TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.407

TEST REPORT

For

Shenzhen EDUP Electronics Technology Co.,Ltd.

6 Floor, #6 Building, No.48, Kangzheng Road Liantang Industrial Area, Buji Town Shenzhen, China

FCC ID:2AHRD-EPAC1601

Report Type:	**Product Name:**
Original Report	802.11AC Dual-Band Wi-Fi USB Adapter

Report Number:	RDG191119004-00B
Report Date:	2019-12-10
Reviewed By:	Gavin Xu RF Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	802.11AC Dual-Band Wi-Fi USB Adapter
EUT Model:	EP-AC1601
Multiple Models:	WT-AC1601, EPLOVE-AC1601, AC1200, EP-AC1602, WT-AC1602, EP-AC1683, EP-AC1686, WT-AC1686, WT-AC1683
Operation Frequency:	802.11a/n ht20/ac vht20: 5745-5825 MHz 802.11n ht40/ac vht40: 5755-5795MHz 802.11ac vht80: 5775MHz
Maximum Peak Output Power (Conducted):	12.41 dBm
Modulation Type:	OFDM
Rated Input Voltage:	DC 5V from USB port
Serial Number:	RDG191119004-RF-S2
EUT Received Date:	2019-11-20
EUT Received Status:	Good

Notes 1: Model EP-AC1601 was selected for fully testing, the detailed information about the difference among WT-AC1601, EPLOVE-AC1601, AC1200, EP-AC1602, WT-AC1602, EP-AC1683, EP-AC1686, WT-AC1686, WT-AC1683 and model EP-AC1601 can be referred to the declaration letter which was stated and guaranteed by the manufacturer.

Note 2: The EUT's WLAN 2.4G and 5.8G can't transmit simultaneously for the same antenna.

Objective

This type approval report is prepared on behalf of ***Shenzhen EDUP Electronics 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 15.247 DTS submissions with FCC ID: 2AHRD-EPAC1601.

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)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

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 lab has been recognized as the FCC accredited lab 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 lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "△ ". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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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 supports 802.11a/n ht20/ac vht20/n ht40/ac vht40/ac vht80 in 5.8 GHz band.

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

For 802.11a, 802.11n ht20/ac vht20 modes, Channel 149, 157 and 165 was tested;
For 802.11n ht40/ac vht40 modes, Channel 151, 159 were tested;
For 802.11ac vht80 mode, Channel 155 was tested.

The device supports SISO and MIMO at 802.11n ht20/ac vht20/n ht40/ac vht40 modes, per pre-test, MIMO 2TX mode was the worst and reported.

EUT Exercise Software

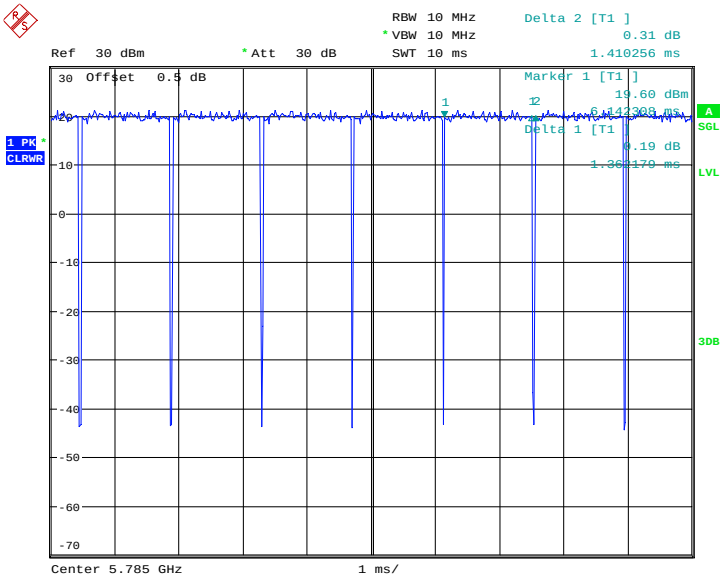
The software "REALTEK11ac 882BU USB WLAN NIC.exe" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations. The maximum power was configured as below table, that provided by the manufacturer:

Band	Mode	Frequency (MHz)	Data Rate(Mbps)		Power level	
			Chain 0	Chain 1	Chain 0	Chain 1
5.8G	802.11a	5745	6	6	57	60
		5785	6	6	55	60
		5825	6	6	55	59
	802.11n ht20	5745	MCS8	MCS8	52	55
		5785	MCS8	MCS8	51	54
		5825	MCS8	MCS8	50	53
	802.11n ht 40	5755	MCS8	MCS8	48	51
		5795	MCS8	MCS8	48	51
	802.11 ac20	5745	NSS1 MCS8	NSS1 MCS8	50	51
		5785	NSS1 MCS8	NSS1 MCS8	47	50
		5825	NSS1 MCS8	NSS1 MCS8	47	50
	802.11 ac40	5755	NSS1 MCS8	NSS1 MCS8	46	50
		5795	NSS1 MCS8	NSS1 MCS8	45	49
	802.11 ac80	5775	NSS1 MCS8	NSS1 MCS8	45	46

The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle(x) (%)
802.11 a	1.362	1.410	96.60
802.11n ht20	0.667	0.718	92.90
802.11n ht40	0.340	0.397	85.64
802.11 ac20	0.143	0.199	71.86
802.11 ac40	0.091	0.146	62.33
802.11 ac80	0.321	0.375	85.60

802.11a



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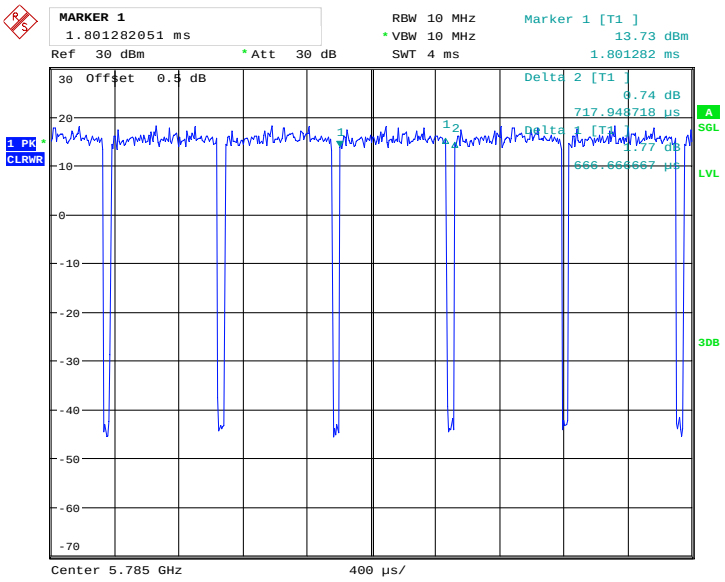
802.11n ht20



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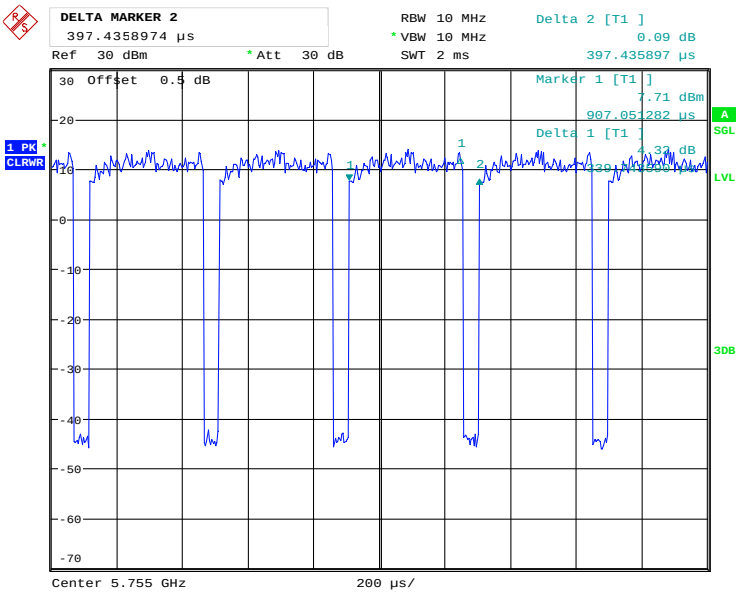

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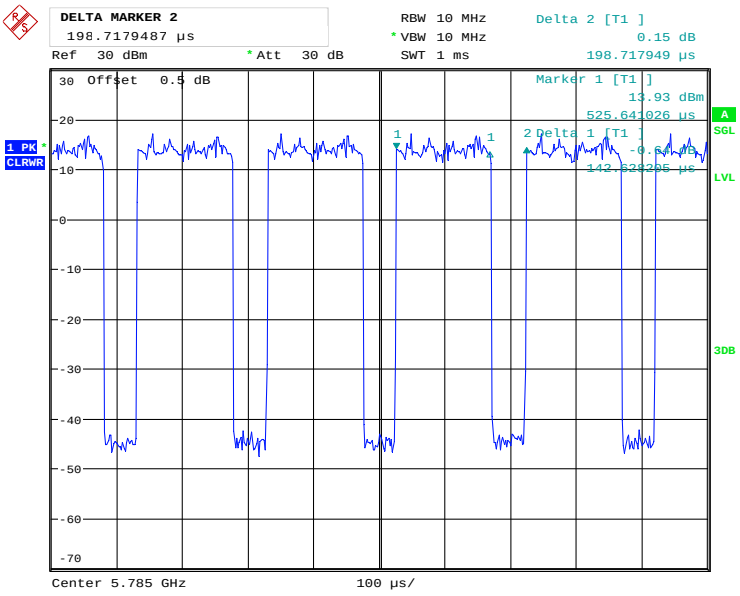
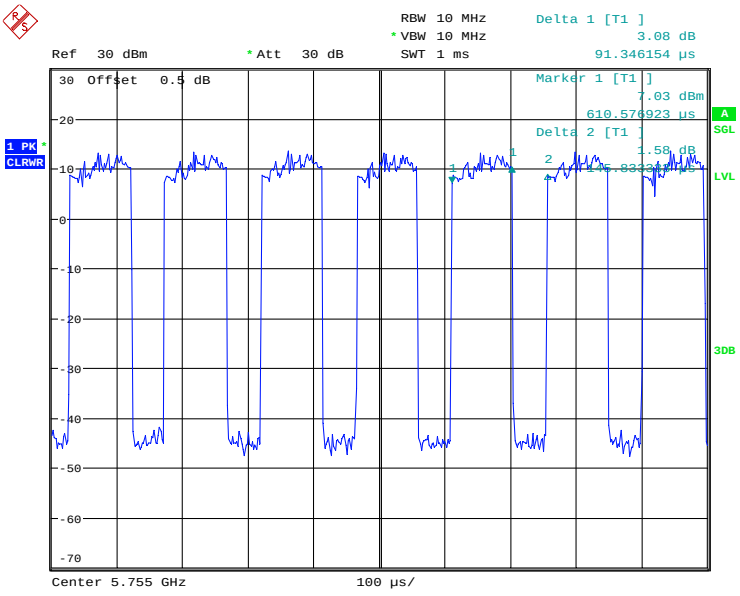
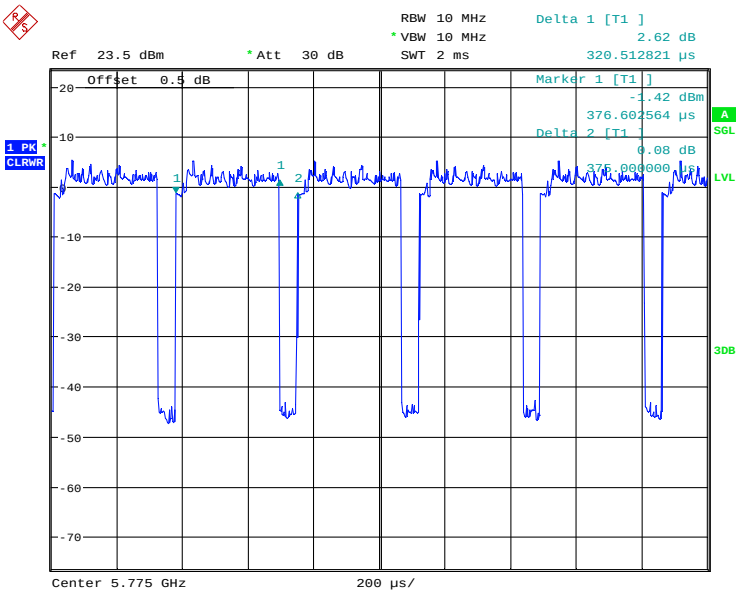
802.11 ac20



802.11 ac40



802.11 ac80



Equipment Modifications

No modification was made to the EUT.

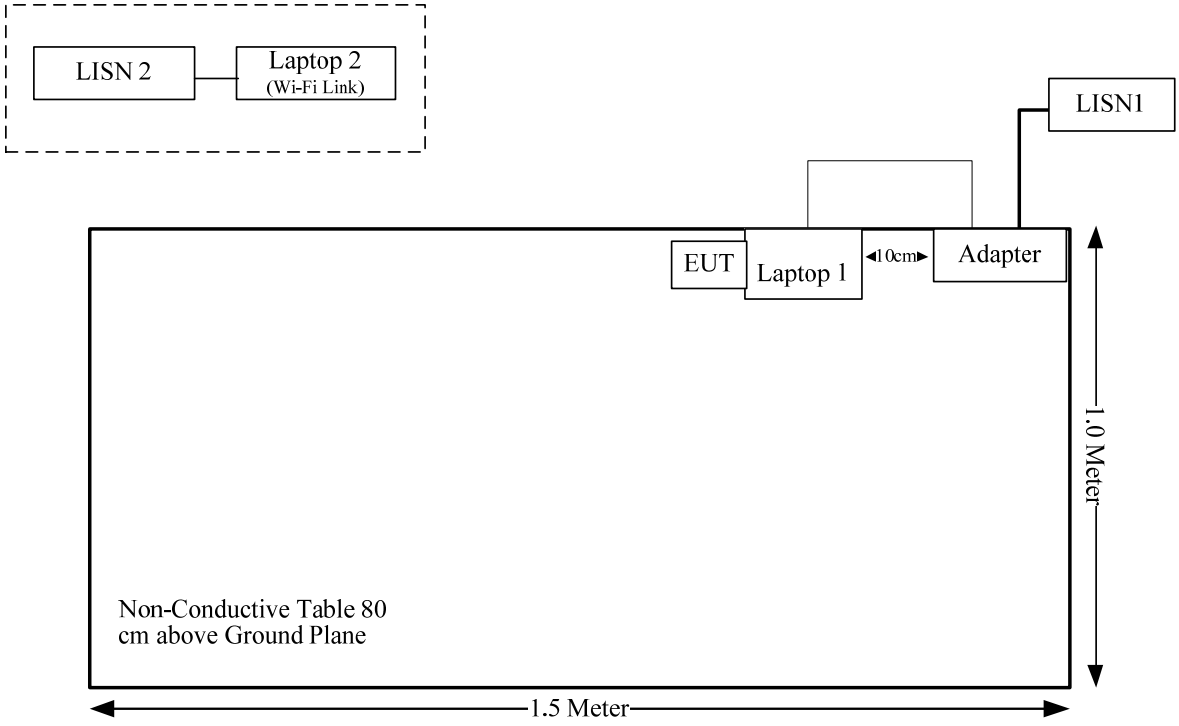
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Lenovo	Laptop 1	ThinkPad E450	PF-0MRADG
Lenovo	Laptop 2 (Wi-Fi link)	ThinkPad E450	PF-0MR8KV
Lenovo	Adapter	ADL65NDC3A	36200249

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	Yes	Yes	2.0	Adapter	Laptop

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.407 (f) & §1.1310 & §2.1093	RF Exposure	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(a)(e)	Emission Bandwidth	Compliance
§15.407(a)	Conducted Transmitter Output Power	Compliance
§15.407 (a)	Power Spectral Density	Compliance

FCC §15.407 (f) & §1.1310 & §2.1093- RF EXPOSURE

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.

Result:

Compliance, please refer to the SAR report: RDG191119004-20.

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.

Antenna Connector Construction

The EUT has 2 internal antenna permanently attached to the unit, fulfill the requirement of this section. Please refer to the EUT photos and below information:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
PCB	50	2.0 dBi/2.4-2.5GHz 2.0 dBi/5.725-5.85GHz

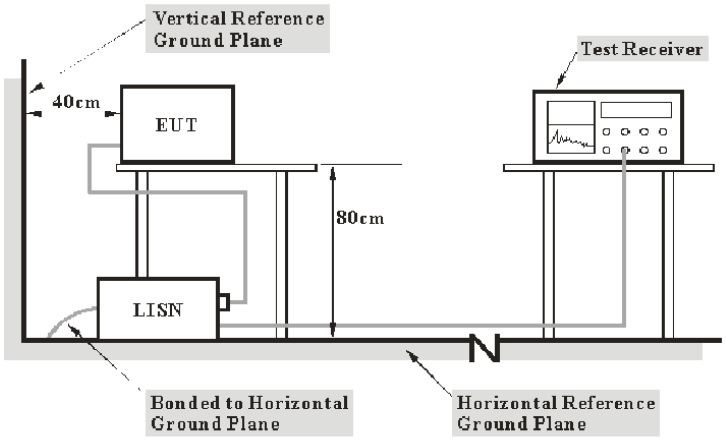
Result: Compliance.

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
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2019-05-09	2020-05-09

*** 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 adapter 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

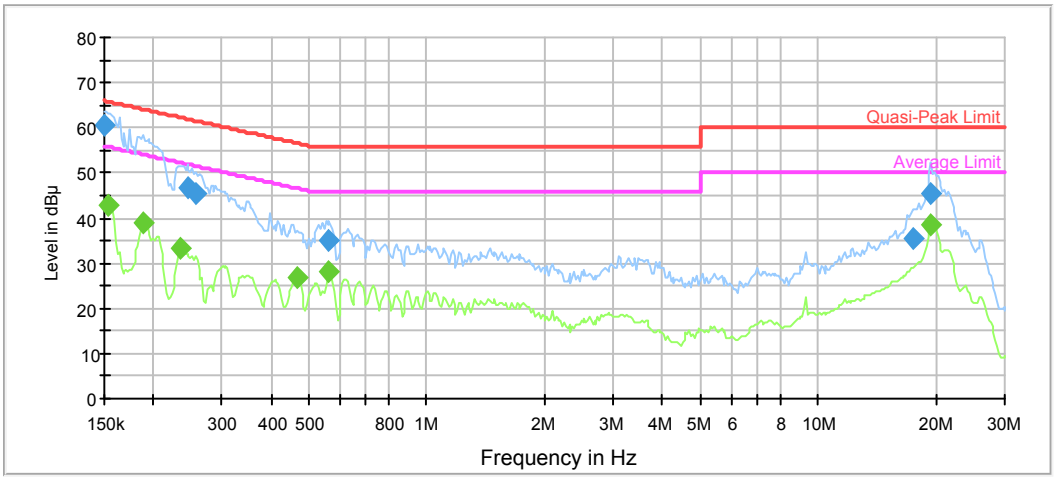
Environmental Conditions

Temperature:	25.6 °C
Relative Humidity:	64 %
ATM Pressure:	100.5 kPa

The testing was performed by Sem Xiang on 2019-11-25.

Test Mode: Transmitting (802.11a mode 5785MHz chain 1 was the worst)

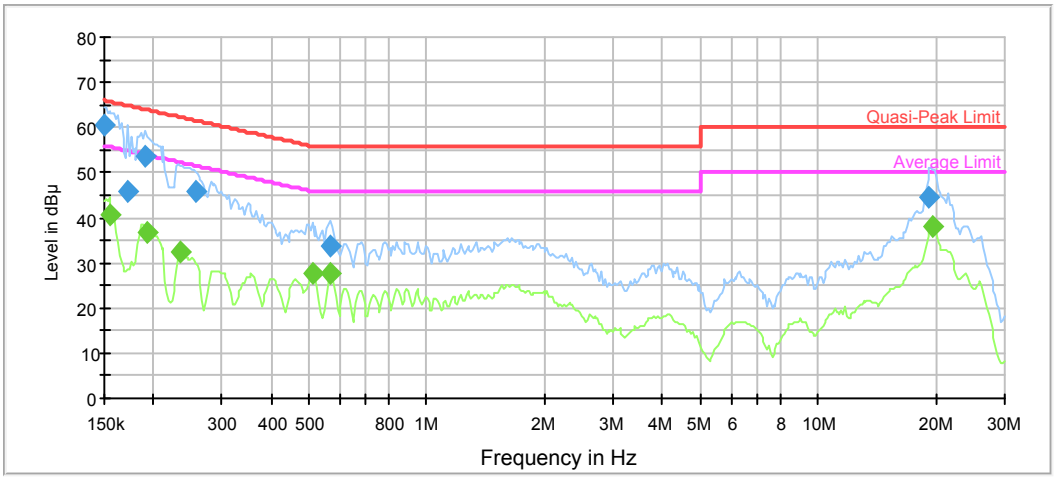
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	60.6	9.000	L1	11.2	5.4	66.0	Compliance
0.244252	46.8	9.000	L1	10.3	15.2	62.0	Compliance
0.256712	45.5	9.000	L1	10.3	16.0	61.5	Compliance
0.563423	35.1	9.000	L1	9.8	20.9	56.0	Compliance
17.446496	35.4	9.000	L1	10.0	24.6	60.0	Compliance
19.464503	45.3	9.000	L1	10.1	14.7	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153015	42.8	9.000	L1	11.1	13.0	55.8	Compliance
0.188575	39.0	9.000	L1	10.7	15.1	54.1	Compliance
0.234722	33.4	9.000	L1	10.4	18.9	52.3	Compliance
0.466367	26.9	9.000	L1	9.9	19.7	46.6	Compliance
0.563423	28.1	9.000	L1	9.8	17.9	46.0	Compliance
19.464503	38.5	9.000	L1	10.1	11.5	50.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	60.5	9.000	N	11.2	5.5	66.0	Compliance
0.172421	46.0	9.000	N	10.9	18.8	64.8	Compliance
0.190460	53.5	9.000	N	10.7	10.5	64.0	Compliance
0.256712	45.7	9.000	N	10.3	15.8	61.5	Compliance
0.569057	33.8	9.000	N	9.8	22.2	56.0	Compliance
19.271786	44.3	9.000	N	10.0	15.7	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154545	40.7	9.000	N	11.1	15.1	55.8	Compliance
0.192365	36.9	9.000	N	10.7	17.0	53.9	Compliance
0.234722	32.4	9.000	N	10.4	19.9	52.3	Compliance
0.510059	27.7	9.000	N	9.9	18.3	46.0	Compliance
0.569057	27.7	9.000	N	9.8	18.3	46.0	Compliance
19.659148	37.8	9.000	N	10.0	12.2	50.0	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.

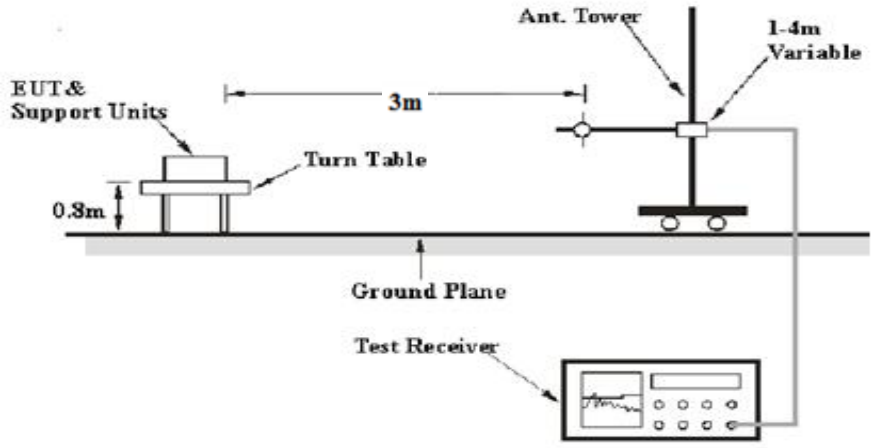
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(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.

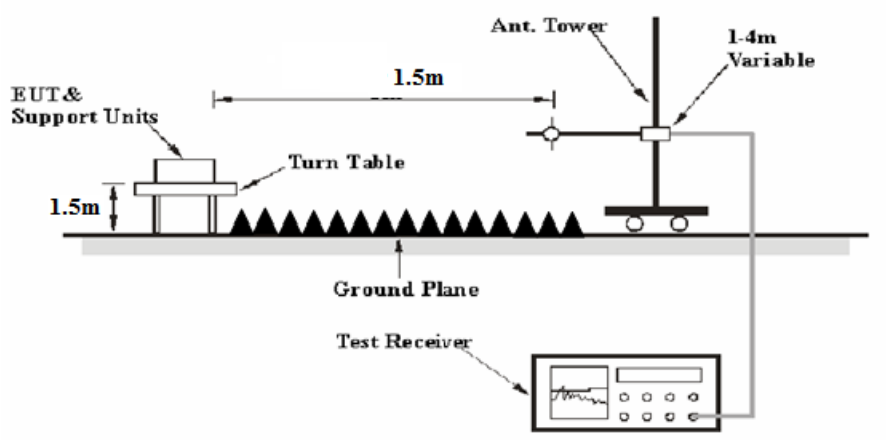
(7) The provisions of §15.205 apply to intentional radiators operating under this section.

EUT Setup

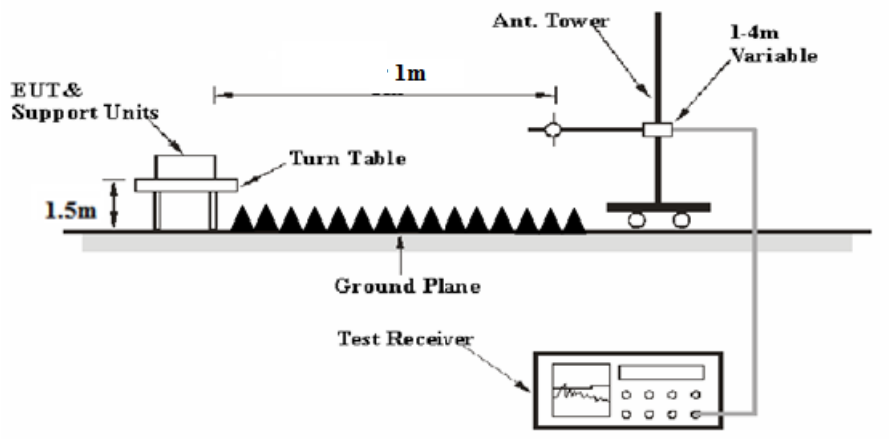
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission Below 1GHz tests were performed in the 10 meters chamber test site, 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

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

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	ESR3	102453	2019-09-12	2020-09-12
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2019-05-06	2020-05-06
R&S	Spectrum Analyzer	FSV40	101474	2019-01-09	2020-01-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1302	2017-12-06	2020-12-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2019-02-24	2020-02-24
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2019-09-05	2020-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27
Sinoscite	Bandstop Filters	BSF5150-5850MN-0899-003	0899003	2019-05-06	2020-05-06
Mini Circuits	High Pass Filter	VHF-6010+	31118	2019-06-16	2020-06-16

*** 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

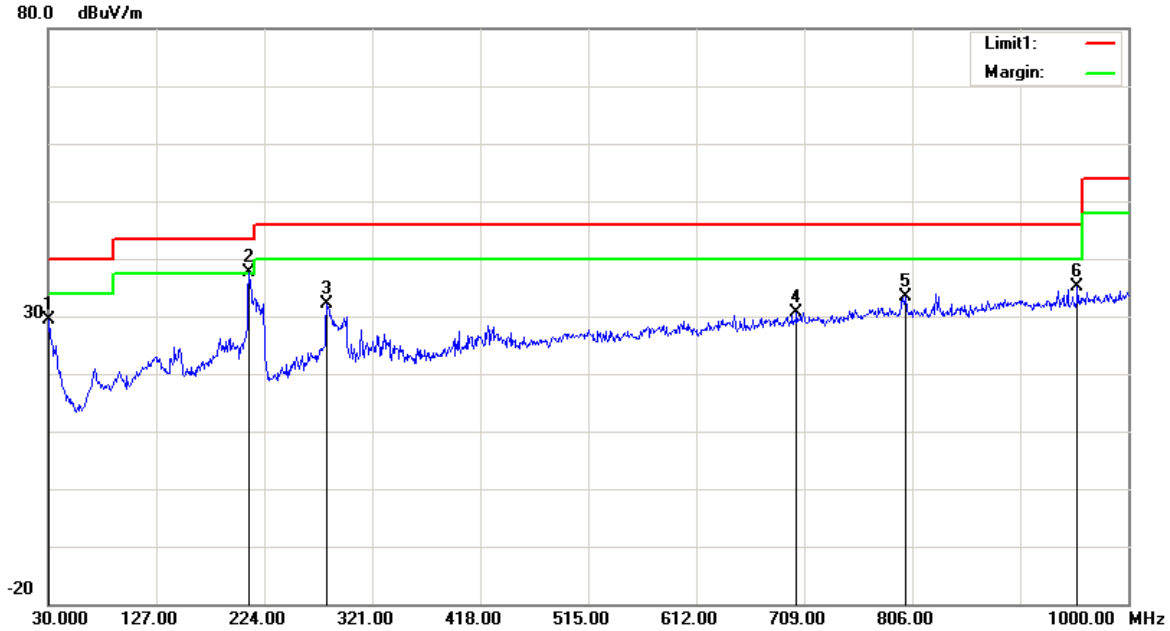
Temperature:	23.4~25.4°C
Relative Humidity:	43~46 %
ATM Pressure:	100.5~101.1kPa

The testing was performed by Tyler Pan and Vern Shen on 2019-11-25 and 2019-12-03.

Test Mode: Transmitting

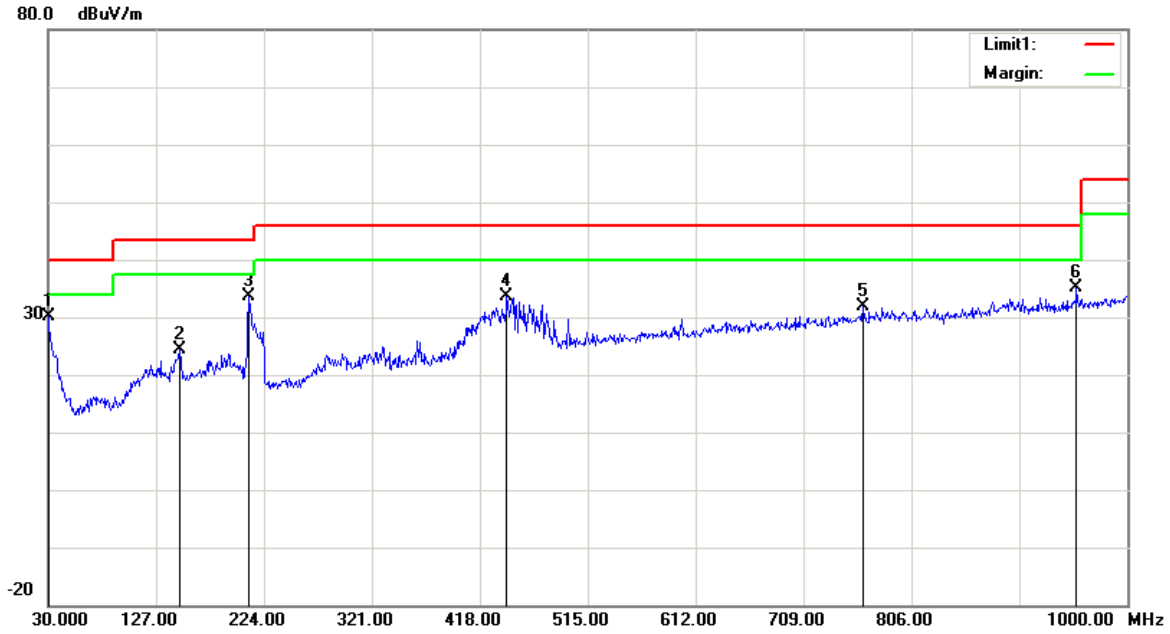
1) Below 1GHz (802.11a mode 5785 MHz was the worst):

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	28.54	peak	0.91	29.45	40.00	10.55
210.4200	44.95	peak	-7.37	37.58	43.50	5.92
280.2600	36.39	peak	-4.15	32.24	46.00	13.76
702.2100	27.62	peak	3.04	30.66	46.00	15.34
800.1800	28.86	peak	4.43	33.29	46.00	12.71
954.4100	34.23	peak	0.82	35.05	46.00	10.95

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	28.48	peak	1.72	30.20	40.00	9.80
148.3400	30.37	peak	-6.05	24.32	43.50	19.18
210.4200	41.10	peak	-7.37	33.73	43.50	9.77
442.2500	34.70	peak	-1.19	33.51	46.00	12.49
762.3500	27.72	peak	4.06	31.78	46.00	14.22
954.4100	34.25	peak	0.82	35.07	46.00	10.93

2) 1GHz-40GHz:

802.11a, Chain 0

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	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	68.02	PK	H	34.20	3.69	0.00	105.91	99.89	N/A	N/A
5745.00	58.34	AV	H	34.20	3.69	0.00	96.23	90.21	N/A	N/A
5745.00	72.51	PK	V	34.20	3.69	0.00	110.40	104.38	N/A	N/A
5745.00	62.84	AV	V	34.20	3.69	0.00	100.73	94.71	N/A	N/A
5725.00	51.62	PK	V	34.19	3.69	0.00	89.50	83.48	122.20	38.72
5720.00	37.31	PK	V	34.19	3.69	0.00	75.19	69.17	110.80	41.63
5700.00	32.09	PK	V	34.18	3.68	0.00	69.95	63.93	105.20	41.27
5650.00	32.35	PK	V	34.16	3.63	0.00	70.14	64.12	68.20	4.08
11490.00	47.57	PK	V	38.99	6.59	25.51	67.64	61.62	74.00	12.38
11490.00	34.69	AV	V	38.99	6.59	25.51	54.76	48.74	54.00	5.26
17235.00	37.24	PK	V	41.56	8.78	23.72	63.86	57.84	68.20	10.36
Middle Channel: 5785 MHz										
5785.00	66.54	PK	H	34.21	3.71	0.00	104.46	98.44	N/A	N/A
5785.00	56.20	AV	H	34.21	3.71	0.00	94.12	88.1	N/A	N/A
5785.00	71.21	PK	V	34.21	3.71	0.00	109.13	103.11	N/A	N/A
5785.00	64.10	AV	V	34.21	3.71	0.00	102.02	96	N/A	N/A
11570.00	46.50	PK	V	39.00	6.61	25.46	66.65	60.63	74.00	13.37
11570.00	34.57	AV	V	39.00	6.61	25.46	54.72	48.7	54.00	5.30
17355.00	36.10	PK	V	42.26	8.81	23.60	63.57	57.55	68.20	10.65
High Channel: 5825 MHz										
5825.00	64.80	PK	H	34.23	3.73	0.00	102.76	96.74	N/A	N/A
5825.00	54.87	AV	H	34.23	3.73	0.00	92.83	86.81	N/A	N/A
5825.00	70.36	PK	V	34.23	3.73	0.00	108.32	102.3	N/A	N/A
5825.00	61.28	AV	V	34.23	3.73	0.00	99.24	93.22	N/A	N/A
5850.00	38.80	PK	V	34.24	3.75	0.00	76.79	70.77	122.20	51.43
5855.00	36.33	PK	V	34.24	3.75	0.00	74.32	68.3	110.80	42.50
5875.00	35.50	PK	V	34.25	3.77	0.00	73.52	67.5	105.20	37.70
5925.00	33.21	PK	V	34.27	3.80	0.00	71.28	65.26	68.20	2.94
11650.00	45.63	PK	V	39.00	6.64	25.41	65.86	59.84	74.00	14.16
11650.00	34.56	AV	V	39.00	6.64	25.41	54.79	48.77	54.00	5.23
17475.00	36.32	PK	V	42.96	8.84	23.48	64.64	58.62	68.20	9.58

802.11a, Chain 1

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	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	68.25	PK	H	34.20	3.69	0.00	106.14	100.12	N/A	N/A
5745.00	58.18	AV	H	34.20	3.69	0.00	96.07	90.05	N/A	N/A
5745.00	73.14	PK	V	34.20	3.69	0.00	111.03	105.01	N/A	N/A
5745.00	63.54	AV	V	34.20	3.69	0.00	101.43	95.41	N/A	N/A
5725.00	51.88	PK	V	34.19	3.69	0.00	89.76	83.74	122.20	38.46
5720.00	37.69	PK	V	34.19	3.69	0.00	75.57	69.55	110.80	41.25
5700.00	33.19	PK	V	34.18	3.68	0.00	71.05	65.03	105.20	40.17
5650.00	32.87	PK	V	34.16	3.63	0.00	70.66	64.64	68.20	3.56
11490.00	48.84	PK	V	38.99	6.59	25.51	68.91	62.89	74.00	11.11
11490.00	36.39	AV	V	38.99	6.59	25.51	56.46	50.44	54.00	3.56
17235.00	37.89	PK	V	41.56	8.78	23.72	64.51	58.49	68.20	9.71
Middle Channel: 5785 MHz										
5785.00	66.56	PK	H	34.21	3.71	0.00	104.48	98.46	N/A	N/A
5785.00	56.11	AV	H	34.21	3.71	0.00	94.03	88.01	N/A	N/A
5785.00	72.54	PK	V	34.21	3.71	0.00	110.46	104.44	N/A	N/A
5785.00	65.25	AV	V	34.21	3.71	0.00	103.17	97.15	N/A	N/A
11570.00	47.87	PK	V	39.00	6.61	25.46	68.02	62	74.00	12.00
11570.00	36.21	AV	V	39.00	6.61	25.46	56.36	50.34	54.00	3.66
17355.00	37.00	PK	V	42.26	8.81	23.60	64.47	58.45	68.20	9.75
High Channel: 5825 MHz										
5825.00	63.03	PK	H	34.23	3.73	0.00	100.99	94.97	N/A	N/A
5825.00	54.37	AV	H	34.23	3.73	0.00	92.33	86.31	N/A	N/A
5825.00	67.38	PK	V	34.23	3.73	0.00	105.34	99.32	N/A	N/A
5825.00	57.75	AV	V	34.23	3.73	0.00	95.71	89.69	N/A	N/A
5850.00	33.92	PK	V	34.24	3.75	0.00	71.91	65.89	122.20	56.31
5855.00	33.24	PK	V	34.24	3.75	0.00	71.23	65.21	110.80	45.59
5875.00	34.24	PK	V	34.25	3.77	0.00	72.26	66.24	105.20	38.96
5925.00	33.35	PK	V	34.27	3.80	0.00	71.42	65.4	68.20	2.80
11650.00	46.27	PK	V	39.00	6.64	25.41	66.50	60.48	74.00	13.52
11650.00	35.21	AV	V	39.00	6.64	25.41	55.44	49.42	54.00	4.58
17475.00	36.00	PK	V	42.96	8.84	23.48	64.32	58.3	68.20	9.90

802.11n ht20(2Tx was the worst)

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	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	69.20	PK	H	34.20	3.69	0.00	107.09	101.07	N/A	N/A
5745.00	62.11	AV	H	34.20	3.69	0.00	100.00	93.98	N/A	N/A
5745.00	74.16	PK	V	34.20	3.69	0.00	112.05	106.03	N/A	N/A
5745.00	66.91	AV	V	34.20	3.69	0.00	104.80	98.78	N/A	N/A
5725.00	40.92	PK	V	34.19	3.69	0.00	78.80	72.78	122.20	49.42
5720.00	33.22	PK	V	34.19	3.69	0.00	71.10	65.08	110.80	45.72
5700.00	32.48	PK	V	34.18	3.68	0.00	70.34	64.32	105.20	40.88
5650.00	32.25	PK	V	34.16	3.63	0.00	70.04	64.02	68.20	4.18
11490.00	41.13	PK	V	38.99	6.59	25.51	61.20	55.18	74.00	18.82
11490.00	29.86	AV	V	38.99	6.59	25.51	49.93	43.91	54.00	10.09
17235.00	37.36	PK	V	41.56	8.78	23.72	63.98	57.96	68.20	10.24
Middle Channel: 5785 MHz										
5785.00	68.20	PK	H	34.21	3.71	0.00	106.12	100.1	N/A	N/A
5785.00	60.80	AV	H	34.21	3.71	0.00	98.72	92.7	N/A	N/A
5785.00	73.45	PK	V	34.21	3.71	0.00	111.37	105.35	N/A	N/A
5785.00	65.70	AV	V	34.21	3.71	0.00	103.62	97.6	N/A	N/A
11570.00	43.20	PK	V	39.00	6.61	25.46	63.35	57.33	74.00	16.67
11570.00	29.80	AV	V	39.00	6.61	25.46	49.95	43.93	54.00	10.07
17355.00	37.10	PK	V	42.26	8.81	23.60	64.57	58.55	68.20	9.65
High Channel: 5825 MHz										
5825.00	67.25	PK	H	34.23	3.73	0.00	105.21	99.19	N/A	N/A
5825.00	60.10	AV	H	34.23	3.73	0.00	98.06	92.04	N/A	N/A
5825.00	72.60	PK	V	34.23	3.73	0.00	110.56	104.54	N/A	N/A
5825.00	65.60	AV	V	34.23	3.73	0.00	103.56	97.54	N/A	N/A
5850.00	34.05	PK	V	34.24	3.75	0.00	72.04	66.02	122.20	56.18
5855.00	33.62	PK	V	34.24	3.75	0.00	71.61	65.59	110.80	45.21
5875.00	34.28	PK	V	34.25	3.77	0.00	72.30	66.28	105.20	38.92
5925.00	33.82	PK	V	34.27	3.80	0.00	71.89	65.87	68.20	2.33
11650.00	44.25	PK	V	39.00	6.64	25.41	64.48	58.46	74.00	15.54
11650.00	29.30	AV	V	39.00	6.64	25.41	49.53	43.51	54.00	10.49
17475.00	37.20	PK	V	42.96	8.84	23.48	65.52	59.5	68.20	8.70

802.11n ht40(2Tx was the worst)

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	Polar (H/V)	Factor (dB/m)						
Low Channel: 5755 MHz										
5755.00	66.20	PK	H	34.20	3.70	0.00	104.10	98.08	N/A	N/A
5755.00	58.08	AV	H	34.20	3.70	0.00	95.98	89.96	N/A	N/A
5755.00	71.05	PK	V	34.20	3.70	0.00	108.95	102.93	N/A	N/A
5755.00	63.20	AV	V	34.20	3.70	0.00	101.10	95.08	N/A	N/A
5725.00	41.95	PK	V	34.19	3.69	0.00	79.83	73.81	122.20	48.39
5720.00	44.52	PK	V	34.19	3.69	0.00	82.40	76.38	110.80	34.42
5700.00	33.02	PK	V	34.18	3.68	0.00	70.88	64.86	105.20	40.34
5650.00	32.62	PK	V	34.16	3.63	0.00	70.41	64.39	68.20	3.81
11510.00	41.28	PK	V	39.00	6.59	25.50	61.37	55.35	74.00	18.65
11510.00	28.49	AV	V	39.00	6.59	25.50	48.58	42.56	54.00	11.44
17265.00	36.45	PK	V	41.74	8.79	23.69	63.29	57.27	68.20	10.93
High Channel: 5795 MHz										
5795.00	65.80	PK	H	34.22	3.71	0.00	103.73	97.71	N/A	N/A
5795.00	57.21	AV	H	34.22	3.71	0.00	95.14	89.12	N/A	N/A
5795.00	70.88	PK	V	34.22	3.71	0.00	108.81	102.79	N/A	N/A
5795.00	63.80	AV	V	34.22	3.71	0.00	101.73	95.71	N/A	N/A
5850.00	34.13	PK	V	34.24	3.75	0.00	72.12	66.1	122.20	56.10
5855.00	34.30	PK	V	34.24	3.75	0.00	72.29	66.27	110.80	44.53
5875.00	33.75	PK	V	34.25	3.77	0.00	71.77	65.75	105.20	39.45
5925.00	34.20	PK	V	34.27	3.80	0.00	72.27	66.25	68.20	1.95
11590.00	40.95	PK	V	39.00	6.62	25.45	61.12	55.1	74.00	18.90
11590.00	27.96	AV	V	39.00	6.62	25.45	48.13	42.11	54.00	11.89
17385.00	37.10	PK	V	42.43	8.82	23.57	64.78	58.76	68.20	9.44

802.11 ac20(2Tx was the worst)

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	Polar (H/V)	Factor (dB/m)						
Low Channel: 5745 MHz										
5745.00	70.51	PK	H	34.20	3.69	0.00	108.40	102.38	N/A	N/A
5745.00	64.58	AV	H	34.20	3.69	0.00	102.47	96.45	N/A	N/A
5745.00	75.55	PK	V	34.20	3.69	0.00	113.44	107.42	N/A	N/A
5745.00	67.75	AV	V	34.20	3.69	0.00	105.64	99.62	N/A	N/A
5725.00	39.98	PK	V	34.19	3.69	0.00	77.86	71.84	122.20	50.36
5720.00	33.66	PK	V	34.19	3.69	0.00	71.54	65.52	110.80	45.28
5700.00	33.04	PK	V	34.18	3.68	0.00	70.90	64.88	105.20	40.32
5650.00	31.76	PK	V	34.16	3.63	0.00	69.55	63.53	68.20	4.67
11490.00	41.99	PK	V	38.99	6.59	25.51	62.06	56.04	74.00	17.96
11490.00	34.03	AV	V	38.99	6.59	25.51	54.10	48.08	54.00	5.92
17235.00	37.63	PK	V	41.56	8.78	23.72	64.25	58.23	68.20	9.97
Middle Channel: 5785 MHz										
5785.00	70.20	PK	H	34.21	3.71	0.00	108.12	102.1	N/A	N/A
5785.00	64.20	AV	H	34.21	3.71	0.00	102.12	96.1	N/A	N/A
5785.00	74.50	PK	V	34.21	3.71	0.00	112.42	106.4	N/A	N/A
5785.00	67.00	AV	V	34.21	3.71	0.00	104.92	98.9	N/A	N/A
11570.00	44.21	PK	V	39.00	6.61	25.46	64.36	58.34	74.00	15.66
11570.00	34.12	AV	V	39.00	6.61	25.46	54.27	48.25	54.00	5.75
17355.00	37.54	PK	V	42.26	8.81	23.60	65.01	58.99	68.20	9.21
High Channel: 5825 MHz										
5825.00	70.52	PK	H	34.23	3.73	0.00	108.48	102.46	N/A	N/A
5825.00	64.85	AV	H	34.23	3.73	0.00	102.81	96.79	N/A	N/A
5825.00	74.31	PK	V	34.23	3.73	0.00	112.27	106.25	N/A	N/A
5825.00	67.78	AV	V	34.23	3.73	0.00	105.74	99.72	N/A	N/A
5850.00	33.91	PK	V	34.24	3.75	0.00	71.90	65.88	122.20	56.32
5855.00	34.74	PK	V	34.24	3.75	0.00	72.73	66.71	110.80	44.09
5875.00	33.85	PK	V	34.25	3.77	0.00	71.87	65.85	105.20	39.35
5925.00	34.73	PK	V	34.27	3.80	0.00	72.80	66.78	68.20	1.42
11650.00	44.35	PK	V	39.00	6.64	25.41	64.58	58.56	74.00	15.44
11650.00	34.68	AV	V	39.00	6.64	25.41	54.91	48.89	54.00	5.11
17475.00	37.24	PK	V	42.96	8.84	23.48	65.56	59.54	68.20	8.66

802.11 ac40(2Tx was the worst)

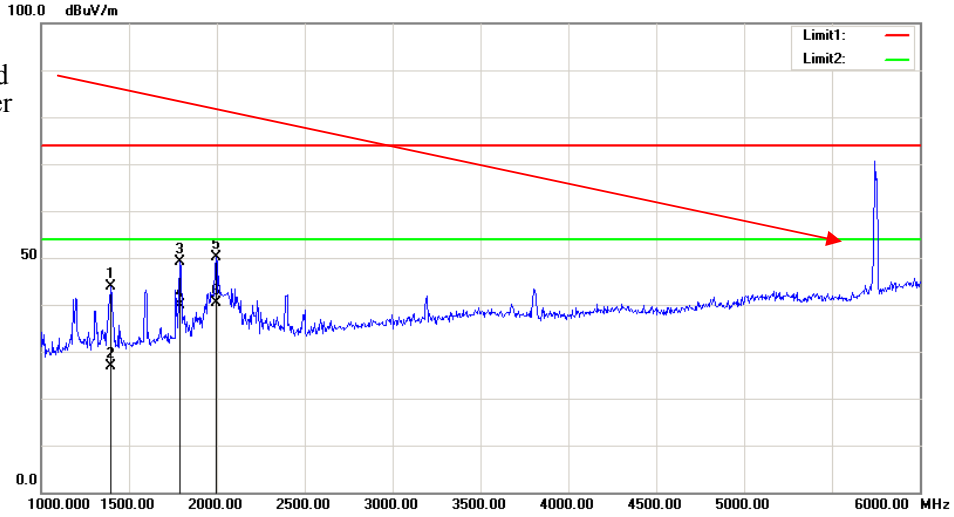
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5755 MHz										
5755.00	67.16	PK	H	34.20	3.70	0.00	105.06	99.04	N/A	N/A
5755.00	59.04	AV	H	34.20	3.70	0.00	96.94	90.92	N/A	N/A
5755.00	72.19	PK	V	34.20	3.70	0.00	110.09	104.07	N/A	N/A
5755.00	64.82	AV	V	34.20	3.70	0.00	102.72	96.7	N/A	N/A
5725.00	44.60	PK	V	34.19	3.69	0.00	82.48	76.46	122.20	45.74
5720.00	45.92	PK	V	34.19	3.69	0.00	83.80	77.78	110.80	33.02
5700.00	33.81	PK	V	34.18	3.68	0.00	71.67	65.65	105.20	39.55
5650.00	32.50	PK	V	34.16	3.63	0.00	70.29	64.27	68.20	3.93
11510.00	42.07	PK	V	39.00	6.59	25.50	62.16	56.14	74.00	17.86
11510.00	33.65	AV	V	39.00	6.59	25.50	53.74	47.72	54.00	6.28
17265.00	37.53	PK	V	41.74	8.79	23.69	64.37	58.35	68.20	9.85
High Channel: 5795 MHz										
5795.00	66.54	PK	H	34.22	3.71	0.00	104.47	98.45	N/A	N/A
5795.00	58.87	AV	H	34.22	3.71	0.00	96.80	90.78	N/A	N/A
5795.00	71.62	PK	V	34.22	3.71	0.00	109.55	103.53	N/A	N/A
5795.00	63.11	AV	V	34.22	3.71	0.00	101.04	95.02	N/A	N/A
5850.00	34.09	PK	V	34.24	3.75	0.00	72.08	66.06	122.20	56.14
5855.00	34.42	PK	V	34.24	3.75	0.00	72.41	66.39	110.80	44.41
5875.00	34.59	PK	V	34.25	3.77	0.00	72.61	66.59	105.20	38.61
5925.00	34.40	PK	V	34.27	3.80	0.00	72.47	66.45	68.20	1.75
11590.00	41.21	PK	V	39.00	6.62	25.45	61.38	55.36	74.00	18.64
11590.00	31.91	AV	V	39.00	6.62	25.45	52.08	46.06	54.00	7.94
17385.00	36.35	PK	V	42.43	8.82	23.57	64.03	58.01	68.20	10.19

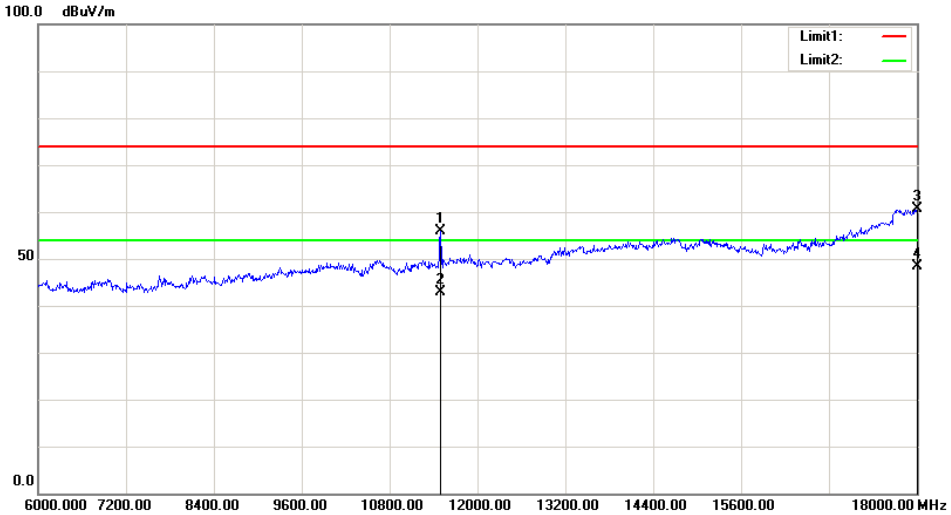
802.11 ac80(2Tx was the worst)

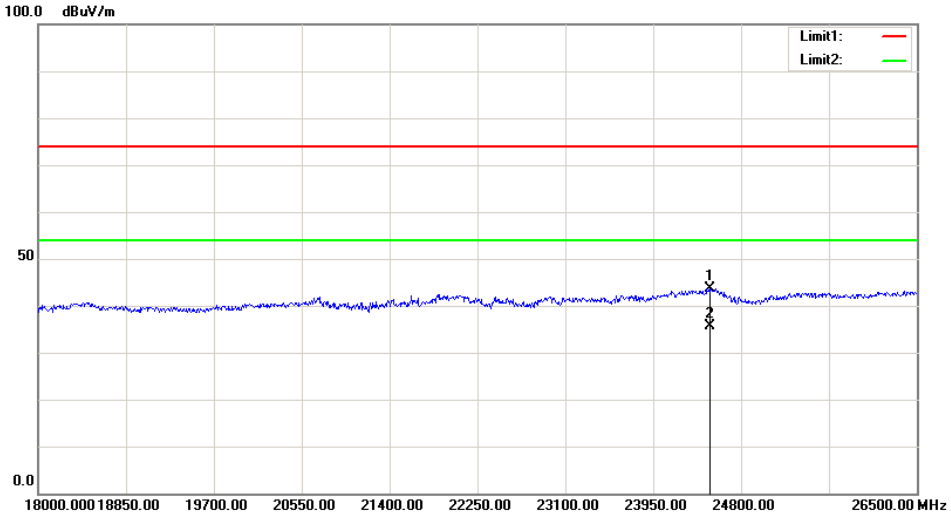
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Middle Channel: 5775 MHz										
5775.00	62.12	PK	H	34.21	3.70	0.00	100.03	94.01	N/A	N/A
5775.00	53.45	AV	H	34.21	3.70	0.00	91.36	85.34	N/A	N/A
5775.00	66.79	PK	V	34.21	3.70	0.00	104.70	98.68	N/A	N/A
5775.00	58.56	AV	V	34.21	3.70	0.00	96.47	90.45	N/A	N/A
5725.00	35.70	PK	V	34.19	3.69	0.00	73.58	67.56	122.20	54.64
5720.00	35.54	PK	V	34.19	3.69	0.00	73.42	67.4	110.80	43.40
5700.00	34.45	PK	V	34.18	3.68	0.00	72.31	66.29	105.20	38.91
5650.00	32.28	PK	V	34.16	3.63	0.00	70.07	64.05	68.20	4.15
5850.00	34.79	PK	V	34.24	3.75	0.00	72.78	66.76	122.20	55.44
5855.00	35.29	PK	V	34.24	3.75	0.00	73.28	67.26	110.80	43.54
5875.00	34.31	PK	V	34.25	3.77	0.00	72.33	66.31	105.20	38.89
5925.00	34.77	PK	V	34.27	3.80	0.00	72.84	66.82	68.20	1.38
11550.00	36.39	PK	V	39.00	6.61	25.48	56.52	50.5	74.00	23.50
11550.00	27.17	AV	V	39.00	6.61	25.48	47.30	41.28	54.00	12.72
17325.00	35.78	PK	V	42.09	8.80	23.63	63.04	57.02	68.20	11.18

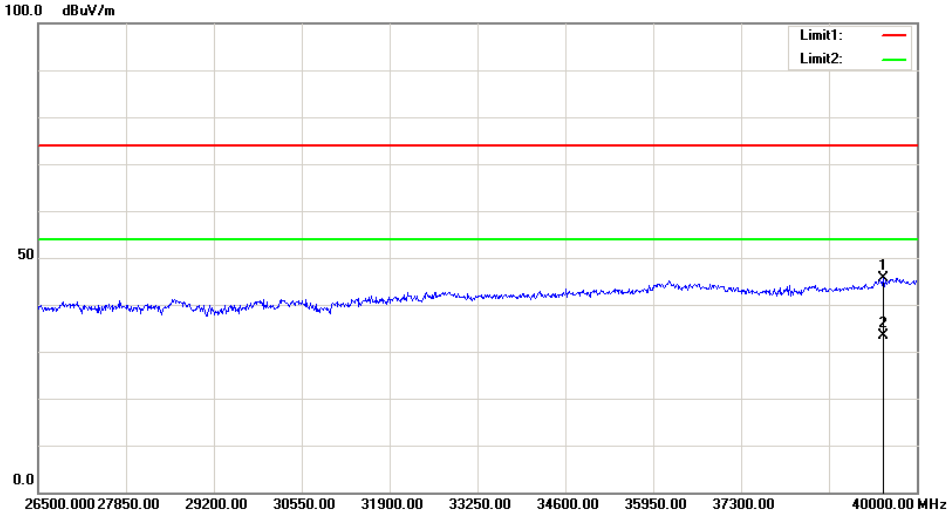
3) Test Plots(802.11a mode chain 1 5745MHz was the worst)
Horizontal

Fundamental Test with Band Rejection Filter



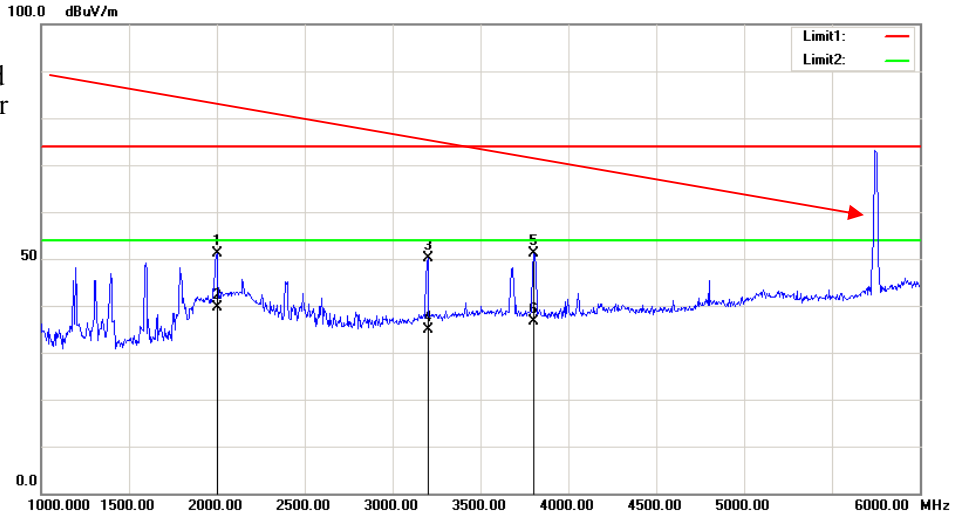


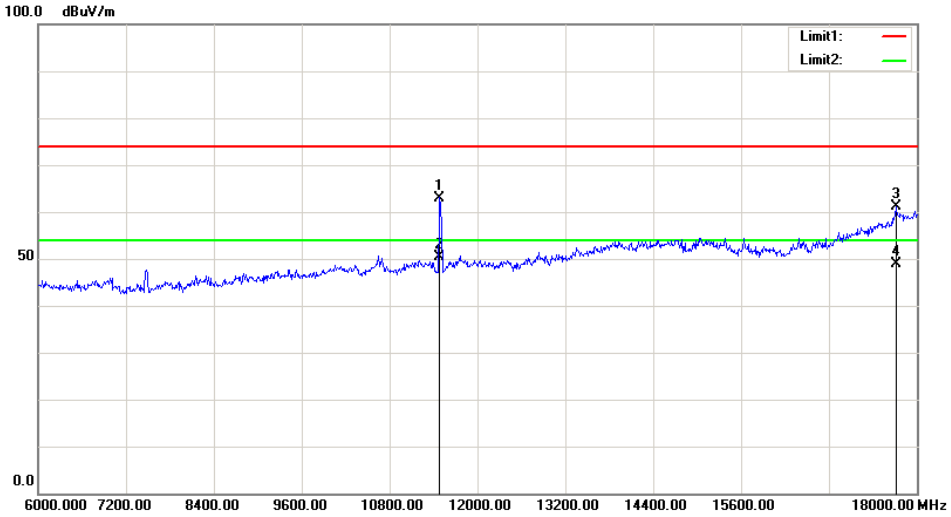


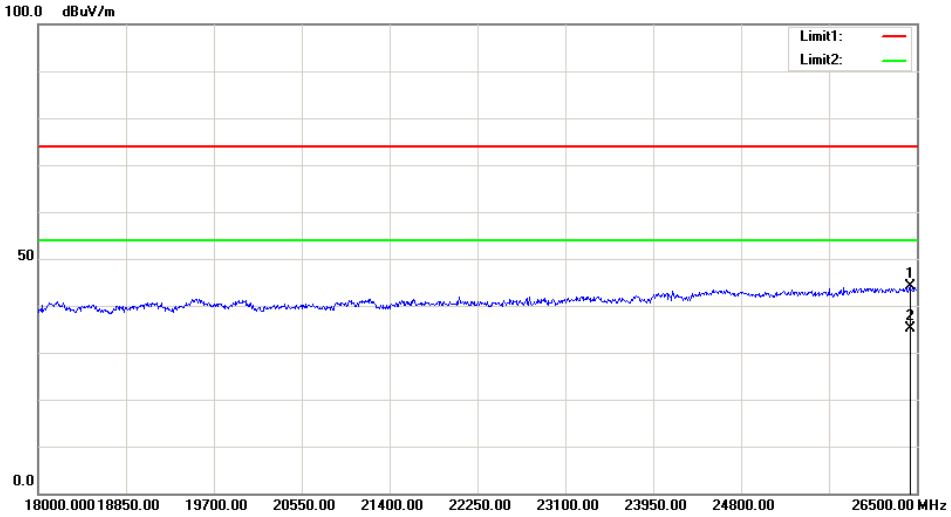


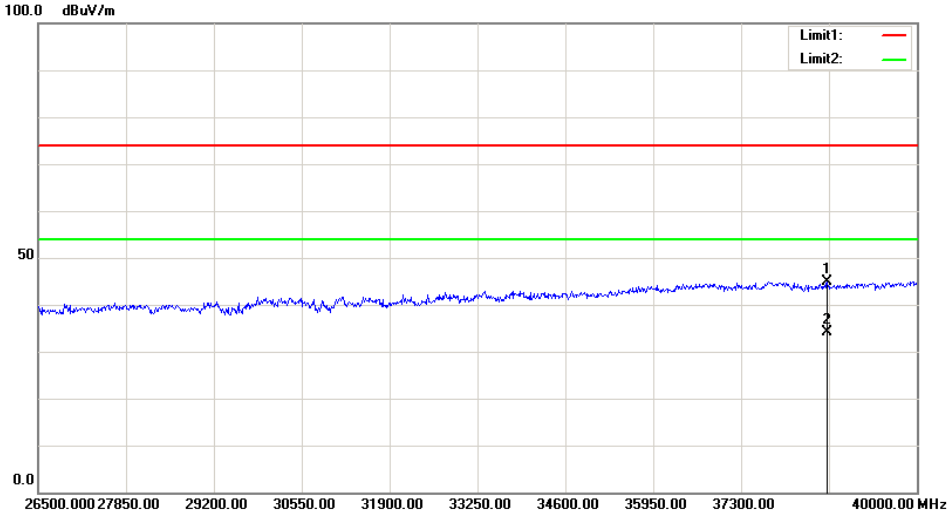
Vertical

Fundamental Test with Band Rejection Filter






100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

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	2019-05-09	2020-05-09
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41010013	2018-09-05	2020-09-05

*** 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

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

Test Data

Environmental Conditions

Temperature:	25.6°C
Relative Humidity:	60 %
ATM Pressure:	100.2 kPa

The testing was performed by Severn Zhu on 2019-11-24.

Test Result: Pass.

Please refer to the following tables and plots.

Test mode: Transmitting

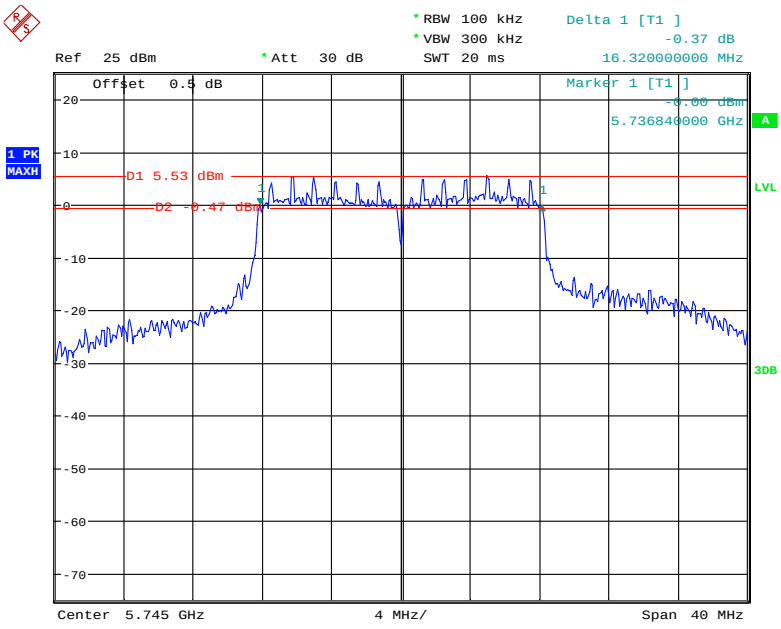
Note: Test was only performed at chain 0.

Mode	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11 a	5745	16.320	20.800
	5785	16.160	20.720
	5825	16.320	20.800
802.11n ht20	5745	16.640	17.920
	5785	16.640	18.000
	5825	16.880	18.080
802.11n ht40	5755	35.840	36.960
	5795	36.000	36.960
802.11 ac20	5745	17.440	18.160
	5785	17.520	18.080
	5825	17.520	18.160
802.11 ac40	5755	36.160	36.960
	5795	36.160	37.120
802.11 ac80	5775	75.200	75.840

Note 1: Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.
Note 2: the 99% Occupied Bandwidth have not fall into the band 5250-5350MHz or 5470-5725MHz, please refer to the test plots of 99% Occupied Bandwidth.

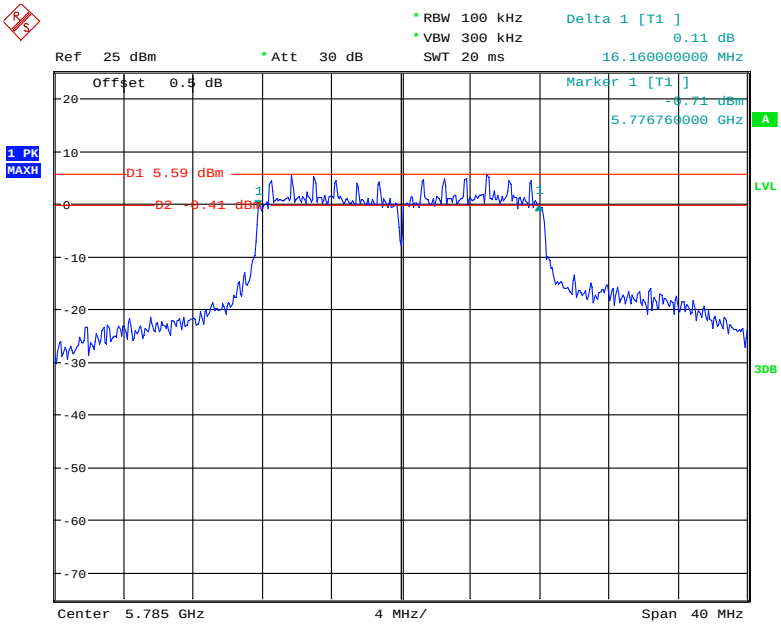
6dB Emission Bandwidth:

802.11a Low Channel



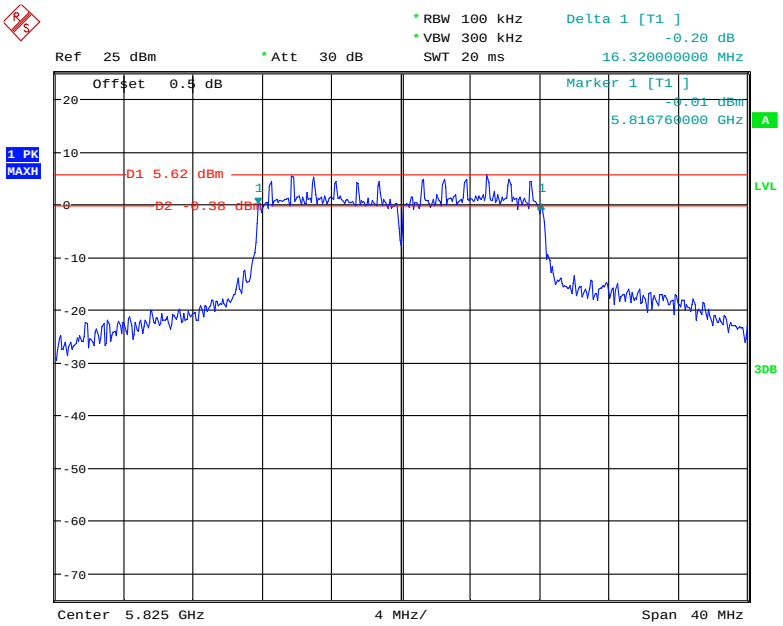
Date: 24.NOV.2019 16:59:01

802.11a Middle Channel



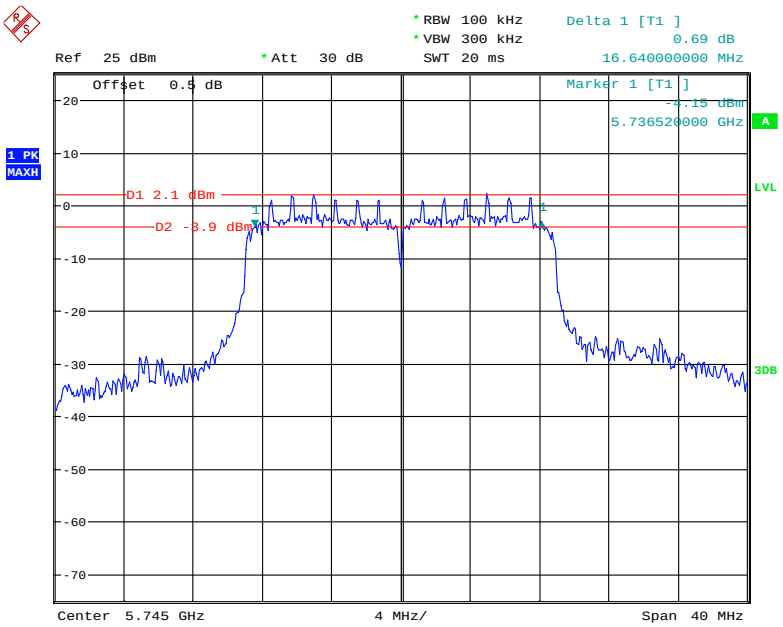
Date: 24.NOV.2019 17:00:28

802.11a High Channel



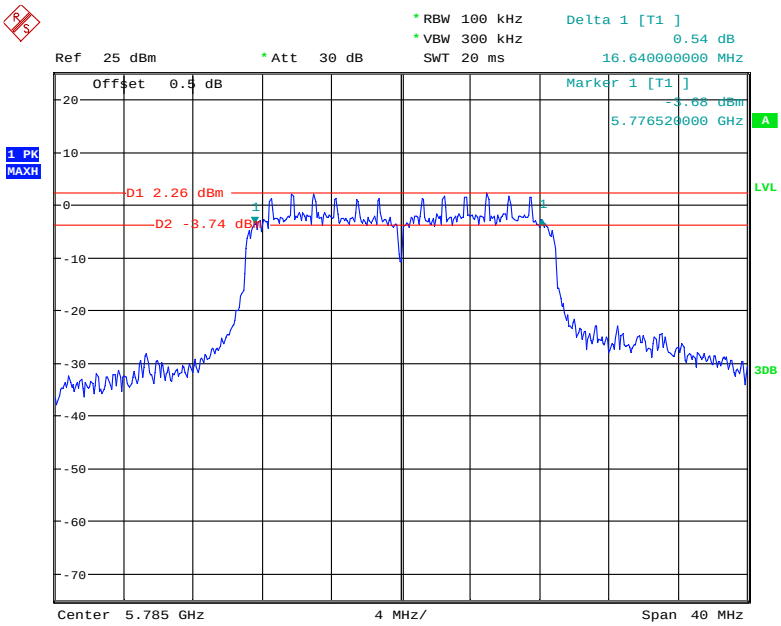
Date: 24.NOV.2019 17:01:55

802.11n ht20 Low Channel



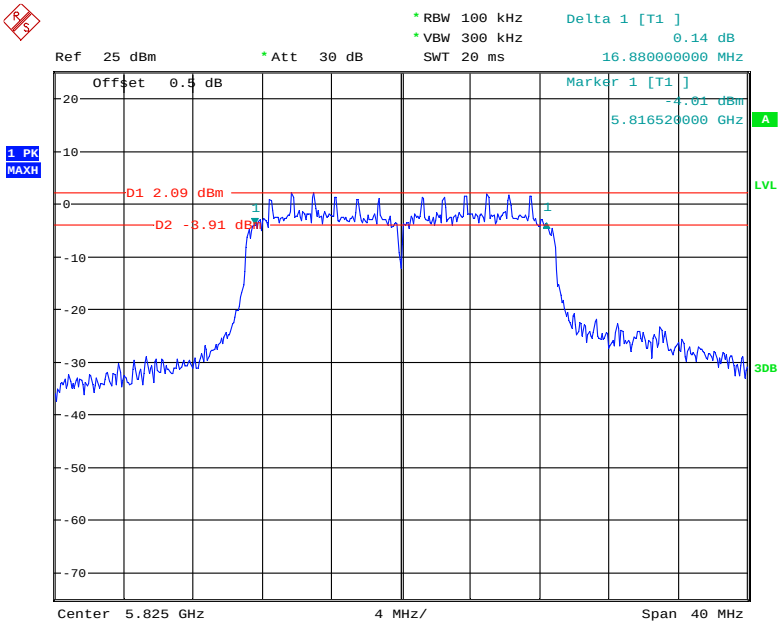
Date: 24.NOV.2019 15:56:07

802.11n ht20 Middle Channel



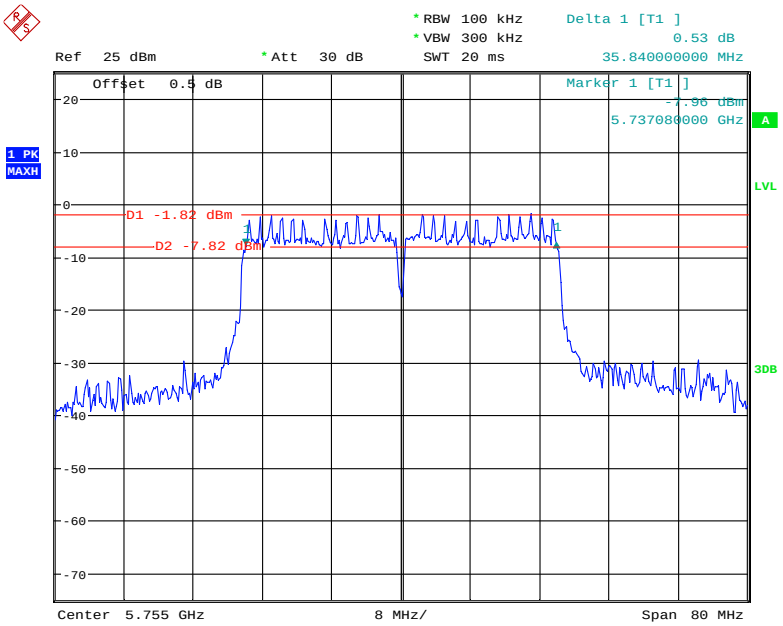
Date: 24.NOV.2019 15:59:05

802.11n ht20 High Channel



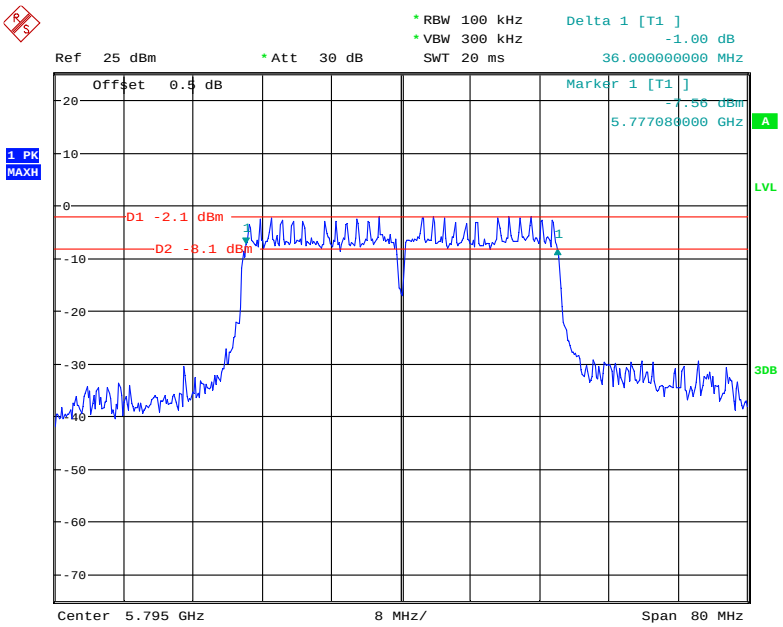
Date: 24.NOV.2019 16:00:23

802.11n ht40 Low Channel



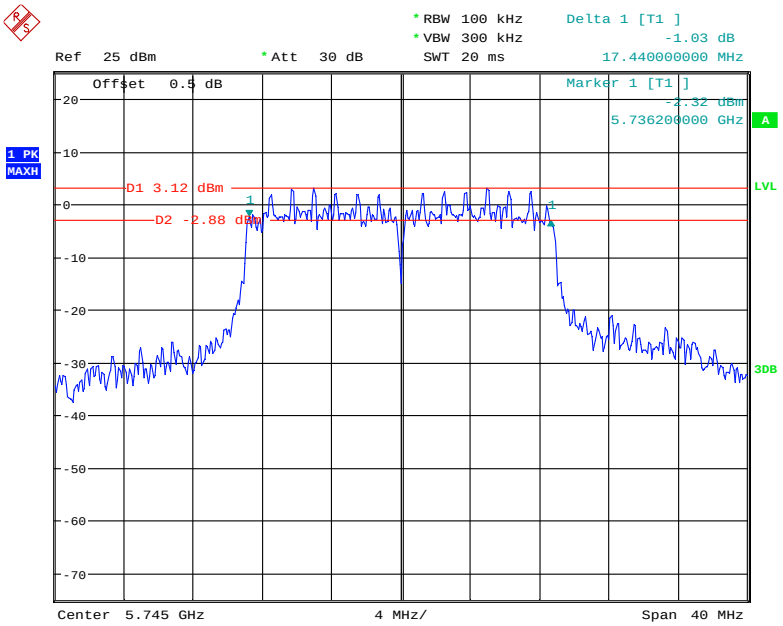
Date: 24.NOV.2019 16:17:54

802.11n ht40 High Channel



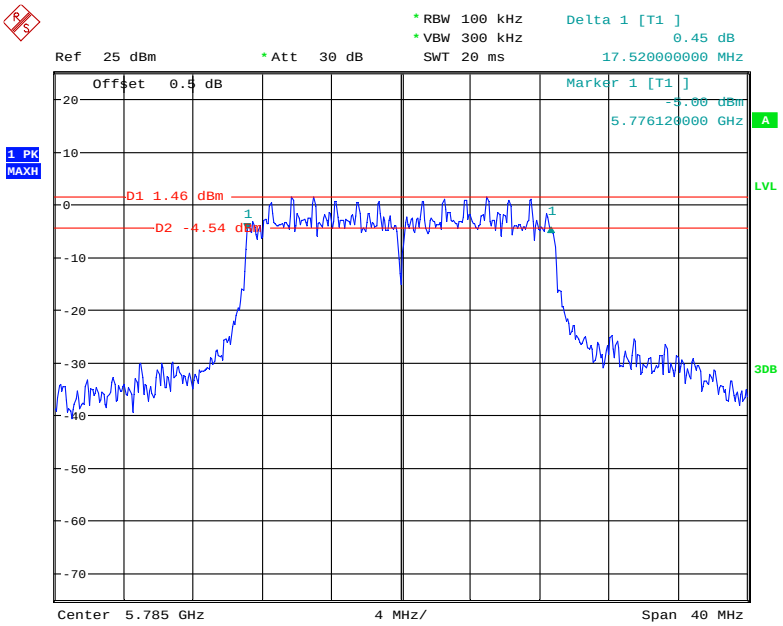
Date: 24.NOV.2019 16:16:59

802.11 ac20 Low Channel



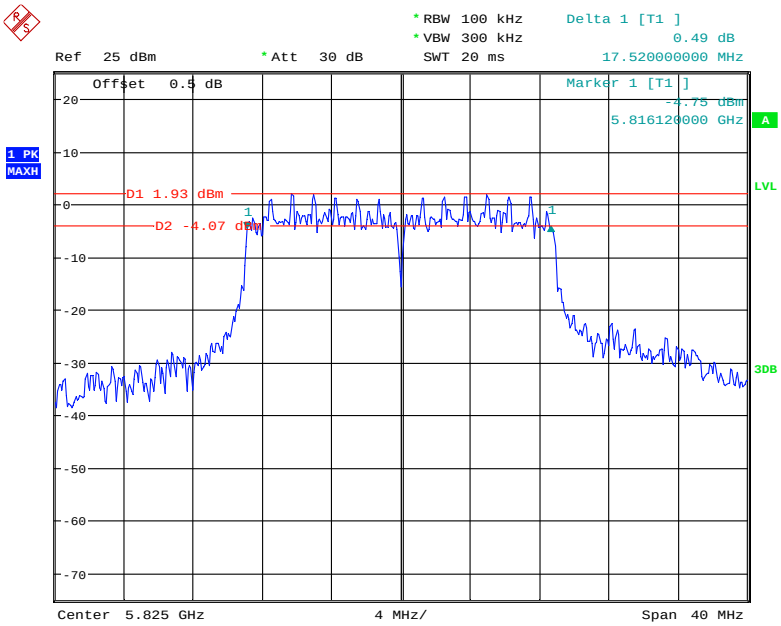
Date: 24.NOV.2019 16:20:35

802.11 ac20 Middle Channel



Date: 24.NOV.2019 16:22:19

802.11 ac20 High Channel



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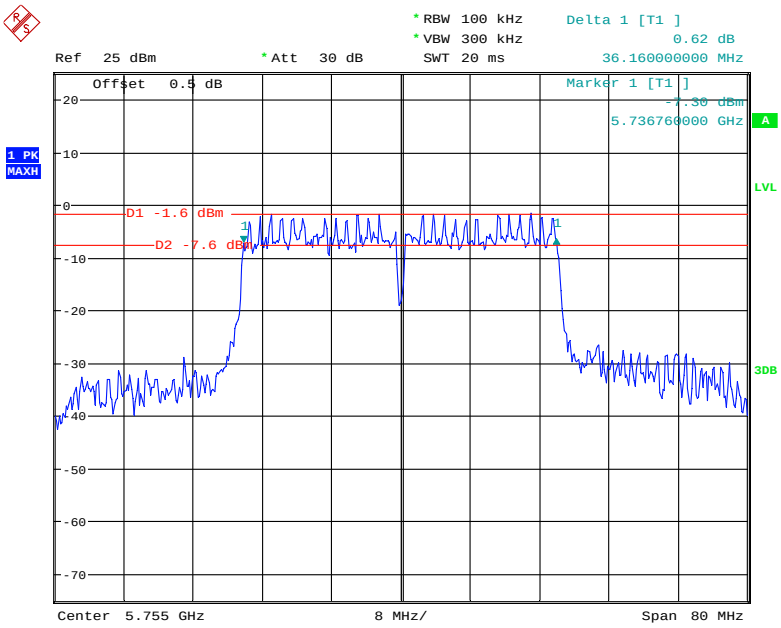
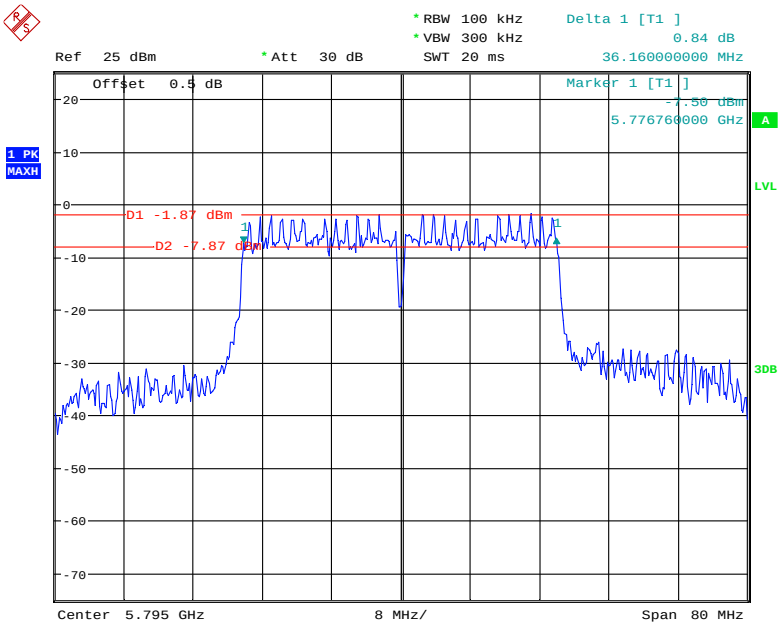
802.11ac40 Low Channel



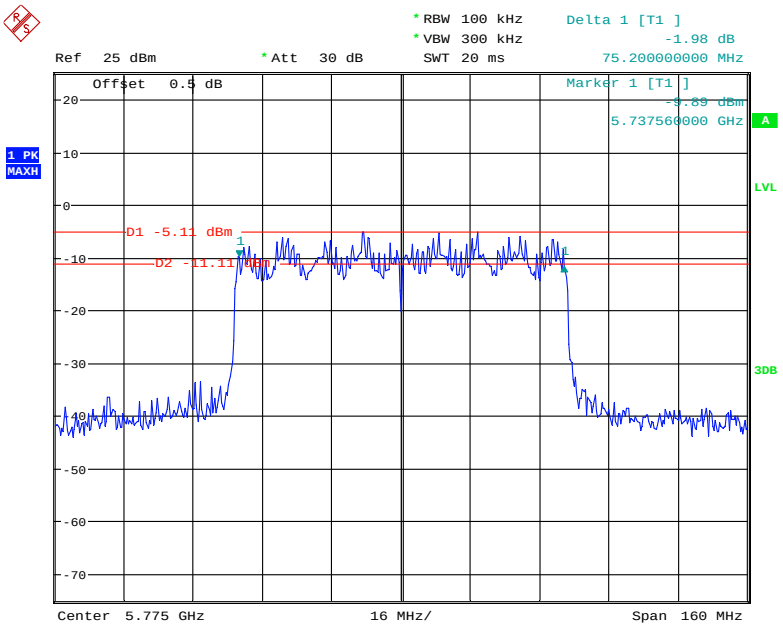
Date: 24.NOV.2019 16:36:51

802.11 ac40 High Channel



Date: 24.NOV.2019 16:38:25

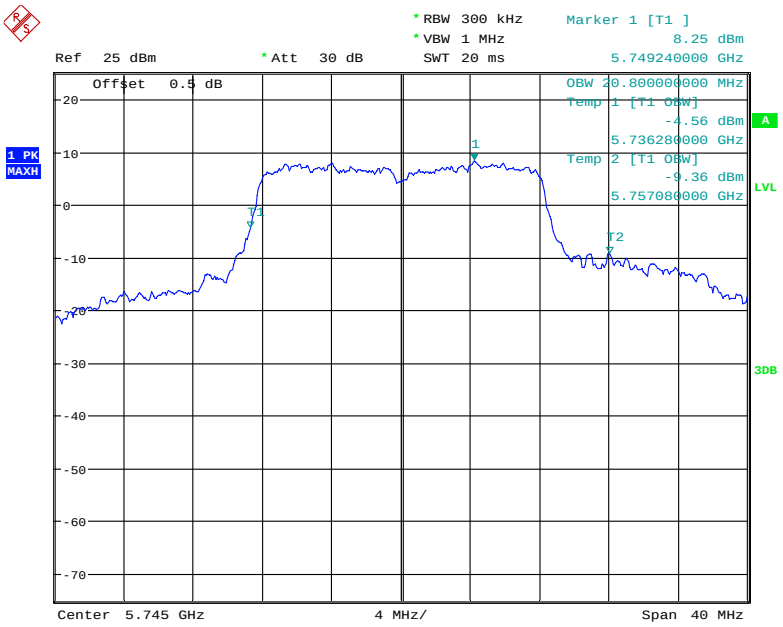
802.11 ac80 Middle Channel



Date: 24.NOV.2019 16:40:54

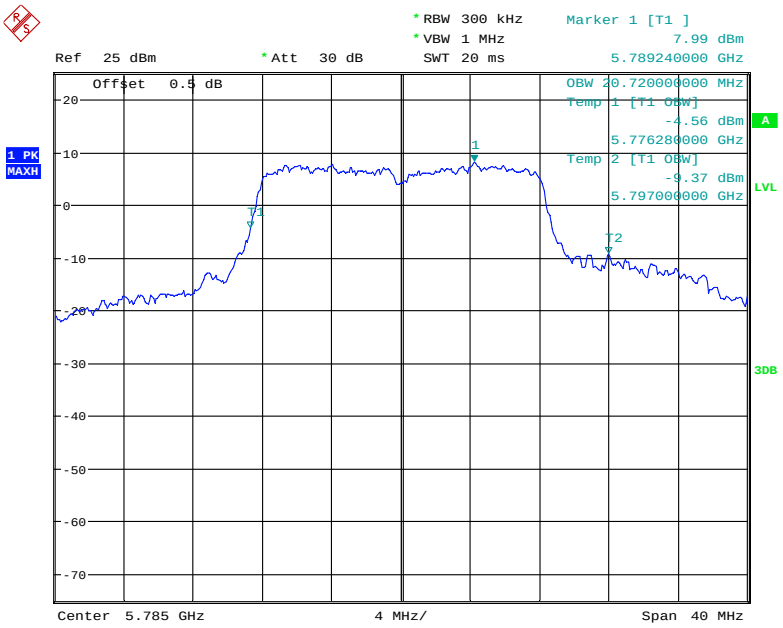
99% Occupied Bandwidth:

802.11a Low Channel



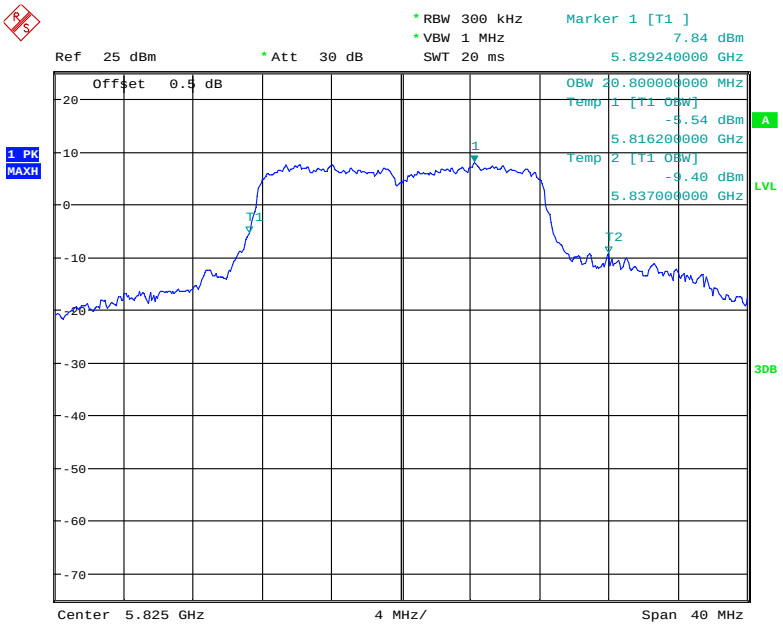
Date: 24.NOV.2019 16:59:11

802.11a Middle Channel



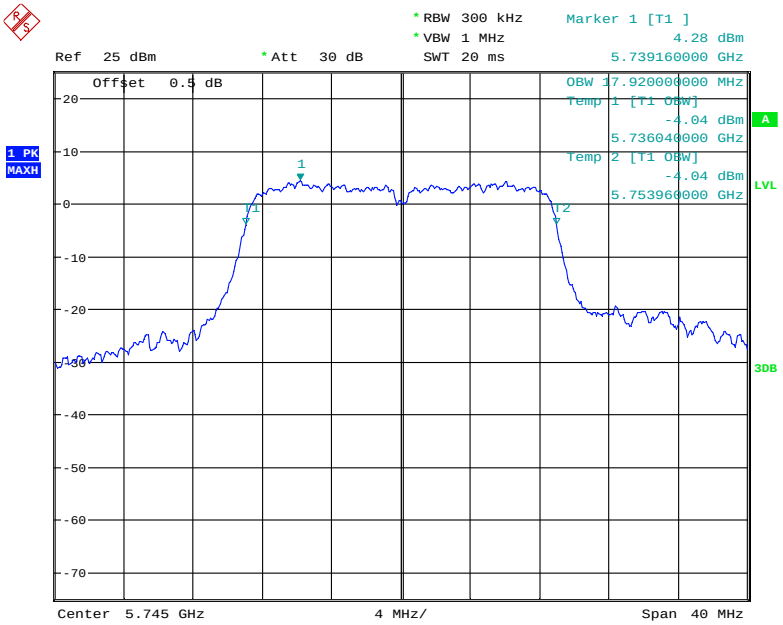
Date: 24.NOV.2019 17:00:37

802.11a High Channel



Date: 24.NOV.2019 17:27:01

802.11n ht20 Low Channel



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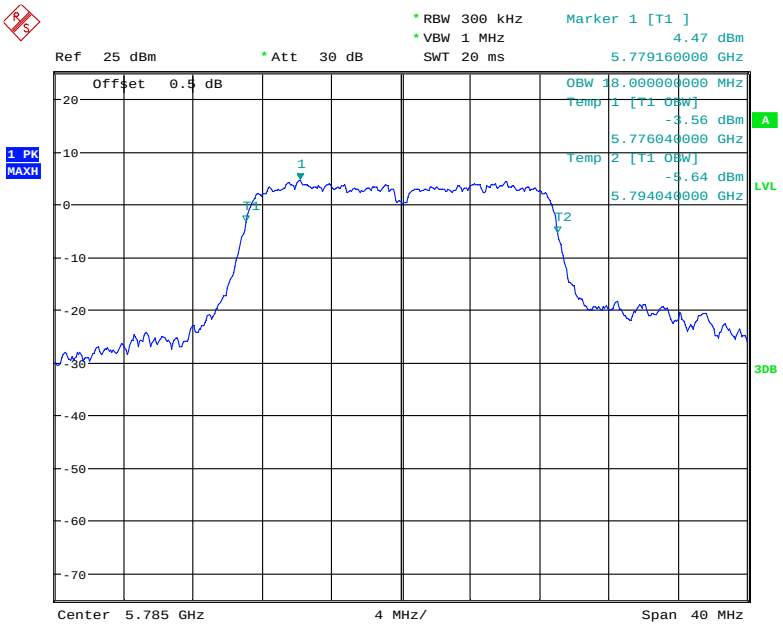
802.11n ht20 Middle Channel



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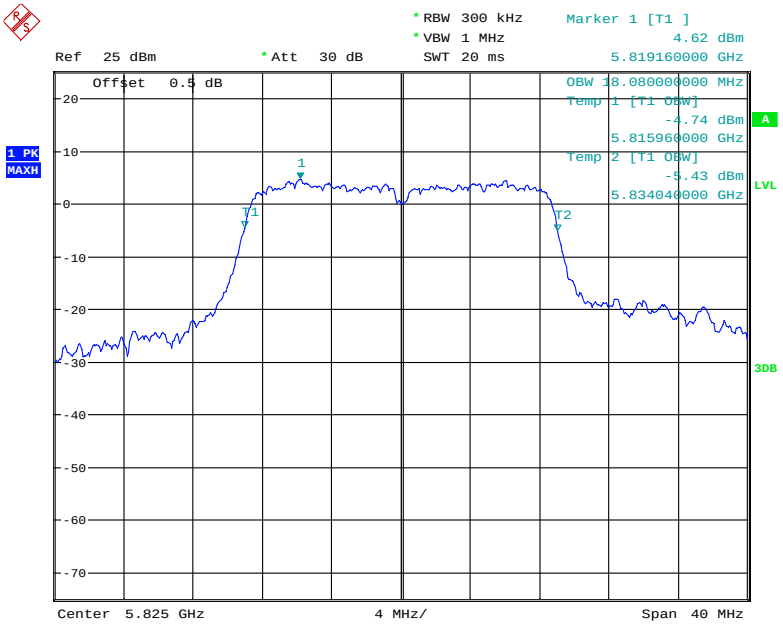
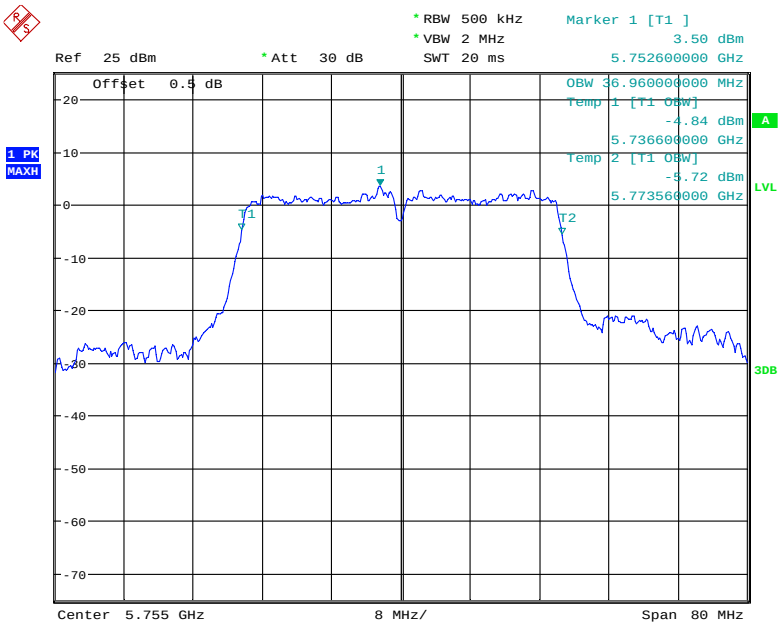
802.11n ht20 High Channel



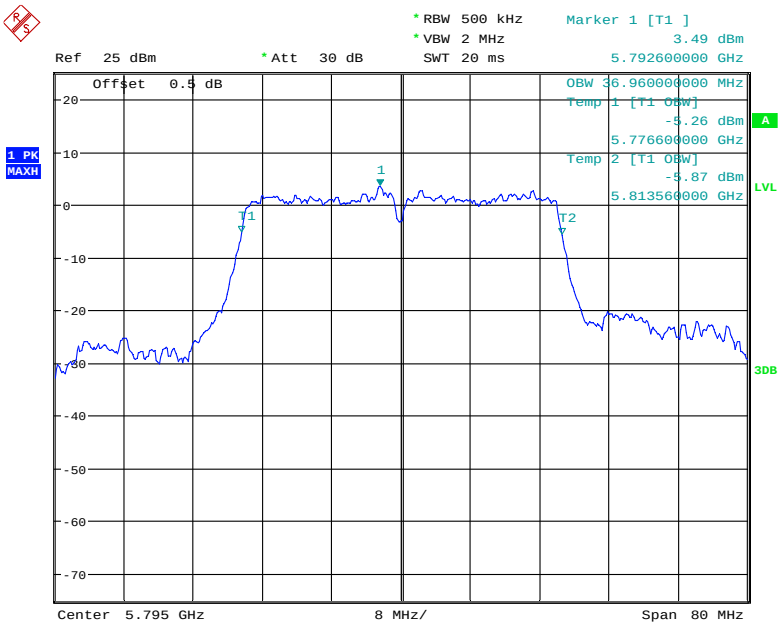
Date: 24.NOV.2019 16:00:32

802.11n ht40 Low Channel



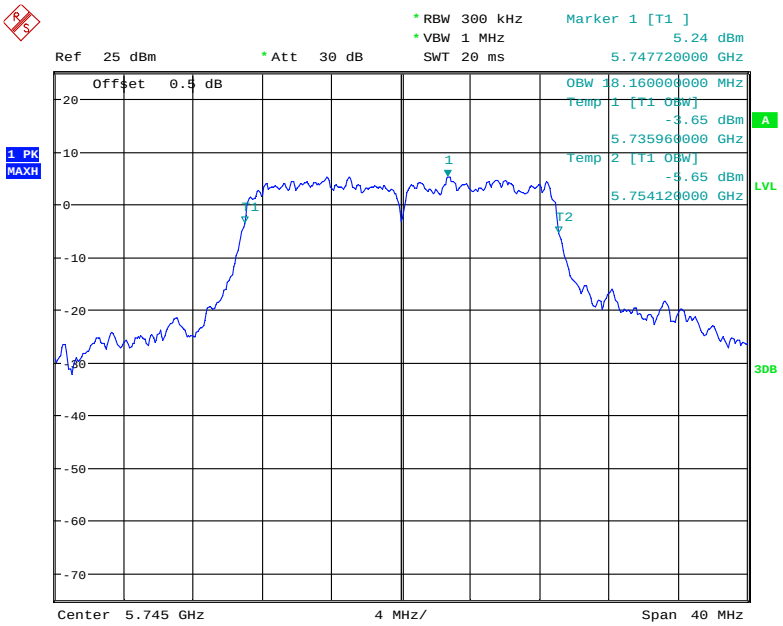
Date: 24.NOV.2019 16:18:03

802.11n ht40 High Channel

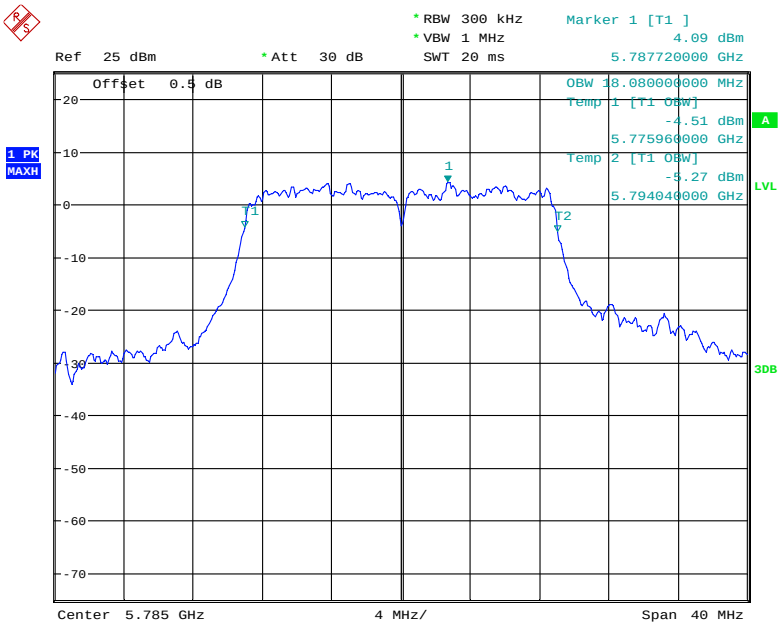


Date: 24.NOV.2019 16:17:08

802.11 ac20 Low Channel



802.11 ac20 Middle Channel



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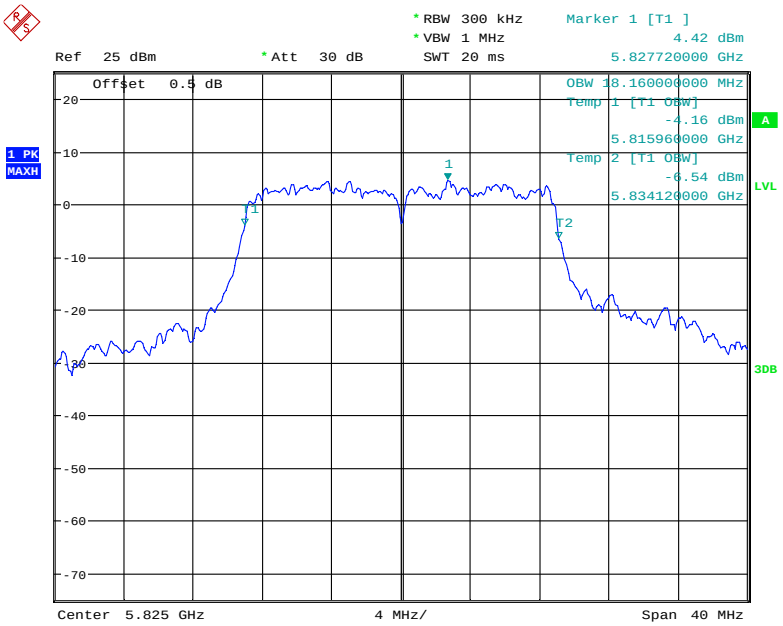
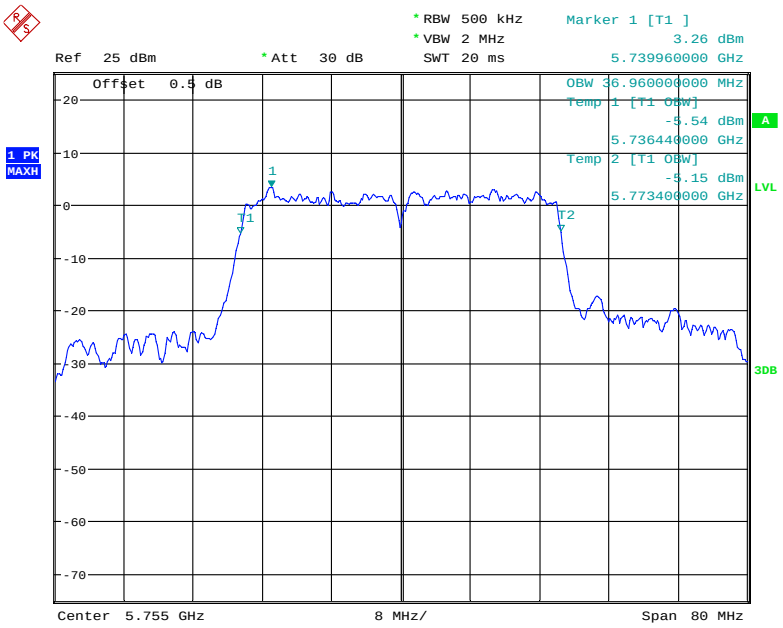


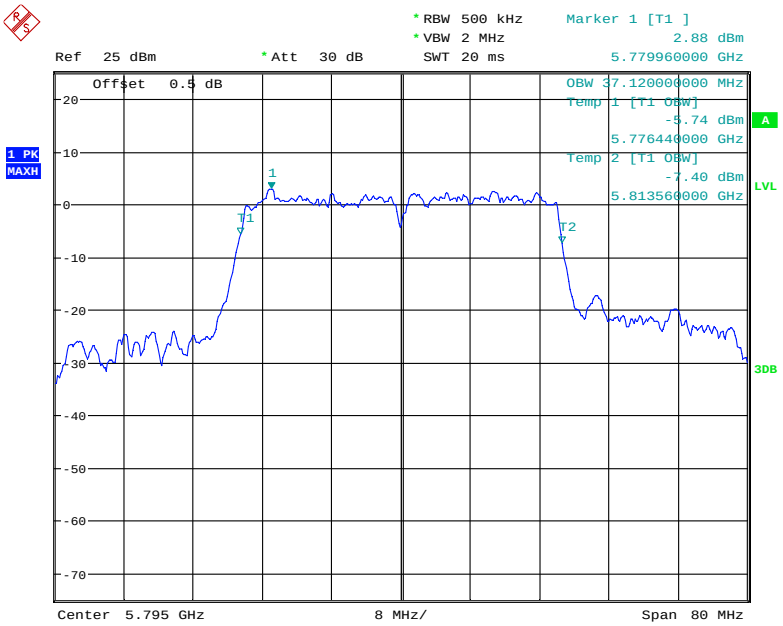
Date: 24.NOV.2019 16:24:59

802.11ac40 Low Channel



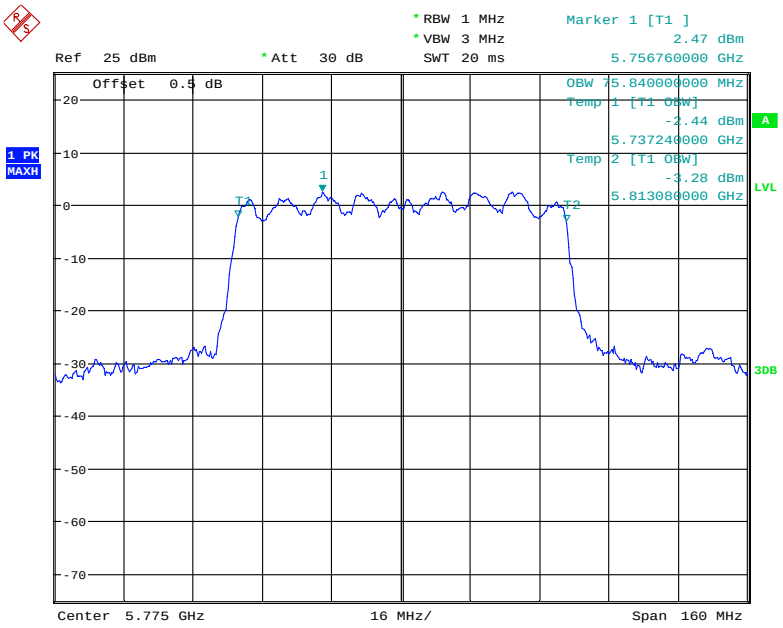
Date: 24.NOV.2019 16:37:00

802.11 ac40 High Channel



Date: 24.NOV.2019 16:38:34

802.11 ac80 Middle Channel



Date: 24.NOV.2019 16:41:03

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
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2019-09-23	2020-09-23
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2019-09-06	2020-09-06
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:	25.6°C
Relative Humidity:	60 %
ATM Pressure:	100.2 kPa

The testing was performed by Severn Zhu on 2019-11-24.

Test Mode: Transmitting

Band	Mode	Frequency (MHz)	Conducted Average Output Power (dBm)			Limit (dBm)
			Chain 0	Chain 1	Total	
5725 - 5850 MHz	802.11 a	5745	9.48	9.41	/	30
		5785	9.78	9.83	/	30
		5825	10.24	10.14	/	30
	802.11n ht20	5745	8.74	9.46	12.13	30
		5785	9.30	9.50	12.41	30
		5825	8.76	9.67	12.25	30
	802.11n ht40	5755	9.09	8.51	11.82	30
		5795	9.54	9.13	12.35	30
	802.11 ac20	5745	8.94	8.43	11.70	30
		5785	9.39	9.14	12.28	30
		5825	9.07	9.36	12.23	30
	802.11 ac40	5755	8.40	8.79	11.61	30
		5795	8.88	9.31	12.11	30
	802.11 ac80	5775	7.34	7.24	10.30	30

Note:
The duty cycle factor has been calculated into the test data.
The maximum antenna gain is 2.0 dBi.
The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

So:

Directional gain = G_{ANT} + Array Gain = 2.0 dBi < 6dBi

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	2019-05-09	2020-05-09
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41010013	2018-09-05	2020-09-05

*** 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 Data

Environmental Conditions

Temperature:	25.6°C
Relative Humidity:	60 %
ATM Pressure:	100.2 kPa

The testing was performed by Severn Zhu on 2019-11-24.

Test Mode: Transmitting

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

Mode	Frequency (MHz)	Result (dBm/500kHz)			Limit (dBm/500kHz)
		Chain 0	Chain 1	Total	
802.11a	5745	-6.15	-4.17	/	30
	5785	-5.77	-3.48	/	30
	5825	-5.24	-2.95	/	30
802.11n ht20	5745	-3.33	-3.58	-0.44	30
	5785	-2.74	-3.57	-0.12	30
	5825	-3.33	-3.11	-0.21	30
802.11n ht40	5755	-6.01	-7.31	-3.60	30
	5795	-5.39	-6.05	-2.70	30
802.11 ac20	5745	-2.48	-5.02	-0.56	30
	5785	-3.03	-4.05	-0.50	30
	5825	-4.14	-3.65	-0.88	30
802.11 ac40	5755	-7.10	-7.11	-4.09	30
	5795	-6.26	-6.25	-3.24	30
802.11 ac80	5775	-7.83	-8.46	-5.12	30

Note 1:
The maximum antenna gain is 2dBi in 5GHz band.
The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

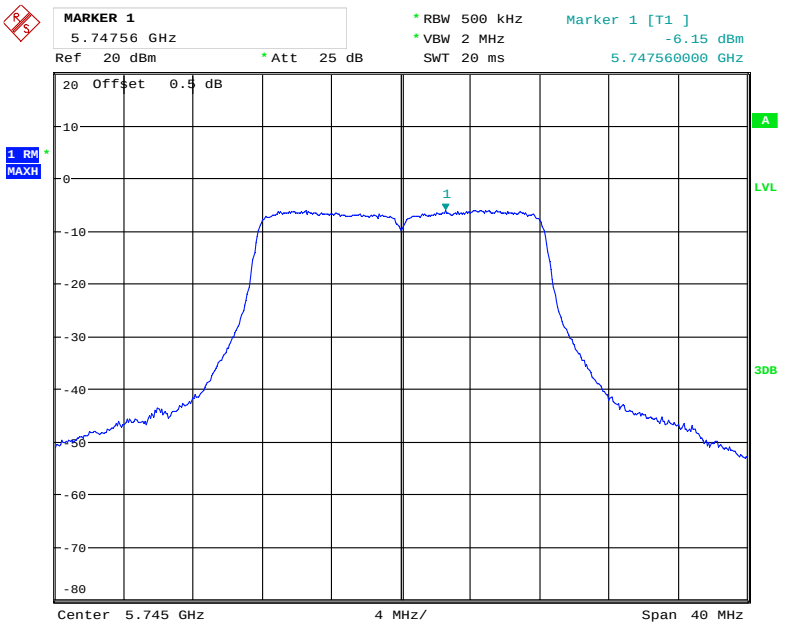
So:

Directional gain = G_{ANT} + Array Gain = 2dBi+10*log(2/1)=5dBi

Note 2: Method SA-3 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01was used for PSD test.

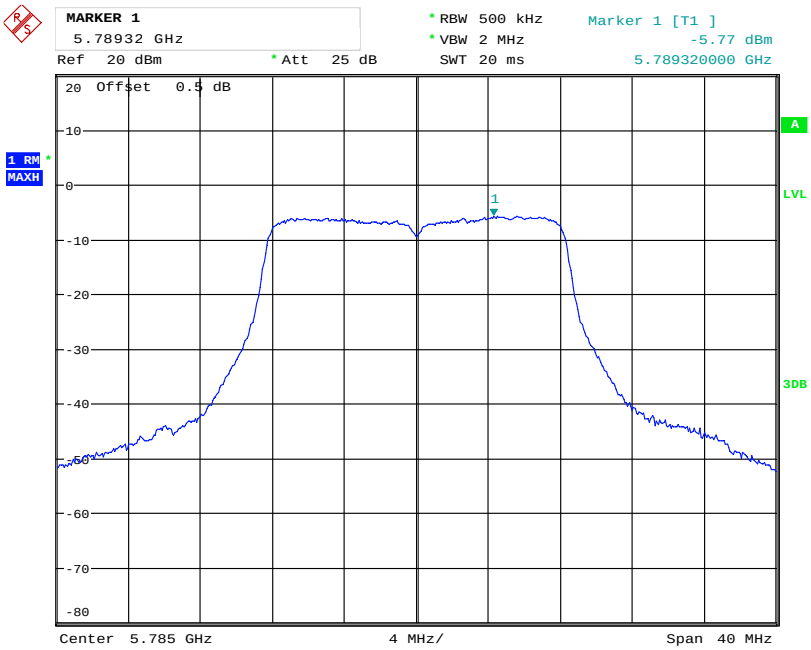
Chain 0:

802.11a Low Channel



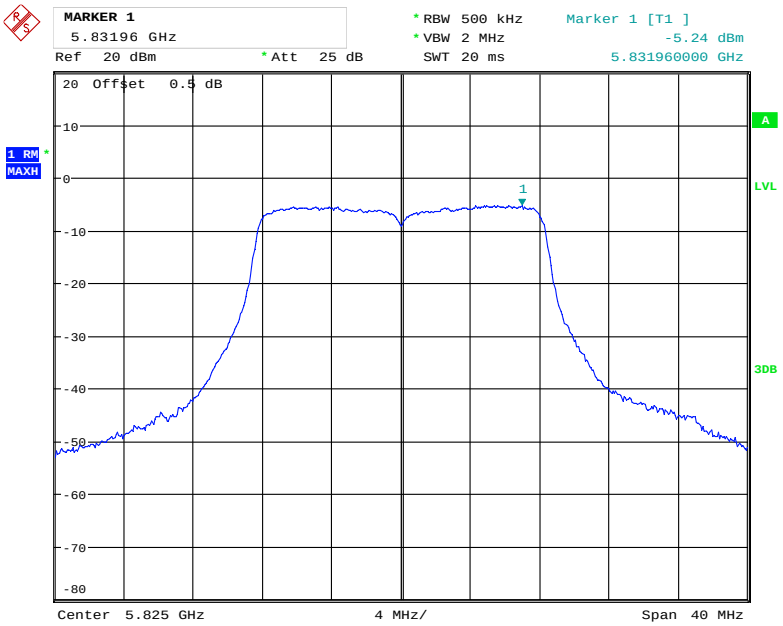
Date: 18.DEC.2019 15:28:12

802.11a Middle Channel



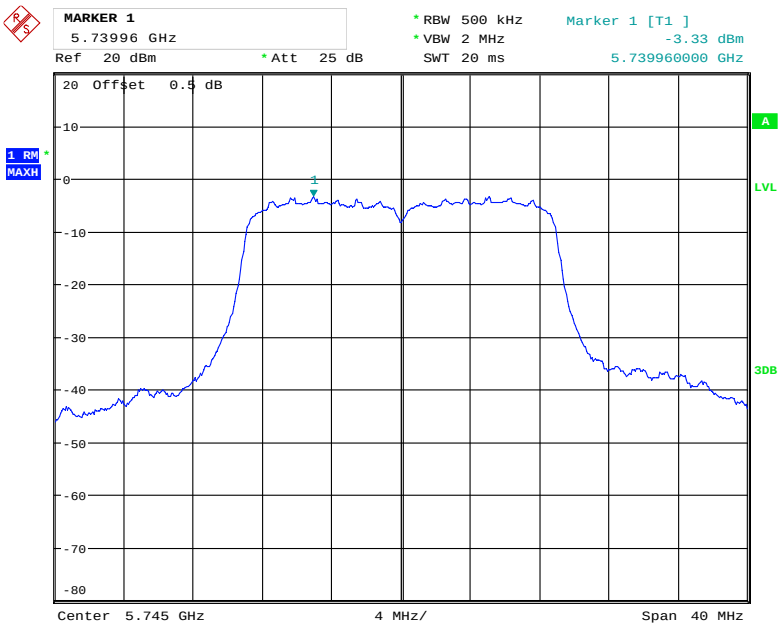
Date: 18.DEC.2019 15:29:21

802.11a High Channel



Date: 18.DEC.2019 15:30:01

802.11n ht20 Low Channel



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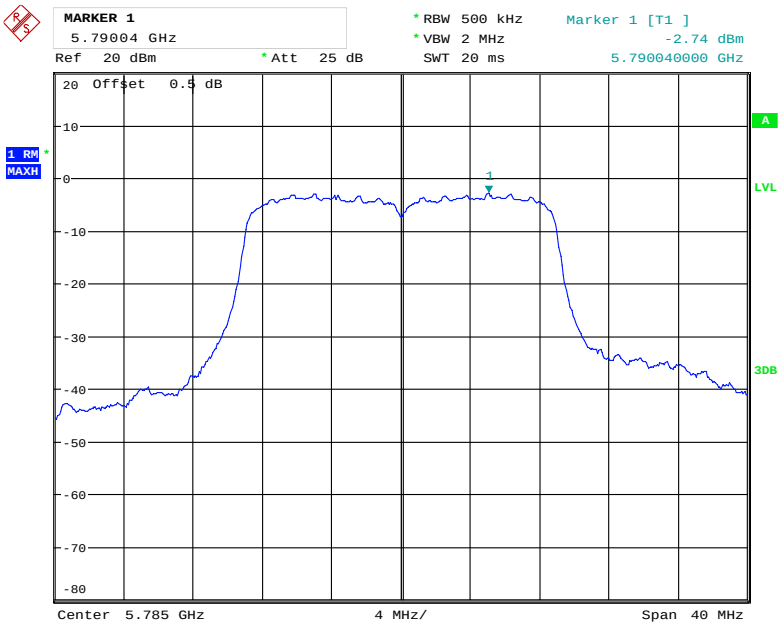

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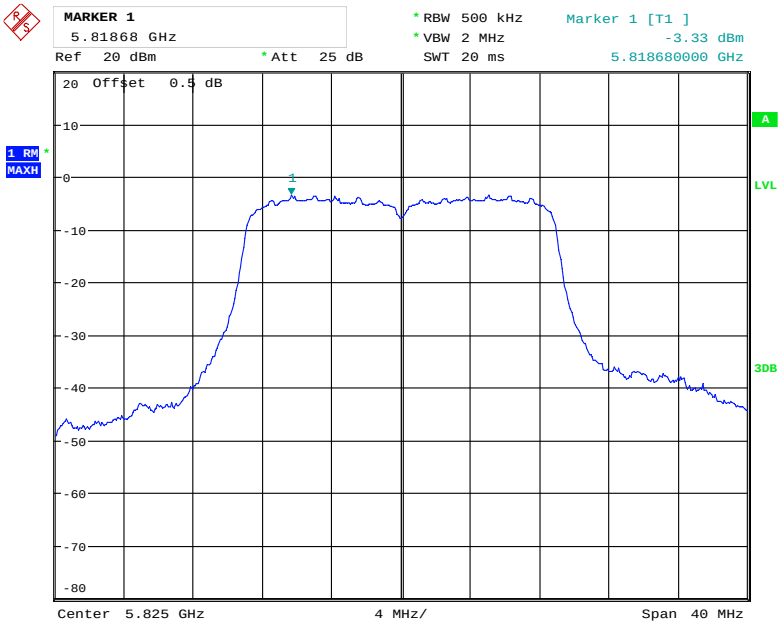
802.11n ht20 High Channel



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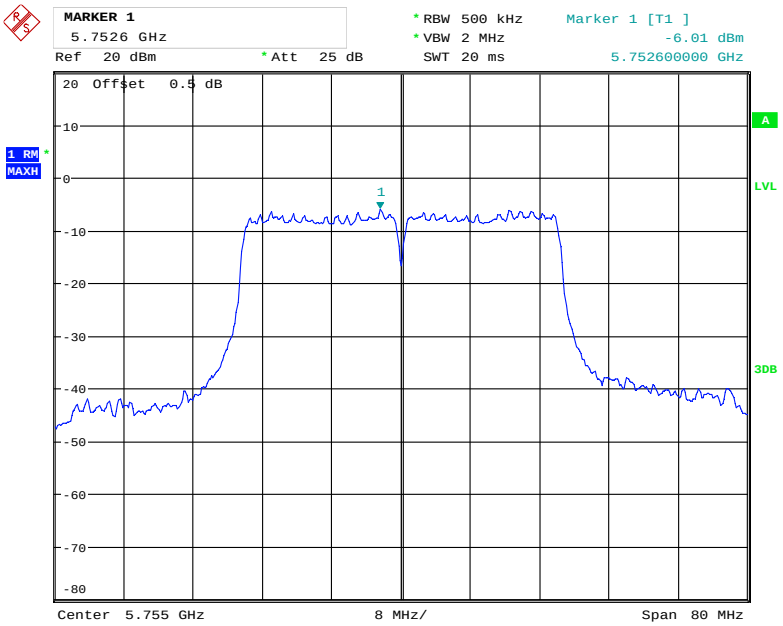
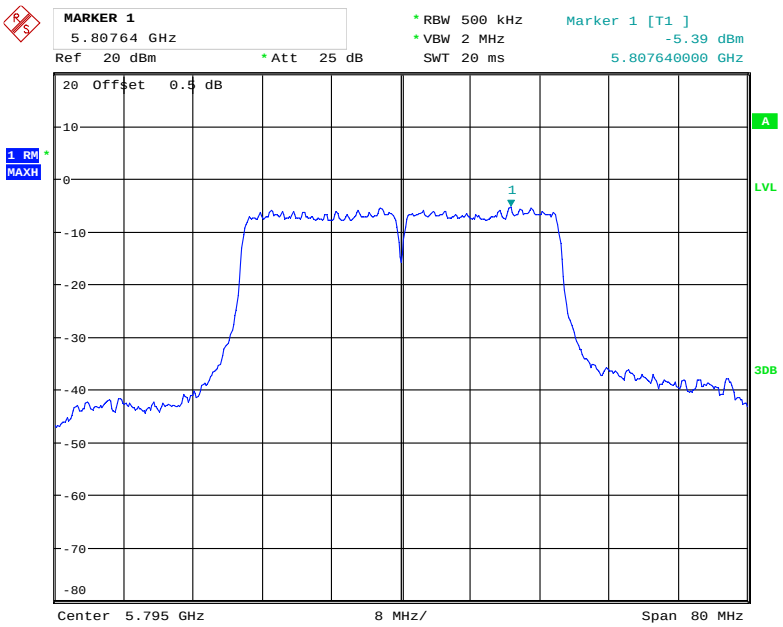
802.11n ht40 Low Channel



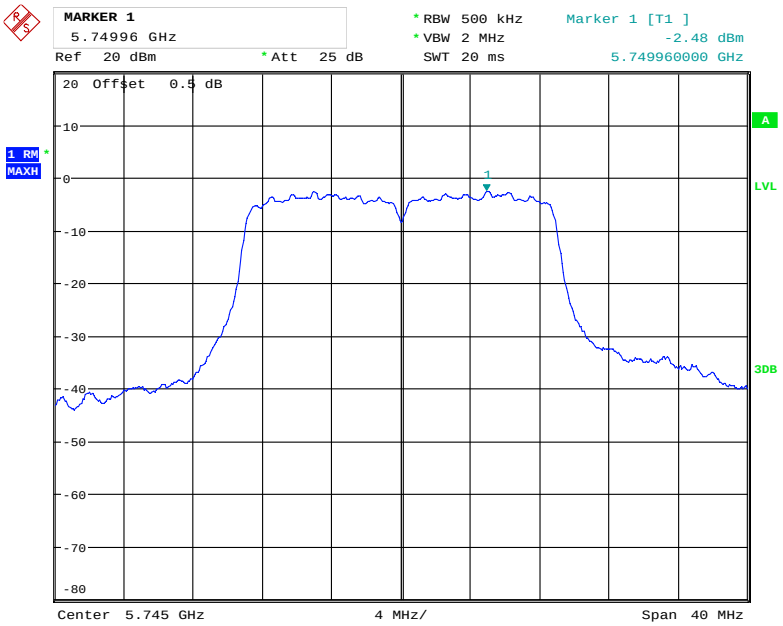
Date: 18.DEC.2019 15:36:02

802.11n ht40 High Channel



Date: 18.DEC.2019 15:36:51

802.11 ac20 Low Channel



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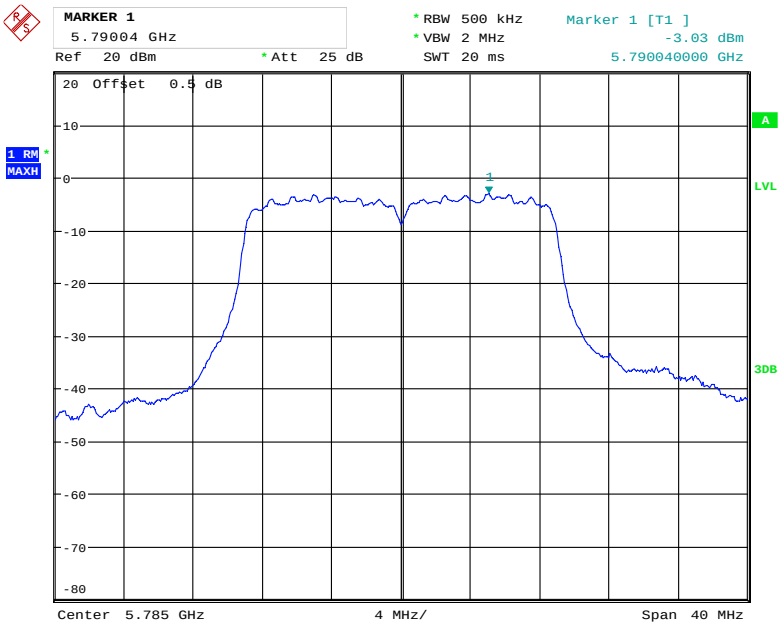

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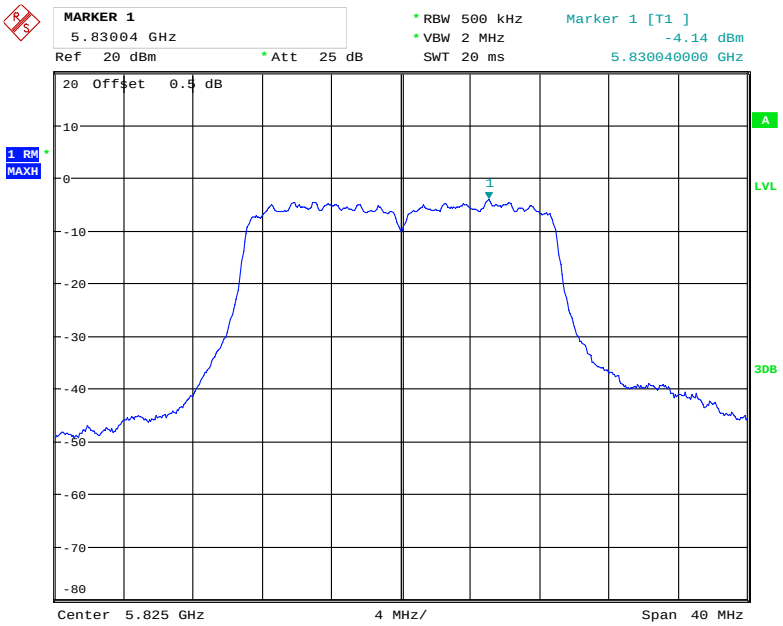

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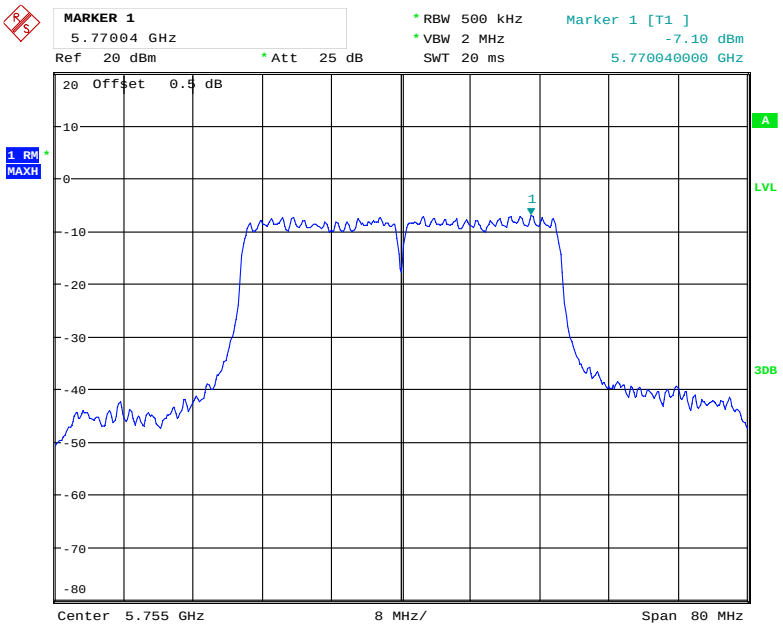
802.11ac40 Low Channel



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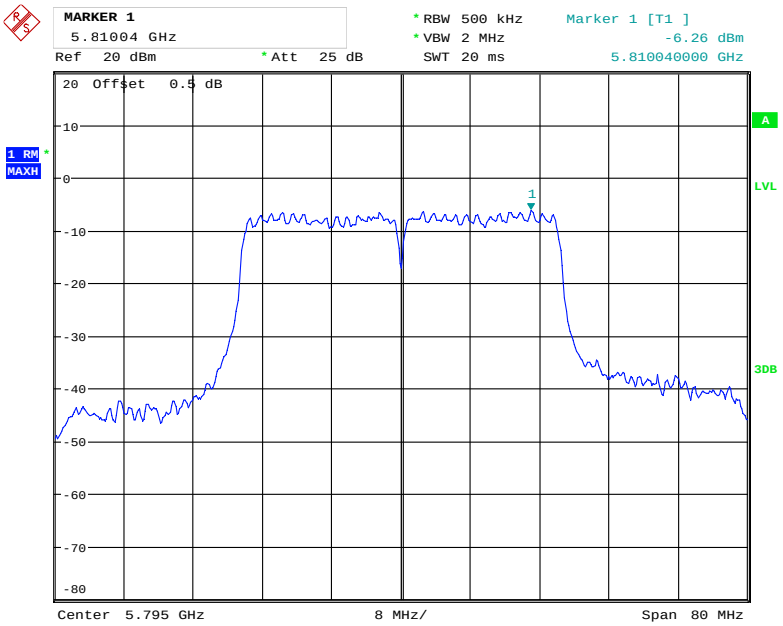
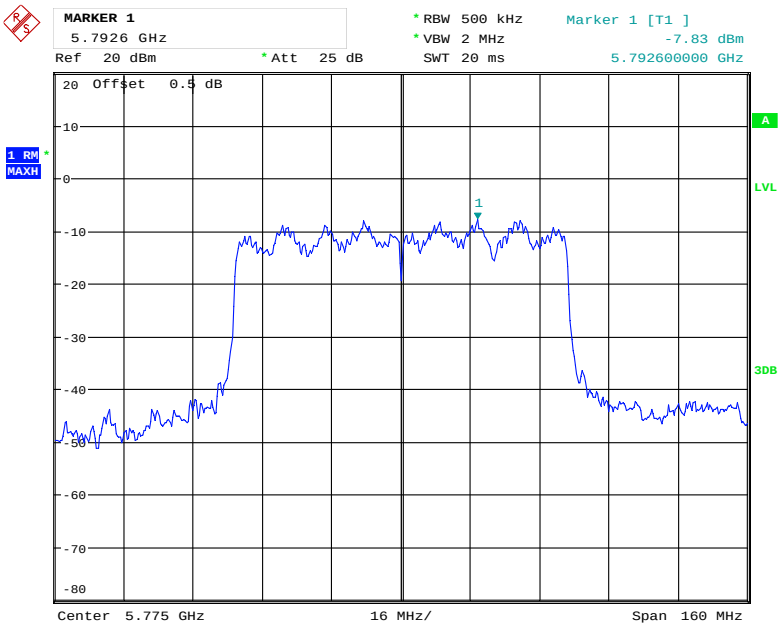
802.11 ac40 High Channel



Date: 18.DEC.2019 15:38:12

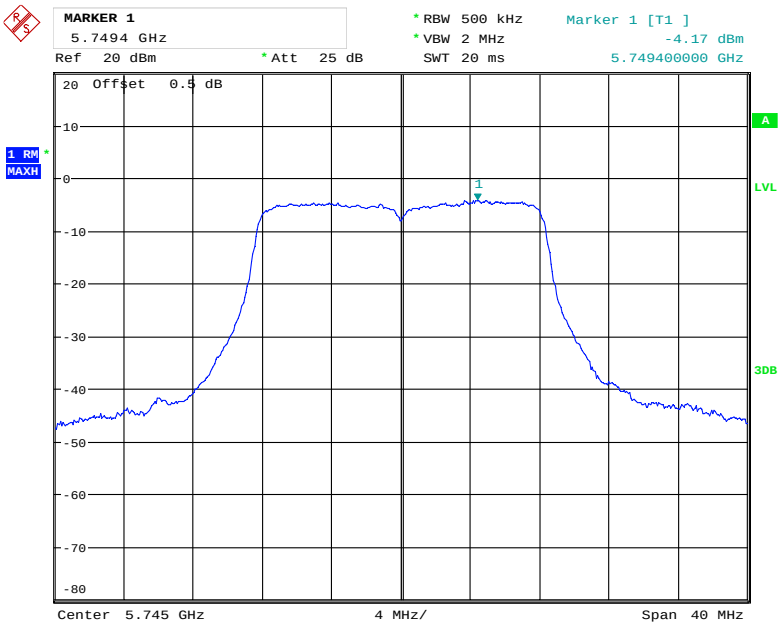
802.11 ac80 Middle Channel



Date: 18.DEC.2019 15:39:00

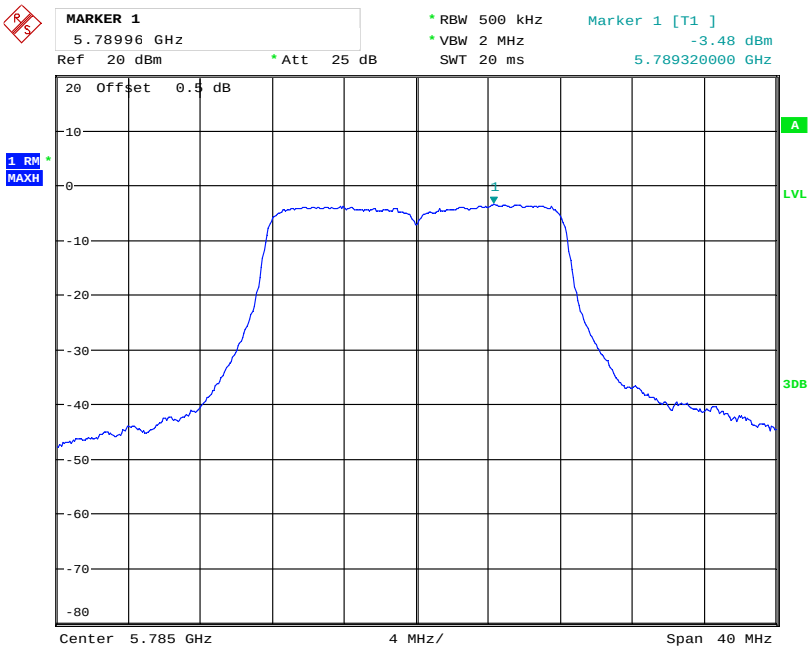
Chain 1:

802.11a Low Channel



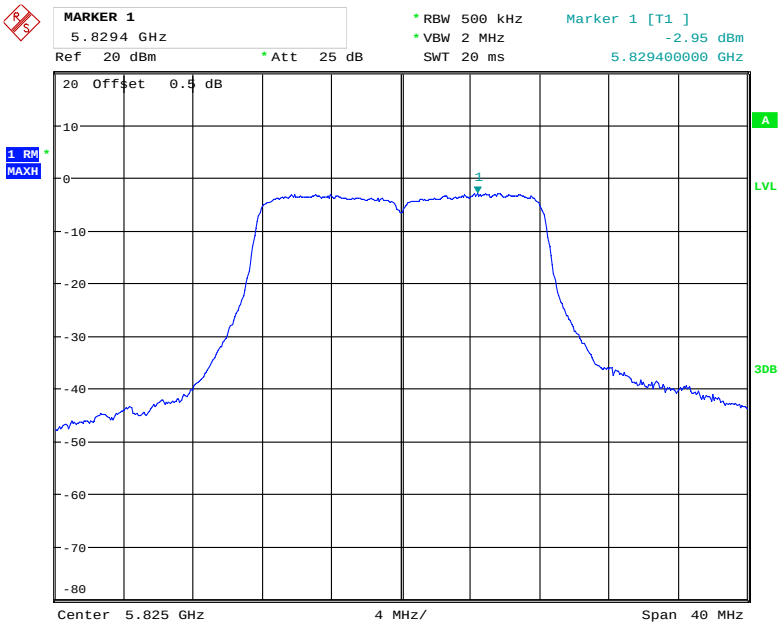
Date: 18.DEC.2019 15:10:08

802.11a Middle Channel



Date: 18.DEC.2019 15:11:01

802.11a High Channel



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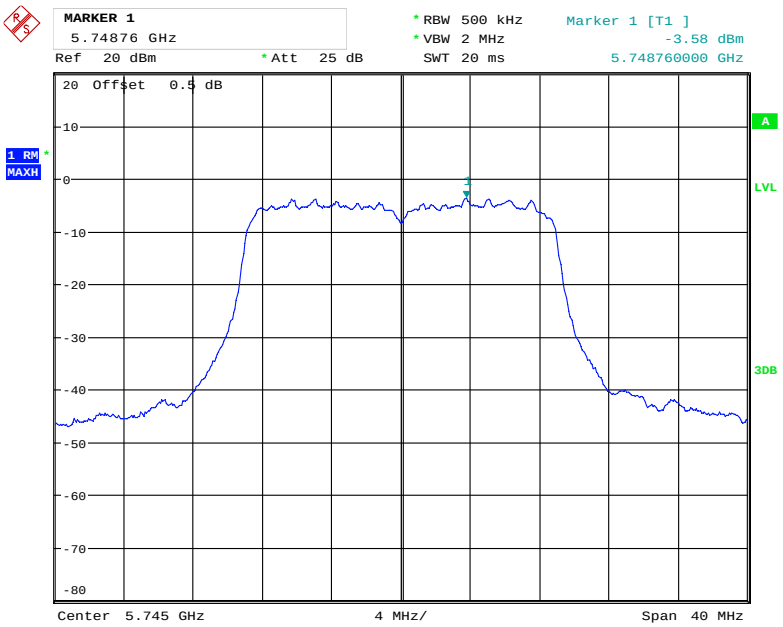
802.11n ht20 Low Channel



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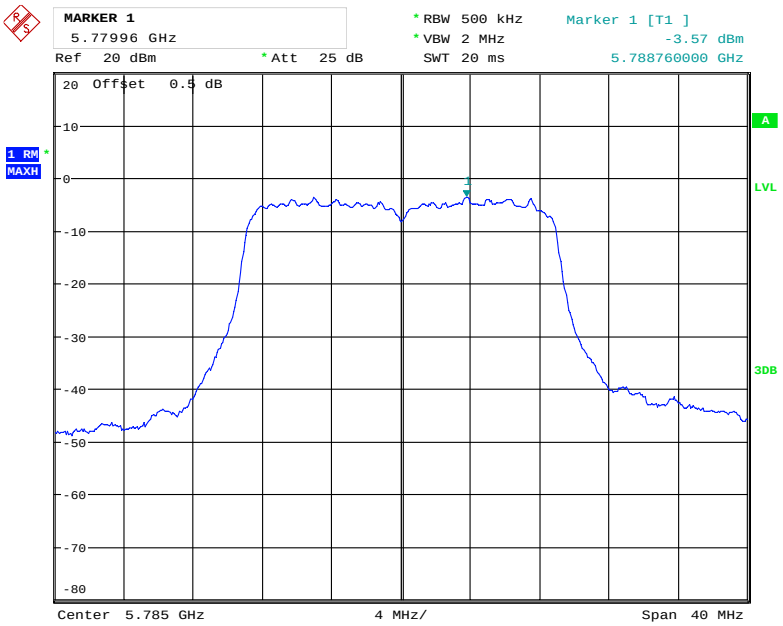
802.11n ht20 Middle Channel



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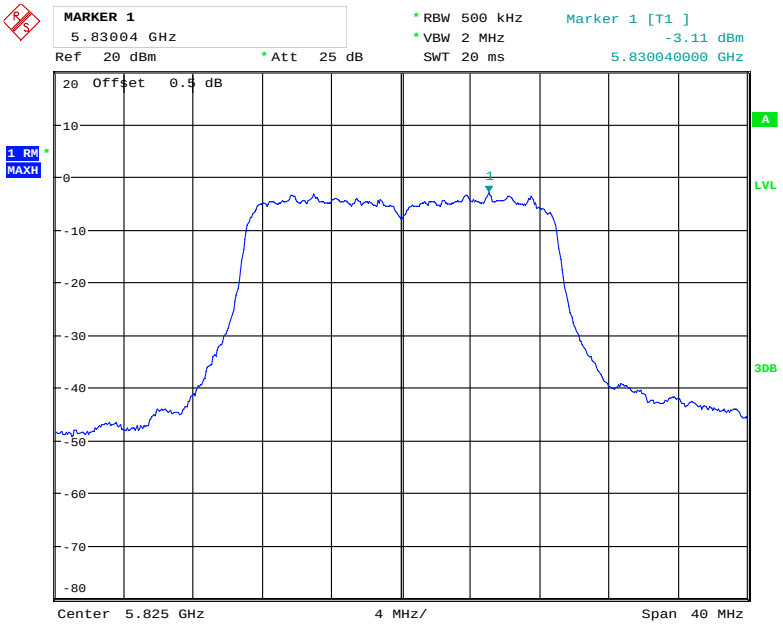

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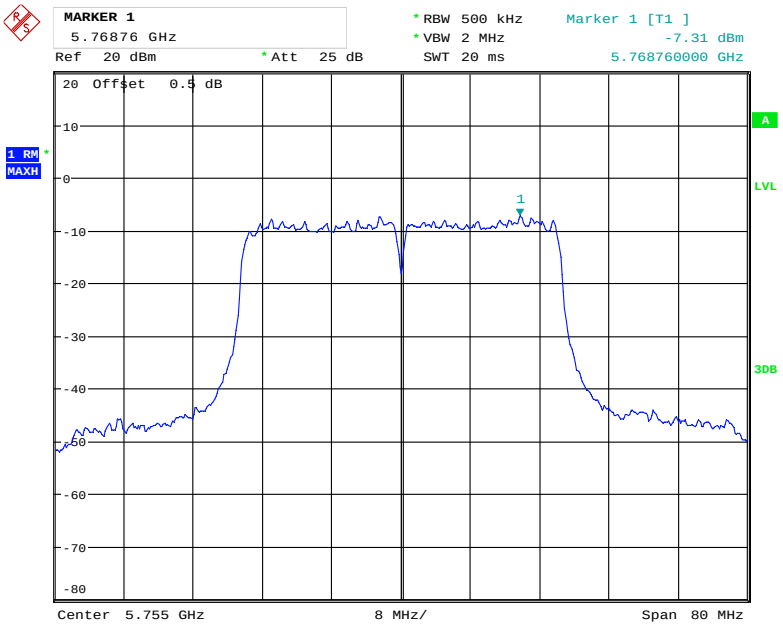
802.11n ht40 Low Channel



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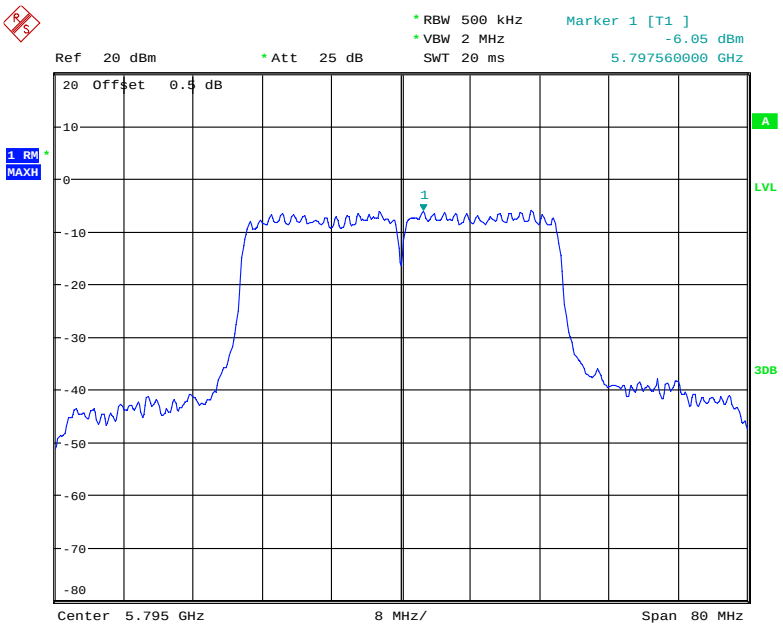
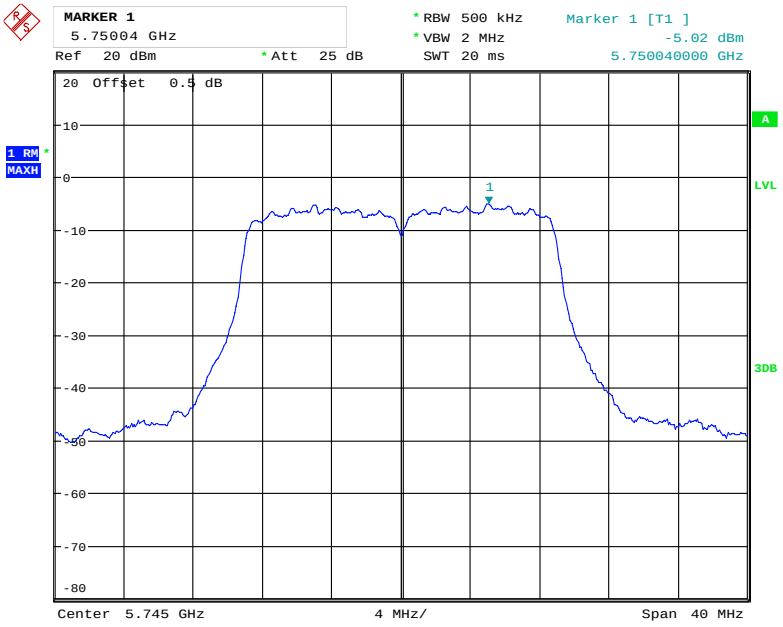
802.11n ht40 High Channel



Date: 18.DEC.2019 17:34:52

802.11 ac20 Low Channel



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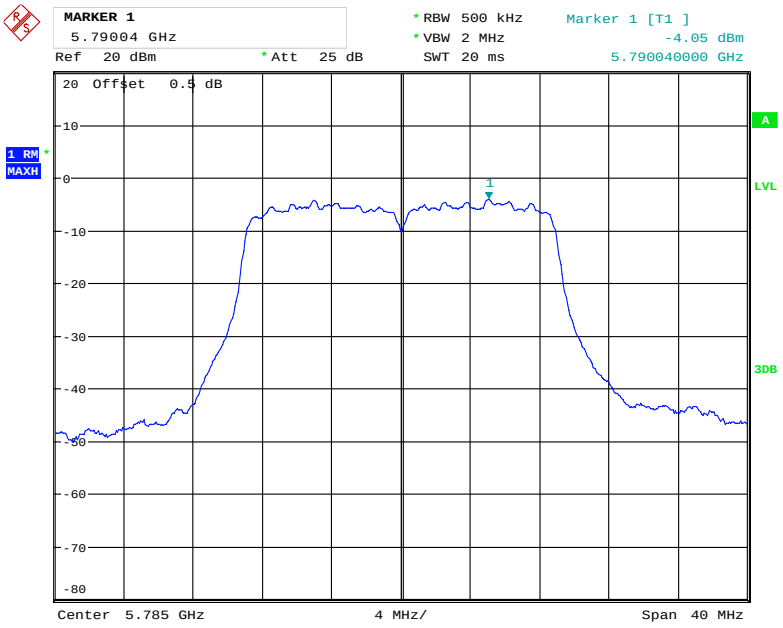

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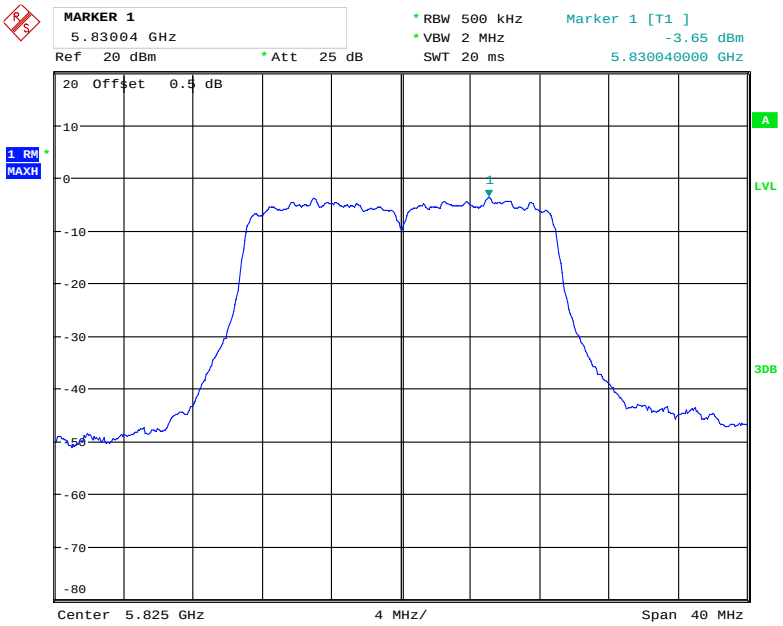
802.11 ac20 High Channel



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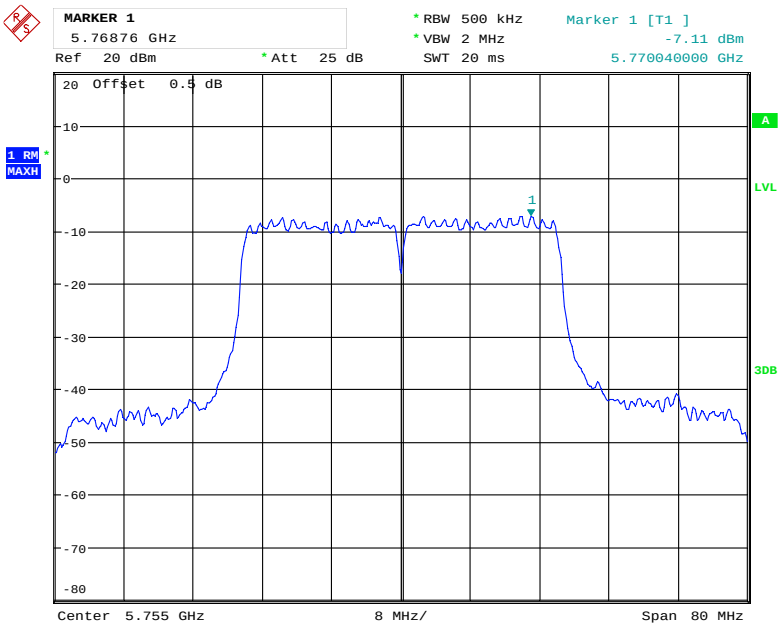
802.11ac40 Low Channel



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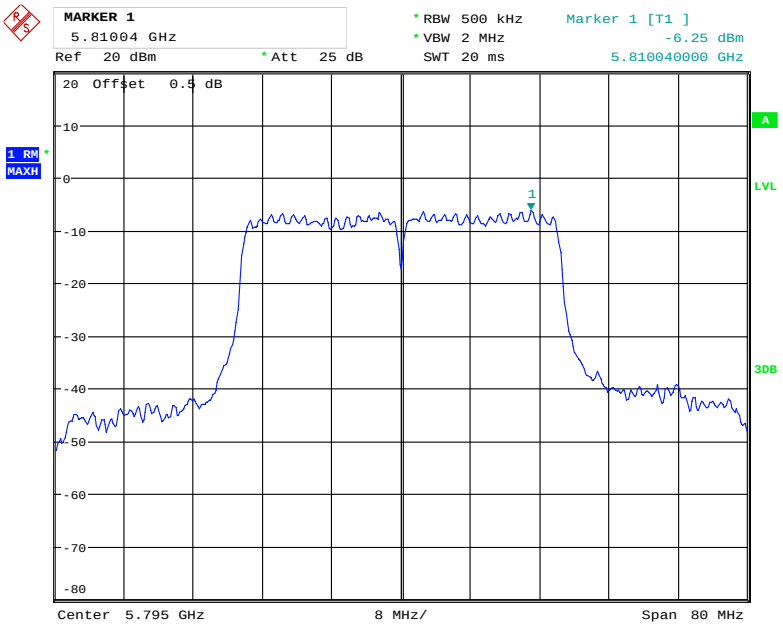
802.11 ac40 High Channel



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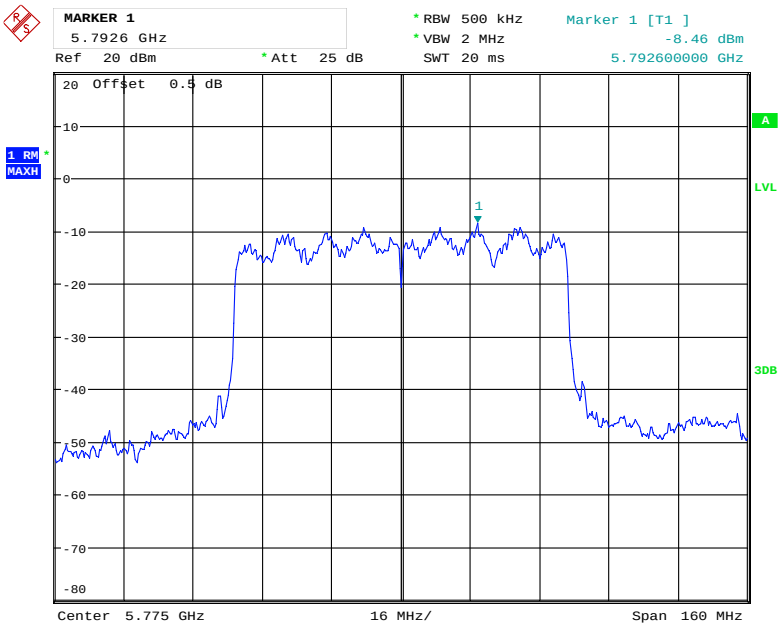
802.11 ac80 Middle Channel



Date: 18.DEC.2019 15:22:22

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