ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL Bay Area Compliance Labs Corp.

FCC PART 15.407

TEST REPORT

For

ShenZhen Foscam Intelligent Technology Co., Ltd.

9/F, Block F5, TCL International E City, No.1001 ZhongShanyuan Rd.,
NanShan District, Shenzhen, China

FCC ID: ZDESD2X

Report Type:	Product Type:
Original Report	HD Wireless PTZ Dome IP Camera

Report Number:	RSZ200119811-00B
Report Date:	2020-05-19
Reviewed By:	Jimmy Xiao RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	HD Wireless PTZ Dome IP Camera
Tested Model	SD2X
Multiple Model	SD2X VX;D2MS;D2MS VX; SD2* VX;SD4;SD4 VX ;SD4* VX; MDS4020;MDS4020 VX;MDS4021VX, MDS4022 VX; MDS4023 VX; MDS4024VX; MDS4025 VX;PS4 VX;Genie 2 VX; Foscam Genie 2 VX ;MDS2060VX, MDS2061 VX; MDS2062 VX; MDS2063VX; MDS2064 VX;MDS2065 VX;(Remark: "VX" denote the software version which can be from V0 to V9. The default state is empty while it is V0； and * denote the small version is indentified by letters.)
Model Differences	Refer to the DOS letter
Frequency Range	5G Wi-Fi: 5725-5850 MHz
Conducted Average Ouput Power	8.83dBm (802.11a), 8.90dBm(802.11n20), 8.79 dBm(802.11n40), 8.81dBm (802.11ac20), 8.85dBm(802.11 ac40), 8.81dBm(802.11 ac80)
Modulation Technique	OFDM
Antenna Specification	5.0 dBi
Voltage Range	DC 12V from adapter
Date of Test	2020-03-21 to 2020-05-19
Sample serial number	RSZ200119811-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-01-19
Sample/EUT Status	Good condition
Adapter information	Model: SAW30-120-2000U Input: 100-240V~50/60Hz 0.8A Output: 12V, 2000 mA

Objective

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

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submissions with FCC ID: ZDESD2X.

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 KDB789033 D02 General U-NII Test Procedures New Rules v02r01.

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

Measurement Uncertainty

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

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

Test Facility

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

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The device support 802.11a/n20/n40/ac20/ac40/ac80 modes.

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

EUT Exercise Software

"REALTEK 3.03" software was used to test.

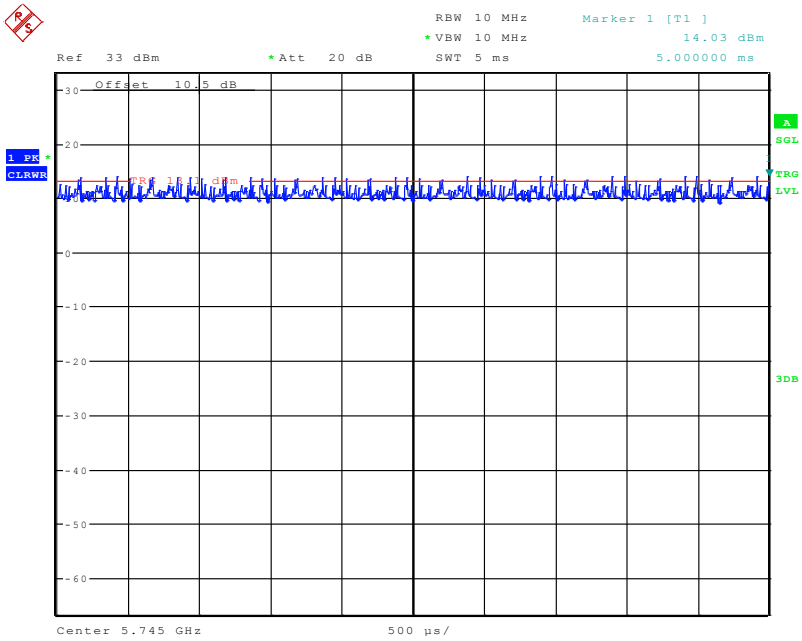
Test frequencies and power level were configured as below:

U-NII	Mode	Frequency (MHz)	Data Rate (Mbps)	Power Level
5725 – 5850MHz	802.11 a	5745	6	36
		5785	6	36
		5825	6	38
	802.11 n20	5745	MCS0	36
		5785	MCS0	37
		5825	MCS0	37
	802.11 n40	5755	MCS0	36
		5795	MCS0	37
	802.11 ac20	5745	MCS0	36
		5785	MCS0	37
		5825	MCS0	38
	802.11 ac40	5755	MCS0	36
		5795	MCS0	37
	802.11 ac80	5775	MCS0	38

Note: the above data rate is the worst case according to the output power test for every modulation.

Duty cycle

802.11a mode



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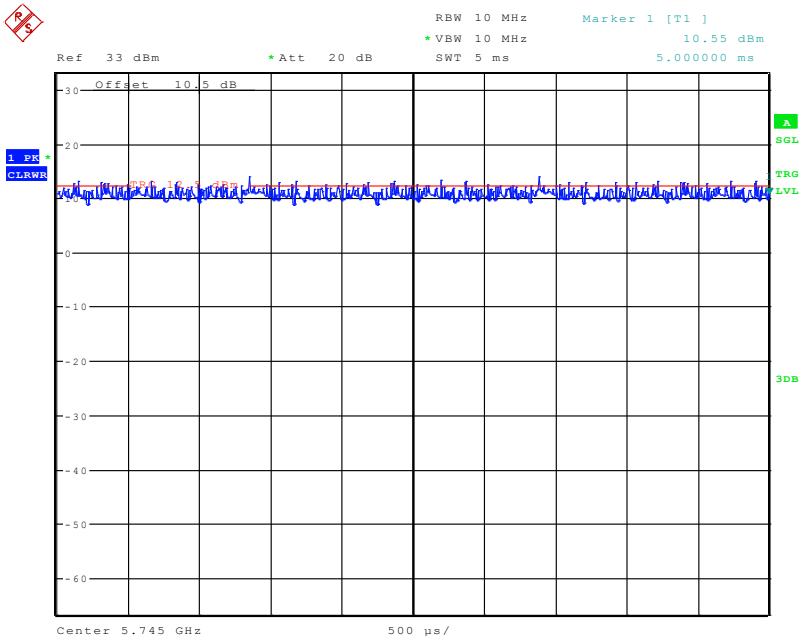
802.11n20 mode



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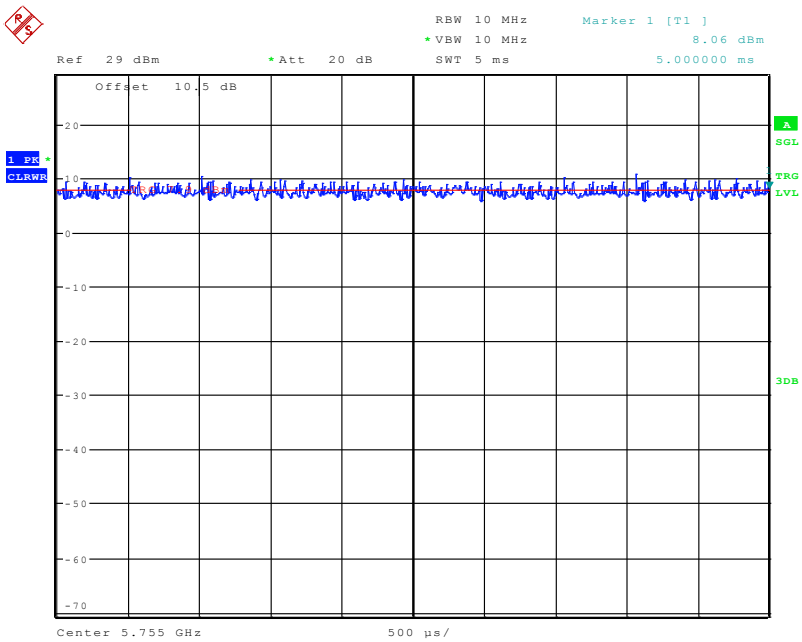
802.11n40 mode



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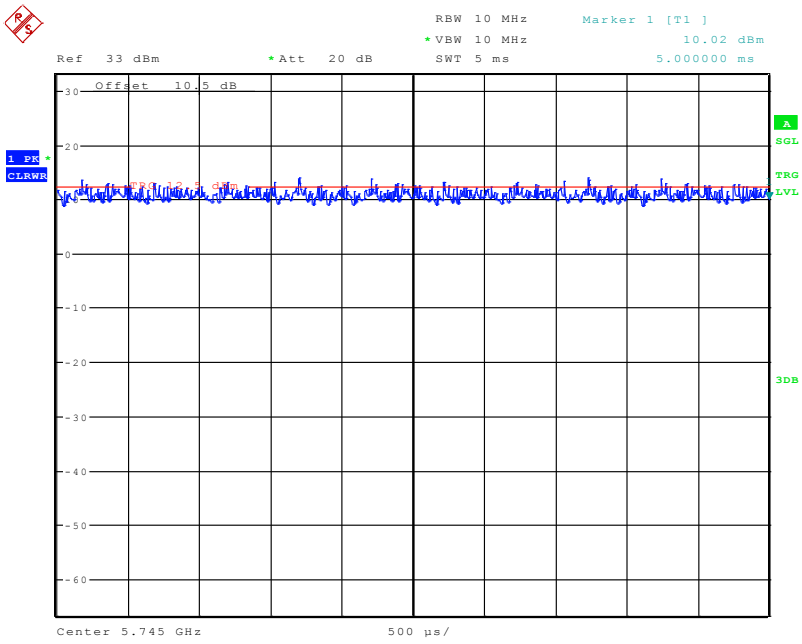
802.11ac20 Mode



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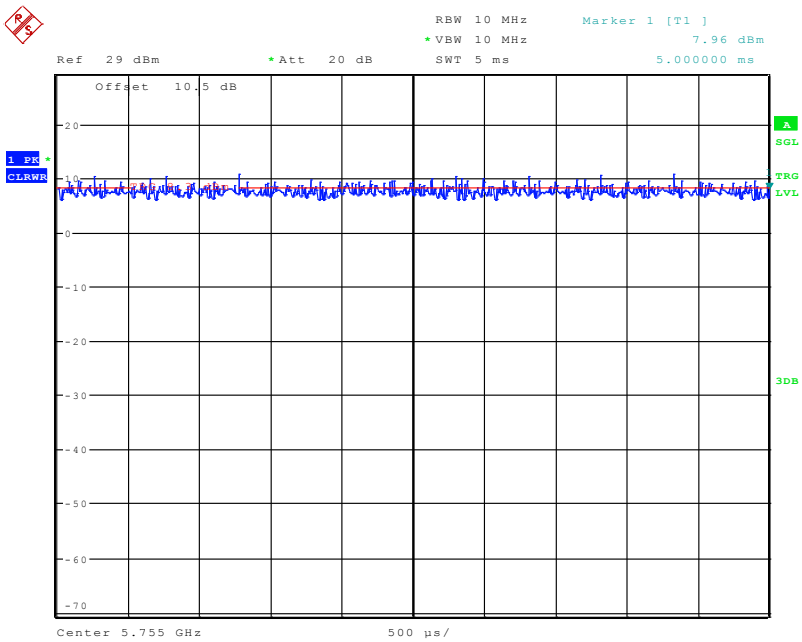
802.11ac40 Mode



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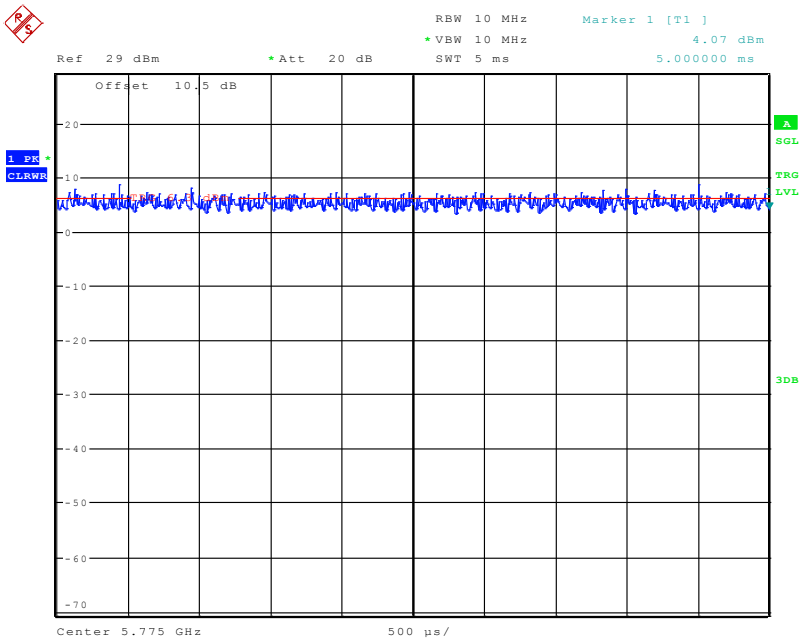
802.11ac80 Mode



Date: 26.MAR.2020 12:01:01

Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	10log(1/x)
802.11a	100	-	-	10Hz	-
802.11n20	100	-	-	10Hz	-
802.11n40	100	-	-	10Hz	-
802.11ac20	100	-	-	10Hz	-
802.11ac40	100	-	-	10Hz	-
802.11ac80	100	-	-	10Hz	-

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

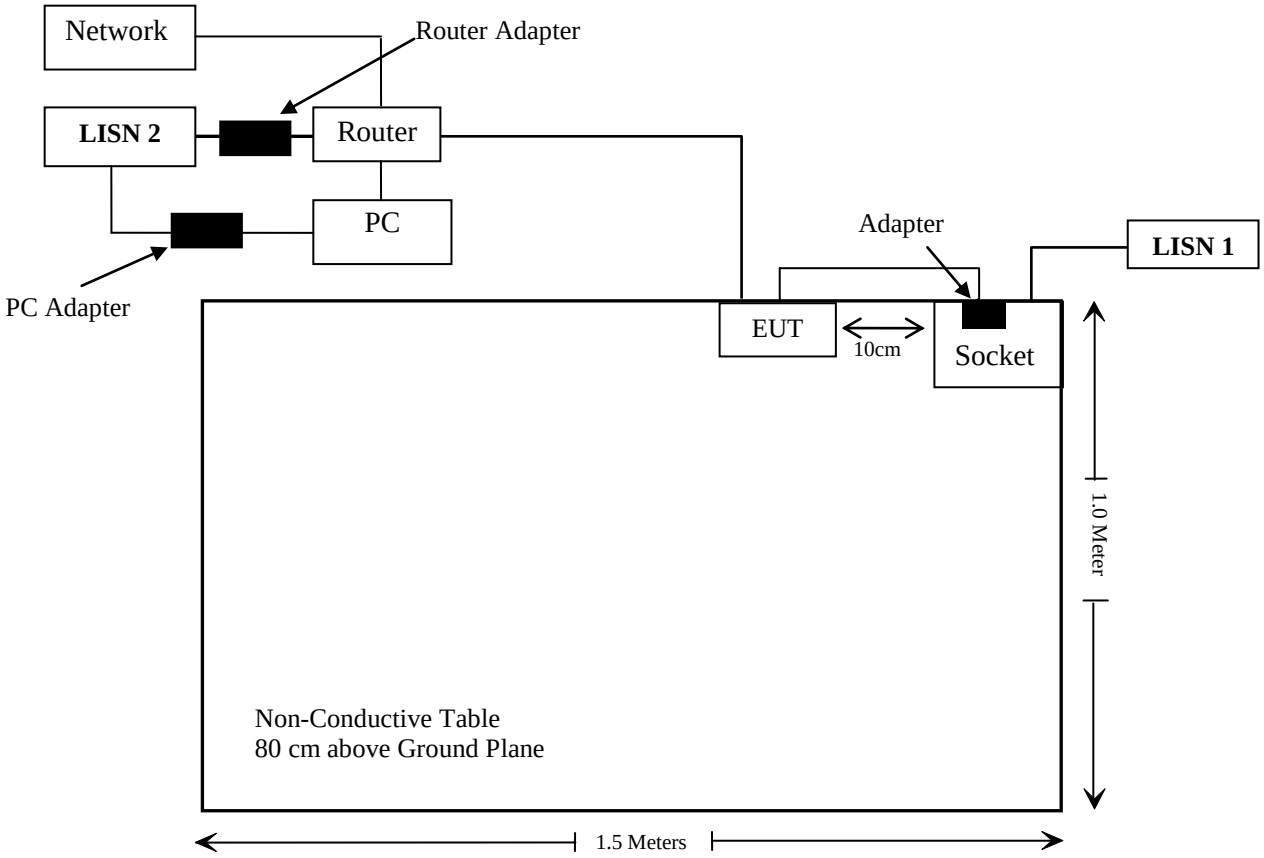
Manufacturer	Description	Model	Serial Number
BULL	Socket	GN-212	A37209315081183
HP	PC	Compaq CQ45	5CG33407QL
HP	PC Adapter	SeriesHSTNN-LA15	159753
HIKVISION	Router	DS-3WR03-E	10021642429
Unknown	Router Adapter	BN003-A05009	Unknown

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielded detachable AC cable	1.0	LISN 1	Socket
Un-shielded Un-detachable DC cable	1.5	Adapter	EUT
Un-shielded detachable Network cable	2.5	EUT	Router
Un-shielded Un-detachable DC cable	1.0	Router	Router Adapter
Un-shielded detachable Network cable	10.0	Network	Router
Un-shielded detachable Network cable	1.0	PC	Router
Un-shielded Un-detachable DC cable	1.0	PC	PC Adapter
Un-shielded detachable AC cable	1.2	PC Adapter	LISN 2

Block Diagram of Test Setup

For conducted emissions



SUMMARY OF TEST RESULTS

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

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019/7/9	2020/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2019/4/20	2020/4/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/6	2020/12/5
Ducommun Technolagies	Horn antenna	ARH-2823-02	1007726-02 1302	2017/12/6	2020/12/5

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Agilent	USB Wideband Power Sensor	U2021XA	MY54250003	2019/7/10	2020/7/9
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200982	2020/3/2	2021/3/2
WEINSCHEL	10dB Attenuator	5324	AU3842	2019/11/29	2020/11/28
Ducommun technologies	RF Cable	RG-214	3	Each Time	

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

FCC §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

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

Result

Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	**Antenna Gain**		**Max Tune Up Conducted Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2412-2472	5.0	3.16	18.0	63.10	20	0.04	1.0
5745-5825	5.0	3.16	9.0	7.94	20	0.005	1.0

The 2.4G Wi-Fi can't transmit with the 5.8G Wi-Fi at the same time.

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: compliance.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

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

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

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

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has a RP-SMA antenna connector and the antenna gain is 5.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

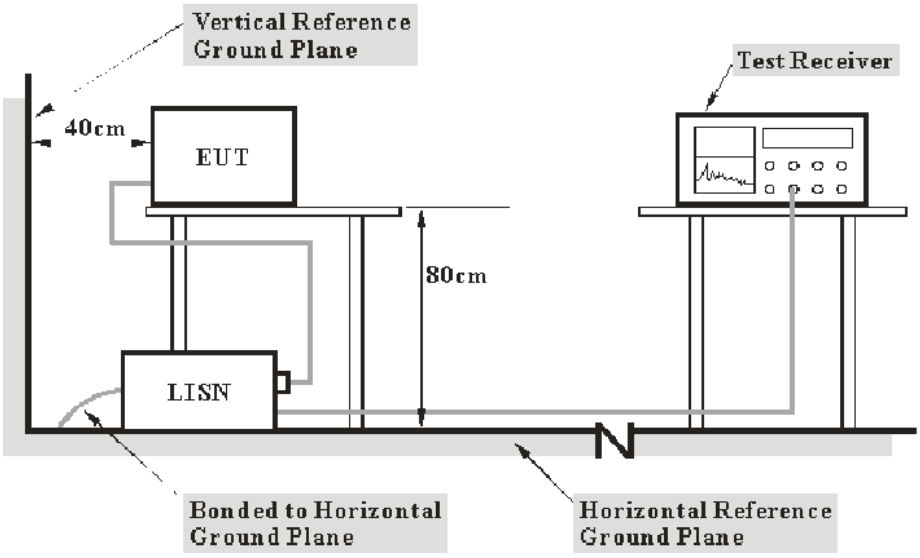
Result: Compliance.

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

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

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

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Test Results Summary

According to the EUT complied with the FCC Part 15.207.

Test Data

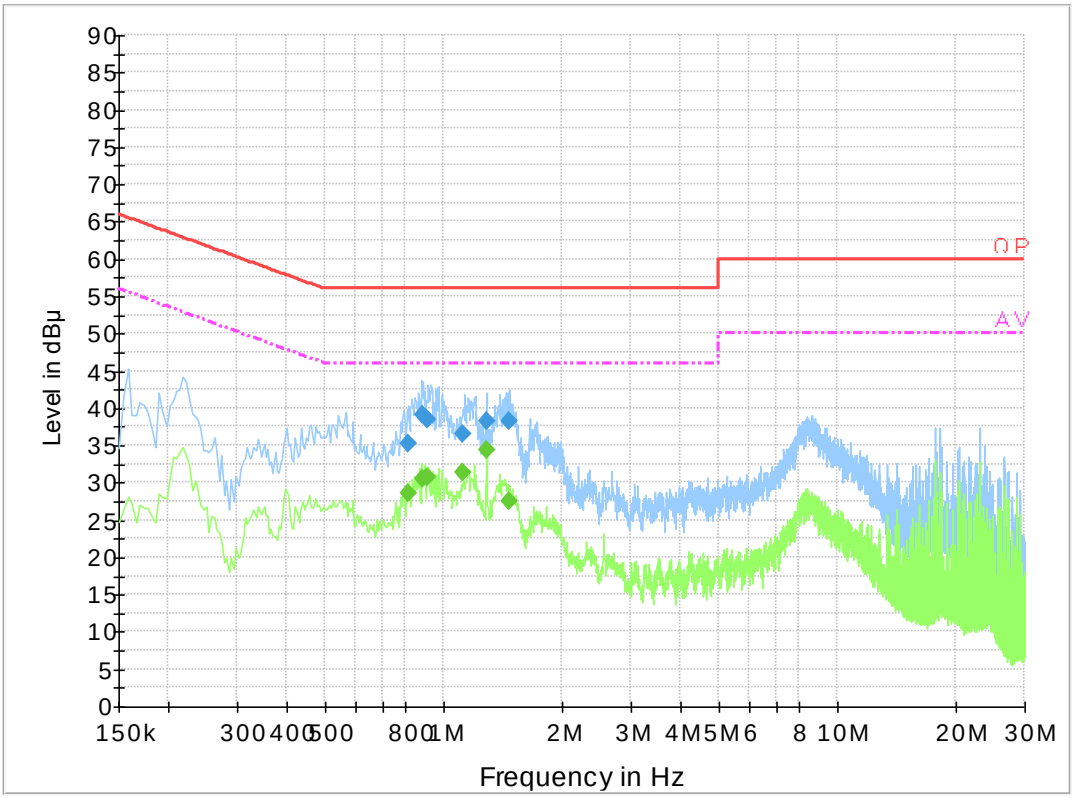
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-04-10

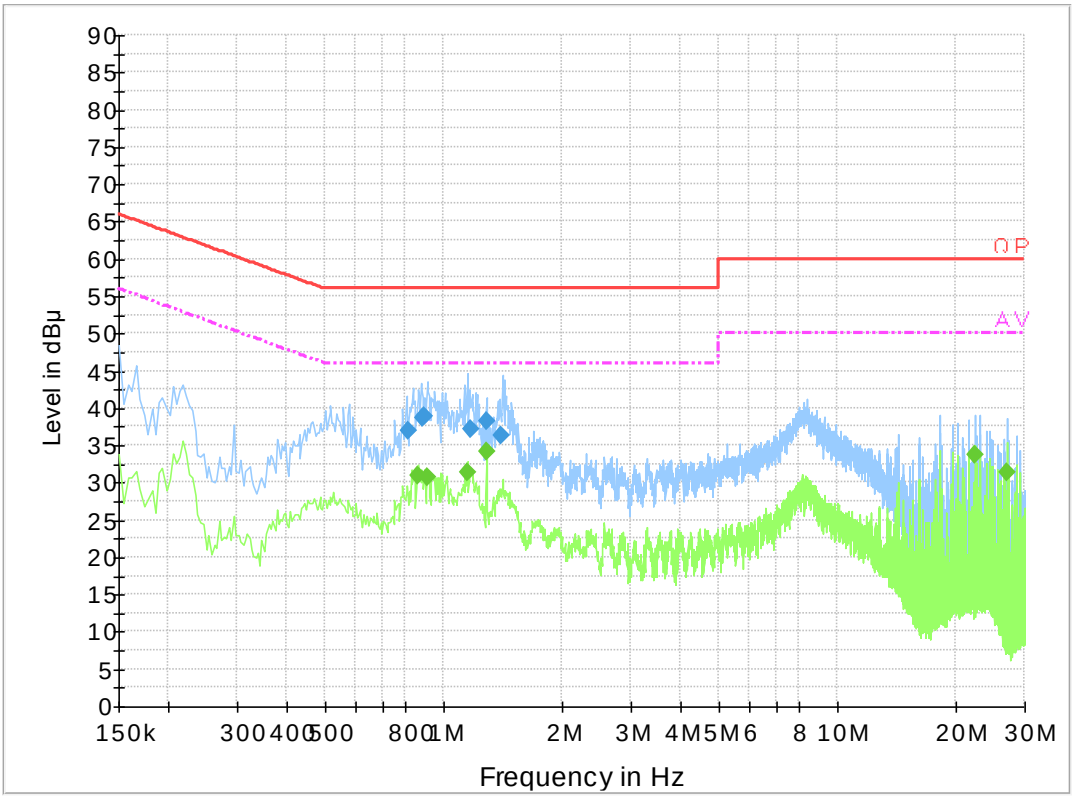
EUT operation mode: Transmitting (worst case is 802.11a mode 5785 MHz)

AC 120V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.813790	35.3	19.8	56.0	20.7	QP
0.888770	39.0	19.8	56.0	17.0	QP
0.916290	38.5	19.8	56.0	17.5	QP
1.124930	36.5	19.8	56.0	19.5	QP
1.286710	38.2	19.8	56.0	17.8	QP
1.475950	38.3	19.8	56.0	17.7	QP
0.813790	28.5	19.8	46.0	17.5	Ave.
0.888770	30.5	19.8	46.0	15.5	Ave.
0.916290	30.7	19.8	46.0	15.3	Ave.
1.124930	31.3	19.8	46.0	14.7	Ave.
1.286710	34.5	19.8	46.0	11.5	Ave.
1.475950	27.6	19.8	46.0	18.4	Ave.

AC120V, 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.818090	37.0	19.8	56.0	19.0	QP
0.891170	38.7	19.7	56.0	17.3	QP
0.896350	39.0	19.7	56.0	17.0	QP
1.171310	37.2	19.8	56.0	18.8	QP
1.286710	38.2	19.8	56.0	17.8	QP
1.408790	36.3	19.8	56.0	19.7	QP
0.866000	30.9	19.8	46.0	15.1	Ave.
0.910000	30.7	19.7	46.0	15.3	Ave.
1.154000	31.4	19.8	46.0	14.6	Ave.
1.286000	34.1	19.8	46.0	11.9	Ave.
22.458000	33.7	20.3	50.0	16.3	Ave.
27.158000	31.3	20.2	50.0	18.7	Ave.

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

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

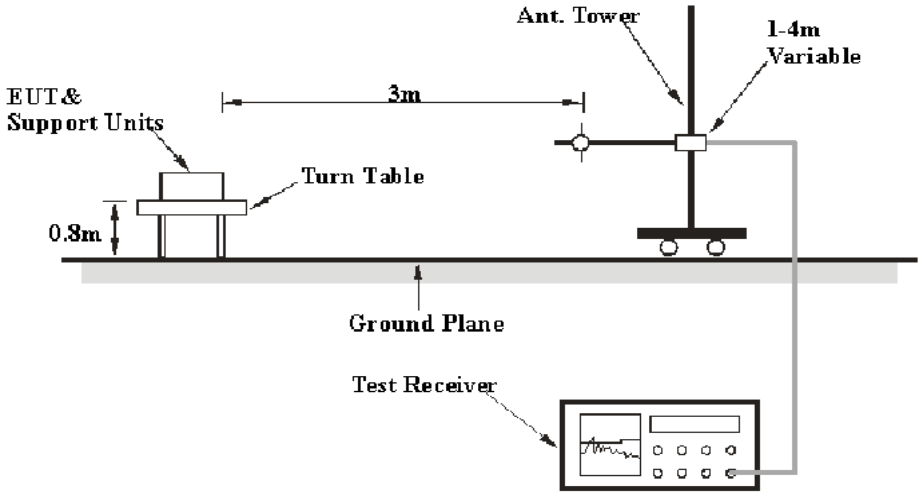
Applicable Standard

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

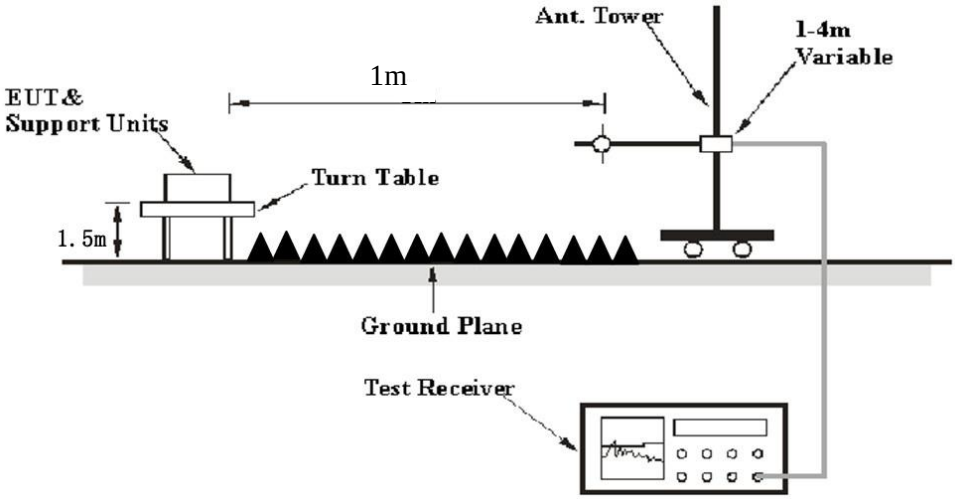
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



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

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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

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

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

Radiated Spurious Emission

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

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

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

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart E, section 15.205, 15.209 and 15.407 rules.

Test Data

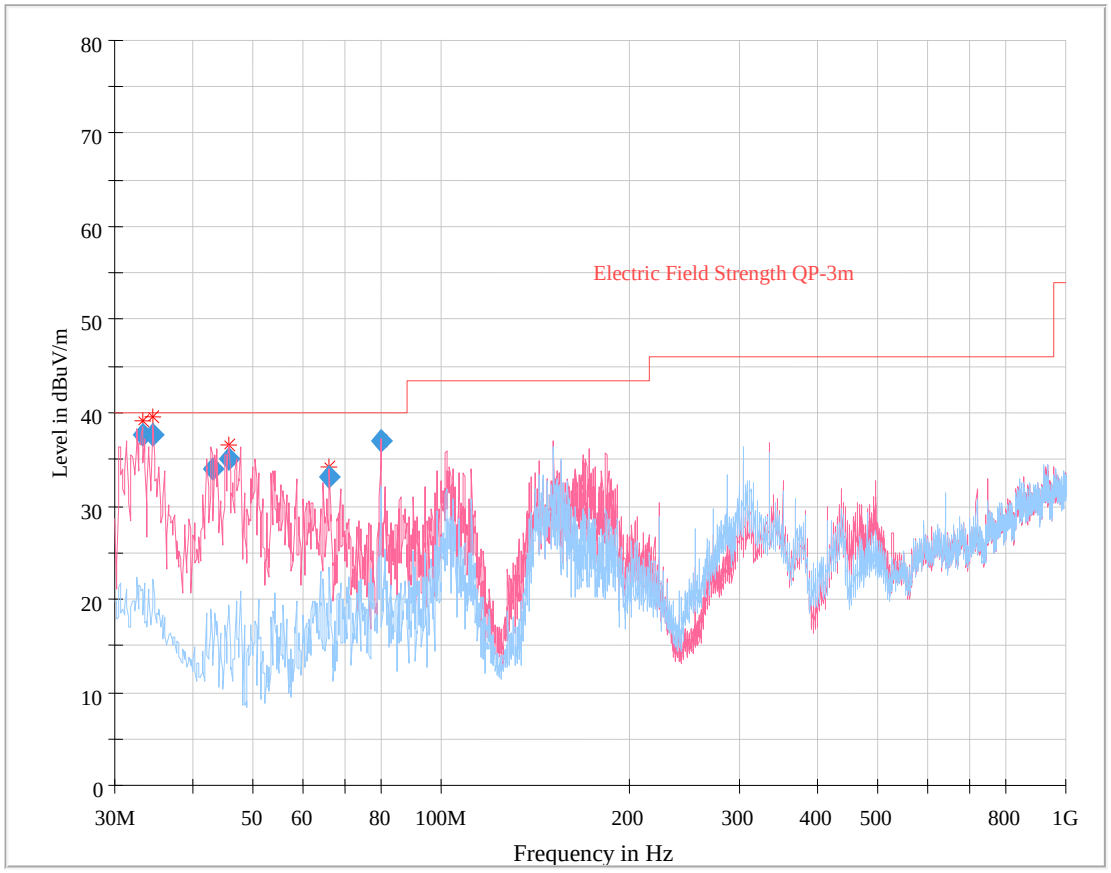
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	60%
ATM Pressure:	101.0 kPa

The testing was performed by Zero Yan on 2020-04-09 for below 1G and Charlie Cha on 2020-03-25 for above 1G.

EUT operation mode: Transmitting (Pre-scan with the Horizontal and Vertical polar, the worst case is Vertical)

30 MHz – 1 GHz: *(worst case is 802.11a mode 5785 MHz)*



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
33.190875	36.58	102.0	V	205.0	-9.5	40.00	3.42
34.639875	36.57	104.0	V	70.0	-10.3	40.00	3.43
42.962875	33.97	103.0	V	312.0	-15.9	40.00	6.03
45.741875	35.11	114.0	V	312.0	-17.6	40.00	4.89
66.274875	33.12	136.0	V	0.0	-20.5	40.00	6.88
79.994125	36.91	118.0	V	142.0	-20.0	40.00	3.09

30 MHz ~ 40 GHz:

Note: The test distance is 1m, so the correct factor from 3m to 1m is 20log(3/1)=9.5dB which was added into the final limit.

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5745 MHz									
5723.62	32.89	PK	26	1.9	V	39.49	72.38	128.55	56.17
5716.95	32.92	Ave.	26	1.9	V	39.49	72.41	119.45	47.04
5696.25	33.32	PK	14	1.2	V	39.49	72.81	111.93	39.12
5650.00	46.29	PK	58	1.7	V	7.51	53.80	77.7	23.90
11490.00	42.69	PK	198	1.6	V	17.47	60.16	83.5	23.34
11490.00	28.29	Ave.	198	1.6	V	17.47	45.76	63.5	17.74
5785 MHz									
11570.00	42.85	PK	195	1.9	V	17.51	60.36	83.5	23.14
11570.00	28.31	Ave.	195	1.9	V	17.51	45.82	63.5	17.68
5825 MHz									
5853.65	32.58	PK	260	2.3	V	39.87	72.45	123.38	50.93
5858.53	32.89	Ave.	260	2.3	V	39.87	72.76	119.31	46.55
5872.69	32.33	PK	335	1.6	V	39.87	72.20	116.41	44.21
5925.00	44.84	PK	76	1.6	V	8.76	53.60	77.7	24.10
11650.00	43.01	PK	66	1.6	V	16.18	59.19	83.5	24.31
11650.00	28.36	Ave.	66	1.6	V	16.18	44.54	63.5	18.96

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
802.11n20									
5745 MHz									
5724.12	32.85	PK	104	1.4	V	39.49	72.34	129.69	57.35
5716.98	33.15	Ave.	104	1.4	V	39.49	72.64	119.45	46.81
5697.63	33.11	PK	178	1.4	V	39.49	72.60	112.95	40.35
5650.00	46.73	PK	80	1.1	V	7.51	54.24	77.7	23.46
11490.00	43.61	PK	344	1.8	V	17.47	61.08	83.5	22.42
11490.00	28.58	Ave.	344	1.8	V	17.47	46.05	63.5	17.45
5785 MHz									
11570.00	43.52	PK	8	2.4	V	17.51	61.03	83.5	22.47
11570.00	28.49	Ave.	8	2.4	V	17.51	46.00	63.5	17.50
5825 MHz									
5851.95	32.69	PK	193	1.1	V	39.87	72.56	127.25	54.69
5856.23	33.01	Ave.	193	1.1	V	39.87	72.88	119.96	47.08
5879.63	33.21	PK	18	1.8	V	39.87	73.08	111.27	38.19
5925.00	46.13	PK	116	1.3	V	8.76	54.89	77.7	22.81
11650.00	43.08	PK	19	1.6	V	16.18	59.26	83.5	24.24
11650.00	28.73	Ave.	19	1.6	V	16.18	44.91	63.5	18.59

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5755 MHz									
5724.16	33.65	PK	257	2.4	V	39.49	73.14	131.68	58.54
5716.26	33.12	Ave.	301	1.4	V	39.49	72.61	119.22	46.61
5695.71	32.95	PK	301	1.4	V	39.49	72.44	111.56	39.12
5650.00	47.07	PK	48	1.1	V	7.51	54.58	77.7	23.12
11510.00	43.66	PK	343	1.3	V	17.47	61.13	83.5	22.37
11510.00	28.56	Ave.	343	1.3	V	17.47	46.03	63.5	17.47
5795 MHz									
5850.03	33.60	PK	7	2.1	V	39.87	73.47	131.63	58.16
5855.73	32.68	PK	11	2.4	V	39.87	72.55	120.1	47.55
5879.12	33.50	PK	11	2.4	V	39.87	73.37	111.65	38.28
5925.00	45.96	PK	146	1.2	V	8.76	54.72	77.7	22.98
11590.00	43.71	PK	282	1.7	V	17.51	61.22	83.5	22.28
11590.00	28.79	Ave.	282	1.7	V	17.51	46.30	63.5	17.20
802.11ac20									
5745 MHz									
5724.64	33.12	PK	126	2.3	V	39.49	72.61	130.92	58.31
5719.78	32.85	Ave.	221	1.9	V	39.49	72.34	120.29	47.95
5696.91	33.17	PK	221	1.9	V	39.49	72.66	112.47	39.81
5650.00	45.75	PK	212	1.5	V	7.51	53.26	77.7	24.44
11490.00	43.46	PK	49	1.3	V	17.47	60.93	83.5	22.57
11490.00	28.81	Ave.	49	1.3	V	17.47	46.28	63.5	17.22
5785 MHz									
11570.00	43.72	PK	140	2.3	V	17.51	61.23	83.5	22.27
11570.00	28.63	Ave.	140	2.3	V	17.51	46.14	63.5	17.36
5825 MHz									
5850.11	33.26	PK	45	1.7	V	39.87	73.13	131.68	58.55
5855.49	33.51	Ave.	45	1.7	V	39.87	73.38	120.17	46.79
5881.24	32.98	PK	299	1.9	V	39.87	72.85	110.23	37.38
5925.00	45.85	PK	83	1.5	V	8.76	54.61	77.7	23.09
11650.00	43.51	PK	14	1.1	V	16.18	59.69	83.5	23.81
11650.00	28.37	Ave.	14	1.1	V	16.18	44.55	63.5	18.95

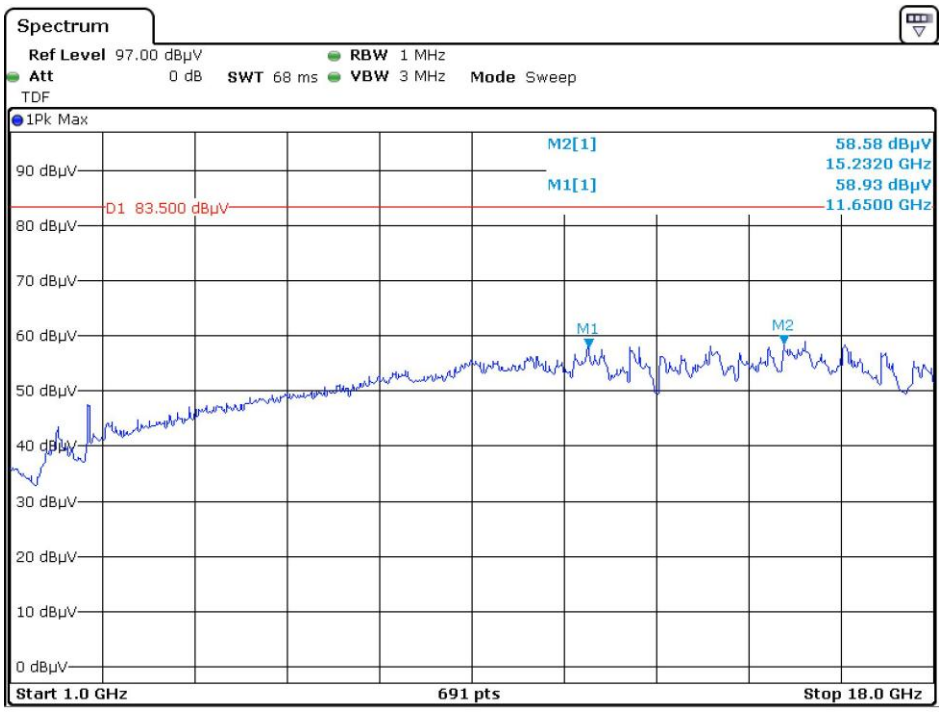
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11ac40									
5755 MHz									
5723.91	33.15	PK	108	2.3	V	39.49	72.64	129.33	56.69
5718.86	33.29	Ave.	21	1.1	V	39.49	72.78	119.99	47.21
5699.69	33.45	PK	21	1.1	V	39.49	72.94	114.46	41.52
5650.00	45.81	PK	164	1.5	V	7.51	53.32	77.7	24.38
11510.00	43.74	PK	207	1.6	V	17.47	61.21	83.5	22.29
11510.00	28.91	Ave.	207	1.6	V	17.47	46.38	63.5	17.12
5795 MHz									
5852.69	34.26	PK	149	1.4	V	39.87	74.13	125.36	51.23
5874.89	33.34	Ave.	149	1.4	V	39.87	73.21	114.81	41.60
5889.67	32.12	PK	322	2.4	V	39.87	71.99	103.84	31.85
5925.00	45.02	PK	49	1.3	V	8.76	53.78	77.7	23.92
11590.00	43.56	PK	95	1.1	V	17.51	61.07	83.5	22.43
11590.00	28.65	Ave.	95	1.1	V	17.51	46.16	63.5	17.34
802.11ac80									
5775 MHz									
5722.59	33.42	PK	143	1.2	V	39.49	72.91	126.21	53.30
5714.38	33.29	PK	143	1.2	V	39.49	72.78	118.73	45.95
5689.21	33.07	PK	310	1.9	V	42.15	75.22	106.72	31.50
5650.00	47.10	PK	191	1.7	V	7.51	54.61	77.70	23.09
5853.54	33.62	PK	183	2.1	V	39.87	73.49	123.63	50.14
5865.15	33.45	PK	183	2.1	V	39.87	73.32	117.46	44.14
5881.26	32.94	PK	169	2.0	V	39.87	72.81	110.07	37.26
5925.00	44.78	PK	165	1.5	V	8.76	53.54	77.70	24.16
11550.00	42.96	PK	307	1.4	V	17.51	60.47	83.5	23.03
11550.00	28.53	AV	307	1.4	V	17.51	46.04	63.5	17.46

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

Peak

Pre-scan with 802.11a 5825MHz

Horizontal



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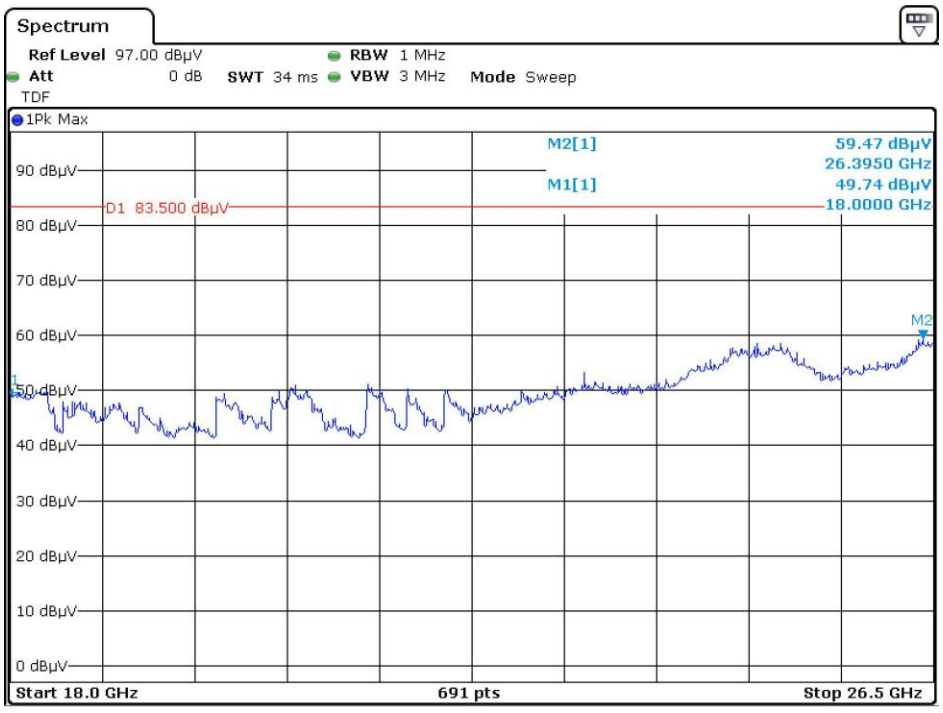

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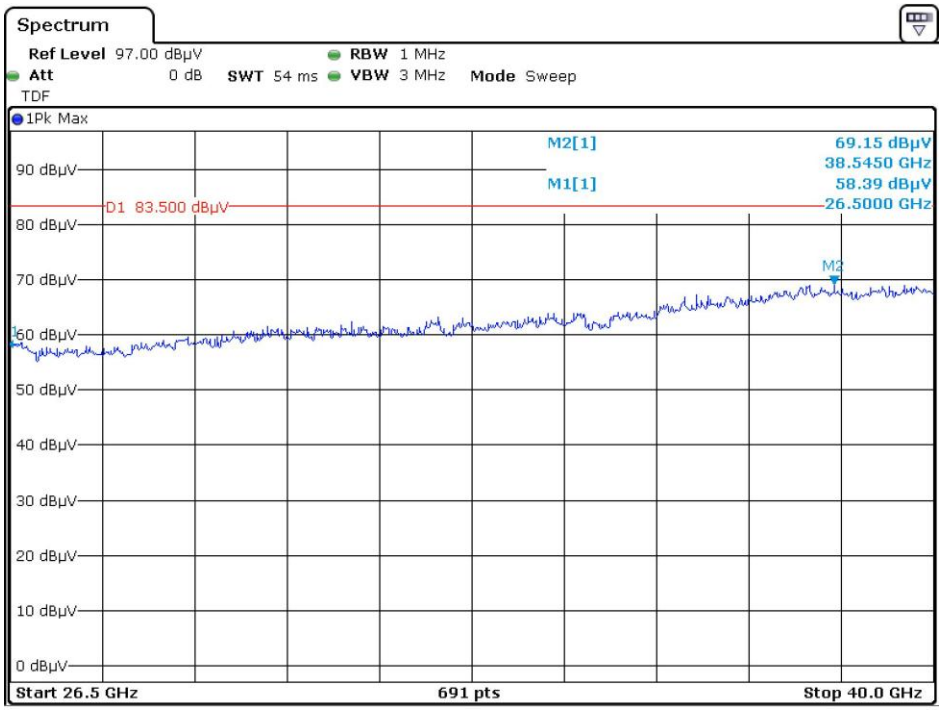

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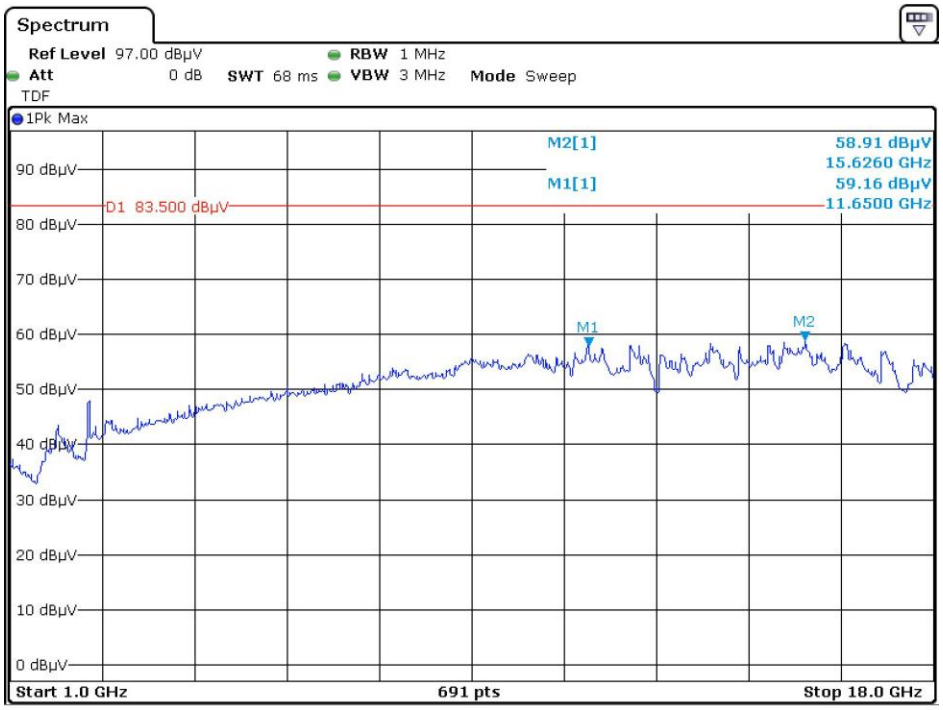
Vertical



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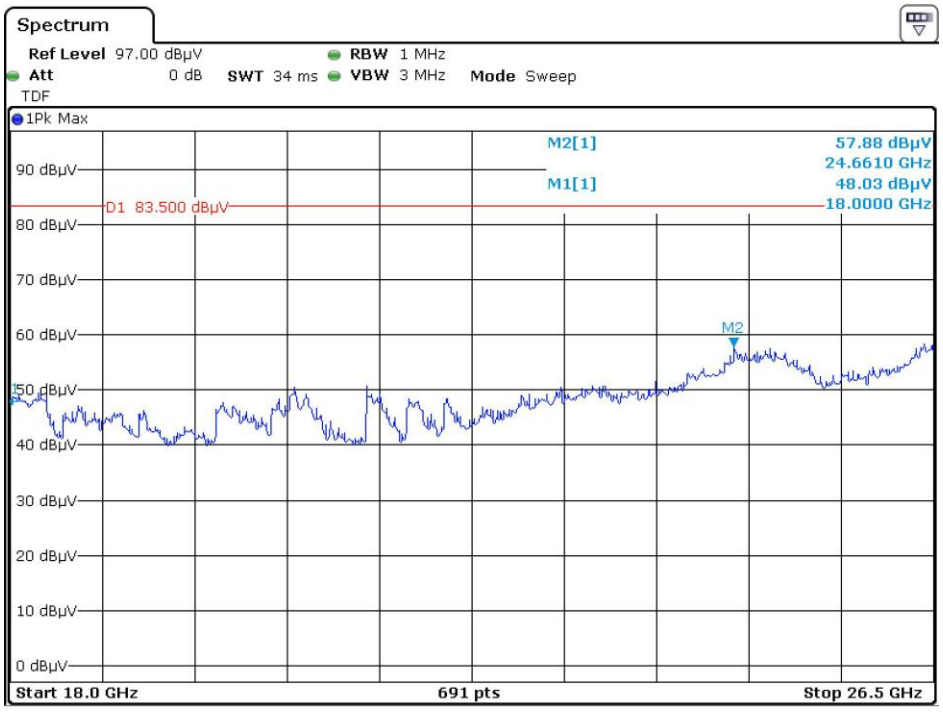

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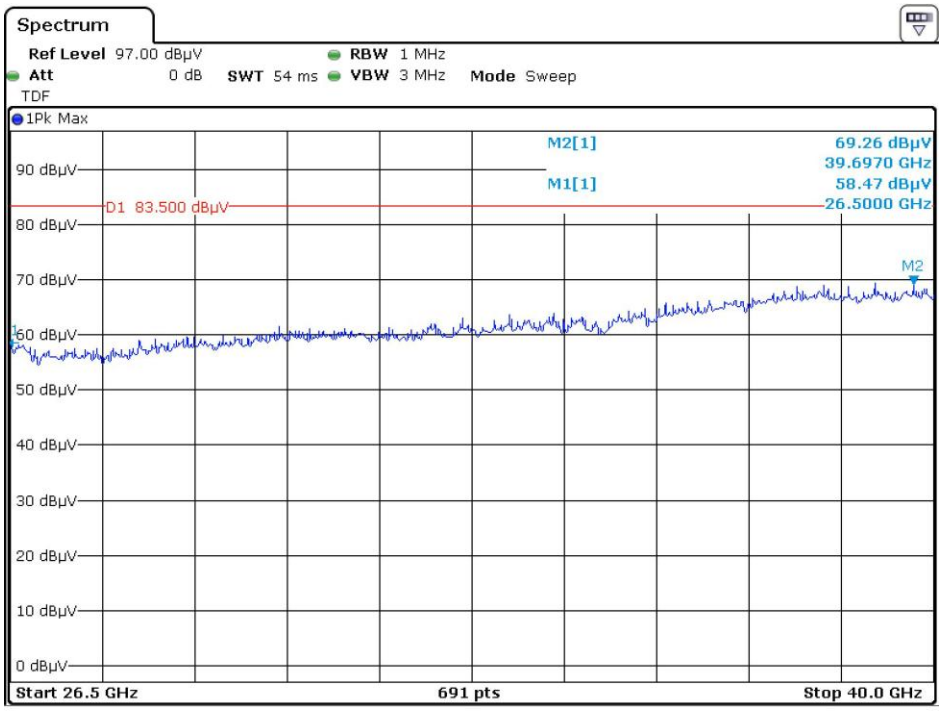

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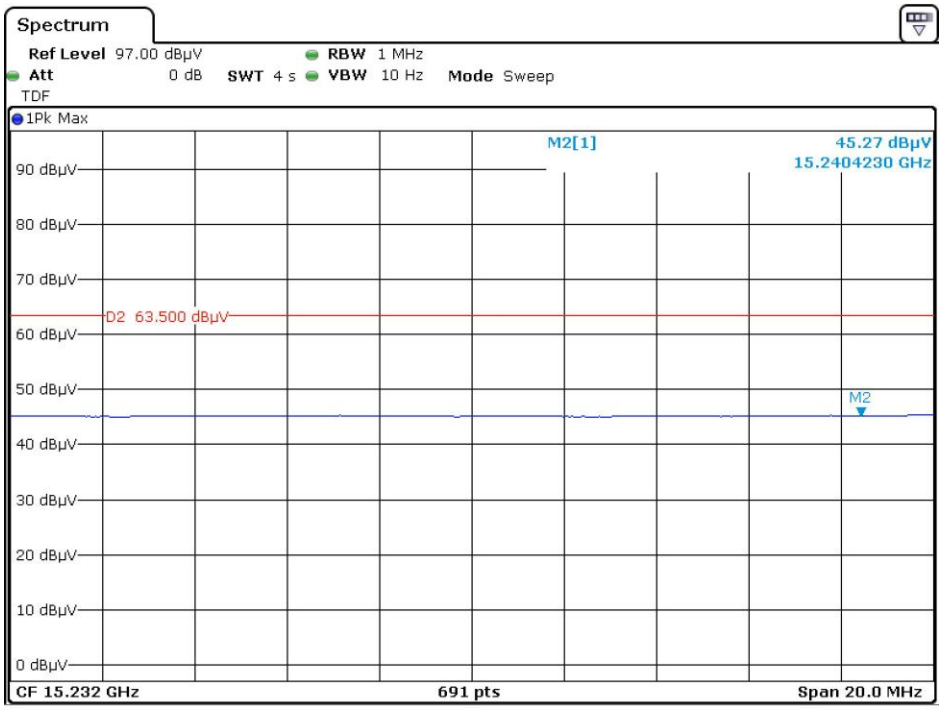
Average
Horizontal



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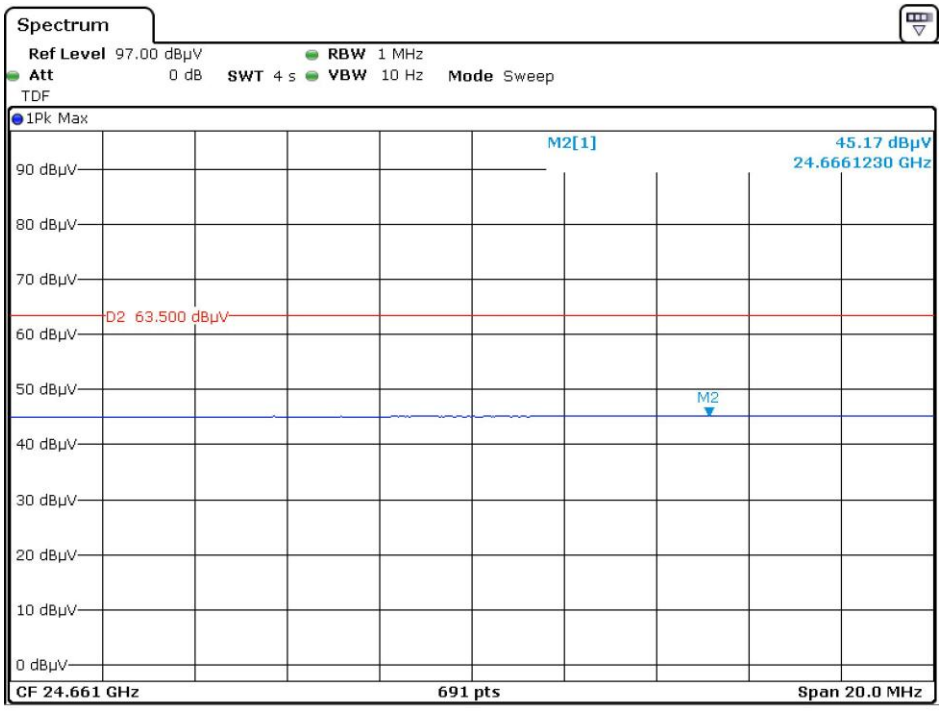

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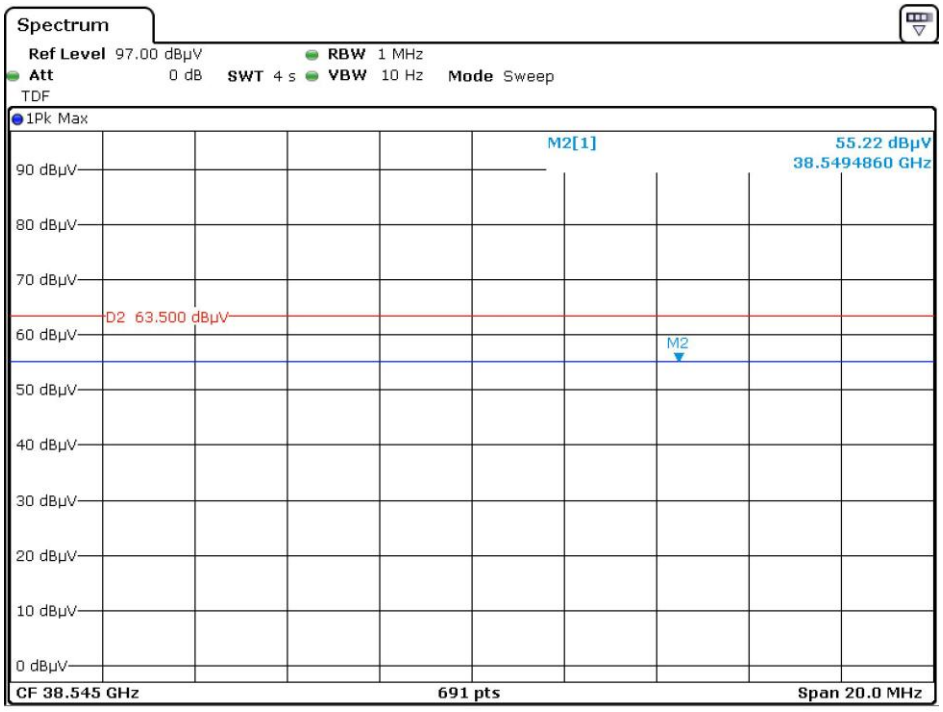

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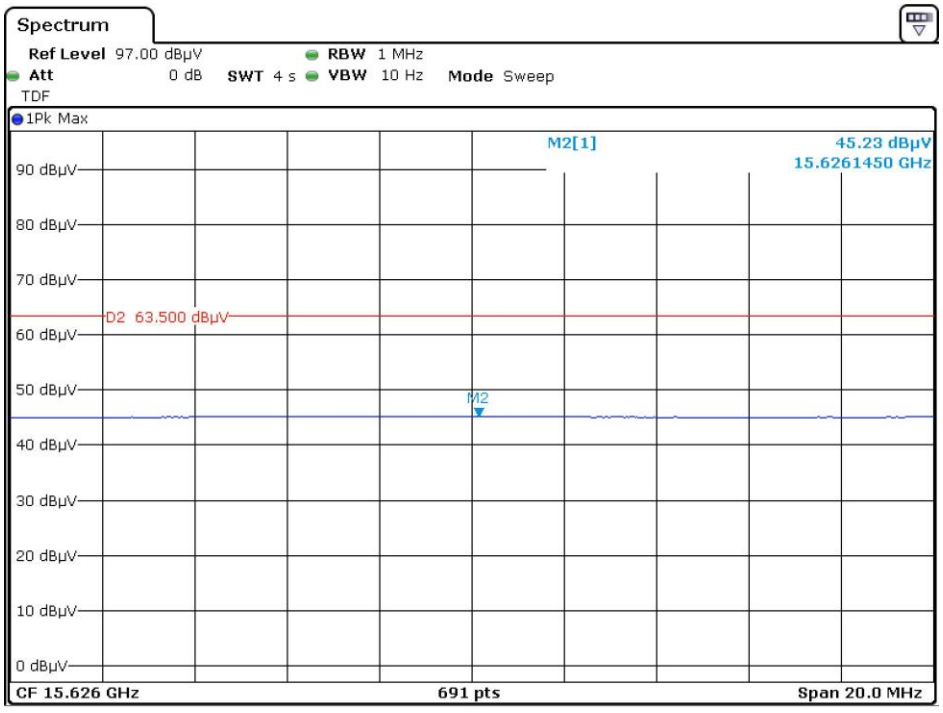
Vertical



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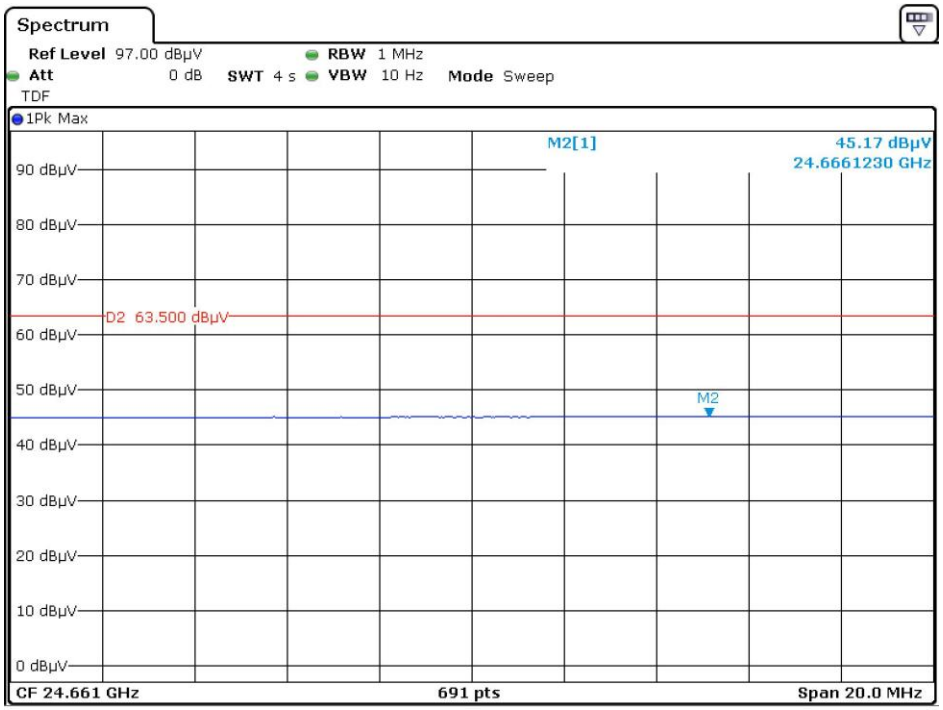

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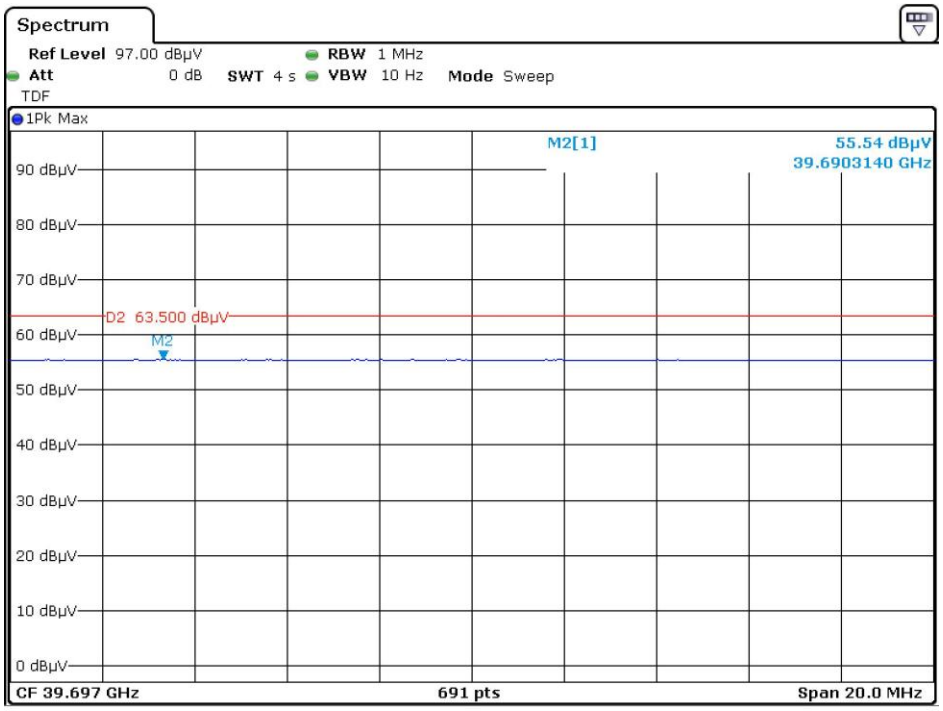


Date: 25.MAR.2020 21:29:47

FCC §15.407(e) –6dB EMISSION BANDWIDTH

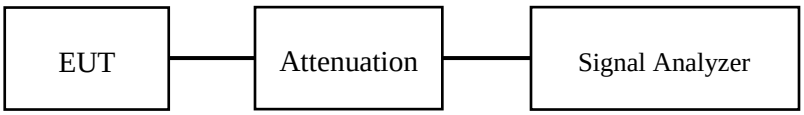
Applicable Standard

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

Minimum Emission Bandwidth for the band 5.725-5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Alan He on 2020-03-26 and 2020-05-19.

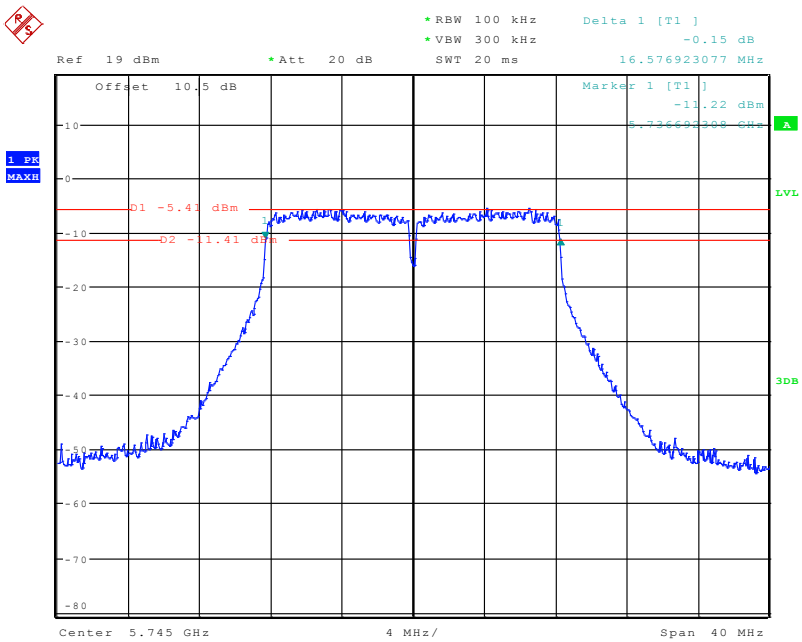
EUT operation mode: Transmitting

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

5725 MHz – 5850 MHz:

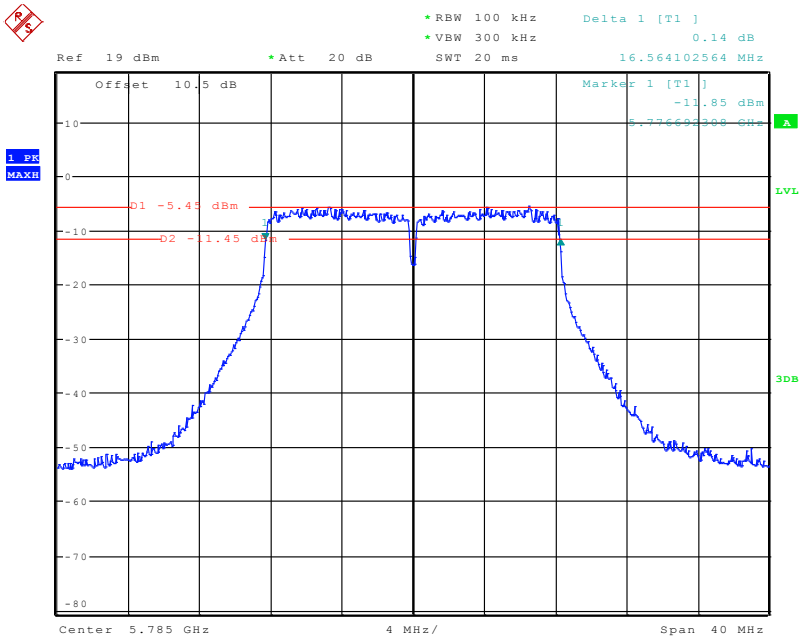
Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Remark
802.11a				No transmitted signal in the 99% bandwidth extends into the U-NII-2C band
5745	16.58	16.73	0.5	
5785	16.56	16.60	0.5	
5825	16.56	16.73	0.5	
802.11n20				
5745	17.77	17.82	0.5	
5785	17.77	17.88	0.5	
5825	17.77	17.82	0.5	
802.11n40				
5755	36.62	36.15	0.5	
5795	36.69	36.15	0.5	
802.11ac20				
5745	17.77	17.82	0.5	
5785	17.77	17.88	0.5	
5825	17.77	17.82	0.5	
802.11ac40				
5755	36.60	36.15	0.5	
5795	36.60	36.15	0.5	
802.11ac80				
5775	77.06	75.64	0.5	

802.11a mode, 6dB Emission Bandwidth, 5745 MHz



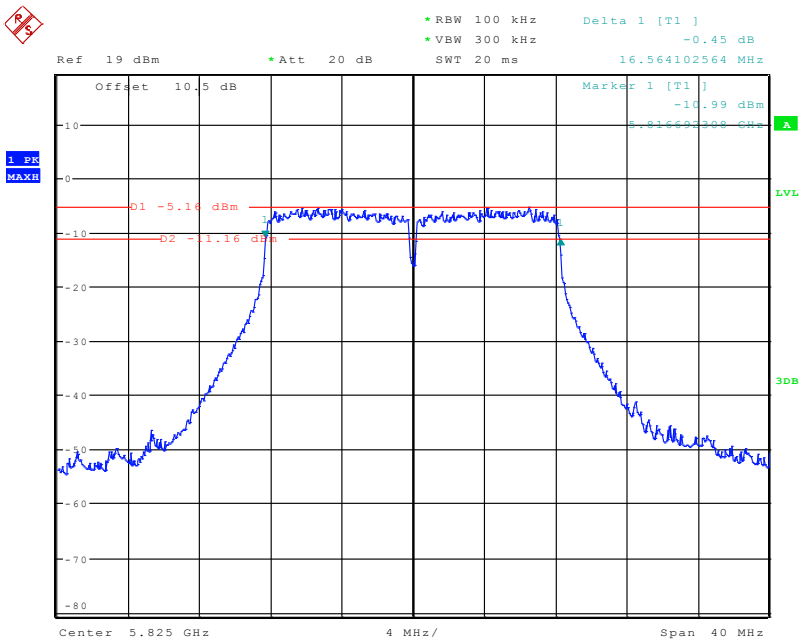
Date: 26.MAR.2020 13:13:01

802.11a mode, 6dB Emission Bandwidth, 5785 MHz



Date: 26.MAR.2020 13:16:41

802.11a mode, 6dB Emission Bandwidth, 5825 MHz



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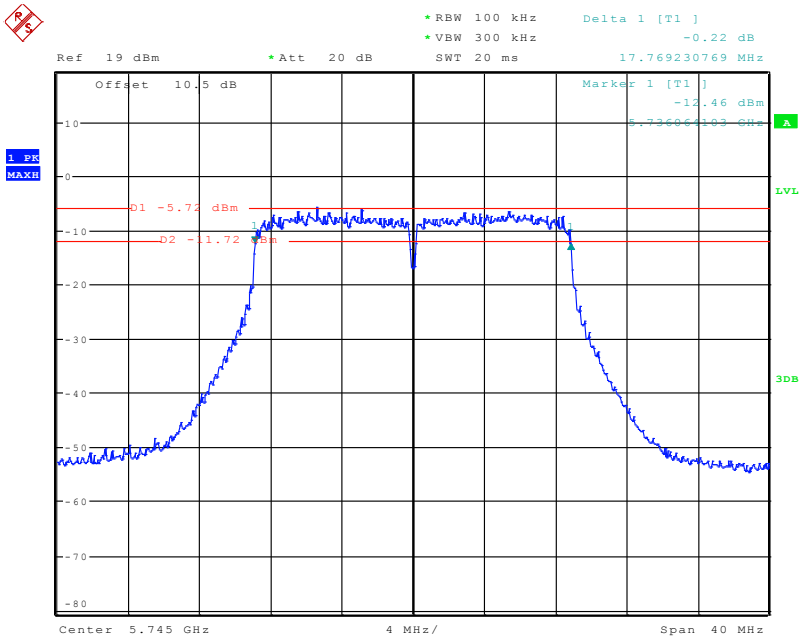
802.11n20 mode, 6dB Emission Bandwidth, 5745 MHz



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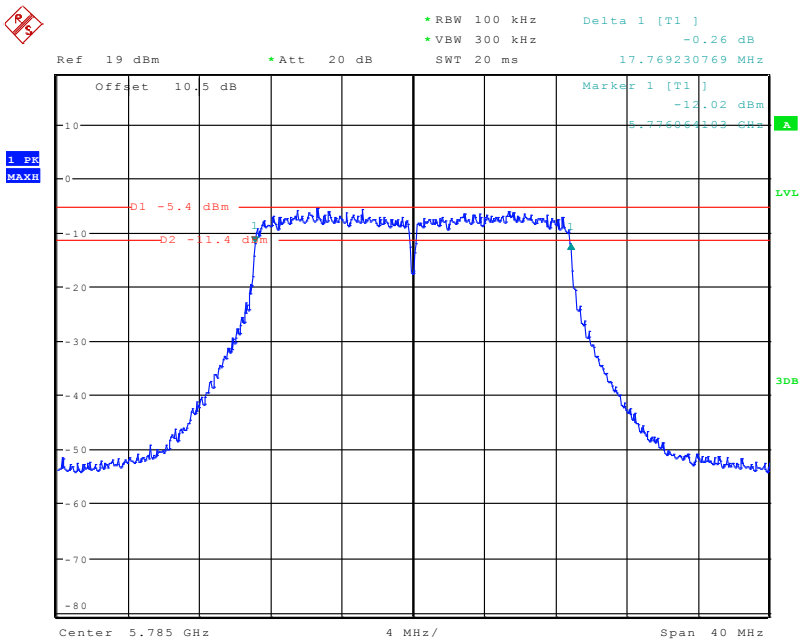
802.11n20 mode, 6dB Emission Bandwidth, 5785 MHz



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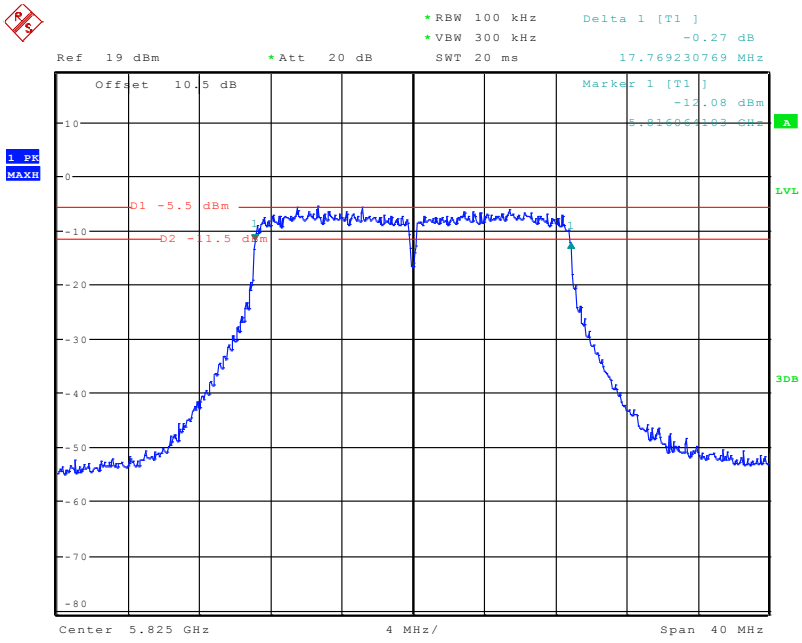
802.11n20 mode, 6dB Emission Bandwidth, 5825 MHz



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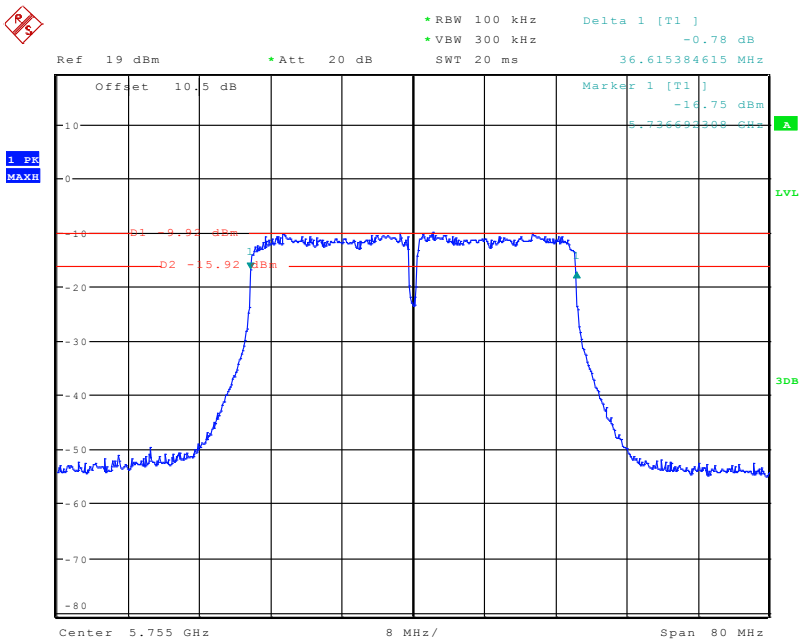
802.11n40 mode, 6dB Emission Bandwidth, 5755 MHz



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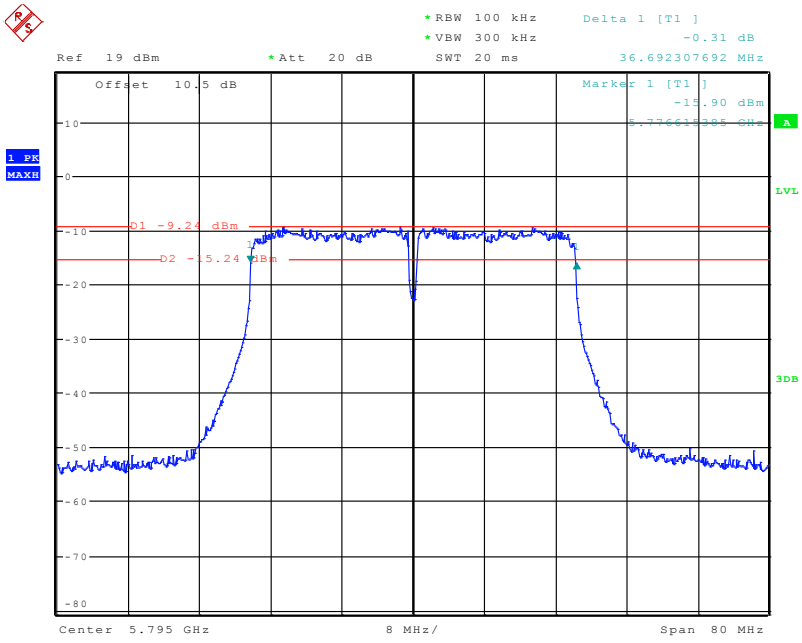
802.11n40 mode, 6dB Emission Bandwidth, 5795 MHz



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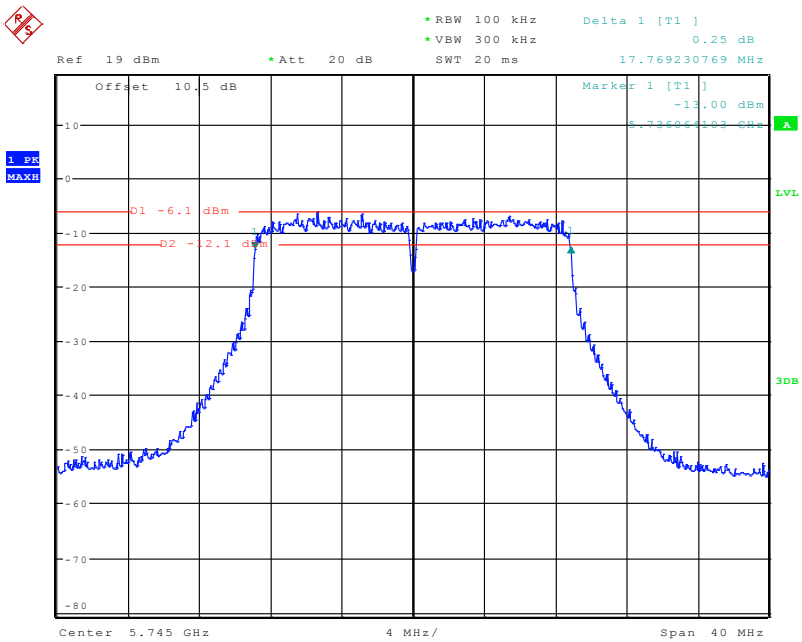
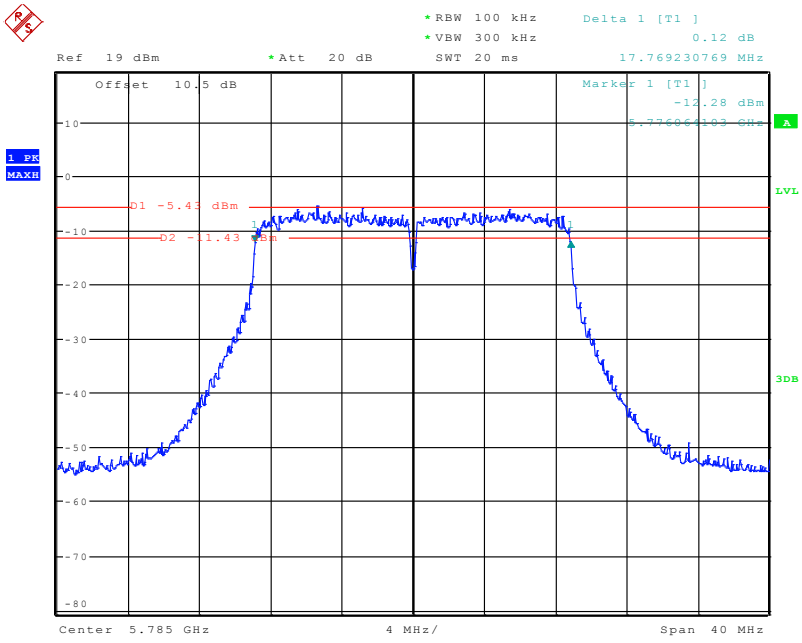
802.11ac20 mode, 6dB Emission Bandwidth, 5745 MHz



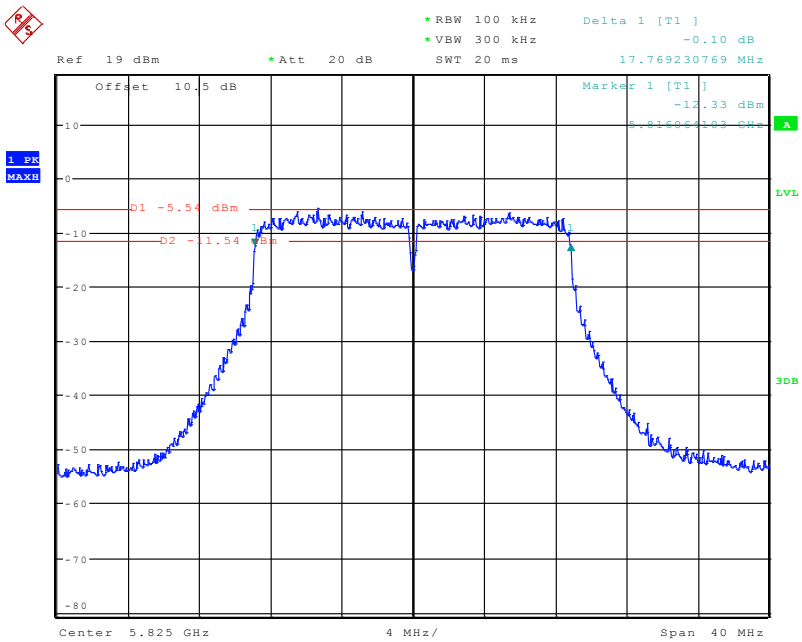
Date: 26.MAR.2020 13:34:04

802.11ac20 mode, 6dB Emission Bandwidth, 5785 MHz



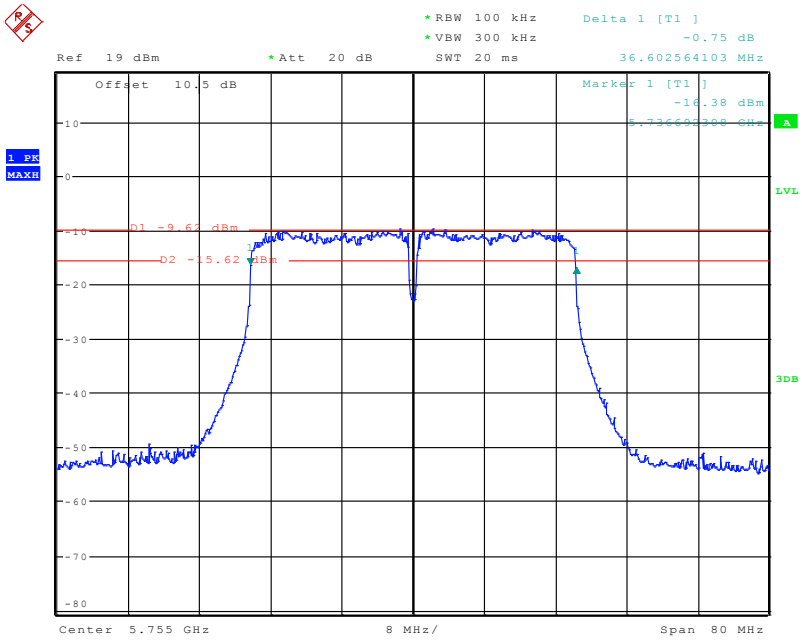
Date: 26.MAR.2020 13:35:52

802.11ac20 mode, 6dB Emission Bandwidth, 5825 MHz



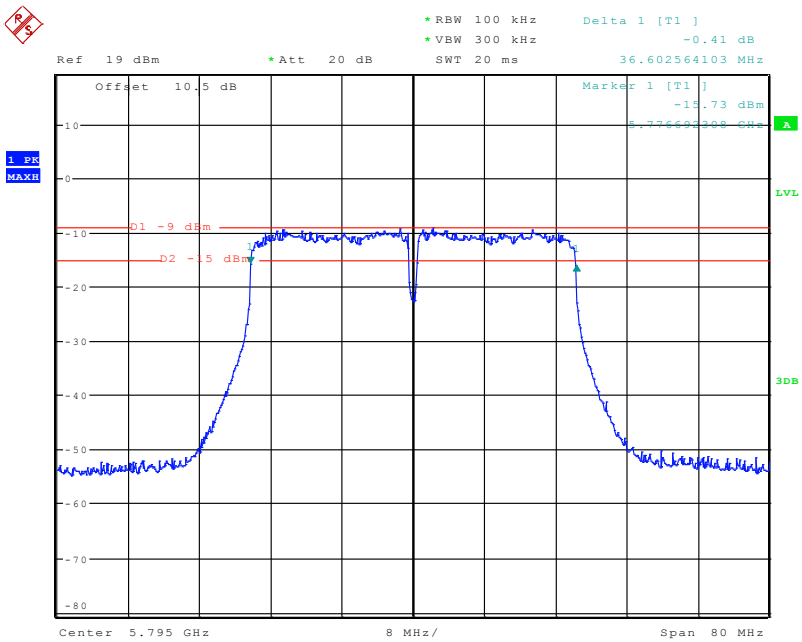
Date: 26.MAR.2020 13:35:03

802.11ac40 mode, 6dB Emission Bandwidth, 5755 MHz



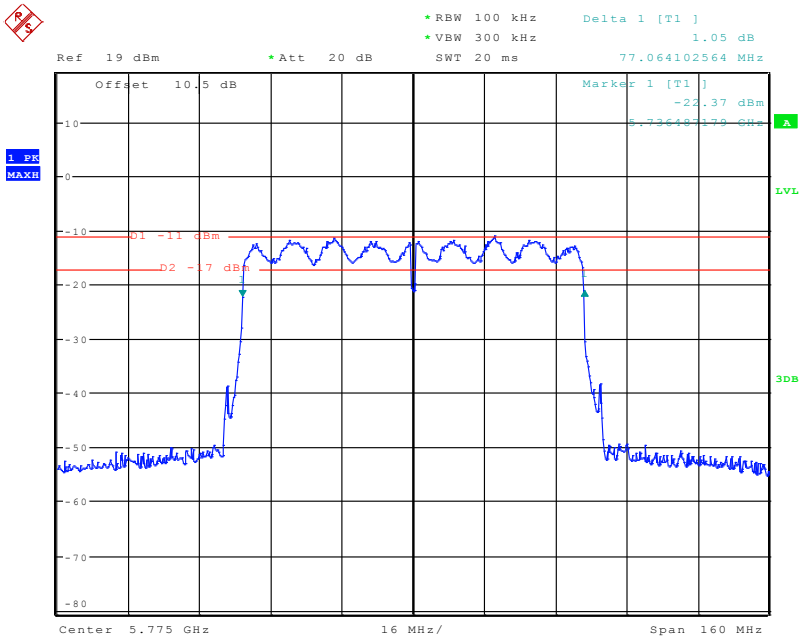
Date: 26.MAR.2020 13:37:35

802.11ac40 mode, 6dB Emission Bandwidth, 5795 MHz



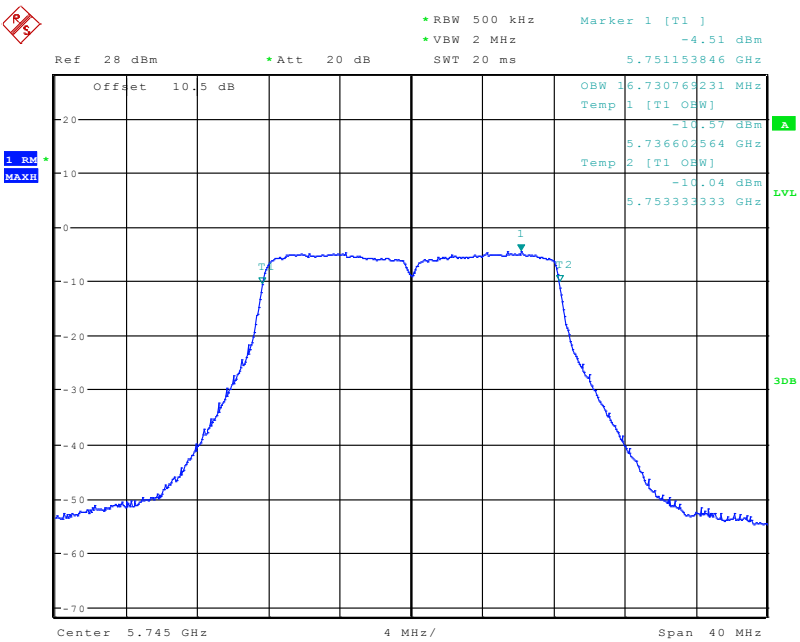
Date: 26.MAR.2020 13:38:40

802.11ac80 mode, 6dB Emission Bandwidth, 5775 MHz



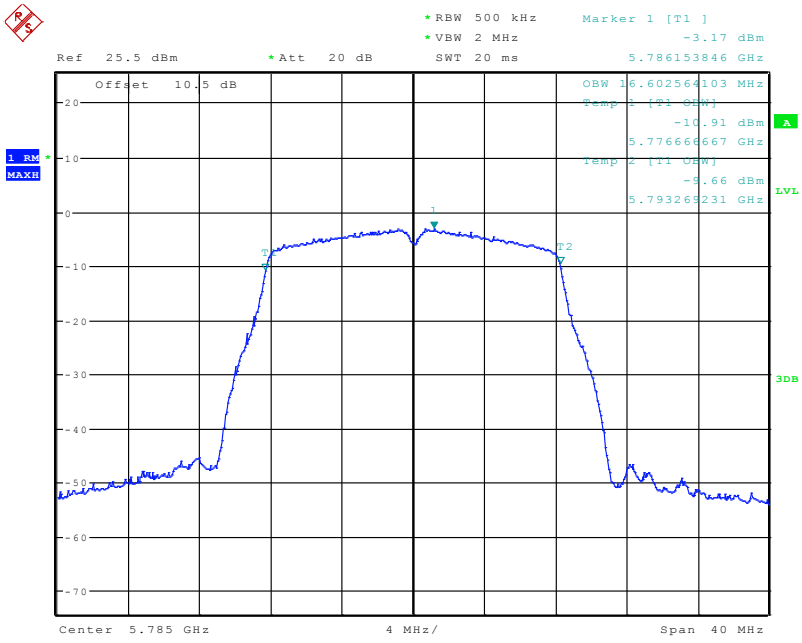
Date: 26.MAR.2020 13:39:37

802.11a mode, 99% Occupied Bandwidth, 5745 MHz



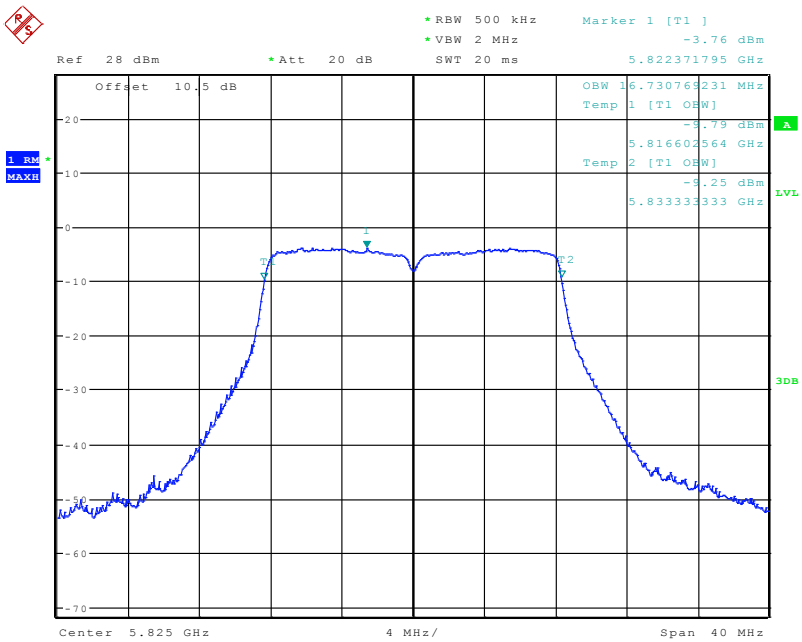
Date: 26.MAR.2020 11:44:23

802.11a mode, 99% Occupied Bandwidth, 5785 MHz



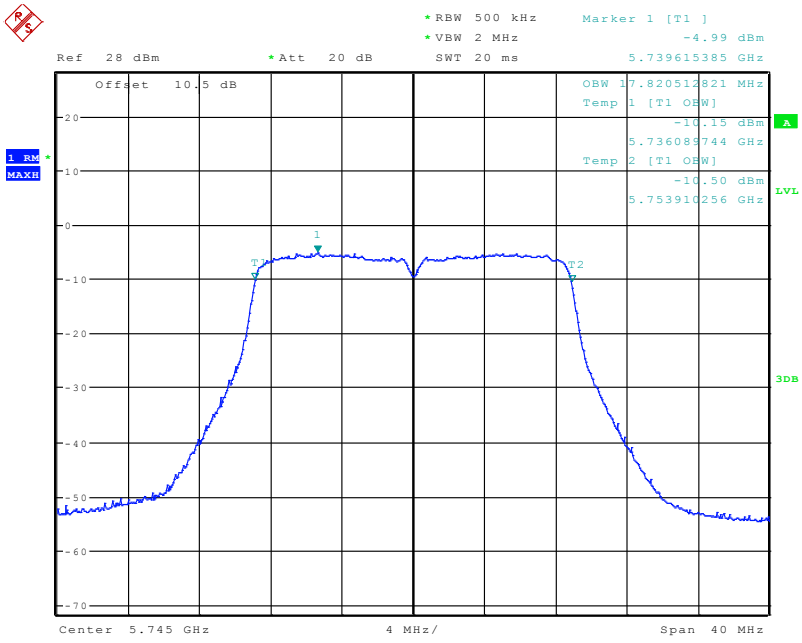
Date: 19.MAY.2020 14:03:39

802.11a mode, 99% Occupied Bandwidth, 5825 MHz



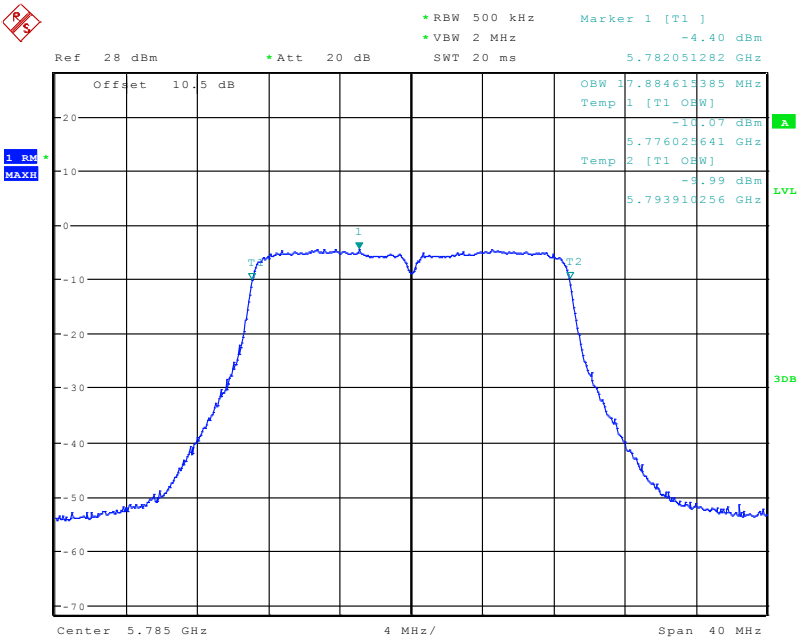
Date: 26.MAR.2020 11:46:22

802.11n20 mode, 99% Occupied Bandwidth, 5745 MHz



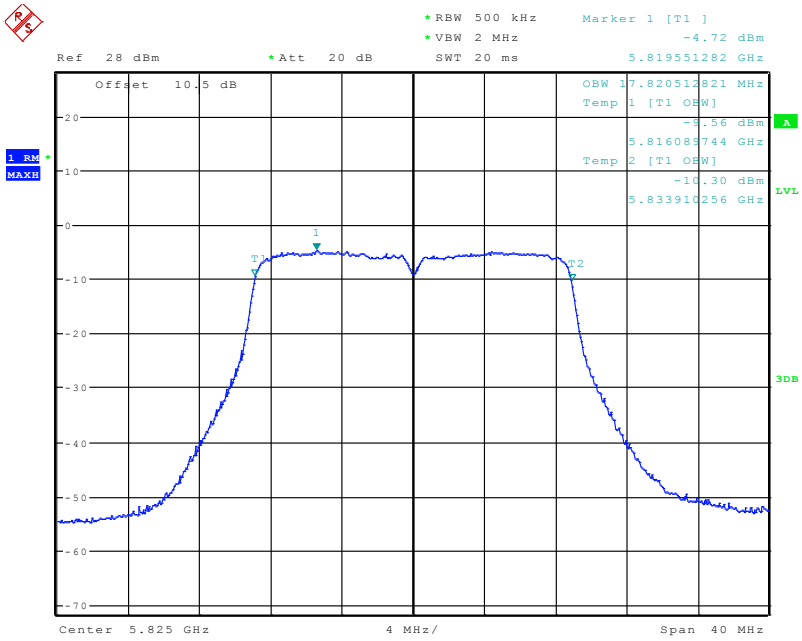
Date: 26.MAR.2020 11:40:24

802.11n20 mode, 99% Occupied Bandwidth, 5785 MHz



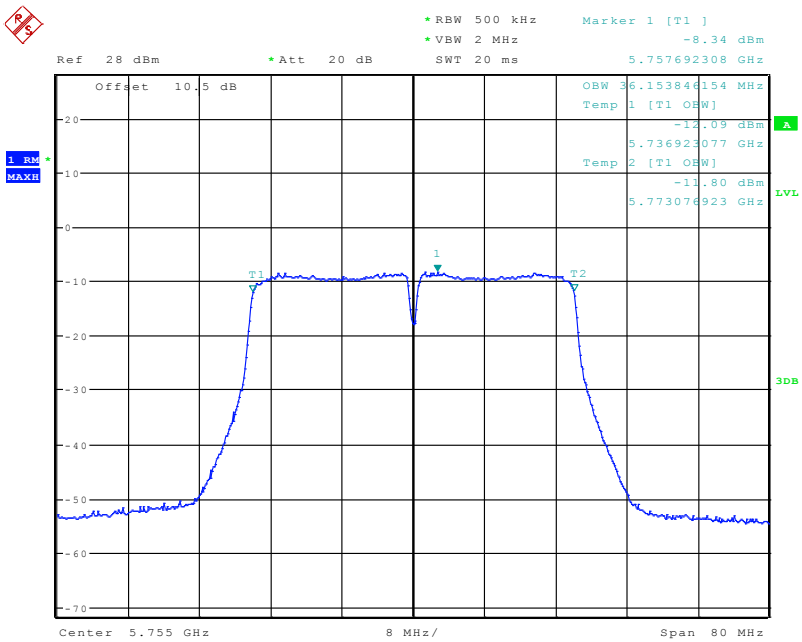
Date: 26.MAR.2020 11:41:14

802.11n20 mode, 99% Occupied Bandwidth, 5825 MHz



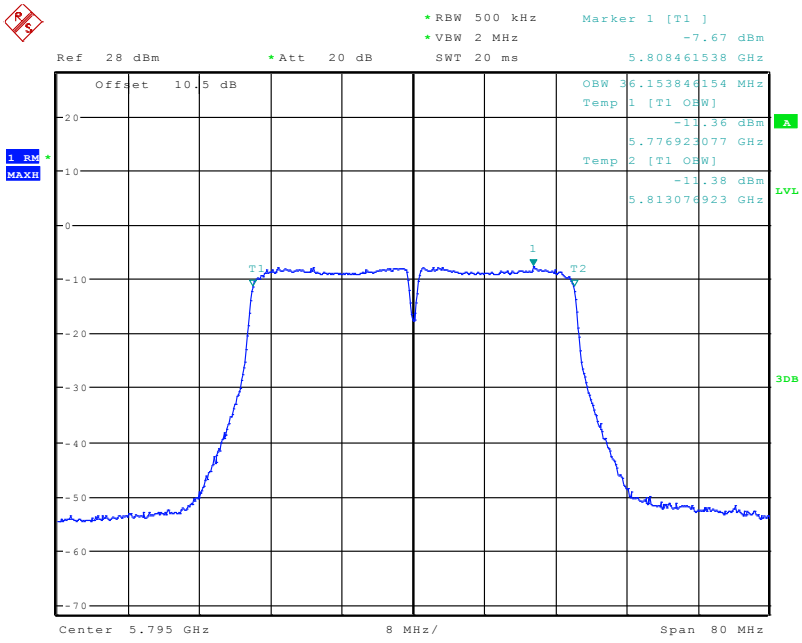
Date: 26.MAR.2020 11:41:46

802.11n40 mode, 99% Occupied Bandwidth, 5755 MHz



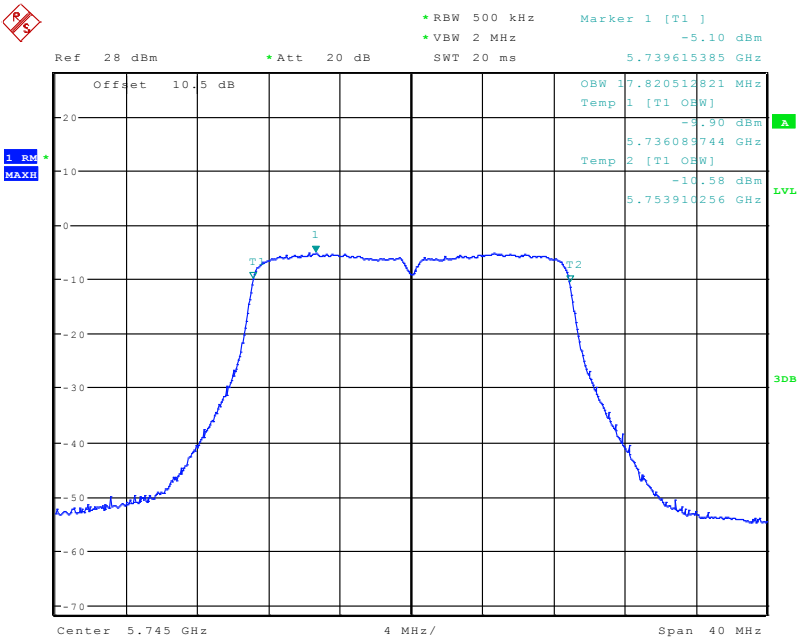
Date: 26.MAR.2020 11:36:45

802.11n40 mode, 99% Occupied Bandwidth, 5795 MHz



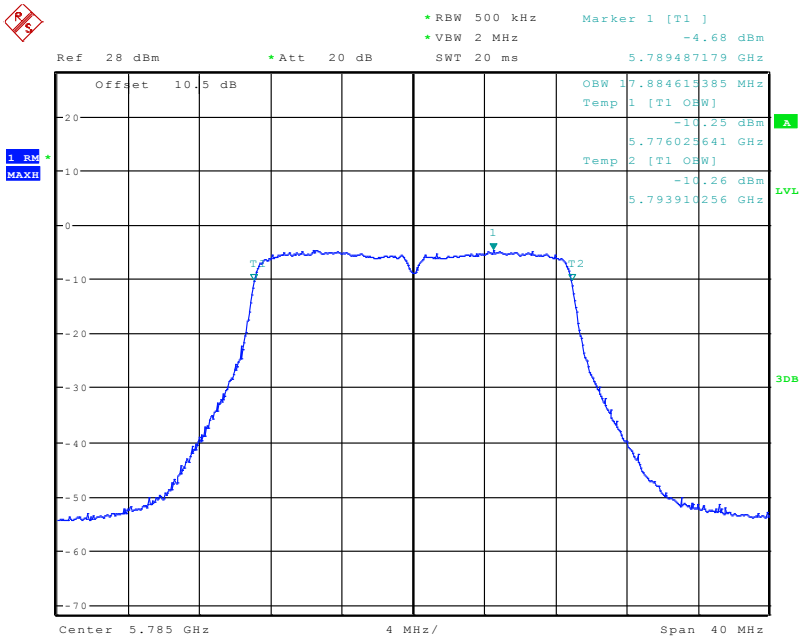
Date: 26.MAR.2020 11:37:19

802.11ac20 mode, 99% Occupied Bandwidth, 5745 MHz



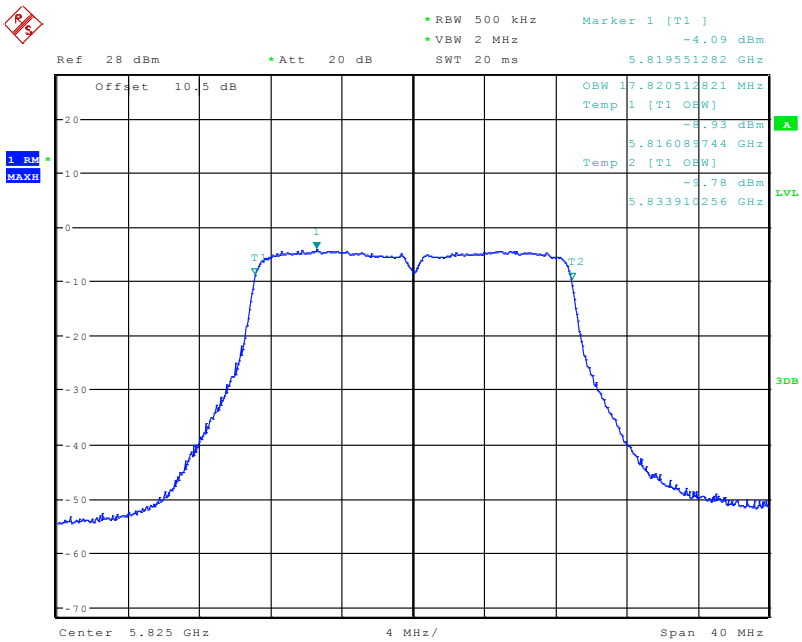
Date: 26.MAR.2020 11:42:12

802.11ac20 mode, 99% Occupied Bandwidth, 5785 MHz



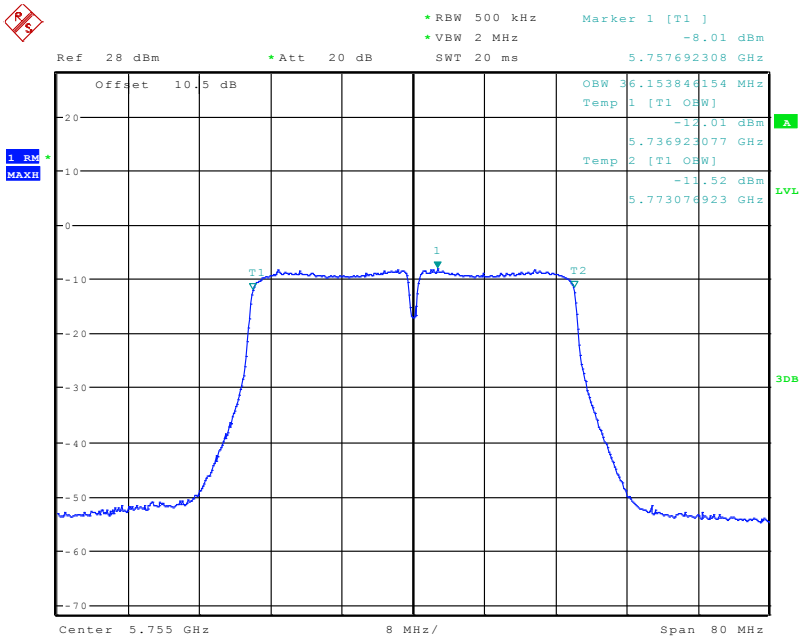
Date: 26.MAR.2020 11:43:04

802.11ac20 mode, 99% Occupied Bandwidth, 5825 MHz



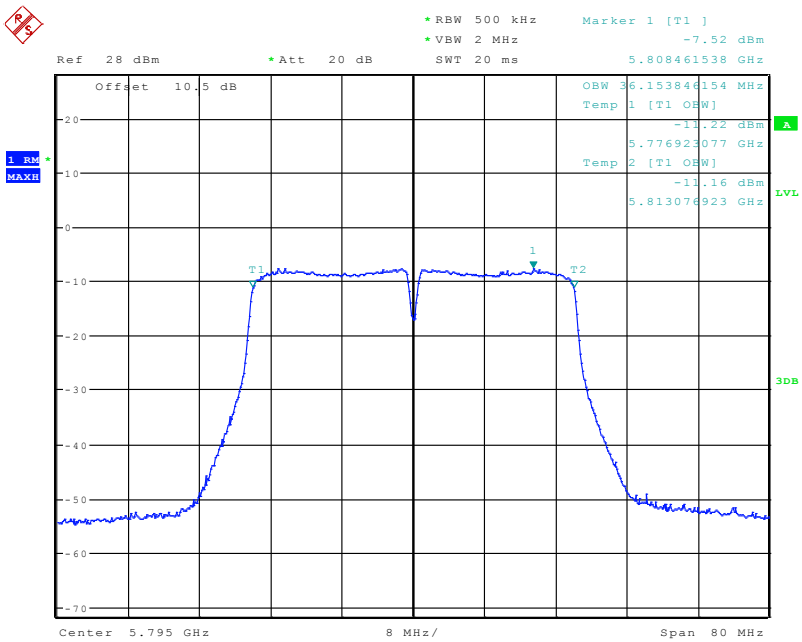
Date: 26.MAR.2020 11:43:34

802.11ac40 mode, 99% Occupied Bandwidth, 5755 MHz



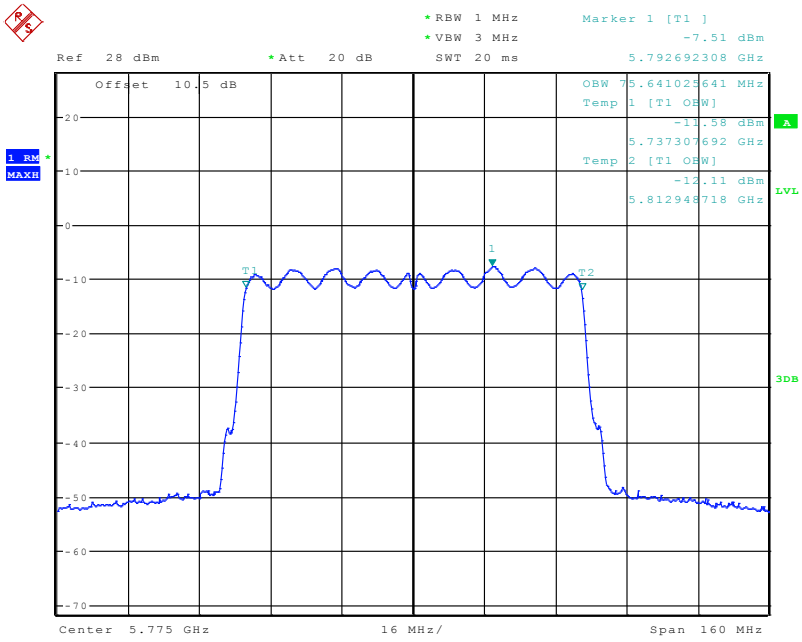
Date: 26.MAR.2020 11:38:47

802.11ac40 mode, 99% Occupied Bandwidth, 5795 MHz



Date: 26.MAR.2020 11:39:21

802.11ac80 mode, 99% Occupied Bandwidth, 5775 MHz



Date: 26.MAR.2020 11:35:18

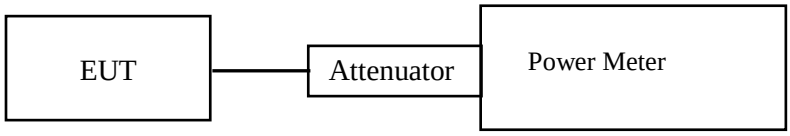
FCC §15.407(a) (3) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

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

Test Procedure

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



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Alan He on 2020-03-26.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

5725 MHz – 5825 MHz:

Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
802.11a		
5745	8.72	30
5785	8.82	
5825	8.83	
802.11n20		
5745	8.62	30
5785	8.89	
5825	8.90	
802.11n40		
5755	8.59	30
5795	8.79	
802.11ac20		
5745	8.81	30
5785	8.77	
5825	8.74	
802.11ac40		
5755	8.85	30
5795	8.81	
802.11ac80		
5775	8.81	30

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

Applicable Standard

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

Test Procedure

For devices operating in the bands 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.l.a).
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101 kPa

The testing was performed by Alan He on 2020-03-26.

EUT operation mode: Transmitting

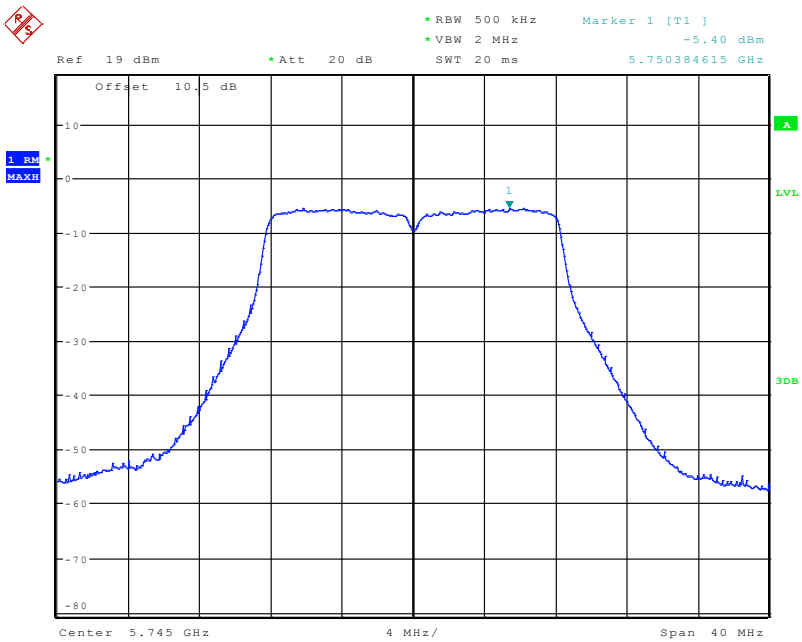
Test Result: Pass

Please refer to the following tables and plots.

5725 MHz – 5825 MHz

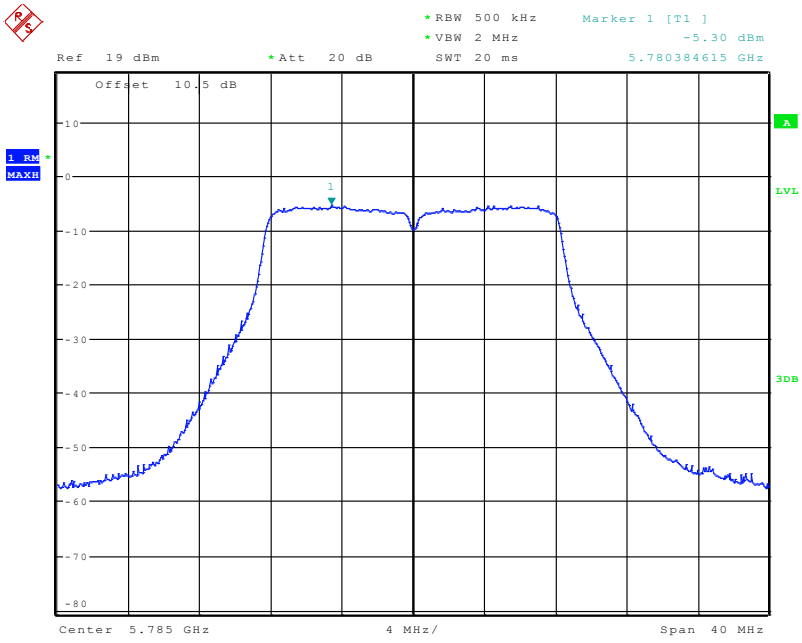
Frequency (MHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
802.11a		
5745	-5.40	30
5785	-5.30	
5825	-4.83	
802.11n20		
5745	-5.14	30
5785	-5.03	
5825	-3.91	
802.11n40		
5755	-8.29	30
5795	-7.82	
802.11ac20		
5745	-5.40	30
5785	-4.61	
5825	-3.69	
802. 11ac40		
5755	-7.01	30
5795	-7.07	
802. 11ac80		
5775	-9.71	30

802.11a mode, Power Spectral Density, 5745 MHz



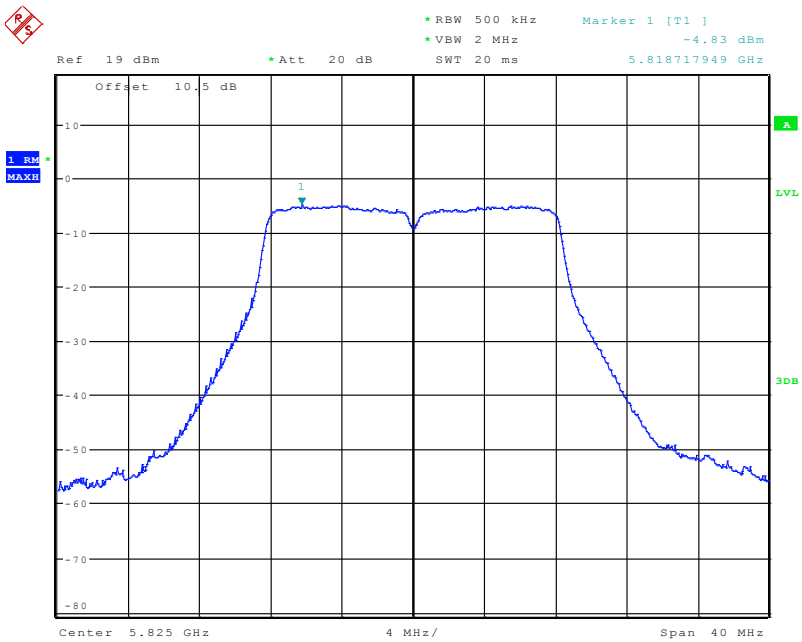
Date: 26.MAR.2020 14:00:33

802.11a mode, Power Spectral Density, 5785 MHz



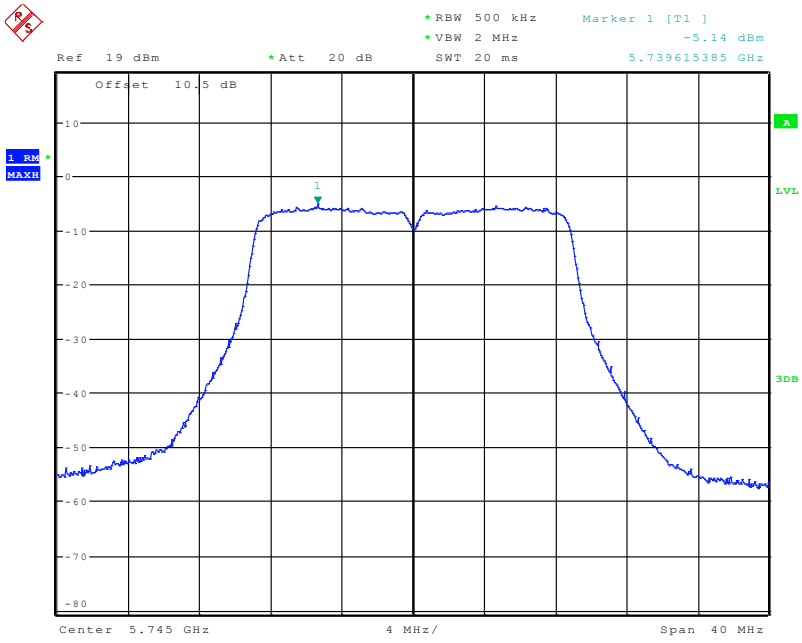
Date: 26.MAR.2020 13:59:38

802.11a mode, Power Spectral Density, 5825 MHz



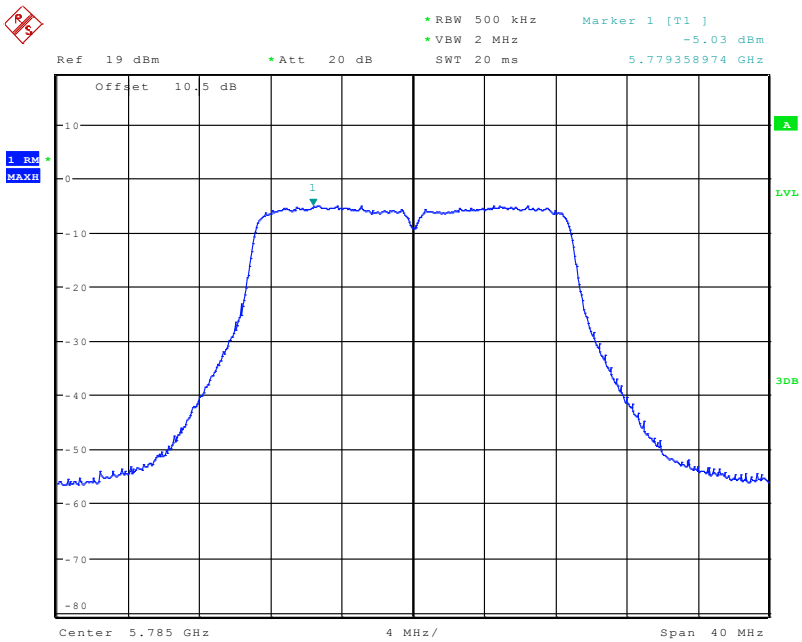
Date: 26.MAR.2020 13:58:40

802.11n20 mode, Power Spectral Density, 5745 MHz



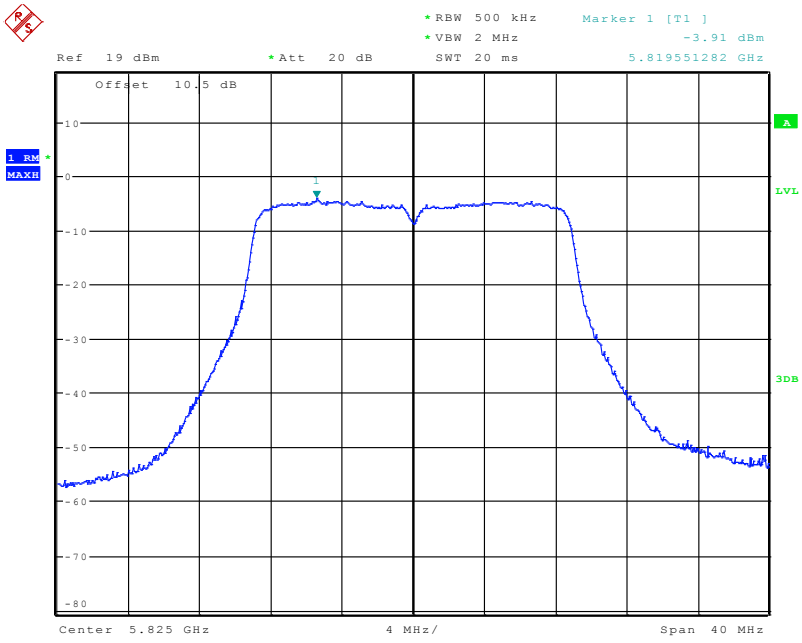
Date: 26.MAR.2020 14:01:23

802.11n20 mode, Power Spectral Density, 5785 MHz



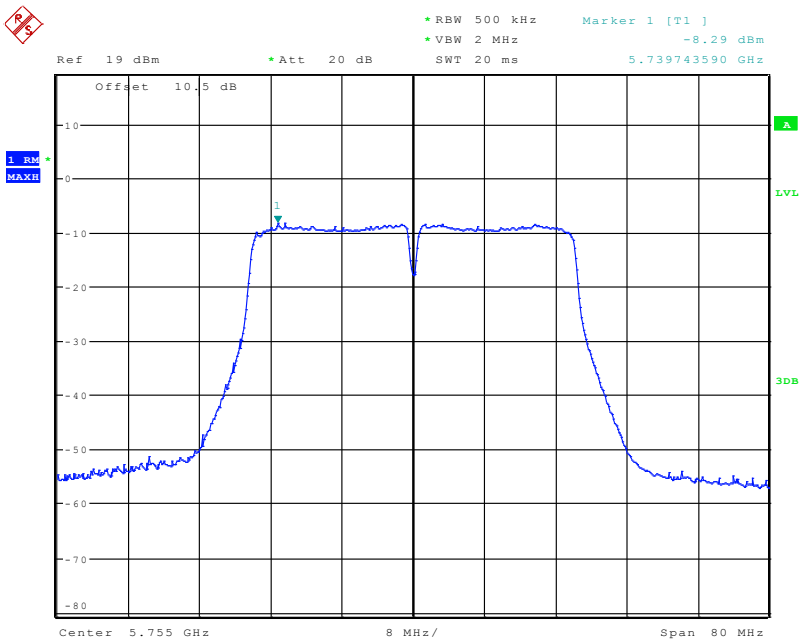
Date: 26.MAR.2020 14:02:07

802.11n20 mode, Power Spectral Density, 5825 MHz



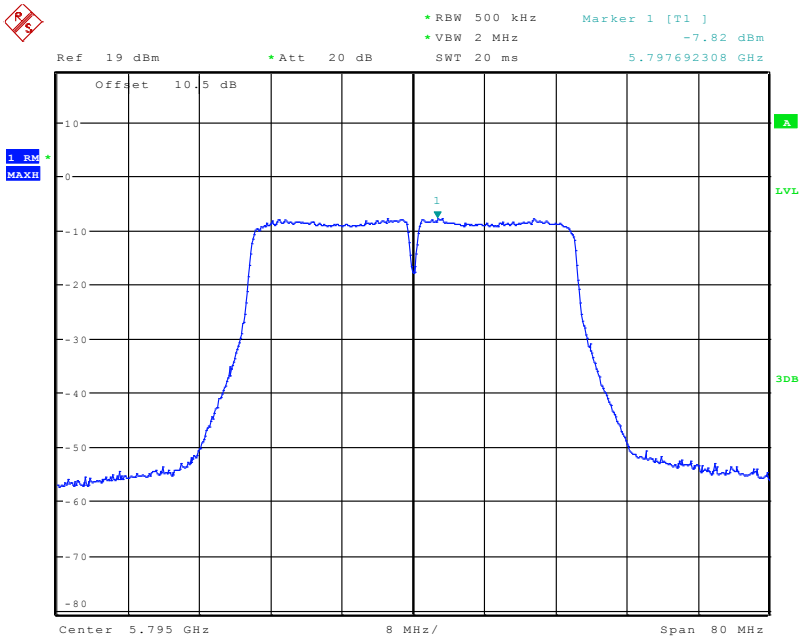
Date: 26.MAR.2020 14:03:07

802.11n40 mode, Power Spectral Density, 5755 MHz



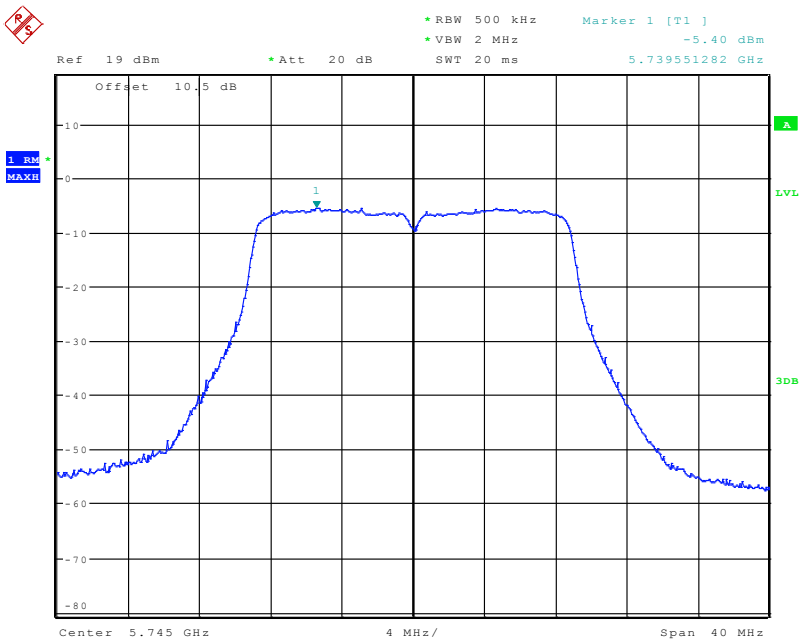
Date: 26.MAR.2020 14:06:18

802.11n40 mode, Power Spectral Density, 5795 MHz



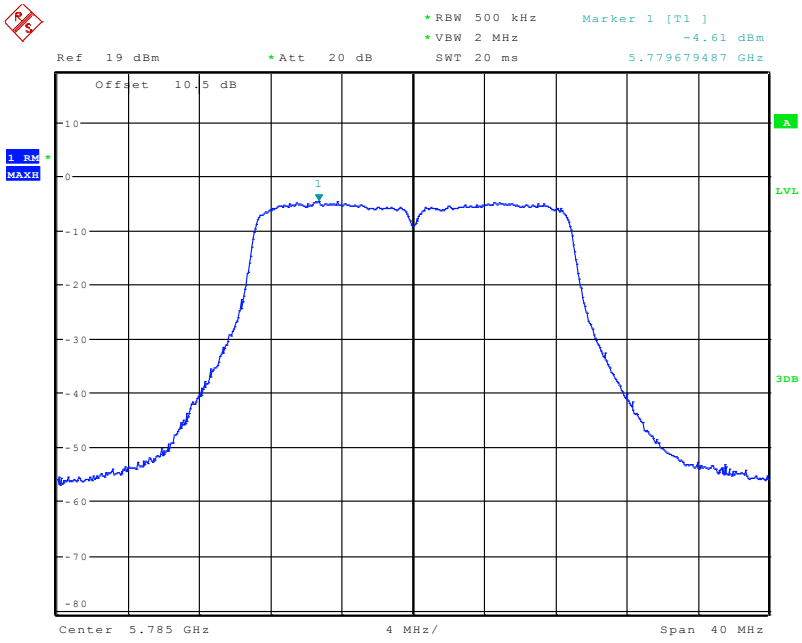
Date: 26.MAR.2020 14:06:55

802.11ac20 mode, Power Spectral Density, 5745 MHz



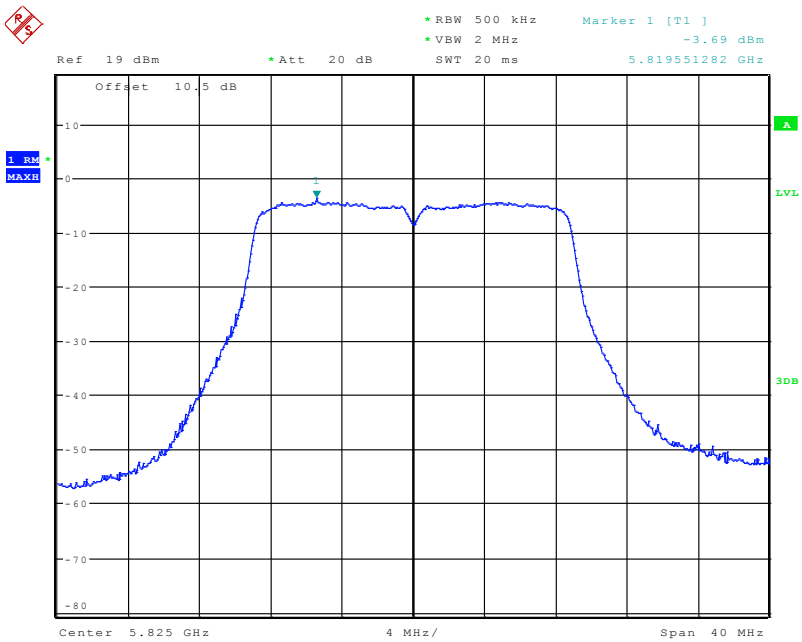
Date: 26.MAR.2020 14:04:01

802. 11ac20 mode, Power Spectral Density, 5785 MHz



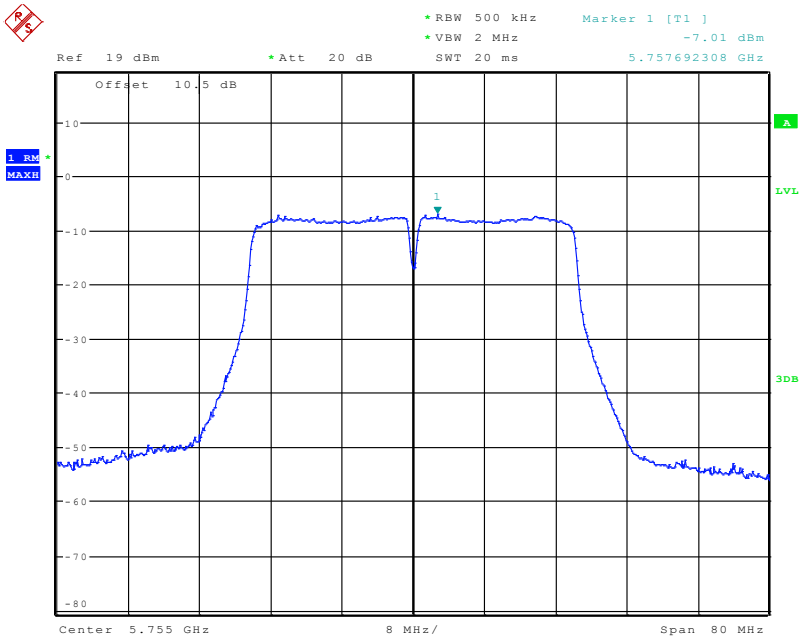
Date: 26.MAR.2020 14:04:35

802. 11ac20 mode, Power Spectral Density, 5825 MHz



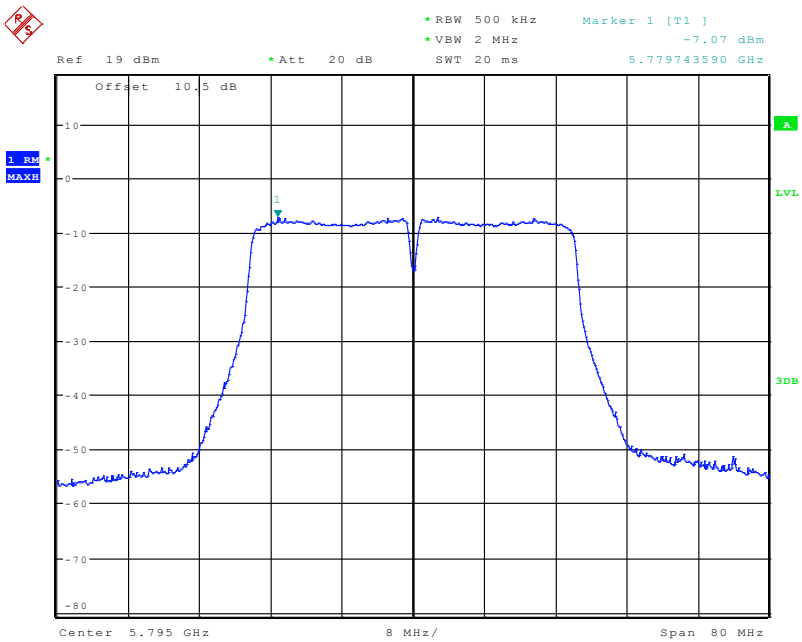
Date: 26.MAR.2020 14:05:34

802. 11ac40 mode, Power Spectral Density, 5755 MHz



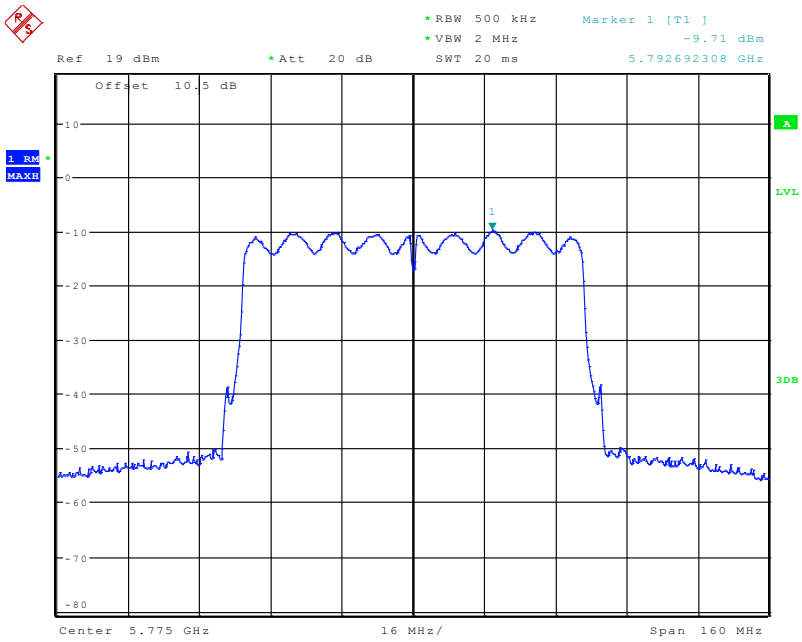
Date: 26.MAR.2020 14:57:58

802. 11ac40 mode, Power Spectral Density, 5795 MHz



Date: 26.MAR.2020 14:58:33

802. 11ac80 mode, Power Spectral Density, 5775 MHz



Date: 26.MAR.2020 14:09:53

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