

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

Test Report No. : W166R-D006

AGR No. : A164A-091

Applicant : RAYENCE Co., Ltd.

Address : 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, South Korea

Manufacturer : RAYENCE Co., Ltd.

Address : 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, South Korea

Type of Equipment : Interface Box

FCC ID. : QIIRYRAP001A

IC Certification No. : 10742A-RAP001A

Model Name : RAP001A

Serial number : N/A

Total page of Report : 248 pages (including this page)

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SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247 and IC RSS-Gen Issue 4 Nov 2014 and RSS-247 Issue 1 May 2015**

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:



Jae-Ho, Lee / Chief Engineer
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Approved by:



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ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W166R-D006	June 07, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : RAYENCE Co., Ltd.
 Address : 14, Samsung 1-ro 1-gil, Hwaseong-si, Gyeonggi-do, South Korea
 Contact Person : Ha Nam-young / Assistant Manager
 Telephone No. : +82-31-8015-6465
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 FCC ID : QIIRYRAP001A
 IC Certification No. : 10742A-RAP001A
 Model Name : RAP001A
 Serial Number : N/A
 Date : June 07, 2016

EQUIPMENT CLASS	FCC : DTS – DIGITAL TRNSMISSION SYSTEM IC : Low Power License-Exempt Radio-communication Device
E.U.T. DESCRIPTION	Interface Box
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, RSS-Gen Issue 4 Nov 2014, RSS-247 Issue 1 May 2015
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&IC 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)	RSS-247, 5.2(1) Minimum 6 dB Bandwidth & 99 % Occupied Bandwidth	Met the Limit / PASS
15.247 (b) (3)	RSS-247, 5.4(4) Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	RSS-247, 5.5 100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	RSS-247, 5.5 Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	RSS-247, 5.2(2) Peak Power Spectral Density	Met the Limit / PASS
15.209	RSS-247, 5.5 Radiated Emission Limits	Met the Limit / PASS
15.207	RSS-Gen, Section 7.2.4 Conducted Limits	Met the Limit / PASS
15.203	RSS-Gen, Section 7.1.2 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, IC RSS-Gen Issue 4 Nov 2014 and RSS-247 Issue 1 May 2015

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# 3736A-3

-. Site Accreditation:

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The RAYENCE Co., Ltd., Model RAP001A (referred to as the EUT in this report) is an Interface Box. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Interface Box	
FREQUENCY RANGE	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20)) 2 422 MHz ~ 2 452 MHz (802.11n(HT40))	
MAX. RF OUTPUT POWER	Ant.0	Wi-Fi 802.11b (19.01 dBm) Wi-Fi 802.11g (18.31 dBm) Wi-Fi 802.11n_20 MHz (16.56 dBm) Wi-Fi 802.11n_40 MHz (15.78 dBm)
	Ant.1	Wi-Fi 802.11b (20.21 dBm) Wi-Fi 802.11g (19.51 dBm) Wi-Fi 802.11n_20 MHz (17.36 dBm) Wi-Fi 802.11n_40 MHz (17.59 dBm)
	Ant.2	Wi-Fi 802.11b (19.82 dBm) Wi-Fi 802.11g (19.76 dBm) Wi-Fi 802.11n_20 MHz (17.53 dBm) Wi-Fi 802.11n_40 MHz (17.50 dBm)
	MIMO	Wi-Fi 802.11n_20 MHz (21.94 dBm) Wi-Fi 802.11n_40 MHz (21.80 dBm)
MODULATION TYPE	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
ANTENNA TYPE	Dipole antenna	
ANTENNA GAIN	4.674 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	40 MHz, 25 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	MJ Technology	N/A	N/A
Power Board 1	N/A	N/A	N/A
Power Board 2	XP Power	ECS45US12	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
RAP001A	RAYENCE Co., Ltd.	Interface Box (EUT)	Notebook PC, Jig
Latitude D505	Dell Asia Pacific Sdn.	Notebook PC	EUT, Adapter
HA65NS0-00	Hipro Electronics (Dongguan) Co., Ltd.	Adapter	Notebook PC
N/A	N/A	Jig	EUT, Notebook PC

5.3 Mode of operation during the test

Modulation & Channel selected	DATA RATE	OUTPUT POWER[dBm]		
		Ant 0	Ant 1	Ant 2
802.11b (Middle Channel)	1 Mbps	19.01	20.21	19.82
	2 Mbps	18.96	20.17	19.80
	5.5 Mbps	18.53	19.68	19.45
	11 Mbps	18.30	19.45	19.10
802.11g (Middle Channel)	6 Mbps	18.31	19.51	19.76
	9 Mbps	18.27	19.46	19.72
	12 Mbps	18.20	19.40	19.65
	18 Mbps	18.12	19.18	19.49
	24 Mbps	18.00	18.96	19.11
	36 Mbps	16.24	16.73	16.98
	48 Mbps	14.49	15.39	16.30
	54 Mbps	13.52	14.77	15.00
HT20 (Middle Channel)	6.5 Mbps	16.56	17.36	17.53
	13 Mbps	16.40	17.34	17.37
	19.5 Mbps	16.27	17.23	17.20
	26 Mbps	16.10	17.09	17.06
	39 Mbps	15.87	16.96	16.90
	52 Mbps	15.76	16.74	16.72
	58.5 Mbps	15.53	16.45	16.59
	65 Mbps	13.78	14.50	14.67
HT40 (Middle Channel)	13.5 Mbps	15.78	17.59	17.50
	27.0 Mbps	15.68	17.38	17.47
	40.5 Mbps	15.62	17.35	17.33
	54.0 Mbps	15.54	17.22	17.28
	81.0 Mbps	15.47	17.18	17.14
	108.0 Mbps	15.39	17.06	17.06
	121.5 Mbps	15.12	16.97	16.88
	135.0 Mbps	12.77	14.58	14.54

The worse case data rate for each modulation is determined 1 Mbps(Ant.0) / 1 Mbps(Ant.1) / 1 Mbps(Ant.2) for IEEE 802.11b, 6 Mbps(Ant.0) / 6 Mbps(Ant.1) / 6 Mbps(Ant.2) for IEEE 802.11g, 6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) / 6.5 Mbps(Ant.2) for HT20, 13.5 Mbps(Ant.0) / 13.5 Mbps(Ant.1) / 13.5 Mbps(Ant.2) for HT40.

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 m 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 and RSS-Gen Issue 4 November 2014 Section 8.3, 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 Dipole antenna(Reverse SMA type), so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

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

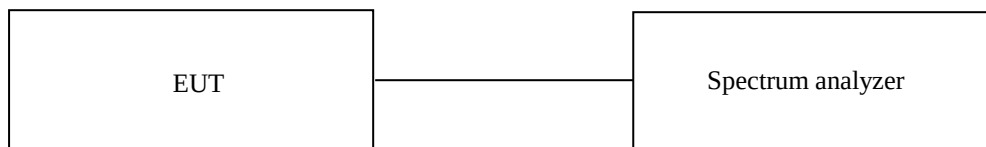
7. MINIMUM 6 dB BANDWIDTH & 99 % OCCUPIED BANDWIDTH

7.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



7.3 Test 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 802.11b WLAN Mode

7.4.1 Test data for Antenna 0

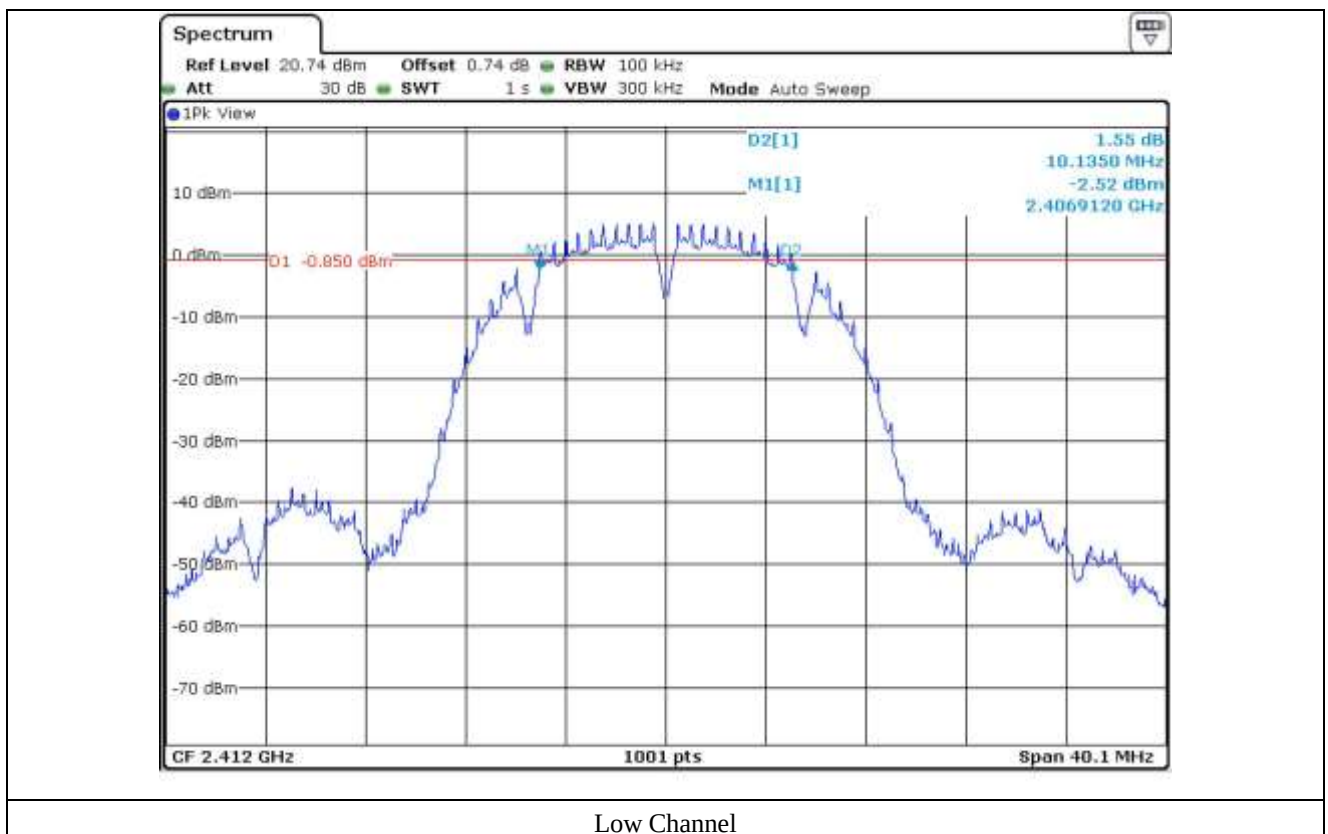
-. Test Date : April 30, 2016

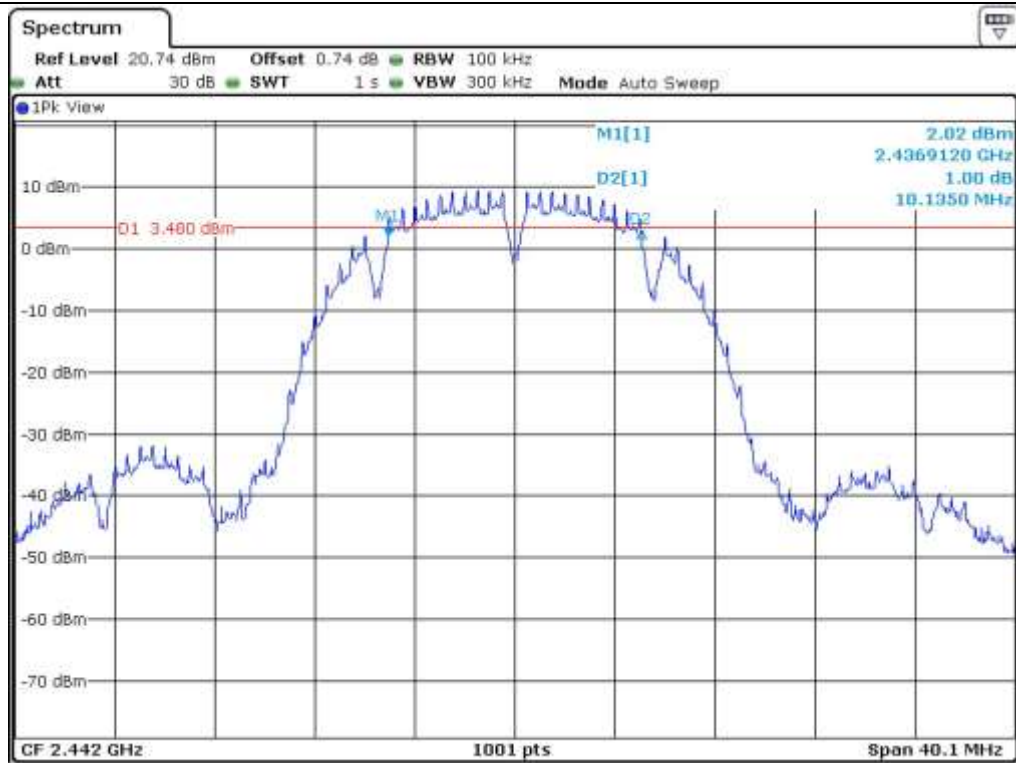
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	10.14	13.95	0.50	9.64	13.45
Middle	2 442	10.14	13.99	0.50	9.64	13.49
High	2 462	10.10	13.83	0.50	9.60	13.33

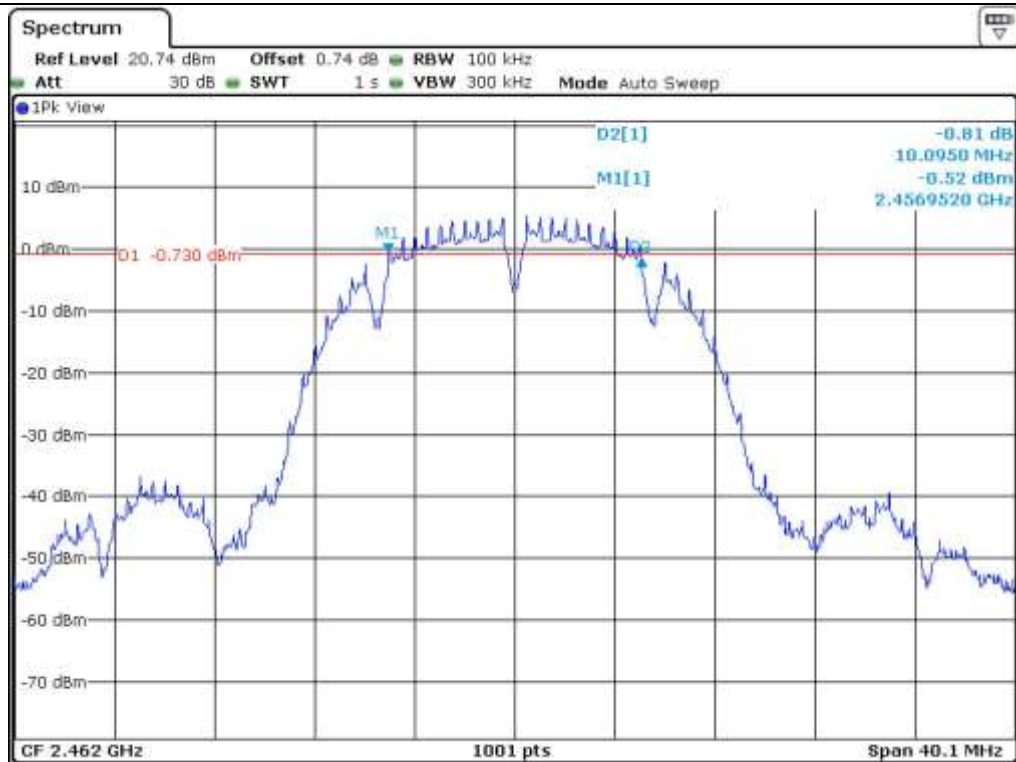
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer





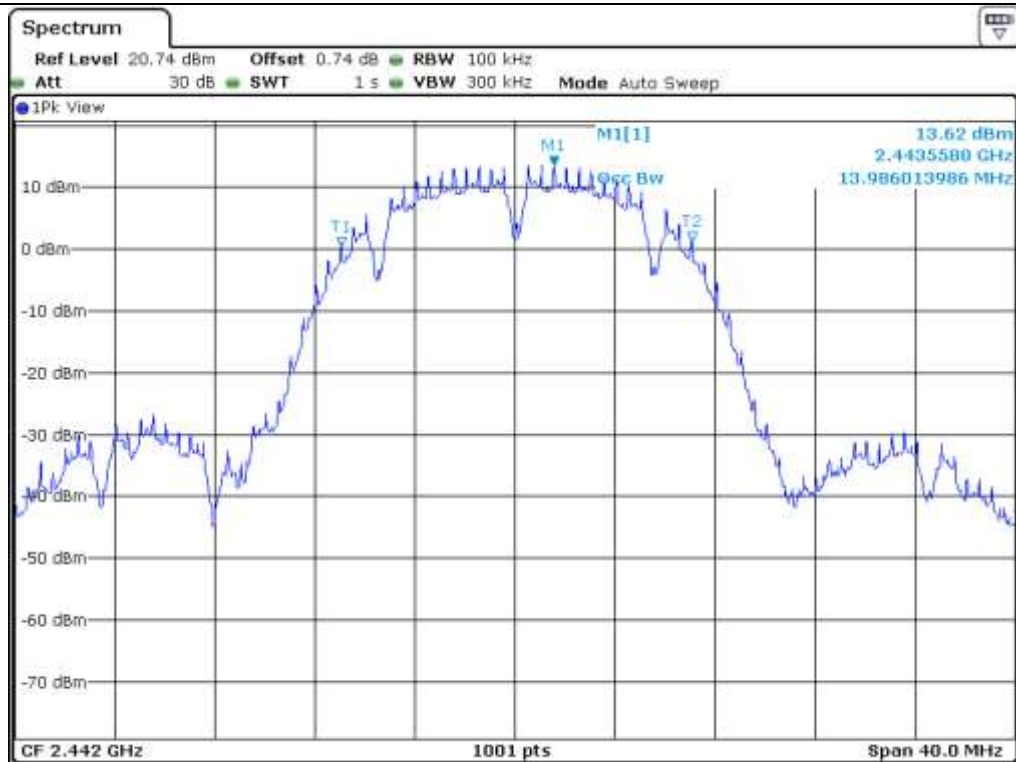
Middle Channel



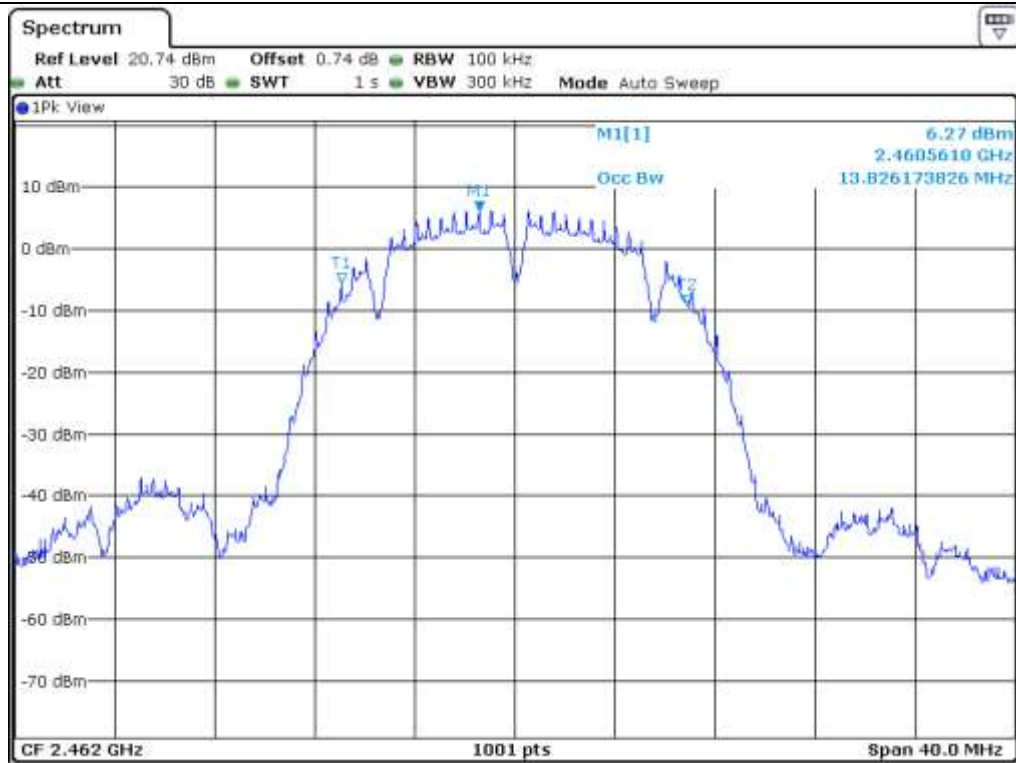
High Channel



Low Channel



Middle Channel



High Channel

7.4.2 Test data for Antenna 1

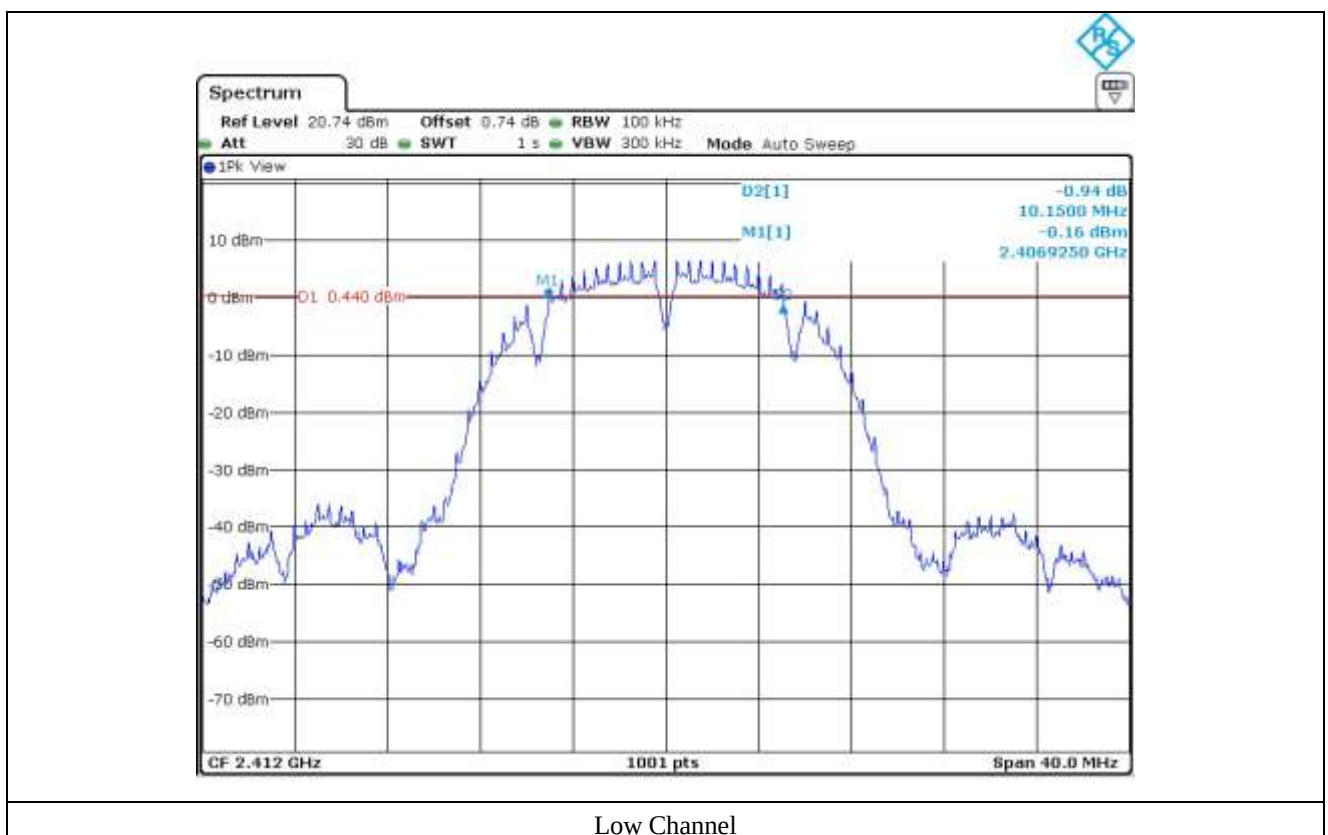
-. Test Date : April 30, 2016

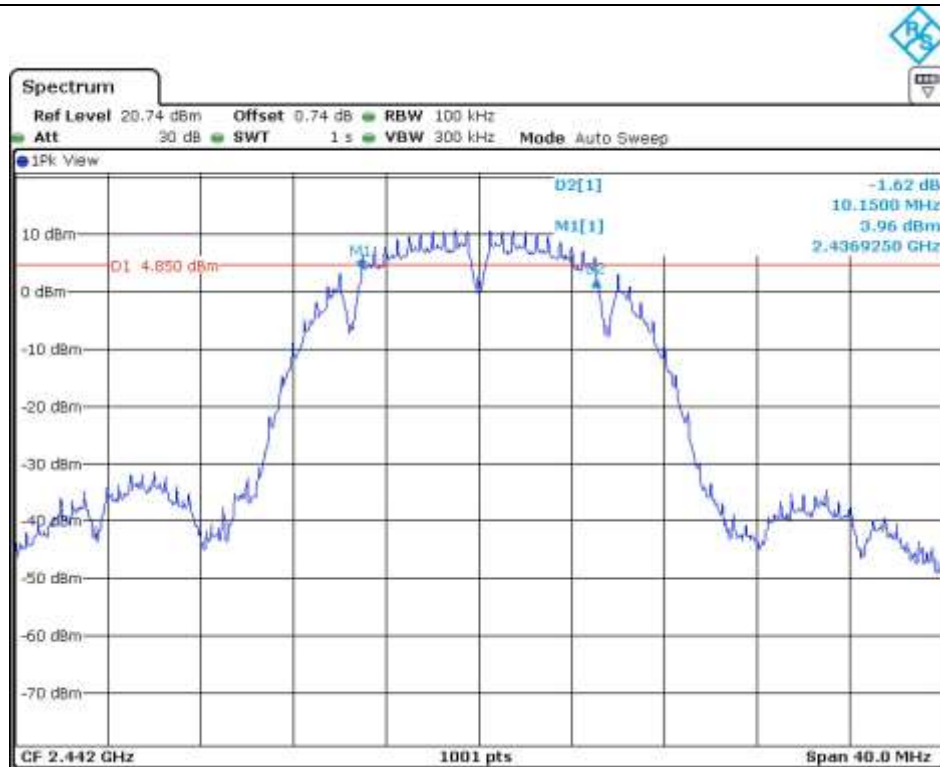
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	10.15	13.87	0.50	9.65	13.37
Middle	2 442	10.15	13.83	0.50	9.65	13.33
High	2 462	10.11	13.91	0.50	9.61	13.41

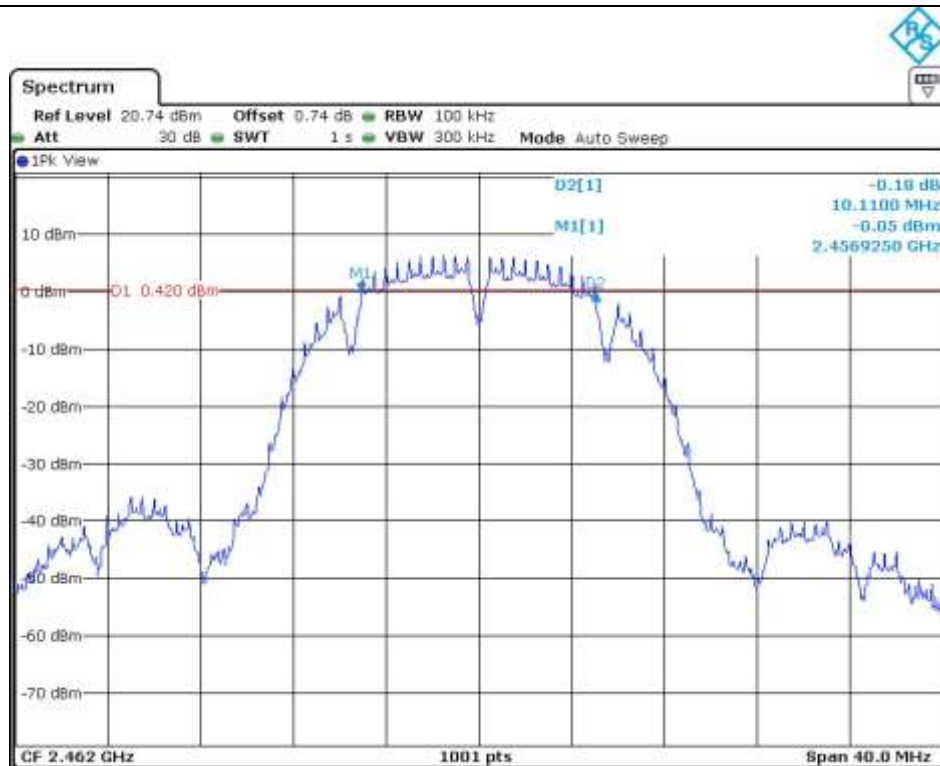
Remark. Margin = Measured Value - Limit

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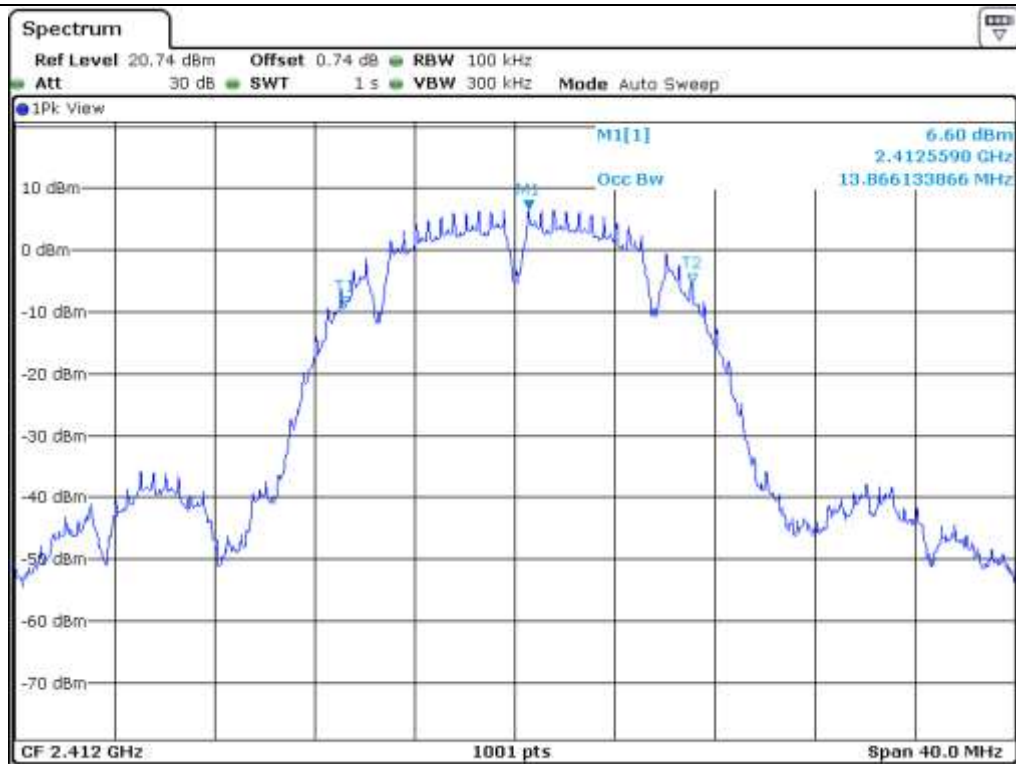




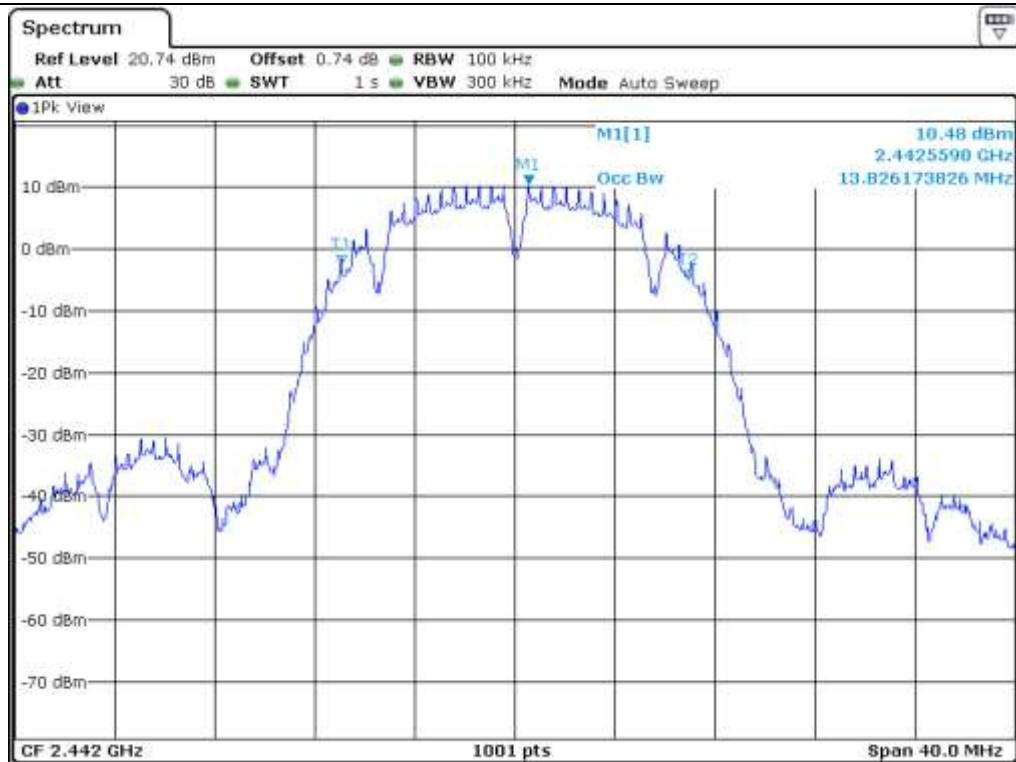
Middle Channel



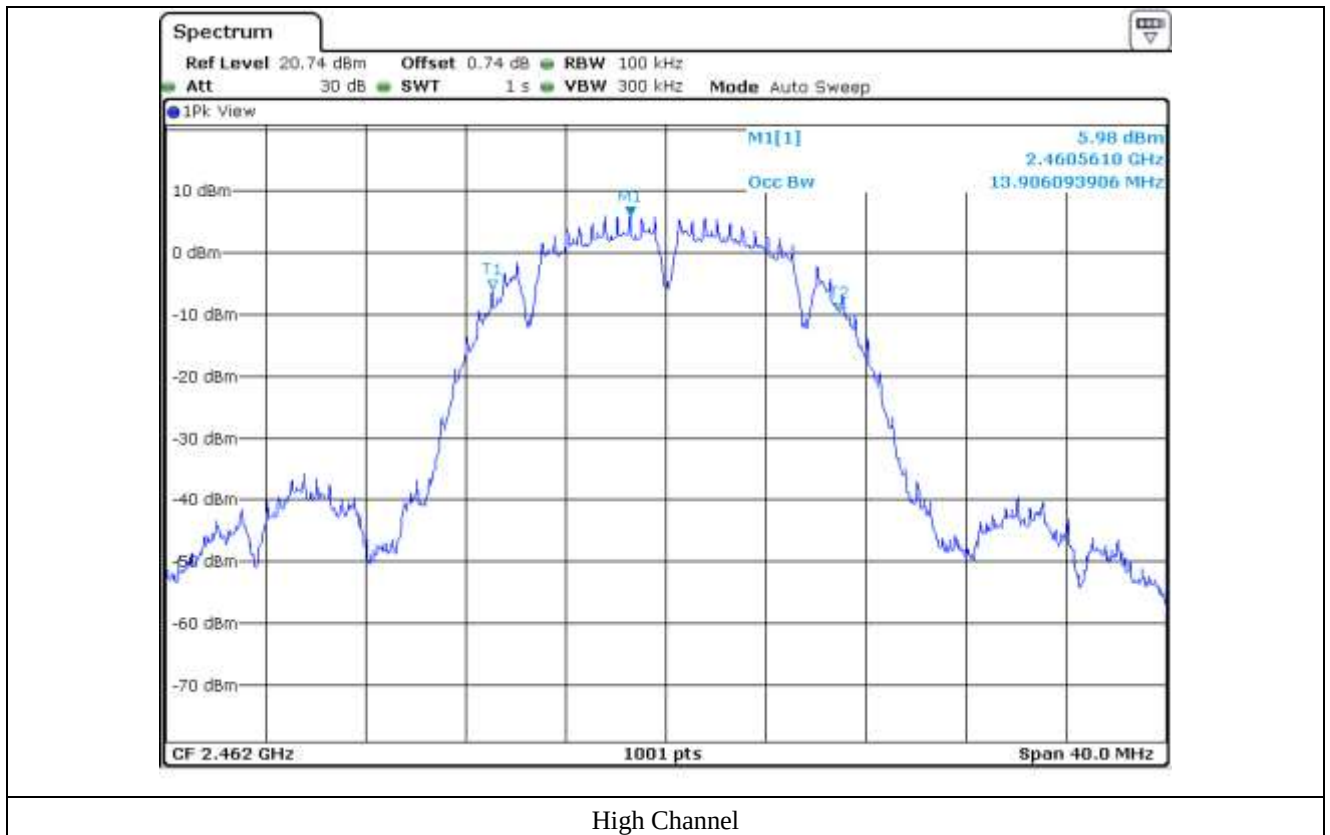
High Channel



Low Channel



Middle Channel



7.4.3 Test data for Antenna 2

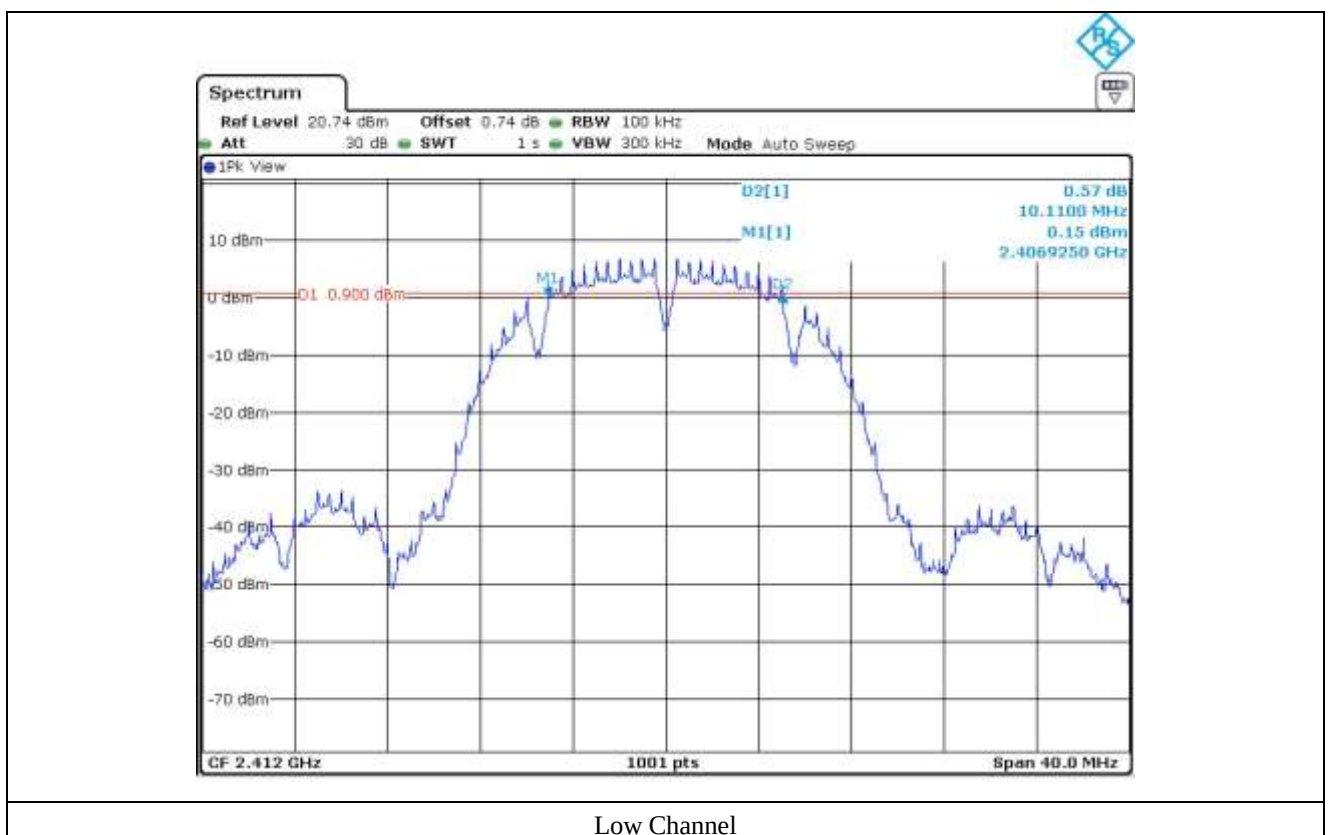
-. Test Date : April 30, 2016

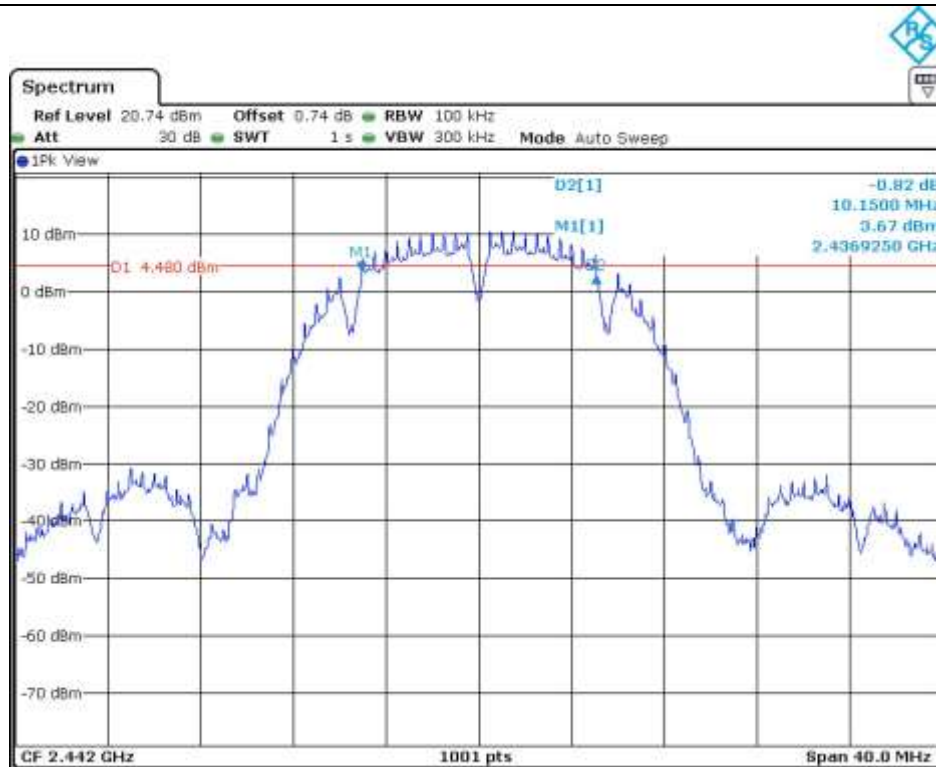
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	10.11	13.87	0.50	9.61	13.37
Middle	2 442	10.15	13.87	0.50	9.65	13.37
High	2 462	10.15	13.87	0.50	9.65	13.37

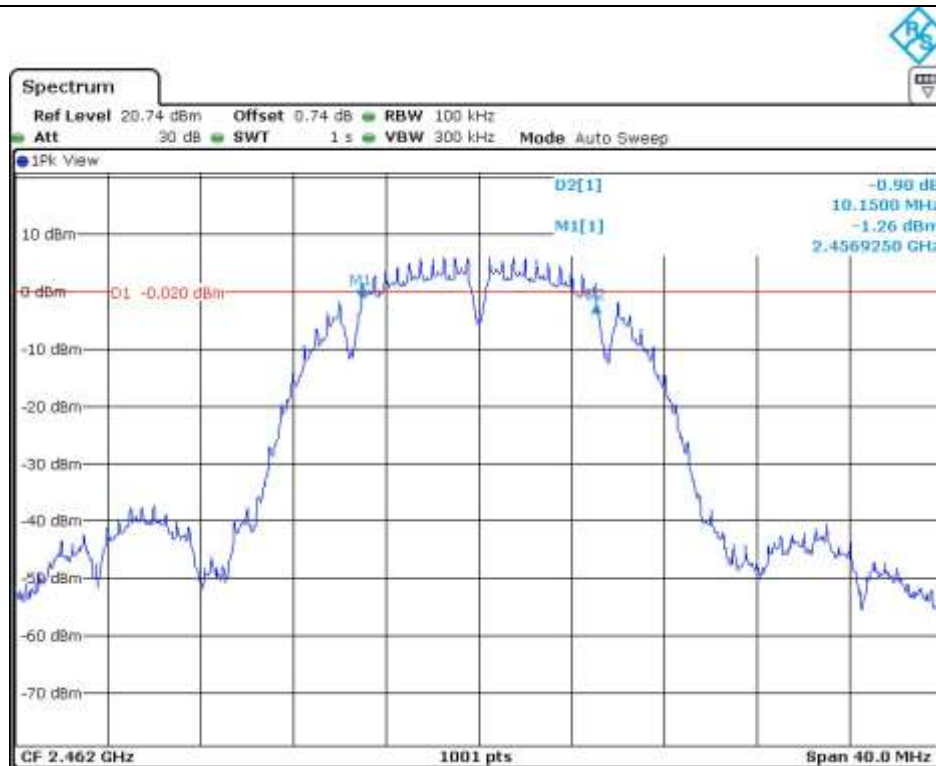
Remark. Margin = Measured Value - Limit


 Tested by: Jun-Hui, Lee / Senior Engineer





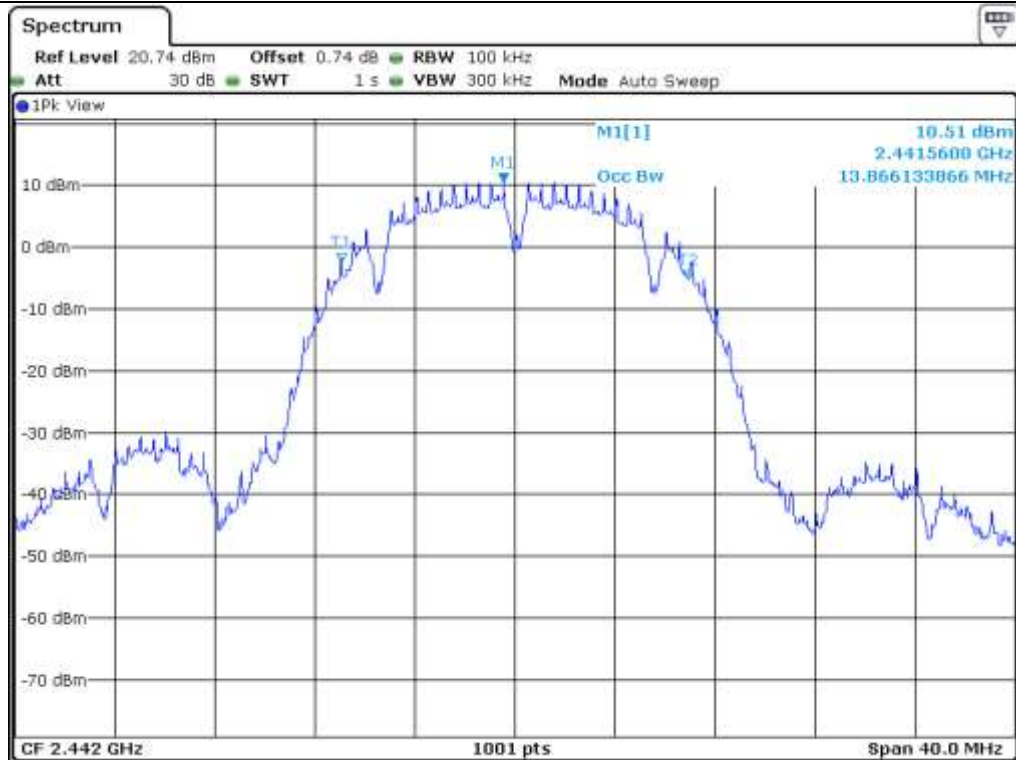
Middle Channel



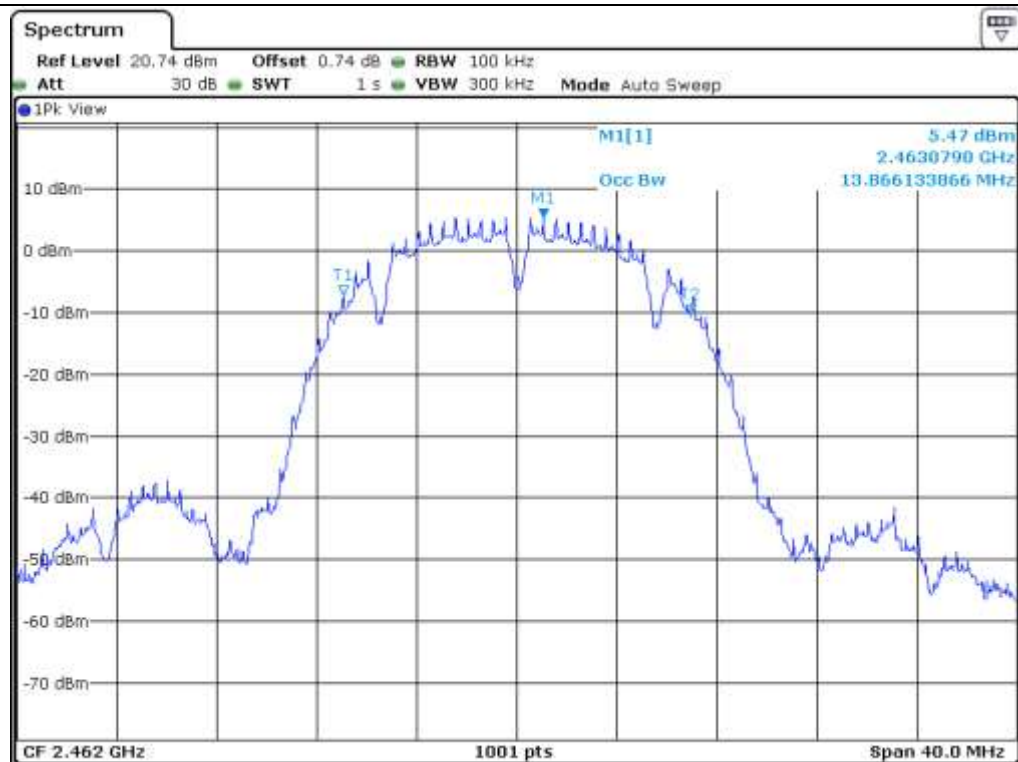
High Channel



Low Channel



Middle Channel



High Channel

7.5 Test data for 802.11g WLAN Mode

7.5.1 Test data for Antenna 0

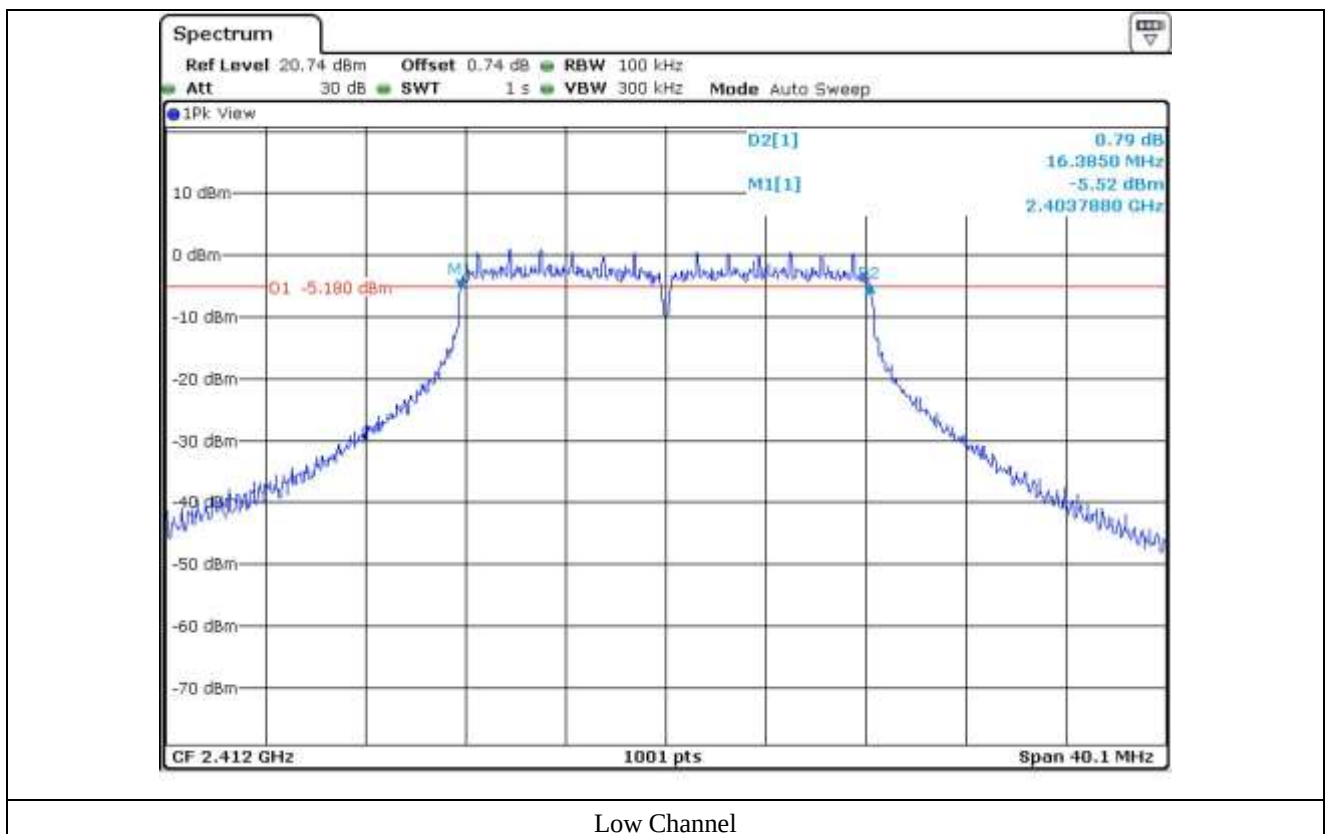
-. Test Date : April 30, 2016

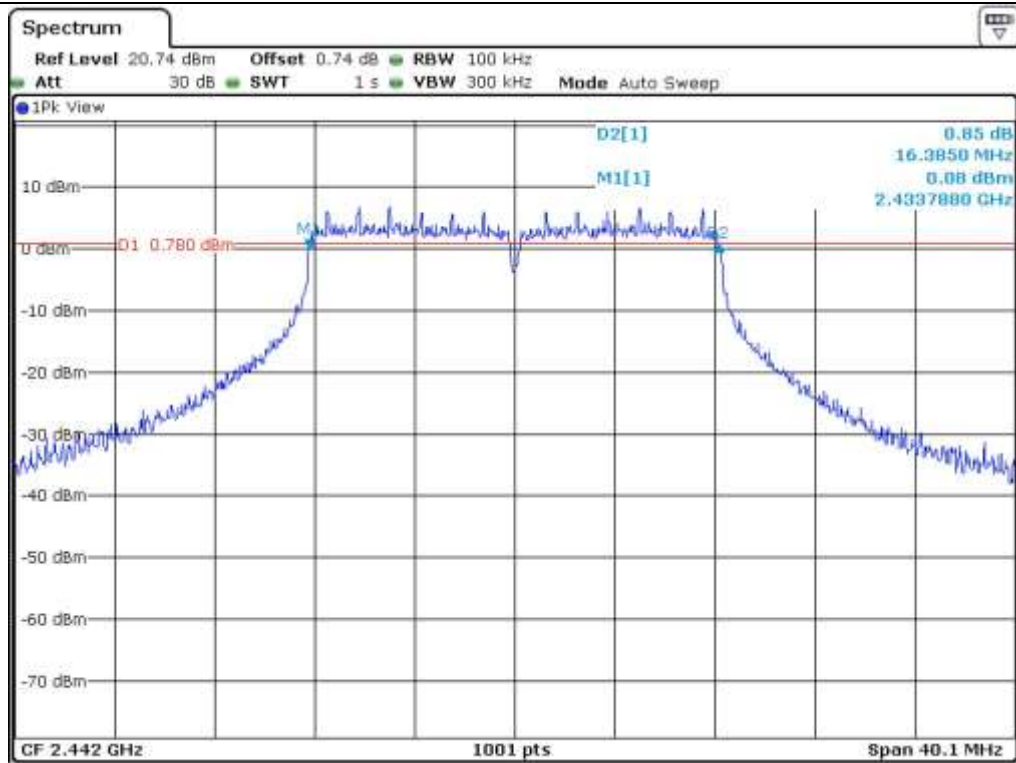
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	16.39	16.54	0.50	15.89	16.04
Middle	2 442	16.39	16.54	0.50	15.89	16.04
High	2 462	16.39	16.54	0.50	15.89	16.04

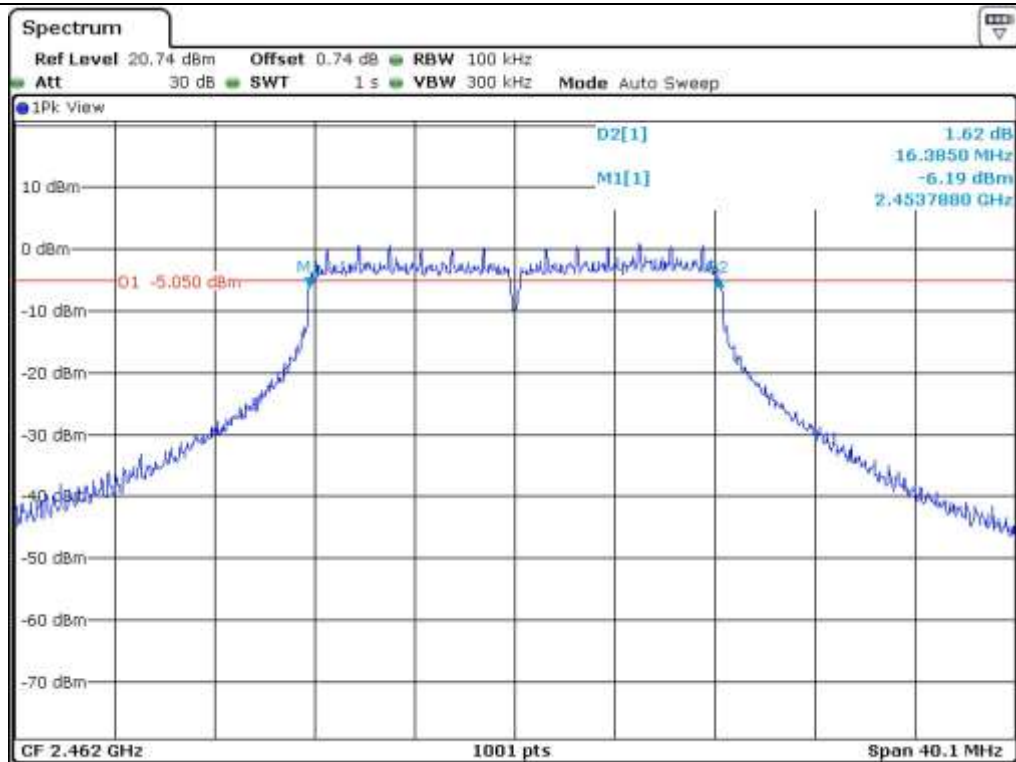
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer

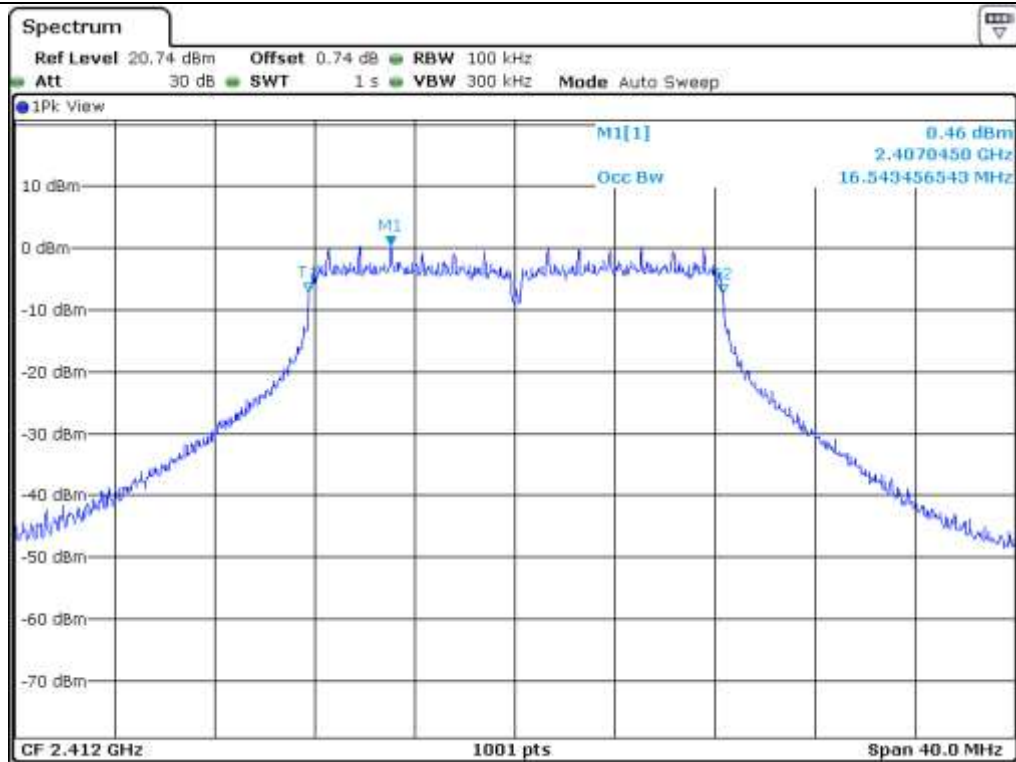




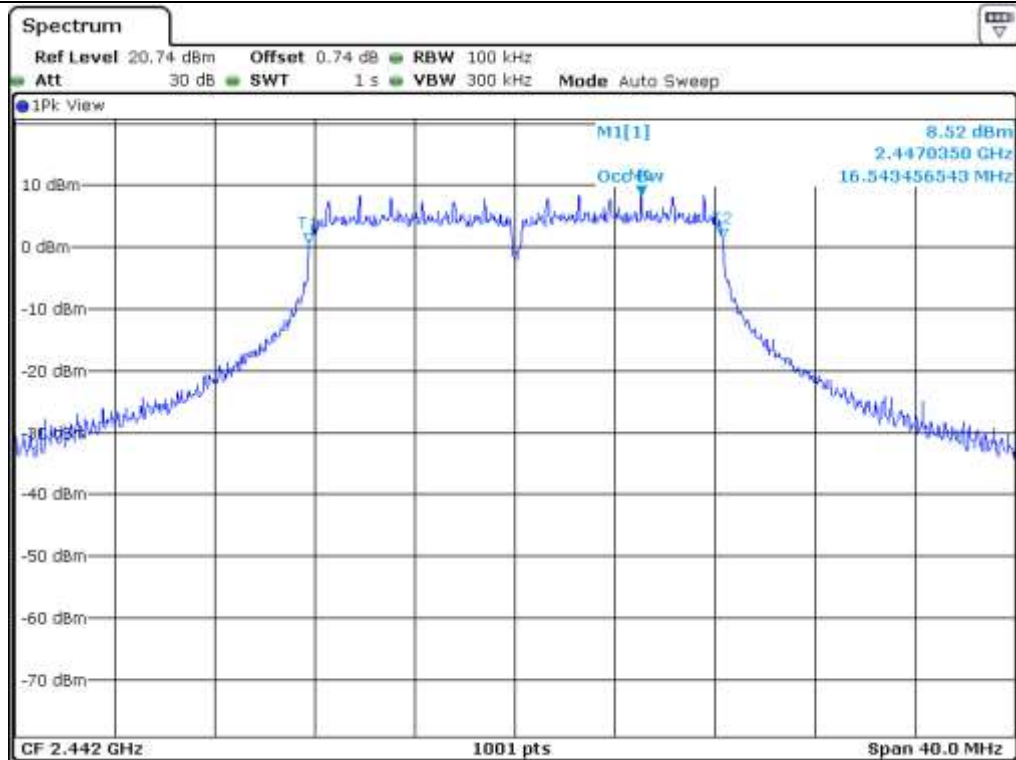
Middle Channel



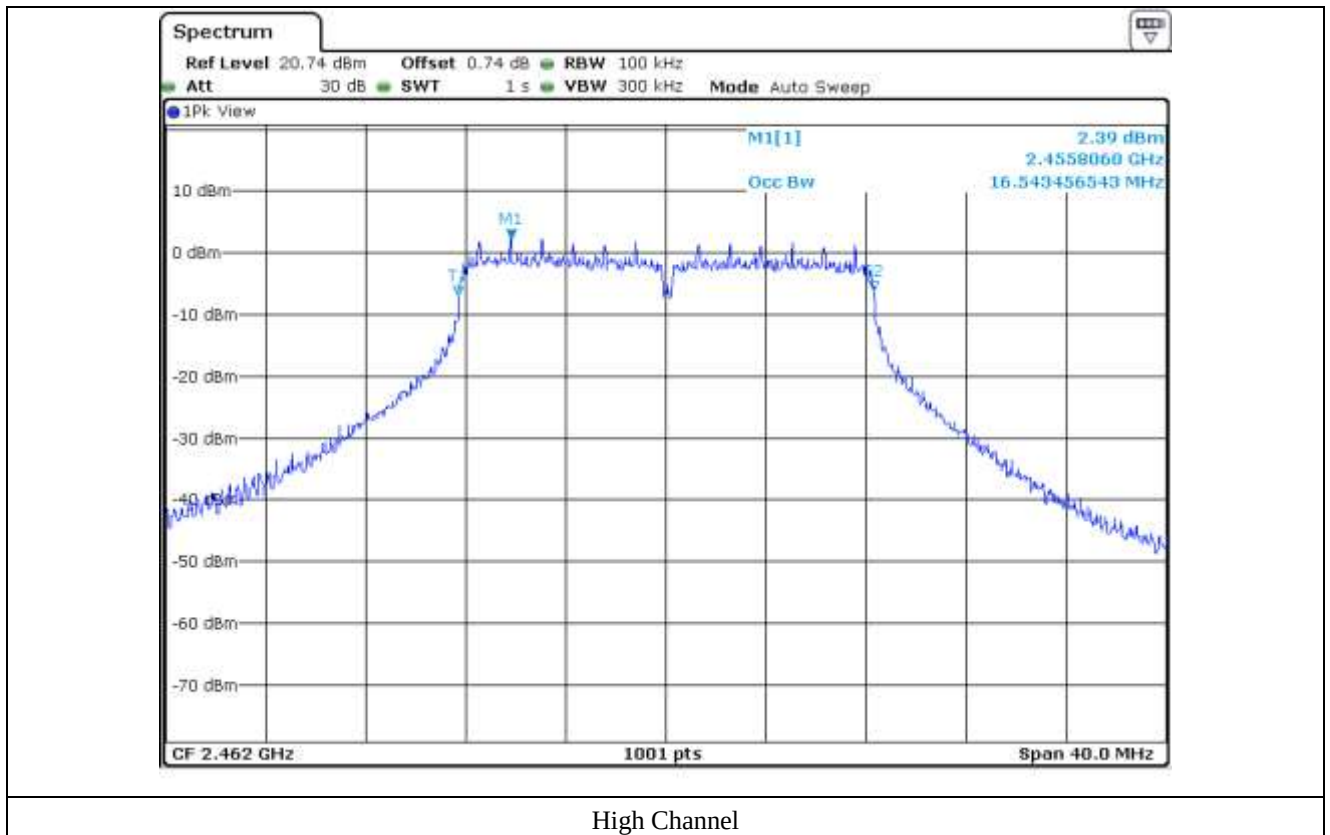
High Channel



Low Channel



Middle Channel



7.5.2 Test data for Antenna 1

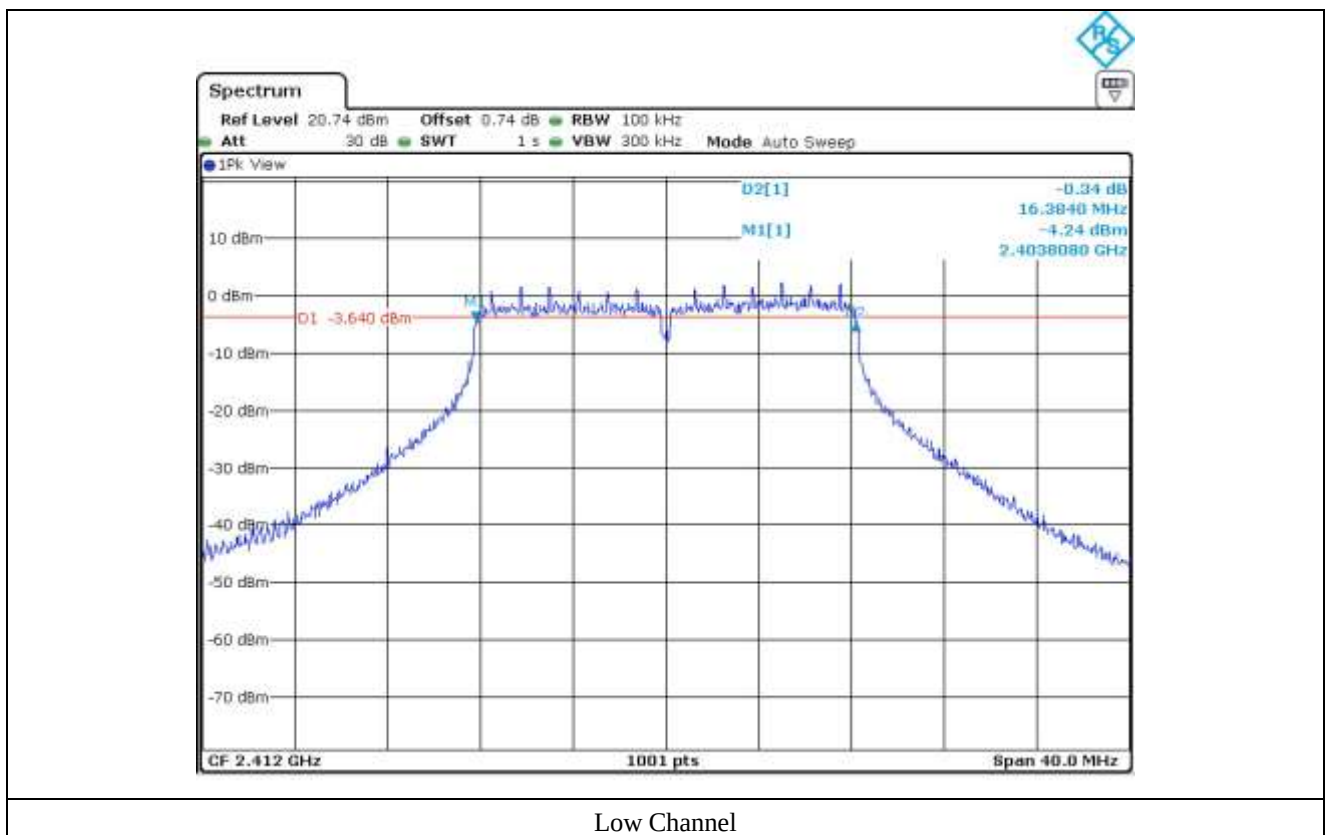
-. Test Date : April 30, 2016

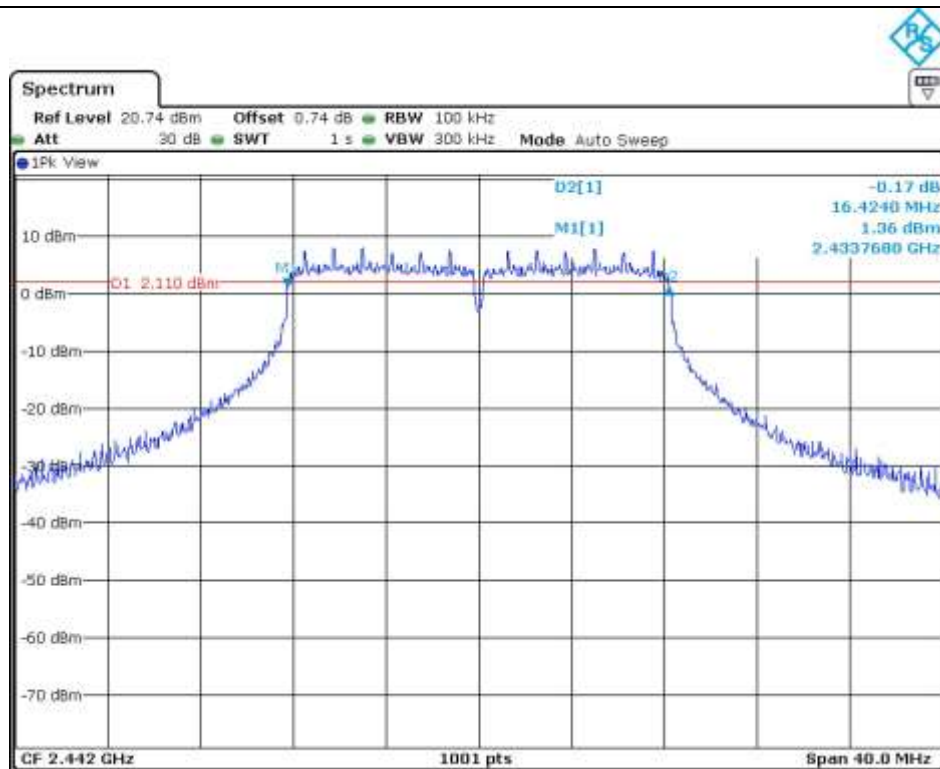
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	16.38	16.58	0.50	15.88	16.08
Middle	2 442	16.42	16.58	0.50	15.92	16.08
High	2 462	16.38	16.54	0.50	15.88	16.04

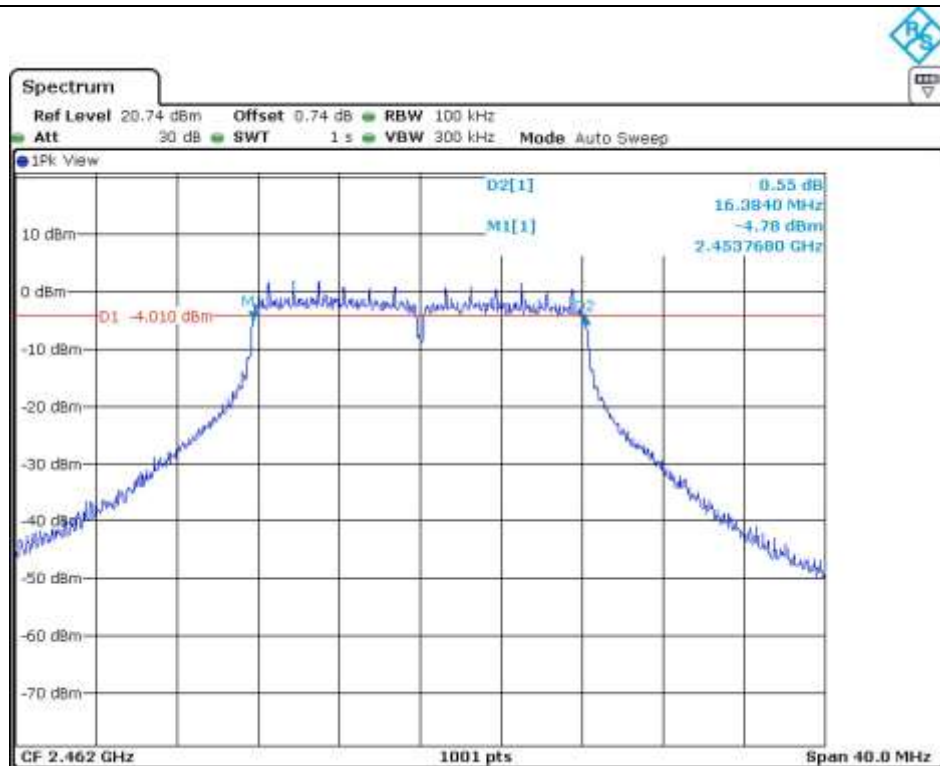
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer

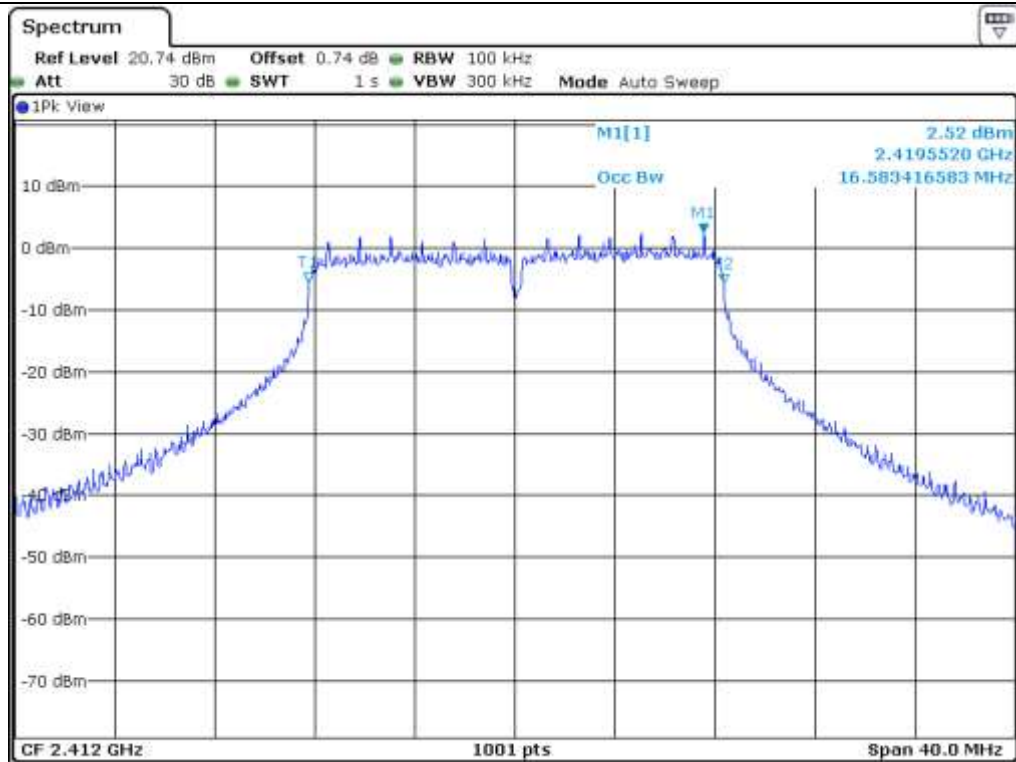




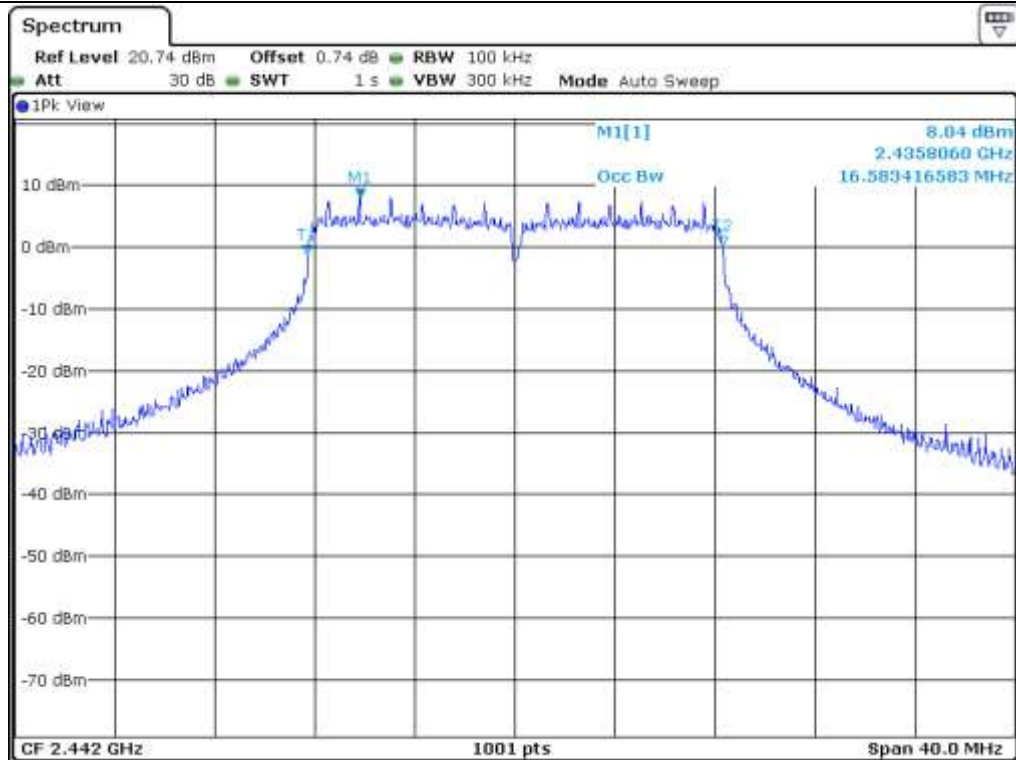
Middle Channel



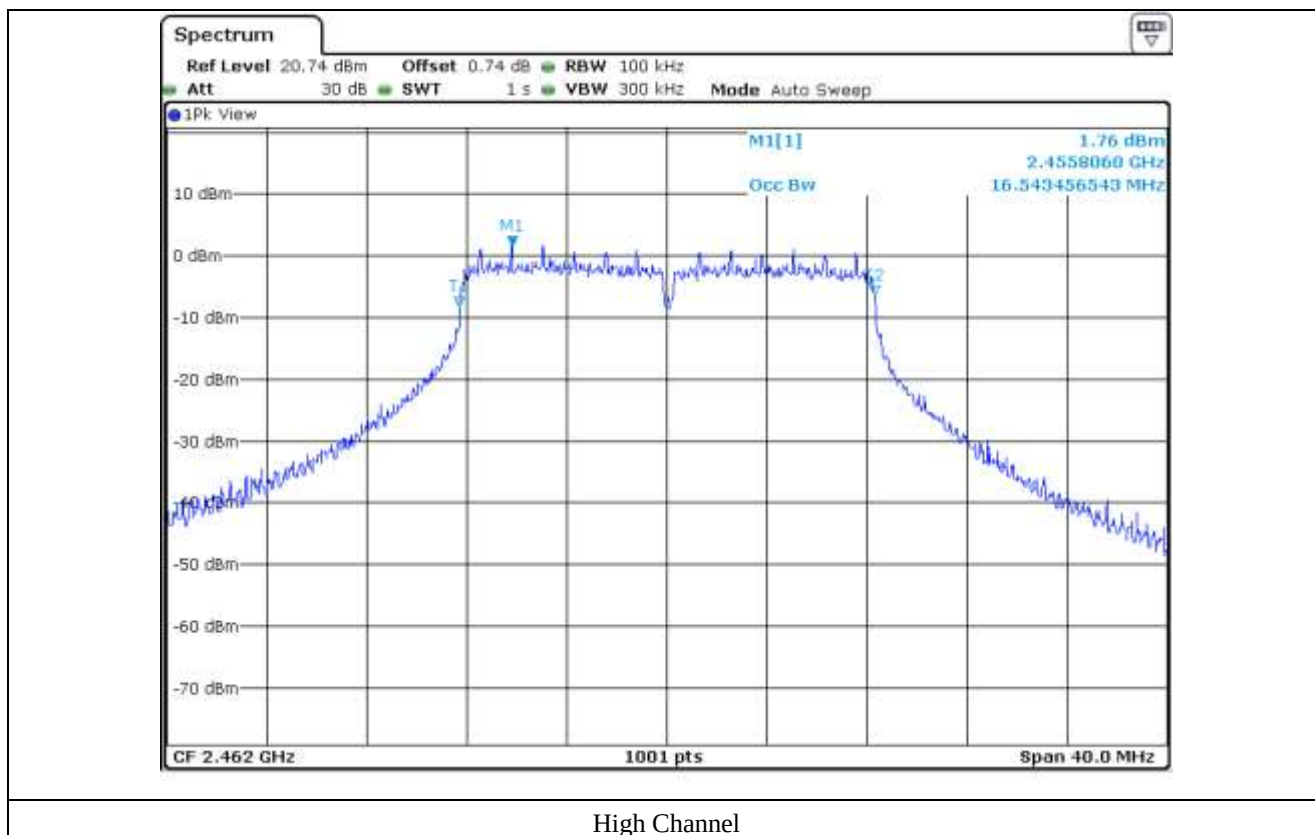
High Channel



Low Channel



Middle Channel



7.5.3 Test data for Antenna 2

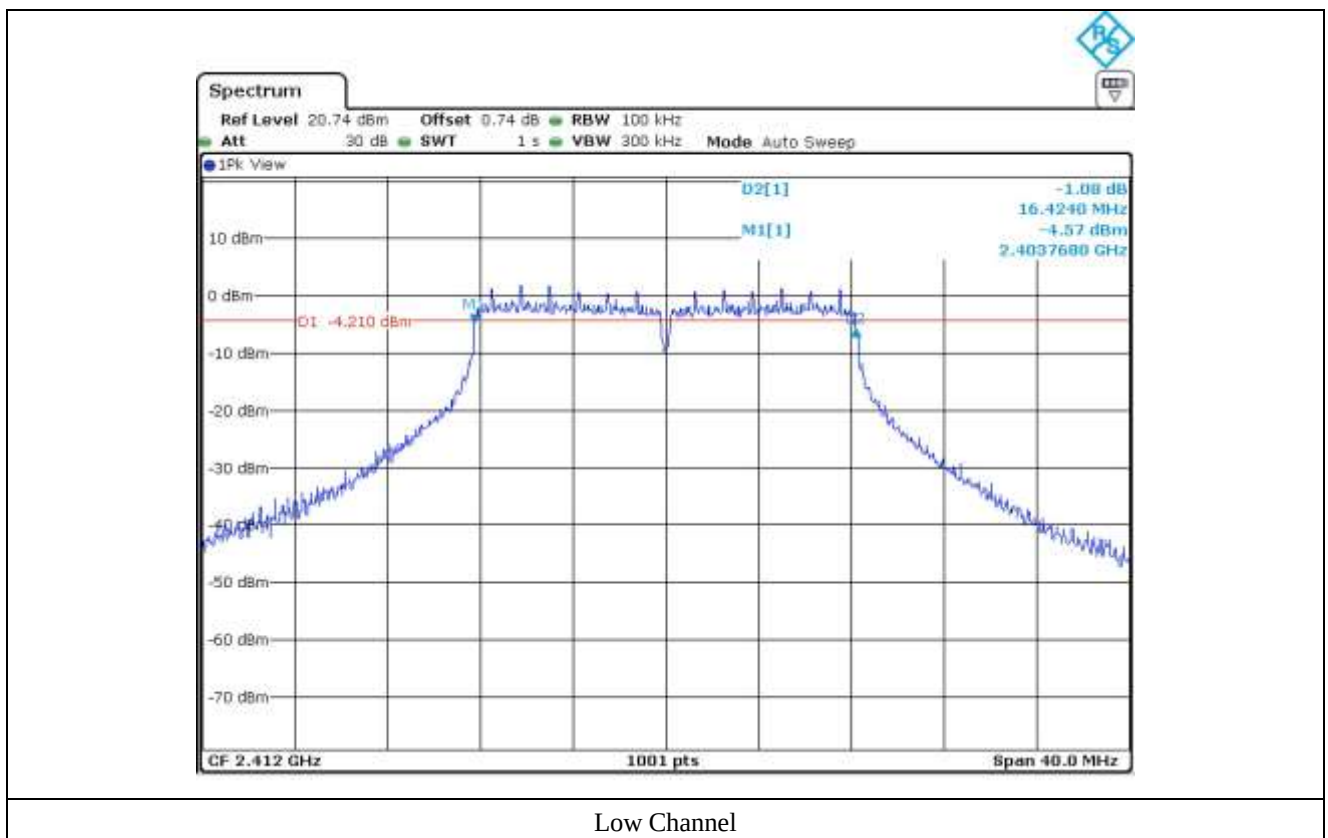
-. Test Date : April 30, 2016

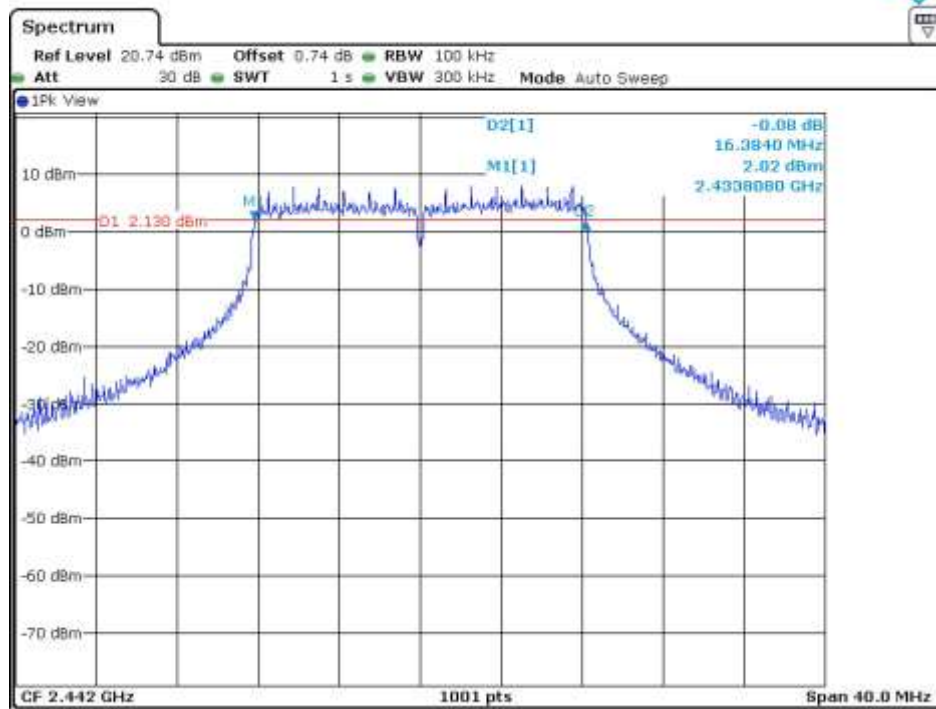
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	16.42	16.58	0.50	15.92	16.08
Middle	2 442	16.38	16.58	0.50	15.88	16.08
High	2 462	16.42	16.54	0.50	15.92	16.04

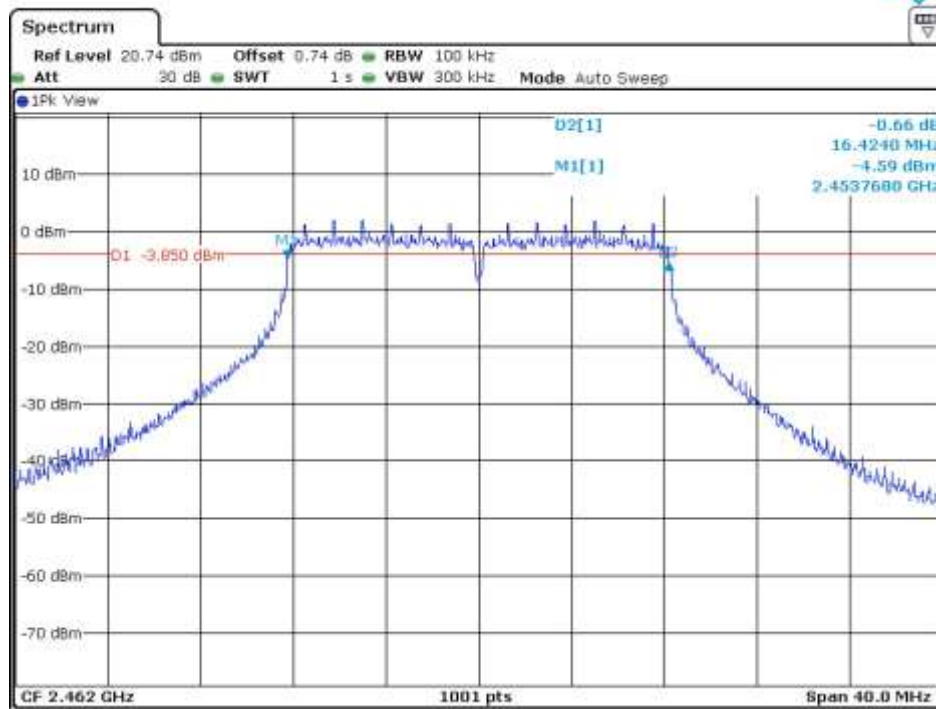
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer

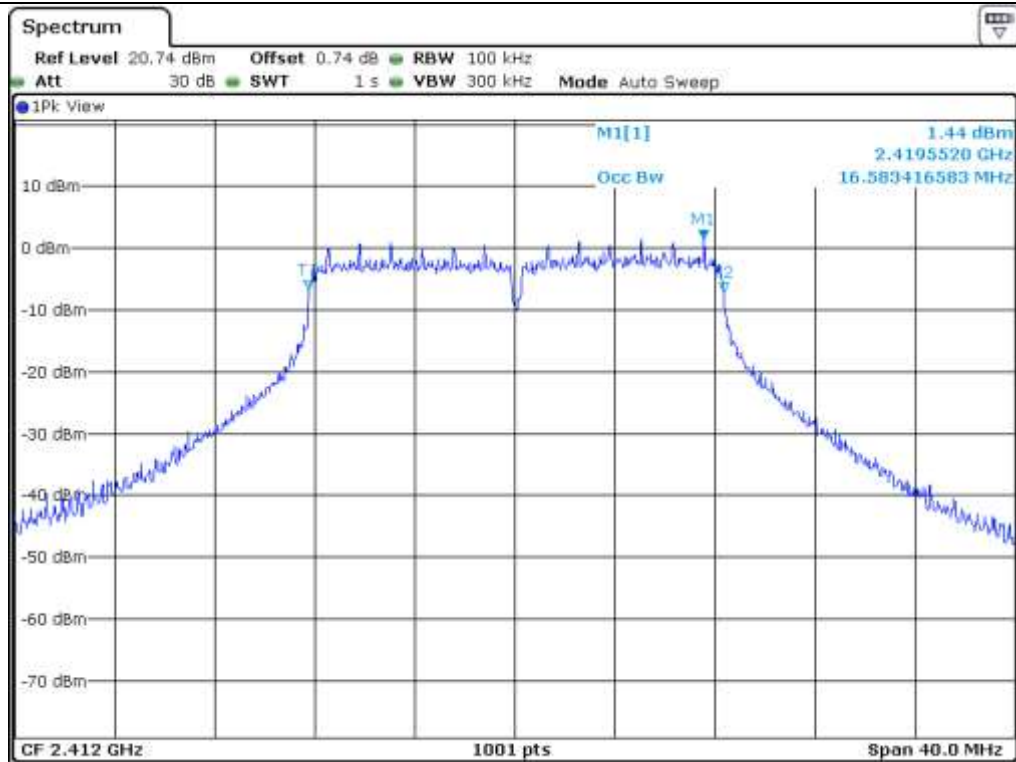




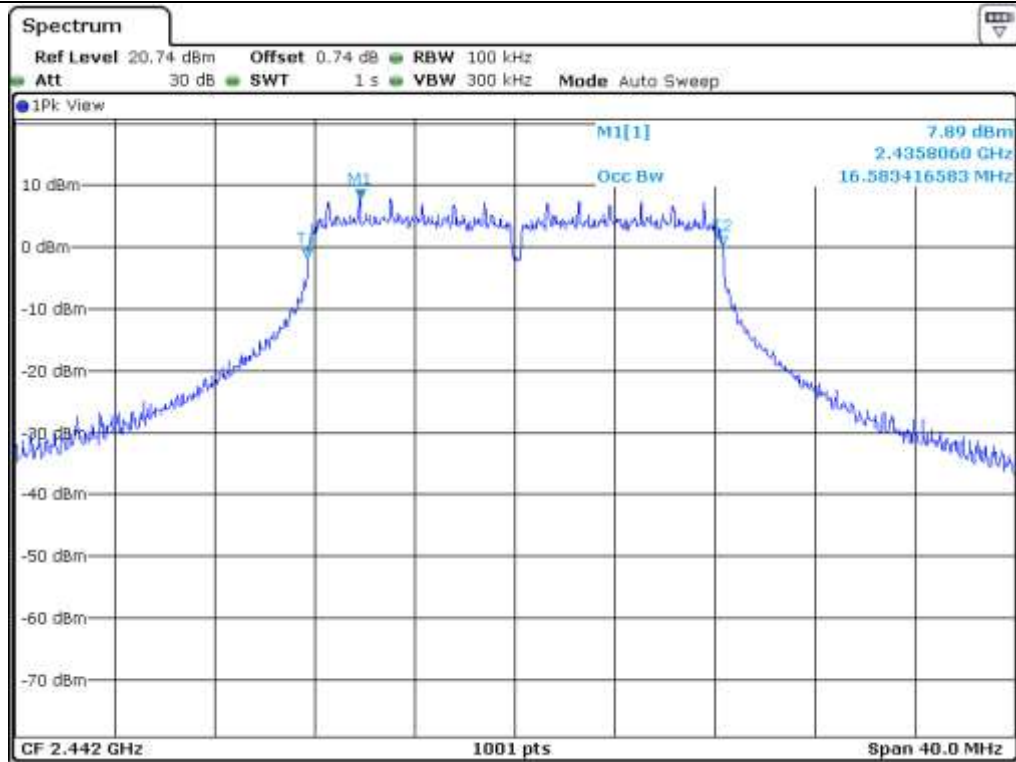
Middle Channel



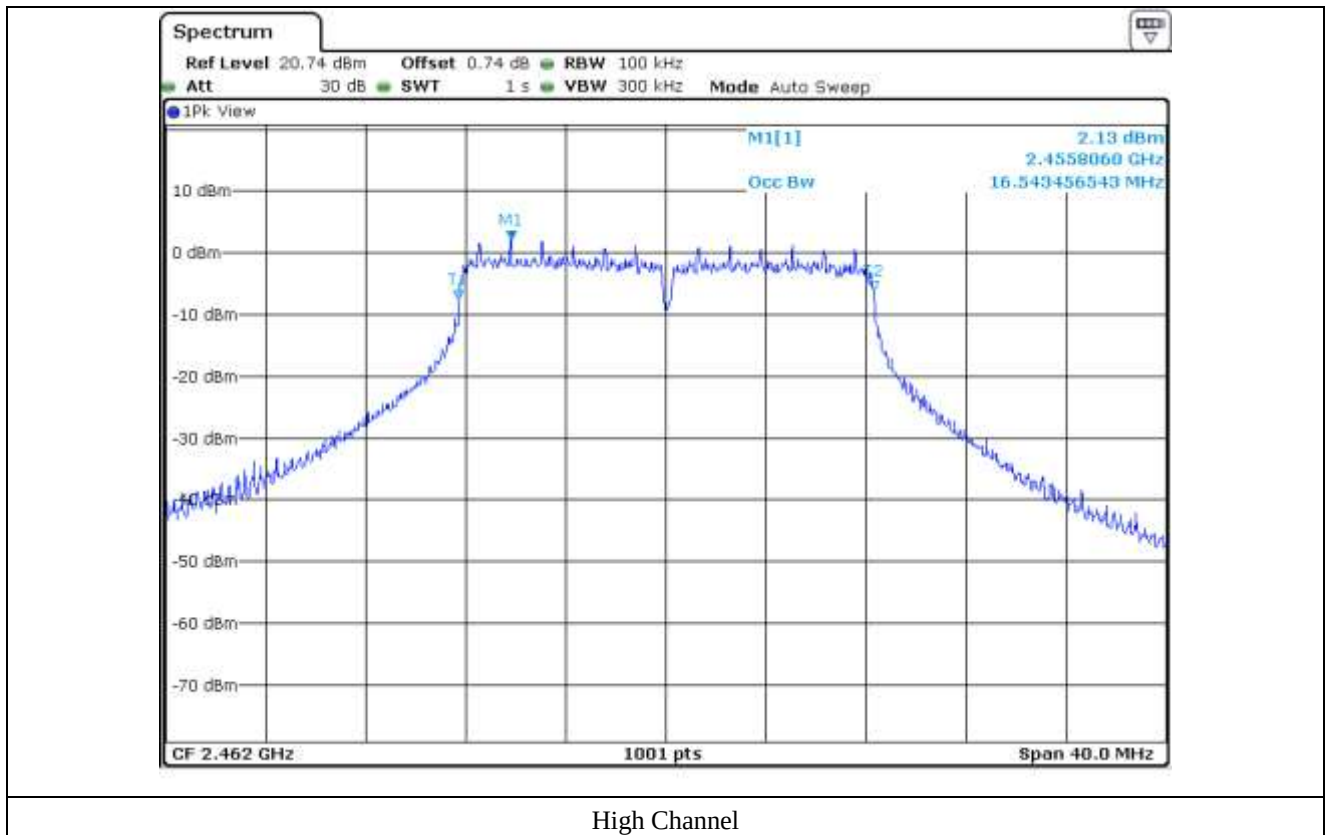
High Channel



Low Channel



Middle Channel



7.6 Test data for 802.11n_HT20 WLAN Mode

7.6.1 Test data for Antenna 0

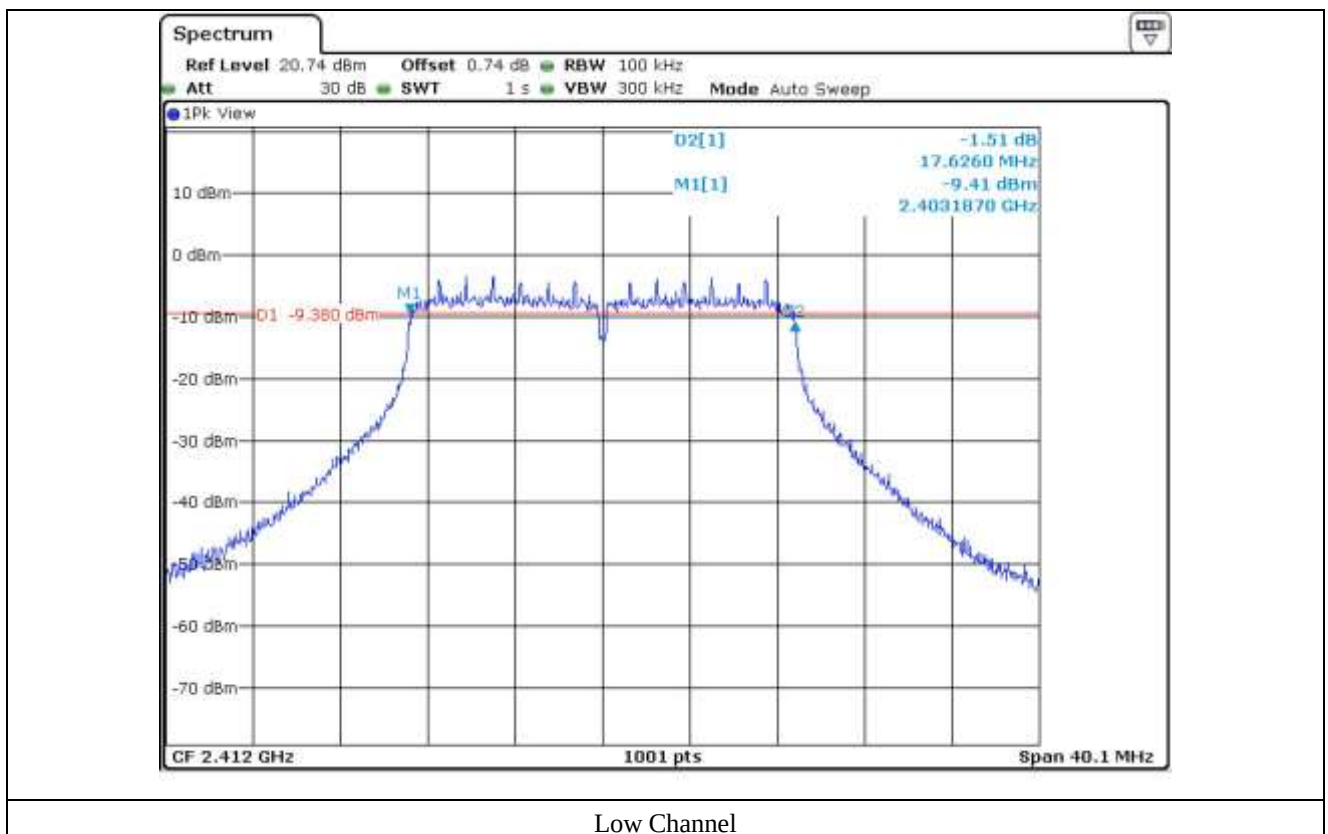
-. Test Date : April 30, 2016

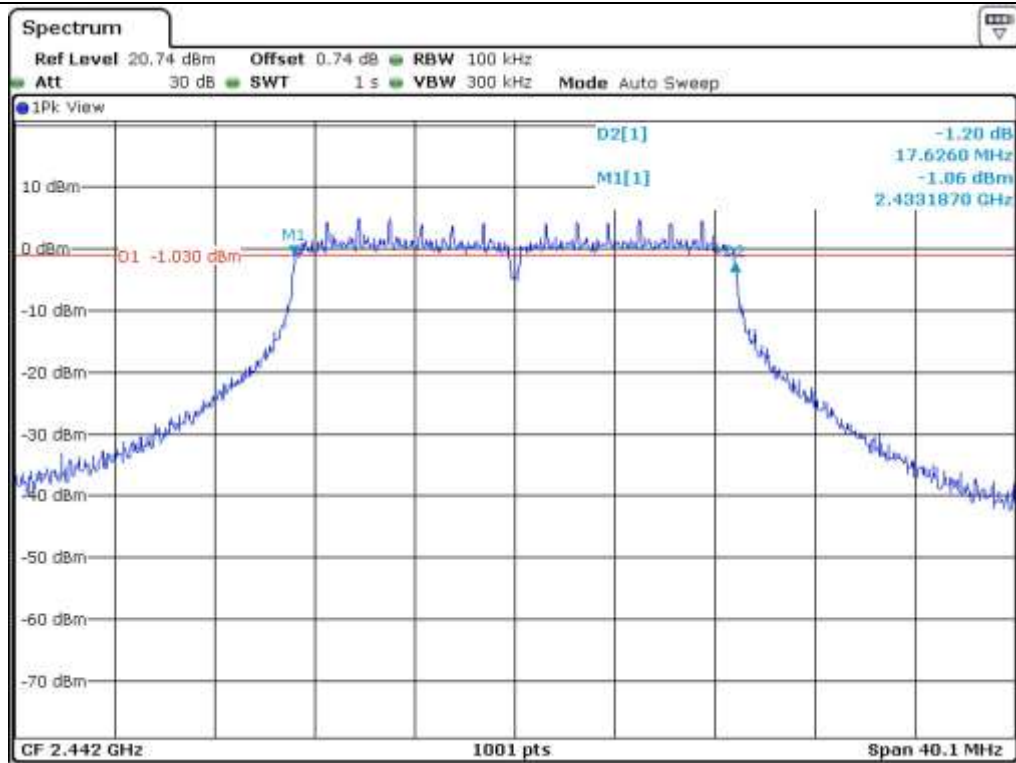
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	17.63	17.74	0.50	17.13	17.24
Middle	2 442	17.63	17.74	0.50	17.13	17.24
High	2 462	17.63	17.70	0.50	17.13	17.20

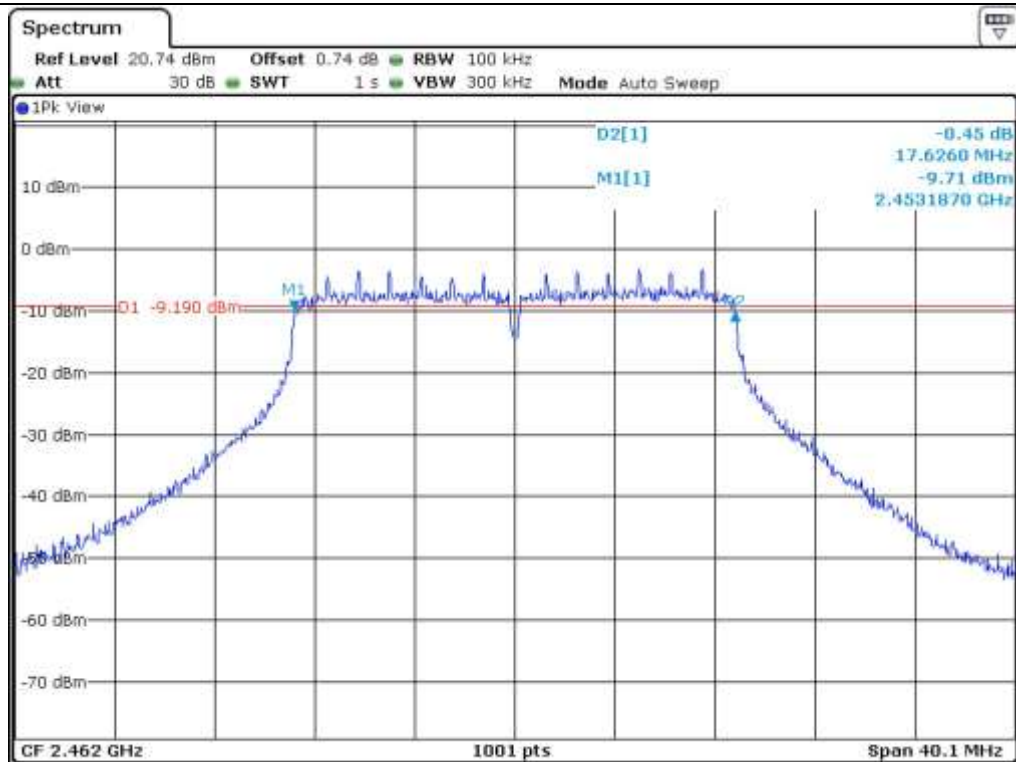
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer

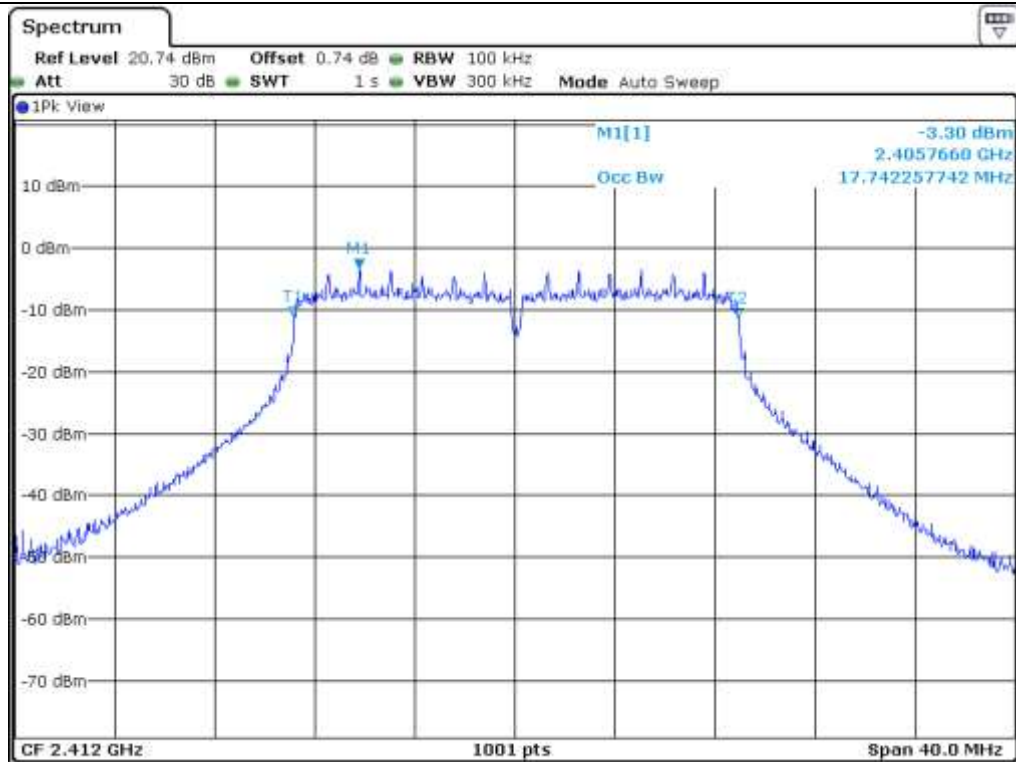




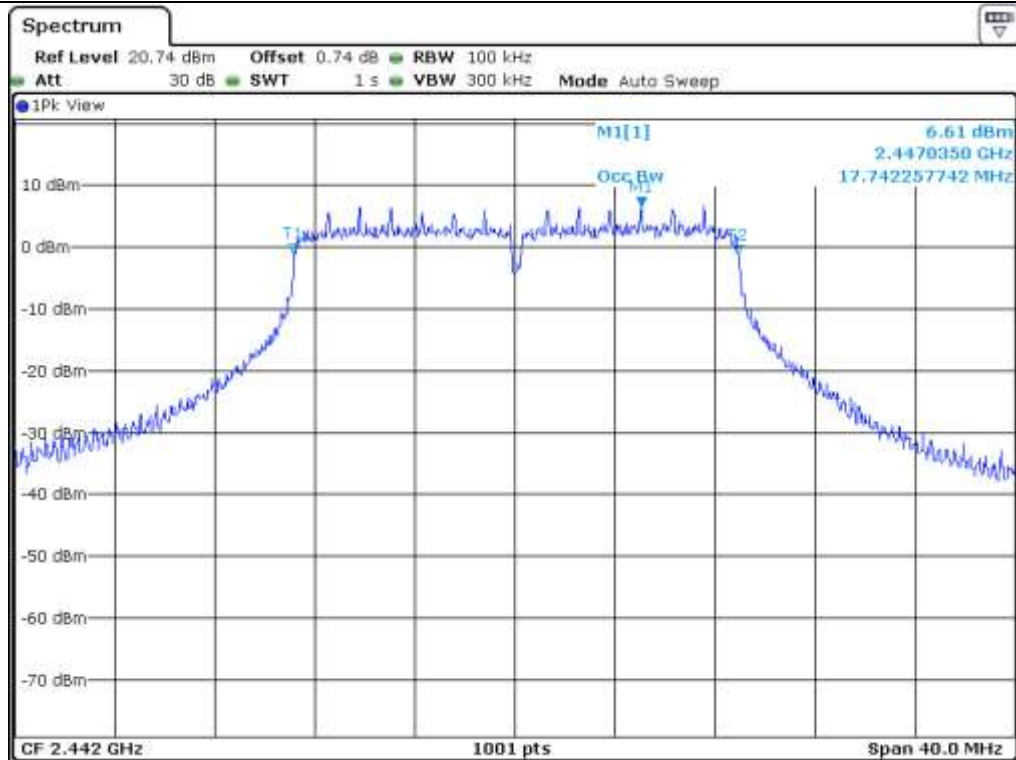
Middle Channel



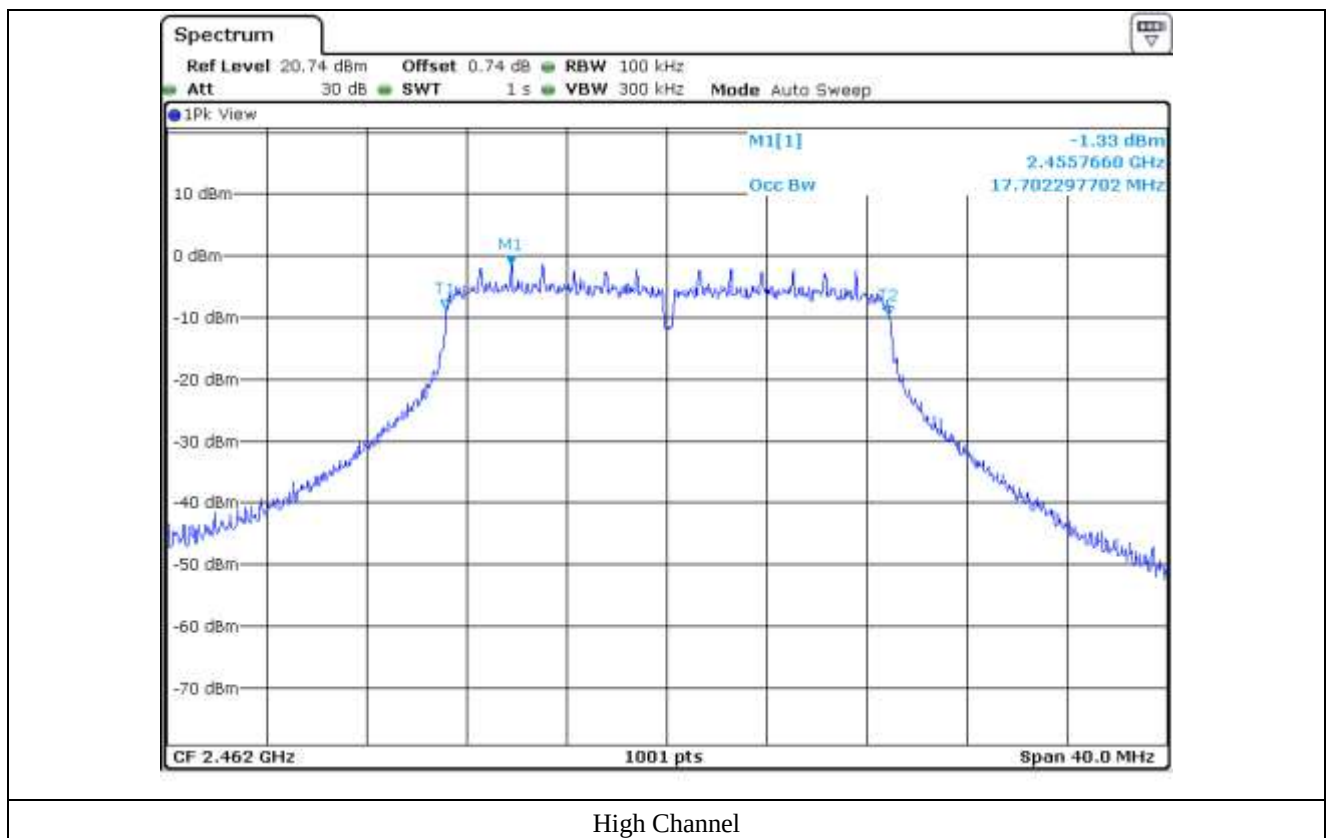
High Channel



Low Channel



Middle Channel



7.6.2 Test data for Antenna 1

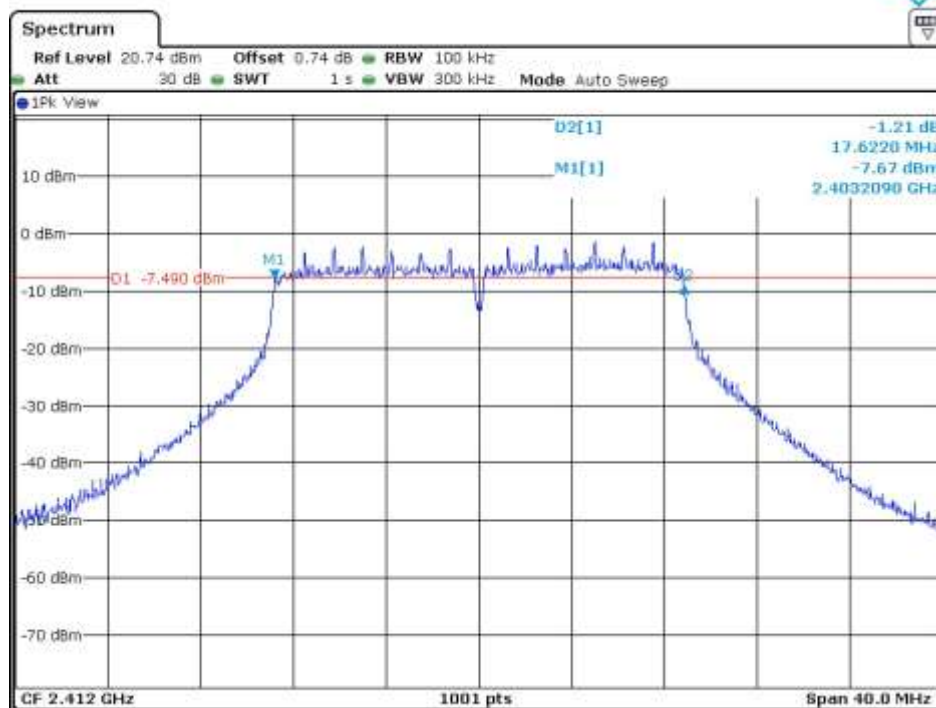
-. Test Date : April 30, 2016

-. Test Result : Pass

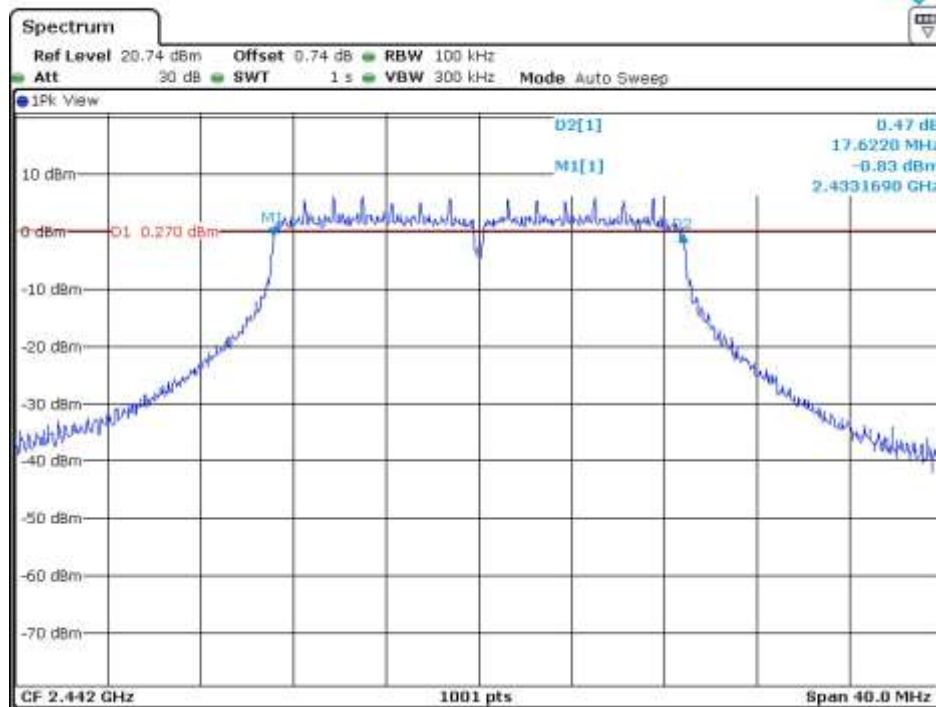
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	17.62	17.74	0.50	17.12	17.24
Middle	2 442	17.62	17.70	0.50	17.12	17.20
High	2 462	17.58	17.70	0.50	17.08	17.20

Remark. Margin = Measured Value - Limit

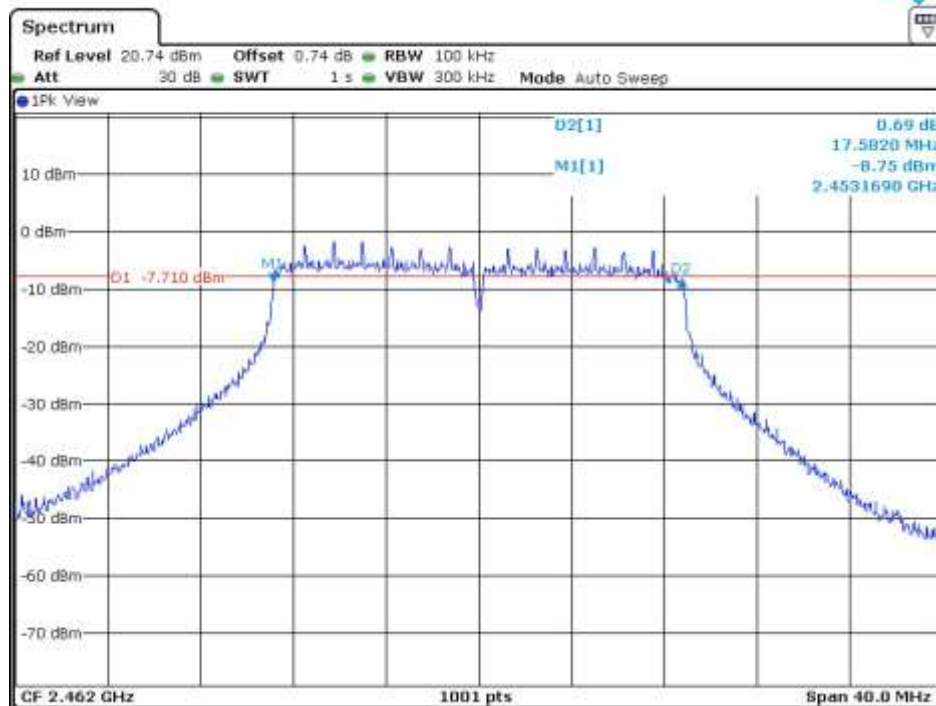
Tested by: Jun-Hui, Lee / Senior Engineer



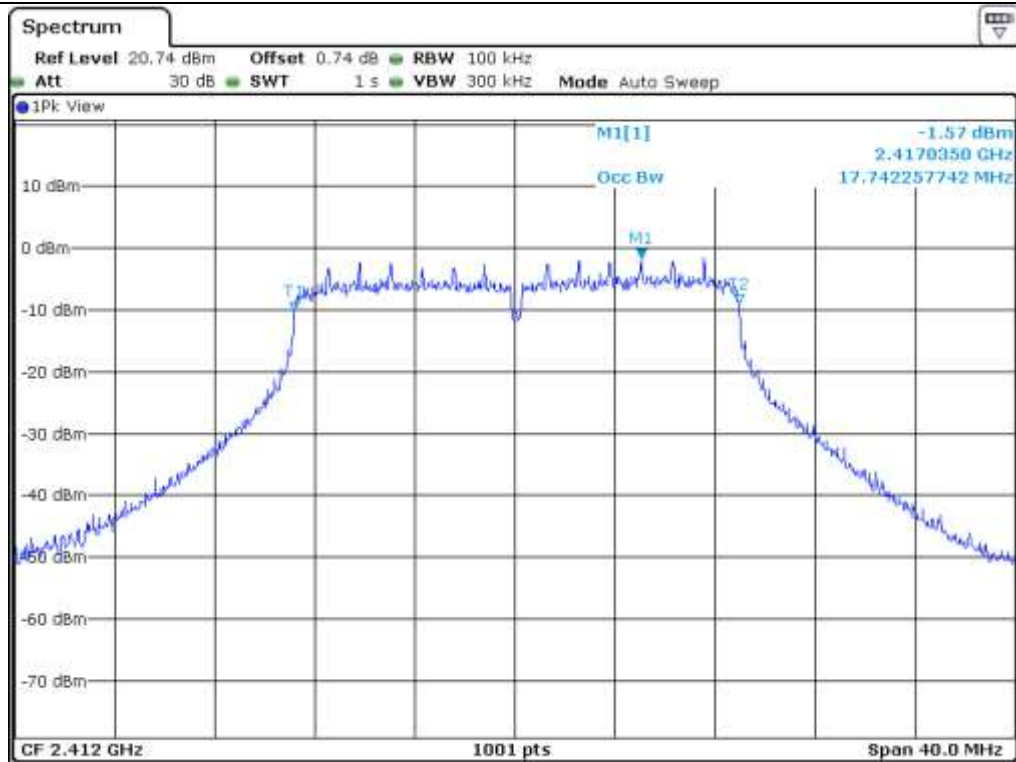
Low Channel



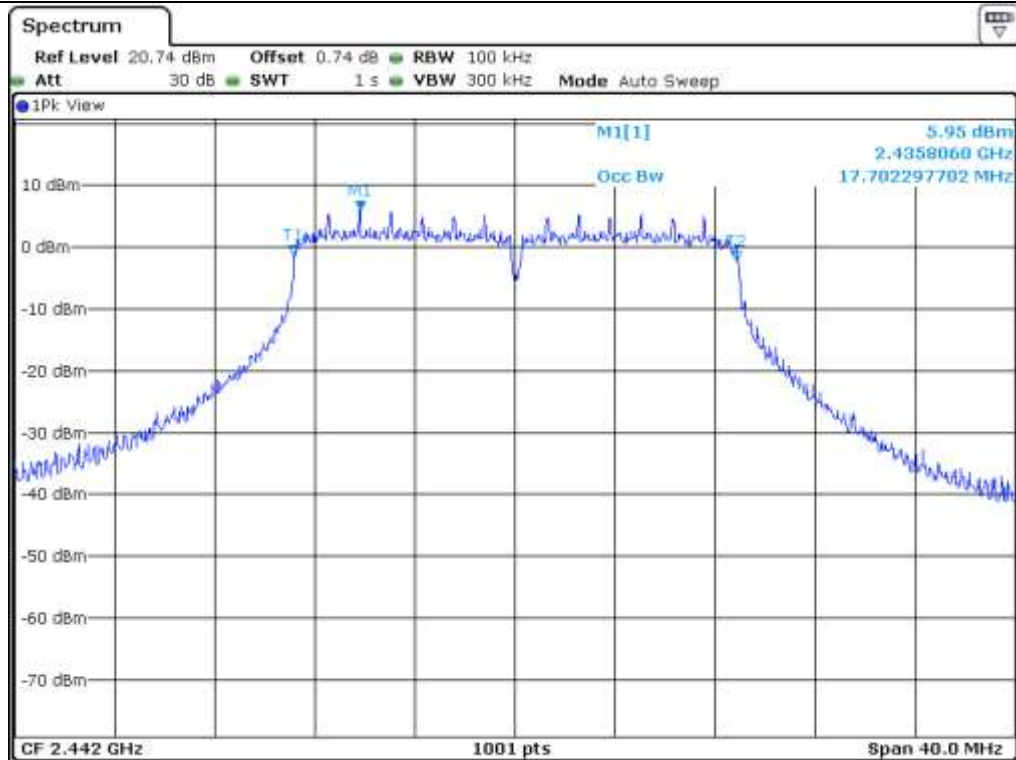
Middle Channel



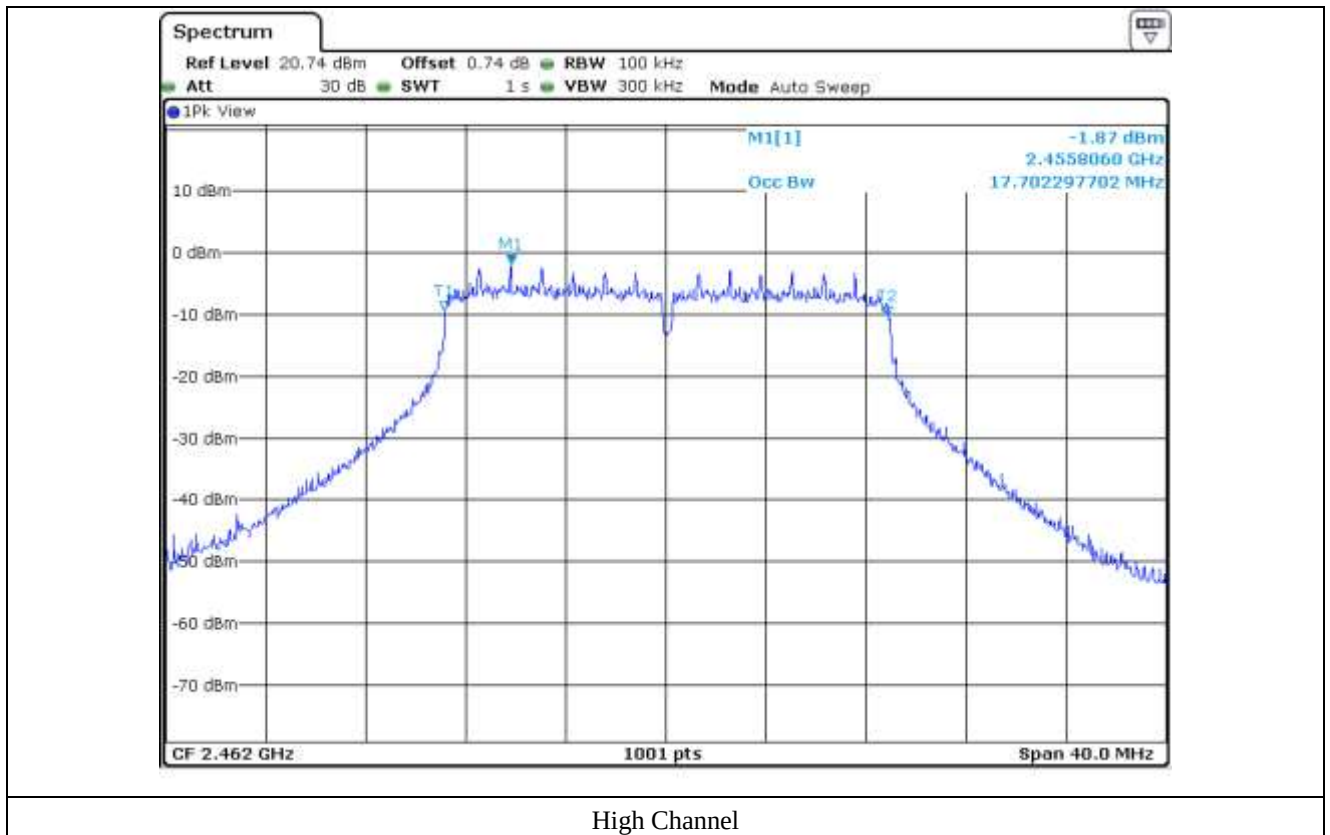
High Channel



Low Channel



Middle Channel



7.6.3 Test data for Antenna 2

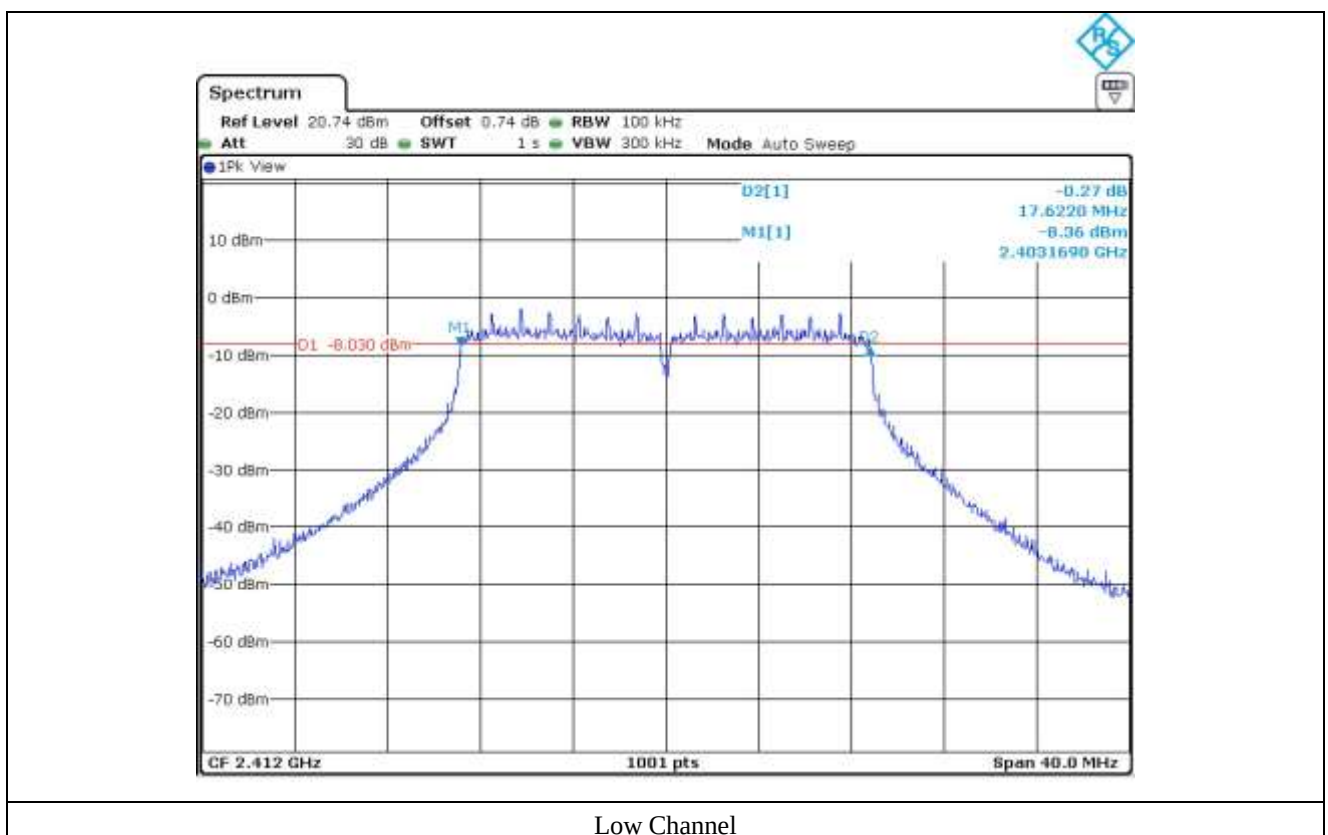
-. Test Date : April 30, 2016

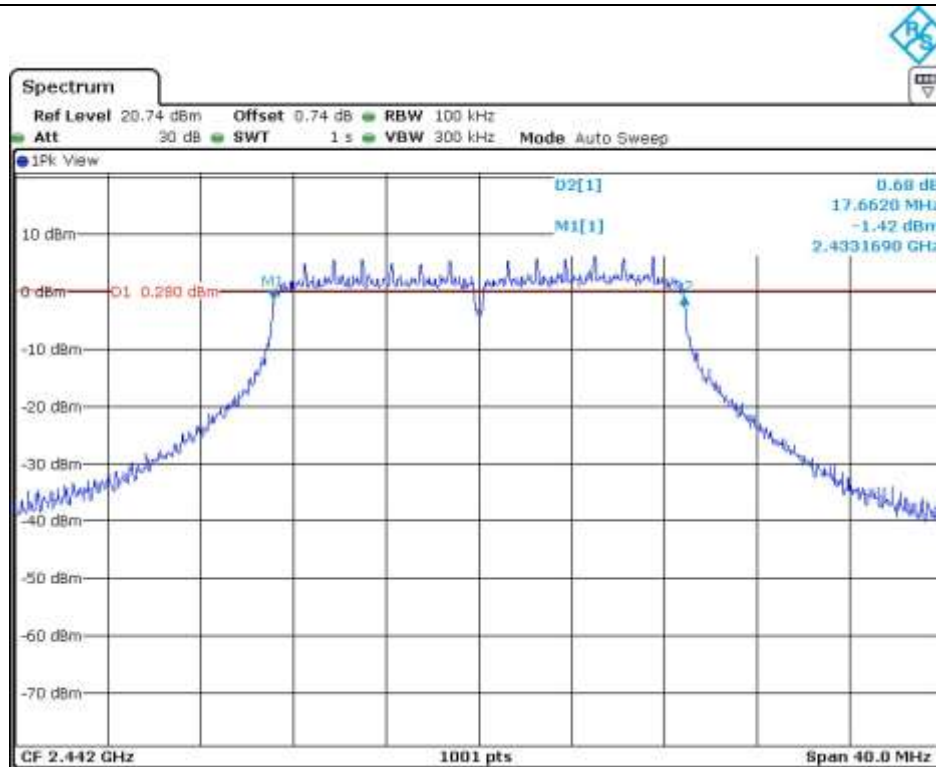
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 412	17.62	17.74	0.50	17.12	17.24
Middle	2 442	17.66	17.70	0.50	17.16	17.20
High	2 462	17.62	17.74	0.50	17.12	17.24

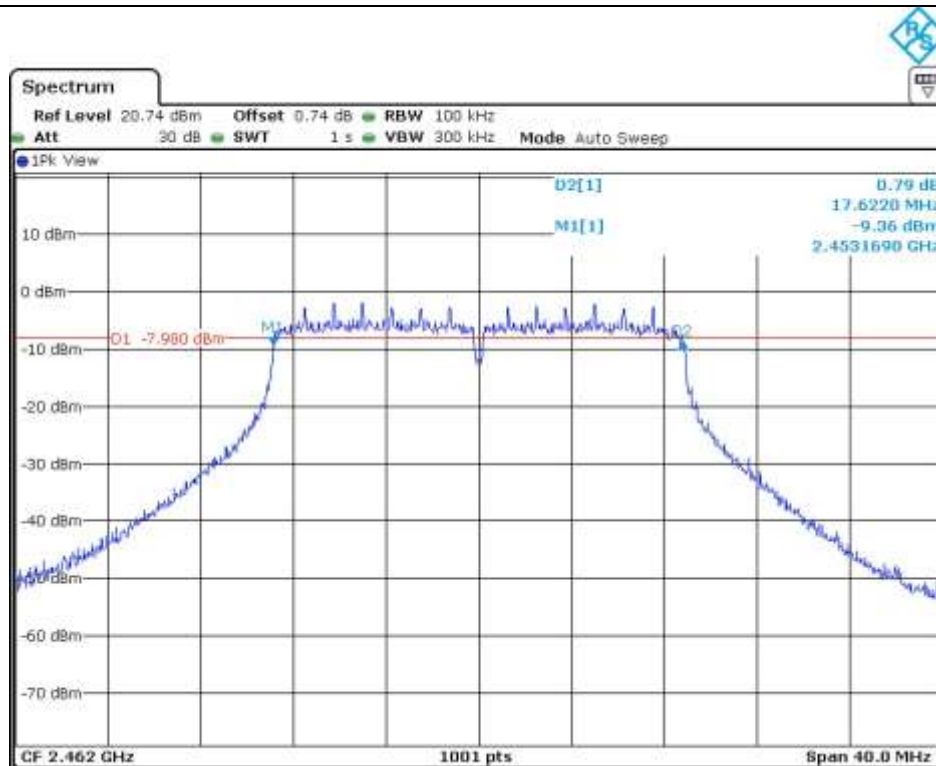
Remark. Margin = Measured Value - Limit


 Tested by: Jun-Hui, Lee / Senior Engineer

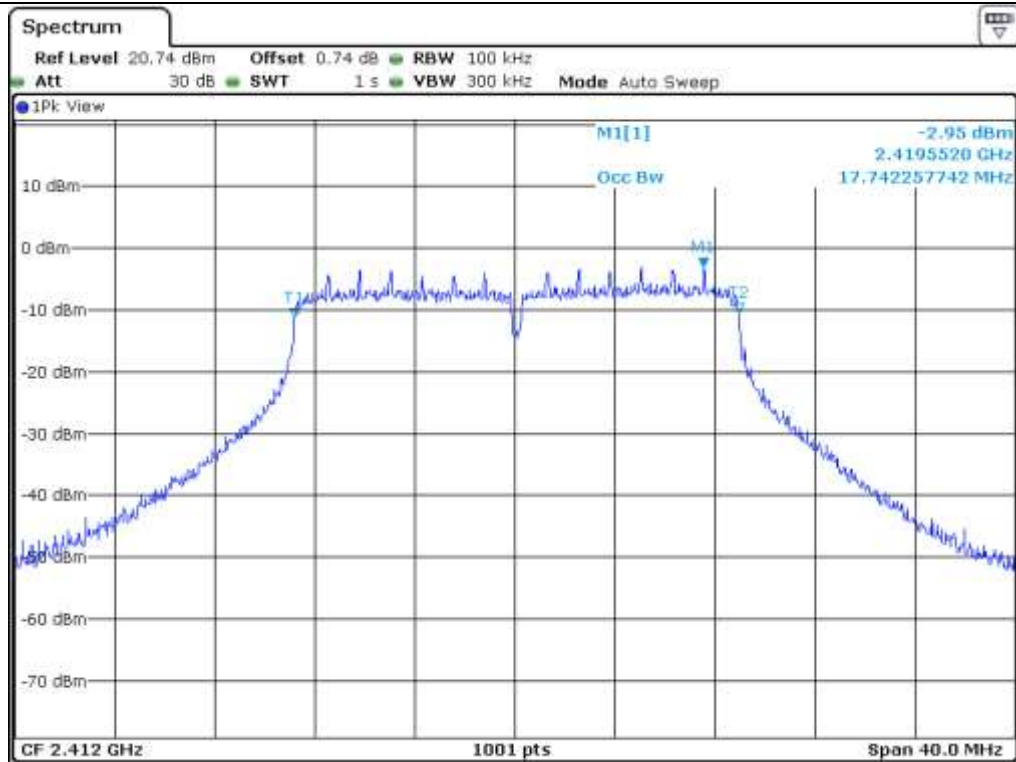




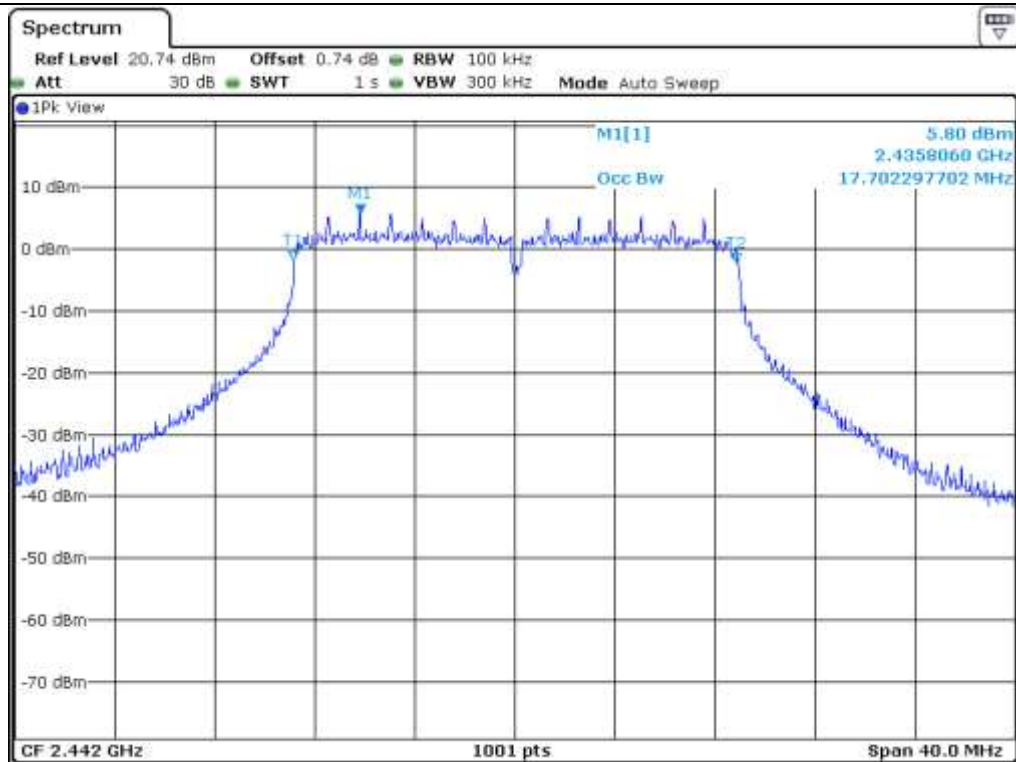
Middle Channel



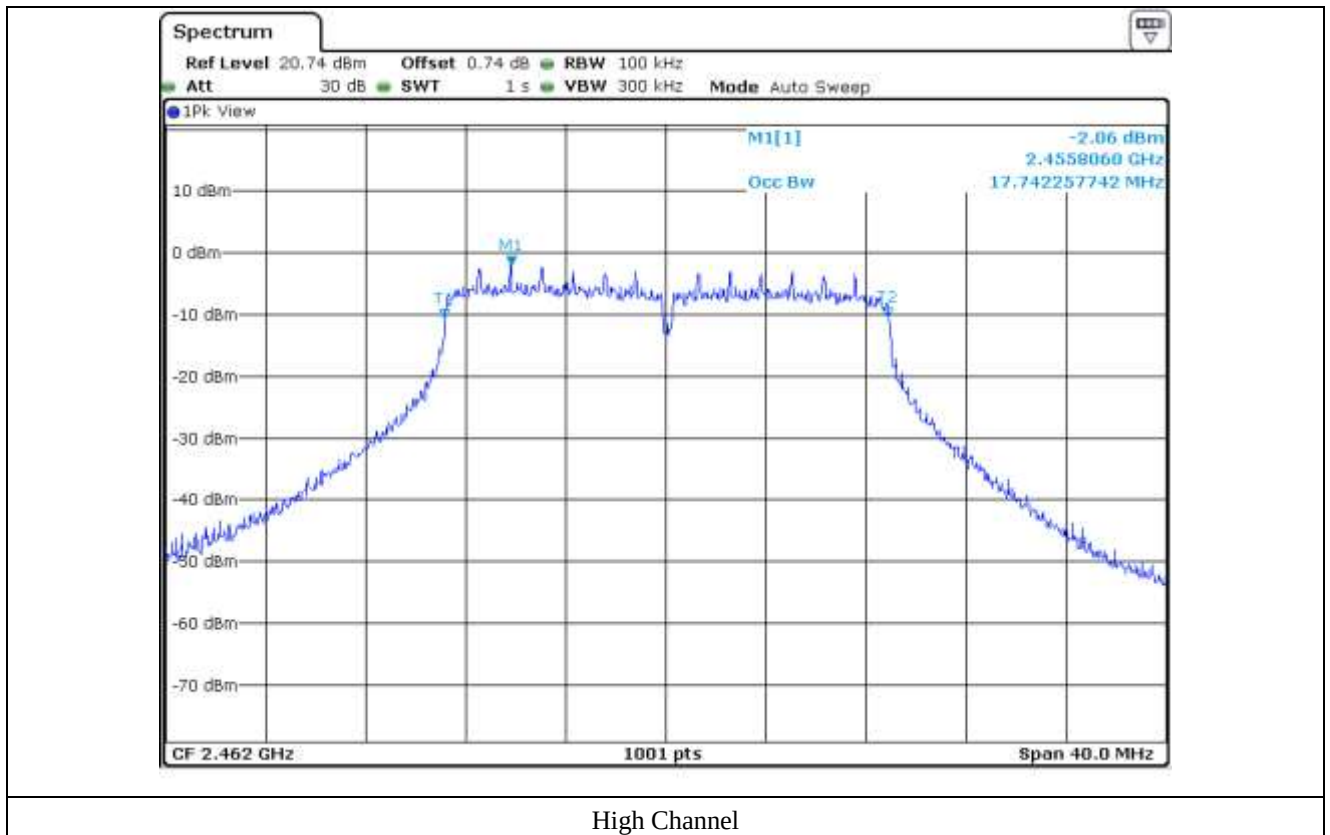
High Channel

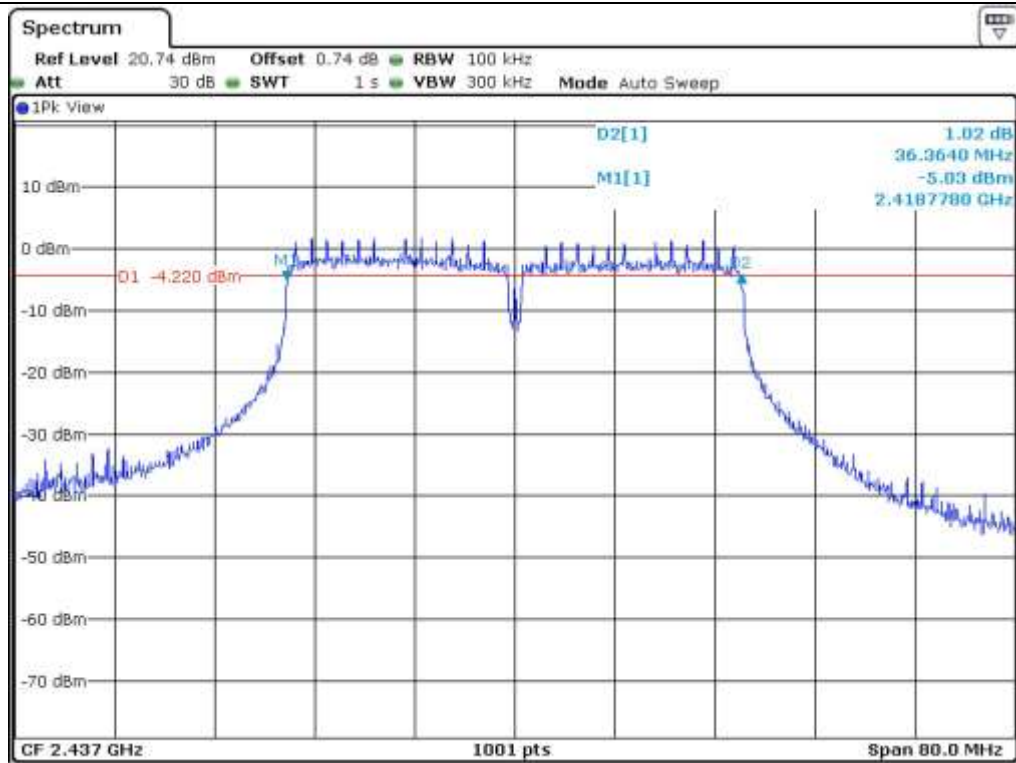


Low Channel

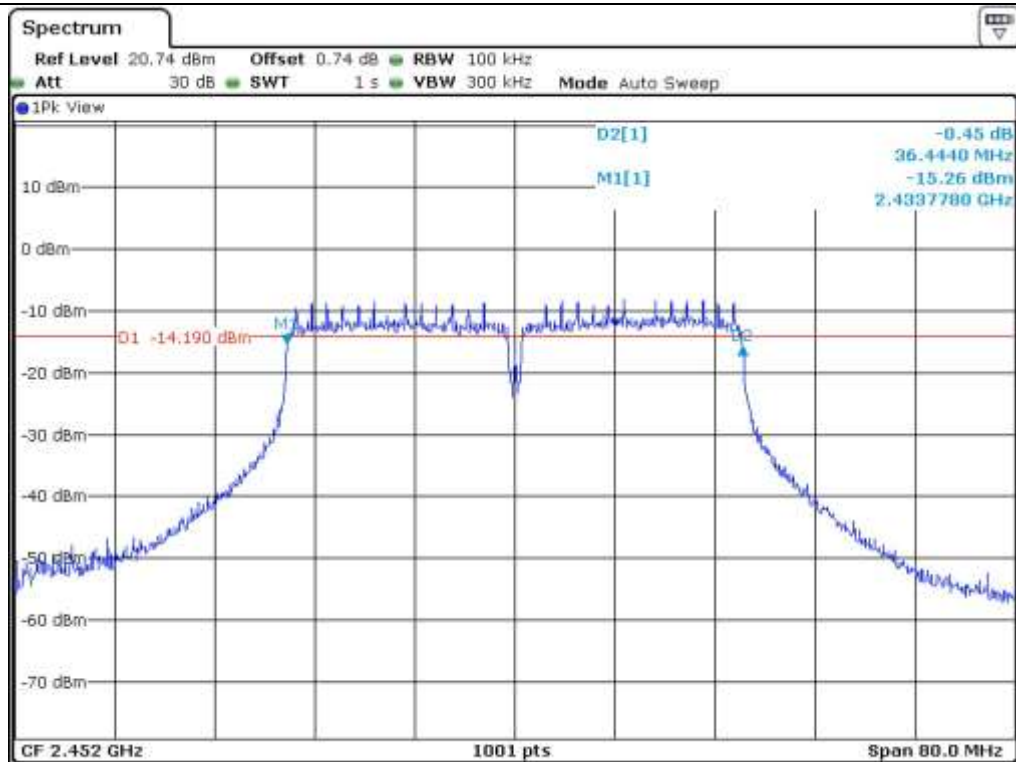


Middle Channel

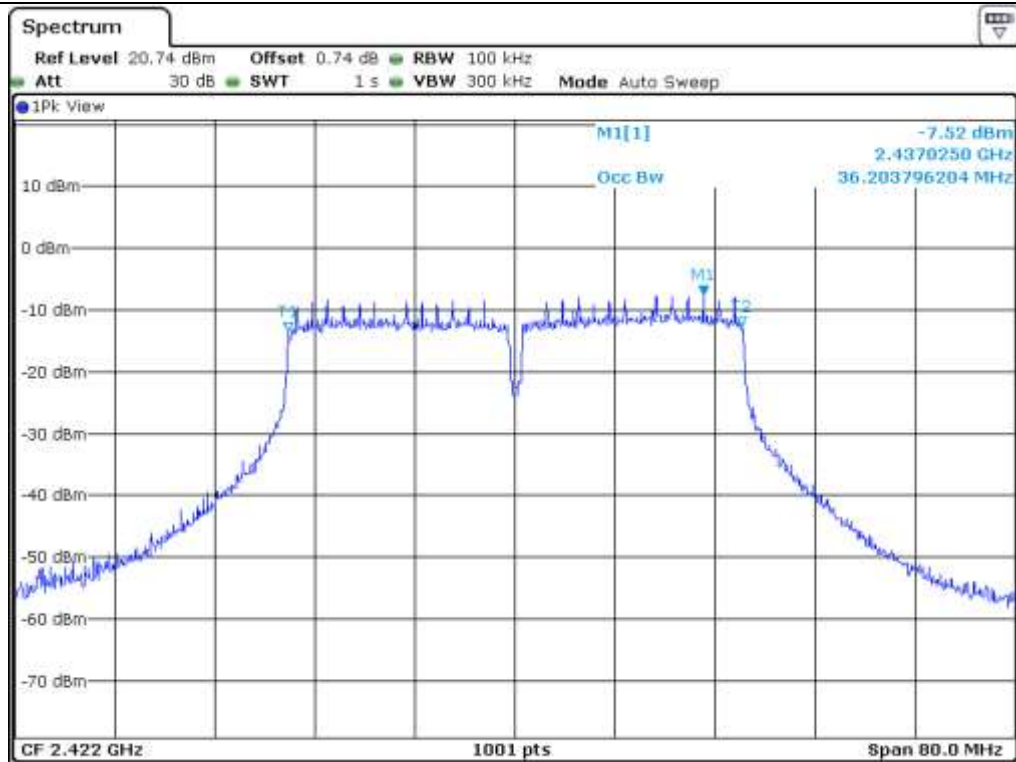




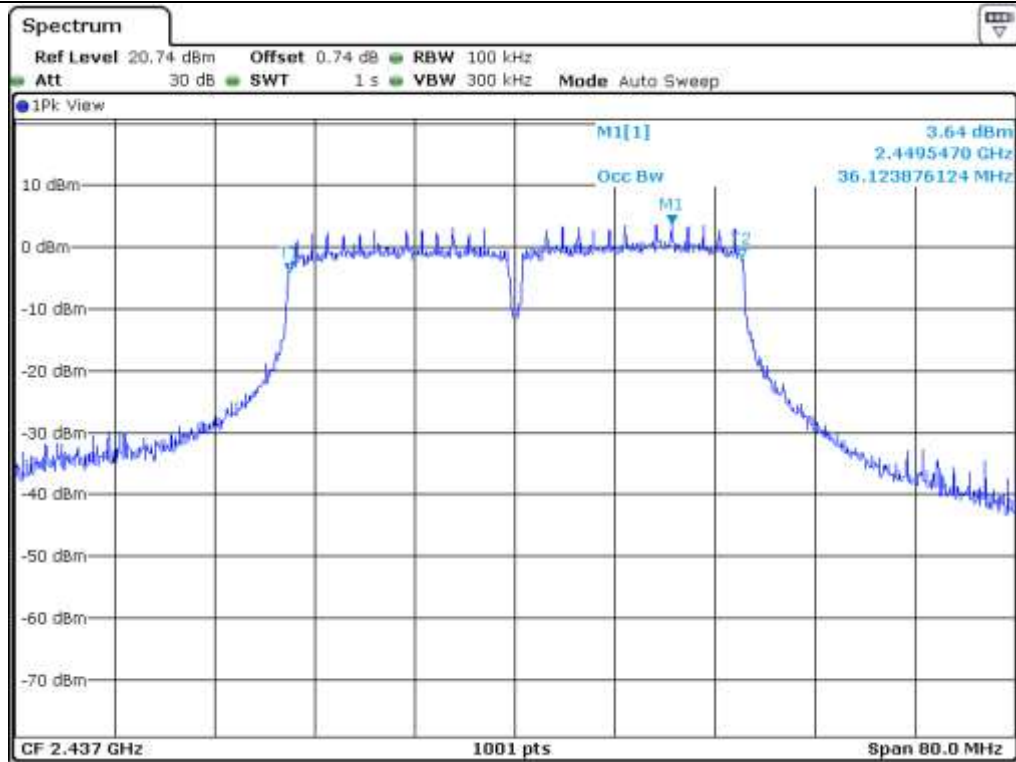
Middle Channel



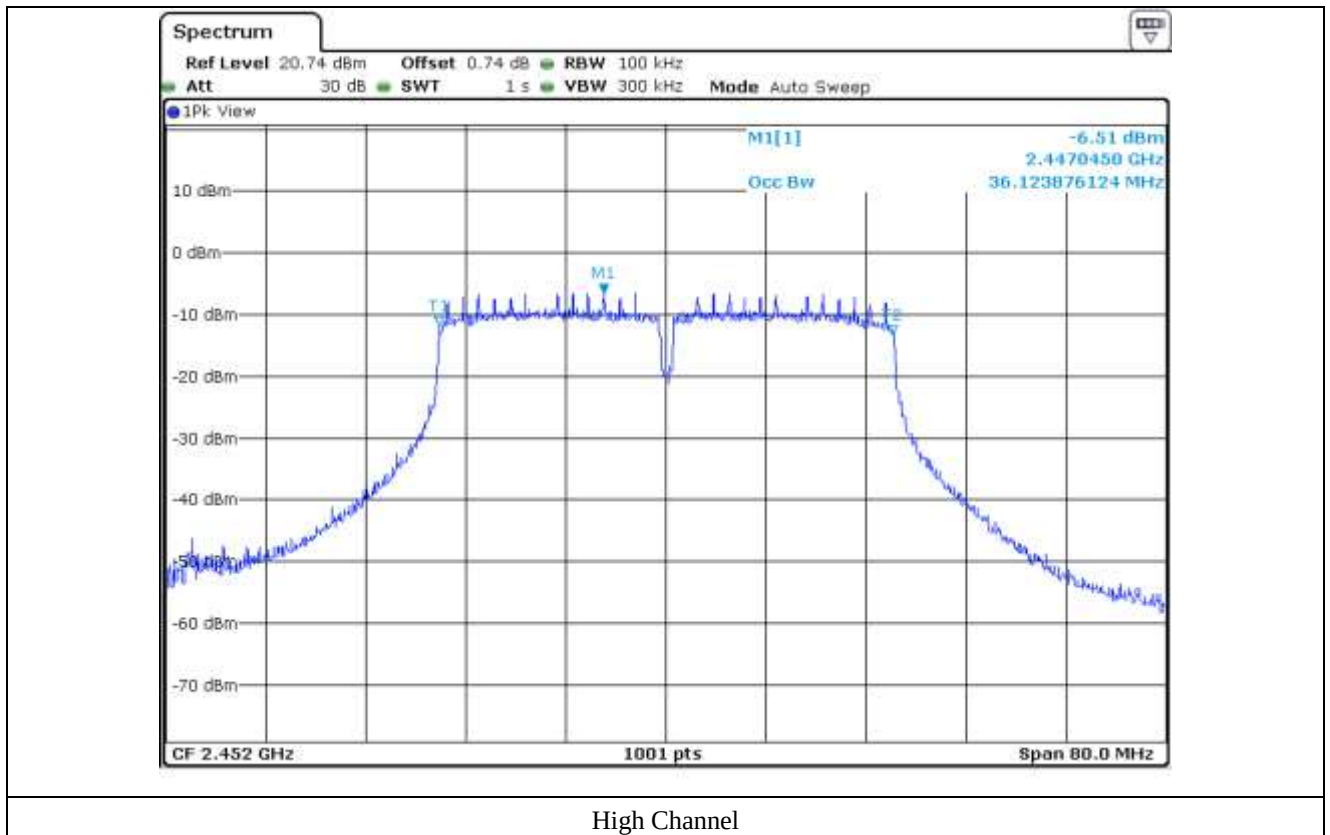
High Channel



Low Channel



Middle Channel



7.7.2 Test data for Antenna 1

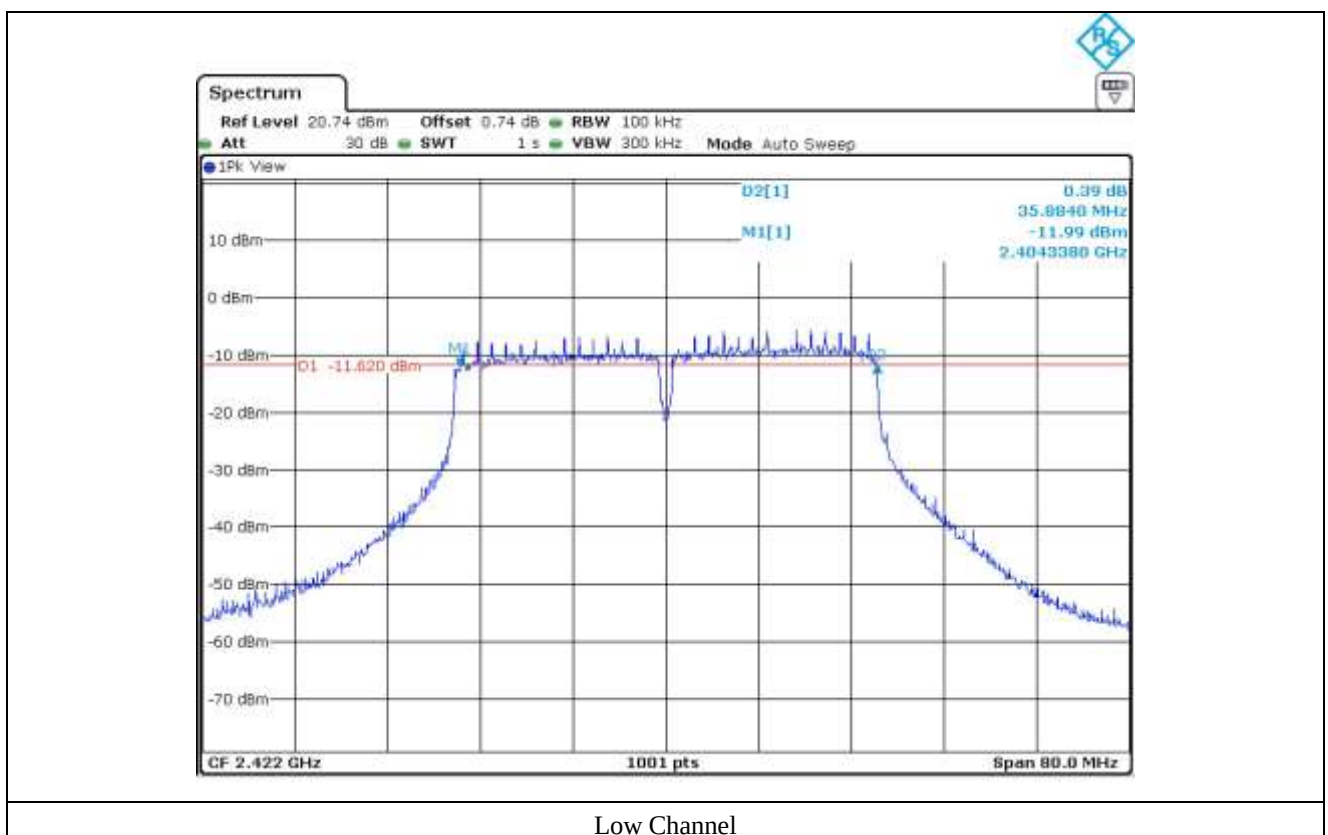
-. Test Date : April 30, 2016

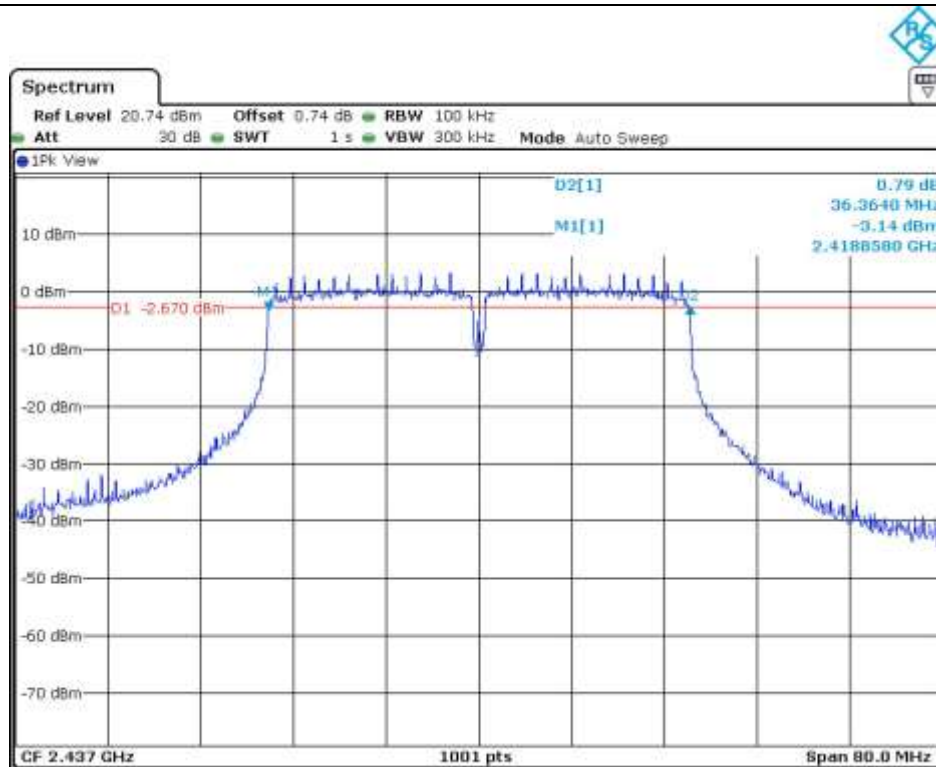
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 422	35.88	36.04	0.50	35.38	35.54
Middle	2 437	36.36	36.12	0.50	35.86	35.62
High	2 452	36.20	36.12	0.50	35.70	35.62

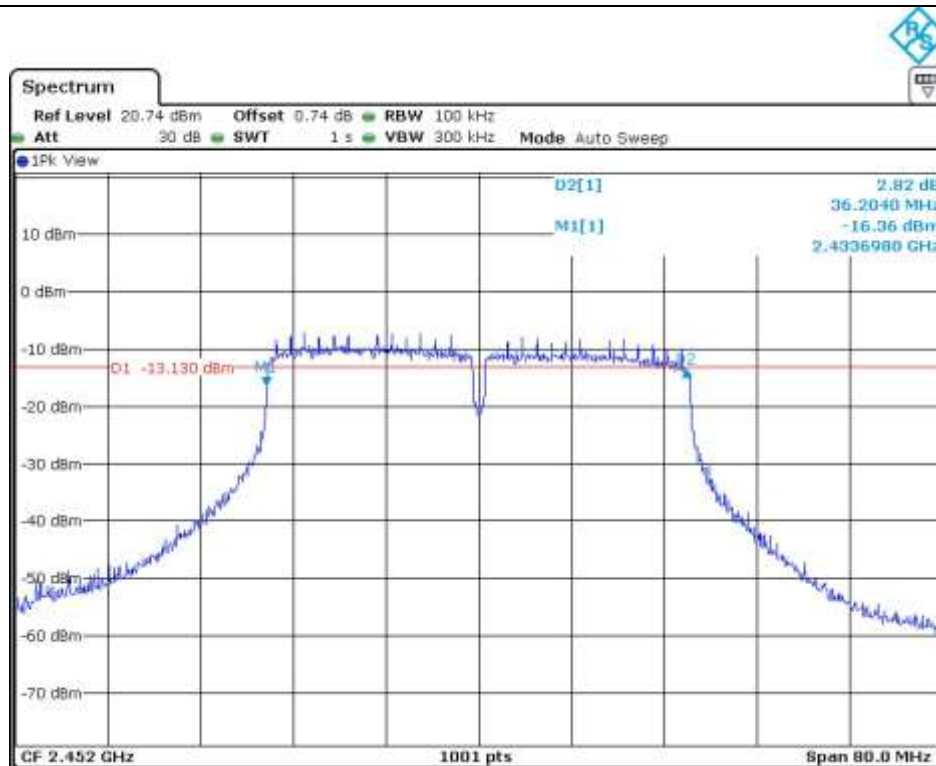
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer

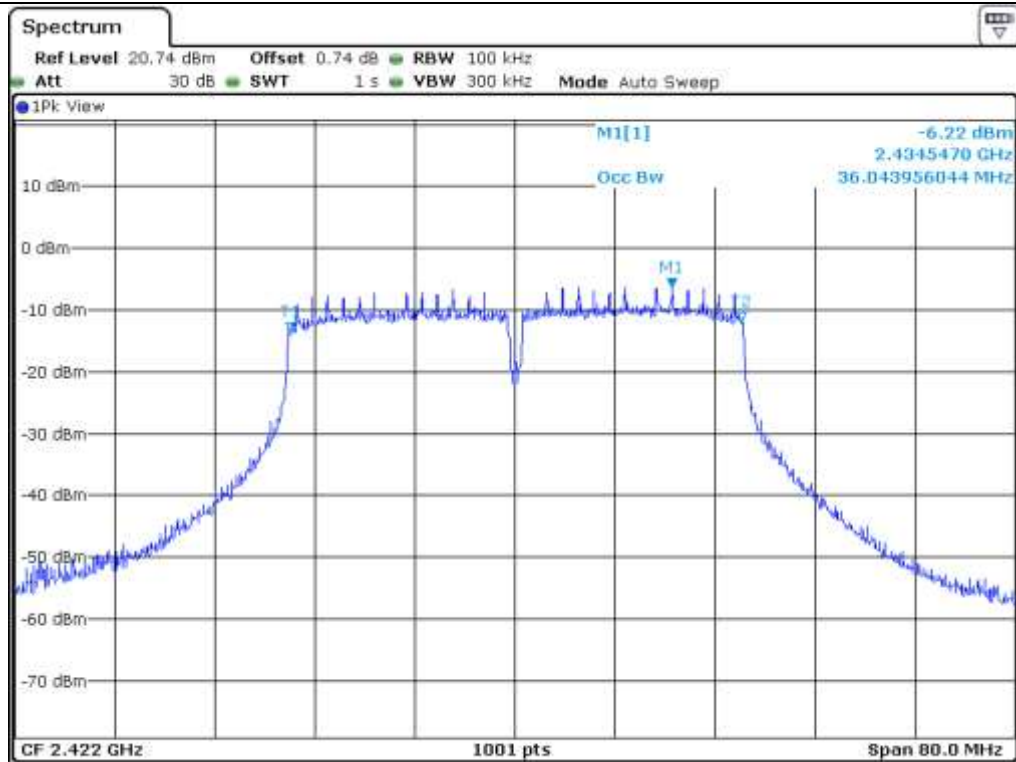




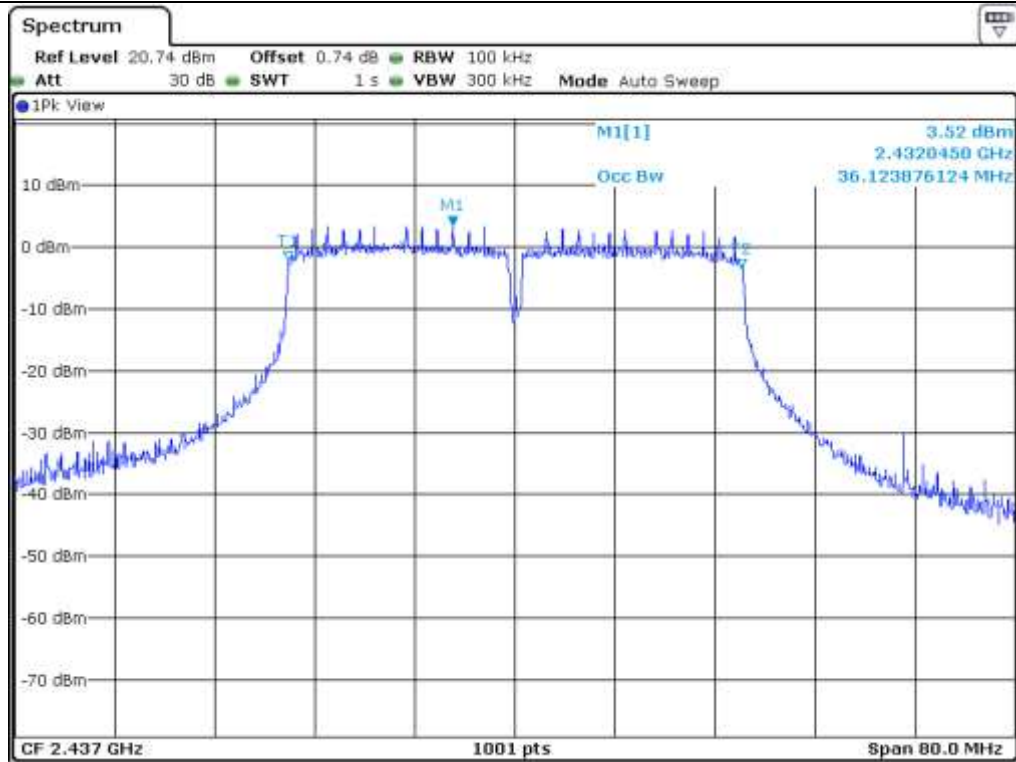
Middle Channel



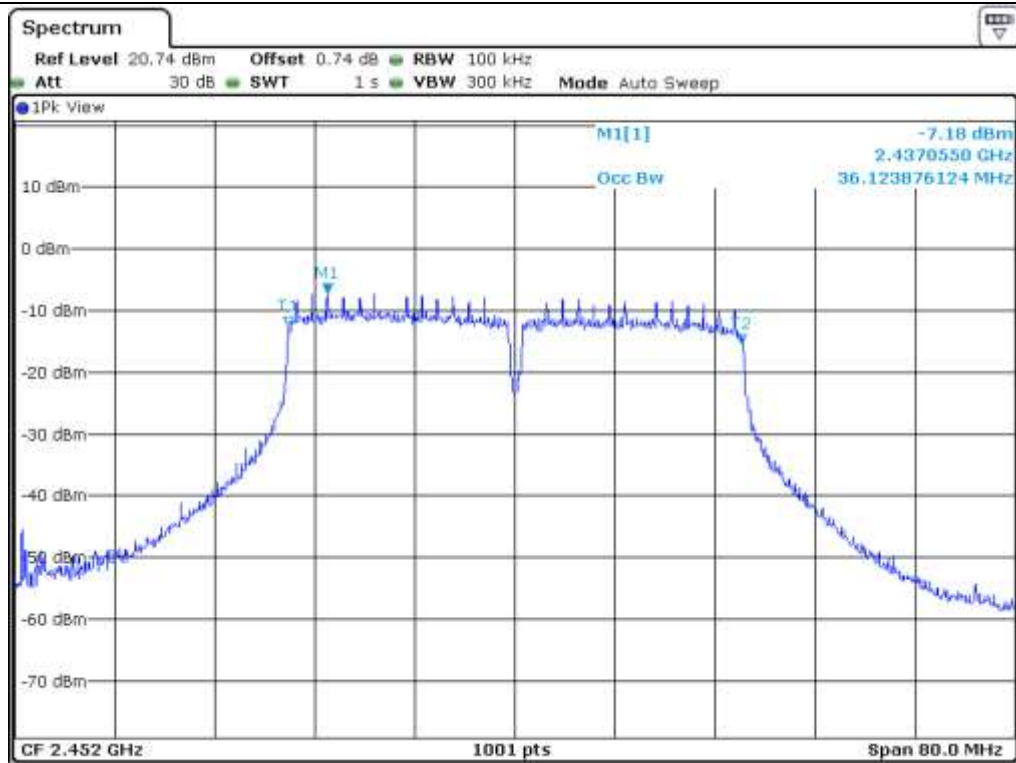
High Channel



Low Channel



Middle Channel



High Channel

7.7.3 Test data for Antenna 2

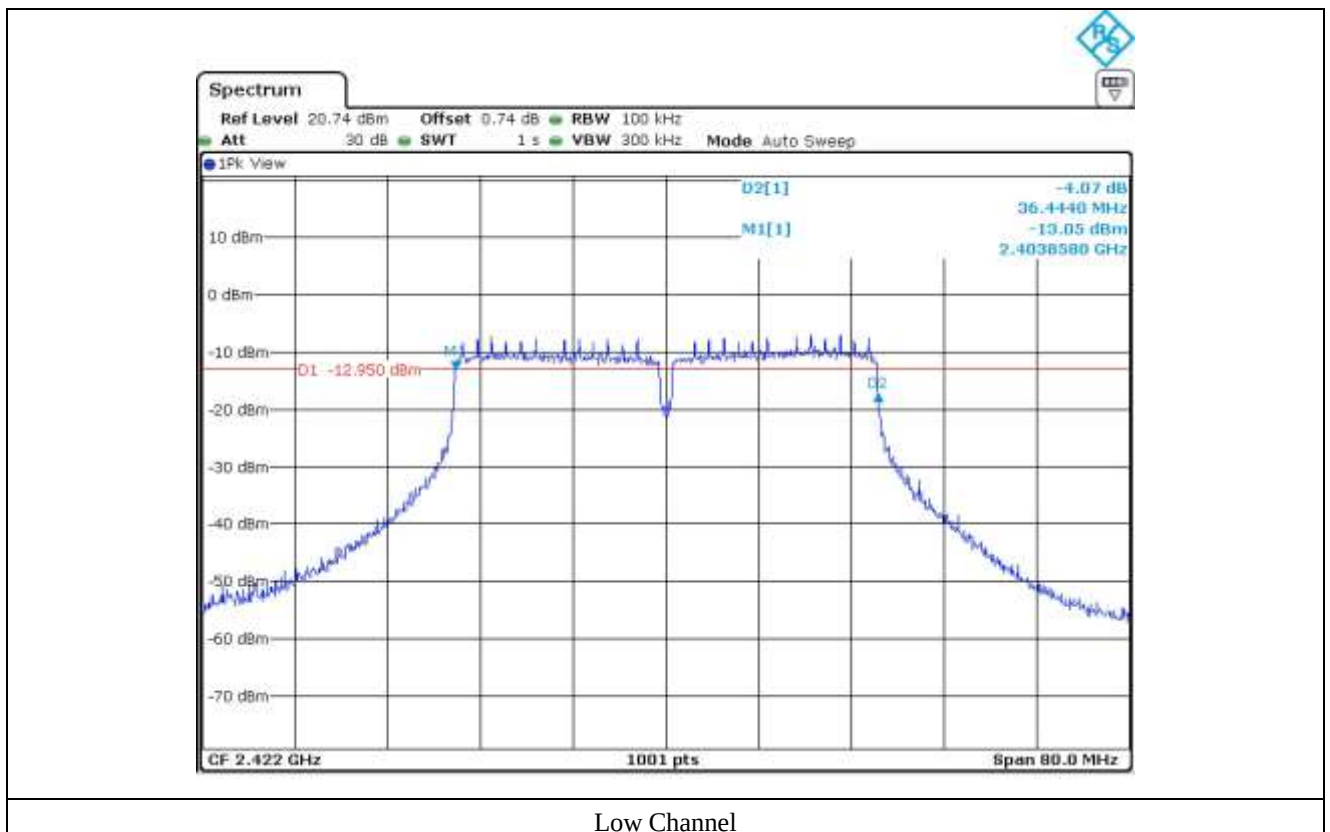
-. Test Date : April 30, 2016

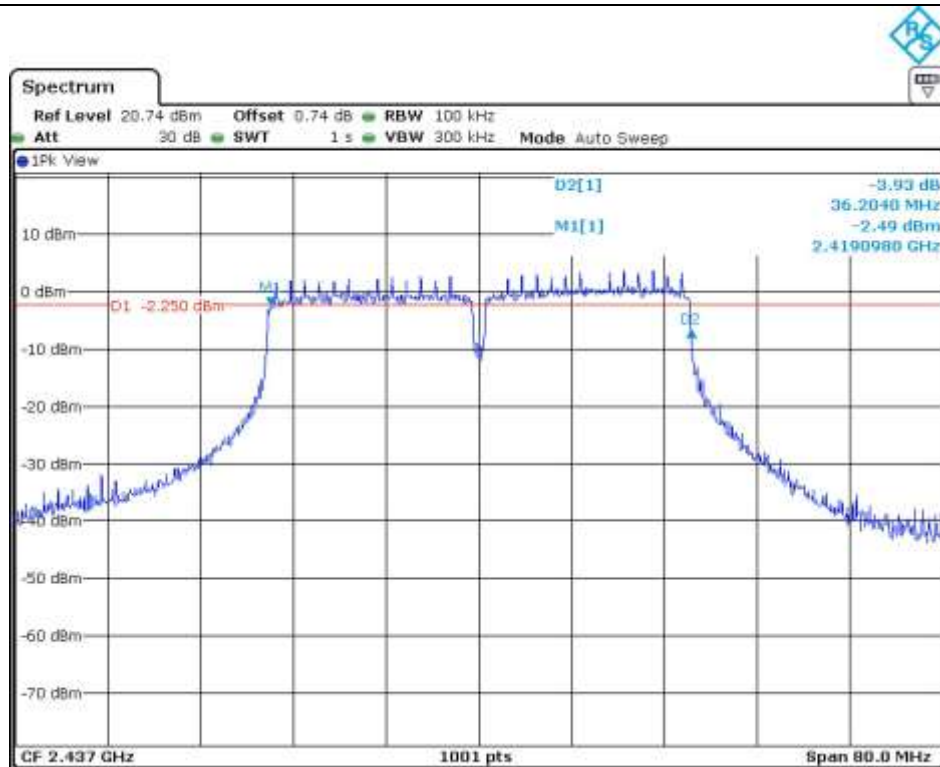
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	LIMIT (MHz)	Margin(MHz)	
					FCC	IC
Low	2 422	36.44	36.12	0.50	35.94	35.62
Middle	2 437	36.20	36.12	0.50	35.70	35.62
High	2 452	36.36	36.04	0.50	35.86	35.54

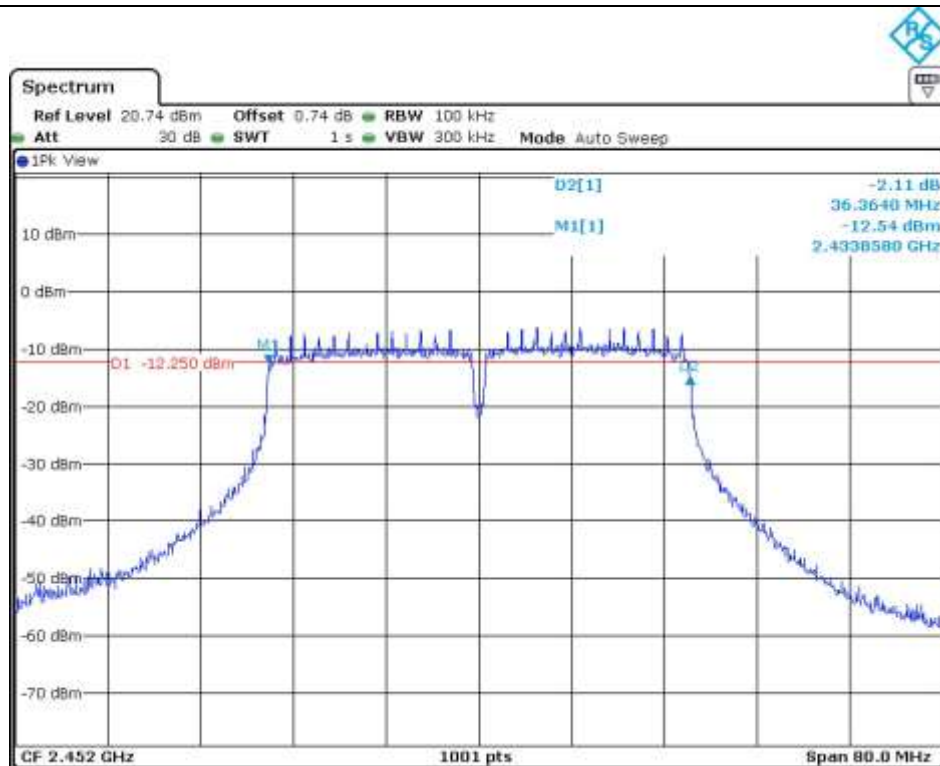
Remark. Margin = Measured Value - Limit

Tested by: Jun-Hui, Lee / Senior Engineer

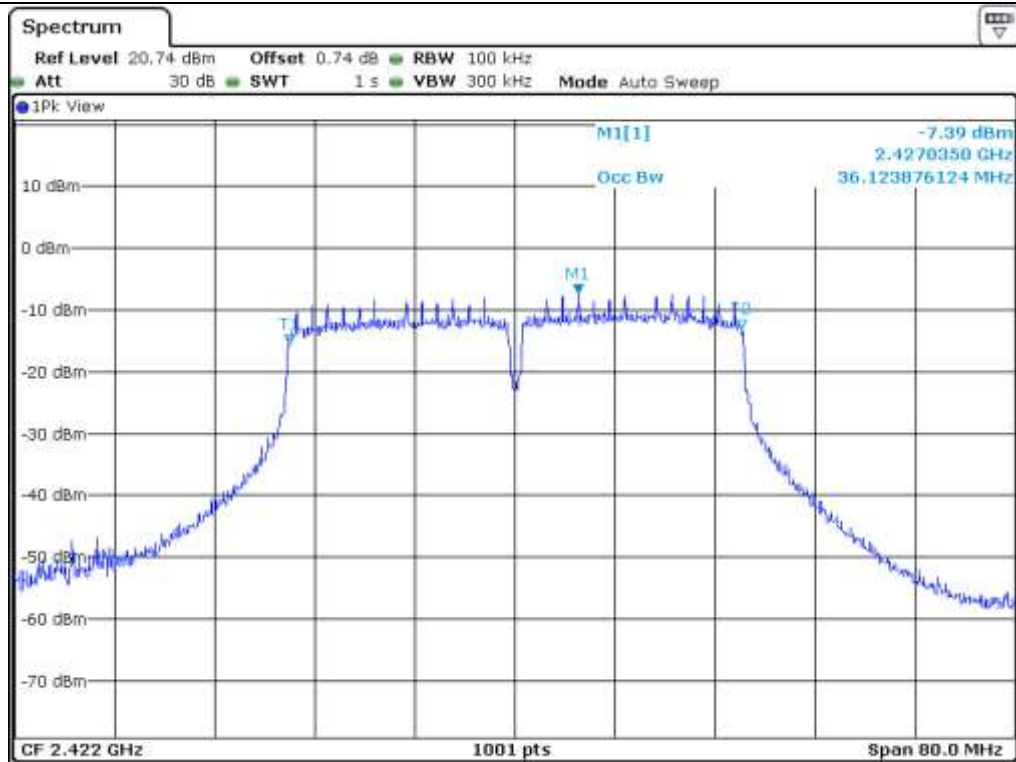




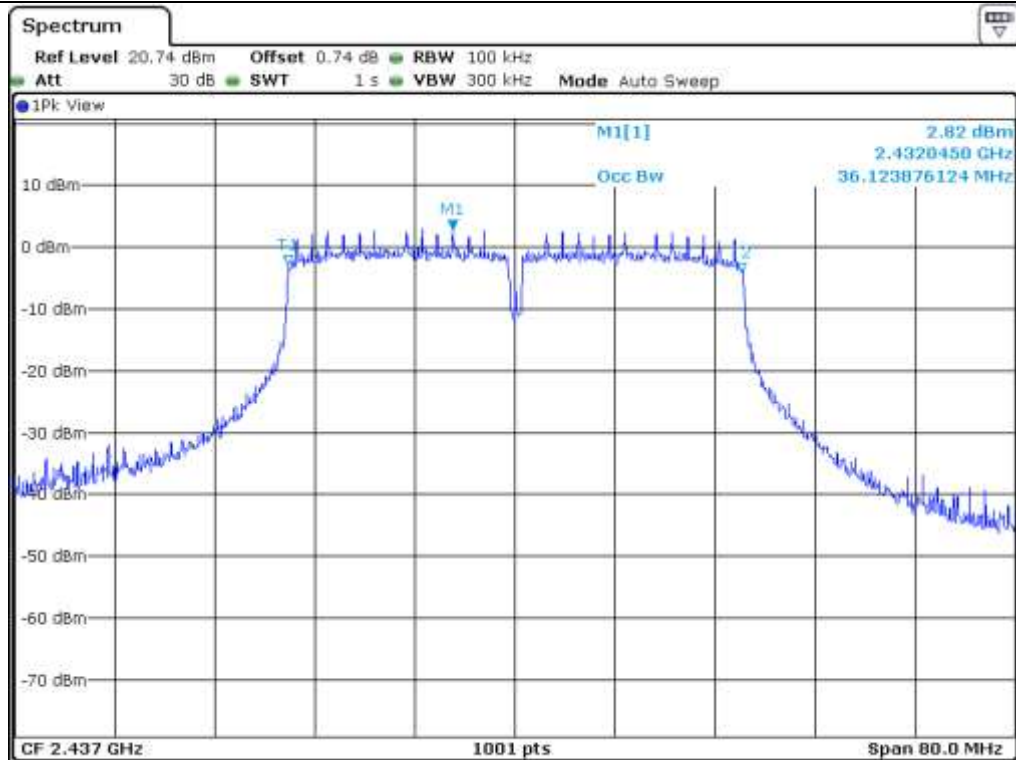
Middle Channel



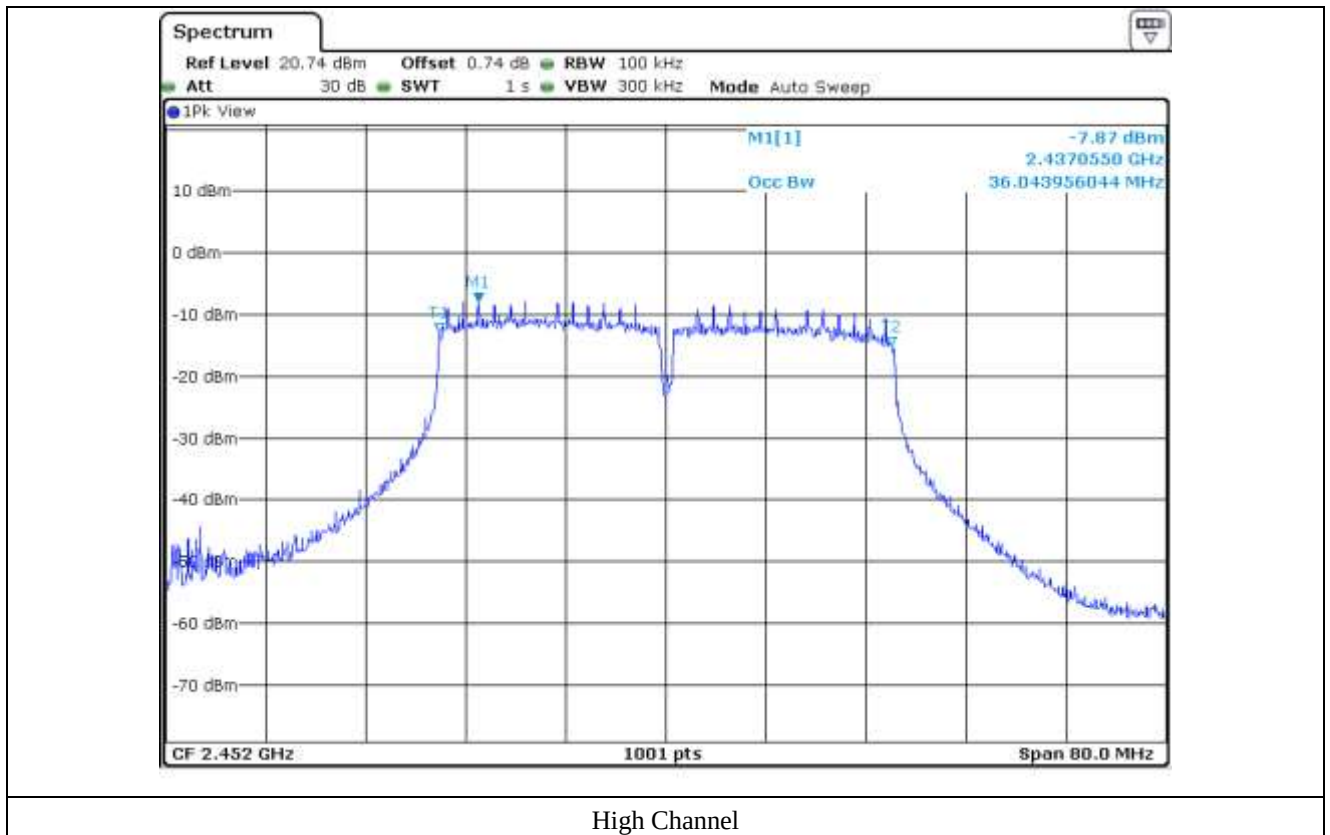
High Channel



Low Channel



Middle Channel



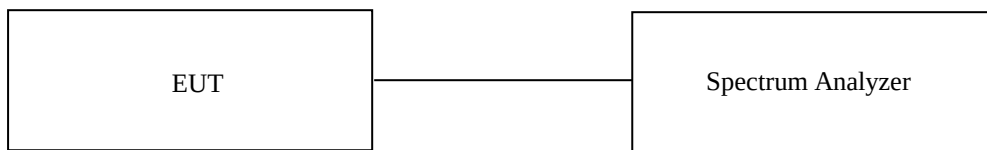
8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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 802.11b WLAN Mode

8.4.1 Test data for Antenna 0

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	10.14	14.61	30.00	15.39
MIDDLE	2 442	10.14	19.01	30.00	10.99
HIGH	2 462	10.10	14.52	30.00	15.48

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

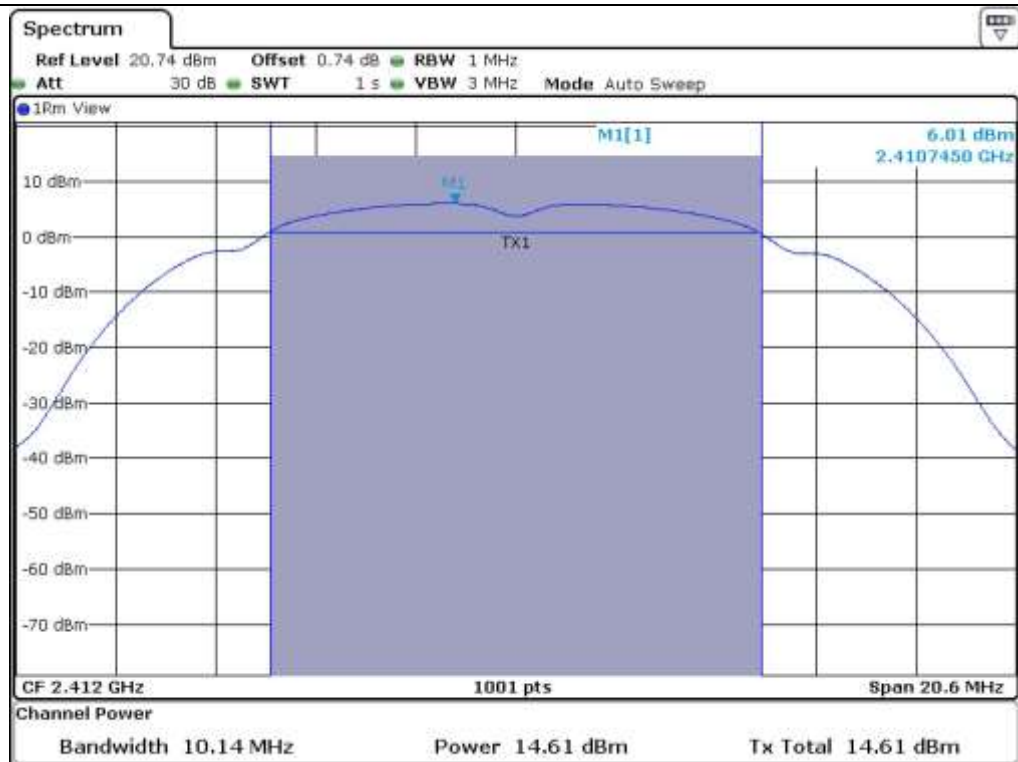
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	13.95	15.17	30.00	14.83
MIDDLE	2 442	13.99	22.08	30.00	7.92
HIGH	2 462	13.83	16.91	30.00	13.09

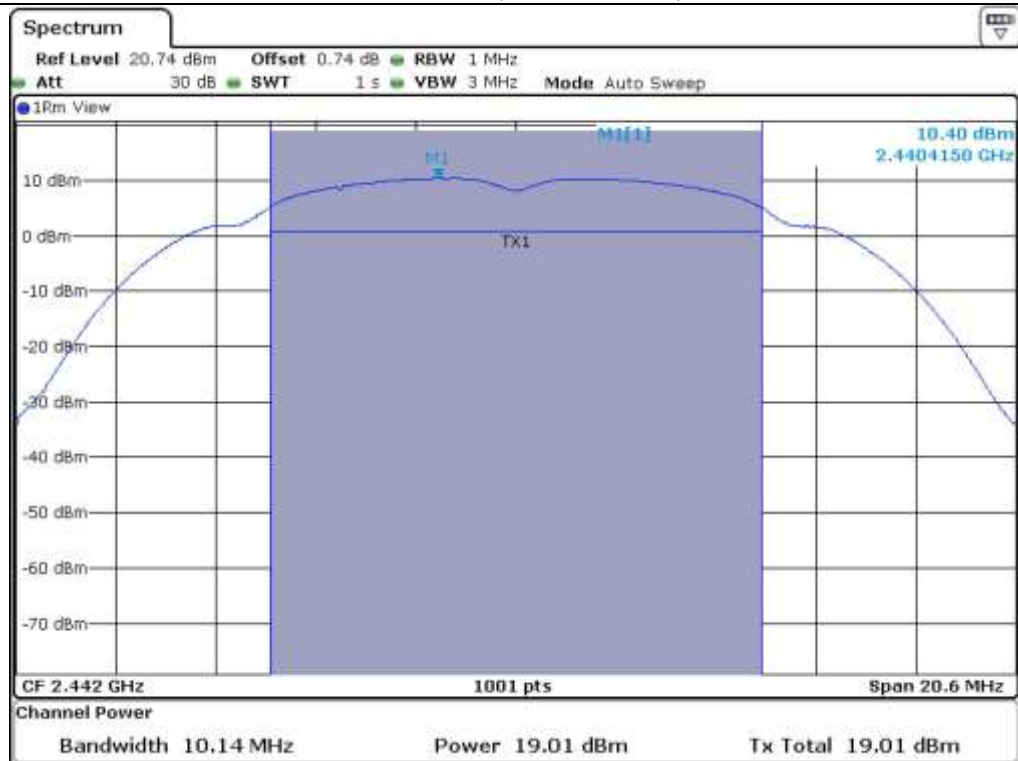
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



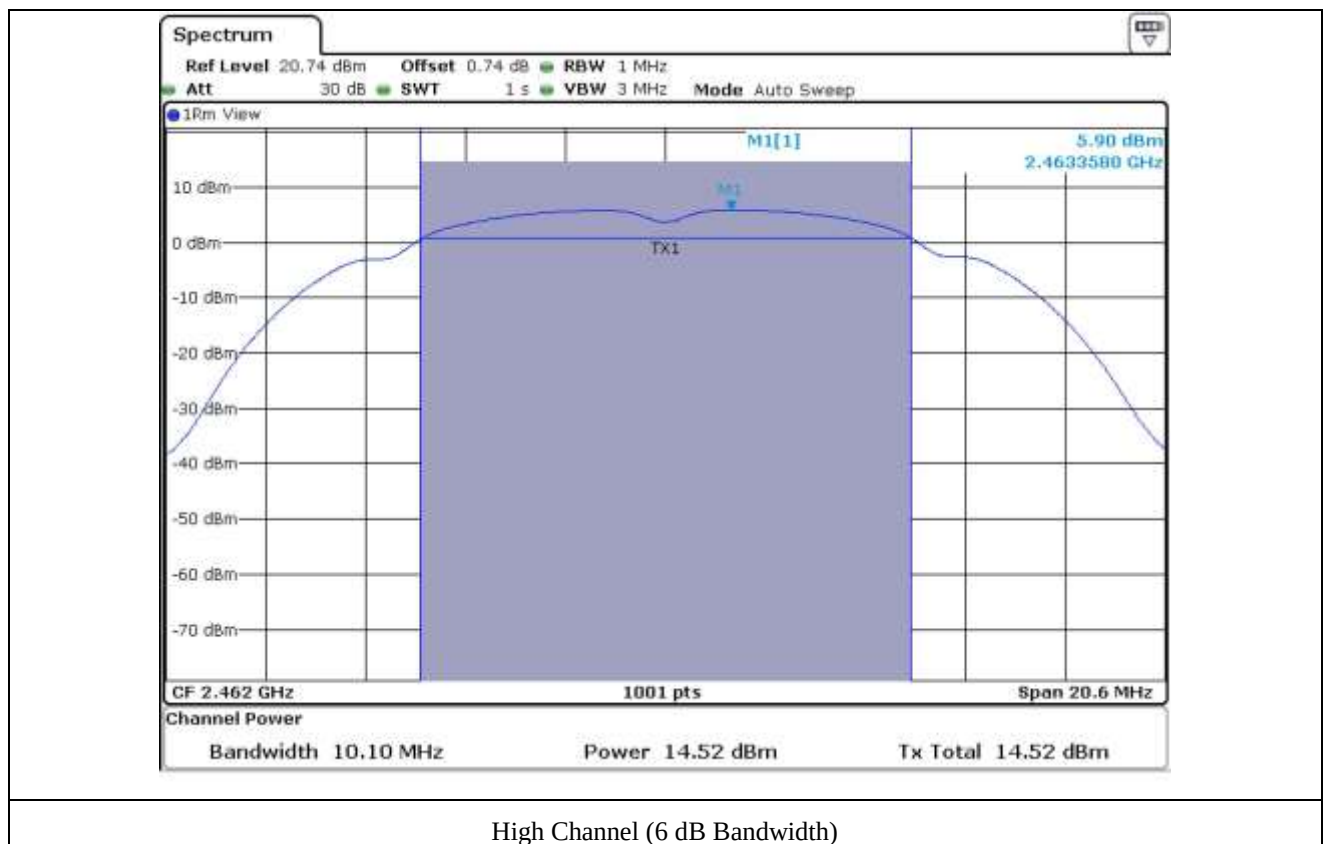
Tested by: Jun-Hui, Lee / Senior Engineer

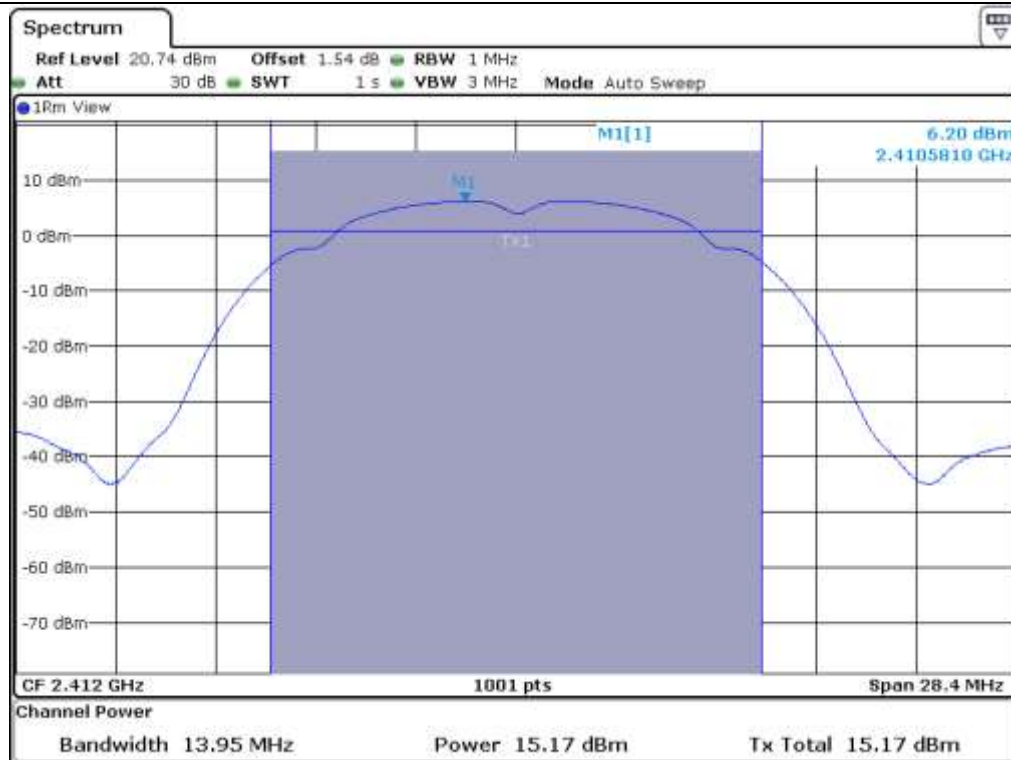


Low Channel (6 dB Bandwidth)

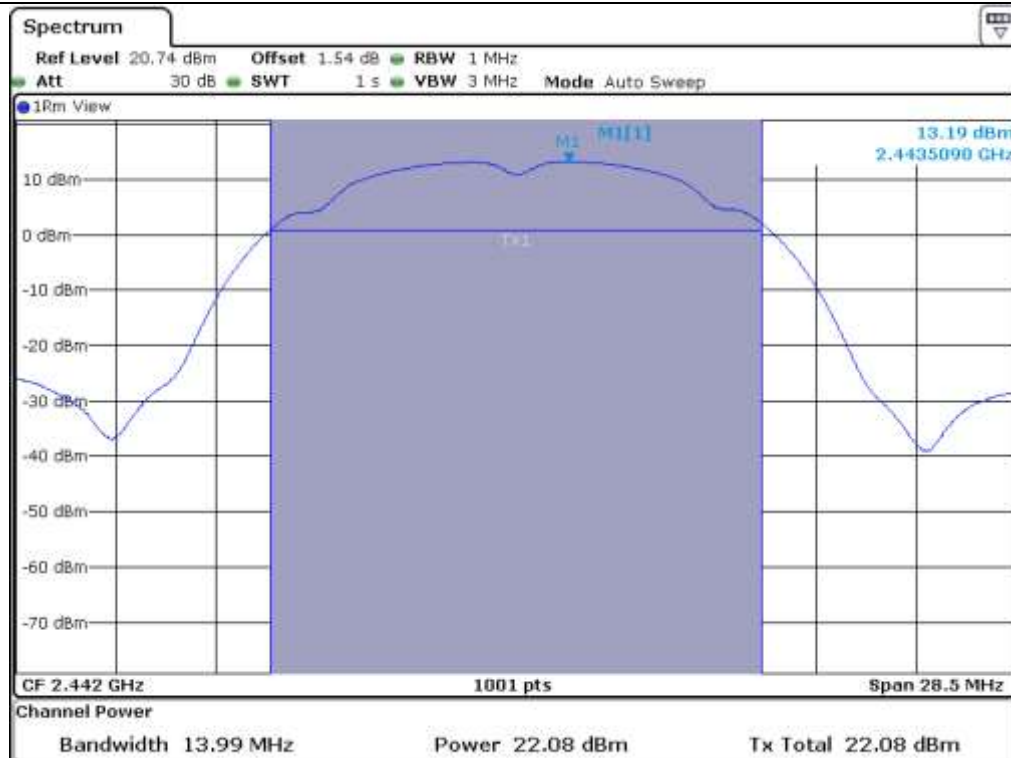


Middle Channel (6 dB Bandwidth)

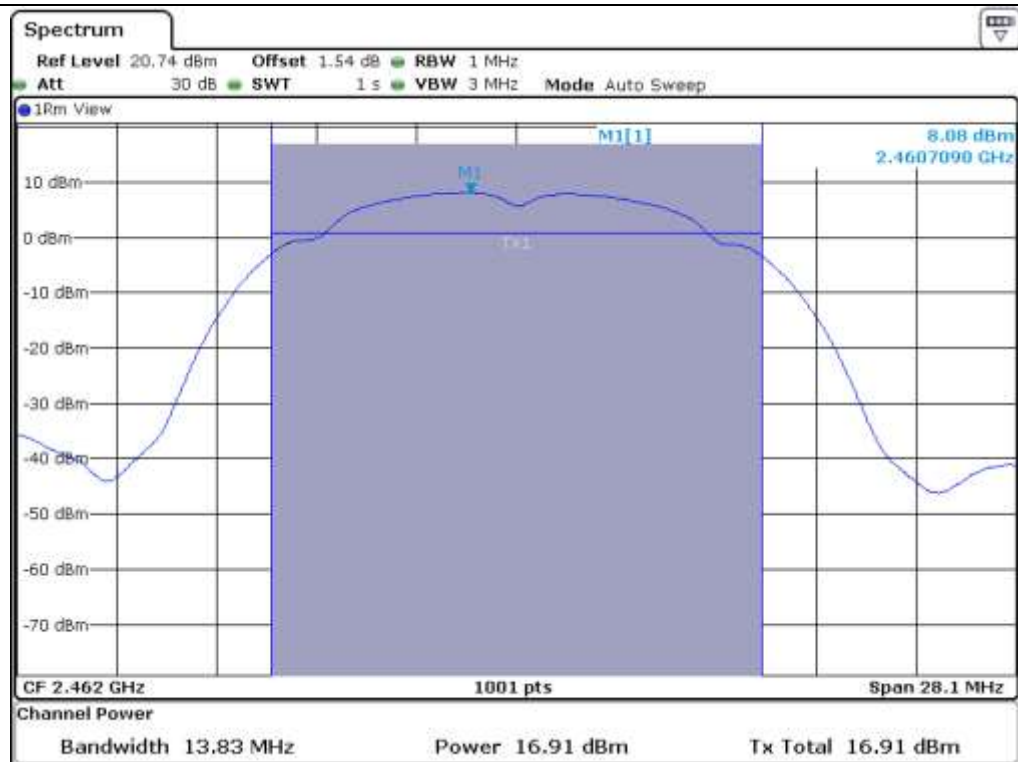




Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.4.2 Test data for Antenna 1

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	10.15	15.66	30.00	14.34
MIDDLE	2 442	10.15	20.21	30.00	9.79
HIGH	2 462	10.11	15.54	30.00	14.46

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

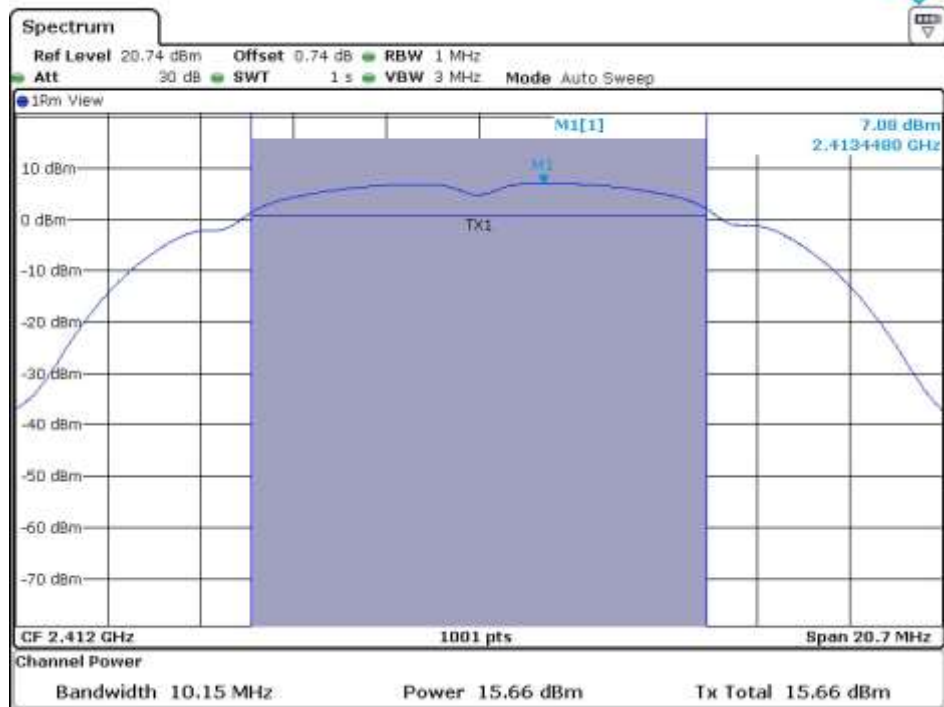
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	13.87	16.25	30.00	13.75
MIDDLE	2 442	13.83	20.24	30.00	9.76
HIGH	2 462	13.91	15.77	30.00	14.23

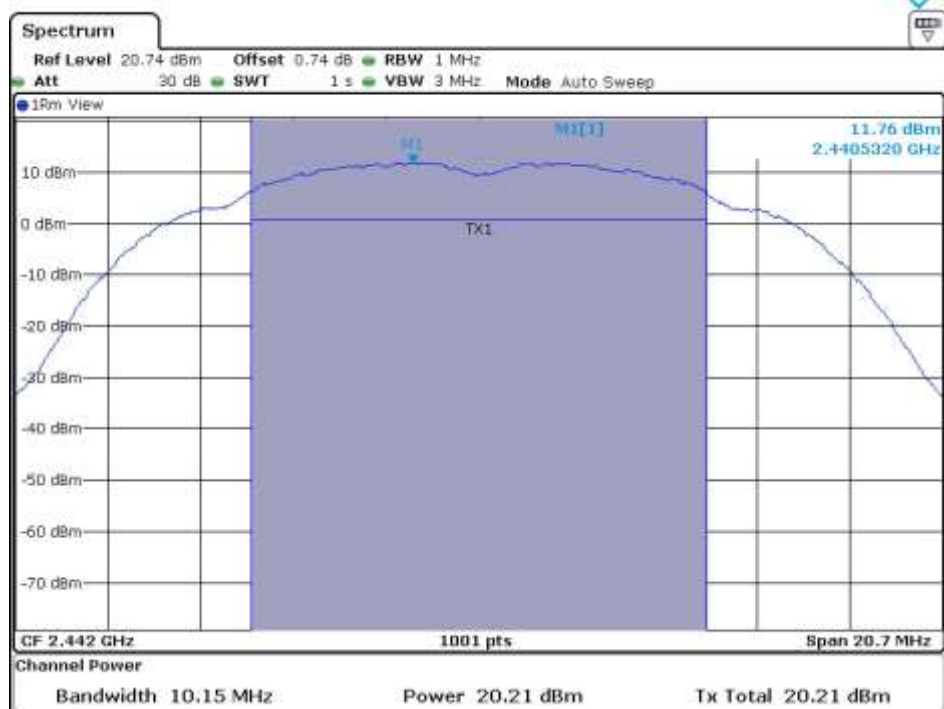
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



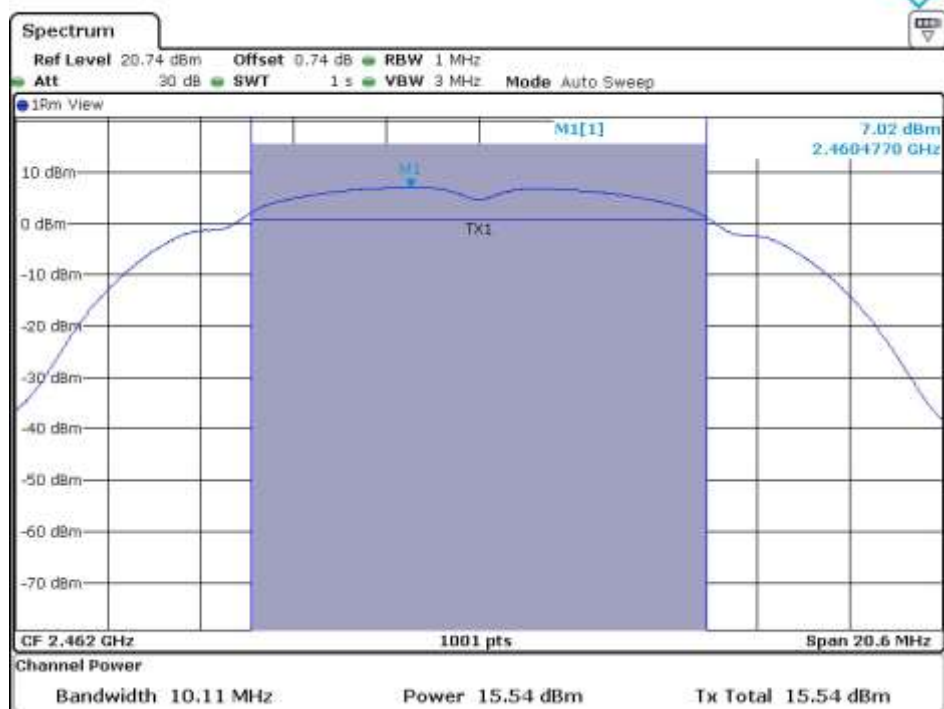
Tested by: Jun-Hui, Lee / Senior Engineer



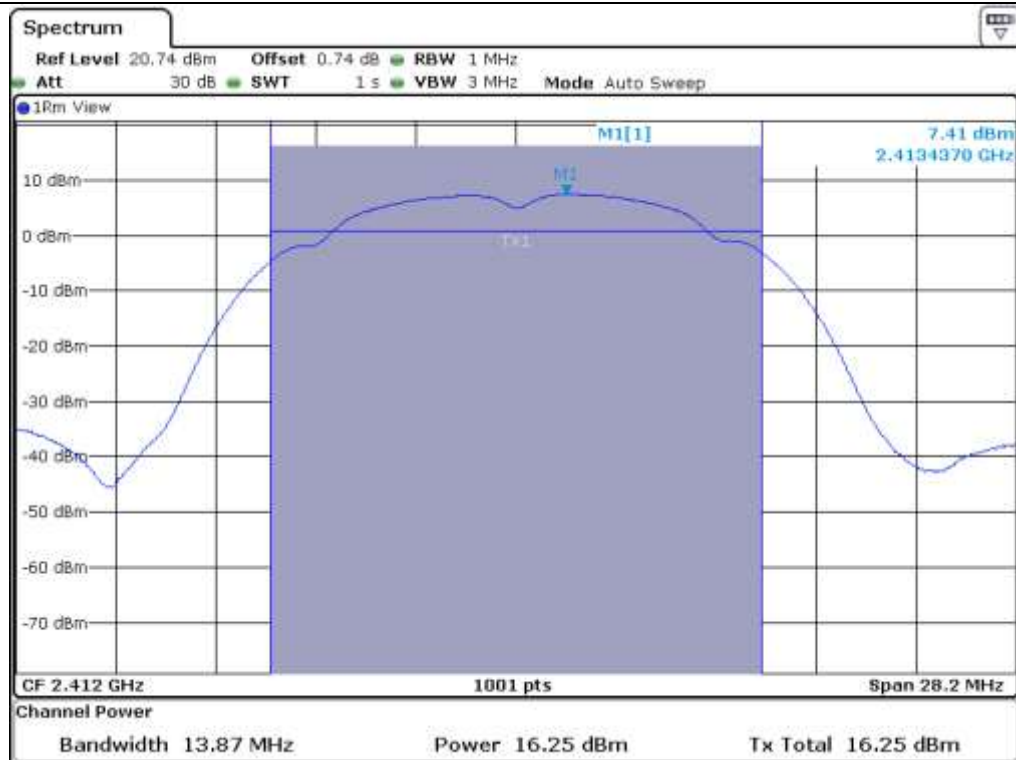
Low Channel (6 dB Bandwidth)



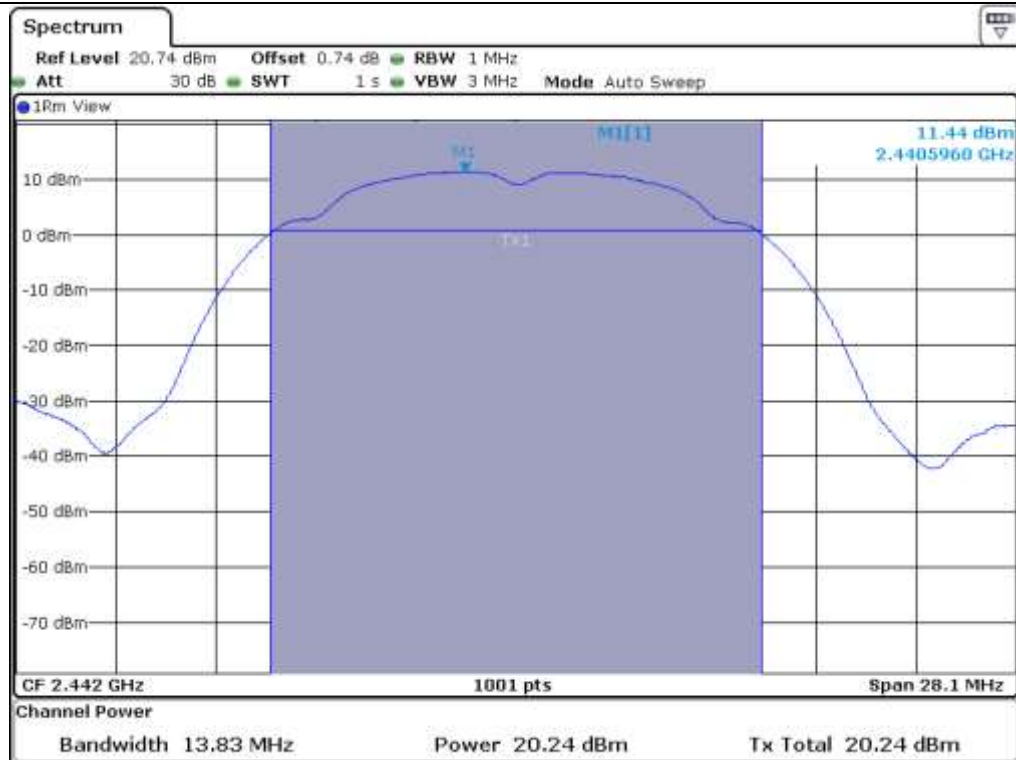
Middle Channel (6 dB Bandwidth)



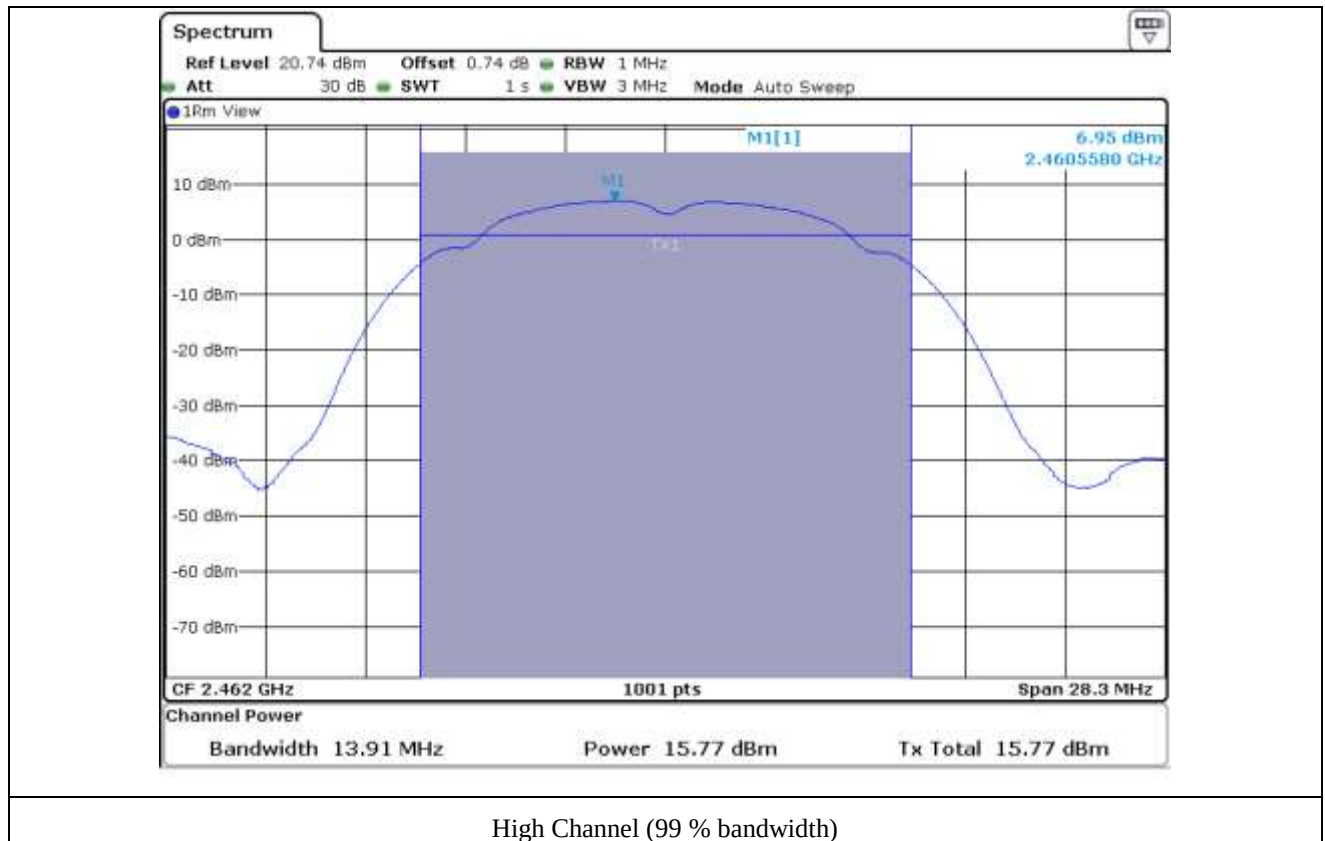
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



8.4.3 Test data for Antenna 2

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	10.11	15.10	30.00	14.90
MIDDLE	2 442	10.15	19.82	30.00	10.18
HIGH	2 462	10.15	15.64	30.00	14.36

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

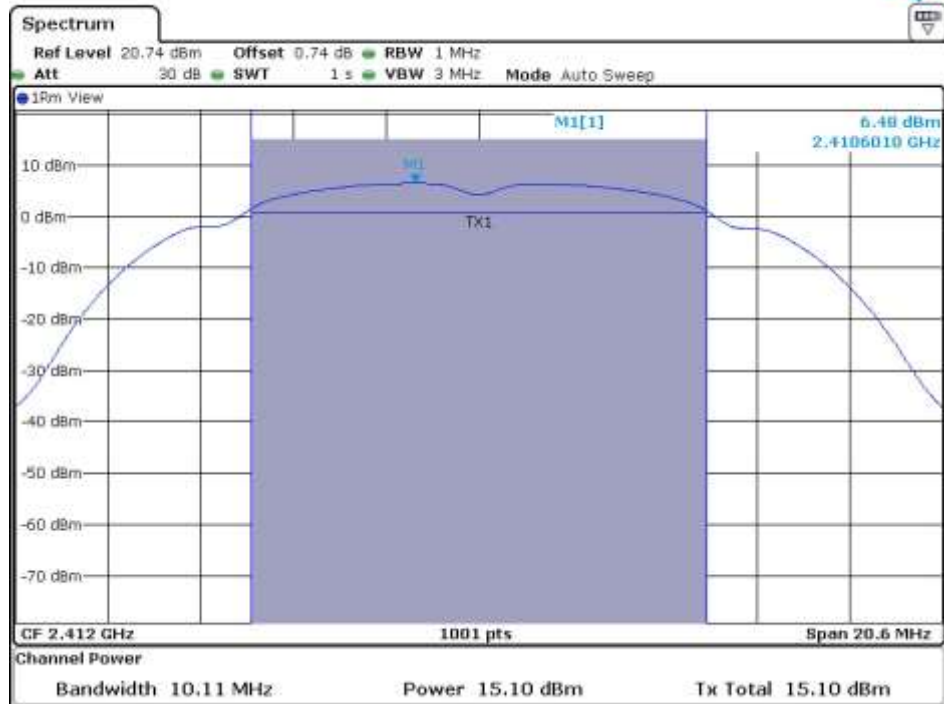
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	13.87	15.16	30.00	14.84
MIDDLE	2 442	13.87	20.17	30.00	9.83
HIGH	2 462	13.87	15.46	30.00	14.54

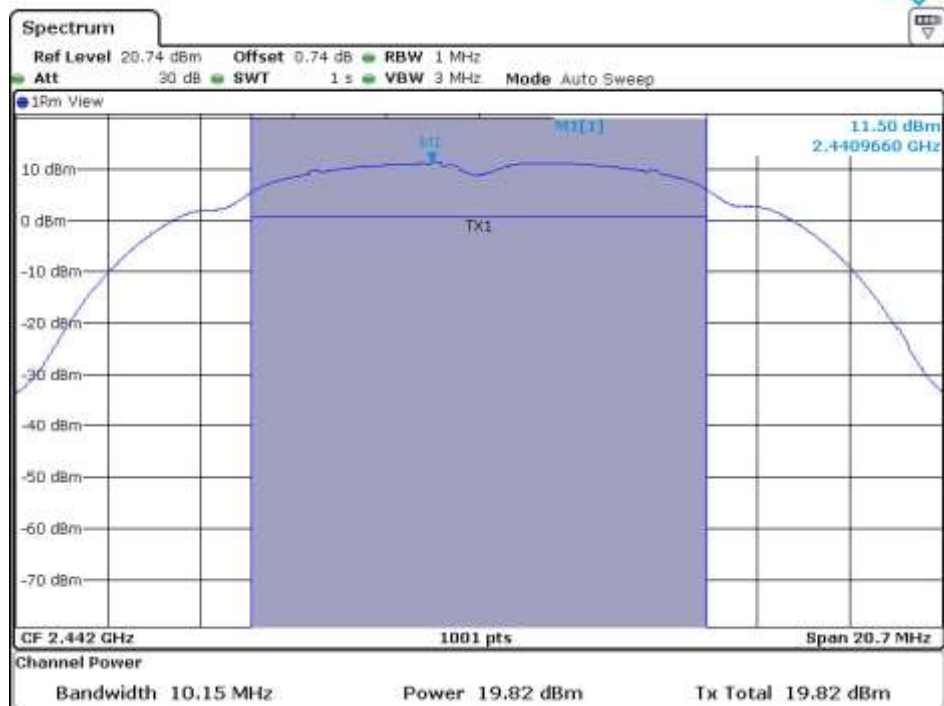
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



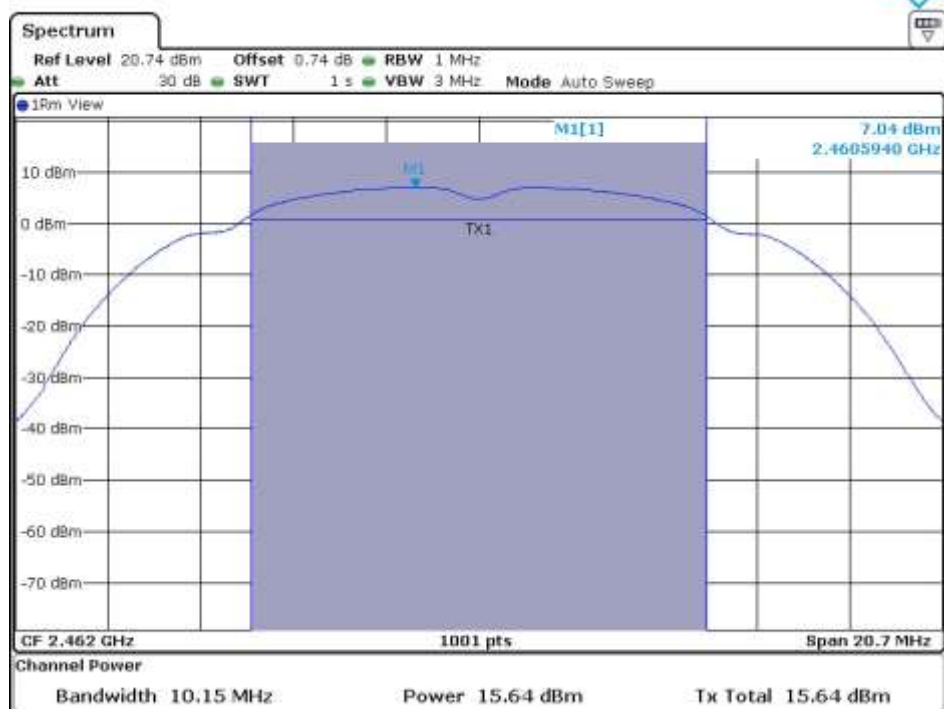
Tested by: Jun-Hui, Lee / Senior Engineer



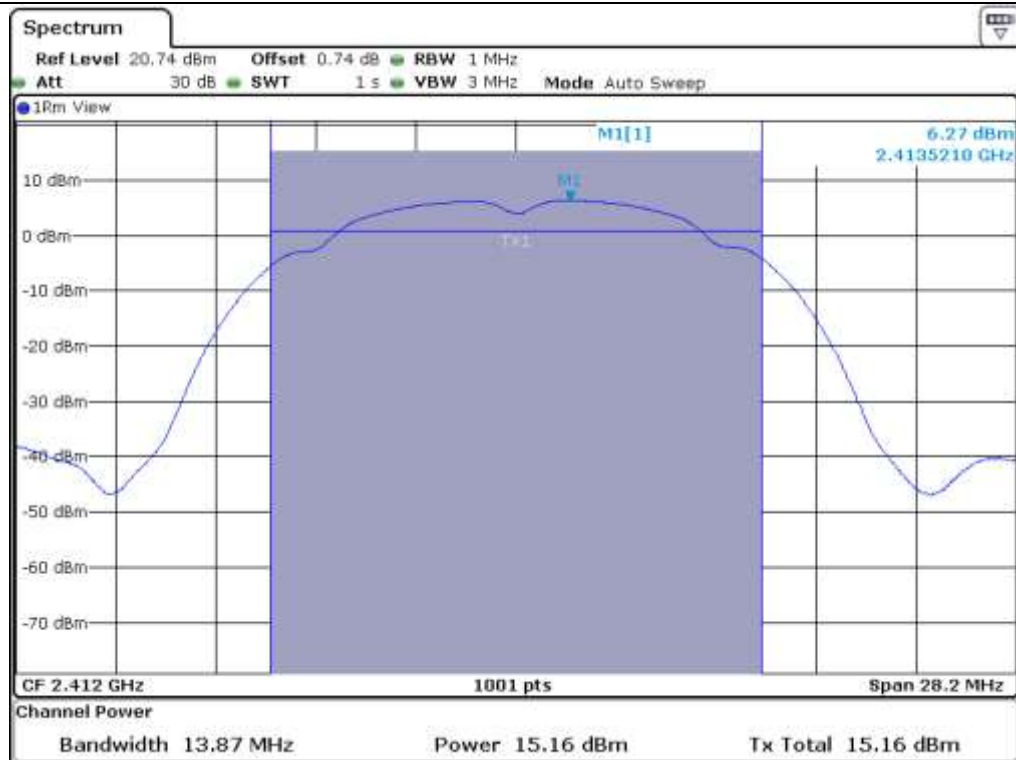
Low Channel (6 dB Bandwidth)



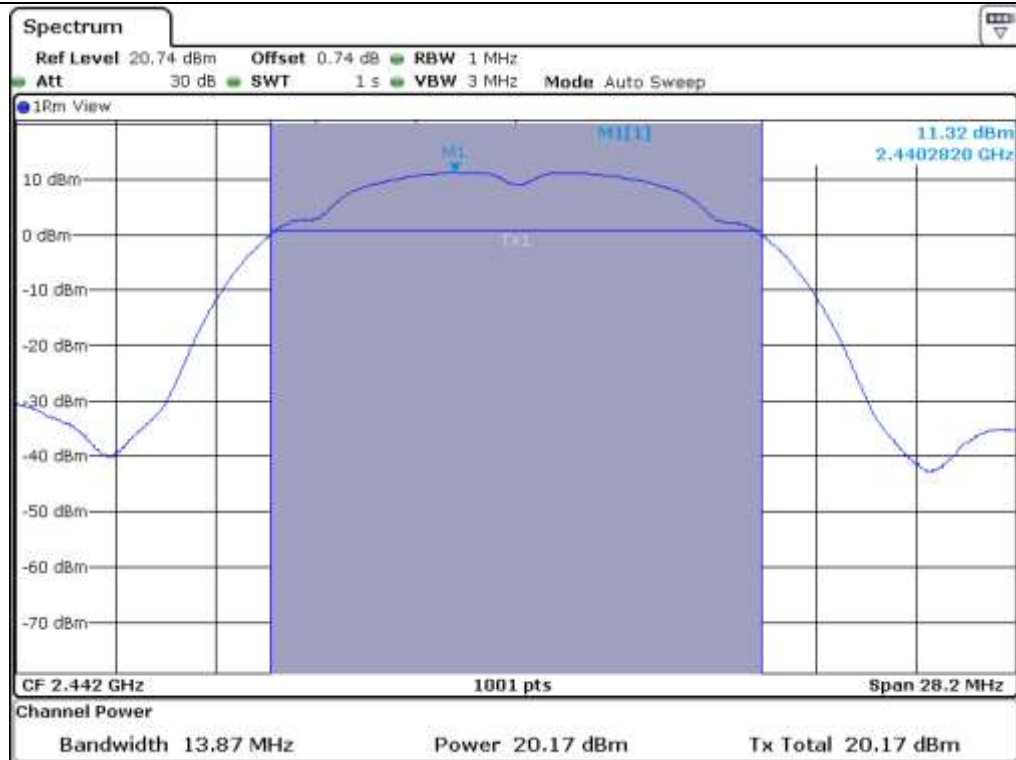
Middle Channel (6 dB Bandwidth)



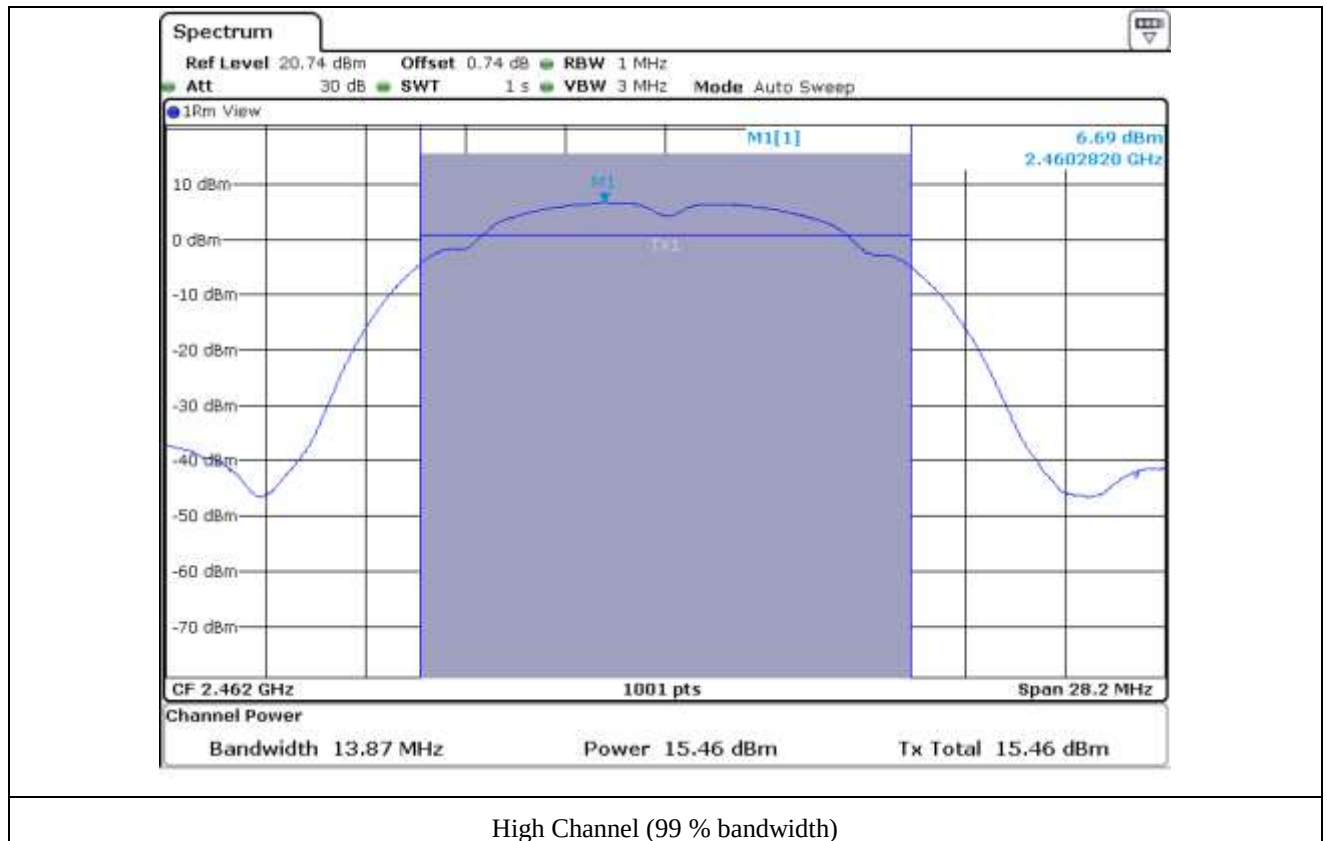
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



8.5 Test data for 802.11g WLAN Mode

8.5.1 Test data for Antenna 0

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.39	12.50	30.00	17.50
MIDDLE	2 442	16.39	18.31	30.00	11.69
HIGH	2 462	16.39	12.19	30.00	17.81

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

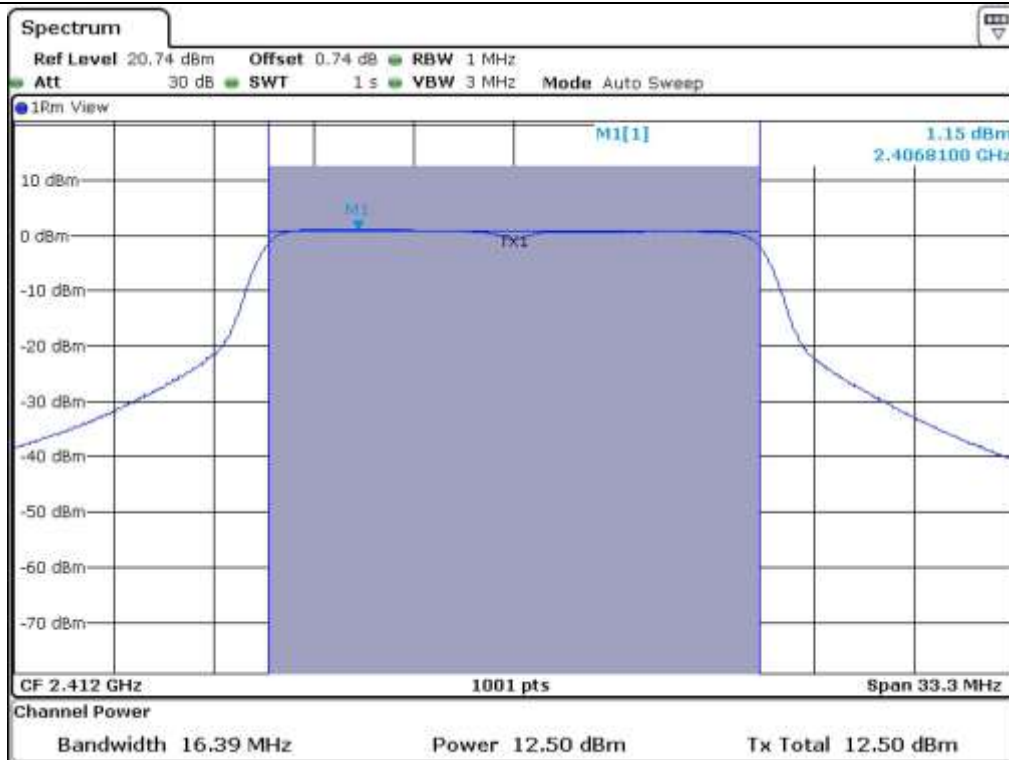
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.54	12.85	30.00	17.15
MIDDLE	2 442	16.54	20.81	30.00	9.19
HIGH	2 462	16.54	14.54	30.00	15.46

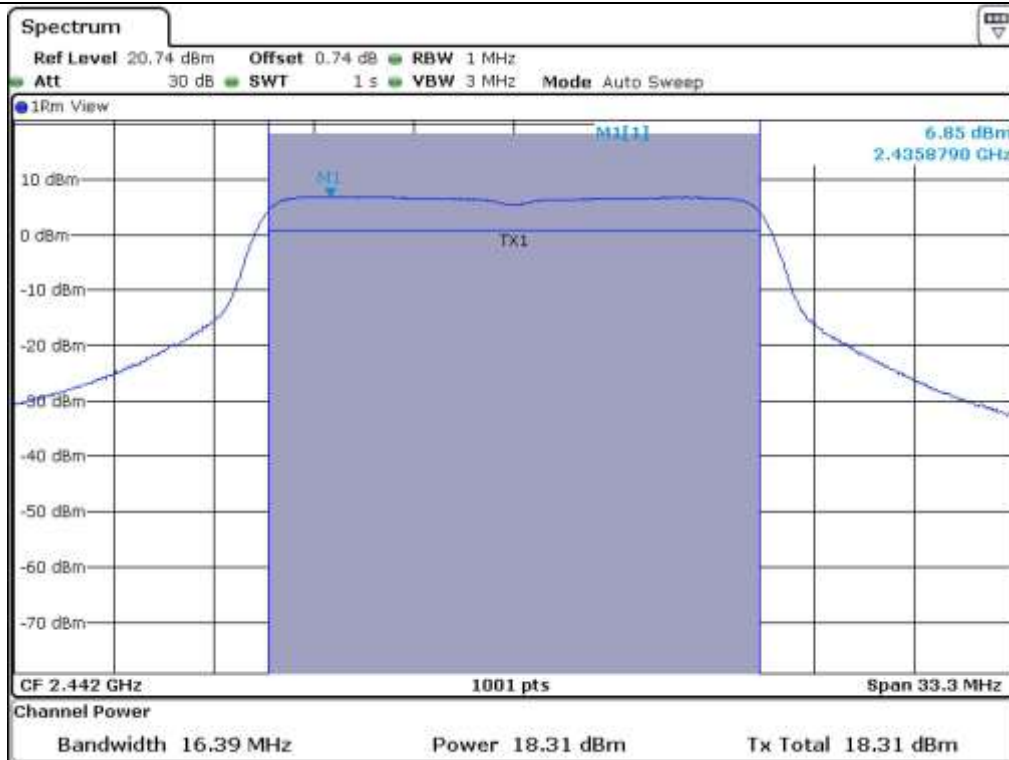
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



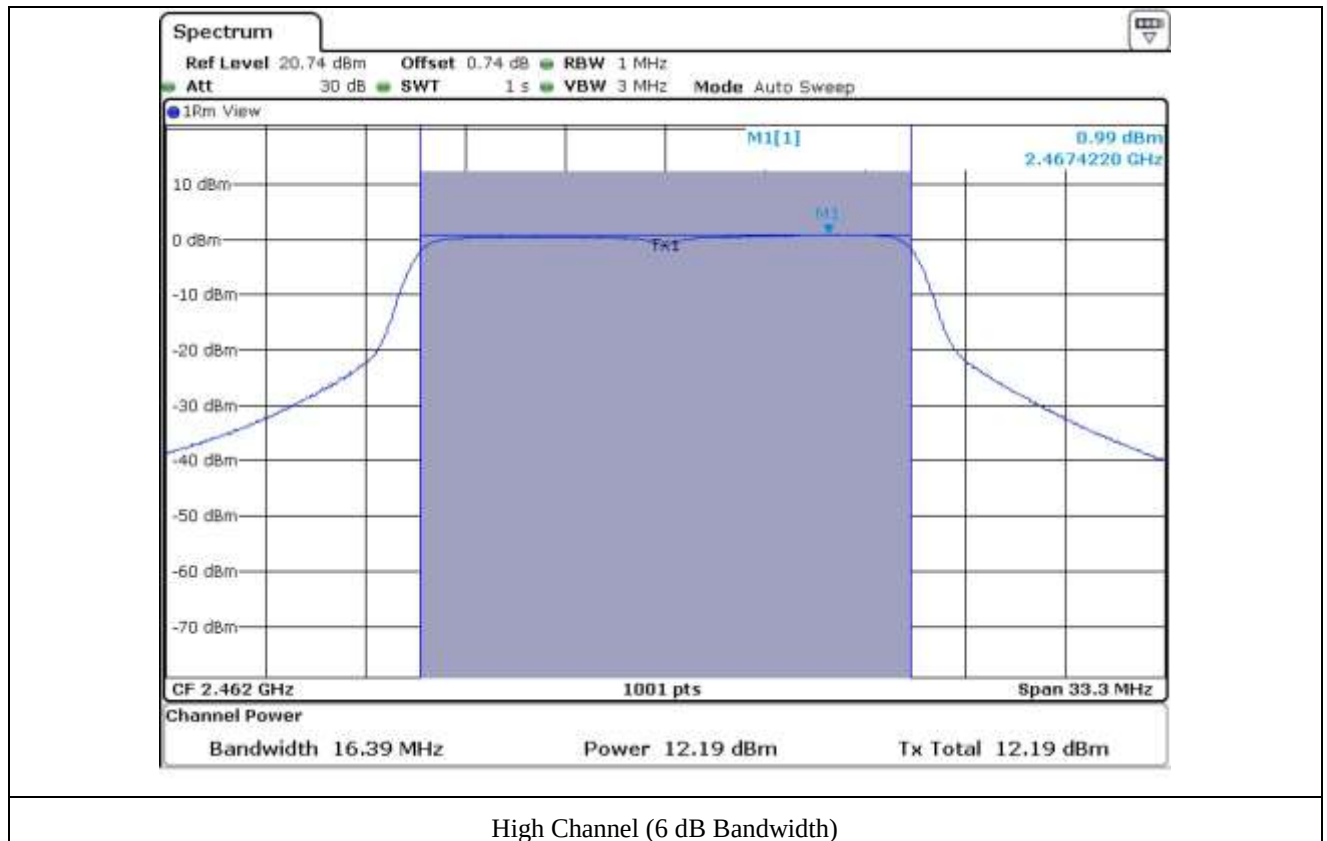
 Tested by: Jun-Hui, Lee / Senior Engineer

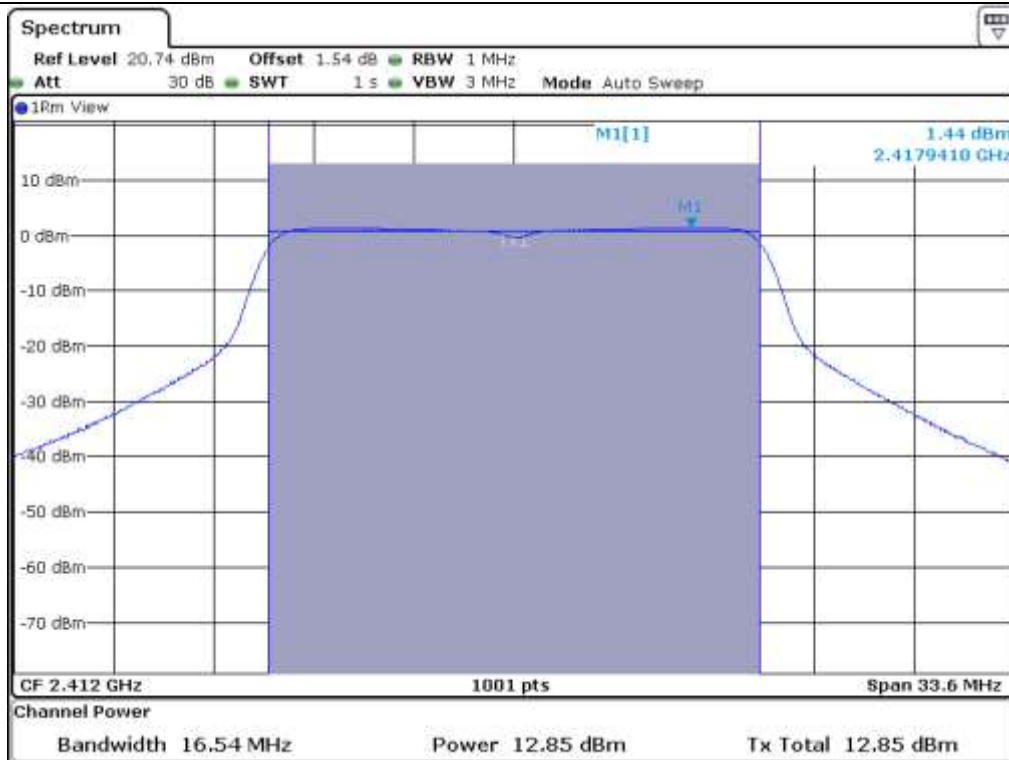


Low Channel (6 dB Bandwidth)

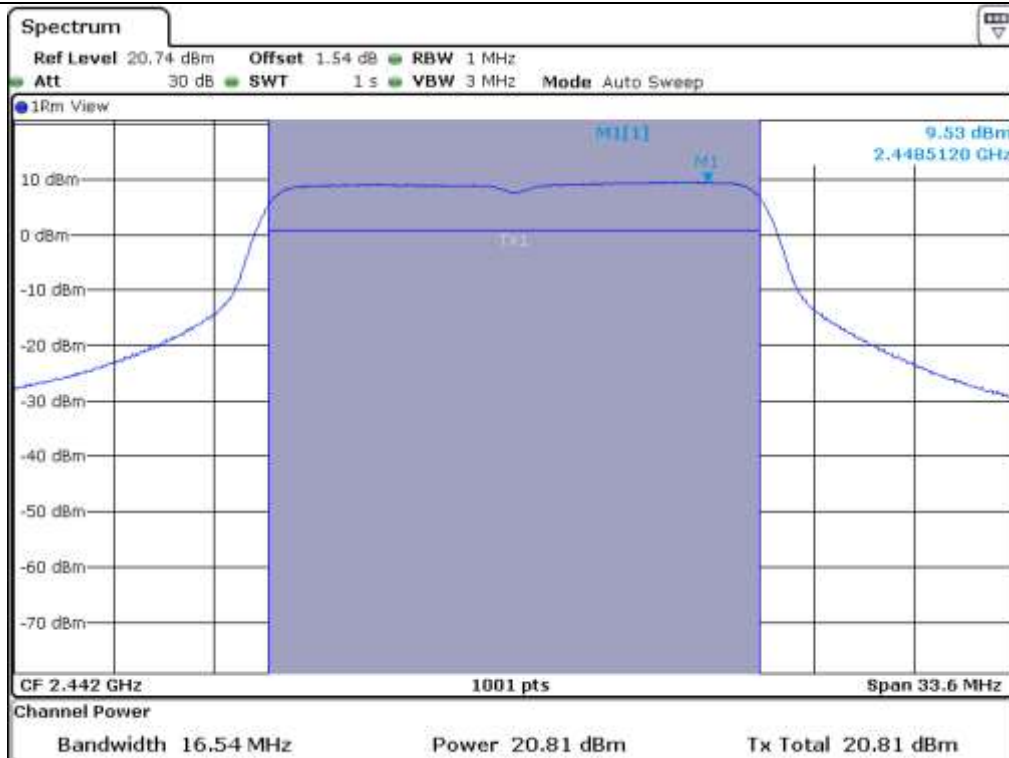


Middle Channel (6 dB Bandwidth)

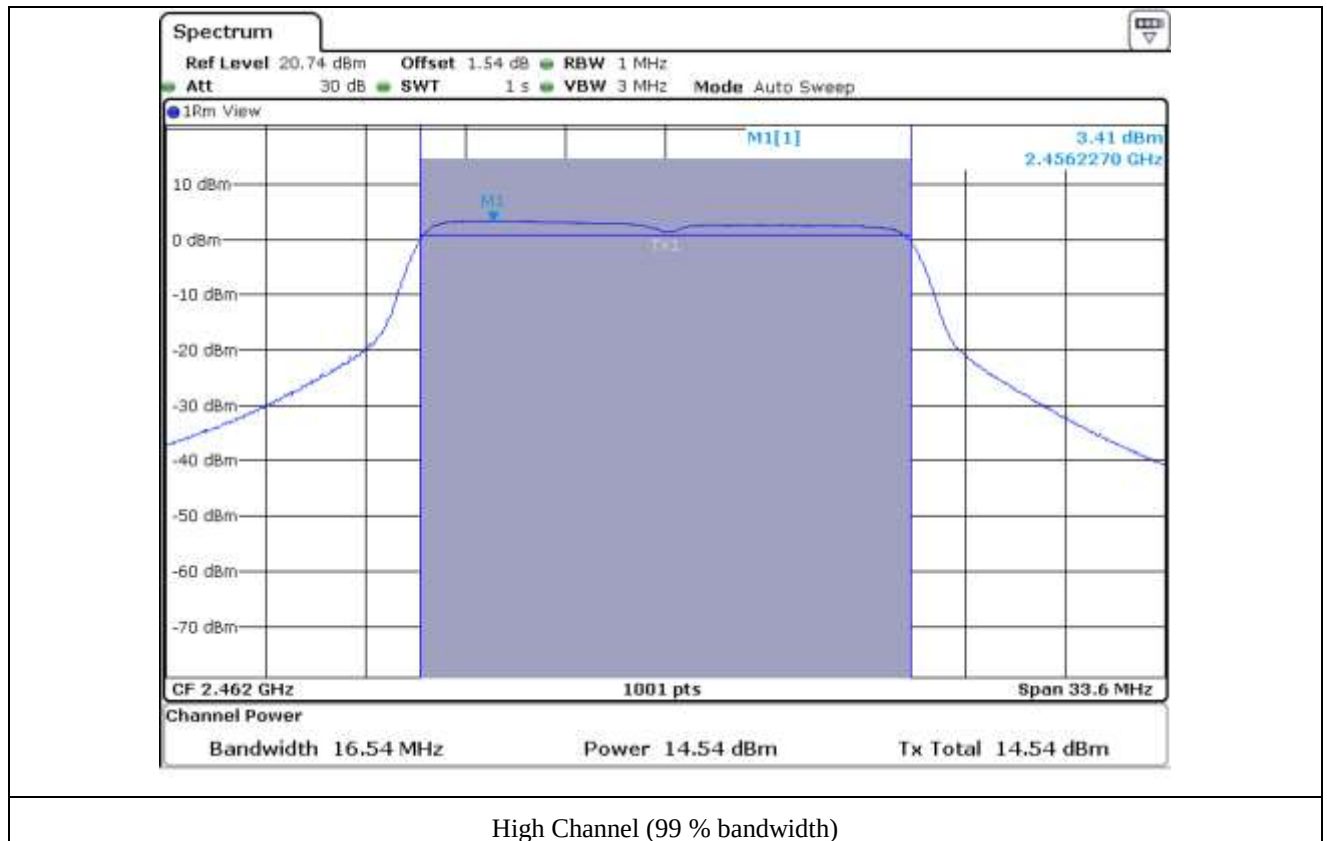




Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



8.5.2 Test data for Antenna 1

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.38	13.50	30.00	16.50
MIDDLE	2 442	16.42	19.51	30.00	10.49
HIGH	2 462	16.38	13.10	30.00	16.90

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

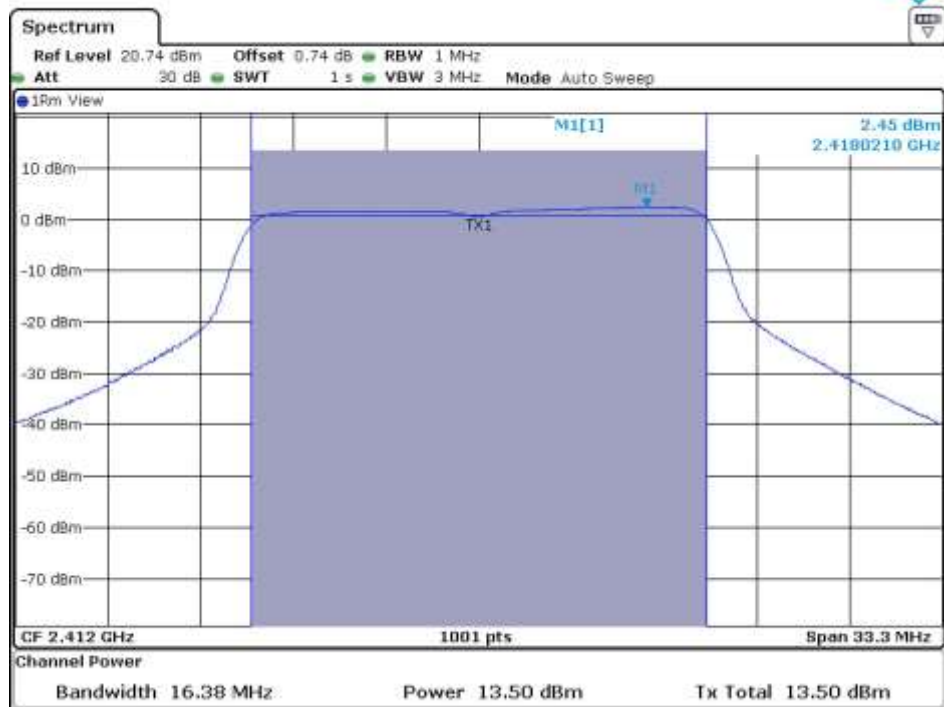
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.58	13.86	30.00	16.14
MIDDLE	2 442	16.58	19.38	30.00	10.62
HIGH	2 462	16.54	13.07	30.00	16.93

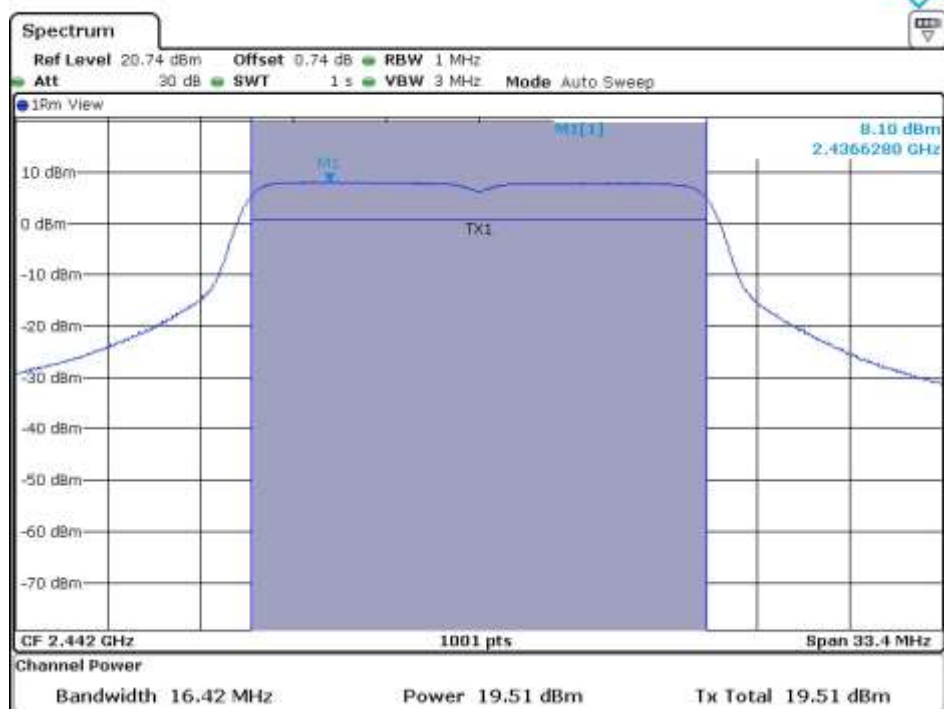
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



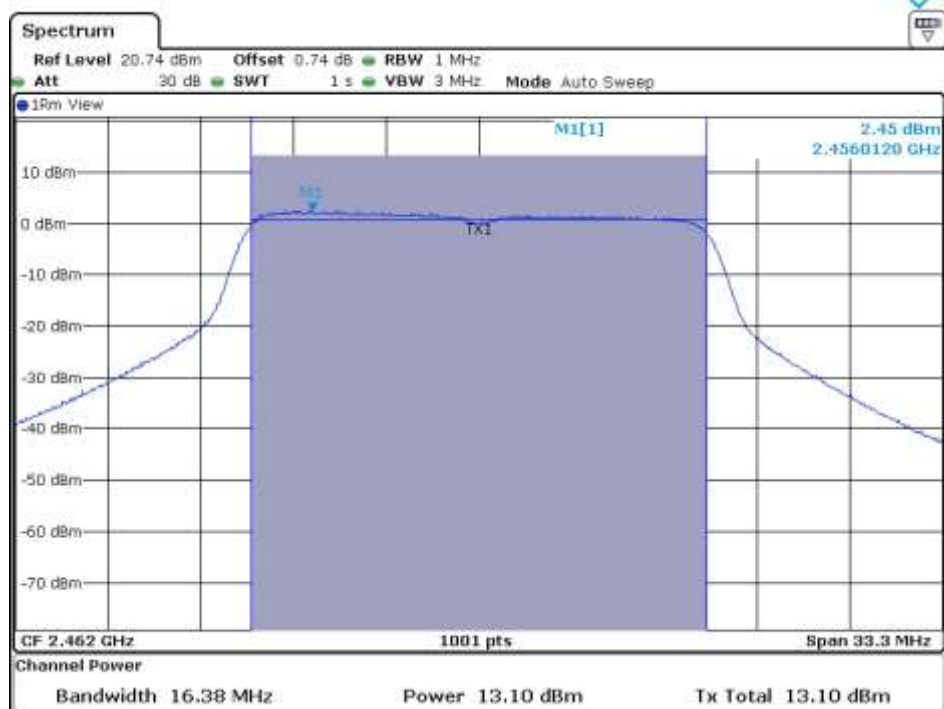
Tested by: Jun-Hui, Lee / Senior Engineer



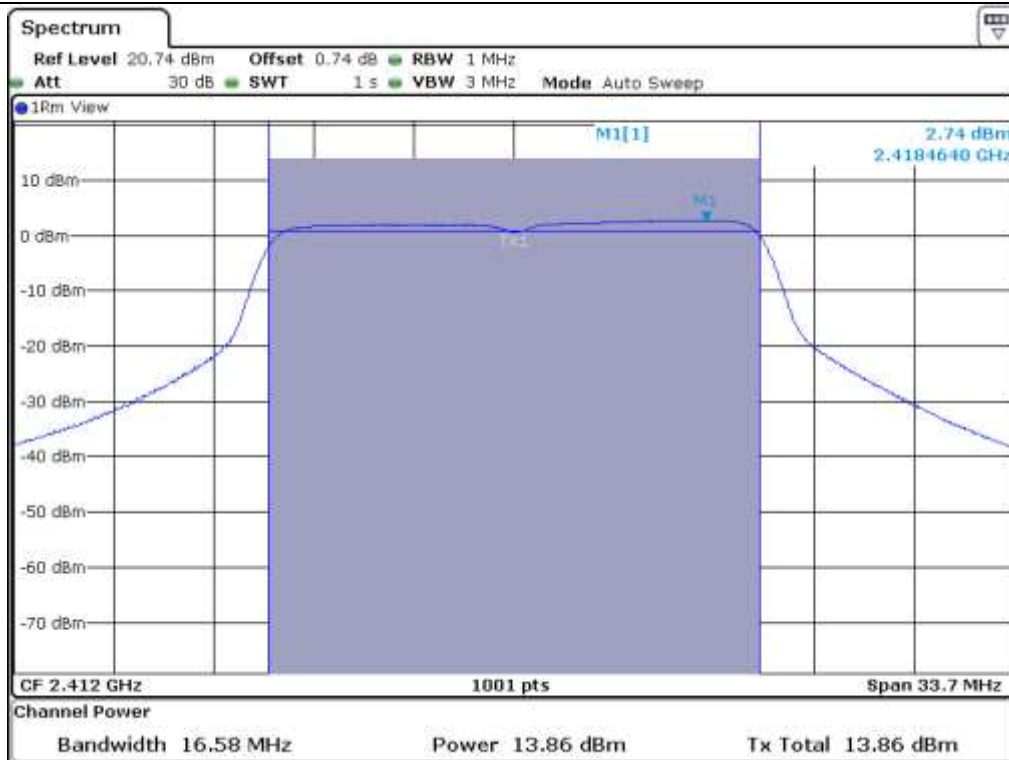
Low Channel (6 dB Bandwidth)



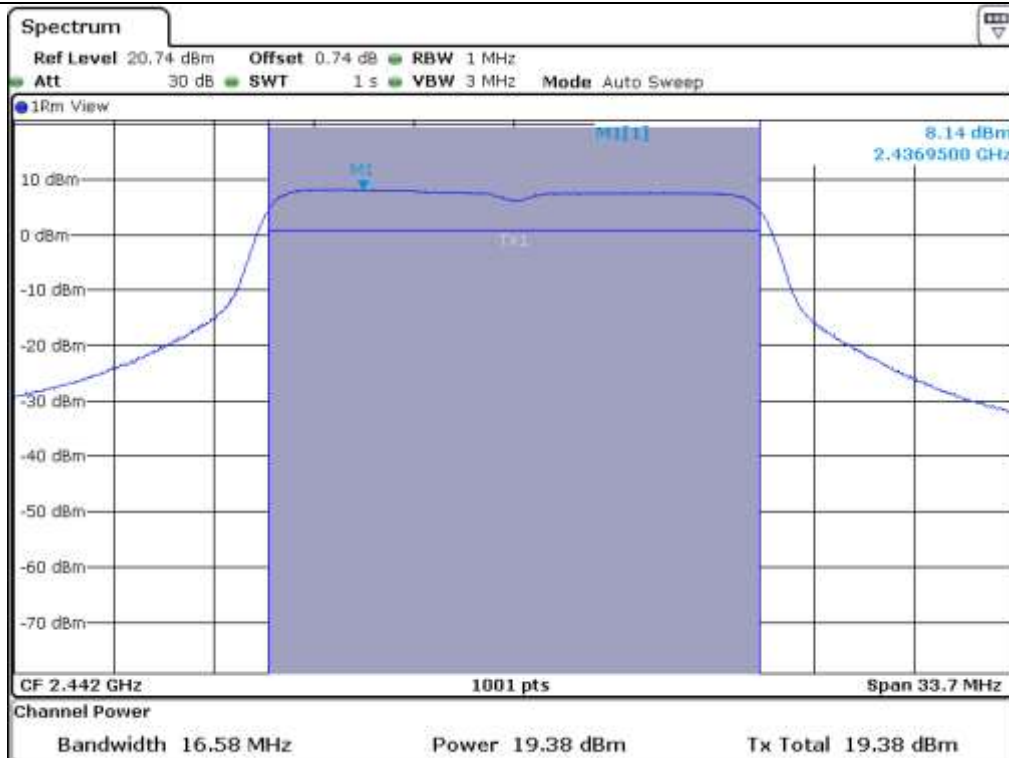
Middle Channel (6 dB Bandwidth)



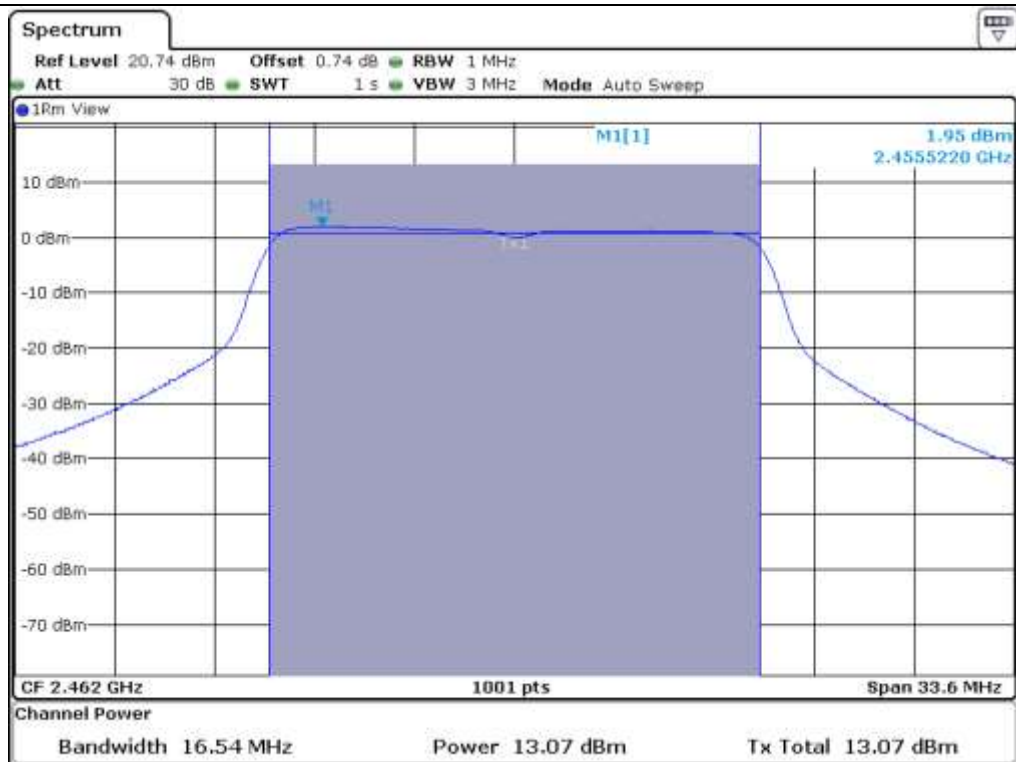
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.5.3 Test data for Antenna 2

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.42	13.22	30.00	16.78
MIDDLE	2 442	16.38	19.76	30.00	10.24
HIGH	2 462	16.42	13.56	30.00	16.44

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

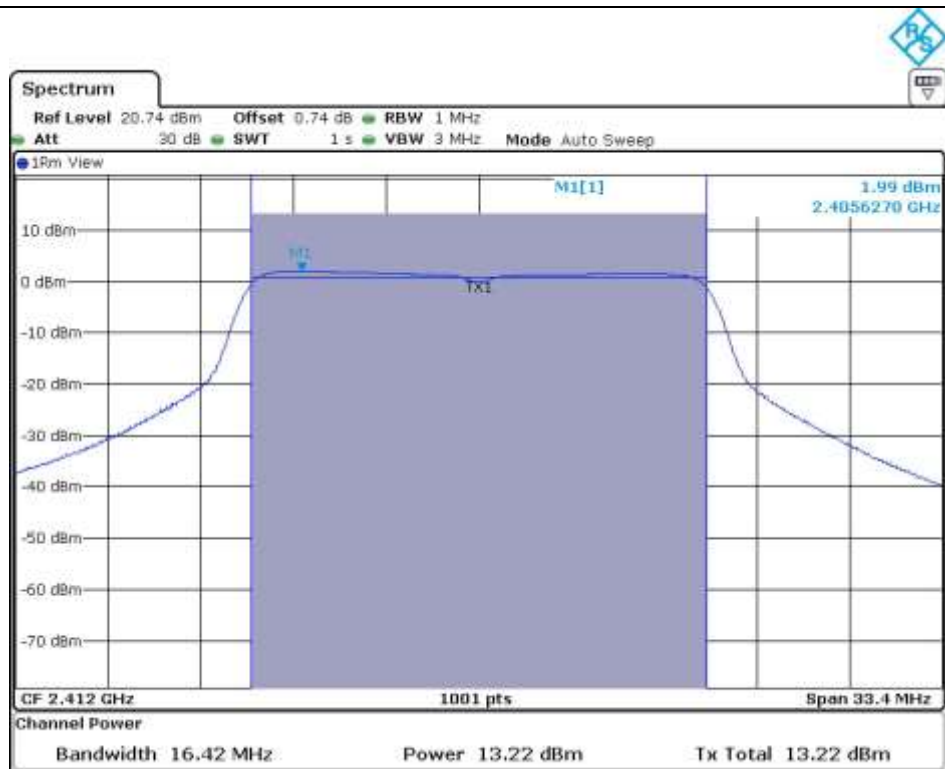
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	16.58	13.14	30.00	16.86
MIDDLE	2 442	16.58	19.37	30.00	10.63
HIGH	2 462	16.54	13.27	30.00	16.73

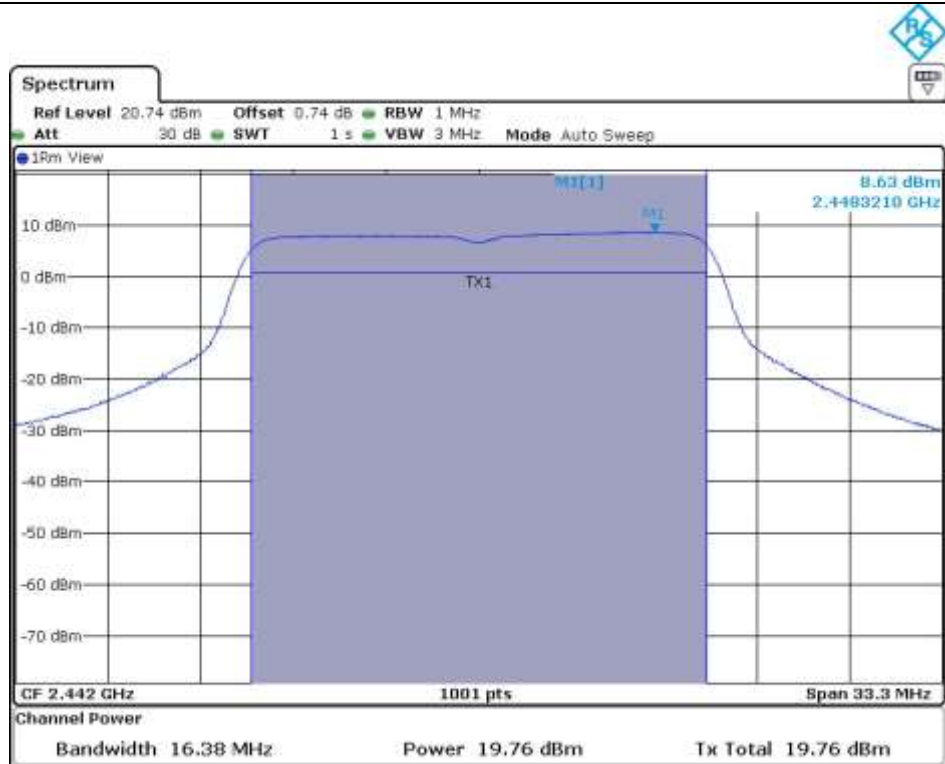
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



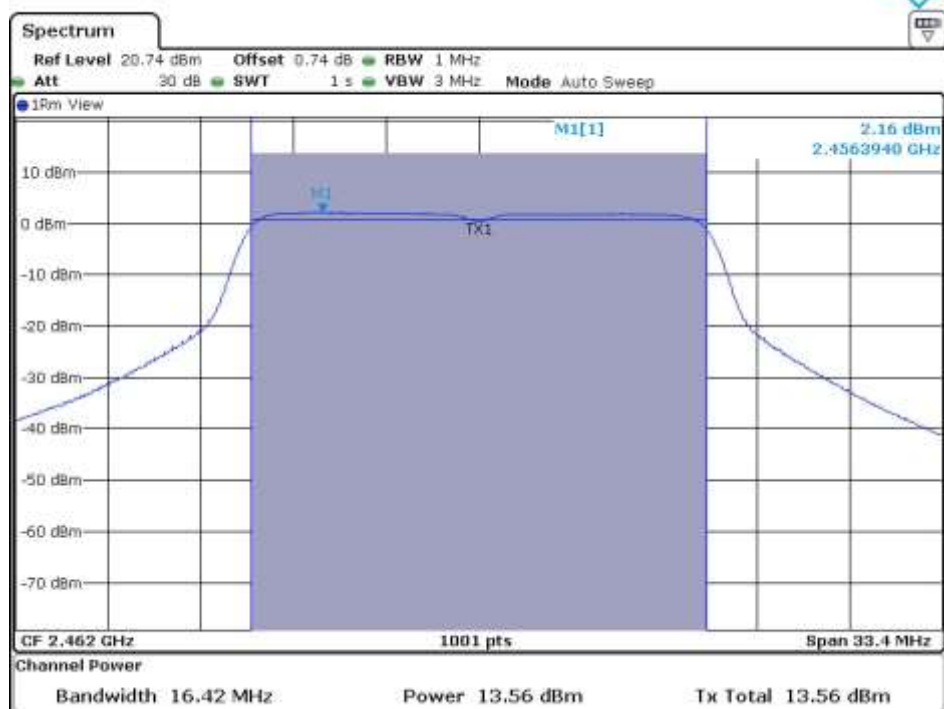
Tested by: Jun-Hui, Lee / Senior Engineer



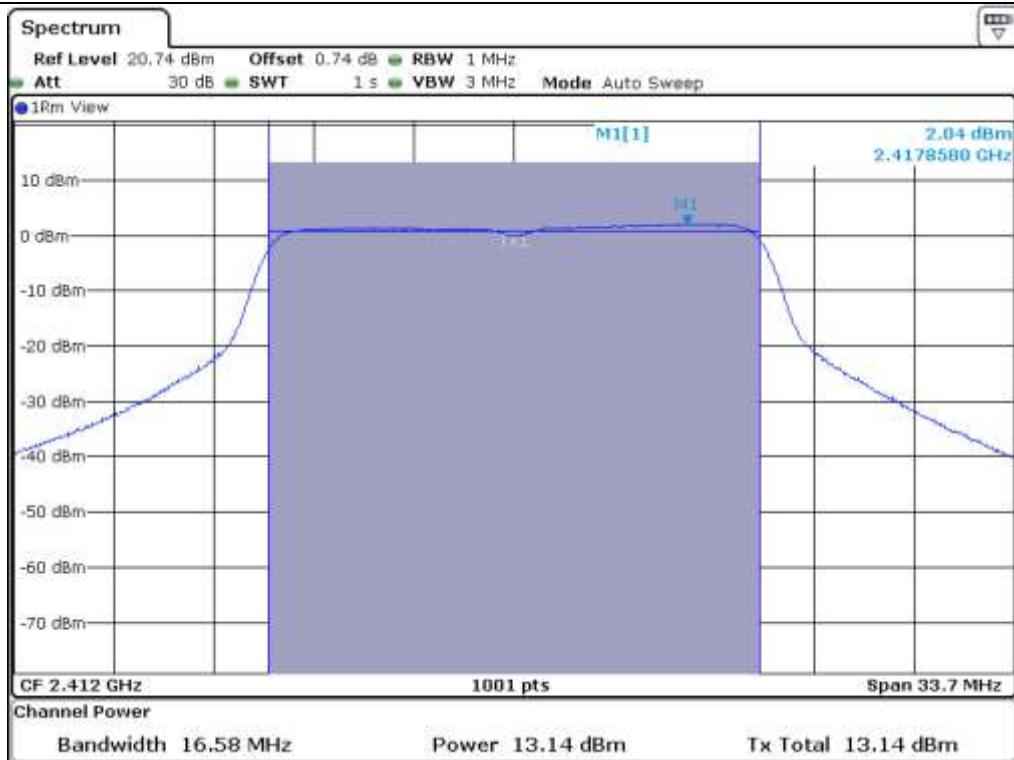
Low Channel (6 dB Bandwidth)



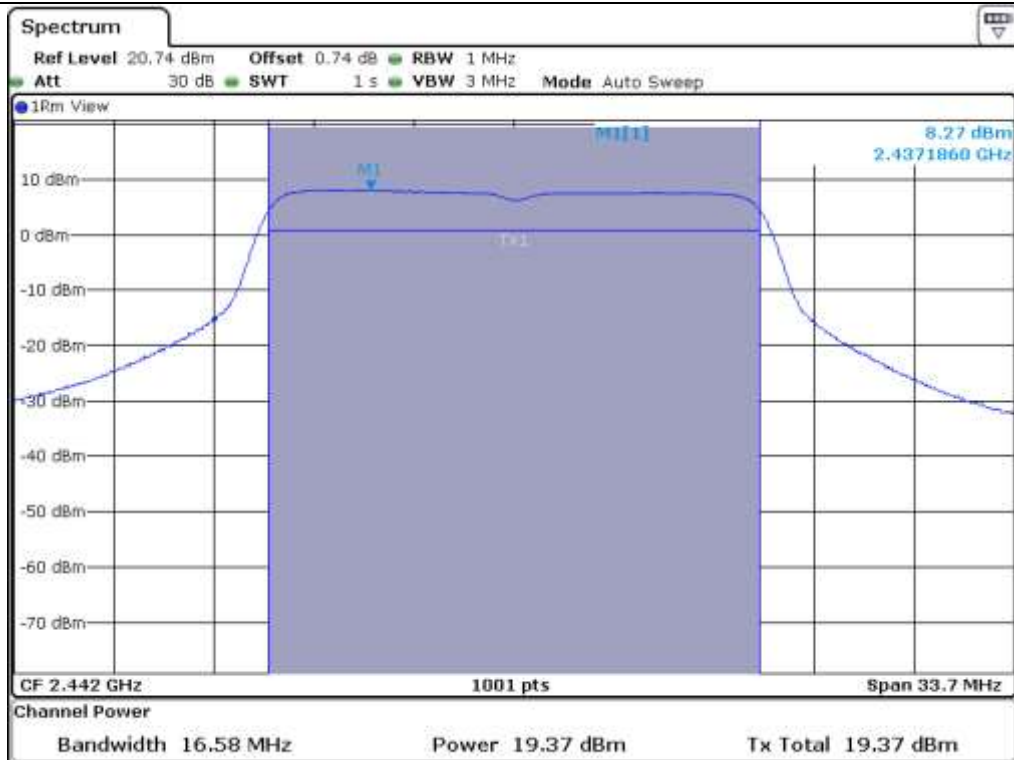
Middle Channel (6 dB Bandwidth)



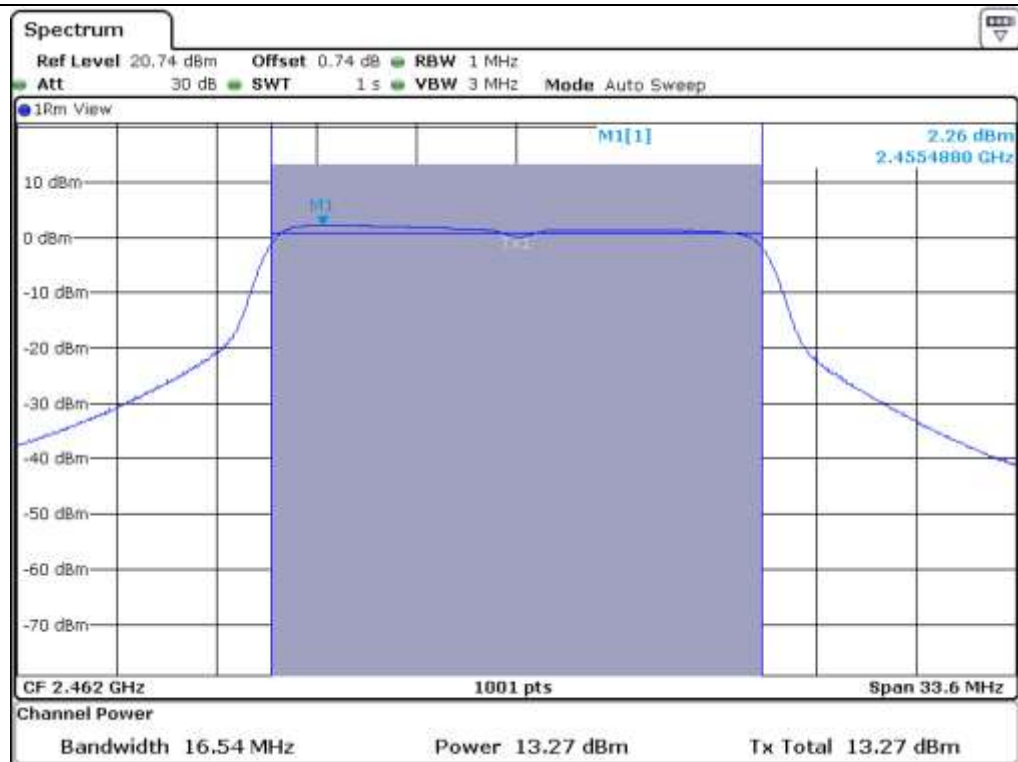
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.6 Test data for 802.11n_HT20 WLAN Mode

8.6.1 Test data for Antenna 0

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

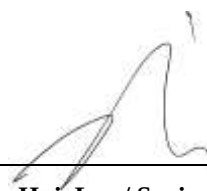
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.63	8.24	30.00	21.76
MIDDLE	2 442	17.63	16.56	30.00	13.44
HIGH	2 462	17.63	8.20	30.00	21.80

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

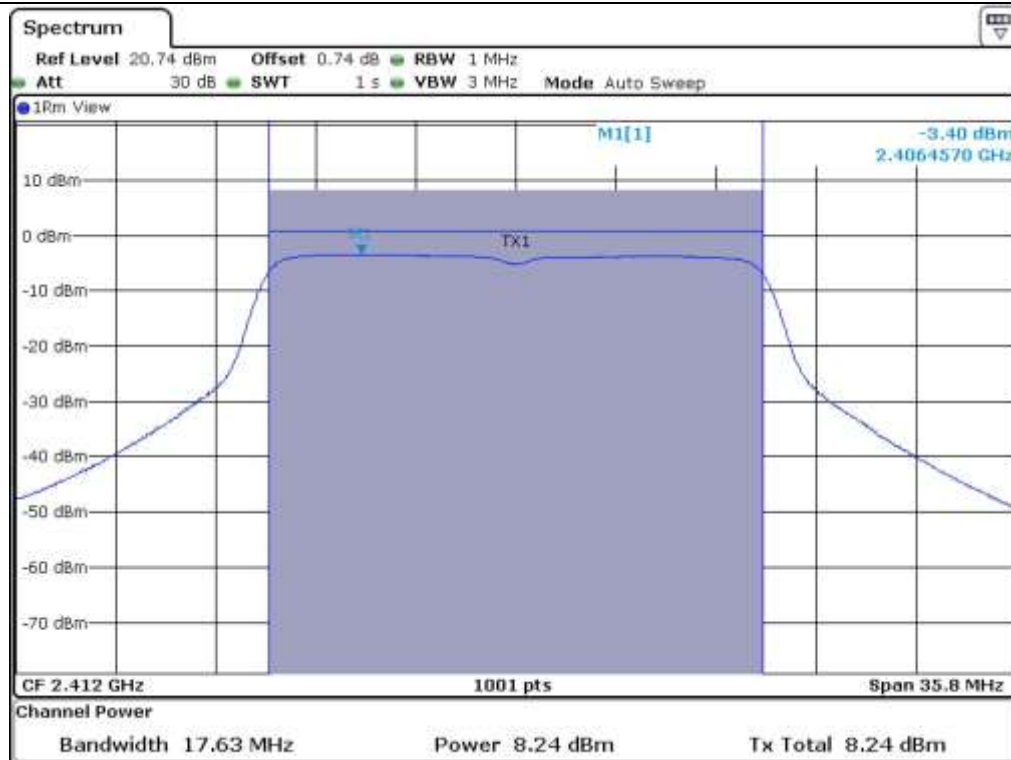
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.74	9.02	30.00	20.98
MIDDLE	2 442	17.74	14.96	30.00	15.04
HIGH	2 462	17.70	10.72	30.00	19.28

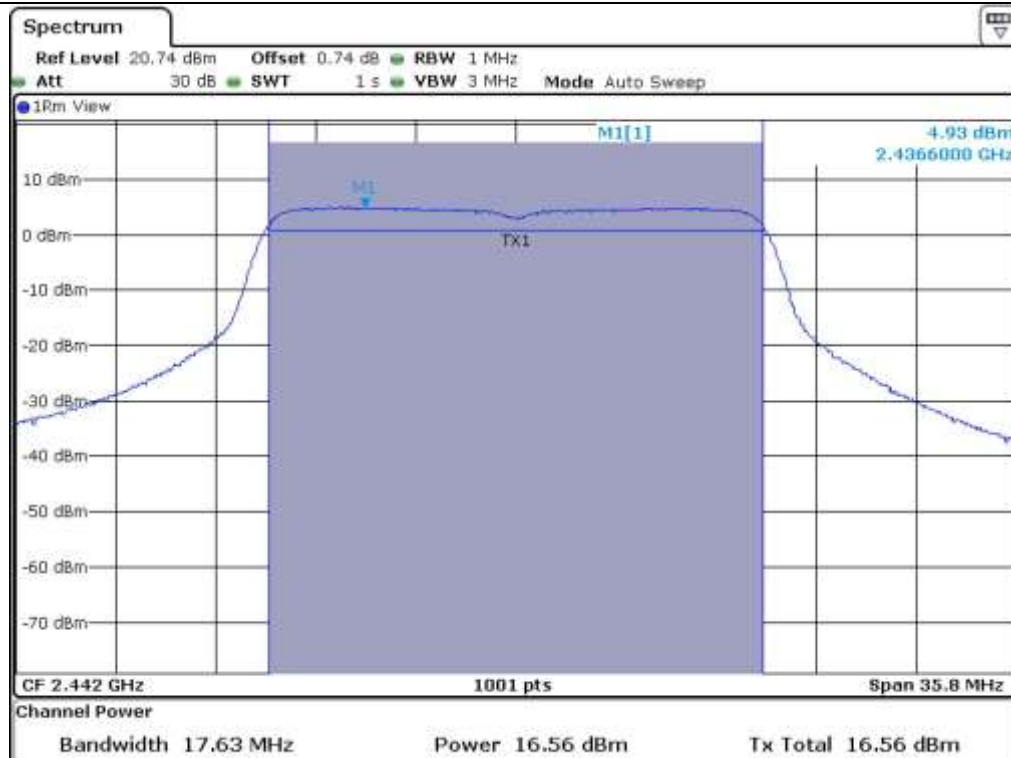
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



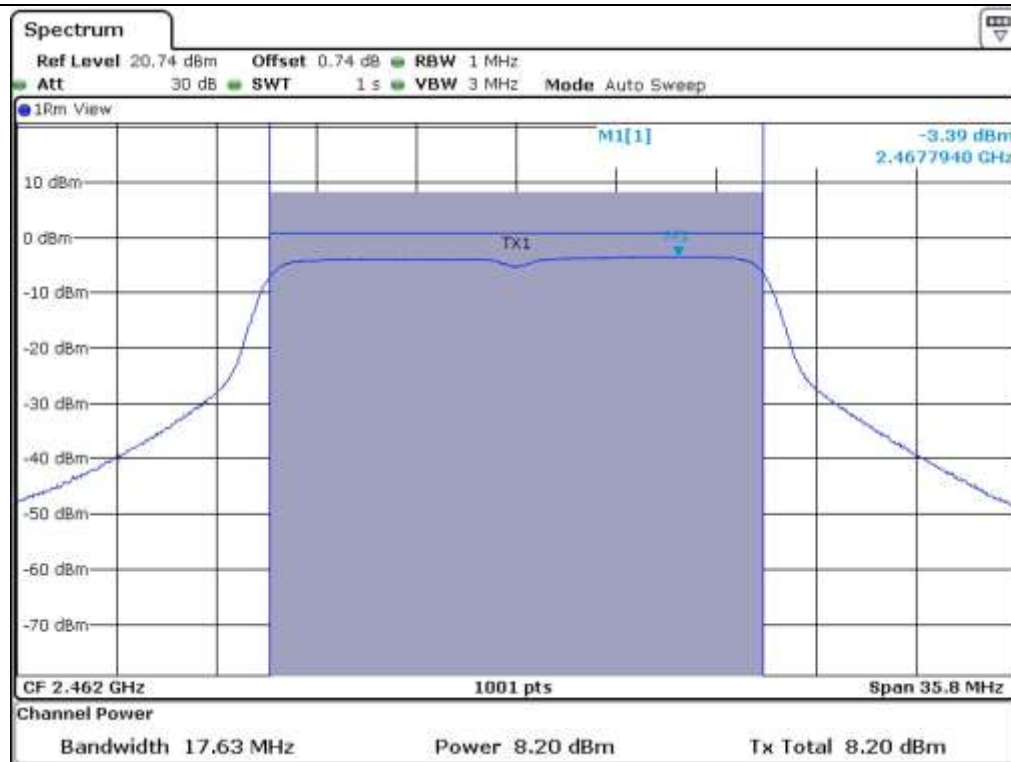
 Tested by: Jun-Hui, Lee / Senior Engineer



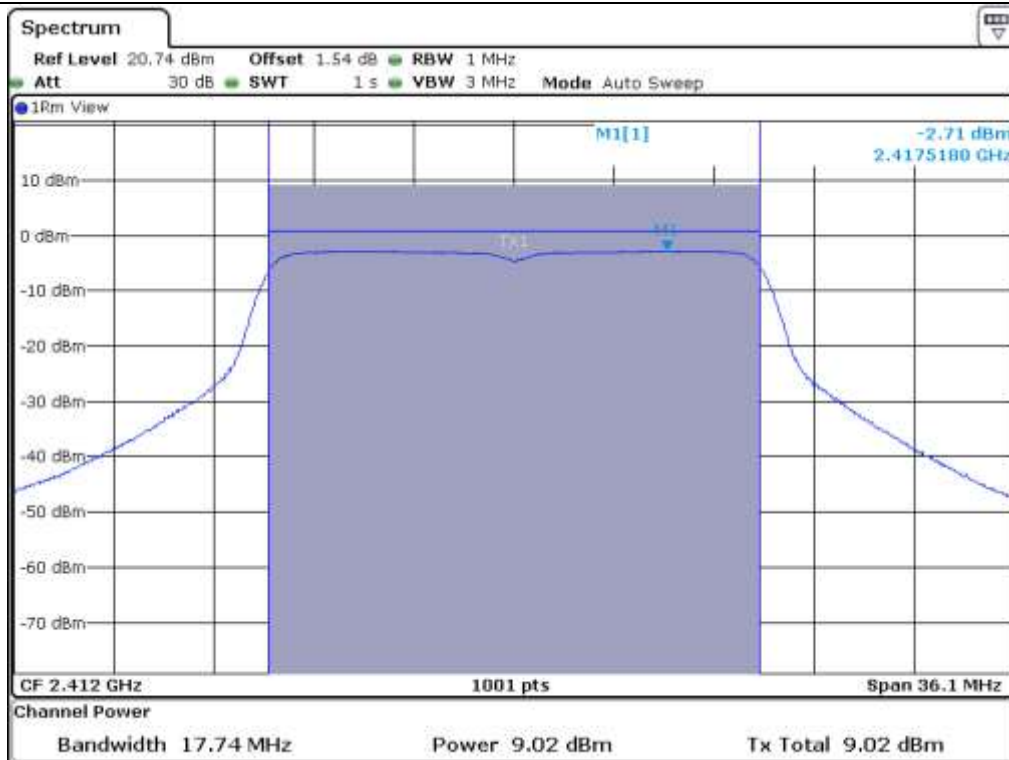
Low Channel (6 dB Bandwidth)



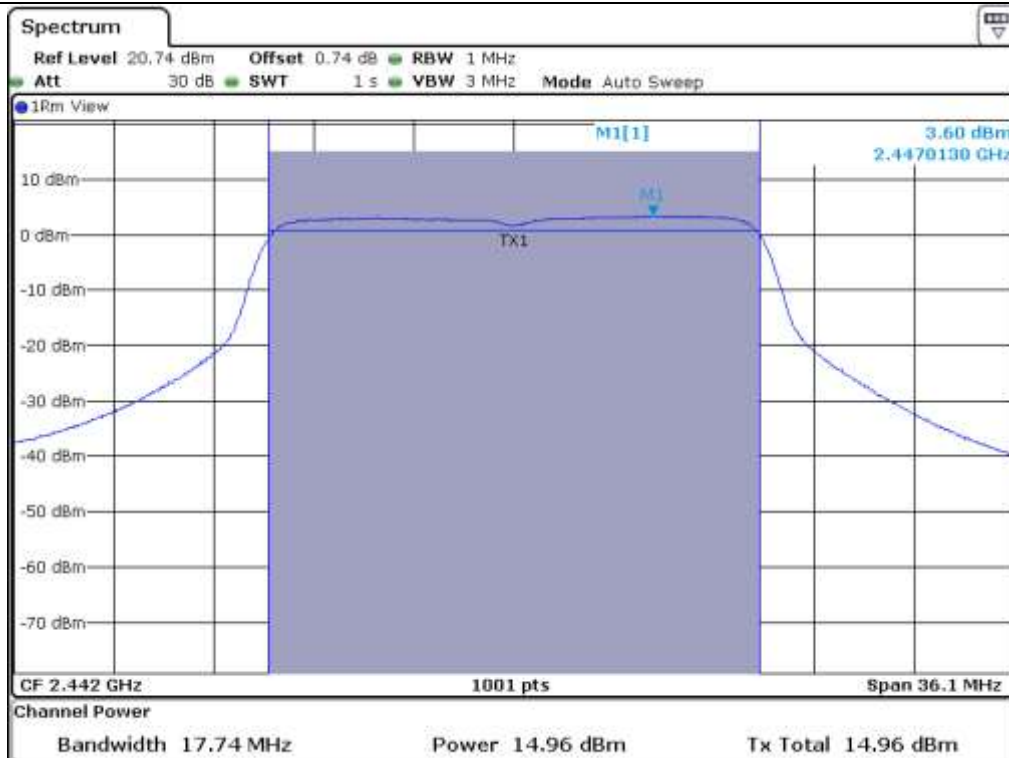
Middle Channel (6 dB Bandwidth)



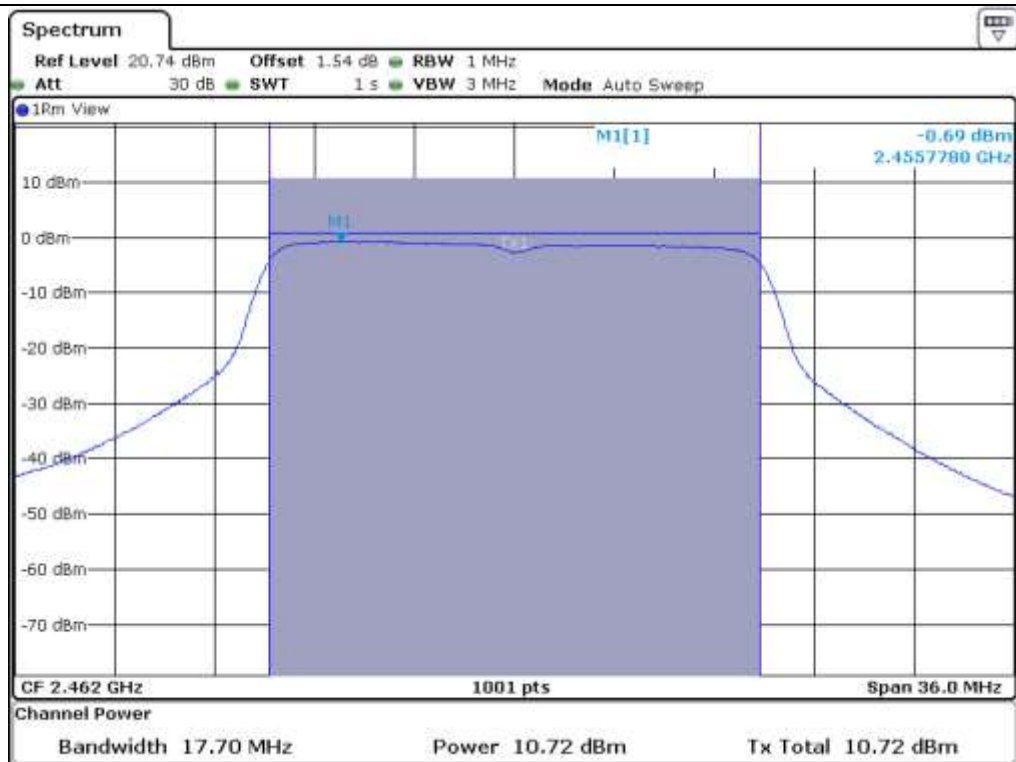
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.6.2 Test data for Antenna 1

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.62	9.64	30.00	20.36
MIDDLE	2 442	17.62	17.36	30.00	12.64
HIGH	2 462	17.58	9.28	30.00	20.72

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

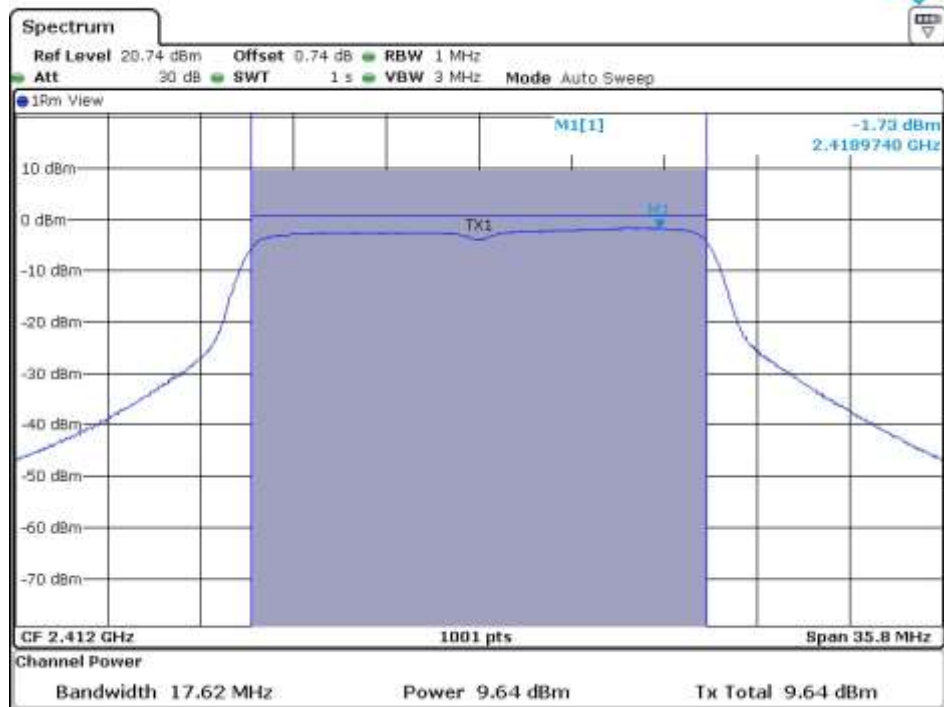
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.74	9.62	30.00	20.38
MIDDLE	2 442	17.70	14.23	30.00	15.77
HIGH	2 462	17.70	8.93	30.00	21.07

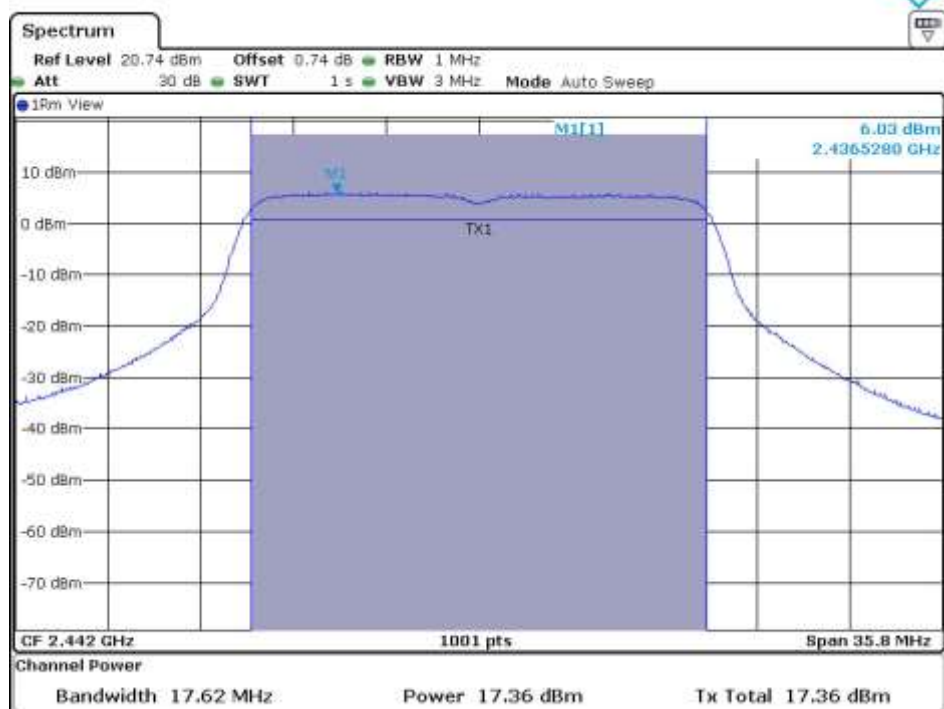
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



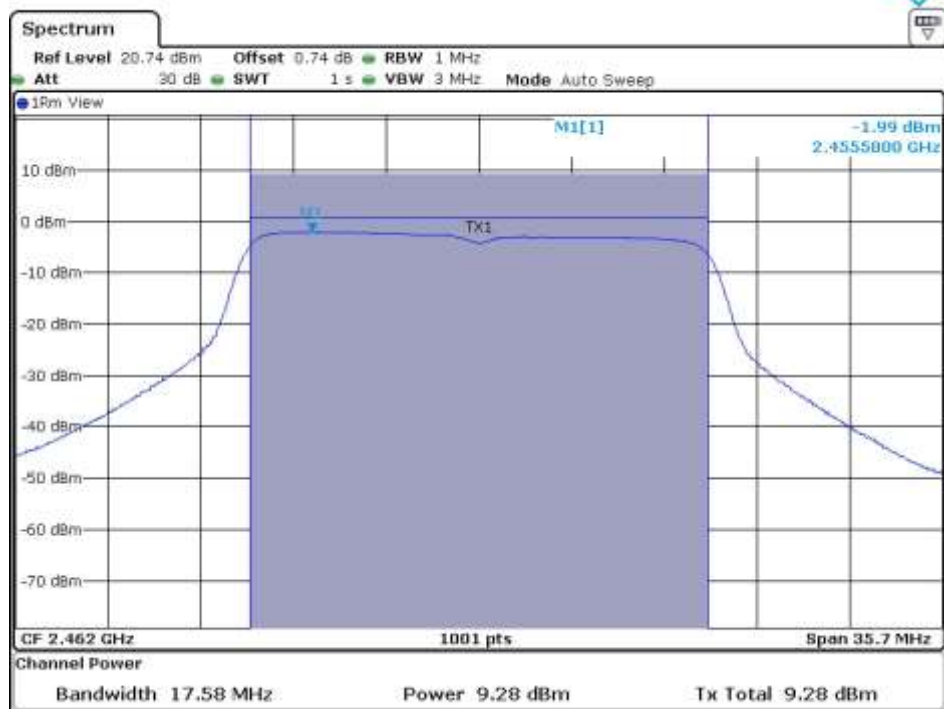
Tested by: Jun-Hui, Lee / Senior Engineer



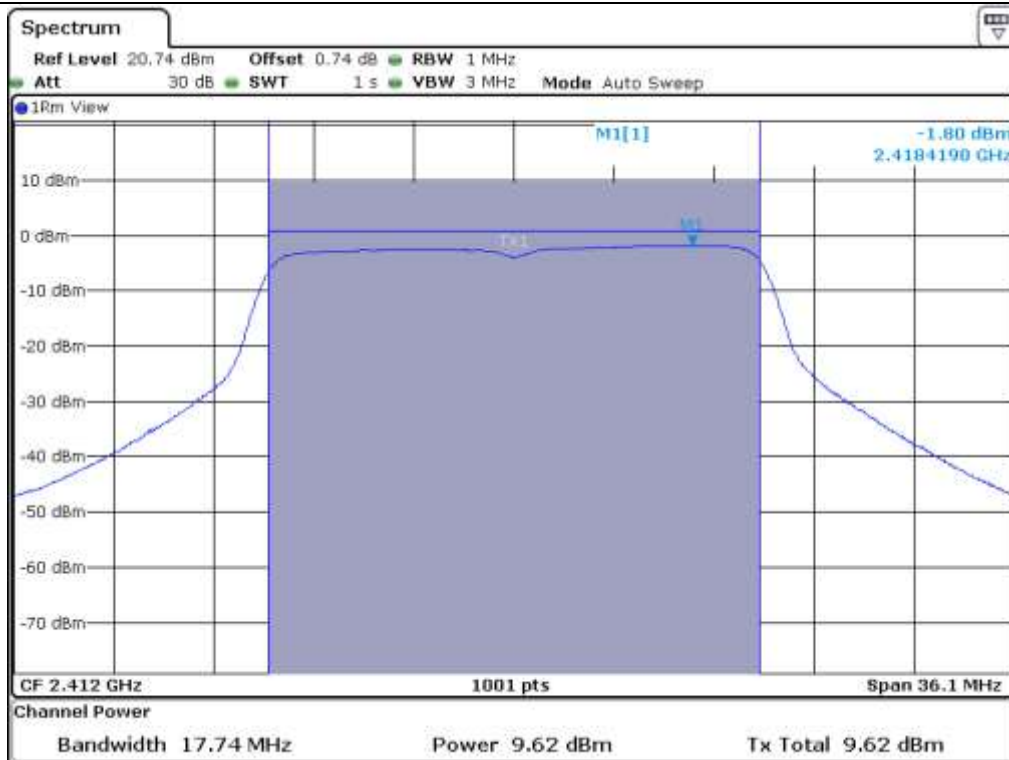
Low Channel (6 dB Bandwidth)



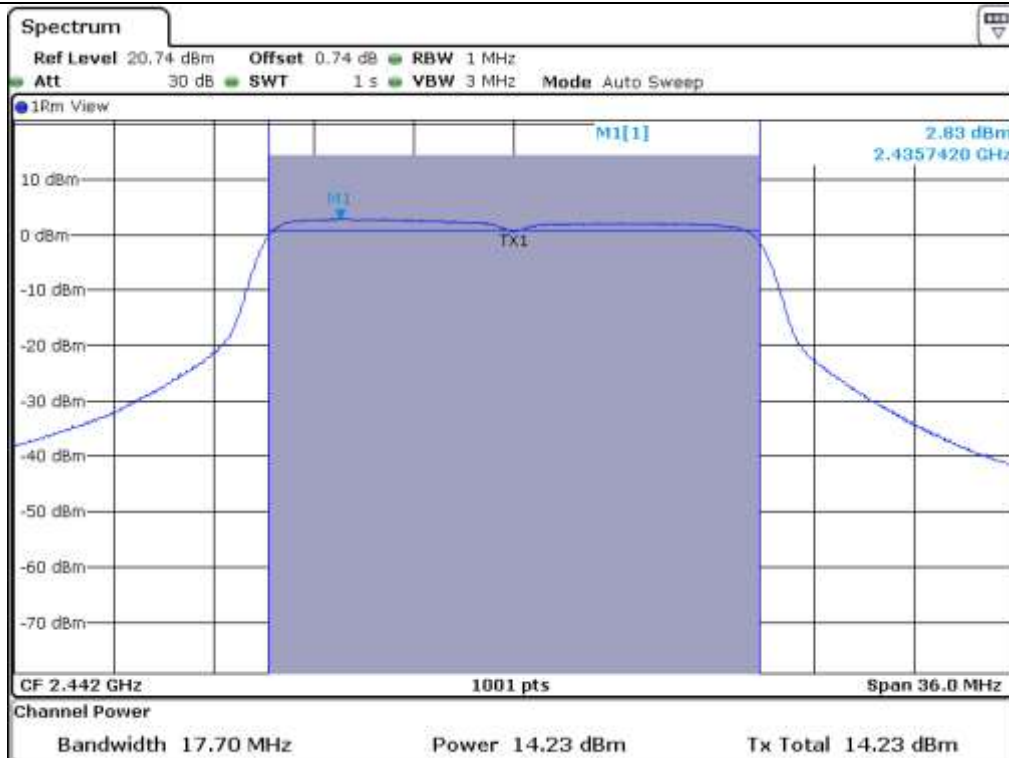
Middle Channel (6 dB Bandwidth)



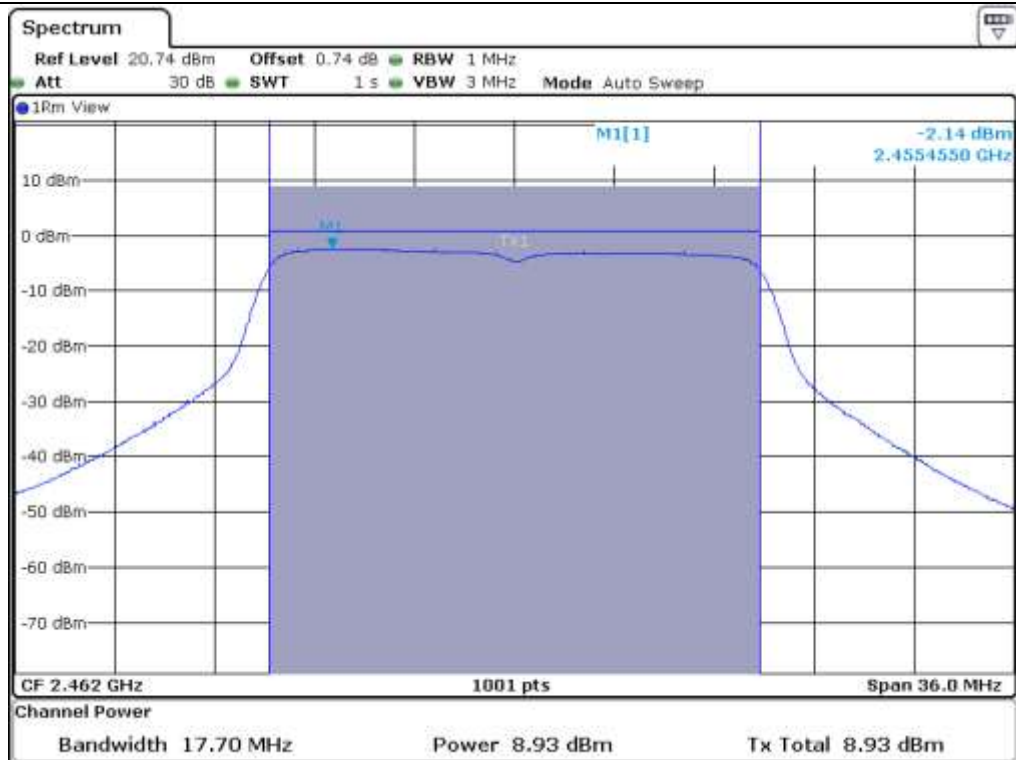
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.6.3 Test data for Antenna 2

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.62	9.34	30.00	20.66
MIDDLE	2 442	17.66	17.53	30.00	12.47
HIGH	2 462	17.62	9.36	30.00	20.64

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

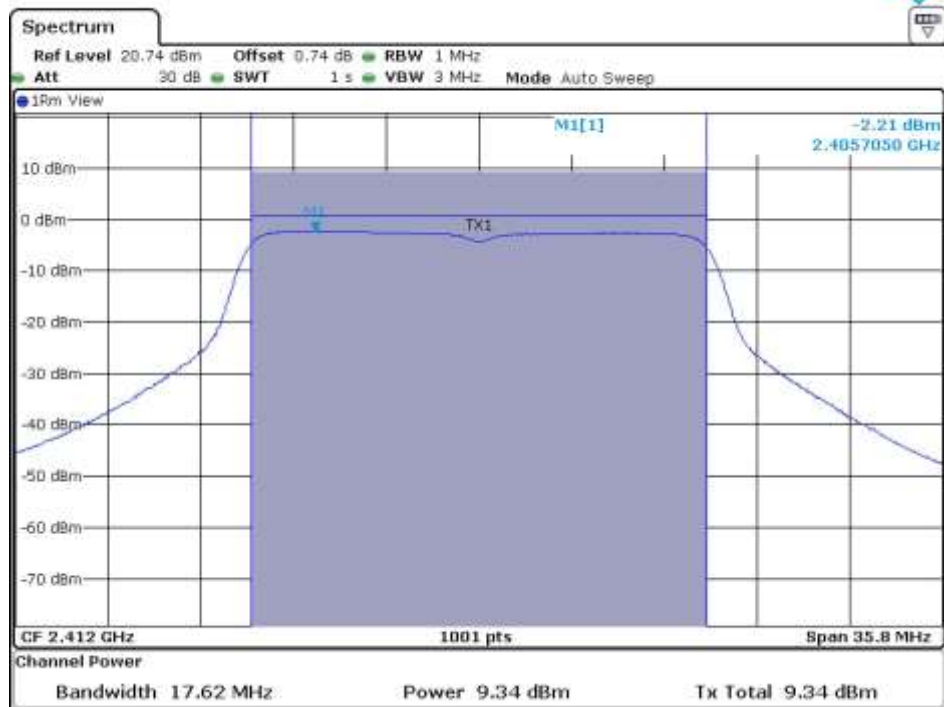
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.74	8.80	30.00	21.20
MIDDLE	2 442	17.70	15.00	30.00	15.00
HIGH	2 462	17.74	8.95	30.00	21.05

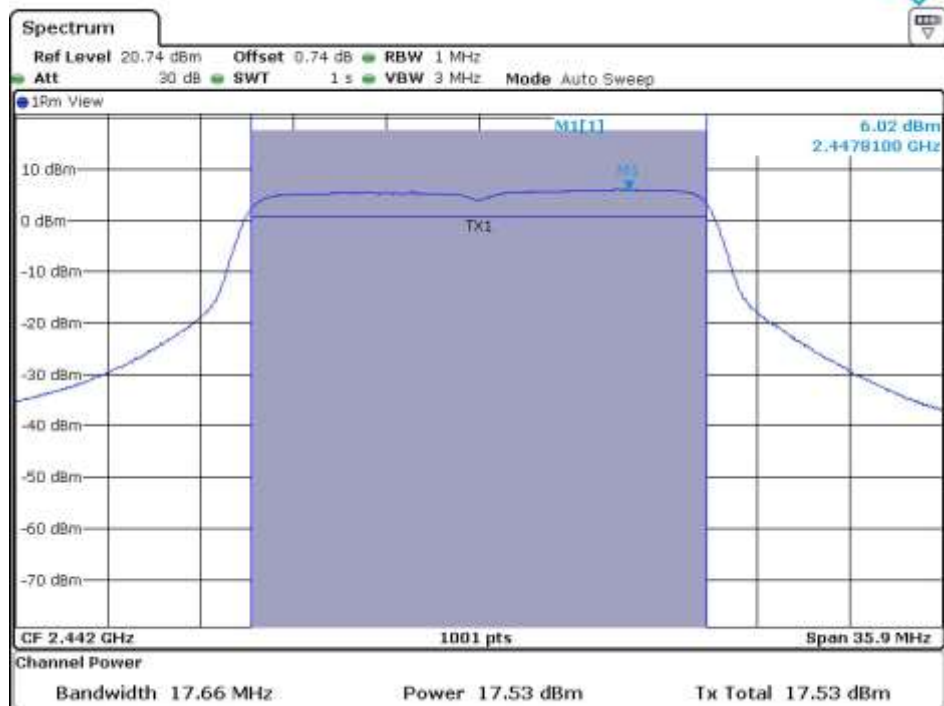
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



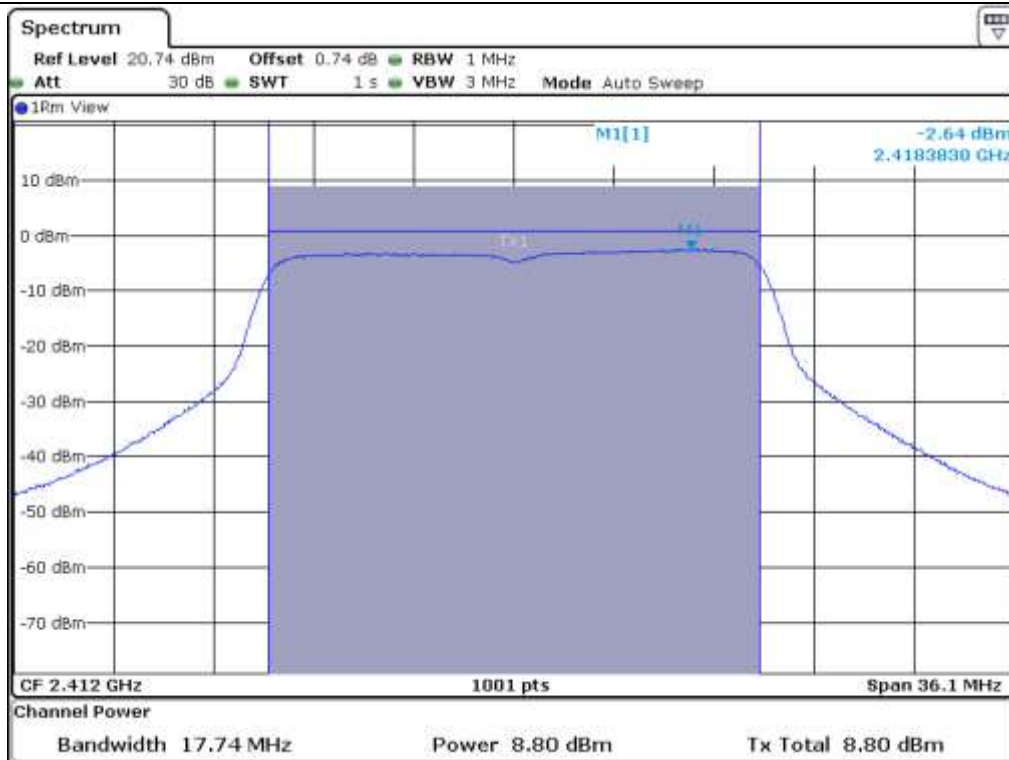
Tested by: Jun-Hui, Lee / Senior Engineer



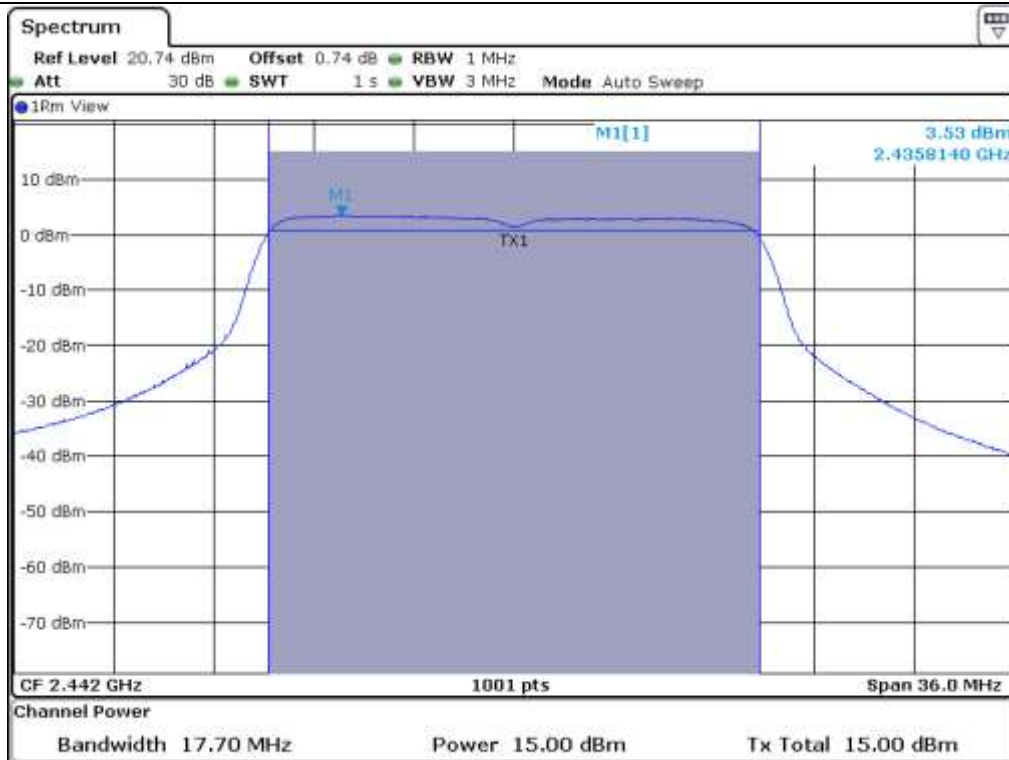
Low Channel (6 dB Bandwidth)



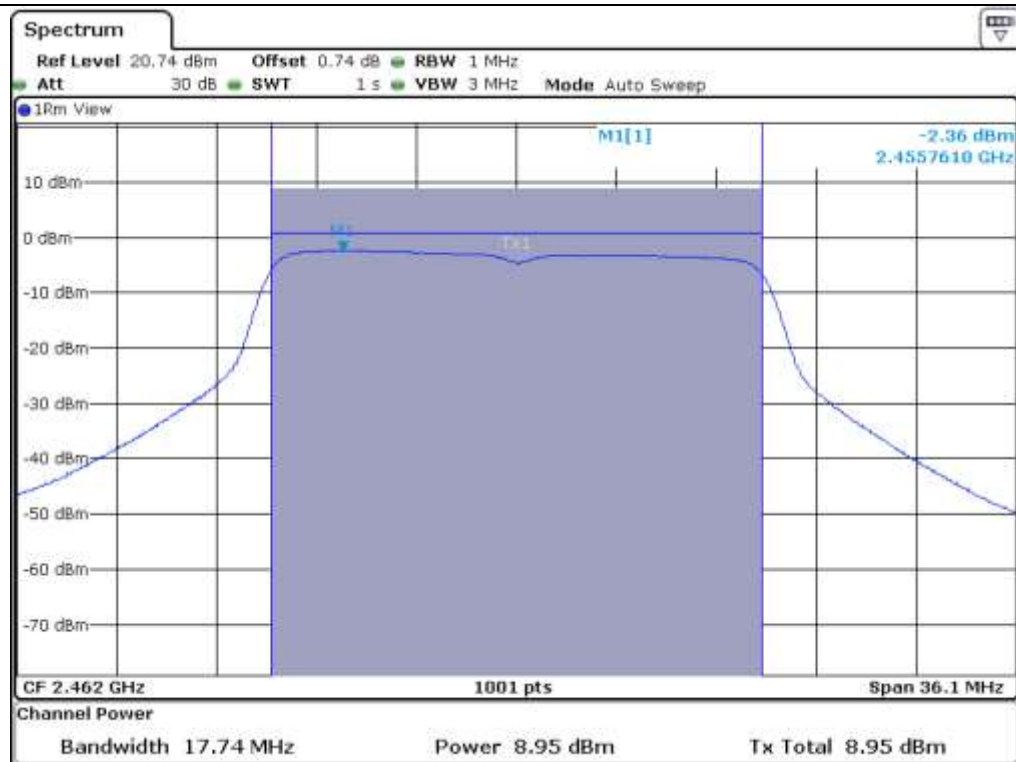
Middle Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.6.4 Test data for Multiple transmit

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	CALCULATED OUTPUT POWER (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.63	13.89	26.55	12.67
MIDDLE	2 442	17.66	21.94	26.55	4.61
HIGH	2 462	17.63	13.75	26.55	12.81

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

Remark 2 : Calculated Output Power= $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)})$

Remark 3 : Limit = 30 dBm – Exceeds Antenna gain

Remark 4 : Exceeds Antenna gain = $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)})$

-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	CALCULATED OUTPUT POWER (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	17.74	18.70	26.55	7.85
MIDDLE	2 442	17.74	24.29	26.55	2.27
HIGH	2 462	17.74	19.16	26.55	7.39

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

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

Remark 3 : Limit = 30 dBm – Exceeds Antenna gain

Remark 4 : Exceeds Antenna gain = $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)})$

Tested by: Jun-Hui, Lee / Senior Engineer

8.7 Test data for 802.11n_HT40 WLAN Mode

8.7.1 Test data for Antenna 0

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422	36.04	5.76	30.00	24.24
MIDDLE	2 442	36.36	15.78	30.00	14.22
HIGH	2 452	36.44	6.39	30.00	23.61

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

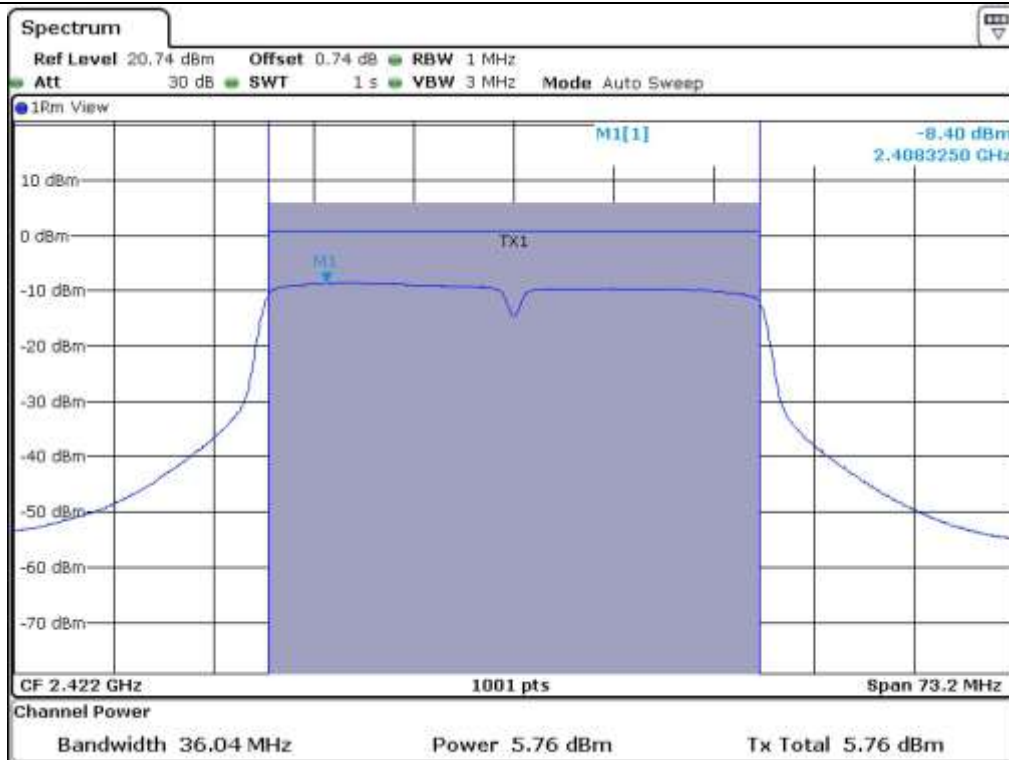
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422	36.20	7.27	30.00	22.73
MIDDLE	2 442	36.12	13.23	30.00	16.77
HIGH	2 452	36.12	8.70	30.00	21.30

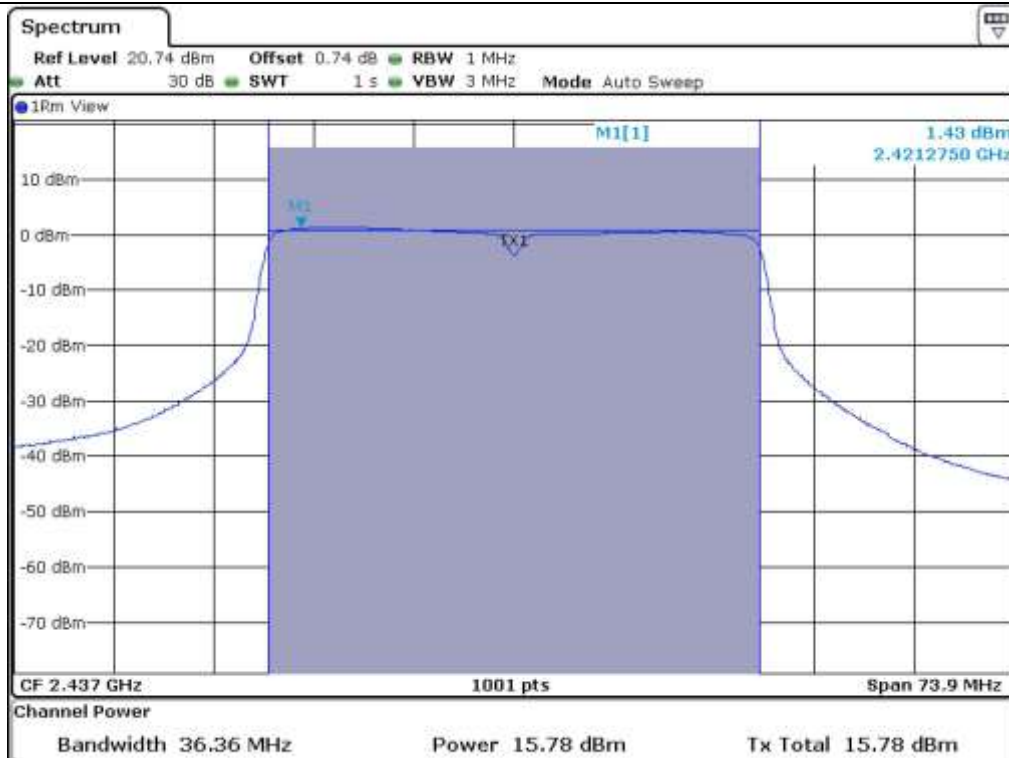
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



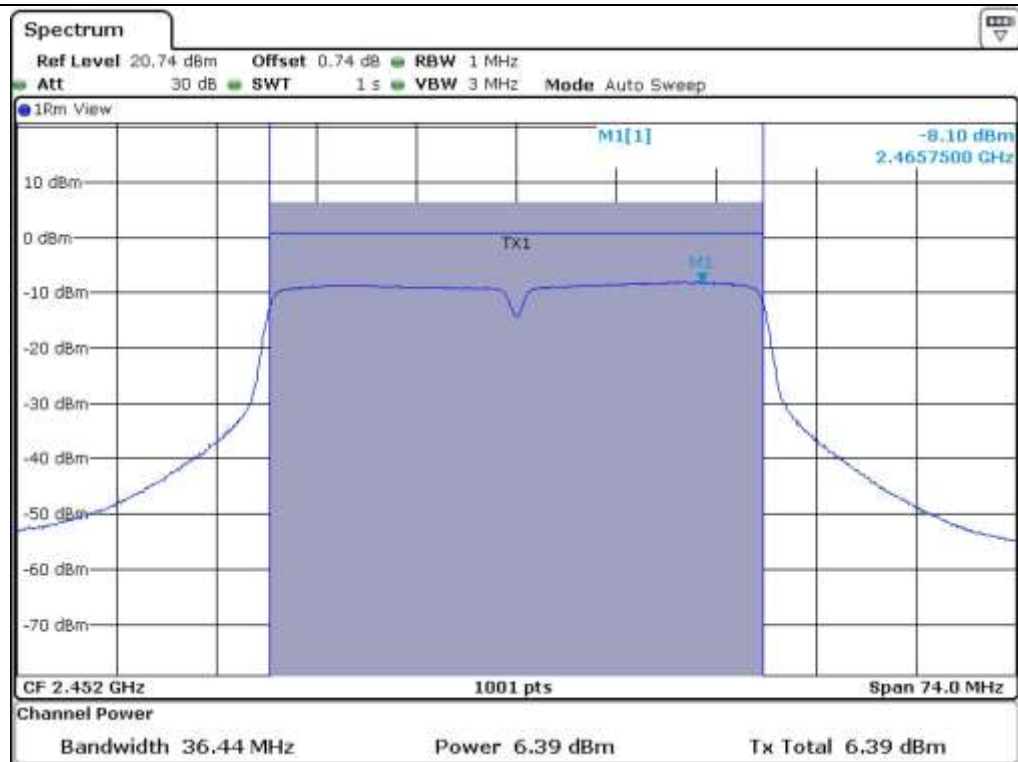
Tested by: Jun-Hui, Lee / Senior Engineer



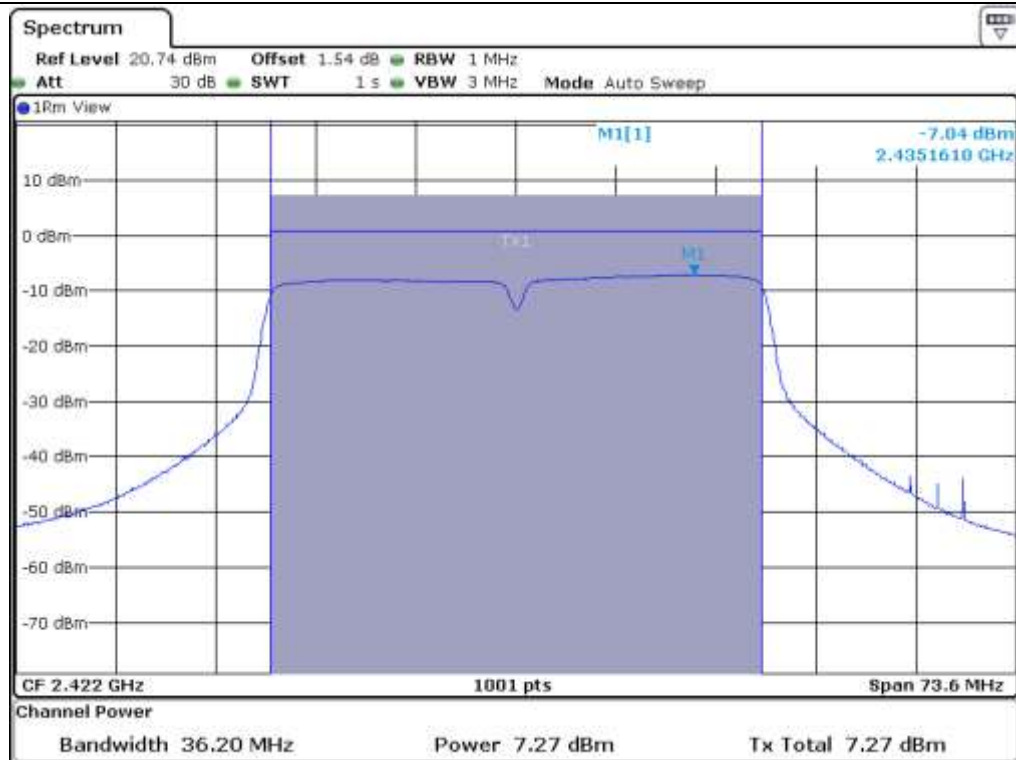
Low Channel (6 dB Bandwidth)



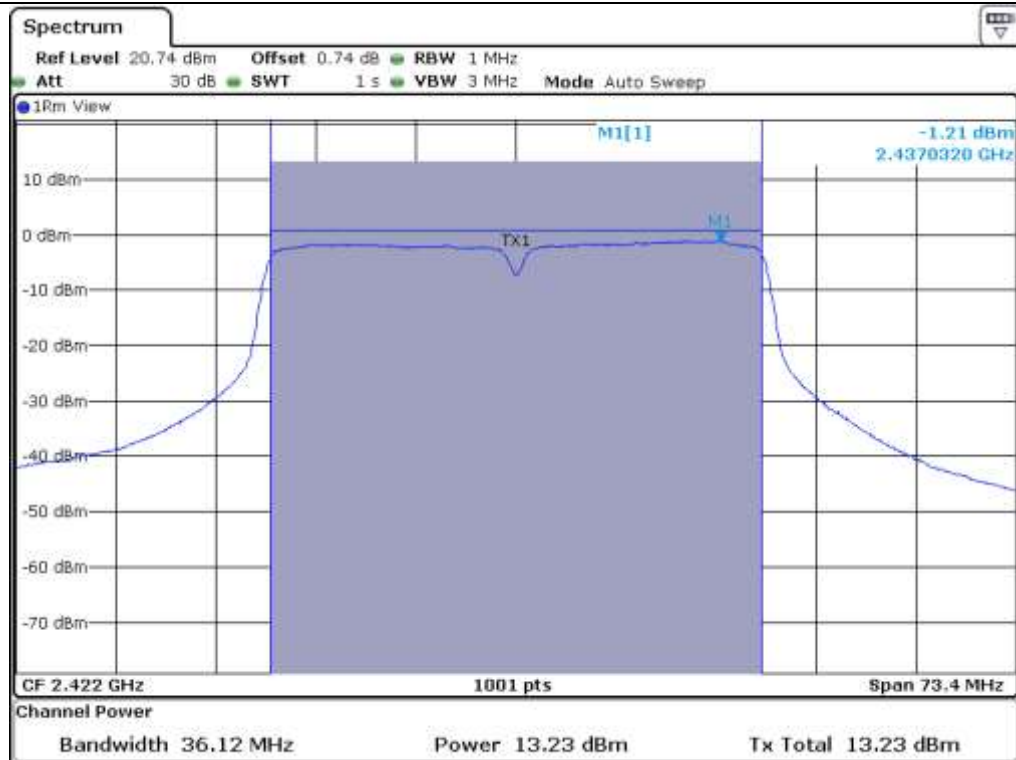
Middle Channel (6 dB Bandwidth)



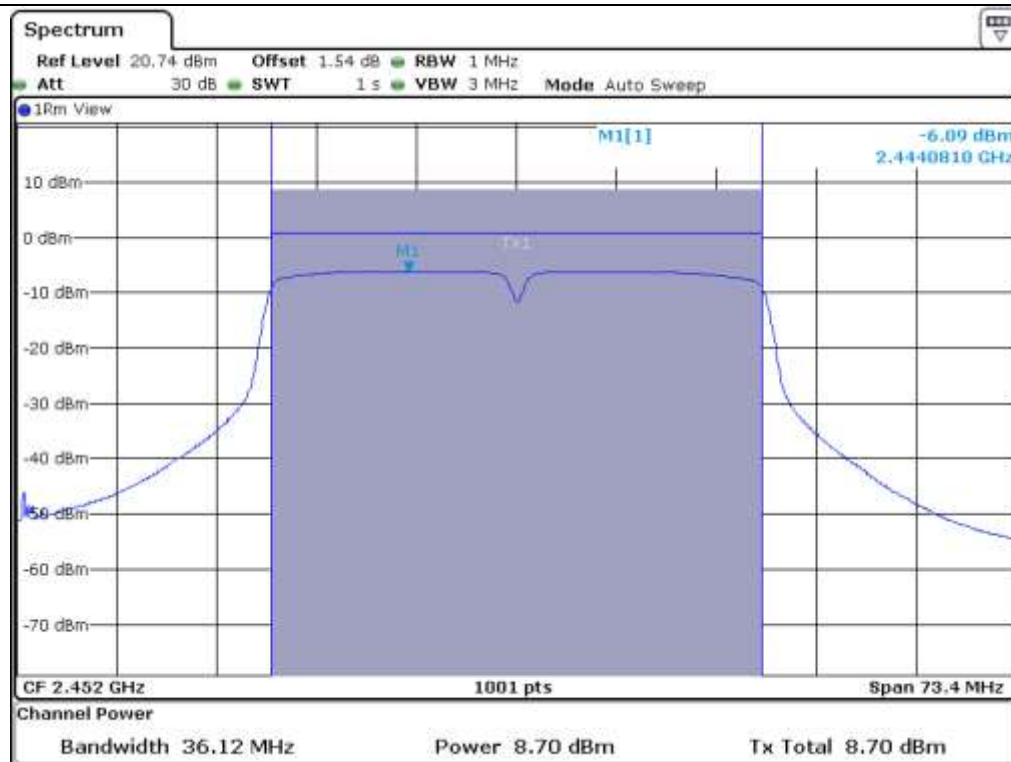
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.7.2 Test data for Antenna 1

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422	35.88	8.30	30.00	21.70
MIDDLE	2 442	36.36	17.59	30.00	12.41
HIGH	2 452	36.20	6.90	30.00	23.10

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

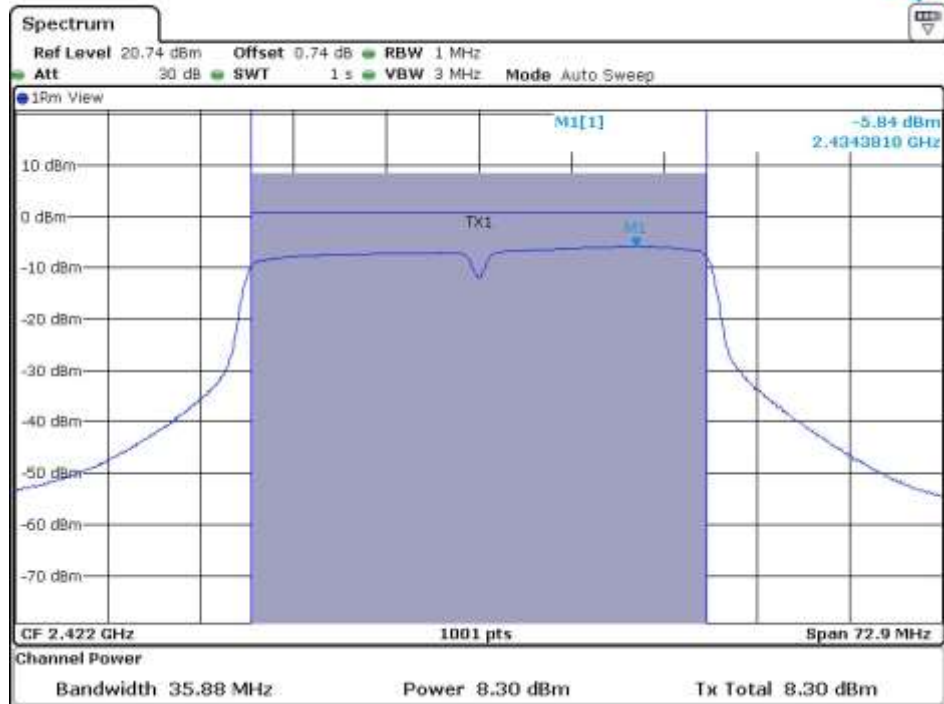
-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422	36.04	8.04	30.00	21.96
MIDDLE	2 442	36.12	14.90	30.00	15.10
HIGH	2 452	36.12	6.82	30.00	23.18

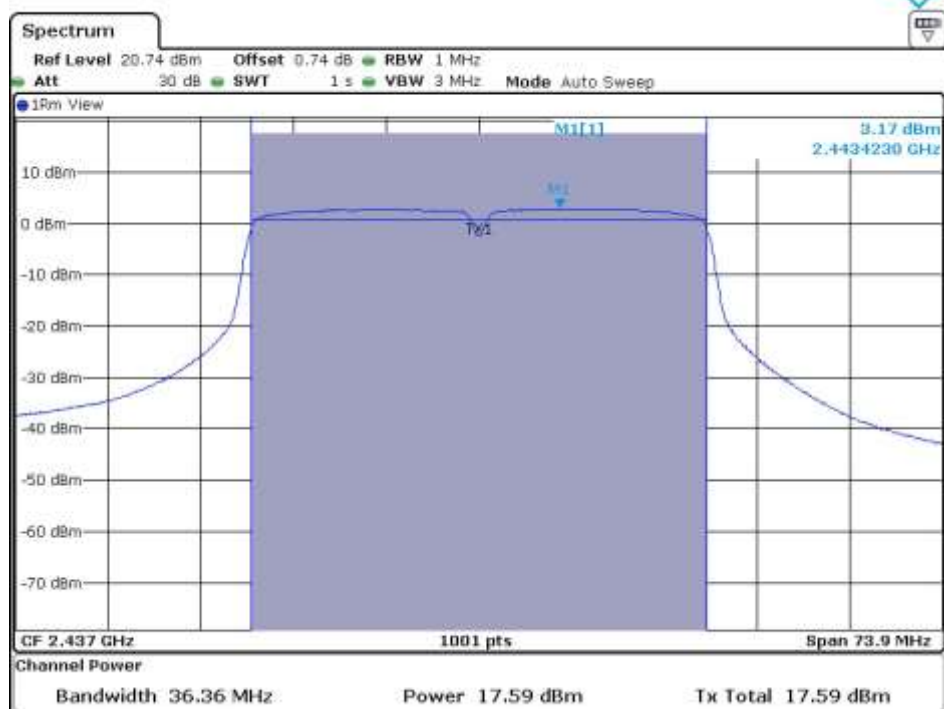
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



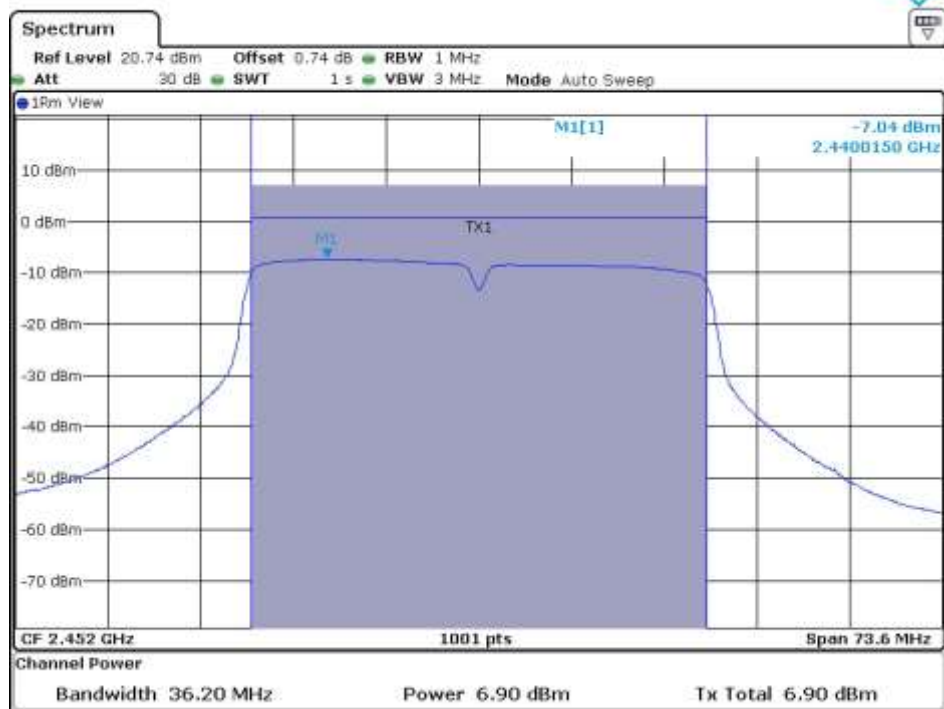
Tested by: Jun-Hui, Lee / Senior Engineer



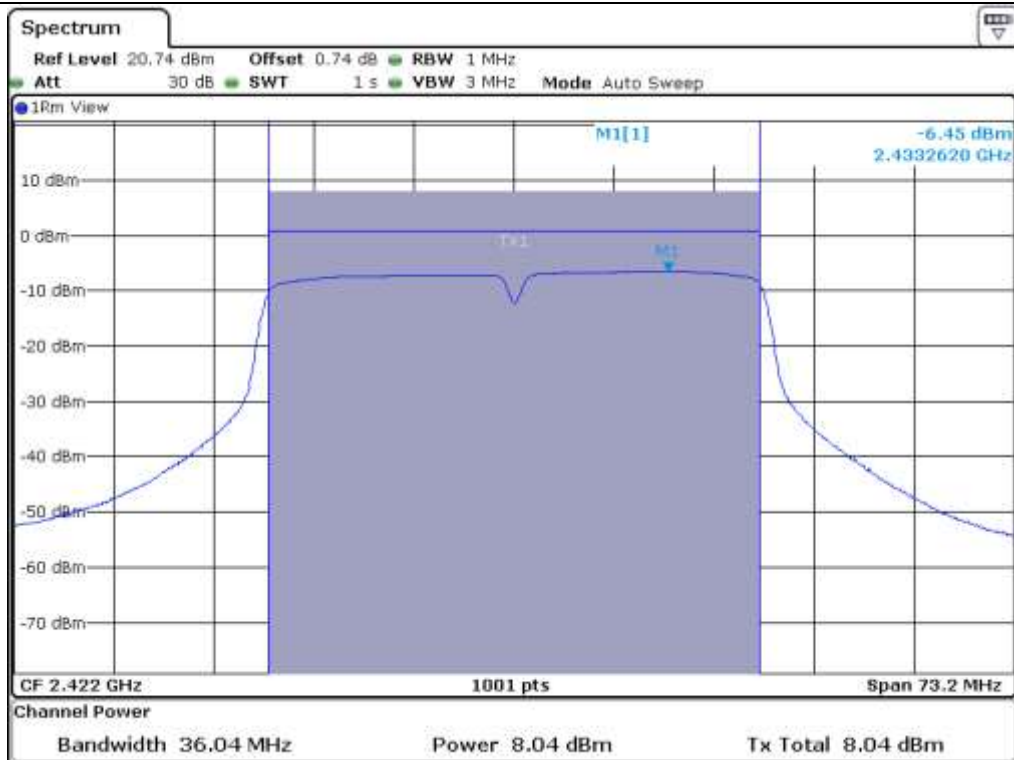
Low Channel (6 dB Bandwidth)



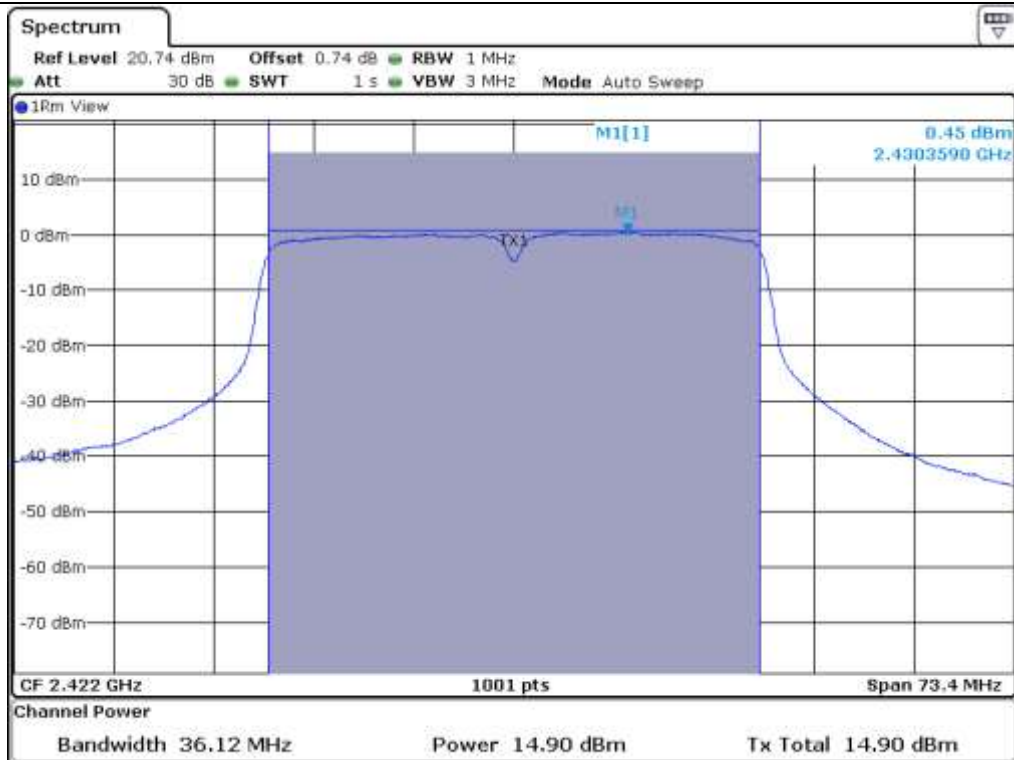
Middle Channel (6 dB Bandwidth)



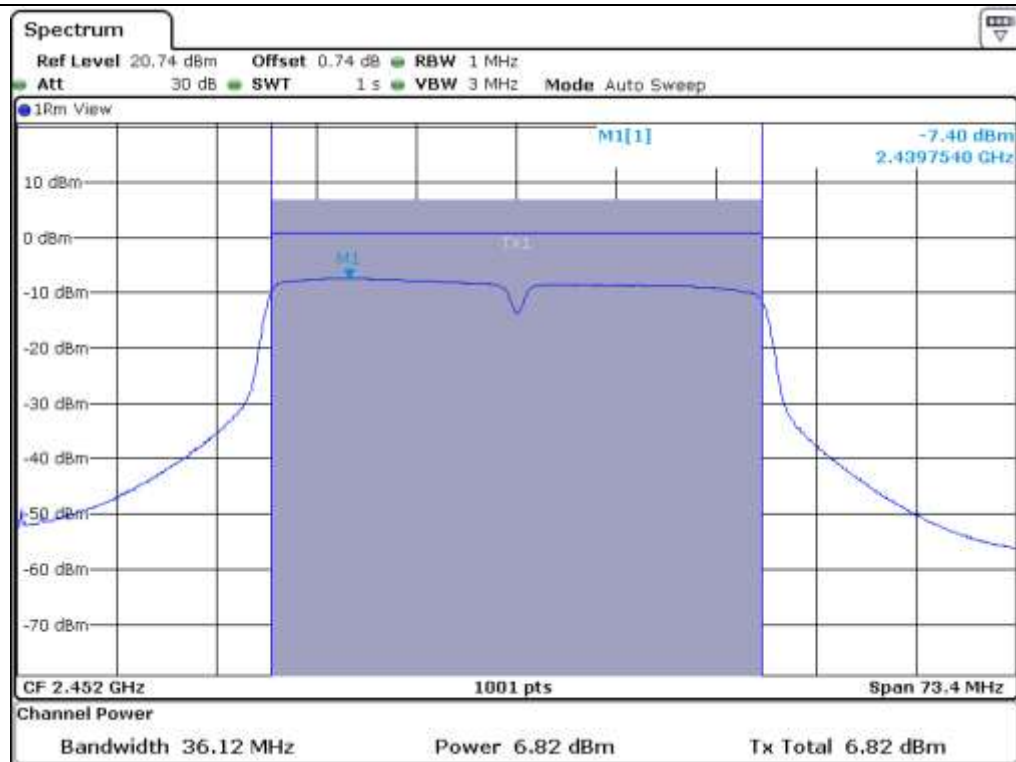
High Channel (6 dB Bandwidth)



Low Channel (99 % bandwidth)



Middle Channel (99 % bandwidth)



High Channel (99 % bandwidth)

8.7.3 Test data for Antenna 2

-. Test Date : April 30, 2016

-. Test Result : Pass

-. FCC Test data

CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422	36.44	7.24	30.00	22.76
MIDDLE	2 442	36.20	17.50	30.00	12.50
HIGH	2 452	36.36	8.05	30.00	21.95

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

-. IC Test data

CHANNEL	FREQUENCY (MHz)	99 % bandwidth (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422	36.12	6.91	30.00	23.09
MIDDLE	2 442	36.12	15.00	30.00	15.00
HIGH	2 452	36.04	6.18	30.00	23.82

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



Tested by: Jun-Hui, Lee / Senior Engineer