TESTING LABORATORY
CERTIFICATE # 4821.01

FCC PART 15.407

TEST REPORT

For

Mikrotikls SIA

Brivibas gatve 214i, Riga, Latvia LV-1039

FCC ID: TV7RBD53-5ACD2ND

Report Type:	**Product Type:**
Class II Permissive Change	hAP ac^3 LTE6 kit

Report Number:	RSZ200901003-00A1
Report Date:	2021-01-04
Reviewed By:	Jacob Kong RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	hAP ac^3 LTE6 kit
Model	RBD53GR-5HacD2HnD-US&R11e-LTE6
Frequency Range	5G Wi-Fi: 5250-5350 MHz; 5470-5725 MHz
Average Output Power	5250-5350 MHz: 17.49dBm (802.11a), 17.49dBm(802.11n20), 15.99dBm(802.11n40), 17.49dBm (802.11ac20), 16.11dBm(802.11 ac40) 5470-5725 MHz 17.50dBm (802.11a), 17.49dBm(802.11n20), 17.41dBm(802.11n40), 17.50dBm (802.11ac20), 17.40dBm(802.11 ac40)
Modulation Technique	Wi-Fi: OFDM
Antenna Specification*	5.5 dBi (provided by the applicant)
Voltage Range	DC 24V from adapter
Date of Test	2020-09-12 to 2021-01-04
Sample serial number	RSZ200901003-RFA1-S1 (Assigned by BACL, Shenzhen)
Received date	2020-09-01
Sample/EUT Status	Good condition

Objective

This type approval report is 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 difference between the original device and the current one described as following:

(1) Adding Band 2 (5250-5350MHz) and Band 3 (5470-5725MHz) test.

Based on above differences, it will affected test data, so the changed items were performed.

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. And KDB789033D02 General U-NII Test Procedures New Rules v02r01.

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 EUT has two antennas for 5G Wi-Fi, it can operate in 802.11a/n20/n40/ac20/ac40 modes.

For 5250-5350MHz Band, 6 channels are provided to testing:

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

For 5470-5725MHz Band, 16 channels are provided to testing:

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

EUT Exercise Software

EUT was configed to test through the website UI. Test frequencies and power level were configured as below:

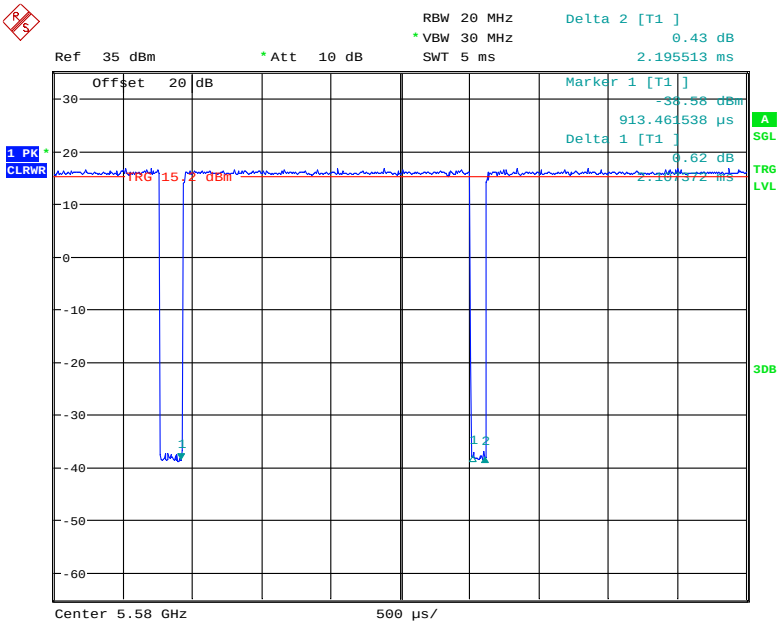
U-NII	Mode	Frequency (MHz)	Rate (Mbps)	Power Level*
5250 – 5350MHz	802.11 a	5260	6	19
		5280	6	19
		5320	6	19
	802.11 n20	5260	MCS0	18
		5280	MCS0	19
		5320	MCS0	19
	802.11 n40	5270	MCS0	18
		5310	MCS0	18
	802.11 ac20	5260	MCS0	19
		5280	MCS0	19
		5320	MCS0	19
	802.11 ac40	5270	MCS0	18
		5310	MCS0	18
5470 – 5725MHz	802.11 a	5500	6	19
		5580	6	19
		5700	6	19
	802.11 n20	5500	MCS0	19
		5580	MCS0	19
		5700	MCS0	18
	802.11 n40	5510	MCS0	18
		5550	MCS0	18
		5670	MCS0	17
	802.11 ac20	5500	MCS0	19
		5580	MCS0	19
		5700	MCS0	19
	802.11 ac40	5510	MCS0	18
		5550	MCS0	18
		5670	MCS0	17

Note:

1. The above data rate was the worst case according to the output power test.
2. The software and power level was provided by the applicant.

Duty cycle

802.11a mode



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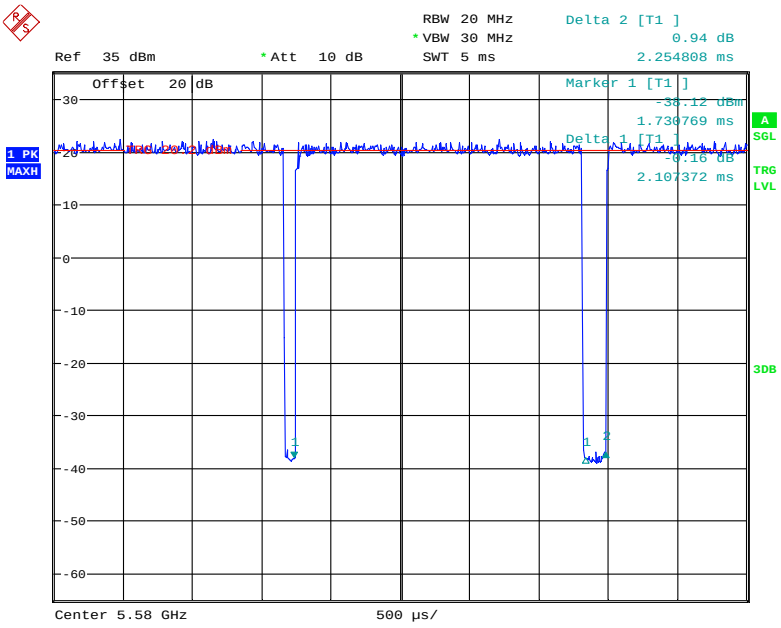
802.11n20 mode



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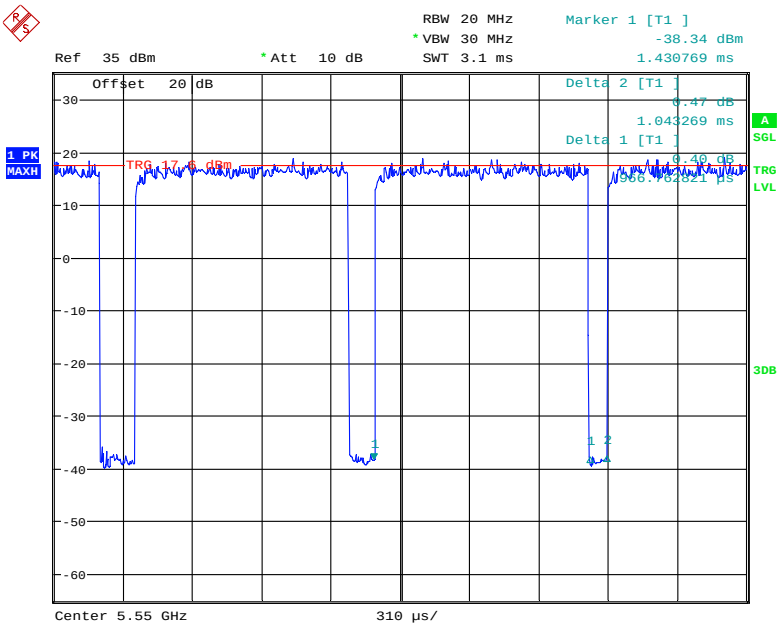
802.11n40 mode



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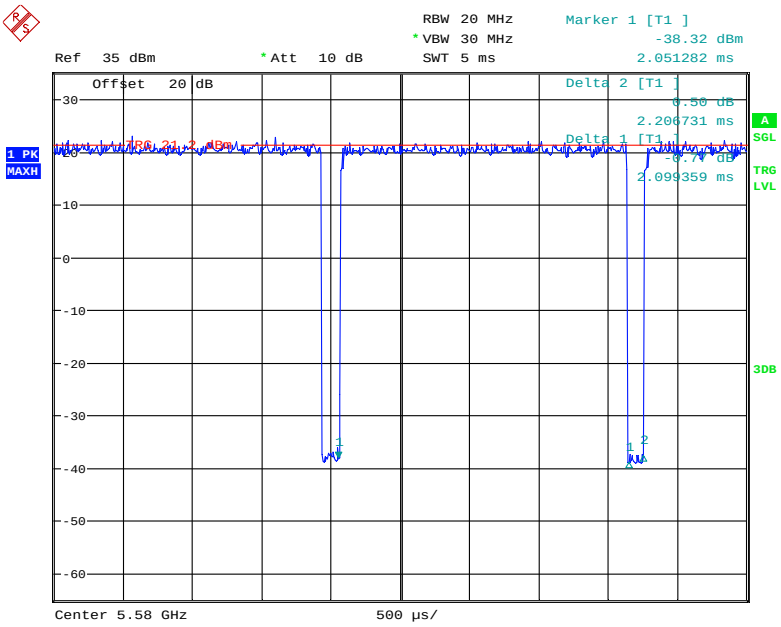
802.11ac20 Mode



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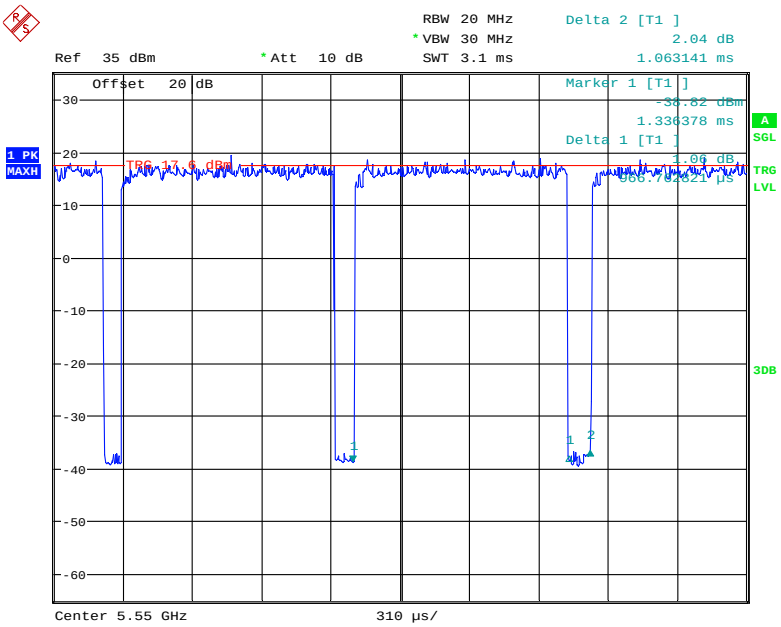
802.11ac40 Mode



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Mode	Ton(ms)	Ton+Toff(ms)	Duty Cycle (%)
802.11a	2.11	2.2	95.91
802.11n20	2.11	2.25	93.78
802.11n40	0.97	1.04	93.27
802.11ac20	2.1	2.21	95.02
802.11ac40	0.97	1.06	91.51

Equipment Modifications

No modification was made to the EUT tested.

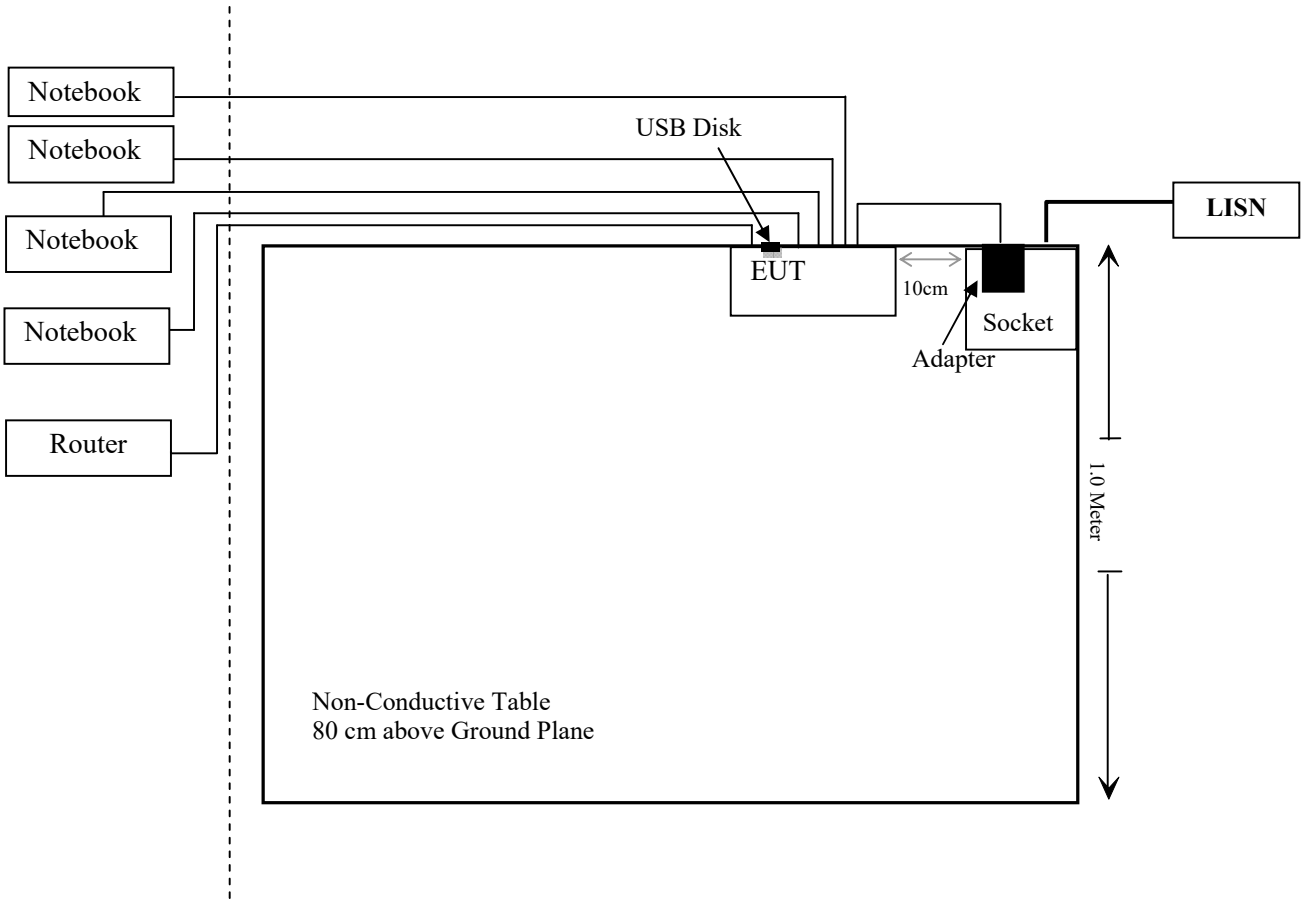
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HIKVISION	Router	DS-3WR03-E	10021642429
Mikrotikls SIA	Adapter	SAW30-240-1200U	SAW30-240-1200UA
Kingston	USB Disk	DTSE9G2 64G	DTSE9G2
DELL	Notebook	Latitude E6410	11429208685
DELL	Notebook	Latitude E5430	11429208495
DELL	Notebook	Latitude E7320	11429208645
DELL	Notebook	Latitude E5172	11429208895

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shielding Detachable RJ45 Cable	5.0	EUT	Notebook
Un-Shielding Detachable RJ45 Cable	5.0	EUT	Notebook
Un-Shielding Detachable RJ45 Cable	5.0	EUT	Notebook
Un-Shielding Detachable RJ45 Cable	5.0	EUT	Notebook
Un-Shielding Detachable RJ45 Cable	5.0	EUT	Router
Un-Shielding Detachable DC Cable	1.0	EUT	Adapter

Block Diagram of Test Setup



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), (6),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (1)	26 dB Emission Bandwidth	Compliance
§15.407(a) (2)	Conducted Transmitter Output Power	Compliance
§15.407 (a) (2)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test (Below 1G)					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Radiated Emission Test (Above 1G)					
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
Ducommun technologies	RF Cable	RG-214	1	2019/11/12	2020/11/12
Unknown	Signal Cable	RG-214	2	2019/11/29	2020/11/28
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2020/04/20	2021/04/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/06	2020/12/05
Ducommun Technolagies	Horn antenna	ARH-2823-02	1007726-01 1302	2017/12/06	2020/12/05

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2020/04/03	2021/04/02
WEINSCHEL	10dB Attenuator	5324	AU3842	2019/11/29	2020/11/28
WEINSCHEL	10dB Attenuator	5324	AU3842	2020/11/29	2021/11/28
WEINSCHEL	10dB Attenuator	5324	F-03-EM122	2019/11/29	2020/11/28
WEINSCHEL	10dB Attenuator	5324	AU3842	2020/11/29	2021/11/28
Unknown	RF Cable	Unknown	2301 276	2019/11/29	2020/11/28
Unknown	RF Cable	Unknown	2301 276	2020/11/29	2021/11/28

*** 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)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \le 1$$

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4GHz Wi-Fi	2412-2462	3.0	2.0	/	186	20	0.074	1
5GHz Wi-Fi	5250-5350	5.5	3.55	18.5	70.79	20	0.050	1
	5470-5725	5.5	3.55	18.5	70.79	20	0.050	1
	5150-5250& 5725-5850	5.5	3.55	/	330.11	20	0.233	1
GSM850	824-849	4.0	2.51	24	251.19	20	0.125	0.549
DCS1900	1850-1910	-0.21	0.95	24	251.19	20	0.047	1
WCDMA B5	824-849	4.0	2.51	24	251.19	20	0.125	0.549
WCDMA B2	1850-1910	-0.21	0.95	26	398.11	20	0.075	1
LTE B5	824-849	4.0	2.51	24	251.19	20	0.125	0.549
LTE B2	1850-1910	-0.21	0.95	25	316.23	20	0.060	1
LTE B7	2500-2570	4.0	2.51	24	251.19	20	0.125	1
LTE B12	699-716	4.0	2.51	24	251.19	20	0.125	0.466
LTE B17	704-716	4.0	2.51	24	251.19	20	0.125	0.469
LTE B25	1850-1915	-0.21	0.95	25	316.23	20	0.060	1
LTE B26	814-849	4.0	2.51	24	251.19	20	0.125	0.543
LTE B38	2570-2620	4.0	2.51	24	251.19	20	0.125	1
LTE B39	1880-1910	-0.21	0.95	25	316.23	20	0.060	1
LTE B40	2305-2315& 2350-2360	4.0	2.51	21	125.89	20	0.063	1
LTE B41	2496-2690	4.0	2.51	26	398.11	20	0.199	1

Note: 1. EUT contains a certified module FCC ID: TV7R11ELTE6
2. the tune up conducted power of 2.4GHz Wi-Fi and 5GHz Wi-Fi 5150-5250MHz and 5725-5850MHz range refer to the MPE report of FCC ID: TV7RBD53-5ACD2ND.
3. The tune up conducted power of WWAN refer to the MPE reportof FCC ID: TV7R11ELTE6.
4. the antenna gain was provided by applicant.
5. the 2.4G Wi-Fi, 5GHz Wi-Fi and WWAN can transmit at the same time.
6. for GSM850&DCS1900, the duty cycle for 1 TX slot is 1/8, the time based Ave. power compared to slotted Ave. power ratio is -9dB, So:
For GSM850, slotted Ave. power=33dBm, time based Ave. power 24dBm
For DCS1900, slotted Ave. power=33dBm, time based Ave. power 24dBm

Simultaneous transmitting consideration:

The ratio=MPE_{DTS}/limit+MPE_{NII}/limit+MPE_{WWAN}/limit=0.074/1+0.233/1+0.125/0.466=0.575＜1.0

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

Result: Pass

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 two internal antennas which use non-standard antenna connectors. The antenna gain is 5.5dBi, fulfill the requirement of this section. Please refer to the EUT photos.

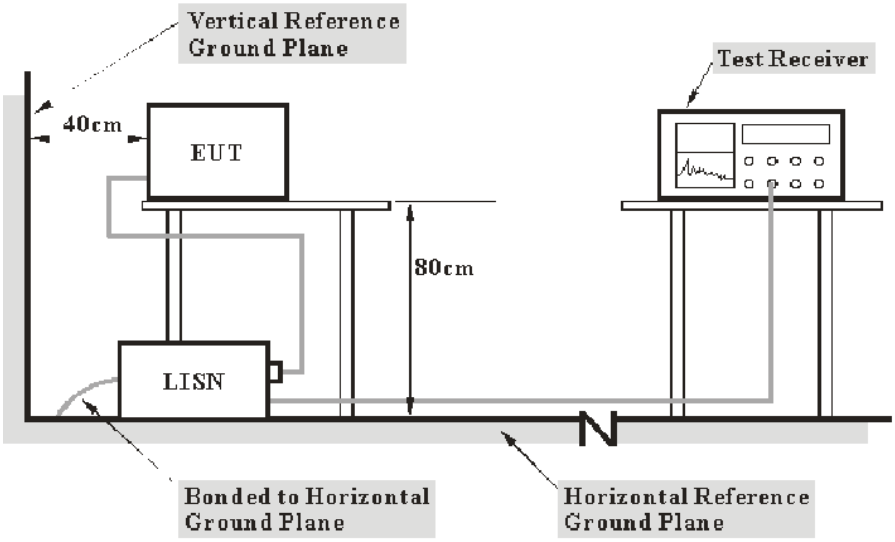
Result: Pass

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.

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 Data

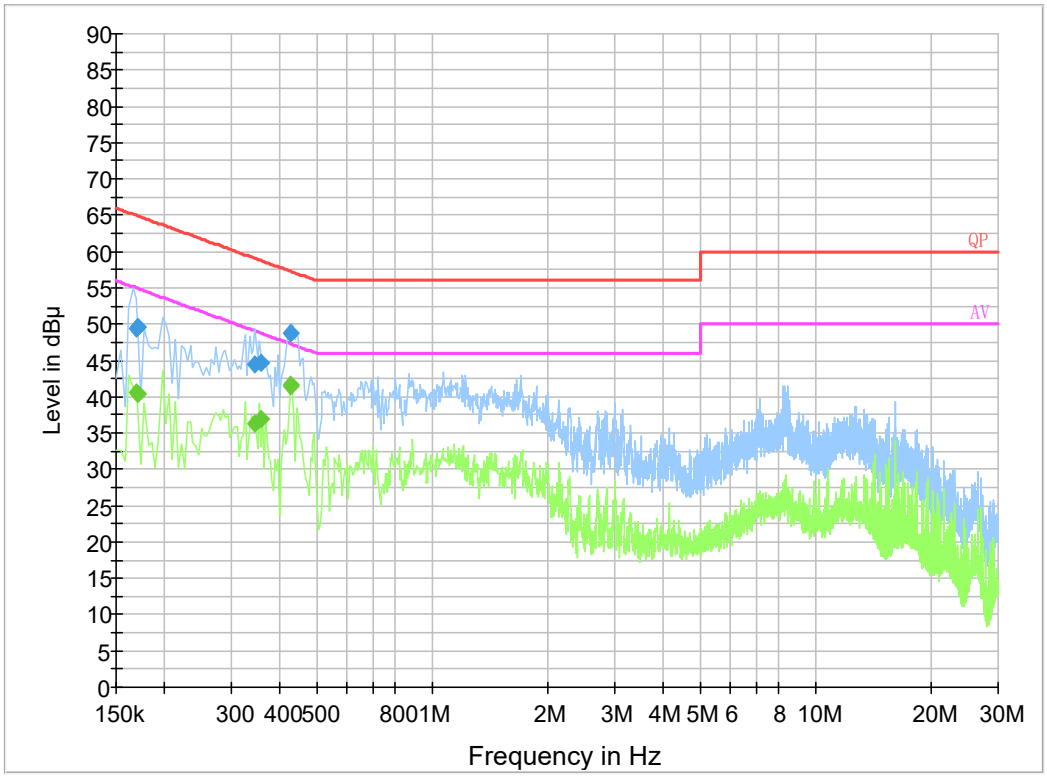
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-10-24.

EUT operation mode: WiFi Transmitting (worst case is 802.11ac40 mode, 5270MHz, MIMO mode)

AC 120 V/60 Hz, Line:



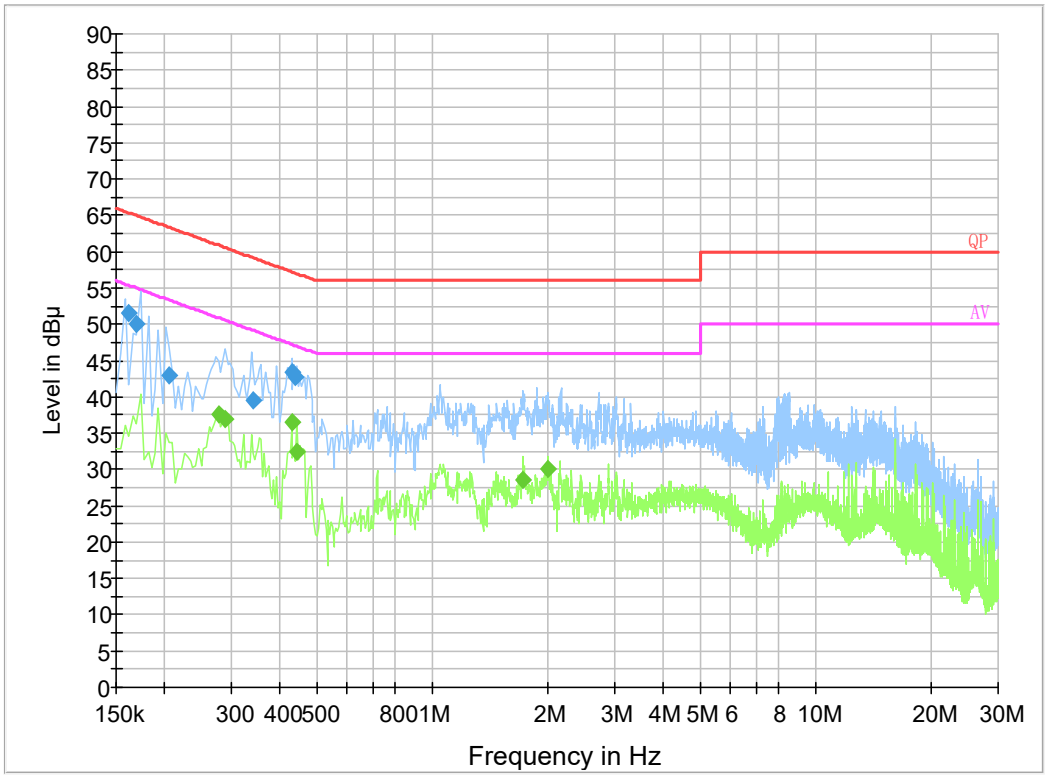
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.169500	49.5	9.000	L1	19.9	15.5	65.0
0.170501	49.6	9.000	L1	19.9	15.3	64.9
0.344810	44.5	9.000	L1	19.9	14.6	59.1
0.356690	44.7	9.000	L1	19.9	14.1	58.8
0.427490	48.7	9.000	L1	19.9	8.6	57.3
0.427610	48.7	9.000	L1	19.9	8.6	57.3

Final Result 2

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.169500	40.5	9.000	L1	19.9	14.5	55.0
0.170501	40.5	9.000	L1	19.9	14.4	54.9
0.344810	36.3	9.000	L1	19.9	12.8	49.1
0.356690	36.9	9.000	L1	19.9	11.9	48.8
0.427490	41.7	9.000	L1	19.9	5.6	47.3
0.427610	41.5	9.000	L1	19.9	5.8	47.3

AC 120V/60 Hz, Neutral:



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.161500	51.5	9.000	N	19.8	13.9	65.4
0.169500	50.0	9.000	N	19.8	15.0	65.0
0.205500	43.0	9.000	N	19.8	20.4	63.4
0.340930	39.5	9.000	N	19.8	19.7	59.2
0.431550	43.4	9.000	N	19.8	13.8	57.2
0.439310	42.7	9.000	N	19.8	14.4	57.1

Final Result 2

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.278000	37.5	9.000	N	19.7	13.4	50.9
0.290000	36.9	9.000	N	19.7	13.6	50.5
0.430000	36.5	9.000	N	19.8	10.8	47.3
0.446000	32.5	9.000	N	19.8	14.4	46.9
1.730000	28.5	9.000	N	19.8	17.5	46.0
2.006000	30.1	9.000	N	19.9	15.9	46.0

§15.205 & §15.209 & §15.407(b) (2), (3), (6),(7) – UNDESIRABLE EMISSION

Applicable Standard

FCC §15.407 (b) (2), (3), (6), (7); §15.209; §15.205;

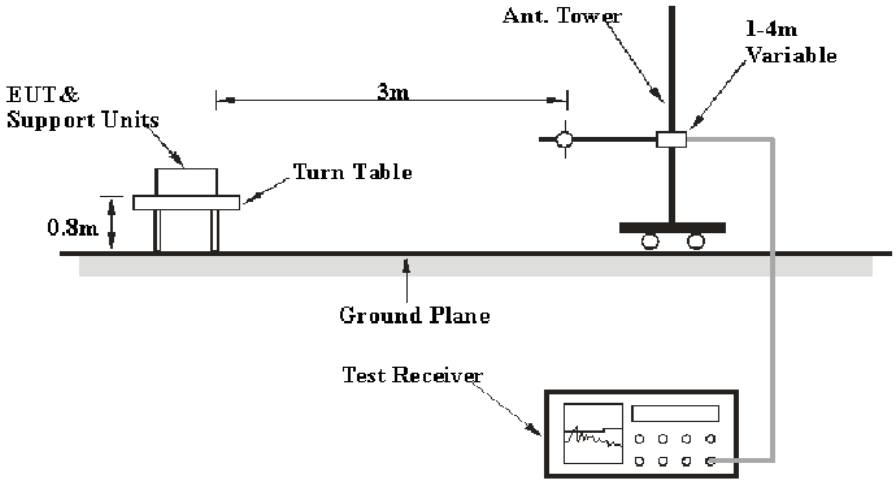
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 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.

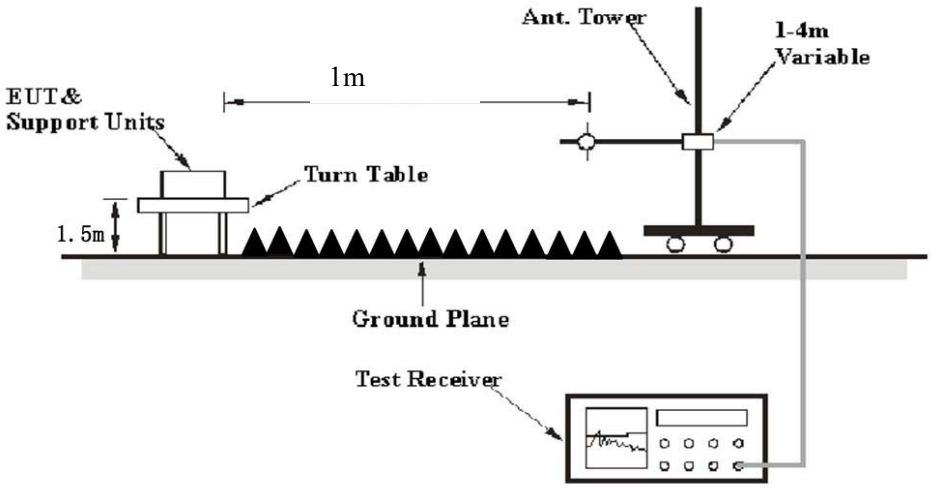
The general limit of -27 dBm EIRP (= 68.2 dBμV/m) is applied for unwanted emission of U-NII devices.
However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.,* some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer
The general 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

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

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

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

Test Procedure

Radiated Spurious Emission

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

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

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

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 Data

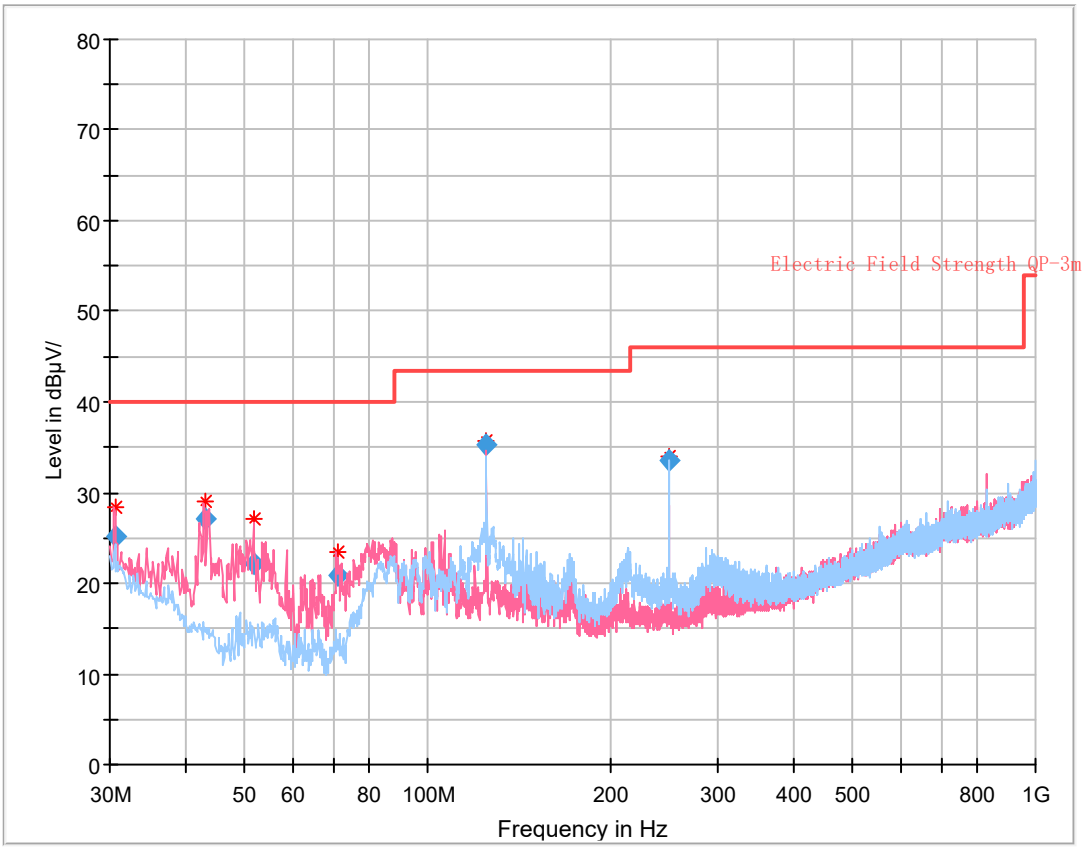
Environmental Conditions

Temperature:	26~29 ℃
Relative Humidity:	46~62 %
ATM Pressure:	101.0 kPa

The testing was performed by Harris He on 2020-10-24 for below 1G and by Alan He on 2020-09-26 for above 1G.

EUT operation mode: Transmitting(worst case is MIMO mode)

30 MHz – 1 GHz: *(worst case is 802.11ac40 mode 5270MHz)*



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.619319	25.15	40.00	14.85	102.0	V	147.0	-4.8
42.926500	27.08	40.00	12.92	145.0	V	193.0	-12.7
51.840875	22.25	40.00	17.75	115.0	V	211.0	-16.6
71.089750	20.80	40.00	19.20	123.0	V	345.0	-17.4
125.003875	35.17	43.50	8.33	102.0	V	272.0	-10.8
250.004500	33.45	46.00	12.55	120.0	H	286.0	-10.8

1G ~ 40 GHz:

Note: The test distance is 1m, so the correct factor from 3m to 1m is 20log(3/1)=9.5dB which was added into the final limit.

5250-5350 MHz:

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11a									
5260 MHz									
4551.27	29.96	PK	252	1.5	H	37.60	67.56	83.5	15.94
4551.27	18.58	Ave.	252	1.5	H	37.60	56.18	63.5	7.32
5395.13	31.56	PK	306	2.2	H	39.19	70.75	83.5	12.75
5395.13	18.35	Ave.	306	2.2	H	39.19	57.54	63.5	5.96
10520.00	42.48	PK	277	1.1	H	17.25	59.73	77.7	17.97
5280 MHz									
10560.00	42.70	PK	258	2.3	H	17.91	60.61	77.7	17.09
5320 MHz									
5017.84	30.24	PK	256	1.4	H	38.04	68.28	83.5	15.22
5017.84	18.18	Ave.	256	1.4	H	38.04	56.22	63.5	7.28
5360.59	34.33	PK	134	1.4	H	39.09	73.42	83.5	10.08
5360.59	18.58	Ave.	134	1.4	H	39.09	57.67	63.5	5.83
10640.00	43.32	PK	109	1.6	H	18.01	61.33	83.5	22.17
10640.00	28.52	Ave.	109	1.6	H	18.01	46.53	63.5	16.97
802.11n20									
5260 MHz									
5074.28	31.59	PK	152	1.2	H	38.26	69.85	83.5	13.65
5074.28	18.47	Ave.	152	1.2	H	38.26	56.73	63.5	6.77
5394.33	32.32	PK	117	1.7	H	39.19	71.51	83.5	11.99
5394.33	18.57	Ave.	117	1.7	H	39.19	57.76	63.5	5.74
10520.00	42.65	PK	187	1.1	H	17.25	59.90	77.7	17.80
5280 MHz									
10560.00	43.43	PK	200	1.3	H	17.91	61.34	77.7	16.36
5320 MHz									
4925.65	30.14	PK	346	1.0	H	37.92	68.06	83.5	15.44
4925.65	18.45	Ave.	346	1.0	H	37.92	56.37	63.5	7.13
5356.13	35.68	PK	96	1.5	H	39.09	74.77	83.5	8.73
5356.13	19.21	Ave.	96	1.5	H	39.09	58.30	63.5	5.20
10640.00	42.72	PK	227	2.0	H	18.01	60.73	83.5	22.77
10640.00	28.38	Ave.	227	2.0	H	18.01	46.39	63.5	17.11

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5270 MHz									
5065.81	32.02	PK	293	2.0	H	38.16	70.18	83.5	13.32
5065.81	19.68	Ave.	293	2.0	H	38.16	57.84	63.5	5.66
5399.11	31.82	PK	157	1.6	H	39.19	71.01	83.5	12.49
5399.11	19.32	Ave.	157	1.6	H	39.19	58.51	63.5	4.99
10540.00	42.39	PK	60	1.5	H	17.25	59.64	77.7	18.06
5310 MHz									
5126.01	29.87	PK	339	1.5	H	38.36	68.23	83.5	15.27
5126.01	18.81	Ave.	339	1.5	H	38.36	57.17	63.5	6.33
5357.88	34.86	PK	122	1.8	H	39.09	73.95	83.5	9.55
5357.88	21.05	Ave.	122	1.8	H	39.09	60.14	63.5	3.36
10620.00	43.50	PK	92	2.5	H	18.01	61.51	83.5	21.99
10620.00	28.42	Ave.	92	2.5	H	18.01	46.43	63.5	17.07
802.11ac20									
5260 MHz									
5014.07	30.74	PK	137	1.7	H	38.04	68.78	83.5	14.72
5014.07	18.52	Ave.	137	1.7	H	38.04	56.56	63.5	6.94
5355.33	30.92	PK	45	2.1	H	39.09	70.01	83.5	13.49
5355.33	18.51	Ave.	45	2.1	H	39.09	57.60	63.5	5.90
10520.00	43.75	PK	278	1.6	H	17.25	61.00	77.7	16.70
5280 MHz									
10560.00	42.91	PK	277	2.4	H	17.91	60.82	77.7	16.88
5320 MHz									
4819.36	30.33	PK	342	1.6	H	37.80	68.13	83.5	15.37
4819.36	18.35	Ave.	342	1.6	H	37.80	56.15	63.5	7.35
5358.20	34.30	PK	255	2.0	H	39.09	73.39	83.5	10.11
5358.20	18.94	Ave.	255	2.0	H	39.09	58.03	63.5	5.47
10640.00	42.87	PK	273	2.3	H	18.01	60.88	83.5	22.62
10640.00	28.56	Ave.	273	2.3	H	18.01	46.57	63.5	16.93

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11ac40									
5270 MHz									
5075.22	30.43	PK	277	1.4	H	38.26	68.69	83.5	14.81
5075.22	19.17	Ave.	277	1.4	H	38.26	57.43	63.5	6.07
5354.06	30.79	PK	127	1.1	H	39.09	69.88	83.5	13.62
5354.06	19.50	Ave.	127	1.1	H	39.09	58.59	63.5	4.91
10540.00	41.57	PK	301	2.4	H	17.25	58.82	77.7	18.88
5310 MHz									
4698.01	30.31	PK	356	1.8	H	37.58	67.89	83.5	15.61
4698.01	18.88	Ave.	356	1.8	H	37.58	56.46	63.5	7.04
5359.95	35.83	PK	280	1.6	H	39.09	74.92	83.5	8.58
5359.95	21.27	Ave.	280	1.6	H	39.09	60.36	63.5	3.14
10620.00	42.43	PK	348	1.6	H	18.01	60.44	83.5	23.06
10620.00	28.53	Ave.	348	1.6	H	18.01	46.54	63.5	16.96

5470-5725 MHz:

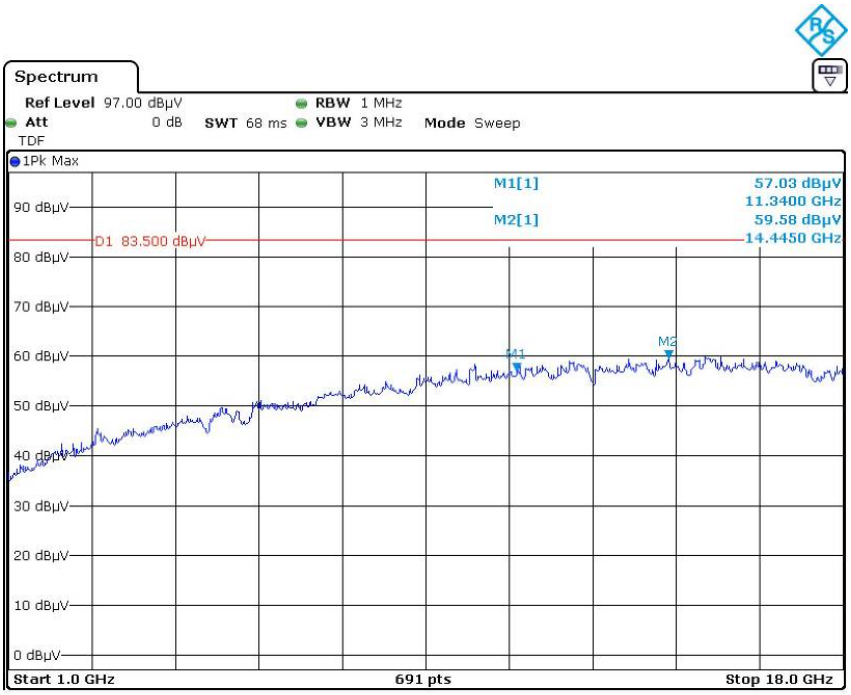
Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11a									
5500 MHz									
5469.99	32.21	PK	118	1.5	H	39.37	71.58	77.7	6.12
5726.84	32.85	PK	138	1.9	H	39.49	72.34	77.7	5.36
11000.00	41.84	PK	154	1.4	H	17.66	59.50	83.5	24.00
11000.00	27.59	Ave.	154	1.4	H	17.66	45.25	63.5	18.25
5580 MHz									
11160.00	41.78	PK	263	1.7	H	17.39	59.17	83.5	24.33
11160.00	27.49	Ave.	263	1.7	H	17.39	44.88	63.5	18.62
5700 MHz									
5468.41	32.84	PK	156	1.8	H	39.37	72.21	77.7	5.49
5727.55	34.62	PK	26	1.4	H	39.49	74.11	77.7	3.59
11400.00	41.84	PK	78	2.5	H	17.73	59.57	83.5	23.93
11400.00	27.56	Ave.	78	2.5	H	17.73	45.29	63.5	18.21
802.11n20									
5500 MHz									
5469.47	34.83	PK	340	1.6	H	39.37	74.20	77.7	3.50
5726.75	32.79	PK	176	2.3	H	39.49	72.28	77.7	5.42
11000.00	41.85	PK	129	1.5	H	17.66	59.51	83.5	23.99
11000.00	27.91	Ave.	129	1.5	H	17.66	45.57	63.5	17.93
5580 MHz									
11160.00	41.83	PK	224	1.8	H	17.39	59.22	83.5	24.28
11160.00	27.89	Ave.	224	1.8	H	17.39	45.28	63.5	18.22
5700 MHz									
5467.81	33.14	PK	348	1.3	H	39.37	72.51	77.7	5.19
5725.78	35.47	PK	32	1.9	H	39.49	74.96	77.7	2.74
11400.00	42.04	PK	306	2.2	H	17.73	59.77	83.5	23.73
11400.00	27.92	Ave.	306	2.2	H	17.73	45.65	63.5	17.85

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11n40									
5510 MHz									
5469.19	35.34	PK	275	1.7	H	39.37	74.71	77.7	2.99
5726.86	32.84	PK	186	1.8	H	39.49	72.33	77.7	5.37
11020.00	42.54	PK	61	1.6	H	17.66	60.20	83.5	23.30
11020.00	28.67	Ave.	61	1.6	H	17.66	46.33	63.5	17.17
5550 MHz									
11100.00	42.29	PK	111	2.5	H	16.72	59.01	83.5	24.49
11100.00	28.59	Ave.	111	2.5	H	16.72	45.31	63.5	18.19
5670 MHz									
5468.85	33.22	PK	155	1.0	H	39.37	72.59	77.7	5.11
5725.19	35.79	PK	46	1.5	H	39.49	75.28	77.7	2.42
11340.00	42.31	PK	297	1.7	H	17.43	59.74	83.5	23.76
11340.00	29.58	Ave.	297	1.7	H	17.43	47.01	63.5	16.49
802.11ac20									
5500 MHz									
5469.54	35.07	PK	355	2.4	H	39.37	74.44	77.7	3.26
5727.43	32.84	PK	259	2.1	H	39.49	72.33	77.7	5.37
11000.00	43.12	PK	154	1.7	H	17.66	60.78	83.5	22.72
11000.00	28.03	Ave.	154	1.7	H	17.66	45.69	63.5	17.81
5580 MHz									
11160.00	41.85	PK	96	2.2	H	17.39	59.24	83.5	24.26
11160.00	28.11	Ave.	96	2.2	H	17.39	45.50	63.5	18.00
5700 MHz									
5467.85	32.69	PK	253	2.5	H	39.37	72.06	77.7	5.64
5728.99	34.78	PK	274	1.5	H	39.49	74.27	77.7	3.43
11400.00	42.02	PK	275	1.6	H	17.73	59.75	83.5	23.75
11400.00	28.17	Ave.	275	1.6	H	17.73	45.90	63.5	17.60

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11ac40									
5510 MHz									
5469.33	35.63	PK	348	1.9	H	39.37	75.00	77.7	2.70
5727.45	32.99	PK	272	2.0	H	39.49	72.48	77.7	5.22
11020.00	41.81	PK	86	1.5	H	17.66	59.47	83.5	24.03
11020.00	28.03	Ave.	86	1.5	H	17.66	45.69	63.5	17.81
5550 MHz									
11100.00	41.92	PK	327	2.2	H	16.72	58.64	83.5	24.86
11100.00	28.11	Ave.	327	2.2	H	16.72	44.83	63.5	18.67
5670 MHz									
5468.24	32.75	PK	333	2.2	H	39.37	72.12	77.7	5.58
5728.64	34.87	PK	147	1.4	H	39.49	74.36	77.7	3.34
11340.00	41.87	PK	190	1.0	H	17.43	59.30	83.5	24.20
11340.00	28.09	Ave.	190	1.0	H	17.43	45.52	63.5	17.98

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 802.11n40 5670MHz, for Peak
Horizontal



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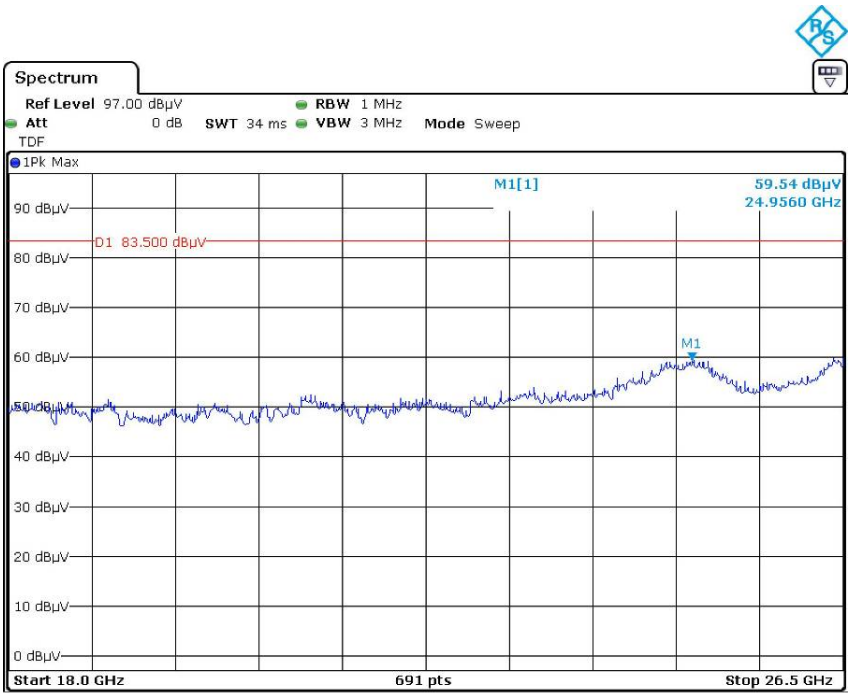

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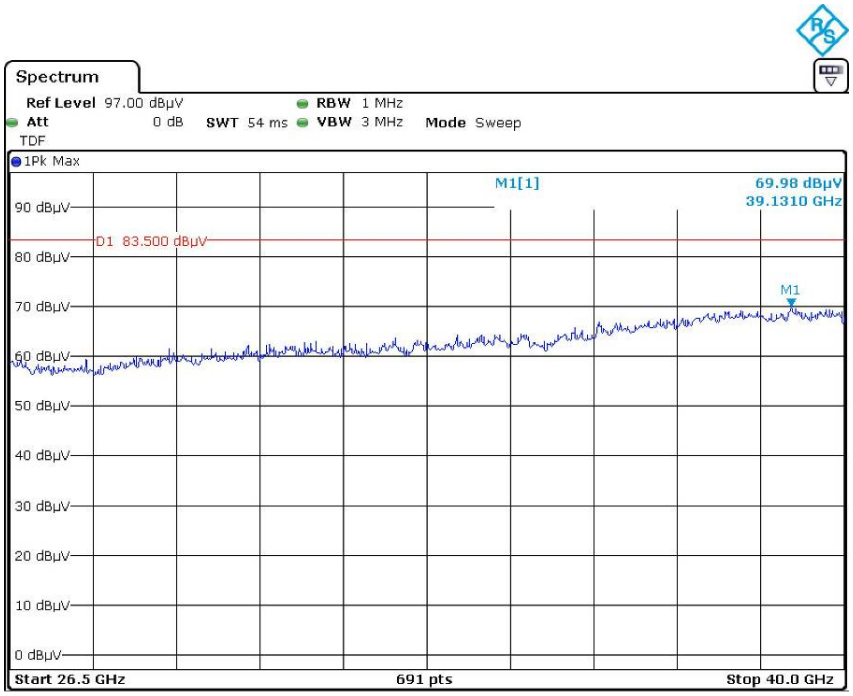
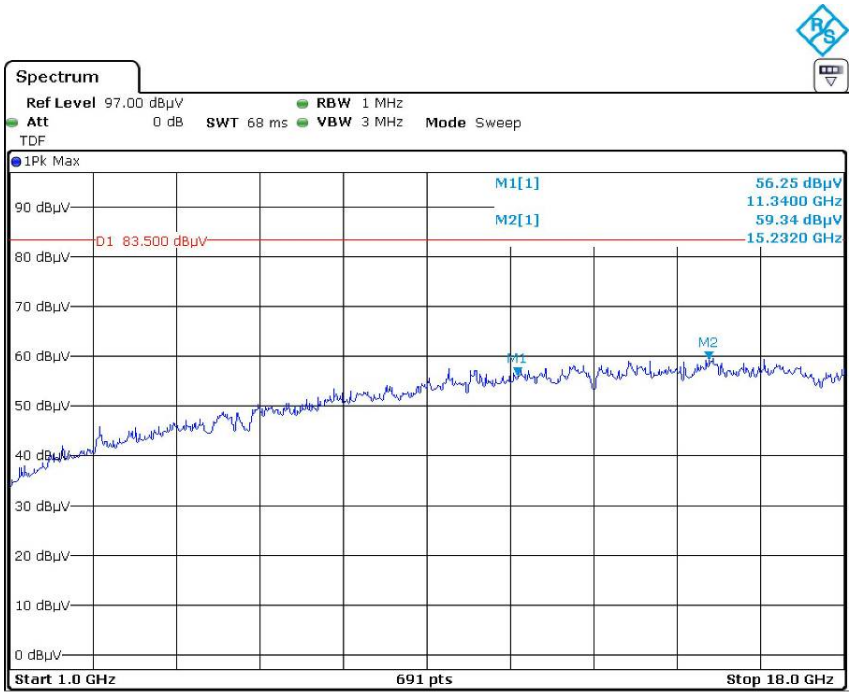


Date: 26.SEP.2020 21:43:30

Vertical



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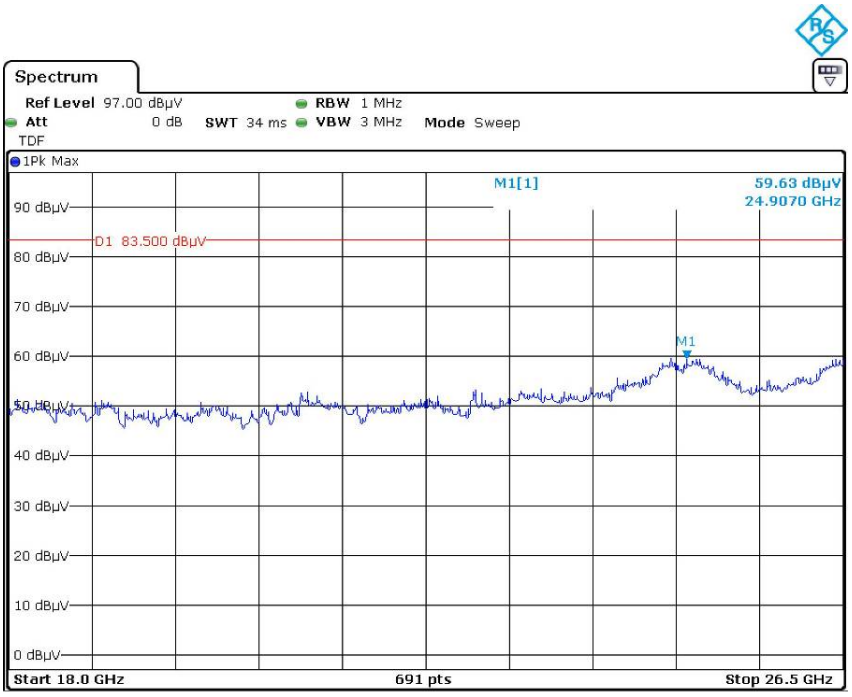
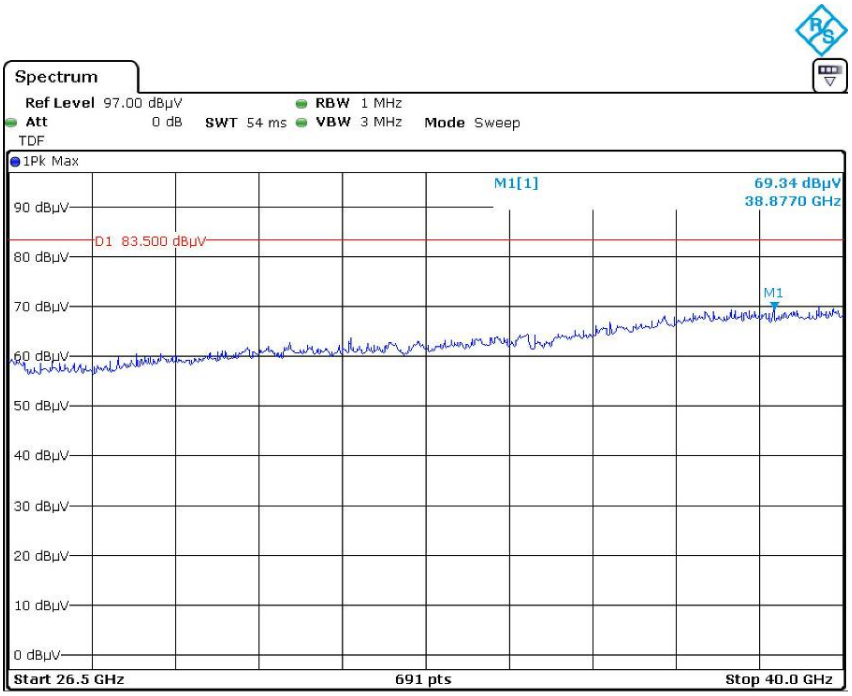
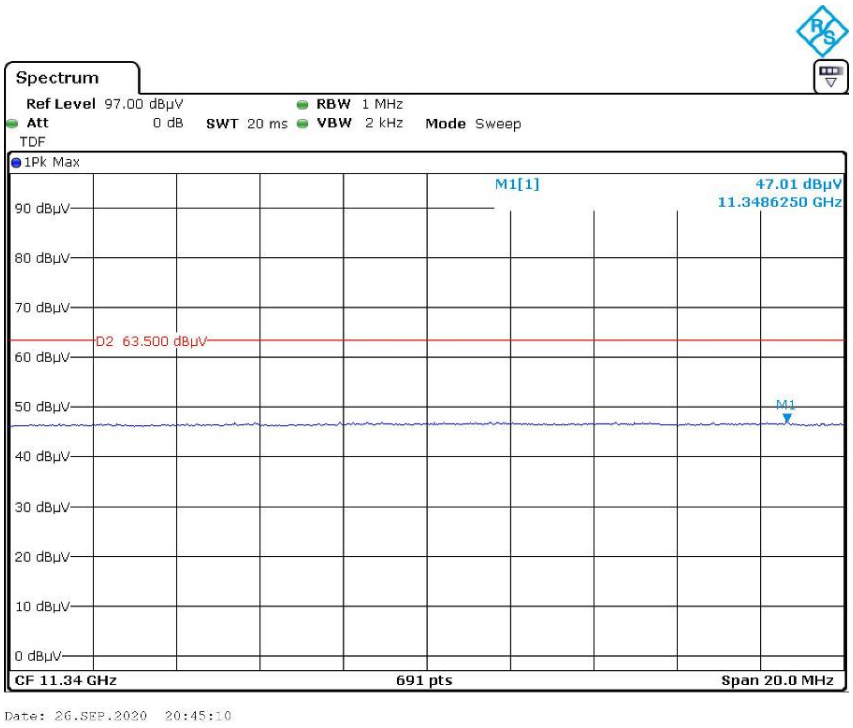


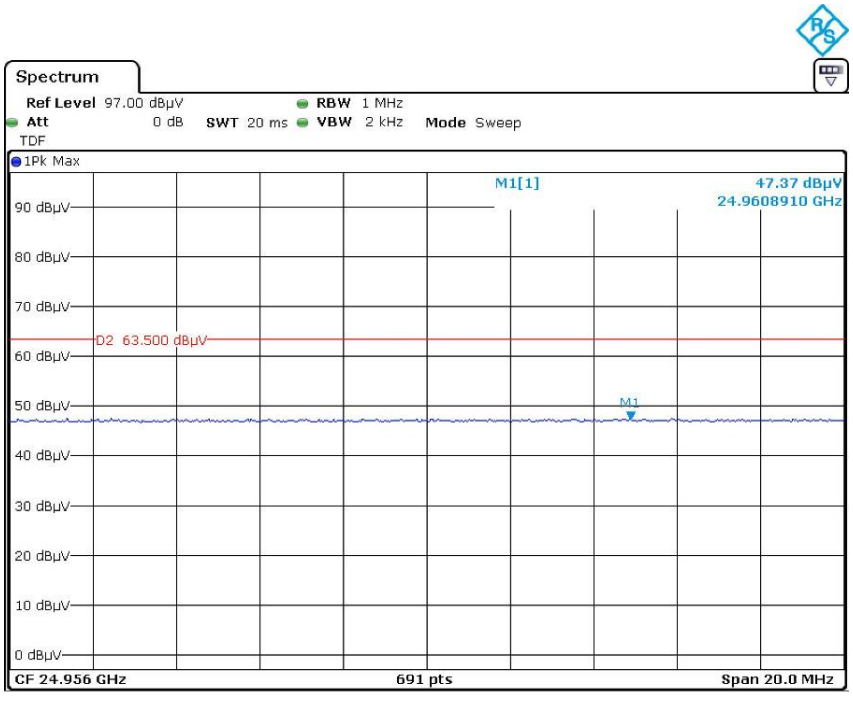
Date: 26.SEP.2020 21:37:42

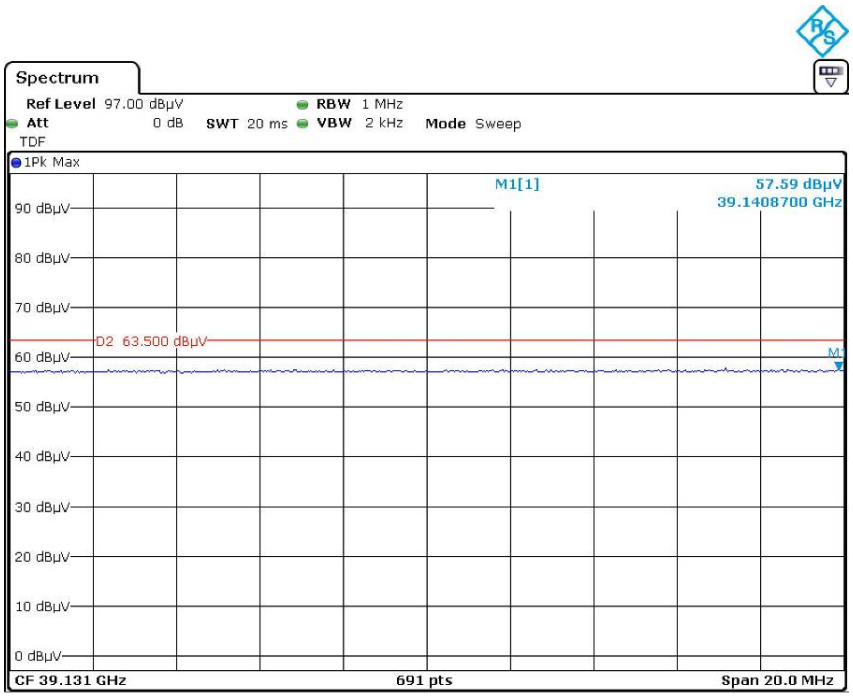


Date: 26.SEP.2020 21:50:16

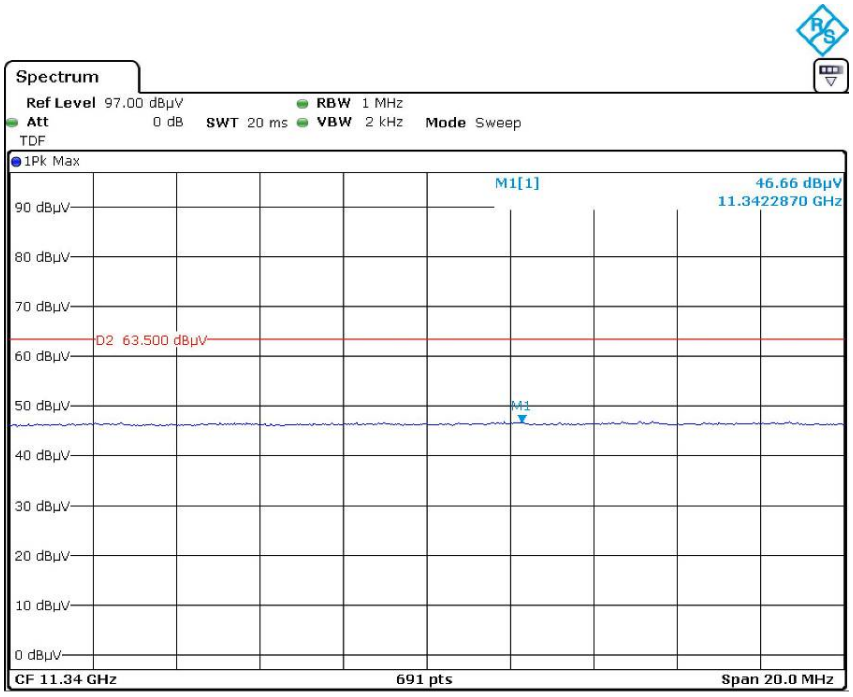
Pre-scan with 802.11a 5320MHz, for Average
Horizontal

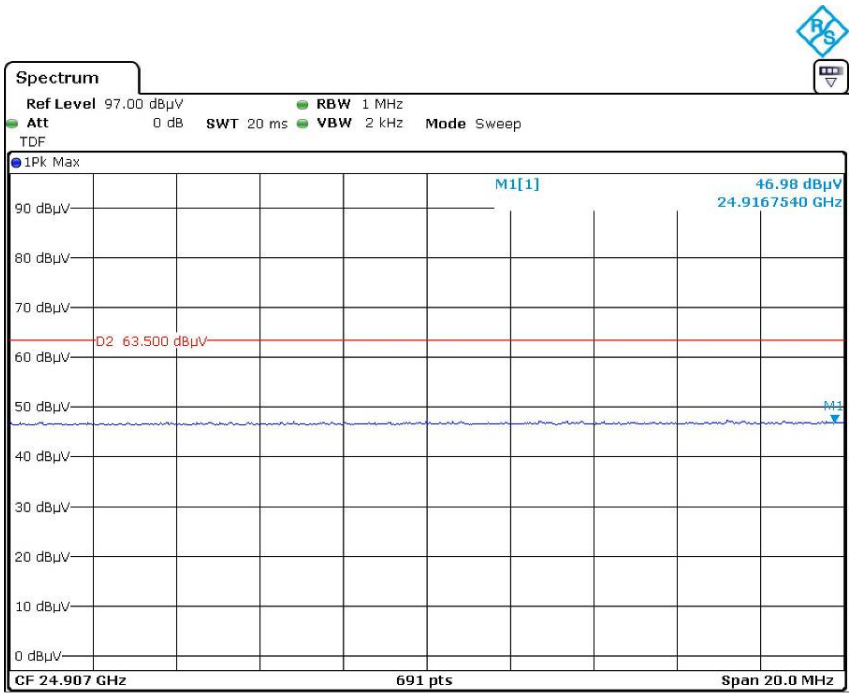




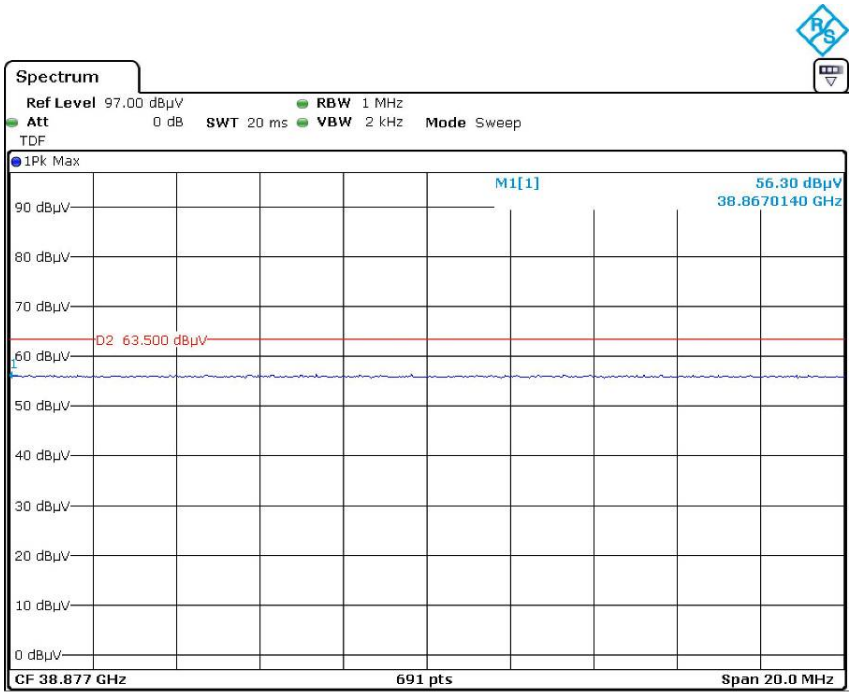

Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 20 ms
VBW 2 kHz
Mode Sweep
TDF
1Pk Max
M1[1]
57.59 dBµV
39.1408700 GHz
D2 63.500 dBµV
90 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 39.131 GHz
691 pts
Span 20.0 MHz
Date: 26.SEP.2020 21:46:55

Vertical


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 20 ms
VBW 2 kHz
Mode Sweep
TDF
1Pk Max
M1[1]
46.66 dBµV
11.3422870 GHz
D2 63.500 dBµV
90 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 11.34 GHz
691 pts
Span 20.0 MHz
Date: 26.SEP.2020 20:52:33



Date: 26.SEP.2020 21:40:01



Date: 26.SEP.2020 21:53:34

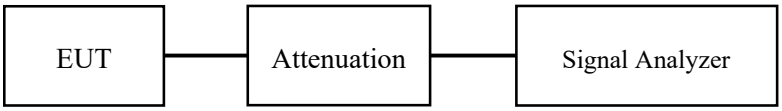
FCC §15.407(a) (1) – 26 dB EMISSION BANDWIDTH

Applicable Standard

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

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:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu from 2020-09-12 to 2020-12-30.

EUT operation mode: Transmitting (worst case at chain 0)

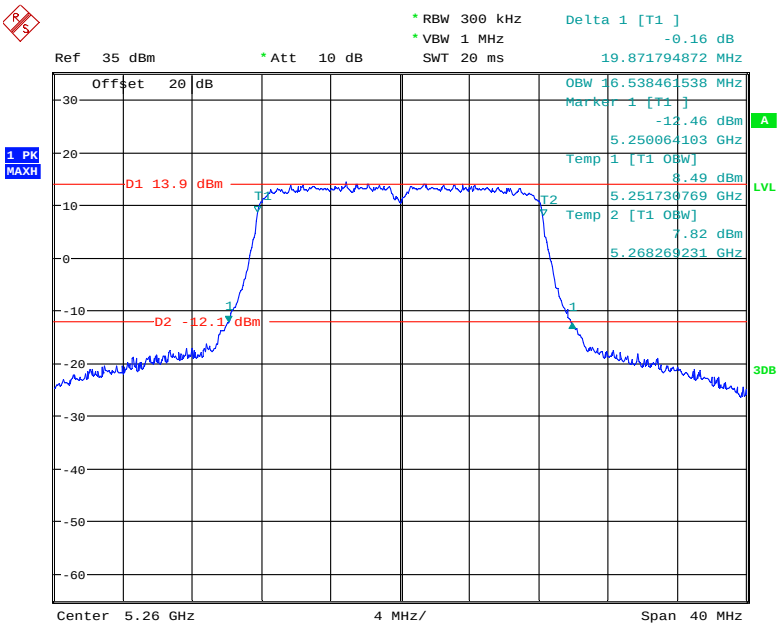
Test Result: Pass

Please refer to the following tables and plots.

5250 MHz - 5350 MHz:

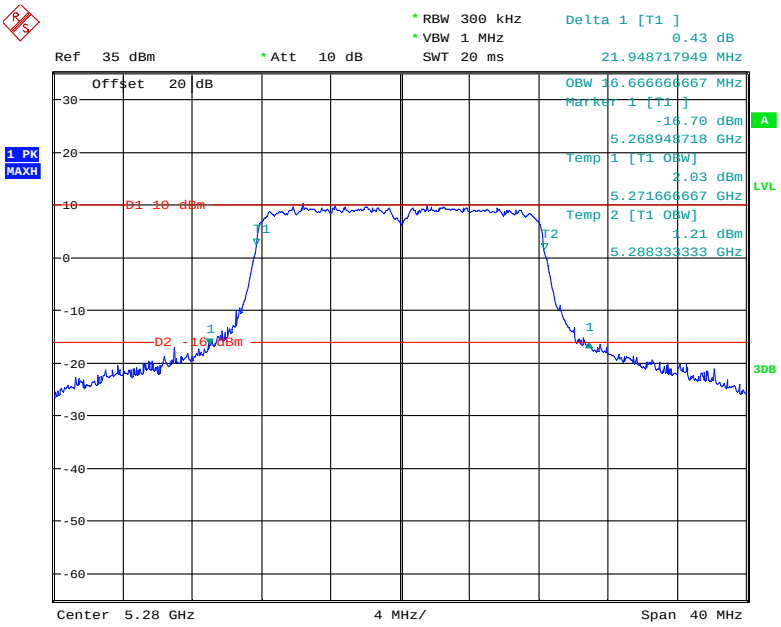
Frequency (MHz)	Antenna Port	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a			
5260	Chain 0	19.87	16.54
5280	Chain 0	21.95	16.67
5320	Chain 0	22.64	16.67
802.11n20			
5260	Chain 0	20.71	17.82
5280	Chain 0	20.51	17.82
5320	Chain 0	20.71	17.82
802.11n40			
5270	Chain 0	40.69	36.15
5310	Chain 0	40.59	36.28
802.11ac20			
5260	Chain 0	20.51	17.82
5280	Chain 0	21.81	17.82
5320	Chain 0	22.17	17.82
802.11ac40			
5270	Chain 0	40.32	36.15
5310	Chain 0	41.69	36.15

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



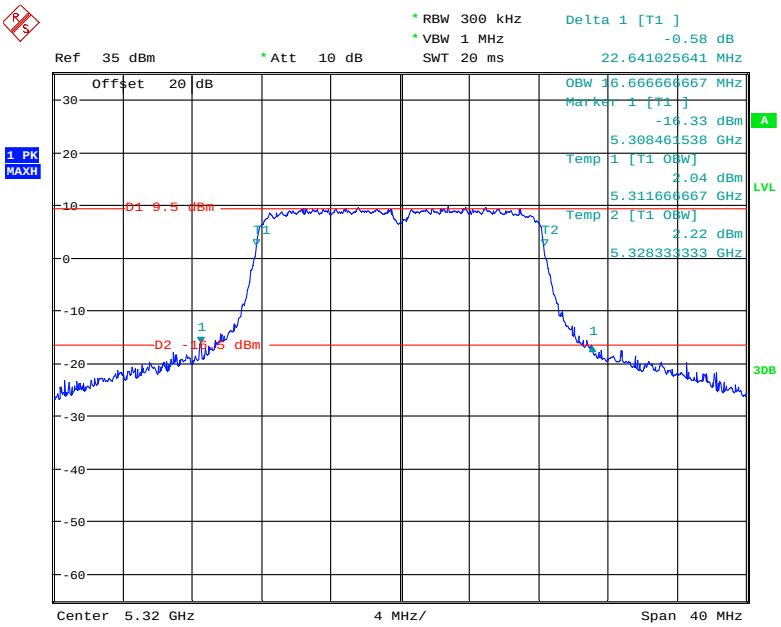
Date: 29.DEC.2020 17:55:36

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



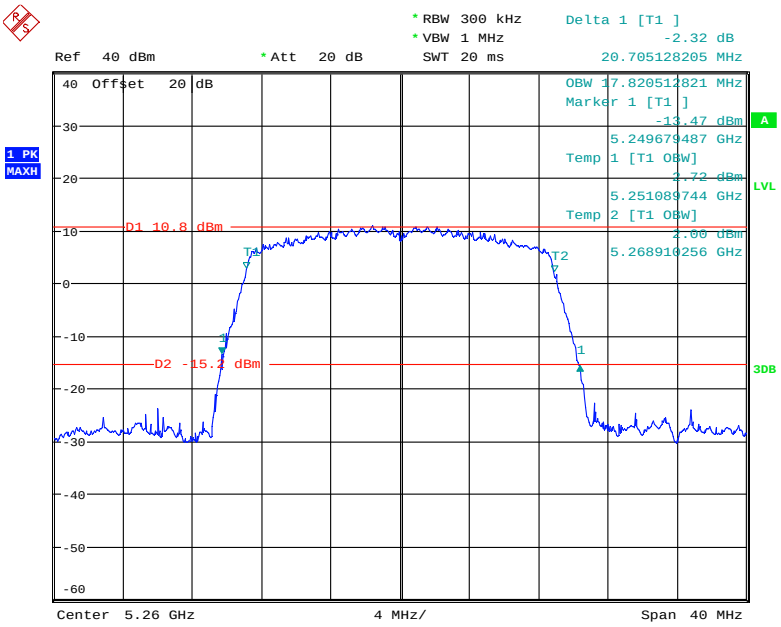
Date: 12.SEP.2020 18:30:24

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



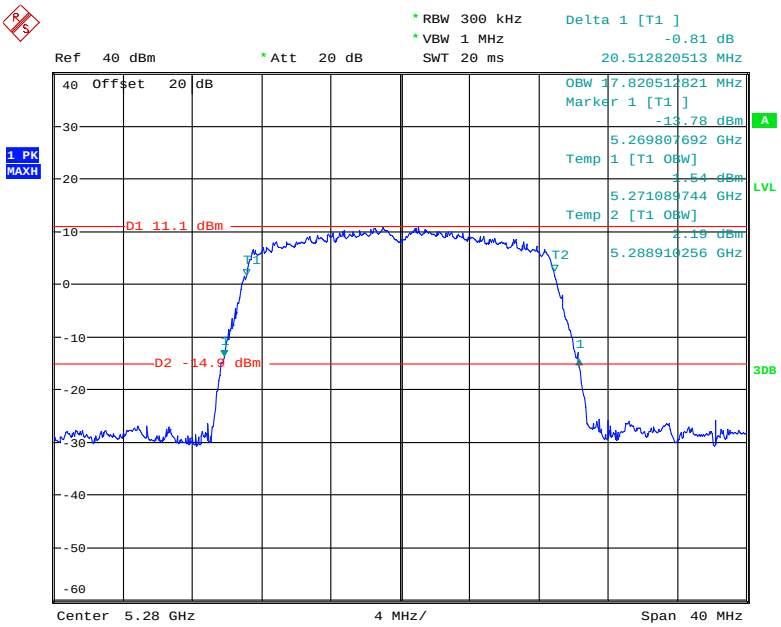
Date: 12.SEP.2020 18:33:15

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



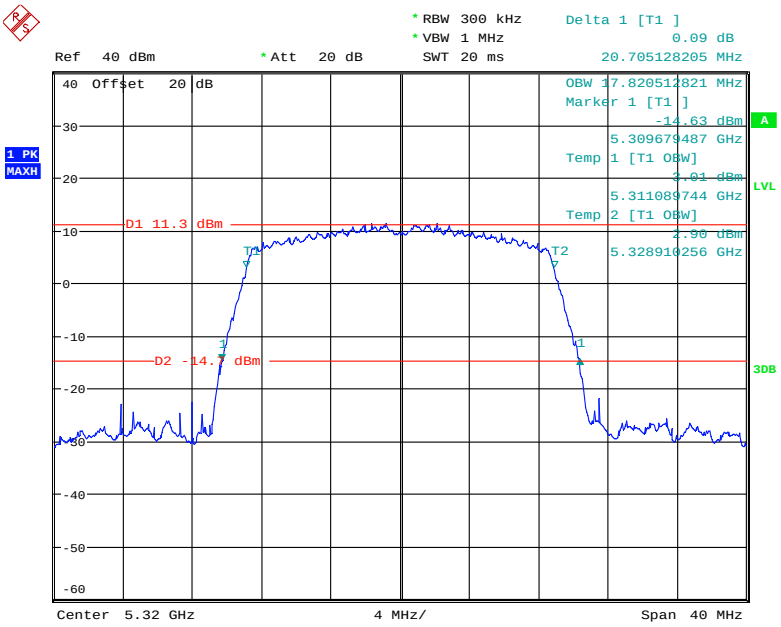
Date: 30.DEC.2020 13:19:00

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



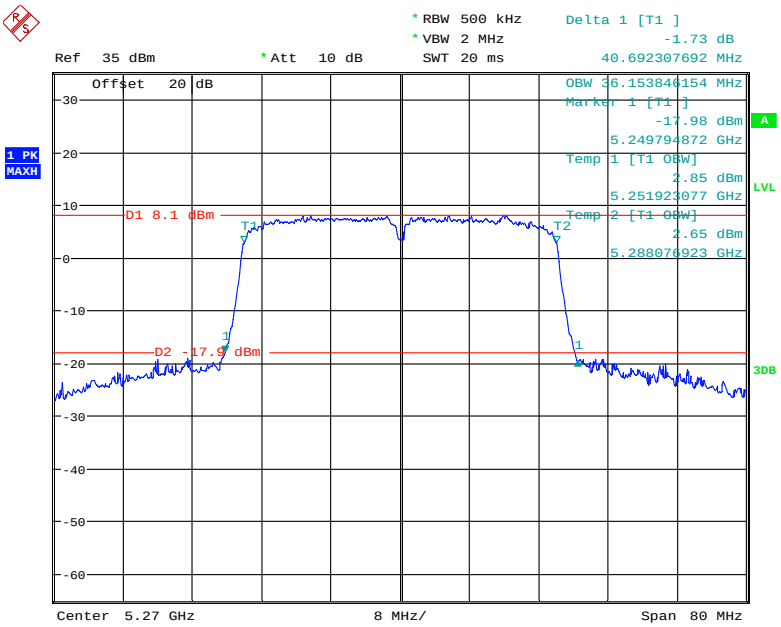
Date: 30.DEC.2020 13:17:14

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



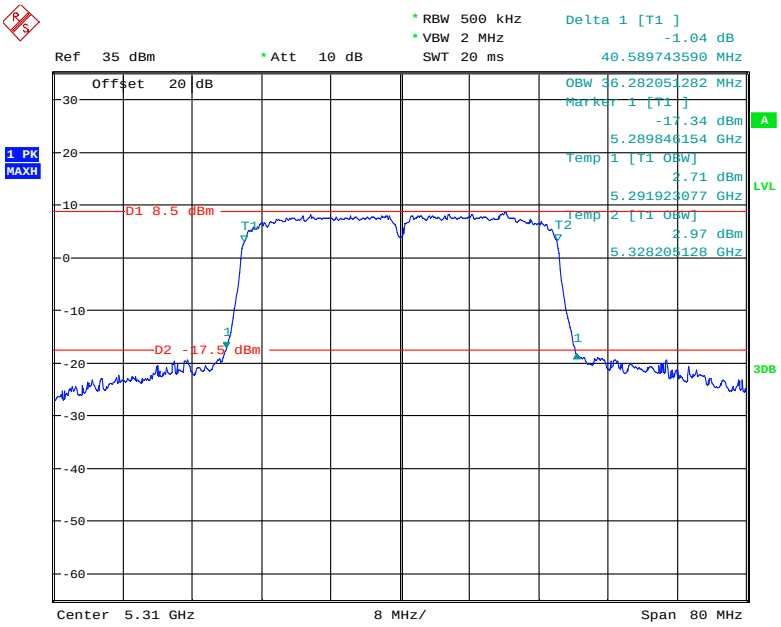
Date: 30.DEC.2020 13:15:40

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



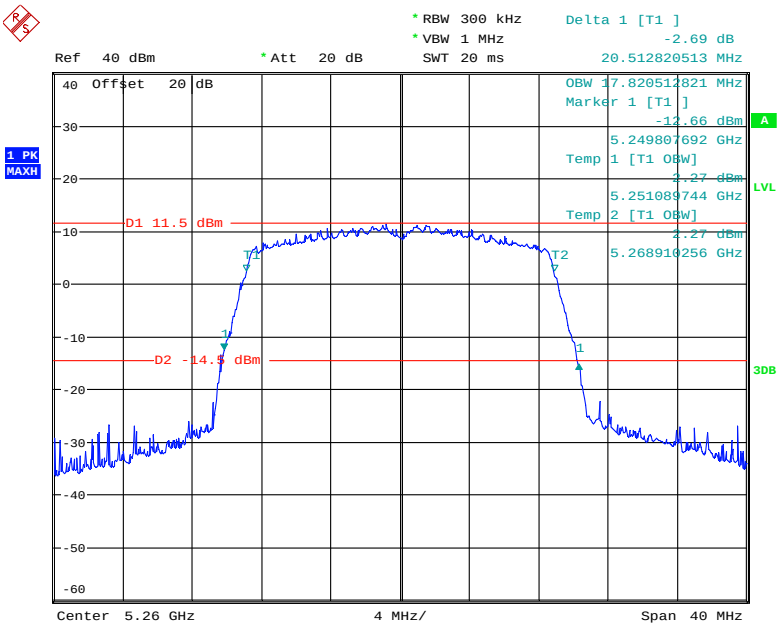
Date: 12.SEP.2020 17:57:37

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



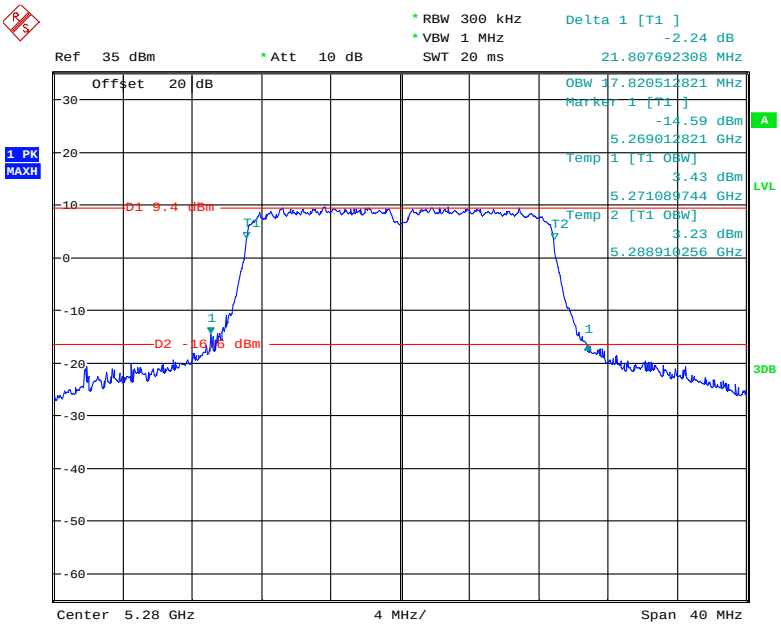
Date: 15.OCT.2020 09:21:01

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



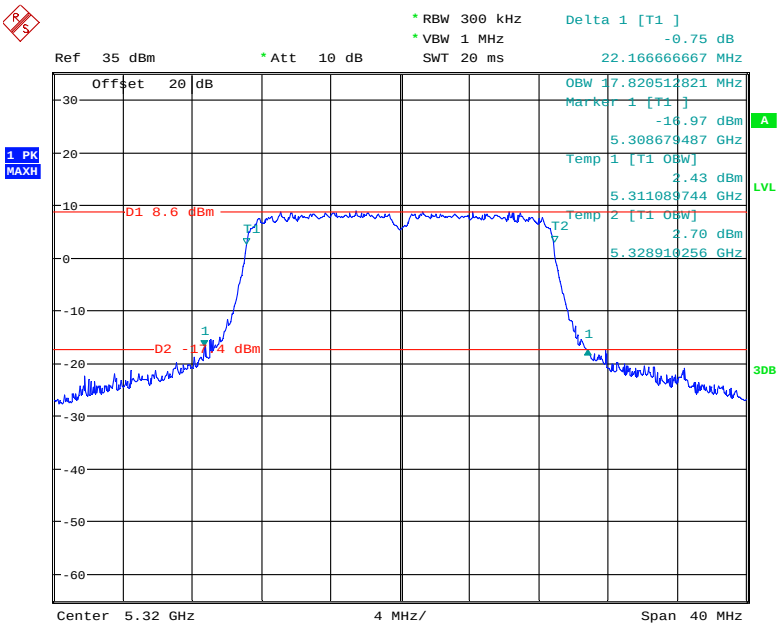
Date: 30.DEC.2020 13:10:38

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



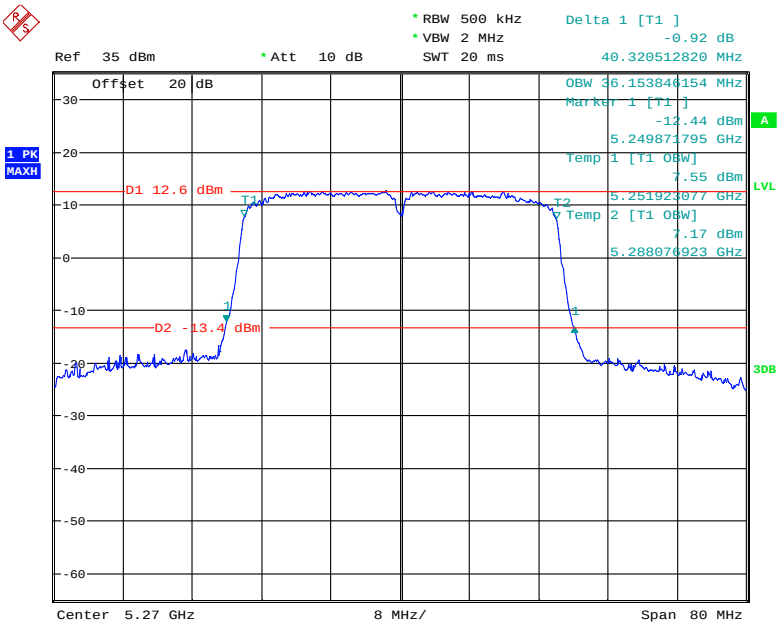
Date: 12.SEP.2020 17:42:08

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



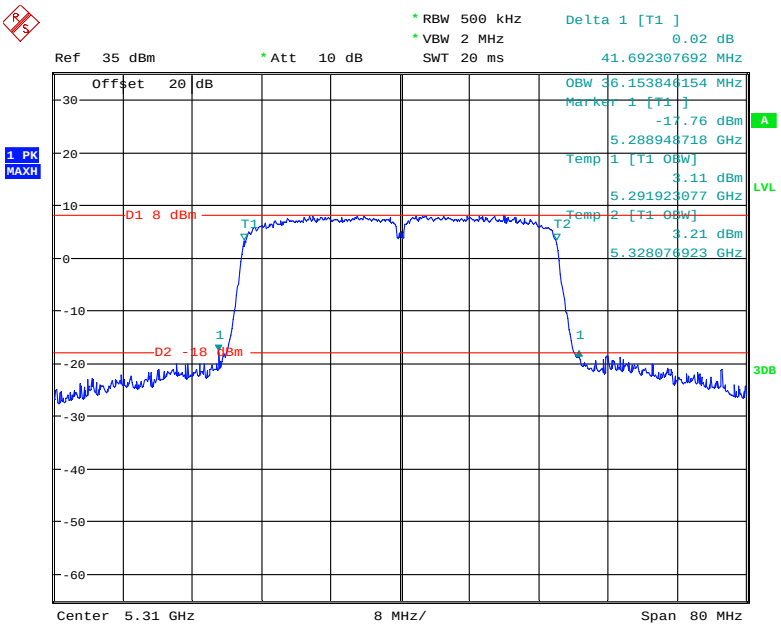
Date: 12.SEP.2020 17:45:11

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



Date: 29.DEC.2020 18:01:59

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

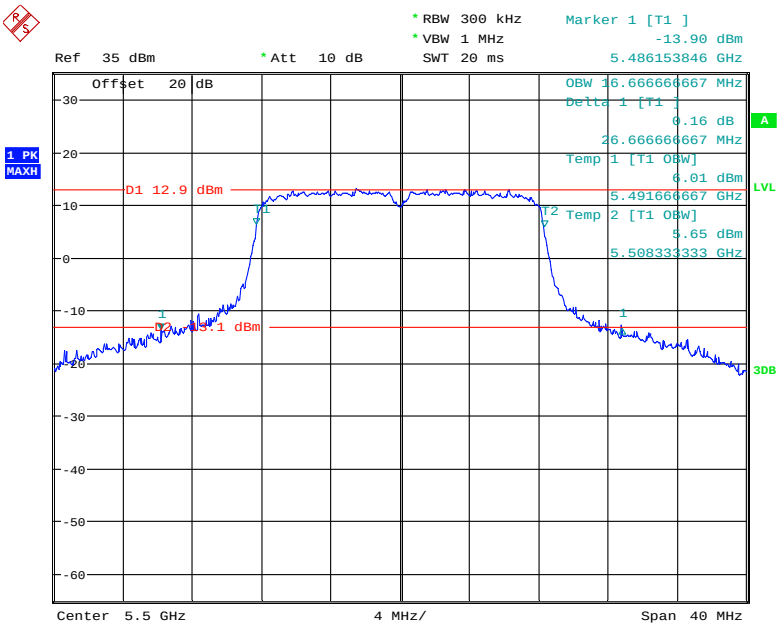


Date: 15.OCT.2020 10:02:13

5470 MHz – 5725 MHz:

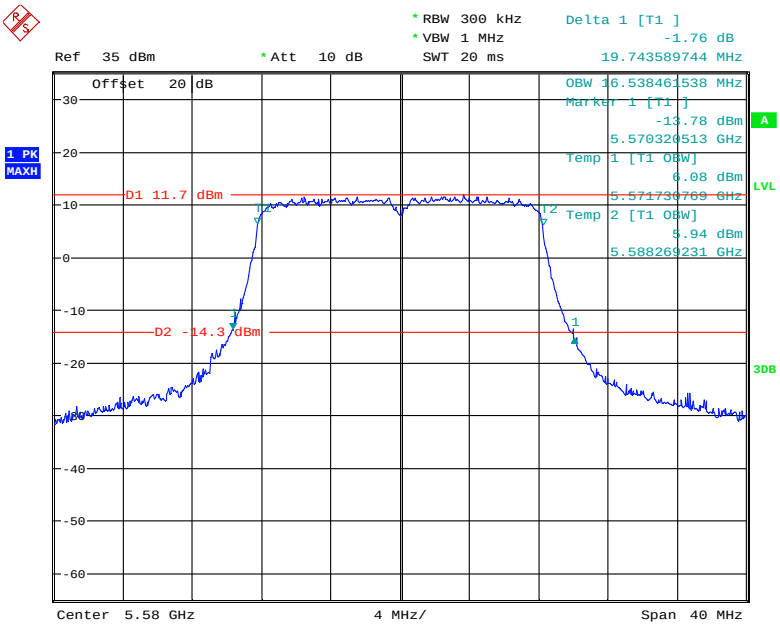
Frequency (MHz)	Antenna Port	26dB bandwidth (MHz)	99% Bandwidth (MHz)
802.11a			
5500	Chain 0	26.67	16.67
5580	Chain 0	19.74	16.54
5700	Chain 0	20.00	16.53
802.11n20			
5500	Chain 0	20.58	17.82
5580	Chain 0	20.67	17.82
5700	Chain 0	20.58	17.82
802.11n40			
5510	Chain 0	40.12	36.15
5550	Chain 0	40.12	36.15
5670	Chain 0	39.97	36.03
802.11ac20			
5500	Chain 0	20.58	17.82
5580	Chain 0	20.64	17.82
5700	Chain 0	20.58	17.82
802.11ac40			
5510	Chain 0	40.00	36.15
5550	Chain 0	40.00	36.15
5670	Chain 0	39.97	36.15

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



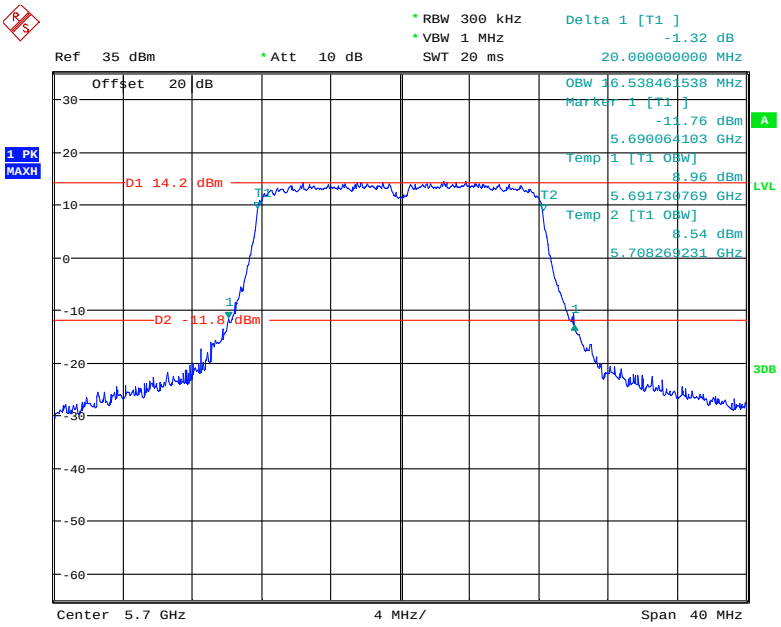
Date: 29.DEC.2020 18:10:56

802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5580 MHz



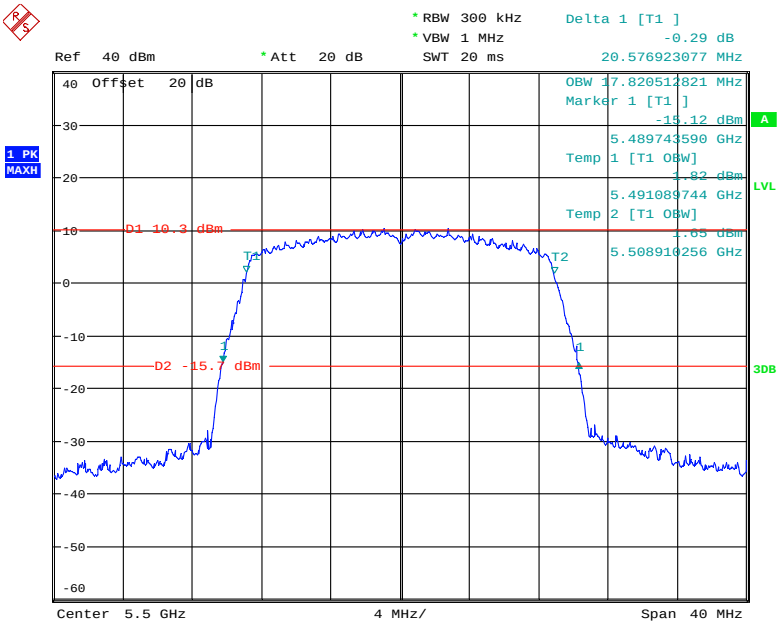
Date: 29.DEC.2020 18:12:53

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



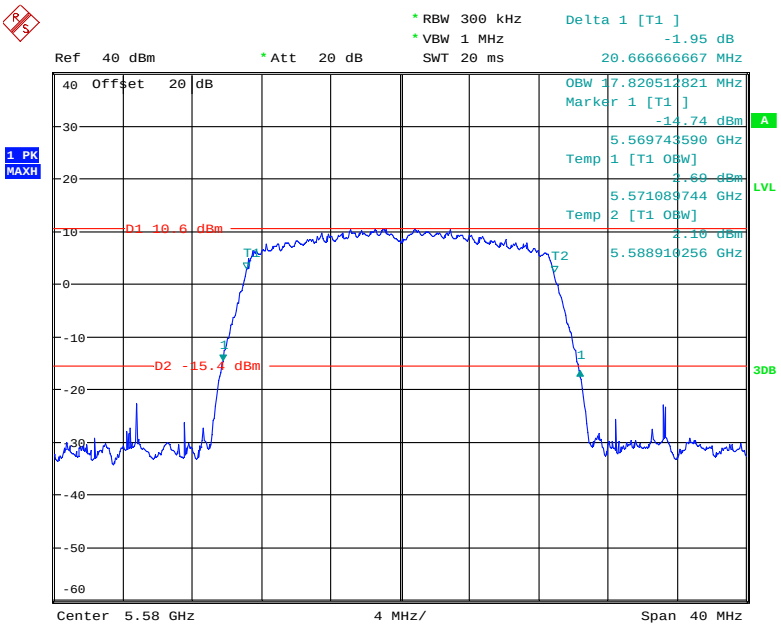
Date: 29.DEC.2020 18:14:44

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



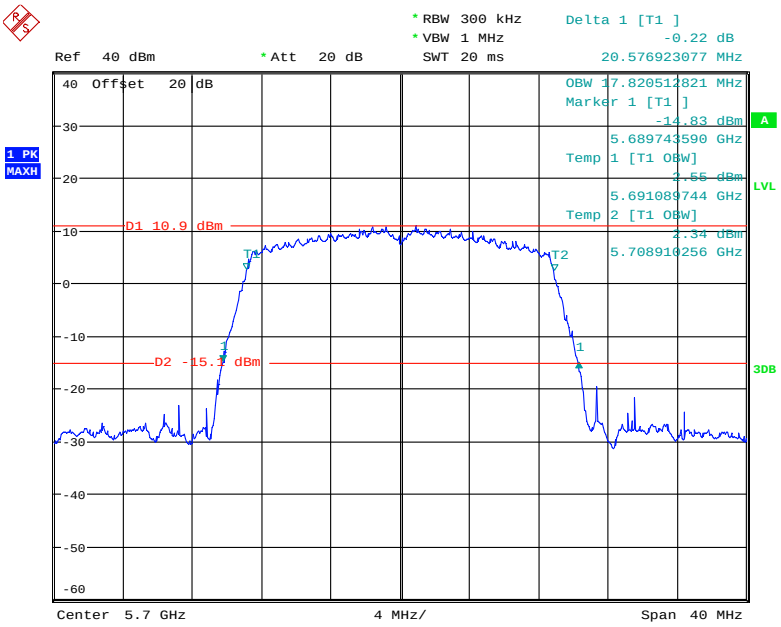
Date: 30.DEC.2020 12:58:36

802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5580 MHz



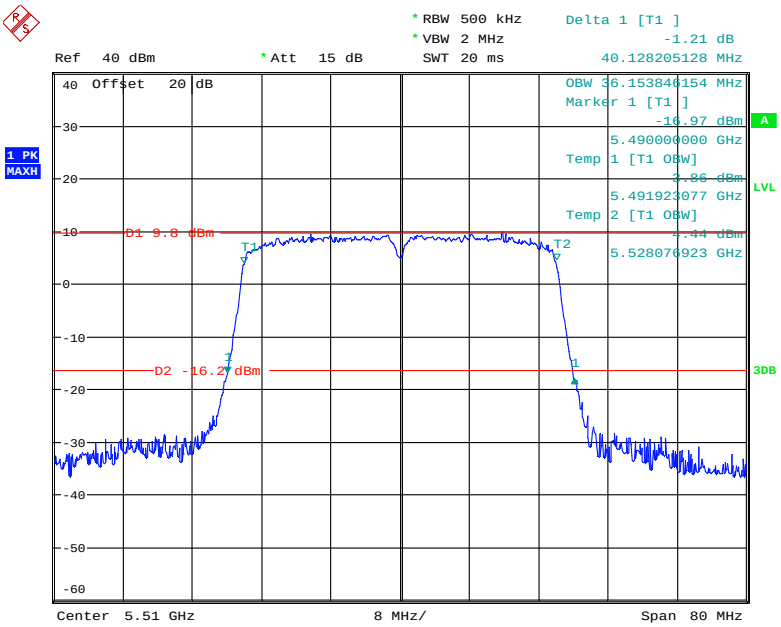
Date: 30.DEC.2020 13:01:24

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



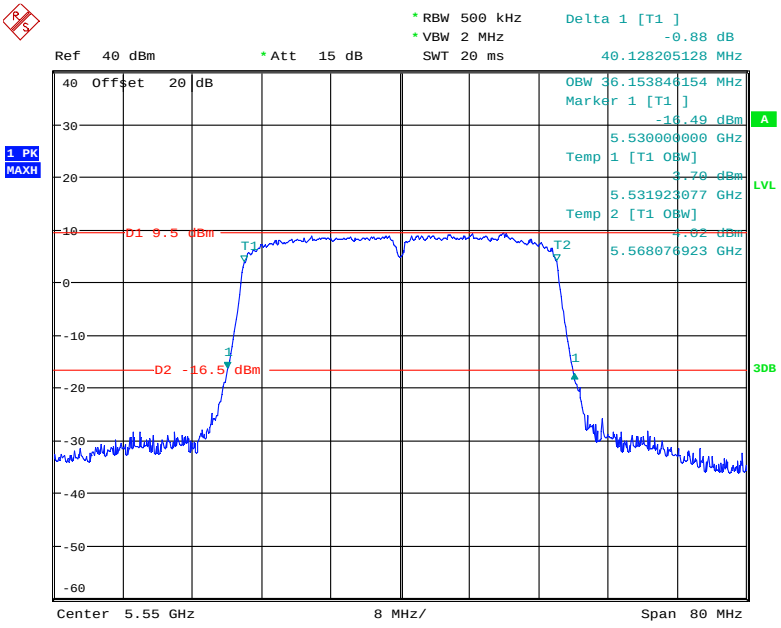
Date: 30.DEC.2020 13:03:36

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



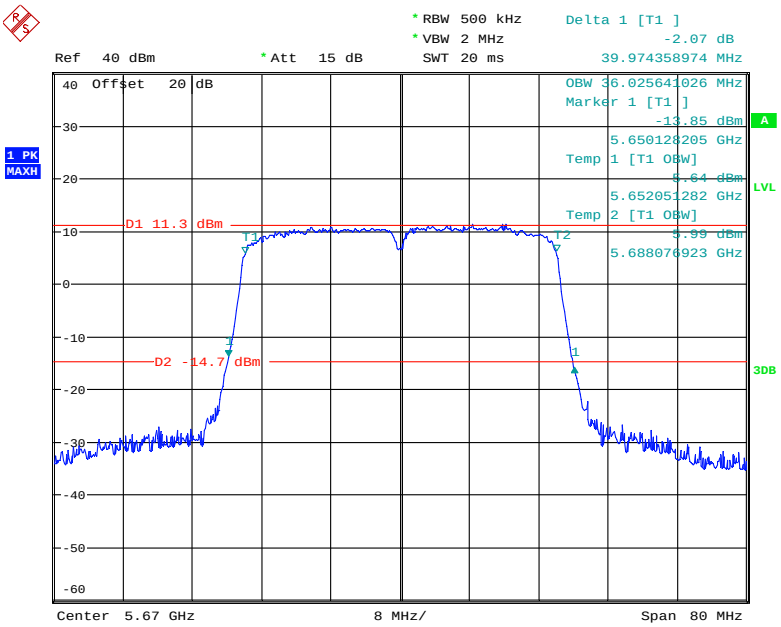
Date: 30.DEC.2020 11:36:21

802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5550 MHz



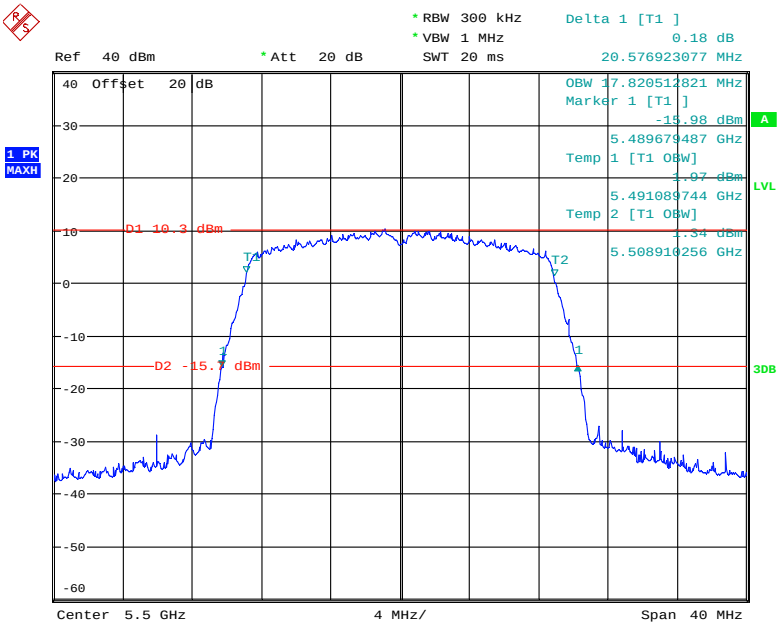
Date: 30.DEC.2020 11:32:41

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



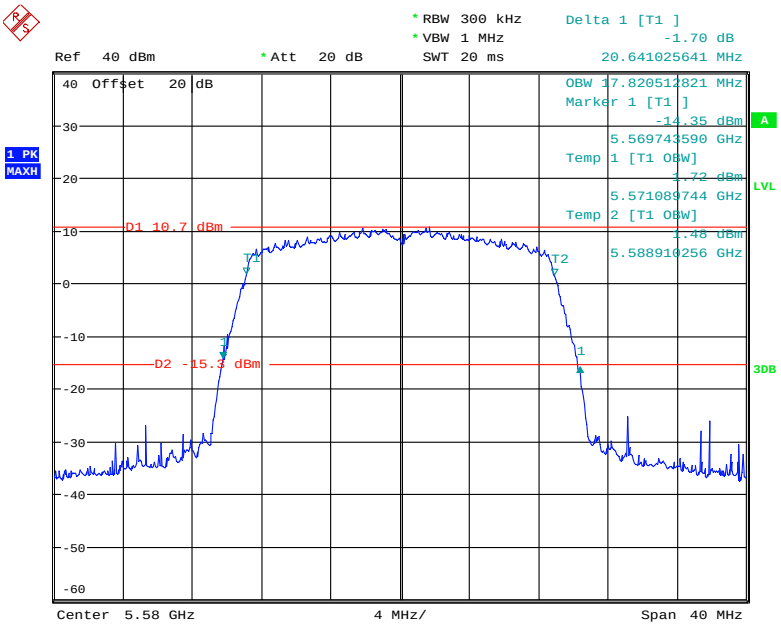
Date: 30.DEC.2020 11:37:59

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



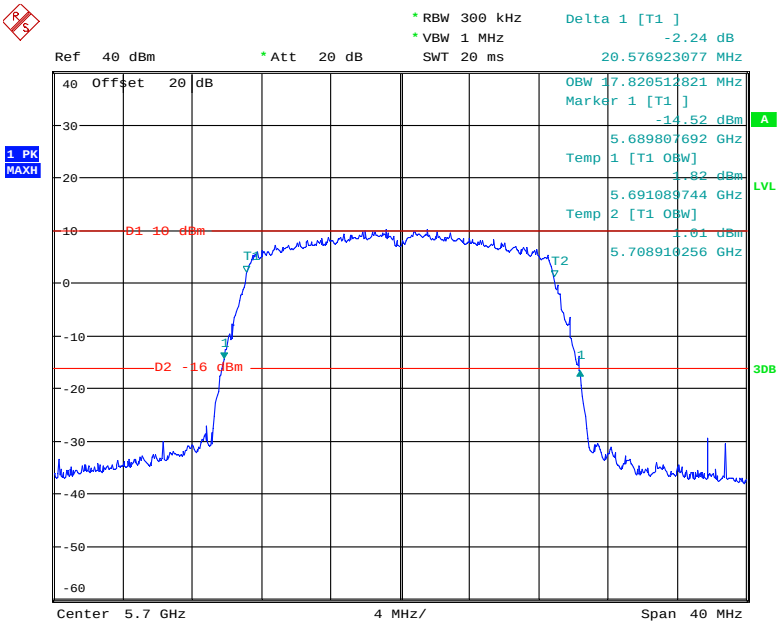
Date: 30.DEC.2020 13:08:21

802.11ac20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5580 MHz



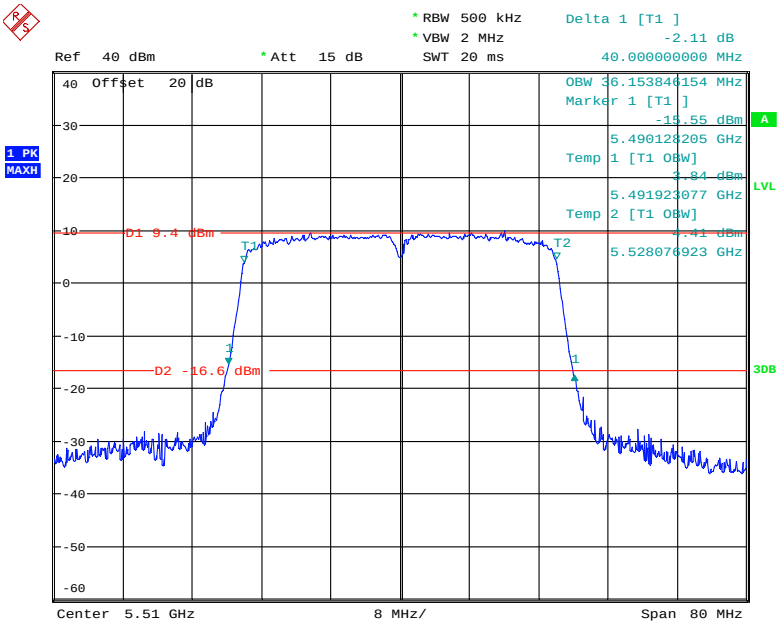
Date: 30.DEC.2020 13:06:45

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

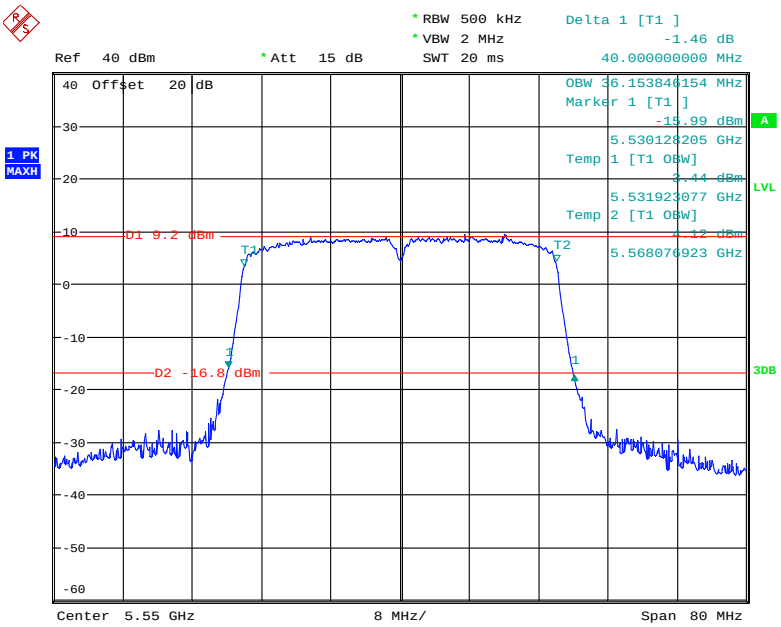


Date: 30.DEC.2020 13:04:49

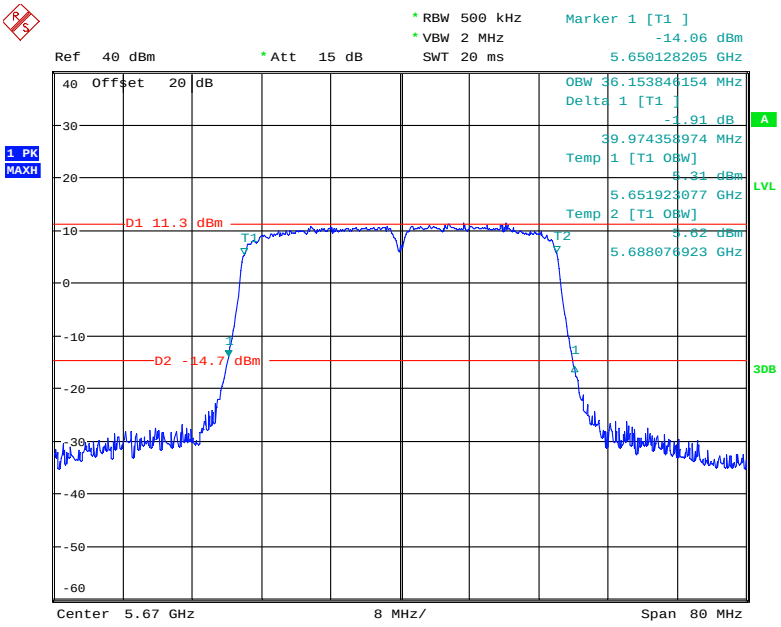
802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5510 MHz



802.11ac40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5550 MHz



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



Date: 30.DEC.2020 11:39:00

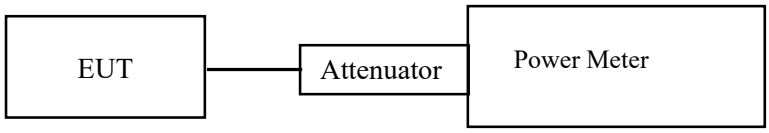
FCC §15.407(a) (2) – CONDUCTED TRANSMITTER OUTPUT POWER

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:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu from 2020-12-19 to 2021-01-04.

EUT operation mode: Transmitting(worst case is MIMO mode)

Test Result: Pass

Please refer to the following tables.

5250 MHz – 5350 MHz:

Frequency(MHz)	Antenna Port	Average Output Power (dBm)	Total Power (dBm)	Limit (dBm)
802.11a				
5260	0	11.91	15.98	24
	1	13.82		
5280	0	14.15	17.44	
	1	14.69		
5320	0	14.24	17.49	
	1	14.71		
802.11n20				
5260	0	14.79	17.46	24
	1	14.07		
5280	0	14.89	17.49	
	1	14.03		
5320	0	14.88	17.48	
	1	14.02		
802.11n40				
5270	0	11.62	15.98	24
	1	13.99		
5310	0	11.62	15.99	
	1	14.01		
802.11ac20				
5260	0	14.72	17.47	24
	1	14.18		
5280	0	14.74	17.49	
	1	14.21		
5320	0	14.80	17.48	
	1	14.11		
802.11ac40				
5270	0	11.64	15.83	24
	1	13.74		
5310	0	11.58	16.11	
	1	14.23		

Note:
For output power:
Directional gain = array gain+Ant gain, array gain=0 for $N_{ant} \leqslant 4$
So Directional gain=5.5dBi<6dBi

5470 MHz – 5725 MHz:

Frequency(MHz)	Antenna Port	Average Output Power (dBm)	Total Power (dBm)	Limit (dBm)
802.11a				
5500	0	14.09	17.46	24
	1	14.79		
5580	0	14.23	17.47	
	1	14.68		
5700	0	14.18	17.50	
	1	14.78		
802.11n20				
5500	0	14.11	17.47	24
	1	14.79		
5580	0	14.24	17.48	
	1	14.68		
5700	0	14.38	17.49	
	1	14.57		
802.11n40				
5510	0	15.15	17.28	24
	1	13.16		
5550	0	14.97	17.41	
	1	13.74		
5670	0	14.43	17.07	
	1	13.65		
802.11ac20				
5500	0	14.12	17.44	24
	1	14.72		
5580	0	14.19	17.50	
	1	14.77		
5700	0	14.31	17.49	
	1	14.65		
802.11ac40				
5510	0	15.07	17.20	24
	1	13.09		
5550	0	14.83	17.40	
	1	13.89		
5670	0	14.52	17.09	
	1	13.60		

Note:
For output power:
Directional gain = array gain+Ant gain, array gain=0 for $N_{ant} \leqslant 4$
So Directional gain=5.5dBi<6dBi

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:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu from 2020-12-19 to 2021-01-04.

EUT operation mode: Transmitting(worst case is MIMO mode)

Test Result: Pass

Please refer to the following tables and plots.

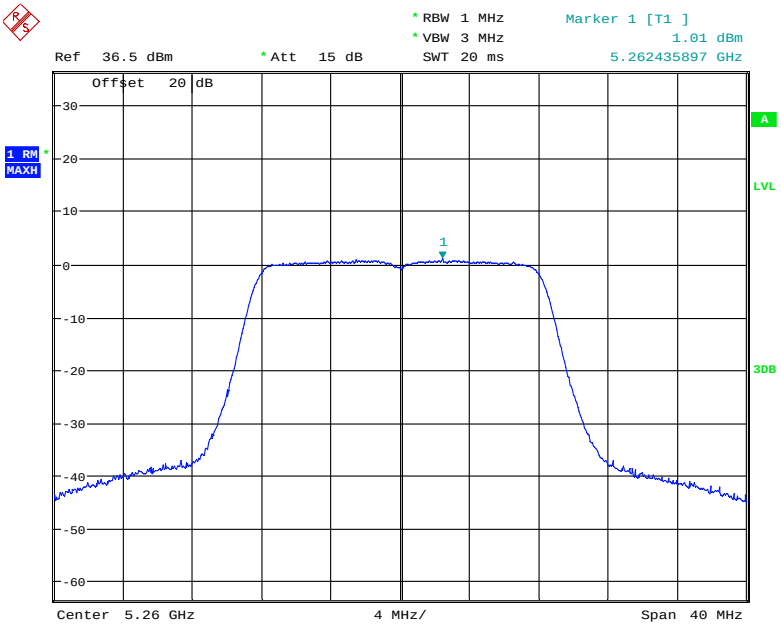
5250 MHz – 5350 MHz:

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Total Power Spectral (dBm/MHz)	Limit (dBm/MHz)
802.11a				
5260	0	1.01	5.06	8.5
	1	2.89		
5280	0	3.84	7.36	
	1	4.80		
5320	0	4.71	7.40	
	1	4.05		
802.11n20				
5260	0	3.95	6.62	8.5
	1	3.25		
5280	0	4.15	6.90	
	1	3.61		
5320	0	4.30	6.86	
	1	3.35		
802.11n40				
5270	0	-2.27	1.85	8.5
	1	-0.27		
5310	0	-2.43	2.02	
	1	0.09		
802.11ac20				
5260	0	4.00	6.62	8.5
	1	3.18		
5280	0	4.03	6.84	
	1	3.61		
5320	0	4.20	6.87	
	1	3.48		
802.11ac40				
5270	0	-2.43	1.79	8.5
	1	-0.27		
5310	0	-2.13	2.08	
	1	0.01		

Note:
For power spectral density:
Directional gain = array gain+Ant gain=10*log(Nant/Nss)+ 3.5dBi =8.5dBi>6dBi,
So Limit=11-(8.5-6)=8.5dBm

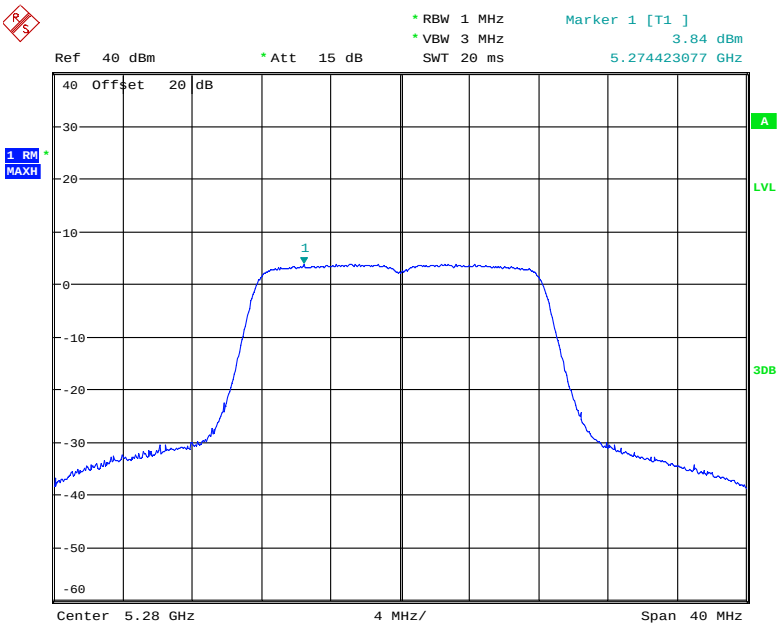
Antenna 0:

802.11a mode, Power Spectral Density, 5260 MHz



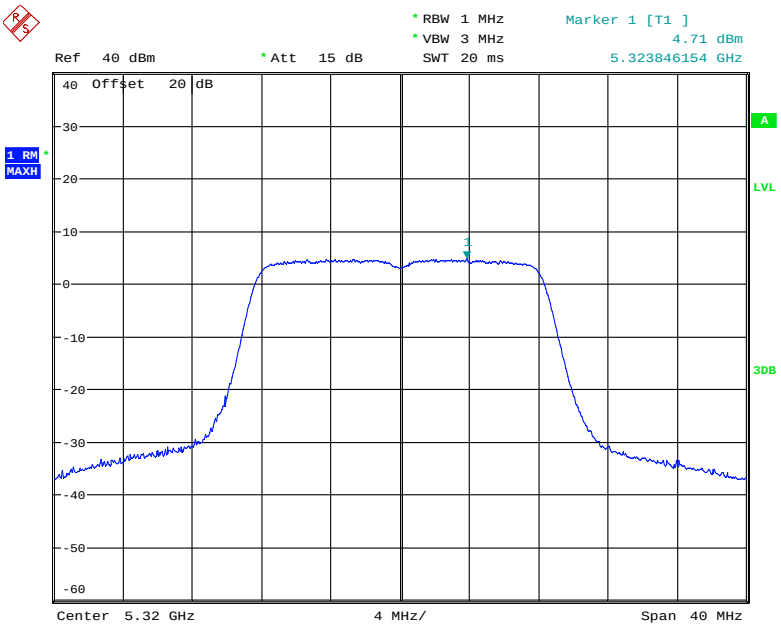
Date: 31.DEC.2020 13:55:32

802.11a mode, Power Spectral Density, 5280 MHz



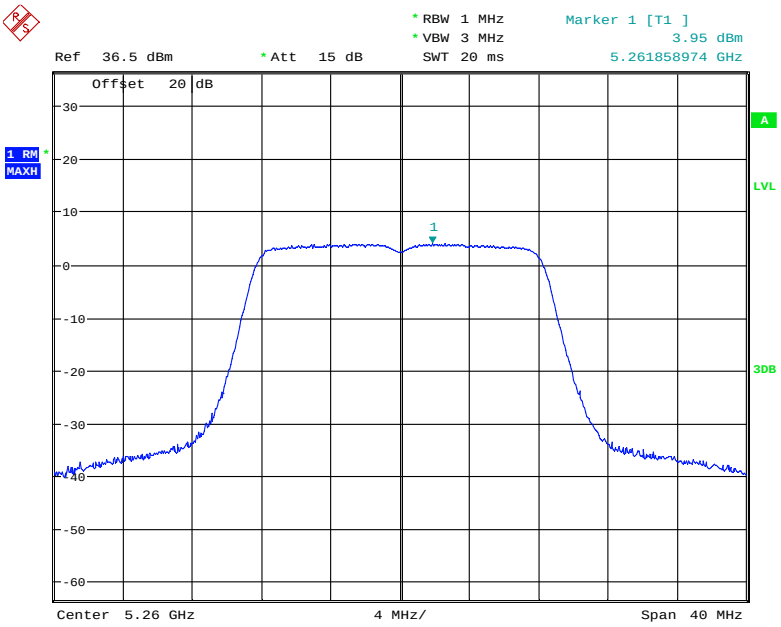
Date: 19.DEC.2020 15:41:44

802.11a mode, Power Spectral Density, 5320 MHz



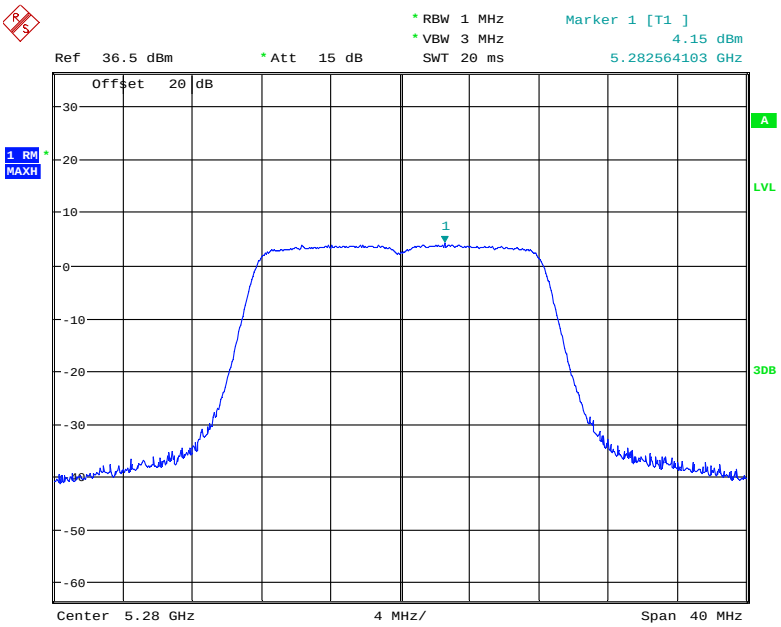
Date: 19.DEC.2020 15:40:06

802.11n20 mode, Power Spectral Density, 5260 MHz



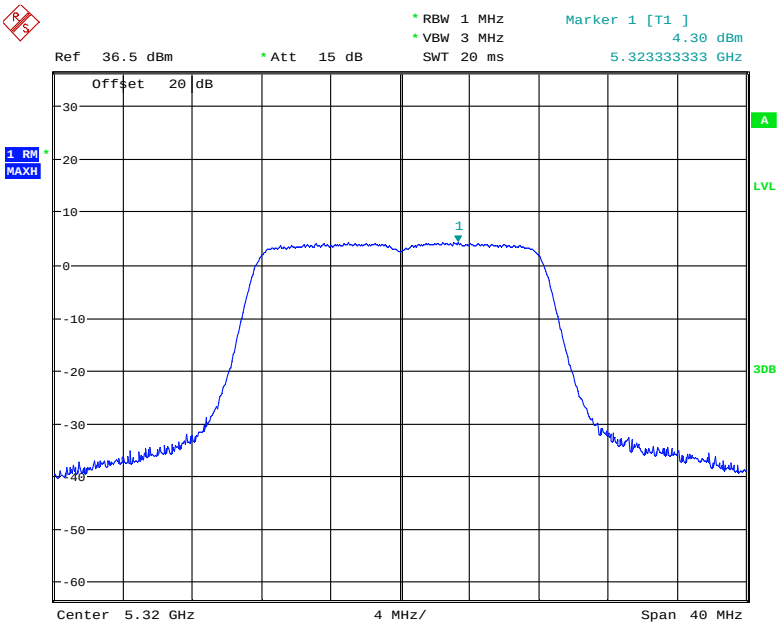
Date: 31.DEC.2020 16:53:25

802.11n20 mode, Power Spectral Density, 5280 MHz



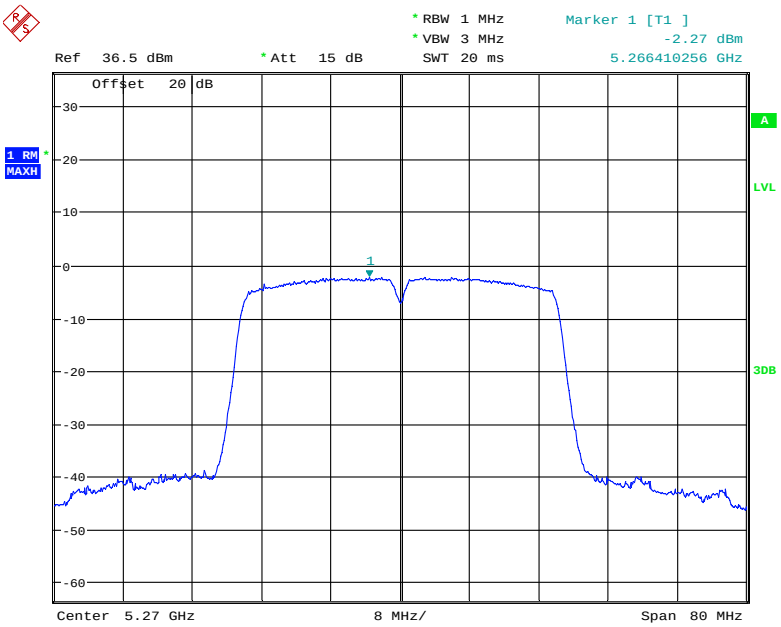
Date: 31.DEC.2020 16:56:33

802.11n20 mode, Power Spectral Density, 5320 MHz



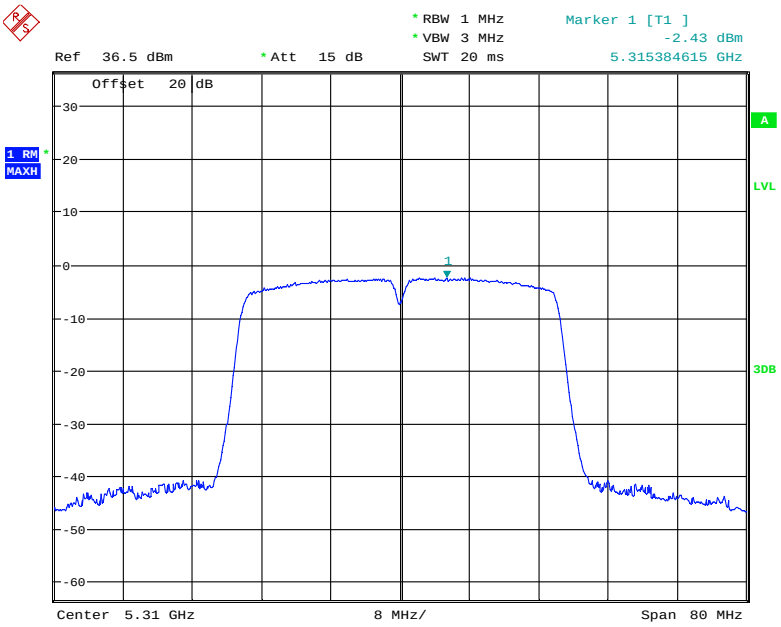
Date: 31.DEC.2020 16:58:37

802.11n40 mode, Power Spectral Density, 5270 MHz



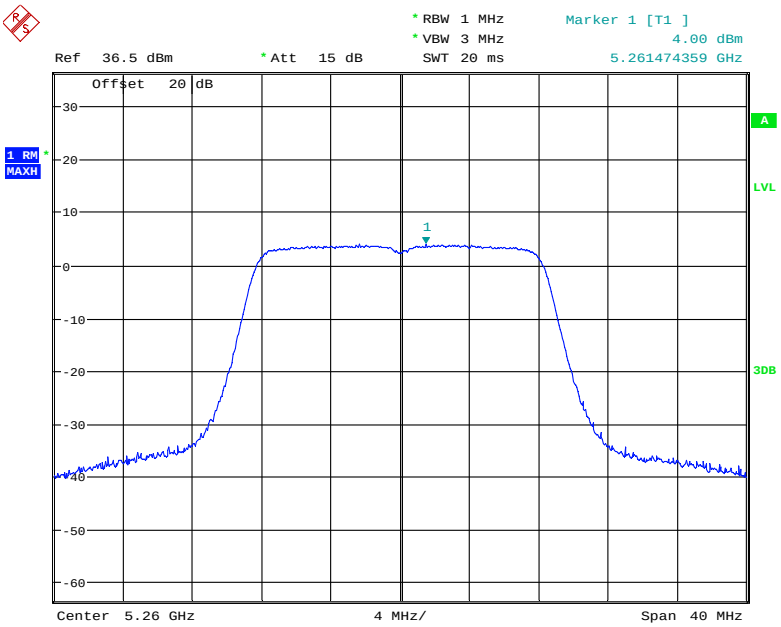
Date: 31.DEC.2020 13:57:53

802.11n40 mode, Power Spectral Density, 5310 MHz



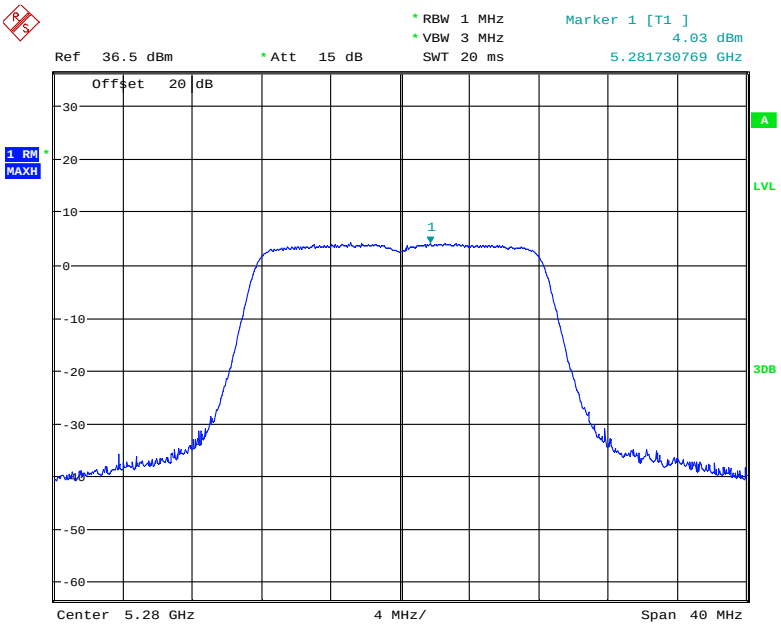
Date: 31.DEC.2020 14:07:29

802.11ac20 mode, Power Spectral Density, 5260 MHz



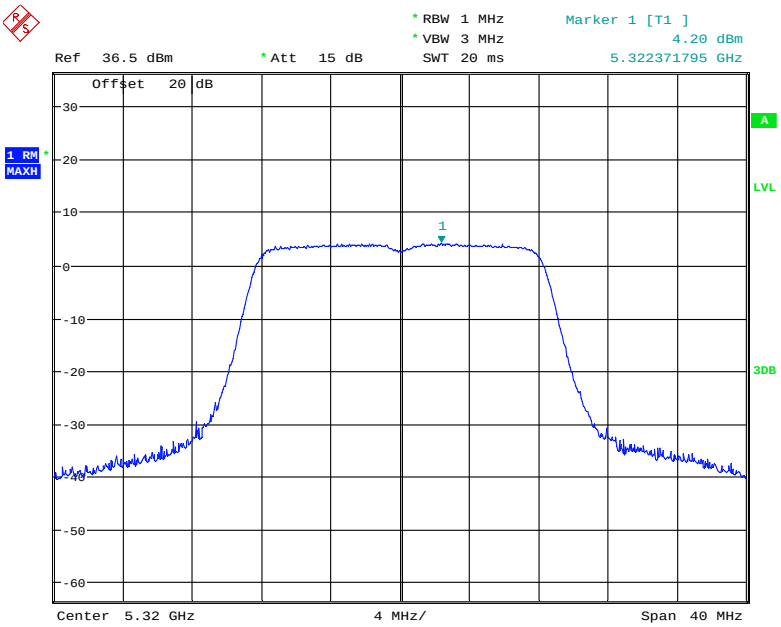
Date: 31.DEC.2020 16:54:54

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



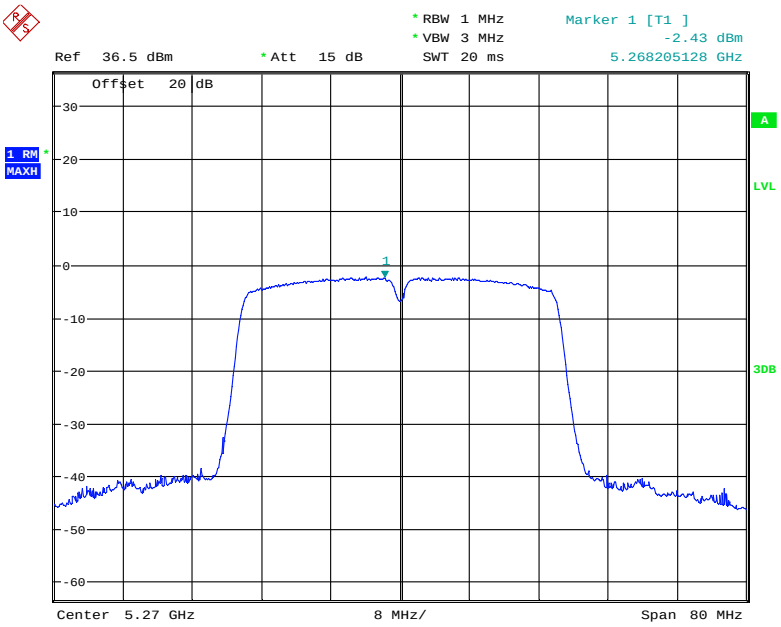
Date: 31.DEC.2020 16:56:05

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



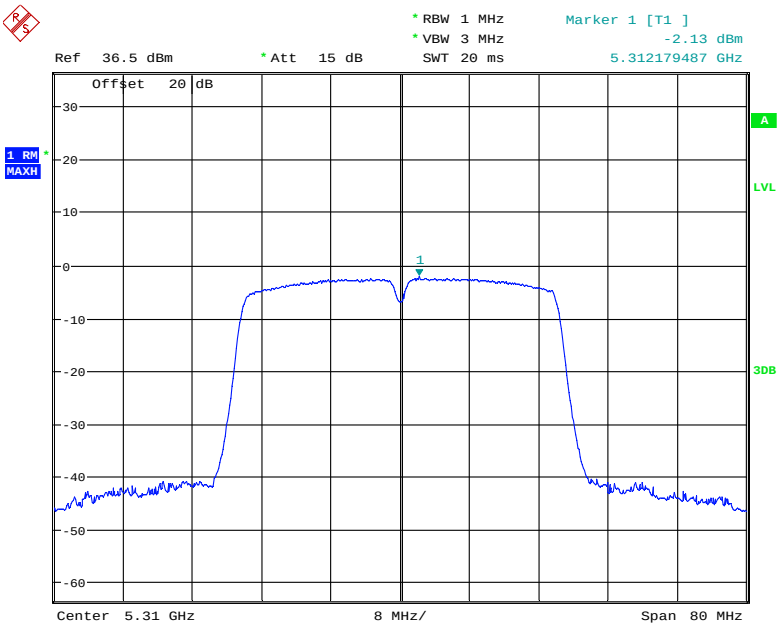
Date: 31.DEC.2020 16:59:09

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



Date: 31.DEC.2020 14:02:05

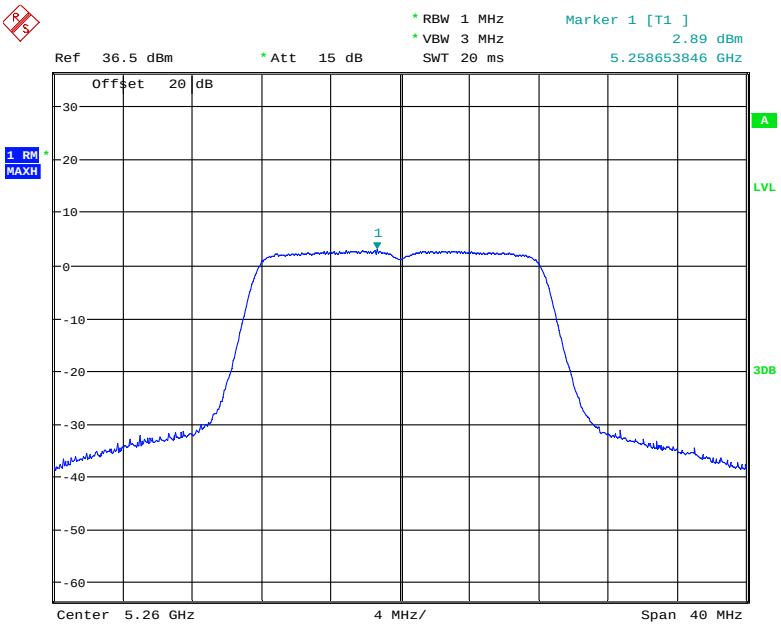
802. 11ac40 mode, Power Spectral Density, 5310 MHz



Date: 31.DEC.2020 14:06:21

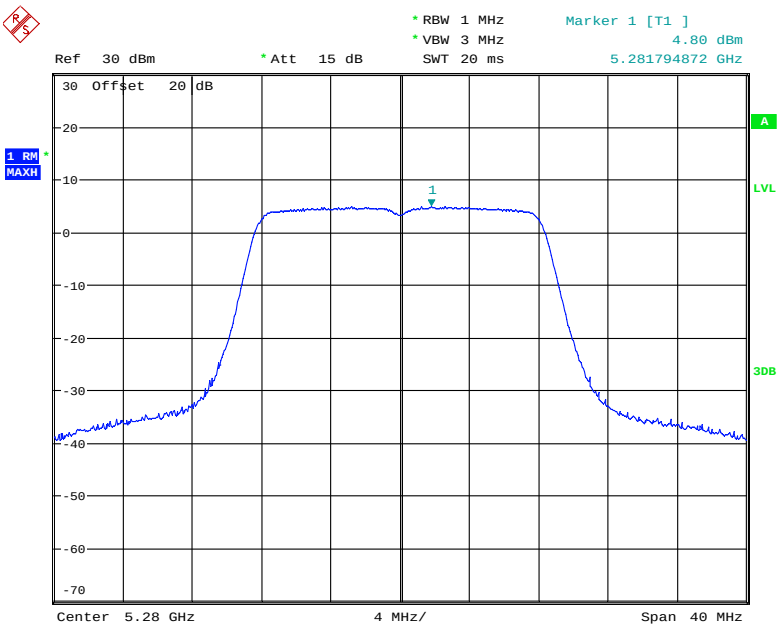
Antenna 1:

802.11a mode, Power Spectral Density, 5260 MHz



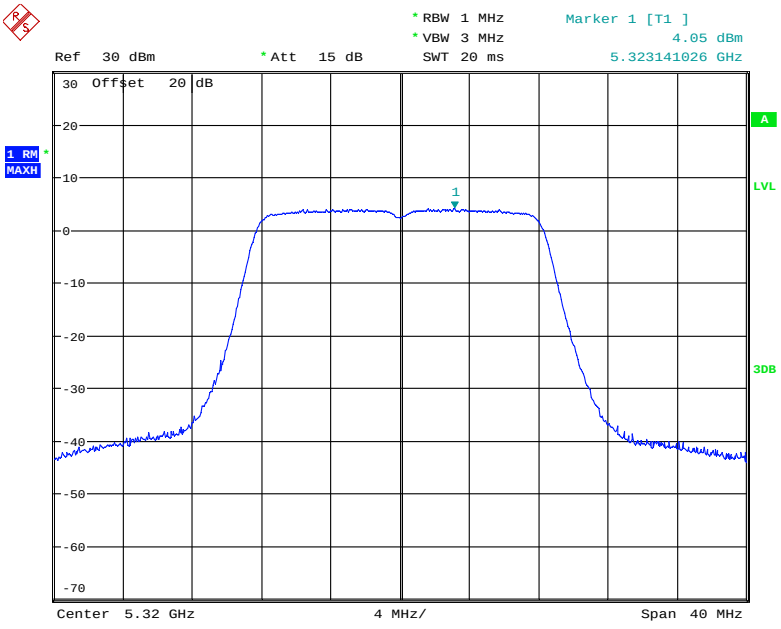
Date: 31.DEC.2020 13:23:03

802.11a mode, Power Spectral Density, 5280 MHz



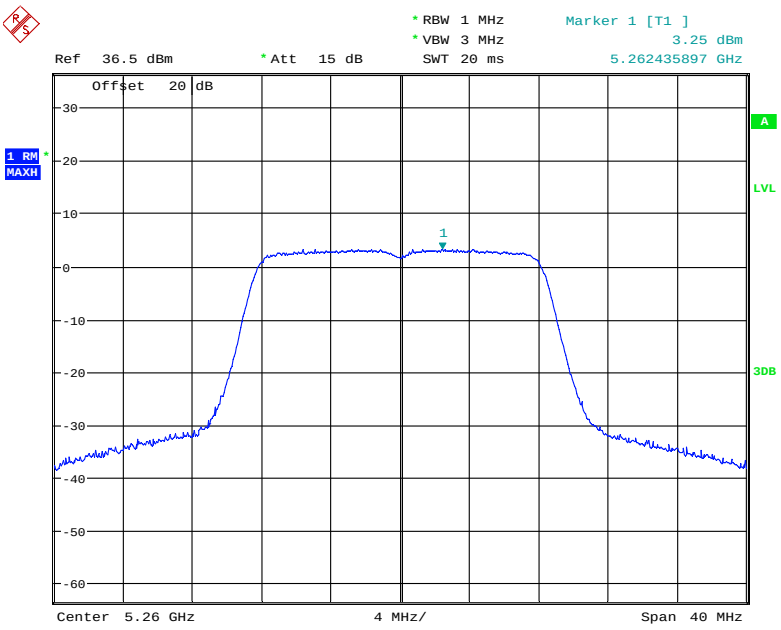
Date: 19.DEC.2020 11:36:10

802.11a mode, Power Spectral Density, 5320 MHz



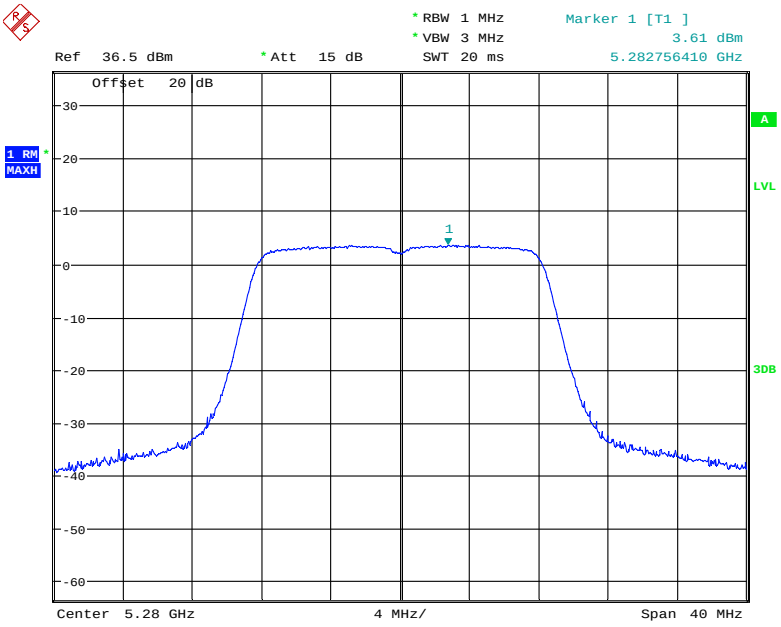
Date: 19.DEC.2020 11:41:35

802.11n20 mode, Power Spectral Density, 5260 MHz



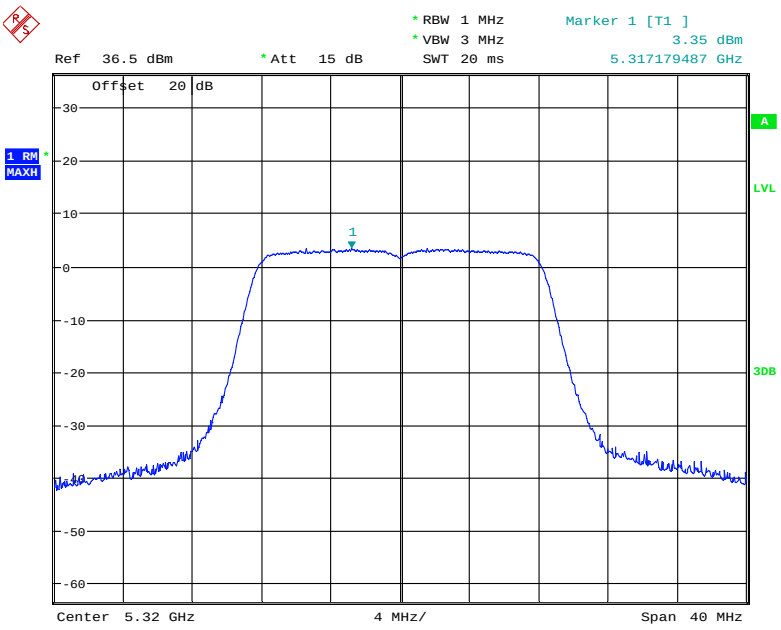
Date: 31.DEC.2020 18:23:46

802.11n20 mode, Power Spectral Density, 5280 MHz



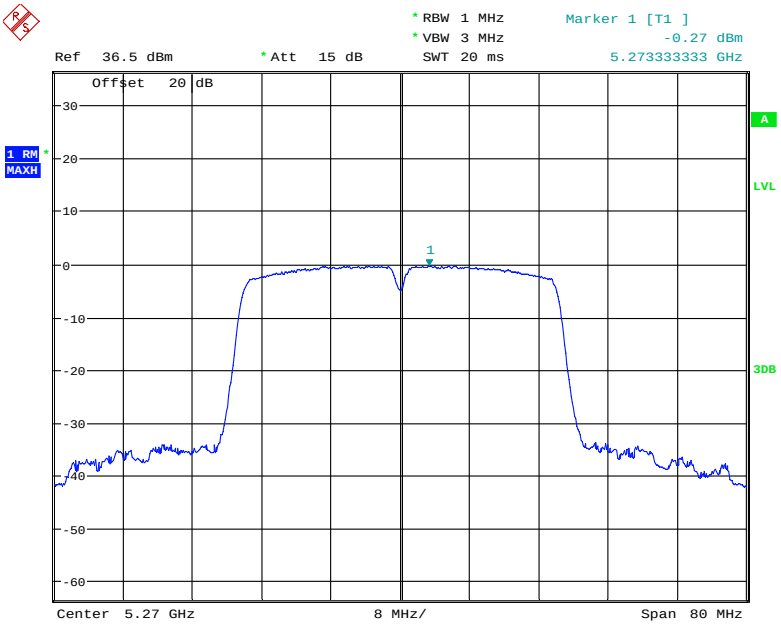
Date: 31.DEC.2020 18:29:38

802.11n20 mode, Power Spectral Density, 5320 MHz



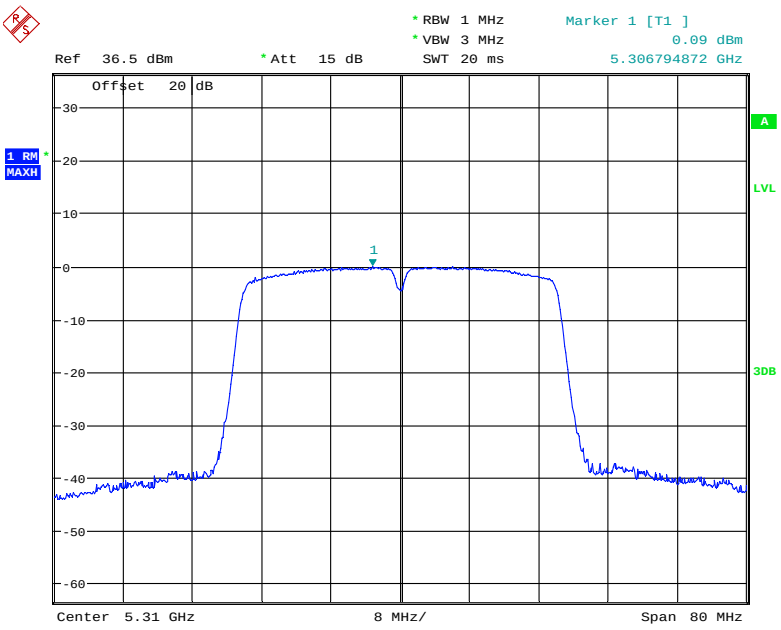
Date: 31.DEC.2020 18:50:56

802.11n40 mode, Power Spectral Density, 5270 MHz



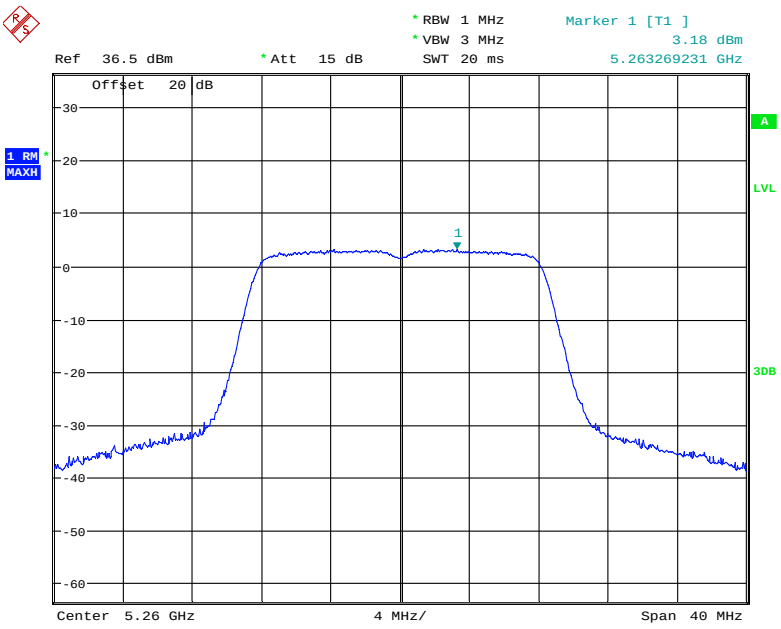
Date: 31.DEC.2020 13:26:52

802.11n40 mode, Power Spectral Density, 5310 MHz



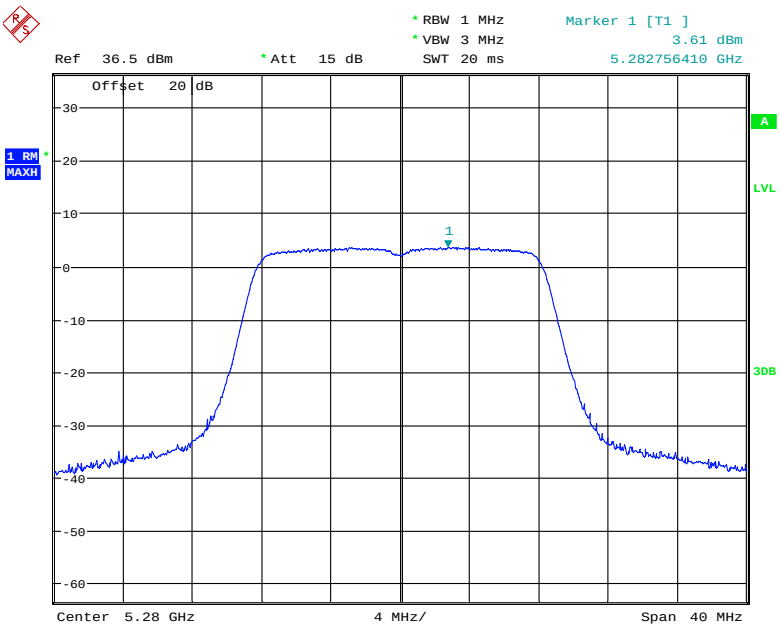
Date: 31.DEC.2020 13:30:53

802.11ac20 mode, Power Spectral Density, 5260 MHz



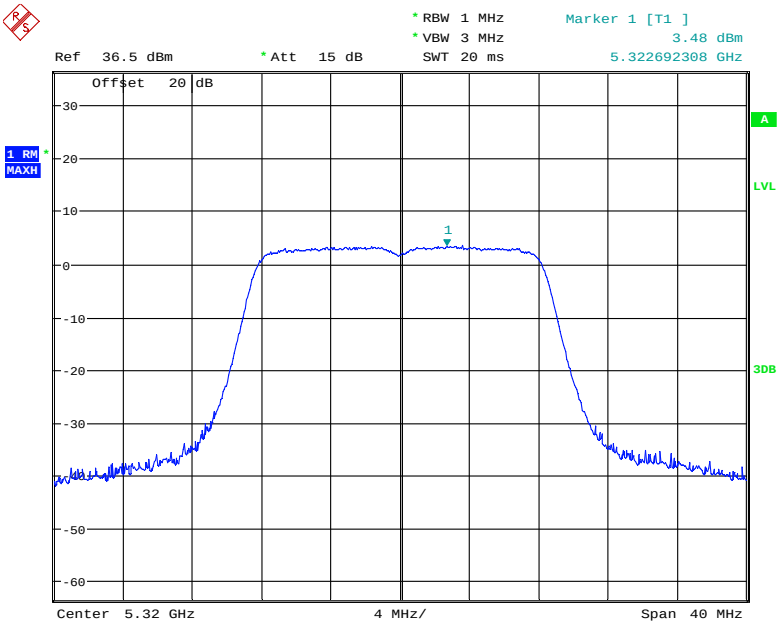
Date: 31.DEC.2020 18:24:27

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



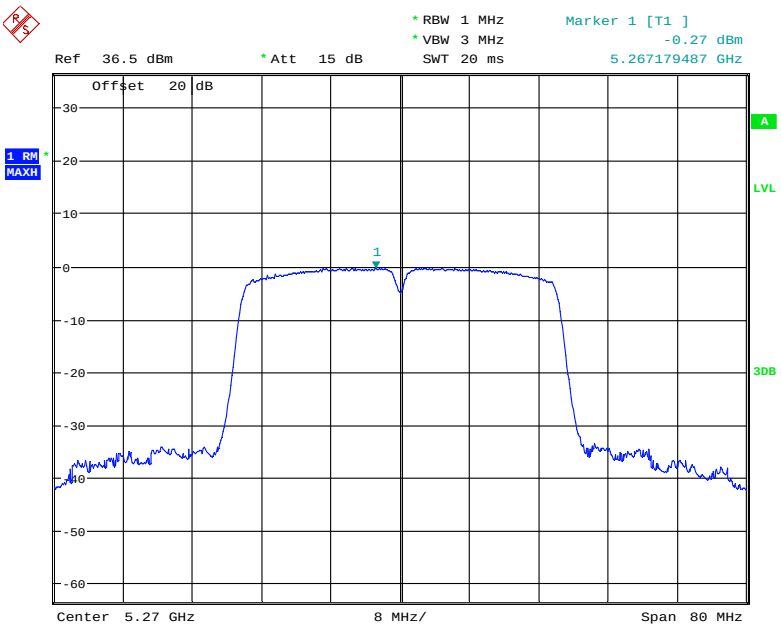
Date: 31.DEC.2020 18:29:38

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



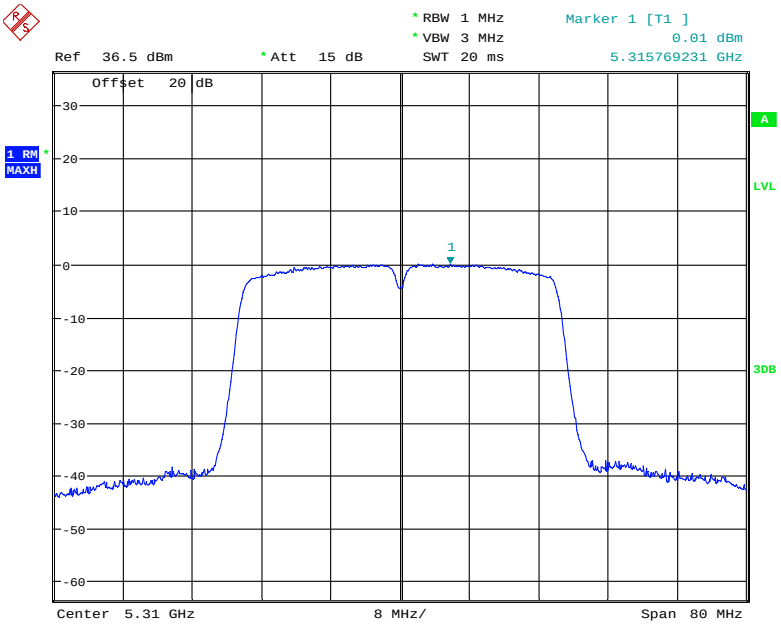
Date: 31.DEC.2020 18:51:29

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



Date: 31.DEC.2020 13:27:49

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



Date: 31.DEC.2020 13:30:19

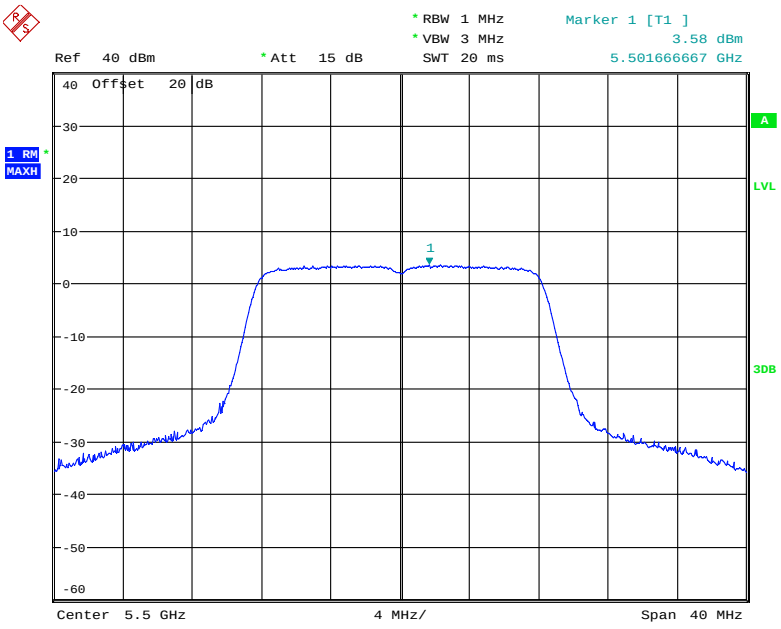
5470 MHz – 5725 MHz:

Frequency (MHz)	Antenna Port	Power Spectral Density (dBm/MHz)	Total Power Spectral (dBm/MHz)	Limit (dBm/MHz)
802.11a				
5500	0	3.58	7.29	8.5
	1	4.89		
5580	0	3.46	6.76	
	1	4.03		
5700	0	4.03	6.99	
	1	3.92		
802.11n20				
5500	0	3.54	7.36	8.5
	1	5.03		
5580	0	3.55	6.82	
	1	4.06		
5700	0	3.95	7.01	
	1	4.04		
802.11n40				
5510	0	1.10	4.22	8.5
	1	1.32		
5550	0	1.62	4.87	
	1	2.09		
5670	0	0.49	3.05	
	1	-0.46		
802.11ac20				
5500	0	3.92	7.13	8.5
	1	4.31		
5580	0	3.29	6.70	
	1	4.05		
5700	0	4.04	6.98	
	1	3.90		
802.11ac40				
5510	0	1.01	4.21	8.5
	1	1.39		
5550	0	1.80	4.91	
	1	1.99		
5670	0	0.55	3.12	
	1	-0.39		

Note:
For power spectral density:
Directional gain = array gain+Ant gain=10*log(Nant/Nss)+ 5.5dBi =8.5dBi>6dBi,
So Limit=11-(8.5-6)=8.5dBm

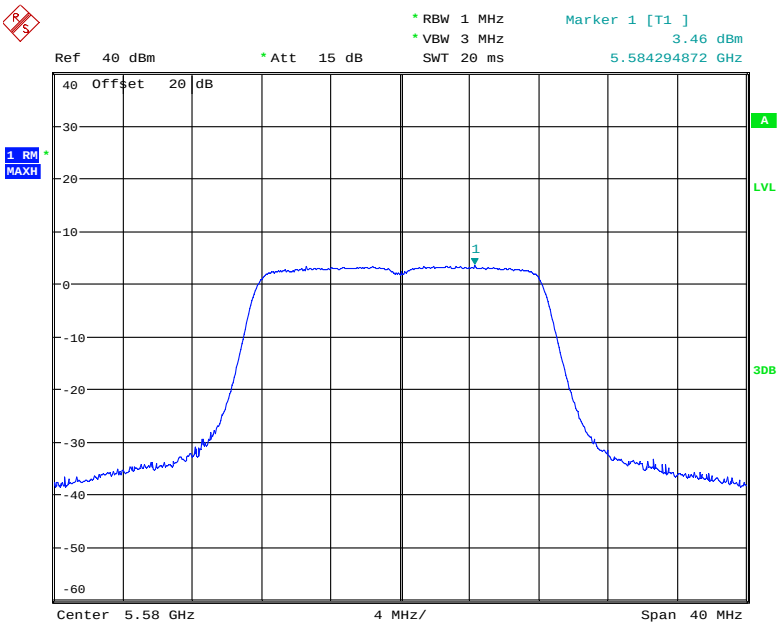
Antenna 0:

802.11a mode, Power Spectral Density, 5500 MHz



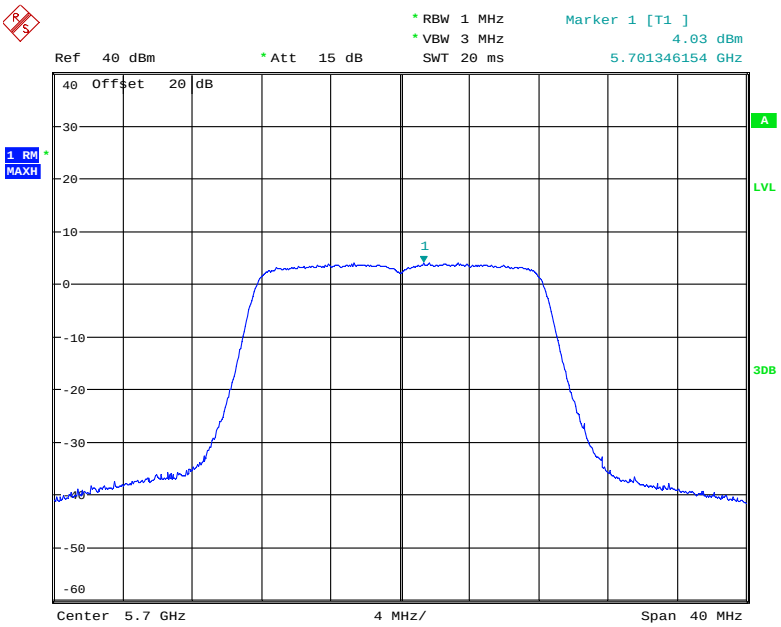
Date: 19.DEC.2020 14:49:40

802.11a mode, Power Spectral Density, 5580 MHz



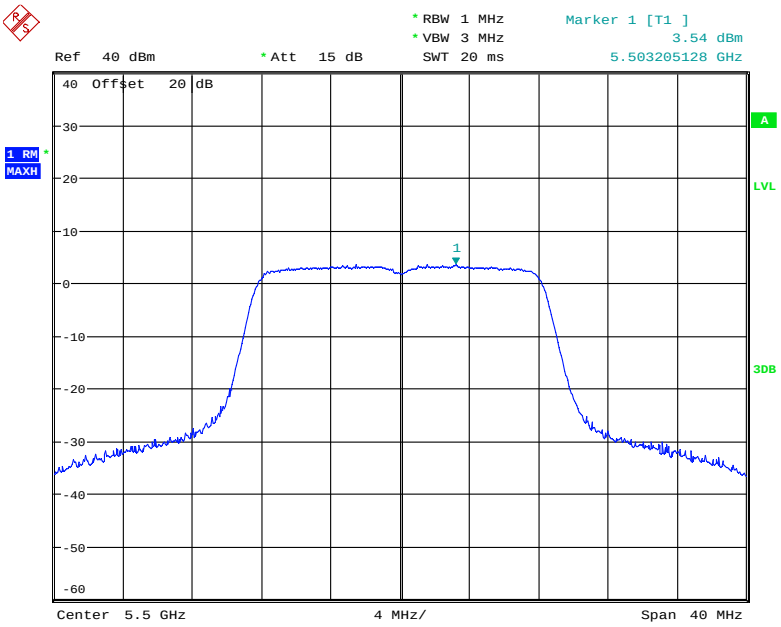
Date: 19.DEC.2020 14:47:12

802.11a mode, Power Spectral Density, 5700 MHz



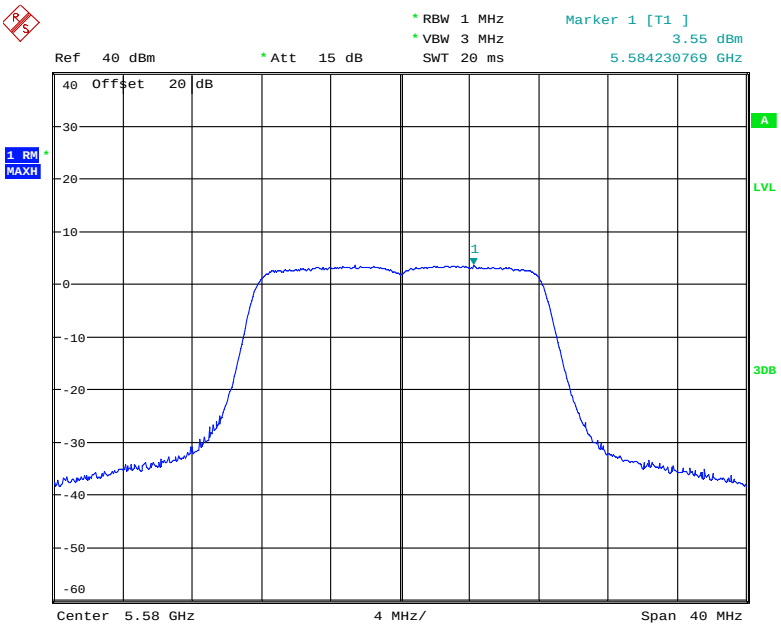
Date: 19.DEC.2020 14:42:56

802.11n20 mode, Power Spectral Density, 5500 MHz



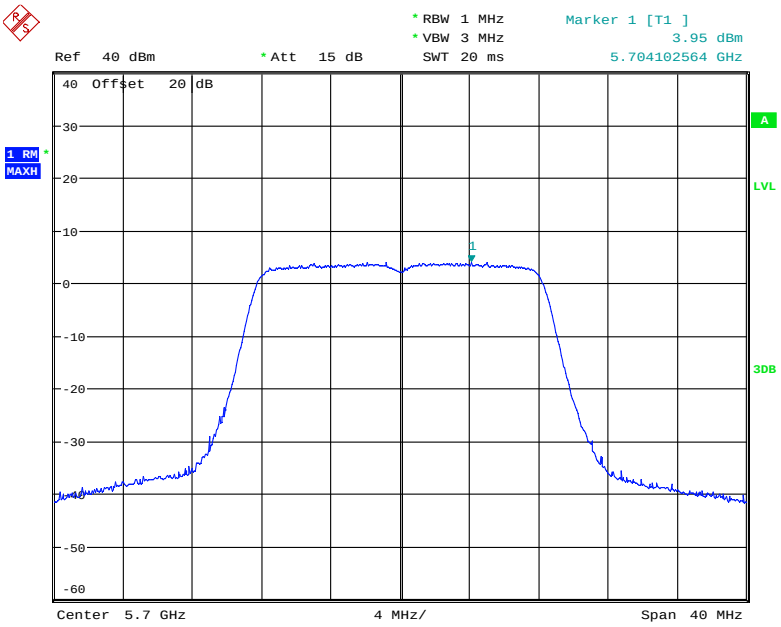
Date: 19.DEC.2020 14:50:57

802.11n20 mode, Power Spectral Density, 5580 MHz



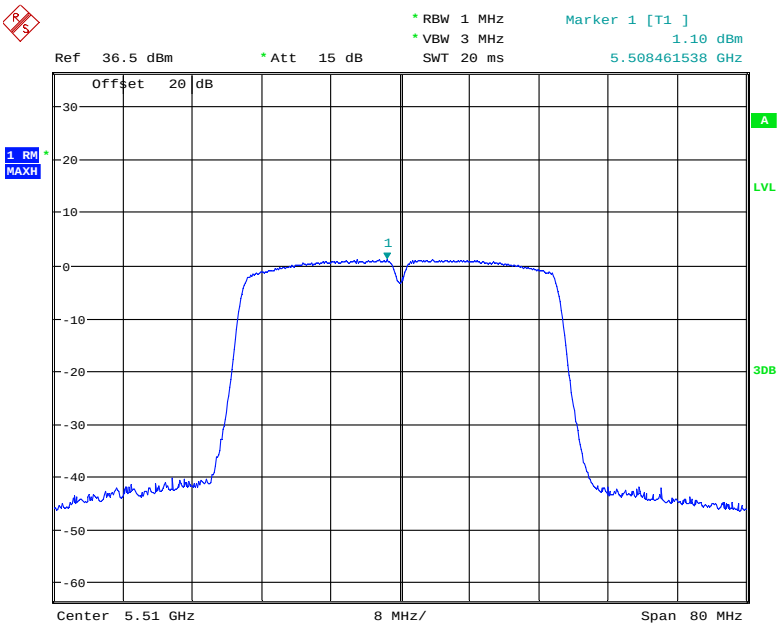
Date: 19.DEC.2020 14:55:21

802.11n20 mode, Power Spectral Density, 5700 MHz



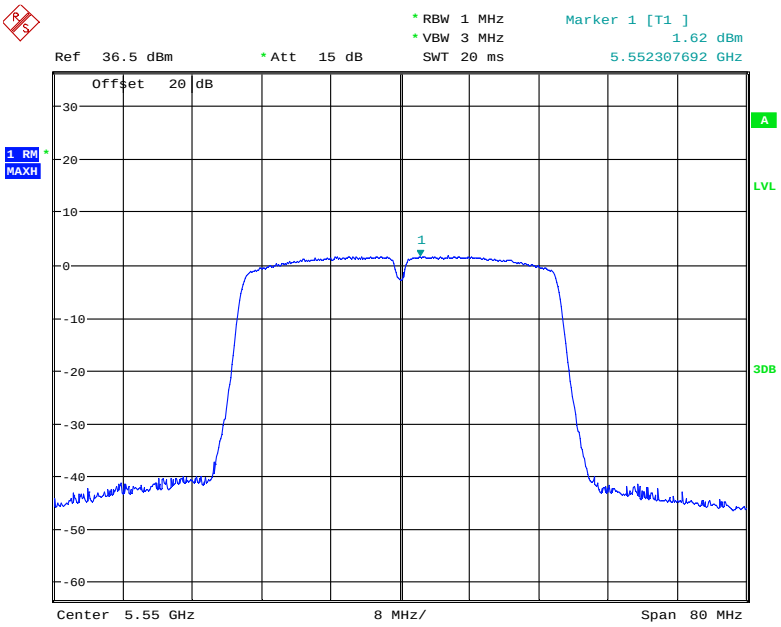
Date: 19.DEC.2020 14:56:09

802.11n40 mode, Power Spectral Density, 5510 MHz



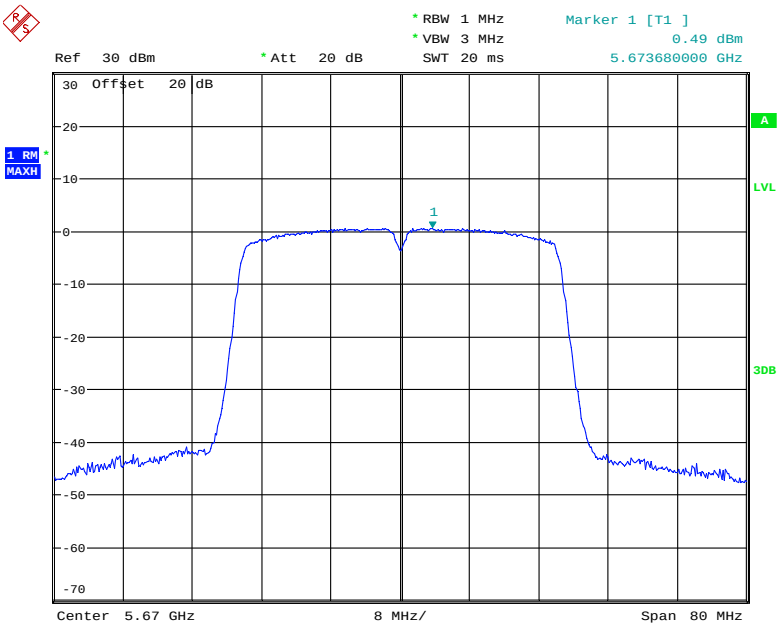
Date: 31.DEC.2020 14:31:31

802.11n40 mode, Power Spectral Density, 5550 MHz



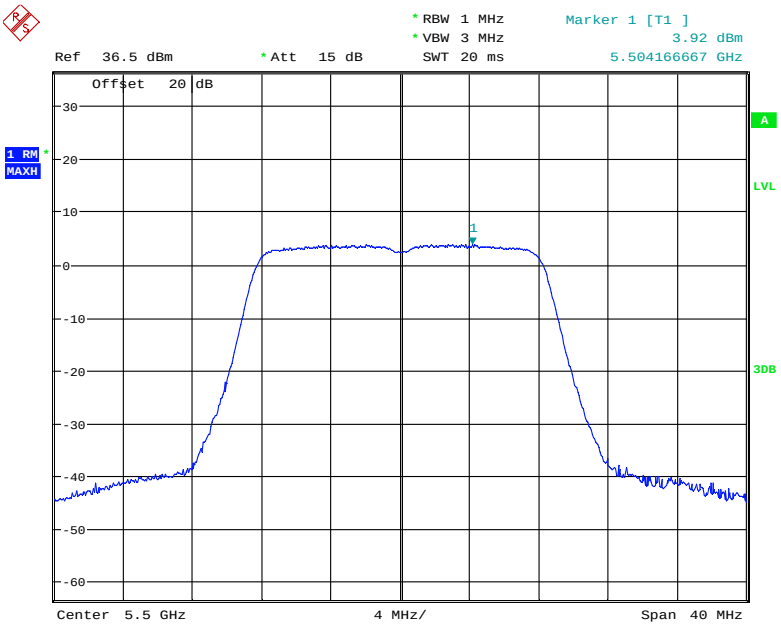
Date: 31.DEC.2020 14:33:18

802.11n40 mode, Power Spectral Density, 5670 MHz



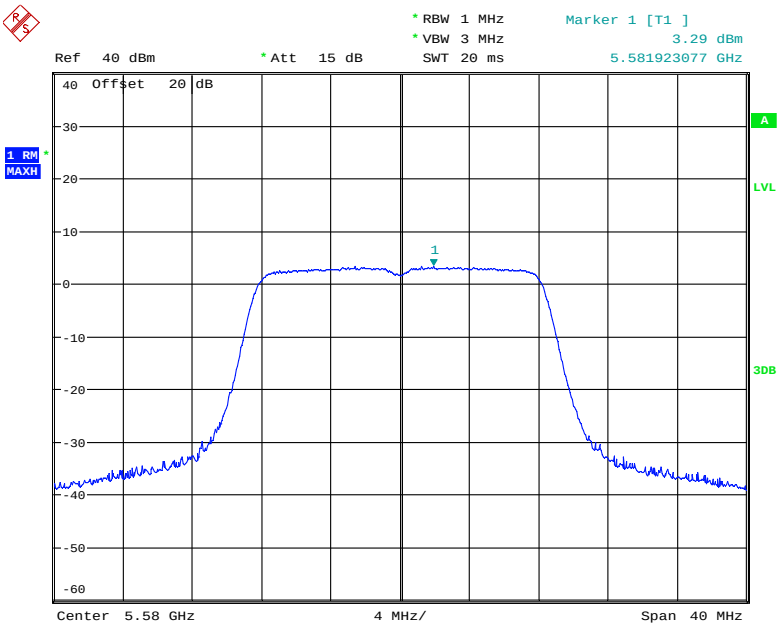
Date: 4.JAN.2021 09:09:24

802.11ac20 mode, Power Spectral Density, 5500 MHz



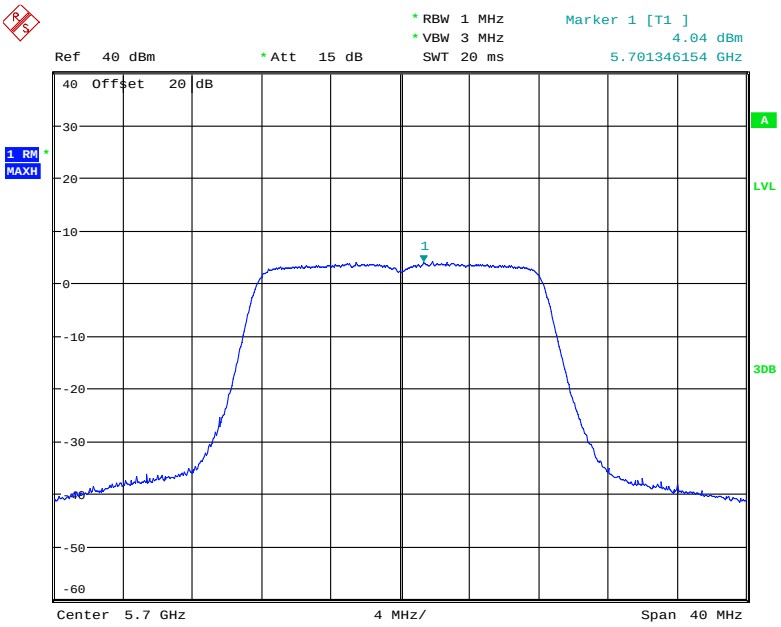
Date: 31.DEC.2020 17:11:10

802. 11ac20 mode, Power Spectral Density, 5580 MHz



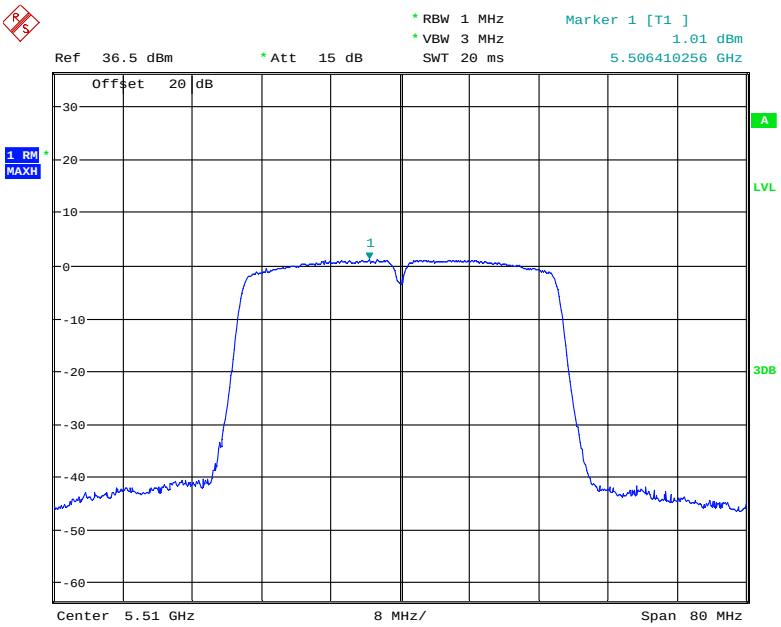
Date: 19.DEC.2020 14:53:37

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



Date: 19.DEC.2020 14:57:38

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



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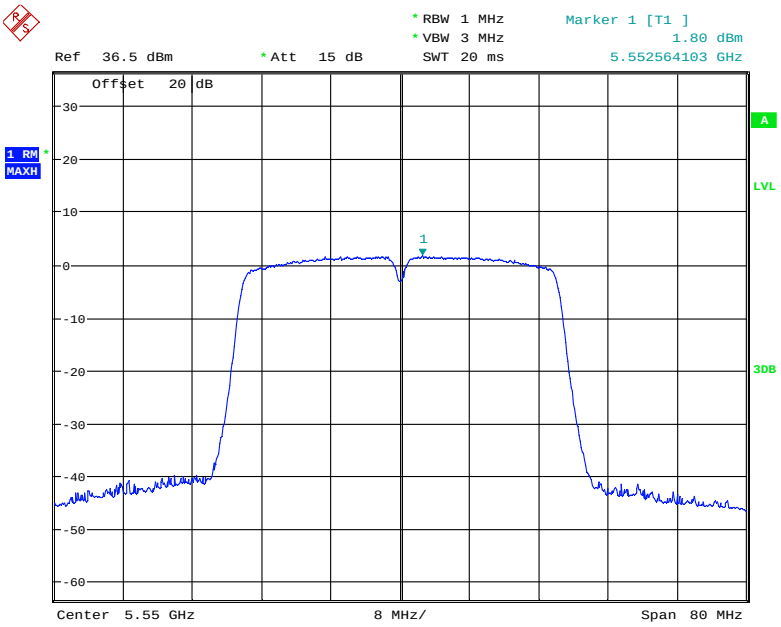
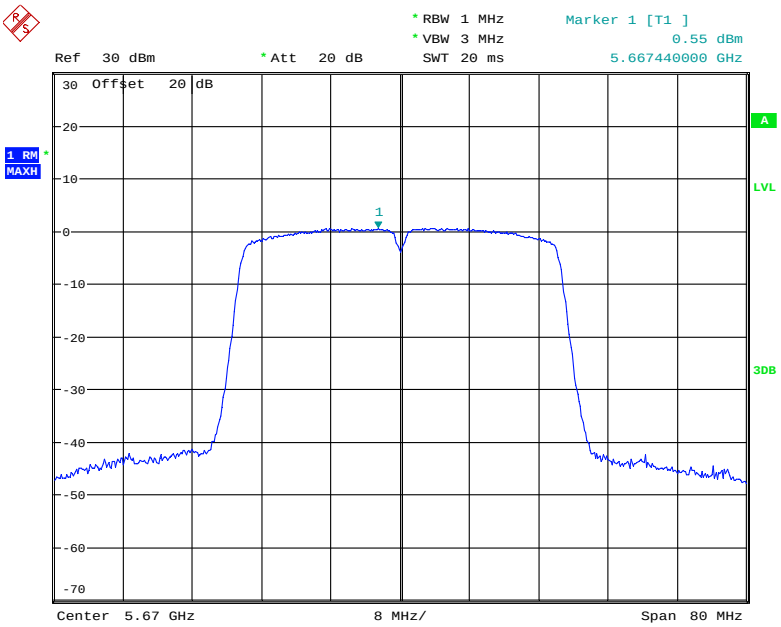
802. 11ac40 mode, Power Spectral Density, 5550 MHz



Date: 31.DEC.2020 14:32:51

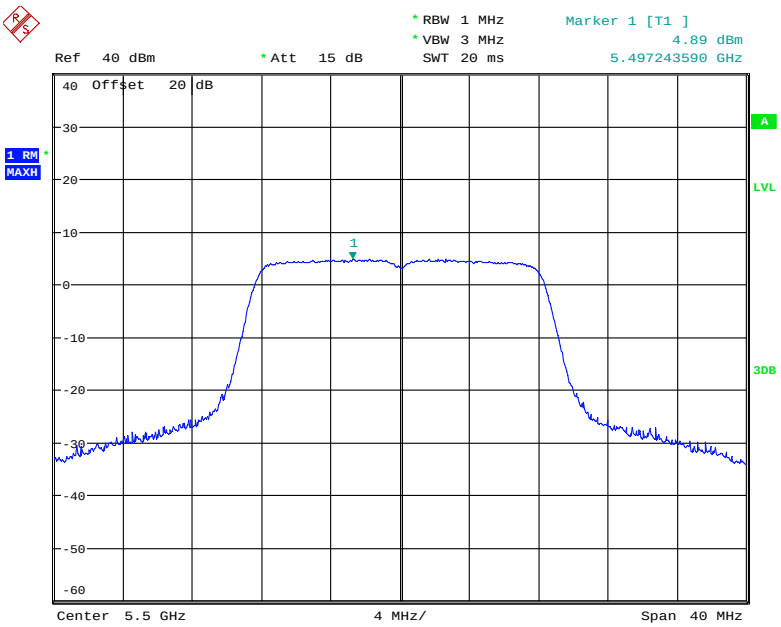
802. 11ac40 mode, Power Spectral Density, 5670 MHz



Date: 4.JAN.2021 09:08:56

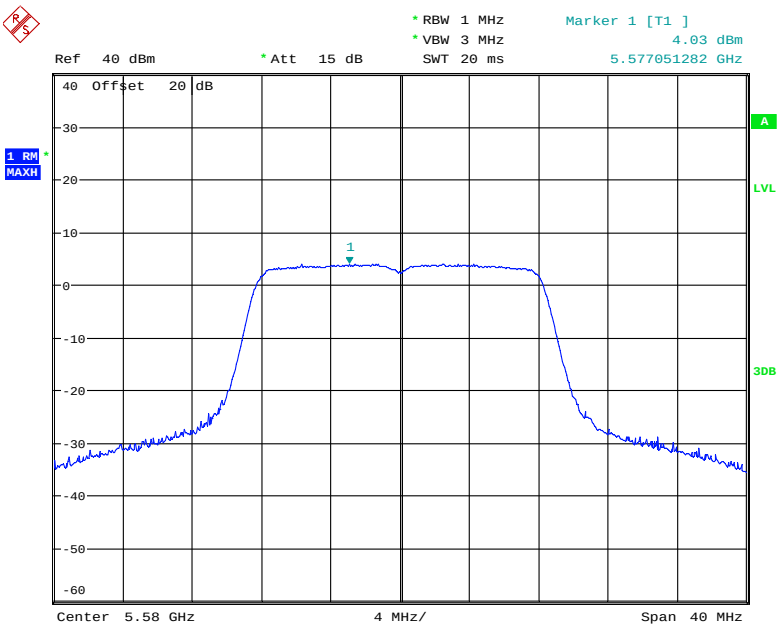
Antenna 1:

802.11a mode, Power Spectral Density, 5500 MHz



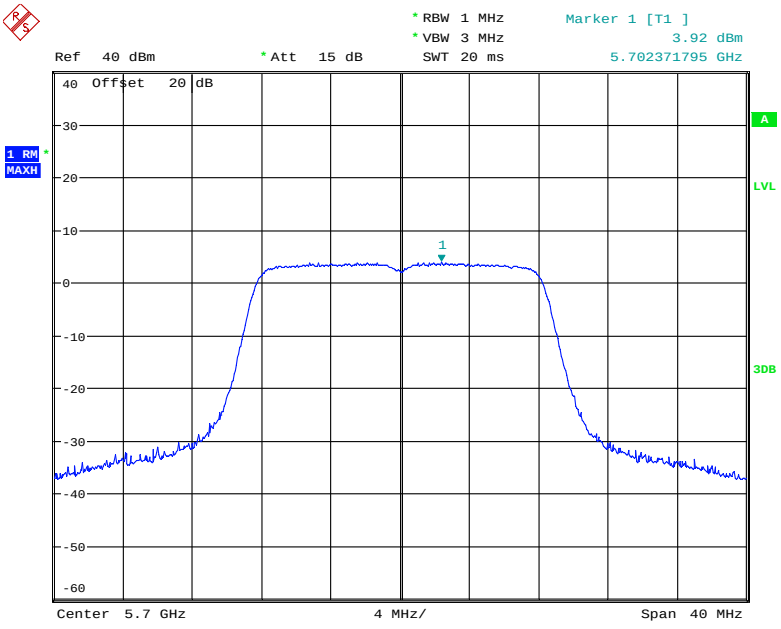
Date: 19.DEC.2020 14:29:32

802.11a mode, Power Spectral Density, 5580 MHz



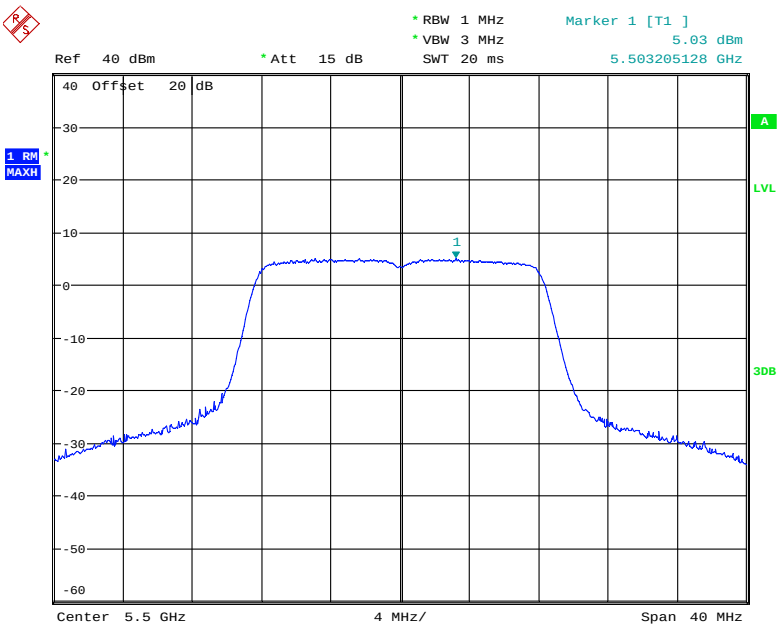
Date: 19.DEC.2020 14:32:00

802.11a mode, Power Spectral Density, 5700 MHz



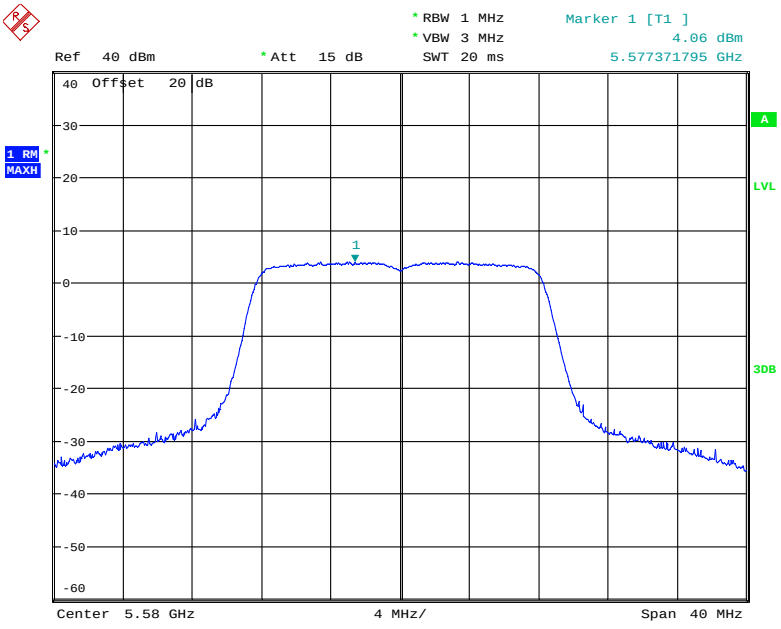
Date: 19.DEC.2020 14:39:40

802.11n20 mode, Power Spectral Density, 5500 MHz



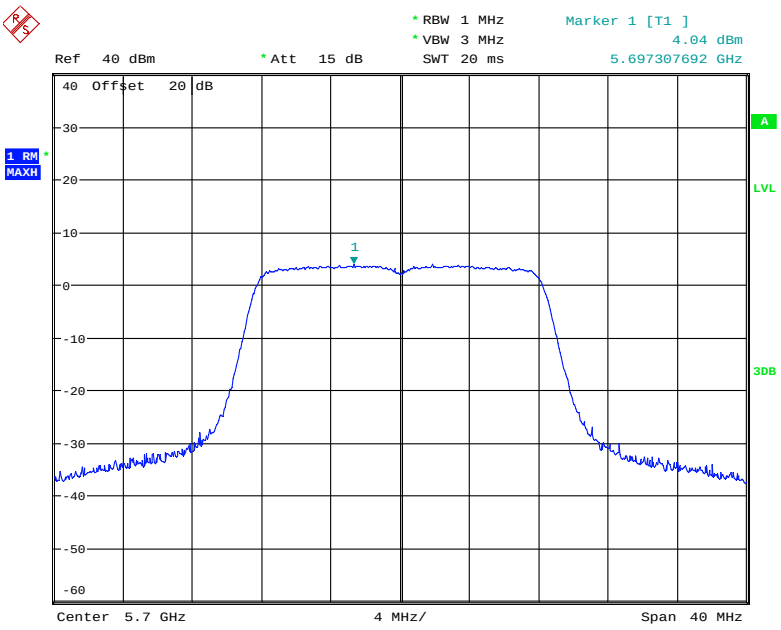
Date: 19.DEC.2020 14:25:54

802.11n20 mode, Power Spectral Density, 5580 MHz



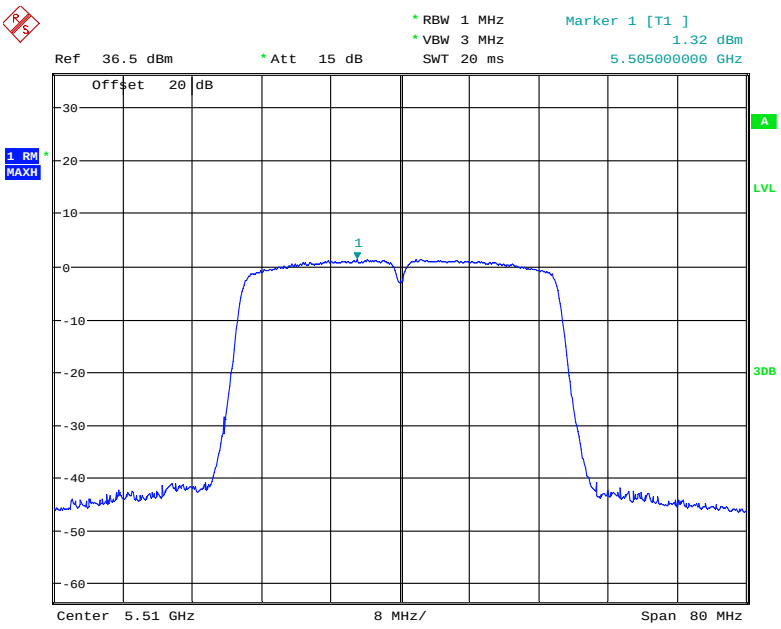
Date: 19.DEC.2020 14:33:26

802.11n20 mode, Power Spectral Density, 5700 MHz



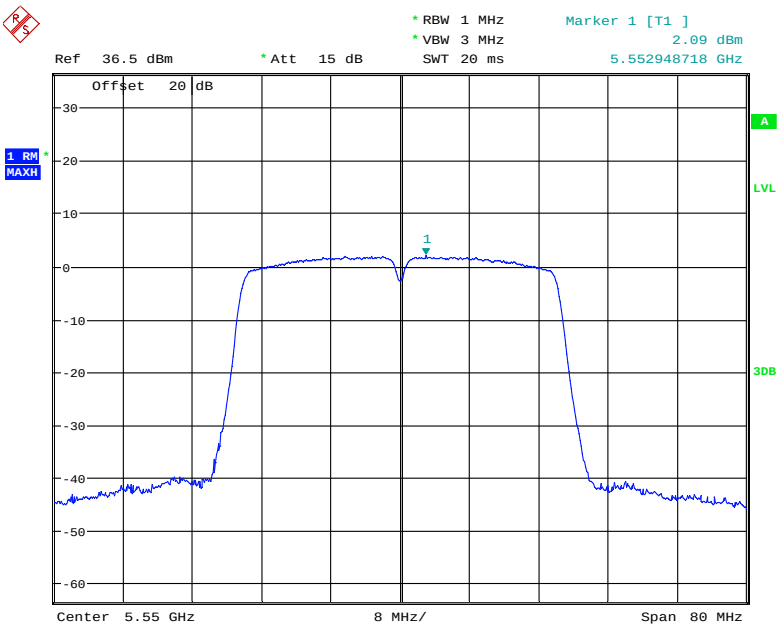
Date: 19.DEC.2020 14:38:09

802.11n40 mode, Power Spectral Density, 5510 MHz



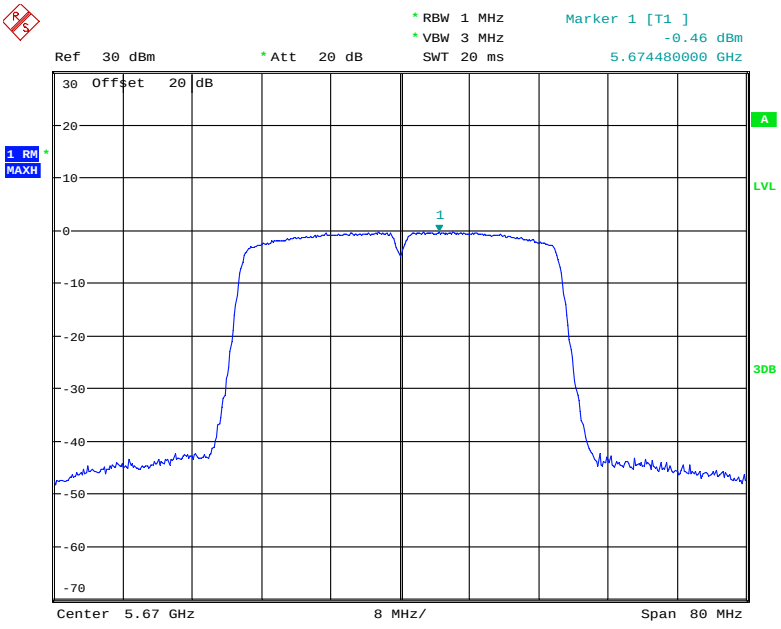
Date: 31.DEC.2020 13:42:10

802.11n40 mode, Power Spectral Density, 5550 MHz



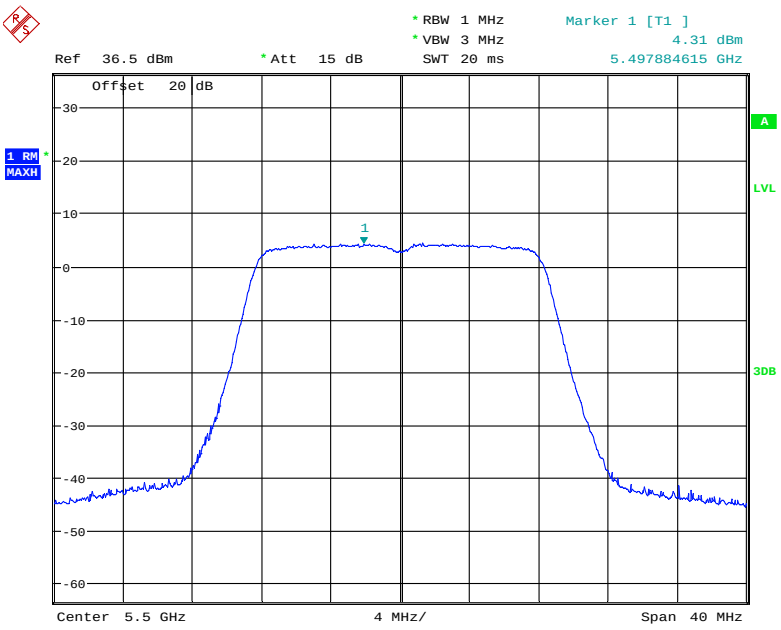
Date: 31.DEC.2020 13:42:57

802.11n40 mode, Power Spectral Density, 5670 MHz



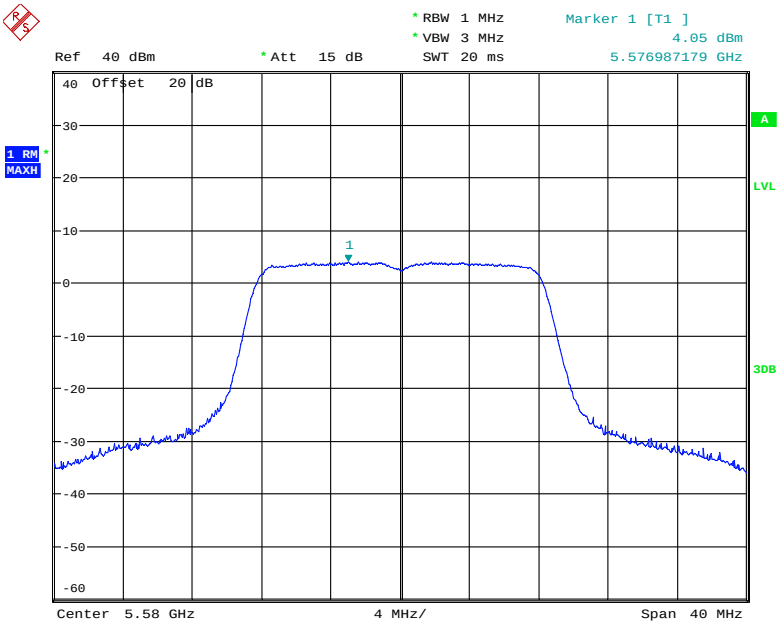
Date: 4.JAN.2021 09:07:42

802.11ac20 mode, Power Spectral Density, 5500 MHz



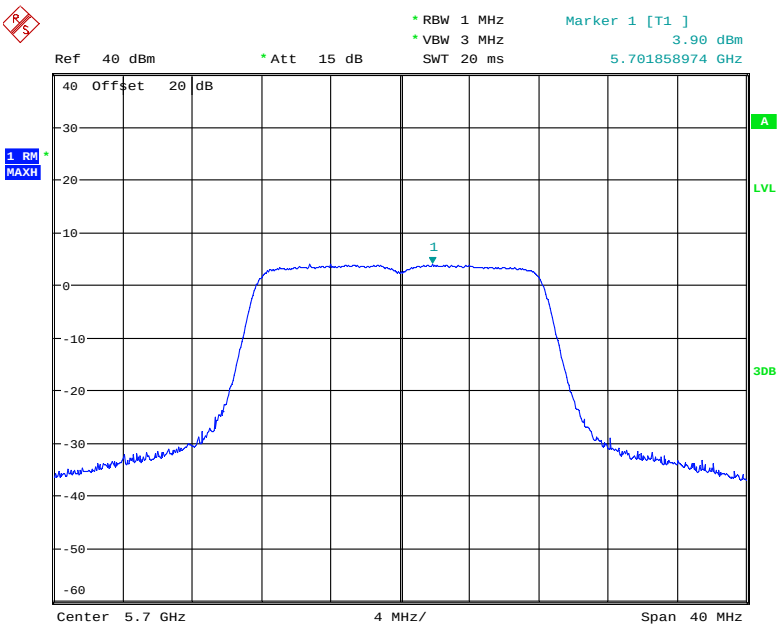
Date: 31.DEC.2020 18:54:16

802. 11ac20 mode, Power Spectral Density, 5580 MHz



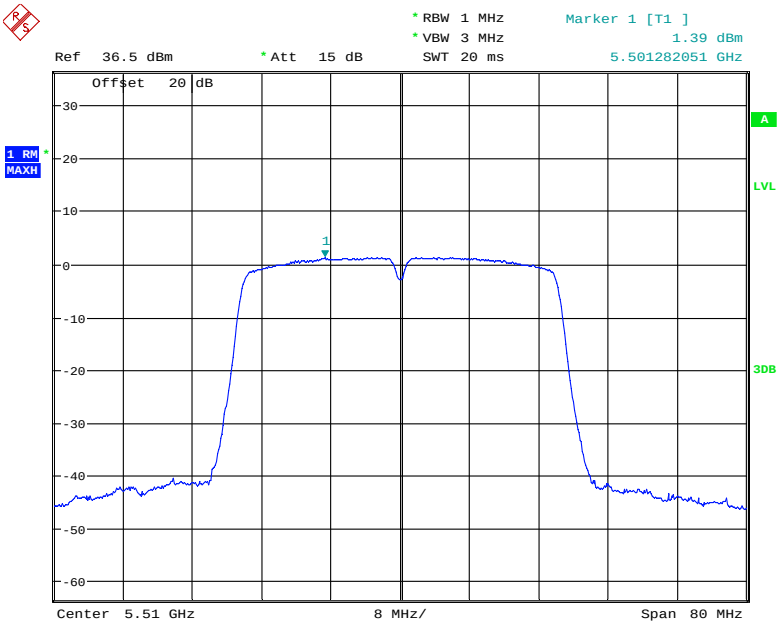
Date: 19.DEC.2020 14:34:45

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



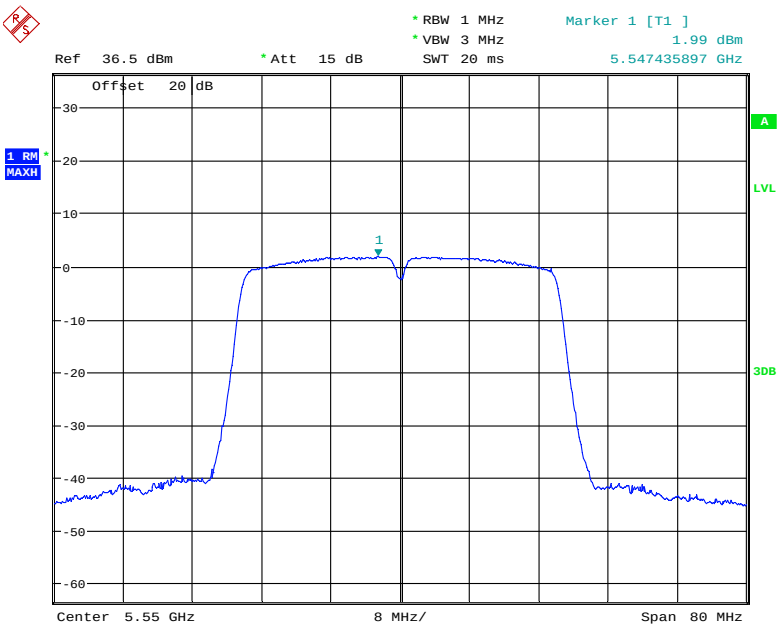
Date: 19.DEC.2020 14:35:58

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



Date: 31.DEC.2020 13:40:50

802. 11ac40 mode, Power Spectral Density, 5550 MHz



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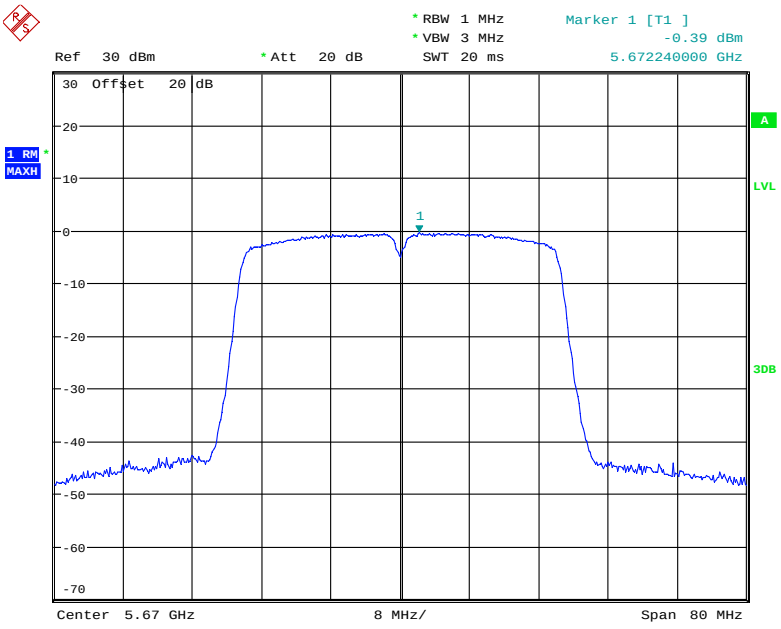
802. 11ac40 mode, Power Spectral Density, 5670 MHz



Date: 4.JAN.2021 09:08:09

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