DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD

TEST REPORT

SCOPE OF WORK
FCC TESTING–ECH-REFL01-5G, ECH-REFL02-5G, ECH-REFL03, ECH-REFL03-SPT

REPORT NUMBER
201207054SZN-001

ISSUE DATE **[REVISED DATE]**
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TEST REPORT

Intertek Report No.: 201207054SZN-001

DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD

Application
For
Certification

FCC ID: 2ATAP-ECHELON

REFLECT MIRROR, REFLECT TOUCH SPORT

Model: ECH-REFL01-5G, ECH-REFL02-5G, ECH-REFL03, ECH-REFL03-SPT

2.4GHz Wi-Fi Transceiver

Report No.: 201207054SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-19]

Prepared and Checked by:

Winkey Wang
Senior Project Engineer

Approved by:

Peter Kang
Senior Technical Supervisor
Date: June 17, 2021

MEASUREMENT/TECHNICAL REPORT

This report concerns (check one) Original Grant _____ Class II Change ____X_____

Equipment Type: DTS - Part 15 Digital Transmission Systems (Wi-Fi transmitter portion)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No ____X_____

If yes, defer until : _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No ____X_____

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-19] Edition] provision.

Report prepared by:

Winkey Wang
Intertek Testing Services Shenzhen Ltd. Longhua Branch
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1.0 Summary of Test results

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Applicant Address: Room 201, Building 3rd, No. 43 of Gangjian RD. Changping town, Dongguan City, Guangdong Province, China
Manufacturer: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Manufacturer Address: Room 201, Building 3rd, No. 43 of Gangjian RD. Changping town, Dongguan City, Guangdong Province, China

Model: ECH-REFL01-5G, ECH-REFL02-5G, ECH-REFL03, ECH-REFL03-SPT

FCC ID: 2ATAP-ECHELON

TEST ITEM	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
Conducted Emission	15.209	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is an Echelon Reflect with BT5.0 (dual-mode) operating in 2402-2480MHz, 2.4G Wi-Fi function operating in 2412-2462MHz and 5G Wi-Fi function operating in 5180-5240&5745-5825MHz. The EUT is powered by A.C. 120V, 60Hz. Bluetooth and WIFI transmitters are share one antenna and can transmit simultaneously, but 2.4G WIFI and 5G WIFI cannot transmit simultaneously. User cannot access USB/SD card ports in normal use. For more detailed features description, please refer to the user's manual.

Type of Modulation: CCK, BPSK, QPSK, 16QAM, 64QAM, DQPSK, DBPSK
Antenna Type: Internal Antenna
Antenna Gain: 3dBi

The model: ECH-REFL03 is the same as the model: ECH-REFL03-SPT in hardware aspect. Their difference in product name, model number and with/without support touch screen function for marketing purpose. Details as below:

Product name	Model Number	Description
REFLECT MIRROR	ECH-REFL03	Not support touch screen function
REFLECT TOUCH SPORT	ECH-REFL03-SPT	Support touch screen function

There are 4 replaceable touch screen function board be used in model ECH-REFL03-SPT, all independently installed in the product for testing.

Product name	Model Number	touch screen function board Model
REFLECT TOUCH SPORT	ECH-REFL03-SPT	126
		4101
		8083
		8756

Partial tests are required to both designing schemes after evaluation, but only worst-case is reflected in the report.

The Models: ECH-REFL03, ECH-REFL03-SPT are the same as the certified models: ECH-REFL02-5G, ECH-REFL01-5G which was approved on 2019-11-07, except mentioned as below:

Production Name	Model Number	Description
REFLECT MIRROR	ECH-REFL01-5G	Certified model
REFLECT TOUCH SPORT	ECH-REFL03	Different appearance, power supply board and camera board with model ECH-REFL01-5G
REFLECT MIRROR	ECH-REFL02-5G	Certified model
REFLECT TOUCH SPORT	ECH-REFL03-SPT	Different appearance, power supply board and camera board, touch function board with model ECH-REFL02-5G

This report bases on the previous report with report number 190926001SZN-001 dated October 17, 2019 (original signature by Jeff Liang, Kidd Yang on file), due to added model number, partial tests are required after evaluation.

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants

The Models: ECH-REFL02-5G, ECH-REFL01-5G has been granted under the certification number with FCC ID: 2ATAP-ECHELON.

This is an application for certification of:
DTS- Part 15 Digital Transmission Systems (2.4GHz Wi-Fi transmitter portion).

Remaining functions are subjected to the following documents:
For the 5G Wi-Fi function was tested and demonstrated in report 201207054SZN-002.
For the BT 5.0 EDR function was tested and demonstrated in report 201207054SZN-003.
For the BT 5.0 BLE function was tested and demonstrated in report 201207054SZN-004.
For other functions were reported in the SDoC report: 201207054SZN-005.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013) and KDB 558074 D01 v05r02. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Justification Section" of this Application.

2.4 Test Facility

The Semi-anechoic chamber and shielded room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by A.C. 120V, 60Hz during the test. Both designing schemes have been considered, only the worst data was reported in this report.

On 802.11b/g/n-HT20 mode, only one antenna is used, and all data rate were tested and only the worst case data is shown in the report.

For maximizing emissions, the EUT was rotated through 360°, the EUT was placed on the styrene turntable with 0.8m up to 1GHz and 1.5 m above 1GHz. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

The rear of unit shall be flushed with the rear of the table.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

Test Software: Ampak RFTestTool, VER: 5.6

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

3.3 Special Accessories

N/A.

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

3.5 Equipment Modification

Any modifications installed previous to testing by DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Portable computer (Provided by Intertek)	DELL	Latitude 3480

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

The antenna power of the EUT was connected to the input of a broadband peak RF power meter. The power meter have a video bandwidth that is greater than DTS bandwidth and utilize a fast-responding diode detector. Power was read directly at the EUT antenna terminals with cable loss added.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

4.1.1 Test Result

Operating Mode: Standalone transmission (2.4G WIFI)

IEEE 802.11b (Antenna Gain = 3dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	17.2	52.48
Middle Channel: 2437	17.3	53.70
High Channel: 2462	17.0	50.12

IEEE 802.11g (Antenna Gain = 3dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	20.5	112.20
Middle Channel: 2437	20.3	107.15
High Channel: 2462	20.2	104.71

IEEE 802.11n-HT20 (Antenna Gain = 3dBi) (64QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	20.6	114.82
Middle Channel: 2437	20.6	114.82
High Channel: 2462	20.4	109.65

Operating Mode: Simultaneous transmission (BT+2.4G WIFI)

IEEE 802.11b (Antenna Gain = 3dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	17.6	57.54
Middle Channel: 2437	17.5	56.23
High Channel: 2462	17.3	53.70

IEEE 802.11g (Antenna Gain = 3dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	20.6	114.82
Middle Channel: 2437	20.5	112.20
High Channel: 2462	20.3	107.15

IEEE 802.11n-HT20 (Antenna Gain = 3dBi) (64QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	20.9	123.03
Middle Channel: 2437	20.8	120.23
High Channel: 2462	20.6	114.82

Cable loss: 2.5 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 20.9dBm
EUT max. E.I.R.P = 20.9dBm + 3dBi = 23.9dBm = 245.5mW

For RF Exposure, the information is saved with filename: RF exposure.pdf.

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01 v05r02. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.
Limit: The 6 dB Bandwidth is at least 500 kHz.

4.2.1 Test Result

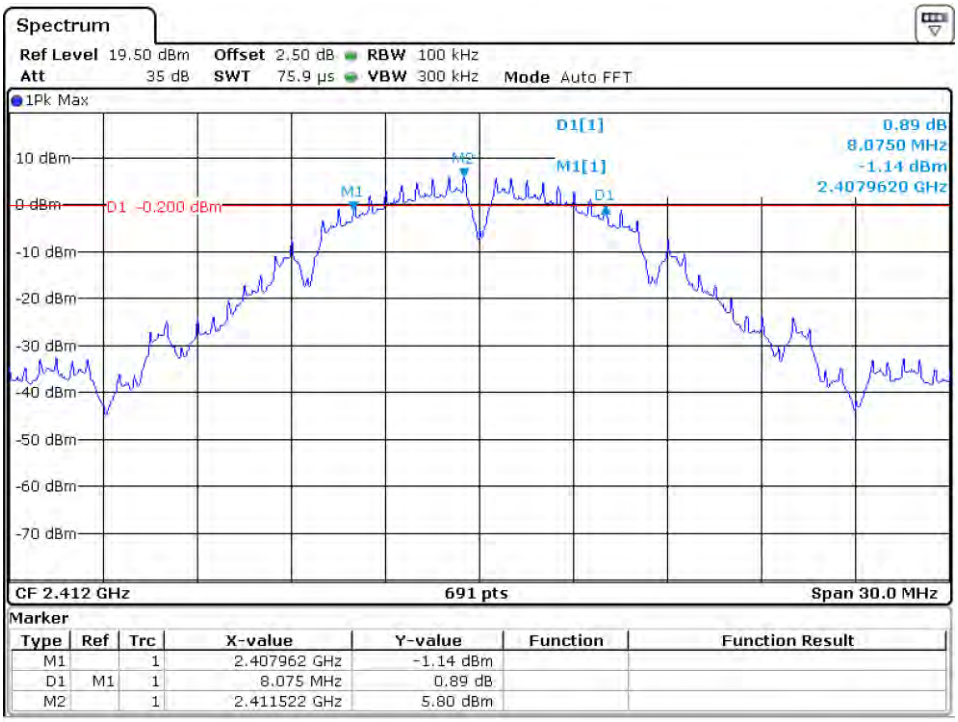
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	8.075
2437	8.075
2462	8.075

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	15.716
2437	15.716
2462	15.716

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.368
2437	16.889
2462	16.324

The test plots are attached as below.

802.11b



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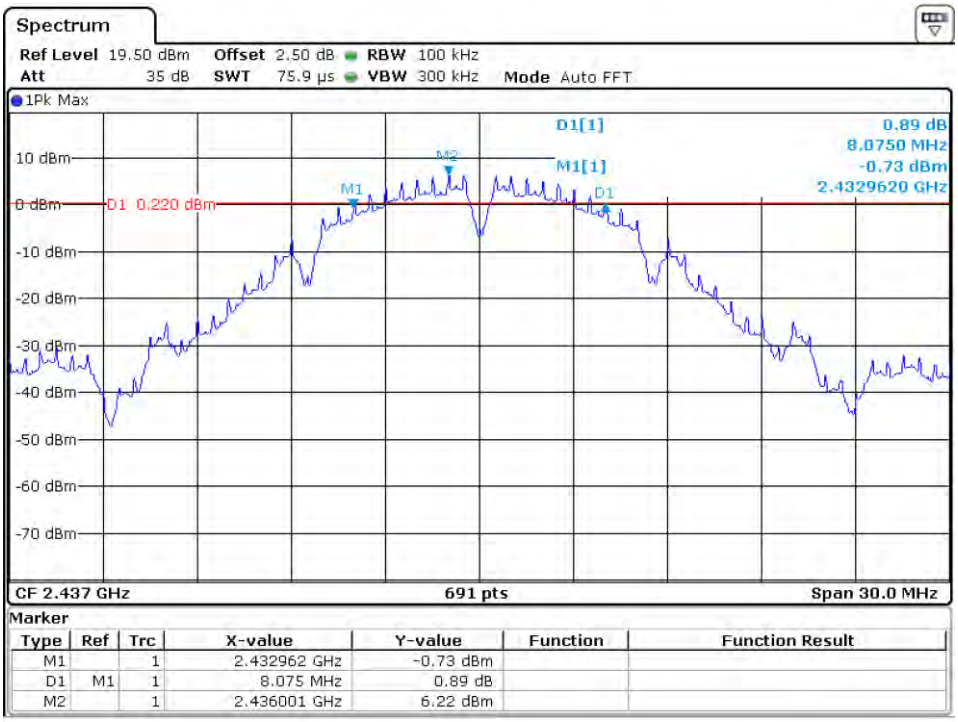

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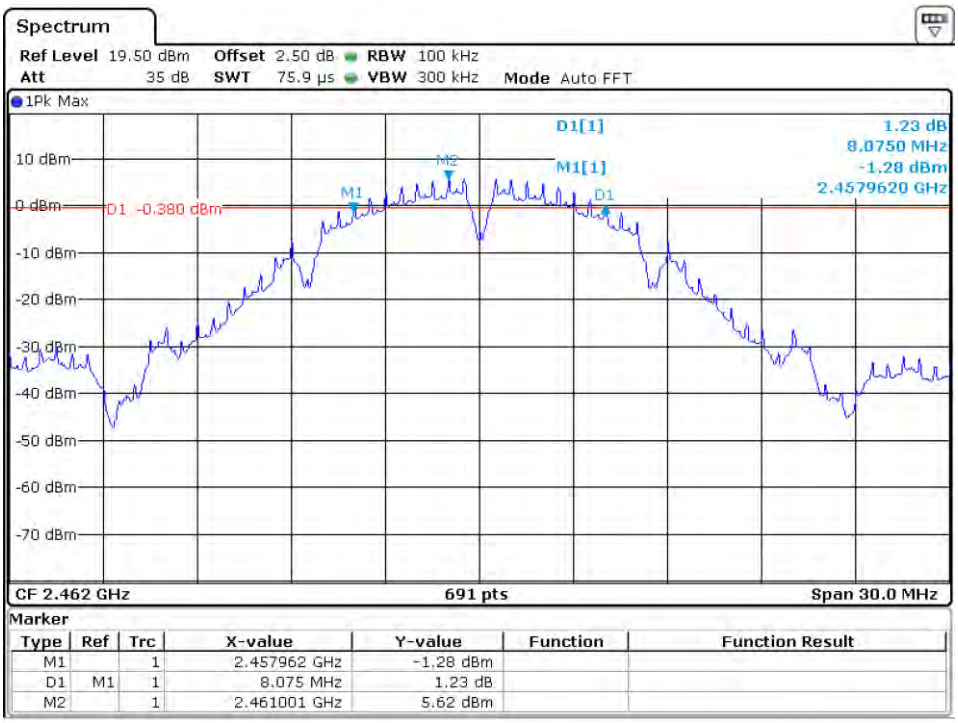
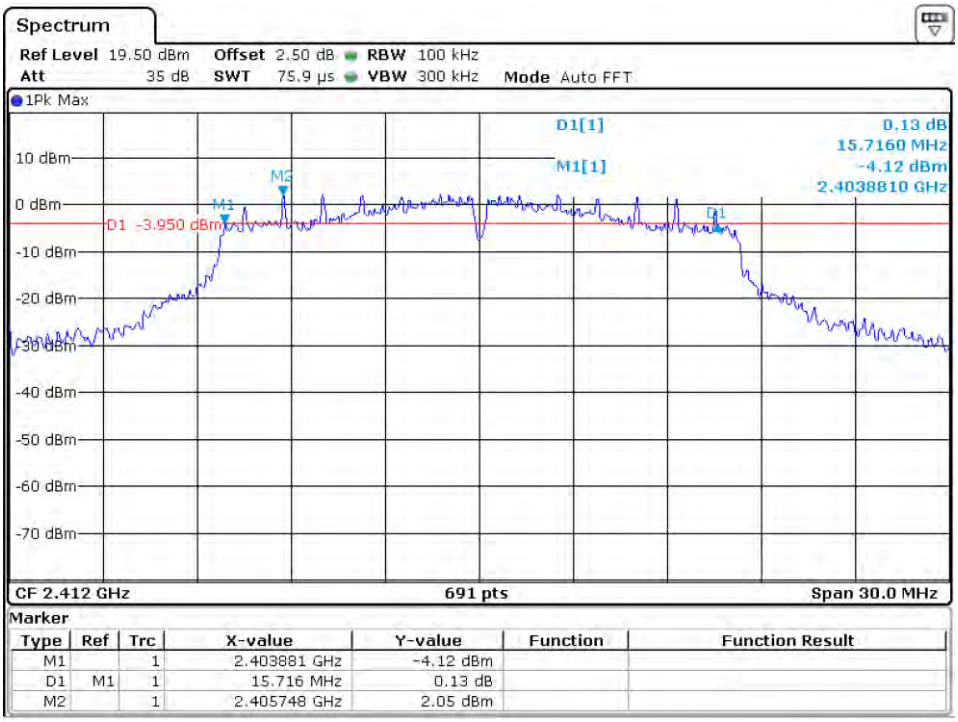

Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 75.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] 1.23 dB
8.0750 MHz
M1[1] -1.28 dBm
2.4579620 GHz
10 dBm
0 dBm
D1 -0.380 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
D1
CF 2.462 GHz
691 pts
Span 30.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.457962 GHz -1.28 dBm
D1 M1 1 8.075 MHz 1.23 dB
M2 1 2.461001 GHz 5.62 dBm
Date: 15.OCT.2019 13:57:54

802.11g



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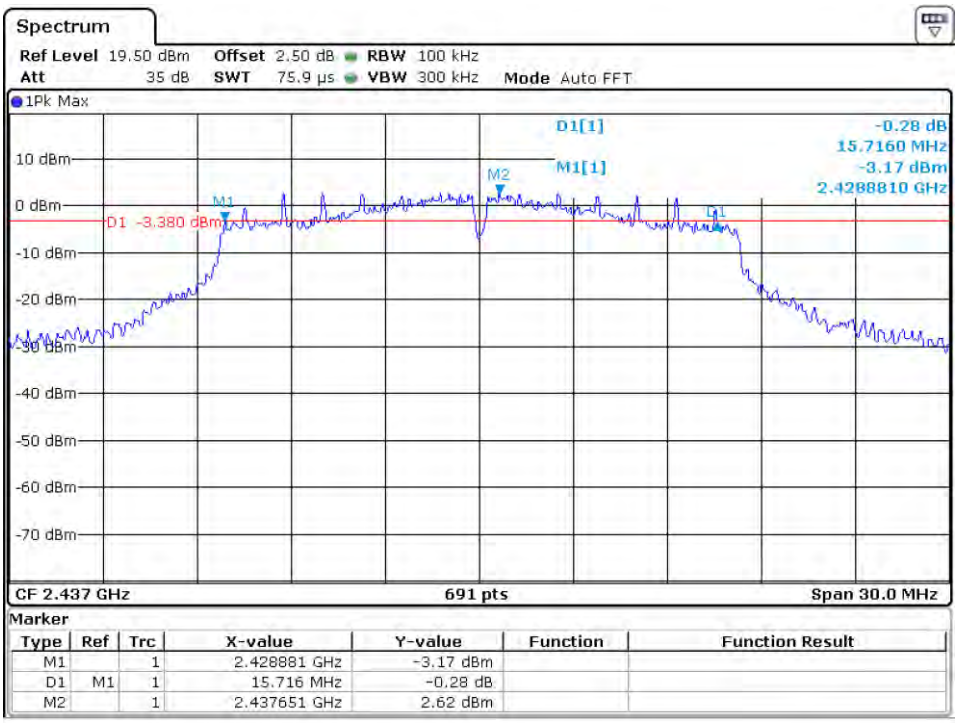

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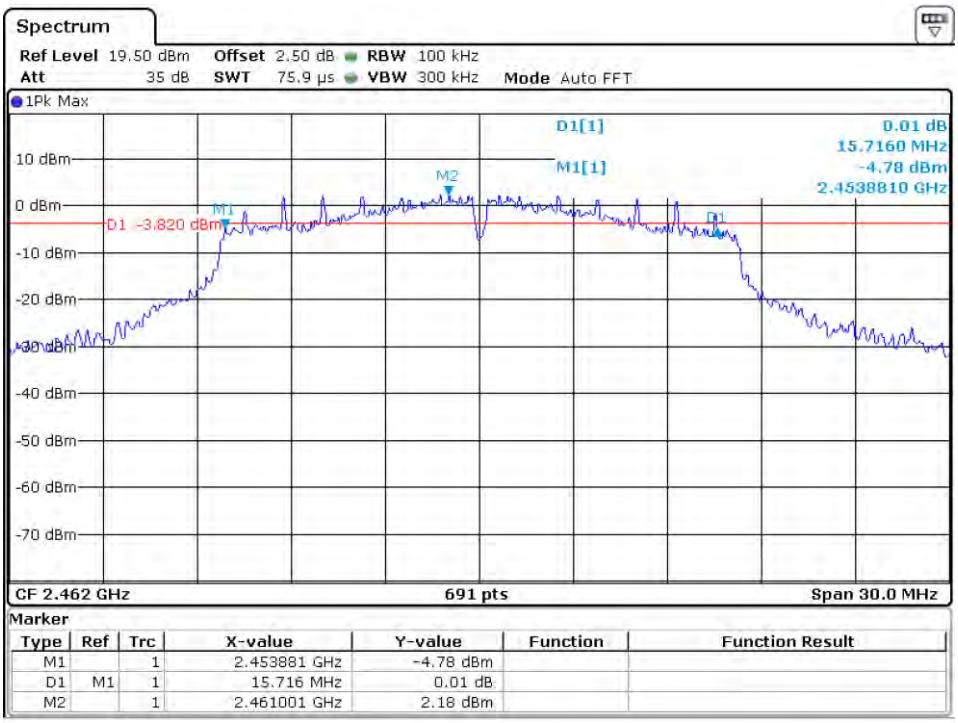
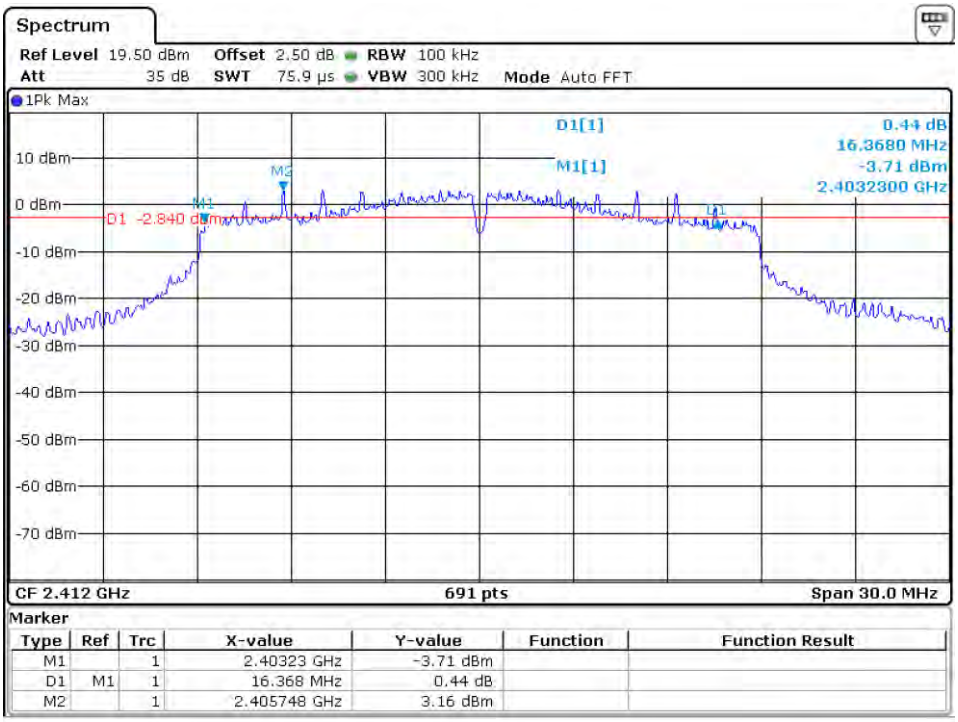

Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 75.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] 0.01 dB
15.7160 MHz
M1[1] -4.78 dBm
2.4538810 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
D1
D1 -3.820 dBm
CF 2.462 GHz
691 pts
Span 30.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.453881 GHz -4.78 dBm
D1 M1 1 15.716 MHz 0.01 dB
M2 1 2.461001 GHz 2.18 dBm
Date: 15.OCT.2019 14:19:24

802.11n-HT20



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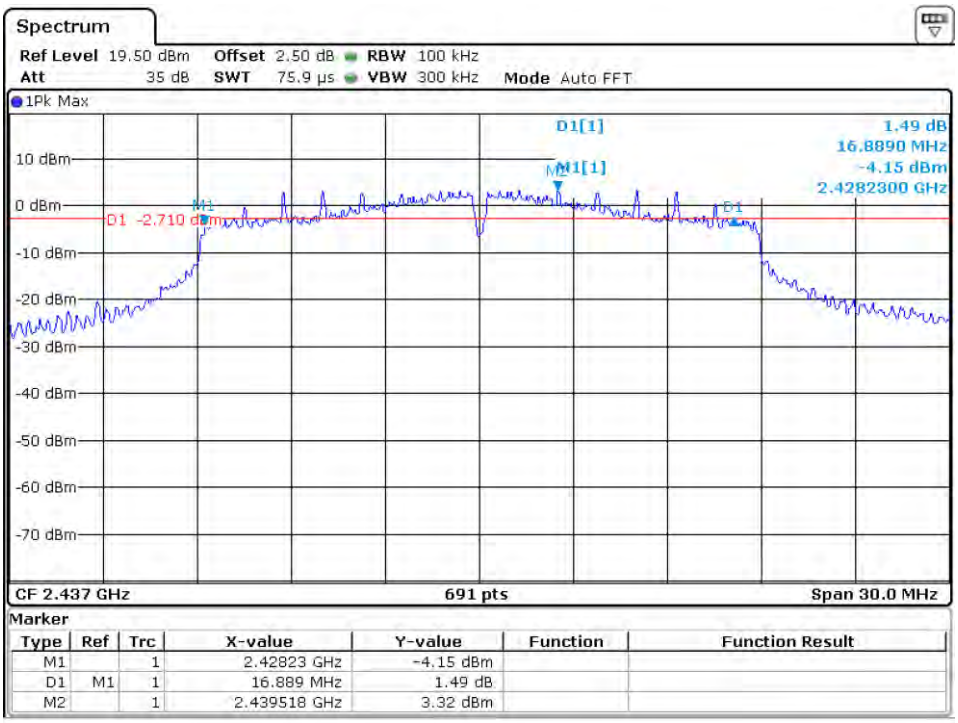

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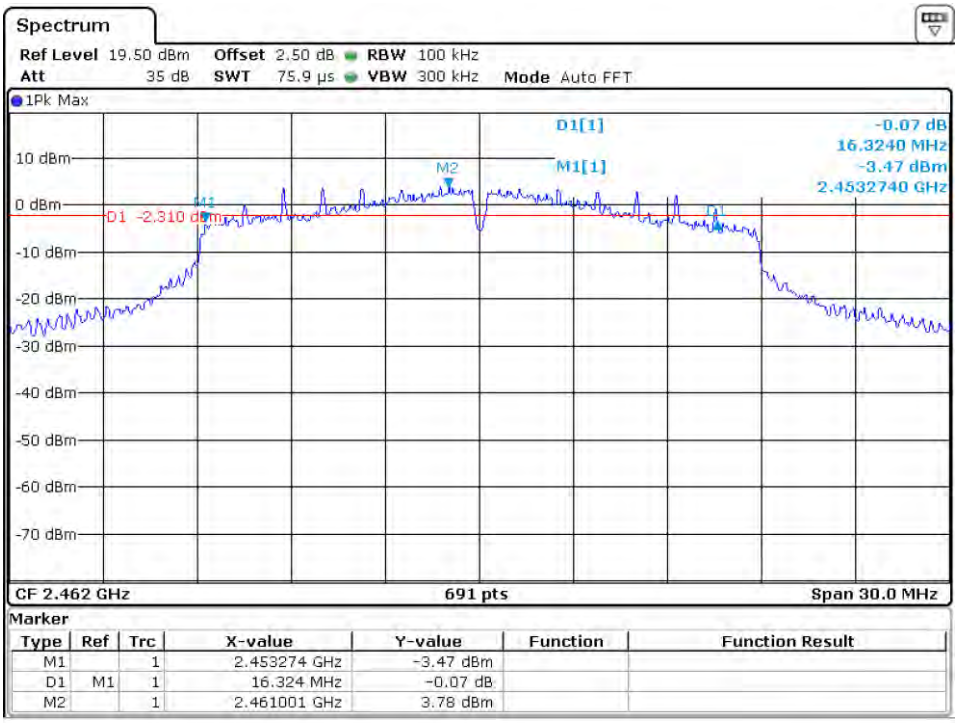

Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 75.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -0.07 dB
16.3240 MHz
M1[1] -3.47 dBm
2.4532740 GHz
10 dBm
0 dBm
D1 -2.310 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 30.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.453274 GHz -3.47 dBm
D1 M1 1 16.324 MHz -0.07 dB
M2 1 2.461001 GHz 3.78 dBm
Date: 15.OCT.2019 14:56:54

4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05r02.

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/100 kHz.

4.3.1 Test Result

Operating Mode: Standalone transmission (2.4G WIFI)

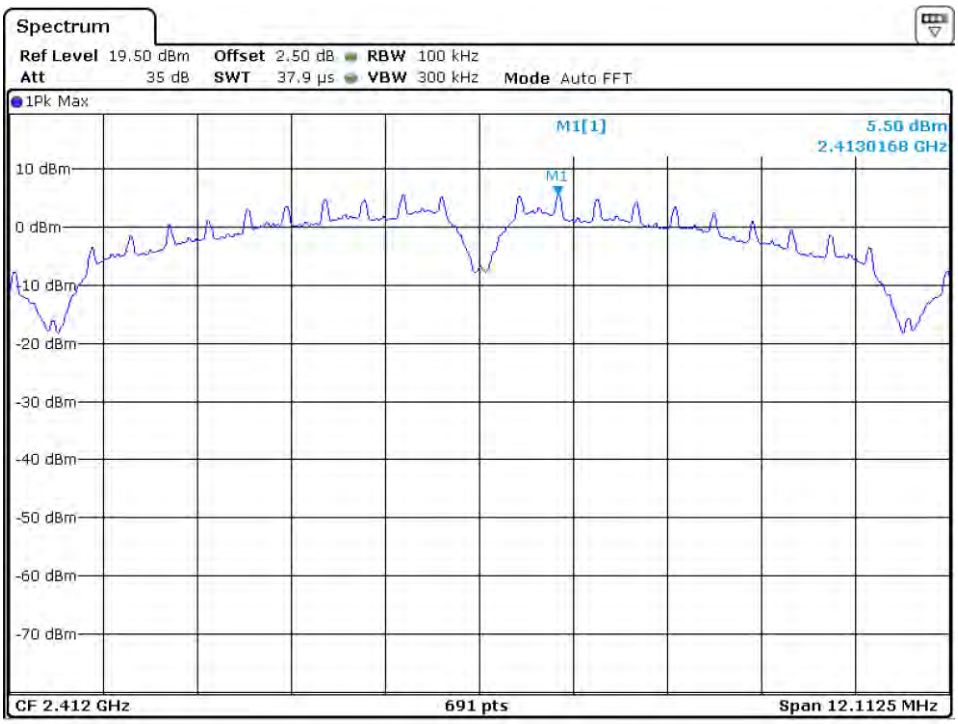
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	5.50
2437	6.26
2462	5.52

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	2.06
2437	2.61
2462	2.15

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	3.11
2437	3.21
2462	3.87

The test plots are attached as below.

802.11b



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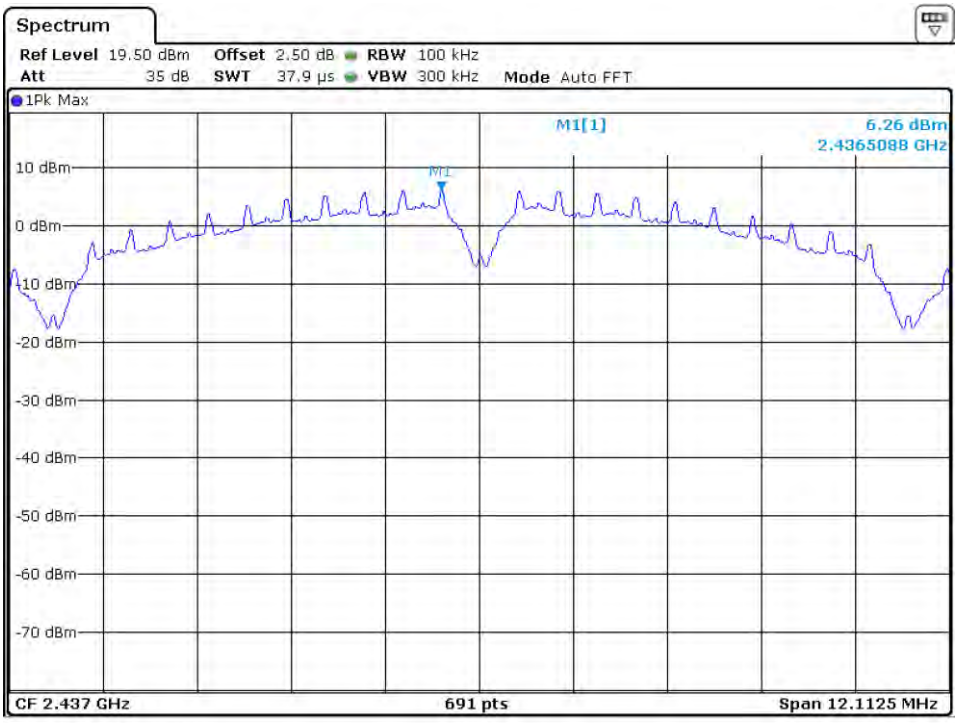

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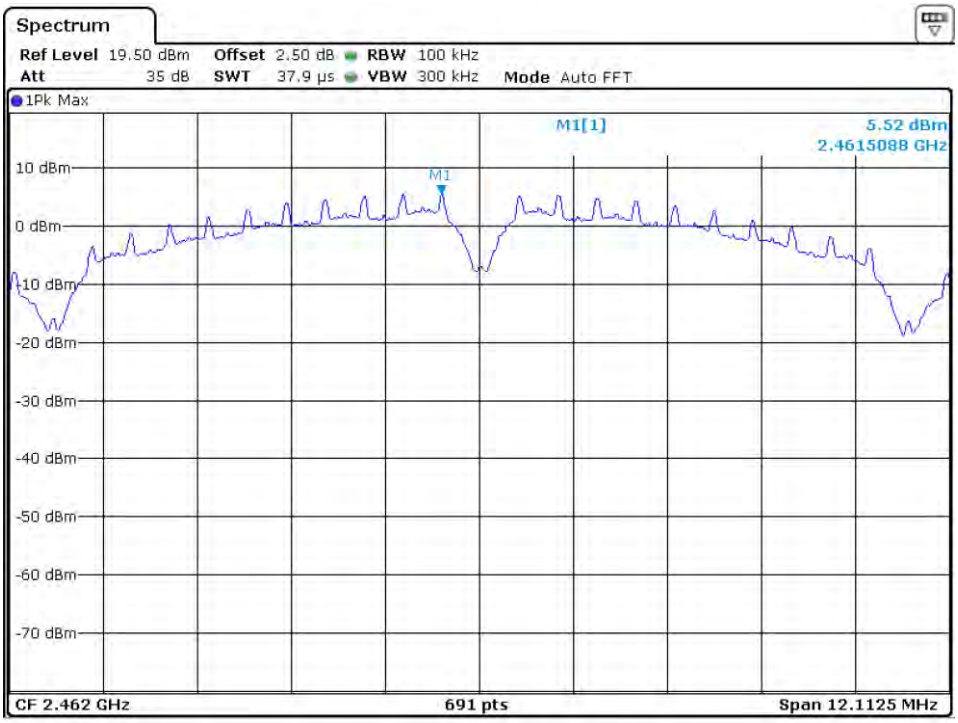
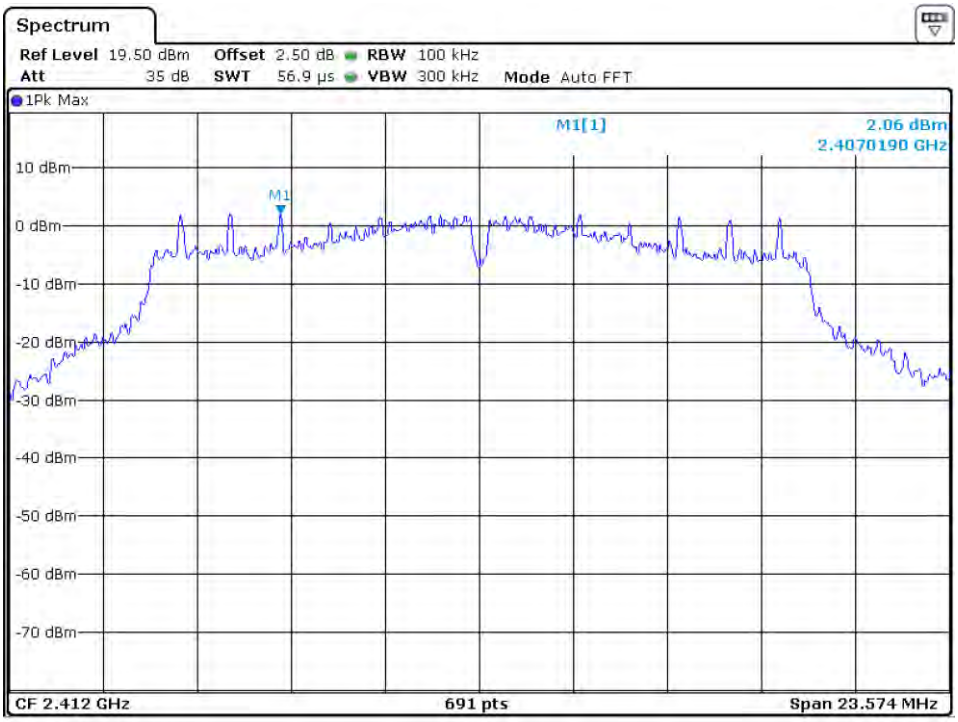

Spectrum
Ref Level 19.50 dBm
Offset 2.50 dB
RBW 100 kHz
Att 35 dB
SWT 37.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
M1[1]
5.52 dBm
2.4615088 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 12.1125 MHz
Date: 15.OCT.2019 13:58:43

802.11g



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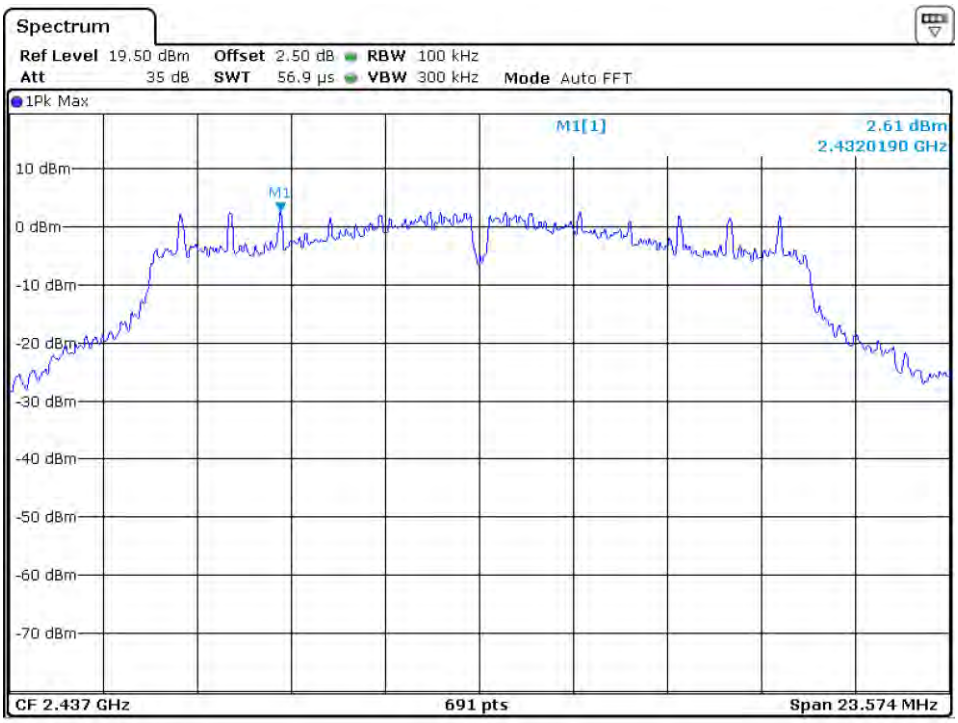

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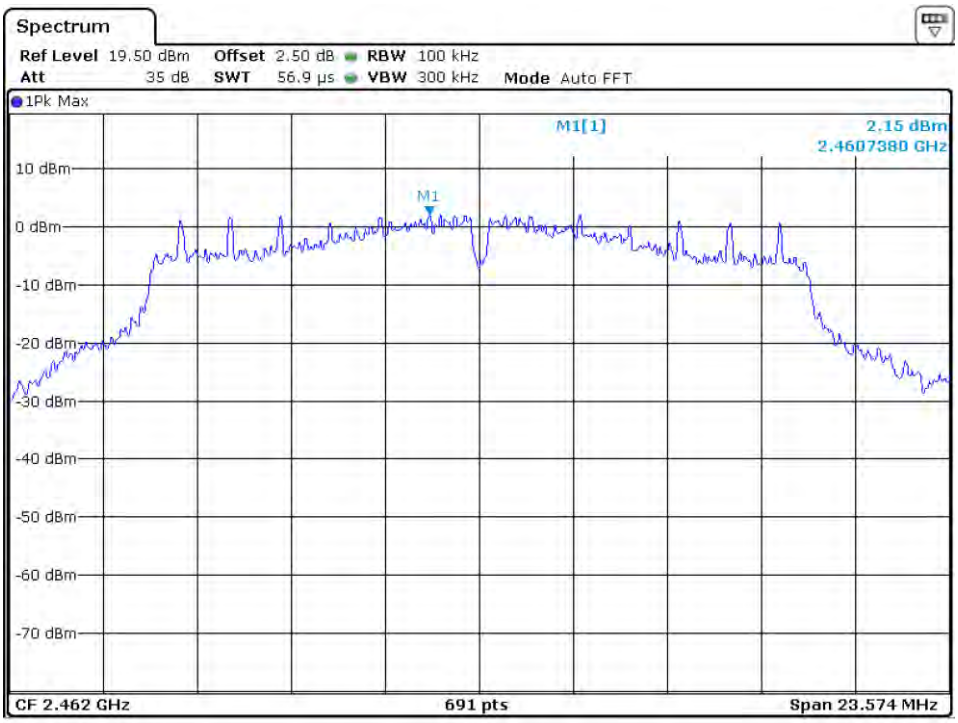
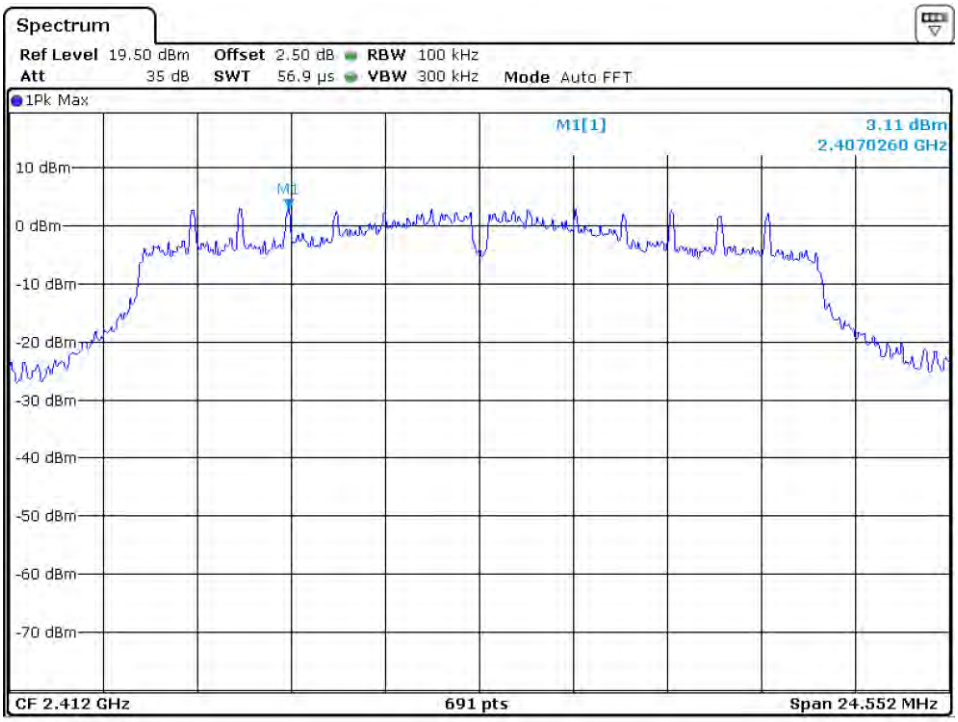

Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.15 dBm
2.4607380 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 23.574 MHz
Date: 15.OCT.2019 14:20:17

802.11n-HT20



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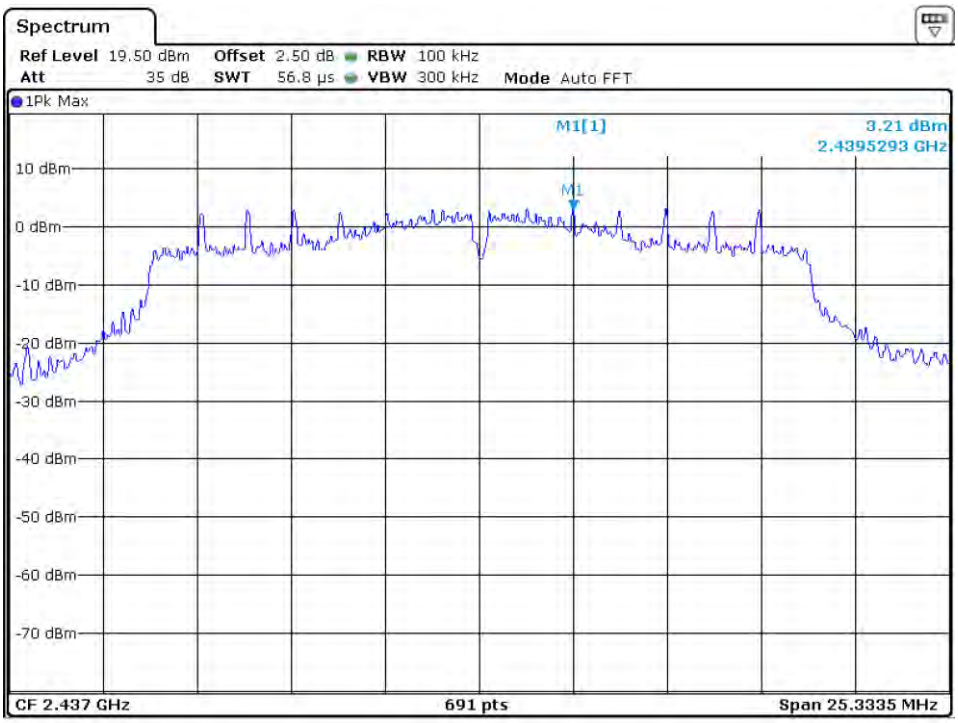
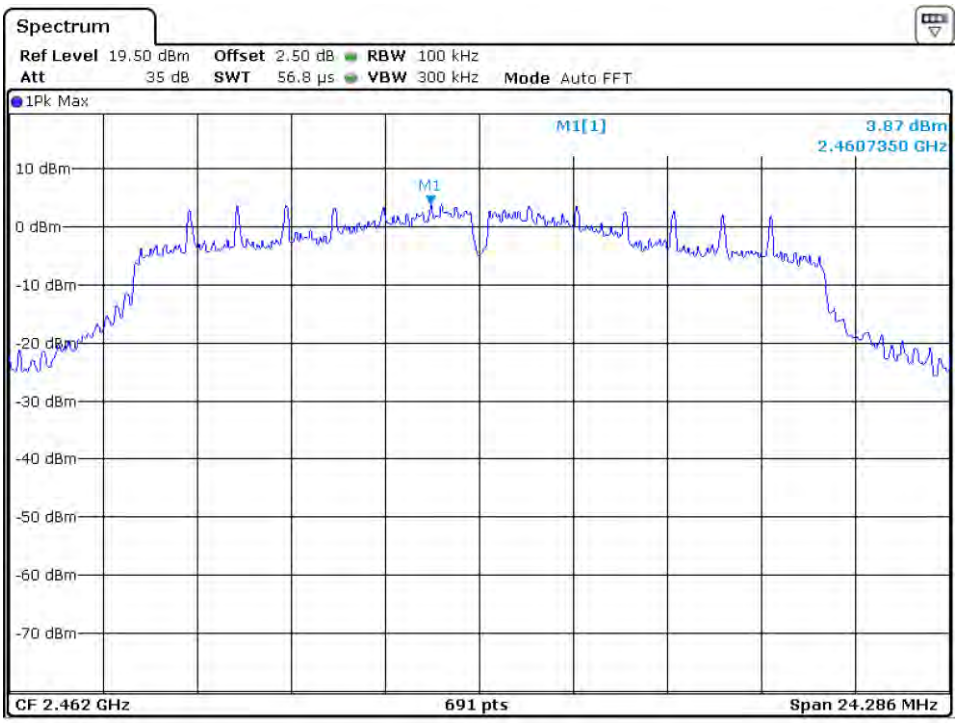


Date: 15.OCT.2019 14:51:48


Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 56.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 3.87 dBm
2.4607350 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 24.286 MHz
Date: 15.OCT.2019 14:57:53

Operating Mode: Simultaneous transmission (BT+2.4G WIFI)

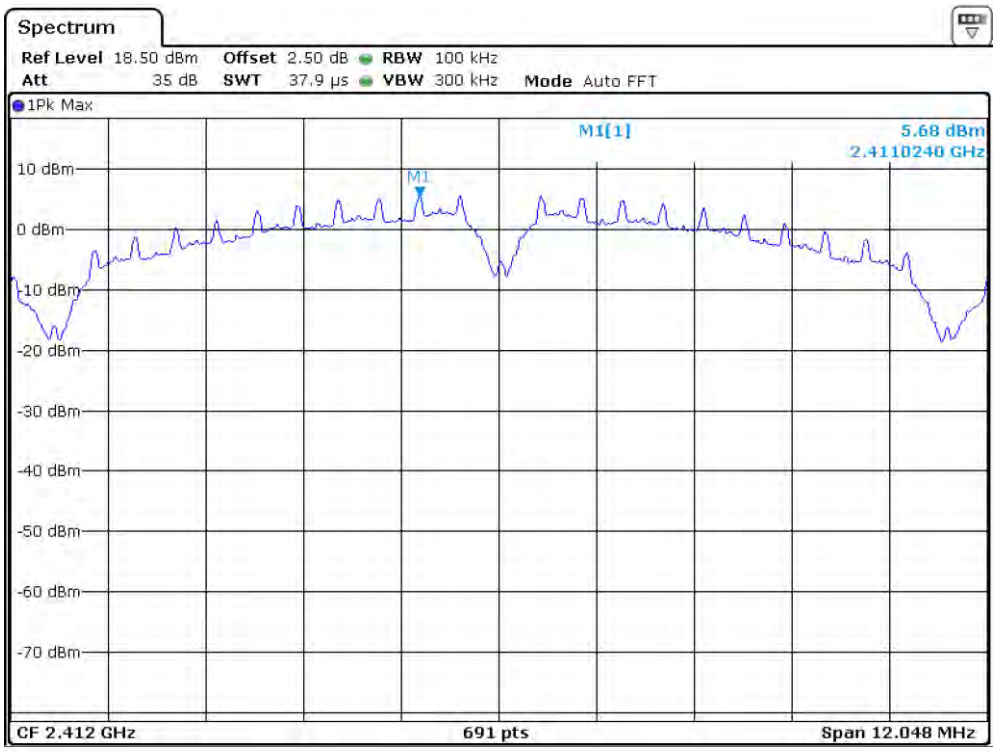
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	5.68
2437	5.80
2462	5.45

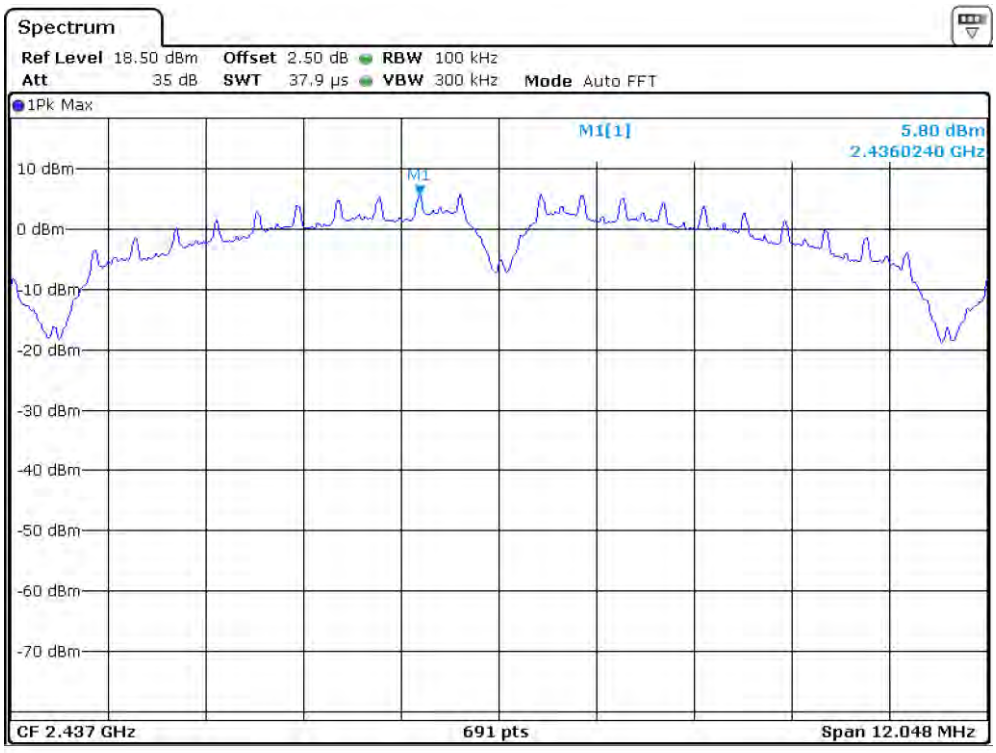
IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	1.95
2437	2.44
2462	2.57

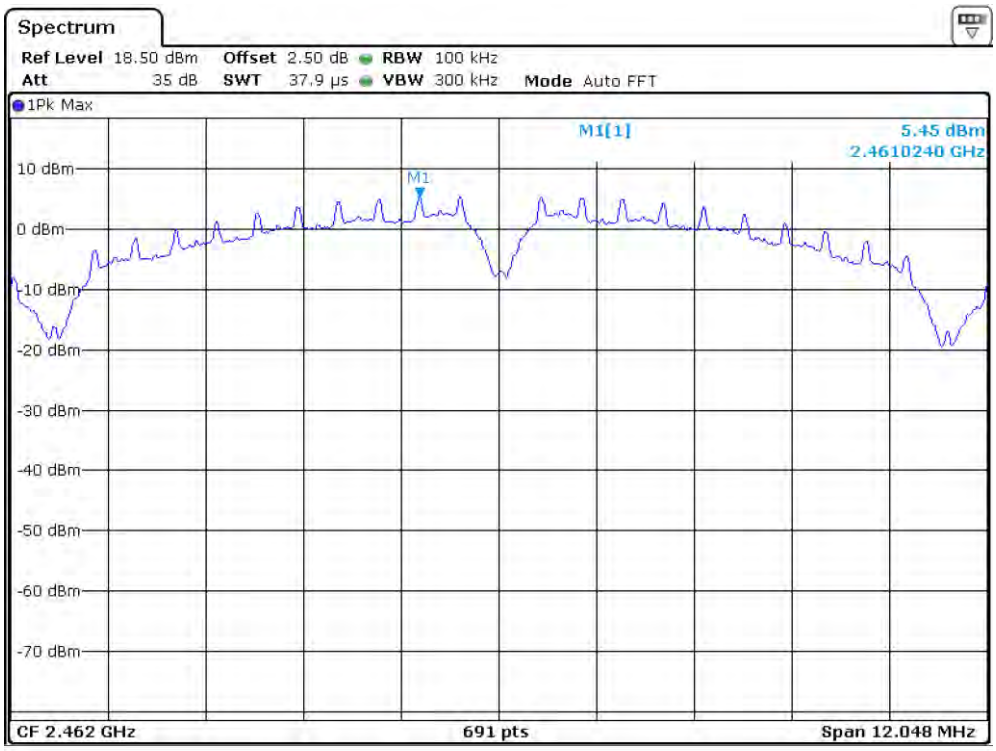
IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	3.29
2437	3.38
2462	3.11

The test plots are attached as below.

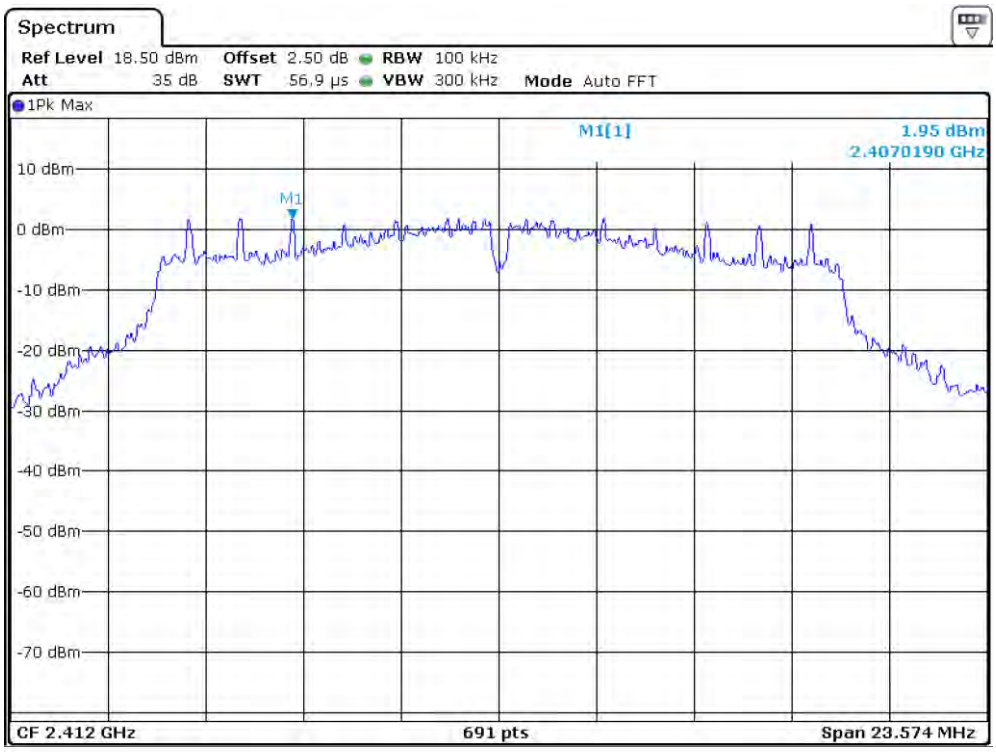
802.11b

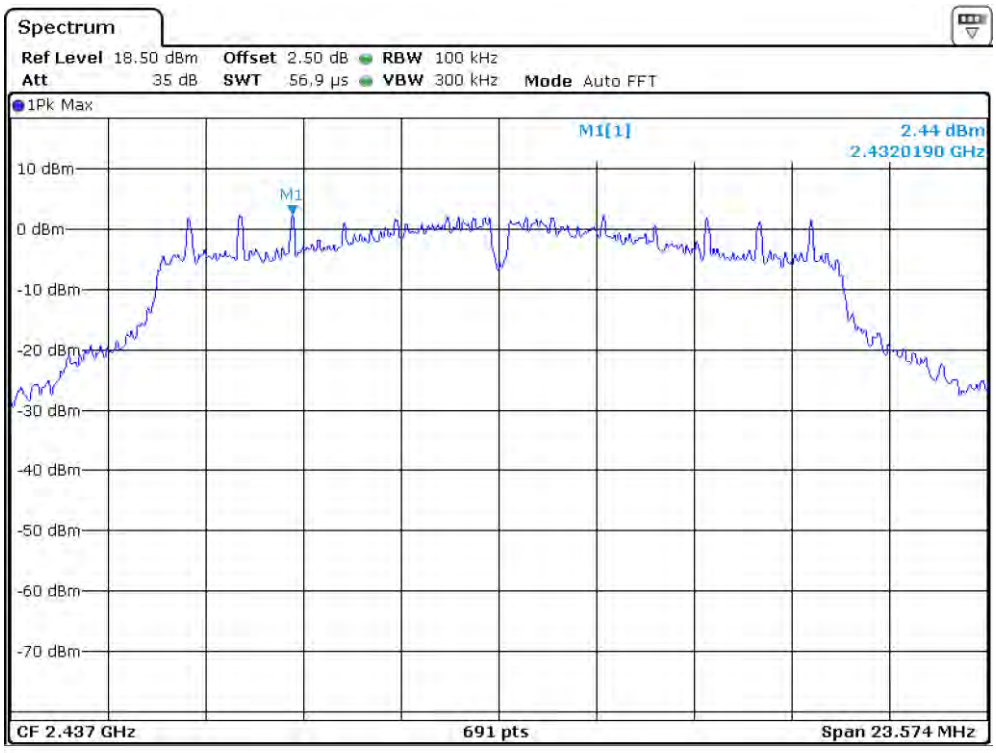

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 5.68 dBm
2.4110240 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.412 GHz
691 pts
Span 12.048 MHz

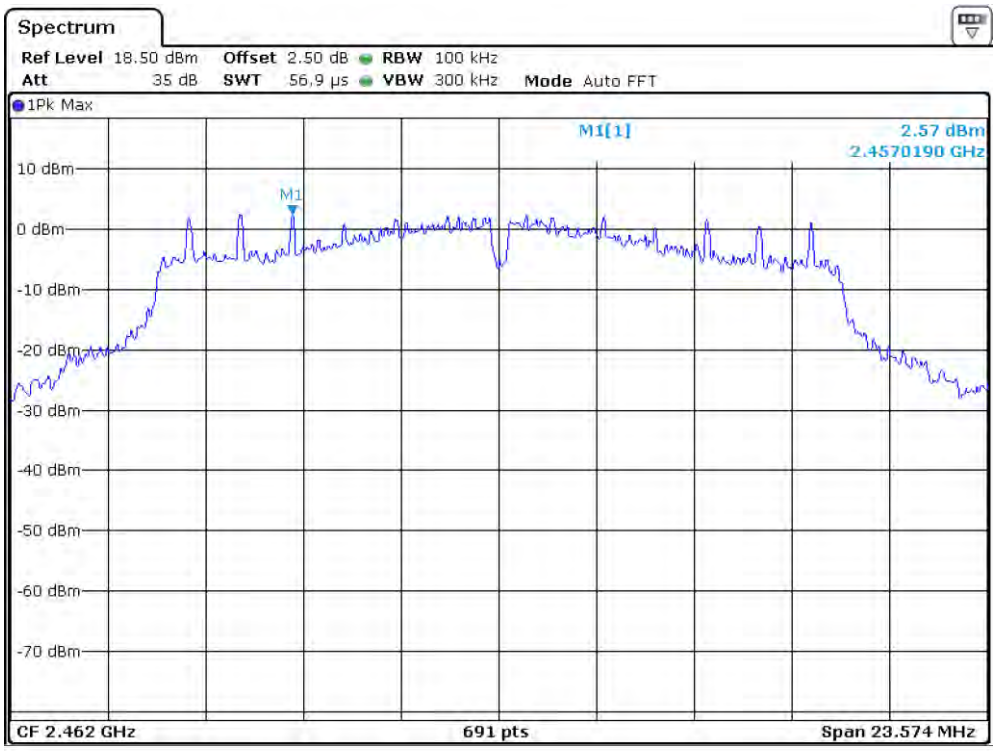

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 5.80 dBm
2.4360240 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 12.048 MHz


Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 5.45 dBm
2.4610240 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 12.048 MHz

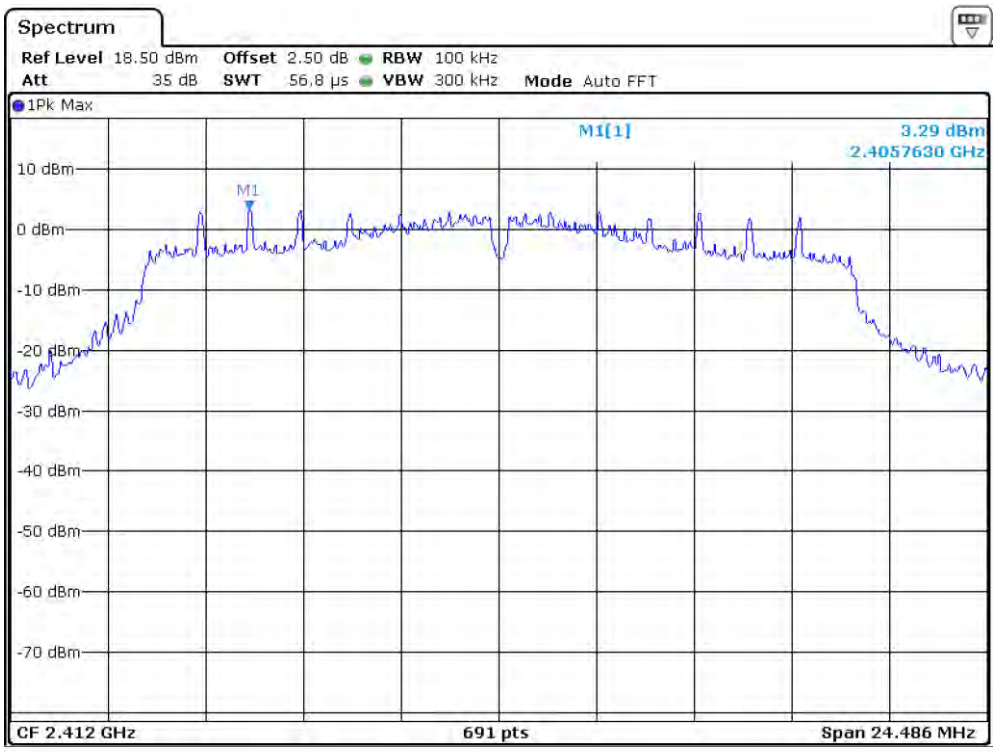
802.11g

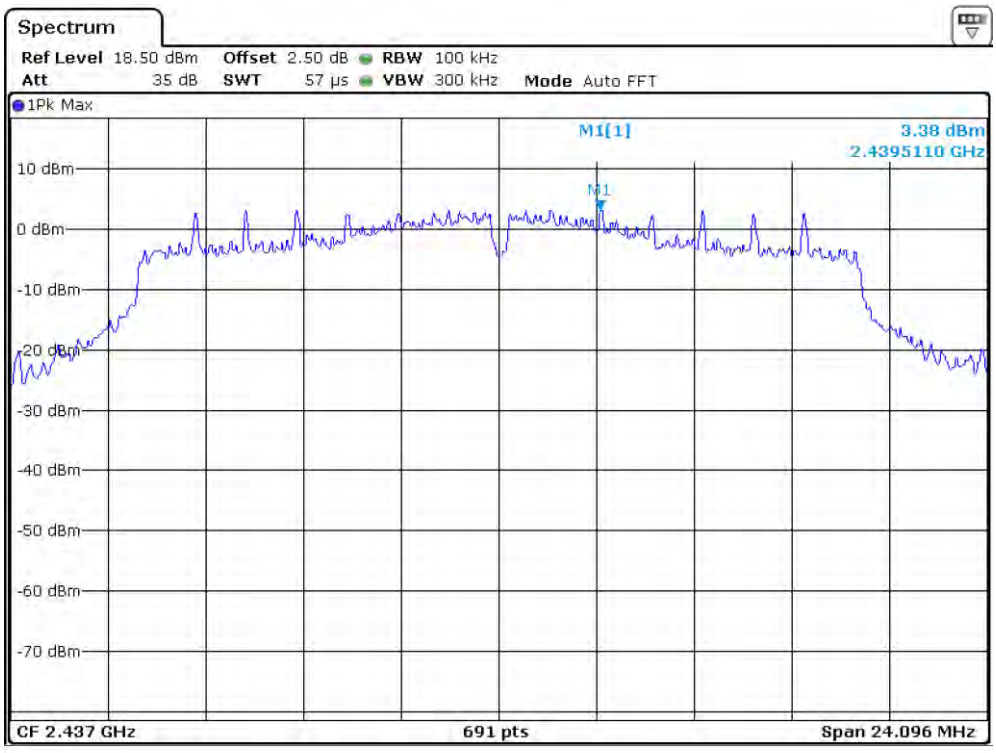

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 1.95 dBm
2.4070190 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.412 GHz
691 pts
Span 23.574 MHz

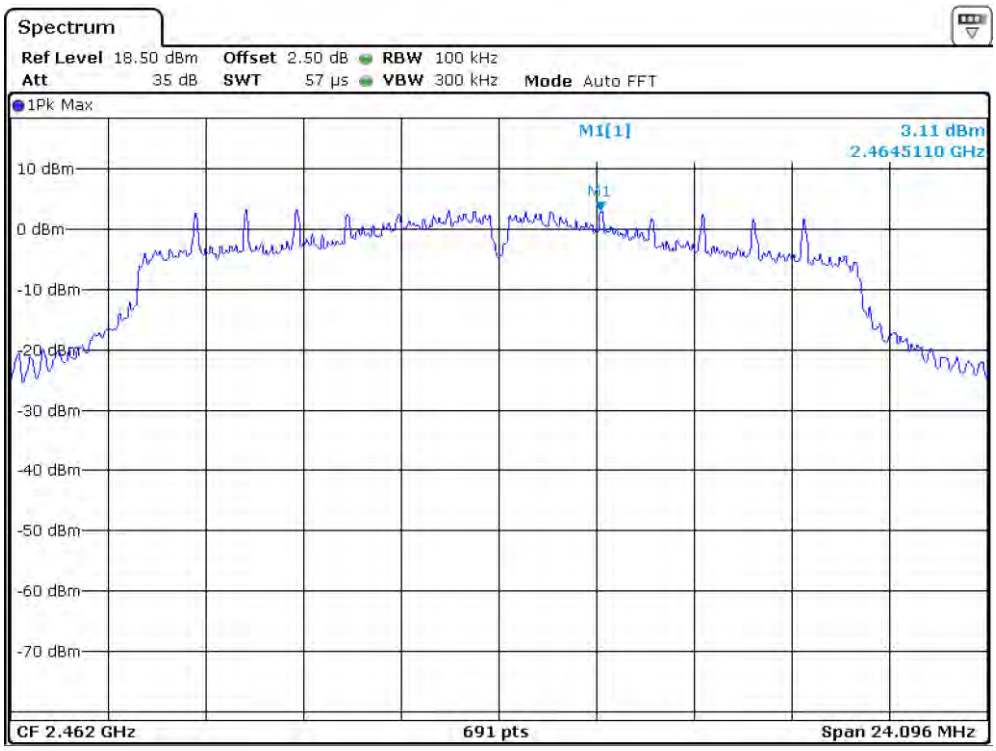

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.44 dBm
2.4320190 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.437 GHz
691 pts
Span 23.574 MHz


Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.57 dBm
2.4570190 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.462 GHz
691 pts
Span 23.574 MHz

802.11n-HT20


Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 56.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 3.29 dBm
2.4057630 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.412 GHz
691 pts
Span 24.486 MHz


Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 57 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 3.38 dBm
2.4395110 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 24.096 MHz


Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 57 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 3.11 dBm
2.4645110 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.462 GHz
691 pts
Span 24.096 MHz

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. The Measurement Procedure was set according to the FCC KDB 558074 D01 v05r02.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for 802.11b and 6Mbps for 802.11g and 6Mbps for 802.11n-HT20.

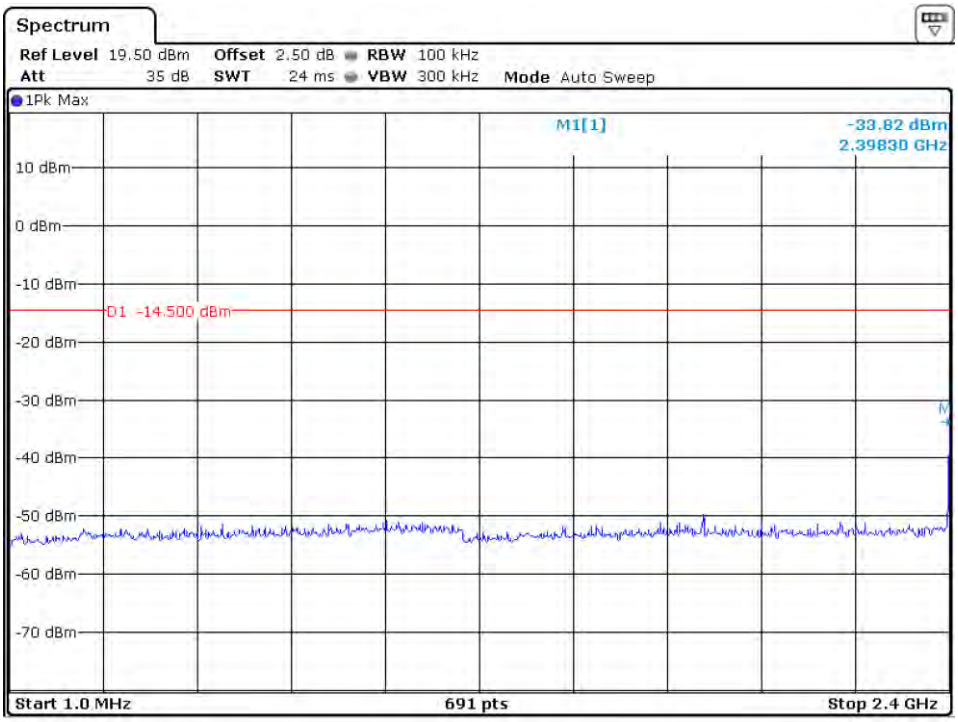
The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The test plots are attached as below.

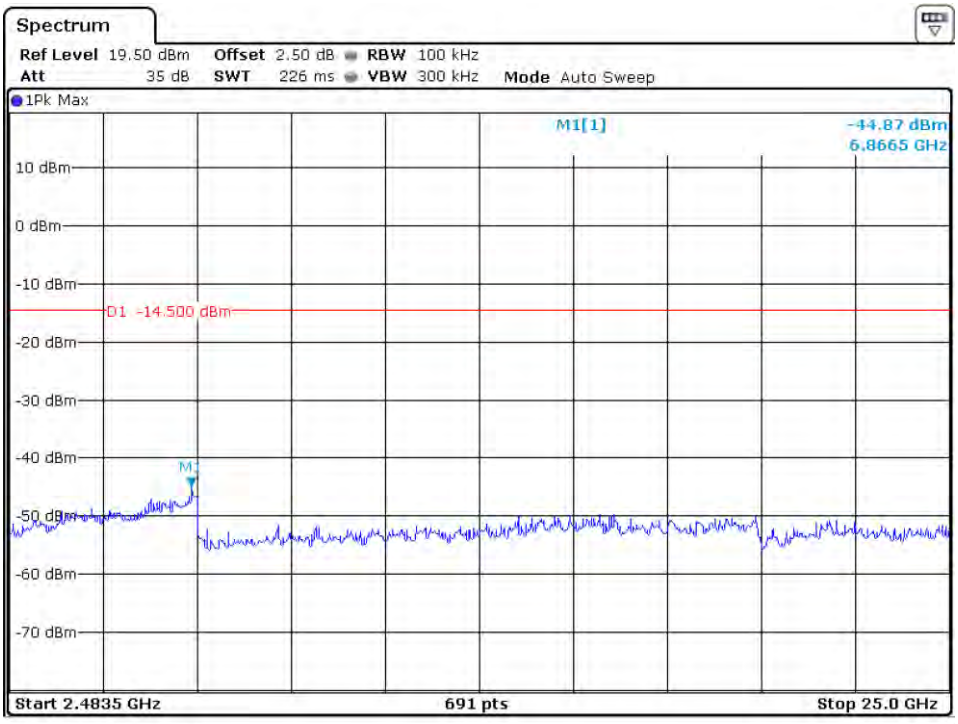
4.4.1 Test Result

Operating Mode: Standalone transmission (2.4G WIFI)

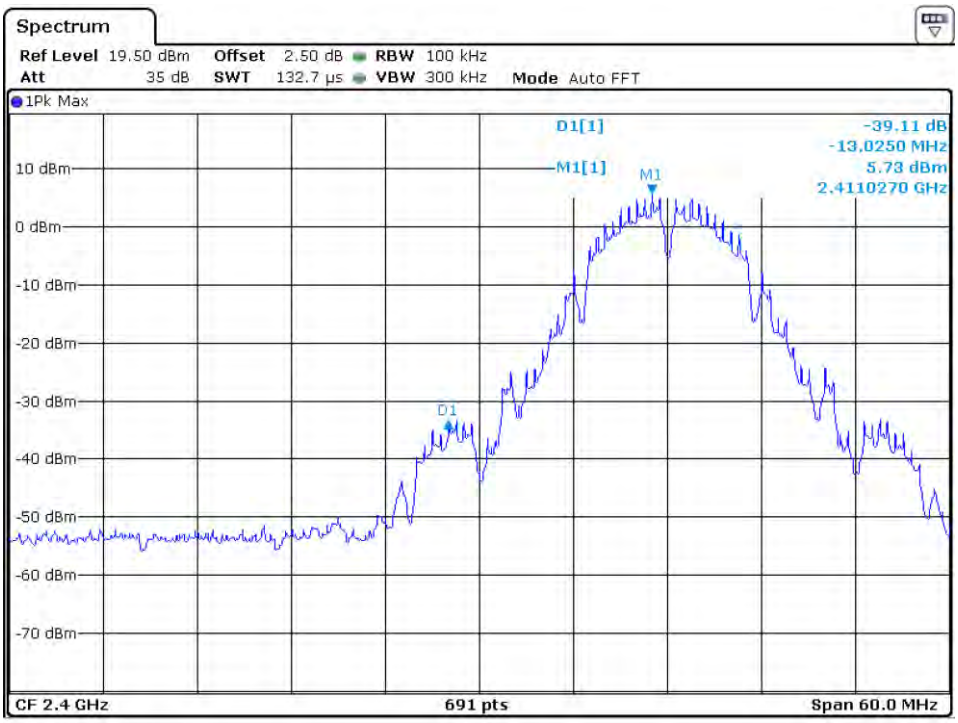
802.11b
Channel 01 (2412MHz) Reference Level: 5.5dBm



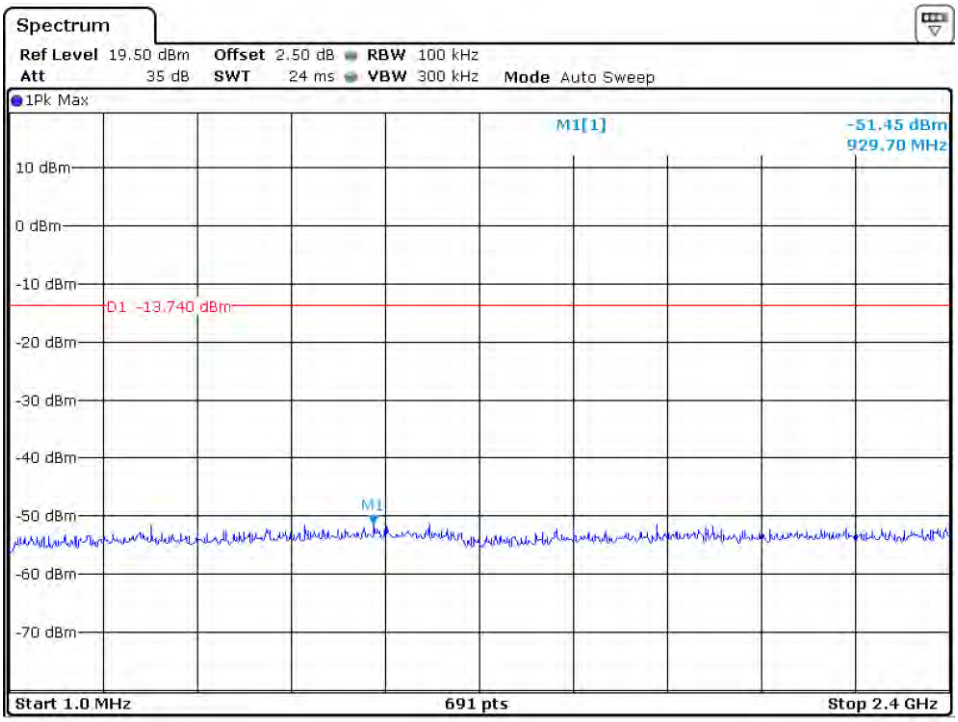
Date: 15.OCT.2019 13:49:46



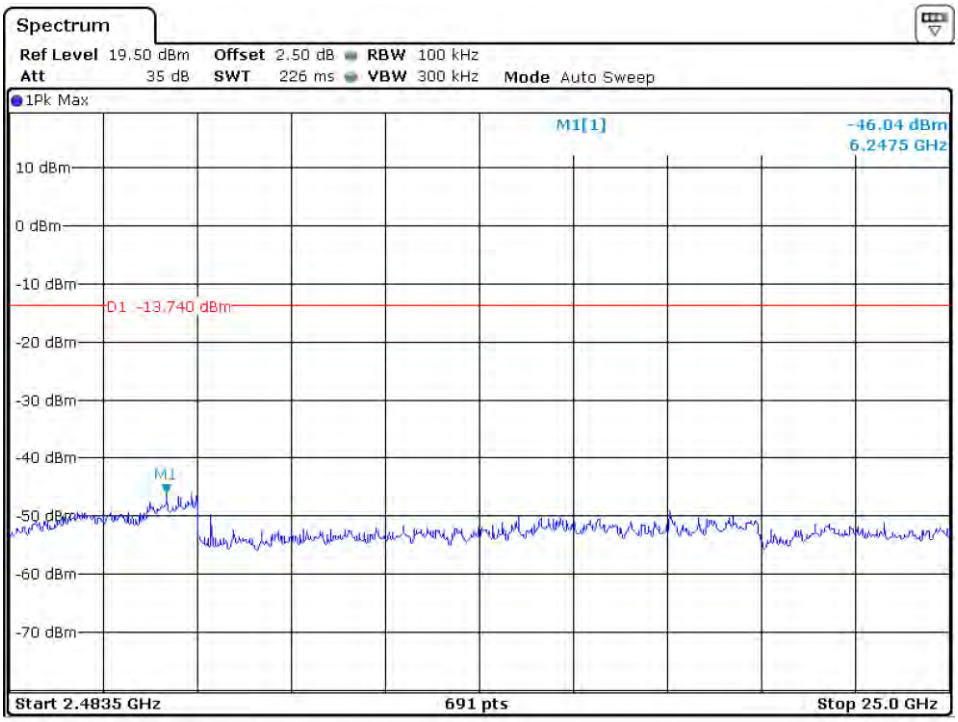
Date: 15.OCT.2019 13:50:23


Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -39.11 dB
-13.0250 MHz
M1[1] 5.73 dBm
2.4110270 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
D1
M1
CF 2.4 GHz
691 pts
Span 60.0 MHz
Date: 15.OCT.2019 13:50:54

Channel 06 (2437MHz) Reference Level: 6.26dBm

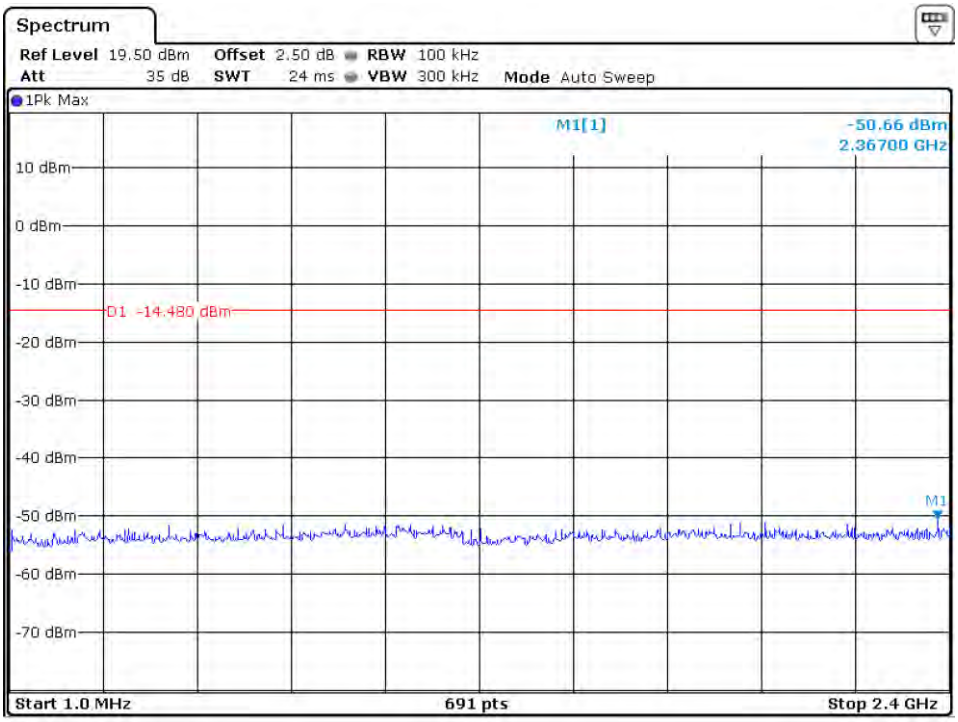


Date: 15.OCT.2019 13:55:30

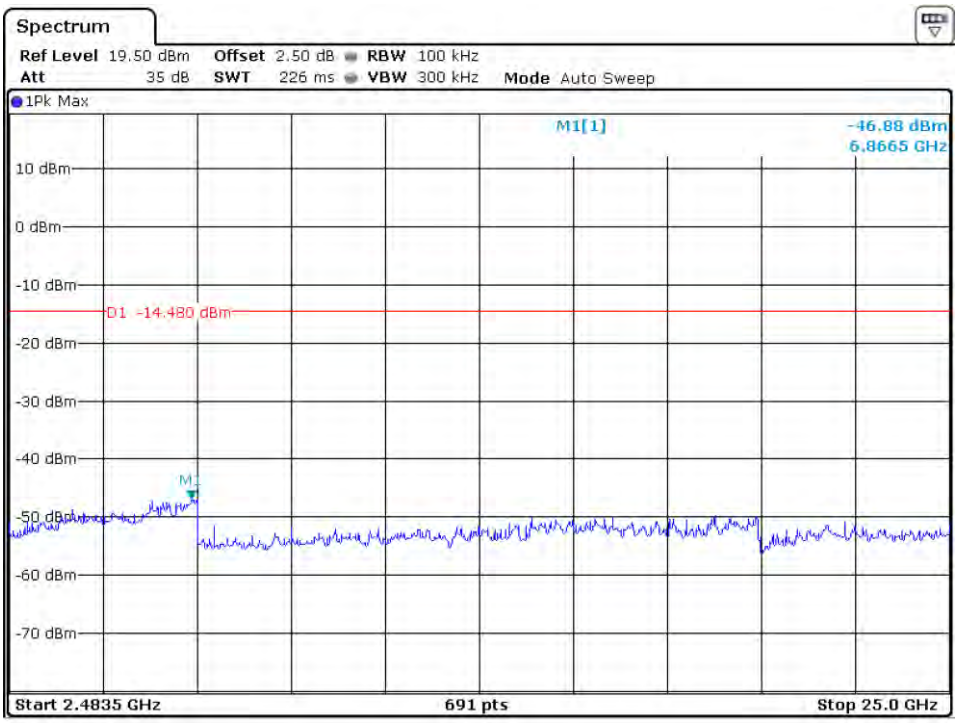


Date: 15.OCT.2019 13:55:56

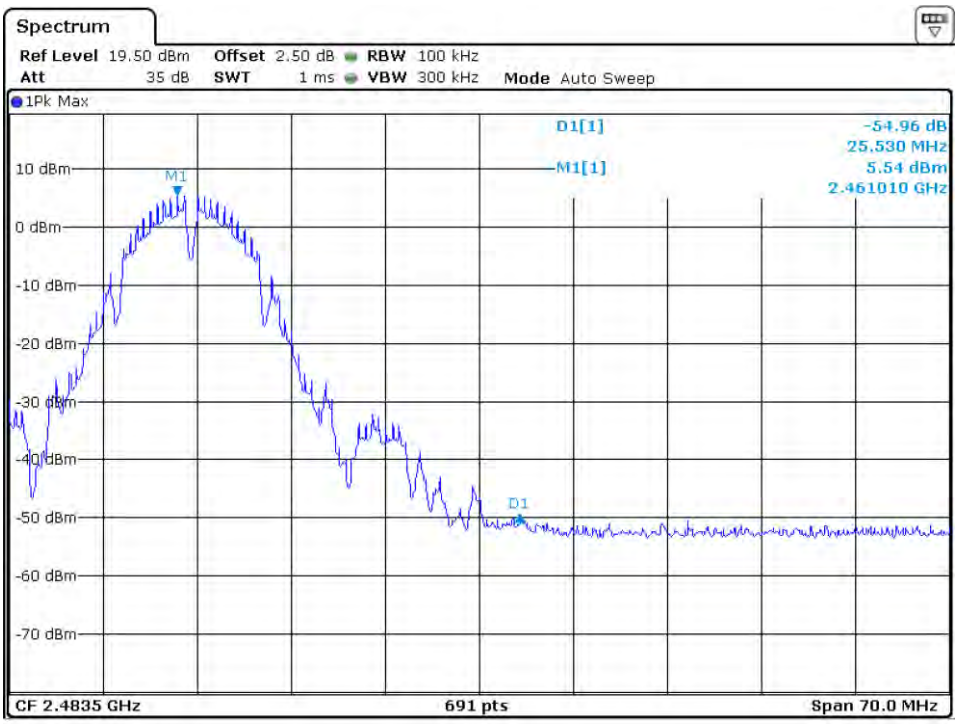
Channel 11 (2462MHz) Reference Level: 5.52dBm



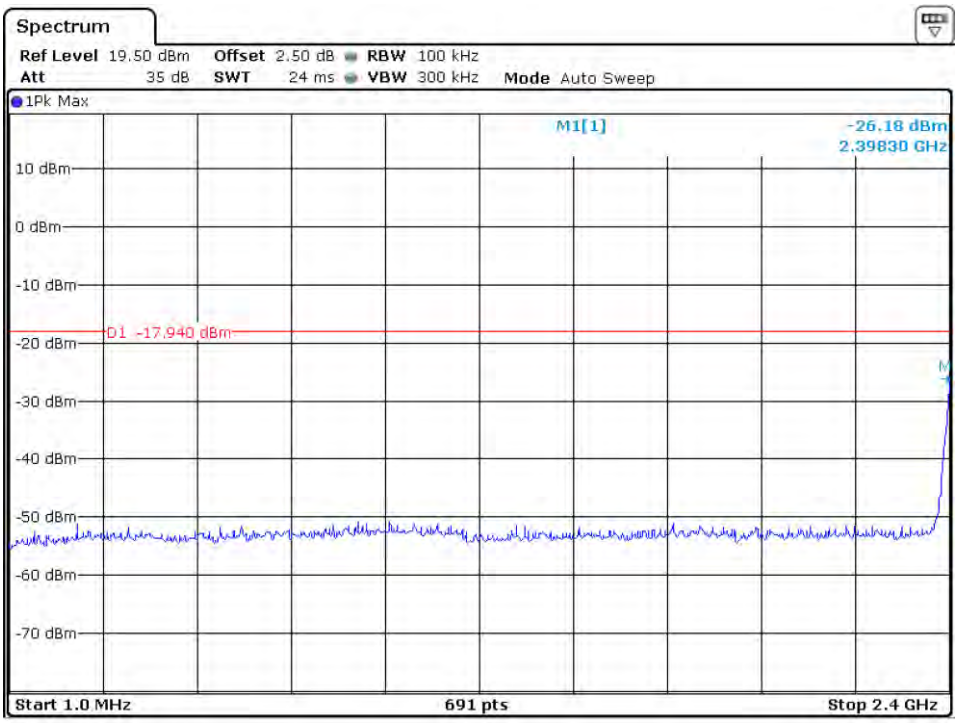
Date: 15.OCT.2019 13:59:27



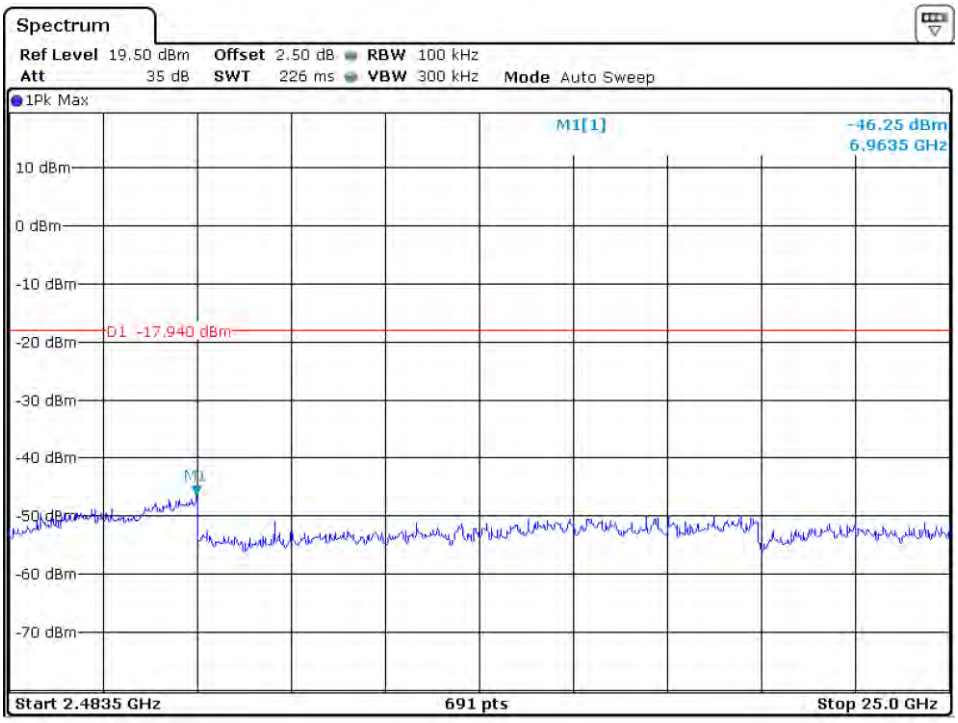
Date: 15.OCT.2019 13:59:55


Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -54.96 dB
25.530 MHz
M1[1] 5.54 dBm
2.461010 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.4835 GHz
691 pts
Span 70.0 MHz
Date: 15.OCT.2019 14:00:31

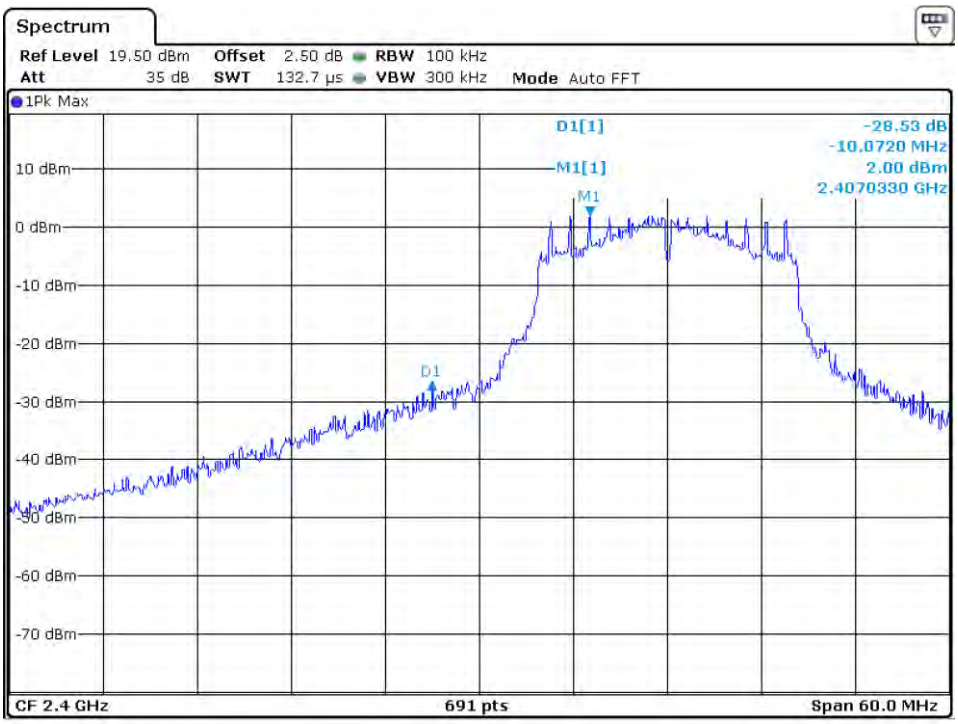
802.11g
Channel 01 (2412MHz) Reference Level: 2.06dBm



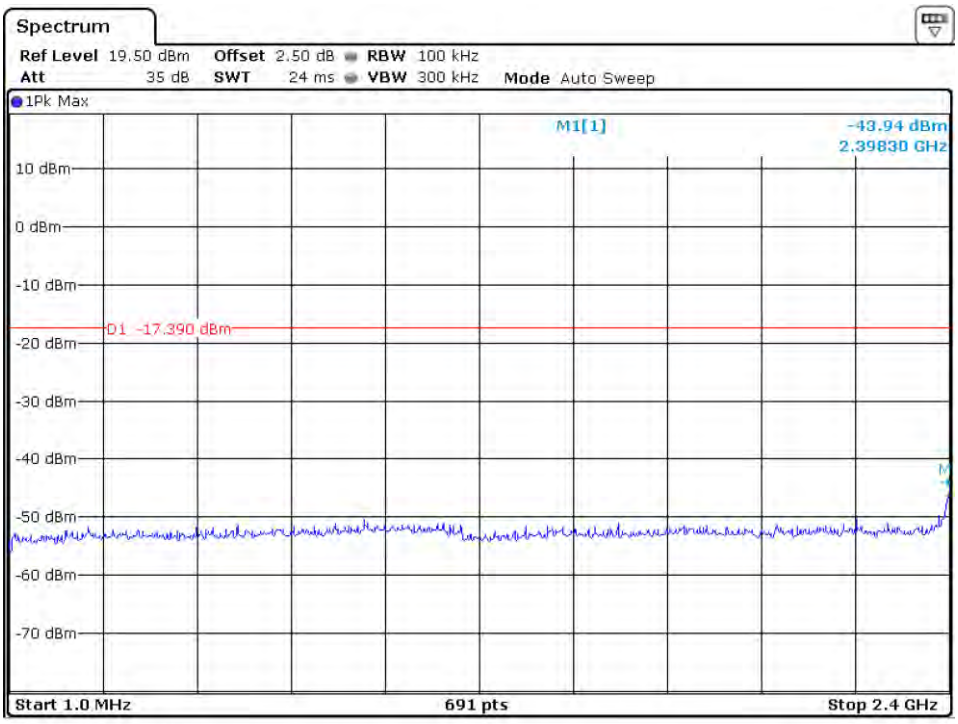
Date: 15.OCT.2019 14:06:48



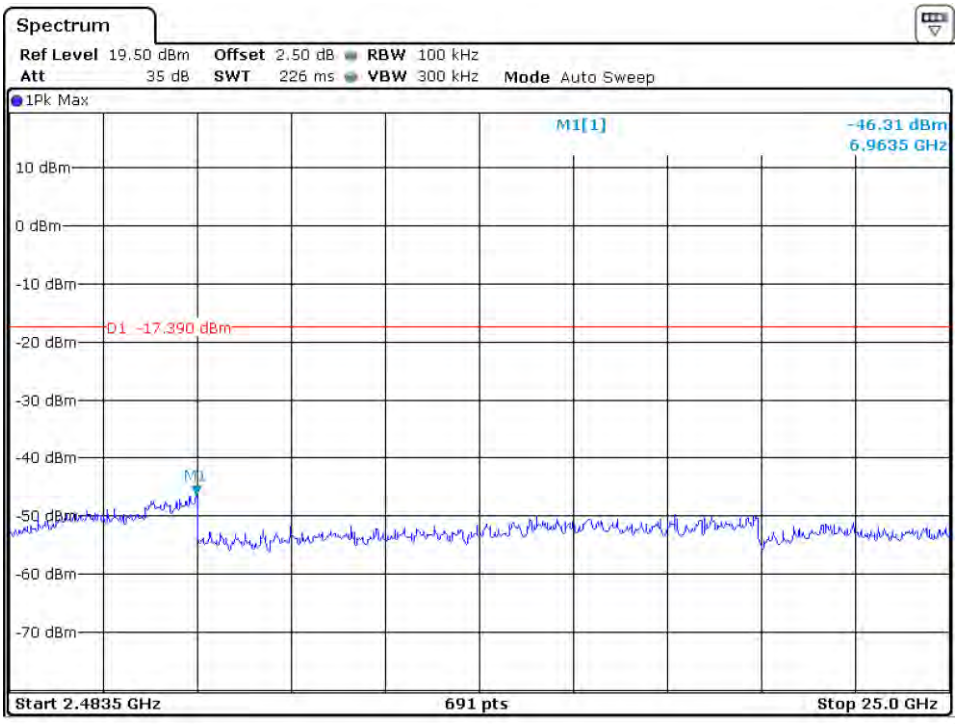
Date: 15.OCT.2019 14:07:17


Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -28.53 dB
-10.0720 MHz
M1[1] 2.00 dBm
2.4070330 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.4 GHz
691 pts
Span 60.0 MHz
Date: 15.OCT.2019 14:08:09

Channel 06 (2437MHz) Reference Level: 2.61dBm

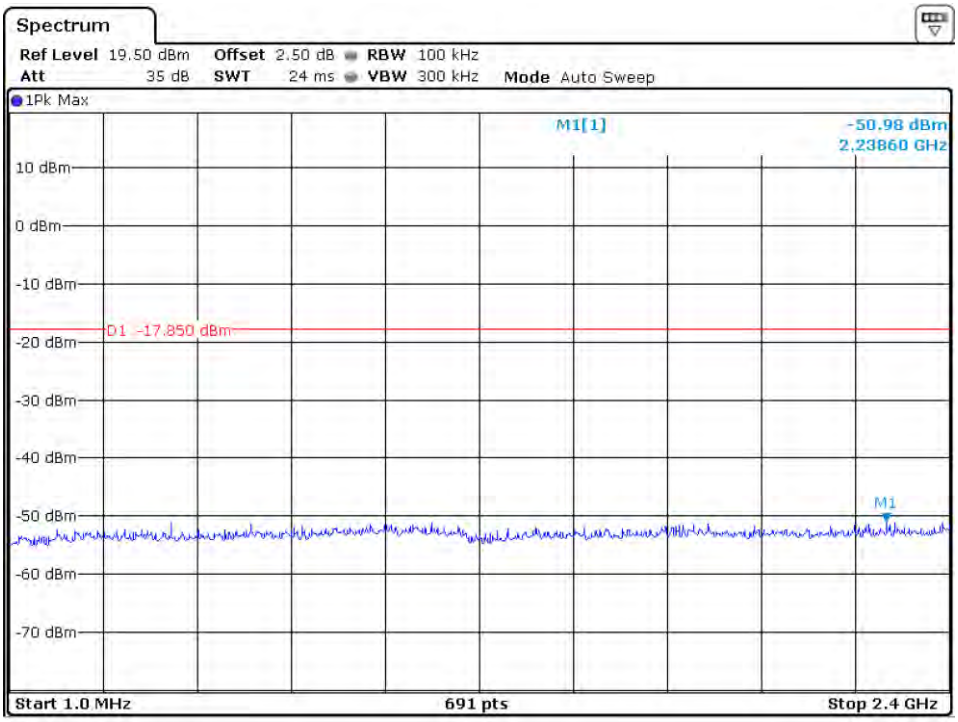


Date: 15.OCT.2019 14:15:15

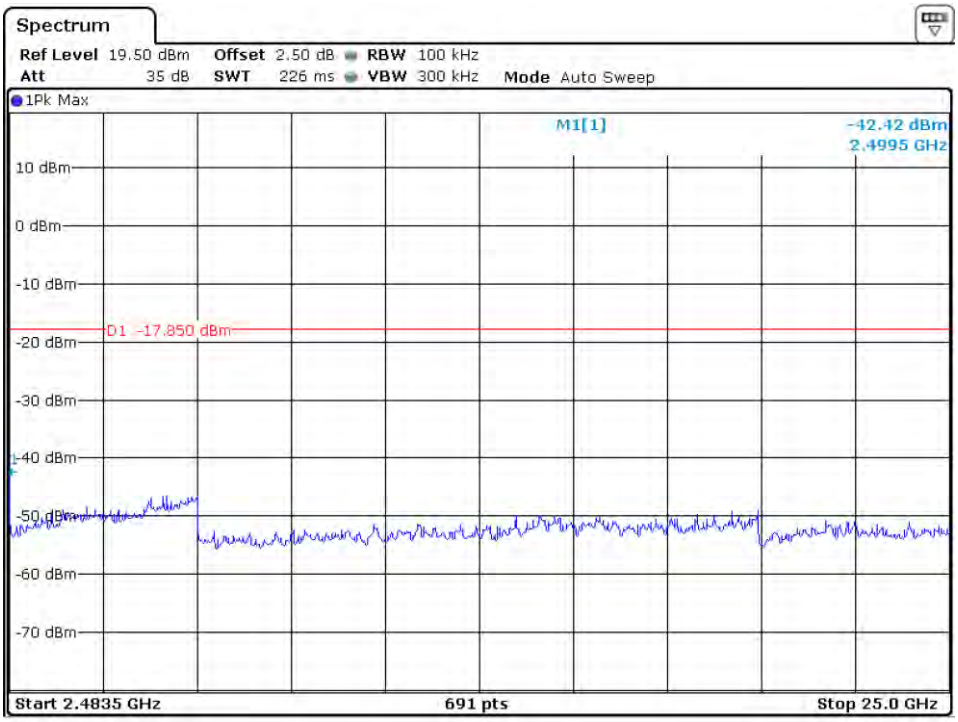


Date: 15.OCT.2019 14:15:42

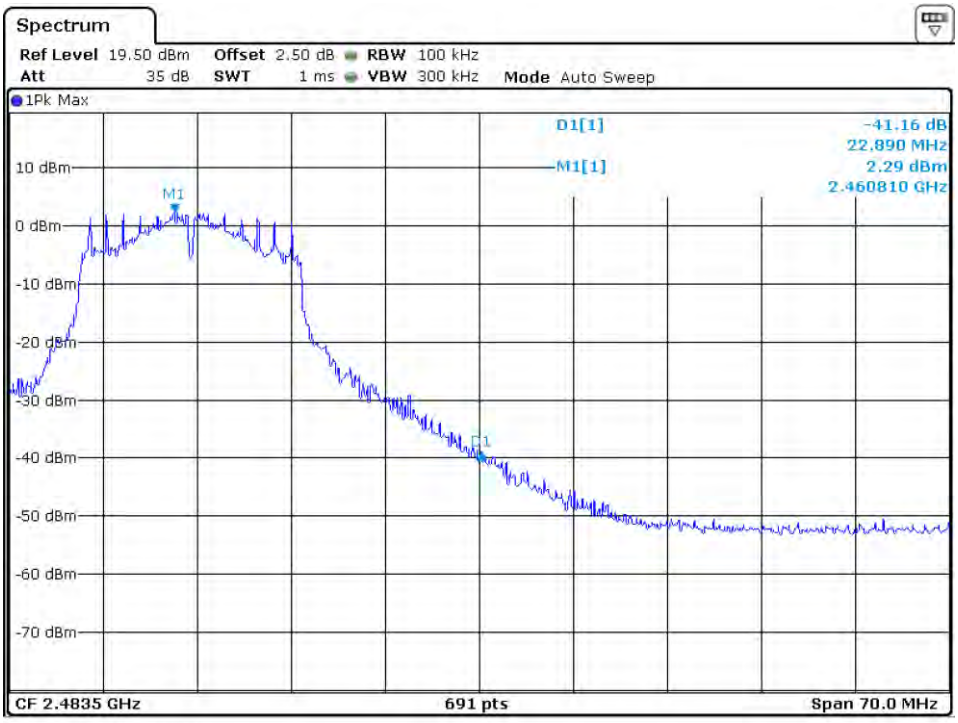
Channel 11 (2462MHz) Reference Level: 2.15dBm



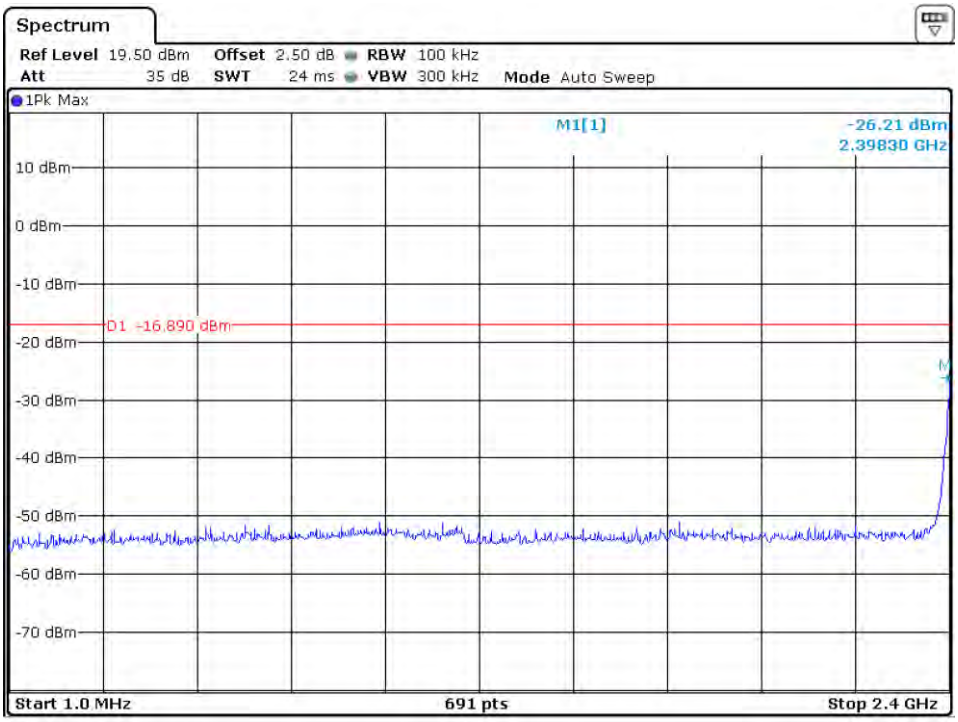
Date: 15.OCT.2019 14:21:23



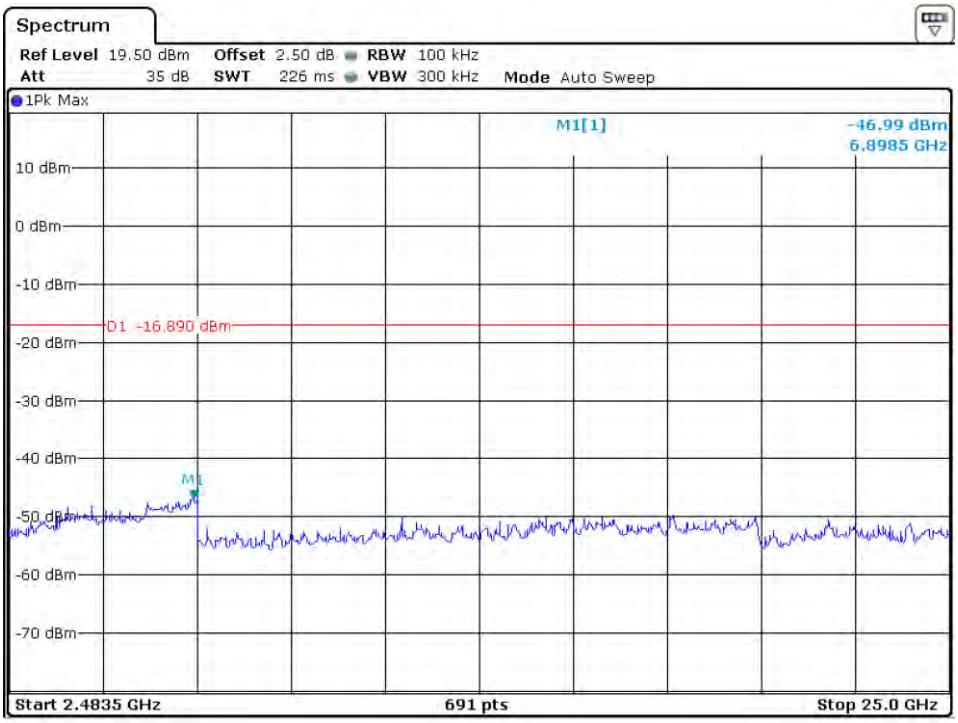
Date: 15.OCT.2019 14:22:02


Spectrum
Ref Level 19.50 dBm
Offset 2.50 dB
RBW 100 kHz
Att 35 dB
SWT 1 ms
VBW 300 kHz
Mode Auto Sweep
1Pk Max
D1[1]
-41.16 dB
22.890 MHz
M1[1]
2.29 dBm
2.460810 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.4835 GHz
691 pts
Span 70.0 MHz
Date: 15.OCT.2019 14:17:01

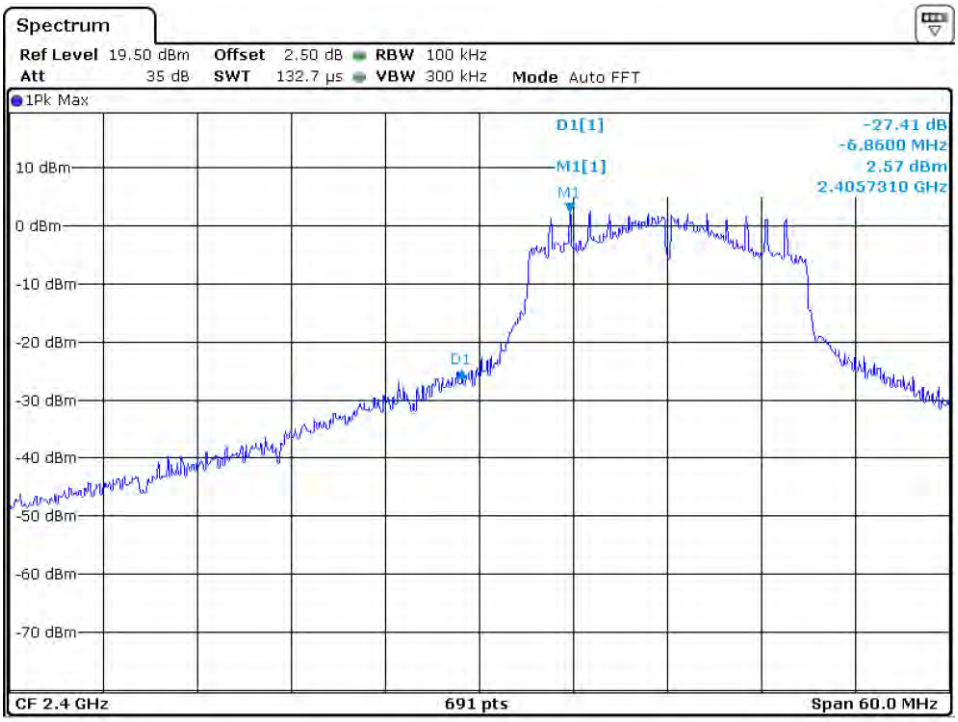
802.11n-HT20
Channel 01 (2412MHz) Reference Level: 3.11dBm



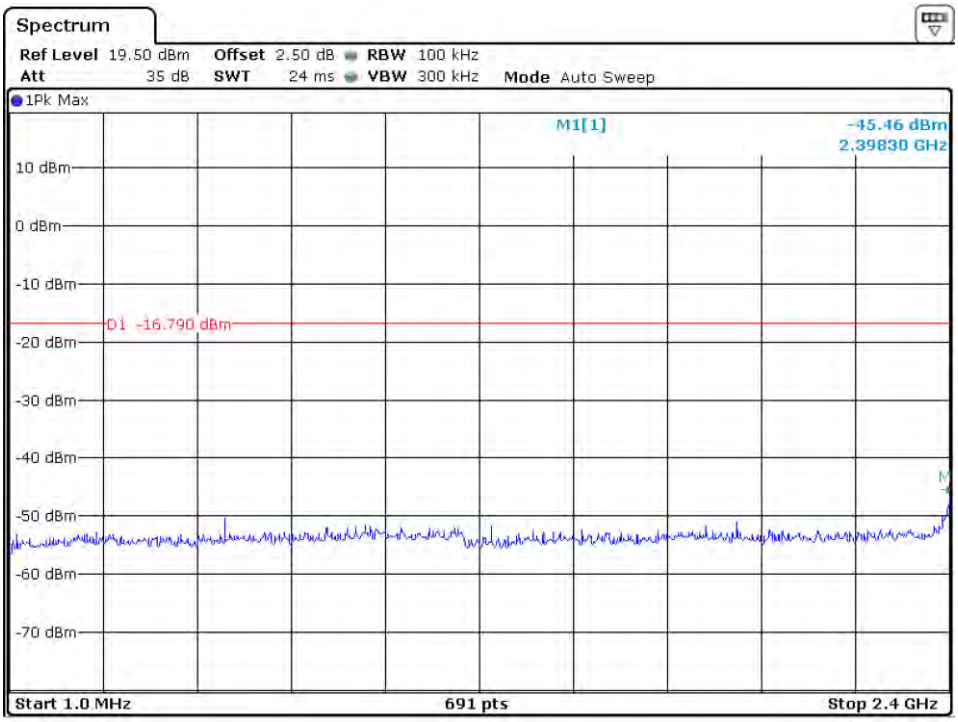
Date: 15.OCT.2019 14:37:48



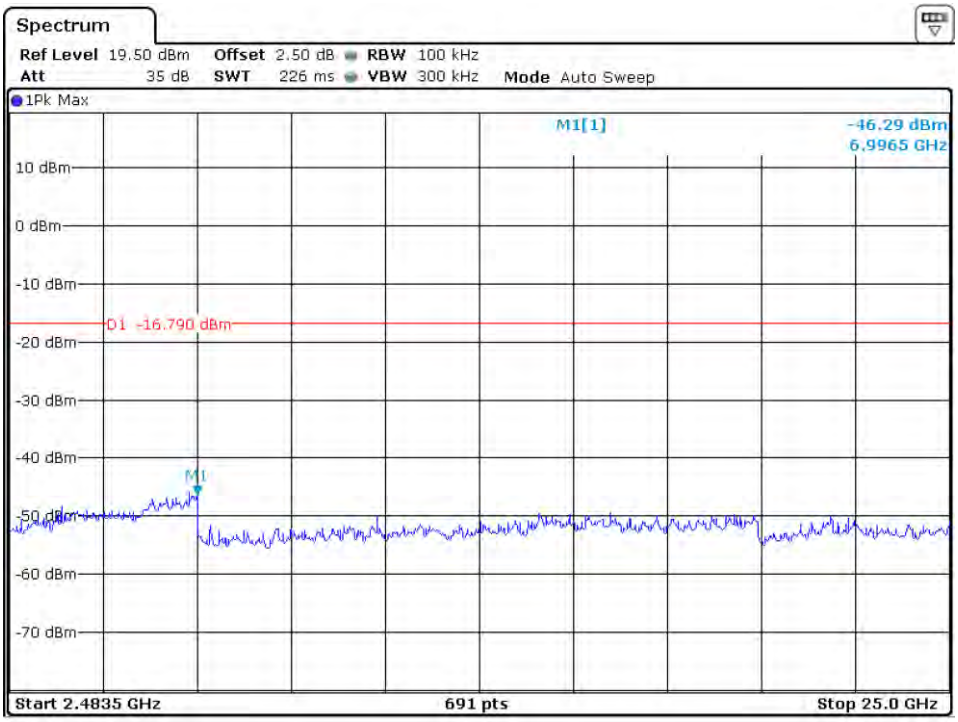
Date: 15.OCT.2019 14:38:21


Spectrum
Ref Level 19.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -27.41 dB
-6.8600 MHz
M1[1] 2.57 dBm
2.4057310 GHz
M1
D1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.4 GHz
691 pts
Span 60.0 MHz
Date: 15.OCT.2019 14:42:05

Channel 06 (2437MHz) Reference Level: 3.21dBm

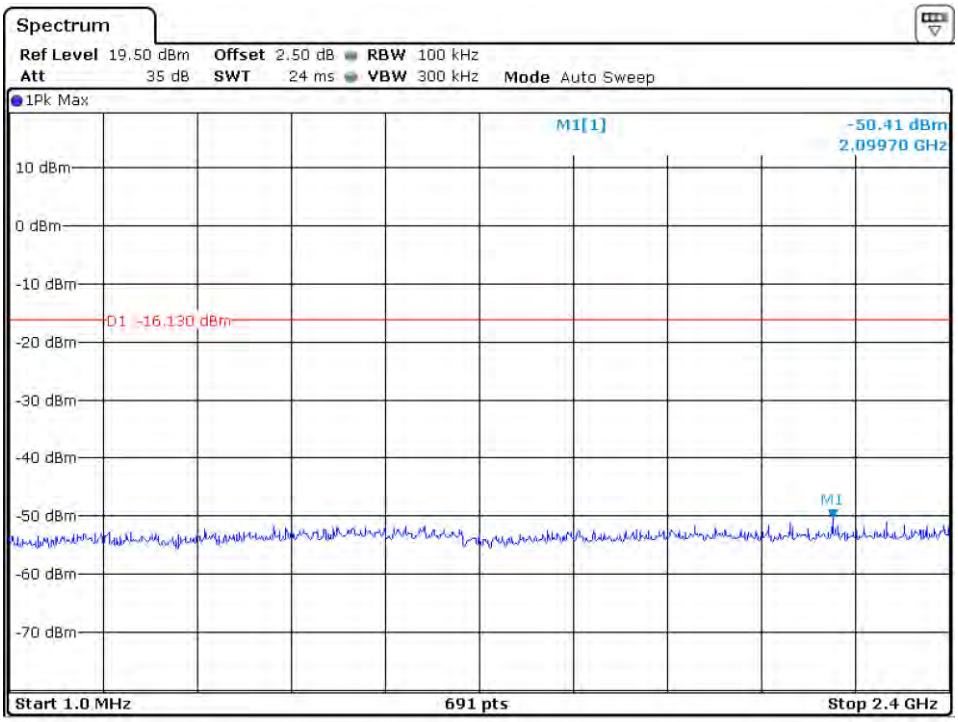


Date: 15.OCT.2019 14:52:41

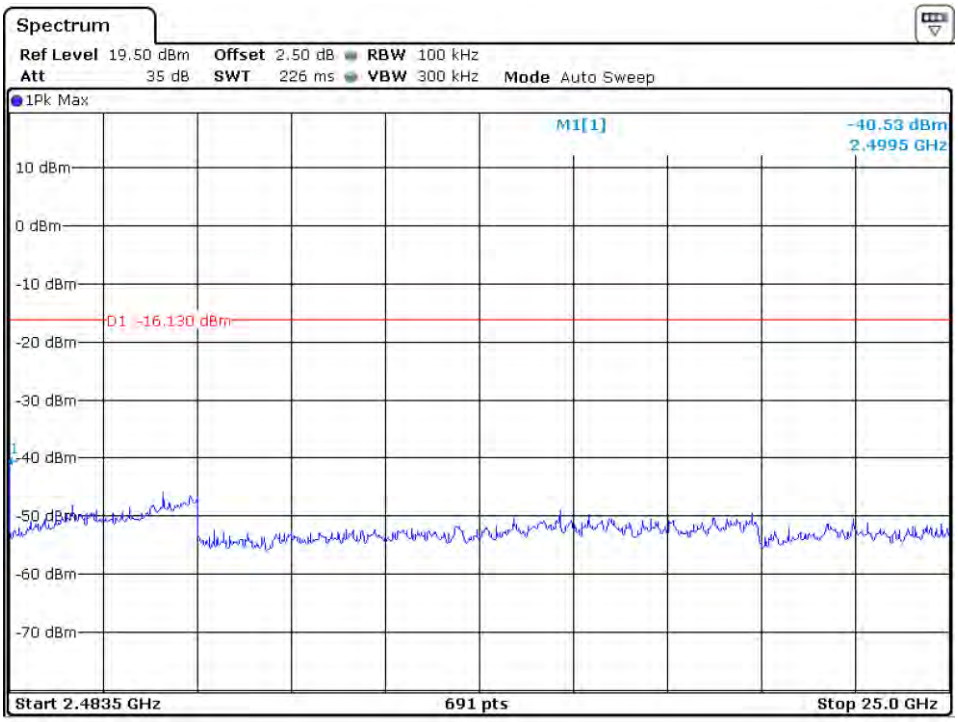


Date: 15.OCT.2019 14:53:25

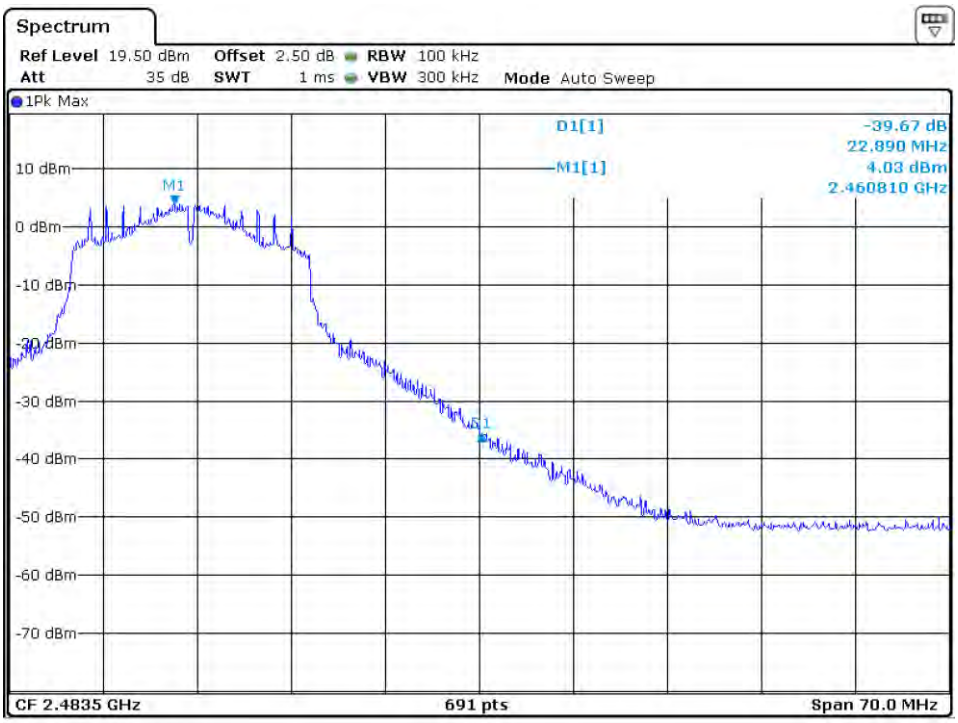
Channel 11 (2462MHz) Reference Level: 3.87dBm



Date: 15.OCT.2019 14:58:48

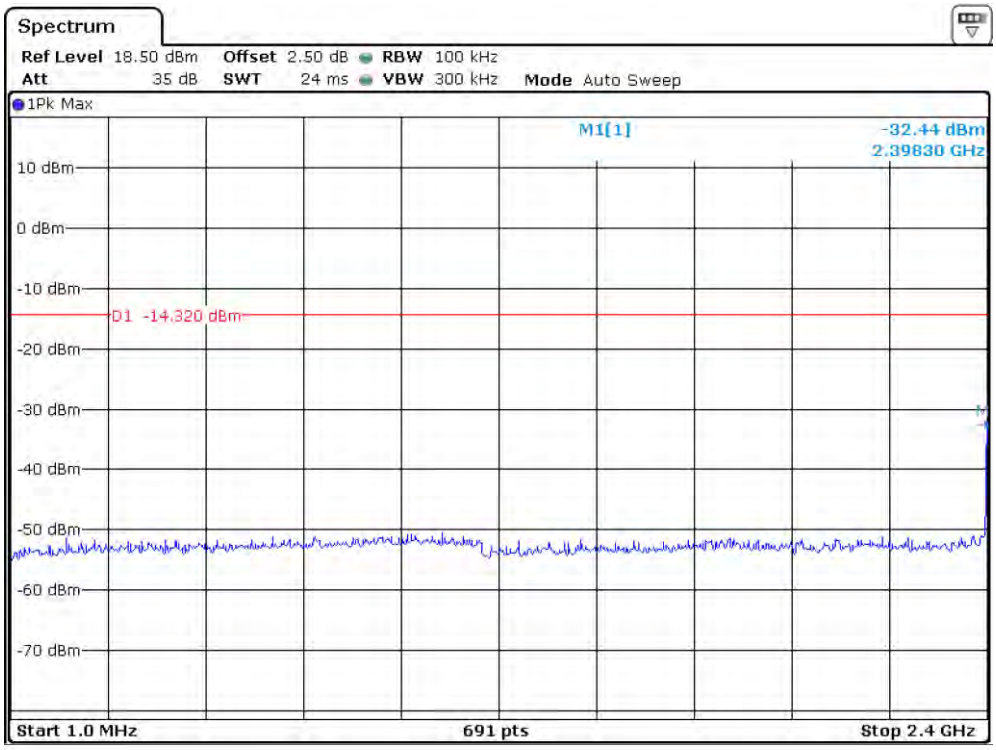


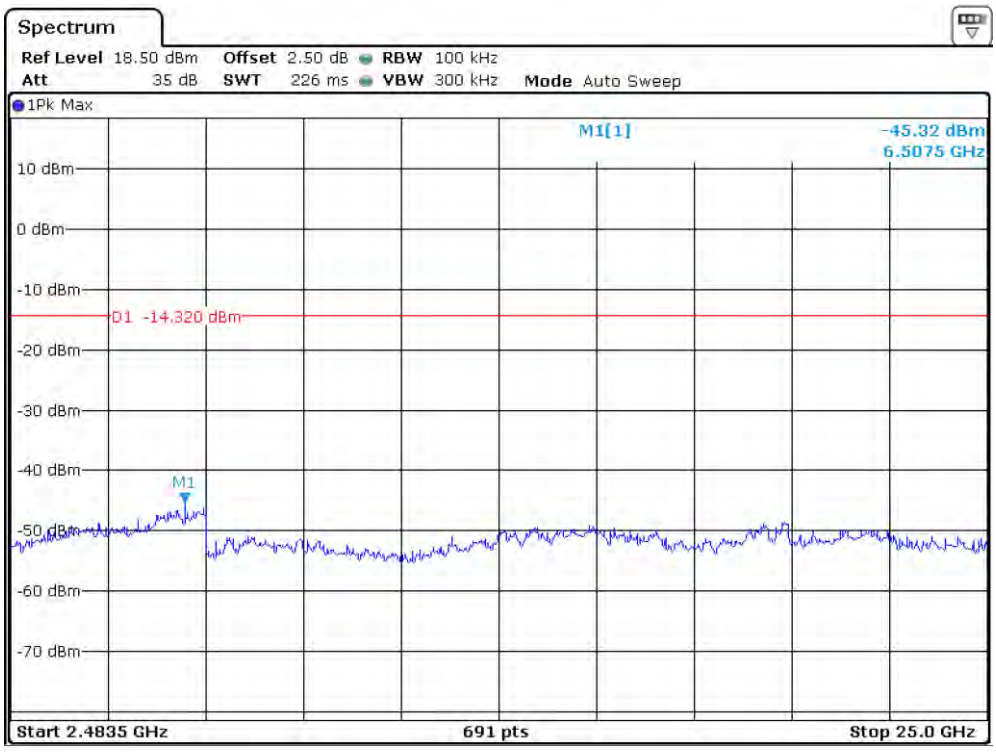
Date: 15.OCT.2019 14:59:15

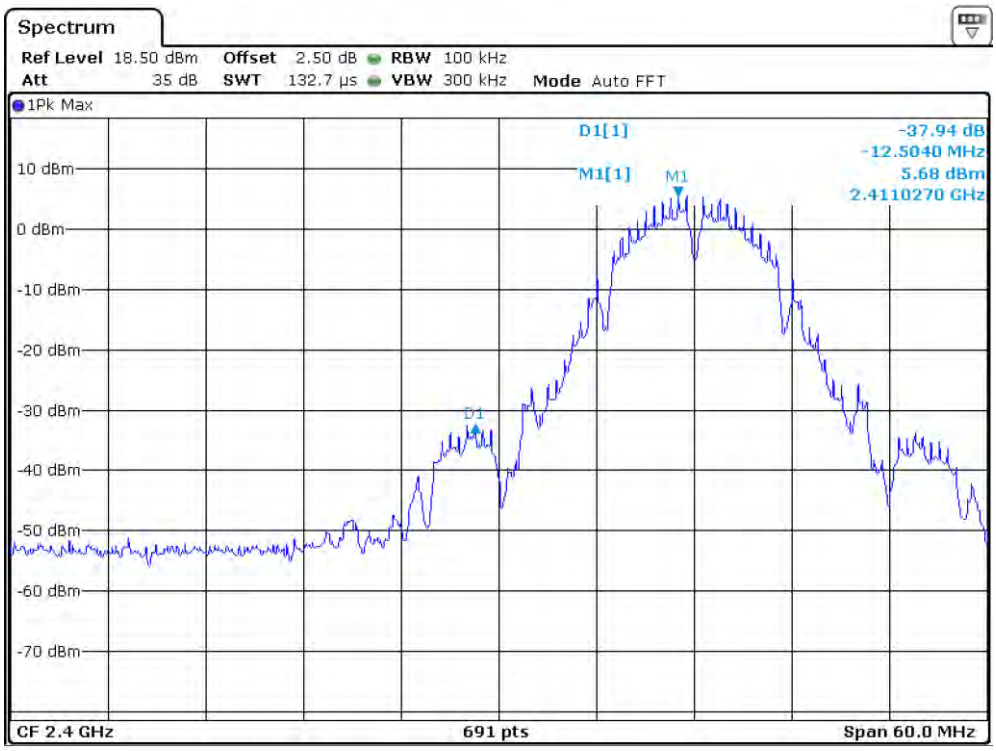

Spectrum
Ref Level 19.50 dBm
Offset 2.50 dB
RBW 100 kHz
Att 35 dB
SWT 1 ms
VBW 300 kHz
Mode Auto Sweep
1Pk Max
D1[1]
-39.67 dB
22.890 MHz
M1[1]
4.03 dBm
2.460810 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.4835 GHz
691 pts
Span 70.0 MHz
Date: 15.OCT.2019 15:00:55

Operating Mode: Simultaneously transmission (BT+2.4G WIFI)

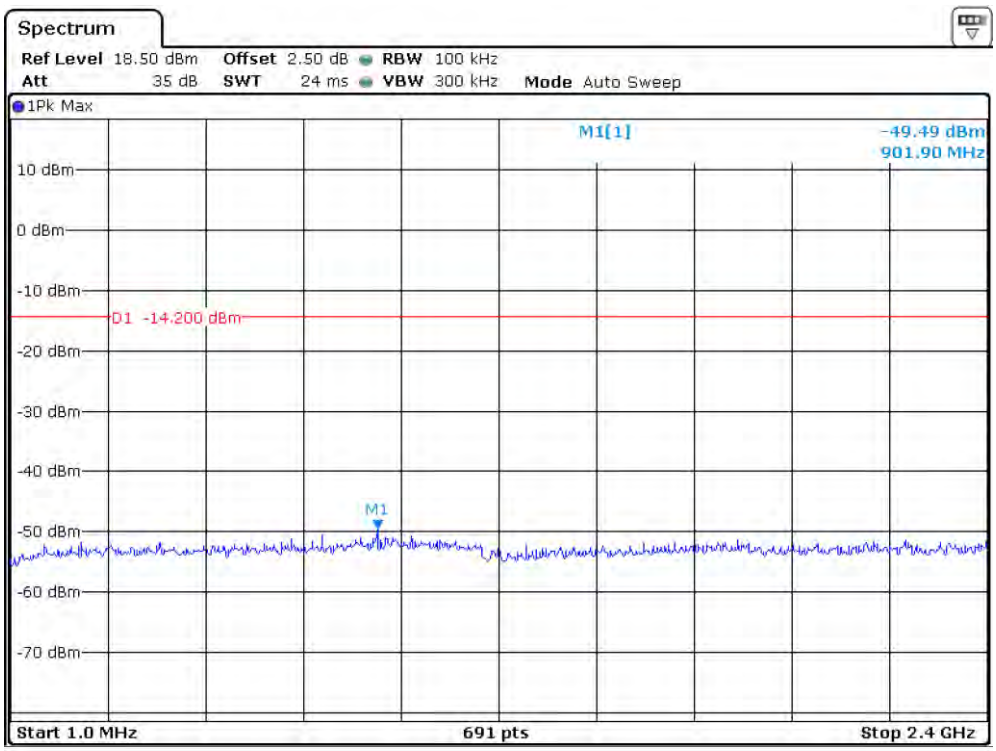
802.11b
Channel 01 (2412MHz) Reference Level: 5.68dBm

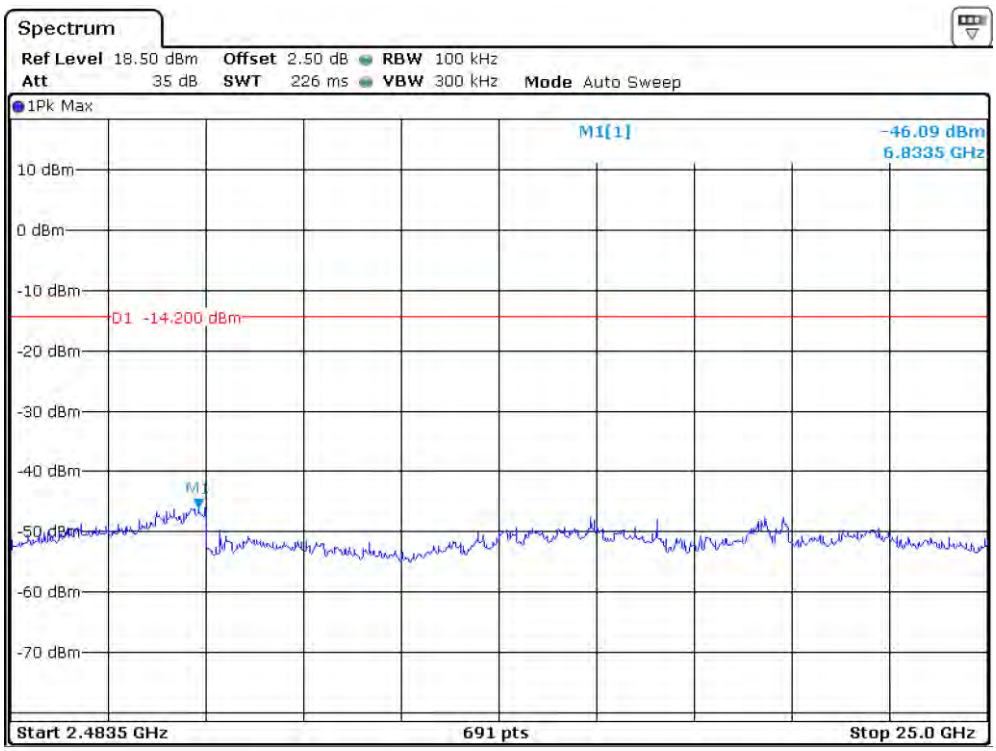




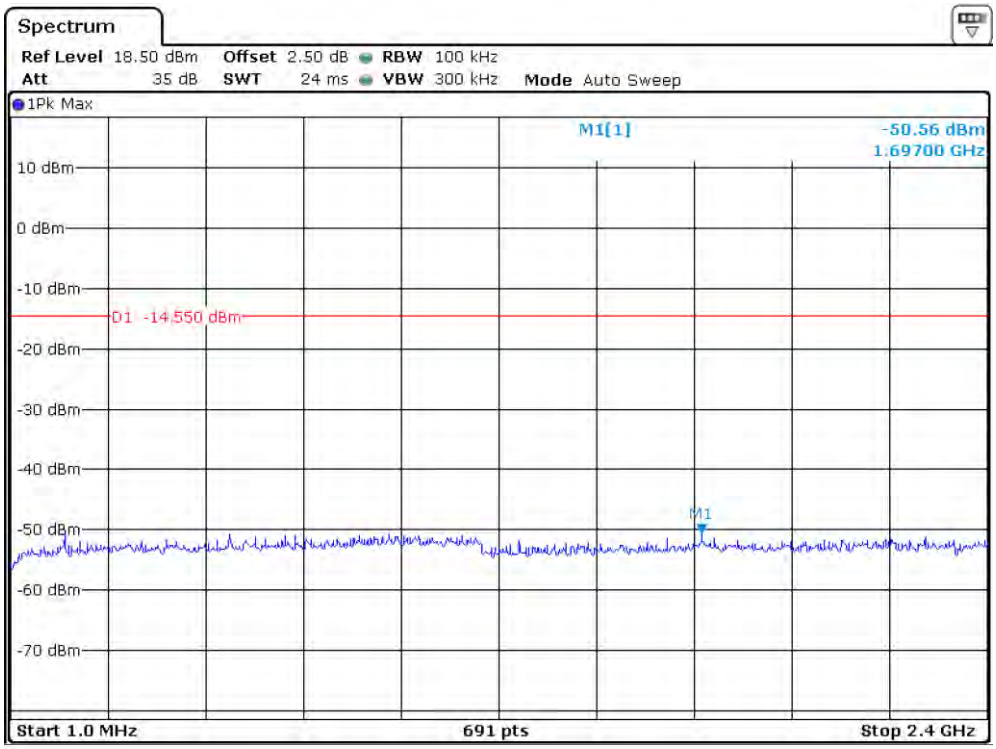

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -37.94 dB
-12.5040 MHz
M1[1] 5.68 dBm
2.4110270 GHz
M1
D1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.4 GHz
691 pts
Span 60.0 MHz

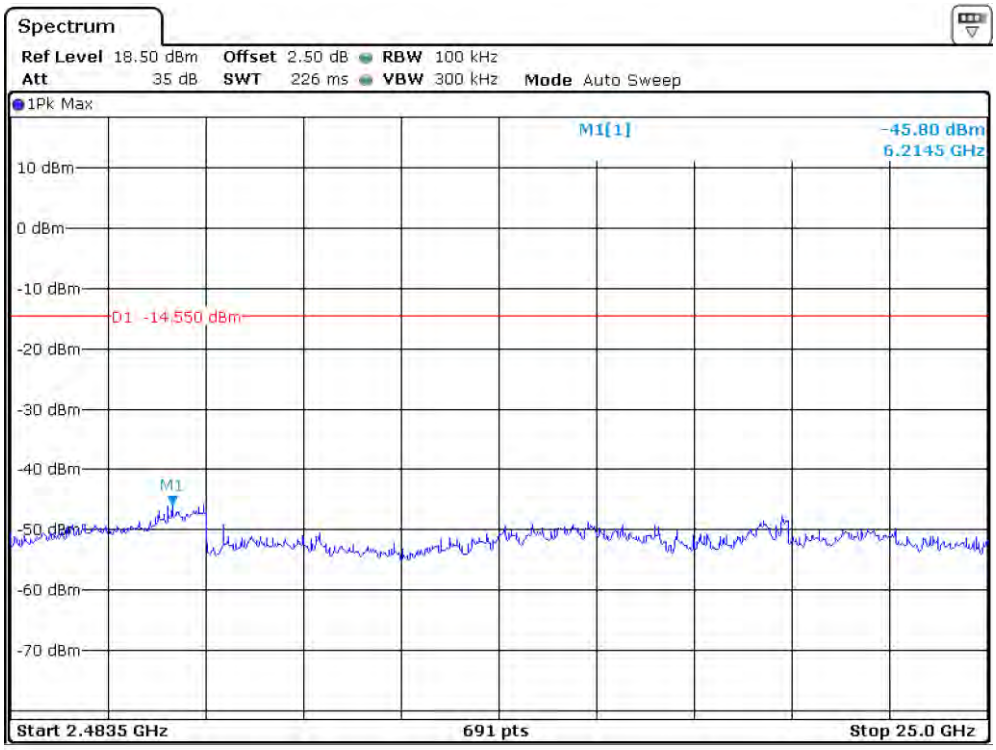
Channel 06 (2437MHz) Reference Level: 5.8dBm

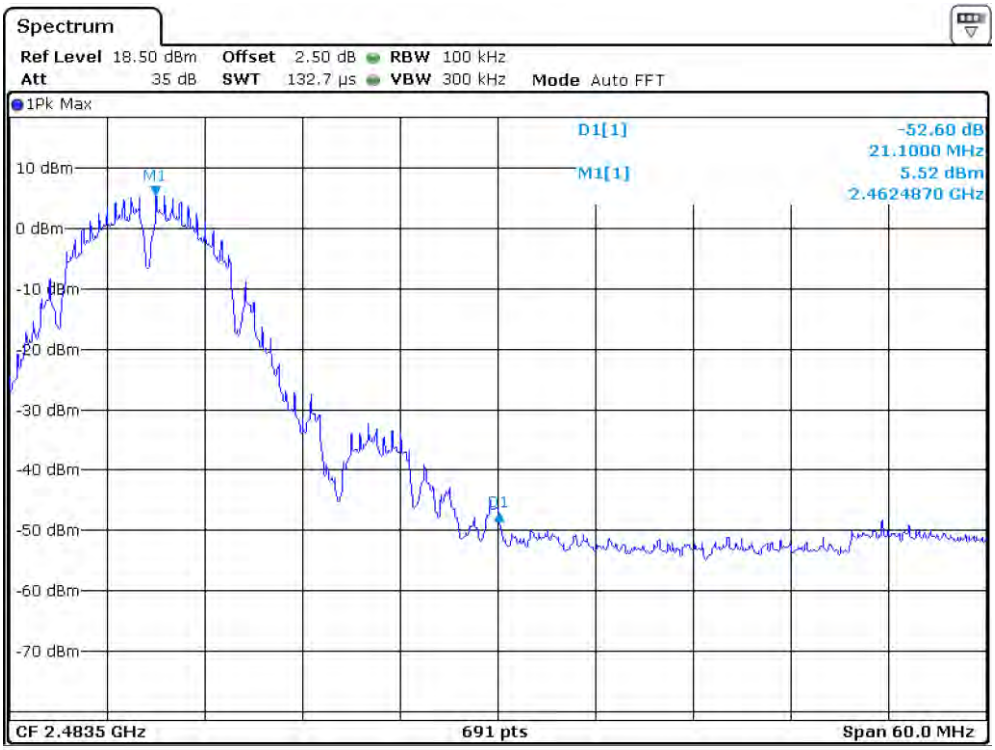




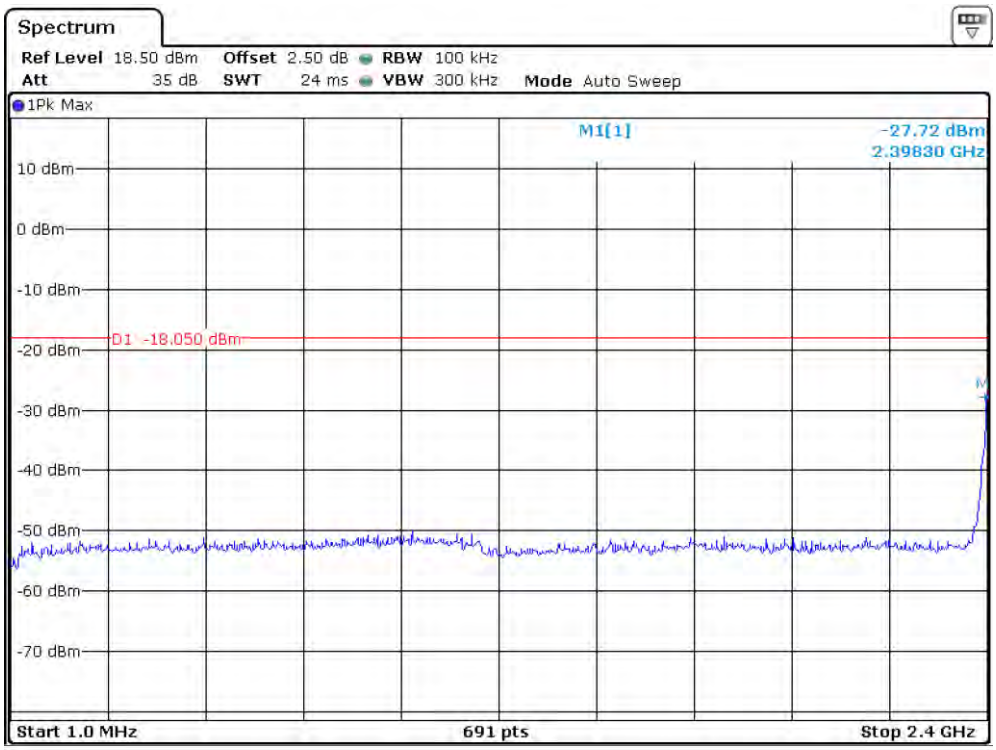
Channel 11 (2462MHz) Reference Level: 5.45dBm

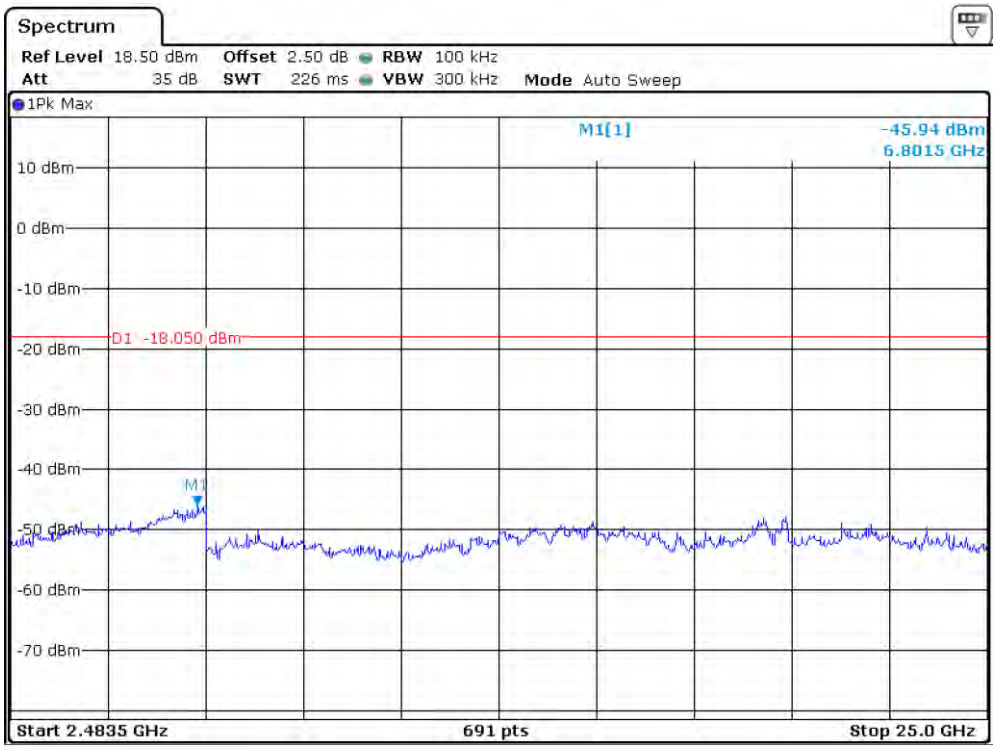


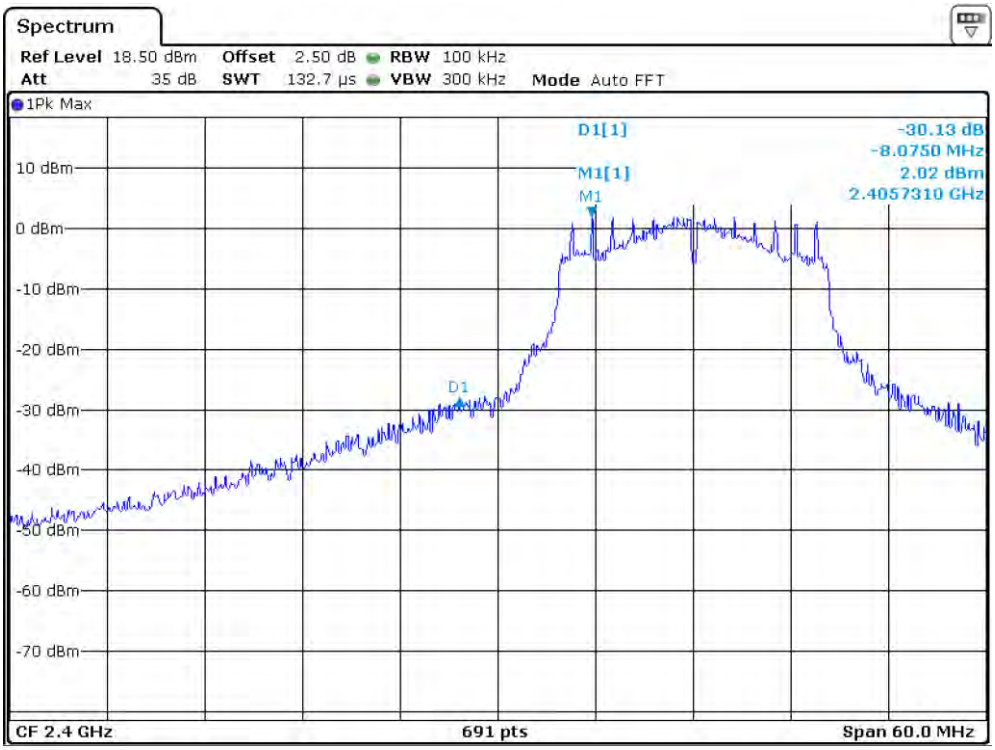



Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -52.60 dB
21.1000 MHz
M1[1] 5.52 dBm
2.4624870 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.4835 GHz
691 pts
Span 60.0 MHz

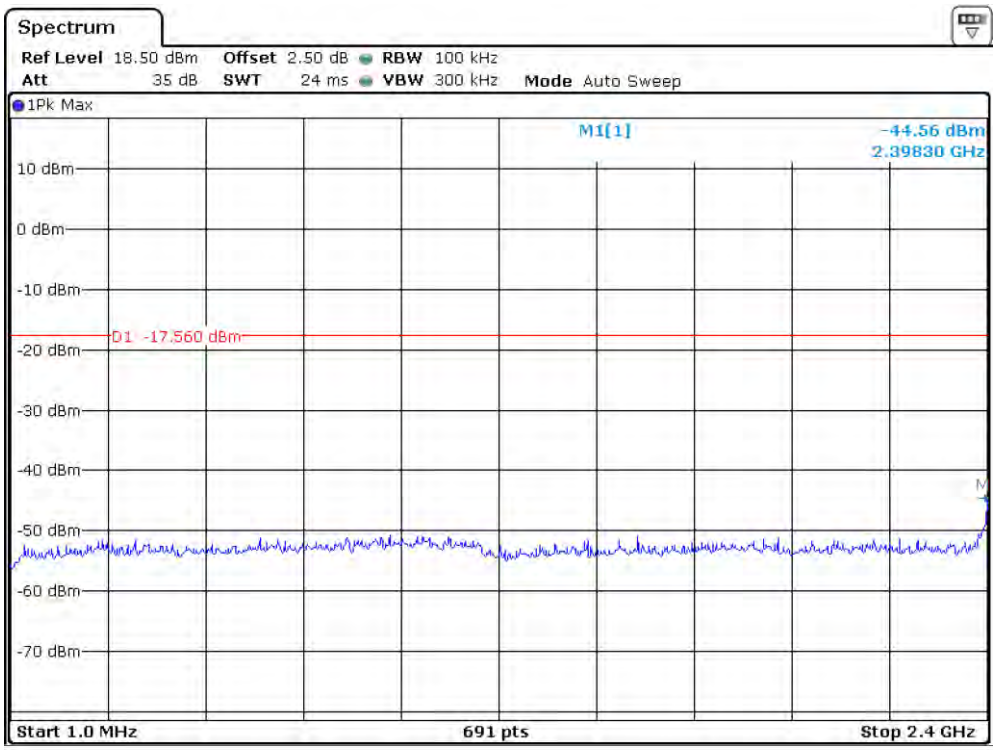
802.11g
Channel 01 (2412MHz) Reference Level: 1.95dBm

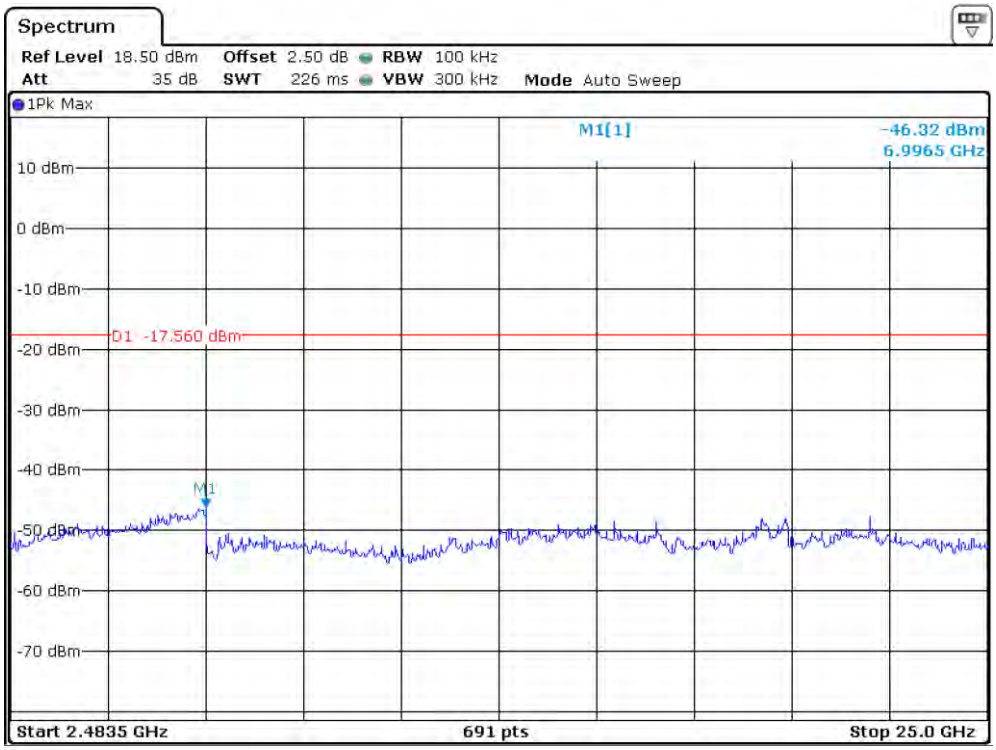




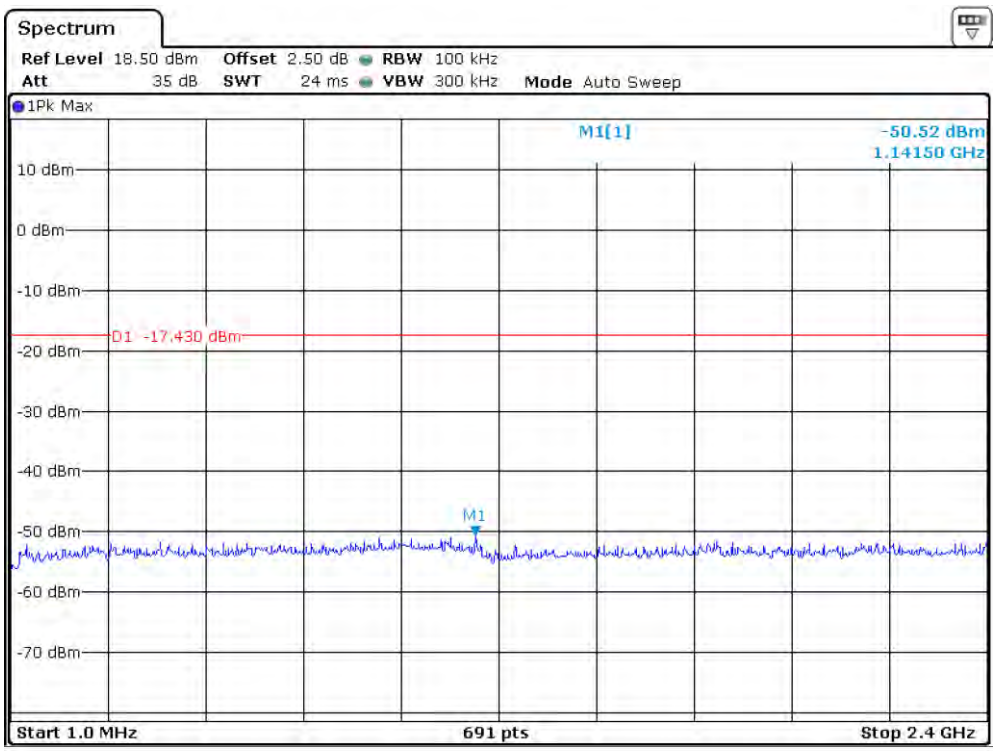

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -30.13 dB
-8.0750 MHz
M1[1] 2.02 dBm
2.4057310 GHz
M1
D1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.4 GHz
691 pts
Span 60.0 MHz

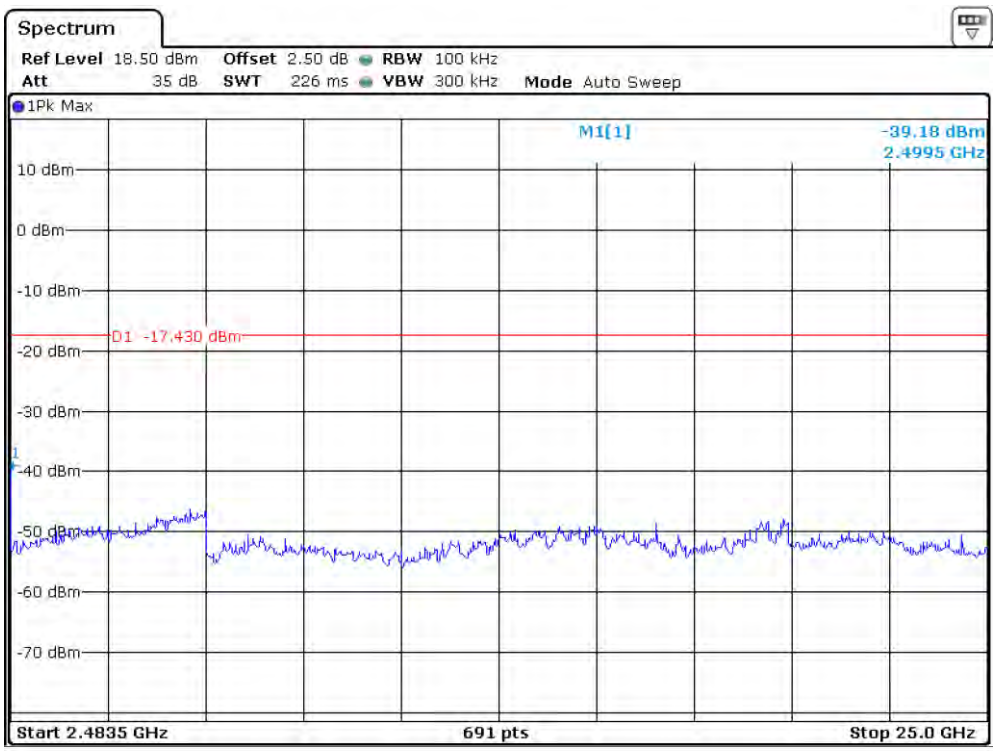
Channel 06 (2437MHz) Reference Level: 2.44dBm

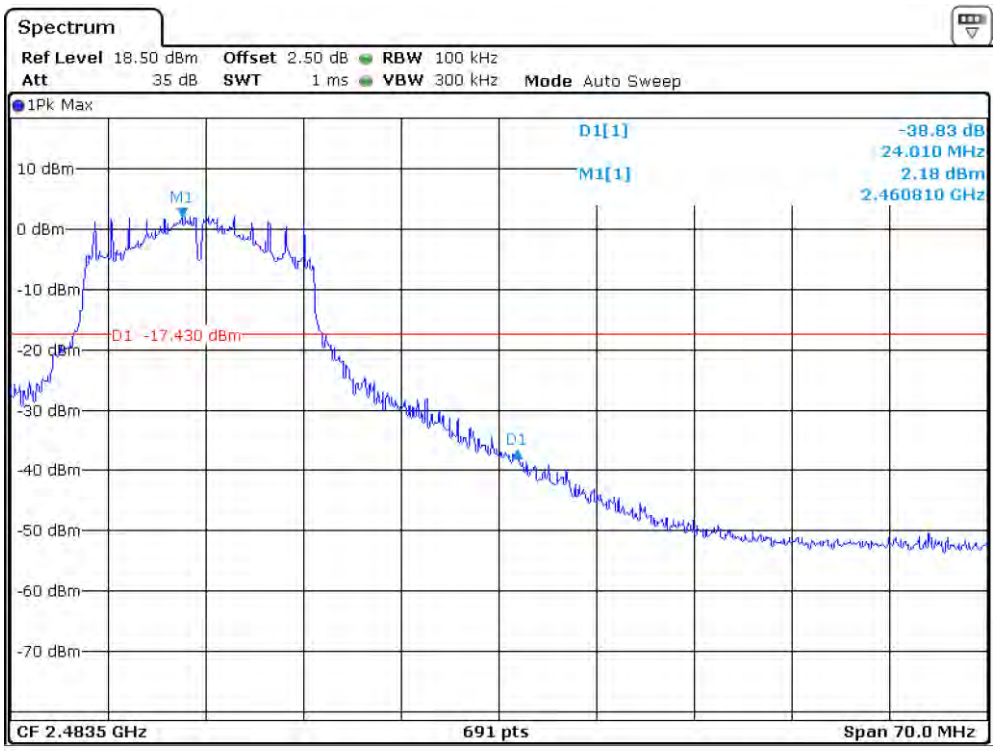




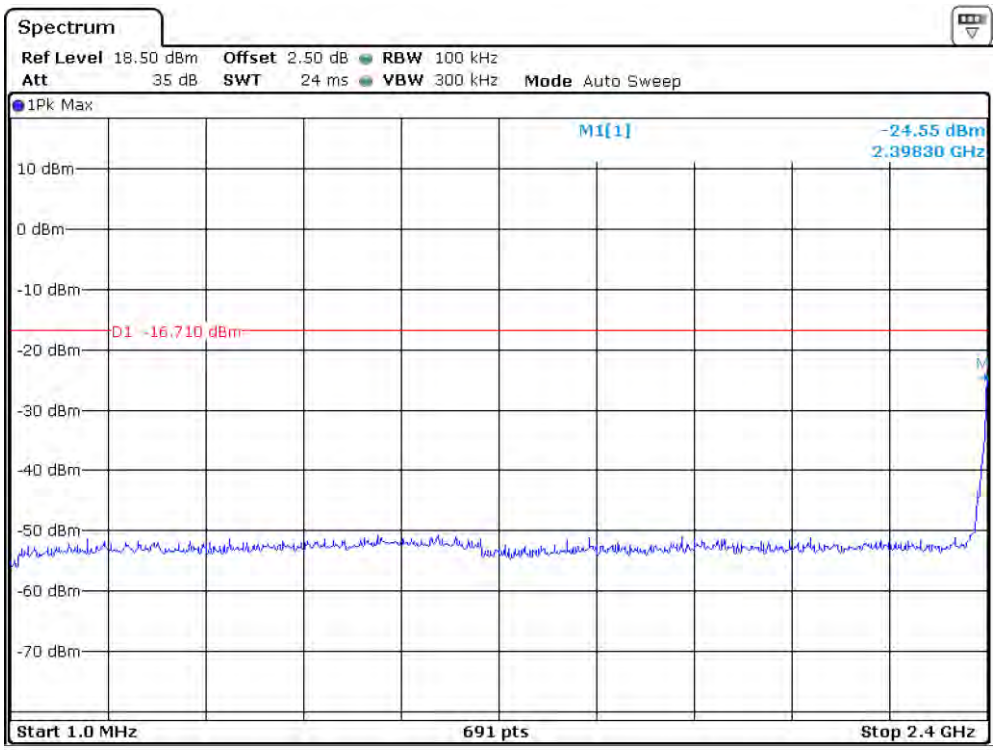
Channel 11 (2462MHz) Reference Level: 2.57dBm

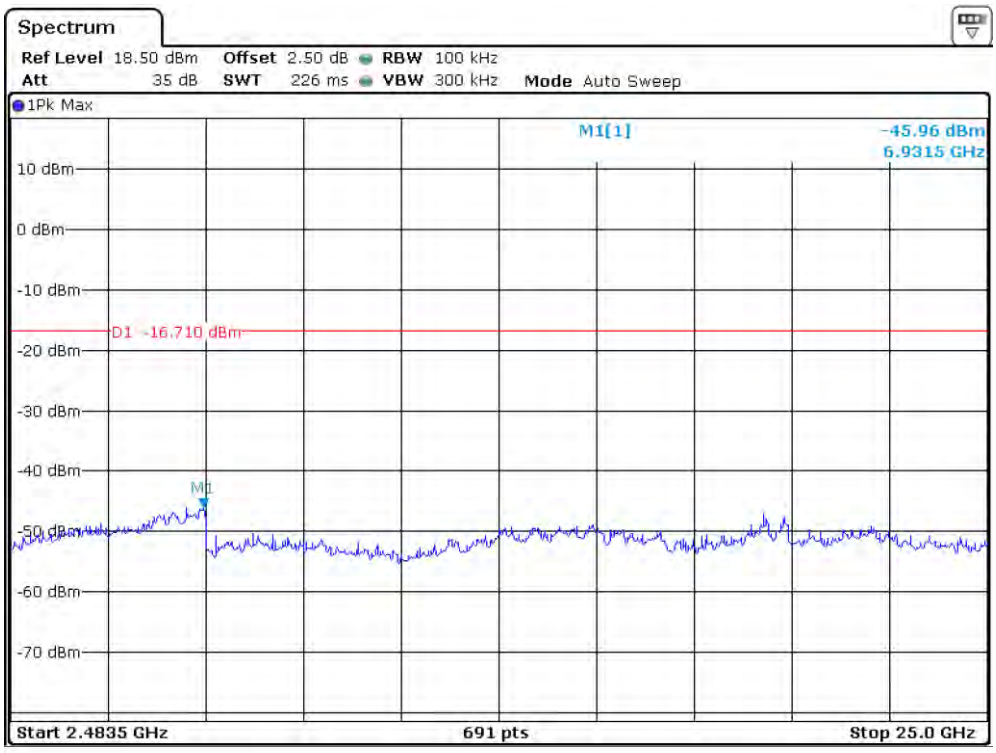


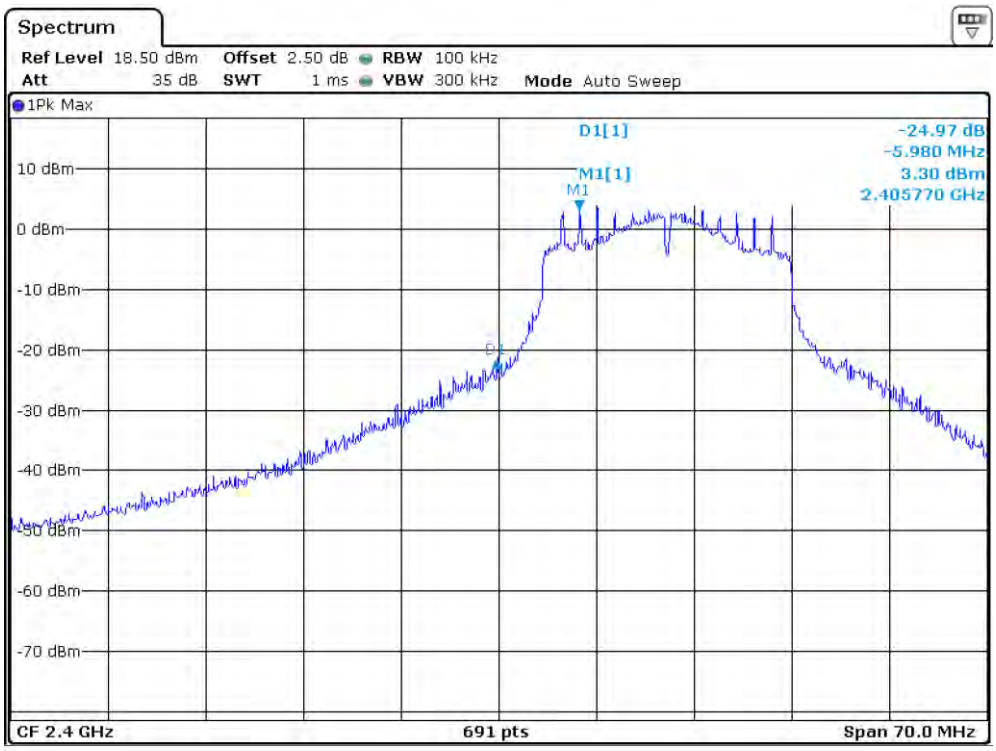



Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -38.83 dB
24.010 MHz
M1[1] 2.18 dBm
2.460810 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1 -17.430 dBm
D1
CF 2.4835 GHz
691 pts
Span 70.0 MHz

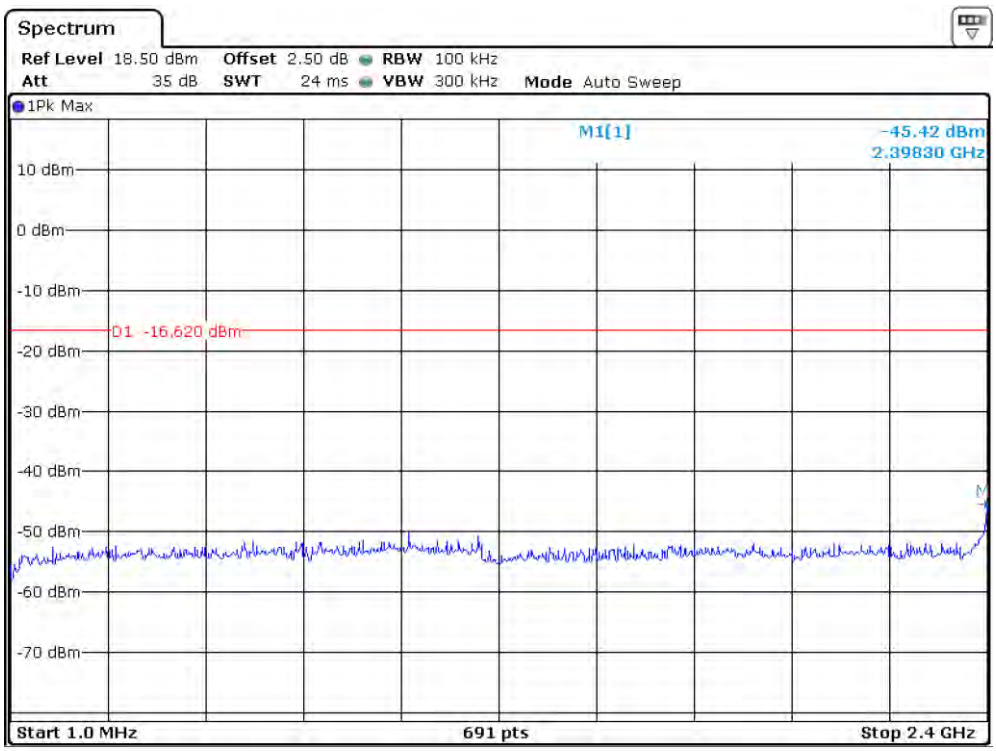
802.11n-HT20
Channel 01 (2412MHz) Reference Level: 3.29dBm

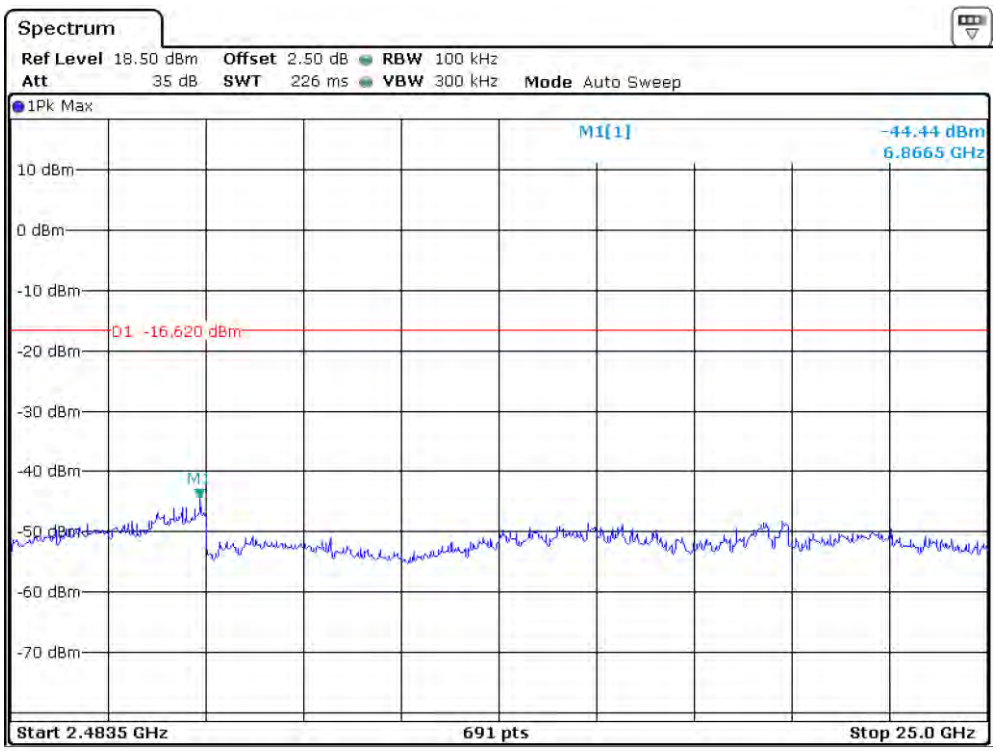




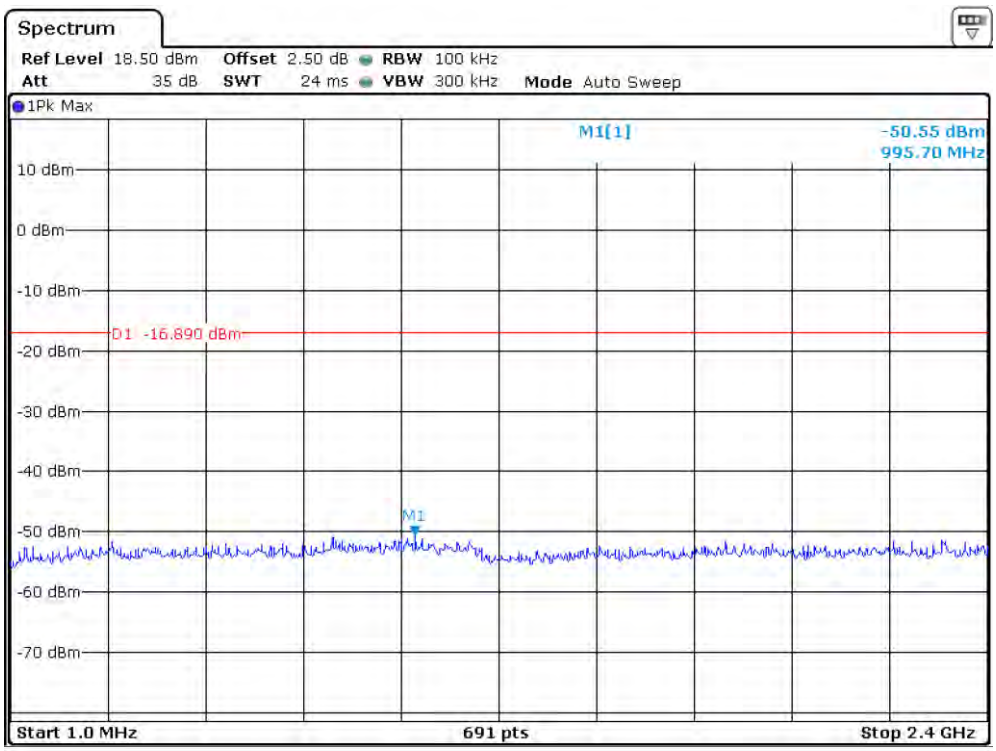

Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -24.97 dB
-5.980 MHz
M1[1] 3.30 dBm
2.405770 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.4 GHz
691 pts
Span 70.0 MHz

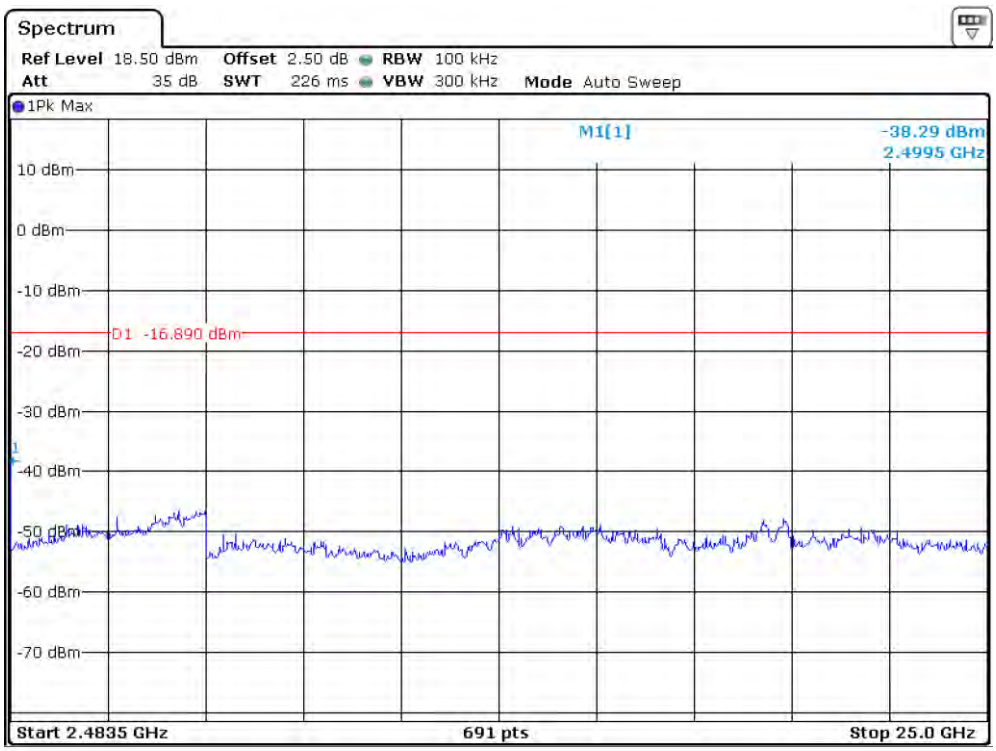
Channel 06 (2437MHz) Reference Level: 3.38dBm

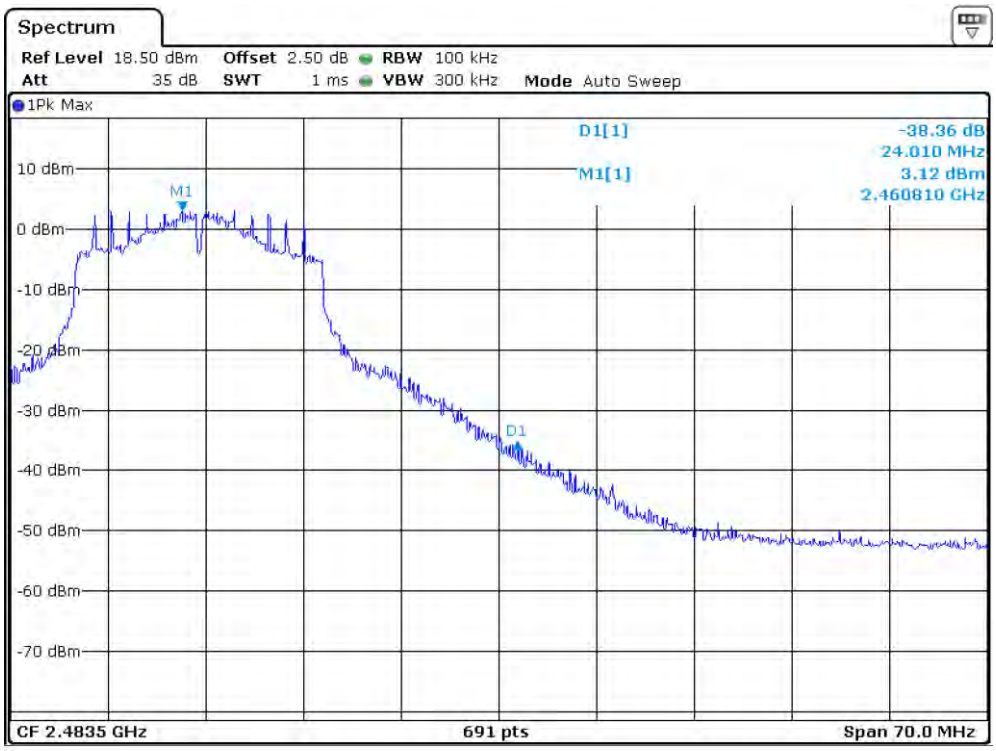




Channel 11 (2462MHz) Reference Level: 3.11dBm






Spectrum
Ref Level 18.50 dBm Offset 2.50 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -38.36 dB
24.010 MHz
M1[1] 3.12 dBm
2.460810 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.4835 GHz
691 pts
Span 70.0 MHz

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[×] Not required, since all emissions are more than 20dB below fundamental.
[ ] See attached data sheet.

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b) (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD

Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD

Example

Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 42 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBμV/m

Level in mV/m = Common Antilogarithm [(42 dBμV/m)/20] = 125.9 μV/m

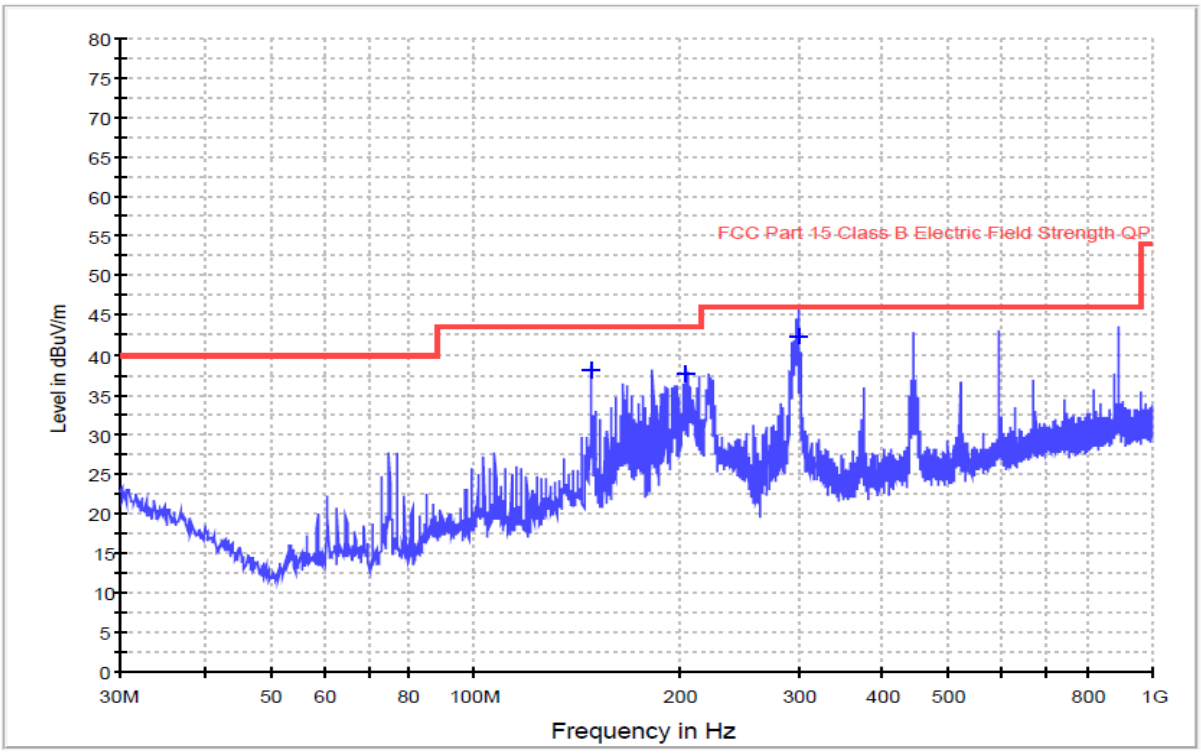
4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission
at 301.357500MHz
is passed by 3.6dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf. Simultaneous transmission was considered during the test.

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: January 29, 2021 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Simultaneous transmission (BT+2.4G WIFI)

ANT Polarity: Horizontal



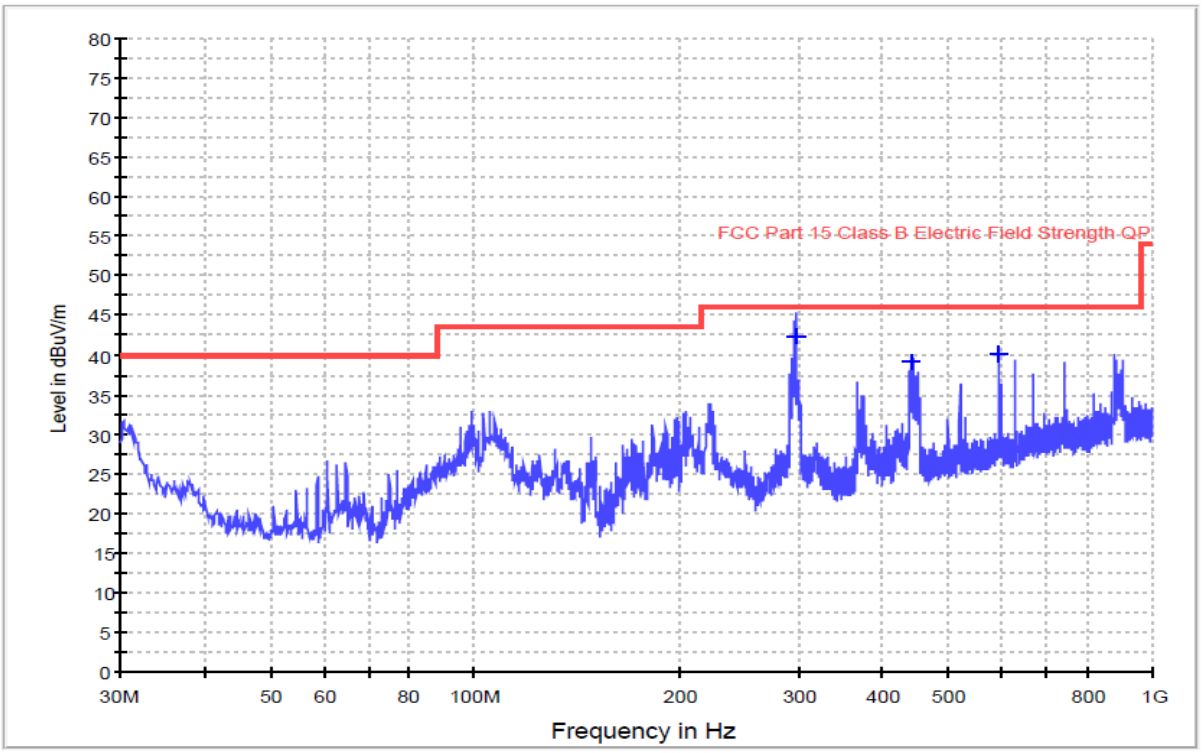
Limit and Margin

Frequency (MHz)	Quasi Peak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
148.461250	38.1	1000.0	120.000	H	11.1	5.4	43.5
204.963750	37.6	1000.0	120.000	H	13.0	5.9	43.5
301.357500	42.4	1000.0	120.000	H	16.8	3.6	46.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: January 29, 2021 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Simultaneous transmission (BT+2.4G WIFI)

ANT Polarity: Vertical



Limit and Margin

Frequency (MHz)	Quasi Peak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
298.447500	42.3	1000.0	120.000	V	16.7	3.7	46.0
442.007500	39.1	1000.0	120.000	V	20.9	6.9	46.0
594.055000	40.2	1000.0	120.000	V	24.1	5.8	46.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: January 29, 2021 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Transmitting (802.11b)

Radiated Emissions

(802.11b-Channel 01)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	60.8	36.8	33.5	57.5	74.0	-16.5
Horizontal	*2390.000	68.8	36.4	29.1	61.5	74.0	-12.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	45.5	36.8	33.5	42.2	54.0	-11.8
Horizontal	*2390.000	55.6	36.4	29.1	48.3	54.0	-5.7

NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: January 29, 2021 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Transmitting (802.11b)

Radiated Emissions

(802.11b-Channel 06)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	61.7	36.7	33.4	58.4	74.0	-15.6
Horizontal	*7311.000	58.2	36.6	35.8	57.4	74.0	-16.6

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	45.0	36.7	33.4	41.7	54.0	-12.3
Horizontal	*7311.000	46.0	36.6	35.8	45.2	54.0	-8.8

NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: January 29, 2021 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Transmitting (802.11b)

Radiated Emissions

(802.11b-Channel 11)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	61.6	36.8	33.3	58.1	74.0	-15.9
Horizontal	*2484.50	67.5	36.5	29.3	60.3	74.0	-13.7

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	45.8	36.8	33.3	42.3	54.0	-11.7
Horizontal	*2484.500	56.4	36.5	29.3	49.2	54.0	-4.8

NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: December 15, 2020
Model: ECH-REFL03-SPT

4.9 Conducted Emission

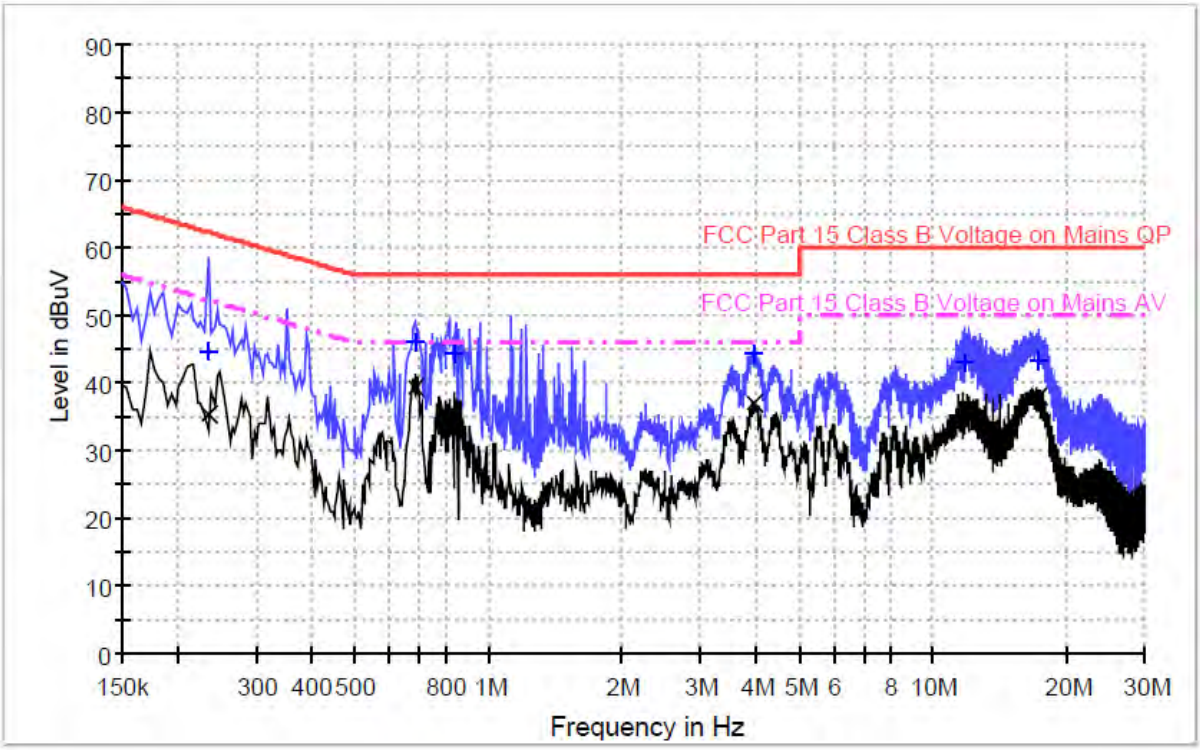
Worst Case Conducted Emission (WIFI Link)
at 0.486000MHz
is passed by 6.7dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: conducted photos.pdf.

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: December 15, 2020 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Simultaneous transmission (BT+2.4G WIFI)
Phase: Live

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Result Table QP

Frequency (MHz)	Quasi Peak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.235500	44.6	L1	9.6	17.7	62.3
0.686000	45.9	L1	9.7	10.1	56.0
0.838000	44.3	L1	9.7	11.7	56.0
3.974000	44.4	L1	9.7	11.6	56.0
11.790000	43.0	L1	9.9	17.0	60.0
17.210000	43.2	L1	10.2	16.8	60.0

Result Table AV

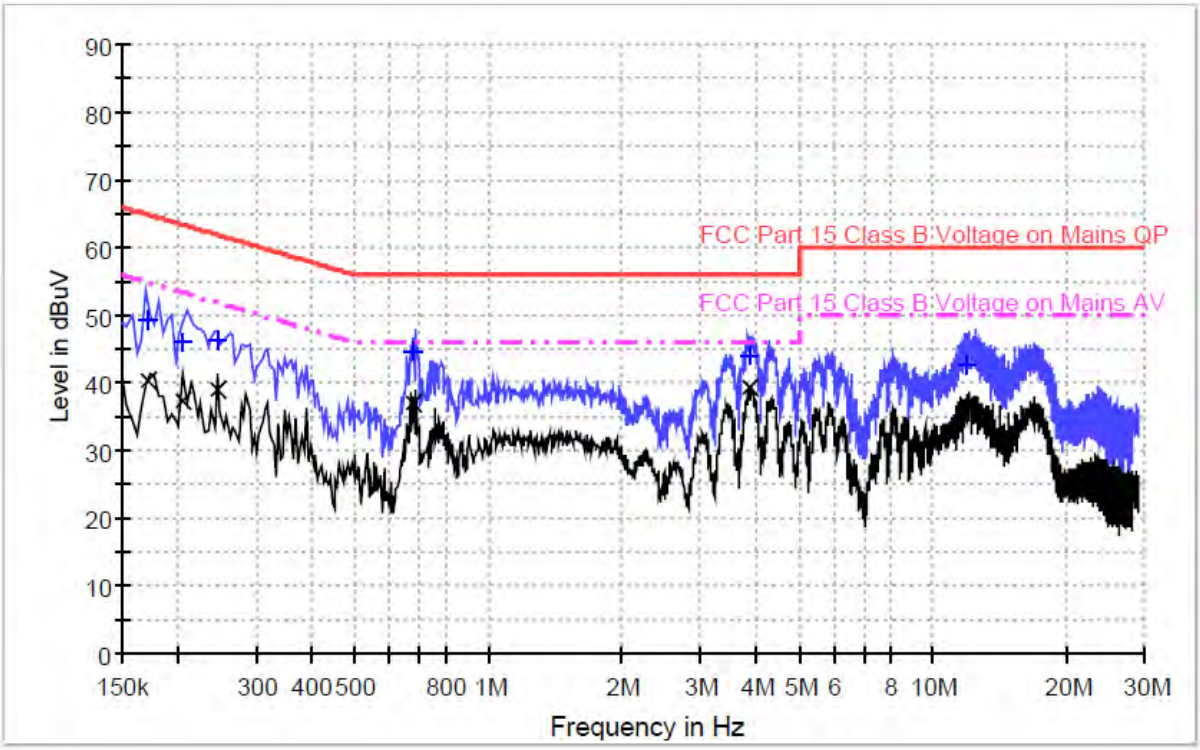
Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.242000	35.2	L1	9.6	17.1	52.3
0.486000	39.3	L1	9.7	6.7	46.0
0.778000	33.0	L1	9.7	13.0	46.0
1.310000	37.0	L1	9.7	9.0	46.0
1.742000	35.9	L1	9.9	14.1	50.0
13.398000	38.2	L1	10.2	11.8	50.0

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Limit (dBuV) – Level (dBuV)

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: December 15, 2020 Model: ECH-REFL03-SPT
Worst Case Operating Mode: Simultaneous transmission (BT+2.4G WIFI)
Phase: Neutral

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Result Table QP

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	49.4	N	9.6	15.4	64.8
0.206000	46.1	N	9.6	17.3	63.4
0.246000	46.4	N	9.6	15.5	61.9
0.678000	44.7	N	9.7	11.3	56.0
3.886000	43.9	N	9.7	12.1	56.0
11.890000	42.6	N	9.9	17.4	60.0

Result Table AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	40.2	N	9.6	14.6	54.8
0.206000	37.3	N	9.6	16.1	53.4
0.246000	38.9	N	9.6	13.0	51.9
0.678000	37.1	N	9.7	8.9	46.0
3.886000	39.2	N	9.7	6.8	46.0
11.890000	36.8	N	9.9	13.2	50.0

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Limit (dBuV) – Level (dBuV)

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: October 16, 2019
Model: ECH-REFL01-5G

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

[ ] Not required - No digital part

[ ] Test results are attached

[x] Included in the separated report.

Applicant: DONGGUAN TYSTART GLASS TECHNOLOGY CO., LTD
Date of Test: October 16, 2019
Model: ECH-REFL01-5G

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.

5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf & internal photos.pdf.

6.0 Product Labeling

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.

10.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

11.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	28-May-2019	28-May-2020
					24-May-2020	24-May-2021
SZ182-02-01	Power Sensor	Anritsu	MA2411B	1207429	28-May-2019	28-May-2020
					24-May-2020	24-May-2021
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	14-Sep-2018	14-Sep-2021
SZ185-01	EMI Receiver	R&S	ESCI	100547	24-Dec-2019	24-Dec-2020
					22-Dec-2020	22-Dec-2021
SZ061-08	Horn Antenna	ETS	3115	00092346	7-Sep-2019	7-Sep-2021
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	13-Aug-2019	13-Aug-2021
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	27-May-2020	27-May-2021
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	27-May-2020	27-May-2021
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	27-May-2020	27-May-2021
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2021
SZ062-02	RF Cable	RADIALL	RG 213U	--	12-Jun-2020	12-Jun-2021
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	26-Feb-2020	26-Feb-2021
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	26-Feb-2020	26-Feb-2021
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	27-May-2020	27-May-2021
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	27-Oct-2020	27-Oct-2021
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	27-Oct-2020	27-Oct-2021
SZ187-02	Two-Line V-Network	R&S	ENV216	100072	27-May-2020	27-May-2021
SZ188-03	Shielding Room	ETS	RFD-100	4100	07-Jan-2020	07-Jan-2023
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	13-Nov-2020	13-Nov-2021

********** End of Report**********