FCC PART 15.407

TEST REPORT

For

Vuzix Corporation

25 Hendrix Rd, West Henrietta, New York, United States 14586

FCC ID: 2AA9D-472

Report Type:	**Product Type:**
Original Report	M400

Report Number: RSZ190723001-00D

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	M400
Tested Model	472
Frequency Range	5G Wi-Fi: 5150-5250 MHz; 5725-5850 MHz
Transmit Power	5150-5250 MHz: 14.65dBm (802.11a), 14.70dBm(802.11n20), 15.28 dBm(802.11n40), 14.92dBm (802.11ac20), 15.33dBm(802.11 ac40), 15.40 dBm(802.11 ac80) 5725-5850 MHz 15.73dBm (802.11a), 15.84dBm(802.11n20), 16.44 dBm(802.11n40), 15.70dBm (802.11ac20), 16.39dBm(802.11 ac40), 16.28 dBm(802.11 ac80)
Modulation Technique	Wi-Fi: OFDM
Antenna Specification	3dBi
Voltage Range	DC 3.7 V from battery
Date of Test	2019-08-14 to 2019-09-05
Sample serial number	190723001(Assigned by BACL, Shenzhen)
Received date	2019-07-23
Sample/EUT Status	Good condition

Objective

This type approval report is prepared on behalf of *Vuzix Corporation* in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS&DSS submissions with FCC ID: 2AA9D-472.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
Humidity		±6%
Supply voltages		±0.4%

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

The device support 802.11a/n20/n40/ac20/ac40/ac80 modes.

For 5150-5250MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 5725-5850MHz Band, 8 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785
151	5755	159	5795
153	5765	161	5805
155	5775	165	5825

EUT Exercise Software

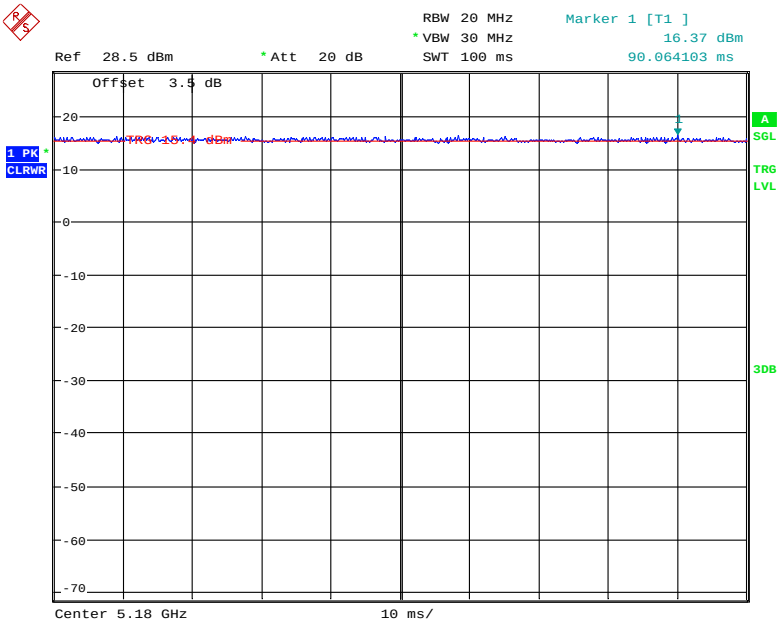
"QRCT.exe" exercise software was used.

Test frequencies and power level were configured as below:

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power Level
5150 – 5250MHz	802.11 a	CH36	5180	6	17
		CH40	5200	6	17
		CH48	5240	6	17
	802.11 n20	CH36	5180	MCS0	17
		CH40	5200	MCS0	17
		CH48	5240	MCS0	17
	802.11 n40	CH38	5190	MCS0	17
		CH46	5230	MCS0	17
	802.11 ac20	CH36	5180	MCS0	17
		CH40	5200	MCS0	17
		CH48	5240	MCS0	17
	802.11 ac40	CH38	5190	MCS0	17
		CH46	5230	MCS0	17
	802.11 ac80	CH42	5210	MCS0	17
5725 – 5850MHz	802.11 a	CH149	5745	6	17
		CH157	5785	6	17
		CH165	5825	6	17
	802.11 n20	CH149	5745	MCS0	17
		CH157	5785	MCS0	17
		CH165	5825	MCS0	17
	802.11 n40	CH151	5755	MCS0	17
		CH159	5795	MCS0	17
	802.11 ac20	CH149	5745	MCS0	17
		CH157	5785	MCS0	17
		CH165	5825	MCS0	17
	802.11 ac40	CH151	5755	MCS0	17
		CH159	5795	MCS0	17
	802.11 ac80	CH155	5775	MCS0	17

Duty cycle
5150-5250 MHz

802.11a mode



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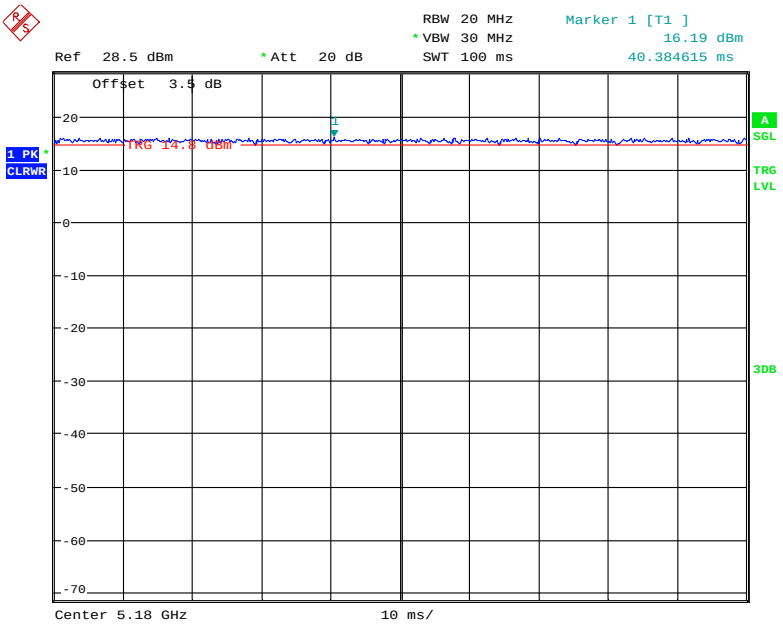
802.11n20 mode



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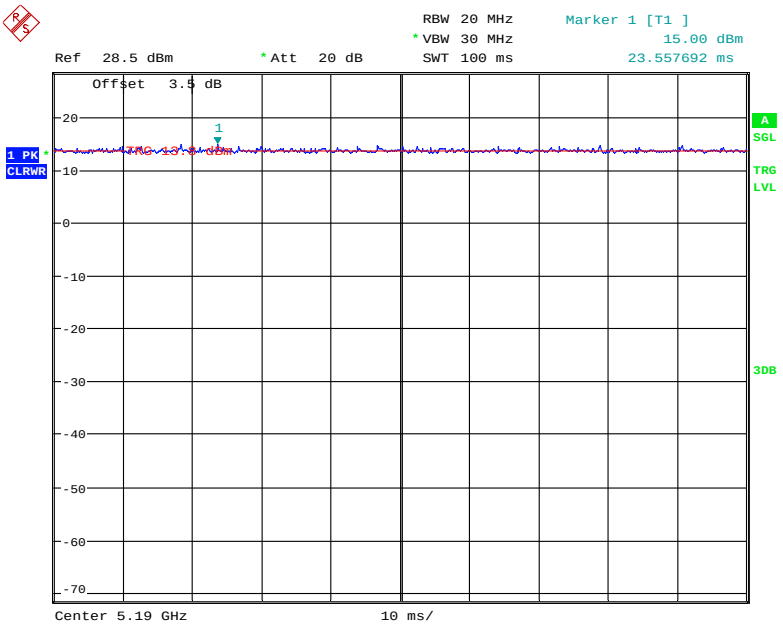
802.11n40 mode



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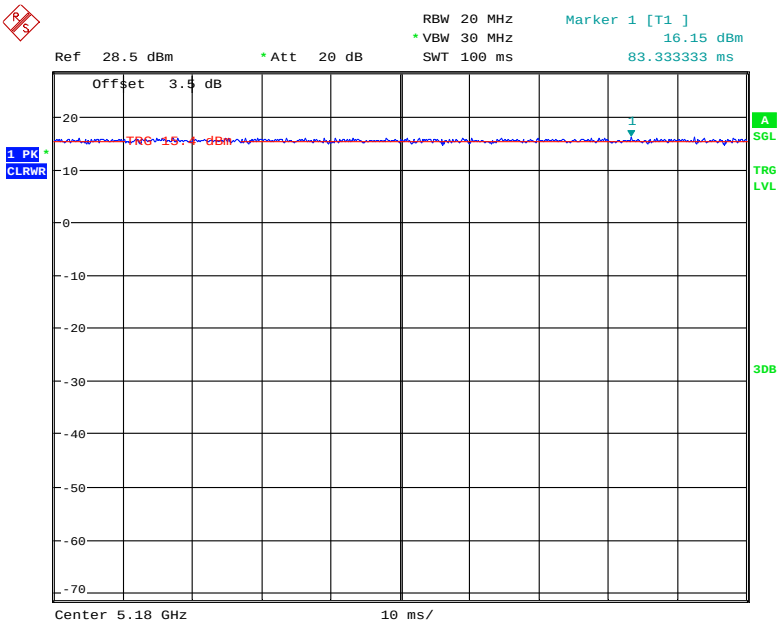
802.11ac20 Mode



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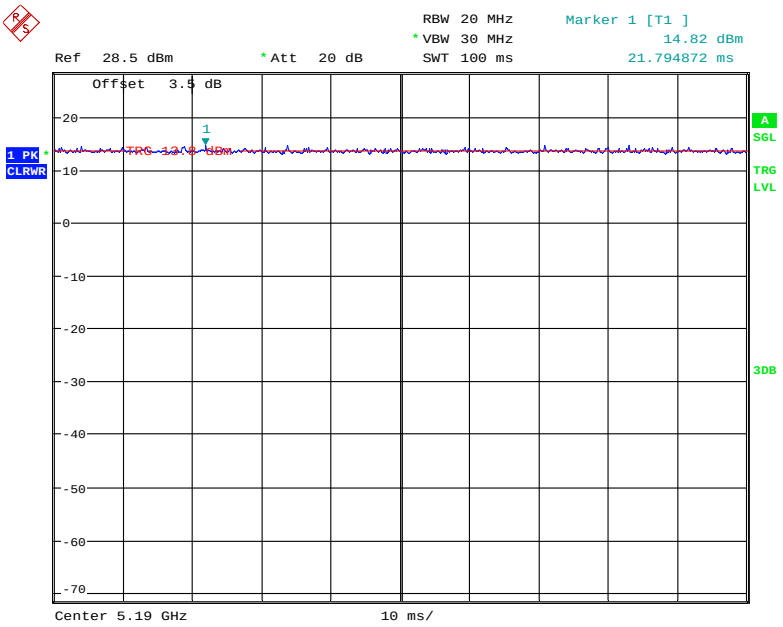

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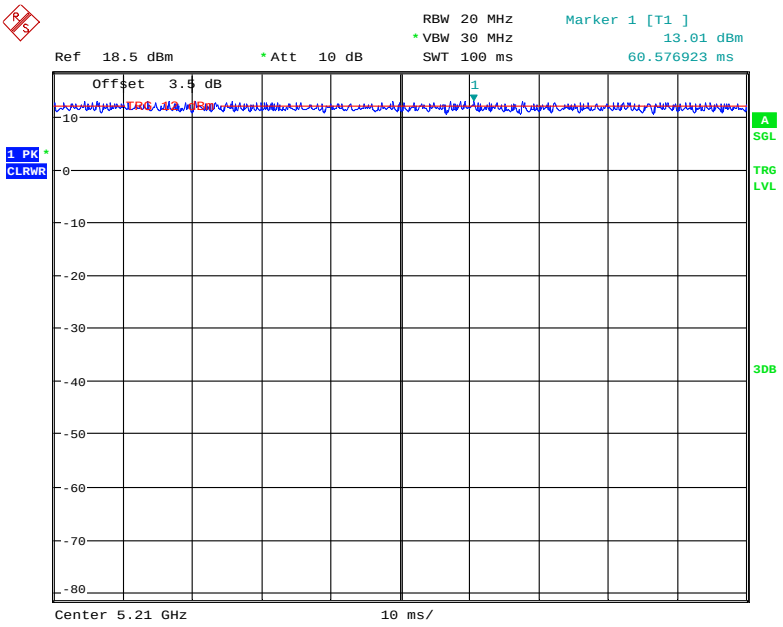
802.11ac80 Mode



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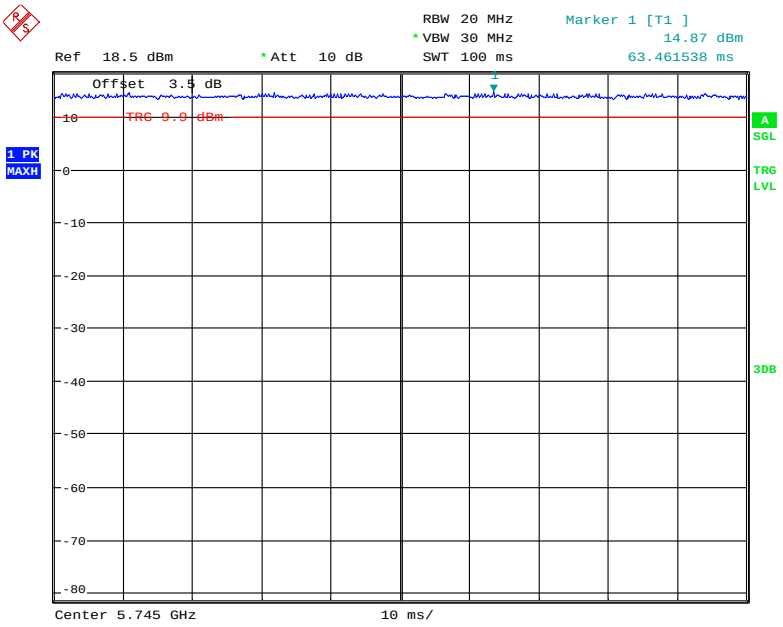
5725 – 5850MHz

802.11a mode



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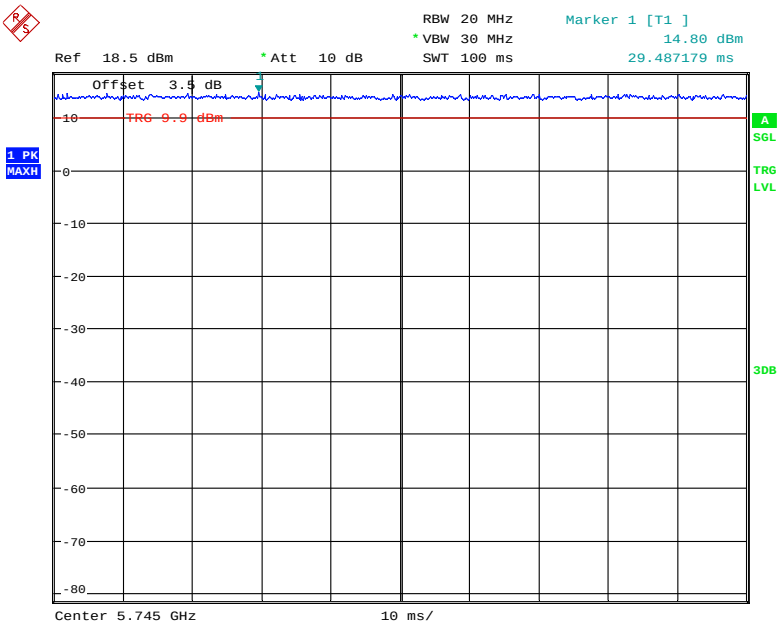
802.11n20 mode



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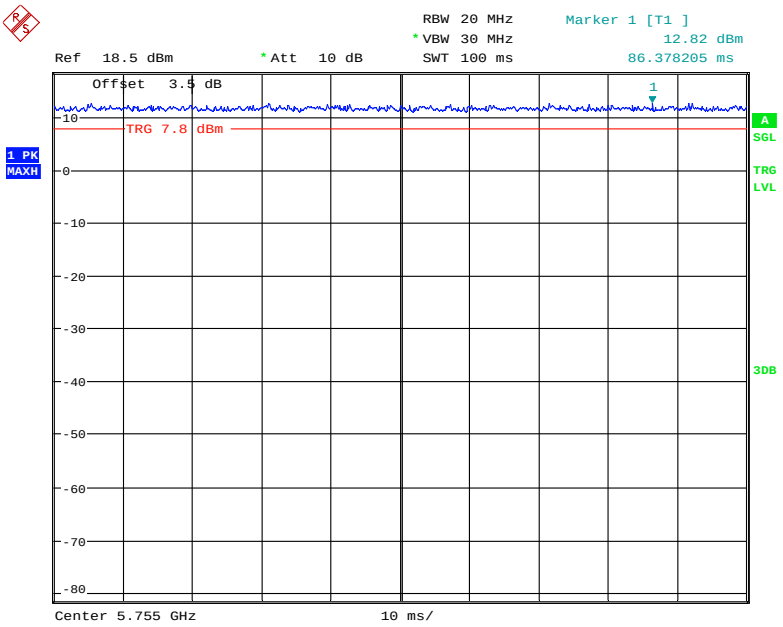
802.11n40 mode



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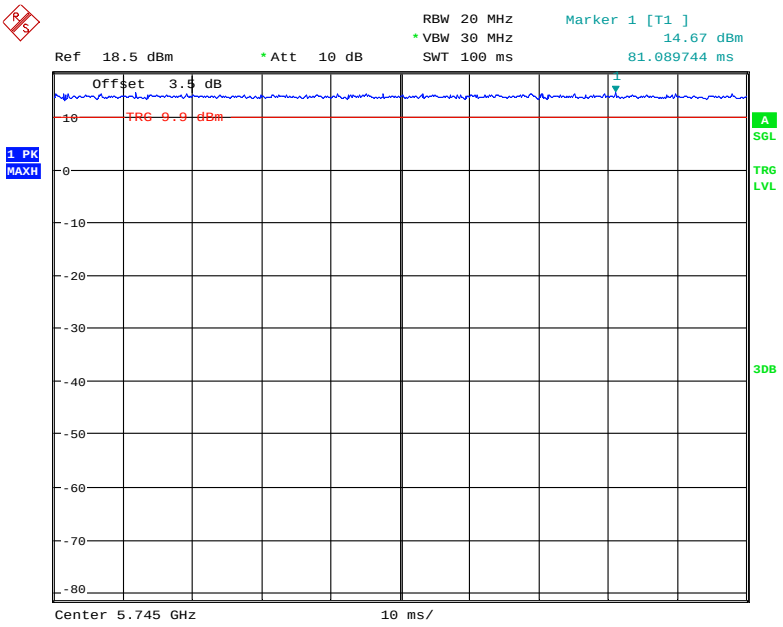

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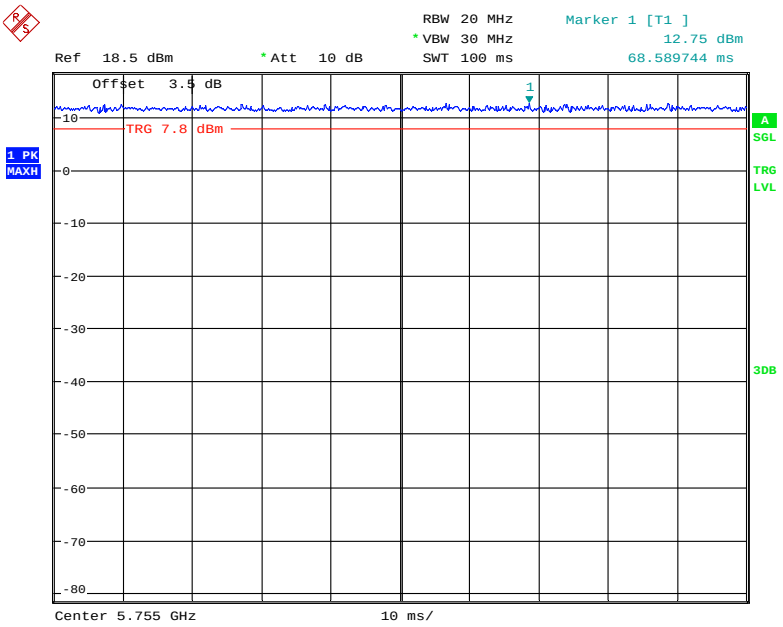

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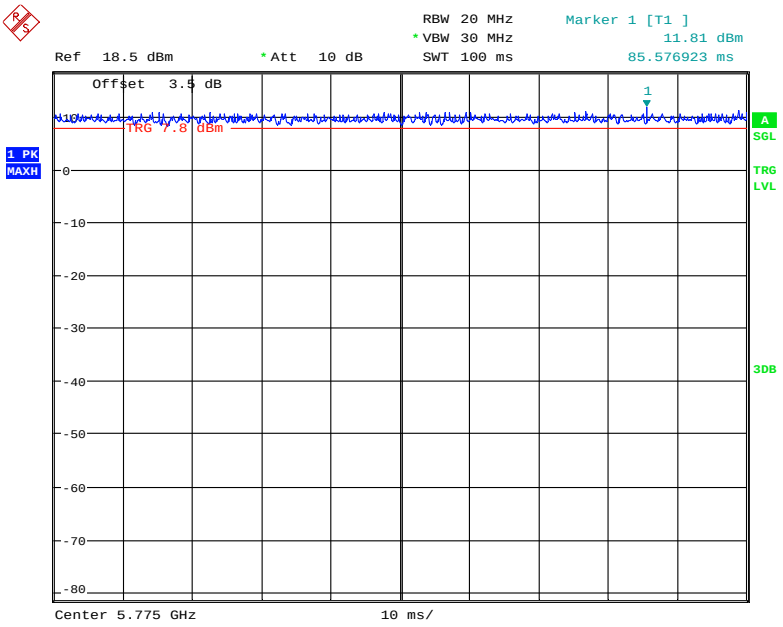
802.11ac80 Mode



Date: 5.SEP.2019 15:58:42

Band	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	10log(1/x)
802.11a	100	-	-	10Hz	-
802.11n20	100	-	-	10Hz	-
802.11n40	100	-	-	10Hz	-
802.11ac20	100	-	-	10Hz	-
802.11ac40	100	-	-	10Hz	-
802.11ac80	100	-	-	10Hz	-

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

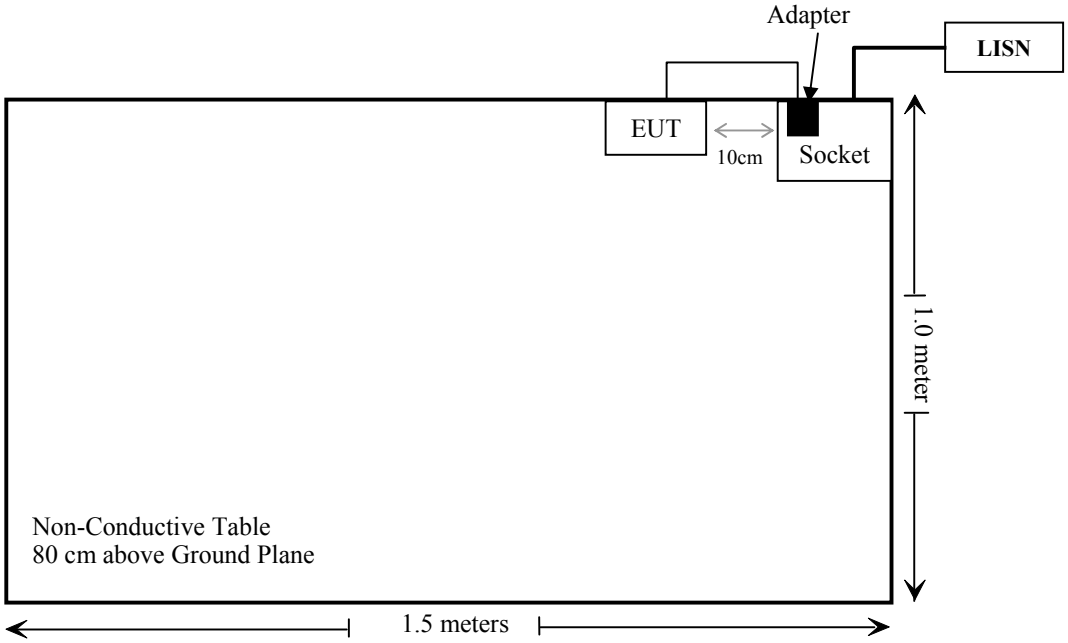
Manufacturer	Description	Model	Serial Number
Dongguan Aohai Power Technology Co.,Ltd	Adapter	A8-501000	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielded detachable USB Cable	1.0	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 , §2.1093	RF Exposure (SAR)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (1), (4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b) (1),(4)	Out Of Band Emission	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a)(1),(3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1),(3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2019-07-11	2020-07-11
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-01
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1-0720-504504	2018-11-12	2019-11-12
Radiated Emission Test					
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019-07-22	2020-07-21
Agilent	Spectrum Analyzer	8564E	3943A01781	2019-03-02	2020-03-01
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2019-07-09	2020-07-08
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun Technologies	RF Cable	RG-214	1	2019-05-21	2019-11-19
Ducommun Technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-03	2016-11-18	2019-11-18
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-11-12	2019-11-12
Un-known	Band Reject Filter	BSF5150-5850MN-0899-004	Un-known	2018-11-12	2019-11-12

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200120	2019-03-02	2020-03-01
Agilent	USB wideband power meter	U2021XA	MY54250003	2019-07-10	2020-07-09
Ducommun Technologies	RF Cable	RG-214	3	Each Time	
WEINSCHEL	3dB Attenuator	6231	666	Each Time	

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ190723002-SAA.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

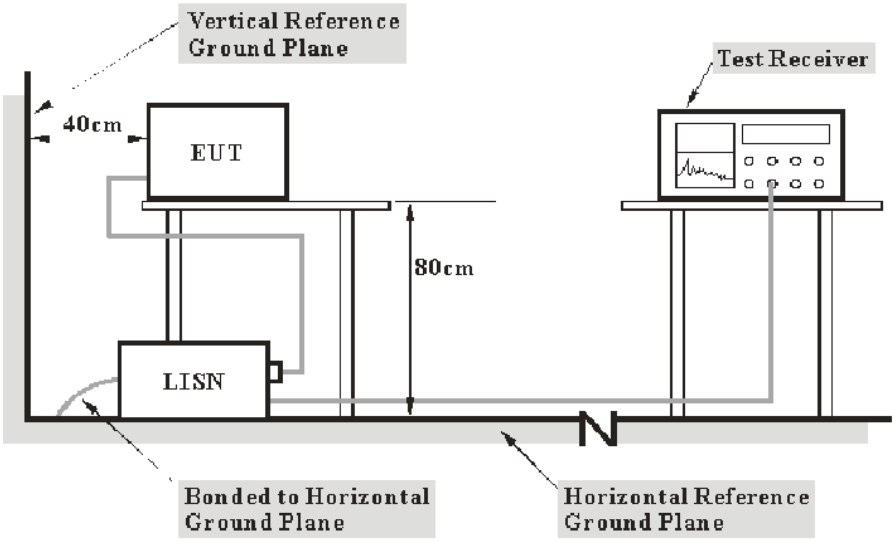
Result: Compliance.

FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Results Summary

According to the EUT complied with the FCC Part 15.207.

Test Data

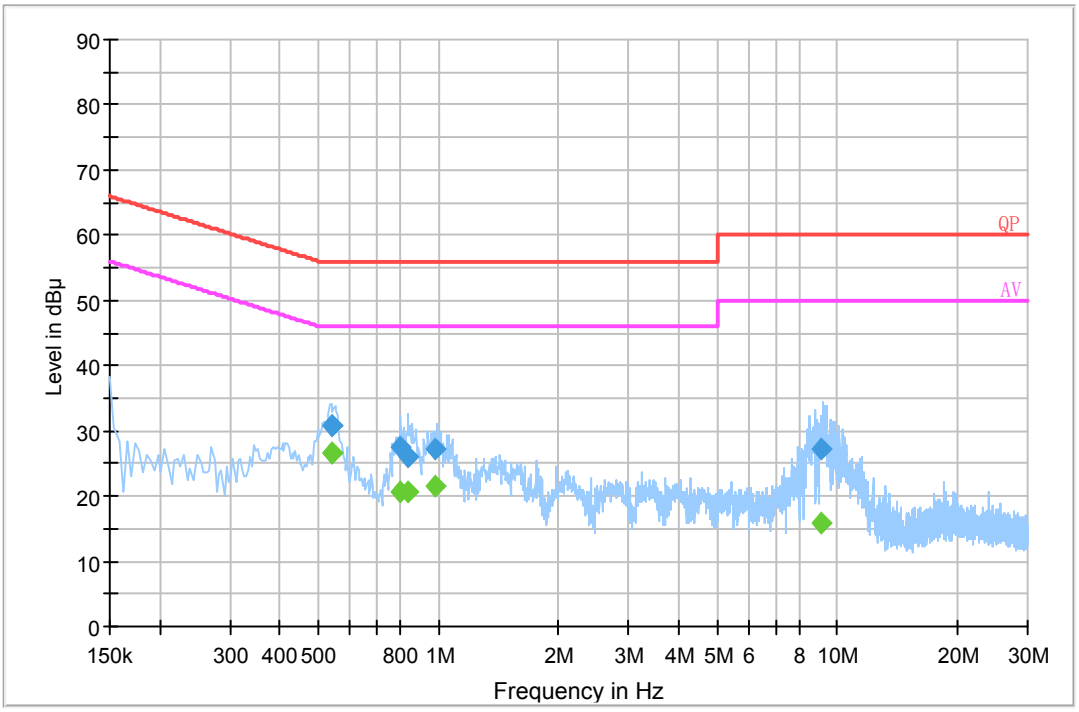
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Kiki Geng on 2019-08-14.

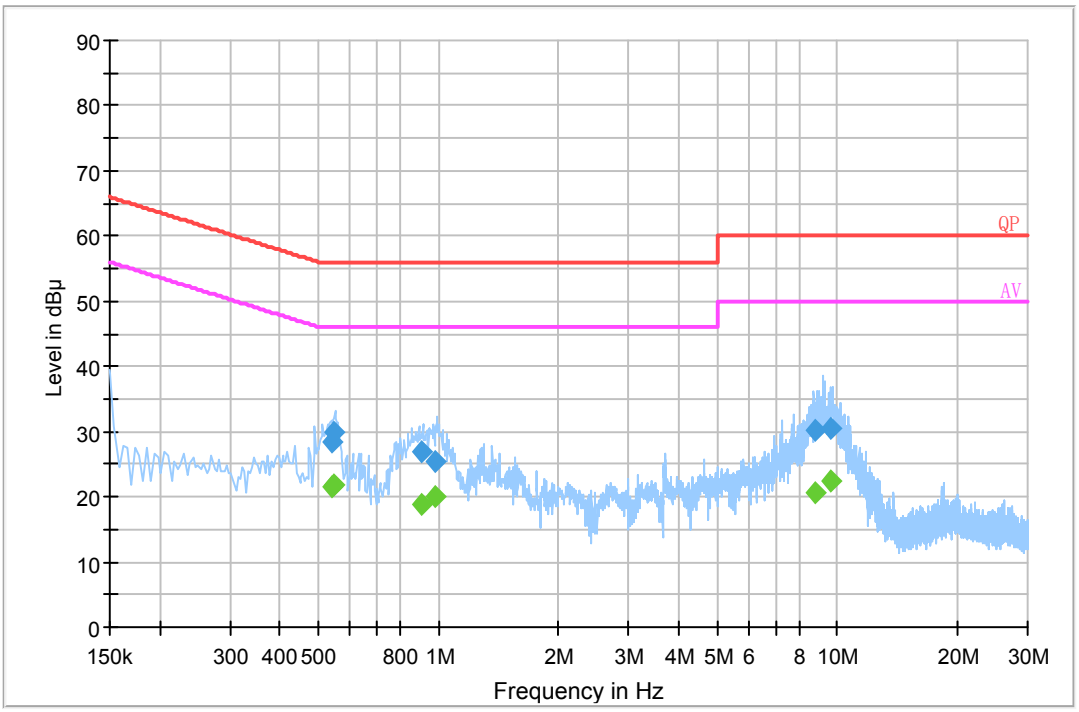
EUT operation mode: Transmitting (worst case is 802.11a mode 5180 MHz)

AC 120V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.541930	30.7	19.8	56.0	25.3	QP
0.542010	30.8	19.8	56.0	25.2	QP
0.805910	27.4	19.8	56.0	28.6	QP
0.837430	26.0	19.8	56.0	30.0	QP
0.983090	27.1	19.9	56.0	28.9	QP
9.103970	27.2	20.0	60.0	32.8	QP
0.541930	26.6	19.8	46.0	19.4	Ave.
0.542010	26.6	19.8	46.0	19.4	Ave.
0.805910	20.6	19.8	46.0	25.4	Ave.
0.837430	20.6	19.8	46.0	25.4	Ave.
0.983090	21.4	19.9	46.0	24.6	Ave.
9.103970	15.7	20.0	50.0	34.3	Ave.

AC120V, 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.541990	28.5	19.8	56.0	27.5	QP
0.549750	30.0	19.8	56.0	26.0	QP
0.907410	27.0	19.7	56.0	29.0	QP
0.979090	25.5	19.8	56.0	30.5	QP
8.850630	30.2	19.9	60.0	29.8	QP
9.597490	30.6	20.0	60.0	29.4	QP
0.541990	21.4	19.8	46.0	24.6	Ave.
0.549750	21.8	19.8	46.0	24.2	Ave.
0.907410	18.8	19.7	46.0	27.2	Ave.
0.979090	20.0	19.8	46.0	26.0	Ave.
8.850630	20.7	19.9	50.0	29.3	Ave.
9.597490	22.3	20.0	50.0	27.7	Ave.

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

§15.205 & §15.209 & §15.407(B) (1), (4), (6), (7) – UNDESIRABLE EMISSION

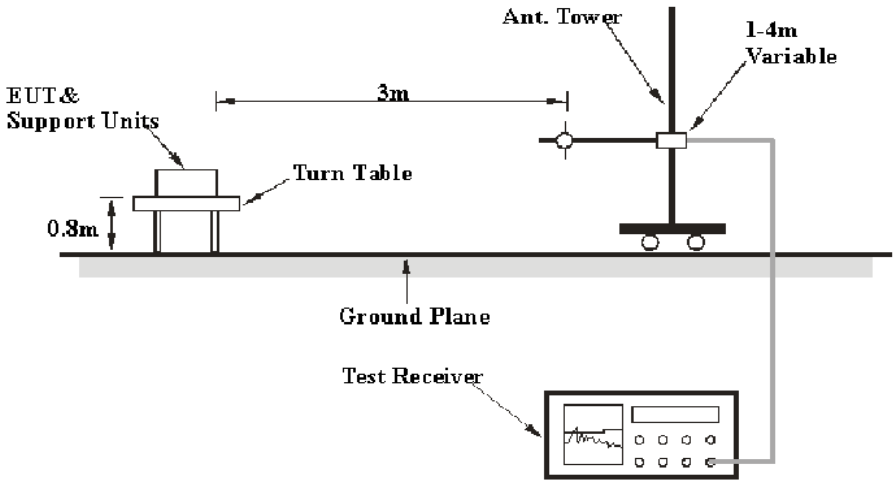
Applicable Standard

FCC §15.407 (b) (1), (4), (6), (7); §15.209; §15.205;

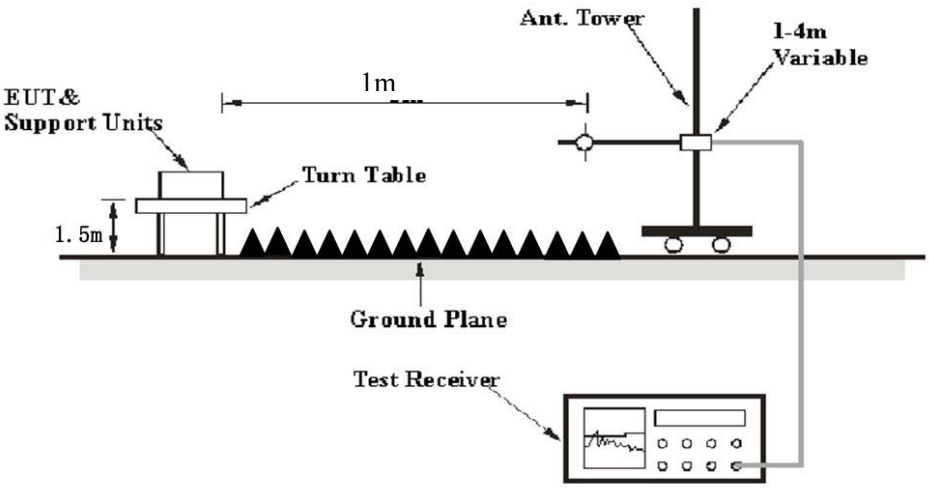
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

Radiated Spurious Emission

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Average detection modes for frequencies above 1GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart E, section 15.205, 15.209 and 15.407 rules.

Test Data

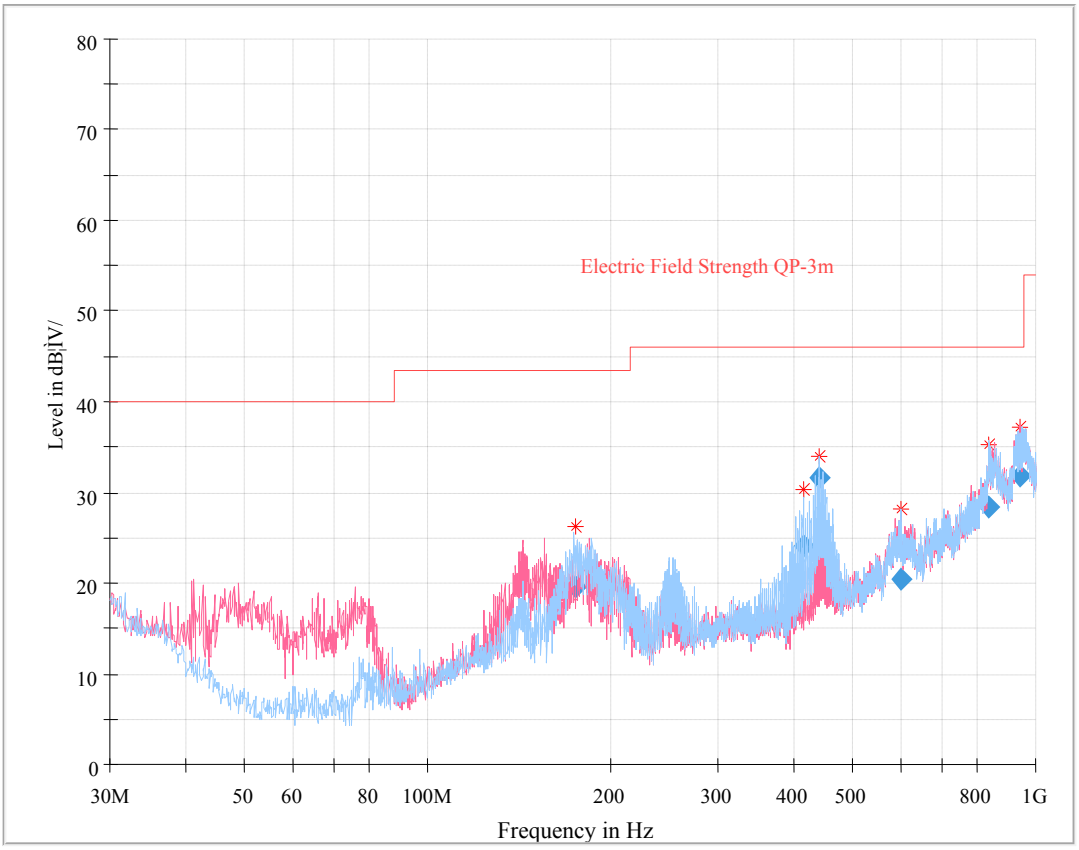
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Steve Lan on 2019-08-14 for below 1G and Curry Xiang on 2019-08-29 for above 1G.

EUT operation mode: Transmitting

30 MHz – 1 GHz: *(worst case is 802.11a mode 5180 MHz)*



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
174.808500	19.49	243.0	H	260.0	-15.1	43.50	24.01
416.025625	24.17	122.0	H	93.0	-9.6	46.00	21.83
441.595500	31.60	111.0	H	75.0	-8.6	46.00	14.40
599.017000	20.41	324.0	H	300.0	-1.6	46.00	25.59
838.337125	28.36	277.0	H	148.0	5.8	46.00	17.64
940.478250	31.89	158.0	V	292.0	8.9	46.00	14.11

1GHz ~ 40 GHz:

The test distance is 1m, so the limit was added the factor -20lg(3/1)=9.5dB

5150-5250 MHz:

802.11a mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
5180 MHz									
5125.14	31.59	PK	240	2.0	V	38.36	69.95	83.5	13.55
5125.14	16.74	Ave.	240	2.0	V	38.36	55.10	63.5	8.40
5420.60	32.18	PK	288	2.3	V	39.19	71.37	83.5	12.13
5420.60	17.12	Ave.	288	2.3	V	39.19	56.31	63.5	7.19
10360.00	41.90	PK	69	1.6	V	17.42	59.32	77.7	18.38
5200 MHz									
10400.00	40.78	PK	127	1.9	V	17.52	58.30	77.7	19.40
5240 MHz									
5081.30	31.75	PK	120	1.5	V	38.26	70.01	83.5	13.49
5081.30	16.52	Ave.	120	1.5	V	38.26	54.78	63.5	8.72
5401.18	31.51	PK	250	1.7	V	39.19	70.70	83.5	12.80
5401.18	16.22	Ave.	250	1.7	V	39.19	55.41	63.5	8.09
10480.00	41.84	PK	6	1.0	V	17.25	59.09	77.7	18.61

802.11n20 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
5180 MHz									
5140.33	30.87	PK	132	2.1	V	38.36	69.23	83.5	14.27
5140.33	16.54	Ave.	132	2.1	V	38.36	54.90	63.5	8.60
5449.25	31.28	PK	174	1.6	V	39.29	70.57	83.5	12.93
5449.25	16.91	Ave.	174	1.6	V	39.29	56.20	63.5	7.30
10360.00	41.31	PK	37	1.1	V	17.42	58.73	77.7	18.97
5200 MHz									
10400.00	41.58	PK	292	1.4	V	17.52	59.10	77.7	18.60
5240 MHz									
5143.62	30.95	PK	70	1.4	V	38.36	69.31	83.5	14.19
5143.62	16.40	Ave.	70	1.4	V	38.36	54.76	63.5	8.74
5365.84	30.76	PK	74	1.2	V	39.09	69.85	83.5	13.65
5365.84	16.52	Ave.	74	1.2	V	39.09	55.61	63.5	7.89
10480.00	41.24	PK	351	1.5	V	17.25	58.49	77.7	19.21

802.11n40 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5190 MHz									
5133.72	31.90	PK	149	2.2	V	38.36	70.26	83.5	13.24
5133.72	17.12	Ave.	149	2.2	V	38.36	55.48	63.5	8.02
5451.60	30.41	PK	294	2.2	V	39.37	69.78	83.5	13.72
5451.60	16.38	Ave.	294	2.2	V	39.37	55.75	63.5	7.75
10380.00	41.07	PK	140	1.1	V	17.42	58.49	77.7	19.21
5230 MHz									
5119.21	31.01	PK	12	1.8	V	38.36	69.37	83.5	14.13
5119.21	16.87	Ave.	12	1.8	V	38.36	55.23	63.5	8.27
5411.30	30.03	PK	341	1.1	V	39.19	69.22	83.5	14.28
5411.30	16.25	Ave.	341	1.1	V	39.19	55.44	63.5	8.06
10460.00	40.58	PK	249	1.4	V	17.15	57.73	77.7	19.97

802.11ac20 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5180 MHz									
5098.88	32.16	PK	354	1.8	V	38.26	70.42	83.5	13.08
5098.88	17.56	Ave.	354	1.8	V	38.26	55.82	63.5	7.68
5438.75	31.89	PK	179	2.2	V	39.29	71.18	83.5	12.32
5438.75	16.84	Ave.	179	2.2	V	39.29	56.13	63.5	7.37
10360.00	41.41	PK	17	1.4	V	17.42	58.83	77.7	18.87
5200 MHz									
10400.00	40.97	PK	269	1.7	V	17.52	58.49	77.7	19.21
5240 MHz									
5085.15	31.54	PK	74	1.3	V	38.26	69.80	83.5	13.70
5085.15	16.81	Ave.	74	1.3	V	38.26	55.07	63.5	8.43
5434.93	31.47	PK	213	1.7	V	39.29	70.76	83.5	12.74
5434.93	16.53	Ave.	213	1.7	V	39.29	55.82	63.5	7.68
10480.00	41.53	PK	27	1.1	V	17.25	58.78	77.7	18.92

802.11ac40 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5190 MHz									
5121.02	31.23	PK	157	1.7	V	38.36	69.59	83.5	13.91
5121.02	16.53	Ave.	157	1.7	V	38.36	54.89	63.5	8.61
5439.83	30.26	PK	59	1.4	V	39.29	69.55	83.5	13.95
5439.83	16.11	Ave.	59	1.4	V	39.29	55.40	63.5	8.10
10380.00	41.36	PK	239	2.4	V	17.42	58.78	77.7	18.92
5230 MHz									
5080.21	31.61	PK	286	1.5	V	38.26	69.87	83.5	13.63
5080.21	16.73	Ave.	286	1.5	V	38.26	54.99	63.5	8.51
5396.88	30.15	PK	118	1.3	V	39.19	69.34	83.5	14.16
5396.88	16.12	Ave.	118	1.3	V	39.19	55.31	63.5	8.19
10460.00	41.01	PK	124	1.5	V	17.15	58.16	77.7	19.54

802.11ac80 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5210 MHz									
5136.03	30.98	PK	133	1.6	V	38.36	69.34	83.5	14.16
5136.03	16.28	Ave.	133	1.6	V	38.36	54.64	63.5	8.86
5442.41	30.76	PK	74	1.6	V	39.29	70.05	83.5	13.45
5442.41	16.20	Ave.	74	1.6	V	39.29	55.49	63.5	8.01
10420.00	40.68	PK	274	2.0	V	17.52	58.20	77.7	19.50

5725-5850 MHz:

802.11a mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
5745 MHz									
5699.81	31.67	PK	267	1.6	V	39.49	71.16	114.56	43.40
5711.91	32.30	PK	267	1.6	V	39.49	71.79	118.03	46.24
5724.67	36.46	PK	315	1.3	V	39.49	75.95	130.95	55.00
5851.66	32.20	PK	315	1.3	V	39.87	72.07	127.92	55.85
11490.00	41.03	PK	45	1.2	V	17.47	58.50	83.5	25.00
11490.00	27.14	Ave.	45	1.2	V	17.47	44.61	63.5	18.89
5785 MHz									
11570.00	41.62	PK	347	1.1	V	17.51	59.13	83.5	24.37
11570.00	27.78	Ave.	347	1.1	V	17.51	45.29	63.5	18.21
5825 MHz									
5724.00	31.66	PK	195	2.1	V	39.49	71.15	129.42	58.27
5854.65	32.57	PK	195	2.1	V	39.87	72.44	121.1	48.66
5866.99	32.09	PK	276	1.4	V	39.87	71.96	116.94	44.98
5889.21	33.06	PK	276	1.4	V	39.87	72.93	104.18	31.25
11650.00	41.65	PK	49	2.0	V	16.18	57.83	83.5	25.67
11650.00	27.96	Ave.	49	2.0	V	16.18	44.14	63.5	19.36

802.11n20 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
5745 MHz									
5689.47	31.62	PK	340	2.2	V	39.49	71.11	106.91	35.80
5714.60	32.61	PK	340	2.2	V	39.49	72.10	118.79	46.69
5724.00	32.34	PK	90	1.7	V	39.49	71.83	129.42	57.59
5853.35	31.92	PK	90	1.7	V	39.87	71.79	124.06	52.27
11490.00	42.24	PK	115	1.3	V	17.47	59.71	83.5	23.79
11490.00	27.89	Ave.	285	1.4	V	17.47	45.36	63.5	18.14
5785 MHz									
11570.00	41.38	PK	32	1.1	V	17.51	58.89	83.5	24.61
11570.00	27.16	Ave.	32	1.1	V	17.51	44.67	63.5	18.83
5825 MHz									
5724.06	32.84	PK	128	1.1	V	55.25	88.09	129.56	41.47
5850.95	33.09	PK	128	1.1	V	42.76	75.85	129.53	53.68
5869.05	33.61	PK	25	1.7	V	42.76	76.37	116.37	40.00
5920.33	32.16	PK	25	1.7	V	42.86	75.02	81.16	6.14
11650.00	41.82	PK	58	1.6	V	16.18	58.00	83.5	25.50
11650.00	27.22	Ave.	58	1.6	V	16.18	43.40	63.5	20.10

802.11n40 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
5755 MHz									
5657.48	31.55	PK	299	1.4	V	39.49	71.04	83.24	12.20
5717.78	31.80	PK	299	1.4	V	39.49	71.29	119.68	48.39
5724.88	32.03	PK	332	1.2	V	39.49	71.52	131.43	59.91
5850.18	32.29	PK	332	1.2	V	39.87	72.16	131.29	59.13
11510.00	41.87	PK	323	1.2	V	17.47	59.34	83.5	24.16
11510.00	27.31	Ave.	323	1.2	V	17.47	44.78	63.5	18.72
5795 MHz									
5722.37	31.22	PK	75	1.5	V	39.49	70.71	125.7	54.99
5852.06	33.44	PK	75	1.5	V	39.87	73.31	127	53.69
5872.75	32.44	PK	96	1.6	V	39.87	72.31	115.33	43.02
5887.98	32.55	PK	96	1.6	V	39.87	72.42	105.09	32.67
11590.00	41.63	PK	23	1.8	V	17.51	59.14	83.5	24.36
11590.00	27.44	Ave.	23	1.8	V	17.51	44.95	63.5	18.55

802.11ac20 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
5745 MHz									
5698.51	32.12	PK	87	1.3	V	39.49	71.61	113.6	41.99
5716.25	31.13	PK	87	1.3	V	39.49	70.62	119.25	48.63
5721.50	31.71	PK	207	1.4	V	39.49	71.20	123.72	52.52
5851.37	32.02	PK	207	1.4	V	39.87	71.89	128.58	56.69
11490.00	40.27	PK	340	2.2	V	17.47	57.74	83.5	25.76
11490.00	27.33	Ave.	351	1.4	V	17.47	44.80	63.5	18.70
5785 MHz									
11570.00	41.51	PK	73	1.7	V	17.51	59.02	83.5	24.48
11570.00	27.77	Ave.	73	1.7	V	17.51	45.28	63.5	18.22
5825 MHz									
5721.59	31.93	PK	247	2.4	V	39.49	71.42	123.93	52.51
5851.68	32.45	PK	247	2.4	V	39.87	72.32	127.87	55.55
5864.07	32.08	PK	20	2.1	V	39.87	71.95	117.7	45.75
5903.83	32.05	PK	20	2.1	V	39.87	71.92	93.37	21.45
11650.00	40.97	PK	75	1.6	V	16.18	57.15	83.5	26.35
11650.00	27.13	Ave.	75	1.6	V	16.18	43.31	63.5	20.19

802.11ac40 mode

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5755 MHz									
5690.91	30.78	PK	209	2.5	V	39.49	70.27	107.97	37.70
5715.93	31.20	PK	209	2.5	V	39.49	70.69	119.16	48.47
5720.72	32.16	PK	9	1.0	V	39.49	71.65	121.94	50.29
5852.37	31.18	PK	9	1.0	V	39.87	71.05	126.3	55.25
11510.00	42.15	PK	96	2.2	V	17.47	59.62	83.5	23.88
11510.00	27.26	Ave.	96	2.2	V	17.47	44.73	63.5	18.77
5795 MHz									
5724.37	31.69	PK	65	1.0	V	39.49	71.18	130.26	59.08
5850.06	32.23	PK	65	1.0	V	39.87	72.10	131.56	59.46
5868.90	32.76	PK	324	1.9	V	39.87	72.63	116.41	43.78
5914.68	32.07	PK	324	1.9	V	39.87	71.94	85.34	13.40
11590.00	41.23	PK	134	1.3	V	17.51	58.74	83.5	24.76
11590.00	27.11	Ave.	134	1.3	V	17.51	44.62	63.5	18.88

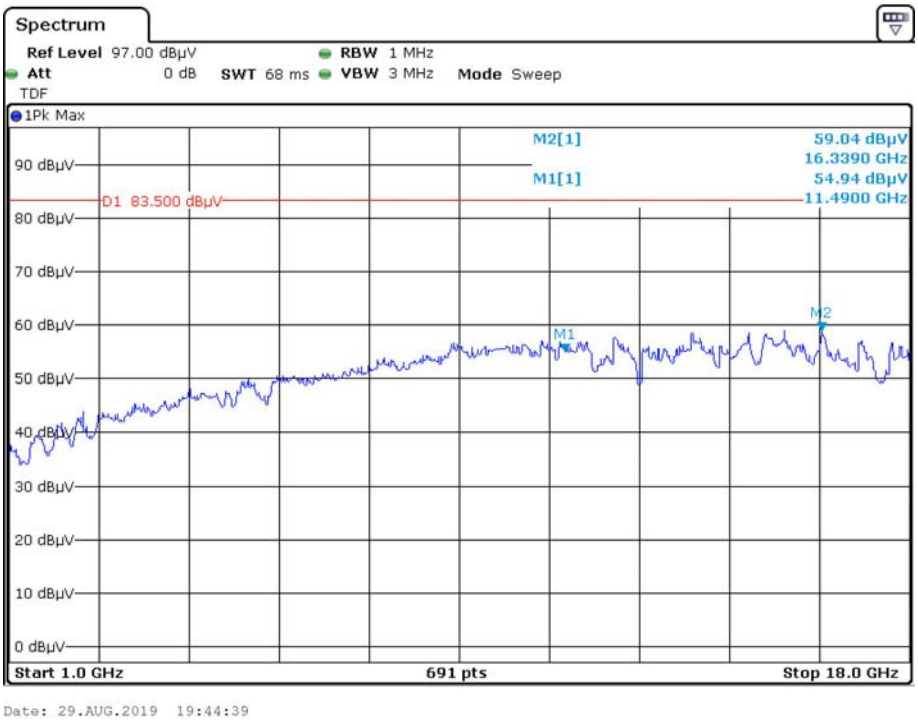
802.11ac80 mode

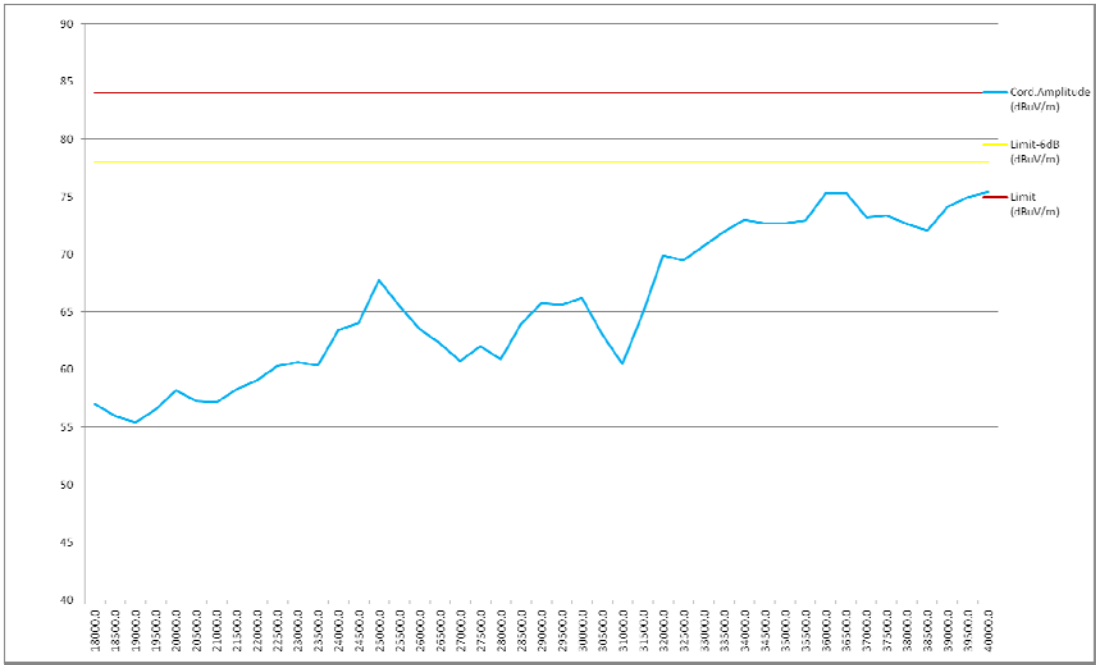
Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5775 MHz									
5722.13	34.56	PK	15	2.1	V	39.49	74.05	125.16	51.11
5850.98	32.82	PK	15	2.1	V	39.87	72.69	129.47	56.78
5874.58	32.91	PK	285	1.2	V	39.87	72.78	114.82	42.04
5890.95	33.09	PK	285	1.2	V	39.87	72.96	102.9	29.94
11550.00	42.13	PK	170	2.5	V	17.51	59.64	83.5	23.86
11550.00	27.68	Ave.	170	2.5	V	17.51	45.19	63.5	18.31

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

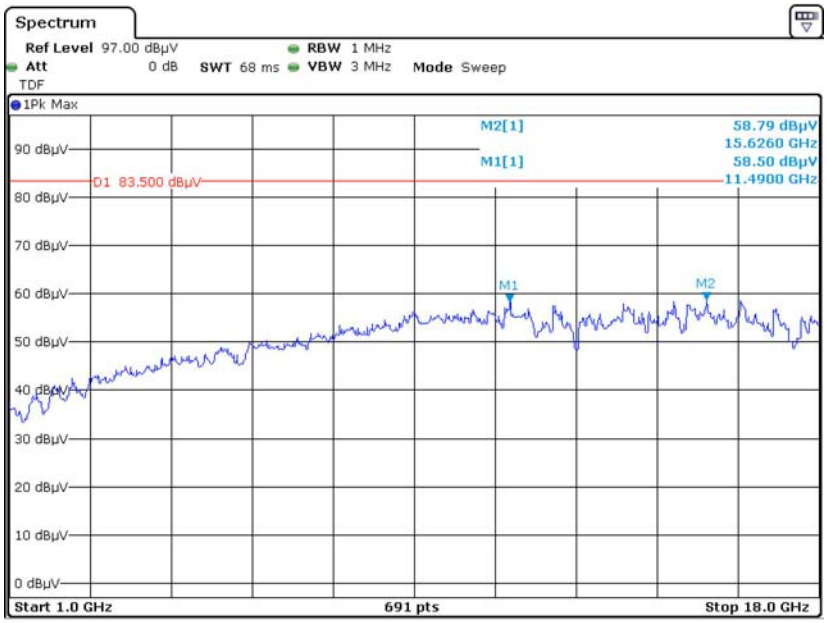
Peak

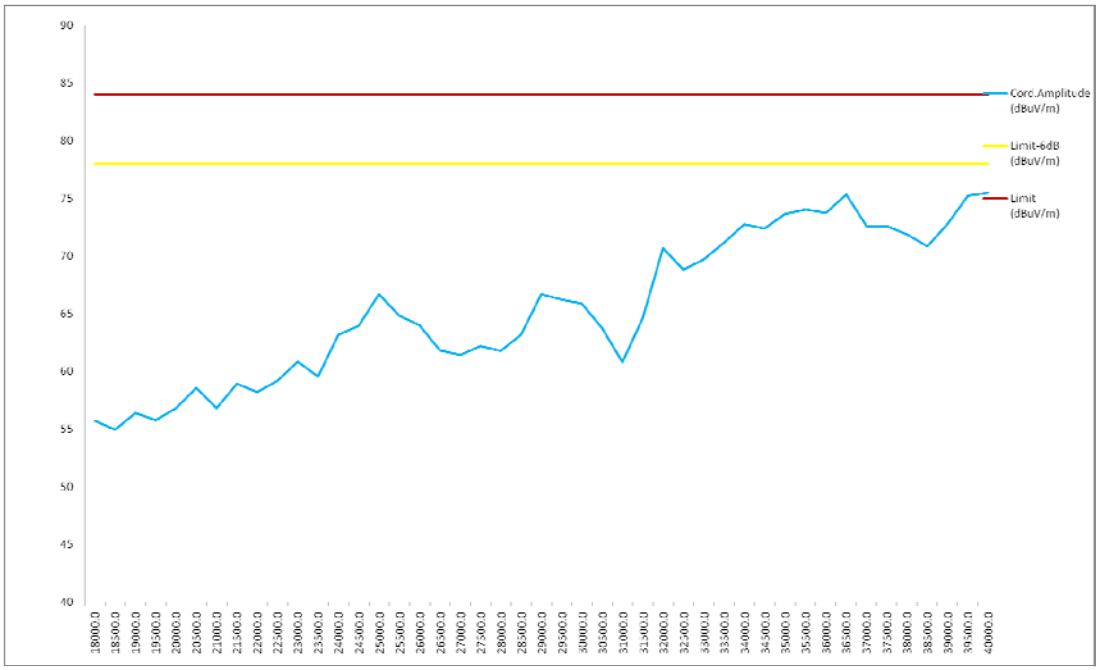
Pre-scan with 802.11a 5745MHz
Horizontal



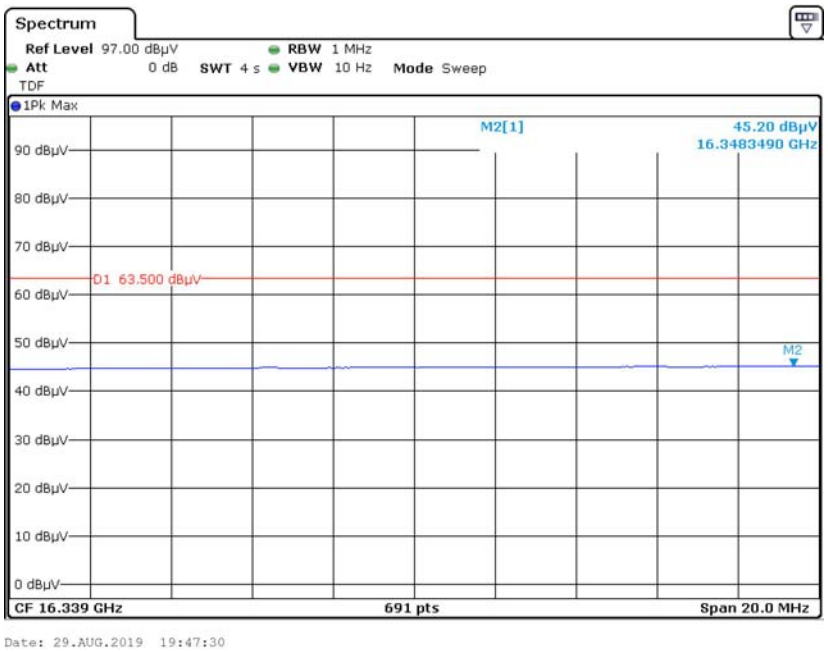


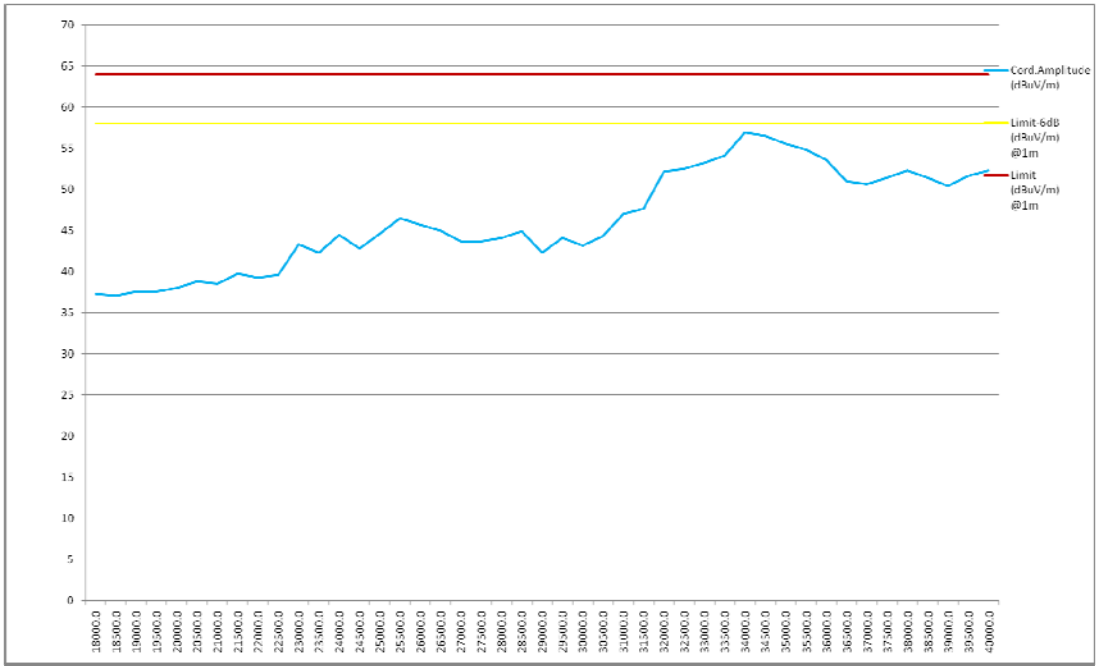
Vertical


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 68 ms
VBW 3 MHz
Mode Sweep
TDF
1Pk Max
M2[1] 58.79 dBµV 15.6260 GHz
M1[1] 58.50 dBµV 11.4900 GHz
D1 83.500 dBµV
90 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
M1
M2
Start 1.0 GHz
691 pts
Stop 18.0 GHz
Date: 29.AUG.2019 19:52:07

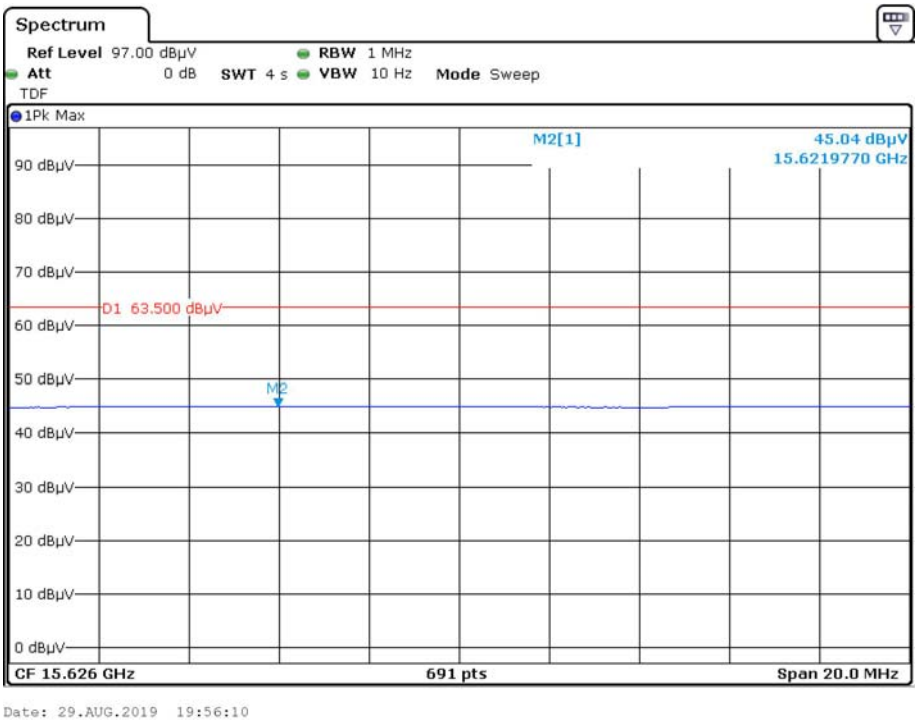

Corr.Amplitude (dBuV/m)
Limit-6dB (dBuV/m)
Limit (dBuV/m)

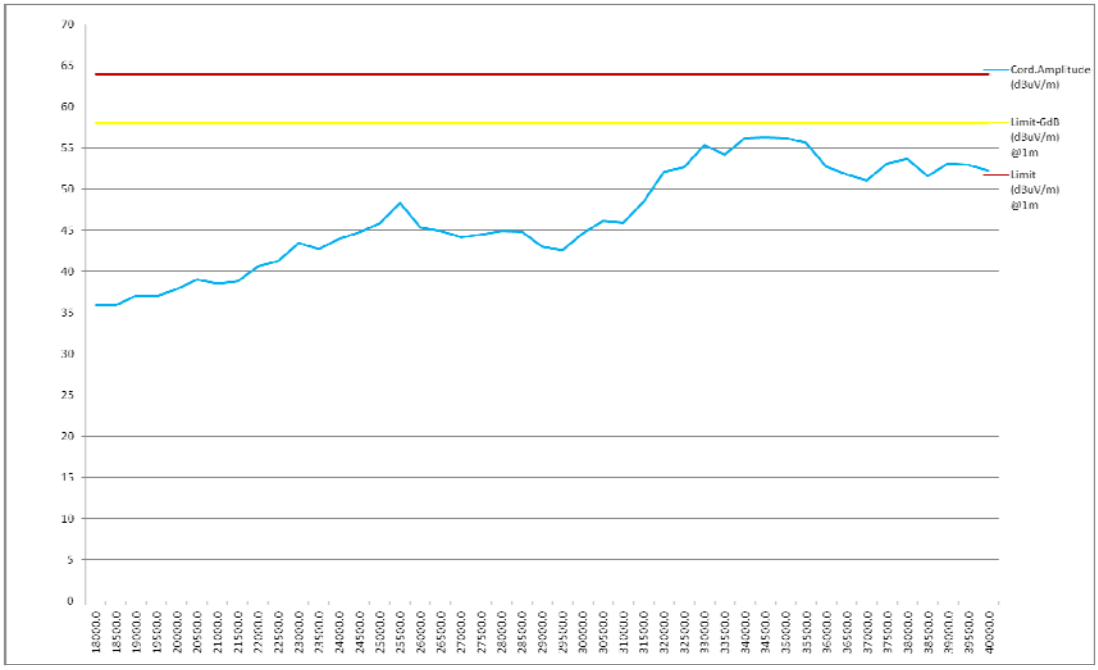
Average
Horizontal





Vertical


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 4 s
VBW 10 Hz
Mode Sweep
TDF
1Pk Max
M2[1]
45.04 dBµV
15.6219770 GHz
90 dBµV
80 dBµV
70 dBµV
D1 63.500 dBµV
60 dBµV
50 dBµV
M2
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 15.626 GHz
691 pts
Span 20.0 MHz
Date: 29.AUG.2019 19:56:10


Cord.Amplitude (d3uV/m)
Limit-6dB (d3uV/m) @1m
Limit (d3uV/m) @1m

FCC §15.407(a) (1) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

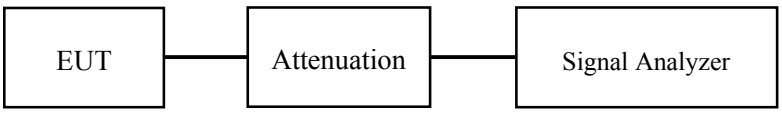
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) 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%.

2. **Minimum Emission Bandwidth for the band 5.725-5.85 GHz**
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by James Fu on 2019-08-16 and 2019-08-17.

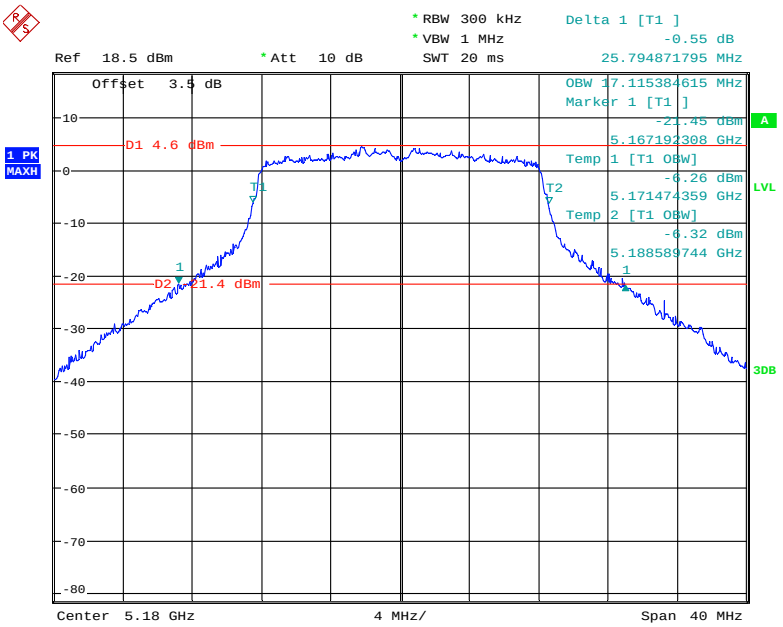
EUT operation mode: Transmitting

Test Result: Pass; please refer to the following tables and plots.

5150 MHz - 5250 MHz:

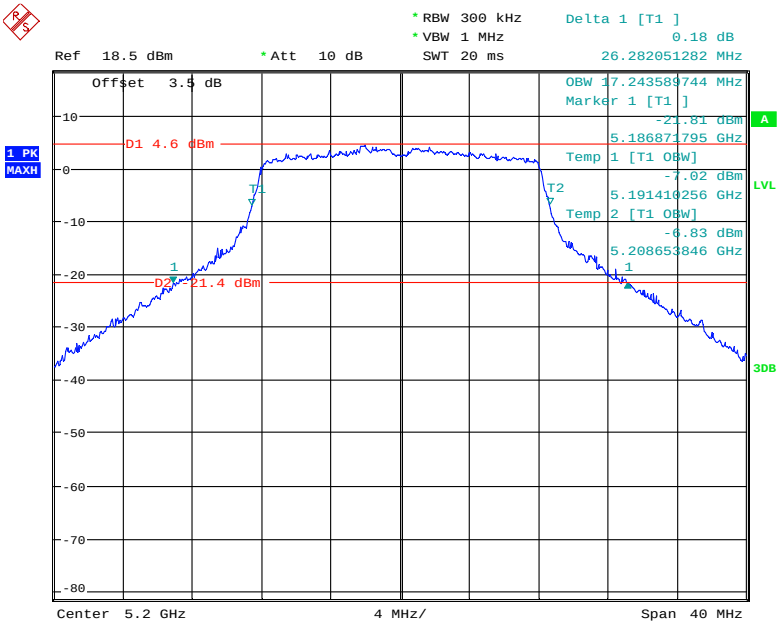
Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Remark
802.11a			No transmitted signal in the 99% bandwidth extends into the U-NII-2A band
5180	25.79	17.12	
5200	26.28	17.24	
5240	25.86	17.24	
802.11n20			
5180	25.14	18.01	
5200	25.82	18.01	
5240	26.73	18.01	
802.11n40			
5190	42.79	36.48	
5230	42.52	36.48	
802.11ac20			
5180	26.91	18.32	
5200	26.06	18.24	
5240	25.95	18.24	
802.11ac40			
5190	42.54	36.64	
5230	42.65	36.48	
802.11ac80			
5210	88.10	76.16	

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5180 MHz



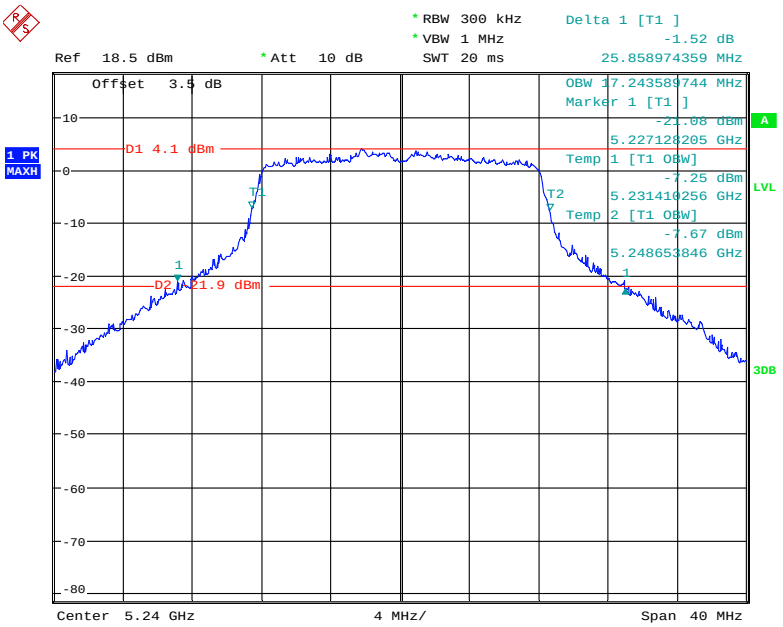
Date: 16.AUG.2019 22:09:45

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5200 MHz



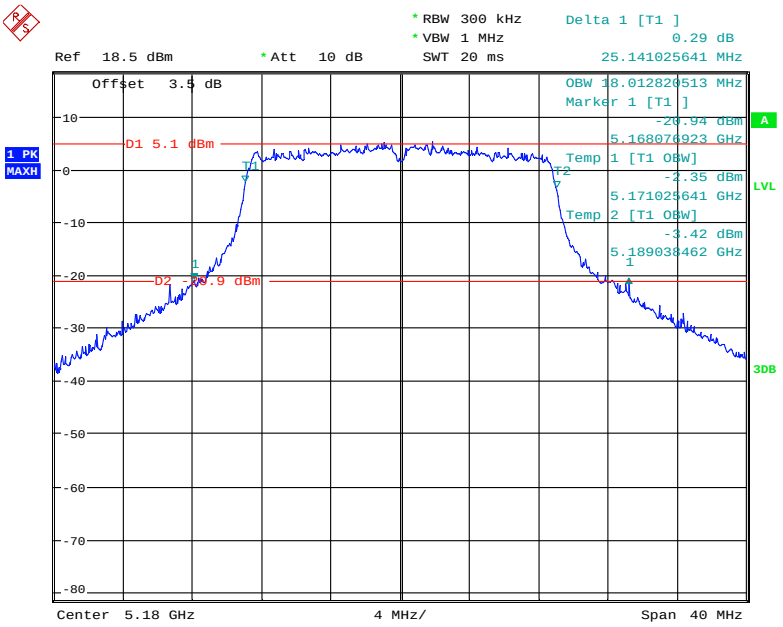
Date: 16.AUG.2019 22:14:32

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5240 MHz



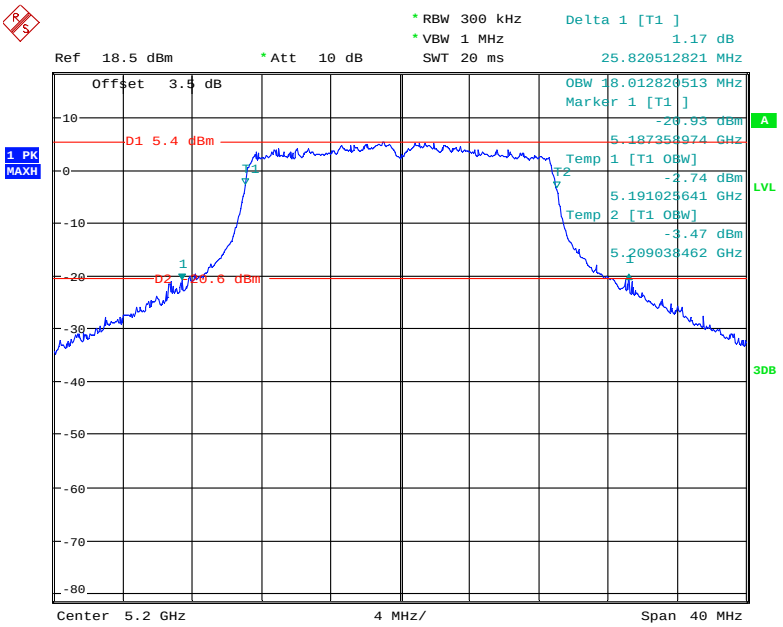
Date: 16.AUG.2019 22:16:10

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5180 MHz



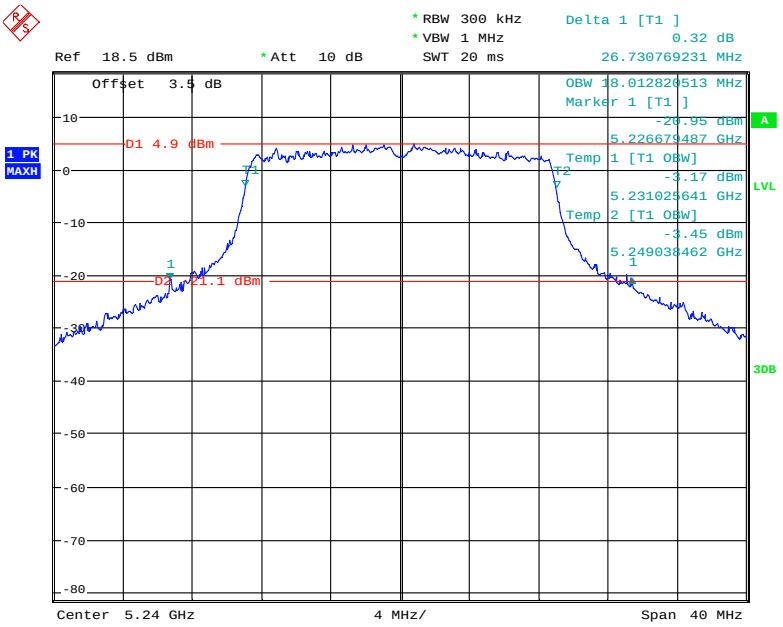
Date: 16.AUG.2019 21:58:49

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5200 MHz



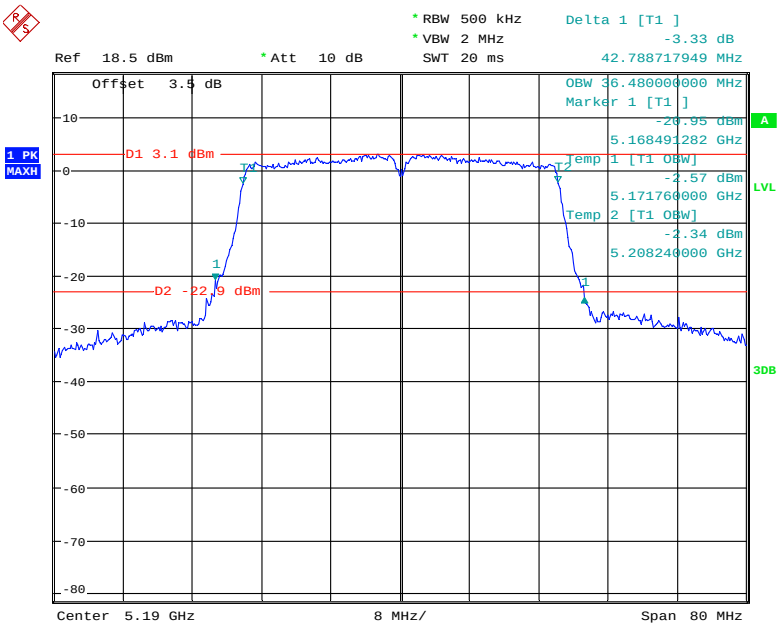
Date: 16.AUG.2019 22:03:36

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5240 MHz



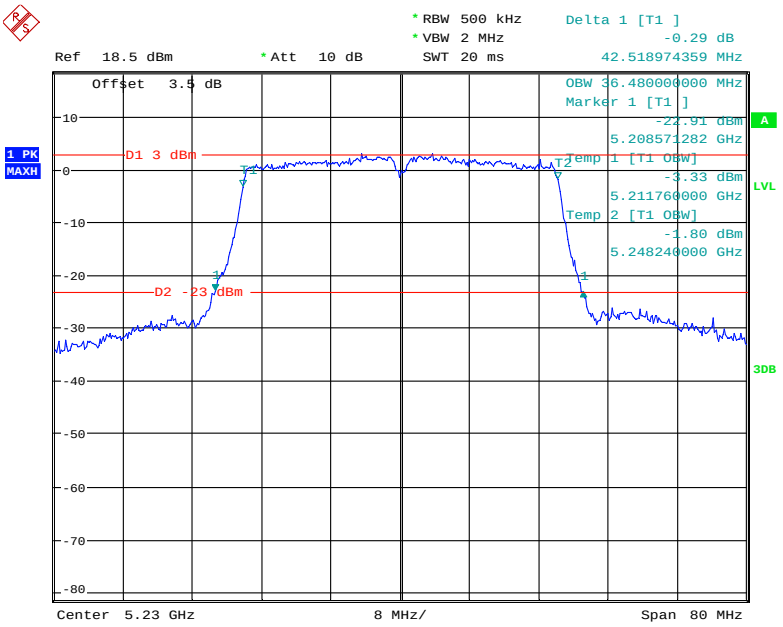
Date: 16.AUG.2019 22:08:23

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5190 MHz



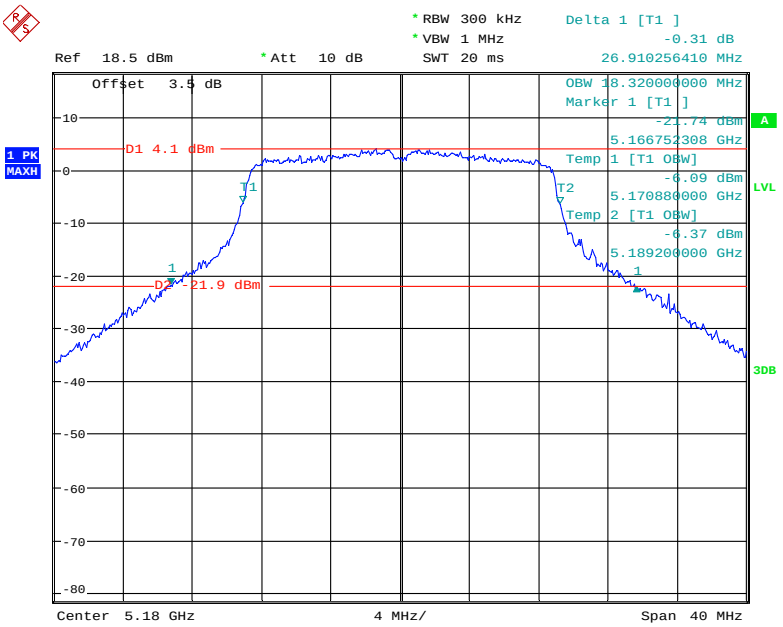
Date: 16.AUG.2019 02:45:46

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5230 MHz



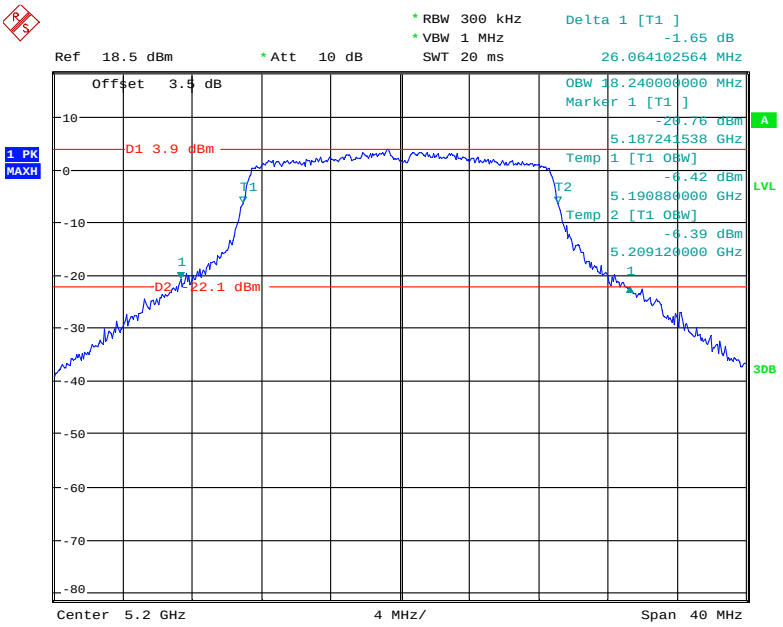
Date: 16.AUG.2019 02:48:26

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5180 MHz



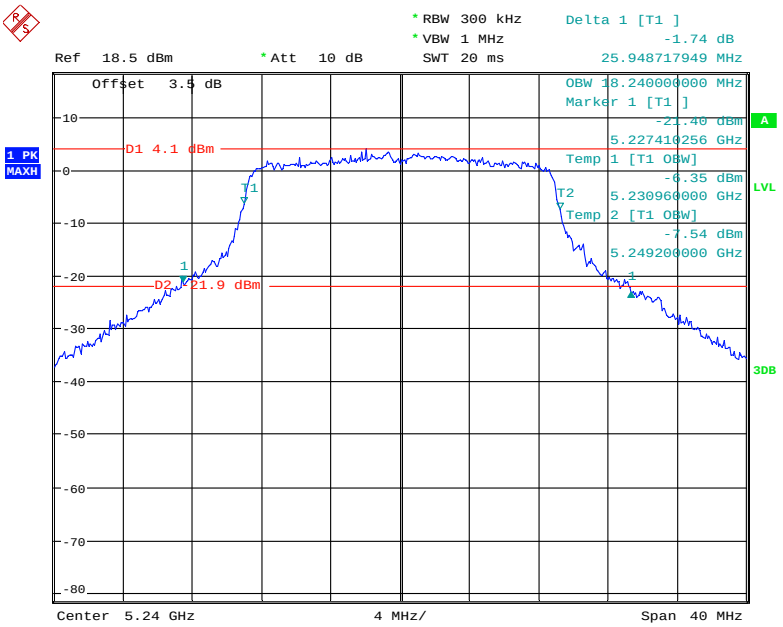
Date: 16.AUG.2019 02:58:46

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5200 MHz



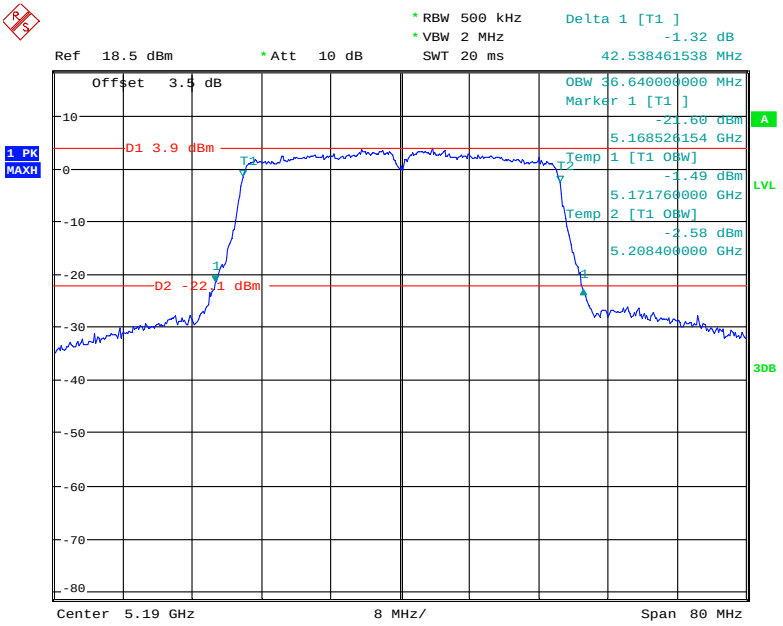
Date: 16.AUG.2019 03:02:56

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5240 MHz



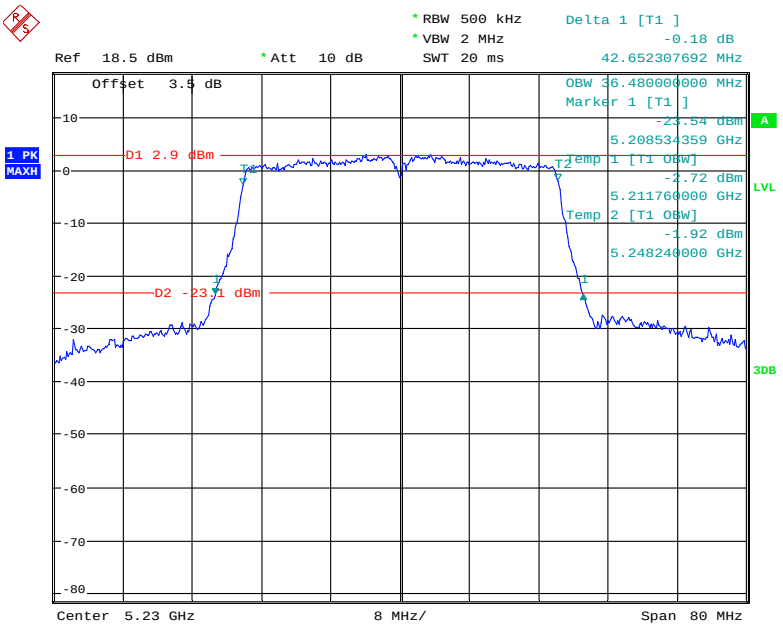
Date: 16.AUG.2019 03:04:43

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5190 MHz



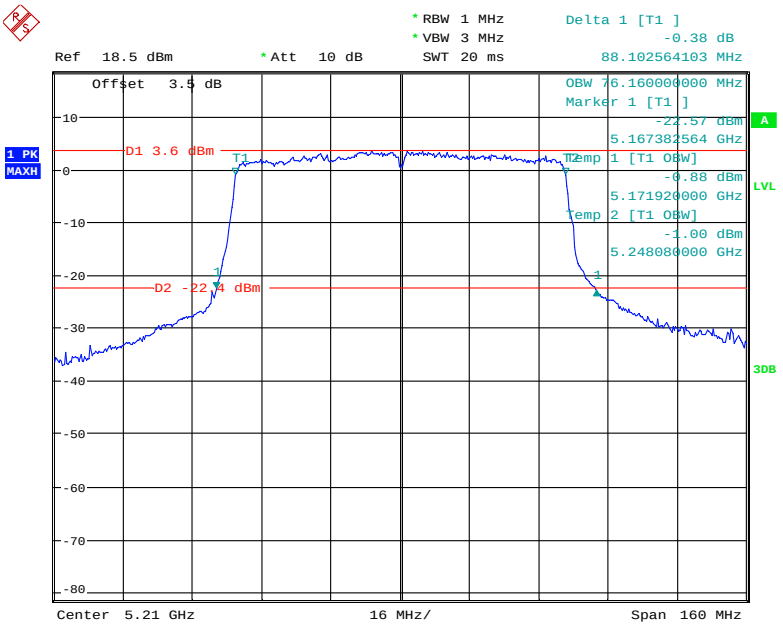
Date: 16.AUG.2019 02:33:16

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5230 MHz



Date: 16.AUG.2019 02:52:01

802.11ac80 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5210 MHz

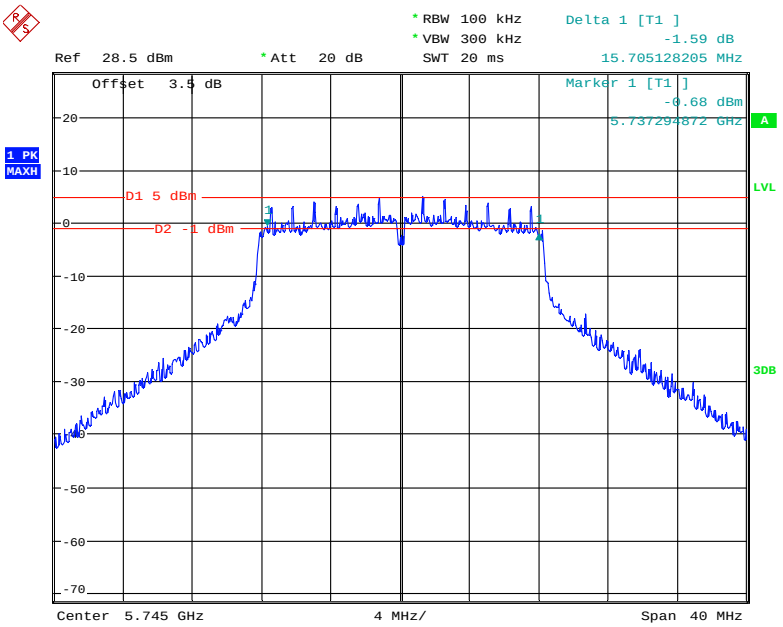


Date: 16.AUG.2019 02:26:34

5725 MHz – 5850 MHz:

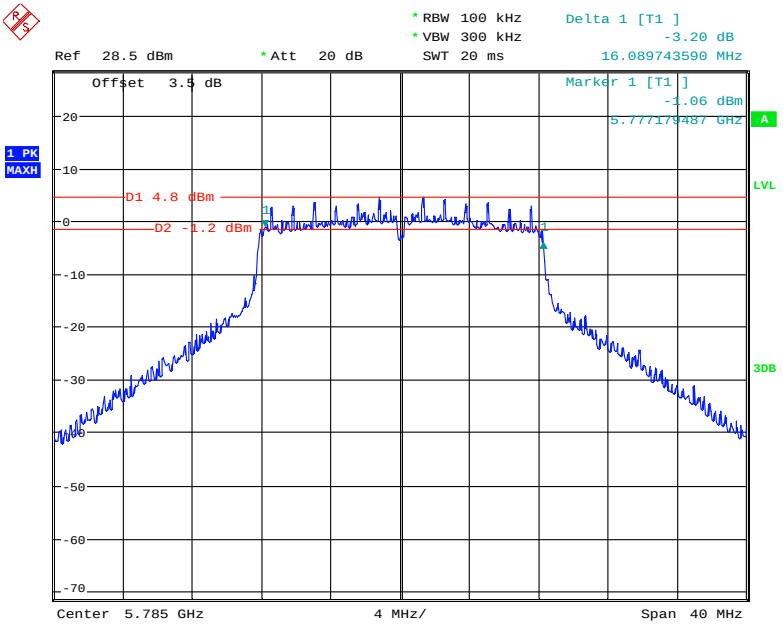
Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Remark
802.11a				No transmitted signal in the 99% bandwidth extends into the U-NII-2C band
5745	15.71	17.05	0.5	
5785	16.09	17.05	0.5	
5825	16.22	17.05	0.5	
802.11n20				
5745	16.99	18.14	0.5	
5785	16.88	18.08	0.5	
5825	16.86	18.08	0.5	
802.11n40				
5755	36.23	36.54	0.5	
5795	36.26	36.54	0.5	
802.11ac20				
5745	16.88	18.08	0.5	
5785	16.97	18.27	0.5	
5825	17.47	18.14	0.5	
802.11ac40				
5755	36.41	36.41	0.5	
5795	35.36	36.41	0.5	
802.11ac80				
5775	75.74	75.90	0.5	

802.11a mode, 6dB Emission Bandwidth, 5745 MHz



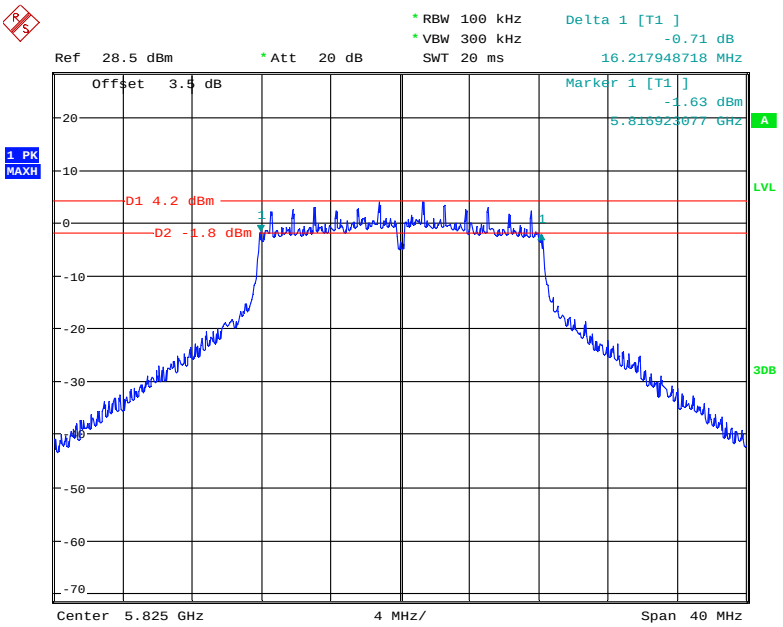
Date: 17.AUG.2019 01:53:09

802.11a mode, 6dB Emission Bandwidth, 5785 MHz



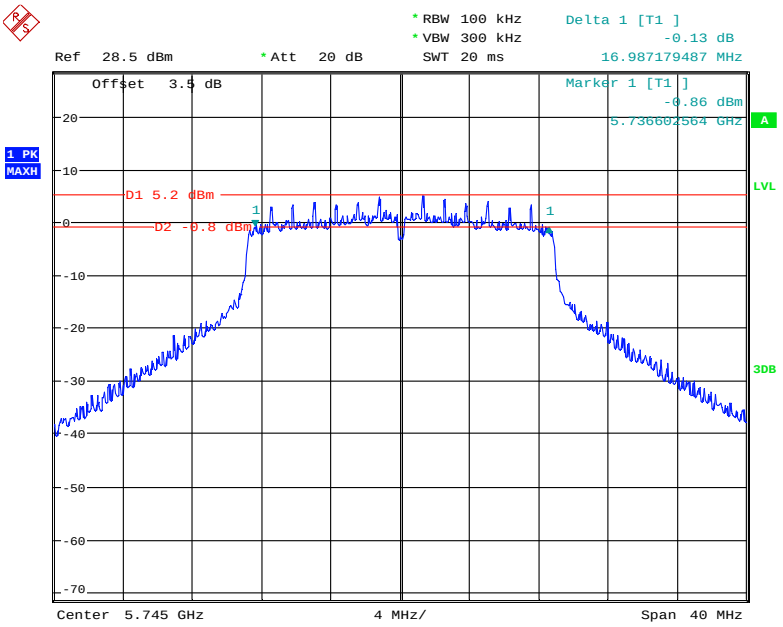
Date: 17.AUG.2019 01:59:35

802.11a mode, 6dB Emission Bandwidth, 5825 MHz



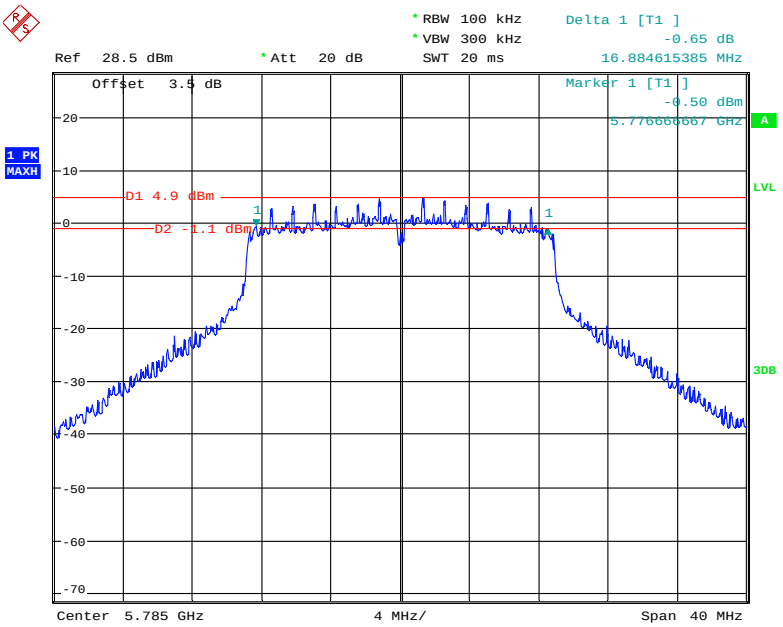
Date: 17.AUG.2019 02:01:03

802.11n20 mode, 6dB Emission Bandwidth, 5745 MHz



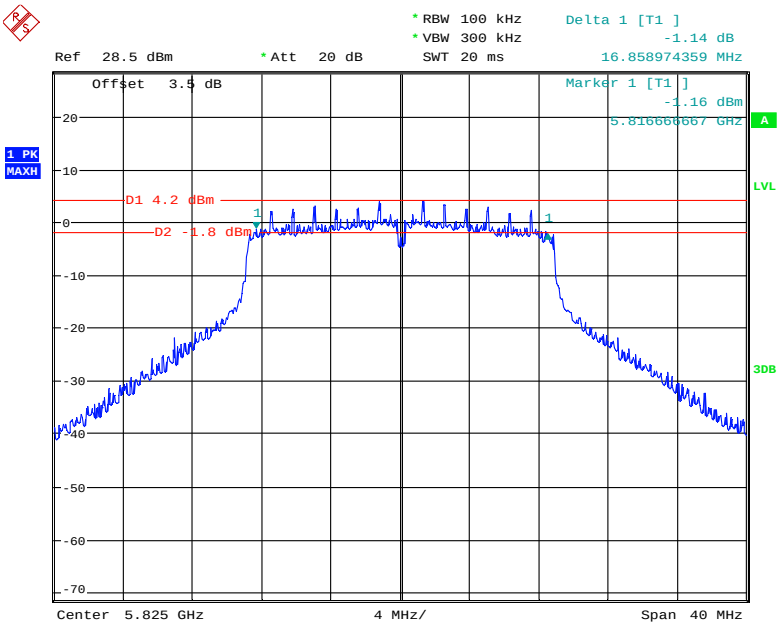
Date: 17.AUG.2019 01:19:14

802.11n20 mode, 6dB Emission Bandwidth, 5785 MHz



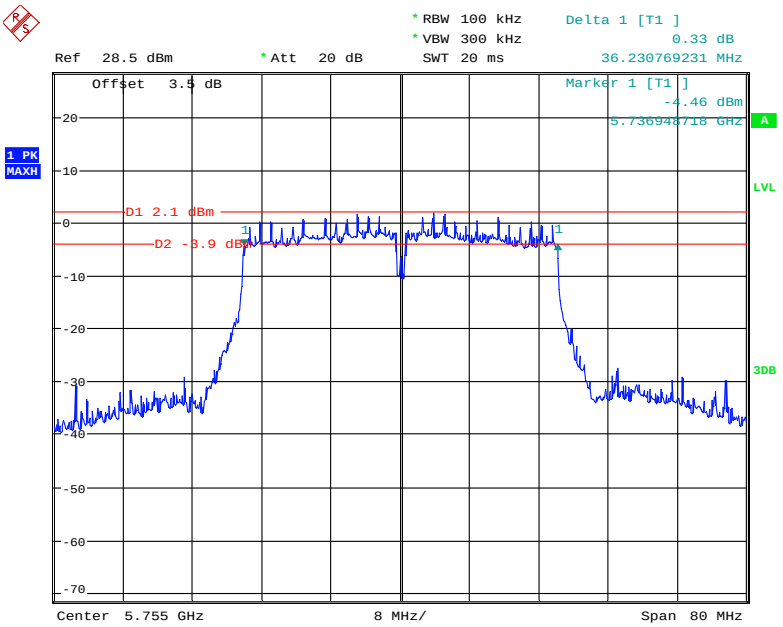
Date: 17.AUG.2019 01:23:00

802.11n20 mode, 6dB Emission Bandwidth, 5825 MHz



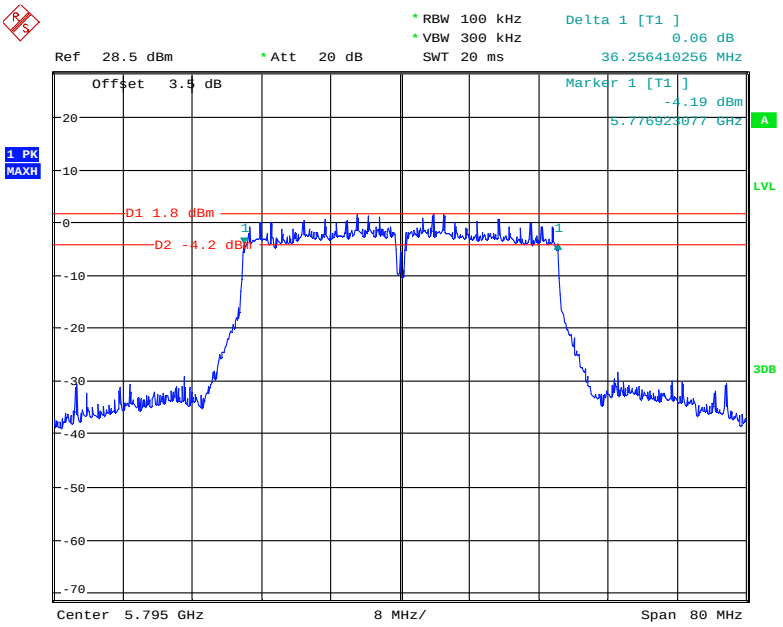
Date: 17.AUG.2019 01:28:03

802.11n40 mode, 6dB Emission Bandwidth, 5755 MHz



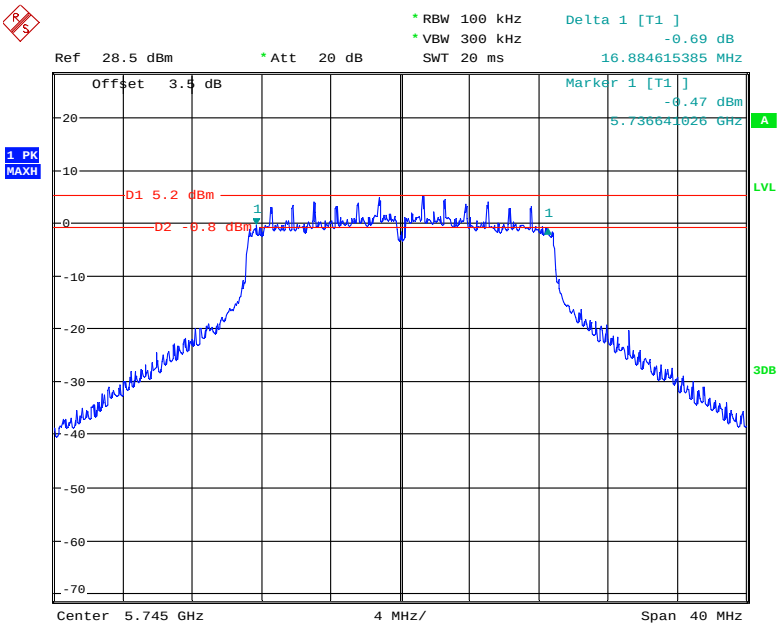
Date: 17.AUG.2019 01:01:57

802.11n40 mode, 6dB Emission Bandwidth, 5795 MHz



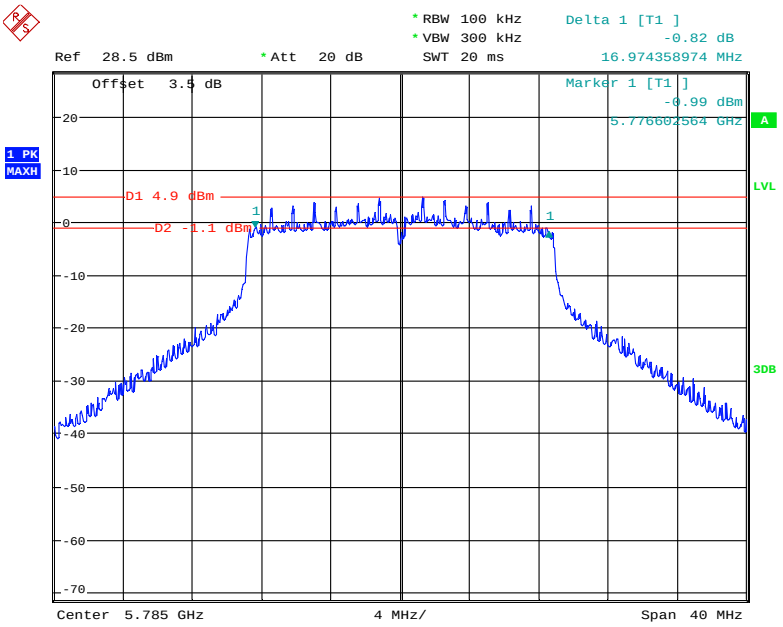
Date: 17.AUG.2019 01:00:06

802.11ac20 mode, 6dB Emission Bandwidth, 5745 MHz



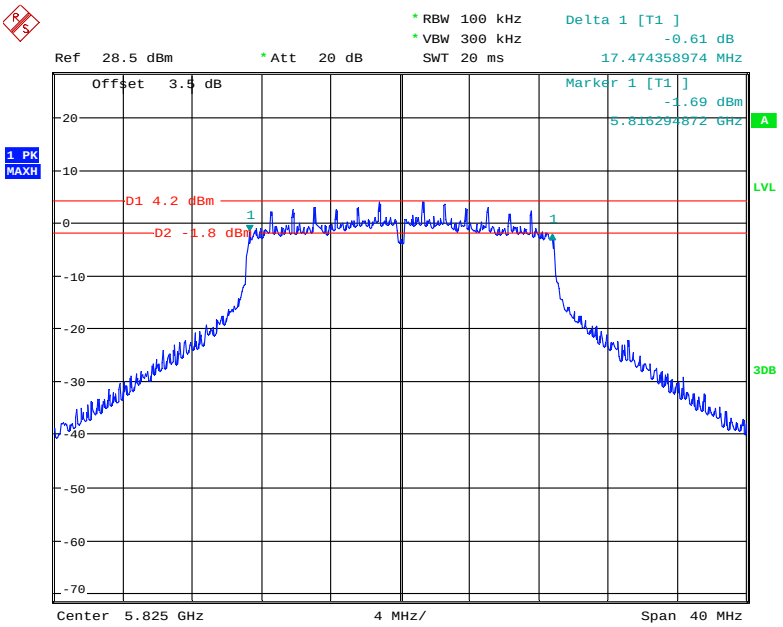
Date: 17.AUG.2019 01:52:04

802.11ac20 mode, 6dB Emission Bandwidth, 5785 MHz



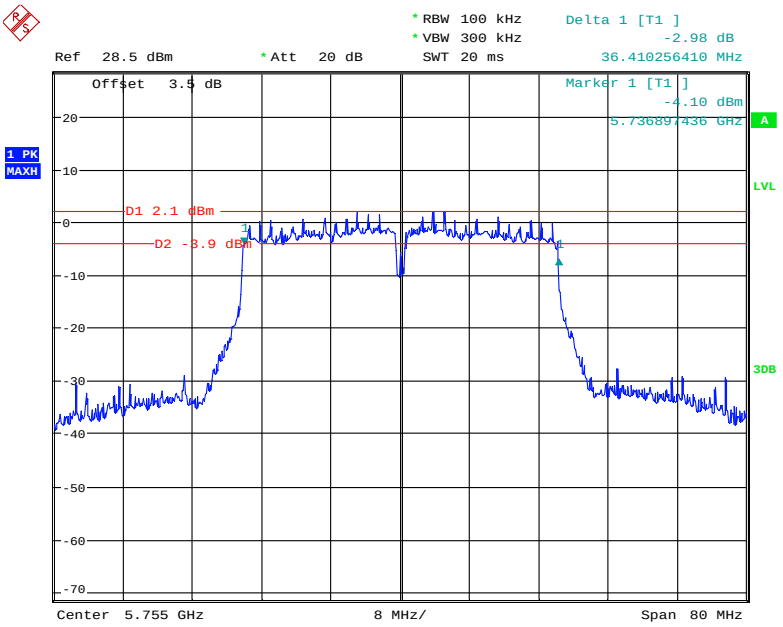
Date: 17.AUG.2019 01:41:20

802.11ac20 mode, 6dB Emission Bandwidth, 5825 MHz



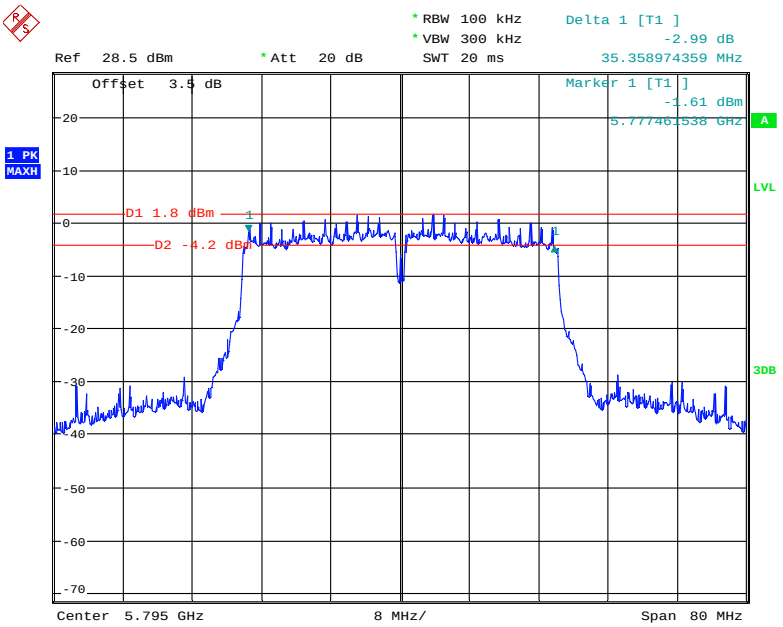
Date: 17.AUG.2019 01:38:19

802.11ac40 mode, 6dB Emission Bandwidth, 5755 MHz



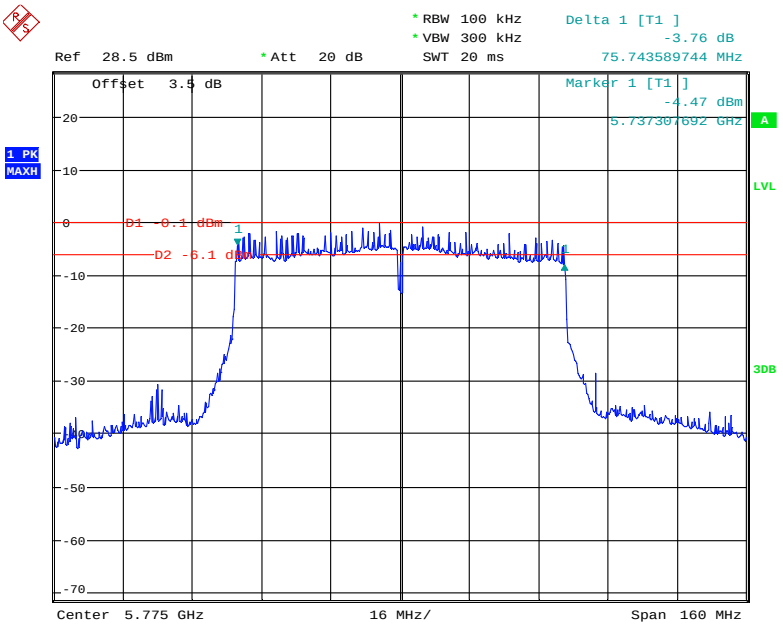
Date: 17.AUG.2019 00:43:28

802.11ac40 mode, 6dB Emission Bandwidth, 5795 MHz



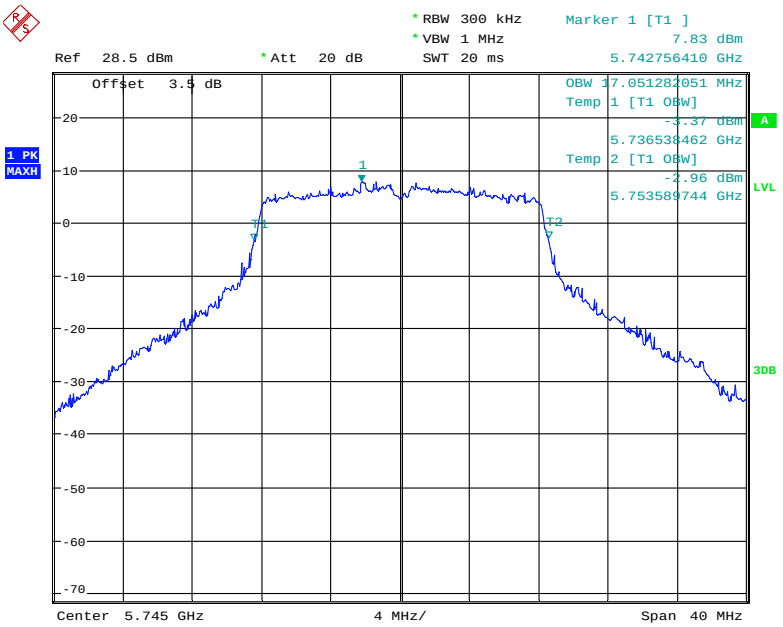
Date: 17.AUG.2019 00:45:39

802.11ac80 mode, 6dB Emission Bandwidth, 5775 MHz



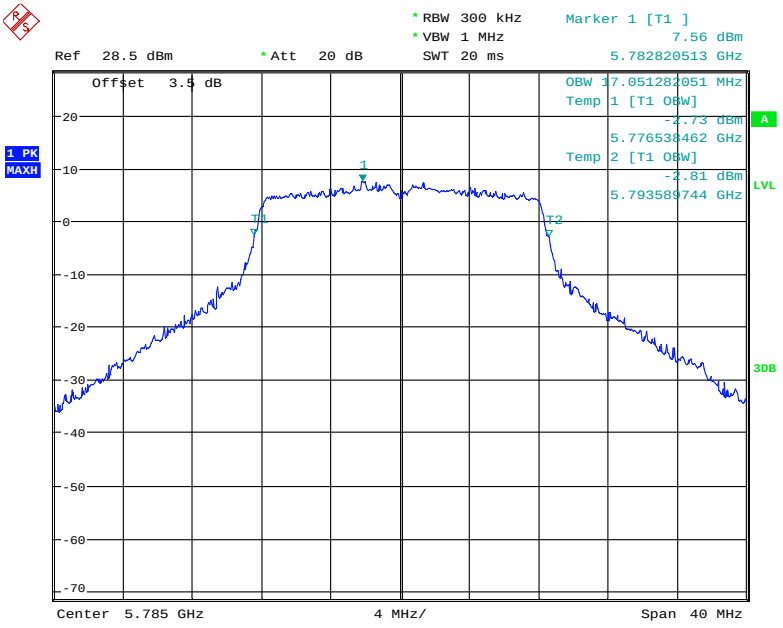
Date: 17.AUG.2019 00:39:53

802.11a mode, 99% Occupied Bandwidth, 5745 MHz



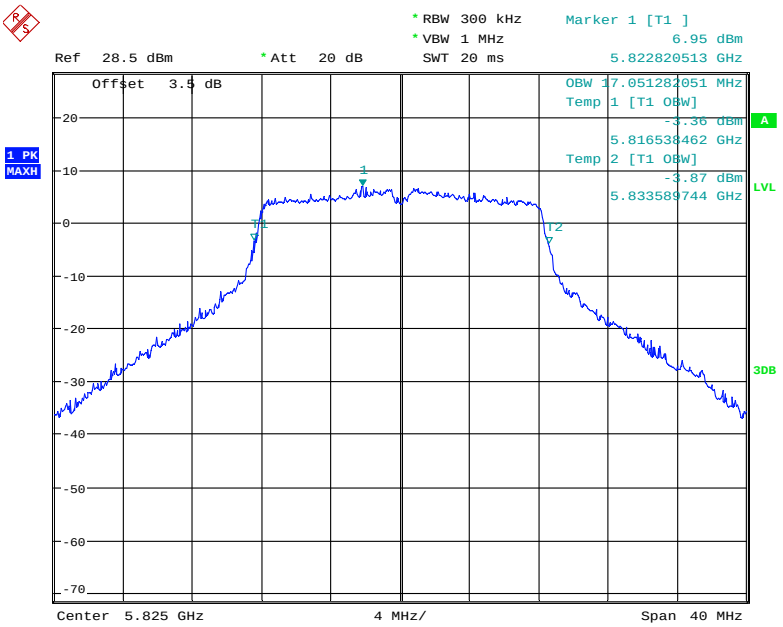
Date: 17.AUG.2019 01:53:42

802.11a mode, 99% Occupied Bandwidth, 5785 MHz



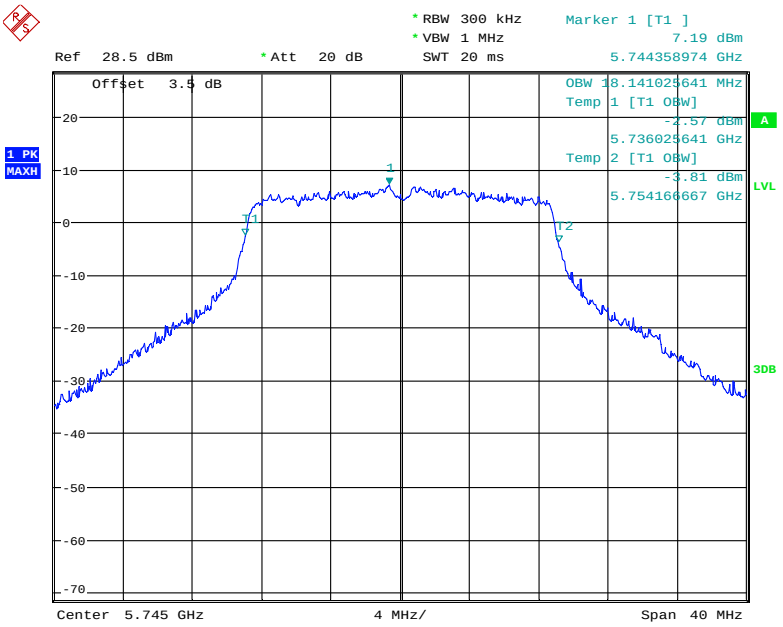
Date: 17.AUG.2019 01:58:30

802.11a mode, 99% Occupied Bandwidth, 5825 MHz



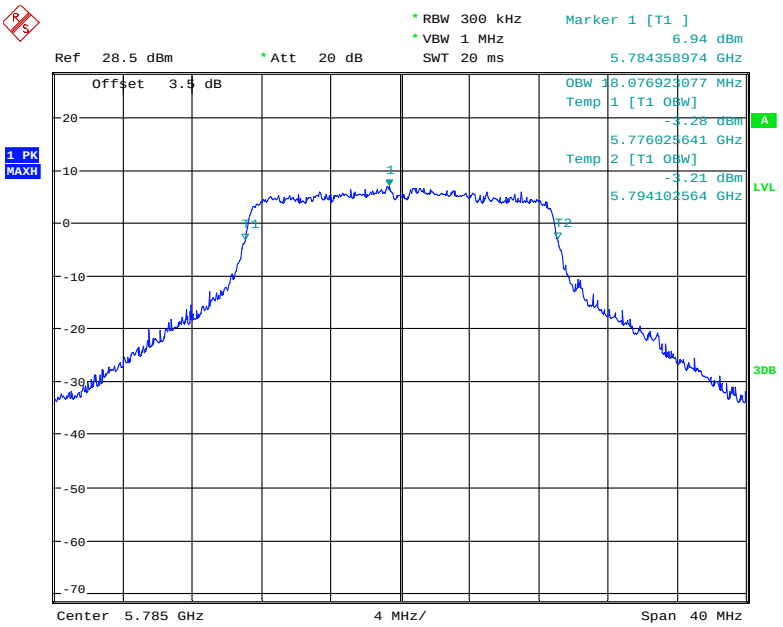
Date: 17.AUG.2019 02:03:03

802.11n20 mode, 99% Occupied Bandwidth, 5745 MHz



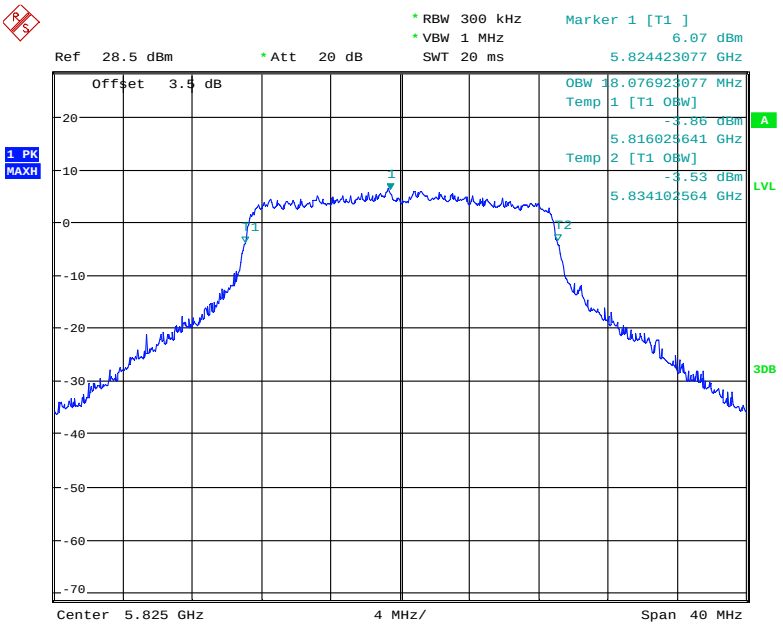
Date: 17.AUG.2019 01:19:44

802.11n20 mode, 99% Occupied Bandwidth, 5785 MHz



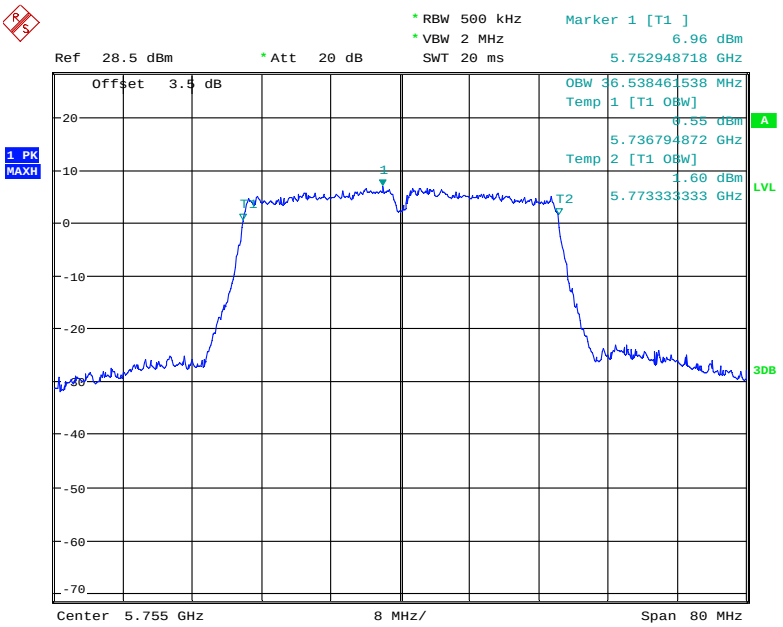
Date: 17.AUG.2019 01:20:14

802.11n20 mode, 99% Occupied Bandwidth, 5825 MHz



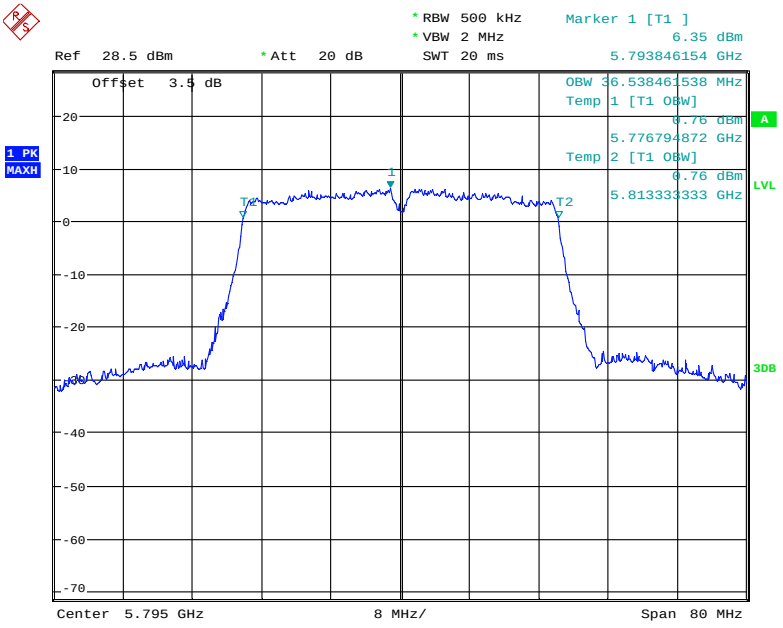
Date: 17.AUG.2019 01:28:27

802.11n40 mode, 99% Occupied Bandwidth, 5755 MHz



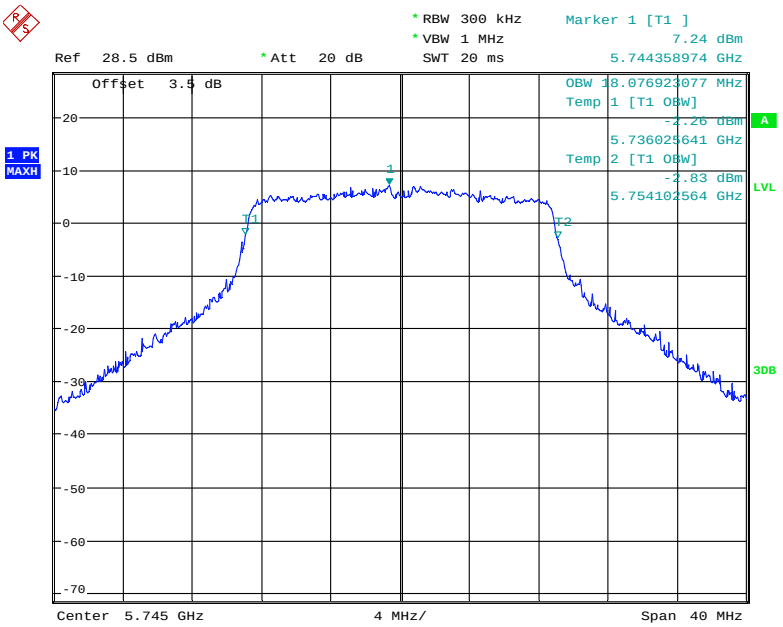
Date: 17.AUG.2019 01:01:13

802.11n40 mode, 99% Occupied Bandwidth, 5795 MHz



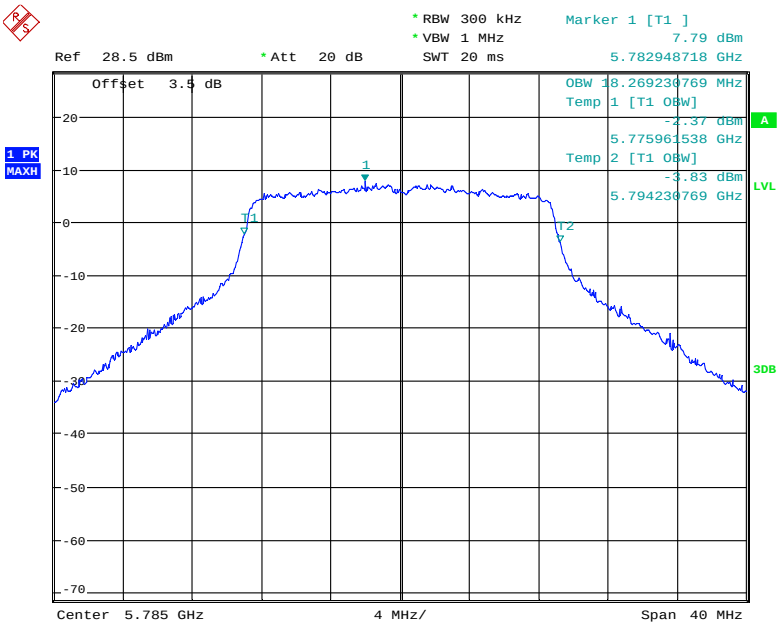
Date: 17.AUG.2019 01:00:30

802.11ac20 mode, 99% Occupied Bandwidth, 5745 MHz



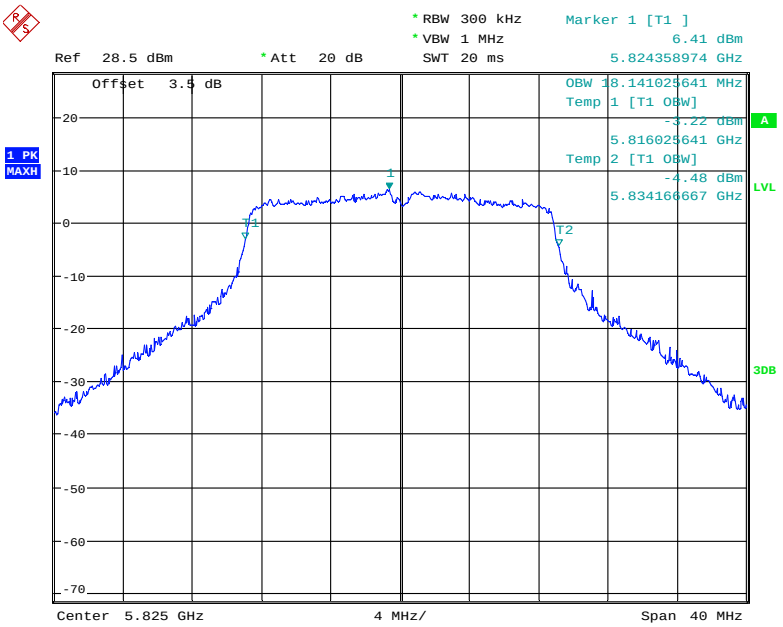
Date: 17.AUG.2019 01:48:58

802.11ac20 mode, 99% Occupied Bandwidth, 5785 MHz



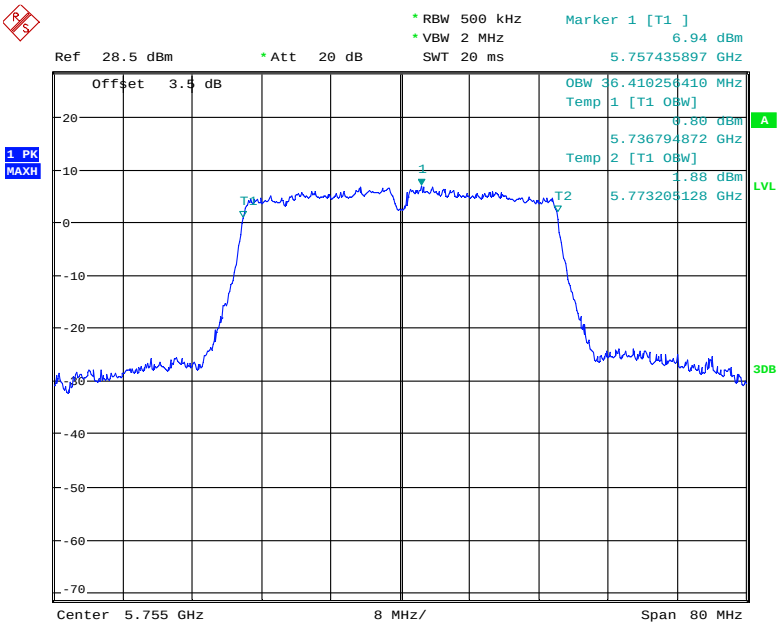
Date: 17.AUG.2019 01:48:26

802.11ac20 mode, 99% Occupied Bandwidth, 5825 MHz



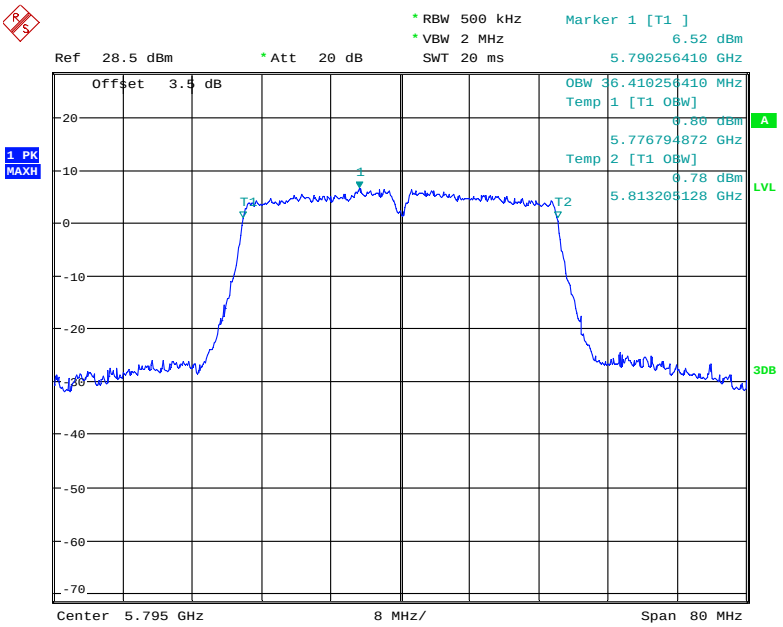
Date: 17.AUG.2019 01:29:14

802.11ac40 mode, 99% Occupied Bandwidth, 5755 MHz



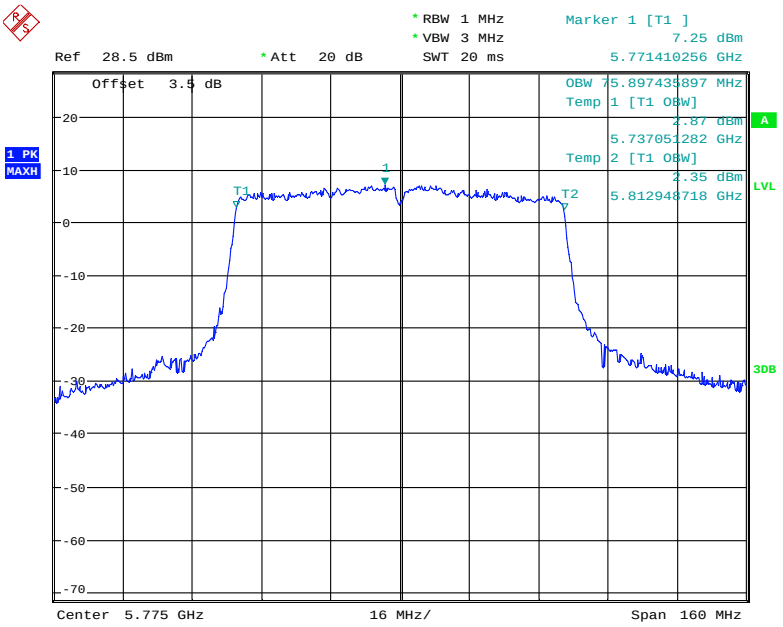
Date: 17.AUG.2019 00:44:02

802.11ac40 mode, 99% Occupied Bandwidth, 5795 MHz



Date: 17.AUG.2019 00:44:40

802.11ac80 mode, 99% Occupied Bandwidth, 5775 MHz



Date: 17.AUG.2019 00:37:09

FCC §15.407(a) (1) (3) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

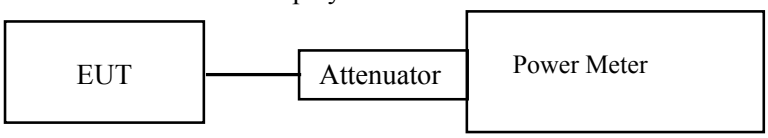
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Leo Huang on 2019-08-17.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

5150 MHz – 5250 MHz(this is a *client device*)

Frequency (MHz)	Output Power (dBm)	Limit (dBm)
802.11a		
5180	14.26	24
5200	14.65	
5240	14.15	
802.11n20		
5180	14.43	24
5200	14.70	
5240	14.26	
802.11n40		
5190	14.87	24
5230	15.28	
802.11ac20		
5180	14.63	24
5200	14.92	
5240	14.15	
802.11ac40		
5190	14.82	24
5230	15.33	
802.11ac80		
5210	15.40	24

5725 MHz – 5825 MHz:

Frequency (MHz)	Output Power (dBm)	Limit (dBm)
802.11a		
5745	15.73	30
5785	15.53	
5825	14.91	
802.11n20		
5745	15.84	30
5785	15.69	
5825	14.88	
802.11n40		
5755	16.44	30
5795	15.97	
802.11ac20		
5745	15.70	30
5785	15.54	
5825	14.96	
802.11ac40		
5755	16.39	30
5795	16.08	
802.11ac80		
5775	16.28	30

FCC §15.407(a) (1) (3) - POWER SPECTRAL DENSITY

Applicable Standard

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ⩾ 1/T, where T is defined in section II.B.l.a).
b) Set VBW ⩾ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101 kPa

The testing was performed by Leo Huang on 2019-08-17.

EUT operation mode: Transmitting

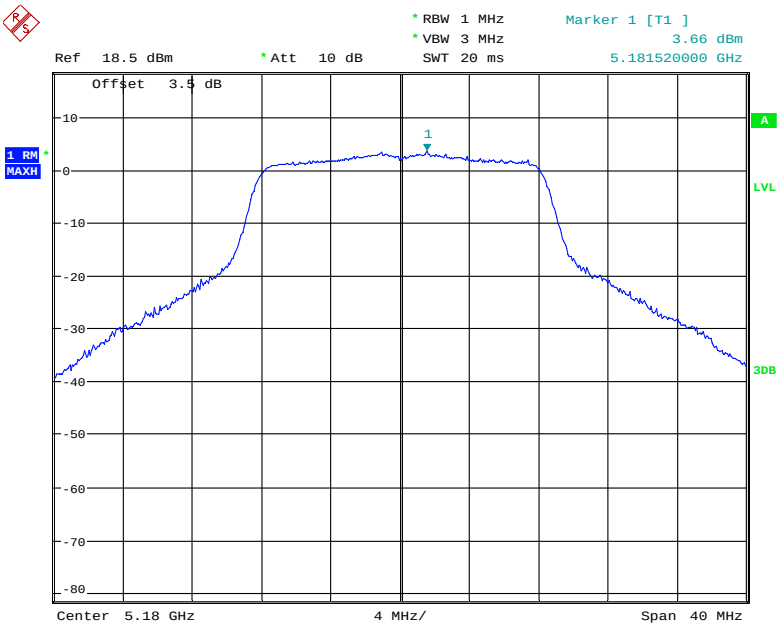
Test Result: Pass

Please refer to the following tables and plots.

5150 MHz – 5250 MHz

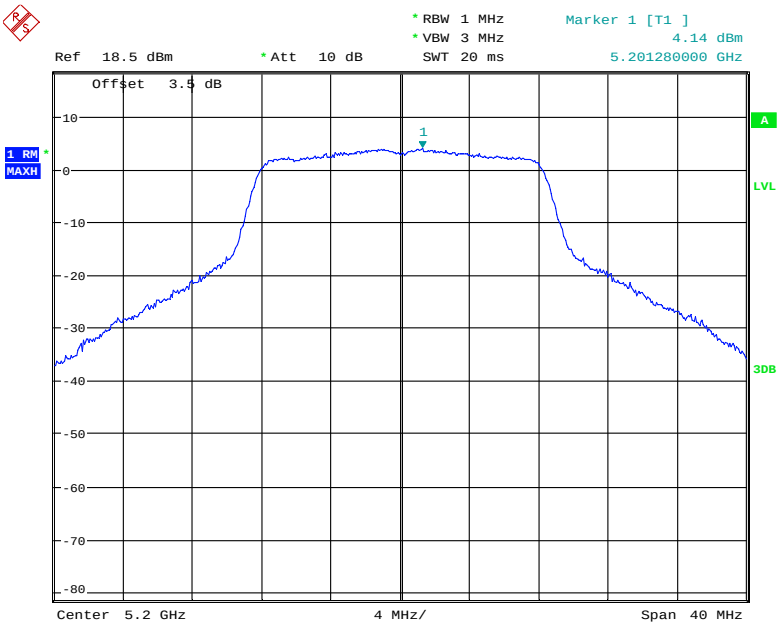
Frequency (MHz)	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)
802.11a		
5180	3.66	11
5200	4.14	
5240	4.50	
802.11n20		
5180	3.70	11
5200	4.14	
5240	4.80	
802.11n40		
5190	1.27	11
5230	1.82	
802. 11ac20		
5180	3.99	11
5200	4.28	
5240	4.94	
802. 11ac40		
5190	1.04	11
5230	1.54	
802. 11ac80		
5210	-0.98	11

802.11a mode, Power Spectral Density, 5180 MHz



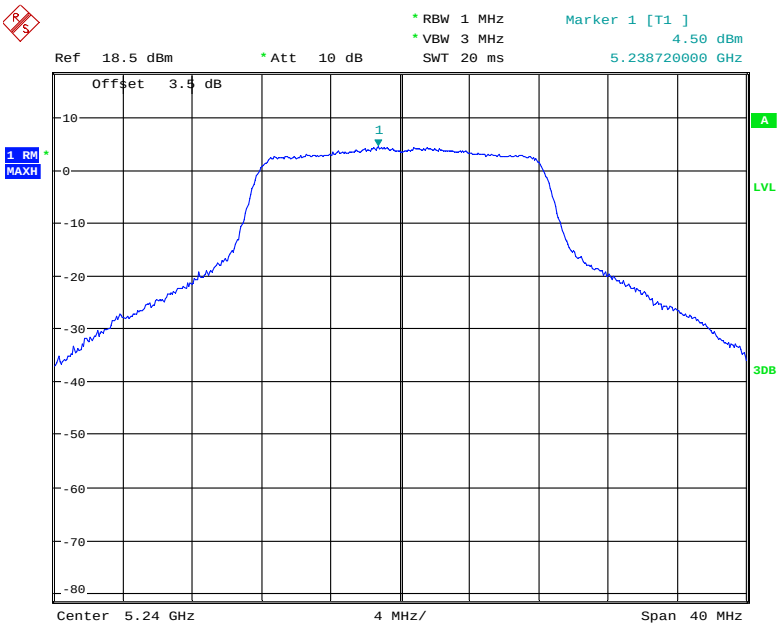
Date: 17.SEP.2019 11:44:39

802.11a mode, Power Spectral Density, 5200 MHz



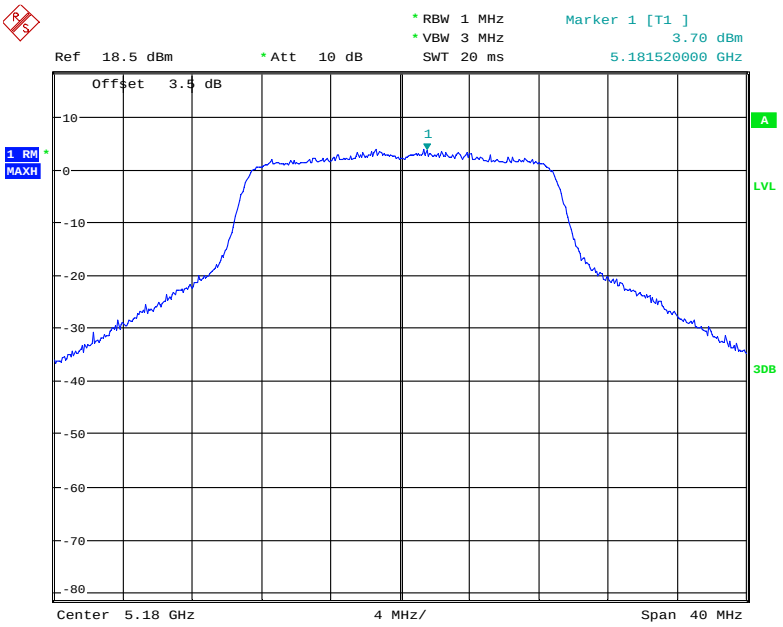
Date: 17.SEP.2019 11:43:52

802.11a mode, Power Spectral Density, 5240 MHz



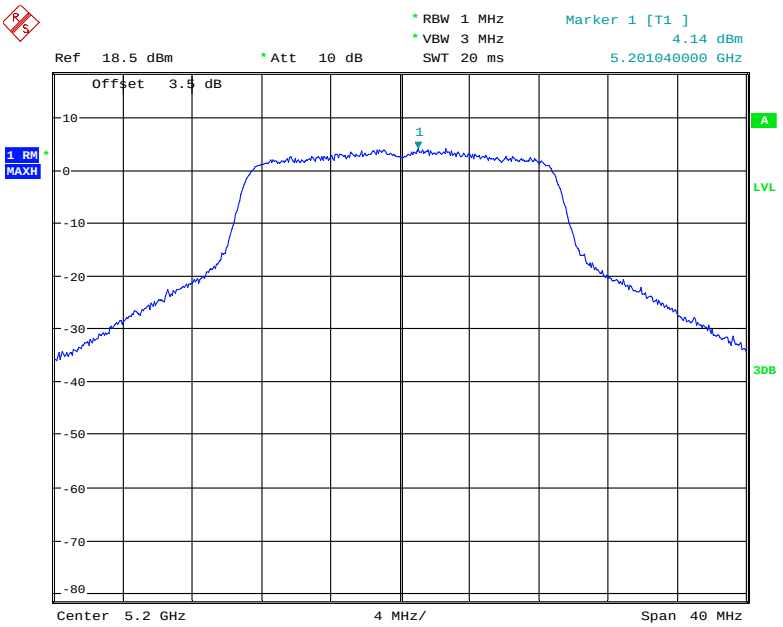
Date: 17.SEP.2019 11:43:16

802.11n20 mode, Power Spectral Density, 5180 MHz



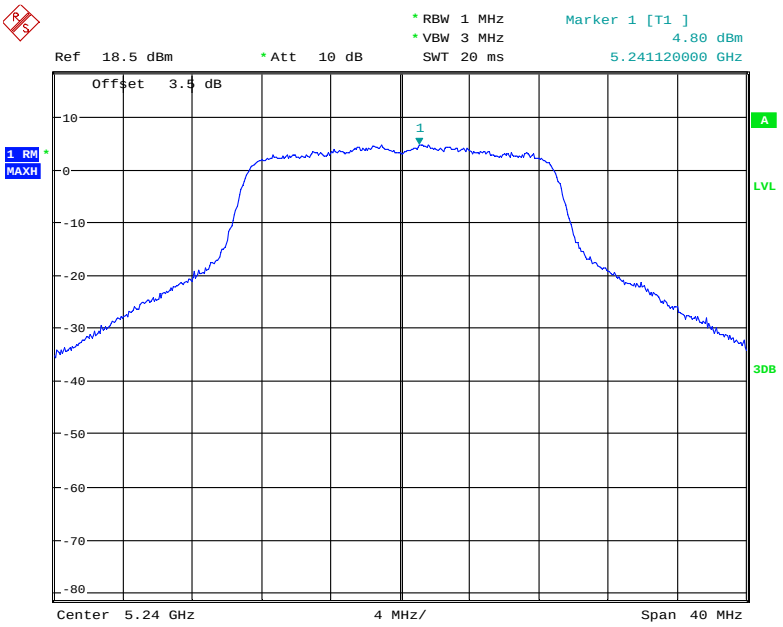
Date: 17.SEP.2019 11:41:35

802.11n20 mode, Power Spectral Density, 5200 MHz



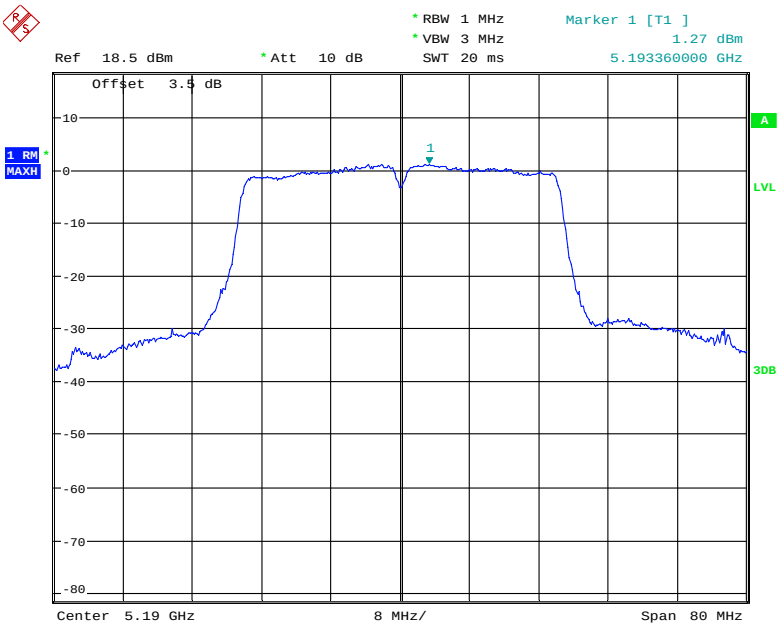
Date: 17.SEP.2019 11:42:02

802.11n20 mode, Power Spectral Density, 5240 MHz



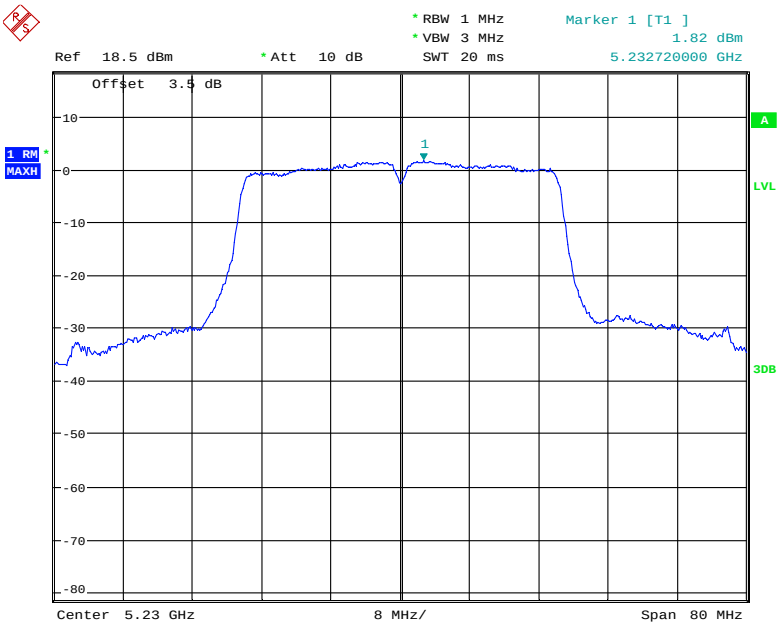
Date: 17.SEP.2019 11:42:41

802.11n40 mode, Power Spectral Density, 5190 MHz



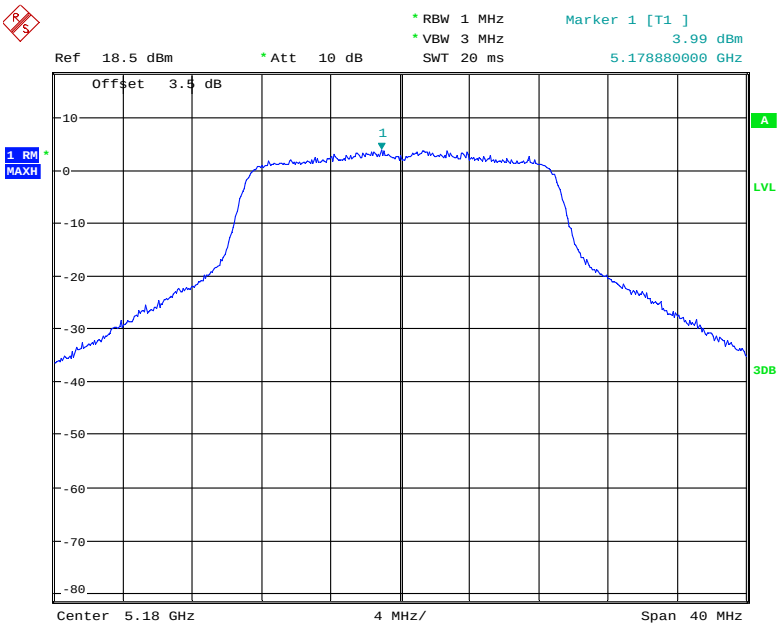
Date: 17.SEP.2019 13:30:49

802.11n40 mode, Power Spectral Density, 5230 MHz



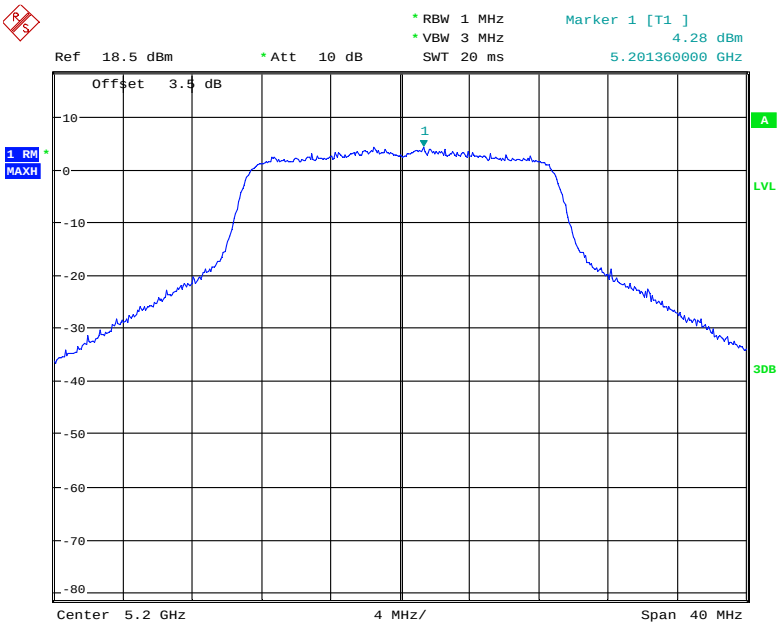
Date: 17.SEP.2019 13:29:16

802.11ac20 mode, Power Spectral Density, 5180 MHz



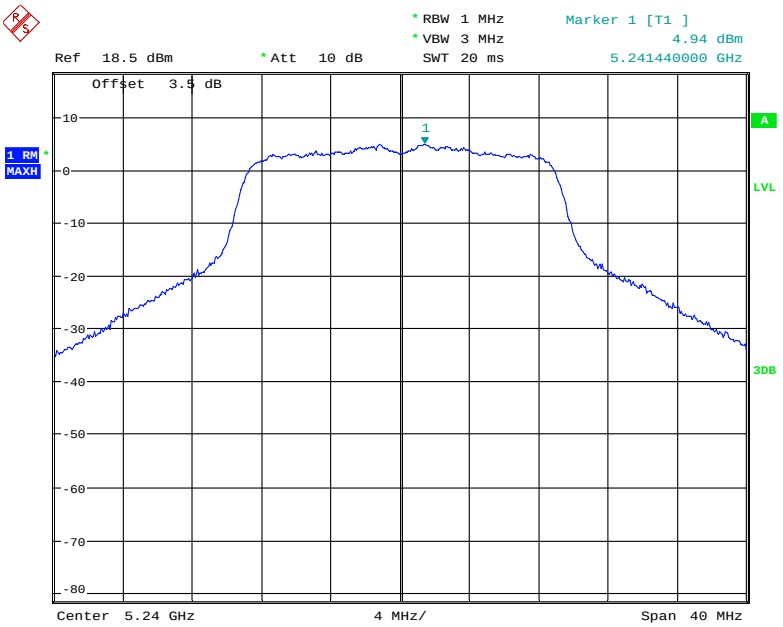
Date: 17.SEP.2019 11:40:45

802. 11ac20 mode, Power Spectral Density, 5200 MHz



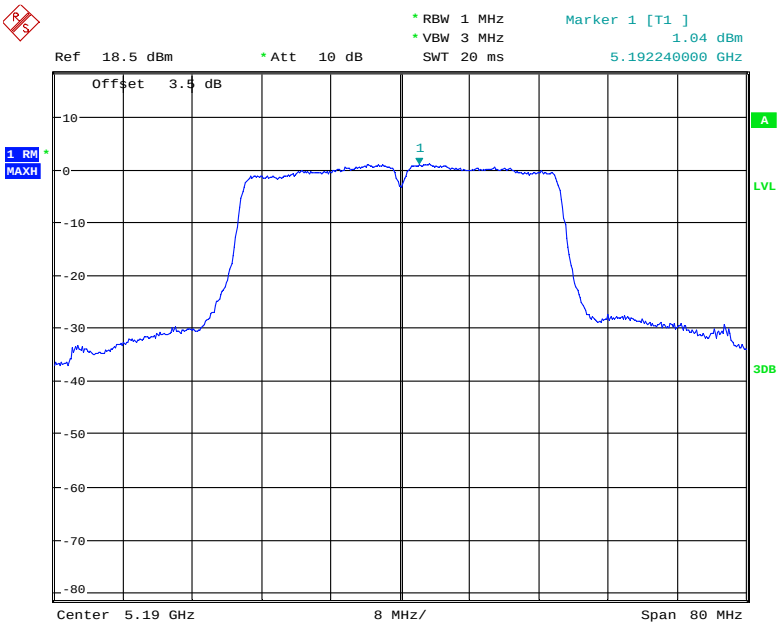
Date: 17.SEP.2019 11:40:19

802. 11ac20 mode, Power Spectral Density, 5240 MHz



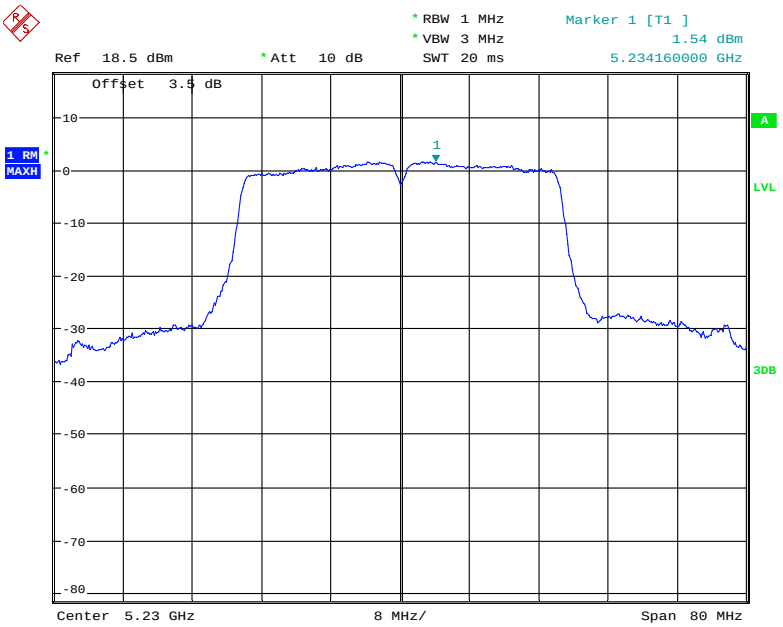
Date: 17.SEP.2019 11:37:42

802. 11ac40 mode, Power Spectral Density, 5190 MHz



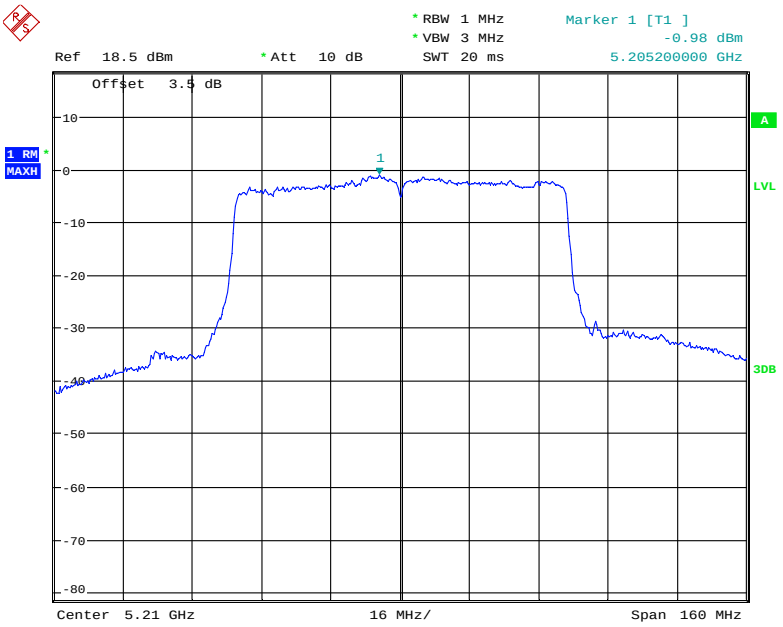
Date: 17.SEP.2019 13:25:39

802. 11ac40 mode, Power Spectral Density, 5230 MHz



Date: 17.SEP.2019 13:24:41

802. 11ac80 mode, Power Spectral Density, 5210 MHz

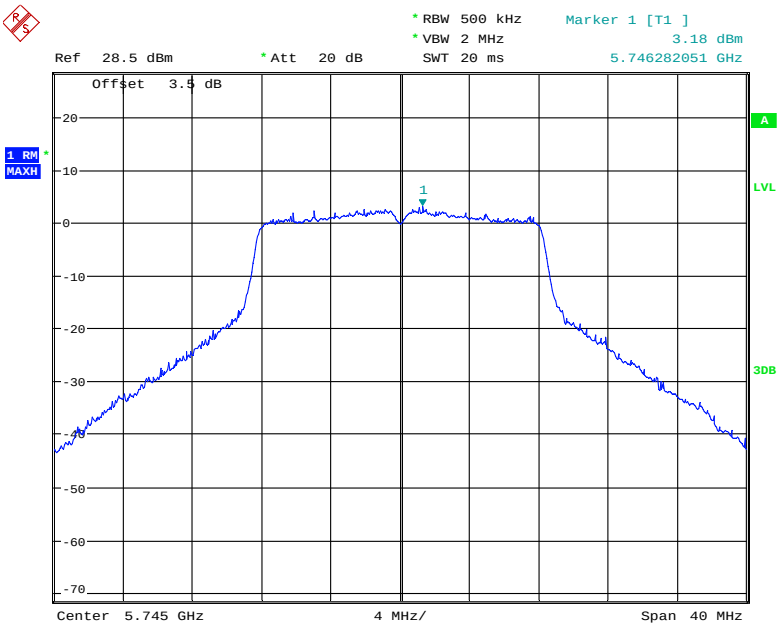


Date: 17.SEP.2019 13:27:08

5725 MHz – 5825 MHz:

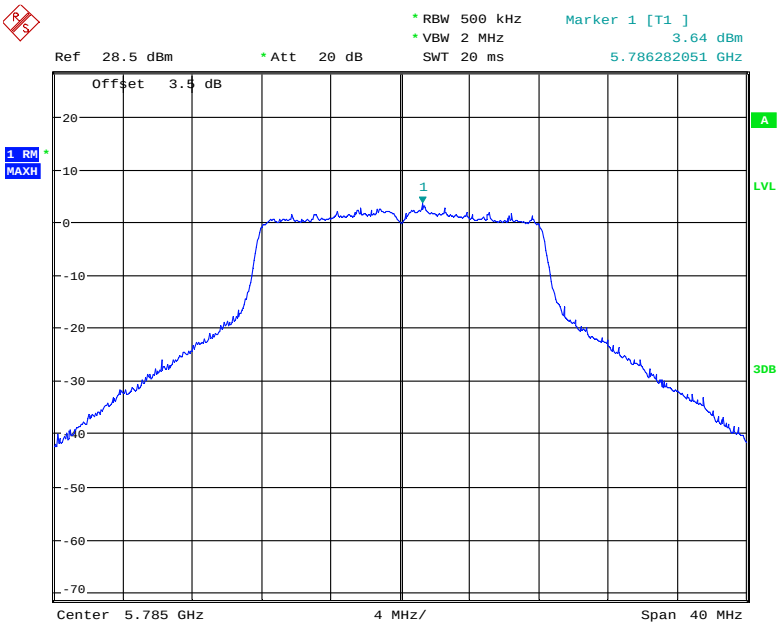
Frequency (MHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
802.11a		
5745	3.18	30
5785	3.64	
5825	2.12	
802.11n20		
5745	3.31	30
5785	3.06	
5825	2.80	
802.11n40		
5755	-0.18	30
5795	-0.17	
802.11ac20		
5745	3.46	30
5785	3.17	
5825	2.62	
802. 11ac40		
5755	0.19	30
5795	-0.26	
802.11ac80		
5775	-2.21	30

802.11a mode, Power Spectral Density, 5745 MHz



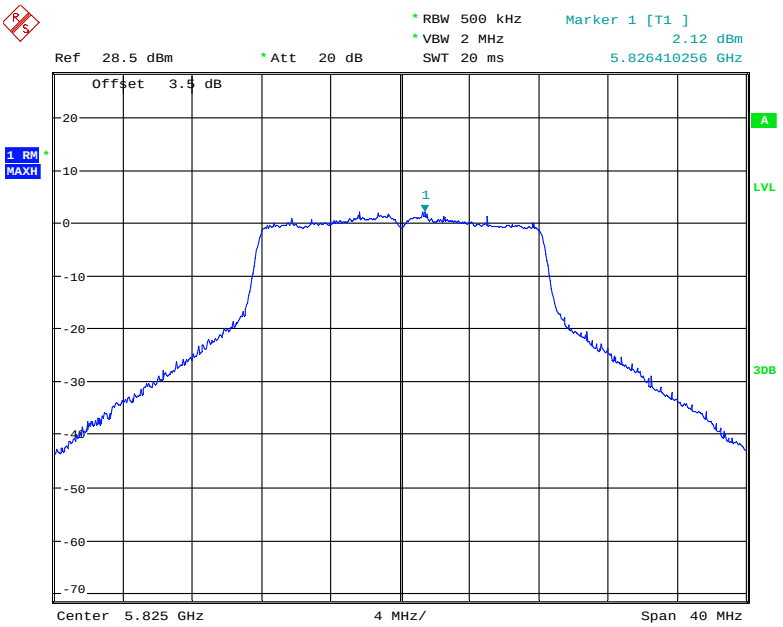
Date: 17.AUG.2019 02:08:29

802.11a mode, Power Spectral Density, 5785 MHz



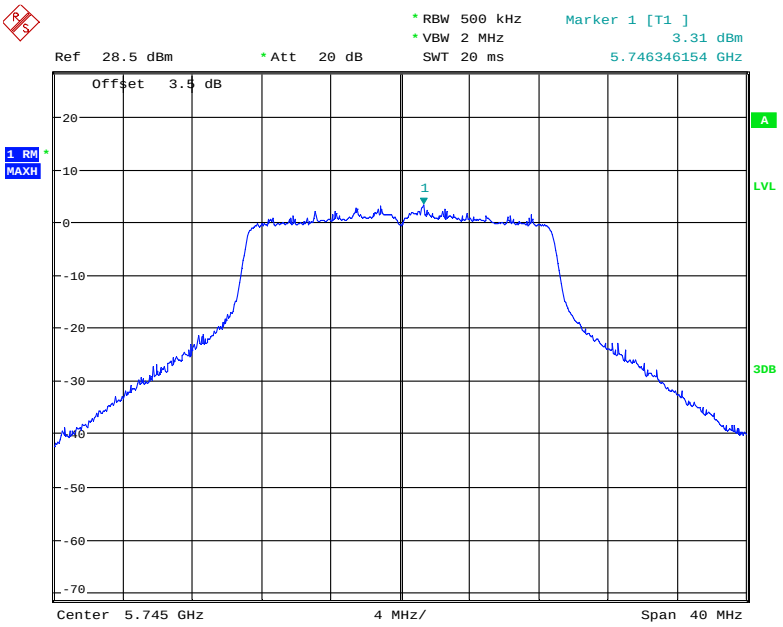
Date: 17.AUG.2019 02:04:54

802.11a mode, Power Spectral Density, 5825 MHz



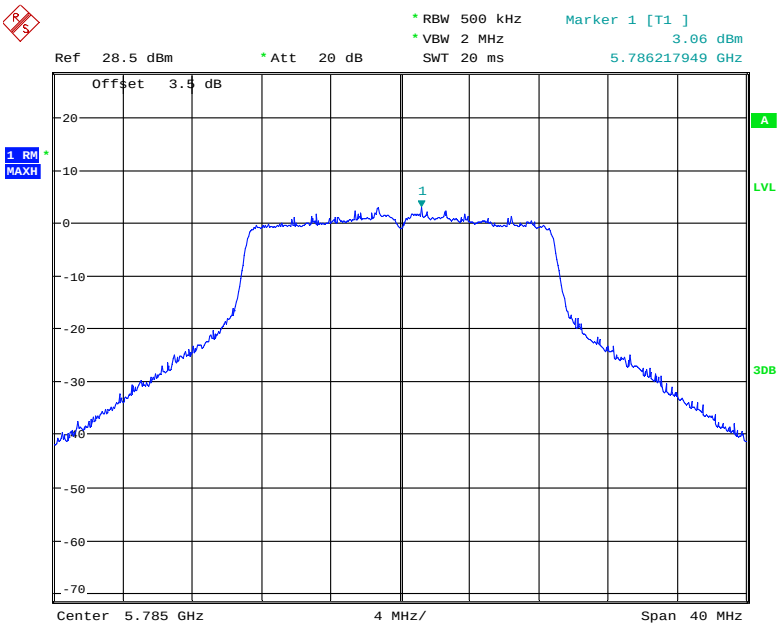
Date: 17.AUG.2019 02:03:56

802.11n20 mode, Power Spectral Density, 5745 MHz



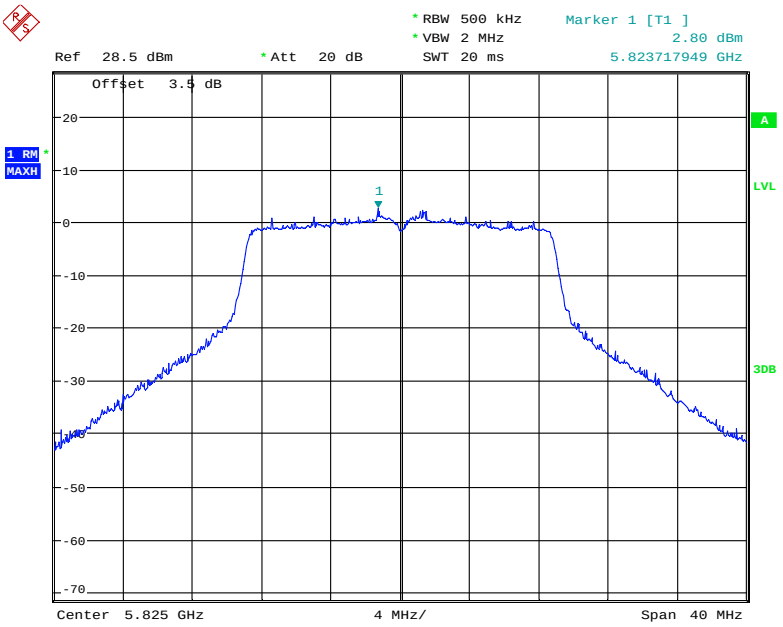
Date: 17.AUG.2019 02:08:55

802.11n20 mode, Power Spectral Density, 5785 MHz



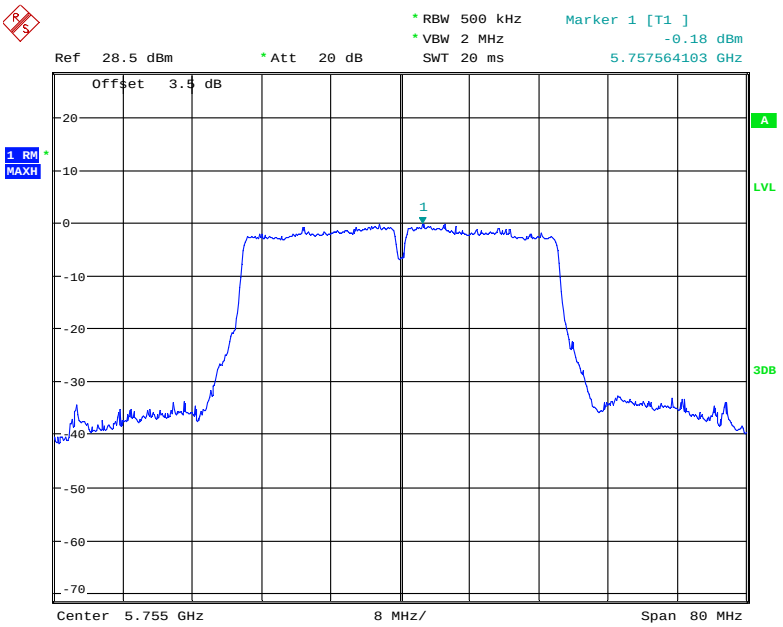
Date: 17.AUG.2019 02:09:16

802.11n20 mode, Power Spectral Density, 5825 MHz



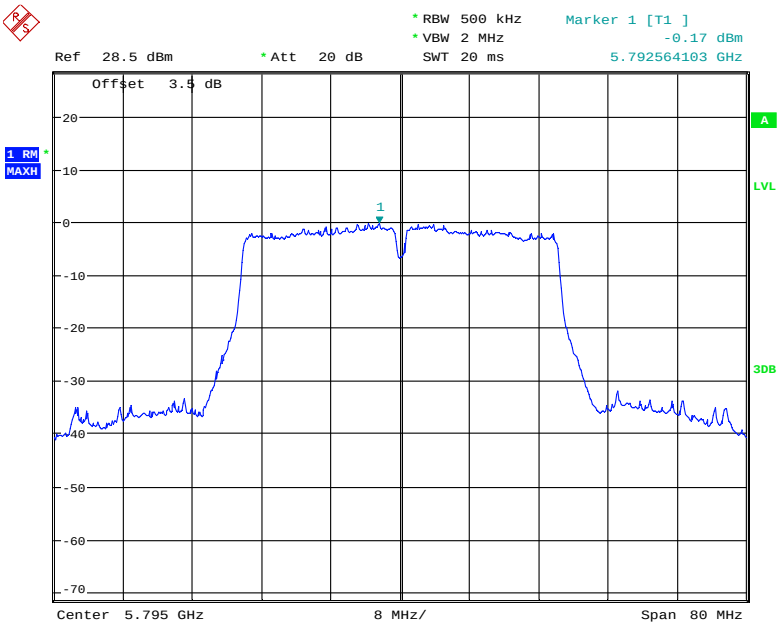
Date: 17.AUG.2019 02:14:21

802.11n40 mode, Power Spectral Density, 5755 MHz



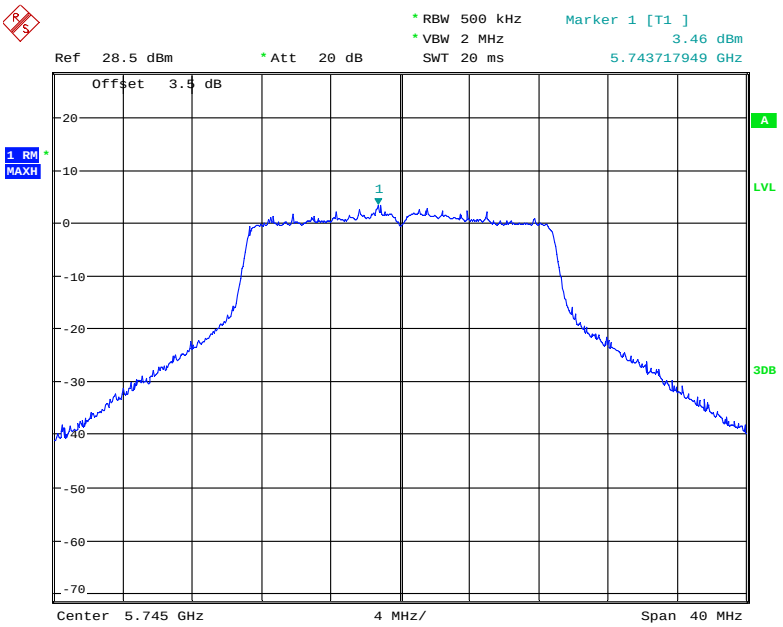
Date: 17.AUG.2019 02:27:58

802.11n40 mode, Power Spectral Density, 5795 MHz



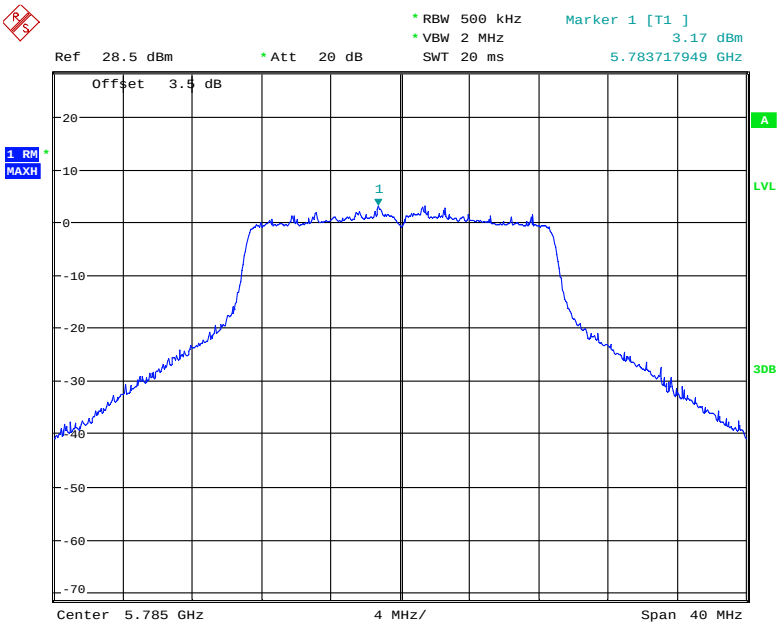
Date: 17.AUG.2019 02:28:59

802.11ac20 mode, Power Spectral Density, 5745 MHz



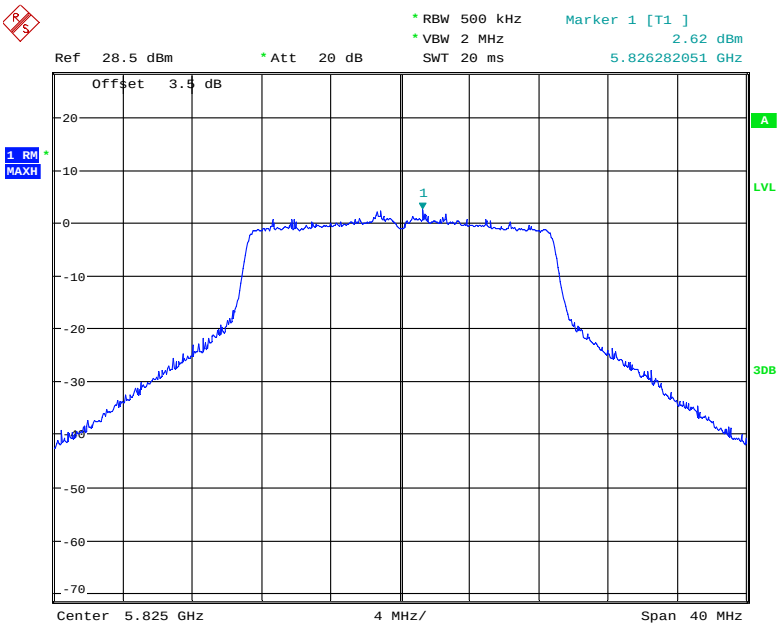
Date: 17.AUG.2019 02:15:46

802. 11ac20 mode, Power Spectral Density, 5785 MHz



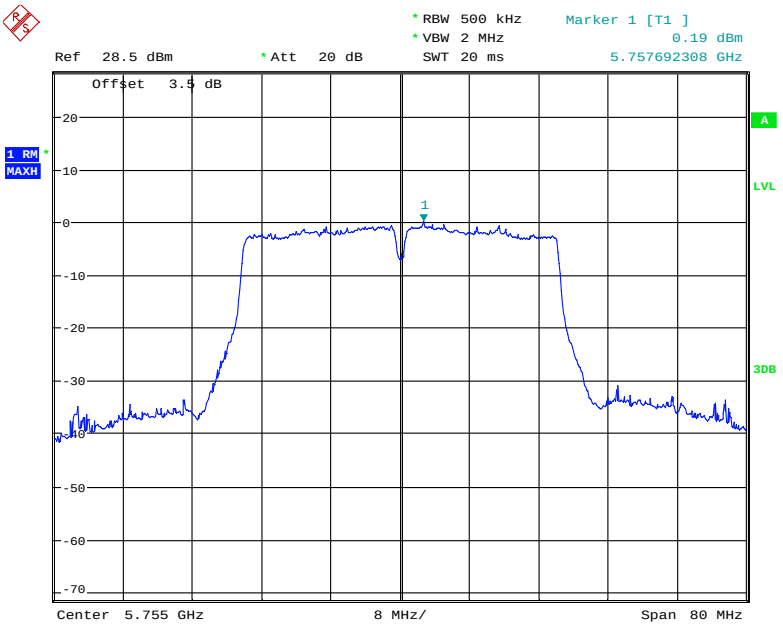
Date: 17.AUG.2019 02:15:14

802. 11ac20 mode, Power Spectral Density, 5825 MHz



Date: 17.AUG.2019 02:14:47

802. 11ac40 mode, Power Spectral Density, 5755 MHz



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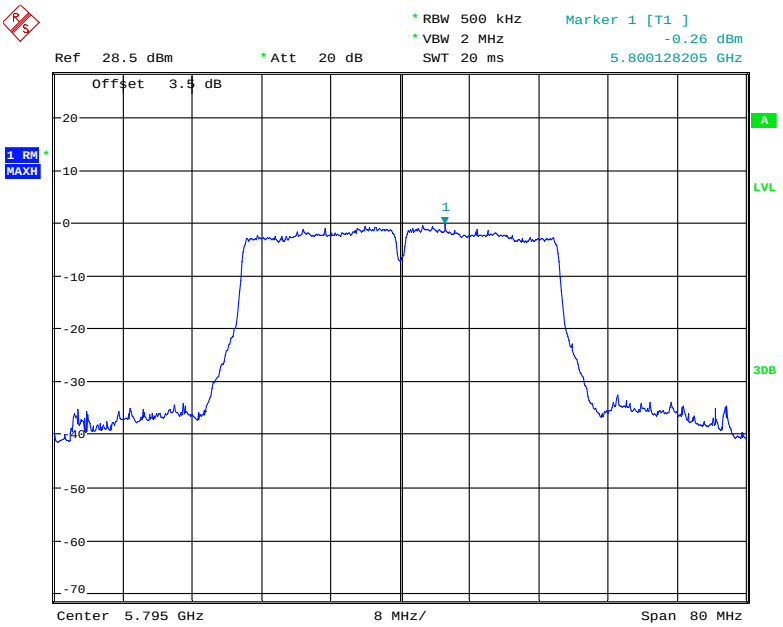
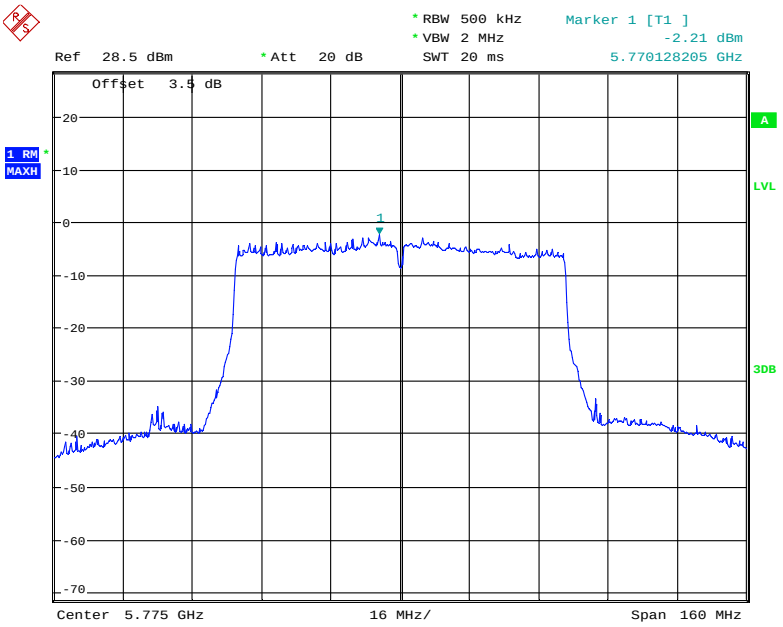
802. 11ac40 mode, Power Spectral Density, 5795 MHz



Date: 17.AUG.2019 02:31:09

802. 11ac80 mode, Power Spectral Density, 5775 MHz



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