

FCC PART 15.407

TEST REPORT

For

Shanghai Sunmi Technology Co.,Ltd.

Room 605, Block 7, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai 200433 China

FCC ID: 2AH25T6920

Report Type: Original Report		Product Type: Smart POS system	
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Report Number:	RKSA190719002-00E		
Report Date:	2019-09-04		
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Shanghai Sunmi Technology Co.,Ltd.
Tested Model	T6920
Product Type	Smart POS system
Dimension	219.1mm(L)* 80mm(W)* 17.8mm(H)
Power Supply	DC 5V from adapter and DC 7.6V from battery

Adapter information:

Model: TPA-23A050200UU01

Input: AC 100-240V, 50/60Hz 0.3A

Output: DC 5V, 2A

**All measurement and test data in this report was gathered from production sample serial number: 20190719002.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2019-07-19)*

Objective

This type approval report is prepared on behalf of Shanghai Sunmi 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 Part15.247 DSS, Part 15.247 DTS, Part 15.225 DXX and Part 22H/24E/27/90 PCB submittals with FCC ID: 2AH25T6920.

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.

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

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

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. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01), the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

In **5150~5250 MHz** band, test channel list is as below:

802.11a/n20 mode Channel 36, 40, 48 were tested.

802.11n40 mode Channel 38, 46 were tested.

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

In **5725~5850 MHz** band, test channel list is as below:

802.11a/n20 mode Channel 149, 157, 165 were tested.

802.11n40 mode Channel 151, 159 were tested.

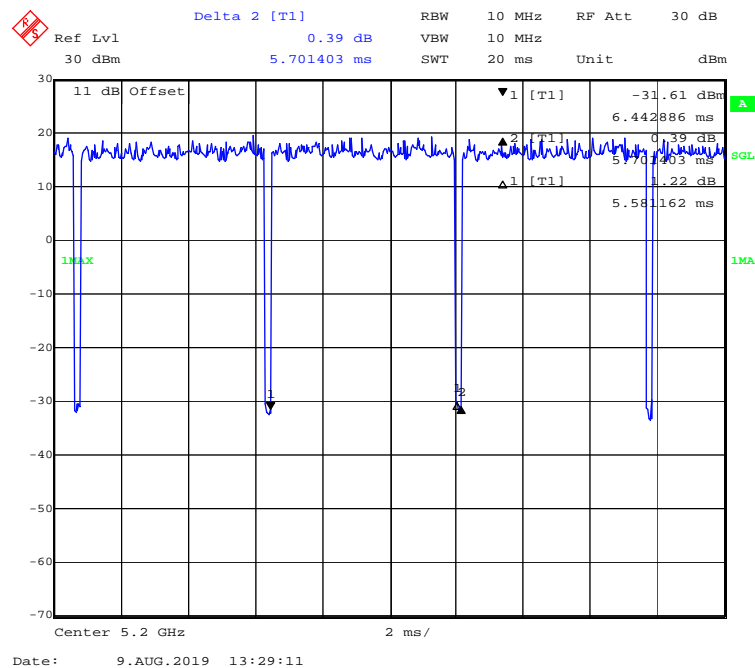
Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	159	5795
151	5755	161	5805
153	5765	165	5825
155	5775	/	/
157	5785	/	/

EUT Exercise Software

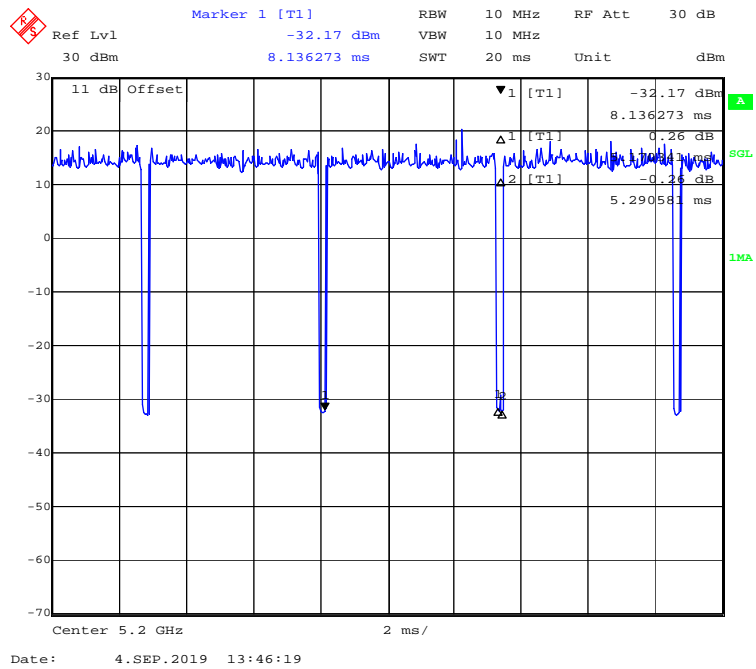
RF test tool: QRCT

The worst case was performed under:

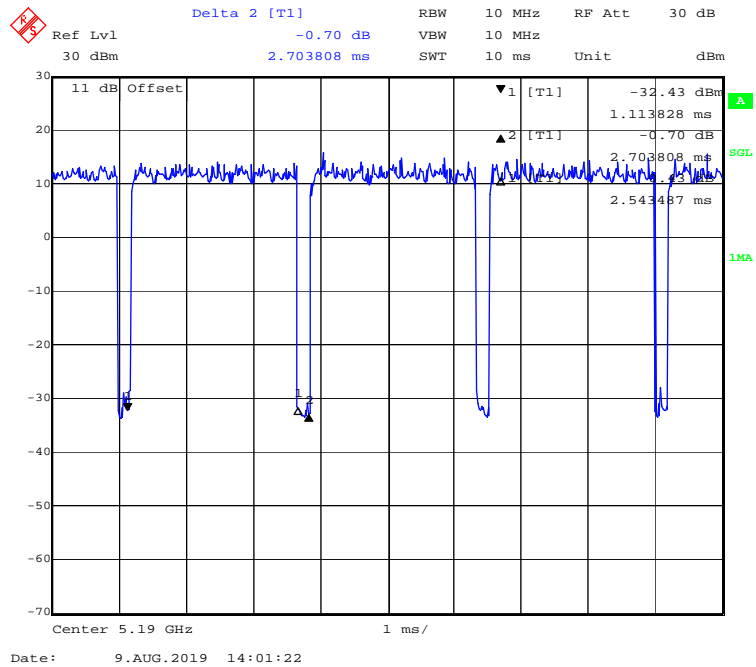
Mode	Data rate	Channel	Power setting	
			5150-5250 Band	5725-5850 Band
802.11a	6 Mbps	low	13	12
		middle		13
		high		15
802.11n-HT20	MCS0	low	13	13
		middle		14
		high		16
802.11n-HT40	MCS0	low	12	13
		high		16

Duty Cycle**5150MHz-5250MHz Band:****802.11a mode**

802.11n-HT20 mode

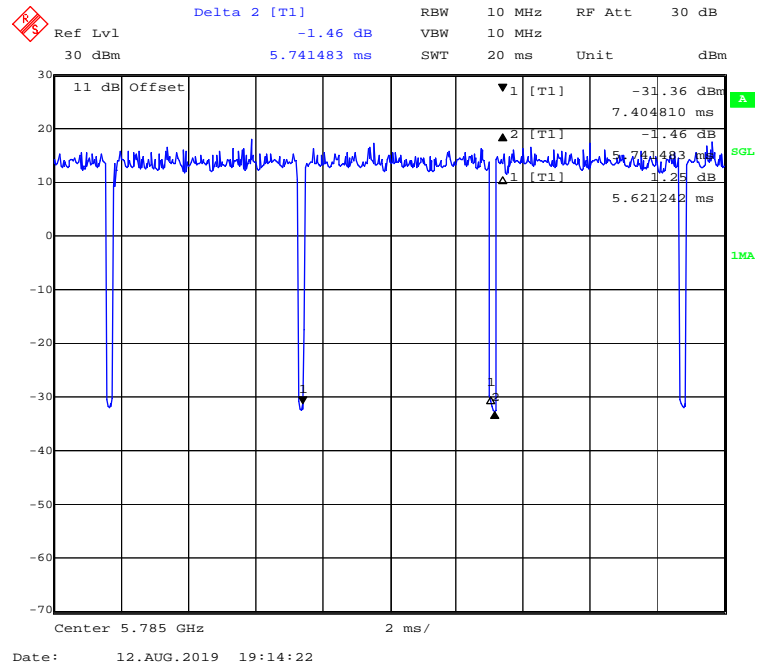


802.11n-HT40 mode

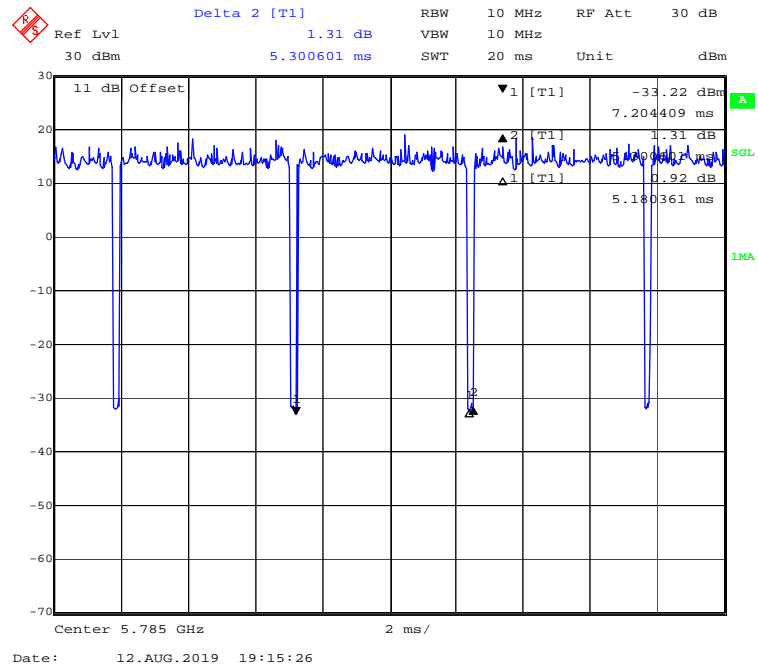


5725MHz-5850MHz Band:

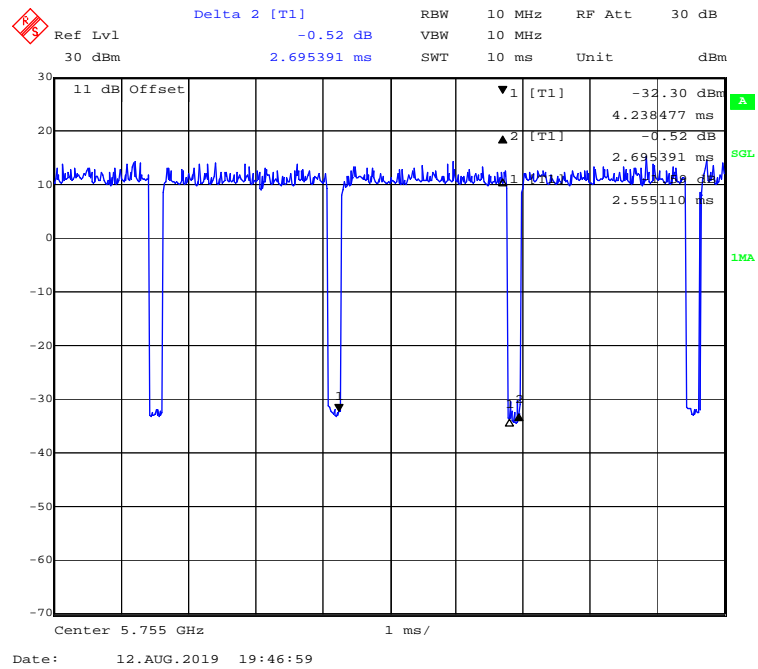
802.11a mode



802.11n-HT20 mode



802.11n-HT40 mode



Mode	Frequency Range (MHz)	Duty Cycle (%)	T (ms)	1/T (kHz)	10log(1/x)
802.11a	5150-5250	97.90	5.581	0.18	0.09
802.11n-HT20		97.71	5.170	0.19	0.10
802.11n-HT40		94.05	2.543	0.39	0.27
802.11a	5725-5850	97.91	5.621	0.18	0.09
802.11n-HT20		97.72	5.180	0.19	0.10
802.11n-HT40		94.81	2.555	0.39	0.23

Note: "x" means duty cycle.

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

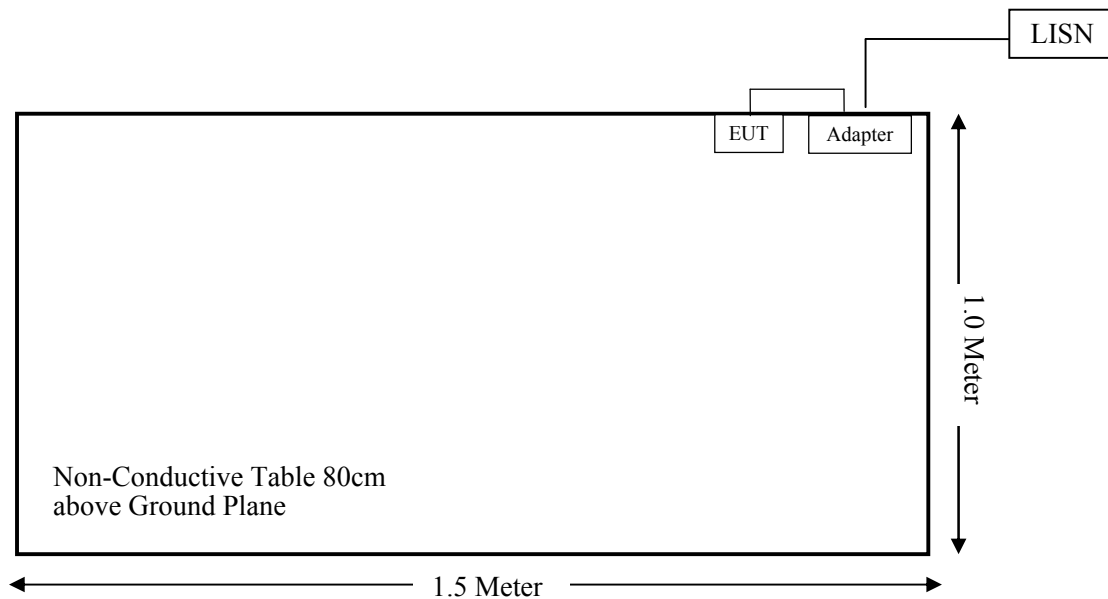
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter1	LA65NS0-00	DF263

External I/O Cable

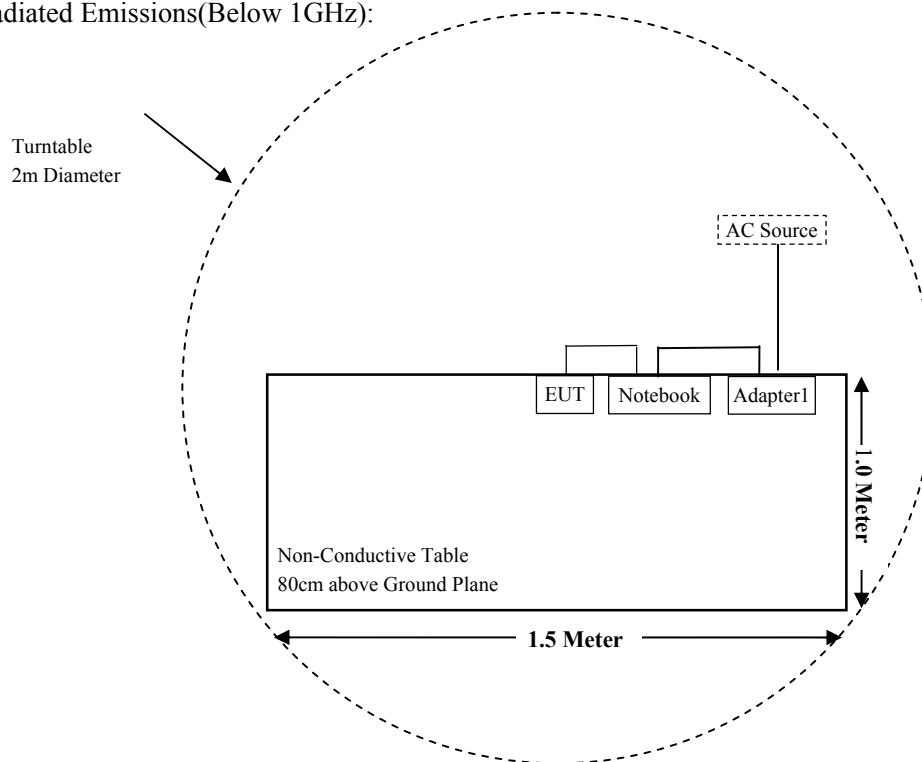
Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	Adapter

Block Diagram of Test Setup

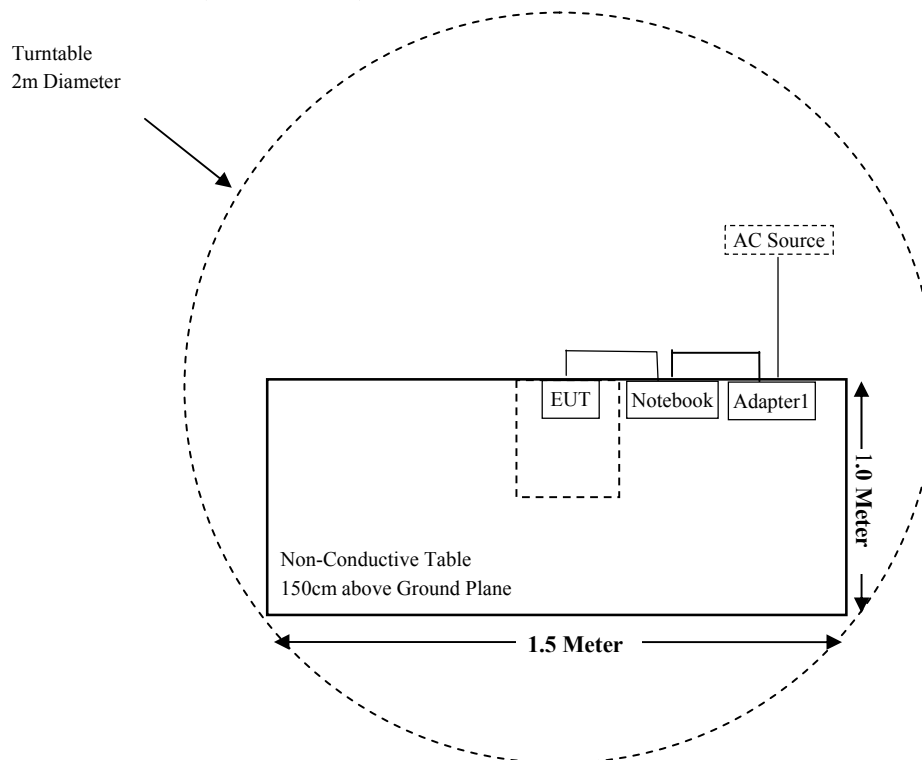
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 & §2.1093	RF EXPOSURE	Compliant
§15.203	Antenna Requirement	Compliant
FCC §15.207 & §15.407(b) (6)	AC Power Line Conducted Emissions	Compliant
§15.205 & §15.209 & §15.407(b) (1) ,(6) ,(7)	Undesirable Emission & Restricted Bands	Compliant
§15.407(a)(1) (5) & §15.407 (e)	Emission Bandwidth	Compliant
§15.407 (a)(1) (3)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(1) (3)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-07-11	2020-07-10
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Audix	Test Software	e3	V9	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-27	2019-08-26
ETS-LINDGREN	Horn Antenna	3115	6229	2016-12-12	2019-12-11
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-12-12	2019-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
MICRO-TRONICS	Band Reject Filter	BRC50703	G094	2019-08-05	2020-08-04
MICRO-TRONICS	Band Reject Filter	BRC50705	G085	2019-08-05	2020-08-04
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2018-11-30	2019-11-29
Agilent	Power Meter	N1912A	MY5000492	2018-11-18	2019-11-17
Agilent	Power Sensor	N1921A	MY54210024	2018-11-18	2019-11-17
Narda	Attenuator	10dB	010	2018-08-15	2019-08-14
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
BACL	Temperature & Humidity Chamber	BTH-150	30023	2018-12-20	2019-12-19
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2018-10-10	2019-10-09
Sunmi	RF Cable	Sunmi C01	C01	Each Time	/

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-07-11	2020-07-10
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2018-11-30	2019-11-29
Audix	Test Software	e3	V9	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2019-01-10	2020-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2019-08-15	2020-08-14

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

§1.1310 & §2.1093 –RF EXPOSURE

Applicable Standard

§2.1093 and §1.1310

Measurement Result

Please refer to the SAR report: RKSA190719052-20.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the 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, if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has an FPC antenna for 5G Wi-Fi and the antenna gain is 1.95 dBi, which was permanently attached, fulfill the requirement of this section. Please refer to the EUT photos.

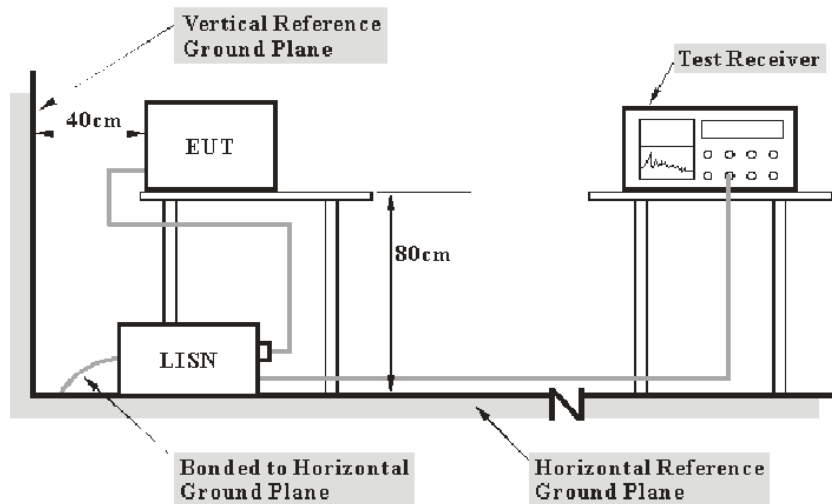
Result: Compliant.

FCC §15.407 (b) (6) §15.207 (a) – AC POWER LINE 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.

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 first LISN and the other support equipments were connected to the outlet of the second 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.

Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of 7 dB means the emission is 7 dB above the limit. The equation for over limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)} - \text{Limit (dB}\mu\text{V)}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

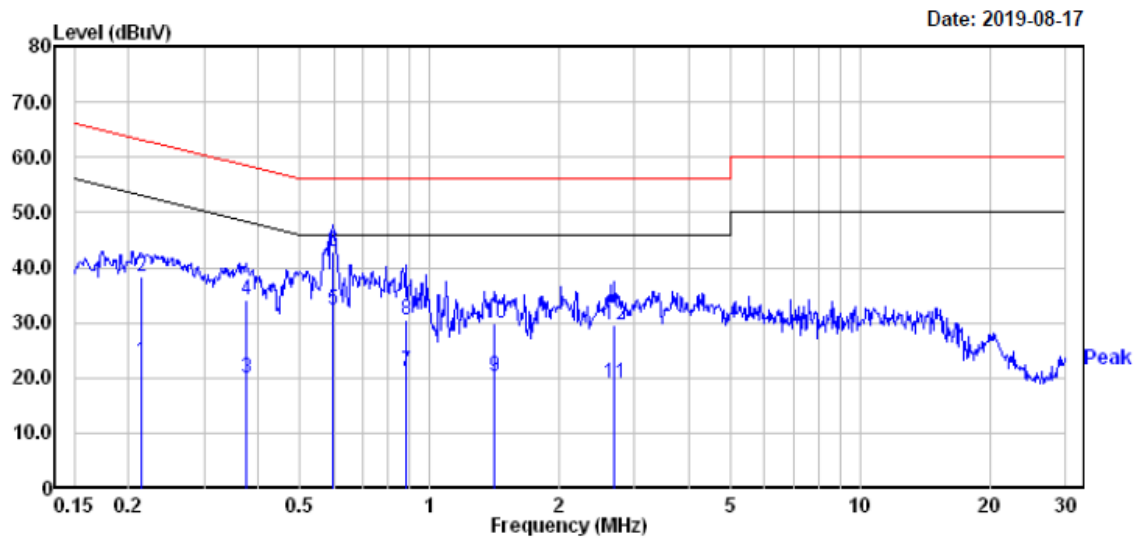
Environmental Conditions

Temperature:	20.2 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Sam Ye on 2019-08-17.

EUT operation mode: Transmitting in 802.11a mode middle channel of 5150-5250MHz (worst case)

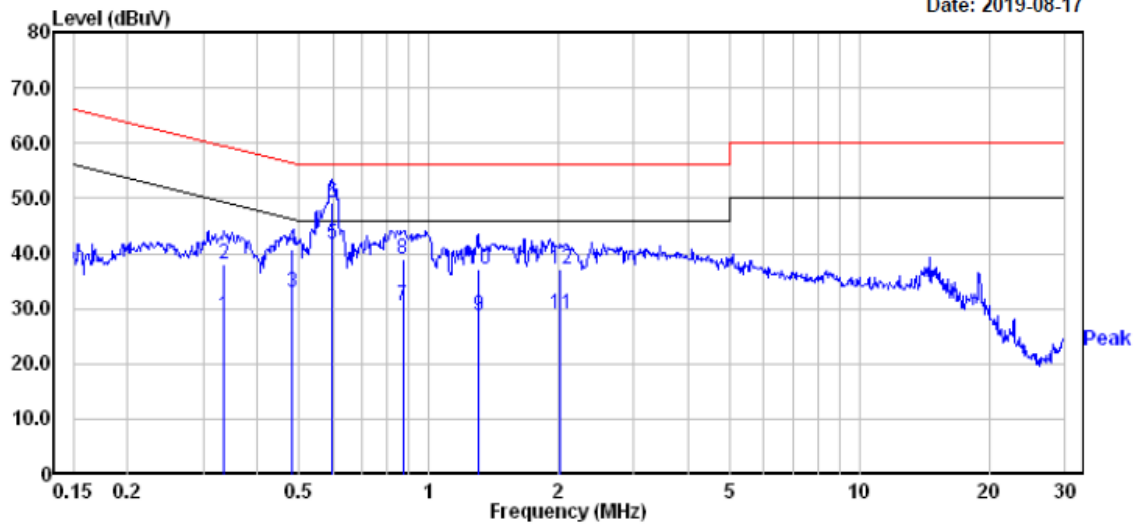
AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.215	3.20	19.65	22.85	53.01	-30.16	Average
2	0.215	18.60	19.65	38.25	63.01	-24.76	QP
3	0.377	0.30	19.66	19.96	48.34	-28.38	Average
4	0.377	14.60	19.66	34.26	58.34	-24.08	QP
5	0.595	12.59	19.68	32.27	46.00	-13.73	Average
6	0.595	23.29	19.68	42.97	56.00	-13.03	QP
7	0.880	1.50	19.69	21.19	46.00	-24.81	Average
8	0.880	10.90	19.69	30.59	56.00	-25.41	QP
9	1.418	0.40	19.73	20.13	46.00	-25.87	Average
10	1.418	10.30	19.73	30.03	56.00	-25.97	QP
11	2.692	-0.70	19.78	19.08	46.00	-26.92	Average
12	2.692	9.70	19.78	29.48	56.00	-26.52	QP

AC 120V/60 Hz, Neutral

Date: 2019-08-17



	Freq	Read		Limit	Over	
	MHz	Level	Factor	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB
1	0.334	9.00	19.67	28.67	49.35	-20.68 Average
2	0.334	18.40	19.67	38.07	59.35	-21.28 QP
3	0.481	13.20	19.67	32.87	46.32	-13.45 Average
4	0.481	21.10	19.67	40.77	56.32	-15.55 QP
5	0.595	22.09	19.68	41.77	46.00	-4.23 Average
6	0.595	29.49	19.68	49.17	56.00	-6.83 QP
7	0.871	10.70	19.69	30.39	46.00	-15.61 Average
8	0.871	19.30	19.69	38.99	56.00	-17.01 QP
9	1.303	8.90	19.72	28.62	46.00	-17.38 Average
10	1.303	17.50	19.72	37.22	56.00	-18.78 QP
11	2.023	9.20	19.76	28.96	46.00	-17.04 Average
12	2.023	17.40	19.76	37.16	56.00	-18.84 QP

Note:

- 1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
- 2) Over Limit (dB) = Read level (dBUV) + Factor (dB) - Limit (dBUV)

§15.205 & §15.209 & §15.407(B) (1),(6),(7) – UNDESIRABLE EMISSION & RESTRICTED BANDS

Applicable Standard

FCC §15.407 (b) (1), (6), (7); §15.209; §15.205;

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 EIRP of –27dBm/MHz

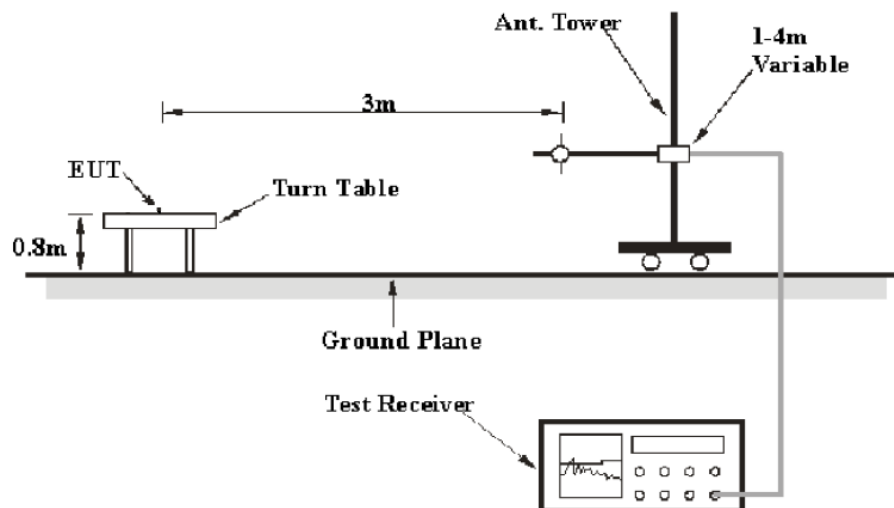
For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of –27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to 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.

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000MHz shall be performed using a minimum resolution bandwidth of 1MHz.

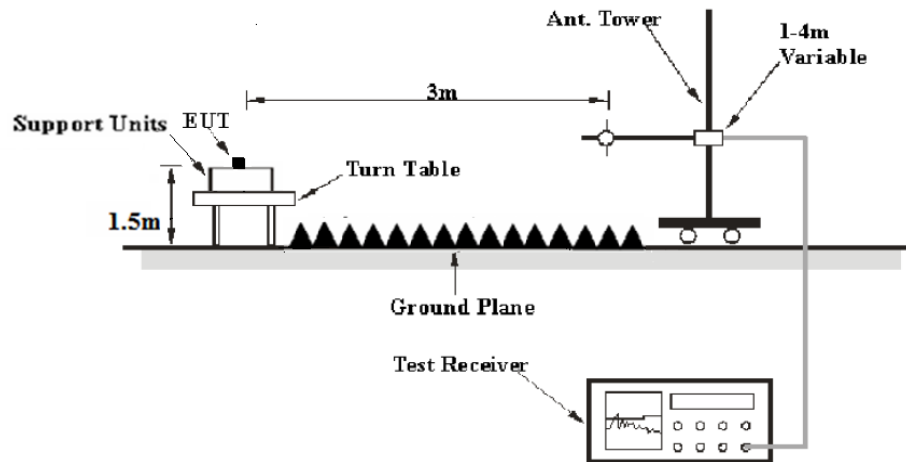
According to 789033 D02 General UNII Test Procedures New Rules v02r01, emission shall be computed as: $E \text{ [dB}\mu\text{V/m]} = \text{EIRP [dBm]} + 95.2$, for $d = 3$ meters.

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.

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 Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave.

Test Procedure

During the radiated emission test, the adapter was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

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

Factor & Over Limit & Corrected Amplitude & Margin Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)} - \text{Limit (dB}\mu\text{V)}$$

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:

$$\text{Corrected Amplitude (dB}\mu\text{V /m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V /m)}$$

Test Data

Environmental Conditions

Temperature:	20.2 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Sam Ye on 2019-08-20.

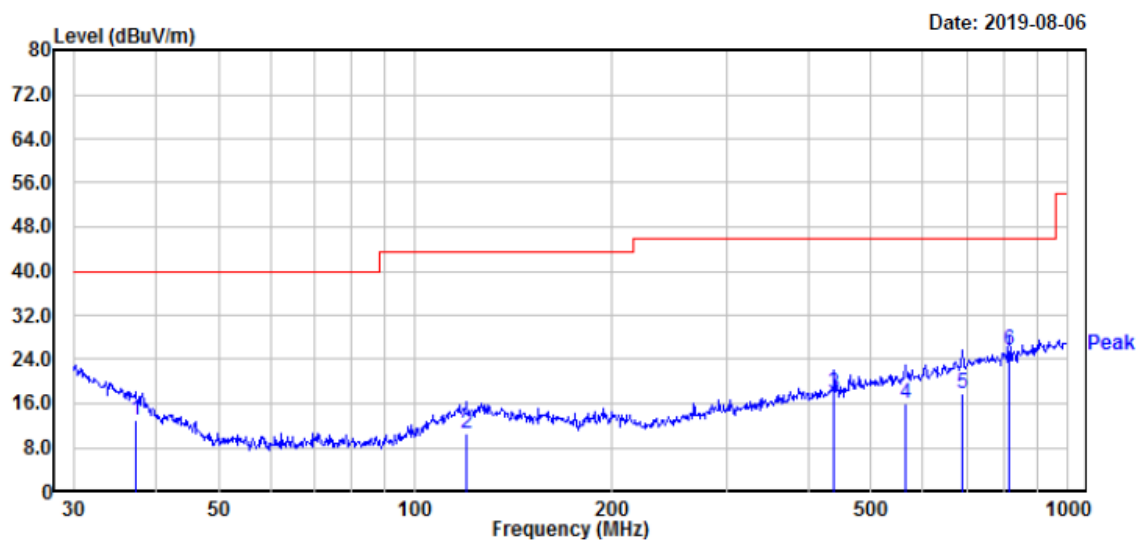
Test Mode: Transmitting

Spurious Emission Test

30MHz-1GHz:

Horizontal:

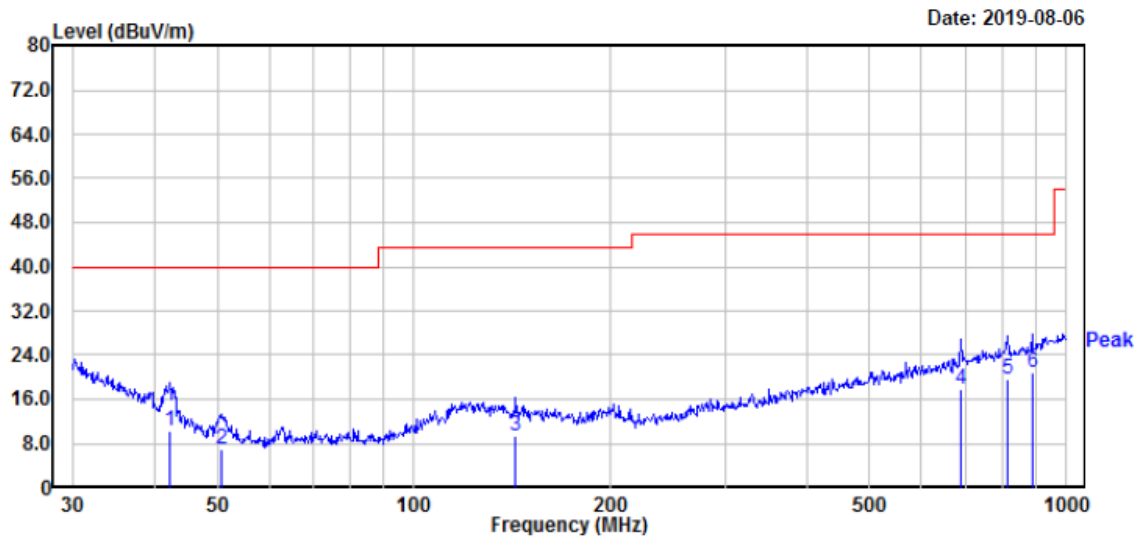
Pre-scan with 802.11a, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case 802.11a mode in channel 5200 in Y-axis of orientation was recorded



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	APos	TPos	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	37.29	22.21	-9.20	13.01	40.00	-26.99	100	134	QP
2	119.86	21.20	-10.68	10.52	43.50	-32.98	100	207	QP
3	438.66	24.81	-6.85	17.96	46.00	-28.04	183	28	QP
4	564.64	20.50	-4.54	15.96	46.00	-30.04	200	232	QP
5	689.57	20.20	-2.28	17.92	46.00	-28.08	193	349	QP
6	813.11	26.30	-0.57	25.73	46.00	-20.27	200	116	QP

Vertical:

Pre-scan with 802.11a, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case 802.11a mode in channel 5200 in Y-axis of orientation was recorded



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	APos	TPos	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	42.30	22.90	-12.71	10.19	40.00	-29.81	100	372	QP
2	50.59	23.90	-16.98	6.92	40.00	-33.08	100	172	QP
3	143.33	21.11	-11.81	9.30	43.50	-34.20	100	117	QP
4	689.56	20.20	-2.28	17.92	46.00	-28.08	100	165	QP
5	813.11	20.10	-0.57	19.53	46.00	-26.47	200	158	QP
6	887.61	19.90	0.79	20.69	46.00	-25.31	200	134	QP

1GHz-18GHz (5150-5250MHz Band):**802.11a Mode:**

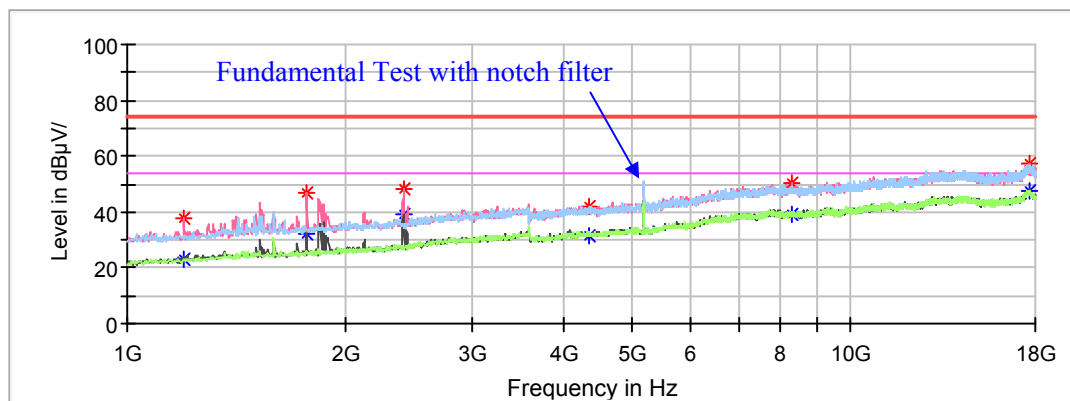
(Pre-scan in the X, Y and Z axes of orientation, the worst case **Y-axis of orientation** was recorded.)

Note:

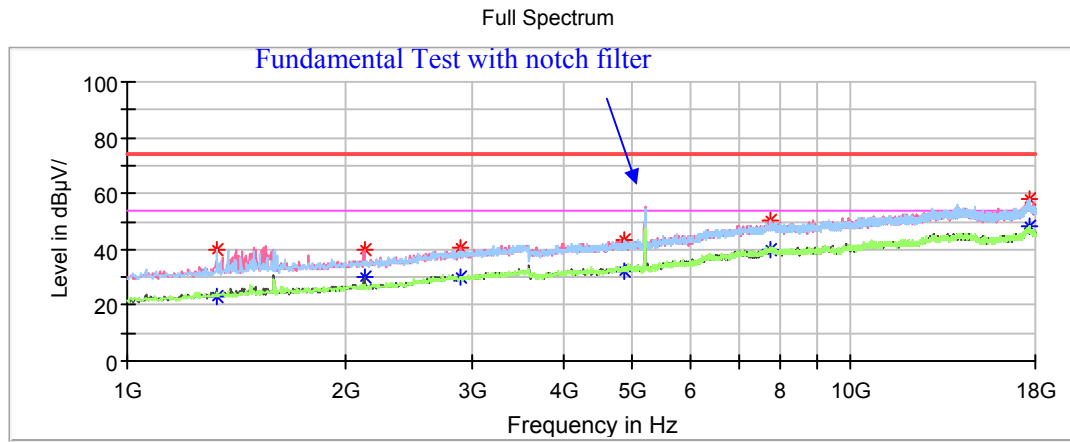
1. This test was performed with the 5150-5250MHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 5180MHz

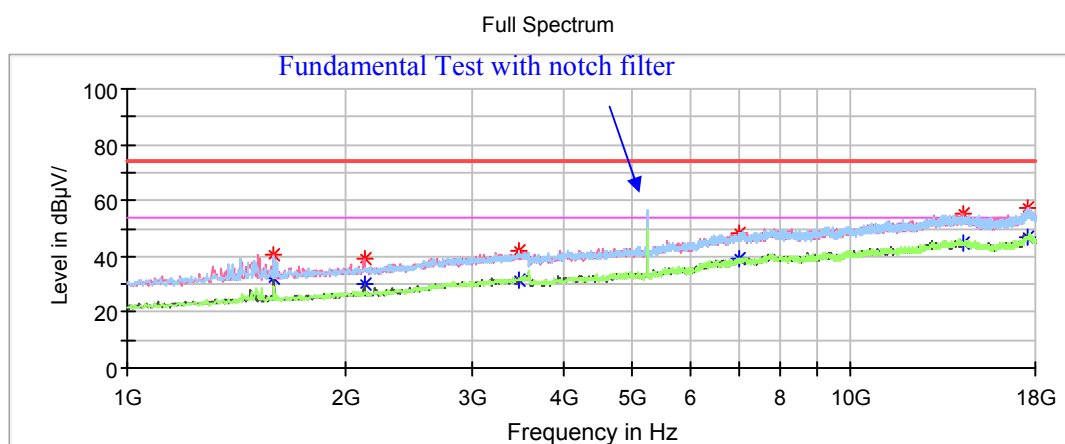
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1197.20	---	23.40	200	V	317	-11.6	54.00	30.60
1197.20	37.73	---	200	V	317	-11.6	74.00	36.27
1768.40	46.95	---	150	V	107	-9.0	68.20	21.25
2407.60	48.59	---	150	V	131	-7.2	68.20	19.61
4362.60	---	31.34	200	V	115	-1.2	54.00	22.66
4362.60	42.11	---	200	V	115	-1.2	74.00	31.89
8286.20	---	39.40	150	H	8	6.6	54.00	14.60
8286.20	50.15	---	150	H	8	6.6	74.00	23.85
17666.80	57.19	---	200	V	104	14.0	68.20	11.01

Middle Channel: 5200MHz

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1329.80	---	23.26	150	V	345	-10.9	54.00	30.74
1329.80	39.92	---	150	V	345	-10.9	74.00	34.08
2128.80	39.98	---	200	V	192	-7.9	68.20	28.22
2890.40	---	29.79	150	V	216	-4.9	54.00	24.21
2890.40	40.65	---	150	V	216	-4.9	74.00	33.35
4876.00	---	32.31	200	H	0	-0.5	54.00	21.69
4876.00	43.41	---	200	H	0	-0.5	74.00	30.59
7742.20	---	39.58	150	H	192	6.6	54.00	14.42
7742.20	50.54	---	150	H	192	6.6	74.00	23.46
17649.80	57.95	---	150	H	52	14.0	68.20	10.25

High Channel: 5240MHz

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1595.00	---	32.22	200	V	330	-9.6	54.00	21.78
1595.00	40.91	---	200	V	330	-9.6	74.00	33.09
2128.80	39.44	---	200	V	170	-7.9	68.20	28.76
3475.20	41.82	---	150	H	63	-3.6	68.20	26.38
6997.60	48.37	---	200	H	347	5.3	68.20	19.83
14345.00	55.16	---	200	V	108	12.6	68.20	13.04
17530.80	57.46	---	150	H	86	14.2	68.20	10.74

802.11n-HT20 Mode:

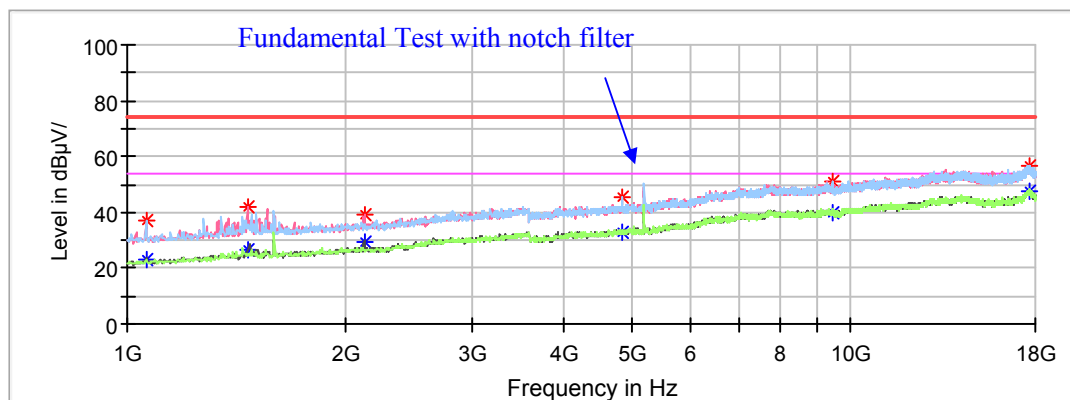
Pre-scan with X,Y and Z axes of orientation, the worst case Y-axis of orientation was recorded

Note:

1. This test was performed with the 5150-5250MHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 5180MHz

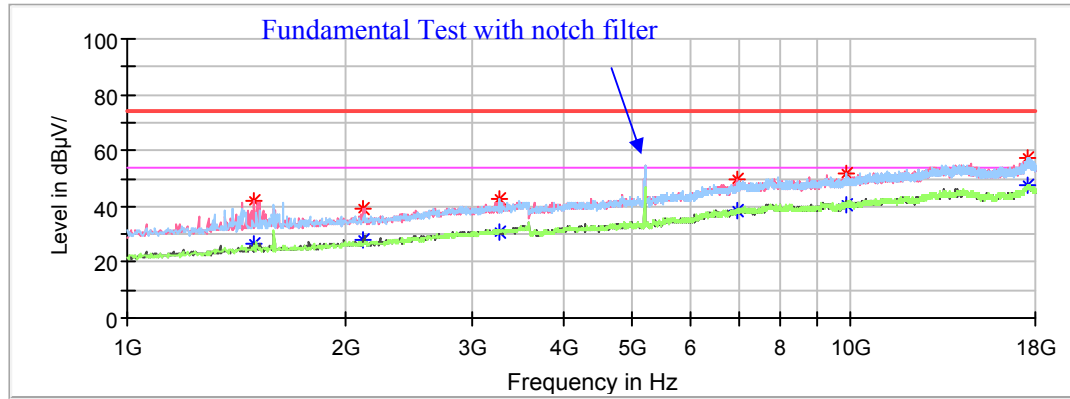
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1061.20	---	23.01	200	H	250	-12.3	54.00	30.99
1061.20	37.02	---	200	H	250	-12.3	74.00	36.98
1469.20	---	26.86	200	V	110	-10.1	54.00	27.14
1469.20	41.98	---	200	V	110	-10.1	74.00	32.02
2128.80	39.44	---	200	V	139	-7.9	68.20	28.76
4835.20	45.13	---	150	H	0	-0.5	74.00	28.87
4835.20	---	32.94	150	H	0	-0.5	54.00	21.06
9418.40	---	39.86	150	H	185	7.6	54.00	14.14
9418.40	51.08	---	150	H	185	7.6	74.00	22.92
17649.80	56.96	---	200	H	357	14.0	68.20	11.24

Middle Channel: 5200MHz

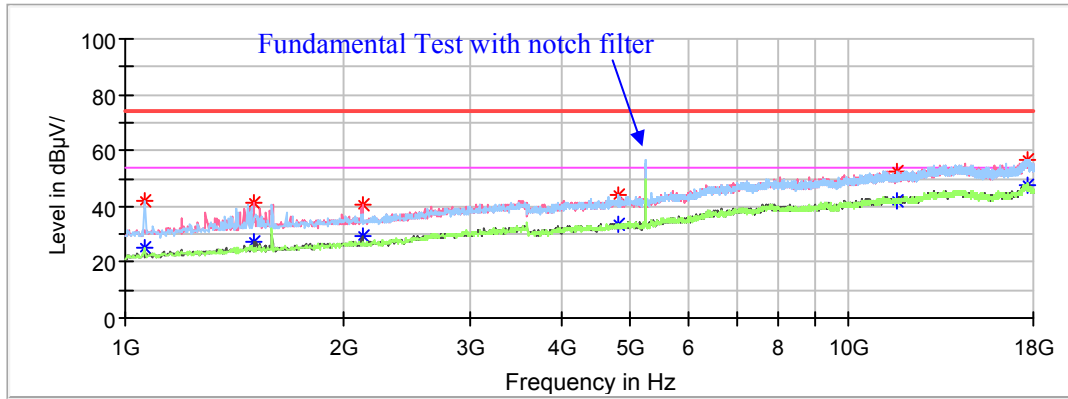
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1496.40	42.15	---	150	V	317	-9.9	74.00	31.85
1496.40	---	26.81	150	V	317	-9.9	54.00	27.19
2122.00	39.40	---	200	V	0	-7.9	68.20	28.80
3264.40	---	30.68	150	H	98	-3.9	54.00	23.32
3264.40	42.47	---	150	H	98	-3.9	74.00	31.53
6950.00	49.55	---	200	V	269	5.2	68.20	18.65
9853.60	51.74	---	200	H	140	8.1	68.20	16.46
17541.00	57.60	---	150	H	232	14.2	68.20	10.60

High Channel: 5240MHz

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1061.20	---	25.23	200	H	235	-12.3	54.00	28.77
1061.20	41.68	---	200	H	235	-12.3	74.00	32.32
1506.60	---	27.54	150	V	309	-9.9	54.00	26.46
1506.60	41.20	---	150	V	309	-9.9	74.00	32.80
2128.80	40.37	---	200	V	137	-7.9	68.20	27.83
4808.00	44.10	---	150	H	219	-0.5	74.00	29.90
4808.00	---	33.69	150	H	219	-0.5	54.00	20.31
11665.80	---	41.88	200	H	317	9.9	54.00	12.12
11665.80	52.26	---	200	H	317	9.9	74.00	21.74
17646.40	56.90	---	200	H	317	14.0	68.20	11.30

802.11n-HT40 Mode:

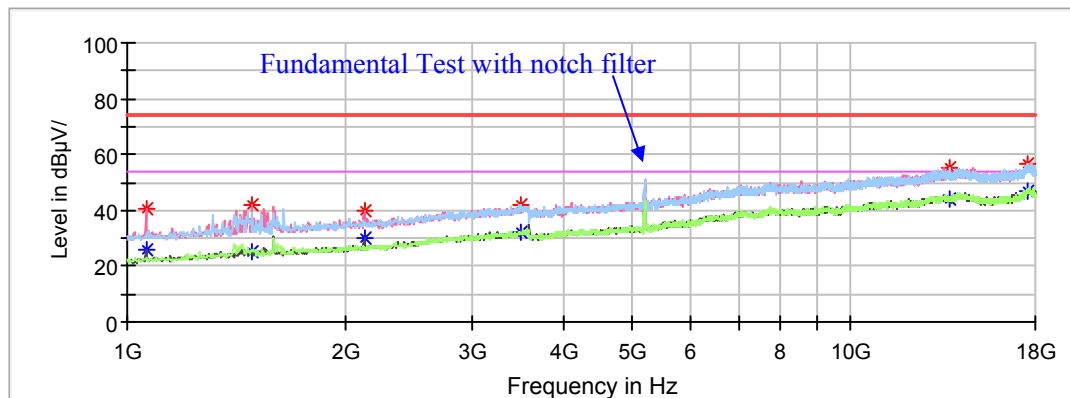
Pre-scan with X,Y and Z axes of orientation, the worst case Y-axis of orientation was recorded

Note:

1. This test was performed with the 5150-5250MHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 5190MHz

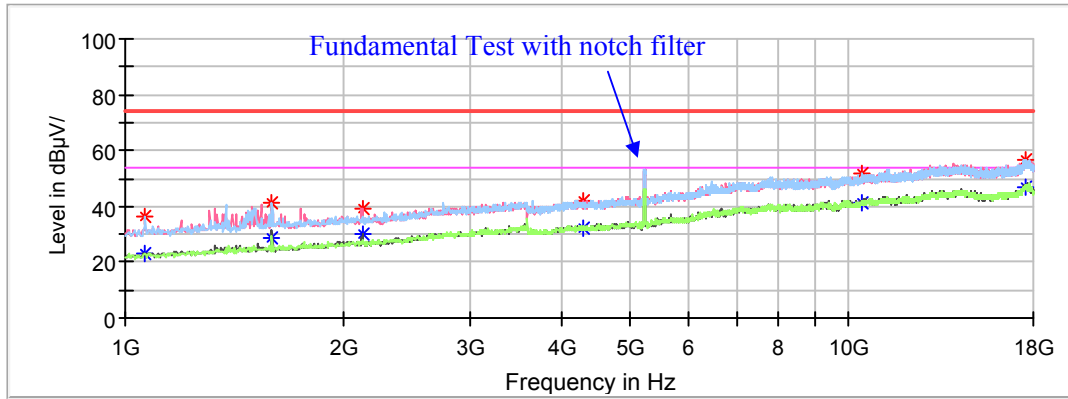
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1061.20	---	25.76	200	V	0	-12.3	54.00	28.24
1061.20	40.23	---	200	V	0	-12.3	74.00	33.77
1486.20	---	25.34	200	V	121	-10.0	54.00	28.66
1486.20	41.98	---	200	V	121	-10.0	74.00	32.02
2128.80	39.89	---	200	V	145	-7.9	68.20	28.31
3495.60	42.16	---	150	H	339	-3.5	68.20	26.04
13716.00	55.06	---	150	V	115	12.2	68.20	13.14
17561.40	56.90	---	150	H	110	14.2	68.20	11.30

High Channel: 5230MHz

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1064.60	---	23.06	200	H	44	-12.3	54.00	30.94
1064.60	36.61	---	200	H	44	-12.3	74.00	37.39
1595.00	---	28.66	150	H	220	-9.6	54.00	25.34
1595.00	41.29	---	150	H	220	-9.6	74.00	32.71
2128.80	39.50	---	200	V	143	-7.9	68.20	28.70
4308.20	---	32.02	200	V	15	-1.3	54.00	21.98
4308.20	42.24	---	200	V	15	-1.3	74.00	31.76
10428.20	51.61	---	200	H	211	8.9	68.20	16.59
17537.60	56.76	---	200	V	61	14.2	68.20	11.44

1GHz-18GHz (5725-5850MHz Band):**802.11a Mode:**

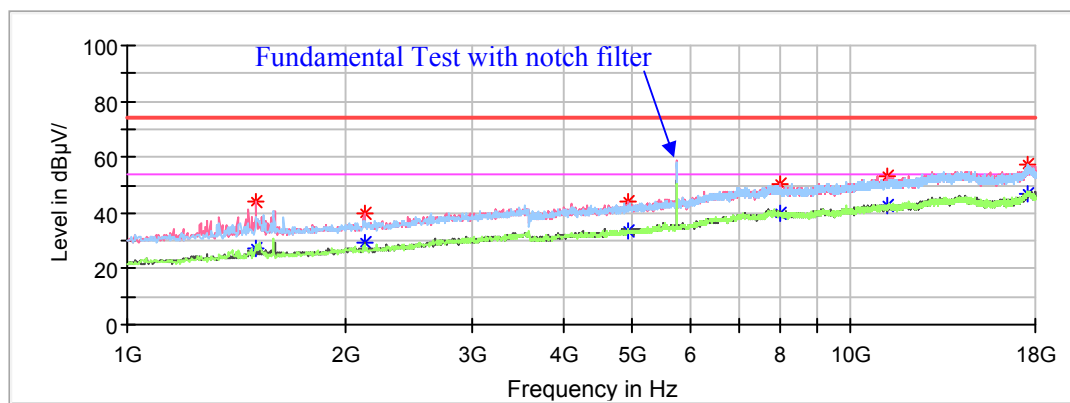
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Y-axis of orientation** was recorded.)

Note:

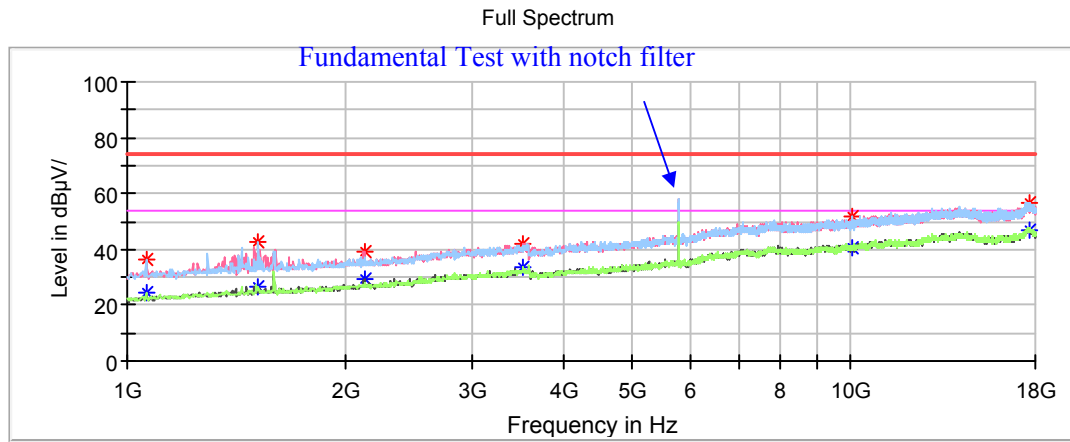
1. This test was performed with the 5725-5850MHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 5745MHz

Full Spectrum



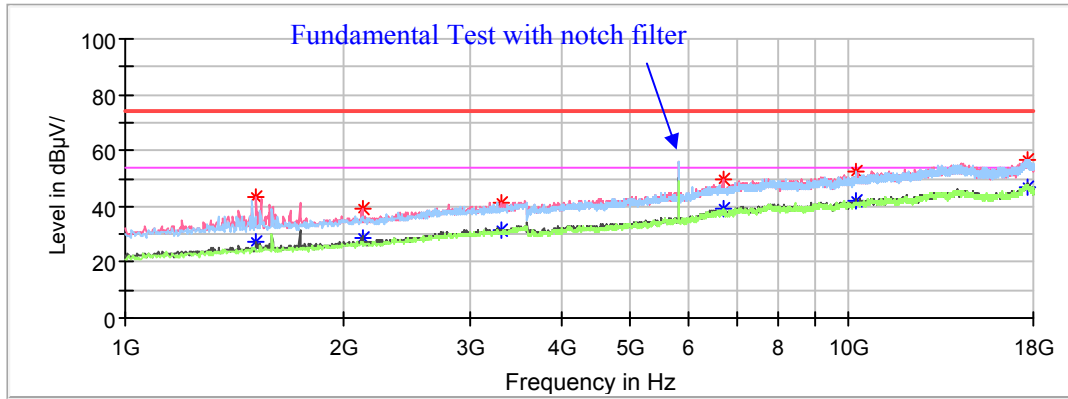
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1506.60	---	27.44	200	V	338	-9.9	54.00	26.56
1506.60	44.36	---	200	V	338	-9.9	74.00	29.64
2128.80	40.12	---	150	V	140	-7.9	68.20	28.08
4937.20	---	33.49	150	H	317	-0.4	54.00	20.51
4937.20	43.96	---	150	H	317	-0.4	74.00	30.04
8000.60	50.14	---	150	V	152	7.1	68.20	18.06
11237.40	---	42.40	150	V	199	9.8	54.00	11.60
11237.40	52.86	---	150	V	199	9.8	74.00	21.14
17561.40	57.17	---	200	H	7	14.2	68.20	11.03

Middle Channel: 5785MHz

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1061.20	---	24.18	150	H	243	-12.3	54.00	29.82
1061.20	36.13	---	150	H	243	-12.3	74.00	37.87
1516.80	---	26.57	200	H	44	-9.9	54.00	27.43
1516.80	42.57	---	200	H	44	-9.9	74.00	31.43
2128.80	39.18	---	200	V	165	-7.9	68.20	29.02
3516.00	42.27	---	150	V	260	-3.5	68.20	25.93
10037.20	51.79	---	150	H	0	8.3	68.20	16.41
17653.20	56.88	---	150	V	236	14.0	68.20	11.32

High Channel: 5825MHz

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1516.80	---	27.38	150	V	109	-9.9	54.00	26.62
1516.80	43.09	---	150	V	109	-9.9	74.00	30.91
2125.40	39.48	---	200	V	163	-7.9	68.20	28.72
3301.80	41.02	---	150	V	215	-3.9	68.20	27.18
6695.00	49.39	---	200	V	245	4.8	68.20	18.81
10237.80	52.60	---	150	H	332	8.6	68.20	15.60
17680.40	56.73	---	150	V	7	14.0	68.20	11.47

802.11n-HT20 Mode:

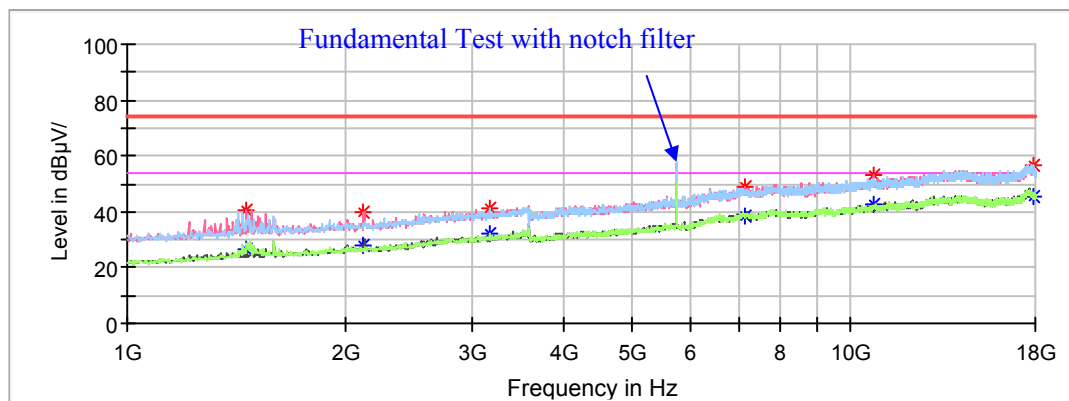
(Pre-scan with X,Y and Z axes of orientation, the worst case **Y-axis of orientation** was recorded)

Note:

1. This test was performed with the 5725-5850MHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 5745MHz

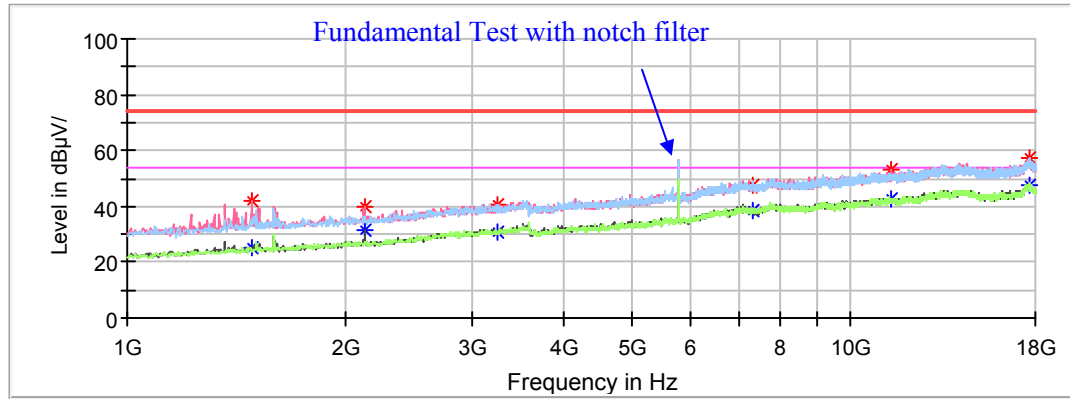
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1462.40	---	26.27	200	V	121	-10.1	54.00	27.73
1462.40	40.33	---	200	V	121	-10.1	74.00	33.67
2122.00	39.80	---	150	V	139	-7.9	68.20	28.40
3172.60	41.23	---	150	H	6	-4.1	68.20	26.97
7150.60	48.95	---	150	V	281	5.6	68.20	19.25
10741.00	---	42.83	200	V	86	9.4	54.00	11.17
10741.00	53.13	---	200	V	86	9.4	74.00	20.87
17925.20	---	45.53	150	H	135	13.6	54.00	8.47
17925.20	56.85	---	150	H	135	13.6	74.00	17.15

Middle Channel: 5785MHz

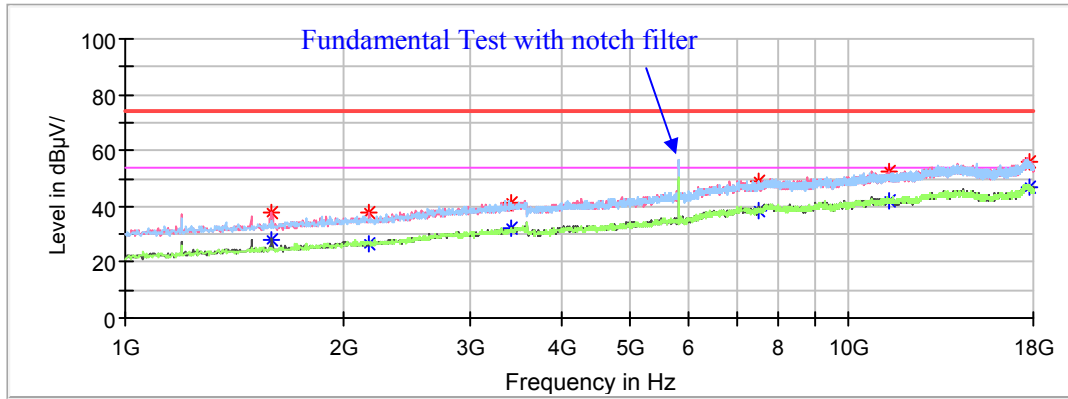
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1486.20	---	25.16	200	V	209	-10.0	54.00	28.84
1486.20	41.78	---	200	V	209	-10.0	74.00	32.22
2128.80	39.67	---	150	V	91	-7.9	68.20	28.53
3247.40	40.53	---	150	H	3	-4.0	68.20	27.67
7327.40	---	38.40	150	H	328	5.9	54.00	15.60
7327.40	47.75	---	150	H	328	5.9	74.00	26.25
11376.80	---	42.61	150	V	7	9.8	54.00	11.39
11376.80	52.80	---	150	V	7	9.8	74.00	21.20
17690.60	57.35	---	200	H	353	14.0	68.20	10.85

High Channel: 5825MHz

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1591.60	---	28.29	200	V	162	-9.6	54.00	25.71
1591.60	37.81	---	200	V	162	-9.6	74.00	36.19
2176.40	37.90	---	200	V	139	-7.8	68.20	30.30
3414.00	41.22	---	150	H	15	-3.7	68.20	26.98
7524.60	---	38.22	200	H	357	6.2	54.00	15.78
7524.60	49.30	---	200	H	357	6.2	74.00	24.70
11349.60	---	42.05	150	V	304	9.8	54.00	11.95
11349.60	52.64	---	150	V	304	9.8	74.00	21.36
17734.80	---	46.76	200	H	329	13.9	54.00	7.24
17734.80	55.76	---	200	H	329	13.9	74.00	18.24

802.11n-HT40 Mode:

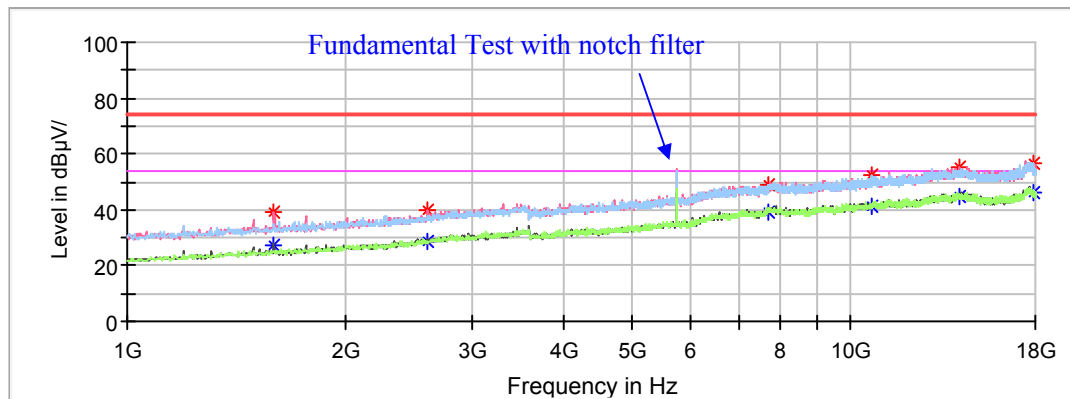
(Pre-scan with X,Y and Z axes of orientation, the worst case **Y-axis of orientation** was recorded)

Note:

1. This test was performed with the 5725-5850MHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 5755MHz

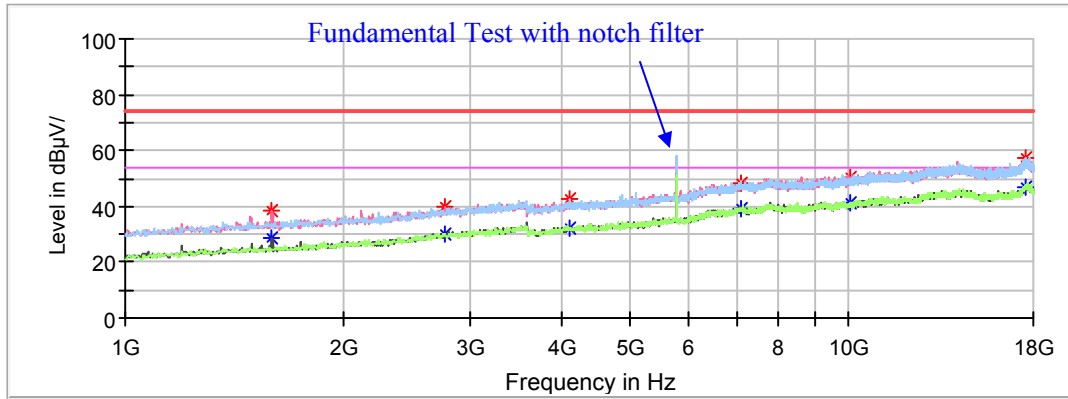
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1595.00	---	27.42	200	V	151	-9.6	54.00	26.58
1595.00	39.39	---	200	V	151	-9.6	74.00	34.61
2604.80	39.61	---	150	V	297	-6.4	68.20	28.59
7687.80	---	39.26	150	H	281	6.5	54.00	14.74
7687.80	49.19	---	150	H	281	6.5	74.00	24.81
10659.40	---	40.96	200	H	92	9.2	54.00	13.04
10659.40	52.26	---	200	H	92	9.2	74.00	21.74
14110.40	55.38	---	150	V	297	12.5	68.20	12.82
17864.00	---	45.95	150	H	17	13.7	54.00	8.05
17864.00	56.88	---	150	H	17	13.7	74.00	17.12

High Channel: 5795MHz

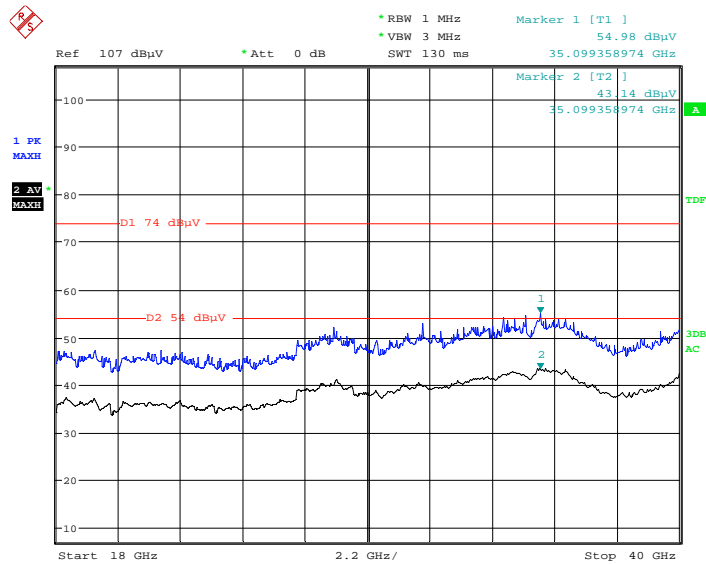
Full Spectrum



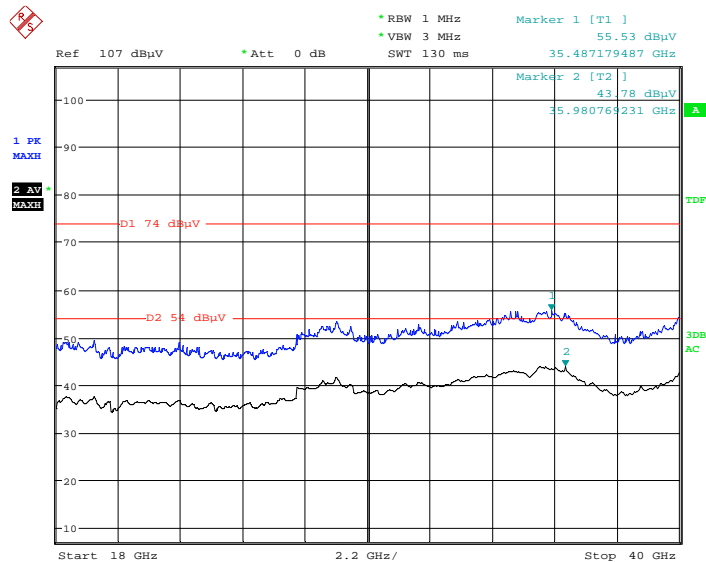
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1595.00	---	28.85	200	V	157	-9.6	54.00	25.15
1595.00	38.20	---	200	V	157	-9.6	74.00	35.80
2771.40	---	29.77	200	V	99	-5.5	54.00	24.23
2771.40	40.12	---	200	V	99	-5.5	74.00	33.88
4124.60	---	31.88	200	H	352	-1.6	54.00	22.12
4124.60	42.61	---	200	H	352	-1.6	74.00	31.39
7113.20	48.50	---	150	H	110	5.5	68.20	19.70
10047.40	50.12	---	200	V	300	8.3	68.20	18.08
17534.20	57.55	---	150	H	64	14.2	68.20	10.65

18GHz-40GHz (5150-5250MHz Band):

Pre-scan with 802.11a, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **middle channel of 802.11a mode in Y-axis of orientation** was recorded

Horizontal

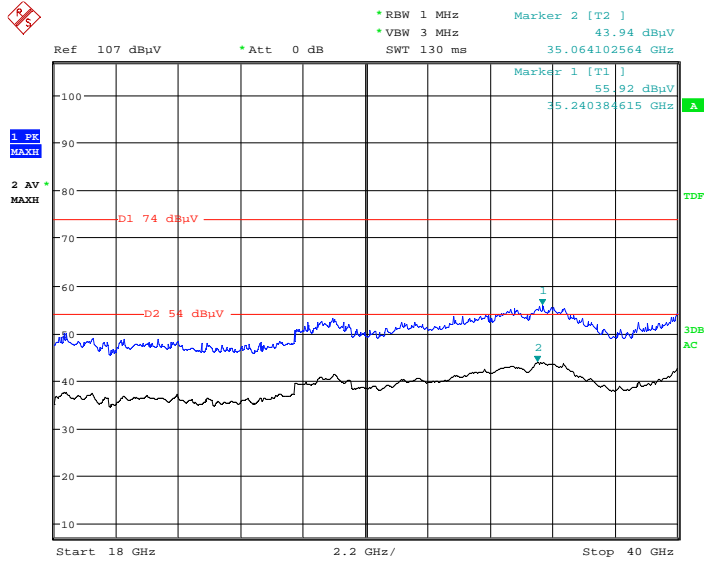
Date: 20.AUG.2019 12:41:08

Vertical

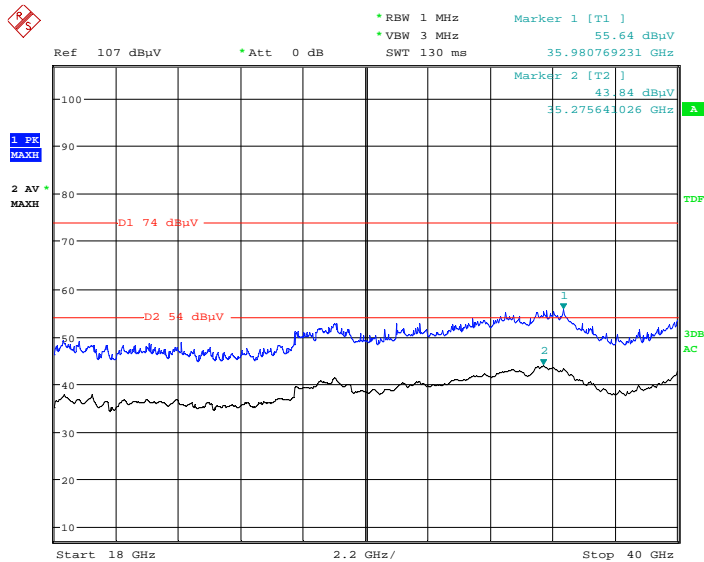
Date: 20.AUG.2019 13:43:23

18GHz-40GHz (5725-5850 Band):

Pre-scan with 802.11a, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **high channel of 802.11n-HT20 mode in Y-axis of orientation** was recorded

Horizontal

Date: 20.AUG.2019 14:45:33

Vertical

Date: 20.AUG.2019 15:01:08

Restricted Bands Emissions Test (5150-5250MHz Band):

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

802.11a Mode: (Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 5180MHz								
5150.00	57.55	---	100.0	H	291.0	10.2	74.00	16.45
5150.00	---	48.87	100.0	H	291.0	10.2	54.00	5.13
5150.00	56.32	---	100.0	V	294.0	10.2	74.00	17.68
5150.00	---	47.65	100.0	V	294.0	10.2	54.00	6.35
High Channel: 5240MHz								
5350.00	59.83	---	100.0	H	175.0	10.9	74.00	14.17
5350.00	---	49.45	100.0	H	175.0	10.9	54.00	4.55
5350.00	58.39	---	150.0	V	192.0	10.9	74.00	15.61
5350.00	---	48.22	150.0	V	192.0	10.9	54.00	5.78

802.11n-HT20 Mode: (Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 5180MHz								
5150.00	58.40	---	200.0	H	234.0	10.2	74.00	15.60
5150.00	---	48.89	200.0	H	234.0	10.2	54.00	5.11
5150.00	57.66	---	150.0	V	35.0	10.2	74.00	16.34
5150.00	---	47.29	150.0	V	35.0	10.2	54.00	6.71
High Channel: 5240MHz								
5350.00	---	49.62	100.0	V	350.0	10.9	54.00	4.38
5350.00	59.16	---	100.0	V	350.0	10.9	74.00	14.84
5350.00	---	48.33	100.0	H	84.0	10.9	54.00	5.67
5350.00	57.91	---	100.0	H	84.0	10.9	74.00	16.09

802.11n-HT40 Mode: (Pre-scan in the X, Y and Z axes of orientation, the worst case in Z-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 5190MHz								
5150.00	58.93	---	200.0	H	6.0	10.2	74.00	15.07
5150.00	---	49.52	200.0	H	6.0	10.2	54.00	4.48
5150.00	57.51	---	150.0	V	43.0	10.2	74.00	16.49
5150.00	---	48.36	150.0	V	43.0	10.2	54.00	5.64
Middle Channel: 5230MHz								
5350.00	---	50.30	100.0	H	68.0	10.9	54.00	3.70
5350.00	64.21	---	100.0	H	68.0	10.9	74.00	9.79
5350.00	---	49.28	100.0	V	174.0	10.9	54.00	4.72
5350.00	62.67	---	100.0	V	174.0	10.9	74.00	11.33

Restricted Bands Emissions Test (5725-5850MHz band):

Note:

1. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
2. Corrected Amplitude = Corrected Factor + Reading
3. Margin = Limit - Corrected. Amplitude

802.11a Mode: (Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 5745MHz								
5650.00	58.65	---	100.0	V	143.0	11.7	68.20	9.55
5700.00	58.79	---	150.0	V	105.0	11.7	105.20	46.41
5720.00	60.33	---	150.0	V	342.0	11.7	110.80	50.47
5725.00	61.58	---	200.0	V	205.0	11.7	122.20	60.62
High Channel: 5825MHz								
5850.00	64.69	---	100.0	H	330.0	12.2	122.20	57.51
5855.00	62.55	---	100.0	H	330.0	12.2	110.80	48.25
5875.00	61.38	---	100.0	H	237.0	12.2	105.20	43.82
5925.00	60.60	---	100.0	H	237.0	12.2	68.20	7.60

802.11n-HT20 Mode: (Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 5745MHz								
5650.00	59.32	---	150.0	H	259.0	11.7	68.20	8.88
5700.00	60.29	---	250.0	H	53.0	11.7	105.20	44.91
5720.00	61.77	---	150.0	H	280.0	11.7	110.80	49.03
5725.00	62.09	---	200.0	H	190.0	11.7	122.20	60.11
High Channel: 5825MHz								
5850.00	62.88	---	200.0	V	85.0	12.2	122.20	59.32
5855.00	62.05	---	200.0	V	85.0	12.2	110.80	48.75
5875.00	61.75	---	200.0	V	85.0	12.2	105.20	43.45
5925.00	60.39	---	200.0	V	85.0	12.2	68.20	7.81

802.11n-HT40 Mode: (Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 5755MHz								
5650.00	59.74	---	100.0	H	150.0	11.7	68.20	8.46
5700.00	60.33	---	150.0	H	143.0	11.7	105.20	44.87
5720.00	61.85	---	100.0	H	89.0	11.7	110.80	48.95
5725.00	62.06	---	100.0	H	17.0	11.7	122.20	60.14
High Channel: 5795MHz								
5850.00	62.76	---	150.0	V	8.0	12.2	122.20	59.44
5855.00	61.93	---	150.0	V	8.0	12.2	110.80	48.87
5875.00	60.52	---	150.0	V	294.0	12.2	105.20	44.68
5925.00	59.08	---	150.0	V	294.0	12.2	68.20	9.12

FCC §15.407(a) & §15.407(e)–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. Measurements in the 5.15-5.25 GHz are made over a bandwidth of 1 MHz 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

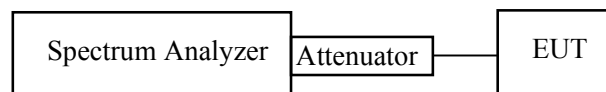
1. Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. 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 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ 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:	23.5~24.5 °C
Relative Humidity:	50~52 %
ATM Pressure:	101.2~101.4 kPa

The testing was performed by Sam Ye from 2019-08-09 to 2019-08-12.

Test Result: Pass.

5150-5250 MHz:

Test mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a	Low	5180	24.529	17.555
	Middle	5200	24.248	17.555
	High	5240	24.048	17.475
802.11n-HT20	Low	5180	24.048	18.437
	Middle	5200	23.647	18.437
	High	5240	23.888	18.437
802.11n-HT40	Low	5190	45.311	36.613
	High	5230	44.890	36.613

5725-5850MHz:

Test mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)
802.11a	Low	5745	16.513	17.395	≥0.5
	Middle	5785	16.513	17.555	≥0.5
	High	5825	16.593	17.956	≥0.5
802.11n-HT20	Low	5745	17.715	18.357	≥0.5
	Middle	5785	17.796	18.437	≥0.5
	High	5825	17.715	18.758	≥0.5
802.11n-HT40	Low	5755	35.912	36.713	≥0.5
	High	5795	36.072	36.874	≥0.5

802.11a mode, 5180MHz



Delta 1 [T1] 1.46 dB RBW 300 kHz RF Att 20 dB

Ref Lvl 20 dBm 24.04809619 MHz SWT 5 ms Unit dBm

11 dB Offset

D1 3.2 dBm

1MAX

D2 -22.8 dBm

T1

T2

▼1 [T1] -23.61 dBm 5.22801603 GHz

▲1 [T1] 1.46 dB 24.04809619 MHz

OPA

▼T1 [T1] -6.98 dBm 5.23130261 GHz

▼T2 [T1] -7.72 dBm 5.24877756 GHz

1

1MAX

Center 5.24 GHz 4 MHz/ Span 40 MHz

Date: 9.AUG.2019 14:50:53

Delta 1 [T1] -2.04 dB

RBW 300 kHz RF Att 20 dB

Ref Lvl 20 dBm 24.04809619 MHz

SWT 5 ms Unit dBm

11 dB Offset

D1 3.02 dBm

1MAX

T1

OPB

T1 [T1]

T2 [T1]

-21.08 dBm

5.16793587 GHz

-2.04 dB

24.04809619 MHz

18.43687375 MHz

-5.43 dBm

5.17082164 GHz

-6.16 dBm

5.18925852 GHz

D2 -22.98 dBm

1MA

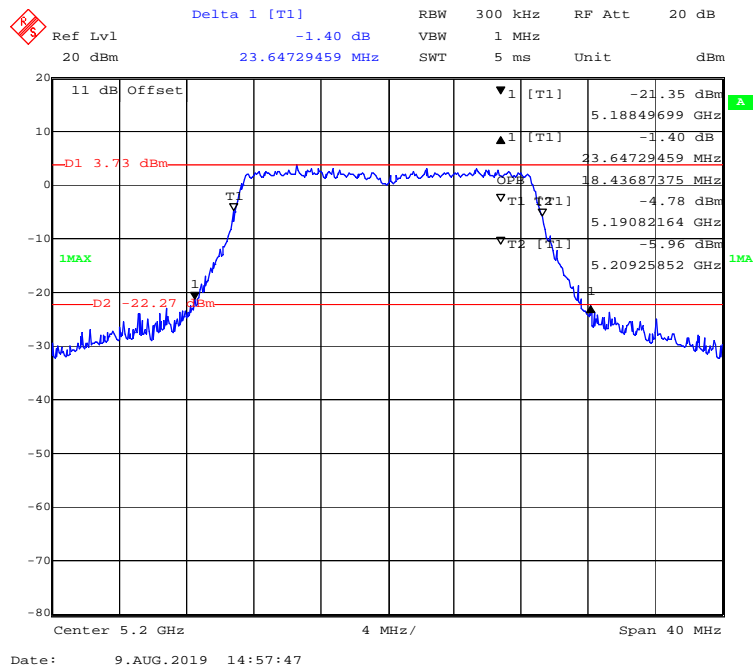
Center 5.18 GHz

4 MHz/

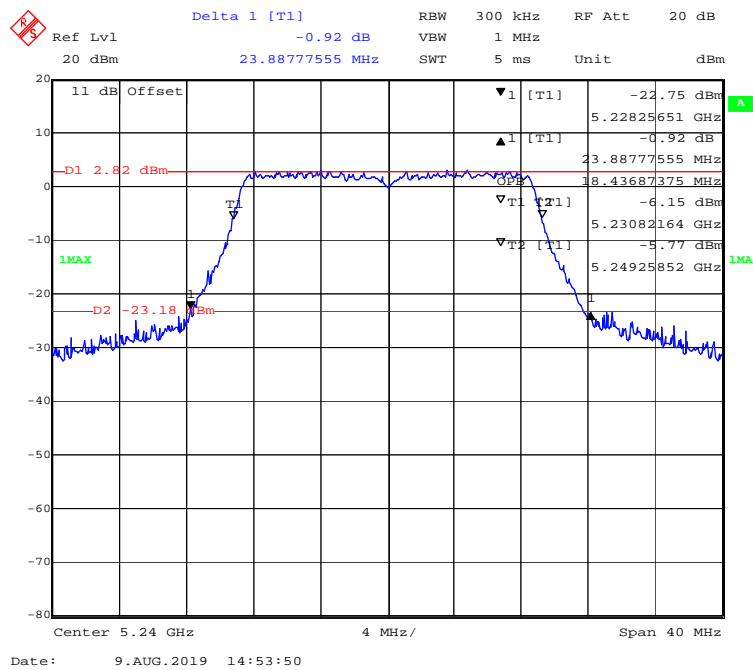
Span 40 MHz

Date: 9.AUG.2019 15:00:51

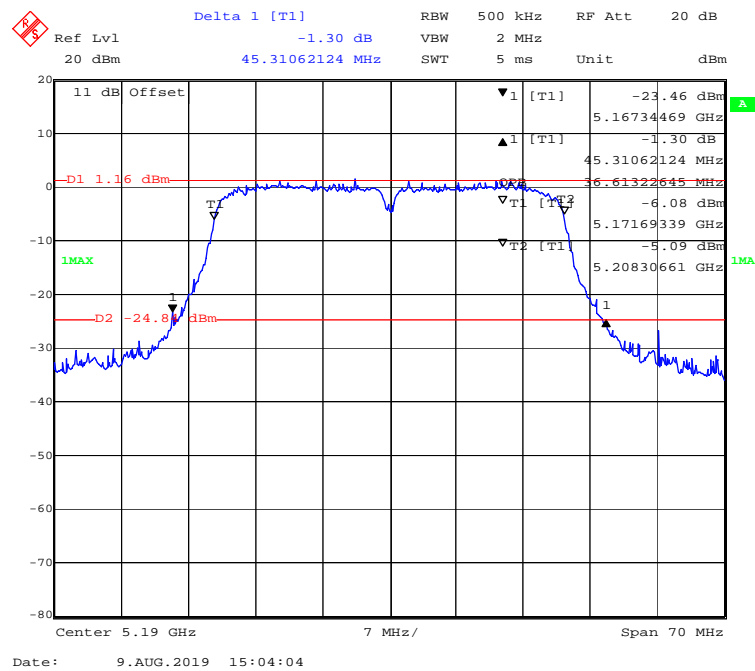
802.11n-HT20 mode, 5200MHz



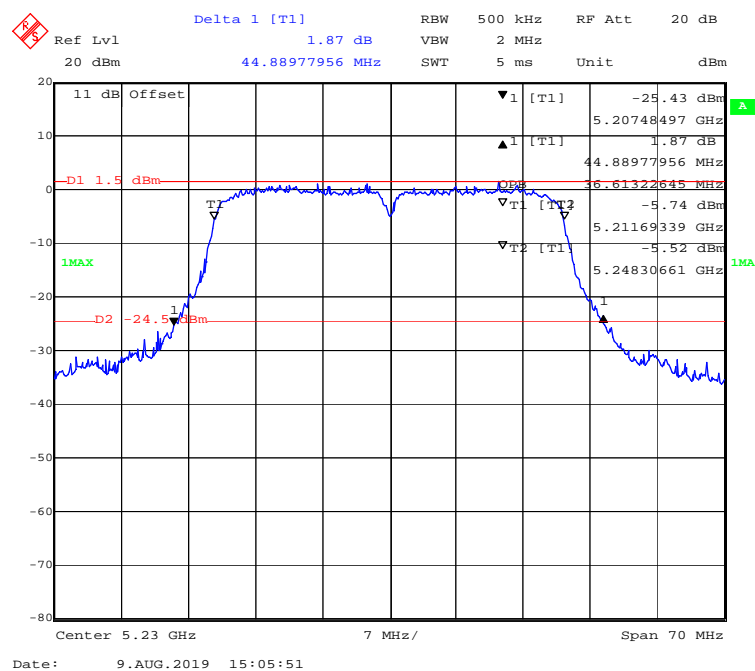
802.11n-HT20 mode, 5240MHz



802.11n-HT40 mode, 5190MHz



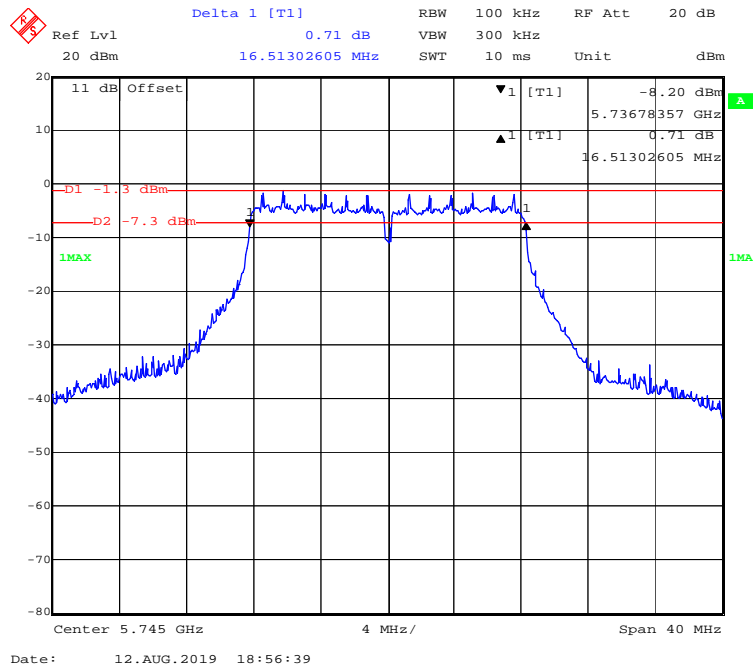
802.11n-HT40 mode, 5230MHz



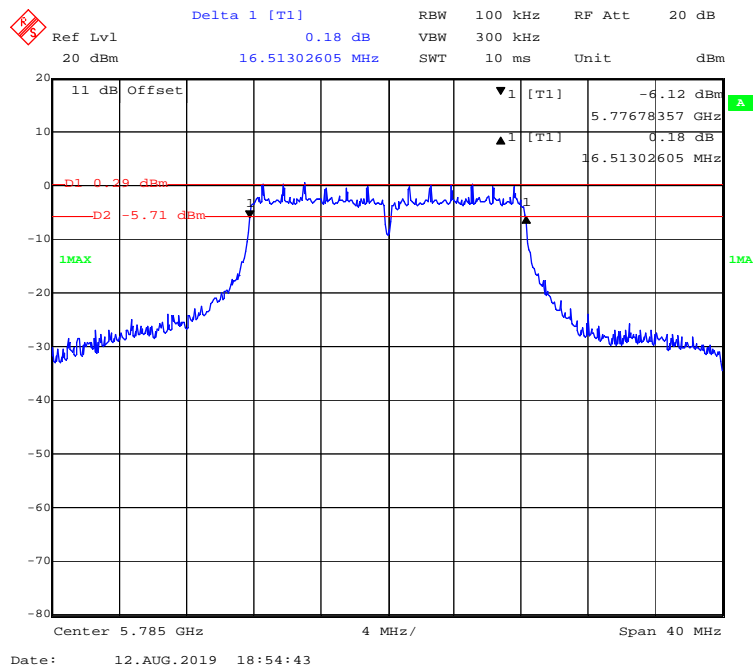
5725-5850 MHz Band

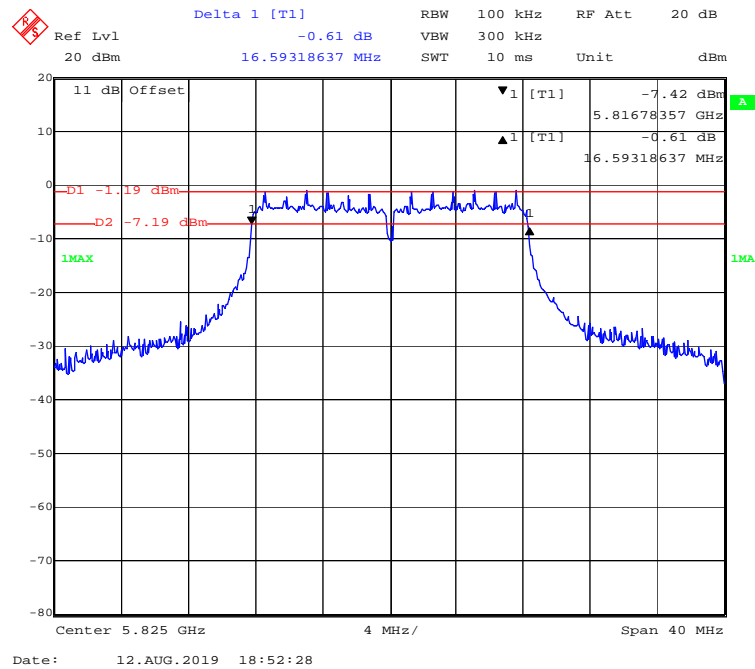
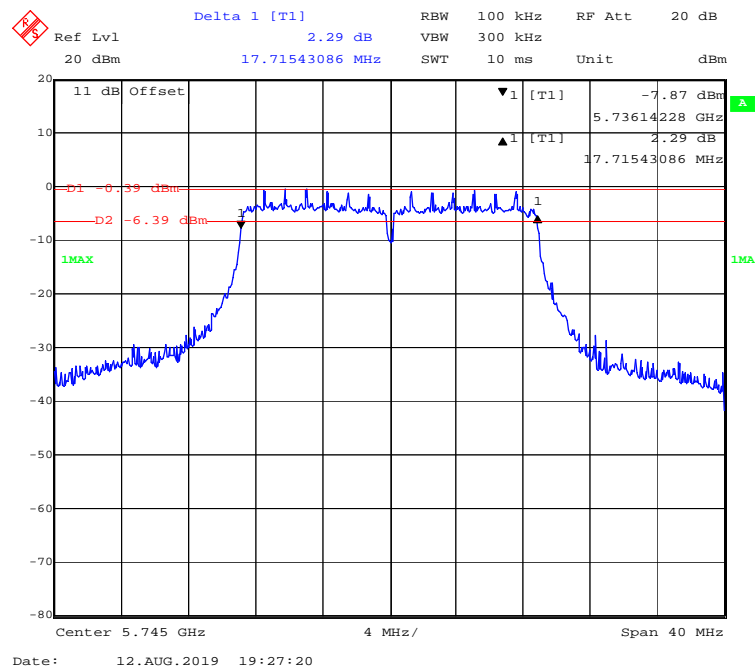
6dB Bandwidth

802.11a mode, 5745MHz

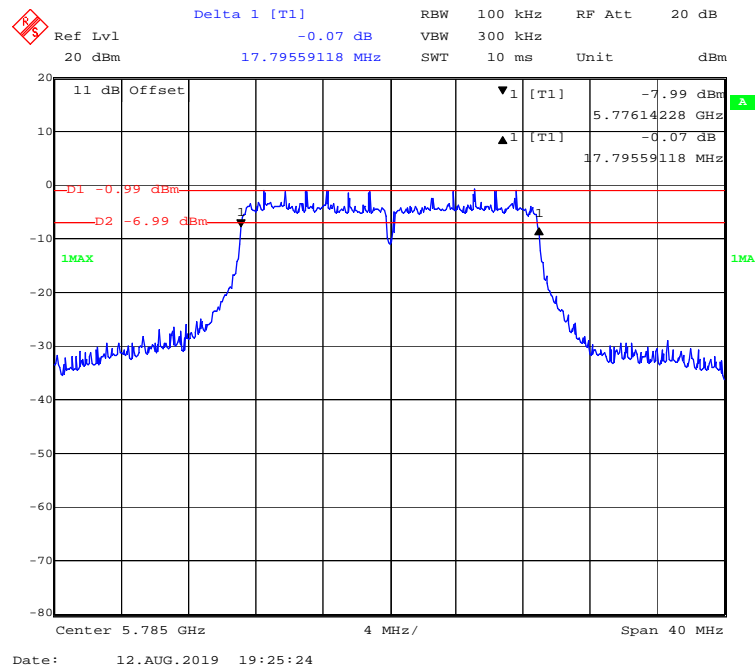


802.11a mode, 5785MHz

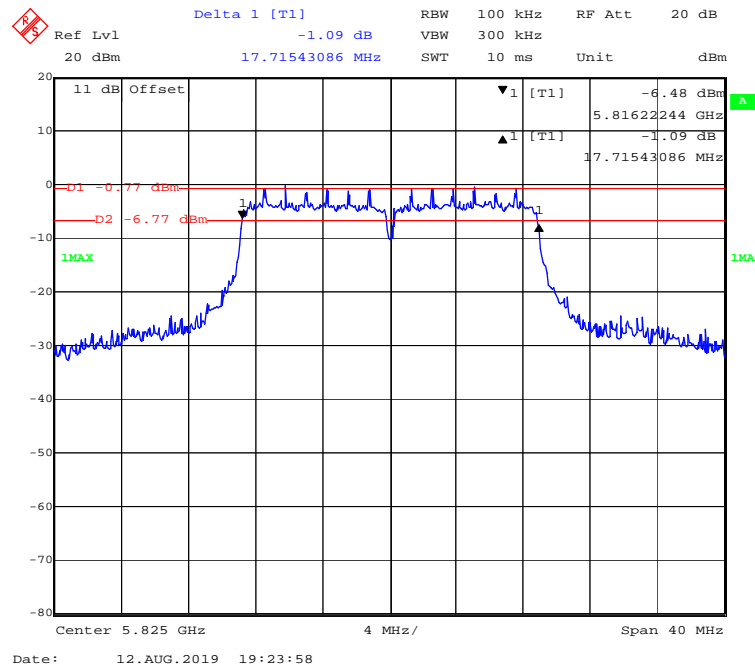


802.11a mode, 5825MHz**802.11n-HT20 mode, 5745MHz**

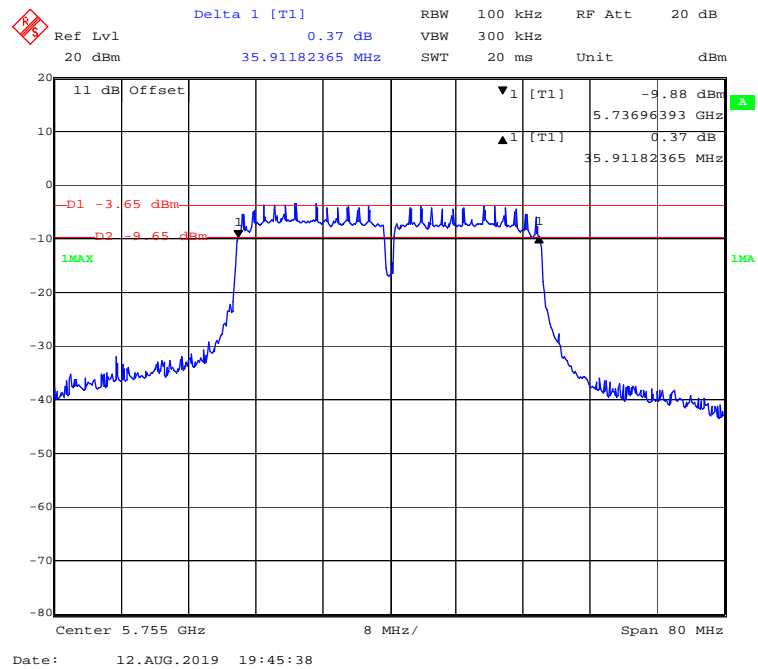
802.11n-HT20 mode, 5785MHz



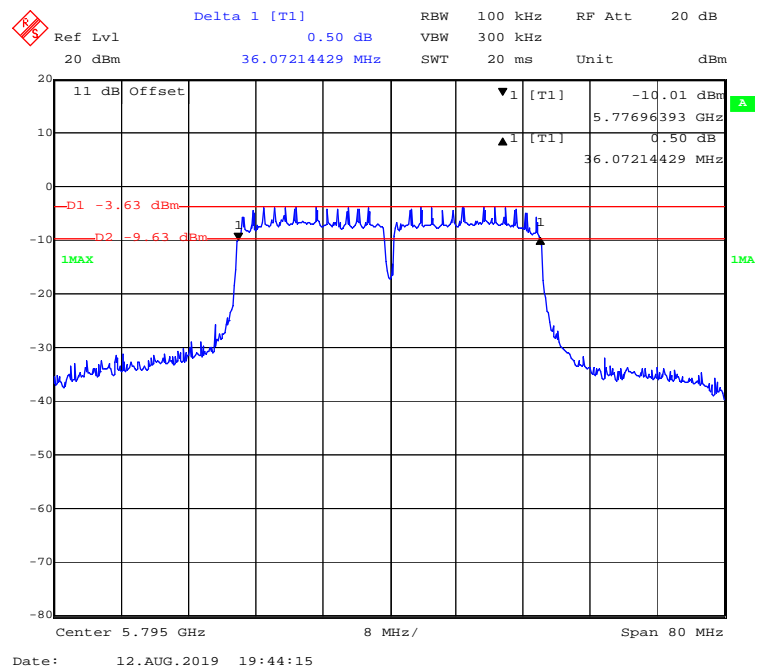
802.11n-HT20 mode, 5825MHz



802.11n-HT40 mode, 5755MHz

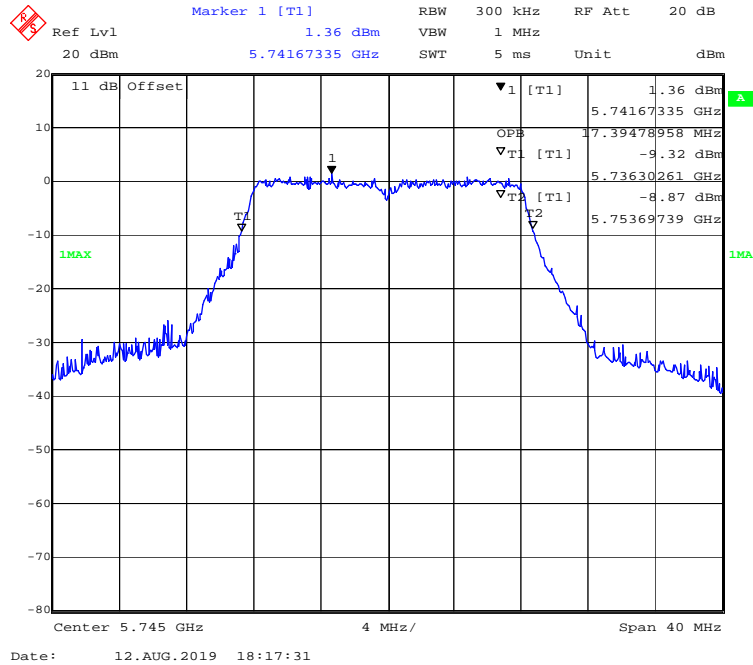


802.11n-HT40 mode, 5795MHz

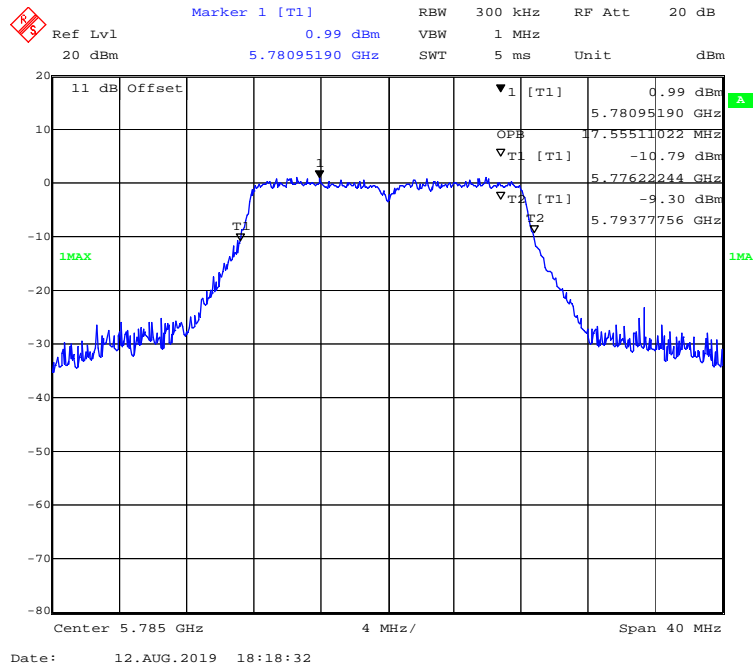


99% Occupied Bandwidth

802.11a mode, 5745MHz



802.11a mode, 5785MHz



Ref Lvl 20 dBm
 20 dBm
 300 kHz
 5 ms
 RF Att 20 dB
 Unit dBm

Marker 1 [T1]
 1.52 dBm
 5.82351703 GHz

11 dB Offset
 11.95591182 MHz
 -11.49 dBm
 5.81614228 GHz
 -9.87 dBm
 5.83409820 GHz

Center 5.825 GHz
 4 MHz/
 Span 40 MHz

Date: 12.AUG.2019 18:19:12

Ref Lvl 1.27 dBm RBW 300 kHz RF Att 20 dB
 20 dBm 5.73982966 GHz SWT 5 ms Unit dBm

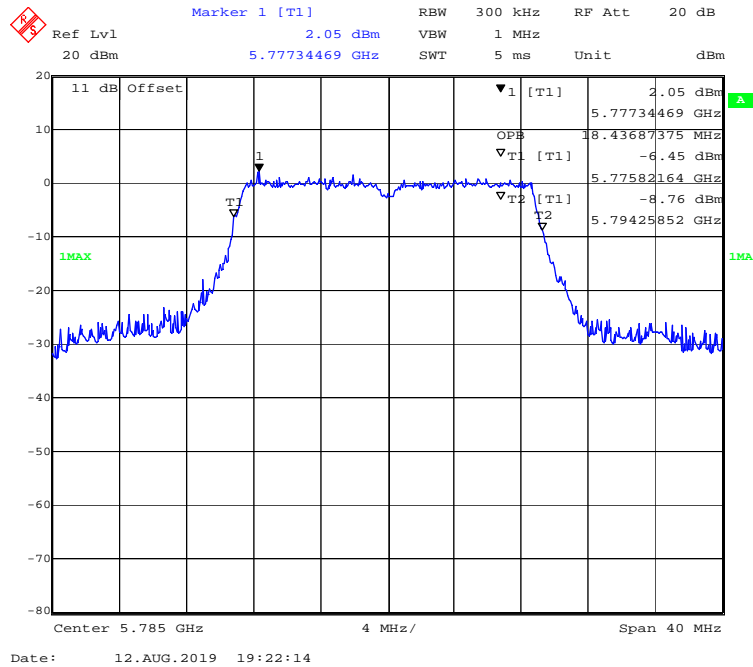
11 dB Offset
 1.27 dBm
 5.73982966 GHz
 1.35671343 MHz
 -7.49 dBm
 5.73582164 GHz
 -7.45 dBm
 5.75417836 GHz

1MAX
 1MA

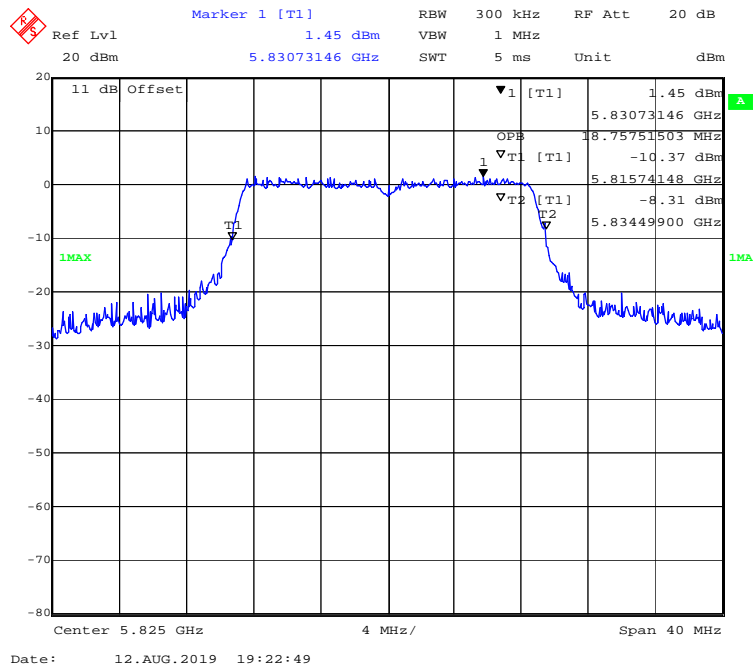
Center 5.745 GHz 4 MHz/
 Span 40 MHz

Date: 12.AUG.2019 19:21:36

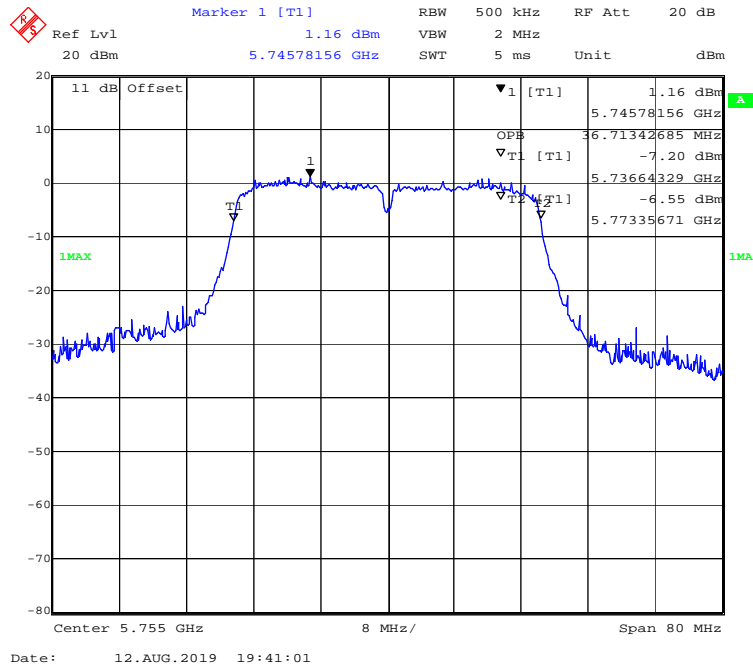
802.11n-HT20 mode, 5785MHz



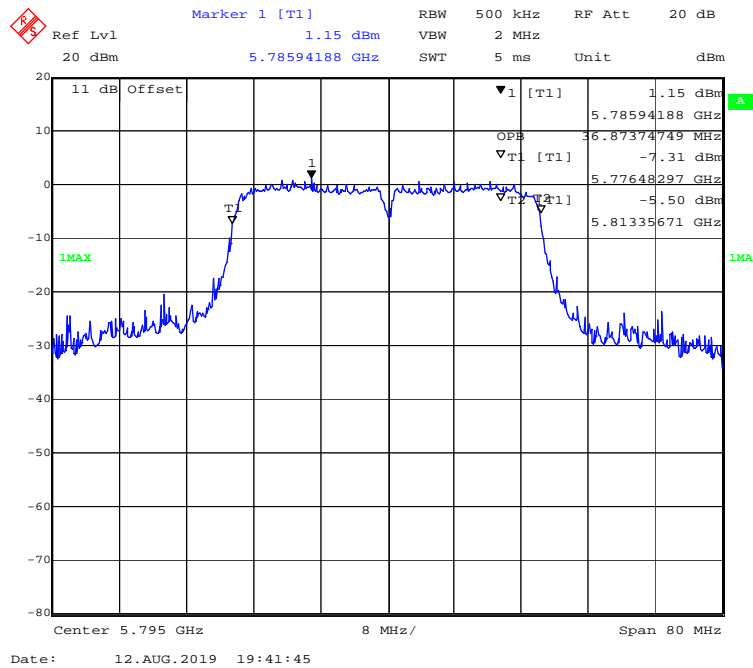
802.11n-HT20 mode, 5825MHz



802.11n-HT40 mode, 5755MHz



802.11n-HT40 mode, 5795MHz



FCC §15.407(a) (1) (3) – CONDUCTED TRANSMITTER OUTPUT POWER**Applicable Standard**

According to §15.407(a)(1)

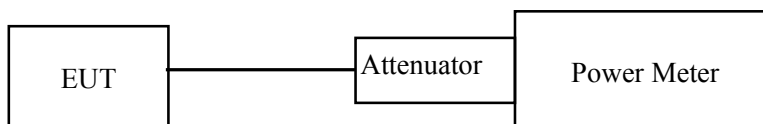
(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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..

According to §15.407(a) (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

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:	23.5 °C
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Sam Ye on 2019-08-12.

Test Mode: Transmitting

Test mode	Band	Channel	Frequency (MHz)	Conducted Output Power Reading (dBm)	Duty Cycle factor (dB)	Average Conducted Output Power (dBm)	Limit (dBm)	Result
802.11a	5150-5250 MHz	Low	5180	11.73	0.09	11.82	24	PASS
		Middle	5200	12.09	0.09	12.18	24	PASS
		High	5240	11.84	0.09	11.93	24	PASS
	5725-5850 MHz	Low	5745	10.54	0.09	10.63	30	PASS
		Middle	5785	10.60	0.09	10.69	30	PASS
		High	5825	10.77	0.09	10.86	30	PASS
802.11n-HT20	5150-5250 MHz	Low	5180	11.62	0.10	11.72	24	PASS
		Middle	5200	11.77	0.10	11.87	24	PASS
		High	5240	12.01	0.10	12.11	24	PASS
	5725-5850 MHz	Low	5745	11.24	0.10	11.34	30	PASS
		Middle	5785	11.20	0.10	11.3	30	PASS
		High	5825	11.33	0.10	11.43	30	PASS
802.11n-HT40	5150-5250 MHz	Low	5190	11.05	0.27	11.32	24	PASS
		High	5230	10.85	0.27	11.12	24	PASS
	5725-5850 MHz	Low	5755	11.06	0.23	11.29	30	PASS
		High	5795	10.91	0.23	11.14	30	PASS

Note: The maximum antenna gain is 1.95 dBi.

FCC §15.407(a) (1) (3) - POWER SPECTRAL DENSITY**Applicable Standard**

According to §15.407(a) (1)

(iv) For 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.

According to §15.407(a) (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

The measurements are base on FCC KDB 789033 D02 General UNII Test Proceдыres New Rules v02r01: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section F: Maximum power spectral density (PPSD)

Test Data**Environmental Conditions**

Temperature:	22.5~24.5 °C
Relative Humidity:	50~52 %
ATM Pressure:	101.2~101.3 kPa

The testing was performed by Sam Ye from 2019-08-09 to 2019-08-12.

Test Mode: Transmitting

5150MHz-5250MHz:

Mode	Channel	Frequency (MHz)	PSD Reading (dBm/MHz)	Duty Cycle factor (dB)	PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	Low	5180	0.79	0.09	0.88	11	PASS
	Middle	5200	0.86	0.09	0.95	11	PASS
	High	5240	1.34	0.09	1.43	11	PASS
802.11n20	Low	5180	0.70	0.10	0.8	11	PASS
	Middle	5200	0.51	0.10	0.61	11	PASS
	High	5240	0.76	0.10	0.86	11	PASS
802.11n40	Low	5190	-2.86	0.27	-2.59	11	PASS
	High	5230	-3.43	0.27	-3.16	11	PASS

Note: The maximum antenna gain is 1.95 dBi.

5725MHz-5850MHz:

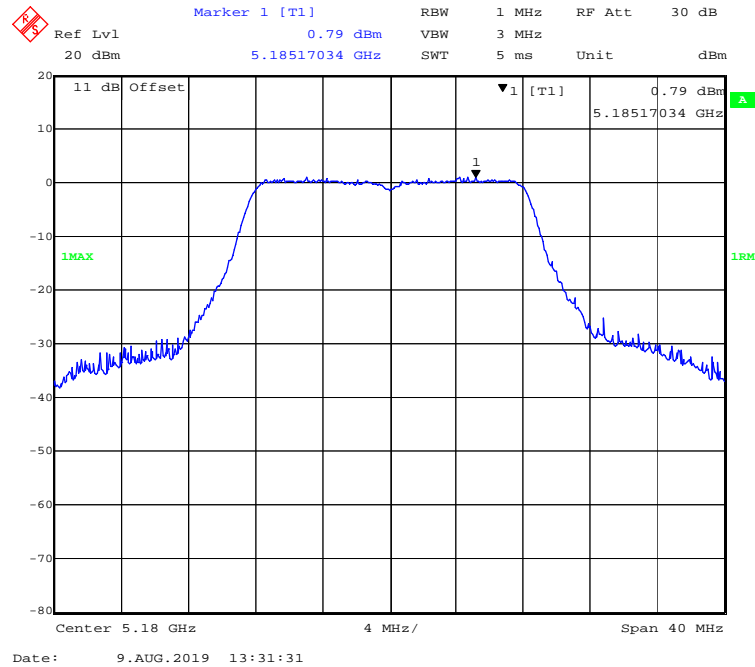
Mode	Channel	Frequency (MHz)	Reading (dBm/1MHz)	Duty Cycle factor (dB)	PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11a	Low	5745	-0.37	0.09	-3.29	30	PASS
	Middle	5785	-0.53	0.09	-3.45	30	PASS
	High	5825	-0.20	0.09	-3.12	30	PASS
802.11n20	Low	5745	-0.08	0.10	-2.99	30	PASS
	Middle	5785	0.25	0.10	-2.66	30	PASS
	High	5825	0.12	0.10	-2.79	30	PASS
802.11n40	Low	5755	-2.38	0.23	-5.16	30	PASS
	High	5795	-3.01	0.23	-5.79	30	PASS

Note 1: The maximum antenna gain is 1.95 dBi.

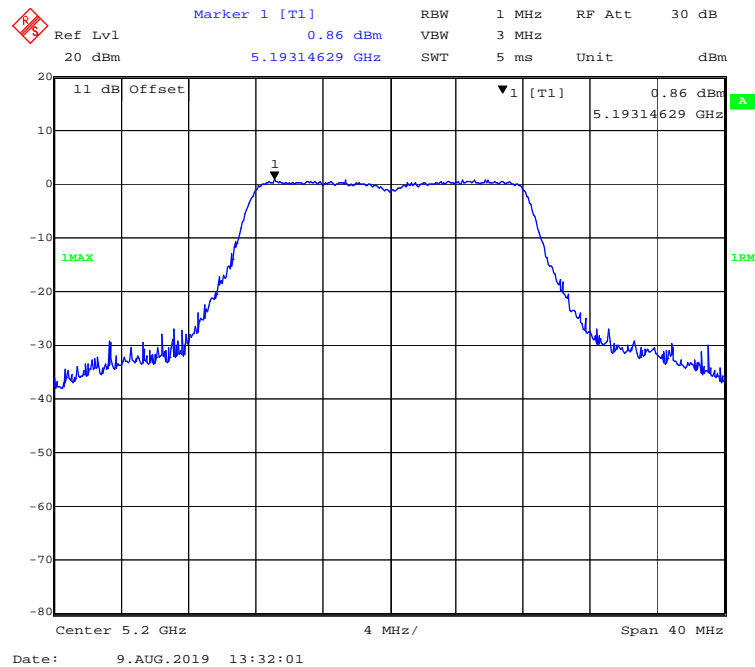
Note 2: The RBW = 1MHz, add the offset $10\lg(1\text{MHz}/500\text{kHz})=3.01$, $\text{PSD} = \text{Reading} + \text{Duty Cycle factor} - 10\lg(1\text{MHz}/500\text{kHz})$.

5150MHz-5250MHz Band :

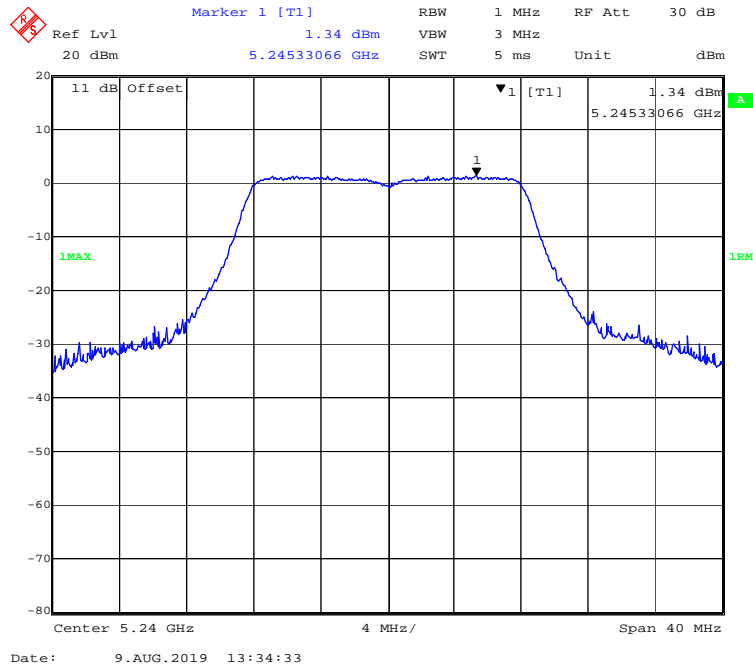
802.11a mode, Power spectral density-5180MHz



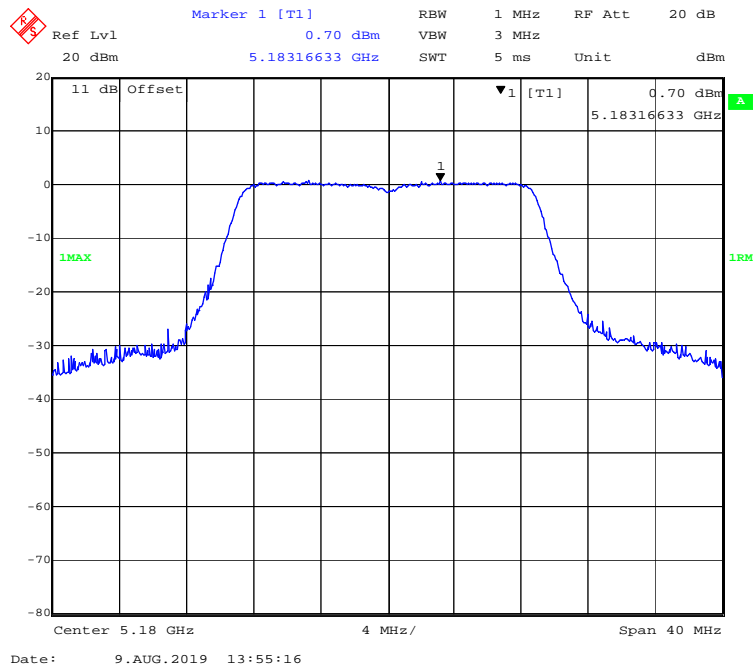
802.11a mode, Power spectral density-5200MHz



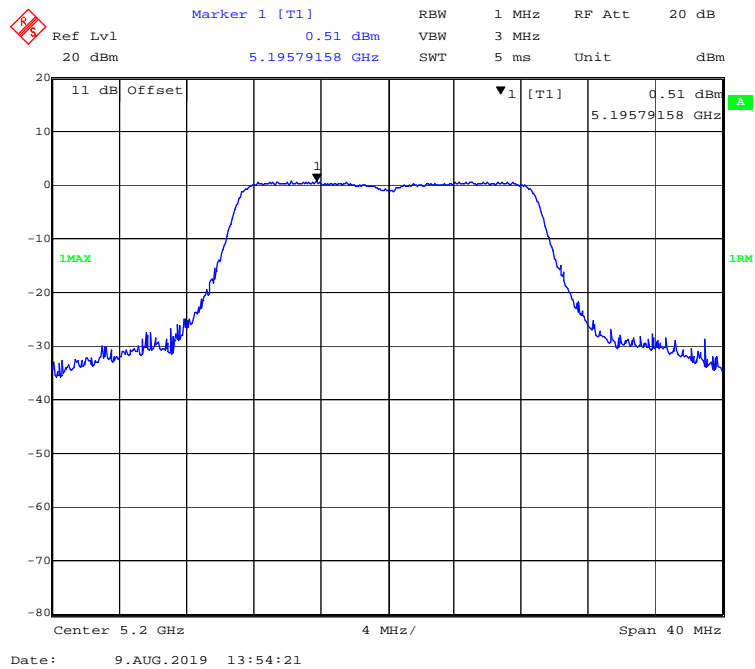
802.11a mode, Power spectral density-5240MHz



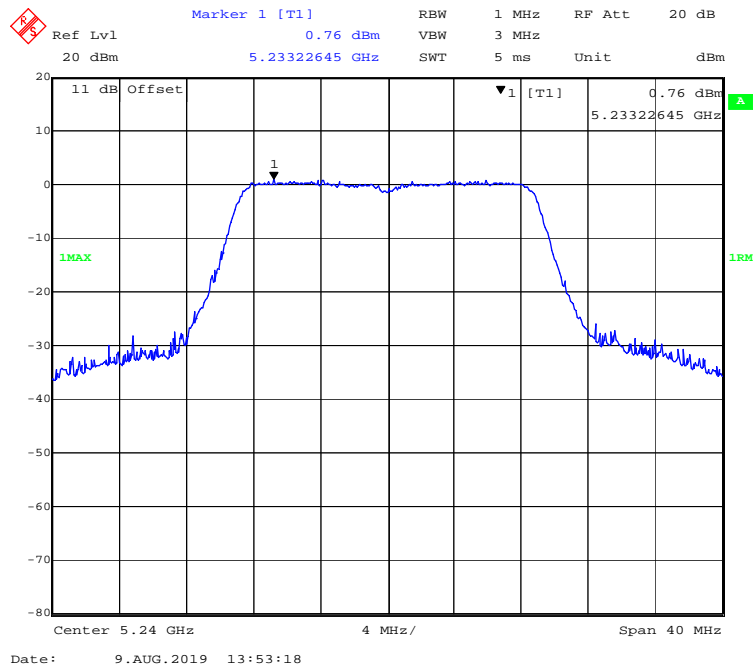
802.11n-HT20 mode, Power spectral density-5180MHz



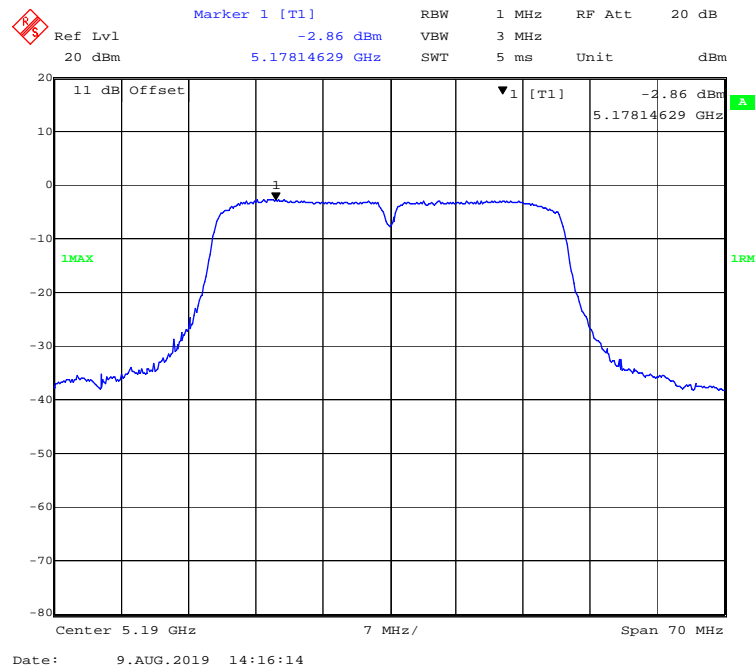
802.11n-HT20 mode, Power spectral density-5200MHz



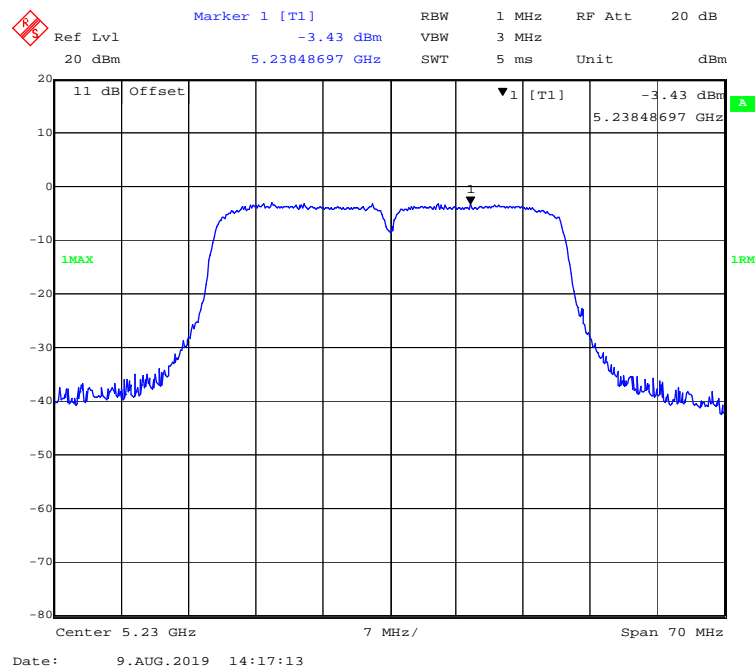
802.11n-HT20 mode, Power spectral density-5240MHz

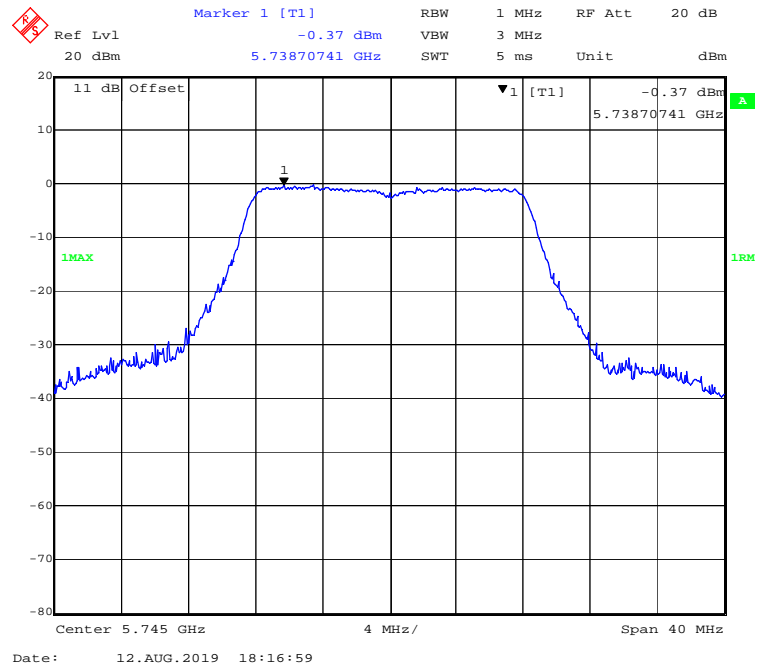
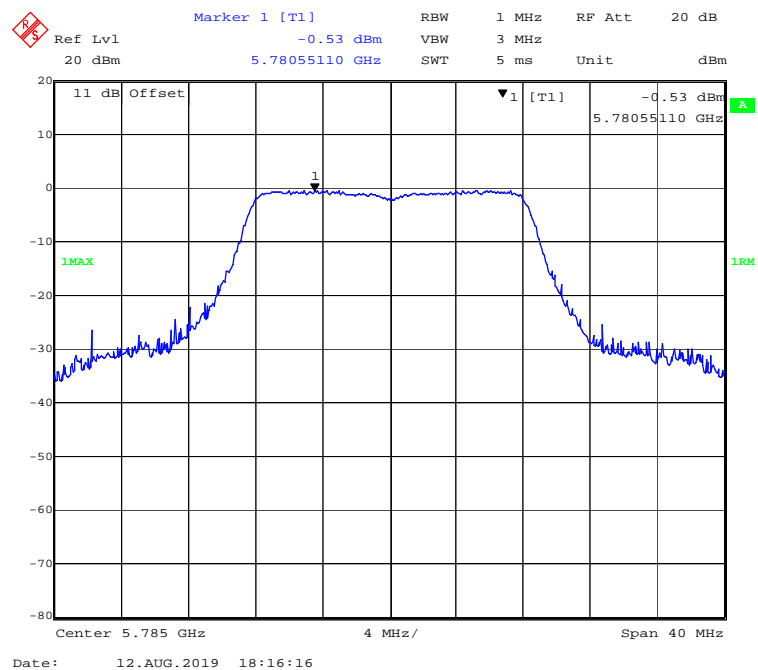


802.11n-HT40 mode, Power spectral density-5190MHz

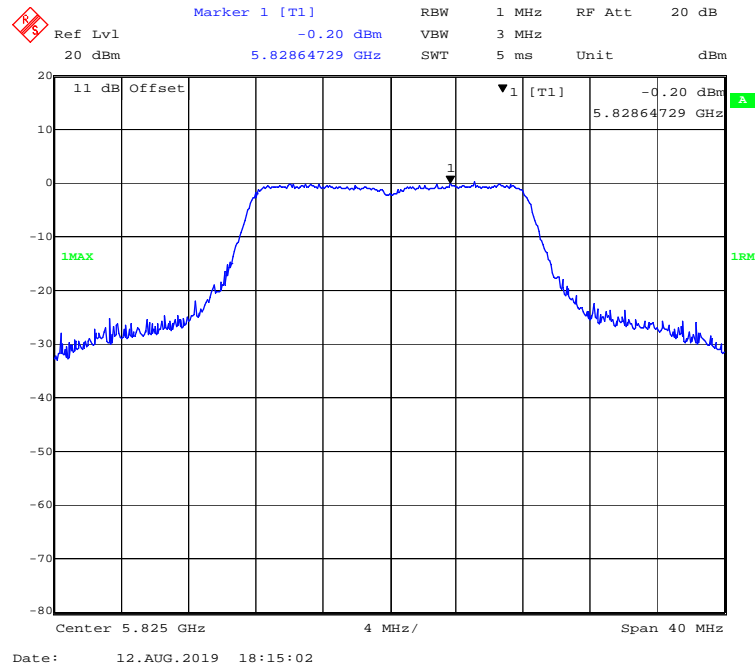


802.11n-HT40 mode, Power spectral density-5230MHz

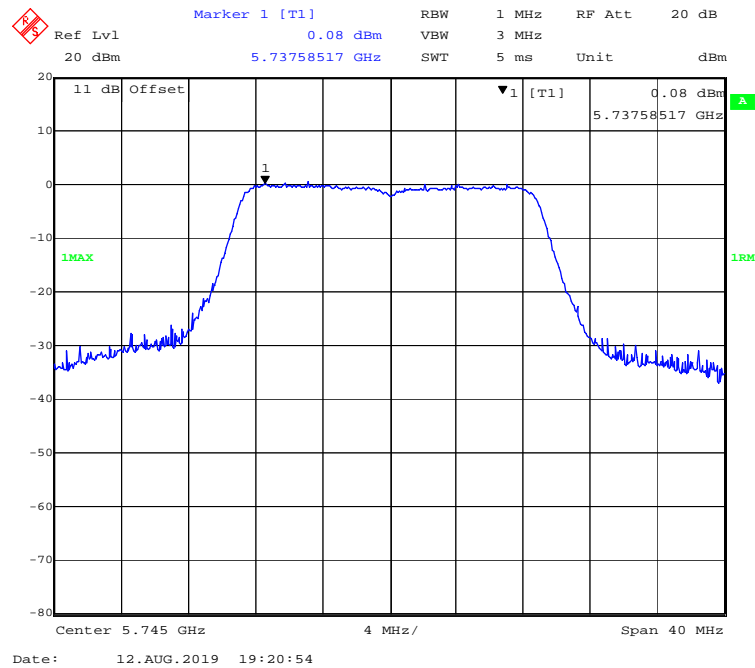


5725MHz-5850 MHz Band:**802.11a mode, Power spectral density-5745MHz****802.11a mode, Power spectral density-5785MHz**

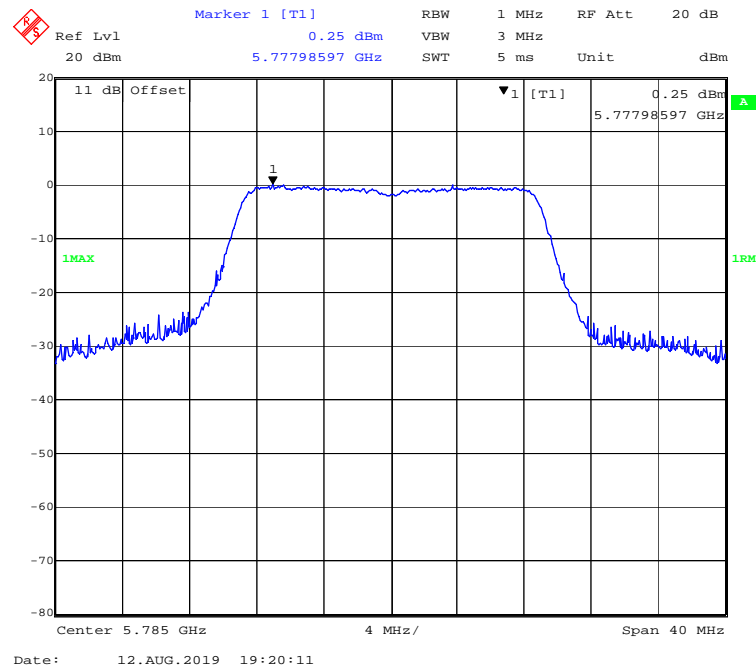
802.11a mode, Power spectral density-5825MHz



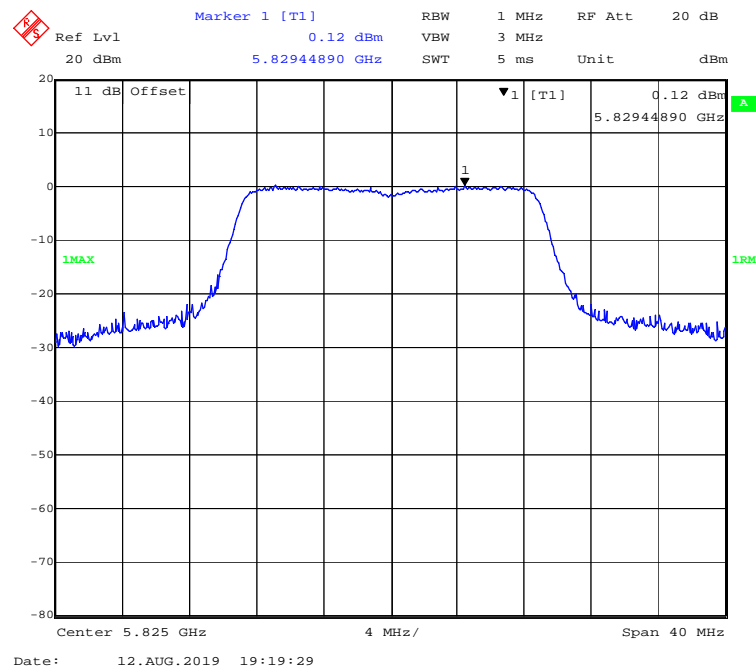
802.11n-HT20 mode, Power spectral density-5745MHz



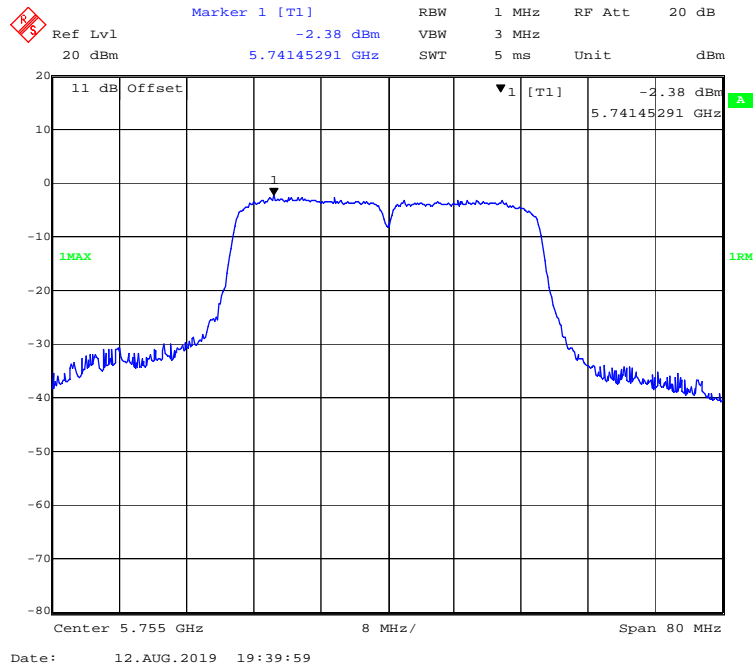
802.11n-HT20 mode, Power spectral density-5785MHz



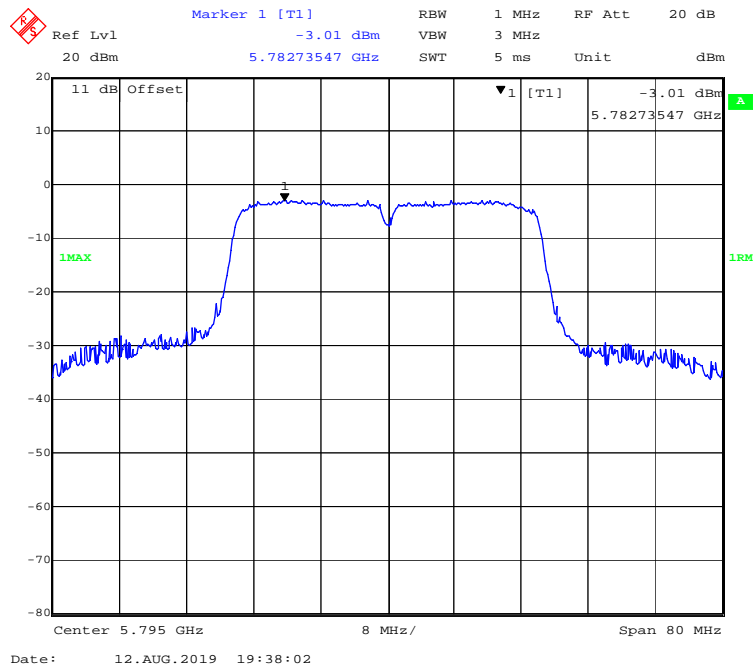
802.11n-HT20 mode, Power spectral density-5825MHz



802.11n-HT40 mode, Power spectral density-5755MHz



802.11n-HT40 mode, Power spectral density-5795MHz



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