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TEST REPORT

SCOPE OF WORK
FCC TESTING–QCM1212

REPORT NUMBER
191216047SZN-003

ISSUE DATE **[REVISED DATE]**

15 January 2020 [----------]

PAGES
46

DOCUMENT CONTROL NUMBER
FCC 15C_Tx_b

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TEST REPORT

Intertek Report No.: 191216047SZN-003

RF TEST REPORT

Report No.	**: 191216047SZN-003**
Product	**: QooCam 8K 360 Camera**
Model No.	**: QCM1212**
FCC ID:	**: 2ATPV-KDUC**

Applicant:	**KanDao Technology Co.Ltd**
Test Method/ Standard:	**FCC Part 15 Subpart E; KDB 789033 D02 v02r01; ANSI C63.10-2013**
Test By:	**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.**

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Senior Project Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: 15 January 2020

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Summary of Tests

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15.407 g	Frequency Stability	8	Pass

1. General information

1.1 Identification of the EUT

Product:	QOOCAM 8K 360 CAMERA
Model No.:	QCM1212
Type of Device:	Client device
Nominal Channel Bandwidth:	802.11a/n-HT20 (20 MHz), 802.11n-HT40 (40MHz), 802.11ac (20/40/80MHz)
Operating Frequency:	5150MHz~5250 MHz
Channel Number:	4 channels for 5180 MHz ~ 5240 MHz (802.11a/n/ac-HT20); 2 channels for 5190 MHz ~ 5230 MHz (802.11n/ac-HT40); 1 channels for 5210 MHz (802.11ac-HT80);
Modulation:	802.11a: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Rated Power:	DC 5V 3A max by AC/DC adapter
Test Date(s):	17 December 2019 to 09 January 2020
Note 1:	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.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 Additional information about the EUT

The EUT is a QOOCAM 8K 360 CAMERA with 5G WIFI technology. The EUT is powered by DC 5V/3A from AC/DC Adapter. 2.4GHz Wi-Fi and 5GHz Wi-Fi transmitter can not transmit at the same time.

For more detail features, please refer to User's description as file name “descri.pdf”.

Related Submittal(s) Grants

This is an application for certification of U–NII device (5GHz Wi-Fi transmitter portion).

For the 2.4GHz WIFI function was tested and demonstrated in report 191216047SZN-002.

For other functions were reported in the SDOC report: 190102036SZN-001.

1.3 Antenna description (15.203)

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

Antenna Type: Integral Antenna

Antenna Gain: 2dBi

1.4 Peripherals equipment

Refer List:

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)

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15E, Section15.203, 15.207, 15.209, 15.407 and ANSI C63.10/2013, method of measurement: KDB 789033.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band was all meet limit requirement, thus we evaluate the EUT pass the specified test.

The AC power conducted emissions was invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz (15.207 paragraph).

Radiated emissions were invested cover the frequency range from 9KHz to 30MHz using a receiver RBW of 9kHz, from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz, VBW of 3MHz, Detector=Peak record for Peak reading, RBW of 1 MHz, VBW of 3MHz, Detector=RMS record for Average reading recorded on the report.

The EUT setup configurations please refer to the photo of test setup photos.pdf.

2.2 Operation mode

The EUT was supplied by and it was run in TX mode that was controlled by client provided RF testing program.

The EUT was transmitted continuously during the test. The worst case test result was showed in the report.

With individual verifying, the maximum output power was found at 6 Mbps data rate for 802.11a mode, 6.5 Mbps data rate for 802.11n-HT20 mode, 13.5 Mbps data rate for 802.11n-HT40 mode, 29.3Mbps data rate for 802.11ac. The final tests were executed under these conditions and recorded in this report individually.

Table for Parameters of Test Software Setting
During testing, Channel & Power Controlling Software provided by the customer 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 customer and is going to be fixed on the firmware of the final end product.
Test software: wi-fi_rf_test_commands_for_linux_bcm4339-v03

3. Maximum Output Power test (FCC 15.407)

3.1 Operating environment

Temperature:	25	℃
Relative Humidity:	55	%
Atmospheric Pressure:	1011	hPa

3.2 Test setup & procedure

The power output per FCC §15.407(a) was measured on the EUT using a 50 ohm SMA cable connected to Power Meter and the measurement method refer to 789033 D02. Power was read directly and cable loss correction (1.0dB) was added to the reading to obtain power at the EUT antenna terminals.

3.3 Limit

Operating Frequency (MHz)	Max Conducted TX Power	Max EIRP
5150~5250	30dBm (1W) for master device	4W (36dBm) with 6dBi antenna
	24dBm (250mW) for client device	

Remark:

1) The device was declared as client device.

2) Tx Power Reduction (dBm-by-dBi) required when antenna exceeds 6dBi.

3) Max. antenna gain= 2.0 dBi< 6 dBi.

3.4 Measured data of Maximum Output Power test results

5150 MHz ~ 5250 MHz

Max Conducted TX Power

Test Mode	Channel	Result	Limit	Verdict
11A	5180	19.07	24.0	PASS
	5200	19.46	24.0	PASS
	5240	19.68	24.0	PASS
11N20	5180	17.35	24.0	PASS
	5200	17.92	24.0	PASS
	5240	18.16	24.0	PASS
11N40	5190	19.04	24.0	PASS
	5230	19.40	24.0	PASS
11AC20	5180	18.85	24.0	PASS
	5200	19.45	24.0	PASS
	5240	19.92	24.0	PASS
11AC40	5190	18.08	24.0	PASS
	5230	18.35	24.0	PASS
11AC80	5210	18.70	24.0	PASS

Max EIRP

Test Mode	Channel	Output Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	Limit	Verdict
11A	5180	19.07	2	21.07	36.0	PASS
	5200	19.46	2	21.46	36.0	PASS
	5240	19.68	2	21.68	36.0	PASS
11N20	5180	17.35	2	19.35	36.0	PASS
	5200	17.92	2	19.92	36.0	PASS
	5240	18.16	2	20.16	36.0	PASS
11N40	5190	19.04	2	21.04	36.0	PASS
	5230	19.40	2	21.40	36.0	PASS
11AC20	5180	18.85	2	20.85	36.0	PASS
	5200	19.45	2	21.45	36.0	PASS
	5240	19.92	2	21.92	36.0	PASS
11AC40	5190	18.08	2	20.08	36.0	PASS
	5230	18.35	2	20.35	36.0	PASS
11AC80	5210	18.70	2	20.70	36.0	PASS

4. Power Spectrum Density test (FCC 15.407)

4.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1011	hPa

4.2 Test setup & procedure

Method of Measurement:

The power spectrum density per FCC §15.407(a) was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 1MHz/500KHz, the video bandwidth set at 3 MHz/2MHz (measurement method refer to KDB 789033 D02). Power spectrum density was read directly and cable loss (1.0 dB) reading to obtain power at the EUT antenna terminals.

4.3 Limit

Operating Frequency (MHz)	Max Conducted Power Spectral Density
5150~5250	*17dBm/MHz for master device
	11dBm/MHz for mobile/portable client device

Remark: 1) *The device was declared as Slave device.

2) Tx Power Reduction (dBm-by-dBi) required when antenna exceeds 6dBi.

3) Max. antenna gain= 2.0 dBi< 6 dBi.

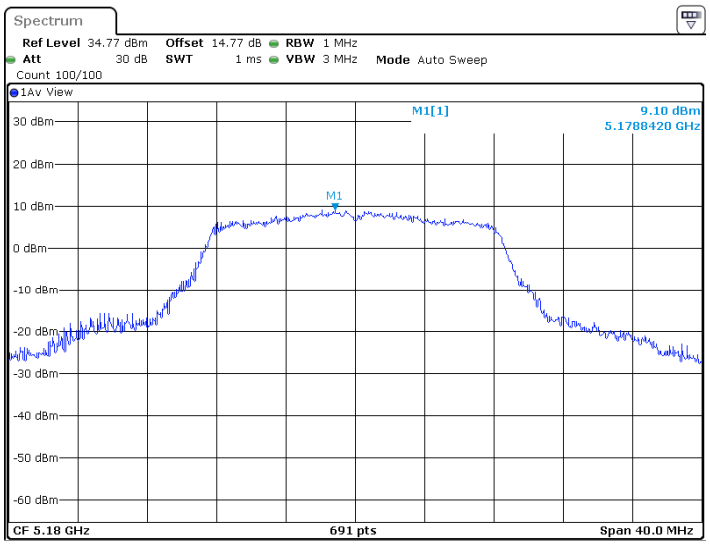
4.4 Measured data of Power Spectrum Density test results

5150 MHz ~ 5250 MHz

Test Mode	Channel	Result (dBm/MHz)	Limit (dBm/MHz)	Verdict
11A	5180	9.10	11.0	PASS
	5200	9.47	11.0	PASS
	5240	9.67	11.0	PASS
11N20	5180	7.26	11.0	PASS
	5200	8.42	11.0	PASS
	5240	7.91	11.0	PASS
11N40	5190	6.04	11.0	PASS
	5230	6.55	11.0	PASS
11AC20	5180	8.53	11.0	PASS
	5200	9.22	11.0	PASS
	5240	9.36	11.0	PASS
11AC40	5190	5.06	11.0	PASS
	5230	5.11	11.0	PASS
11AC80	5210	3.06	11.0	PASS

802.11a

5180MHz



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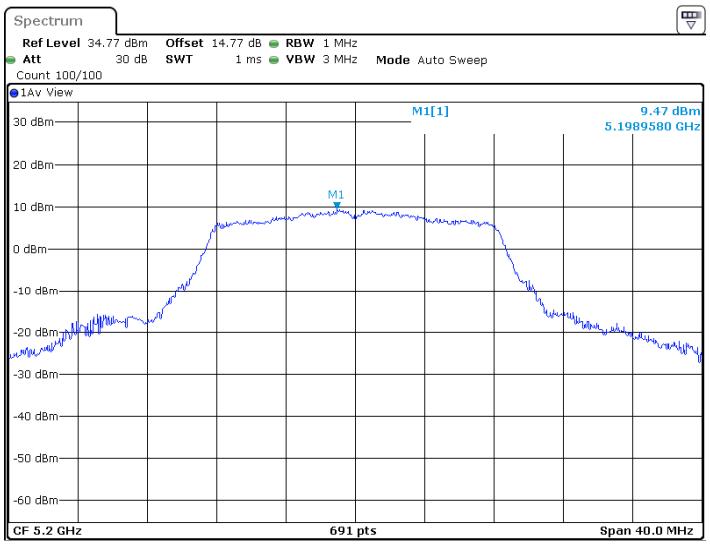

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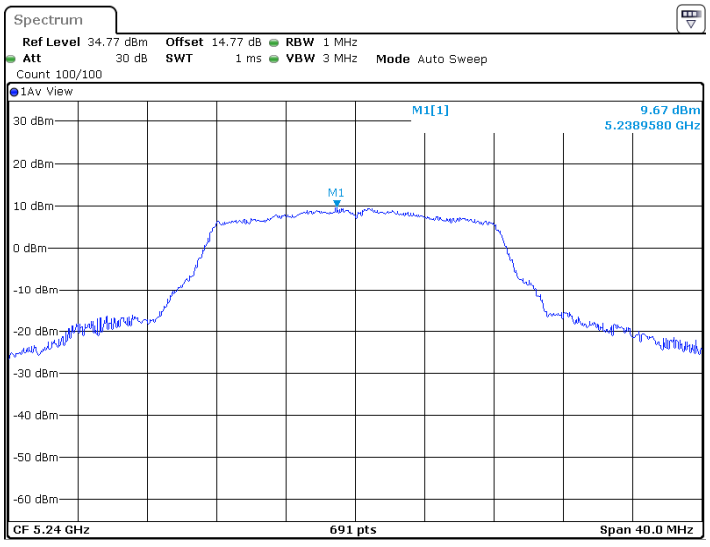

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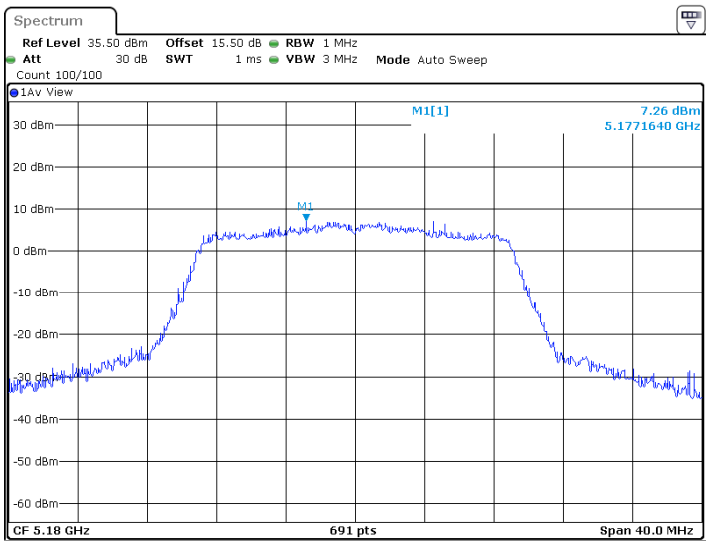
802.11n20

5180MHz



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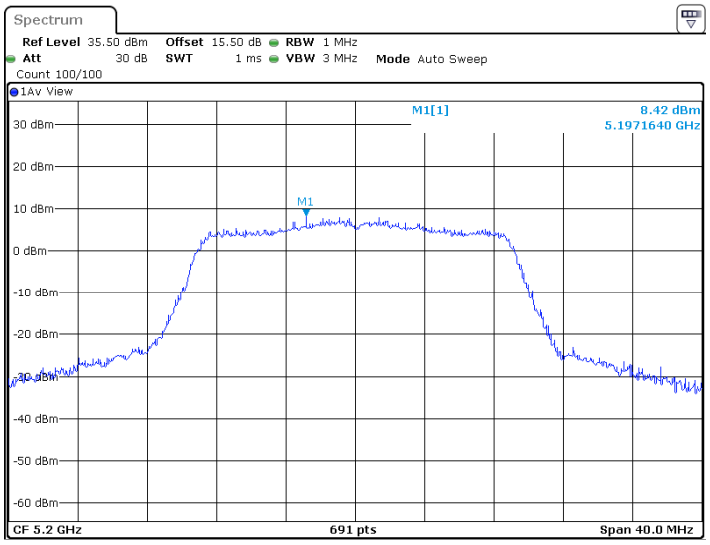

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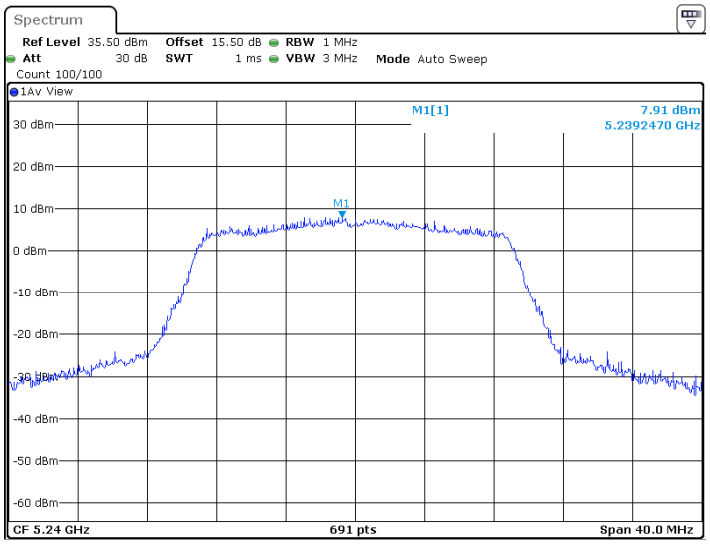

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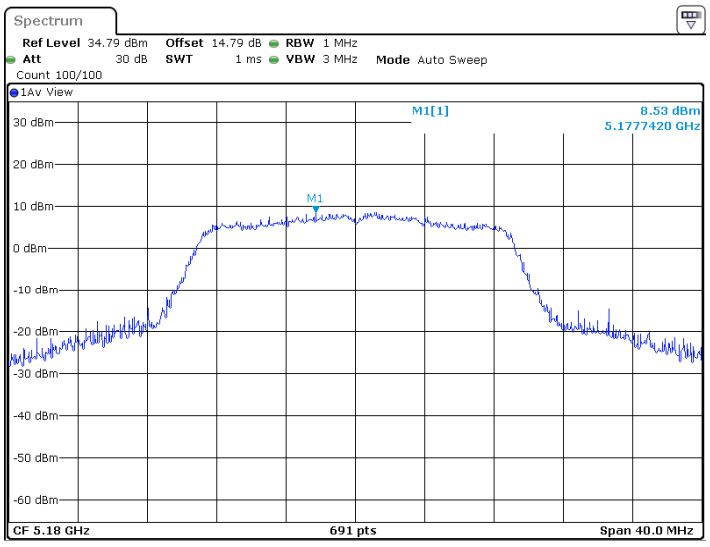
802.11ac20

5180MHz



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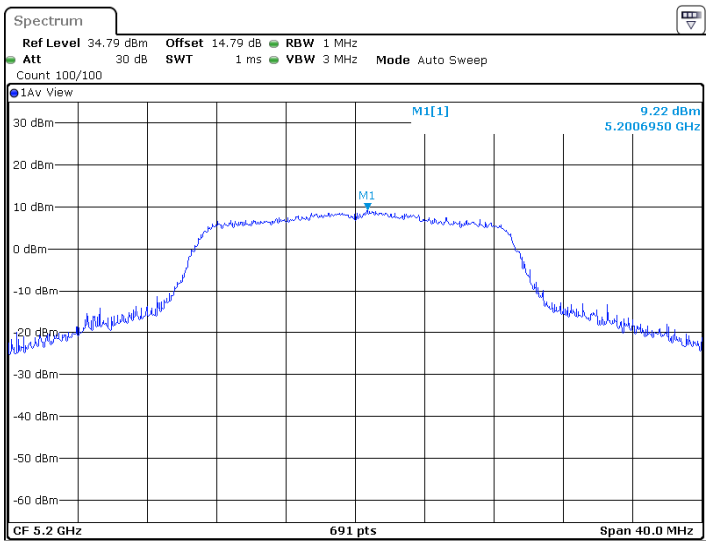

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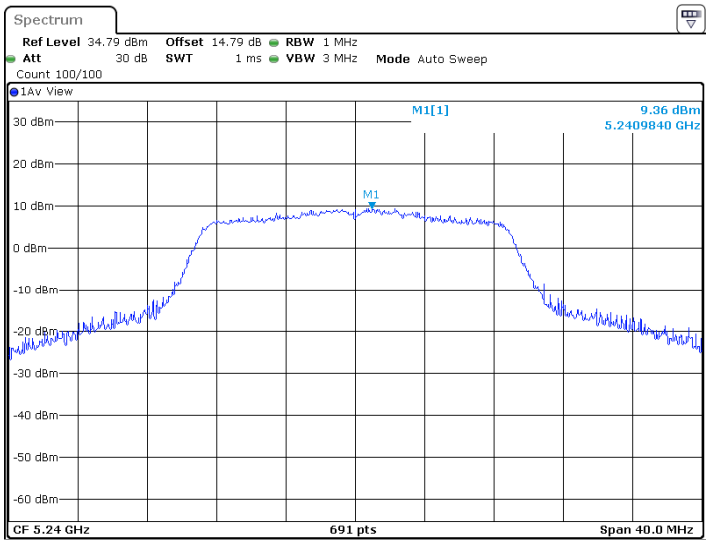

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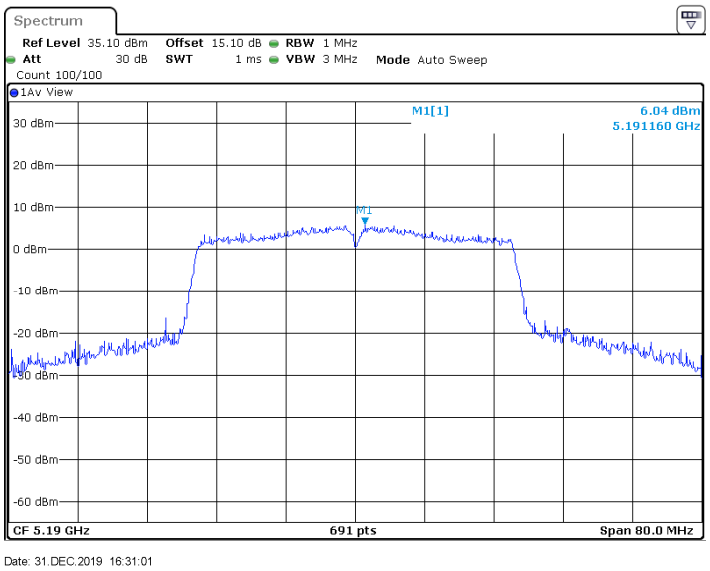
802.11n40

5190MHz



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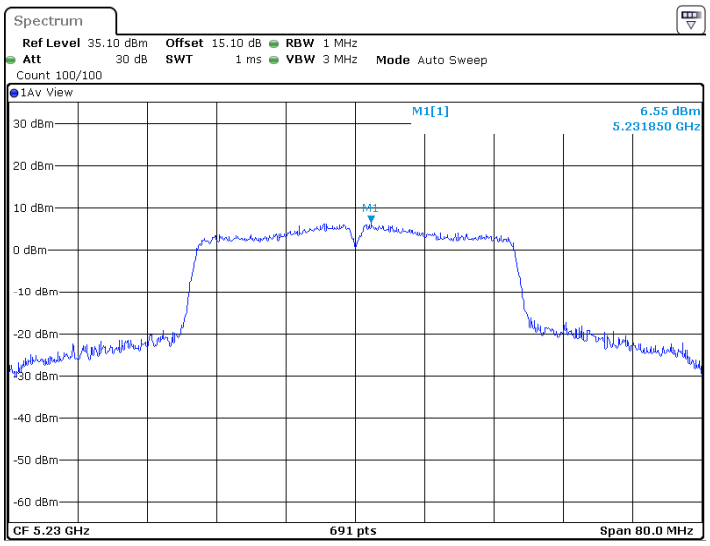
5230MHz



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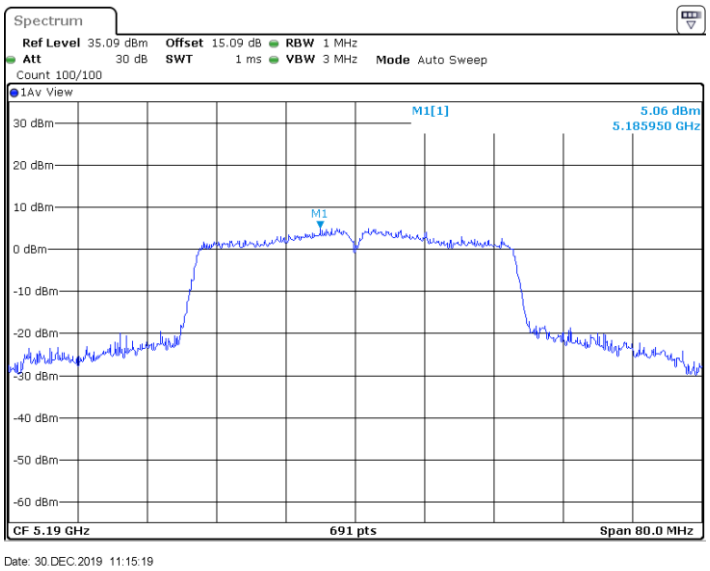
802.11ac40

5190MHz



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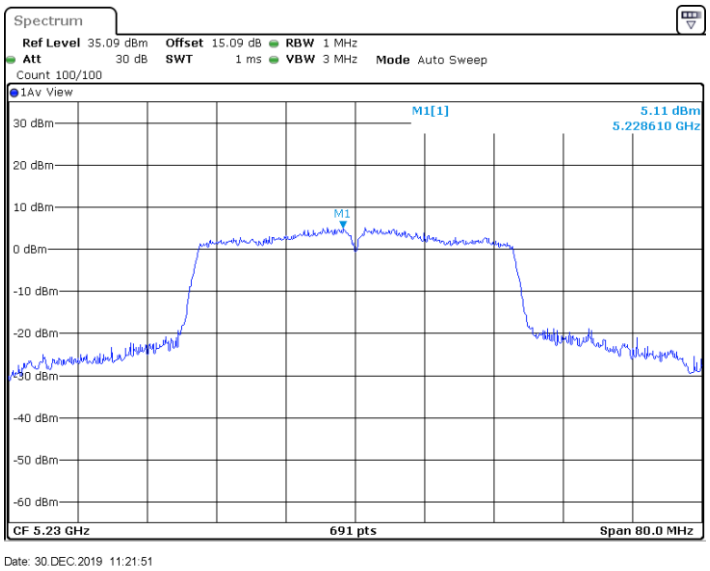
5230MHz



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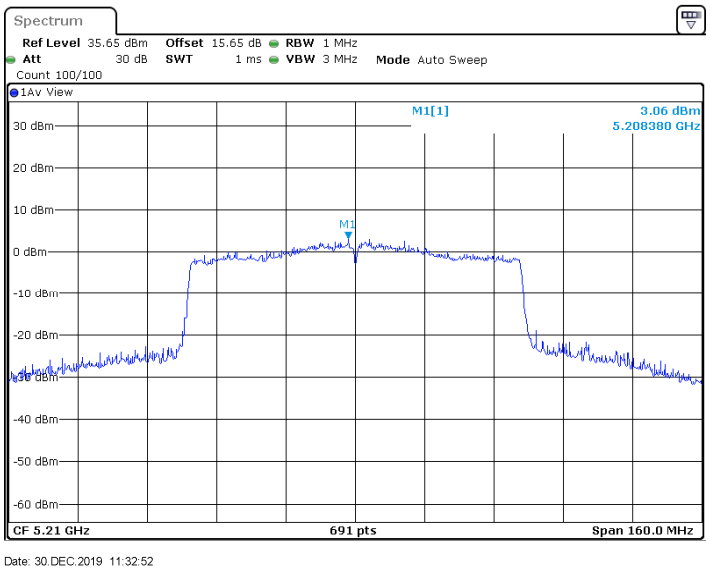
802.11ac80

5210MHz



5. Minimum 6 dB RF Bandwidth (FCC 15.407)

5.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1011	hPa

5.2 Test setup & procedure

The Minimum 6 dB RF Bandwidth per 789033 D02 was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100KHz, and set the video bandwidth (VBW) ≥ 3 x RBW. 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.

For 26dB down Emission Bandwidth

The 26dB down Emission Bandwidth per 789033 D02 was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set RBW = approximately 1% of the emission bandwidth. Set the VBW > RBW, Detector = Peak, Trace mode = max hold (Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%).

For 99% Occupied Bandwidth

The 99% Occupied Bandwidth per 789033 D02 was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set center frequency to the nominal EUT channel center frequency, set span = 1.5 times to 5.0 times the OBW, set RBW = 1 % to 5 % of the OBW, set VBW ≥ 3x RBW, The 99% occupied bandwidth was determined from where the channel output spectrum intersected the display line.

5.3 Limit

Operating Frequency (MHz)	Minimum 6 dB RF Bandwidth Limit
5150~5250	N/A

5.4 Measured data of 26dB down and 99% Emission Bandwidth test results

Test Mode	Channel	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	5180	22.480	5168.880	5191.360	---	PASS
	5200	23.080	5188.680	5211.760	---	PASS
	5240	23.000	5228.680	5251.680	---	PASS
11N20	5180	21.120	5169.360	5190.480	---	PASS
	5200	21.080	5189.440	5210.520	---	PASS
	5240	21.160	5229.480	5250.640	---	PASS
11N40	5190	54.960	5165.440	5220.400	---	PASS
	5230	55.040	5204.000	5259.040	---	PASS
11AC20	5180	24.240	5167.360	5191.600	---	PASS
	5200	25.360	5188.280	5213.640	---	PASS
	5240	25.480	5227.400	5252.880	---	PASS
11AC40	5190	59.840	5162.720	5222.560	---	PASS
	5230	54.080	5204.960	5259.040	---	PASS
11AC80	5210	109.760	5155.440	5265.200	---	PASS

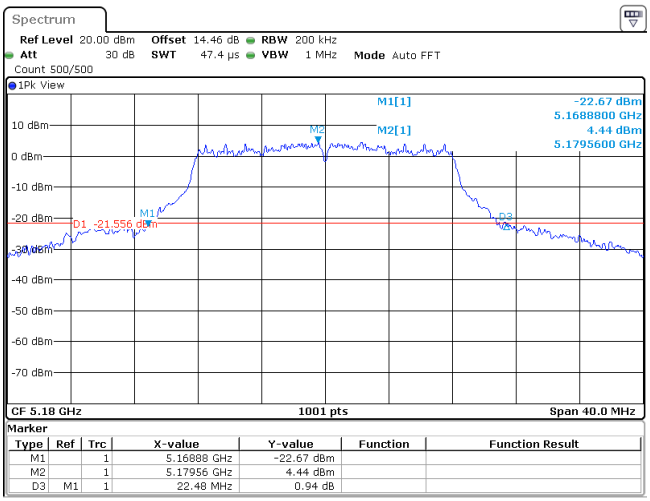
Test Mode	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	5180	18.182	5170.849	5189.031	---	PASS
	5200	18.262	5190.809	5209.071	---	PASS
	5240	18.182	5230.849	5249.031	---	PASS
11N20	5180	18.342	5170.849	5189.191	---	PASS
	5200	18.382	5190.809	5209.191	---	PASS
	5240	18.342	5230.849	5249.191	---	PASS
11N40	5190	37.163	5171.459	5208.621	---	PASS
	5230	37.003	5211.618	5248.621	---	PASS
11AC20	5180	18.901	5170.569	5189.471	---	PASS
	5200	19.341	5190.370	5209.710	---	PASS
	5240	19.181	5230.450	5249.630	---	PASS
11AC40	5190	37.003	5171.618	5208.621	---	PASS
	5230	37.083	5211.538	5248.621	---	PASS
11AC80	5210	76.404	5171.958	5248.362	---	PASS

The test plots are attached as below.

26dB OBW

802.11a

5180MHz



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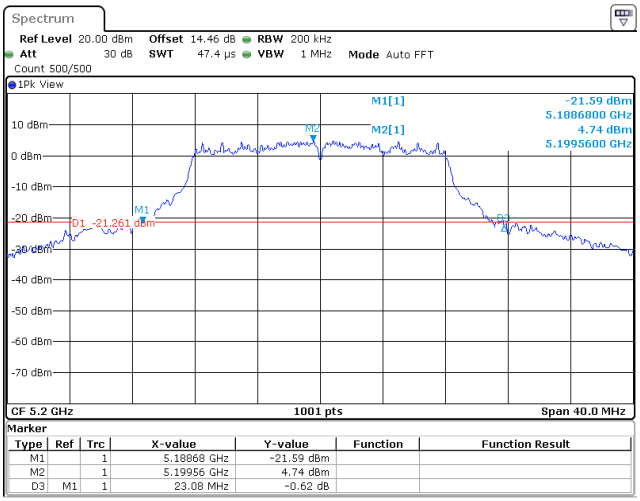
5200MHz



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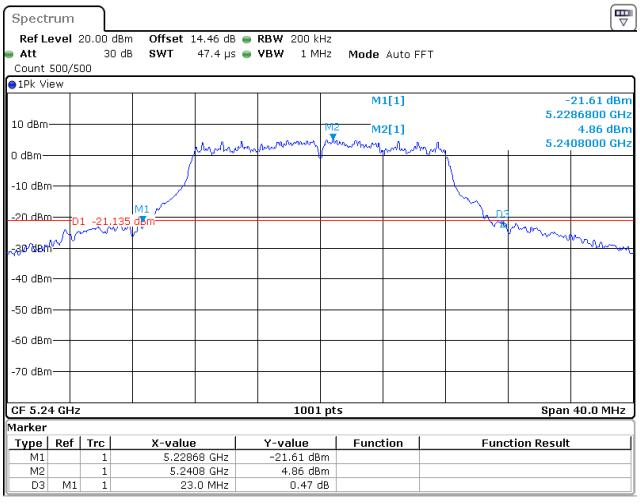
5240MHz



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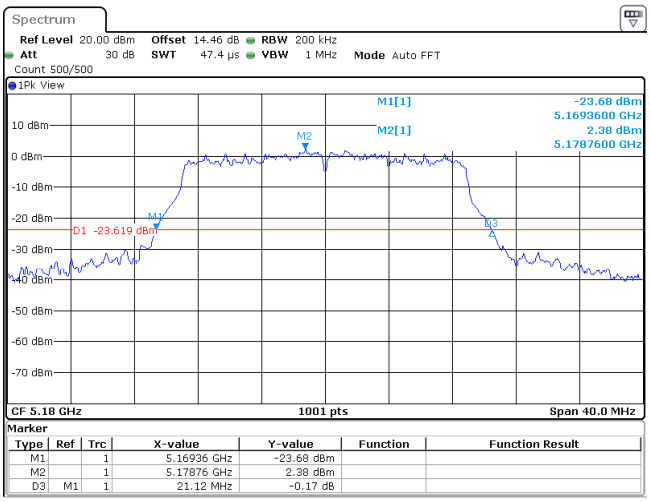
802.11n20

5180MHz



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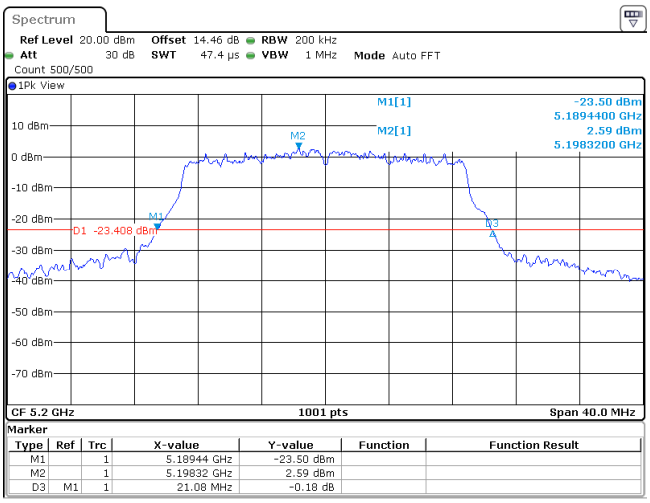

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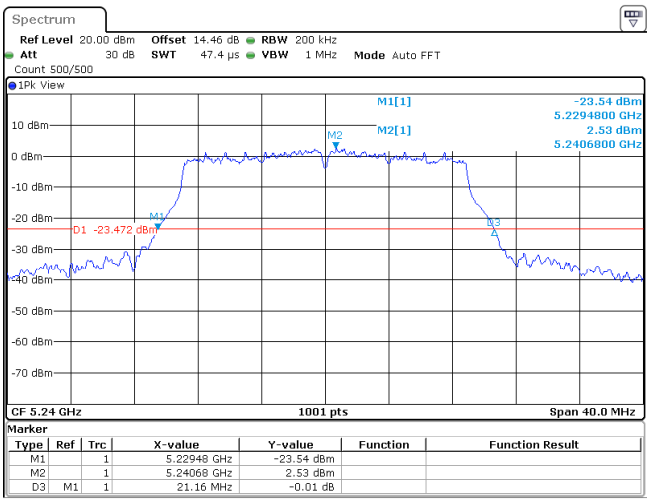
5240MHz



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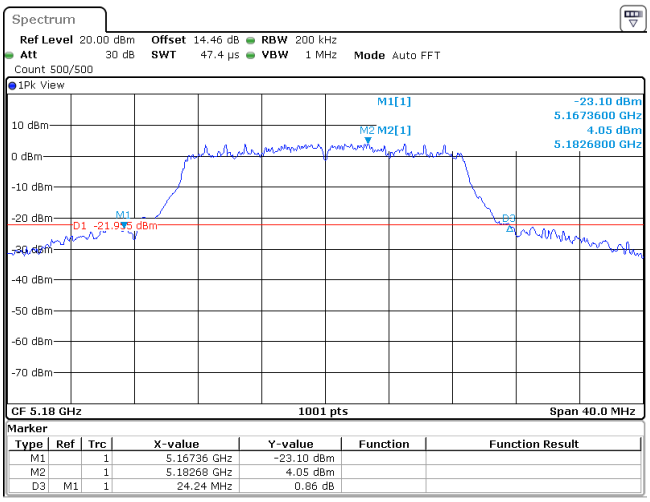
802.11ac20

5180MHz



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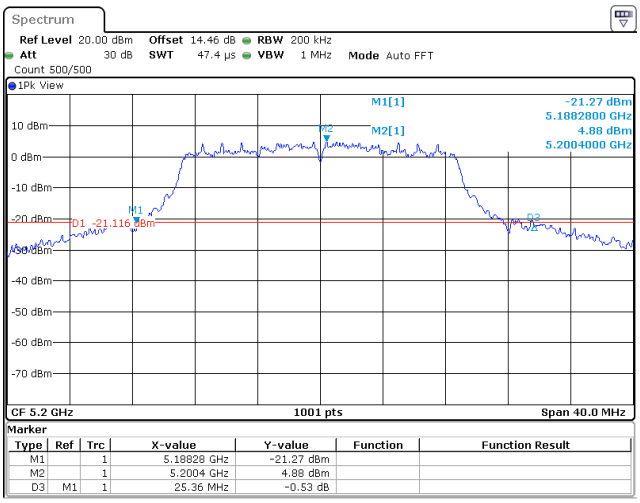
5200MHz



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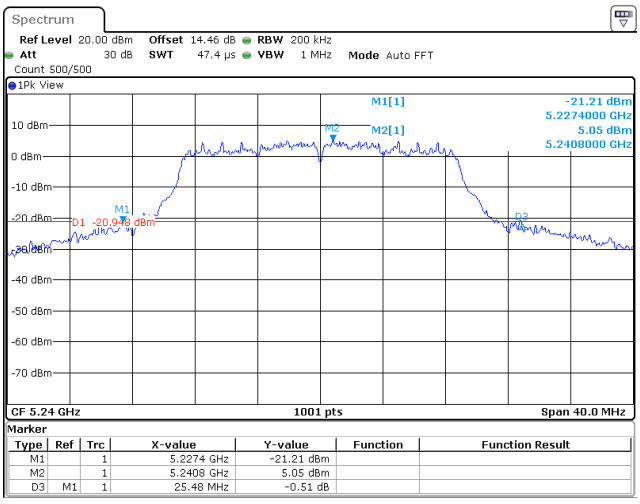
5240MHz



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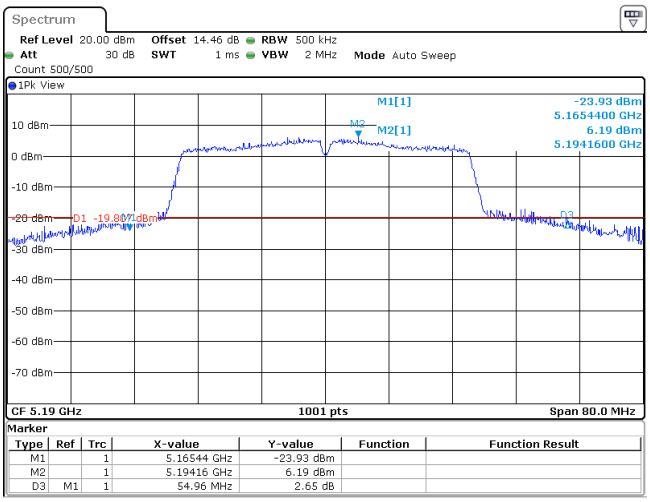
802.11n40

5190MHz



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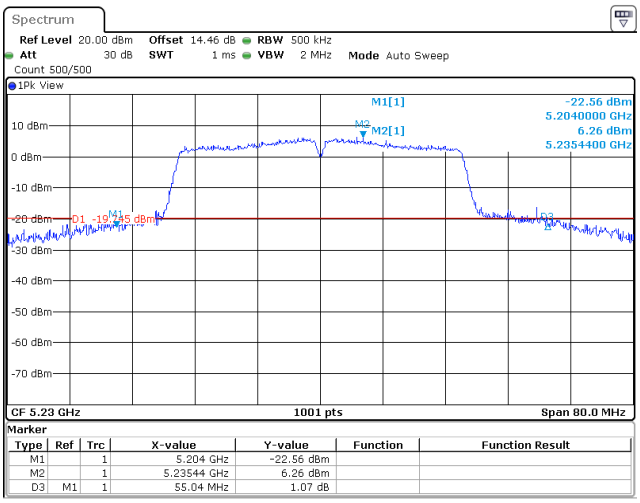
5230MHz



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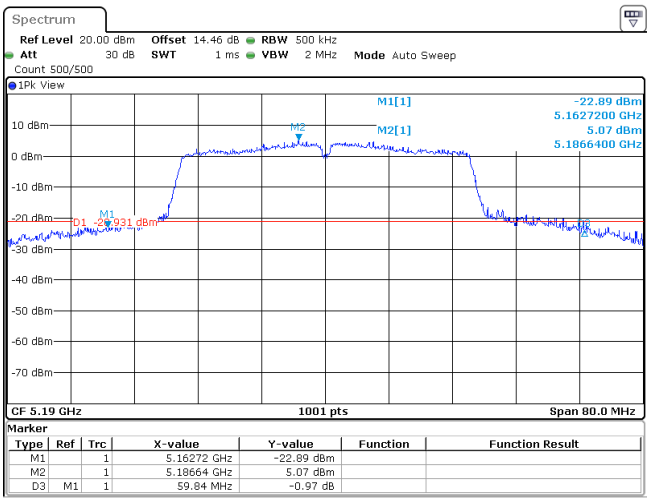
802.11ac40

5190MHz



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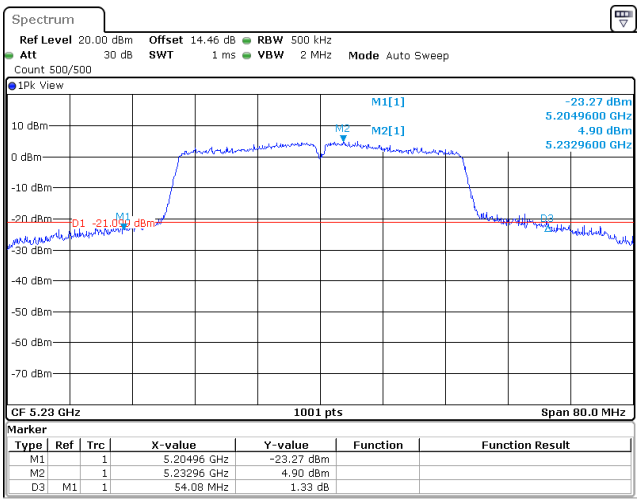
5230MHz



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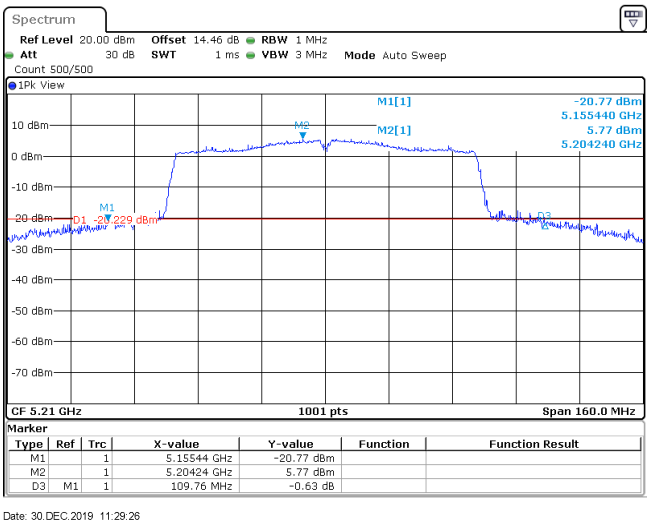
802.11ac80

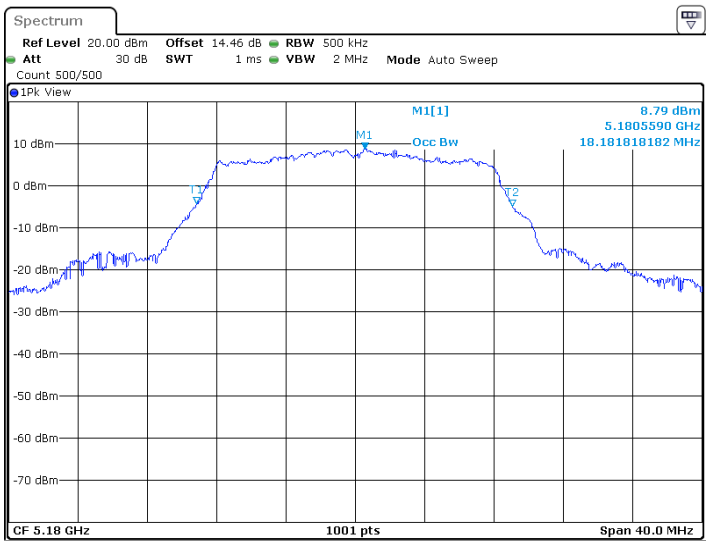
5210MHz



99% OCBW

802.11a

5180MHz



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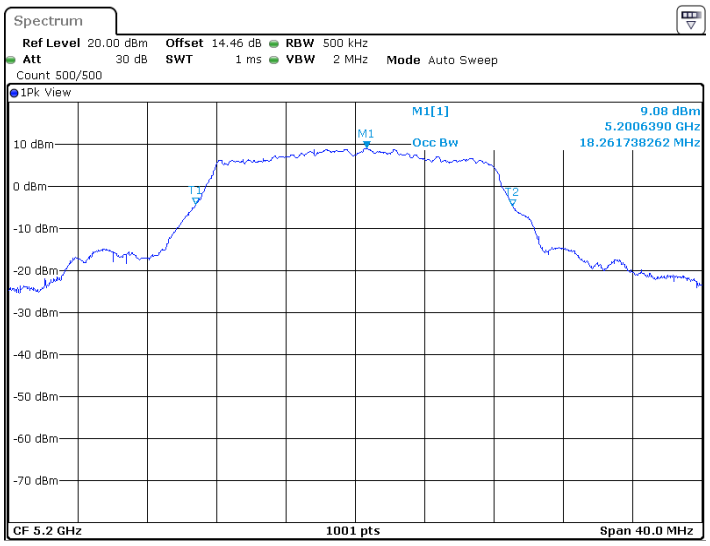
5200MHz



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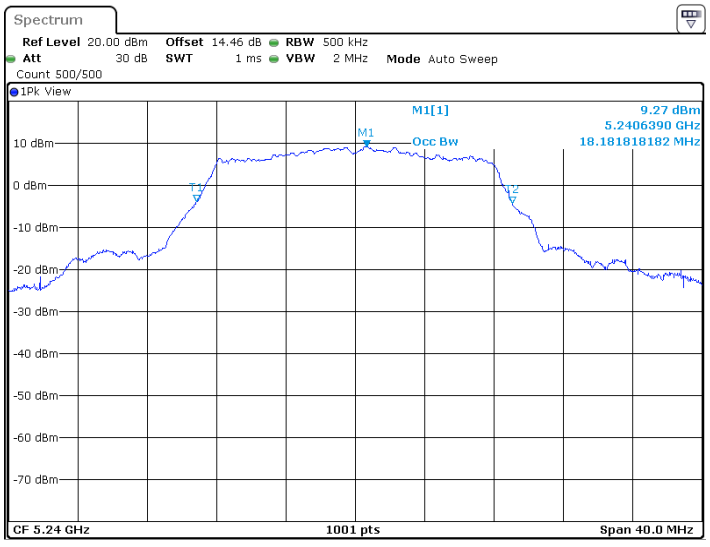
5240MHz



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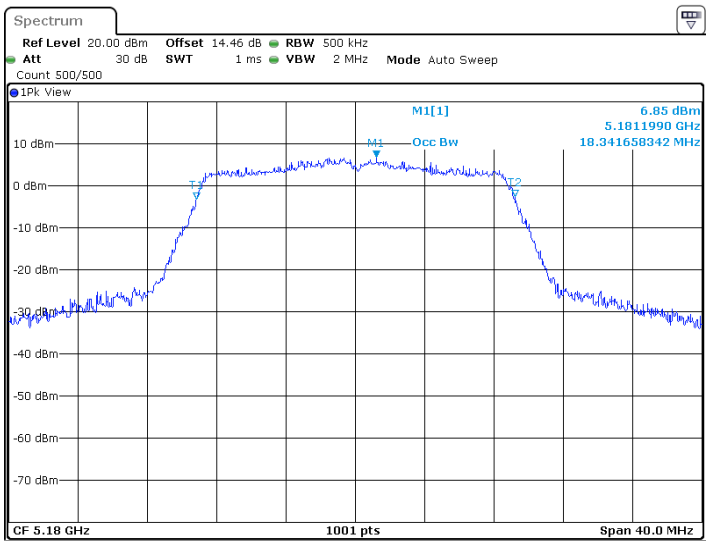
802.11n20

5180MHz



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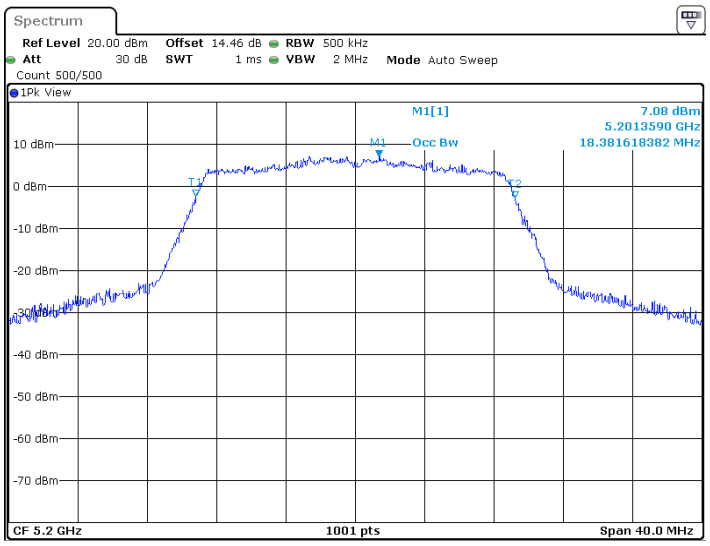
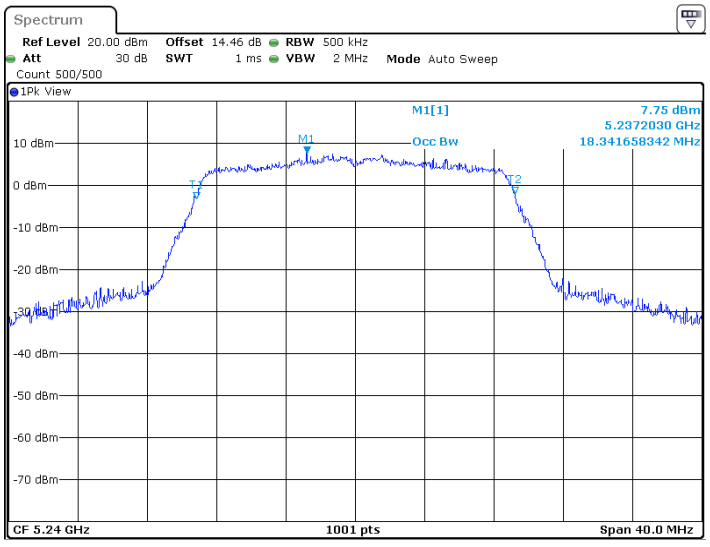
5200MHz



Date: 31.DEC.2019 16:49:10

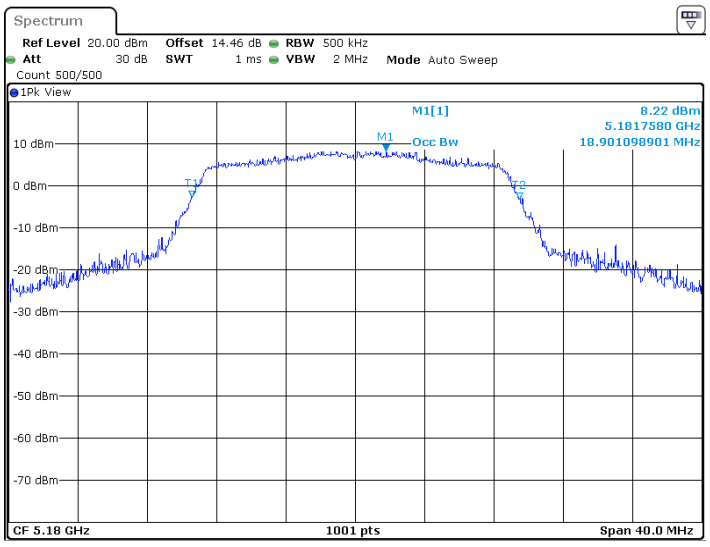
5240MHz



Date: 31.DEC.2019 16:55:09

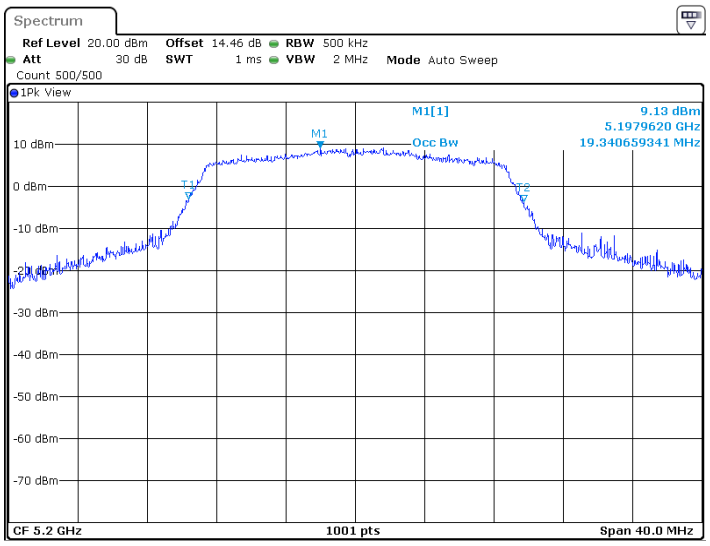
802.11ac20

5180MHz



Date: 27.DEC.2019 17:07:29

5200MHz



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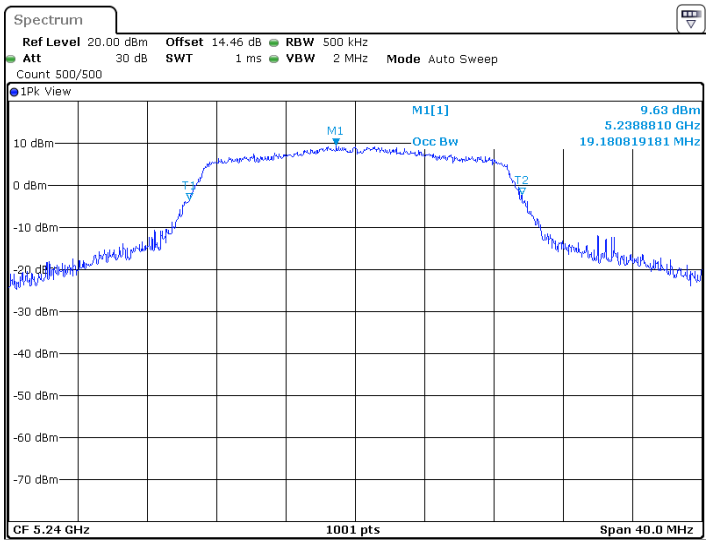
5240MHz



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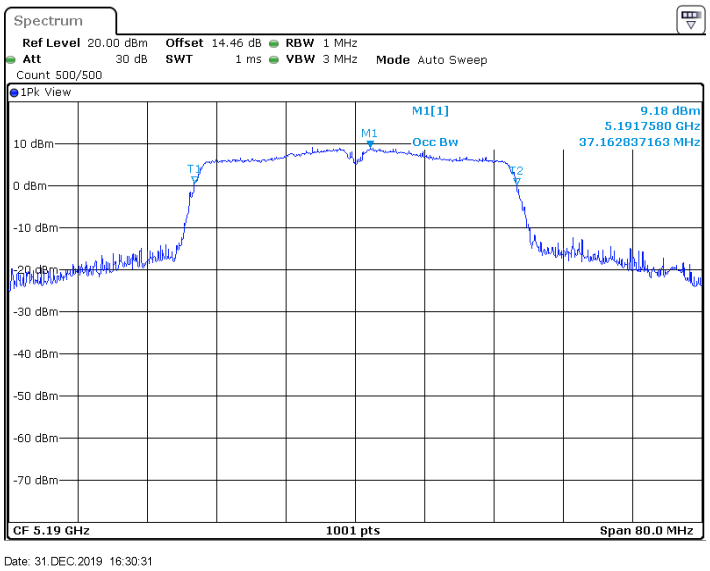
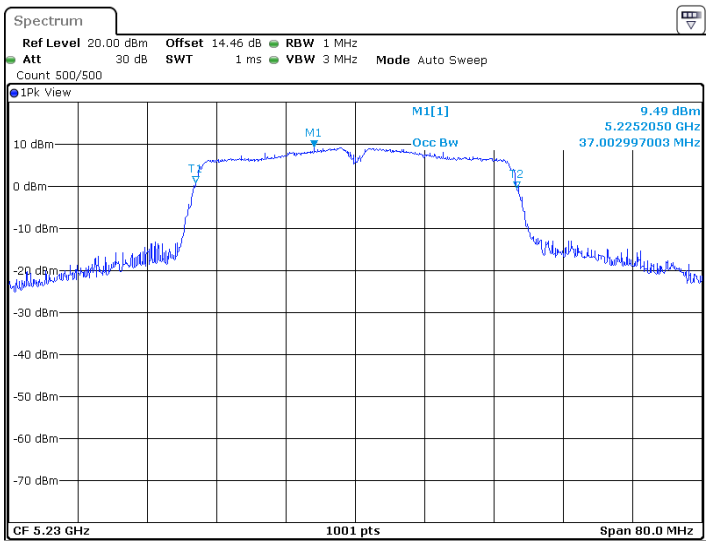
802.11n40

5190MHz



Date: 31.DEC.2019 16:30:31

5230MHz



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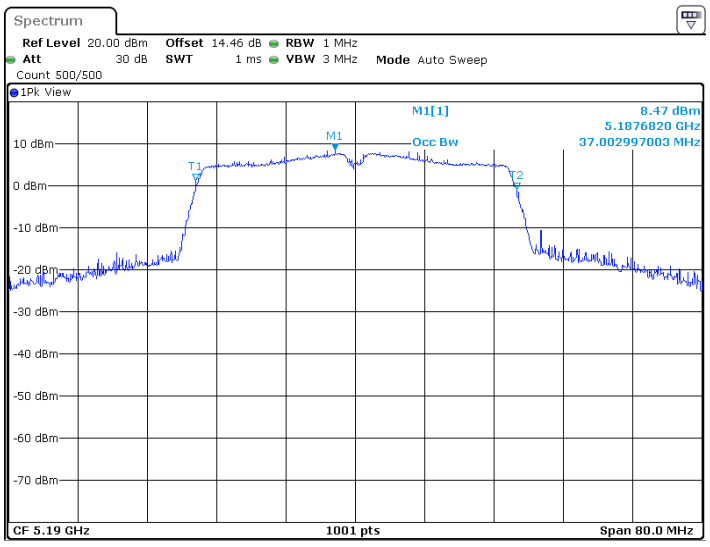
802.11ac40

5190MHz



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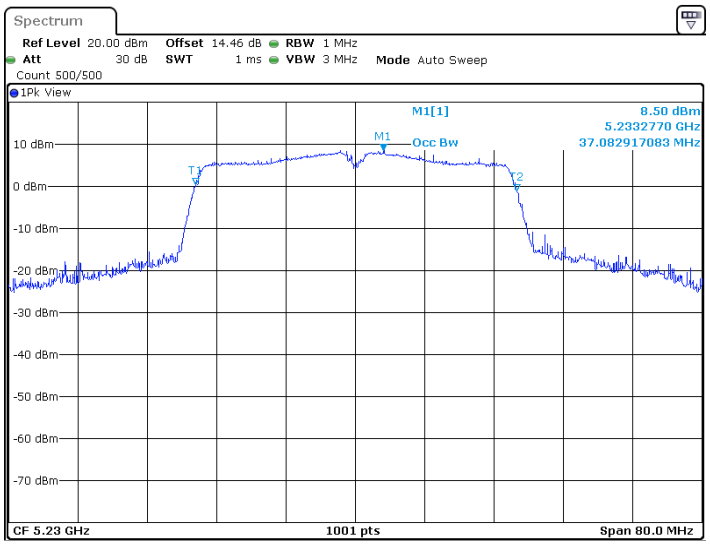
5230MHz



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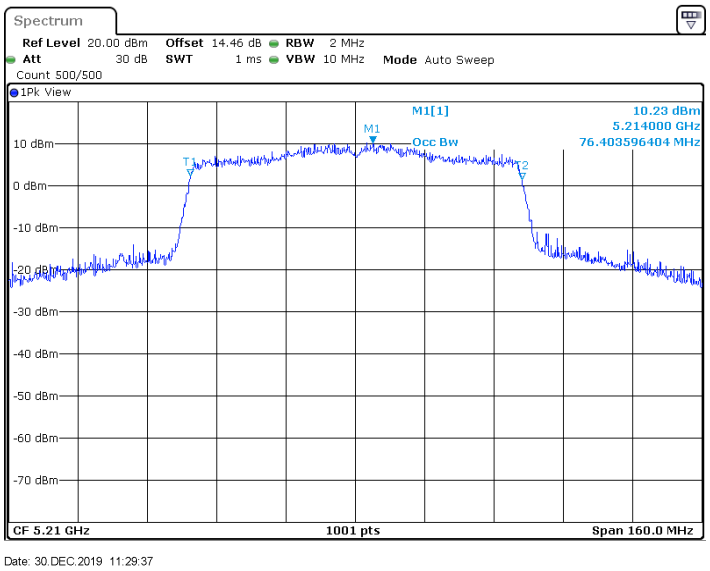
802.11ac80

5210MHz



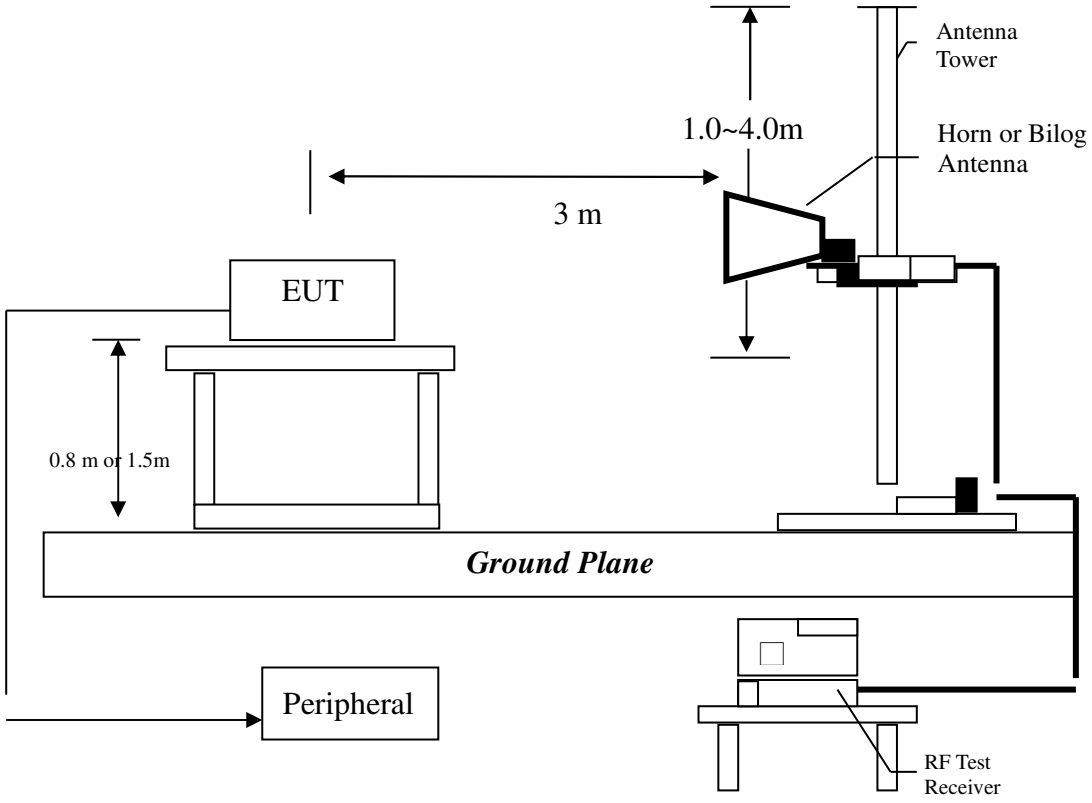
6. Radiated Emission test (FCC 15.205 & 15.209 & 15.407)

6.1 Operating environment

Temperature:	22	℃
Relative Humidity:	55	%
Atmospheric Pressure	1010	hPa

6.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emission measurements were performed from 9KHz to tenth harmonic or 40GHz. The EUT for testing is arranged on a styrene turntable with the height of 0.8m up to 1GHz and 1.5m above 1GHz. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

Testing settings (refer to KDB 789033 D02)
Peak Measurements below 1GHz
1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
2, Span=encompass the entire emission
3, RBW=120KHz
4, Detector=Quasi-Peak
5, Trace was allowed to stabilize

Peak Measurements above 1GHz
1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
2, Span=encompass the entire emission
3, RBW=1MHz
4, VBW=3MHz
4, Detector= Peak (Max-hold)
5, Trace was allowed to stabilize

Average Measurements above 1GHz
1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
2, Span=encompass the entire emission
3, RBW=1MHz
4, VBW=3MHz
4, Detector= RMS (Max-hold)
5, Trace was allowed to stabilize

6.3 Limit

The spurious Emission shall test through the 10th harmonic or 40GHz (whichever is lower). In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Notes:
1, All emission out-side of the 5.15-5.35GHz band shall not exceed an EIRP of -27dBm/MHz (68.2dBuV/m, test distance: 3 meter).

2, The spectrum is measured from 9KHz to the 10^{th} harmonic of the fundamental frequency of the transmitter using QP detector below 1GHz, above 1GHz, average & peak measurements were taken using for test. The worst-case emission are reported however emission whose levels were not within 20dB of the respective limited were not reported.

3, The test was performed on EUT under 802.11a/n-HT20/40/ac-HT20/40/80 continuously transmitting mode. All mode had been tested, but only the worst-case is recorded in the following graph and table.

Field Strength Calculation

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

FS = RA + AF + CF - AG + PD

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

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

FS = RA + AF + CF - AG + PD

Example
Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 32 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

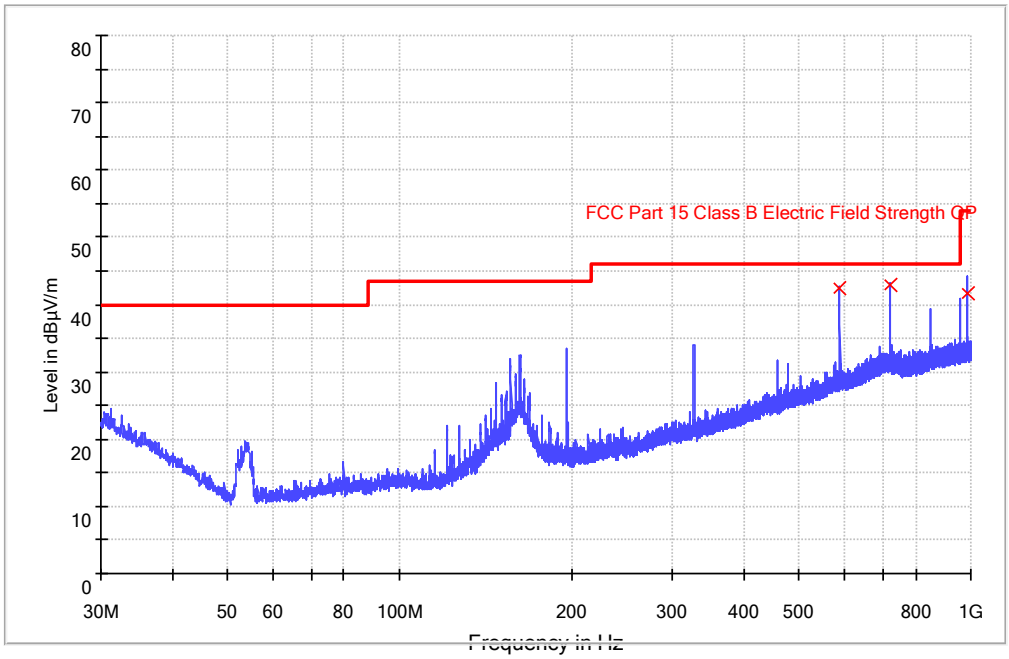
Level in mV/m = Common Antilogarithm [(42 dBµV/m)/20] = 125.9 µV/m

6.4 Radiated spurious emission test data

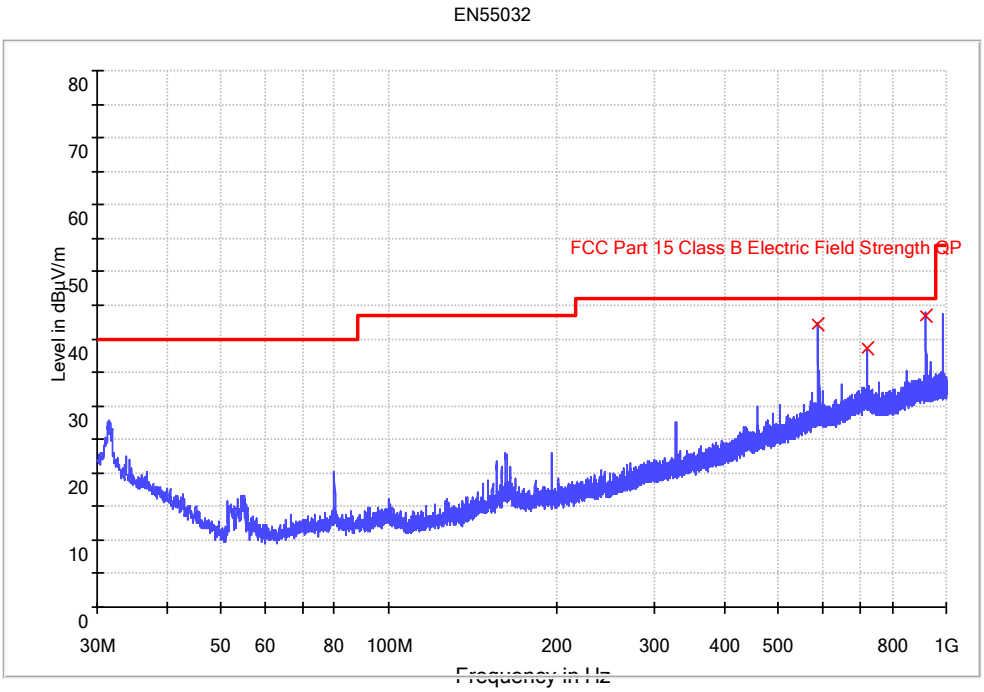
6.4.1 Measurement results: frequencies equal to or less than 1 GHz

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

ANT Polarity: Horizontal



ANT Polarity: Vertical



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

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	589.851667	39.1	20.0	23.5	42.6	46.0	-3.4
Horizontal	720.931000	36.9	20.0	26.0	42.9	46.0	-3.1
Horizontal	983.060547	33.6	20.0	28.0	41.6	54.0	-12.4
Vertical	589.819333	38.8	20.0	23.5	42.3	46.0	-3.7
Vertical	720.898667	32.7	20.0	26.0	38.7	46.0	-7.3
Vertical	921.624000	35.4	20.0	27.7	43.1	46.0	-2.9

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.
4. All emissions are below the QP limit.

6.4.2 Measurement results: frequency above 1GHz

The worst case occurred at 802.11ac-VHT40

Channel 38/27 Mbps

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	10380.000	49.0	36.3	38.9	51.6	68.2	-16.6
Horizontal	15570.000	48.6	34.7	41.0	54.9	68.2	-13.3

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	10380.000	38.7	36.3	38.9	41.3	54.0	-12.7
Horizontal	15570.000	38.3	34.7	41.0	44.6	54.0	-9.4

Channel 46/27Mbps

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	10460.000	45.9	36.3	38.9	48.5	68.2	-19.7
Horizontal	15690.000	46.0	34.7	41.0	52.3	68.2	-15.9

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	10460.000	38.9	36.3	38.9	41.5	54.0	-12.5
Horizontal	15690.000	38.4	34.7	41.0	44.7	54.0	-9.3

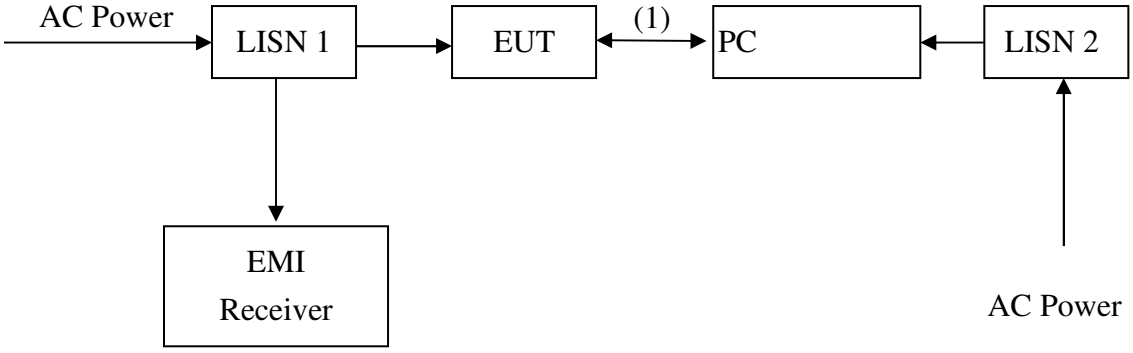
* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted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

7. Power Line Conducted Emission test

7.1 Operating environment

Temperature:	23	℃
Relative Humidity:	55	%
Atmospheric Pressure	1011	hPa

7.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50 uH coupling impedance with 50 ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10/2013 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCI 30) is set at 9 kHz.

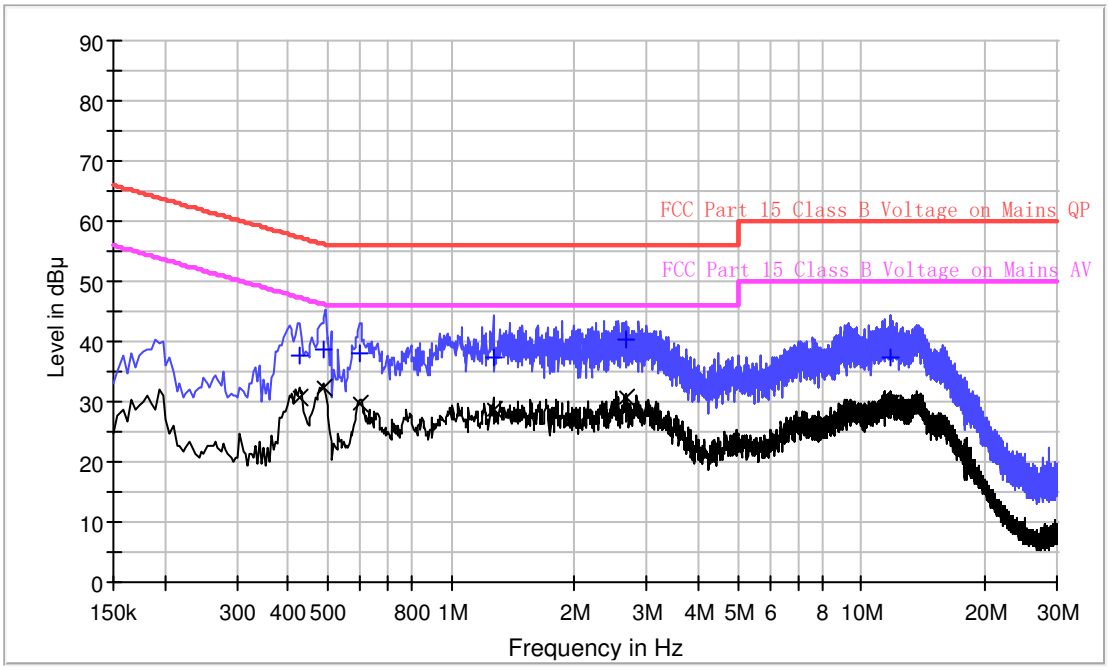
7.3 Limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

7.4 Power Line Conducted Emission test data

Applicant: KanDao Technology Co.Ltd
Date of Test: December 30, 2019 Model: QCM1212
Worst Case Operating Mode: WIFI Link
Phase: Live



Result Table QP

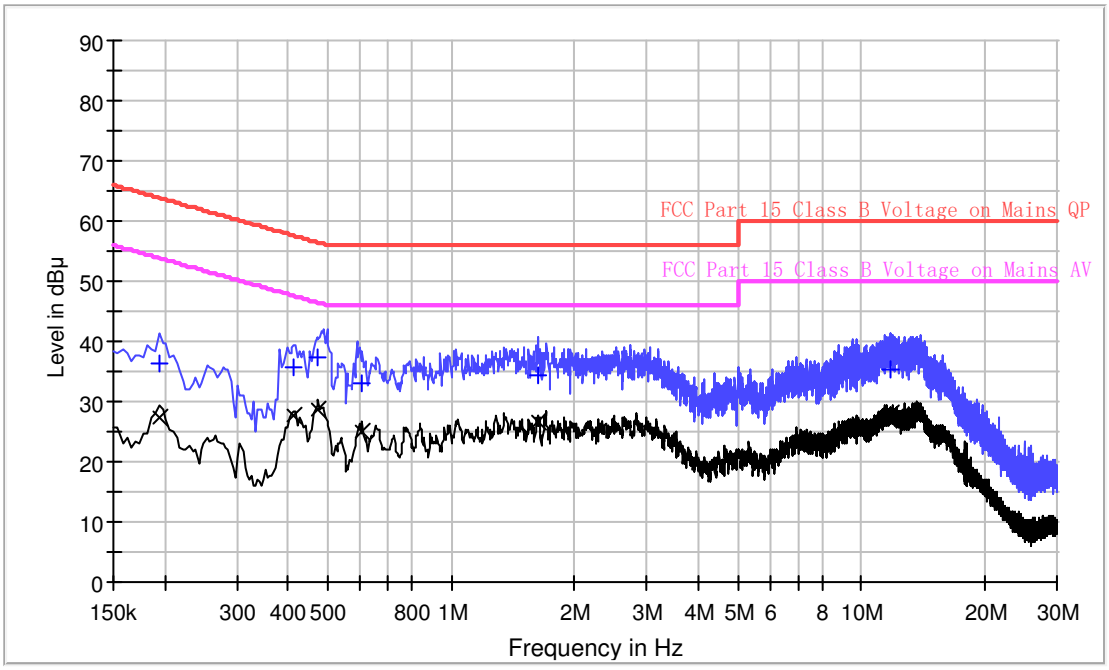
Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.426000	37.8	L	9.7	19.5	57.3
0.486000	38.7	L	9.7	17.5	56.2
0.598000	38.1	L	9.7	17.9	56.0
1.266000	37.5	L	9.7	18.5	56.0
2.686000	40.2	L	9.7	15.8	56.0
11.742000	37.2	L	10.0	22.8	60.0

Result Table AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.426000	30.8	L	9.7	16.5	47.3
0.486000	32.2	L	9.7	14.0	46.2
0.598000	29.5	L	9.7	16.5	46.0
1.266000	28.6	L	9.7	17.4	46.0
2.686000	30.8	L	9.7	15.2	46.0
11.742000	29.7	L	10.0	20.3	50.0

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

Applicant: KanDao Technology Co.Ltd
Date of Test: December 30, 2019 Model: QCM1212
Worst Case Operating Mode: WIFI Link
Phase: Neutral



Result Table QP

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.194000	36.2	N	9.7	27.7	63.9
0.414000	35.7	N	9.7	21.9	57.6
0.474000	37.2	N	9.7	19.2	56.4
0.606000	33.0	N	9.7	23.0	56.0
1.626000	34.3	N	9.7	21.7	56.0
11.826000	35.3	N	10.1	24.7	60.0

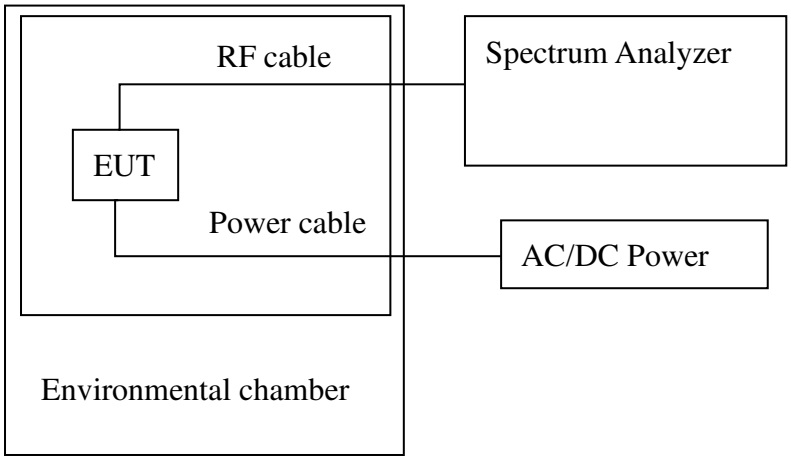
Result Table AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.194000	27.4	N	9.7	26.5	53.9
0.414000	27.6	N	9.7	20.0	47.6
0.474000	28.8	N	9.7	17.6	46.4
0.606000	25.0	N	9.7	21.0	46.0
1.626000	26.7	N	9.7	19.3	46.0
11.826000	28.0	N	10.1	22.0	50.0

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

8. Frequency Stability Test

8.1 Test setup & procedure



Note 1: The frequency stability is measured with the temperature variation range of 0˚C to +35˚C, and voltage supply variation range of 85% to 115% of nominal AC supply voltage.

2: To ensure emission at the band-edge is maintained within the authorized band, the frequency 802.11a/n-HT20/40/ac-HT20/40/80 channel 36, 48, 38, 46, 42 are selected to test and the worst case was reported.

8.2 Frequency Stability Test Data

20˚C is taken as temperature in normal condition.

Model: 802.11a, Operation frequency: 5180MHz, Channel: 36, Rate: 6Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5180.08	80	Pass
	+5	5180.05	50	Pass
	+15	5180.03	30	Pass
	+25	5180.01	10	Pass
	+35	5180.05	50	Pass
102	+20	5180.09	90	Pass
138	+20	5180.03	30	Pass

Model: 802.11a, Operation frequency: 5240MHz, Channel: 48, Rate: 6Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5240.04	40	Pass
	+5	5240.05	50	Pass
	+15	5240.05	50	Pass
	+25	5240.03	30	Pass
	+35	5240.02	20	Pass
102	+20	5240.08	80	Pass
138	+20	5240.07	70	Pass

Model: 802.11n-HT20, Operation frequency: 5180MHz, Channel: 36, Rate: 6.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5180.04	40	Pass
	+5	5180.03	30	Pass
	+15	5180.05	50	Pass
	+25	5180.07	70	Pass
	+35	5180.05	50	Pass
102	+20	5180.07	70	Pass
138	+20	5180.03	30	Pass

Model: 802.11n-HT20, Operation frequency: 5240MHz, Channel: 48, Rate: 6.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5240.07	70	Pass
	+5	5240.04	40	Pass
	+15	5240.05	50	Pass
	+25	5240.08	80	Pass
	+35	5240.06	60	Pass
102	+20	5240.05	50	Pass
138	+20	5240.07	70	Pass

Model: 802.11n-HT40, Operation frequency: 5190MHz, Channel: 38, Rate: 13.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5190.05	50	Pass
	+5	5190.03	30	Pass
	+15	5190.05	50	Pass
	+25	5190.03	30	Pass
	+35	5190.05	50	Pass
102	+20	5190.07	70	Pass
138	+20	5190.06	60	Pass

Model: 802.11n-HT40, Operation frequency: 5230MHz, Channel: 46, Rate: 13.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5230.08	80	Pass
	+5	5230.03	30	Pass
	+15	5230.07	70	Pass
	+25	5230.09	90	Pass
	+35	5230.05	50	Pass
102	+20	5230.02	20	Pass
138	+20	5230.07	70	Pass

Model: 802.11ac-HT20, Operation frequency: 5180MHz, Channel: 36, Rate: 6.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5180.03	30	Pass
	+5	5180.06	60	Pass
	+15	5180.08	80	Pass
	+25	5180.07	70	Pass
	+35	5180.09	90	Pass
102	+20	5180.04	40	Pass
138	+20	5180.07	70	Pass

Model: 802.11ac-HT20, Operation frequency: 5240MHz, Channel: 48, Rate: 6.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5240.06	60	Pass
	+5	5240.07	70	Pass
	+15	5240.05	50	Pass
	+25	5240.06	60	Pass
	+35	5240.03	30	Pass
102	+20	5240.08	80	Pass
138	+20	5240.03	30	Pass

Model: 802.11ac-HT40, Operation frequency: 5190MHz, Channel: 38, Rate: 13.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5190.03	30	Pass
	+5	5190.08	80	Pass
	+15	5190.03	30	Pass
	+25	5190.07	70	Pass
	+35	5190.06	60	Pass
102	+20	5190.08	80	Pass
138	+20	5190.03	30	Pass

Model: 802.11ac-HT40, Operation frequency: 5230MHz, Channel: 46, Rate: 13.5Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5230.07	70	Pass
	+5	5230.05	50	Pass
	+15	5230.09	90	Pass
	+25	5230.07	70	Pass
	+35	5230.03	30	Pass
102	+20	5230.08	80	Pass
138	+20	5230.06	60	Pass

Model: 802.11ac-HT80, Operation frequency: 5210MHz, Channel: 42, Rate: 29.3Mbps

Input voltage (VAC)	Temperature (˚C)	Measured Frequency (MHz)	Frequency deviation (KHz)	Result
120	0	5210.07	70	Pass
	+5	5210.00	0	Pass
	+15	5210.02	20	Pass
	+25	5210.05	50	Pass
	+35	5210.07	70	Pass
102	+20	5210.08	80	Pass
138	+20	5210.00	0	Pass

Note: All emissions are maintained within the band of operation under all conditions of normal operation as specified in the user manual. It fulfills the requirement of 15.407(g).

Appendix A: 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	Pulse Power Sensor	Anritsu	MA2411B	1207429	28-May-2019	28-May-2020
SZ070-24	Open Switch and Control Unit with TS8997 option for power measurement test	R&S	OSP120+B157	---	30-Oct-2019	30-Oct-2020
SZ070-20	Combiner	Mini-Circuits	ZN2PD-63-S+	---	28-May-2019	28-May-2020
SZ070-21	Combiner	Mini-Circuits	ZN2PD-63-S+	---	28-May-2019	28-May-2020
SZ056-05	Spectrum Analyzer	Agilent	E4407B	US40522113	24-Dec-2019	24-Dec-2020
SZ180-13	MXG Vector Signal Generator	Keysight	N5182B	MY53051328	29-Oct-2019	29-Oct-2020
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	14-Sep-2018	14-Sep-2020
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	24-May-2019	24-May-2020
SZ061-09	Horn Antenna	ETS	3115	00092346	24-Aug-2019	24-Aug-2021
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	13-Aug-2019	13-Aug-2021
SZ185-01	EMI Receiver	R&S	ESCI	100547	24-Dec-2019	24-Dec-2020
SZ056-06	Signal Analyzer	R&S	FSV40	101101	28-May-2019	28-May-2020
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	5-Jul-2019	5-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
SZ067-25	Notch Filter	Micro-Tronics	BRM50716	--	22-Mar-2019	22-Mar-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-2017	16-Jan-2020
SZ016-12	Programmable Temperature & Humidity Chamber	Taili	MHK-120NK	AB0105	17-Jan-2019	17-Jan-2020
SZ006-30	DC Power Supply	Guwei	SPS-3610	GEQ920551	15-Jan-2019	15-Jan-2020

Expanded uncertainty of radiated emission measurement is ±4.9 dB.
Expanded uncertainty of conducted emission measurement is ±3.6 dB.

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