FCC PART 15.407

TEST REPORT

For

CAPTANA GMBH

Bundesstrasse 16, D-77955 Ettenheim, Germany

FCC ID: 2APO5-SHELFCAM

Report Type:	Product Type:
Original Report	Shelfcam

Report Number:	RTZ201222003-00C
Report Date:	2021-03-20
Reviewed By:	Candy Li RF Engineer
Prepared By:	Shenzhen Accurate Technology Co., Ltd. 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China Tel: (0755) 26503290 Fax: (0755) 26503396 Http://www.atc-lab.com

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

Shenzhen Accurate Technology Co., Ltd. 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.

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Shelfcam
Tested Model	shelfEye
Multiple Model	shelfEye Pro
Model Differences	All the same except for pixels of the camera
Frequency Range	5G Wi-Fi: 5150-5250 MHz; 5725-5850 MHz
Maximum Average Conducted Output Power	5G Wi-Fi: 5150-5250 MHz: 14.52dBm (802.11a), 12.18dBm(802.11n20), 11.29 dBm(802.11n40) 11.13dBm (802.11ac20) 5725-5850 MHz: 14.29dBm (802.11a), 11.40dBm(802.11n20), 11.23dBm(802.11n40) 10.23dBm (802.11ac20)
Modulation Technique	OFDM
Antenna Specification	4.05 dBi
Voltage Range	DC3.7V from battery or DC 5.0V from USB Port
Date of Test	2021-01-04 to 2021-03-20
Sample serial number	RTZ201222003-RF-S1 (Assigned by ATC)
Received date	2020-12-22
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.

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 Shenzhen Accurate Technology Co., Ltd.. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
AC Power Lines Conducted Emissions		±2.72dB
Emissions, Radiated	30MHz - 1GHz	±4.28dB
	1GHz- 18GHz	±4.98dB
	18GHz- 26.5GHz	±5.06dB

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 Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. 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.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A-2

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The device only supports 5G Wi-Fi 802.11a/n20/n40/ac20 modes, which was declared by manufacturer.

For 5150-5250MHz Band, 6 channels are provided to testing:

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

For 802.11a, 802.11n20, 802.11ac20 channel 36, 40, 48 were tested; For 802.11n40 channel 38, 46 were tested.

For 5725-5850MHz Band, 7 channels are provided to testing:

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

For 802.11a, 802.11n20, 802.11ac20 channel 149, 157, 165 were tested; For 802.11n40, channel 151, 159 were tested.

EUT Exercise Software

"AmebaPRO mptool 1v8" exercise software was used.

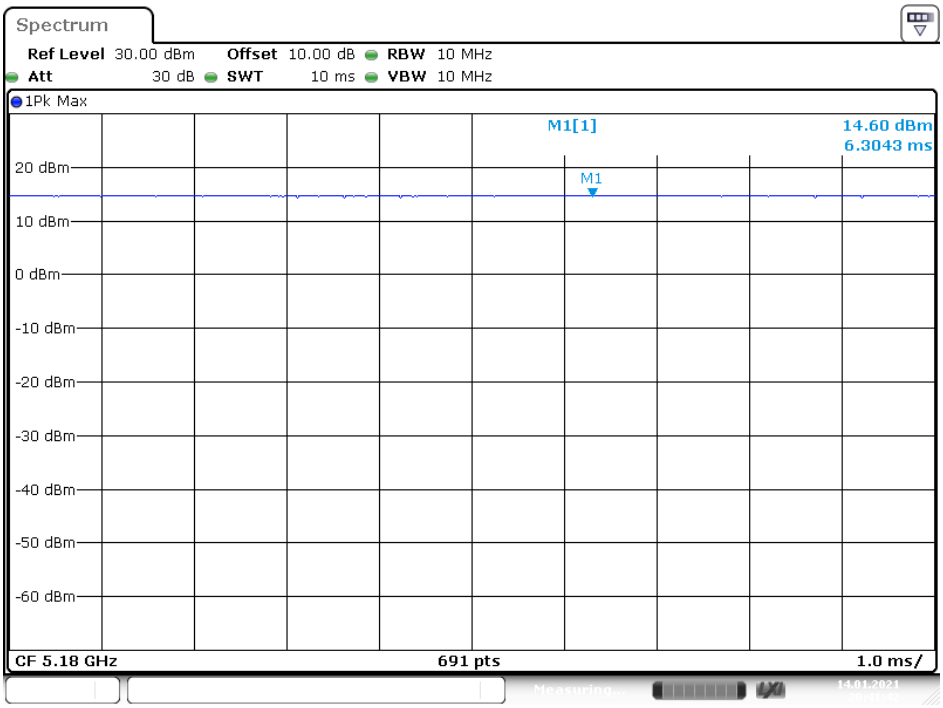
Test frequencies and power level were configured as below:

U-NII	Mode	Frequency (MHz)	Data Rate (Mbps)	Power Level
5150 – 5250MHz	802.11 a	5180	6	40.1
		5200	6	40.1
		5240	6	40.1
	802.11 n20	5180	MCS0	34
		5200	MCS0	34
		5240	MCS0	34
	802.11 n40	5190	MCS0	34
		5230	MCS0	34
	802.11 ac20	5180	MCS0	38
		5200	MCS0	38
		5240	MCS0	38
5725 – 5850MHz	802.11 a	5745	6	40.1
		5785	6	40.1
		5825	6	40.1
	802.11 n20	5745	MCS0	34
		5785	MCS0	34
		5825	MCS0	34
	802.11 n40	5755	MCS0	34
		5795	MCS0	34
	802.11 ac20	5745	MCS0	38
		5785	MCS0	38
		5825	MCS0	38

Note: the above data rate was the worst case.

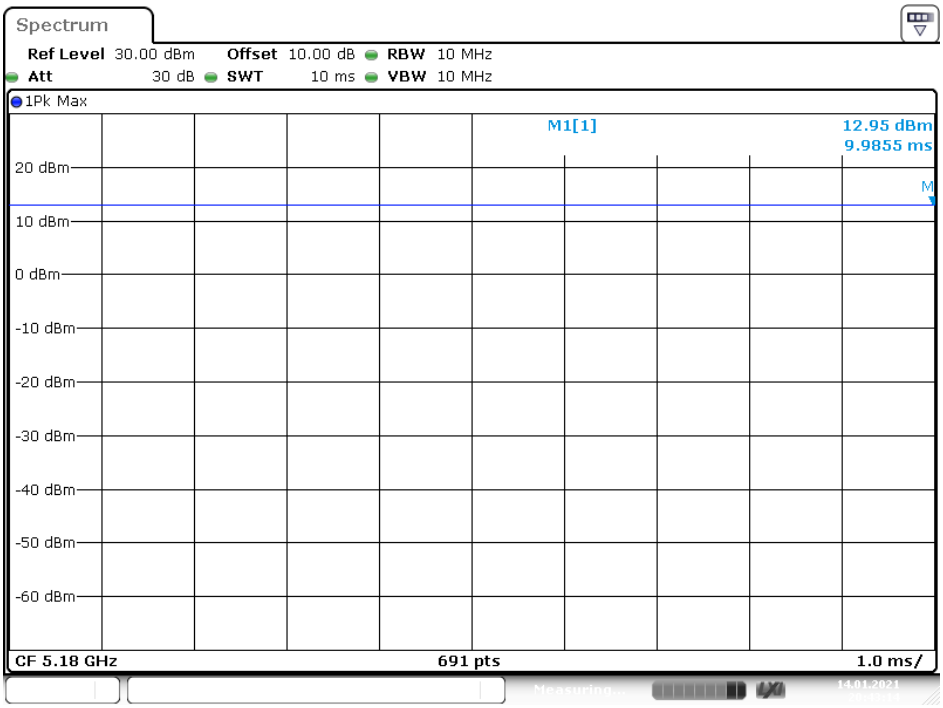
Duty cycle

802.11a mode



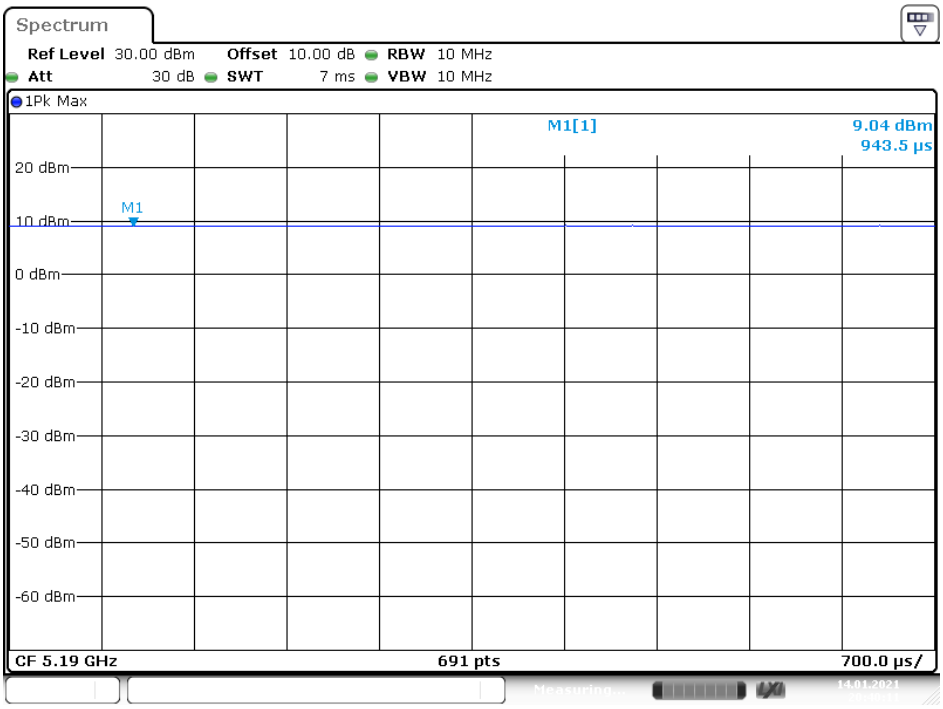
Date: 14.JAN.2021 20:41:43

802.11n20 mode



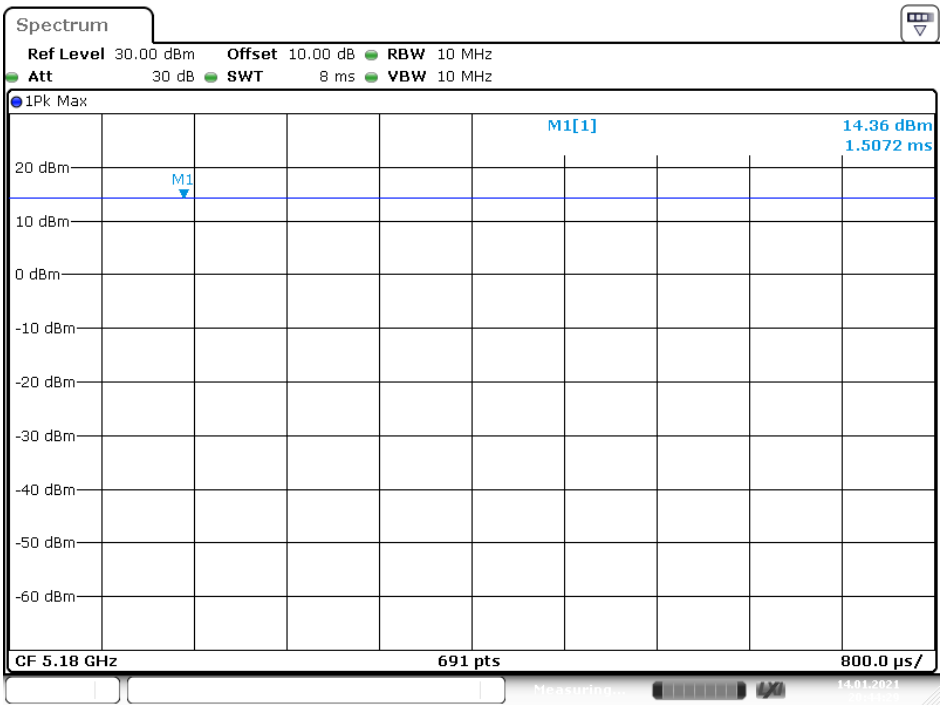
Date: 14.JAN.2021 20:43:14

802.11n40 mode



Date: 14.JAN.2021 20:40:11

802.11ac20 Mode



Date: 14.JAN.2021 20:44:29

Mode	Ton (ms)	Ton+off (ms)	Duty Cycle (%)	10*log(1/duty cycle) (dB)
802.11a	-	-	100	0
802.11n20	-	-	100	0
802.11n40	-	-	100	0
802.11ac20	-	-	100	0

Equipment Modifications

No modification was made to the EUT tested.

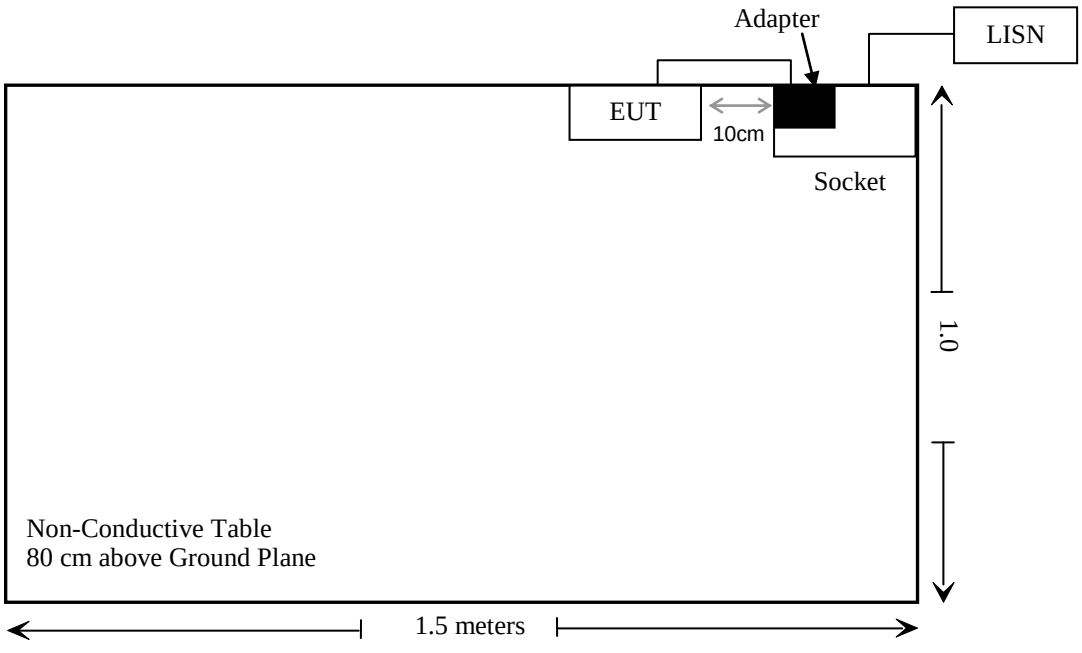
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HUAWEI	Adapter	HW-050200C01	Unknown

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shielding Detachable USB Cable	0.95	Adapter	EUT

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)(8) & §15.207(a)	Conducted Emissions	Compliance
§15.205 & §15.209 & §15.407(b) (1), (4), (7), (8), (9), (10)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (12), (e)	Bandwidth	Compliance
§15.407(a) (1), (3)	Conducted Transmitter Output Power	Compliance
§15.407 (a) (1), (3)	Power Spectral Density	Compliance

Note: For the difference of shelfEye and shelfEye Pro, according to the test result of FCC Part 15B test Result, the model (shelfEye) is worst case, only worst case was performed in report.

.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission test					
Rohde & Schwarz	Test Receiver	ESCS30	100307	2020/12/25	2021/12/24
Schwarzbeck	L.I.S.N.	NLSK8126	8126431	2020/12/25	2021/12/24
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	100815	2020/12/25	2021/12/24
Anritsu Corp	50ΩCoaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Radiated emission test					
Rohde& Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2020/07/08	2021/07/07
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2020/11/28	2021/11/27
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
RF conducted test					
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Open Switch and Control Unit	OSP120 +OSP -B157	101244 + 100866	2020/12/24	2021/12/23
Rohde & Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. 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 worst case:

Frequency (MHz)	Antenna Gain		Tune Up Conducted Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
5150-5250	4.05	2.54	15.0	31.62	20	0.016	1.0
5725-5850	4.05	2.54	15.0	31.62	20	0.016	1.0

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 one internal antenna arrangement, which was permanently attached and the antenna gain is 4.05 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

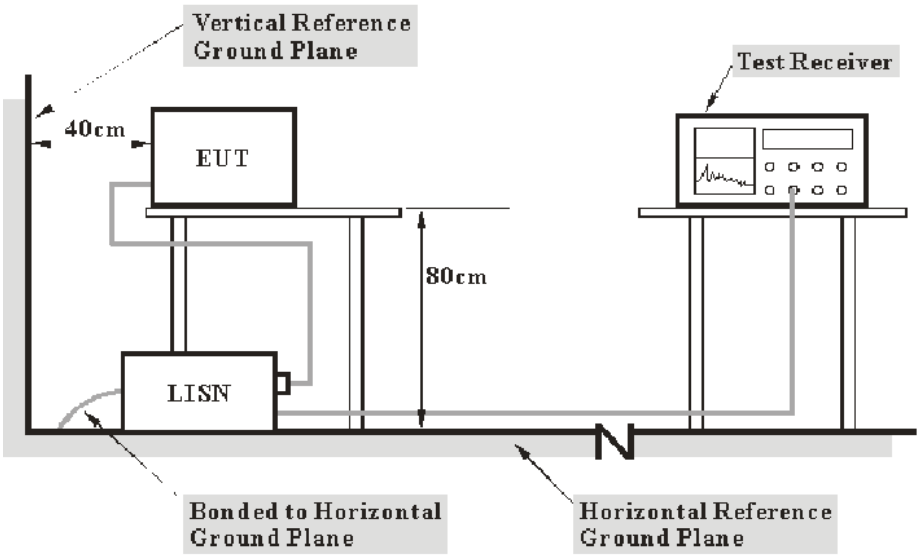
Result: Compliance.

FCC §15.407 (B) (8) §15.207 (A) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (8)

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

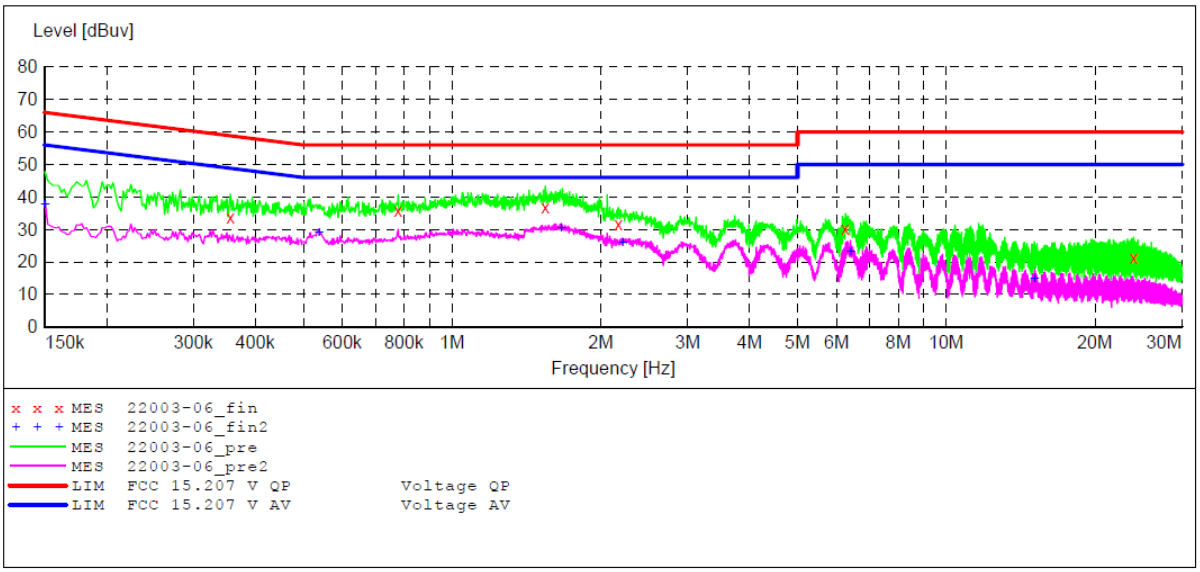
Environmental Conditions

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

The testing was performed by Ting Lü on 2021-01-04.

EUT operation mode: Transmitting (Worst case as below)

AC 120V/60 Hz, Line



MEASUREMENT RESULT: "22003-06_fin"

1/4/2021 17:53PM

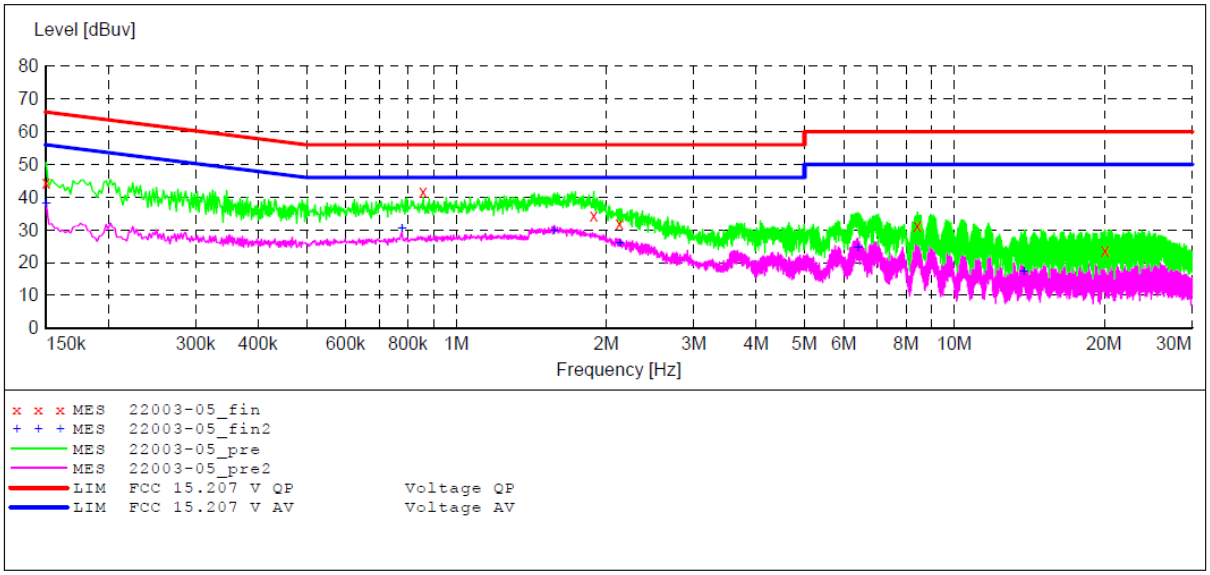
Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.356000	33.70	10.9	59	25.3	QP	L1	GND
0.778000	35.70	11.1	56	20.3	QP	L1	GND
1.544000	36.90	11.2	56	19.1	QP	L1	GND
2.170000	31.60	11.3	56	24.4	QP	L1	GND
6.250000	30.20	11.5	60	29.8	QP	L1	GND
23.955000	21.20	11.7	60	38.8	QP	L1	GND

MEASUREMENT RESULT: "22003-06_fin2"

1/4/2021 17:53PM

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.150000	37.90	10.8	56	18.1	AV	L1	GND
0.538000	29.20	11.0	46	16.8	AV	L1	GND
1.664000	30.60	11.2	46	15.4	AV	L1	GND
2.215000	26.00	11.3	46	20.0	AV	L1	GND
6.400000	23.40	11.5	50	26.6	AV	L1	GND
15.100000	14.80	11.6	50	35.2	AV	L1	GND

AC 120V/60 Hz, Neutral



MEASUREMENT RESULT: "22003-05_fin"

1/4/2021 17:49PM

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.150000	44.60	10.8	66	21.4	QP	N	GND
0.858000	41.80	11.1	56	14.2	QP	N	GND
1.888000	34.30	11.3	56	21.7	QP	N	GND
2.125000	32.10	11.3	56	23.9	QP	N	GND
8.430000	31.30	11.5	60	28.7	QP	N	GND
20.080000	23.50	11.7	60	36.5	QP	N	GND

MEASUREMENT RESULT: "22003-05_fin2"

1/4/2021 17:49PM

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.150000	38.20	10.8	56	17.8	AV	N	GND
0.778000	30.60	11.1	46	15.4	AV	N	GND
1.574000	29.80	11.2	46	16.2	AV	N	GND
2.130000	25.90	11.3	46	20.1	AV	N	GND
6.400000	24.70	11.5	50	25.3	AV	N	GND
13.795000	17.30	11.6	50	32.7	AV	N	GND

§15.205 & §15.209 & §15.407(B) (1), (4), (7), (8) , (9), (10) – UNDESIRABLE EMISSION

Applicable Standard

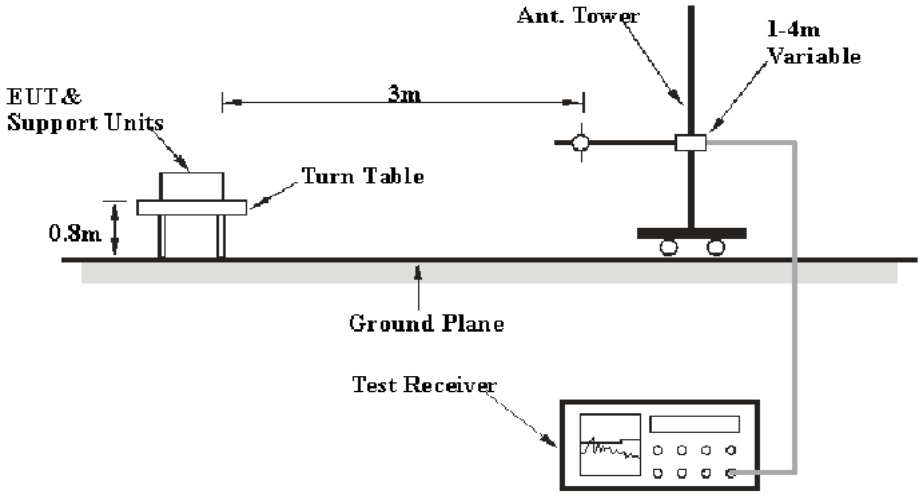
FCC §15.407 (b) (1), (4), (7), (8), (9), (10); §15.209; §15.205;

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

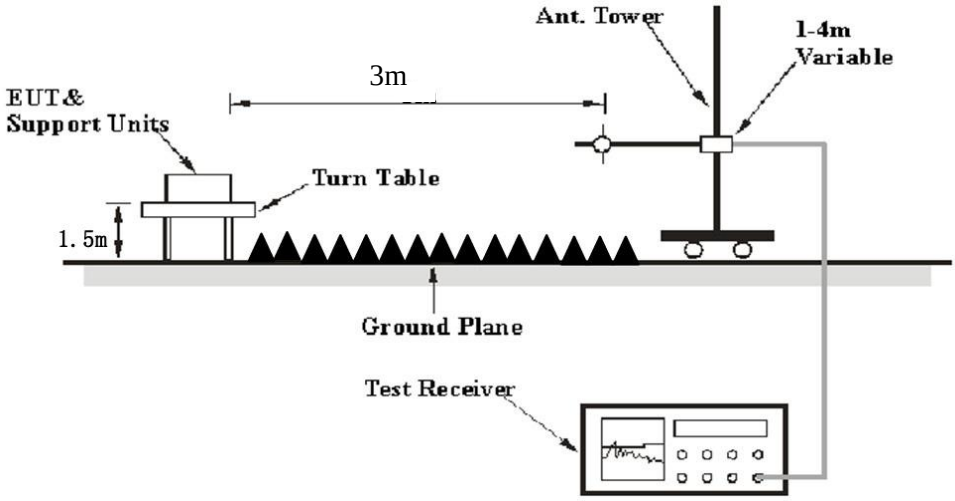
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



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

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

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

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

$E_{SpecLimit}$	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
$d_{SpecLimit}$	is the distance specified by the limit, in m

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

Factor & Margin Calculation

The Factor 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:

Factor = 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 = Result-Limit
Result = Reading + Factor

Test Data

Environmental Conditions

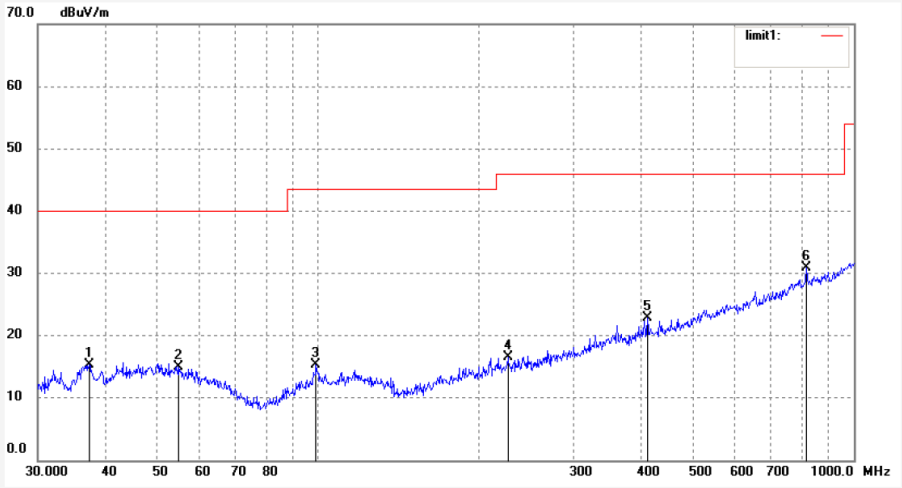
Temperature:	22~29 ℃
Relative Humidity:	50~56 %
ATM Pressure:	101.0 kPa

The testing was performed by Ting Lüon 2021-01-09.

EUT operation mode: Transmitting

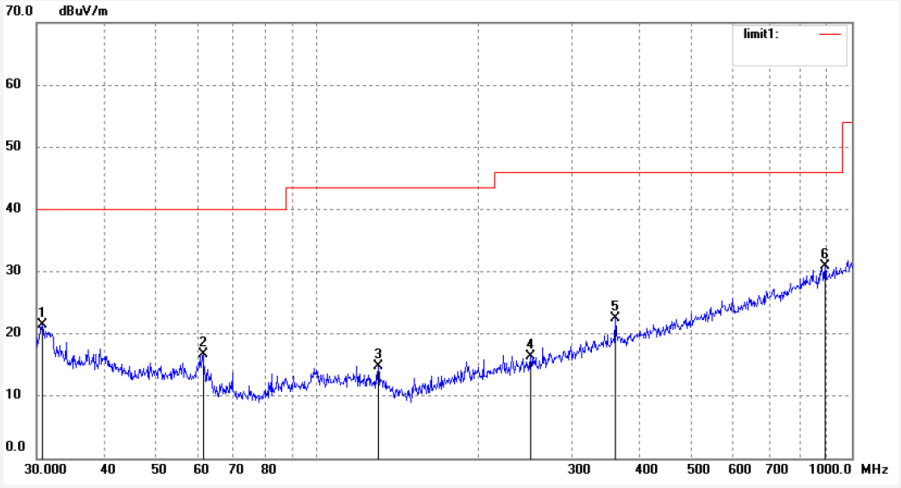
30 MHz~1 GHz:
Note: Pretest with 802.11a, 802.11n20, 802.11n40 and 802.11ac20, the worst case was 802.11a mode.
802.11a, 5180MHz:

Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	37.4165	28.25	-12.98	15.27	40.00	-24.73	peak			
2	54.8348	26.34	-11.34	15.00	40.00	-25.00	peak			
3	99.1797	27.35	-12.06	15.29	43.50	-28.21	peak			
4	226.0994	27.19	-10.59	16.60	46.00	-29.40	peak			
5	411.8240	28.29	-5.53	22.76	46.00	-23.24	peak			
6	815.9678	29.37	1.56	30.93	46.00	-15.07	peak			

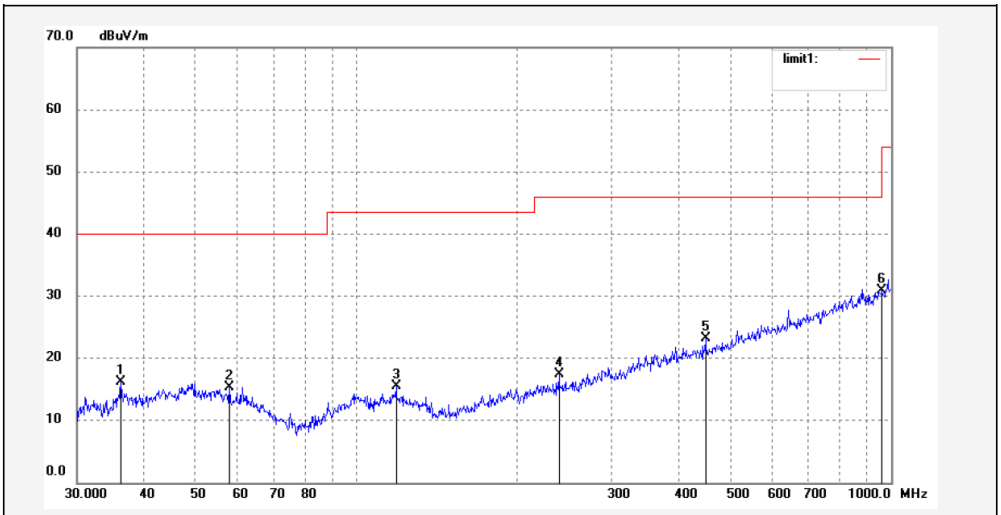
Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	30.7455	29.04	-7.63	21.41	40.00	-18.59	peak			
2	61.3463	29.81	-13.08	16.73	40.00	-23.27	peak			
3	130.3789	27.62	-12.75	14.87	43.50	-28.63	peak			
4	251.1804	26.50	-10.14	16.36	46.00	-29.64	peak			
5	361.7139	29.06	-6.56	22.50	46.00	-23.50	peak			
6	890.7278	28.38	2.52	30.90	46.00	-15.10	peak			

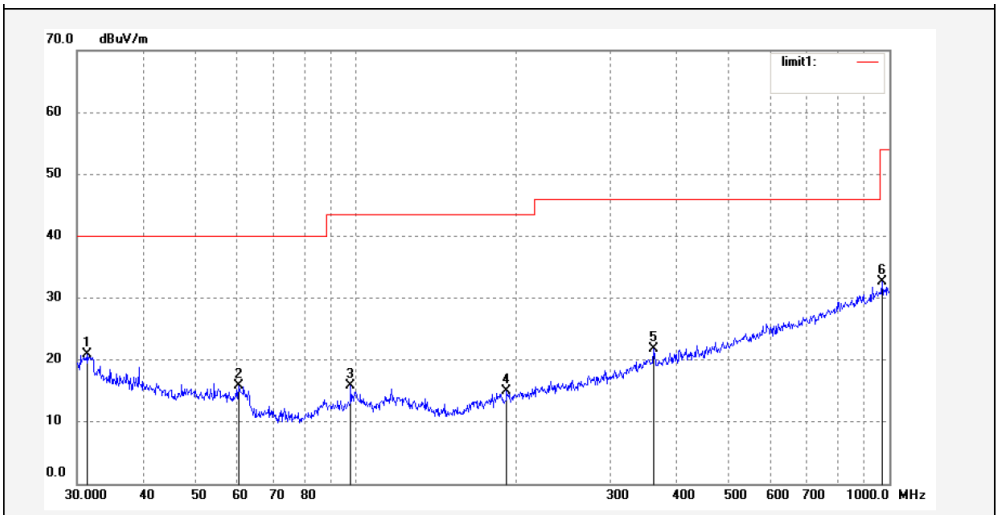
802.11a, 5745MHz:

Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	36.2541	29.50	-13.37	16.13	40.00	-23.87	peak			
2	57.7962	27.29	-12.00	15.29	40.00	-24.71	peak			
3	118.6014	27.45	-11.93	15.52	43.50	-27.98	peak			
4	239.1473	27.55	-10.18	17.37	46.00	-28.63	peak			
5	449.5558	28.28	-5.12	23.16	46.00	-22.84	peak			
6	962.1623	26.83	4.01	30.84	54.00	-23.16	peak			

Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	31.3992	28.80	-7.83	20.97	40.00	-19.03	peak			
2	60.2801	28.48	-12.70	15.78	40.00	-24.22	peak			
3	97.7983	28.32	-12.53	15.79	43.50	-27.71	peak			
4	191.7450	26.47	-11.56	14.91	43.50	-28.59	peak			
5	361.7139	28.29	-6.56	21.73	46.00	-24.27	peak			
6	968.9338	28.50	4.11	32.61	54.00	-21.39	peak			

1 ~ 18 GHz:

5150-5250 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11a									
Low Channel (5180 MHz)									
4500.00	47.21	PK	229	1.5	H	0.31	47.52	74	-26.48
4500.00	37.36	AV	229	1.5	H	0.31	37.67	54	-16.33
4500.00	46.35	PK	257	1.5	V	0.31	46.66	74	-27.34
4500.00	36.52	AV	257	1.5	V	0.31	36.83	54	-17.17
5150.00	48.26	PK	302	1.5	H	2.04	50.3	74	-23.7
5150.00	38.45	AV	302	1.5	H	2.04	40.49	54	-13.51
5150.00	49.03	PK	173	1.5	V	2.04	51.07	74	-22.93
5150.00	39.21	AV	173	1.5	V	2.04	41.25	54	-12.75
10360.00	48.91	PK	216	1.5	H	8.62	57.53	68.2	-10.67
10360.00	49.21	PK	159	1.5	V	8.62	57.83	68.2	-10.37
Middle Channel (5200 MHz)									
10400.00	43.43	PK	13	1.5	H	8.64	52.07	68.2	-16.13
10400.00	45.36	PK	52	1.5	V	8.64	54	68.2	-14.2
High Channel (5240 MHz)									
5350.00	55.02	PK	77	1.5	H	2.28	57.3	74	-16.7
5350.00	45.28	AV	77	1.5	H	2.28	47.56	54	-6.44
5350.00	53.47	PK	96	1.5	V	2.28	55.75	74	-18.25
5350.00	43.13	AV	96	1.5	V	2.28	45.41	54	-8.59
5460.00	47.38	PK	125	1.5	H	2.40	49.78	74	-24.22
5460.00	37.59	AV	125	1.5	H	2.40	39.99	54	-14.01
5460.00	48.07	PK	168	1.5	V	2.40	50.47	74	-23.53
5460.00	38.21	AV	168	1.5	V	2.40	40.61	54	-13.39
10480.00	49.23	PK	147	1.5	H	8.68	57.91	68.2	-10.29
10480.00	46.58	PK	129	1.5	V	8.68	55.26	68.2	-12.94

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n20									
Low Channel (5180 MHz)									
4500.00	45.74	PK	208	1.5	H	0.31	46.05	74	-27.95
4500.00	35.39	AV	208	1.5	H	0.31	35.7	54	-18.3
4500.00	46.05	PK	257	1.5	V	0.31	46.36	74	-27.64
4500.00	36.25	AV	257	1.5	V	0.31	36.56	54	-17.44
5150.00	48.06	PK	302	1.5	H	2.04	50.1	74	-23.9
5150.00	38.31	AV	302	1.5	H	2.04	40.35	54	-13.65
5150.00	46.53	PK	173	1.5	V	2.04	48.57	74	-25.43
5150.00	36.24	AV	173	1.5	V	2.04	38.28	54	-15.72
10360.00	46.11	PK	216	1.5	H	8.62	54.73	68.2	-13.47
10360.00	47.41	PK	159	1.5	V	8.62	56.03	68.2	-12.17
Middle Channel (5200 MHz)									
10400.00	47.23	PK	24	1.5	H	8.64	55.87	68.2	-12.33
10400.00	48.46	PK	57	1.5	V	8.64	57.1	68.2	-11.1
High Channel (5240 MHz)									
5350.00	53.72	PK	92	1.5	H	2.28	56	74	-18
5350.00	43.59	AV	92	1.5	H	2.28	45.87	54	-8.13
5350.00	51.67	PK	109	1.5	V	2.28	53.95	74	-20.05
5350.00	41.23	AV	109	1.5	V	2.28	43.51	54	-10.49
5460.00	46.78	PK	125	1.5	H	2.40	49.18	74	-24.82
5460.00	36.94	AV	125	1.5	H	2.40	39.34	54	-14.66
5460.00	47.17	PK	201	1.5	V	2.40	49.57	74	-24.43
5460.00	37.74	AV	201	1.5	V	2.40	40.14	54	-13.86
10480.00	45.78	PK	156	1.5	H	8.68	54.46	68.2	-13.74
10480.00	46.83	PK	264	1.5	V	8.68	55.51	68.2	-12.69

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
Low Channel (5190 MHz)									
4500.00	45.84	PK	250	1.5	H	0.31	46.15	74	-27.85
4500.00	35.68	AV	250	1.5	H	0.31	35.99	54	-18.01
4500.00	46.35	PK	302	1.5	V	0.31	46.66	74	-27.34
4500.00	36.28	AV	302	1.5	V	0.31	36.59	54	-17.41
5150.00	49.04	PK	238	1.5	H	2.04	51.08	74	-22.92
5150.00	39.26	AV	238	1.5	H	2.04	41.3	54	-12.7
5150.00	47.23	PK	184	1.5	V	2.04	49.27	74	-24.73
5150.00	37.51	AV	184	1.5	V	2.04	39.55	54	-14.45
10380.00	44.71	PK	261	1.5	H	8.63	53.34	68.2	-14.86
10380.00	45.21	PK	183	1.5	V	8.63	53.84	68.2	-14.36
High Channel (5230 MHz)									
5350.00	54.32	PK	84	1.5	H	2.28	56.6	74	-17.4
5350.00	44.92	AV	84	1.5	H	2.28	47.2	54	-6.8
5350.00	53.17	PK	95	1.5	V	2.28	55.45	74	-18.55
5350.00	43.61	AV	95	1.5	V	2.28	45.89	54	-8.11
5460.00	48.28	PK	163	1.5	H	2.40	50.68	74	-23.32
5460.00	38.43	AV	163	1.5	H	2.40	40.83	54	-13.17
5460.00	49.34	PK	189	1.5	V	2.40	51.74	74	-22.26
5460.00	39.10	AV	189	1.5	V	2.40	41.5	54	-12.5
10460.00	48.18	PK	107	1.5	H	8.67	56.85	68.2	-11.35
10460.00	49.36	PK	196	1.5	V	8.67	58.03	68.2	-10.17

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11ac20									
Low Channel (5180 MHz)									
4500.00	48.21	PK	203	1.5	H	0.31	48.52	74	-25.48
4500.00	38.46	AV	203	1.5	H	0.31	38.77	54	-15.23
4500.00	47.75	PK	242	1.5	V	0.31	48.06	74	-25.94
4500.00	37.58	AV	242	1.5	V	0.31	37.89	54	-16.11
5150.00	46.44	PK	305	1.5	H	2.04	48.48	74	-25.52
5150.00	36.92	AV	305	1.5	H	2.04	38.96	54	-15.04
5150.00	47.87	PK	156	1.5	V	2.04	49.91	74	-24.09
5150.00	37.02	AV	156	1.5	V	2.04	39.06	54	-14.94
10360.00	45.61	PK	267	1.5	H	8.62	54.23	68.2	-13.97
10360.00	47.01	PK	159	1.5	V	8.62	55.63	68.2	-12.57
Middle Channel (5200 MHz)									
10400.00	47.51	PK	230	1.5	H	8.64	56.15	68.2	-12.05
10400.00	46.23	PK	120	1.5	V	8.64	54.87	68.2	-13.33
High Channel (5240 MHz)									
5350.00	55.89	PK	28	1.5	H	2.28	58.17	74	-15.83
5350.00	45.63	AV	28	1.5	H	2.28	47.91	54	-6.09
5350.00	54.50	PK	47	1.5	V	2.28	56.78	74	-17.22
5350.00	44.26	AV	47	1.5	V	2.28	46.54	54	-7.46
5460.00	46.78	PK	159	1.5	H	2.40	49.18	74	-24.82
5460.00	36.51	AV	159	1.5	H	2.40	38.91	54	-15.09
5460.00	47.54	PK	137	1.5	V	2.40	49.94	74	-24.06
5460.00	37.27	AV	137	1.5	V	2.40	39.67	54	-14.33
10480.00	49.20	PK	201	1.5	H	8.68	57.88	68.2	-10.32
10480.00	48.63	PK	230	1.5	V	8.68	57.31	68.2	-10.89

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11a									
Low Channel (5745 MHz)									
5646.50	43.91	PK	231	1.5	H	47.76	68.2	20.44	47.76
5696.20	44.51	PK	231	1.5	H	48.57	102.39	53.82	48.57
5717.50	45.65	PK	189	1.5	H	49.81	110.1	60.29	49.81
5724.50	43.58	PK	189	1.5	H	47.74	121.06	73.32	47.74
11490.00	45.59	PK	205	1.5	H	55.63	74	18.37	55.63
11490.00	35.84	AV	205	1.5	H	45.88	54	8.12	45.88
Middle Channel (5785 MHz)									
11570.00	47.54	PK	167	1.5	V	10.12	57.66	74	16.34
11570.00	37.31	AV	167	1.5	V	10.12	47.43	54	6.57
High Channel (5825 MHz)									
5854.80	46.19	PK	82	1.5	H	4.58	50.77	111.26	60.49
5871.60	45.20	PK	103	1.5	H	4.62	49.82	106.15	56.33
5886.70	47.28	PK	139	1.5	H	4.66	51.94	96.54	44.6
5929.70	46.20	PK	139	1.5	H	4.85	51.05	68.2	17.15
11650.00	47.10	PK	265	1.5	H	10.20	57.3	74	16.7
11650.00	37.26	AV	265	1.5	H	10.20	47.46	54	6.54

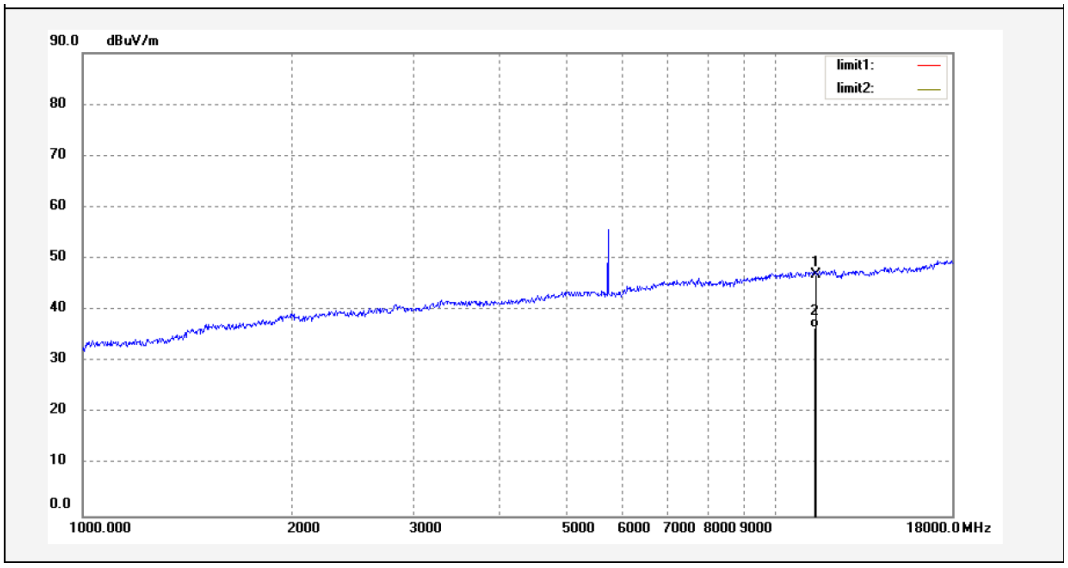
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n20									
Low Channel (5745 MHz)									
5646.50	45.51	PK	250	1.5	H	3.85	49.36	68.2	18.84
5696.20	43.89	PK	250	1.5	H	4.06	47.95	102.39	54.44
5717.50	44.39	PK	302	1.5	H	4.16	48.55	110.1	61.55
5724.50	45.26	PK	302	1.5	H	4.16	49.42	121.06	71.64
11490.00	46.04	PK	284	1.5	H	10.04	56.08	74	17.92
11490.00	36.51	AV	284	1.5	H	10.04	46.55	54	7.45
Middle Channel (5785 MHz)									
11570.00	47.59	PK	226	1.5	H	10.12	57.71	74	16.29
11570.00	37.82	AV	226	1.5	H	10.12	47.94	54	6.06
High Channel (5825 MHz)									
5854.80	45.29	PK	29	1.5	H	4.58	49.87	68.2	18.33
5871.60	43.36	PK	29	1.5	H	4.62	47.98	76.84	28.86
5886.70	46.78	PK	84	1.5	H	4.66	51.44	109.85	58.41
5929.70	44.91	PK	84	1.5	H	4.85	49.76	121.71	71.95
11650.00	49.31	PK	137	1.5	H	10.20	59.51	74	14.49
11650.00	39.61	AV	137	1.5	H	10.20	49.81	54	4.19

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
Low Channel (5755 MHz)									
5646.50	45.21	PK	229	1.5	H	3.85	49.06	68.2	19.14
5696.20	43.03	PK	229	1.5	H	4.06	47.09	102.39	55.3
5717.50	44.43	PK	251	1.5	H	4.16	48.59	110.1	61.51
5724.50	42.24	PK	251	1.5	H	4.16	46.4	121.06	74.66
11510.00	48.52	PK	278	1.5	H	10.07	58.59	74	15.41
11510.00	38.25	AV	278	1.5	H	10.07	48.32	54	5.68
High Channel (5795 MHz)									
5854.80	44.78	PK	88	1.5	H	4.58	49.36	68.2	18.84
5871.60	43.50	PK	88	1.5	H	4.62	48.12	87.47	39.35
5886.70	45.42	PK	36	1.5	H	4.66	50.08	107.98	57.9
5929.70	43.20	PK	36	1.5	H	4.85	48.05	121.95	73.9
11590.00	49.53	PK	254	1.5	H	10.14	59.67	74	14.33
11590.00	39.01	AV	254	1.5	H	10.14	49.15	54	4.85

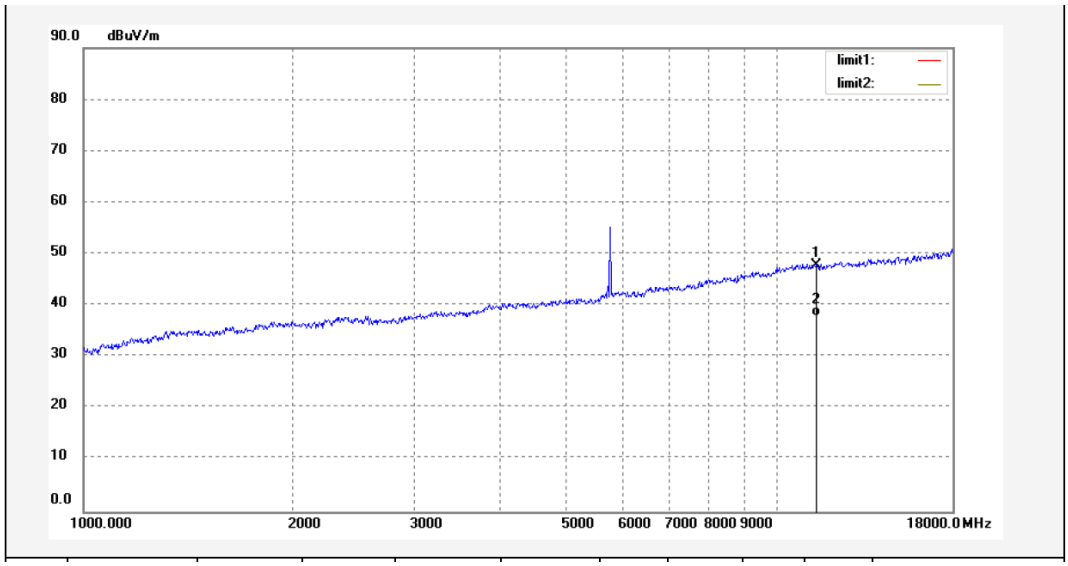
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC 15.209/15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11ac20									
Low Channel (5745 MHz)									
5646.50	45.81	PK	236	1.5	H	3.85	49.66	68.2	18.54
5696.20	44.36	PK	236	1.5	H	4.06	48.42	102.39	53.97
5717.50	43.30	PK	264	1.5	H	4.16	47.46	110.1	62.64
5724.50	42.82	PK	264	1.5	H	4.16	46.98	121.06	74.08
11490.00	47.34	PK	72	1.5	H	10.04	57.38	74	16.62
11490.00	37.29	AV	72	1.5	H	10.04	47.33	54	6.67
Middle Channel (5785 MHz)									
11570.00	46.42	PK	299	1.5	H	10.12	56.54	74	17.46
11570.00	36.99	AV	299	1.5	H	10.12	47.11	54	6.89
High Channel (5825 MHz)									
5854.80	43.49	PK	324	1.5	H	4.58	48.07	68.2	20.13
5871.60	45.33	PK	324	1.5	H	4.62	49.95	76.84	26.89
5886.70	43.62	PK	320	1.5	H	4.66	48.28	109.85	61.57
5929.70	44.76	PK	320	1.5	H	4.85	49.61	121.71	72.1
11650.00	49.08	PK	175	1.5	H	10.20	59.28	74	14.72
11650.00	39.26	AV	175	1.5	H	10.20	49.46	54	4.54

Note 1:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude
Note 2:
For 18-40GHz, all spurious emissions are 20 dB below the limit or are on the system noise floor level.

Pre-scan with 802.11a 5745MHz
Horizontal



Vertical



FCC §15.407(a) (12), (e) – BANDWIDTH

Applicable Standard

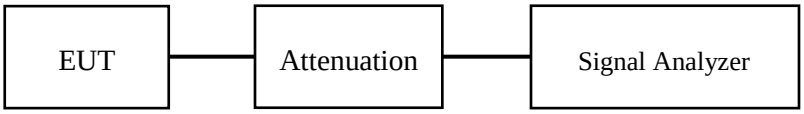
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band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

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

Test Procedure

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

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



Test Data

Environmental Conditions

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

The testing was performed by Ting Lü on 2021-01-14 to 2021-01-22.

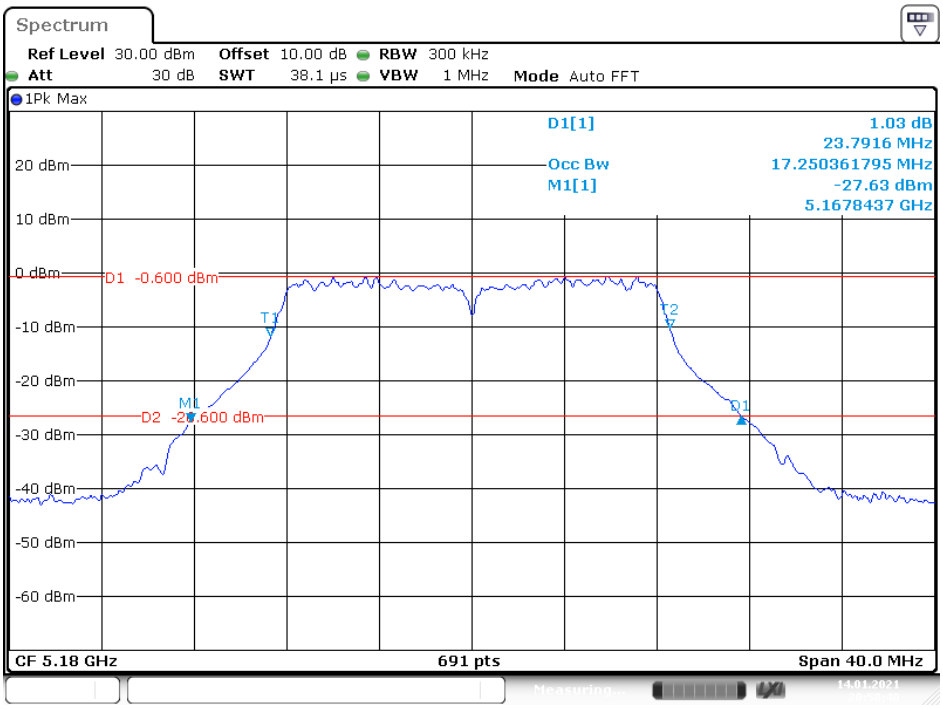
EUT operation mode: Transmitting

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

5150 MHz - 5250 MHz:

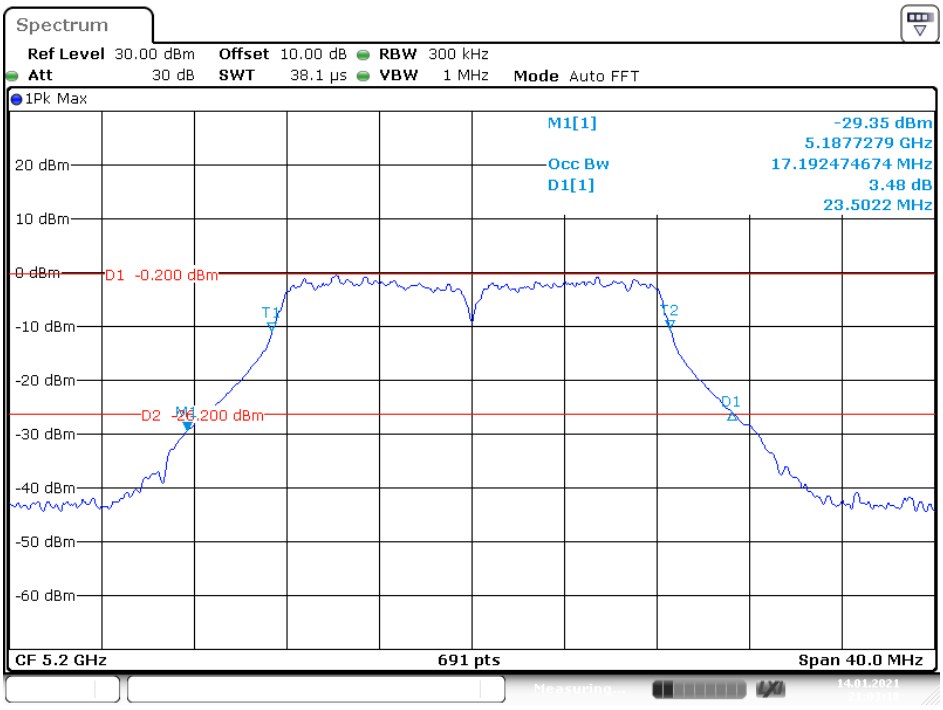
Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Remark
802.11a			No transmitted signal in the 99% bandwidth extends into the U-NII-2A band
5180	23.79	17.25	
5200	23.50	17.19	
5240	23.79	17.42	
802.11n20			
5180	23.62	17.42	
5200	23.73	17.42	
5240	23.91	17.48	
802.11n40			
5190	45.27	36.93	
5230	44.34	37.05	
802.11ac20			
5180	23.85	18.35	
5200	23.91	18.29	
5240	23.97	18.41	

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



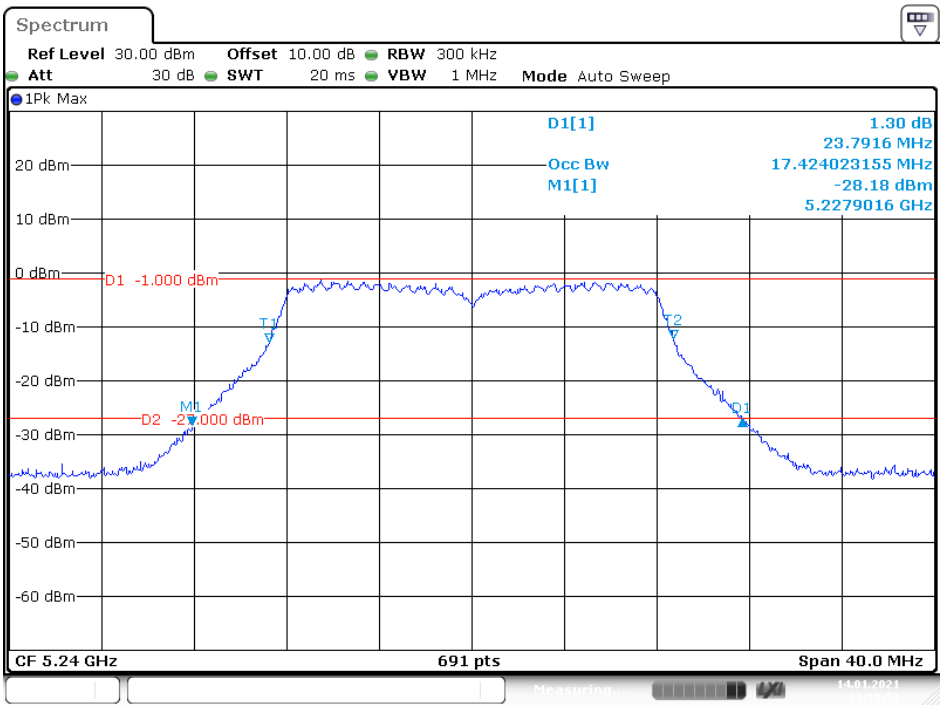
Date: 14.JAN.2021 20:58:40

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



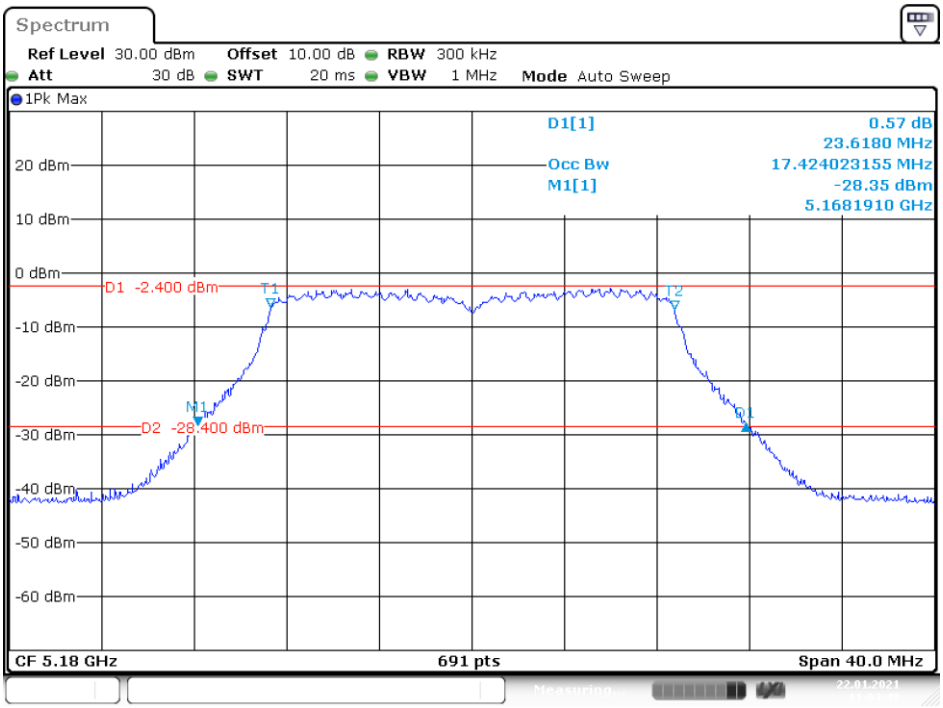
Date: 14.JAN.2021 21:03:18

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



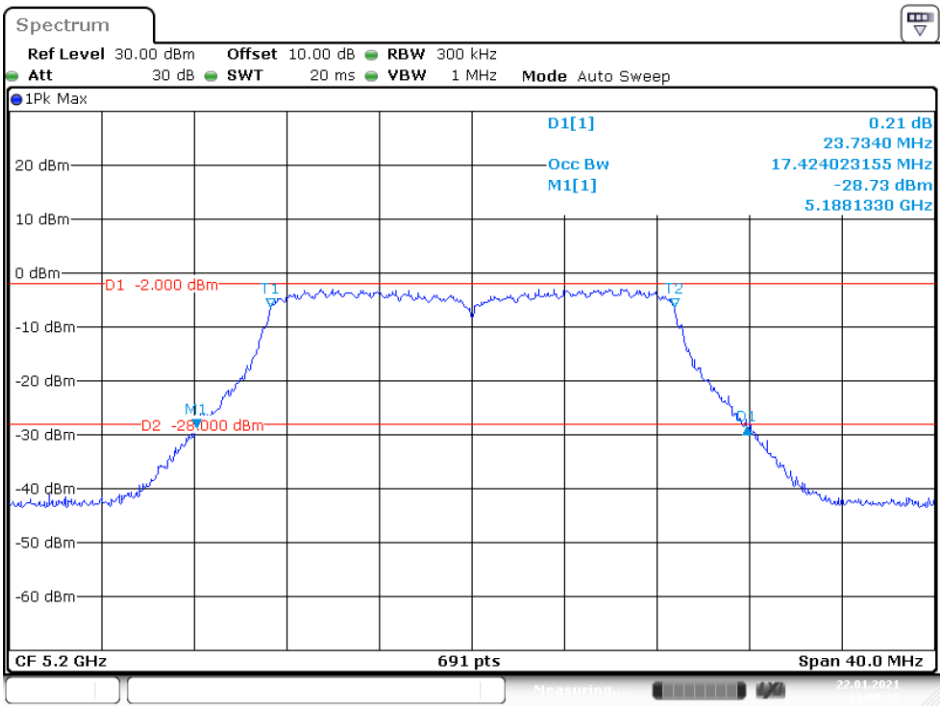
Date: 14.JAN.2021 21:18:51

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

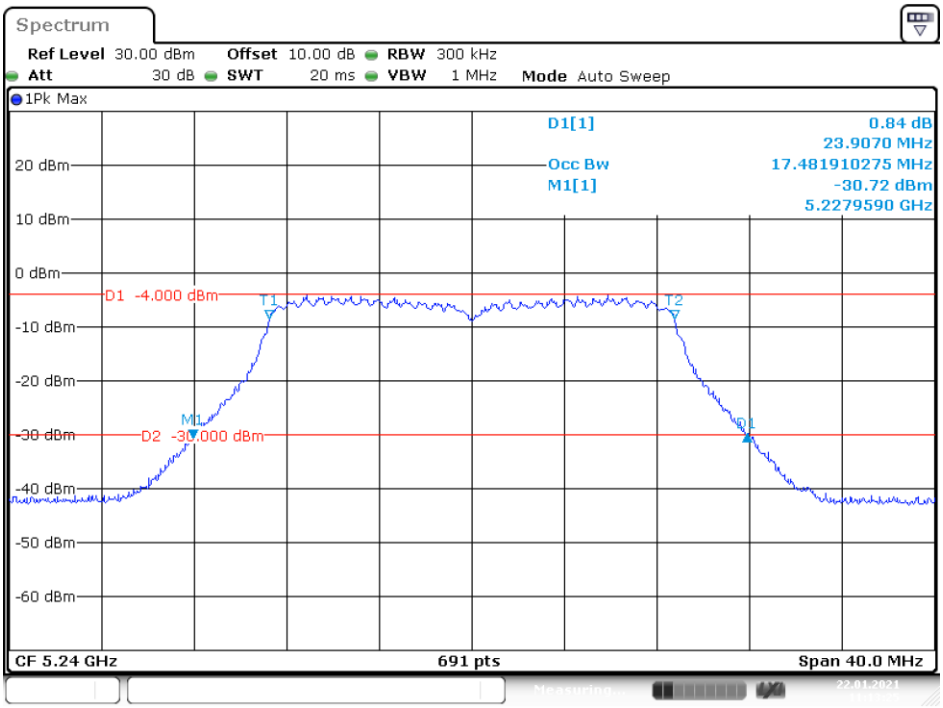


Date: 22.JAN.2021 11:04:48

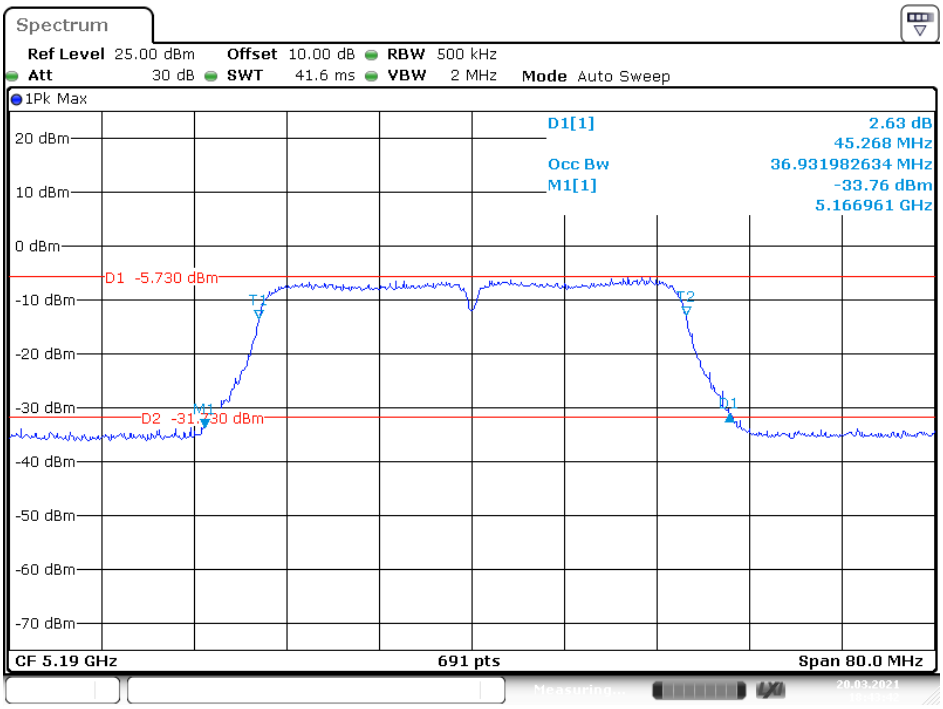
802.11n20 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5200 MHz



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

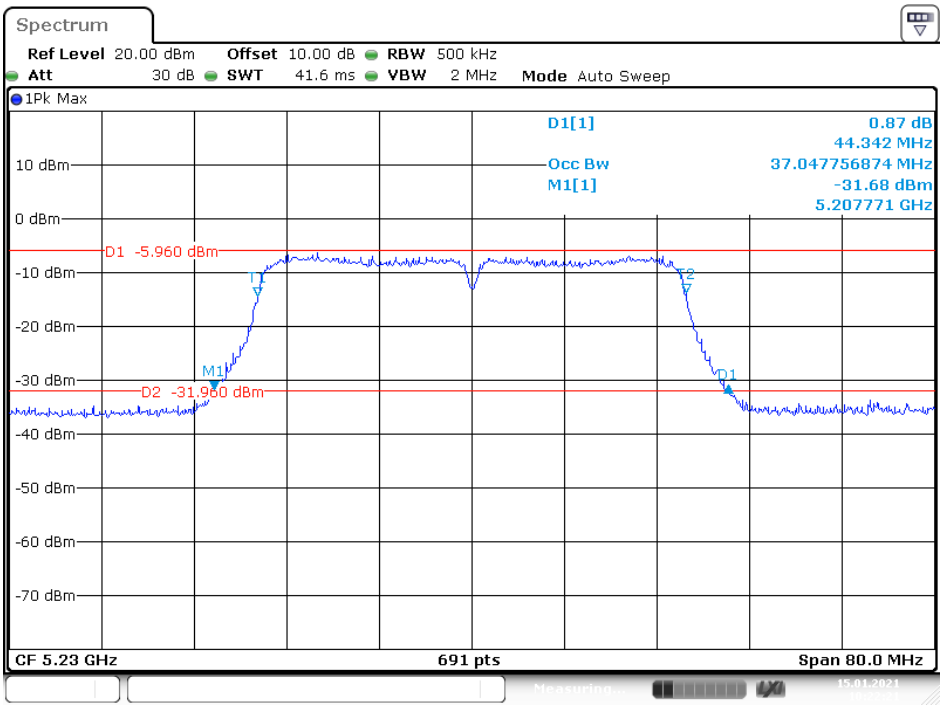


802.11n40 mode, 26 dB Emissions & 99% Occupied Bandwidth, 5190 MHz



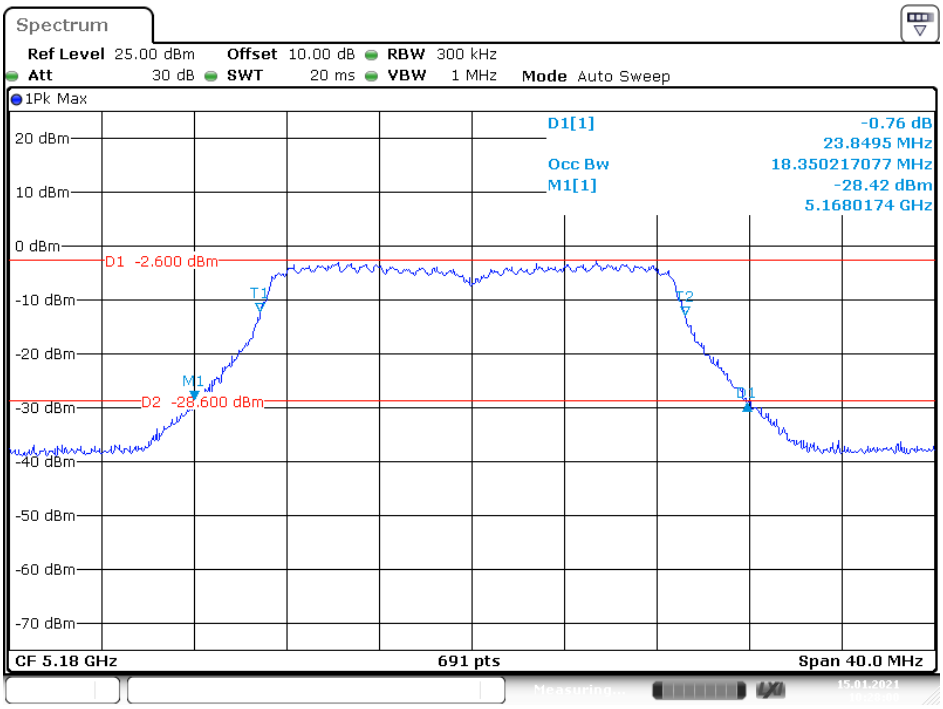
Date: 20.MAR.2021 18:43:42

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



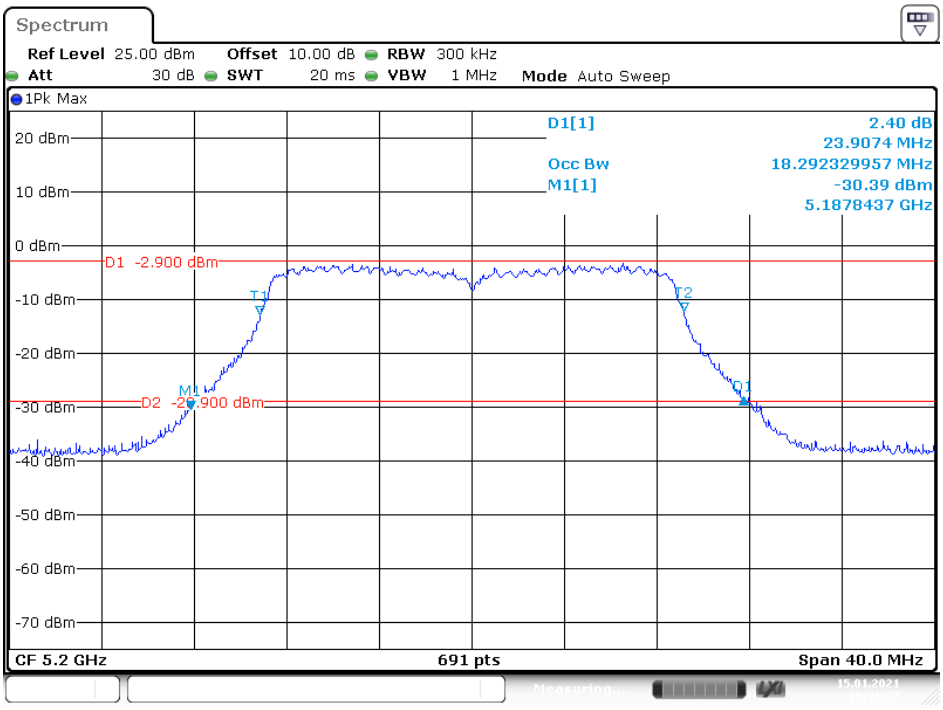
Date: 15.JAN.2021 10:22:21

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



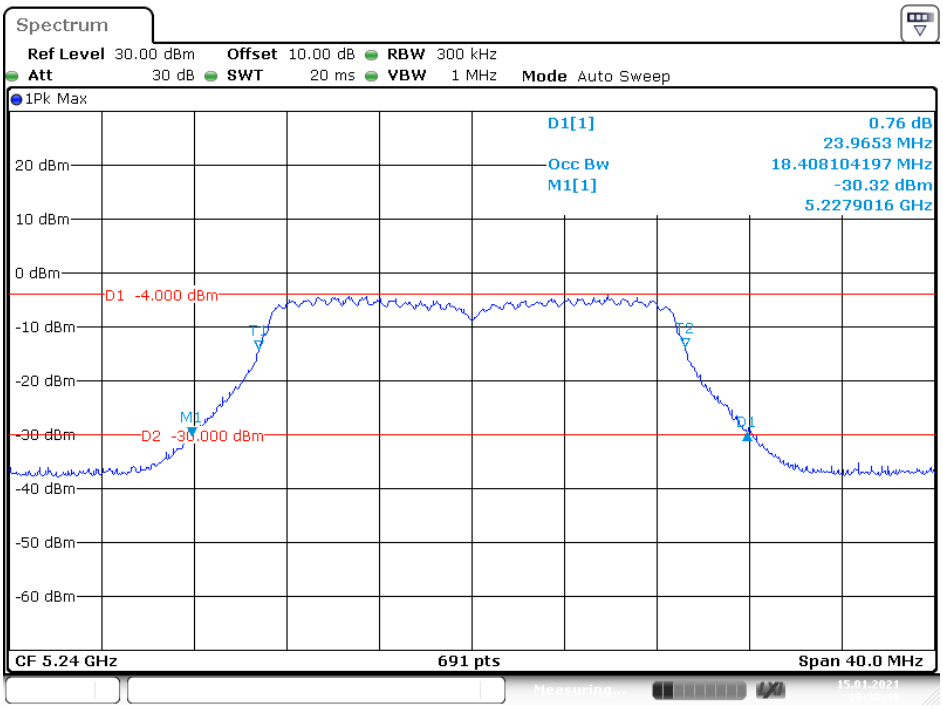
Date: 15.JAN.2021 10:28:01

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



Date: 15.JAN.2021 10:31:27

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

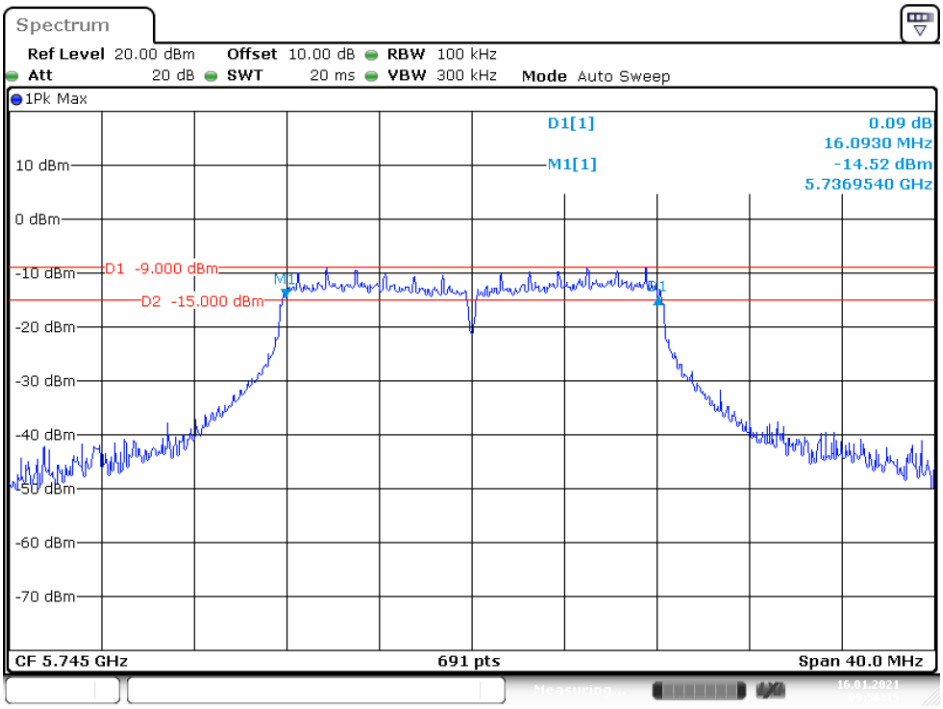


Date: 15.JAN.2021 10:38:49

5725 MHz – 5850 MHz:

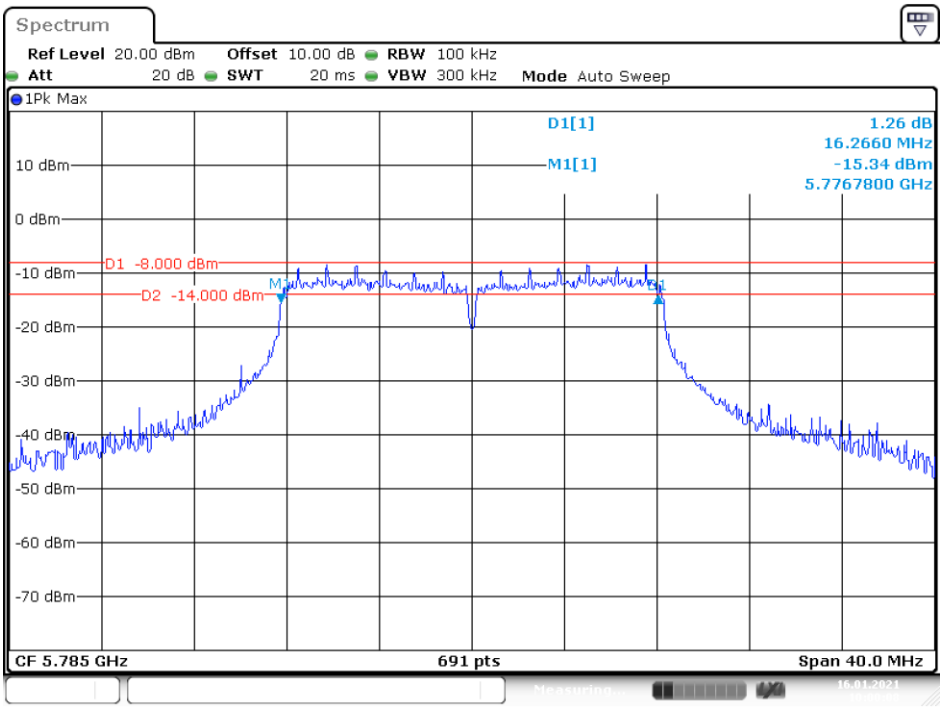
Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Remark
802.11a				No transmitted signal in the 99% bandwidth extends into the U-NII-2C band
5745	16.09	16.67	0.5	
5785	16.27	16.79	0.5	
5825	16.15	16.79	0.5	
802.11n20				
5745	17.31	17.66	0.5	
5785	17.37	17.77	0.5	
5825	17.42	17.71	0.5	
802.11n40				
5755	36.16	36.12	0.5	
5795	36.11	36.24	0.5	
802.11ac20				
5745	17.25	17.66	0.5	
5785	17.37	17.71	0.5	
5825	17.25	17.71	0.5	

802.11a mode, 6dB Emission Bandwidth, 5745 MHz



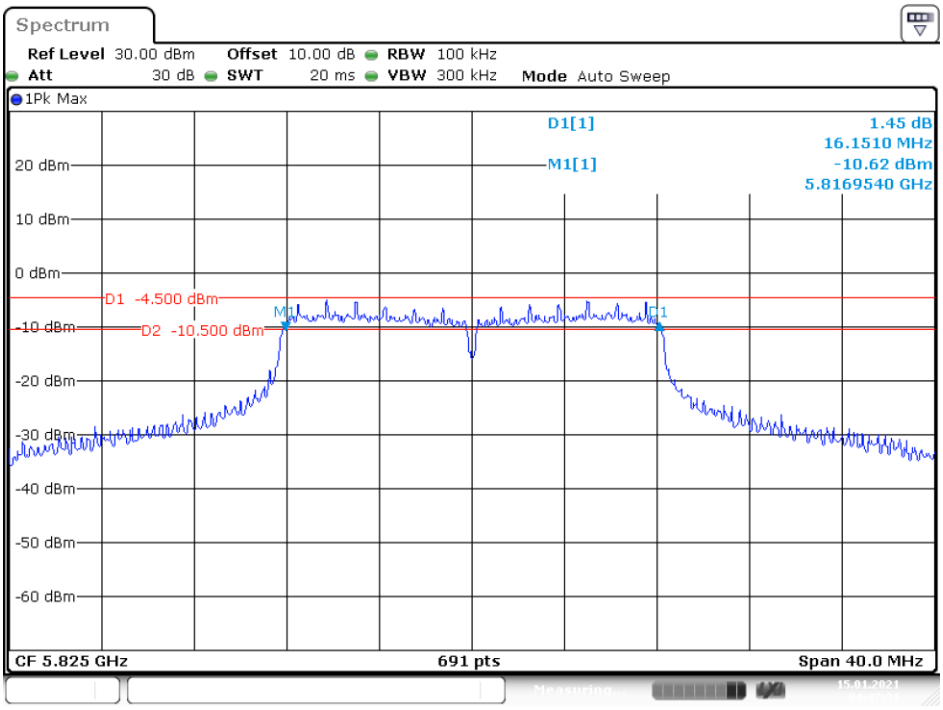
Date: 16.JAN.2021 09:56:15

802.11a mode, 6dB Emission Bandwidth, 5785 MHz



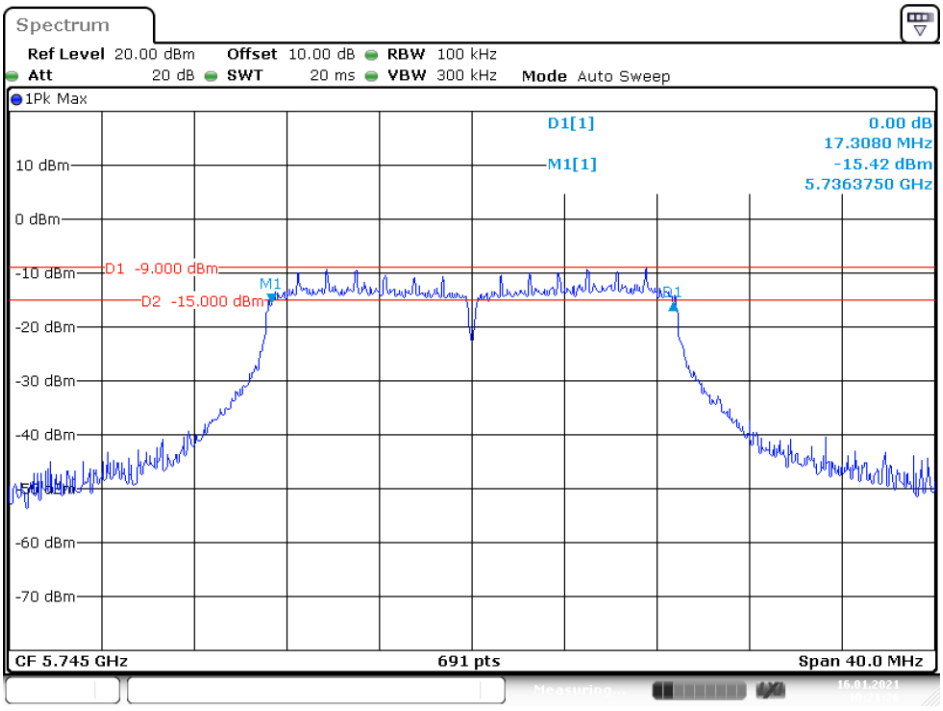
Date: 16.JAN.2021 10:00:08

802.11a mode, 6dB Emission Bandwidth, 5825 MHz



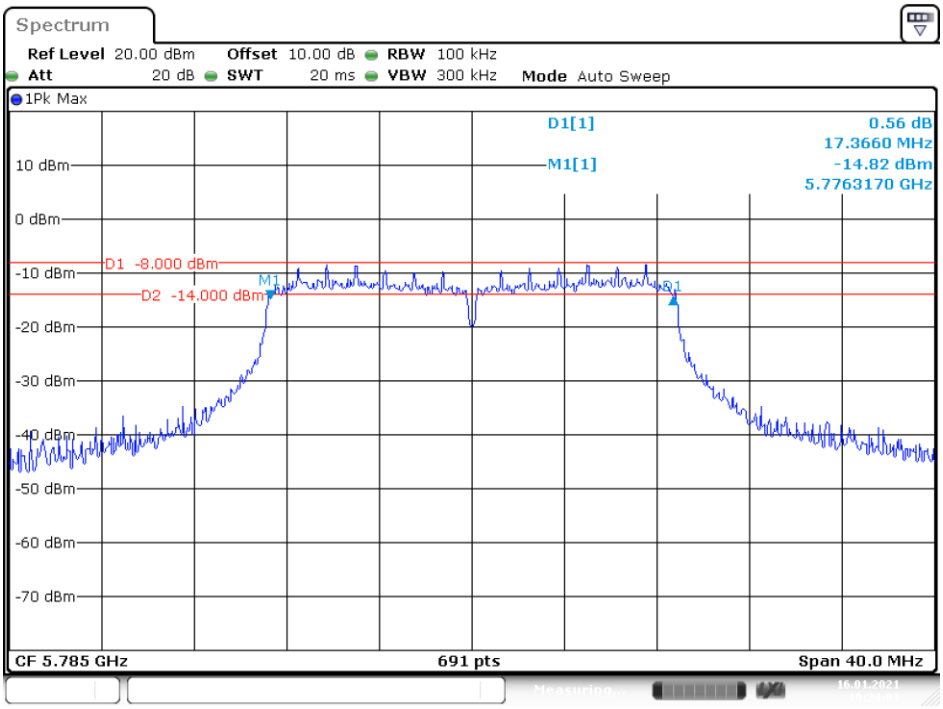
Date: 15.JAN.2021 04:47:32

802.11n20 mode, 6dB Emission Bandwidth, 5745 MHz



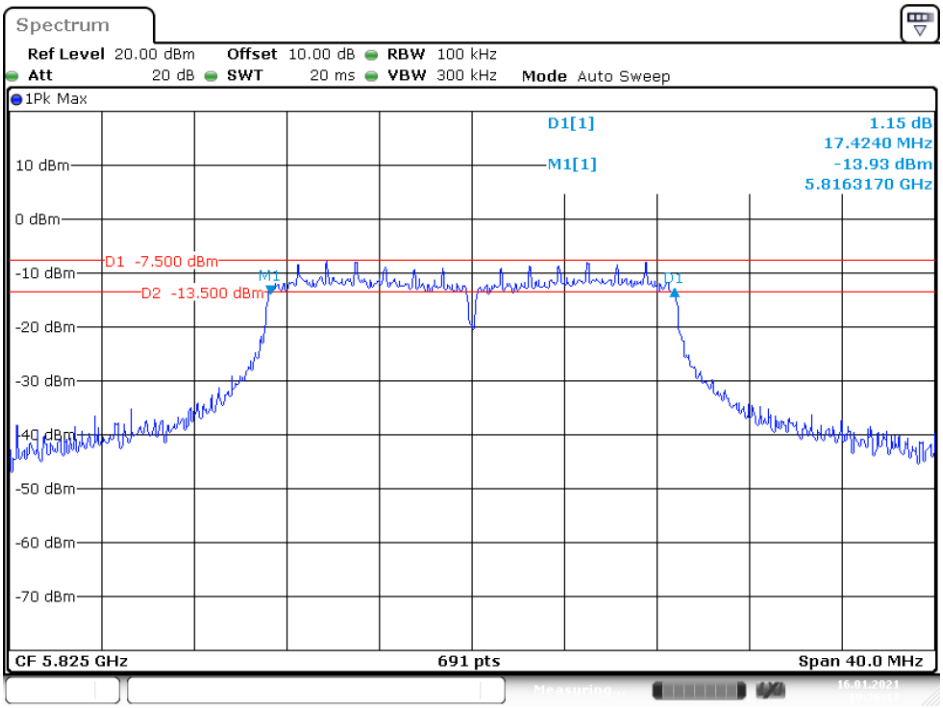
Date: 16.JAN.2021 10:21:26

802.11n20 mode, 6dB Emission Bandwidth, 5785 MHz



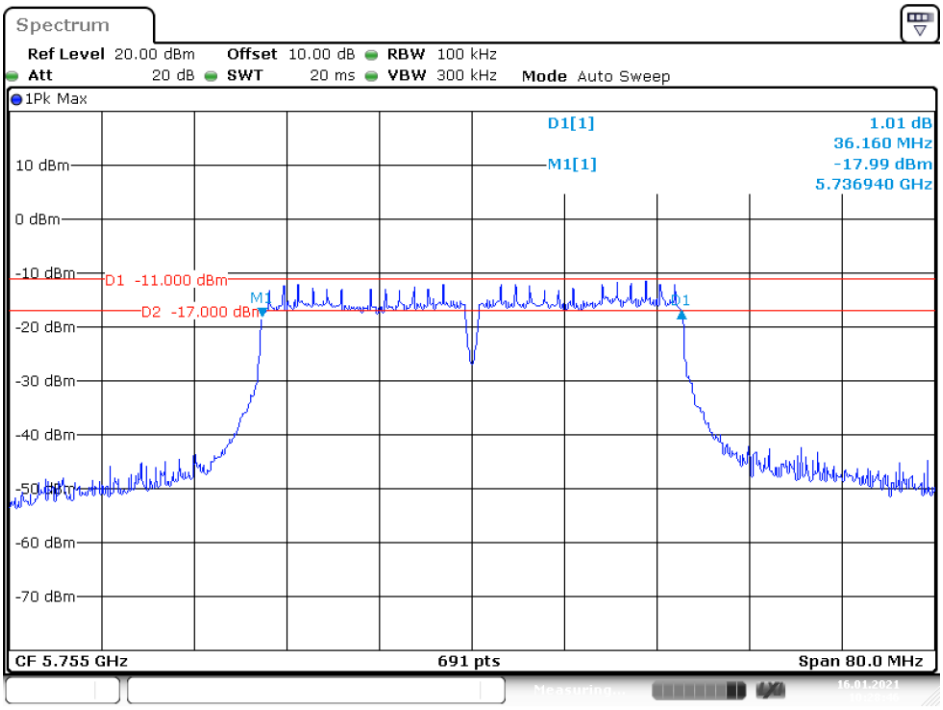
Date: 16.JAN.2021 10:24:04

802.11n20 mode, 6dB Emission Bandwidth, 5825 MHz



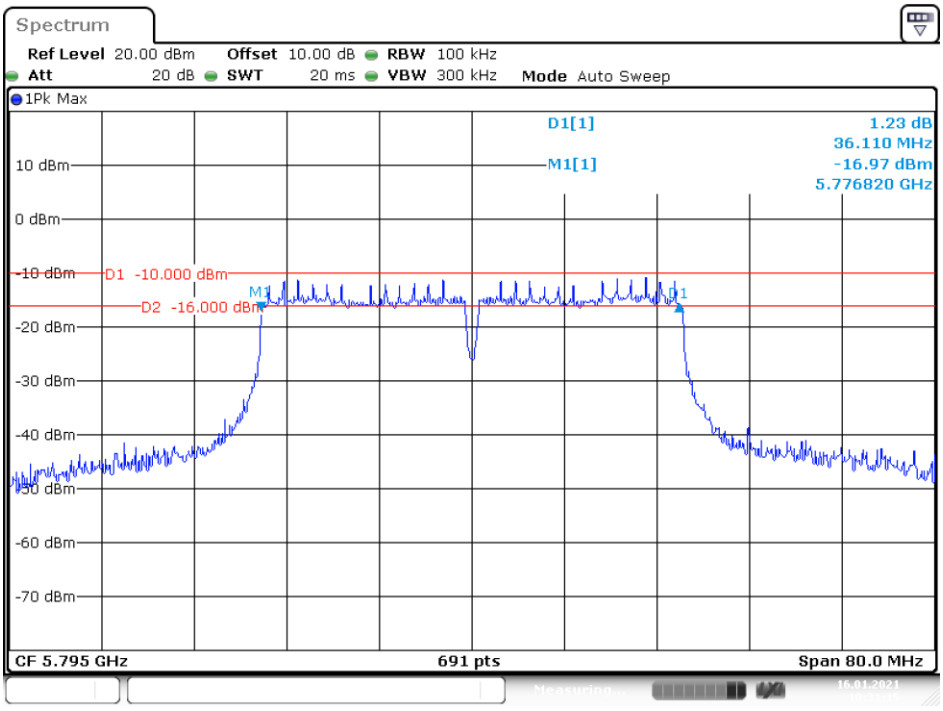
Date: 16.JAN.2021 10:26:17

802.11n40 mode, 6dB Emission Bandwidth, 5755 MHz



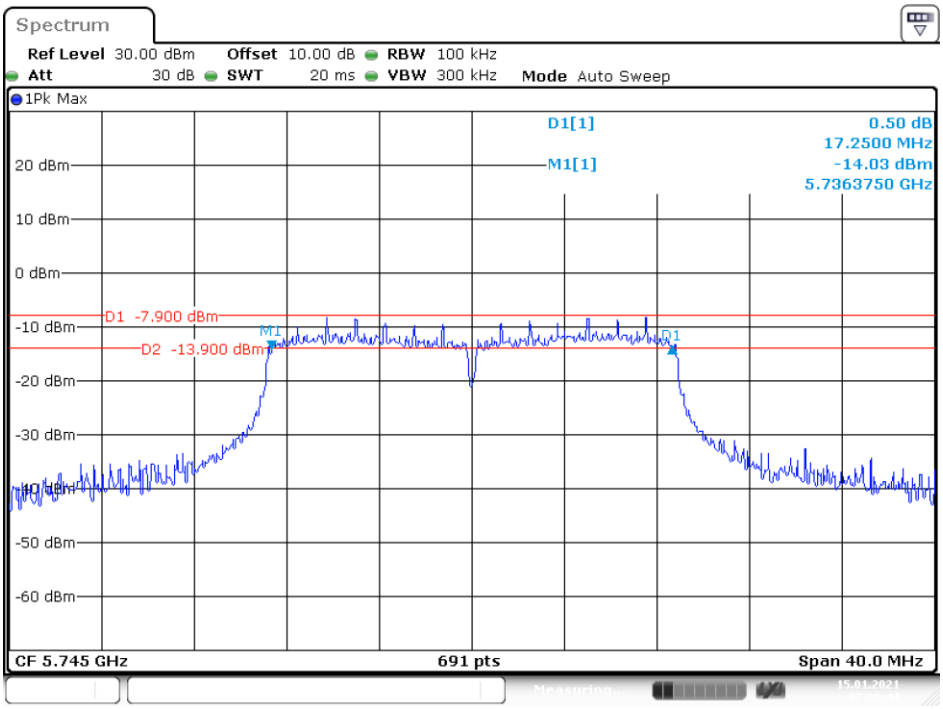
Date: 16.JAN.2021 10:28:47

802.11n40 mode, 6dB Emission Bandwidth, 5795 MHz



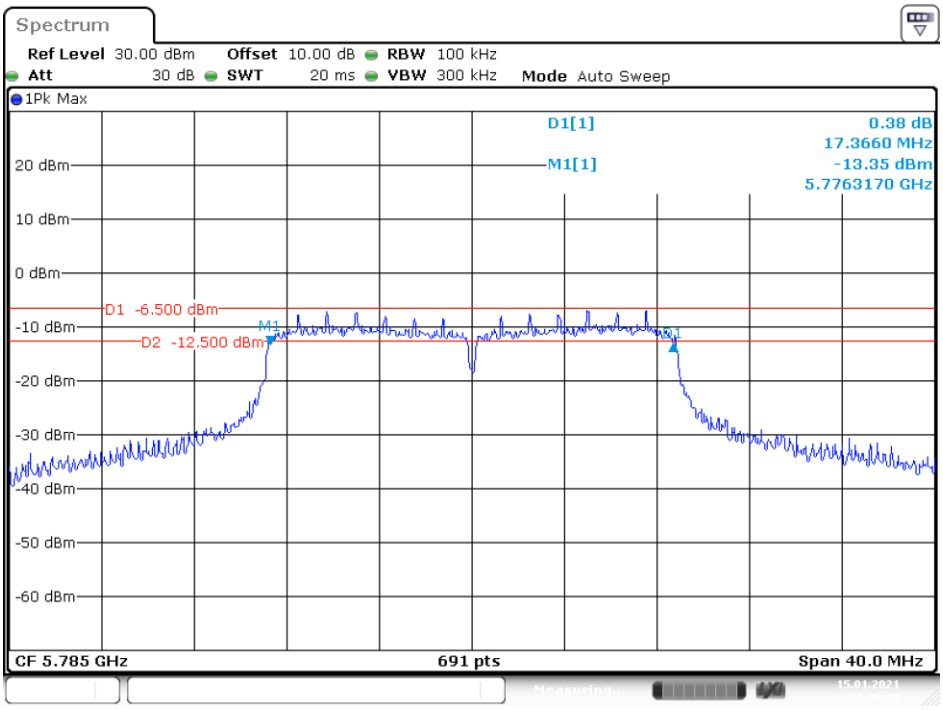
Date: 16.JAN.2021 10:31:16

802.11ac20 mode, 6dB Emission Bandwidth, 5745 MHz



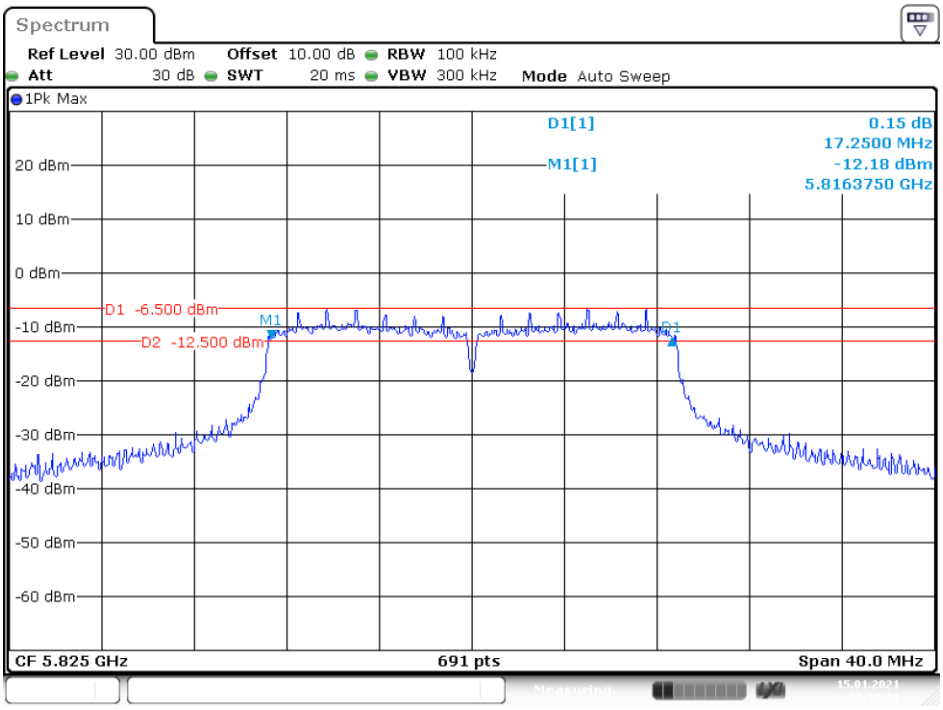
Date: 15.JAN.2021 07:09:44

802.11ac20 mode, 6dB Emission Bandwidth, 5785 MHz



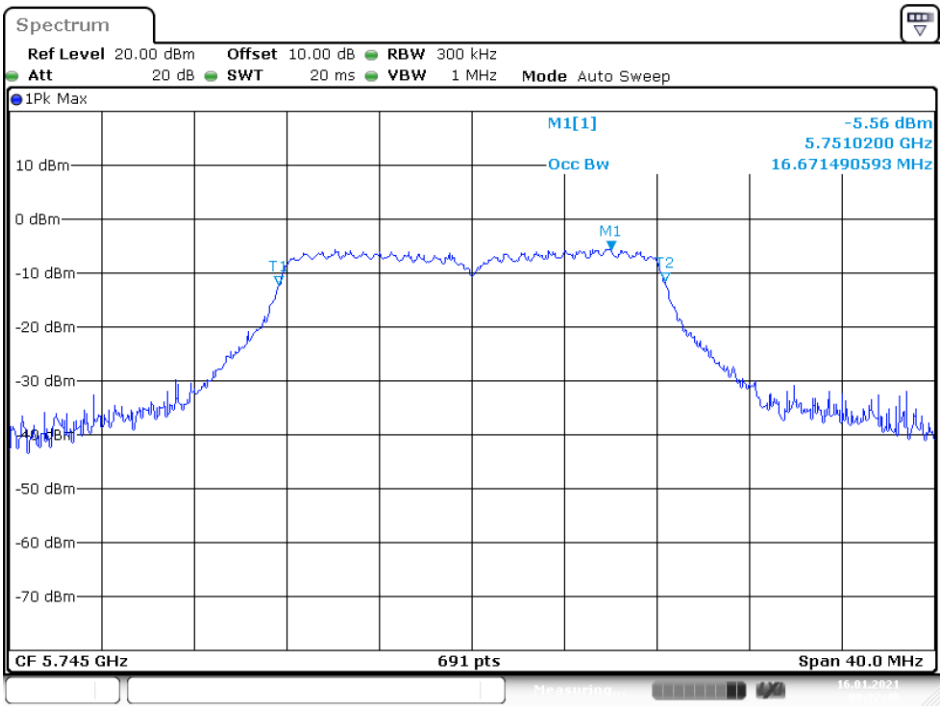
Date: 15.JAN.2021 07:36:05

802.11ac20 mode, 6dB Emission Bandwidth, 5825 MHz



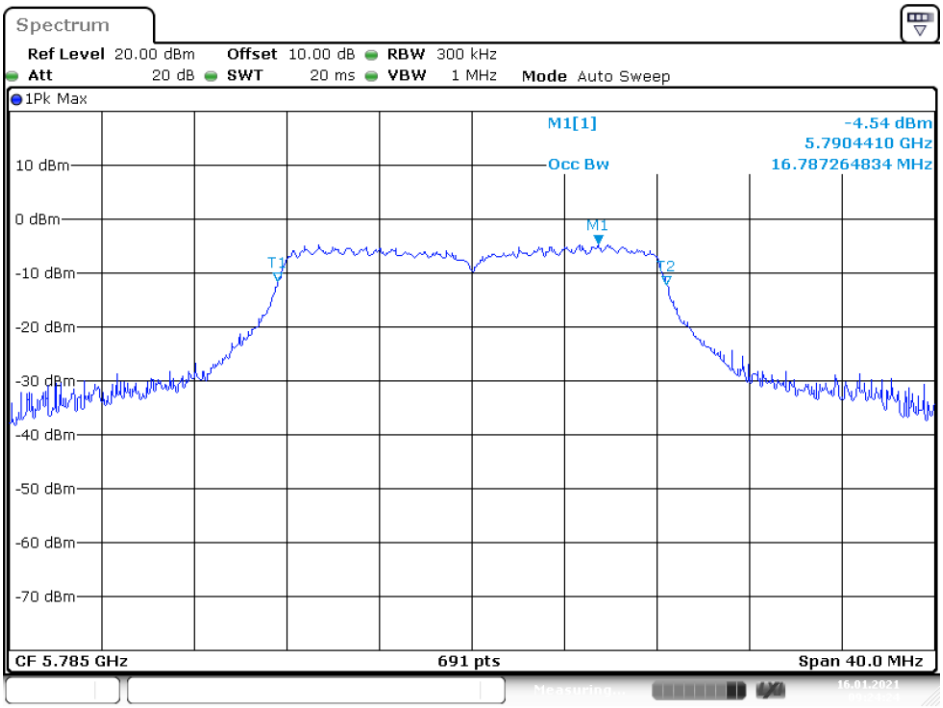
Date: 15.JAN.2021 07:32:11

802.11a mode, 99% Occupied Bandwidth, 5745 MHz



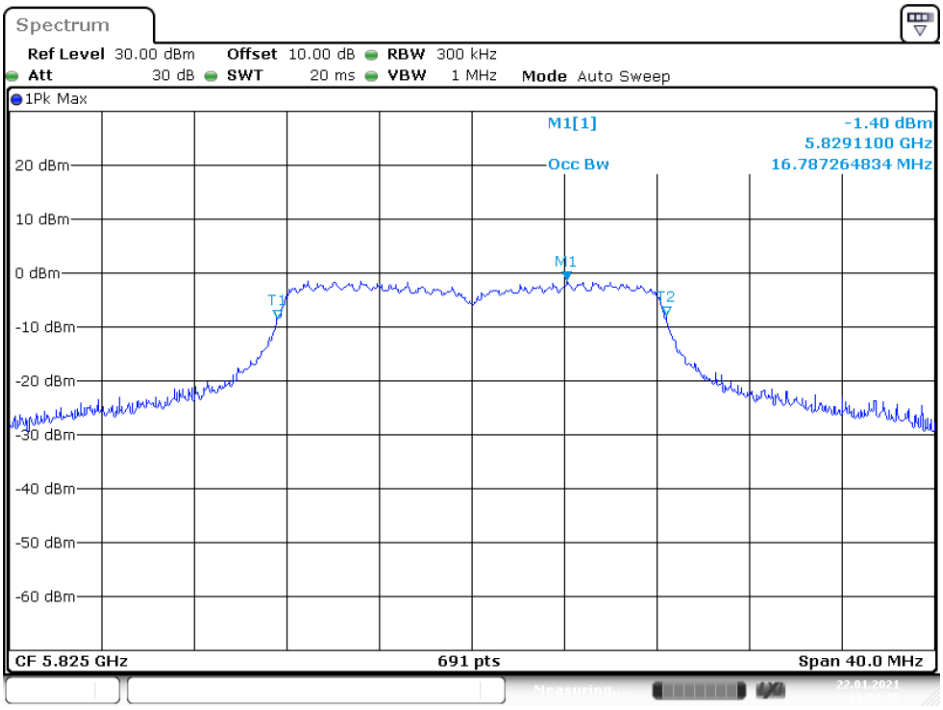
Date: 16.JAN.2021 09:22:40

802.11a mode, 99% Occupied Bandwidth, 5785 MHz



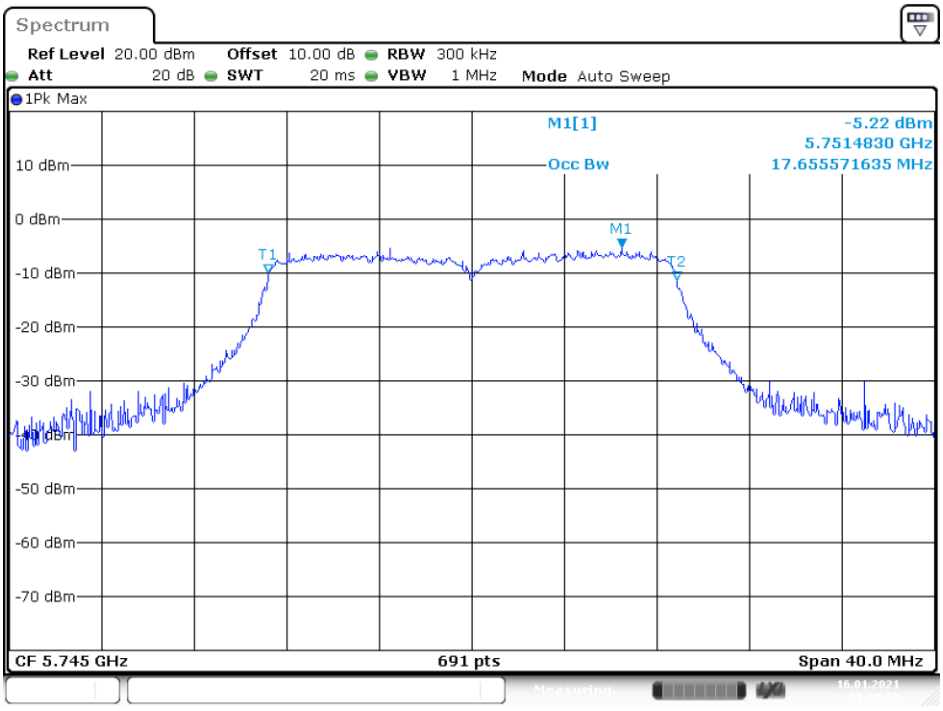
Date: 16.JAN.2021 09:24:24

802.11a mode, 99% Occupied Bandwidth, 5825 MHz



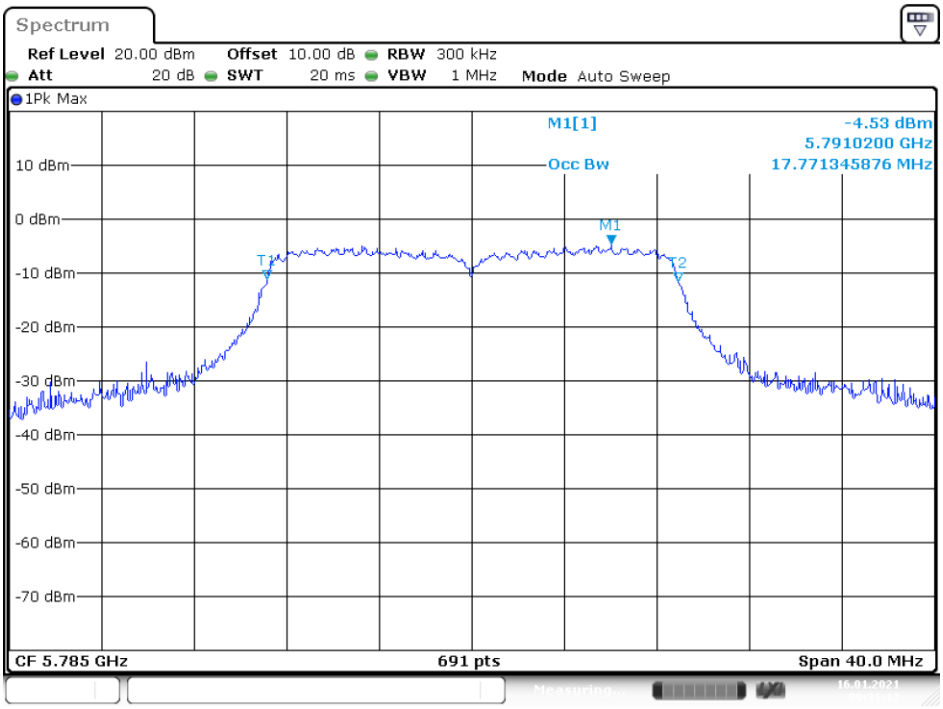
Date: 22.JAN.2021 11:22:35

802.11n20 mode, 99% Occupied Bandwidth, 5745 MHz



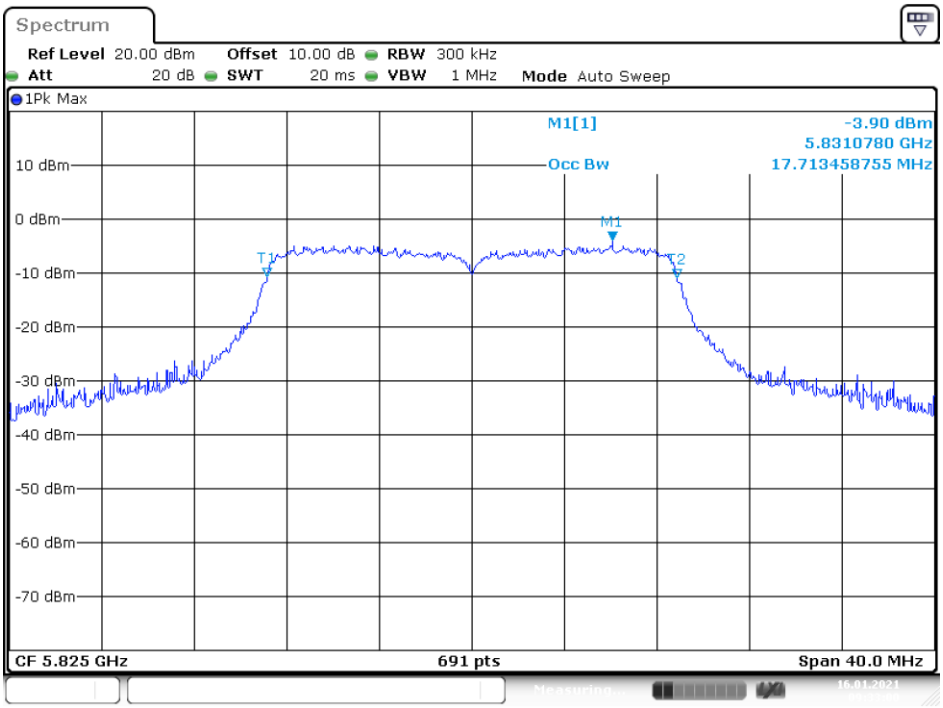
Date: 16.JAN.2021 09:29:52

802.11n20 mode, 99% Occupied Bandwidth, 5785 MHz



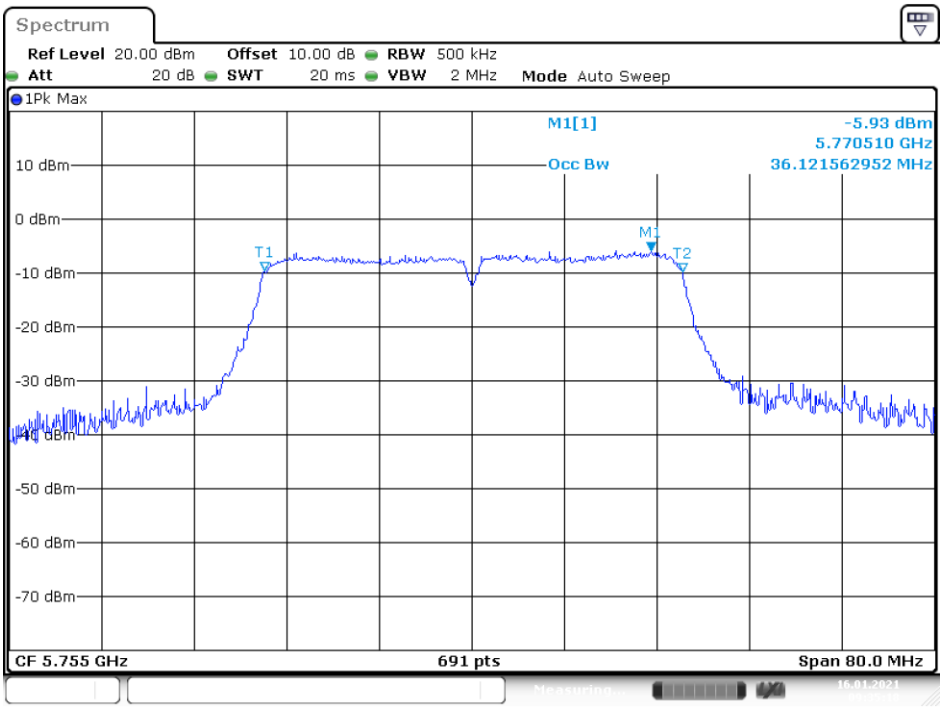
Date: 16.JAN.2021 09:31:12

802.11n20 mode, 99% Occupied Bandwidth, 5825 MHz



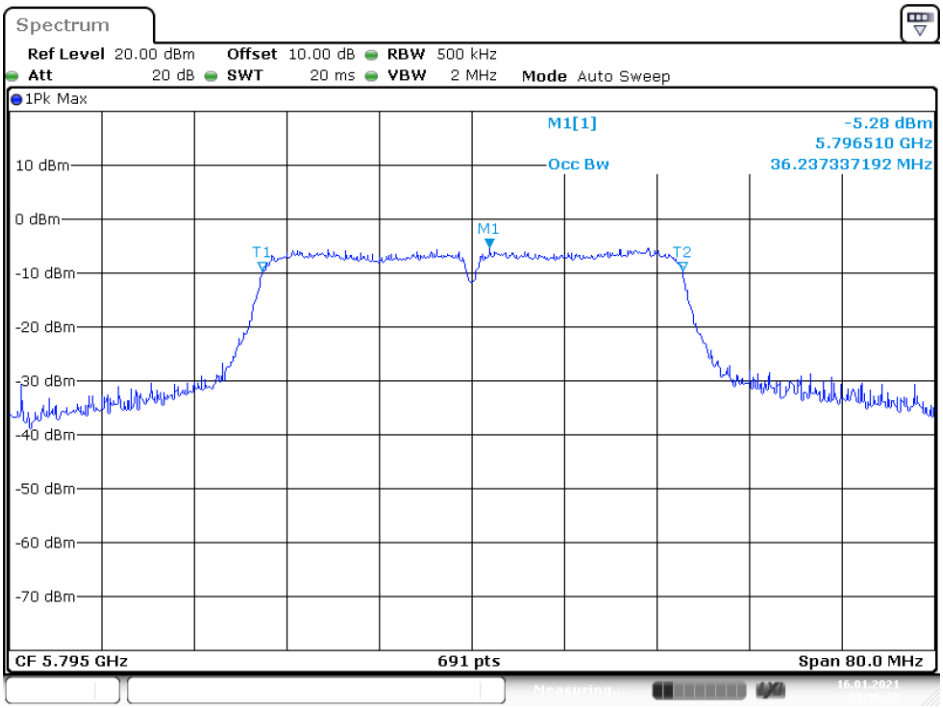
Date: 16.JAN.2021 09:33:00

802.11n40 mode, 99% Occupied Bandwidth, 5755 MHz



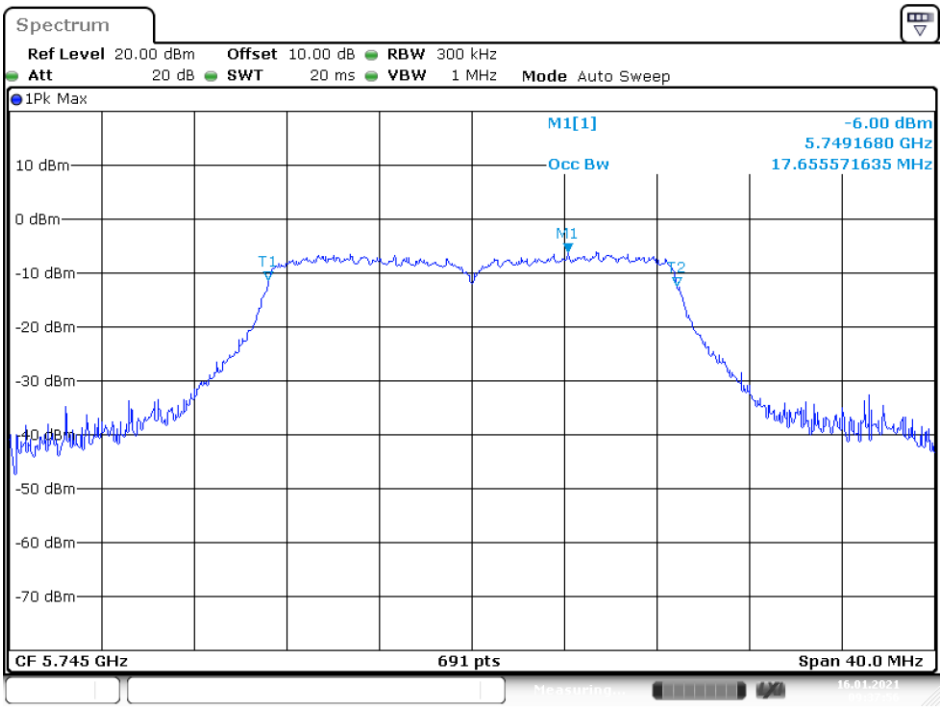
Date: 16.JAN.2021 09:35:18

802.11n40 mode, 99% Occupied Bandwidth, 5795 MHz



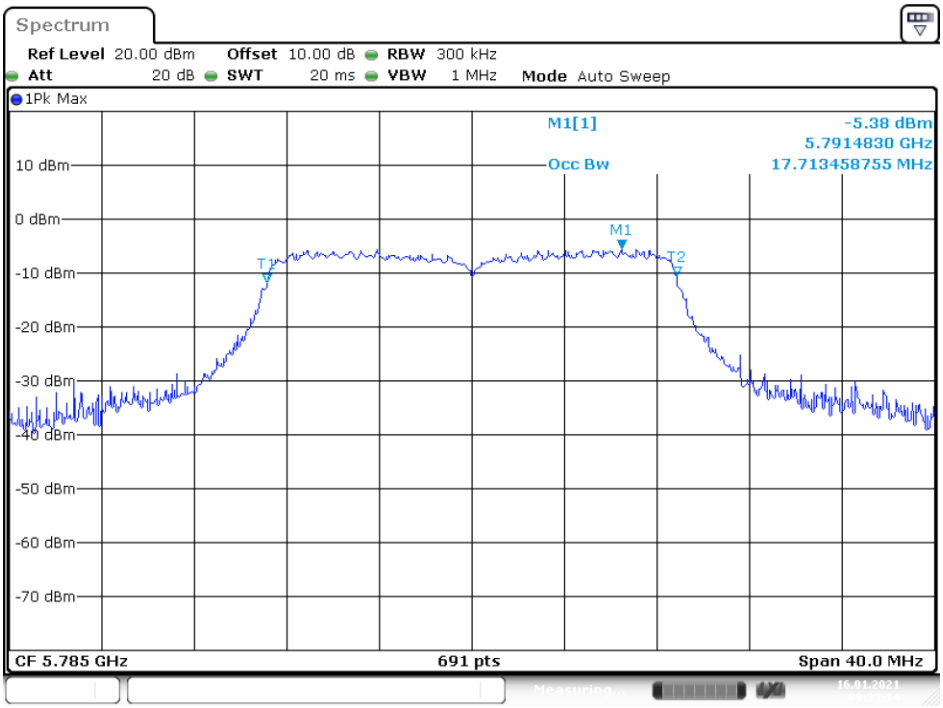
Date: 16.JAN.2021 09:36:32

802.11ac20 mode, 99% Occupied Bandwidth, 5745 MHz



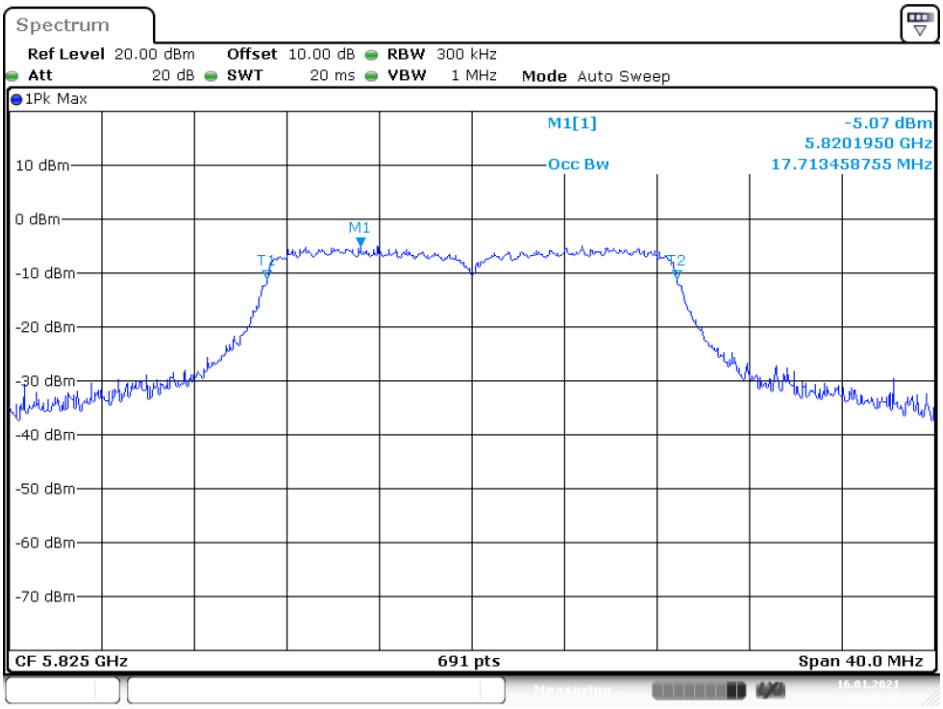
Date: 16.JAN.2021 09:37:56

802.11ac20 mode, 99% Occupied Bandwidth, 5785 MHz



Date: 16.JAN.2021 09:39:14

802.11ac20 mode, 99% Occupied Bandwidth, 5825 MHz



Date: 16.JAN.2021 09:40:30

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

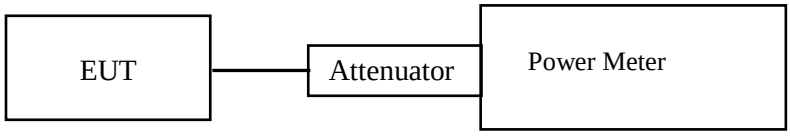
Applicable Standard

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

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

Test Procedure

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



Test Data

Environmental Conditions

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

The testing was performed by Ting Lüon 2021-01-16.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

5150 MHz – 5250 MHz

Frequency (MHz)	Average Conducted Output Power (dBm)	Duty Cycle Factor (dB)	Corrected Average Conducted Output Power (dBm)	Limit (dBm)
802.11a				
5180	14.27	0	14.27	24
5200	14.10	0	14.10	
5240	14.52	0	14.52	
802.11n20				
5180	12.18	0	12.18	24
5200	10.19	0	10.19	
5240	10.32	0	10.32	
802.11n40				
5190	11.29	0	11.29	24
5230	11.22	0	11.22	
802.11ac20				
5180	10.97	0	10.97	24
5200	10.82	0	10.82	
5240	11.13	0	11.13	

5725 MHz – 5825 MHz:

Frequency (MHz)	Average Conducted Output Power (dBm)	Duty Cycle Factor (dB)	Corrected Average Conducted Output Power (dBm)	Limit (dBm)
802.11a				
5745	14.16	0	14.16	30
5785	14.29	0	14.29	
5825	14.21	0	14.21	
802.11n20				
5745	11.40	0	11.40	30
5785	10.70	0	10.70	
5825	10.22	0	10.22	
802.11n40				
5755	11.19	0	11.19	30
5795	11.23	0	11.23	
802.11ac20				
5745	10.00	0	10.00	30
5785	10.23	0	10.23	
5825	10.08	0	10.08	

Note: This product is used for client device.

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

Applicable Standard

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

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

Test Procedure

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

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

Test Data

Environmental Conditions

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

The testing was performed by Ting Lüon 2021-01-16.

EUT operation mode: Transmitting

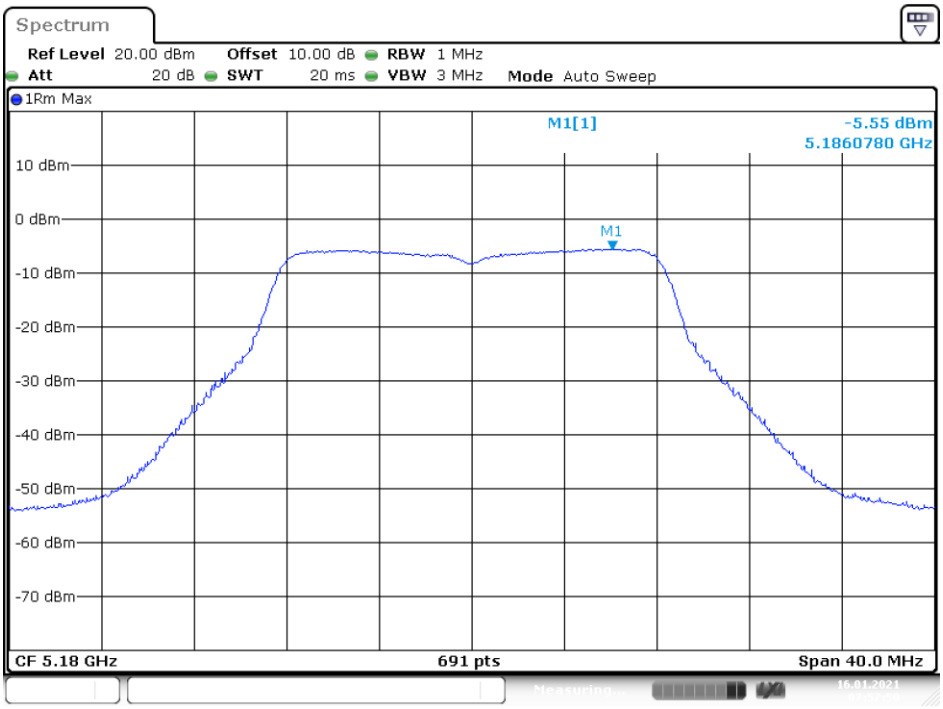
Test Result: Pass

Please refer to the following tables and plots.

5150 – 5250 MHz

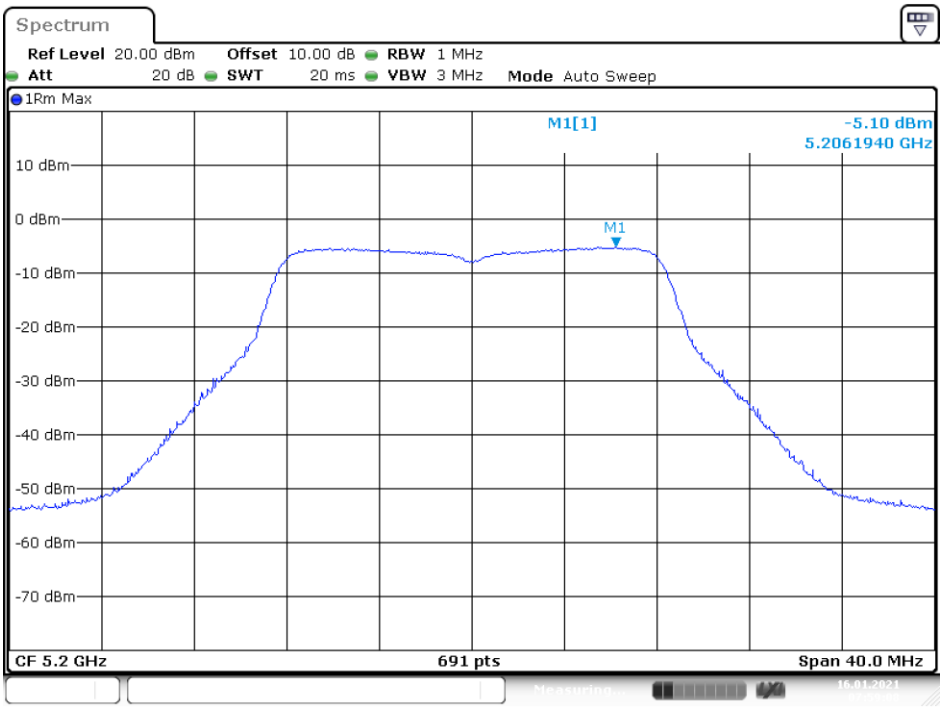
Frequency (MHz)	Power Spectral Density (dBm/MHz)	Duty Cycle Factor (dB)	Corrected Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)
802.11a				
5180	-5.55	0	-5.55	11
5200	-5.10	0	-5.10	
5240	-5.03	0	-5.03	
802.11n20				
5180	-6.06	0	-6.06	11
5200	-5.81	0	-5.81	
5240	-5.79	0	-5.79	
802.11n40				
5190	-8.64	0	-8.64	11
5230	-8.56	0	-8.56	
802.11ac20				
5180	-6.11	0	-6.11	11
5200	-5.61	0	-5.61	
5240	-6.48	0	-6.48	

802.11a mode, Power Spectral Density, 5180 MHz



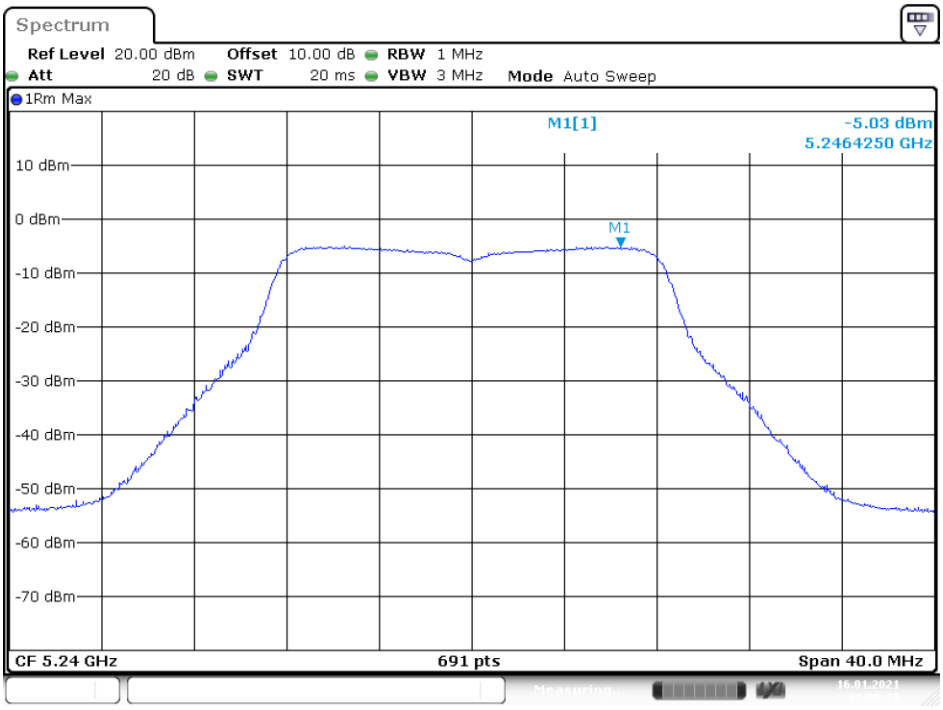
Date: 16.JAN.2021 07:57:50

802.11a mode, Power Spectral Density, 5200 MHz



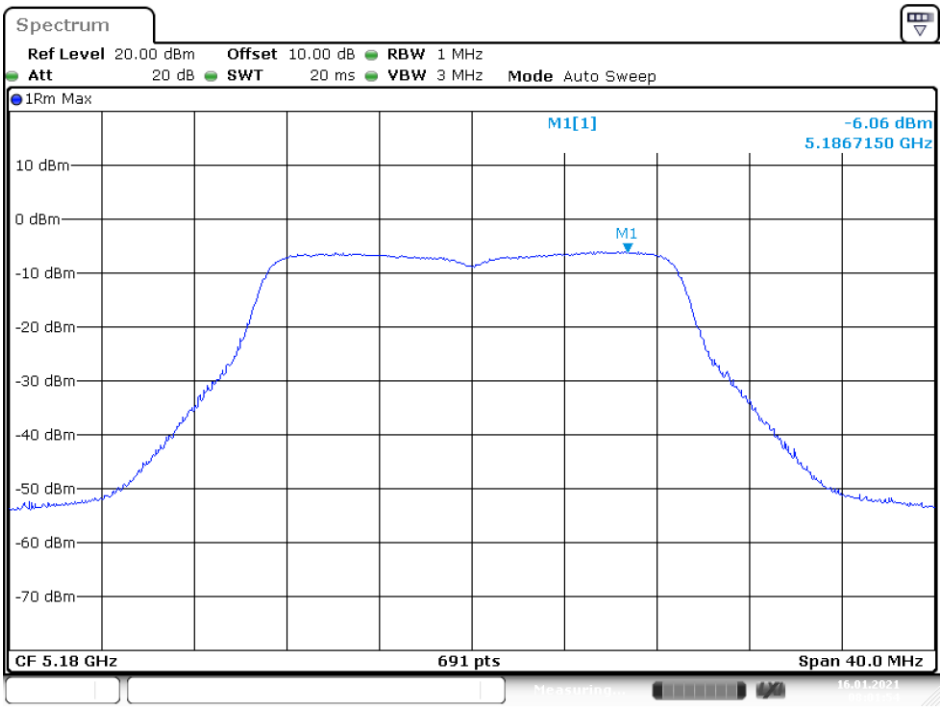
Date: 16.JAN.2021 07:59:08

802.11a mode, Power Spectral Density, 5240 MHz



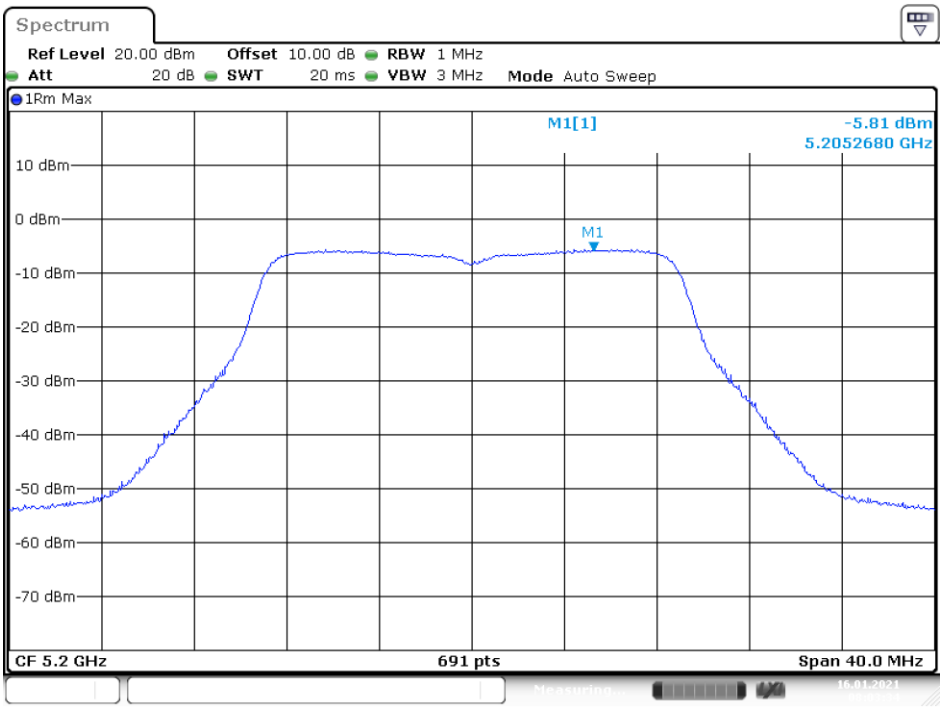
Date: 16.JAN.2021 08:00:29

802.11n20 mode, Power Spectral Density, 5180 MHz



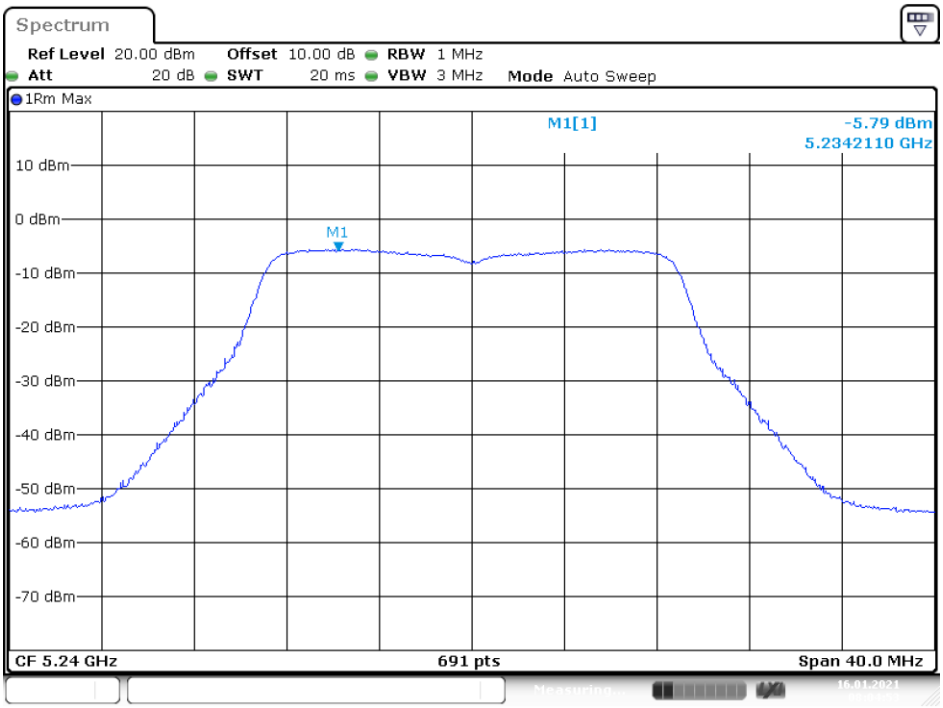
Date: 16.JAN.2021 08:01:55

802.11n20 mode, Power Spectral Density, 5200 MHz



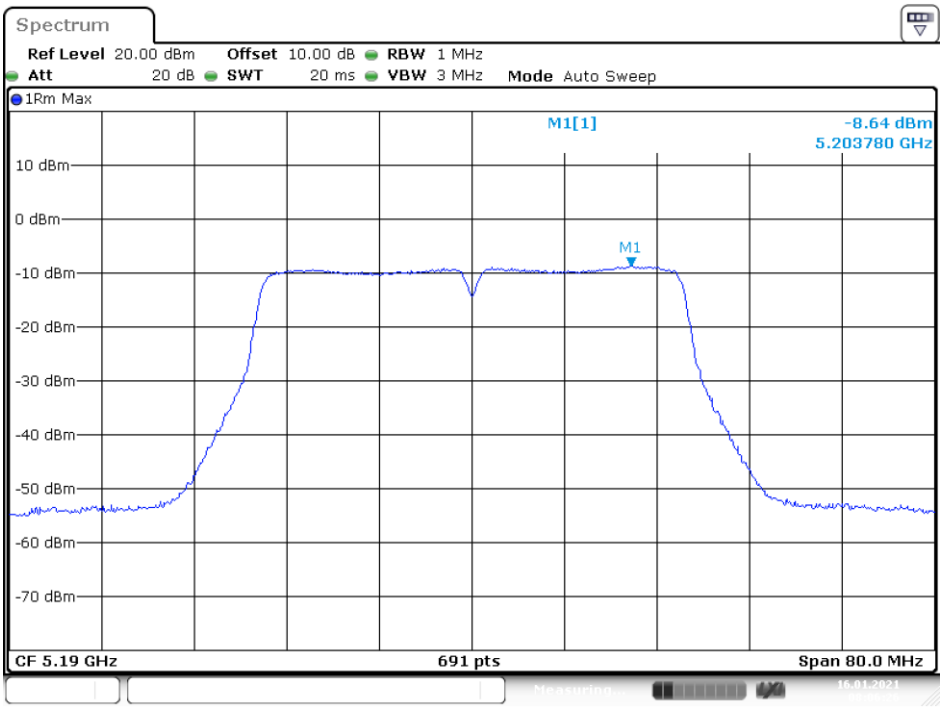
Date: 16.JAN.2021 08:03:34

802.11n20 mode, Power Spectral Density, 5240 MHz



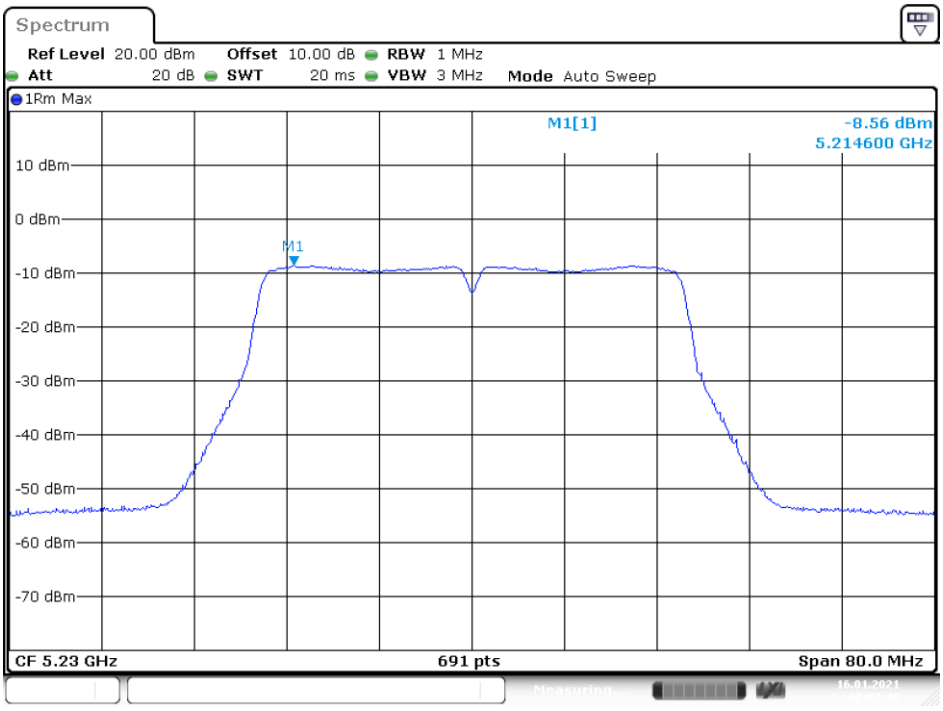
Date: 16.JAN.2021 08:04:54

802.11n40 mode, Power Spectral Density, 5190 MHz



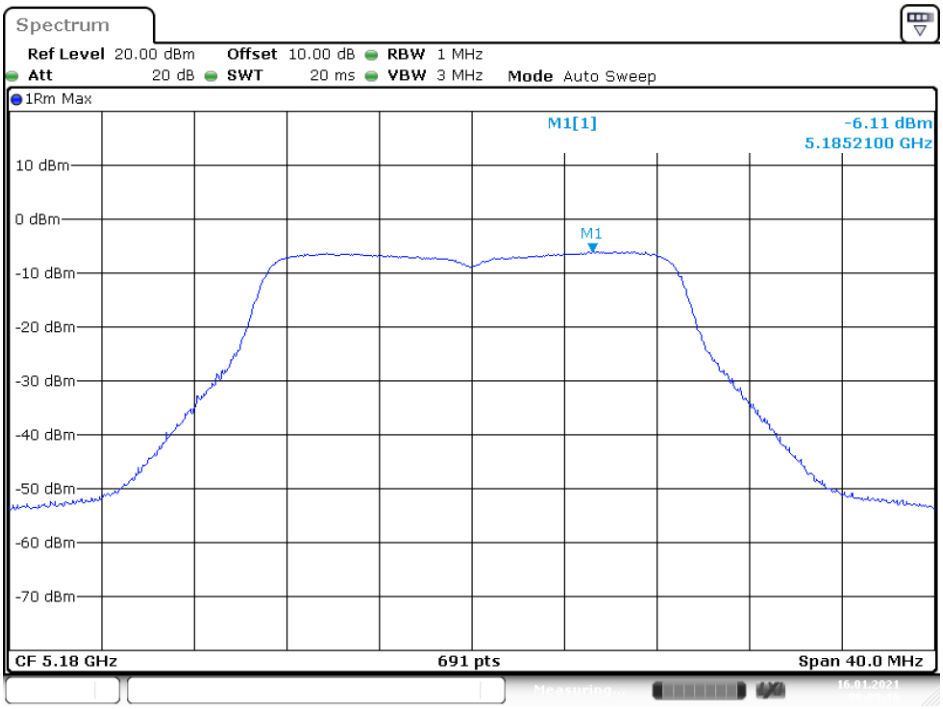
Date: 16.JAN.2021 08:06:26

802.11n40 mode, Power Spectral Density, 5230 MHz



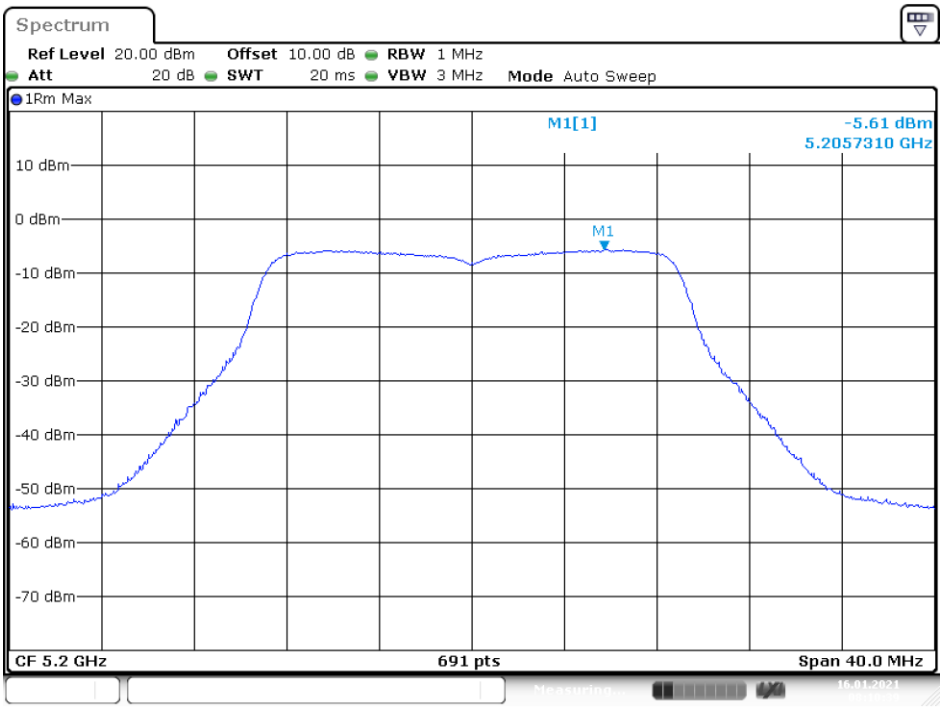
Date: 16.JAN.2021 08:07:46

802.11ac20 mode, Power Spectral Density, 5180 MHz



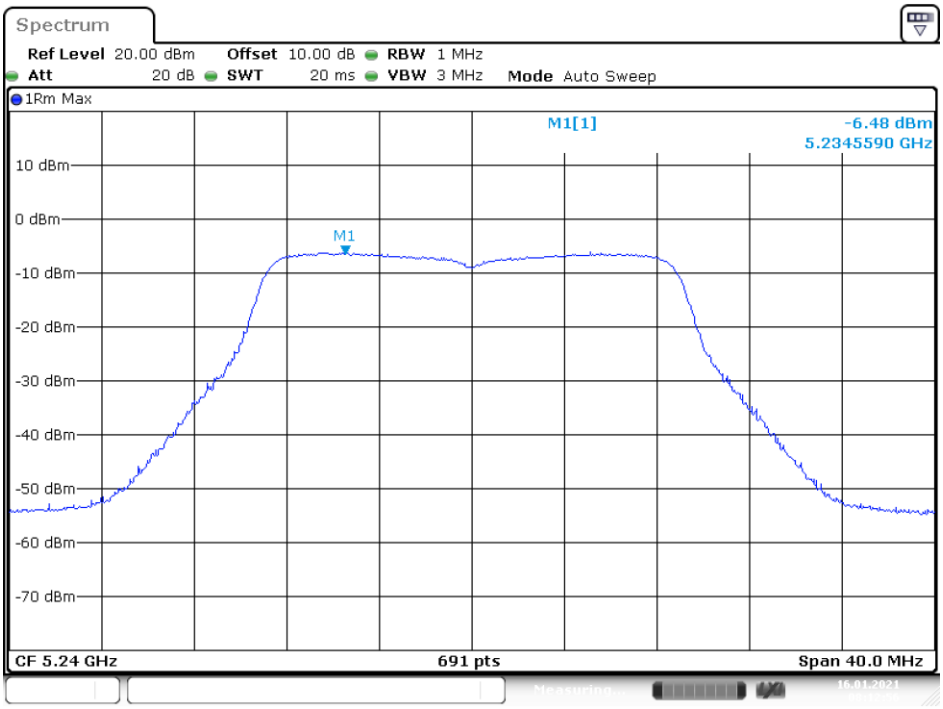
Date: 16.JAN.2021 08:09:17

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



Date: 16.JAN.2021 08:10:39

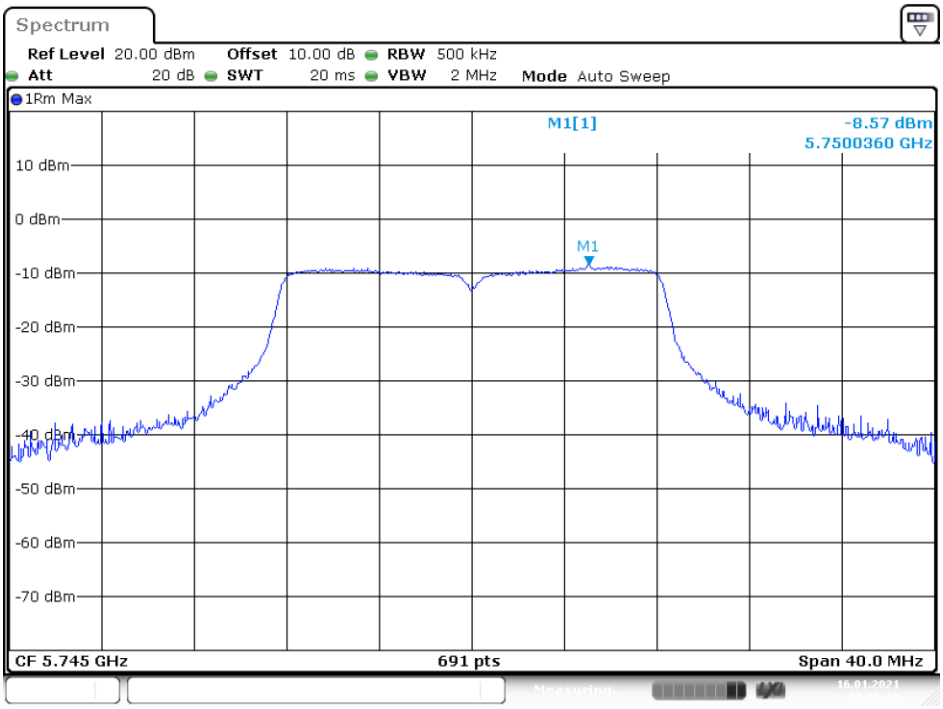
802. 11ac20 mode, Power Spectral Density, 5240 MHz



5745– 5825 MHz:

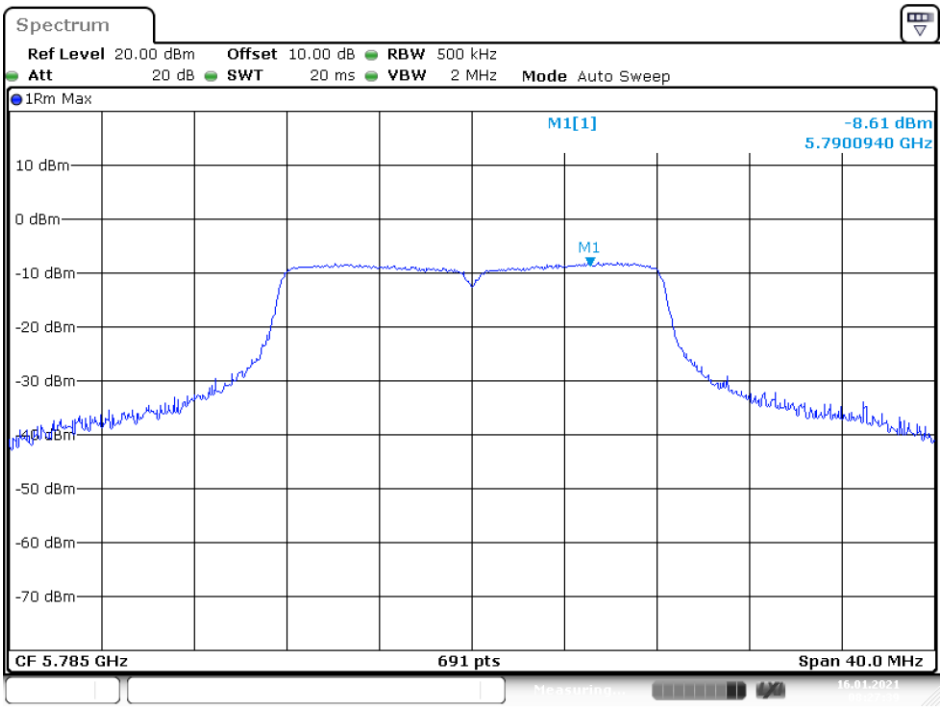
Frequency (MHz)	Power Spectral Density (dBm/500kHz)	Duty Cycle Factor (dB)	Corrected Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
802.11a				
5745	-8.57	0	-8.57	30
5785	-8.61	0	-8.61	
5825	-7.47	0	-7.47	
802.11n20				
5745	-8.97	0	-8.97	30
5785	-8.25	0	-8.25	
5825	-8.36	0	-8.36	
802.11n40				
5755	-11.57	0	-11.57	30
5795	-10.86	0	-10.86	
802.11ac20				
5745	-8.97	0	-8.97	30
5785	-8.11	0	-8.11	
5825	-8.01	0	-8.01	

802.11a mode, Power Spectral Density, 5745 MHz



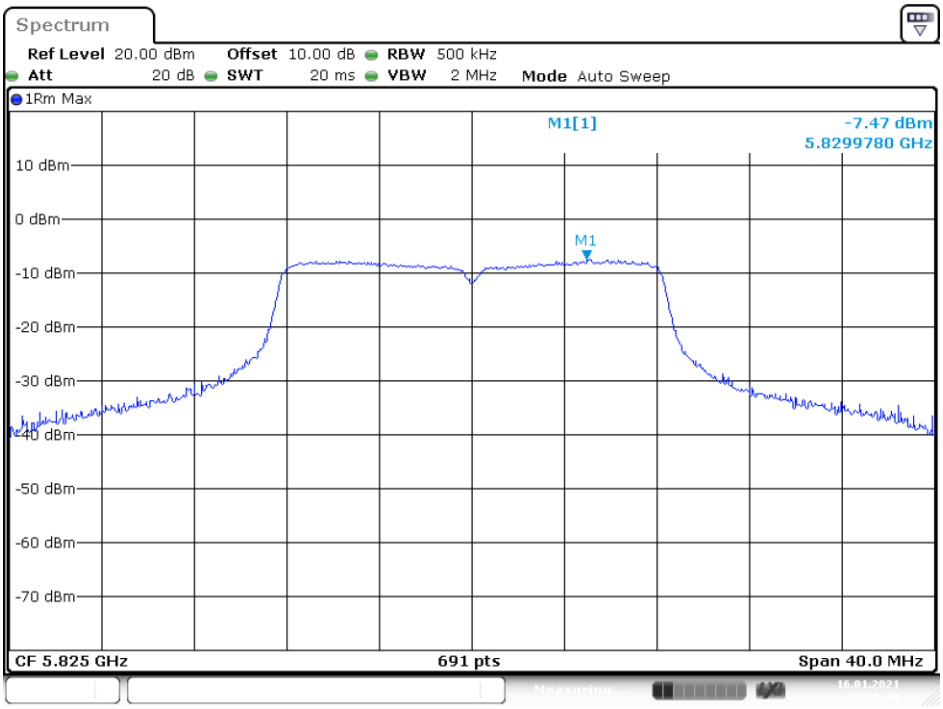
Date: 16.JAN.2021 08:26:13

802.11a mode, Power Spectral Density, 5785 MHz



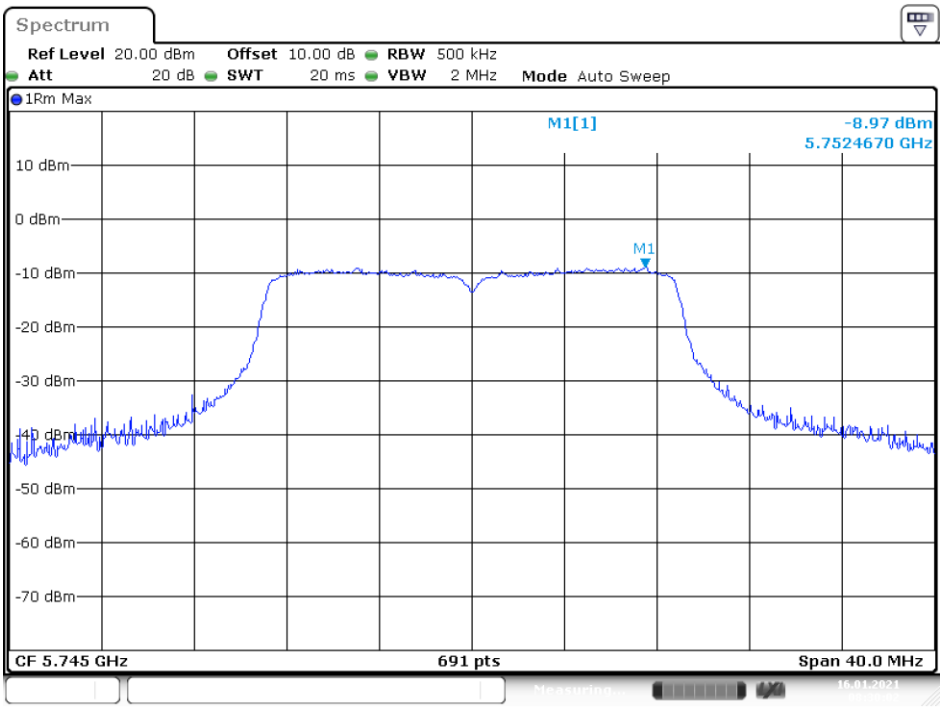
Date: 16.JAN.2021 08:27:39

802.11a mode, Power Spectral Density, 5825 MHz



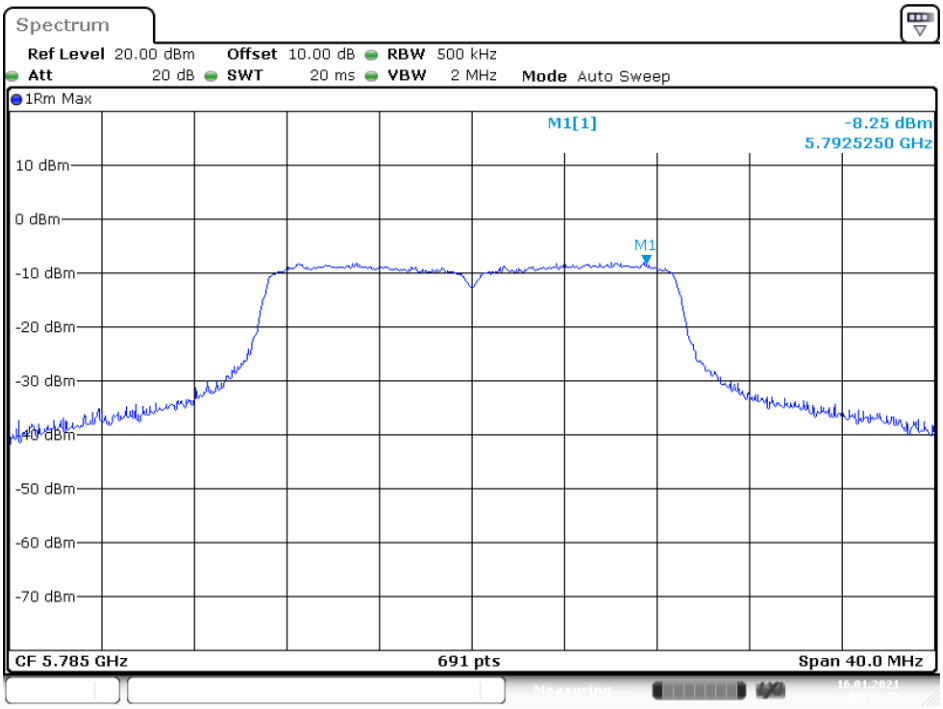
Date: 16.JAN.2021 08:28:45

802.11n20 mode, Power Spectral Density, 5745 MHz



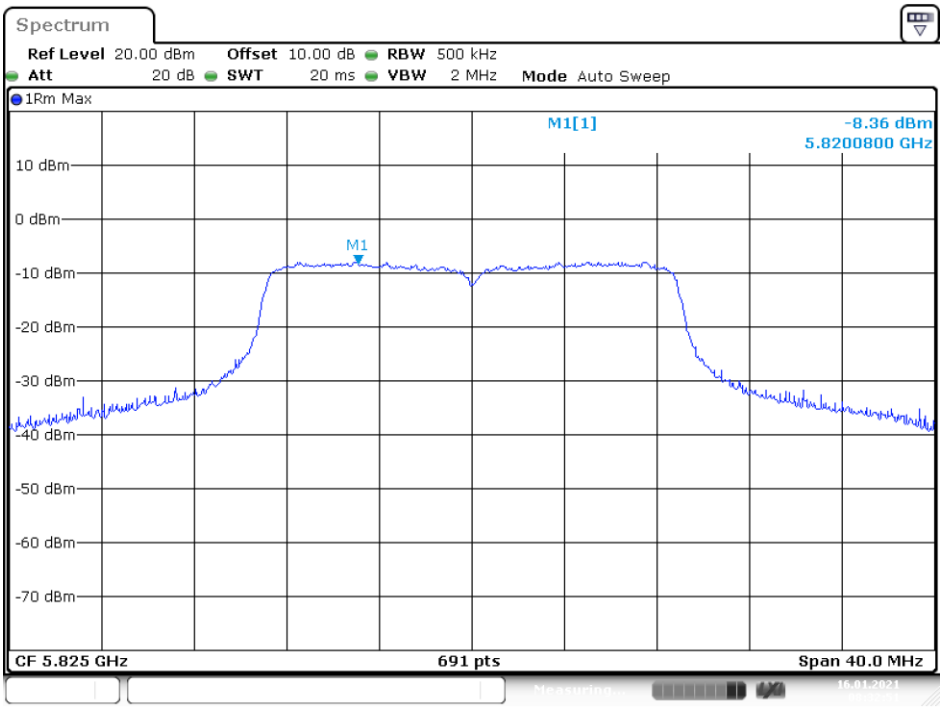
Date: 16.JAN.2021 08:30:02

802.11n20 mode, Power Spectral Density, 5785 MHz



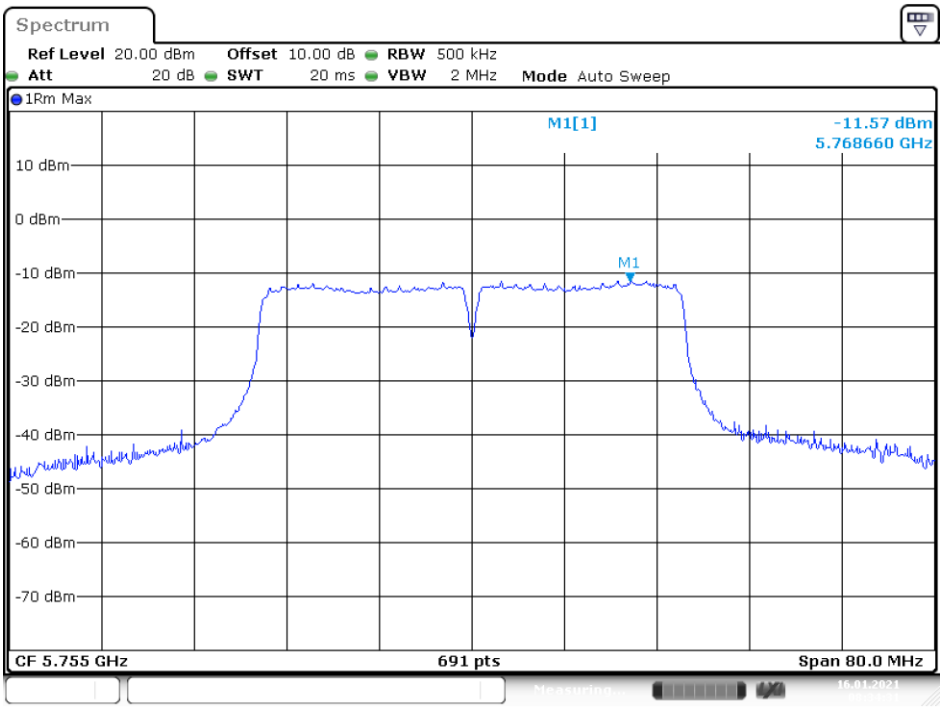
Date: 16.JAN.2021 08:31:57

802.11n20 mode, Power Spectral Density, 5825 MHz



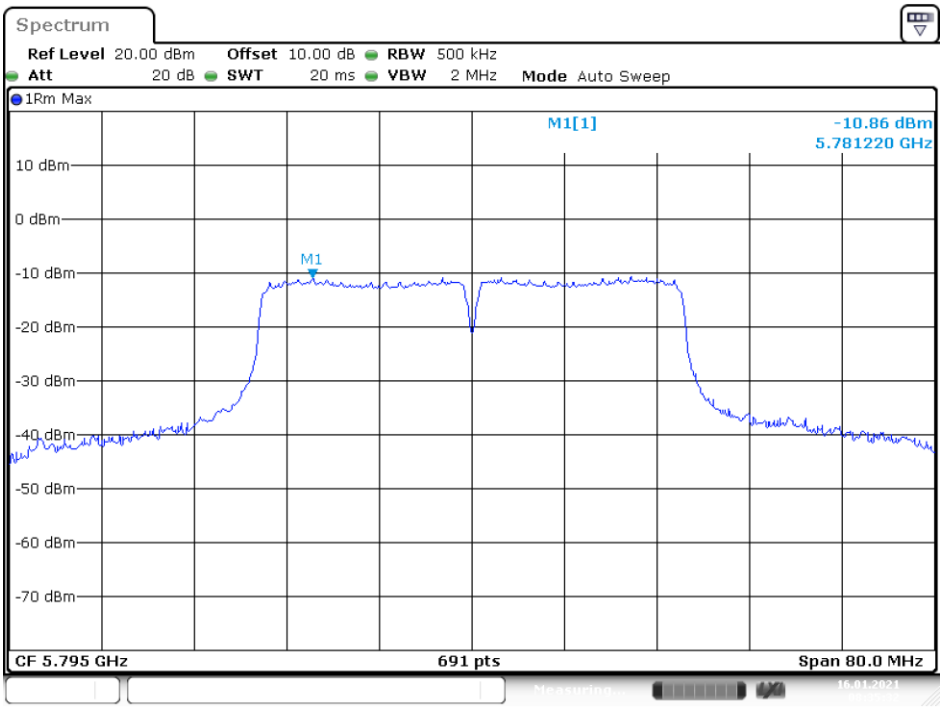
Date: 16.JAN.2021 08:32:51

802.11n40 mode, Power Spectral Density, 5755 MHz



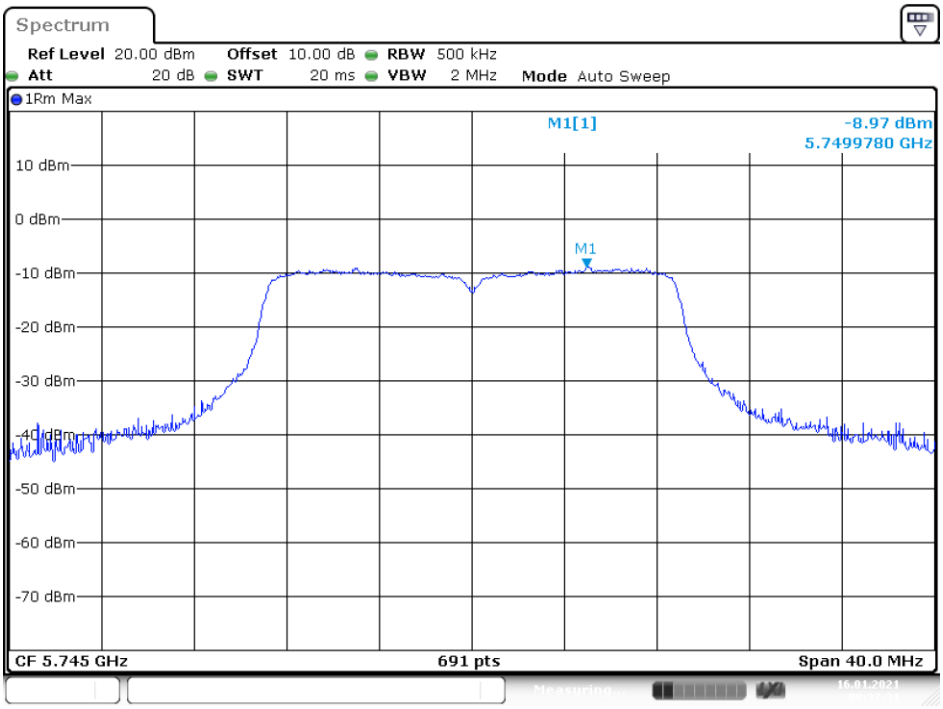
Date: 16.JAN.2021 08:34:32

802.11n40 mode, Power Spectral Density, 5795 MHz



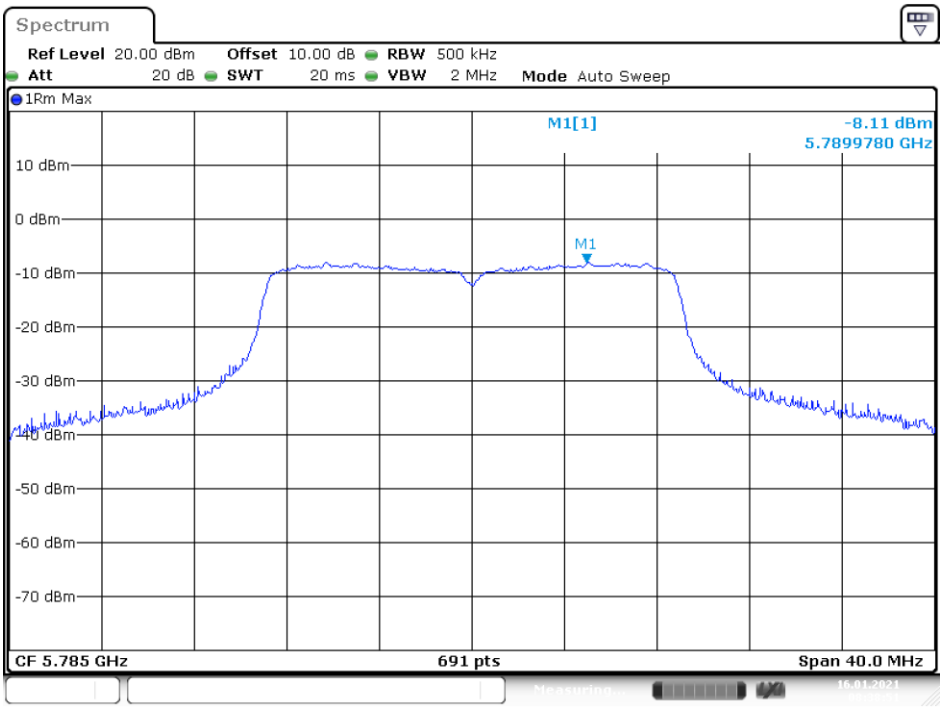
Date: 16.JAN.2021 08:35:33

802.11ac20 mode, Power Spectral Density, 5745 MHz



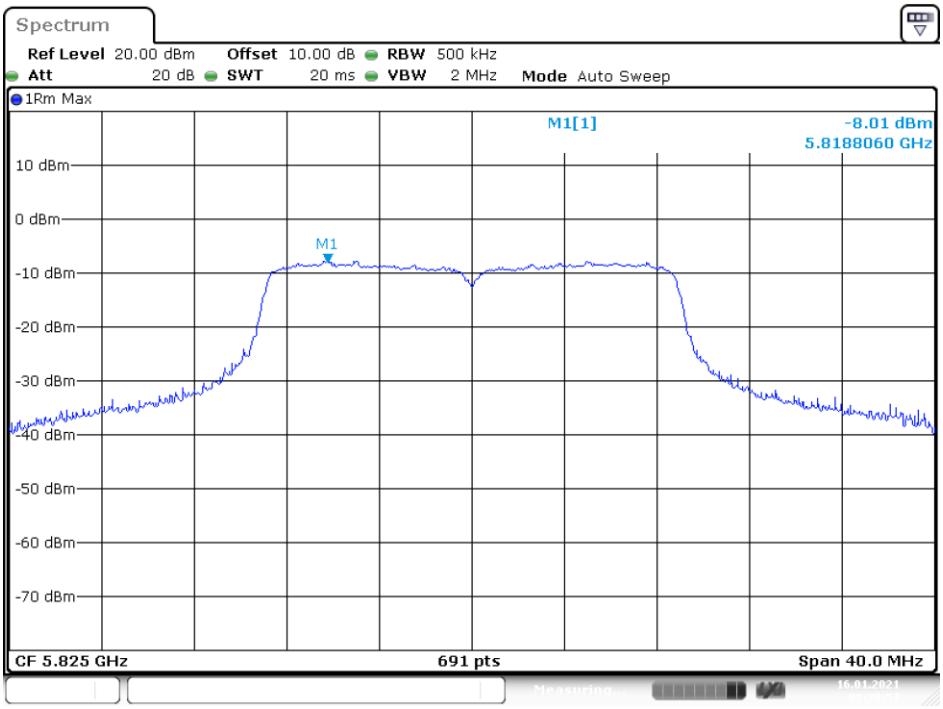
Date: 16.JAN.2021 08:37:32

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



Date: 16.JAN.2021 08:38:52

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



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