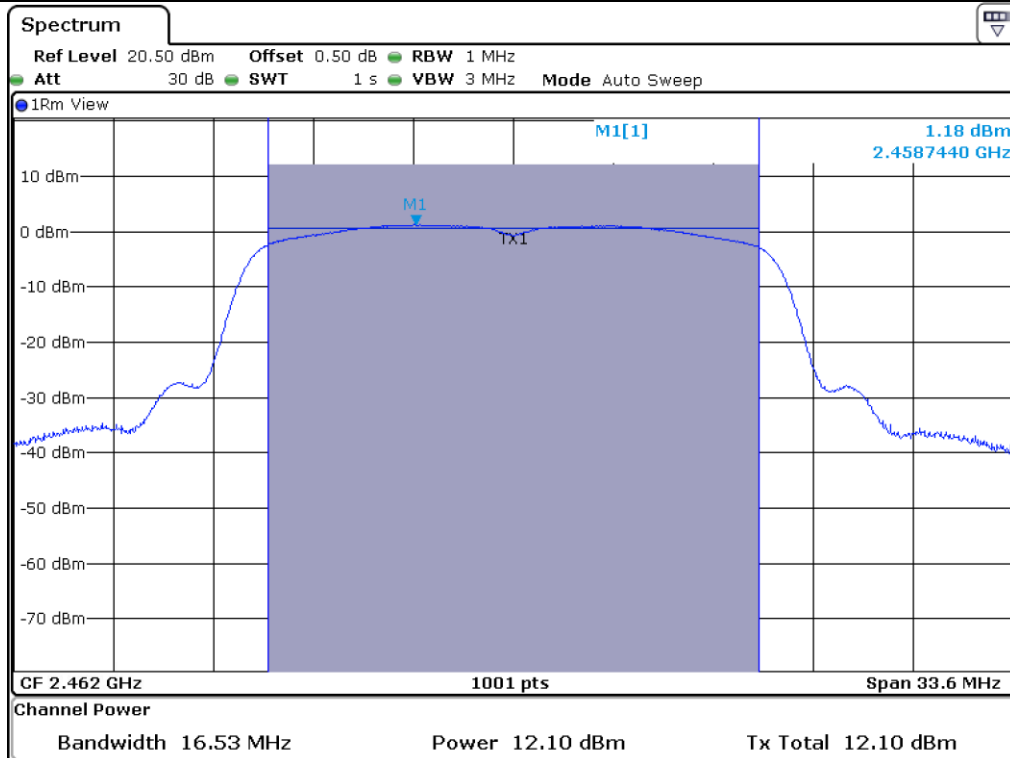
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Tae-Ho, Kim / Senior Engineer





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

8.5.3 Test data for Multiple Antenna

- Test Date : May 03, 2016
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.48	14.69	28.77	14.08
MIDDLE	2 442	16.28	14.84	28.77	13.93
HIGH	2 462	16.28	15.11	28.77	13.66

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

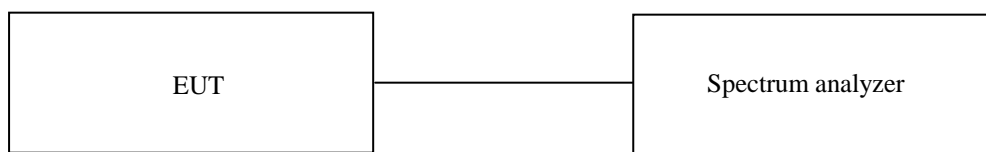
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

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

9.2 Test set-up for conducted measurement

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



9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

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

9.4 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Jul. 22, 2015 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 29, 2016 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2016 (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. 31, 2015 (2Y)

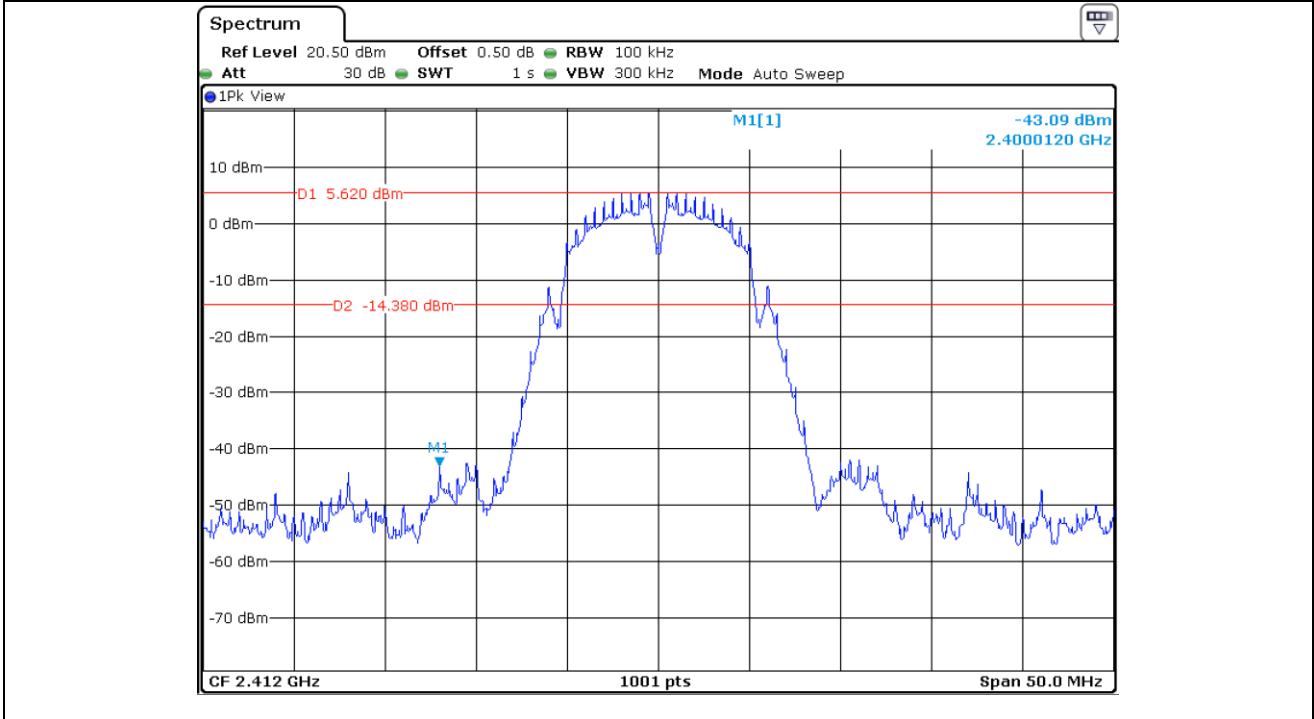
All test equipment used is calibrated on a regular basis.

9.5 Test data for conducted emission

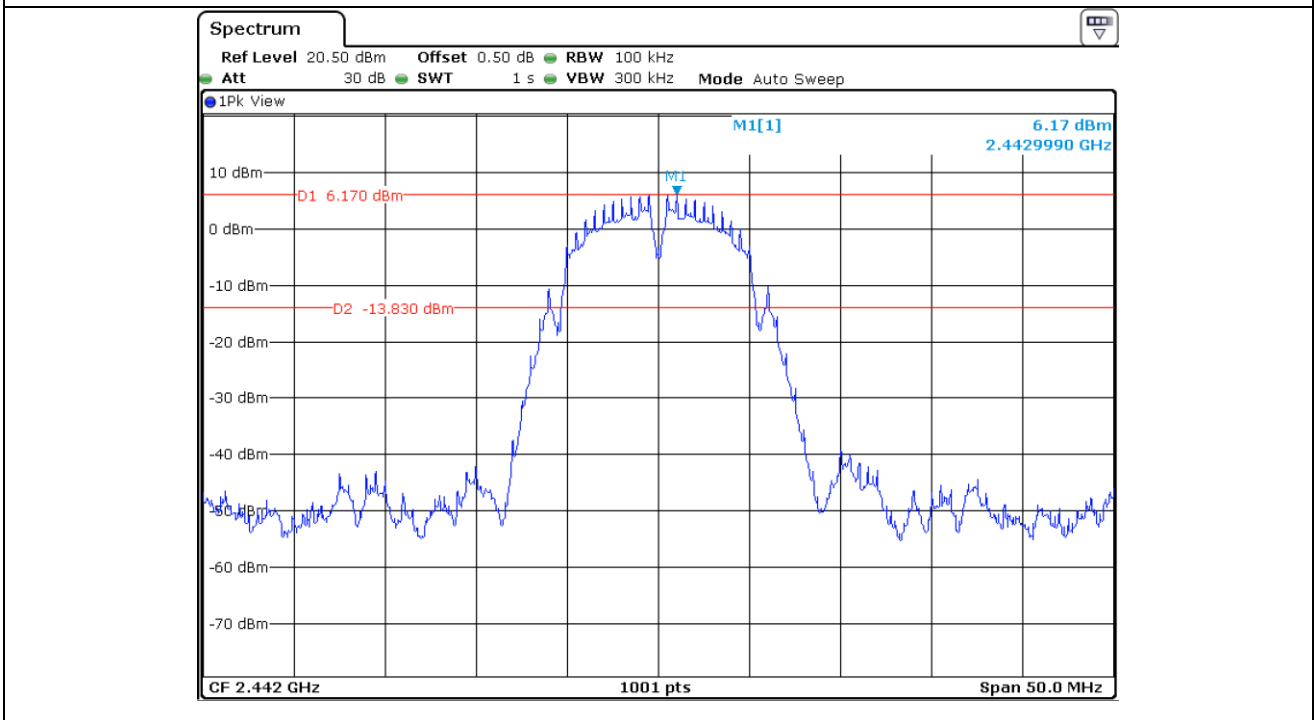
9.5.1 Test data for AC 12 V

9.5.1.1 Test data for Antenna 0

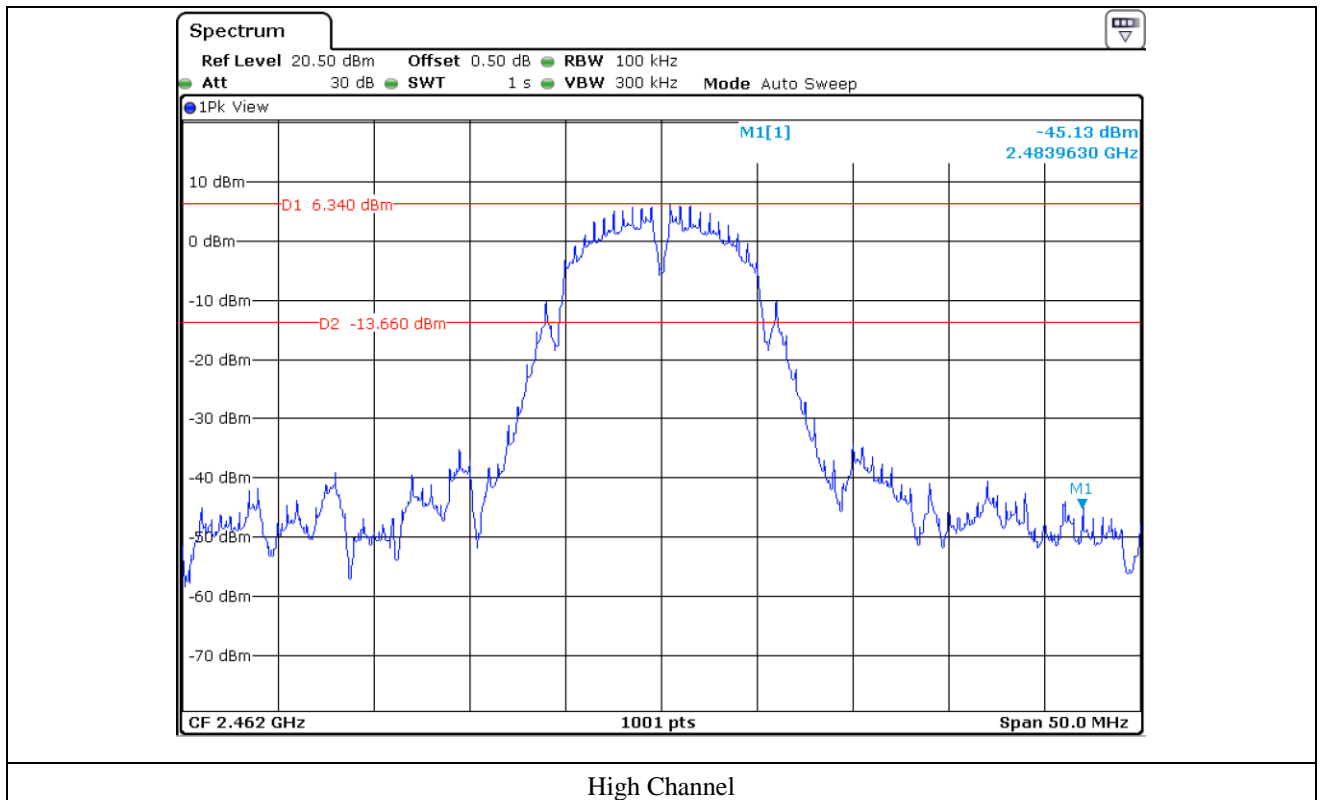
9.5.1.1.1 Test data for 802.11b WLAN Mode

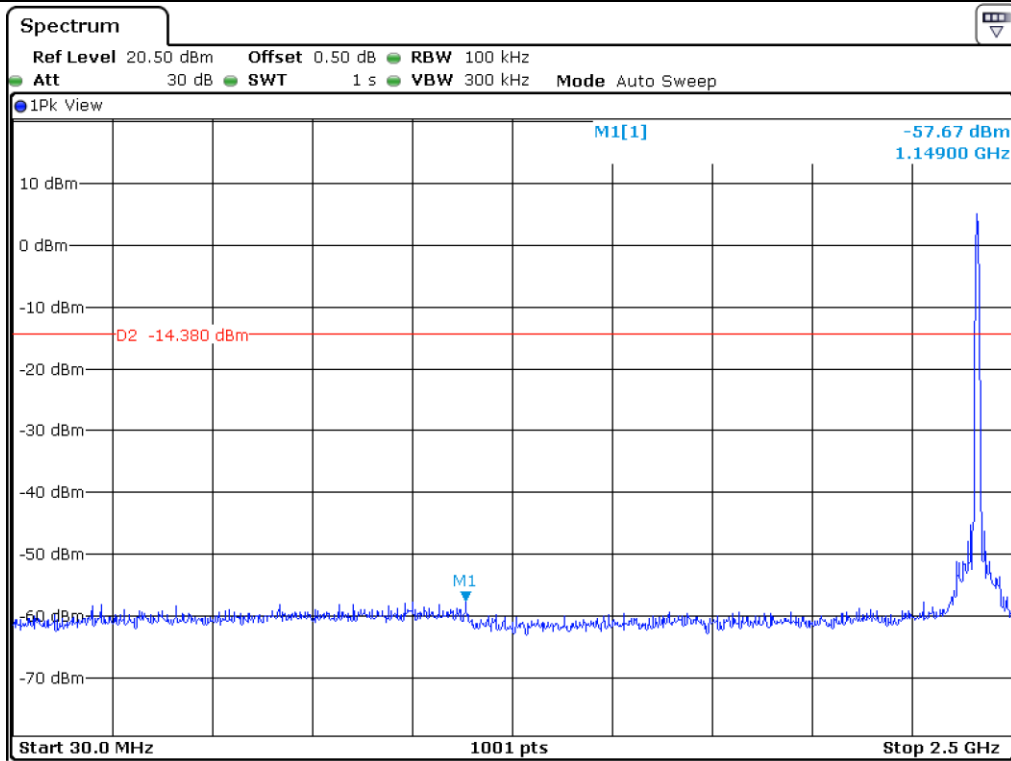


Low Channel

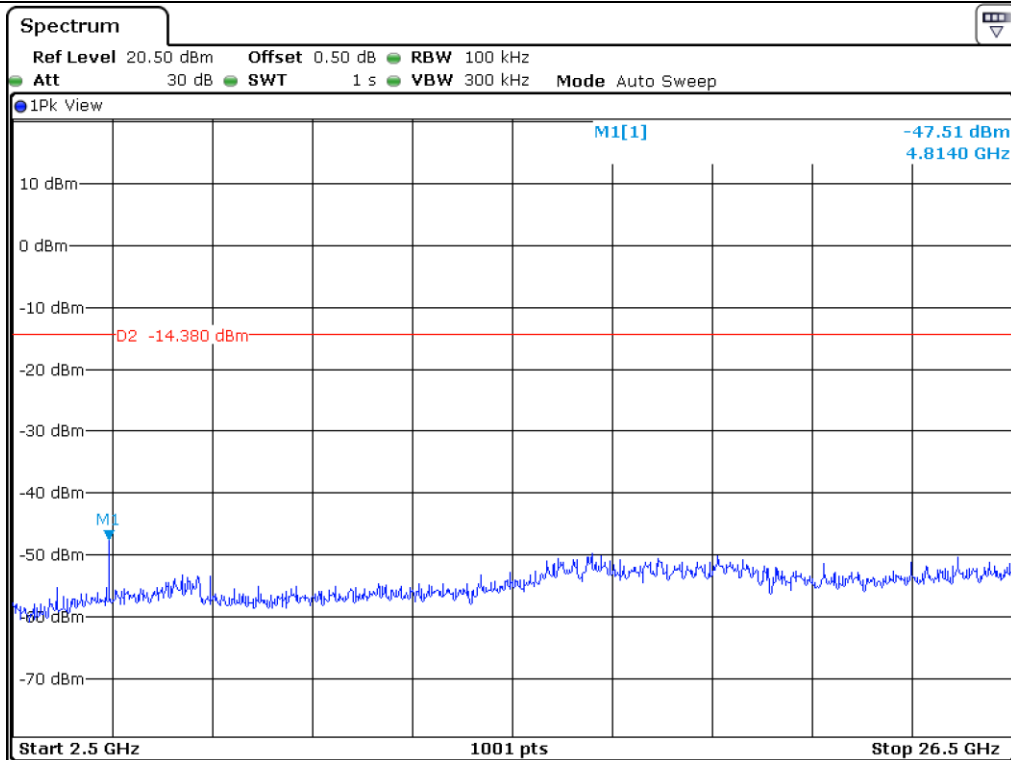


Middle Channel

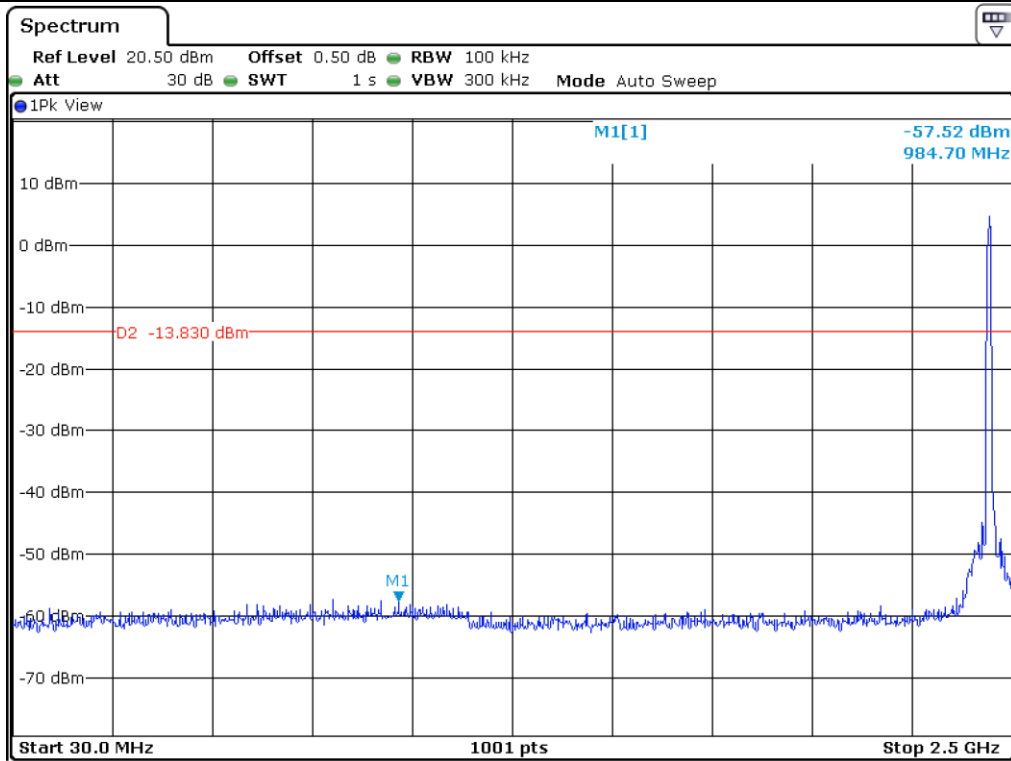




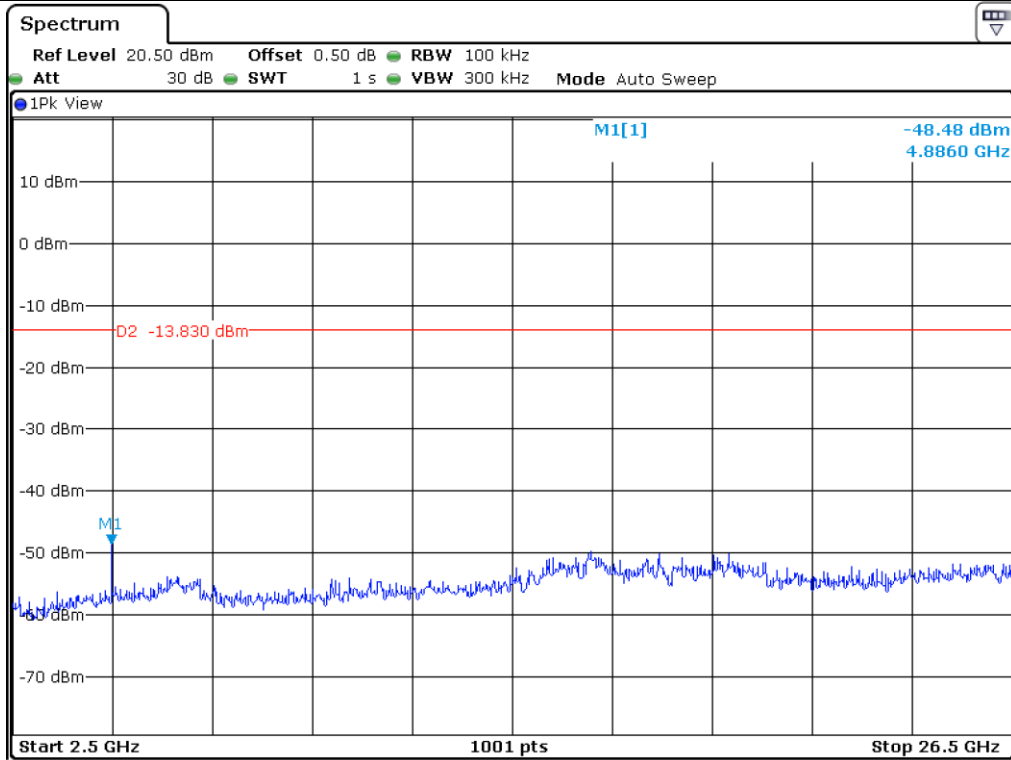
Low Channel



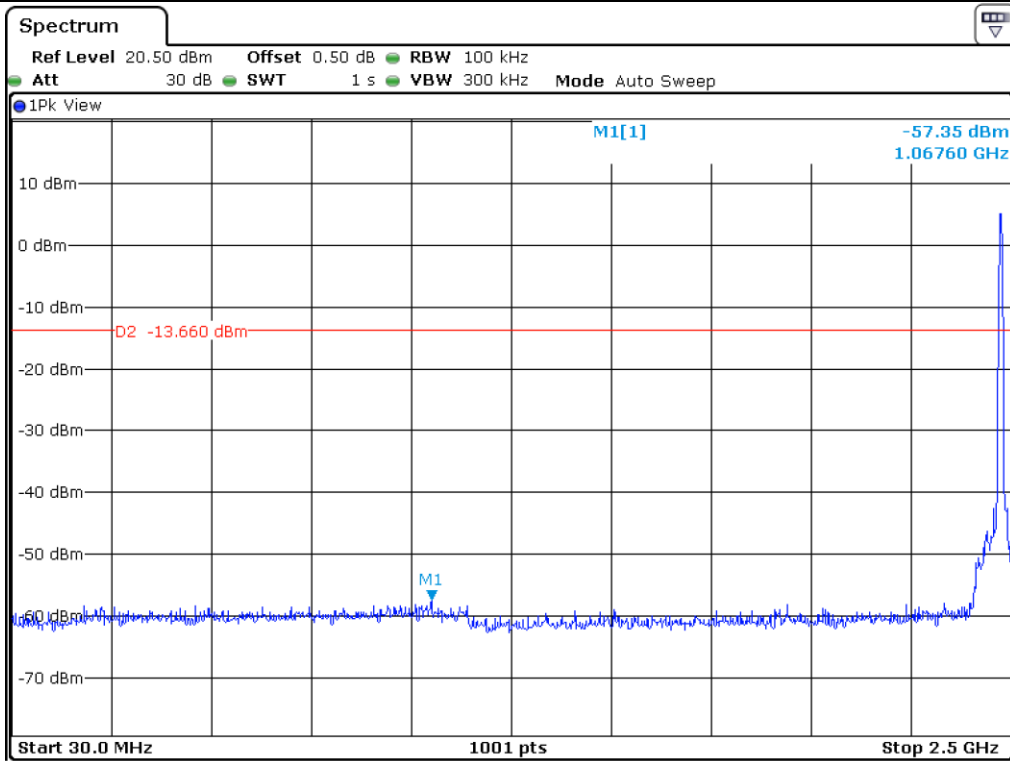
Low Channel



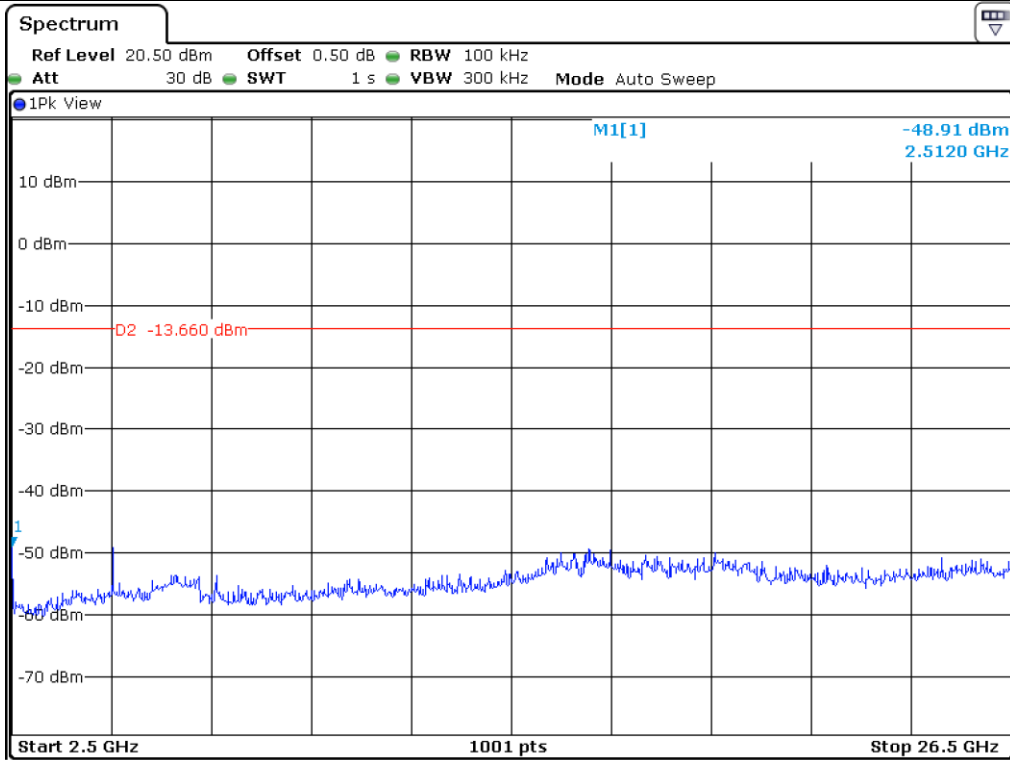
Middle Channel



Middle Channel



High Channel



High Channel