TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.407

TEST REPORT

For

Xiamen Ursalink Technology Co., Ltd.

4/F,NO. 63-2 Wanghai Road, 2nd Software Park,Xiamen ,China

FCC ID: 2AOSV-UR51

Report Type:	**Product Name:**
Original Report	Industrial Cellular Router

Report Number:	RDG180313051-00C
Report Date:	2018-07-27
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Industrial Cellular Router
EUT Model:		UR51
FCC ID:		2AOSV-UR51
Rated Input Voltage:		DC 12V from Adapter
Adapter Information	**Model:**	OH-1015A1201000U1-UL
	Input:	100-240V~50/60Hz 350mA
	Output:	DC 12V/1A
External Dimension:		100mm(L)*96.1mm(W)*30mm(H)
Serial Number:		180313051
EUT Received Date:		2018.05.30

Objective

This type approval report is prepared on behalf of ***Xiamen Ursalink Technology Co., Ltd.***in accordance with Part 2-Subpart J, Part 15-Subparts A, and E of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AOSV-UR51.
FCC Part 15B JBP submissions with FCC ID: 2AOSV-UR51.

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 KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions,conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, 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. : 897218,the FCC Designation No. : CN1220.

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

The system support 802.11a/n ht20/n ht40/ac vht20/ac vht40/ac vht80, the vh20/vht40 were reduced since the identical parameters with 802.11n ht20 and ht40.

For 5150~5250 MHz 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	/	/

802.11a, 802.11n ht20 were tested with Channel 36, 40 and 48,
802.11n ht40 were tested with Channel 38 and 46.
802.11ac80 mode was tested with channel 42

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

802.11a, 802.11n ht20 were tested with Channel 149, 157 and 165,
802.11n ht40 were tested with Channel 151 and 159.
802.11ac80 mode was tested with channel 155.

EUT Exercise Software

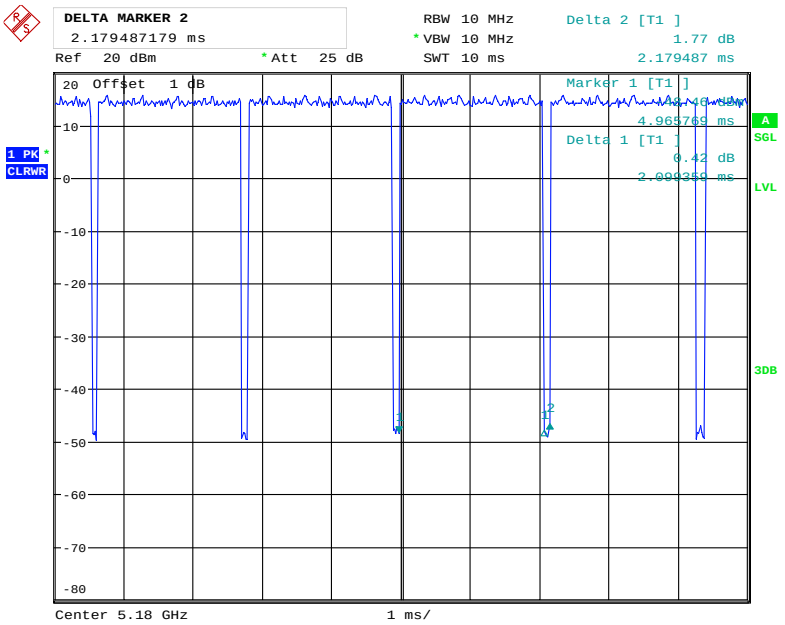
The software "QRCT Version3.0.265.0" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations. The maximum power was configured as below table, that provided by the manufacturer:

Software and version				QRCT Version3.0.265.0	
UNII Band	**Mode**	**Channel**	**Frequency (MHz)**	**Data Rate (Mbps)**	**Power Level**
5150-5250MHz	**802.11a**	Low	5180	6	10
		Middle	5200	6	17
		High	5240	6	17
	802.11n ht20	Low	5180	MCS0	10
		Middle	5200	MCS0	17
		High	5240	MCS0	17
	802.11n ht40	Low	5190	MCS0	9
		High	5230	MCS0	16
	802.11 ac80	Middle	5210	MCS0	11
5725-5850MHz	**802.11a**	Low	5745	6	23
		Middle	5785	6	23
		High	5825	6	23
	802.11n ht20	Low	5745	MCS0	22
		Middle	5785	MCS0	22
		High	5825	MCS0	22
	802.11n ht40	Low	5755	MCS0	22
		High	5795	MCS0	22
	802.11 ac80	Middle	5775	MCS0	22

The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11 a	2.099	2.179	96.3
802.11n ht20	1.954	2.035	96.0
802.11n ht40	0.978	1.122	87.2
802.11ac80	0.477	0.602	79.2

802.11a



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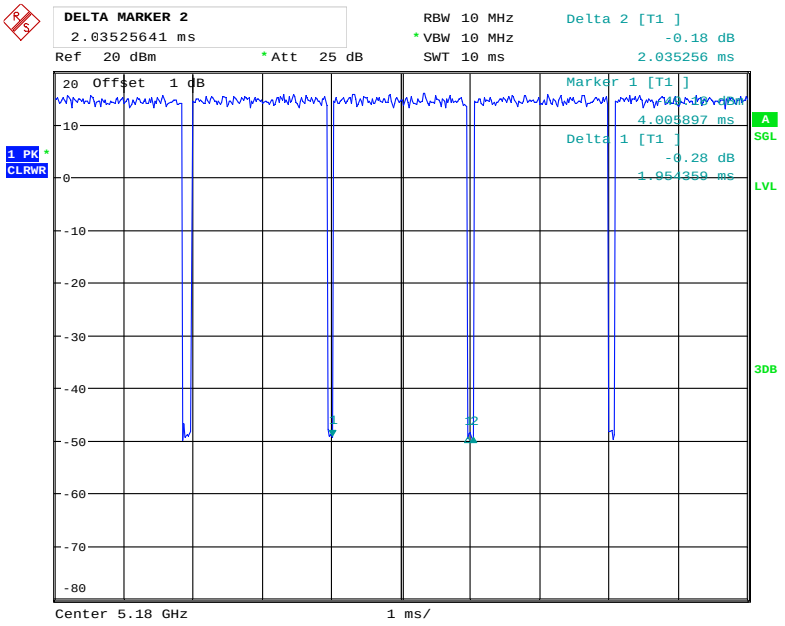
802.11n ht20



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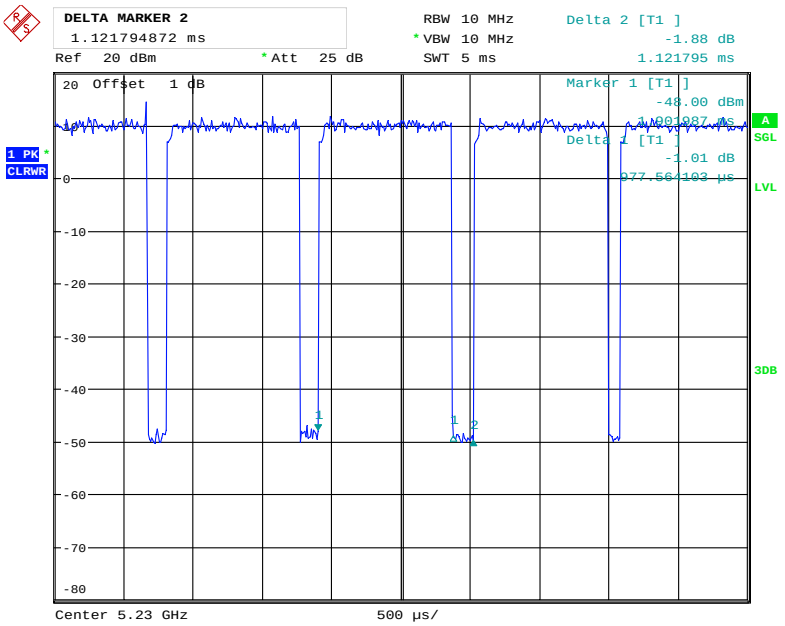
802.11n ht40



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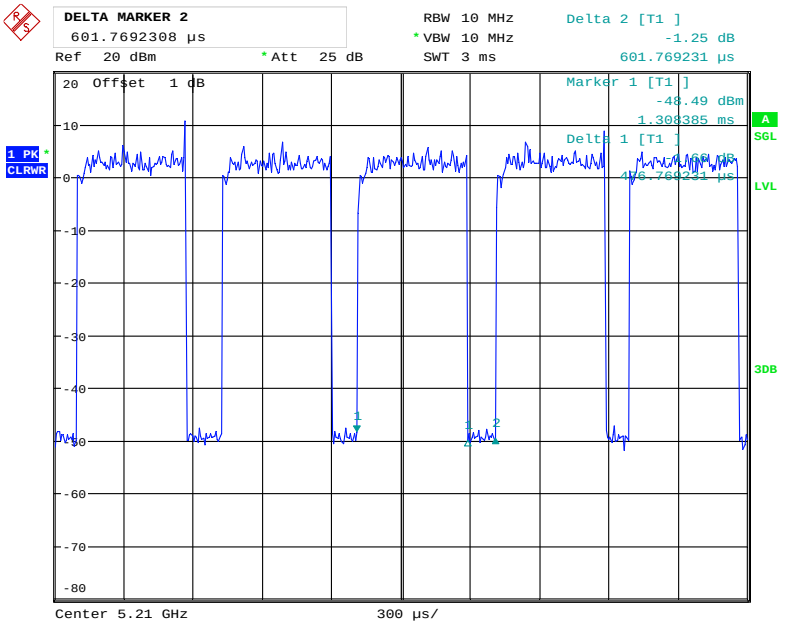
802.11 ac80



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Equipment Modifications

No modification was made to the EUT.

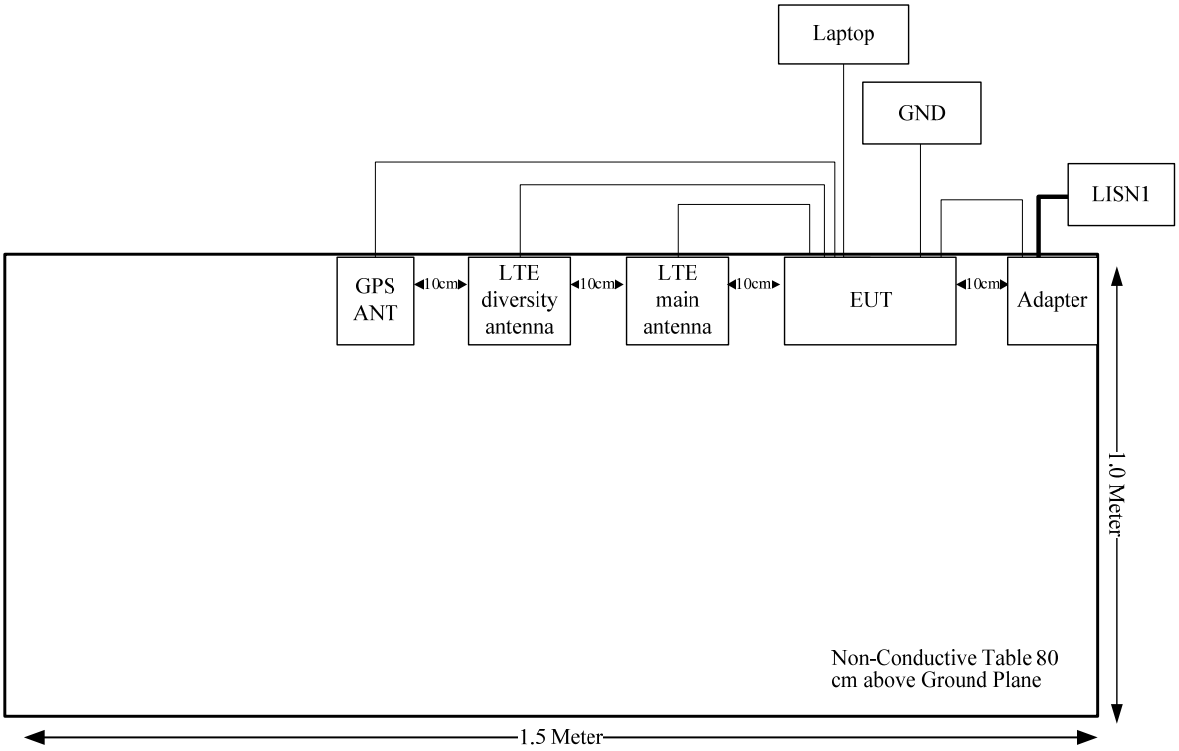
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	HLKYGB1

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	No	No	0.8	RJ45 Port of EUT	Laptop
Antenna Cable	No	No	1.5	Antenna Port of EUT	LTE main antenna
Antenna Cable	No	No	1.5	Antenna Port of EUT	LTE diversity antenna
GPS Cable	No	No	1.5	GPS Port of EUT	GPS ANT
Adapter Cable	No	Yes	1.5	EUT	Adapter
Ground line	No	No	1.5	Gnd Port of EUT	ground

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.407 (f) & §1.1310 & §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)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b)	Out Of Band Emissions	Compliance
§15.407(a) (e)	Emission Bandwidth	Compliance
§15.407(g)	Frequency Stability	Compliance
§15.407(a)	Conducted Transmitter Output Power	Compliance
§15.407 (a)	Power Spectral Density	Compliance

FCC §15.407 (f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.407(f)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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/f²)	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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

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

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

Calculated Data:

Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm^2)	S_{limit} (mW/cm^2)	S_i/S_{limit}
	(dBi)	(numeric)	(dBm)	(mW)				
5150-5250 & 5725-5850	5	3.16	15	31.62	20.00	0.02	1.0	0.02
2412-2462	3	2.00	20	100.00	20.00	0.04	1.0	0.04
824-849	2.5	1.78	23.5	223.87	20.00	0.08	0.55	0.14
1850-1910	3	2.00	24	251.19	20.00	0.10	1.00	0.10
1710-1755	3	2.00	24	251.19	20.00	0.10	1.00	0.10

The Wi-Fi function and LTE Module can transmit simultaneously.

The Wi-Fi function and LTE Module can transmit simultaneously. 2.4GHz and 5GHz Wi-Fi can not transmit simultaneously. Worst case as below.

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

$=S_{Wi\text{-}Fi}/S_{Wi\text{-}Fi}+ S_{WWAN}/S_{limit\ WWAN}$

$= 0.04+0.14=0.18<1$

Result: The device meet FCC MPE at 20 cm distance

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 use of a standard antenna jack or electrical connector is prohibited.
And according to FCC 47 CFR section 15.407 (a)(1),if transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak 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 have one external antenna, and the antenna gain is 5dBi, the EUT requires professional installation. Please refer to the professional installation statement letter.

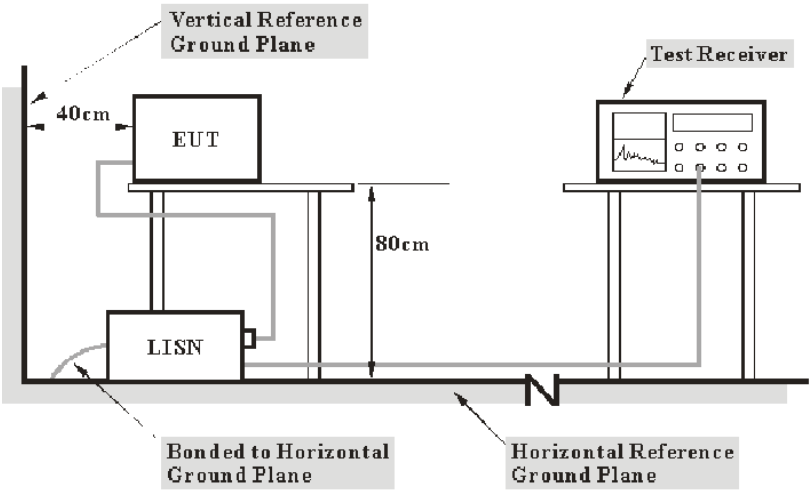
Result: Compliance.

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

Applicable Standard

FCC §15.207(a), §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 the main lisn with a 120 V/60 Hz AC 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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-25	2018-09-25
R&S	Two-line V-network	ENV 216	3560.6550.12	2017-12-08	2018-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05

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

Test Procedure

During the conducted emission test, the EUT was connected to the first 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

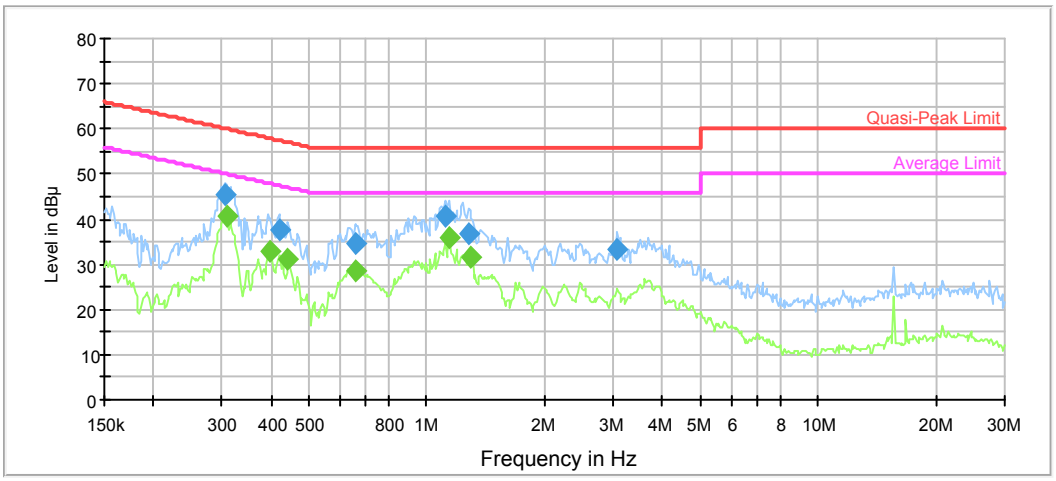
Environmental Conditions

Temperature:	28.4 °C
Relative Humidity:	56 %
ATM Pressure:	100.3 kPa

The testing was performed by Sider Huang on 2018-07-20.

Test Mode: Transmitting

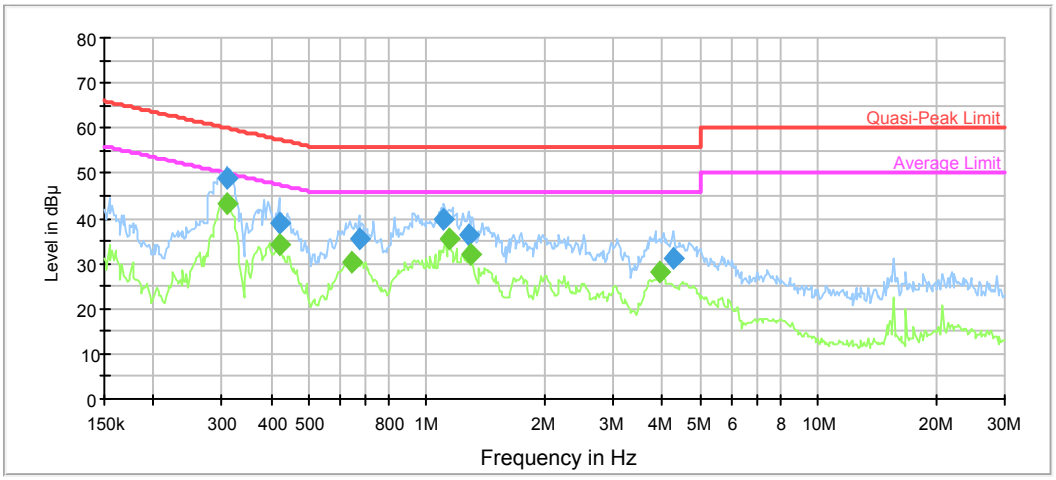
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.304845	45.6	9.000	L1	10.1	14.5	60.1	Compliance
0.419276	37.7	9.000	L1	10.0	19.8	57.5	Compliance
0.655073	34.5	9.000	L1	9.8	21.5	56.0	Compliance
1.117238	40.8	9.000	L1	9.8	15.2	56.0	Compliance
1.279307	36.9	9.000	L1	9.8	19.1	56.0	Compliance
3.073500	33.1	9.000	L1	9.8	22.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.307284	40.7	9.000	L1	10.1	9.3	50.0	Compliance
0.396530	32.7	9.000	L1	10.0	15.2	47.9	Compliance
0.443327	31.1	9.000	L1	9.9	15.9	47.0	Compliance
0.660314	28.5	9.000	L1	9.8	17.5	46.0	Compliance
1.144267	35.9	9.000	L1	9.8	10.1	46.0	Compliance
1.289541	31.6	9.000	L1	9.8	14.4	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.307284	48.9	9.000	N	10.1	11.1	60.0	Compliance
0.419276	38.8	9.000	N	10.0	18.7	57.5	Compliance
0.670921	35.6	9.000	N	9.8	20.4	56.0	Compliance
1.108371	39.6	9.000	N	9.8	16.4	56.0	Compliance
1.279307	36.5	9.000	N	9.8	19.5	56.0	Compliance
4.261034	31.0	9.000	N	9.8	25.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.307284	43.3	9.000	N	10.1	6.7	50.0	Compliance
0.419276	34.0	9.000	N	10.0	13.5	47.5	Compliance
0.644717	30.2	9.000	N	9.8	15.8	46.0	Compliance
1.144267	35.3	9.000	N	9.8	10.7	46.0	Compliance
1.289541	32.1	9.000	N	9.8	13.9	46.0	Compliance
3.934683	27.9	9.000	N	9.8	18.1	46.0	Compliance

FCC §15.209, §15.205 & §15.407(b) –UNWANTED EMISSION

Applicable Standard

FCC §15.407; §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.

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

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(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.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

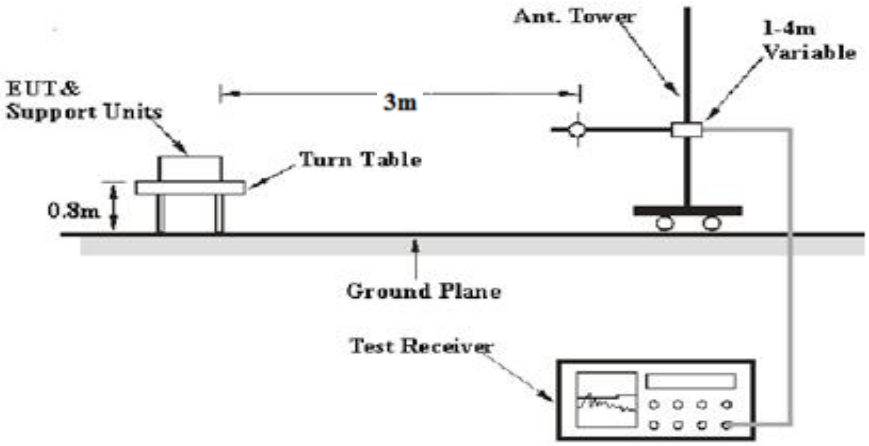
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

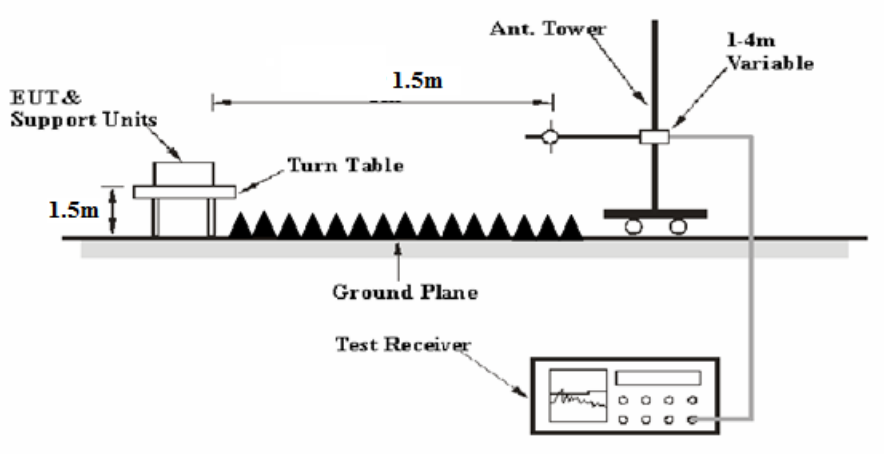
(7) The provisions of §15.205 apply to intentional radiators operating under this section.

EUT Setup

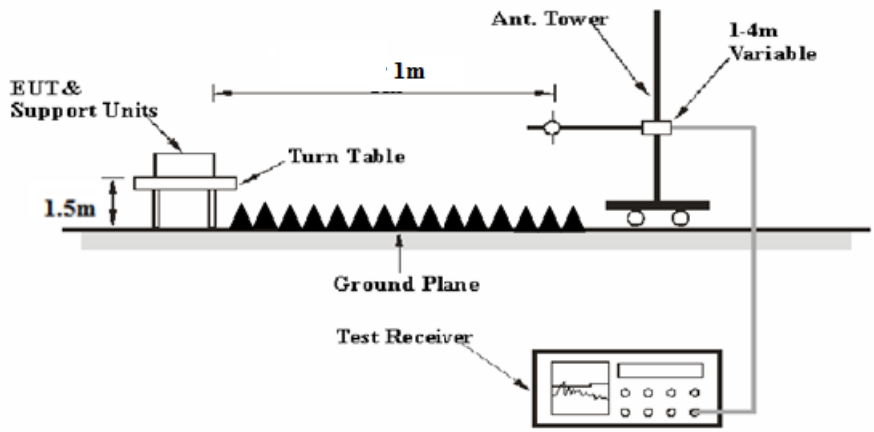
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was 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.

The spacing between the peripherals was 10 cm.

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:

30-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 40GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Test Procedure

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

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 KDB 789033 D02 General UNII Test Procedures New Rules v02r01, emission shall be computed as: E [dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

According to C63.10, the above 1G test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m or 1m
Distance extrapolation factor =20 log (specific distance [3m]/test distance [1.5m]) dB= 6.02 dB
or
Distance extrapolation factor =20 log (specific distance [3m]/test distance [1m]) dB= 9.54 dB

All emissions under the average limit and under the noise floor have not recorded in the report.

Corrected Amplitude & Margin Calculation

For the range 30MHz-1GHz, the Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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

Margin = Limit - Corrected Amplitude

For the range 1GHz-40GHz, Test performed at 1.5m or 1m, the Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading and the Distance extrapolation factor. The basic equation is as follows:

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

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

Margin = Limit- Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
R&S	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1302	2016-11-18	2019-11-18
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2018-06-27	2019-06-27
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2018-06-27	2019-06-27
Sinoscite	Bandstop Filters	BSF5150-5850MN-0899-003	0899003	2018-05-06	2019-05-06
Mini Circuits	High Pass Filter	VHF-6010+	31118	2018-06-16	2019-06-16

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

Test Data

Environmental Conditions

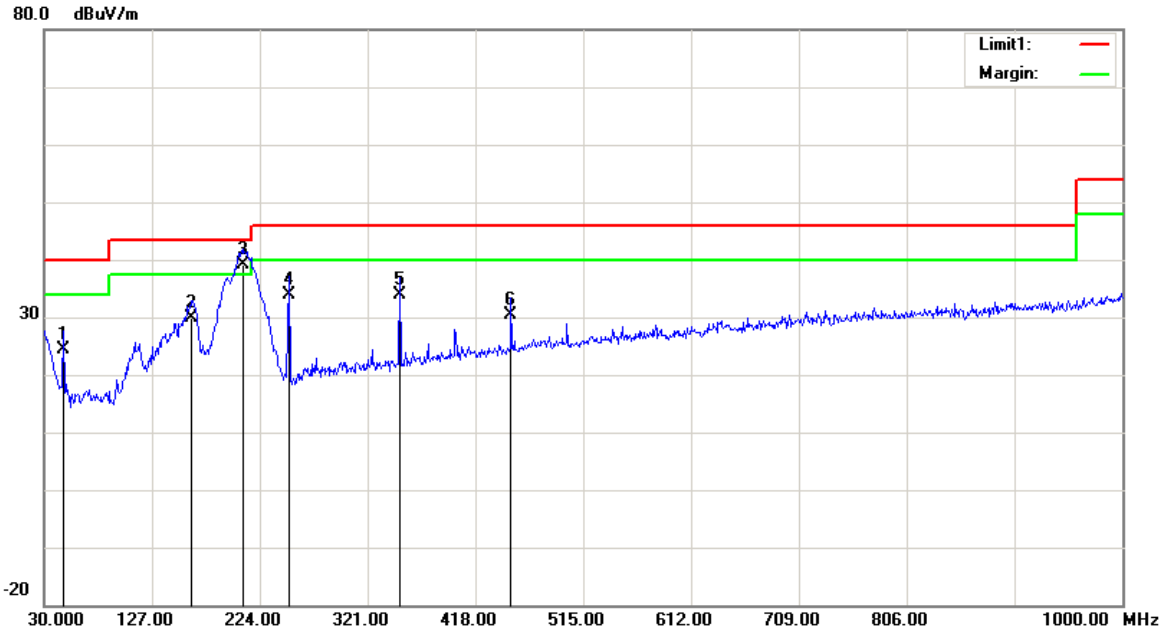
Temperature:	26.3~29.9 °C
Relative Humidity:	39~41 %
ATM Pressure:	99.5~100.1 kPa

** The testing was performed by Vem Shen & Tyler Pan from 2018-07-19 to 2018-07-22.*

Test Mode: Transmitting

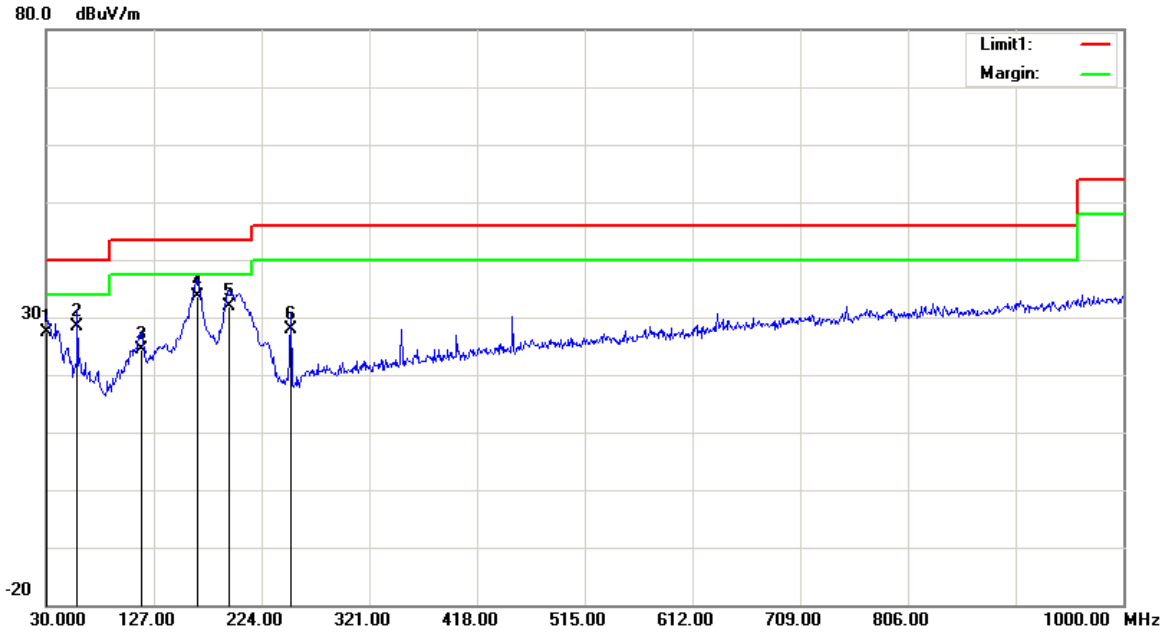
1) Below 1GHz(802.11 a 5785 MHz was the worst):

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
47.4600	34.92	QP	-10.42	24.50	40.00	15.50
161.9200	36.13	QP	-6.23	29.90	43.50	13.60
208.4800	46.60	QP	-7.40	39.20	43.50	4.30
250.1900	40.18	QP	-6.18	34.00	46.00	12.00
350.1000	36.92	QP	-3.02	33.90	46.00	12.10
450.0100	31.49	QP	-1.19	30.30	46.00	15.70

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	25.85	QP	1.55	27.40	40.00	12.60
58.1300	40.73	QP	-12.43	28.30	40.00	11.70
115.3600	29.89	QP	-5.39	24.50	43.50	19.00
165.8000	40.11	QP	-6.41	33.70	43.50	9.80
194.9000	38.72	QP	-6.82	31.90	43.50	11.60
250.1900	34.08	QP	-6.18	27.90	46.00	18.10

2) 1GHz-40GHz:
5150-5250MHz

802.11a

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Low Channel: 5180 MHz										
5180.00	59.10	PK	H	33.59	3.58	0.00	96.27	90.25	N/A	N/A
5180.00	48.85	AV	H	33.59	3.58	0.00	86.02	80	N/A	N/A
5180.00	72.12	PK	V	33.59	3.58	0.00	109.29	103.27	N/A	N/A
5180.00	61.87	AV	V	33.59	3.58	0.00	99.04	93.02	N/A	N/A
5150.00	34.64	PK	V	33.54	3.56	0.00	71.74	65.72	74.00	8.28
5150.00	15.32	AV	V	33.54	3.56	0.00	52.42	46.4	54.00	7.60
10360.00	46.33	PK	V	38.17	6.29	36.85	53.94	47.92	74.00	26.08
10360.00	33.87	AV	V	38.17	6.29	36.85	41.48	35.46	54.00	18.54
15540.00	45.68	PK	V	38.06	8.85	39.04	53.55	47.53	74.00	26.47
15540.00	33.10	AV	V	38.06	8.85	39.04	40.97	34.95	54.00	19.05
Middle Channel: 5200 MHz										
5200.00	65.12	PK	H	33.62	3.60	0.00	102.34	96.32	N/A	N/A
5200.00	54.79	AV	H	33.62	3.60	0.00	92.01	85.99	N/A	N/A
5200.00	79.22	PK	V	33.62	3.60	0.00	116.44	110.42	N/A	N/A
5200.00	68.93	AV	V	33.62	3.60	0.00	106.15	100.13	N/A	N/A
10400.00	47.10	PK	V	38.18	6.32	36.86	54.74	48.72	74.00	25.28
10400.00	34.58	AV	V	38.18	6.32	36.86	42.22	36.2	54.00	17.80
15600.00	45.39	PK	V	38.00	8.83	39.09	53.13	47.11	74.00	26.89
15600.00	33.10	AV	V	38.00	8.83	39.09	40.84	34.82	54.00	19.18
High Channel: 5240 MHz										
5240.00	64.64	PK	H	33.68	3.52	0.00	101.84	95.82	N/A	N/A
5240.00	54.66	AV	H	33.68	3.52	0.00	91.86	85.84	N/A	N/A
5240.00	78.10	PK	V	33.68	3.52	0.00	115.30	109.28	N/A	N/A
5240.00	67.97	AV	V	33.68	3.52	0.00	105.17	99.15	N/A	N/A
5350.00	24.45	PK	V	33.86	3.52	0.00	61.83	55.81	74.00	18.19
5350.00	13.58	AV	V	33.86	3.52	0.00	50.96	44.94	54.00	9.06
10480.00	46.87	PK	V	38.20	6.37	36.88	54.56	48.54	74.00	25.46
10480.00	34.36	AV	V	38.20	6.37	36.88	42.05	36.03	54.00	17.97
15720.00	45.89	PK	V	37.88	8.79	39.18	53.38	47.36	74.00	26.64
15720.00	33.57	AV	V	37.88	8.79	39.18	41.06	35.04	54.00	18.96

802.11n ht20

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Low Channel: 5180 MHz										
5180.00	58.36	PK	H	33.59	3.58	0.00	95.53	89.51	N/A	N/A
5180.00	48.38	AV	H	33.59	3.58	0.00	85.55	79.53	N/A	N/A
5180.00	72.73	PK	V	33.59	3.58	0.00	109.90	103.88	N/A	N/A
5180.00	62.49	AV	V	33.59	3.58	0.00	99.66	93.64	N/A	N/A
5150.00	37.57	PK	V	33.54	3.56	0.00	74.67	68.65	74.00	5.35
5150.00	15.56	AV	V	33.54	3.56	0.00	52.66	46.64	54.00	7.36
10360.00	46.52	PK	V	38.17	6.29	36.85	54.13	48.11	74.00	25.89
10360.00	34.13	AV	V	38.17	6.29	36.85	41.74	35.72	54.00	18.28
15540.00	45.88	PK	V	38.06	8.85	39.04	53.75	47.73	74.00	26.27
15540.00	33.38	AV	V	38.06	8.85	39.04	41.25	35.23	54.00	18.77
Middle Channel: 5200 MHz										
5200.00	65.07	PK	H	33.62	3.60	0.00	102.29	96.27	N/A	N/A
5200.00	55.10	AV	H	33.62	3.60	0.00	92.32	86.3	N/A	N/A
5200.00	79.37	PK	V	33.62	3.60	0.00	116.59	110.57	N/A	N/A
5200.00	69.28	AV	V	33.62	3.60	0.00	106.50	100.48	N/A	N/A
10400.00	47.02	PK	V	38.18	6.32	36.86	54.66	48.64	74.00	25.36
10400.00	34.66	AV	V	38.18	6.32	36.86	42.30	36.28	54.00	17.72
15600.00	46.38	PK	V	38.00	8.83	39.09	54.12	48.1	74.00	25.90
15600.00	33.87	AV	V	38.00	8.83	39.09	41.61	35.59	54.00	18.41
High Channel: 5240 MHz										
5240.00	64.41	PK	H	33.68	3.52	0.00	101.61	95.59	N/A	N/A
5240.00	54.22	AV	H	33.68	3.52	0.00	91.42	85.4	N/A	N/A
5240.00	78.99	PK	V	33.68	3.52	0.00	116.19	110.17	N/A	N/A
5240.00	68.54	AV	V	33.68	3.52	0.00	105.74	99.72	N/A	N/A
5350.00	26.06	PK	V	33.86	3.52	0.00	63.44	57.42	74.00	16.58
5350.00	13.92	AV	V	33.86	3.52	0.00	51.30	45.28	54.00	8.72
10480.00	46.88	PK	V	38.20	6.37	36.88	54.57	48.55	74.00	25.45
10480.00	34.39	AV	V	38.20	6.37	36.88	42.08	36.06	54.00	17.94
15720.00	46.23	PK	V	37.88	8.79	39.18	53.72	47.7	74.00	26.30
15720.00	33.79	AV	V	37.88	8.79	39.18	41.28	35.26	54.00	18.74

802.11n ht40

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Low Channel: 5190 MHz										
5190.00	54.79	PK	H	33.60	3.59	0.00	91.98	85.96	N/A	N/A
5190.00	44.37	AV	H	33.60	3.59	0.00	81.56	75.54	N/A	N/A
5190.00	69.23	PK	V	33.60	3.59	0.00	106.42	100.4	N/A	N/A
5190.00	58.92	AV	V	33.60	3.59	0.00	96.11	90.09	N/A	N/A
5150.00	35.59	PK	V	33.54	3.56	0.00	72.69	66.67	74.00	7.33
5150.00	15.44	AV	V	33.54	3.56	0.00	52.54	46.52	54.00	7.48
10380.00	46.85	PK	V	38.18	6.31	36.85	54.49	48.47	74.00	25.53
10380.00	34.36	AV	V	38.18	6.31	36.85	42.00	35.98	54.00	18.02
15570.00	46.25	PK	V	38.03	8.84	39.06	54.06	48.04	74.00	25.96
15570.00	33.82	AV	V	38.03	8.84	39.06	41.63	35.61	54.00	18.39
High Channel: 5230 MHz										
5230.00	61.02	PK	H	33.67	3.54	0.00	98.23	92.21	N/A	N/A
5230.00	51.22	AV	H	33.67	3.54	0.00	88.43	82.41	N/A	N/A
5230.00	74.71	PK	V	33.67	3.54	0.00	111.92	105.9	N/A	N/A
5230.00	65.14	AV	V	33.67	3.54	0.00	102.35	96.33	N/A	N/A
5350.00	28.57	PK	V	33.86	3.52	0.00	65.95	59.93	74.00	14.07
5350.00	14.49	AV	V	33.86	3.52	0.00	51.87	45.85	54.00	8.15
10460.00	47.23	PK	V	38.19	6.36	36.87	54.91	48.89	74.00	25.11
10460.00	34.84	AV	V	38.19	6.36	36.87	42.52	36.5	54.00	17.50
15690.00	46.52	PK	V	37.91	8.80	39.15	54.08	48.06	74.00	25.94
15690.00	34.10	AV	V	37.91	8.80	39.15	41.66	35.64	54.00	18.36

802.11 ac80

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Middle Channel: 5210 MHz										
5210.00	55.98	PK	H	33.64	3.58	0.00	93.20	87.18	N/A	N/A
5210.00	43.09	AV	H	33.64	3.58	0.00	80.31	74.29	N/A	N/A
5210.00	70.27	PK	V	33.64	3.58	0.00	107.49	101.47	N/A	N/A
5210.00	57.41	AV	V	33.64	3.58	0.00	94.63	88.61	N/A	N/A
5150.00	33.49	PK	V	33.54	3.56	0.00	70.59	64.57	74.00	9.43
5150.00	18.02	AV	V	33.54	3.56	0.00	55.12	49.1	54.00	4.90
5350.00	27.26	PK	V	33.86	3.52	0.00	64.64	58.62	74.00	15.38
5350.00	14.92	AV	V	33.86	3.52	0.00	52.30	46.28	54.00	7.72
10420.00	47.10	PK	V	38.18	6.33	36.86	54.75	48.73	74.00	25.27
10420.00	34.75	AV	V	38.18	6.33	36.86	42.40	36.38	54.00	17.62
15630.00	46.22	PK	V	37.97	8.82	39.11	53.90	47.88	74.00	26.12
15630.00	33.81	AV	V	37.97	8.82	39.11	41.49	35.47	54.00	18.53

5725-5850MHz

802.11a

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745MHz										
5745.00	68.45	PK	H	34.20	3.69	0.00	106.34	100.32	N/A	N/A
5745.00	57.86	AV	H	34.20	3.69	0.00	95.75	89.73	N/A	N/A
5745.00	81.42	PK	V	34.20	3.69	0.00	119.31	113.29	N/A	N/A
5745.00	70.81	AV	V	34.20	3.69	0.00	108.70	102.68	N/A	N/A
5725.00	57.51	PK	V	34.19	3.69	0.00	95.39	89.37	122.20	32.83
5720.00	48.25	PK	V	34.19	3.69	0.00	86.13	80.11	110.80	30.69
5700.00	38.98	PK	V	34.18	3.68	0.00	76.84	70.82	105.20	34.38
5650.00	25.93	PK	V	34.16	3.63	0.00	63.72	57.7	68.20	10.50
11490.00	47.38	PK	V	38.99	6.59	37.35	55.61	49.59	74.00	24.41
11490.00	34.67	AV	V	38.99	6.59	37.35	42.90	36.88	54.00	17.12
17235.00	46.10	PK	V	41.56	8.78	38.61	57.83	51.81	74.00	22.19
17235.00	33.59	AV	V	41.56	8.78	38.61	45.32	39.3	54.00	14.70
Middle Channel: 5785 MHz										
5785.00	68.22	PK	H	34.21	3.71	0.00	106.14	100.12	N/A	N/A
5785.00	57.71	AV	H	34.21	3.71	0.00	95.63	89.61	N/A	N/A
5785.00	81.35	PK	V	34.21	3.71	0.00	119.27	113.25	N/A	N/A
5785.00	70.84	AV	V	34.21	3.71	0.00	108.76	102.74	N/A	N/A
11570.00	47.20	PK	V	39.00	6.61	37.44	55.37	49.35	74.00	24.65
11570.00	34.69	AV	V	39.00	6.61	37.44	42.86	36.84	54.00	17.16
17355.00	46.02	PK	V	42.26	8.81	38.52	58.57	52.55	74.00	19.45
17355.00	33.57	AV	V	42.26	8.81	38.52	46.12	40.1	54.00	13.90
High Channel: 5825 MHz										
5825.00	68.03	PK	H	34.23	3.73	0.00	105.99	99.97	N/A	N/A
5825.00	57.51	AV	H	34.23	3.73	0.00	95.47	89.45	N/A	N/A
5825.00	81.17	PK	V	34.23	3.73	0.00	119.13	113.11	N/A	N/A
5825.00	70.05	AV	V	34.23	3.73	0.00	108.01	101.99	N/A	N/A
5850.00	45.71	PK	V	34.24	3.75	0.00	83.70	77.68	122.20	44.52
5855.00	45.46	PK	V	34.24	3.75	0.00	83.45	77.43	110.80	33.37
5875.00	37.45	PK	V	34.25	3.77	0.00	75.47	69.45	105.20	35.75
5925.00	27.21	PK	V	34.27	3.80	0.00	65.28	59.26	68.20	8.94
11650.00	47.38	PK	V	39.00	6.64	37.53	55.49	49.47	74.00	24.53
11650.00	34.86	AV	V	39.00	6.64	37.53	42.97	36.95	54.00	17.05
17475.00	45.96	PK	V	42.96	8.84	38.44	59.32	53.3	74.00	20.70
17475.00	33.49	AV	V	42.96	8.84	38.44	46.85	40.83	54.00	13.17

802.11n ht20

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745MHz										
5745.00	67.47	PK	H	34.20	3.69	0.00	105.36	99.34	N/A	N/A
5745.00	57.04	AV	H	34.20	3.69	0.00	94.93	88.91	N/A	N/A
5745.00	81.94	PK	V	34.20	3.69	0.00	119.83	113.81	N/A	N/A
5745.00	71.26	AV	V	34.20	3.69	0.00	109.15	103.13	N/A	N/A
5725.00	57.43	PK	V	34.19	3.69	0.00	95.31	89.29	122.20	32.91
5720.00	48.55	PK	V	34.19	3.69	0.00	86.43	80.41	110.80	30.39
5700.00	40.17	PK	V	34.18	3.68	0.00	78.03	72.01	105.20	33.19
5650.00	27.35	PK	V	34.16	3.63	0.00	65.14	59.12	68.20	9.08
11490.00	47.22	PK	V	38.99	6.59	37.35	55.45	49.43	74.00	24.57
11490.00	34.74	AV	V	38.99	6.59	37.35	42.97	36.95	54.00	17.05
17235.00	45.29	PK	V	41.56	8.78	38.61	57.02	51	74.00	23.00
17235.00	32.73	AV	V	41.56	8.78	38.61	44.46	38.44	54.00	15.56
Middle Channel: 5785 MHz										
5785.00	67.21	PK	H	34.21	3.71	0.00	105.13	99.11	N/A	N/A
5785.00	56.83	AV	H	34.21	3.71	0.00	94.75	88.73	N/A	N/A
5785.00	81.45	PK	V	34.21	3.71	0.00	119.37	113.35	N/A	N/A
5785.00	70.92	AV	V	34.21	3.71	0.00	108.84	102.82	N/A	N/A
11570.00	47.09	PK	V	39.00	6.61	37.44	55.26	49.24	74.00	24.76
11570.00	34.58	AV	V	39.00	6.61	37.44	42.75	36.73	54.00	17.27
17355.00	46.05	PK	V	42.26	8.81	38.52	58.60	52.58	74.00	21.42
17355.00	33.64	AV	V	42.26	8.81	38.52	46.19	40.17	54.00	13.83
High Channel: 5825 MHz										
5825.00	67.13	PK	H	34.23	3.73	0.00	105.09	99.07	N/A	N/A
5825.00	56.71	AV	H	34.23	3.73	0.00	94.67	88.65	N/A	N/A
5825.00	80.97	PK	V	34.23	3.73	0.00	118.93	112.91	N/A	N/A
5825.00	70.42	AV	V	34.23	3.73	0.00	108.38	102.36	N/A	N/A
5850.00	47.82	PK	V	34.24	3.75	0.00	85.81	79.79	122.20	42.41
5855.00	46.27	PK	V	34.24	3.75	0.00	84.26	78.24	110.80	32.56
5875.00	37.10	PK	V	34.25	3.77	0.00	75.12	69.1	105.20	36.10
5925.00	27.13	PK	V	34.27	3.80	0.00	65.20	59.18	68.20	9.02
11650.00	46.98	PK	V	39.00	6.64	37.53	55.09	49.07	74.00	24.93
11650.00	34.52	AV	V	39.00	6.64	37.53	42.63	36.61	54.00	17.39
17475.00	45.77	PK	V	42.96	8.84	38.44	59.13	53.11	74.00	20.89
17475.00	33.46	AV	V	42.96	8.84	38.44	46.82	40.8	54.00	23.20

802.11n ht40

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Low Channel: 5755MHz										
5755.00	65.28	PK	H	34.20	3.70	0.00	103.18	97.16	N/A	N/A
5755.00	54.77	AV	H	34.20	3.70	0.00	92.67	86.65	N/A	N/A
5755.00	79.38	PK	V	34.20	3.70	0.00	117.28	111.26	N/A	N/A
5755.00	68.79	AV	V	34.20	3.70	0.00	106.69	100.67	N/A	N/A
5725.00	61.23	PK	V	34.19	3.69	0.00	99.11	93.09	122.20	29.11
5720.00	59.48	PK	V	34.19	3.69	0.00	97.36	91.34	110.80	19.46
5700.00	47.27	PK	V	34.18	3.68	0.00	85.13	79.11	105.20	26.09
5650.00	32.23	PK	V	34.16	3.63	0.00	70.02	64	68.20	4.20
11510.00	47.01	PK	V	39.00	6.59	37.37	55.23	49.21	74.00	24.79
11510.00	34.58	AV	V	39.00	6.59	37.37	42.80	36.78	54.00	17.22
17265.00	45.63	PK	V	41.74	8.79	38.58	57.58	51.56	74.00	22.44
17265.00	33.19	AV	V	41.74	8.79	38.58	45.14	39.12	54.00	14.88
High Channel: 5795 MHz										
5795.00	64.58	PK	H	34.22	3.71	0.00	102.51	96.49	N/A	N/A
5795.00	54.04	AV	H	34.22	3.71	0.00	91.97	85.95	N/A	N/A
5795.00	78.76	PK	V	34.22	3.71	0.00	116.69	110.67	N/A	N/A
5795.00	68.24	AV	V	34.22	3.71	0.00	106.17	100.15	N/A	N/A
5850.00	45.83	PK	V	34.24	3.75	0.00	83.82	77.8	122.20	44.40
5855.00	45.46	PK	V	34.24	3.75	0.00	83.45	77.43	110.80	33.37
5875.00	40.25	PK	V	34.25	3.77	0.00	78.27	72.25	105.20	32.95
5925.00	30.65	PK	V	34.27	3.80	0.00	68.72	62.7	68.20	5.50
11590.00	47.20	PK	V	39.00	6.62	37.46	55.36	49.34	74.00	24.66
11590.00	34.74	AV	V	39.00	6.62	37.46	42.90	36.88	54.00	17.12
17385.00	45.61	PK	V	42.43	8.82	38.50	58.36	52.34	74.00	21.66
17385.00	33.10	AV	V	42.43	8.82	38.50	45.85	39.83	54.00	14.17

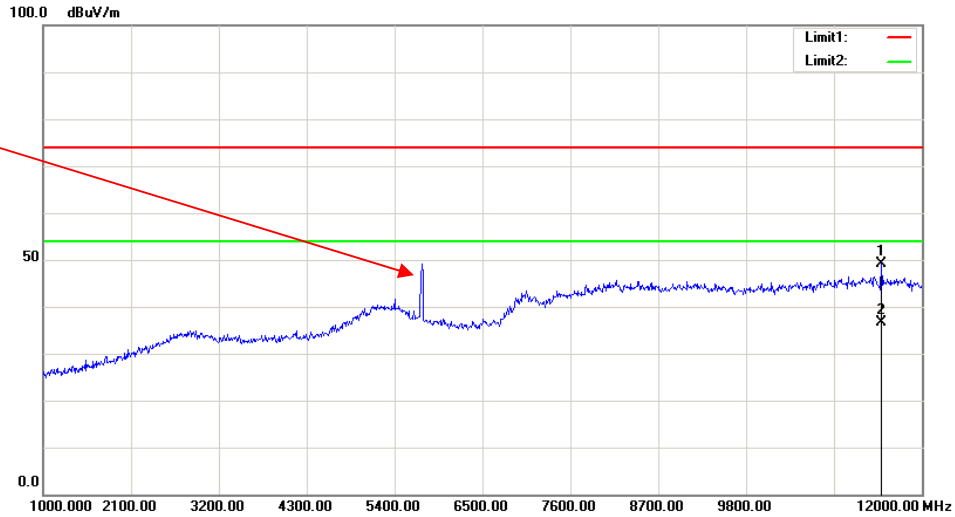
802.11 ac80

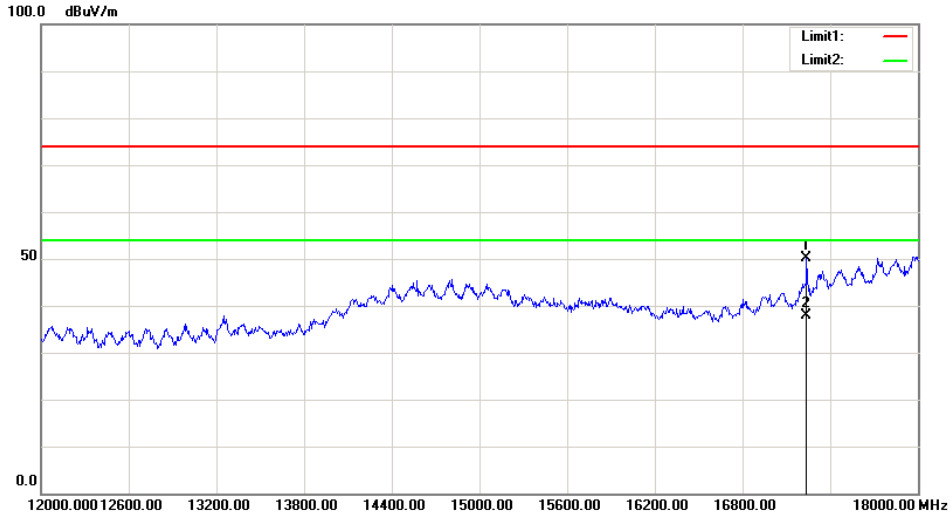
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)						
Middle Channel: 5775 MHz										
5775.00	61.68	PK	H	34.21	3.70	0.00	99.59	93.57	N/A	N/A
5775.00	51.14	AV	H	34.21	3.70	0.00	89.05	83.03	N/A	N/A
5775.00	75.58	PK	V	34.21	3.70	0.00	113.49	107.47	N/A	N/A
5775.00	64.88	AV	V	34.21	3.70	0.00	102.79	96.77	N/A	N/A
5725.00	57.32	PK	V	34.19	3.69	0.00	95.20	89.18	122.20	33.02
5720.00	55.49	PK	V	34.19	3.69	0.00	93.37	87.35	110.80	23.45
5700.00	51.73	PK	V	34.18	3.68	0.00	89.59	83.57	105.20	21.63
5650.00	33.94	PK	V	34.16	3.63	0.00	71.73	65.71	68.20	2.49
5850.00	52.62	PK	V	34.24	3.75	0.00	90.61	84.59	122.20	37.61
5855.00	55.36	PK	V	34.24	3.75	0.00	93.35	87.33	110.80	23.47
5875.00	47.86	PK	V	34.25	3.77	0.00	85.88	79.86	105.20	25.34
5925.00	33.71	PK	V	34.27	3.80	0.00	71.78	65.76	68.20	2.44
11550.00	47.22	PK	V	39.00	6.61	37.42	55.41	49.39	74.00	24.61
11550.00	34.67	AV	V	39.00	6.61	37.42	42.86	36.84	54.00	17.16
17325.00	45.71	PK	V	42.09	8.80	38.54	58.06	52.04	74.00	21.96
17325.00	33.29	AV	V	42.09	8.80	38.54	45.64	39.62	54.00	14.38

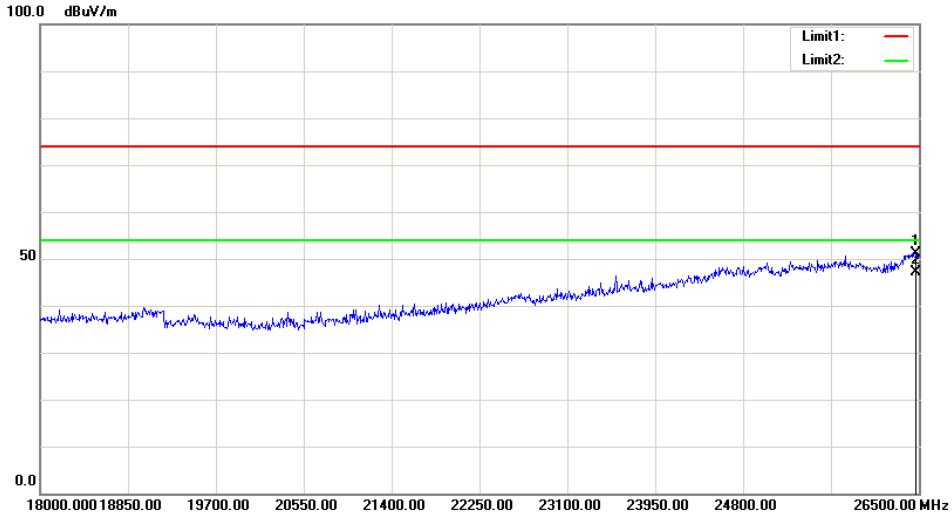
Test Plots(For worst mode 802.11n ht20 5745MHz)

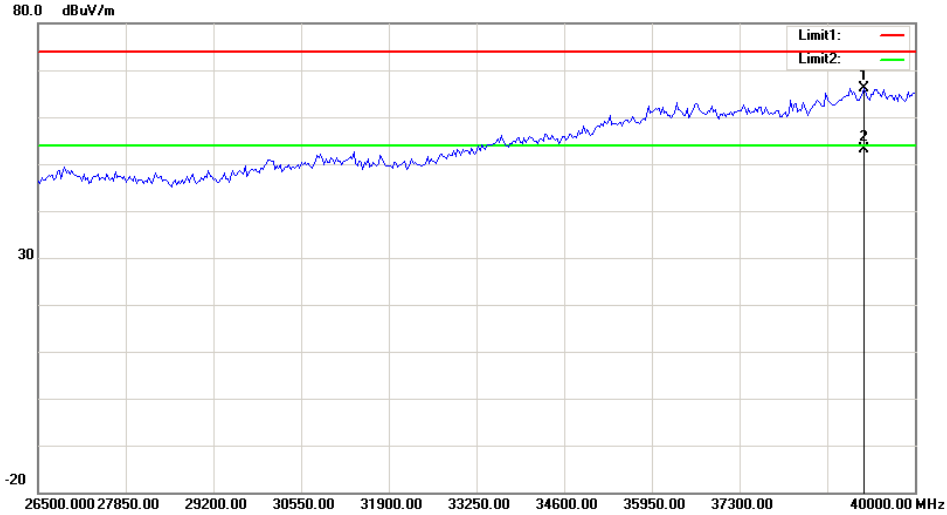
Horizontal

Fundamental Test with Band Rejection Filter



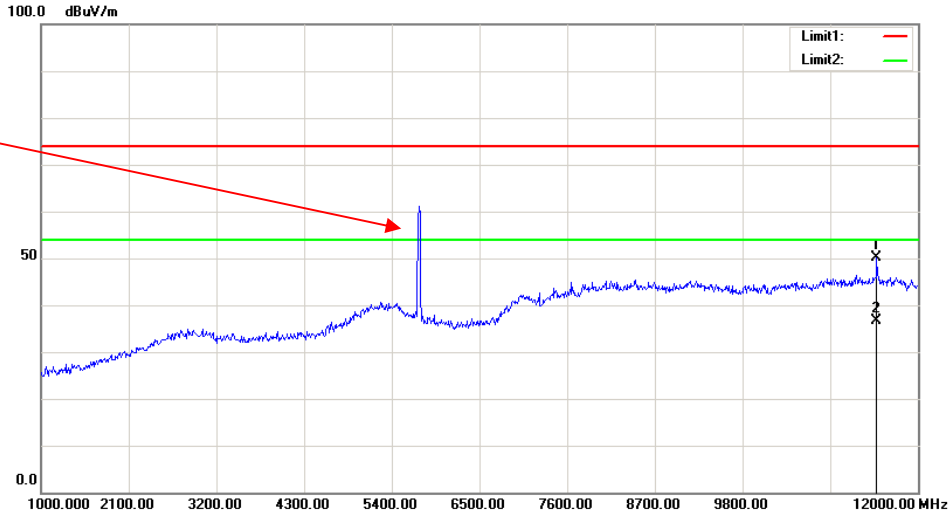


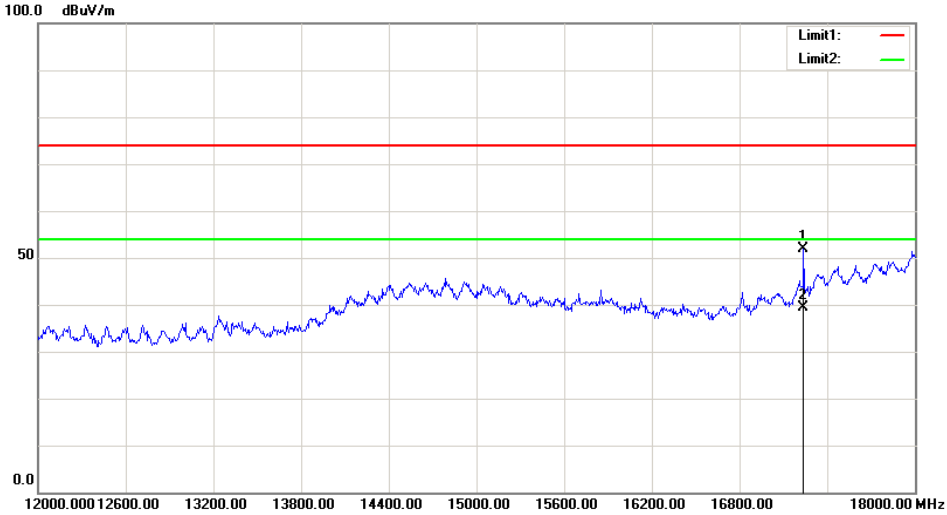


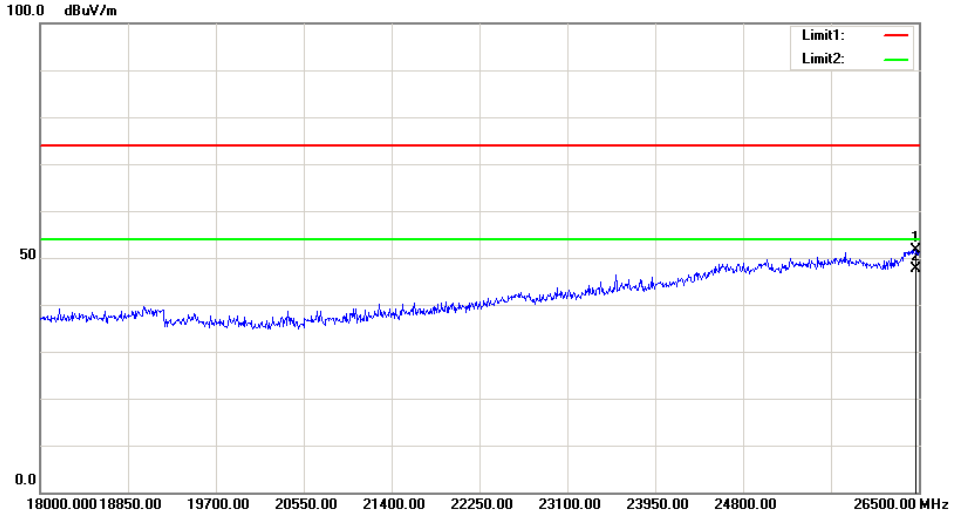


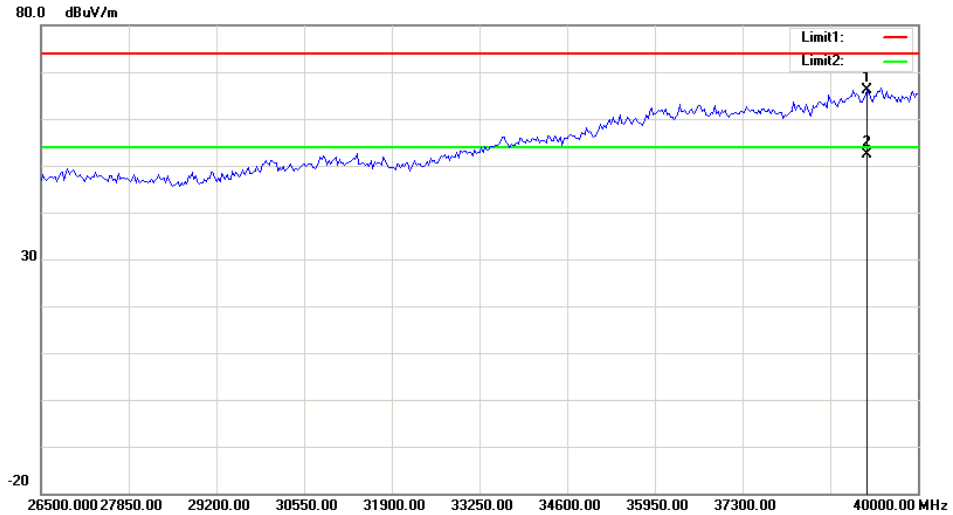
Vertical

Fundamental Test with Band Rejection Filter






100.0 dBuV/m
Limit1:
Limit2:
50
0.0
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz


80.0 dBuV/m
Limit1:
Limit2:
30
-20
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

FCC §15.407(b)–OUT- OF-BAND EMISSIONS

Applicable Standard

FCC §15.407

(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.

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

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(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.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A

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

Test Data

Environmental Conditions

Temperature:	27.4~28.8°C
Relative Humidity:	60~61 %
ATM Pressure:	99.7~99.8 kPa

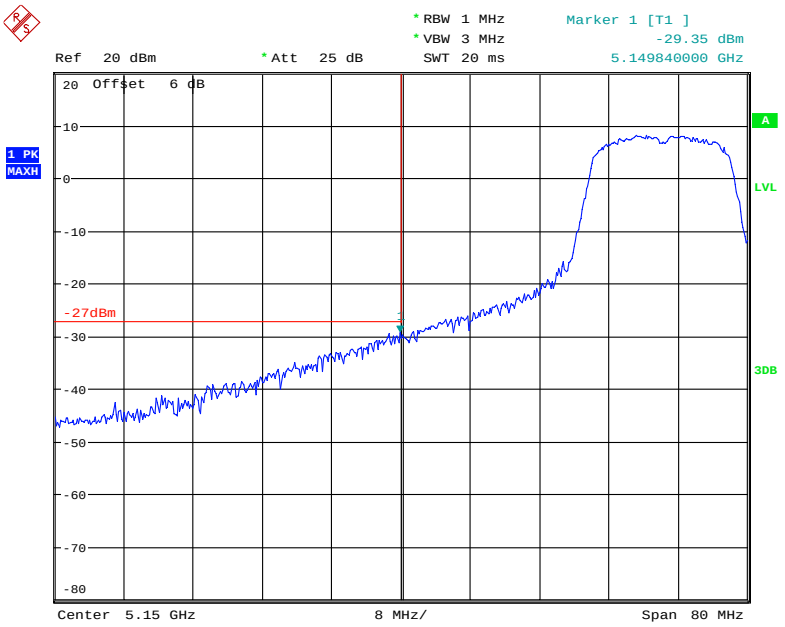
The testing was performed by Andy Huang on 2018-07-18, 2018-07-21.

Test Result: Pass.

Please refer to the following plots.

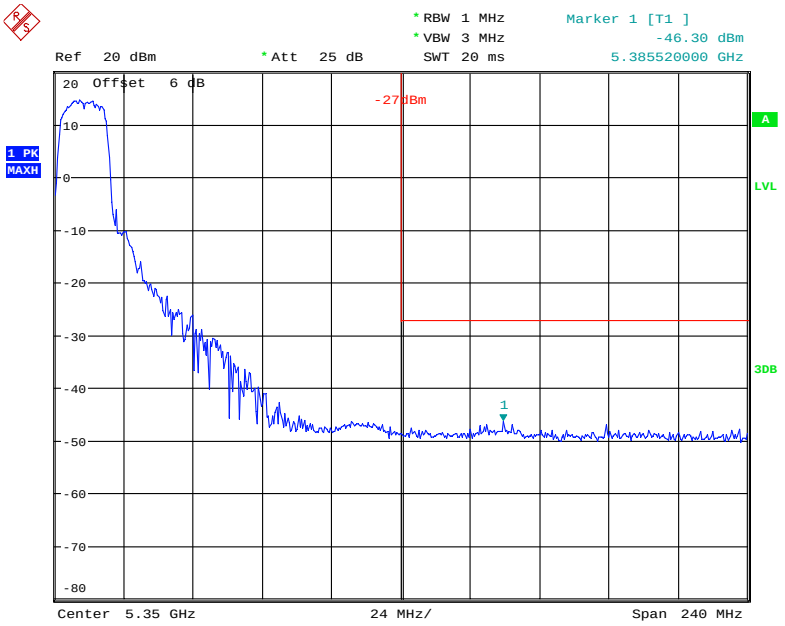
5150-5250MHz(the antenna gain was offset in the display)

802.11a Low Channel



Date: 18.JUL.2018 23:12:48

802.11a High Channel



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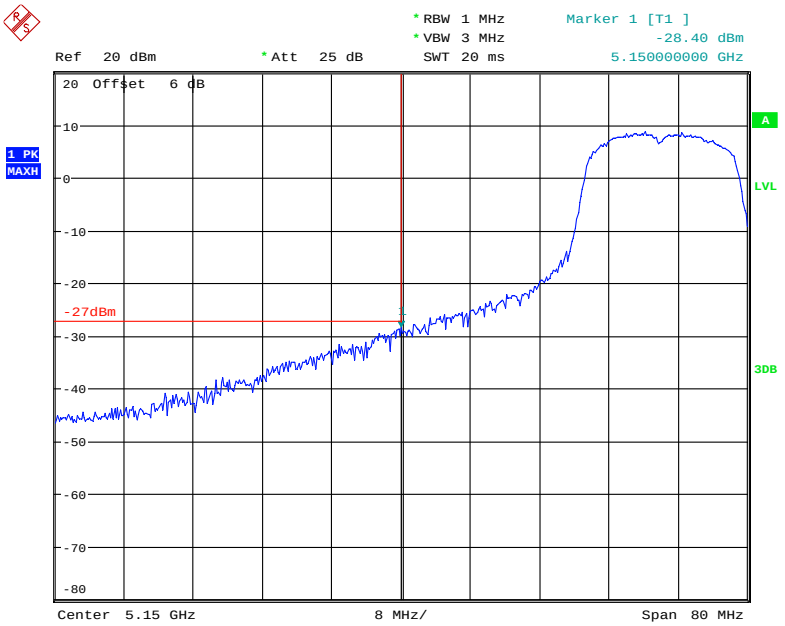
802.11n ht20 Low Channel



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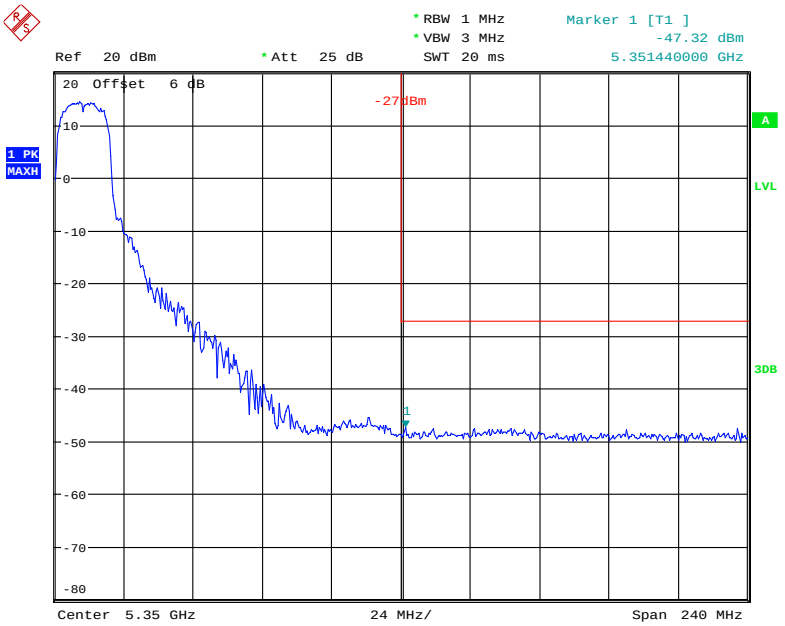
802.11n ht20 High Channel



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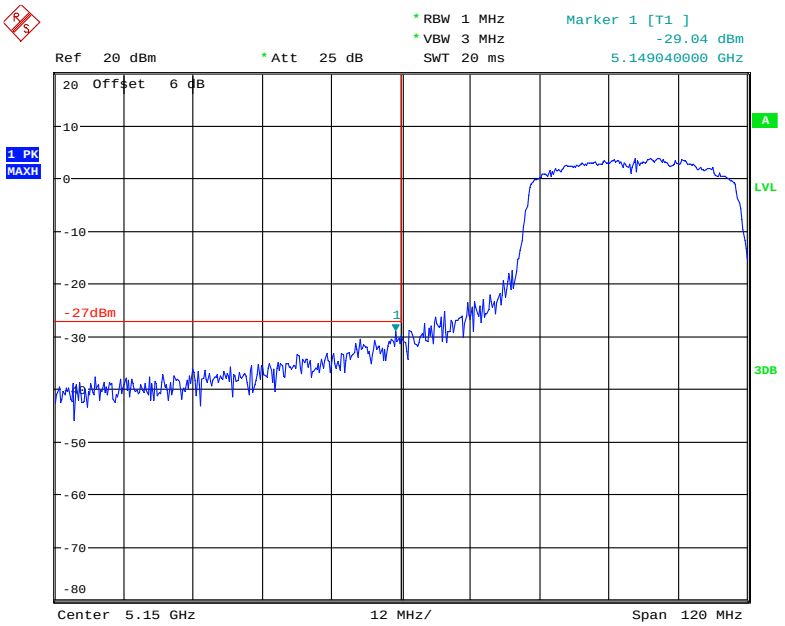
802.11n ht40 Low Channel



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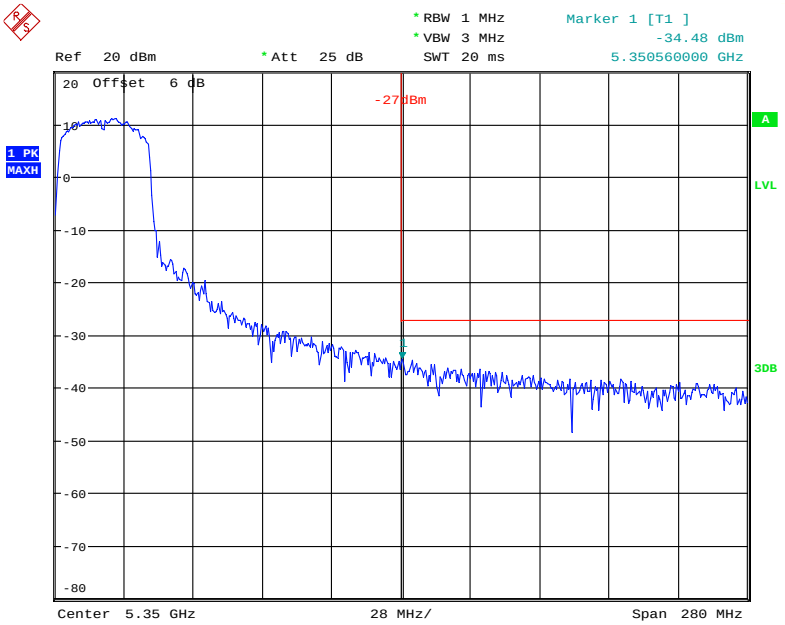
802.11n ht40 High Channel



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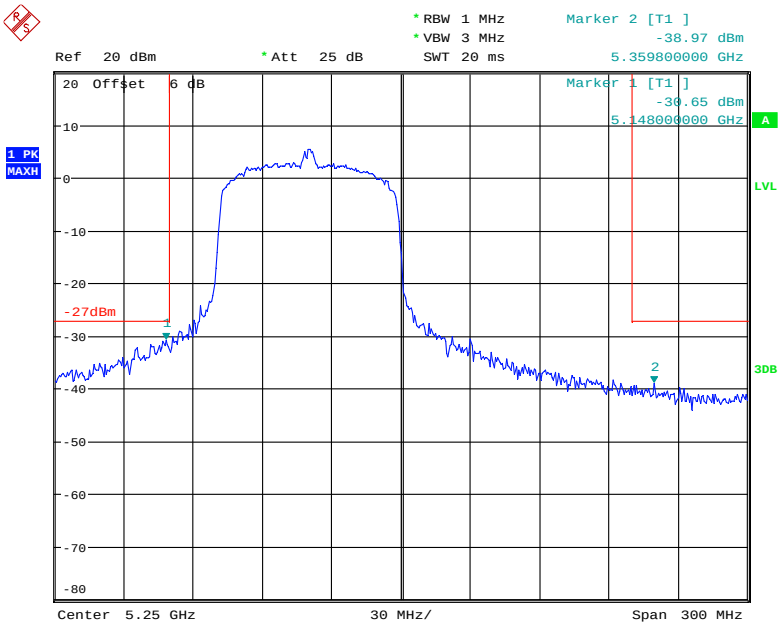
802.11 ac80 Middle Channel



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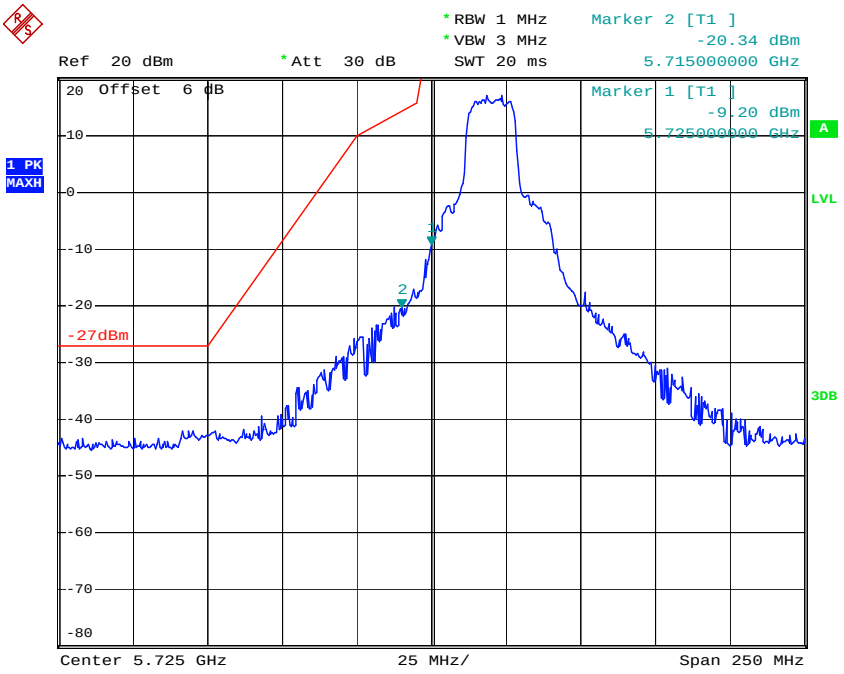
5725-5850MHz(the antenna gain was offset in the display)

802.11a Low Channel



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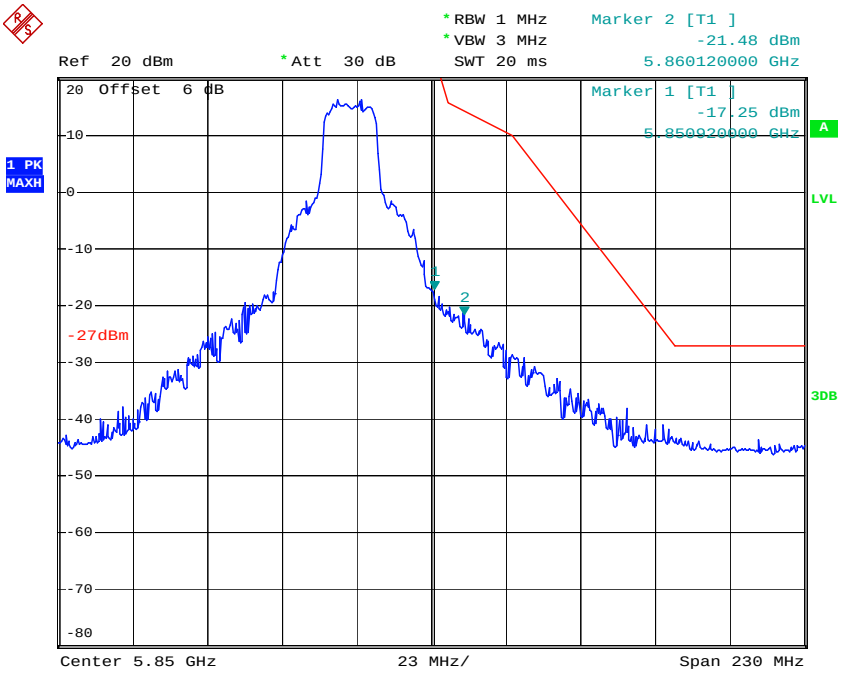
802.11a High Channel



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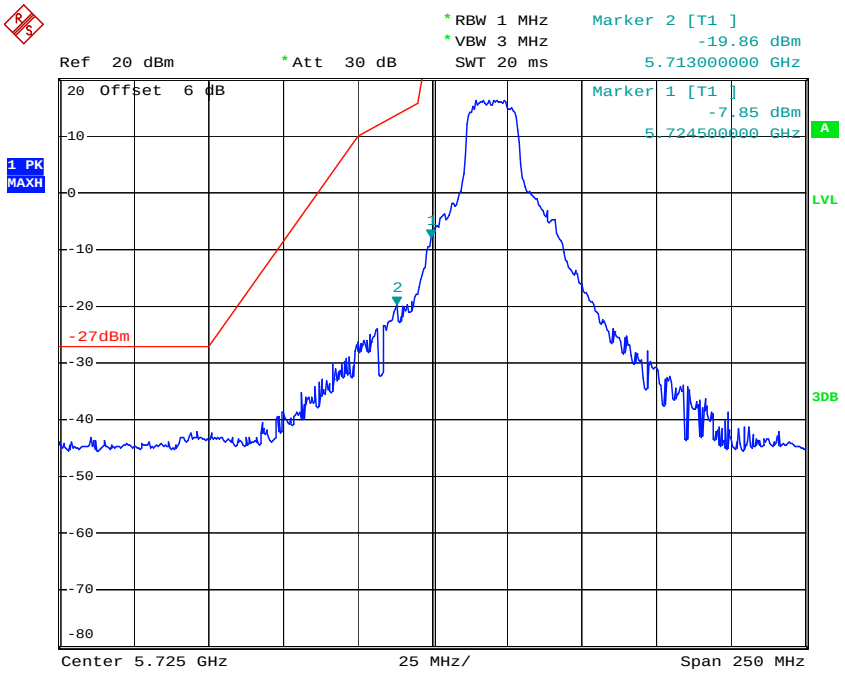
802.11n ht20 Low Channel



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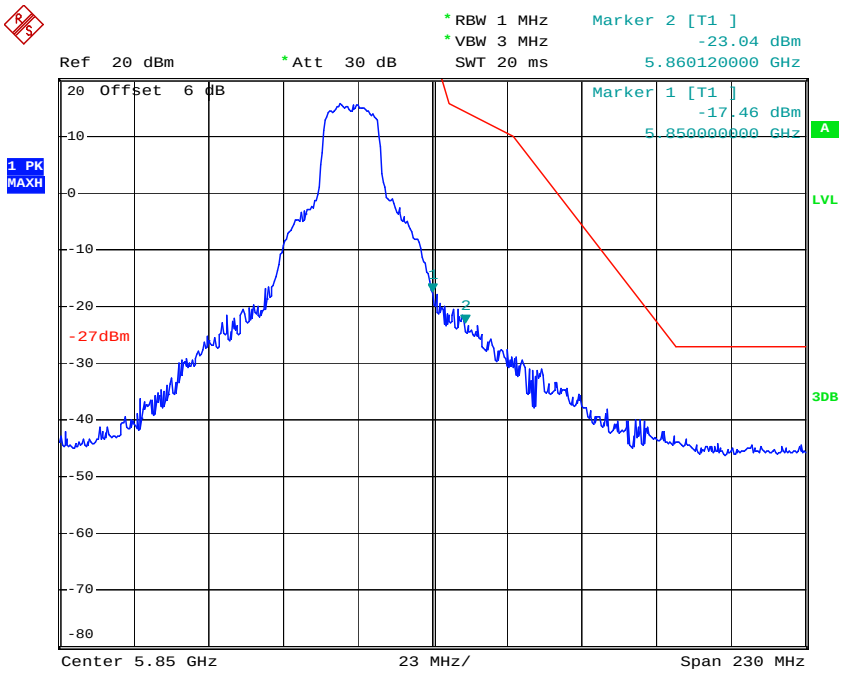
802.11n ht20 High Channel



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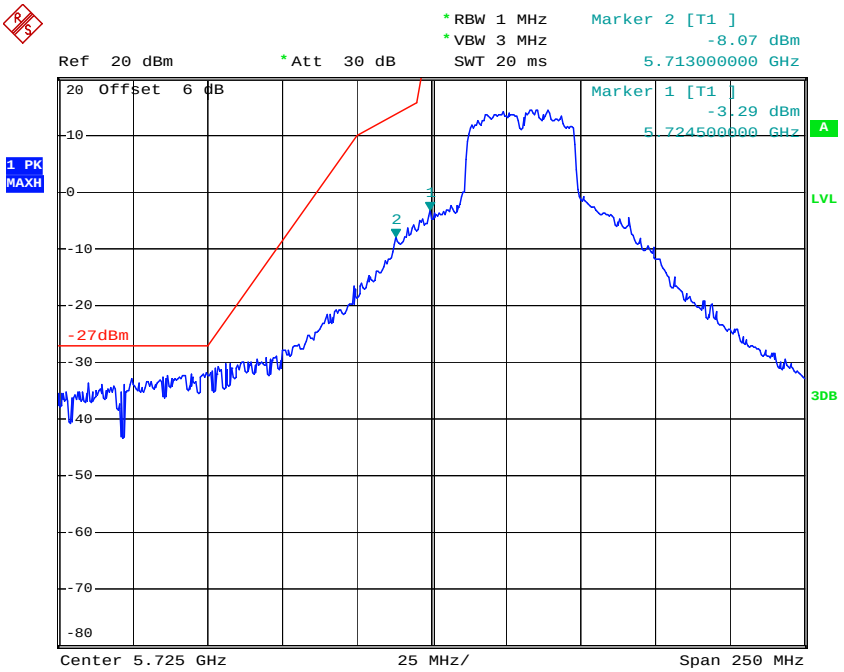
802.11n ht40 Low Channel



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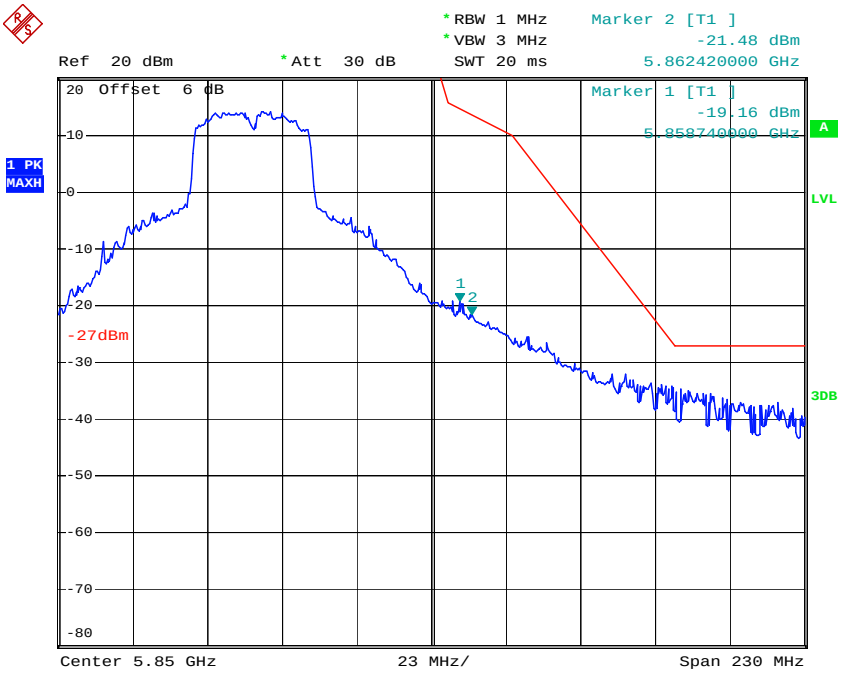
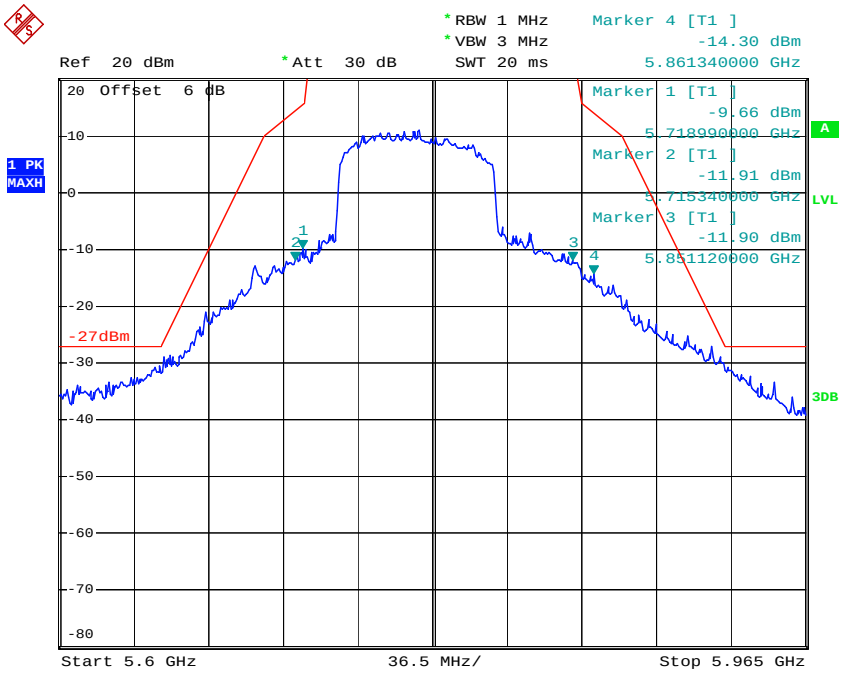
802.11n ht40 High Channel



Date: 21.JUL.2018 00:23:19

802.11 ac80 Middle Channel



Date: 21.JUL.2018 00:26:02

FCC §15.407(a)(e) –EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH

Applicable Standard

15.407(a) (e)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2018-01-04	2019-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A

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

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Data

Environmental Conditions

Temperature:	27.4~28.8°C
Relative Humidity:	60~61 %
ATM Pressure:	99.7~99.8 kPa

The testing was performed by Andy Huang on 2018-07-18, 2018-07-21.

Test Result: Pass.

Please refer to the following tables and plots.

Test mode: Transmitting

5150-5250MHz:

Mode	Channel	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11 a	Low	5180	19.72	16.40
	Middle	5200	30.94	17.28
	High	5240	21.24	16.64
802.11n ht20	Low	5180	21.08	17.52
	Middle	5200	26.21	17.76
	High	5240	21.96	17.76
802.11n ht40	Low	5190	46.67	36.00
	High	5230	53.59	36.16
802.11ac80	Middle	5210	81.44	74.88

Note: the 99% Occupied Bandwidth have not fall into the band 5250-5350MHz, please refer to the test plots of 99% Occupied Bandwidth.

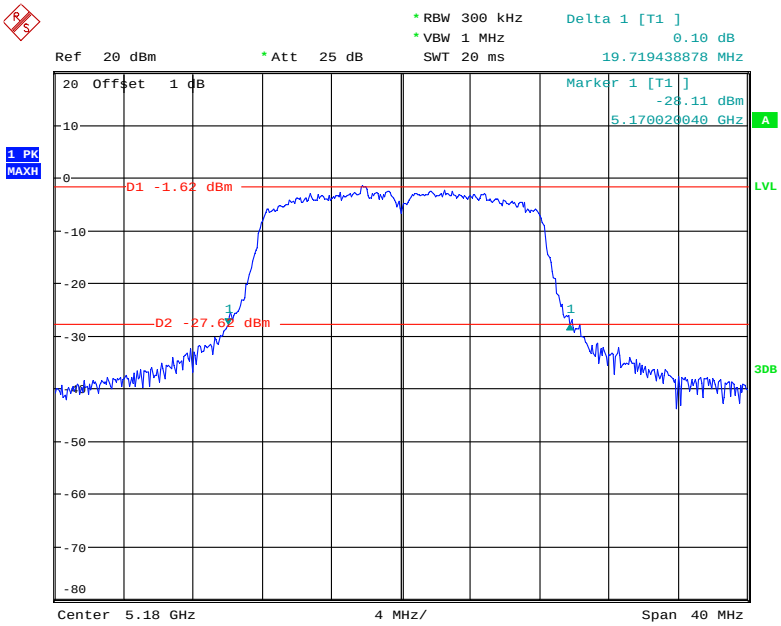
5725-5850MHz:

Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	6 dB Emission Bandwidth Limits (MHz)	99% Occupied Bandwidth (MHz)
802.11 a	Low	5745	15.20	≥0.5	24.88
	Middle	5785	15.20	≥0.5	25.76
	High	5825	15.60	≥0.5	25.28
802.11n ht20	Low	5745	15.28	≥0.5	26.24
	Middle	5785	15.12	≥0.5	28.16
	High	5825	15.28	≥0.5	24.80
802.11n ht40	Low	5755	33.76	≥0.5	53.60
	High	5795	33.92	≥0.5	51.20
802.11ac80	Middle	5775	72.64	≥0.5	87.04

Note: For 5725-5850MHz band, the 99% Occupied Bandwidth have not fall into the band 5470-5725MHz.

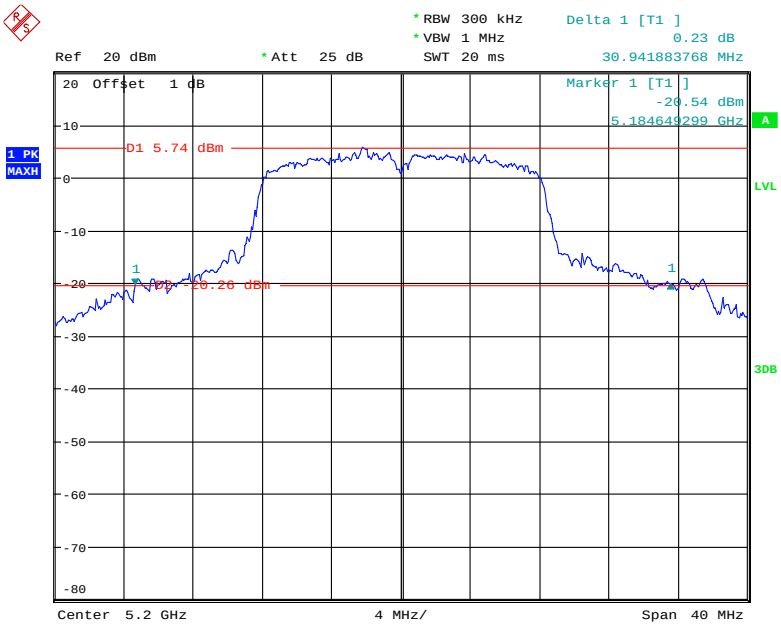
5150-5250MHz: 26dB Emission Bandwidth:

802.11a Low Channel



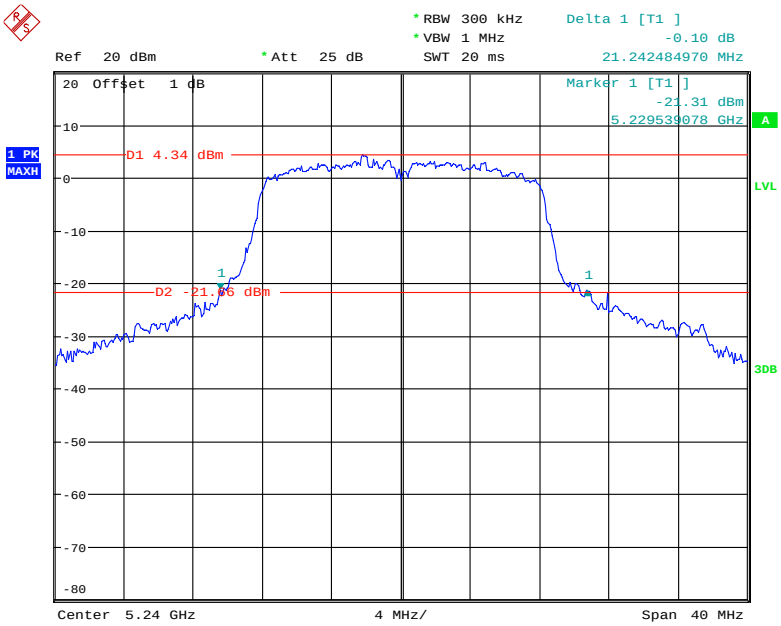
Date: 18.JUL.2018 23:11:41

802.11a Middle Channel



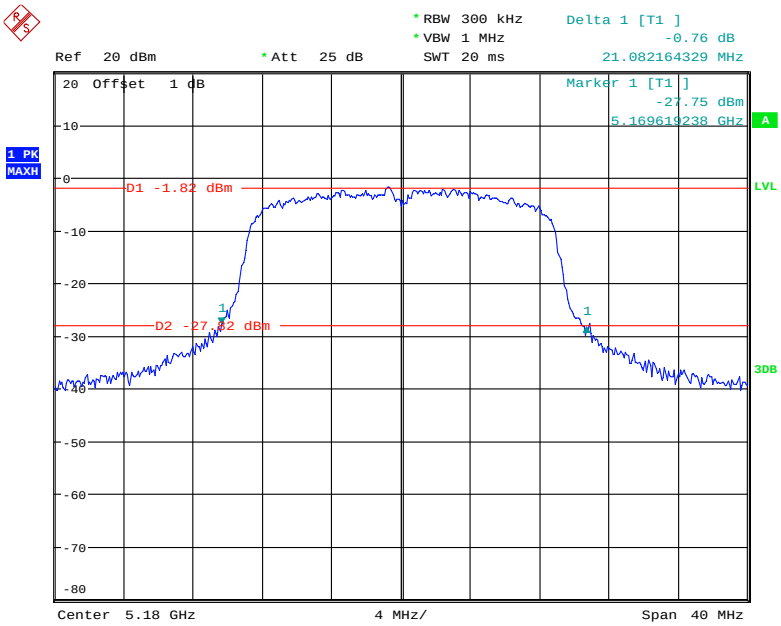
Date: 18.JUL.2018 23:20:03

802.11a High Channel



Date: 18.JUL.2018 23:21:15

802.11n ht20 Low Channel



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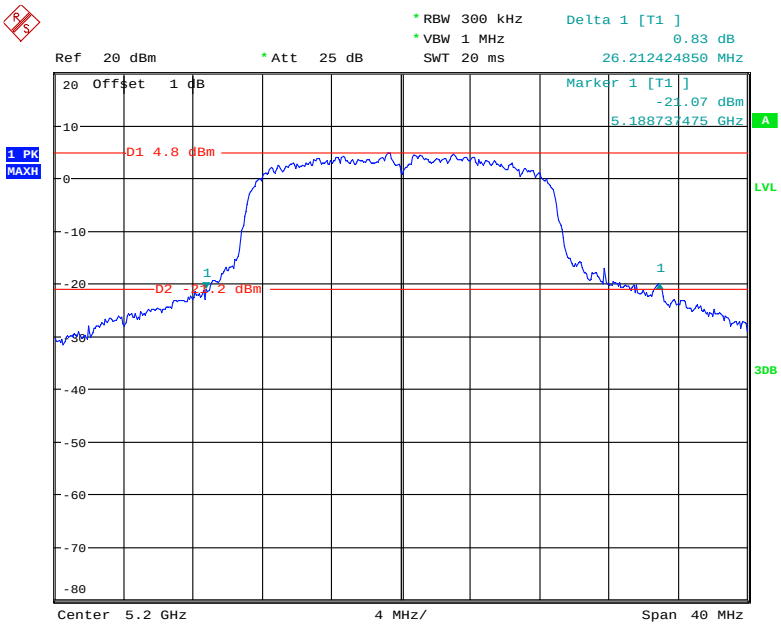

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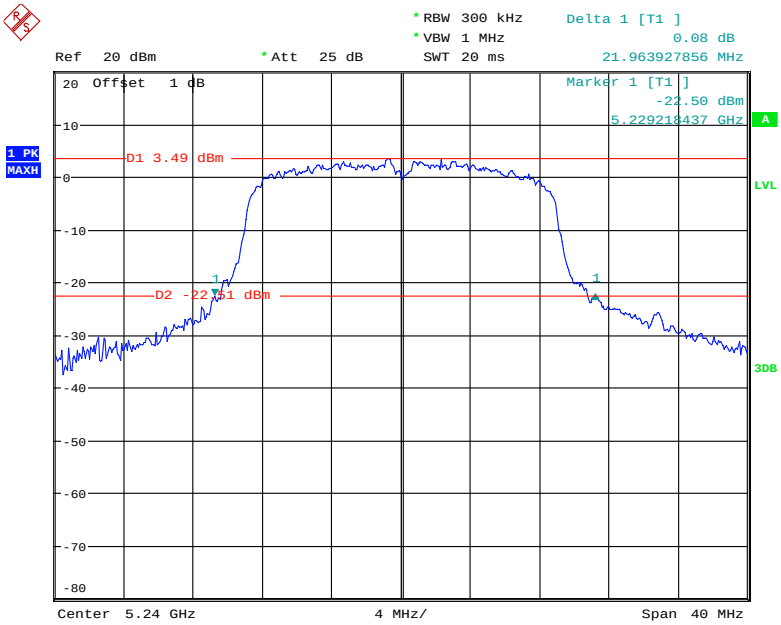

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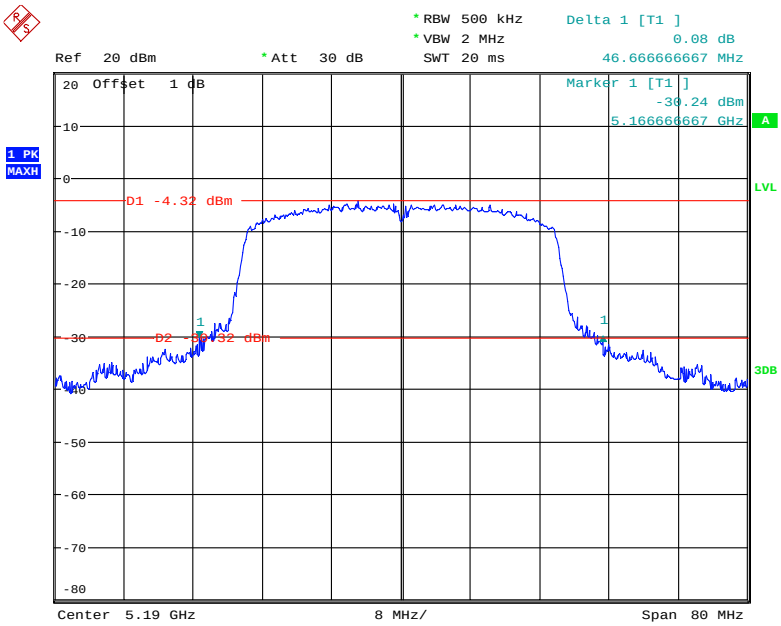

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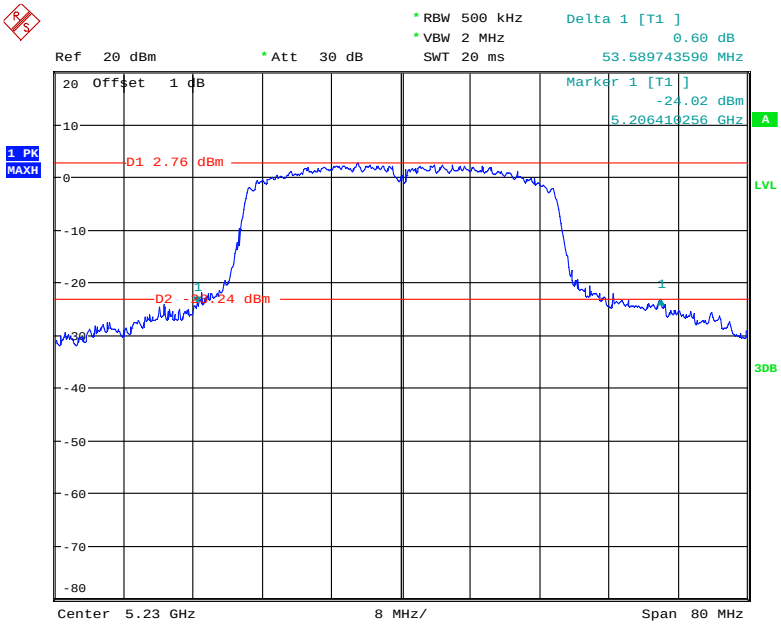
802.11n ht40 High Channel



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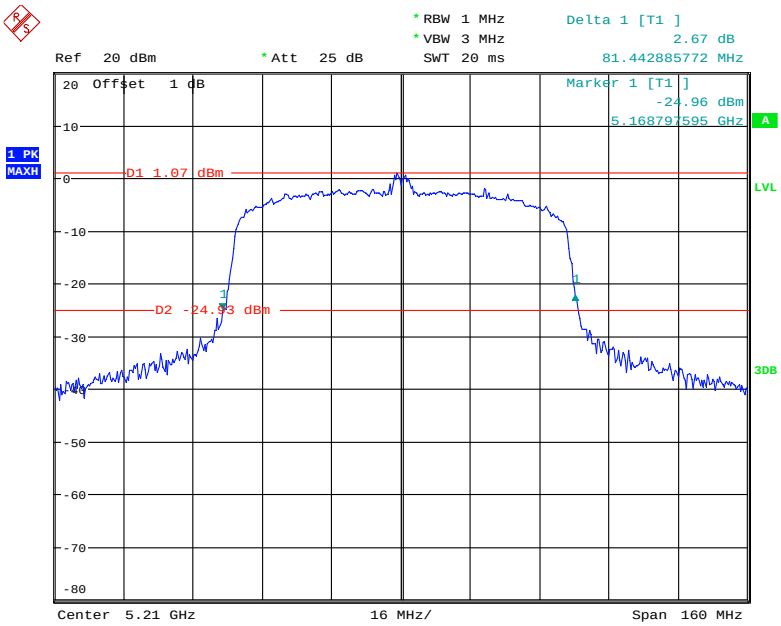
802.11ac80 Middle Channel



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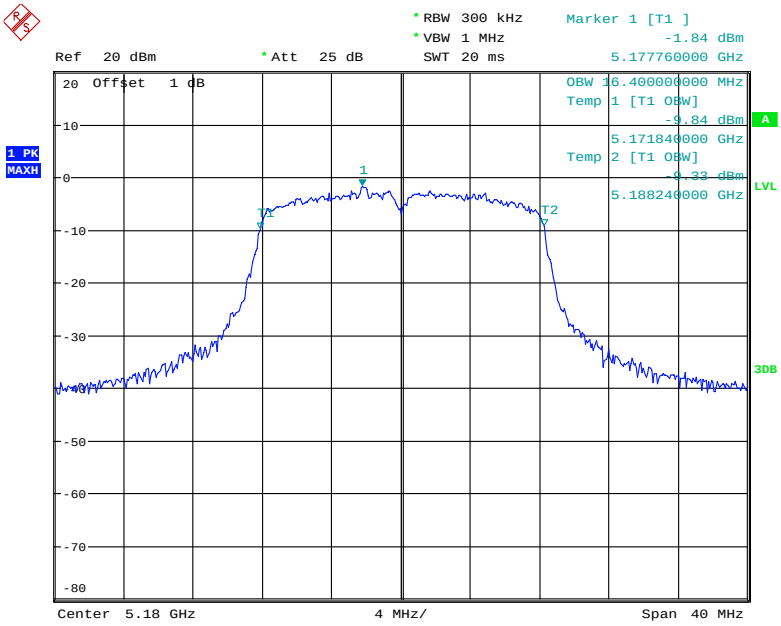
99% Occupied Bandwidth:

802.11a Low Channel



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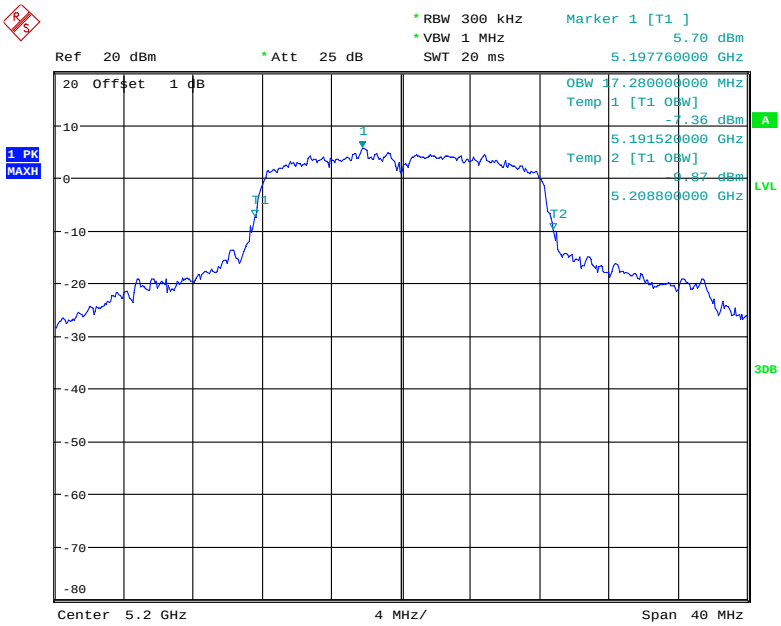
802.11a Middle Channel



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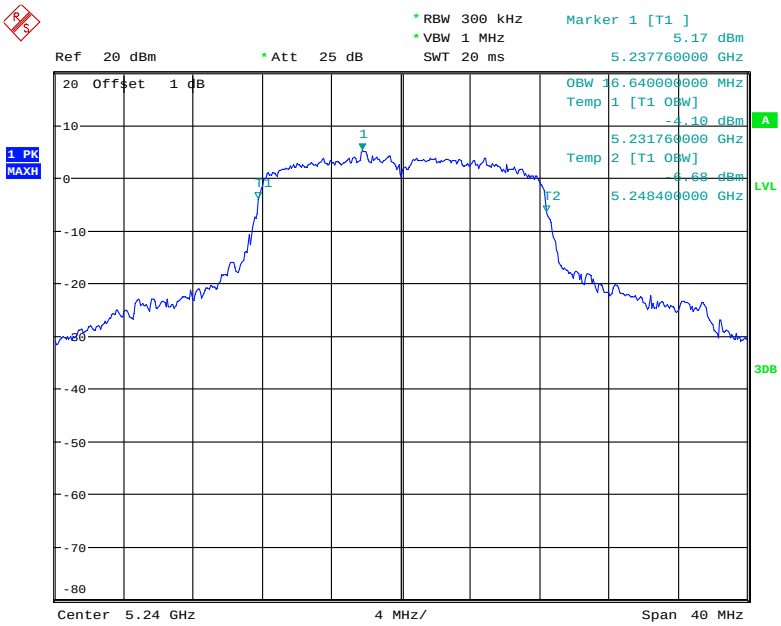
802.11a High Channel



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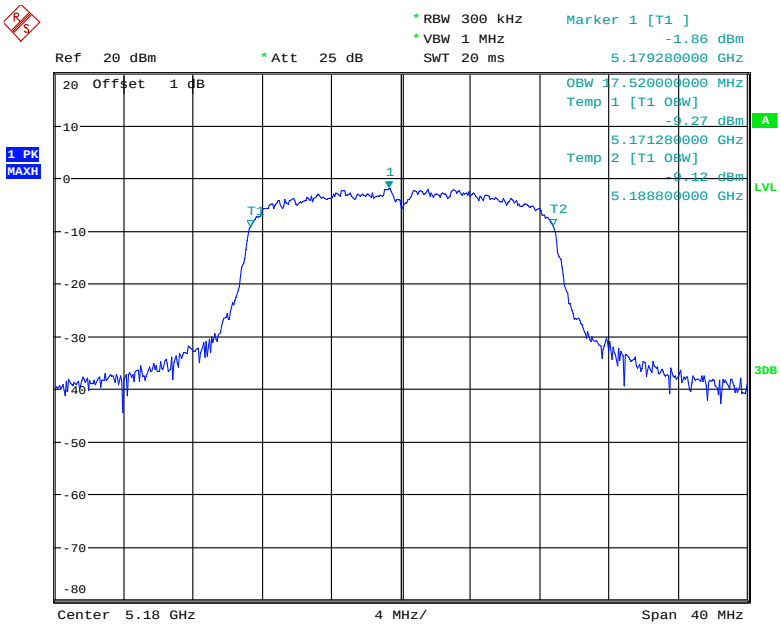
802.11n ht20 Low Channel



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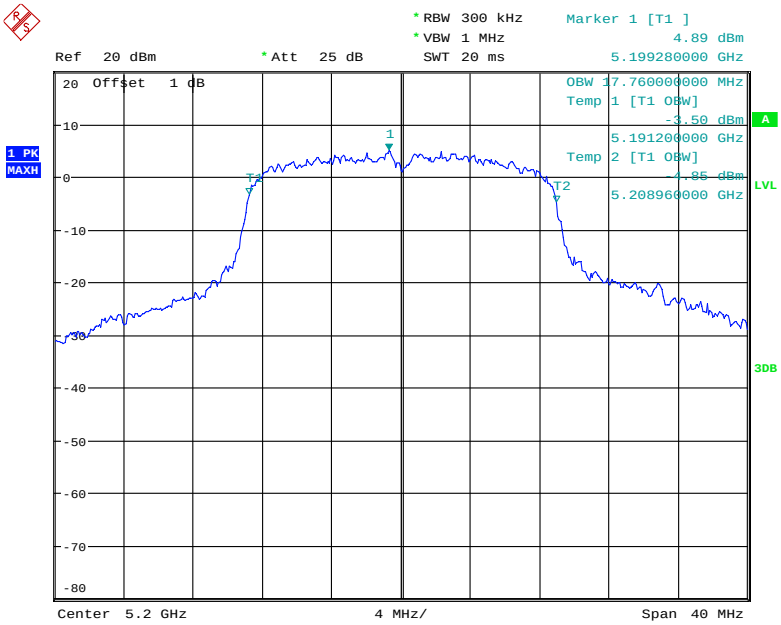
802.11n ht20 Middle Channel



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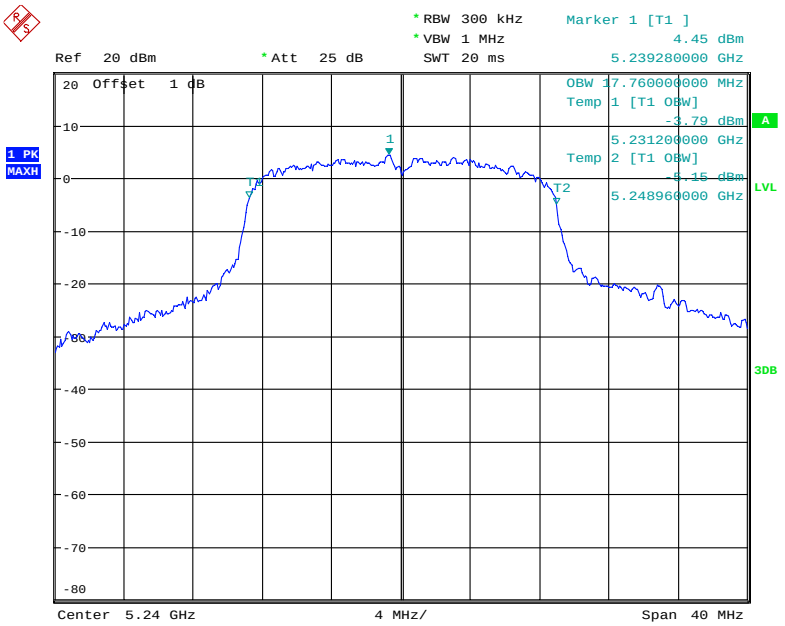
802.11n ht20 High Channel



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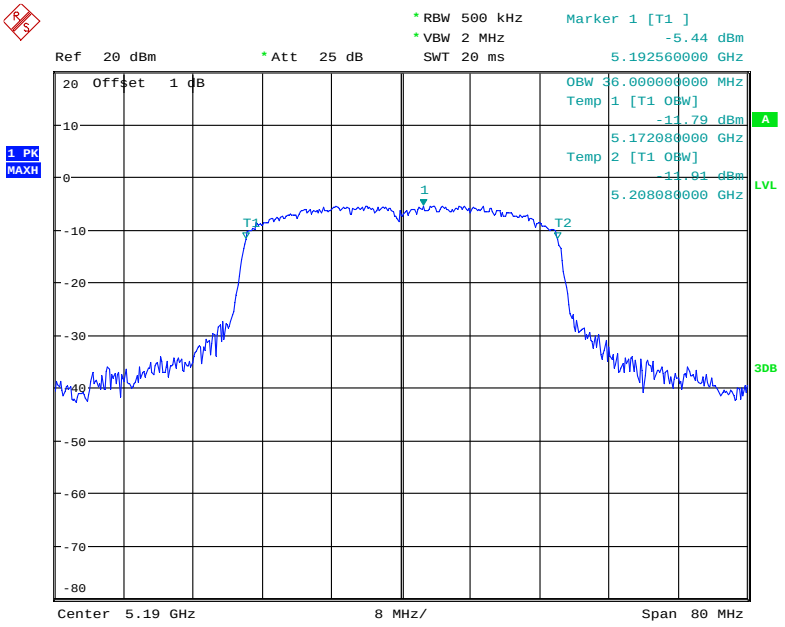
802.11n ht40 Low Channel



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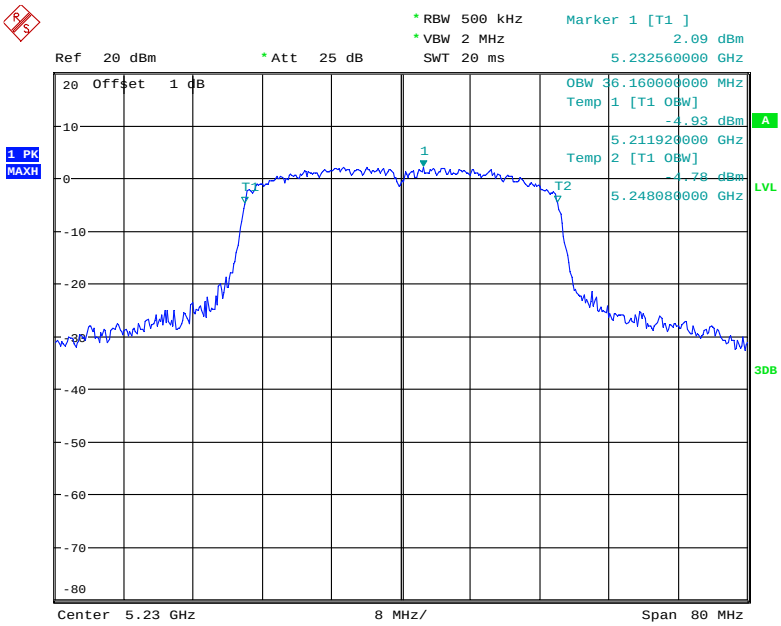
802.11n ht40 High Channel



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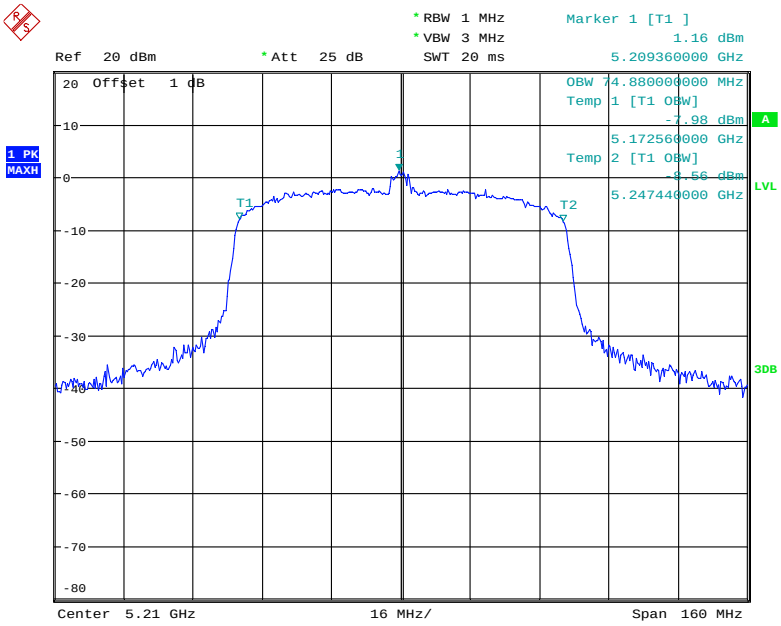
802.11ac80 Middle Channel



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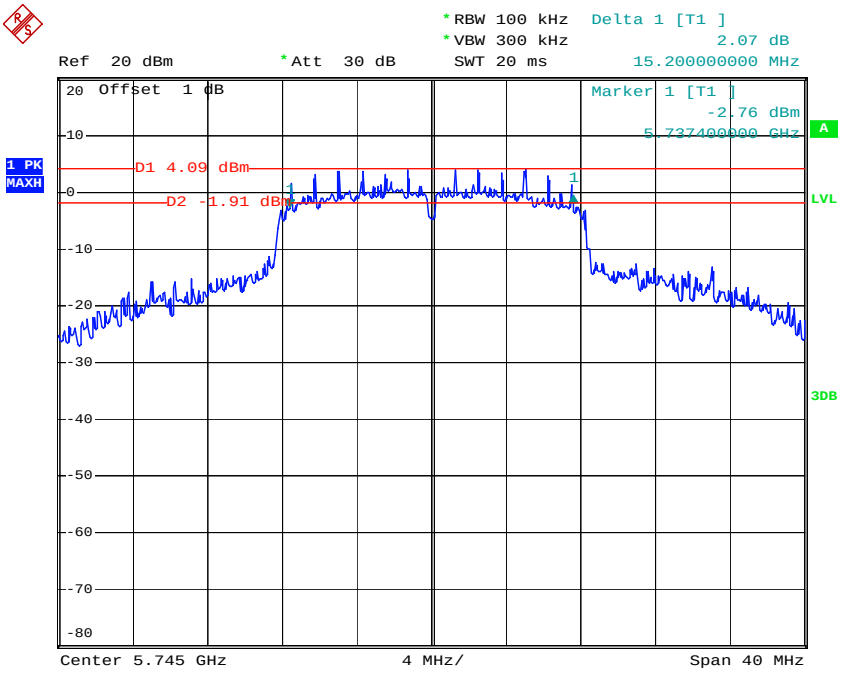
5725-5850MHz:
6dB Bandwidth:

802.11a Low Channel



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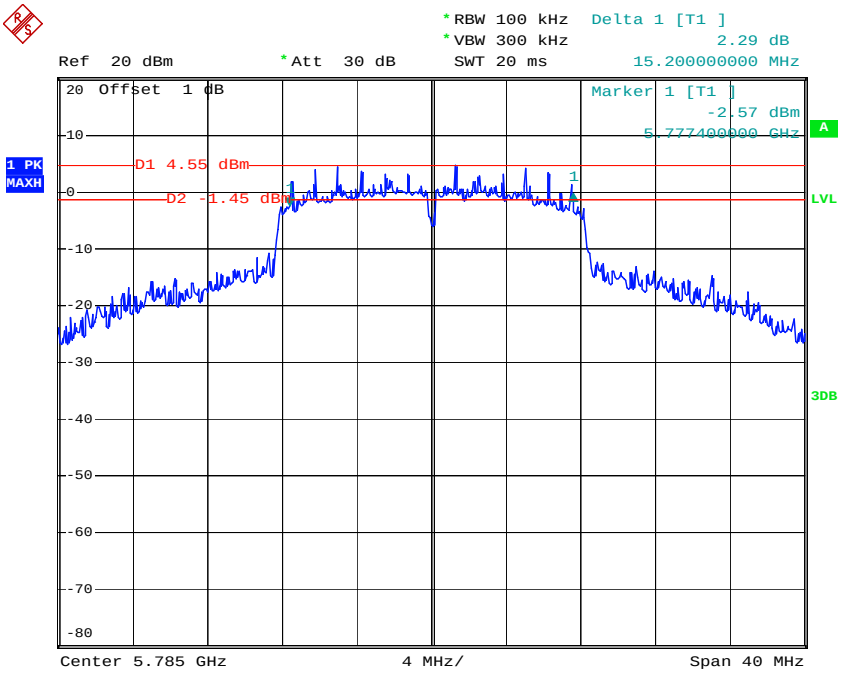
802.11a Middle Channel



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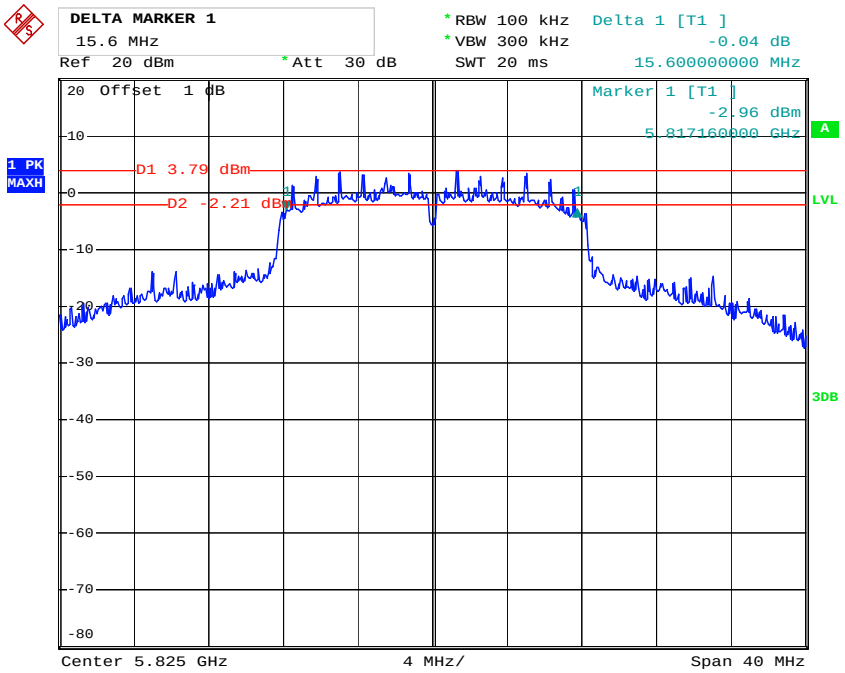
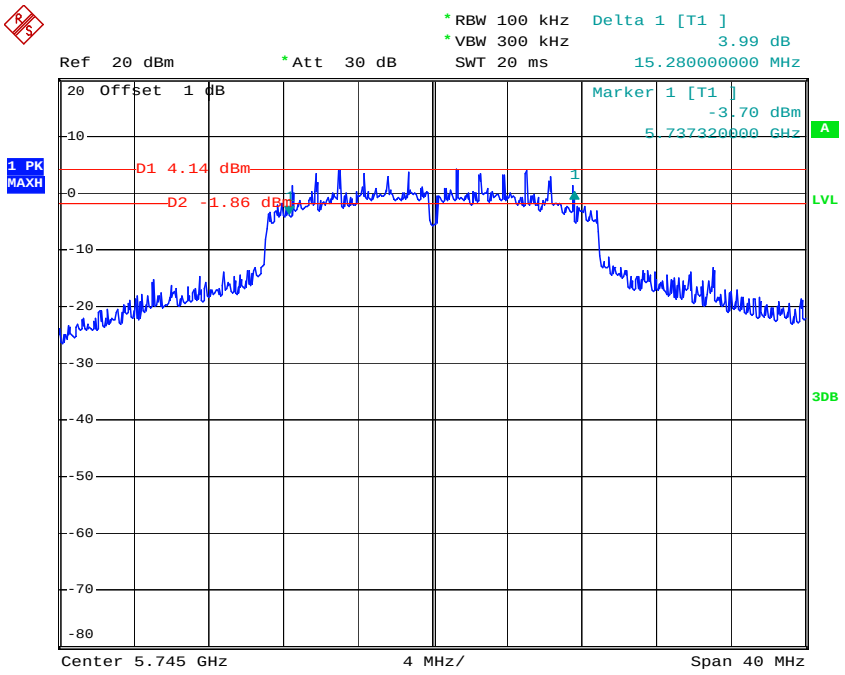
802.11a High Channel



Date: 21.JUL.2018 00:52:00

802.11n ht20 Low Channel



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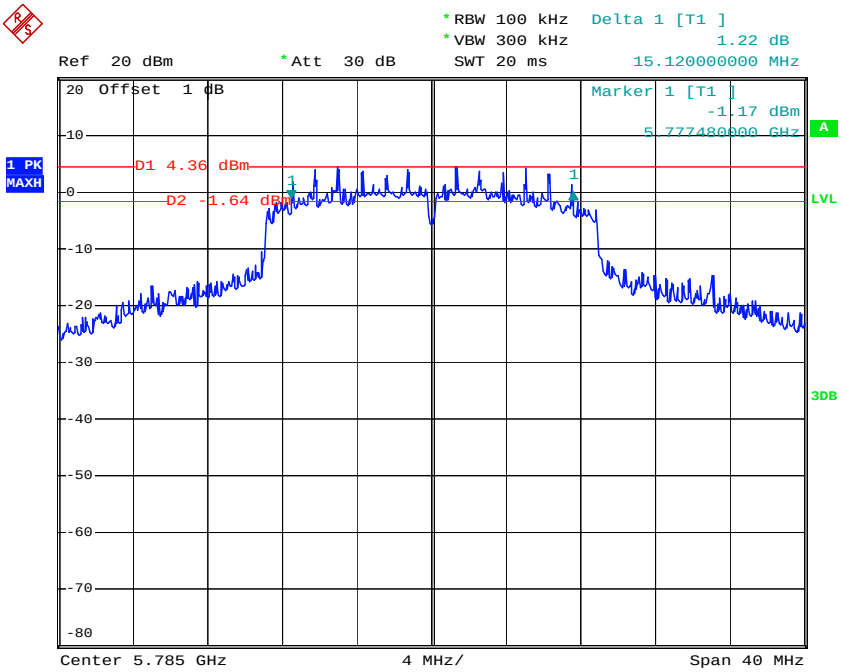
802.11n ht20 Middle Channel



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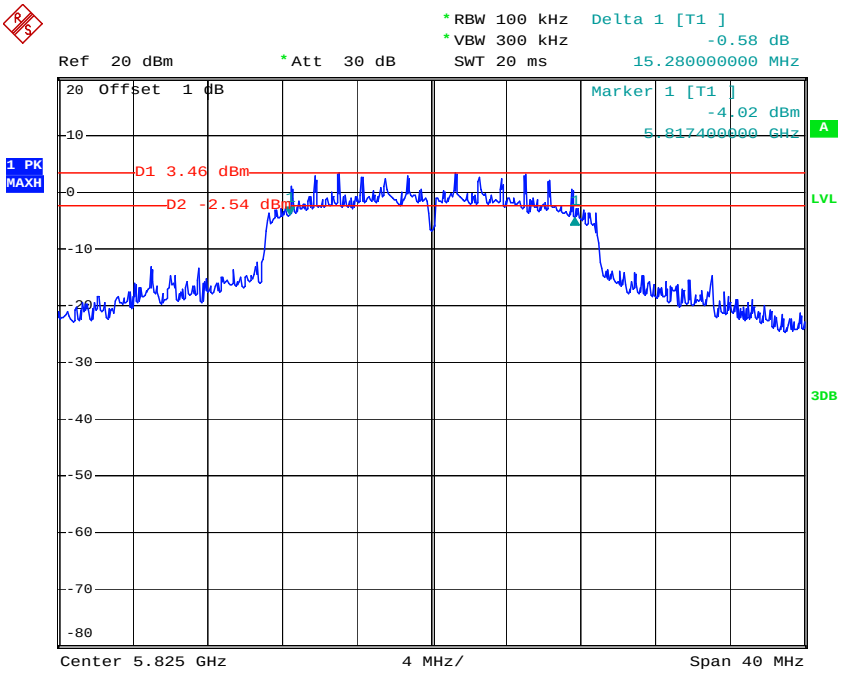
802.11n ht20 High Channel



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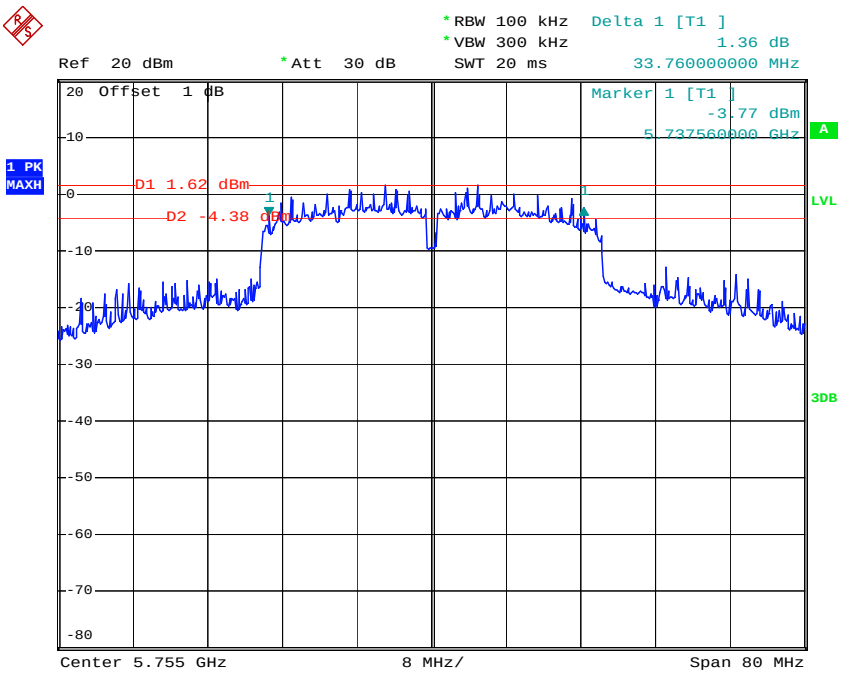
802.11n ht40 Low Channel



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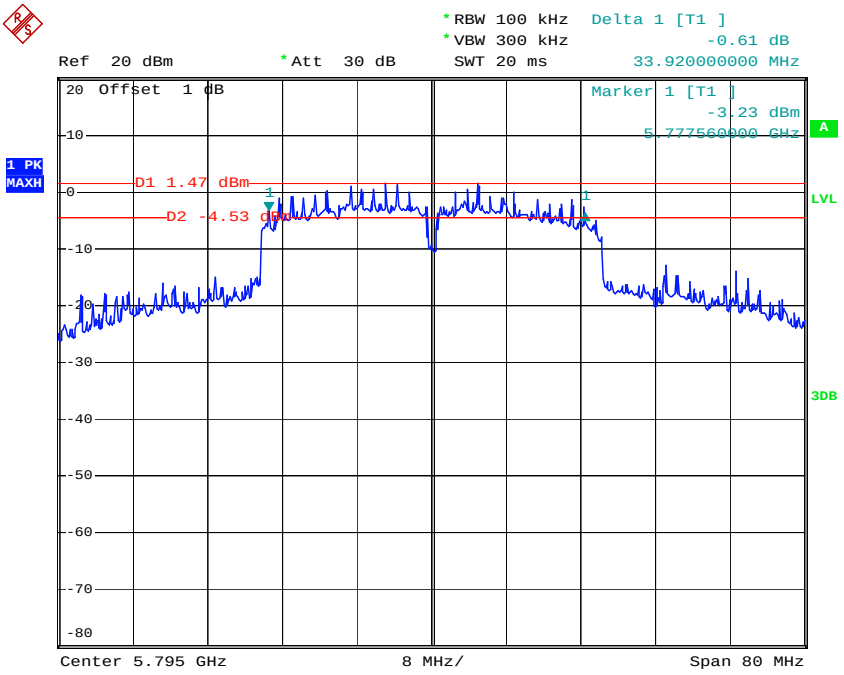
802.11n ht40 High Channel



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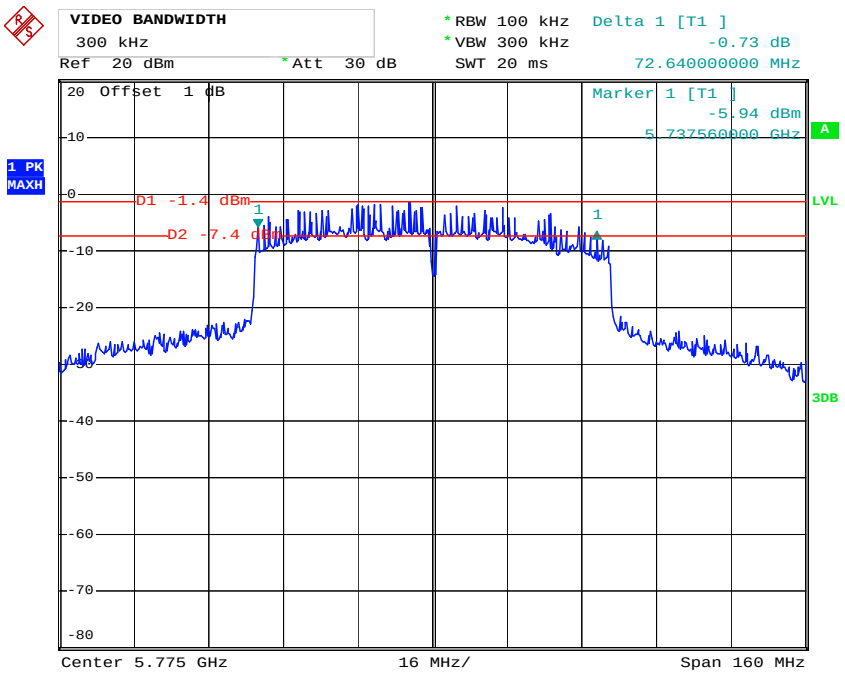
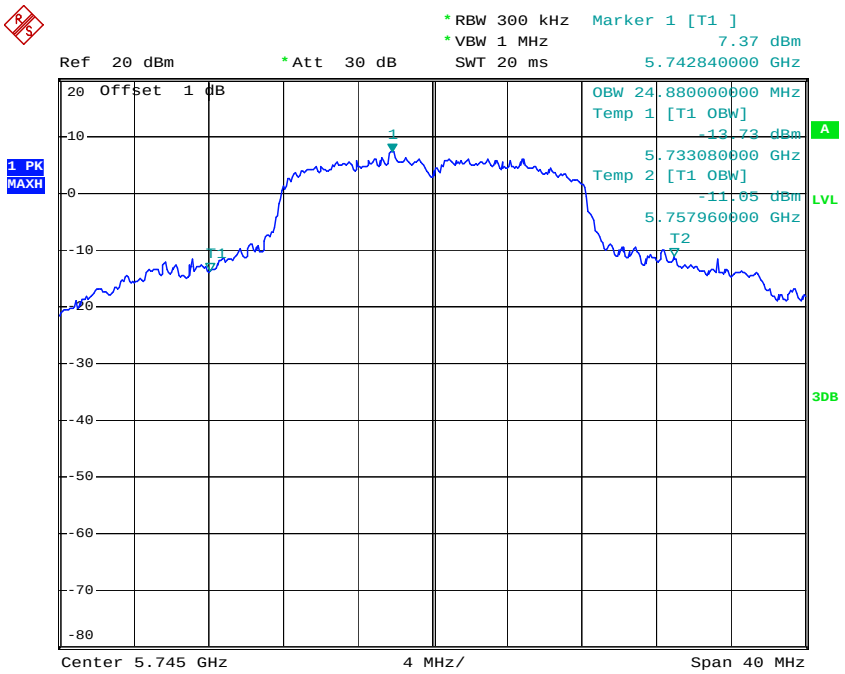
802.11ac80 Middle Channel



Date: 21.JUL.2018 00:44:09

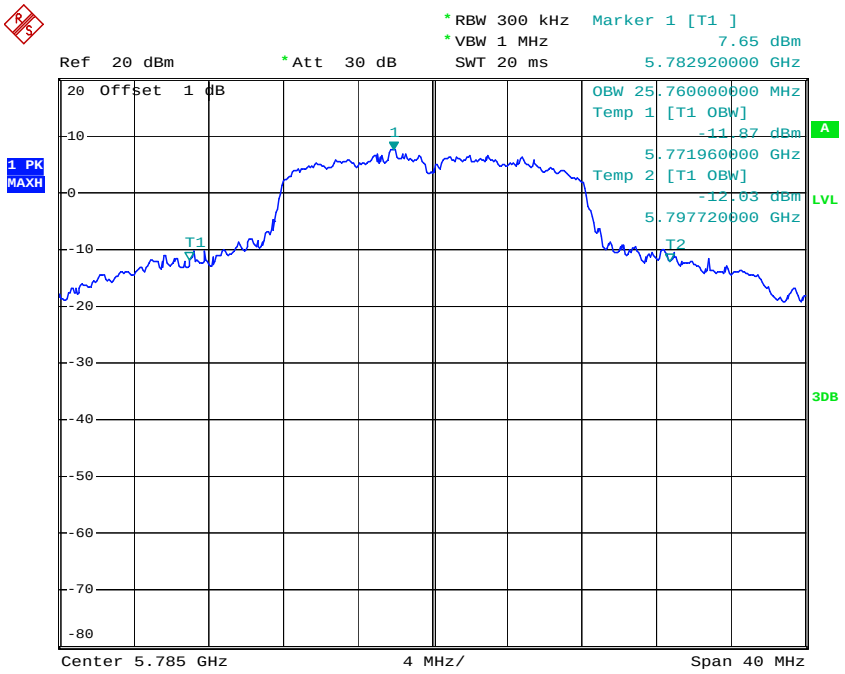
99% Occupied Bandwidth:

802.11a Low Channel



Date: 21.JUL.2018 00:02:56

802.11a Middle Channel



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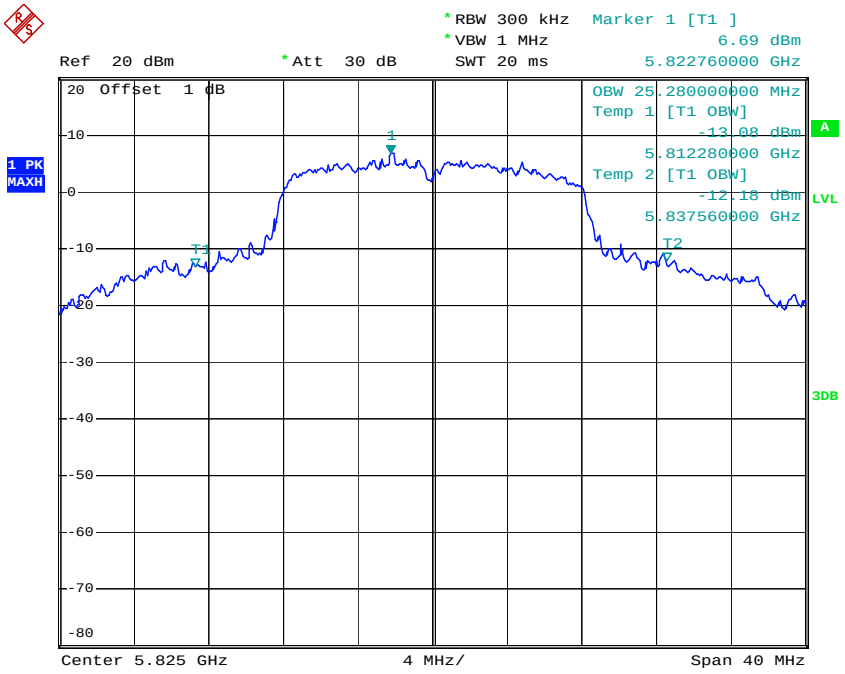
802.11a High Channel



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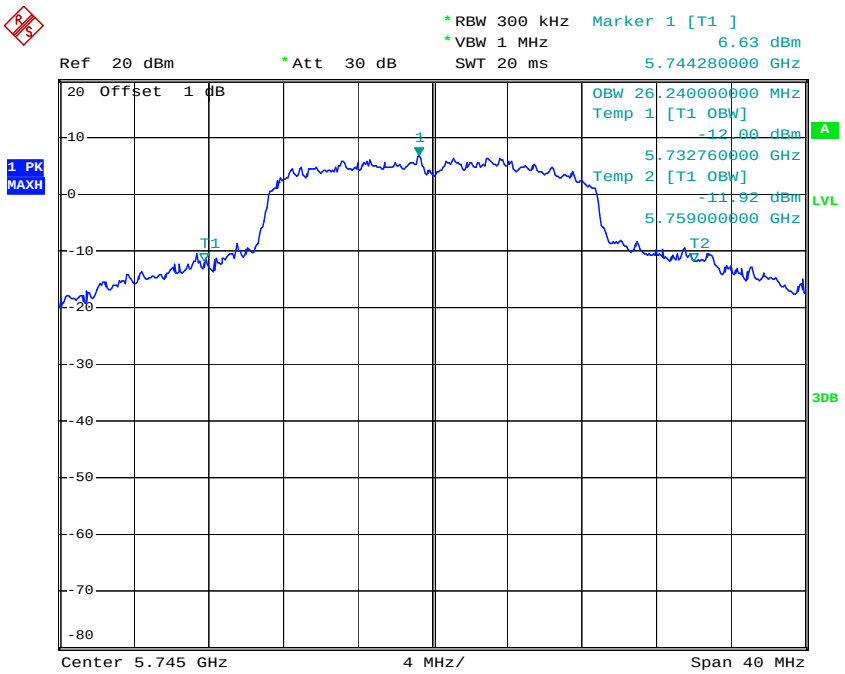
802.11n ht20 Low Channel



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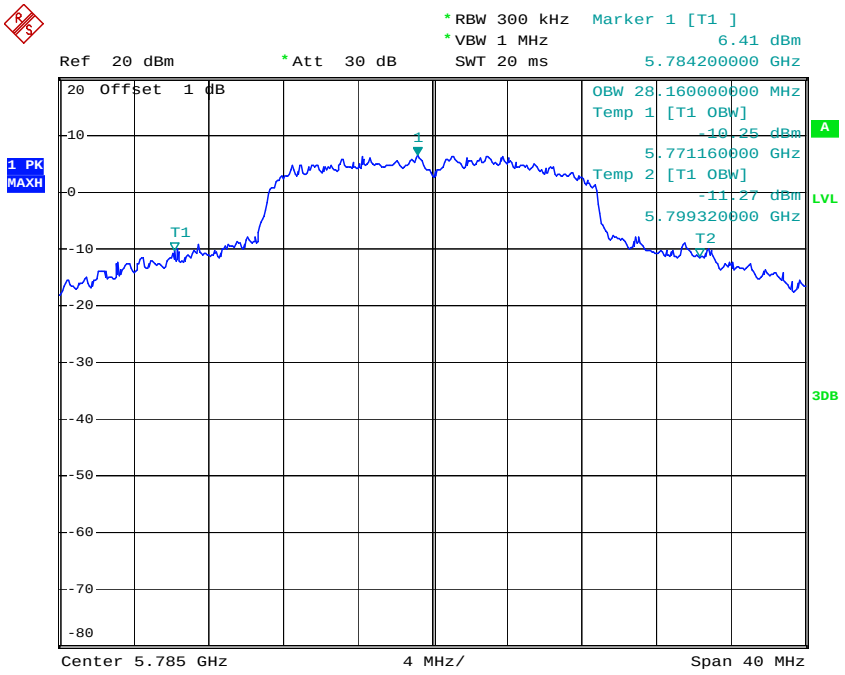
802.11n ht20 Middle Channel



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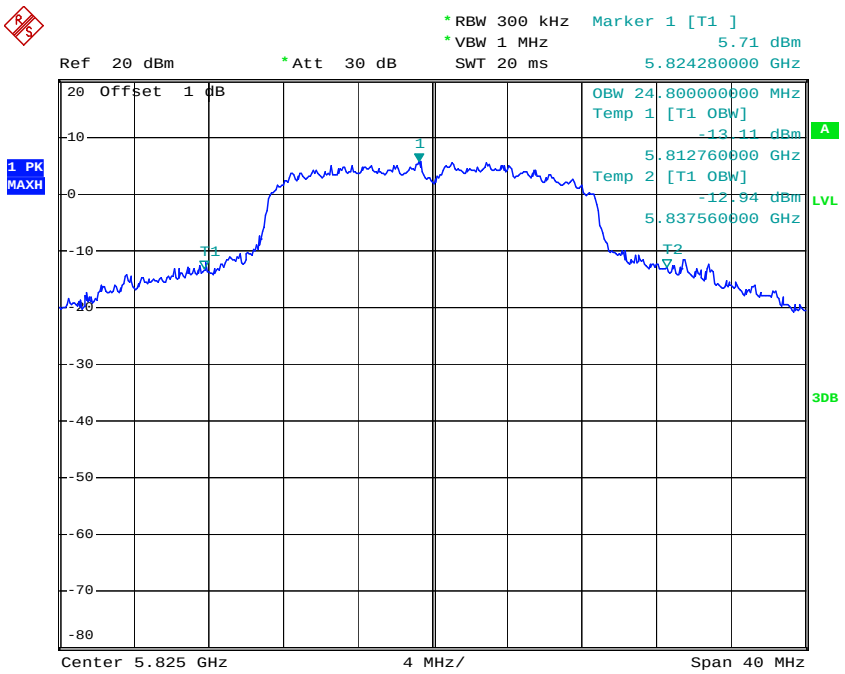
802.11n ht20 High Channel



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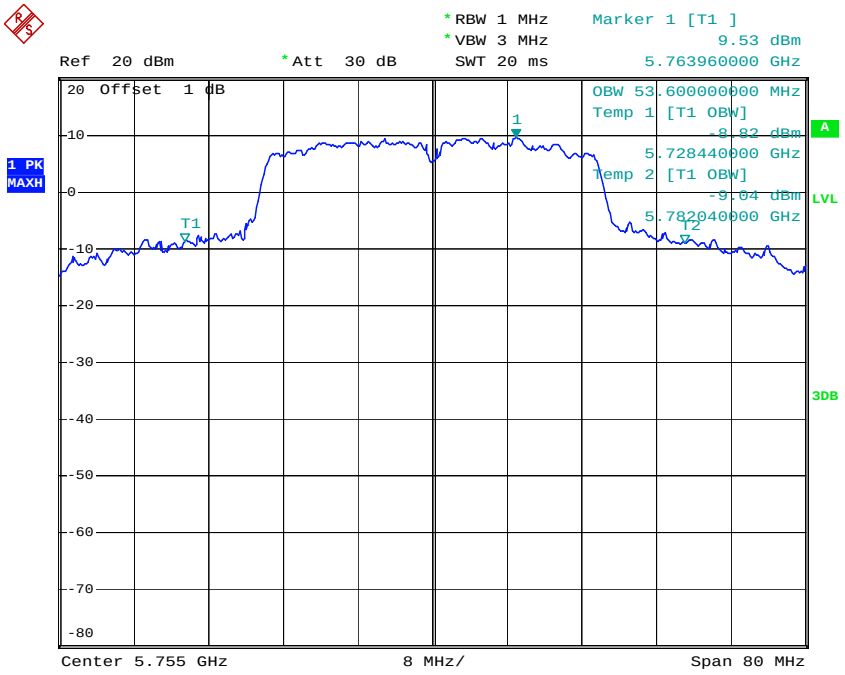
802.11n ht40 Low Channel



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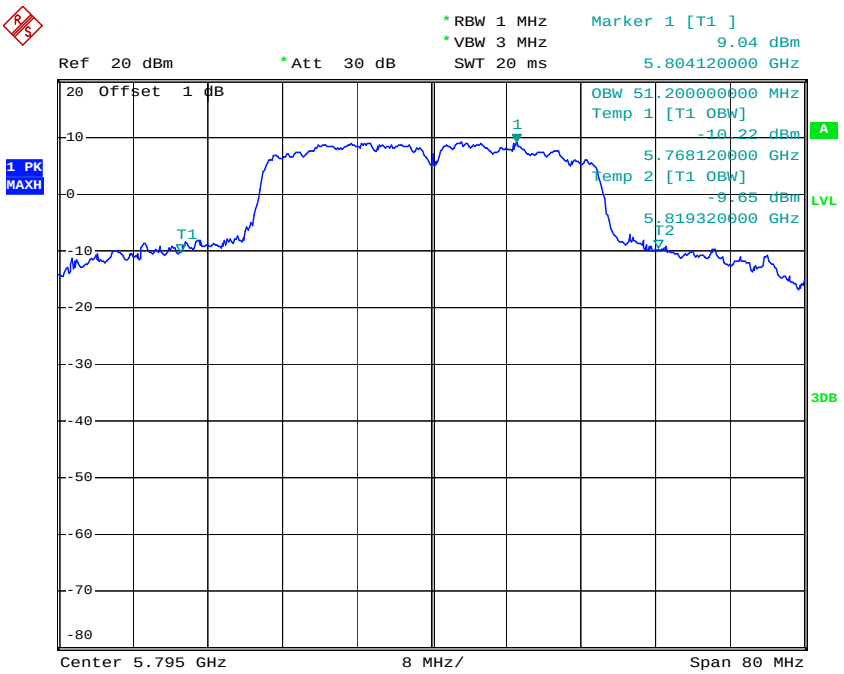
802.11n ht40 High Channel



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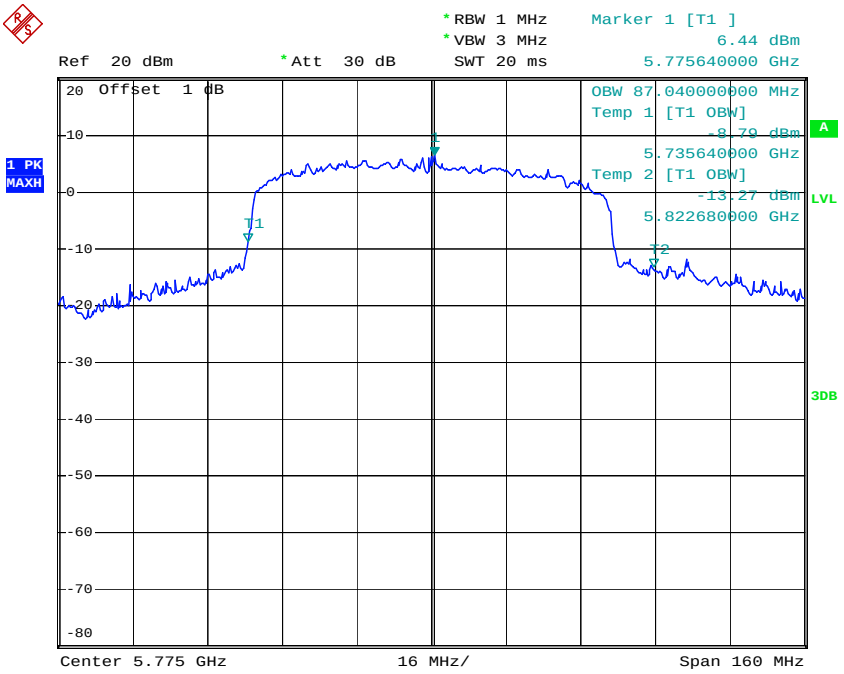
802.11ac80 Middle Channel



Date: 21.JUL.2018 00:25:10

FCC §15.407(a) –MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(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.

(iii) For fixed point-to-point access points 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. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) 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.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A

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

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Data

Environmental Conditions

Temperature:	28.8°C
Relative Humidity:	61 %
ATM Pressure:	99.8 kPa

The testing was performed by Andy Huang on 2018-07-18.

Test Mode: Transmitting

UNII Band	Mode	Frequency (MHz)	Conducted Average Output Power(dBm)	Limit (dBm)	Result
5150-5250 MHz	802.11 a	5180	5.06	30	PASS
		5200	12.43	30	PASS
		5240	12.19	30	PASS
	802.11n ht20	5180	5.61	30	PASS
		5200	12.28	30	PASS
		5240	12.24	30	PASS
	802.11n ht40	5190	3.58	30	PASS
		5230	11.17	30	PASS
	802.11 ac80	5210	5.17	30	PASS
5725-5850 MHz	802.11 a	5745	13.84	30	PASS
		5785	13.88	30	PASS
		5825	13.53	30	PASS
	802.11n ht20	5745	13.61	30	PASS
		5785	13.64	30	PASS
		5825	13.28	30	PASS
	802.11n ht40	5755	14.11	30	PASS
		5795	13.61	30	PASS
	802.11 ac80	5775	12.14	30	PASS

FCC §15.407(a) - POWER SPECTRAL DENSITY

Applicable Standard

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(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.

(iii) For fixed point-to-point access points 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. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output

power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) 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

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2018-01-04	2019-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A

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

Test Data

Environmental Conditions

Temperature:	27.4~28.8°C
Relative Humidity:	60~61 %
ATM Pressure:	99.7~99.8 kPa

The testing was performed by Andy Huang on 2018-07-18, 2018-07-21.

Test Mode: Transmitting

Test Result:Compliance.Please refer to the following table and plot.

5150-5250MHz

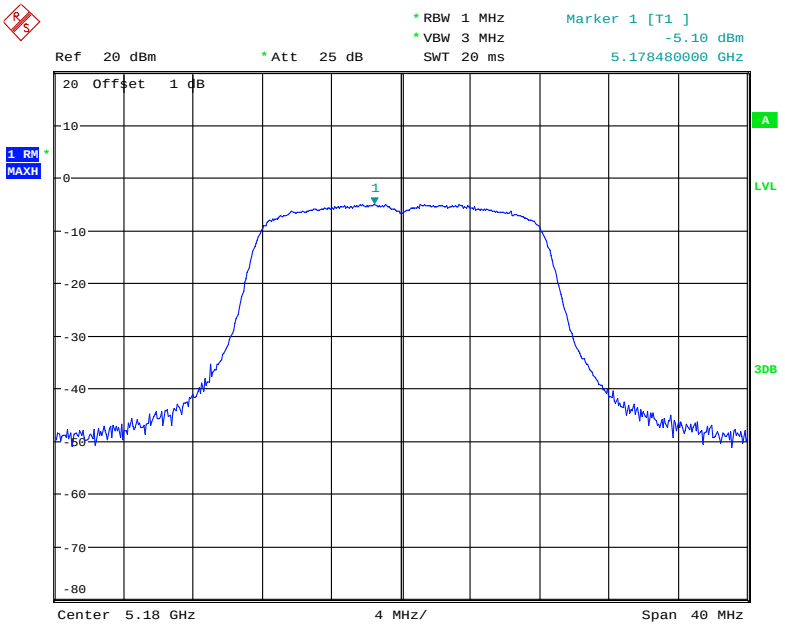
Mode	Frequency (MHz)	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)
802.11 a	5180	-5.10	17
	5200	2.38	17
	5240	1.85	17
802.11 ht20	5180	-4.11	17
	5200	2.45	17
	5240	1.95	17
802.11 ht40	5190	-9.64	17
	5230	-2.26	17
802.11 ac80	5210	-10.10	17

5725-5850MHz

Mode	Frequency (MHz)	Reading (dBm/300kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
802.11 a	5745	1.09	3.31	30
	5785	1.22	3.44	30
	5825	-0.30	1.92	30
802.11 ht20	5745	0.95	3.17	30
	5785	0.74	2.96	30
	5825	0.27	2.49	30
802.11 ht40	5755	-1.61	0.61	30
	5795	-2.12	0.10	30
802.11 ac80	5775	-5.42	-3.20	30

5150-5250MHz

802.11a Low Channel



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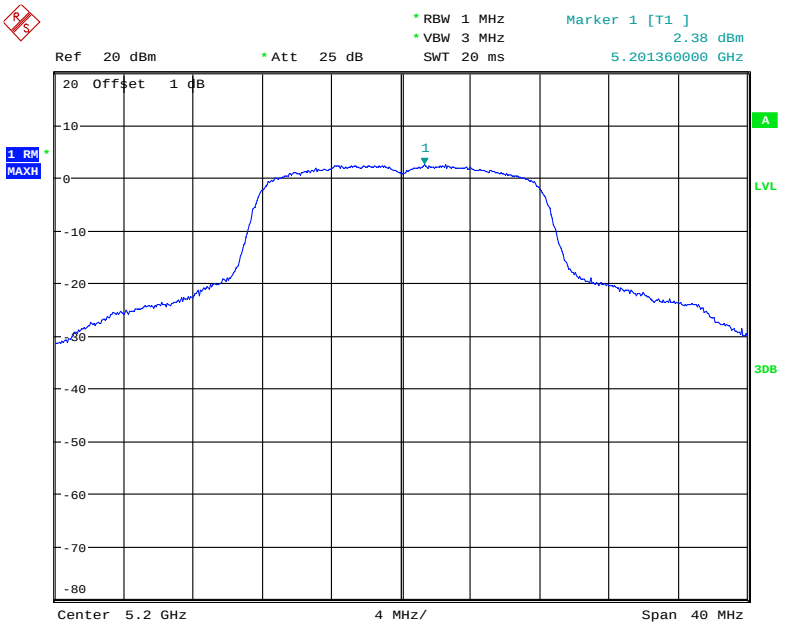
802.11a Middle Channel



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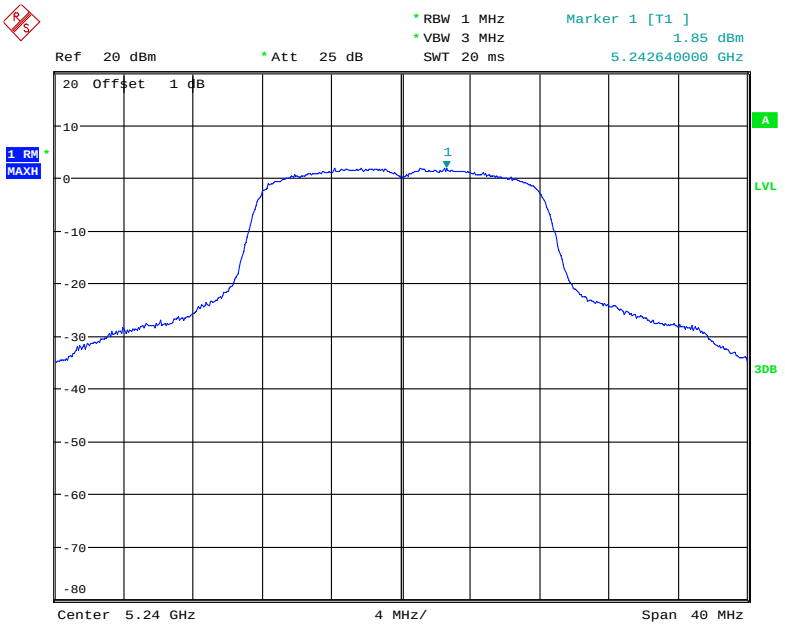
802.11a High Channel



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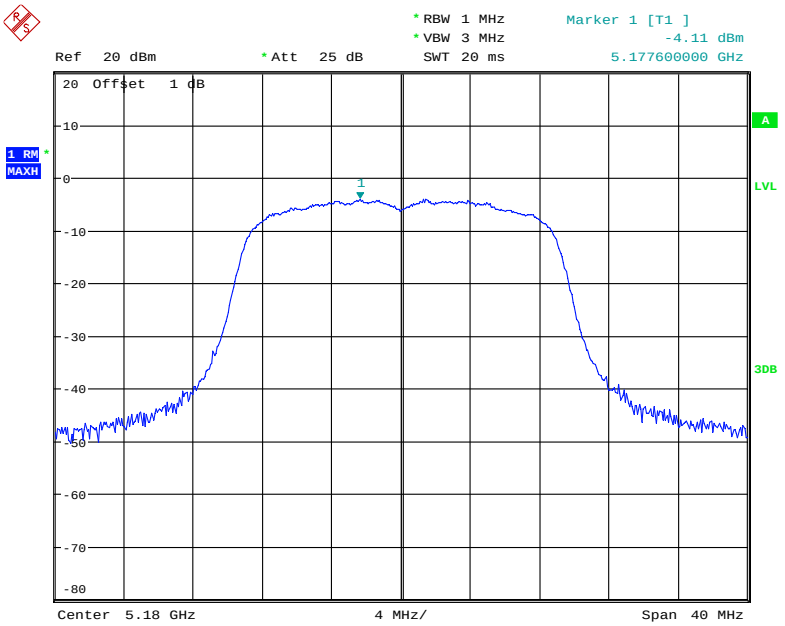
802.11n ht20 Low Channel



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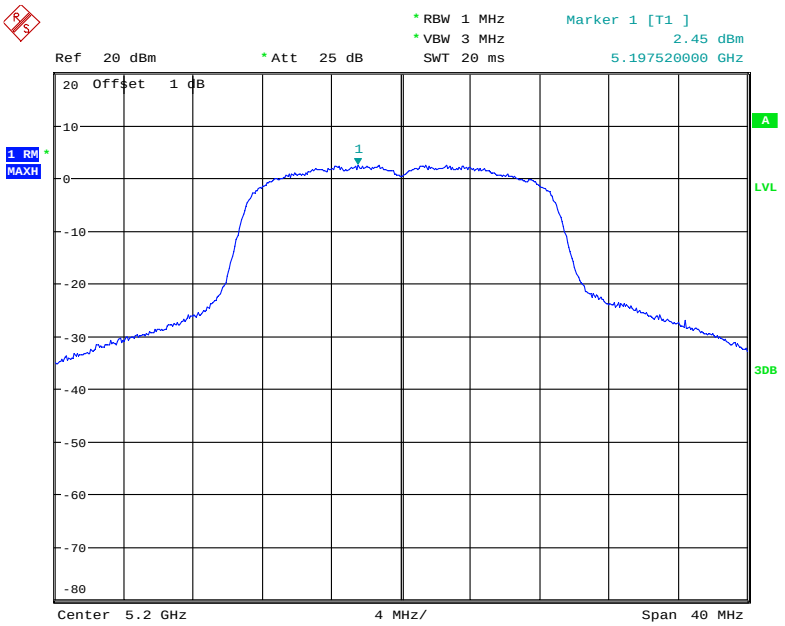

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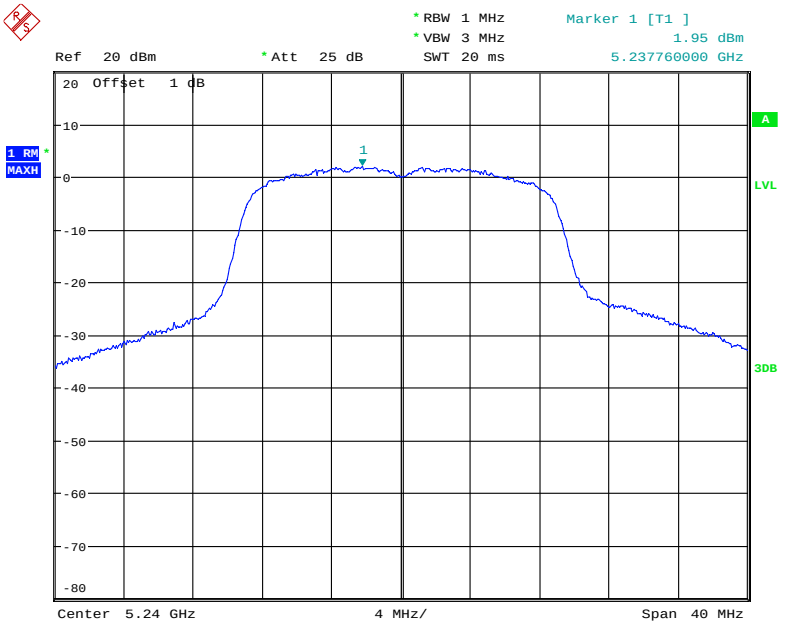

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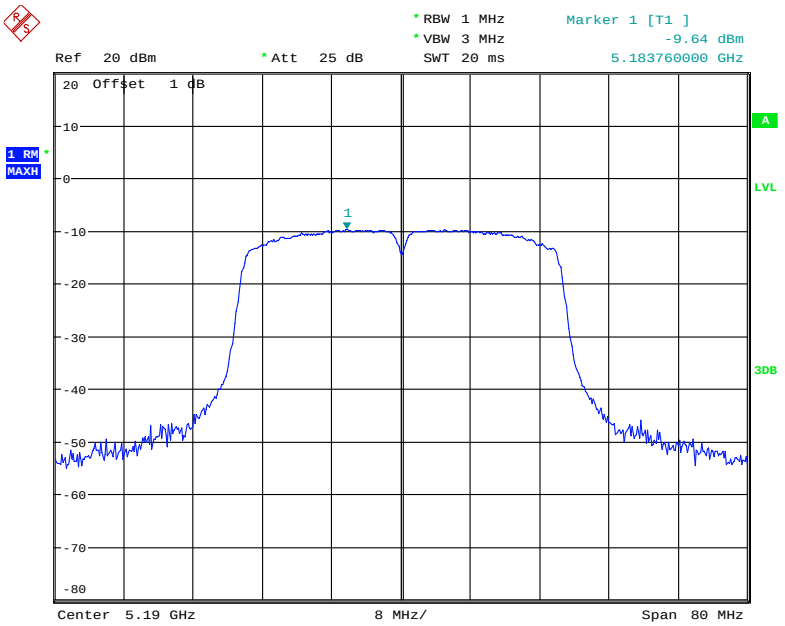

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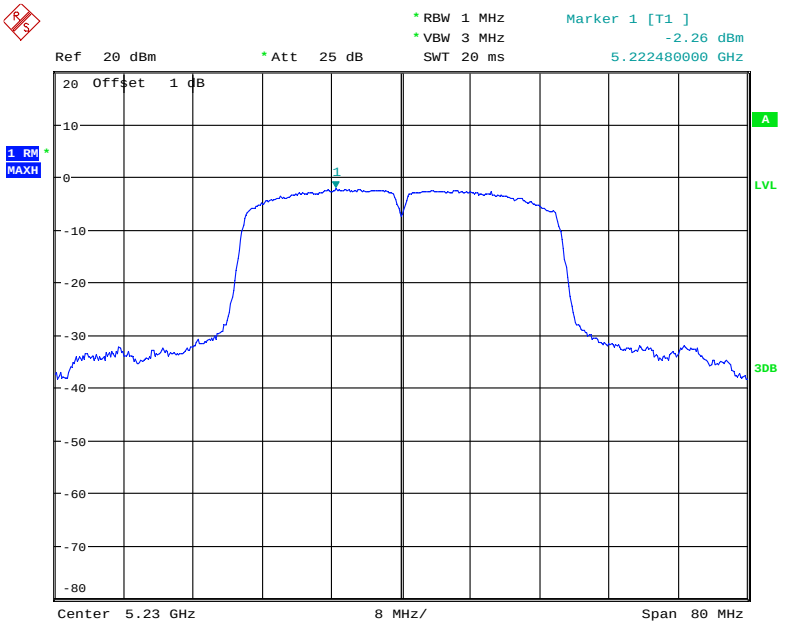

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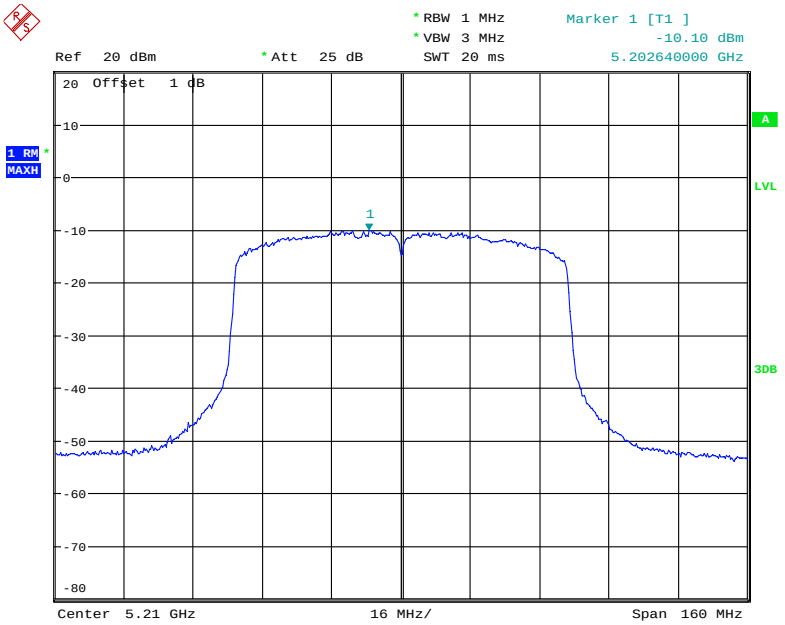
802.11ac80 Middle Channel



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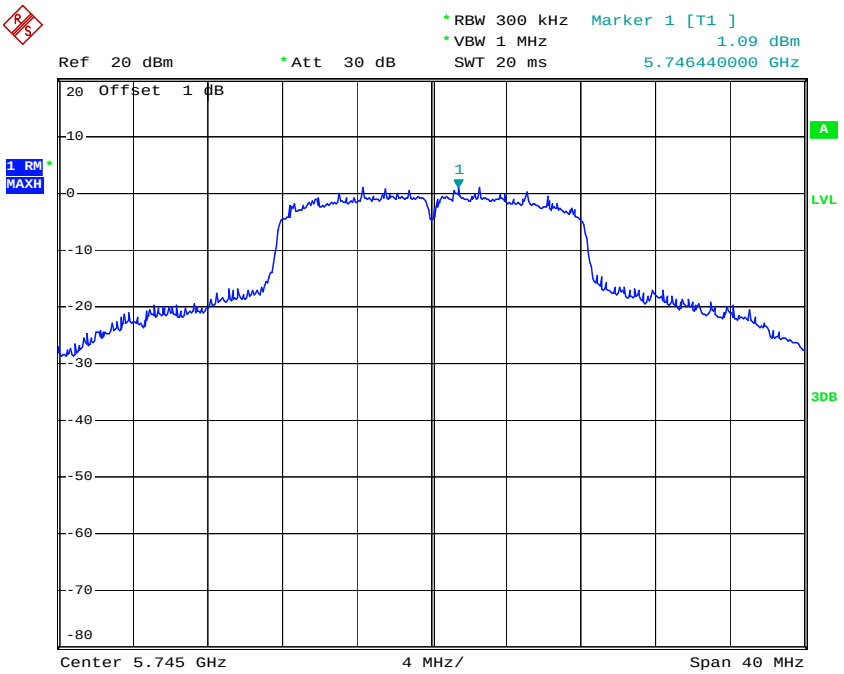
5725-5850MHz

802.11a Low Channel



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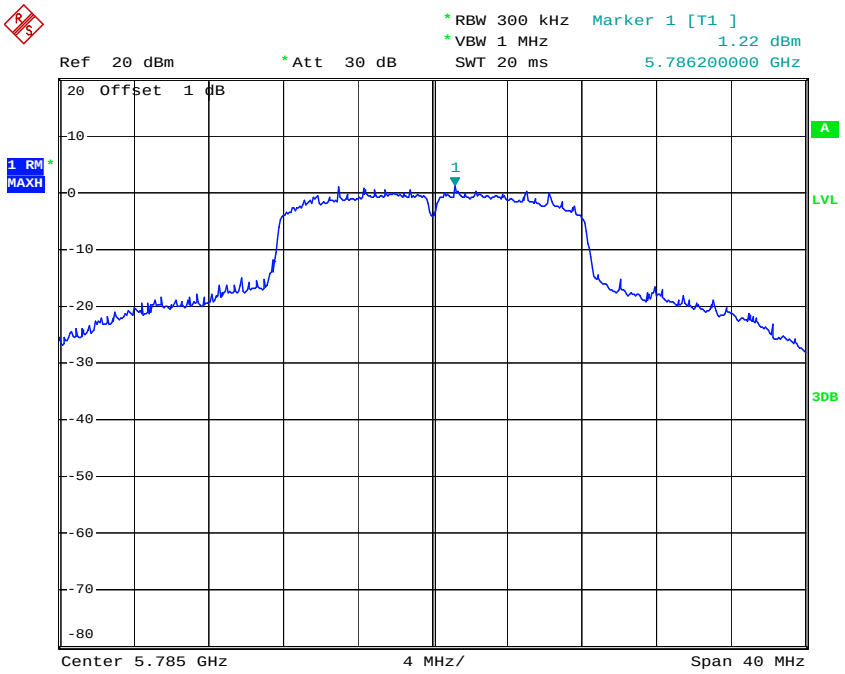
802.11a Middle Channel



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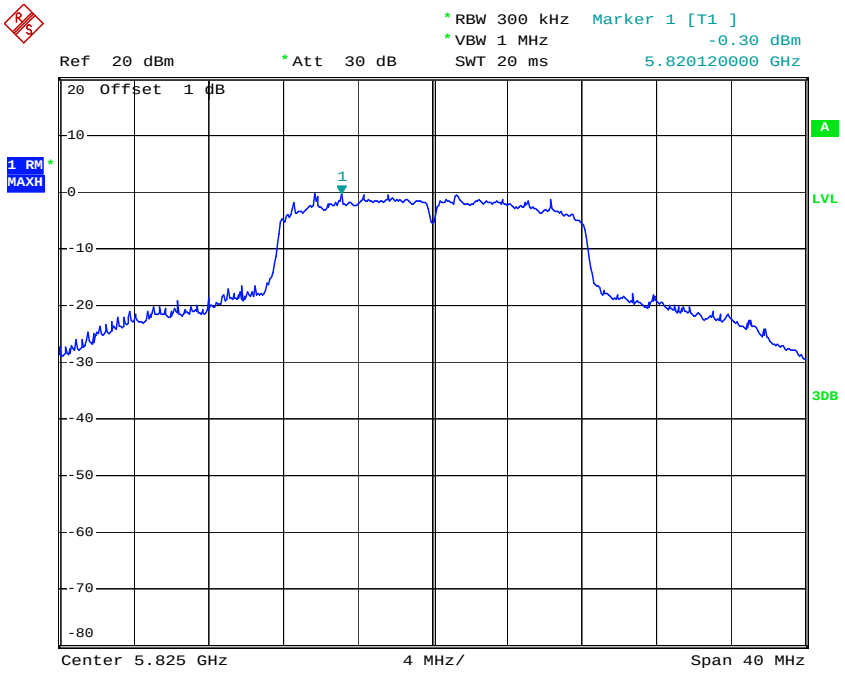

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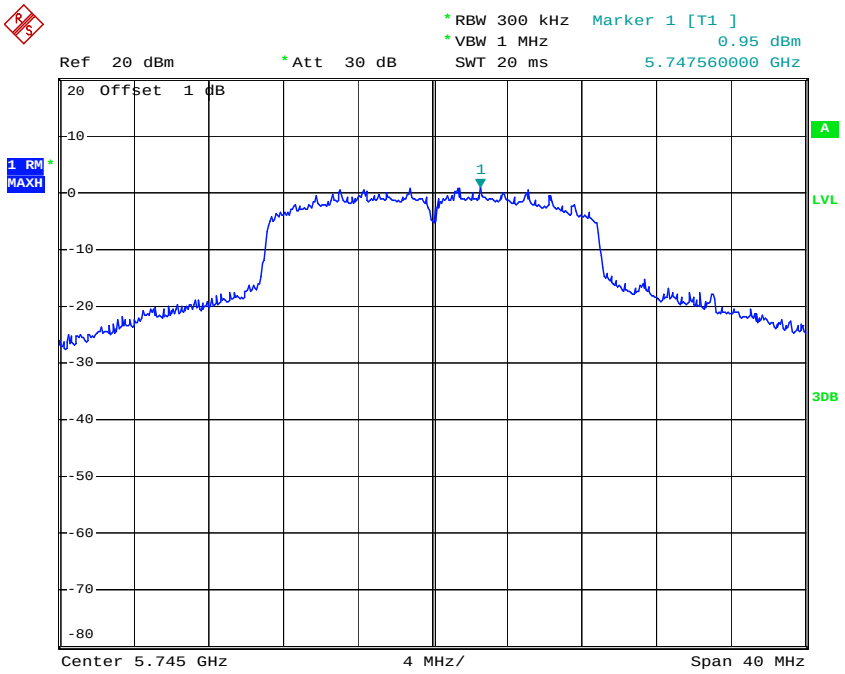

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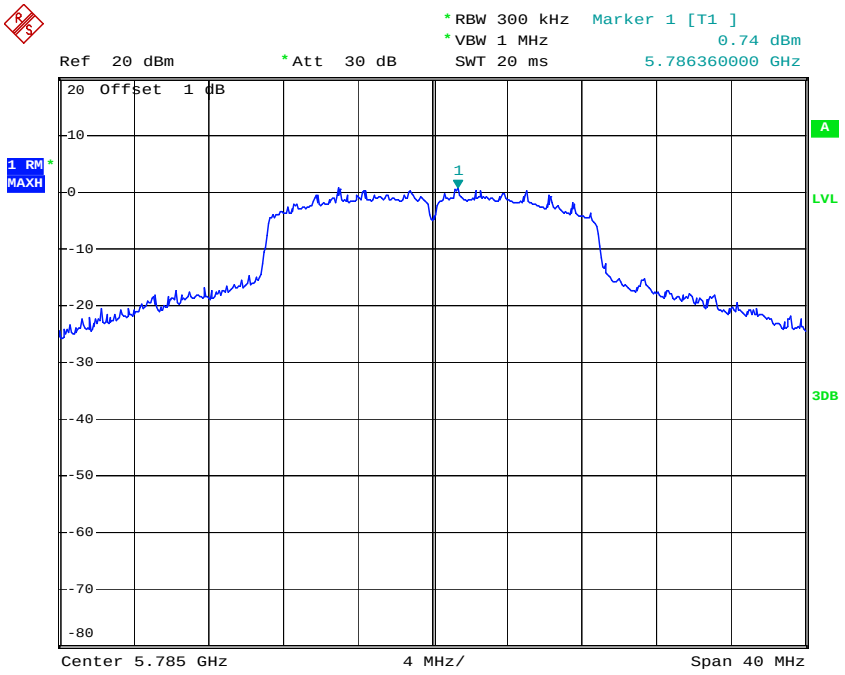

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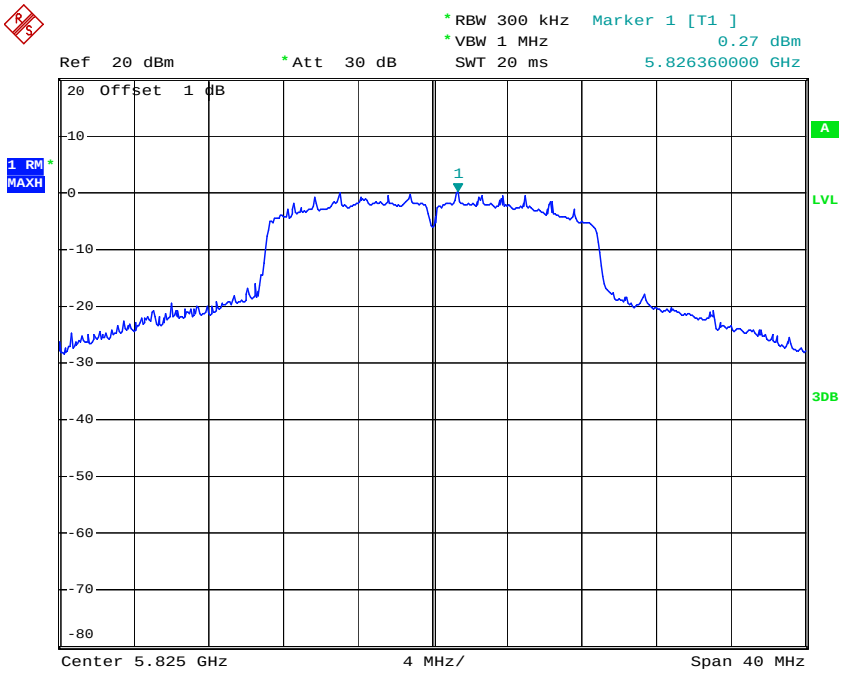
802.11n ht20 High Channel



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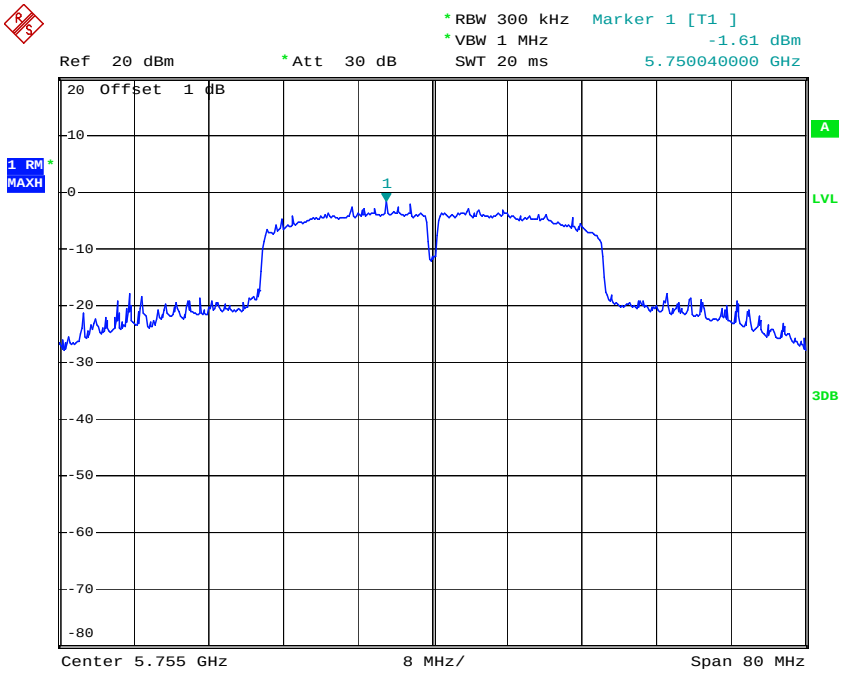
802.11n ht40 Low Channel



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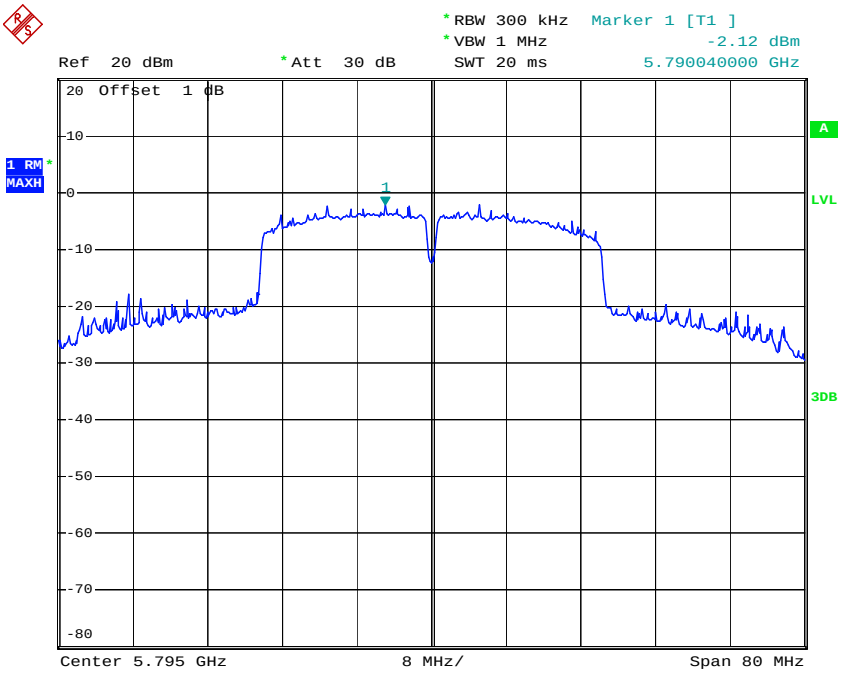
802.11n ht40 High Channel



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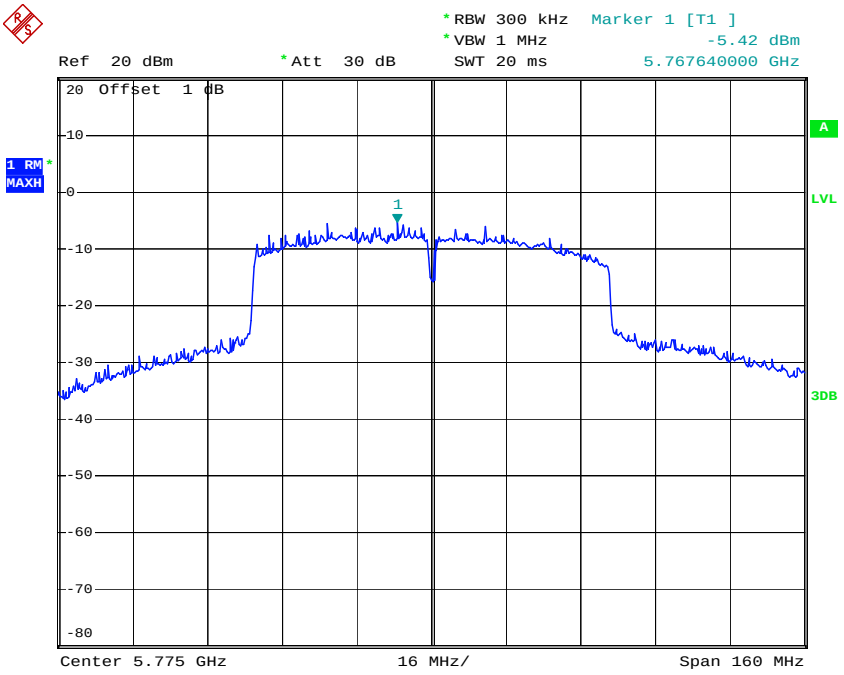
802.11ac80 Middle Channel



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