

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-208-RWD-034
Reception No. : 2008003136
Applicant : BBB Inc.
Address : 7F, 22, Teheran-ro 81-gil, Gangnam-gu, Seoul, Republic of Korea
Manufacturer : BBB Inc.
Address : 7F, 22, Teheran-ro 81-gil, Gangnam-gu, Seoul, Republic of Korea
Type of Equipment : Immnuoassay Analyzer
FCC ID. : 2AKGP-MB101
Model Name : MB-100
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 74 pages (including this page)
Date of Incoming : August 13, 2020
Date of issue : August 28, 2020

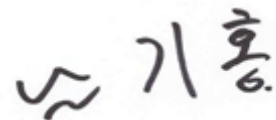
SUMMARY

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.





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CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	6
2. TEST SUMMARY	7
2.1 TEST ITEMS AND RESULTS	7
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	7
2.3 RELATED SUBMITTAL(S) / GRANT(S)	7
2.4 PURPOSE OF THE TEST	7
2.5 TEST METHODOLOGY.....	7
2.6 TEST FACILITY.....	7
3. GENERAL INFORMATION.....	8
3.1 PRODUCT DESCRIPTION.....	8
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	8
4. EUT MODIFICATIONS.....	8
5. SYSTEM TEST CONFIGURATION	9
5.1 JUSTIFICATION.....	9
5.2 PERIPHERAL EQUIPMENT	9
5.3 CONFIGURATION OF TEST SYSTEM.....	10
5.4 ANTENNA REQUIREMENT	10
6. PRELIMINARY TEST	11
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	11
6.2 GENERAL RADIATED EMISSIONS TESTS	11
7. MINIMUM 6 DB BANDWIDTH	12
7.1 OPERATING ENVIRONMENT	12
7.2 TEST SET-UP	12
7.3 TEST DATE	12
7.4 TEST DATA FOR 802.11B WLAN MODE.....	13
7.5 TEST DATA FOR 802.11G WLAN MODE	15
7.6 TEST DATA FOR 802.11N (HT 20) WLAN MODE.....	17
7.7 TEST DATA FOR 802.11N (HT 40) WLAN MODE.....	19
8. MAXIMUM PEAK OUTPUT POWER.....	21
8.1 OPERATING ENVIRONMENT	21
8.2 TEST SET-UP	21
8.3 TEST DATE	21

8.4 TEST DATA FOR 802.11B WLAN MODE.....	22
8.5 TEST DATA FOR 802.11G WLAN MODE	24
8.6 TEST DATA FOR 802.11N(HT20) WLAN MODE	26
8.7 TEST DATA FOR 802.11N(HT40) WLAN MODE	28
9. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....	30
9.1 OPERATING ENVIRONMENT	30
9.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	30
9.3 TEST SET-UP FOR RADIATED MEASUREMENT.....	30
9.4 TEST DATE	30
9.5 TEST DATA FOR CONDUCTED EMISSION	31
9.5.1 Test data for 802.11b WLAN Mode.....	31
9.5.2 Test data for 802.11g WLAN Mode.....	36
9.5.3 Test data for 802.11n (HT20) WLAN Mode	41
9.5.4 Test data for 802.11n (HT40) WLAN Mode	46
9.6 TEST DATA FOR RADIATED EMISSION.....	51
9.6.1 Radiated Emission which fall in the Restricted Band.....	51
9.6.2 Spurious & Harmonic Radiated Emission.....	55
10. PEAK POWER SPECTRAL DENSITY	59
10.1 OPERATING ENVIRONMENT	59
10.2 TEST SET-UP	59
10.3 TEST DATE	59
10.4 TEST DATA FOR 802.11B WLAN MODE.....	60
10.5 TEST DATA FOR 802.11G WLAN MODE	62
10.6 TEST DATA FOR 802.11N (HT20) WLAN MODE	64
10.7 TEST DATA FOR 802.11N (HT40) WLAN MODE	66
11. RADIATED EMISSION TEST	68
11.1 OPERATING ENVIRONMENT	68
11.2 TEST SET-UP	68
11.3 TEST DATE	68
11.4 TEST DATA FOR 30 MHz ~ 1 GHz.....	69
11.5 TEST DATA FOR BELOW 30 MHz	70
11.6 TEST DATA FOR ABOVE 1 GHz	70
12. CONDUCTED EMISSION TEST.....	71
12.1 OPERATING ENVIRONMENT	71
12.2 TEST SET-UP	71
12.3 TEST DATE	71

12.4 TEST DATA.....	72
13. LIST OF TEST EQUIPMENT	74

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-208-RWD-034	August 28, 2020	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : BBB Inc.
Address : 7F, 22, Teheran-ro 81-gil, Gangnam-gu, Seoul, Republic of Korea
Contact Person : Jaekyu Choi / CEO
Telephone No. : +82-2-565-9653
FCC ID. : 2AKGP-MB101
Model Name : MB-100
Brand Name : MARK-B™ 1 analyzer
Serial Number : N/A

EQUIPMENT CLASS	DTS-Digital Transmission System
E.U.T. DESCRIPTION	Immunoassay 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.

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2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	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-14617/ G-10666 / T-1842

ISED (Innovation, Science and Economic Development 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 BBB Inc., Model MB-100 (referred to as the EUT in this report) is an Immnuoassay Analyzer. Product specification information described herein was obtained from product data sheet or user's manual.

Device Type	Immnuoassay Analyzer	
Operating Frequency	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz Band	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
		2 422 MHz ~ 2 452 MHz (802.11n(HT40))
RF Output Power	Bluetooth LE	-4.51 dBm
	WLAN 2.4 GHz Band	802.11b (12.82 dBm) 802.11g (12.93 dBm) 802.11n(HT20) (12.36 dBm) 802.11n(HT40) (12.94 dBm)
Number of Channel	Bluetooth LE	40 Channels
	WLAN 2.4 GHz Band	11 Channels
Modulation Type	Bluetooth LE	DSSS Modulation(GFSK)
	WLAN 2.4 GHz Band	DSSS Modulation(DBPSK/DQPSK/CCK) OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
Antenna Type	Bluetooth LE	FPC Antenna
	WLAN 2.4 GHz Band	
Antenna Gain	Bluetooth LE	1.74 dBi
	WLAN 2.4 GHz Band	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 MHz	
Rated Supply Voltage	DC 3.8 V	

Note: Bluetooth and WLAN do not operate simultaneously.

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	-
Sub Board	N/A	N/A	-
Module Board	N/A	N/A	-
Display Board	N/A	N/A	-
Main Battery	N/A	N/A	-
Sub Battery	N/A	N/A	-

5.2 Peripheral equipment

-None

5.3 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 open area test site.

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

5.4 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 FPC 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)
Charging 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

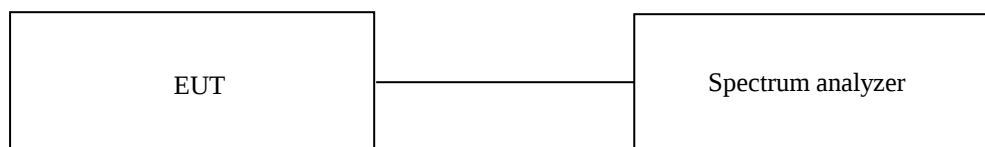
7. MINIMUM 6 dB BANDWIDTH

7.1 Operating environment

Temperature : 22 °C
Relative humidity : 50 % 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 date

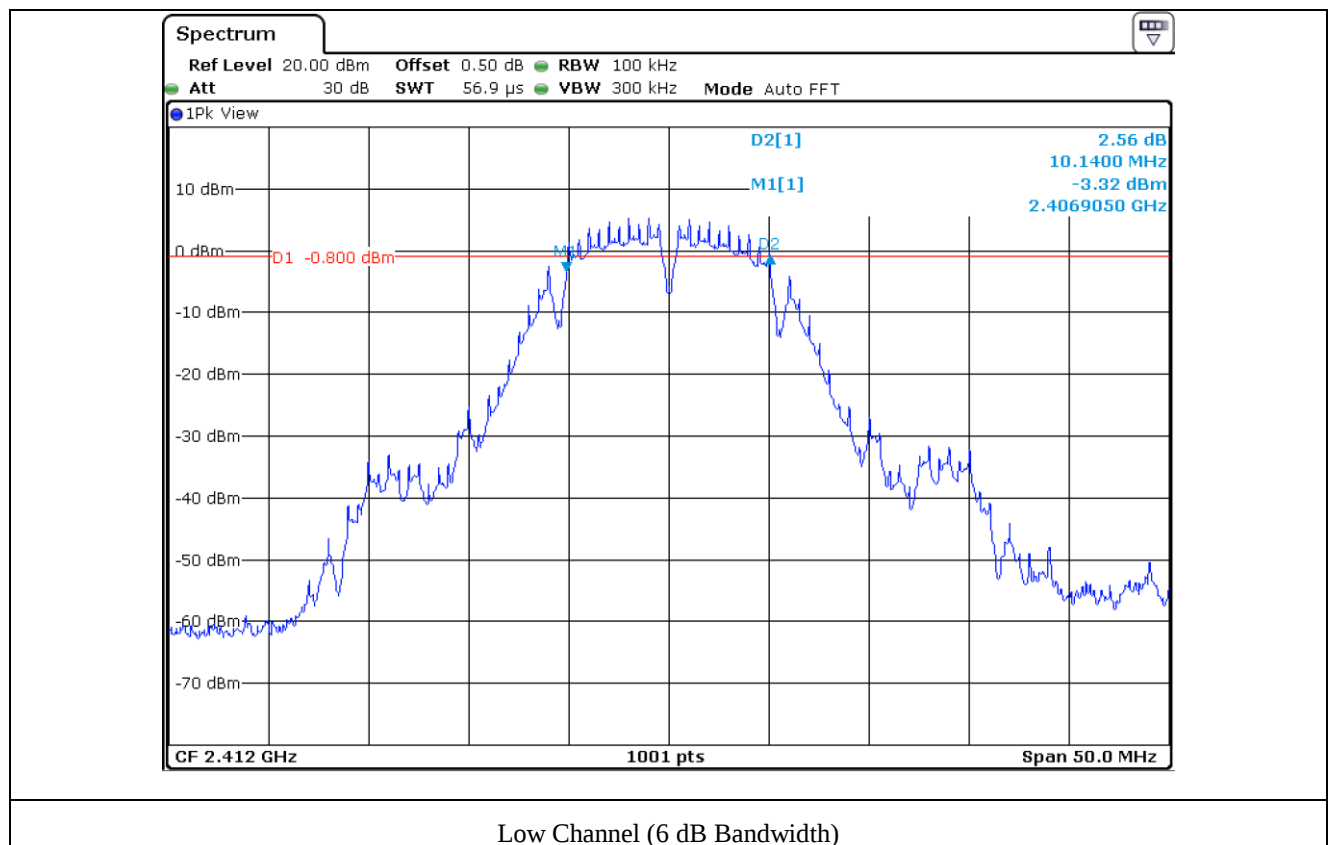
August 20, 2020 ~ August 21, 2020

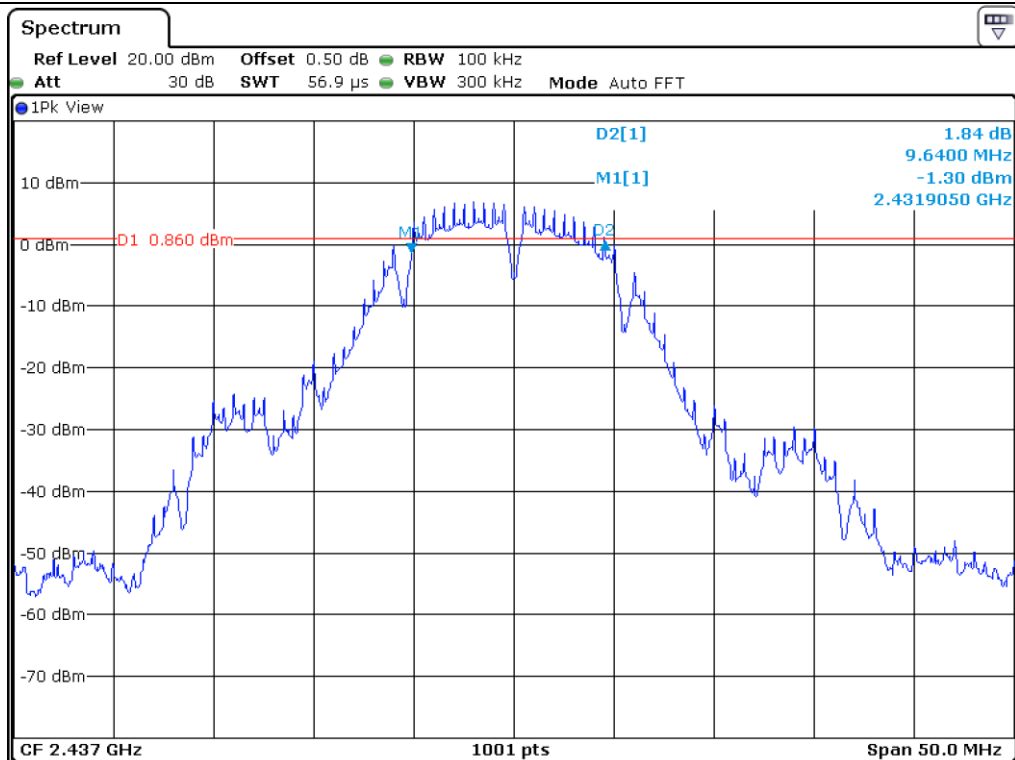
7.4 Test data for 802.11b WLAN Mode

-. Test Result : Pass

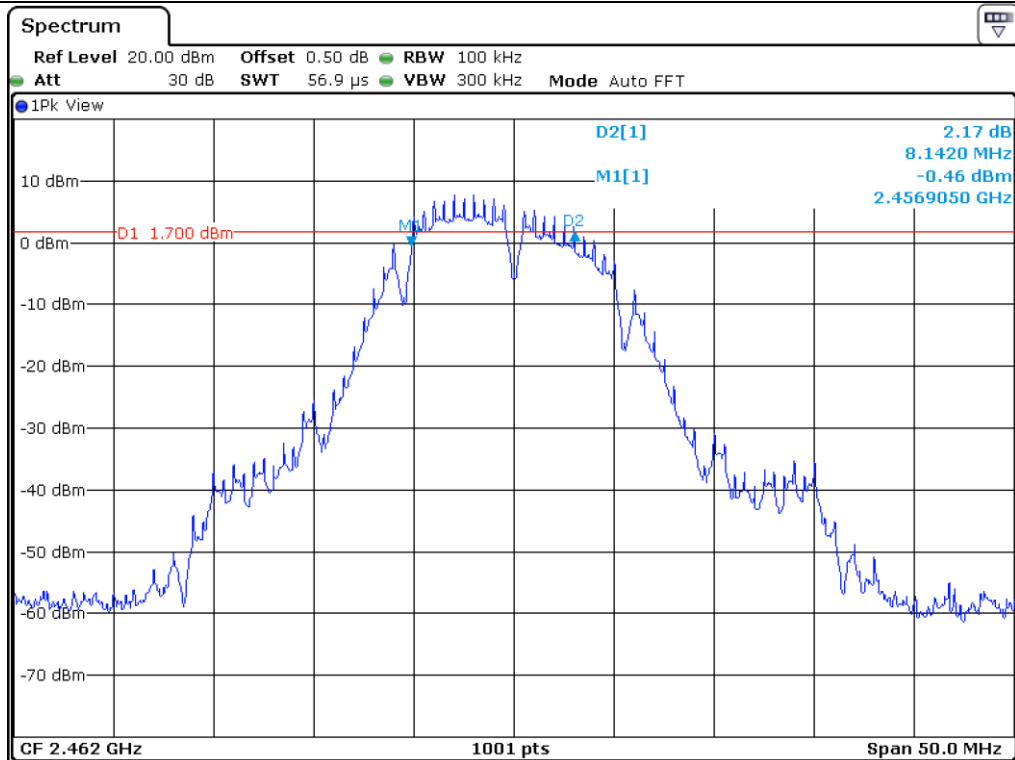
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	LIMIT (MHz)	Bandwidth Margin(MHz)	
					6 dB	99 %
Low	2 412.00	10.14	13.14	>500	9.64	12.64
Middle	2 437.00	9.64	13.29	>500	9.14	12.79
High	2 462.00	8.14	12.09	>500	7.64	11.59

Remark. Margin = Measured Value – Limit





Middle Channel (6 dB Bandwidth)



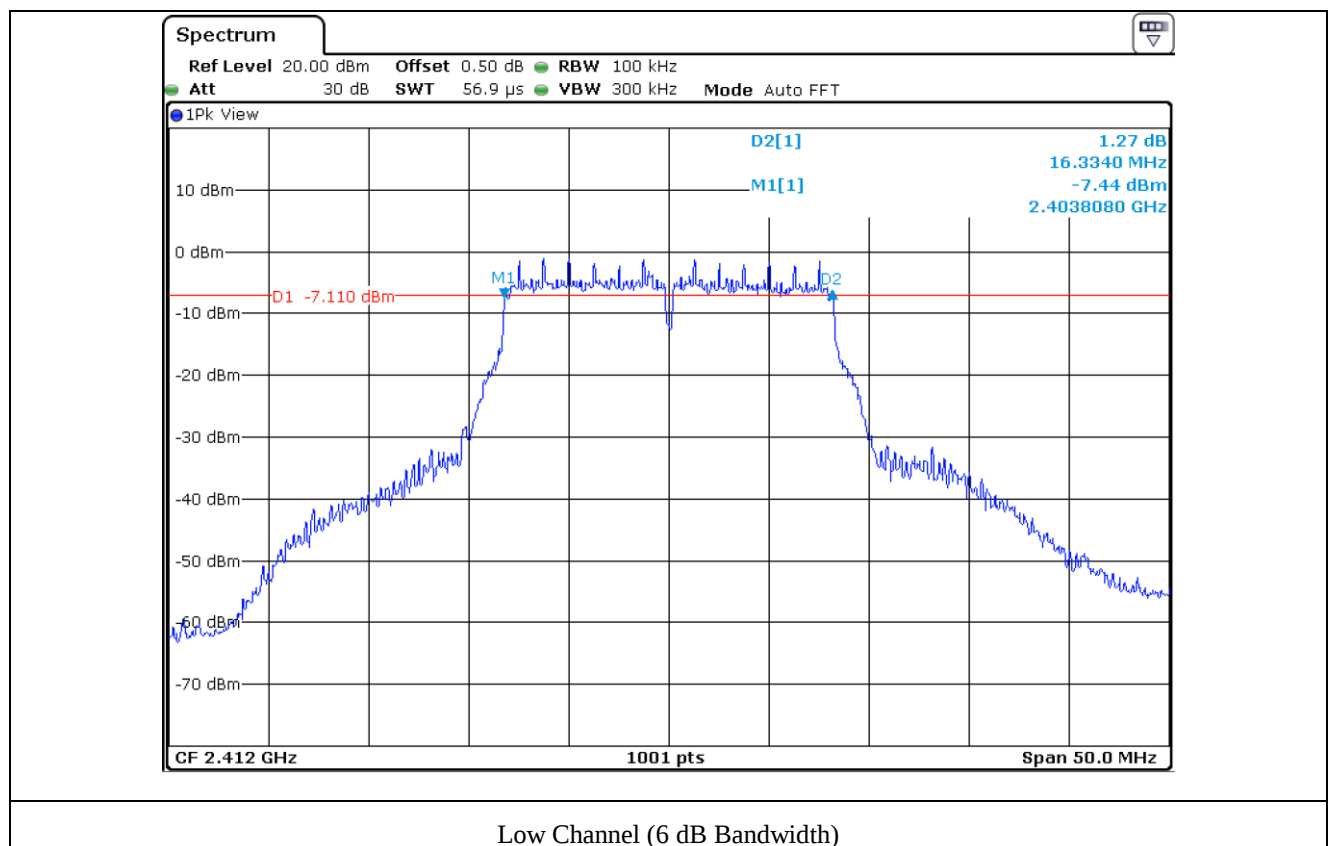
High Channel (6 dB Bandwidth)

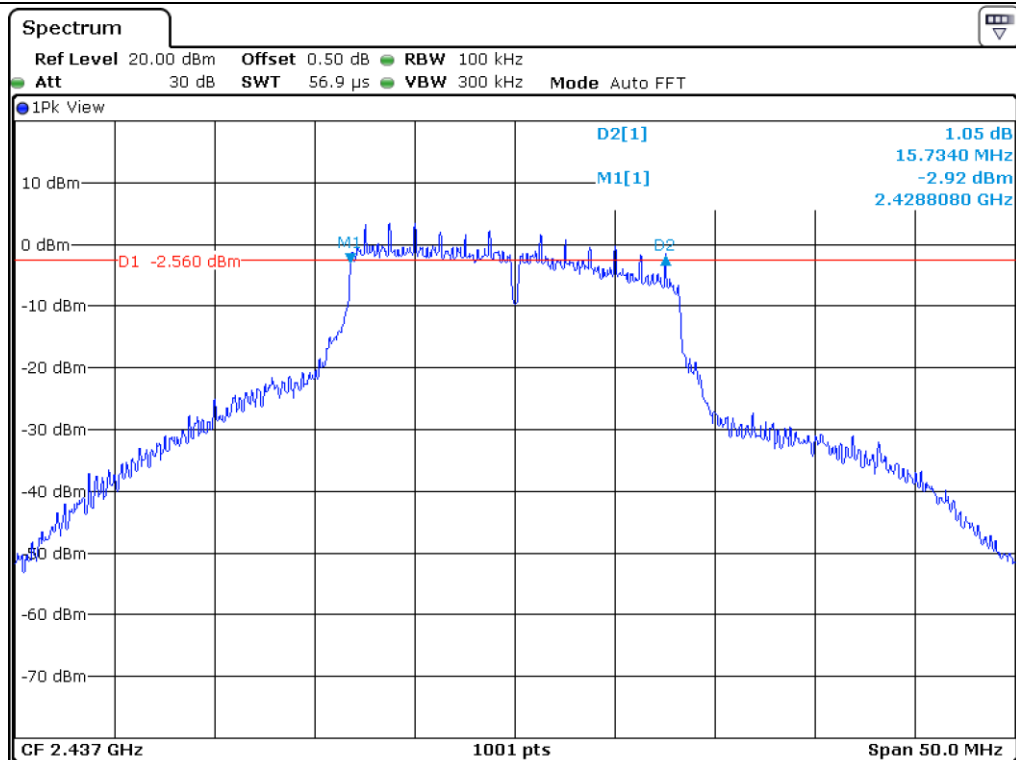
7.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

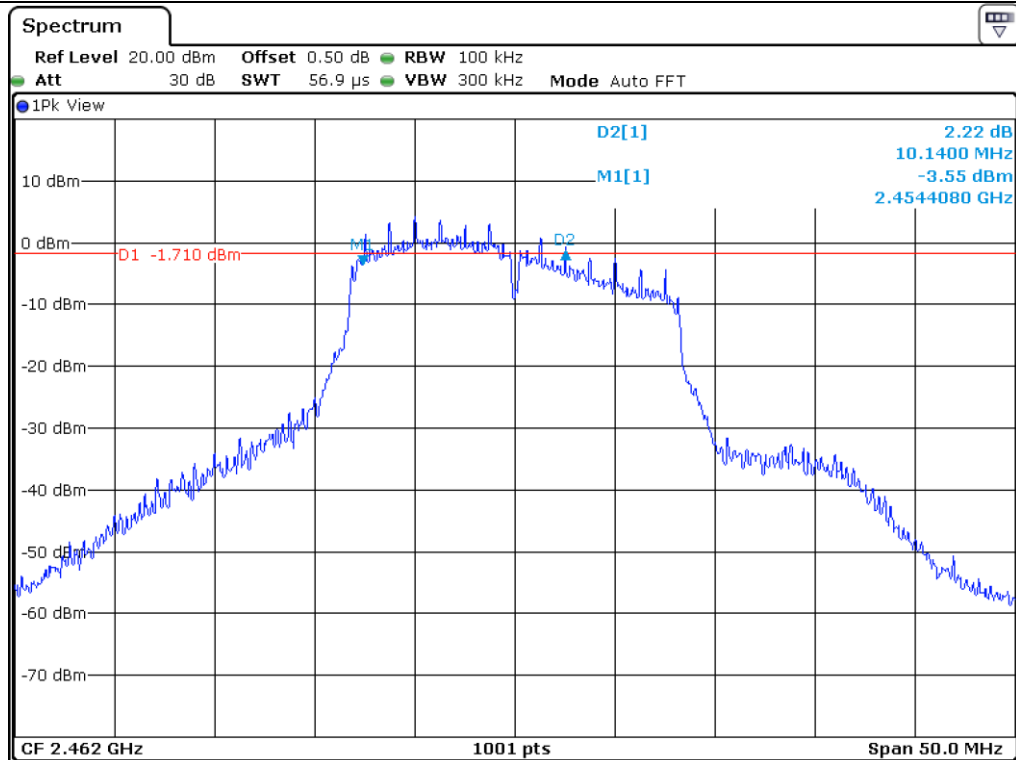
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	LIMIT (MHz)	Bandwidth Margin(MHz)	
					6 dB	99 %
Low	2 412.00	16.33	16.48	>500	15.83	15.98
Middle	2 437.00	15.73	16.53	>500	15.23	16.03
High	2 462.00	10.14	15.93	>500	9.64	15.43

Remark. Margin = Measured Value - Limit





Middle Channel (6 dB Bandwidth)



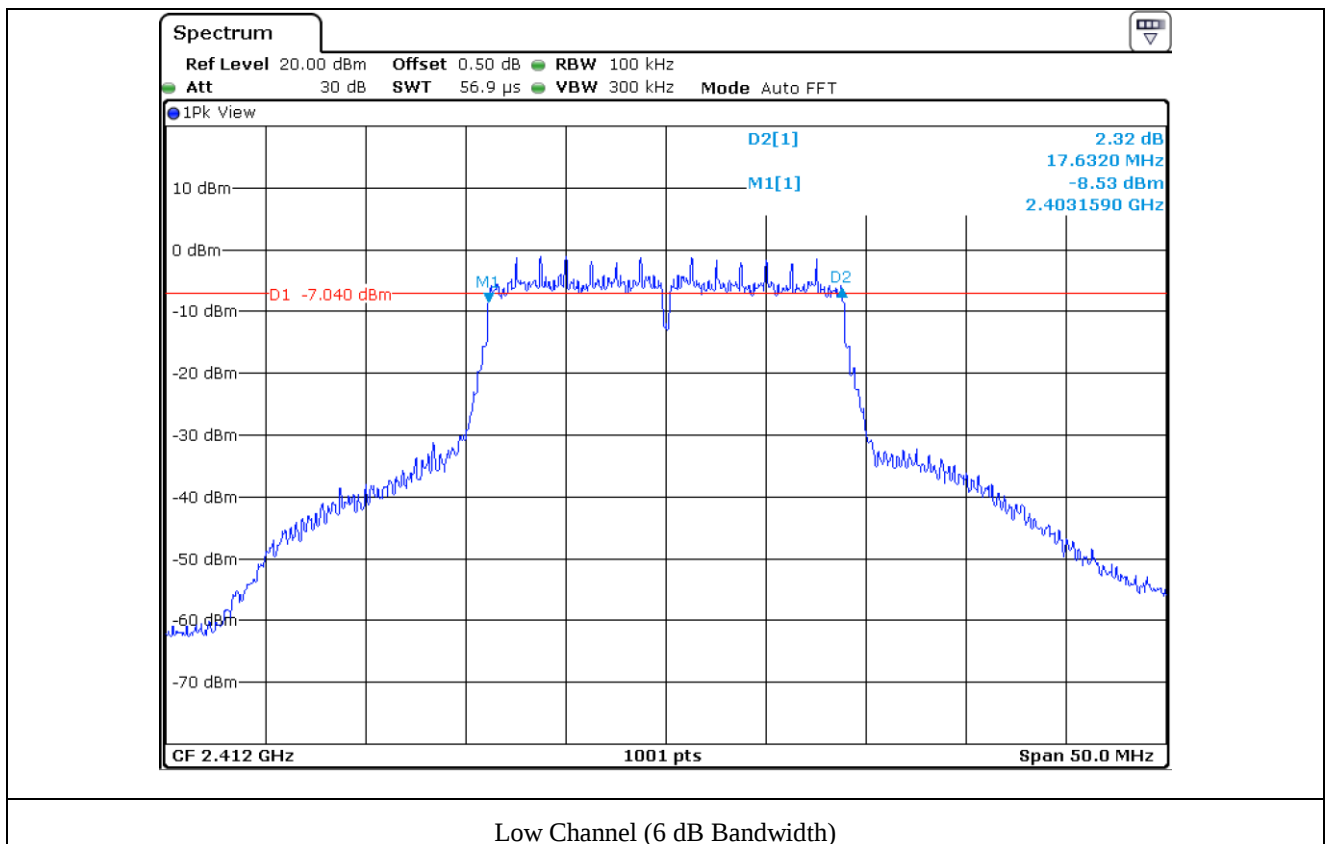
High Channel (6 dB Bandwidth)

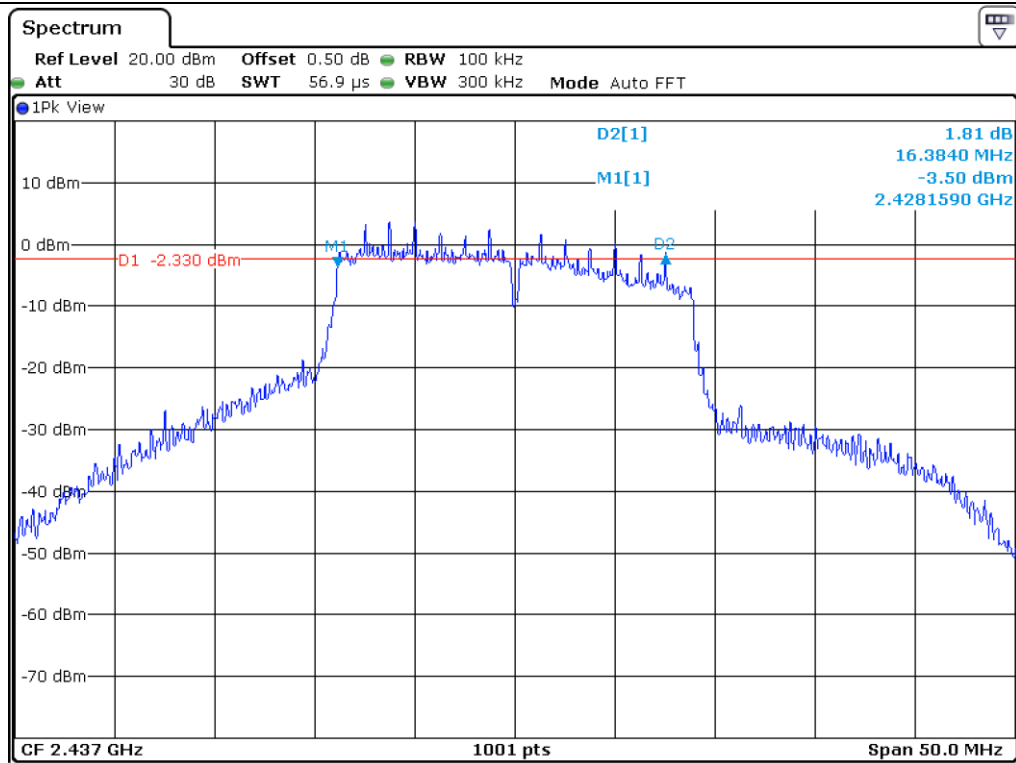
7.6 Test data for 802.11n (HT 20) WLAN Mode

-. Test Result : Pass

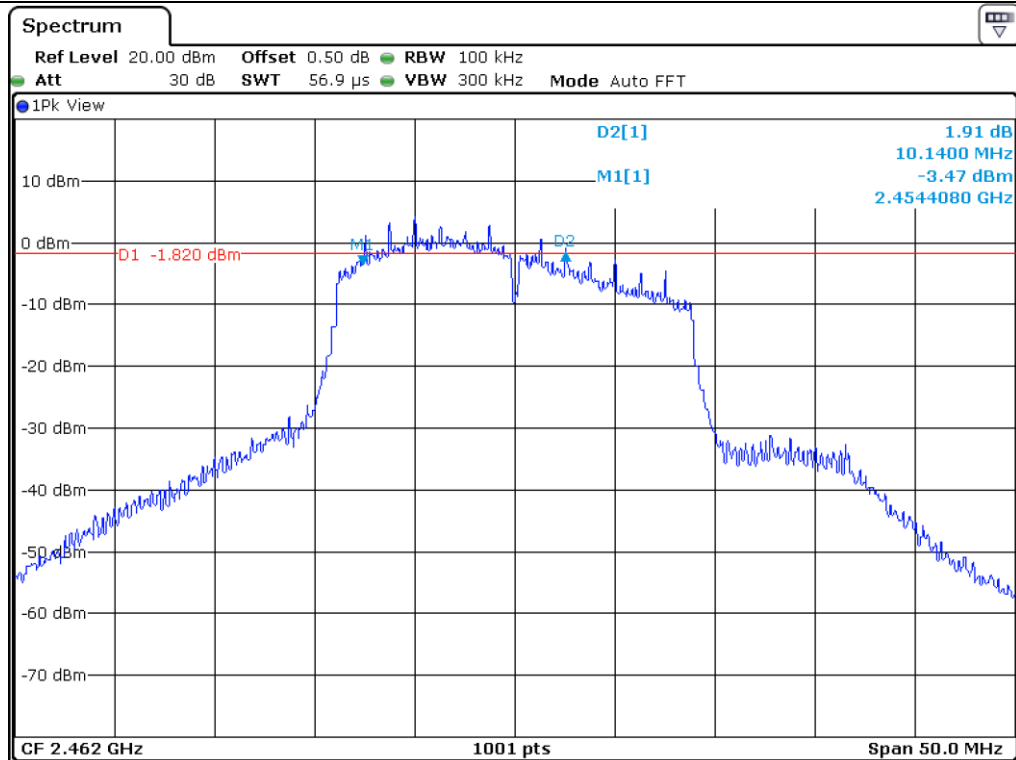
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	LIMIT (MHz)	Bandwidth Margin(MHz)	
					6 dB	99 %
Low	2 412.00	17.63	17.68	>500	17.13	17.18
Middle	2 437.00	16.38	17.83	>500	15.88	17.33
High	2 462.00	10.14	17.18	>500	9.64	16.68

Remark. Margin = Measured Value - Limit





Middle Channel (6 dB Bandwidth)



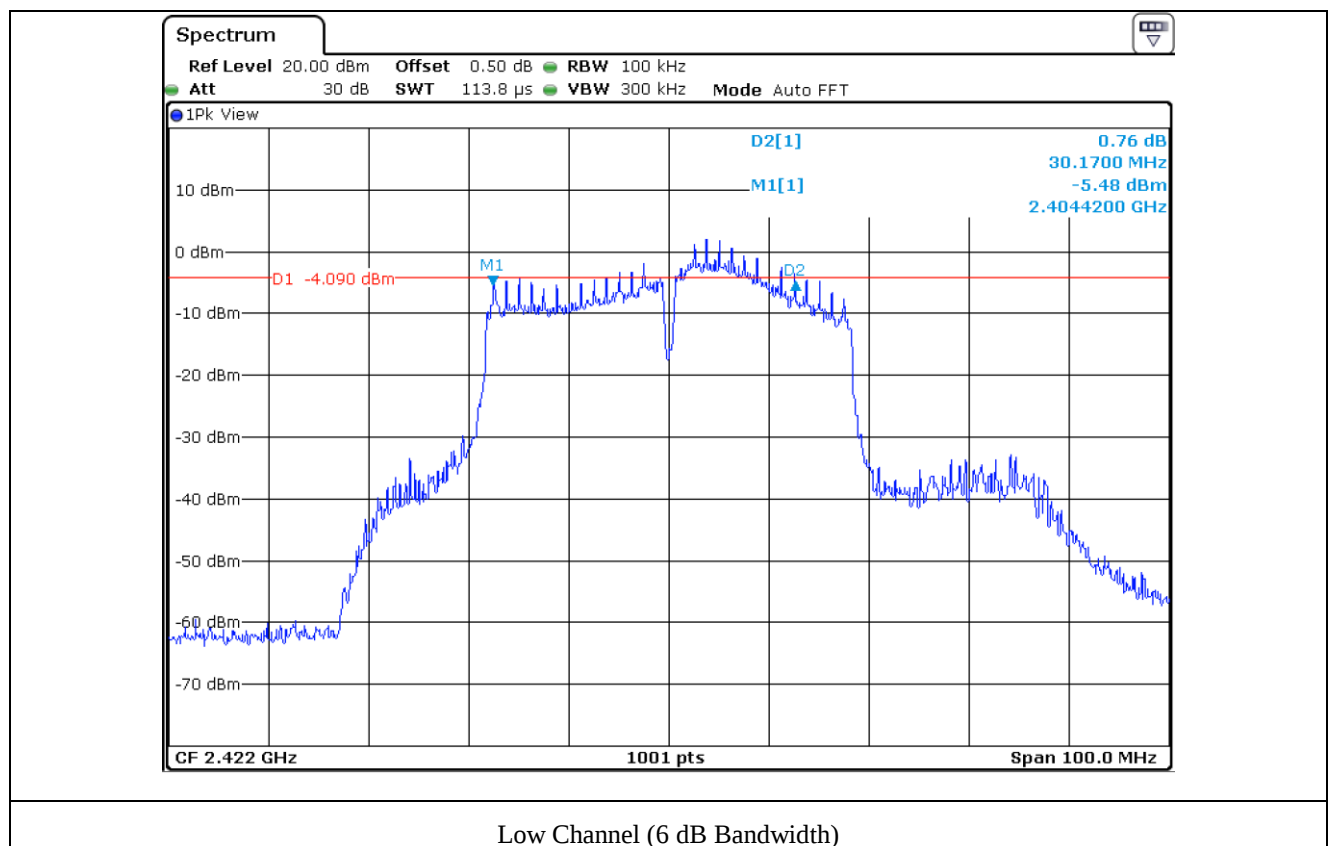
High Channel (6 dB Bandwidth)

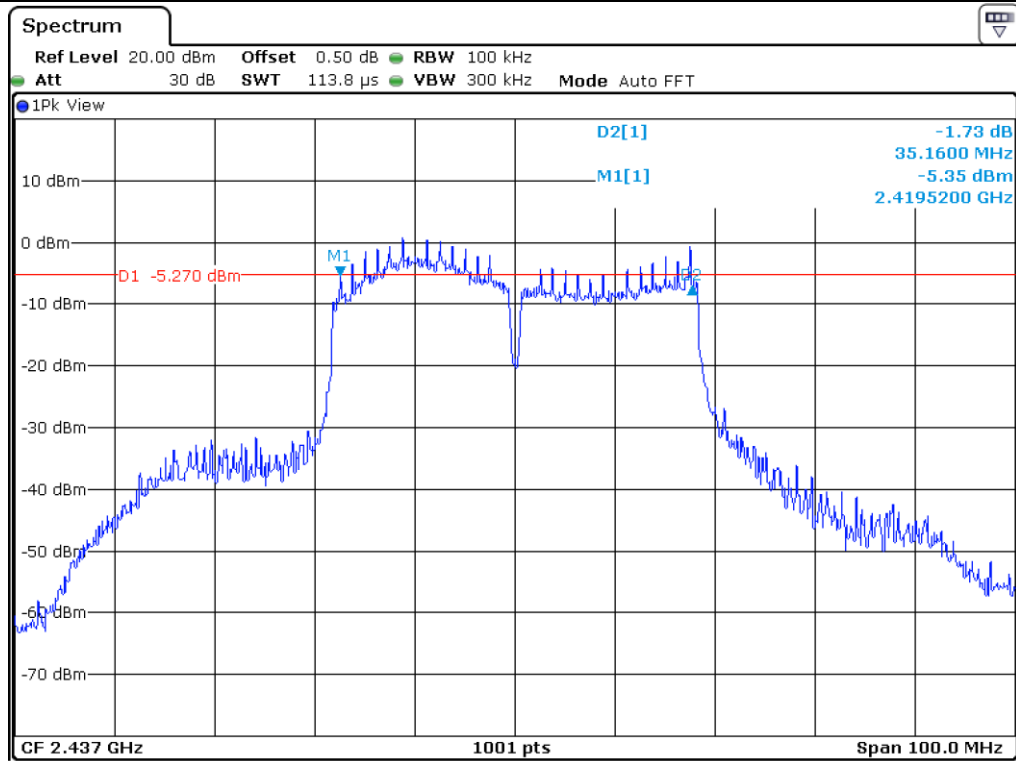
7.7 Test data for 802.11n (HT 40) WLAN Mode

-. Test Result : Pass

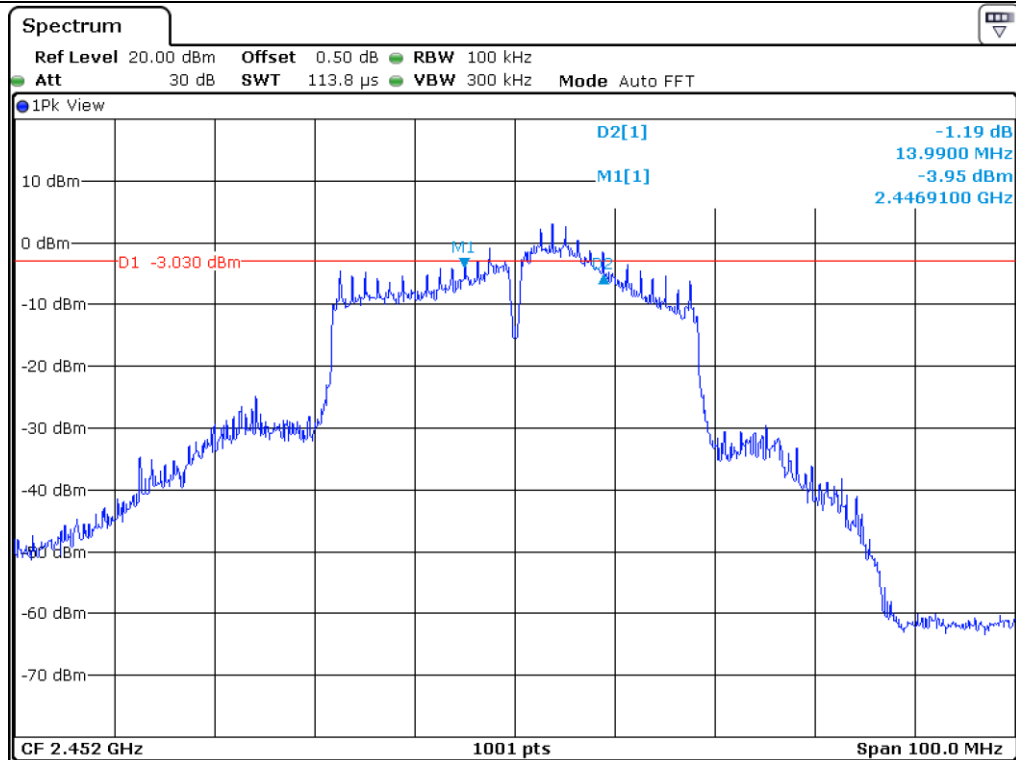
CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	LIMIT (MHz)	Bandwidth Margin(MHz)	
					6 dB	99 %
Low	2 422.00	30.17	35.46	>500	29.67	34.96
Middle	2 437.00	35.16	35.86	>500	34.66	35.36
High	2 452.00	13.99	35.46	>500	13.49	34.96

Remark. Margin = Measured Value - Limit





Middle Channel (6 dB Bandwidth)



High Channel (6 dB Bandwidth)

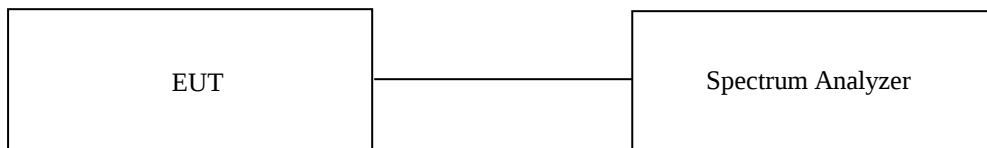
8. MAXIMUM PEAK OUTPUT POWER

8.1 Operating environment

Temperature : 22 °C
Relative humidity : 50 % 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 date

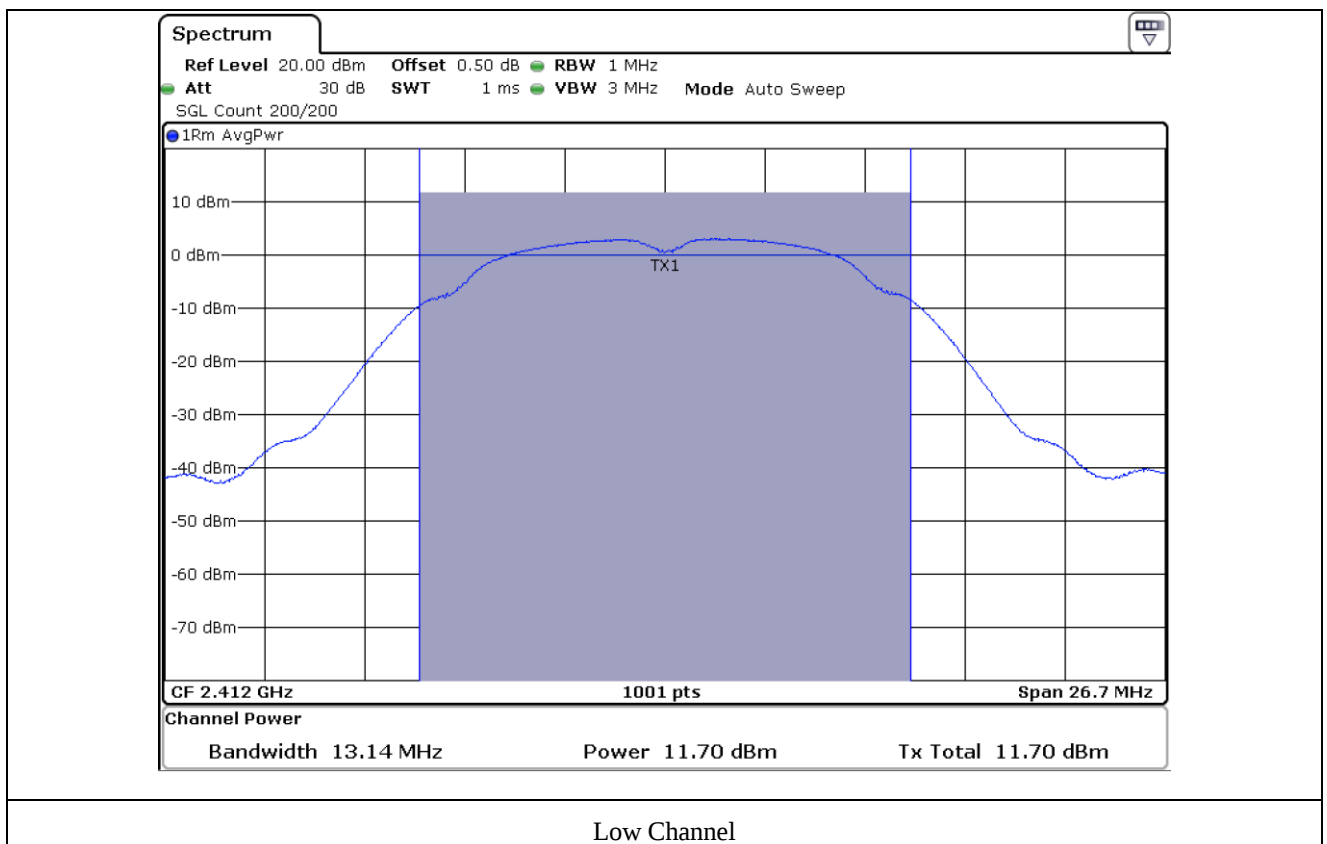
August 20, 2020 ~ August 21, 2020

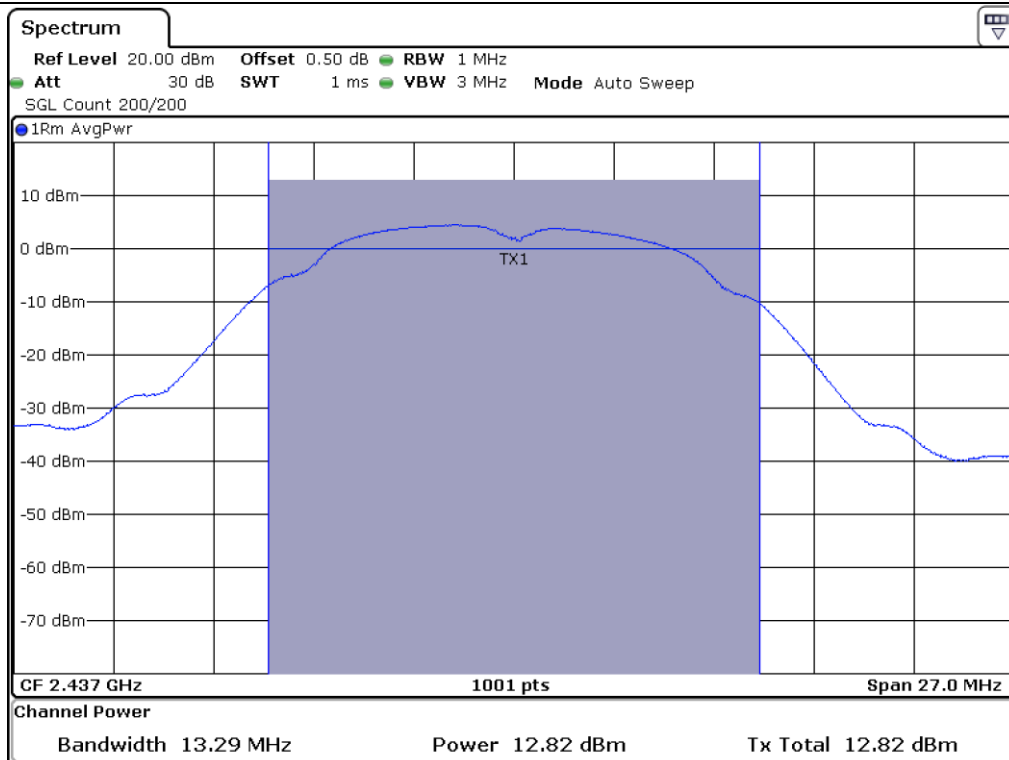
8.4 Test data for 802.11b WLAN Mode

-. Test Result : Pass

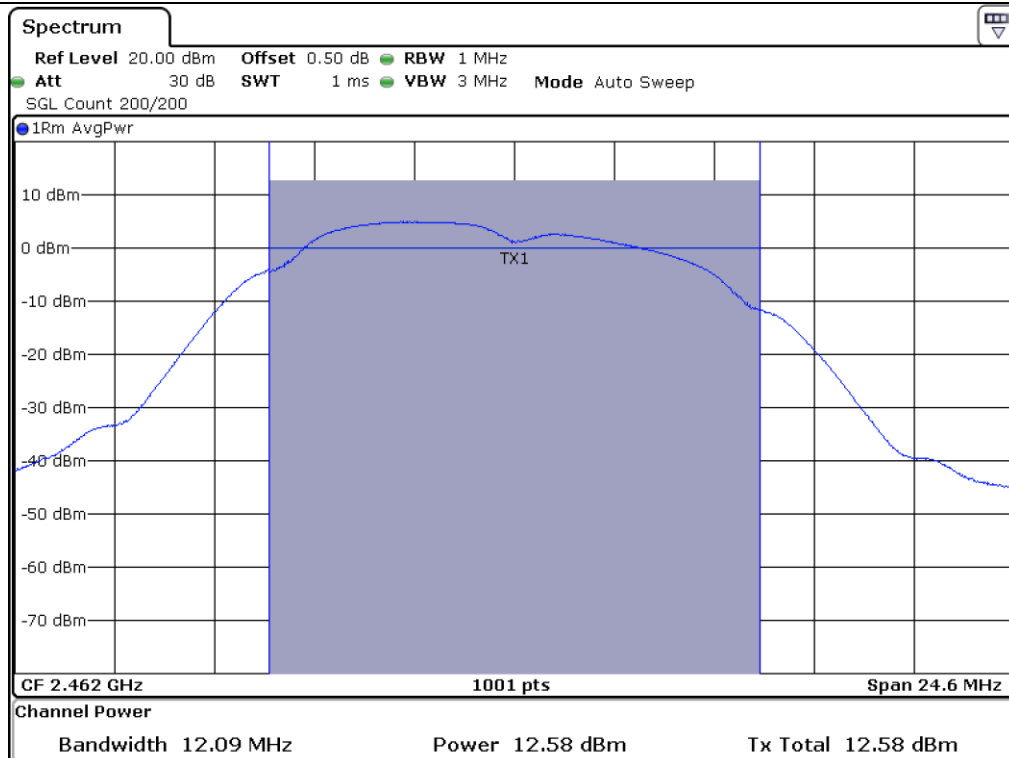
CHANNEL	FREQUENCY (MHz)	99 % Occupied Bandwidth (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	13.14	11.70	30.00	18.30
MIDDLE	2 437.00	13.29	12.82	30.00	17.18
HIGH	2 462.00	12.09	12.58	30.00	17.42

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





Middle Channel



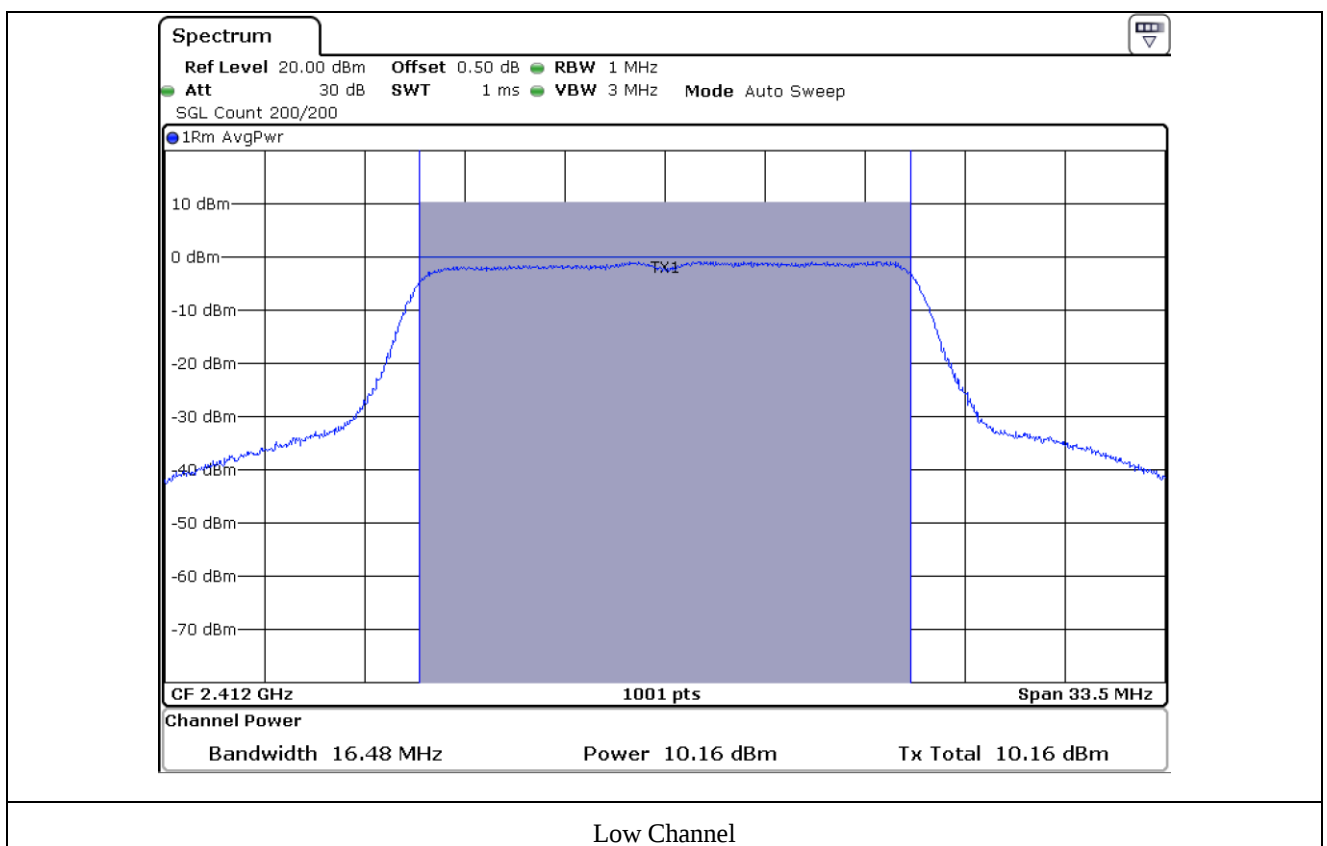
High Channel

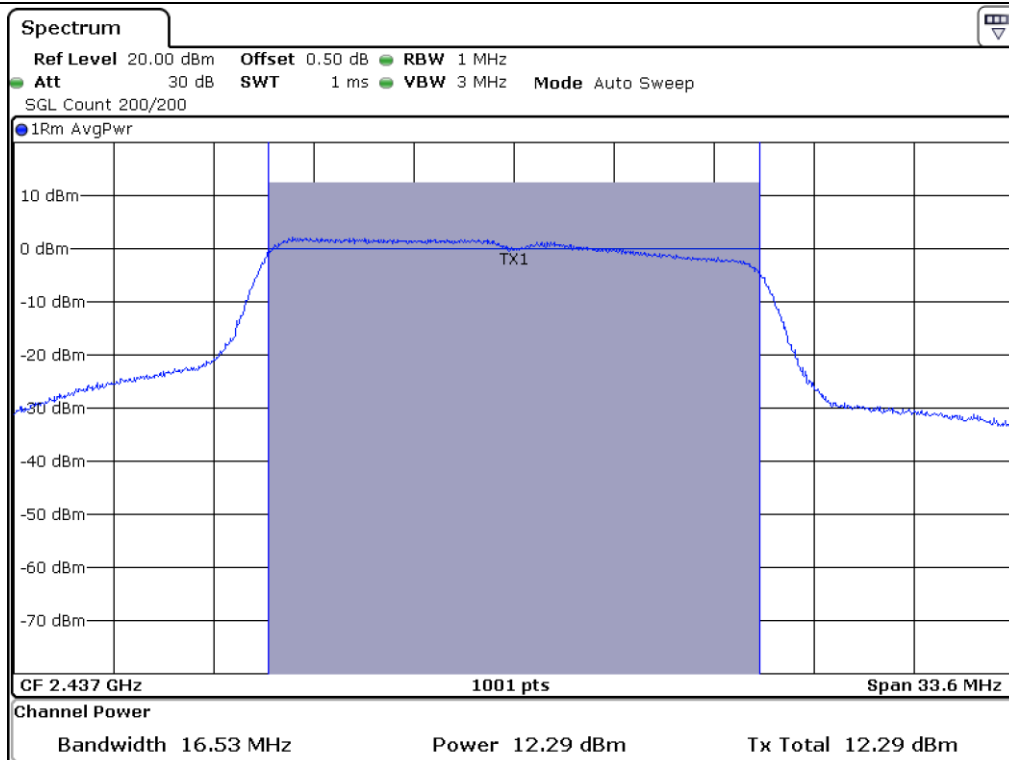
8.5 Test data for 802.11g WLAN Mode

-. Test Result : Pass

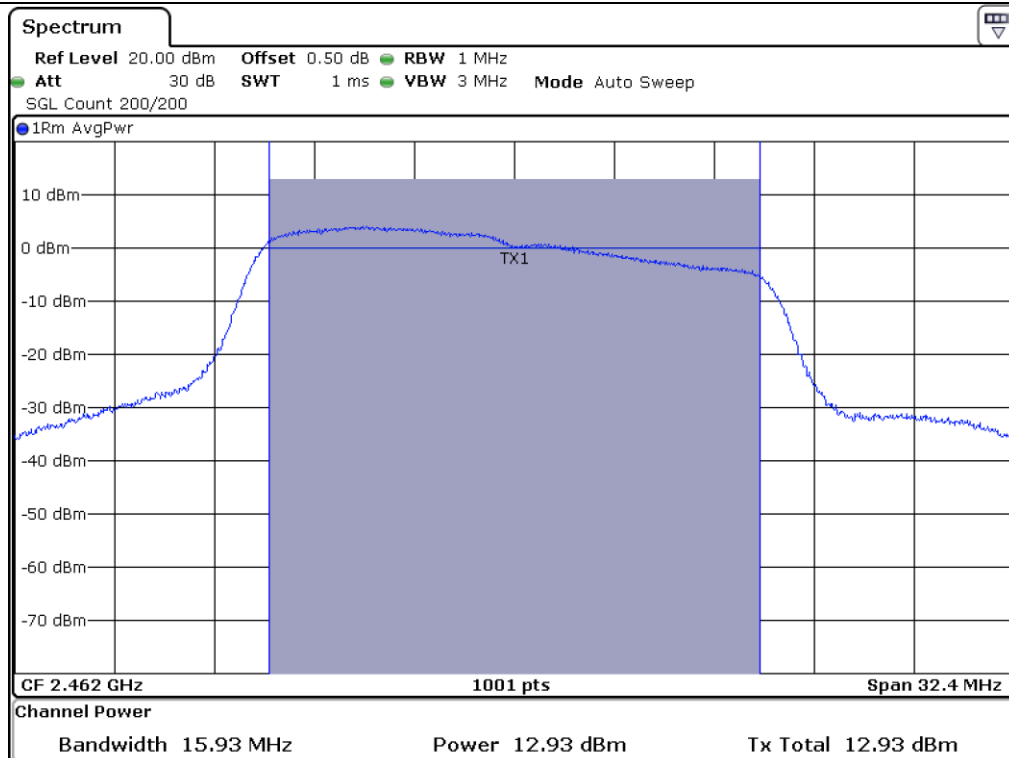
CHANNEL	FREQUENCY (MHz)	99 % Occupied Bandwidth (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	16.48	10.16	30.00	19.84
MIDDLE	2 437.00	16.53	12.29	30.00	17.71
HIGH	2 462.00	15.93	12.93	30.00	17.07

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





Middle Channel



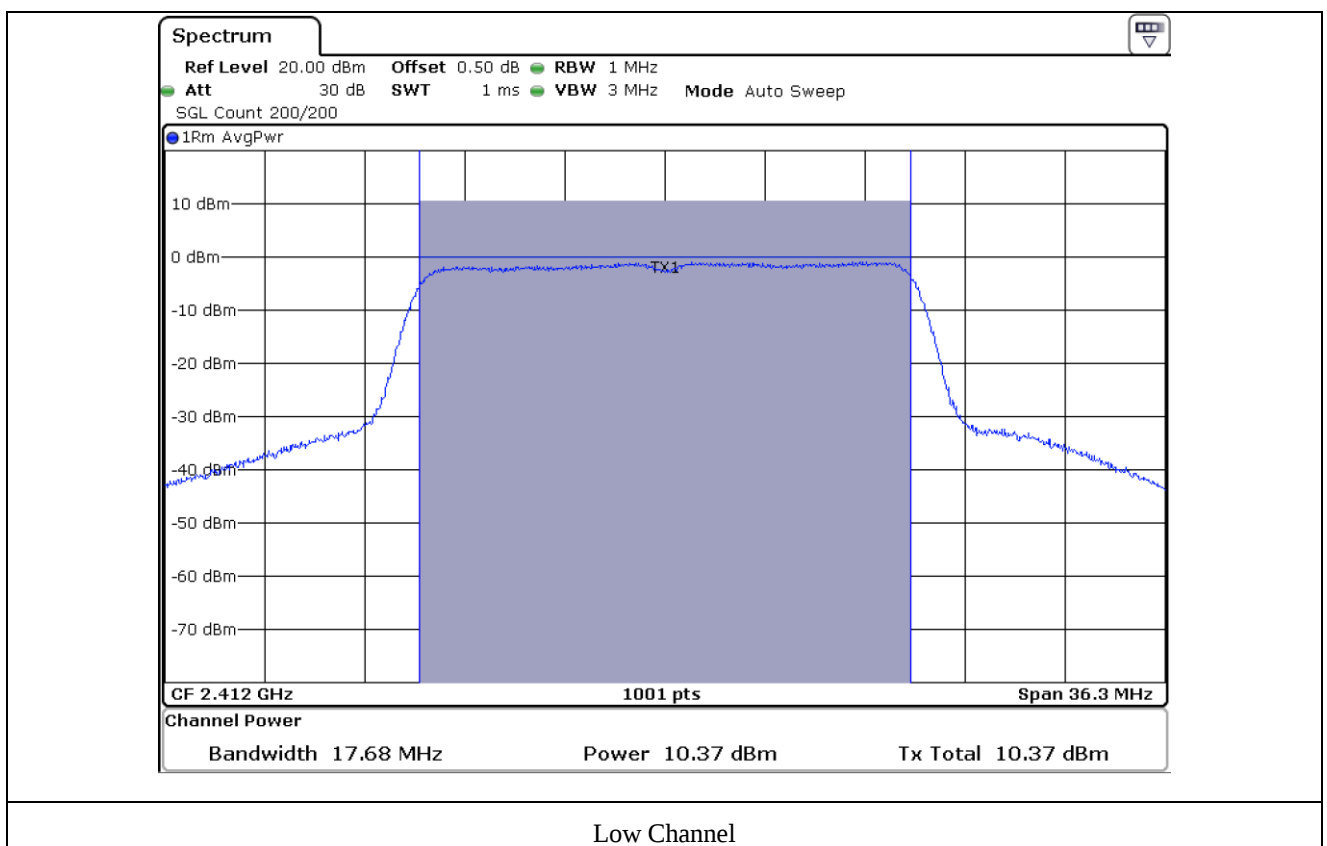
High Channel

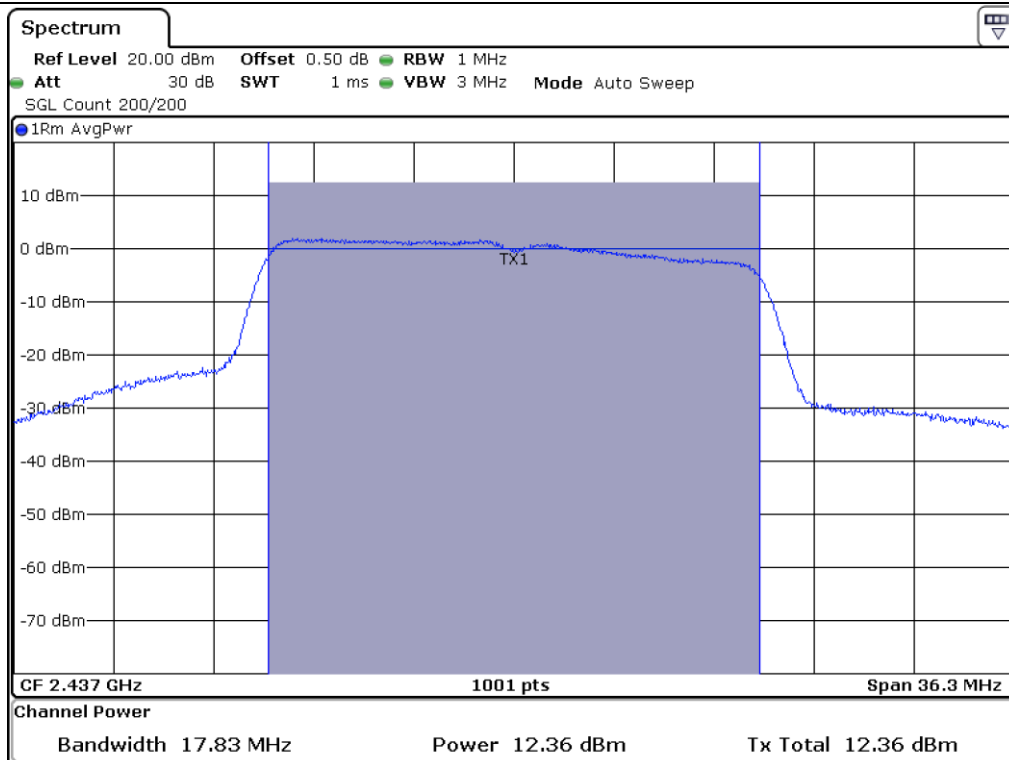
8.6 Test data for 802.11n(HT20) WLAN Mode

-. Test Result : Pass

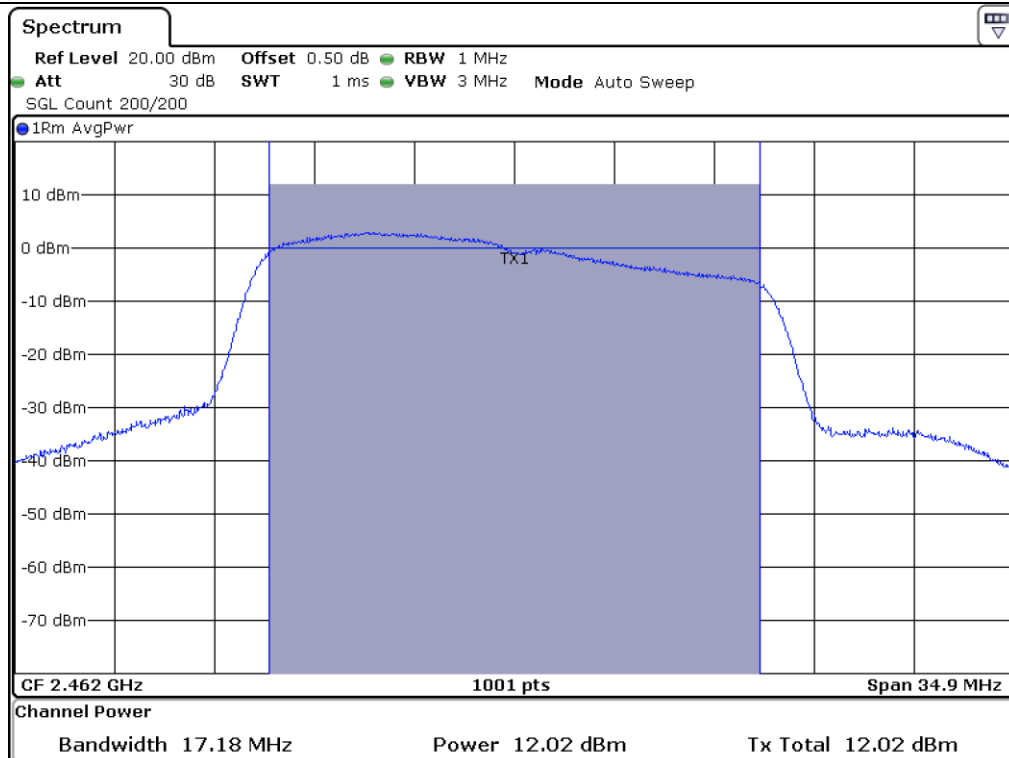
CHANNEL	FREQUENCY (MHz)	99 % Occupied Bandwidth (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 412.00	17.68	10.37	30.00	19.63
MIDDLE	2 437.00	17.83	12.36	30.00	17.64
HIGH	2 462.00	17.18	12.02	30.00	17.98

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





Middle Channel



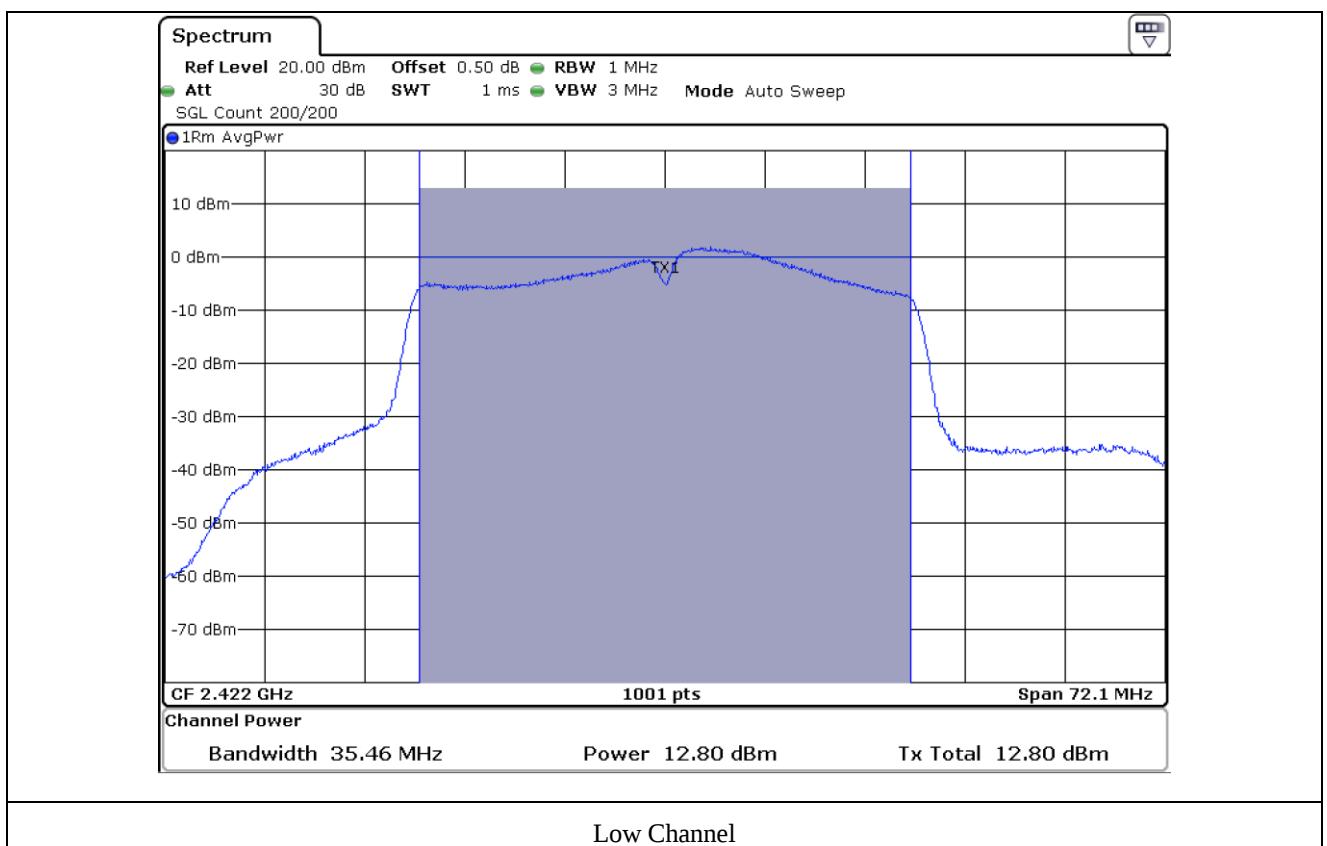
High Channel

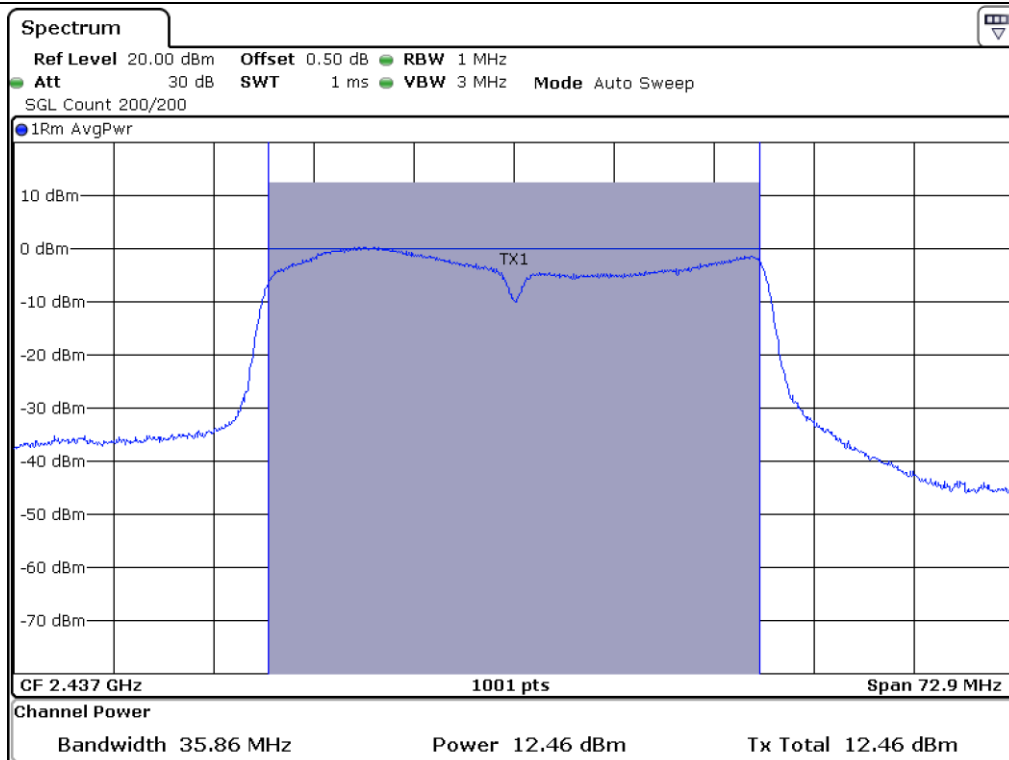
8.7 Test data for 802.11n(HT40) WLAN Mode

-. Test Result : Pass

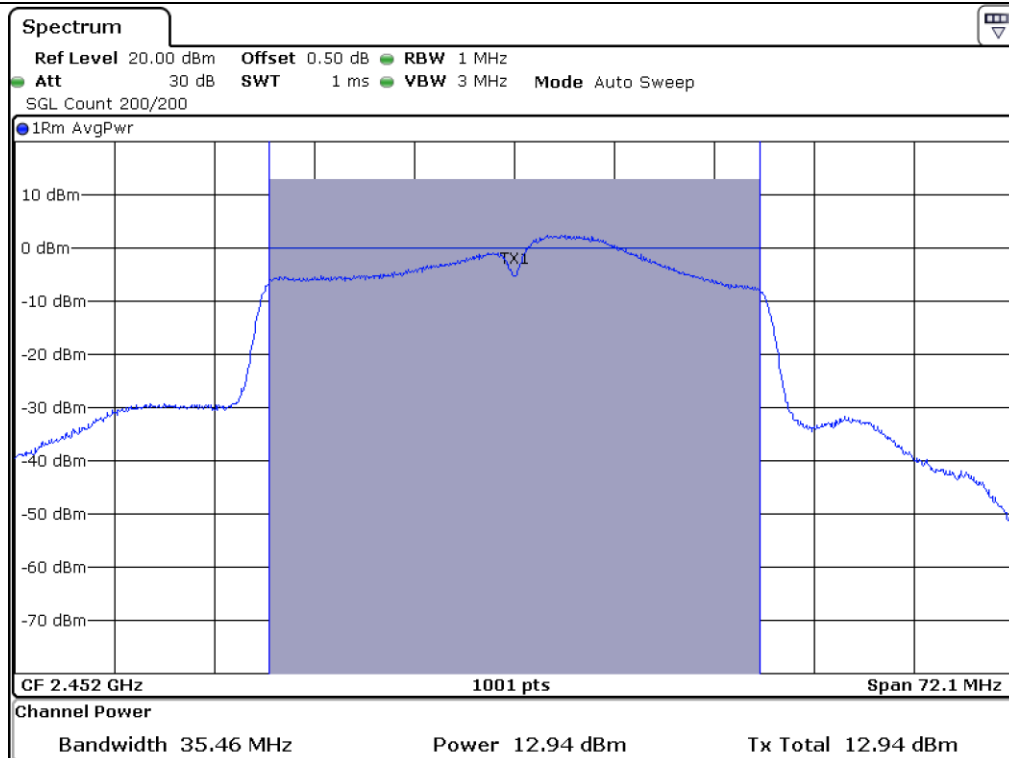
CHANNEL	FREQUENCY (MHz)	99 % Occupied Bandwidth (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 422.00	35.46	12.80	30.00	17.20
MIDDLE	2 437.00	35.86	12.46	30.00	17.54
HIGH	2 452.00	35.46	12.94	30.00	17.06

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





Middle Channel



High Channel

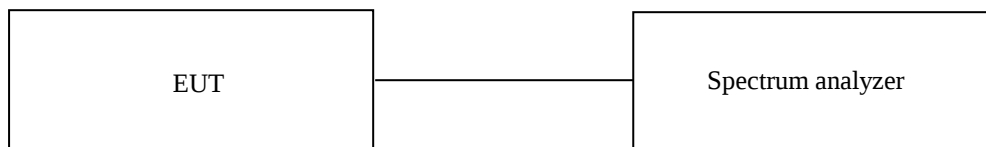
9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

9.1 Operating environment

Temperature : 22 °C
Relative humidity : 50 % 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.

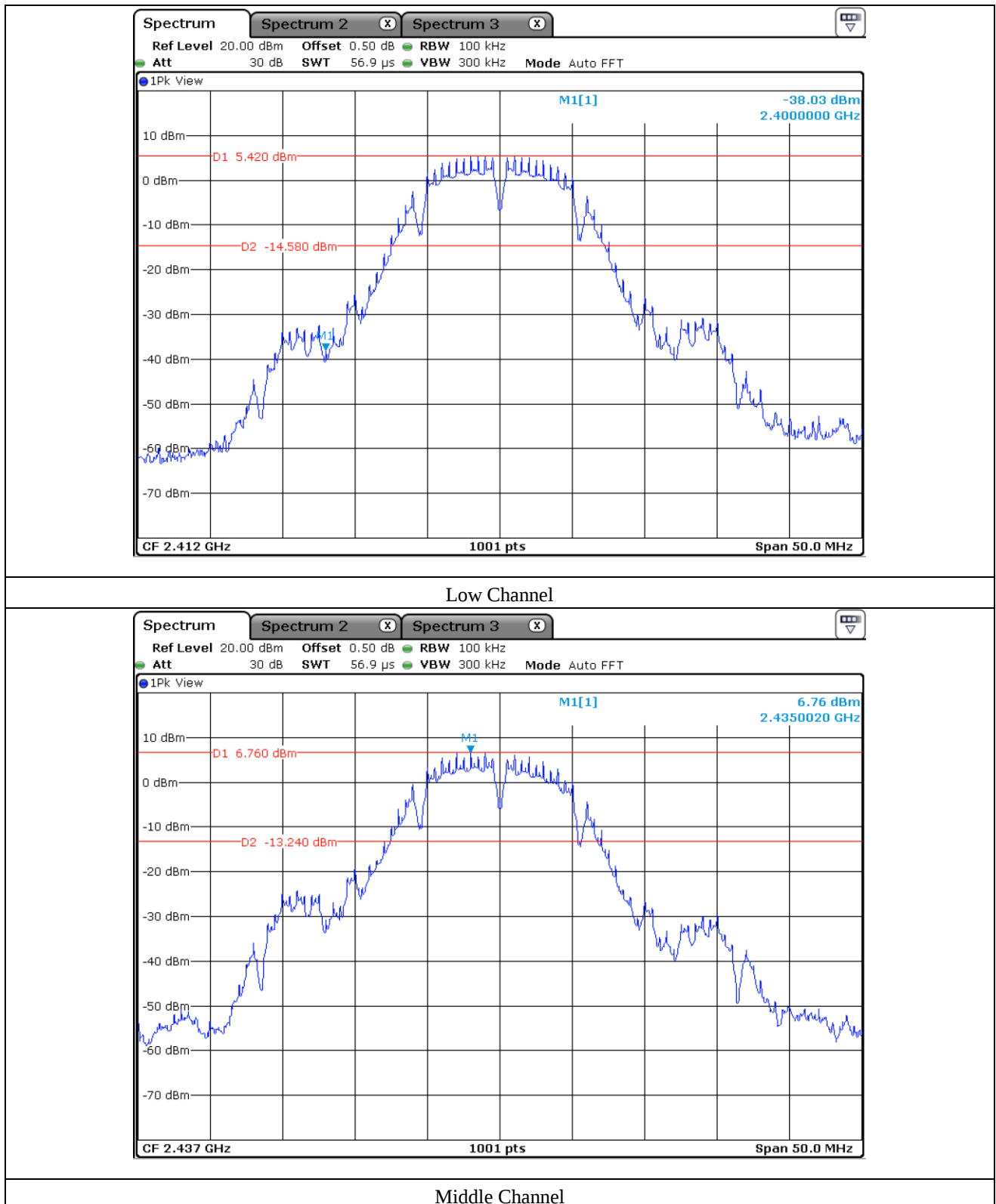
The frequency spectrum from 30 MHz to 40 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

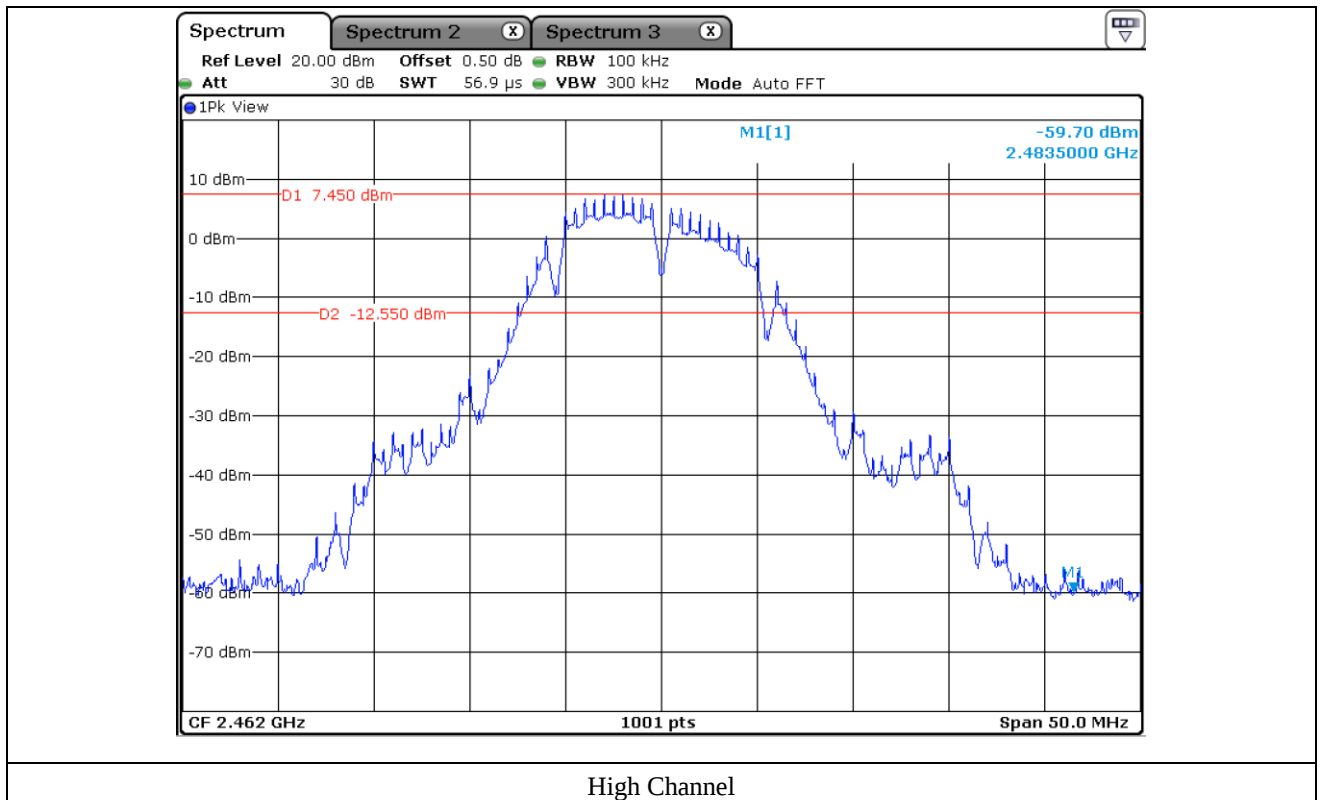
9.4 Test date

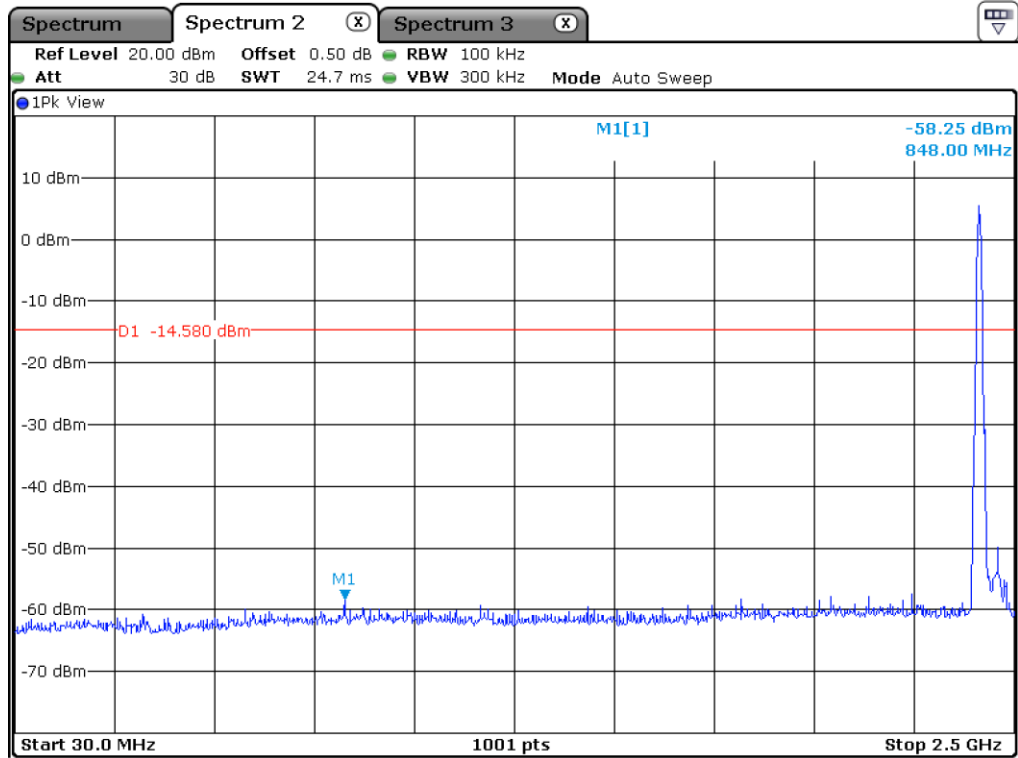
August 20, 2020 ~ August 21, 2020

9.5 Test data for conducted emission

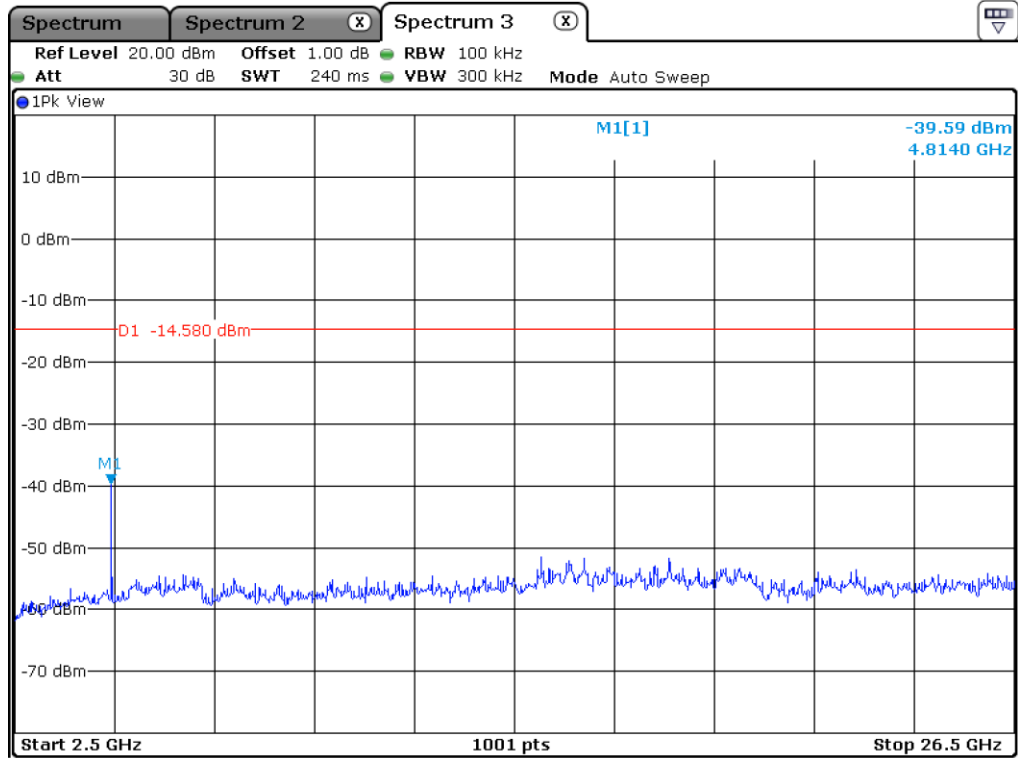
9.5.1 Test data for 802.11b WLAN Mode



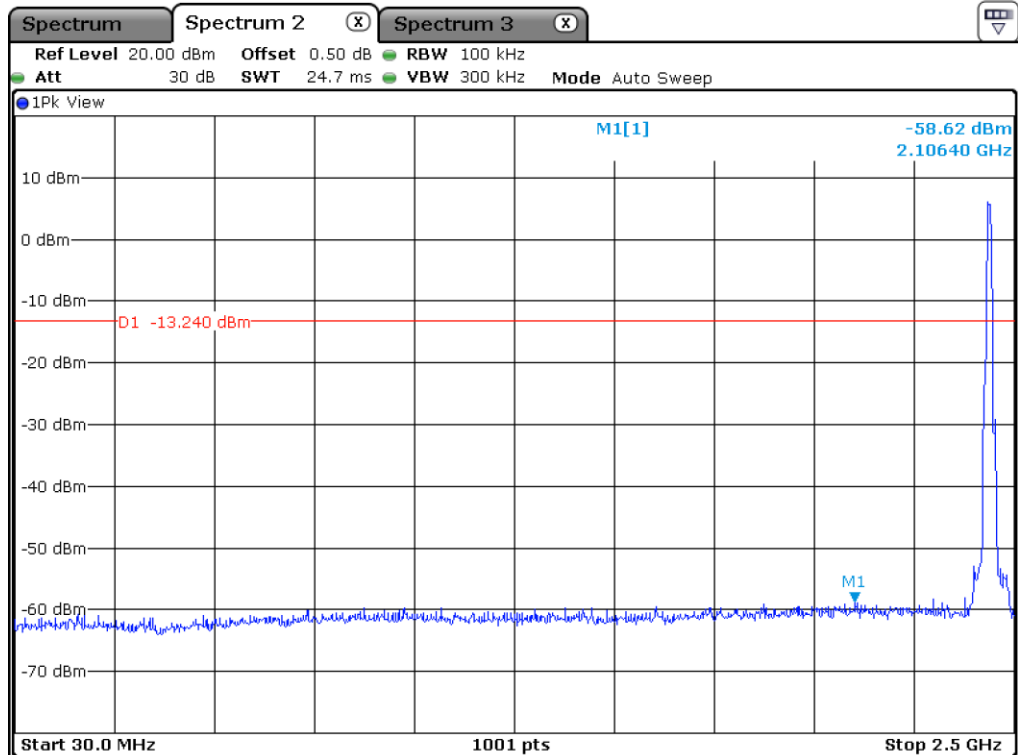




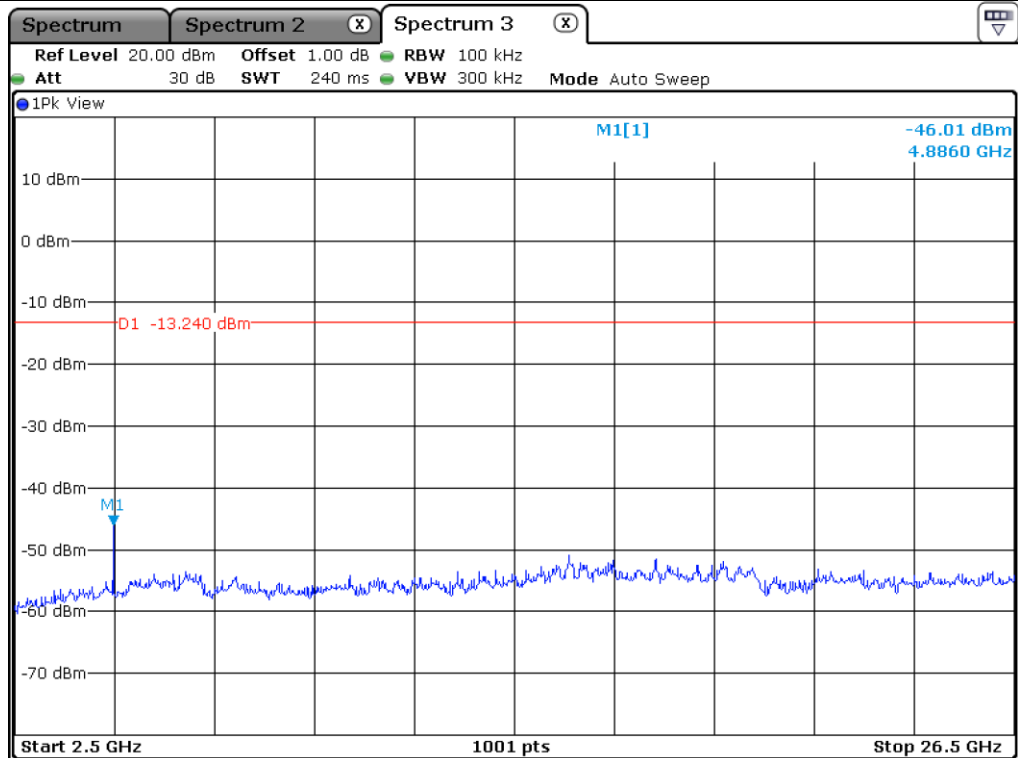
Low Channel



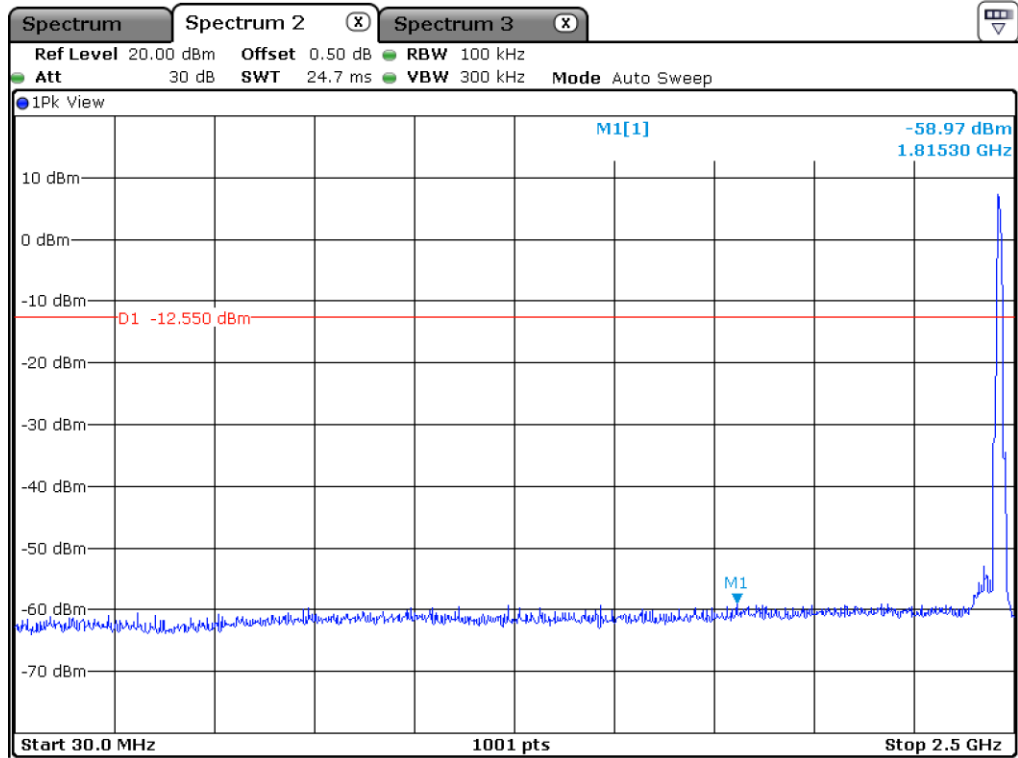
Low Channel



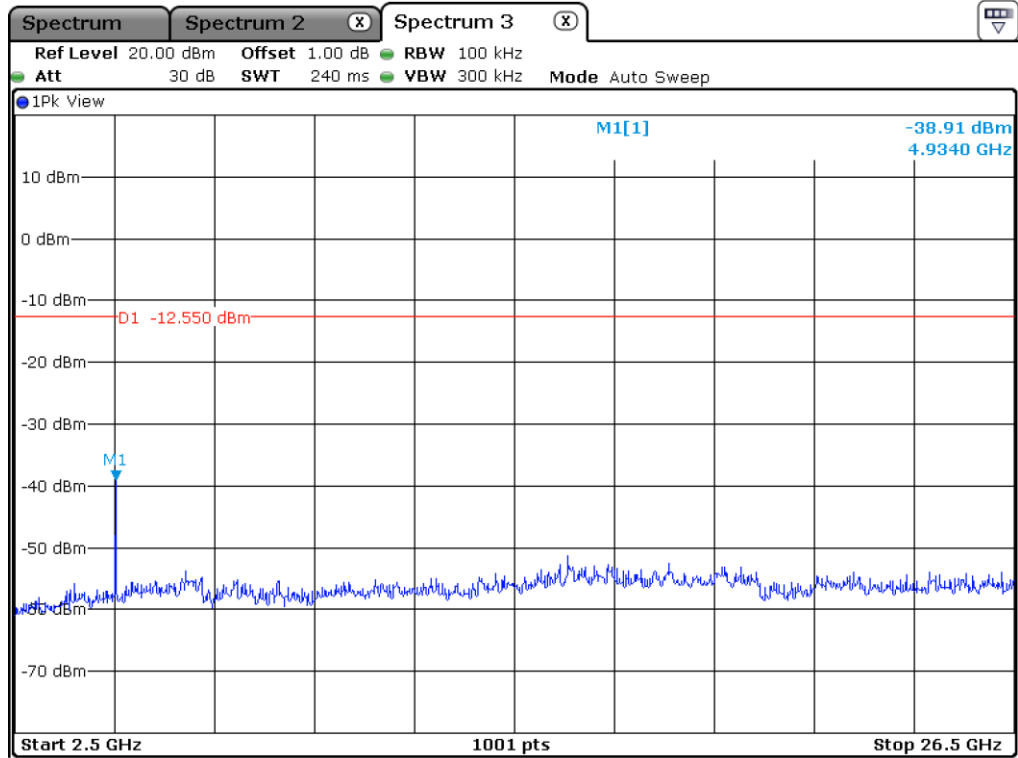
Middle Channel



Middle Channel

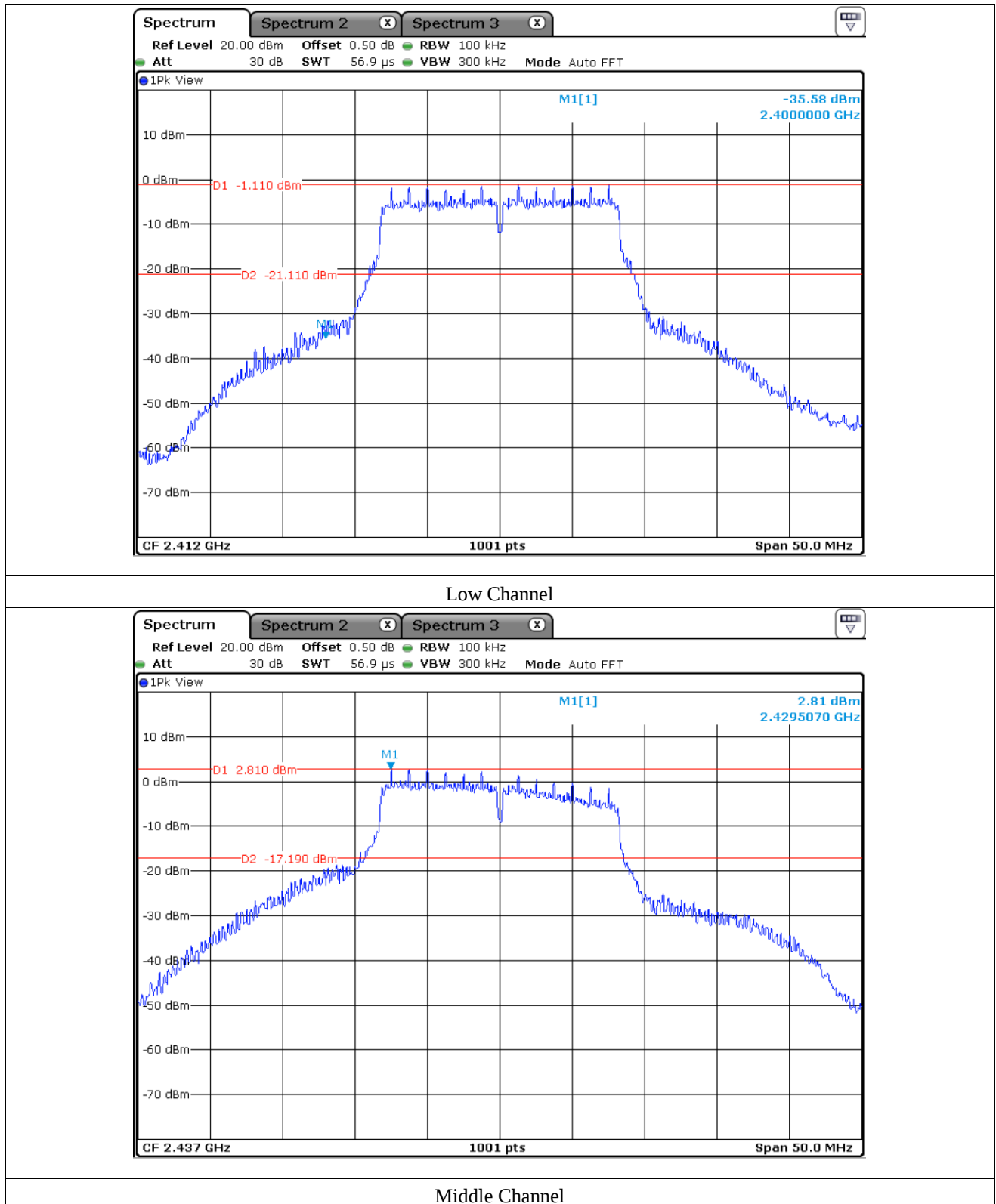


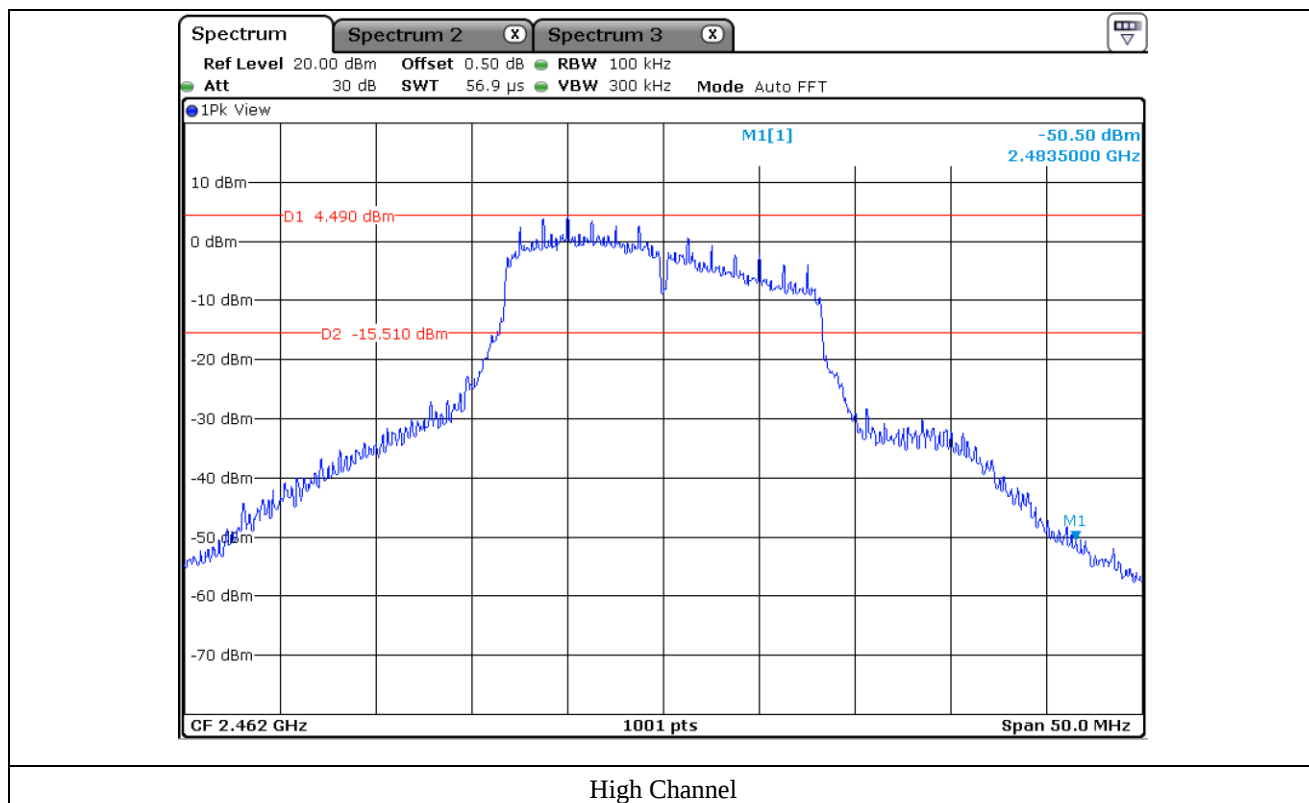
High Channel

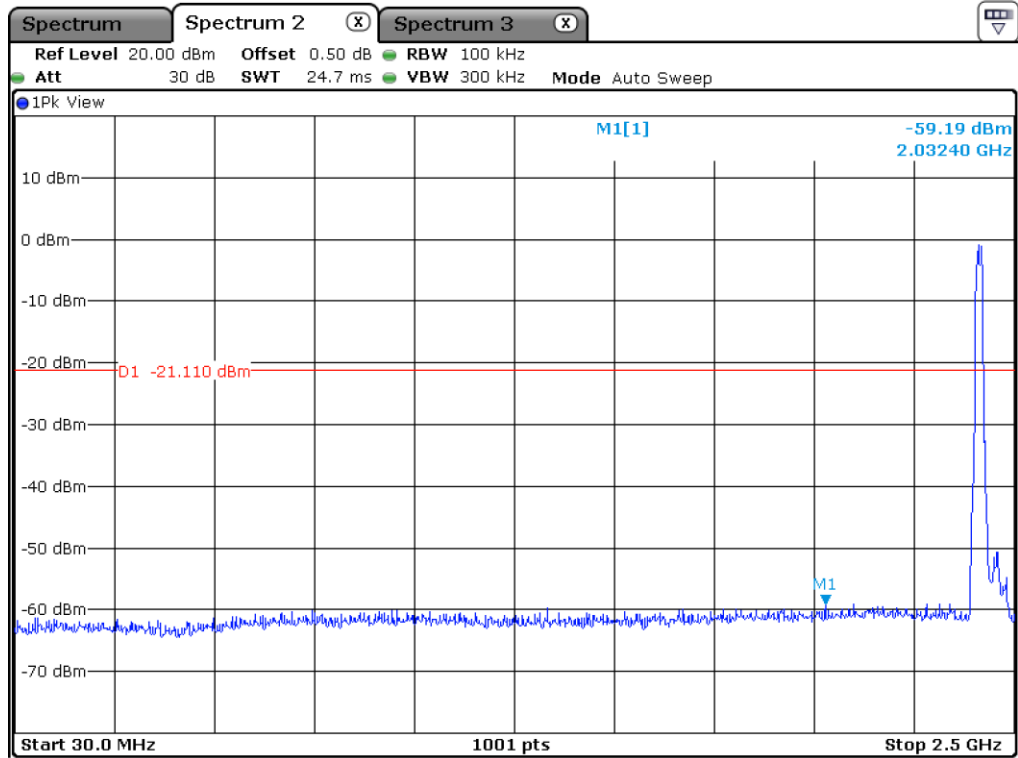


High Channel

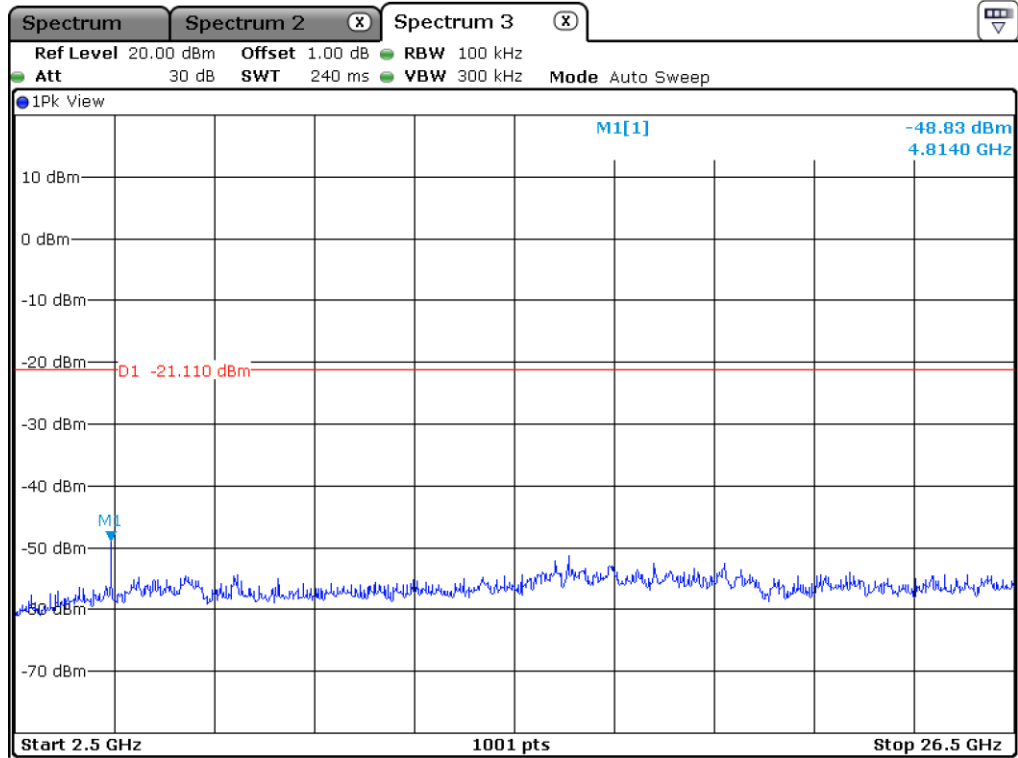
9.5.2 Test data for 802.11g WLAN Mode



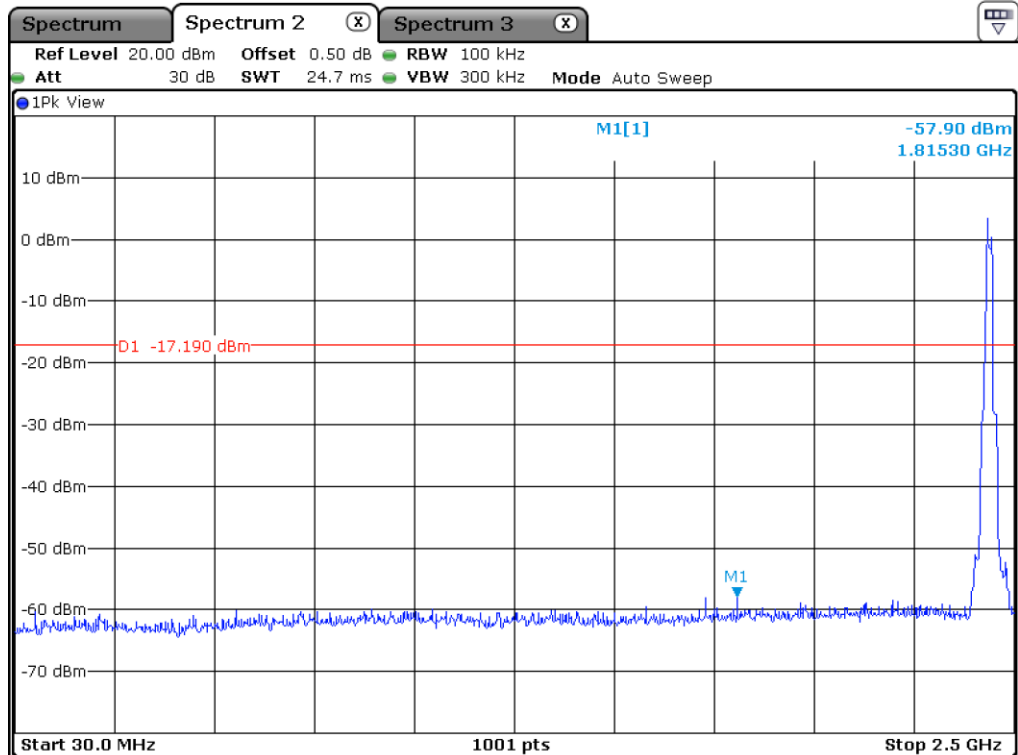




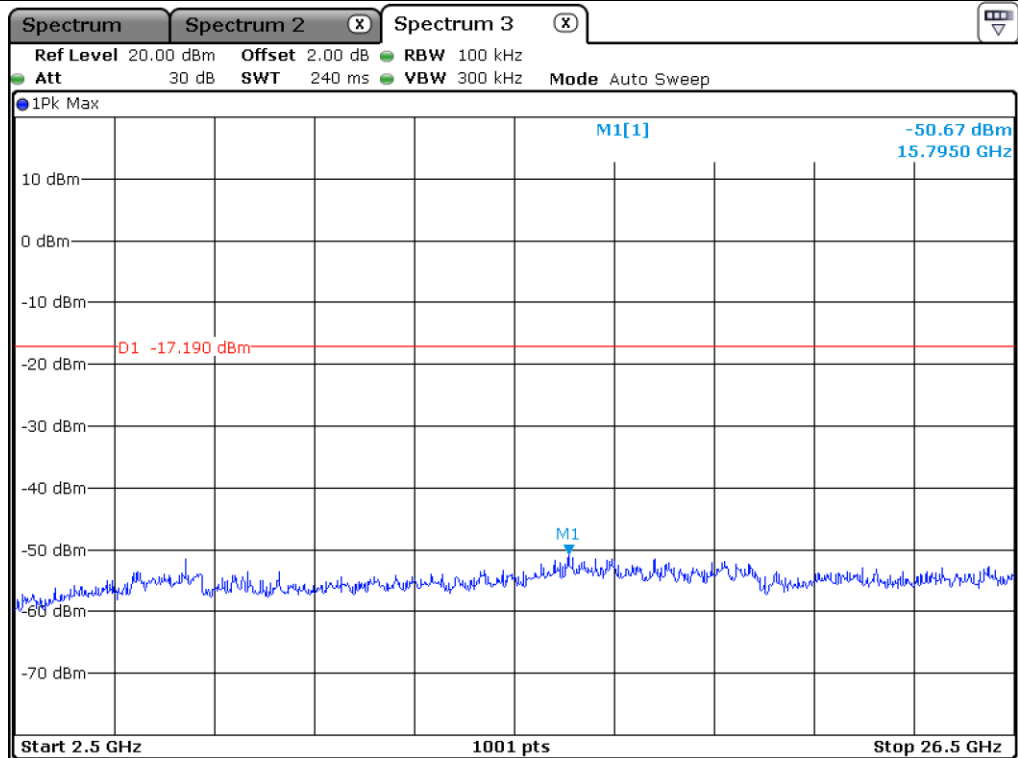
Low Channel



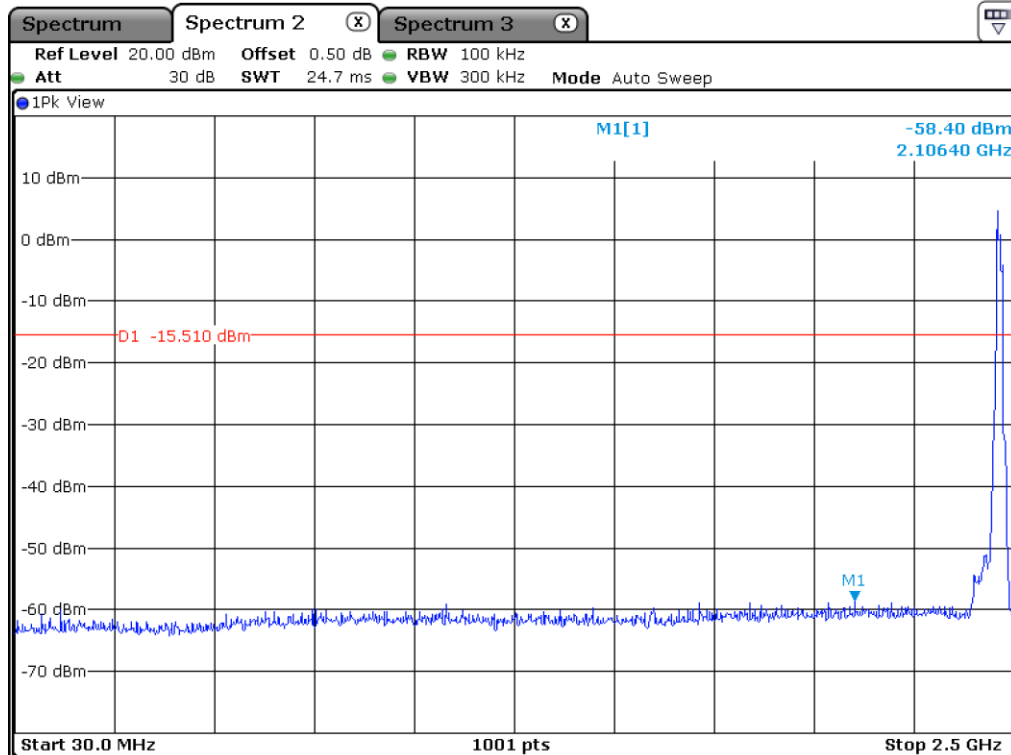
Low Channel



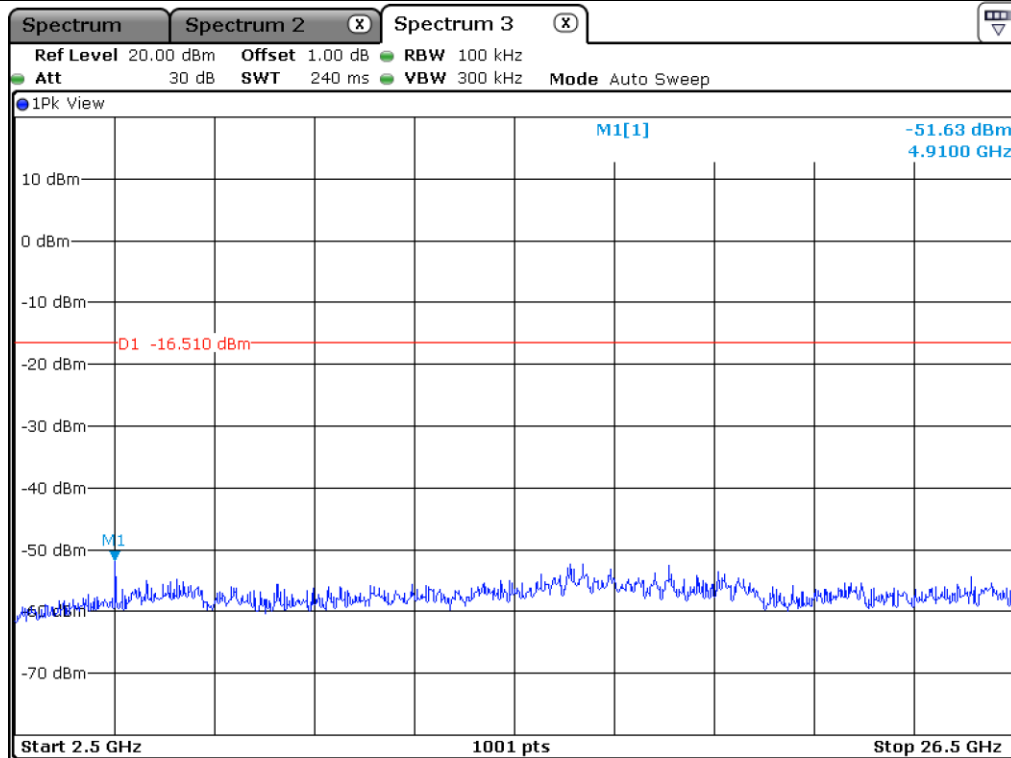
Middle Channel



Middle Channel

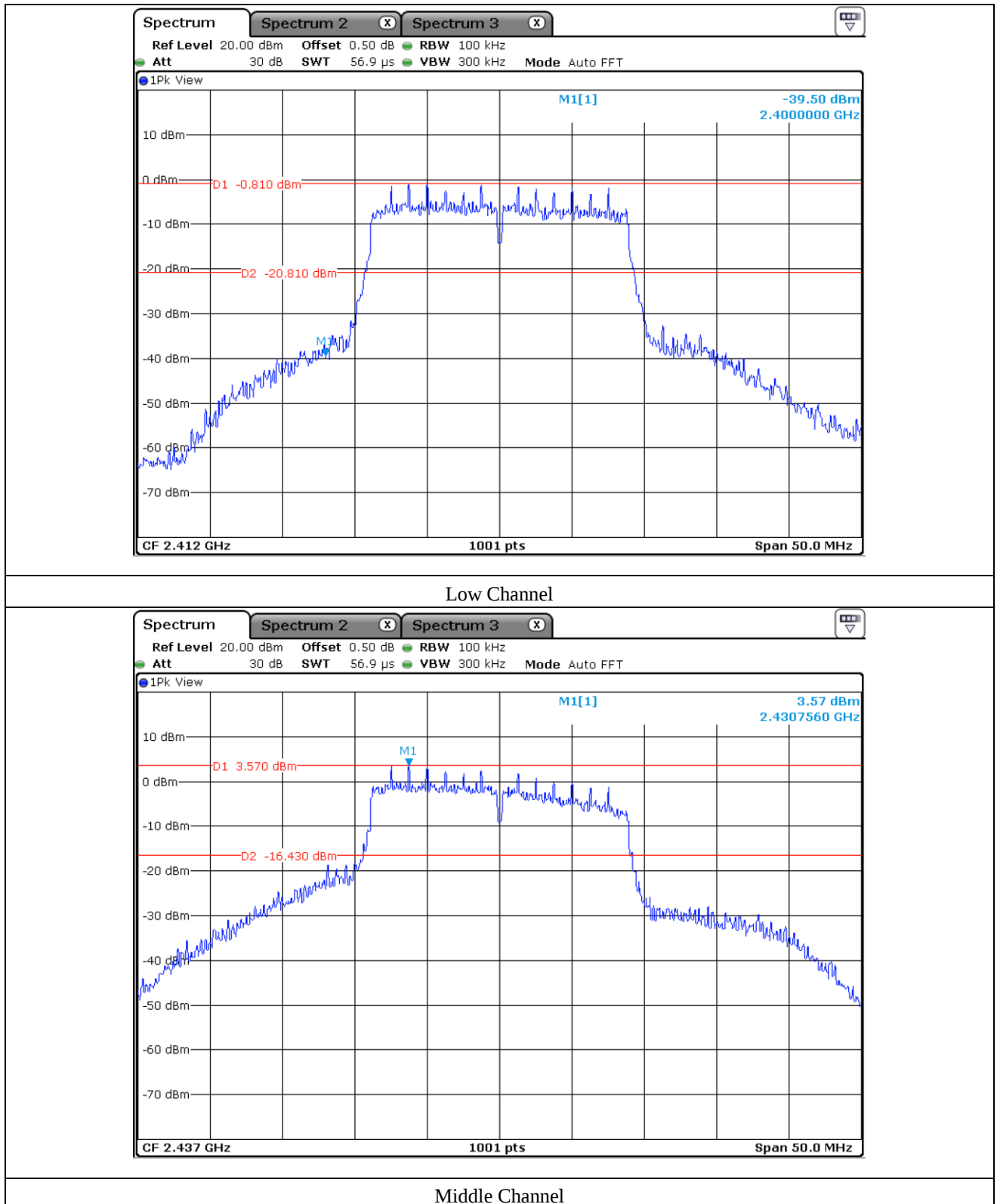


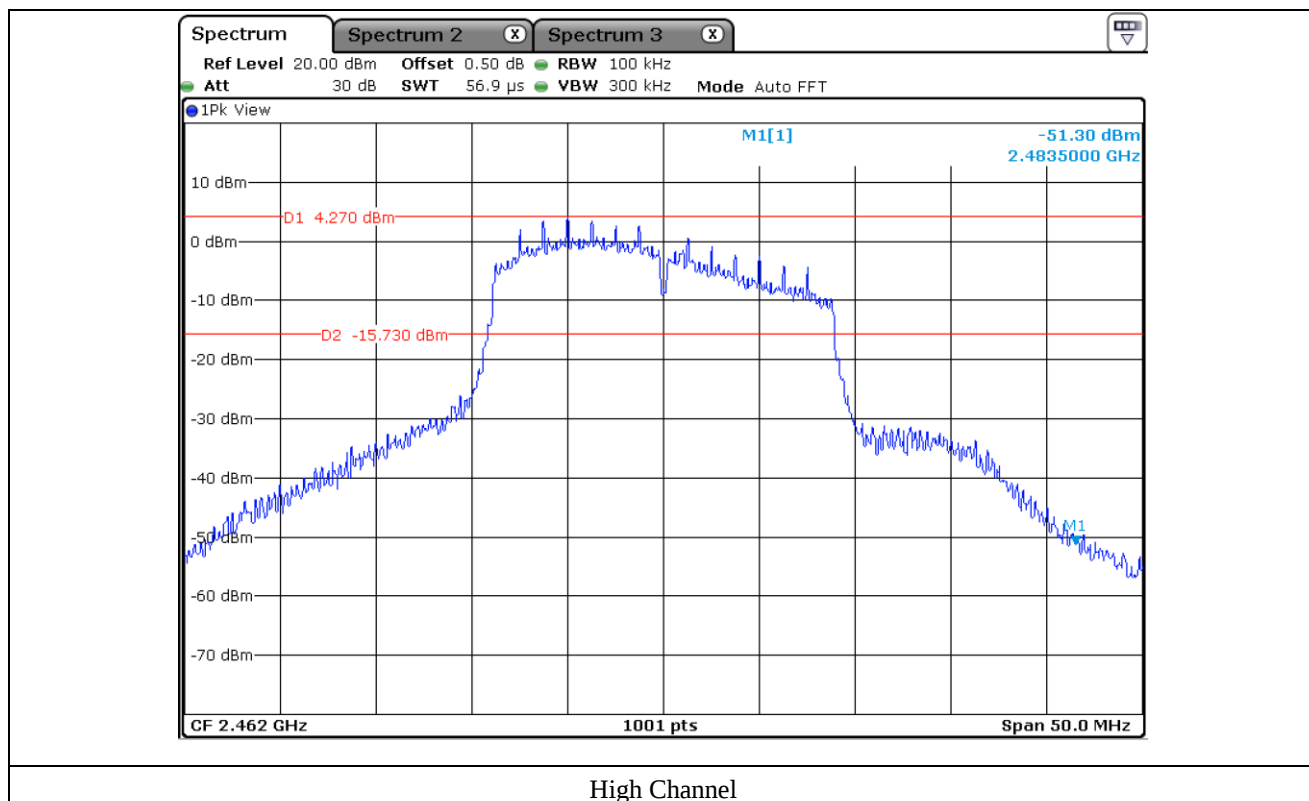
High Channel

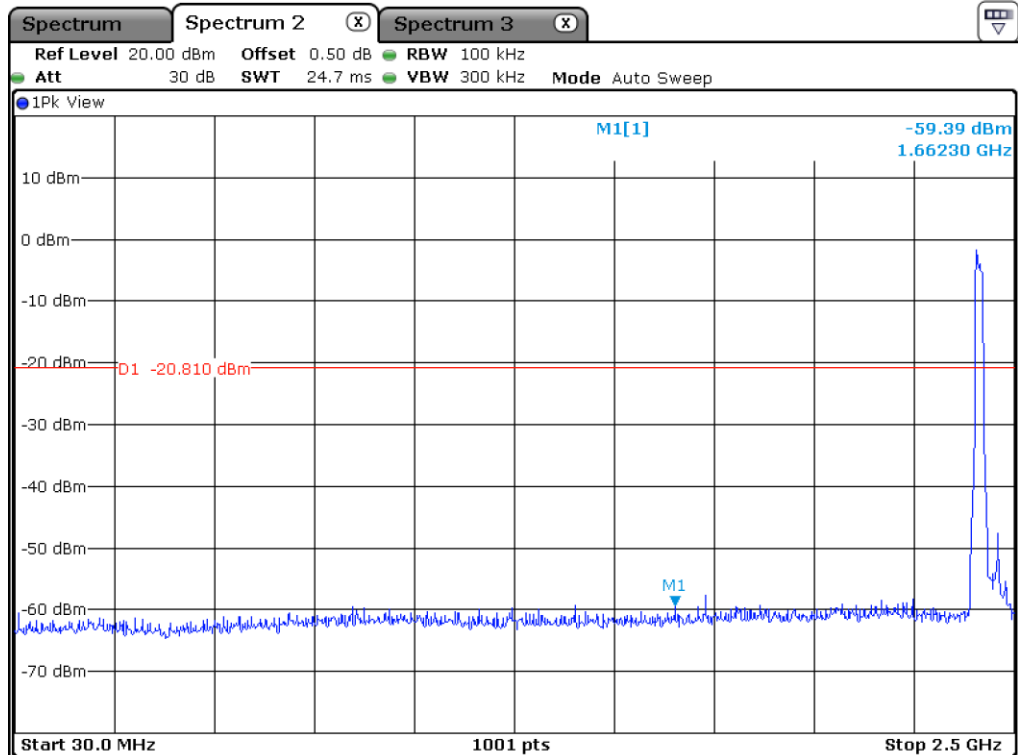


High Channel

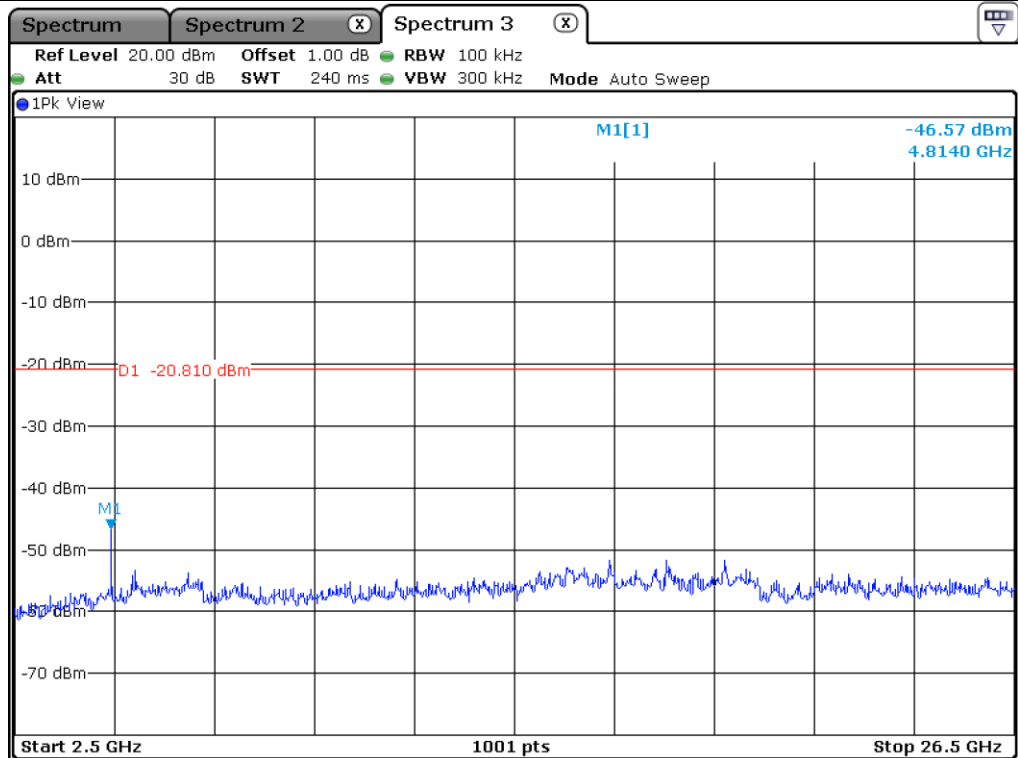
9.5.3 Test data for 802.11n (HT20) WLAN Mode



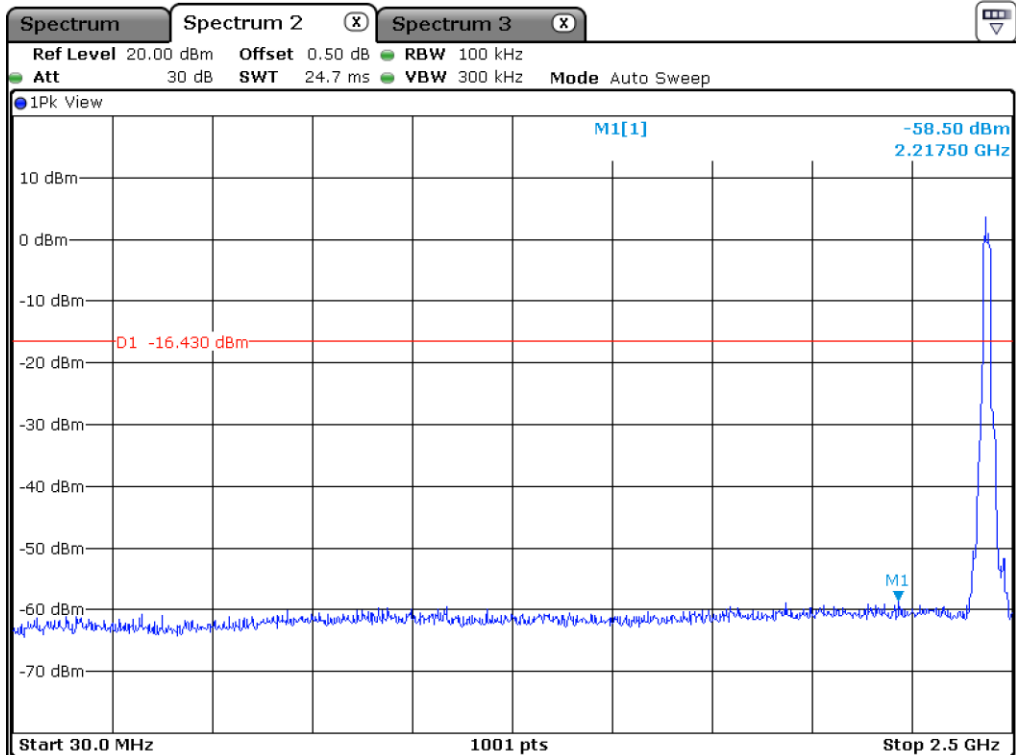




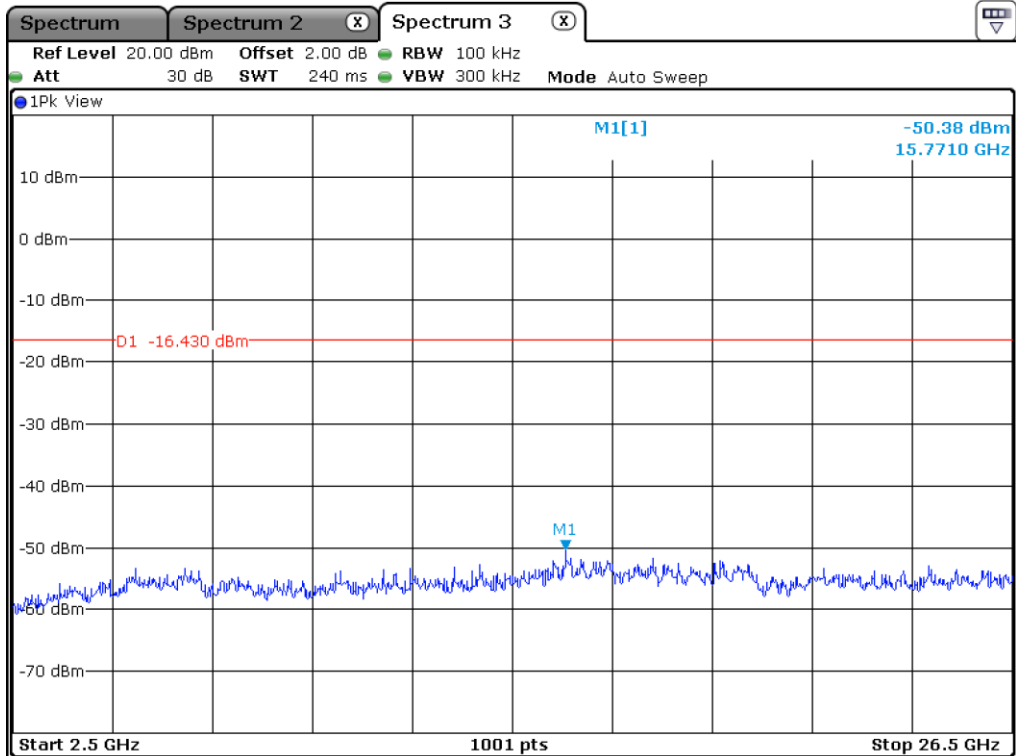
Low Channel



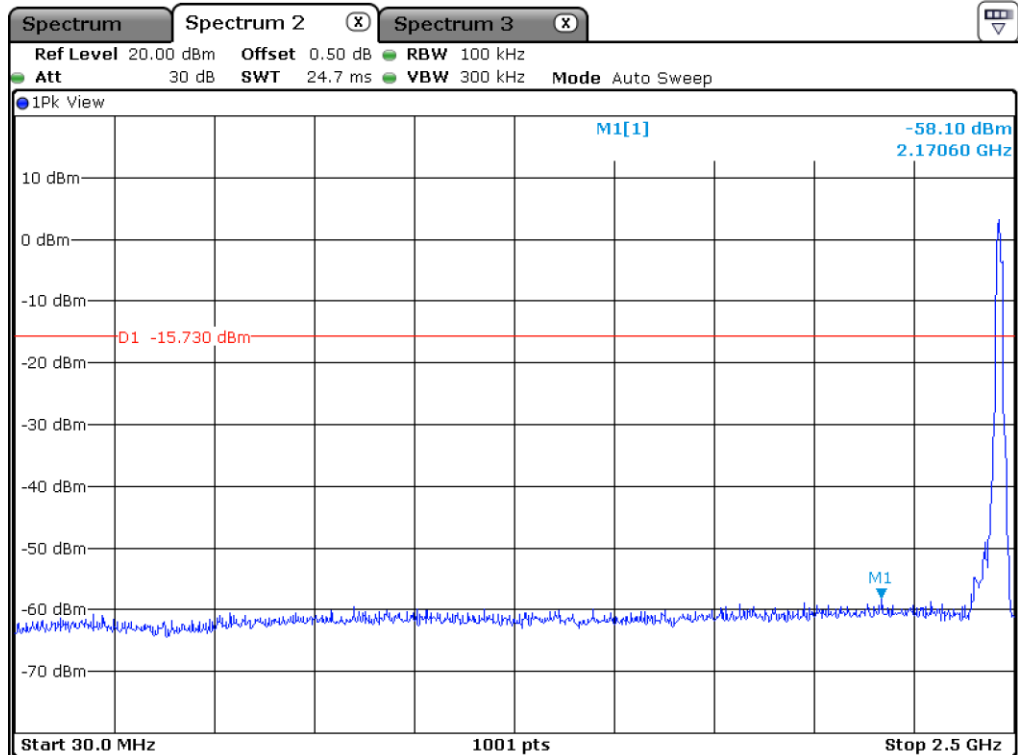
Low Channel



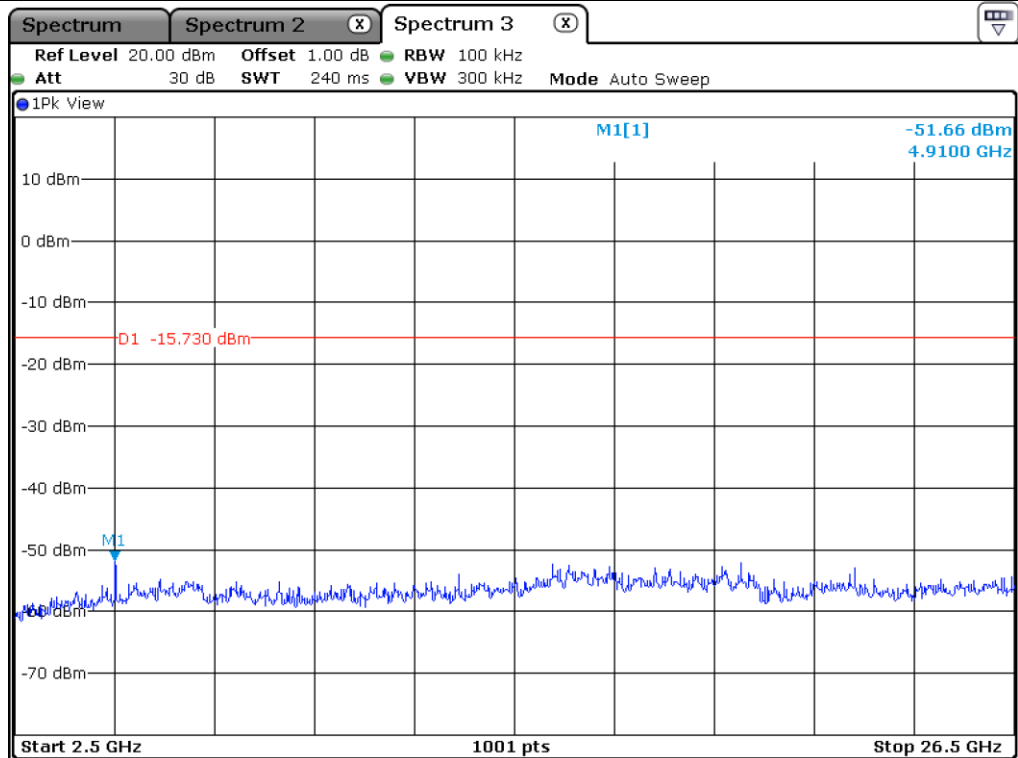
Middle Channel



Middle Channel

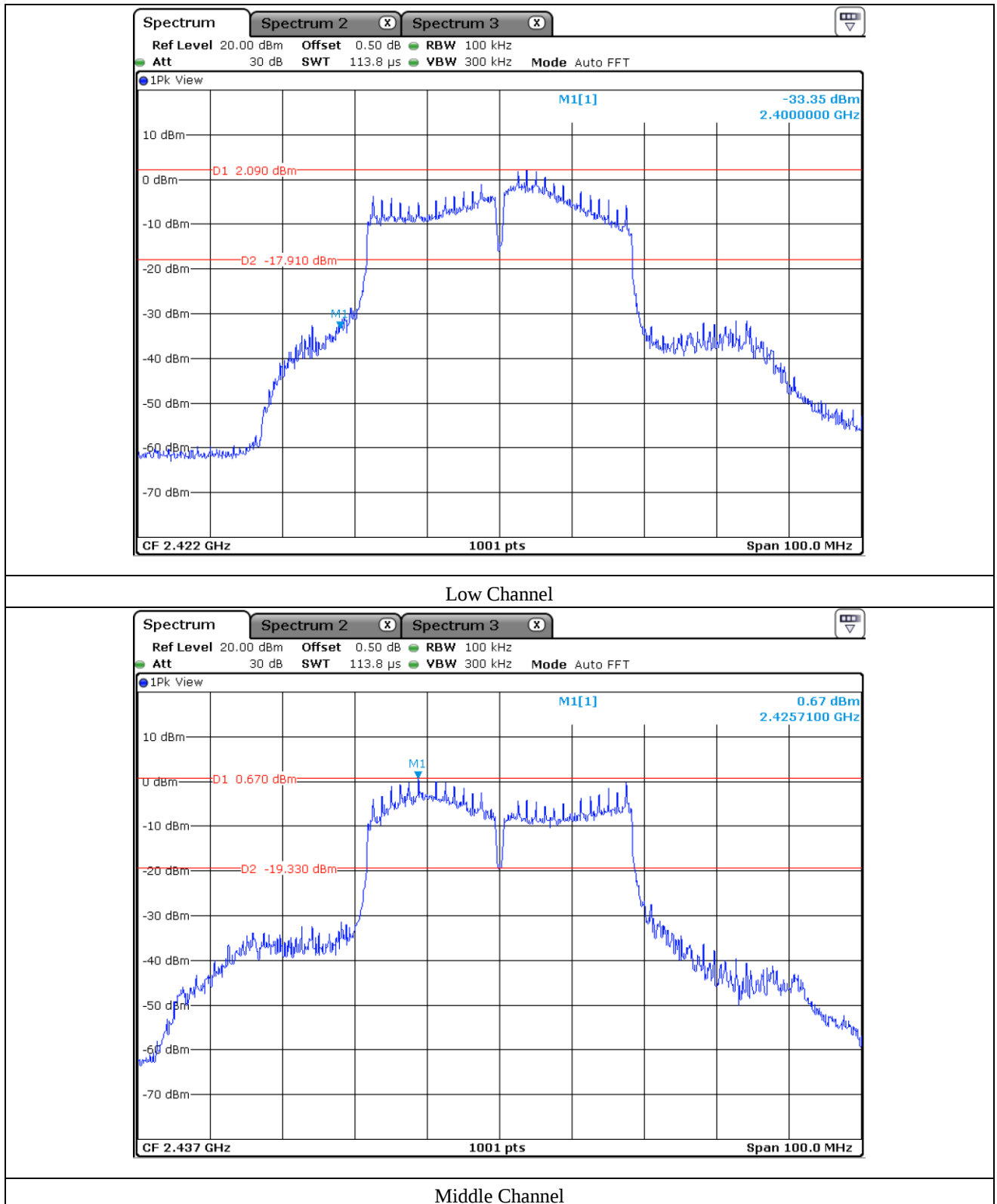


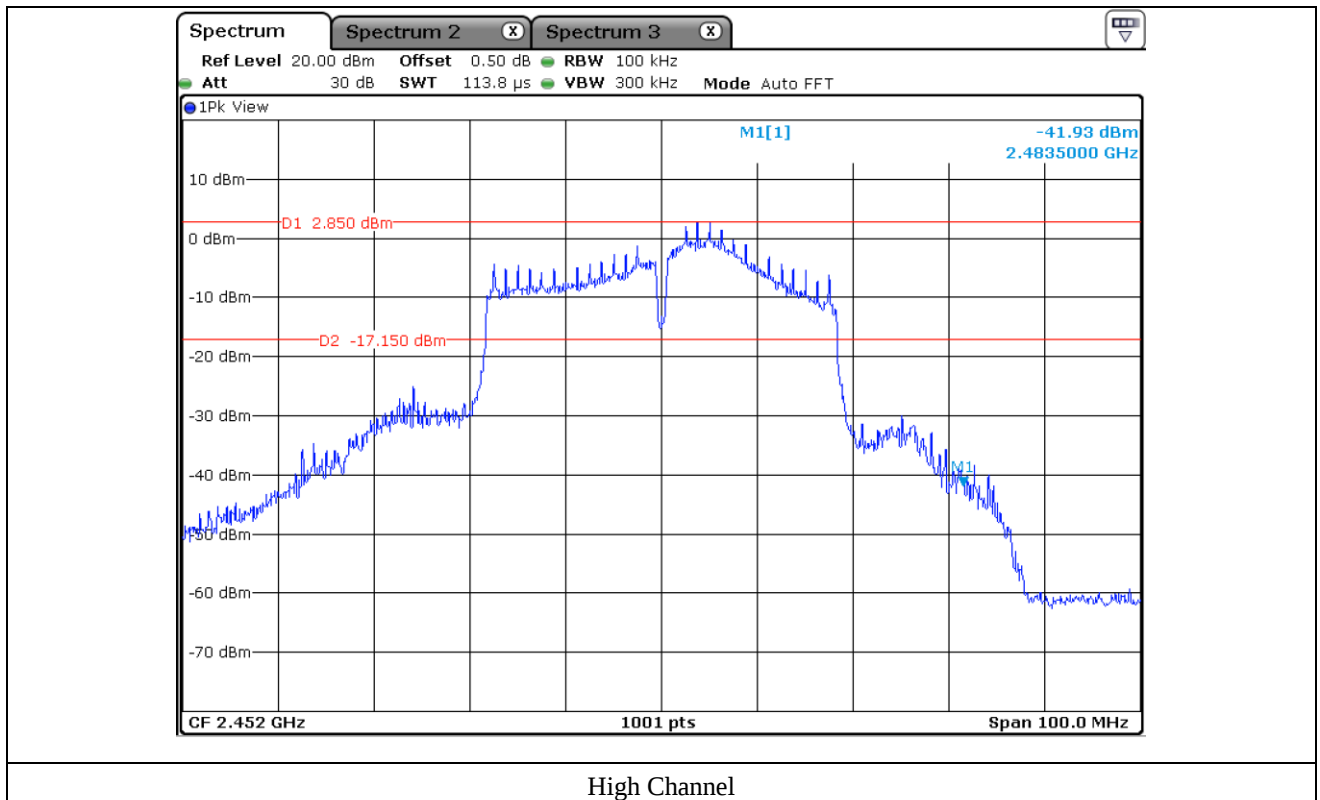
High Channel

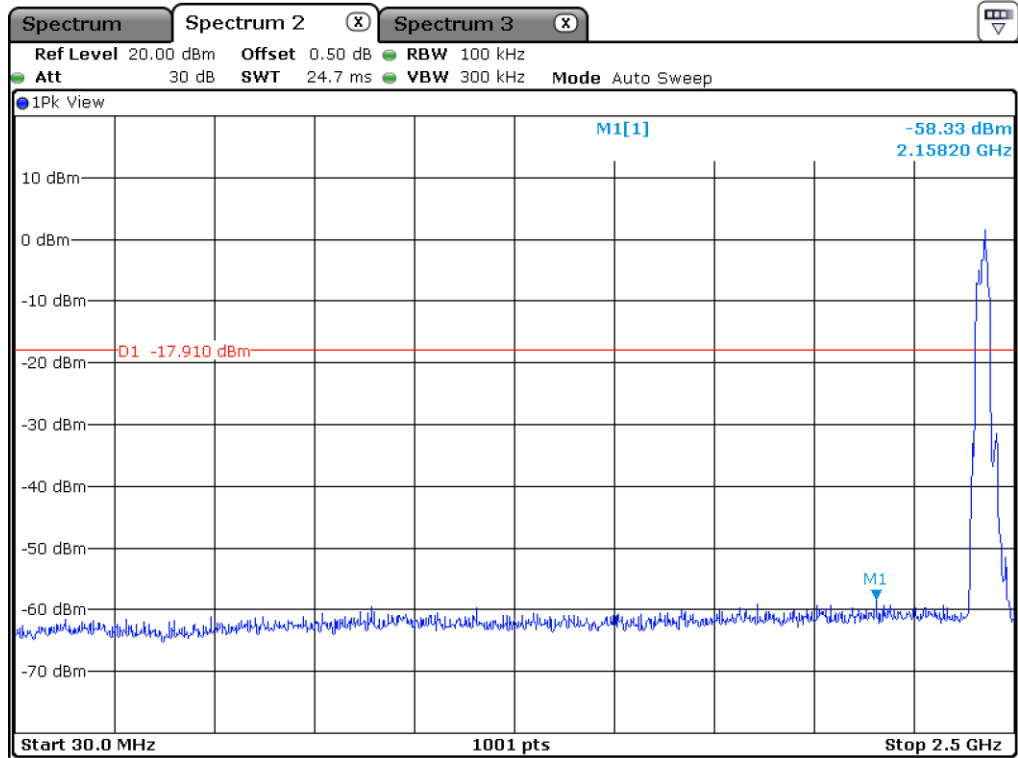


High Channel

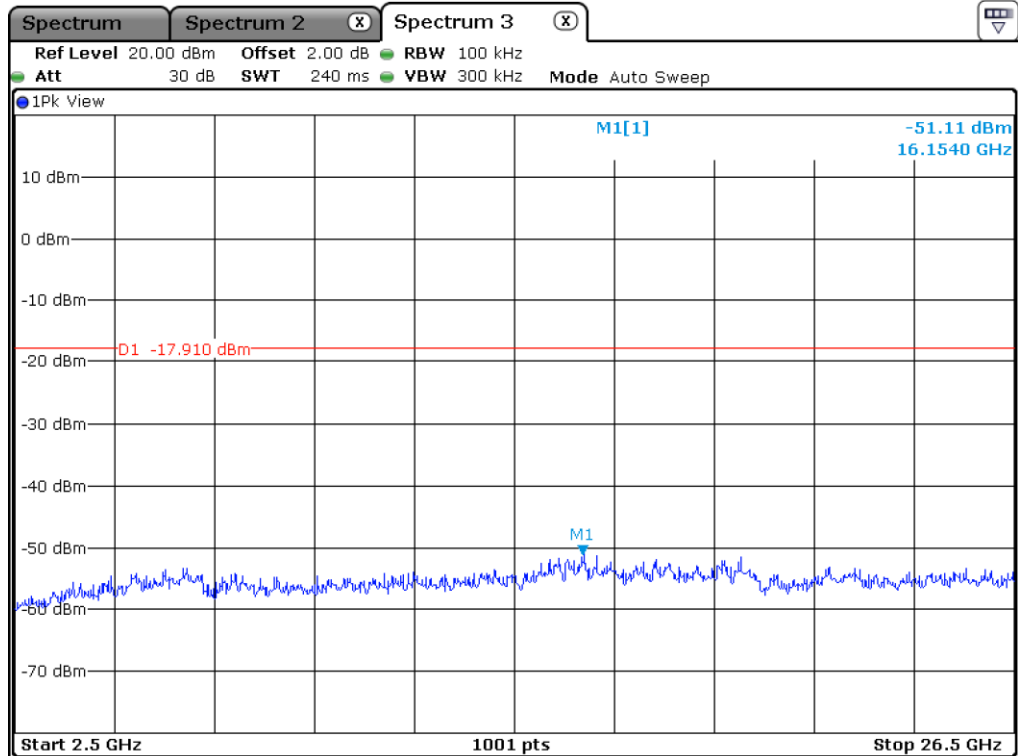
9.5.4 Test data for 802.11n (HT40) WLAN Mode



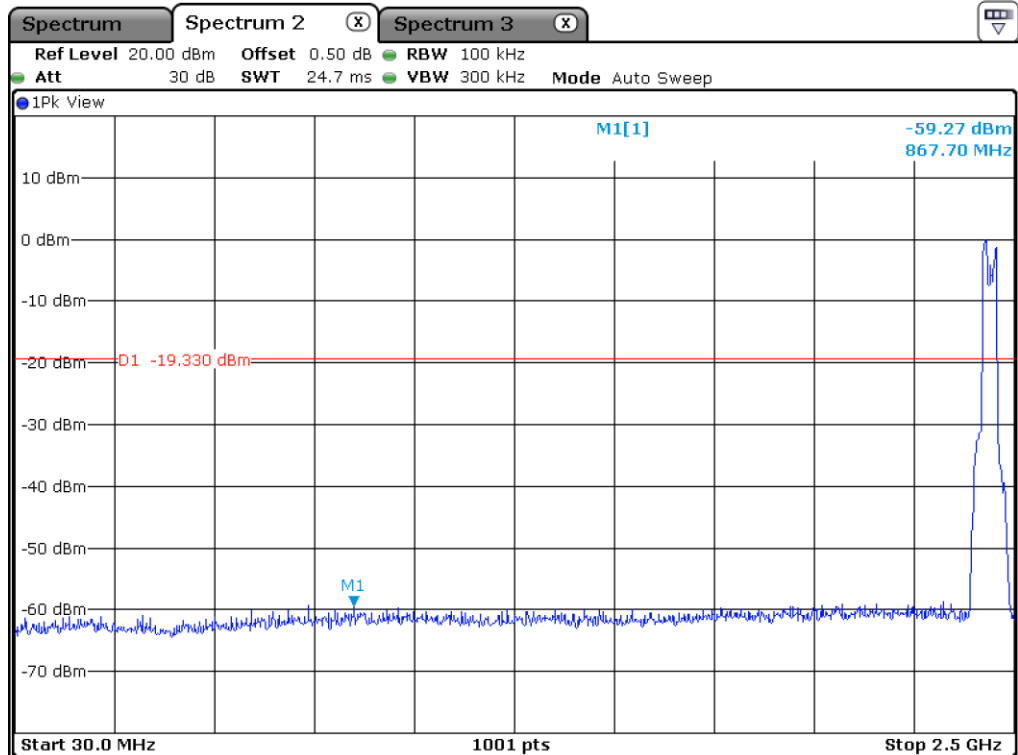




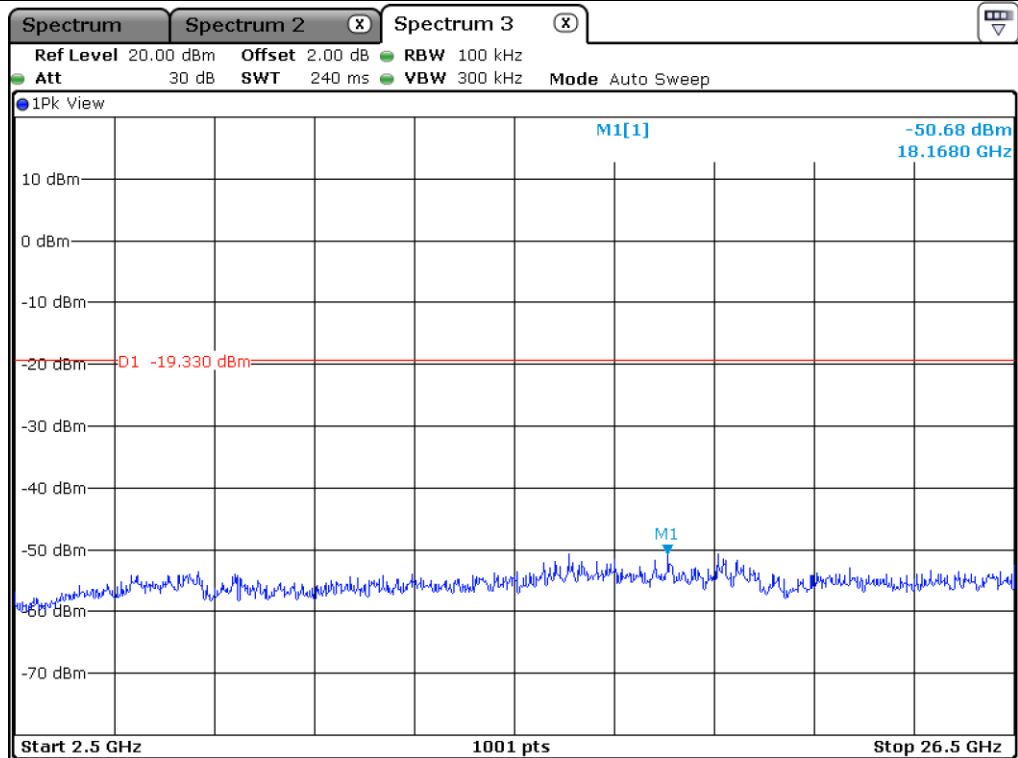
Low Channel



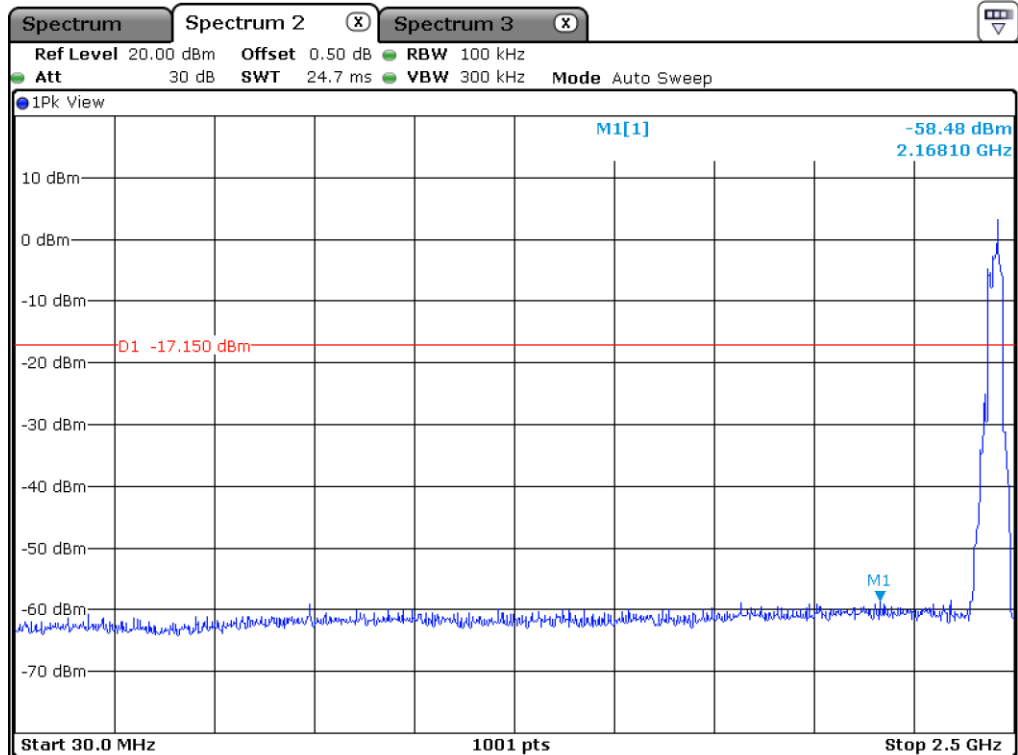
Low Channel



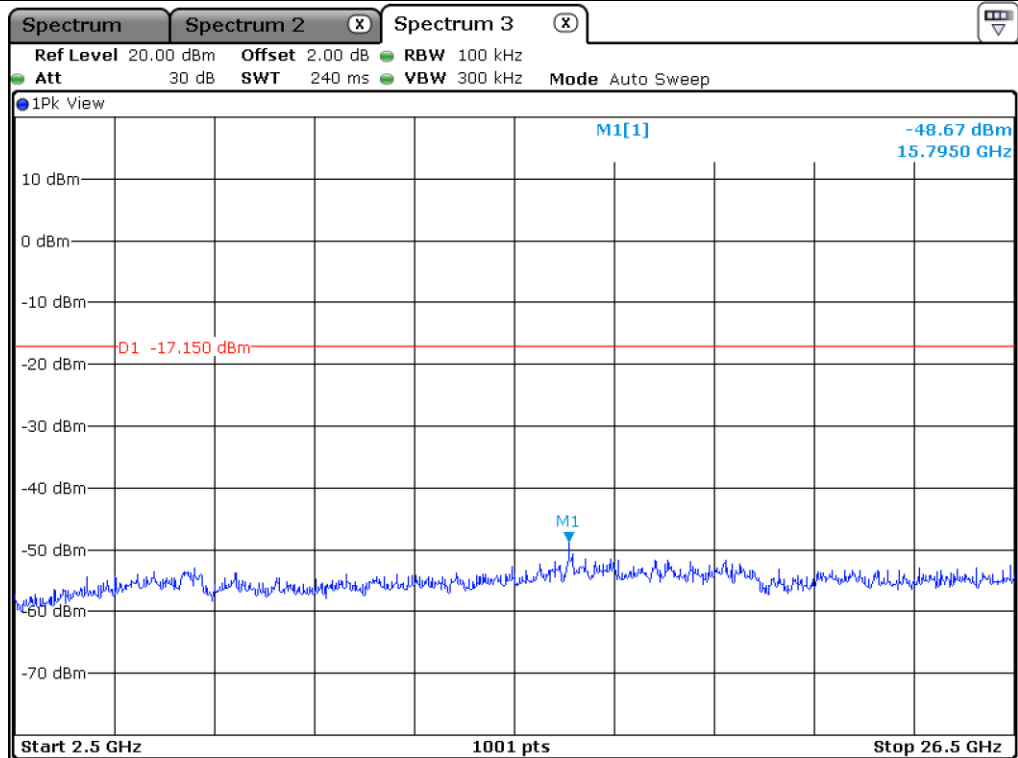
Middle Channel



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 WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 340.25	15.54	Peak	H	27.60	2.91	0.00	46.05	74.00	27.95
2 345.60	5.48	Average	H			0.00	35.99	54.00	18.01
2 375.09	15.59	Peak	V			0.00	46.10	74.00	27.90
2 338.25	5.67	Average	V			0.00	36.18	54.00	17.82
Test Data for High Channel									
2 483.92	15.55	Peak	H	27.50	3.02	0.00	46.07	74.00	27.93
2 483.50	7.38	Average	H			0.00	37.90	54.00	16.10
2 483.50	15.40	Peak	V			0.00	45.92	74.00	28.08
2 485.19	5.79	Average	V			0.00	36.31	54.00	17.69

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

9.6.1.2 Test data for 802.11g WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.96	15.95	Peak	H	27.60	2.91	0.00	46.46	74.00	27.54
2 342.64	5.43	Average	H			0.00	35.94	54.00	18.06
2 384.84	16.06	Peak	V			0.00	46.57	74.00	27.43
2 344.40	5.66	Average	V			0.00	36.17	54.00	17.83
Test Data for High Channel									
2 483.50	22.94	Peak	H	27.50	3.02	0.00	53.46	74.00	20.54
2 483.72	10.57	Average	H			0.00	41.09	54.00	12.91
2 483.82	20.51	Peak	V			0.00	51.03	74.00	22.97
2 485.00	12.04	Average	V			0.00	42.56	54.00	11.44

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

9.6.1.3 Test data for 802.11n (HT 20) WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.96	19.41	Peak	H	27.60	2.91	0.00	49.92	74.00	24.08
2 389.32	6.31	Average	H			0.00	36.82	54.00	17.18
2 389.96	20.59	Peak	V			0.00	51.10	74.00	22.90
2 389.96	7.94	Average	V			0.00	38.45	54.00	15.55
Test Data for High Channel									
2 483.65	23.75	Peak	H	27.50	3.02	0.00	54.27	74.00	19.73
2 483.50	11.55	Average	H			0.00	42.07	54.00	11.93
2 483.65	23.57	Peak	V			0.00	54.09	74.00	19.91
2 483.50	9.46	Average	V			0.00	39.98	54.00	14.02

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

9.6.1.4 Test data for 802.11n (HT 40) WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 388.92	19.44	Peak	H	27.60	2.91	0.00	49.95	74.00	24.05
2 389.96	7.64	Average	H			0.00	38.15	54.00	15.85
2 389.00	20.03	Peak	V			0.00	50.54	74.00	23.46
2 389.48	9.63	Average	V			0.00	40.14	54.00	13.86
Test Data for High Channel									
2 483.52	19.68	Peak	H	27.50	3.02	0.00	50.20	74.00	23.80
2 483.50	8.39	Average	H			0.00	38.91	54.00	15.09
2 483.50	18.10	Peak	V			0.00	48.62	74.00	25.38
2 483.50	7.65	Average	V			0.00	38.17	54.00	15.83

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

9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 802.11b WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	17.51	Peak	H	31.20	4.65	0.00	53.36	74.00	20.64
	7.74	Average	H			0.00	43.59	54.00	10.41
	17.41	Peak	V			0.00	53.26	74.00	20.74
	7.32	Average	V			0.00	43.17	54.00	10.83
Test Data for Middle Channel									
4 874.00	17.55	Peak	H	31.40	4.72	0.00	53.67	74.00	20.33
	7.49	Average	H			0.00	43.61	54.00	10.39
	17.22	Peak	V			0.00	53.34	74.00	20.66
	7.22	Average	V			0.00	43.34	54.00	10.66
Test Data for High Channel									
4 924.00	17.40	Peak	H	31.70	4.86	0.00	53.96	74.00	20.04
	7.39	Average	H			0.00	43.95	54.00	10.05
	17.34	Peak	V			0.00	53.90	74.00	20.10
	7.27	Average	V			0.00	43.83	54.00	10.17

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

9.6.2.2 Test data for 802.11g WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	16.91	Peak	H	31.20	4.65	0.00	52.76	74.00	21.24
	7.40	Average	H			0.00	43.25	54.00	10.75
	16.72	Peak	V			0.00	52.57	74.00	21.43
	7.16	Average	V			0.00	43.01	54.00	10.99
Test Data for Middle Channel									
4 874.00	16.81	Peak	H	31.40	4.72	0.00	52.93	74.00	21.07
	7.24	Average	H			0.00	43.36	54.00	10.64
	16.53	Peak	V			0.00	52.65	74.00	21.35
	7.18	Average	V			0.00	43.30	54.00	10.70
Test Data for High Channel									
4 924.00	16.89	Peak	H	31.70	4.86	0.00	53.45	74.00	20.55
	7.05	Average	H			0.00	43.61	54.00	10.39
	16.50	Peak	V			0.00	53.06	74.00	20.94
	6.87	Average	V			0.00	43.43	54.00	10.57

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

9.6.2.3 Test data for 802.11n (HT 20) WLAN Mode

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- 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	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	17.73	Peak	H	31.20	4.65	0.00	53.58	74.00	20.42
	7.55	Average	H			0.00	43.40	54.00	10.60
	17.47	Peak	V			0.00	53.32	74.00	20.68
	7.29	Average	V			0.00	43.14	54.00	10.86
Test Data for Middle Channel									
4 874.00	17.51	Peak	H	31.40	4.72	0.00	53.63	74.00	20.37
	7.35	Average	H			0.00	43.47	54.00	10.53
	17.29	Peak	V			0.00	53.41	74.00	20.59
	7.12	Average	V			0.00	43.24	54.00	10.76
Test Data for High Channel									
4 924.00	17.50	Peak	H	31.70	4.86	0.00	54.06	74.00	19.94
	7.30	Average	H			0.00	43.86	54.00	10.14
	17.21	Peak	V			0.00	53.77	74.00	20.23
	7.20	Average	V			0.00	43.76	54.00	10.24

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

9.6.2.4 Test data for 802.11n (HT 40) WLAN Mode

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . 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									
4 844.00	17.69	Peak	H	31.20	4.65	0.00	53.54	74.00	20.46
	7.41	Average	H			0.00	43.26	54.00	10.74
	17.52	Peak	V			0.00	53.37	74.00	20.63
	7.22	Average	V			0.00	43.07	54.00	10.93
Test Data for Middle Channel									
4 874.00	17.45	Peak	H	31.40	4.72	0.00	53.57	74.00	20.43
	7.51	Average	H			0.00	43.63	54.00	10.37
	17.36	Peak	V			0.00	53.48	74.00	20.52
	7.40	Average	V			0.00	43.52	54.00	10.48
Test Data for High Channel									
4 904.00	17.34	Peak	H	31.70	4.86	0.00	53.90	74.00	20.10
	7.65	Average	H			0.00	44.21	54.00	9.79
	17.10	Peak	V			0.00	53.66	74.00	20.34
	7.64	Average	V			0.00	44.20	54.00	9.80

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

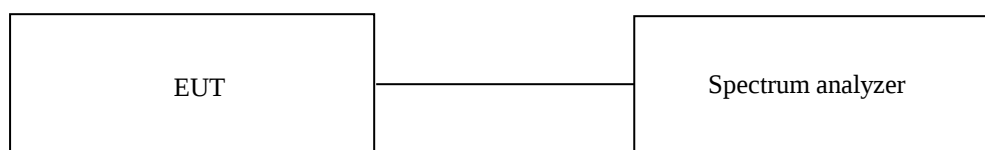
10. PEAK POWER SPECTRAL DENSITY

10.1 Operating environment

Temperature : 22 °C
Relative humidity : 50 % 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 date

August 20, 2020 ~ August 21, 2020

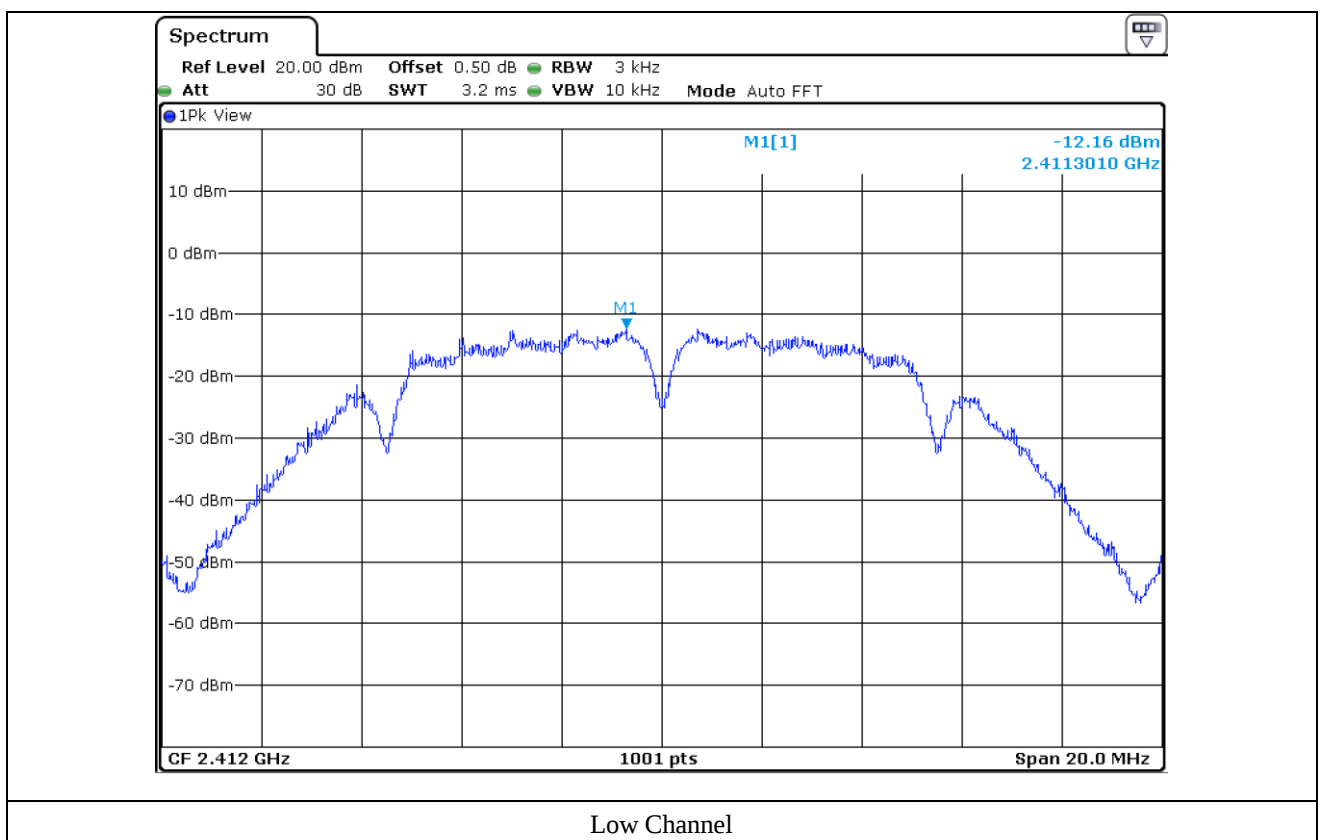
10.4 Test data for 802.11b WLAN Mode

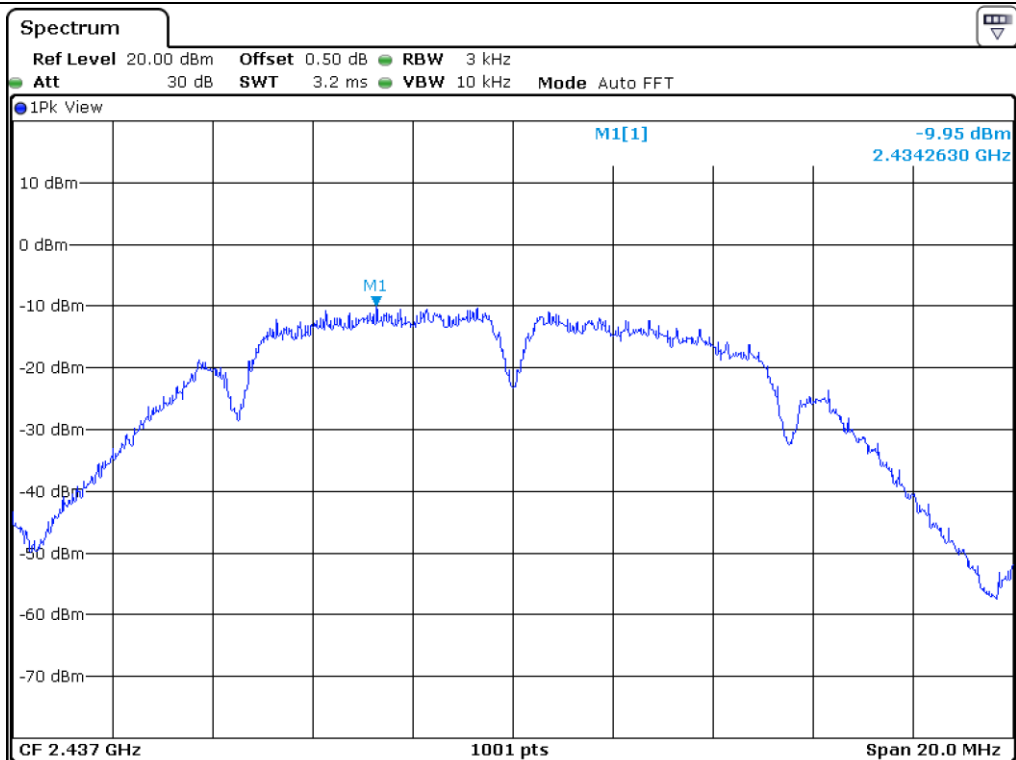
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

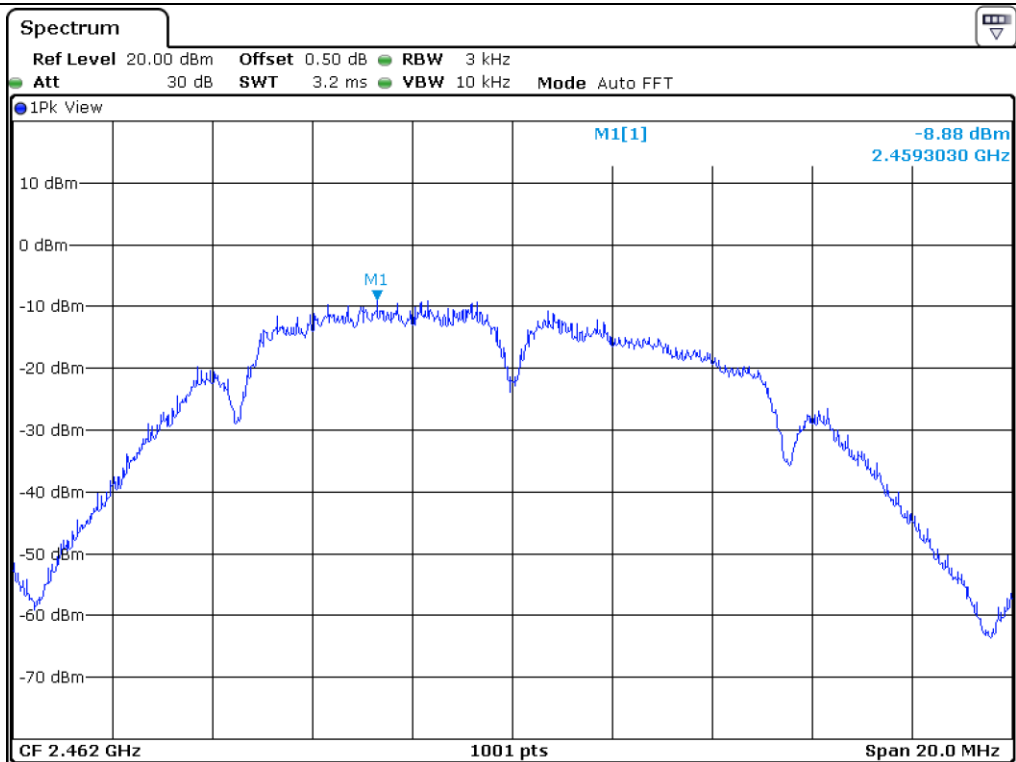
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-12.16	8.00	20.16
Middle	2 437.00	-9.95	8.00	17.95
High	2 462.00	-8.88	8.00	16.88

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

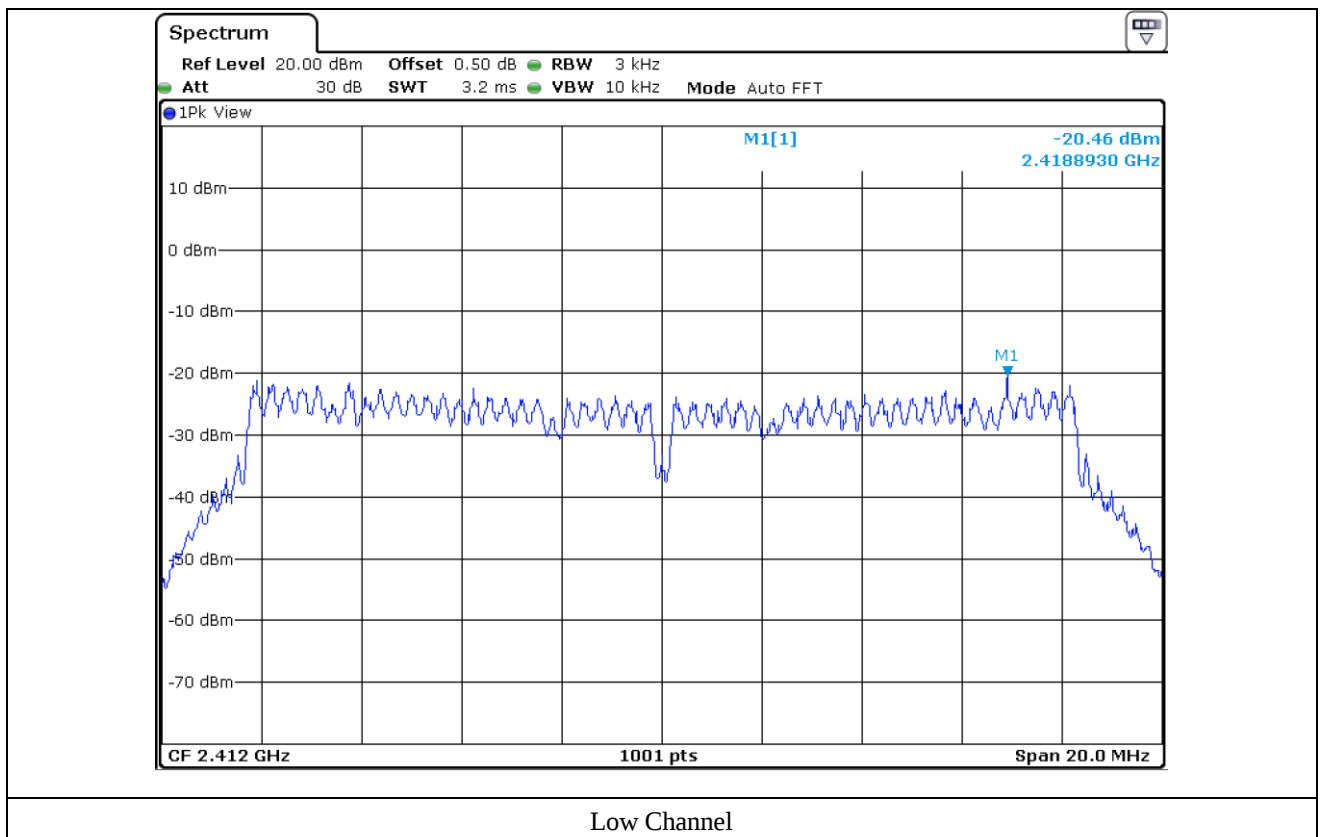
10.5 Test data for 802.11g WLAN Mode

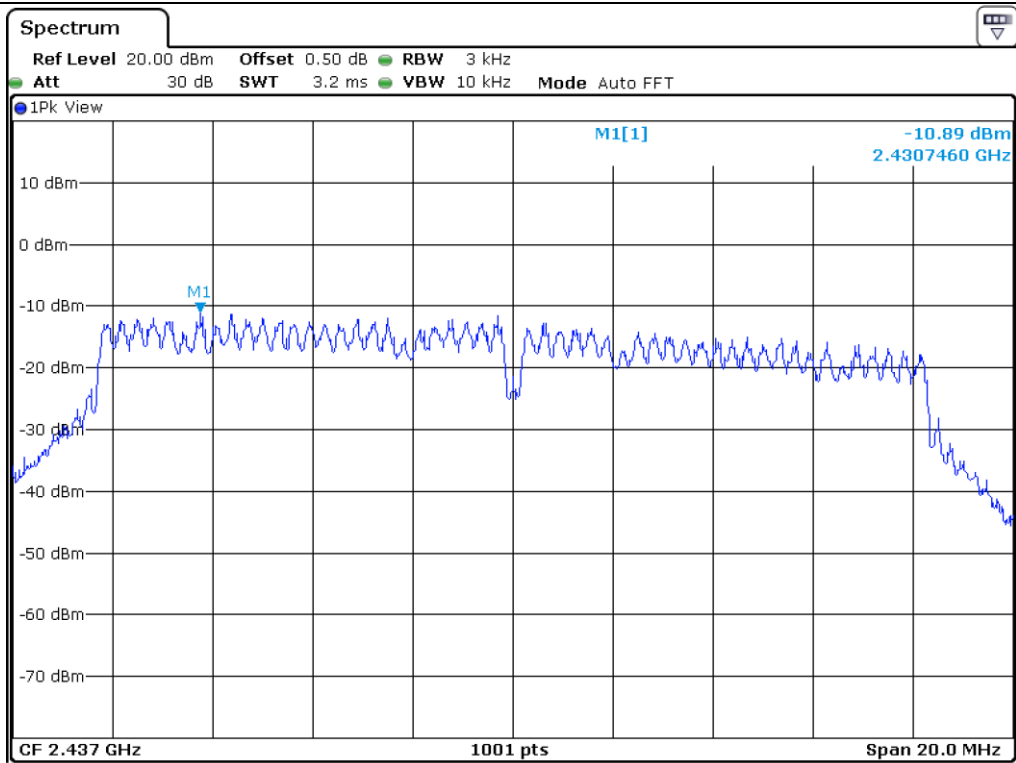
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

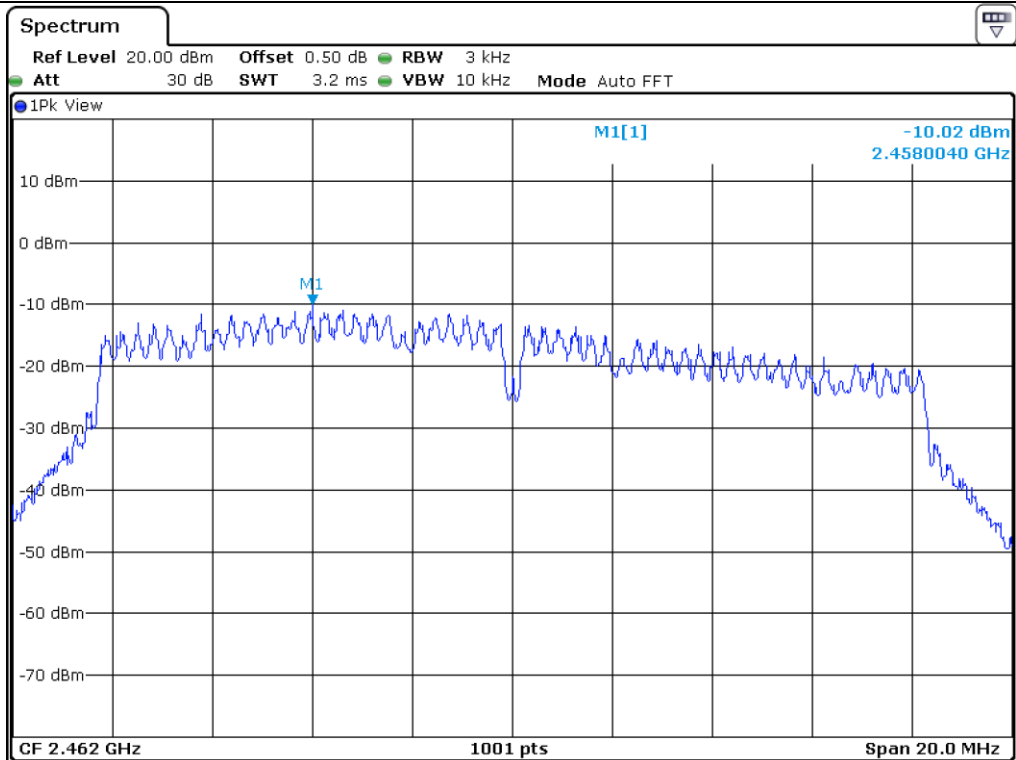
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-20.46	8.00	28.46
Middle	2 437.00	-10.89	8.00	18.89
High	2 462.00	-10.02	8.00	18.02

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

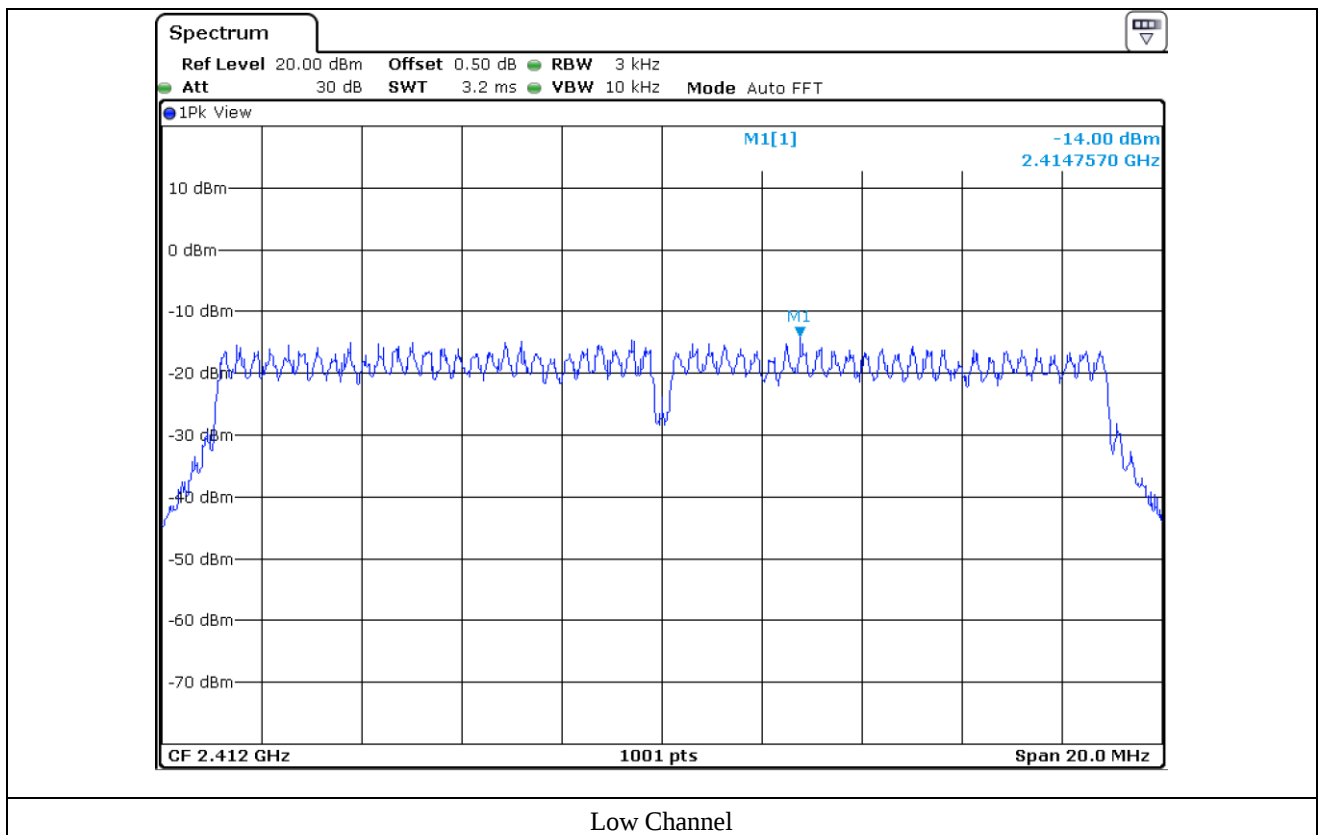
10.6 Test data for 802.11n (HT20) WLAN Mode

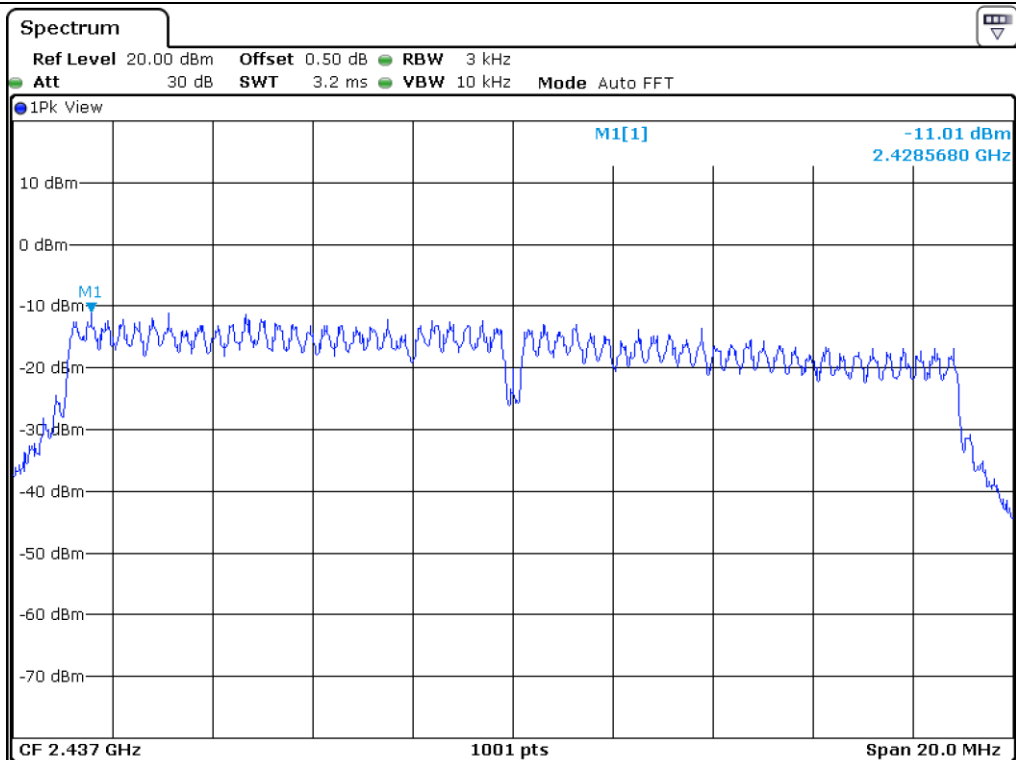
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

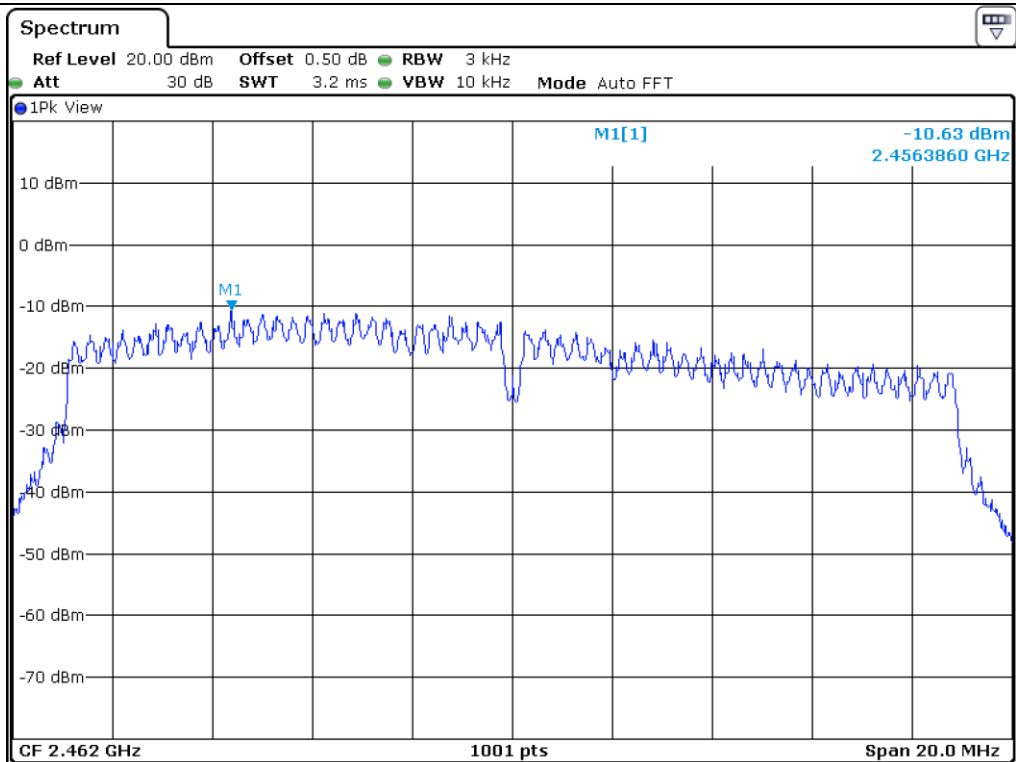
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-14.00	8.00	22.00
Middle	2 437.00	-11.01	8.00	19.01
High	2 462.00	-10.63	8.00	18.63

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

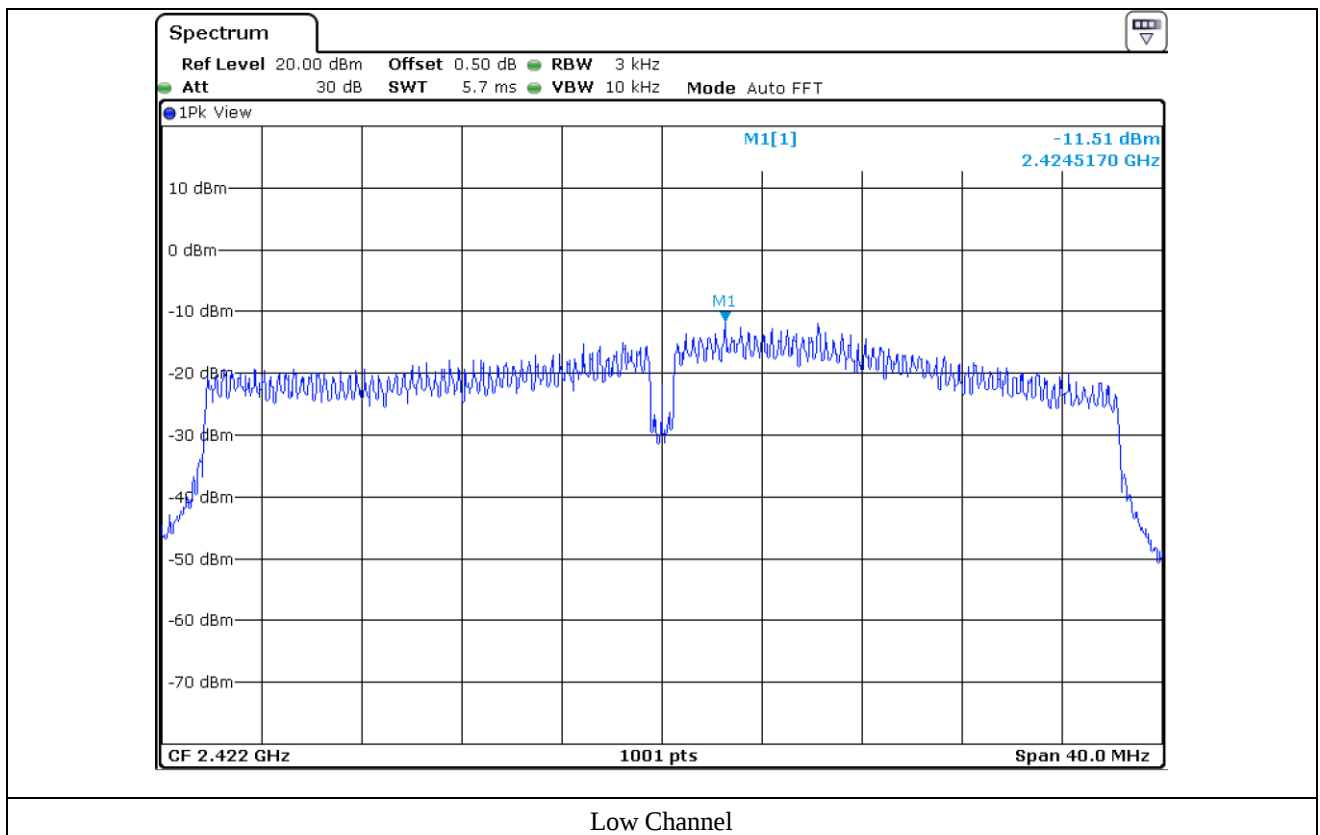
10.7 Test data for 802.11n (HT40) WLAN Mode

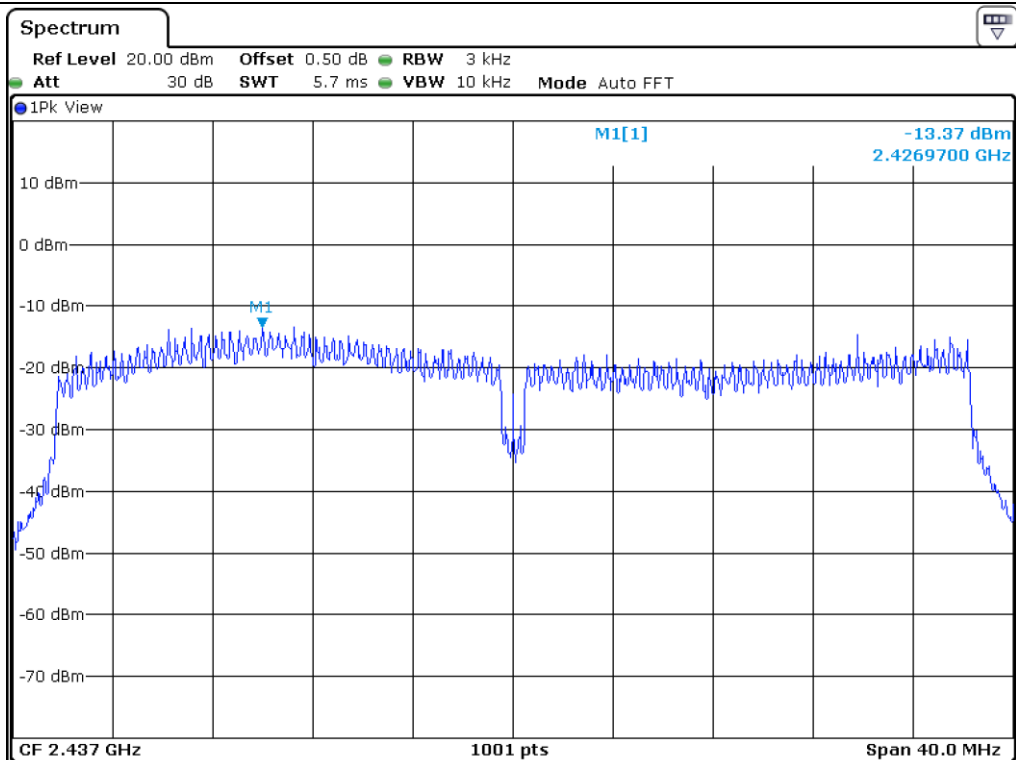
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

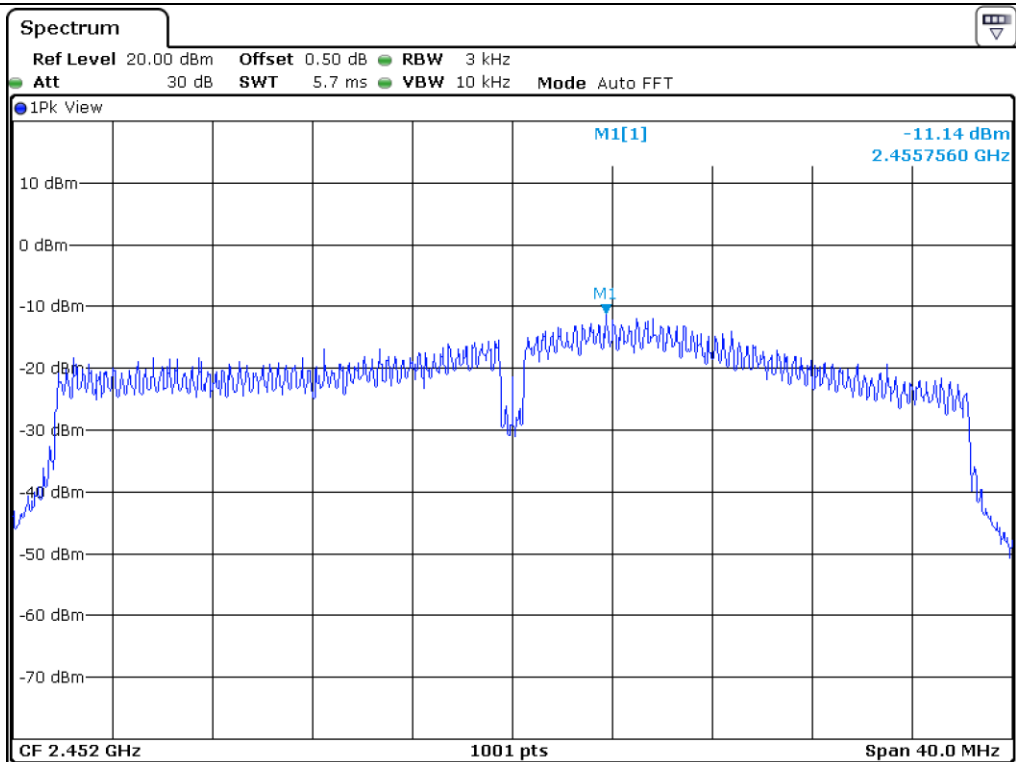
CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-11.51	8.00	19.51
Middle	2 437.00	-13.37	8.00	21.37
High	2 452.00	-11.14	8.00	19.14

Remark. Margin = Limit – Measured value





Middle Channel



High Channel

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 22 °C
Relative humidity : 50 % R.H.

11.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. 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.

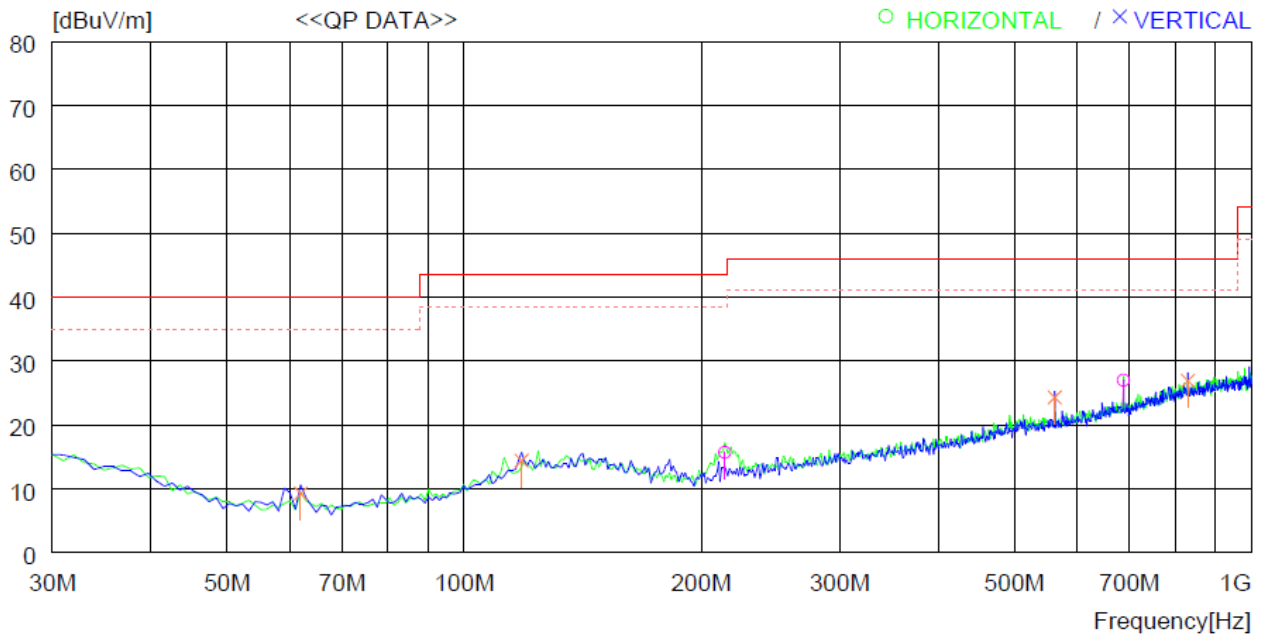
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal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

11.3 Test date

August 20, 2020 ~ August 21, 2020

11.4 Test data for 30 MHz ~ 1 GHz

- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 1 GHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	214.300	30.3	16.2	1.8	32.6	15.7	43.5	27.8	200	138
2	687.655	31.1	25.4	3.4	32.9	27.0	46.0	19.0	300	290
----- Vertical -----										
3	62.010	28.8	12.3	0.9	32.7	9.3	40.0	30.7	100	355
4	118.270	27.4	18.3	1.4	32.7	14.4	43.5	29.1	100	0
5	562.529	30.6	23.8	2.9	33.0	24.3	46.0	21.7	100	0
6	830.241	28.0	27.2	4.1	32.4	26.9	46.0	19.1	200	359

11.5 Test data for Below 30 MHz

- . 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)
All emissions observed were 20dB below the limit and thus not reported.									

11.6 Test data for above 1 GHz

- . 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)
All emissions observed were 20dB below the limit and thus not reported.									

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 22 °C
Relative humidity : 50 % R.H

12.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

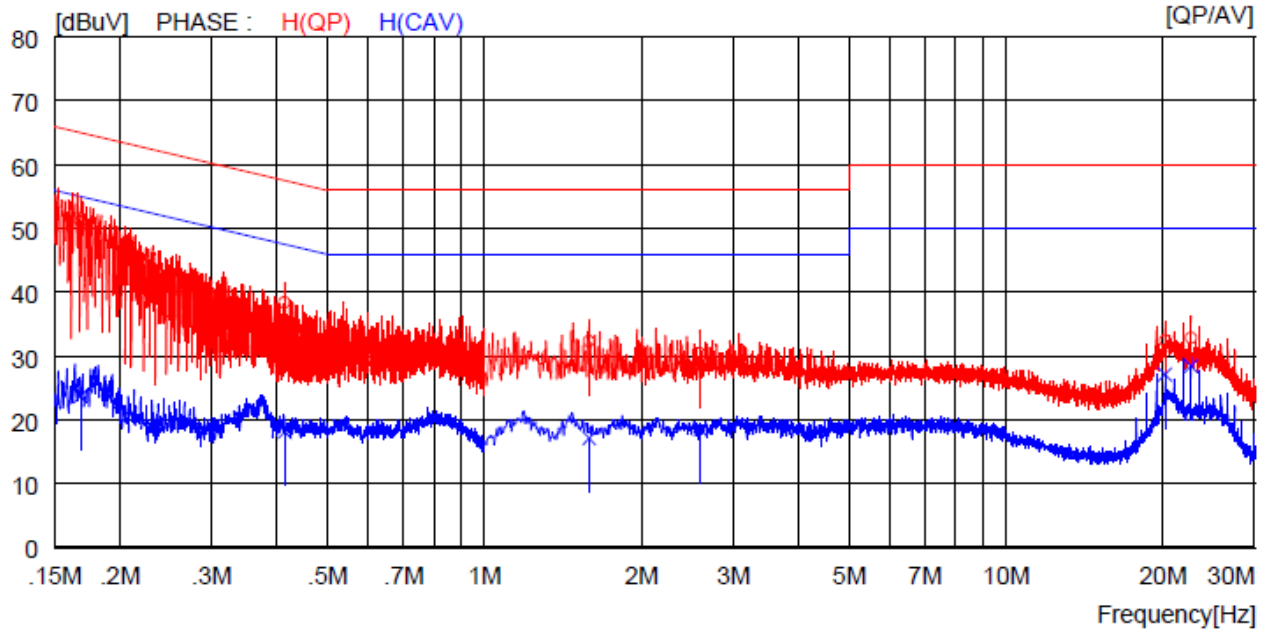
12.3 Test date

August 20, 2020 ~ August 21, 2020

12.4 Test data

- . Resolution bandwidth : 9 kHz
- . Frequency range : 0.15 MHz ~ 30 MHz
- . Tested Line : HOT LINE

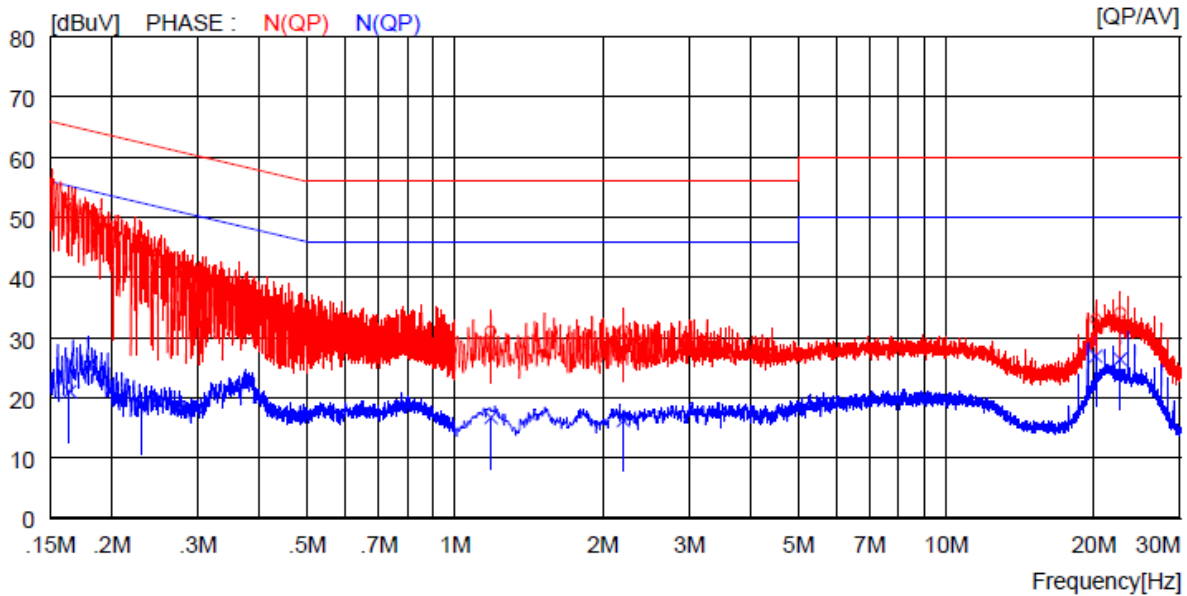
LIMIT : EN.KN.FCC.VCCI_CISPR Pub.22 Class B, Quasi-Peak Limits (Mains Ports)
EN.KN.FCC.VCCI_CISPR Pub.22 Class B, Average Limits (Mains Ports)



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16800	41.1	----	10.0	51.1	----	65.1	----	14.0	----	H(QP)
2	0.41400	28.5	----	9.9	38.4	----	57.6	----	19.2	----	H(QP)
3	1.58800	22.2	----	10.1	32.3	----	56.0	----	23.7	----	H(QP)
4	2.58800	20.3	----	10.1	30.4	----	56.0	----	25.6	----	H(QP)
5	20.22000	21.9	----	10.5	32.4	----	60.0	----	27.6	----	H(QP)
6	22.65000	22.3	----	10.5	32.8	----	60.0	----	27.2	----	H(QP)
7	0.16800	----	13.7	10.0	----	23.7	----	55.1	----	31.4	H(CAV)
8	0.41400	----	8.2	9.9	----	18.1	----	47.6	----	29.5	H(CAV)
9	1.58800	----	7.0	10.1	----	17.1	----	46.0	----	28.9	H(CAV)
10	2.58800	----	8.4	10.1	----	18.5	----	46.0	----	27.5	H(CAV)
11	20.22000	----	16.6	10.5	----	27.1	----	50.0	----	22.9	H(CAV)
12	22.65000	----	17.9	10.5	----	28.4	----	50.0	----	21.6	H(CAV)

-. Tested Line : NEUTRAL LINE

LIMIT : EN.KN.FCC.VCCI_CISPR Pub.22 Class B, Quasi-Peak Limits (Mains Ports)
EN.KN.FCC.VCCI_CISPR Pub.22 Class B, Average Limits (Mains Ports)



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16400	42.2	----	10.0	52.2	----	65.3	----	13.1	----	N(QP)
2	0.22900	36.0	----	9.9	45.9	----	62.5	----	16.6	----	N(QP)
3	1.18400	20.9	----	10.1	31.0	----	56.0	----	25.0	----	N(QP)
4	2.20400	21.0	----	10.1	31.1	----	56.0	----	24.9	----	N(QP)
5	20.22000	22.5	----	10.5	33.0	----	60.0	----	27.0	----	N(QP)
6	22.65000	23.6	----	10.5	34.1	----	60.0	----	25.9	----	N(QP)
7	0.16400	----	11.1	10.0	----	21.1	----	55.3	----	34.2	N(CAV)
8	0.22900	----	9.0	9.9	----	18.9	----	52.5	----	33.6	N(CAV)
9	1.18400	----	6.6	10.1	----	16.7	----	46.0	----	29.3	N(CAV)
10	2.20400	----	6.1	10.1	----	16.2	----	46.0	----	29.8	N(CAV)
11	20.22000	----	16.4	10.5	----	26.9	----	50.0	----	23.1	N(CAV)
12	22.65000	----	15.9	10.5	----	26.4	----	50.0	----	23.6	N(CAV)

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

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

13. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101200	Jul. 15, 2020 (1Y)
ESR7	Rohde & Schwarz	EMI Test Receiver	102190	Oct. 16, 2019 (1Y)
310N	Sonoma Instrument	AMPLIFIER	312545	Mar. 16, 2020 (1Y)
MA-4640-XPET	Innco Systems GmbH	Antenna Master	MA4640/652	N/A
HD100	HD GmbH	Position Controller	N/A	N/A
DT2000-2t	Innco Systems GmbH	Turn Table	N/A	N/A
FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	Mar. 24, 2020 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Feb. 27, 2020 (2Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020(1Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 18, 2019 (1Y)
ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2019 (1Y)
ESH3-Z2	Rohde & Schwarz	Pulse Limiter	060117	Mar. 16, 2020 (1Y)
NSLK8128	Schwarzbeck	LISN	8128216	Mar. 16, 2020 (1Y)