

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

Test Report No. : OT-182-RWD-018
AGR No. : A176A-090
Applicant : True Systems Co., Ltd.
Address : D-603, Bundang Techno Park, Yatap-dong, Bundang-gu, Seongnam-si, Gyunggi-do, 13516, Korea
Manufacturer : True Systems Co., Ltd.
Address : D-603, Bundang Techno Park, Yatap-dong, Bundang-gu, Seongnam-si, Gyunggi-do, 13516, Korea
Type of Equipment : Smart Beauty Analyzer
FCC ID. : 2AO9H-MSAMINI
Model Name : MSA mini
Serial number : N/A
Total page of Report : 57 pages (including this page)
Date of Incoming : July 21, 2017
Date of issue : February 08, 2017

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:


 Jae-Ho Lee / Chief Engineer
 ONETECH Corp.

Approved by:


 Keun-Young, Choi / Vice President
 ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
OT-182-RWD-018	February 08, 2017	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : True Systems Co., Ltd.
Address : D-603, Bundang Techno Park, Yatap-dong, Bundang-gu, Seongnam-si, Gyunggi-do, 13516, Korea
Contact Person : Roh, Hyeong Nam / Director
Telephone No. : +82-31-712-8031
FCC ID : 2AO9H-MSAMINI
Model Name : MSA mini
Serial Number : N/A
Date : February 08, 2017

EQUIPMENT CLASS	DTS-Digital Transmission System
EQUIPMENT DESCRIPTION	Smart Beauty Analyzer
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	N/A (See Note)
15.203	Antenna Requirement	Met requirement / PASS

Note: The test is not performed because the EUT is operated by DC battery.

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-14617/ G-10666 / T-1842

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

-. Site Accreditation:

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The True Systems Co., Ltd., Model MSA mini (referred to as the EUT in this report) is a Smart Beauty Analyzer. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Smart Beauty Analyzer
OPERATING FREQUENCY	802.11b/g/n(HT20): 2 412 MHz ~ 2 462 MHz
MAX. RF OUTPUT POWER	802.11b: 16.45 dBm
	802.11g: 18.73 dBm
	802.11n(HT20): 18.14 dBm
MODULATION TYPE	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
ANTENNA TYPE	Chip Antenna
ANTENNA GAIN	1.99 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	11.059 2 MHz, 24 MHz, 26 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	N/A	N/A	N/A
Camera Board	N/A	MSA_MINI_MICOM_170526	N/A
Display	N/A	N/A	N/A
LED Board	N/A	MSA_MINI_LED_170526	N/A
POGO Board	N/A	MSA_MINI_POGO	N/A
Battery	N/A	N/A	N/A

5.2 Peripheral equipment

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

Model	Manufacturer	Description	Connected to
N/A	N/A	N/A	N/A

5.3 Mode of operation during the test

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

The worse case data rate for each modulation is determined in 11 Mbps for IEEE 802.11b, 6 Mbps for IEEE 802.11g, and 6.5 Mbps for HT20.

5.4 Configuration of Test System

Line Conducted Test: It is not need to test this requirement, because the EUT shall be operated by DC battery.

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, 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 Chip 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)
It is not need to test this requirement, because the power of the EUT is supplied by battery.	

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

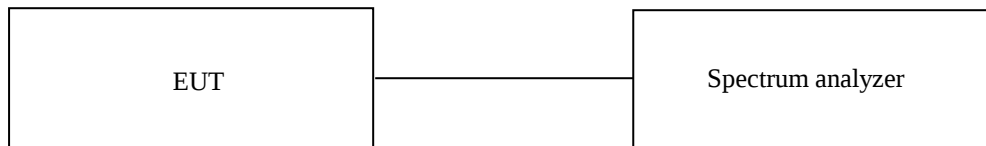
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 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.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct.26, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

7.4 Test data for 802.11b

-. Test Date : January 31, 2018

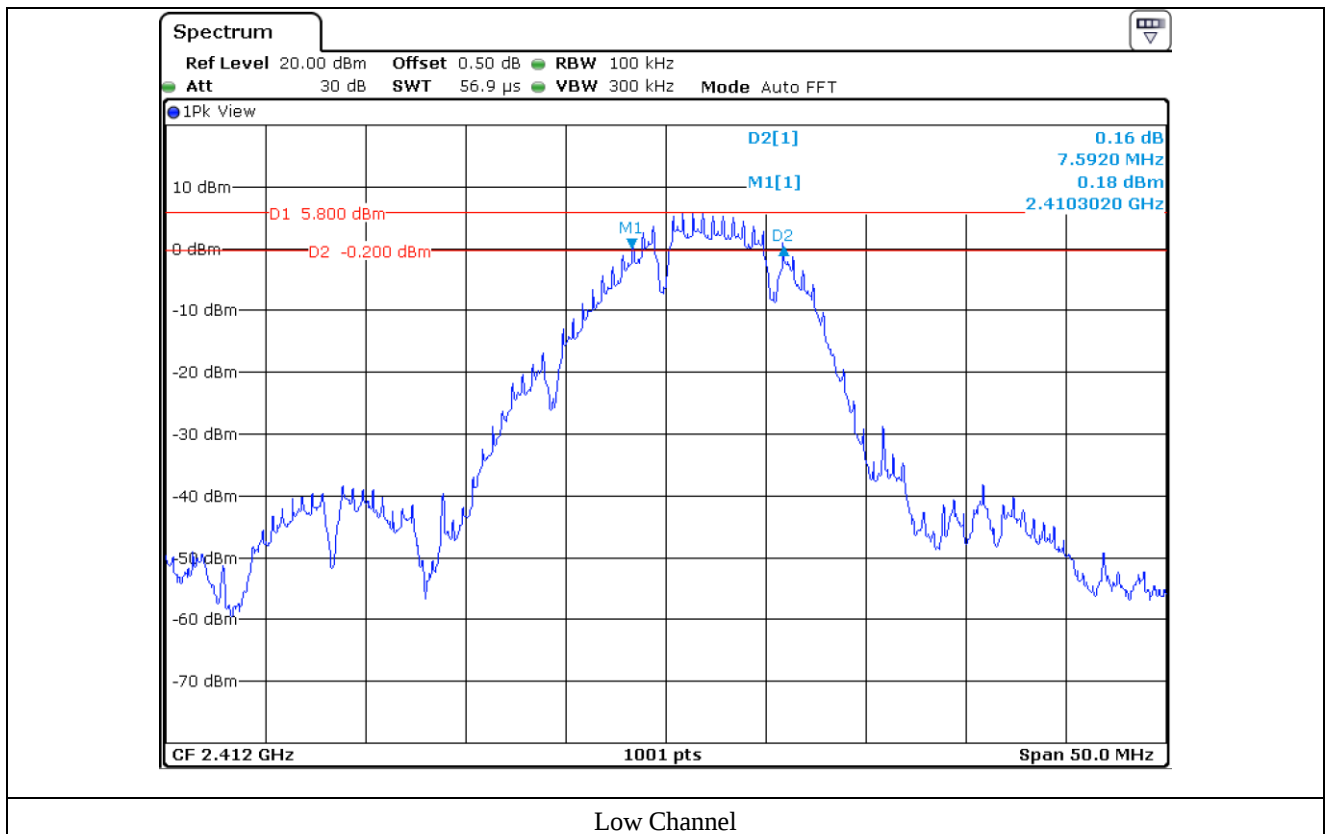
-. Test Result : Pass

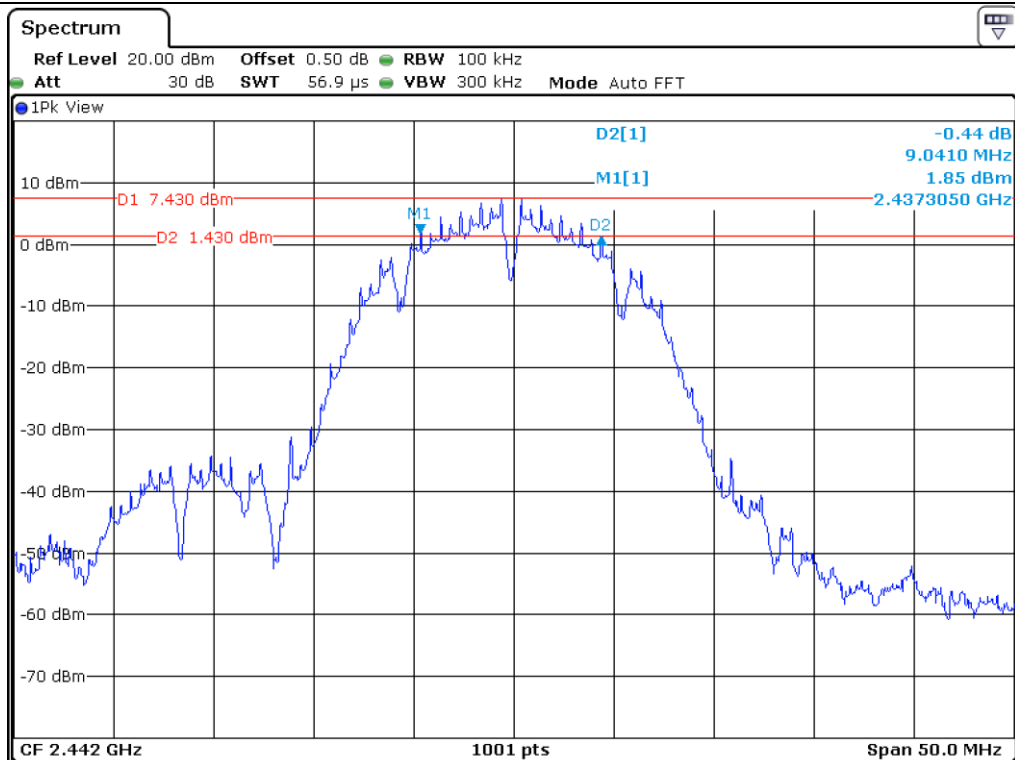
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (MHz)	LIMIT(MHz)	Margin(MHz)
Low	2 412	7.59	0.50	7.09
Middle	2 442	9.04	0.50	8.54
High	2 462	9.59	0.50	9.09

Remark. Margin = Measured Value - Limit

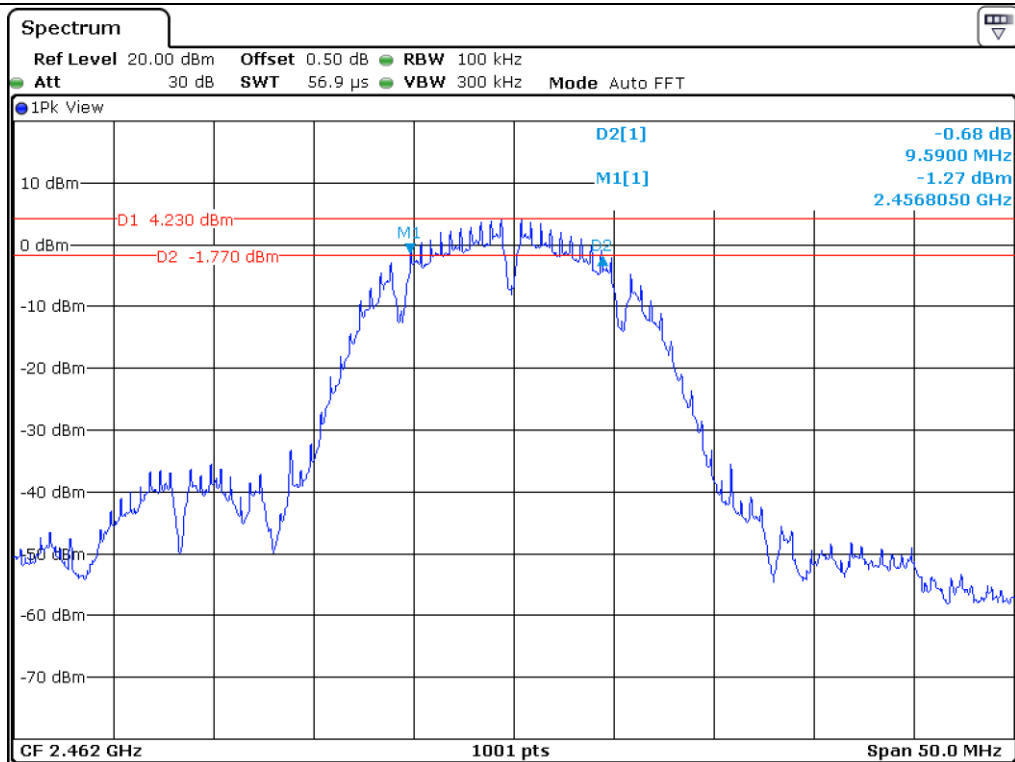


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

7.5 Test data for 802.11g

-. Test Date : January 31, 2018

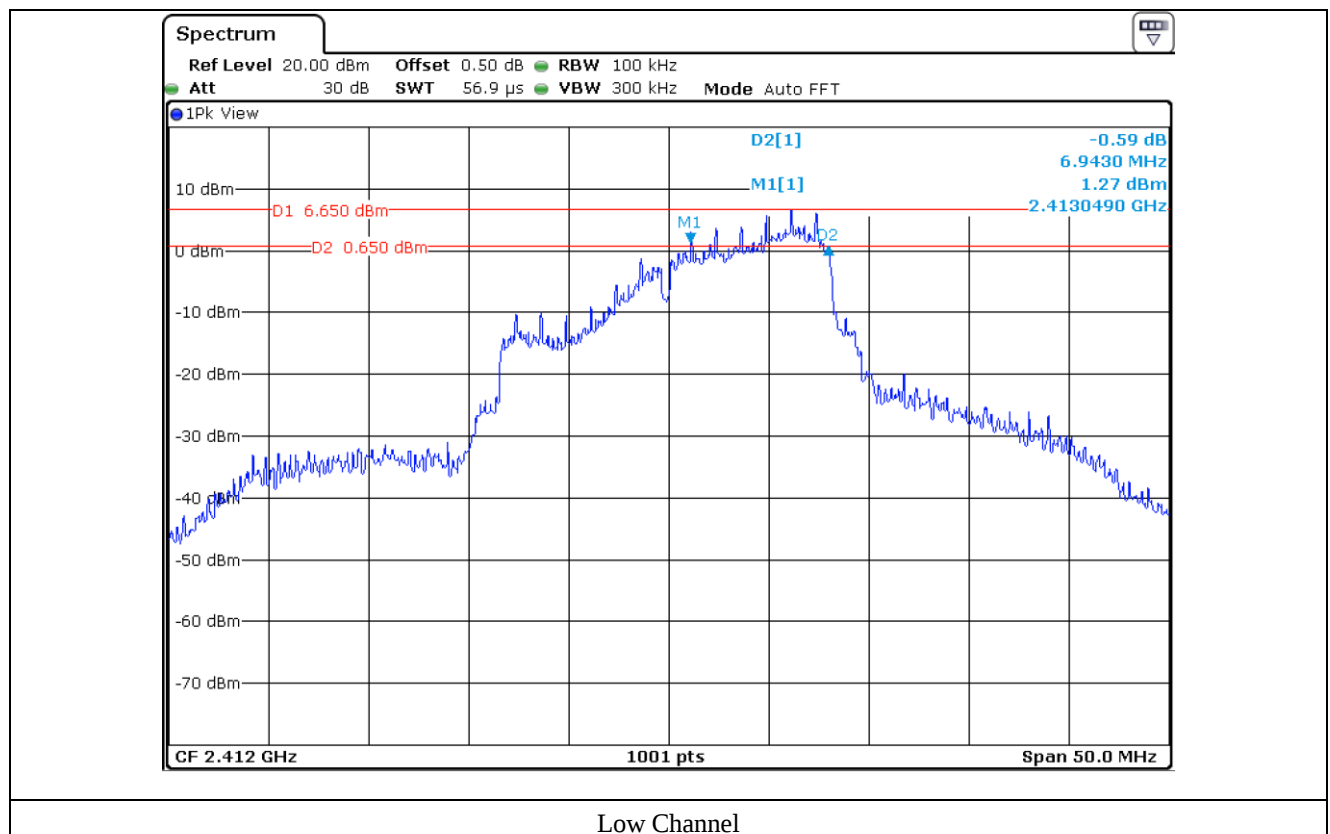
-. Test Result : Pass

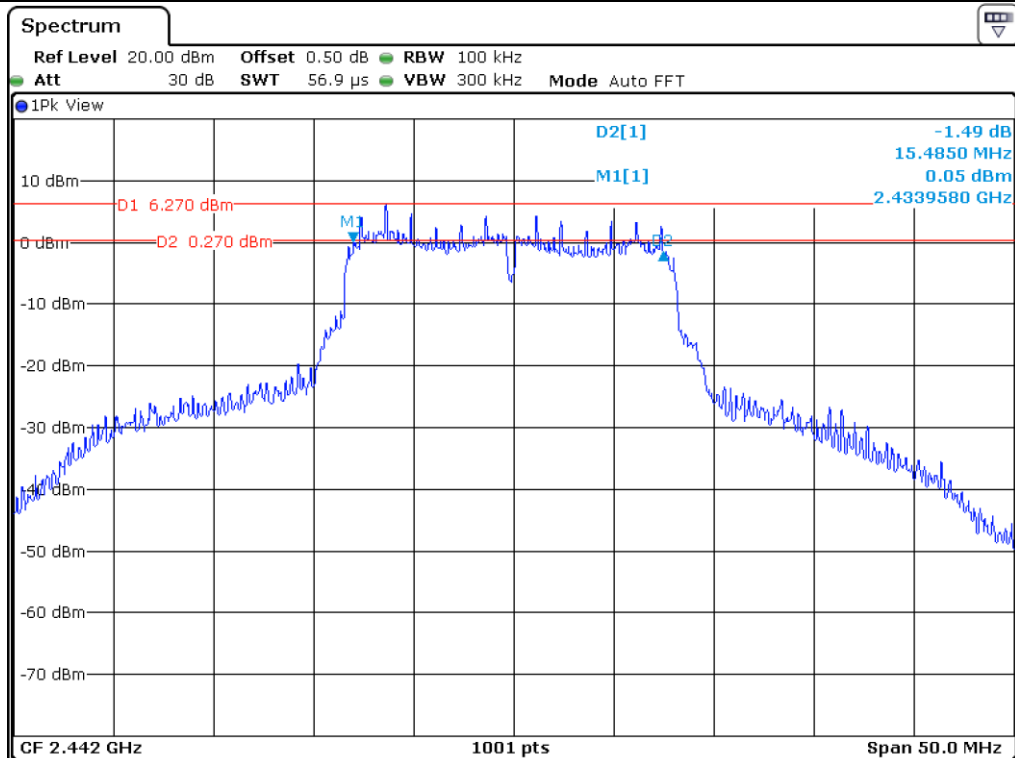
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (MHz)	LIMIT(MHz)	Margin(MHz)
Low	2 412	6.94	0.50	6.44
Middle	2 442	15.49	0.50	14.99
High	2 462	15.39	0.50	14.89

Remark. Margin = Measured Value - Limit

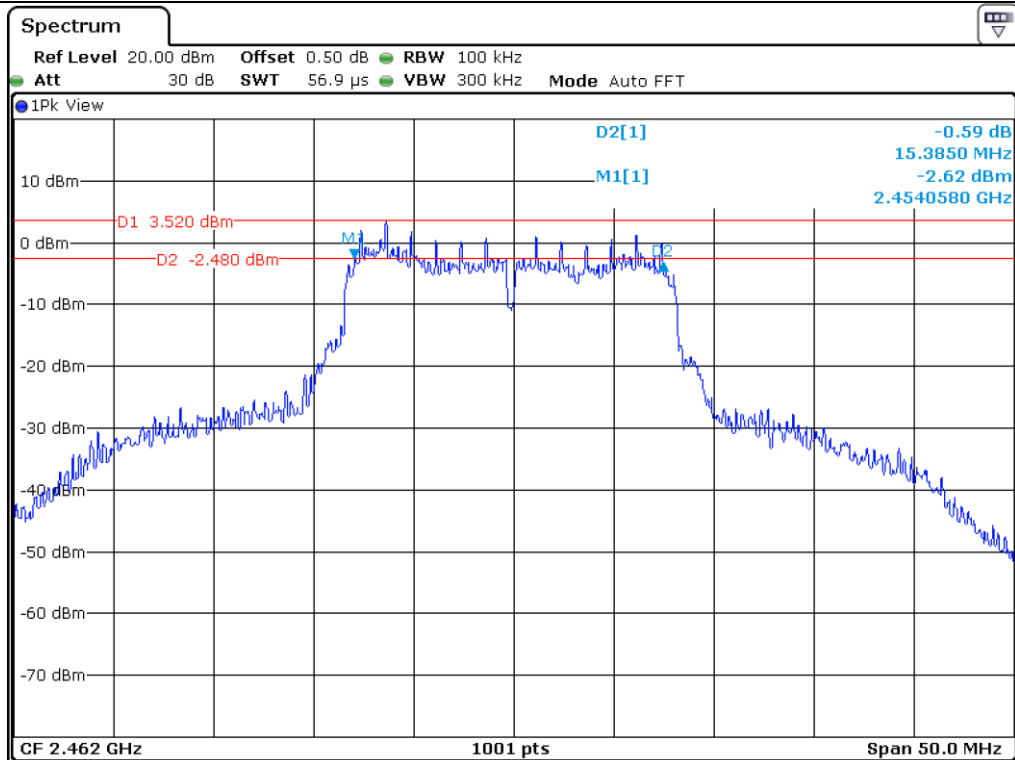


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

7.6 Test data for 802.11n_HT20

-. Test Date : January 31, 2018

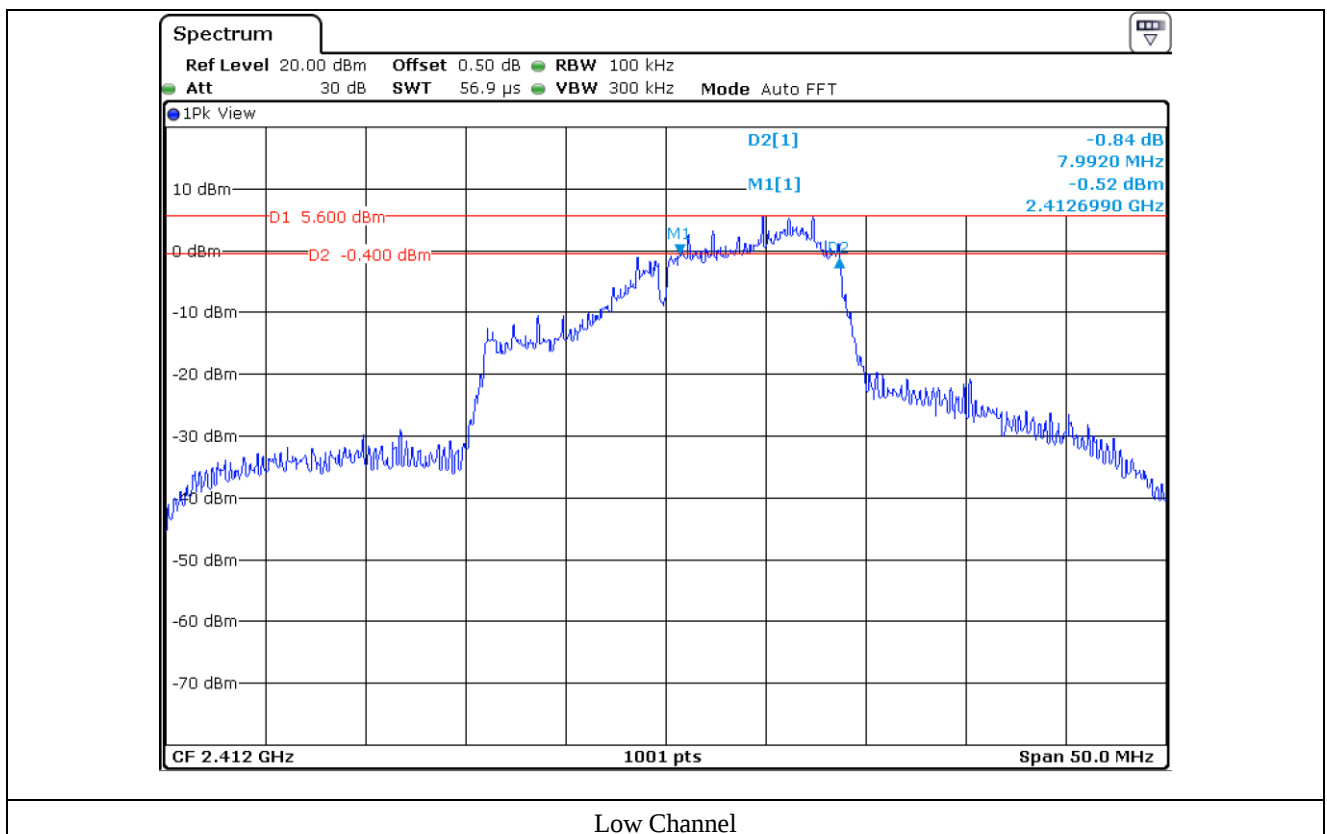
-. Test Result : Pass

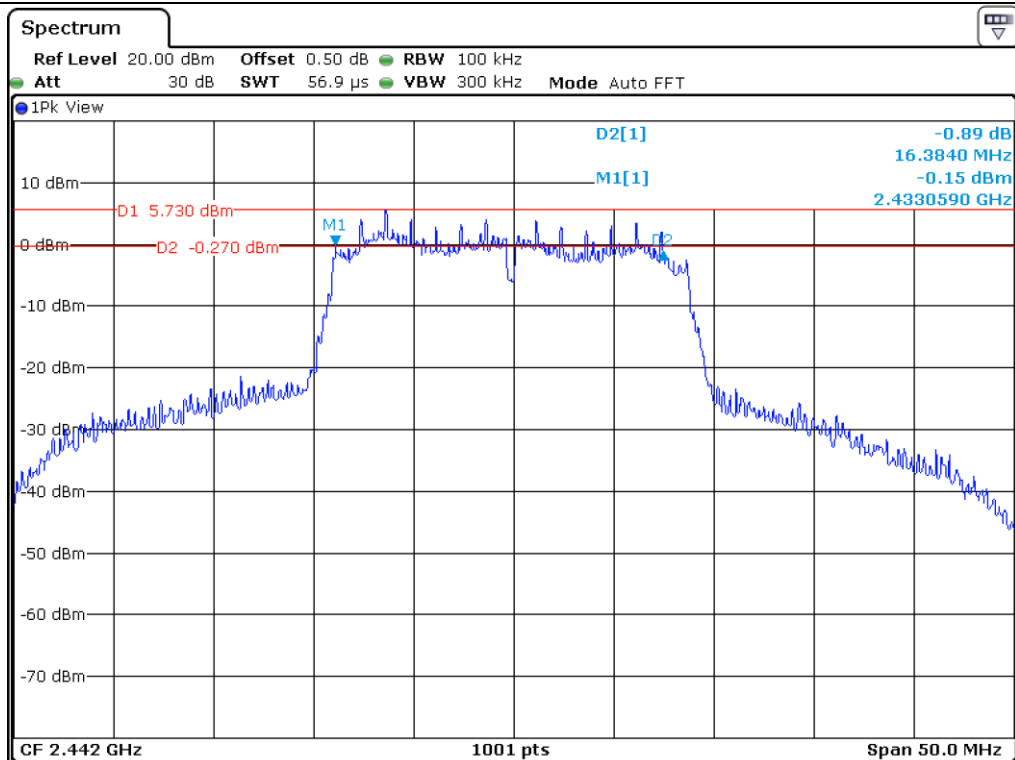
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (MHz)	LIMIT(MHz)	Margin(MHz)
Low	2 412	7.99	0.50	7.49
Middle	2 442	16.38	0.50	15.88
High	2 462	16.38	0.50	15.88

Remark. Margin = Measured Value - Limit

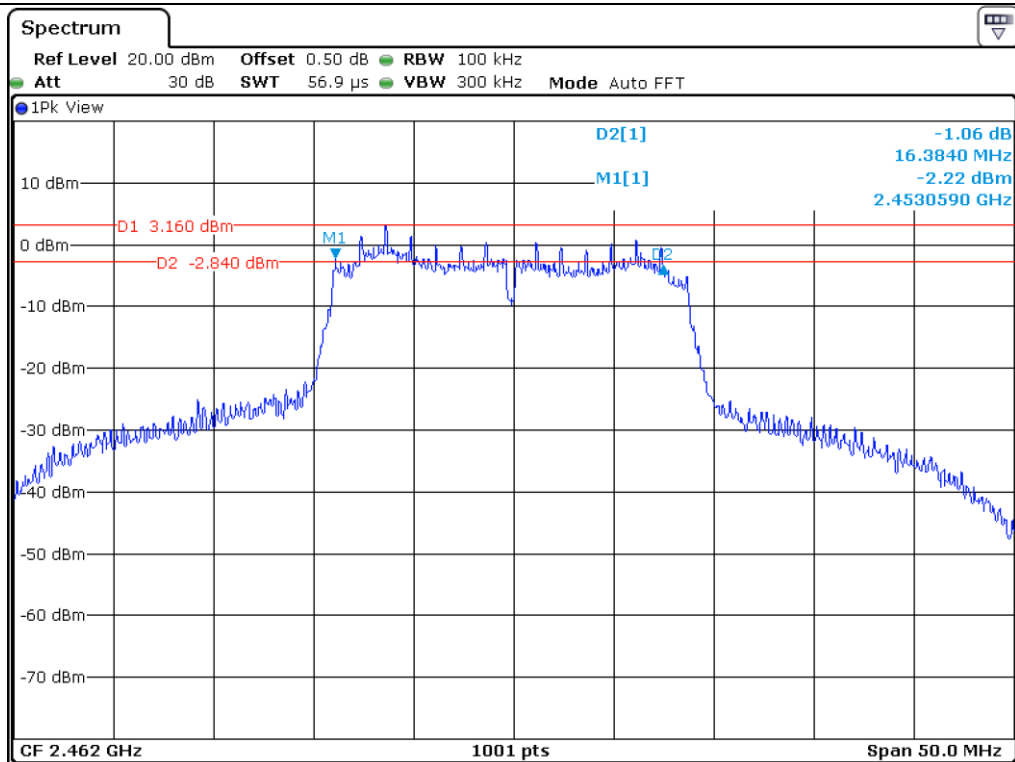


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

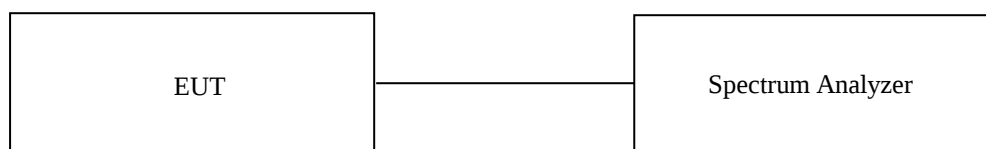
8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % 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.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct.26, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

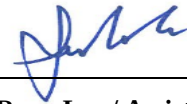
8.4 Test data for 802.11b

-. Test Date : January 31, 2018

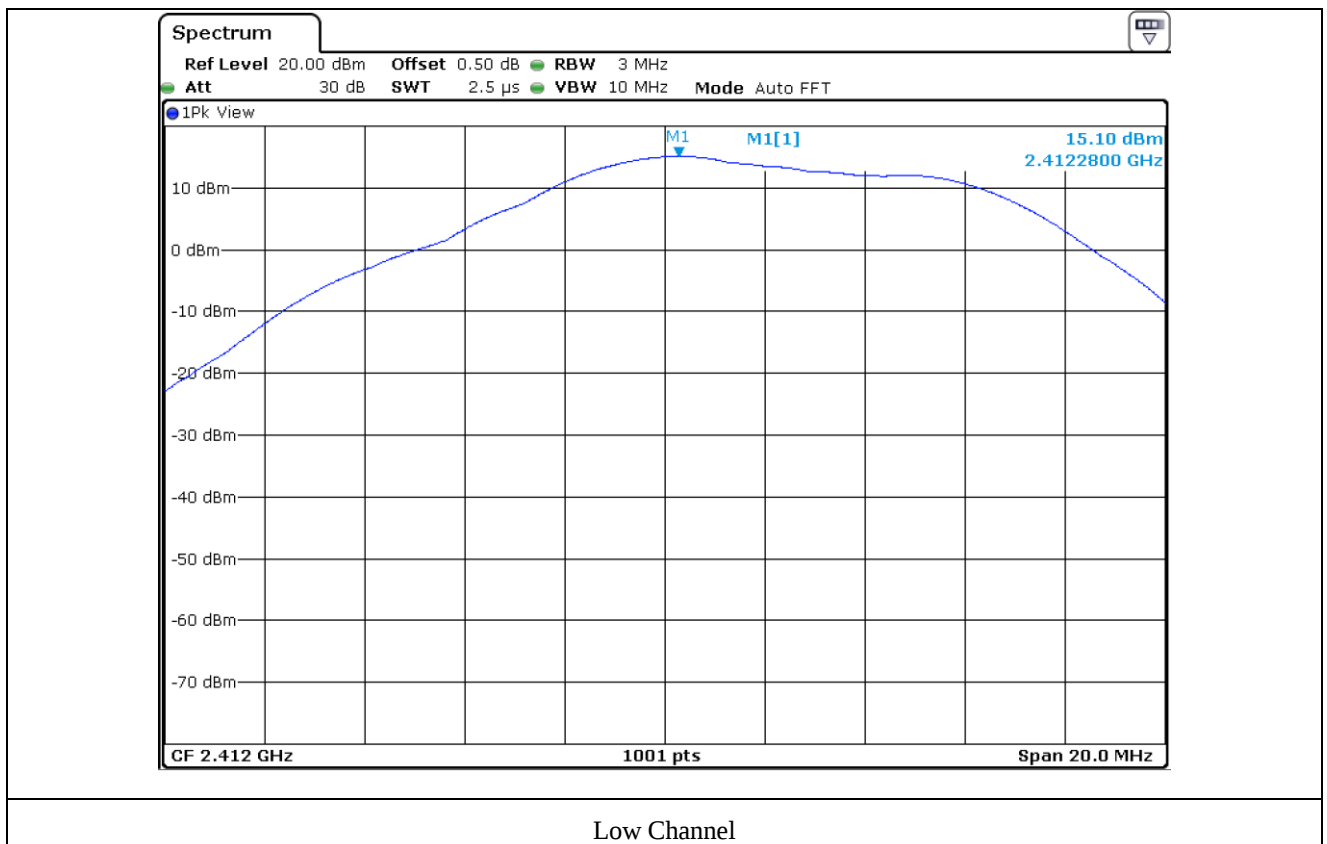
-. Test Result : Pass

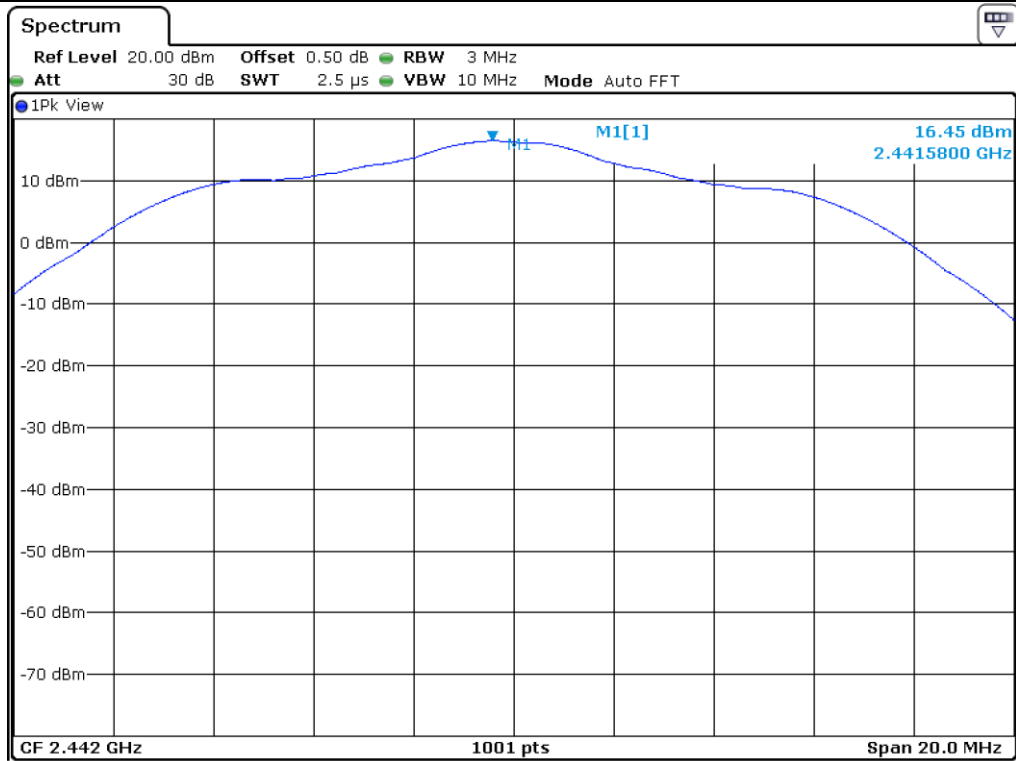
CHANNEL	FREQUENCY (MHz)	DTS (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	7.59	15.10	30.00	14.90
MIDDLE	2 442	9.04	16.45	30.00	13.55
HIGH	2 462	9.59	13.40	30.00	16.60

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

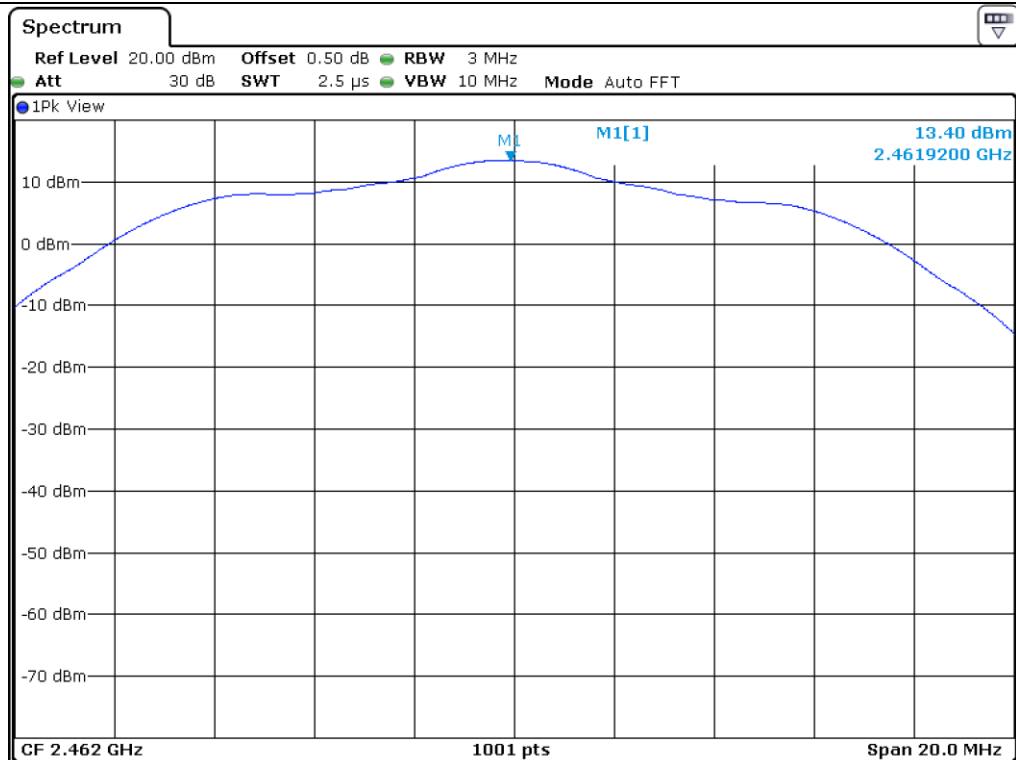


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

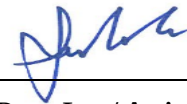
8.5 Test data for 802.11g

-. Test Date : January 31, 2018

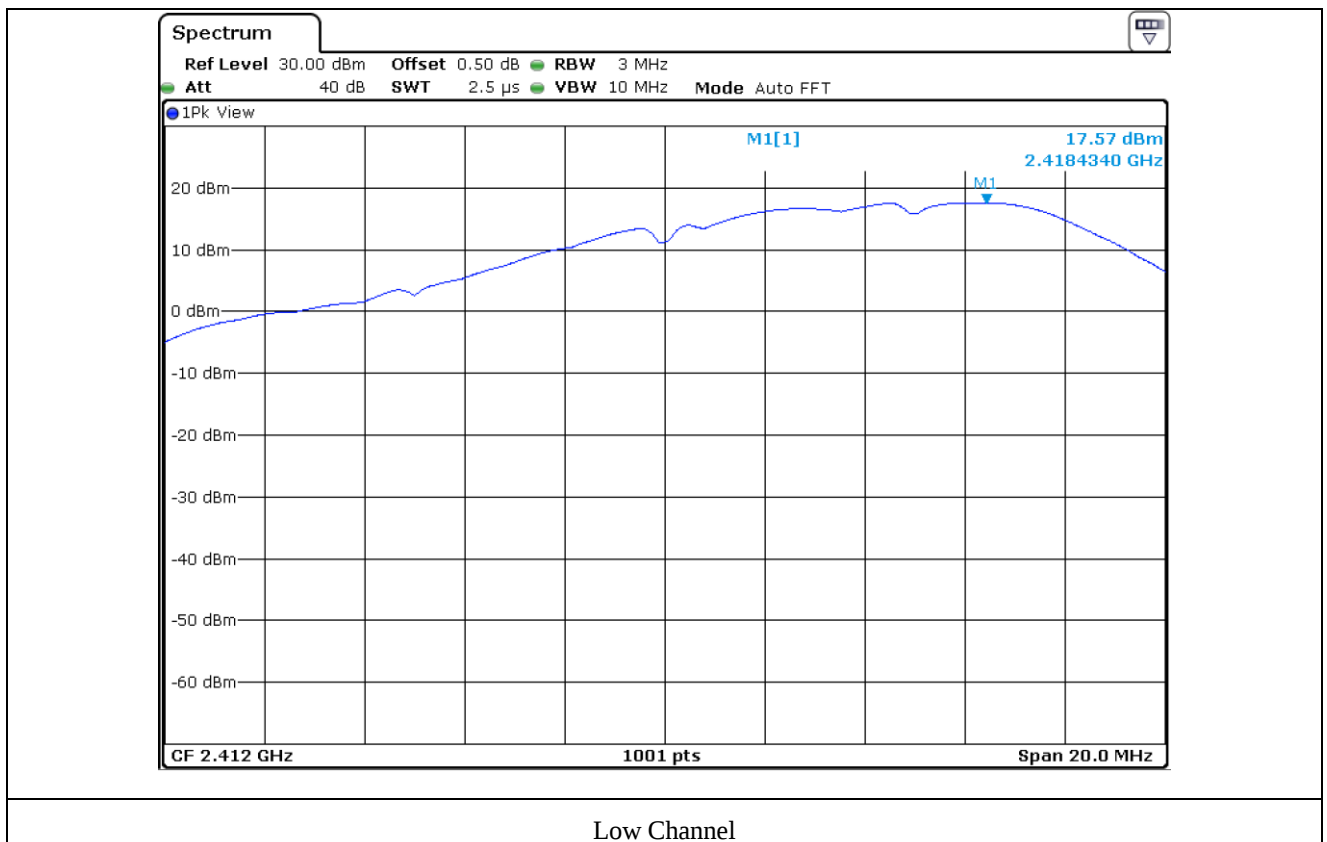
-. Test Result : Pass

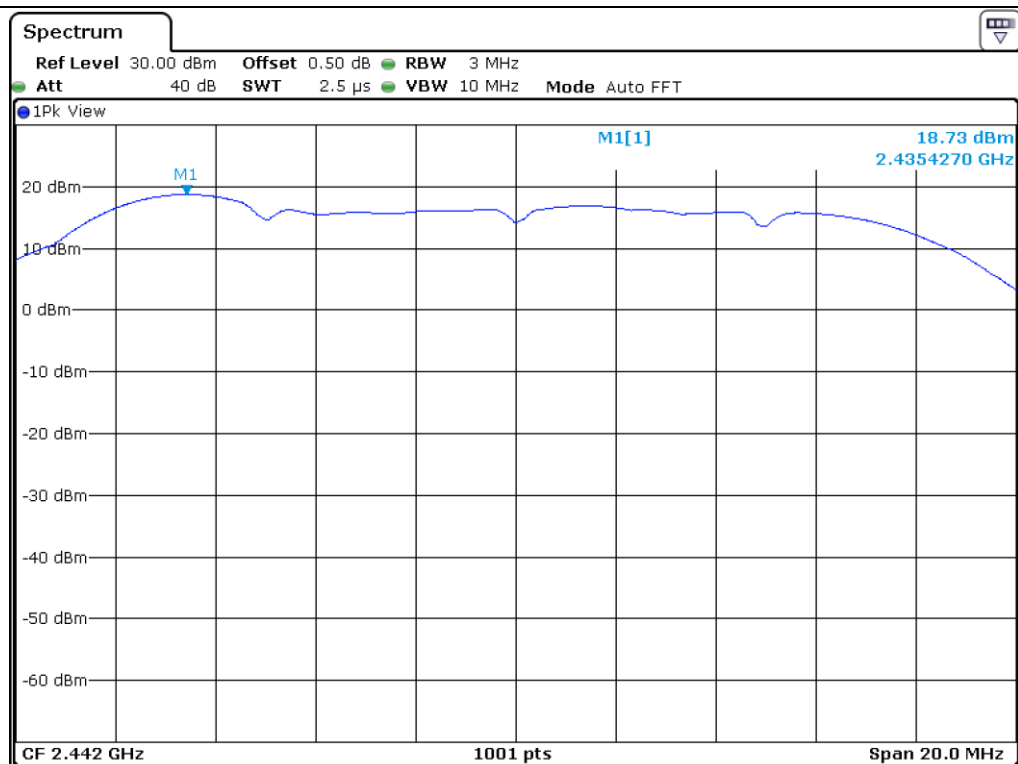
CHANNEL	FREQUENCY (MHz)	DTS (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	6.94	17.57	30.00	12.43
MIDDLE	2 442	15.49	18.73	30.00	11.27
HIGH	2 462	15.39	14.15	30.00	15.85

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

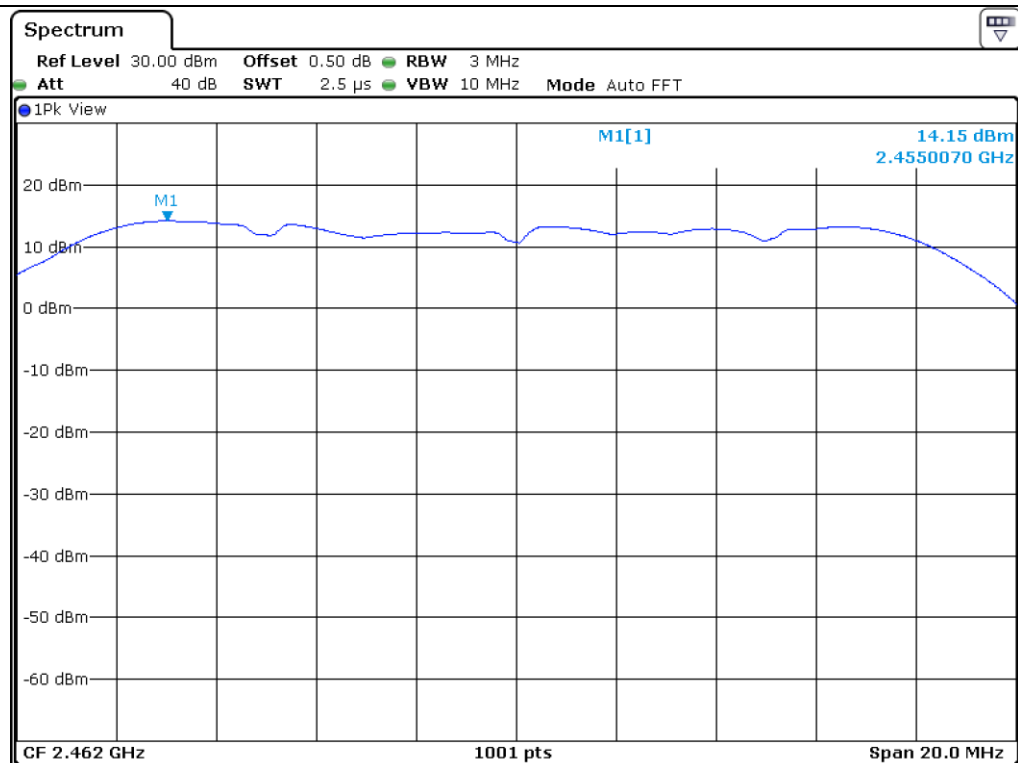


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

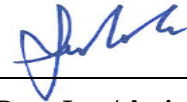
8.6 Test data for 802.11n_HT20

-. Test Date : January 31, 2018

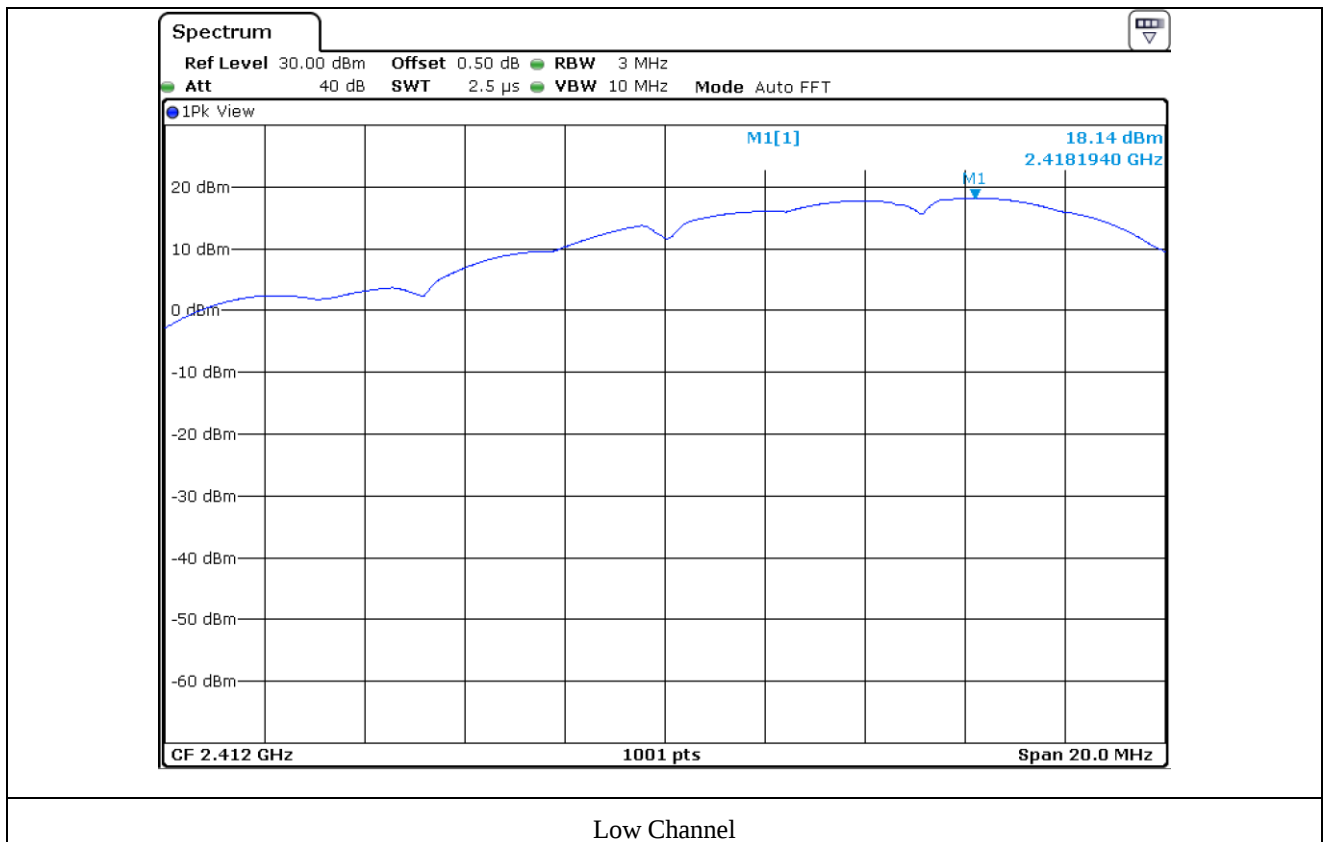
-. Test Result : Pass

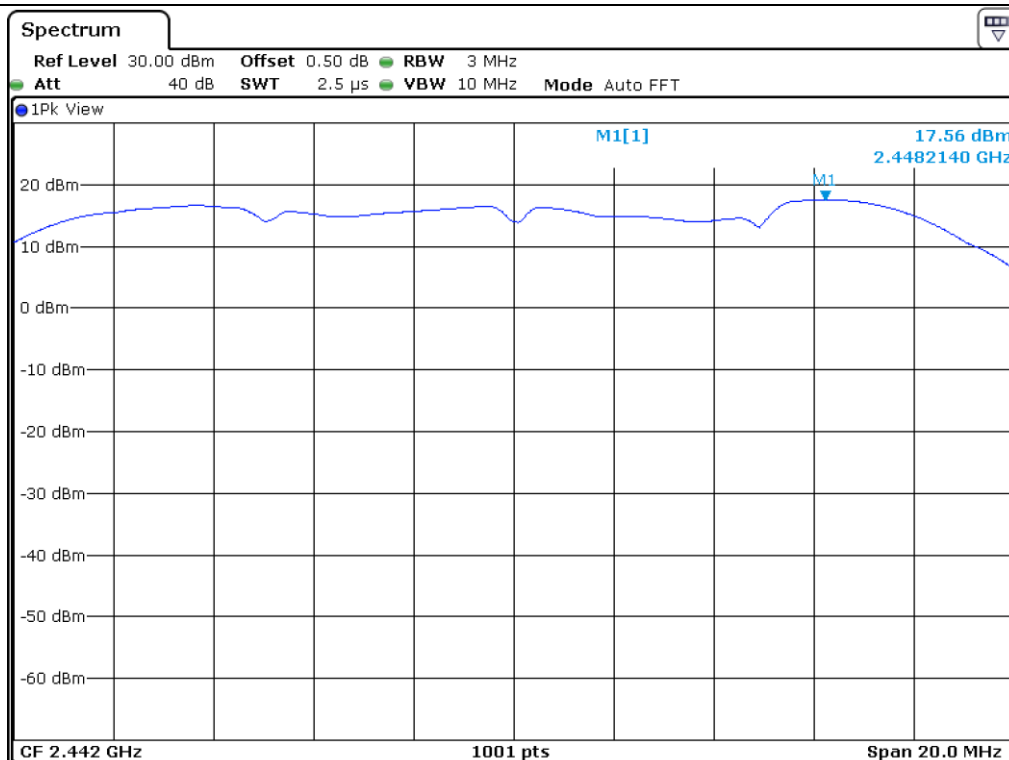
CHANNEL	FREQUENCY (MHz)	DTS (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412	7.99	18.14	30.00	11.86
MIDDLE	2 442	16.38	17.56	30.00	12.44
HIGH	2 462	16.38	14.80	30.00	15.20

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

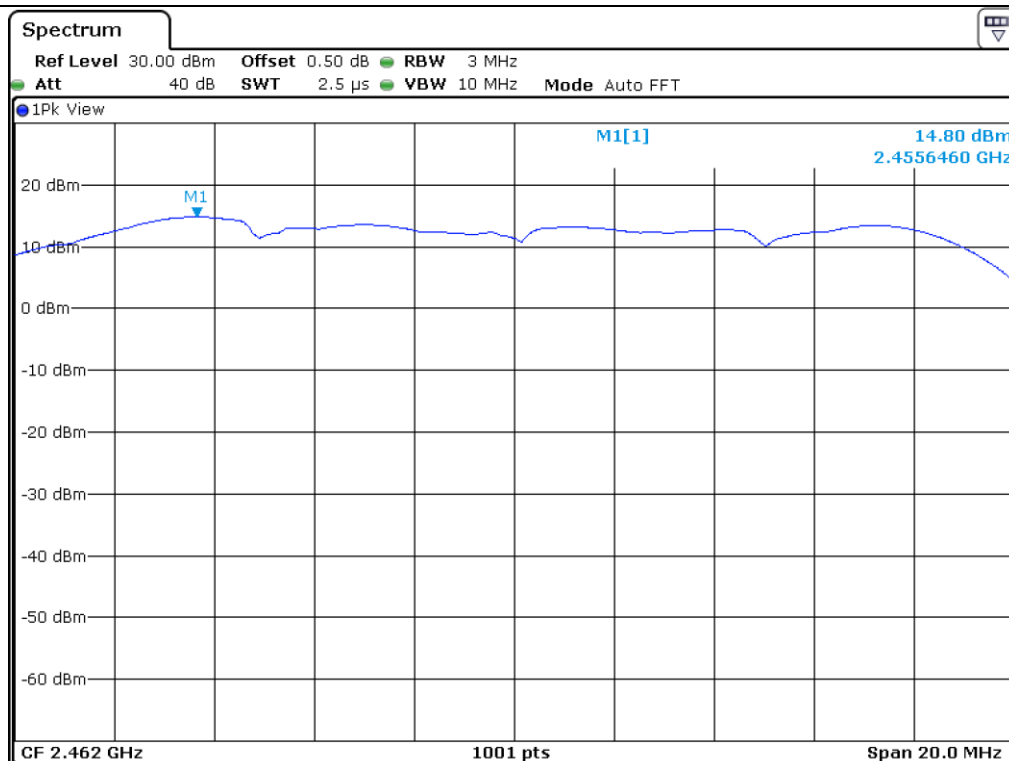


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % 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, open-field test site. The EUT was placed on a non-conductive turntable 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.

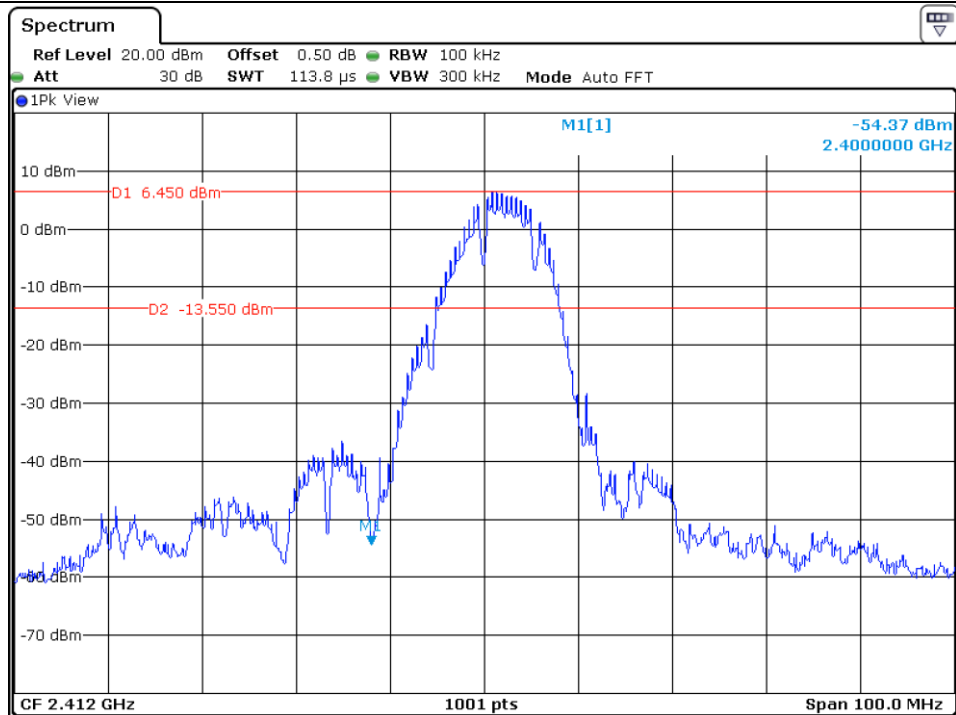
9.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 27, 2017 (1Y)
☒ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 27, 2017 (1Y)
☐ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Sep. 04, 2017 (1Y)
☒ -	310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 04, 2017 (1Y)
☒ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct. 26, 2017 (1Y)
☒ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	102346	Oct. 24, 2017 (1Y)
☒ -	MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509	N/A
☐ -	HD100	HD GmbH	Position Controller	N/A	N/A
☒ -	DT3000-3t	Innco Systems GmbH	Turn Table	N/A	N/A
☐ -	FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	Jun. 10, 2016 (2Y)
☒ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May 20, 2016 (2Y)
☒ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2017 (2Y)
☒ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA91700179	Jul. 28, 2017 (2Y)
☒ -	SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Apr. 04, 2017 (1Y)

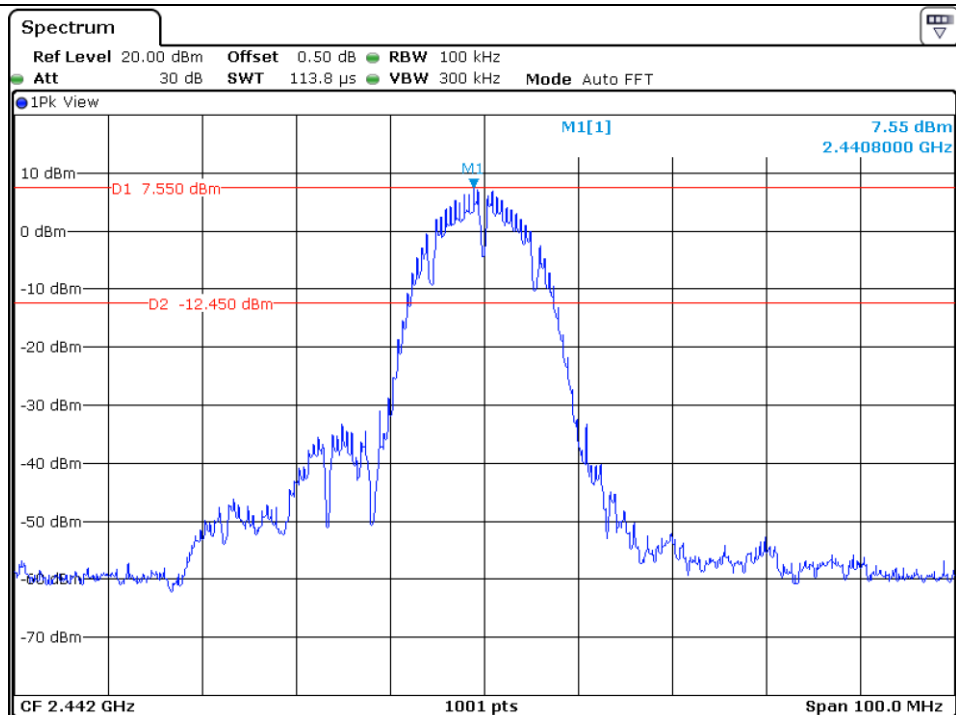
All test equipment used is calibrated on a regular basis.

9.5 Test data for conducted emission

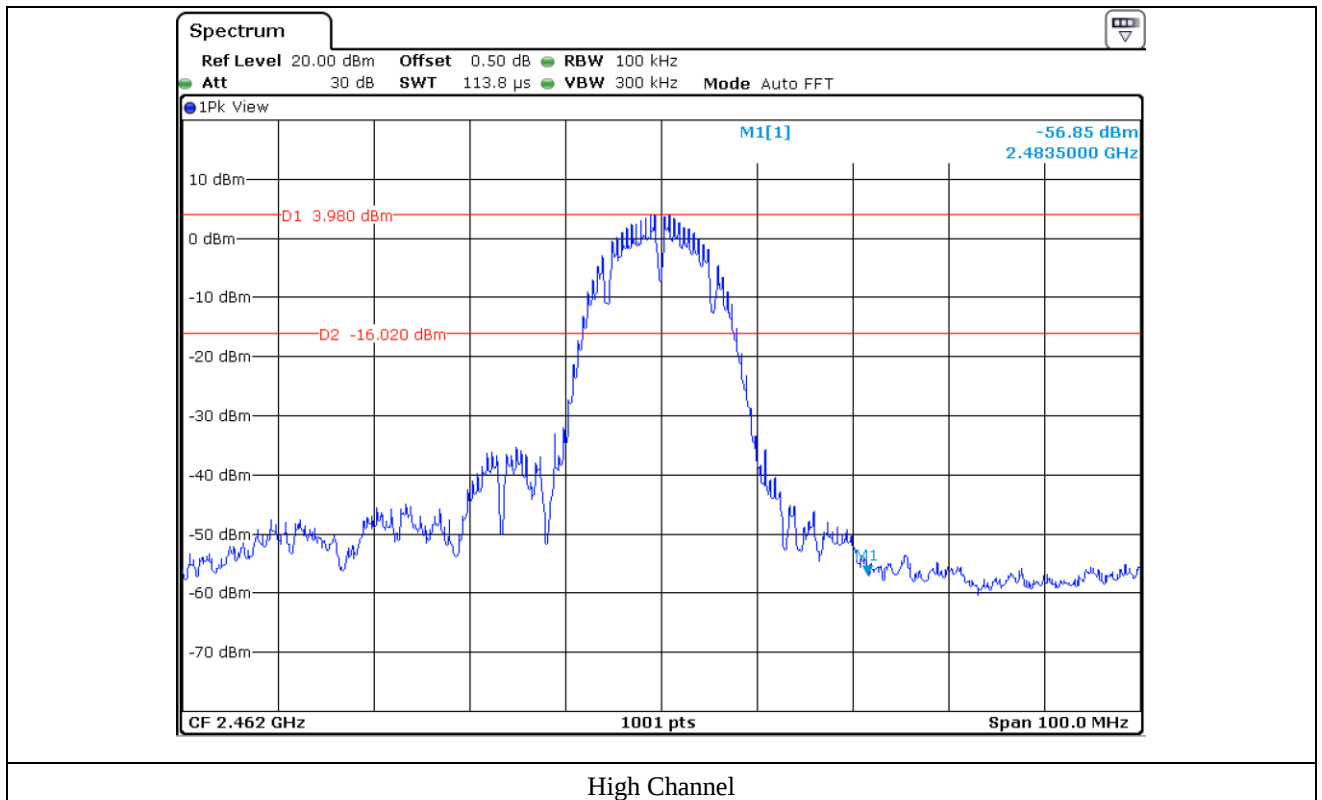
9.5.1 Test data for 802.11b

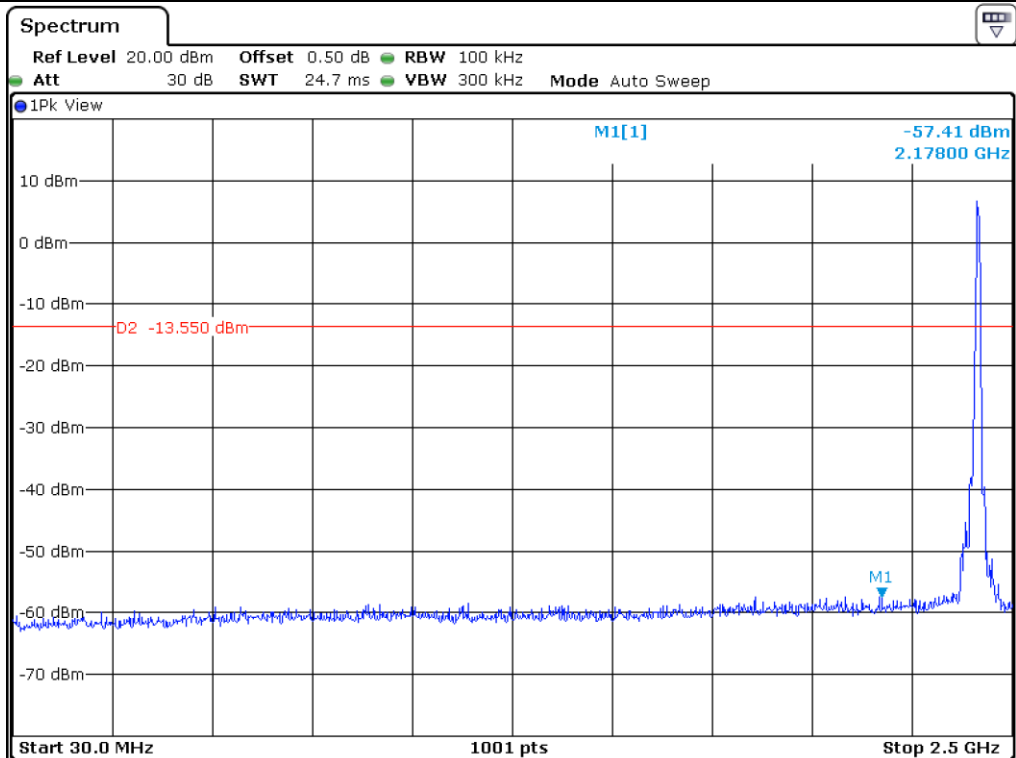


Low Channel

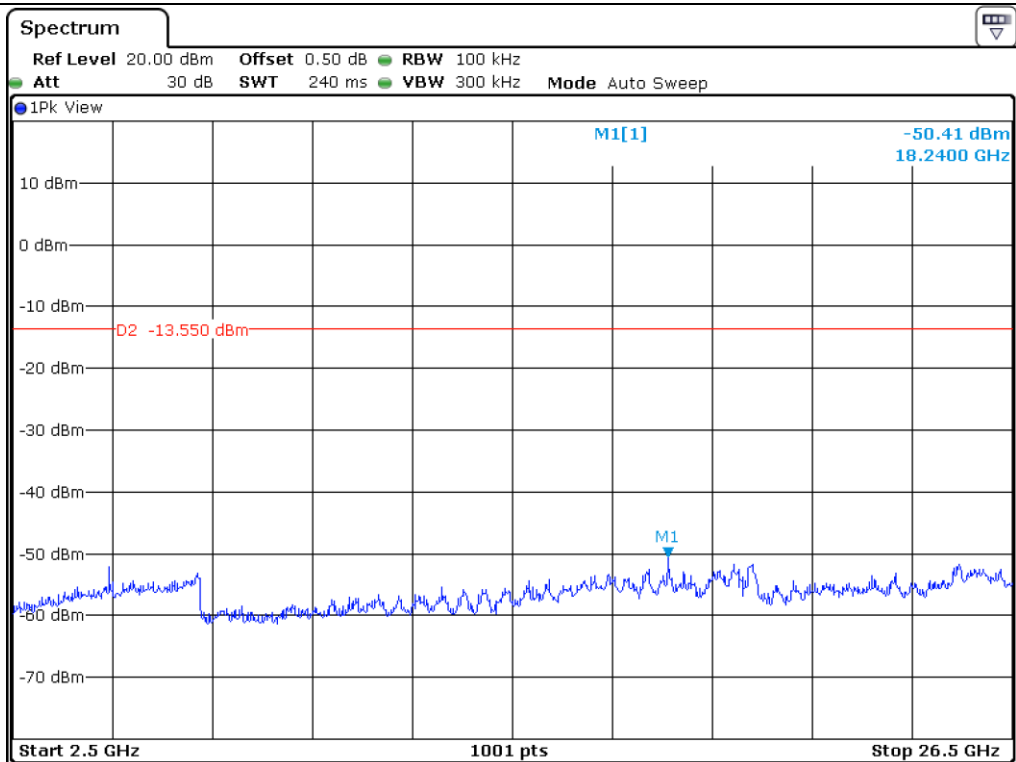


Middle Channel

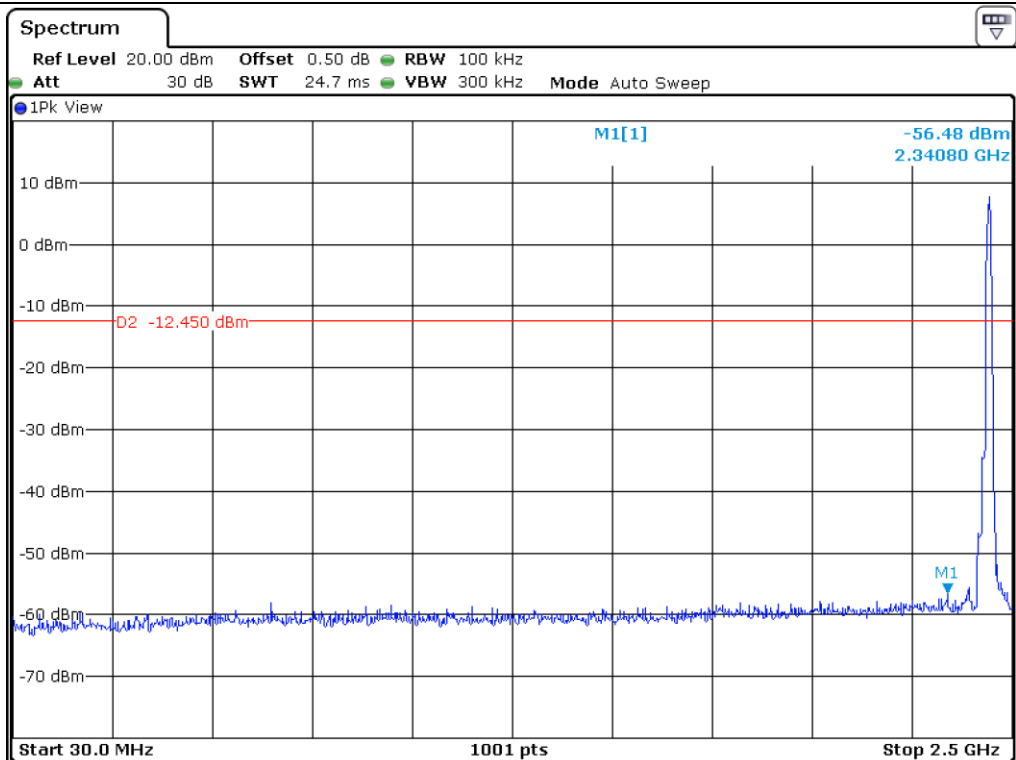




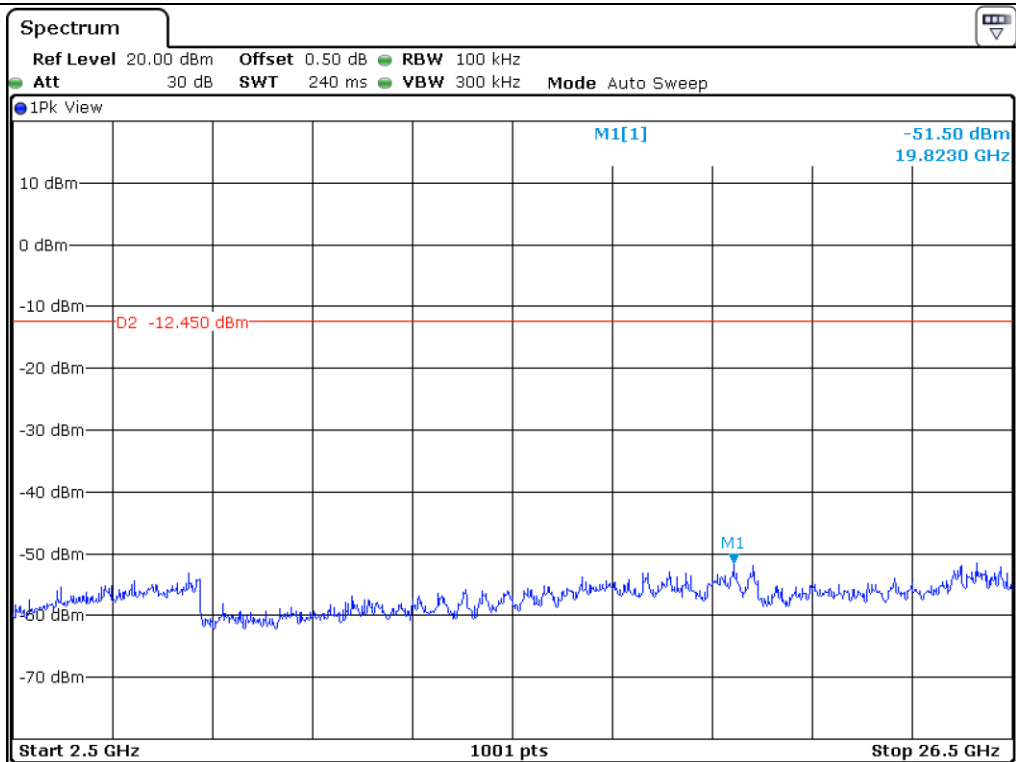
Low Channel



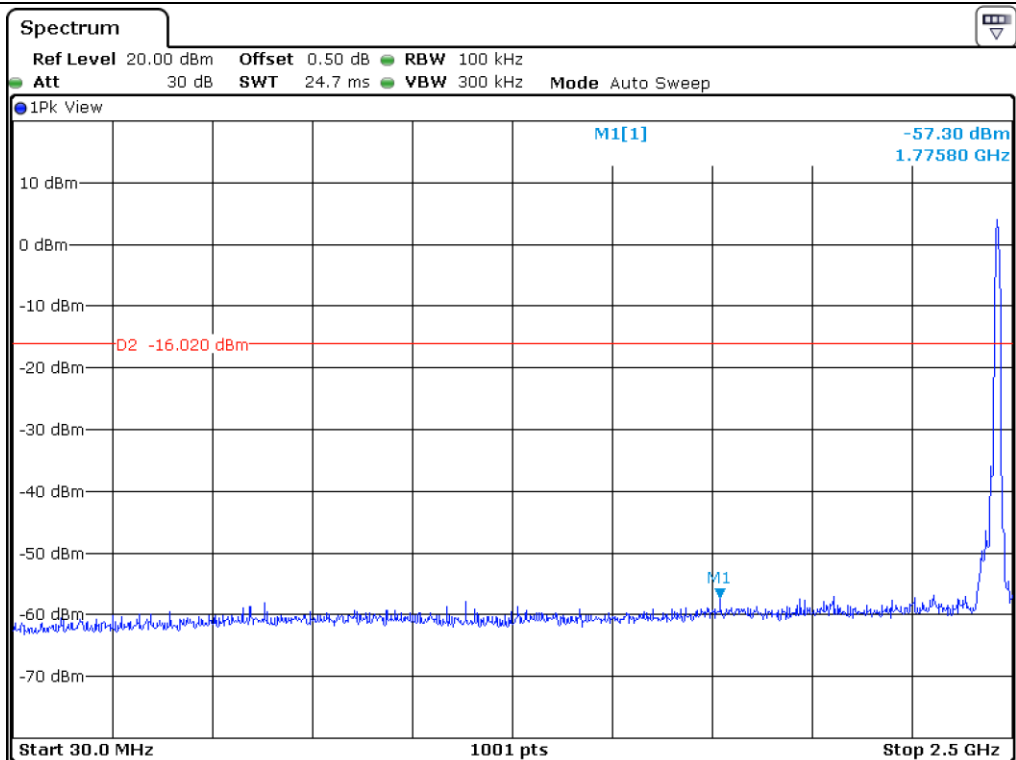
Low Channel



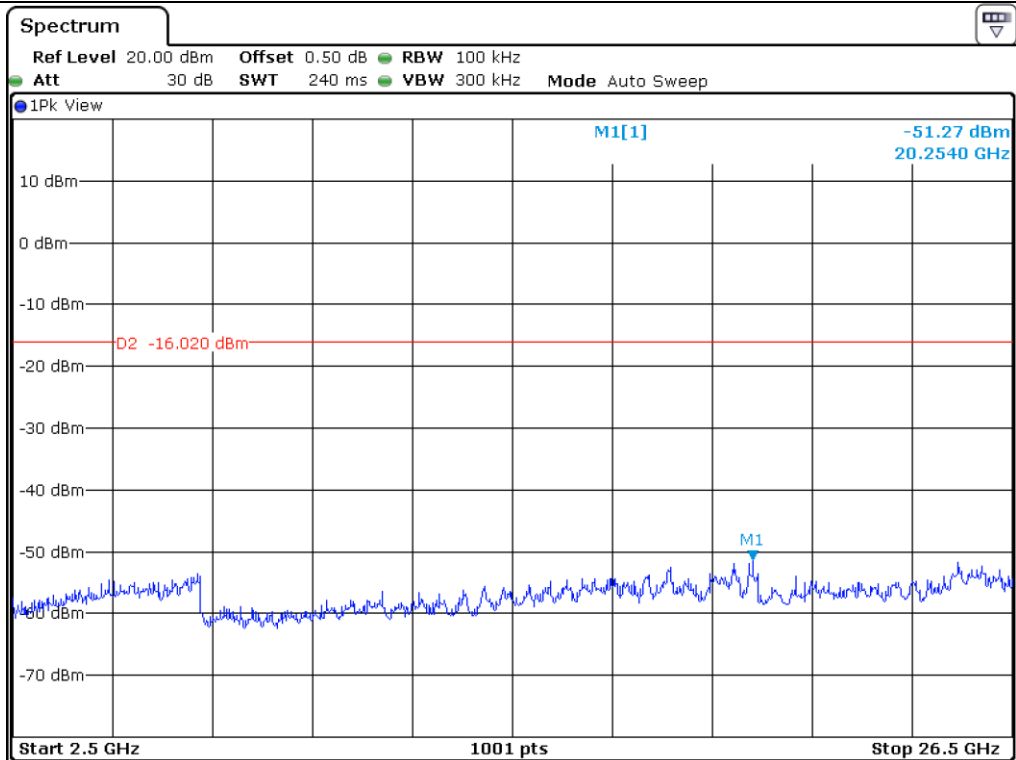
Middle Channel



Middle Channel

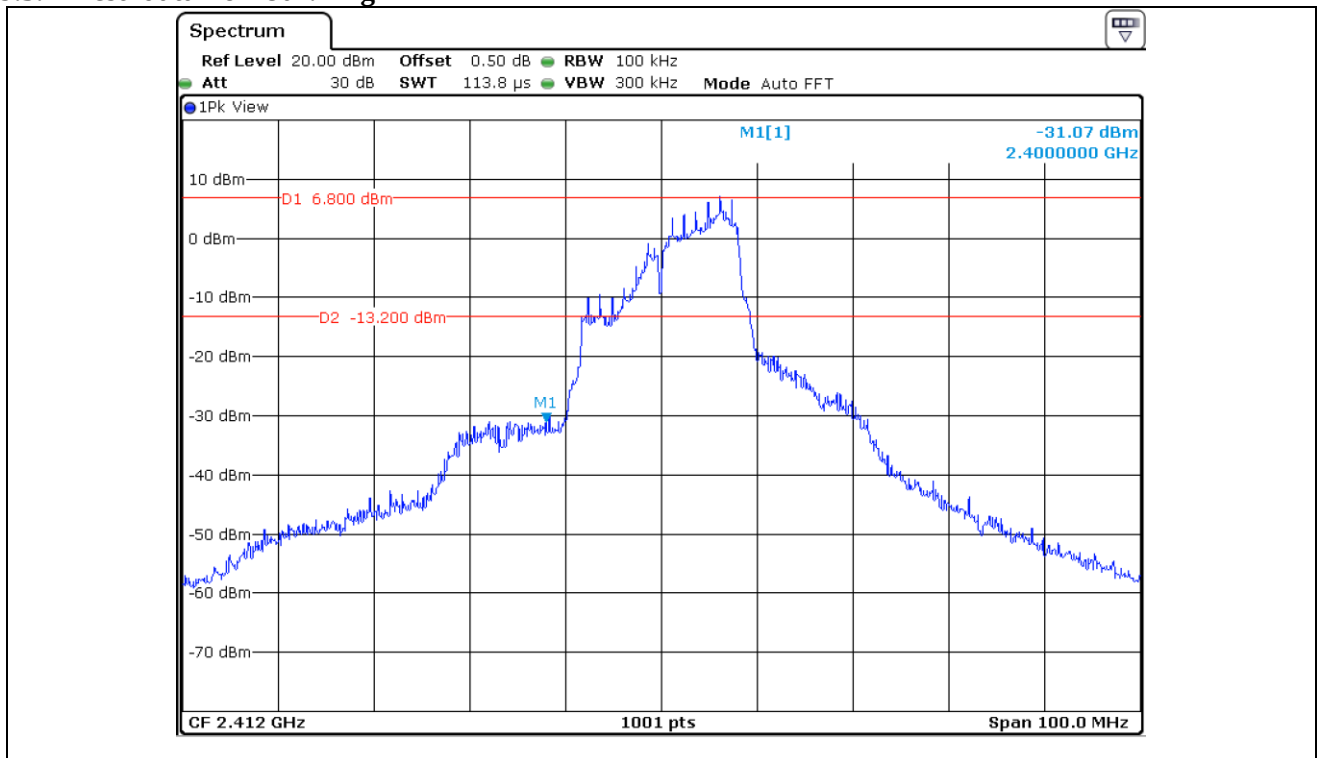


High Channel

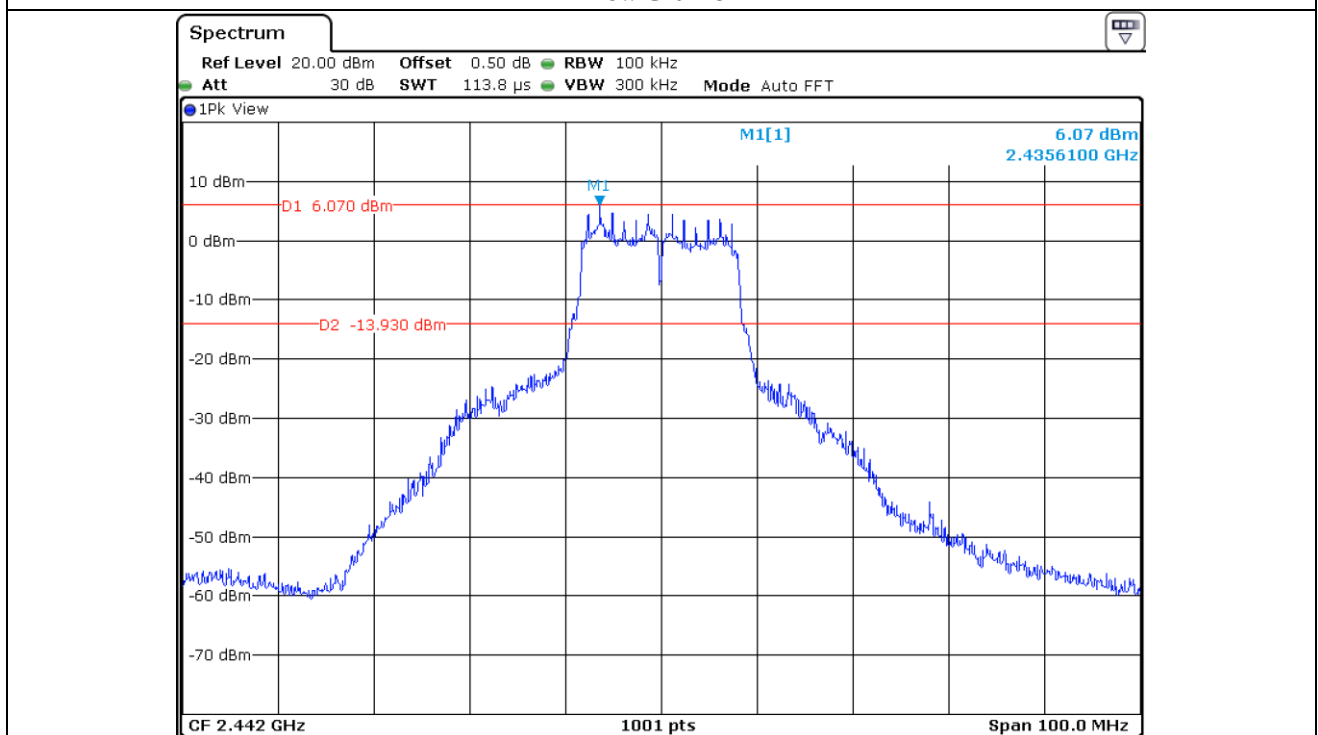


High Channel

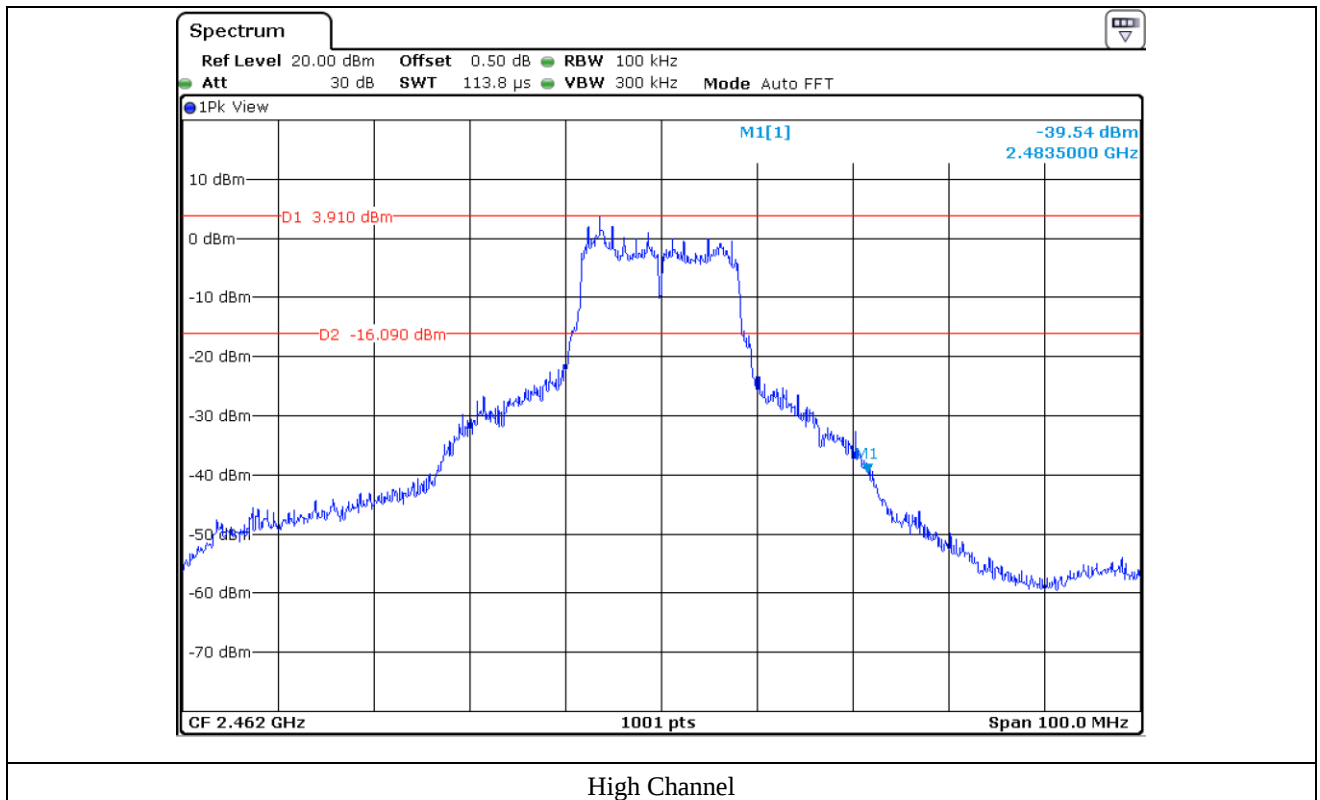
9.5.2 Test data for 802.11 g

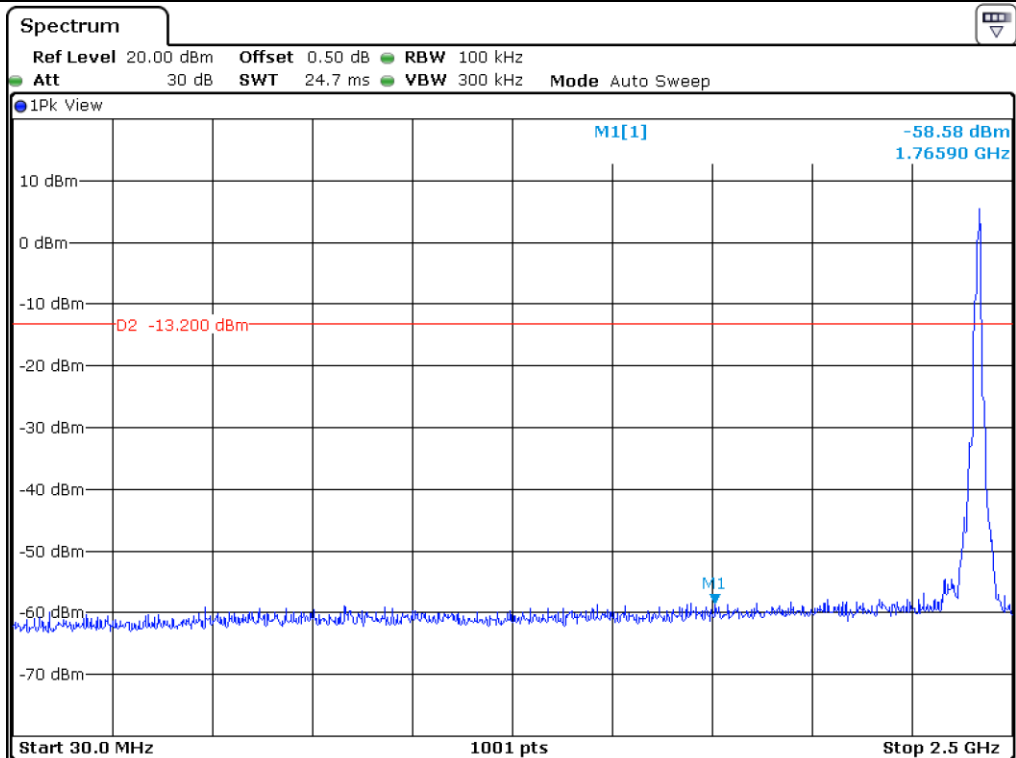


Low Channel

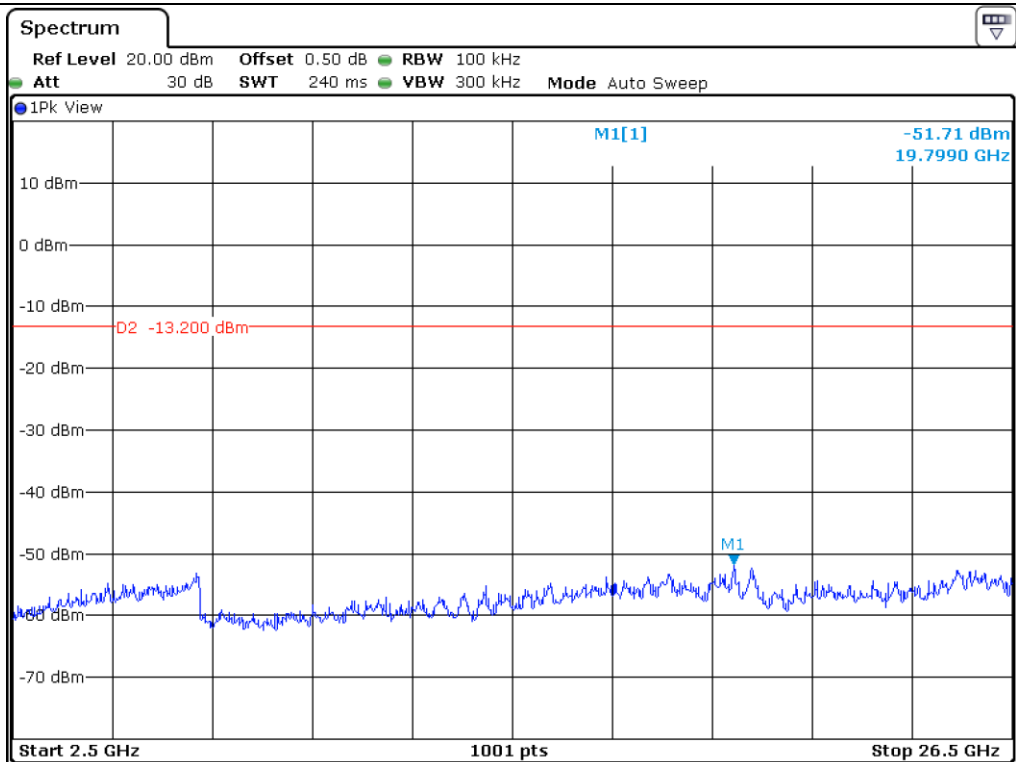


Middle Channel

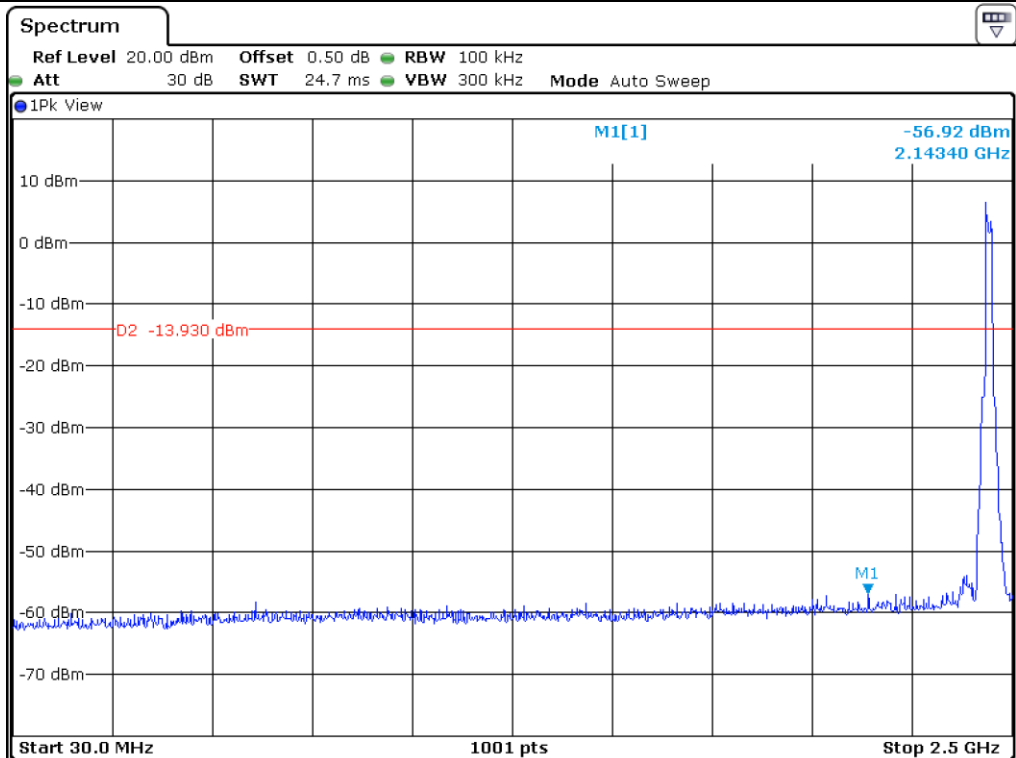




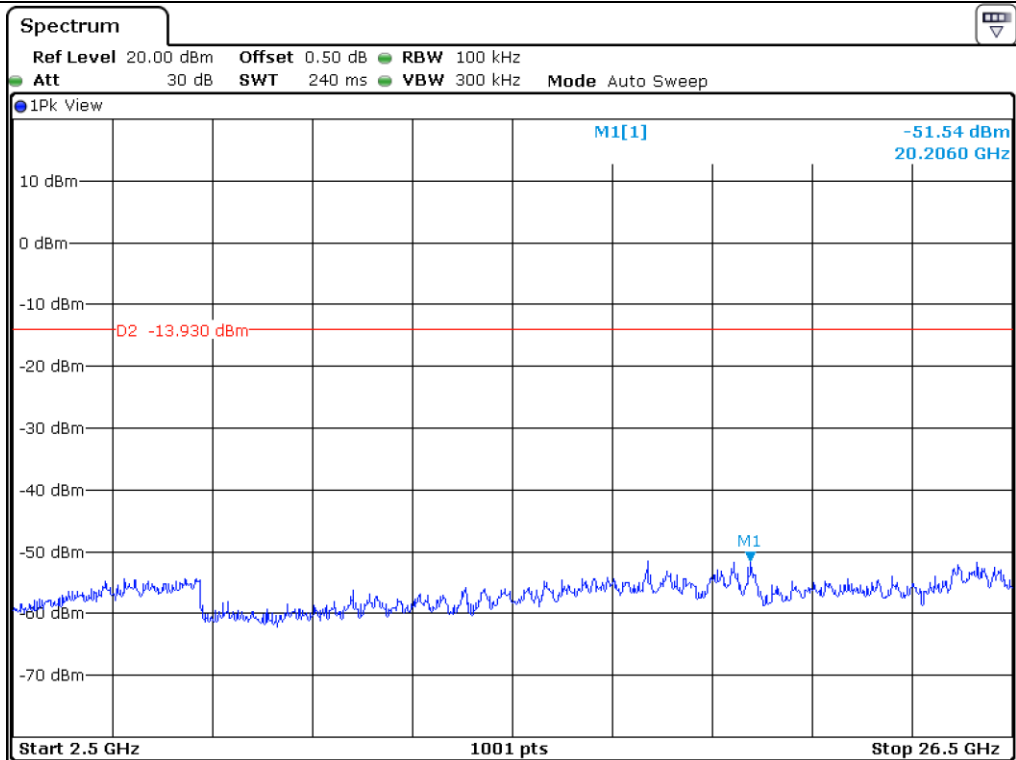
Low Channel



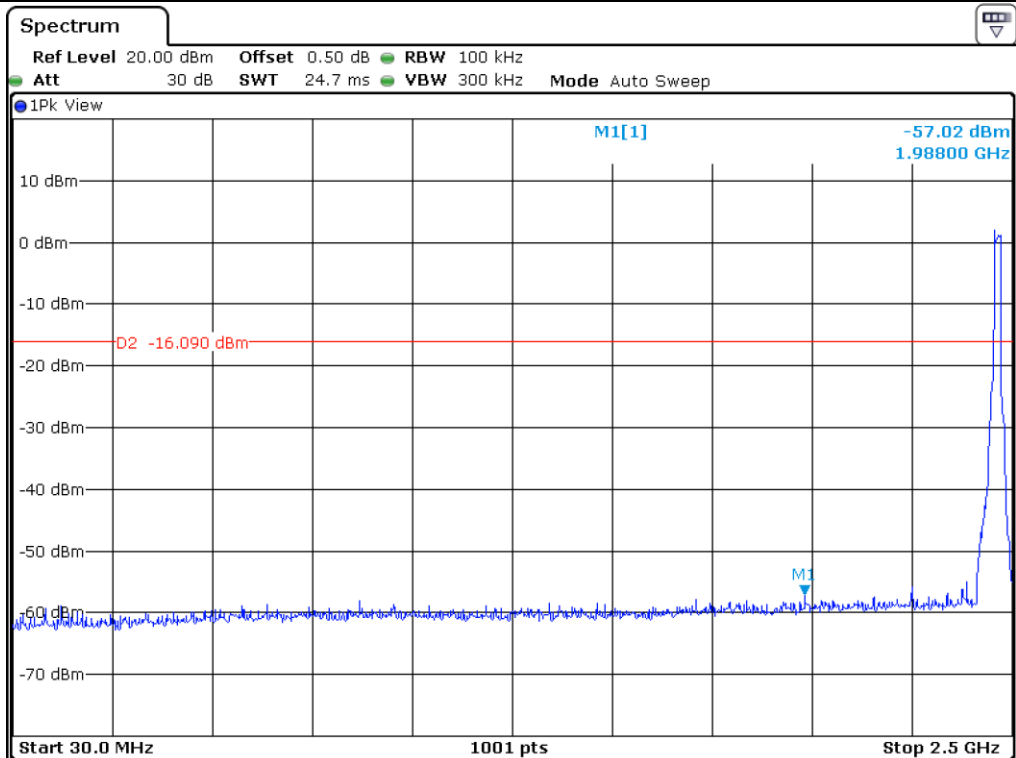
Low Channel



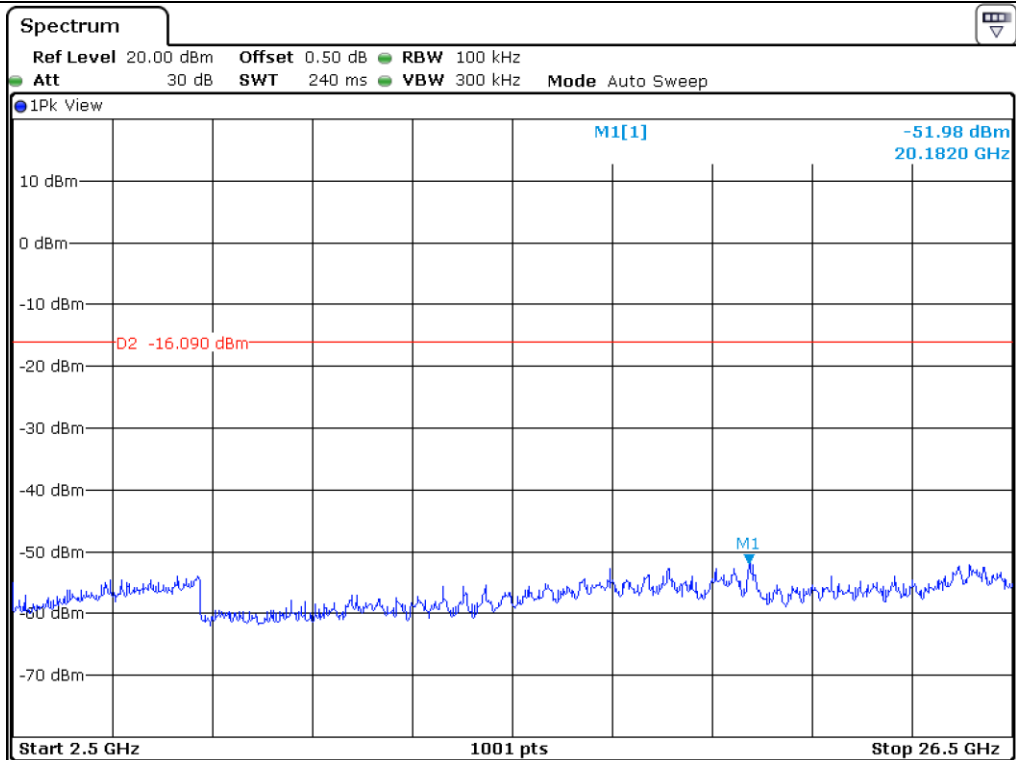
Middle Channel



Middle Channel

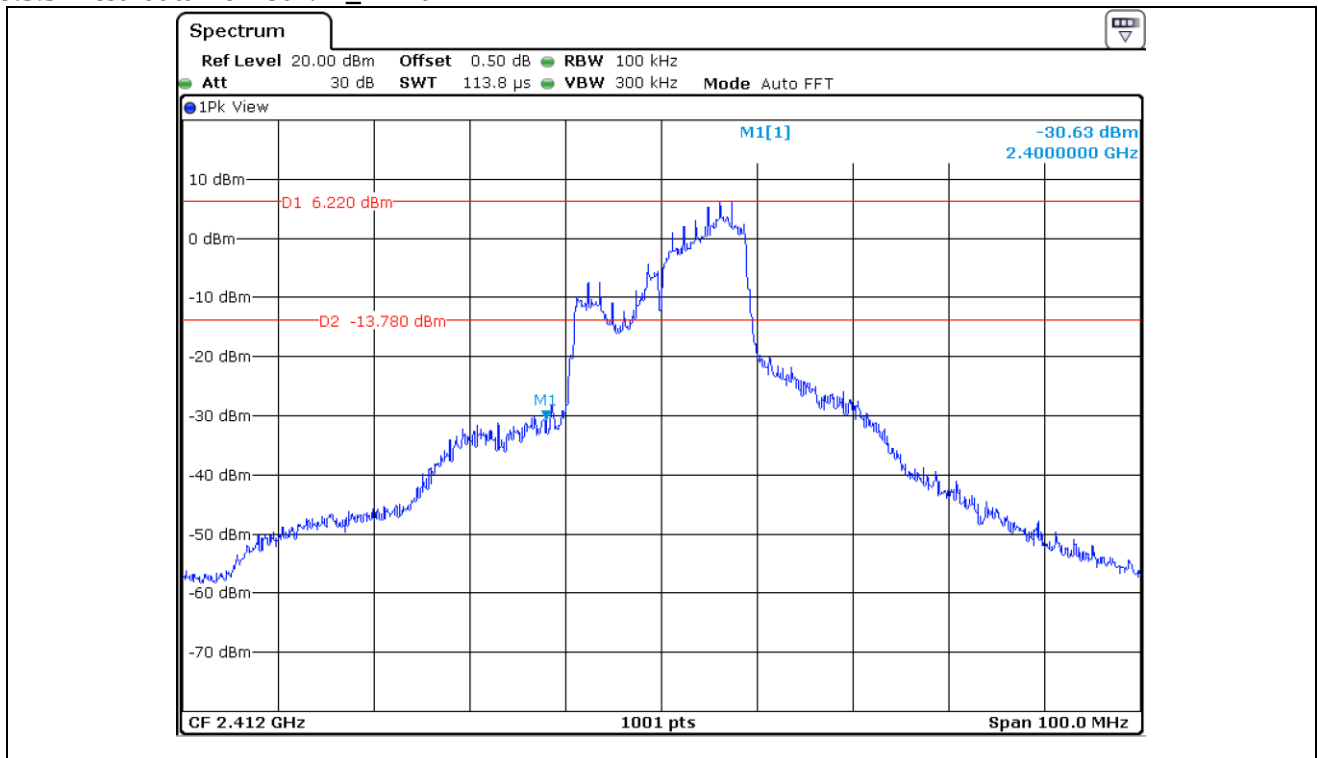


High Channel

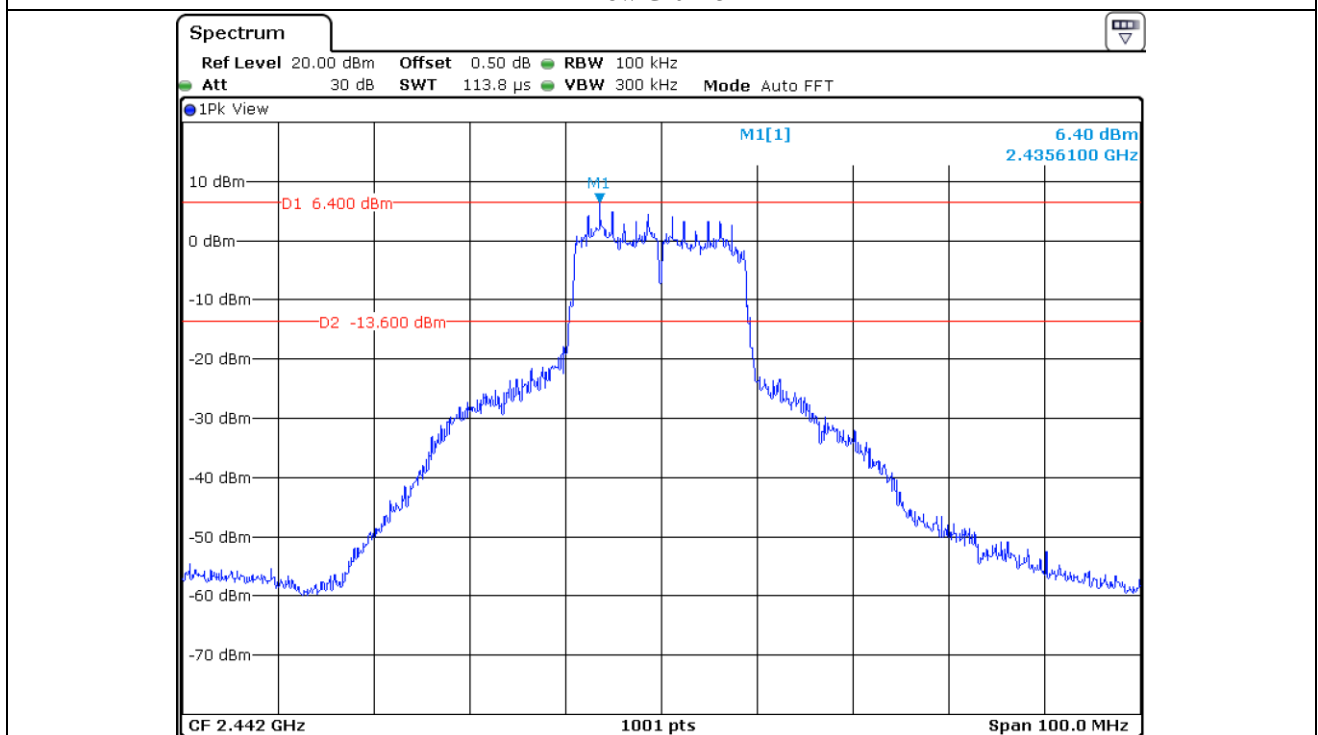


High Channel

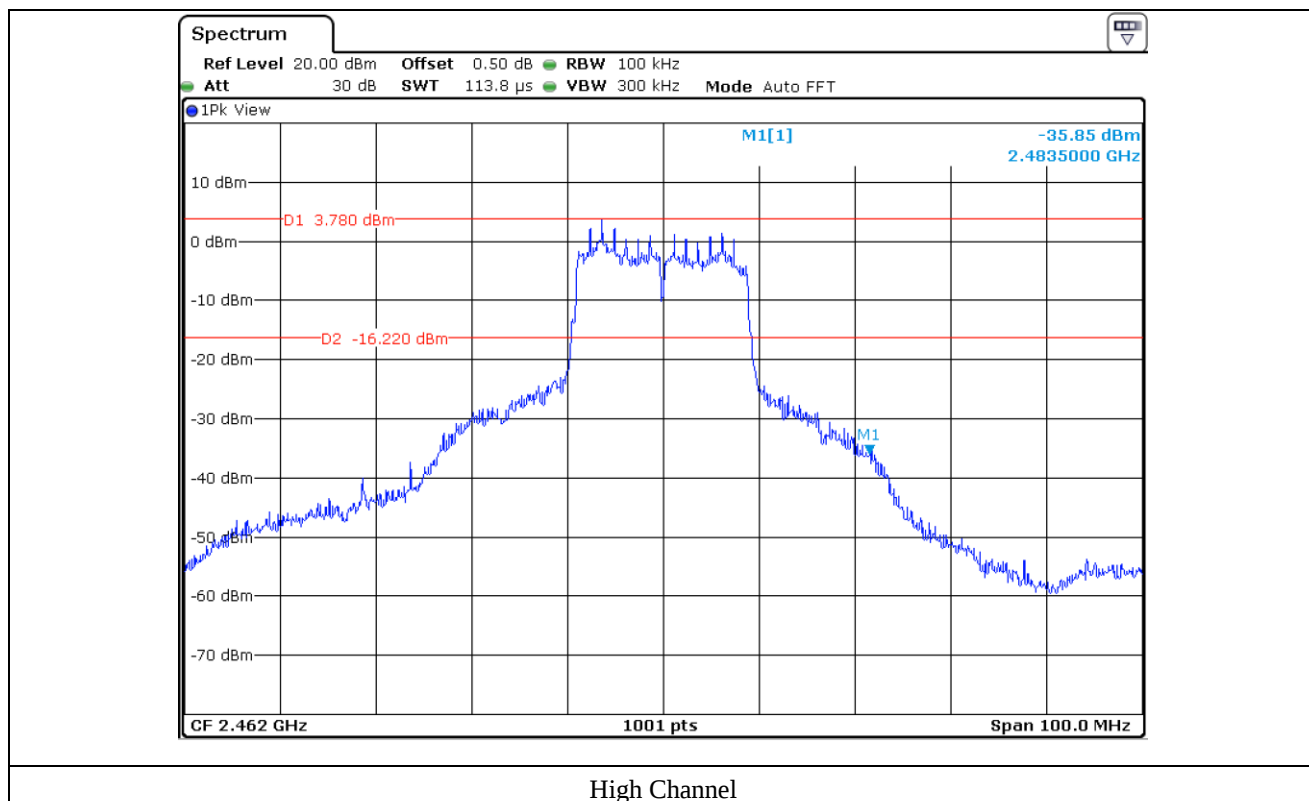
9.5.3 Test data for 802.11_HT20

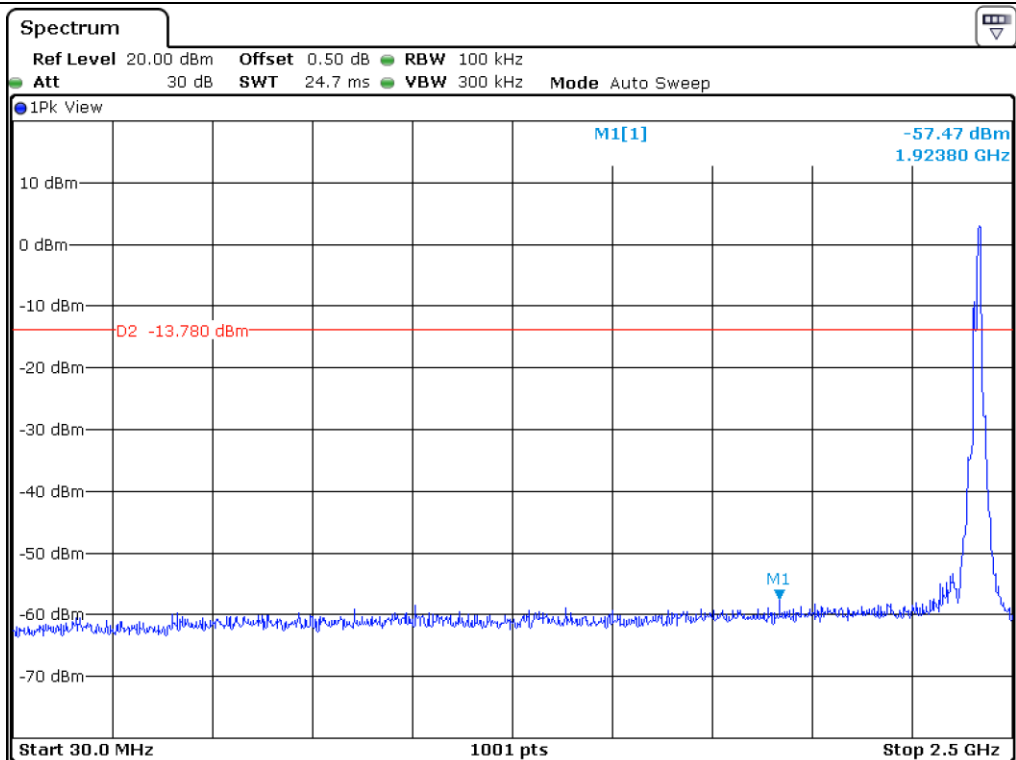


Low Channel

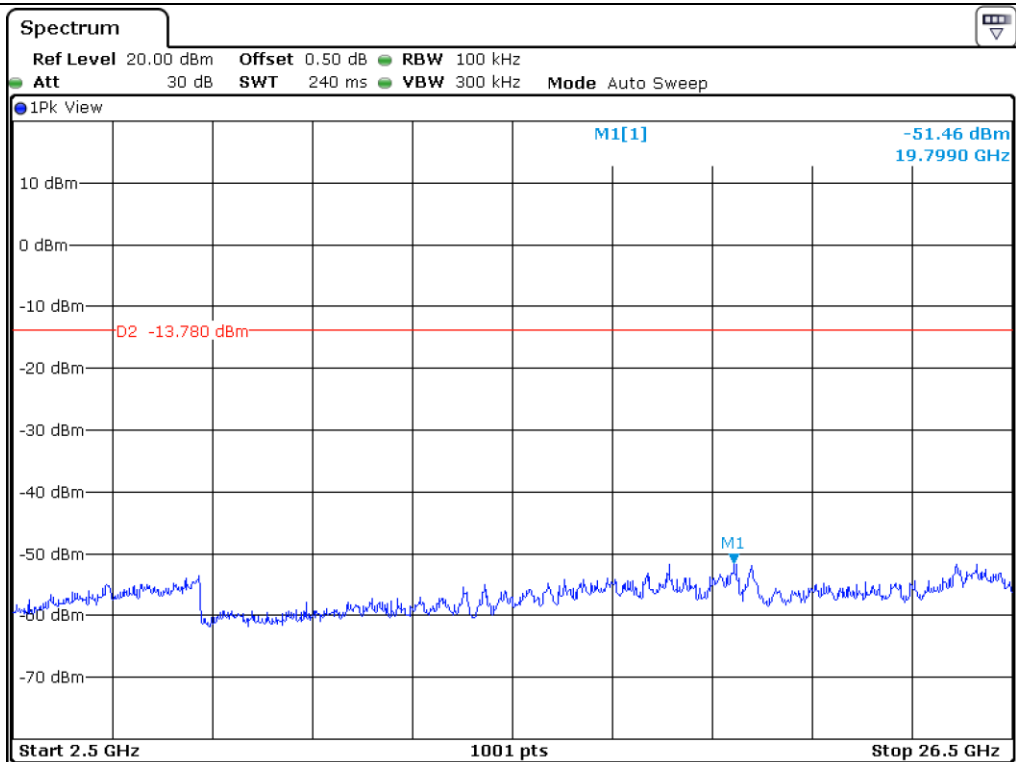


Middle Channel

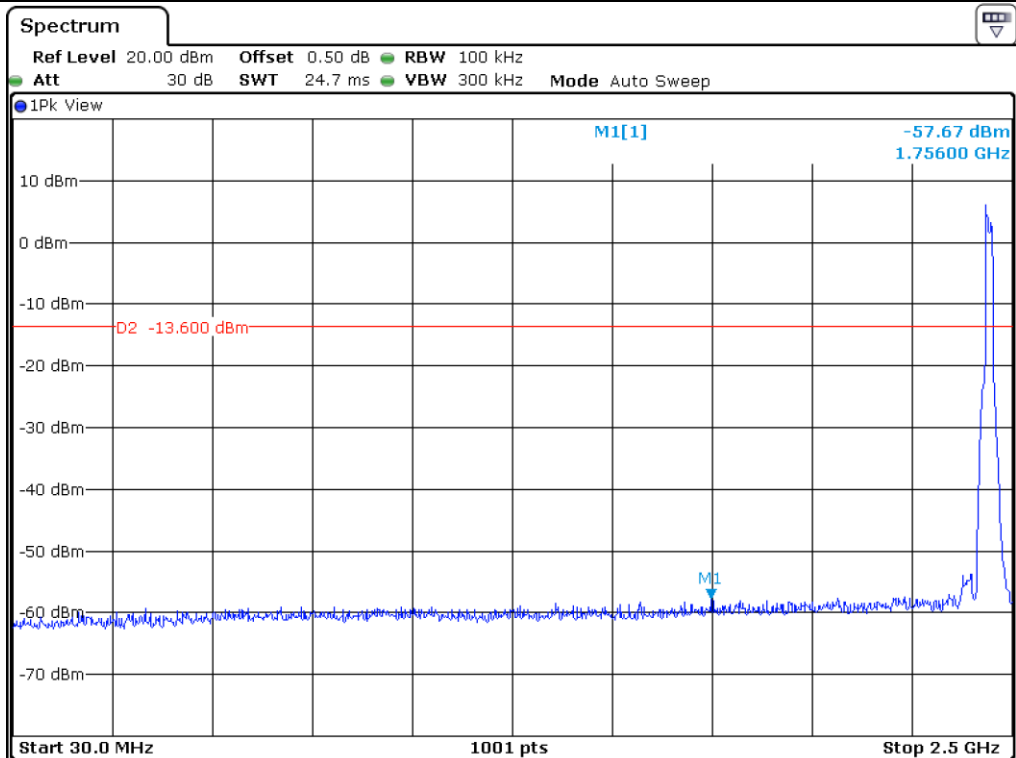




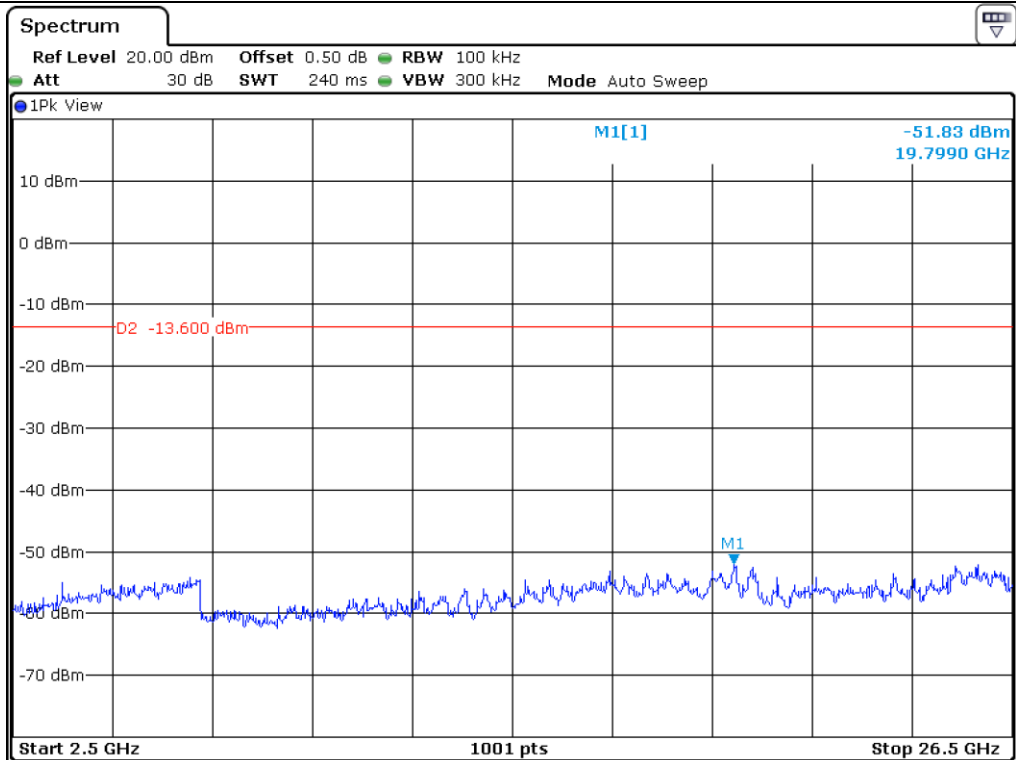
Low Channel



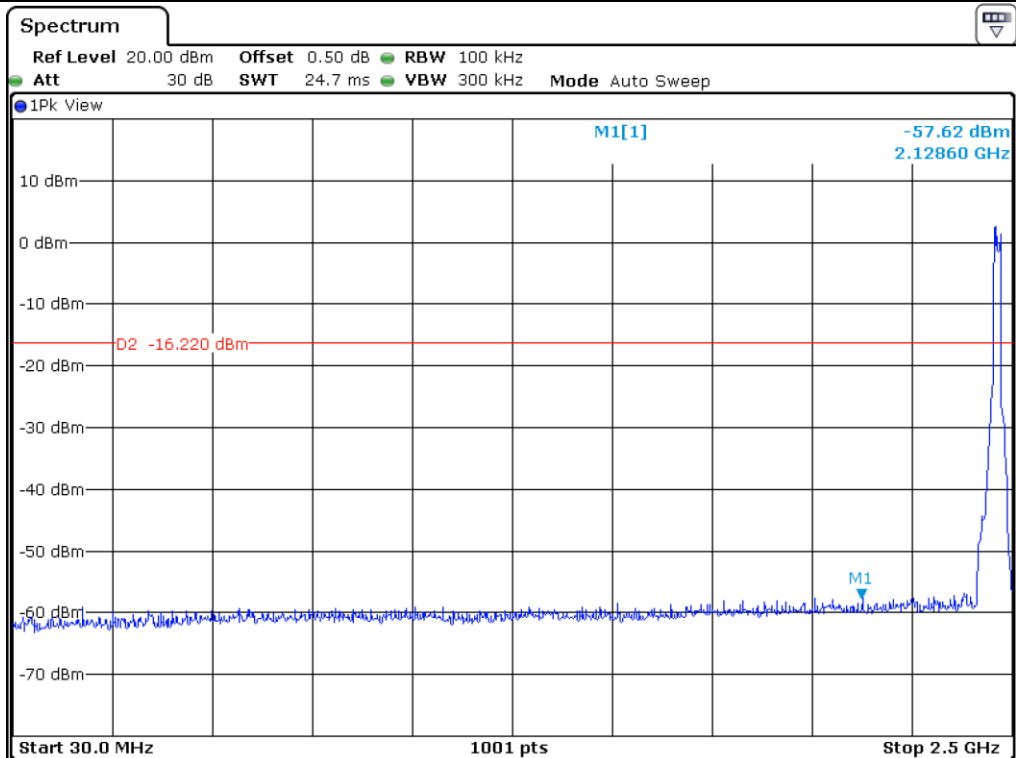
Low Channel



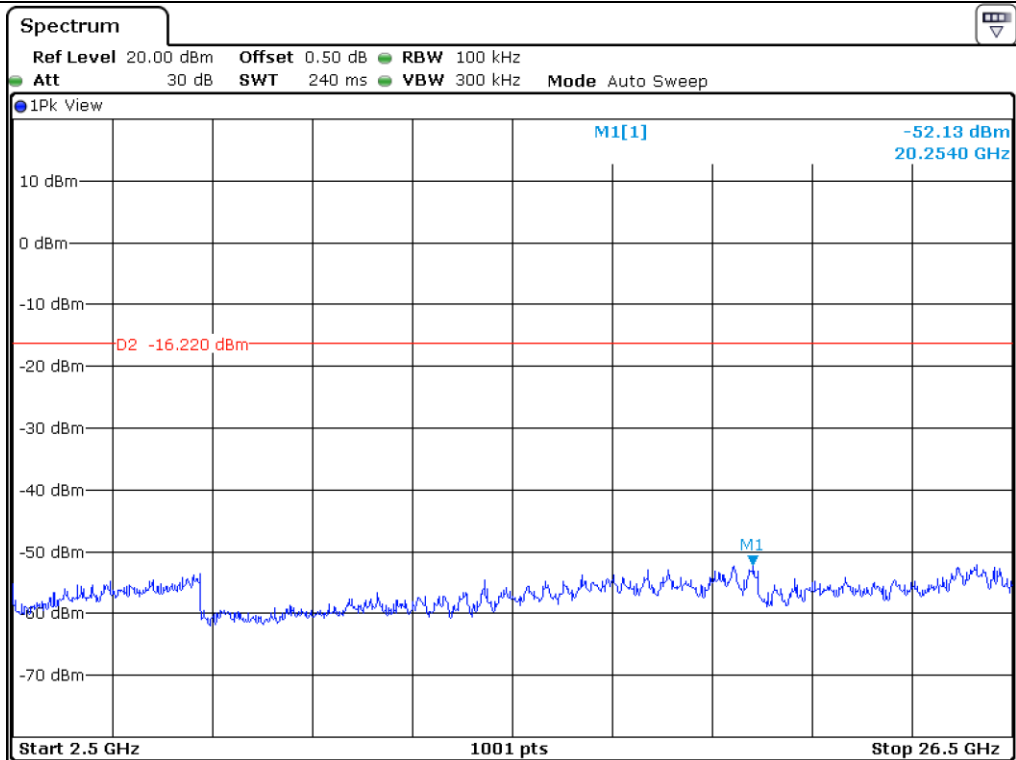
Middle Channel



Middle Channel



High Channel



High Channel

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

9.6.1.1 Test data for 802.11b

- . Test Date : February 04, 2018
- . Resolution bandwidth : 1 MHz for Peak and Average Mode,
100 KHz for Peak and Average Mode for the emissions in Bandedge
- . Video bandwidth : 3 MHz for Peak Mode and Average Mode
300 KHz for Peak and Average Mode for the emissions in Bandedge
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Frequency range : 30 MHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.24	44.45	Peak	H	27.60	11.40	34.76	48.69	74.00	25.31
2 382.37	32.47	Average	H				36.71	54.00	17.29
2 326.63	43.54	Peak	V				47.78	74.00	26.22
2 369.98	30.64	Average	V				34.88	54.00	19.12
Test Data for High Channel									
2 490.28	46.13	Peak	H	27.80	11.40	35.51	49.82	74.00	24.18
2 490.42	33.66	Average	H				37.35	54.00	16.65
2 498.00	44.17	Peak	V				47.86	74.00	26.14
2 490.56	31.56	Average	V				35.25	54.00	18.75

Tabulated test data for Restricted Band

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

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

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Ha-Ram, Lee / Assistant Manager

9.6.1.2 Test data for 802.11g

- . Test Date : February 04, 2018
- . Resolution bandwidth : 1 MHz for Peak and Average Mode,
100 KHz for Peak and Average Mode for the emissions in Bandedge
- . Video bandwidth : 3 MHz for Peak Mode and Average Mode
300 KHz for Peak and Average Mode for the emissions in Bandedge
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Frequency range : 30 MHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.72	47.29	Peak	H	27.60	11.40	34.76	51.53	74.00	22.47
2 389.96	35.12	Average	H				39.36	54.00	14.64
2 386.60	43.77	Peak	V				48.01	74.00	25.99
2 363.19	31.28	Average	V				35.52	54.00	18.48
Test Data for High Channel									
2 483.51	59.65	Peak	H	27.80	11.40	35.51	63.34	74.00	10.66
2 483.51	39.70	Average	H				43.39	54.00	10.61
2 498.06	45.16	Peak	V				48.85	74.00	25.15
2 491.75	31.74	Average	V				35.43	54.00	18.57

Tabulated test data for Restricted Band

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

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

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Ha-Ram, Lee / Assistant Manager

9.6.1.3 Test data for 802.11n_HT20

- . Test Date : February 04, 2018
- . Resolution bandwidth : 1 MHz for Peak and Average Mode,
100 KHz for Peak and Average Mode for the emissions in Bandedge
- . Video bandwidth : 3 MHz for Peak Mode and Average Mode
300 KHz for Peak and Average Mode for the emissions in Bandedge
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Frequency range : 30 MHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

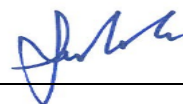
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.96	50.96	Peak	H	27.60	11.40	34.76	55.20	74.00	18.80
2 389.96	36.96	Average	H				41.20	54.00	12.80
2 342.25	43.45	Peak	V				47.69	74.00	26.31
2 389.96	31.37	Average	V				35.61	54.00	18.39
Test Data for High Channel									
2 484.43	58.62	Peak	H	27.80	11.40	35.51	62.31	74.00	11.69
2 483.51	43.14	Average	H				46.83	54.00	7.17
2 497.21	44.28	Peak	V				47.97	74.00	26.03
2 488.31	31.87	Average	V				35.56	54.00	18.44

Tabulated test data for Restricted Band

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

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

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



Tested by: Ha-Ram, Lee / Assistant Manager

9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 802.11b

- Test Date : February 04, 2018
- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak Mode and Average Mode
300 kHz for Peak Mode for the emissions outside restricted band
- Detector : Peak Mode(Peak), Average Mode(RMS)
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	44.73	Peak	H	31.00	16.10	35.74	56.09	74.00	17.91
	32.99	Average	H				44.35	54.00	9.65
	44.55	Peak	V				55.91	74.00	18.09
	32.33	Average	V				43.69	54.00	10.31
Test Data for Middle Channel									
4 884.00	44.66	Peak	H	31.10	16.10	35.80	56.06	74.00	17.94
	32.61	Average	H				44.01	54.00	9.99
	43.92	Peak	V				55.32	74.00	18.68
	32.17	Average	V				43.57	54.00	10.43
Test Data for High Channel									
4 924.00	45.06	Peak	H	31.20	16.10	35.96	56.40	74.00	17.60
	32.11	Average	H				43.45	54.00	10.55
	44.35	Peak	V				55.69	74.00	18.31
	32.22	Average	V				43.56	54.00	10.44

Tabulated test data for Spurious & Harmonic

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

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

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Ha-Ram, Lee / Assistant Manager

9.6.2.2 Test data for 802.11g

- . Test Date : February 04, 2018
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak Mode and Average Mode
300 kHz for Peak Mode for the emissions outside restricted band
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	44.95	Peak	H	31.00	16.10	35.74	56.31	74.00	17.69
	32.54	Average	H				43.90	54.00	10.10
	44.87	Peak	V				56.23	74.00	17.77
	32.52	Average	V				43.88	54.00	10.12
Test Data for Middle Channel									
4 884.00	43.89	Peak	H	31.10	16.10	35.80	55.29	74.00	18.71
	32.04	Average	H				43.44	54.00	10.56
	44.23	Peak	V				55.63	74.00	18.37
	32.41	Average	V				43.81	54.00	10.19
Test Data for High Channel									
4 924.00	44.41	Peak	H	31.20	16.10	35.96	55.75	74.00	18.25
	32.82	Average	H				44.16	54.00	9.84
	43.99	Peak	V				55.33	74.00	18.67
	32.63	Average	V				43.97	54.00	10.03

Tabulated test data for Spurious & Harmonic

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

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

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Ha-Ram, Lee / Assistant Manager

9.6.2.3 Test data for 802.11n_HT20

- . Test Date : February 04, 2018
- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak Mode and Average Mode
300 kHz for Peak Mode for the emissions outside restricted band
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	44.05	Peak	H	31.00	16.10	35.74	55.41	74.00	18.59
	32.75	Average	H				44.11	54.00	9.89
	45.00	Peak	V				56.36	74.00	17.64
	32.78	Average	V				44.14	54.00	9.86
Test Data for Middle Channel									
4 884.00	44.03	Peak	H	31.10	16.10	35.80	55.43	74.00	18.57
	32.94	Average	H				44.34	54.00	9.66
	44.26	Peak	V				55.66	74.00	18.34
	32.04	Average	V				43.44	54.00	10.56
Test Data for High Channel									
4 924.00	44.38	Peak	H	31.20	16.10	35.96	55.72	74.00	18.28
	32.12	Average	H				43.46	54.00	10.54
	44.46	Peak	V				55.80	74.00	18.20
	32.62	Average	V				43.96	54.00	10.04

Tabulated test data for Spurious & Harmonic

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

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

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



Tested by: Ha-Ram, Lee / Assistant Manager

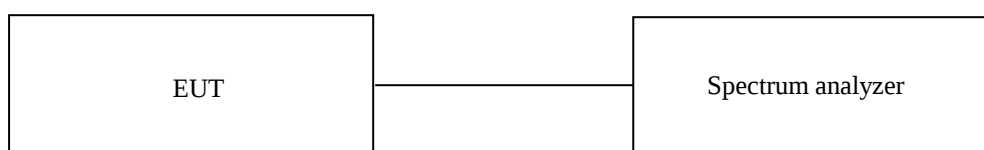
10. PEAK POWER SPECTRUL DENSITY

10.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct.26, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data for 802.11b

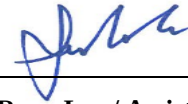
-. Test Date : January 31, 2018

-. Test Result : Pass

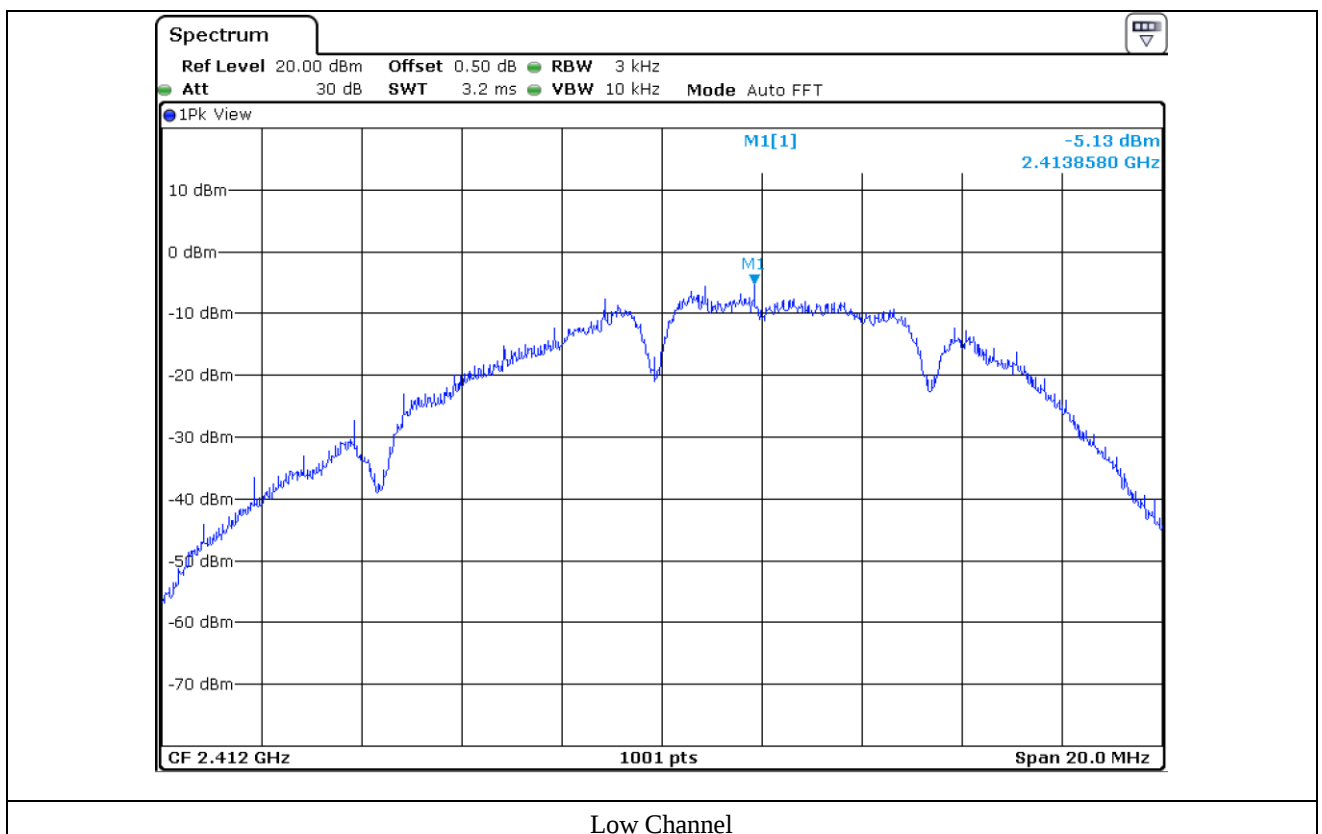
-. Operating Condition : Continuous transmitting mode

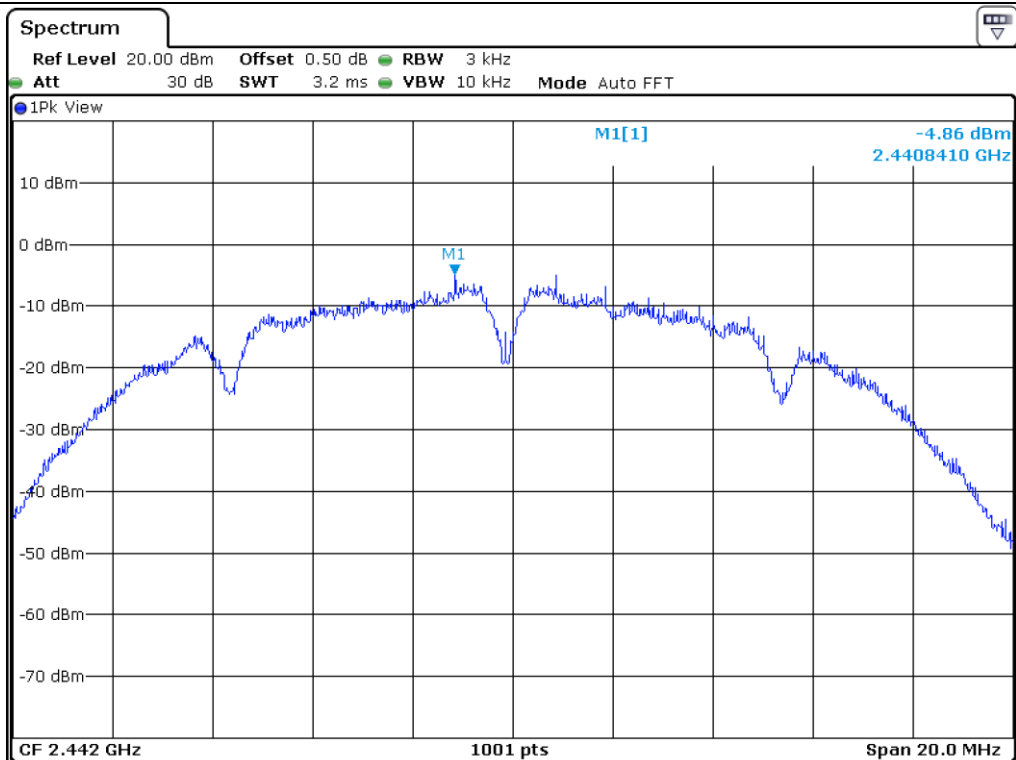
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412	-5.13	8.00	13.13
Middle	2 442	-4.86	8.00	12.86
High	2 462	-9.38	8.00	17.38

Remark. Margin = Limit – Measured value

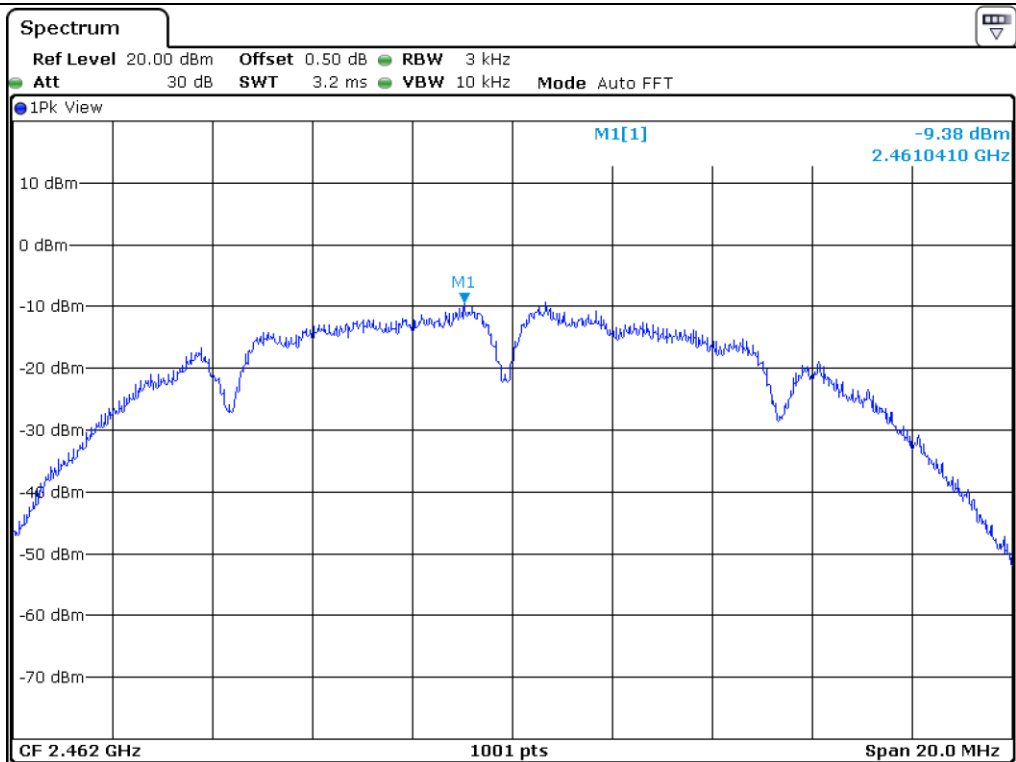


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

10.5 Test data for 802.11g

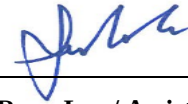
-. Test Date : January 31, 2018

-. Test Result : Pass

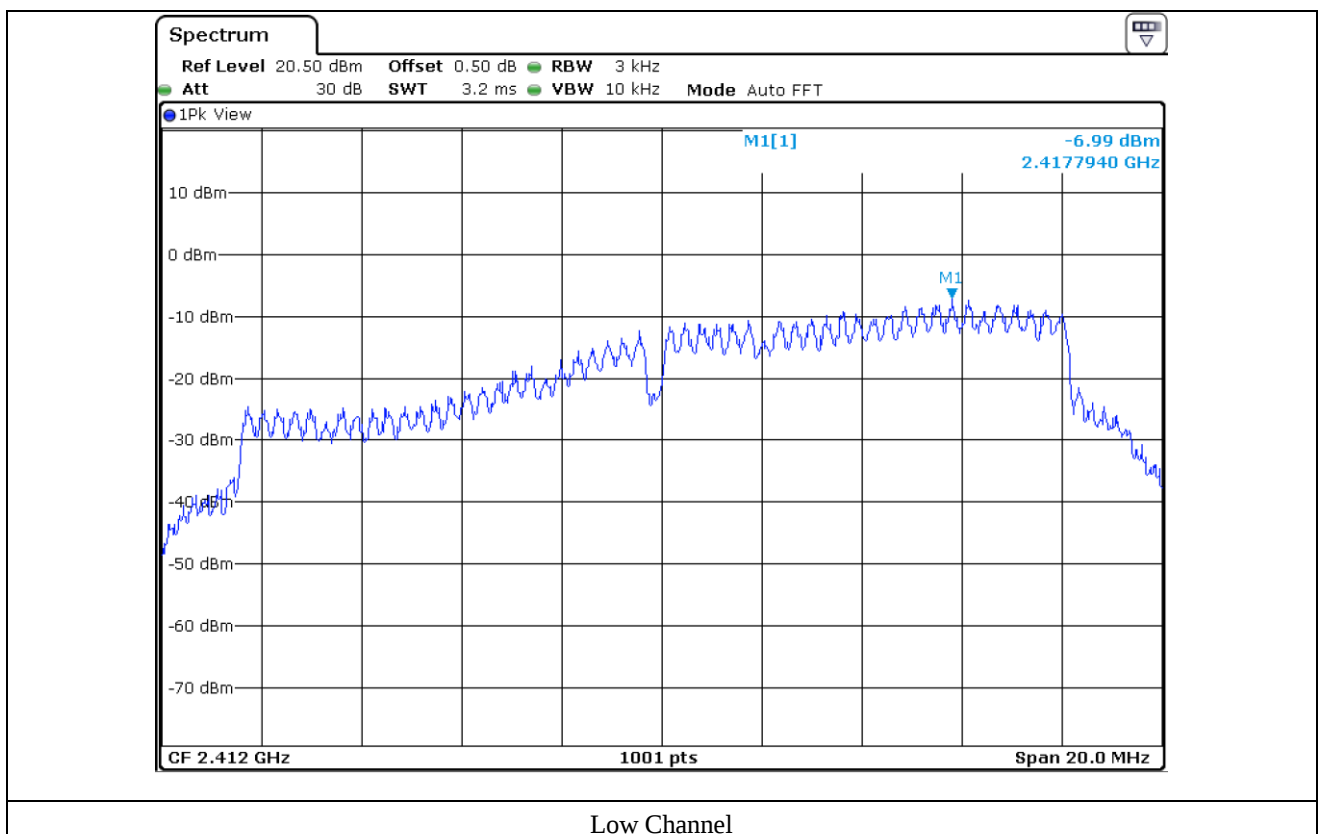
-. Operating Condition : Continuous transmitting mode

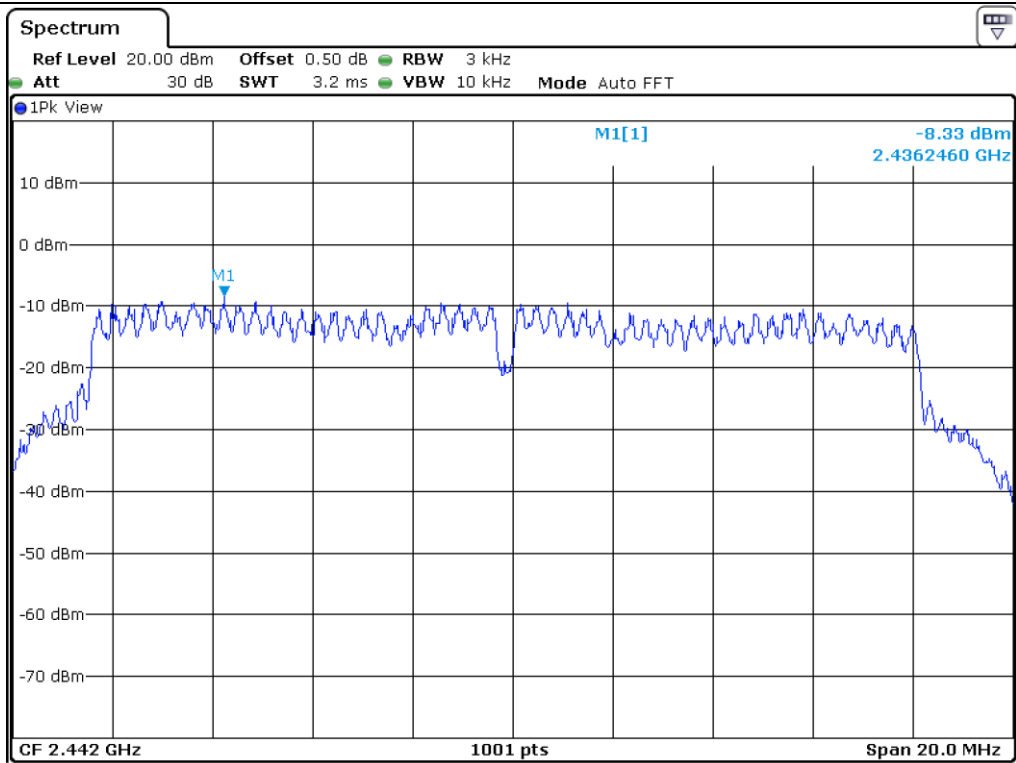
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412	-6.99	8.00	14.99
Middle	2 442	-8.33	8.00	16.33
High	2 462	-11.28	8.00	19.28

Remark. Margin = Limit – Measured value

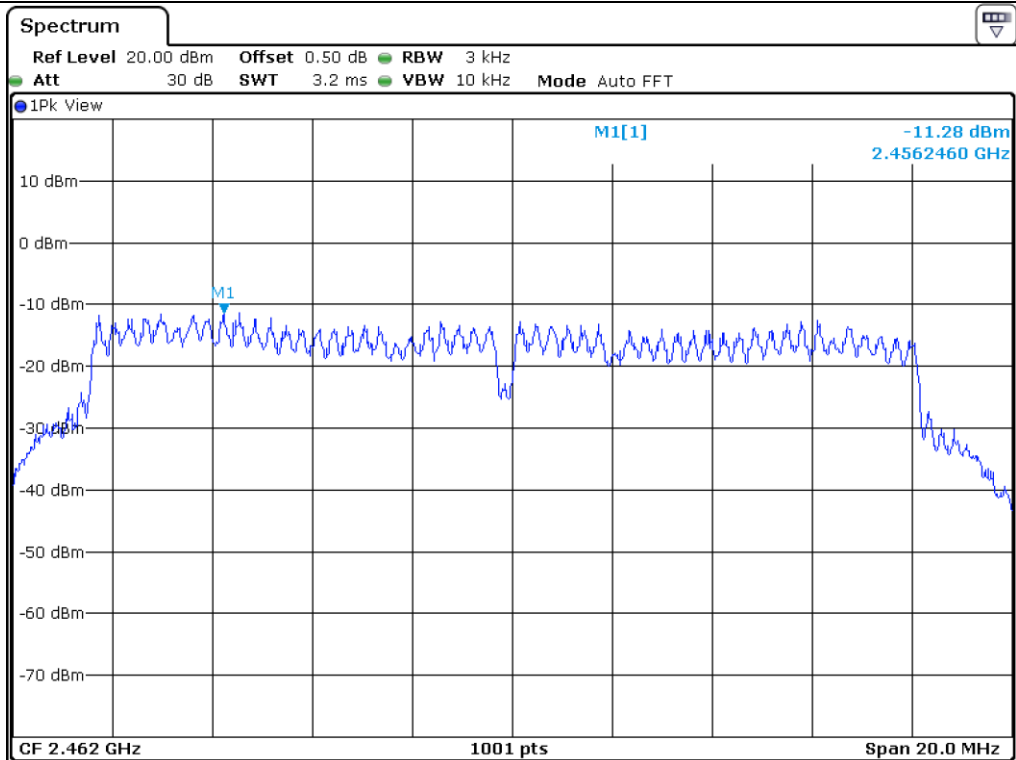


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

10.6 Test data for 802.11n_HT20

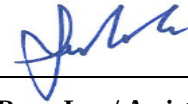
-. Test Date : January 31, 2018

-. Test Result : Pass

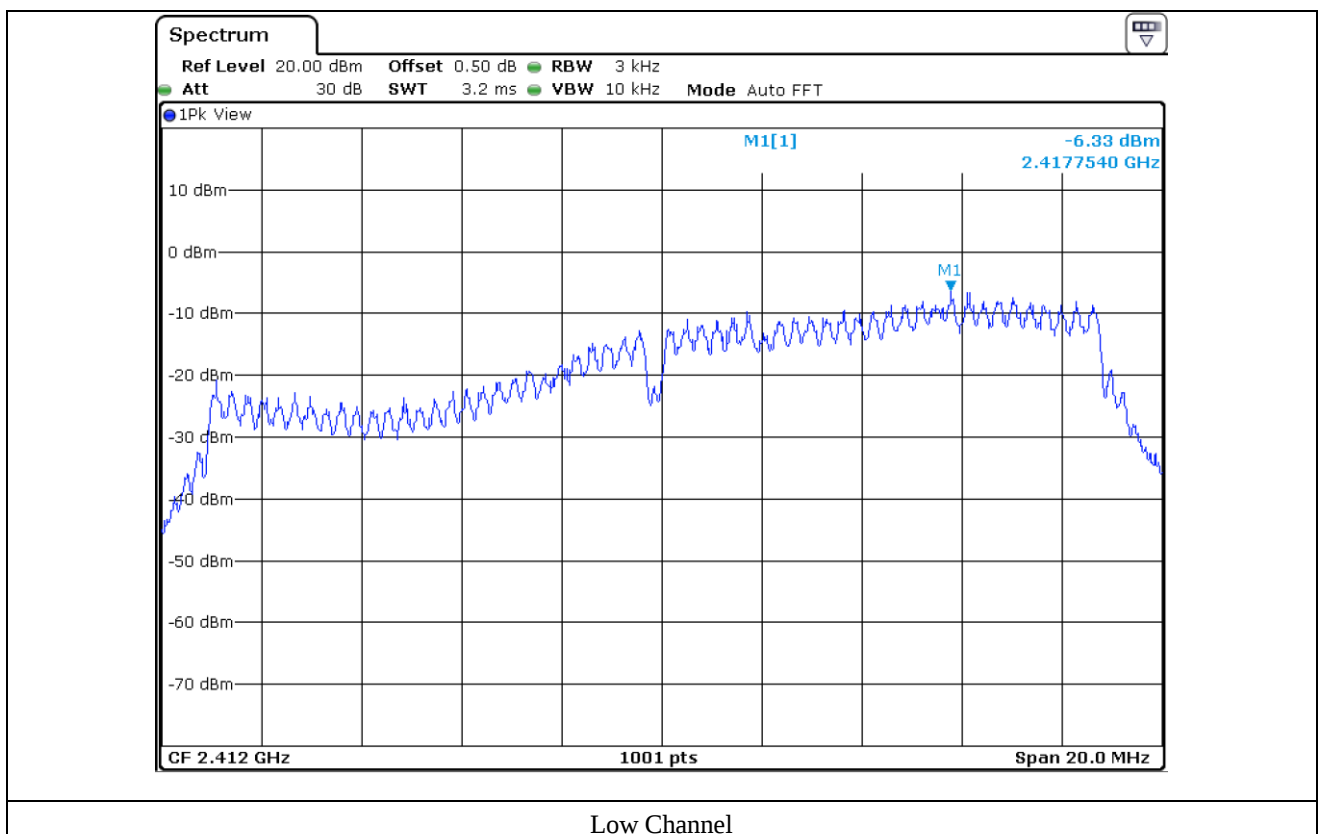
-. Operating Condition : Continuous transmitting mode

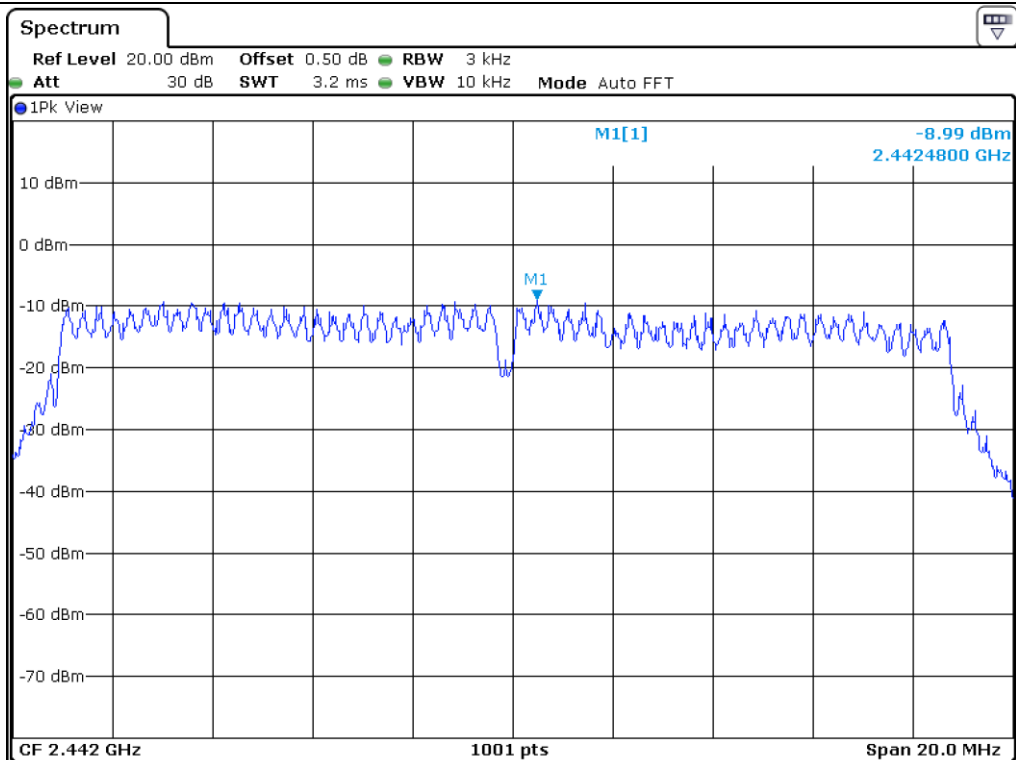
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412	-6.33	8.00	14.33
Middle	2 442	-8.99	8.00	16.99
High	2 462	-10.70	8.00	18.70

Remark. Margin = Limit – Measured value

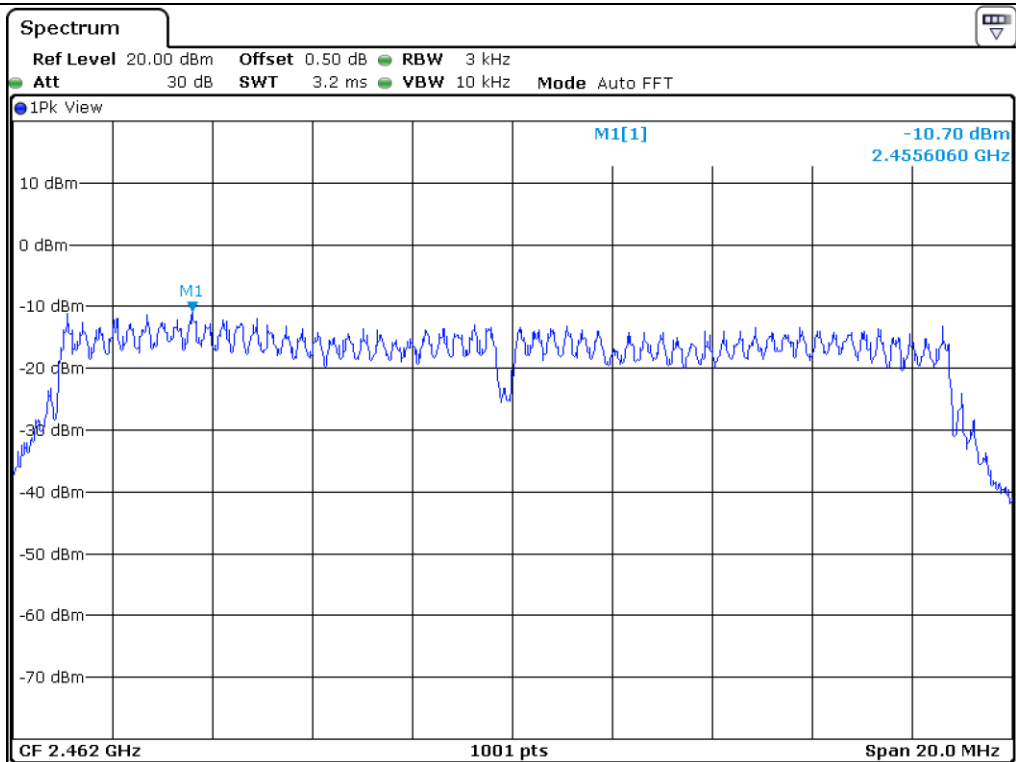


Tested by: Ha-Ram, Lee / Assistant Manager





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 24 °C
Relative humidity : 45 % R.H.

11.2 Test set-up

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

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

11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
□ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 27, 2017 (1Y)
■ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 27, 2017 (1Y)
□ -	FSP	Rohde & Schwarz	Spectrum Analyzer	100017	Sep. 04, 2017 (1Y)
■ -	310N	Sonoma Instrument	AMPLIFIER	312544	Apr. 04, 2017 (1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101200	Oct. 26, 2017 (1Y)
■ -	SCU-18	Rohde & Schwarz	Pre-Amplifier	102346	Oct. 24, 2017 (1Y)
■ -	MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509	N/A
□ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DT3000-3t	Innco Systems GmbH	Turn Table	N/A	N/A
□ -	FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	Jun. 10, 2016 (2Y)
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-255	May 20, 2016 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2017 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA91700179	Jul. 28, 2017 (2Y)
■ -	SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Apr. 04, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

11.4 Test data

11.4.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 45 % R.H.

Temperature: 24 °C

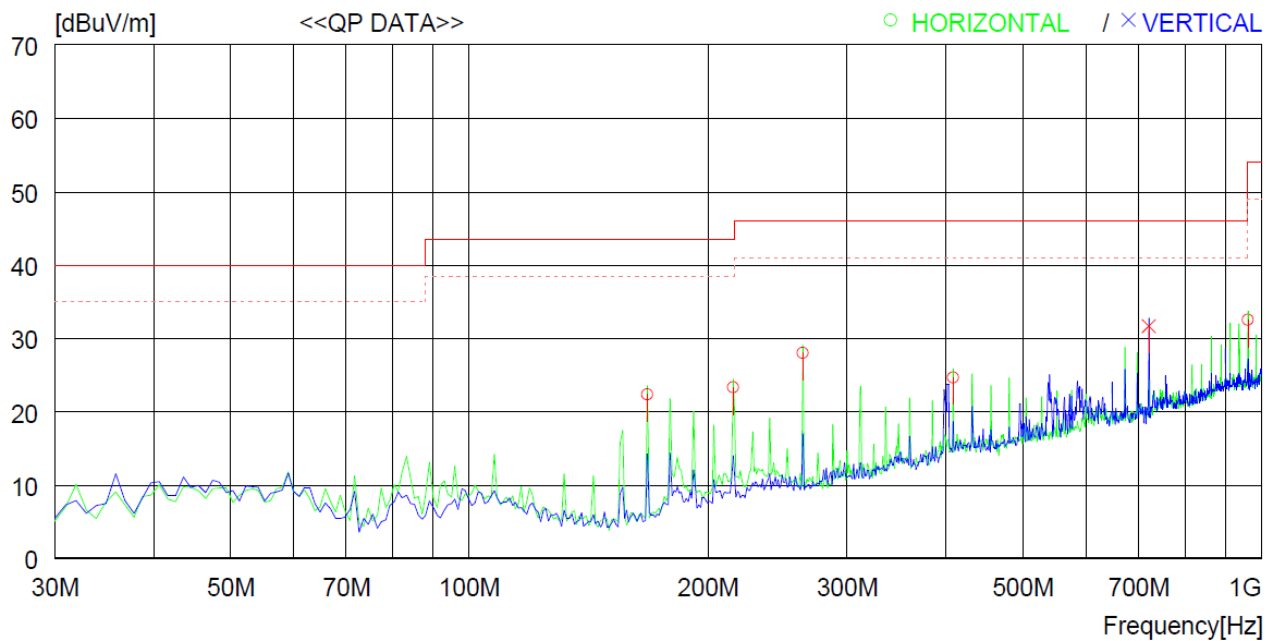
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Smart Beauty Analyzer

Date: February 04, 2018

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



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	167.740	43.5	8.8	3.1	33.0	22.4	43.5	21.1	200	79
2	215.270	42.1	11.0	3.4	33.2	23.3	43.5	20.2	200	0
3	263.770	45.1	12.3	3.7	33.1	28.0	46.0	18.0	100	91
4	408.300	36.9	16.4	4.6	33.2	24.7	46.0	21.3	100	251
5	960.217	35.3	22.0	7.2	32.0	32.5	54.0	21.5	100	267
----- Vertical -----										
6	720.634	39.5	19.5	6.2	33.5	31.7	46.0	14.3	100	53

11.4.2 Test data for Below 30 MHz

- . Test Date : February 04, 2018
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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

11.4.3 Test data for above 1 GHz

- . Test Date : February 04, 2018
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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



Tested by: Ha-Ram, Lee / Assistant Manager