

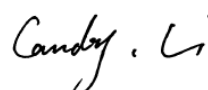
FCC PART 15.407 TEST REPORT

For

Smartlabs Holding Ltd

Nafpliou 15, Limassol, 3025 Cyprus

FCC ID: 2ASFLSML5041W

Report Type: Original Report	Product Type: IPTV Set-top box
Report Number: RSZ190311810-00C	
Report Date: 2019-05-13	
Reviewed By: RF Engineer	Candy Li 
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	IPTV Set-top box
Model	SML-5041W
Frequency Range	5G Wi-Fi: 5150-5250 MHz, 5725-5850 MHz
Transmit Power	5150-5250 MHz: 13.05dBm (802.11a), 12.62dBm(802.11n20/802.11ac 20), 12.55 dBm(802.11n40/802.11ac 40),10.81 dBm(802.11 ac80) 5725-5850 MHz 12.78dBm (802.11a), 12.55dBm(802.11n20/802.11ac 20), 12.42 dBm(802.11n40/802.11ac 40),10.33 dBm(802.11 ac80)
Modulation Technique	Wi-Fi: OFDM
Antenna Specification	2dBi
Voltage Range	DC 12V from adapter
Date of Test	2019/04/03~2019/05/10
Sample serial number	190311810
Received date	2019/03/11
Sample/EUT Status	Good condition
Adapter information	Model: TEKA018-1201200UK Input: AC 100-240V, 50/60Hz, 0.5A Max Output: DC 12V, 1.2A

Objective

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

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS&DTS submissions with FCC ID: 2ASFLSML5041W.

Test Methodology

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

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

Measurement Uncertainty

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

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

Test Facility

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

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The device support 802.11a/n20/n40/ac20/ac40/ac80 modes, the 802.11ac20/ac40 were reduced since the identical parameters with 802.11n20/n40.

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

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

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

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

The EUT 802.11a mode only support SISO mode, the others mode can support SISO and MIMO mode, pre-scan the output power of both modes, the result of both modes was almost identical, so the MIMO mode was chosen for testing.

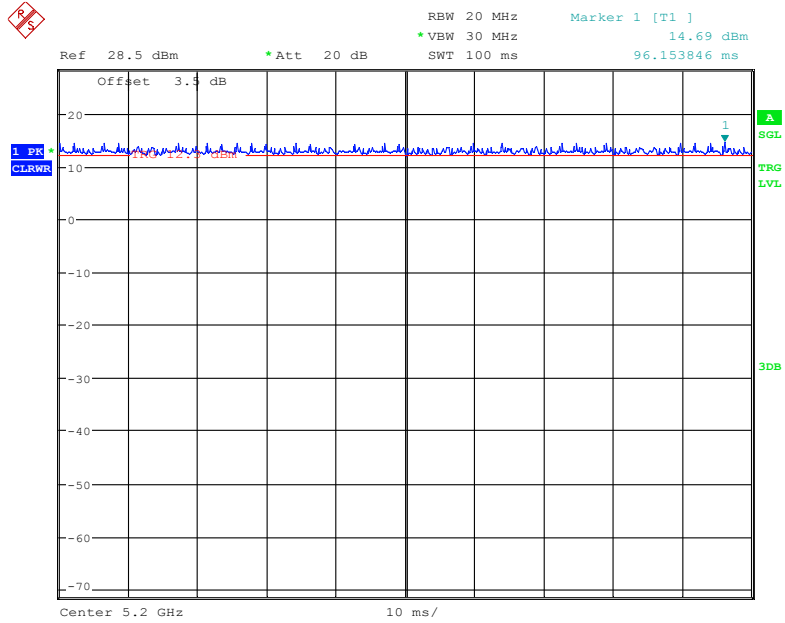
EUT Exercise Software

Exercise software “Xshell” and Commands were used.
Test frequencies and power level were configured as below:

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power level	
					Ant A	Ant B
5150 – 5250MHz	802.11 a	CH36	5180	6	44	44
		CH40	5200	6	44	44
		CH48	5240	6	44	44
	802.11 n20	CH36	5180	MCS0	40	40
		CH40	5200	MCS0	40	40
		CH48	5240	MCS0	40	40
	802.11 n40	CH38	5190	MCS0	39	37
		CH46	5230	MCS0	39	37
	802.11 ac80	CH42	5210	MCS0	38	38
5725 – 5850MHz	802.11 a	CH149	5745	6	56	48
		CH157	5785	6	60	52
		CH165	5825	6	62	56
	802.11 n20	CH149	5745	MCS0	50	44
		CH157	5785	MCS0	52	46
		CH165	5825	MCS0	56	50
	802.11 n40	CH151	5755	MCS0	48	44
		CH159	5795	MCS0	52	46
	802.11 ac80	CH155	5775	MCS0	50	42

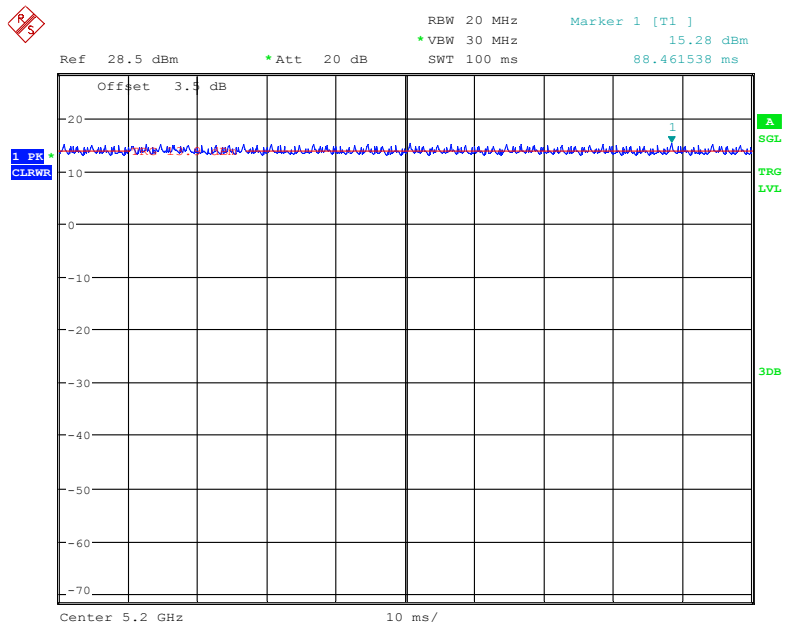
Duty cycle:
5150-5250 MHz

802.11a mode



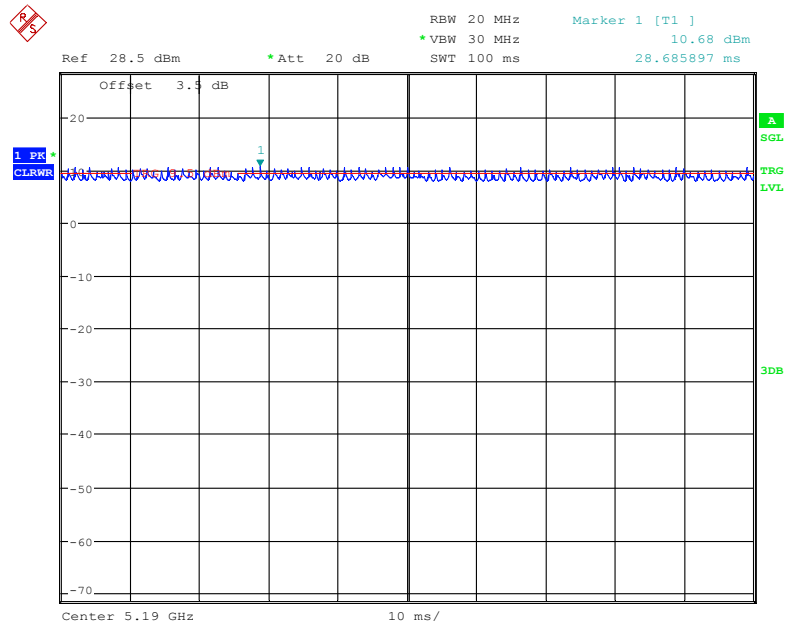
Date: 3.APR.2019 15:28:41

802.11n20 mode



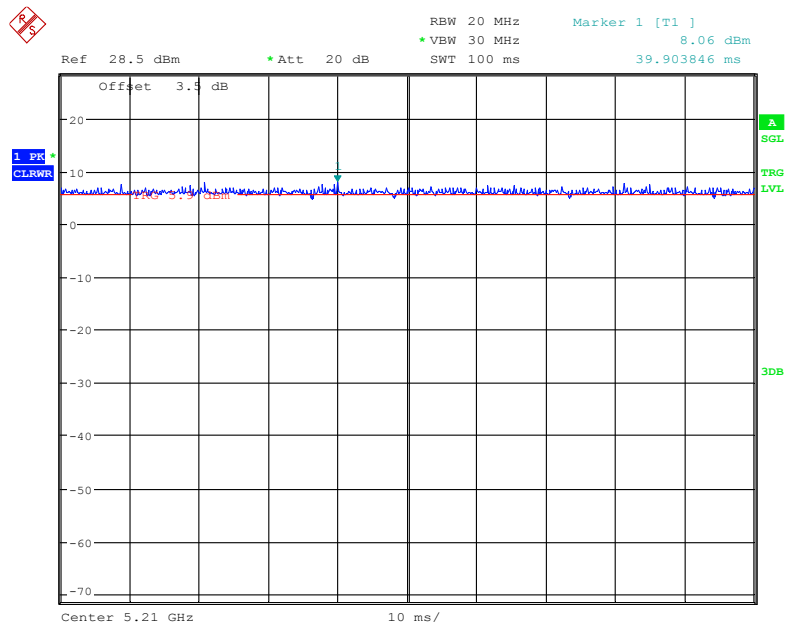
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802.11n40 Mode



Date: 3.APR.2019 15:35:25

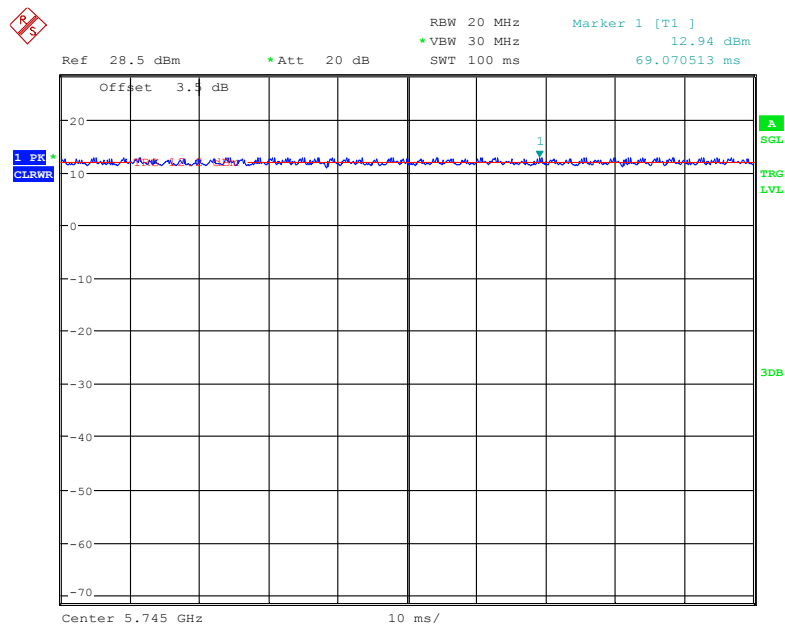
802.11ac80 Mode



Date: 3.APR.2019 15:45:11

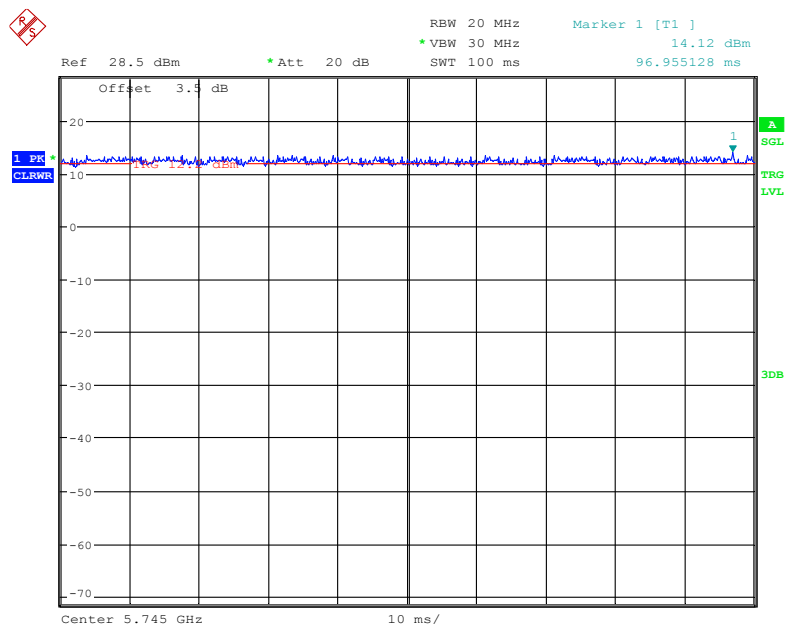
5725 – 5850MHz

802.11a mode



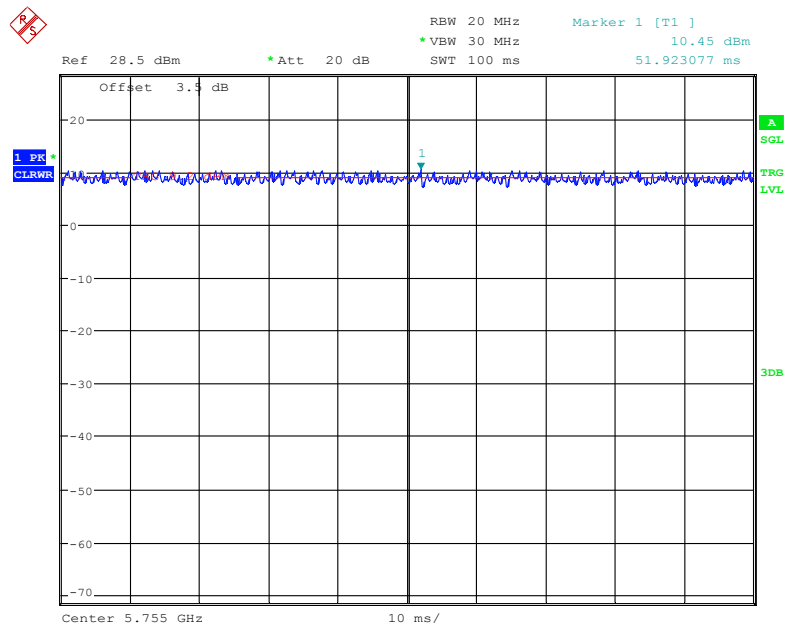
Date: 4.APR.2019 15:11:51

802.11n20 mode



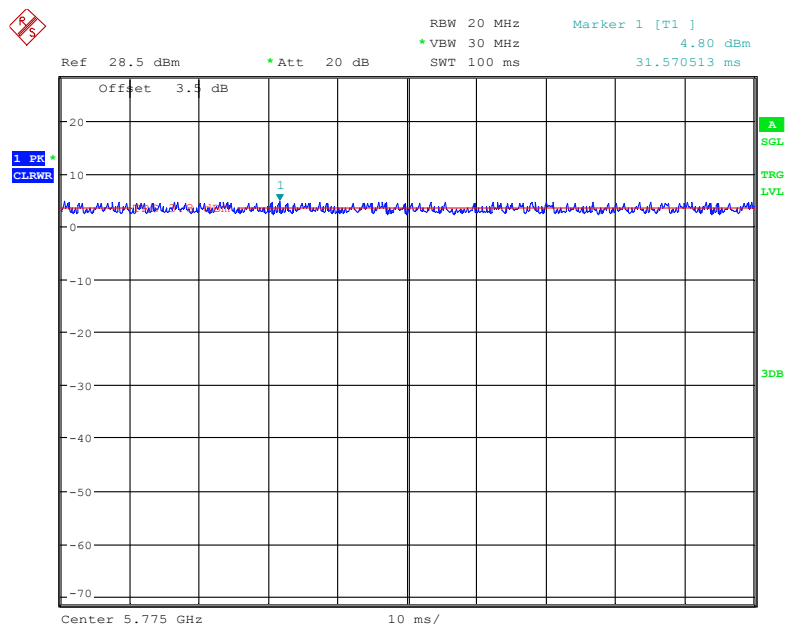
Date: 4.APR.2019 15:12:52

802.11n40 Mode



Date: 4.APR.2019 15:20:16

802.11ac80 Mode



Date: 4.APR.2019 15:22:20

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

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

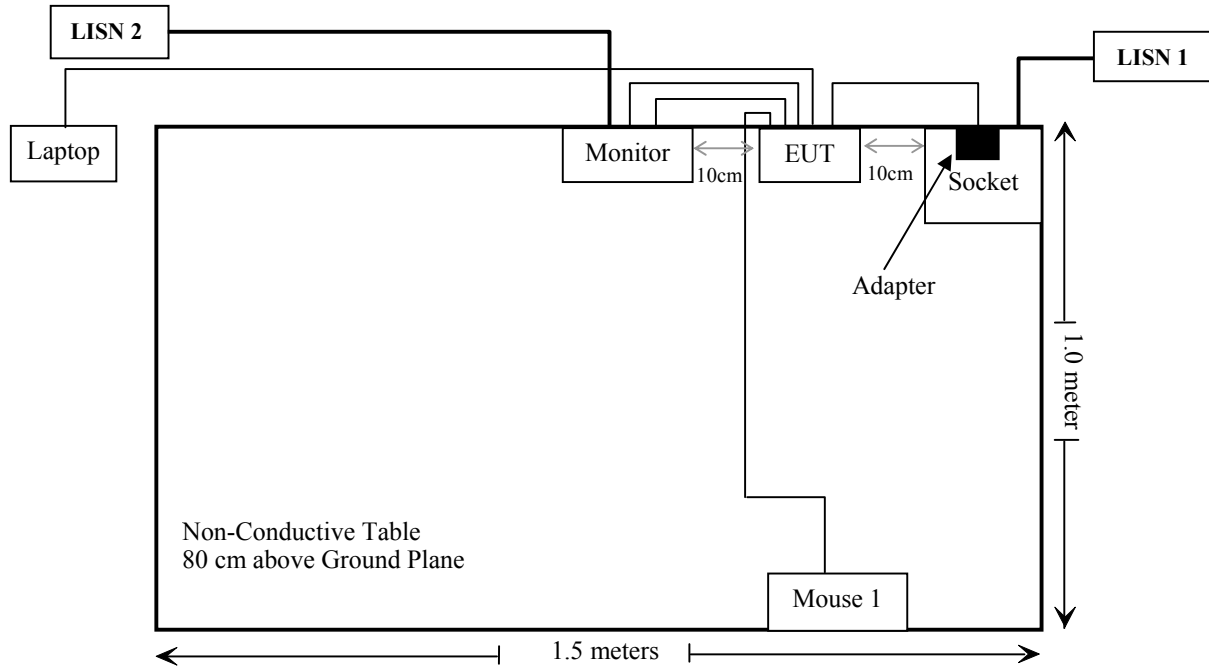
Manufacturer	Description	Model	Serial Number
Lenovo	Mouse 1	Unknown	Unknown
DELL	Mouse 2	MOC5UO	G1900NKD
HP	Laptop	CQ45-m02TU	5CG33407QL
Samsung	Monitor	225MS	LS22CRWSB/XSF

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Un-detachable DC Power Cable	2.4	EUT	Adapter
Un-shielding Detachable AV Cable	1.3	EUT	Monitor
Shielding Detachable HDMI Cable With Ferrite Core	1.6	EUT	Monitor
Un-Shielding Detachable USB Cable	1.5	EUT	Mouse 1 or 2
Un-shielding Detachable RJ45 Cable	10.0	EUT	Laptop

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6) & §15.207(a)	Conducted Emissions	Compliance
§15.205 & §15.209 & §15.407(b) (1), (4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a)(1),(3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1),(3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2018-07-11	2019-07-11
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-02
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1-0720-504504	2018-11-12	2019-11-12
Radiated Emission Test					
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
Agilent	Spectrum Analyzer	8564E	3943A01781	2019-03-02	2020-03-02
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2018-07-11	2019-07-11
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	RG-214	1	2018-11-19	2019-05-21
Ducommun technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-04	2016-11-18	2019-11-18
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2018-08-03	2019-08-03

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200120	2019-03-02	2020-03-01
Agilent	USB wideband power meter	U2021XA	MY54250003	2018-06-23	2019-06-23
Ducommun technologies	RF Cable	RG-214	3	Each Time	
WEINSCHL	10dB Attenuator	5324	AU 3842	Each Time	

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

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

Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm²)

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		Conducted Tune up Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
5150-5250	2	1.58	13.5	22.39	20	0.0071	1.0
5725-5850	2	1.58	13.0	19.95	20	0.0063	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 two internal antenna arrangement for Wi-Fi, which were permanently attached and the antenna gain is 2 dBi for both Antennas, fulfill the requirement of this section. Please refer to the EUT photos.

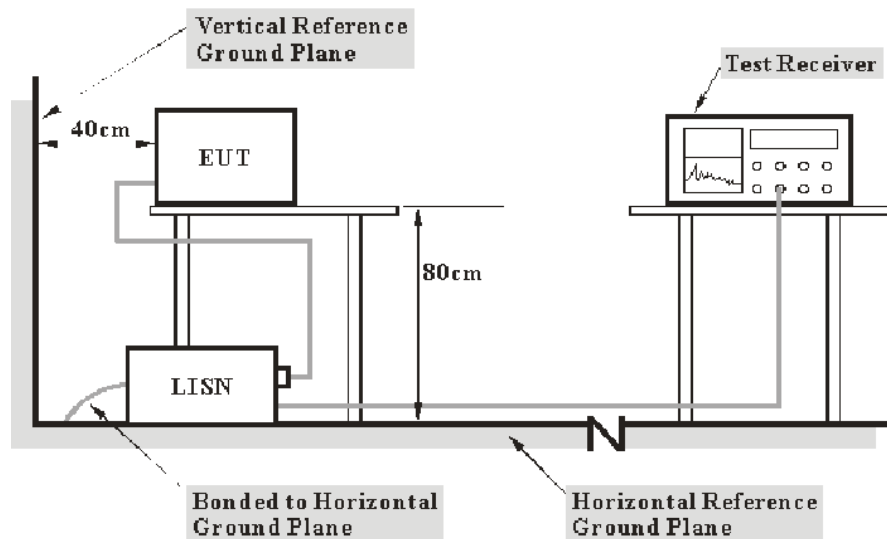
Result: Compliance.

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

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

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

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

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

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

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

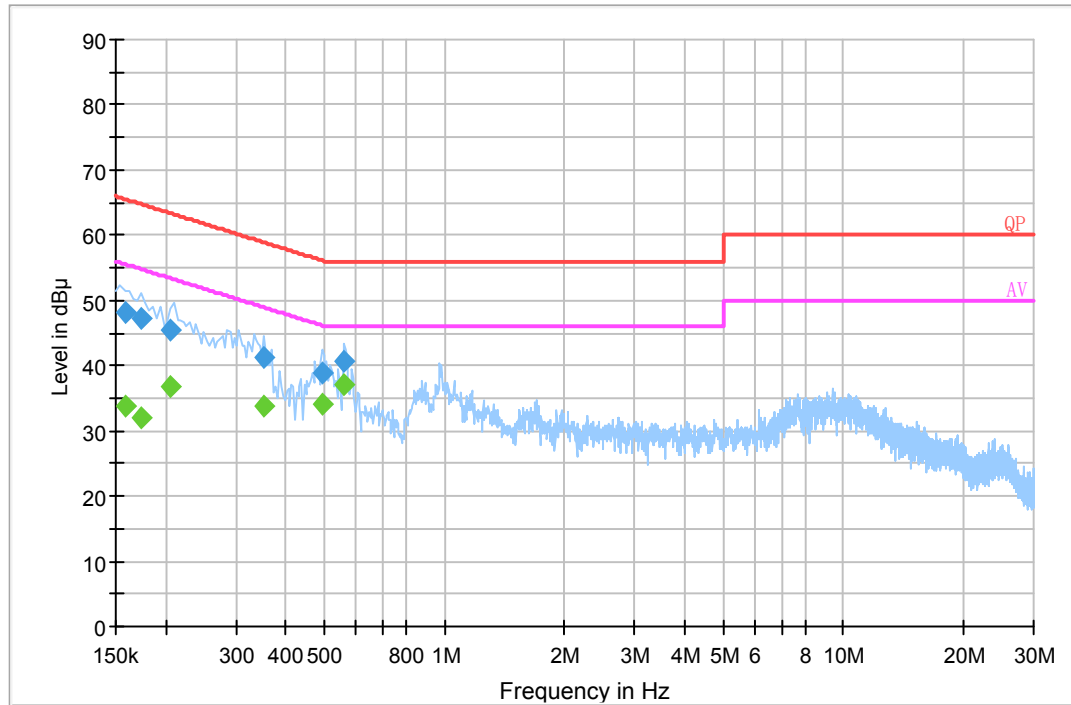
Test Data

Environmental Conditions

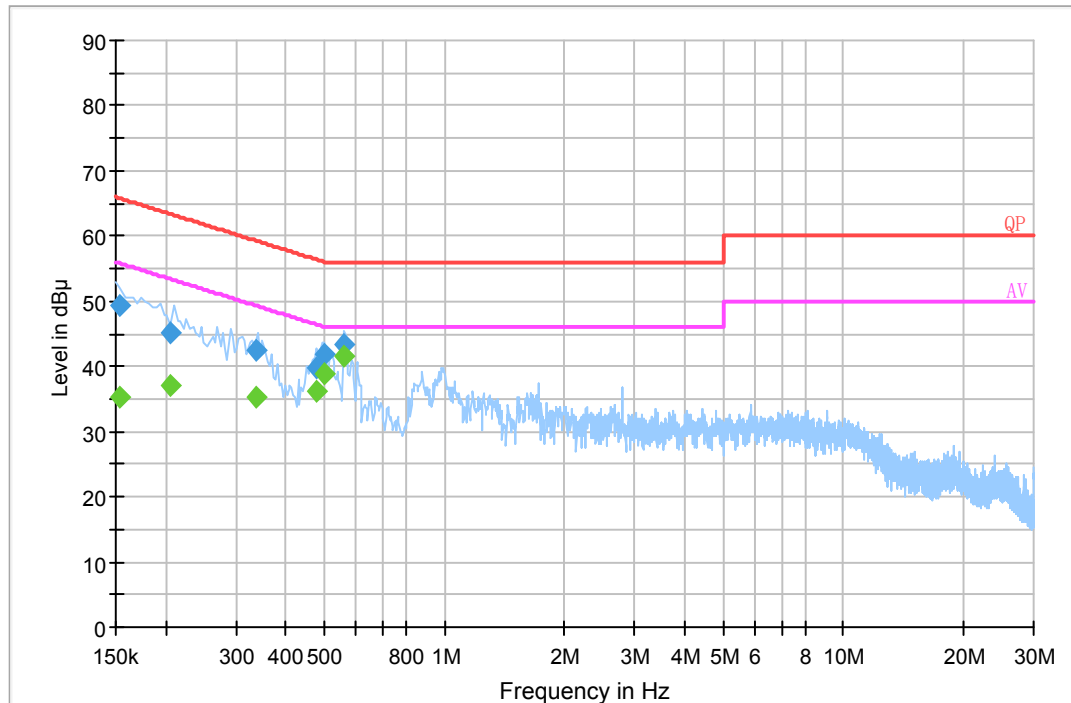
Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2019-04-23.

EUT operation mode: Transmitting (worst case is 802.11a mode 5200 MHz)

AC 120V/60 Hz, Line:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.158500	48.2	19.8	65.5	17.3	QP
0.173500	47.2	19.9	64.8	17.6	QP
0.205500	45.3	19.8	63.4	18.1	QP
0.352690	41.2	19.9	58.9	17.7	QP
0.494590	38.9	19.8	56.1	17.2	QP
0.561570	40.6	19.8	56.0	15.4	QP
0.158500	33.6	19.8	55.5	21.9	Ave.
0.173500	32.1	19.9	54.8	22.7	Ave.
0.205500	36.8	19.8	53.4	16.6	Ave.
0.352690	33.8	19.9	48.9	15.1	Ave.
0.494590	34.2	19.8	46.1	11.9	Ave.
0.561570	36.9	19.8	46.0	9.1	Ave.

AC120V, 60 Hz, Neutral:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.154000	49.3	19.8	65.8	16.5	QP
0.205500	45.0	19.8	63.4	18.4	QP
0.336870	42.5	19.8	59.3	16.8	QP
0.478830	39.8	19.8	56.4	16.6	QP
0.498530	41.8	19.8	56.0	14.2	QP
0.561570	43.3	19.8	56.0	12.7	QP
0.154000	35.2	19.8	55.8	20.6	Ave.
0.205500	37.2	19.8	53.4	16.2	Ave.
0.336870	35.3	19.8	49.3	14.0	Ave.
0.478830	36.1	19.8	46.4	10.3	Ave.
0.498530	38.7	19.8	46.0	7.3	Ave.
0.561570	41.5	19.8	46.0	4.5	Ave.

Note:

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

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

Applicable Standard

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

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

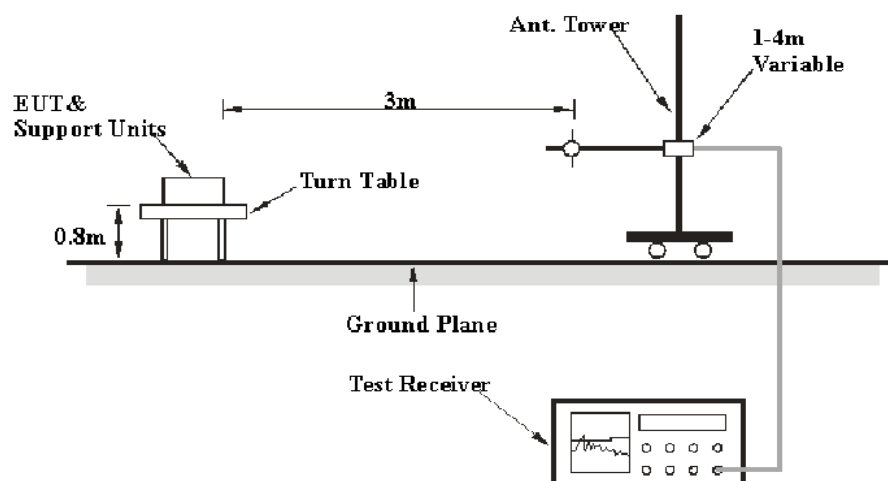
KDB 789033 D02 General UNII Test Procedures New Rules v02r01, clause G),

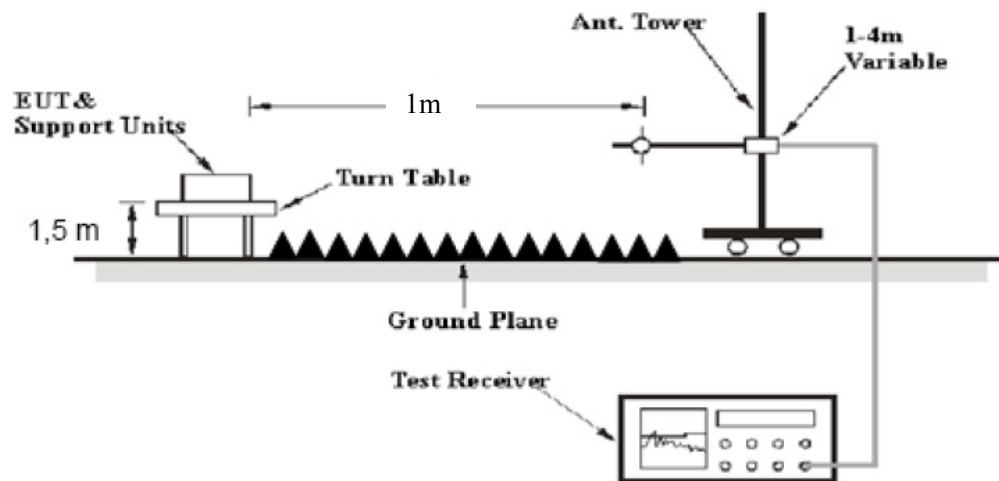
$E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] - 20 \log(d[\text{m}]) + 104.77$, where E = field strength and d = distance at which field strength limit is specified.

For FCC §15.407 (b) (1), (2), (3), (4), $d=1\text{m}$, non-Restricted bands limit $= -27 - 20 \log(1) + 104.77 = 77.7 \text{ dB}\mu\text{V/m}$

EUT Setup

Below 1 GHz:



Above 1 GHz:

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

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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

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

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

Note 2: when duty cycle is less than 98%

Test Procedure**Radiated Spurious Emission**

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

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

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

According to ANSI C63.10-2013: 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;

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

where

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

So the extrapolation factor of 1m is $20 \cdot \log(1/3) = -9.5$ 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

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

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

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

Test Data

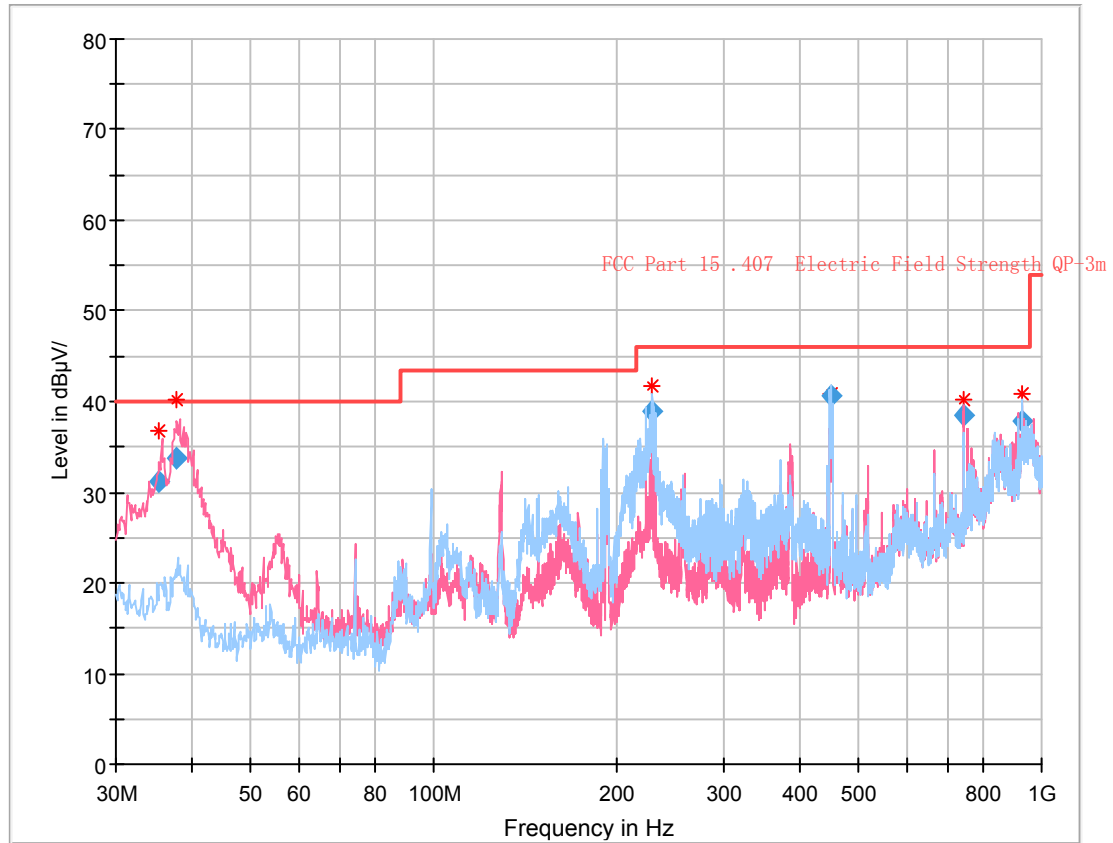
Environmental Conditions

Temperature:	24~26 °C
Relative Humidity:	50~52 %
ATM Pressure:	101.0 kPa

The testing was performed by Yooube Zhao on 2019-04-23 and by Leo Huang from 2019-04-20 to 2019-04-29.

EUT operation mode: Transmitting

30 MHz – 1 GHz: (worst case is 802.11a mode 5200 MHz)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
35.250875	31.12	106.0	V	77.0	-10.7	40.00	8.88
37.854000	33.79	112.0	V	81.0	-12.4	40.00	6.21
229.202625	38.99	151.0	H	105.0	-14.0	46.00	7.01
449.478250	40.59	121.0	H	115.0	-8.3	46.00	5.41
742.242625	38.49	112.0	V	166.0	-0.5	46.00	7.51
927.810000	37.76	107.0	V	185.0	7.4	46.00	8.24

30 MHz ~ 40 GHz:**5150-5250 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 (worst case for Antenna A)									
5180 MHz									
5149.33	27.80	PK	290	1.3	H	38.36	66.16	83.5	17.34
5149.33	13.53	Ave.	290	1.3	H	38.36	51.89	63.5	11.61
5351.26	28.13	PK	217	2.1	H	39.09	67.22	83.5	16.28
5351.26	13.49	Ave.	217	2.1	H	39.09	52.58	63.5	10.92
10360.00	46.96	PK	43	1.7	H	17.42	64.38	77.7	13.32
5200 MHz									
10400.00	45.95	PK	312	1.4	H	17.52	63.47	77.7	14.23
5240 MHz									
5149.83	28.13	PK	59	2.5	H	38.36	66.49	83.5	17.01
5149.83	13.46	Ave.	59	2.5	H	38.36	51.82	63.5	11.68
5352.16	28.24	PK	206	2.1	H	39.09	67.33	83.5	16.17
5352.16	13.88	Ave.	206	2.1	H	39.09	52.97	63.5	10.53
10480.00	46.86	PK	270	1.1	H	17.25	64.11	77.7	13.59
802.11n20 (Antenna A & Antenna B)									
5180 MHz									
5136.94	27.43	PK	282	1.3	H	38.36	65.79	83.5	17.71
5136.94	13.65	Ave.	282	1.3	H	38.36	52.01	63.5	11.49
5351.24	27.83	PK	281	1.8	H	39.09	66.92	83.5	16.58
5351.24	13.66	Ave.	281	1.8	H	39.09	52.75	63.5	10.75
10360.00	45.34	PK	120	1.5	H	17.42	62.76	77.7	14.94
5200 MHz									
10400.00	46.26	PK	36	2.4	H	17.52	63.78	77.7	13.92
5240 MHz									
5148.63	27.53	PK	107	2.2	H	38.36	65.89	83.5	17.61
5148.63	13.46	Ave.	107	2.2	H	38.36	51.82	63.5	11.68
5351.24	27.43	PK	246	1.5	H	39.09	66.52	83.5	16.98
5351.24	13.66	Ave.	246	1.5	H	39.09	52.75	63.5	10.75
10480.00	45.98	PK	166	1.8	H	17.25	63.23	77.7	14.47

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 (Antenna A & Antenna B)									
5190 MHz									
5146.50	27.86	PK	129	1.8	H	38.36	66.22	83.5	17.28
5146.50	13.74	Ave.	129	1.8	H	38.36	52.10	63.5	11.40
5351.25	26.87	PK	308	1.1	H	39.09	65.96	83.5	17.54
5351.25	13.56	Ave.	308	1.1	H	39.09	52.65	63.5	10.85
10380.00	47.09	PK	322	2.1	H	17.48	64.57	77.7	13.13
5230 MHz									
5149.80	27.80	PK	261	1.7	H	38.36	66.16	83.5	17.34
5149.80	13.80	Ave.	261	1.7	H	38.36	52.16	63.5	11.34
5359.07	27.45	PK	83	1.9	H	39.09	66.54	83.5	16.96
5359.07	13.69	Ave.	83	1.9	H	39.09	52.78	63.5	10.72
10460.00	47.14	PK	8	2.2	H	16.88	64.02	77.7	13.68
802.11ac80 (Antenna A & Antenna B)									
5210 MHz									
5149.36	27.33	PK	262	1.4	H	38.36	65.69	83.5	17.81
5149.36	13.56	Ave.	262	1.4	H	38.36	51.92	63.5	11.58
5353.24	27.82	PK	247	1.4	H	39.09	66.91	83.5	16.59
5353.24	13.65	Ave.	247	1.4	H	39.09	52.74	63.5	10.76
10420.00	42.16	PK	44	1.1	H	17.58	59.74	77.7	17.96

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11a (worst case for Antenna A)									
5745 MHz									
1136.27	64.41	PK	199	1.1	H	-5.42	58.99	83.5	24.51
1136.27	39.52	Ave.	199	1.1	H	-5.42	34.10	63.5	29.40
5697.46	28.96	PK	265	2.3	H	39.49	68.45	112.82	44.37
5719.93	40.08	PK	322	1.2	H	39.49	79.57	120.28	40.71
5724.99	48.19	PK	320	1.7	H	39.49	87.68	131.68	44.00
11490.00	47.89	PK	79	2.2	H	17.47	65.36	83.5	18.14
11490.00	33.53	AV	79	2.2	H	17.47	51.00	63.5	12.50
5785 MHz									
1136.27	65.43	PK	318	1.8	H	-5.42	60.01	83.5	23.49
1136.27	40.21	Ave.	318	1.8	H	-5.42	34.79	63.5	28.71
11570.00	46.63	PK	334	2.0	H	17.51	64.14	83.5	19.36
11570.00	31.76	Ave.	334	2.0	H	17.51	49.27	63.5	14.23
5825 MHz									
1136.27	64.72	PK	107	1.5	H	-5.42	59.30	83.5	24.20
1136.27	39.62	Ave.	107	1.5	H	-5.42	34.20	63.5	29.30
5851.08	42.81	PK	185	2.5	H	39.87	82.68	129.24	46.56
5858.09	38.30	PK	252	1.1	H	39.87	78.17	119.43	41.26
5894.63	29.44	PK	284	1.8	H	39.87	69.31	100.17	30.86
11650.00	47.68	PK	64	2.3	H	16.18	63.86	83.5	19.64
11650.00	32.06	Ave.	64	2.3	H	16.18	48.24	63.5	15.26

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n20 (Antenna A & Antenna B)									
5745 MHz									
1136.27	64.37	PK	43	1.3	H	-5.42	58.95	83.5	24.55
1136.27	39.62	Ave.	43	1.3	H	-5.42	34.20	63.5	29.30
5694.49	28.87	PK	325	2.3	H	39.49	68.36	110.62	42.26
5719.92	38.07	PK	312	1.1	H	39.49	77.56	120.28	42.72
5724.34	49.29	PK	349	2.3	H	39.49	88.78	130.2	41.42
11490.00	48.05	PK	288	1.8	H	17.47	65.52	83.5	17.98
11490.00	32.96	Ave.	288	1.8	H	17.47	50.43	63.5	13.07
5785 MHz									
1136.27	65.32	PK	264	1.3	H	-5.42	59.90	83.5	23.60
1136.27	40.06	Ave.	264	1.3	H	-5.42	34.64	63.5	28.86
11570.00	46.84	PK	107	2.0	H	17.51	64.35	83.5	19.15
11570.00	30.95	Ave.	107	2.0	H	17.51	48.46	63.5	15.04
5825 MHz									
1136.27	64.57	PK	189	1.0	H	-5.42	59.15	83.5	24.35
1136.27	40.05	Ave.	189	1.0	H	-5.42	34.63	63.5	28.87
5850.12	42.79	PK	32	2.5	H	39.87	82.66	131.43	48.77
5856.20	36.31	PK	79	2.4	H	39.87	76.18	119.96	43.78
5887.43	29.37	PK	128	1.2	H	39.87	69.24	105.5	36.26
11650.00	46.41	PK	304	1.4	H	16.18	62.59	83.5	20.91
11650.00	30.41	Ave.	304	1.4	H	16.18	46.59	63.5	16.91

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n40 (Antenna A & Antenna B)									
5755 MHz									
1136.27	63.47	PK	0	1.2	H	-5.42	58.05	83.5	25.45
1136.27	39.69	Ave.	0	1.2	H	-5.42	34.27	63.5	29.23
5699.70	32.94	PK	215	1.1	H	39.49	72.43	114.48	42.05
5719.08	46.70	PK	148	2.1	H	39.49	86.19	120.04	33.85
5723.91	47.83	PK	69	2.4	H	39.49	87.32	129.21	41.89
11510.00	46.23	PK	151	2.2	H	17.47	63.70	83.5	19.80
11510.00	32.26	Ave.	151	2.2	H	17.47	49.73	63.5	13.77
5795 MHz									
1136.27	64.33	PK	273	1.9	H	-5.42	58.91	83.5	24.59
1136.27	39.86	Ave.	273	1.9	H	-5.42	34.44	63.5	29.06
5850.12	33.73	PK	225	1.5	H	39.87	73.60	131.43	57.83
5859.65	31.36	PK	315	2.4	H	39.87	71.23	119	47.77
5881.61	28.40	PK	2	1.9	H	39.87	68.27	109.81	41.54
11590.00	42.99	PK	279	1.4	H	17.51	60.50	83.5	23.00
11590.00	28.12	Ave.	279	1.4	H	17.51	45.63	63.5	17.87

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11ac80 (Antenna A & Antenna B)									
5775 MHz									
1136.27	63.55	PK	161	2.5	H	-5.42	58.13	83.5	25.37
1136.27	39.78	Ave.	161	2.5	H	-5.42	34.36	63.5	29.14
5695.99	38.29	PK	241	1.1	H	39.49	77.78	111.73	33.95
5718.96	40.57	PK	134	2.1	H	39.49	80.06	120.01	39.95
5724.47	41.55	PK	68	1.3	H	39.49	81.04	130.49	49.45
5851.21	42.26	PK	303	1.4	H	39.87	82.13	128.94	46.81
5862.75	39.70	PK	18	2.2	H	39.87	79.57	118.13	38.56
5875.80	36.38	PK	292	1.5	H	39.87	76.25	114.11	37.86
11550.00	42.28	PK	31	2.5	H	17.51	59.79	83.5	23.71
11550.00	28.46	Ave.	31	2.5	H	17.51	45.97	63.5	17.53

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

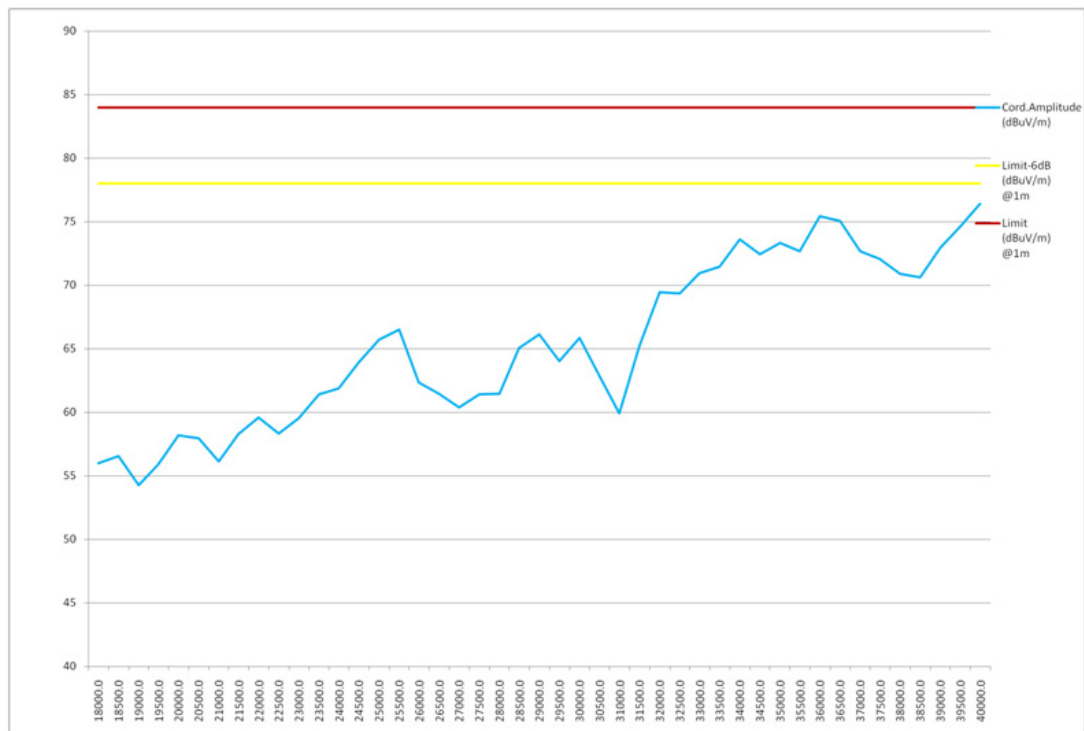
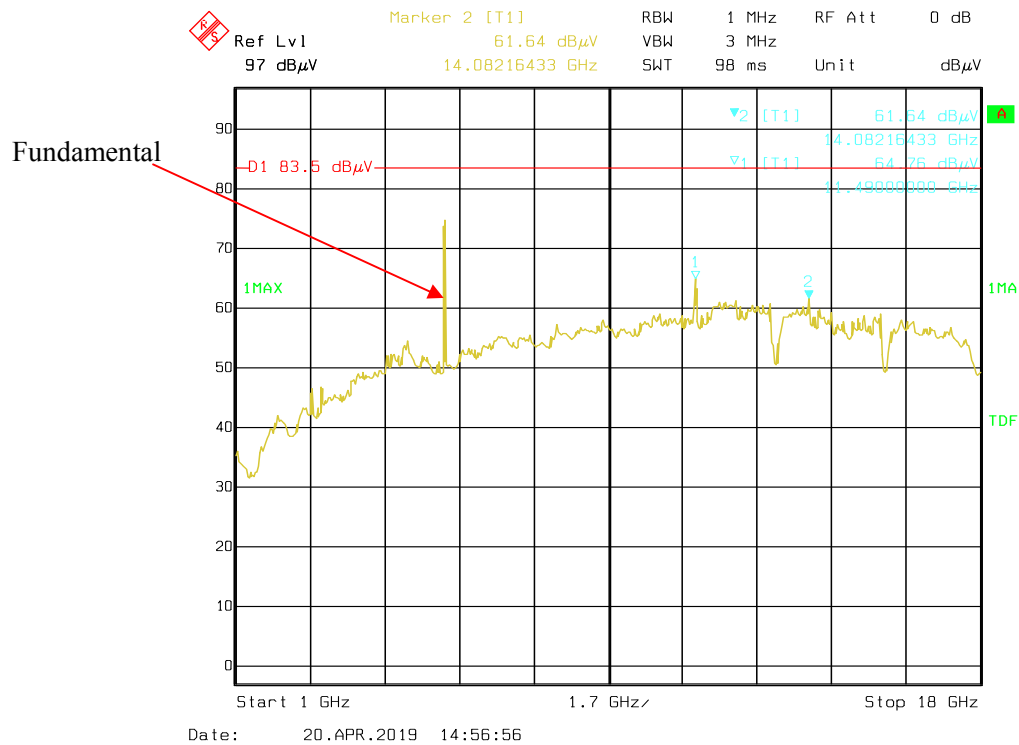
Margin = Limit- Corr. Amplitude

All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

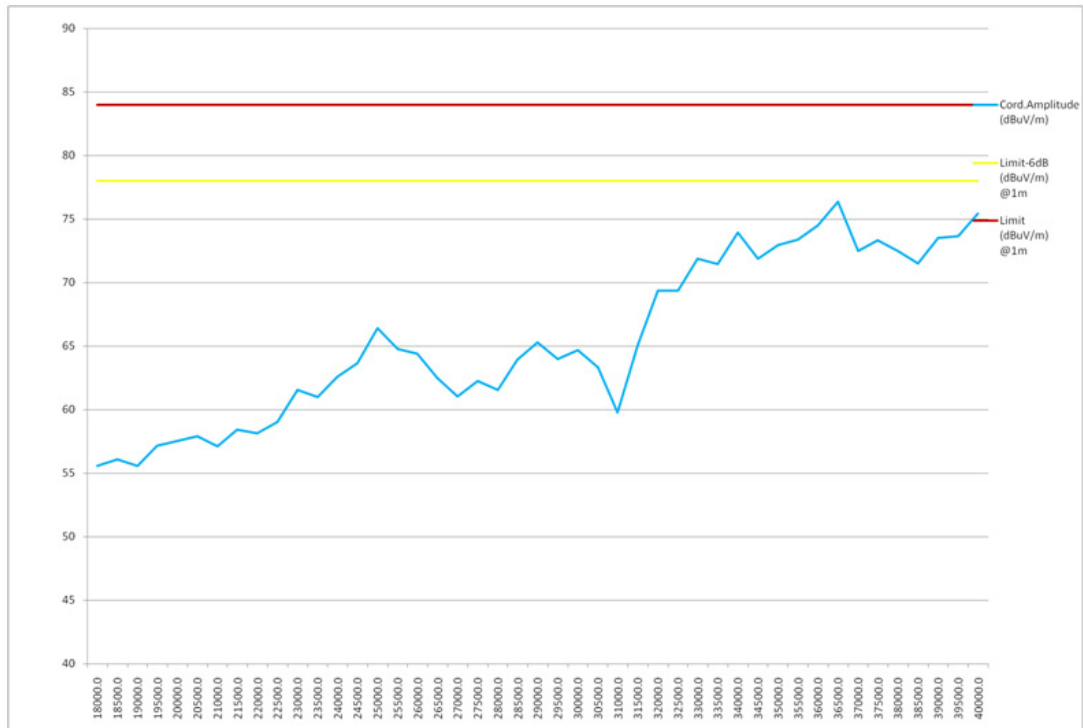
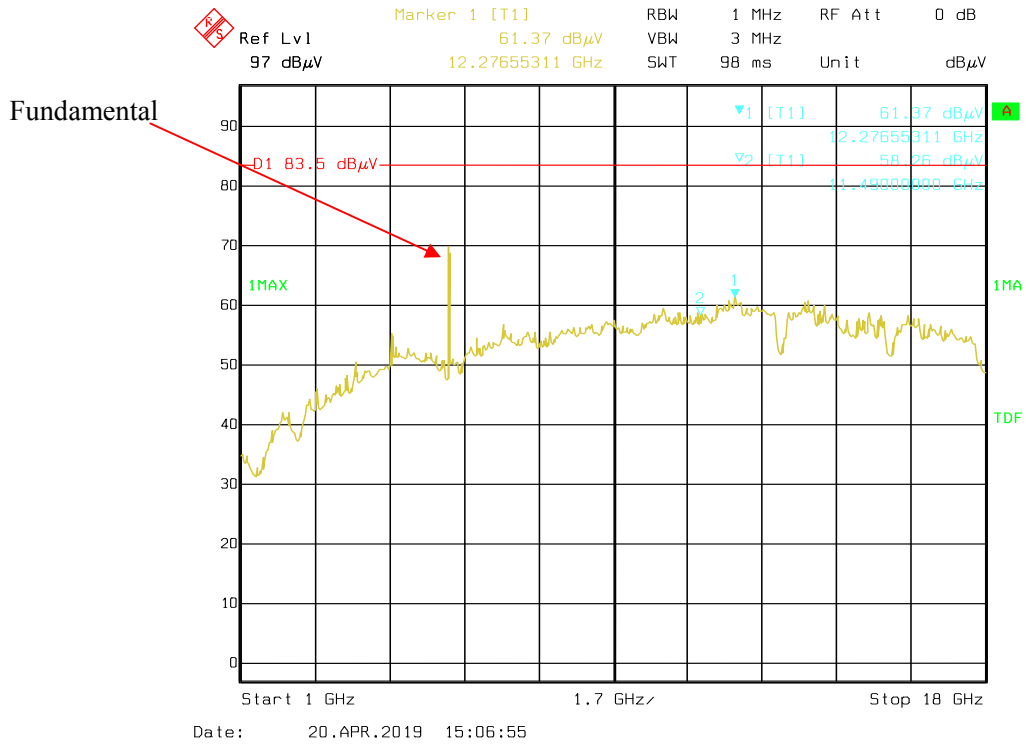
Test at 1m distance for above 1GHz.

Pre-scan with 802.11a 5745MHz for **Peak**

Horizontal

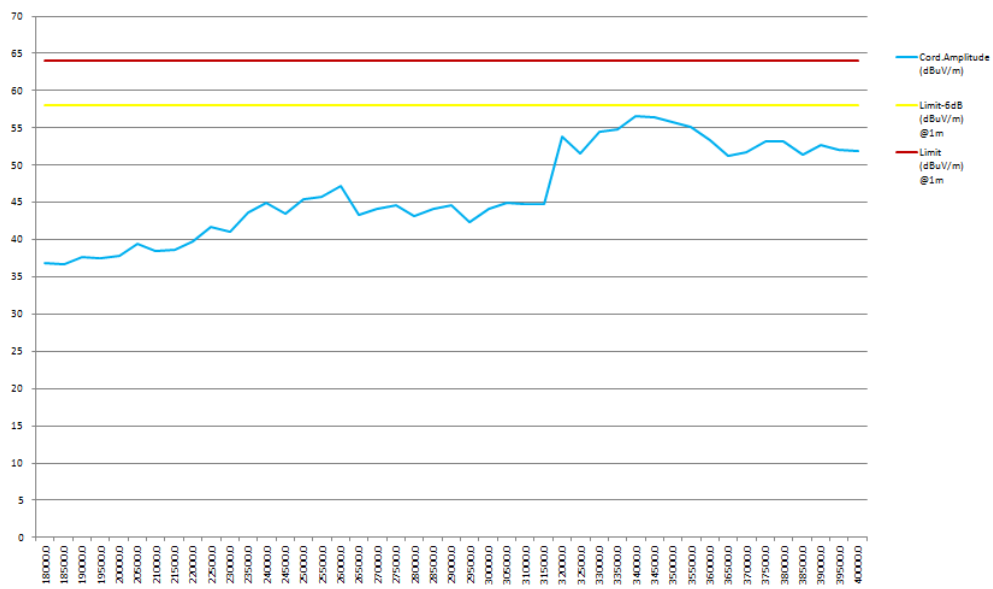
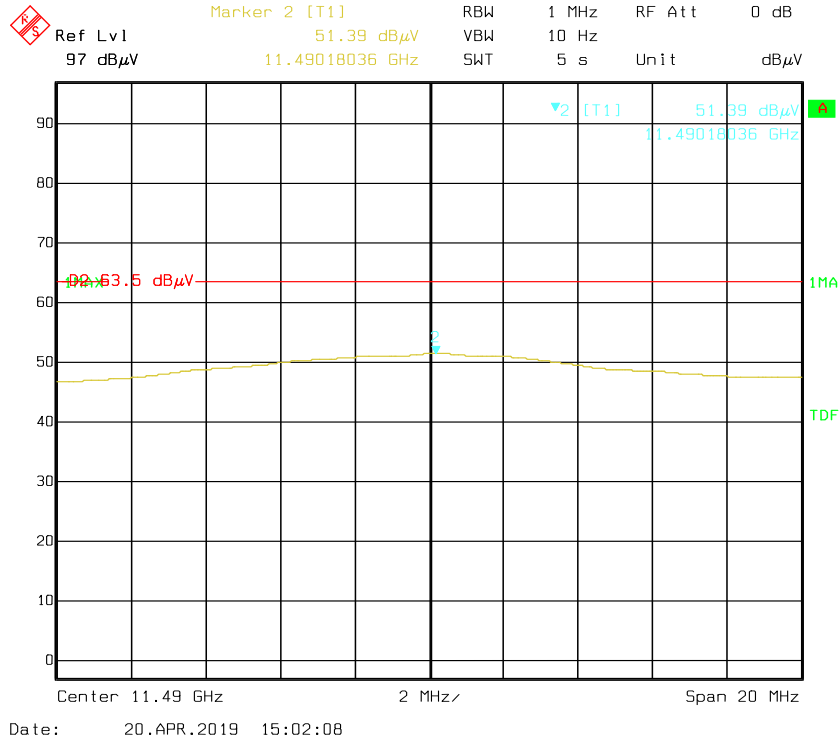


Vertical

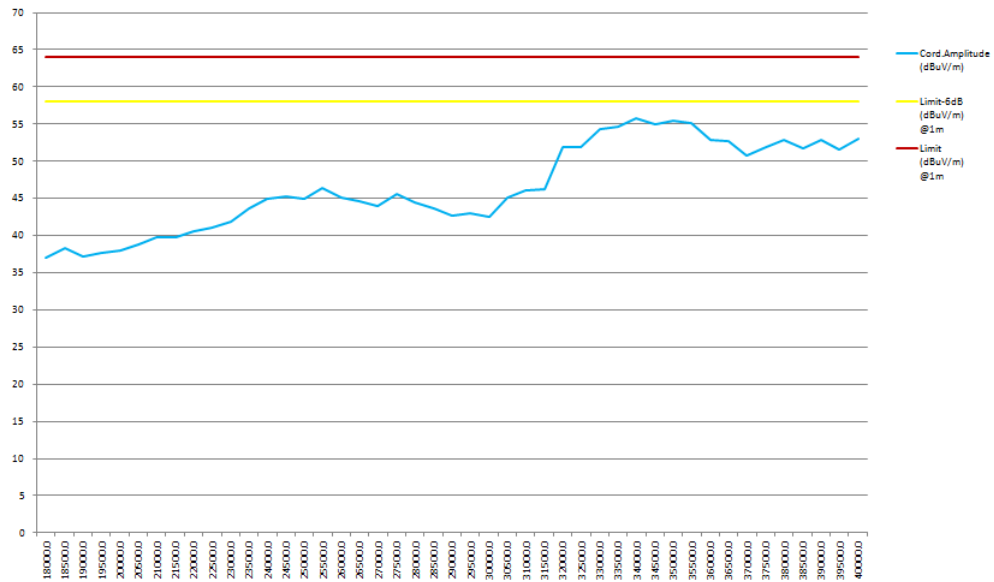
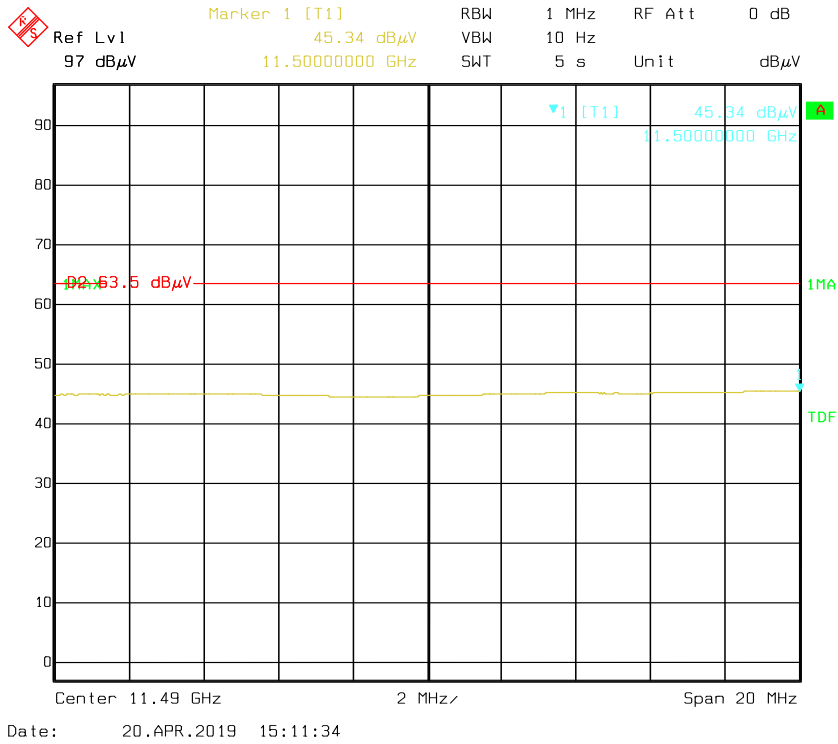


Pre-scan with 802.11a 5745MHz for Average

Horizontal



Vertical



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

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 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.

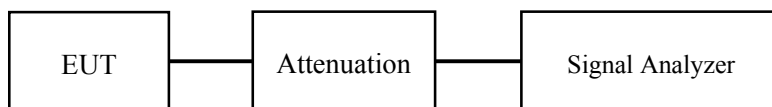
Test Procedure**1. Emission Bandwidth (EBW)**

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

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:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by James Fu on 2019-05-09 and 2019-05-10.

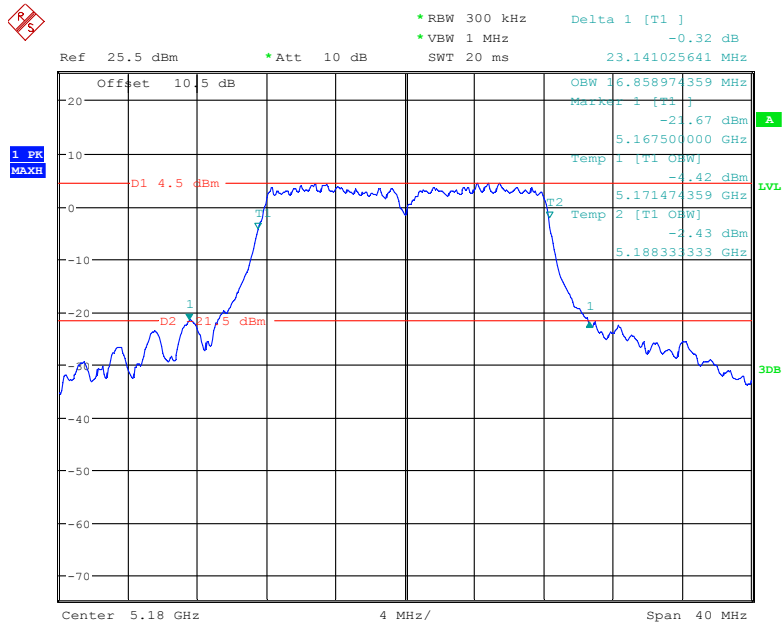
EUT operation mode: Transmitting

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

5150 MHz - 5250 MHz: Antenna A was tested

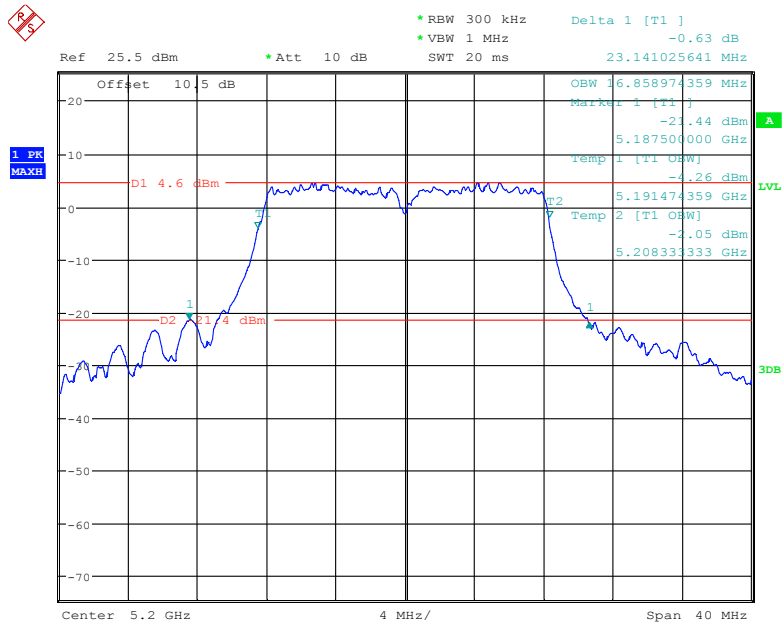
Frequency (MHz)	Antenna Port	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Remark
802.11a				No transmitted signal in the 99% bandwidth extends into the U-NII-2A band
5180	A	23.14	16.86	
5200	A	23.14	16.86	
5240	A	21.28	16.86	
802.11n20				
5180	A	21.47	17.82	
5200	A	21.47	17.82	
5240	A	21.54	17.86	
802.11n40				
5190	A	43.65	36.79	
5230	A	43.72	36.79	
802.11ac80				
5210	A	111.28	76.41	

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

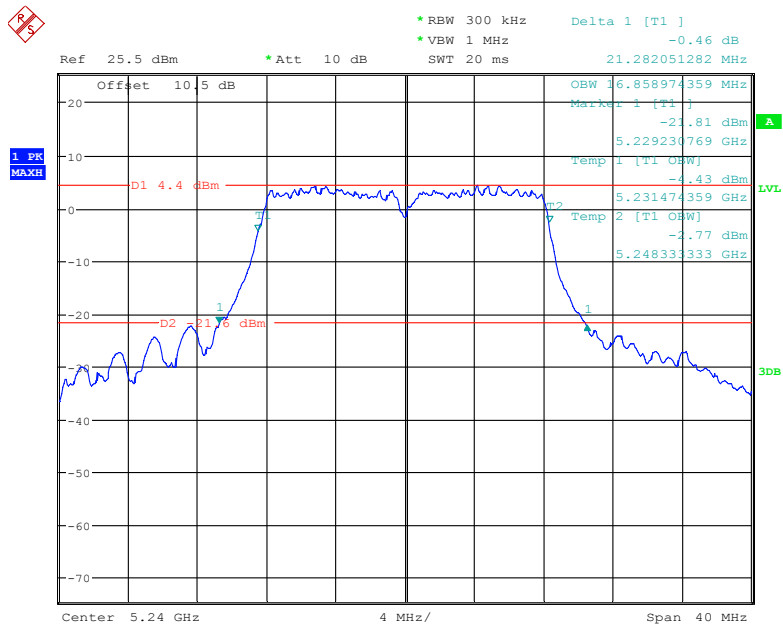


Date: 9.MAY.2019 19:49:53

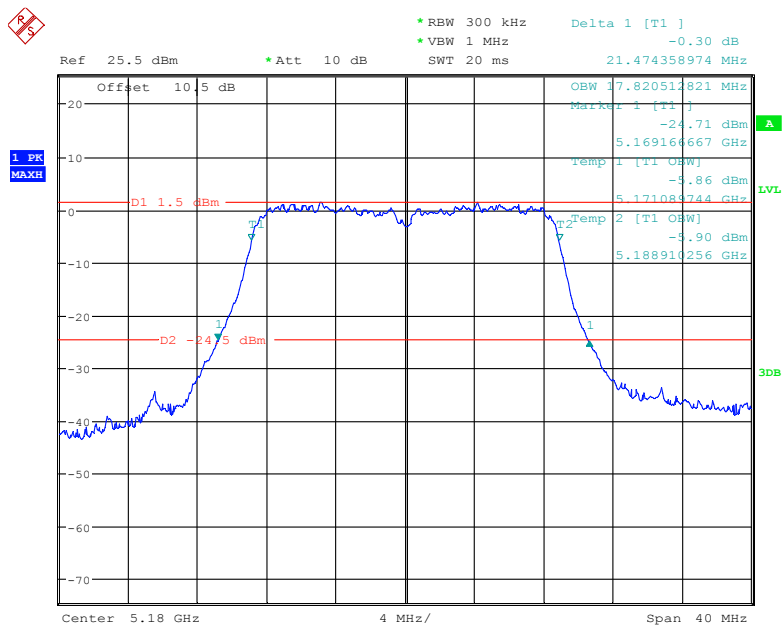
802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5200 MHz



Date: 9.MAY.2019 19:47:07

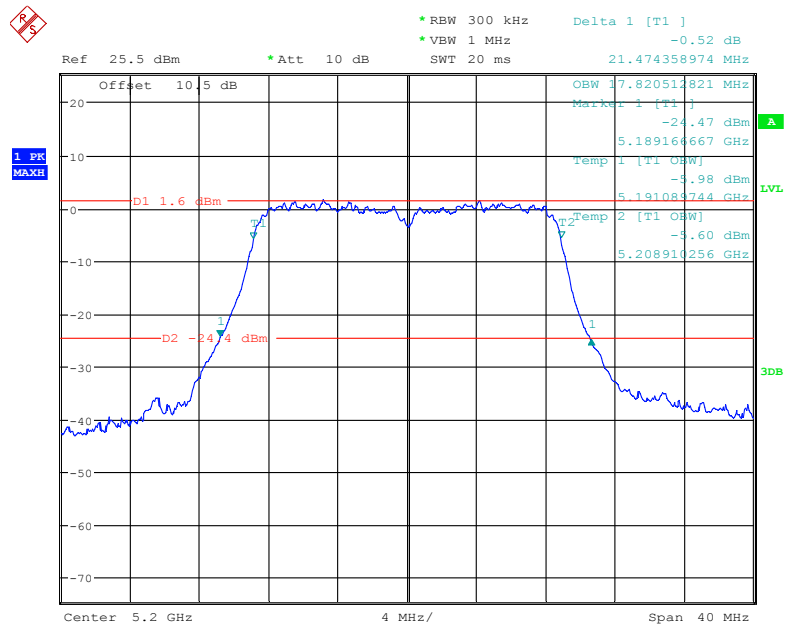
802.11a mode, 26 dB Emissions & 99% Occupied Bandwidth, 5240 MHz

Date: 9.MAY.2019 19:58:40

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

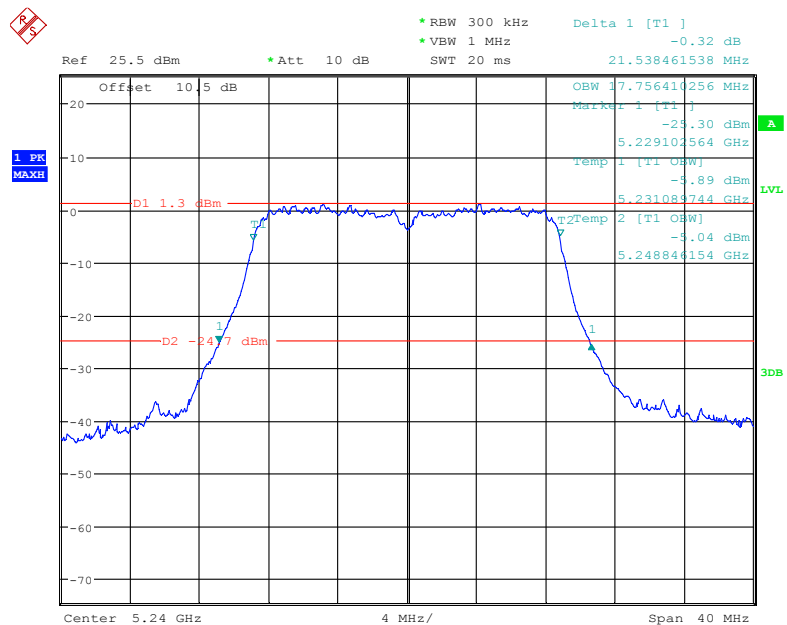
Date: 9.MAY.2019 20:07:07

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



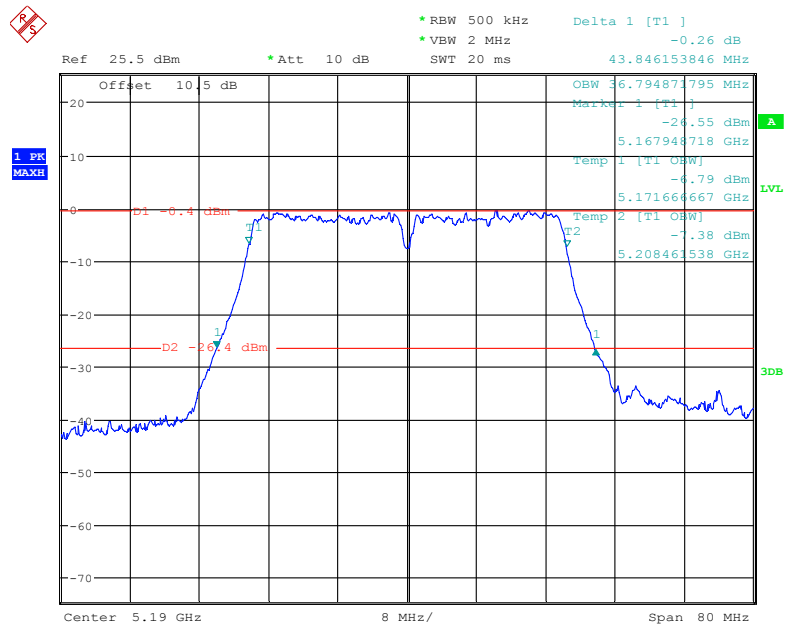
Date: 9.MAY.2019 20:11:58

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



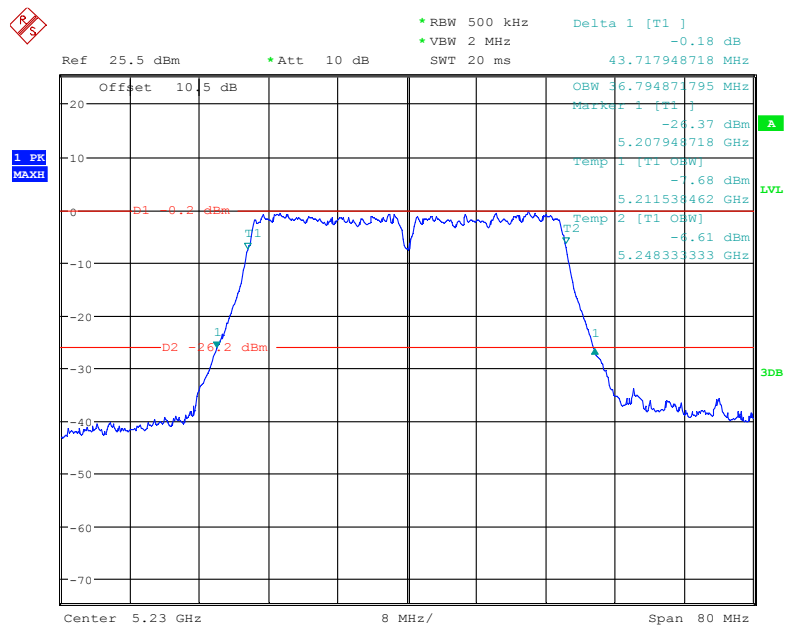
Date: 9.MAY.2019 20:14:22

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



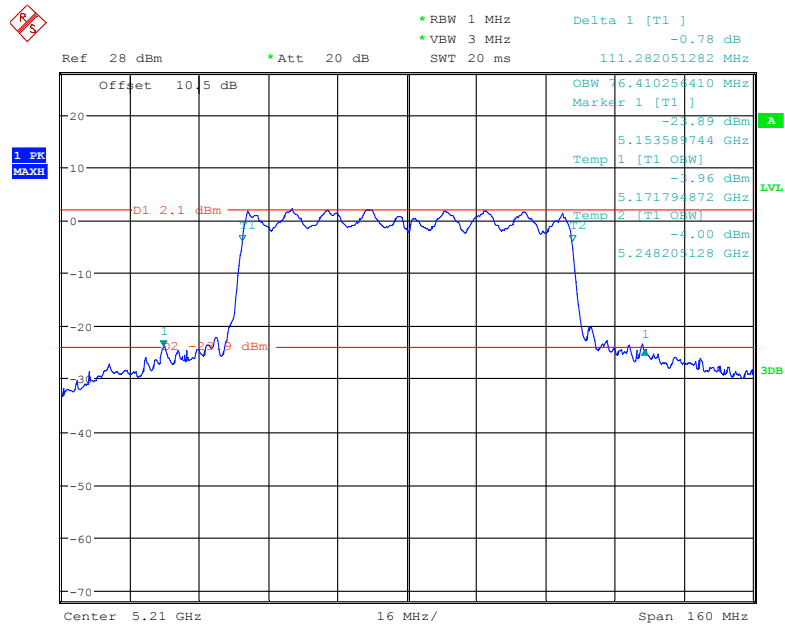
Date: 9.MAY.2019 20:17:20

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



Date: 9.MAY.2019 20:19:34

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

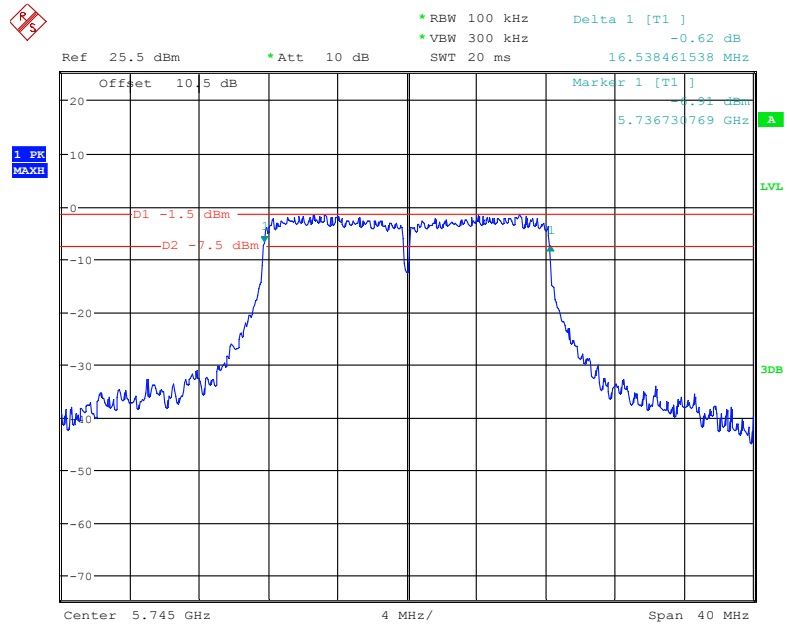


Date: 10.MAY.2019 22:25:51

5725 MHz – 5850 MHz: Antenna A was tested

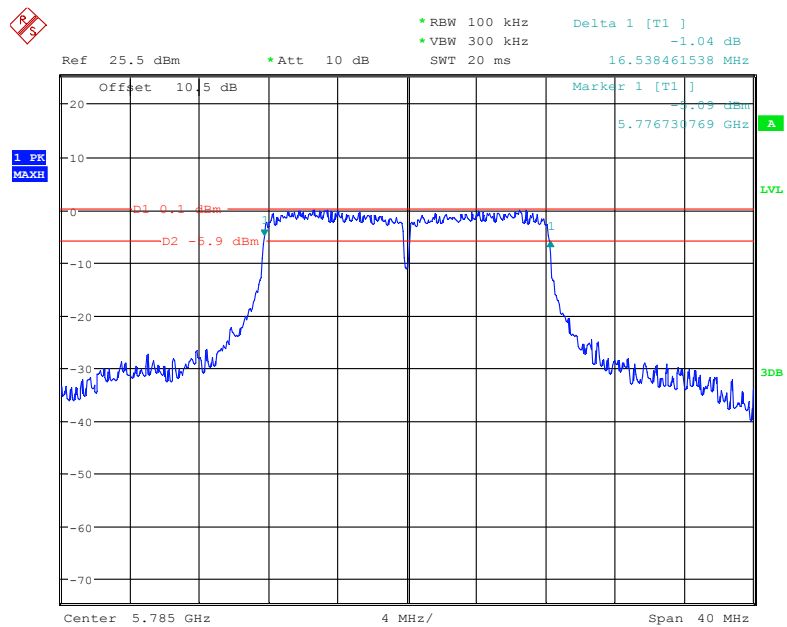
Frequency (MHz)	Antenna Port	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Remark
802.11a					No transmitted signal in the 99% bandwidth extends into the U-NII-2C band
5745	A	16.54	16.86	0.5	
5785	A	16.54	16.92	0.5	
5825	A	16.60	17.12	0.5	
802.11n20					
5745	A	17.69	17.82	0.5	
5785	A	17.69	17.76	0.5	
5825	A	17.69	17.82	0.5	
802.11n40					
5755	A	36.67	36.79	0.5	
5795	A	36.67	36.79	0.5	
802.11ac80					
5775	A	76.92	76.92	0.5	

802.11a mode, 6dB Emission Bandwidth, 5745 MHz



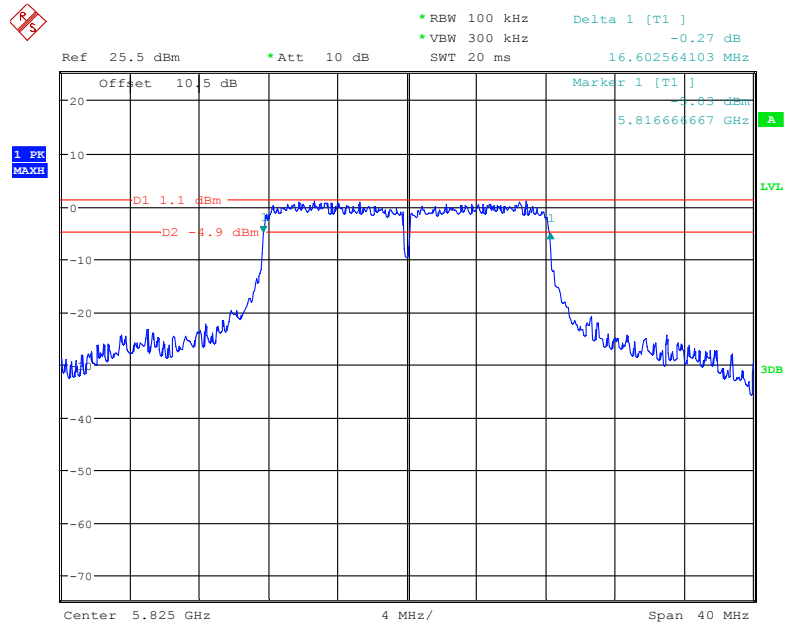
Date: 9.MAY.2019 21:50:20

802.11a mode, 6dB Emission Bandwidth, 5785 MHz



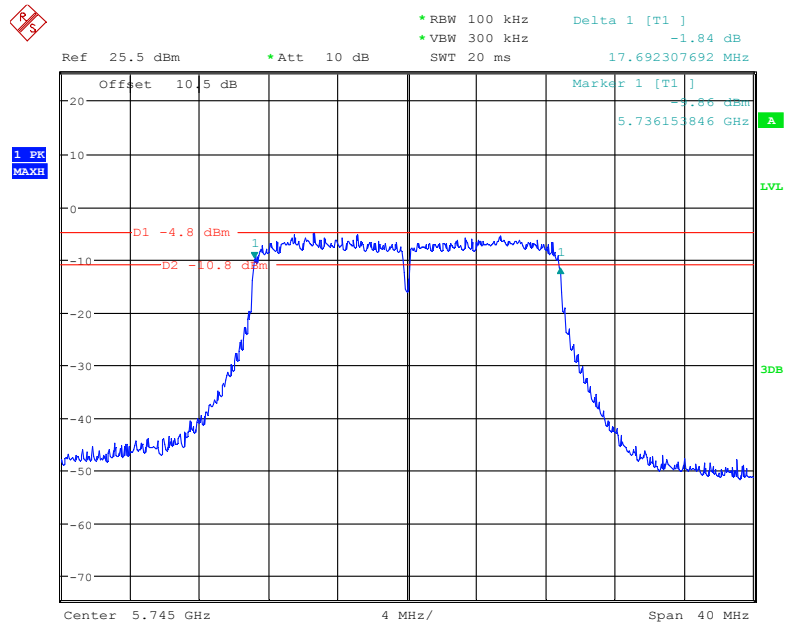
Date: 9.MAY.2019 21:51:45

802.11a mode, 6dB Emission Bandwidth, 5825 MHz



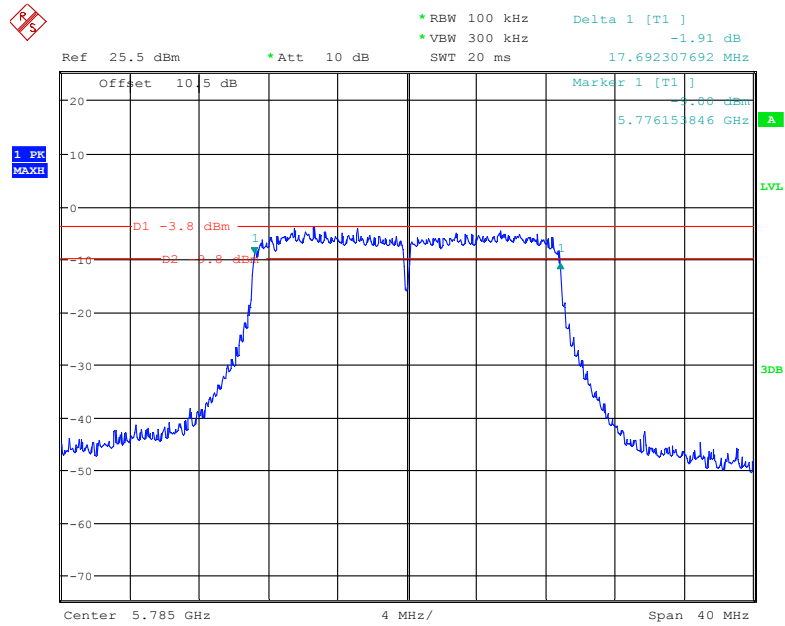
Date: 9.MAY.2019 21:53:29

802.11n20 mode, 6dB Emission Bandwidth, 5745 MHz



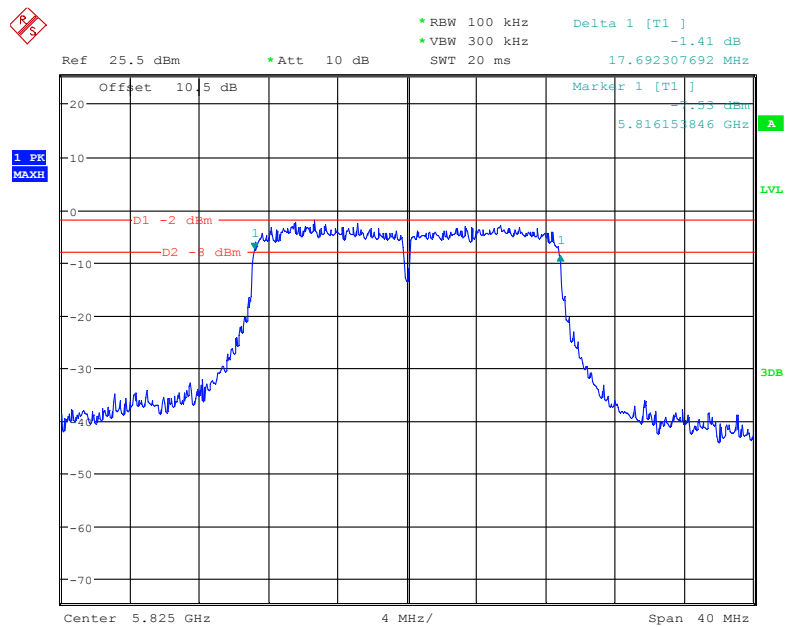
Date: 9.MAY.2019 21:57:08

802.11n20 mode, 6dB Emission Bandwidth, 5785 MHz



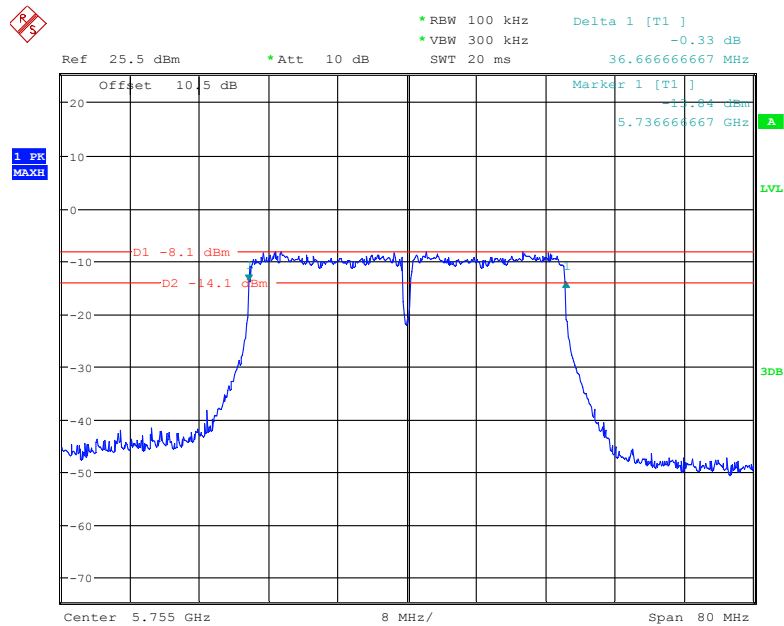
Date: 9.MAY.2019 21:55:56

802.11n20 mode, 6dB Emission Bandwidth, 5825 MHz



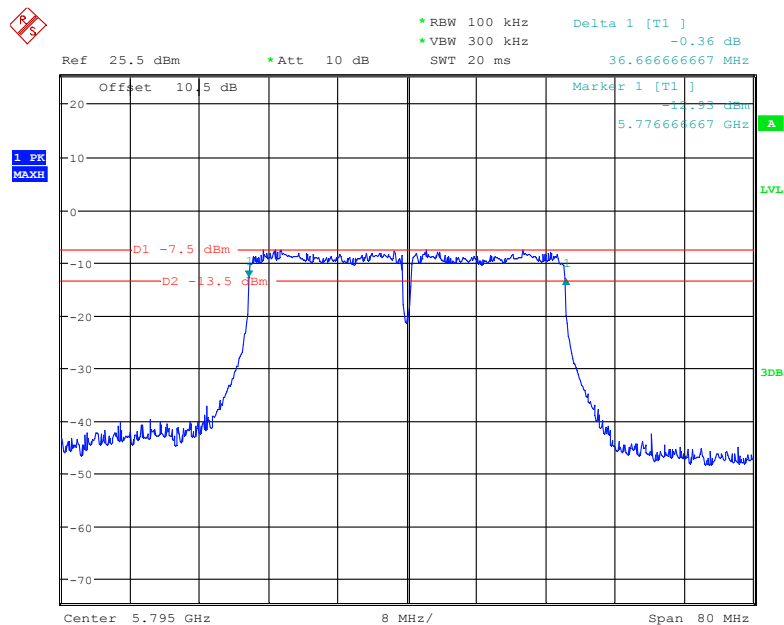
Date: 9.MAY.2019 21:54:39

802.11n40 mode, 6dB Emission Bandwidth, 5755 MHz



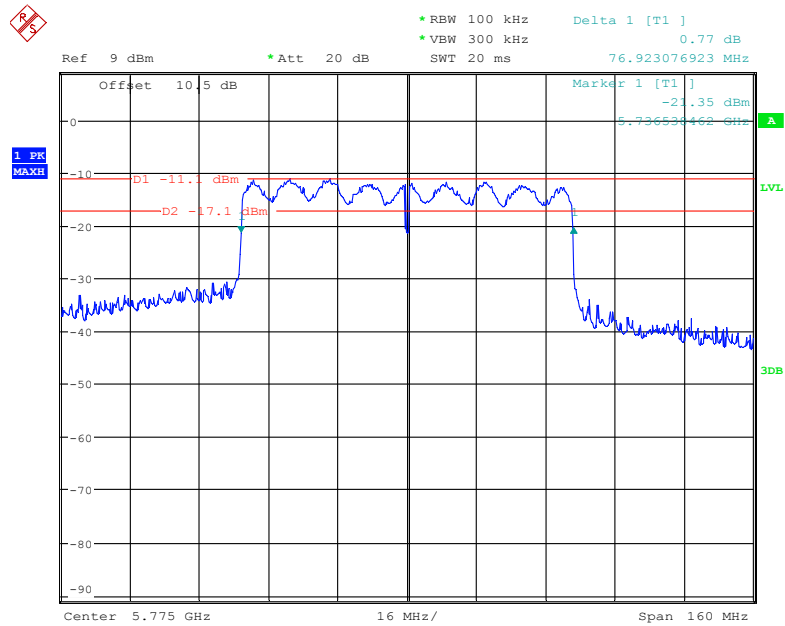
Date: 9.MAY.2019 21:58:51

802.11n40 mode, 6dB Emission Bandwidth, 5795 MHz



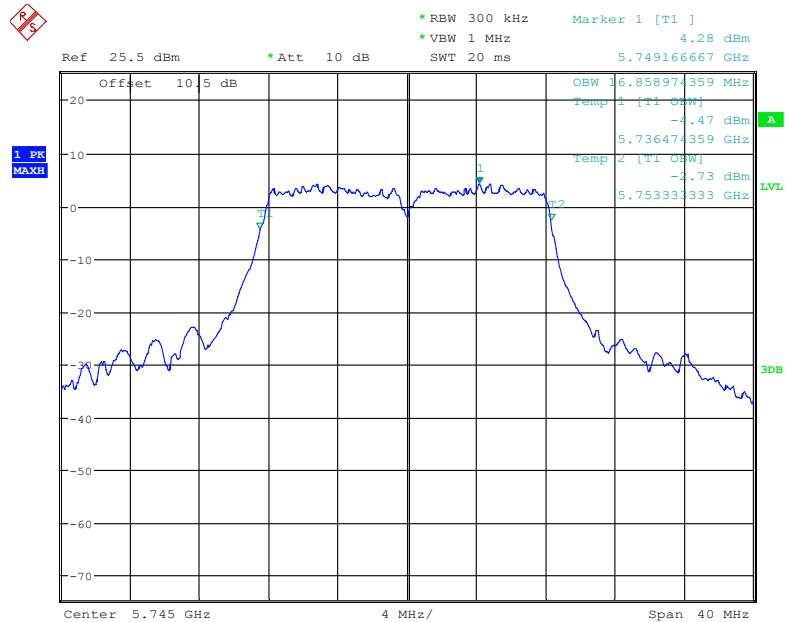
Date: 9.MAY.2019 22:00:07

802.11ac80 mode, 6dB Emission Bandwidth, 5775 MHz



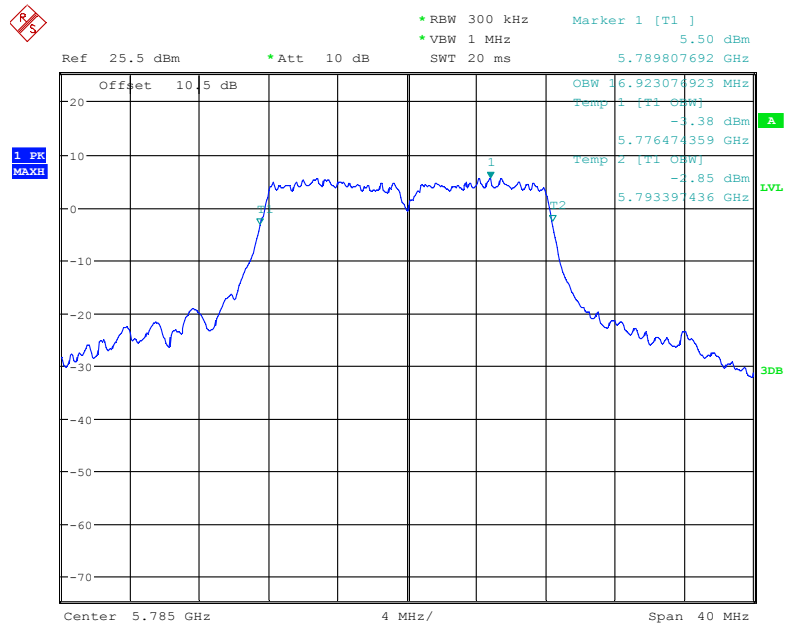
Date: 10.MAY.2019 21:59:18

802.11a mode, 99% Occupied Bandwidth, 5745 MHz



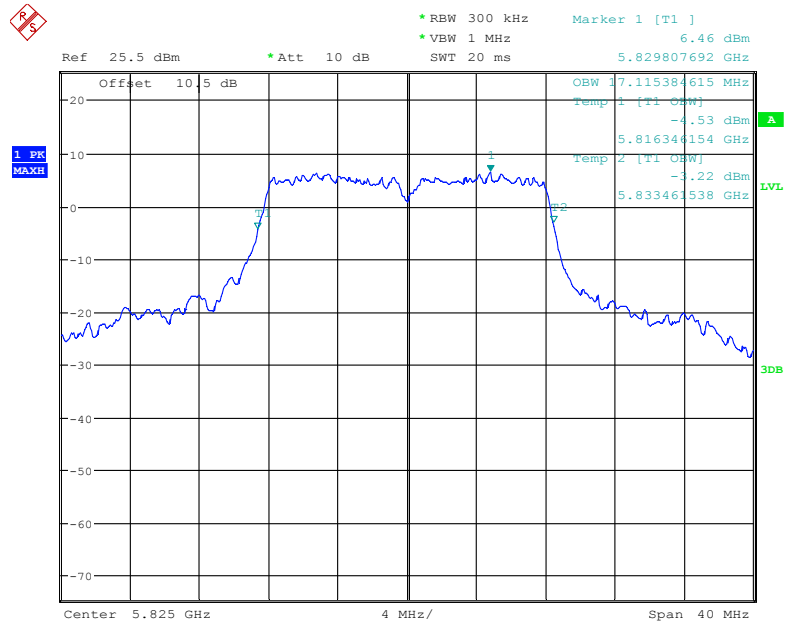
Date: 9.MAY.2019 22:11:04

802.11a mode, 99% Occupied Bandwidth, 5785 MHz



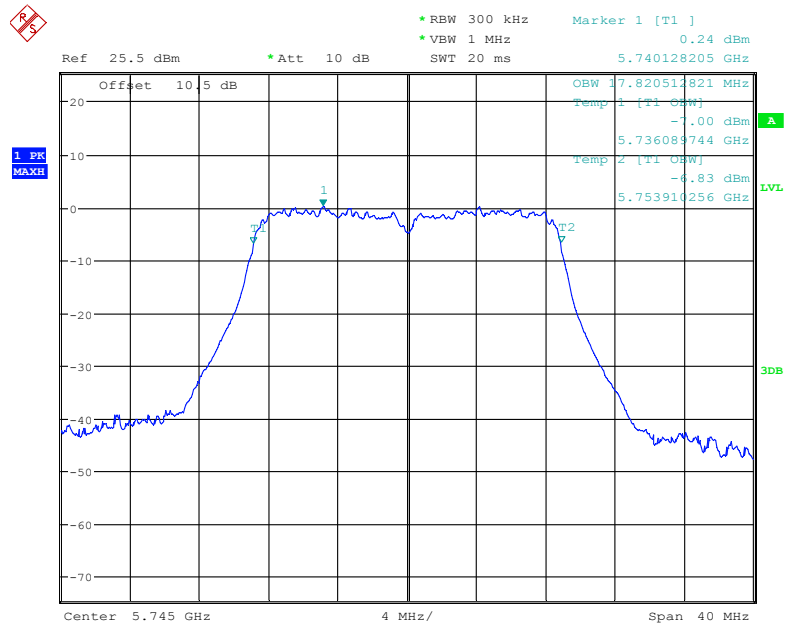
Date: 9.MAY.2019 22:10:06

802.11a mode, 99% Occupied Bandwidth, 5825 MHz



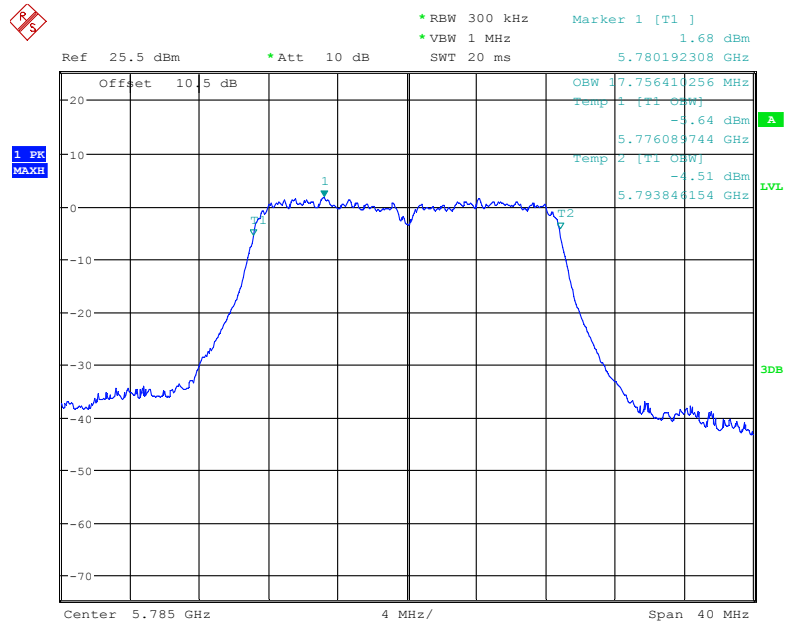
Date: 9.MAY.2019 22:09:12

802.11n20 mode, 99% Occupied Bandwidth, 5745 MHz



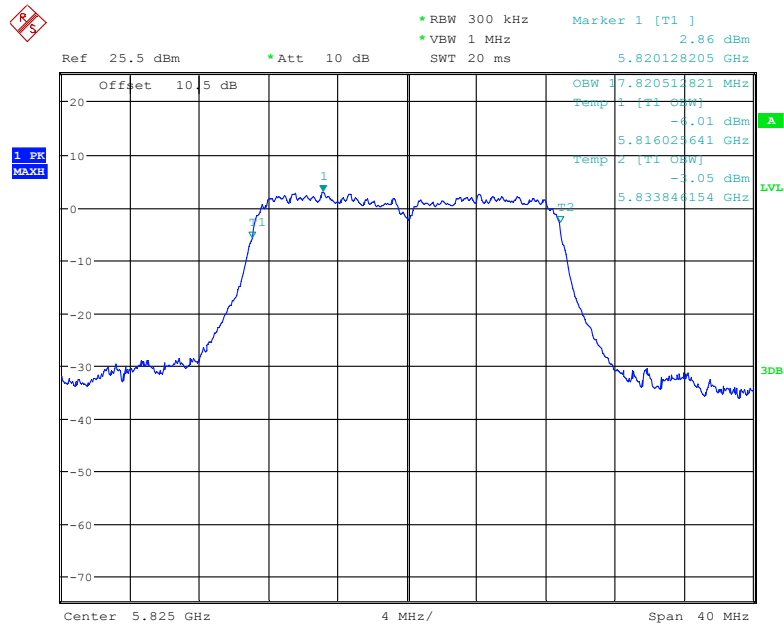
Date: 9.MAY.2019 22:04:25

802.11n20 mode, 99% Occupied Bandwidth, 5785 MHz



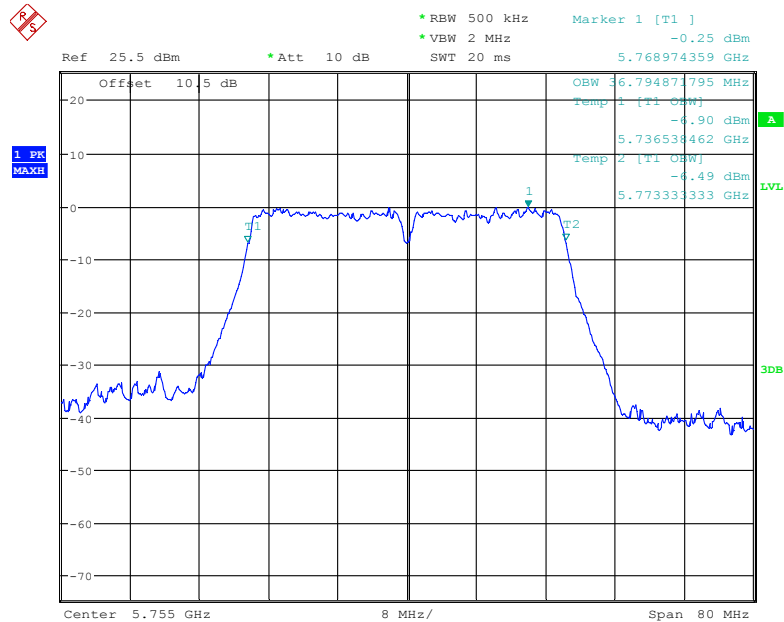
Date: 9.MAY.2019 22:06:42

802.11n20 mode, 99% Occupied Bandwidth, 5825 MHz



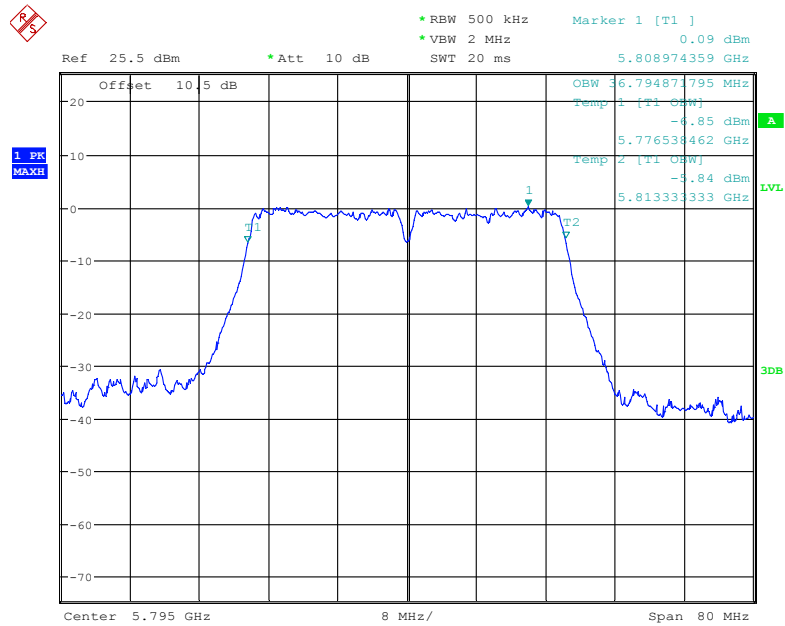
Date: 9.MAY.2019 22:07:41

802.11n40 mode, 99% Occupied Bandwidth, 5755 MHz



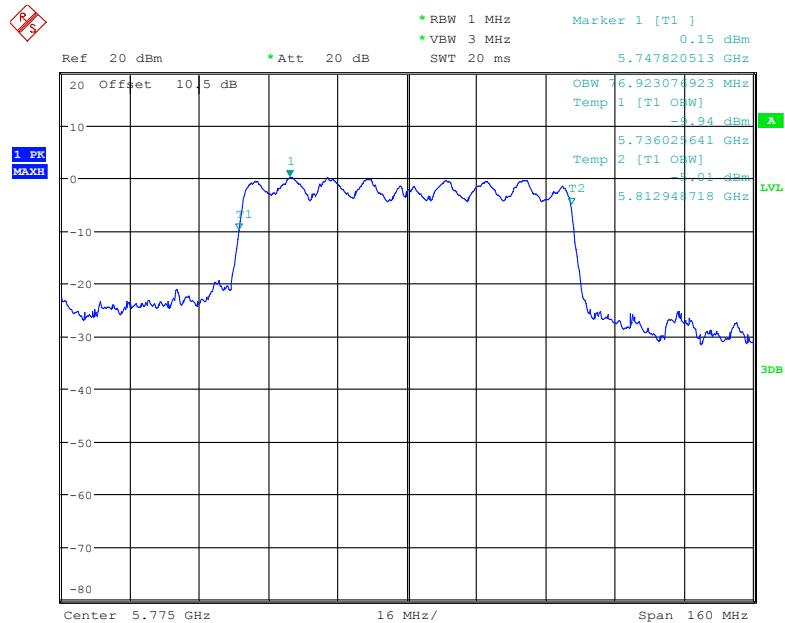
Date: 9.MAY.2019 22:01:57

802.11n40 mode, 99% Occupied Bandwidth, 5795 MHz



Date: 9.MAY.2019 22:02:50

802.11ac80 mode, 99% Occupied Bandwidth, 5775 MHz



Date: 10.MAY.2019 22:07:15

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

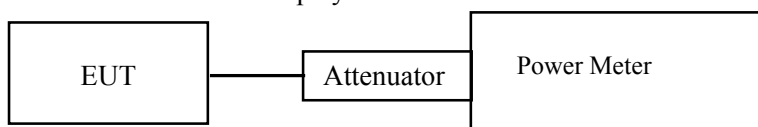
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz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

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

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

Test Procedure

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



Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by James Fu on 2019-05-09.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

5150 MHz – 5250 MHz

Mode	Frequency (MHz)	Antenna Port	RMS Conducted Output Power (dBm)	Duty Cycle factor (dB)	Total Power (dBm)	Limit (dBm)
802.11a	5180	A	12.97	0	/	30
		B	12.21			
	5200	A	13.05	0	/	30
		B	12.72			
	5240	A	12.71	0	/	30
		B	12.89			
802.11n20	5180	A	9.62	0	12.43	30
		B	9.20			
	5200	A	9.60	0	12.43	30
		B	9.23			
	5240	A	9.53	0	12.62	30
		B	9.68			
802.11n40	5190	A	9.39	0	12.55	30
		B	9.69			
	5230	A	9.32	0	12.34	30
		B	9.33			
802.11ac80	5210	A	7.96	0	10.81	30
		B	7.63			

5725 MHz – 5825 MHz:

Mode	Frequency (MHz)	Antenna Port	RMS Conducted Output Power (dBm)	Duty Cycle factor (dB)	Total Power (dBm)	Limit (dBm)
802.11a	5745	A	12.55	0	/	30
		B	12.61			
	5785	A	12.78	0	/	30
		B	12.71			
	5825	A	12.14	0	/	30
		B	12.43			
802.11n20	5745	A	9.11	0	12.29	30
		B	9.44			
	5785	A	8.98	0	12.06	30
		B	9.11			
	5825	A	9.54	0	12.55	30
		B	9.54			
802.11n40	5755	A	9.63	0	12.42	30
		B	9.17			
	5795	A	9.00	0	12.10	30
		B	9.17			
802.11ac80	5775	A	7.53	0	10.33	30
		B	7.10			

Note:

This product is an Indoor Access Point, which was declared by manufacturer.

The maximum antenna gain is 2dBi.

This Device Employed Cyclic Delay Diversity.

When determining reductions in conducted power limits, array gain is calculated as follows:

As to this device, $N_{ANT} \leq 2$, Array Gain = 0 dB.

Total directional gain (dBi) = gain of individual transmit antennas (dBi) + 0 (dB) = 2dBi.

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

Applicable Standard

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

For 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 $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ 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 $10 \log (1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ 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 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by James Fu on 2019-05-09 and 2019-05-10.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables and plots.

Note:

The maximum antenna gain is 2dBi.

This Device Employed Cyclic Delay Diversity.

When determining reductions in power spectral density limits, array gain is calculated as follows:

Array gain = $10 \log (N_{\text{ANT}}/N_{\text{ss}})$, where N_{ANT} is the number of transmit antennas is 2,

and N_{ss} = the number of independent spatial streams of data=1.

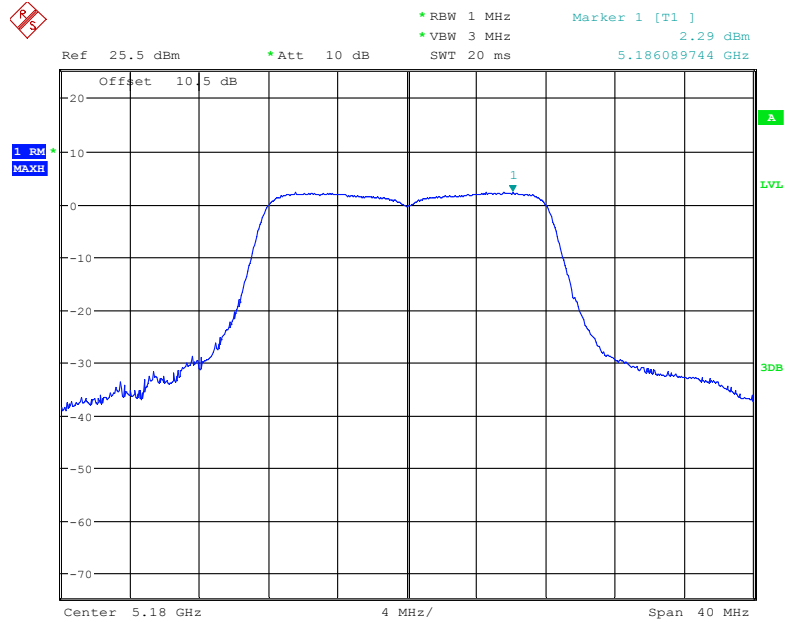
Total directional gain (dBi) = gain of individual transmit antennas (dBi) + $10 \cdot \log(2/1) = 5\text{dBi}$.

5150 MHz – 5250 MHz

Mode	Frequency (MHz)	Antenna Port	Reading PSD (dBm/MHz)	Duty Cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)
802.11a	5180	A	2.29	0	/	17
		B	-0.16			
	5200	A	2.36	0	/	17
		B	0.02			
	5240	A	2.28	0	/	17
		B	-0.02			
802.11n20	5180	A	-0.84	0	1.10	17
		B	-3.33			
	5200	A	-0.93	0	1.00	17
		B	-3.46			
	5240	A	-1.06	0	0.93	17
		B	-3.42			
802.11n40	5190	A	-5.05	0	-3.28	17
		B	-8.03			
	5230	A	-4.96	0	-3.11	17
		B	-7.71			
802.11ac80	5210	A	-4.59	0	-1.96	17
		B	-5.39			

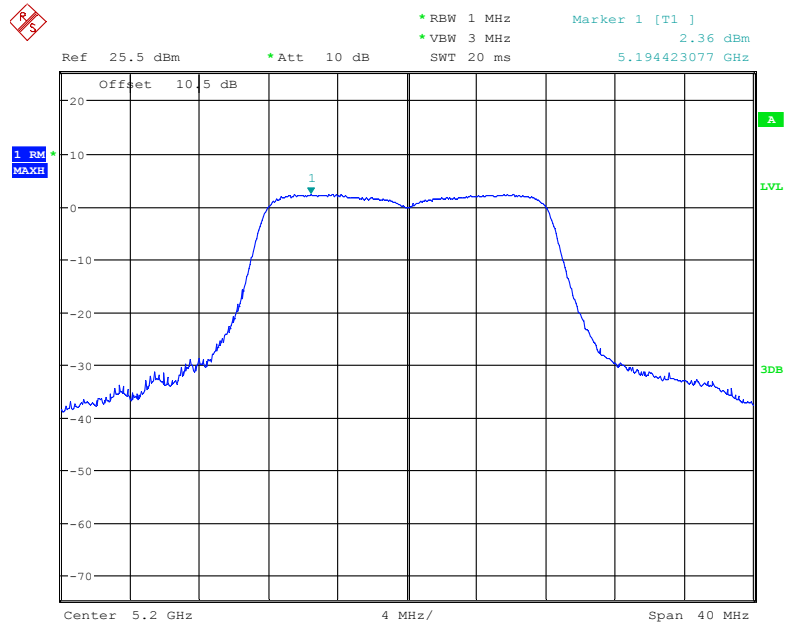
Antenna A:

802.11a mode, Power Spectral Density, 5180 MHz



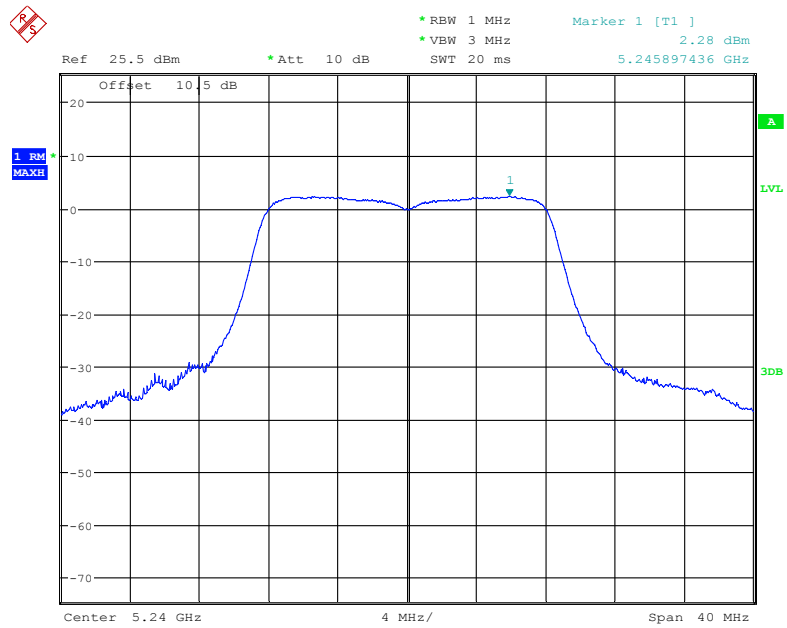
Date: 9.MAY.2019 21:10:13

802.11a mode, Power Spectral Density, 5200 MHz



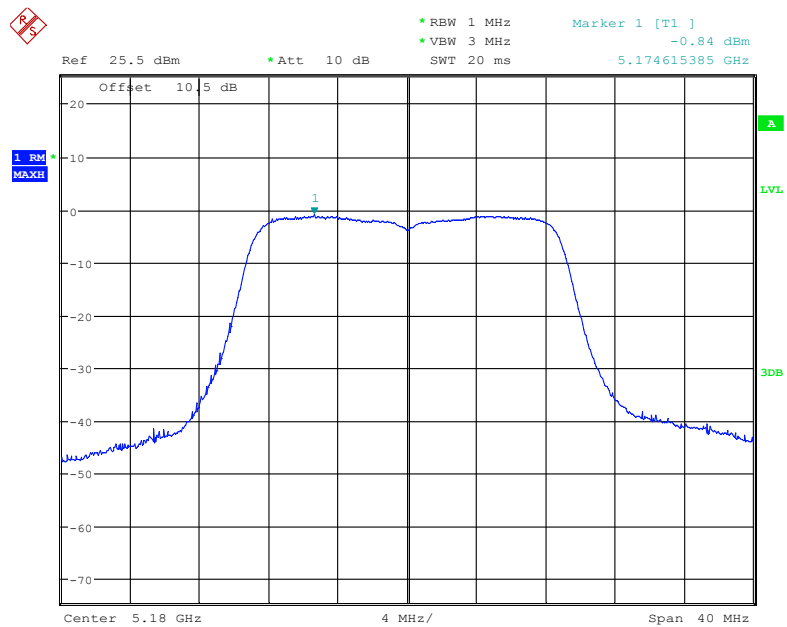
Date: 9.MAY.2019 21:09:36

802.11a mode, Power Spectral Density, 5240 MHz



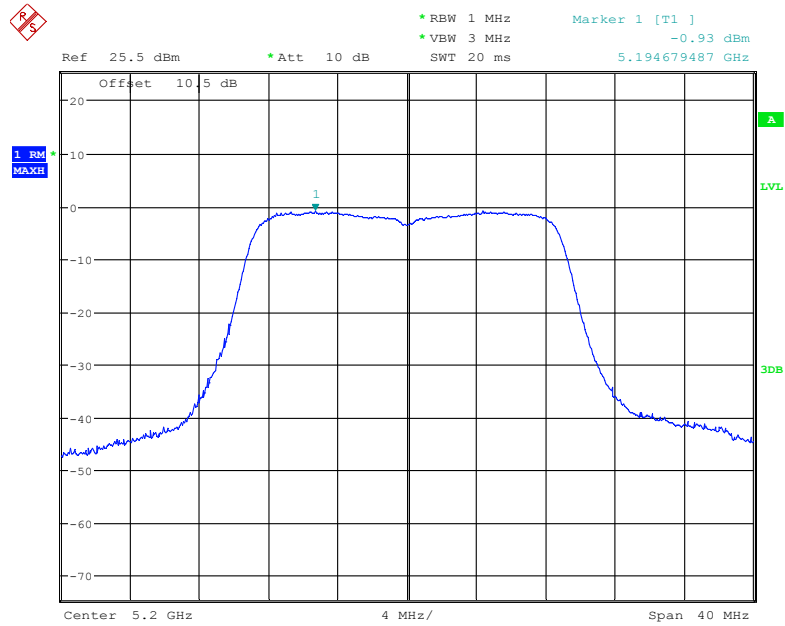
Date: 9.MAY.2019 21:08:52

802.11n20 mode, Power Spectral Density, 5180 MHz



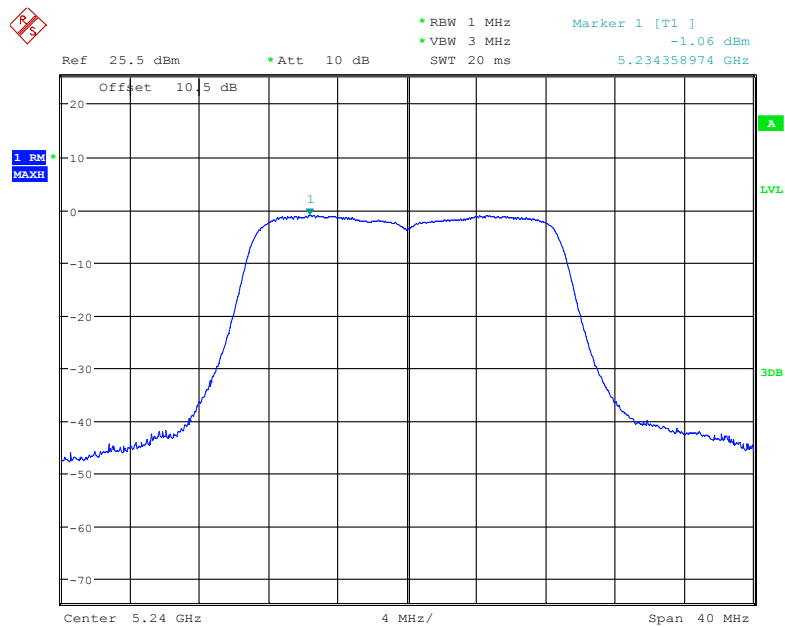
Date: 9.MAY.2019 21:12:38

802.11n20 mode, Power Spectral Density, 5200 MHz



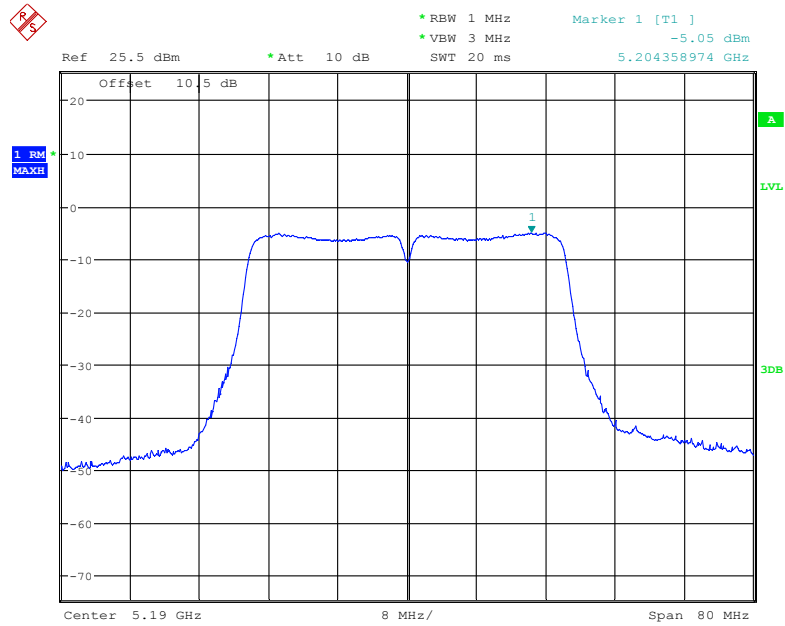
Date: 9.MAY.2019 21:11:47

802.11n20 mode, Power Spectral Density, 5240 MHz



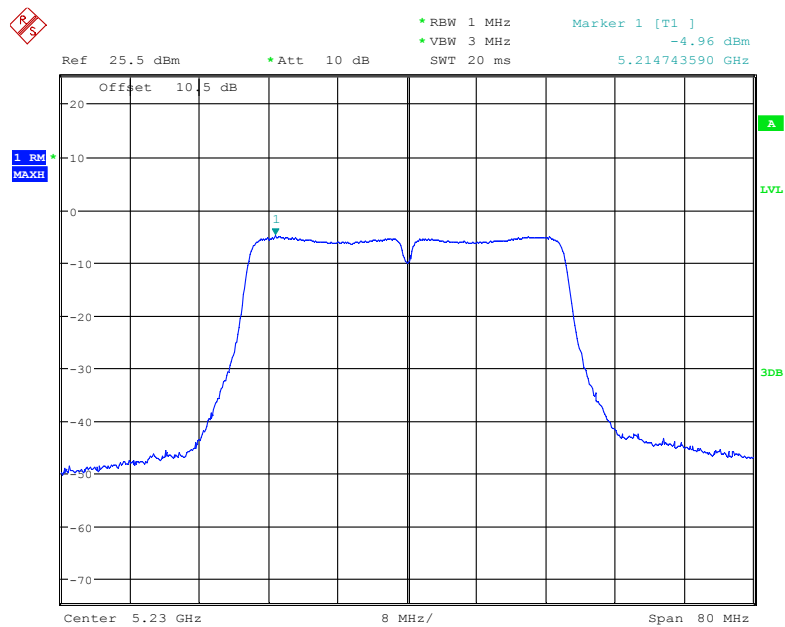
Date: 9.MAY.2019 21:11:03

802.11n40 mode, Power Spectral Density, 5190 MHz



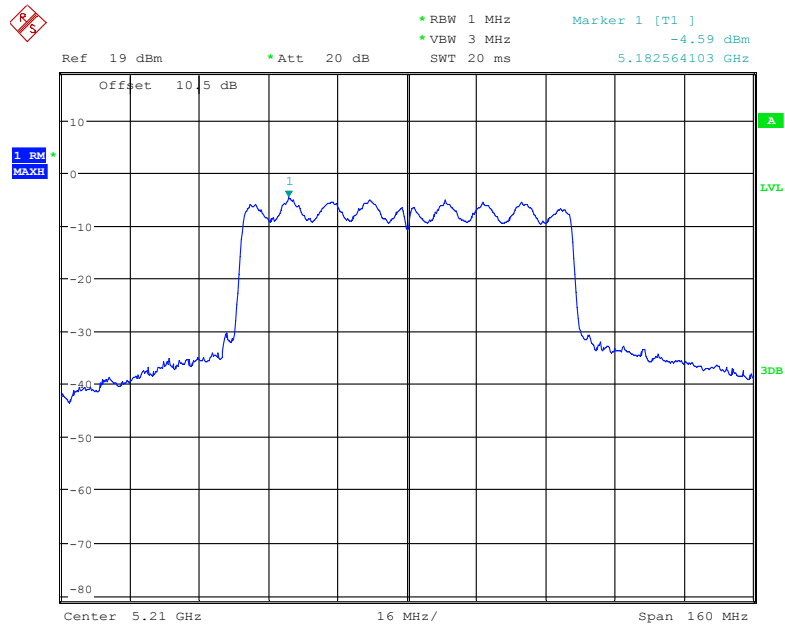
Date: 9.MAY.2019 21:23:24

802.11n40 mode, Power Spectral Density, 5230 MHz



Date: 9.MAY.2019 21:24:06

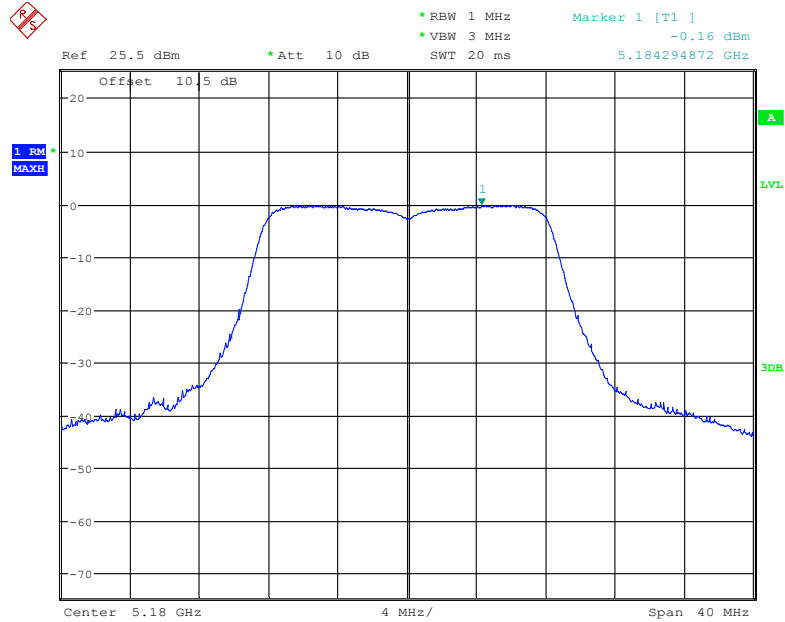
802.11ac80 mode, Power Spectral Density, 5210 MHz



Date: 10.MAY.2019 22:29:46

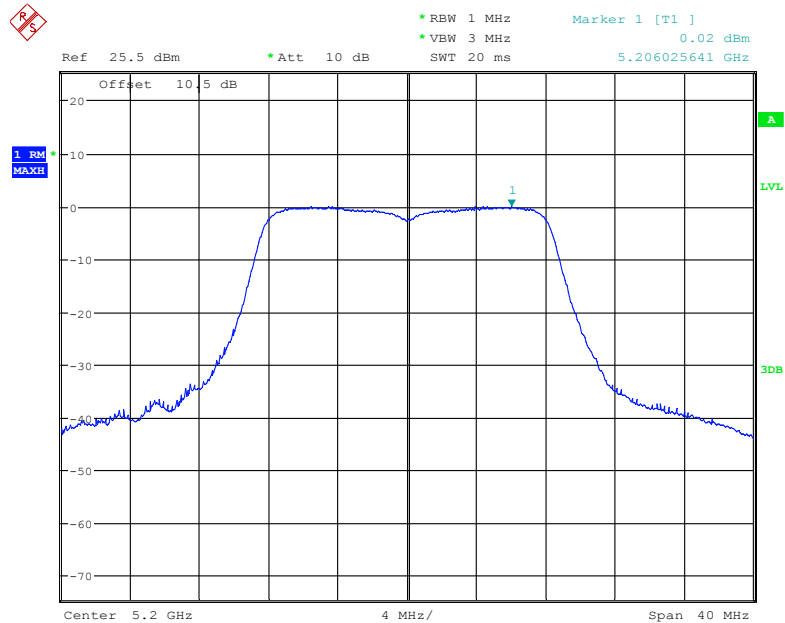
Antenna B:

802.11a mode, Power Spectral Density, 5180 MHz



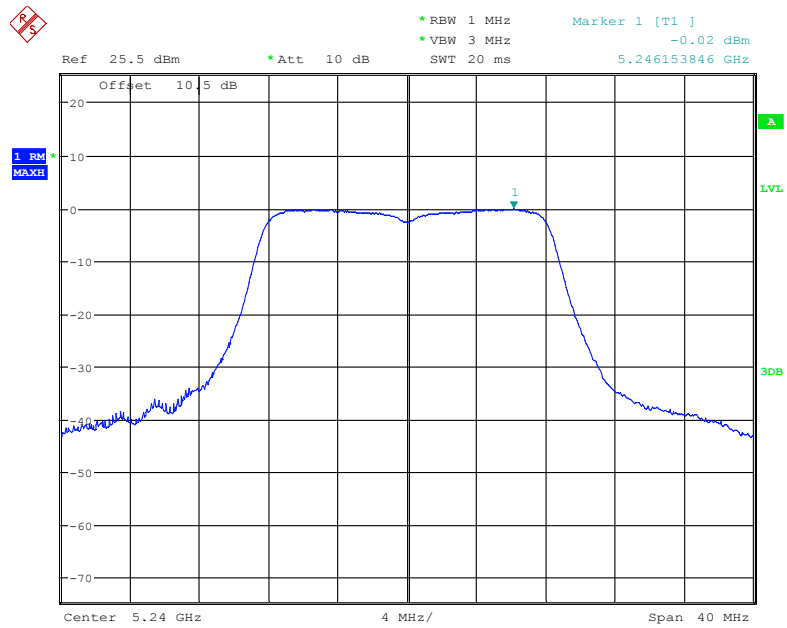
Date: 9.MAY.2019 21:06:18

802.11a mode, Power Spectral Density, 5200 MHz



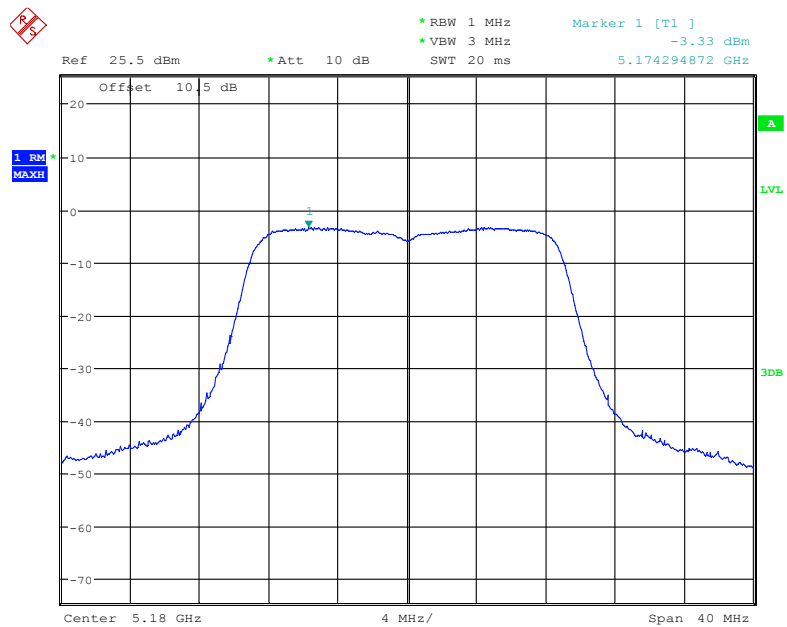
Date: 9.MAY.2019 21:06:58

802.11a mode, Power Spectral Density, 5240 MHz



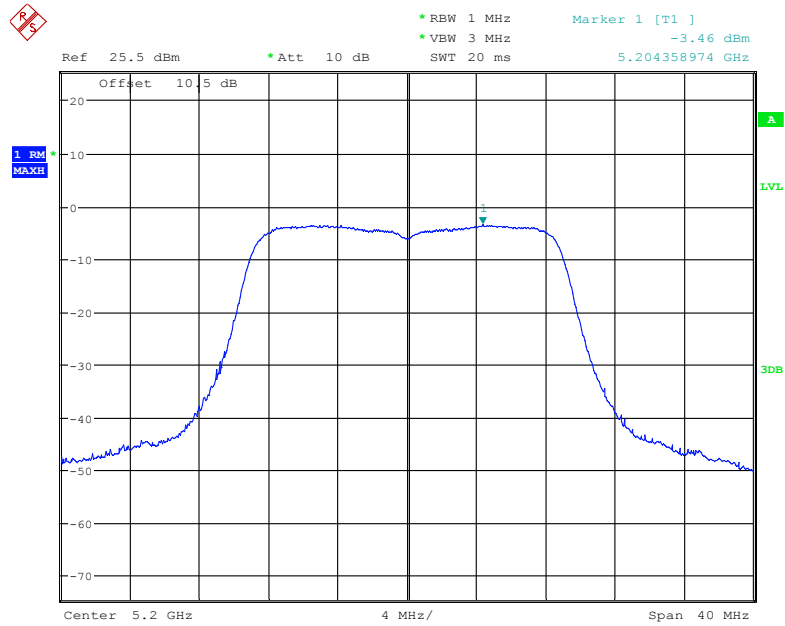
Date: 9.MAY.2019 21:07:36

802.11n20 mode, Power Spectral Density, 5180 MHz



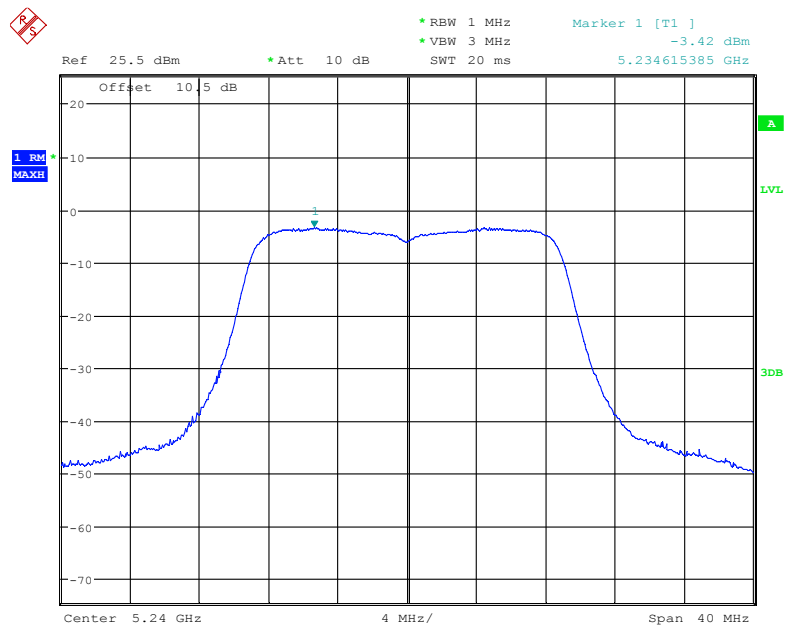
Date: 9.MAY.2019 21:01:17

802.11n20 mode, Power Spectral Density, 5200 MHz



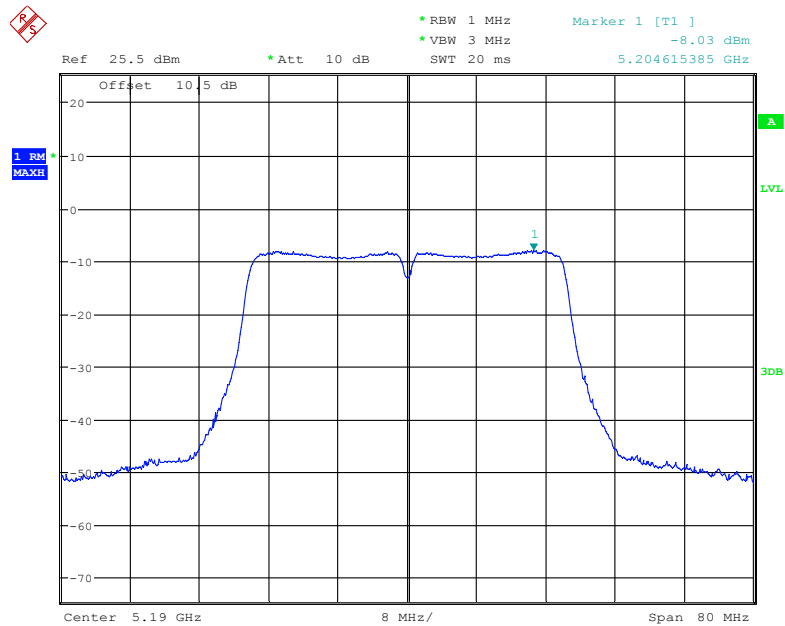
Date: 9.MAY.2019 21:01:58

802.11n20 mode, Power Spectral Density, 5240 MHz



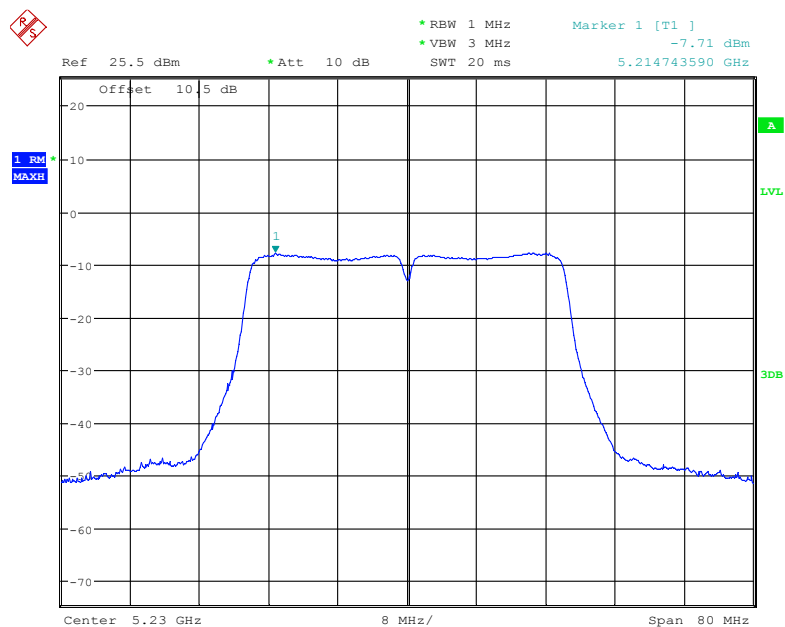
Date: 9.MAY.2019 21:02:37

802.11n40 mode, Power Spectral Density, 5190 MHz



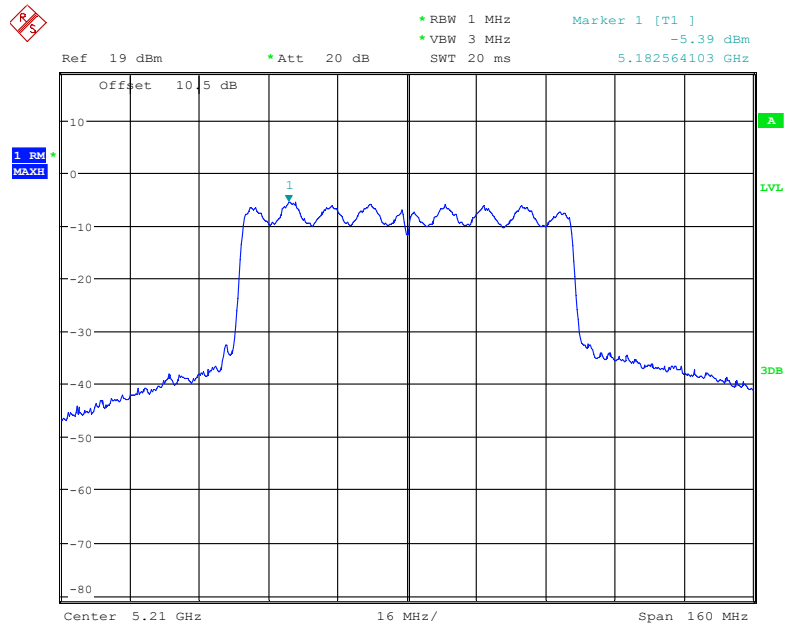
Date: 9.MAY.2019 21:00:26

802.11n40 mode, Power Spectral Density, 5230 MHz



Date: 9.MAY.2019 20:59:07

802.11ac80 mode, Power Spectral Density, 5210 MHz



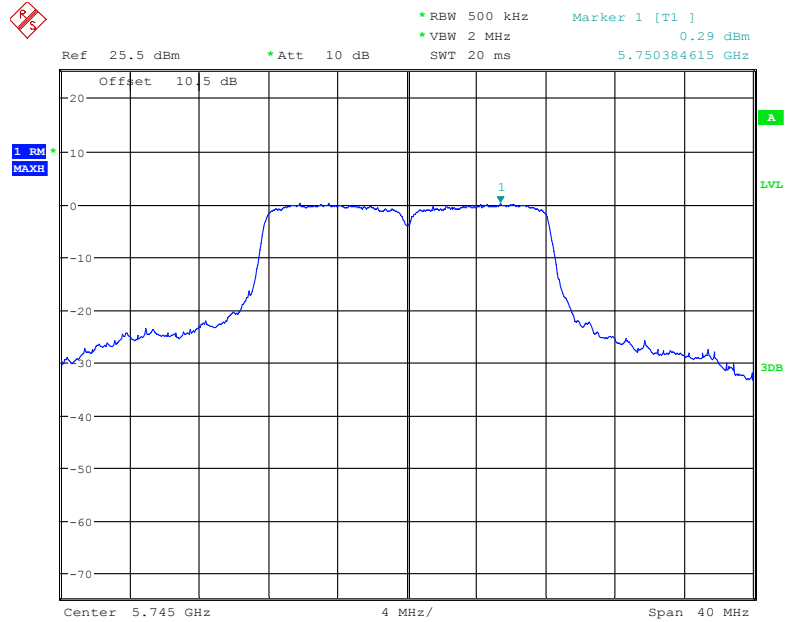
Date: 10.MAY.2019 22:34:07

5725 MHz – 5825 MHz:

Mode	Frequency (MHz)	Antenna Port	Reading PSD (dBm/500kHz)	Duty Cycle factor (dB)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)
802.11a	5745	A	0.29	0	/	30
		B	0.50			
	5785	A	1.15	0	/	30
		B	1.27			
	5825	A	0.83	0	/	30
		B	1.85			
802.11n20	5745	A	-0.55	0	1.03	30
		B	-4.12			
	5785	A	-0.07	0	1.61	30
		B	-3.33			
	5825	A	0.39	0	2.43	30
		B	-1.82			
802.11n40	5755	A	-6.11	0	-3.48	30
		B	-6.91			
	5795	A	-5.12	0	-2.26	30
		B	-5.43			
802.11ac80	5775	A	-10.71	0	-7.71	30
		B	-10.73			

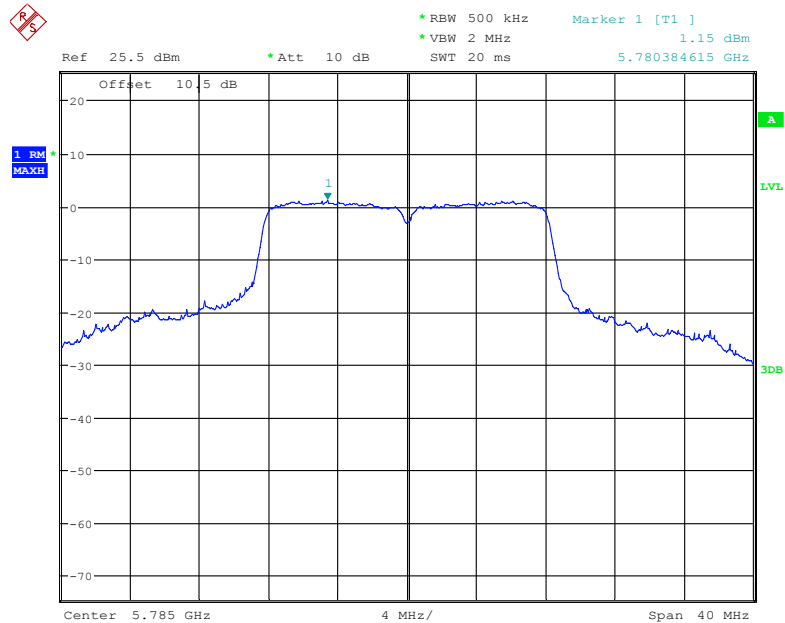
Antenna A:

802.11a mode, Power Spectral Density, 5745 MHz



Date: 9.MAY.2019 21:28:31

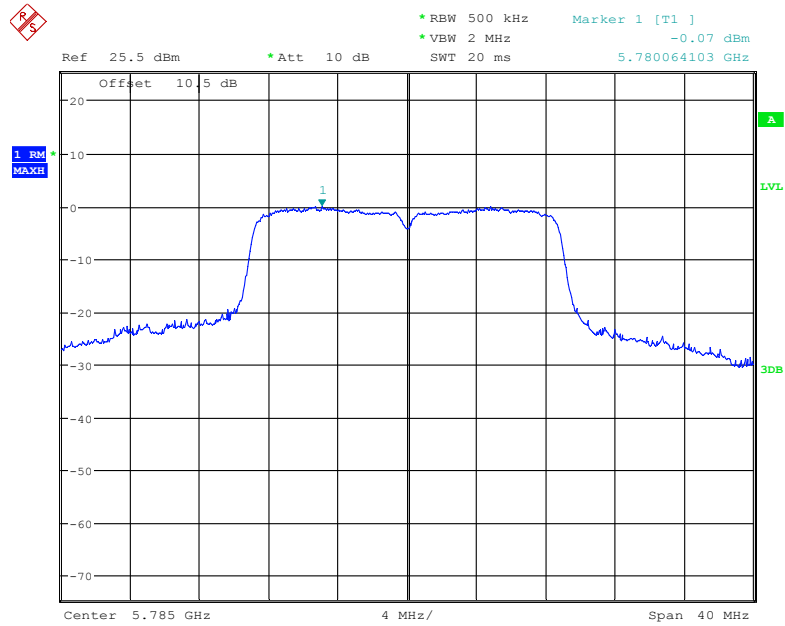
802.11a mode, Power Spectral Density, 5785 MHz



Date: 9.MAY.2019 21:31:01

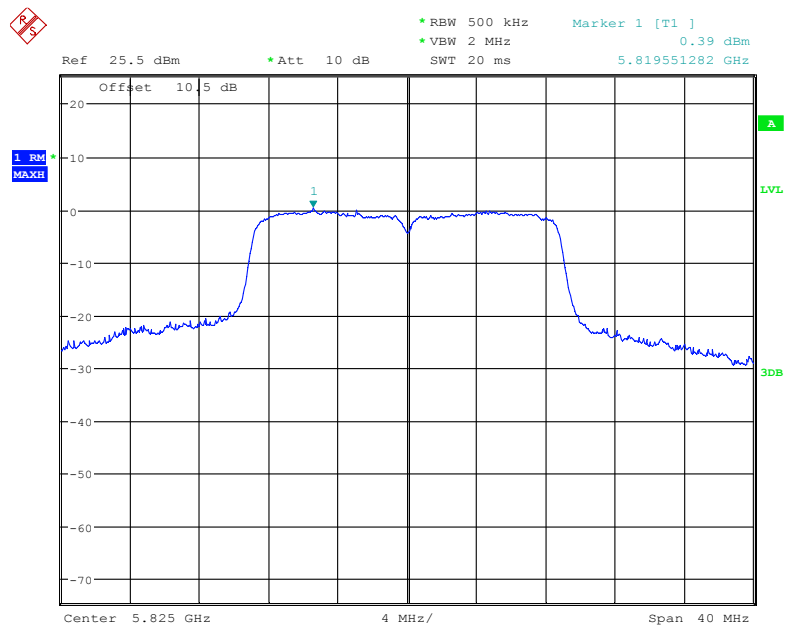


802.11n20 mode, Power Spectral Density, 5785 MHz



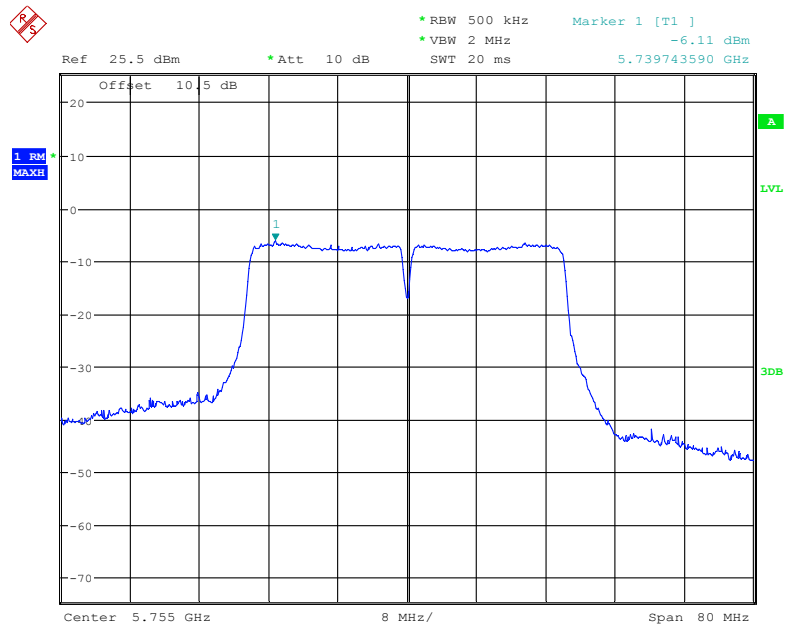
Date: 9.MAY.2019 21:37:26

802.11n20 mode, Power Spectral Density, 5825 MHz



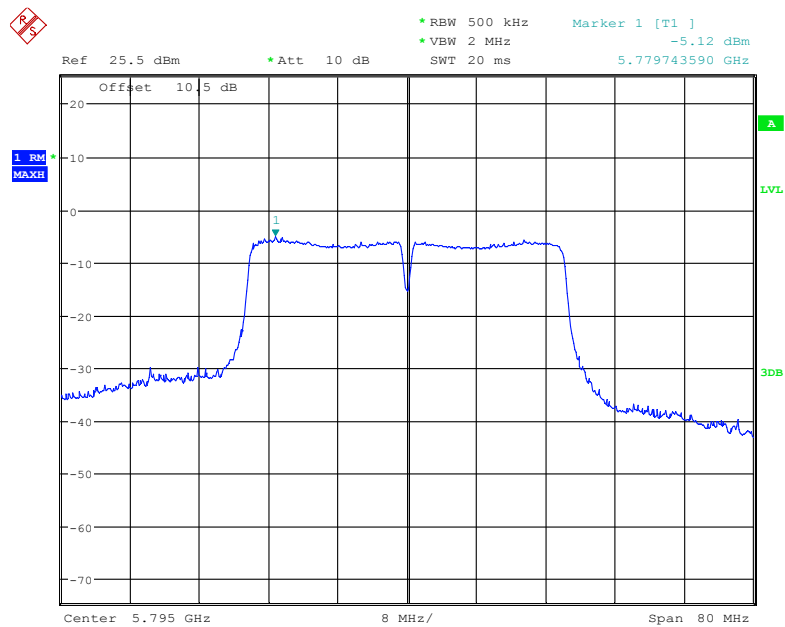
Date: 9.MAY.2019 21:38:28

802.11n40 mode, Power Spectral Density, 5755 MHz



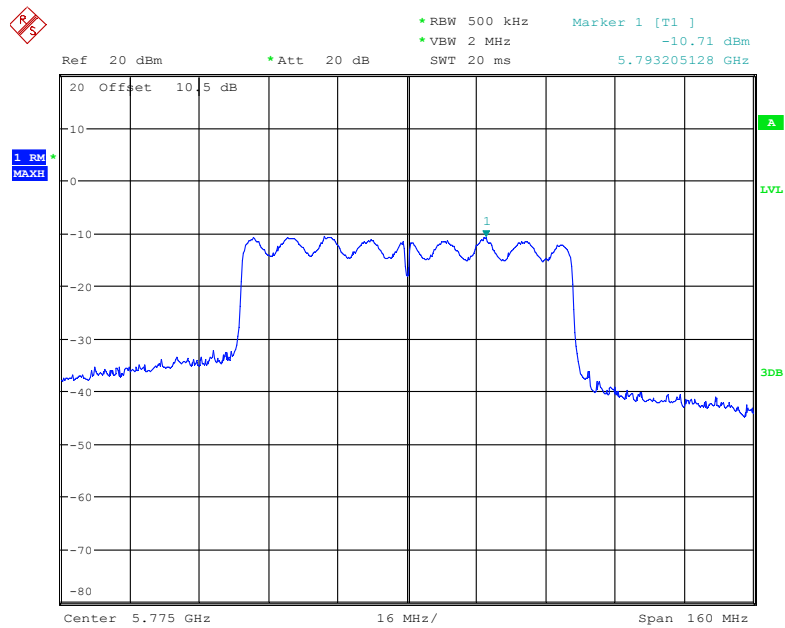
Date: 9.MAY.2019 21:39:33

802.11n40 mode, Power Spectral Density, 5795 MHz



Date: 9.MAY.2019 21:40:31

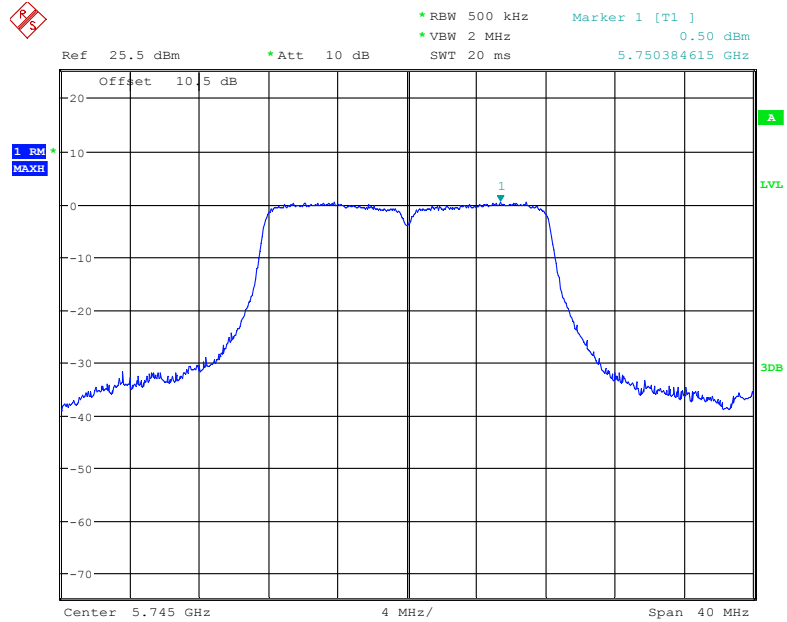
802.11ac80 mode, Power Spectral Density, 5775 MHz



Date: 10.MAY.2019 22:10:51

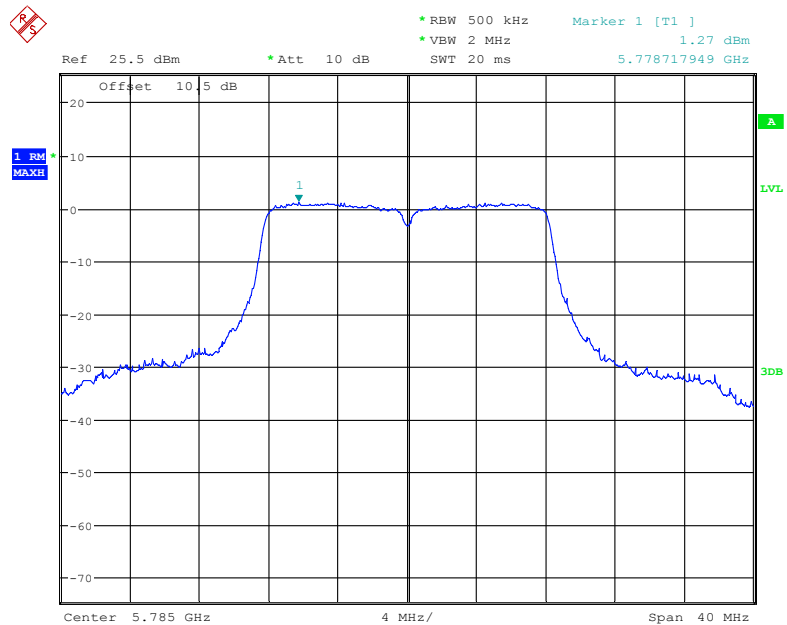
Antenna B:

802.11a mode, Power Spectral Density, 5745 MHz



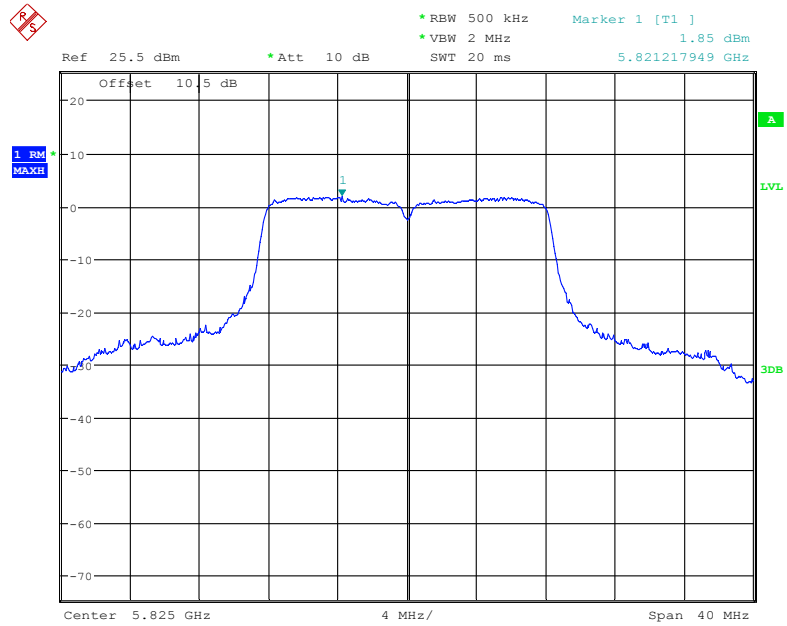
Date: 9.MAY.2019 21:49:13

802.11a mode, Power Spectral Density, 5785 MHz



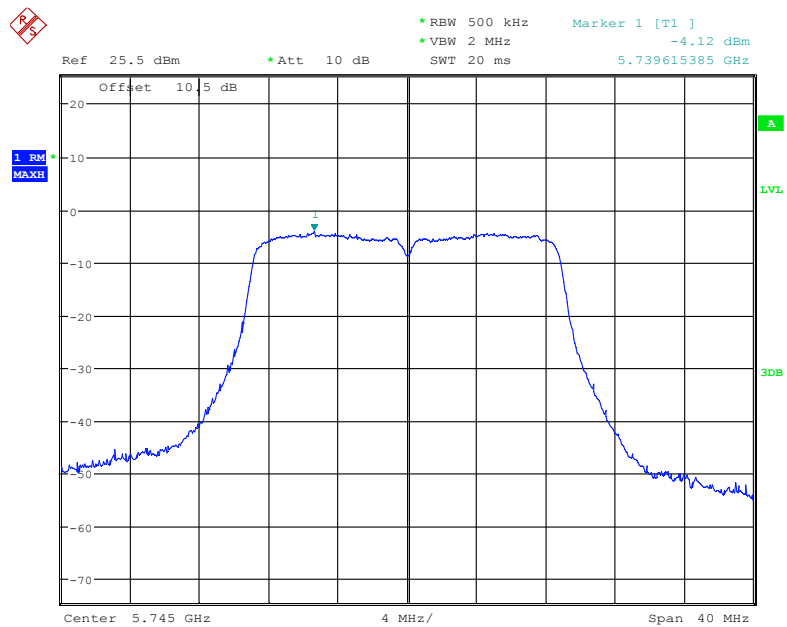
Date: 9.MAY.2019 21:48:22

802.11a mode, Power Spectral Density, 5825 MHz



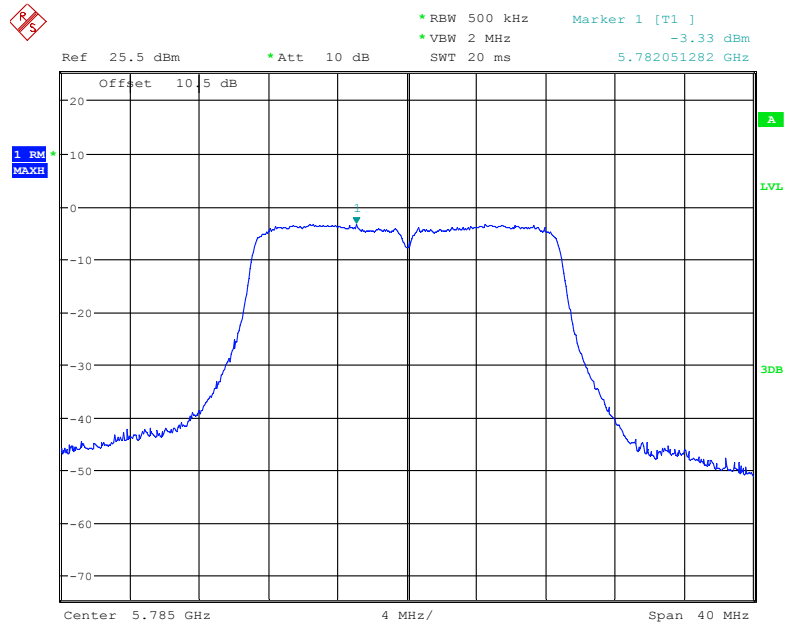
Date: 9.MAY.2019 21:46:57

802.11n20 mode, Power Spectral Density, 5745 MHz



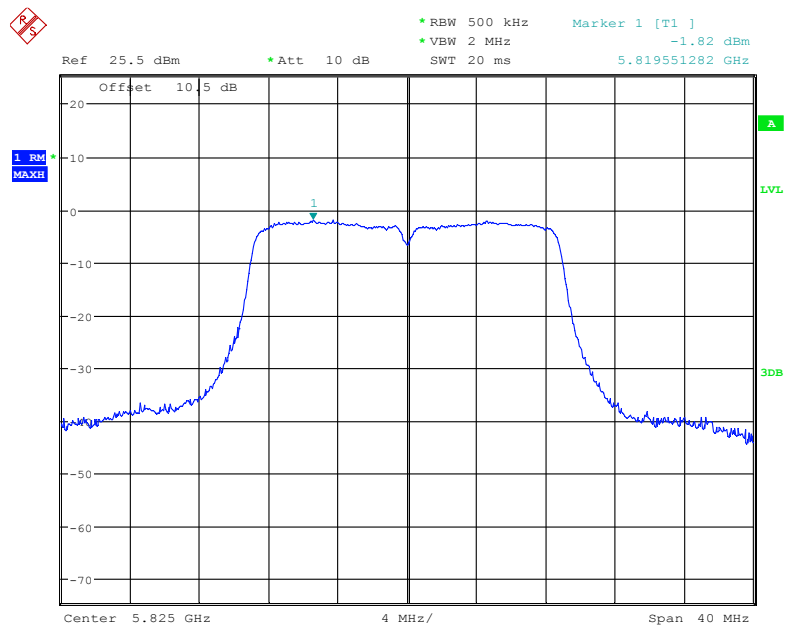
Date: 9.MAY.2019 21:44:08

802.11n20 mode, Power Spectral Density, 5785 MHz



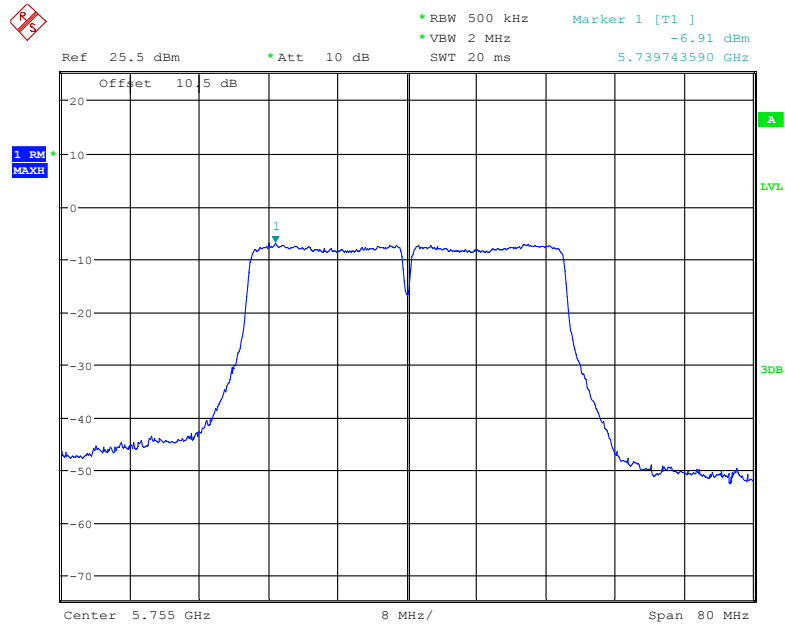
Date: 9.MAY.2019 21:45:02

802.11n20 mode, Power Spectral Density, 5825 MHz



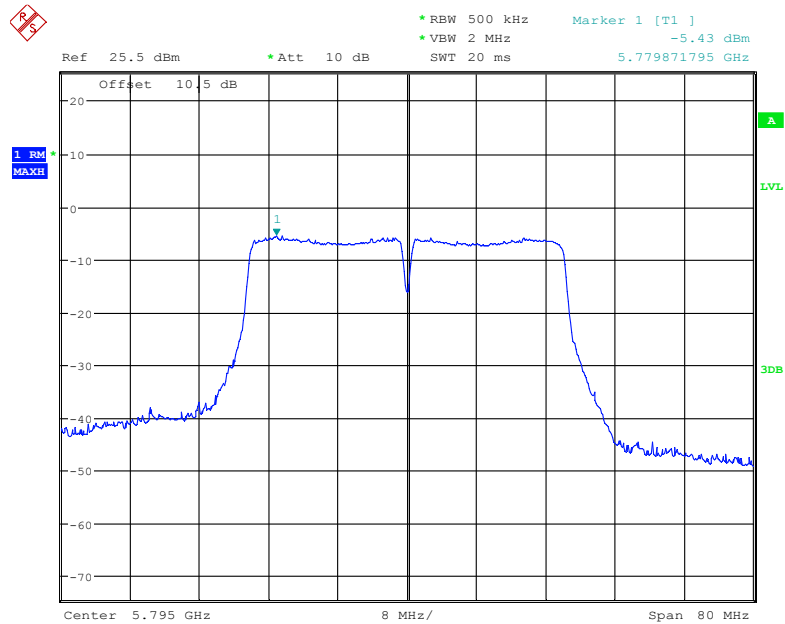
Date: 9.MAY.2019 21:45:52

802.11n40 mode, Power Spectral Density, 5755 MHz



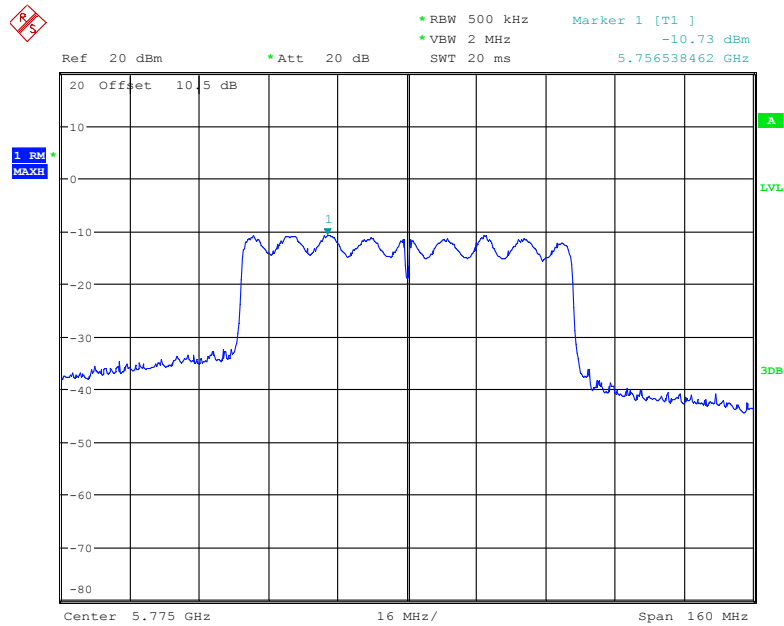
Date: 9.MAY.2019 21:43:03

802.11n40 mode, Power Spectral Density, 5795 MHz



Date: 9.MAY.2019 21:42:12

802.11ac80 mode, Power Spectral Density, 5775 MHz



Date: 10.MAY.2019 22:11:55

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