intertek
Total Quality. Assured.

KanDao Technology Co.Ltd

TEST REPORT

SCOPE OF WORK
FCC TESTING–QCM1212

REPORT NUMBER
191216047SZN-002

ISSUE DATE	**[REVISED DATE]**
15 January 2020	[----------]

PAGES
600

DOCUMENT CONTROL NUMBER
FCC ID 247_b
© 2017 INTERTEK

101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China.

Tel: (86 755) 8601 6288
Fax: (86 755) 8601 6751
www.intertek.com

Total Quality. Assured.

TEST REPORT

Intertek Report No.: 191216047SZN-002

KanDao Technology Co.Ltd

Application
For
Certification

FCC ID: 2ATPV-KDUC

QooCam 8K 360 Camera

Model: QCM1212

2.4GHz Wi-Fi Transceiver

Report No.: 191216047SZN-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 [10-1-18]

Prepared and Checked by:

Winkey Wang
Senior Project Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: 15 January 2020

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

MEASUREMENT/TECHNICAL REPORT

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 [10-01-18] Edition] provision.

Report prepared by:

Winkey Wang
Intertek Testing Services Shenzhen Ltd. Longhua Branch
101, 201, Building B, No. 308 Wuhe Avenue,
Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China.
Tel: (86 755) 8614 0684 Fax: (86 755) 8601 6661

Table of Contents

1.0 Summary of Test results 4
2.0 General Description 5
2.1 Product Description 5
2.2 Related Submittal(s) Grants 5
2.3 Test Methodology 5
2.4 Test Facility 5
3.0 System Test Configuration 6
3.1 Justification 6
3.2 EUT Exercising Software 6
3.3 Special Accessories 6
3.4 Measurement Uncertainty 7
3.5 Equipment Modification 7
3.6 Support Equipment List and Description 7
4.0 Measurement Results 8
4.1 Maximum Conducted Output Power at Antenna Terminals 8
4.2 Minimum 6 dB RF Bandwidth 9
4.3 Maximum Power Density Reading 16
4.4 Out of Band Conducted Emissions 23
4.5 Out of Band Radiated Emissions 39
4.6 Transmitter Radiated Emissions in Restricted Bands 40
4.7 Field Strength Calculation 41
4.8 Radiated Spurious Emission 42
4.9 Conducted Emission 54
4.10 Radiated Emissions from Digital Section of Transceiver 57
4.11 Transmitter Duty Cycle Calculation and Measurements 58
5.0 Equipment Photographs 59
6.0 Product Labelling 59
7.0 Technical Specifications 59
8.0 Instruction Manual 59
9.0 Confidentiality Request 59
10.0 Discussion of Pulse Desensitization 59
11.0 Test Equipment List 60

1.0 Summary of Test results

Applicant: KanDao Technology Co.Ltd
Applicant Address: 5th Floor, M7 Steel Building, the second way in Technology Road, Nanshan District, Shenzhen, China
Manufacturer: Same as applicant
Manufacturer Address: Same as applicant

Model: QCM1212
FCC ID: 2ATPV-KDUC

TEST ITEM	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6dB 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), 15.209, FCC 15.205	Pass
AC Conducted Emission	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.

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a QooCam 8K 360 Camera 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 AC/DC adaptor through AC120V/60Hz. For more detailed features description, please refer to the user's manual.

Type of Modulation: BPSK, QPSK, 16QAM, 64QAM for OFDM; CCK, DQPSK, DBPSK for DSSS.
Antenna Type: Integral Antenna
Antenna Gain: 3dBi

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).

Remaining portions are subject to the following procedures:
1. Receiver portion of WiFi: exempt from technical requirement of this Part.
2. 5G WIFI function was tested and demonstrated in report 191216047SZN-003.
3. Other Digital Function: Subject to FCC Part 15B SDOC.

2.3 Test Methodology

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

2.4 Test Facility

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

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by AC/DC adaptor with AC120V/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 shall be flushed with the rear of the table.

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

3.2 EUT Exercising Software

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

Test Software: wi-fi_rf_test_commands_for_linux_bcm4339-v03

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

Microphone (with a ferrite bead on the cable)

3.4 Measurement Uncertainty

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

3.5 Equipment Modification

Any modifications installed previous to testing by KanDao Technology Co.Ltd will be incorporated in each production model sold / leased in the United States.

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

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Adapter	Xiaomi	Model: MDY-08-EI Input: AC100-240V, 50/60Hz, 1A Output: DC 12V/1.5A, 9V/2A, 5V/3A (Provided by Intertek)
TF card	SanDisk	SDCZ36-002G-P36 (Provided by Intertek)
Microphone	BOYA	BY-MM1 (with a ferrite bead on the cable) (Provided by Applicant)
USB-C to USB-C cable	KanDao	1.0m (unshielded) (Provided by Applicant)
USB-C to Micro USB cable	KanDao	0.4m (unshielded) (Provided by Applicant)
USB-C to USB-A cable	KanDao	1.0m (unshielded) (Provided by Applicant)
Smart Phone	Samsung	S7 (Provided by Intertek)

Applicant: KanDao Technology Co.Ltd
Date of Test: December 30, 2019 Model: QCM1212

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 = 3dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	19.22	83.56
Middle Channel: 2437	19.12	81.66
High Channel: 2462	18.75	74.99

IEEE 802.11g (Antenna Gain = 3dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	23.92	246.60
Middle Channel: 2437	23.65	231.74
High Channel: 2462	23.48	222.84

IEEE 802.11n-HT20 (Antenna Gain = 3dBi) (64QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	24.01	251.77
Middle Channel: 2437	24.08	255.86
High Channel: 2462	23.59	228.56

Cable loss: 1.0 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 24.08dBm
EUT max. E.I.R.P = 24.08dBm + 3dBi = 27.08dBm = 510.50mW

Applicant: KanDao Technology Co.Ltd
Date of Test: January 2, 2020 Model: QCM1212

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

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

Limit: The 6 dB Bandwidth is at least 500 kHz.

IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	9.0300
2437	9.0300
2462	9.0300

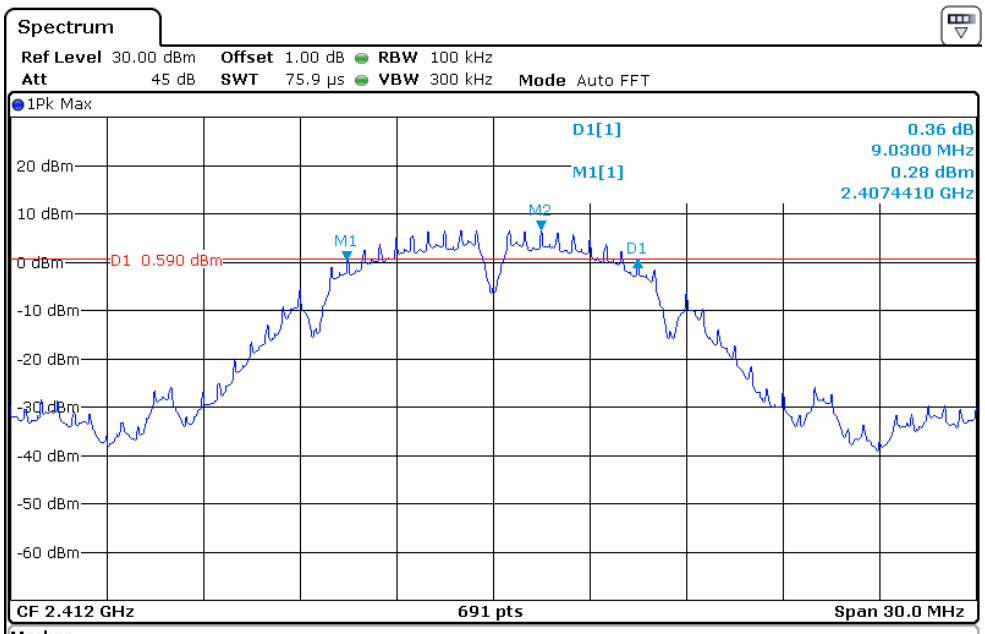
IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.2810
2437	16.2810
2462	16.2810

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	17.5400
2437	17.5400
2462	16.9320

The test plots are attached as below.

802.11b

2412MHz

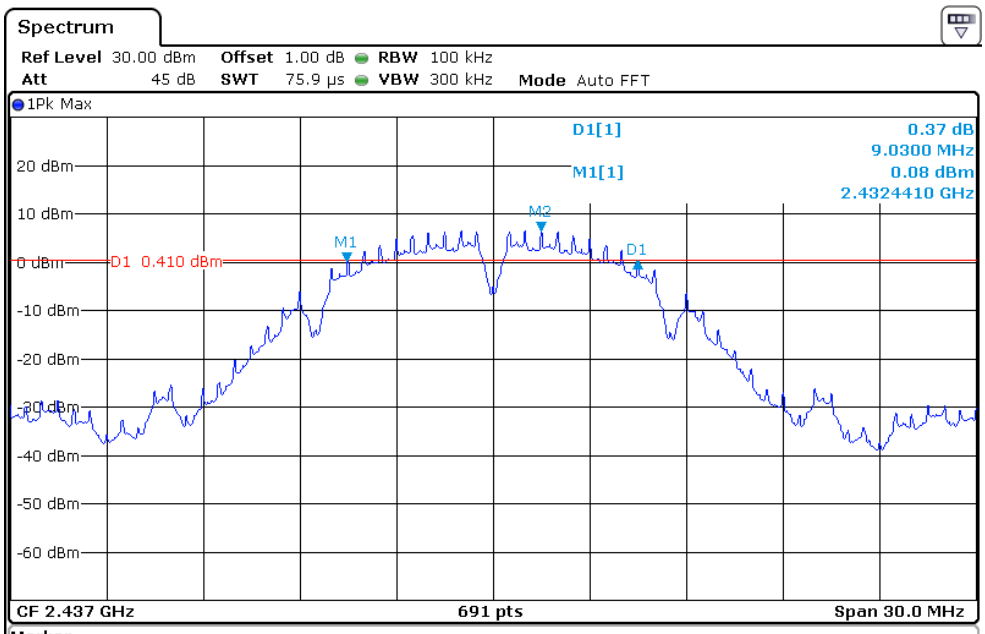


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.407441 GHz	0.28 dBm		
D1	M1	1	9.03 MHz	0.36 dB		
M2		1	2.413476 GHz	6.59 dBm		

Date: 2.JAN.2020 16:51:27

2437MHz

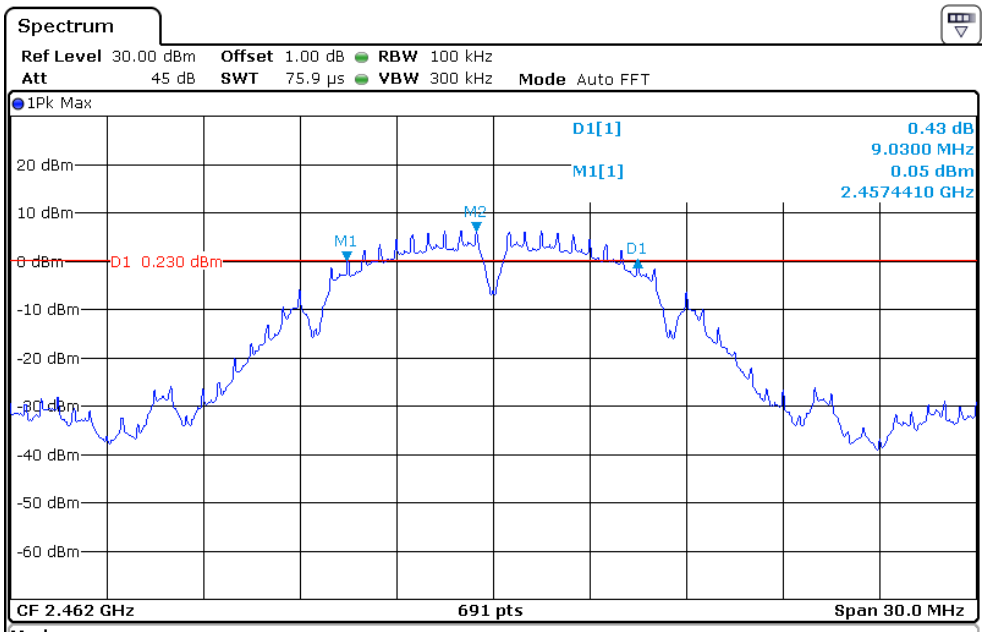


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432441 GHz	0.08 dBm		
D1	M1	1	9.03 MHz	0.37 dB		
M2		1	2.438476 GHz	6.41 dBm		

Date: 2.JAN.2020 17:01:19

2462MHz

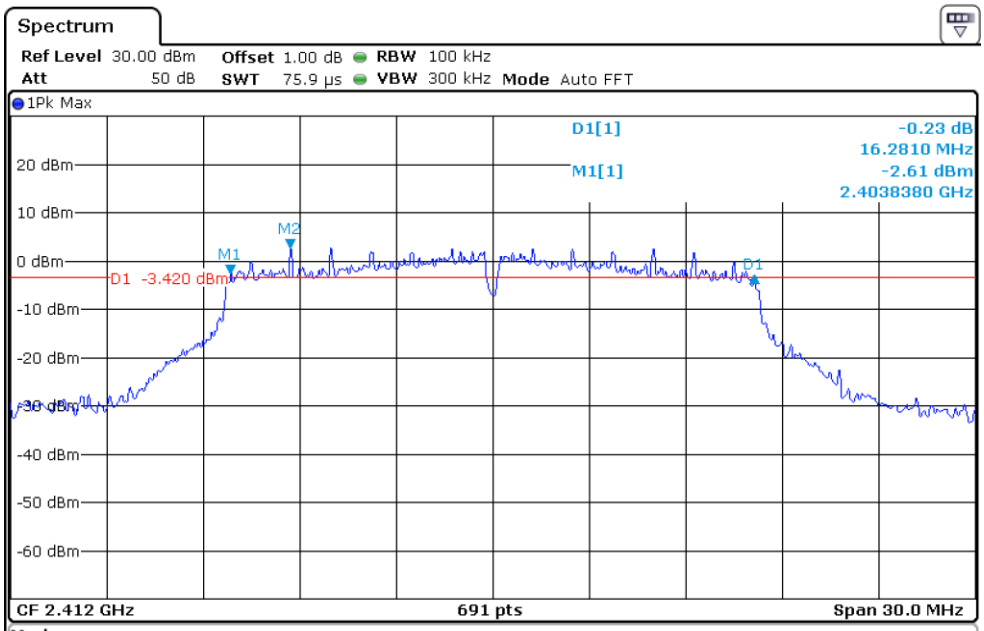


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457441 GHz	0.05 dBm		
D1	M1	1	9.03 MHz	0.43 dB		
M2		1	2.461479 GHz	6.23 dBm		

Date: 2.JAN.2020 17:05:25

802.11g

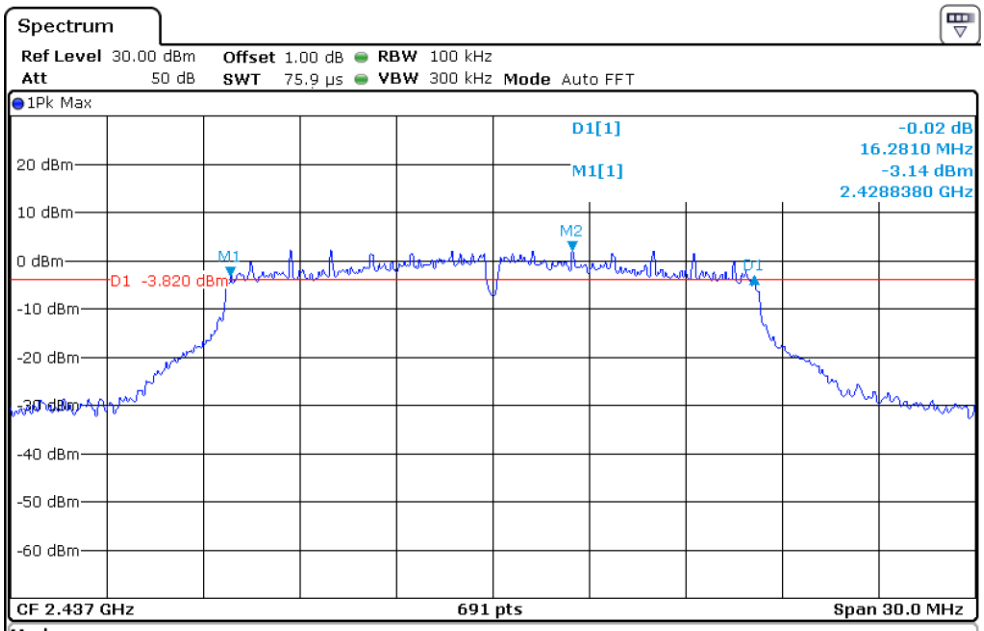


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403838 GHz	-2.61 dBm		
D1	M1	1	16.281 MHz	-0.23 dB		
M2		1	2.405705 GHz	2.58 dBm		

Date: 2.JAN.2020 18:59:18

2437MHz

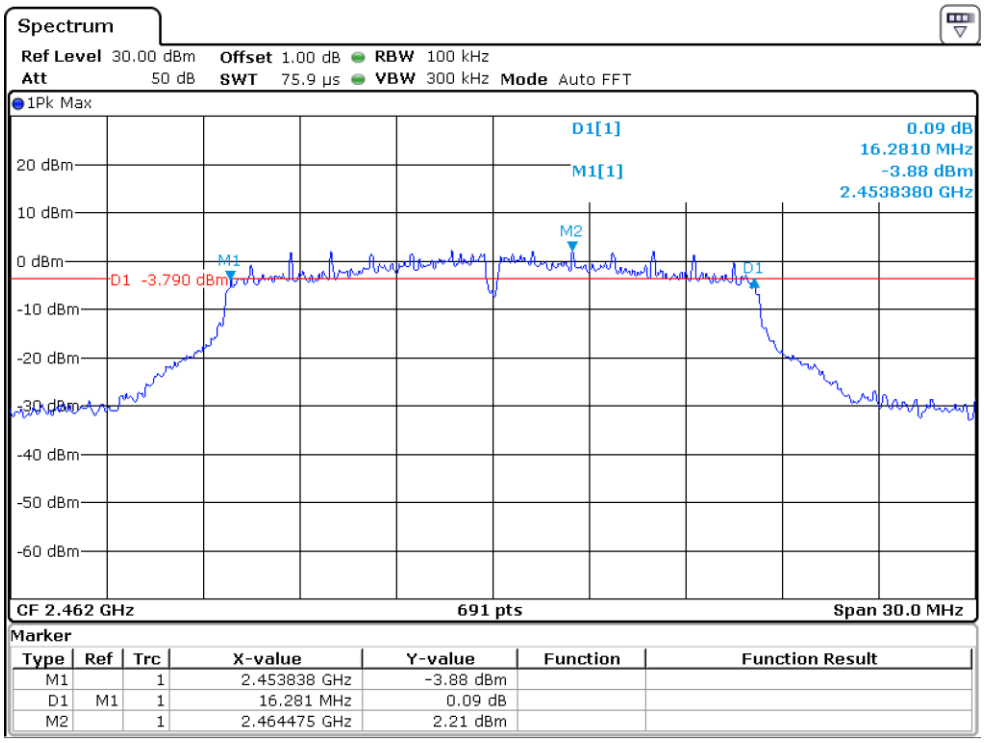


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428838 GHz	-3.14 dBm		
D1	M1	1	16.281 MHz	-0.02 dB		
M2		1	2.439475 GHz	2.18 dBm		

Date: 2.JAN.2020 19:08:35

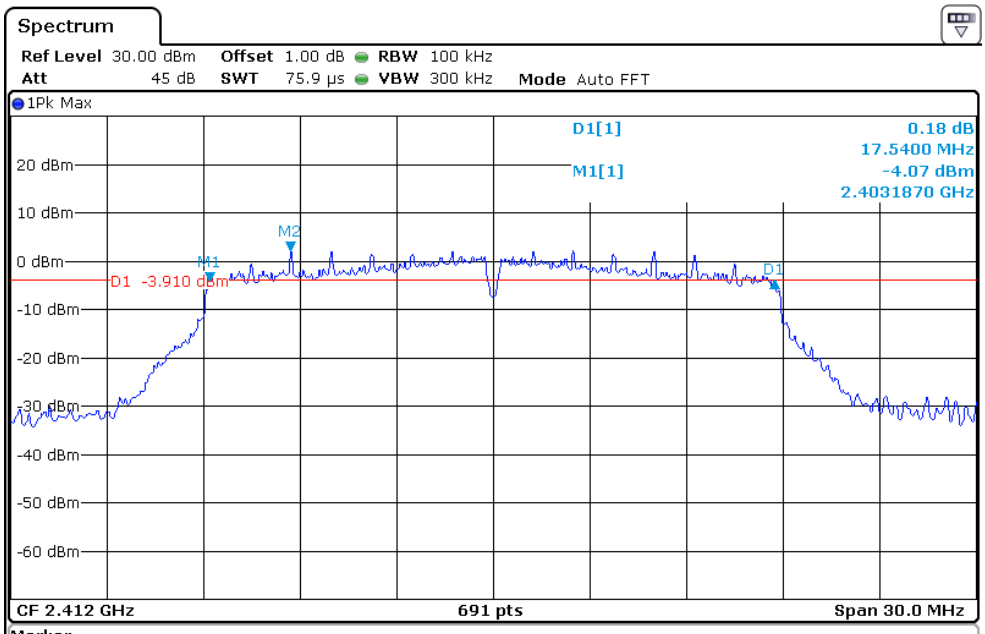
2462MHz



Date: 2.JAN.2020 19:21:31

802.11n-HT20

2412MHz

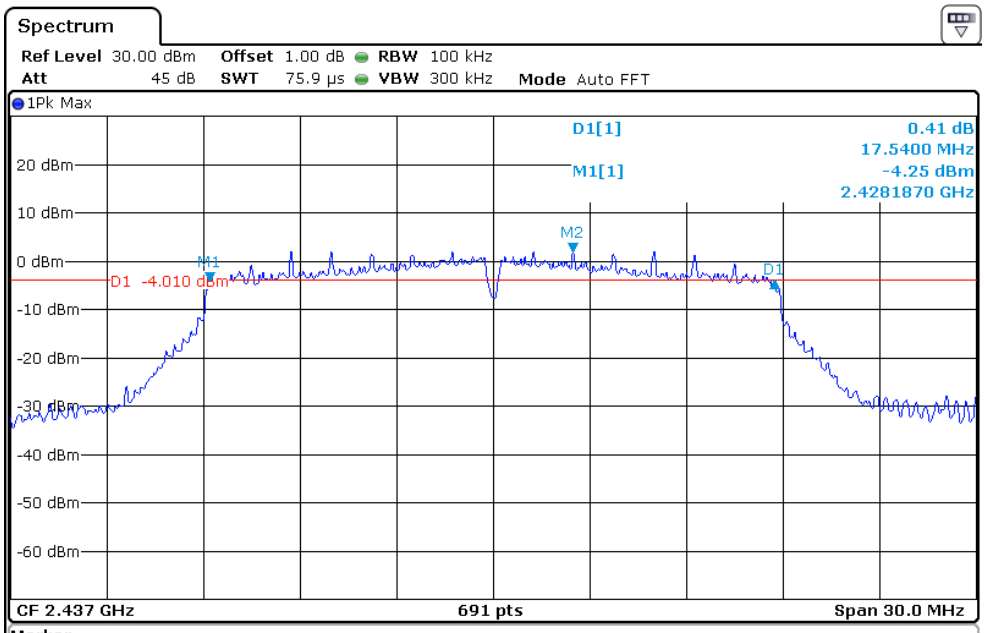


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403187 GHz	-4.07 dBm		
D1	M1	1	17.54 MHz	0.18 dB		
M2		1	2.405705 GHz	2.09 dBm		

Date: 2.JAN.2020 16:27:16

2437MHz

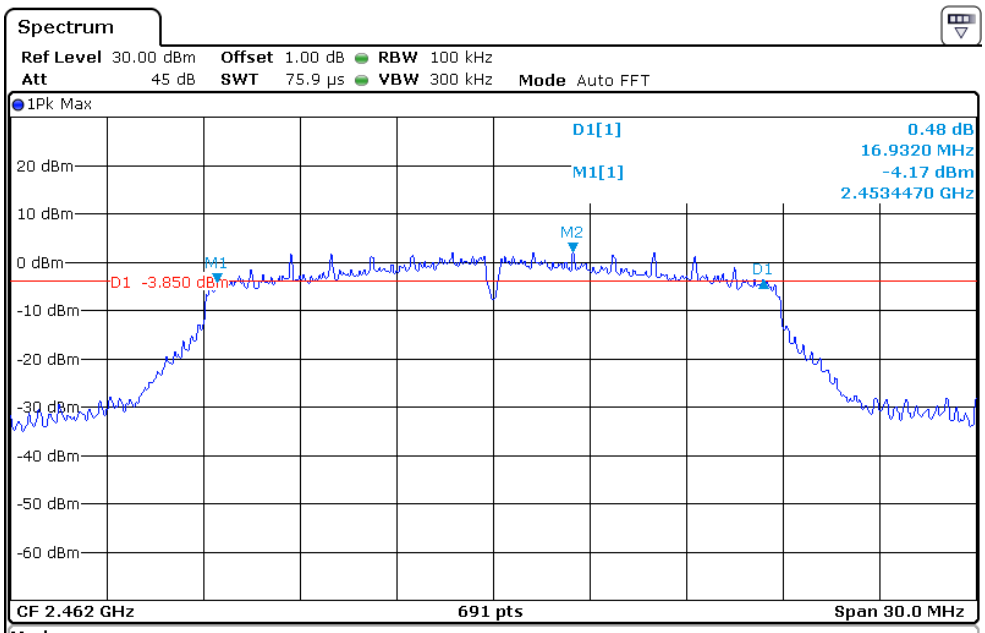


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428187 GHz	-4.25 dBm		
D1	M1	1	17.54 MHz	0.41 dB		
M2		1	2.439475 GHz	1.99 dBm		

Date: 2.JAN.2020 16:35:46

2462MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453447 GHz	-4.17 dBm		
D1	M1	1	16.932 MHz	0.48 dB		
M2		1	2.464475 GHz	2.15 dBm		

Date: 2.JAN.2020 16:42:51

Applicant: KanDao Technology Co.Ltd
Date of Test: January 2, 2020 Model: QCM1212

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

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

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

Limit: The Power Density does not exceed 8dBm/3 kHz.

IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	6.62
2437	6.30
2462	6.29

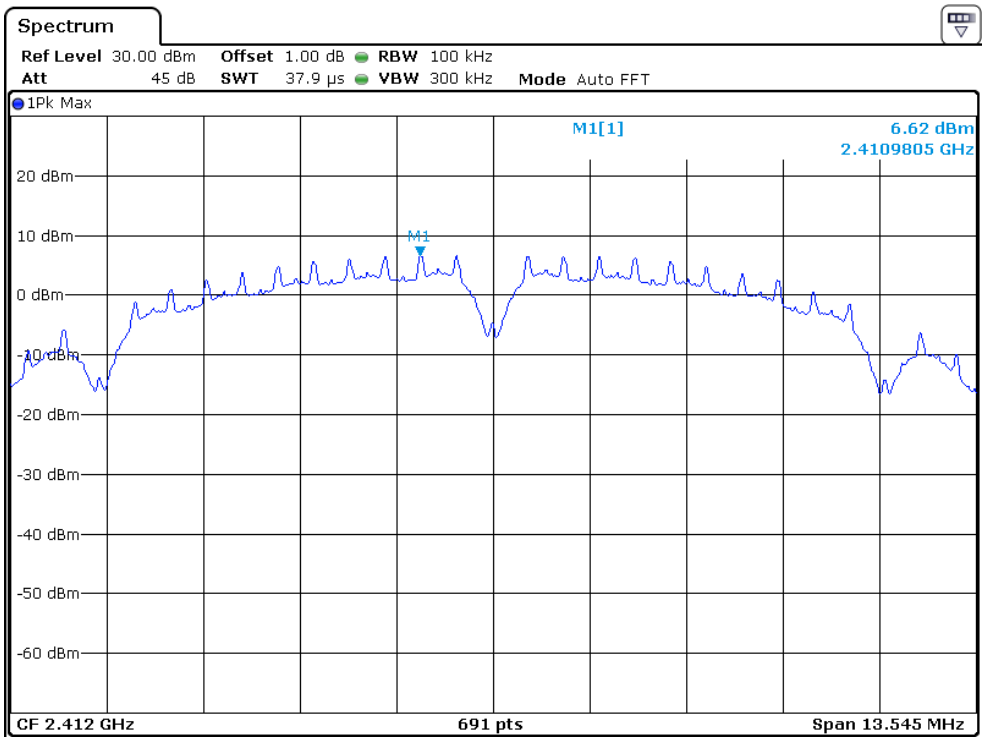
IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	2.52
2437	2.17
2462	2.28

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	2.02
2437	2.02
2462	2.11

The test plots are attached as below.

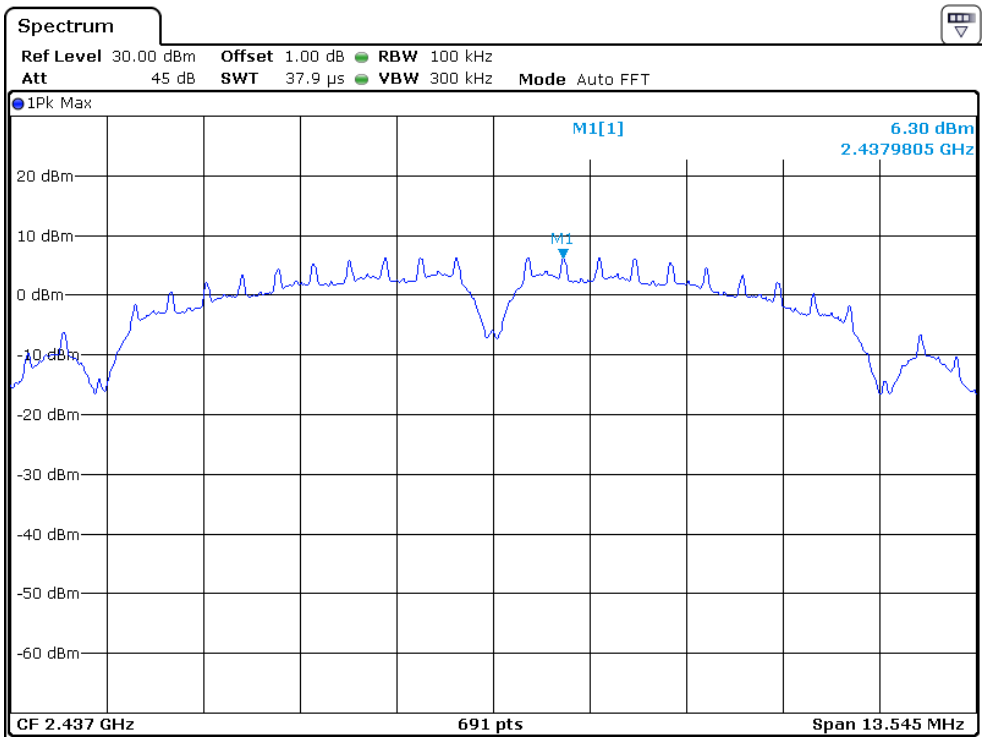
802.11b

2412MHz



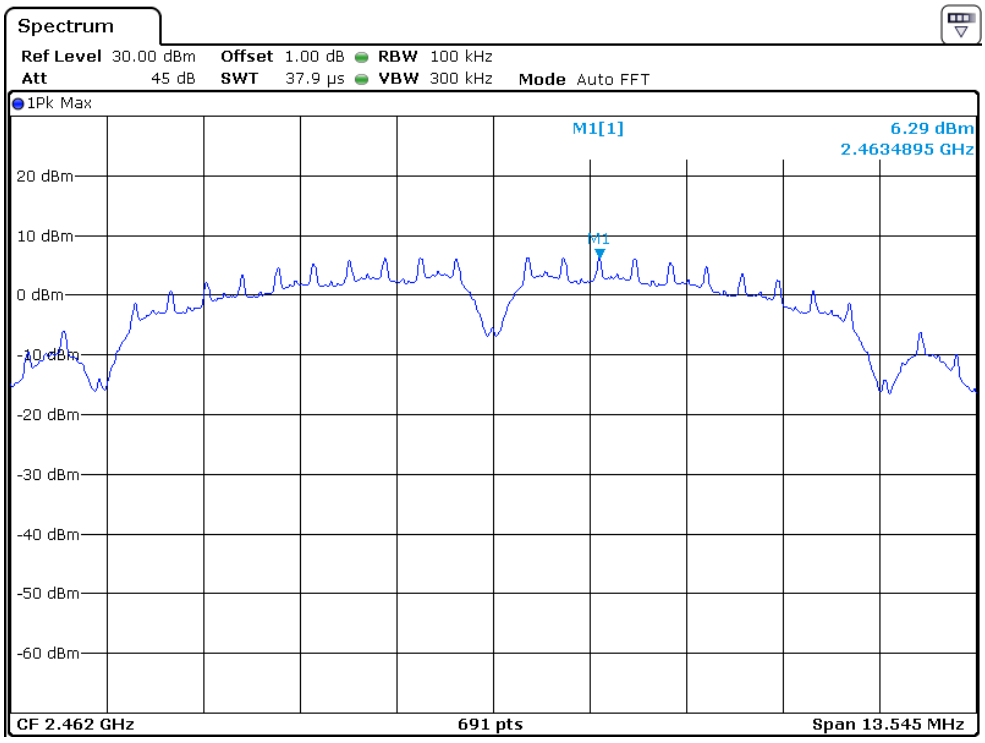
Date: 2.JAN.2020 16:52:51

2437MHz



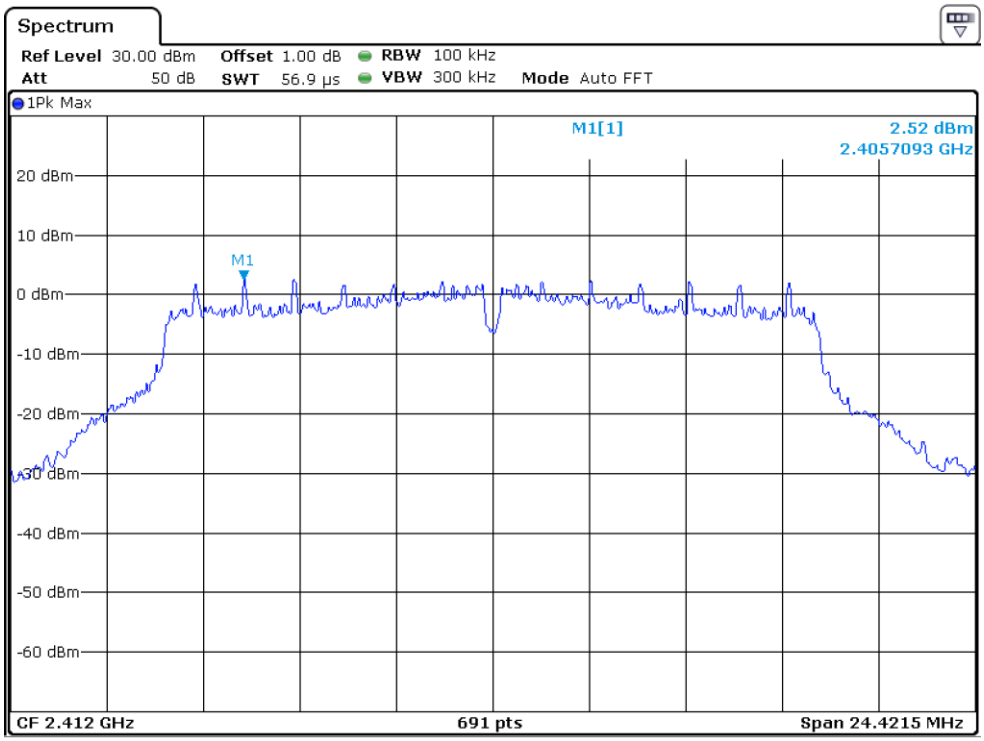
Date: 2.JAN.2020 17:02:19

2462MHz



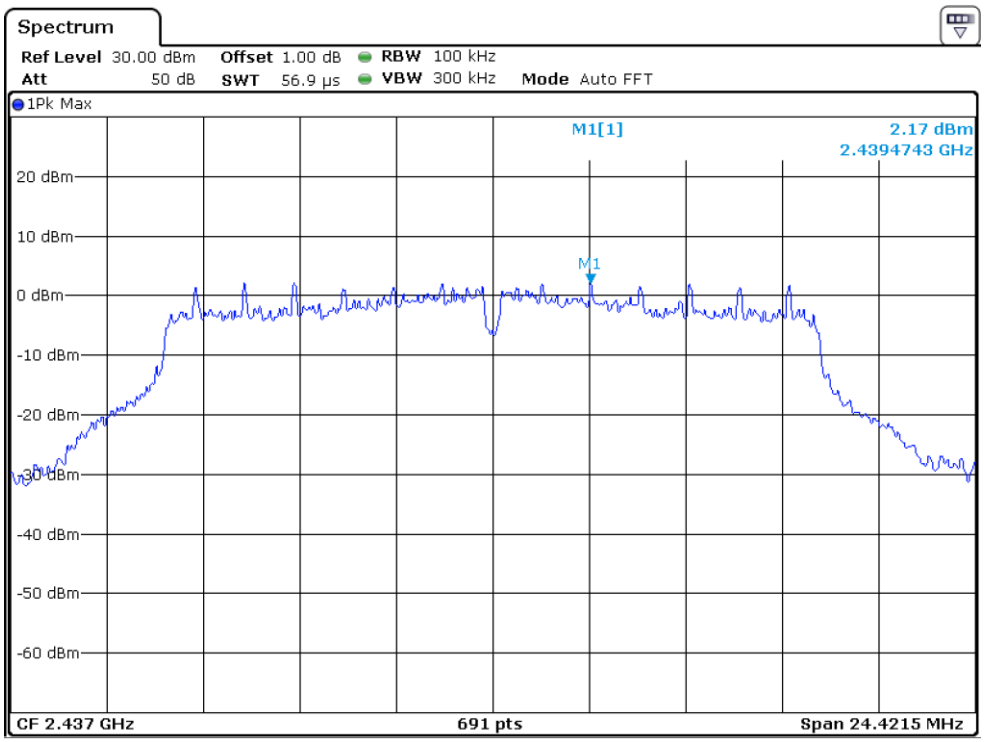
Date: 2.JAN.2020 17:06:59

802.11g



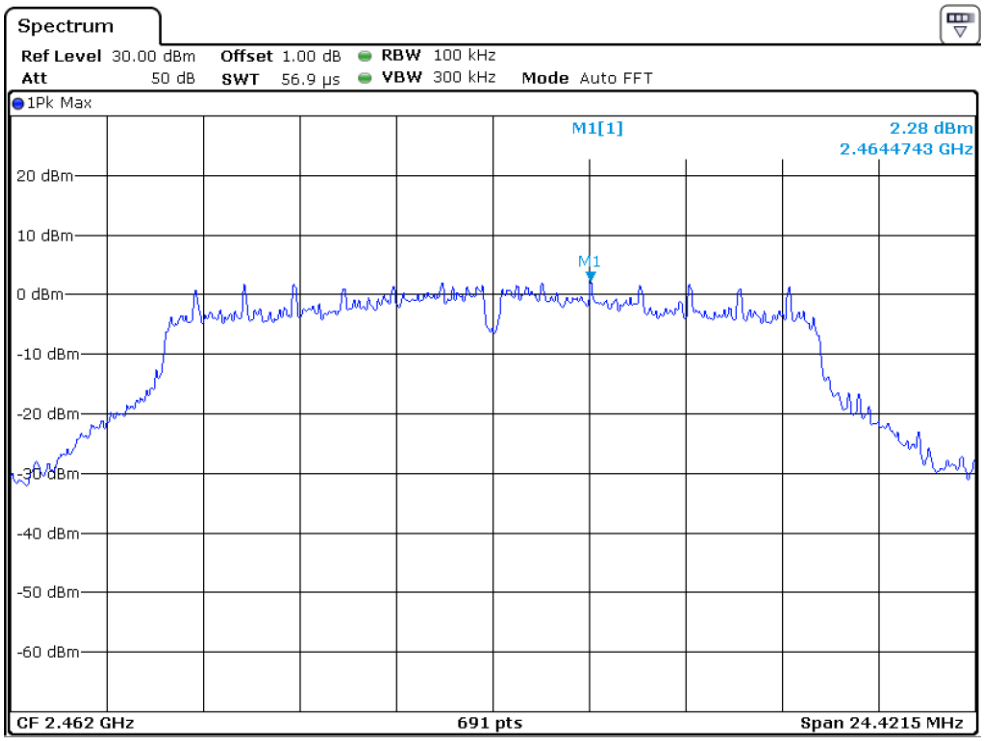
Date: 2.JAN.2020 19:01:18

2437MHz



Date: 2.JAN.2020 19:09:59

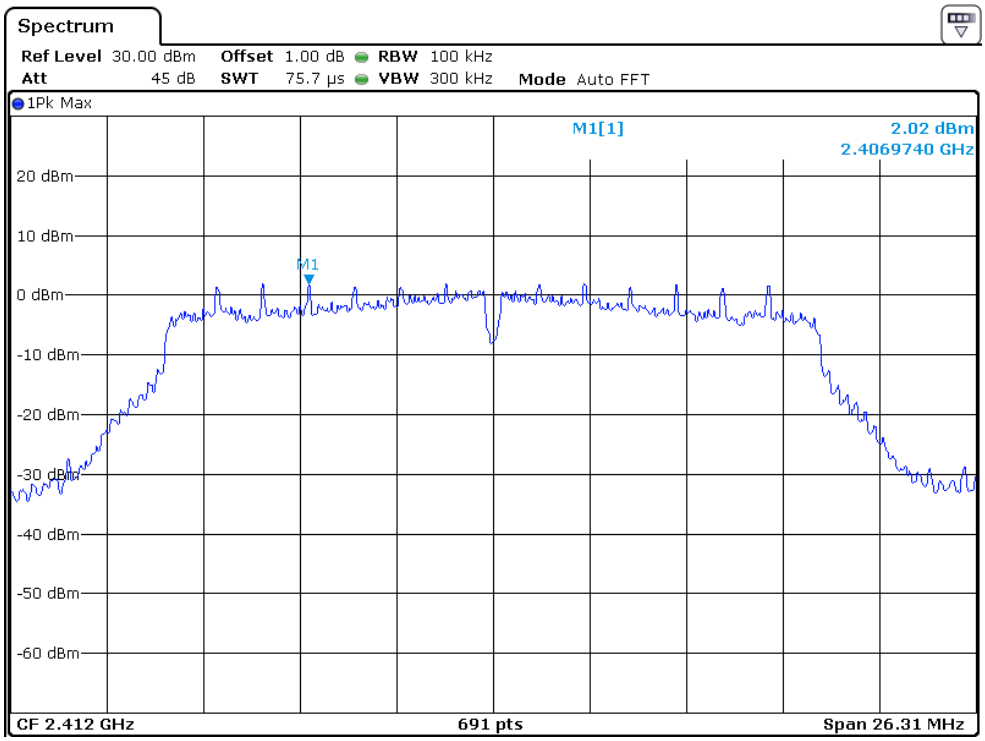
2462MHz



Date: 2.JAN.2020 19:22:55

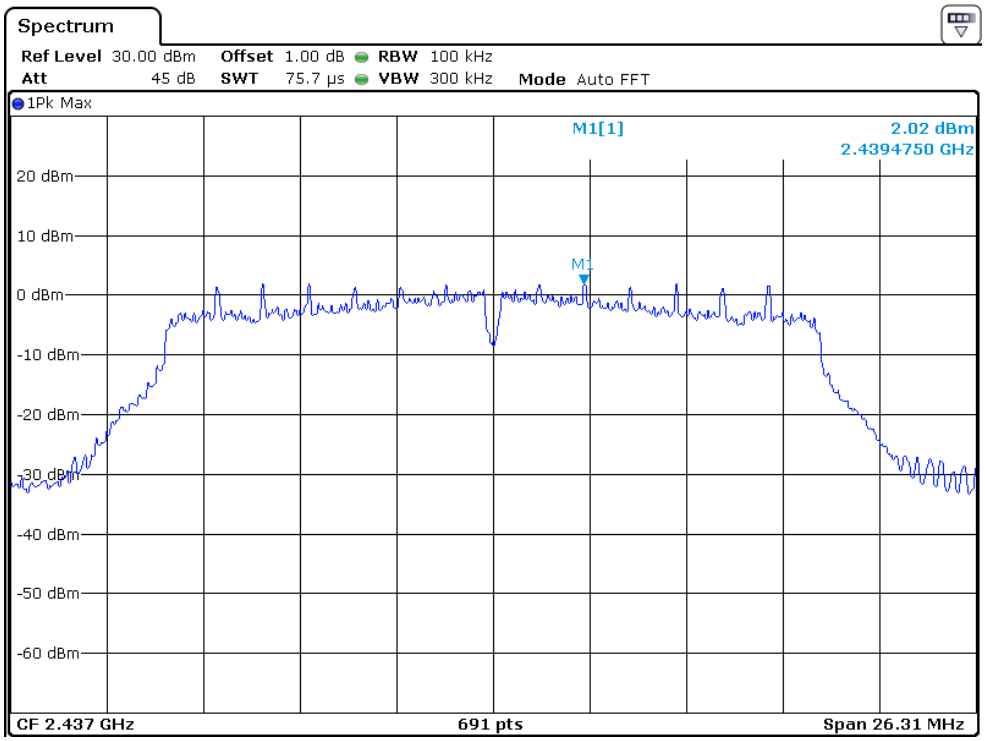
802.11n-HT20

2412MHz



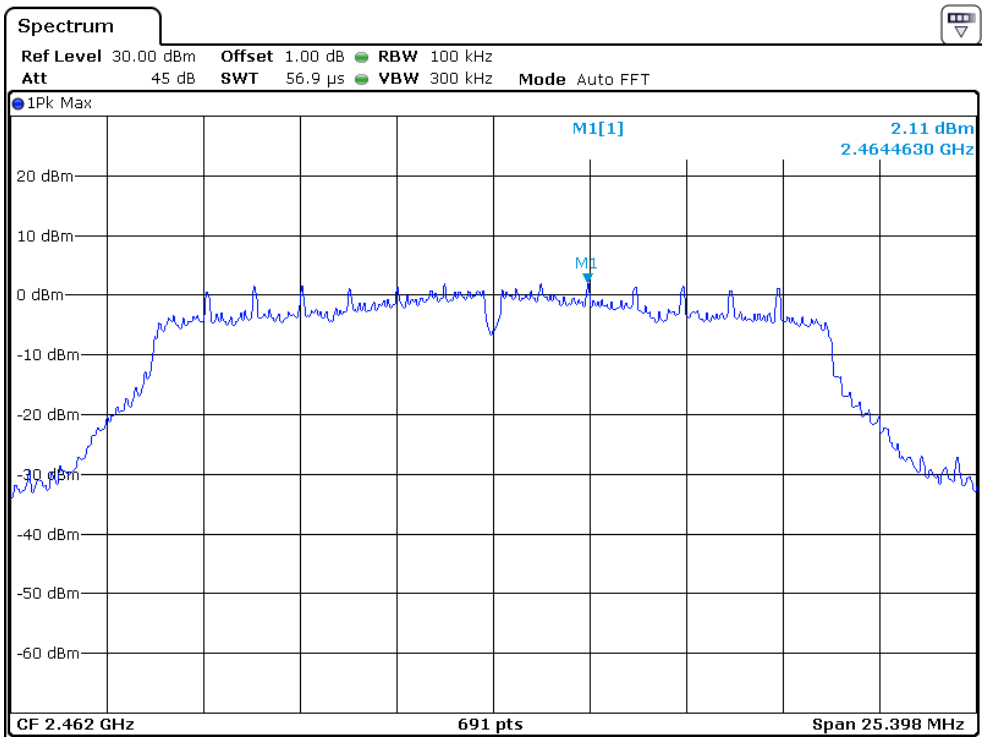
Date: 2.JAN.2020 16:29:05

2437MHz



Date: 2.JAN.2020 16:37:30

2462MHz



Date: 2.JAN.2020 16:44:38

Applicant: KanDao Technology Co.Ltd
Date of Test: January 2, 2020 Model: QCM1212

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

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

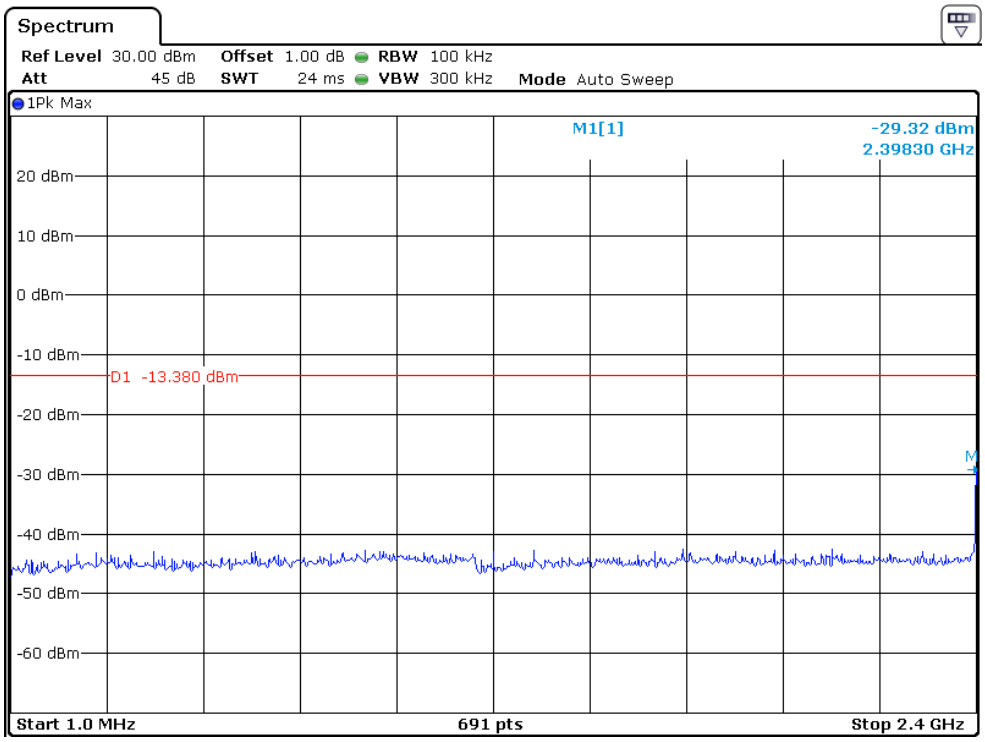
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

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

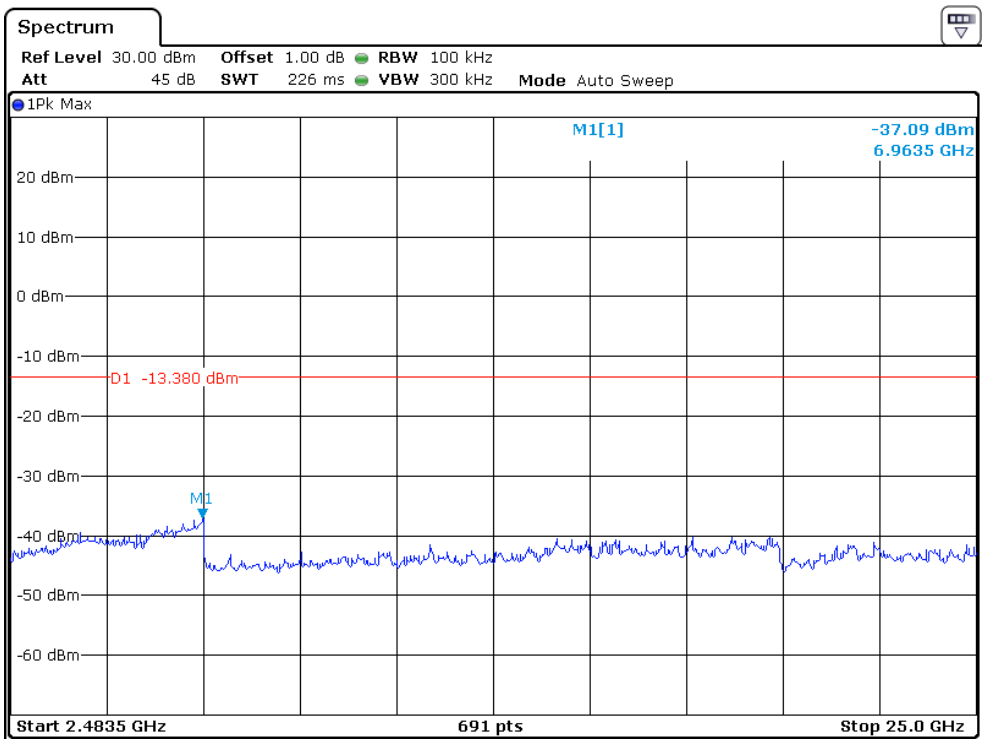
The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The test plots are attached as below.

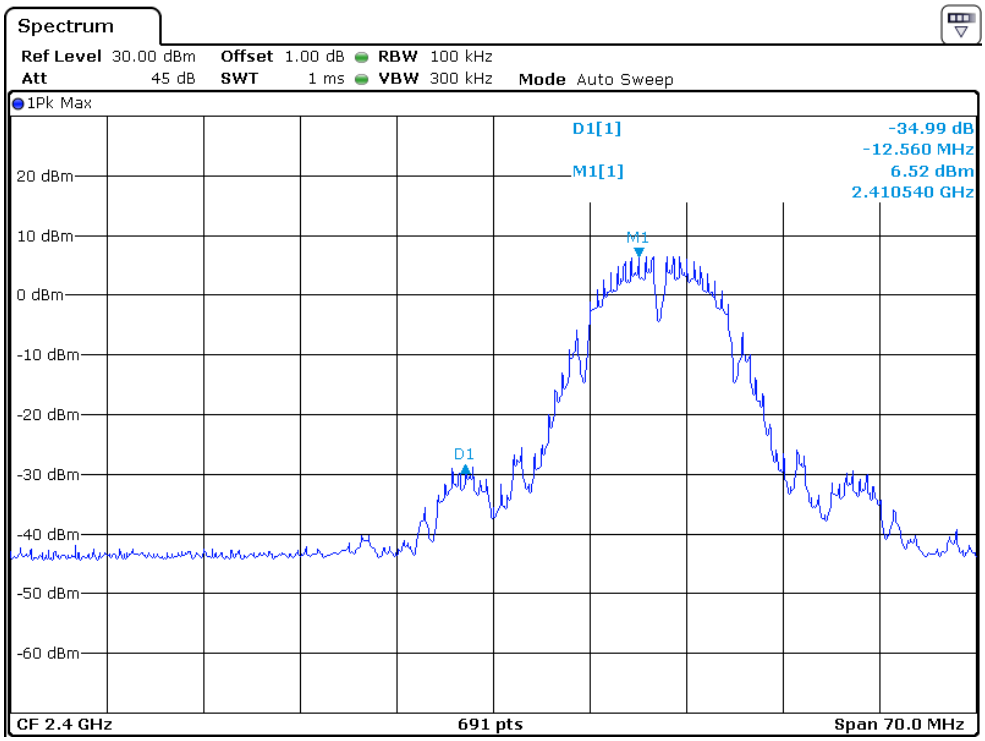
802.11b
Channel 01 (2412MHz) Reference Level: 6.62dBm



Date: 2.JAN.2020 16:53:41

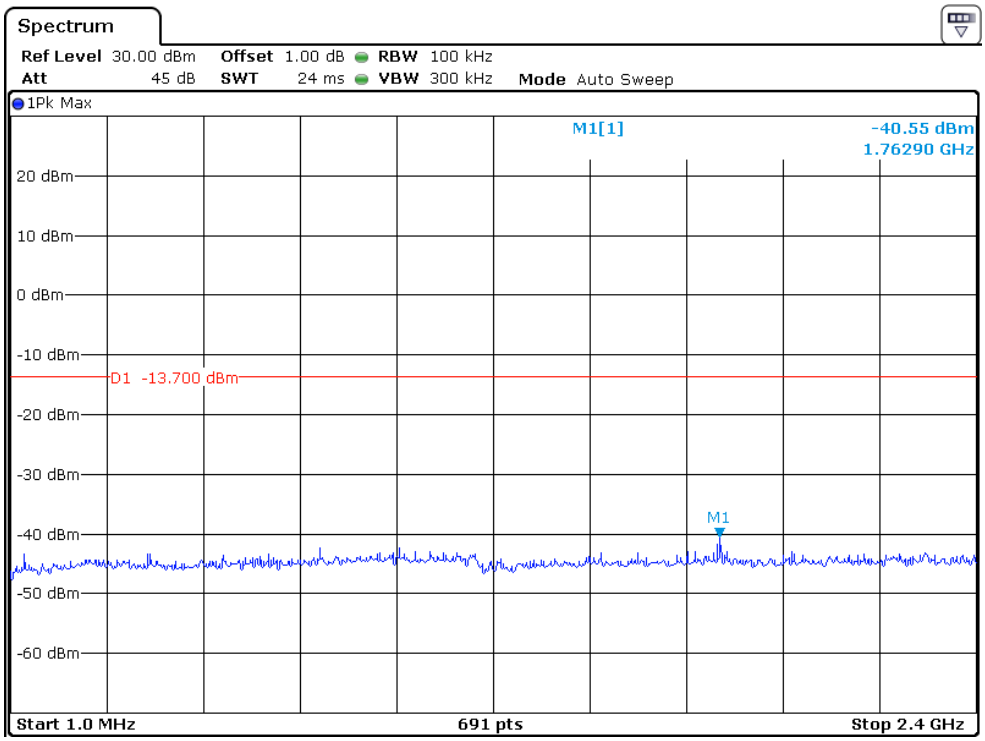


Date: 2.JAN.2020 16:54:48

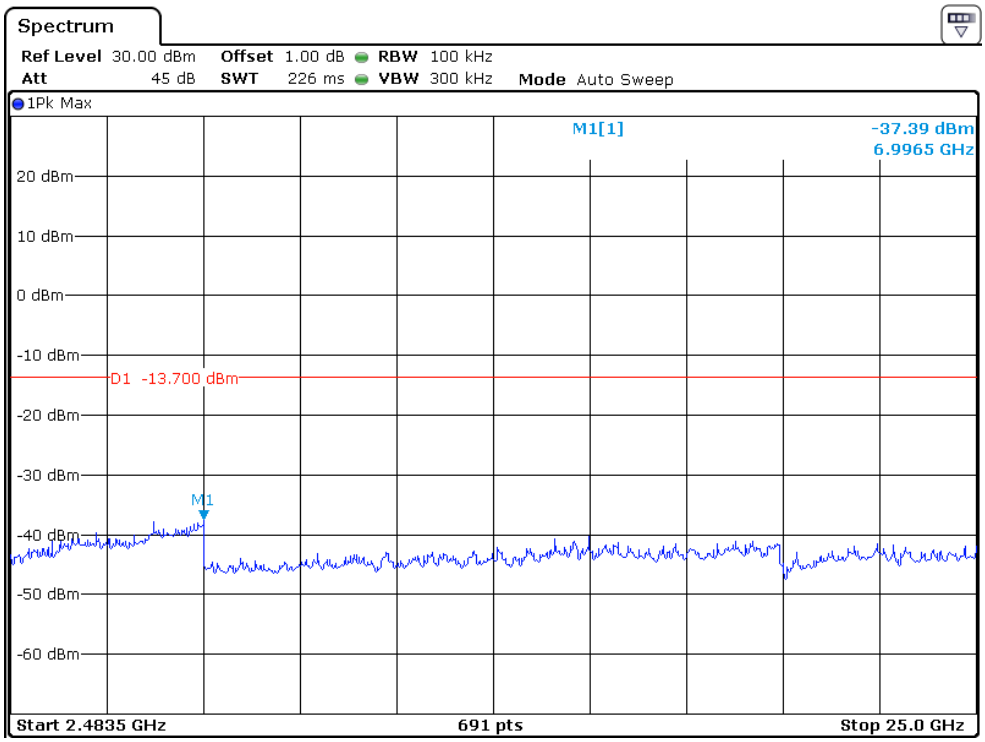


Date: 2.JAN.2020 16:57:10

Channel 06 (2437MHz) Reference Level: 6.30dBm

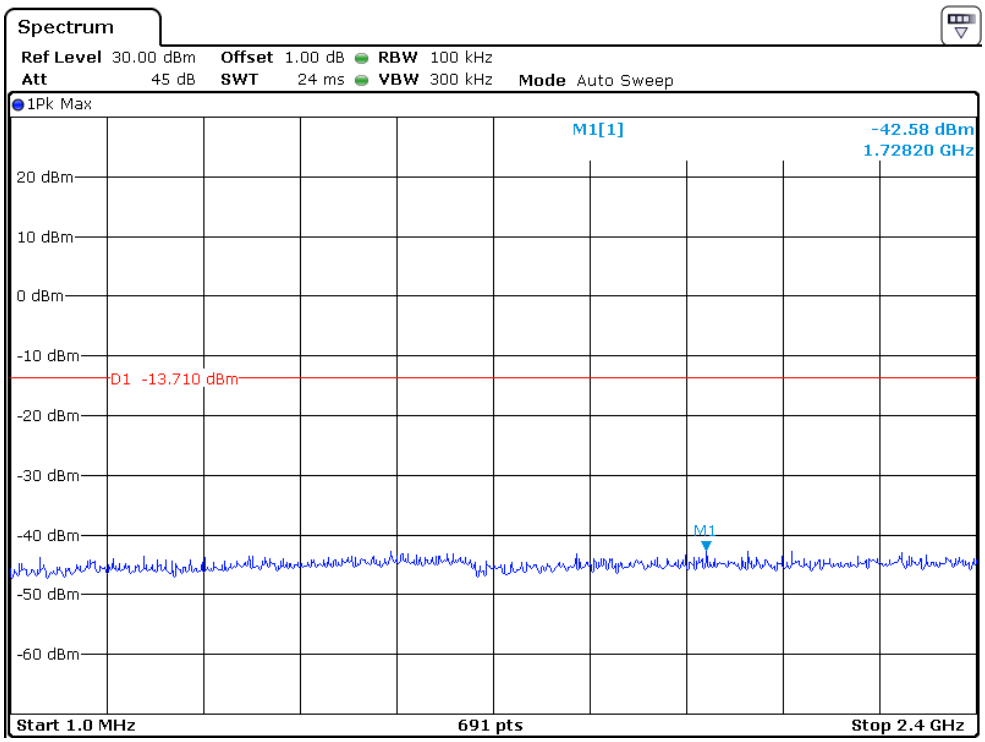


Date: 2.JAN.2020 17:03:24

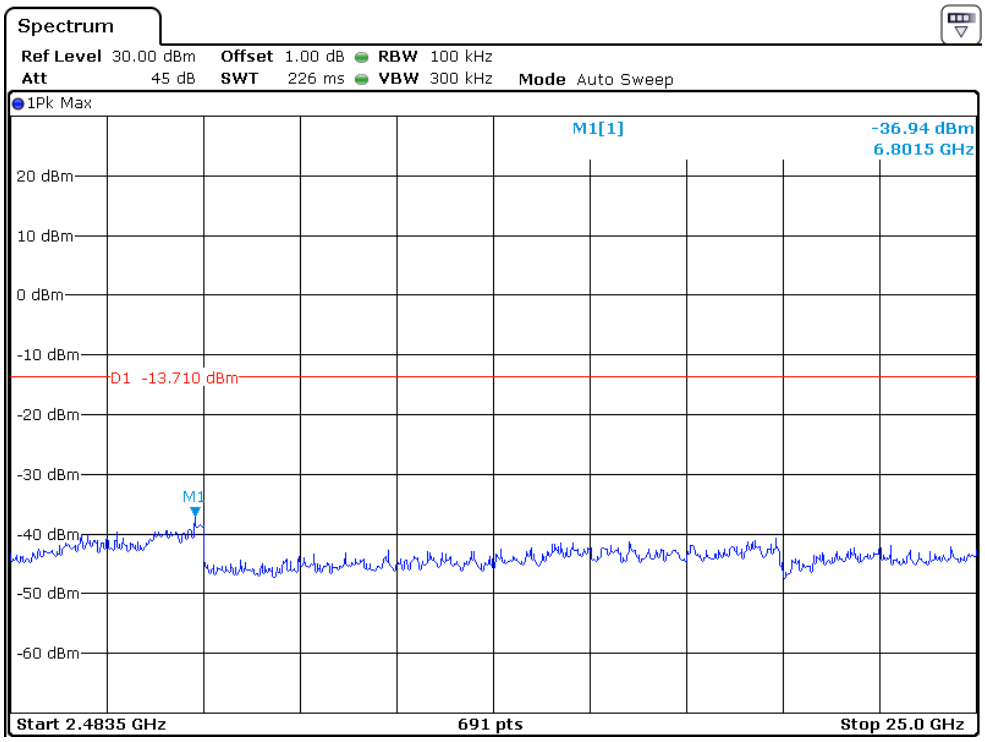


Date: 2.JAN.2020 17:04:00

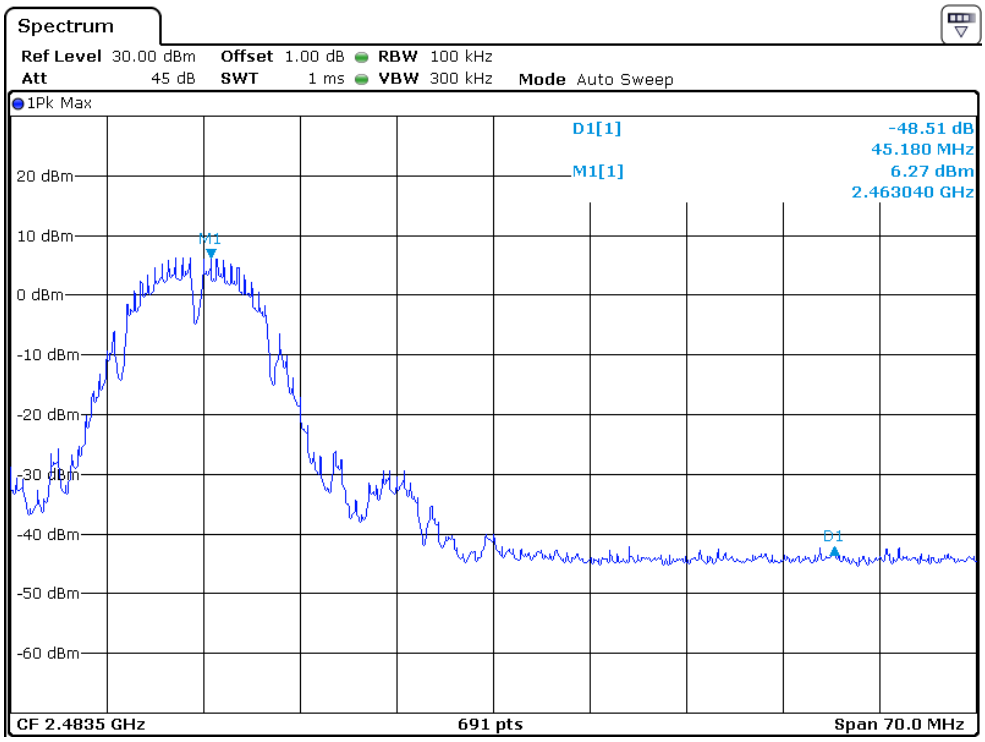
Channel 11 (2462MHz) Reference Level: 6.29dBm



Date: 2.JAN.2020 17:07:40

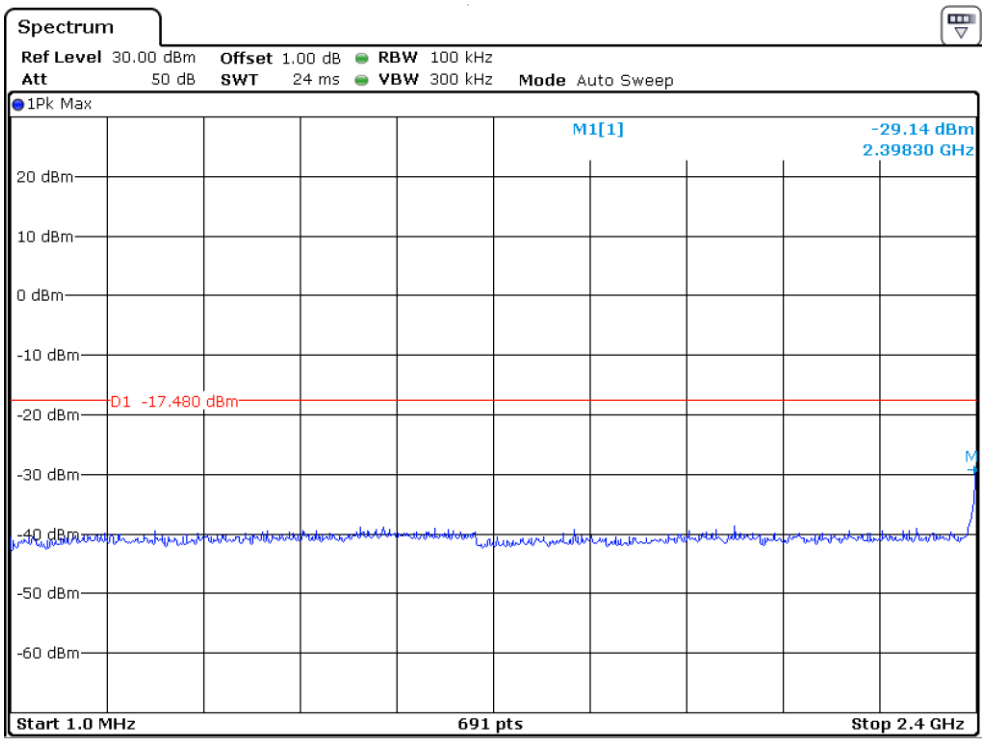


Date: 2.JAN.2020 17:08:05

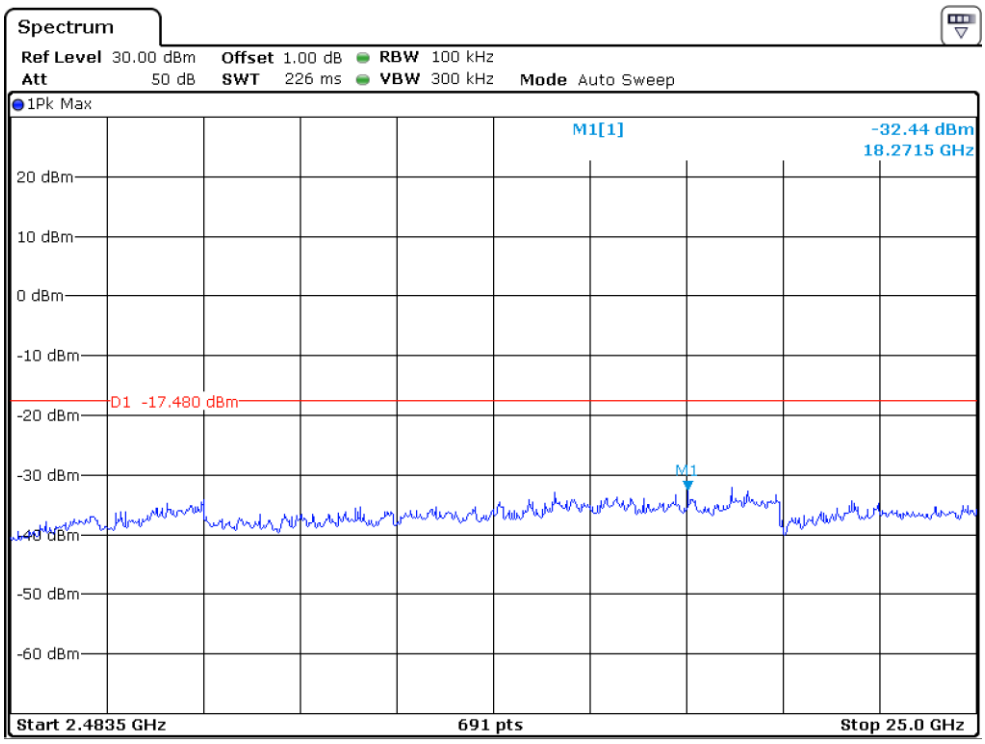


Date: 2.JAN.2020 17:08:29

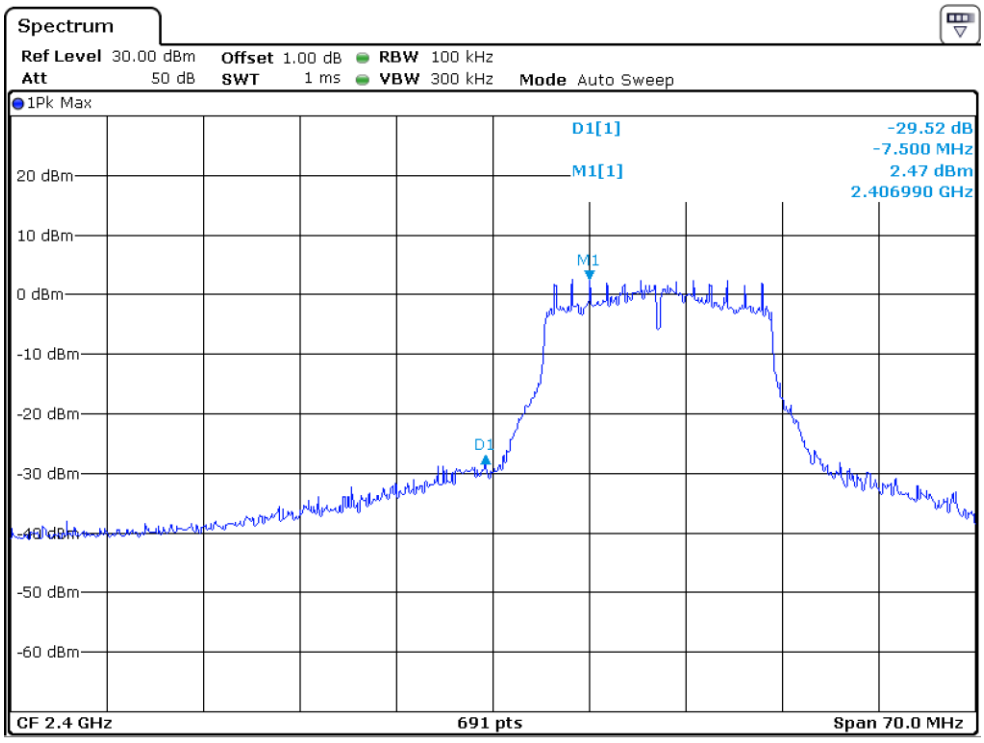
802.11g
Channel 01 (2412MHz) Reference Level: 2.52dBm



Date: 2.JAN.2020 19:02:34

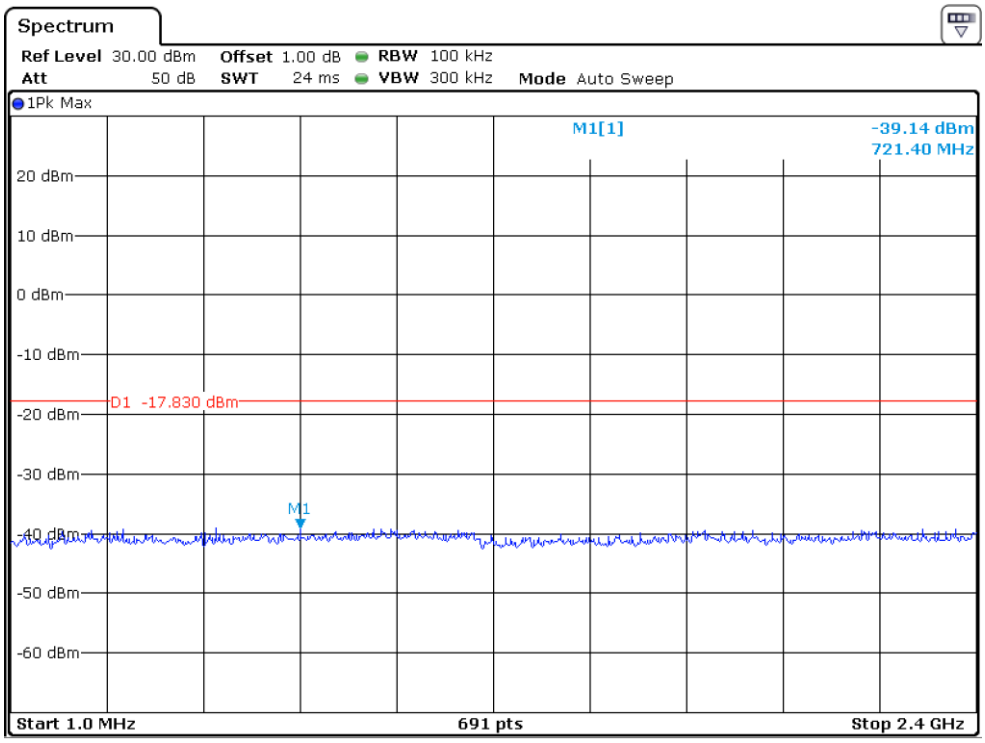


Date: 2.JAN.2020 19:03:23

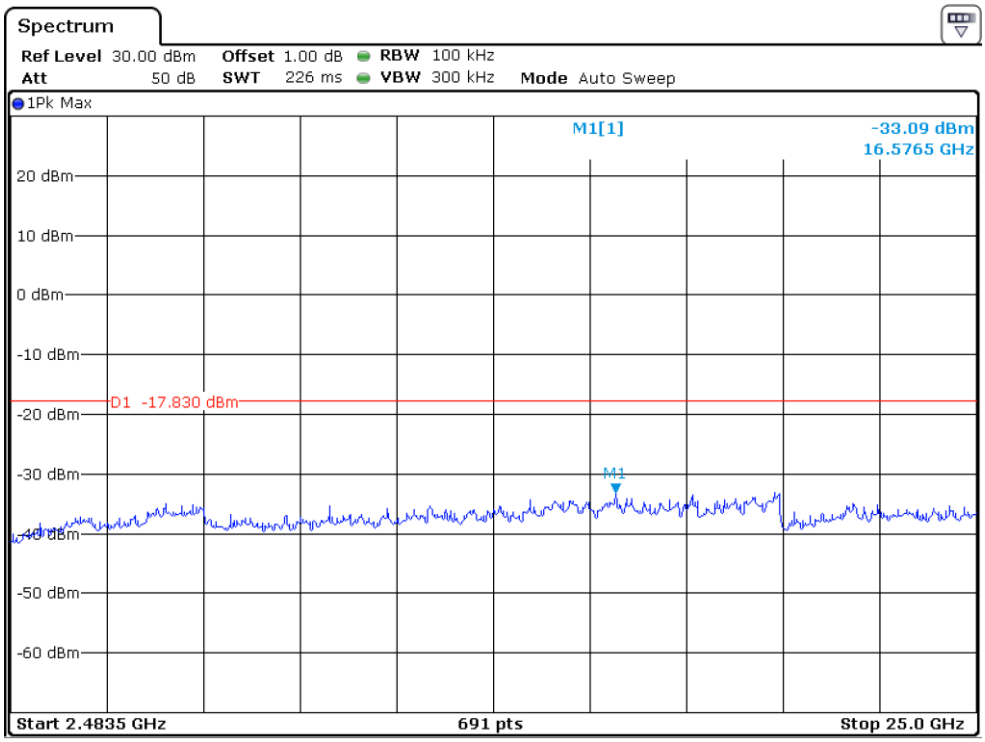


Date: 2.JAN.2020 19:04:04

Channel 06 (2437MHz) Reference Level: 2.17dBm

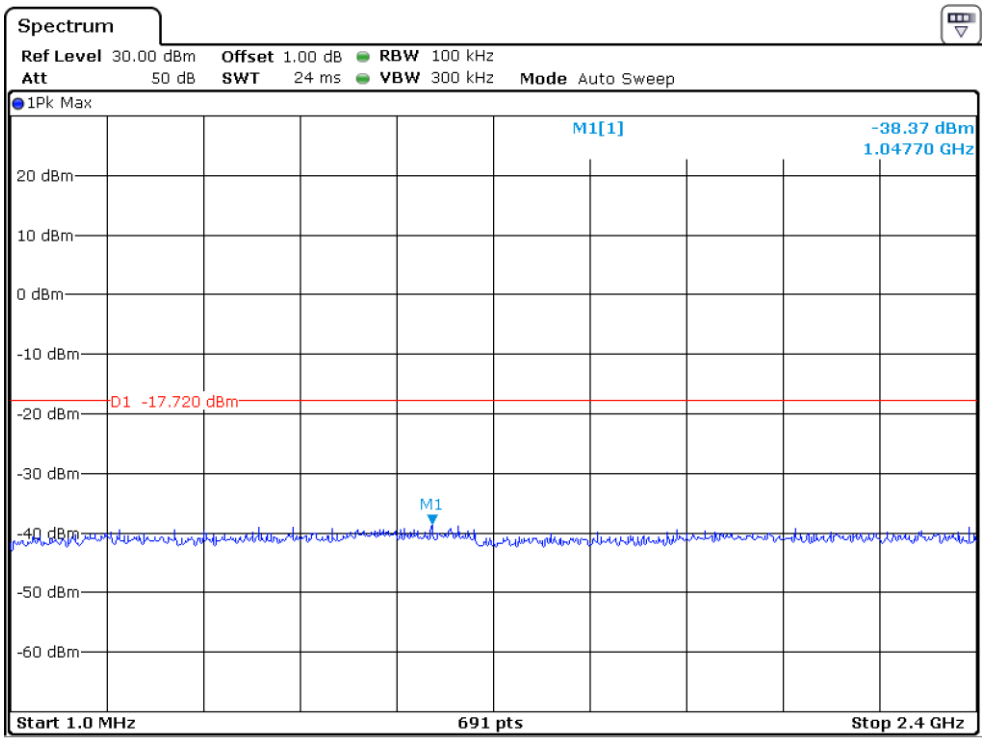


Date: 2.JAN.2020 19:11:20

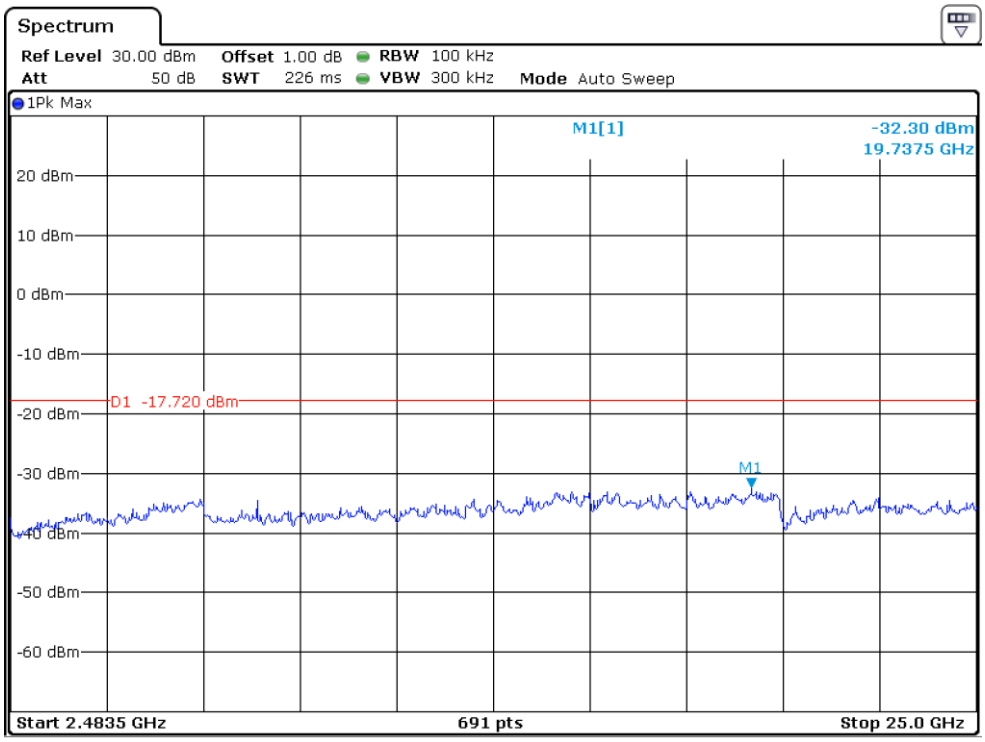


Date: 2.JAN.2020 19:11:54

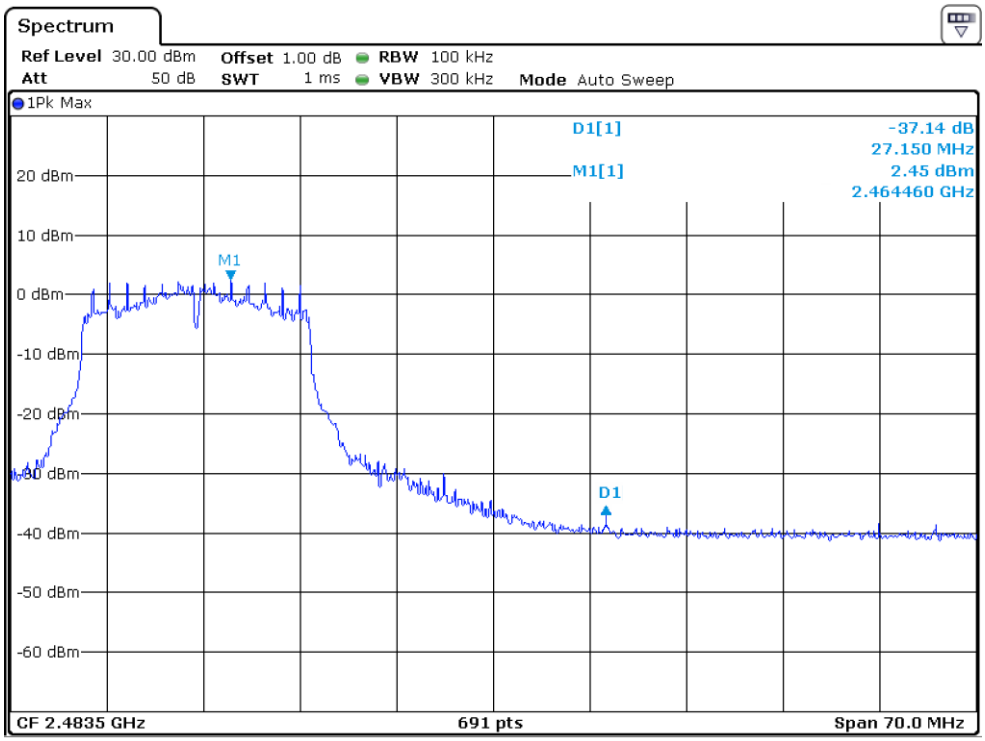
Channel 11 (2462MHz) Reference Level: 2.28dBm



Date: 2.JAN.2020 19:23:56

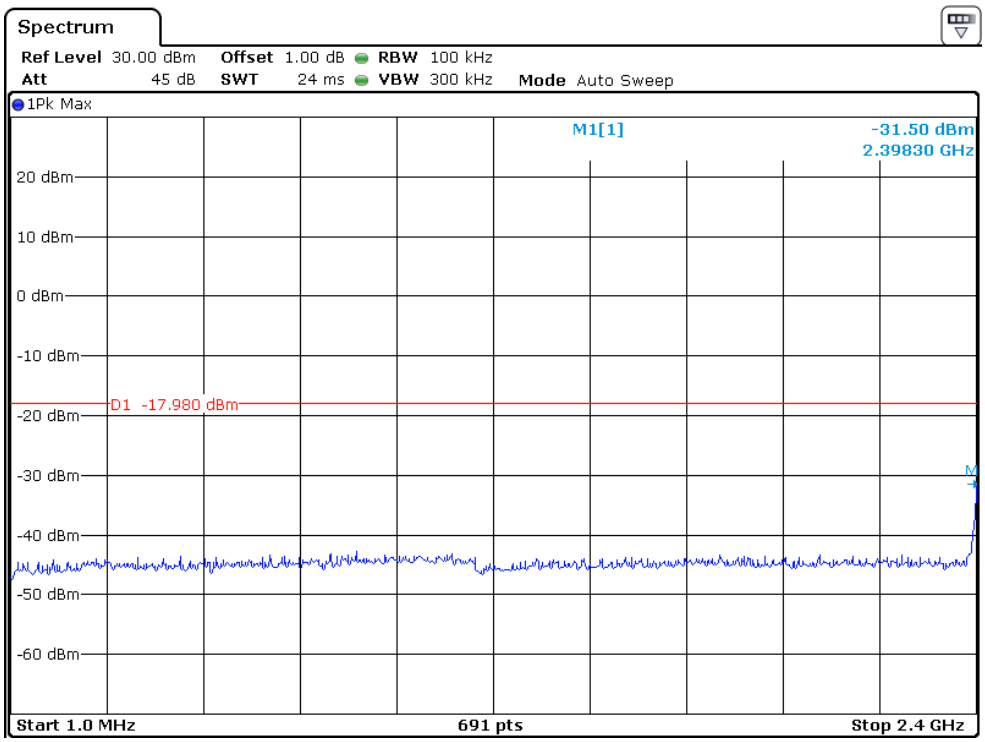


Date: 2.JAN.2020 19:26:18

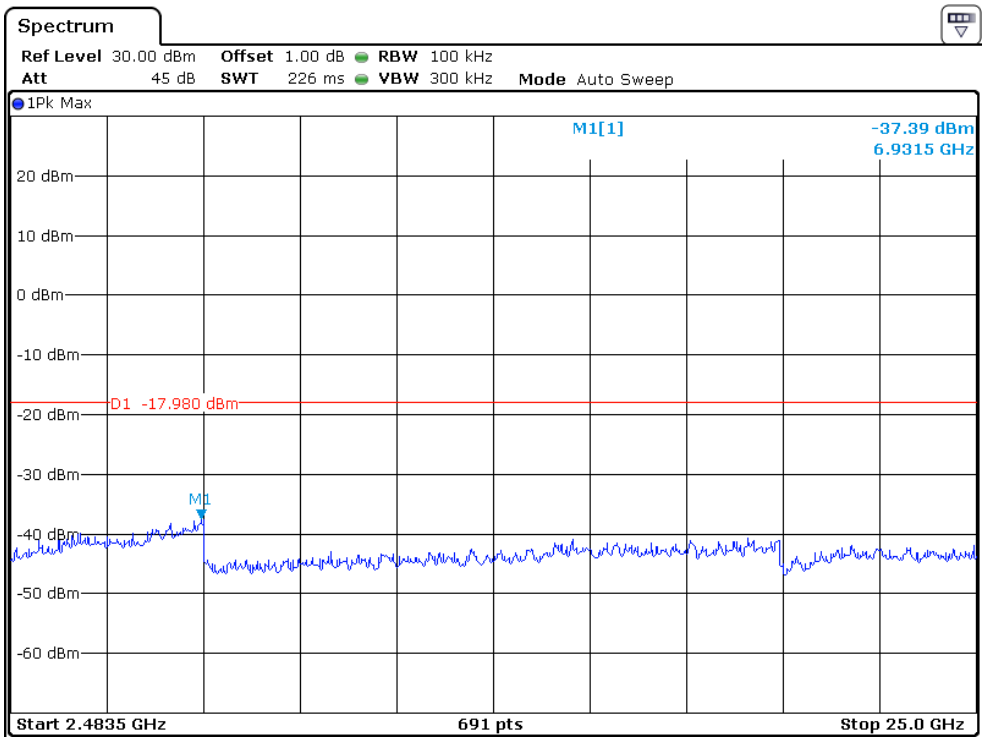


Date: 2.JAN.2020 19:27:28

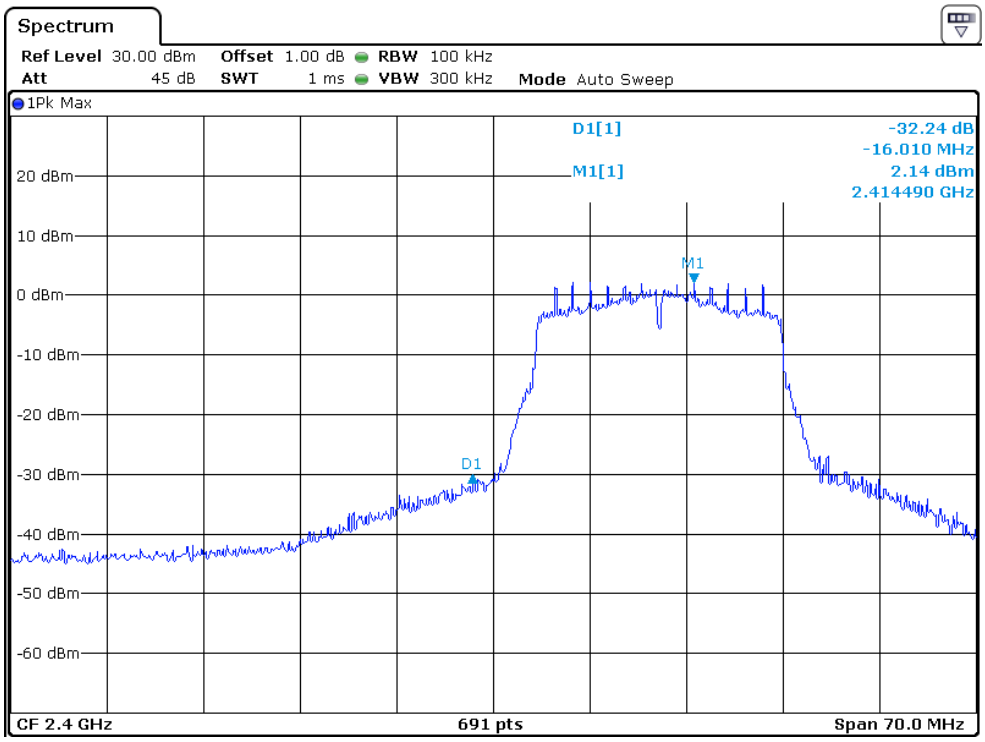
802.11n-HT20
Channel 01 (2412MHz) Reference Level: 2.02dBm



Date: 2.JAN.2020 16:29:55

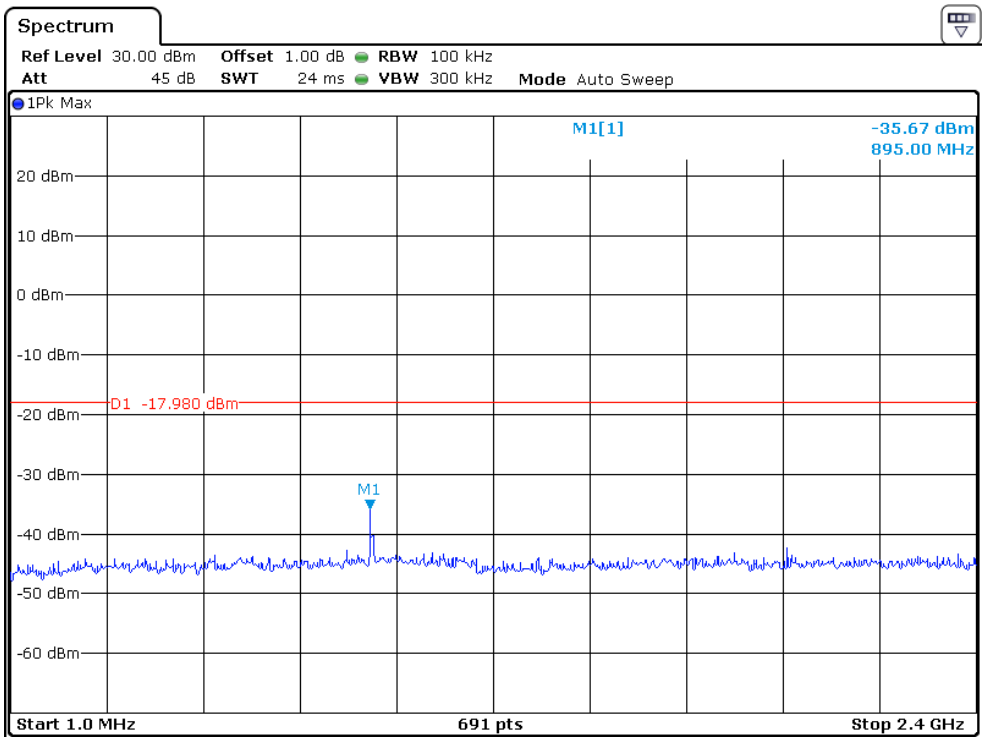


Date: 2.JAN.2020 16:30:33

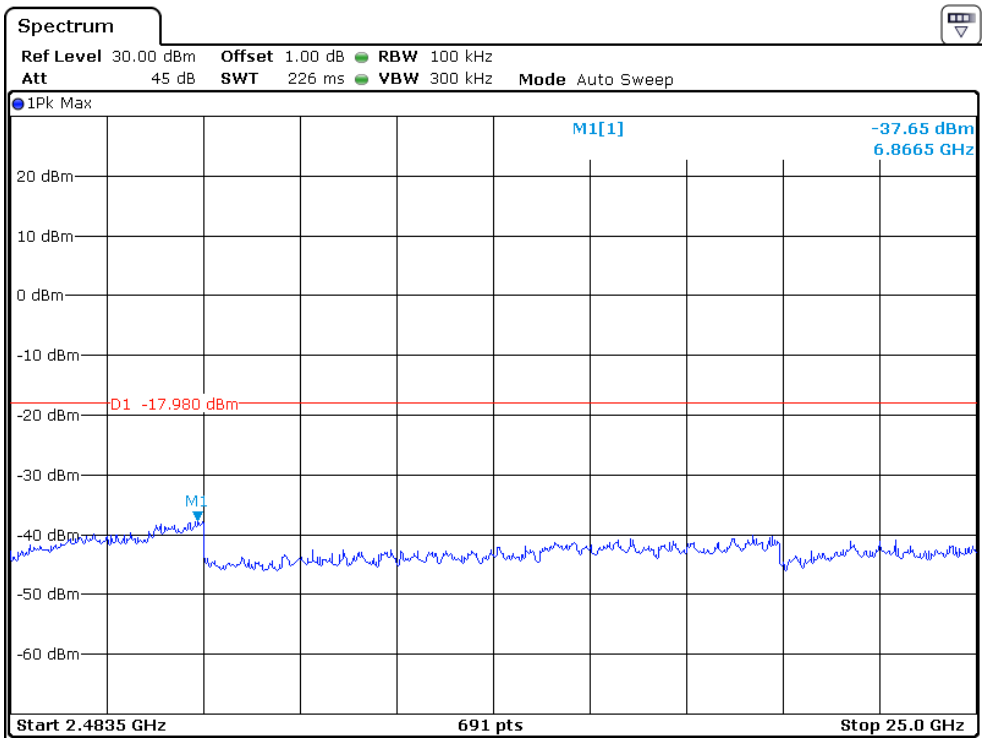


Date: 2.JAN.2020 16:31:37

Channel 06 (2437MHz) Reference Level: 2.02dBm

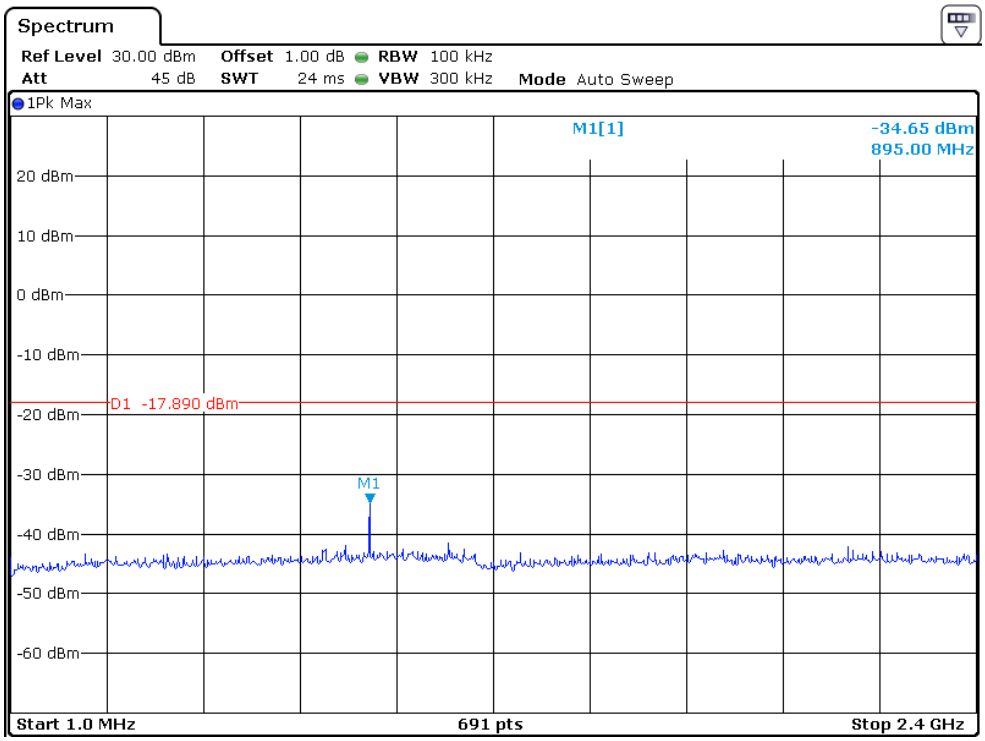


Date: 2.JAN.2020 16:38:22

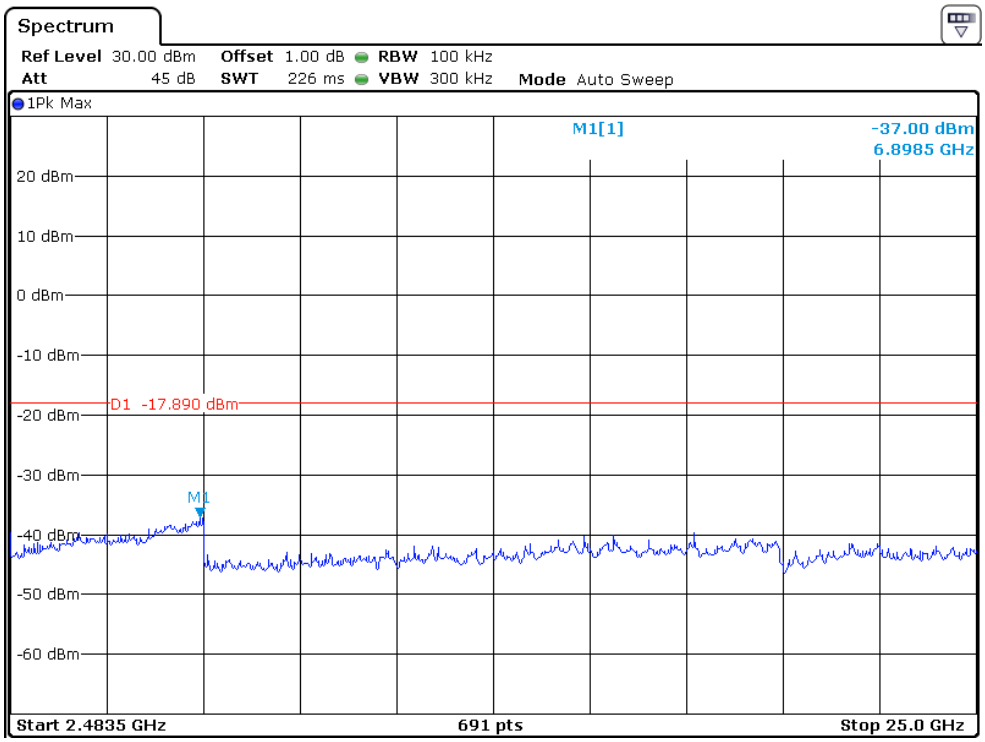


Date: 2.JAN.2020 16:39:49

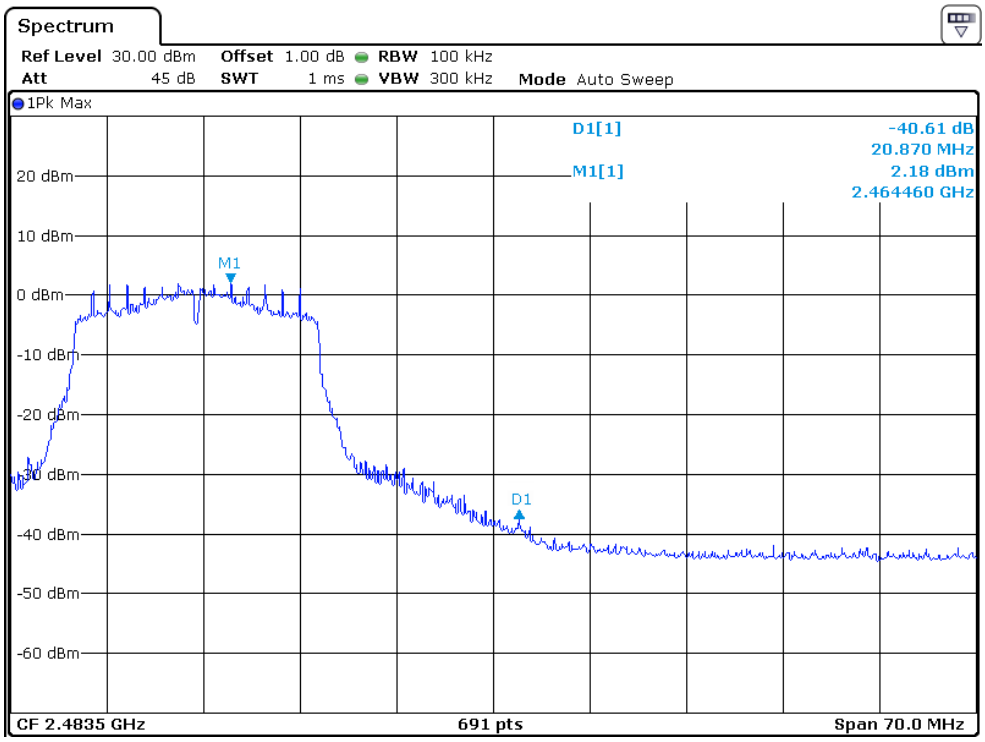
Channel 11 (2462MHz) Reference Level: 2.11dBm



Date: 2.JAN.2020 16:45:42



Date: 2.JAN.2020 16:46:49



Date: 2.JAN.2020 16:47:48

Applicant: KanDao Technology Co.Ltd
Date of Test: January 2, 2020 Model: QCM1212

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.

Applicant: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212

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

Applicant: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212

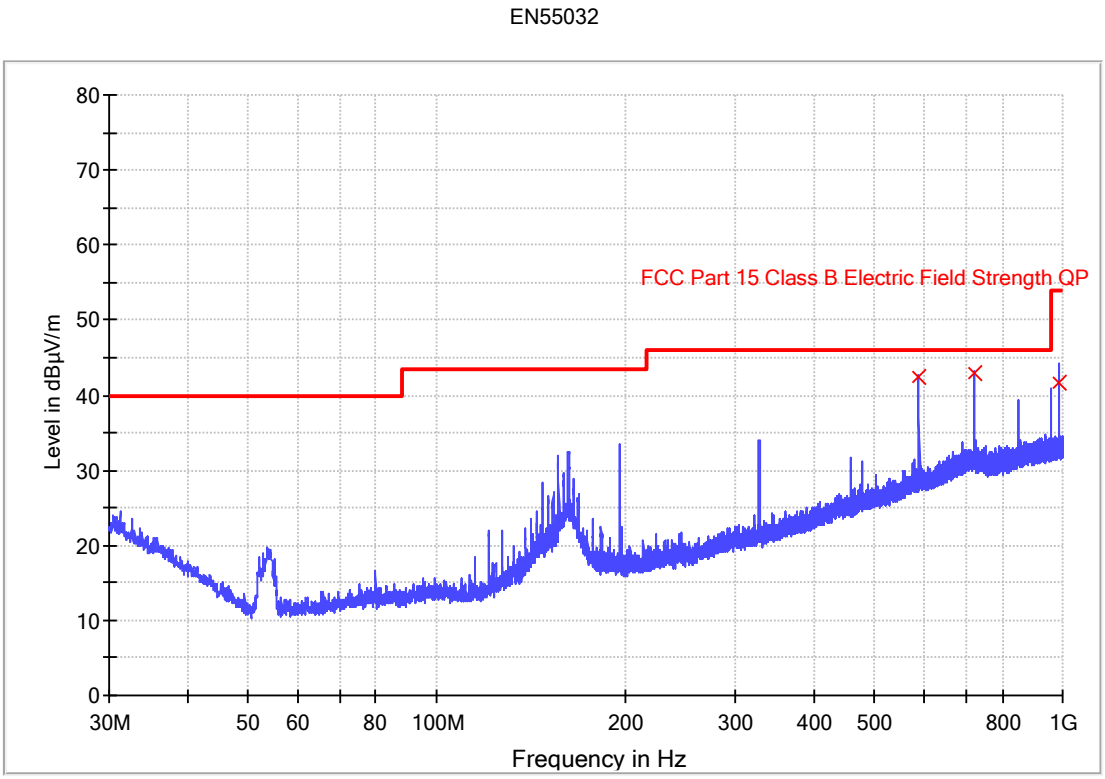
4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission (802.11b-Channel 11)
at 921.624000MHz
is passed by 2.6dB margin.

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

Applicant: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11b-Channel 01)

ANT Polarity: Horizontal



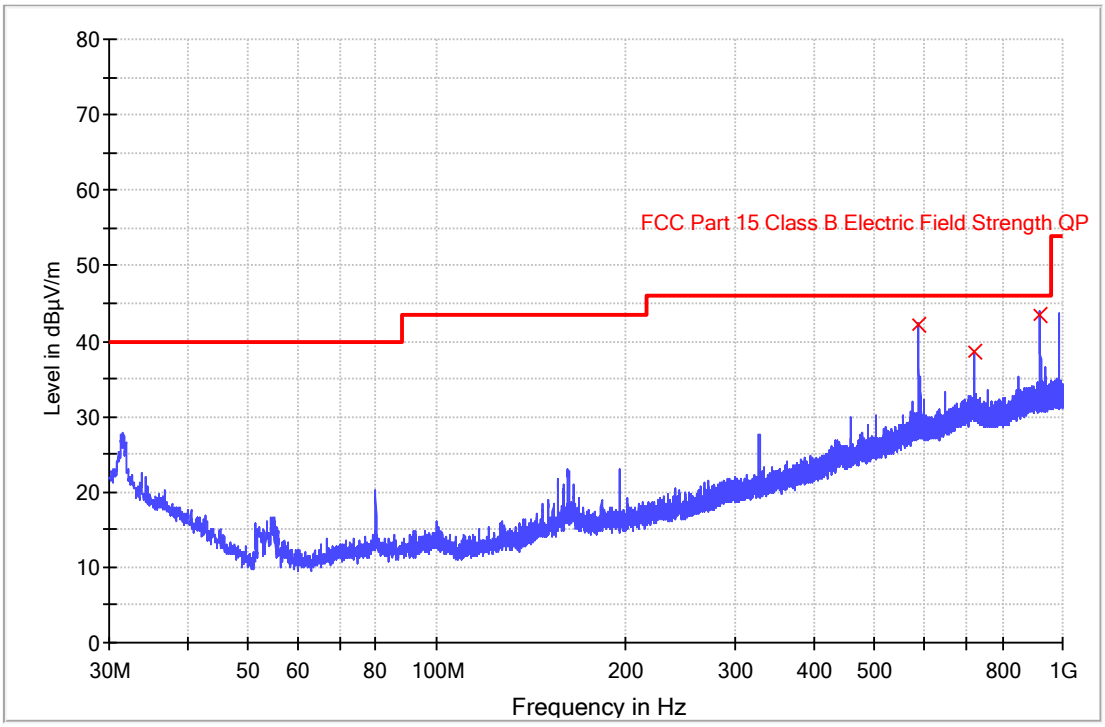
Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
589.851667	42.5	1000.0	120.000	100.0	H	23.5	3.5	46.0
720.931000	42.8	1000.0	120.000	100.0	H	26.0	3.2	46.0
983.060547	41.6	1000.0	120.000	100.0	H	28.0	12.4	54.0

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

Applicant: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11b-Channel 01)

ANT Polarity: Vertical

EN55032



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
589.819333	42.1	1000.0	120.000	100.0	V	23.5	3.9	46.0
720.898667	38.6	1000.0	120.000	100.0	V	26.0	7.4	46.0
921.624000	43.4	1000.0	120.000	100.0	V	27.7	2.6	46.0

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

Applicant: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11b-Channel 01)

Radiated Emissions (above 1GHz)

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	61.5	36.8	33.5	58.2	74.0	-15.8
Horizontal	*2390.000	59.9	36.4	29.1	52.6	74.0	-21.4

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	*4824.000	41.8	36.8	33.5	38.5	54.0	-15.5
Horizontal	*2390.000	43.5	36.4	29.1	36.2	54.0	-17.8

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11b-Channel 06)

Radiated Emissions (above 1GHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	61.8	36.7	33.4	58.5	74.0	-15.5
Horizontal	*7311.000	57.5	36.6	35.8	56.7	74.0	-17.3

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	*4874.000	43.7	36.7	33.4	40.4	54.0	-13.6
Horizontal	*7311.000	38.1	36.6	35.8	37.3	54.0	-16.7

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11b-Channel 11)

Radiated Emissions (above 1GHz)

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	60.6	36.8	33.3	57.1	74.0	-16.9
Horizontal	*7386.000	63.7	36.5	29.3	56.5	74.0	-17.5

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	43.7	36.8	33.3	40.2	54.0	-13.8
Horizontal	*7386.000	44.7	36.5	29.3	37.5	54.0	-16.5

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11g-Channel 01)

Radiated Emissions (above 1GHz)

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	61.7	36.4	29.1	54.4	74.0	-19.6

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	42.8	36.8	33.5	39.5	54.0	-14.5
Horizontal	*2390.000	43.5	36.4	29.1	36.2	54.0	-17.8

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11g-Channel 06)

Radiated Emissions (above 1GHz)

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	54.0	36.6	35.8	53.2	74.0	-20.8

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	41.9	36.7	33.4	38.6	54.0	-15.4
Horizontal	*7311.000	36.1	36.6	35.8	35.3	54.0	-18.7

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11g-Channel 11)

Radiated Emissions (above 1GHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	61.3	36.8	33.3	57.8	74.0	-16.2
Horizontal	*7386.000	60.3	36.5	29.3	53.1	74.0	-20.9

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	39.8	36.8	33.3	36.3	54.0	-17.7
Horizontal	*7386.000	39.6	36.5	29.3	32.4	54.0	-21.6

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11n20-Channel 01)

Radiated Emissions (above 1GHz)

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	59.5	36.8	33.5	56.2	74.0	-17.8
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	40.4	36.8	33.5	37.1	54.0	-16.9
Horizontal	*2390.000	41.2	36.4	29.1	33.9	54.0	-20.1

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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11n20-Channel 06)

Radiated Emissions (above 1GHz)

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	59.4	36.7	33.4	56.1	74.0	-17.9
Horizontal	*7311.000	49.1	36.6	35.8	48.3	74.0	-25.7

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	40.0	36.7	33.4	36.7	54.0	-17.3
Horizontal	*7311.000	33.0	36.6	35.8	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: KanDao Technology Co.Ltd
Date of Test: January 9, 2020 Model: QCM1212
Worst Case Operating Mode: Transmitting (802.11n20-Channel 11)

Radiated Emissions (above 1GHz)

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	*7386.000	59.6	36.5	29.3	52.4	74.0	-21.6

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	*4924.000	40.7	36.8	33.3	37.2	54.0	-16.8
Horizontal	*7386.000	39.7	36.5	29.3	32.5	54.0	-21.5

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: KanDao Technology Co.Ltd
Date of Test: December 30, 2019
Model: QCM1212

4.9 Conducted Emission

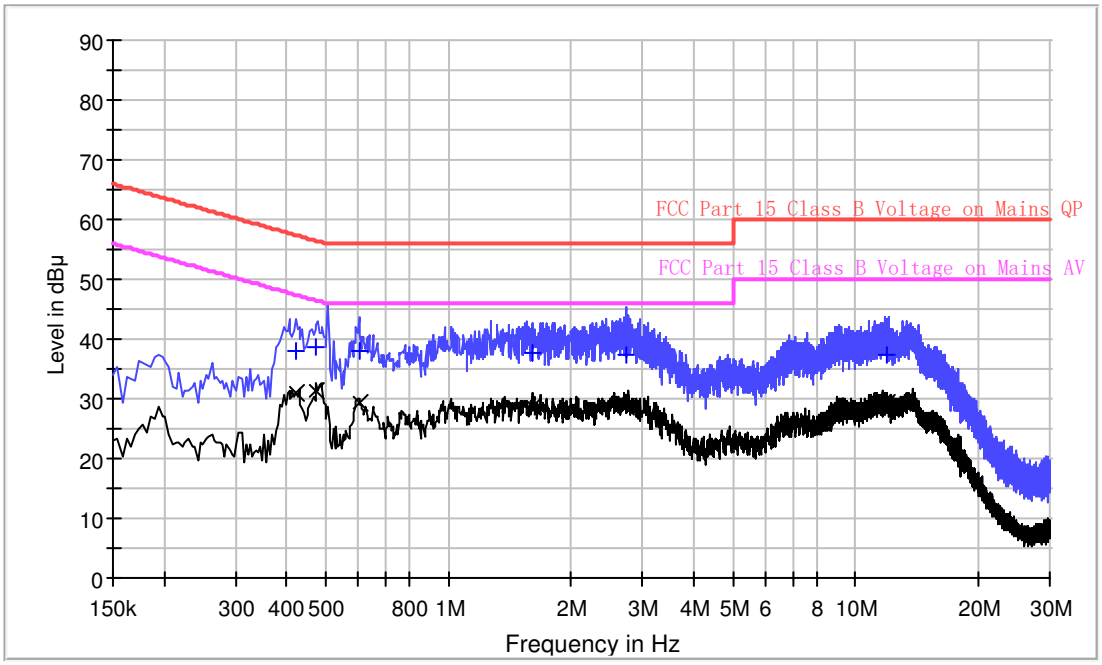
Worst Case Conducted Emission (802.11b-Channel 01)
at 0.474000MHz
is passed by 15.1dB margin.

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

Applicant: KanDao Technology Co.Ltd
Date of Test: December 30, 2019
Model: QCM1212
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 (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.422000	38.2	9.000	L1	9.7	19.2	57.4
0.474000	38.7	9.000	L1	9.7	17.7	56.4
0.602000	37.9	9.000	L1	9.7	18.1	56.0
1.606000	37.6	9.000	L1	9.7	18.4	56.0
2.722000	37.4	9.000	L1	9.7	18.6	56.0
11.958000	37.3	9.000	L1	10.0	22.7	60.0

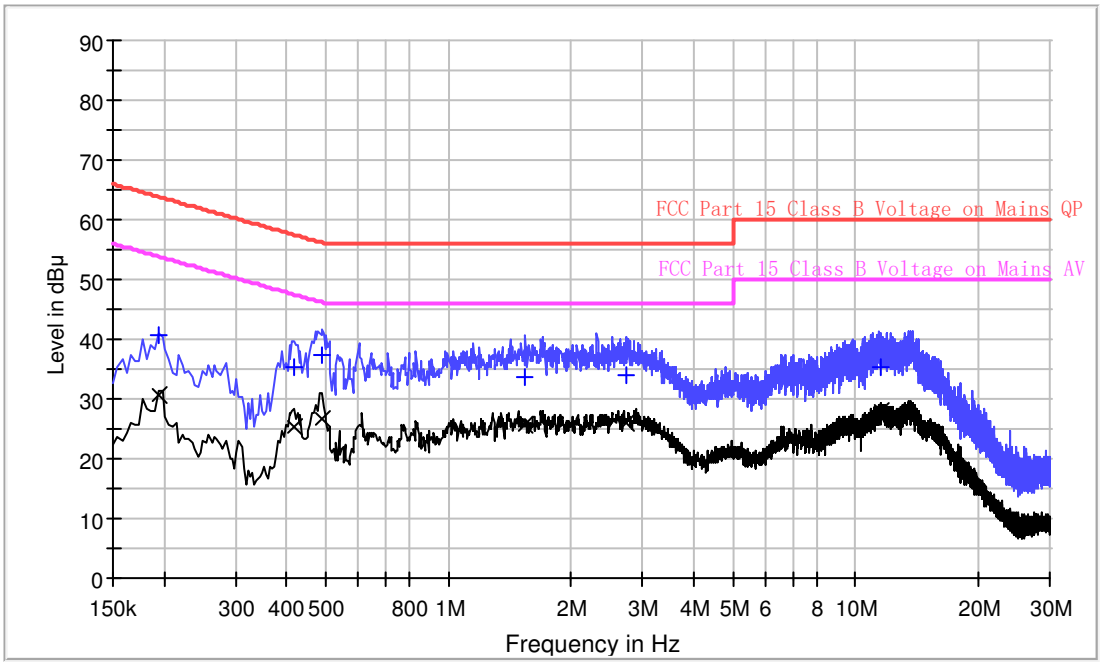
Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.422000	31.2	9.000	L1	9.7	16.2	47.4
0.474000	31.3	9.000	L1	9.7	15.1	46.4
0.602000	29.5	9.000	L1	9.7	16.5	46.0
1.606000	28.7	9.000	L1	9.7	17.3	46.0
2.722000	28.8	9.000	L1	9.7	17.2	46.0
11.958000	29.5	9.000	L1	10.0	20.5	50.0

Applicant: KanDao Technology Co.Ltd
Date of Test: December 30, 2020
Model: QCM1212
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 (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.194000	40.8	9.000	N	9.7	23.1	63.9
0.418000	35.5	9.000	N	9.7	22.0	57.5
0.490000	37.2	9.000	N	9.7	19.0	56.2
1.546000	33.6	9.000	N	9.7	22.4	56.0
2.726000	33.9	9.000	N	9.8	22.1	56.0
11.566000	35.4	9.000	N	10.0	24.6	60.0

Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.194000	30.6	9.000	N	9.7	23.3	53.9
0.418000	25.3	9.000	N	9.7	22.2	47.5
0.490000	26.8	9.000	N	9.7	19.4	46.2
1.546000	25.6	9.000	N	9.7	20.4	46.0
2.726000	26.0	9.000	N	9.8	20.0	46.0
11.566000	28.0	9.000	N	10.0	22.0	50.0

Applicant: KanDao Technology Co.Ltd
Date of Test: January 2, 2020
Model: QCM1212

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: KanDao Technology Co.Ltd
Date of Test: January 2, 2020
Model: QCM1212

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

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

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

5.0 Equipment Photographs

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

6.0 Product Labeling

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

7.0 Technical Specifications

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

8.0 Instruction Manual

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

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

9.0 Confidentiality Request

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

10.0 Discussion of Pulse Desensitization

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

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

11.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	28-May-2019	28-May-2020
SZ182-02-01	Power Sensor	Anritsu	MA2411B	1207429	28-May-2019	28-May-2020
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	14-Sep-2018	14-Sep-2020
SZ185-01	EMI Receiver	R&S	ESCI	100547	24-Dec-2019	24-Dec-2020
SZ061-08	Horn Antenna	ETS	3115	00092346	24-Aug-2019	24-Aug-2021
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	24-May-2019	24-May-2020
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	28-May-2019	28-May-2020
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	28-May-2019	28-May-2020
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	05-Jul-2019	05-Jul-2020
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2020
SZ062-02	RF Cable	RADIALL	RG 213U	--	10-Jun-2019	10-Jun-2020
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	10-Jun-2019	10-Jun-2020
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	10-Jun-2019	10-Jun-2020
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	22-Mar-2019	22-Mar-2020
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	29-Oct-2019	29-Oct-2020
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	29-Oct-2019	29-Oct-2020
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	28-May-2019	28-May-2020
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2018	16-Jan-2020

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