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Shenzhen Esun LED Co.,Ltd

TEST REPORT

SCOPE OF WORK
FCC TESTING–ES-WFD02, ES-WFD01, ES-WFD03

REPORT NUMBER
180115031SZN-001

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Total Quality. Assured.

TEST REPORT

Intertek Report No.: 180115031SZN-001

Shenzhen Esun LED Co.,Ltd

Application
For
Certification

FCC ID: 2AOTZ-ESWFD01

Wifi LED Dimmer

Model: ES-WFD02, ES-WFD01, ES-WFD03

2.4GHz Wi-Fi Transceiver

Report No.: 180115031SZN-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 [10-1-16]

Prepared and Checked by:

Damon Wang
Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: 29 January 2018

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MEASUREMENT/TECHNICAL REPORT

Wifi LED Dimmer

Model: ES-WFD02

FCC ID: 2AOTZ-ESWFD01

This report concerns (check one) Original Grant ___X___ Class II Change ____

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 [10-01-16] Edition] provision.

Report prepared by:

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List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

EXHIBIT 1

SUMMARY OF TEST RESULTS

1.0 Summary of Test results

Wifi LED Dimmer

Model: ES-WFD02

FCC ID: 2AOTZ-ESWFD01

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 at Mains Terminal	15.207	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.

EXHIBIT 2

GENERAL DESCRIPTION

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Wifi LED Dimmer with Wi-Fi function operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing. The EUT is powered by DC 12V or 24V. For more detailed features description, please refer to the user's manual.

Type of Modulation: CCK, BPSK, QPSK, 16QAM, 64QAM
Antenna Type: Integral Antenna

The Models:ES-WFD01, ES-WFD03 are the same as the Model: ES-WFD02 in hardware aspect except output port and MOS transistors. The difference in model number and appearance serves as marketing strategy. Details see below.

Production name	Model no.	Description
Wifi LED Dimmer	ES-WFD01	Output line is DC port with 3 MOS transistors
	ES-WFD02	Output line is RGB 4pin port with 3 MOS transistors
	ES-WFD03	Output line is RGBW 5pin port with 4 MOS transistors

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

2.2 Related Submittal(s) Grants

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

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 v04. 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 1F/2F, Building B, QiaoAn Scientific Technology Park, Shangkeng Community, Guanhu Subdistrict, Longhua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: CN1188).

EXHIBIT 3

SYSTEM TEST CONFIGURATION

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 DC 12V or 24V via an DC power supply which was connected to AC mains during the test. Both of these voltages have been tested and only the worst case data (DC24V) is shown in the report.

Three models have been tested and only the worst case data is shown in the 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 was 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.

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.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by Shenzhen Esun LED 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

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
cement resistor (Provided by Intertek)	NA	NA
DC Cable	NA	NA
DC Power Supply (Provided by Intertek)	Solid weft electronics suzhou co., LTD	GPR-6030D

EXHIBIT 4

MEASUREMENT RESULTS

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02

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 has 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).

IEEE 802.11b (Antenna Gain = 3dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	12.82	19.1
Middle Channel: 2437	8.74	7.5
High Channel: 2462	12.06	16.1

IEEE 802.11g (Antenna Gain = 3dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	17.35	54.3
Middle Channel: 2437	15.29	33.8
High Channel: 2462	17.92	61.9

IEEE 802.11n-HT20 (Antenna Gain = 3dBi) (64QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	16.88	48.8
Middle Channel: 2437	14.84	30.5
High Channel: 2462	17.75	59.6

Cable loss: 1.0 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 17.92dBm
EUT max. E.I.R.P level = 17.92dBm + 3dBi = 20.92dBm

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

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02

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 v04. 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.

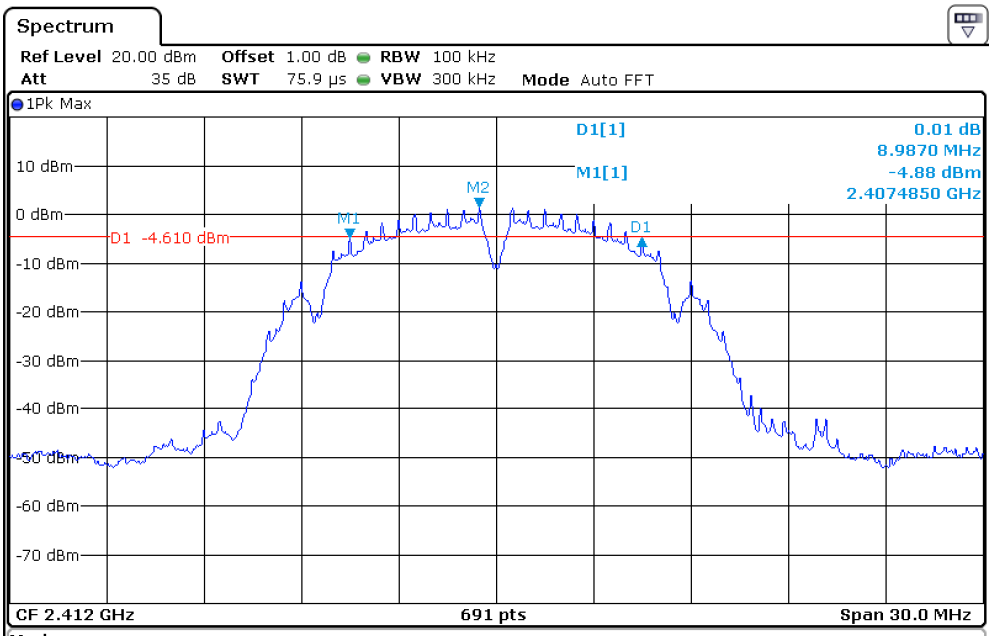
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	8.987
2437	8.987
2462	8.987

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	15.745
2437	15.745
2462	15.745

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	15.745
2437	15.687
2462	15.745

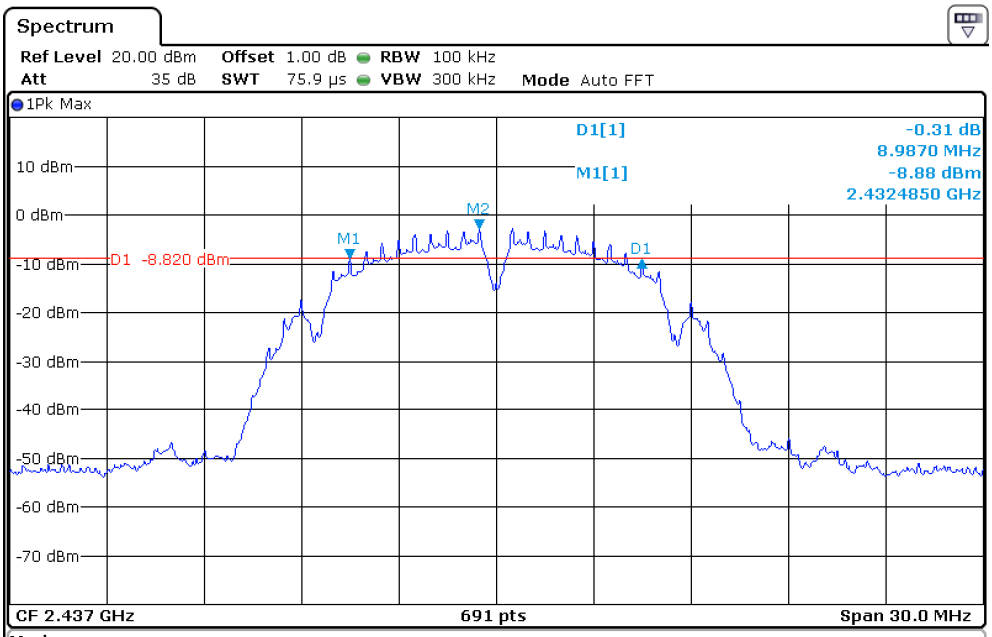
The test plots are attached as below.

802.11b



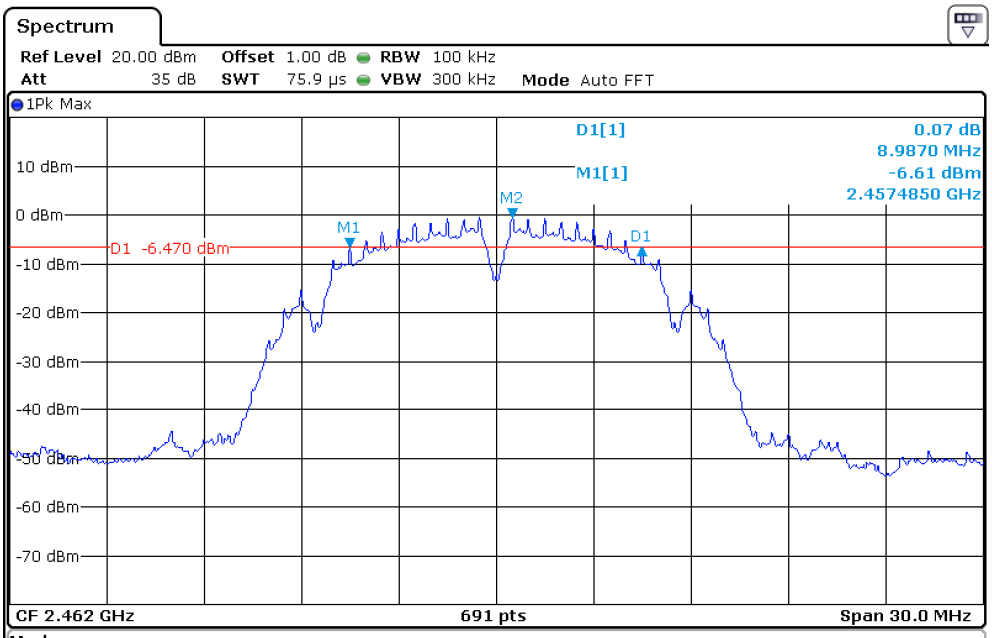
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.407485 GHz	-4.88 dBm		
D1	M1	1	8.987 MHz	0.01 dB		
M2		1	2.411479 GHz	1.39 dBm		



Marker

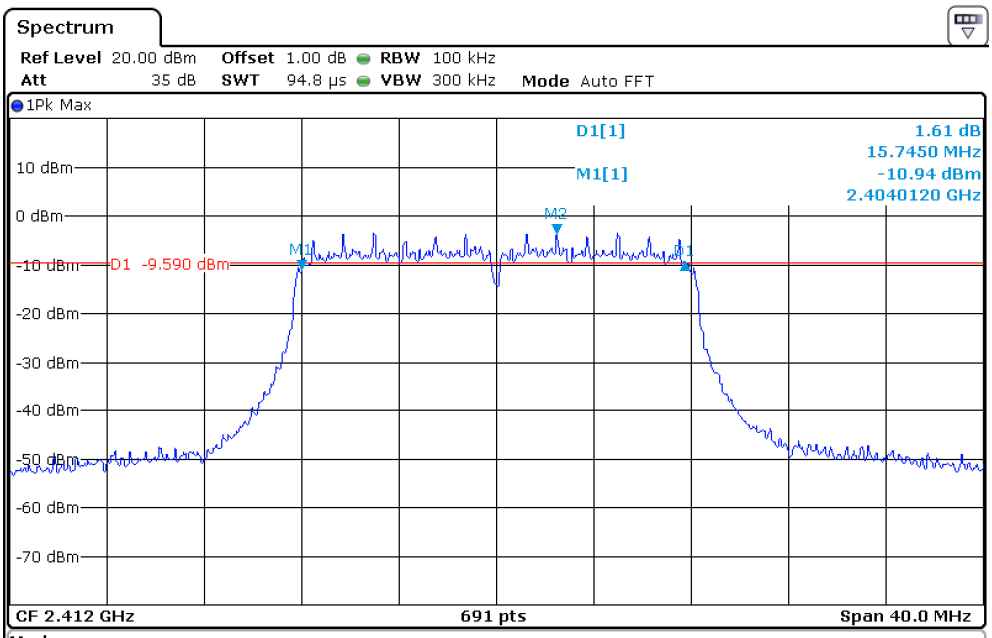
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432485 GHz	-8.88 dBm		
D1	M1	1	8.987 MHz	-0.31 dB		
M2		1	2.436479 GHz	-2.82 dBm		



Marker

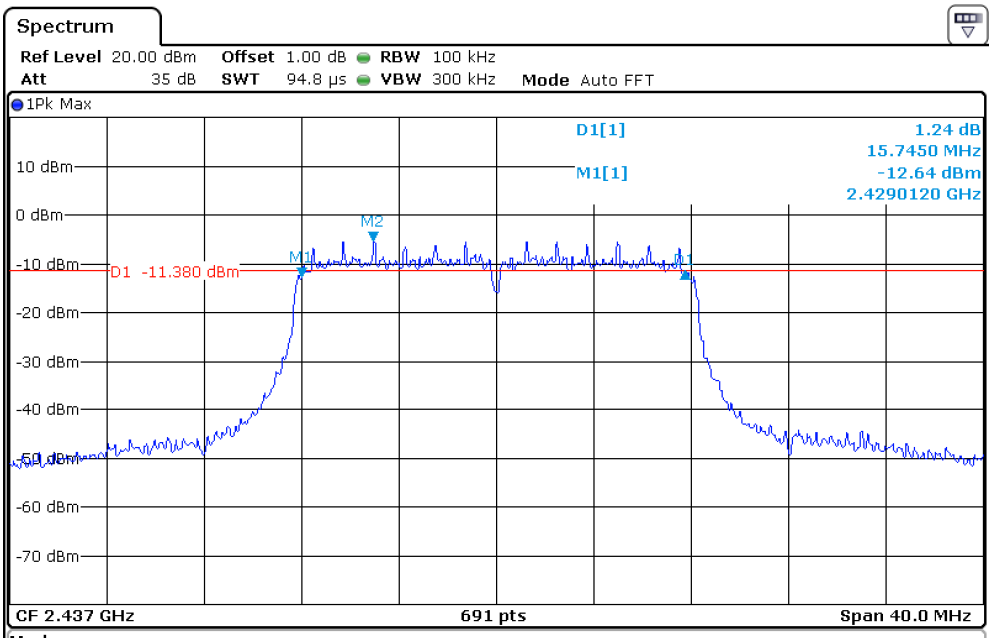
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457485 GHz	-6.61 dBm		
D1	M1	1	8.987 MHz	0.07 dB		
M2		1	2.462478 GHz	-0.47 dBm		

802.11g



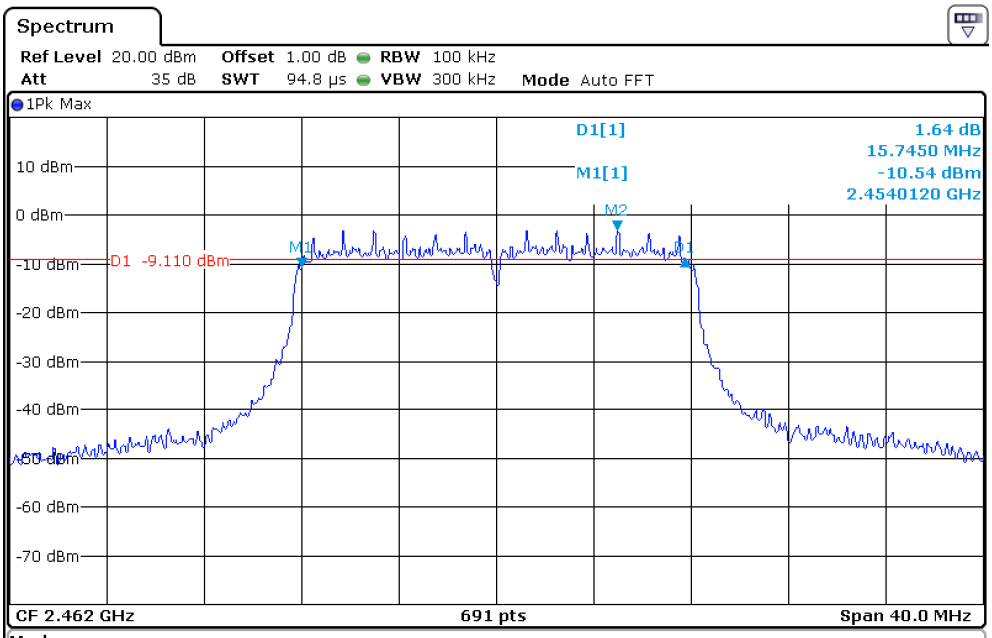
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404012 GHz	-10.94 dBm		
D1	M1	1	15.745 MHz	1.61 dB		
M2		1	2.414489 GHz	-3.59 dBm		



Marker

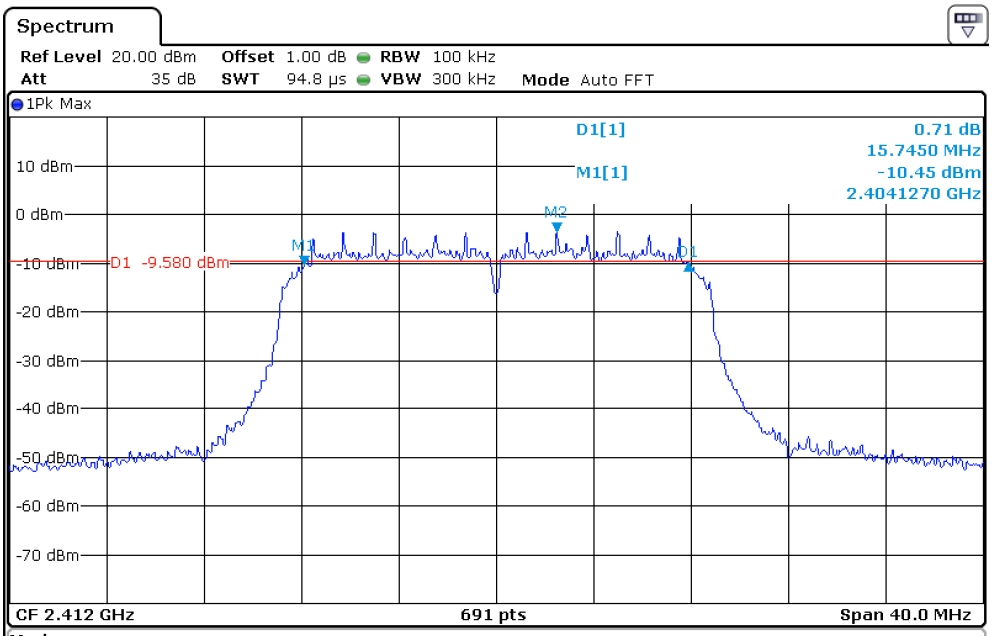
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.429012 GHz	-12.64 dBm		
D1	M1	1	15.745 MHz	1.24 dB		
M2		1	2.431964 GHz	-5.38 dBm		



Marker

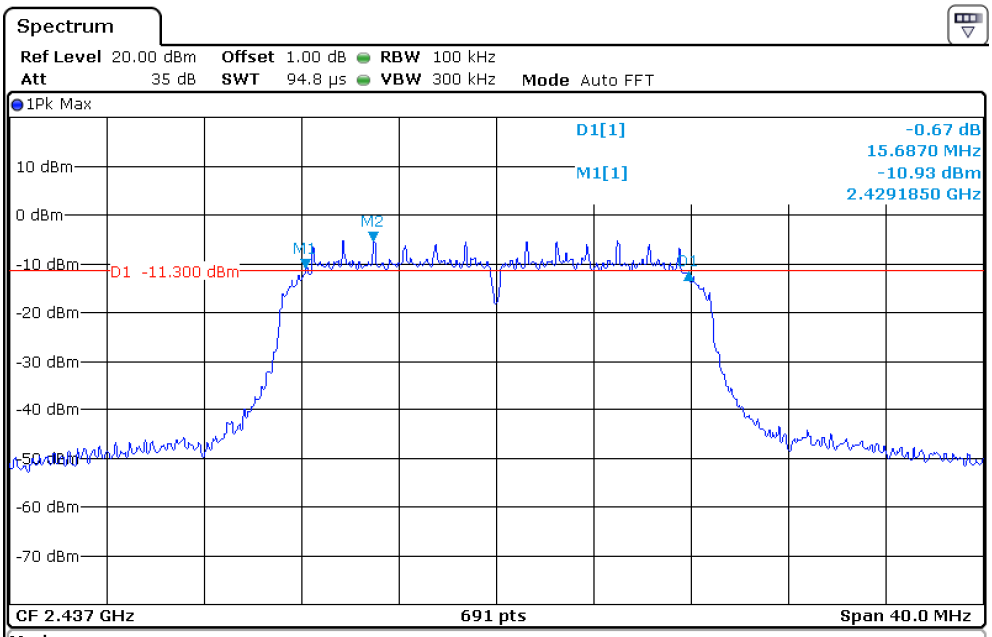
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.454012 GHz	-10.54 dBm		
D1	M1	1	15.745 MHz	1.64 dB		
M2		1	2.466978 GHz	-3.11 dBm		

802.11n-HT20



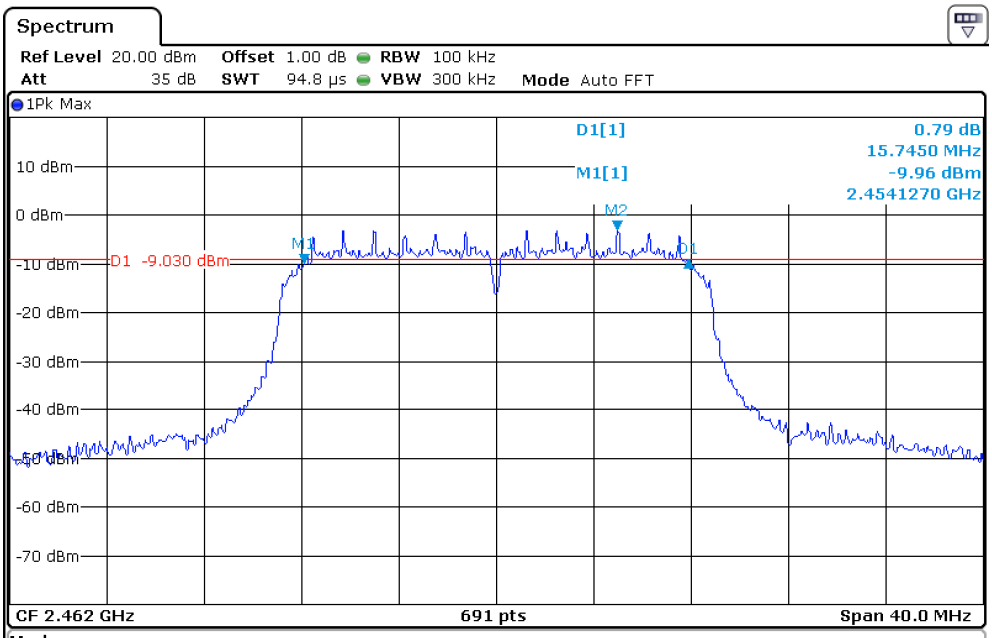
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404127 GHz	-10.45 dBm		
D1	M1	1	15.745 MHz	0.71 dB		
M2		1	2.414489 GHz	-3.58 dBm		



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.429185 GHz	-10.93 dBm		
D1	M1	1	15.687 MHz	-0.67 dB		
M2		1	2.431964 GHz	-5.30 dBm		



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.454127 GHz	-9.96 dBm		
D1	M1	1	15.745 MHz	0.79 dB		
M2		1	2.466978 GHz	-3.03 dBm		

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02

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

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v04.

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/3 kHz.

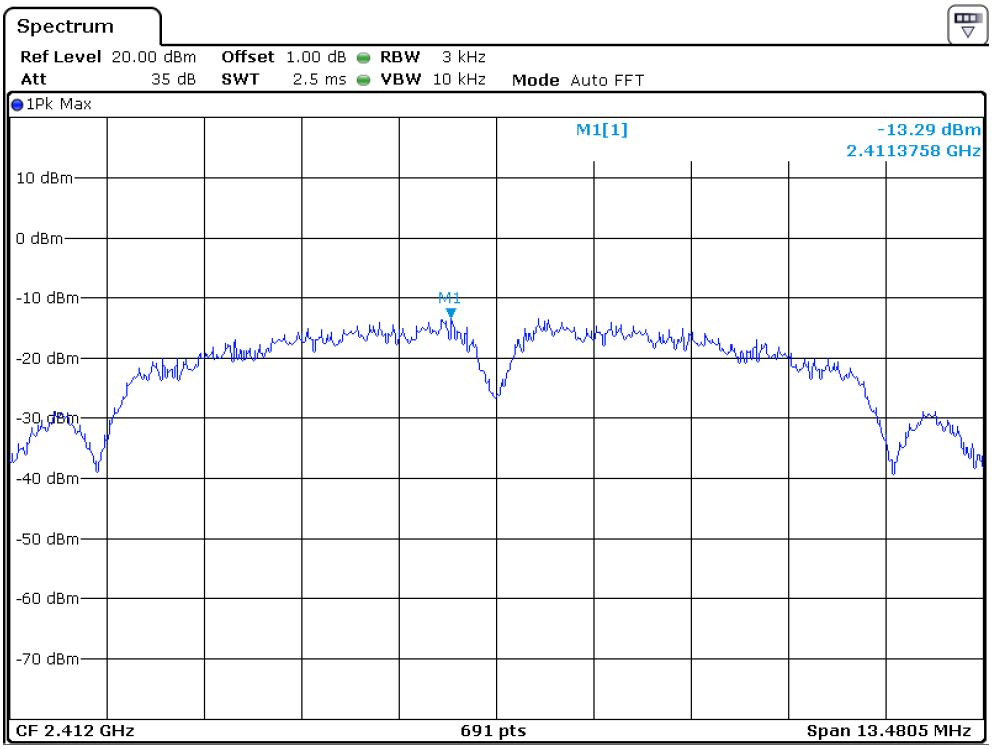
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 3KHz
2412	-13.29
2437	-17.56
2462	-15.31

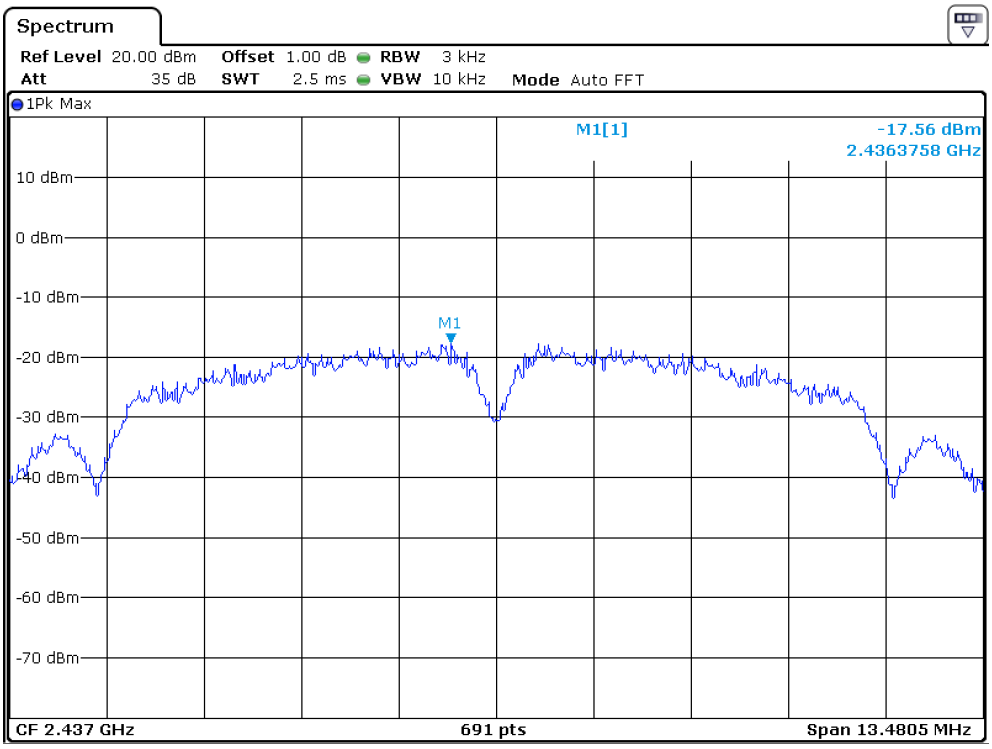
IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 3KHz
2412	-18.06
2437	-20.13
2462	-17.77

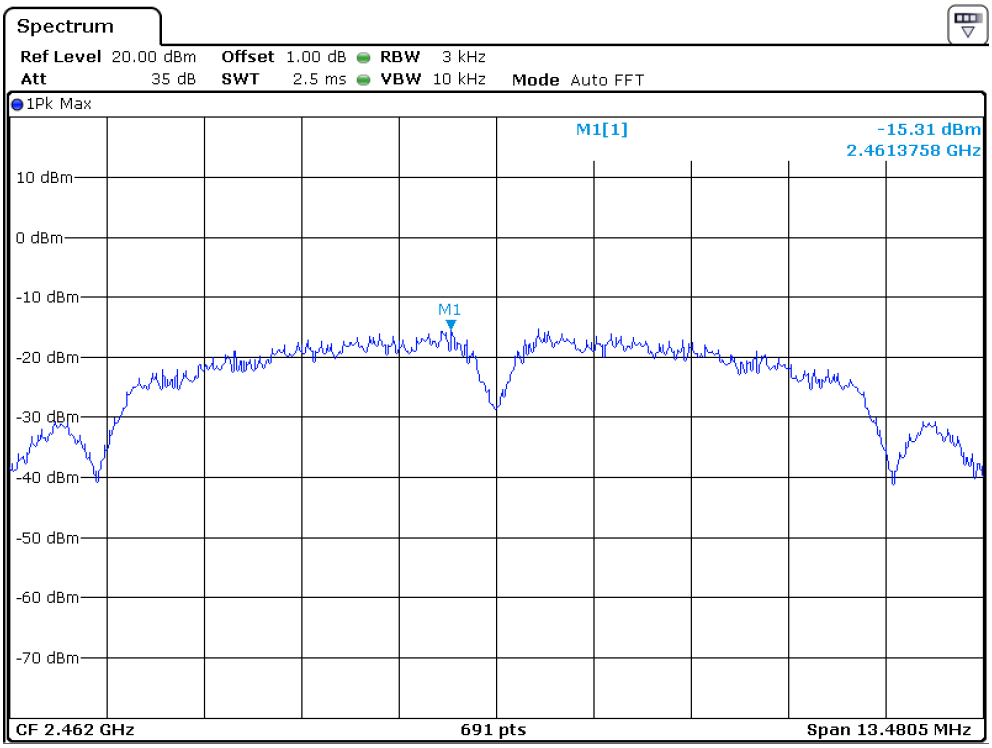
IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 3KHz
2412	-18.93
2437	-20.58
2462	-18.46

The test plots are attached as below.

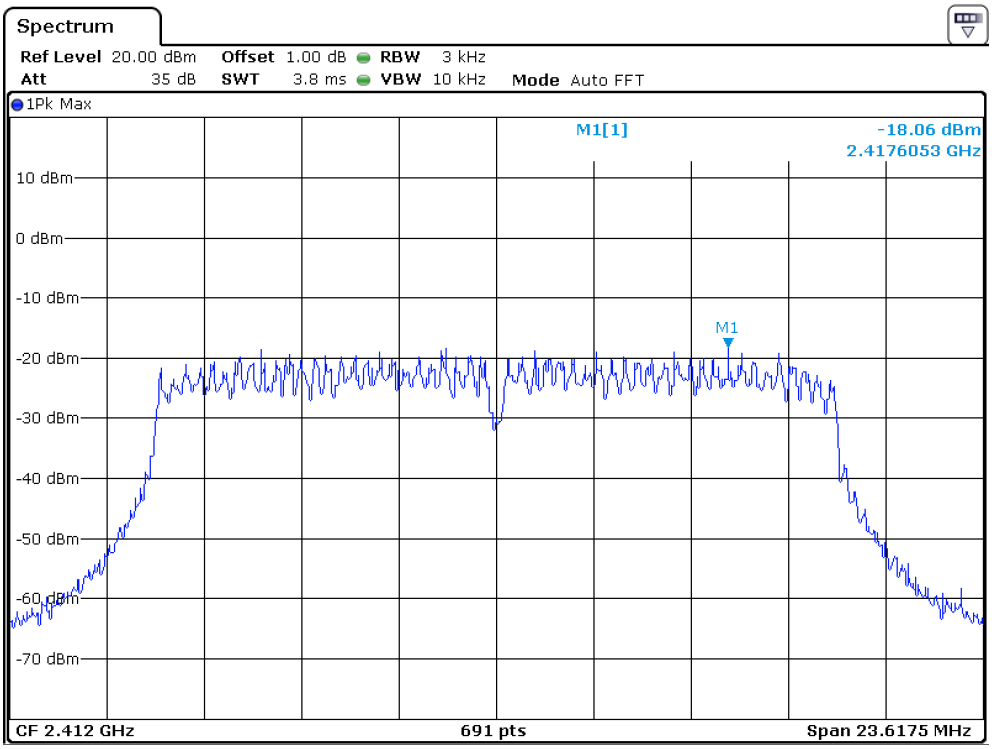
802.11b

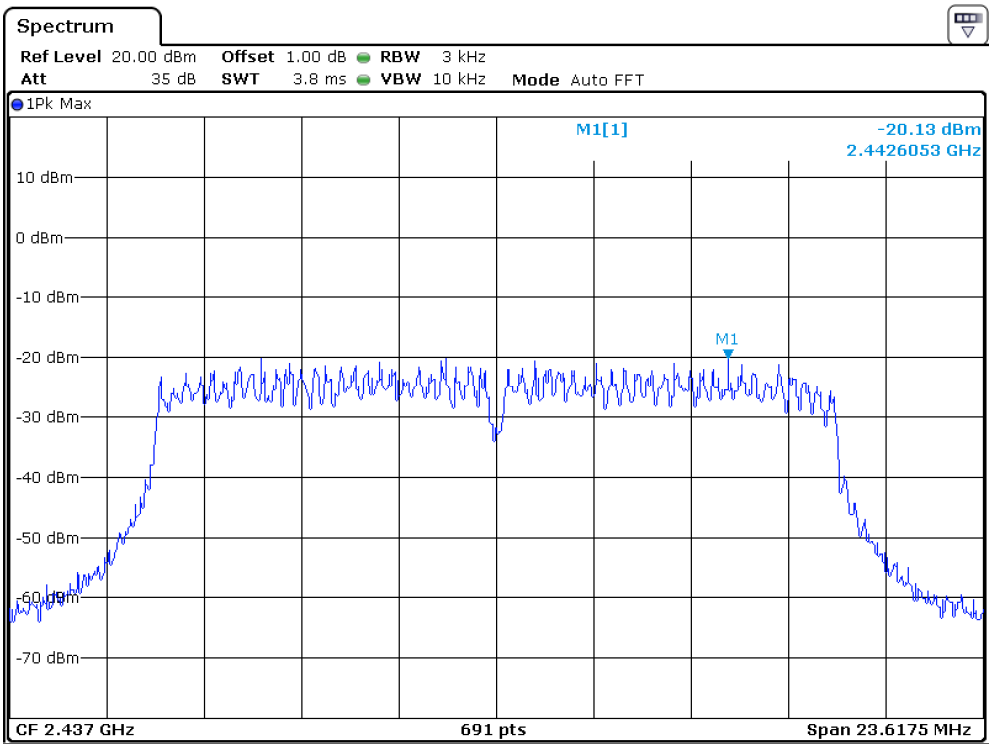

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 2.5 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -13.29 dBm
2.4113758 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.412 GHz
691 pts
Span 13.4805 MHz

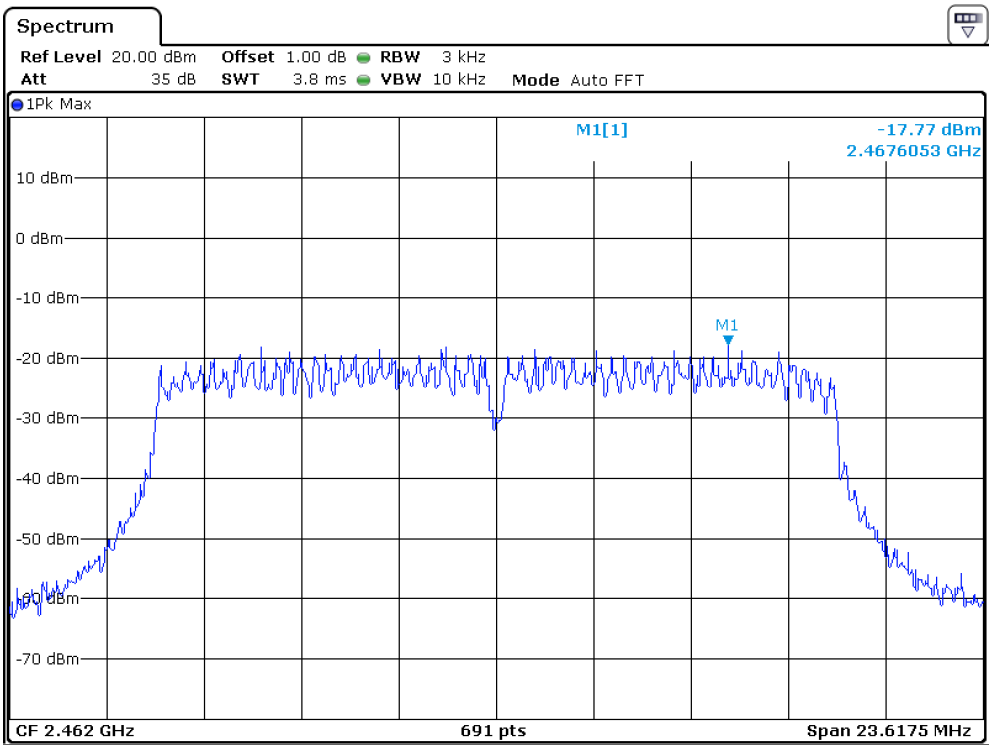

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 2.5 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -17.56 dBm
2.4363758 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.437 GHz
691 pts
Span 13.4805 MHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 2.5 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -15.31 dBm
2.4613758 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 13.4805 MHz

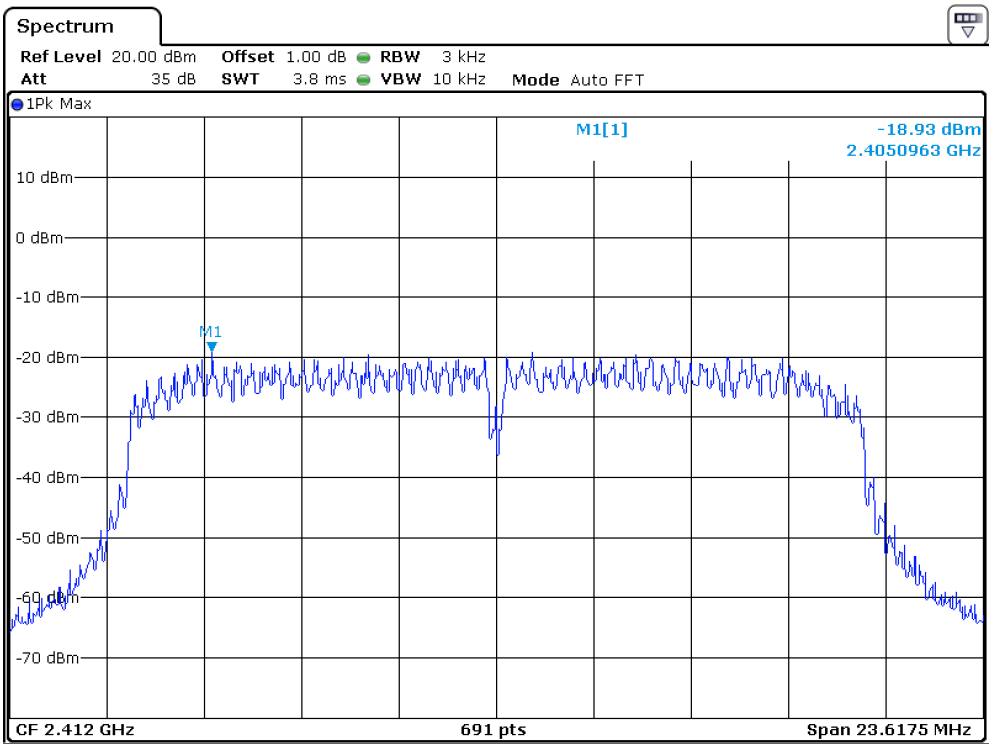
802.11g

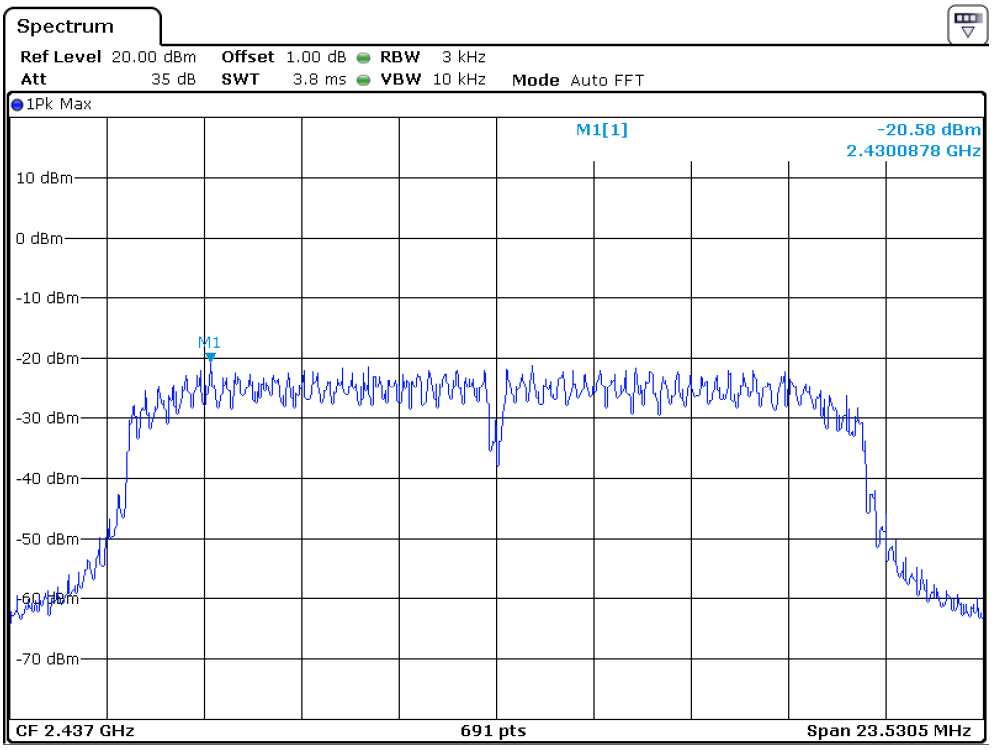

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -18.06 dBm
2.4176053 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.412 GHz
691 pts
Span 23.6175 MHz

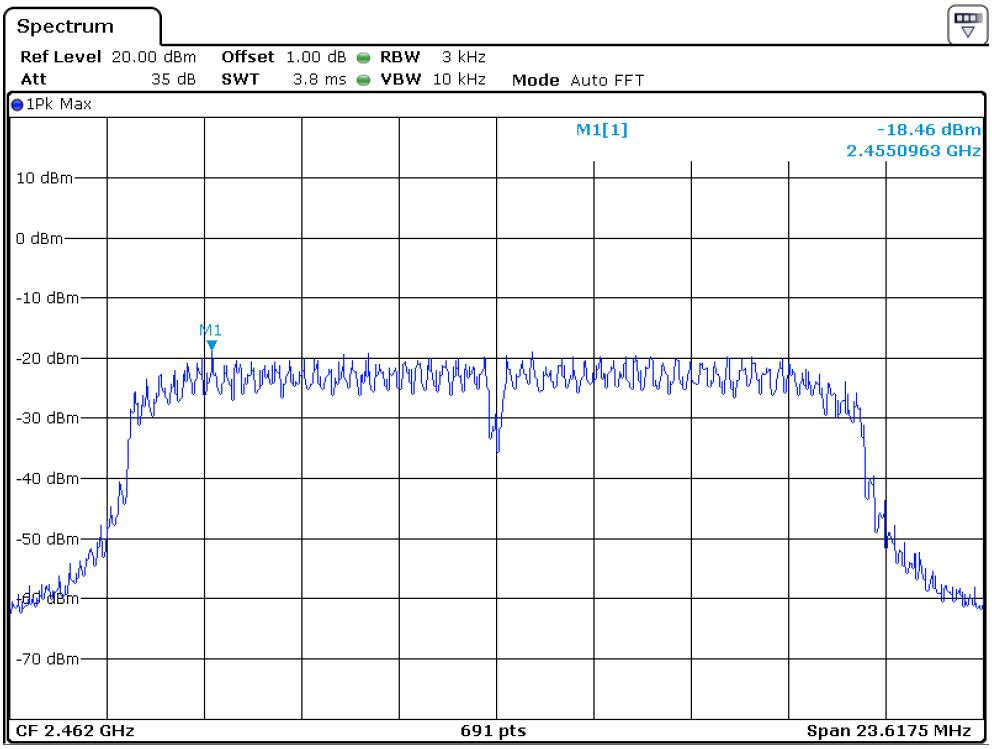

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -20.13 dBm
2.4426053 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 23.6175 MHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1]
-17.77 dBm
2.4676053 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 23.6175 MHz

802.11n-HT20


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -18.93 dBm
2.4050963 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 23.6175 MHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -20.58 dBm
2.4300878 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 23.5305 MHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz
Att 35 dB SWT 3.8 ms VBW 10 kHz Mode Auto FFT
1Pk Max
M1[1] -18.46 dBm
2.4550963 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 23.6175 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 v04.

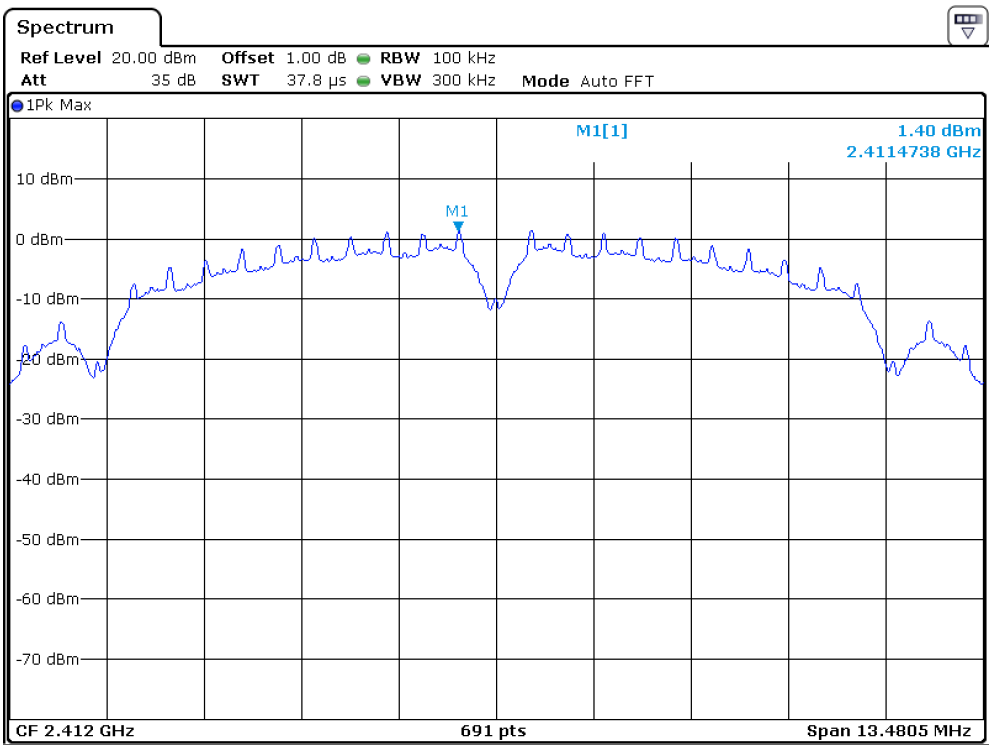
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

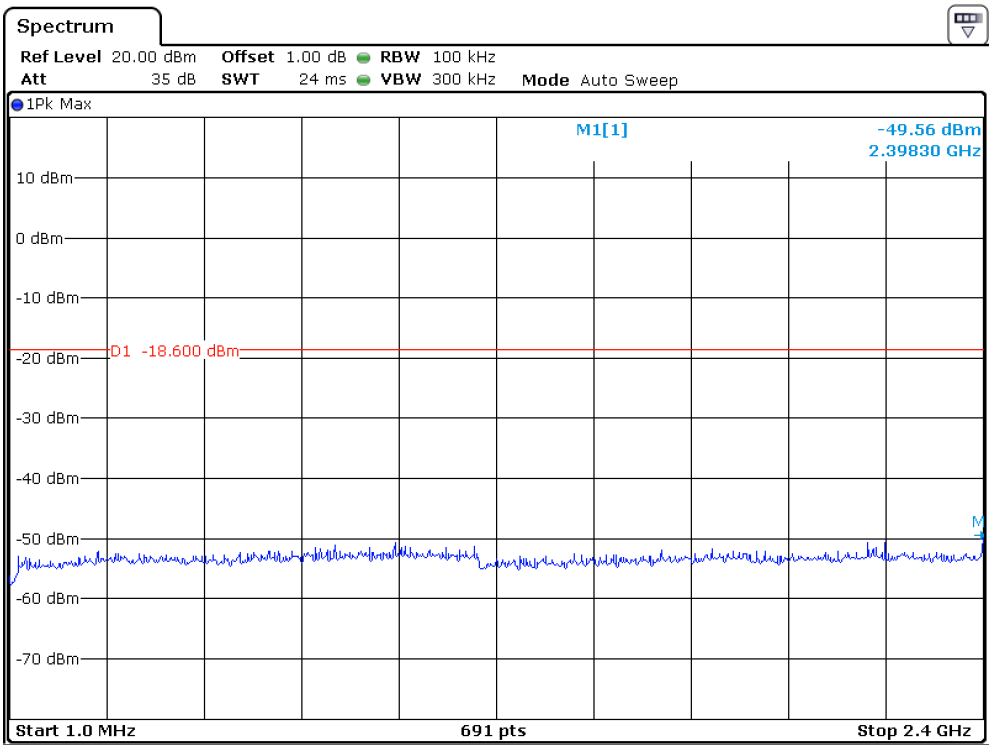
Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for 802.11b and 6Mbps for 802.11g and 6Mbps for 802.11n-HT20.

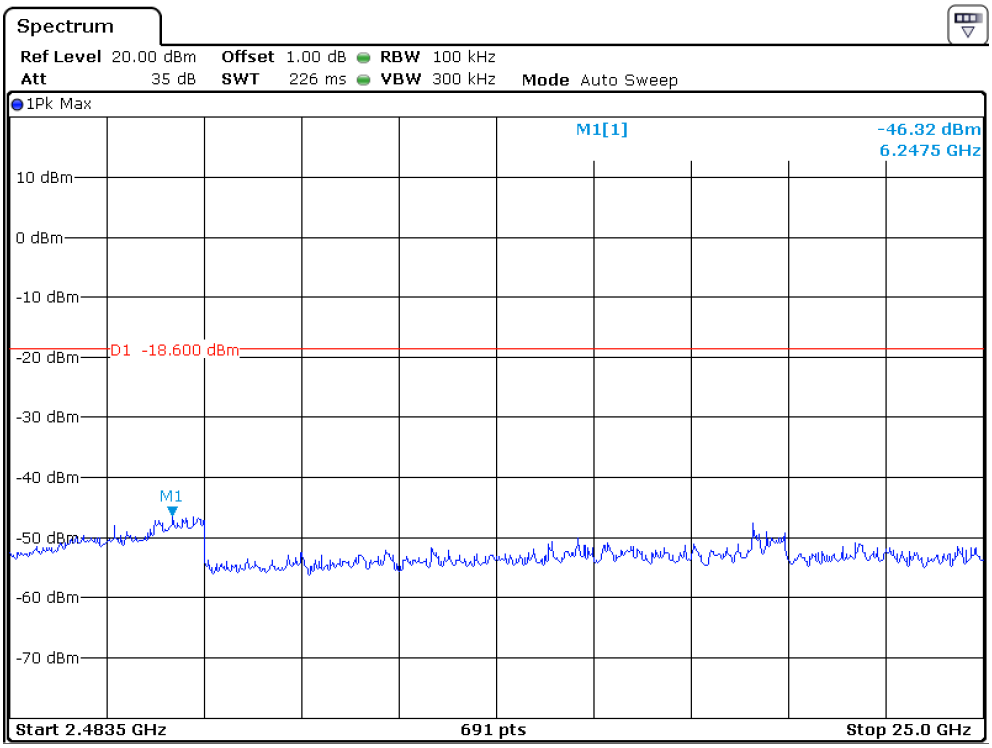
The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

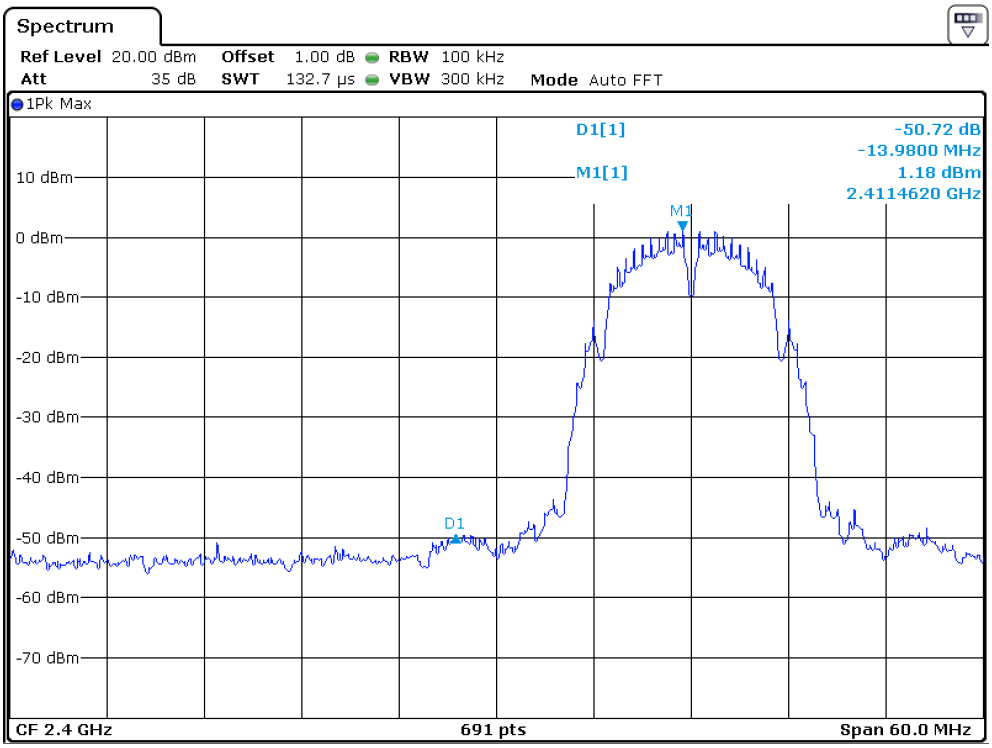
The test plots are attached as below.

802.11b
Channel 01 (2412MHz) Reference Level: 1.40dBm

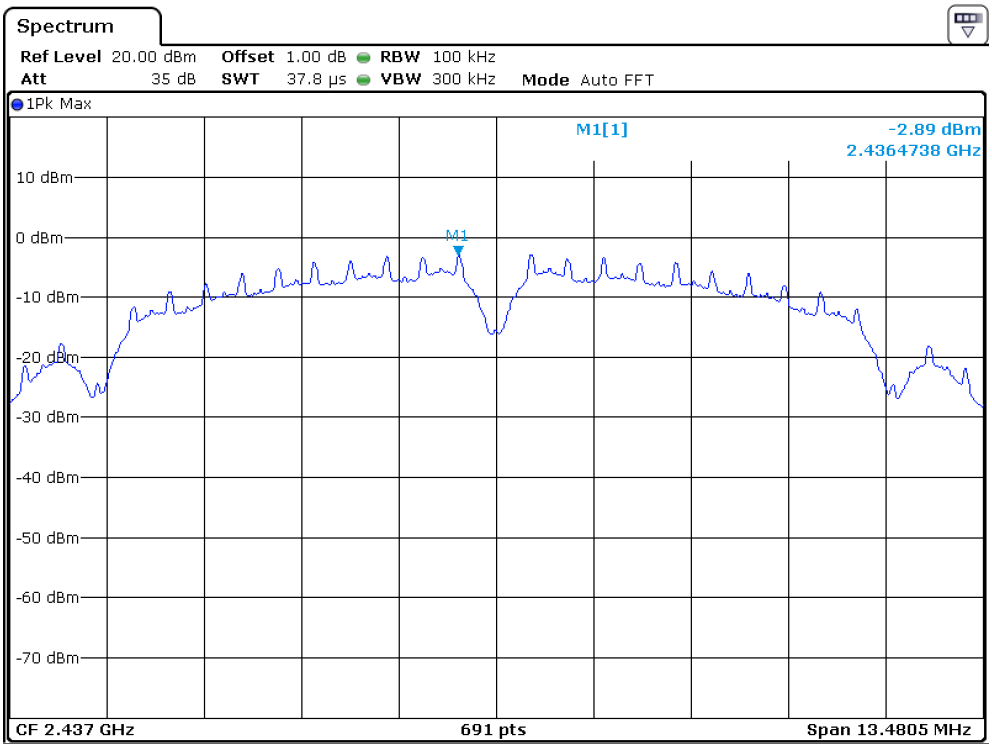


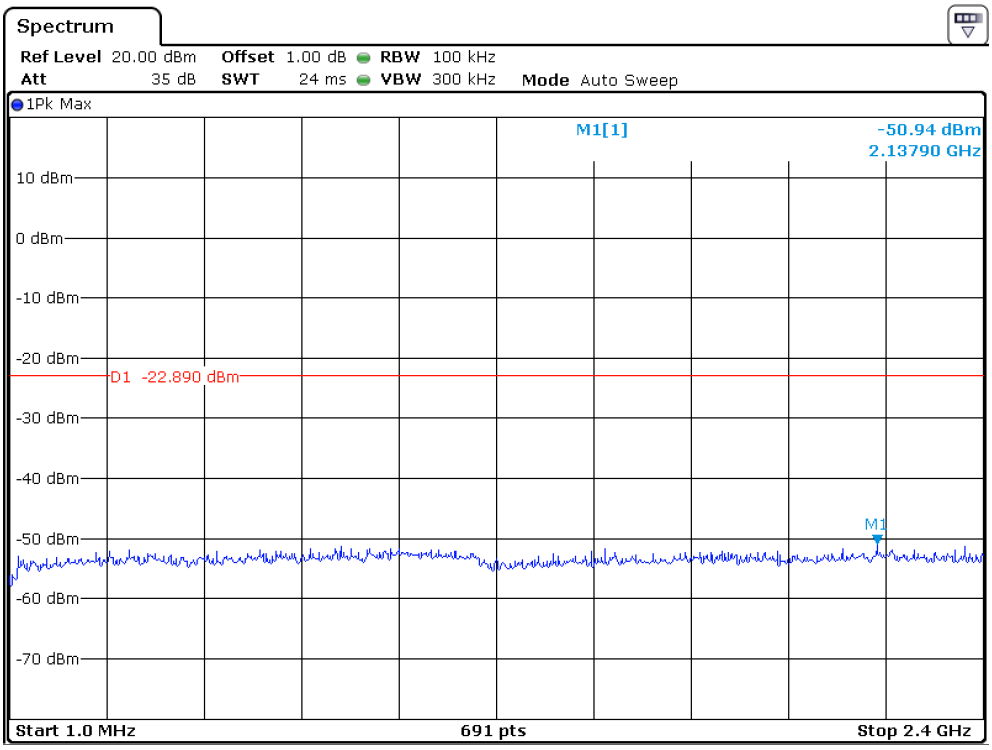


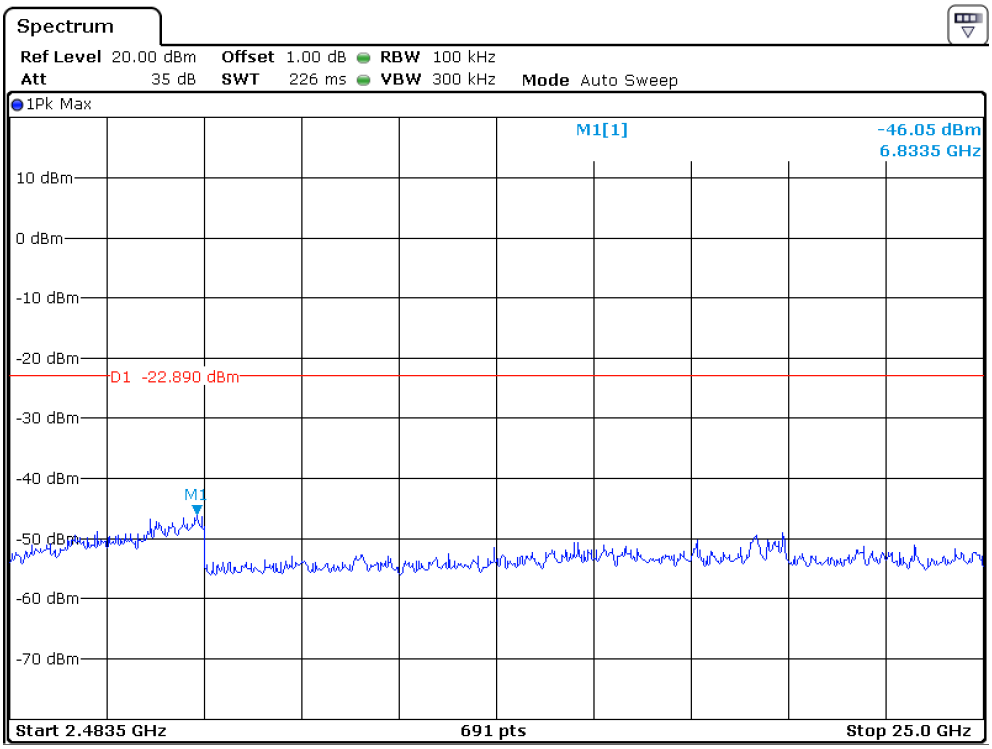

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -46.32 dBm
6.2475 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
D1 -18.600 dBm
M1
Start 2.4835 GHz
691 pts
Stop 25.0 GHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -50.72 dB
-13.9800 MHz
M1[1] 1.18 dBm
2.4114620 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

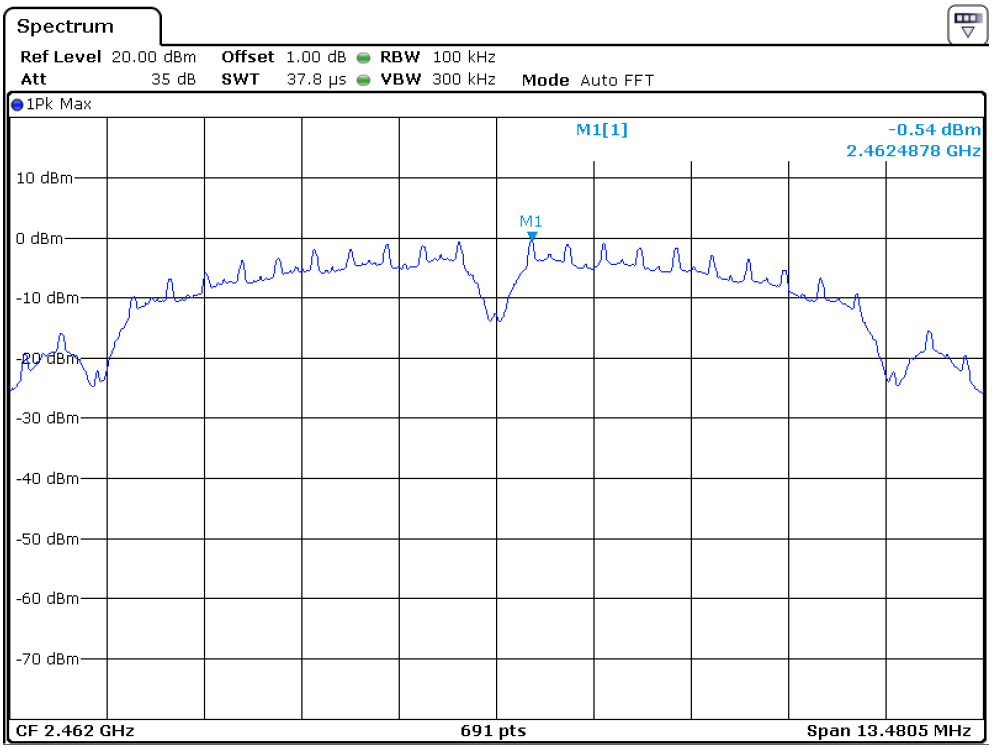
Channel 06 (2437MHz) Reference Level: -2.89dBm

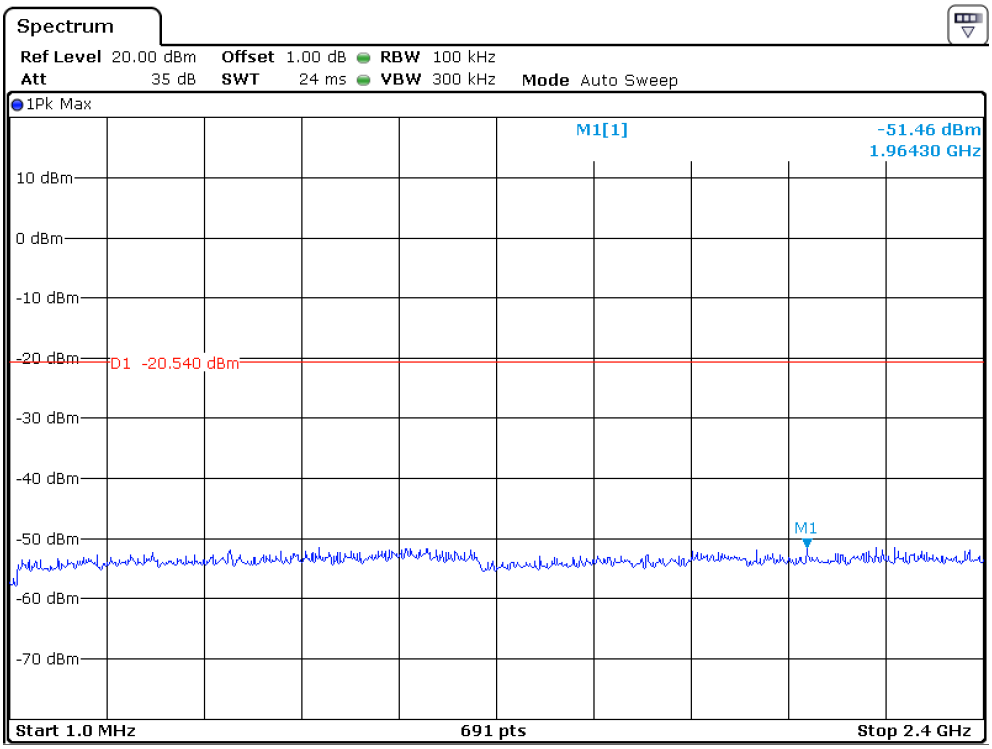


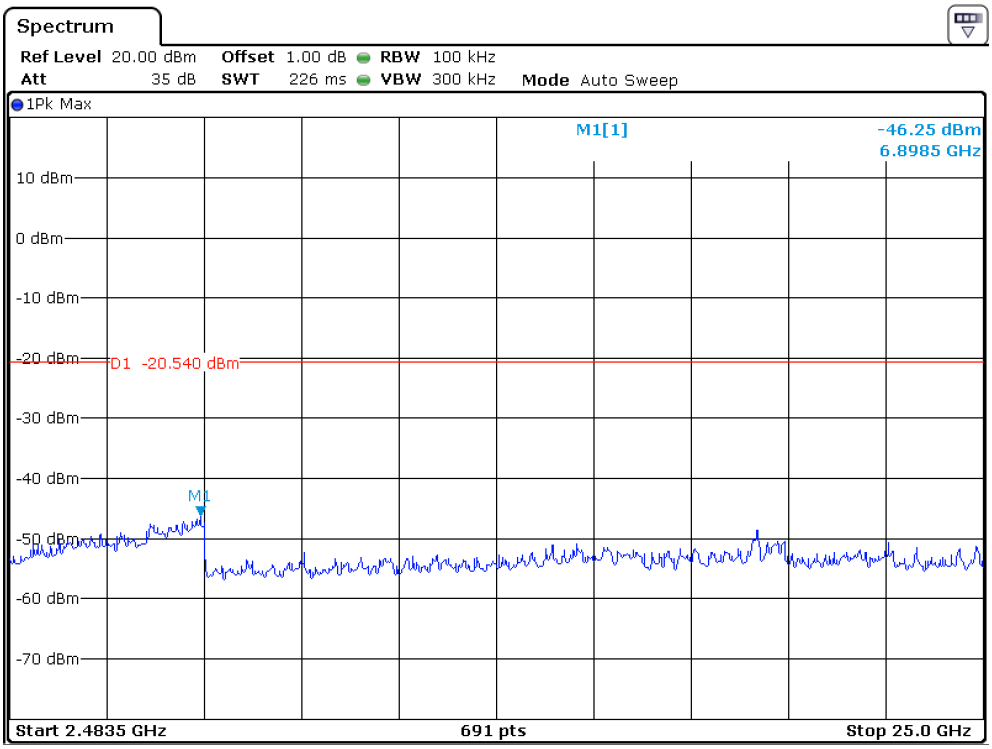


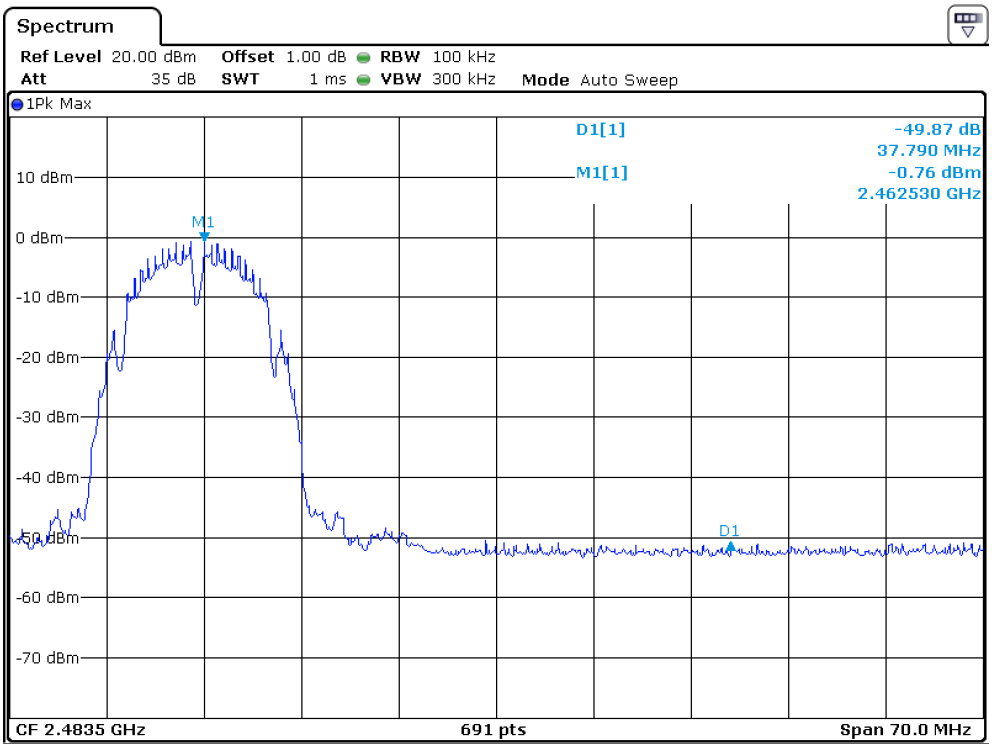

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1]
-46.05 dBm
6.8335 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -22.890 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

Channel 11 (2462MHz) Reference Level: -0.54dBm

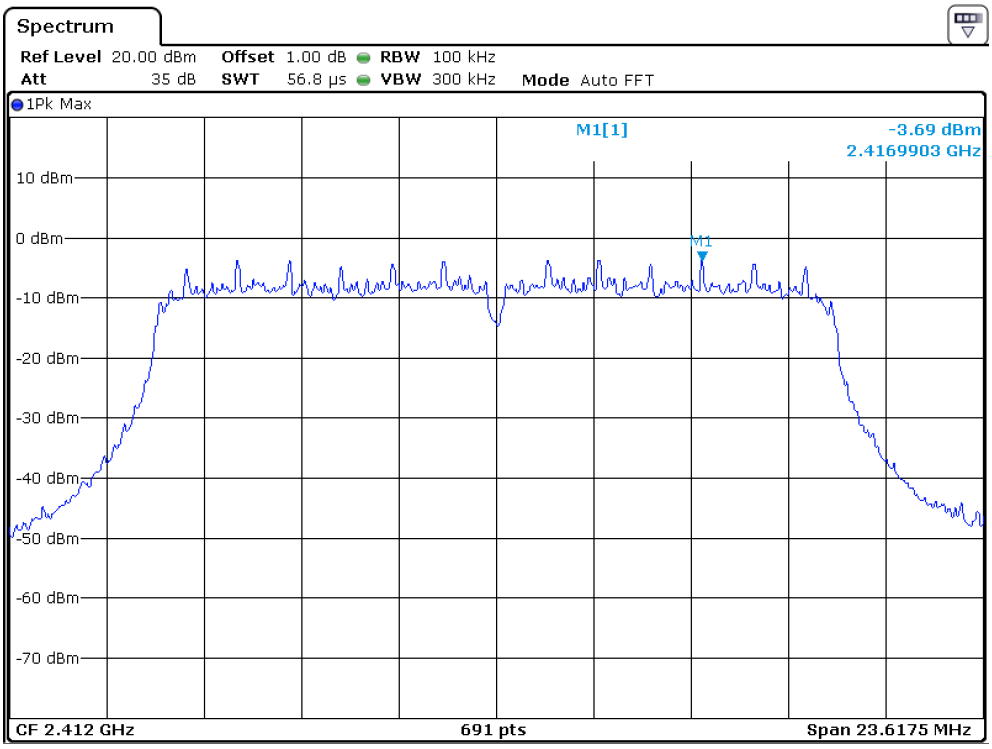


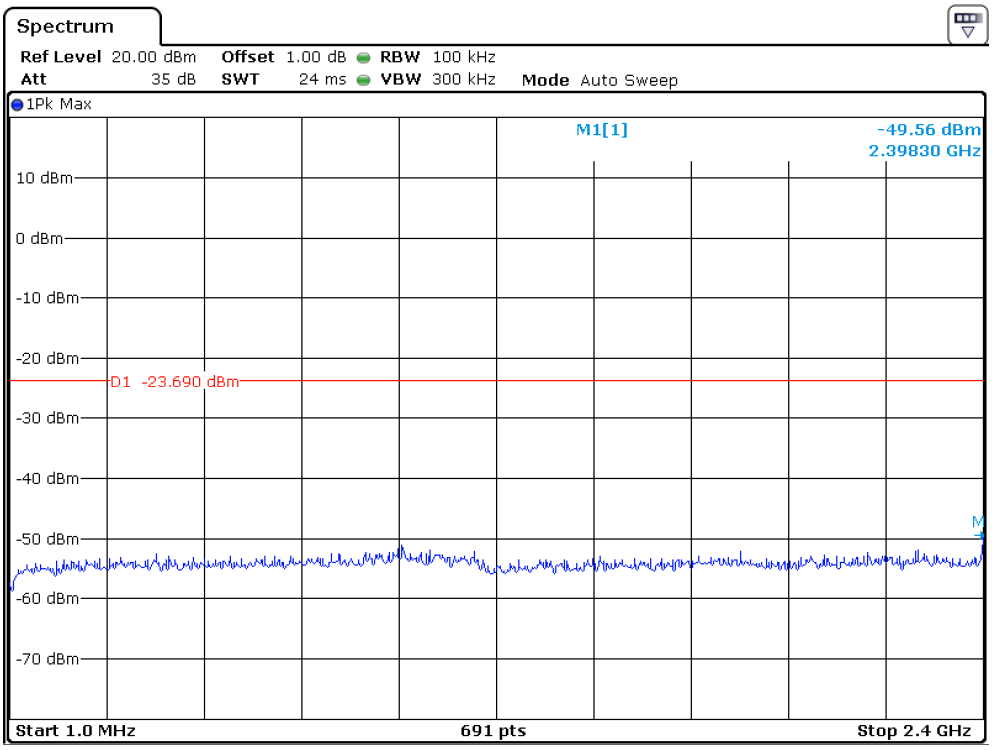


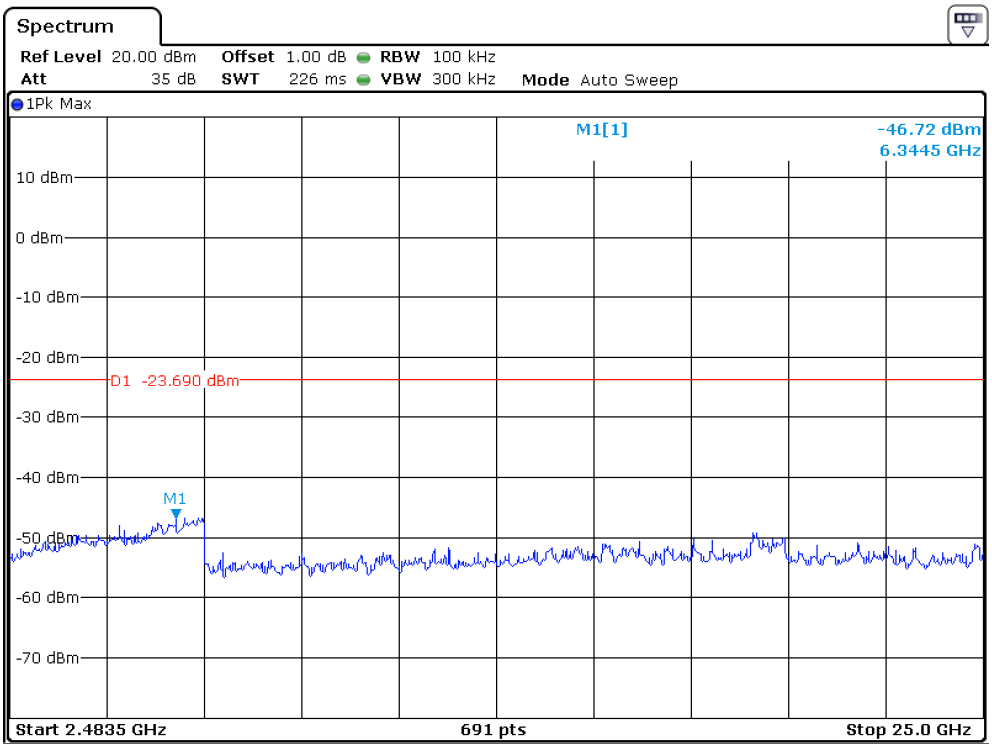

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -46.25 dBm
6.8985 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -20.540 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

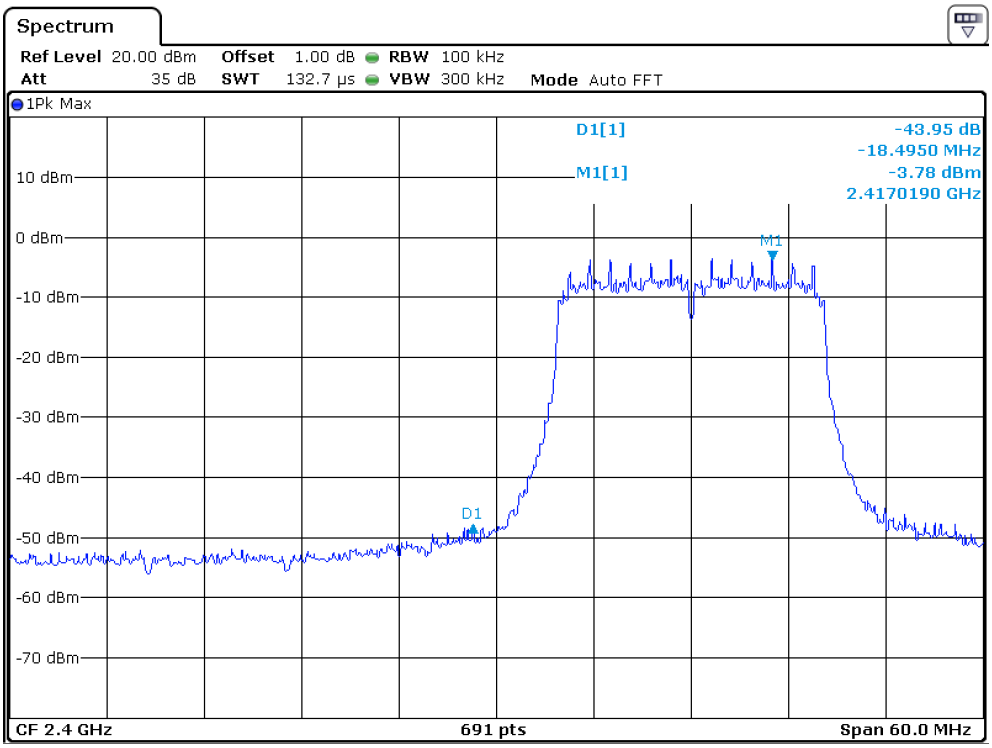

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -49.87 dB
37.790 MHz
M1[1] -0.76 dBm
2.462530 GHz
10 dBm
0 dBm
M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
D1
-50 dBm
-60 dBm
-70 dBm
CF 2.4835 GHz
691 pts
Span 70.0 MHz

802.11g
Channel 01 (2412MHz) Reference Level: -3.69dBm

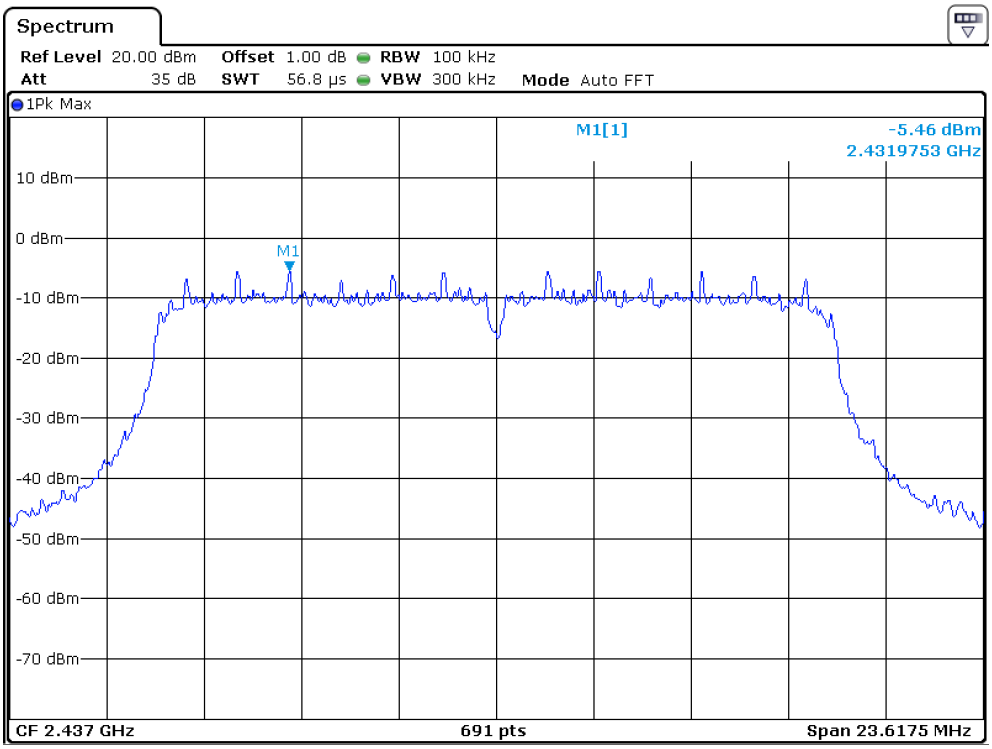


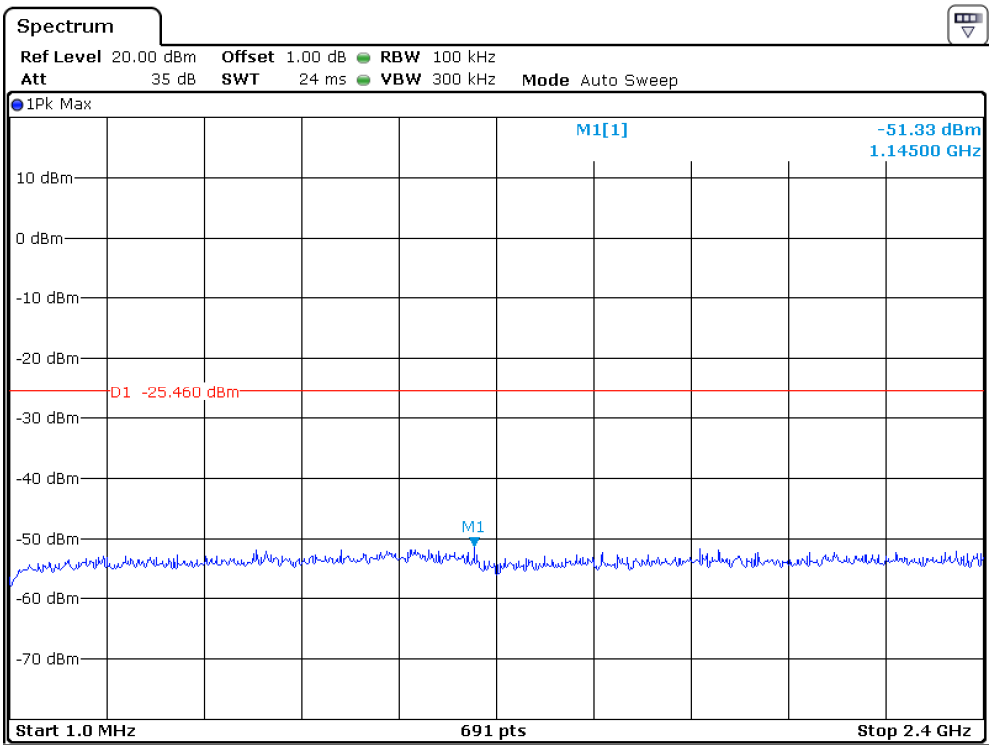


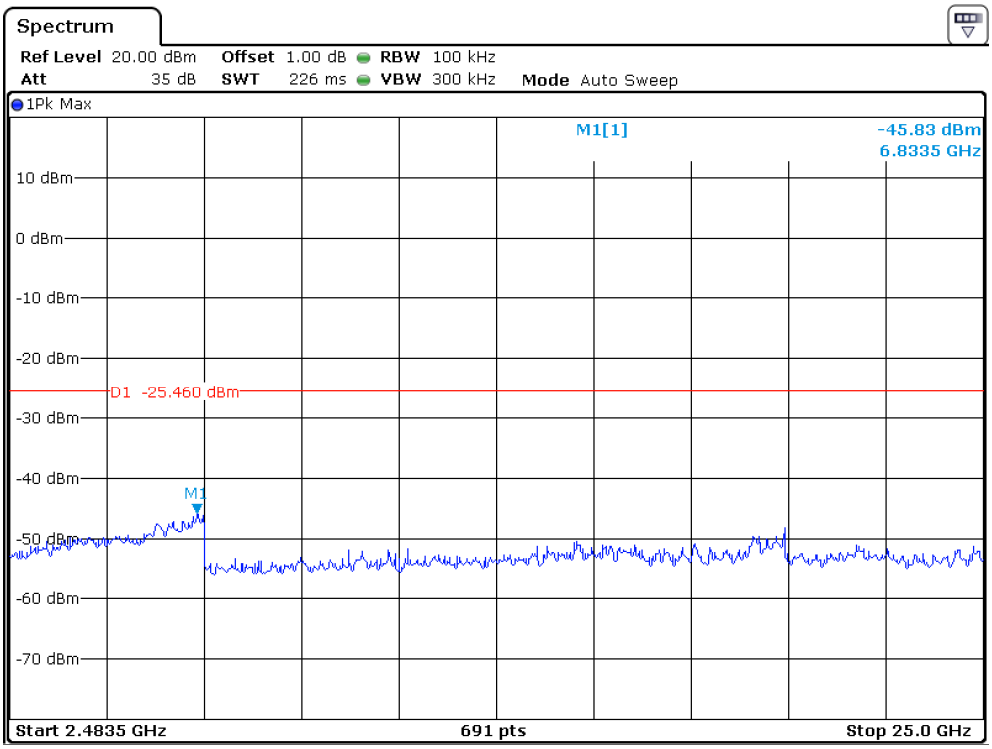

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -46.72 dBm
6.3445 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -23.690 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -43.95 dB
-18.4950 MHz
M1[1] -3.78 dBm
2.4170190 GHz
10 dBm
0 dBm
M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
D1
-50 dBm
-60 dBm
-70 dBm
CF 2.4 GHz
691 pts
Span 60.0 MHz

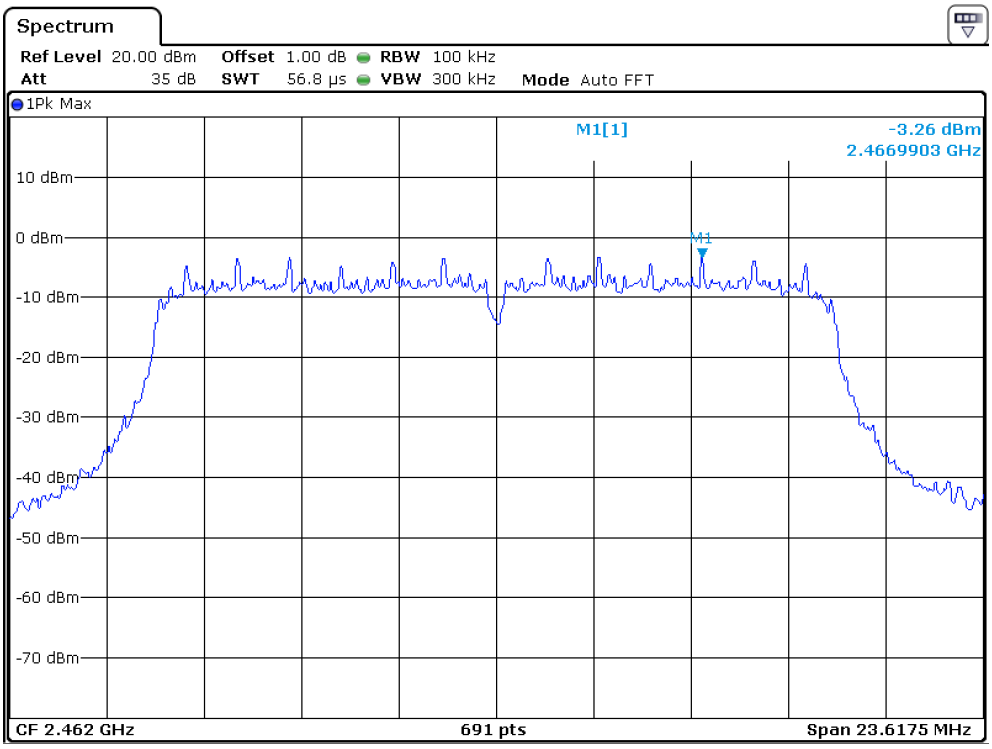
Channel 06 (2437MHz) Reference Level: -5.46dBm

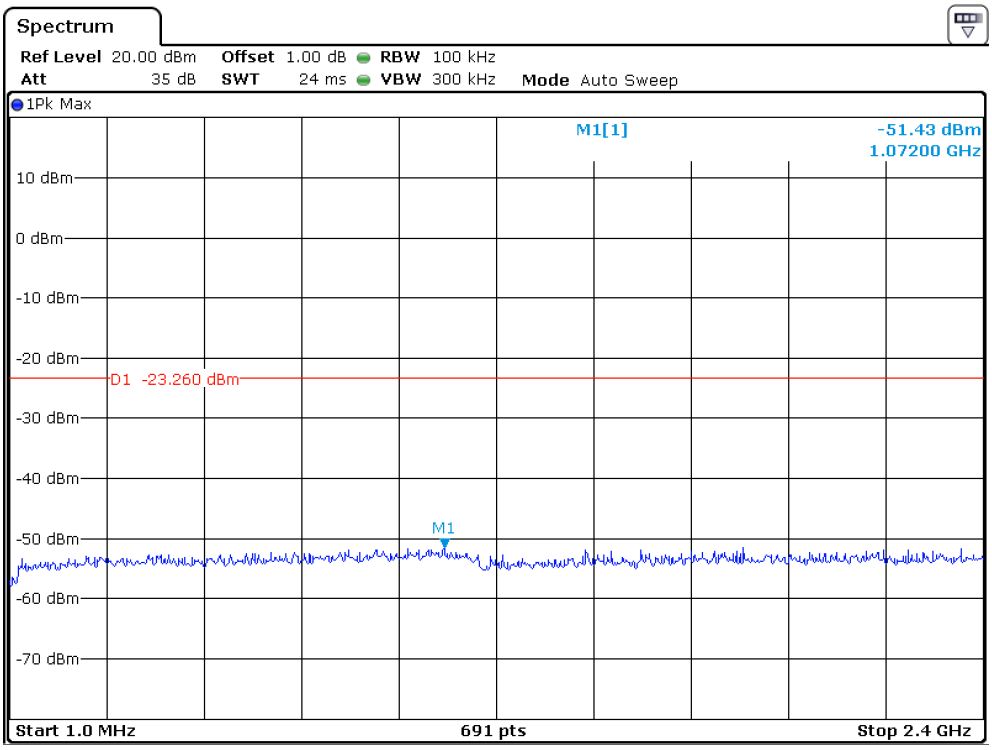


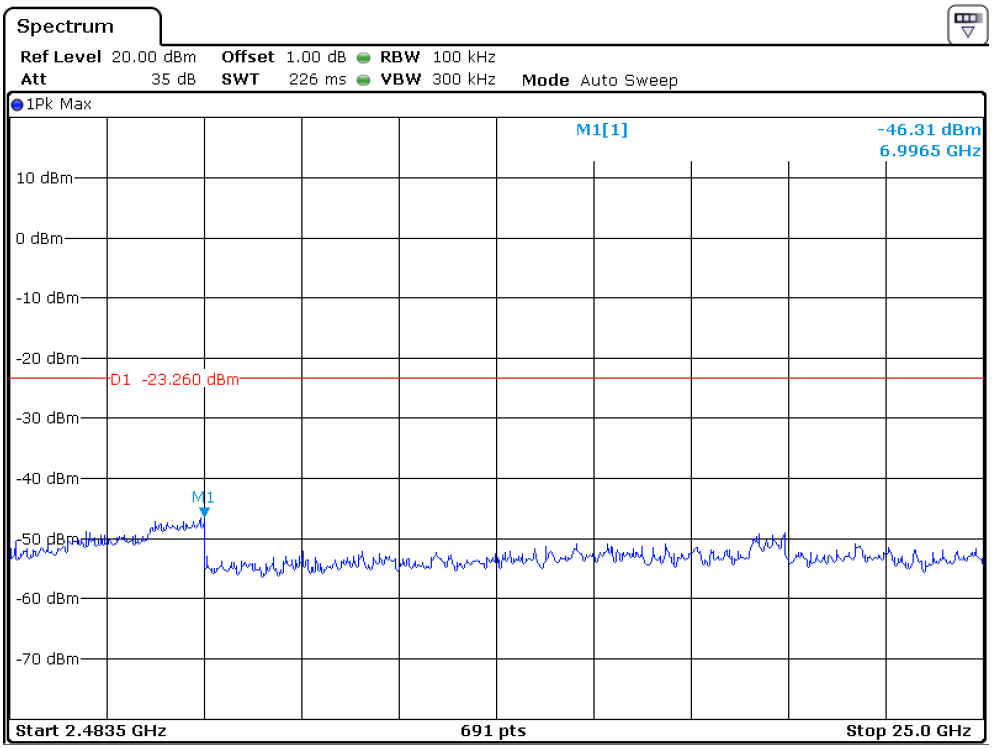


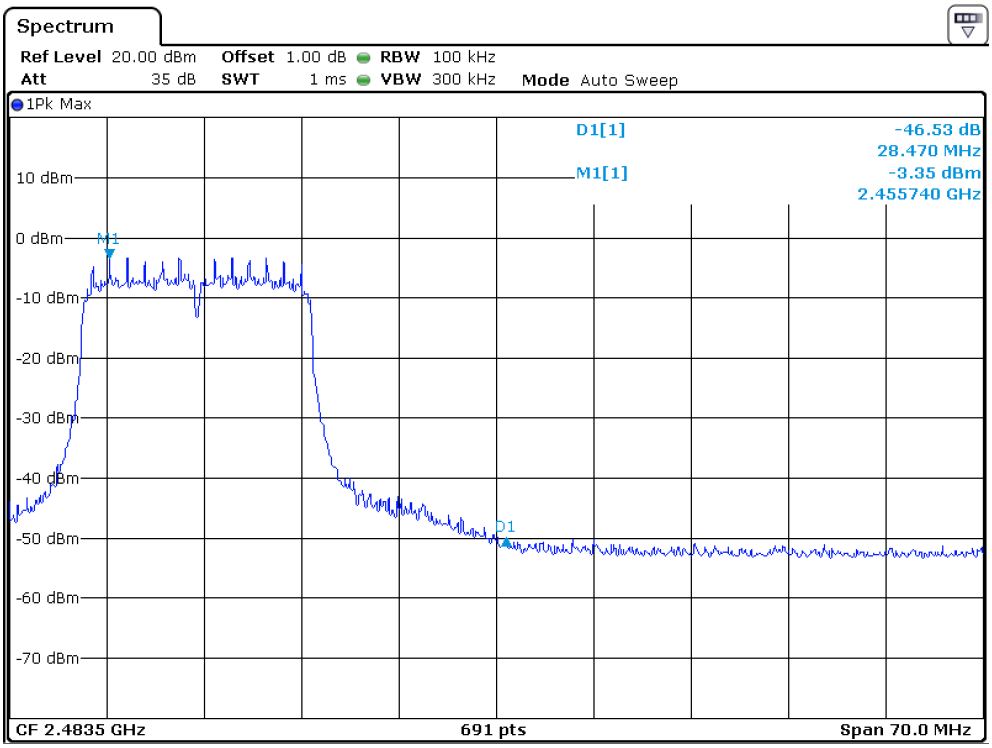

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -45.83 dBm
6.8335 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -25.460 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

Channel 11 (2462MHz) Reference Level: -3.26dBm

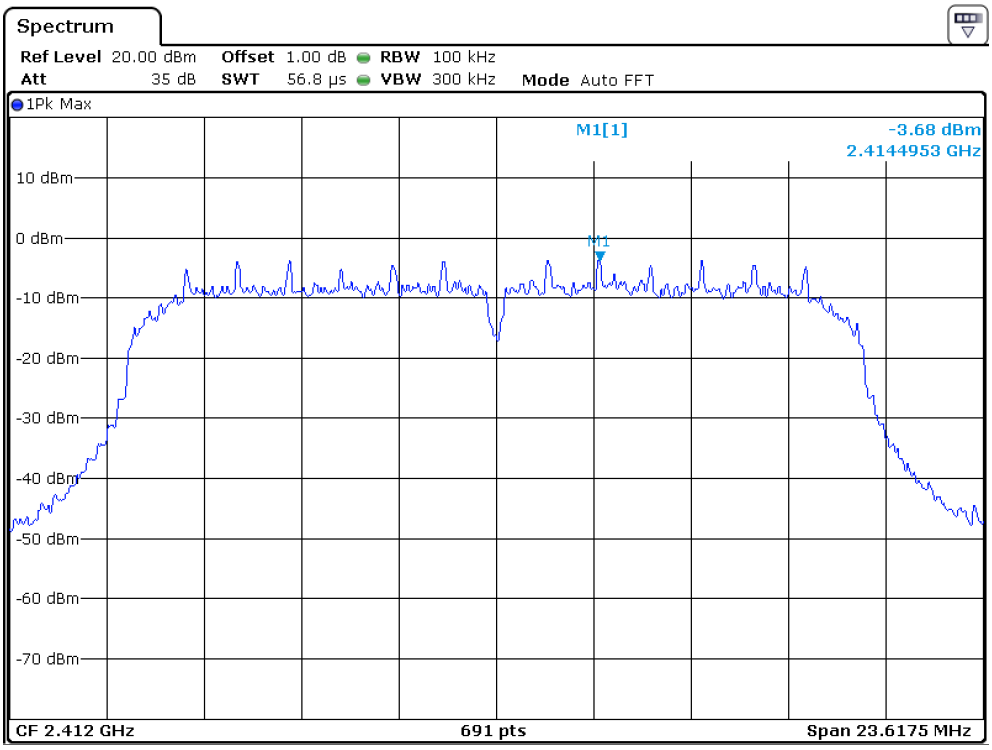


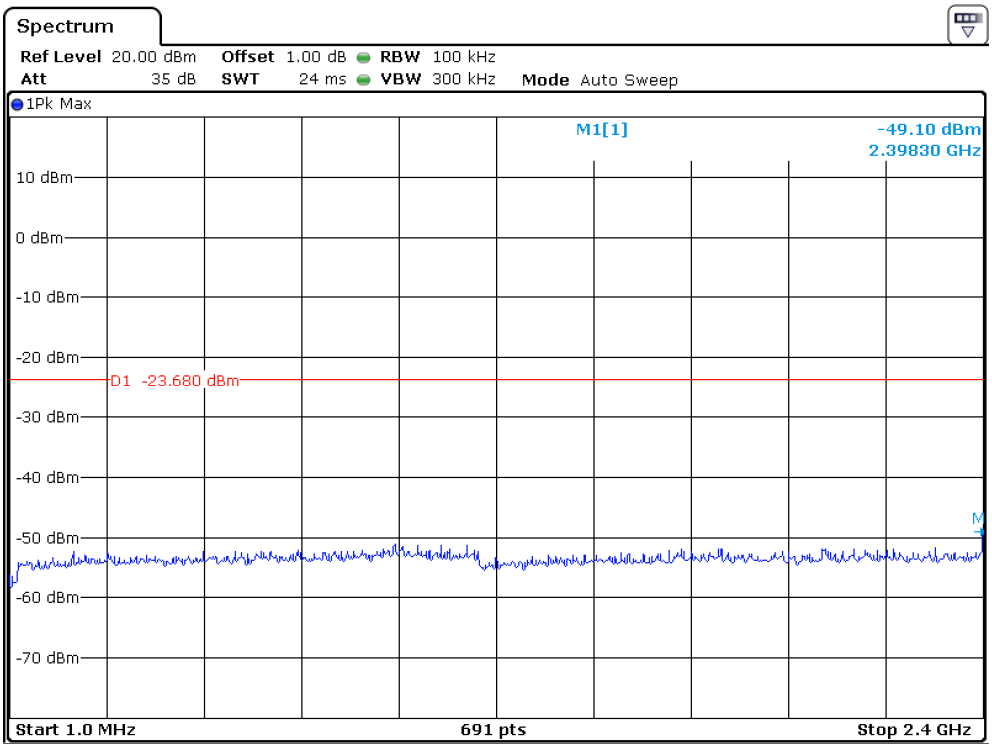


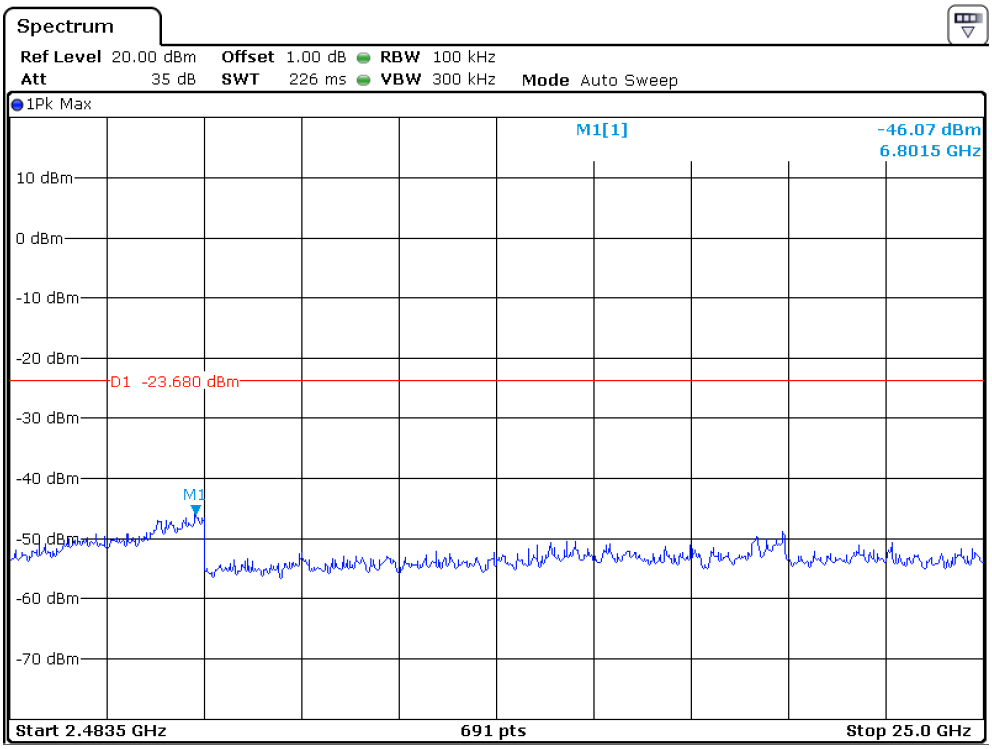

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -46.31 dBm
6.9965 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -23.260 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

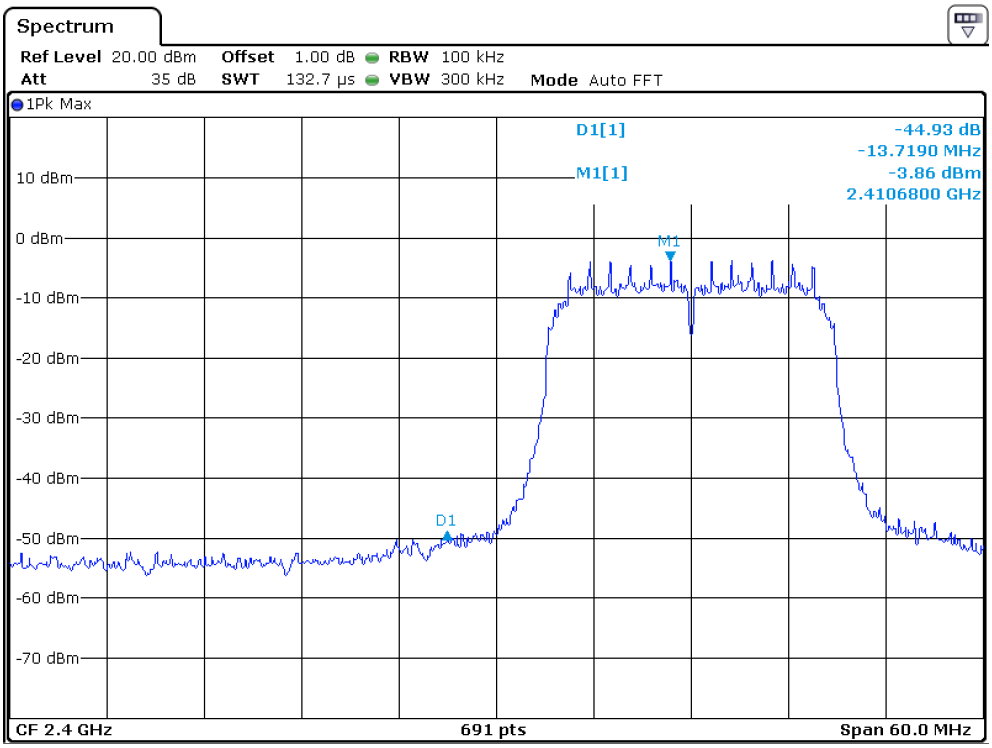

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -46.53 dB
28.470 MHz
M1[1] -3.35 dBm
2.455740 GHz
10 dBm
0 dBm
M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
D1
-50 dBm
-60 dBm
-70 dBm
CF 2.4835 GHz
691 pts
Span 70.0 MHz

802.11n-HT20
Channel 01 (2412MHz) Reference Level: -3.68dBm

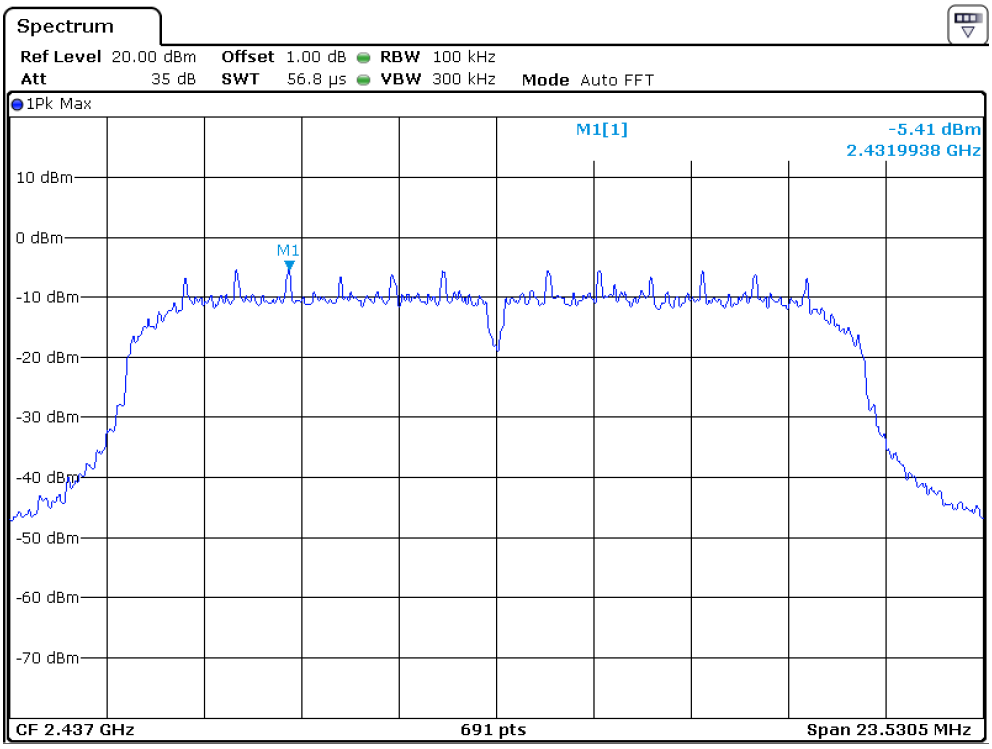


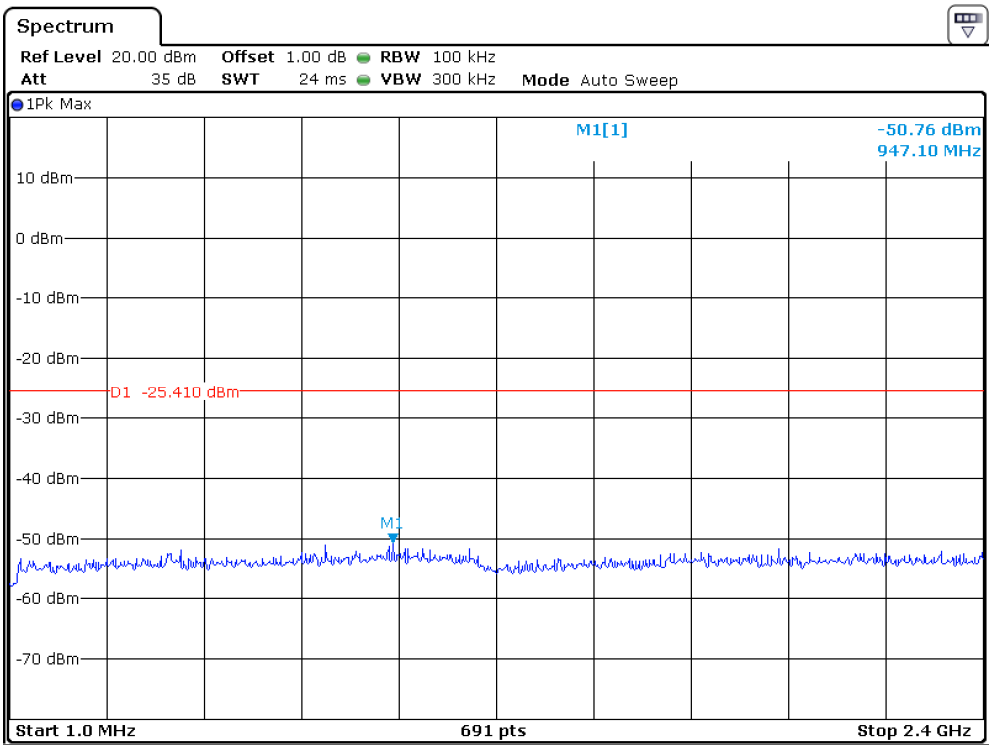


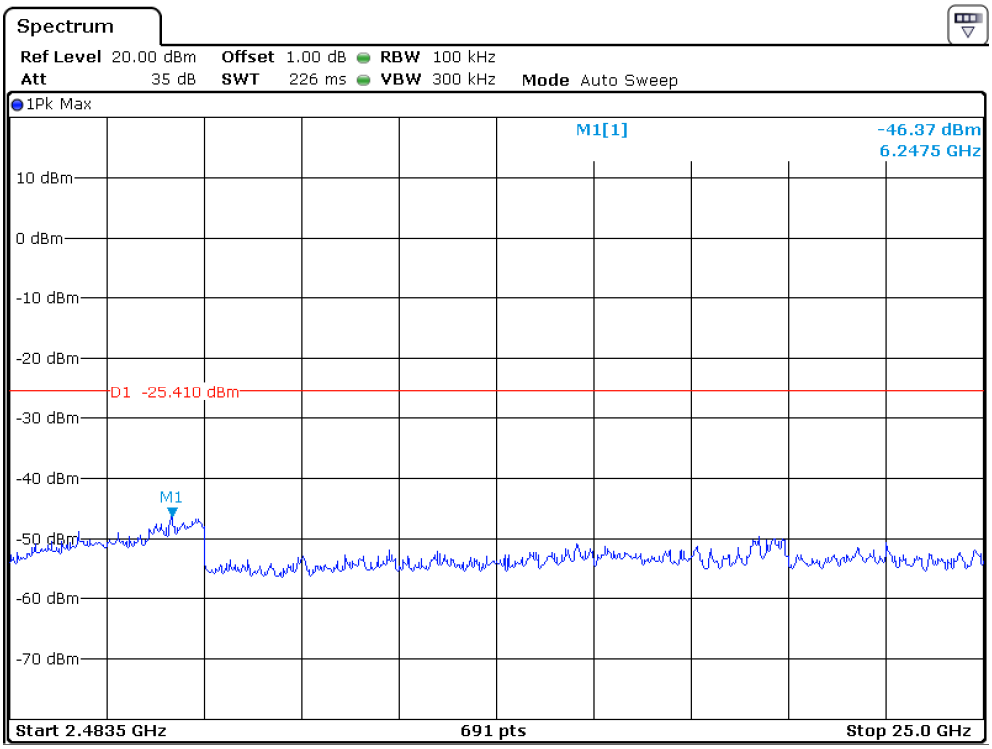

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -46.07 dBm
6.8015 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -23.680 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -44.93 dB
-13.7190 MHz
M1[1] -3.86 dBm
2.4106800 GHz
10 dBm
0 dBm
M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
D1
-50 dBm
-60 dBm
-70 dBm
CF 2.4 GHz
691 pts
Span 60.0 MHz

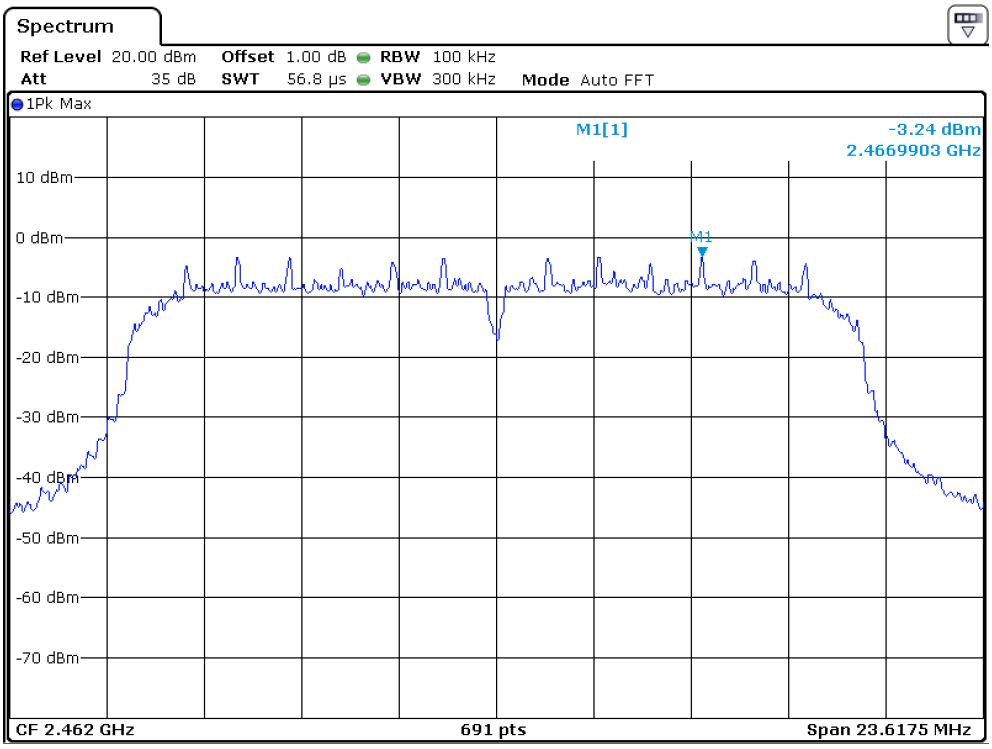
Channel 06 (2437MHz) Reference Level: -5.41dBm

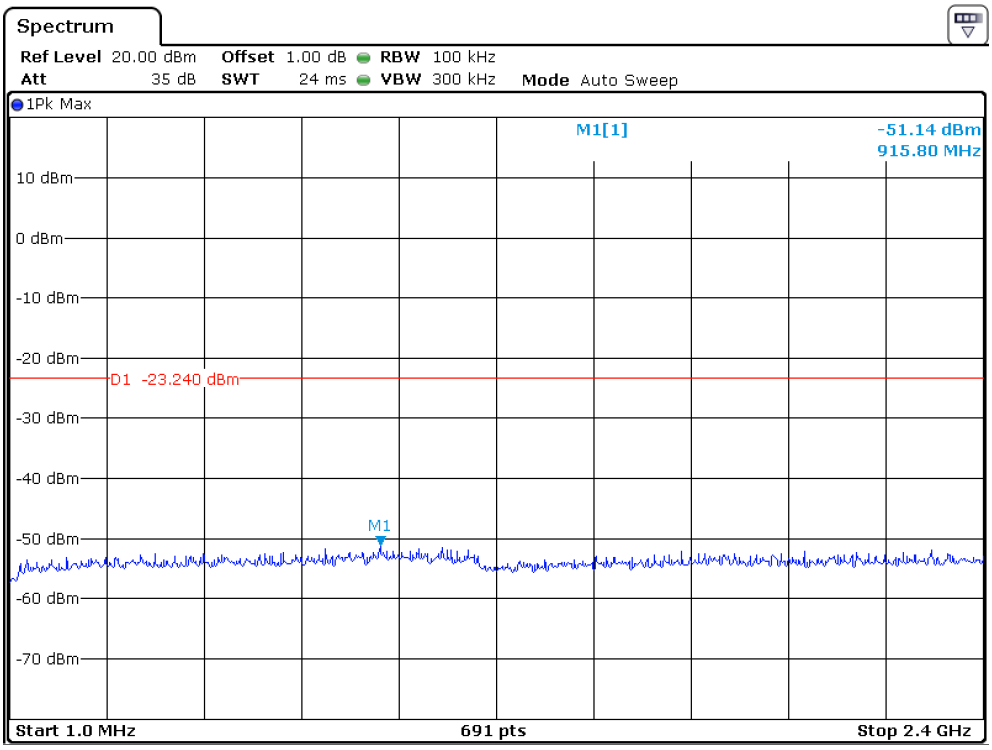


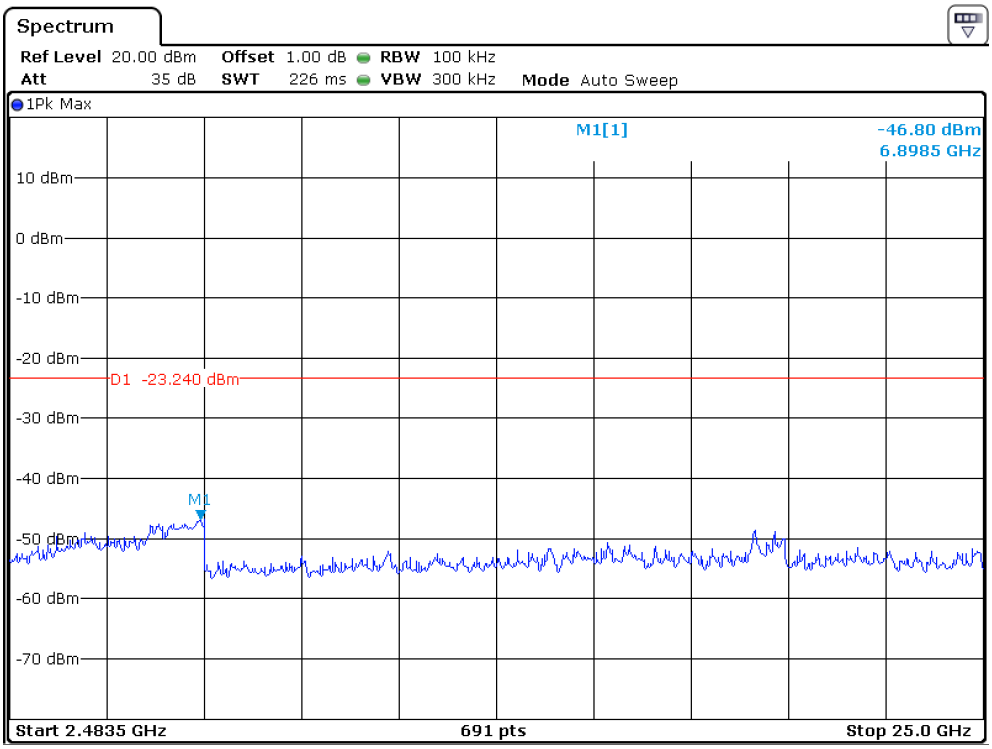


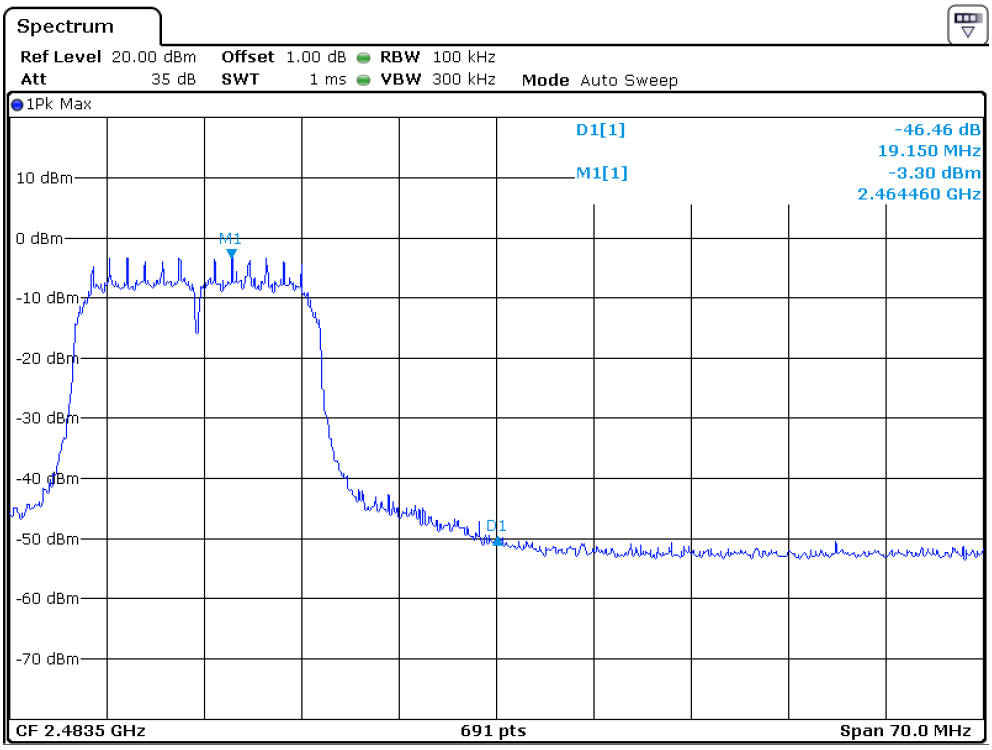

Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1]
-46.37 dBm
6.2475 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -25.410 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

Channel 11 (2462MHz) Reference Level: -3.24dBm






Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -46.80 dBm
6.8985 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -23.240 dBm
-30 dBm
-40 dBm
M1
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz


Spectrum
Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz
Att 35 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -46.46 dB
19.150 MHz
M1[1] -3.30 dBm
2.464460 GHz
10 dBm
0 dBm
M1
-10 dBm
-20 dBm
-30 dBm
-40 dBm
D1
-50 dBm
-60 dBm
-70 dBm
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

<u>Example</u>
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 (802.11b-Channel 1)
at 404.0MHz
is passed by 3.2dB margin.

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

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting(802.11b-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	216.240	38.4	20.0	13.3	31.7	46.0	-14.3
Horizontal	330.700	42.4	20.0	15.7	38.1	46.0	-7.9
Horizontal	404.000	43.5	20.0	19.3	42.8	46.0	-3.2
Vertical	326.820	36.3	20.0	13.5	29.8	46.0	-16.2
Vertical	394.000	41.2	20.0	15.8	37.0	46.0	-9.0
Vertical	494.630	27.4	20.0	20.3	27.7	46.0	-18.3

NOTES:
1. Quasi-Peak detector is used for frequency below 1GHz.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances 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 harmonic 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.

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11b-Channel 01)

Radiated Emissions

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	56.2	36.8	33.5	52.9	74.0	-21.1
Horizontal	*2389.700	56.6	36.4	29.1	49.3	74.0	-24.7

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	*4824.000	40.5	36.8	33.5	37.2	54.0	-16.8
Horizontal	*2389.700	39.4	36.4	29.1	32.1	54.0	-21.9

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11b-Channel 06)

Radiated Emissions

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	55.4	36.7	33.4	52.1	74.0	-21.9
Horizontal	*7311.000	49.3	36.6	35.8	48.5	74.0	-25.5

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	*4874.000	40.4	36.7	33.4	37.1	54.0	-16.9
Horizontal	*7311.000	31.8	36.6	35.8	31.0	54.0	-23.0

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11b-Channel 11)

Radiated Emissions

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	55.8	36.8	33.3	52.3	74.0	-21.7
Horizontal	*2484.50	54.8	36.5	29.3	47.6	74.0	-26.4

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	40.5	36.8	33.3	37.0	54.0	-17.0
Horizontal	*2484.500	38.8	36.5	29.3	31.6	54.0	-22.4

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11g-Channel 01)

Radiated Emissions

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	51.9	36.8	33.5	48.6	74.0	-25.4
Horizontal	*2389.700	50.0	36.4	29.1	42.7	74.0	-31.3

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	39.5	36.8	33.5	36.2	54.0	-17.8
Horizontal	*2389.700	35.8	36.4	29.1	28.5	54.0	-25.5

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11g-Channel 06)

Radiated Emissions

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	52.4	36.7	33.4	49.1	74.0	-24.9
Horizontal	*7311.000	42.1	36.6	35.8	41.3	74.0	-32.7

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	*4874.000	39.4	36.7	33.4	36.1	54.0	-17.9
Horizontal	*7311.000	31.0	36.6	35.8	30.2	54.0	-23.8

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11g-Channel 11)

Radiated Emissions

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	52.3	36.8	33.3	48.8	74.0	-25.2
Horizontal	*2484.50	49.3	36.5	29.3	42.1	74.0	-31.9

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	39.7	36.8	33.3	36.2	54.0	-17.8
Horizontal	*2484.500	37.9	36.5	29.3	30.7	54.0	-23.3

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11n20-Channel 01)

Radiated Emissions

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	51.4	36.8	33.5	48.1	74.0	-25.9
Horizontal	*2389.700	50.7	36.4	29.1	43.4	74.0	-30.6

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	*4824.000	38.2	36.8	33.5	34.9	54.0	-19.1
Horizontal	*2389.700	36.9	36.4	29.1	29.6	54.0	-24.4

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11n20-Channel 06)

Radiated Emissions

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	51.8	36.7	33.4	48.5	74.0	-25.5
Horizontal	*7311.000	43.6	36.6	35.8	42.8	74.0	-31.2

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	37.4	36.7	33.4	34.1	54.0	-19.9
Horizontal	*7311.000	29.2	36.6	35.8	28.4	54.0	-25.6

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018 Model: ES-WFD02
Worst Case Operating Mode: Transmitting (802.11n20-Channel 11)

Radiated Emissions

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	51.7	36.8	33.3	48.2	74.0	-25.8
Horizontal	*2484.50	49.9	36.5	29.3	42.7	74.0	-31.3

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	38.5	36.8	33.3	35.0	54.0	-19.0
Horizontal	*2484.500	36.6	36.5	29.3	29.4	54.0	-24.6

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.

4.9 Conducted Emission at Mains Terminal

Worst Case Conducted emission at 0.450MHz is Passed by 12.3dB margin

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

TEST PERSONNEL:

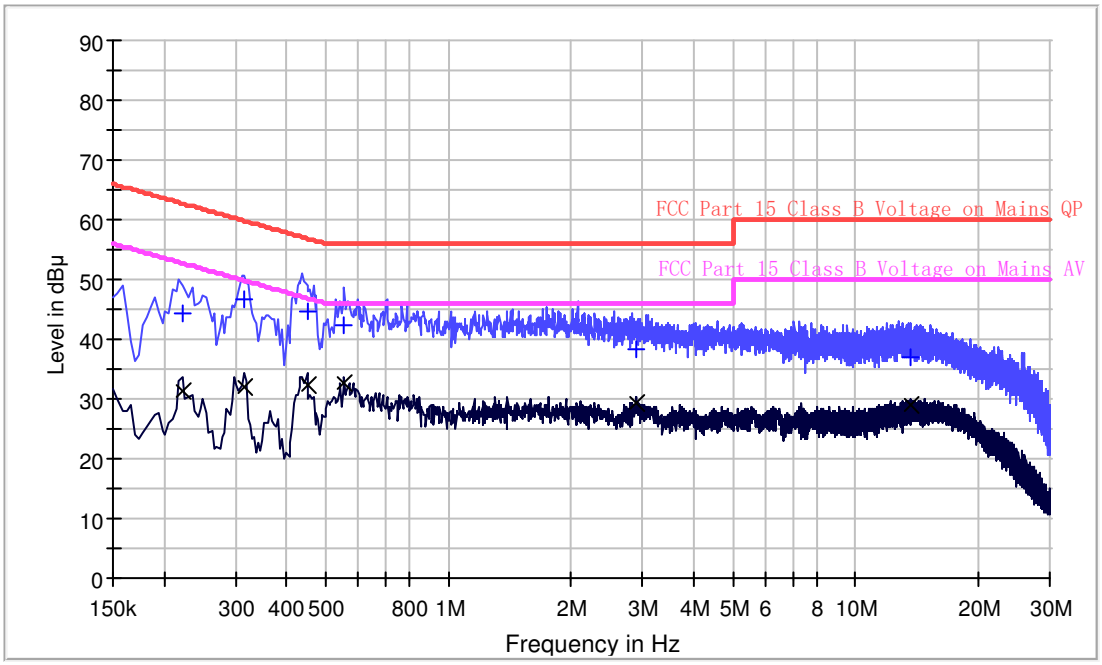
Sign on file

Damon Wang, Engineer
Typed/Printed Name

January 25, 2018
Date

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018
Model: ES-WFD02
Sample: 1/1
Worst-case operating Mode: 802.11b (TX-Channel 01)
Phase: Live

Conducted Emission Test - FCC



Result Table QP

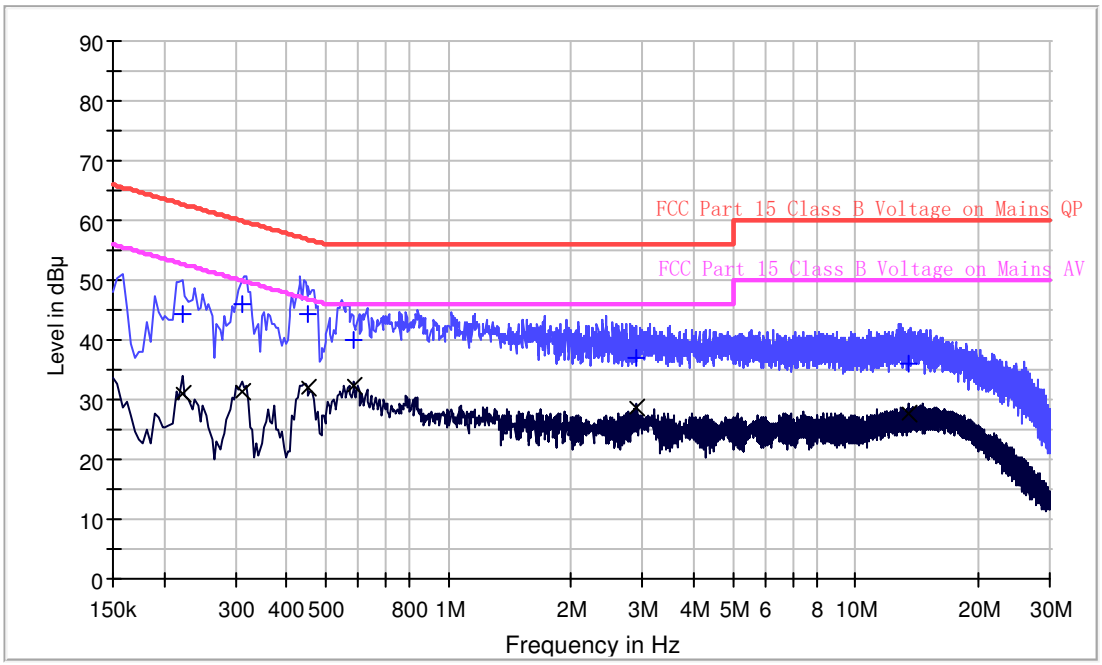
Frequency (MHz)	QuasiPeak (dB¦ÌV)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.222000	44.3	L1	9.7	18.4	62.7
0.314000	46.8	L1	9.7	13.1	59.9
0.450000	44.6	L1	9.7	12.3	56.9
0.554000	42.3	L1	9.7	13.7	56.0
2.894000	38.2	L1	9.7	17.8	56.0
13.726000	37.0	L1	10.0	23.0	60.0

Result Table AV

Frequency (MHz)	Average (dB¦ÌV)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.222000	31.3	L1	9.7	21.4	52.7
0.314000	32.0	L1	9.7	17.9	49.9
0.450000	32.3	L1	9.7	14.6	46.9
0.554000	32.8	L1	9.7	13.2	46.0
2.894000	29.5	L1	9.7	16.5	46.0
13.726000	28.9	L1	10.0	21.1	50.0

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018
Model: ES-WFD02
Sample: 1/1
Worst-case operating Mode: 802.11b (TX-Channel 01)
Phase: Neutral

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB¦ÌV)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.222000	44.4	N	9.7	18.3	62.7
0.310000	45.9	N	9.7	14.1	60.0
0.450000	44.3	N	9.7	12.6	56.9
0.586000	39.8	N	9.7	16.2	56.0
2.906000	37.1	N	9.8	18.9	56.0
13.490000	36.1	N	10.0	23.9	60.0

Result Table AV

Frequency (MHz)	Average (dB¦ÌV)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.222000	30.9	N	9.7	21.8	52.7
0.310000	31.3	N	9.7	18.7	50.0
0.450000	31.8	N	9.7	15.1	46.9
0.586000	32.4	N	9.7	13.6	46.0
2.906000	28.5	N	9.8	17.5	46.0
13.490000	27.7	N	10.0	22.3	50.0

Applicant: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018
Model: ES-WFD02

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: Shenzhen Esun LED Co.,Ltd
Date of Test: January 25, 2018
Model: ES-WFD02

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.

EXHIBIT 5

EQUIPMENT PHOTOGRAPHS

5.0 Equipment Photographs

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

EXHIBIT 6

PRODUCT LABELLING

6.0 Product Labeling

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

EXHIBIT 7

TECHNICAL SPECIFICATIONS

7.0 Technical Specifications

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

EXHIBIT 8

INSTRUCTION MANUAL

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.

EXHIBIT 9

CONFIDENTIALITY REQUEST

9.0 Confidentiality Request

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

.

EXHIBIT 10

MISCELLANEOUS INFORMATION

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.

EXHIBIT 11

TEST EQUIPMENT LIST

11.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ182-01	RF Power Meter	BOONTON	4232A	11002	24-Jan-2018	24-Jan-2019
SZ182-01-01	Power Sensor	BOONTON	51011-EMC	34400	24-Jan-2018	24-Jan-2019
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	20-Sep-2017	20-Sep-2018
SZ185-01	EMI Receiver	R&S	ESCI	100547	9-Feb-2017	9-Feb-2018
SZ061-08	Horn Antenna	ETS	3115	00092346	20-Sep-2017	20-Sep-2018
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	26-May-2017	26-May-2018
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	1-Jun-2017	1-Jun-2018
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	7-Jul-2017	7-Jul-2018
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	9-Feb-2017	9-Feb-2018
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	16-Jan-2017	16-Jan-2019
SZ062-02	RF Cable	RADIALL	RG 213U	--	10-Dec-2017	10-Dec-2018
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	16-Sep-2017	16-Mar-2018
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	16-Sep-2017	16-Mar-2018
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	14-Jun-2017	14-Jun-2018
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	30-Oct-2017	30-Oct-2018
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	30-Oct-2017	30-Oct-2018
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2017	16-Jan-2019