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-EPAC1675

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

Report Number:	RDG191119005-00B
Report Date:	2019-12-20
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

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	802.11AC Dual-Band Wi-Fi USB Adapter
EUT Model:	EP-AC1675
Multiple Models:	WT-AC1675, EPLOVE-AC1675, AC1900, EP-AC1622, WT-AC1622, EPLOVE-1622, EP-1676,WT-1676, EPLOVE-1676
Operation Frequency:	802.11a/n ht20/ac vht20/: 5745-5825MHz; 802.11n ht40/ac vht40: 5755-5795MHz; 802.11ac vht80: 5775MHz
Maximum Peak Output Power (Conducted):	14.37 dBm
Modulation Type:	OFDM
Rated Input Voltage:	DC 5V from USB port
Serial Number:	RDG191119005-RF-S3
EUT Received Date:	2019/11/20
EUT Status:	Good

Note 1: *Model* ***EP-AC1675*** *was selected for fully testing, the detailed information about the difference among* ***WT-AC1675, EPLOVE-AC1675, AC1900, EP-AC1622, WT-AC1622, EPLOVE-1622, EP-1676, WT-1676, EPLOVE-1676*** *and model* ***EP-AC1675*** *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-EPAC1675.

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.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA, or any agency of the U.S. Government.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk "★".

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 802.11a, 802.11n ht20, 802.11ac vht20 Channel 36, 40 and 48 was tested, for 802.11n ht40 Channel 38, 46 were tested.

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

The device supports SISO and MIMO at 802.11n ht20/ac vht20/n ht40/ac vht40/ac vht80 mode, per pre-test, MIMO 3TX mode was the worst and reported.

EUT Exercise Software

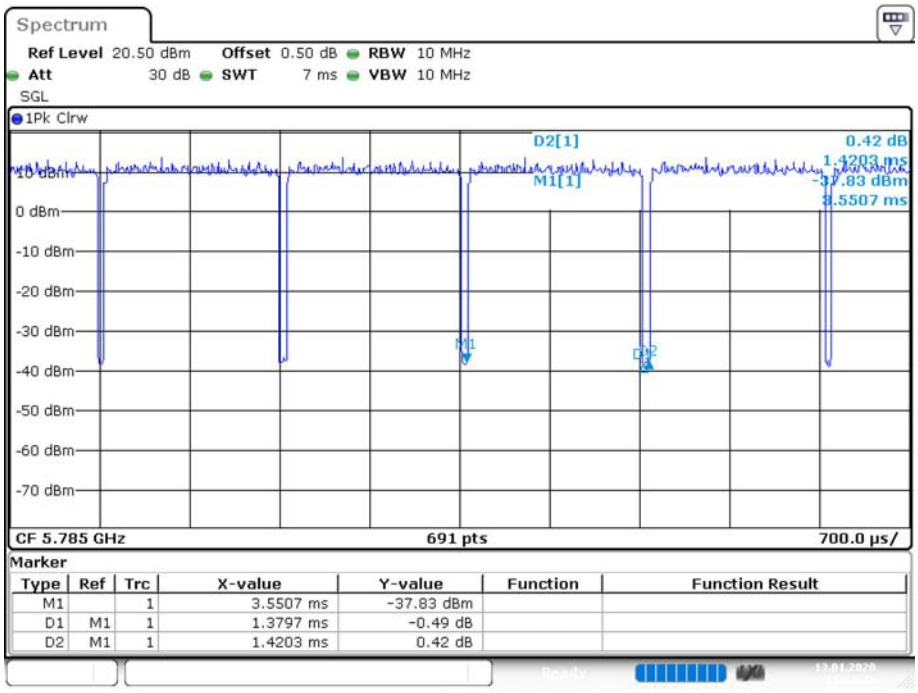
The software "Realtek 11ac 8814A USB WLAN MP Ddiagnostic Program 0.0002.24.20151117.exe" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations. The maximum power was configured as below table, that provided by the manufacturer:

Band	Mode	Channel	Frequency (MHz)	Data rate (Mbps)			Power level		
				Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2
5.8G	802.11 a	Low	5745	OFDM	OFDM	OFDM	23	25	26
		Middle	5785	OFDM	OFDM	OFDM	23	25	26
		High	5825	OFDM	OFDM	OFDM	23	25	26
	802.11 n20	Low	5745	MCS16	MCS16	MCS16	22	30	30
		Middle	5785	MCS16	MCS16	MCS16	21	30	30
		High	5825	MCS16	MCS16	MCS16	21	30	30
	802.11 n40	Low	5755	MCS16	MCS16	MCS16	25	35	31
		High	5795	MCS16	MCS16	MCS16	24	35	31
	802.11 ac20	Low	5745	NSS3 MCS0	NSS3 MCS0	NSS3 MCS0	21	29	36
		Middle	5785	NSS3 MCS0	NSS3 MCS0	NSS3 MCS0	20	29	36
		High	5825	NSS3 MCS0	NSS3 MCS0	NSS3 MCS0	21	29	36
	802.11 ac40	Low	5755	NSS3 MCS0	NSS3 MCS0	NSS3 MCS0	24	34	36
		High	5795	NSS3 MCS0	NSS3 MCS0	NSS3 MCS0	23	34	36
	802.11 ac80	Middle	5775	NSS3 MCS0	NSS3 MCS0	NSS3 MCS0	29	34	29

The duty cycle as below:

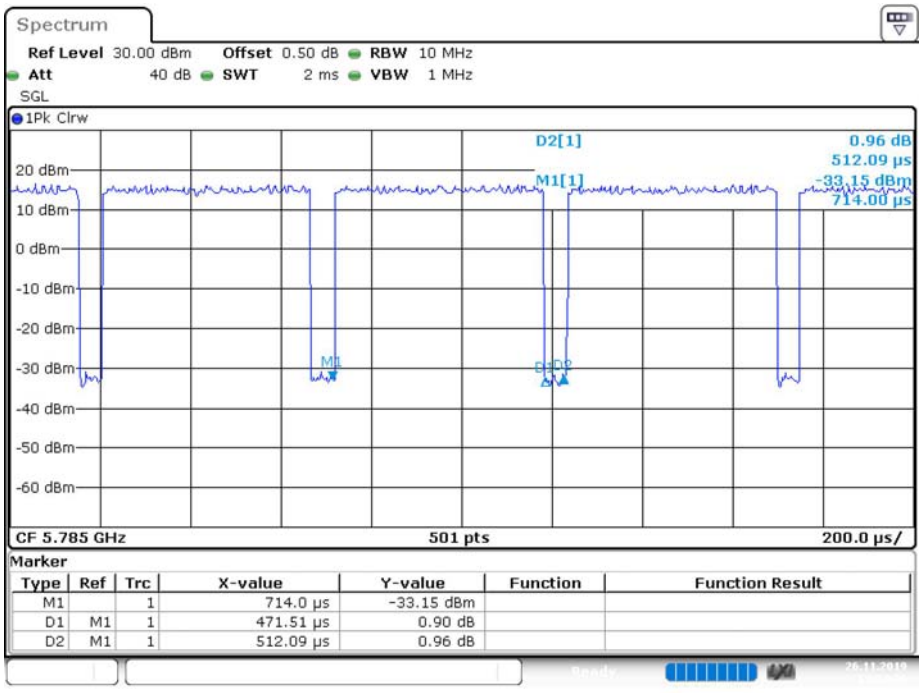
Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
802.11 a	1.380	1.420	97.18	0.12
802.11n ht20	0.472	0.512	92.19	0.35
802.11n ht40	0.261	0.304	85.86	0.66
802.11ac vht20	0.474	0.517	91.68	0.38
802.11ac vht40	0.261	0.307	85.02	0.70
802.11ac vht80	0.151	0.199	75.88	1.20

802.11a



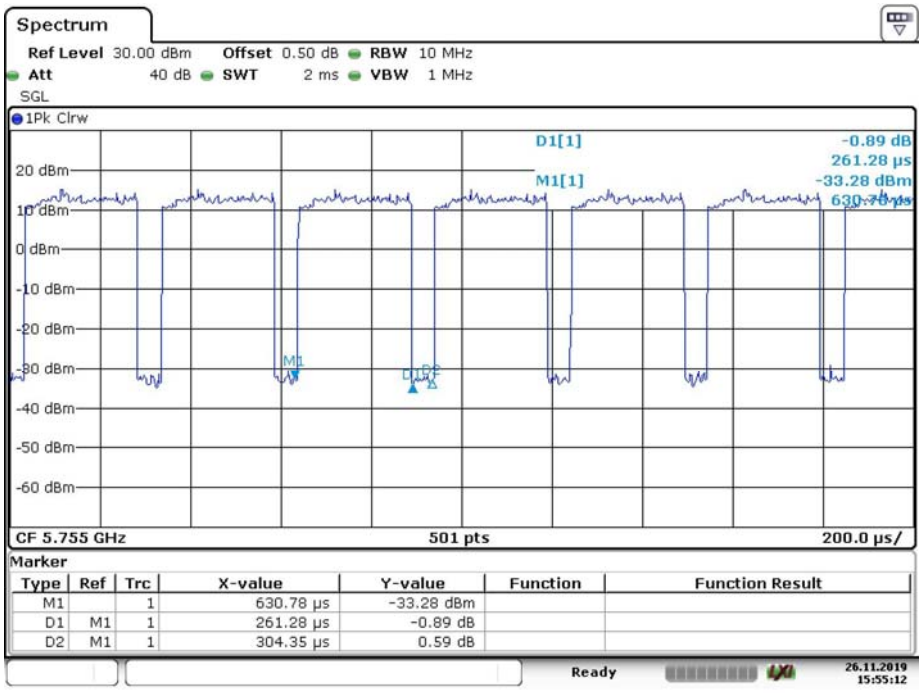
Date: 13.JAN.2020 15:16:16

802.11n ht20



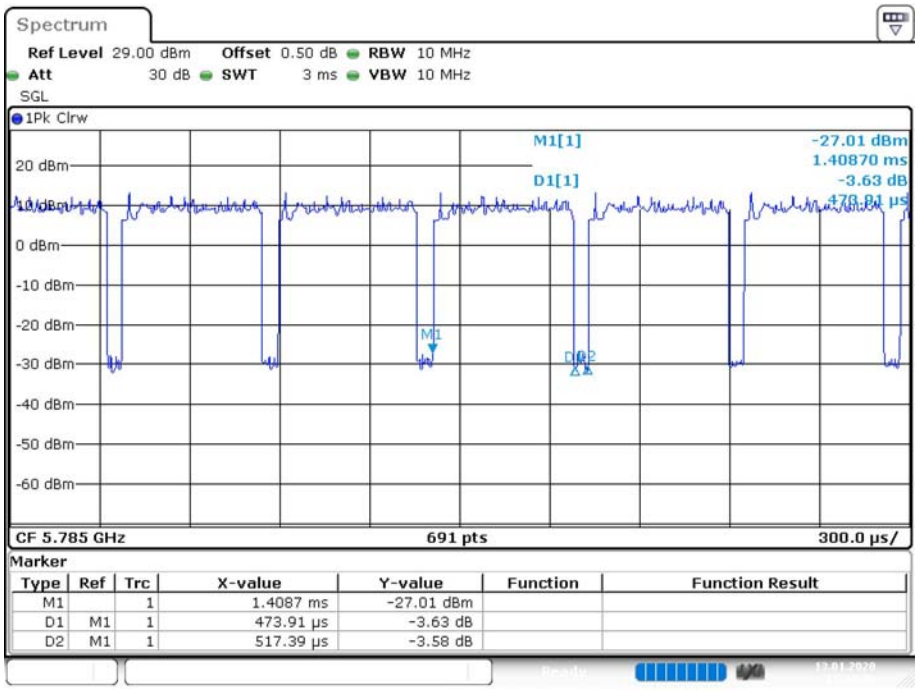
Date: 26.NOV.2019 15:53:37

802.11n ht40



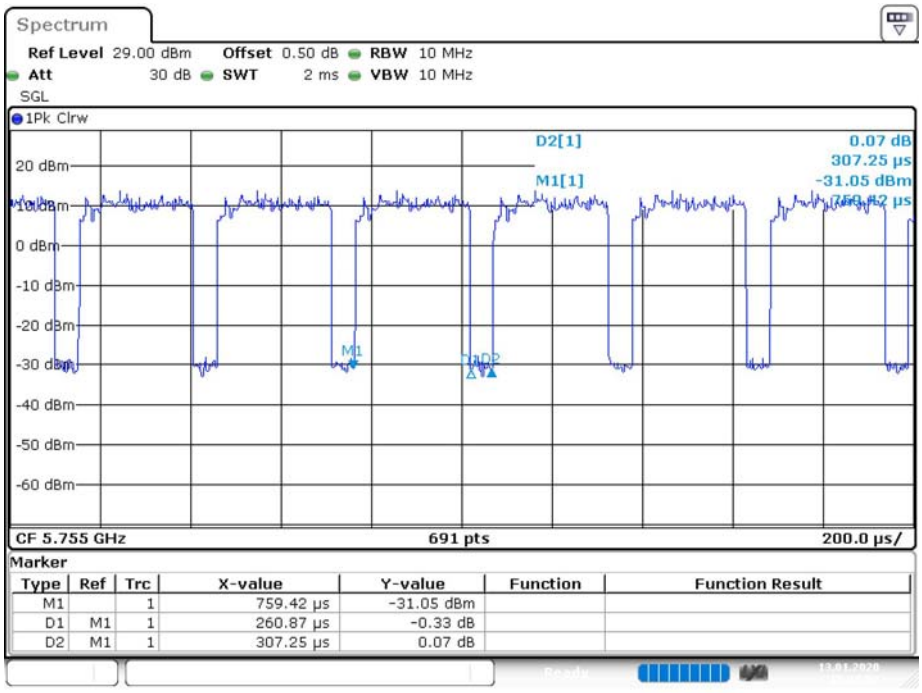
Date: 26.NOV.2019 15:55:13

802.11ac vht20



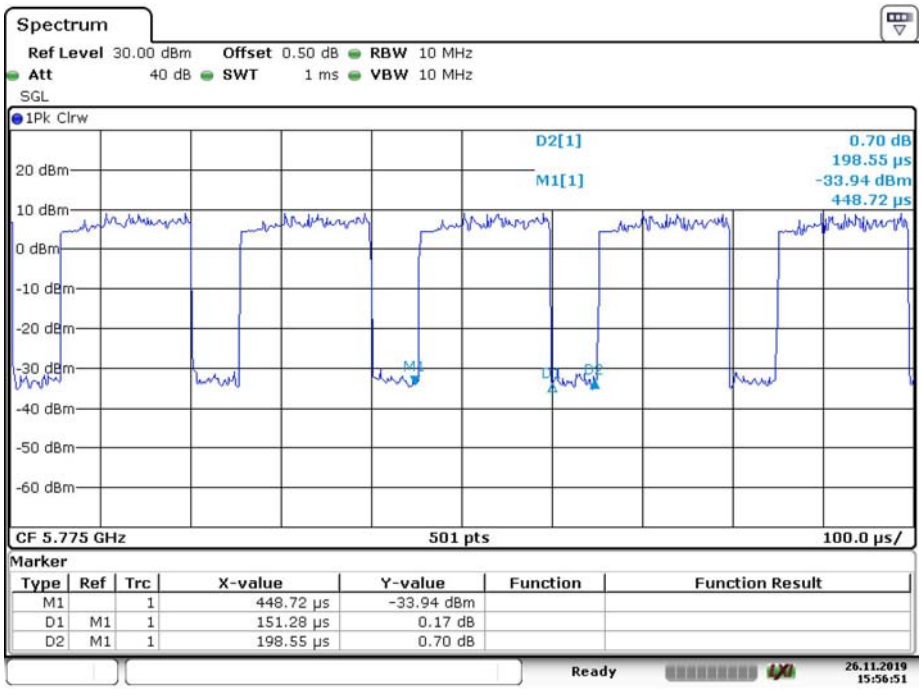
Date: 13.JAN.2020 15:19:08

802.11ac vht40



Date: 13.JAN.2020 15:21:02

802.11ac vht80



Date: 26.NOV.2019 15:56:52

Equipment Modifications

No modification was made to the EUT.

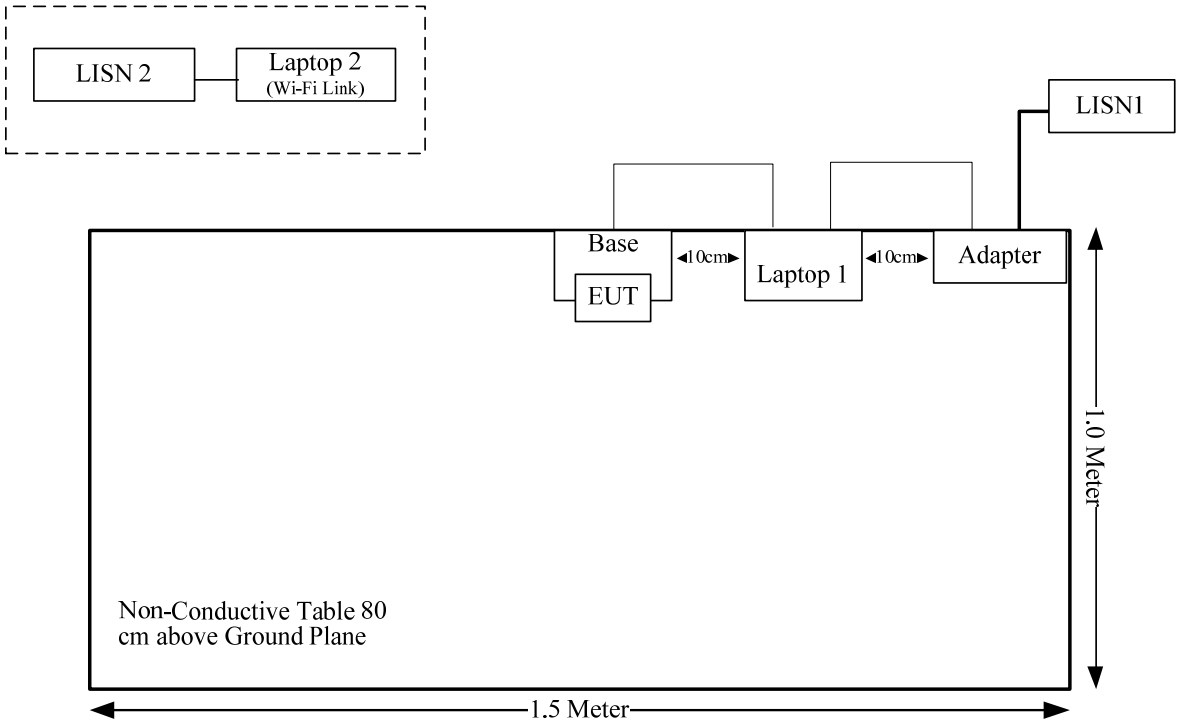
Local Support Equipment List and Details

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
EDUP	USB Base	/	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	Yes	Yes	2	Laptop	Adapter
USB Cable	Yes	No	1.2	Base	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: RDG191119005-20.

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 4 internal antennas arrangement for Wi-Fi, antenna 1/2/3(chain 0/1/2) are for 2.4G&5.8G Wi-Fi transceiver and antenna 4 (chain 3) is for 2.4G Wi-Fi receiver only, fulfill the requirement of this section.

Please refer to below information and the EUT photos:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
FPC	50	3 dBi/2.4~2.5GHz 3 dBi/5.725~5.85GHz

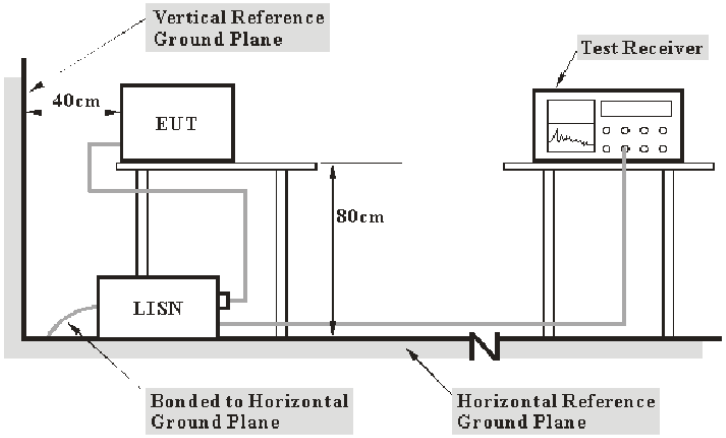
Result: Compliance.

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

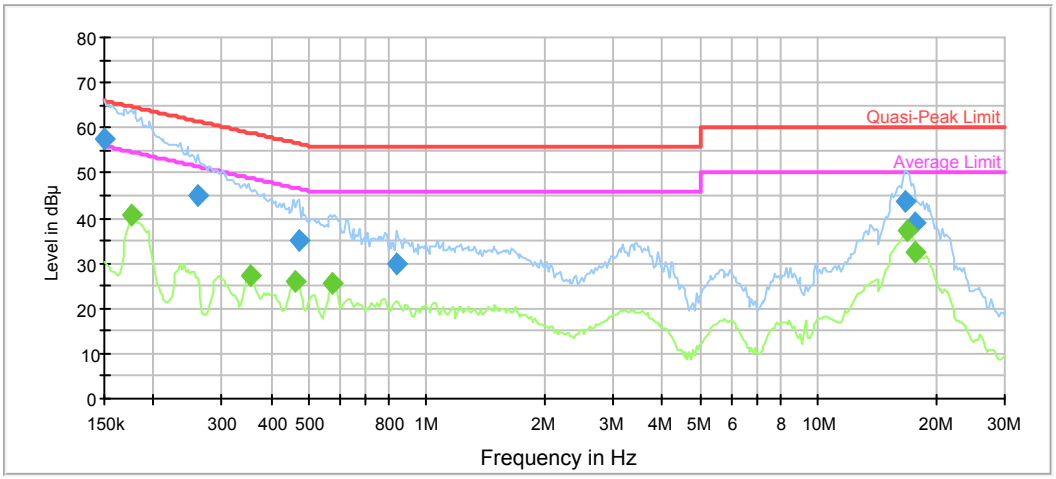
Environmental Conditions

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

The testing was performed by Sevr Xiang on 2019-11-25

Test Mode: Transmitting (802.11a mode chain 2 5825MHz was the worst)

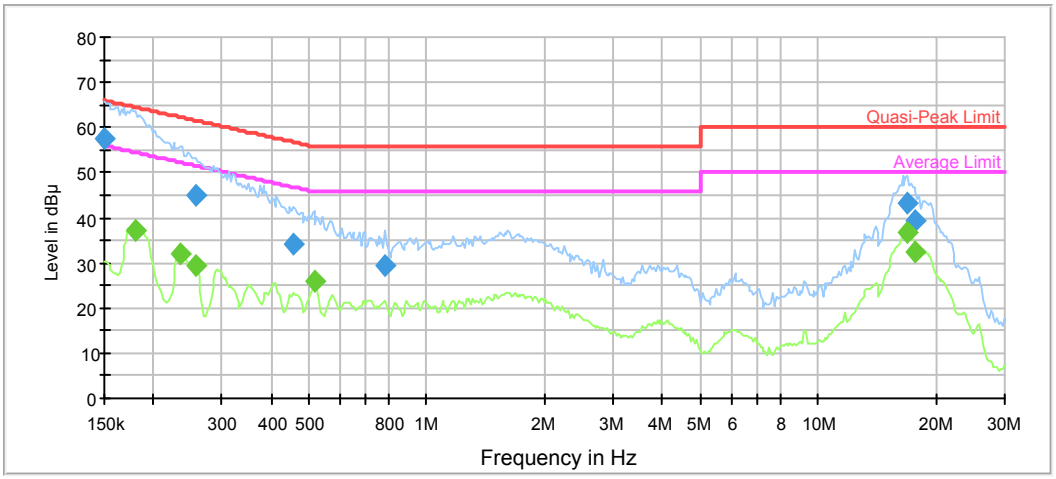
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	57.7	9.000	L1	11.2	8.3	66.0	Compliance
0.259279	45.0	9.000	L1	10.3	16.5	61.5	Compliance
0.471031	35.1	9.000	L1	9.9	21.4	56.5	Compliance
0.838859	29.9	9.000	L1	9.8	26.1	56.0	Compliance
16.765740	43.5	9.000	L1	10.0	16.5	60.0	Compliance
17.797171	39.0	9.000	L1	10.0	21.0	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.175887	40.7	9.000	L1	10.8	14.0	54.7	Compliance
0.352963	27.2	9.000	L1	10.0	21.7	48.9	Compliance
0.461750	25.8	9.000	L1	9.9	20.9	46.7	Compliance
0.574747	25.5	9.000	L1	9.8	20.5	46.0	Compliance
16.933397	37.0	9.000	L1	10.0	13.0	50.0	Compliance
17.797171	32.5	9.000	L1	10.0	17.5	50.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	57.7	9.000	N	11.2	8.3	66.0	Compliance
0.256712	45.1	9.000	N	10.3	16.4	61.5	Compliance
0.457178	34.1	9.000	N	9.9	22.6	56.7	Compliance
0.782419	29.4	9.000	N	9.8	26.6	56.0	Compliance
16.933397	43.4	9.000	N	10.0	16.6	60.0	Compliance
17.797171	39.3	9.000	N	10.0	20.7	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.181216	37.1	9.000	N	10.8	17.3	54.4	Compliance
0.234722	32.1	9.000	N	10.4	20.2	52.3	Compliance
0.256712	29.3	9.000	N	10.3	22.2	51.5	Compliance
0.520311	25.8	9.000	N	9.9	20.2	46.0	Compliance
16.933397	36.8	9.000	N	10.0	13.2	50.0	Compliance
17.797171	32.6	9.000	N	10.0	17.4	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.

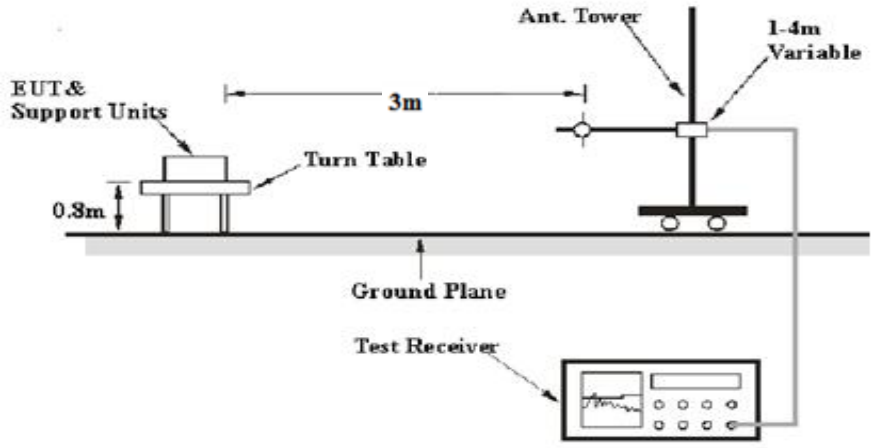
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(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.

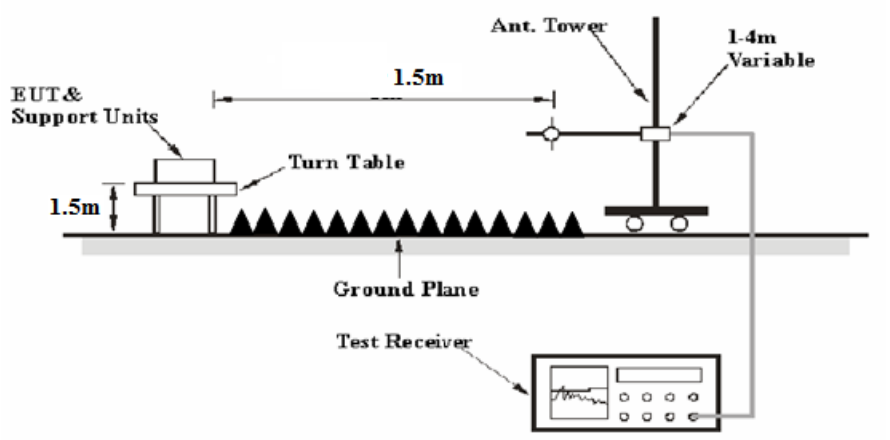
(7) The provisions of §15.205 apply to intentional radiators operating under this section.

EUT Setup

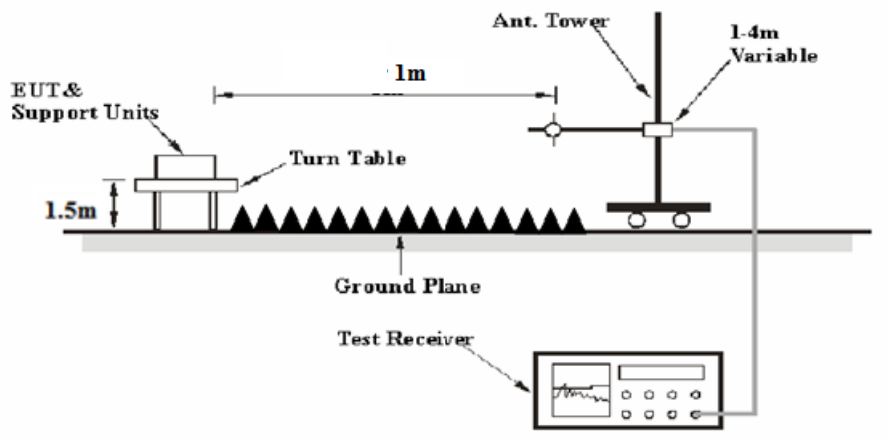
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission Below 1GHz tests were performed in the 3 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
Radiation Below 1GHz					
R&S	EMI Test Receiver	ESR3	102453	2019-09-12	2020-09-12
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	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
HP	Amplifier	8447D	2727A05902	2019-09-05	2020-09-05
Radiation Above 1GHz					
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	2019-11-18	2022-11-18
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1302	2019-11-18	2022-11-18
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

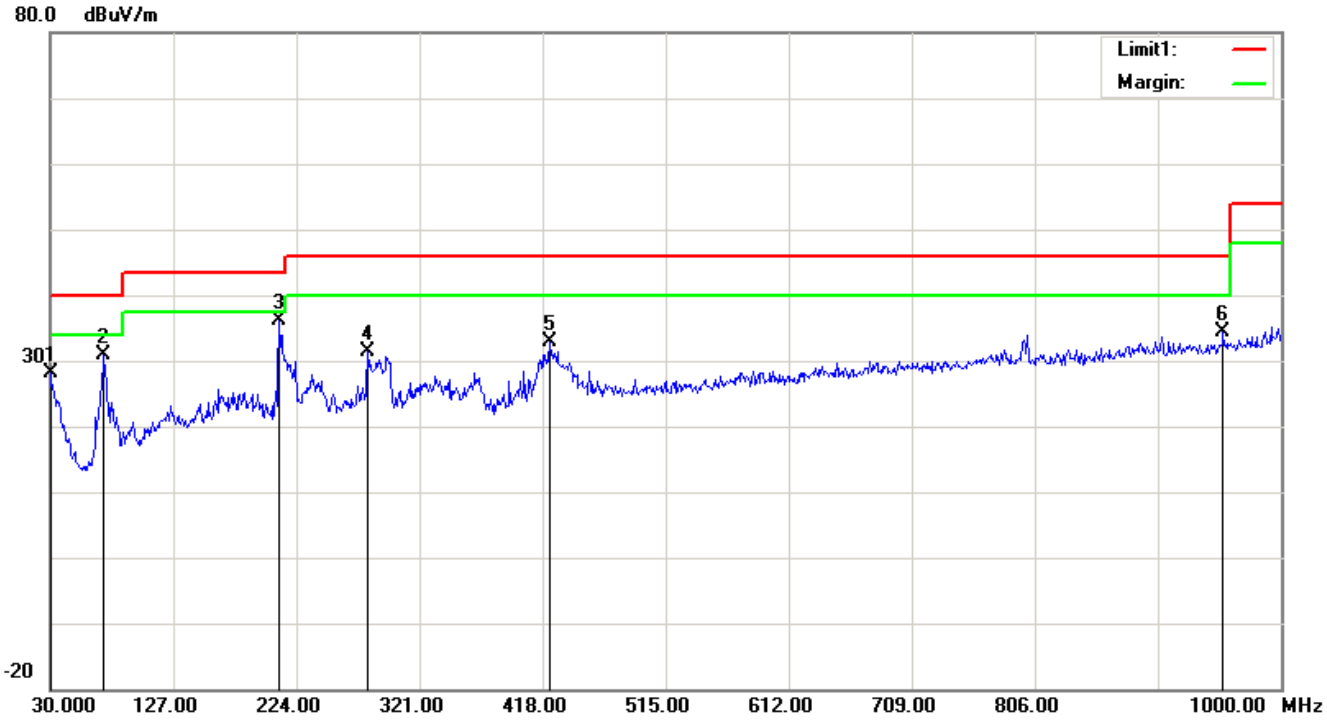
Temperature:	24.1~25.9°C
Relative Humidity:	39~46 %
ATM Pressure:	100.5~102.5kPa

** The testing was performed by Tyler Pan and Vern Shen from 2019-11-25 to 2019-12-01*

Test Mode: Transmitting

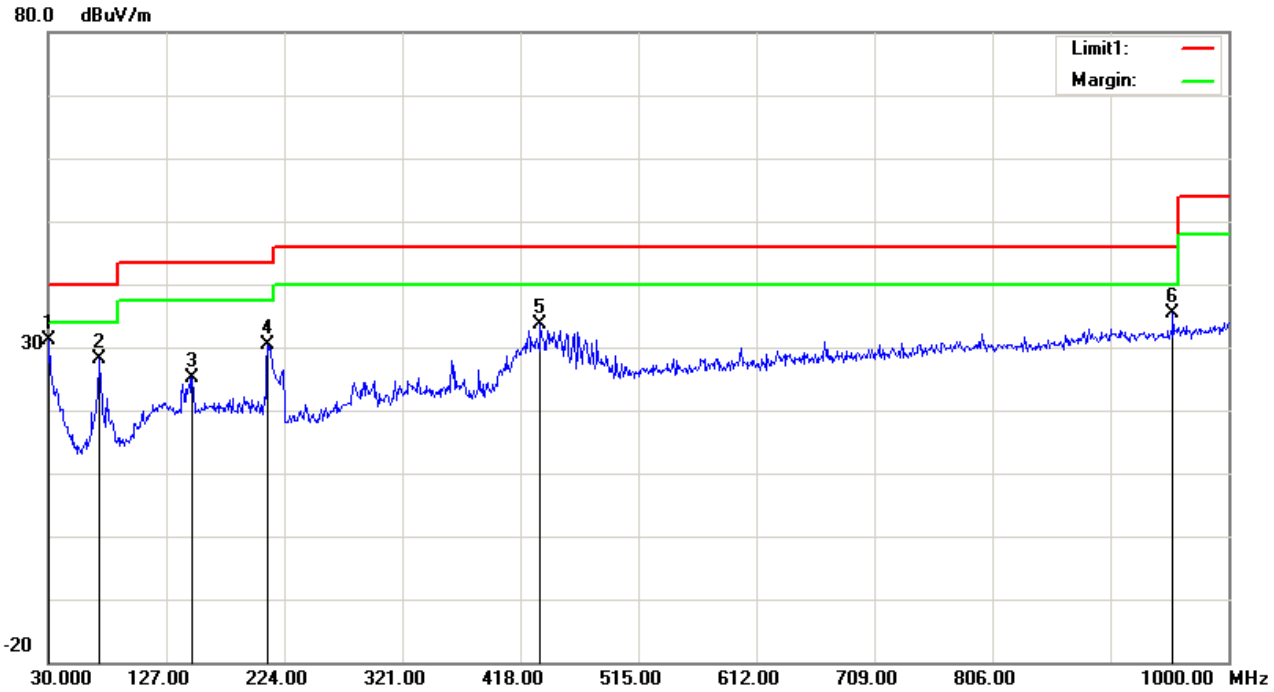
1) Below 1GHz (802.11a mode chain 2 5825MHz was the worst):

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	26.31	peak	1.72	28.03	40.00	11.97
71.7100	42.05	peak	-11.06	30.99	40.00	9.01
210.4200	43.60	peak	-7.37	36.23	43.50	7.27
280.2600	35.51	peak	-4.15	31.36	46.00	14.64
423.8200	34.22	peak	-1.44	32.78	46.00	13.22
954.4100	33.47	peak	0.82	34.29	46.00	11.71

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	30.27	peak	0.91	31.18	40.00	8.82
71.7100	39.10	peak	-11.06	28.04	40.00	11.96
148.3400	31.16	peak	-6.05	25.11	43.50	18.39
210.4200	37.86	peak	-7.37	30.49	43.50	13.01
434.4900	34.88	peak	-1.22	33.66	46.00	12.34
954.4100	34.50	peak	0.82	35.32	46.00	10.68

2) 1GHz-40GHz:

802.11a Chain 2 (The worst case)

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	72.50	PK	H	34.20	3.69	0.00	110.39	104.37	N/A	N/A
5745.00	64.06	AV	H	34.20	3.69	0.00	101.95	95.93	N/A	N/A
5745.00	64.50	PK	V	34.20	3.69	0.00	102.39	96.37	N/A	N/A
5745.00	55.30	AV	V	34.20	3.69	0.00	93.19	87.17	N/A	N/A
5725.00	45.83	PK	H	34.19	3.69	0.00	83.71	77.69	122.20	44.51
5720.00	37.11	PK	H	34.19	3.69	0.00	74.99	68.97	110.80	41.83
5700.00	33.33	PK	H	34.18	3.68	0.00	71.19	65.17	105.20	40.03
5650.00	32.86	PK	H	34.16	3.63	0.00	70.65	64.63	68.20	3.57
11490.00	43.08	PK	H	38.99	6.59	25.51	63.15	57.13	74.00	16.87
11490.00	38.74	AV	H	38.99	6.59	25.51	58.81	52.79	54.00	1.21
17235.00	37.57	PK	H	41.56	8.78	23.72	64.19	58.17	68.20	10.03
Middle Channel: 5785 MHz										
5785.00	72.70	PK	H	34.21	3.71	0.00	110.62	104.6	N/A	N/A
5785.00	63.27	AV	H	34.21	3.71	0.00	101.19	95.17	N/A	N/A
5785.00	62.57	PK	V	34.21	3.71	0.00	100.49	94.47	N/A	N/A
5785.00	53.21	AV	V	34.21	3.71	0.00	91.13	85.11	N/A	N/A
11570.00	42.95	PK	H	39.00	6.61	25.46	63.10	57.077	74.00	16.92
11570.00	38.36	AV	H	39.00	6.61	25.46	58.51	52.49	54.00	1.51
17355.00	37.24	PK	H	42.26	8.81	23.60	64.71	58.69	68.20	9.51
5925.00	33.66	PK	V	34.27	3.80	0.00	71.73	65.71	68.20	2.49
High Channel: 5825MHz										
5825.00	72.85	PK	H	34.23	3.73	0.00	110.81	104.79	N/A	N/A
5825.00	62.39	AV	H	34.23	3.73	0.00	100.35	94.33	N/A	N/A
5825.00	61.56	PK	V	34.23	3.73	0.00	99.52	93.5	N/A	N/A
5825.00	52.90	AV	V	34.23	3.73	0.00	90.86	84.84	N/A	N/A
5850.00	35.70	PK	H	34.24	3.75	0.00	73.69	67.67	122.20	54.53
5855.00	33.77	PK	H	34.24	3.75	0.00	71.76	65.74	110.80	45.06
5875.00	34.15	PK	H	34.25	3.77	0.00	72.17	66.15	105.20	39.05
5925.00	33.60	PK	H	34.27	3.80	0.00	71.67	65.65	68.20	2.55
11650.00	44.87	PK	H	39.00	6.64	25.41	65.10	59.08	74.00	14.92
11650.00	38.52	AV	H	39.00	6.64	25.41	58.75	52.73	54.00	1.27
17475.00	37.65	PK	H	42.96	8.84	23.48	65.97	59.95	68.20	8.25

802.11n ht20(3TX 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	69.50	PK	H	34.20	3.69	0.00	107.39	101.37	N/A	N/A
5745.00	62.34	AV	H	34.20	3.69	0.00	100.23	94.21	N/A	N/A
5745.00	75.20	PK	V	34.20	3.69	0.00	113.09	107.07	N/A	N/A
5745.00	64.29	AV	V	34.20	3.69	0.00	102.18	96.16	N/A	N/A
5725.00	36.67	PK	V	34.19	3.69	0.00	74.55	68.53	122.20	53.67
5720.00	34.40	PK	V	34.19	3.69	0.00	72.28	66.26	110.80	44.54
5700.00	32.67	PK	V	34.18	3.68	0.00	70.53	64.51	105.20	40.69
5650.00	32.80	PK	V	34.16	3.63	0.00	70.59	64.57	68.20	3.63
11490.00	39.04	PK	V	38.99	6.59	25.51	59.11	53.09	74.00	20.91
11490.00	33.62	AV	V	38.99	6.59	25.51	53.69	47.67	54.00	6.33
17235.00	37.21	PK	V	41.56	8.78	23.72	63.83	57.81	68.20	10.39
Middle Channel: 5785 MHz										
5785.00	68.32	PK	H	34.21	3.71	0.00	106.24	100.22	N/A	N/A
5785.00	62.00	AV	H	34.21	3.71	0.00	99.92	93.9	N/A	N/A
5785.00	75.98	PK	V	34.21	3.71	0.00	113.90	107.88	N/A	N/A
5785.00	64.30	AV	V	34.21	3.71	0.00	102.22	96.2	N/A	N/A
11570.00	38.87	PK	V	39.00	6.61	25.46	59.02	53	74.00	21.00
11570.00	32.54	AV	V	39.00	6.61	25.46	52.69	46.67	54.00	7.33
17355.00	37.14	PK	V	42.26	8.81	23.60	64.61	58.59	68.20	9.61
High Channel: 5825 MHz										
5825.00	68.01	PK	H	34.23	3.73	0.00	105.97	99.95	N/A	N/A
5825.00	61.81	AV	H	34.23	3.73	0.00	99.77	93.75	N/A	N/A
5825.00	75.89	PK	V	34.23	3.73	0.00	113.85	107.83	N/A	N/A
5825.00	64.16	AV	V	34.23	3.73	0.00	102.12	96.1	N/A	N/A
5850.00	33.32	PK	V	34.24	3.75	0.00	71.31	65.29	122.20	56.91
5855.00	33.90	PK	V	34.24	3.75	0.00	71.89	65.87	110.80	44.93
5875.00	33.66	PK	V	34.25	3.77	0.00	71.68	65.66	105.20	39.54
5925.00	34.07	PK	V	34.27	3.80	0.00	72.14	66.12	68.20	2.08
11650.00	38.98	PK	V	39.00	6.64	25.41	59.21	53.19	74.00	20.81
11650.00	32.65	AV	V	39.00	6.64	25.41	52.88	46.86	54.00	7.14
17475.00	37.24	PK	V	42.96	8.84	23.48	65.56	59.54	68.20	8.66

802.11n ht40(3TX 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	63.59	PK	H	34.20	3.70	0.00	101.49	95.47	N/A	N/A
5755.00	56.38	AV	H	34.20	3.70	0.00	94.28	88.26	N/A	N/A
5755.00	63.66	PK	V	34.20	3.70	0.00	101.56	95.54	N/A	N/A
5755.00	57.70	AV	V	34.20	3.70	0.00	95.60	89.58	N/A	N/A
5725.00	33.45	PK	V	34.19	3.69	0.00	71.33	65.31	122.20	56.89
5720.00	32.84	PK	V	34.19	3.69	0.00	70.72	64.7	110.80	46.10
5700.00	33.30	PK	V	34.18	3.68	0.00	71.16	65.14	105.20	40.06
5650.00	32.54	PK	V	34.16	3.63	0.00	70.33	64.31	68.20	3.89
11510.00	38.22	PK	V	39.00	6.59	25.50	58.31	52.29	74.00	21.71
11510.00	33.13	AV	V	39.00	6.59	25.50	53.22	47.2	54.00	6.80
17265.00	37.32	PK	V	41.74	8.79	23.69	64.16	58.14	68.20	10.06
High Channel: 5795 MHz										
5795.00	63.34	PK	H	34.22	3.71	0.00	101.27	95.25	N/A	N/A
5795.00	56.47	AV	H	34.22	3.71	0.00	94.40	88.38	N/A	N/A
5795.00	64.00	PK	V	34.22	3.71	0.00	101.93	95.91	N/A	N/A
5795.00	57.48	AV	V	34.22	3.71	0.00	95.41	89.39	N/A	N/A
5850.00	33.69	PK	V	34.24	3.75	0.00	71.68	65.66	122.20	56.54
5855.00	34.13	PK	V	34.24	3.75	0.00	72.12	66.1	110.80	44.70
5875.00	33.73	PK	V	34.25	3.77	0.00	71.75	65.73	105.20	39.47
5925.00	33.70	PK	V	34.27	3.80	0.00	71.77	65.75	68.20	2.45
11590.00	38.42	PK	V	39.00	6.62	25.45	58.59	52.57	74.00	21.43
11590.00	32.78	AV	V	39.00	6.62	25.45	52.95	46.93	54.00	7.07
17385.00	37.35	PK	V	42.43	8.82	23.57	65.03	59.01	68.20	9.19

802.11ac 20 (3TX 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	68.13	PK	H	34.20	3.69	0.00	106.02	100	N/A	N/A
5745.00	60.92	AV	H	34.20	3.69	0.00	98.81	92.79	N/A	N/A
5745.00	69.79	PK	V	34.20	3.69	0.00	107.68	101.66	N/A	N/A
5745.00	62.46	AV	V	34.20	3.69	0.00	100.35	94.33	N/A	N/A
5725.00	33.27	PK	V	34.19	3.69	0.00	71.15	65.13	122.20	57.07
5720.00	33.51	PK	V	34.19	3.69	0.00	71.39	65.37	110.80	45.43
5700.00	33.45	PK	V	34.18	3.68	0.00	71.31	65.29	105.20	39.91
5650.00	32.44	PK	V	34.16	3.63	0.00	70.23	64.21	68.20	3.99
11490.00	39.21	PK	V	38.99	6.59	25.51	59.28	53.26	74.00	20.74
11490.00	33.10	AV	V	38.99	6.59	25.51	53.17	47.15	54.00	6.85
17235.00	37.20	PK	V	41.56	8.78	23.72	63.82	57.8	68.20	10.40
Middle Channel: 5785 MHz										
5785.00	68.21	PK	H	34.21	3.71	0.00	106.13	100.11	N/A	N/A
5785.00	60.97	AV	H	34.21	3.71	0.00	98.89	92.87	N/A	N/A
5785.00	69.02	PK	V	34.21	3.71	0.00	106.94	100.92	N/A	N/A
5785.00	61.20	AV	V	34.21	3.71	0.00	99.12	93.1	N/A	N/A
11570.00	38.40	PK	V	39.00	6.61	25.46	58.55	52.53	74.00	21.47
11570.00	33.01	AV	V	39.00	6.61	25.46	53.16	47.14	54.00	6.86
17355.00	37.50	PK	V	42.26	8.81	23.60	64.97	58.95	68.20	9.25
High Channel: 5825 MHz										
5825.00	68.20	PK	H	34.23	3.73	0.00	106.16	100.14	N/A	N/A
5825.00	60.98	AV	H	34.23	3.73	0.00	98.94	92.92	N/A	N/A
5825.00	69.00	PK	V	34.23	3.73	0.00	106.96	100.94	N/A	N/A
5825.00	61.16	AV	V	34.23	3.73	0.00	99.12	93.1	N/A	N/A
5850.00	34.61	PK	V	34.24	3.75	0.00	72.60	66.58	122.20	55.62
5855.00	34.10	PK	V	34.24	3.75	0.00	72.09	66.07	110.80	44.73
5875.00	34.04	PK	V	34.25	3.77	0.00	72.06	66.04	105.20	39.16
5925.00	32.75	PK	V	34.27	3.80	0.00	70.82	64.8	68.20	3.40
11650.00	39.56	PK	V	39.00	6.64	25.41	59.79	53.77	74.00	20.23
11650.00	33.55	AV	V	39.00	6.64	25.41	53.78	47.76	54.00	6.24
17475.00	37.14	PK	V	42.96	8.84	23.48	65.46	59.44	68.20	8.76

802.11ac 40 (3TX was the worst)

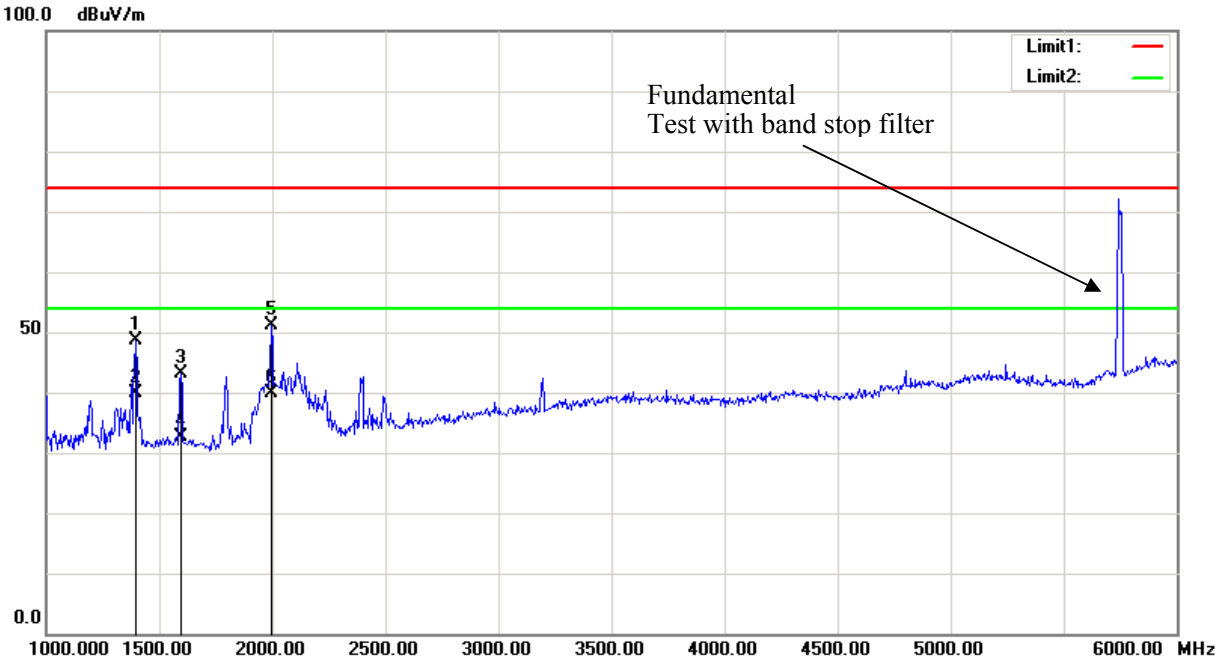
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5755 MHz										
5755.00	67.52	PK	H	34.20	3.70	0.00	105.42	99.4	N/A	N/A
5755.00	58.95	AV	H	34.20	3.70	0.00	96.85	90.83	N/A	N/A
5755.00	67.60	PK	V	34.20	3.70	0.00	105.50	99.48	N/A	N/A
5755.00	59.48	AV	V	34.20	3.70	0.00	97.38	91.36	N/A	N/A
5725.00	33.99	PK	V	34.19	3.69	0.00	71.87	65.85	122.20	56.35
5720.00	33.52	PK	V	34.19	3.69	0.00	71.40	65.38	110.80	45.42
5700.00	32.69	PK	V	34.18	3.68	0.00	70.55	64.53	105.20	40.67
5650.00	33.13	PK	V	34.16	3.63	0.00	70.92	64.9	68.20	3.30
11510.00	37.55	PK	V	39.00	6.59	25.50	57.64	51.62	74.00	22.38
11510.00	32.57	AV	V	39.00	6.59	25.50	52.66	46.64	54.00	7.36
17265.00	37.20	PK	V	41.74	8.79	23.69	64.04	58.02	68.20	10.18
High Channel: 5795 MHz										
5795.00	66.48	PK	H	34.22	3.71	0.00	104.41	98.39	N/A	N/A
5795.00	58.14	AV	H	34.22	3.71	0.00	96.07	90.05	N/A	N/A
5795.00	67.94	PK	V	34.22	3.71	0.00	105.87	99.85	N/A	N/A
5795.00	60.09	AV	V	34.22	3.71	0.00	98.02	92	N/A	N/A
5850.00	33.65	PK	V	34.24	3.75	0.00	71.64	65.62	122.20	56.58
5855.00	33.91	PK	V	34.24	3.75	0.00	71.90	65.88	110.80	44.92
5875.00	33.71	PK	V	34.25	3.77	0.00	71.73	65.71	105.20	39.49
5925.00	33.36	PK	V	34.27	3.80	0.00	71.43	65.41	68.20	2.79
11590.00	38.09	PK	V	39.00	6.62	25.45	58.26	52.24	74.00	21.76
11590.00	32.91	AV	V	39.00	6.62	25.45	53.08	47.06	54.00	6.94
17385.00	37.31	PK	V	42.43	8.82	23.57	64.99	58.97	68.20	9.23

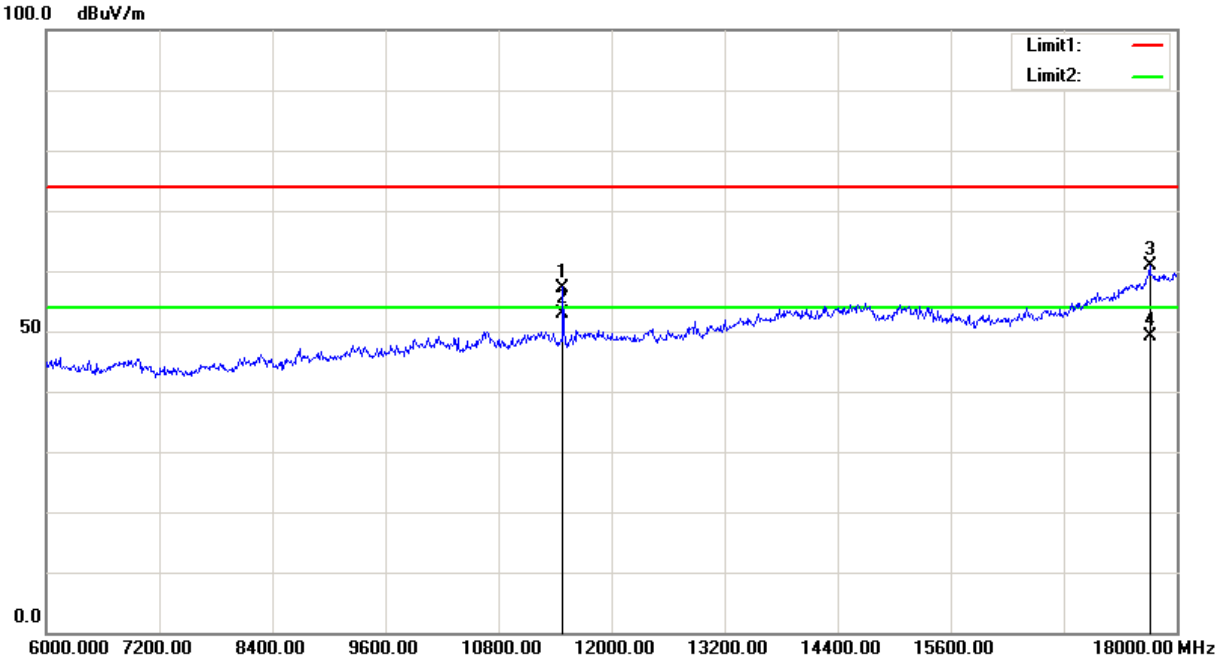
802.11ac 80 (3TX was the worst)

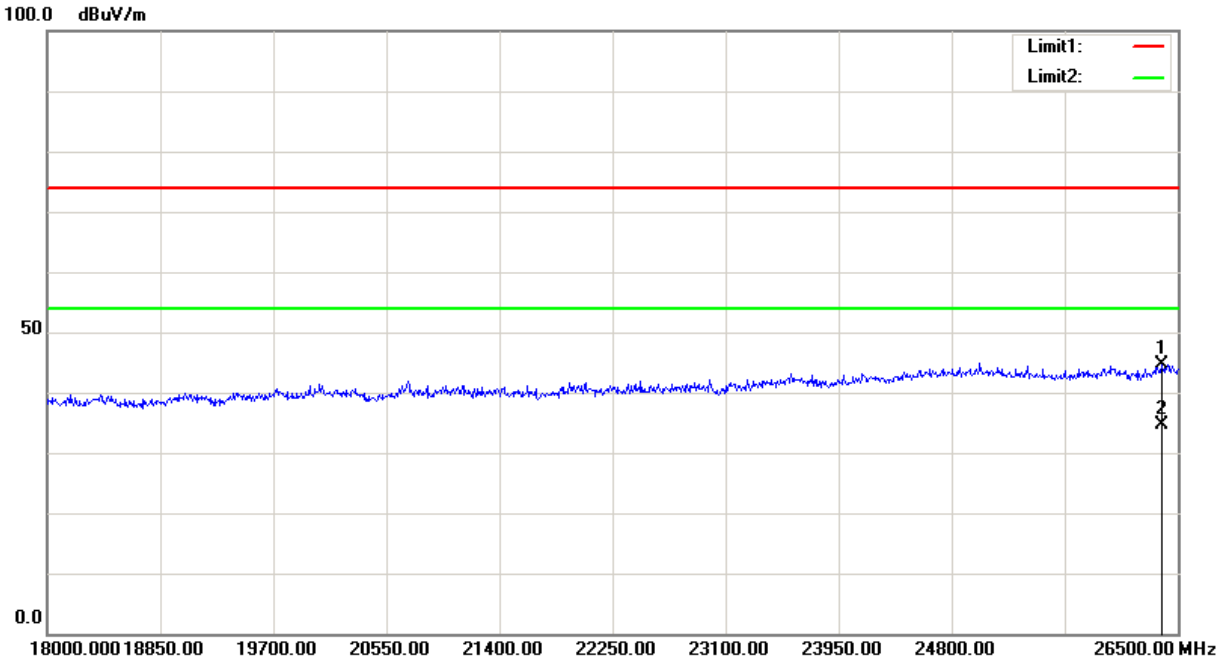
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)						
High Channel: 5775MHz										
5775.00	60.54	PK	H	34.21	3.70	0.00	98.45	92.43	N/A	N/A
5775.00	54.02	AV	H	34.21	3.70	0.00	91.93	85.91	N/A	N/A
5775.00	63.28	PK	V	34.21	3.70	0.00	101.19	95.17	N/A	N/A
5775.00	56.46	AV	V	34.21	3.70	0.00	94.37	88.35	N/A	N/A
5725.00	32.87	PK	V	34.19	3.69	0.00	70.75	64.73	122.20	57.47
5720.00	33.38	PK	V	34.19	3.69	0.00	71.26	65.24	110.80	45.56
5700.00	32.69	PK	V	34.18	3.68	0.00	70.55	64.53	105.20	40.67
5650.00	32.25	PK	V	34.16	3.63	0.00	70.04	64.02	68.20	4.18
5850.00	33.92	PK	V	34.24	3.75	0.00	71.91	65.89	122.20	56.31
5855.00	33.93	PK	V	34.24	3.75	0.00	71.92	65.9	110.80	44.90
5875.00	33.94	PK	V	34.25	3.77	0.00	71.96	65.94	105.20	39.26
5925.00	33.72	PK	V	34.27	3.80	0.00	71.79	65.77	68.20	2.43
11550.00	38.31	PK	V	39.00	6.61	25.48	58.44	52.42	74.00	21.58
11550.00	34.16	AV	V	39.00	6.61	25.48	54.29	48.27	54.00	5.73
17325.00	36.42	PK	V	42.09	8.80	23.63	63.68	57.66	68.20	10.54

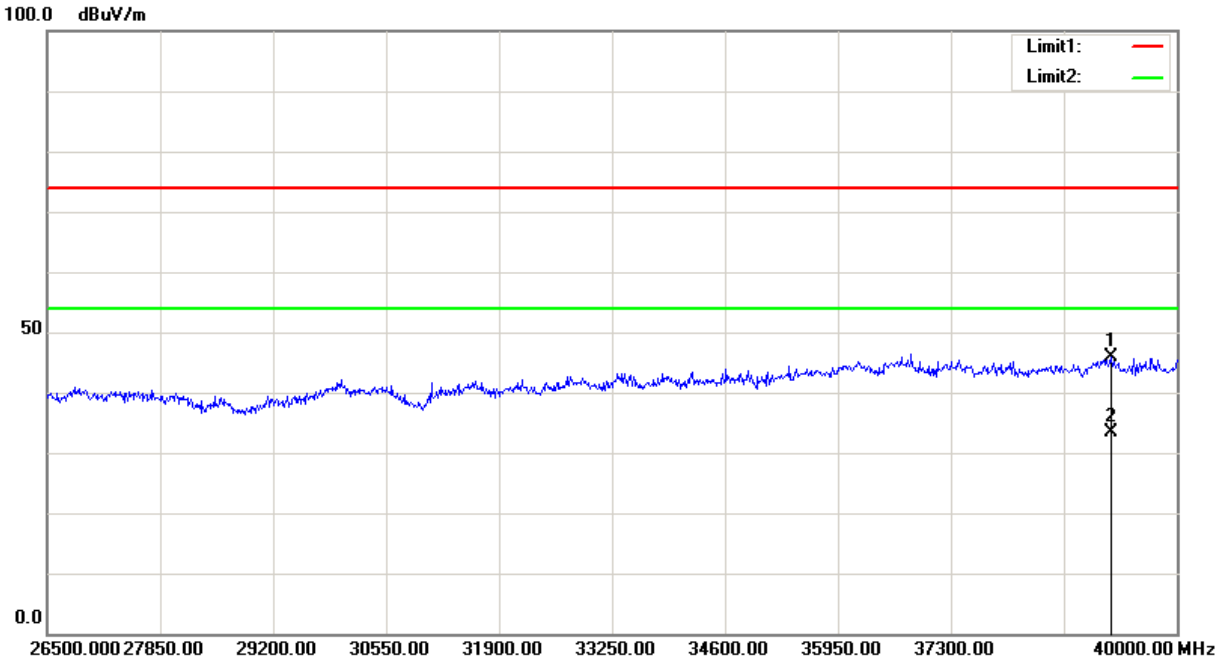
3) Test Plots(802.11a mode chain 2 5745MHz was the worst)

Horizontal

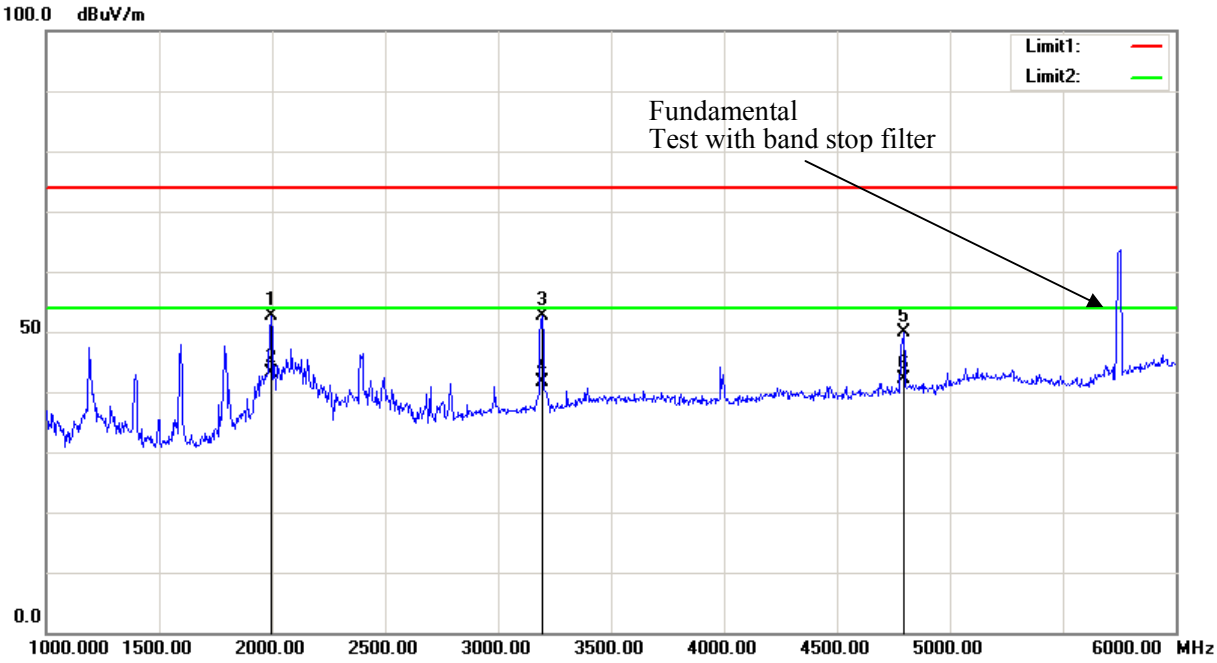


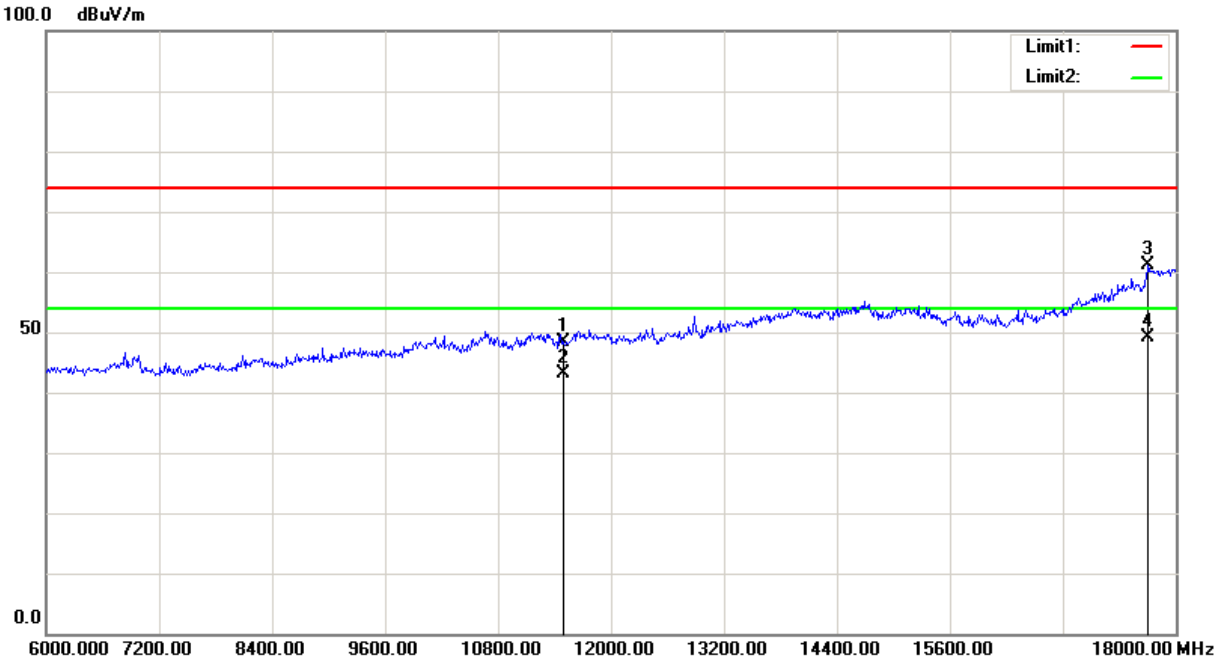


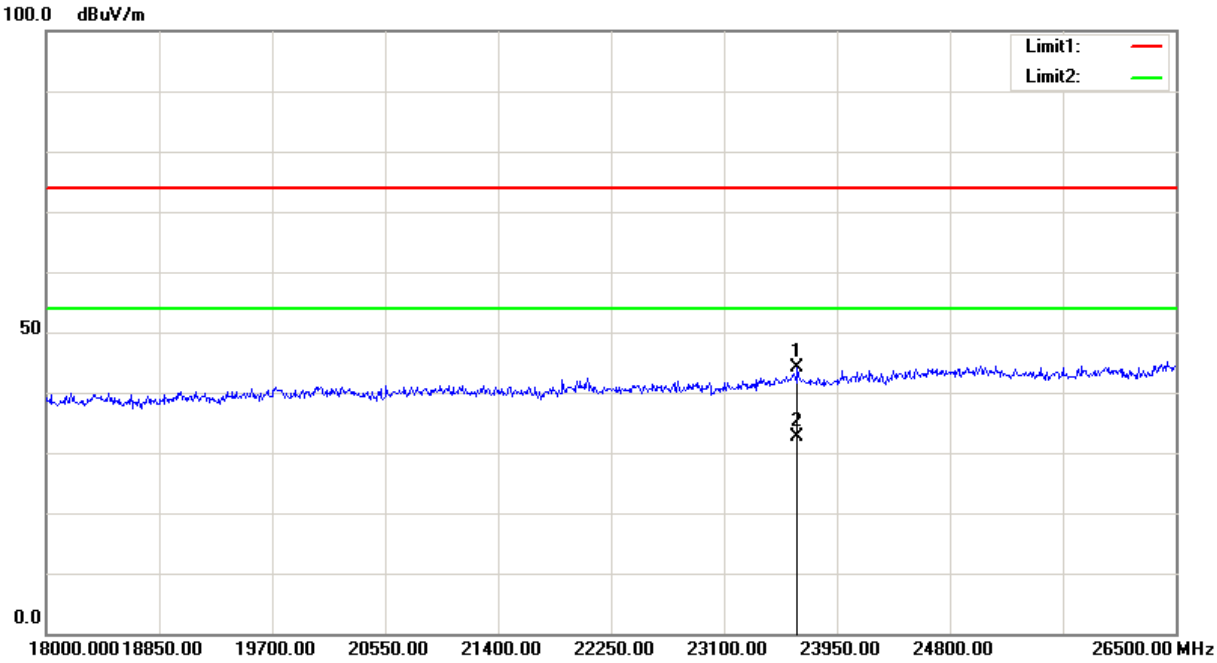

100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz

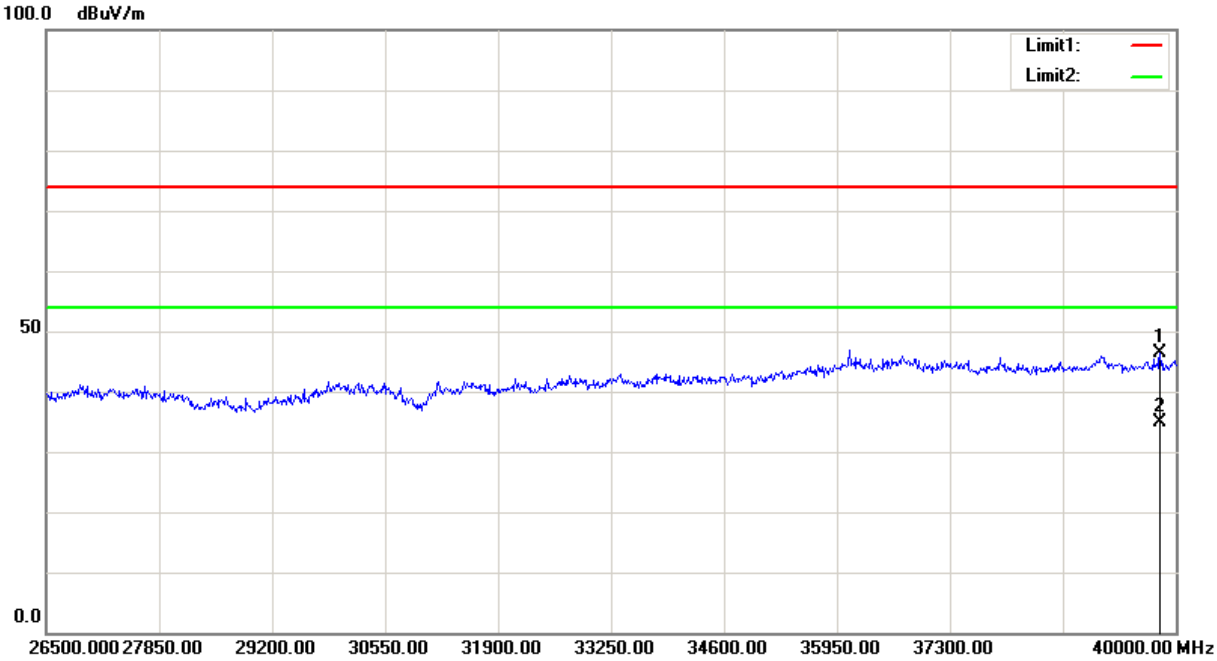

100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

Vertical


100.0 dBuV/m
Limit1:
Limit2:
Fundamental
Test with band stop filter
1
3
5
50
0.0
1000.000 1500.00 2000.00 2500.00 3000.00 3500.00 4000.00 4500.00 5000.00 6000.00 MHz


100.0 dBuV/m
Limit1:
Limit2:
1
3
50
0.0
6000.000 7200.00 8400.00 9600.00 10800.00 12000.00 13200.00 14400.00 15600.00 18000.00 MHz


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	FSV40	101474	2019-01-09	2020-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	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:	25.9°C
Relative Humidity:	44 %
ATM Pressure:	100.5 kPa

The testing was performed by Lily Xie on 2019-11-26.

Test Result: Pass.

Please refer to the following tables and plots.

Test mode: Transmitting (test was only performed at chain 0)

6dB Emission Bandwidth

Band	Mode	Channel	Frequency (MHz)	Result (MHz)	Limit (MHz)
5.8G	802.11 a	Low	5745	16.080	≥0.5
		Middle	5785	16.320	
		High	5825	16.320	
	802.11 n20	Low	5745	16.640	
		Middle	5785	16.320	
		High	5825	16.480	
	802.11 n40	Low	5755	35.360	
		High	5795	35.360	
	802.11 ac20	Low	5745	16.000	
		Middle	5785	16.080	
		High	5825	16.560	
	802.11 ac40	Low	5755	35.520	
		High	5795	35.680	
	802.11 ac80	Middle	5775	72.640	

99% Occupied Bandwidth

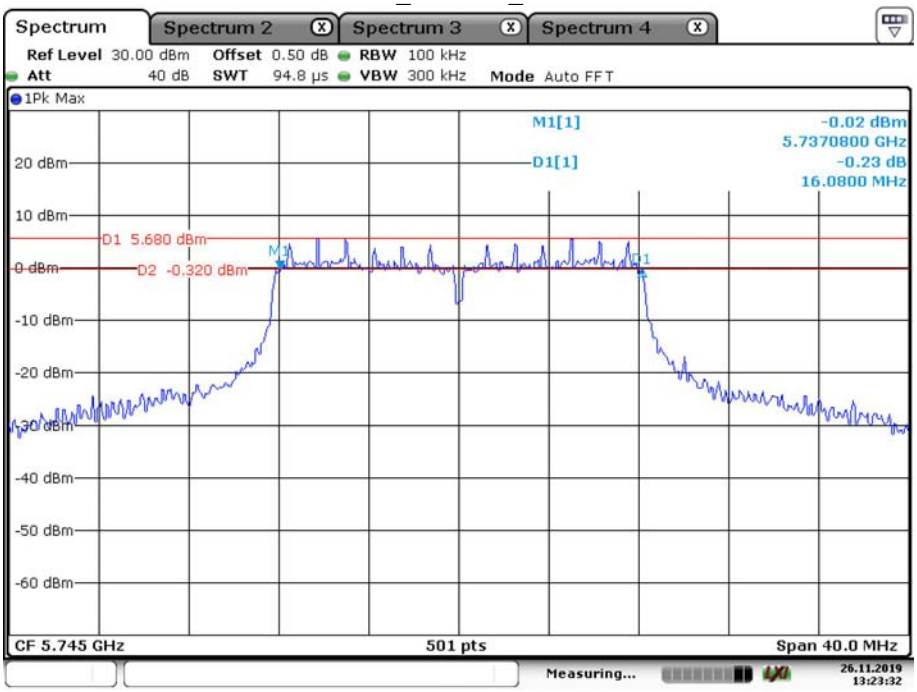
Band	Mode	Channel	Frequency (MHz)	Result (MHz)
5.8G	802.11 a	Low	5745	17.006
		Middle	5785	17.086
		High	5825	17.006
	802.11 n20	Low	5745	17.804
		Middle	5785	17.804
		High	5825	17.804
	802.11 n40	Low	5755	36.567
		High	5795	36.567
	802.11 ac20	Low	5745	17.804
		Middle	5785	17.804
		High	5825	17.804
	802.11 ac40	Low	5755	36.567
		High	5795	36.567
	802.11 ac80	Middle	5775	75.689

Note: 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.

Please refer to following plots:

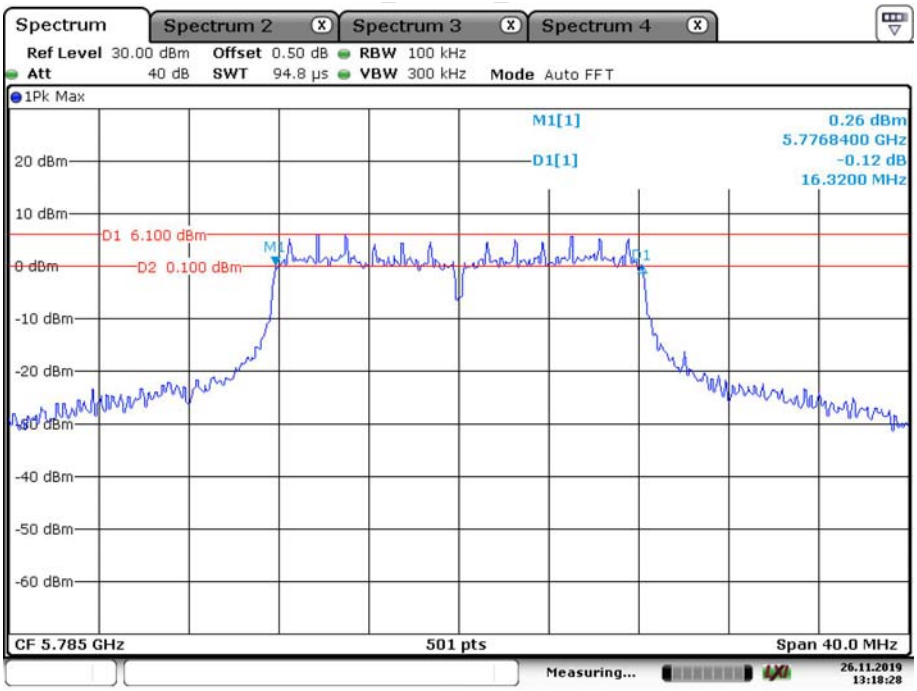
6dB Emission Bandwidth:

5.8G_802.11 a_Low



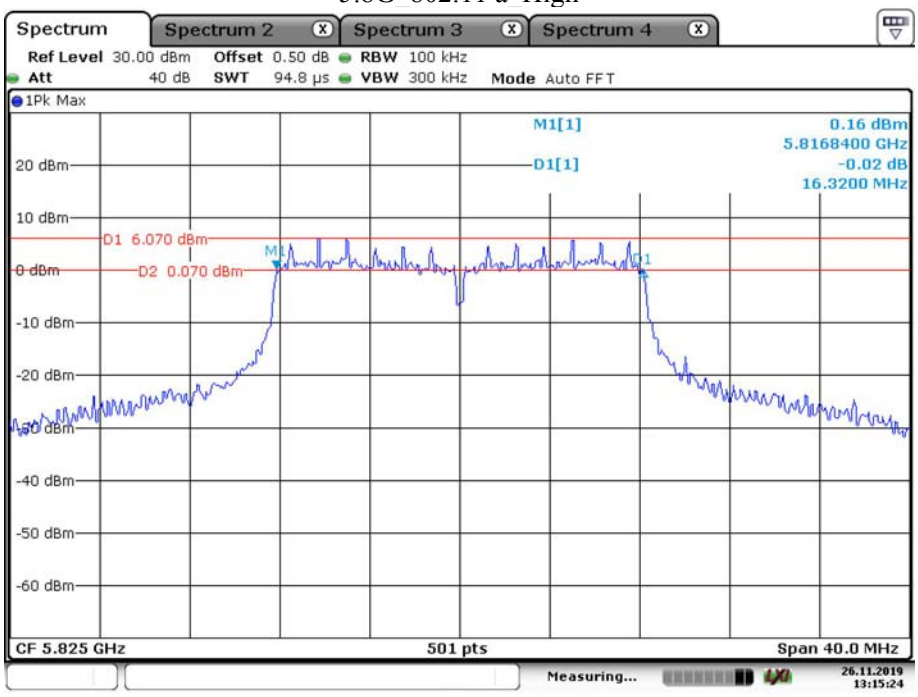
Date: 26.NOV.2019 13:23:33

5.8G_802.11 a_Middle



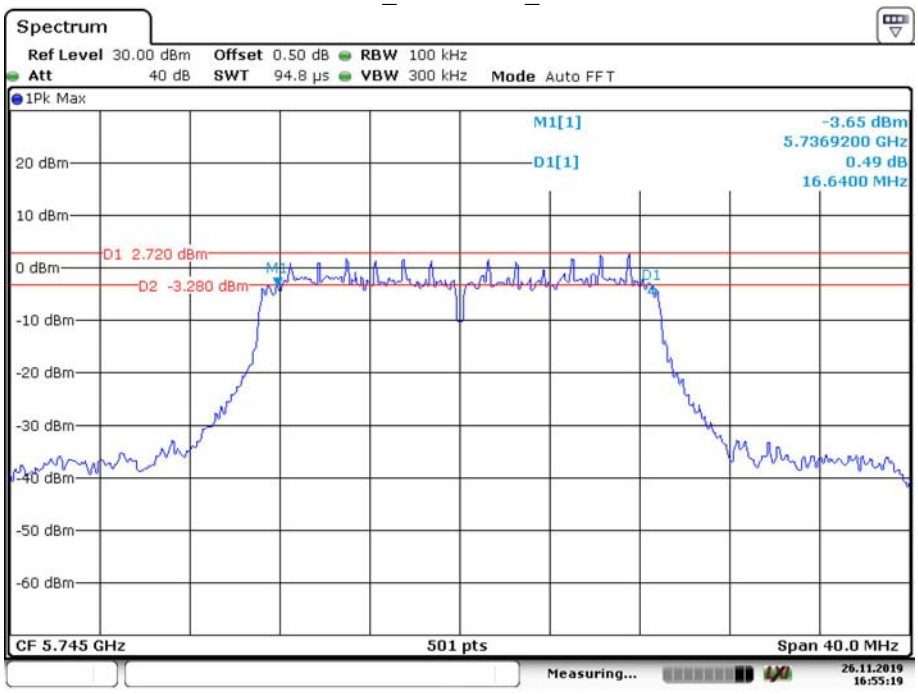
Date: 26.NOV.2019 13:18:28

5.8G_802.11 a_High



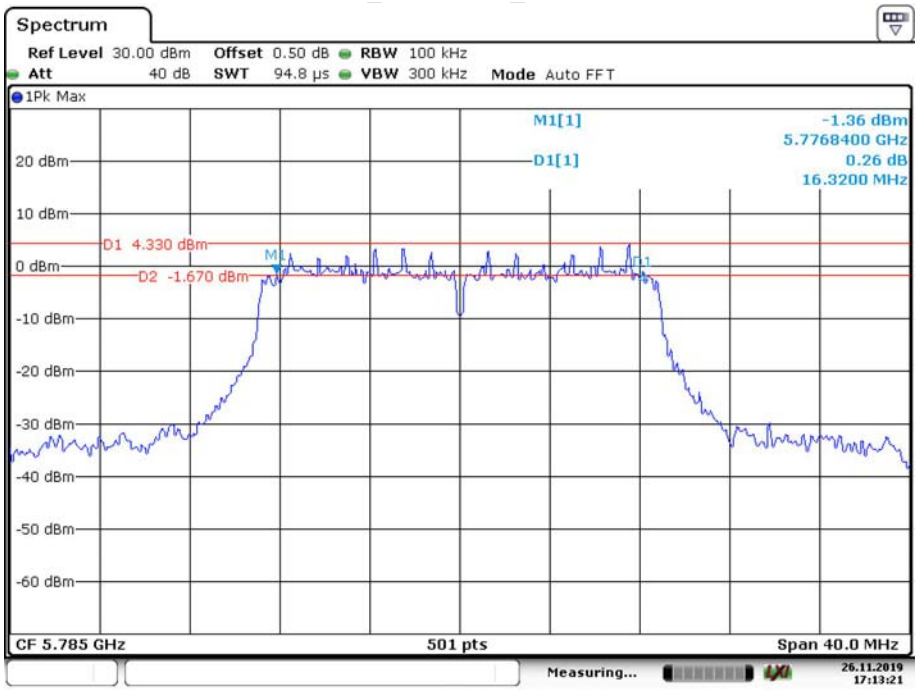
Date: 26.NOV.2019 13:15:25

5.8G_802.11 n20_Low



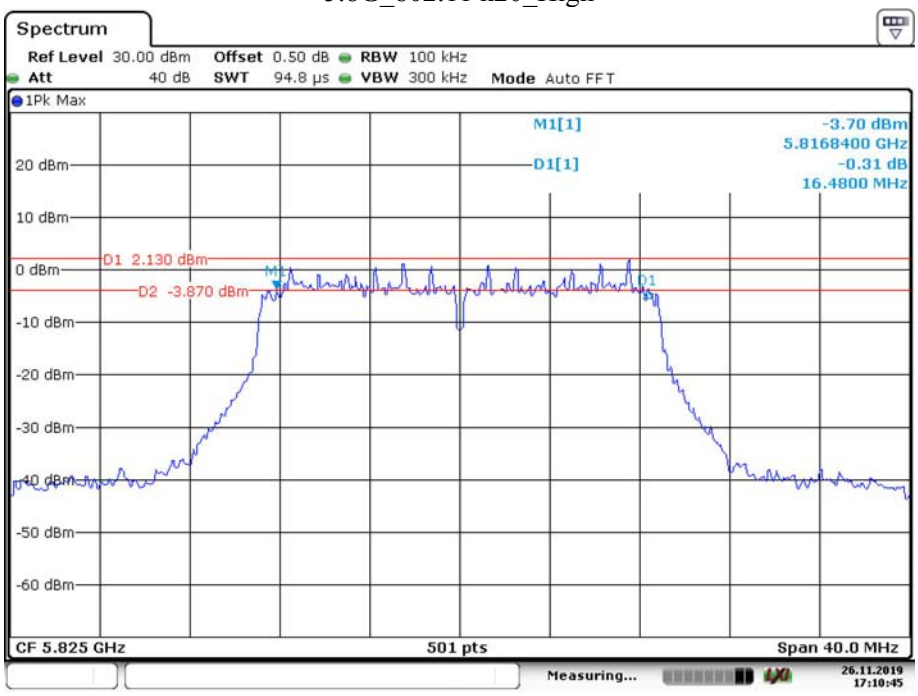
Date: 26.NOV.2019 16:55:20

5.8G_802.11 n20_Middle



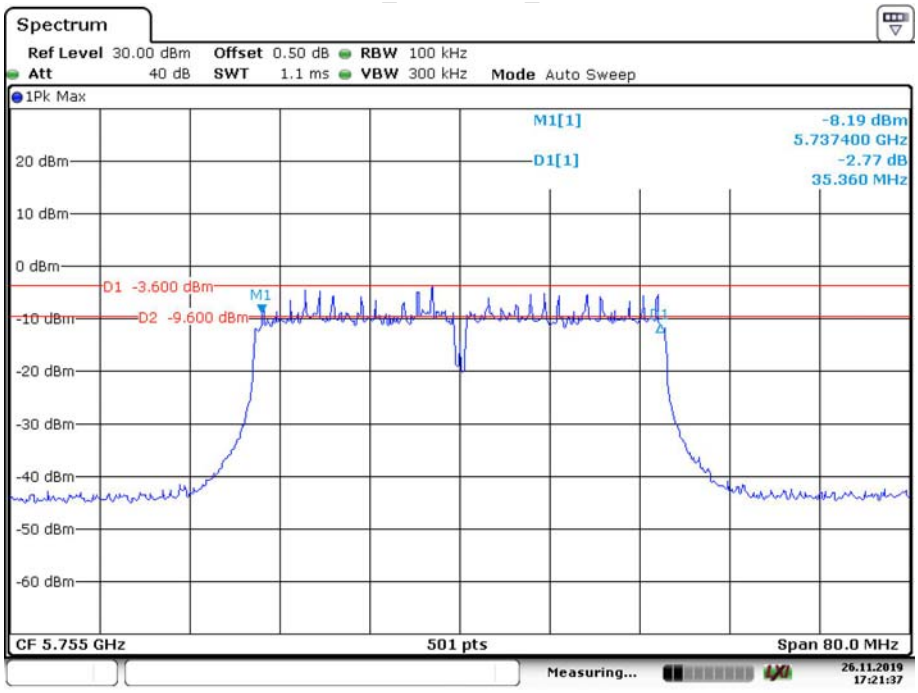
Date: 26.NOV.2019 17:13:22

5.8G_802.11 n20_High



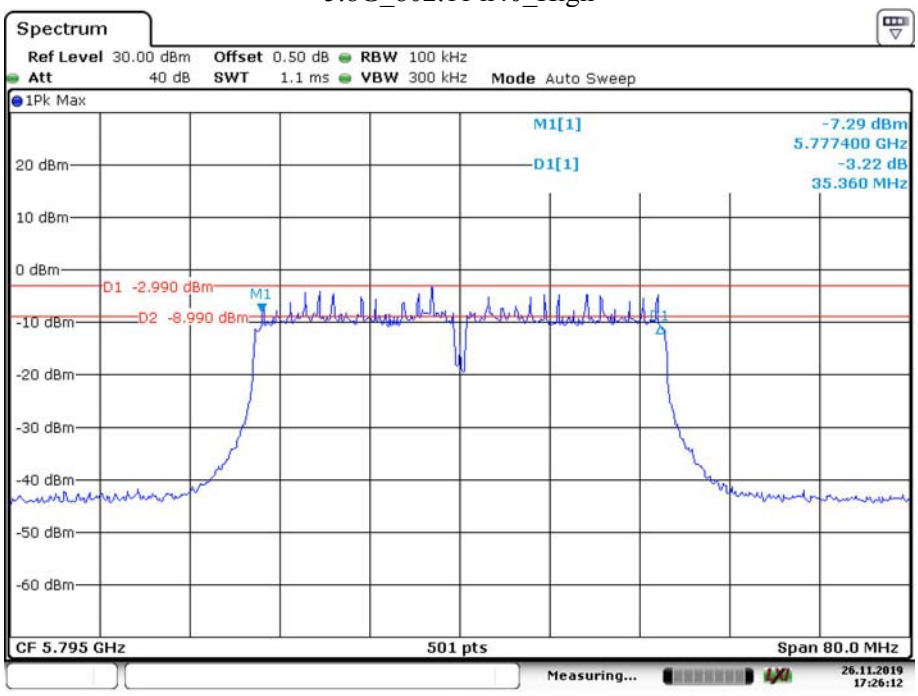
Date: 26.NOV.2019 17:10:45

5.8G_802.11 n40_Low



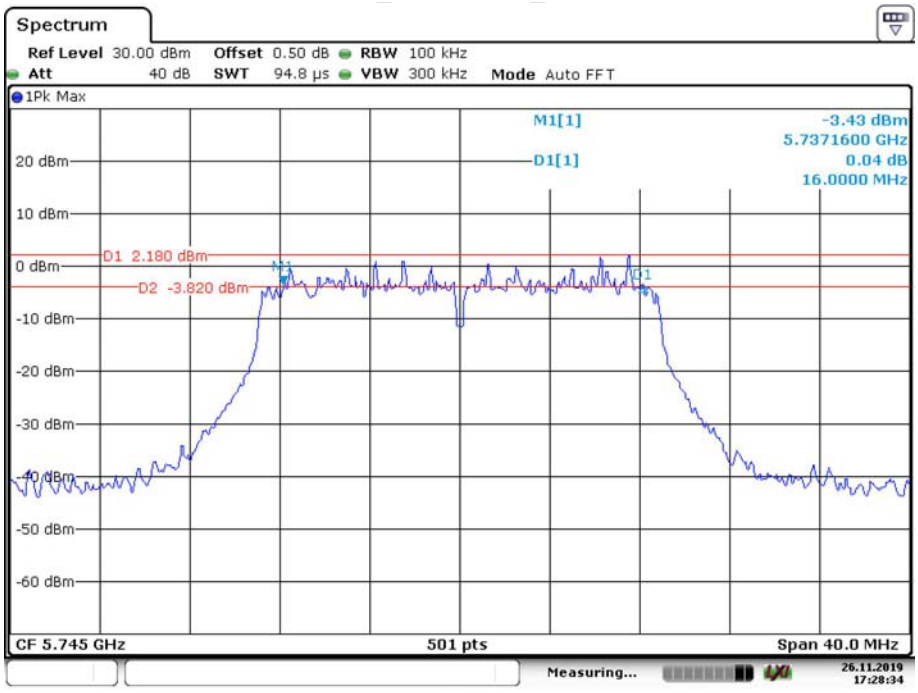
Date: 26.NOV.2019 17:21:38

5.8G_802.11 n40_High



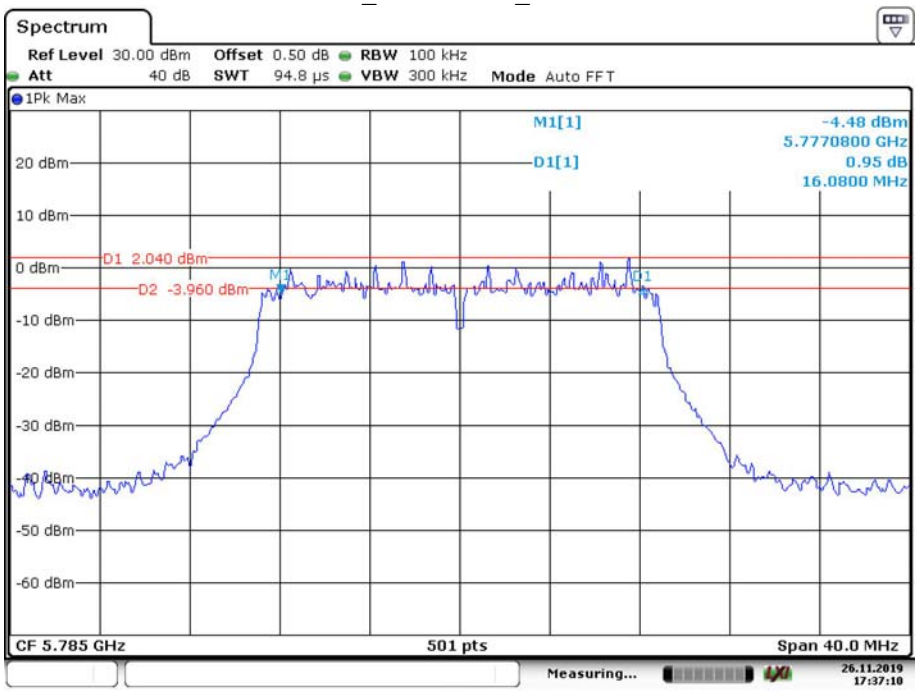
Date: 26.NOV.2019 17:26:13

5.8G_802.11 ac20_Low



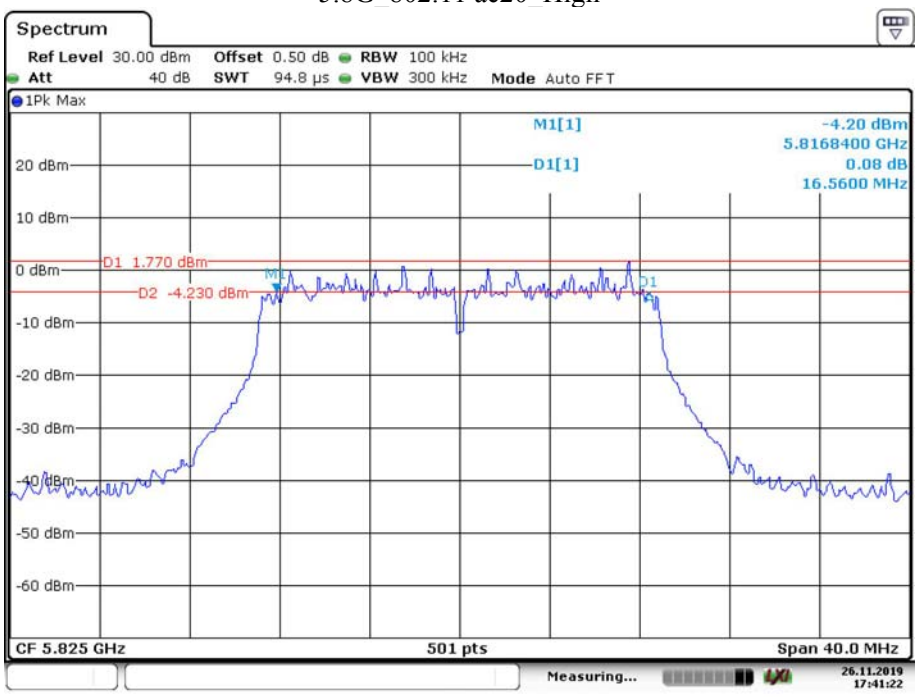
Date: 26.NOV.2019 17:28:35

5.8G_802.11 ac20_Middle



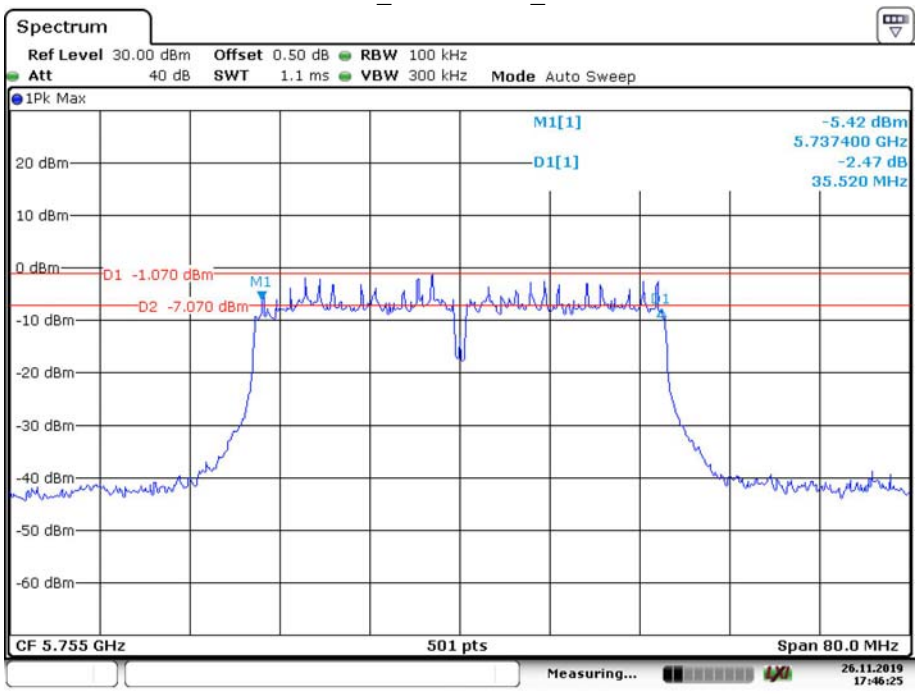
Date: 26.NOV.2019 17:37:11

5.8G_802.11 ac20_High



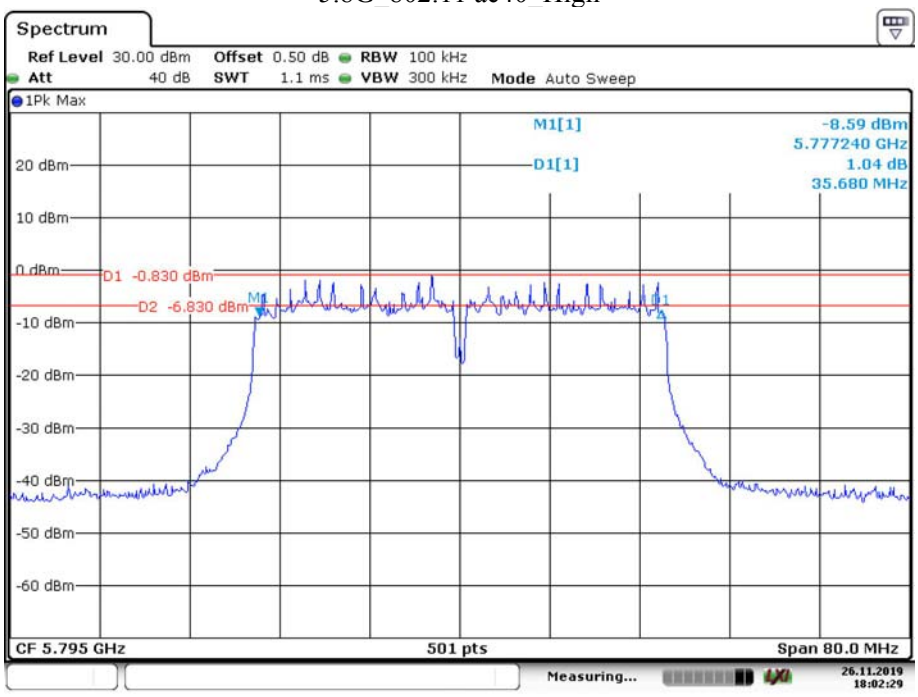
Date: 26.NOV.2019 17:41:22

5.8G_802.11 ac40_Low



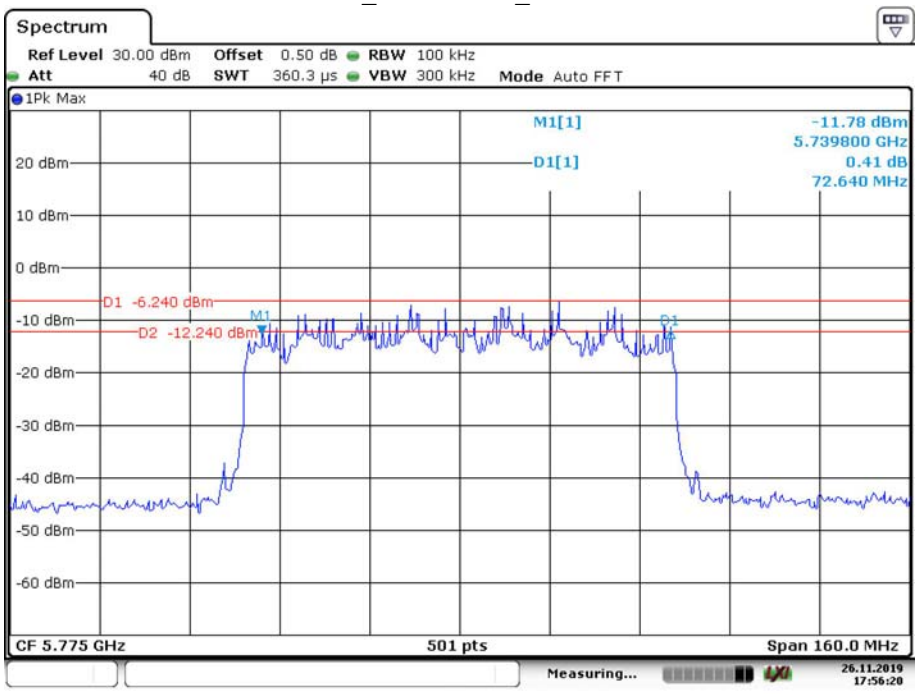
Date: 26.NOV.2019 17:46:26

5.8G_802.11 ac40_High



Date: 26.NOV.2019 18:02:30

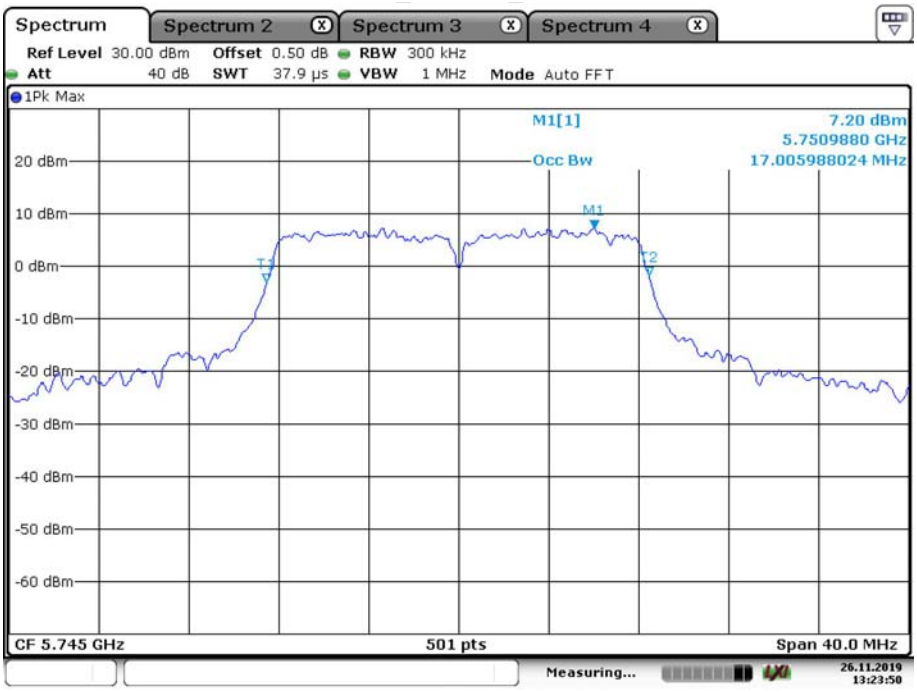
5.8G_802.11 ac80_Middle



Date: 26.NOV.2019 17:56:21

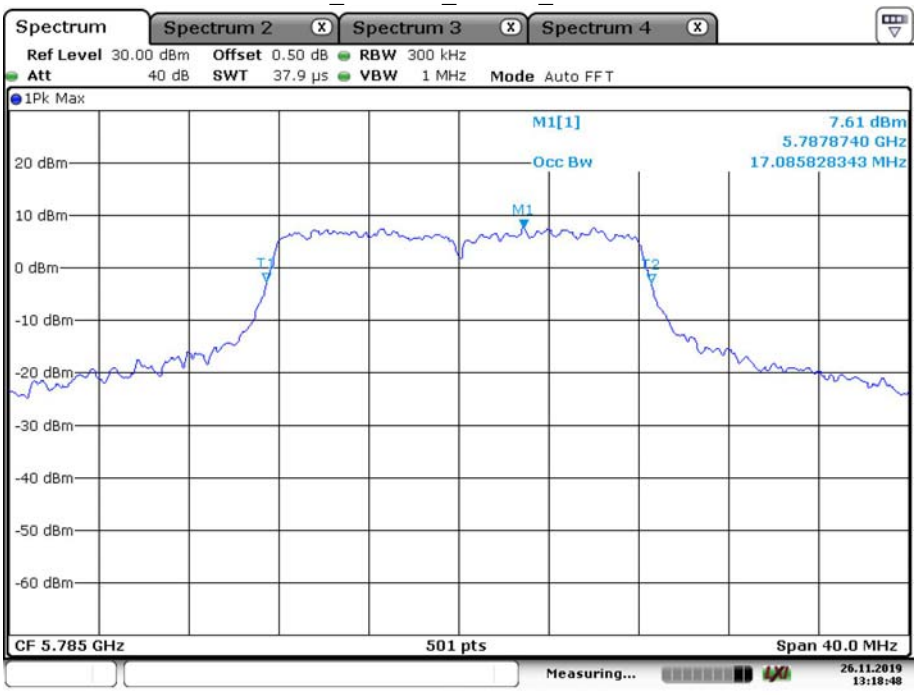
99% Occupied Bandwidth:

5.8G_802.11 a_Low



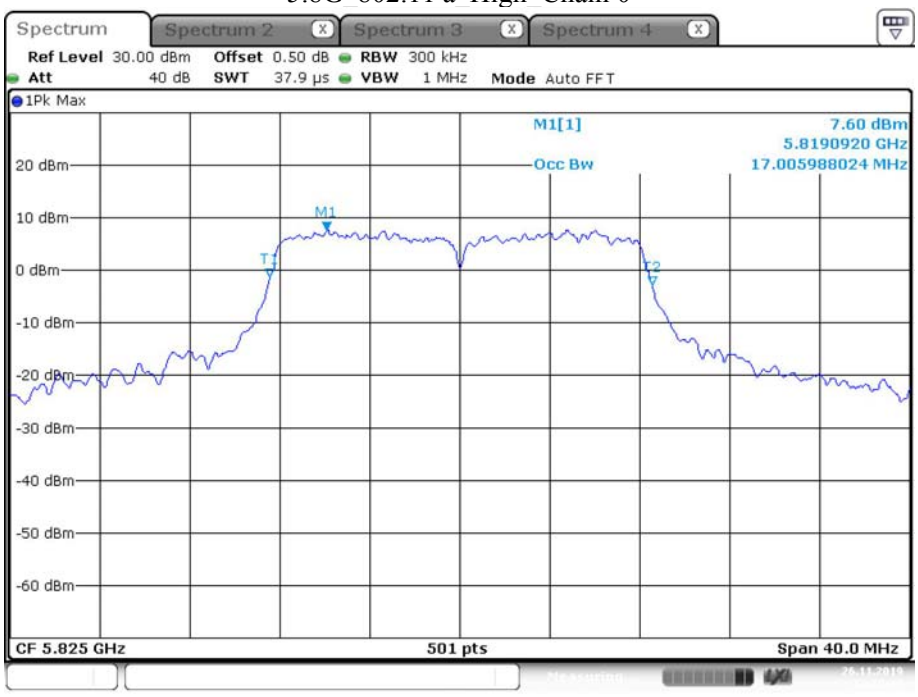
Date: 26.NOV.2019 13:23:51

5.8G_802.11 a_Middle_Chain 0



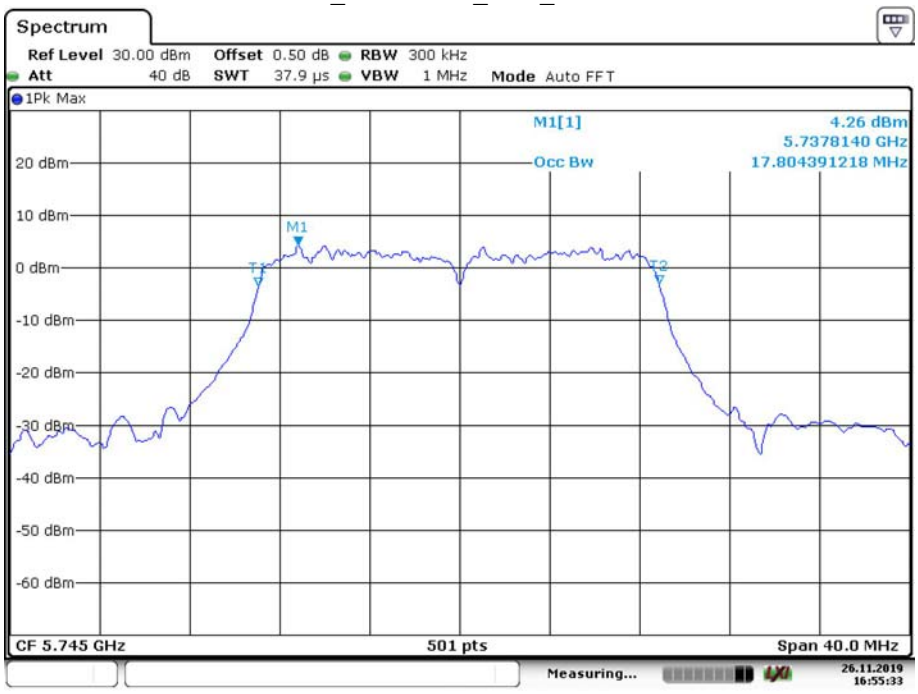
Date: 26.NOV.2019 13:18:49

5.8G_802.11 a_High_Chain 0



Date: 26.NOV.2019 13:15:45

5.8G_802.11 n20_Low_Chain 0

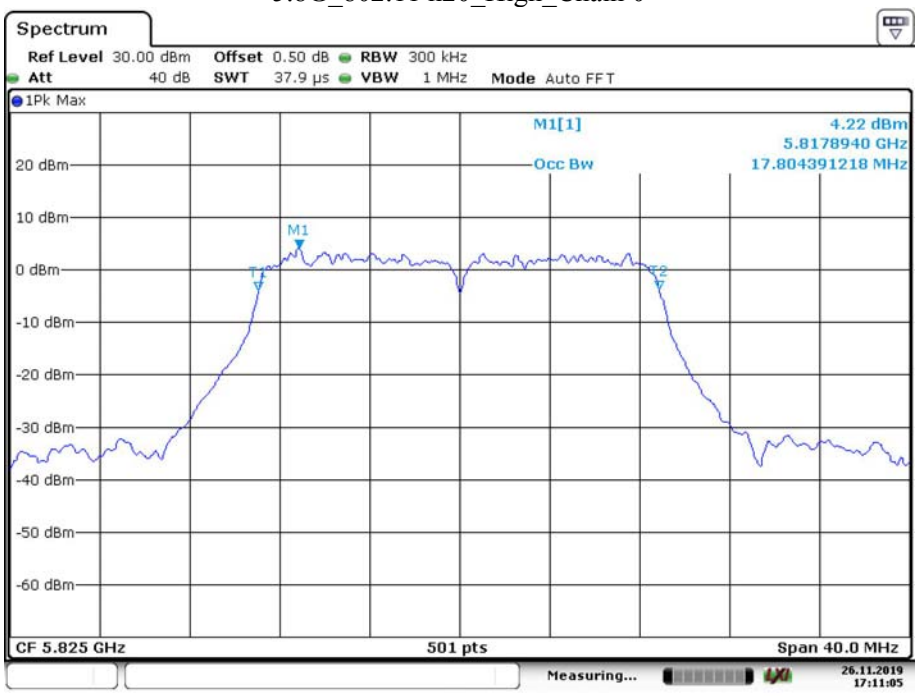


Date: 26.NOV.2019 16:55:34

5.8G_802.11 n20_Middle_Chain 0

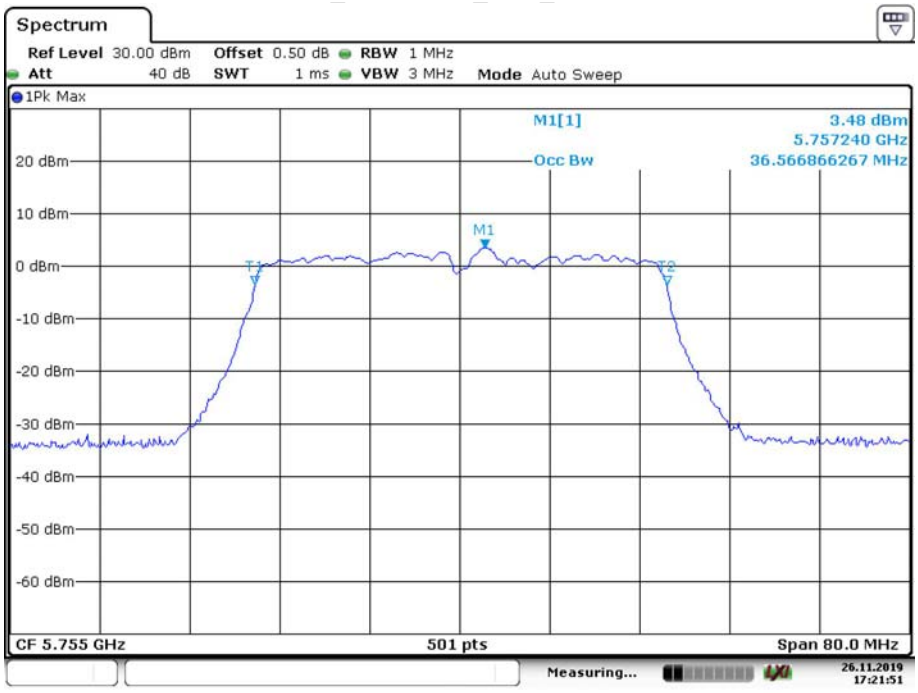
Date: 26.NOV.2019 17:13:39

5.8G_802.11 n20_High_Chain 0



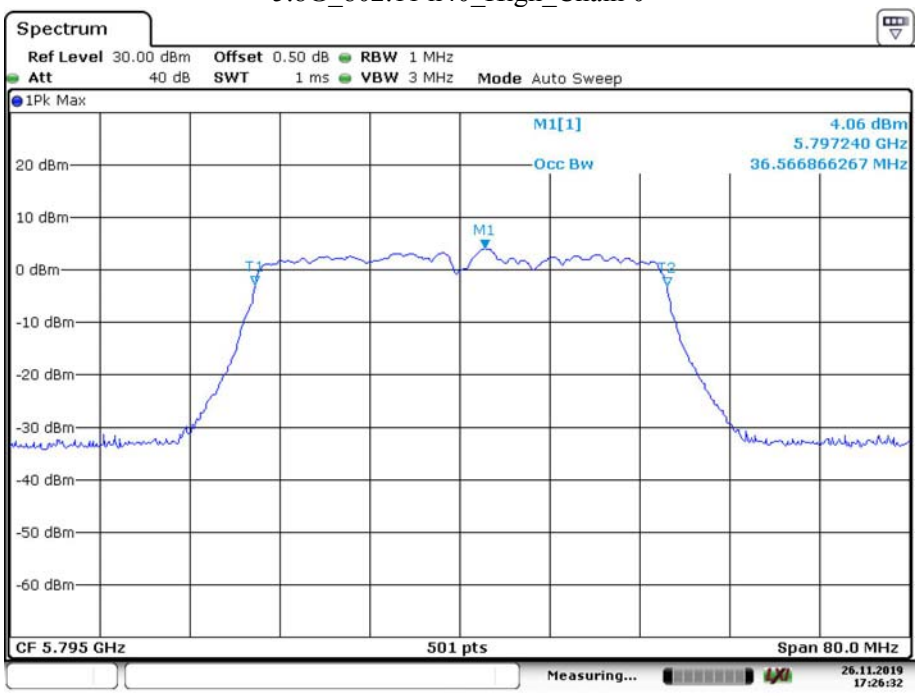
Date: 26.NOV.2019 17:11:06

5.8G_802.11 n40_Low_Chain 0



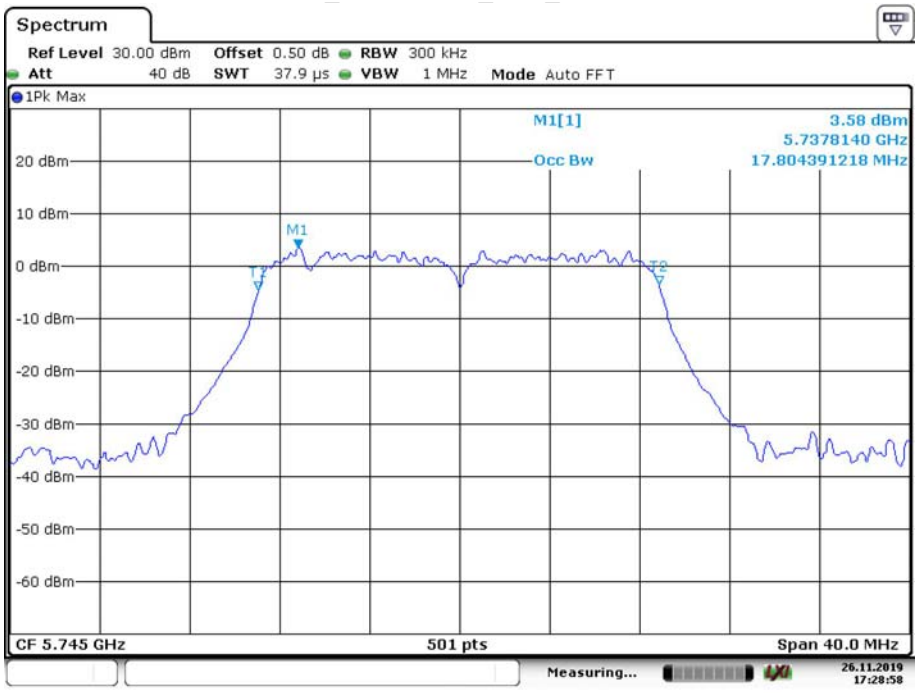
Date: 26.NOV.2019 17:21:52

5.8G_802.11 n40_High_Chain 0



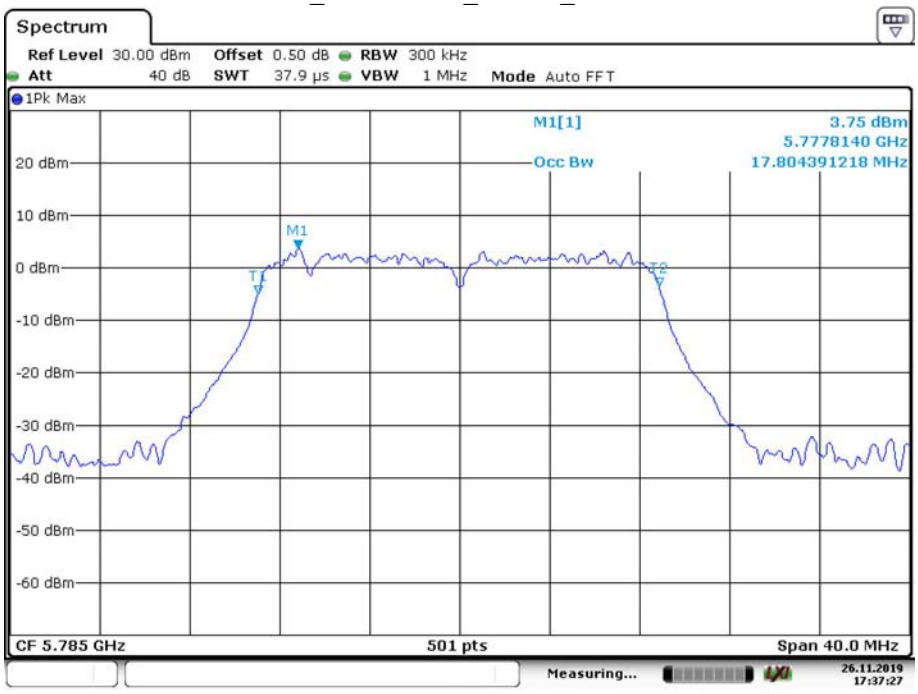
Date: 26.NOV.2019 17:26:33

5.8G_802.11 ac20_Low_Chain 0



Date: 26.NOV.2019 17:28:59

5.8G_802.11 ac20_Middle_Chain 0



Date: 26.NOV.2019 17:37:28

5.8G_802.11 ac20_High_Chain 0

Date: 26.NOV.2019 17:41:43

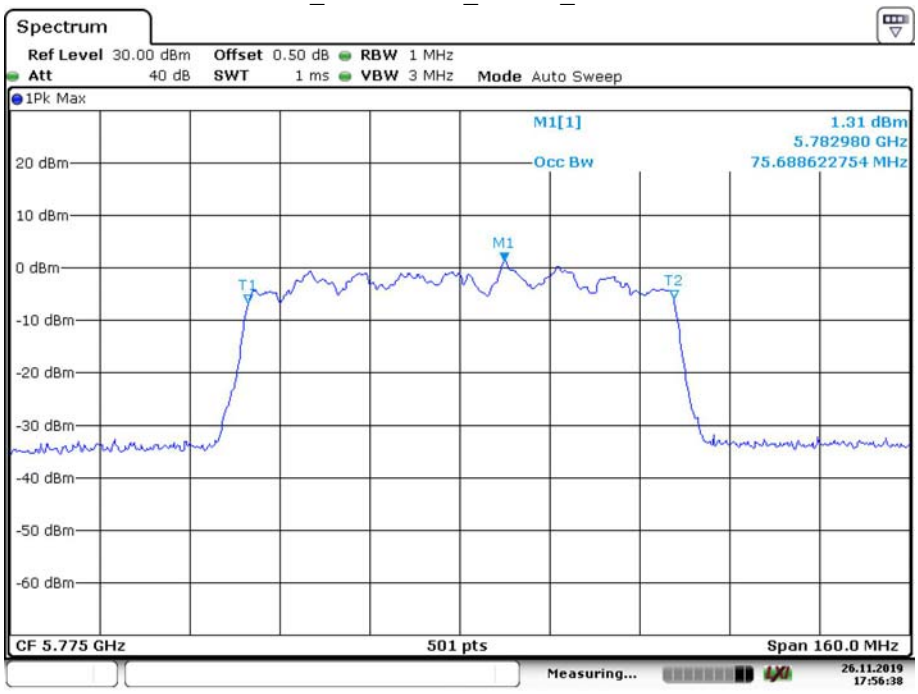
5.8G_802.11 ac40_Low_Chain 0

Date: 26.NOV.2019 17:46:40

5.8G_802.11 ac40_High_Chain 0

Date: 26.NOV.2019 18:02:47

5.8G_802.11 ac80_Middle_Chain 0



Date: 26.NOV.2019 17:56:38

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
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	0E01201048	2019-05-06	2020-05-06
Weinschel	Coaxial Attenuators	53-20-34	LN749	2019-09-06	2020-09-06
Agilent	USB Wideband Power Sensor	U2021XA	MY5425009	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

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

Test Data

Environmental Conditions

Temperature:	25.9°C
Relative Humidity:	44 %
ATM Pressure:	100.5 kPa

The testing was performed by Lily Xie on 2019-11-26.

Test Mode: Transmitting

Band	Mode	Channel	Frequency (MHz)	Result (dBm)				Limit (dBm)
				Chain 0	Chain 1	Chain 2	Total	
5.8G	802.11 a	Low	5745	8.67	8.62	10.32	/	30
		Middle	5785	9.56	8.65	10.27	/	
		High	5825	9.19	8.40	11.26	/	
	802.11 n20	Low	5745	9.05	7.55	10.46	13.95	
		Middle	5785	9.43	8.07	10.71	14.31	
		High	5825	9.17	8.18	10.97	14.37	
	802.11 n40	Low	5755	8.96	7.26	9.71	13.53	
		High	5795	9.35	7.41	9.76	13.73	
	802.11 ac20	Low	5745	9.18	7.55	10.07	13.83	
		Middle	5785	9.16	7.56	10.12	13.84	
		High	5825	8.77	7.59	10.06	13.69	
	802.11 ac40	Low	5755	9.21	7.59	10.19	13.90	
		High	5795	9.45	7.72	10.09	13.97	
	802.11 ac80	Middle	5775	8.15	8.25	8.08	12.93	

Note:
The duty cycle factor has been calculated into the test data.
The maximum antenna gain is 3.0 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 = 3.0 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	FSV40	101474	2019-01-09	2020-01-09
				2020-01-09	2021-01-09
R&S	Spectrum Analyzer	FSU 26	200256	2019/5/9	2020/5/9
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	0E01201048	2019-05-06	2020-05-06

*** 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:	25.1°C
Relative Humidity:	41%
ATM Pressure:	101.5 kPa

The testing was performed by Lily Xie on 2019-12-19.

Test Mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Reading (dBm/300kHz)			Factor (dB)	Result (dBm/500kHz)				Limit (dBm/500 kHz)
			Chain 0	Chain 1	Chain 2		Chain 0	Chain 1	Chain 2	Total	
802.11 a	Low	5745	-4.29	-3.87	-2.61	2.22	-1.95	-1.53	-0.27	/	28.2
	Middle	5785	-3.82	-4.29	-2.15	2.22	-1.48	-1.95	0.19	/	
	High	5825	-4.09	-4.12	-2.12	2.22	-1.75	-1.78	0.22	/	
802.11 n20	Low	5745	-1.13	-1.75	1.45	2.22	1.44	0.82	4.02	7.10	
	Middle	5785	-1.10	-2.84	-0.22	2.22	1.47	-0.27	2.35	6.09	
	High	5825	-2.47	-3.23	-1.00	2.22	0.10	-0.66	1.57	5.21	
802.11 n40	Low	5755	-3.75	-4.38	-3.50	2.22	-0.87	-1.50	-0.62	3.79	
	High	5795	-4.21	-4.58	-4.33	2.22	-1.33	-1.70	-1.45	3.28	
802.11 ac20	Low	5745	-1.26	-3.29	1.88	2.22	1.34	-0.69	4.48	7.01	
	Middle	5785	-1.69	-3.70	1.39	2.22	0.91	-1.10	3.99	6.55	
	High	5825	-3.15	-4.26	1.54	2.22	-0.55	-1.66	4.14	6.19	
802.11 ac40	Low	5755	-4.19	-4.41	-1.79	2.22	-1.27	-1.49	1.13	4.40	
	High	5795	-4.29	-5.09	-1.98	2.22	-1.37	-2.17	0.94	4.11	
802.11 ac80	Middle	5775	-5.79	-7.95	-6.95	2.22	-2.37	-4.53	-3.53	1.38	

Note 1:
The maximum antenna gain is 3dBi 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:

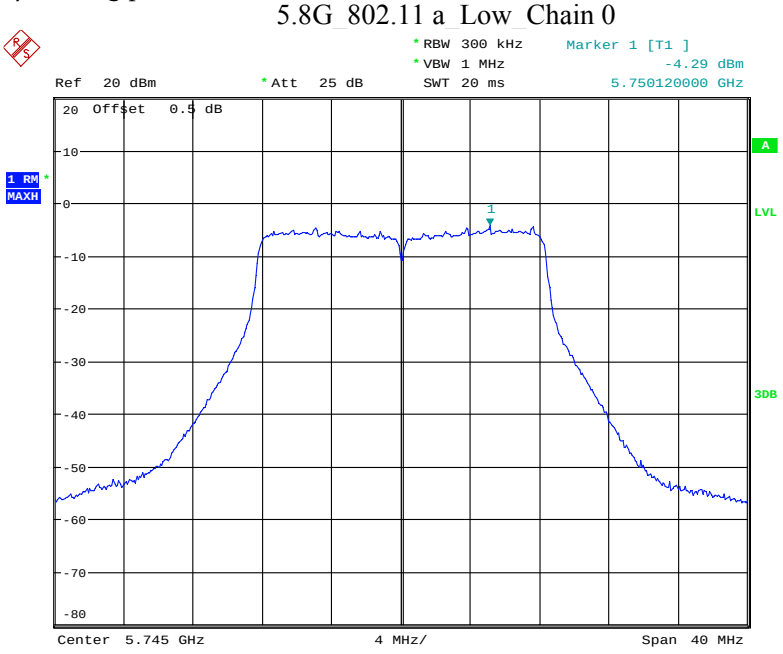
Directional gain = G_{ANT} + Array Gain = 3dBi+10*log(3/1)=7.8dBi

Note2: For 5.8GHz band, If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

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

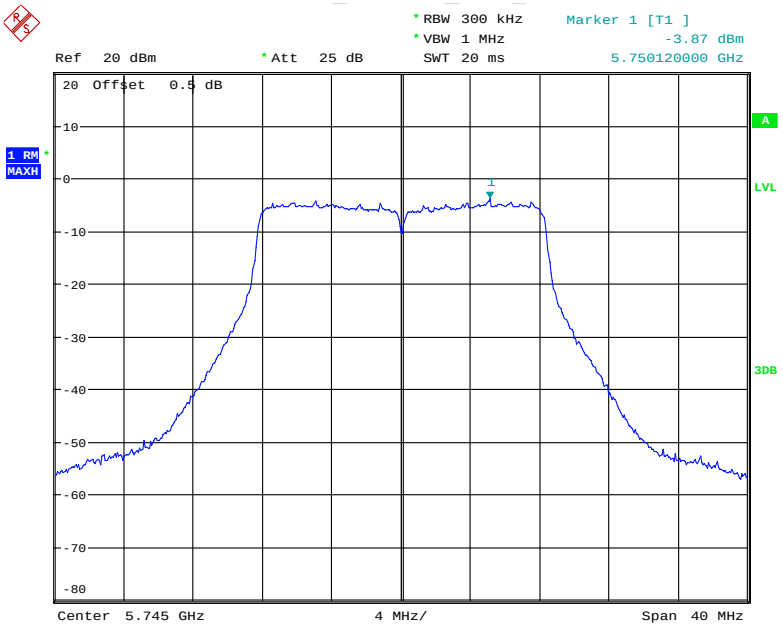
Please refer to following plots:

5.8G_802.11 a_Low_Chain 0



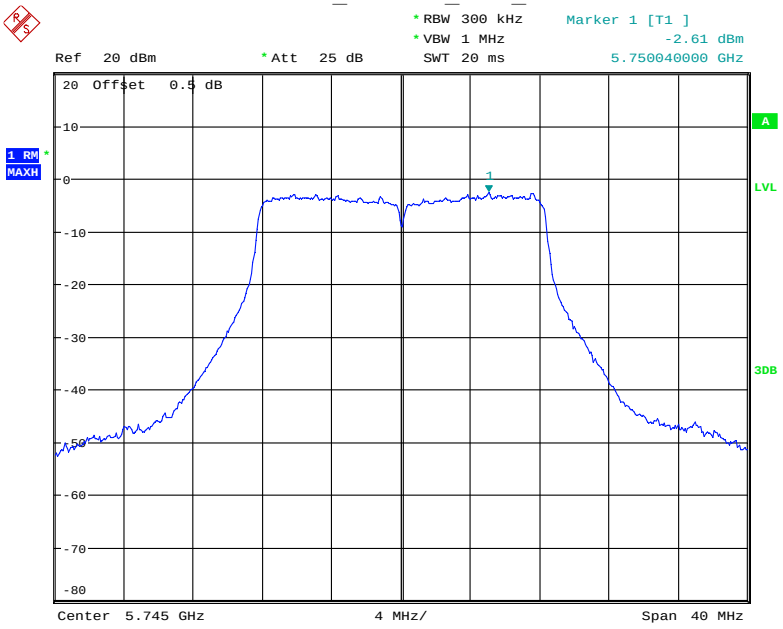
Date: 19.DEC.2019 14:04:05

5.8G_802.11 a_Low_Chain 1



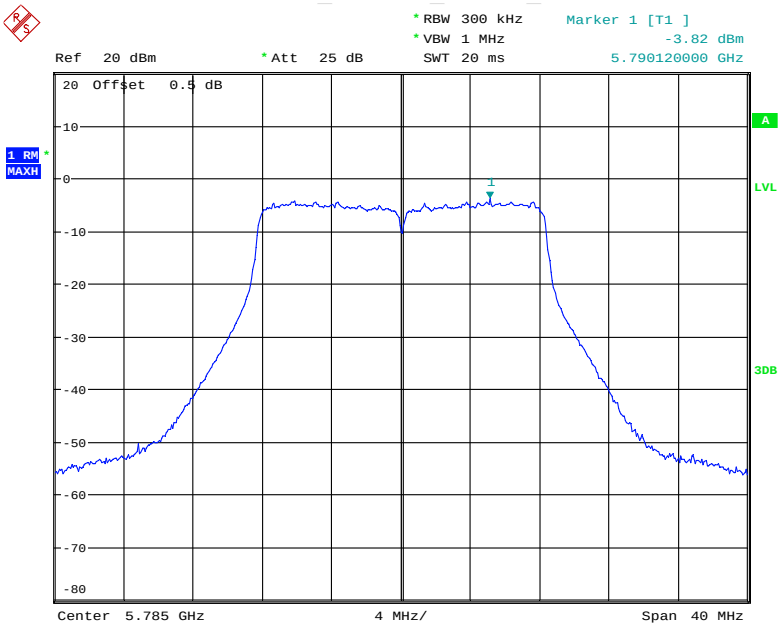
Date: 19.DEC.2019 14:23:55

5.8G_802.11 a_Low_Chain 2



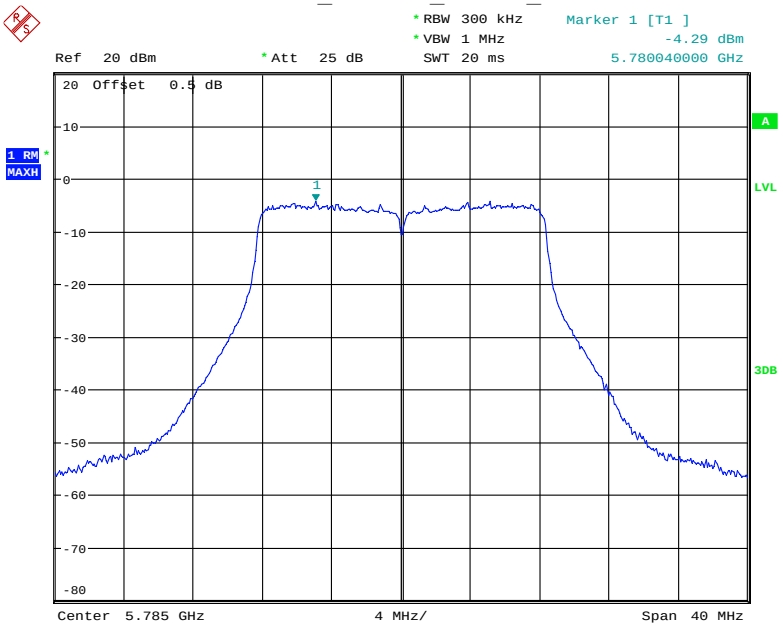
Date: 19.DEC.2019 14:33:15

5.8G_802.11 a_Middle_Chain 0



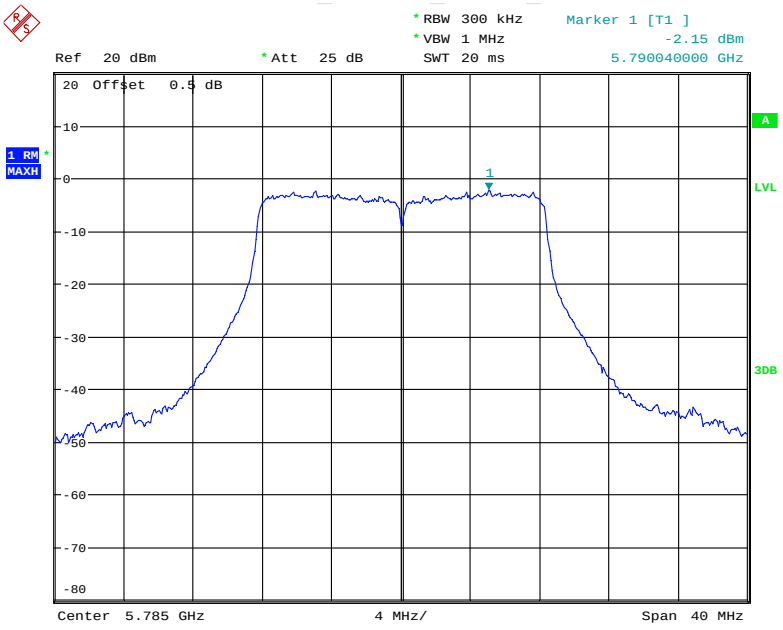
Date: 19.DEC.2019 14:05:41

5.8G_802.11 a_Middle_Chain 1



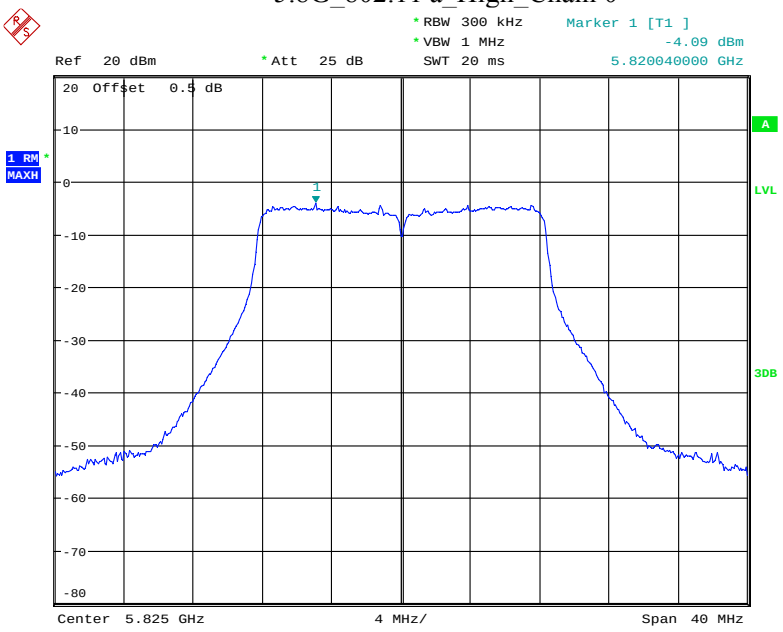
Date: 19.DEC.2019 14:24:26

5.8G_802.11 a_Middle_Chain 2



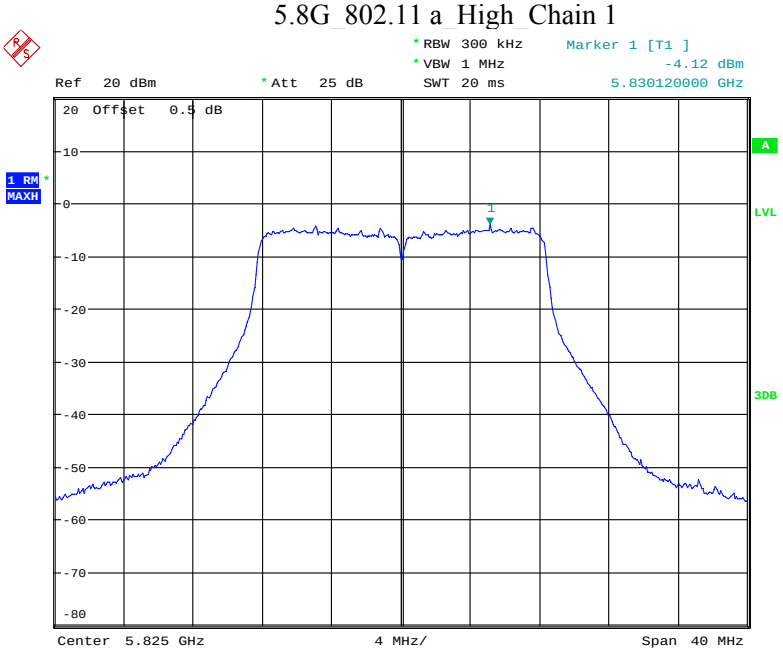
Date: 19.DEC.2019 14:33:51

5.8G_802.11 a_High_Chain 0



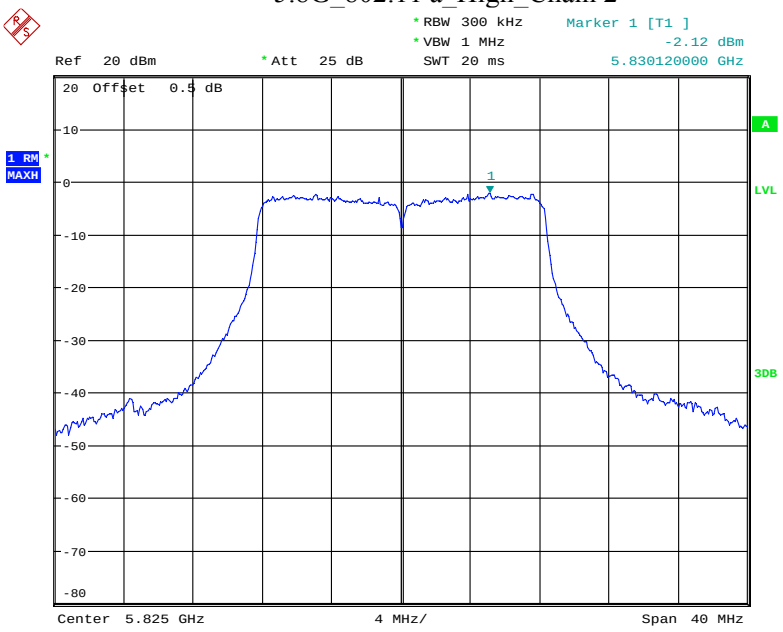
Date: 19.DEC.2019 14:06:14

5.8G_802.11 a_High_Chain 1



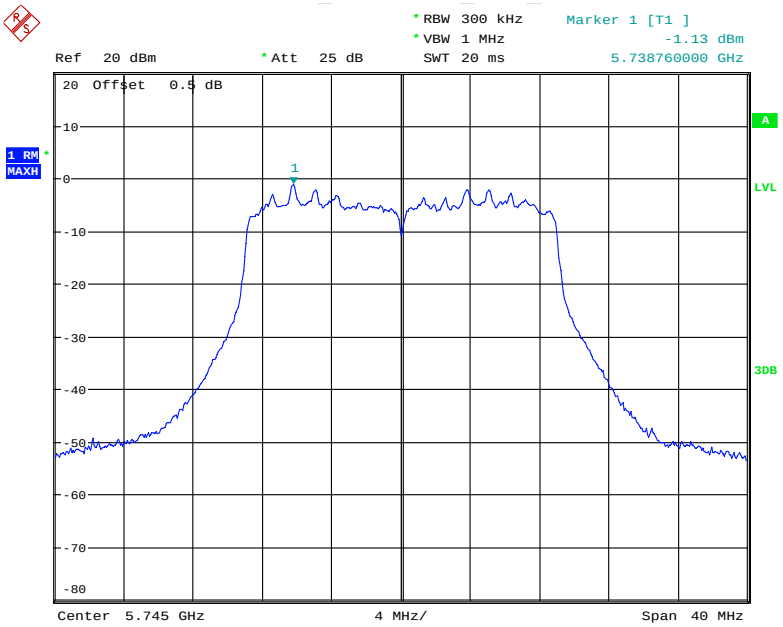
Date: 19.DEC.2019 14:24:57

5.8G_802.11 a_High_Chain 2



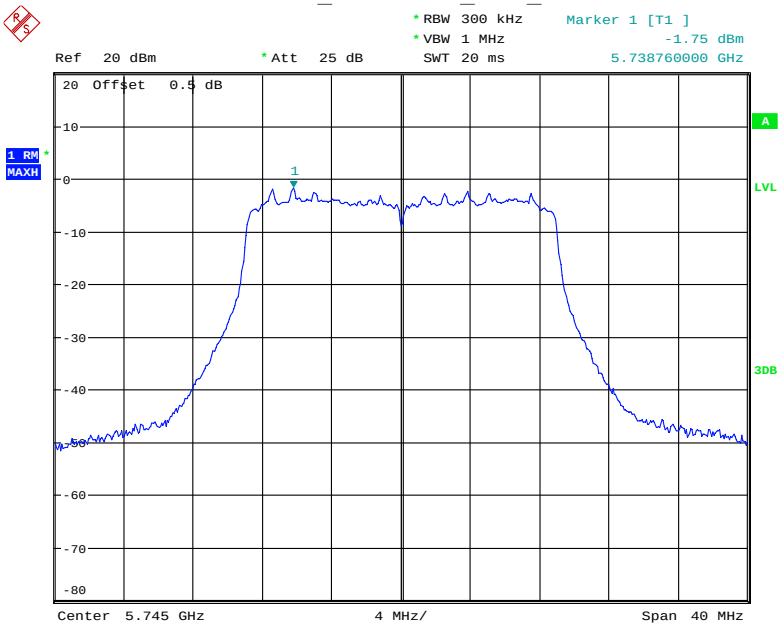
Date: 19.DEC.2019 14:34:19

5.8G_802.11 n20_Low_Chain 0



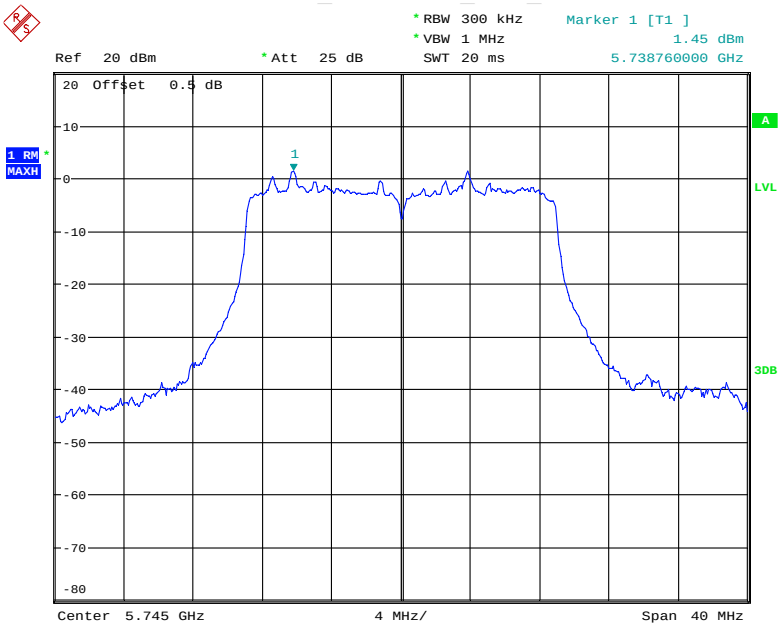
Date: 19.DEC.2019 14:39:52

5.8G_802.11 n20_Low_Chain 1



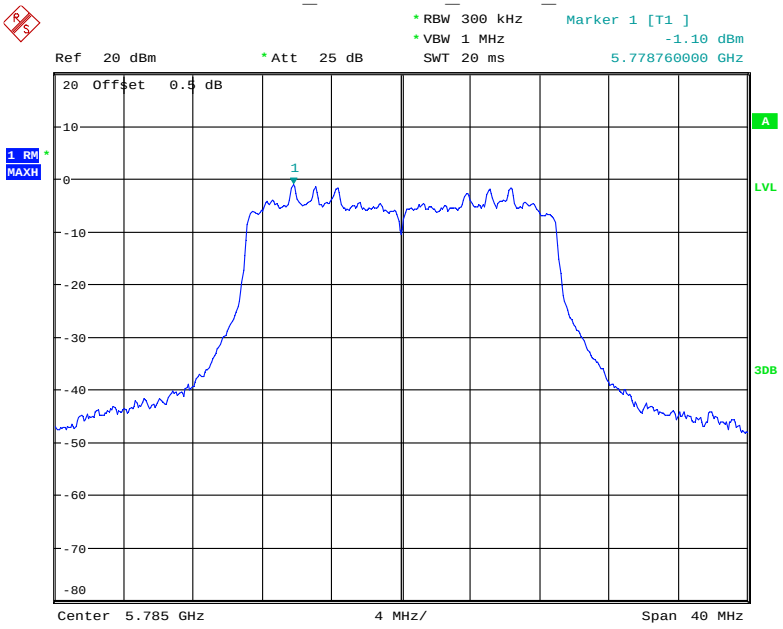
Date: 19.DEC.2019 14:25:43

5.8G_802.11 n20_Low_Chain 2



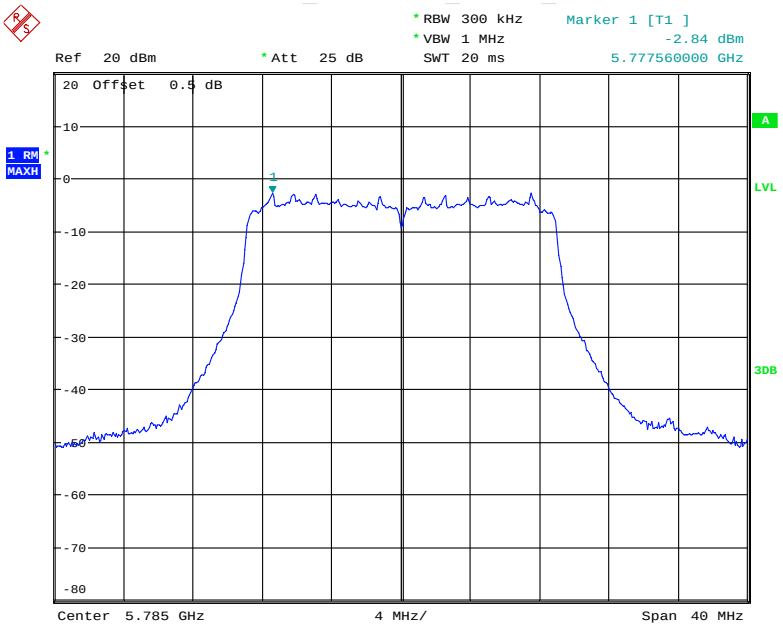
Date: 19.DEC.2019 14:35:04

5.8G_802.11 n20_Middle_Chain 0



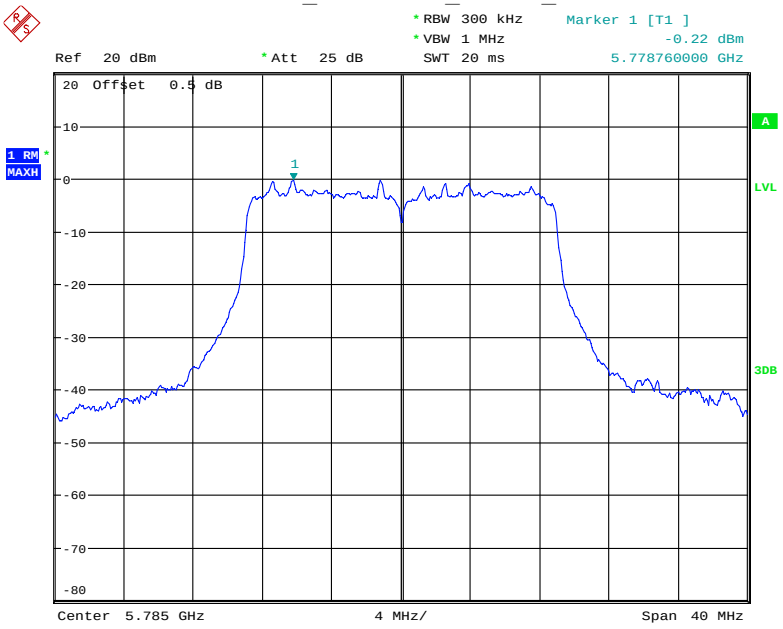
Date: 19.DEC.2019 14:42:46

5.8G_802.11 n20_Middle_Chain 1



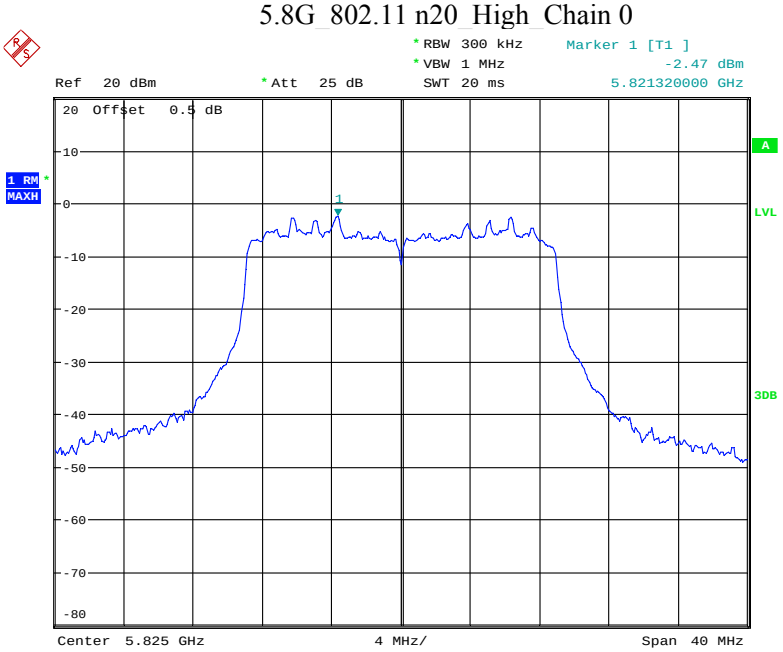
Date: 19.DEC.2019 14:26:34

5.8G_802.11 n20_Middle_Chain 2



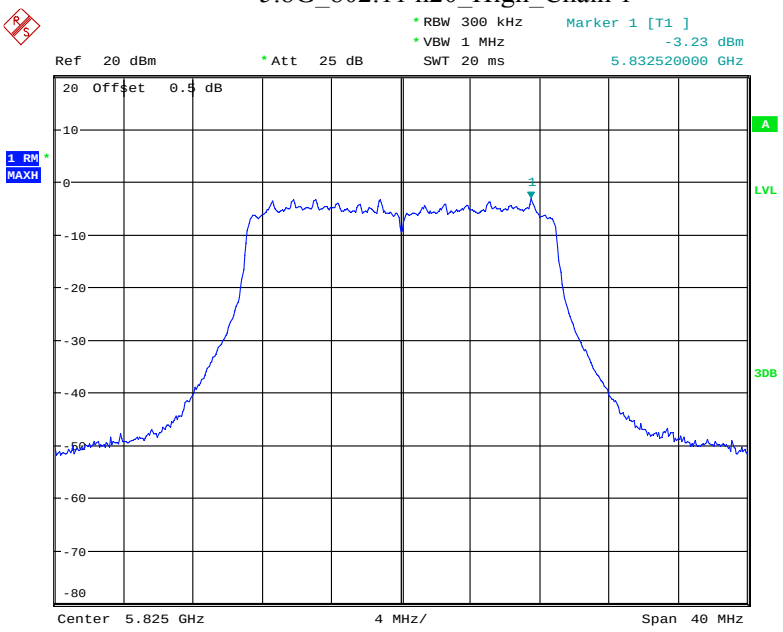
Date: 19.DEC.2019 14:35:32

5.8G_802.11 n20_High_Chain 0



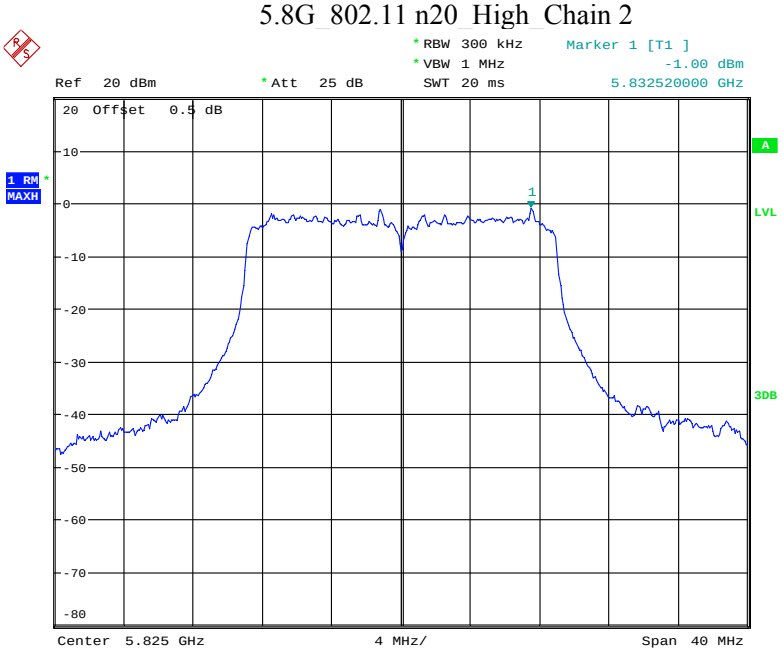
Date: 19.DEC.2019 14:43:35

5.8G_802.11 n20_High_Chain 1



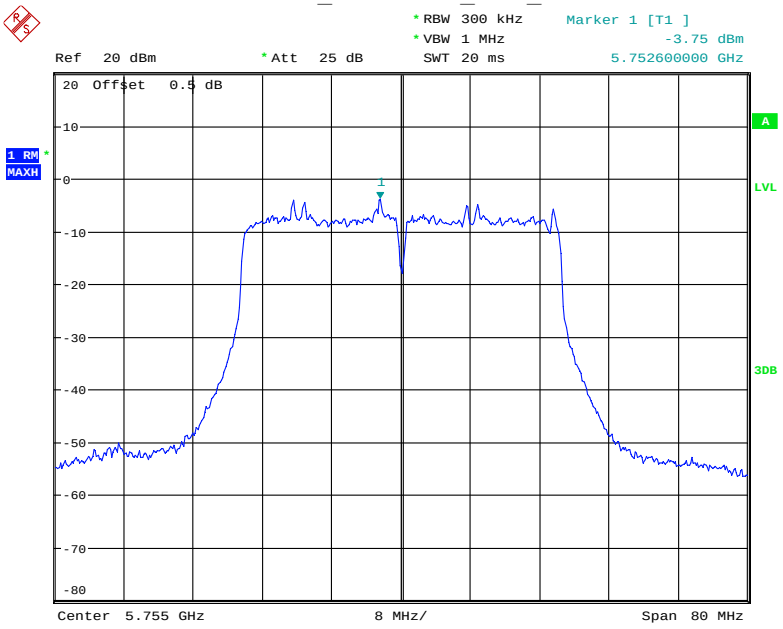
Date: 19.DEC.2019 14:27:02

5.8G_802.11 n20_High_Chain 2



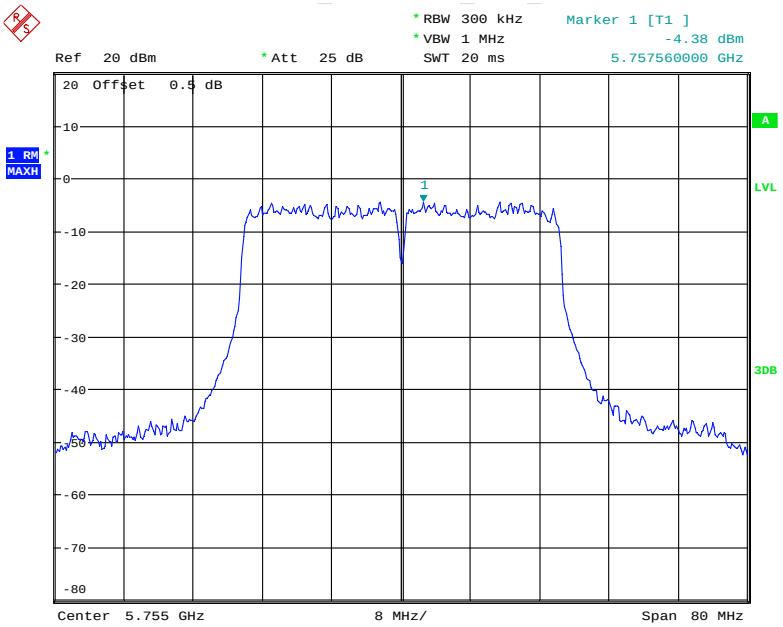
Date: 19.DEC.2019 14:35:57

5.8G_802.11 n40_Low_Chain 0



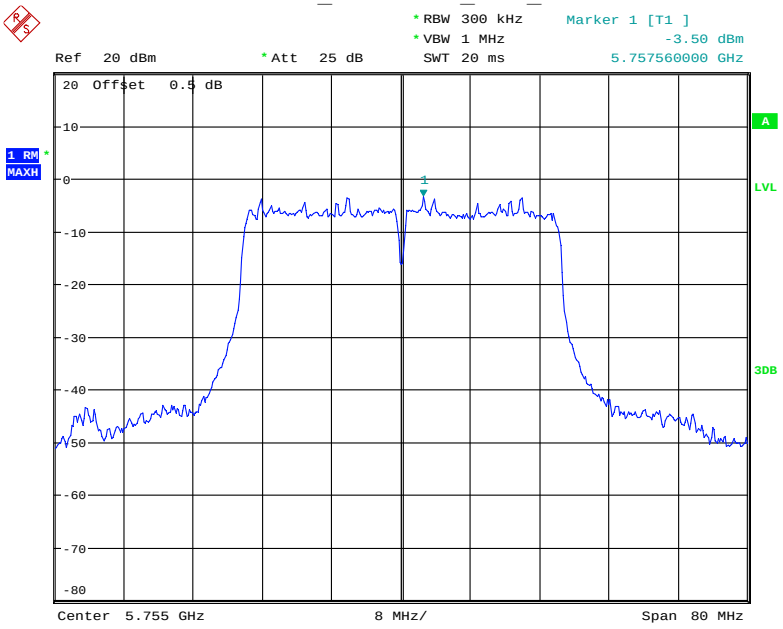
Date: 19.DEC.2019 14:16:44

5.8G_802.11 n40_Low_Chain 1



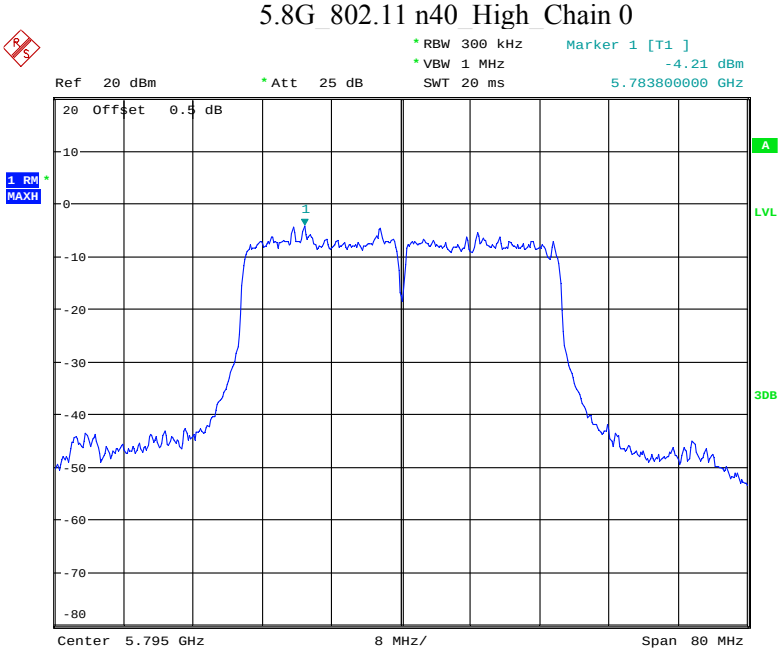
Date: 19.DEC.2019 14:29:48

5.8G_802.11 n40_Low_Chain 2



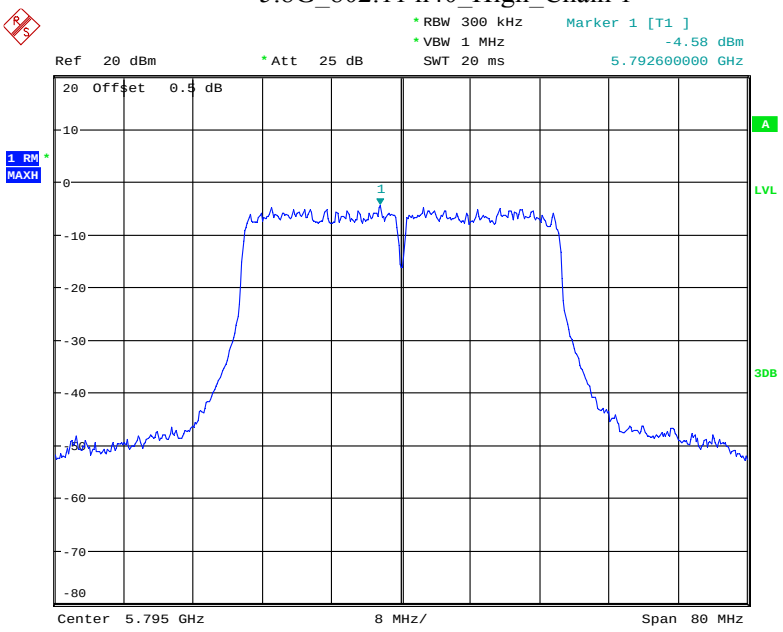
Date: 19.DEC.2019 14:59:45

5.8G_802.11 n40_High_Chain 0



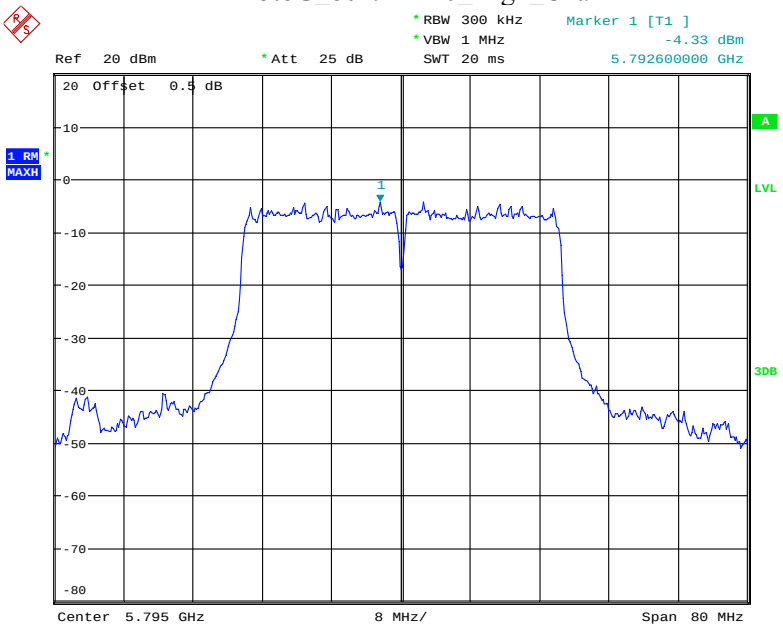
Date: 19.DEC.2019 14:18:15

5.8G_802.11 n40_High_Chain 1



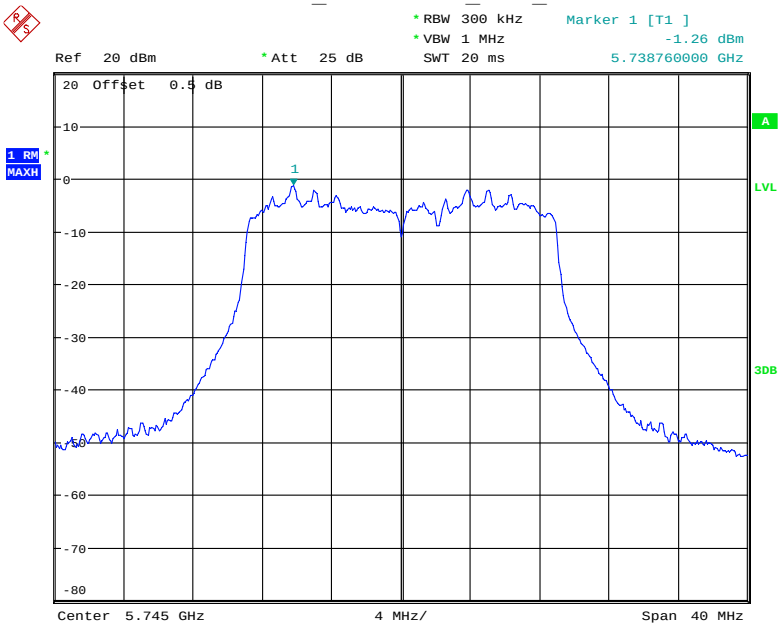
Date: 19.DEC.2019 14:30:15

5.8G_802.11 n40_High_Chain 2



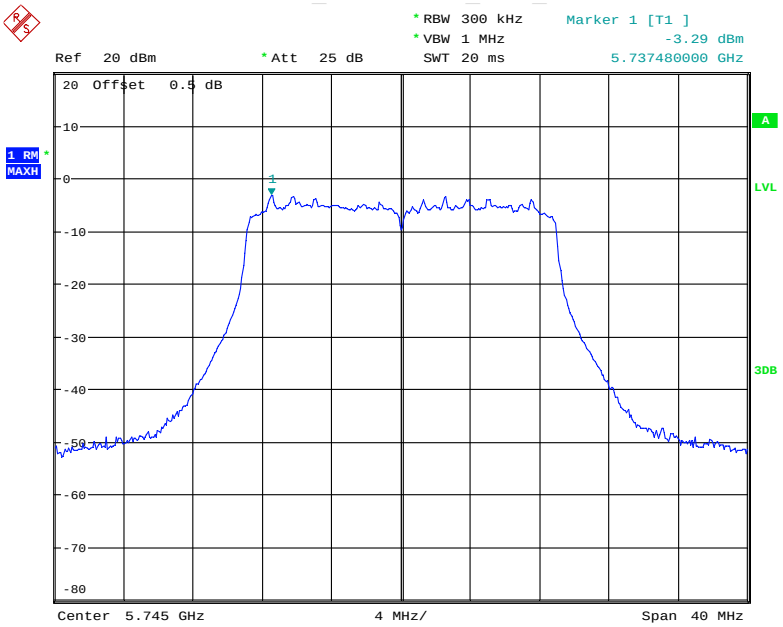
Date: 19.DEC.2019 15:00:10

5.8G_802.11 ac20_Low_Chain 0



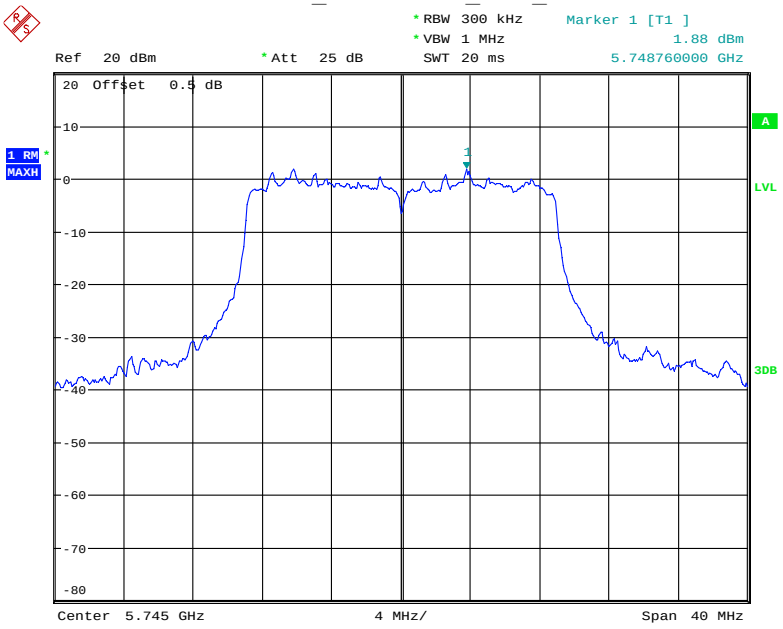
Date: 19.DEC.2019 15:23:43

5.8G_802.11 ac20_Low_Chain 1



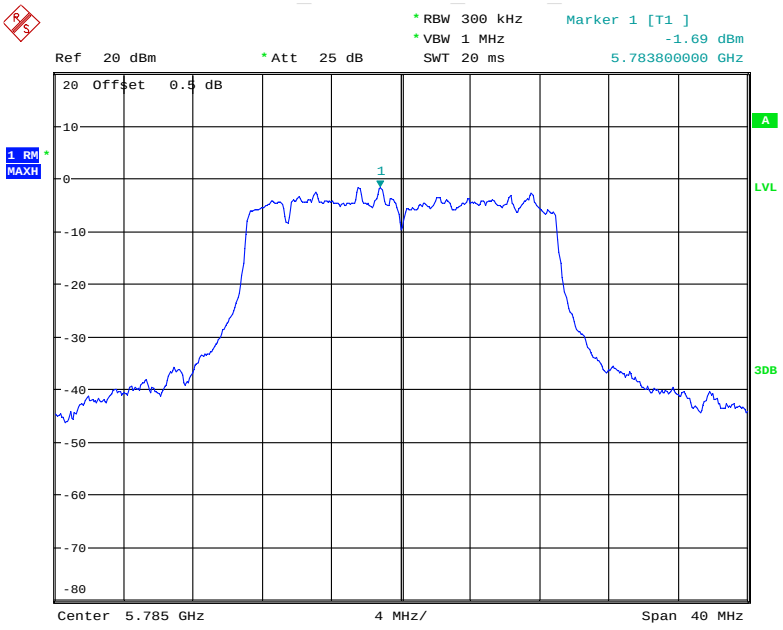
Date: 19.DEC.2019 14:28:15

5.8G_802.11 ac20_Low_Chain 2



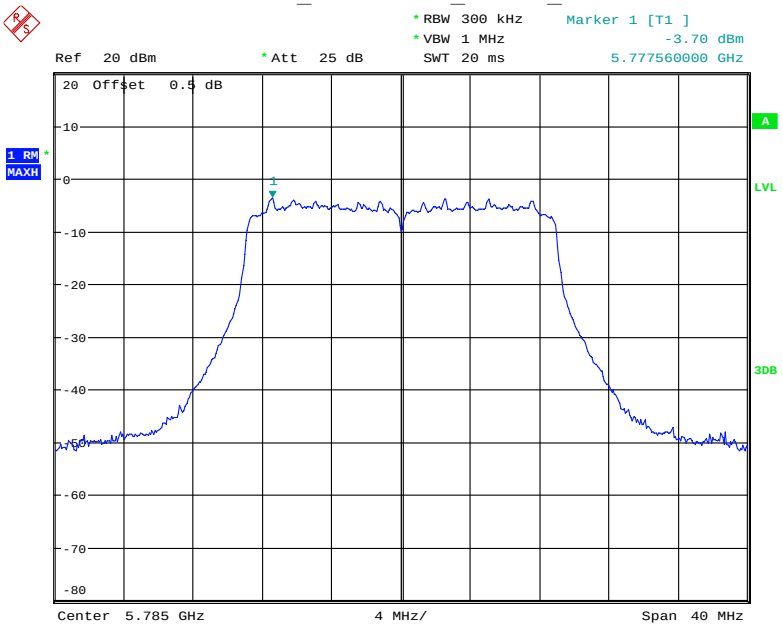
Date: 19.DEC.2019 14:58:33

5.8G_802.11 ac20_Middle_Chain 0



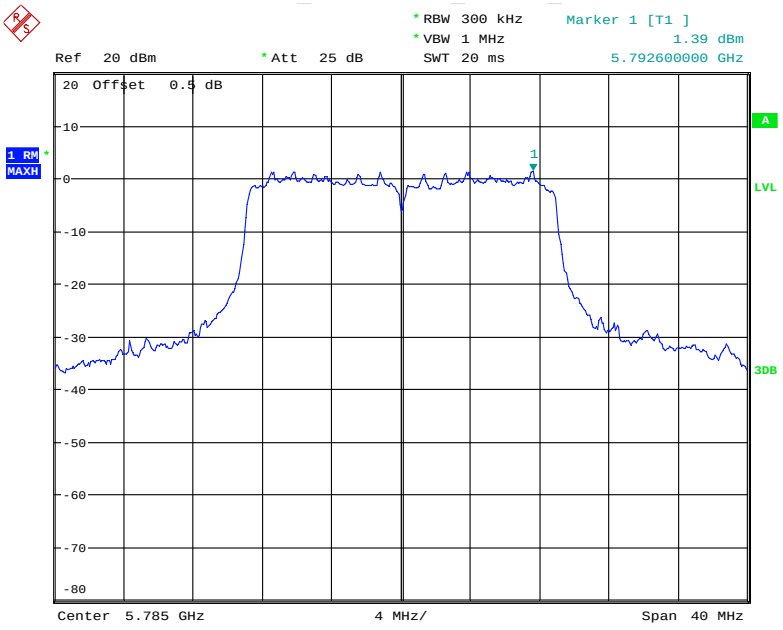
Date: 19.DEC.2019 14:12:36

5.8G_802.11 ac20_Middle_Chain 1



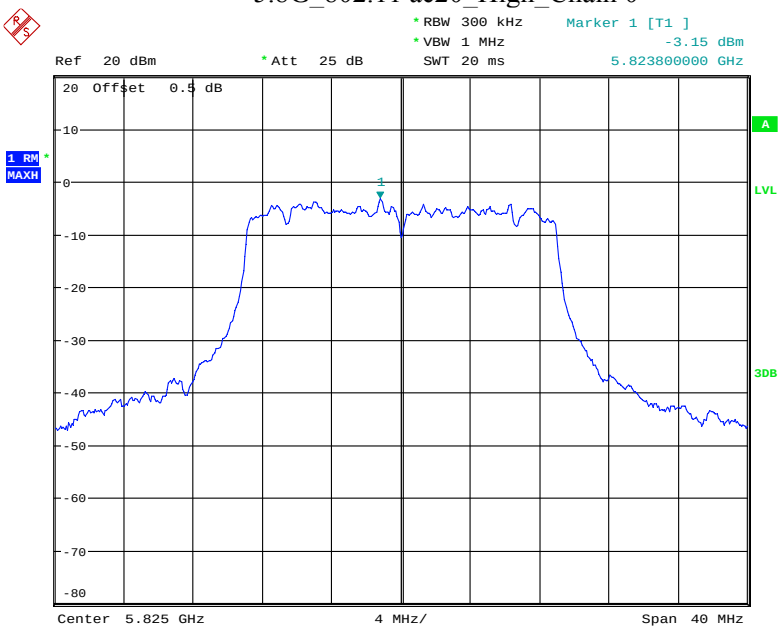
Date: 19.DEC.2019 14:28:45

5.8G_802.11 ac20_Middle_Chain 2



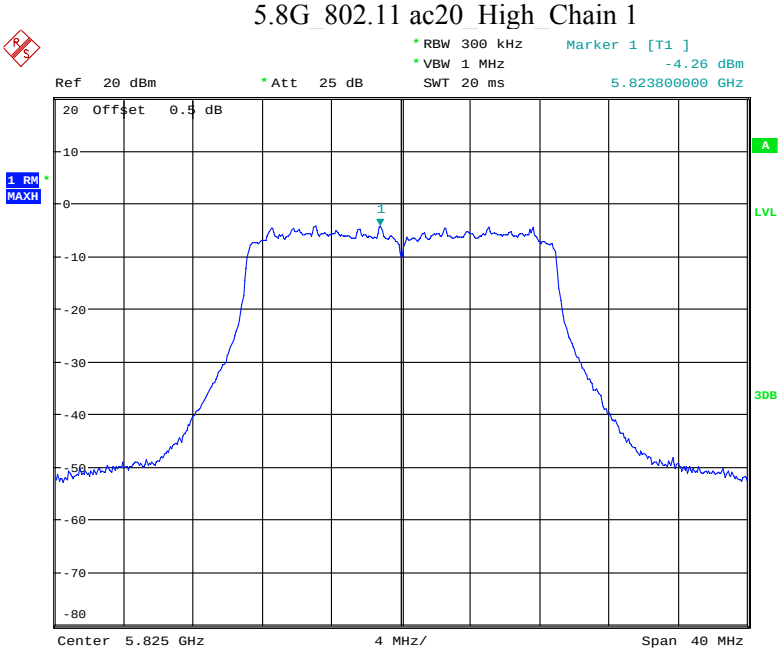
Date: 19.DEC.2019 14:56:45

5.8G_802.11 ac20_High_Chain 0



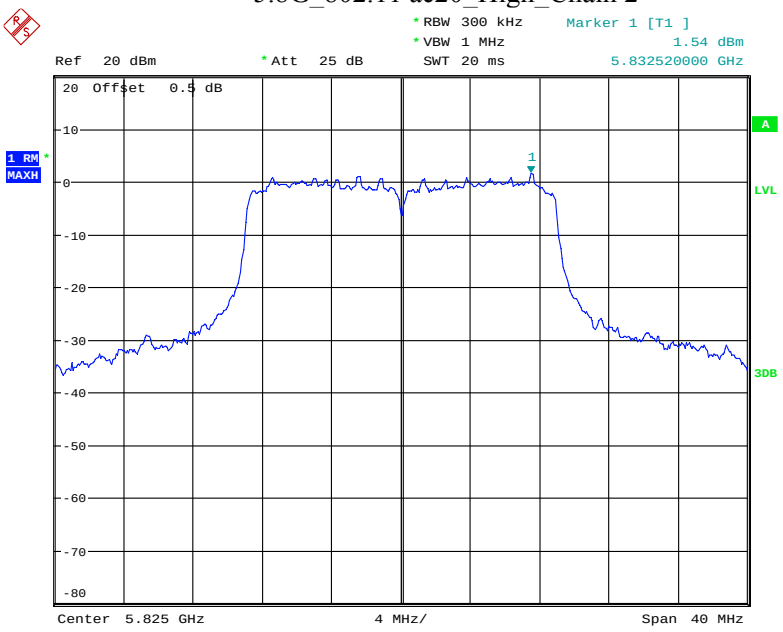
Date: 19.DEC.2019 14:13:12

5.8G_802.11 ac20_High_Chain 1



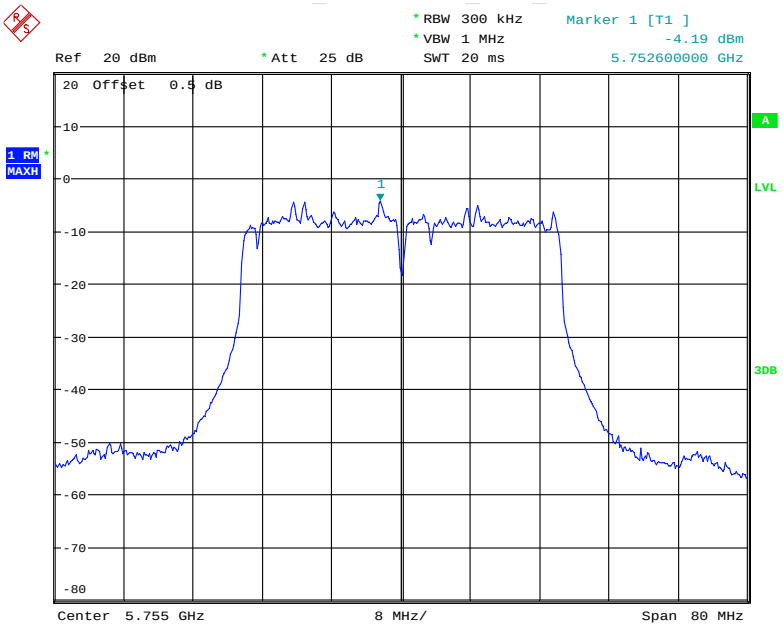
Date: 19.DEC.2019 14:29:09

5.8G_802.11 ac20_High_Chain 2



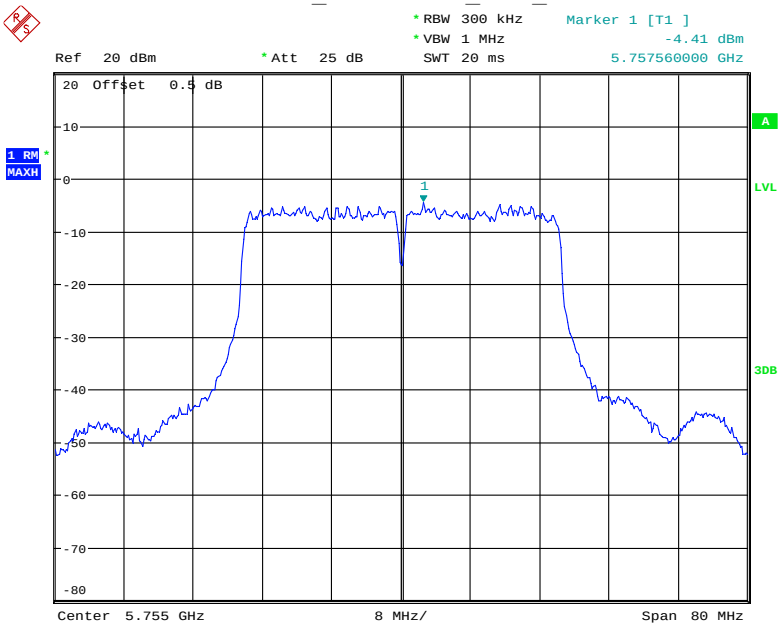
Date: 19.DEC.2019 14:57:13

5.8G_802.11 ac40_Low_Chain 0



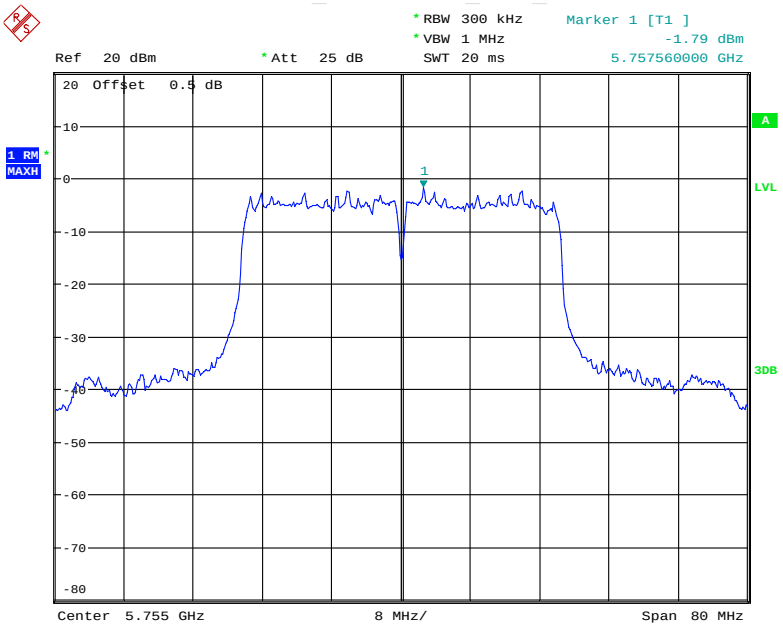
Date: 19.DEC.2019 14:19:00

5.8G_802.11 ac40_Low_Chain 1



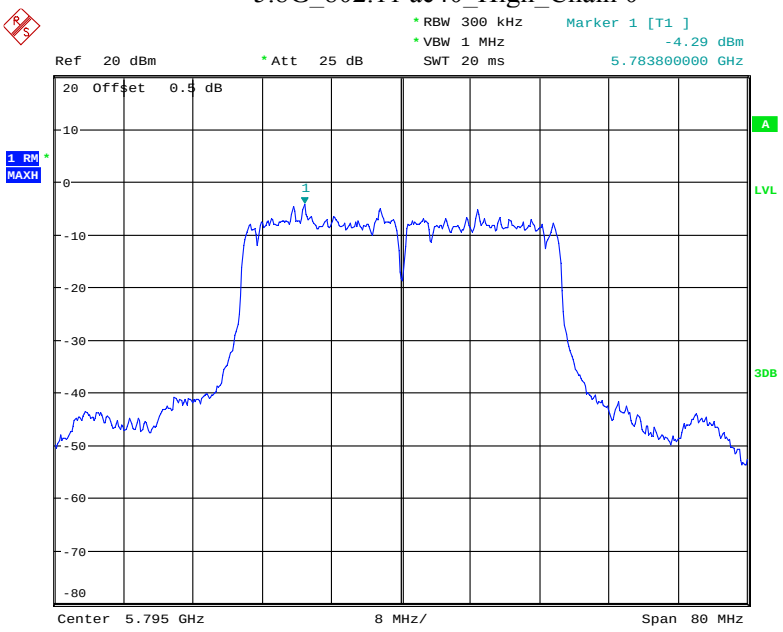
Date: 19.DEC.2019 14:30:55

5.8G_802.11 ac40_Low_Chain 2



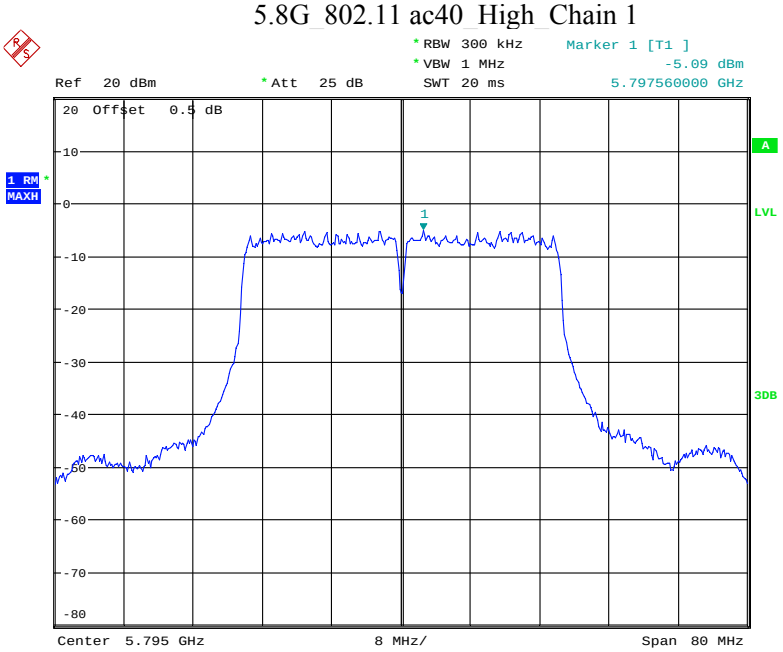
Date: 19.DEC.2019 15:06:04

5.8G_802.11 ac40_High_Chain 0



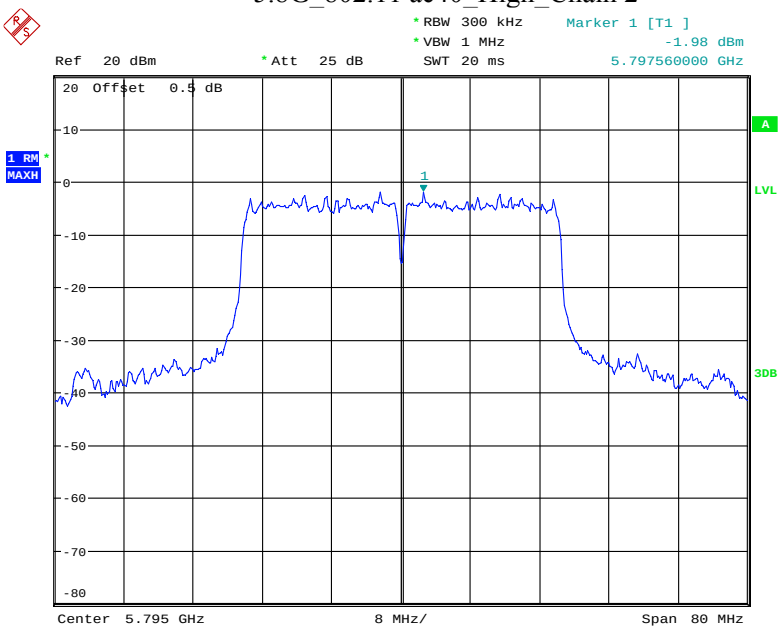
Date: 19.DEC.2019 14:19:29

5.8G_802.11 ac40_High_Chain 1



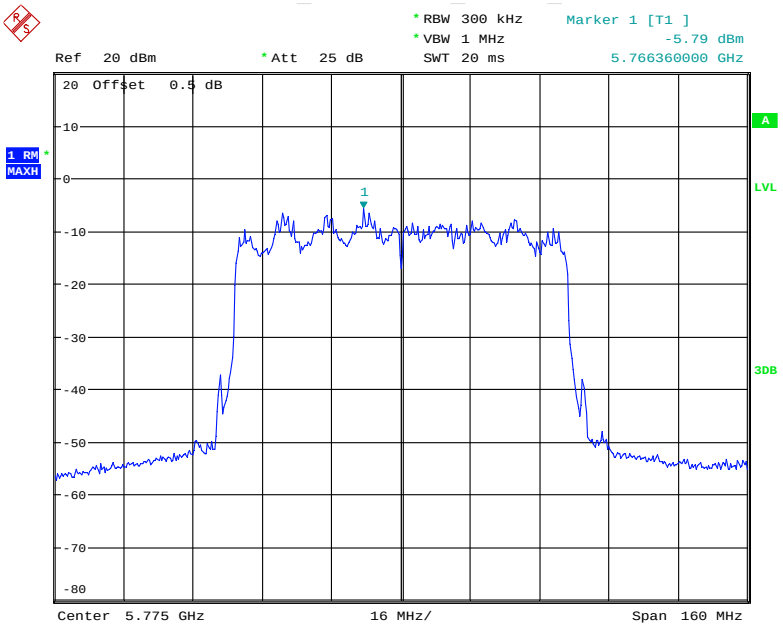
Date: 19.DEC.2019 14:31:20

5.8G_802.11 ac40_High_Chain 2



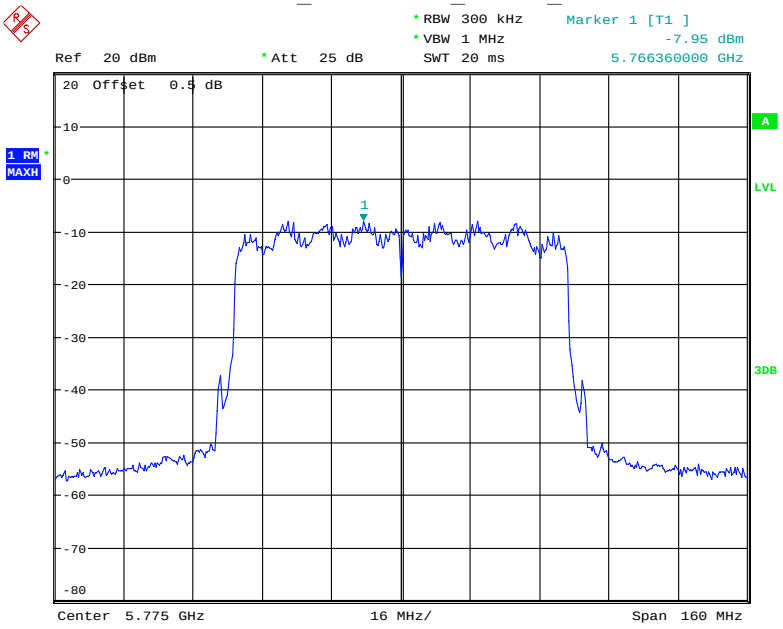
Date: 19.DEC.2019 15:06:29

5.8G_802.11 ac80_Middle_Chain 0



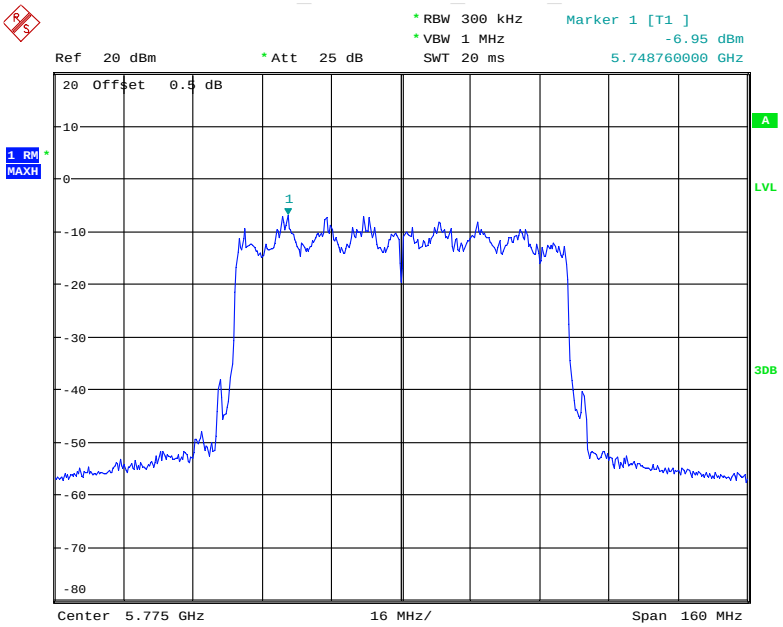
Date: 19.DEC.2019 14:49:42

5.8G_802.11 ac80_Middle_Chain 1



Date: 19.DEC.2019 14:53:01

5.8G_802.11 ac80_Middle_Chain 2



Date: 19.DEC.2019 14:53:31

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