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Hanson Robotics Limited

TEST REPORT

SCOPE OF WORK
FCC TESTING–HR_WIFIUSBD01

REPORT NUMBER
180725019SZN-002

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TEST REPORT

Intertek Report No.: 180725019SZN-002

Hanson Robotics Limited

Application
For
Certification

FCC ID: 2AQ7I-D01

Scratch X Dongle

Model: HR_WIFIUSBD01

2.4GHz Wi-Fi Transceiver

Report No.: 180725019SZN-002

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 [10-1-17]

Prepared and Checked by:

Damon Wang
Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: 12 October 2018

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LIST OF EXHIBITS

INTRODUCTION

EXHIBIT 1:	Summary of Tests
EXHIBIT 2:	General Description
EXHIBIT 3:	System Test Configuration
EXHIBIT 4:	Measurement Results
EXHIBIT 5:	Equipment Photographs
EXHIBIT 6:	Product Labeling
EXHIBIT 7:	Technical Specifications
EXHIBIT 8:	Instruction Manual
EXHIBIT 9:	Confidentiality Request
EXHIBIT 10:	Miscellaneous Information
EXHIBIT 11:	Test Equipment List

MEASUREMENT/TECHNICAL REPORT

Scratch X Dongle

Model: HR_WIFIUSBD01

FCC ID: 2AQ7I-D01

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 [10-01-17] Edition] provision.

Report prepared by:

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Table of Contents

1.0 Summary of Test results 7

2.0 General Description 9

2.1 Product Description 9
2.2 Related Submittal(s) Grants 9
2.3 Test Methodology 9
2.4 Test Facility 9

3.0 System Test Configuration 11

3.1 Justification 11
3.2 EUT Exercising Software 11
3.3 Special Accessories 12
3.4 Measurement Uncertainty 12
3.5 Equipment Modification 12
3.6 Support Equipment List and Description 12

4.0 Measurement Results 14

4.1 Maximum Conducted Output Power at Antenna Terminals 14
4.2 Minimum 6 dB RF Bandwidth 15
4.3 Maximum Power Density Reading 22
4.4 Out of Band Conducted Emissions 29
4.5 Out of Band Radiated Emissions 45
4.6 Transmitter Radiated Emissions in Restricted Bands 46
4.7 Field Strength Calculation 47
4.8 Radiated Spurious Emission 48
4.9 Conducted Emission 59
4.10 Radiated Emissions from Digital Section of Transceiver 62
4.11 Transmitter Duty Cycle Calculation and Measurements 63

5.0 Equipment Photographs 65

6.0 Product Labelling 67

7.0 Technical Specifications 69

8.0 Instruction Manual 71

9.0 Confidentiality Request 73

10.0 Discussion of Pulse Desensitization 75

11.0 Test Equipment List 77

List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated 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

Scratch X Dongle

Model: HR_WIFIUSBD01

FCC ID: 2AQ7I-D01

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
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 Scratch X Dongle 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 USB port(DC 5V). For more detailed features description, please refer to the user's manual.

Type of Modulation: BPSK, QPSK, 16QAM, 64QAM, CCK, DQPSK, DBPSK

Antenna Type: Integral Antenna
Antenna Gain: 5dBi

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 v05. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shielded 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 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen. This test facility and site measurement data have been fully placed on file with File 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 USB port(DC 5V) throung PC with 120V/60Hz input during the test.

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 was 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.

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 Hanson Robotics Limited 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.
Laptop (Provided by Intertek)	DELL	Latitude 3480
USB cable	N/A	Unshielding,150cm
USB disk	USB Memory	UHYBS-004G-BL
USB cable	N/A	Unshielding,150cm
RJ45 cable	N/A	Unshielding,150cm

EXHIBIT 4

MEASUREMENT RESULTS

Applicant: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01

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).

IEEE 802.11b (Antenna Gain = 5dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	18.12	64.86
Middle Channel: 2437	17.10	51.29
High Channel: 2462	15.72	37.33

IEEE 802.11g (Antenna Gain = 5dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	20.47	111.43
Middle Channel: 2437	20.33	107.89
High Channel: 2462	18.10	64.57

IEEE 802.11n-HT20 (Antenna Gain = 5dBi) (64QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	19.63	91.83
Middle Channel: 2437	19.43	87.70
High Channel: 2462	18.40	69.18

Cable loss: 1.0 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. conducted output level = 20.47dBm
EUT max. radiated output power = 20.47dBm + 5dBi = 25.47dBm =352.37mW

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 v05. 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.

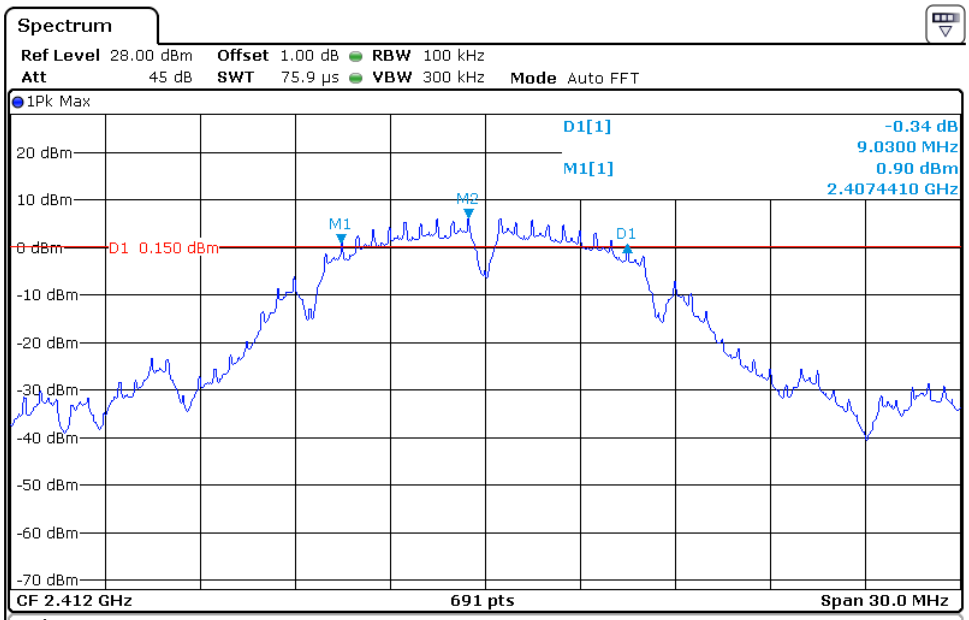
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	9.030
2437	9.074
2462	9.030

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.020
2437	16.020
2462	16.281

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.541
2437	16.237
2462	16.541

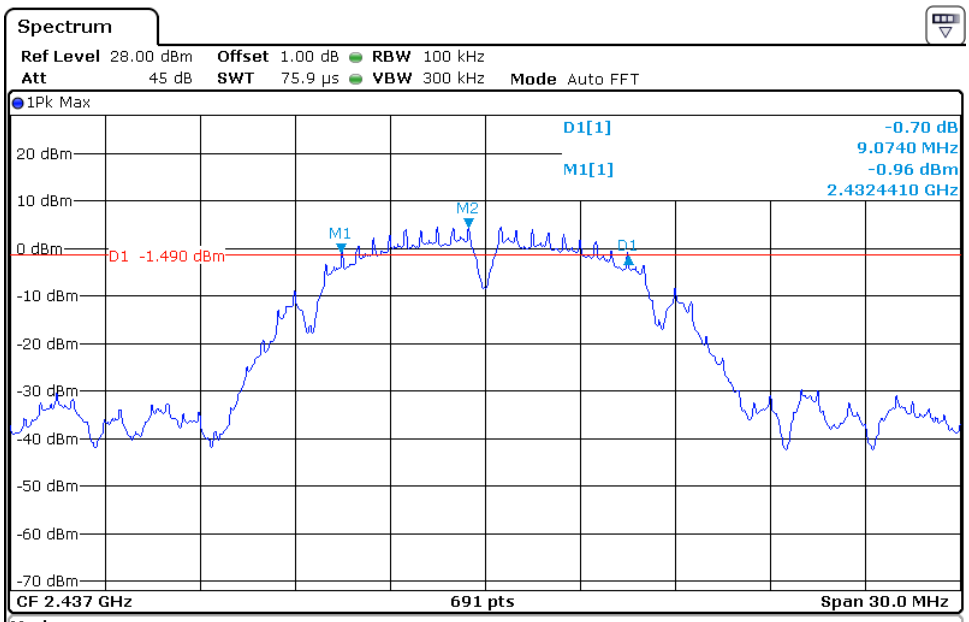
The test plots are attached as below.

802.11b



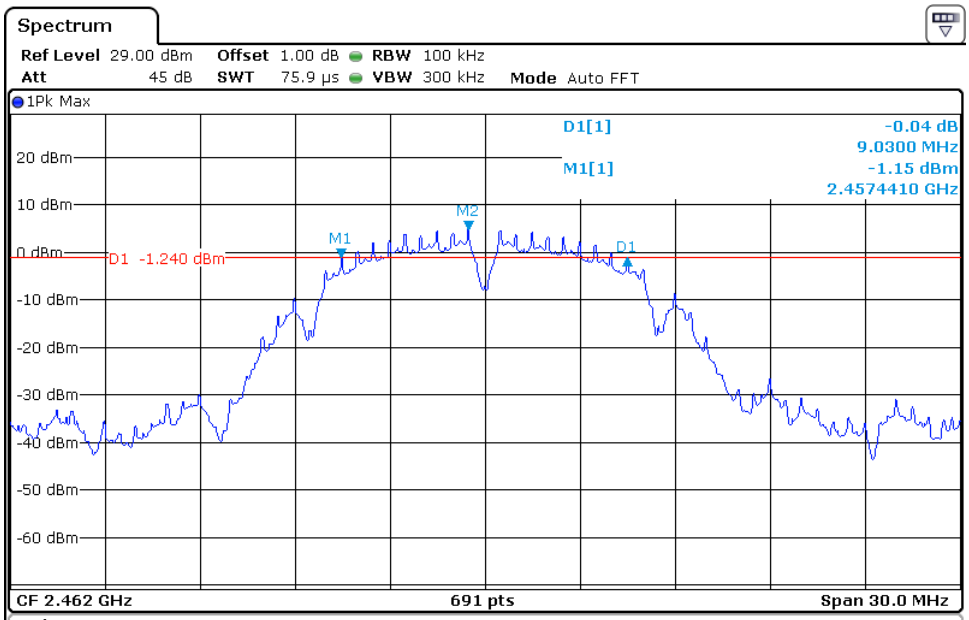
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.407441 GHz	0.90 dBm		
D1	M1	1	9.03 MHz	-0.34 dB		
M2		1	2.411479 GHz	6.15 dBm		



Marker

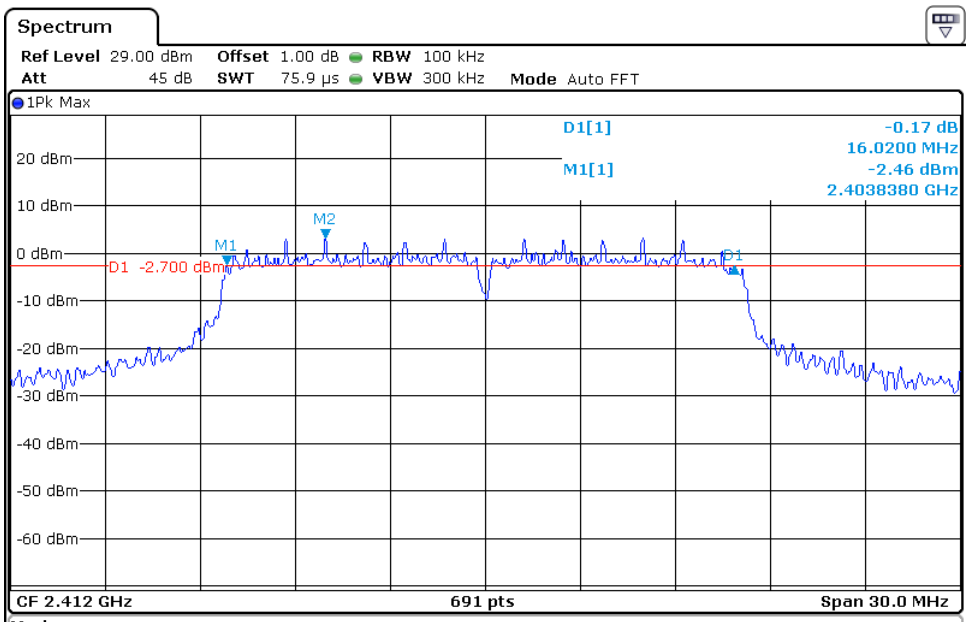
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432441 GHz	-0.96 dBm		
D1	M1	1	9.074 MHz	-0.70 dB		
M2		1	2.436479 GHz	4.51 dBm		



Marker

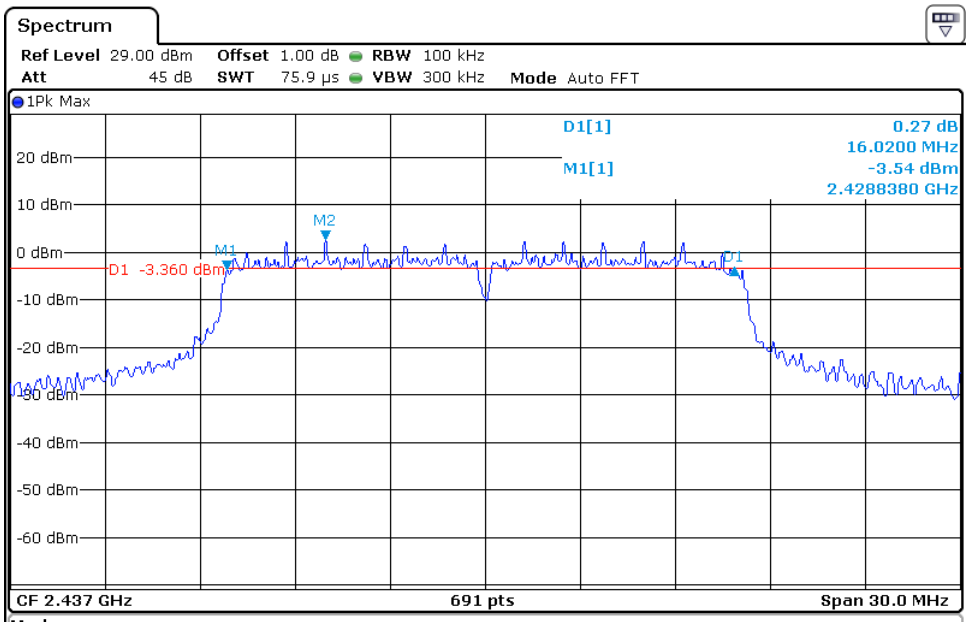
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457441 GHz	-1.15 dBm		
D1	M1	1	9.03 MHz	-0.04 dB		
M2		1	2.461479 GHz	4.76 dBm		

802.11g



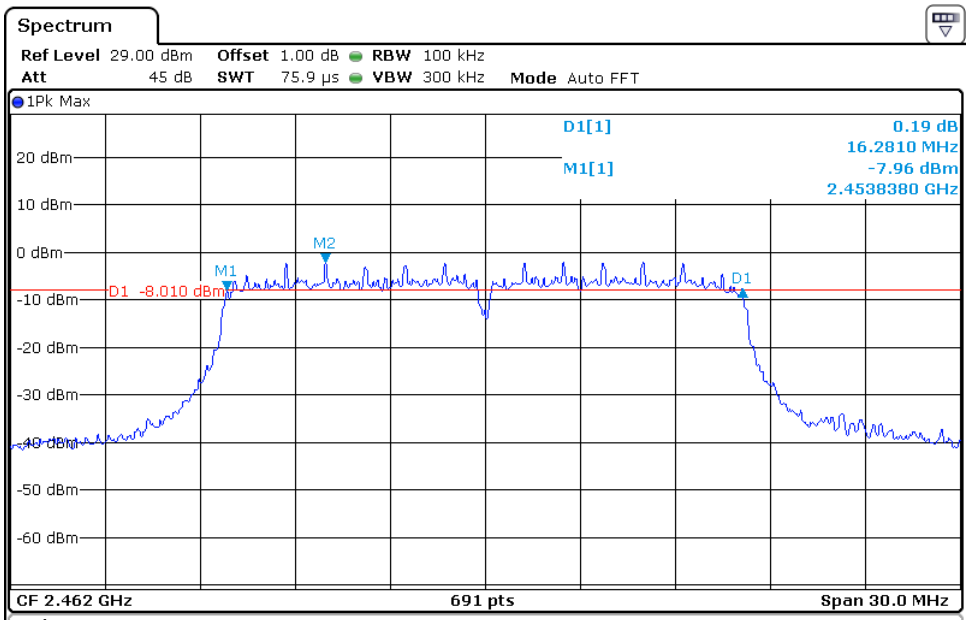
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403838 GHz	-2.46 dBm		
D1	M1	1	16.02 MHz	-0.17 dB		
M2		1	2.406964 GHz	3.30 dBm		



Marker

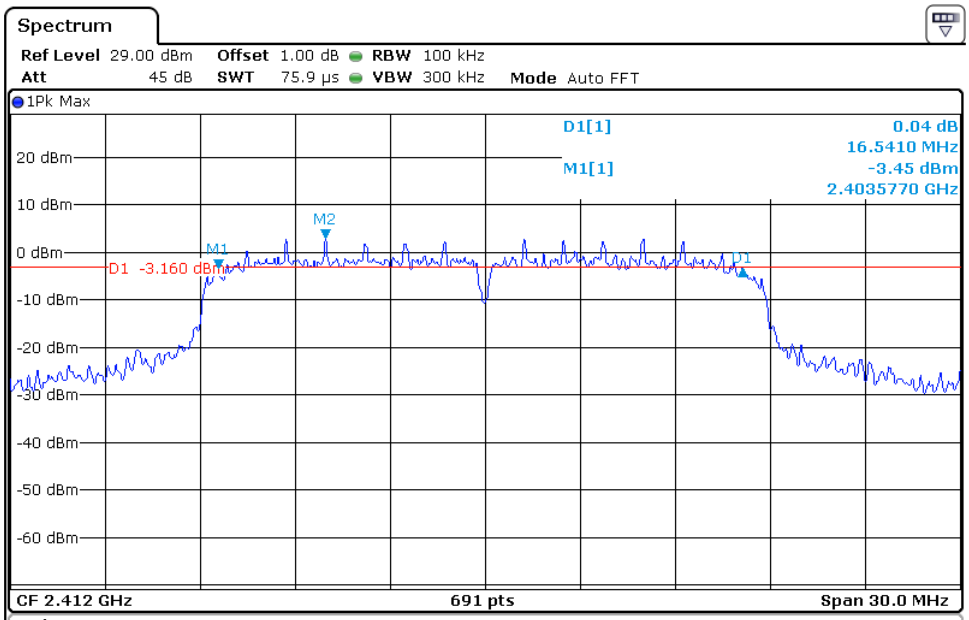
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428838 GHz	-3.54 dBm		
D1	M1	1	16.02 MHz	0.27 dB		
M2		1	2.431964 GHz	2.64 dBm		



Marker

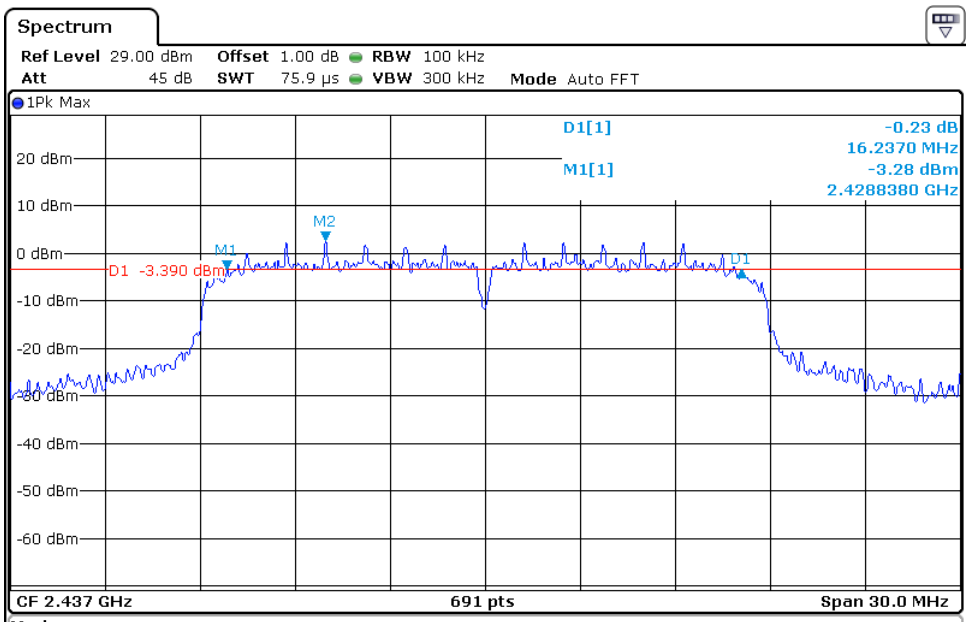
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453838 GHz	-7.96 dBm		
D1	M1	1	16.281 MHz	0.19 dB		
M2		1	2.456964 GHz	-2.01 dBm		

802.11n-HT20



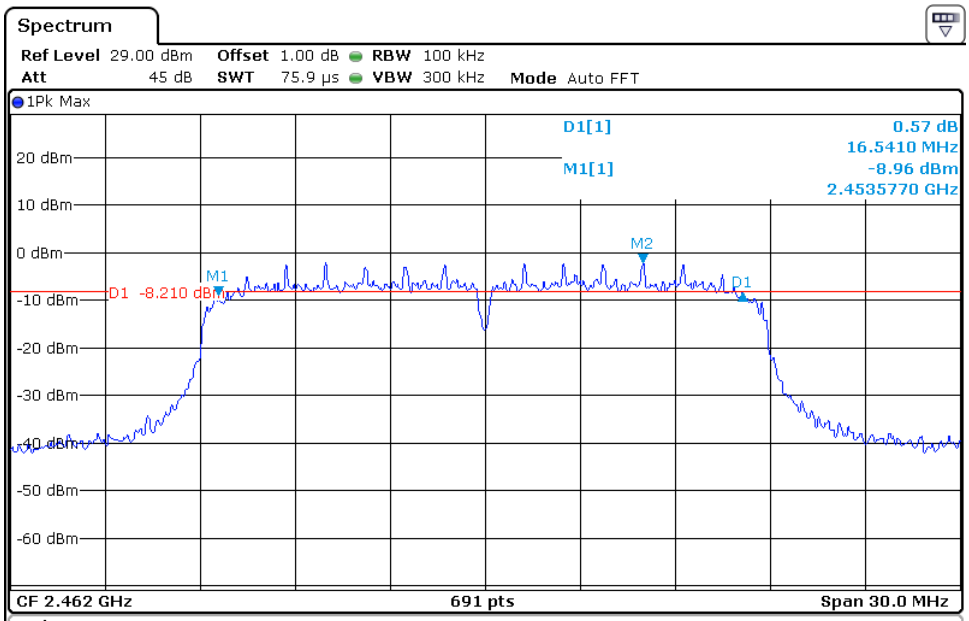
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403577 GHz	-3.45 dBm		
D1	M1	1	16.541 MHz	0.04 dB		
M2		1	2.406964 GHz	2.84 dBm		



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428838 GHz	-3.28 dBm		
D1	M1	1	16.237 MHz	-0.23 dB		
M2		1	2.431964 GHz	2.61 dBm		



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453577 GHz	-8.96 dBm		
D1	M1	1	16.541 MHz	0.57 dB		
M2		1	2.466949 GHz	-2.21 dBm		

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

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05.

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.

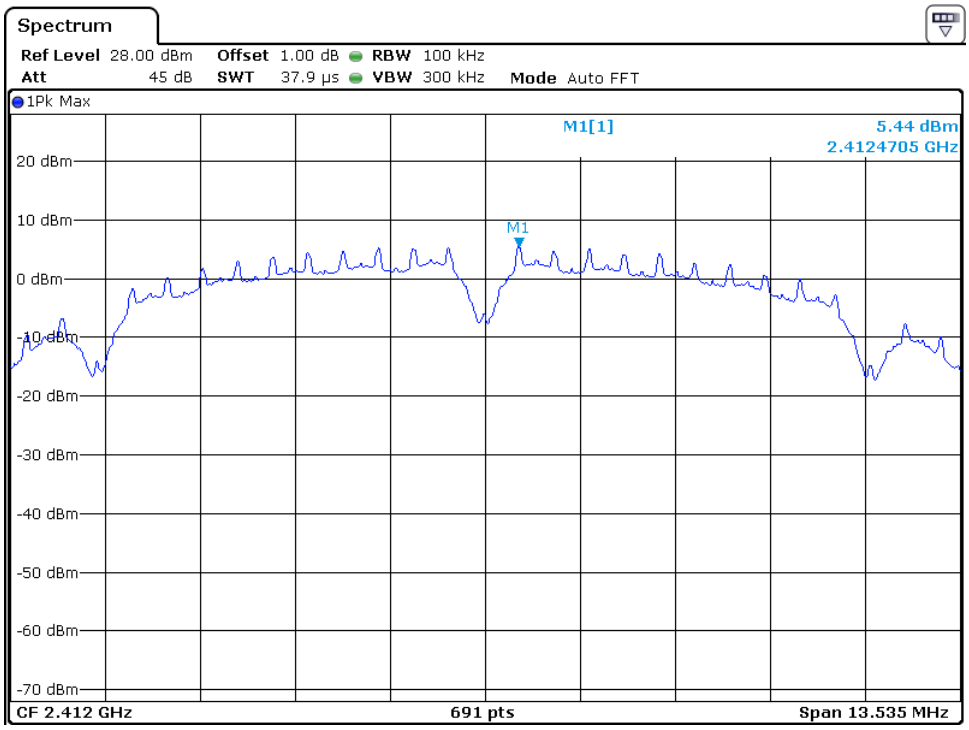
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	5.44
2437	4.43
2462	4.14

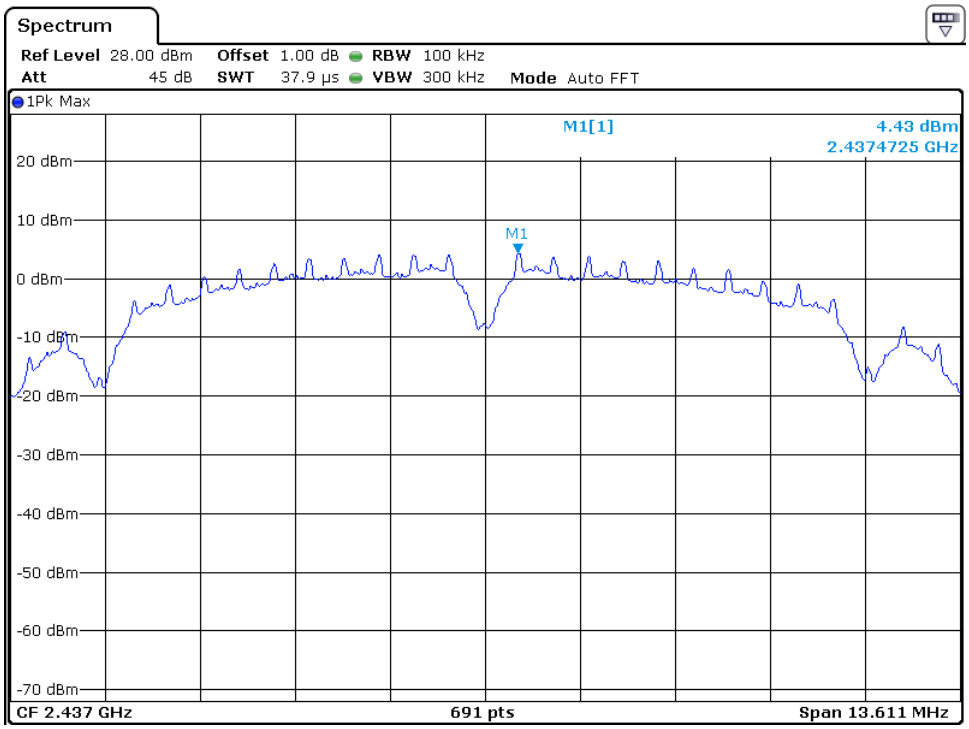
IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	2.64
2437	2.65
2462	-2.29

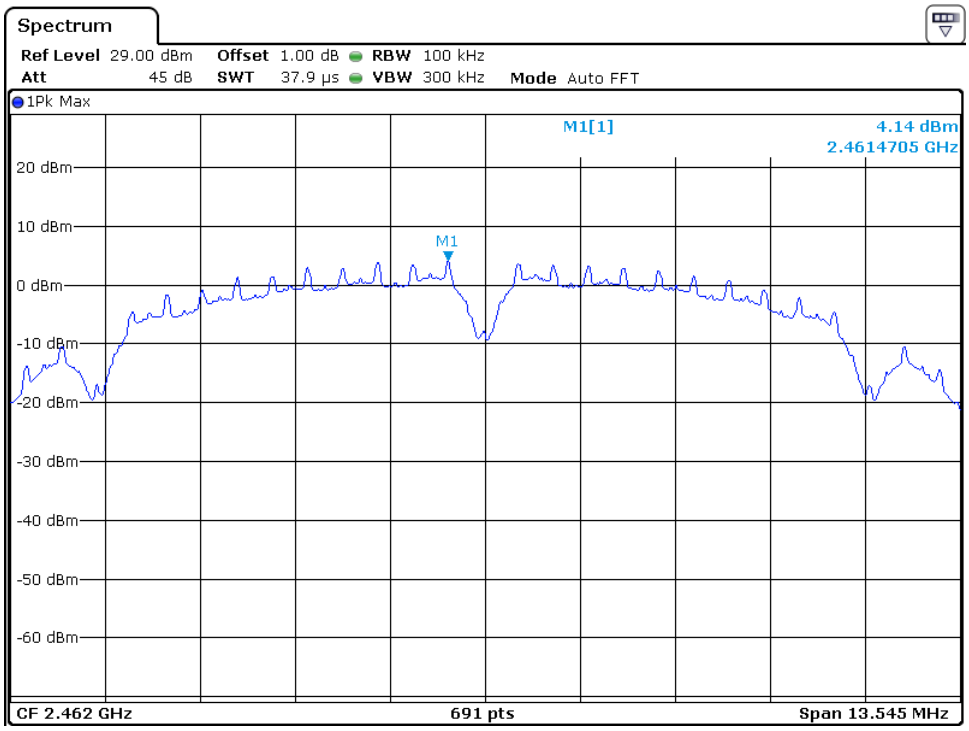
IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	2.51
2437	2.45
2462	-2.36

The test plots are attached as below.

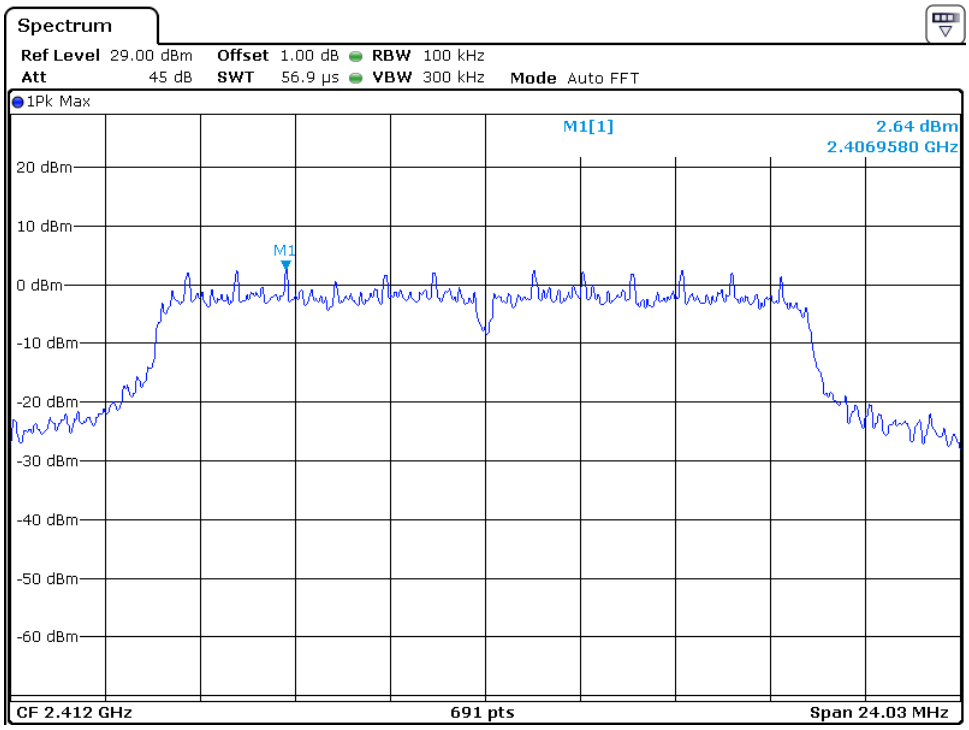
802.11b

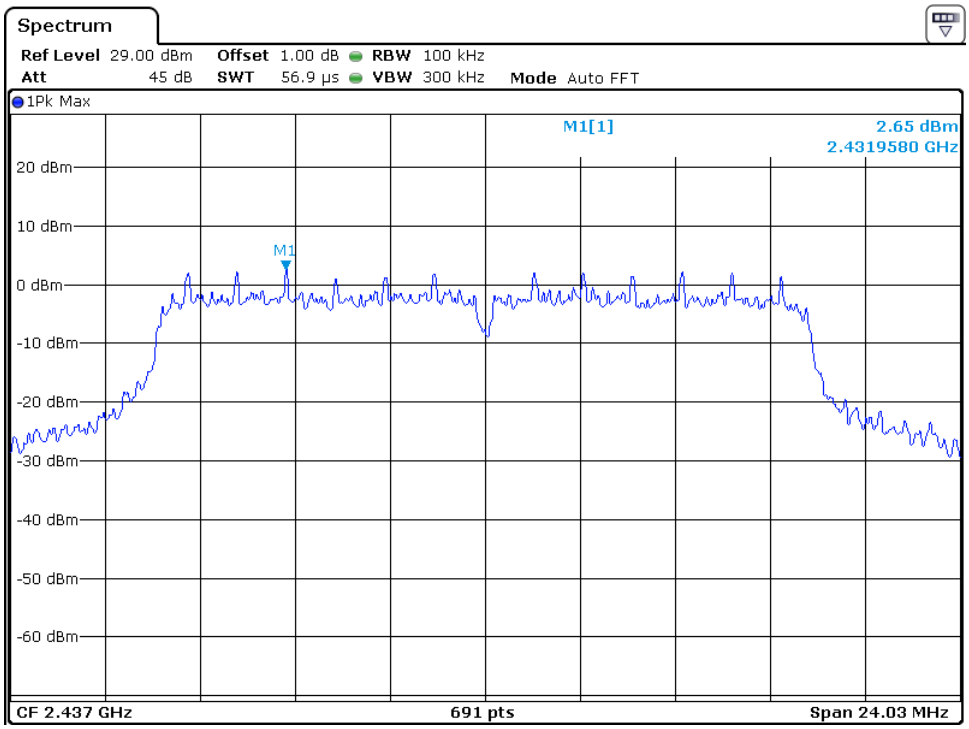

Spectrum
Ref Level 28.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 5.44 dBm
2.4124705 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.412 GHz
691 pts
Span 13.535 MHz

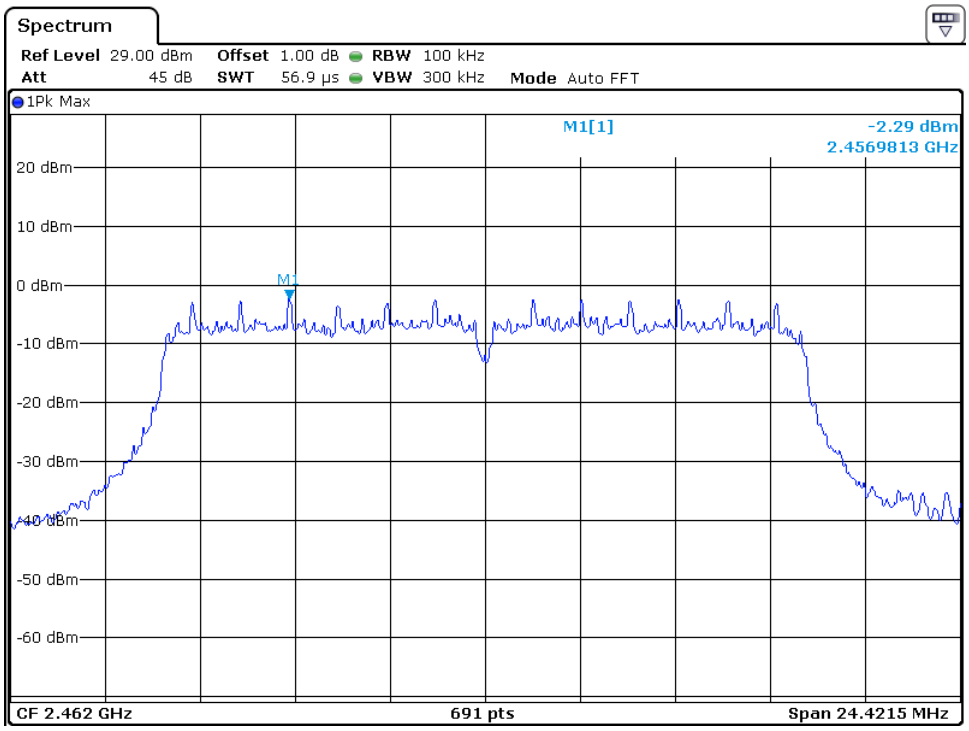

Spectrum
Ref Level 28.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 4.43 dBm
2.4374725 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.437 GHz
691 pts
Span 13.611 MHz


Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1]
4.14 dBm
2.4614705 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.462 GHz
691 pts
Span 13.545 MHz

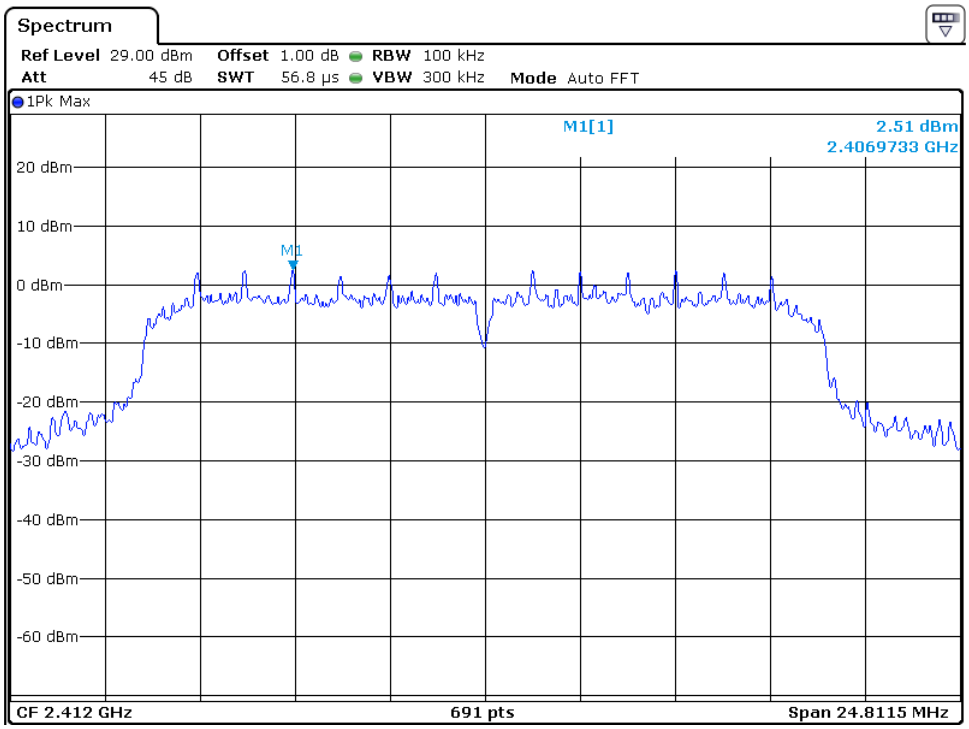
802.11g

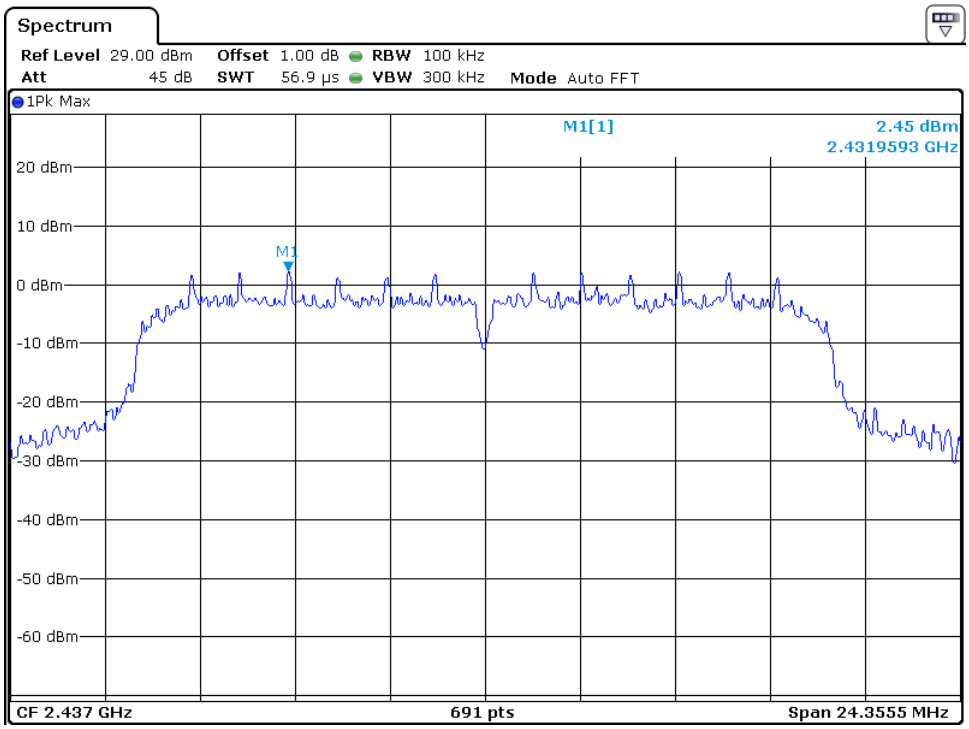

Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.64 dBm
2.4069580 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.412 GHz
691 pts
Span 24.03 MHz

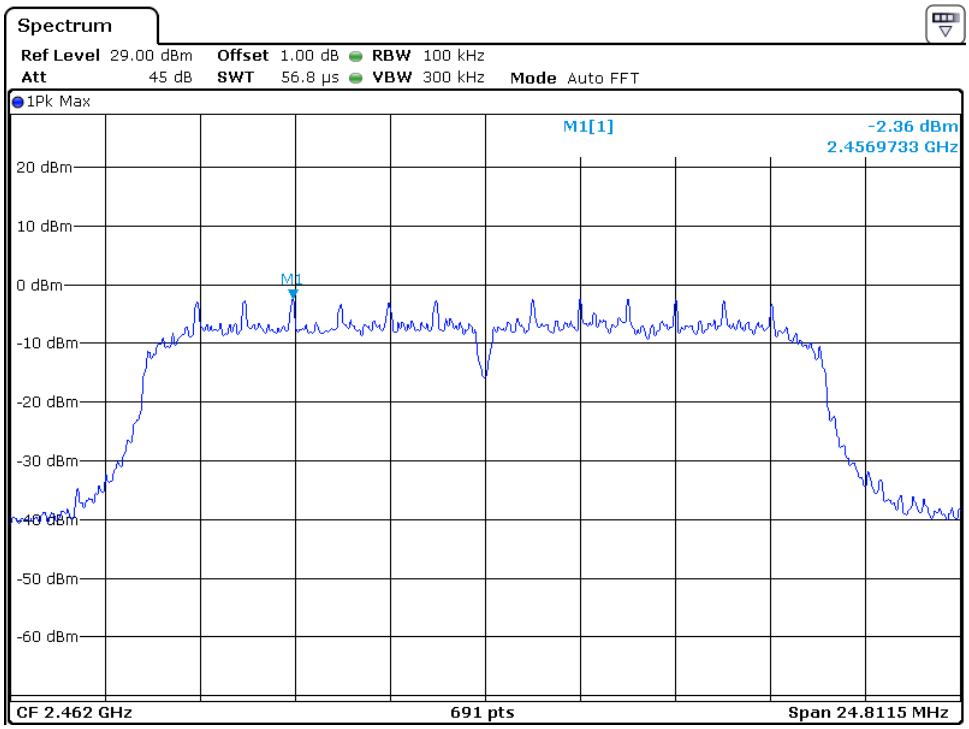

Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.65 dBm
2.4319580 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.437 GHz
691 pts
Span 24.03 MHz


Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -2.29 dBm
2.4569813 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.462 GHz
691 pts
Span 24.4215 MHz

802.11n-HT20


Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 56.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.51 dBm
2.4069733 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.412 GHz
691 pts
Span 24.8115 MHz


Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.45 dBm
2.4319593 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.437 GHz
691 pts
Span 24.3555 MHz


Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 56.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -2.36 dBm
2.4569733 GHz
M1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.462 GHz
691 pts
Span 24.8115 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 v05.

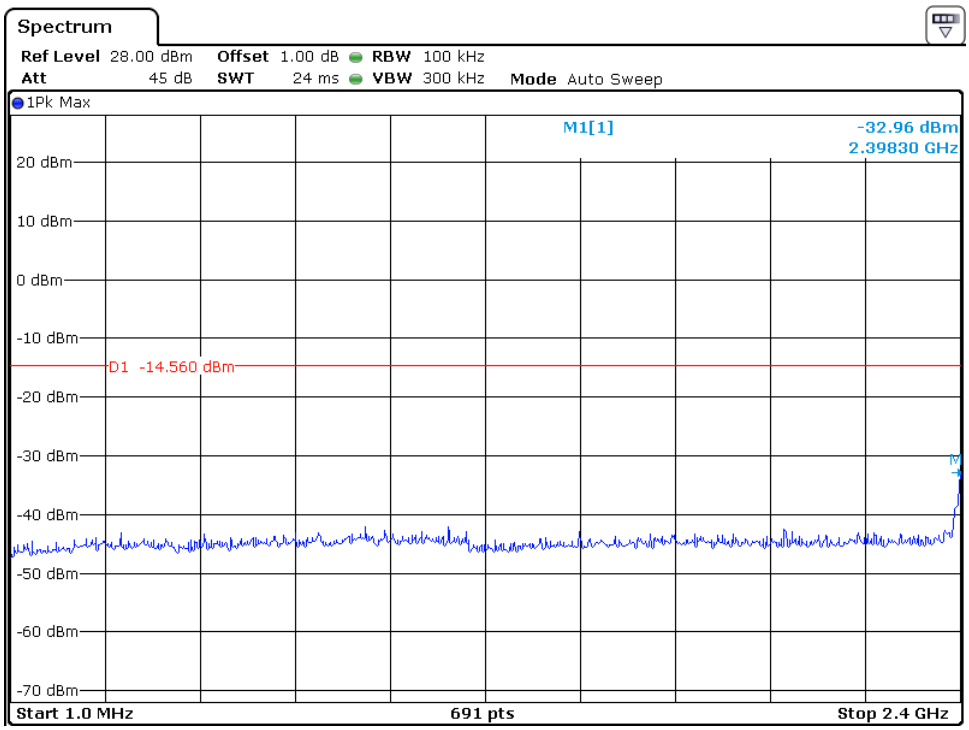
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

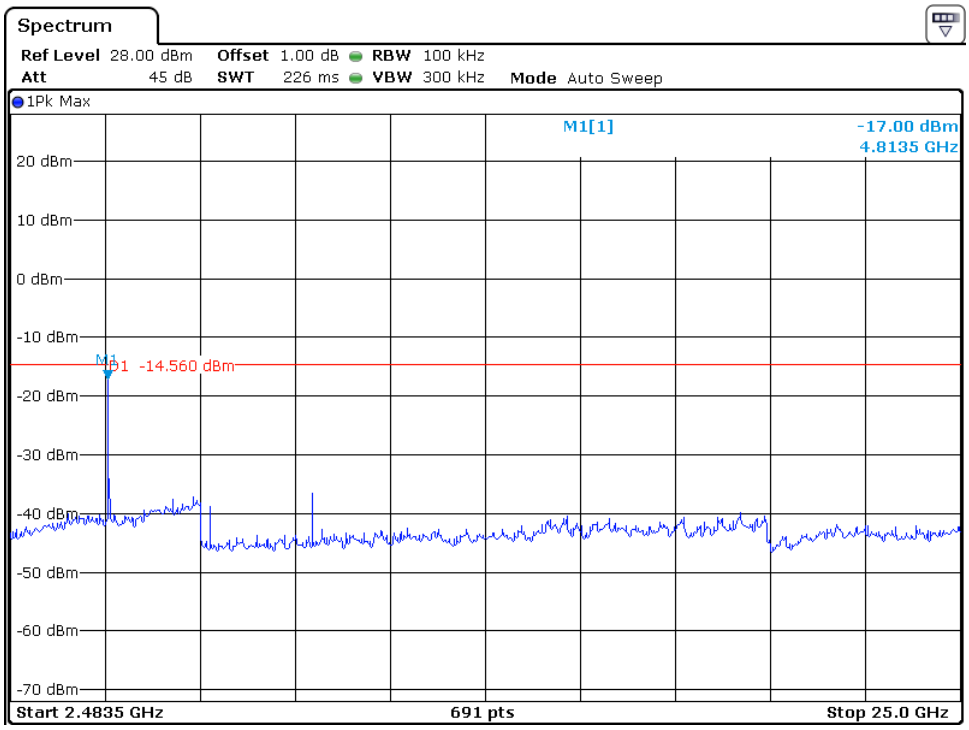
Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for 802.11b and 6Mbps for 802.11g and 6Mbps for 802.11n-HT20.

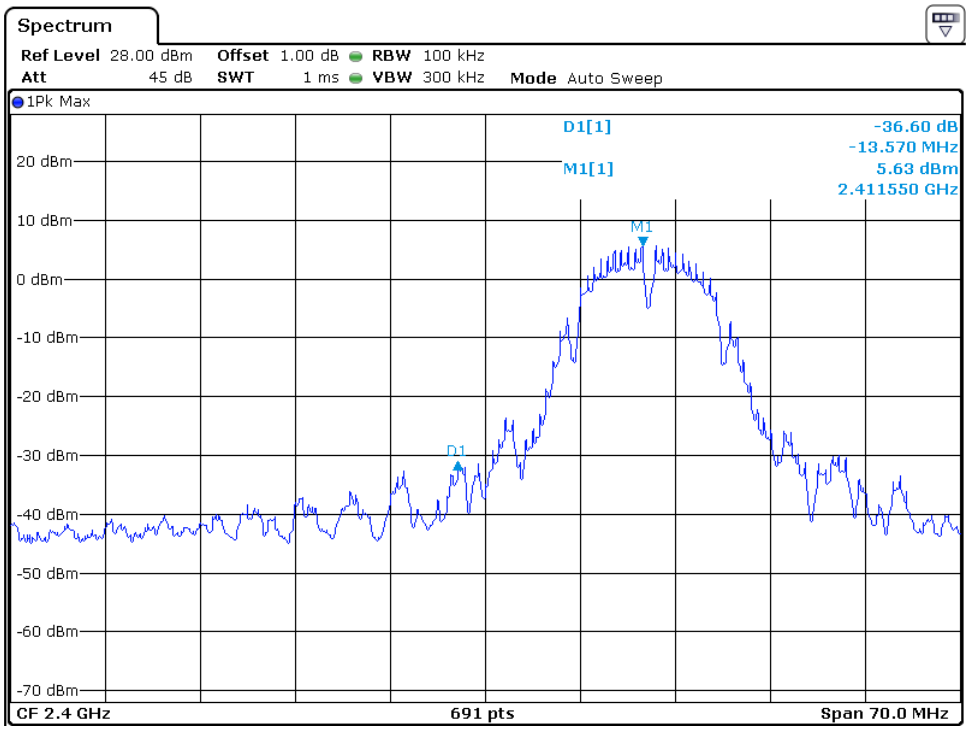
The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The test plots are attached as below.

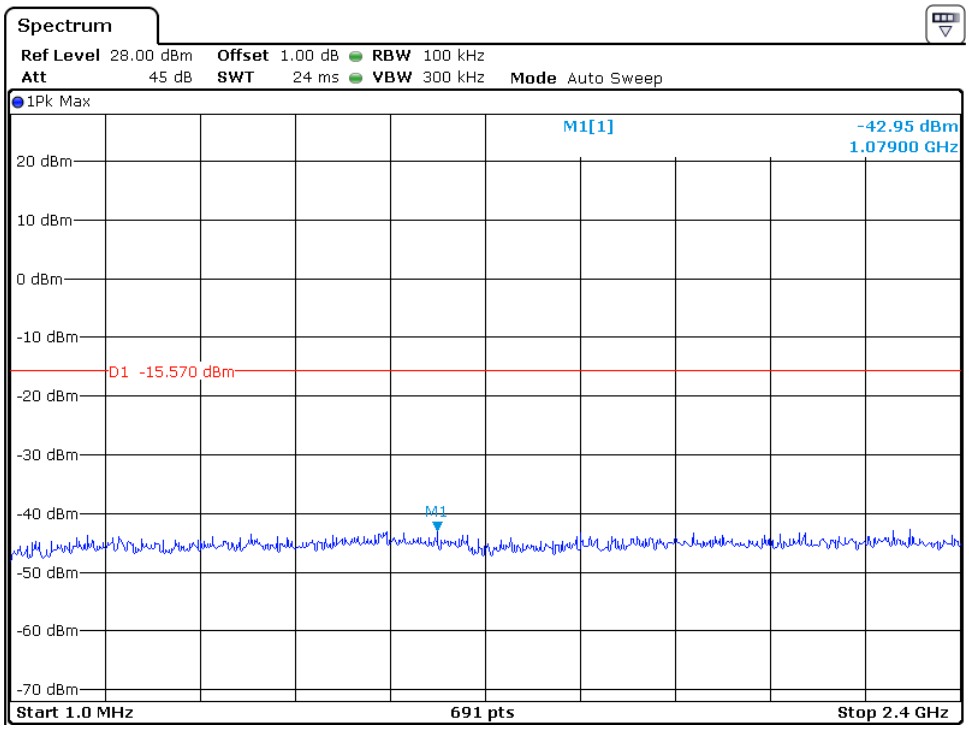
802.11b
Channel 01 (2412MHz) Reference Level: 5.44dBm

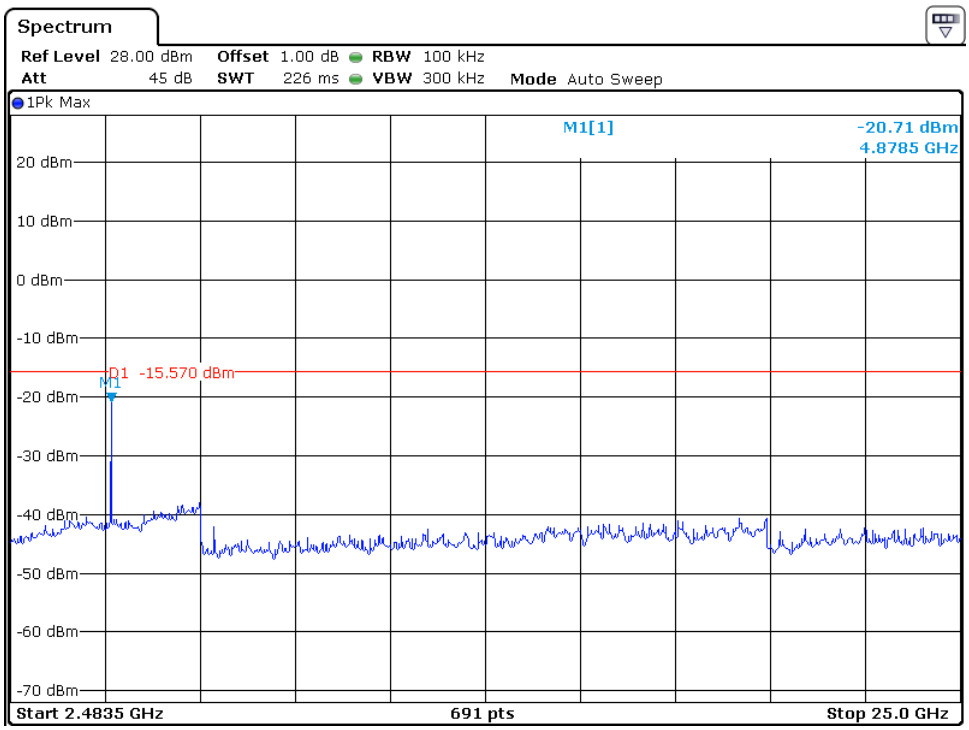




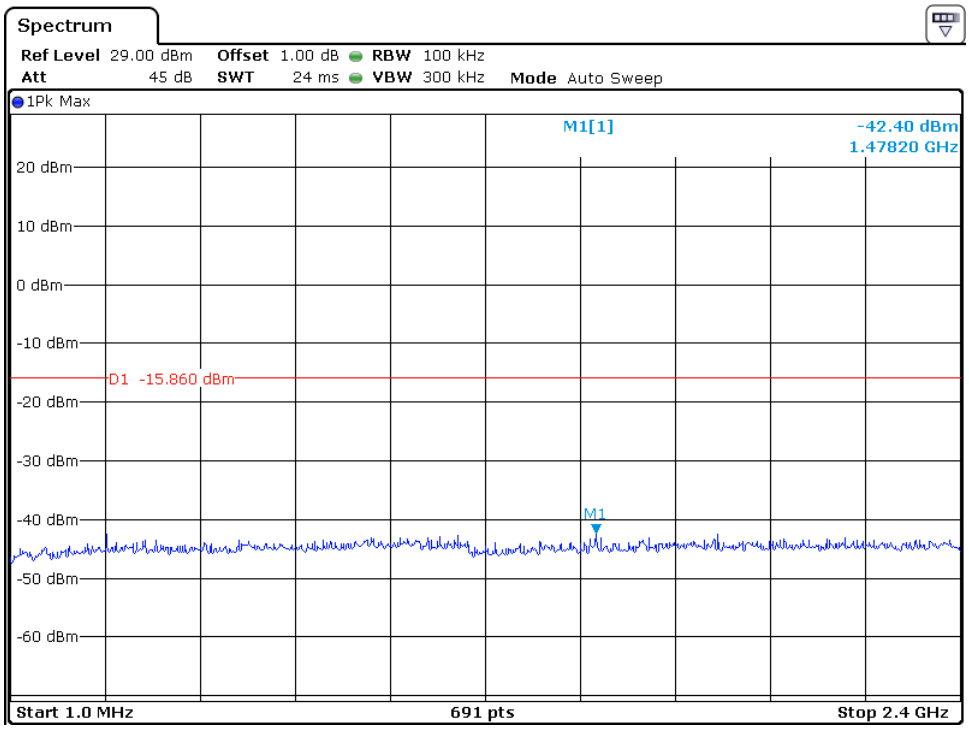

Spectrum
Ref Level 28.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -36.60 dB
-13.570 MHz
M1[1] 5.63 dBm
2.411550 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.4 GHz
691 pts
Span 70.0 MHz

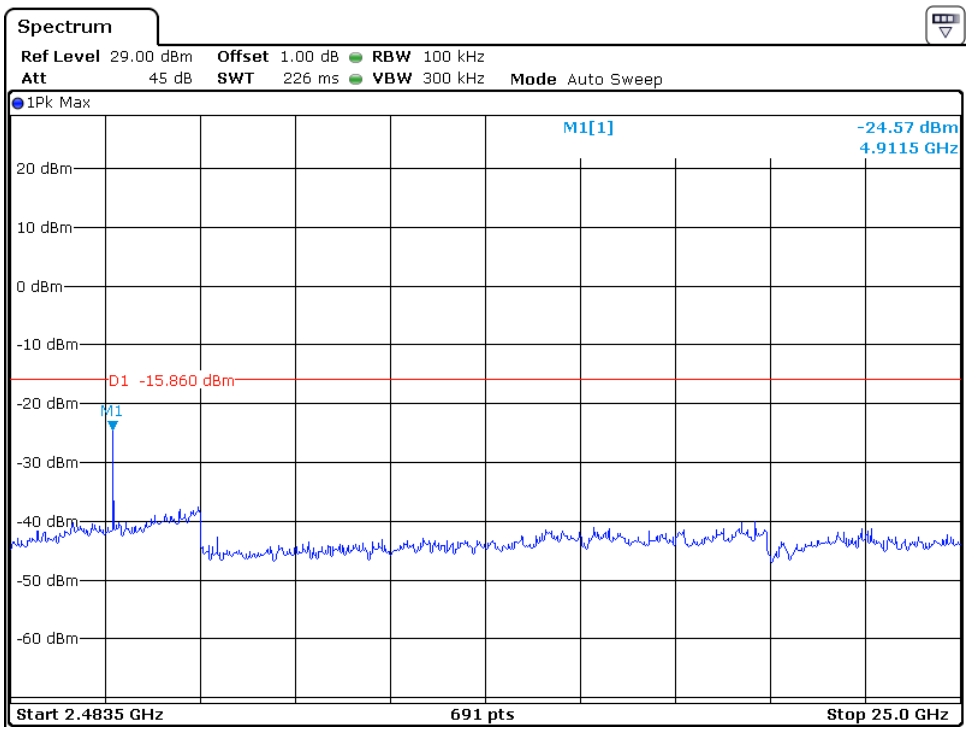
Channel 06 (2437MHz) Reference Level: 4.43dBm

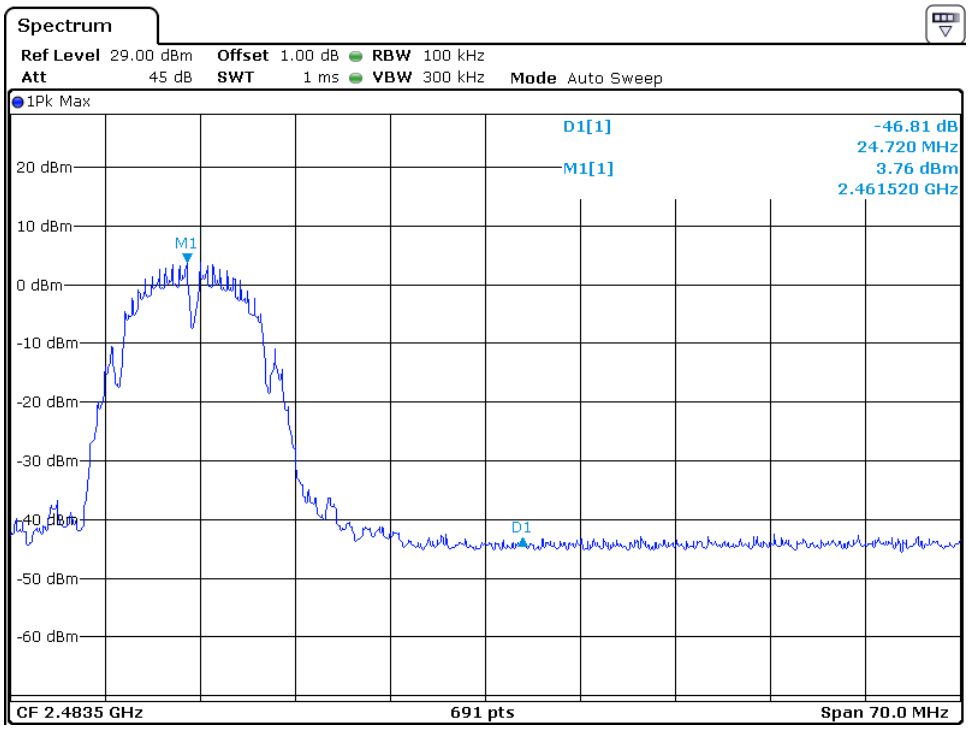




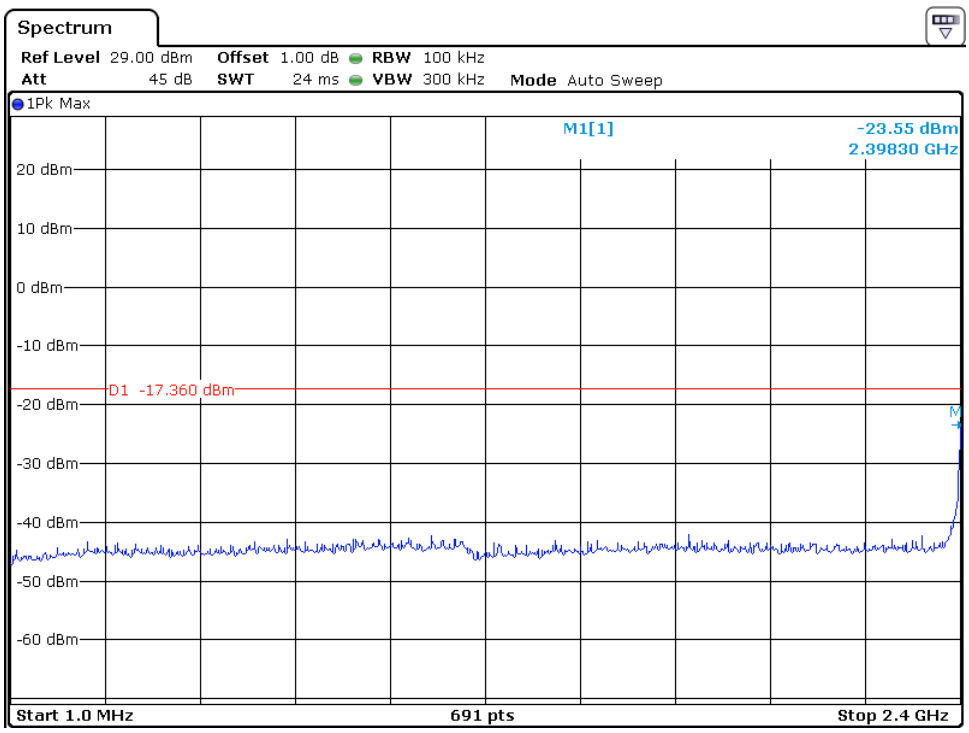
Channel 11 (2462MHz) Reference Level: 4.14dBm

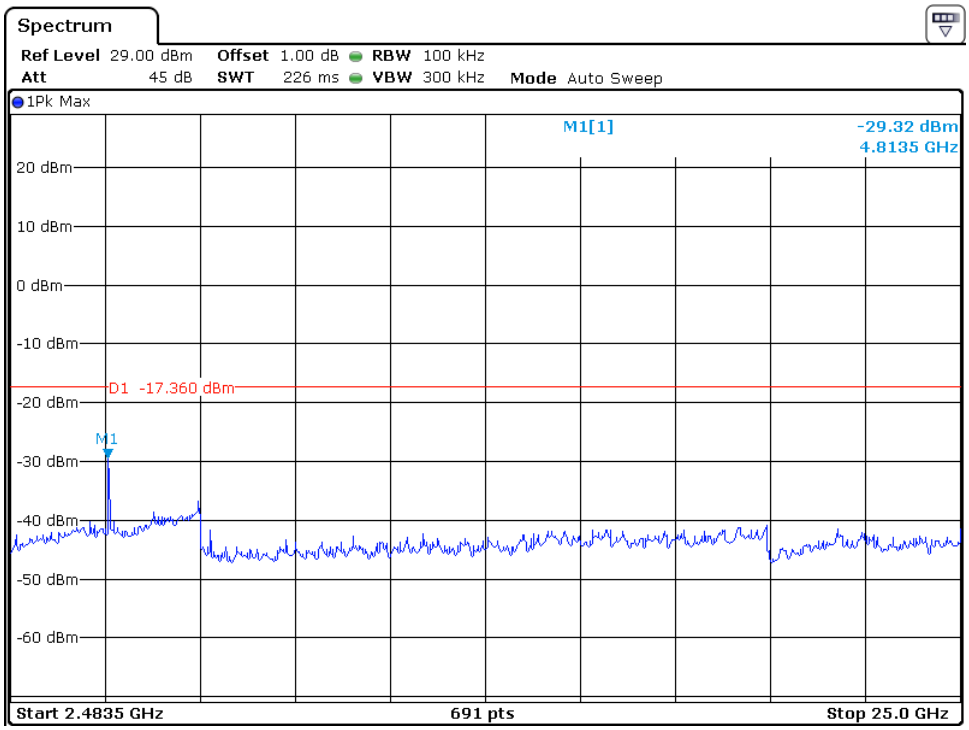


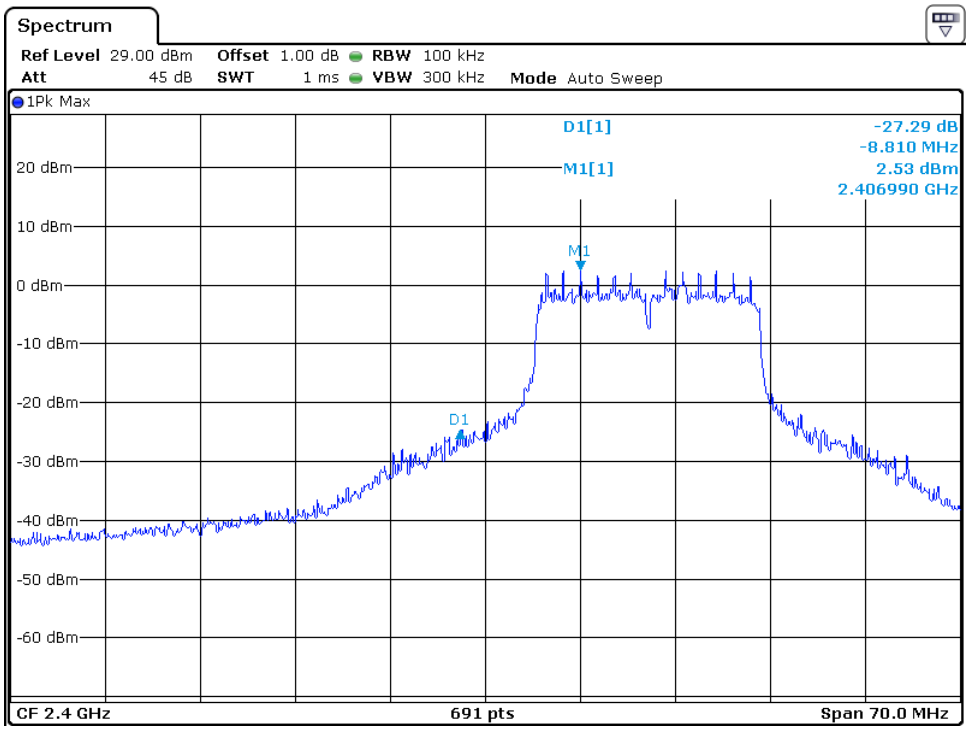



Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -46.81 dB
24.720 MHz
M1[1] 3.76 dBm
2.461520 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
D1
CF 2.4835 GHz
691 pts
Span 70.0 MHz

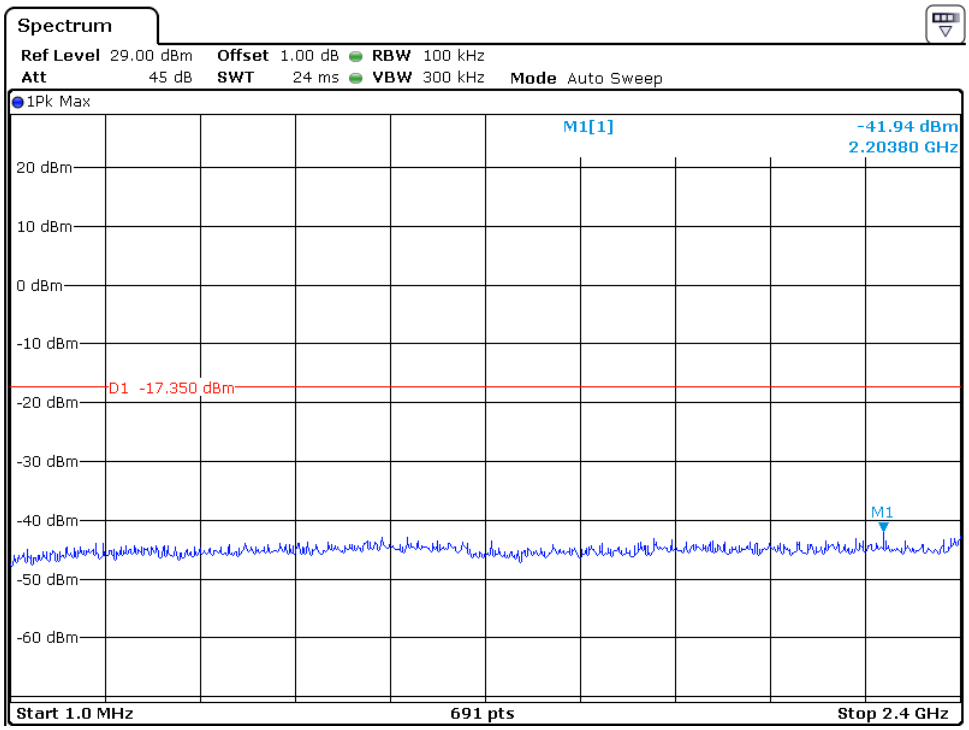
802.11g
Channel 01 (2412MHz) Reference Level: 2.64dBm

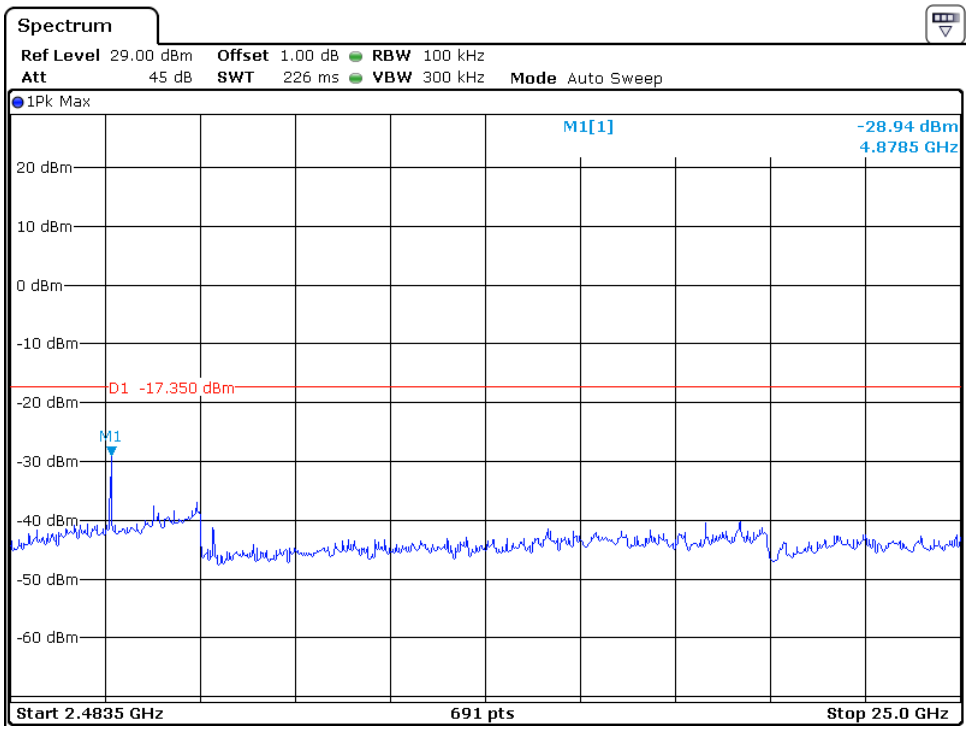




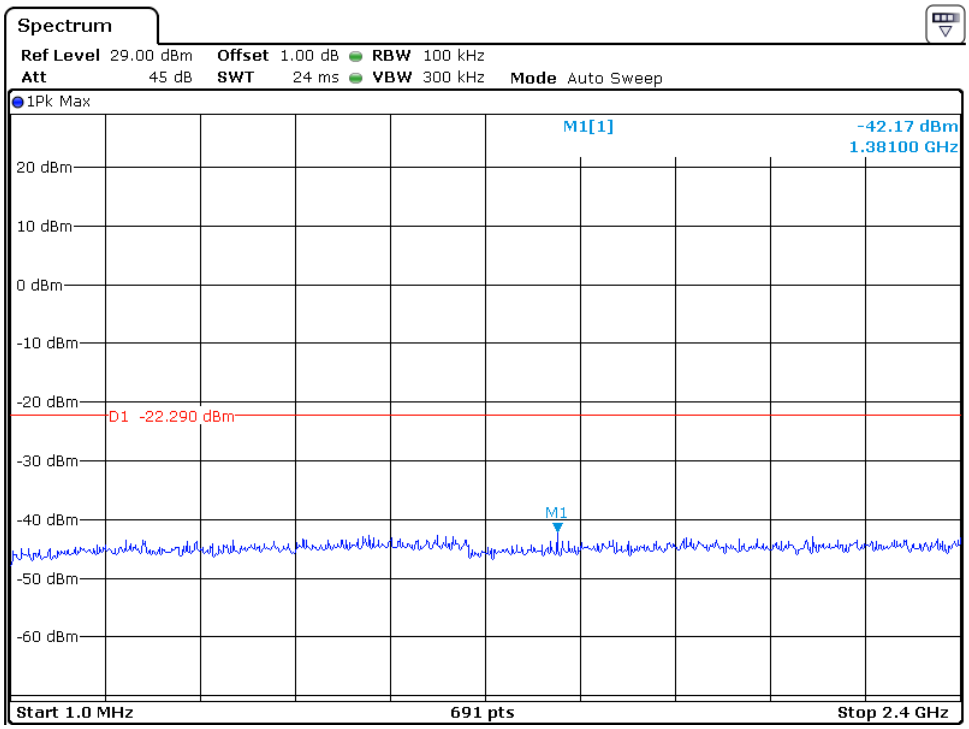

Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1]
-27.29 dB
-8.810 MHz
M1[1]
2.53 dBm
2.406990 GHz
M1
D1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.4 GHz
691 pts
Span 70.0 MHz

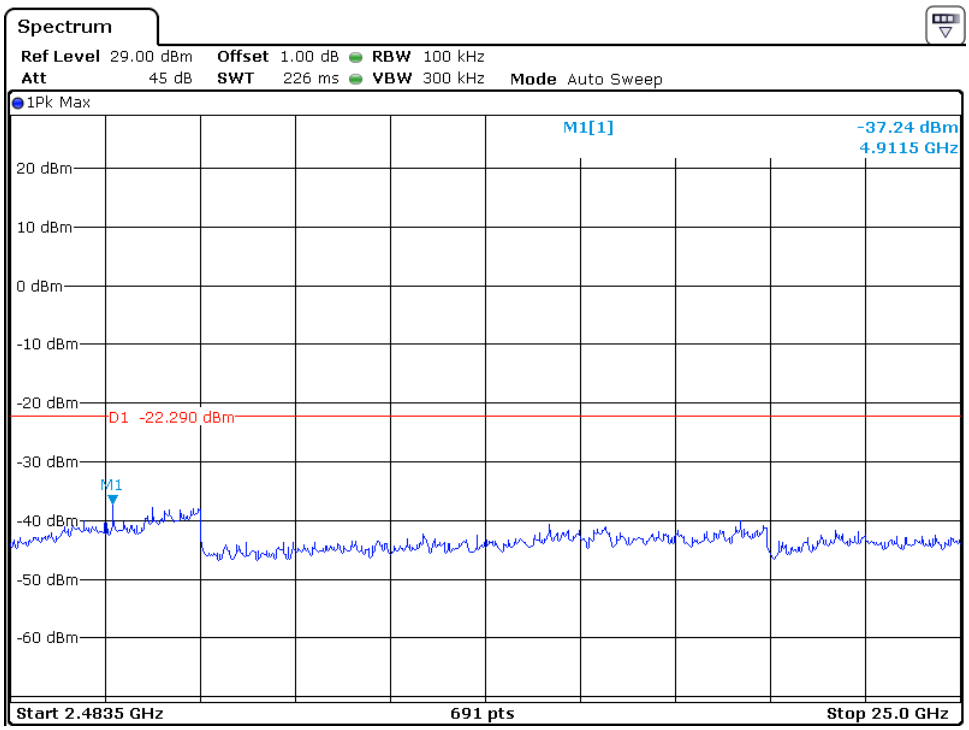
Channel 06 (2437MHz) Reference Level: 2.65dBm

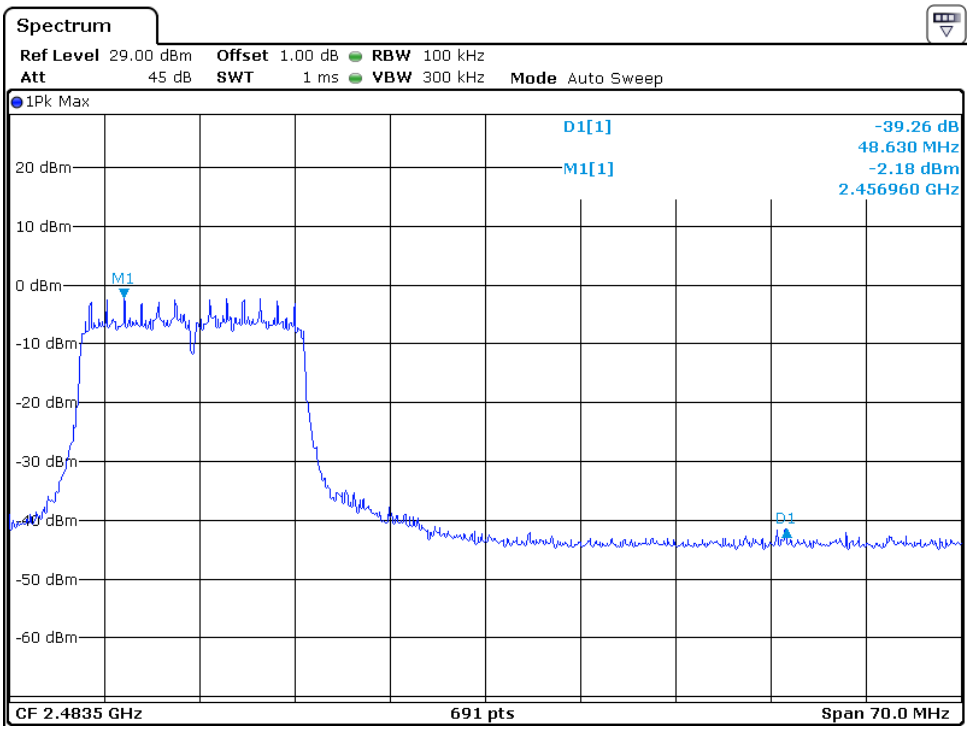




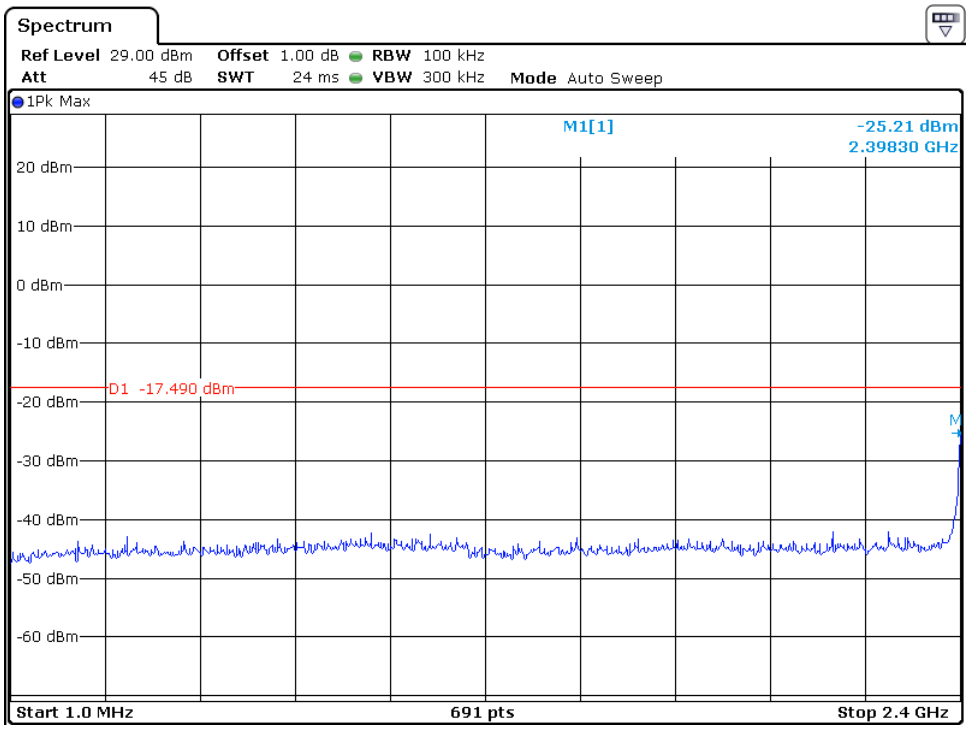
Channel 11 (2462MHz) Reference Level: -2.29dBm

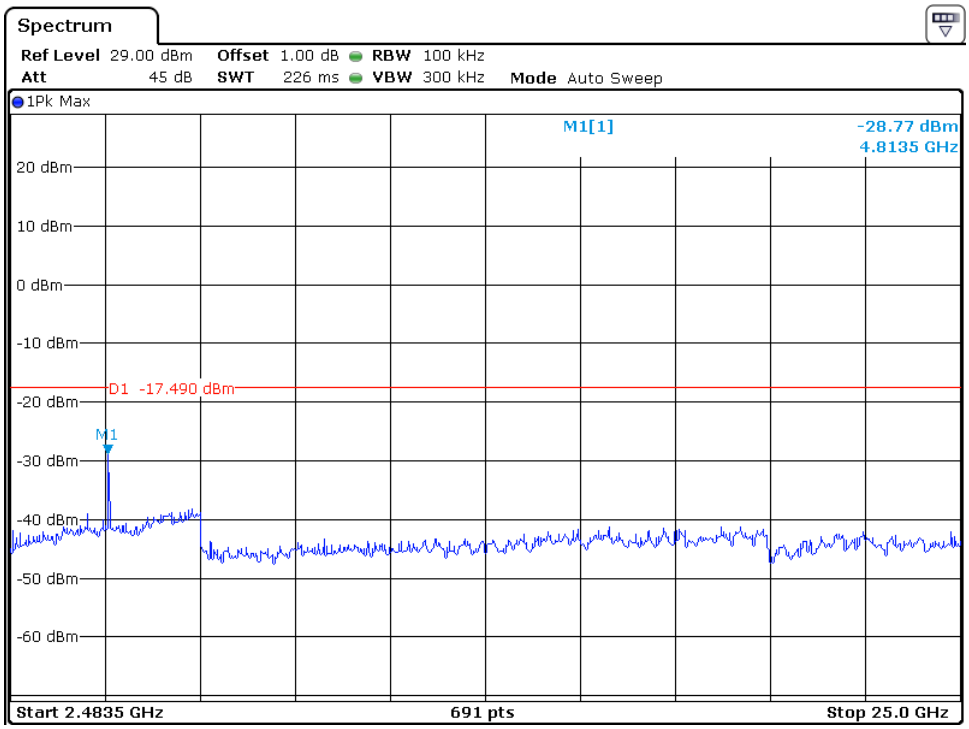


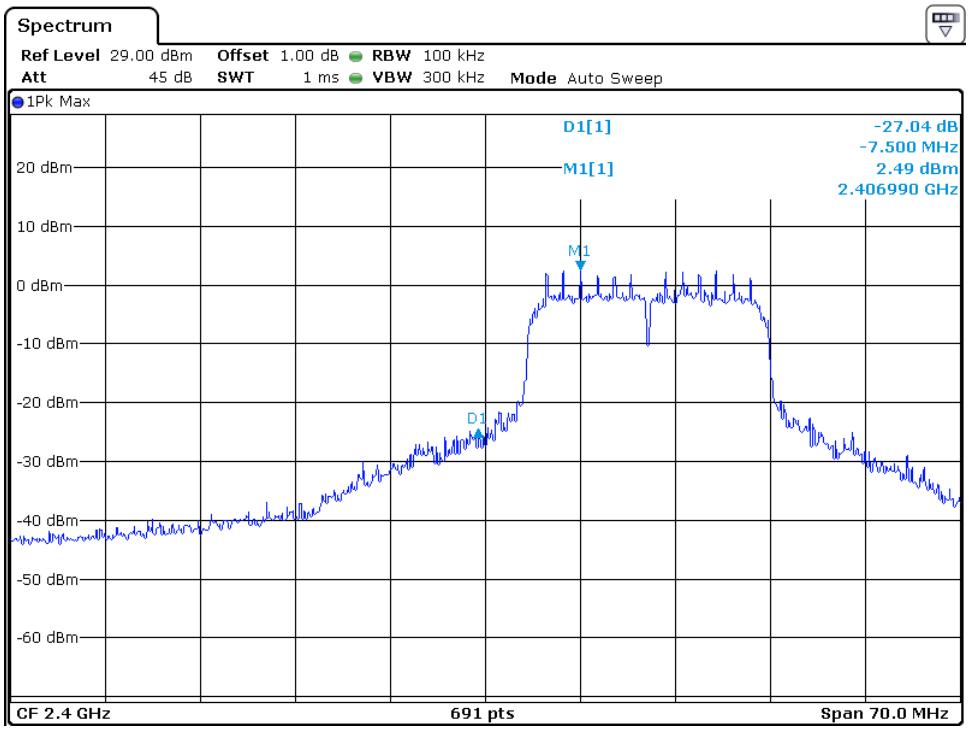



Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -39.26 dB
48.630 MHz
M1[1] -2.18 dBm
2.456960 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
D1
CF 2.4835 GHz
691 pts
Span 70.0 MHz

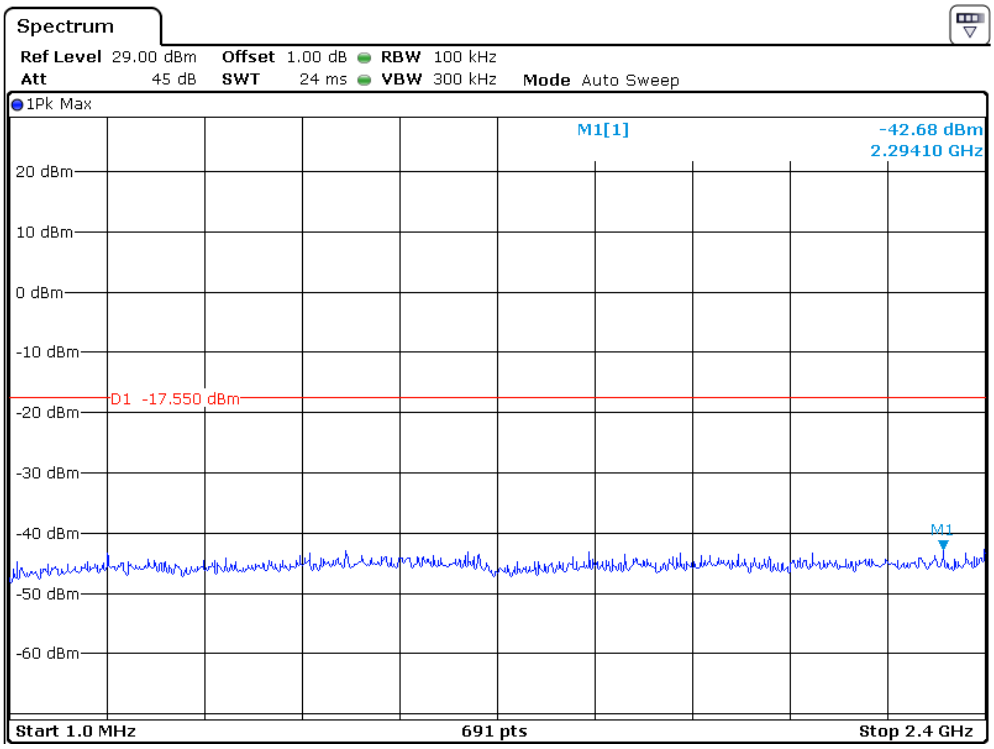
802.11n-HT20
Channel 01 (2412MHz) Reference Level: 2.51dBm

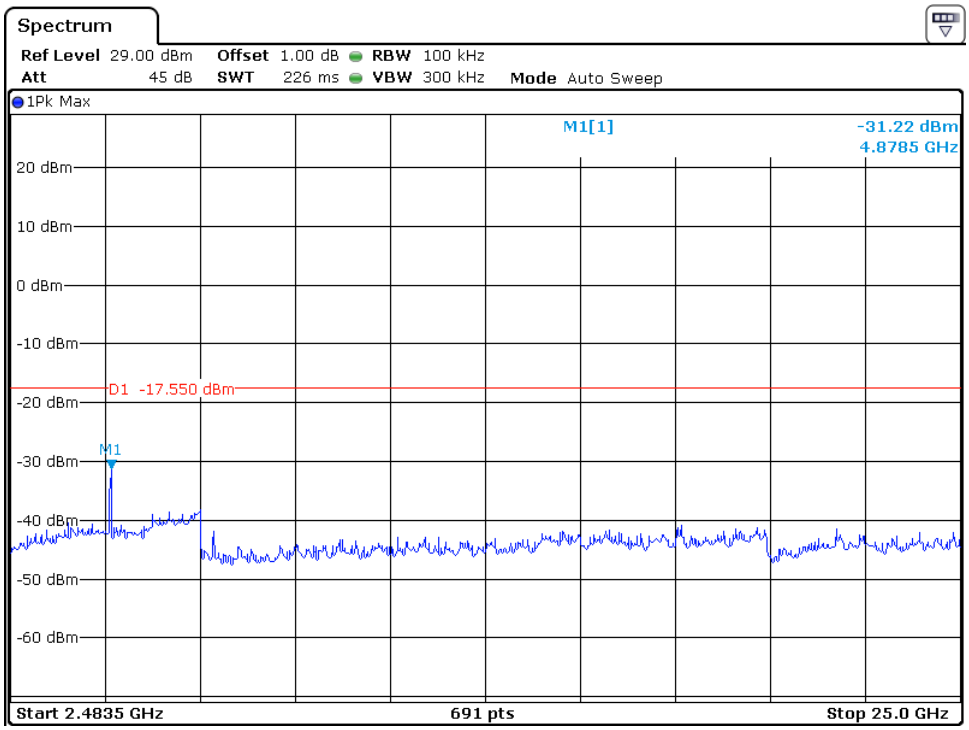




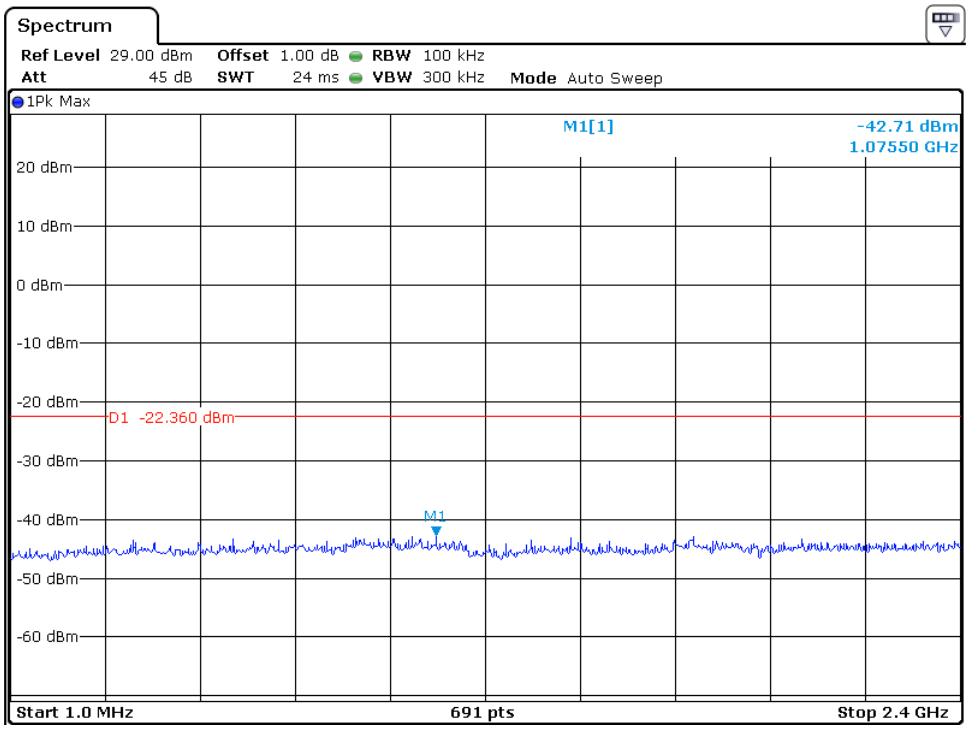

Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1]
-27.04 dB
-7.500 MHz
M1[1]
2.49 dBm
2.406990 GHz
M1
D1
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.4 GHz
691 pts
Span 70.0 MHz

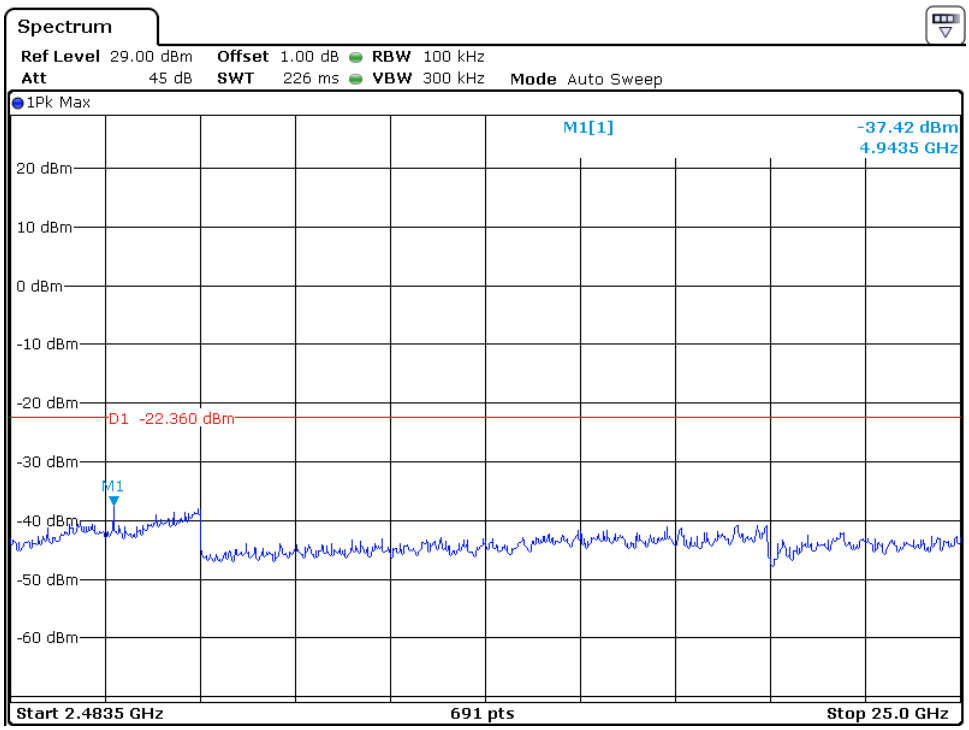
Channel 06 (2437MHz) Reference Level: 2.45dBm

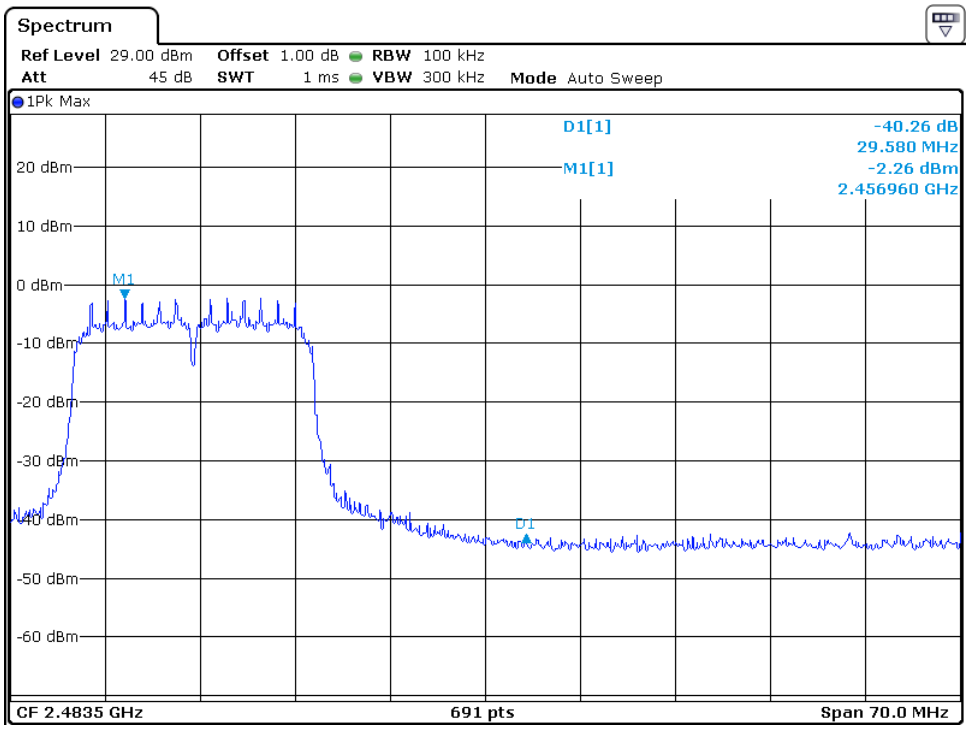




Channel 11 (2462MHz) Reference Level: -2.36dBm






Spectrum
Ref Level 29.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
D1[1] -40.26 dB
29.580 MHz
M1[1] -2.26 dBm
2.456960 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 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

<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 06)
at 4874.0MHz
is passed by 4.8dB margin.

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

Applicant: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	80.000	23.1	20.0	13.3	16.4	40.0	-23.6
Horizontal	160.000	26.2	20.0	15.7	21.9	43.5	-21.6
Horizontal	719.000	29.6	20.0	19.3	28.9	46.0	-17.1
Vertical	31.455	27.7	20.0	13.5	21.2	40.0	-18.8
Vertical	46.000	21.0	20.0	15.8	16.8	40.0	-23.2
Vertical	691.055	28.8	20.0	20.3	29.1	46.0	-16.9

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	63.3	36.8	33.5	60.0	74.0	-14.0
Horizontal	*2390.000	57.6	36.4	29.1	50.3	74.0	-23.7

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	52.4	36.8	33.5	49.1	54.0	-4.9
Horizontal	*2390.000	49.2	36.4	29.1	41.9	54.0	-12.1

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	64.2	36.7	33.4	60.9	74.0	-13.1
Horizontal	*7311.000	58.3	36.6	35.8	57.5	74.0	-16.5

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	52.5	36.7	33.4	49.2	54.0	-4.8
Horizontal	*7311.000	47.2	36.6	35.8	46.4	54.0	-7.6

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	64.0	36.8	33.3	60.5	74.0	-13.5
Horizontal	*2484.50	59.7	36.5	29.3	52.5	74.0	-21.5

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	*4924.000	52.6	36.8	33.3	49.1	54.0	-4.9
Horizontal	*2484.500	48.3	36.5	29.3	41.1	54.0	-12.9

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	60.5	36.8	33.5	57.2	74.0	-16.8
Horizontal	*2390.000	57.4	36.4	29.1	50.1	74.0	-23.9

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	*4824.000	45.7	36.8	33.5	42.4	54.0	-11.6
Horizontal	*2390.000	40.8	36.4	29.1	33.5	54.0	-20.5

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	60.7	36.7	33.4	57.4	74.0	-16.6
Horizontal	*7311.000	56.6	36.6	35.8	55.8	74.0	-18.2

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	45.9	36.7	33.4	42.6	54.0	-11.4
Horizontal	*7311.000	46.2	36.6	35.8	45.4	54.0	-8.6

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	60.9	36.8	33.3	57.4	74.0	-16.6
Horizontal	*2484.50	58.8	36.5	29.3	51.6	74.0	-22.4

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	45.9	36.8	33.3	42.4	54.0	-11.6
Horizontal	*2484.500	42.2	36.5	29.3	35.0	54.0	-19.0

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	55.7	36.8	33.5	52.4	74.0	-21.6
Horizontal	*2390.000	51.2	36.4	29.1	43.9	74.0	-30.1

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	43.4	36.8	33.5	40.1	54.0	-13.9
Horizontal	*2390.000	38.6	36.4	29.1	31.3	54.0	-22.7

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: Hanson Robotics Limited
Date of Test: August 02, 2018 Model: HR_WIFIUSBD01
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	55.4	36.7	33.4	52.1	74.0	-21.9
Horizontal	*7311.000	54.3	36.6	35.8	53.5	74.0	-20.5

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	43.5	36.7	33.4	40.2	54.0	-13.8
Horizontal	*7311.000	41.6	36.6	35.8	40.8	54.0	-13.2

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: Hanson Robotics Limited
Date of Test: August 02, 2018
Model: HR_WIFIUSBD01
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	55.9	36.8	33.3	52.4	74.0	-21.6
Horizontal	*2484.50	51.9	36.5	29.3	44.7	74.0	-29.3

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	43.8	36.8	33.3	40.3	54.0	-13.7
Horizontal	*2484.500	39.4	36.5	29.3	32.2	54.0	-21.8

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: Hanson Robotics Limited
Date of Test: August 02, 2018
Model: HR_WIFIUSBD01

4.9 Conducted Emission

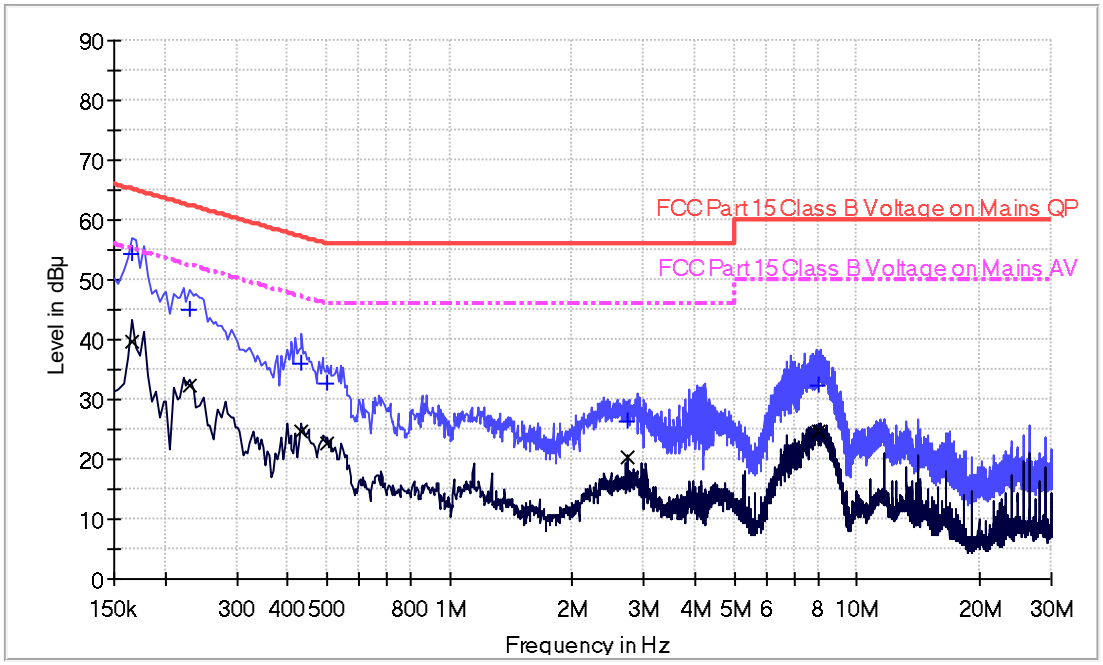
Worst Case Radiated Spurious Emission (802.11b-Channel 01)
at 0.166MHz
is passed by 11.0dB margin.

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

Applicant: Hanson Robotics Limited
Date of Test: August 02, 2018
Model: HR_WIFIUSBD01
Worst Case Operating Mode: Transmitting (802.11b-Channel 01)
Phase: Live

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dB¦ÌV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.166000	54.2	9.000	L1	9.6	11.0	65.2
0.230000	45.0	9.000	L1	9.7	17.4	62.4
0.430000	36.1	9.000	L1	9.7	21.2	57.3
0.502000	32.8	9.000	L1	9.7	23.2	56.0
2.734000	26.2	9.000	L1	9.7	29.8	56.0
8.090000	32.4	9.000	L1	9.9	27.6	60.0

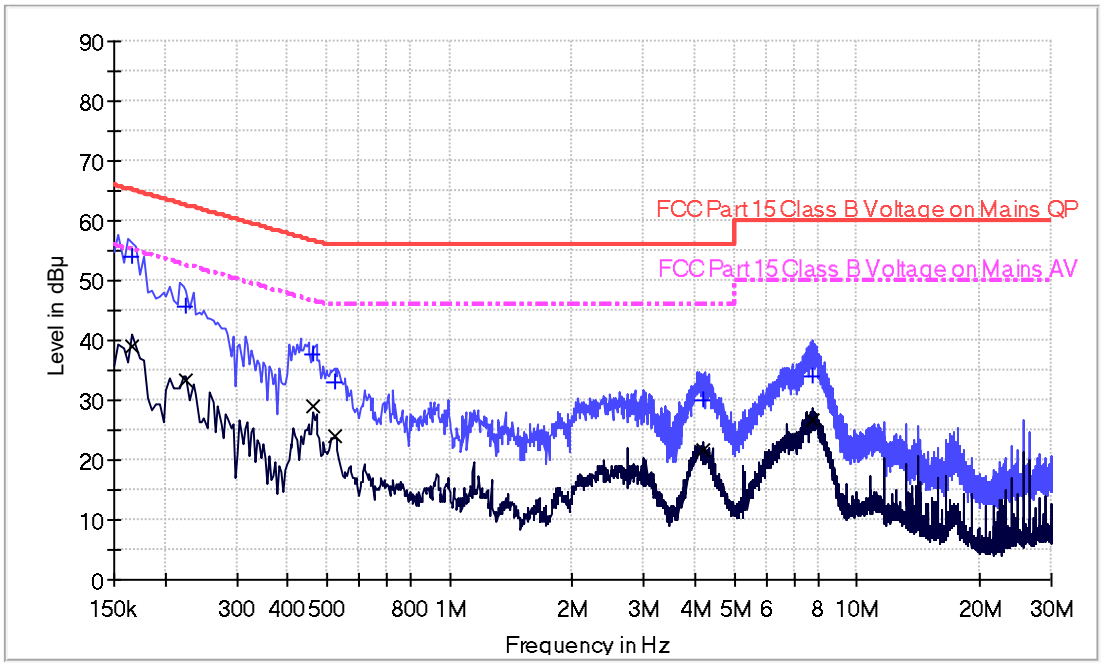
Limit and Margin AV

Frequency (MHz)	Average (dB¦ÌV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.166000	39.6	9.000	L1	9.6	15.6	55.2
0.230000	32.2	9.000	L1	9.7	20.2	52.4
0.430000	24.5	9.000	L1	9.7	22.8	47.3
0.502000	22.7	9.000	L1	9.7	23.3	46.0
2.734000	20.3	9.000	L1	9.7	25.7	46.0
8.090000	24.6	9.000	L1	9.9	25.4	50.0

Applicant: Hanson Robotics Limited
Date of Test: August 02, 2018
Model: HR_WIFIUSBD01
Worst Case Operating Mode: Transmitting (802.11b-Channel 01)
Phase: Neutral

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dB¦ÌV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.166000	53.9	9.000	N	9.6	11.3	65.2
0.226000	45.5	9.000	N	9.7	17.1	62.6
0.462000	37.8	9.000	N	9.7	18.9	56.7
0.522000	33.1	9.000	N	9.7	22.9	56.0
4.206000	30.1	9.000	N	9.8	25.9	56.0
7.762000	33.9	9.000	N	9.9	26.1	60.0

Limit and Margin AV

Frequency (MHz)	Average (dB¦ÌV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB¦ÌV)
0.166000	39.1	9.000	N	9.6	16.1	55.2
0.226000	33.2	9.000	N	9.7	19.4	52.6
0.462000	28.9	9.000	N	9.7	17.8	46.7
0.522000	24.2	9.000	N	9.7	21.8	46.0
4.206000	21.8	9.000	N	9.8	24.2	46.0
7.762000	26.8	9.000	N	9.9	23.2	50.0

Applicant: Hanson Robotics Limited
Date of Test: August 02, 2018
Model: HR_WIFIUSBD01

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: Hanson Robotics Limited
Date of Test: August 02, 2018
Model: HR_WIFIUSBD01

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.

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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
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	5-Jun-2018	5-Jun-2019
SZ182-02-01	Power Sensor	Anritsu	MA2411B	1207429	5-Jun-2018	5-Jun-2019
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	09-Sep-2017	09-Sep-2018
SZ185-01	EMI Receiver	R&S	ESCI	100547	24-Jan-2018	24-Jan-2019
SZ061-08	Horn Antenna	ETS	3115	00092346	09-Sep-2017	09-Sep-2018
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	17-Mar-2018	17-Mar-2019
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	11-May-2018	11-May-2019
SZ056-06	Spectrum Analyzer	R&S	FSV40	101101	5-Jun-2018	5-Jun-2019
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	24-Jan-2018	24-Jan-2019
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	16-Jan-2017	16-Jan-2019
SZ062-02	RF Cable	RADIALL	RG 213U	--	16-Mar-2018	16-Sep-2018
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	16-Mar-2018	16-Sep-2018
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	16-Mar-2018	16-Sep-2018
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	5-Jun-2018	5-Jun-2019
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

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