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TESTING LABORATORY
CERTIFICATE # 4821.01

FCC PART 15.407

TEST REPORT

For

Grandstream Networks, Inc.

126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

FCC ID: YZZGWN7630

Report Type:	**Product Type:**
Class II Permissive Change	Enterprise 802.11ac Wave-2 4×4:4 Wi-Fi Access Point

Report Number: RSZ190626005-00A1

Report Date: 2019-09-10

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Enterprise 802.11ac Wave-2 4×4:4 Wi-Fi Access Point
Model	GWN7630
Frequency Range	5G Wi-Fi: 5250-5350 MHz; 5470-5725 MHz
Maximum Conducted Output Power	5250-5350 MHz: 15.77dBm (802.11a), 15.53dBm(802.11n20), 18.15 dBm(802.11n40), 15.83dBm (802.11ac20), 17.77dBm(802.11 ac40), 18.31 dBm(802.11 ac80) 5470-5725 MHz 15.78dBm (802.11a), 16.01dBm(802.11n20), 18.96 dBm(802.11n40), 16.01dBm (802.11ac20), 17.51dBm(802.11 ac40), 18.61 dBm(802.11 ac80)
Modulation Technique	Wi-Fi: OFDM
Antenna Specification	PIFA Antenna: 5dBi@5GHz
Voltage Range	DC 48V from POE
Date of Test	2019/08/06~2019/09/07
Sample serial number	190626005
Received date	2019/06/26
Sample/EUT Status	Good condition

Objective

This type approval report is prepared on behalf of *Grandstream Networks, Inc.*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.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

1. Adding DFS band by software, no any other hardware change or modification to the device.

2. Adding test for the frequency band: 5250-5350MHz & 5470-5725MHz.

Based on above differences, add the test for the DFS band.

Related Submittal(s)/Grant(s)

FCC original certified on 2019-06-20, FCC ID: YZZGWN7630.

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: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.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 5250-5350MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300
54	5270	62	5310
56	5280	64	5320
58	5290	/	/

For 5470-5725MHz Band, 18 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	124	5620
102	5510	126	5630
104	5520	128	5640
106	5530	132	5660
108	5540	134	5670
110	5550	136	5680
112	5560	140	5700
116	5580	/	/
118	5590	/	/
120	5600	/	/
122	5610	/	/

Note: 802.11a/n20/n40/ac20/ac40/ac80 all support SISO&MIMO mode, the pre-scan result for MIMO mode is the worst, so just test MIMO mode.

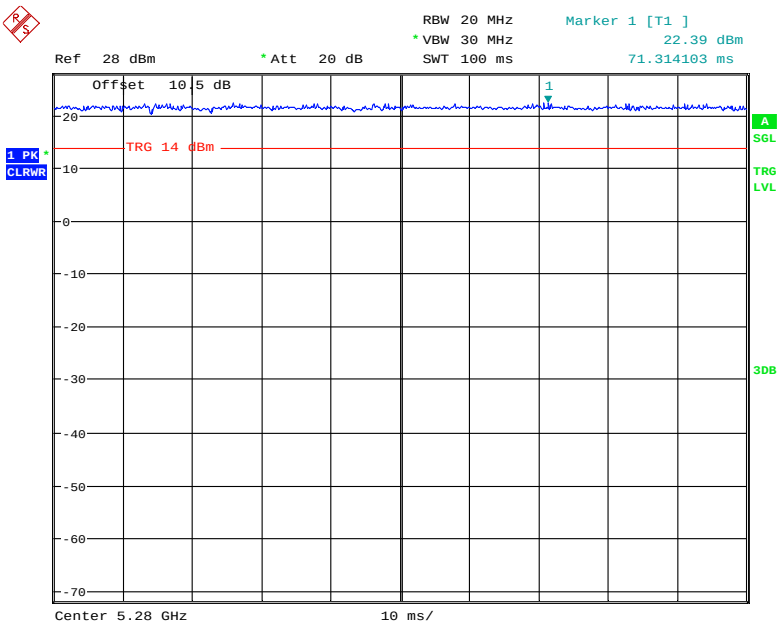
EUT Exercise Software

"Putty, QATool" was used in the test. Test frequencies and power level were configured (Ant 0&1&2&3) used the same power level) as below:

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power Level
5250 – 5350MHz	802.11 a	CH52	5260	6	12.5
		CH56	5280	6	12.5
		CH64	5320	6	12.5
	802.11 n20	CH52	5260	MCS0	13
		CH56	5280	MCS0	13
		CH64	5320	MCS0	13
	802.11 n40	CH54	5270	MCS0	15.5
		CH62	5310	MCS0	15.5
	802.11 ac20	CH52	5260	MCS0	13
		CH56	5280	MCS0	13
		CH64	5320	MCS0	13
	802.11 ac40	CH54	5270	MCS0	15
		CH62	5310	MCS0	15
	802.11 ac80	CH58	5290	MCS0	16
5470 – 5725MHz	802.11 a	CH100	5500	6	12.5
		CH120	5600	6	12.5
		CH140	5700	6	10.0
	802.11 n20	CH100	5500	MCS0	13
		CH120	5600	MCS0	13
		CH140	5700	MCS0	13
	802.11 n40	CH102	5510	MCS0	14
		CH118	5590	MCS0	15.5
		CH134	5670	MCS0	15.5
	802.11 ac20	CH100	5500	MCS0	13
		CH120	5600	MCS0	13
		CH140	5700	MCS0	13
	802.11 ac40	CH102	5510	MCS0	13.5
		CH118	5590	MCS0	15
		CH134	5670	MCS0	12.5
	802.11 ac80	CH106	5530	MCS0	14
		CH122	5610	MCS0	16

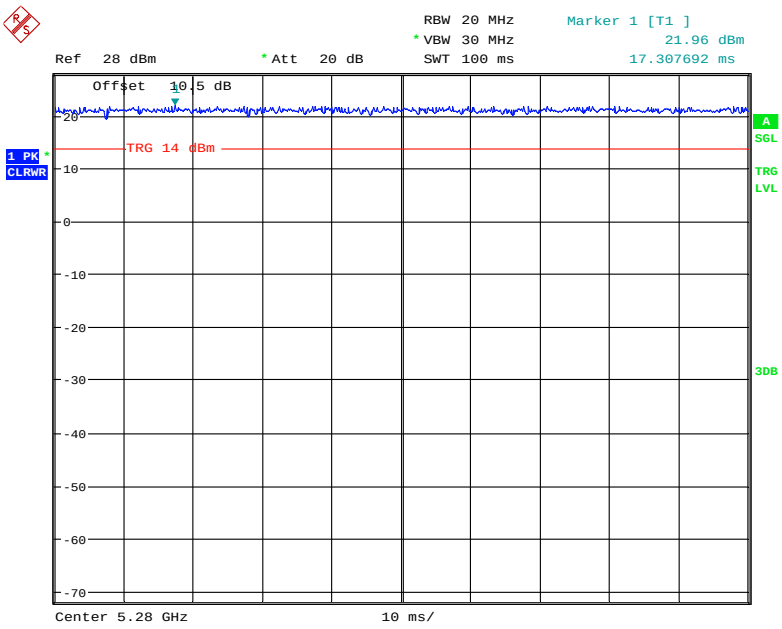
Duty cycle
5250 – 5350 MHz

802.11a mode



Date: 10.AUG.2019 11:19:52

802.11n20 mode



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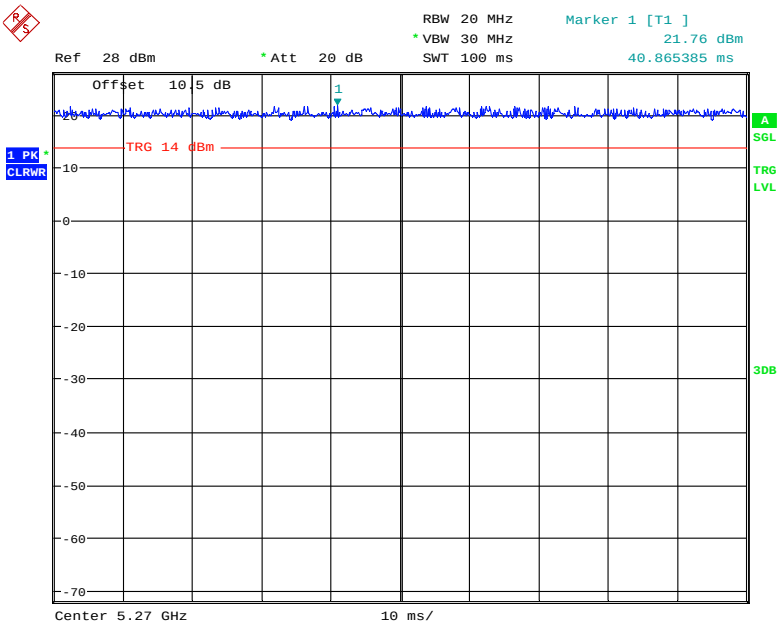
802.11n40 Mode



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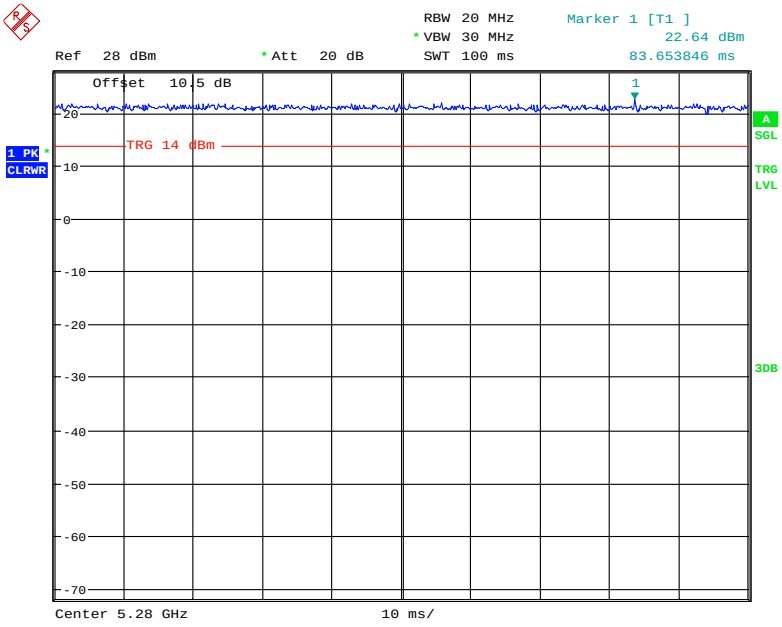
802.11ac20 Mode



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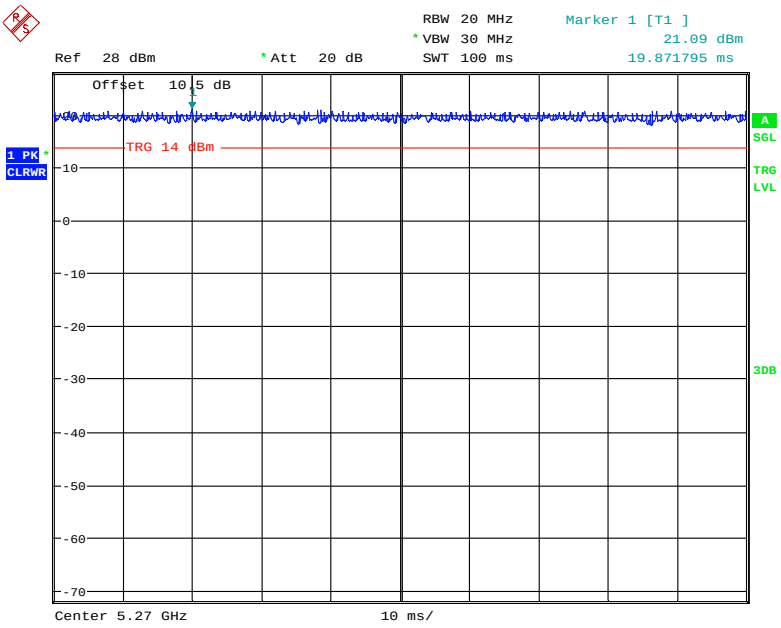
802.11ac40 Mode



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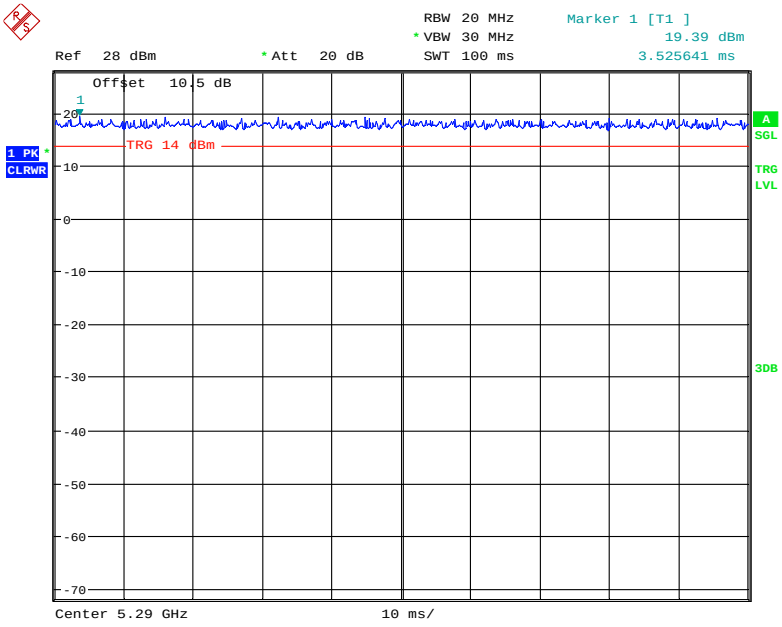
802.11ac80 Mode

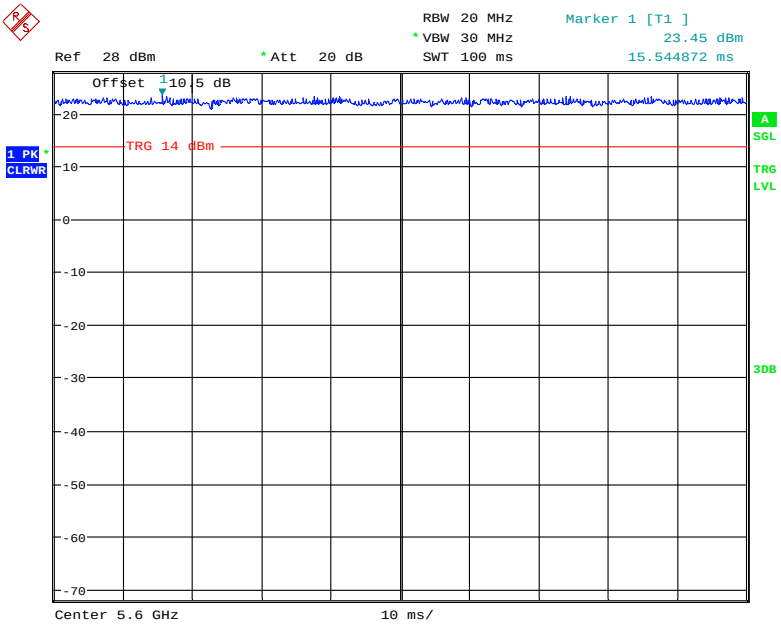


Date: 10.AUG.2019 11:10:52

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	-

5470 – 5725 MHz

802.11a mode



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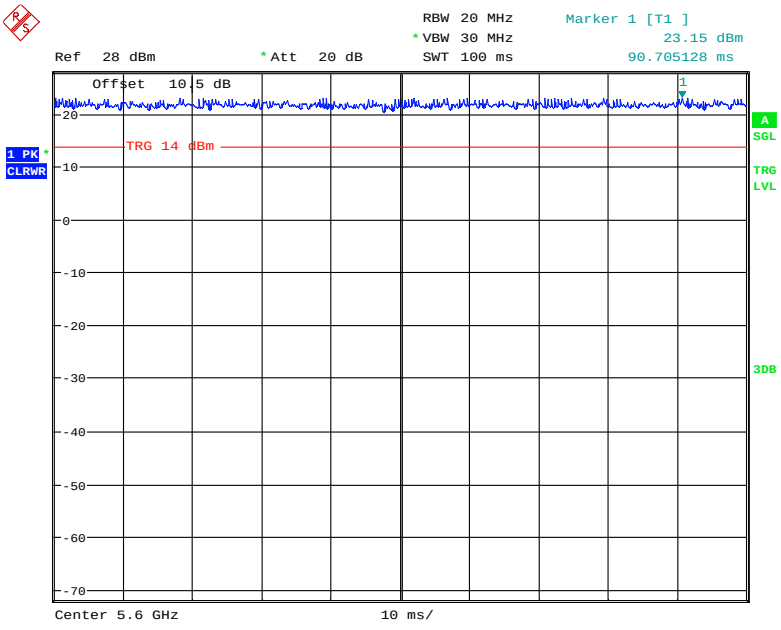
802.11n20 mode



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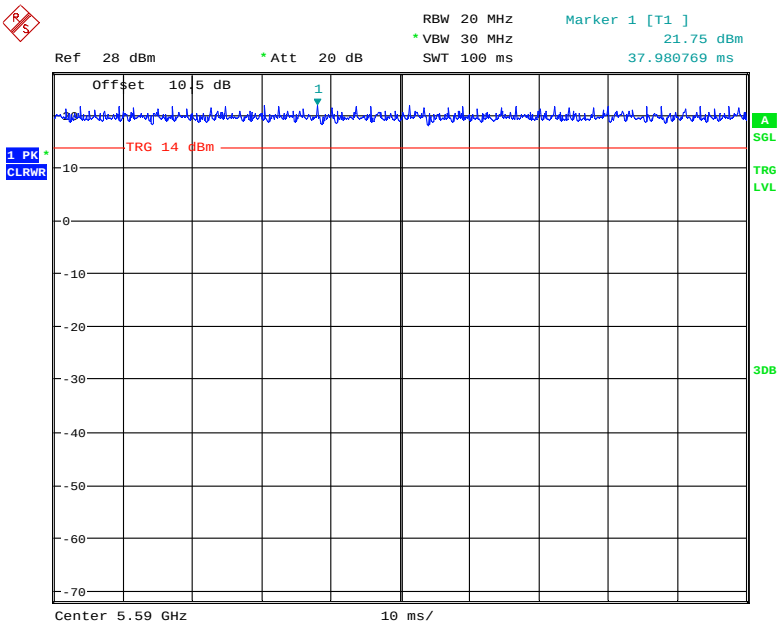
802.11n40 Mode



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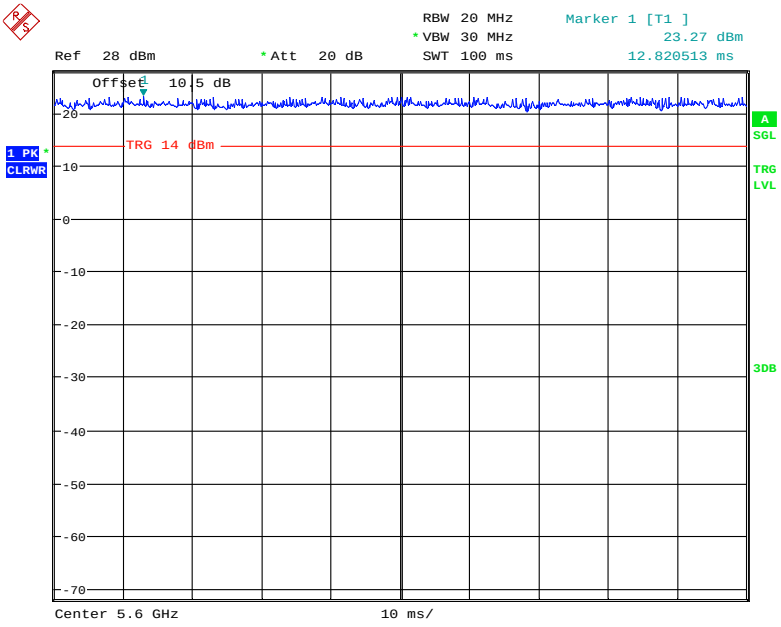
802.11ac20 Mode



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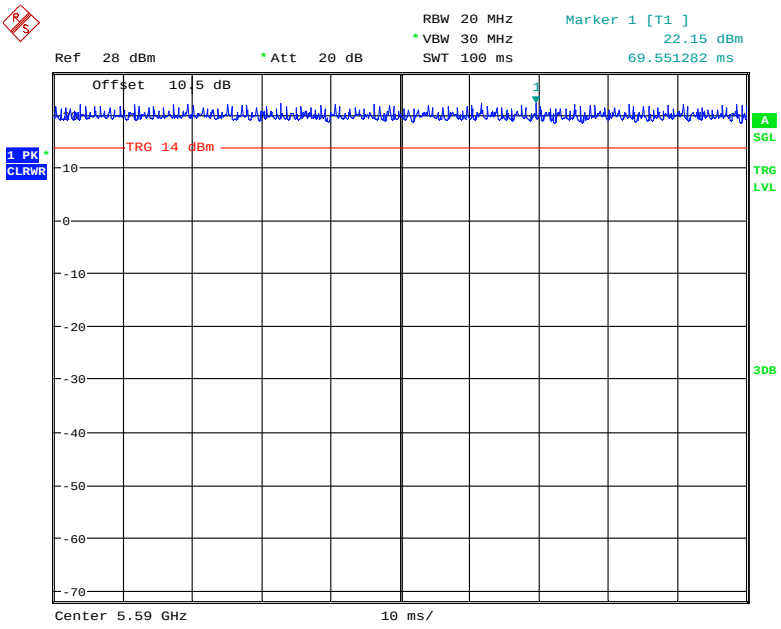
802.11ac40 Mode



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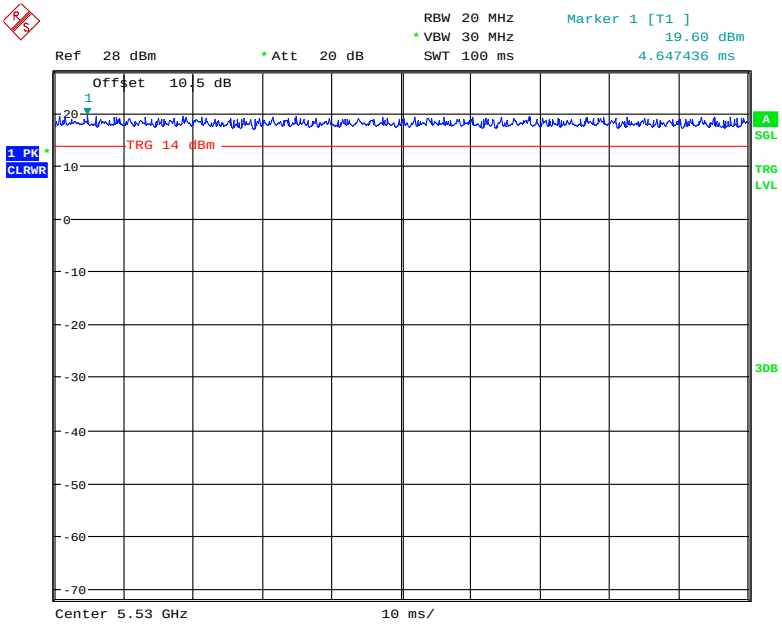
802.11ac80 Mode



Date: 10.AUG.2019 11:10:11

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	-

Support Equipment List and Details

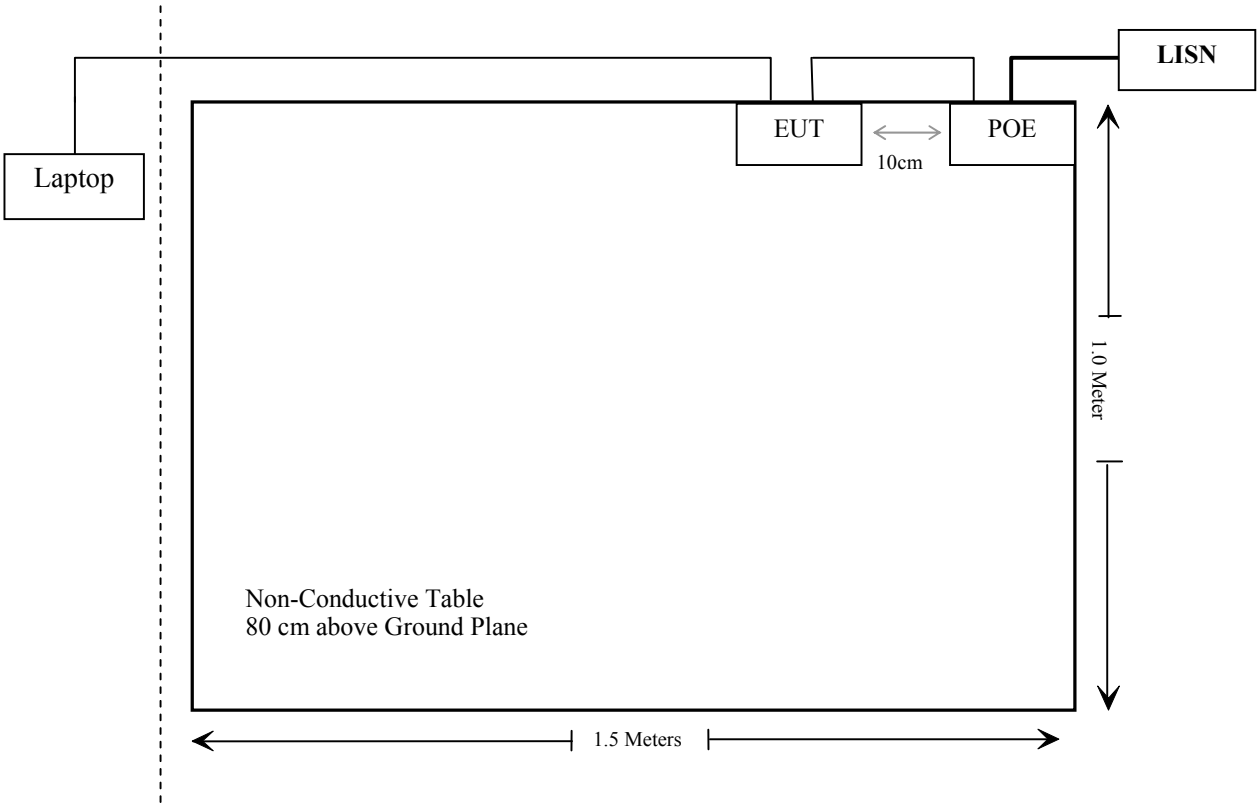
Manufacturer	Description	Model	Serial Number
Dcoma	POE	PSE801G	Un-known
HP	Laptop	Compaq CQ45	5CG33407QL

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable AC Cable	1.0	LISN	POE
Unshielded Detachable RJ45 Cable	1.2	POE	EUT
Unshielded Detachable RJ45 Cable	8.0	EUT	Laptop

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	MaximuM Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (2),(3)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a)(2)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(2)	Power Spectral Density	Compliance

Note: DFS report please refer to RSZ190626007-00 issued by Bay Area Compliance Laboratories Corp.(Dongguan).

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	2020-03-02
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	Signal Analyzer	FSV40	101473	2019-01-09	2020-01-08
Agilent	Spectrum Analyzer	8564E	3943A01781	2019-03-02	2020-03-02
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
Ducommun technologies	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-4223-02	1007726-03	2017-12-29	2020-12-28
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	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	2018-12-24	2019-12-24
Agilent	USB windebond power meter	U2021XA	MY54250003	2019-06-23	2020-06-23
Ducommun technologies	RF Cable	RG-214	3	Each Time	
WEINSCHEL	10dB Attenuator	5324	AU 3842	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).

§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
5250-5350	5	3.16	19	79.43	20	0.05	1.0
5470-5725	5	3.16	19.5	89.13	20	0.06	1.0

Note:
1) The conducted power is the tune-up power of the Max Conducted Output Power.
2) 2.4GHz or 5GHzWi-Fi can't transmit simultaneously for this device.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

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 four internal antennas arrangement, which were permanently attached and the antenna gain is 5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

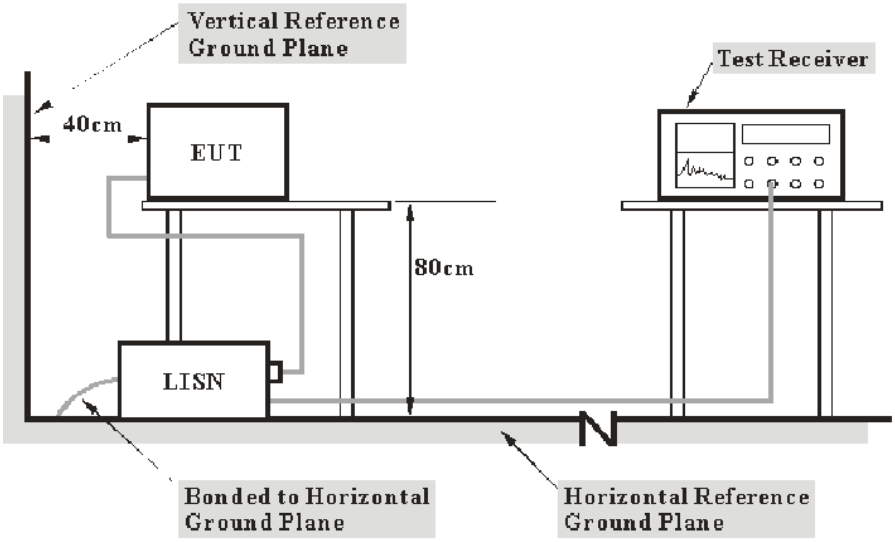
Result: Compliance.

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 24VAC/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 recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

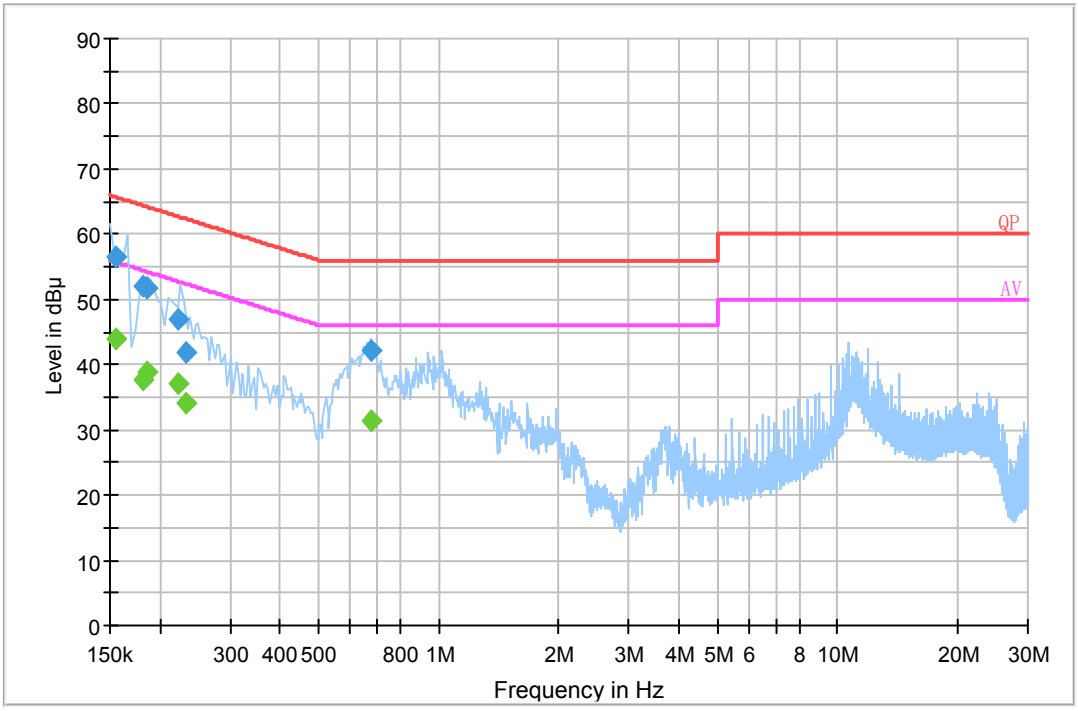
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2019-09-07.

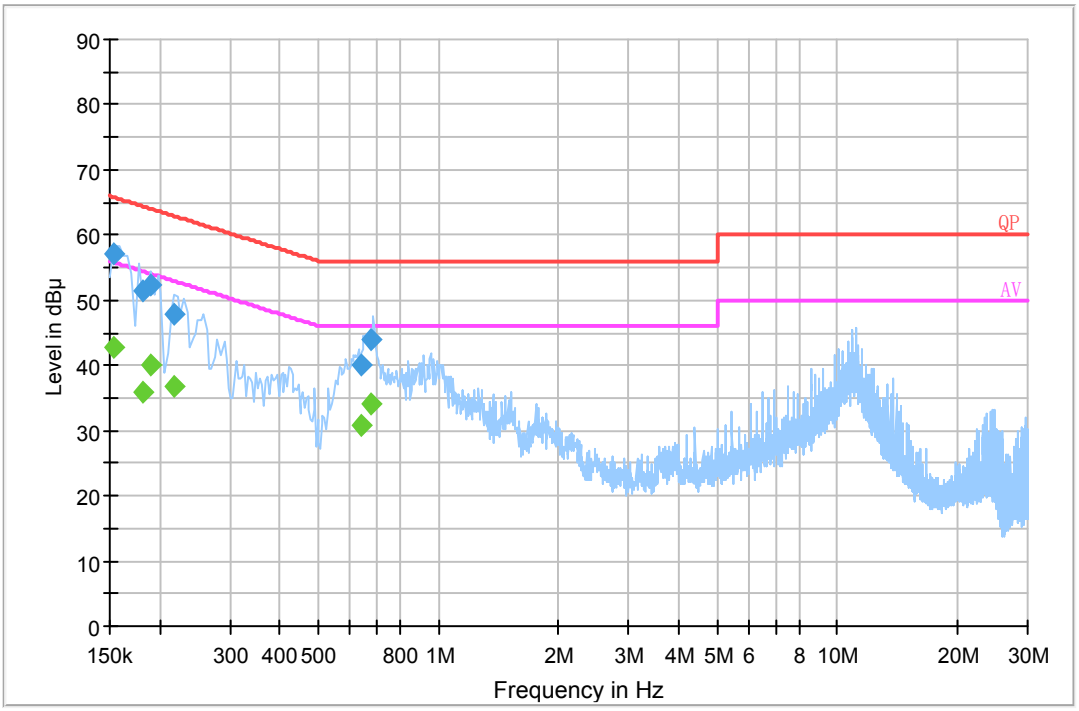
EUT operation mode: Transmitting (worst case)

AC 120V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.154500	56.5	19.8	65.8	9.2	QP
0.181500	51.9	19.9	64.4	12.5	QP
0.185500	51.6	19.8	64.2	12.6	QP
0.221500	47.0	19.8	62.8	15.7	QP
0.233500	41.7	19.8	62.3	20.6	QP
0.679890	42.1	19.8	56.0	13.9	QP
0.154500	44.0	19.8	55.8	11.8	Ave.
0.181500	37.6	19.9	54.4	16.8	Ave.
0.185500	38.8	19.8	54.2	15.4	Ave.
0.221500	37.0	19.8	52.8	15.8	Ave.
0.233500	34.1	19.8	52.3	18.3	Ave.
0.679890	31.4	19.8	46.0	14.6	Ave.

AC 120V, 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.153500	57.0	19.8	65.8	8.8	QP
0.182500	51.6	19.8	64.4	12.8	QP
0.189500	52.2	19.8	64.1	11.9	QP
0.217500	47.8	19.8	62.9	15.1	QP
0.640250	40.2	19.8	56.0	15.8	QP
0.675710	43.8	19.8	56.0	12.2	QP
0.153500	42.6	19.8	55.8	13.2	Ave.
0.182500	35.9	19.8	54.4	18.5	Ave.
0.189500	40.0	19.8	54.1	14.1	Ave.
0.217500	36.8	19.8	52.9	16.1	Ave.
0.640250	30.9	19.8	46.0	15.1	Ave.
0.675710	34.0	19.8	46.0	12.0	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) (2), (3), (7) – UNDESIRABLE EMISSION

Applicable Standard

FCC §15.407 (b) (2), (3), (7); §15.209; §15.205;

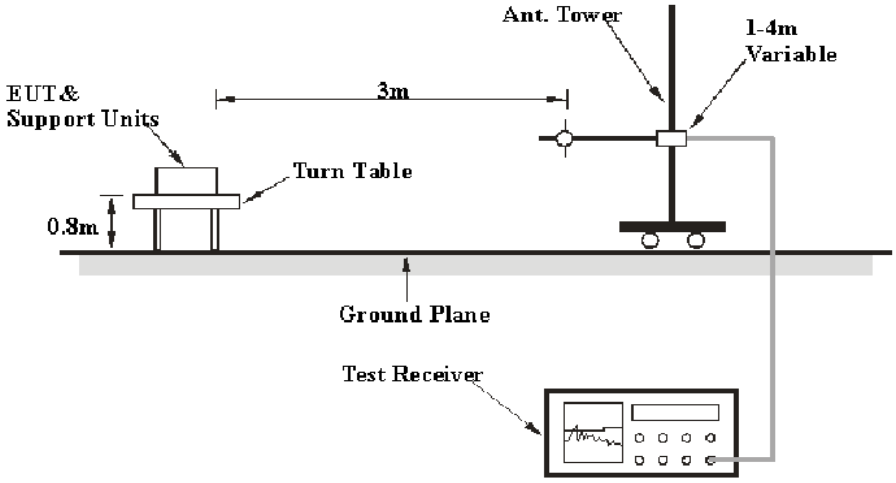
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

KDB 789033 D02 General UNII Test Procedures New Rules v02r01, clause G),
E [dBμV/m] = EIRP [dBm] + 95.2, for d = 3 meters.

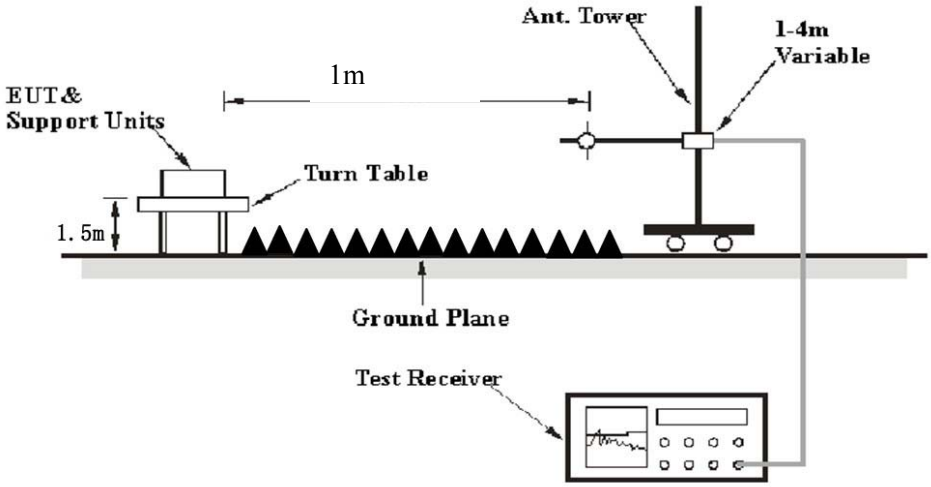
The general limit of -27 dBm EIRP (= 68.2 dBμV/m) is applied for unwanted emission of U-NII devices. However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.,* some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer
The general limit of -27 dBm EIRP (= 68.2 dBμV/m) is applied for unwanted emission of U-NII devices. However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.,* some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer to § 15.205 for restricted bands) that have average and peak limits specified in §§ 15.209 and 15.35(b), respectively.
Although the peak limit of 74 dBμV/m (20 dB above 54 dBμV/m) in the restricted band appears to be higher than 68.2 dBμV/m, the lower average limit of 54 dBμV/m in the restricted bands needs to be complied to

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	Measurements
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

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.

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified,extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\mathrm{SpecLimit}} = E_{\mathrm{Meas}} + 20\log\left(\frac{d_{\mathrm{Meas}}}{d_{\mathrm{SpecLimit}}}\right)$$

where

$E_{\mathrm{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dBμV/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dBμV/m
d_{Meas}	is the measurement distance, in m
$d_{\mathrm{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is 20*log(1/3)= -9.5 dB

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

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_{\mathrm{m}} + U_{(L\mathrm{m})} \leq L_{\mathrm{lim}} + U_{\mathrm{cispr}}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_{m} is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

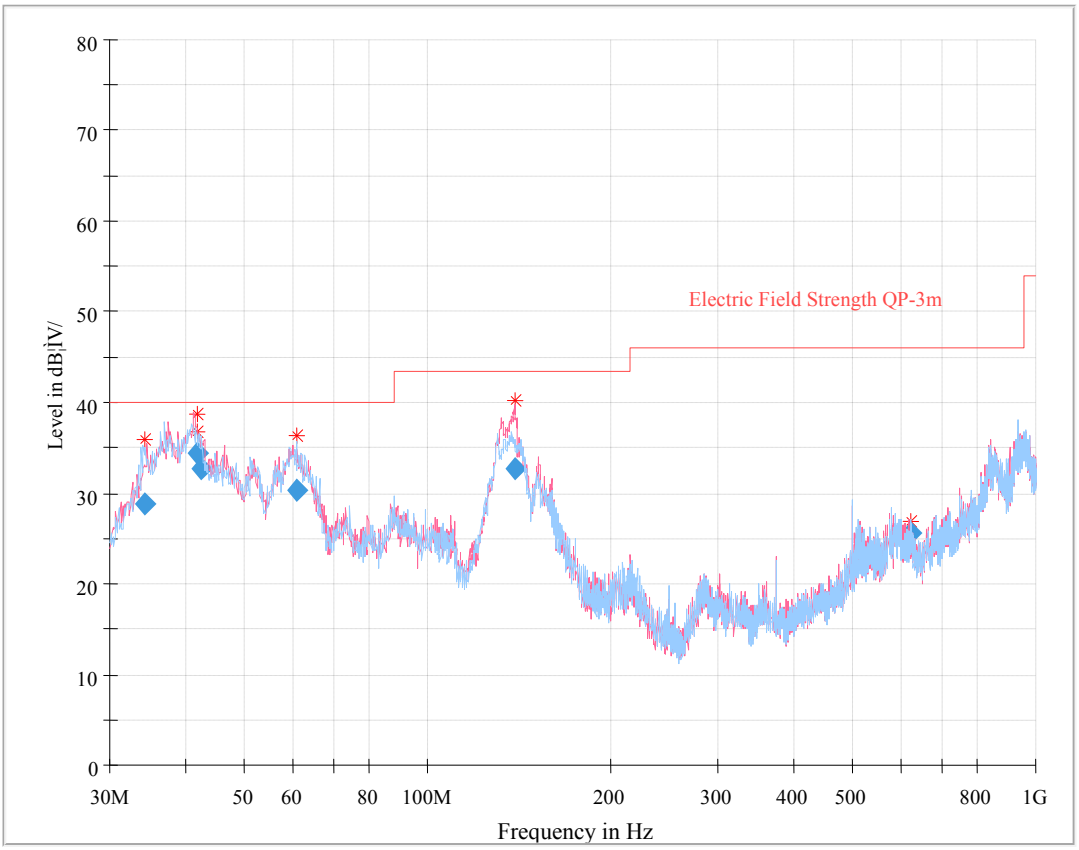
Environmental Conditions

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

The testing was performed by Curry Xiang on 2019-08-06 and Charlie Cha on 2019-09-02.

EUT operation mode: Transmitting

30 MHz – 1 GHz: *(worst case)*



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
34.267750	28.80	122.0	V	174.0	-10.1	40.00	11.20
41.673000	34.32	103.0	V	284.0	-15.0	40.00	5.68
42.486625	32.62	102.0	V	145.0	-15.5	40.00	7.38
61.040750	30.35	114.0	H	195.0	-20.2	40.00	9.65
139.641500	32.75	109.0	V	303.0	-14.2	43.50	10.75
625.011125	25.63	182.0	V	164.0	-2.6	46.00	20.37

30 MHz ~ 40 GHz:

5250-5350 MHz:

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
(MHz)	Reading (dBμV) @1m	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5260 MHz									
5054.16	30.77	PK	322	1.1	V	38.16	68.93	83.5	14.57
5054.16	16.94	Ave.	322	1.1	V	38.16	55.10	63.5	8.40
5357.72	31.18	PK	320	2.2	V	39.09	70.27	83.5	13.23
5357.72	17.35	Ave.	320	2.2	V	39.09	56.44	63.5	7.06
10520.00	55.58	PK	131	2.4	V	17.25	72.83	77.7	4.87
5280 MHz									
10560.00	55.58	PK	157	2.4	V	17.91	73.49	77.7	4.21
5320 MHz									
5110.38	31.48	PK	212	2.1	V	38.26	69.74	83.5	13.76
5110.38	16.89	Ave.	212	2.1	V	38.26	55.15	63.5	8.35
5351.67	40.39	PK	108	2.1	V	39.09	79.48	83.5	4.02
5351.67	21.34	Ave.	108	2.1	V	39.09	60.43	63.5	3.07
10640.00	57.54	PK	313	2.0	V	18.01	75.55	83.5	7.95
10640.00	42.18	Ave.	313	2.0	V	18.01	60.19	63.5	3.31
802.11n20									
5260 MHz									
5094.50	31.88	PK	184	1.5	V	38.26	70.14	83.5	13.36
5094.50	17.62	Ave.	184	1.5	V	38.26	55.88	63.5	7.62
5422.03	31.14	PK	288	1.2	V	39.19	70.33	83.5	13.17
5422.03	17.25	Ave.	288	1.2	V	39.19	56.44	63.5	7.06
10520.00	51.06	PK	297	2.4	V	17.25	68.31	77.7	9.39
5280 MHz									
10560.00	50.14	PK	26	1.3	V	17.91	68.05	77.7	9.65
5320 MHz									
5094.50	31.65	PK	0	2.1	V	38.26	69.91	83.5	13.59
5094.50	17.46	Ave.	0	2.1	V	38.26	55.72	63.5	7.78
5351.67	41.08	PK	241	1.7	V	39.09	80.17	83.5	3.33
5351.67	20.22	Ave.	241	1.7	V	39.09	59.31	63.5	4.19
10640.00	49.40	PK	120	2.0	V	18.01	67.41	83.5	16.09
10640.00	32.29	Ave.	120	2.0	V	18.01	50.30	63.5	13.20

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
(MHz)	Reading (dBμV) @1m	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5270 MHz									
5029.20	32.13	PK	45	1.2	V	38.14	70.27	83.5	13.23
5029.20	17.83	Ave.	45	1.2	V	38.14	55.97	63.5	7.53
5353.42	32.07	PK	100	2.0	V	39.09	71.16	83.5	12.34
5353.42	17.64	Ave.	100	2.0	V	39.09	56.73	63.5	6.77
10540.00	48.14	PK	217	1.2	V	17.25	65.39	77.7	12.31
5310 MHz									
5029.20	30.67	PK	21	1.7	V	38.14	68.81	83.5	14.69
5029.20	16.49	Ave.	21	1.7	V	38.14	54.63	63.5	8.87
5351.03	41.02	PK	280	1.8	V	39.09	80.11	83.5	3.39
5351.03	21.88	Ave.	280	1.8	V	39.09	60.97	63.5	2.53
10620.00	45.62	PK	104	1.6	V	18.01	63.63	83.5	19.87
10620.00	30.56	Ave.	104	1.6	V	18.01	48.57	63.5	14.93
802.11ac20									
5260 MHz									
5086.51	31.76	PK	345	2.0	V	38.26	70.02	83.5	13.48
5086.51	17.83	Ave.	345	2.0	V	38.26	56.09	63.5	7.41
5351.03	31.25	PK	242	2.5	V	39.09	70.34	83.5	13.16
5351.03	17.08	Ave.	242	2.5	V	39.09	56.17	63.5	7.33
10520.00	50.79	PK	295	1.4	V	17.25	68.04	77.7	9.66
5280 MHz									
10560.00	49.59	PK	266	1.2	V	17.91	67.50	77.7	10.20
5320 MHz									
5080.21	30.67	PK	186	2.1	V	38.26	68.93	83.5	14.57
5080.21	16.81	Ave.	186	2.1	V	38.26	55.07	63.5	8.43
5351.67	40.89	PK	169	2.1	V	39.09	79.98	83.5	3.52
5351.67	20.15	Ave.	169	2.1	V	39.09	59.24	63.5	4.26
10460.00	48.71	PK	328	1.6	V	17.15	65.86	83.5	17.64
10460.00	34.46	Ave.	328	1.6	V	17.15	51.61	63.5	11.89

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
(MHz)	Reading (dBμV) @1m	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac40									
5270 MHz									
5035.27	31.77	PK	211	1.5	V	38.14	69.91	83.5	13.59
5035.27	17.75	Ave.	211	1.5	V	38.14	55.89	63.5	7.61
5423.78	31.30	PK	137	2.0	V	39.19	70.49	83.5	13.01
5423.78	17.26	Ave.	137	2.0	V	39.19	56.45	63.5	7.05
10540.00	49.46	PK	118	1.3	V	17.25	66.71	77.7	10.99
5310 MHz									
5031.45	31.66	PK	184	1.3	V	38.14	69.80	83.5	13.70
5031.45	17.54	Ave.	184	1.3	V	38.14	55.68	63.5	7.82
5350.24	43.19	PK	310	2.3	V	39.09	82.28	83.5	1.22
5350.24	23.16	Ave.	310	2.3	V	39.09	62.25	63.5	1.25
10620.00	47.95	PK	9	1.2	V	18.01	65.96	83.5	17.54
10620.00	33.16	Ave.	9	1.2	V	18.01	51.17	63.5	12.33
802.11AC80									
5290 MHz									
5130.14	31.50	PK	200	1.5	V	38.36	69.86	83.5	13.64
5130.14	17.42	Ave.	200	1.5	V	38.36	55.78	63.5	7.72
5351.83	43.28	PK	158	1.2	V	39.09	82.37	83.5	1.13
5351.83	23.36	Ave.	158	1.2	V	39.09	62.45	63.5	1.05
10580.00	45.91	PK	256	2.2	V	17.91	63.82	77.7	13.88

5470-5725 MHz:

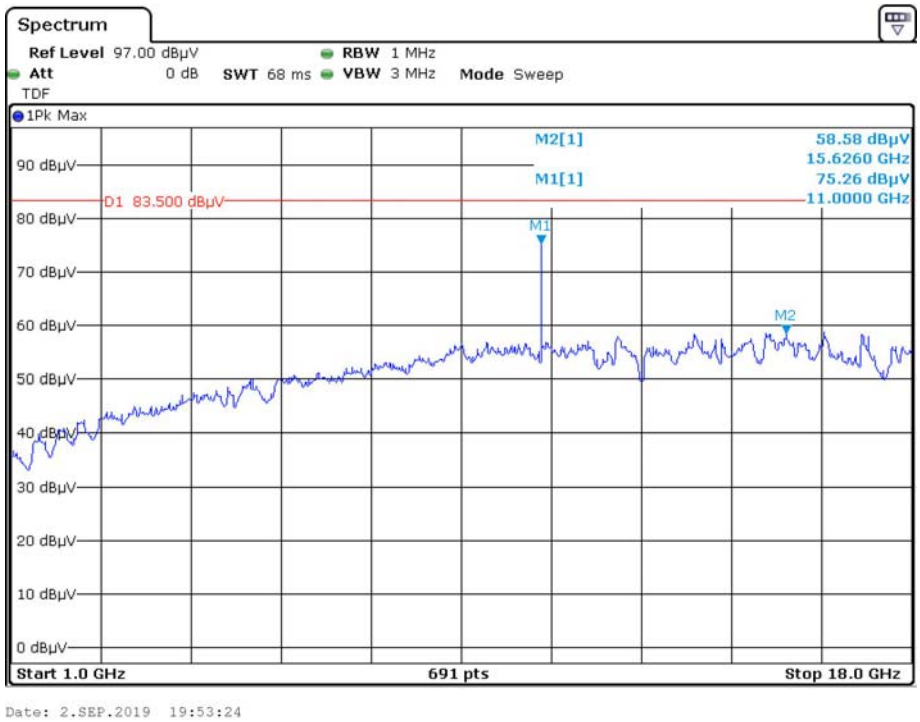
Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m) @1m	FCC Part 15.407/205/209	
(MHz)	Reading (dBµV) @1m	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11a									
5500 MHz									
5469.04	36.92	PK	59	1.5	V	39.37	76.29	77.7	1.41
5728.09	32.03	PK	145	2.3	V	39.49	71.52	77.7	6.18
11000.00	59.16	PK	17	1.2	V	17.66	76.82	83.5	6.68
11000.00	44.08	Ave.	17	1.2	V	17.66	61.74	63.5	1.76
5600 MHz									
11200.00	54.96	PK	182	1.8	V	17.39	72.35	83.5	11.15
11200.00	40.61	Ave.	182	1.8	V	17.39	58.00	63.5	5.50
5700 MHz									
5463.26	32.28	PK	157	2.5	V	39.37	71.65	77.7	6.05
5730.04	37.12	PK	302	2.1	V	39.49	76.61	77.7	1.09
11400.00	47.22	PK	158	2.0	V	17.73	64.95	83.5	18.55
11400.00	32.57	Ave.	158	2.0	V	17.73	50.30	63.5	13.20
802.11n20									
5500 MHz									
5463.49	36.57	PK	312	2.3	V	39.37	75.94	77.7	1.76
5726.17	32.73	PK	59	1.4	V	39.49	72.22	77.7	5.48
11000.00	54.03	PK	349	1.6	V	17.66	71.69	83.5	11.81
11000.00	38.14	Ave.	349	1.6	V	17.66	55.80	63.5	7.70
5600 MHz									
11200.00	51.19	PK	170	2.3	V	17.39	68.58	83.5	14.92
11200.00	35.66	Ave.	170	2.3	V	17.39	53.05	63.5	10.45
5700 MHz									
5465.21	31.45	PK	178	1.3	V	39.37	70.82	77.7	6.88
5725.95	37.31	PK	178	1.3	V	39.49	76.80	77.7	0.90
11400.00	44.74	PK	182	1.6	V	17.73	62.47	83.5	21.03
11400.00	29.85	Ave.	182	1.6	V	17.73	47.58	63.5	15.92

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
(MHz)	Reading (dBμV) @1m	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5510 MHz									
5466.61	37.60	PK	127	1.3	V	39.37	76.97	77.7	0.73
5739.77	32.74	PK	41	2.1	V	39.49	72.23	77.7	5.47
11020.00	49.58	PK	64	2.0	V	17.66	67.24	83.5	16.26
11020.00	34.15	Ave.	64	2.0	V	17.66	51.81	63.5	11.69
5590MHZ									
11180.00	51.34	PK	99	2.4	V	17.39	68.73	83.5	14.77
11180.00	35.25	Ave.	99	2.4	V	17.39	52.64	63.5	10.86
5670 MHz									
5466.31	32.02	PK	351	1.7	V	39.49	71.51	77.7	6.19
5727.61	37.30	PK	351	1.7	V	39.49	76.79	77.7	0.91
11340.00	44.20	PK	23	2.4	V	17.43	61.63	83.5	21.87
11340.00	29.83	Ave.	23	2.4	V	17.43	47.26	63.5	16.24
802.11ac20									
5500 MHz									
5466.27	34.61	PK	1	1.3	V	39.37	73.98	77.7	3.72
5743.43	32.52	PK	138	1.6	V	39.49	72.01	77.7	5.69
11000.00	56.05	PK	73	1.1	V	17.66	73.71	83.5	9.79
11000.00	40.65	Ave.	73	1.1	V	17.66	58.31	63.5	5.19
5600 MHz									
11200.00	50.98	PK	271	2.4	V	17.39	68.37	83.5	15.13
11200.00	34.85	Ave.	271	2.4	V	17.39	52.24	63.5	11.26
5700 MHz									
5464.10	31.92	PK	43	2.3	V	39.37	71.29	77.7	6.41
5725.74	37.36	PK	43	2.3	V	39.49	76.85	77.7	0.85
11400.00	45.45	PK	128	1.0	V	17.73	63.18	83.5	20.32
11400.00	30.79	Ave.	128	1.0	V	17.73	48.52	63.5	14.98

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m) @1m	FCC Part 15.407/205/209	
(MHz)	Reading (dBµV) @1m	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11ac40									
5510 MHz									
5466.96	38.01	PK	122	2.4	V	39.37	77.38	77.7	0.32
5733.41	33.21	PK	122	2.4	V	39.49	72.70	77.7	5.00
11020.00	49.18	PK	40	2.2	V	17.66	66.84	83.5	16.66
11020.00	33.60	Ave.	40	2.2	V	17.66	51.26	63.5	12.24
5590									
11180.00	52.18	PK	281	1.2	V	17.39	69.57	83.5	13.93
11180.00	35.46	Ave.	281	1.2	V	17.39	52.85	63.5	10.65
5670 MHz									
5461.08	31.47	PK	221	1.2	V	39.37	70.84	77.7	6.86
5725.81	37.51	PK	125	2.4	V	39.49	77.00	77.7	0.70
11340.00	43.91	PK	39	1.5	V	17.43	61.34	83.5	22.16
11340.00	28.74	Ave.	39	1.5	V	17.43	46.17	63.5	17.33
802.11ac80									
5530 MHz									
5466.44	37.86	PK	18	1.2	V	39.37	77.23	77.7	0.47
5737.97	31.18	PK	18	1.2	V	39.49	70.67	77.7	7.03
11060.00	44.22	PK	353	2.2	V	16.72	60.94	83.5	22.56
11060.00	29.51	Ave.	353	2.2	V	16.72	46.23	63.5	17.27
5610 MHz									
5469.83	35.15	PK	275	2.1	V	39.37	74.52	77.7	3.18
5736.11	37.65	PK	275	2.1	V	39.49	77.14	77.7	0.56
11220.00	44.95	PK	294	1.1	V	17.39	62.34	83.5	21.16
11220.00	30.03	Ave.	294	1.1	V	17.39	47.42	63.5	16.08

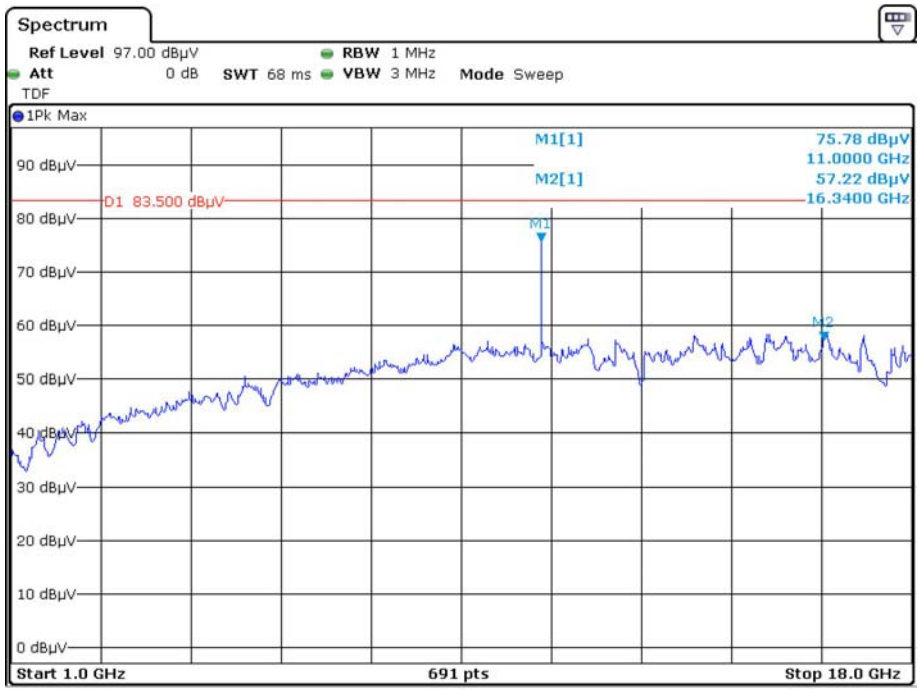
Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

Pre-scan with 802.11a 5500MHz, for Peak
Horizontal



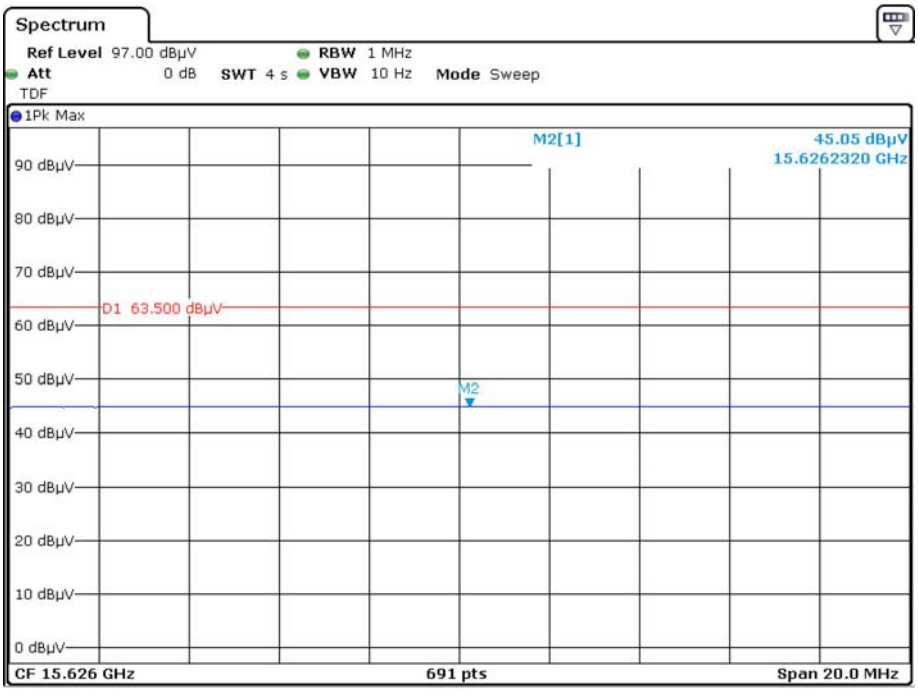
Date: 2.SEP.2019 19:53:24

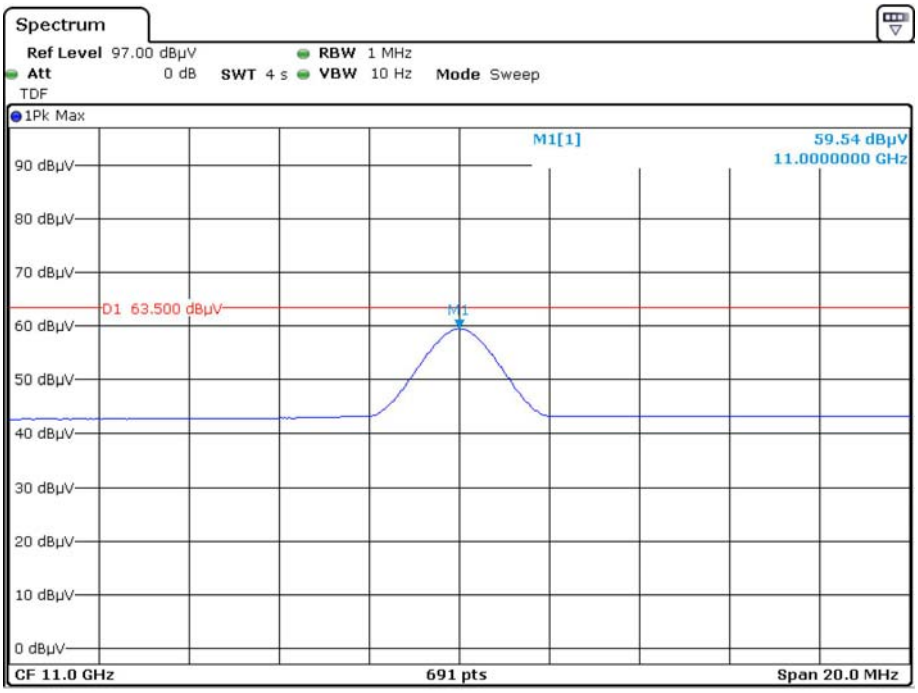
Vertical



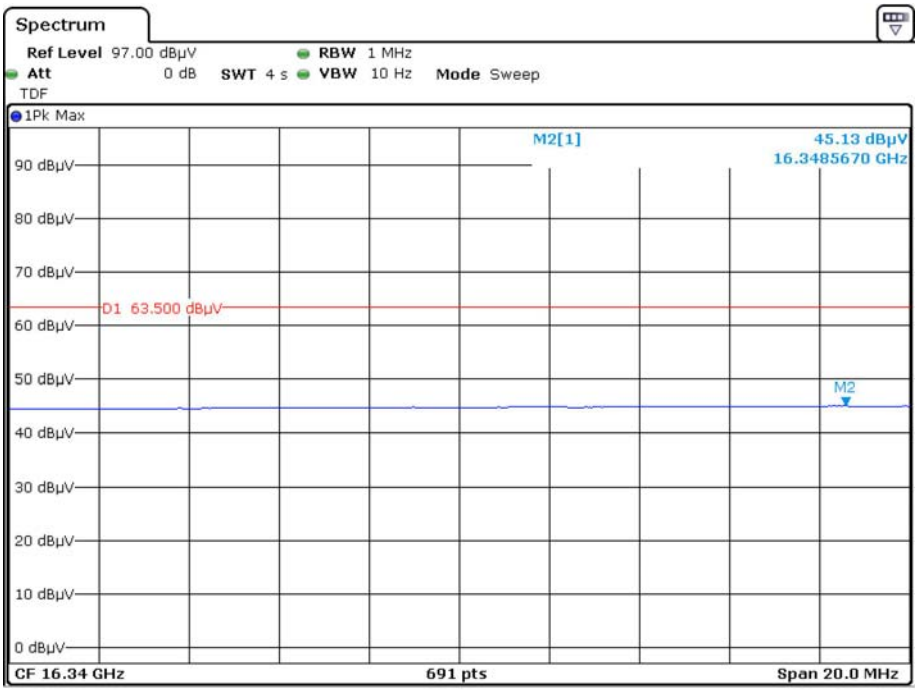
Date: 2.SEP.2019 20:01:12

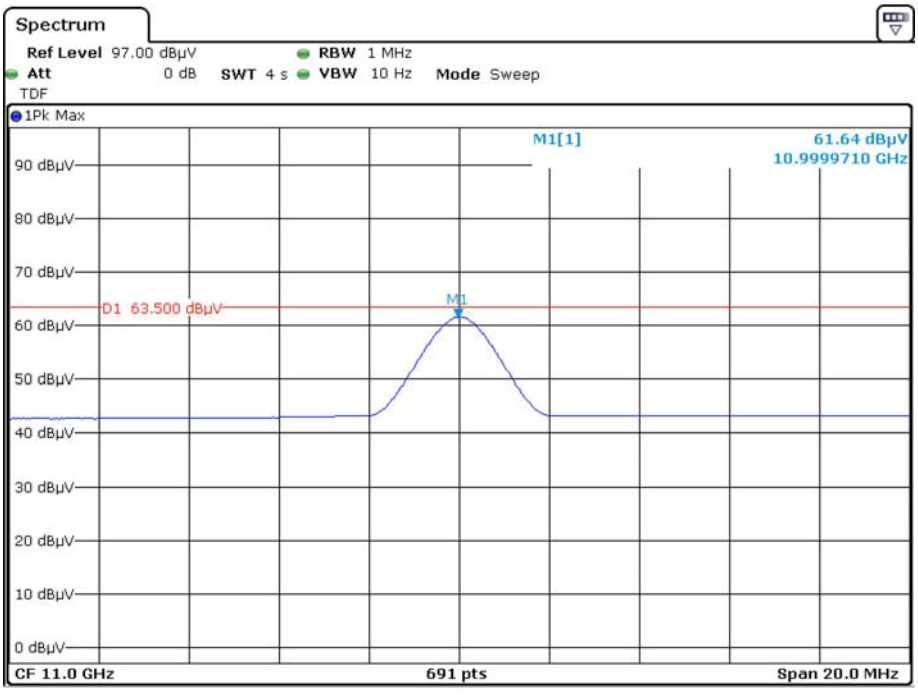
Pre-scan with 802.11a 5500MHz, for Average
Horizontal





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]
45.13 dBµV
16.3485670 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 16.34 GHz
691 pts
Span 20.0 MHz
Date: 2.SEP.2019 20:04:56


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 4 s
VBW 10 Hz
Mode Sweep
TDF
1Pk Max
M1[1]
61.64 dBµV
10.9999710 GHz
90 dBµV
80 dBµV
70 dBµV
D1 63.500 dBµV
M1
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 11.0 GHz
691 pts
Span 20.0 MHz
Date: 2.SEP.2019 20:12:00

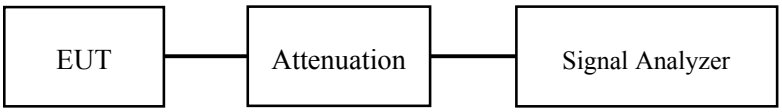
FCC §15.407(a) (1) (5), (e) – 26 dB & 6dB EMISSION BANDWIDTH

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 5.25-5.35 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.

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%.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Kieron Luo on 2019-08-10.

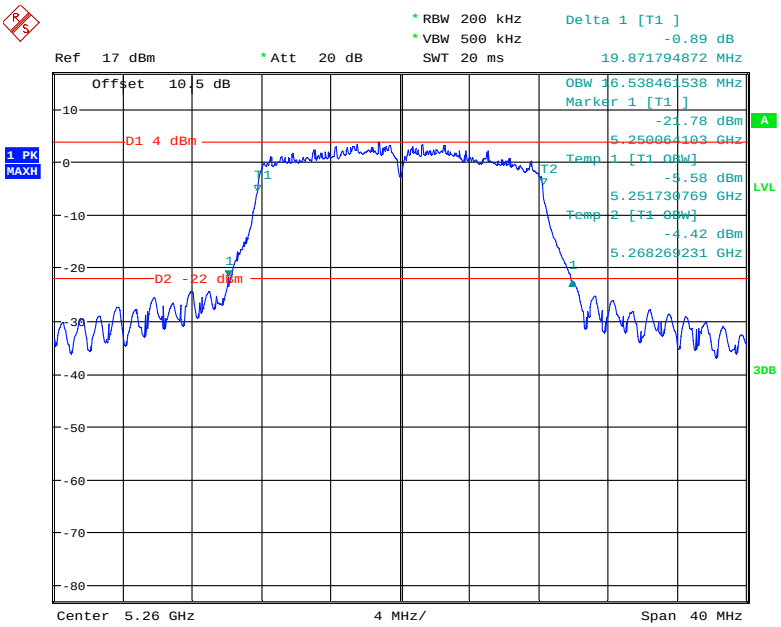
EUT operation mode: Transmitting

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

5250 MHz - 5350 MHz:

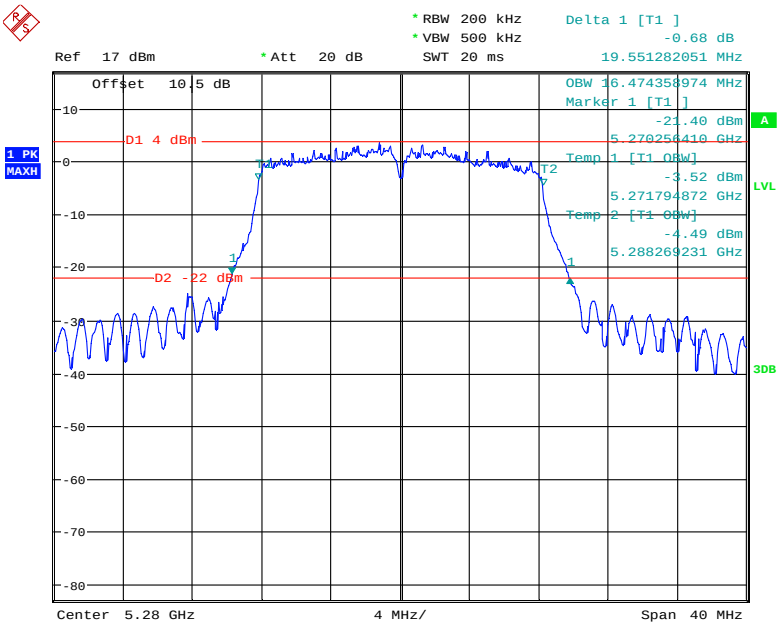
Frequency (MHz)	Antenna Port	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a			
5260	Chain 3	19.872	16.538
5280	Chain 3	19.551	16.474
5320	Chain 3	19.679	16.410
802.11n20			
5260	Chain 3	20.128	17.564
5280	Chain 3	20.192	17.564
5320	Chain 3	20.192	17.564
802.11n40			
5270	Chain 3	40.897	36.282
5310	Chain 3	41.026	36.282
802.11ac20			
5260	Chain 3	20.128	17.564
5280	Chain 3	20.128	17.564
5320	Chain 3	20.256	17.564
802.11ac40			
5270	Chain 3	41.282	36.282
5310	Chain 3	41.154	36.282
802.11ac80			
5290	Chain 3	81.795	75.641

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5260 MHz



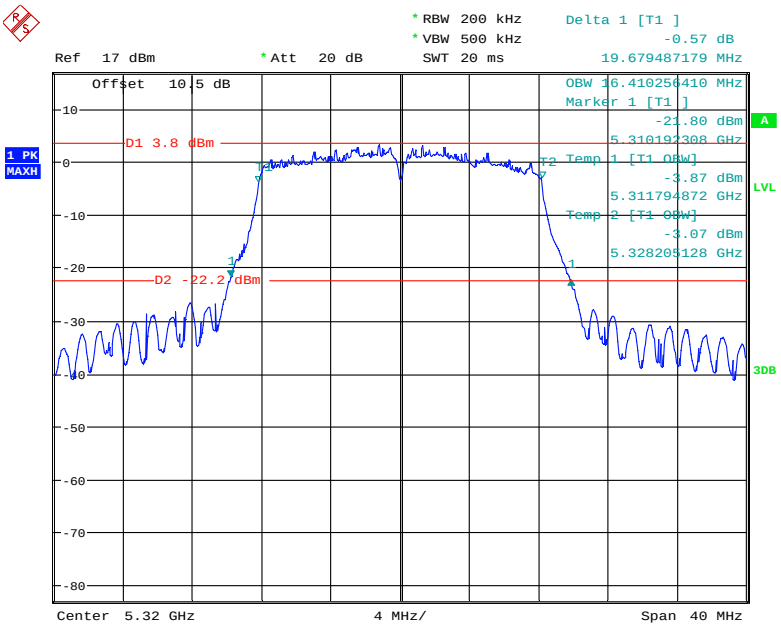
Date: 10.AUG.2019 10:26:03

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5280 MHz



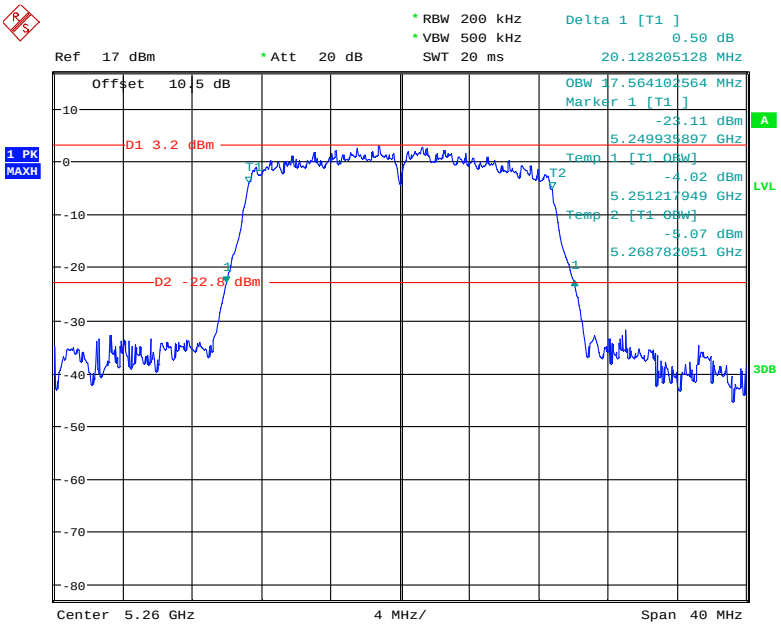
Date: 10.AUG.2019 10:26:34

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5320 MHz



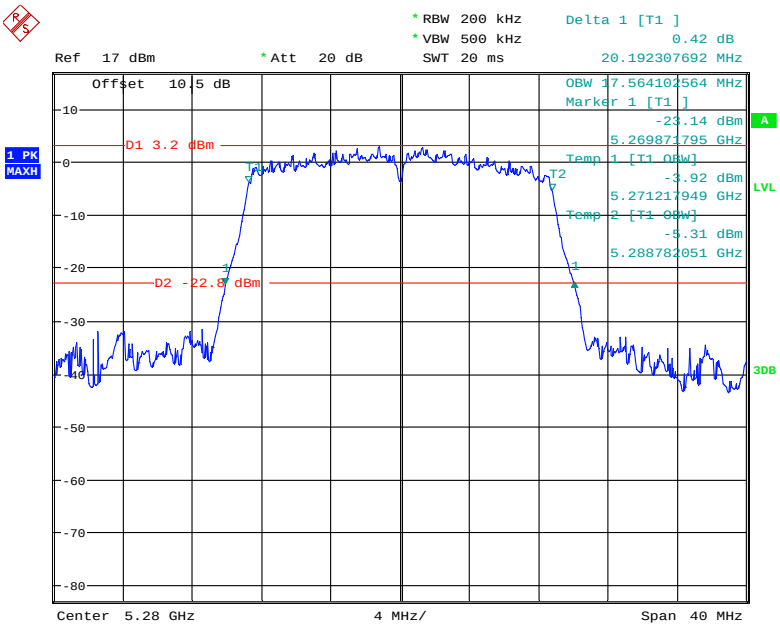
Date: 10.AUG.2019 10:27:46

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5260 MHz



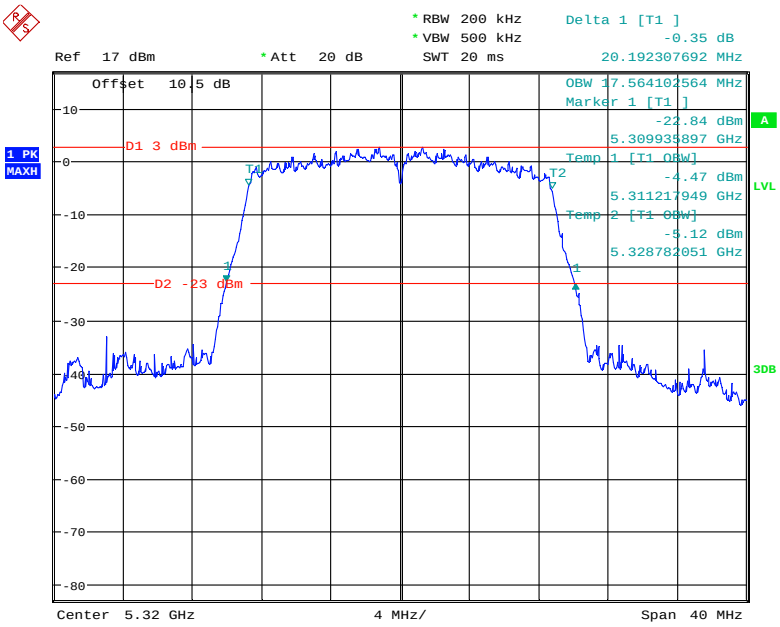
Date: 10.AUG.2019 10:46:04

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5280 MHz



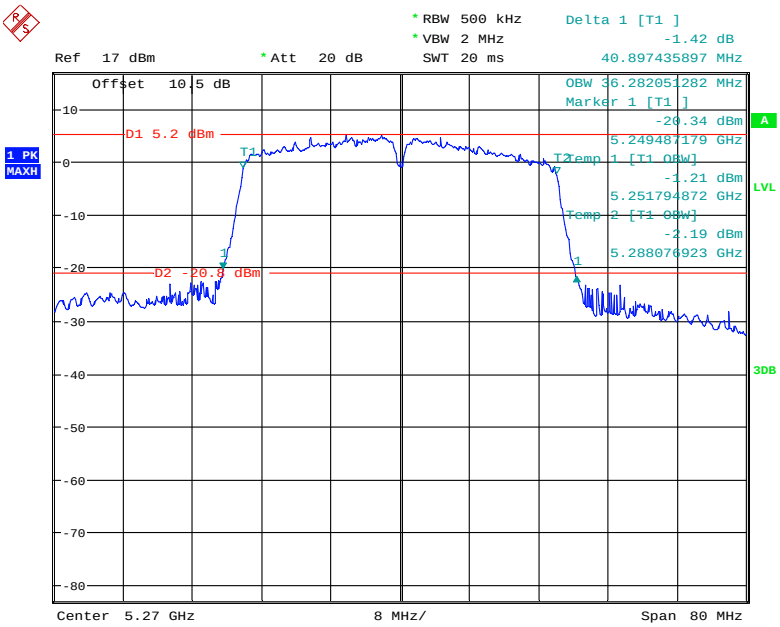
Date: 10.AUG.2019 10:46:42

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5320 MHz



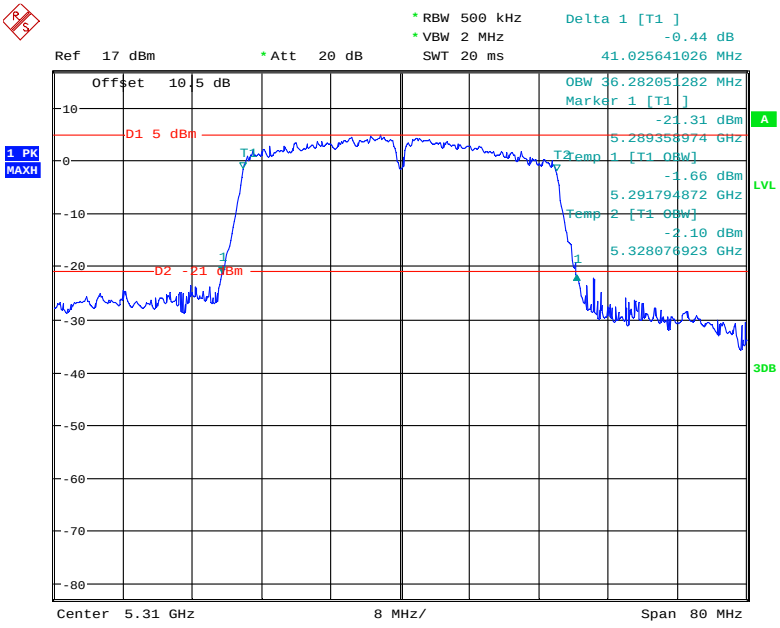
Date: 10.AUG.2019 10:47:39

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5270 MHz



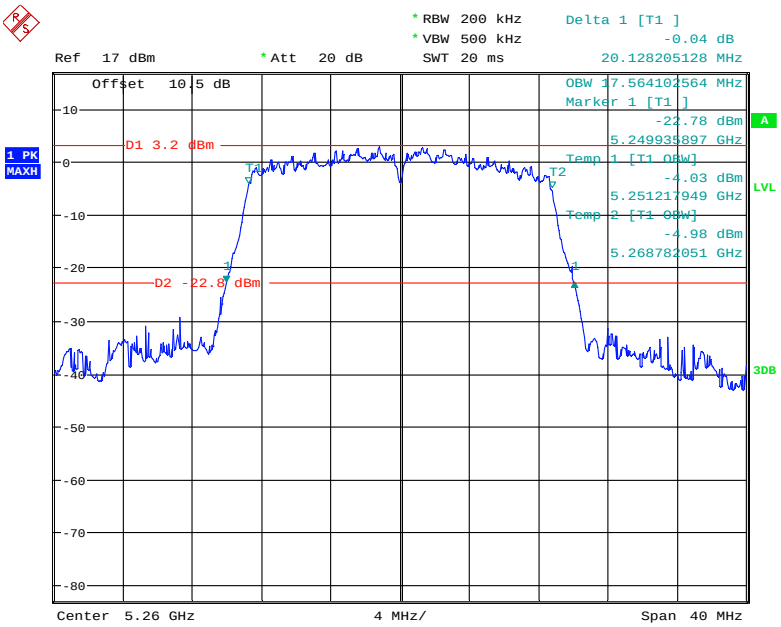
Date: 10.AUG.2019 10:50:41

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5310 MHz



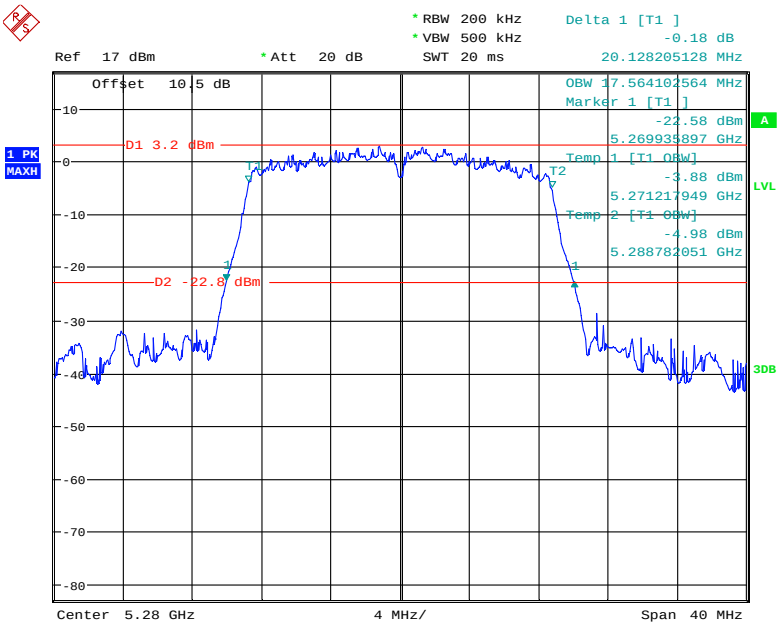
Date: 10.AUG.2019 10:51:42

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5260 MHz



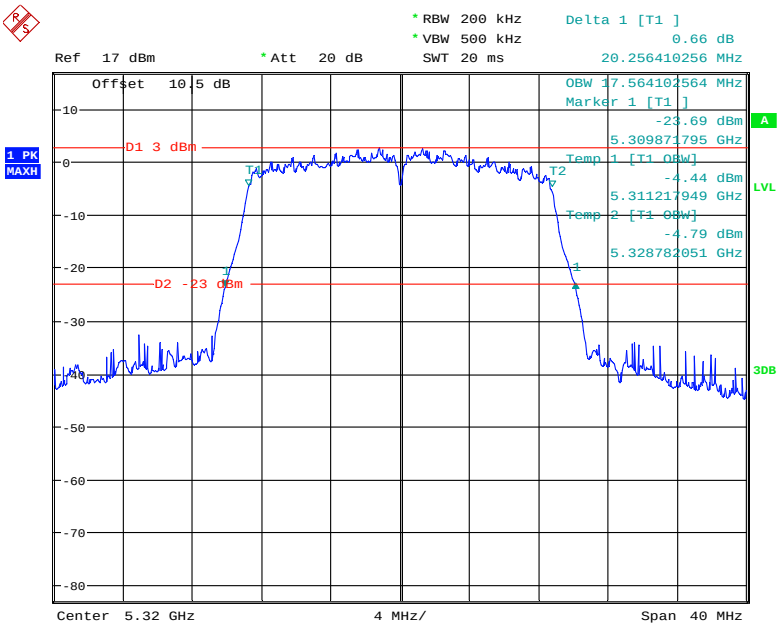
Date: 10.AUG.2019 10:45:31

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5280 MHz



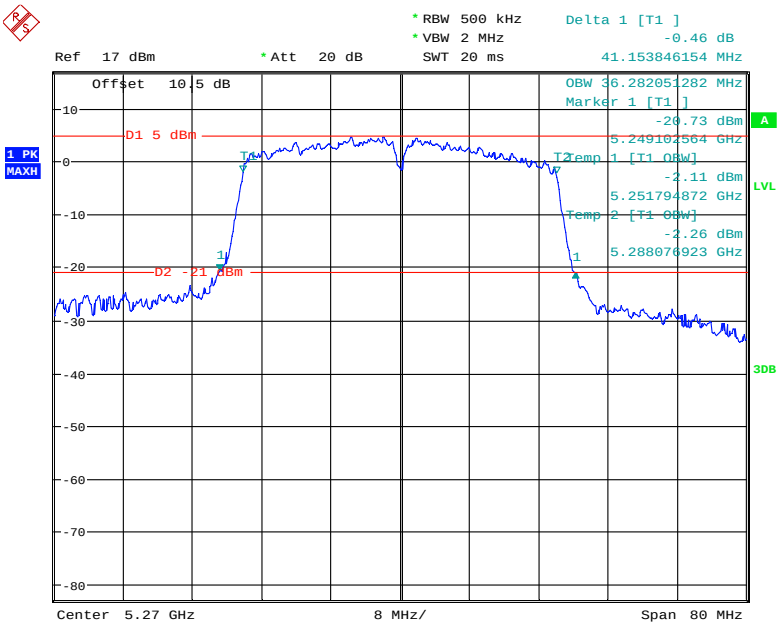
Date: 10.AUG.2019 10:44:58

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5320 MHz



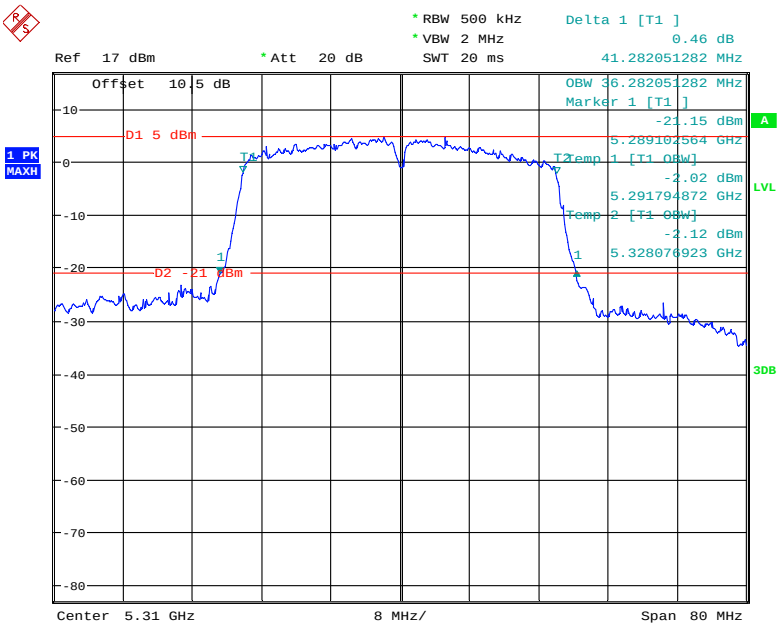
Date: 10.AUG.2019 10:44:16

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5270 MHz



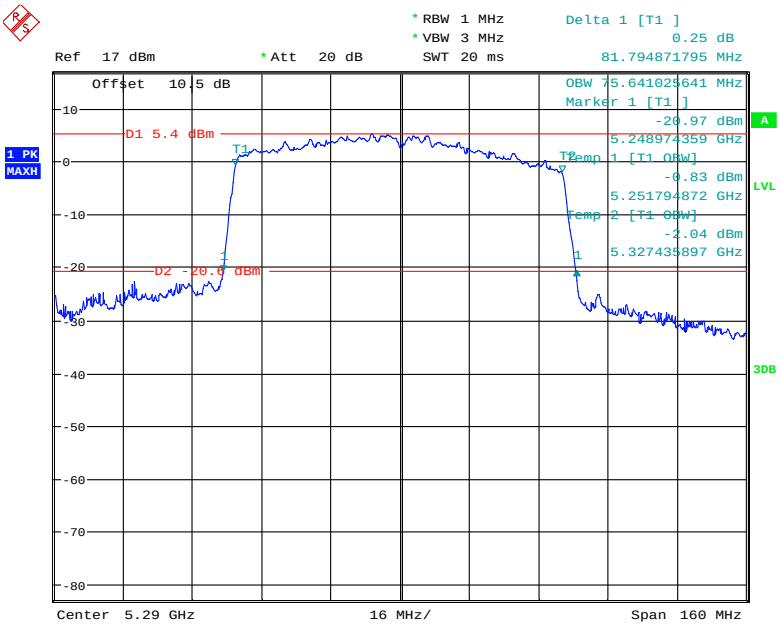
Date: 10.AUG.2019 11:02:35

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5310 MHz



Date: 10.AUG.2019 11:01:48

802.11ac80 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5290 MHz

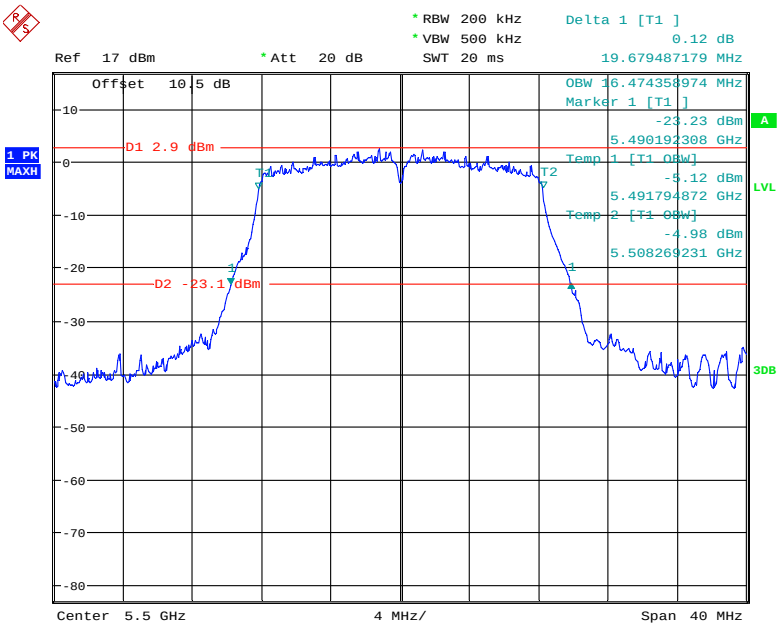


Date: 10.AUG.2019 11:05:33

5470 MHz – 5725 MHz:

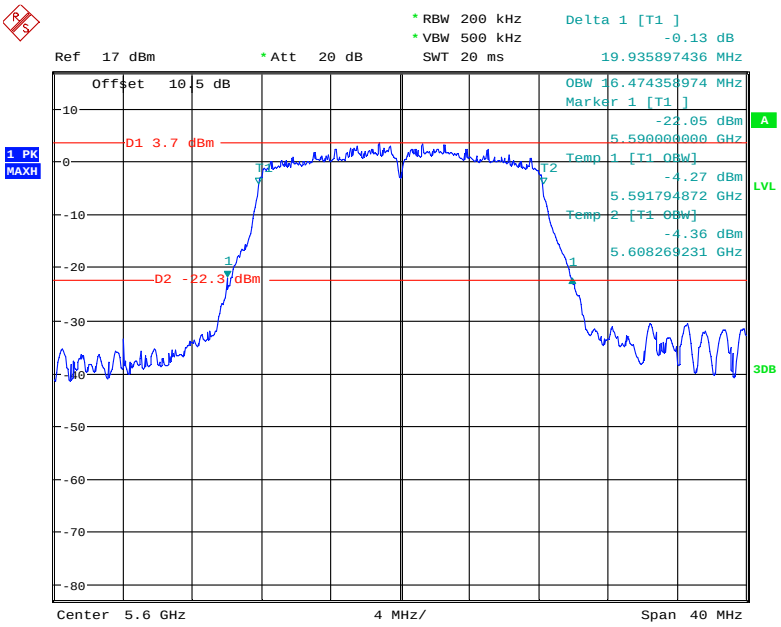
Frequency (MHz)	Antenna Port	26dB bandwidth (MHz)	99% Bandwidth (MHz)
802.11a			
5500	Chain 3	19.679	16.474
5600	Chain 3	19.936	16.474
5700	Chain 3	19.744	16.474
802.11n20			
5500	Chain 3	20.192	17.564
5600	Chain 3	20.192	17.628
5700	Chain 3	20.192	17.564
802.11n40			
5510	Chain 3	41.026	36.282
5590	Chain 3	40.897	36.282
5670	Chain 3	41.026	36.282
802.11ac20			
5500	Chain 3	20.256	17.564
5600	Chain 3	20.256	17.628
5700	Chain 3	20.192	17.564
802.11ac40			
5510	Chain 3	41.026	36.282
5590	Chain 3	41.282	36.282
5670	Chain 3	40.769	36.282
802.11ac80			
5530	Chain 3	82.051	75.385
5610	Chain 3	81.795	75.128

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5500 MHz



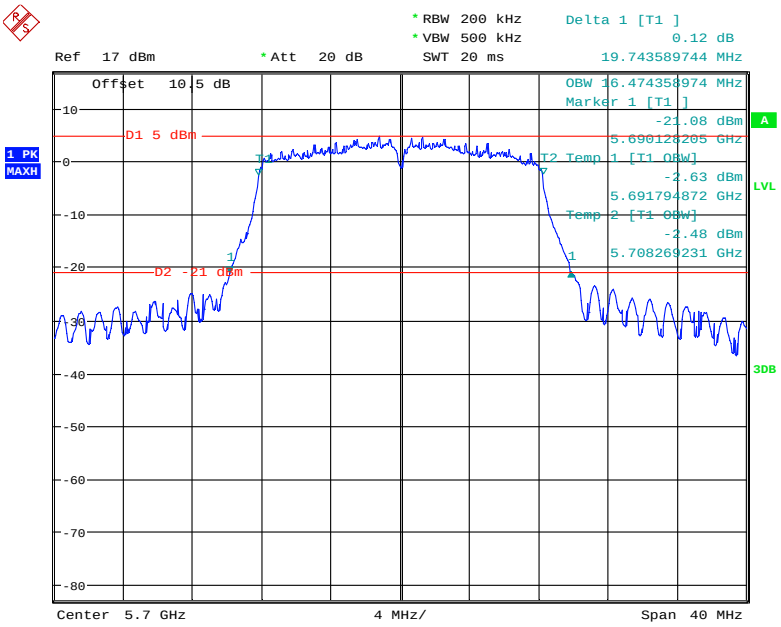
Date: 10.AUG.2019 10:29:10

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5600 MHz



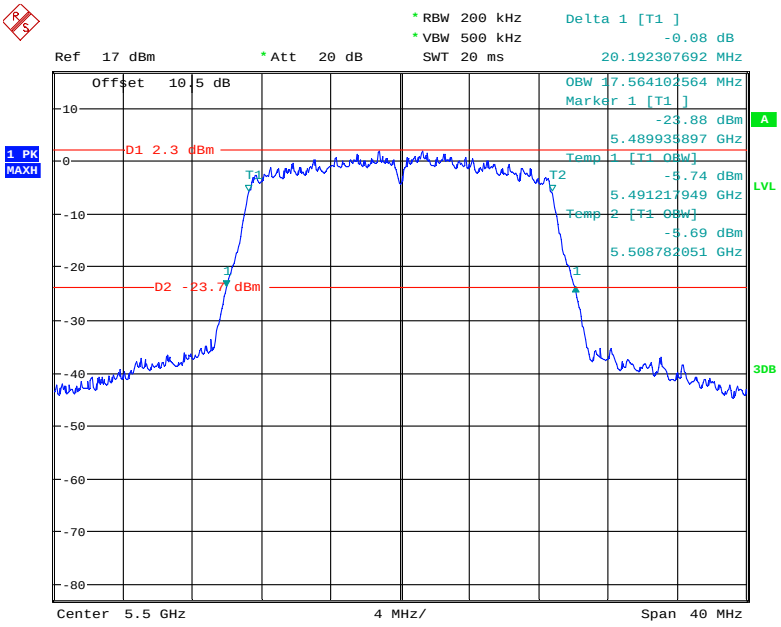
Date: 10.AUG.2019 10:31:37

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5700 MHz



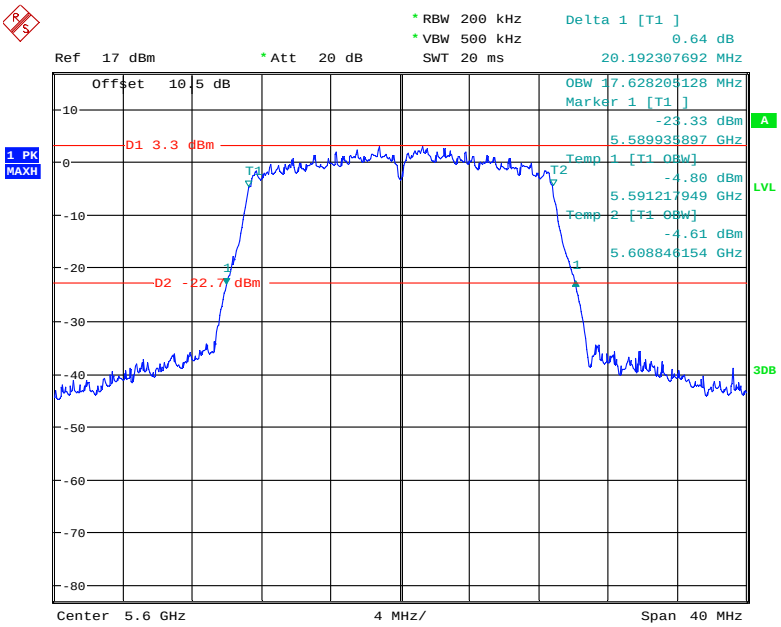
Date: 10.AUG.2019 10:33:07

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5500 MHz



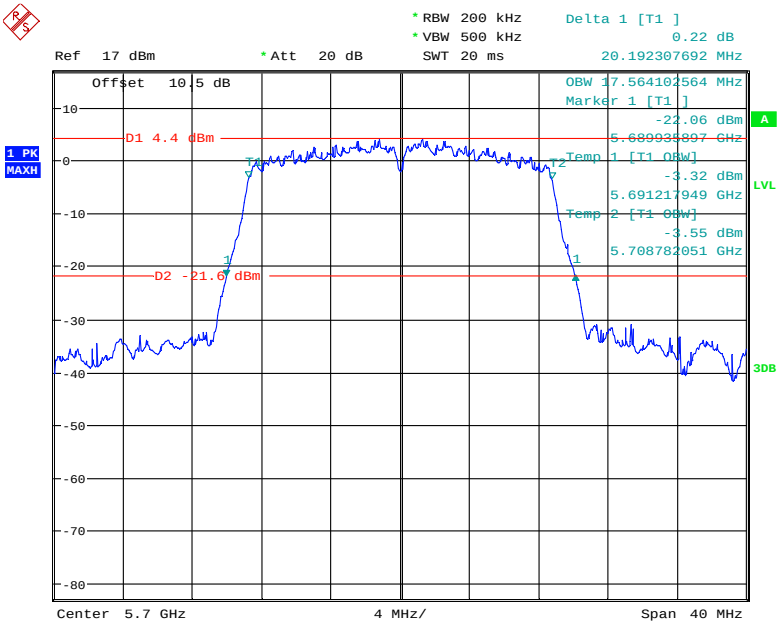
Date: 10.AUG.2019 10:39:40

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5600 MHz



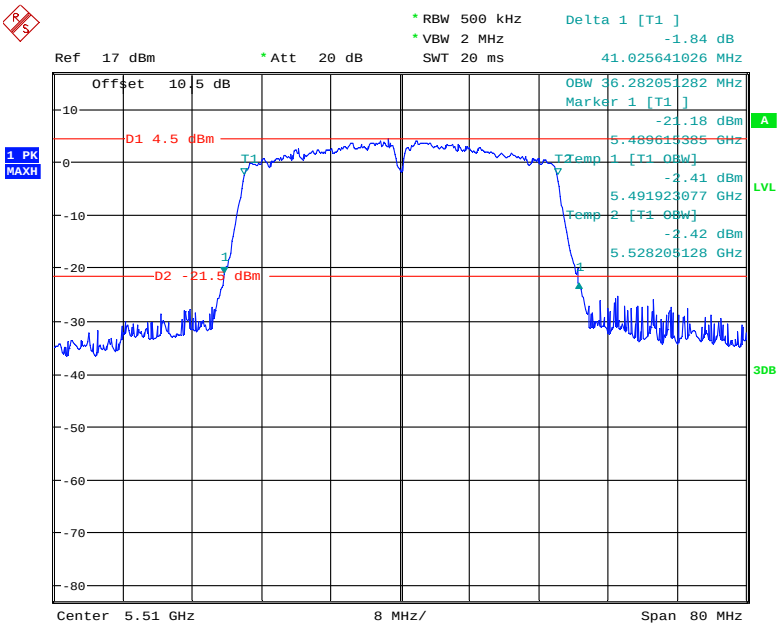
Date: 10.AUG.2019 10:37:36

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5700 MHz



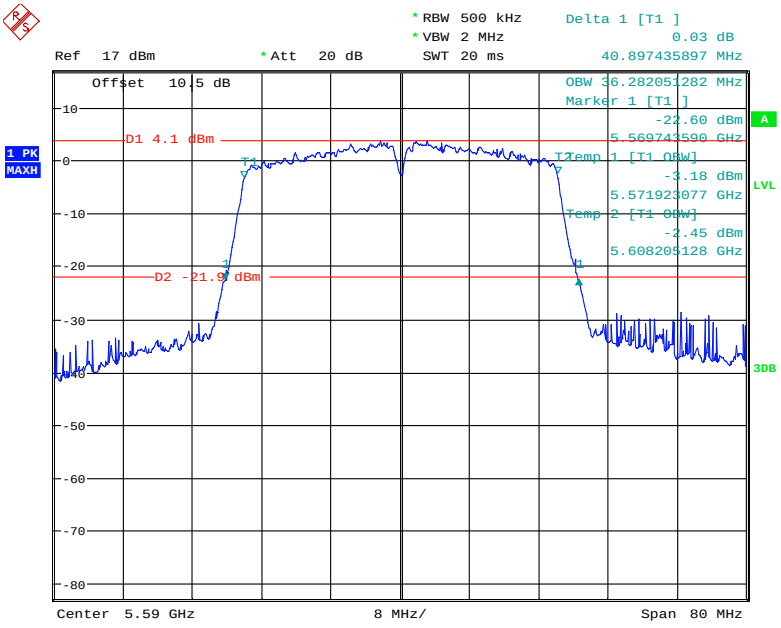
Date: 10.AUG.2019 10:35:53

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5510 MHz



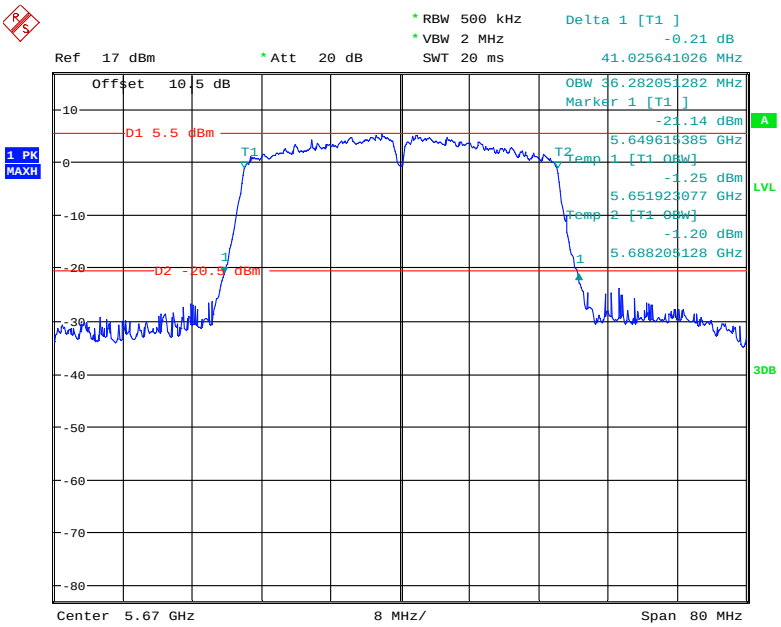
Date: 10.AUG.2019 10:53:24

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5590 MHz



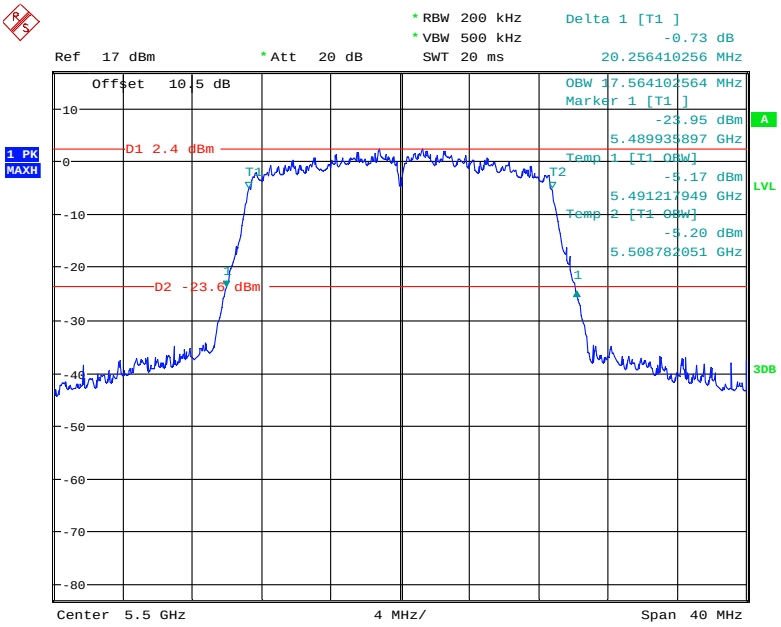
Date: 10.AUG.2019 10:55:19

802.11 n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5670 MHz



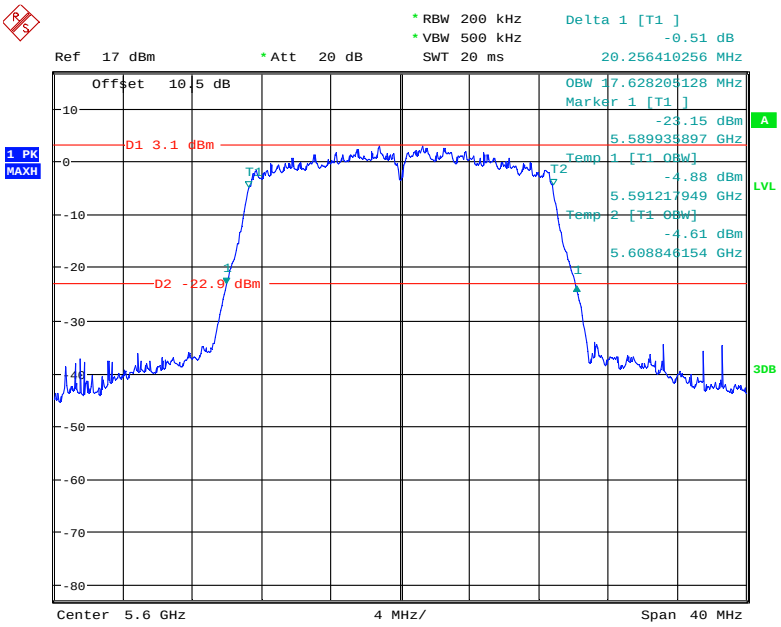
Date: 10.AUG.2019 10:56:38

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5500 MHz



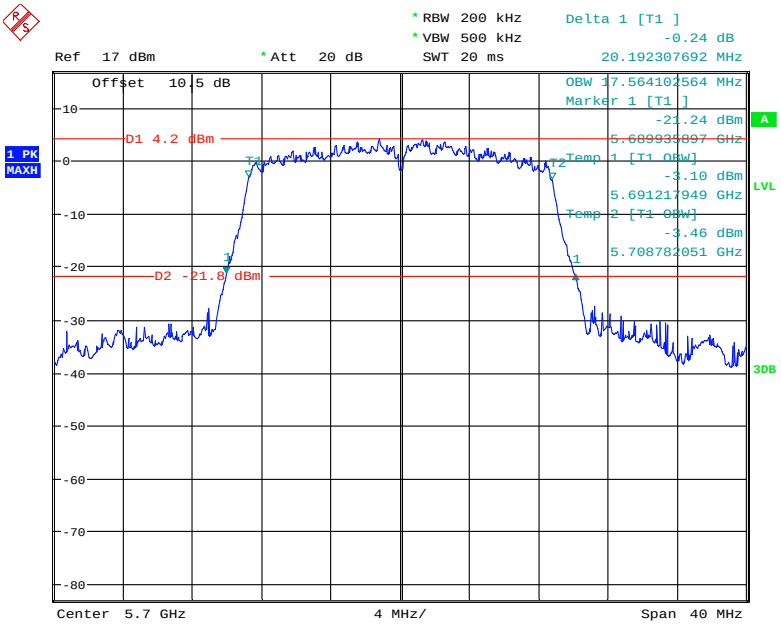
Date: 10.AUG.2019 10:40:27

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5600 MHz



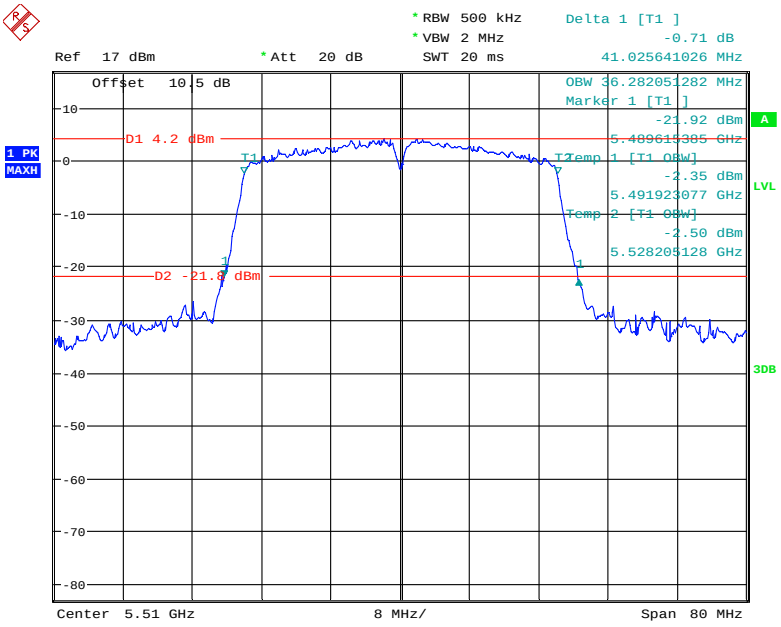
Date: 10.AUG.2019 10:42:11

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5700 MHz



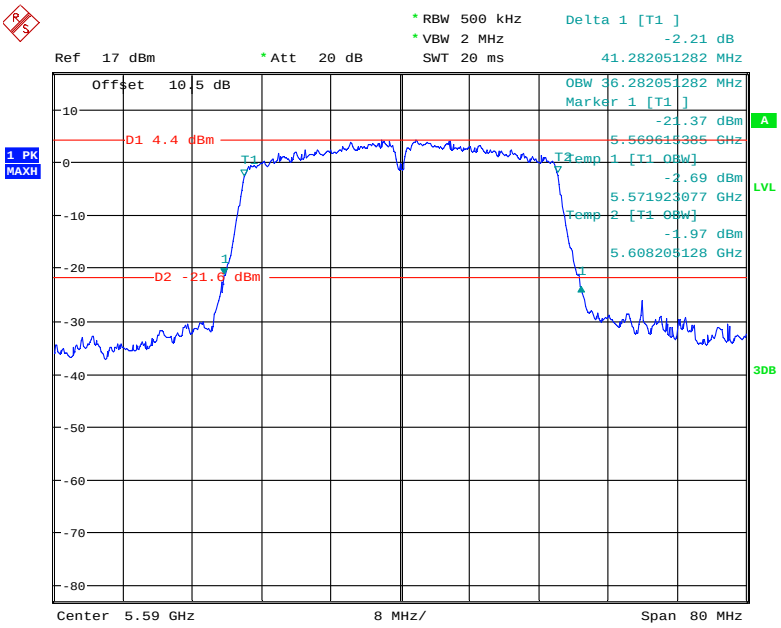
Date: 10.AUG.2019 10:43:22

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5510 MHz



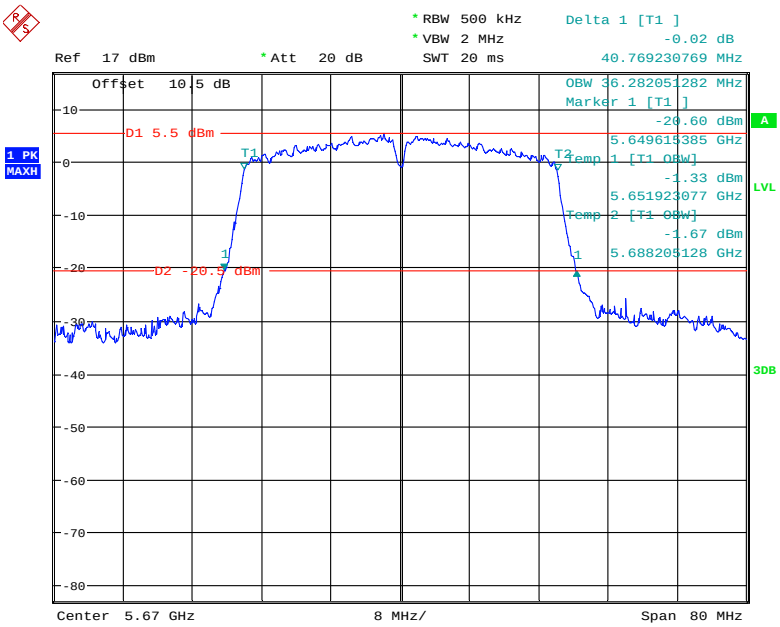
Date: 10.AUG.2019 11:00:30

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5590 MHz



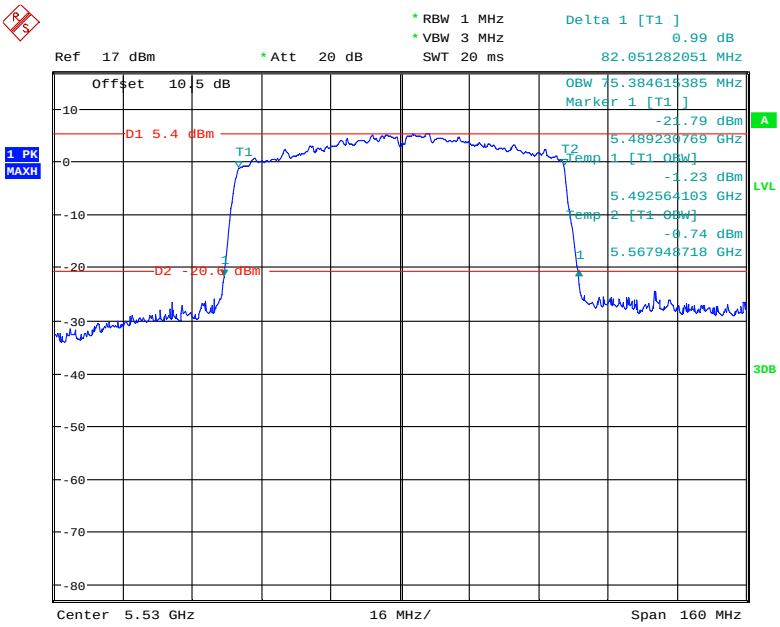
Date: 10.AUG.2019 10:58:39

802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5670 MHz



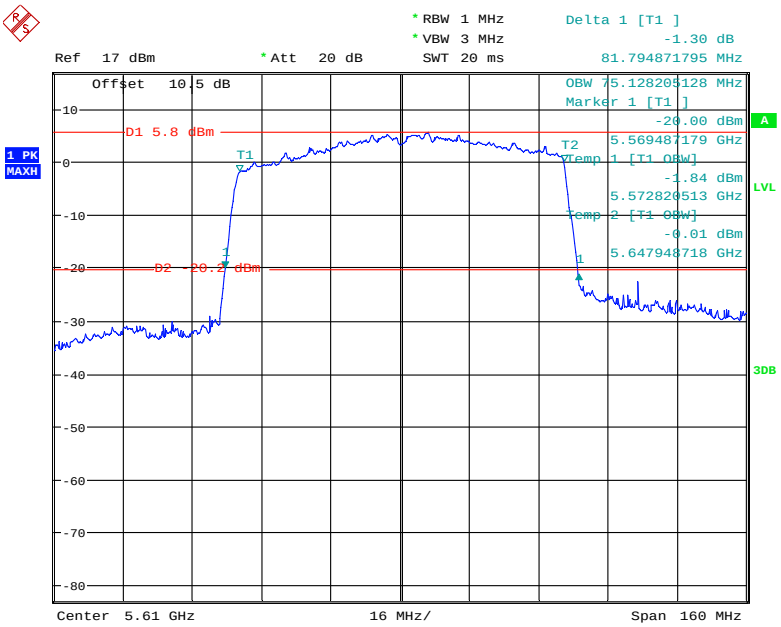
Date: 10.AUG.2019 10:57:21

802.11ac80 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5530 MHz



Date: 10.AUG.2019 11:06:29

802.11ac80 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5610 MHz



Date: 10.AUG.2019 11:07:20

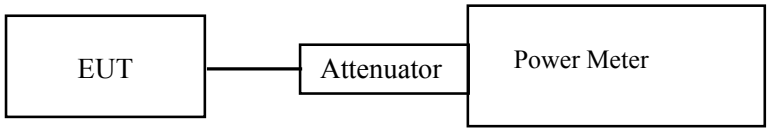
FCC §15.407(a) (2) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

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:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Kieron Luo from 2019-08-09 to 2019-09-03.

EUT operation mode: Transmitting

Note: The device employed Cyclic Delay Diversity (CDD) for the 802.11 MIMO transmitting, per KDB 662911 D01 v02r01, for power measurement on IEEE 802.11 devices
Array Gain =0 dB (i.e., no array gain) for $N_{Ant} \leq 4$; The maximum antenna gain is 5dBi
So
Directional gain = G_{ANT}+Array Gain= 5dBi

Test Result: Pass

Please refer to the following data tables.

5250 MHz – 5350 MHz:

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Total Powet (dBm)	Limit (dBm)
802.11a				
5260	0	8.09	15.72	24
	1	8.41		
	2	8.52		
	3	12.27		
5280	0	7.56	15.45	
	1	8.00		
	2	8.25		
	3	12.15		
5320	0	7.52	15.77	
	1	7.50		
	2	8.89		
	3	12.73		
802.11n20				
5260	0	7.21	15.50	24
	1	7.83		
	2	8.36		
	3	12.38		
5280	0	7.06	15.53	
	1	7.44		
	2	9.02		
	3	12.34		
5320	0	7.11	15.44	
	1	7.58		
	2	8.98		
	3	12.10		

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Total Powet (dBm)	Limit (dBm)
802.11n40				
5270	0	10.52	18.15	24
	1	10.70		
	2	11.30		
	3	14.60		
5310	0	9.83	17.13	
	1	10.35		
	2	10.90		
	3	14.24		
802.11ac20				
5260	0	8.03	15.83	24
	1	8.15		
	2	8.93		
	3	12.44		
5280	0	7.70	15.67	
	1	7.84		
	2	8.67		
	3	12.45		
5320	0	7.44	15.42	
	1	7.54		
	2	8.52		
	3	12.17		

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Total Powet (dBm)	Limit (dBm)
802.11ac40				
5270	0	10.19	17.77	24
	1	10.42		
	2	10.56		
	3	14.31		
5310	0	9.47	17.41	
	1	9.86		
	2	10.18		
	3	14.17		
802.11ac80				
5290	0	10.85	18.31	24
	1	10.71		
	2	11.34		
	3	14.81		

5470 MHz – 5725 MHz:

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Total Powet (dBm)	Limit (dBm)
802.11a				
5500	0	7.51	15.06	24
	1	7.10		
	2	9.35		
	3	11.03		
5600	0	7.81	15.78	
	1	8.07		
	2	10.29		
	3	11.68		
5700	0	2.50	12.63	
	1	5.50		
	2	7.55		
	3	8.63		
802.11n20				
5500	0	7.01	15.03	24
	1	7.14		
	2	9.19		
	3	11.25		
5600	0	7.20	15.49	
	1	7.70		
	2	9.63		
	3	11.79		
5700	0	7.53	16.01	
	1	7.97		
	2	10.69		
	3	12.11		
802.11n40				
5510	0	6.27	14.86	24
	1	5.09		
	2	9.56		
	3	11.50		
5590	0	9.79	18.09	
	1	10.73		
	2	12.38		
	3	14.12		
5670	0	10.36	18.96	
	1	11.67		
	2	13.27		
	3	15.04		

Frequency (MHz)	Antenna Port	Average Output Power (dBm)	Total Powet (dBm)	Limit (dBm)
802.11ac20				
5500	0	7.08	15.14	24
	1	7.55		
	2	9.12		
	3	11.37		
5600	0	7.29	15.60	
	1	8.02		
	2	10.01		
	3	11.64		
5700	0	7.41	16.01	
	1	7.34		
	2	10.94		
	3	12.19		
802.11ac40				
5510	0	5.80	14.68	24
	1	7.07		
	2	8.93		
	3	11.03		
5590	0	9.39	17.51	
	1	10.19		
	2	12.01		
	3	13.30		
5670	0	6.91	15.42	
	1	7.91		
	2	10.13		
	3	11.28		
802.11ac80				
5530	0	6.72	15.48	24
	1	8.04		
	2	9.78		
	3	11.69		
5610	0	10.69	18.61	
	1	10.96		
	2	13.14		
	3	14.43		

FCC §15.407(a) (2) - POWER SPECTRAL DENSITY

Applicable Standard

(ii) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

Test Procedure

For devices operating in the bands 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:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Kieron Luo from 2019-08-09 to 2019-08-10.

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EUT operation mode: Transmitting

Note: The device employed Cyclic Delay Diversity (CDD) for the 802.11 MIMO transmitting, per KDB 662911 D01 v02r01, for power measurement on IEEE 802.11 devices
Array Gain =10logN = 6dB;The maximum antenna gain is 5dBi
So
Directional gain = G_{ANT}+Array Gain= 11dBi

Test Result: Pass

Please refer to the following tables and plots.

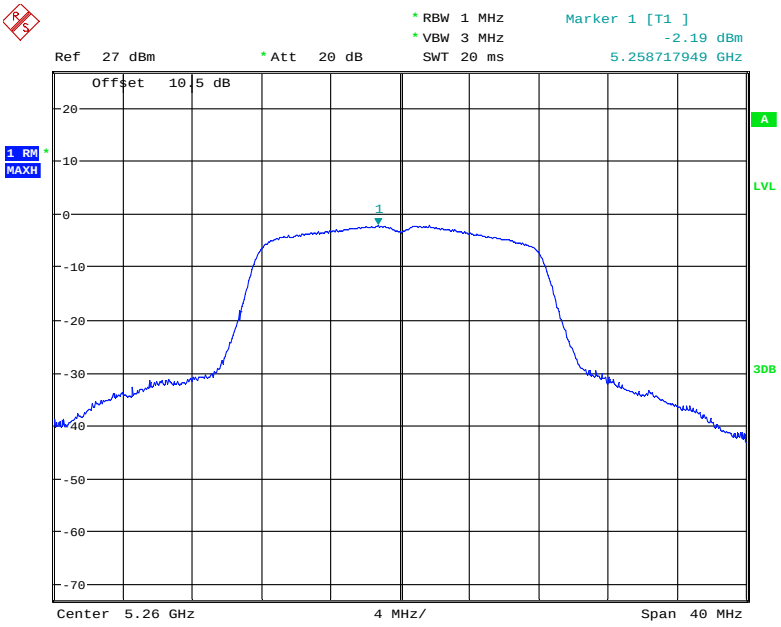
5250 MHz – 5350 MHz:

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Total Power Spectral (dBm/MHz)	Limit (dBm/MHz)
802.11a				
5260	0	-2.19	5.9	6
	1	-2.02		
	2	-1.29		
	3	2.83		
5280	0	-2.56	5.46	
	1	-2.17		
	2	-1.64		
	3	2.23		
5320	0	-2.65	5.46	
	1	-2.67		
	2	-0.95		
	3	2.12		
802.11n20				
5260	0	-2.61	5.50	6
	1	-2.27		
	2	-1.77		
	3	2.40		
5280	0	-3.07	5.46	
	1	-2.52		
	2	-0.82		
	3	2.13		
5320	0	-3.09	5.43	
	1	-2.40		
	2	-1.12		
	3	2.19		
802.11n40				
5270	0	-2.63	4.98	6
	1	-2.43		
	2	-1.97		
	3	1.45		
5310	0	-3.47	4.50	
	1	-2.70		
	2	-2.25		
	3	0.92		

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Total Power Spectral (dBm/MHz)	Limit (dBm/MHz)
802.11ac20				
5260	0	-2.02	5.71	6
	1	-2.16		
	2	-1.23		
	3	2.39		
5280	0	-2.55	5.58	
	1	-1.96		
	2	-1.51		
	3	2.35		
5320	0	-2.75	5.29	
	1	-2.61		
	2	-1.87		
	3	2.17		
802.11ac40				
5270	0	-3.05	4.51	6
	1	-2.69		
	2	-2.66		
	3	0.96		
5310	0	-3.76	4.19	
	1	-3.38		
	2	-3.06		
	3	0.96		
802.11ac80				
5290	0	-3.95	3.57	6
	1	-4.06		
	2	-3.29		
	3	0.04		

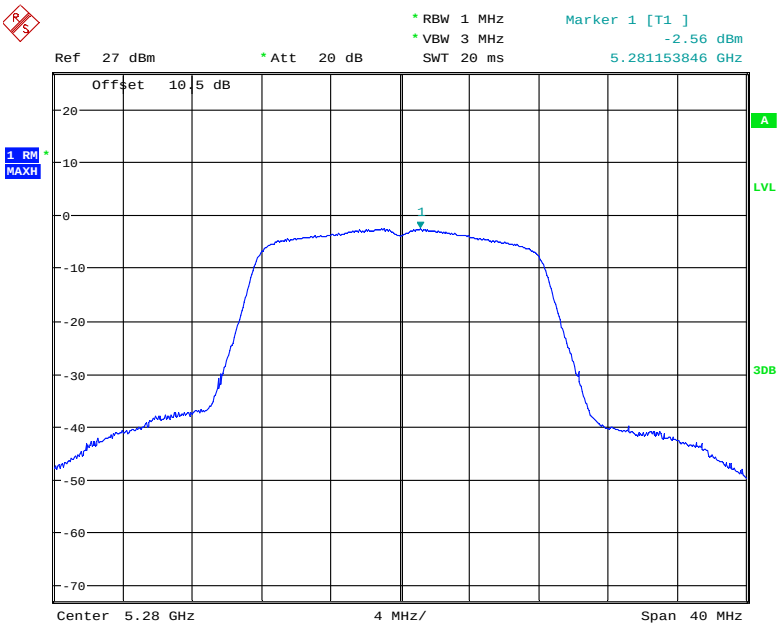
Ant 0:

802.11a mode, Power Spectral Density, 5260 MHz



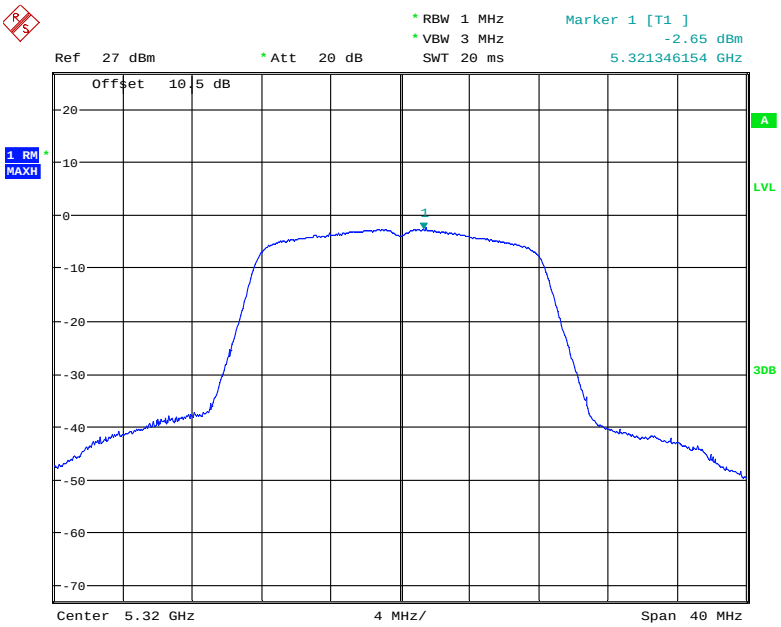
Date: 9.AUG.2019 07:22:53

802.11a mode, Power Spectral Density, 5280 MHz



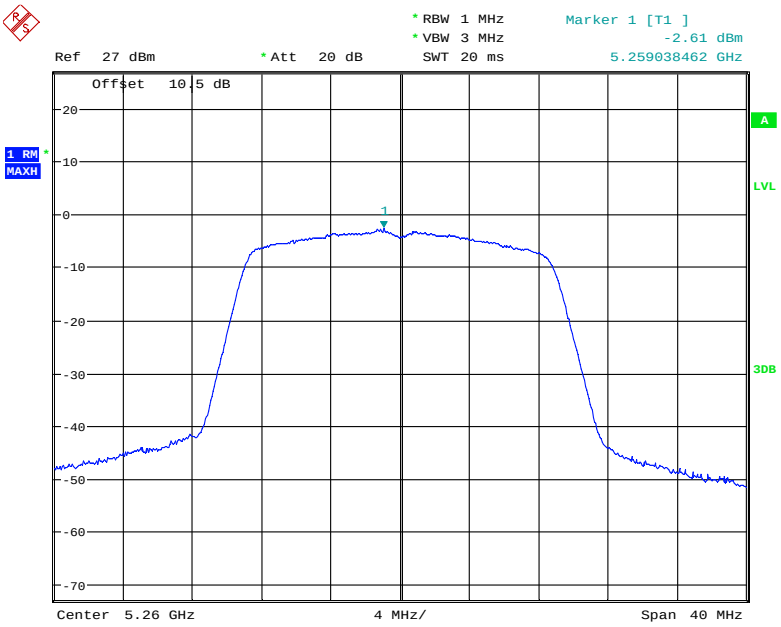
Date: 9.AUG.2019 09:06:50

802.11a mode, Power Spectral Density, 5320 MHz



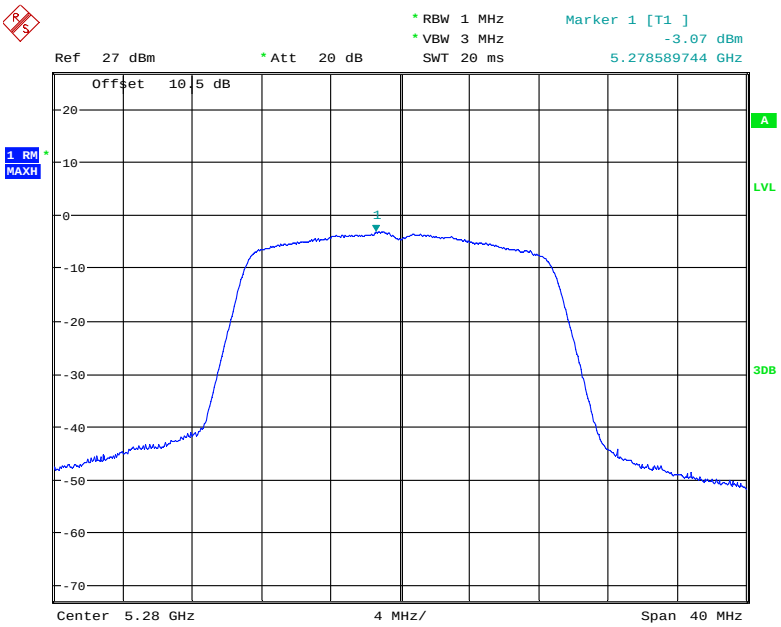
Date: 9.AUG.2019 09:08:53

802.11n20 mode, Power Spectral Density, 5260 MHz



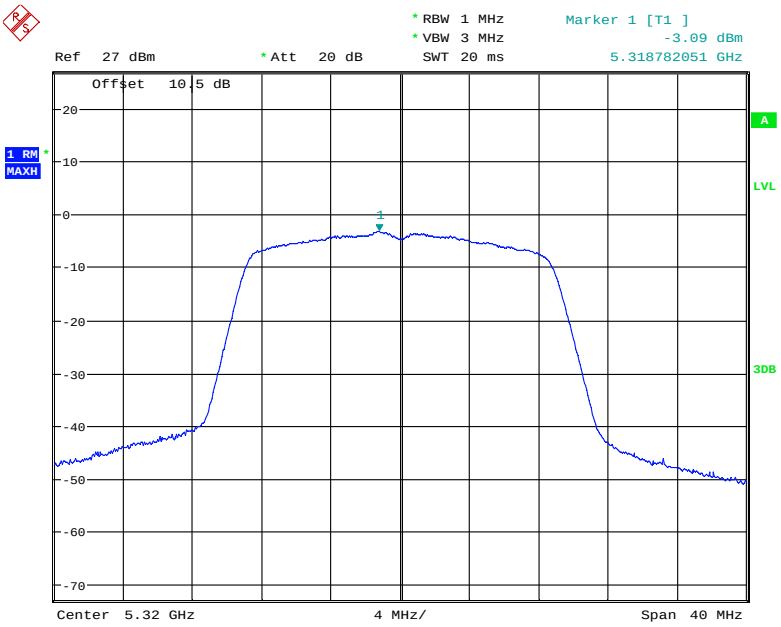
Date: 9.AUG.2019 09:29:17

802.11n20 mode, Power Spectral Density, 5280 MHz



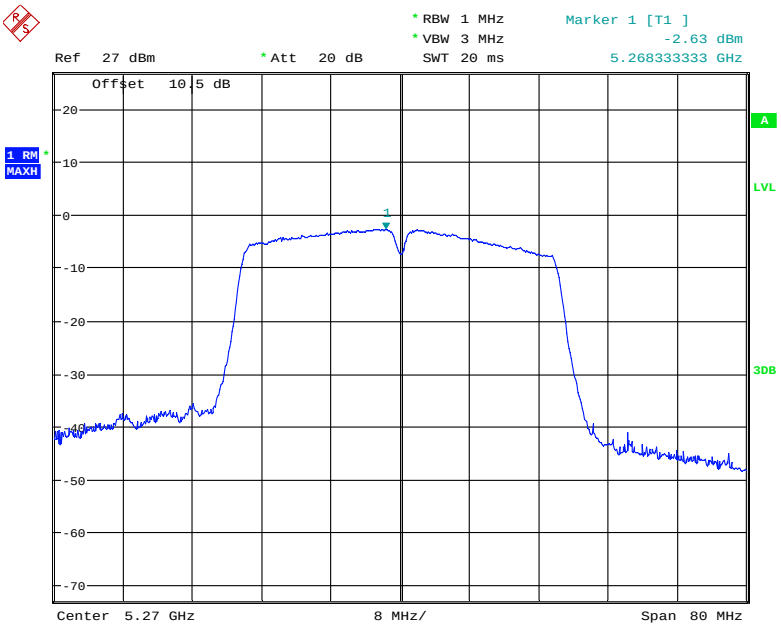
Date: 9.AUG.2019 09:30:08

802.11n20 mode, Power Spectral Density, 5320 MHz



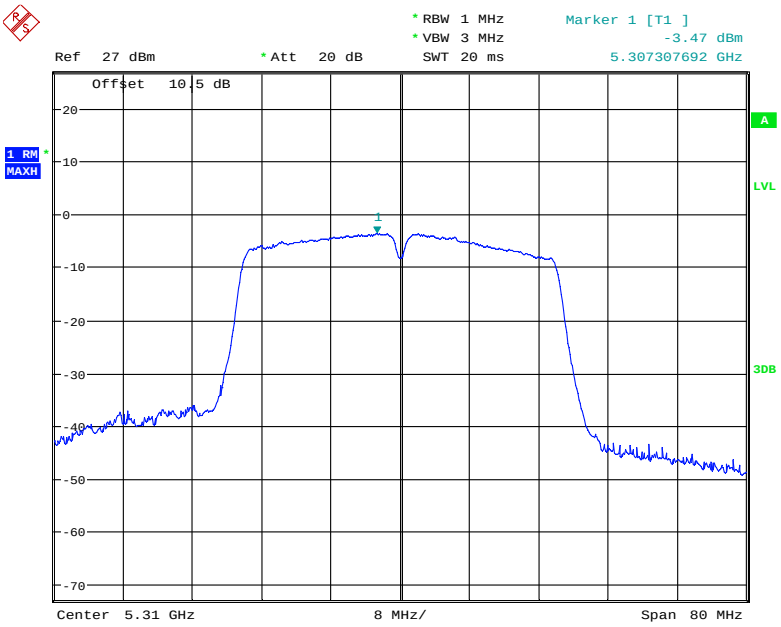
Date: 9.AUG.2019 09:34:46

802.11n40 mode, Power Spectral Density, 5270 MHz



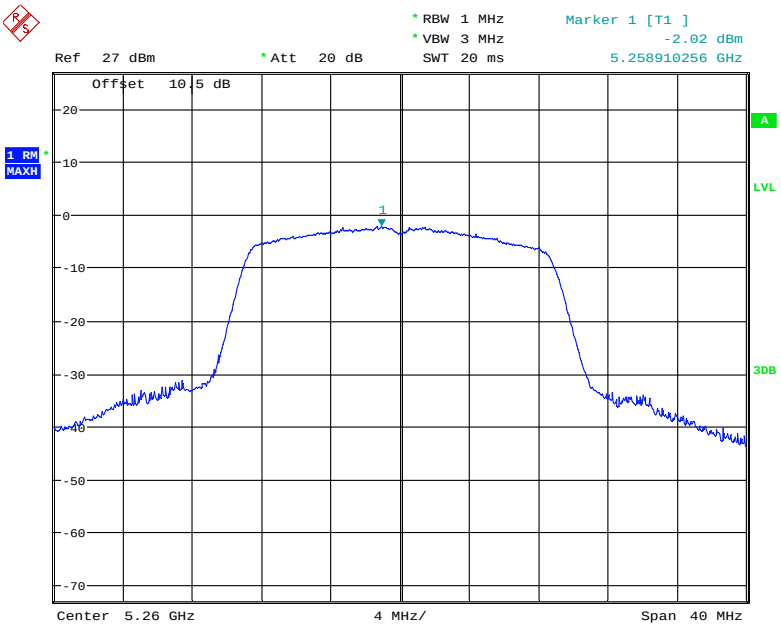
Date: 9.AUG.2019 10:45:40

802.11n40 mode, Power Spectral Density, 5310 MHz



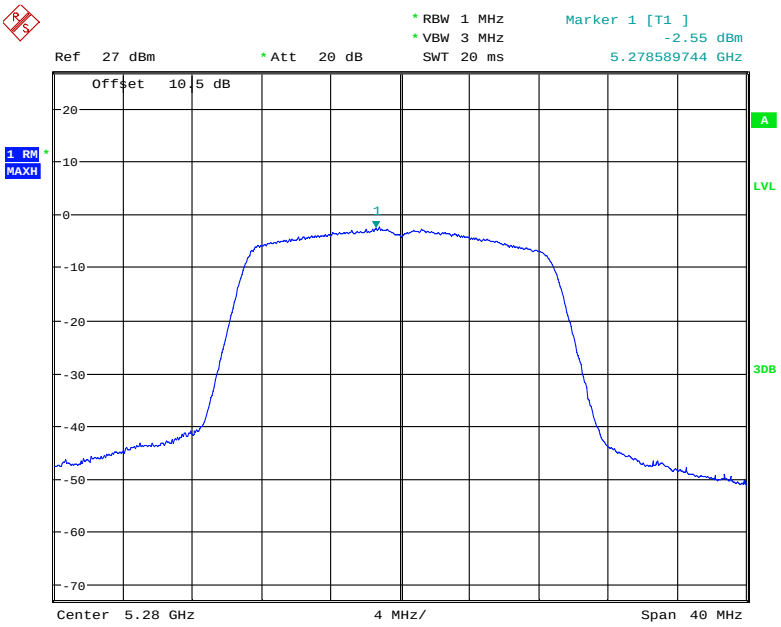
Date: 9.AUG.2019 10:46:52

802.11ac20 mode, Power Spectral Density, 5260 MHz



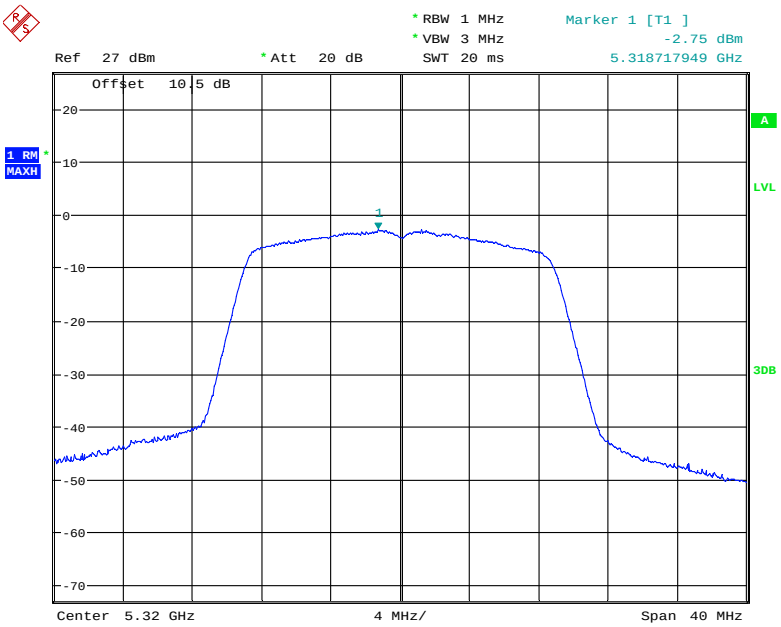
Date: 9.AUG.2019 10:10:19

802. 11ac20 mode, Power Spectral Density, 5280 MHz



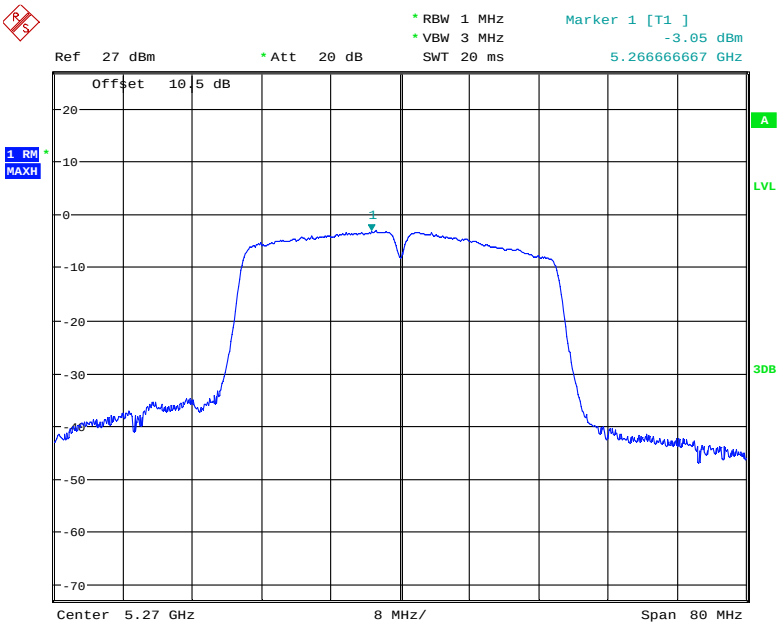
Date: 9.AUG.2019 10:13:05

802. 11ac20 mode, Power Spectral Density, 5320 MHz



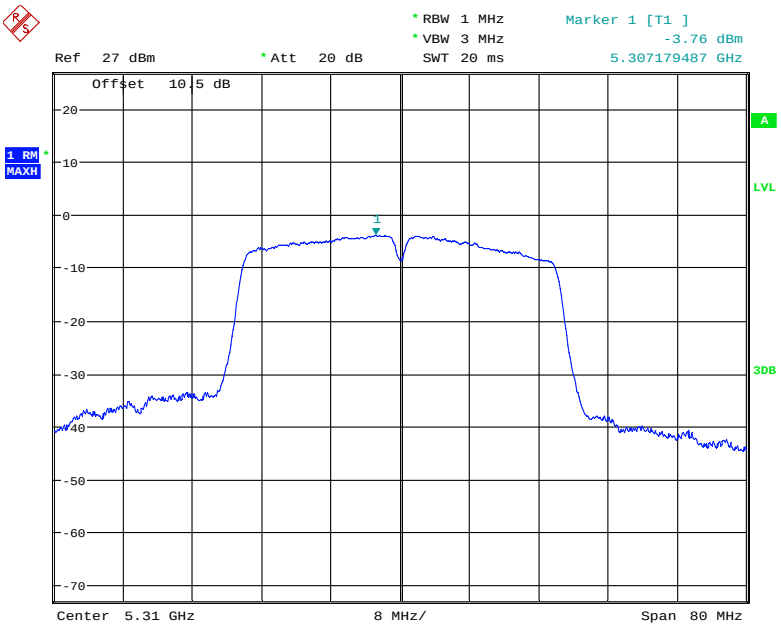
Date: 9.AUG.2019 10:14:34

802. 11ac40 mode, Power Spectral Density, 5270 MHz



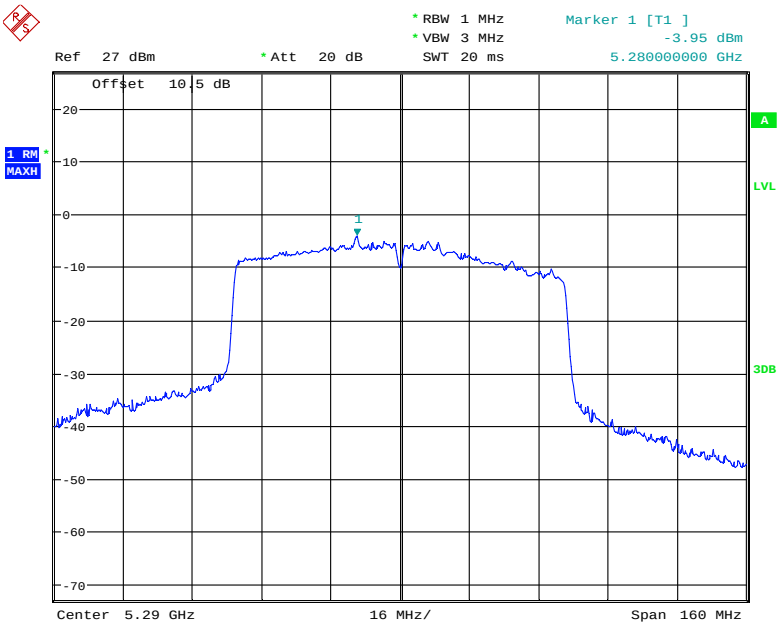
Date: 9.AUG.2019 10:42:07

802. 11ac40 mode, Power Spectral Density, 5310 MHz



Date: 9.AUG.2019 10:40:40

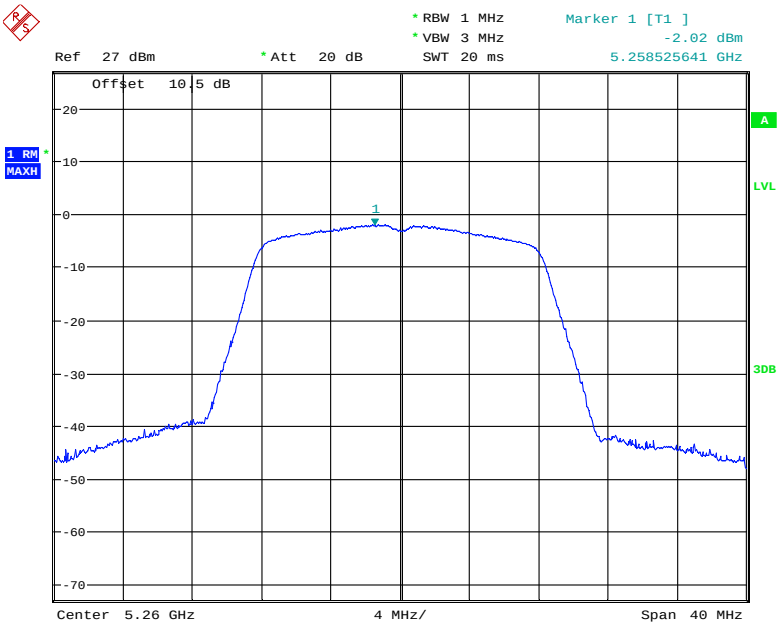
802. 11ac80 mode, Power Spectral Density, 5290 MHz



Date: 9.AUG.2019 11:28:31

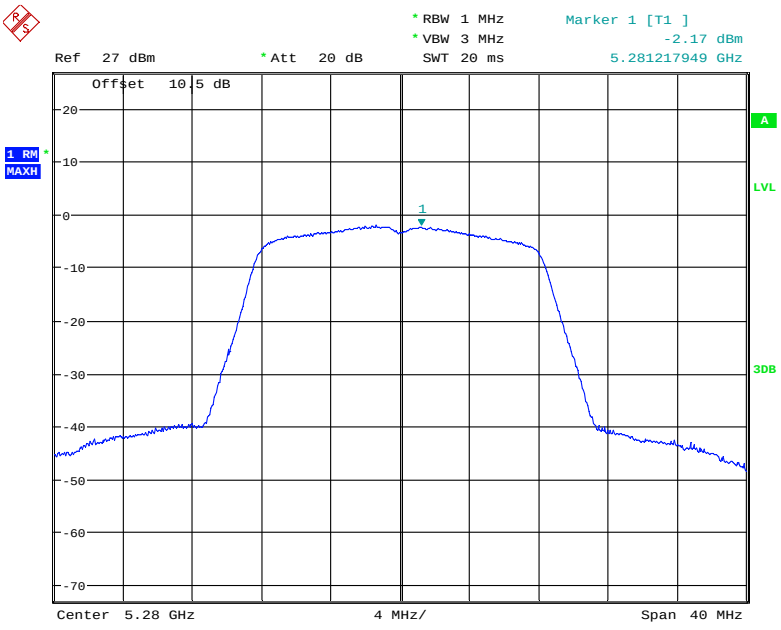
Ant 1:

802.11a mode, Power Spectral Density, 5260 MHz



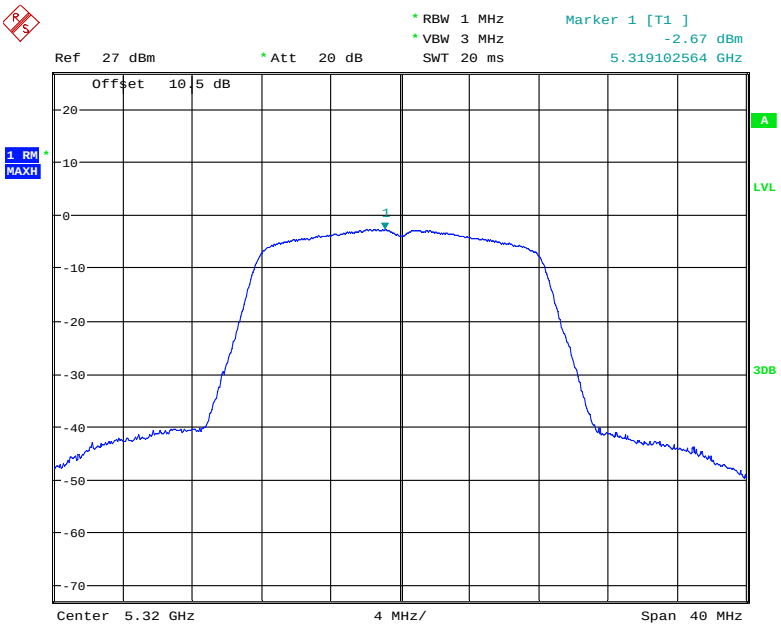
Date: 9.AUG.2019 07:25:10

802.11a mode, Power Spectral Density, 5280 MHz



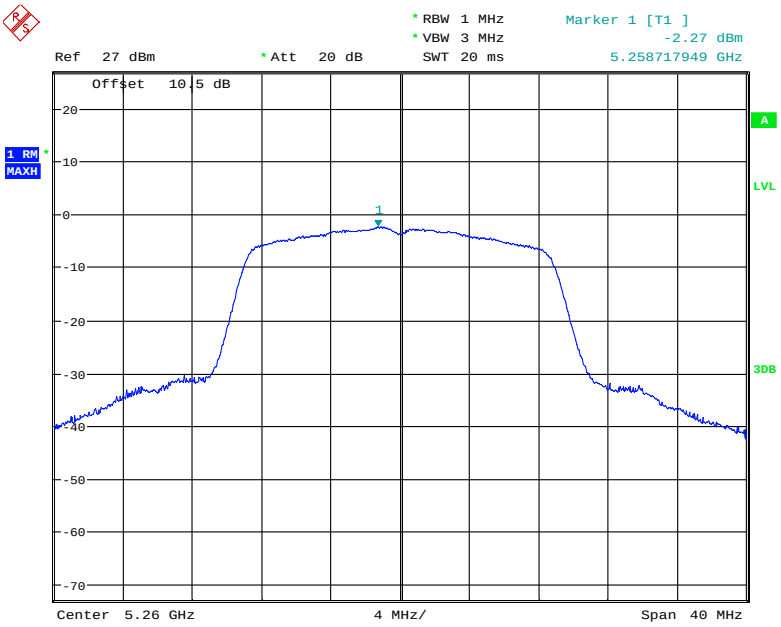
Date: 9.AUG.2019 07:32:04

802.11a mode, Power Spectral Density, 5320 MHz



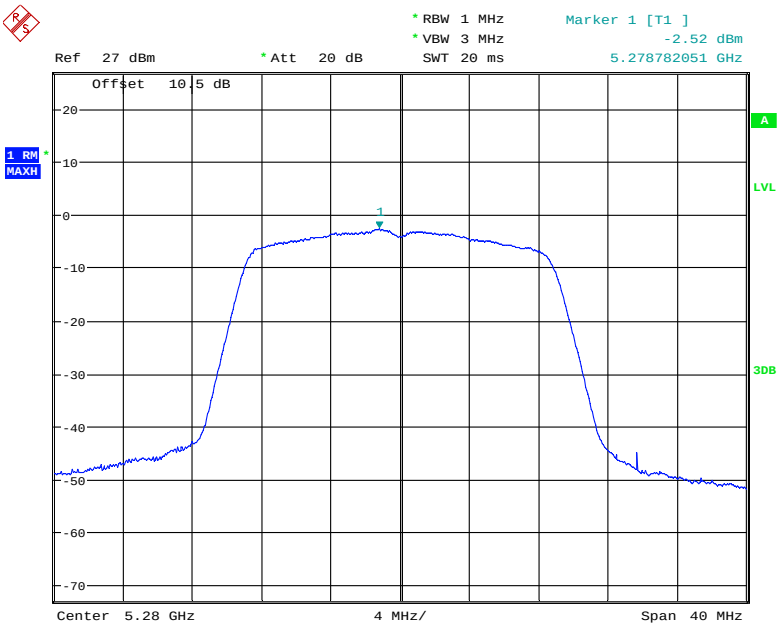
Date: 9.AUG.2019 07:33:24

802.11n20 mode, Power Spectral Density, 5260 MHz



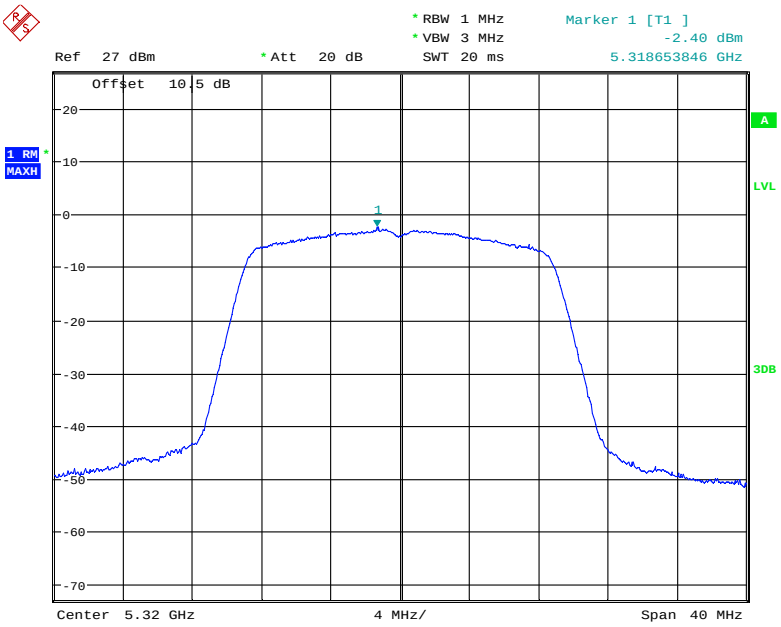
Date: 9.AUG.2019 09:22:16

802.11n20 mode, Power Spectral Density, 5280 MHz



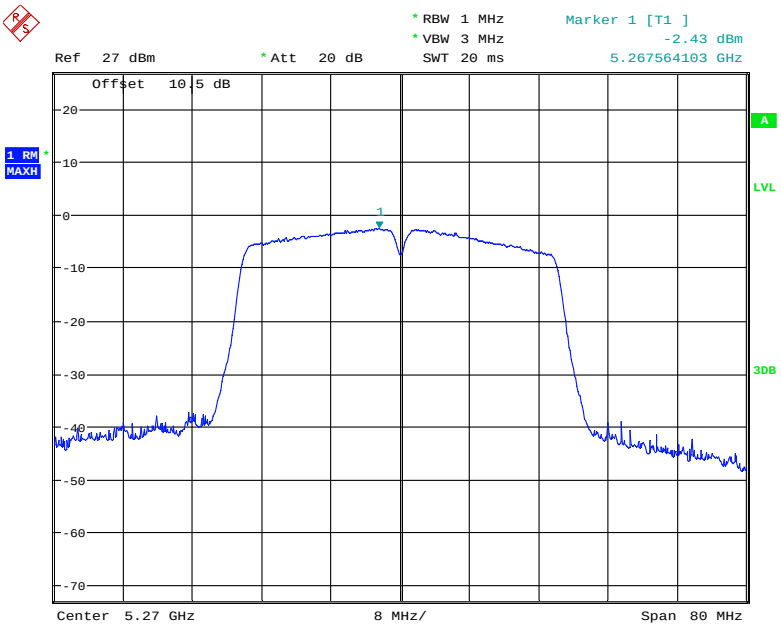
Date: 9.AUG.2019 09:24:19

802.11n20 mode, Power Spectral Density, 5320 MHz



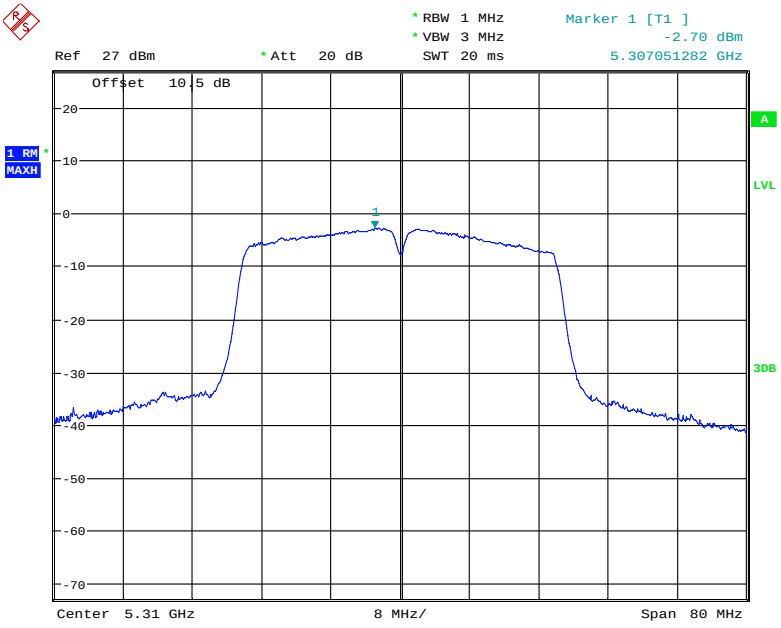
Date: 9.AUG.2019 09:25:03

802.11n40 mode, Power Spectral Density, 5270 MHz



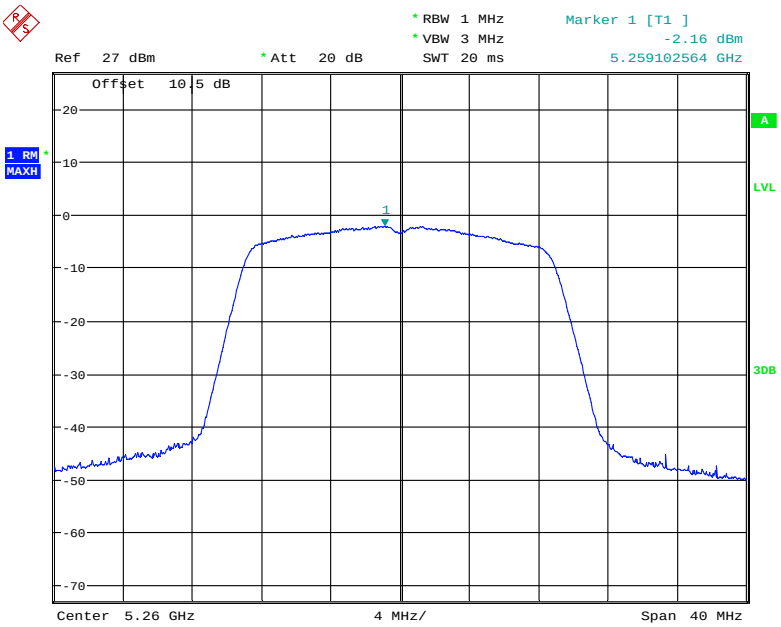
Date: 9.AUG.2019 10:51:46

802.11n40 mode, Power Spectral Density, 5310 MHz



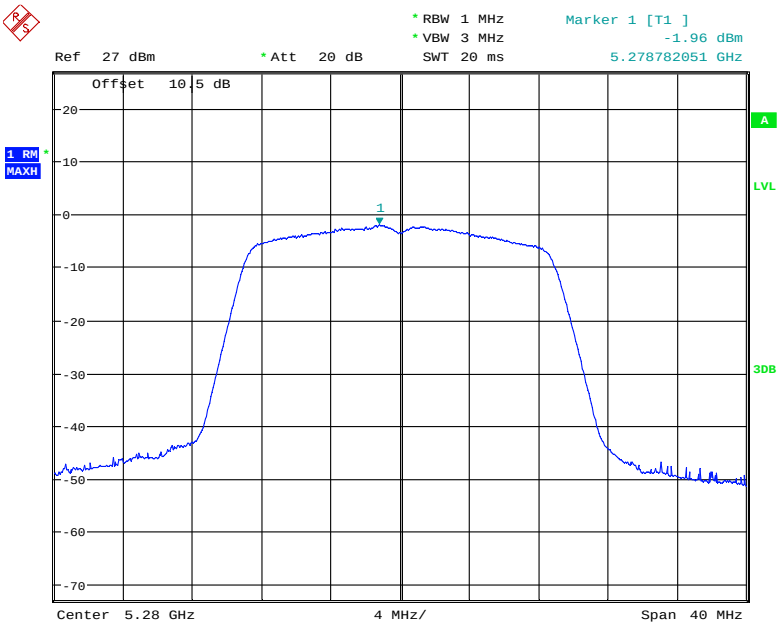
Date: 9.AUG.2019 10:49:54

802.11ac20 mode, Power Spectral Density, 5260 MHz



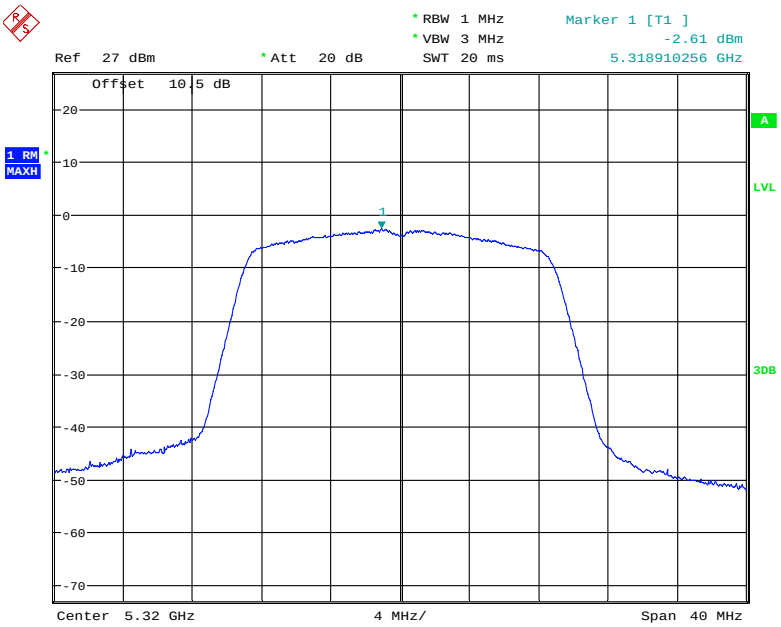
Date: 9.AUG.2019 10:17:42

802. 11ac20 mode, Power Spectral Density, 5280 MHz



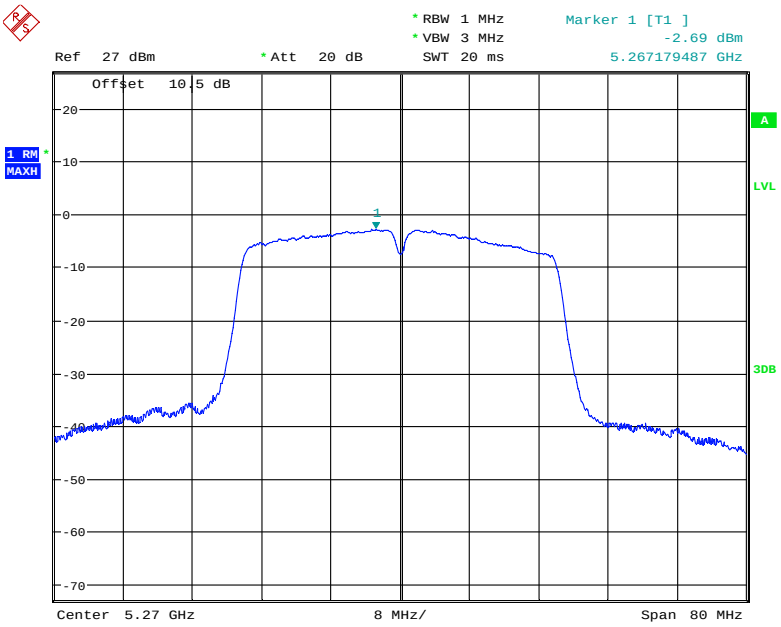
Date: 9.AUG.2019 10:20:04

802. 11ac20 mode, Power Spectral Density, 5320 MHz



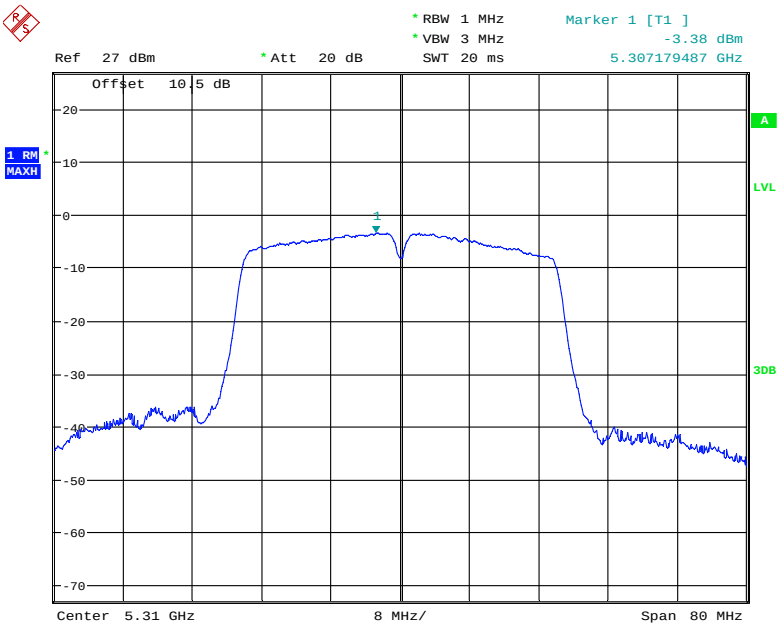
Date: 9.AUG.2019 10:20:33

802. 11ac40 mode, Power Spectral Density, 5270 MHz



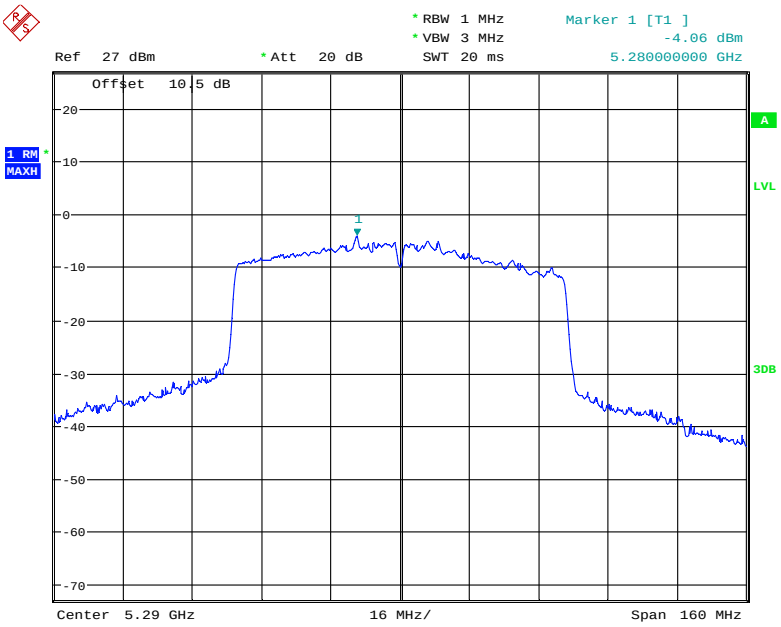
Date: 9.AUG.2019 10:26:28

802. 11ac40 mode, Power Spectral Density, 5310 MHz



Date: 9.AUG.2019 10:30:33

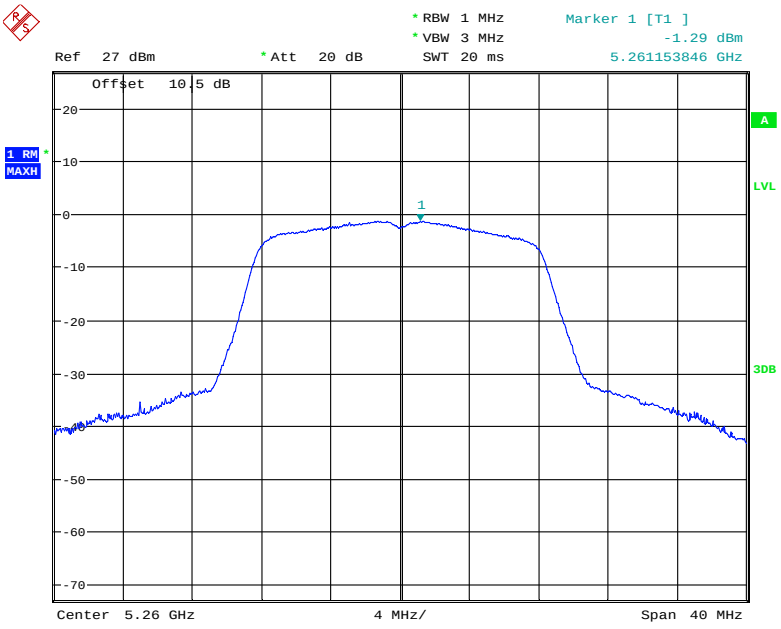
802. 11ac80 mode, Power Spectral Density, 5290 MHz



Date: 9.AUG.2019 11:23:13

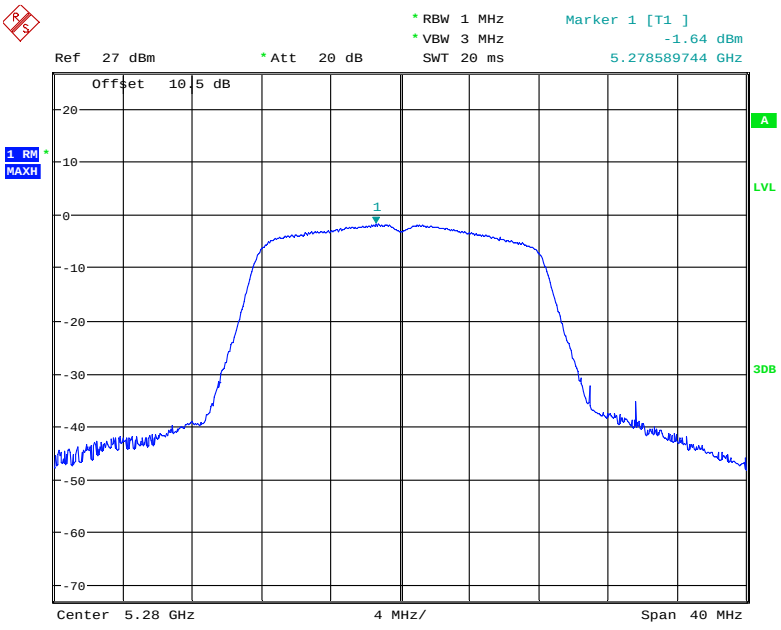
Ant 2:

802.11a mode, Power Spectral Density, 5260 MHz



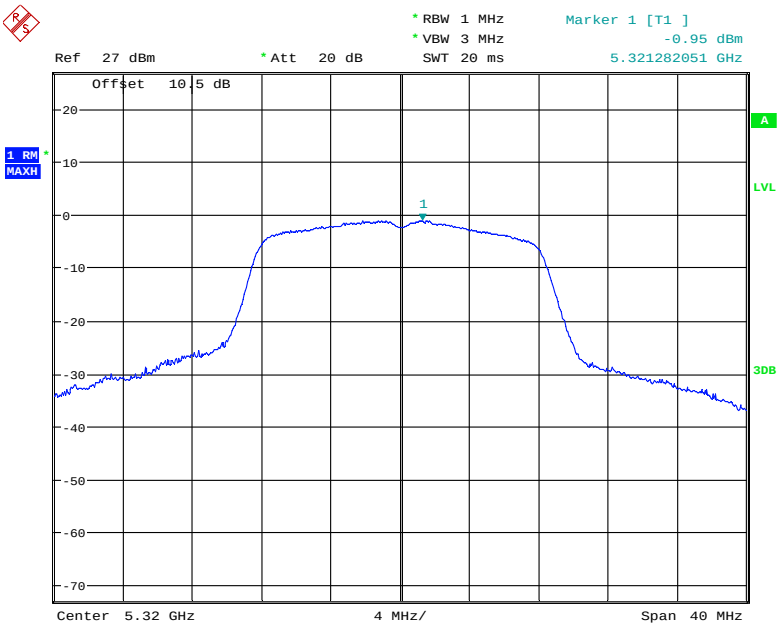
Date: 9.AUG.2019 07:24:07

802.11a mode, Power Spectral Density, 5280 MHz



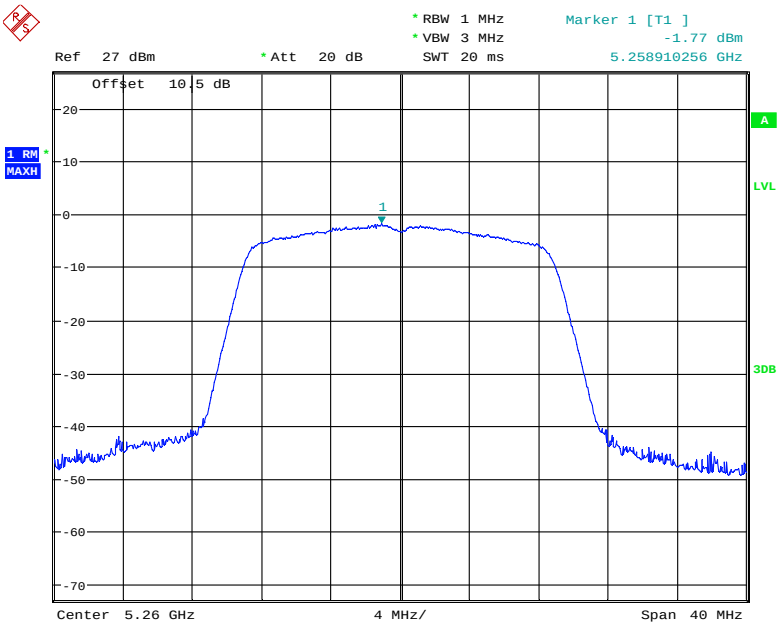
Date: 9.AUG.2019 08:49:01

802.11a mode, Power Spectral Density, 5320 MHz



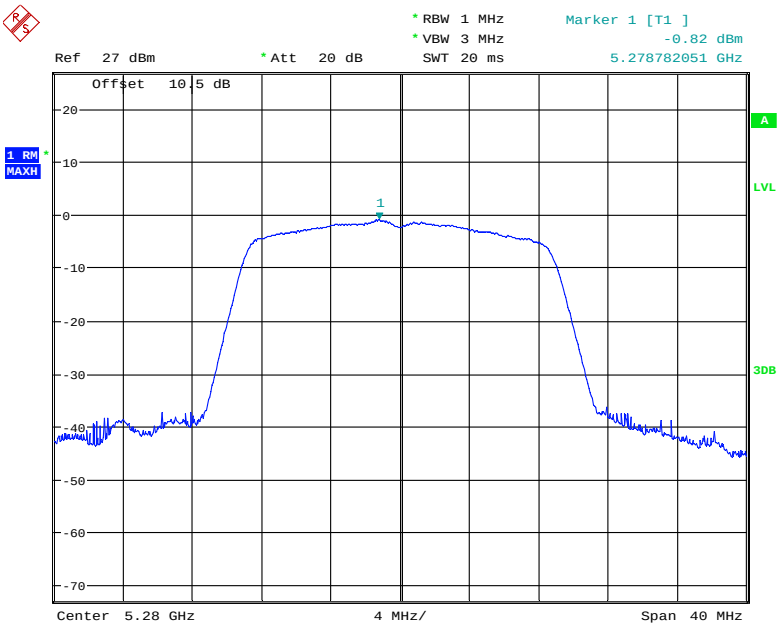
Date: 9.AUG.2019 09:14:14

802.11n20 mode, Power Spectral Density, 5260 MHz



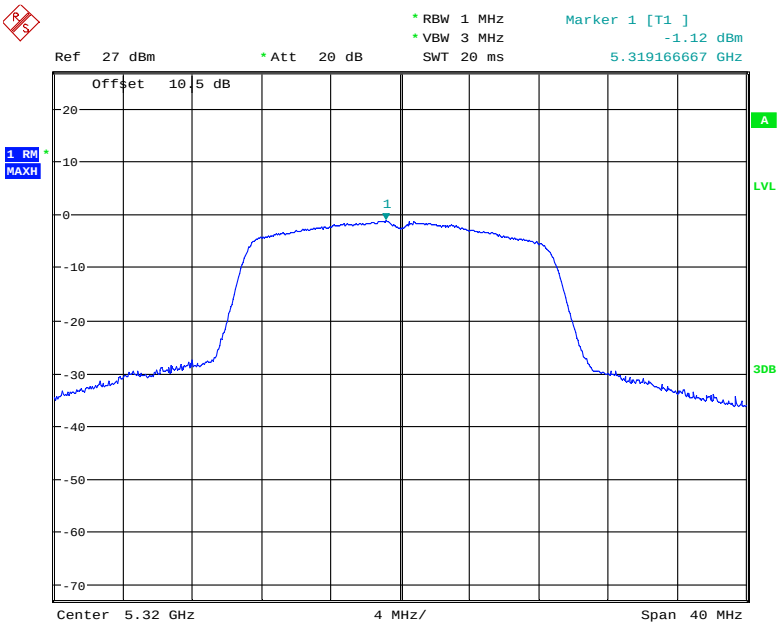
Date: 9.AUG.2019 09:20:37

802.11n20 mode, Power Spectral Density, 5280 MHz



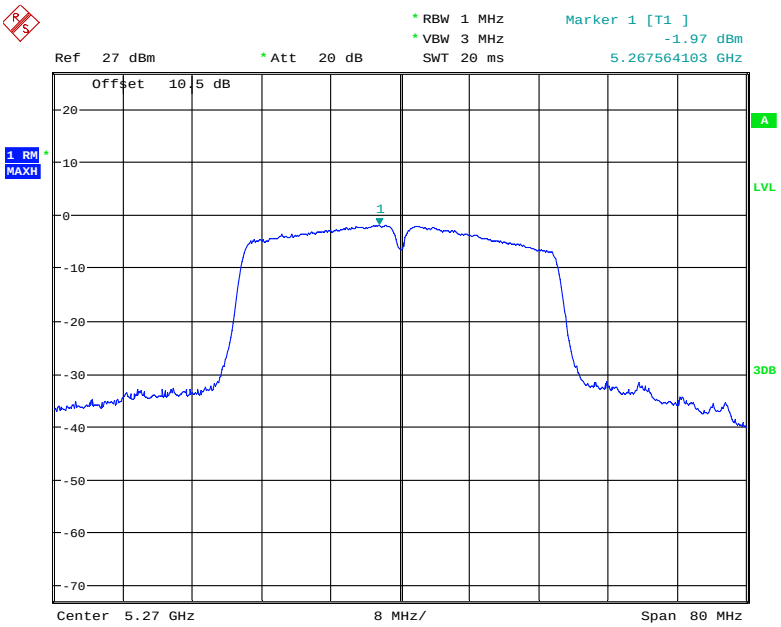
Date: 9.AUG.2019 09:47:51

802.11n20 mode, Power Spectral Density, 5320 MHz



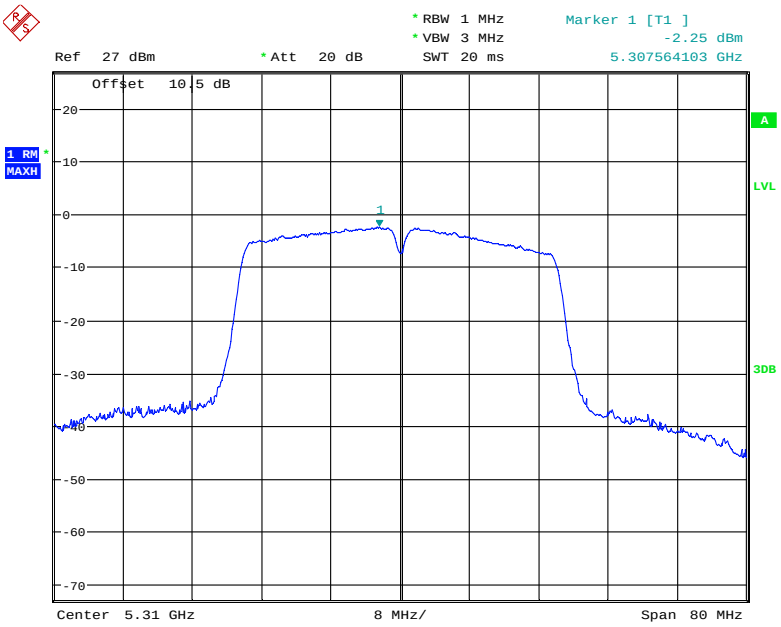
Date: 9.AUG.2019 09:45:30

802.11n40 mode, Power Spectral Density, 5270 MHz



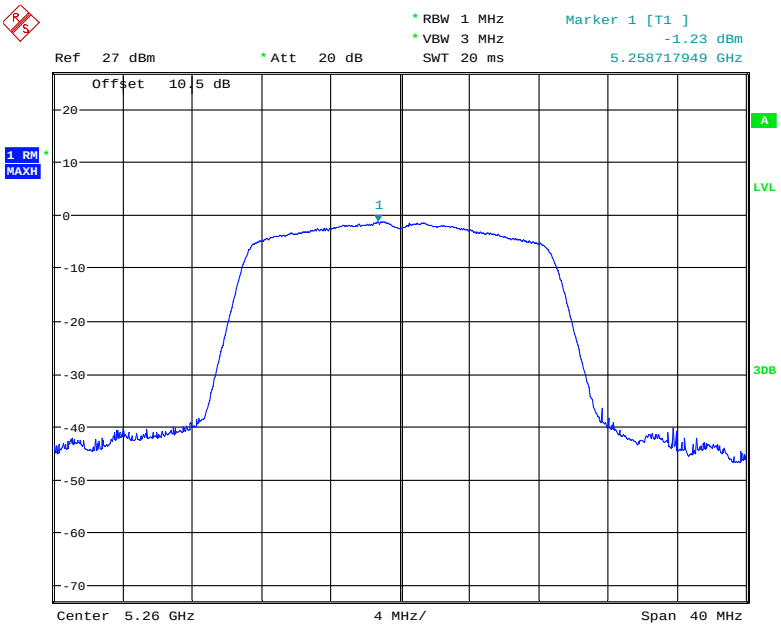
Date: 9.AUG.2019 10:54:47

802.11n40 mode, Power Spectral Density, 5310 MHz



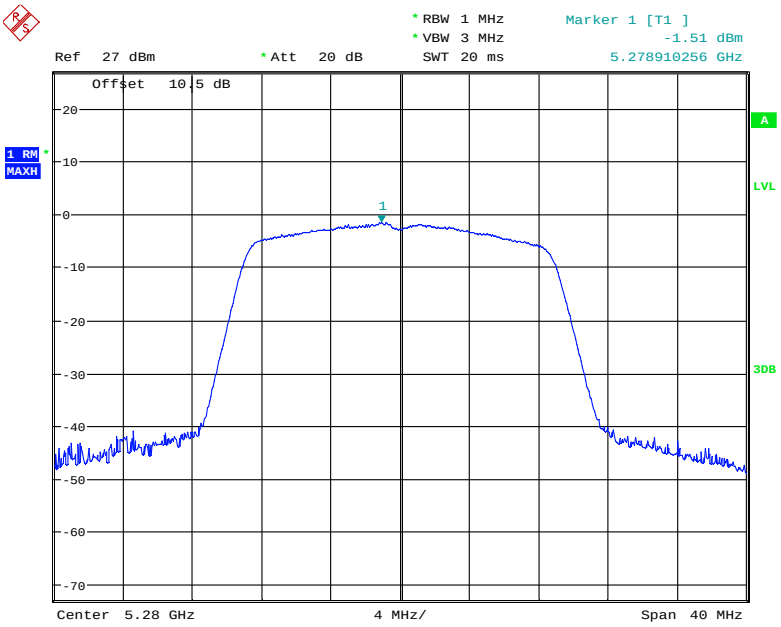
Date: 9.AUG.2019 10:55:59

802.11ac20 mode, Power Spectral Density, 5260 MHz



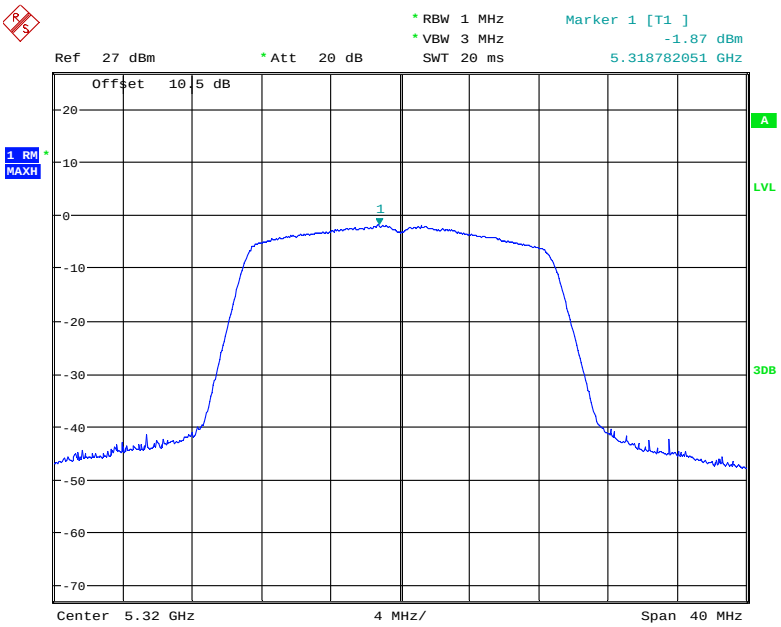
Date: 9.AUG.2019 09:56:32

802. 11ac20 mode, Power Spectral Density, 5280 MHz



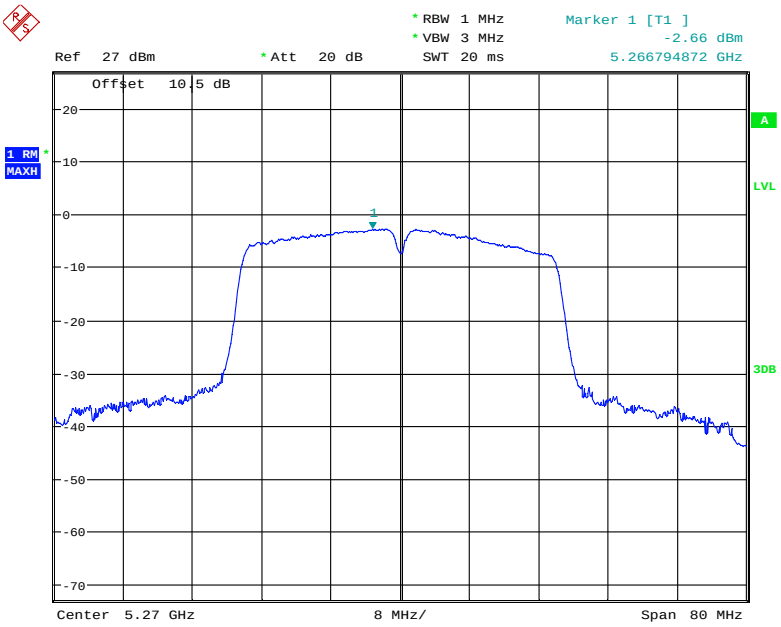
Date: 9.AUG.2019 09:58:06

802. 11ac20 mode, Power Spectral Density, 5320 MHz



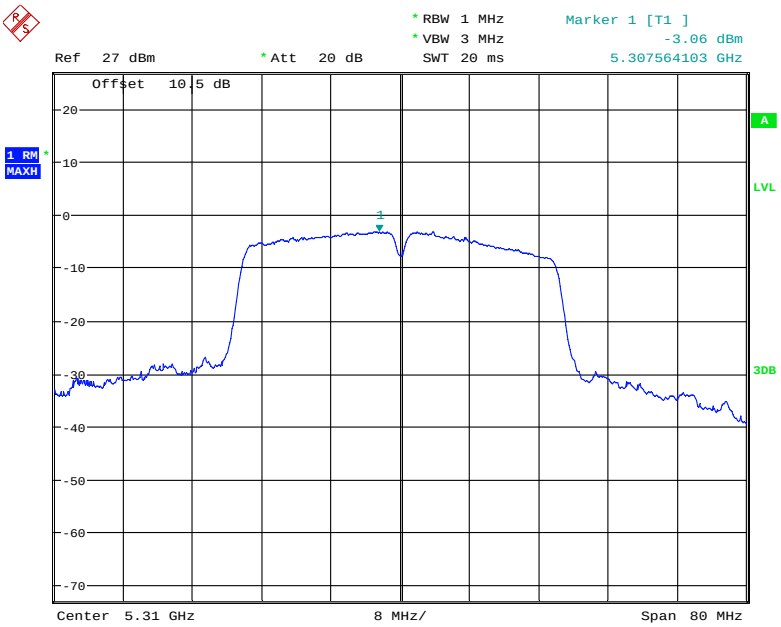
Date: 9.AUG.2019 10:00:34

802. 11ac40 mode, Power Spectral Density, 5270 MHz



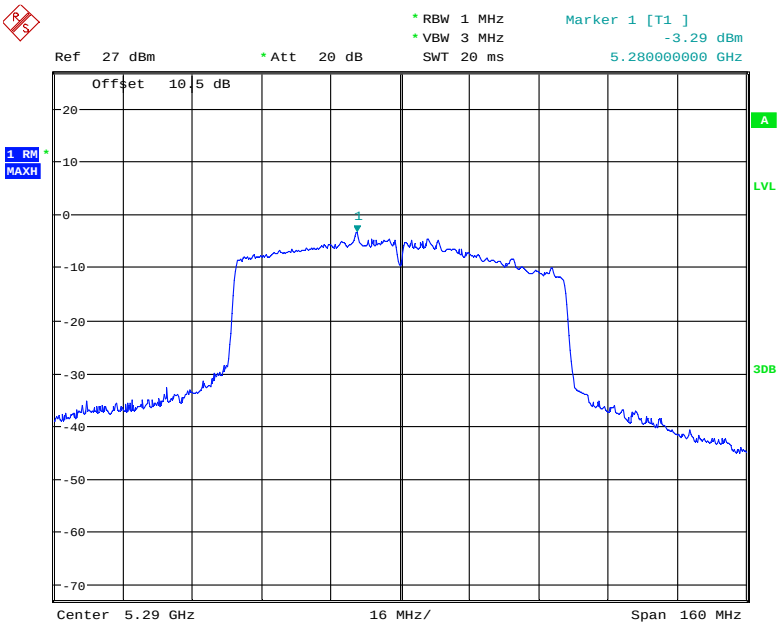
Date: 9.AUG.2019 10:33:57

802. 11ac40 mode, Power Spectral Density, 5310 MHz



Date: 9.AUG.2019 10:31:59

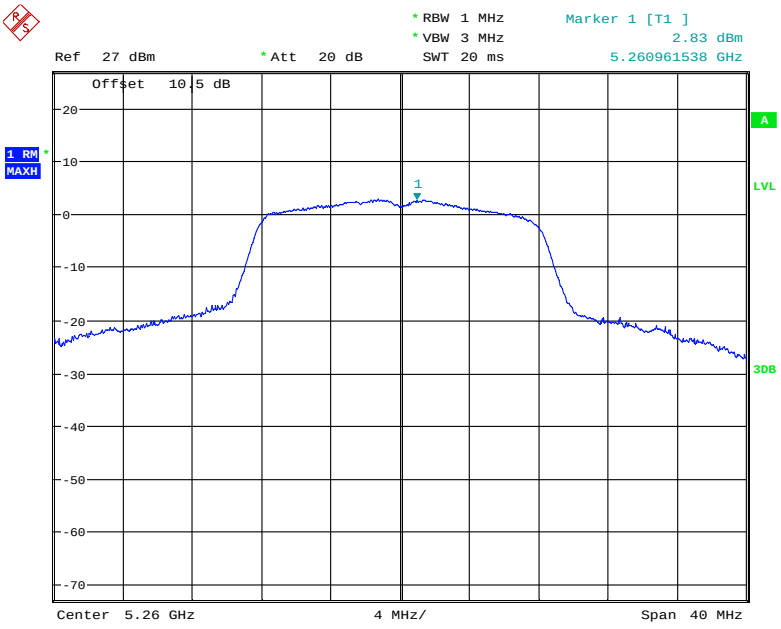
802. 11ac80 mode, Power Spectral Density, 5290 MHz



Date: 9.AUG.2019 11:20:36

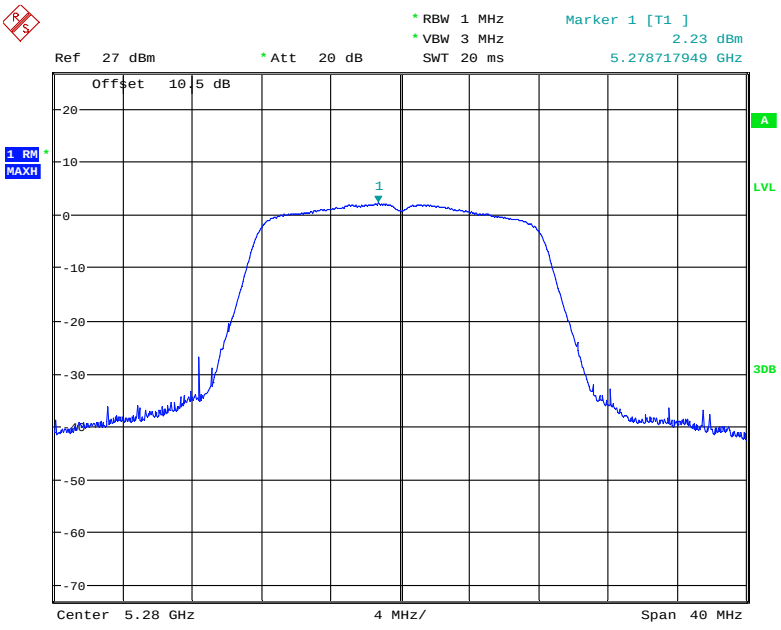
Ant 3:

802.11a mode, Power Spectral Density, 5260 MHz



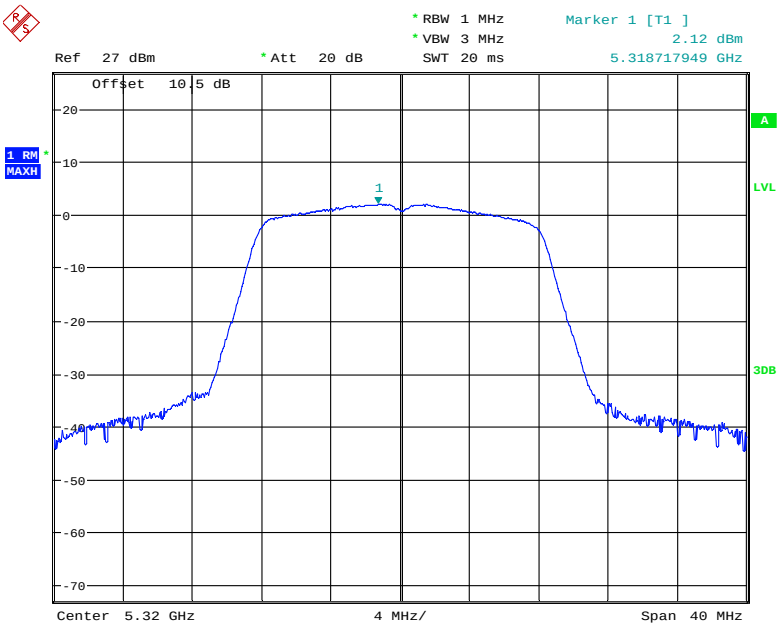
Date: 9.AUG.2019 07:21:00

802.11a mode, Power Spectral Density, 5280 MHz



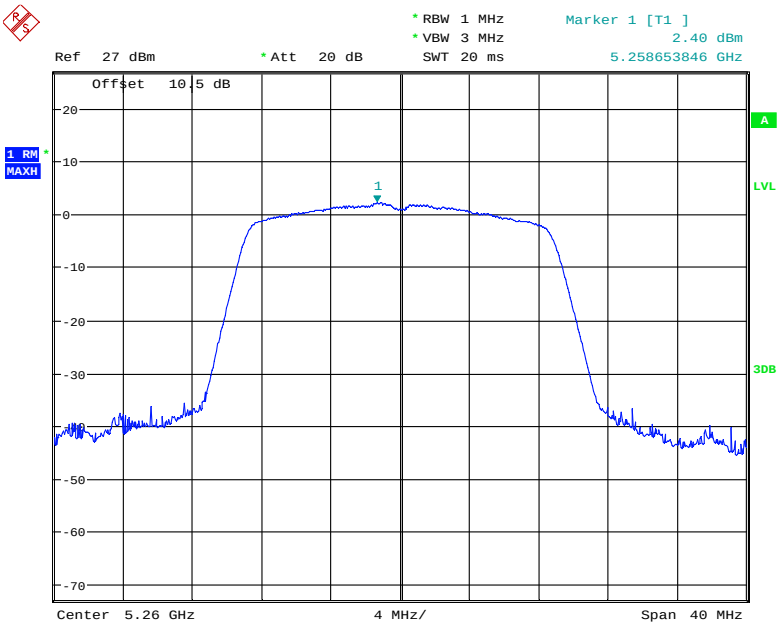
Date: 9.AUG.2019 09:01:03

802.11a mode, Power Spectral Density, 5320 MHz



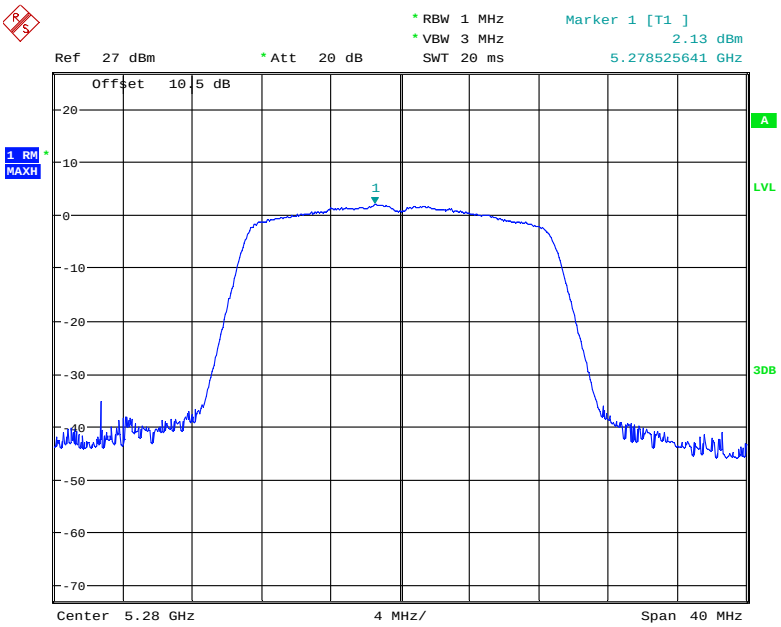
Date: 9.AUG.2019 09:03:09

802.11n20 mode, Power Spectral Density, 5260 MHz



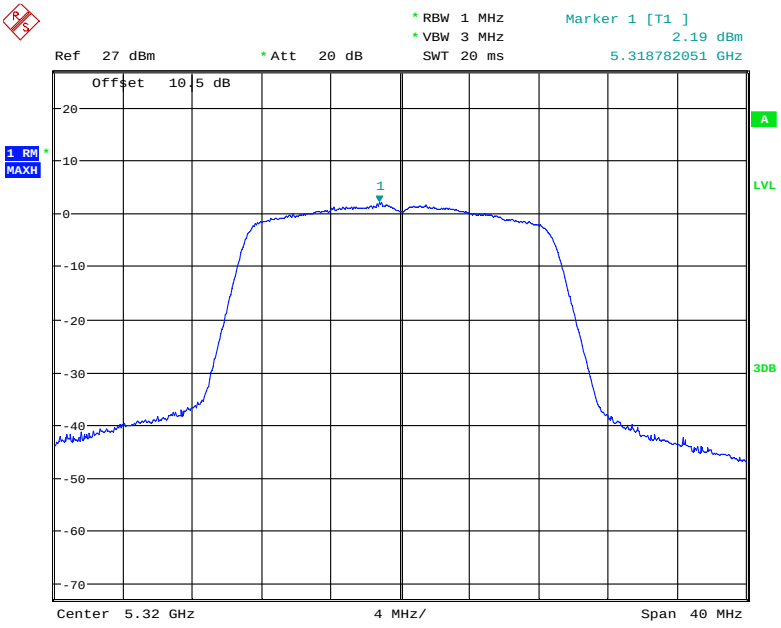
Date: 9.AUG.2019 09:39:22

802.11n20 mode, Power Spectral Density, 5280 MHz



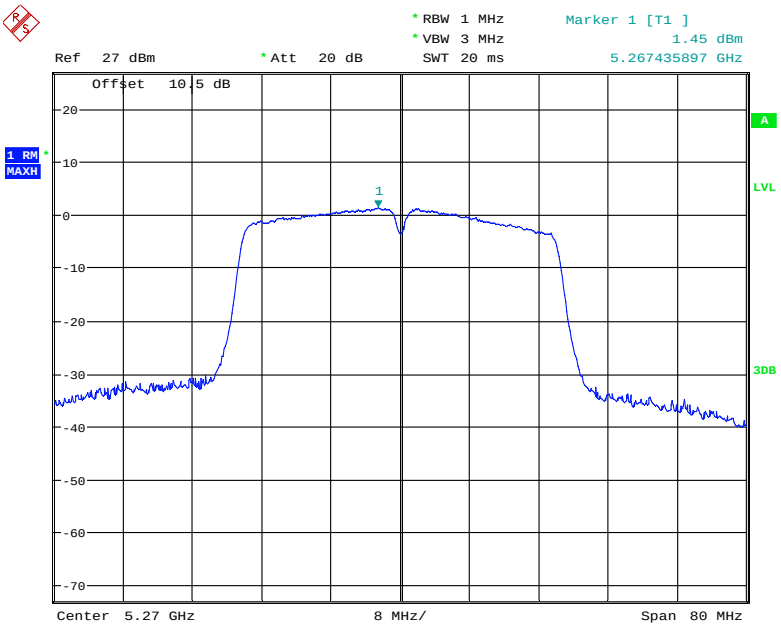
Date: 9.AUG.2019 09:40:20

802.11n20 mode, Power Spectral Density, 5320 MHz



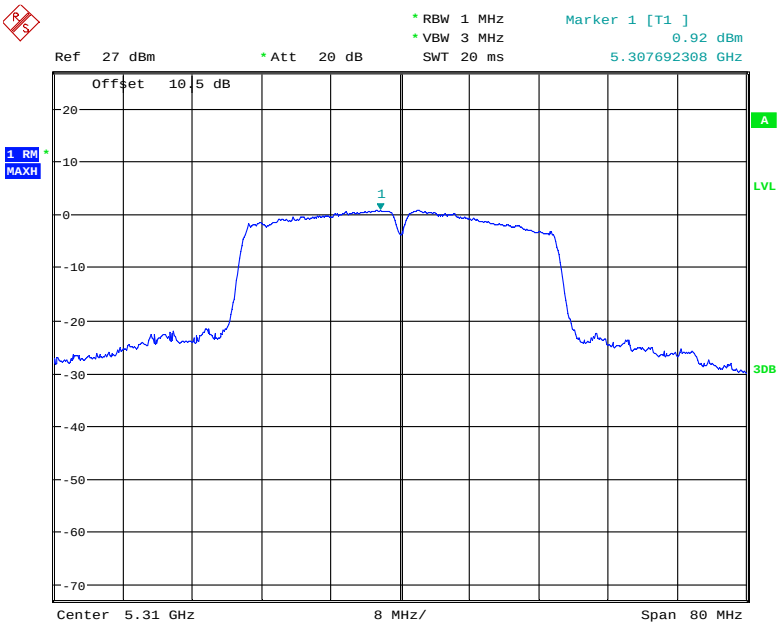
Date: 9.AUG.2019 09:41:21

802.11n40 mode, Power Spectral Density, 5270 MHz



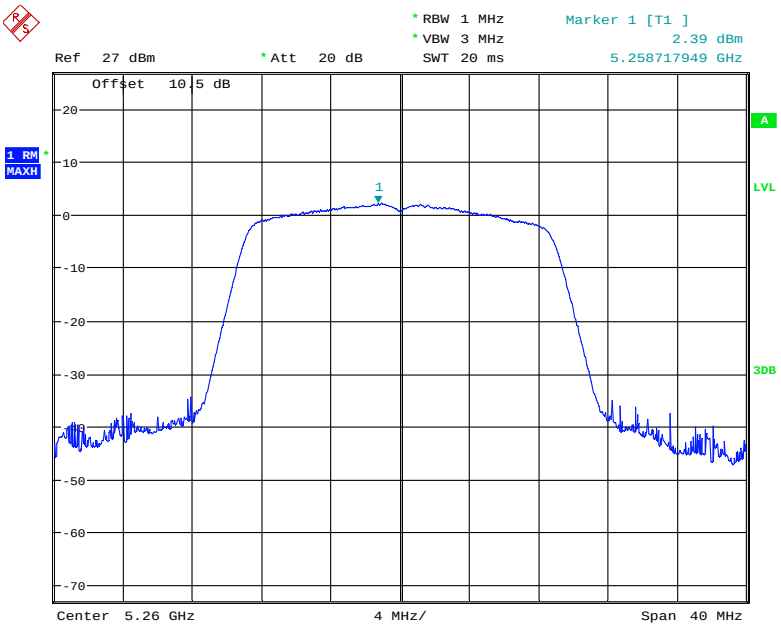
Date: 9.AUG.2019 10:58:50

802.11n40 mode, Power Spectral Density, 5310 MHz



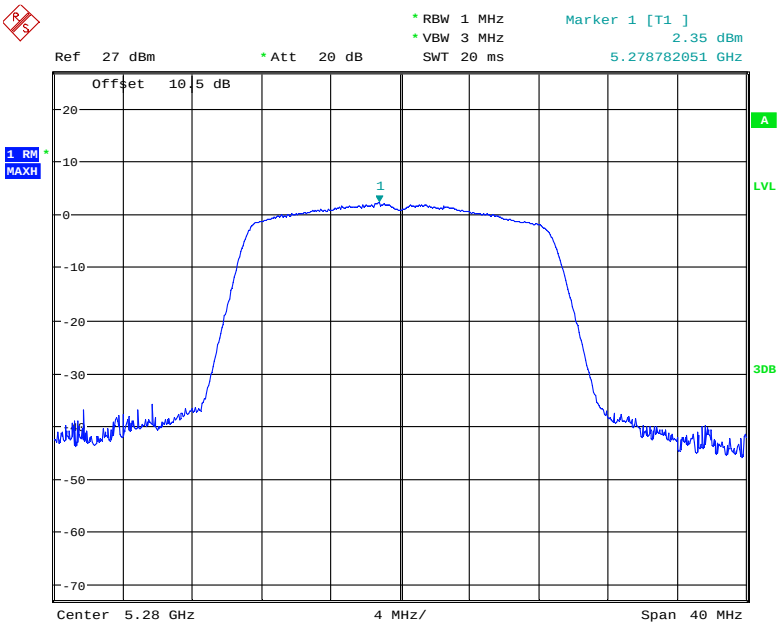
Date: 9.AUG.2019 10:57:47

802.11ac20 mode, Power Spectral Density, 5260 MHz



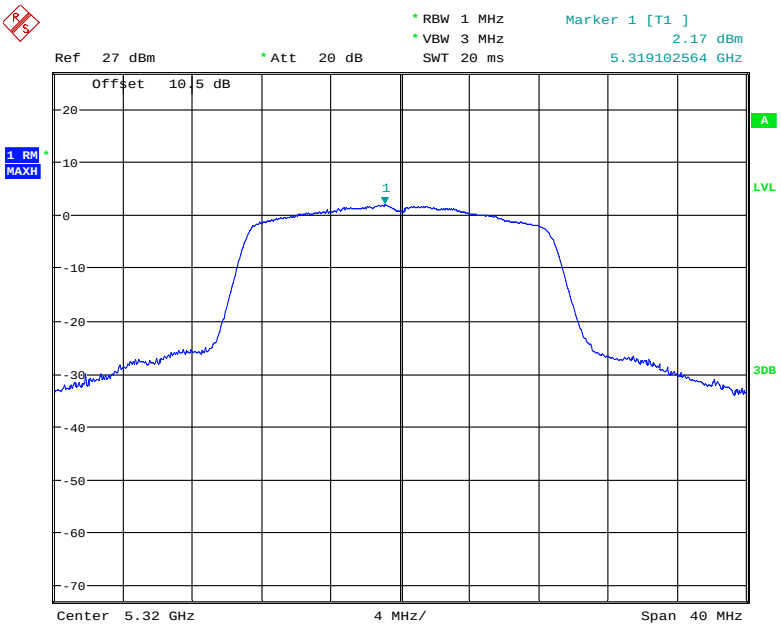
Date: 9.AUG.2019 10:05:41

802. 11ac20 mode, Power Spectral Density, 5280 MHz



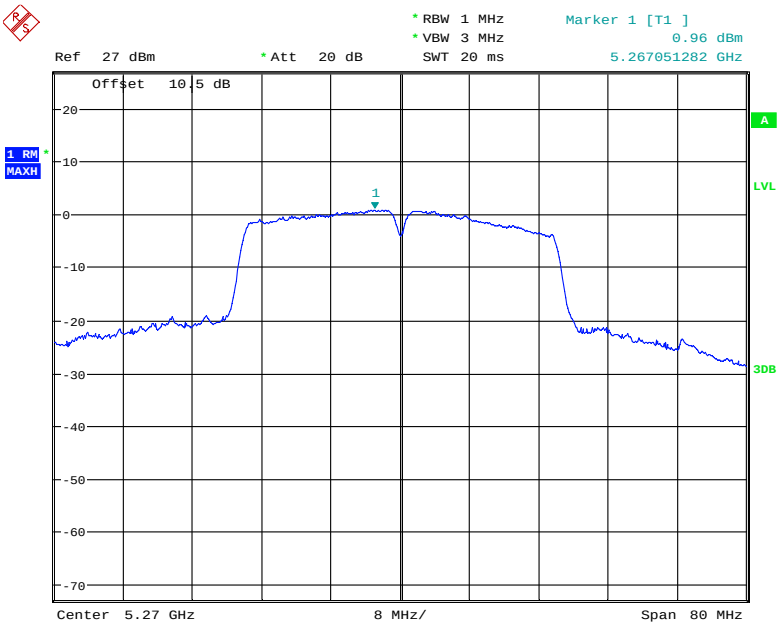
Date: 9.AUG.2019 10:05:09

802. 11ac20 mode, Power Spectral Density, 5320 MHz



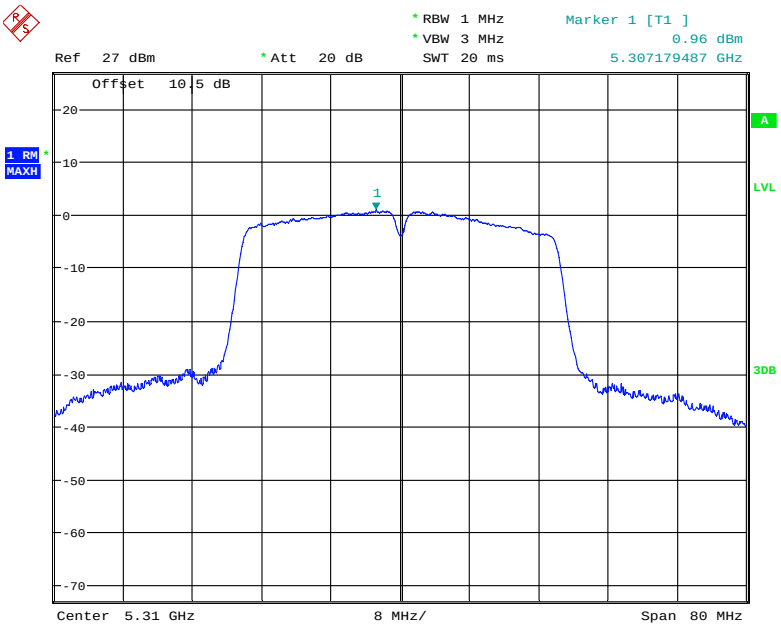
Date: 9.AUG.2019 10:02:33

802. 11ac40 mode, Power Spectral Density, 5270 MHz



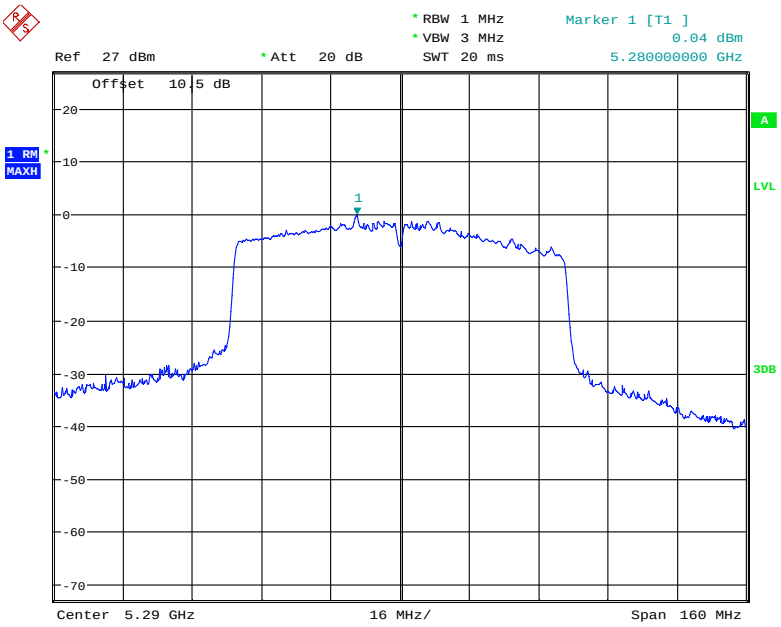
Date: 9.AUG.2019 10:37:38

802. 11ac40 mode, Power Spectral Density, 5310 MHz



Date: 9.AUG.2019 10:38:56

802. 11ac80 mode, Power Spectral Density, 5290 MHz



Date: 9.AUG.2019 11:00:49

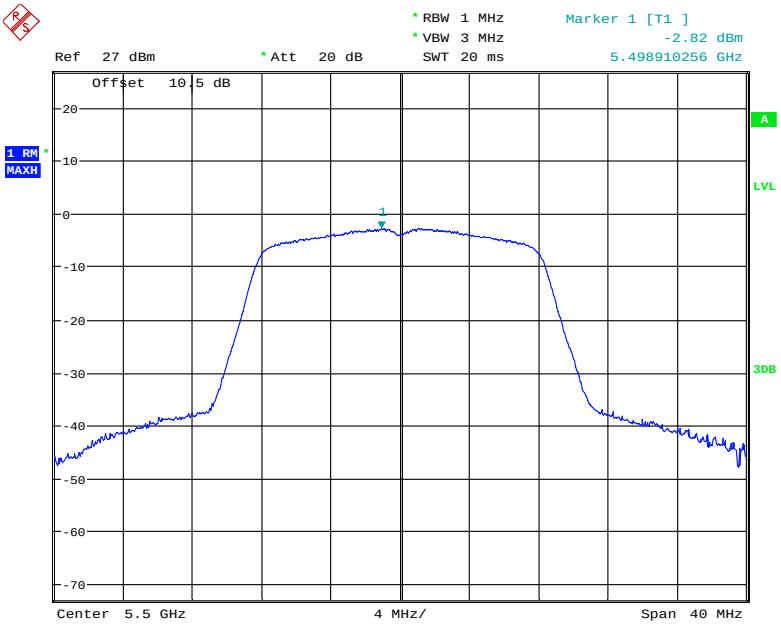
5470 MHz – 5725 MHz:

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Total Power Spectral (dBm/MHz)	Limit (dBm/MHz)
802.11a				
5500	0	-2.82	4.92	6
	1	-3.17		
	2	-0.54		
	3	0.86		
5600	0	-2.10	5.73	
	1	-2.02		
	2	0.25		
	3	1.58		
5700	0	-7.54	2.62	
	1	-4.46		
	2	-2.37		
	3	-1.46		
802.11n20				
5500	0	-3.17	5.09	
	1	-2.91		
	2	-0.68		
	3	1.40		
5600	0	-2.51	5.41	
	1	-2.52		
	2	-0.43		
	3	1.62		
5700	0	-2.59	5.83	
	1	-2.18		
	2	0.42		
	3	1.95		
802.11n40				
5510	0	-6.99	1.72	
	1	-7.88		
	2	-3.58		
	3	-1.64		
5590	0	-3.32	4.90	
	1	-2.52		
	2	-0.74		
	3	0.86		
5670	0	-2.81	5.82	
	1	-1.48		
	2	0.17		
	3	1.89		

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Total Power Spectral (dBm/MHz)	Limit (dBm/MHz)
802.11ac20				
5500	0	-3.59	4.98	6
	1	-2.60		
	2	-0.99		
	3	1.36		
5600	0	-2.81	5.51	
	1	-2.25		
	2	0.12		
	3	1.48		
5700	0	-2.91	5.87	
	1	-3.15		
	2	0.96		
	3	2.09		
802.11ac40				
5510	0	-7.35	1.43	6
	1	-6.21		
	2	-4.16		
	3	-2.34		
5590	0	-3.80	4.28	
	1	-3.02		
	2	-1.24		
	3	0.05		
5670	0	-6.35	2.20	
	1	-5.43		
	2	-3.09		
	3	-1.87		
802.11ac80				
5530	0	-9.14	-0.36	6
	1	-7.63		
	2	-6.07		
	3	-4.21		
5610	0	-4.44	3.53	
	1	-3.98		
	2	-2.04		
	3	-0.60		

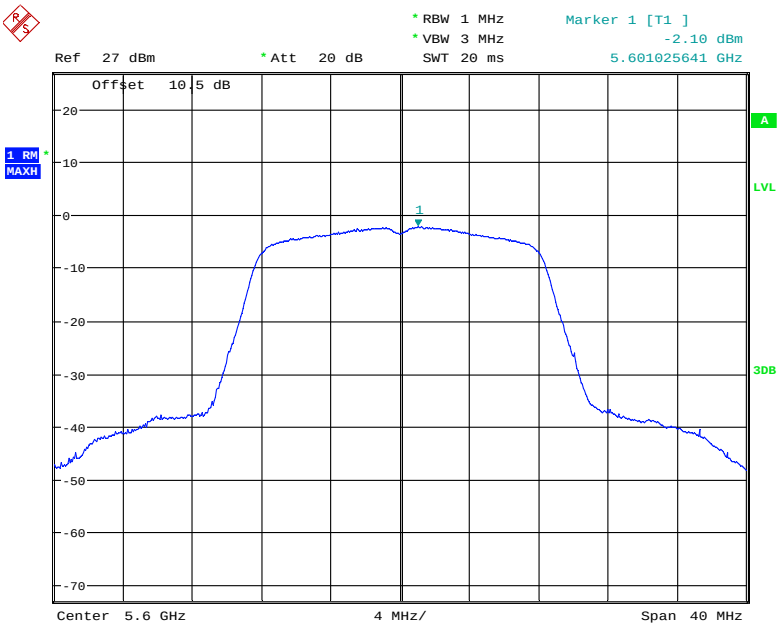
Ant 0:

802.11a mode, Power Spectral Density, 5500 MHz



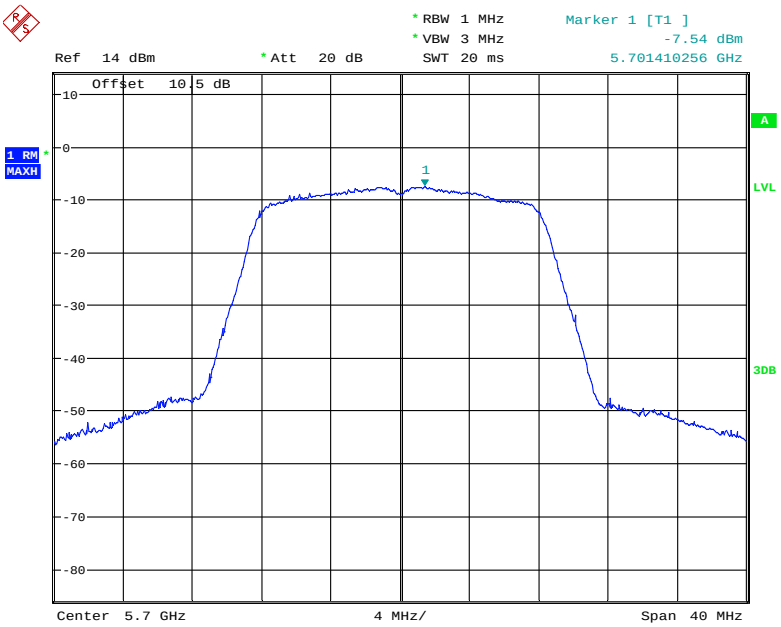
Date: 9.AUG.2019 11:47:47

802.11a mode, Power Spectral Density, 5600 MHz



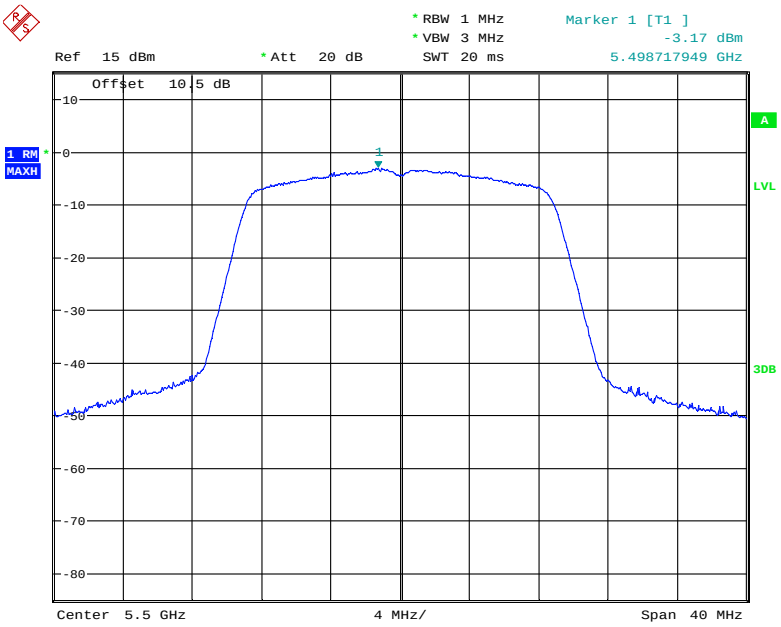
Date: 9.AUG.2019 11:52:27

802.11a mode, Power Spectral Density, 5700 MHz



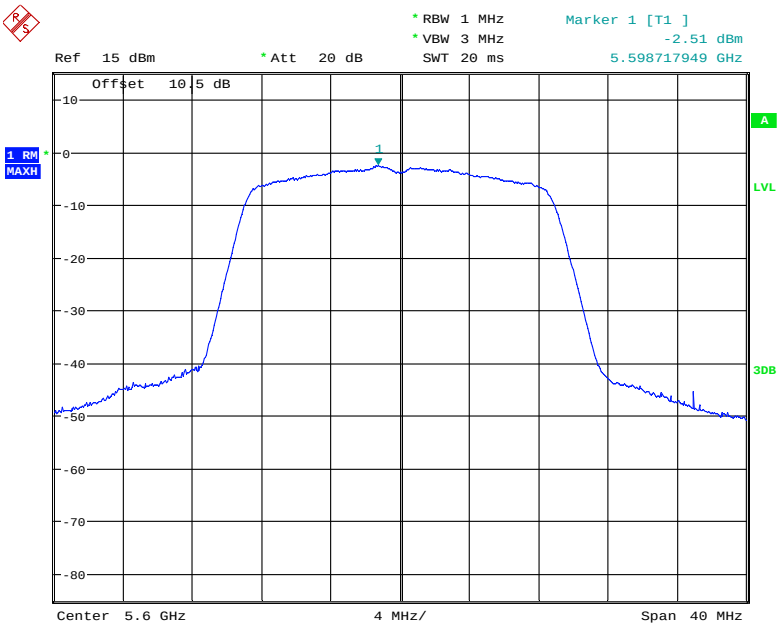
Date: 3.SEP.2019 15:40:30

802.11n20 mode, Power Spectral Density, 5500 MHz



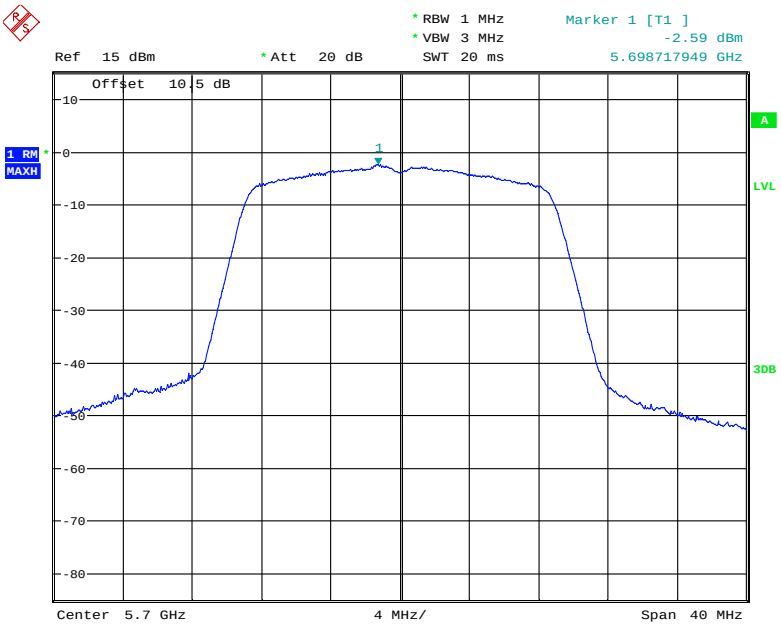
Date: 10.AUG.2019 06:09:43

802.11n20 mode, Power Spectral Density, 5600 MHz



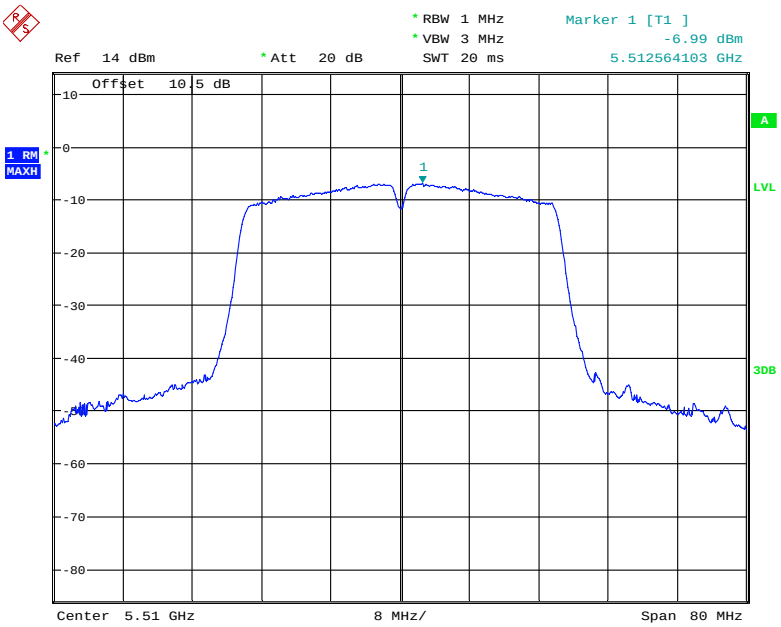
Date: 10.AUG.2019 06:14:59

802.11n20 mode, Power Spectral Density, 5700 MHz



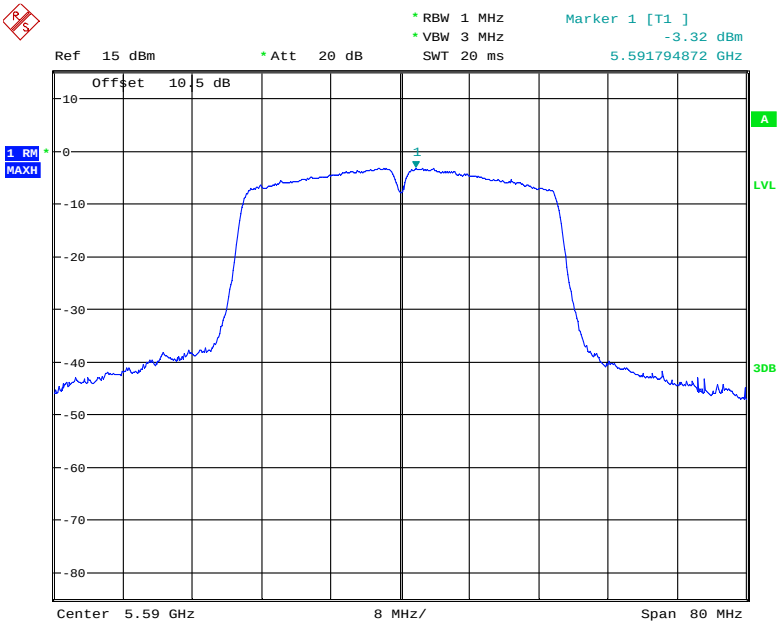
Date: 10.AUG.2019 06:16:26

802.11n40 mode, Power Spectral Density, 5510 MHz



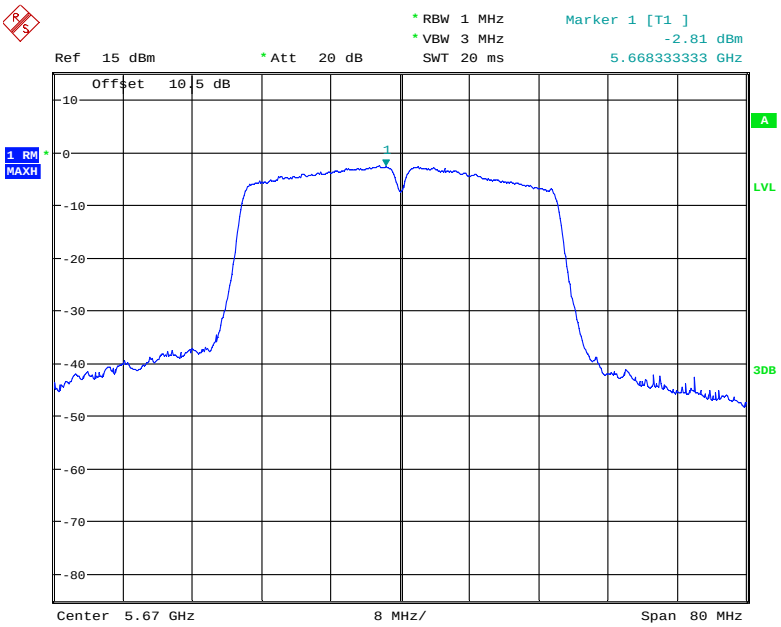
Date: 3.SEP.2019 15:38:01

802.11n40 mode, Power Spectral Density, 5590 MHz



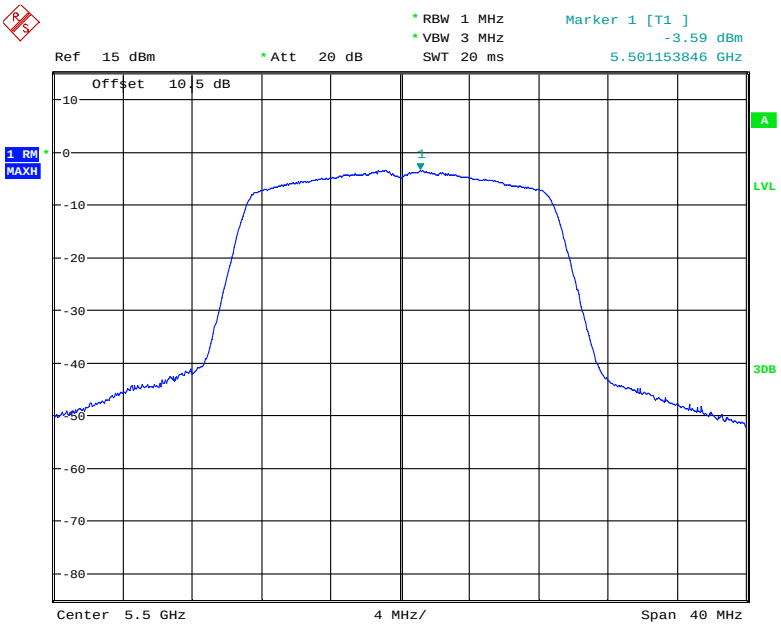
Date: 10.AUG.2019 09:24:48

802.11n40 mode, Power Spectral Density, 5670 MHz



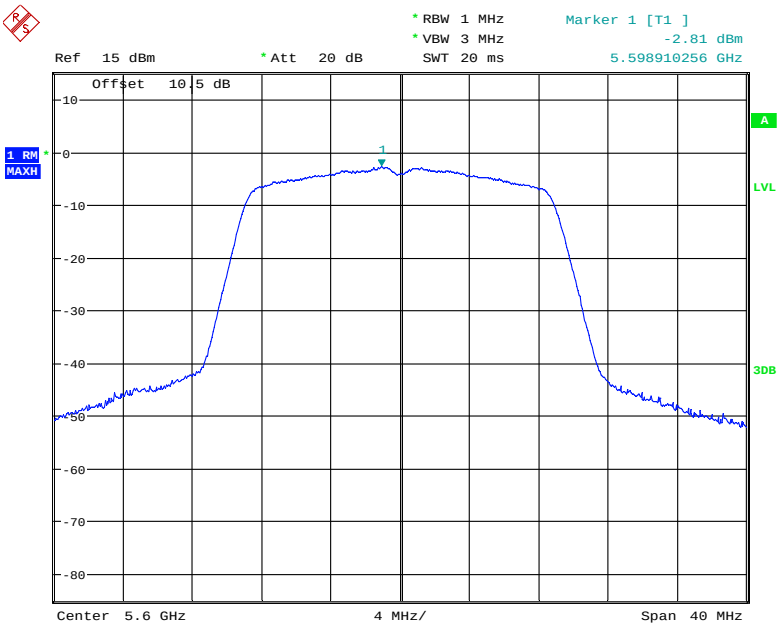
Date: 10.AUG.2019 09:23:40

802.11ac20 mode, Power Spectral Density, 5500 MHz



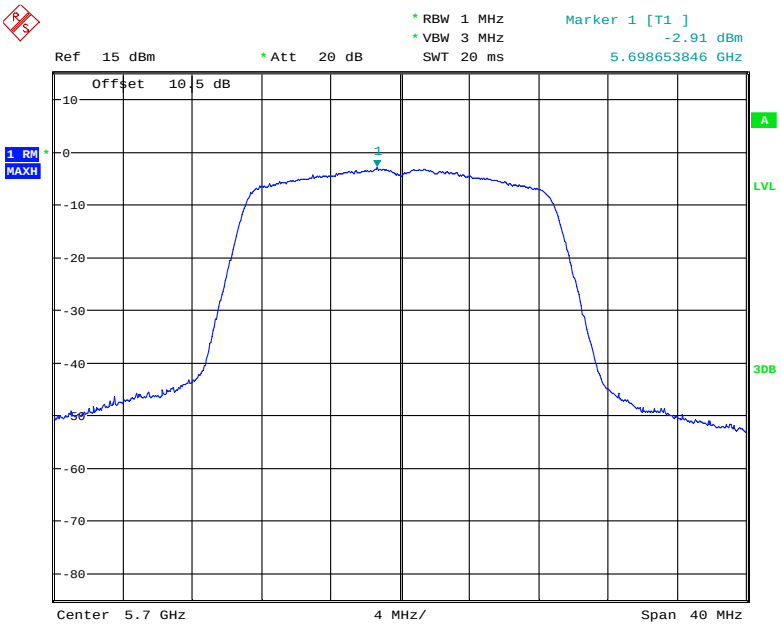
Date: 10.AUG.2019 06:29:49

802. 11ac20 mode, Power Spectral Density, 5600 MHz



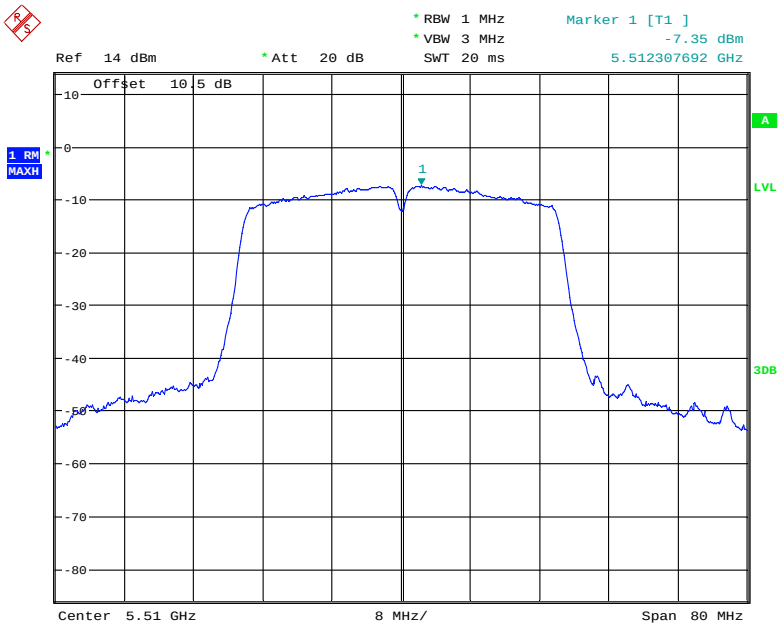
Date: 10.AUG.2019 06:22:40

802. 11ac20 mode, Power Spectral Density, 5700 MHz



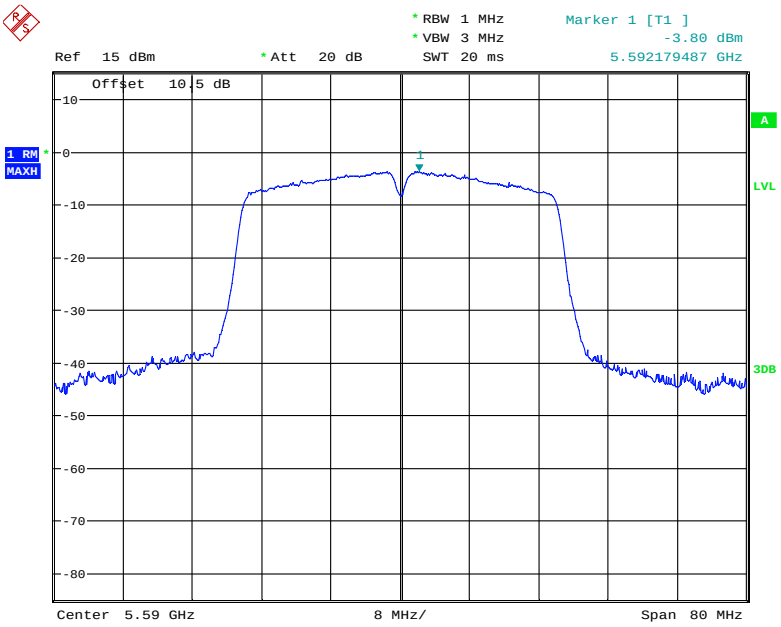
Date: 10.AUG.2019 06:22:00

802. 11ac40 mode, Power Spectral Density, 5510 MHz



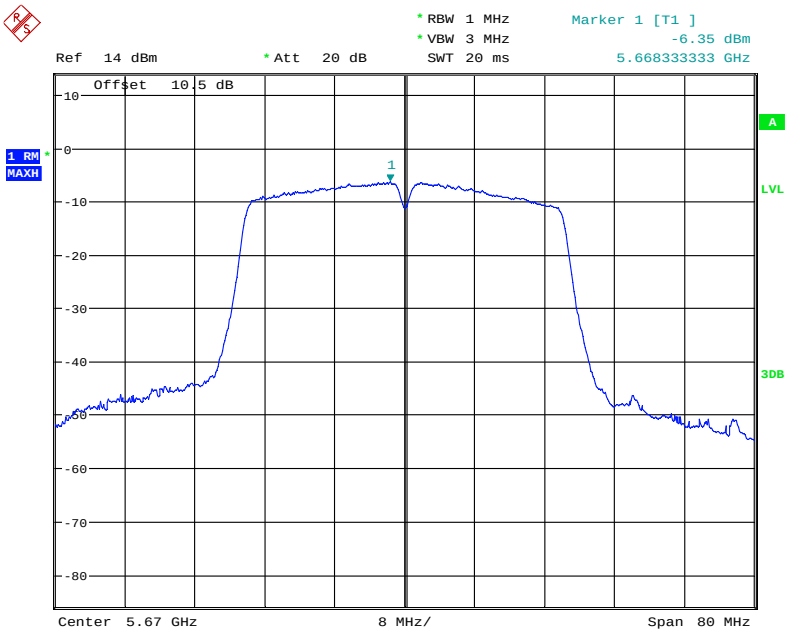
Date: 3.SEP.2019 15:36:51

802. 11ac40 mode, Power Spectral Density, 5590 MHz



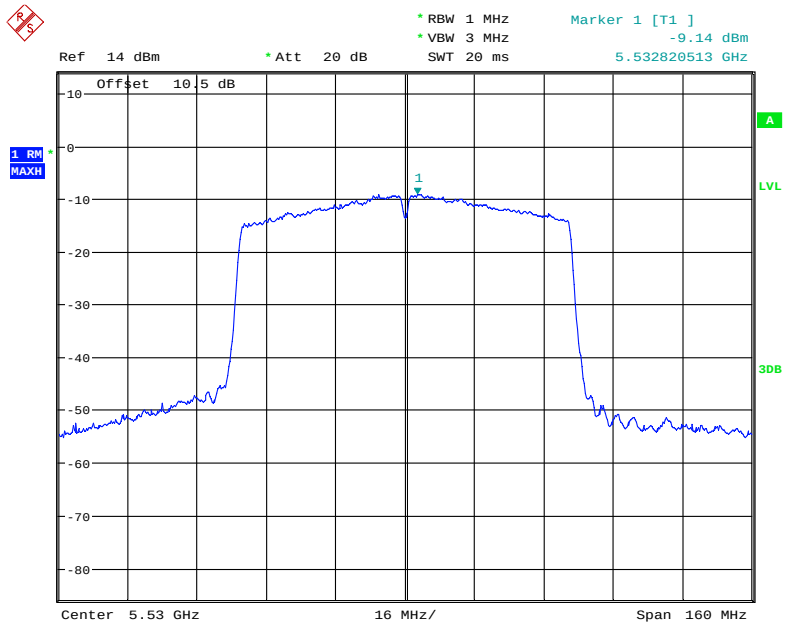
Date: 10.AUG.2019 09:22:01

802. 11ac40 mode, Power Spectral Density, 5670 MHz



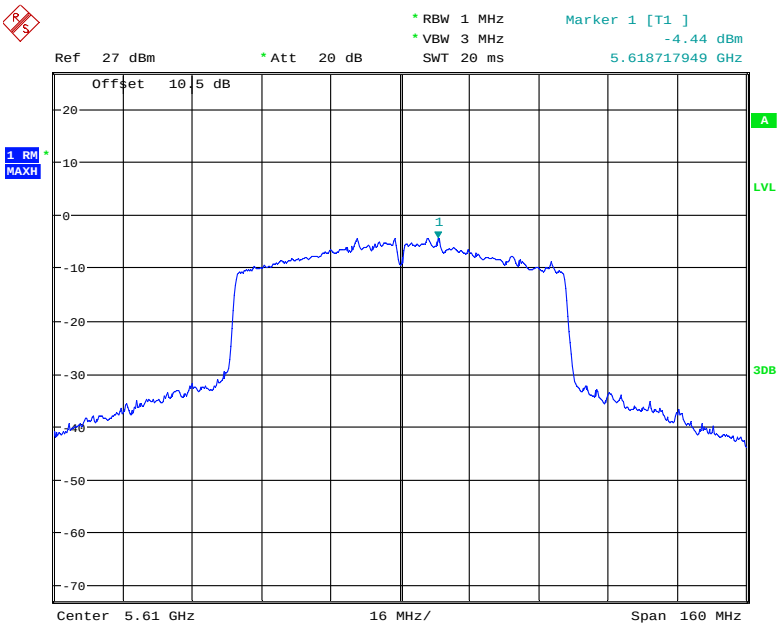
Date: 3.SEP.2019 15:35:57

802. 11ac80 mode, Power Spectral Density, 5530 MHz



Date: 3.SEP.2019 15:34:00

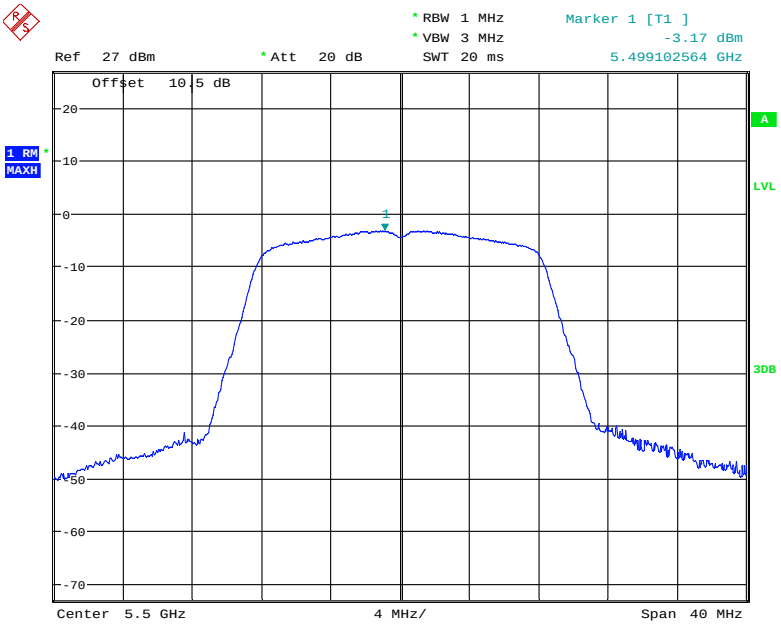
802. 11ac80 mode, Power Spectral Density, 5610 MHz



Date: 9.AUG.2019 11:26:52

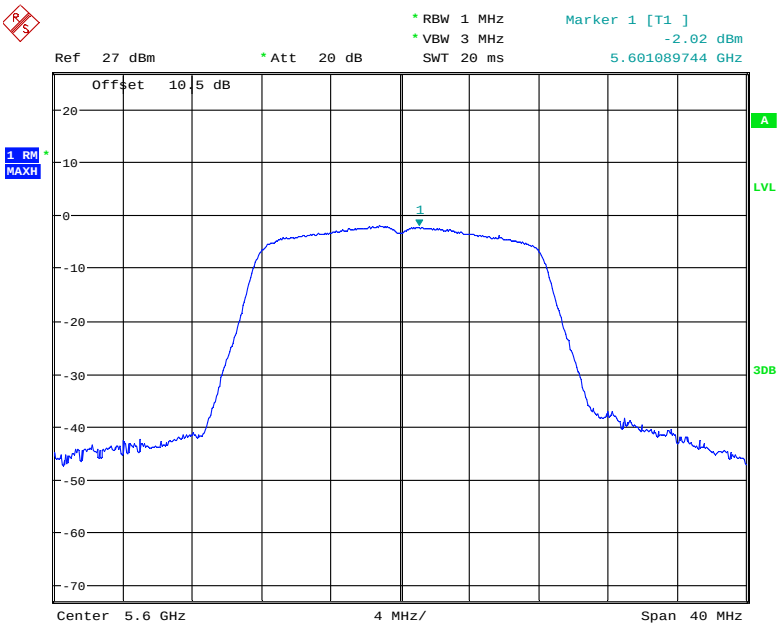
Ant 1:

802.11a mode, Power Spectral Density, 5500 MHz



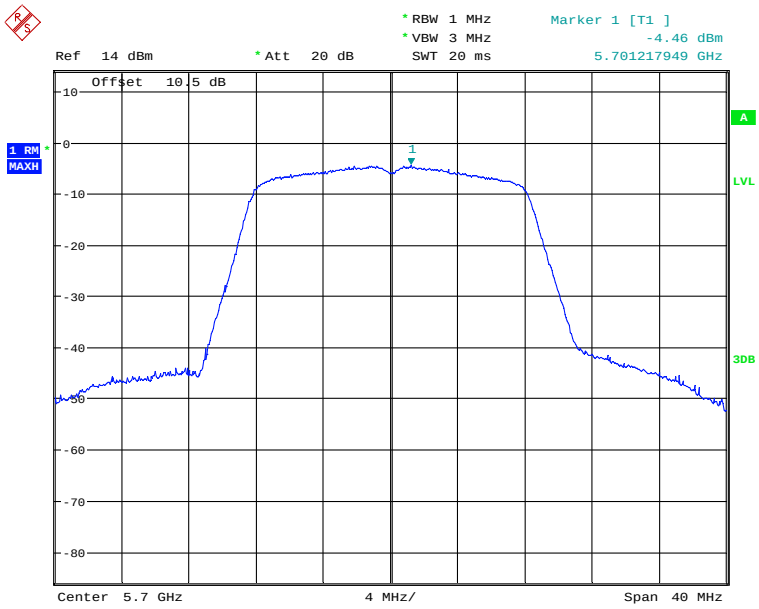
Date: 9.AUG.2019 12:01:23

802.11a mode, Power Spectral Density, 5600 MHz



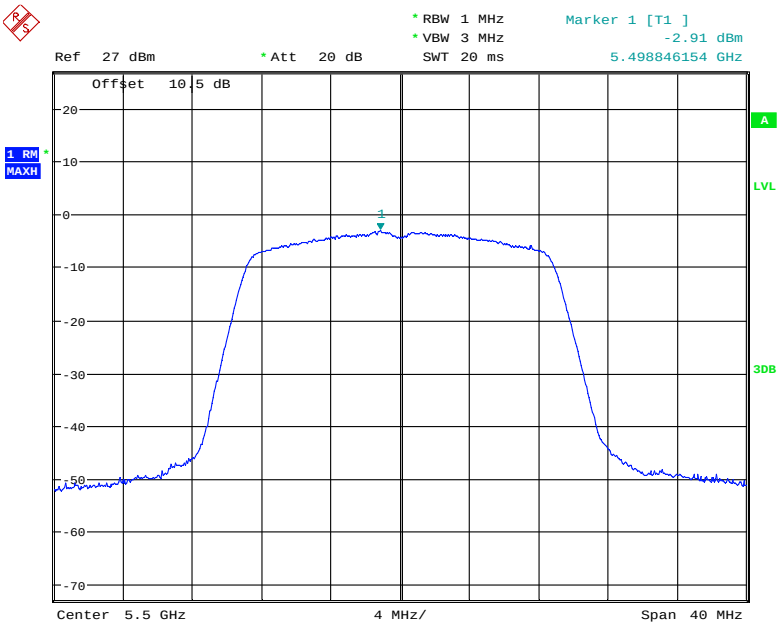
Date: 9.AUG.2019 12:00:08

802.11a mode, Power Spectral Density, 5700 MHz



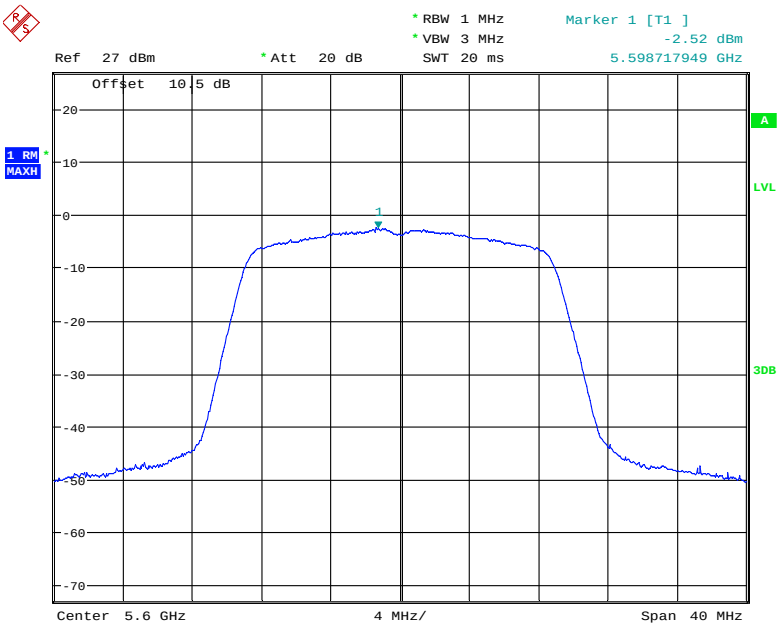
Date: 3.SEP.2019 15:04:24

802.11n20 mode, Power Spectral Density, 5500 MHz



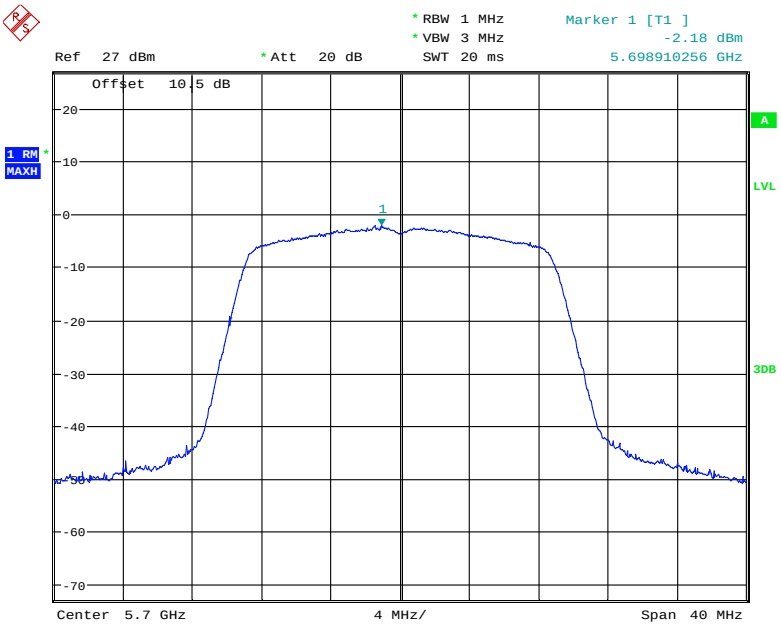
Date: 9.AUG.2019 12:59:30

802.11n20 mode, Power Spectral Density, 5600 MHz



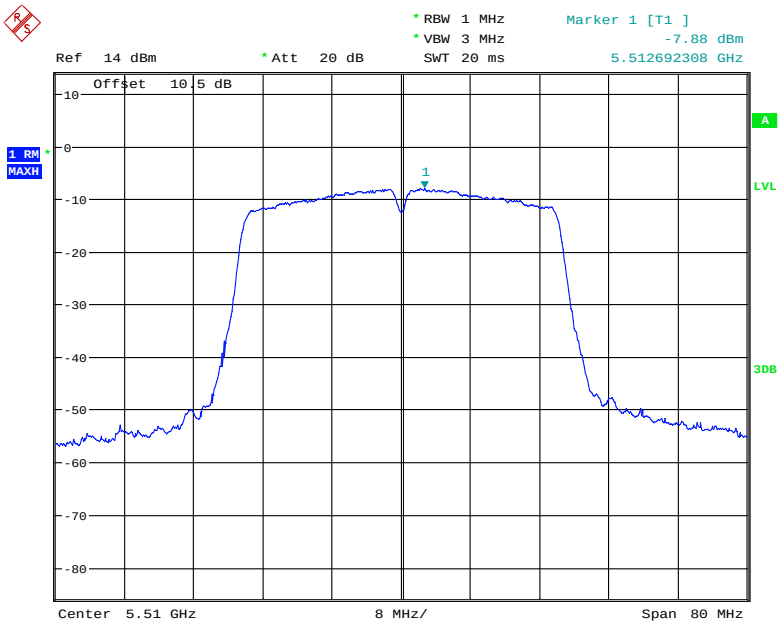
Date: 9.AUG.2019 12:57:40

802.11n20 mode, Power Spectral Density, 5700 MHz



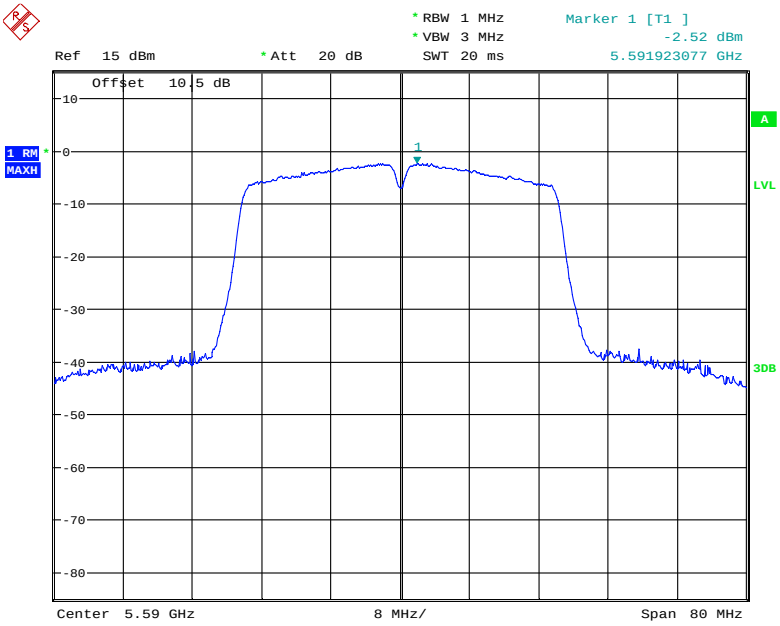
Date: 9.AUG.2019 12:56:44

802.11n40 mode, Power Spectral Density, 5510 MHz



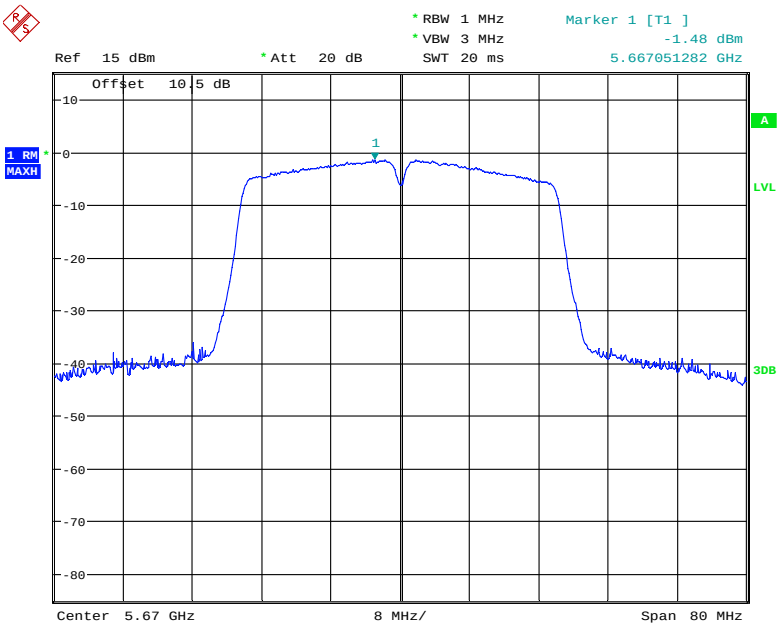
Date: 3.SEP.2019 16:04:10

802.11n40 mode, Power Spectral Density, 5590 MHz



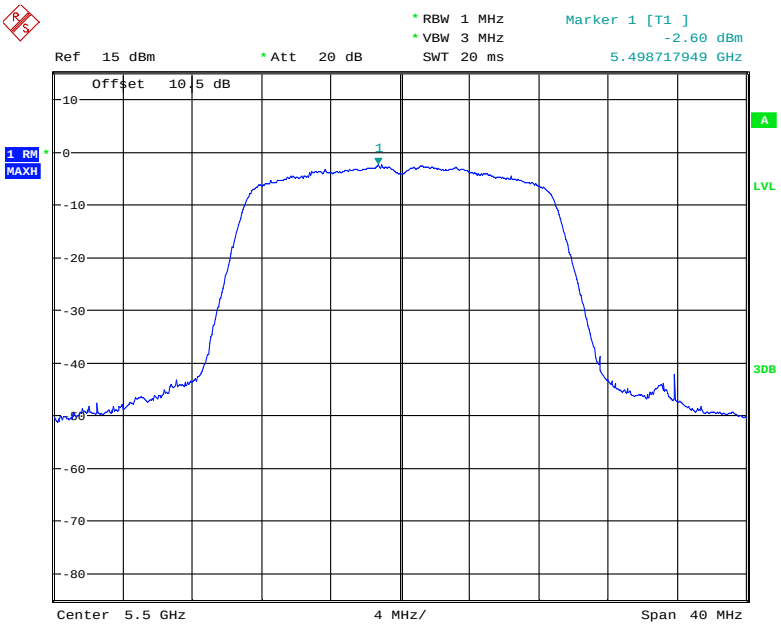
Date: 10.AUG.2019 09:43:02

802.11n40 mode, Power Spectral Density, 5670 MHz



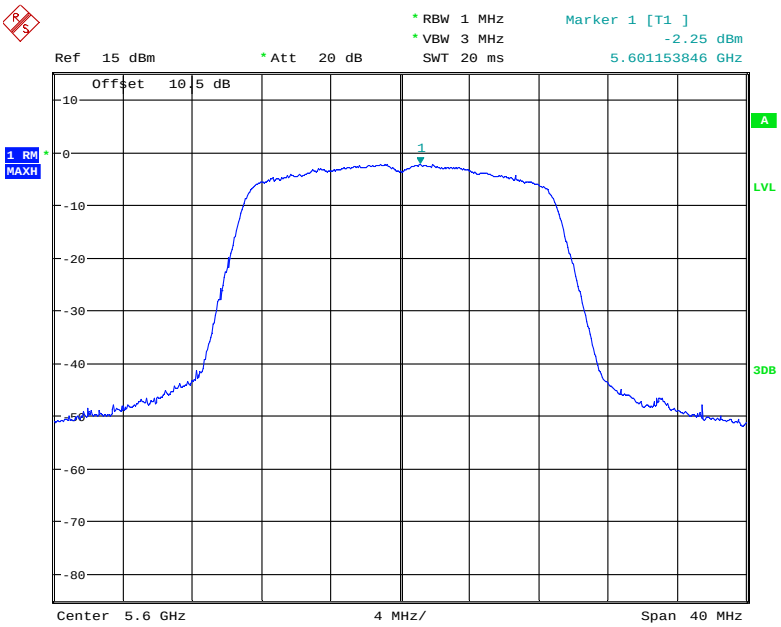
Date: 10.AUG.2019 09:44:16

802.11ac20 mode, Power Spectral Density, 5500 MHz



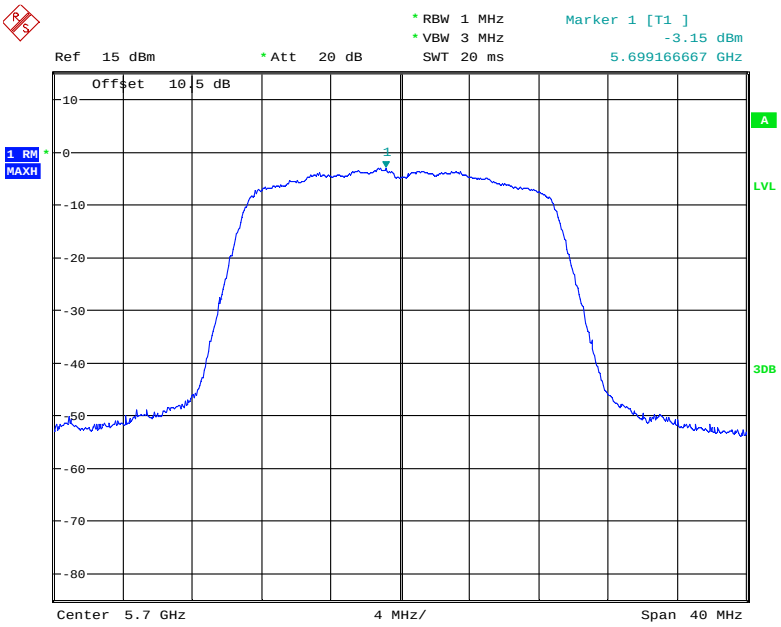
Date: 10.AUG.2019 07:22:26

802. 11ac20 mode, Power Spectral Density, 5600 MHz



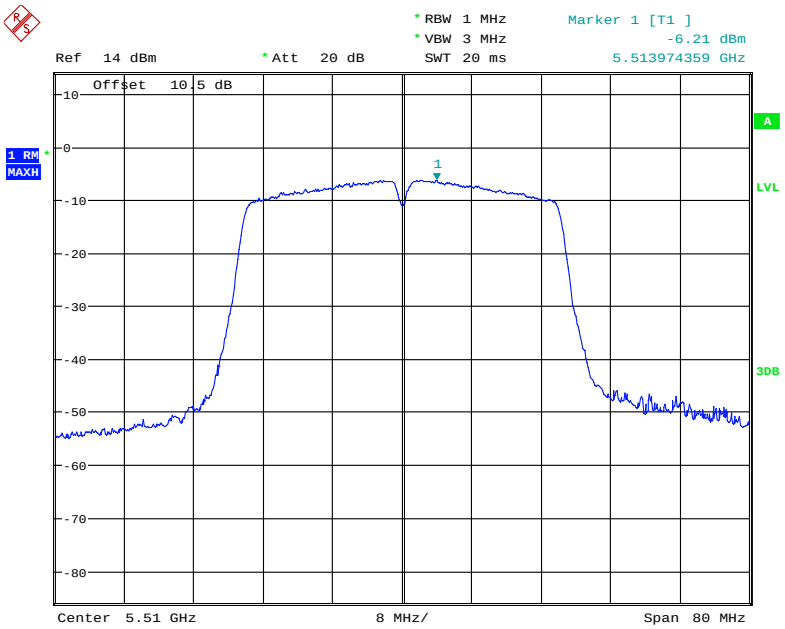
Date: 10.AUG.2019 07:28:08

802. 11ac20 mode, Power Spectral Density, 5700 MHz



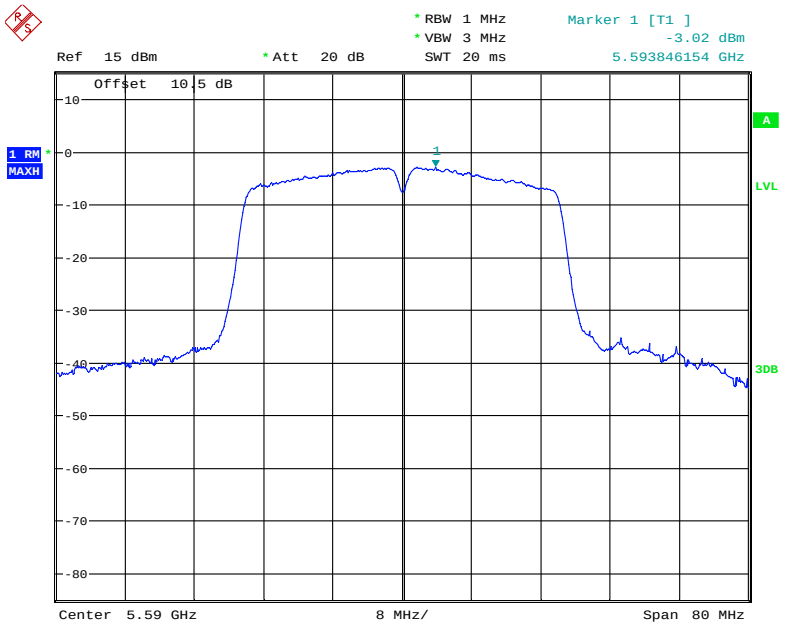
Date: 10.AUG.2019 08:43:49

802. 11ac40 mode, Power Spectral Density, 5510 MHz



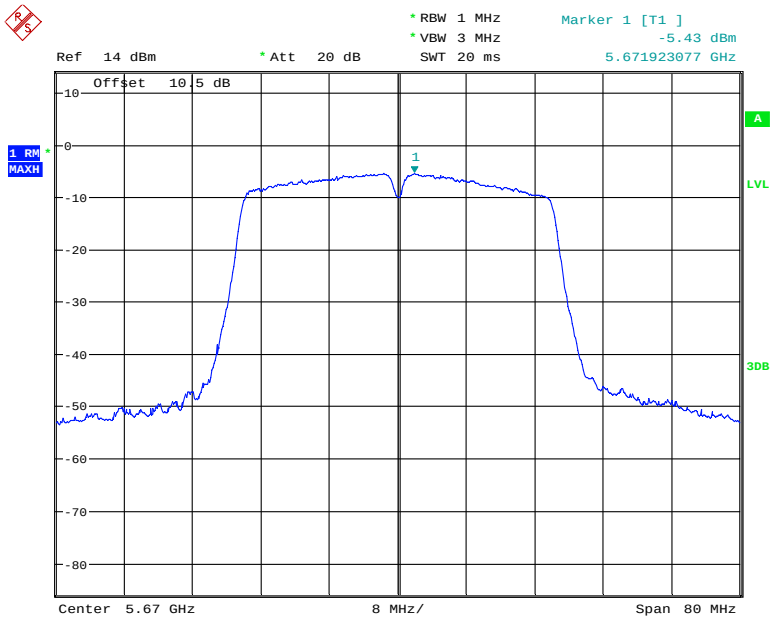
Date: 3.SEP.2019 15:11:11

802. 11ac40 mode, Power Spectral Density, 5590 MHz



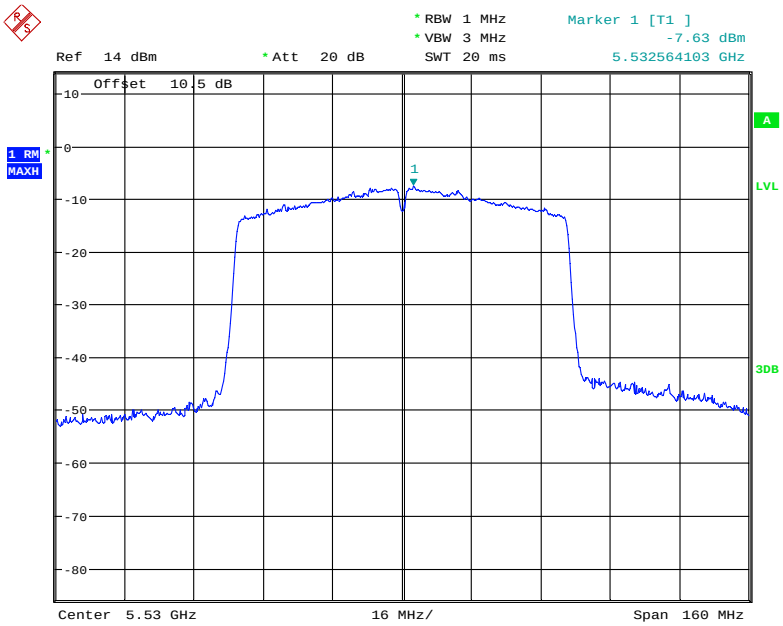
Date: 10.AUG.2019 09:15:36

802. 11ac40 mode, Power Spectral Density, 5670 MHz



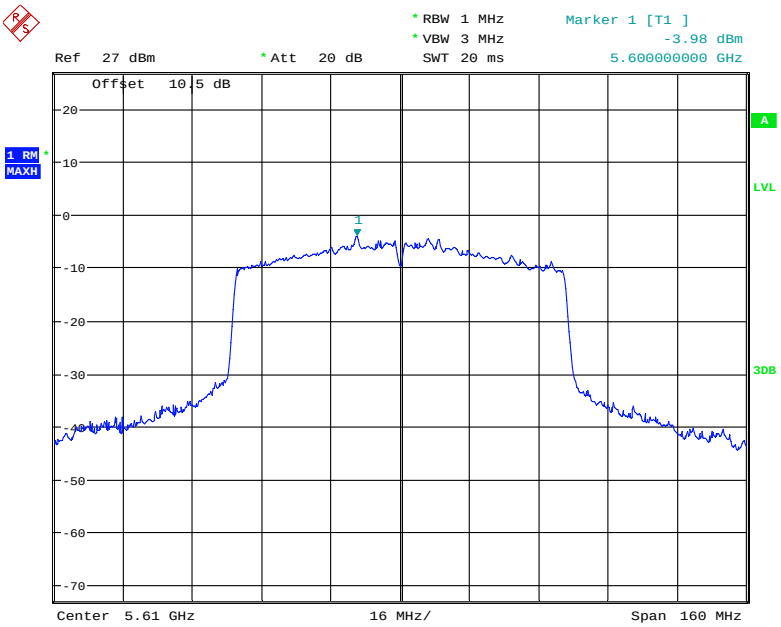
Date: 3.SEP.2019 15:13:17

802. 11ac80 mode, Power Spectral Density, 5530 MHz



Date: 3.SEP.2019 15:16:01

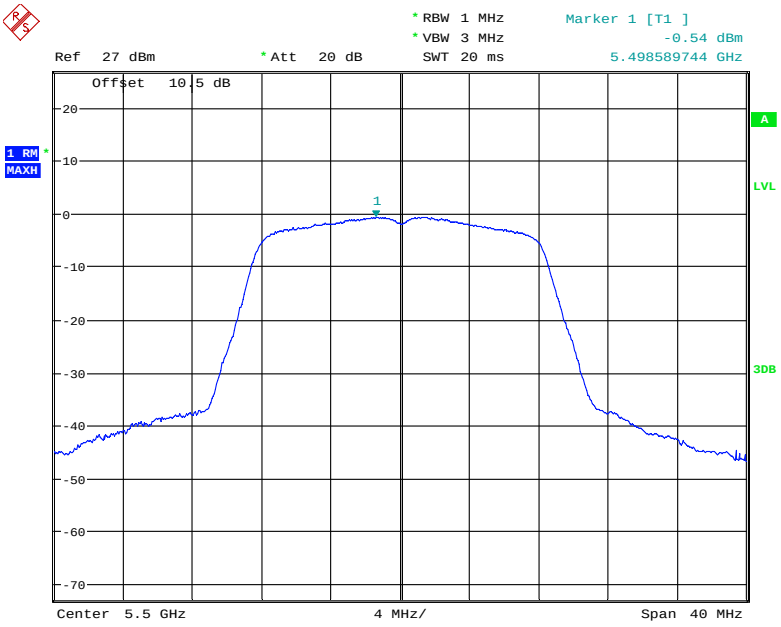
802. 11ac80 mode, Power Spectral Density, 5610 MHz



Date: 9.AUG.2019 11:25:02

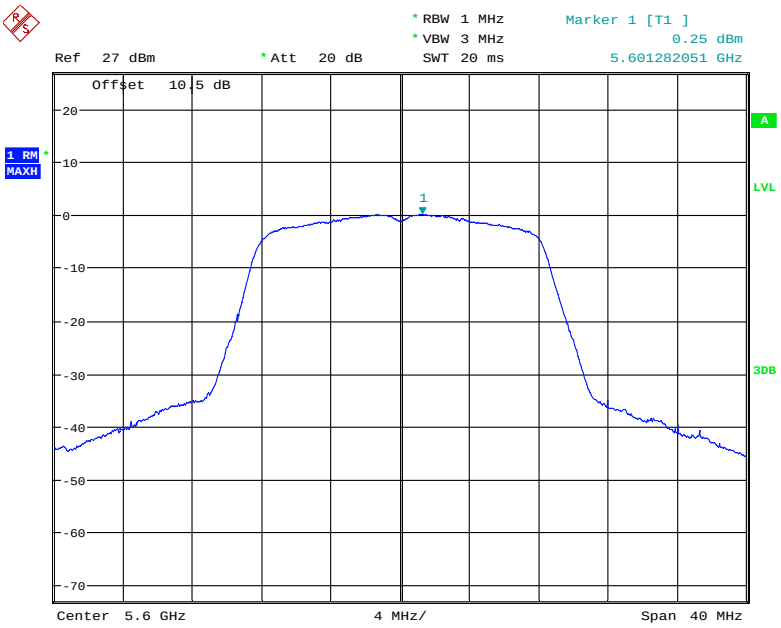
Ant 2:

802.11a mode, Power Spectral Density, 5500 MHz



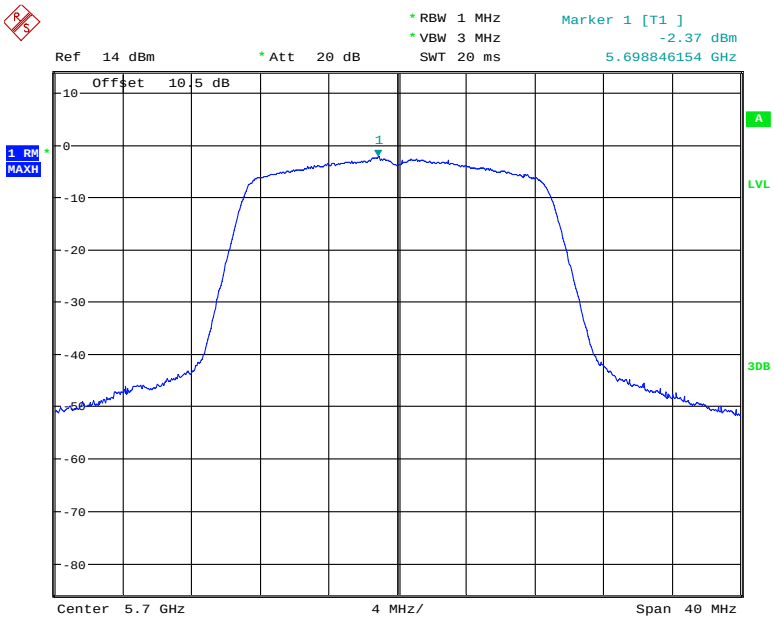
Date: 9.AUG.2019 12:18:52

802.11a mode, Power Spectral Density, 5600 MHz



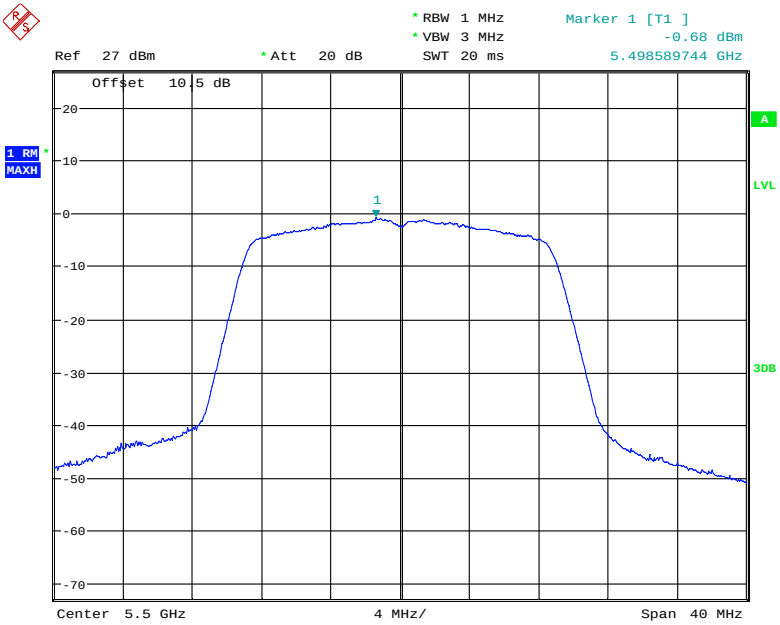
Date: 9.AUG.2019 12:20:19

802.11a mode, Power Spectral Density, 5700 MHz



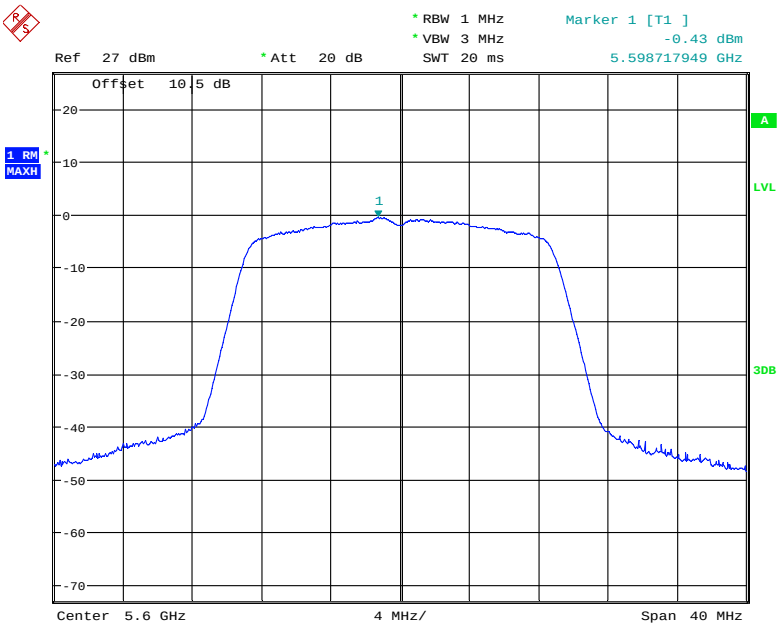
Date: 3.SEP.2019 15:24:54

802.11n20 mode, Power Spectral Density, 5500 MHz



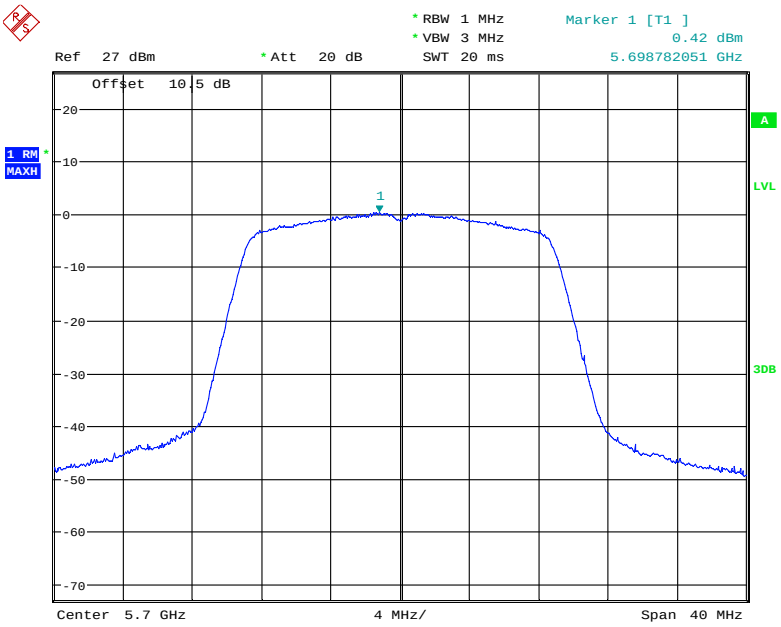
Date: 9.AUG.2019 12:42:11

802.11n20 mode, Power Spectral Density, 5600 MHz



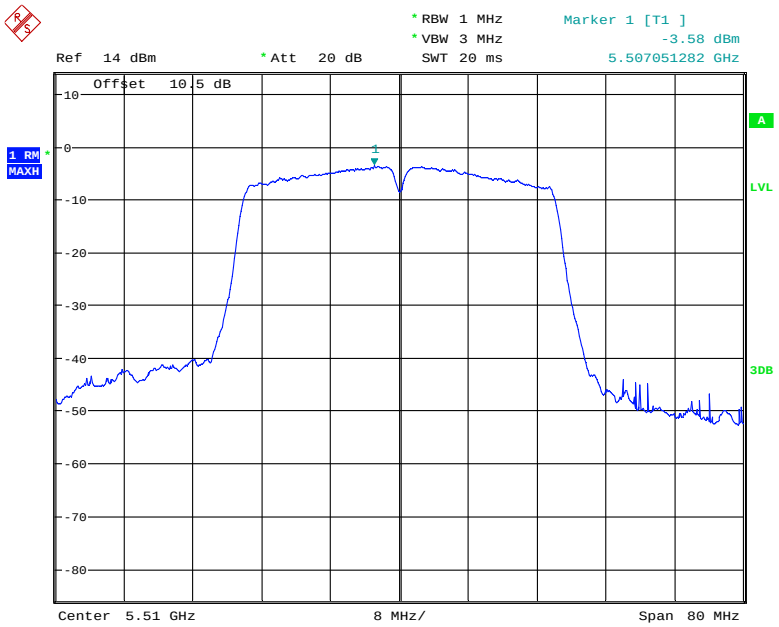
Date: 9.AUG.2019 12:40:26

802.11n20 mode, Power Spectral Density, 5700 MHz



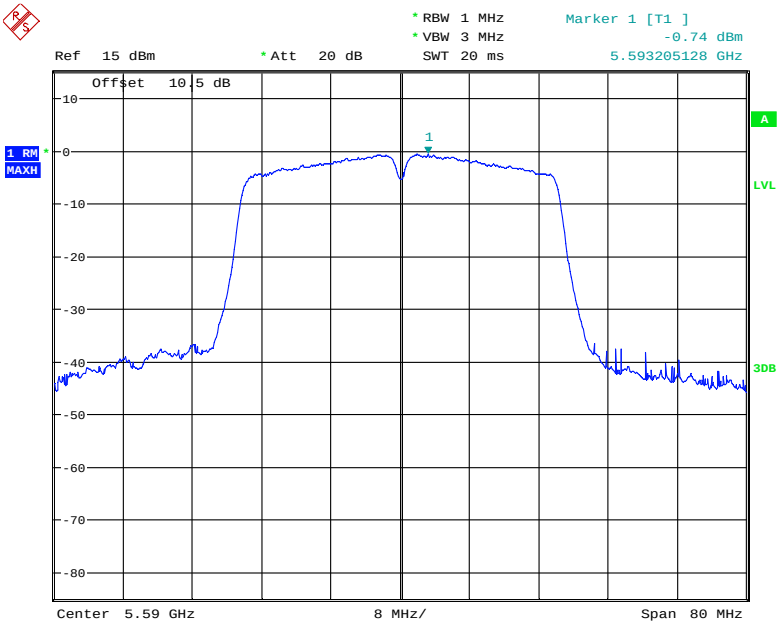
Date: 9.AUG.2019 12:28:29

802.11n40 mode, Power Spectral Density, 5510 MHz



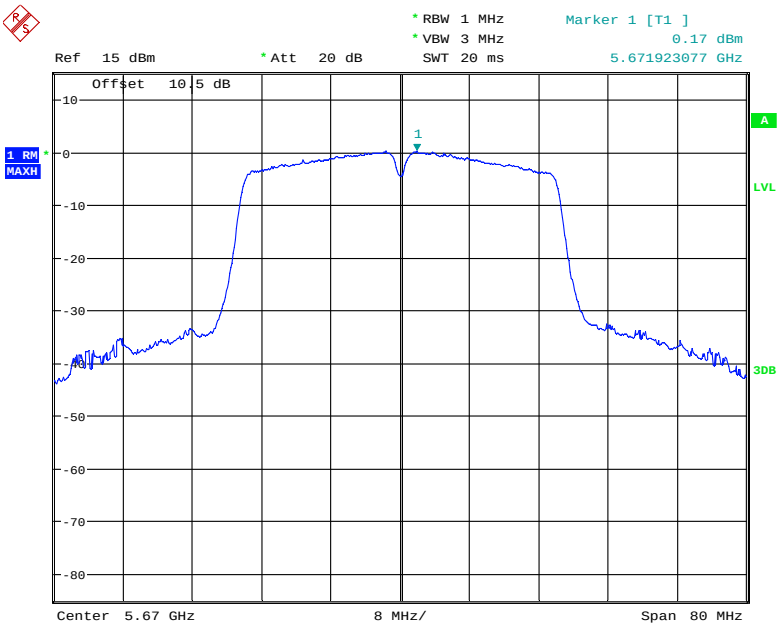
Date: 3.SEP.2019 15:23:16

802.11n40 mode, Power Spectral Density, 5590 MHz



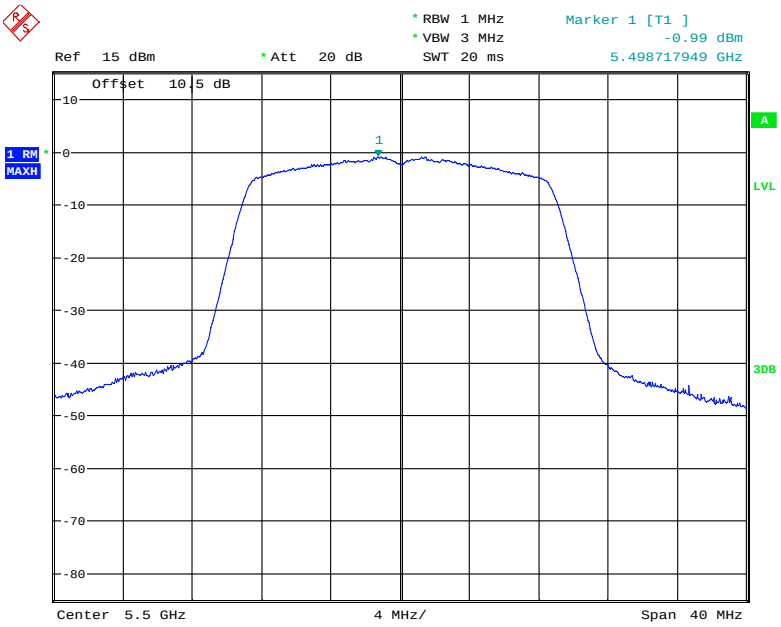
Date: 10.AUG.2019 09:46:30

802.11n40 mode, Power Spectral Density, 5670 MHz



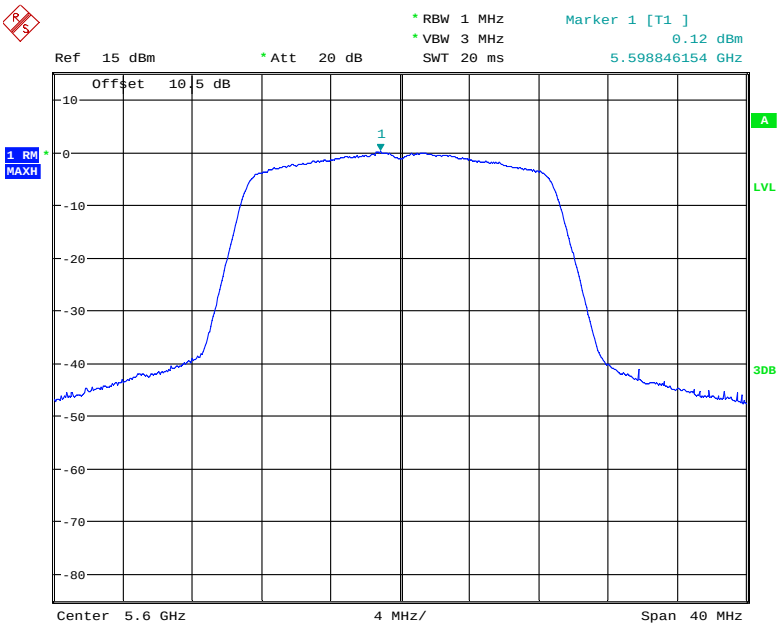
Date: 10.AUG.2019 09:45:30

802.11ac20 mode, Power Spectral Density, 5500 MHz



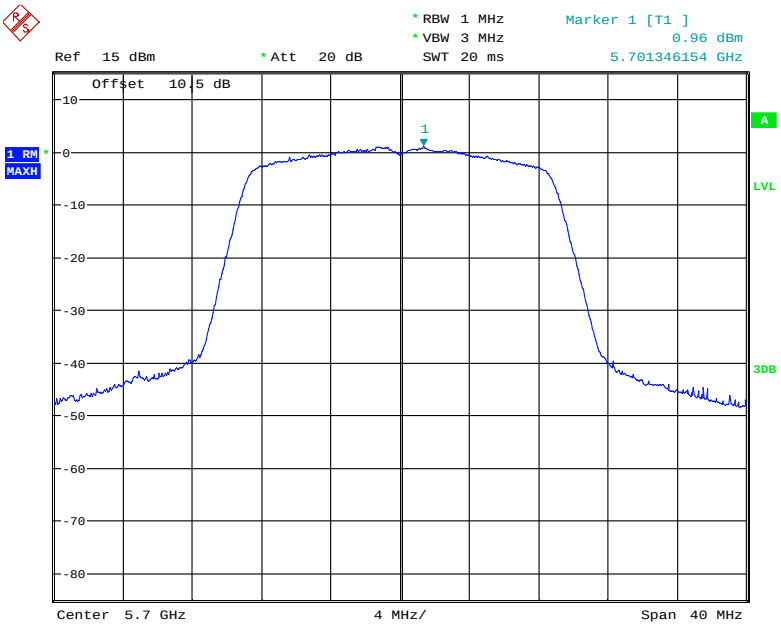
Date: 10.AUG.2019 08:51:45

802. 11ac20 mode, Power Spectral Density, 5600 MHz



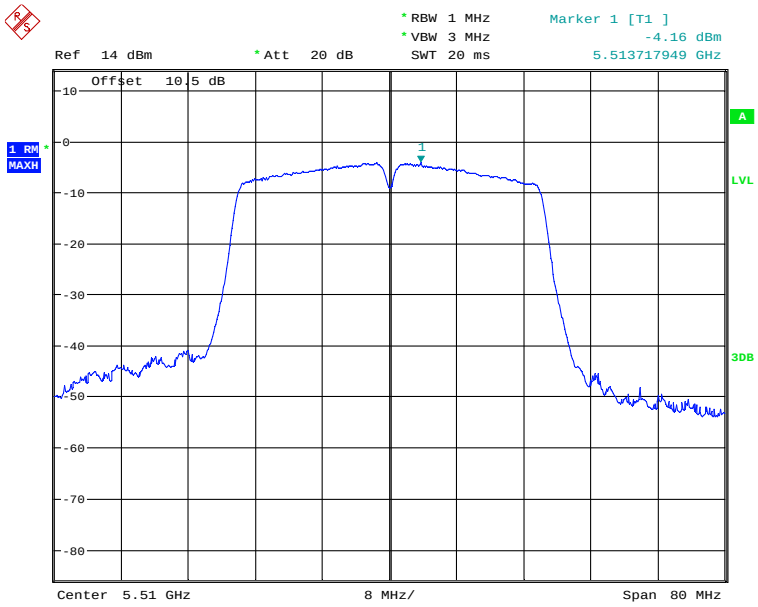
Date: 10.AUG.2019 08:50:40

802. 11ac20 mode, Power Spectral Density, 5700 MHz



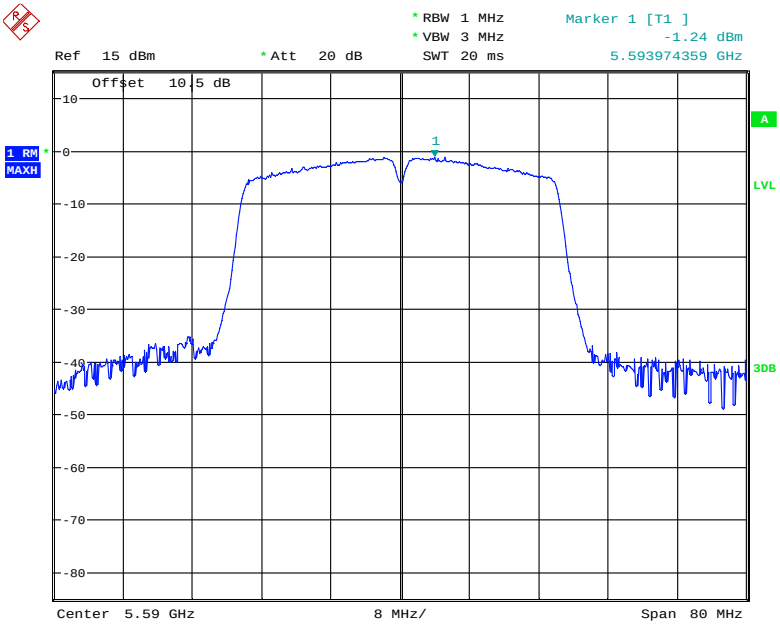
Date: 10.AUG.2019 08:48:30

802. 11ac40 mode, Power Spectral Density, 5510 MHz



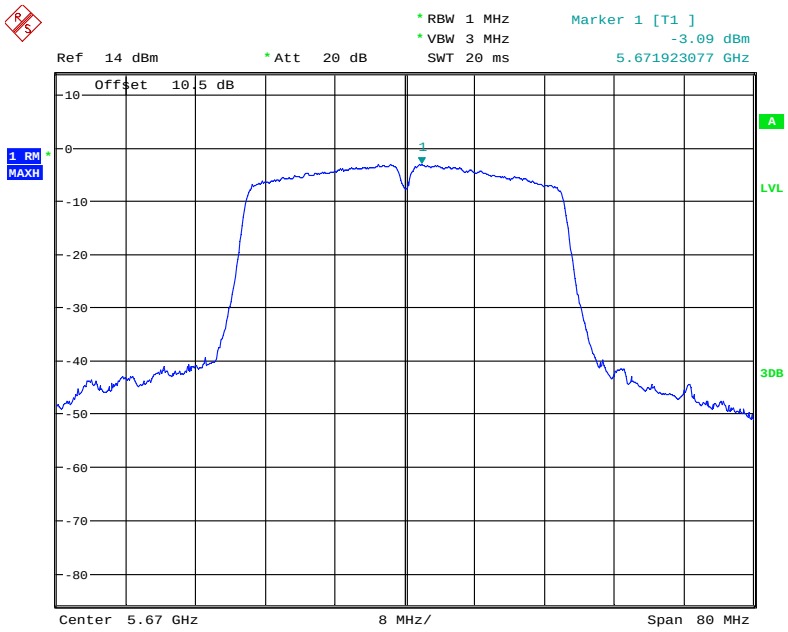
Date: 3.SEP.2019 15:20:21

802. 11ac40 mode, Power Spectral Density, 5590 MHz



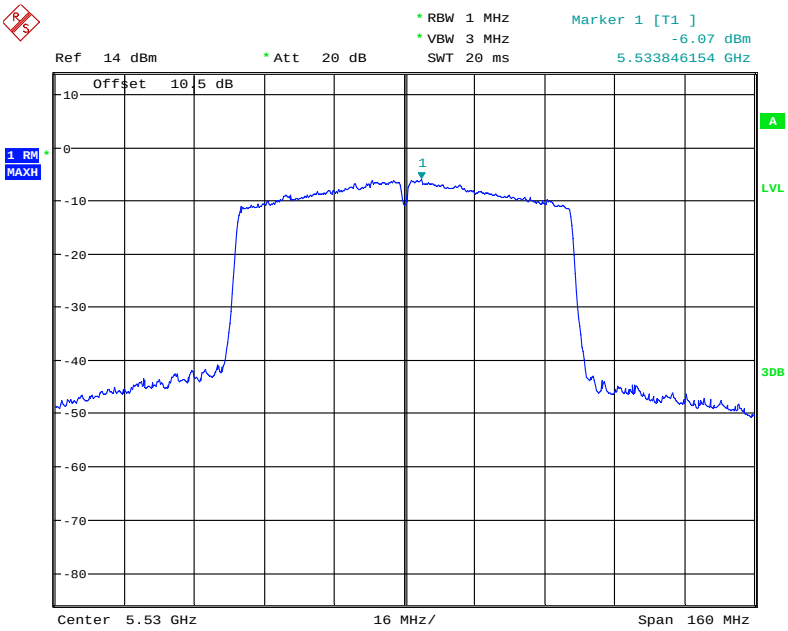
Date: 10.AUG.2019 09:11:18

802. 11ac40 mode, Power Spectral Density, 5670 MHz



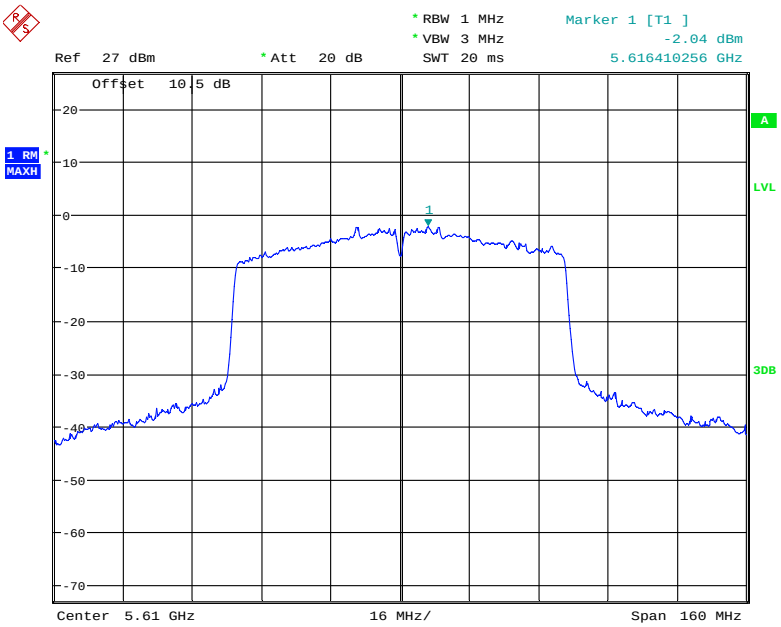
Date: 3.SEP.2019 15:21:32

802. 11ac80 mode, Power Spectral Density, 5530 MHz



Date: 3.SEP.2019 15:17:44

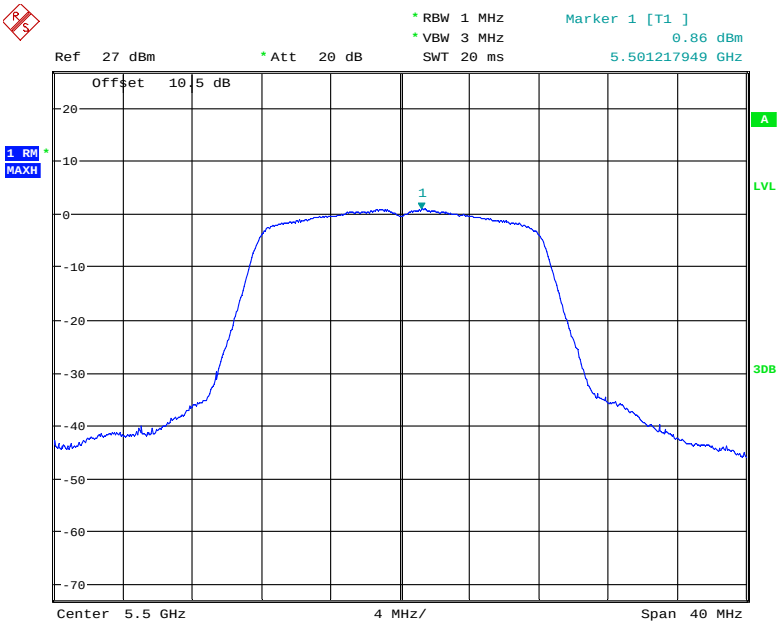
802. 11ac80 mode, Power Spectral Density, 5610 MHz



Date: 9.AUG.2019 11:18:42

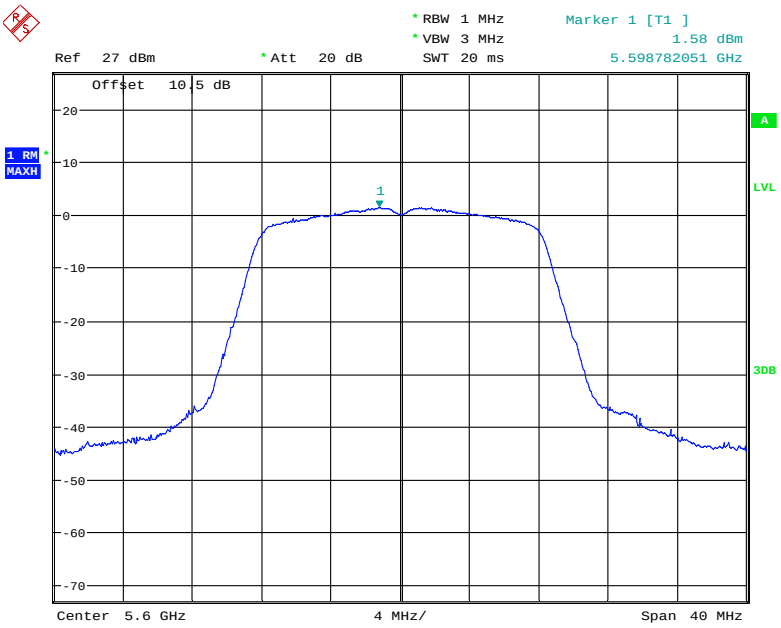
Ant 3:

802.11a mode, Power Spectral Density, 5500 MHz



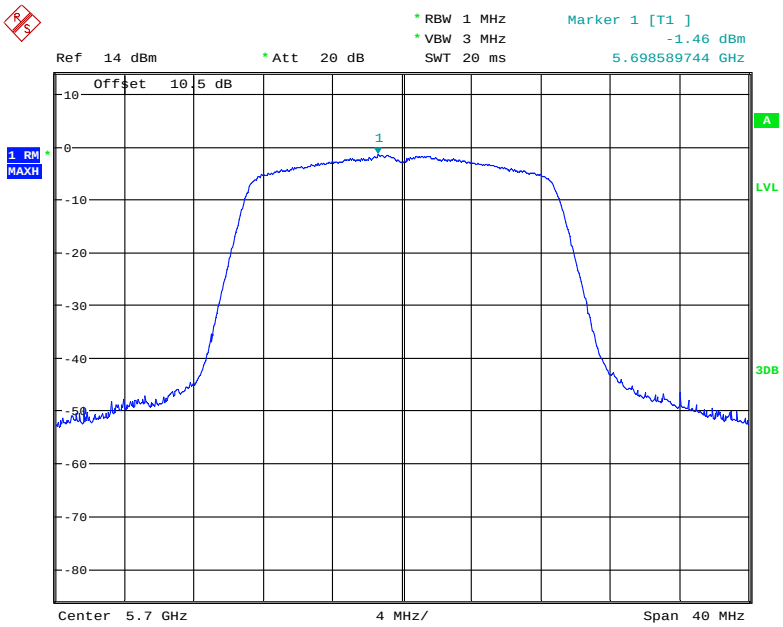
Date: 9.AUG.2019 12:15:41

802.11a mode, Power Spectral Density, 5600 MHz



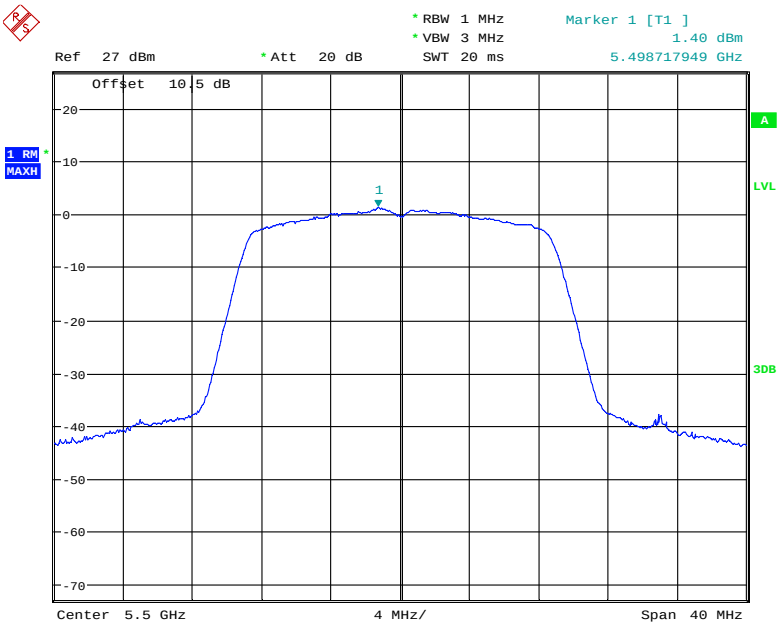
Date: 9.AUG.2019 12:15:14

802.11a mode, Power Spectral Density, 5700 MHz



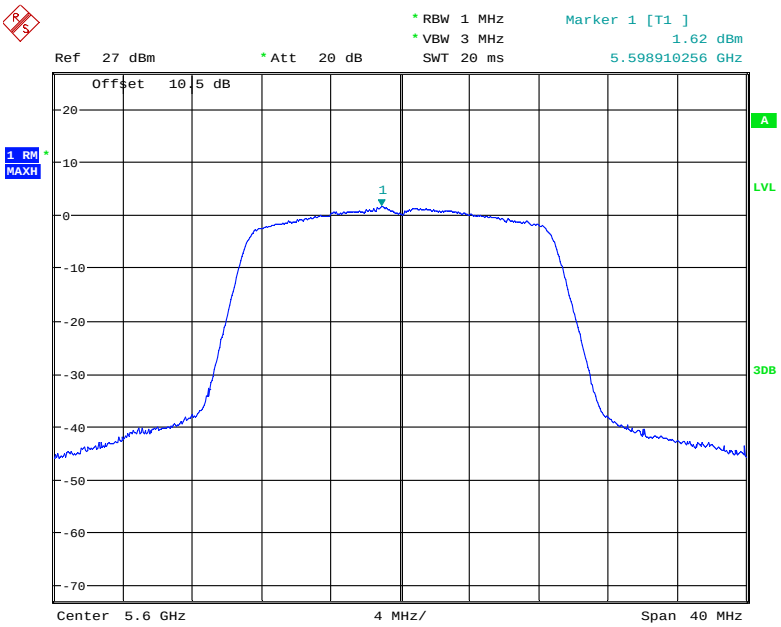
Date: 3.SEP.2019 15:26:54

802.11n20 mode, Power Spectral Density, 5500 MHz



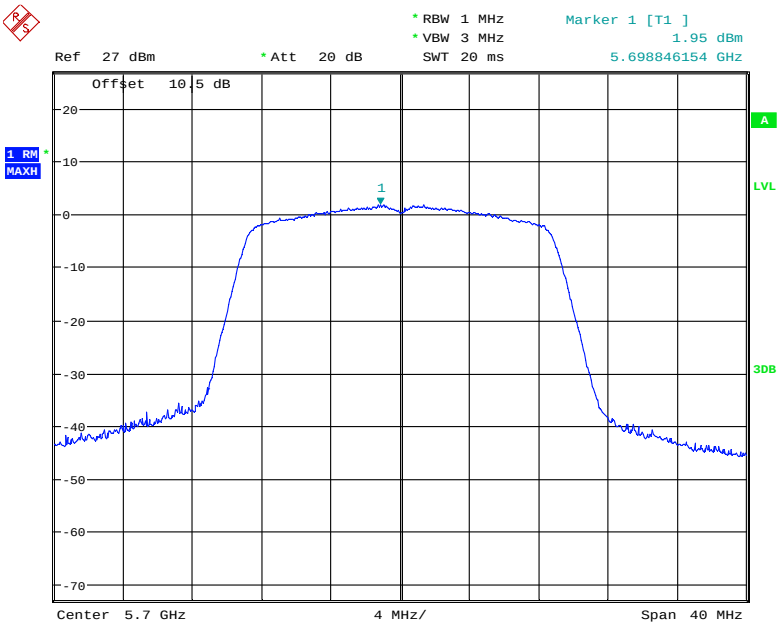
Date: 9.AUG.2019 12:48:52

802.11n20 mode, Power Spectral Density, 5600 MHz



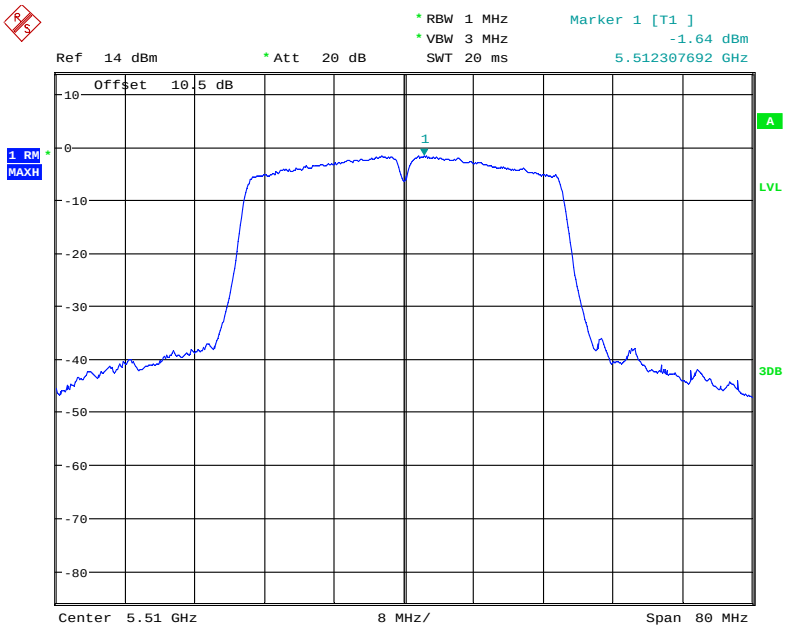
Date: 9.AUG.2019 12:50:31

802.11n20 mode, Power Spectral Density, 5700 MHz



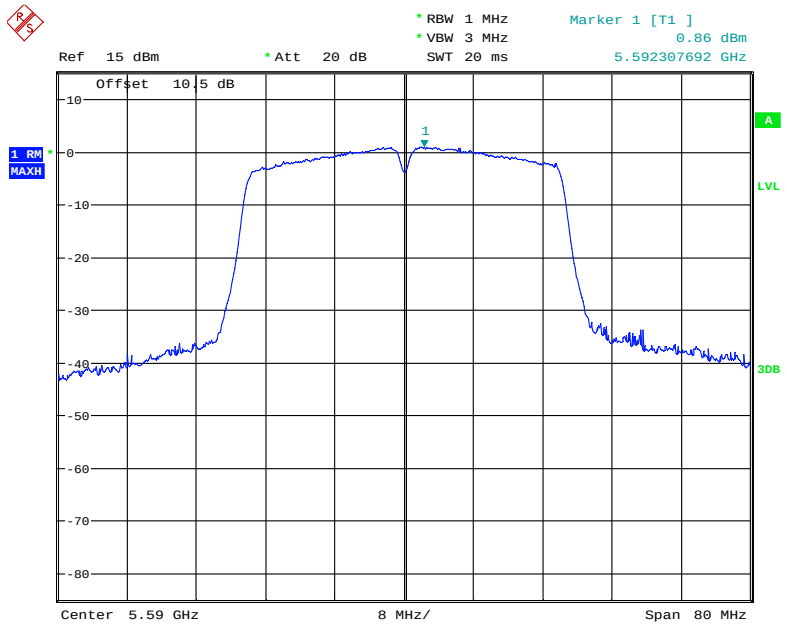
Date: 9.AUG.2019 12:51:38

802.11n40 mode, Power Spectral Density, 5510 MHz



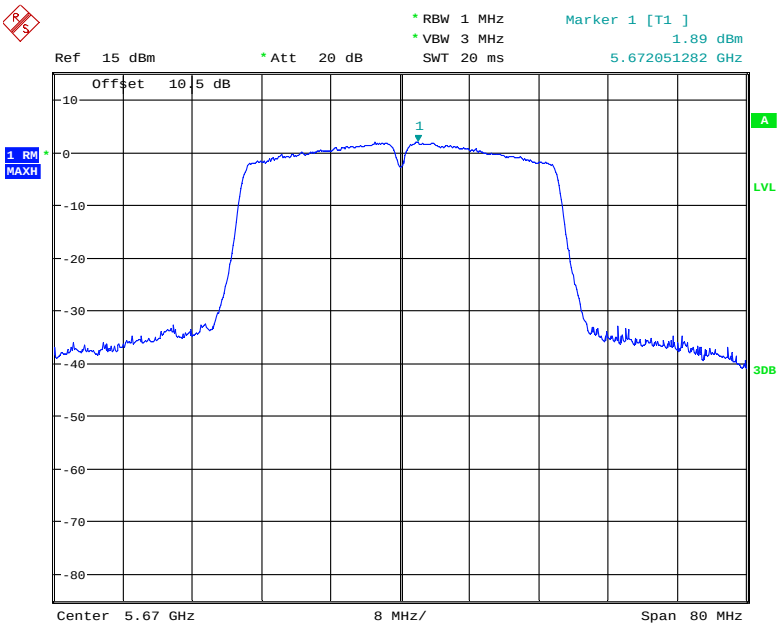
Date: 3.SEP.2019 15:28:28

802.11n40 mode, Power Spectral Density, 5590 MHz



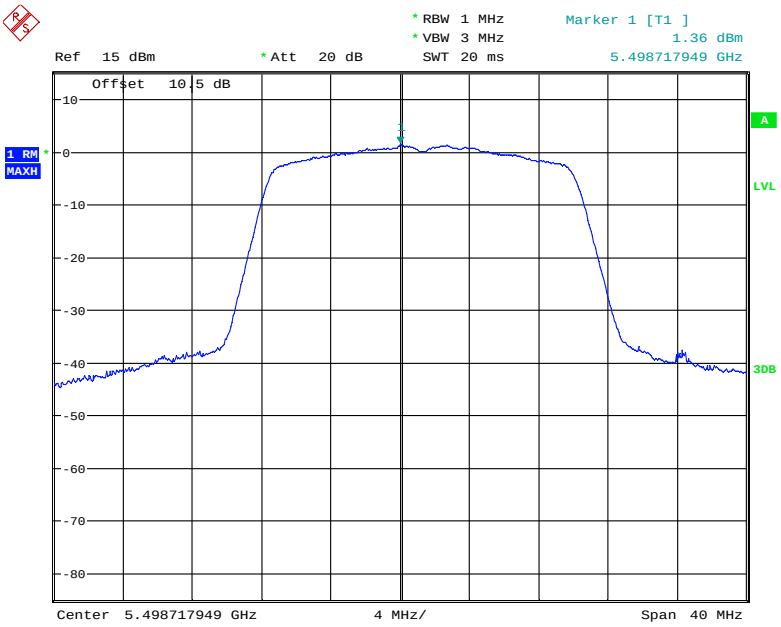
Date: 10.AUG.2019 09:52:45

802.11n40 mode, Power Spectral Density, 5670 MHz



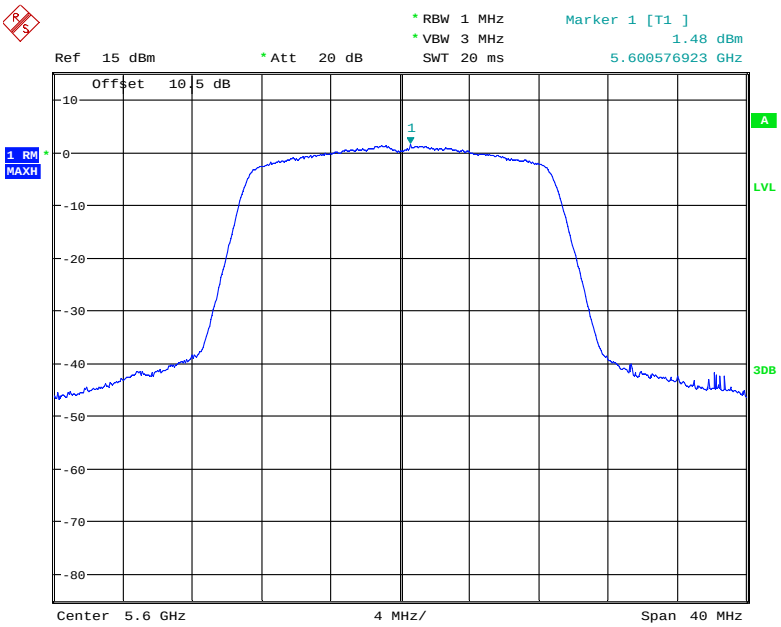
Date: 10.AUG.2019 09:53:32

802.11ac20 mode, Power Spectral Density, 5500 MHz



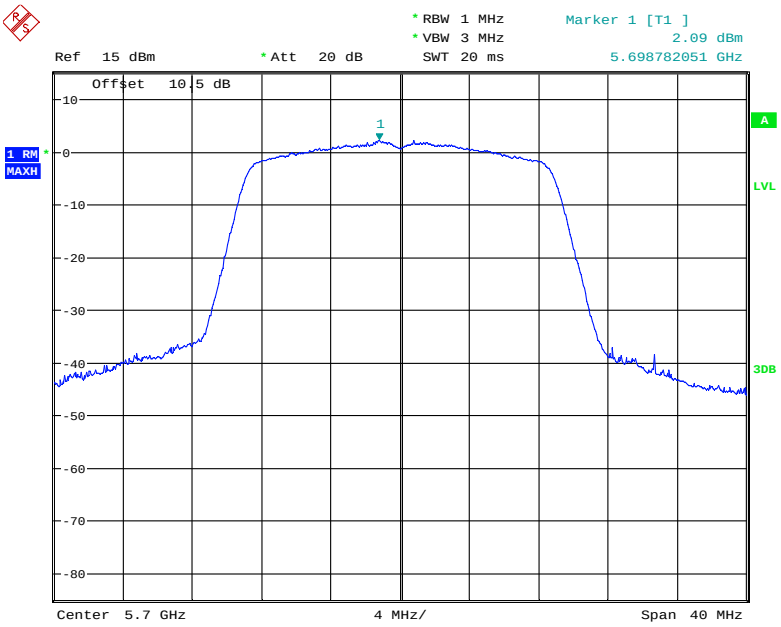
Date: 10.AUG.2019 08:57:23

802. 11ac20 mode, Power Spectral Density, 5600 MHz



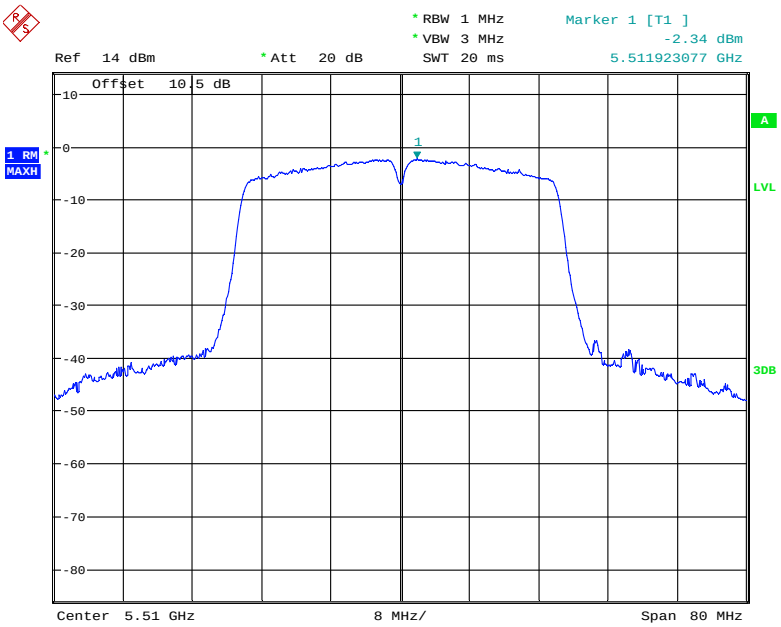
Date: 10.AUG.2019 08:58:26

802. 11ac20 mode, Power Spectral Density, 5700 MHz



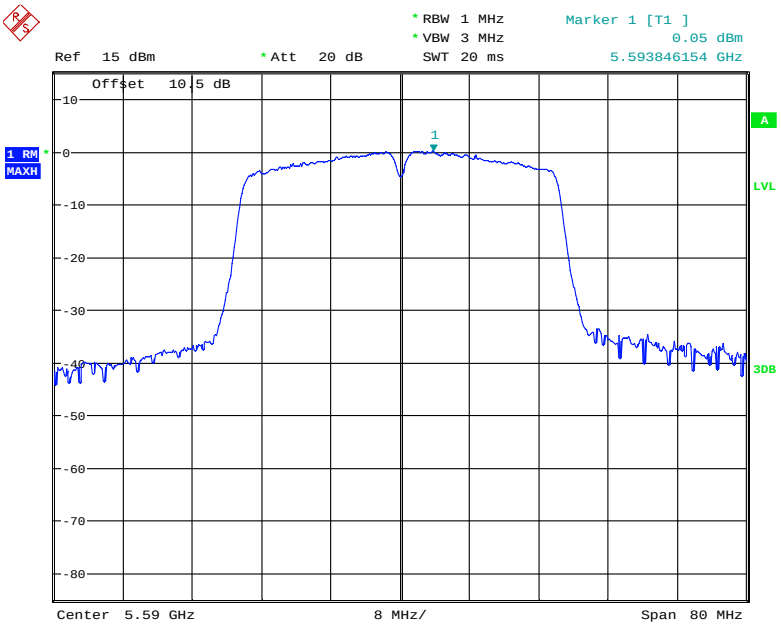
Date: 10.AUG.2019 09:00:10

802. 11ac40 mode, Power Spectral Density, 5510 MHz



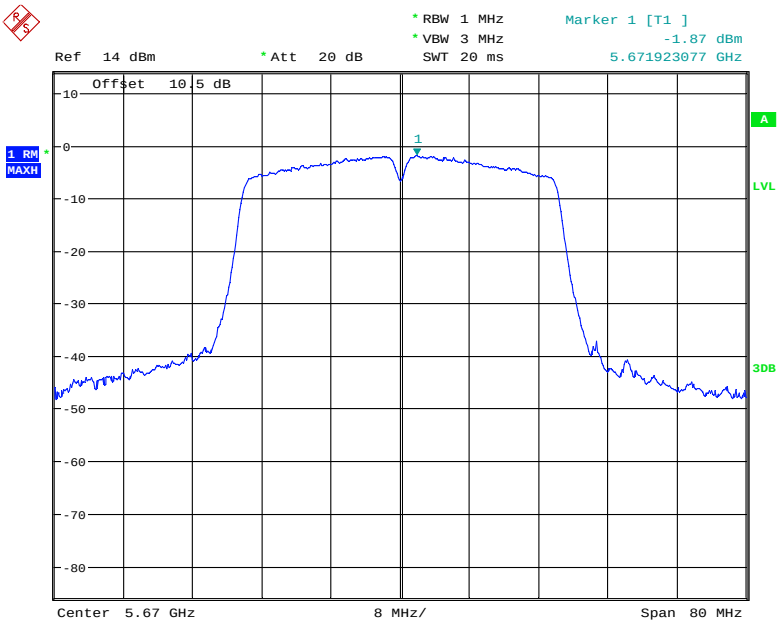
Date: 3.SEP.2019 15:30:08

802. 11ac40 mode, Power Spectral Density, 5590 MHz



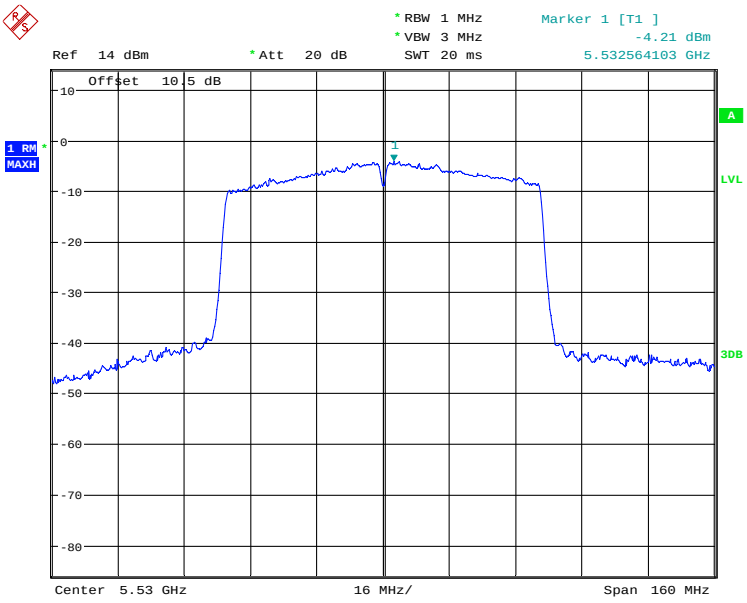
Date: 10.AUG.2019 09:05:02

802. 11ac40 mode, Power Spectral Density, 5670 MHz



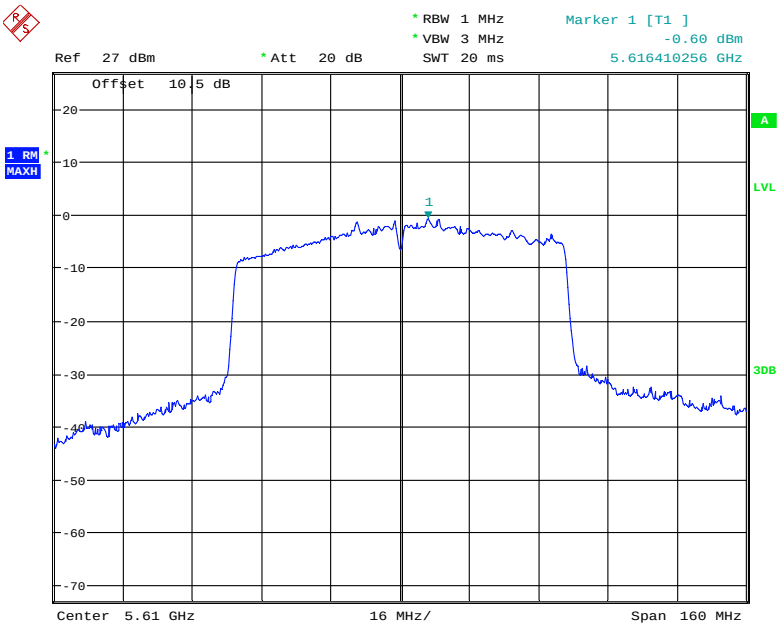
Date: 3.SEP.2019 15:30:39

802. 11ac80 mode, Power Spectral Density, 5530 MHz



Date: 3.SEP.2019 15:32:39

802. 11ac80 mode, Power Spectral Density, 5610 MHz



Date: 9.AUG.2019 11:16:16

******* END OF REPORT *******