TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.407

TEST REPORT

For

Beijing Beebox Technology Co., Ltd.

#2207, 22nd Floor, No.1-2 Building, ShangDi 10th street, Haidian District, Beijing, China

FCC ID: 2AR8O-BSD01ST

Report Type: Original Report	**Product Name:** Biometric Recognition Device (Microcomputer)

Report Number:	RBJ181108054-00A
Report Date:	2019-03-18
Reviewed By:	Jerry Zhang EMC Manager
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Biometric Recognition Device (Microcomputer)
EUT Model :	BRD-ST-SD1
Multiple Models:	BRD-ST-SD2, BRD-ST-SD3, BRD-ST-SD* (* = 1-9, only for different model name)
Operation Frequency:	5180-5240(802.11a/n ht20/ac20), 5190-5230 MHz(802.11n ht40/ac 40) 5210 MHz(802.11ac80) 5745-5825(802.11a/n ht20/ac20), 5755-5795 MHz(802.11n ht40/ac 40) 5775 MHz(802.11ac80)
Maximum Output Power (Conducted):	5150-5250 MHz:14.07 dBm 5725-5850 MHz:15.56 dBm
Modulation Type:	OFDM
Rated Input Voltage:	AC120V or DC12V from adapter
External Dimension:	305mm(L)*170mm(W)*1270mm(H)
Serial Number:	181108054
EUT Received Date:	2018.11.12

Note: The series product model BRD-ST-SD2, BRD-ST-SD3, BRD-ST-SD (* = 1-9, only for different model name) is electrically identical with model BRD-ST-SD1, we selected BRD-ST-SD1 for fully testing, the differences details was explained in the declaration letter.*

Objective

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

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

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AR8O-BSD01ST.
FCC Part 15C DSS submissions with FCC ID: 2AR8O-BSD01ST.

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: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~40GHz: 5.23 dB
Unwanted Emissions,conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

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

The 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.

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/n ht40/ac vht 20/40/80 modes. The vht20/vht40 were reduced since the identical parameters with 802.11n ht20 and ht40.

For 5150~5250 MHz band, 7 channels are provided:

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

For 802.11a, 802.11n ht20 Channel 36, 40 and 48 were tested, for 802.11n ht40 Channel 38, 46 were tested, for 802.11ac vht 80, channel 42 was tested.

For 5725~5850MHz band, 8 channels are provided to testing:

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

For 802.11a, 802.11n ht20 Channel 149, 157 and 165 was tested, for 802.11n ht40 Channel 151, 159 was tested, for 802.11ac vht80, channel 155 was tested.

EUT Exercise Software

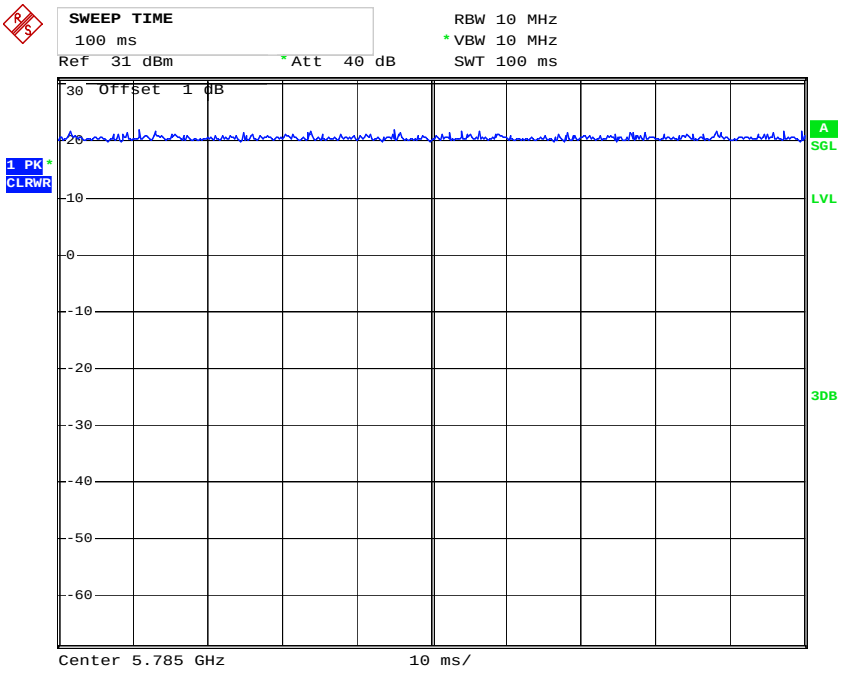
The software "Engineering mode" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations. The maximum power was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

Band	Mode	Test Frequency (MHz)	Data rate (Mbps)	Power level Setting
5150-5250 MHz	802.11a	5180	6 Mbps	21
		5200	6 Mbps	25
		5240	6 Mbps	25
	802.11n ht20	5180	MCS0	20
		5200	MCS0	25
		5240	MCS0	25
	802.11n ht40	5190	MCS0	17
		5230	MCS0	25
	802.11 ac80	5210	MCS0	15
5725-5850 MHz	802.11a	5745	6 Mbps	20
		5785	6 Mbps	20
		5825	6 Mbps	20.5
	802.11n ht20	5745	MCS0	20
		5785	MCS0	20
		5825	MCS0	20.5
	802.11n Ht40	5755	MCS0	20
		5795	MCS0	20
	802.11 ac80	5775	MCS0	18

The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle(x) (%)	Duty cycle Factor (10*lg(1/x))
802.11a	100	100	100	0
802.11n ht20	100	100	100	0
802.11n ht40	100	100	100	0
802.11ac80	100	100	100	0

802.11a mode



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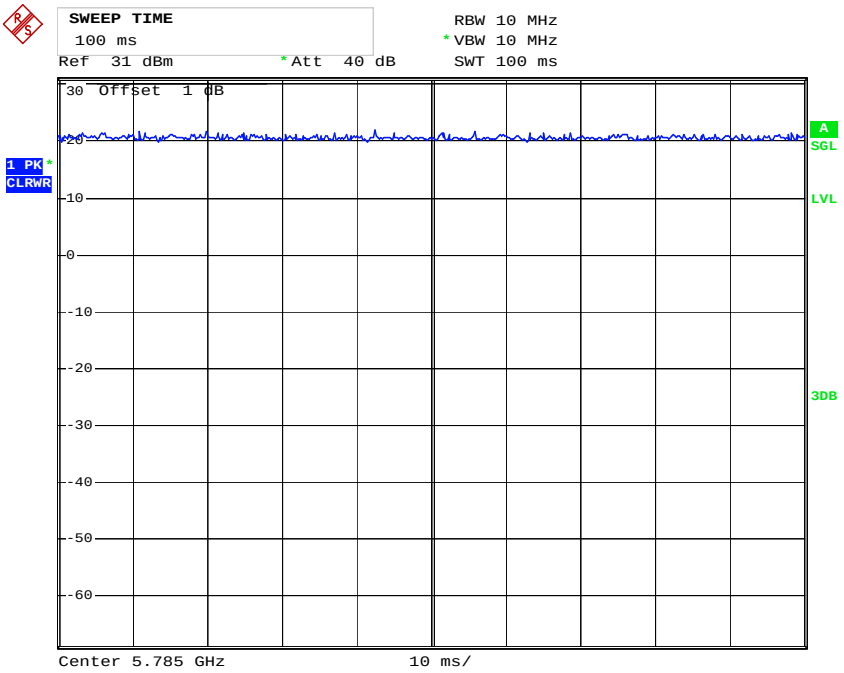
802.11n ht20 mode



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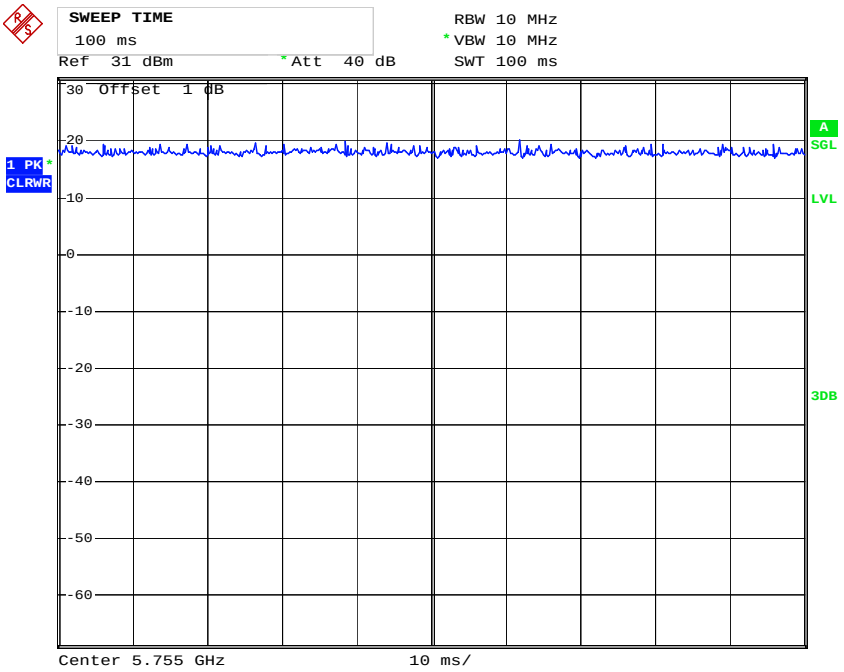
802.11n ht40 mode



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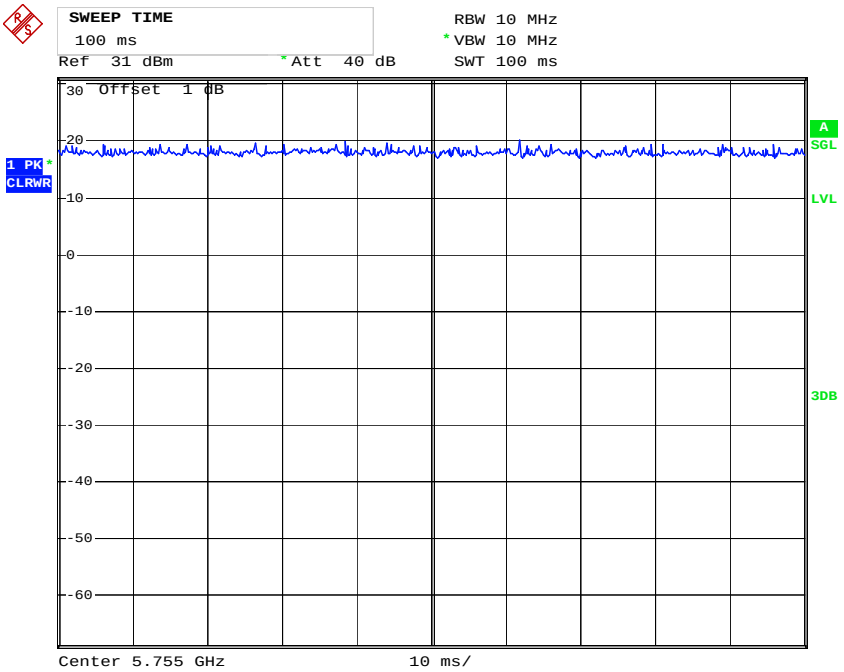
802.11ac80 mode



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Equipment Modifications

No modification was made to the EUT.

Local Support Equipment List and Details

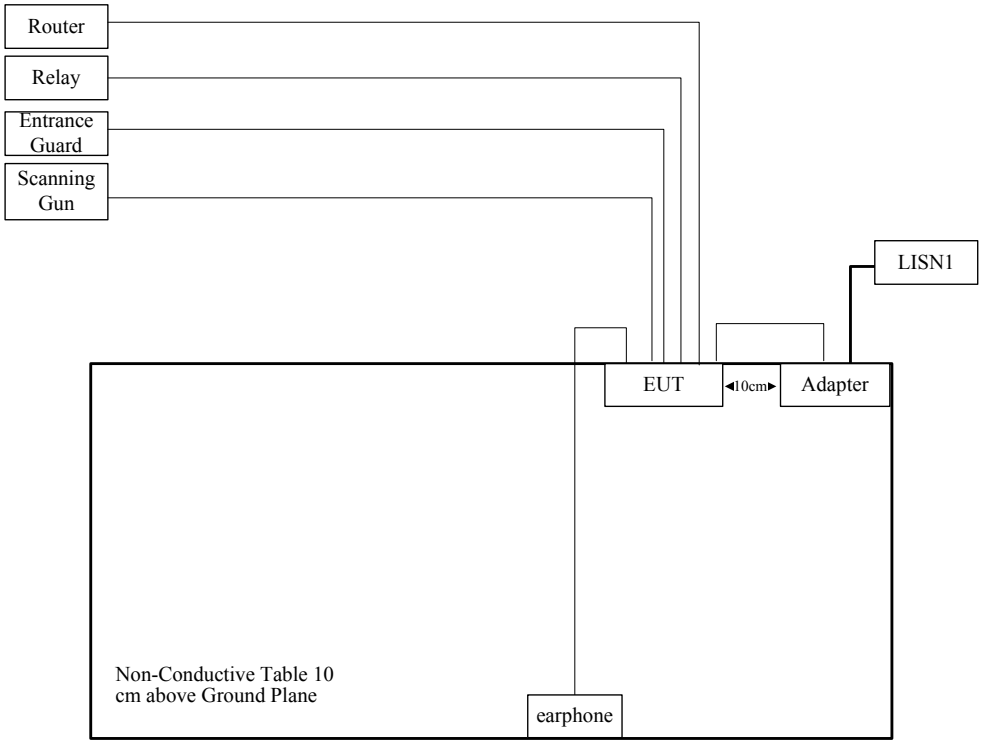
Manufacturer	Description	Model	Serial Number
Huawei	Earphone	/	/
Sandisk	U-DISK	/	/
TP-LINK	Router	TL-SF1008P	114A297001782
Lotus	Entrance guard	L8MF-W	/
Schneider	Relay	RXM2LB2BD	/
ScanHome	Scanning Gun	ZD2200	/

Support Cable List and Details

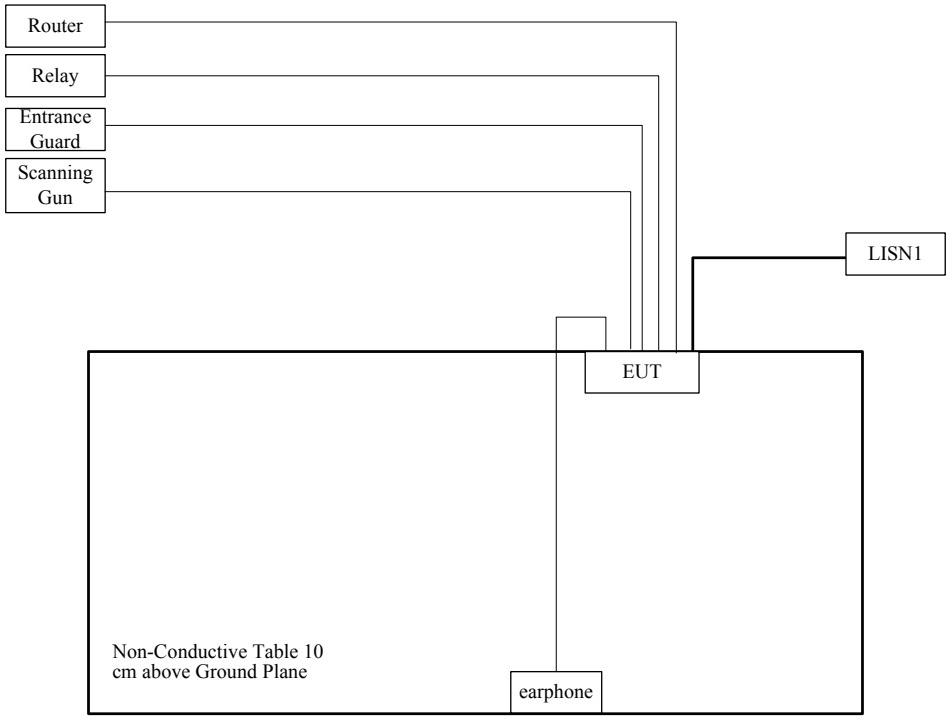
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	No	No	5.00	RJ45 Port of EUT	Router
Adapter Cable	No	No	1.20	Adapter	EUT
Signal Cable	No	No	10.0	EUT	Entrance guard
Signal Cable	No	No	5.00	EUT	Relay
Signal Cable	No	No	5.00	EUT	Scanning Gun

Block Diagram of Test Setup

AC/DC Adapter:



AC Power:



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
§15.407 (f) & §1.1310 & §2.1091	Maximum Permissable Exposure (MPE)	Compliance
FCC §15.203,	Antenna Requirement	Compliance
FCC §15.407(b)(6)& §15.207(a),	Conducted Emissions	Compliance
FCC §15.205& §15.209 &§15.407(b),	Undesirable Emission& Restricted Bands	Compliance
FCC §15.407(b),	Out Of Band Emissions	Compliance
§15.407(a) (e),	Emission Bandwidth	Compliance
FCC §15.407(a),	Conducted Transmitter Output Power	Compliance
FCC §15.407 (a),	Power Spectral Density	Compliance

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

Applicable Standard

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

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

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

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

Calculation formula:

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

Calculated Data:

Frequency Range	**Antenna Gain**		**Max. Target Power including Tolerance**		**Evaluation Distance (cm)**	**Power Density (W/m^2)**	**MPE Limit (W/m^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
5150-5250	3	2.00	15	31.62	20.00	0.013	1.0
5725-5850	3	2.00	16	39.81	20.00	0.016	1.0

Note 1: the Max. Target Power including Tolerance was declared by manufacturer.
Note 2: Wifi 5GHz can`t transmit simultaneously with Bluetooth or 2.4G wifi.

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥20 cm.

FCC §15.203– ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has one internal antenna arrangement for BT and 2.4GHz wifi, the antenna gain is 3 dBi, one internal antenna for 5G wifi, the antenna gain is 3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

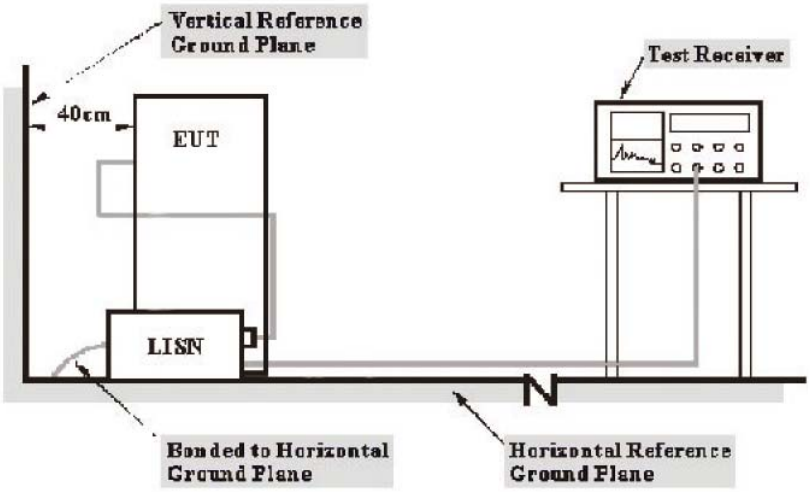
Result: Compliance.

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

Applicable Standard

FCC §15.207(a), §15.407(b) (6)

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

The adapter was connected to the main lisn with a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

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

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

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

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

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2018-12-10	2019-12-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2018-09-05	2019-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2018-12-10	2019-12-10

*** 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

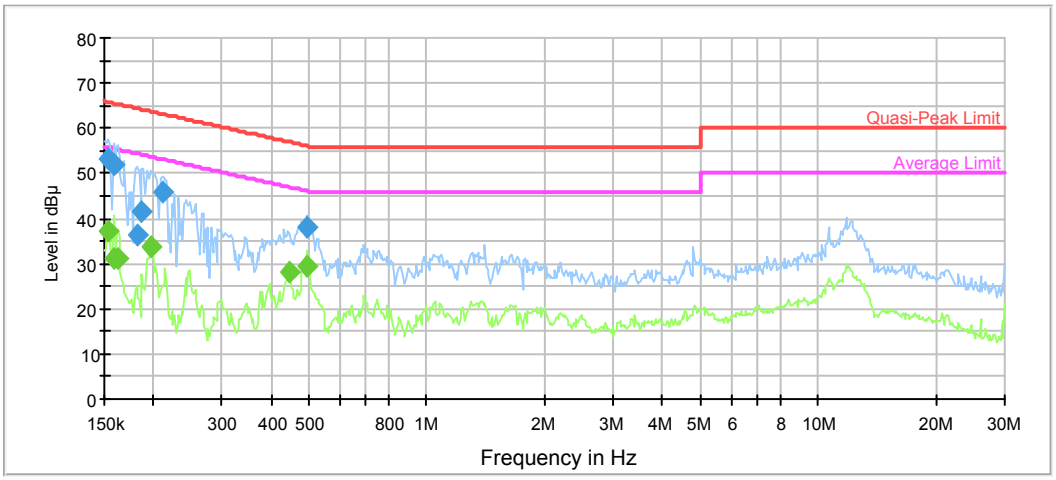
Temperature:	24.4 °C
Relative Humidity:	39 %
ATM Pressure:	100.3kPa

The testing was performed by Ade Xiao on 2019-01-16.

Test Mode: Transmitting

AC/DC Adapter:

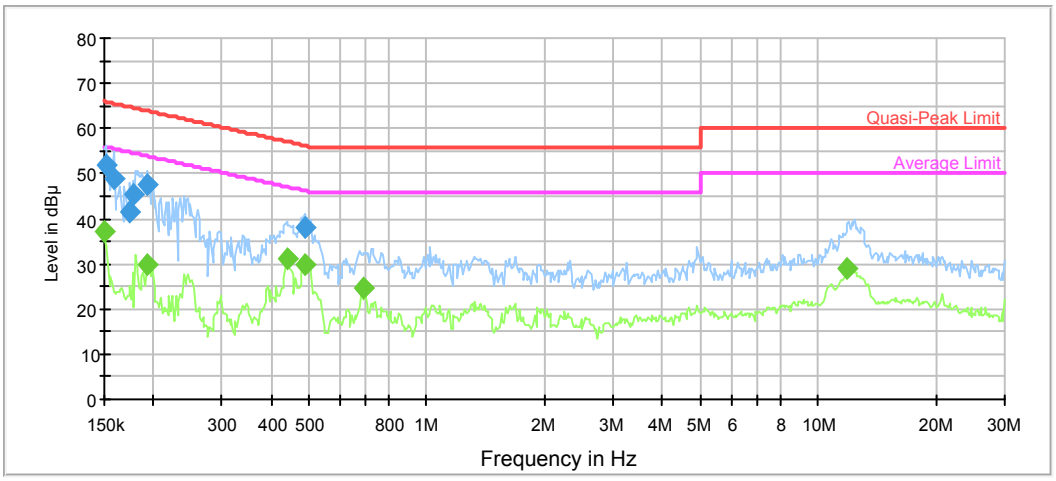
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153629	53.0	9.000	L1	11.1	12.8	65.8	Compliance
0.158604	52.1	9.000	L1	11.1	13.4	65.5	Compliance
0.181612	36.4	9.000	L1	10.8	28.0	64.4	Compliance
0.187494	41.5	9.000	L1	10.7	22.6	64.1	Compliance
0.211298	45.7	9.000	L1	10.5	17.5	63.2	Compliance
0.495646	37.8	9.000	L1	9.9	18.3	56.1	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153629	37.2	9.000	L1	11.1	18.6	55.8	Compliance
0.158604	31.3	9.000	L1	11.1	24.2	55.5	Compliance
0.162441	31.0	9.000	L1	11.0	24.3	55.3	Compliance
0.196675	33.7	9.000	L1	10.6	20.0	53.7	Compliance
0.446873	27.9	9.000	L1	9.9	19.0	46.9	Compliance
0.495646	29.5	9.000	L1	9.9	16.6	46.1	Compliance

AC120 V, 60 Hz, Neutral:

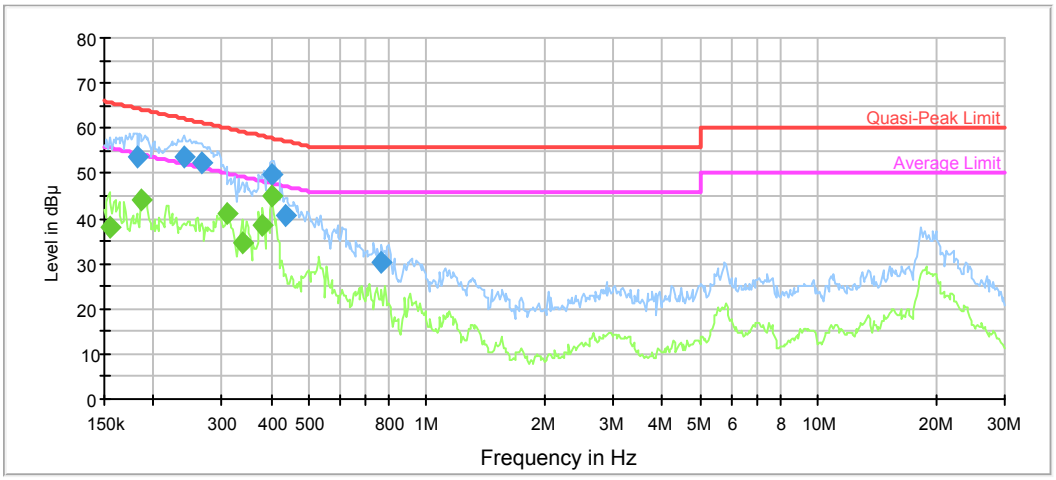


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	51.9	9.000	N	11.1	14.0	65.9	Compliance
0.158604	48.8	9.000	N	11.0	16.7	65.5	Compliance
0.174519	41.7	9.000	N	10.8	23.0	64.7	Compliance
0.177322	45.6	9.000	N	10.8	19.0	64.6	Compliance
0.193566	47.7	9.000	N	10.7	16.2	63.9	Compliance
0.487810	37.9	9.000	N	9.9	18.3	56.2	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	37.3	9.000	N	11.2	18.7	56.0	Compliance
0.193566	29.8	9.000	N	10.7	24.1	53.9	Compliance
0.439808	31.1	9.000	N	9.9	16.0	47.1	Compliance
0.487810	29.9	9.000	N	9.9	16.3	46.2	Compliance
0.687153	24.8	9.000	N	9.8	21.2	46.0	Compliance
11.910327	28.9	9.000	N	9.8	21.1	50.0	Compliance

AC Power:

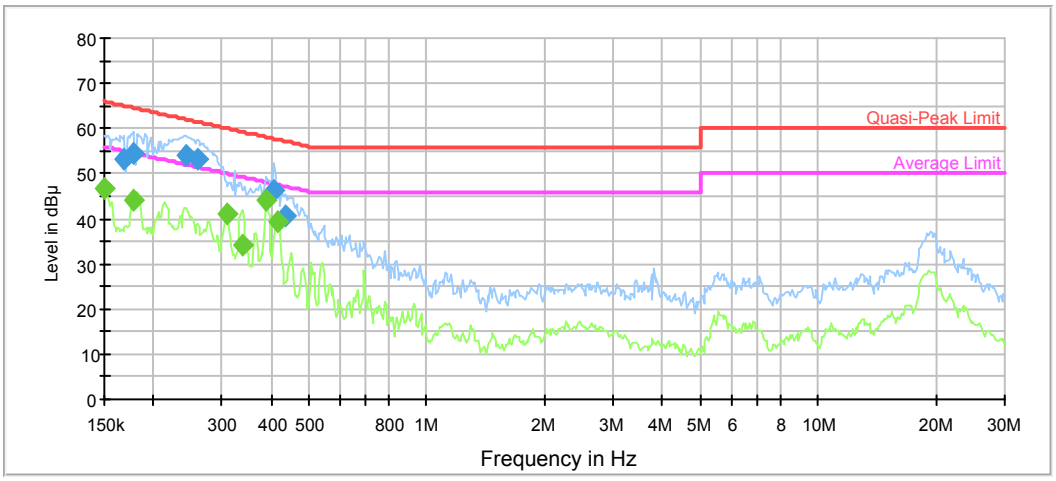
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.181612	53.8	9.000	L1	10.8	10.6	64.4	Compliance
0.240029	53.5	9.000	L1	10.4	8.6	62.1	Compliance
0.266226	52.2	9.000	L1	10.3	9.0	61.2	Compliance
0.402900	49.6	9.000	L1	10.0	8.2	57.8	Compliance
0.436318	40.7	9.000	L1	9.9	16.4	57.1	Compliance
0.768247	30.1	9.000	L1	9.8	25.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154858	38.0	9.000	L1	11.1	17.7	55.7	Compliance
0.186006	44.0	9.000	L1	10.7	10.2	54.2	Compliance
0.309742	41.1	9.000	L1	10.1	8.9	50.0	Compliance
0.338116	34.6	9.000	L1	10.1	14.6	49.2	Compliance
0.381043	38.5	9.000	L1	10.0	9.8	48.3	Compliance
0.402900	44.9	9.000	L1	10.0	2.9	47.8	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.169044	53.1	9.000	N	10.9	11.9	65.0	Compliance
0.178741	54.3	9.000	N	10.8	10.2	64.5	Compliance
0.243884	53.9	9.000	N	10.3	8.1	62.0	Compliance
0.259937	53.0	9.000	N	10.3	8.4	61.4	Compliance
0.406123	46.2	9.000	N	10.0	11.5	57.7	Compliance
0.436318	40.6	9.000	N	9.9	16.5	57.1	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	46.6	9.000	N	11.2	9.4	56.0	Compliance
0.178741	44.2	9.000	N	10.8	10.3	54.5	Compliance
0.307284	41.0	9.000	N	10.1	9.0	50.0	Compliance
0.338116	34.1	9.000	N	10.1	15.1	49.2	Compliance
0.387164	44.2	9.000	N	10.0	3.9	48.1	Compliance
0.415949	39.4	9.000	N	9.9	8.1	47.5	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.

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

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

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

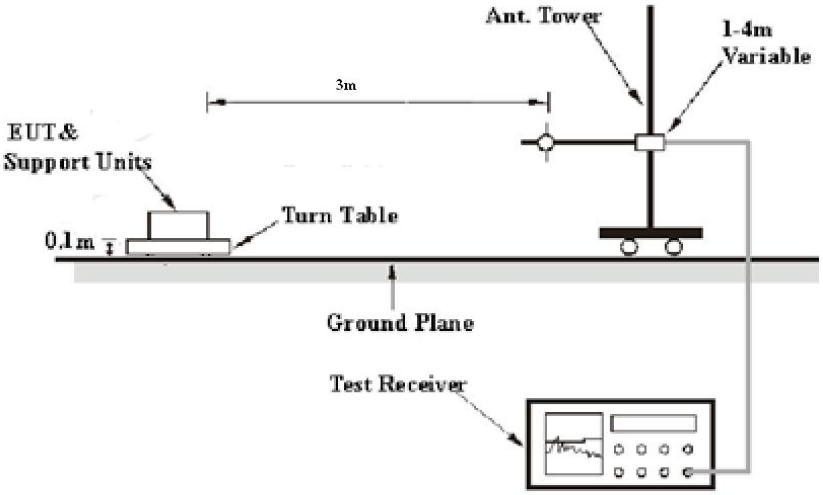
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

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

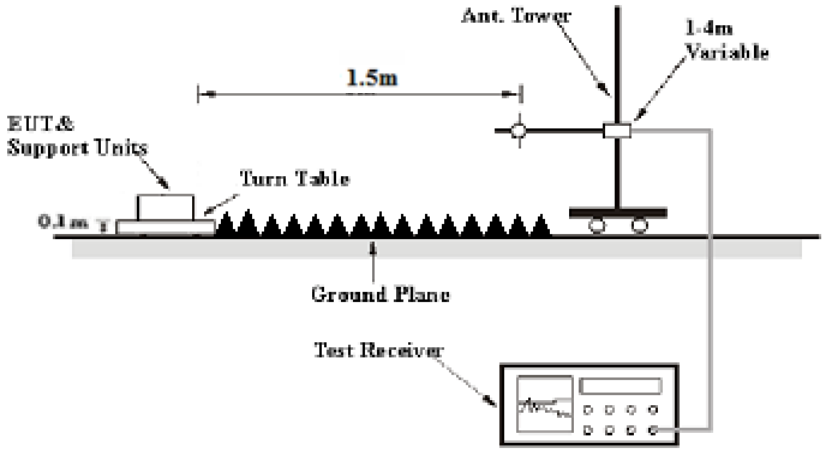
(7) The provisions of §15.205 apply to intentional radiators operating under this section.

EUT Setup

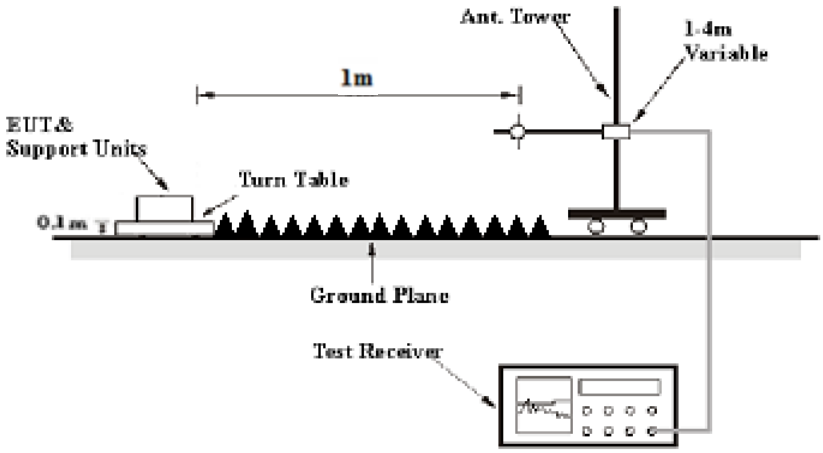
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site A , above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.407 limits.

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

30-1000MHz:

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

1GHz- 40GHz:

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

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
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
R&S	EMI Test Receiver	ESCI	100224	2018-12-10	2019-12-10
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2018-05-06	2019-05-06
HP	Amplifier	8447D	2727A05902	2018-09-05	2019-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-01-04	2020-01-04
R&S	Spectrum Analyzer	FSP 38	100478	2018-12-10	2019-12-10
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1302	2016-11-18	2019-11-18
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2018-06-27	2019-06-27
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2018-09-05	2019-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2018-06-27	2019-06-27
Sinoscite	Bandstop Filters	BSF5150-5850MN-0899-003	0899003	2018-05-06	2019-05-06
Mini Circuits	High Pass Filter	VHF-6010+	31118	2018-06-16	2019-06-16

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

Test Data

Environmental Conditions

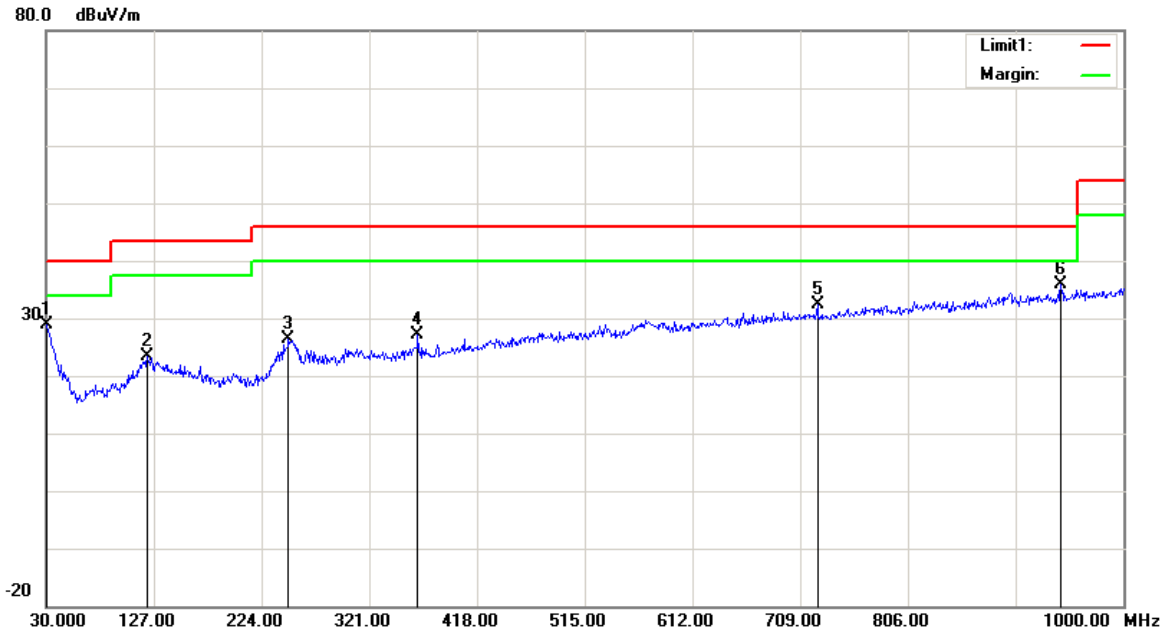
Temperature:	26.6 °C
Relative Humidity:	59 %
ATM Pressure:	102.3 kPa

** The testing was performed by Tyler Pan & Neil Liao on 2019-02-26.*

Test Mode: Transmitting(AC power was the worst and reported)

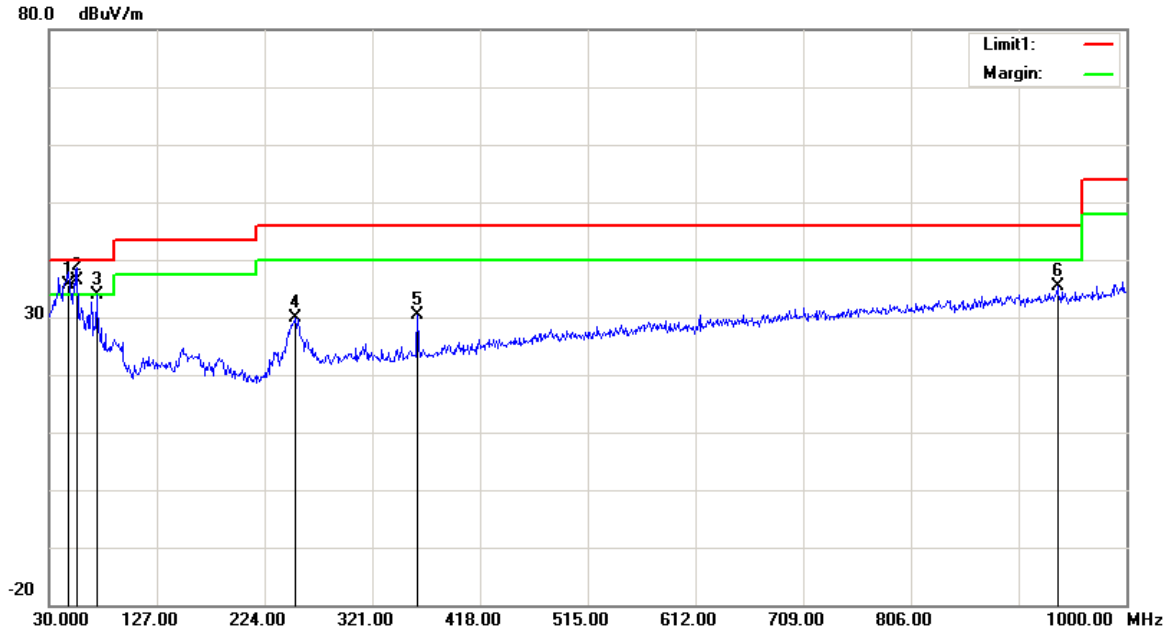
1) **Below 1GHz**(802.11a 5825MHz was the worst):

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Remark	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	27.23	peak	1.76	28.99	40.00	11.01
121.1800	28.03	peak	-4.67	23.36	43.50	20.14
248.2500	32.16	peak	-5.90	26.26	46.00	19.74
364.6500	29.97	peak	-2.81	27.16	46.00	18.84
724.5200	29.08	peak	3.30	32.38	46.00	13.62
943.7400	39.35	peak	-3.41	35.94	46.00	10.06

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Remark	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
47.4600	46.10	QP	-10.35	35.75	40.00	4.25
55.2200	48.50	QP	-12.08	36.42	40.00	3.58
72.6800	44.95	peak	-11.00	33.95	40.00	6.05
252.1300	35.78	peak	-6.02	29.76	46.00	16.24
361.7400	33.12	peak	-2.79	30.33	46.00	15.67
937.9200	38.69	peak	-3.42	35.27	46.00	10.73

1GHz-40GHz:
5150-5250MHz
802.11a

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)						
5180 MHz										
5180.00	69.75	PK	H	33.59	3.58	0.00	106.92	100.9	N/A	N/A
5180.00	60.49	AV	H	33.59	3.58	0.00	97.66	91.64	N/A	N/A
5180.00	68.23	PK	V	33.59	3.58	0.00	105.40	99.38	N/A	N/A
5180.00	59.11	AV	V	33.59	3.58	0.00	96.28	90.26	N/A	N/A
5150.00	31.44	PK	H	33.54	3.56	0.00	68.54	62.52	74.00	11.48
5150.00	16.80	AV	H	33.54	3.56	0.00	53.90	47.88	54.00	6.12
10360.00	61.77	PK	H	38.17	6.29	36.85	69.38	63.36	68.20	4.84
15540.00	57.48	PK	H	38.06	8.85	39.04	65.35	59.33	74.00	14.67
15540.00	43.26	AV	H	38.06	8.85	39.04	51.13	45.11	54.00	8.89
8287.00	51.18	PK	H	37.14	5.00	36.95	56.37	50.35	74.00	23.65
8287.00	45.94	AV	H	37.14	5.00	36.95	51.13	45.11	54.00	8.89
5200 MHz										
5200.00	72.09	PK	H	33.62	3.60	0.00	109.31	103.29	N/A	N/A
5200.00	63.11	AV	H	33.62	3.60	0.00	100.33	94.31	N/A	N/A
5200.00	71.21	PK	V	33.62	3.60	0.00	108.43	102.41	N/A	N/A
5200.00	62.46	AV	V	33.62	3.60	0.00	99.68	93.66	N/A	N/A
10400.00	63.27	PK	H	38.18	6.32	36.86	70.91	64.89	68.20	3.31
15600.00	52.96	PK	H	38.00	8.83	39.09	60.70	54.68	74.00	19.32
15600.00	39.61	AV	H	38.00	8.83	39.09	47.35	41.33	54.00	12.67
5240 MHz										
5240.00	72.97	PK	H	33.68	3.52	0.00	110.17	104.15	N/A	N/A
5240.00	64.02	AV	H	33.68	3.52	0.00	101.22	95.2	N/A	N/A
5240.00	71.74	PK	V	33.68	3.52	0.00	108.94	102.92	N/A	N/A
5240.00	62.89	AV	V	33.68	3.52	0.00	100.09	94.07	N/A	N/A
5350.00	25.00	PK	H	33.86	3.52	0.00	62.38	56.36	74.00	17.64
5350.00	14.73	AV	H	33.86	3.52	0.00	52.11	46.09	54.00	7.91
10480.00	62.41	PK	H	38.20	6.37	36.88	70.10	64.08	68.20	4.12
15720.00	53.49	PK	H	37.88	8.79	39.18	60.98	54.96	74.00	19.04
15720.00	40.72	AV	H	37.88	8.79	39.18	48.21	42.19	54.00	11.81

802.11n ht20

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)						
5180 MHz										
5180.00	69.52	PK	H	33.59	3.58	0.00	106.69	100.67	N/A	N/A
5180.00	60.29	AV	H	33.59	3.58	0.00	97.46	91.44	N/A	N/A
5180.00	67.81	PK	V	33.59	3.58	0.00	104.98	98.96	N/A	N/A
5180.00	58.57	AV	V	33.59	3.58	0.00	95.74	89.72	N/A	N/A
5150.00	32.76	PK	H	33.54	3.56	0.00	69.86	63.84	74.00	10.16
5150.00	18.24	AV	H	33.54	3.56	0.00	55.34	49.32	54.00	4.68
10360.00	60.50	PK	H	38.17	6.29	36.85	68.11	62.09	68.20	6.11
15540.00	55.24	PK	H	38.06	8.85	39.04	63.11	57.09	74.00	16.91
15540.00	41.04	AV	H	38.06	8.85	39.04	48.91	42.89	54.00	11.11
5200 MHz										
5200.00	71.49	PK	H	33.62	3.60	0.00	108.71	102.69	N/A	N/A
5200.00	62.38	AV	H	33.62	3.60	0.00	99.60	93.58	N/A	N/A
5200.00	69.42	PK	V	33.62	3.60	0.00	106.64	100.62	N/A	N/A
5200.00	60.50	AV	V	33.62	3.60	0.00	97.72	91.7	N/A	N/A
10400.00	59.79	PK	H	38.18	6.32	36.86	67.43	61.41	68.20	6.79
15600.00	54.51	PK	H	38.00	8.83	39.09	62.25	56.23	74.00	17.77
15600.00	41.22	AV	H	38.00	8.83	39.09	48.96	42.94	54.00	11.06
5240 MHz										
5240.00	72.24	PK	H	33.68	3.52	0.00	109.44	103.42	N/A	N/A
5240.00	62.59	AV	H	33.68	3.52	0.00	99.79	93.77	N/A	N/A
5240.00	70.32	PK	V	33.68	3.52	0.00	107.52	101.5	N/A	N/A
5240.00	61.46	AV	V	33.68	3.52	0.00	98.66	92.64	N/A	N/A
5350.00	26.03	PK	H	33.86	3.52	0.00	63.41	57.39	74.00	16.61
5350.00	14.73	AV	H	33.86	3.52	0.00	52.11	46.09	54.00	7.91
10480.00	60.30	PK	H	38.20	6.37	36.88	67.99	61.97	68.20	6.23
15720.00	54.24	PK	H	37.88	8.79	39.18	61.73	55.71	74.00	18.29
15720.00	41.63	AV	H	37.88	8.79	39.18	49.12	43.1	54.00	10.90

802.11n ht40

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)						
5190 MHz										
5190.00	64.49	PK	H	33.60	3.59	0.00	101.68	95.66	N/A	N/A
5190.00	55.32	AV	H	33.60	3.59	0.00	92.51	86.49	N/A	N/A
5190.00	61.52	PK	V	33.60	3.59	0.00	98.71	92.69	N/A	N/A
5190.00	52.87	AV	V	33.60	3.59	0.00	90.06	84.04	N/A	N/A
5150.00	33.18	PK	H	33.54	3.56	0.00	70.28	64.26	74.00	9.74
5150.00	18.40	AV	H	33.54	3.56	0.00	55.50	49.48	54.00	4.52
10380.00	54.81	PK	H	38.18	6.31	36.85	62.45	56.43	68.20	11.77
15570.00	49.97	PK	H	38.03	8.84	39.06	57.78	51.76	74.00	22.24
15570.00	36.54	AV	H	38.03	8.84	39.06	44.35	38.33	54.00	15.67
5230 MHz										
5230.00	69.41	PK	H	33.67	3.54	0.00	106.62	100.6	N/A	N/A
5230.00	59.89	AV	H	33.67	3.54	0.00	97.10	91.08	N/A	N/A
5230.00	66.49	PK	V	33.67	3.54	0.00	103.70	97.68	N/A	N/A
5230.00	57.84	AV	V	33.67	3.54	0.00	95.05	89.03	N/A	N/A
5350.00	25.46	PK	H	33.86	3.52	0.00	62.84	56.82	74.00	17.18
5350.00	15.52	AV	H	33.86	3.52	0.00	52.90	46.88	54.00	7.12
10460.00	57.74	PK	H	38.19	6.36	36.87	65.42	59.4	68.20	8.80
15690.00	48.66	PK	H	37.91	8.80	39.15	56.22	50.2	74.00	23.80
15690.00	35.84	AV	H	37.91	8.80	39.15	43.40	37.38	54.00	16.62

802.11 ac80

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)						
5210 MHz										
5210.00	61.47	PK	H	33.64	3.58	0.00	98.69	92.67	N/A	N/A
5210.00	51.69	AV	H	33.64	3.58	0.00	88.91	82.89	N/A	N/A
5210.00	58.23	PK	V	33.64	3.58	0.00	95.45	89.43	N/A	N/A
5210.00	48.45	AV	V	33.64	3.58	0.00	85.67	79.65	N/A	N/A
5150.00	34.87	PK	H	33.54	3.56	0.00	71.97	65.95	74.00	8.05
5150.00	19.61	AV	H	33.54	3.56	0.00	56.71	50.69	54.00	3.31
5350.00	29.18	PK	H	33.86	3.52	0.00	66.56	60.54	74.00	13.46
5350.00	16.30	AV	H	33.86	3.52	0.00	53.68	47.66	54.00	6.34
10420.00	53.53	PK	H	38.18	6.33	36.86	61.18	55.16	68.20	13.04
15630.00	48.78	PK	H	37.97	8.82	39.11	56.46	50.44	74.00	23.56
15630.00	34.25	AV	H	37.97	8.82	39.11	41.93	35.91	54.00	18.09

5725-5850MHz:
802.11a

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Remark	Polar (H/V)	Factor (dB/m)						
5745MHz										
5745.00	78.55	PK	H	34.20	3.69	0.00	116.44	110.42	N/A	N/A
5745.00	69.51	AV	H	34.20	3.69	0.00	107.40	101.38	N/A	N/A
5745.00	76.33	PK	V	34.20	3.69	0.00	114.22	108.2	N/A	N/A
5745.00	67.41	AV	V	34.20	3.69	0.00	105.30	99.28	N/A	N/A
5725.00	49.13	PK	H	34.19	3.69	0.00	87.01	80.99	122.20	41.21
5720.00	42.32	PK	H	34.19	3.69	0.00	80.20	74.18	110.80	36.62
5700.00	31.18	PK	H	34.18	3.68	0.00	69.04	63.02	105.20	42.18
5650.00	25.96	PK	H	34.16	3.63	0.00	63.75	57.73	68.20	10.47
11490.00	49.46	PK	H	38.99	6.59	37.35	57.69	51.67	74.00	22.33
11490.00	36.89	AV	H	38.99	6.59	37.35	45.12	39.1	54.00	14.90
17235.00	51.67	PK	H	41.56	8.78	38.61	63.40	57.38	68.20	10.82
5785 MHz										
5785.00	79.67	PK	H	34.21	3.71	0.00	117.59	111.57	N/A	N/A
5785.00	70.33	AV	H	34.21	3.71	0.00	108.25	102.23	N/A	N/A
5785.00	75.91	PK	V	34.21	3.71	0.00	113.83	107.81	N/A	N/A
5785.00	66.36	AV	V	34.21	3.71	0.00	104.28	98.26	N/A	N/A
11570.00	48.92	PK	H	39.00	6.61	37.44	57.09	51.07	74.00	22.93
11570.00	36.27	AV	H	39.00	6.61	37.44	44.44	38.42	54.00	15.58
17355.00	52.17	PK	H	42.26	8.81	38.52	64.72	58.7	68.20	9.50
5825 MHz										
5825.00	80.47	PK	H	34.23	3.73	0.00	118.43	112.41	N/A	N/A
5825.00	71.45	AV	H	34.23	3.73	0.00	109.41	103.39	N/A	N/A
5825.00	75.87	PK	V	34.23	3.73	0.00	113.83	107.81	N/A	N/A
5825.00	66.36	AV	V	34.23	3.73	0.00	104.32	98.3	N/A	N/A
5850.00	49.54	PK	H	34.24	3.75	0.00	87.53	81.51	122.20	40.69
5855.00	46.75	PK	H	34.24	3.75	0.00	84.74	78.72	110.80	32.08
5875.00	34.12	PK	H	34.25	3.77	0.00	72.14	66.12	105.20	39.08
5925.00	27.21	PK	H	34.27	3.80	0.00	65.28	59.26	68.20	8.94
11650.00	48.86	PK	H	39.00	6.64	37.53	56.97	50.95	74.00	23.05
11650.00	36.32	AV	H	39.00	6.64	37.53	44.43	38.41	54.00	15.59
17475.00	52.18	PK	H	42.96	8.84	38.44	65.54	59.52	68.20	8.68

802.11n ht20

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Extrapolation result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)						
5745MHz										
5745.00	79.65	PK	H	34.20	3.69	0.00	117.54	111.52	N/A	N/A
5745.00	70.49	AV	H	34.20	3.69	0.00	108.38	102.36	N/A	N/A
5745.00	73.37	PK	V	34.20	3.69	0.00	111.26	105.24	N/A	N/A
5745.00	64.26	AV	V	34.20	3.69	0.00	102.15	96.13	N/A	N/A
5725.00	53.26	PK	H	34.19	3.69	0.00	91.14	85.12	122.20	37.08
5720.00	45.91	PK	H	34.19	3.69	0.00	83.79	77.77	110.80	33.03
5700.00	29.99	PK	H	34.18	3.68	0.00	67.85	61.83	105.20	43.37
5650.00	27.24	PK	H	34.16	3.63	0.00	65.03	59.01	68.20	9.19
11490.00	49.37	PK	H	38.99	6.59	37.35	57.60	51.58	74.00	22.42
11490.00	36.41	AV	H	38.99	6.59	37.35	44.64	38.62	54.00	15.38
17235.00	51.32	PK	H	41.56	8.78	38.61	63.05	57.03	68.20	11.17
5785 MHz										
5785.00	79.29	PK	H	34.21	3.71	0.00	117.21	111.19	N/A	N/A
5785.00	70.32	AV	H	34.21	3.71	0.00	108.24	102.22	N/A	N/A
5785.00	74.25	PK	V	34.21	3.71	0.00	112.17	106.15	N/A	N/A
5785.00	65.90	AV	V	34.21	3.71	0.00	103.82	97.8	N/A	N/A
11570.00	49.00	PK	H	39.00	6.61	37.44	57.17	51.15	74.00	22.85
11570.00	35.76	AV	H	39.00	6.61	37.44	43.93	37.91	54.00	16.09
17355.00	52.17	PK	H	42.26	8.81	38.52	64.72	58.7	68.20	9.50
5825 MHz										
5825.00	79.12	PK	H	34.23	3.73	0.00	117.08	111.06	N/A	N/A
5825.00	70.36	AV	H	34.23	3.73	0.00	108.32	102.3	N/A	N/A
5825.00	74.93	PK	V	34.23	3.73	0.00	112.89	106.87	N/A	N/A
5825.00	65.43	AV	V	34.23	3.73	0.00	103.39	97.37	N/A	N/A
5850.00	50.02	PK	H	34.24	3.75	0.00	88.01	81.99	122.20	40.21
5855.00	49.54	PK	H	34.24	3.75	0.00	87.53	81.51	110.80	29.29
5875.00	30.82	PK	H	34.25	3.77	0.00	68.84	62.82	105.20	42.38
5925.00	26.58	PK	H	34.27	3.80	0.00	64.65	58.63	68.20	9.57
11650.00	49.36	PK	H	39.00	6.64	37.53	57.47	51.45	74.00	22.55
11650.00	36.48	AV	H	39.00	6.64	37.53	44.59	38.57	54.00	15.43
17475.00	51.85	PK	H	42.96	8.84	38.44	65.21	59.19	68.20	9.01

802.11n ht40

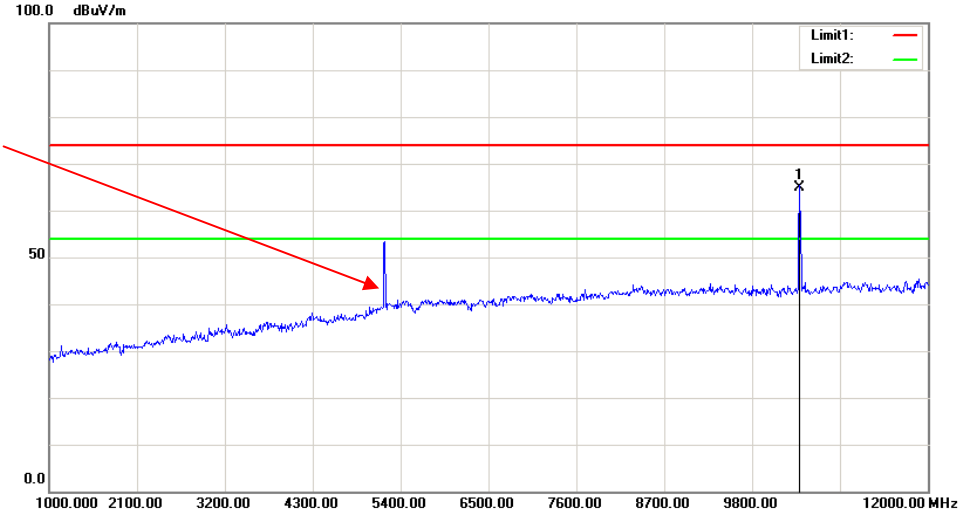
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Remark	Polar (H/V)	Factor (dB/m)						
5755MHz										
5755.00	76.88	PK	H	34.20	3.70	0.00	114.78	108.76	N/A	N/A
5755.00	67.36	AV	H	34.20	3.70	0.00	105.26	99.24	N/A	N/A
5755.00	72.10	PK	V	34.20	3.70	0.00	110.00	103.98	N/A	N/A
5755.00	63.10	AV	V	34.20	3.70	0.00	101.00	94.98	N/A	N/A
5725.00	54.12	PK	H	34.19	3.69	0.00	92.00	85.98	122.20	36.22
5720.00	52.23	PK	H	34.19	3.69	0.00	90.11	84.09	110.80	26.71
5700.00	43.64	PK	H	34.18	3.68	0.00	81.50	75.48	105.20	29.72
5650.00	29.85	PK	H	34.16	3.63	0.00	67.64	61.62	68.20	6.58
11510.00	46.09	PK	H	39.00	6.59	37.37	54.31	48.29	74.00	25.71
11510.00	33.21	AV	H	39.00	6.59	37.37	41.43	35.41	54.00	18.59
17265.00	46.28	PK	H	41.74	8.79	38.58	58.23	52.21	68.20	15.99
5795 MHz										
5795.00	73.77	PK	H	34.22	3.71	0.00	111.70	105.68	N/A	N/A
5795.00	64.90	AV	H	34.22	3.71	0.00	102.83	96.81	N/A	N/A
5795.00	69.59	PK	V	34.22	3.71	0.00	107.52	101.5	N/A	N/A
5795.00	60.51	AV	V	34.22	3.71	0.00	98.44	92.42	N/A	N/A
5850.00	38.38	PK	H	34.24	3.75	0.00	76.37	70.35	122.20	51.85
5855.00	34.69	PK	H	34.24	3.75	0.00	72.68	66.66	110.80	44.14
5875.00	30.16	PK	H	34.25	3.77	0.00	68.18	62.16	105.20	43.04
5925.00	28.56	PK	H	34.27	3.80	0.00	66.63	60.61	68.20	7.59
11590.00	45.51	PK	H	39.00	6.62	37.46	53.67	47.65	74.00	26.35
11590.00	33.19	AV	H	39.00	6.62	37.46	41.35	35.33	54.00	18.67
17385.00	46.02	PK	H	42.43	8.82	38.50	58.77	52.75	68.20	15.45

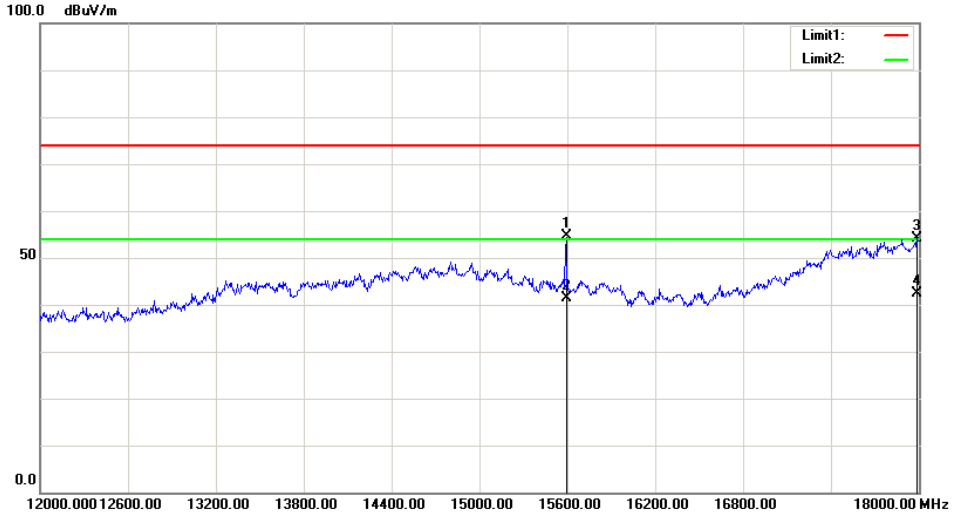
802.11 ac80

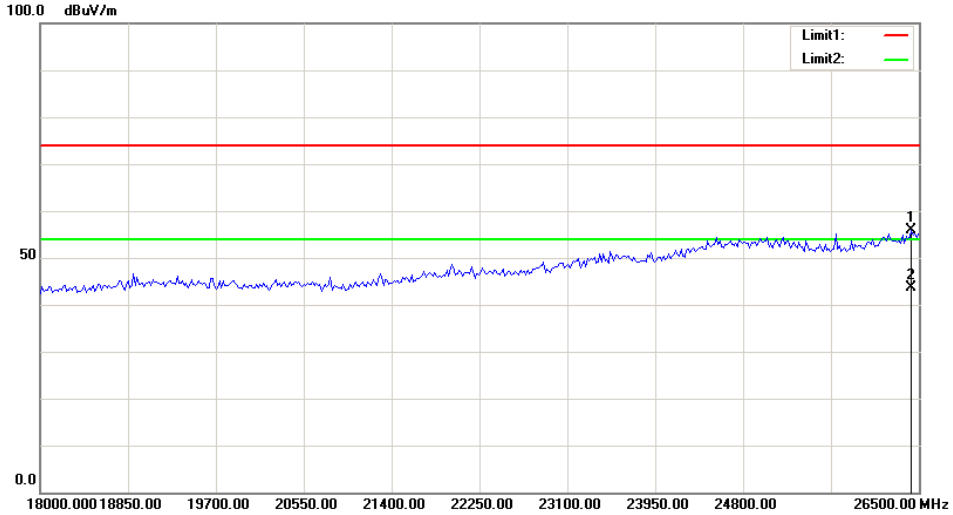
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Remark	Polar (H/V)	Factor (dB/m)						
5775 MHz										
5775.00	69.35	PK	H	34.21	3.70	0.00	107.26	101.24	N/A	N/A
5775.00	59.08	AV	H	34.21	3.70	0.00	96.99	90.97	N/A	N/A
5775.00	65.29	PK	V	34.21	3.70	0.00	103.20	97.18	N/A	N/A
5775.00	55.96	AV	V	34.21	3.70	0.00	93.87	87.85	N/A	N/A
5725.00	41.04	PK	H	34.19	3.69	0.00	78.92	72.9	122.20	49.30
5720.00	39.54	PK	H	34.19	3.69	0.00	77.42	71.4	110.80	39.40
5700.00	36.39	PK	H	34.18	3.68	0.00	74.25	68.23	105.20	36.97
5650.00	28.38	PK	H	34.16	3.63	0.00	66.17	60.15	68.20	8.05
5850.00	39.41	PK	H	34.24	3.75	0.00	77.40	71.38	122.20	50.82
5855.00	37.80	PK	H	34.24	3.75	0.00	75.79	69.77	110.80	41.03
5875.00	37.11	PK	H	34.25	3.77	0.00	75.13	69.11	105.20	36.09
5925.00	28.22	PK	H	34.27	3.80	0.00	66.29	60.27	68.20	7.93
11550.00	46.23	PK	H	39.00	6.61	37.42	54.42	48.4	74.00	25.60
11550.00	33.56	AV	H	39.00	6.61	37.42	41.75	35.73	54.00	18.27
17325.00	46.51	PK	H	42.09	8.80	38.54	58.86	52.84	68.20	15.36

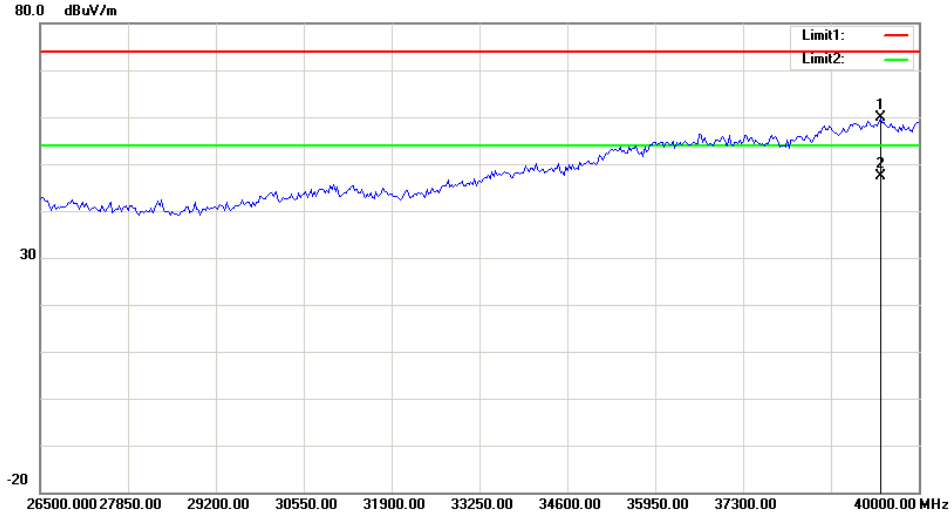
Worst Test Plots (802.11a 5200MHz)
Horizontal:

Fundamental Test with Band Rejection Filter



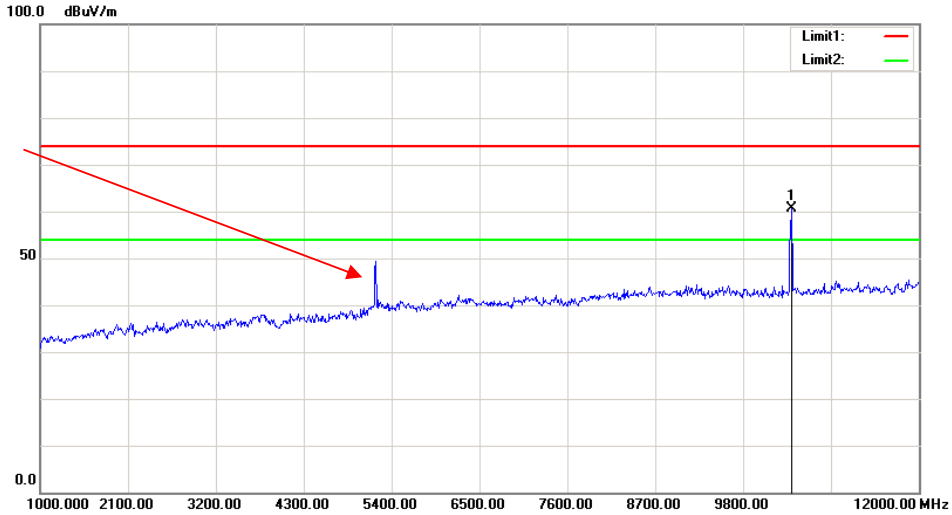


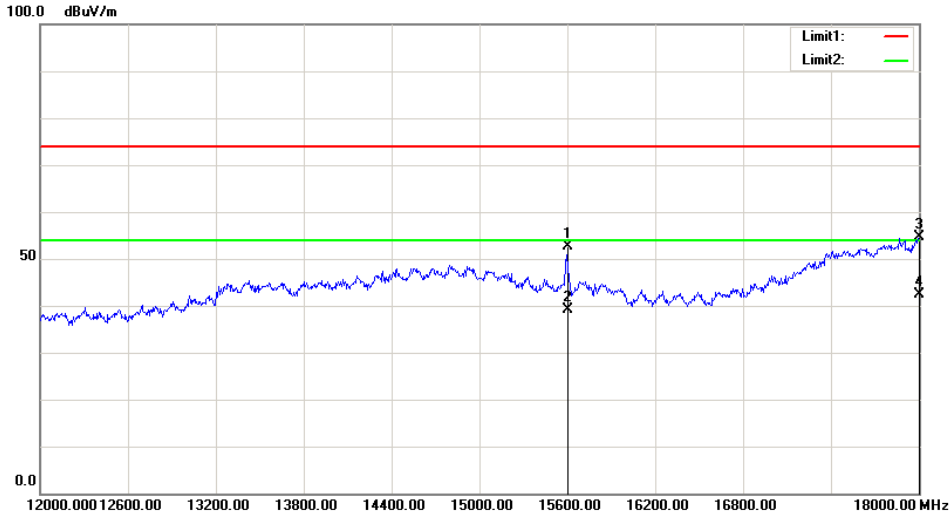


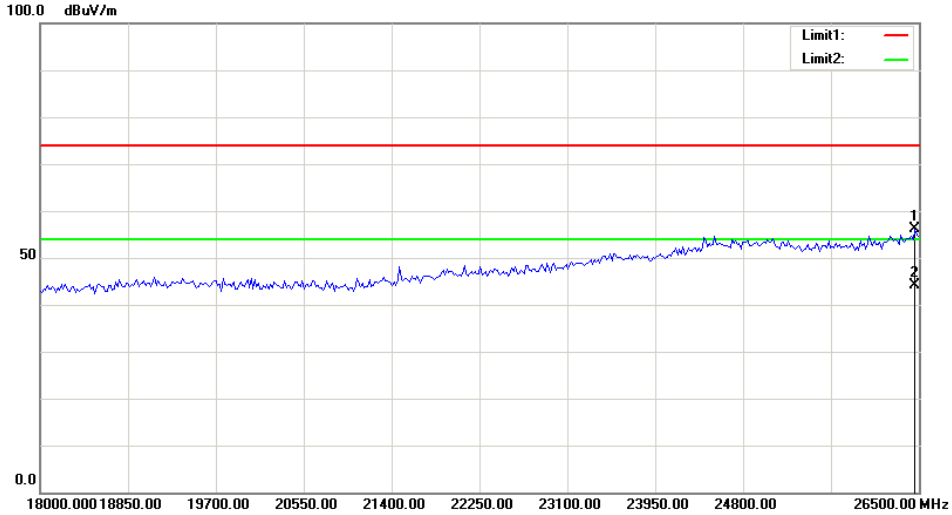


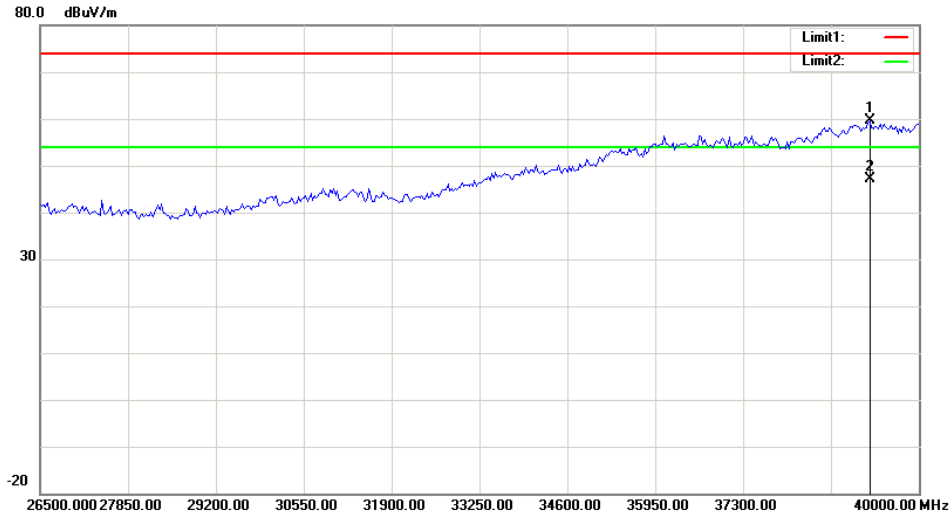
Vertical:

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


80.0 dBuV/m
Limit1:
Limit2:
30
-20
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	FSP 38	100478	2018-12-08	2019-12-08
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 U-NII Test Procedures New Rules v02r01.

Test Data

Environmental Conditions

Temperature:	23.1°C
Relative Humidity:	65 %
ATM Pressure:	100.9kPa

The testing was performed by Blake Yang on 2019-02-27.

Test Result: Pass.

Please refer to the following tables and plots.

Test mode: Transmitting

5150-5250MHz:

Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180	27.094	17.360
	5200	31.583	18.560
	5240	31.743	19.040
802.11n ht20	5180	25.411	18.000
	5200	32.385	18.880
	5240	33.590	19.360
802.11n ht40	5190	40.401	36.320
	5230	64.289	38.240
802.11 ac80	5210	85.932	75.840

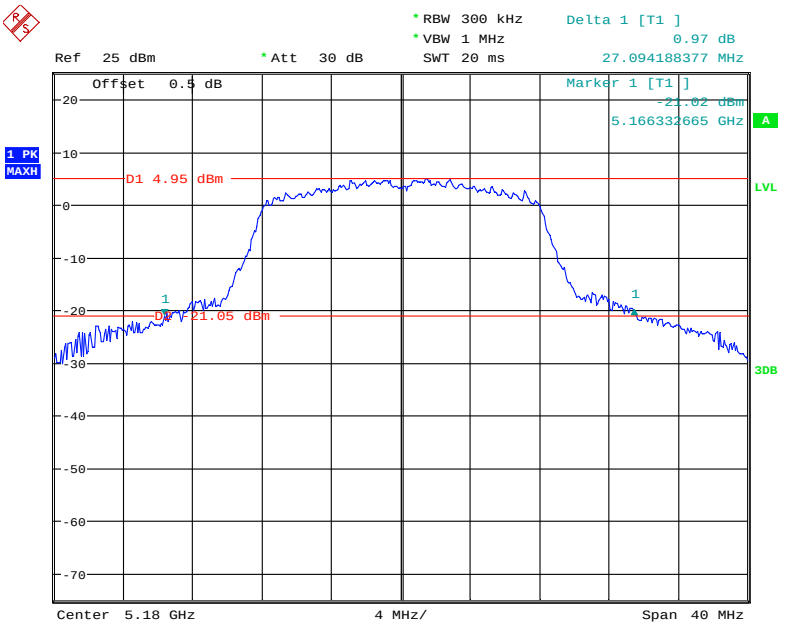
5725-5850MHz:

Mode	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	6dB Emission bandwidth Limits (MHz)	99% Occupied Bandwidth (MHz)
802.11 a	5745	16.032	≥0.5	17.760
	5785	15.952	≥0.5	17.520
	5825	16.032	≥0.5	17.600
802.11 n20	5745	17.234	≥0.5	18.400
	5785	17.395	≥0.5	18.240
	5825	17.395	≥0.5	18.320
802.11 n40	5755	36.480	≥0.5	36.960
	5795	36.538	≥0.5	36.800
802.11 ac80	5775	74.068	≥0.5	76.800

Note: the 99% Occupied Bandwidth have not fall into the band 5150-5250MHz or 5470-5725MHz, please refer to the test plots of 99% Occupied Bandwidth.

26dB Emission Bandwidth:
5150-5250MHz:

802.11a 5180MHz



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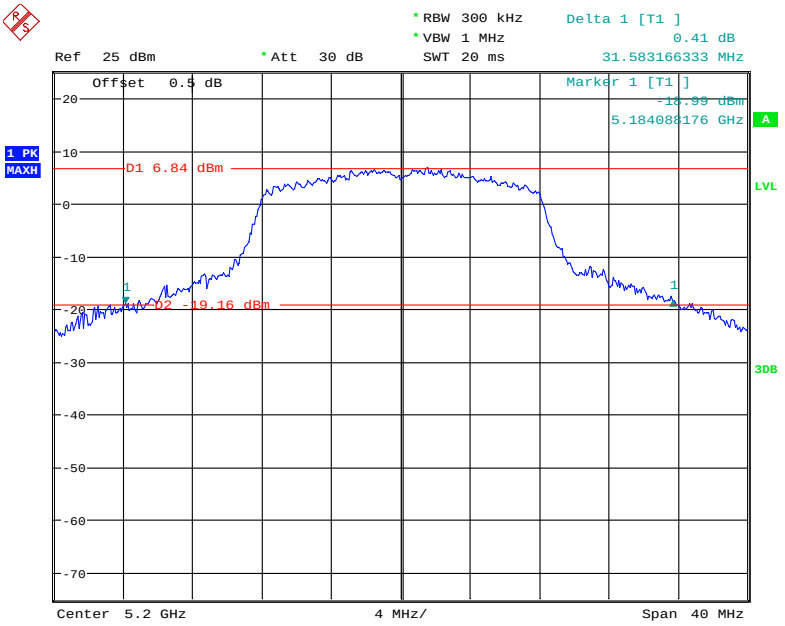
802.11a 5200MHz



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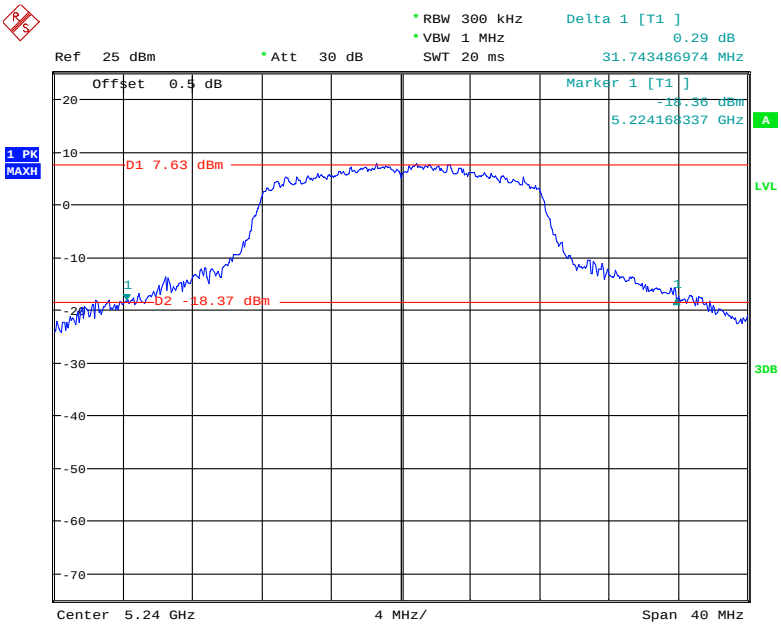
802.11a 5240MHz



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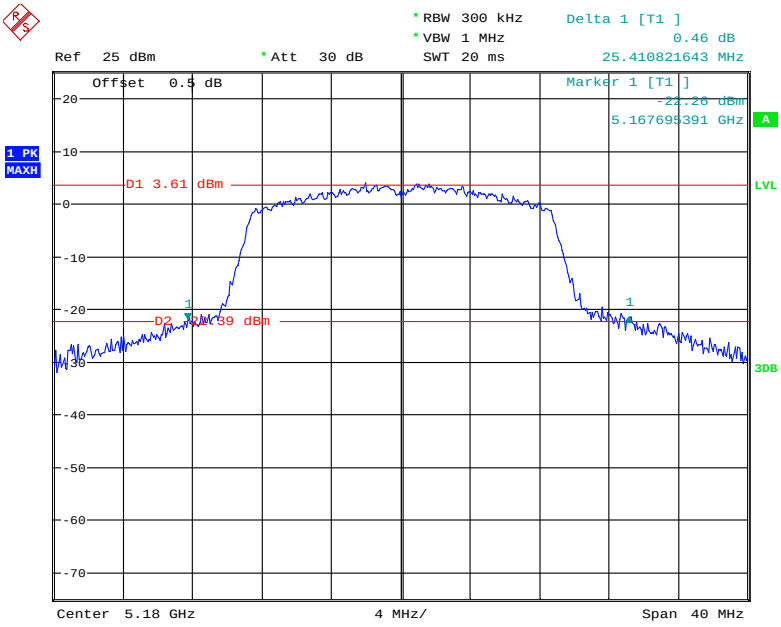
802.11n ht20 5180MHz



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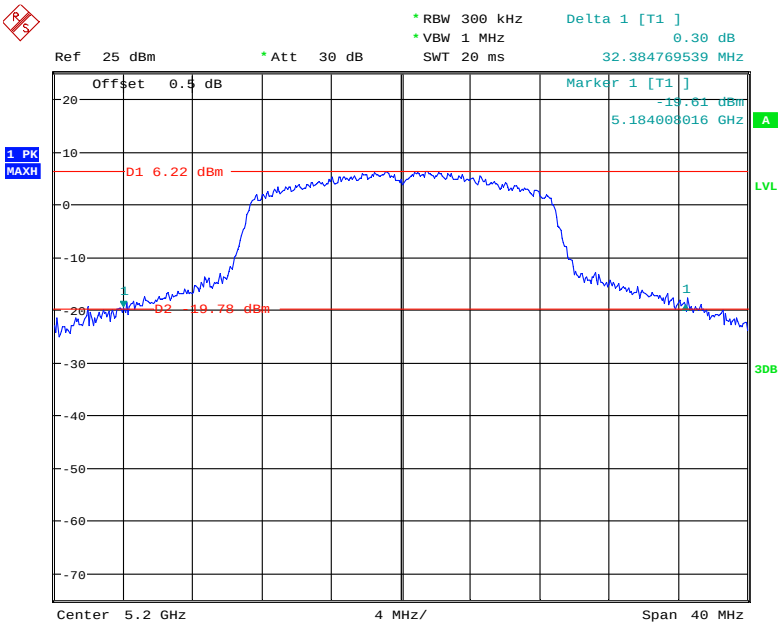
802.11n ht20 5200MHz



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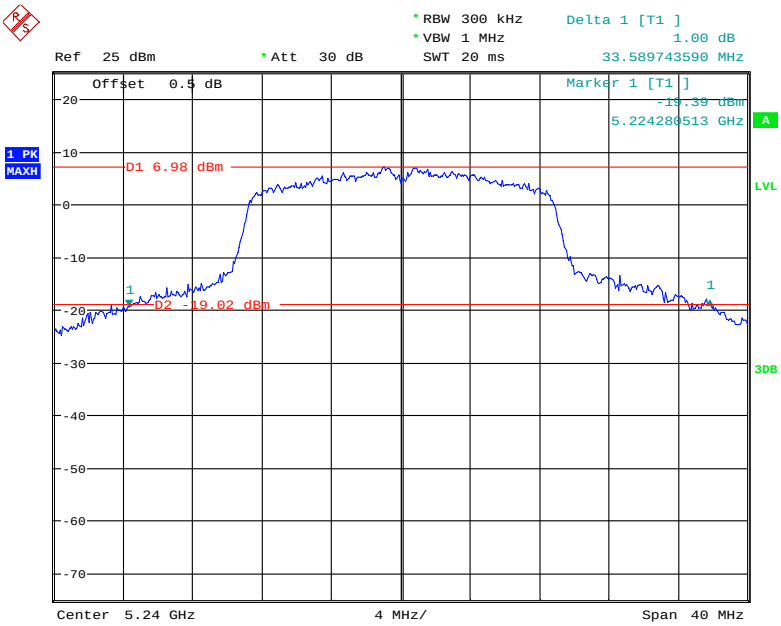
802.11n ht20 5240MHz



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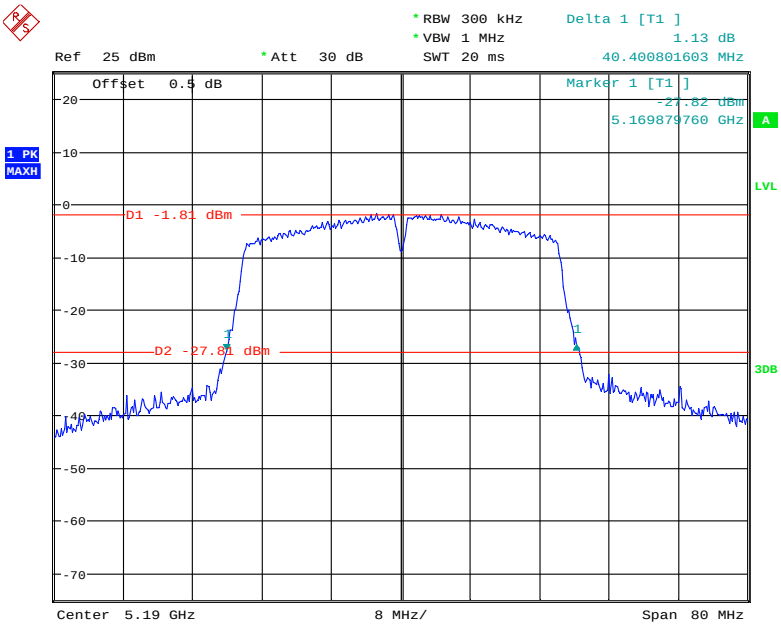
802.11n ht40 5190MHz



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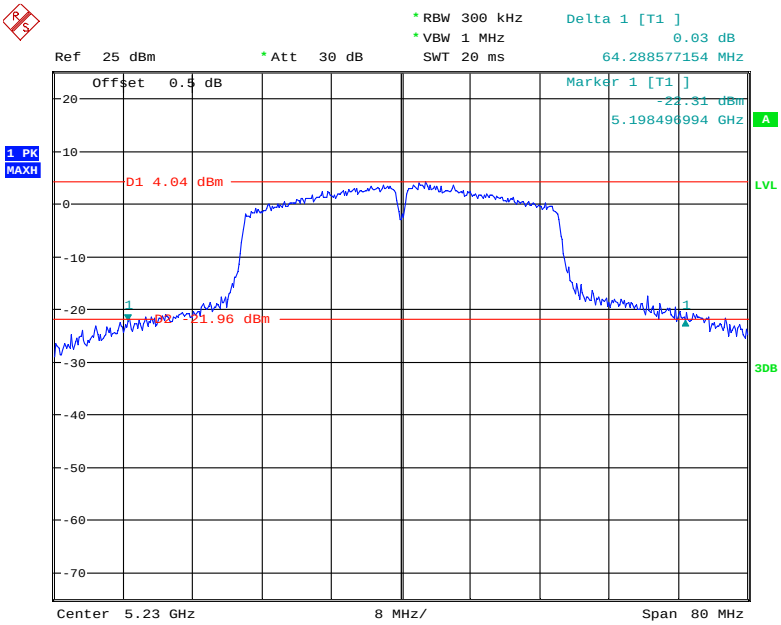
802.11n ht40 5230MHz



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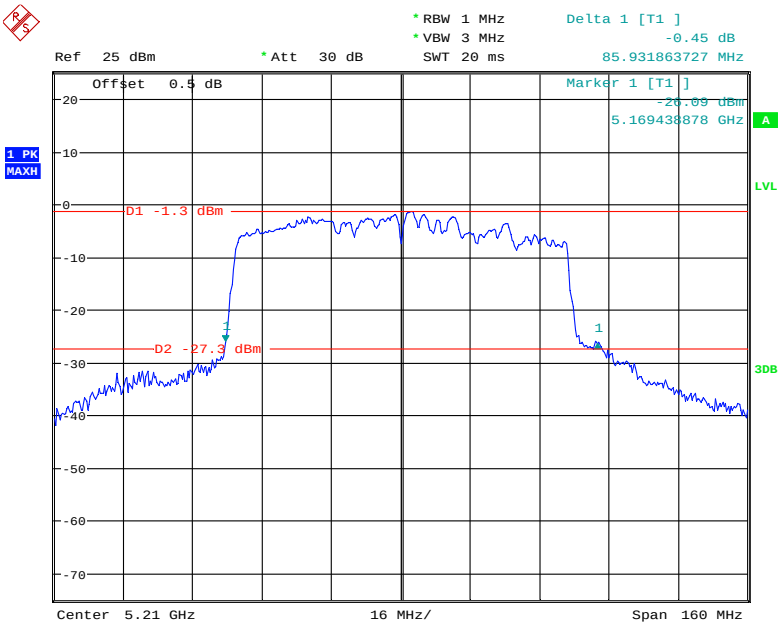
802.11 ac80 5210MHz



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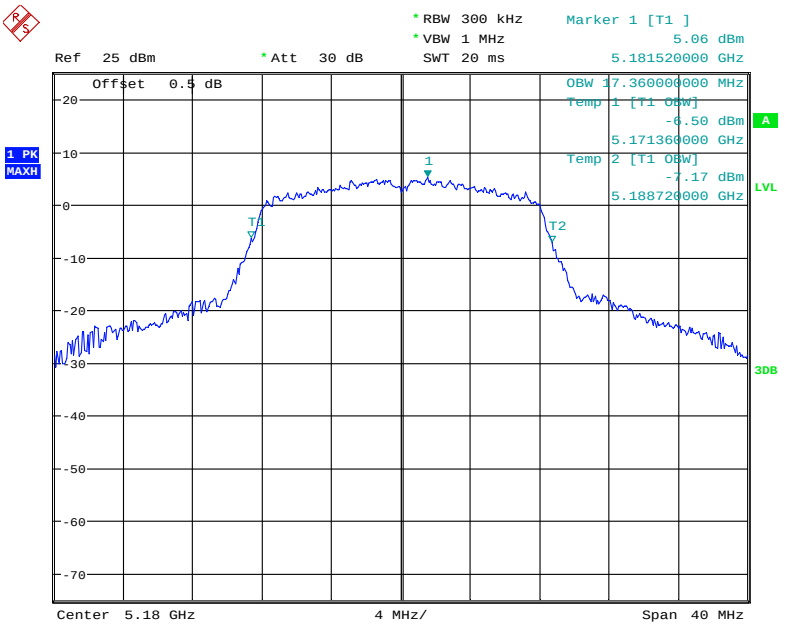
99% Occupied Bandwidth:
5150-5250MHz:

802.11a 5180MHz



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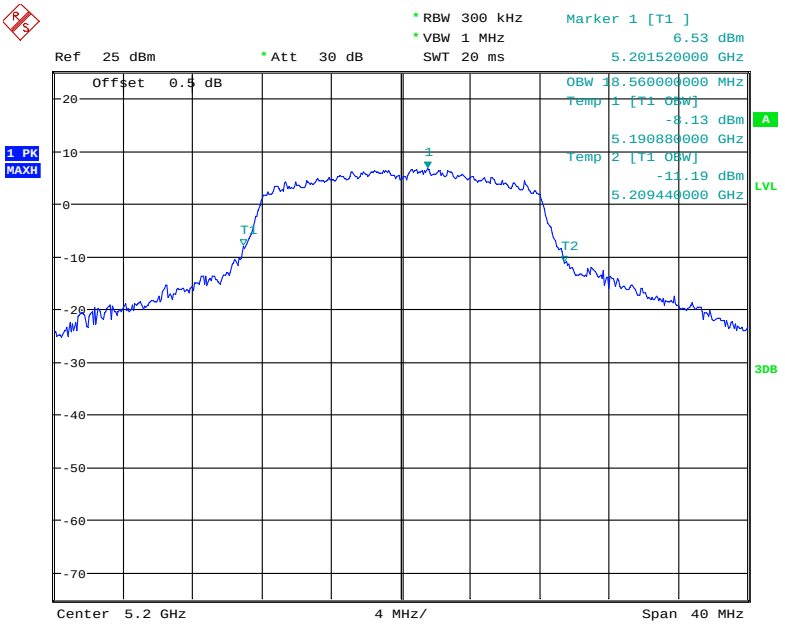
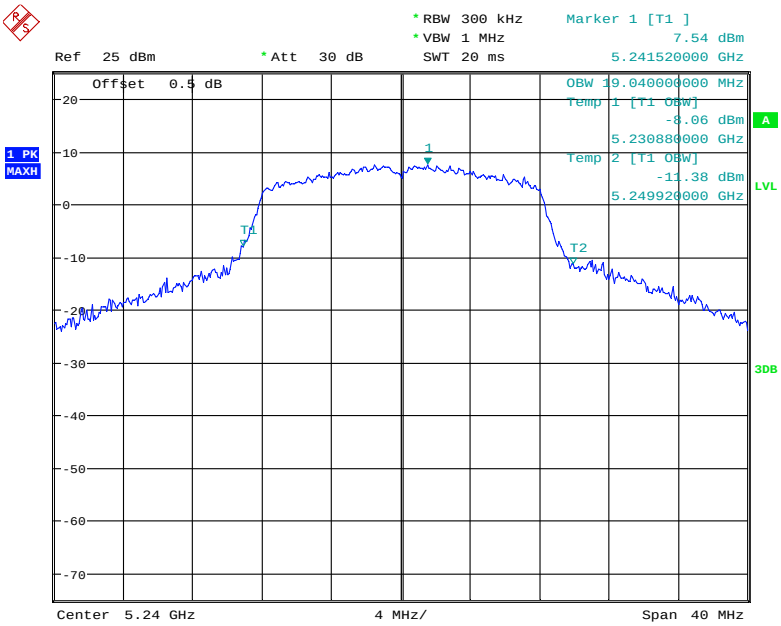
802.11a 5200MHz



Date: 27.FEB.2019 18:46:29

802.11a 5240MHz



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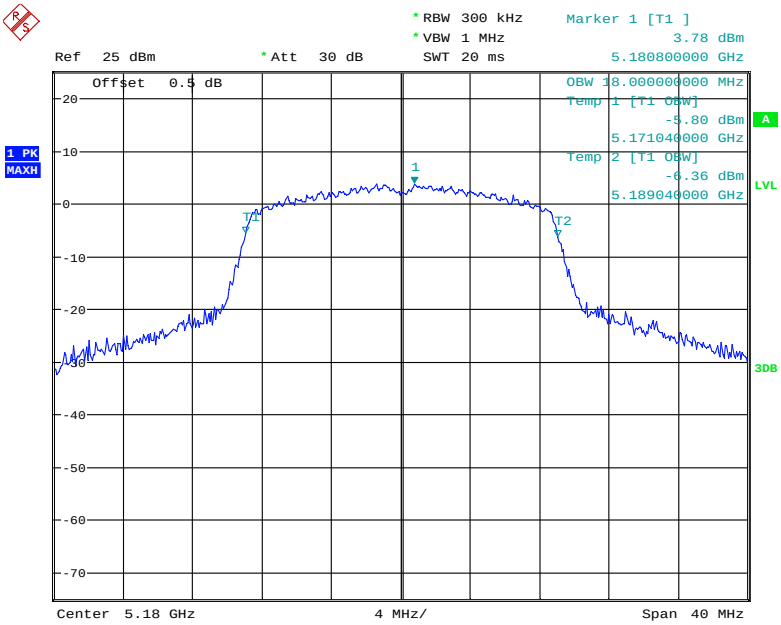
802.11n ht20 5180MHz



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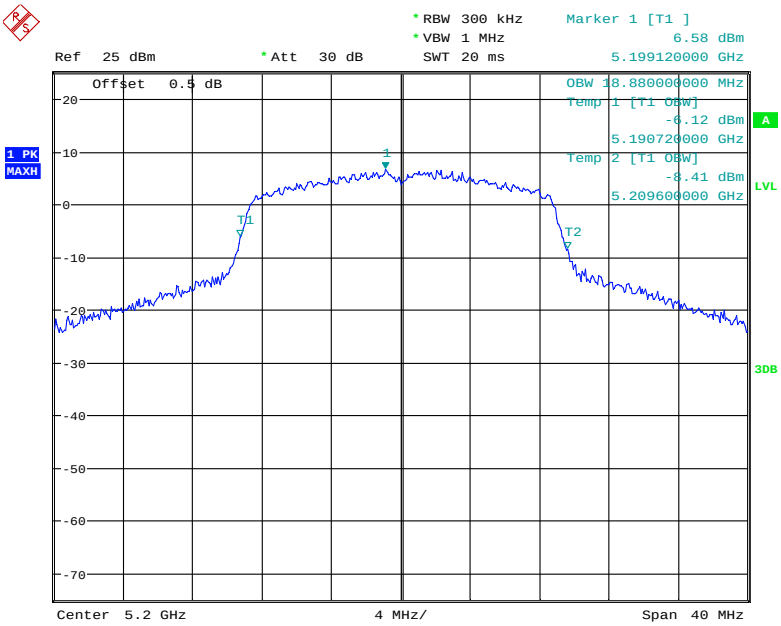

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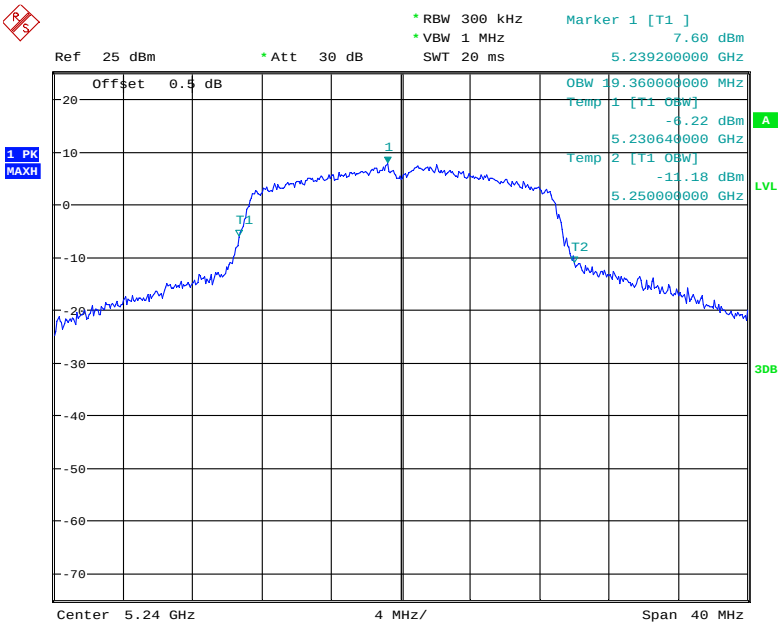

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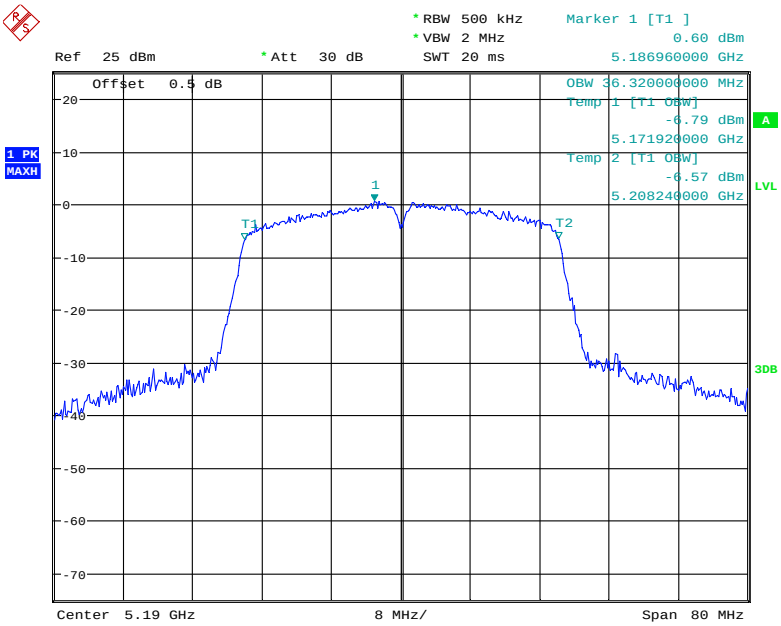
802.11n ht40 5190MHz



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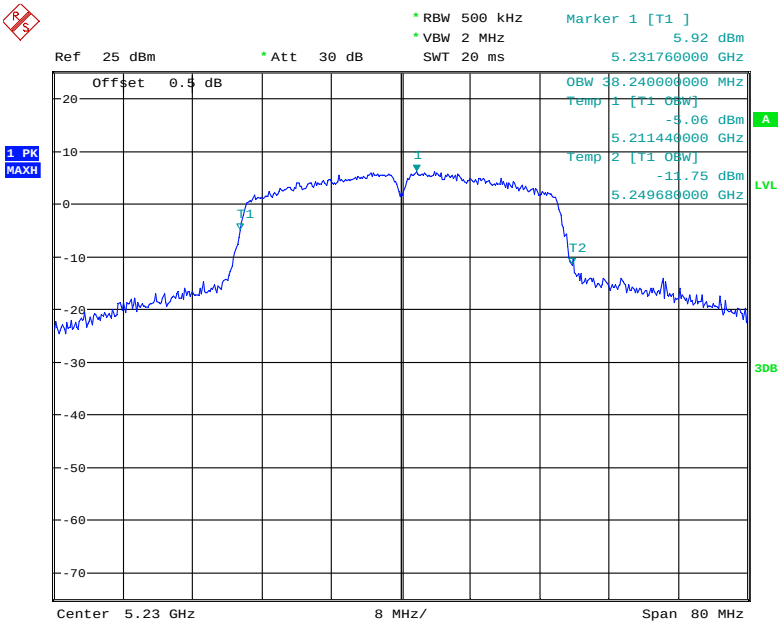

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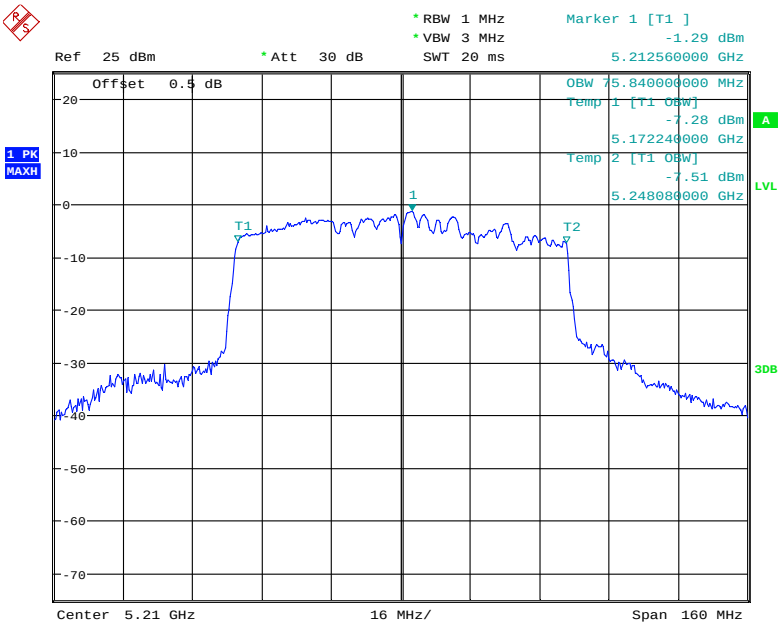

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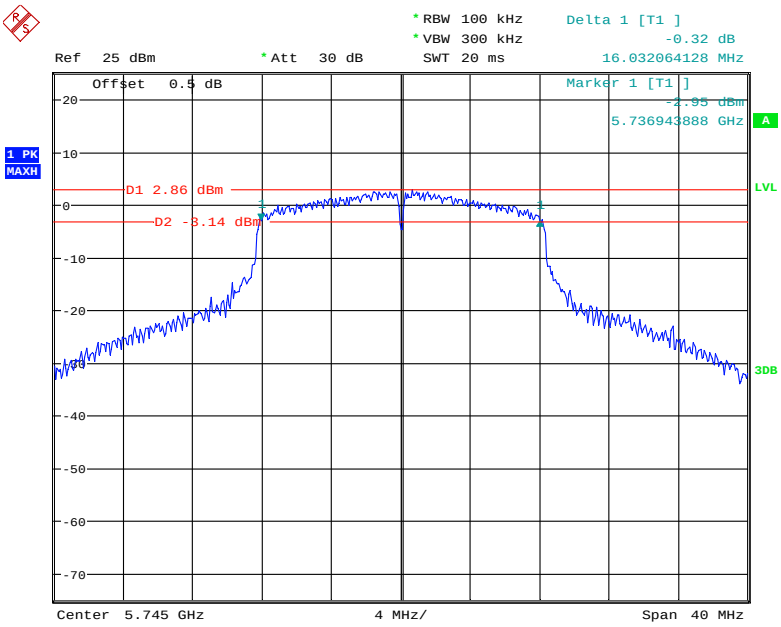
5725-5850MHz
6dB Minimum Emission Bandwidth:

802.11a 5745MHz



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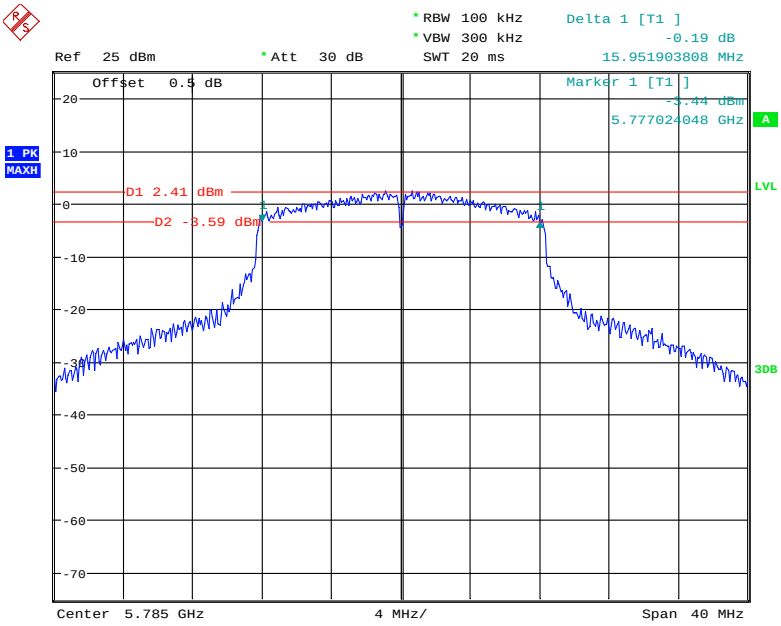
802.11a 5785MHz



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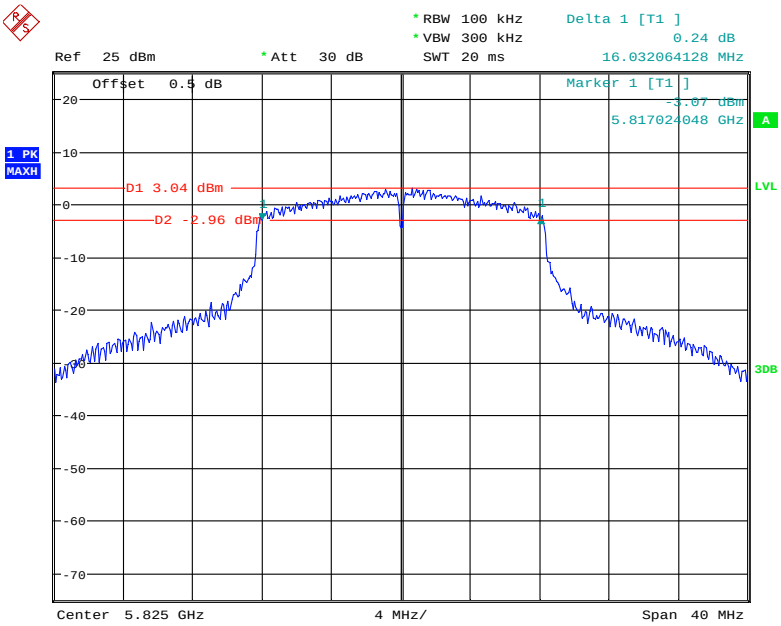

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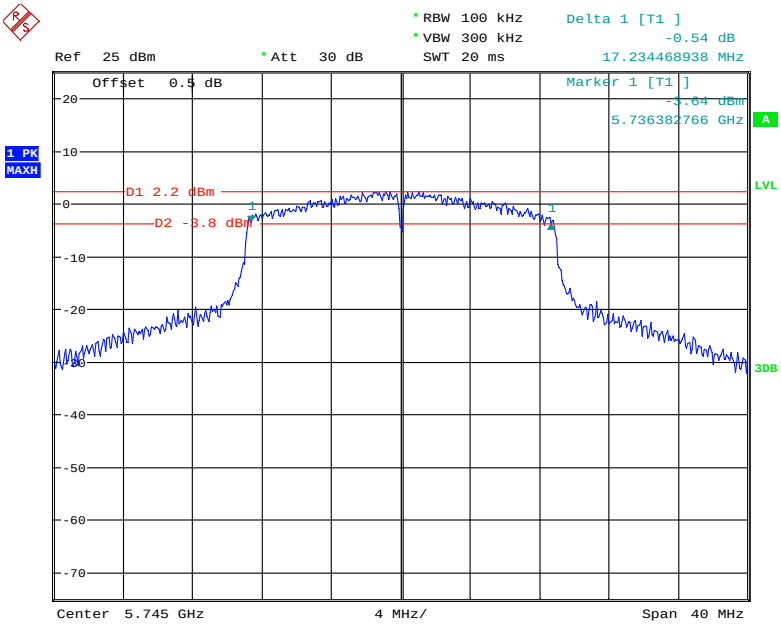
802.11n ht20 5745MHz



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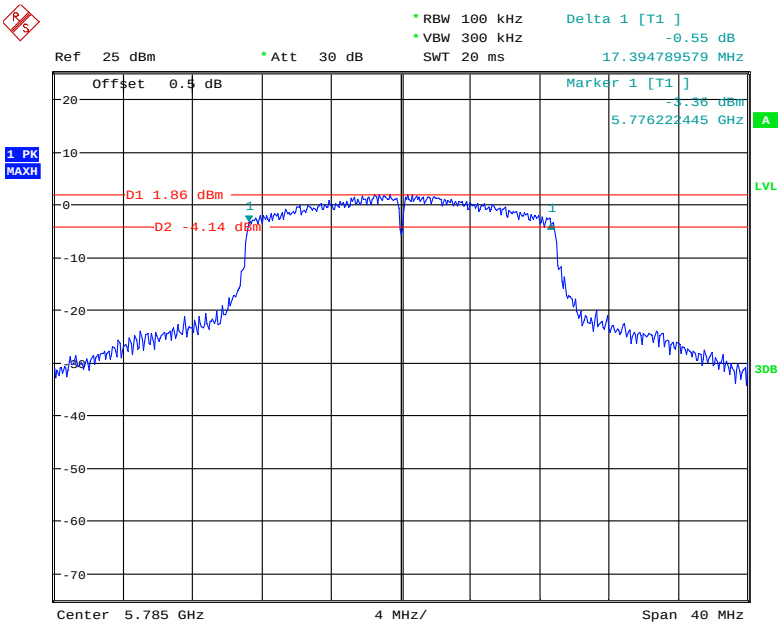

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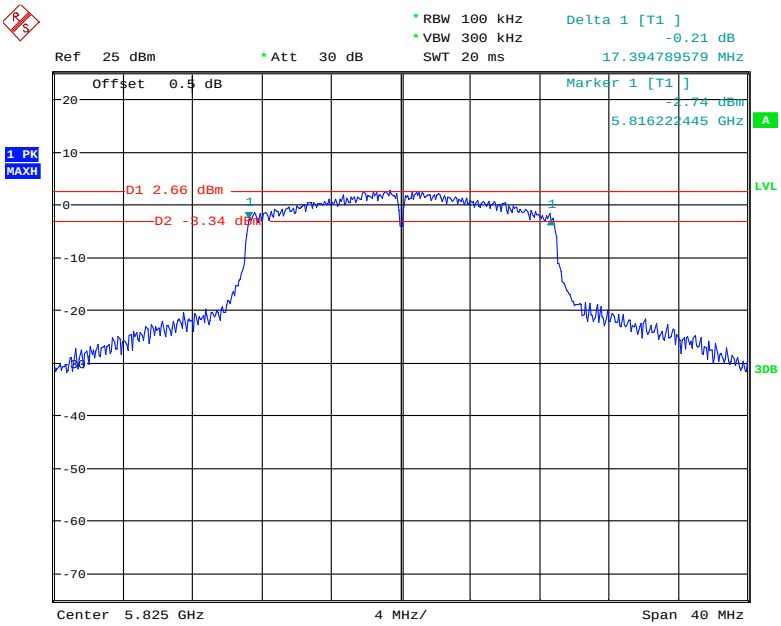

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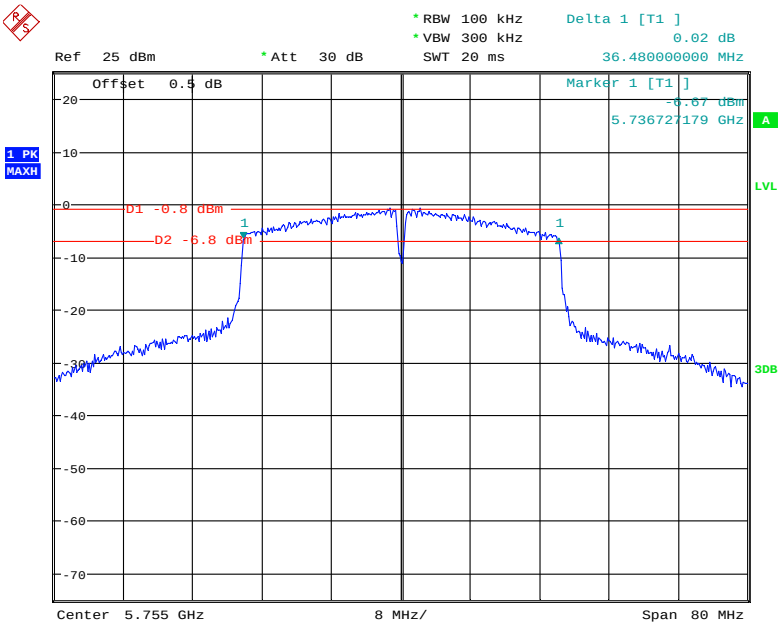
802.11n ht40 5755MHz



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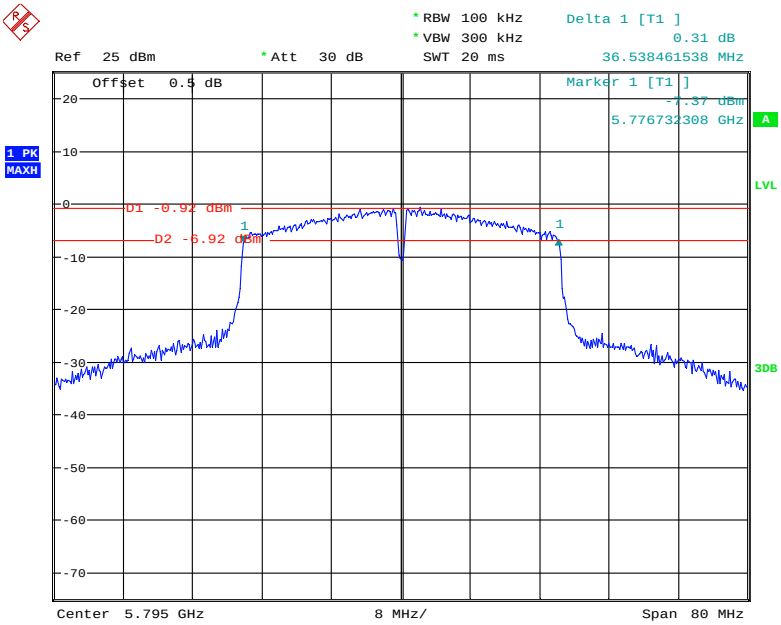

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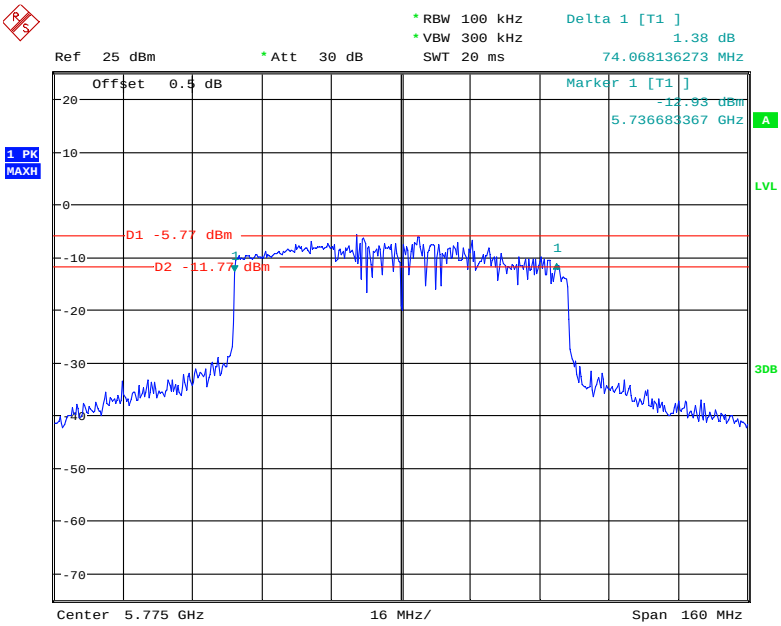

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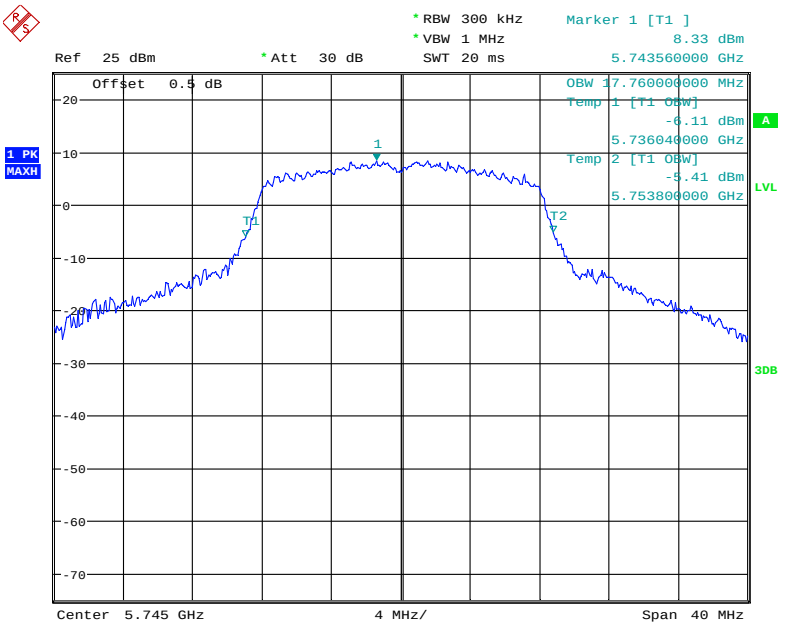
5725-5850MHz
99% Occupied Bandwidth:

802.11a 5745MHz



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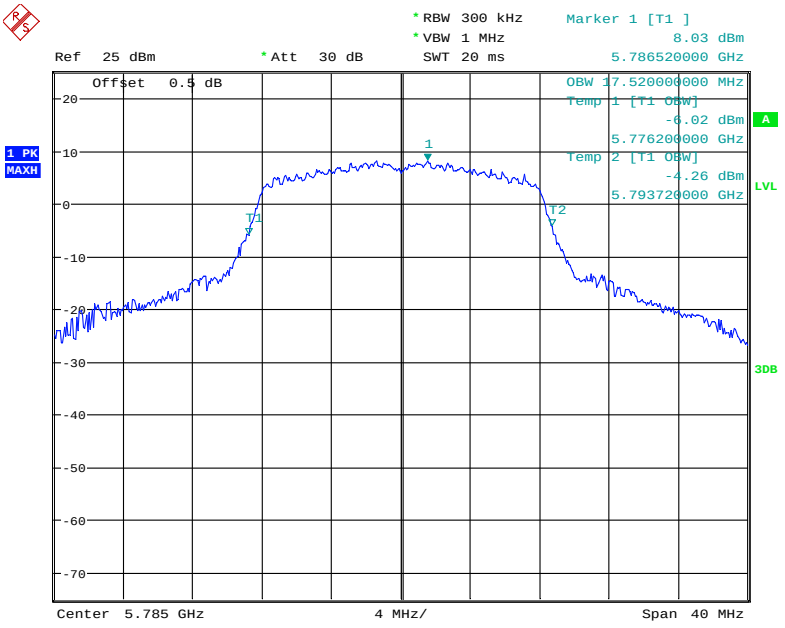

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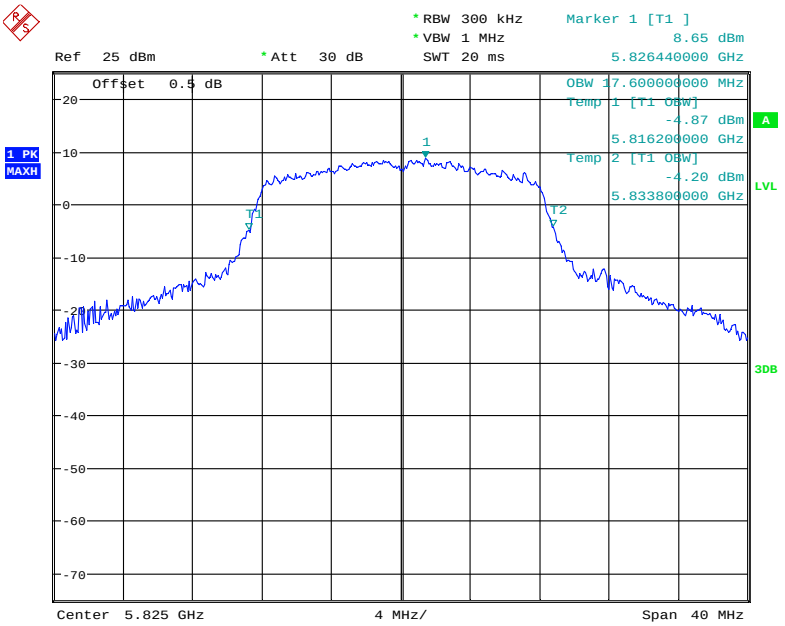
802.11a 5825MHz



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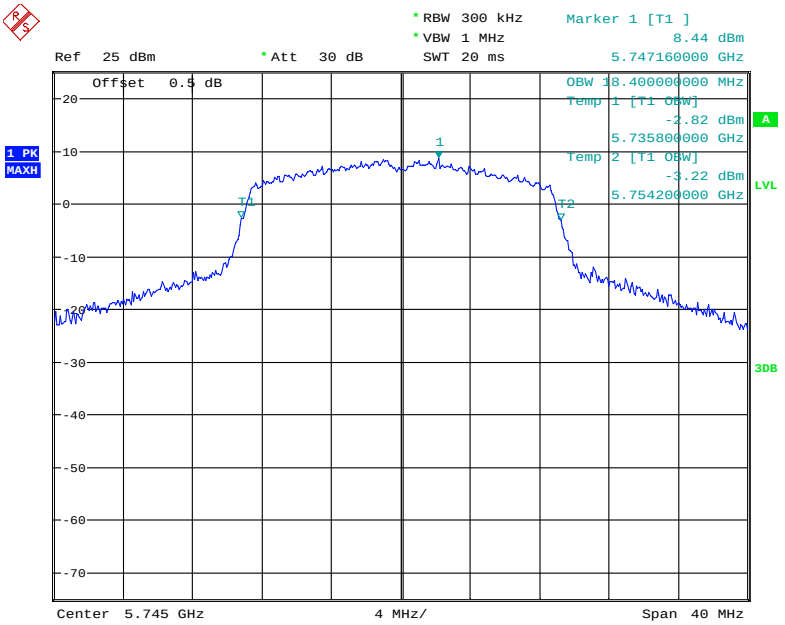
802.11n ht20 5745MHz



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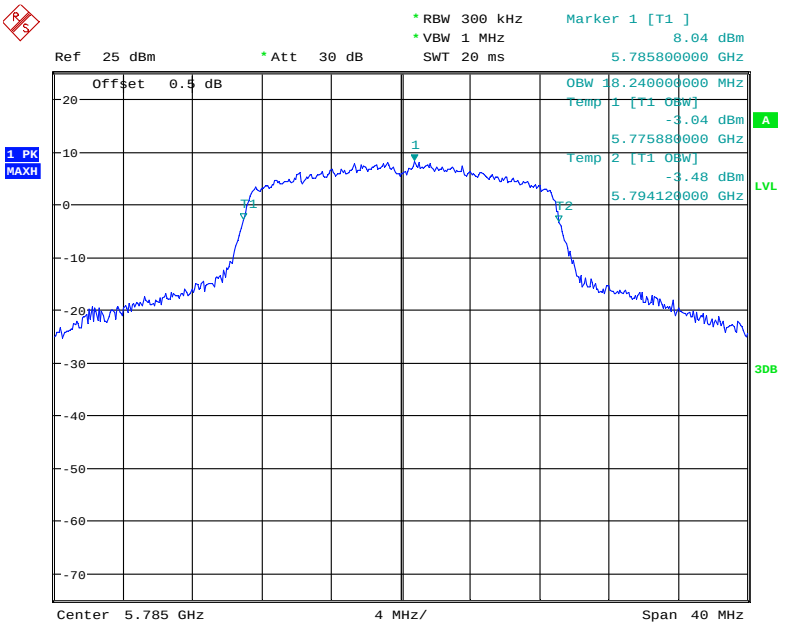

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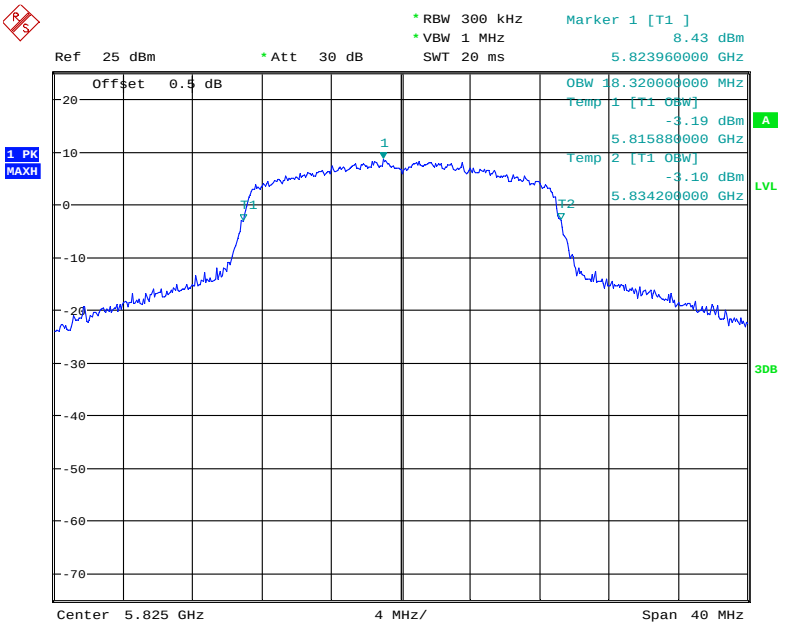

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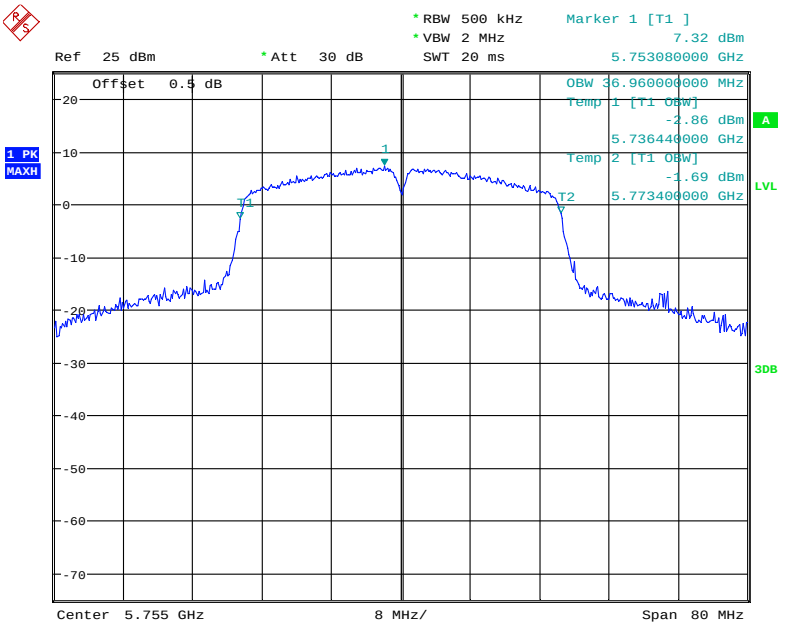
802.11n ht40 5755MHz



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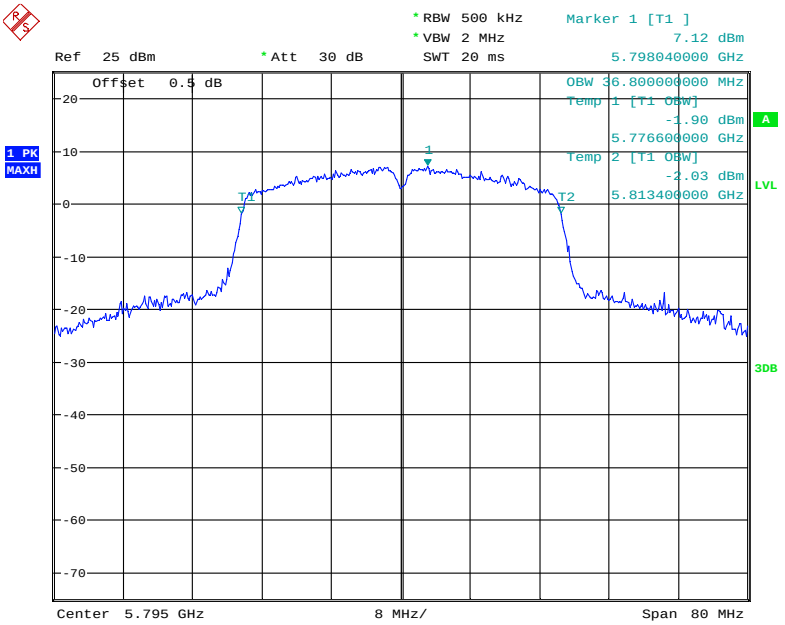

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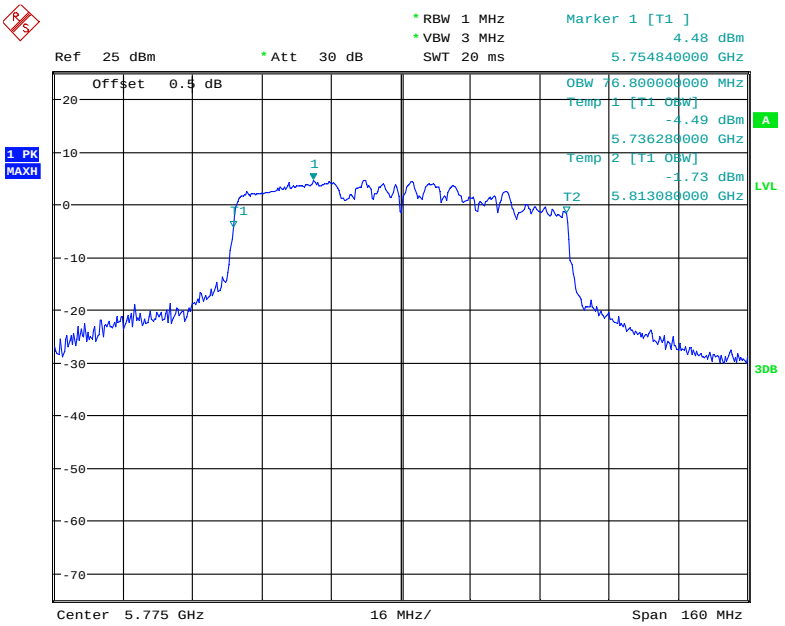
802.11 ac80 5775MHz



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FCC §15.407(a) –MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.407(a)

(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.

(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	C0010/01	Each time	N/A
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2018-12-10	2019-12-10

*** 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 U-NII Test Procedures New Rules v02r01.

Test Data

Environmental Conditions

Temperature:	23.1°C
Relative Humidity:	65 %
ATM Pressure:	100.9kPa

The testing was performed by Blake Yang on 2019-02-27.

Test Mode: Transmitting

Band	Mode	Frequency (MHz)	Conducted Average Output Power (dBm)	Limit (dBm)
5150-5250MHz	802.11a	5180	10.84	24
		5200	13.27	
		5240	13.81	
	802.11n ht20	5180	10.29	
		5200	13.18	
		5240	14.07	
	802.11n ht40	5190	7.43	
		5230	13.12	
	802.11ac80	5210	10.31	
5725-5850MHz	802.11a	5745	15.28	30
		5785	14.91	
		5825	15.56	
	802.11n ht20	5745	15.13	
		5785	14.95	
		5825	15.09	
	802.11n ht40	5755	15.31	
		5795	14.64	
	802.11ac80	5775	13.34	

FCC §15.407(a) - POWER SPECTRAL DENSITY

Applicable Standard

According to FCC §15.407(a)

(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.

(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 U-NII 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	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A

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

Test Data

Environmental Conditions

Temperature:	23.1°C
Relative Humidity:	65 %
ATM Pressure:	100.9 kPa

The testing was performed by Blake Yang on 2019-02-27.

Test Result:Compliance

Test Mode: Transmitting

5150-5250MHz:

Mode	Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)
802.11a	5180	2.39	11
	5200	4.01	
	5240	5.00	
802.11n ht20	5180	1.02	
	5200	3.61	
	5240	4.61	
802.11n ht40	5190	-4.44	
	5230	1.34	
802.11ac80	5210	-8.60	

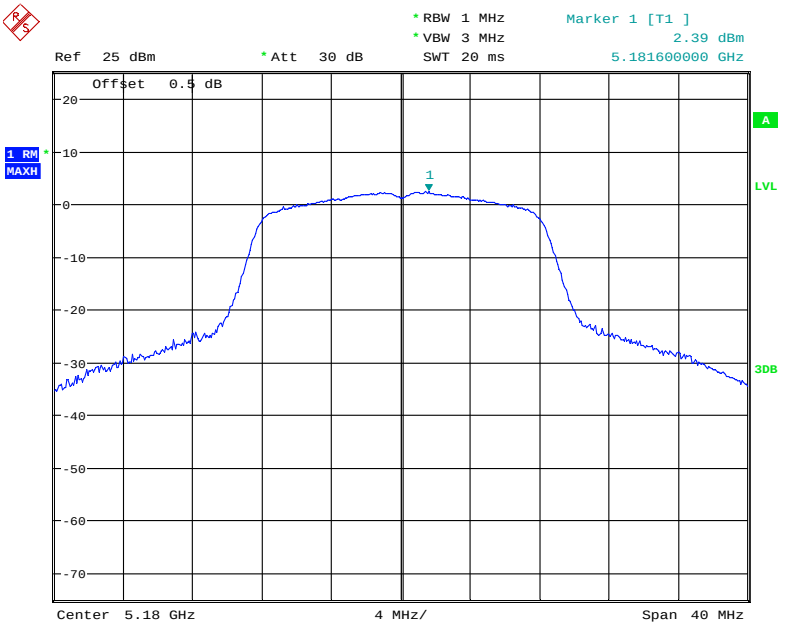
5725-5850 MHz:

Mode	Frequency (MHz)	Maximum Power Spectral Density (dBm/300kHz)	Maximum Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
802.11a	5745	1.52	3.74	30
	5785	1.45	3.67	
	5825	2.04	4.26	
802.11n ht20	5745	1.67	3.89	
	5785	0.94	3.16	
	5825	1.57	3.79	
802.11n ht40	5755	-1.85	0.37	
	5795	-2.00	0.22	
802.11ac80	5775	-6.06	-3.84	

Note:
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.

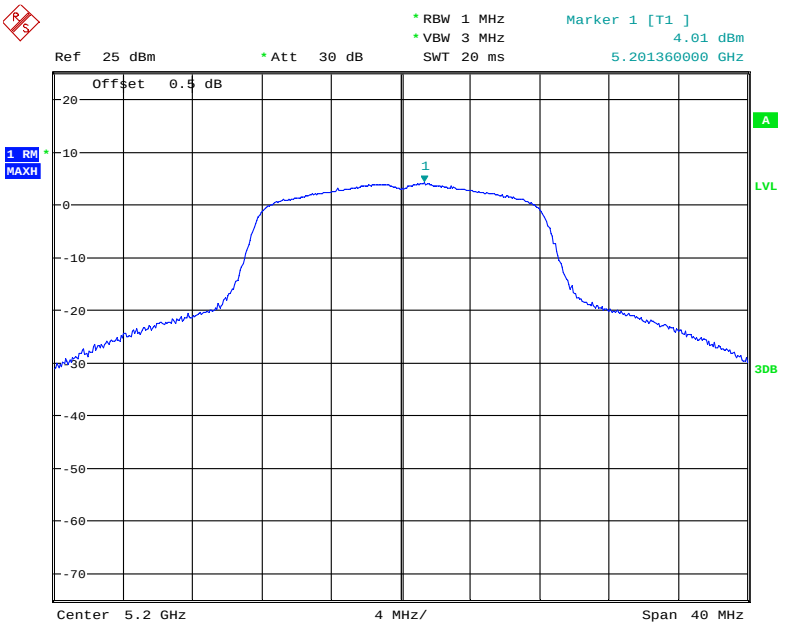
5150-5250MHz:

Power Spectral Density, 802.11a 5180MHz



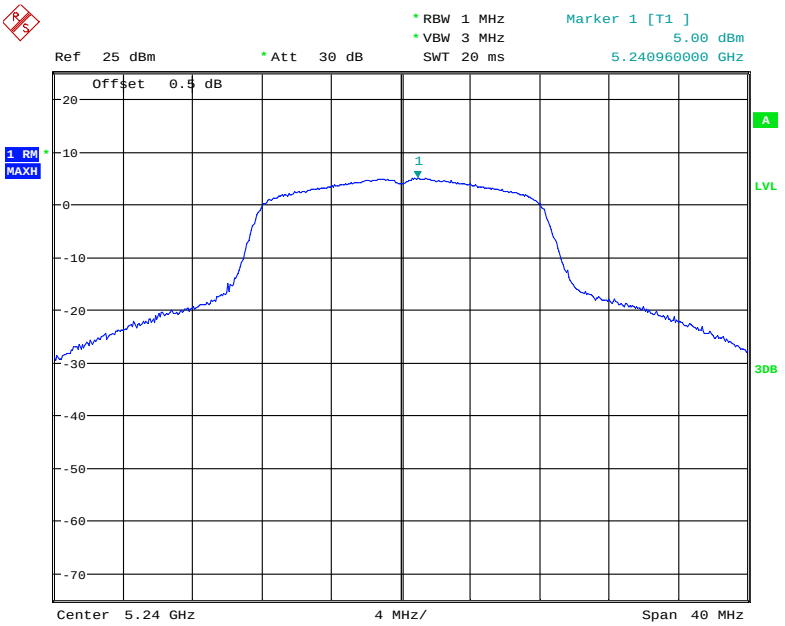
Date: 27.FEB.2019 18:41:28

Power Spectral Density, 802.11a 5200MHz



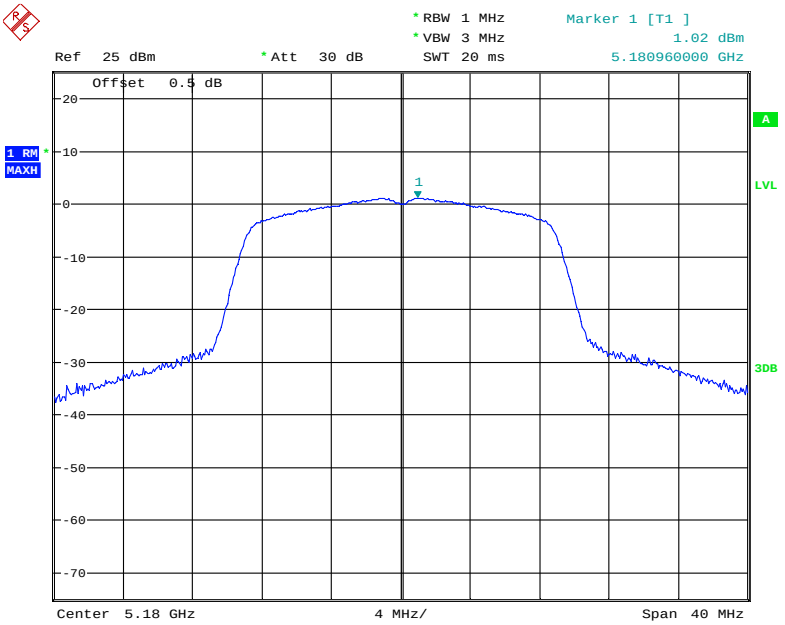
Date: 27.FEB.2019 18:46:47

Power Spectral Density, 802.11a 5240MHz



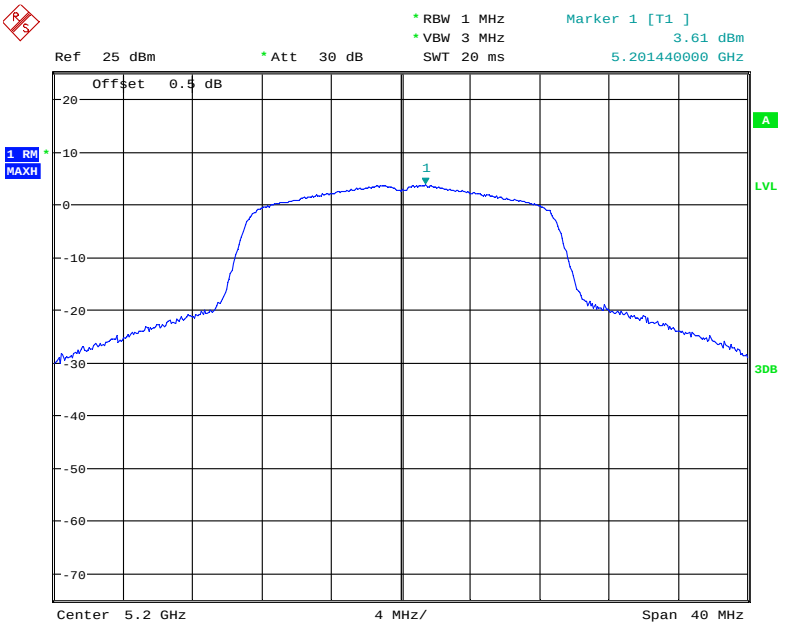
Date: 27.FEB.2019 18:43:55

Power Spectral Density, 802.11n ht20 5180MHz



Date: 27.FEB.2019 19:37:44

Power Spectral Density, 802.11n ht20 5200MHz



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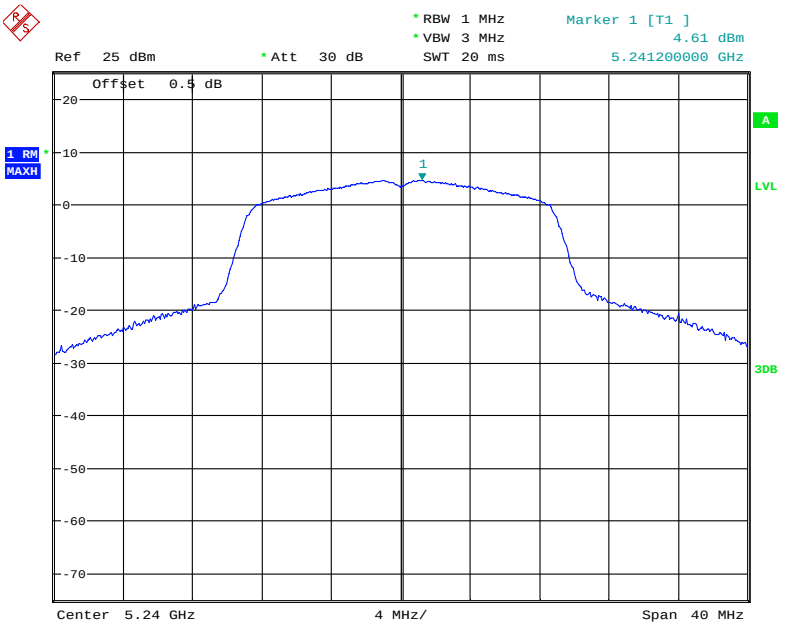
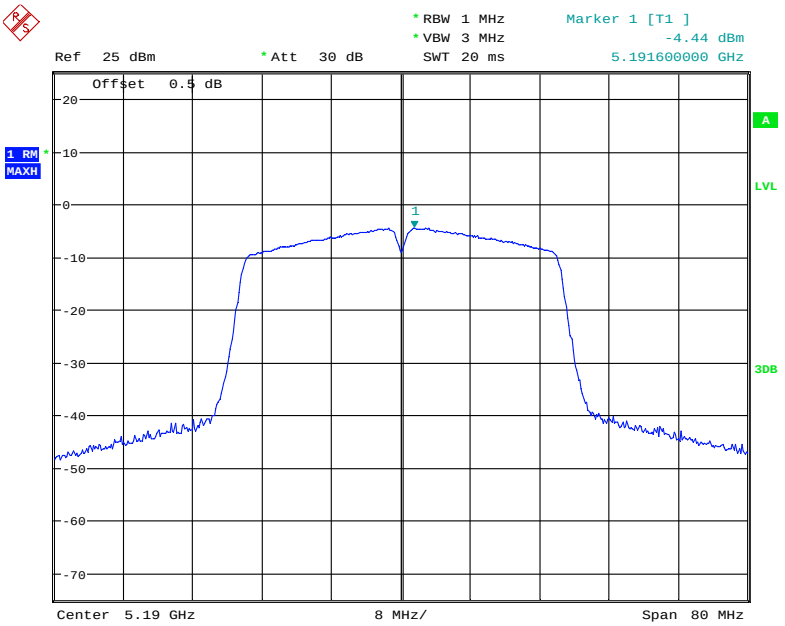
Power Spectral Density, 802.11n ht20 5240MHz



Date: 27.FEB.2019 19:40:17

Power Spectral Density, 802.11n ht40 5190MHz



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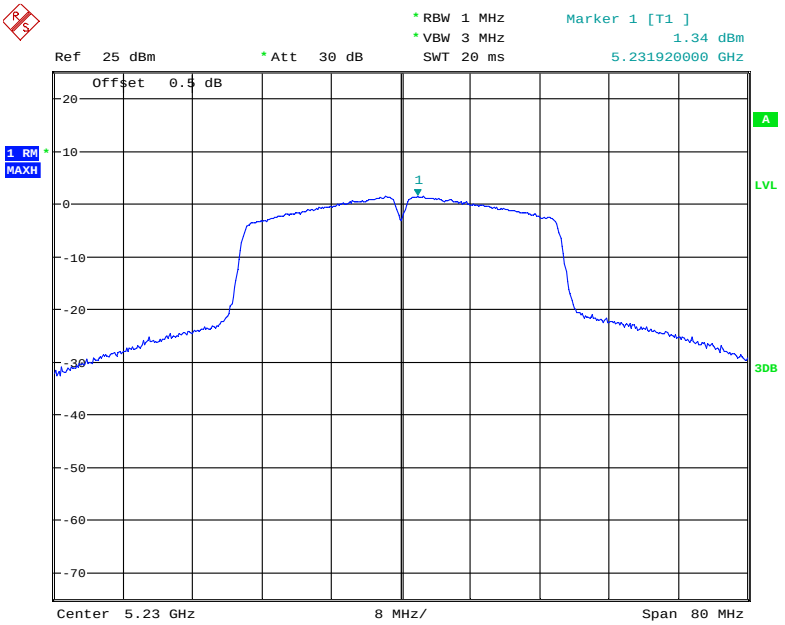
Power Spectral Density, 802.11n ht40 5230MHz



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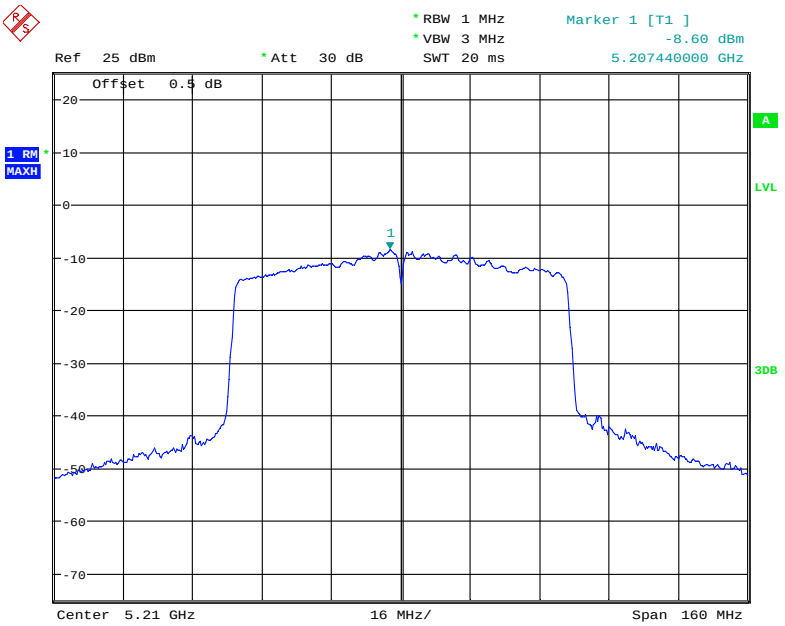
Power Spectral Density, 802.11 ac80 5210MHz



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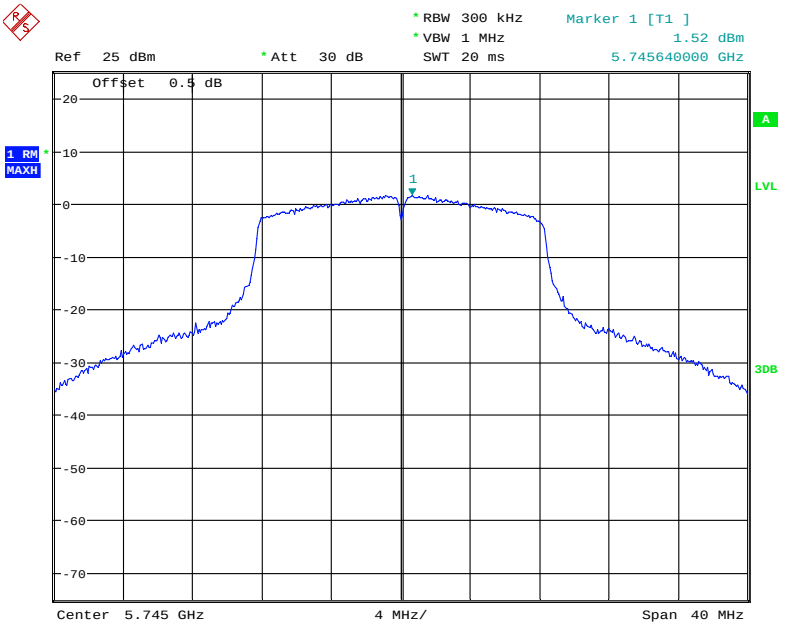
5725-5850MHz:

Power Spectral Density, 802.11a 5745MHz



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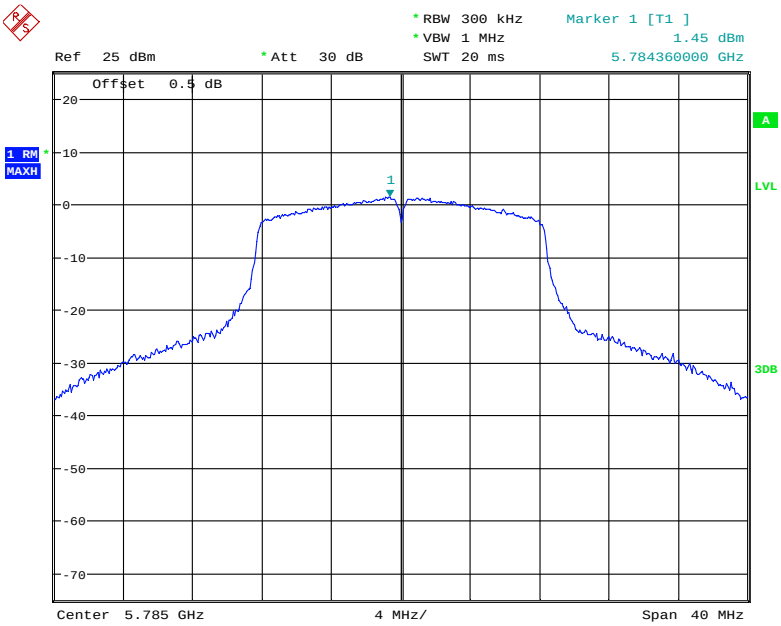
Power Spectral Density, 802.11a 5785MHz



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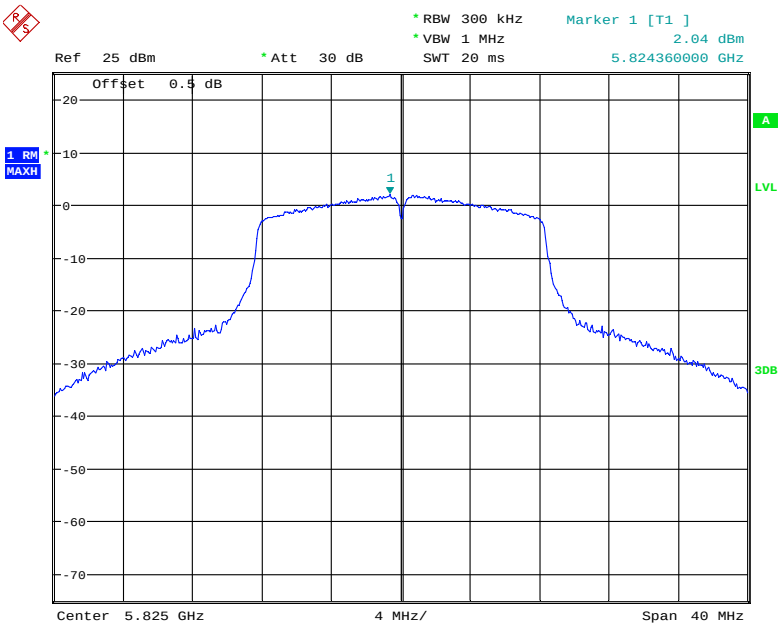
Power Spectral Density, 802.11a 5825MHz



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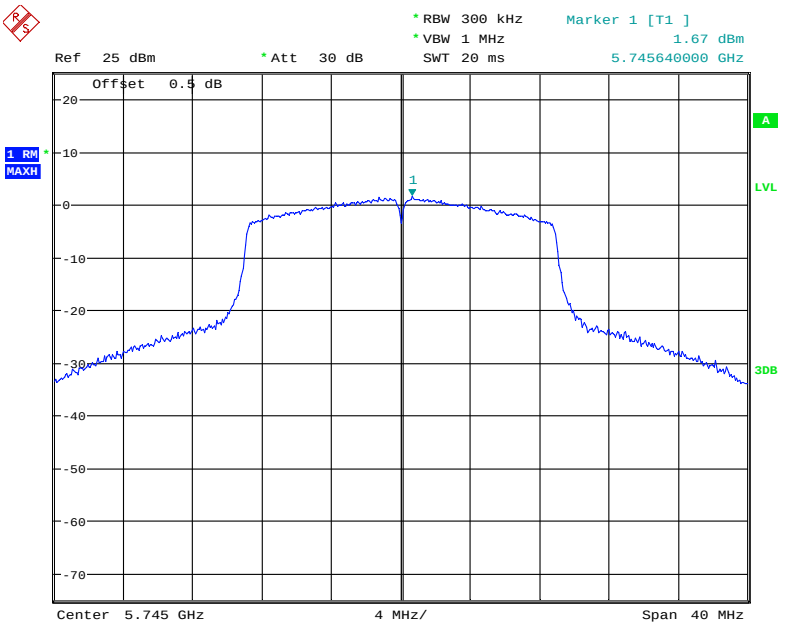
Power Spectral Density, 802.11n ht20 5745MHz



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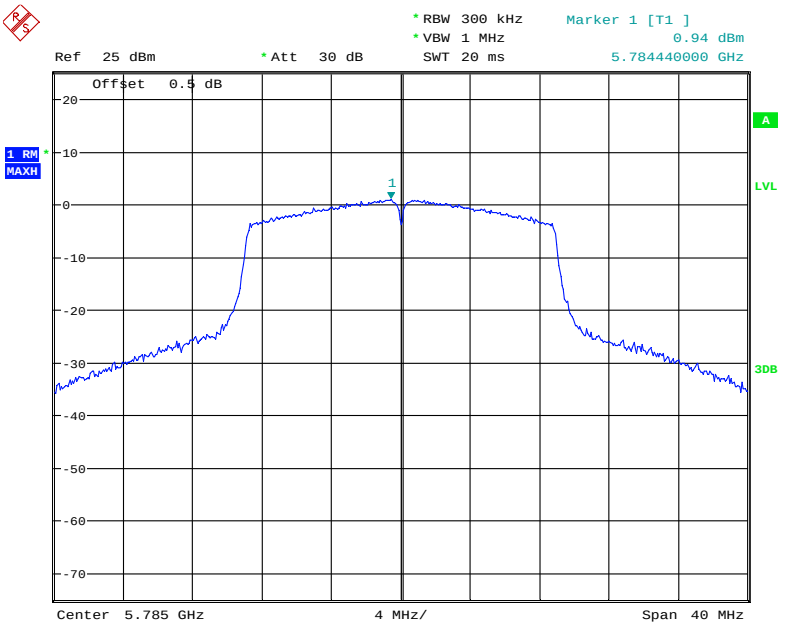
Power Spectral Density, 802.11n ht20 5785MHz



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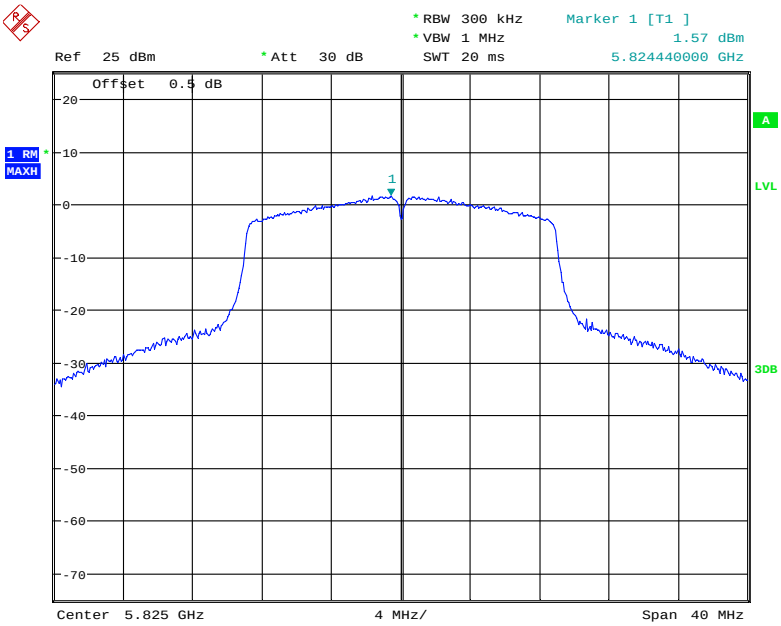
Power Spectral Density, 802.11n ht20 5825MHz



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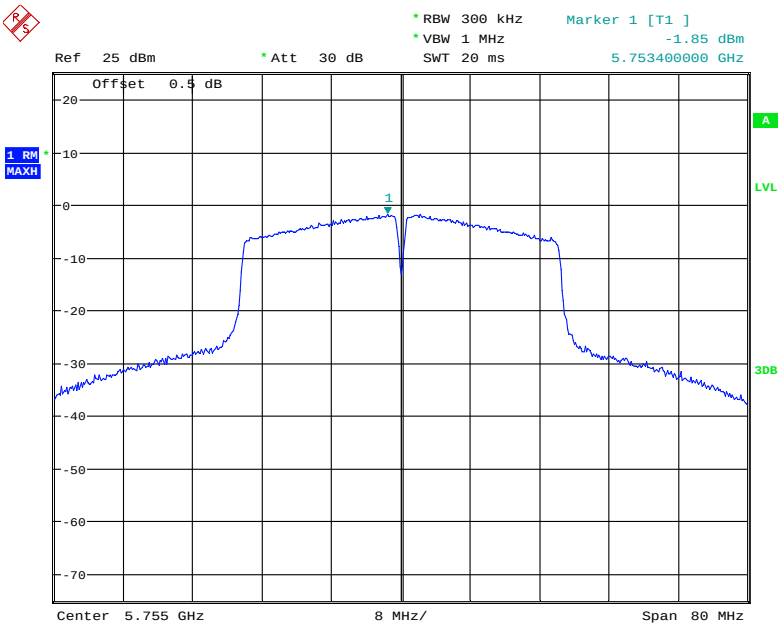
Power Spectral Density, 802.11n ht40 5755MHz



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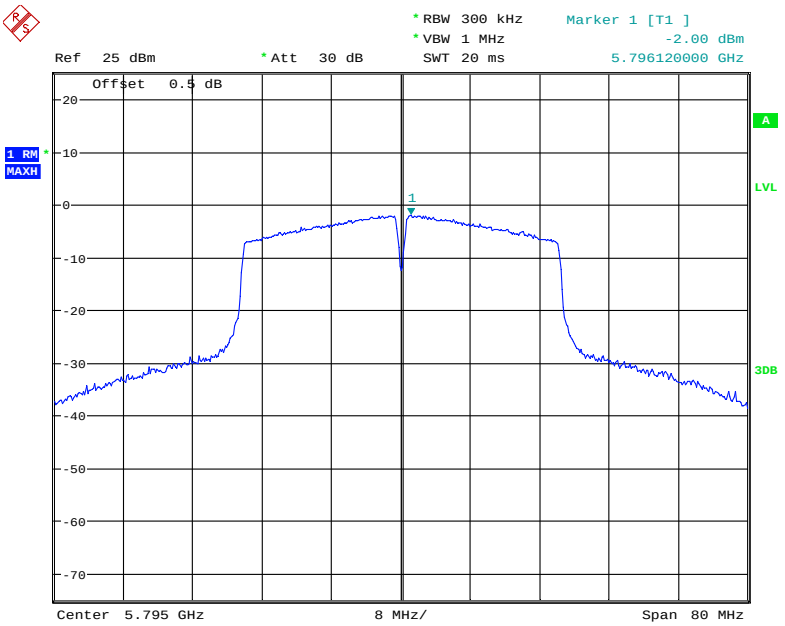
Power Spectral Density, 802.11n ht40 5795MHz



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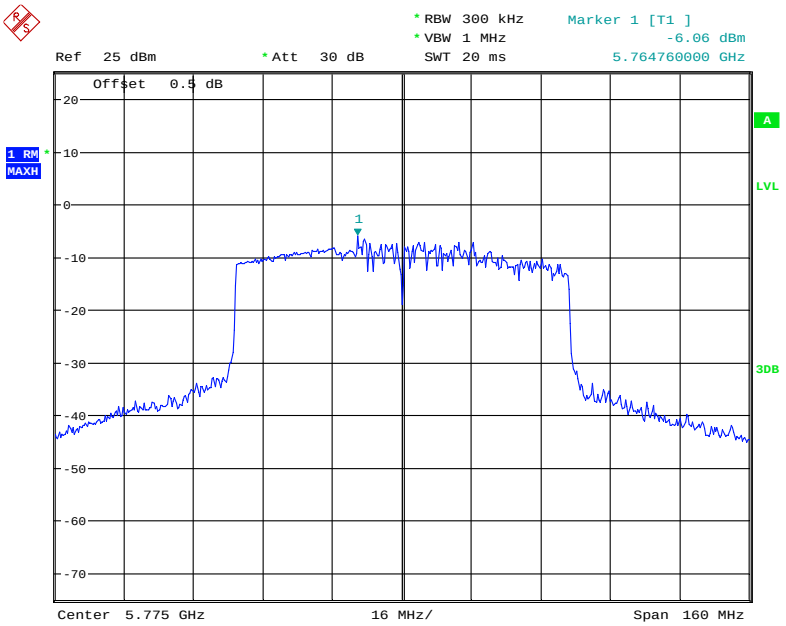
Power Spectral Density, 802.11 ac80 5775MHz



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