



TESTING LABORATORY
CERTIFICATE#4323.01



FCC PART 15.407 TEST REPORT

For

SWIT Electronics Co., Ltd.

10 Heng Tong Road, Xin'gang Economic and Technological Development Zone, Nanjing 210038 China

FCC ID: 2AFFC-CURVE500TX

Report Type: Original Report	Product Type: 500ft Wireless HD
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Report Number:	RSHA200420001-00A
Report Date:	2020-07-15
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	SWIT Electronics Co., Ltd.
Tested Model	CURVE500 Tx
Series Model	FLOW500H Tx
Model Difference	Model name
Power Supply	DC 7V~17V
Product Type	500ft Wireless HD
Operating Frequency	Band1: 5180~5220 MHz, Band4: 5760~5820 MHz
Channel Number	Band1: 3, Band4: 4
Channel Separation	20 MHz
Modulation Type	OFDM
Antenna Type	Omni Antenna
Maximum Antenna Gain	1.0 dBi

**All measurement and test data in this report was gathered from production sample serial number: 20200420001.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2020-04-20)*

Objective

This type approval report is prepared on behalf of *SWIT Electronics 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 15.407 NII submitted with FCC ID: 2AFFC-CURVE500RX

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℃
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 ISSED 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 **5180-5220 MHz** band, the channel list is as below, channel 00, 01, 02 were tested.

Channel	Frequency (MHz)
00	5180
01	5200
02	5220

In **5760-5820 MHz** band, the channel list is as below, channel 03, 04, 06 were tested.

Channel	Frequency (MHz)
03	5760
04	5780
05	5800
06	5820

EUT Exercise Software

RF test tool: ARSiriusPCTool

Pre-scan with all the data rates, and the worst case was performed as below:

5180-5220 MHz

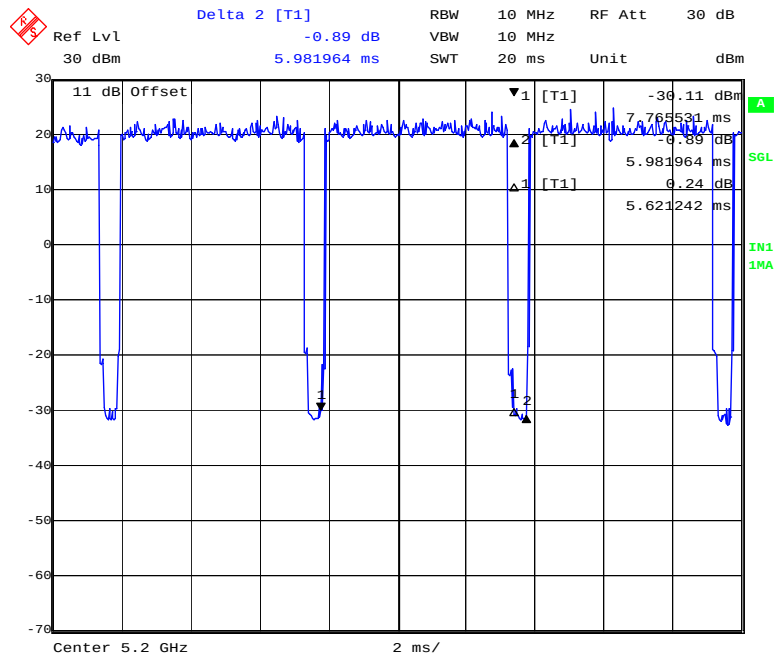
Frequency (MHz)	Data Rate	Power Setting
5180	MCS 0	14
5200		14
5220		14

5760-5820 MHz

Frequency (MHz)	Data Rate	Power Setting
5760	MCS 0	17
5780		17
5820		17

Duty Cycle
5180MHz-5220MHz:

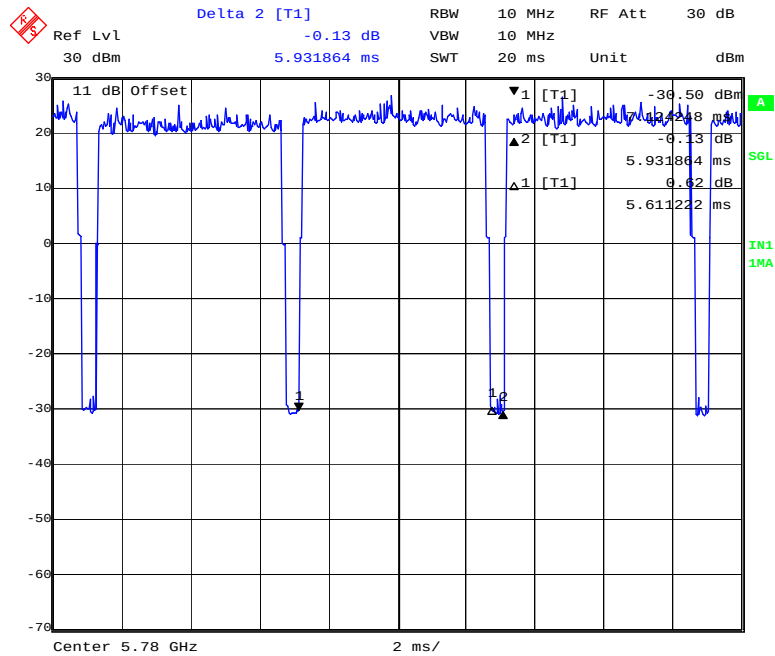
Frequency: 5200MHz



Date: 26.APR.2020 14:44:56

5760MHz-5820MHz:

Frequency: 5780MHz



Date: 26.APR.2020 16:37:59

Frequency Range (MHz)	Duty Cycle (%)	T (ms)	1/T (kHz)	10log(1/x)
5180-5220	93.97	5.621	0.178	0.27
5760-5820	94.59	5.611	0.178	0.24

Note:“x” means duty cycle.

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

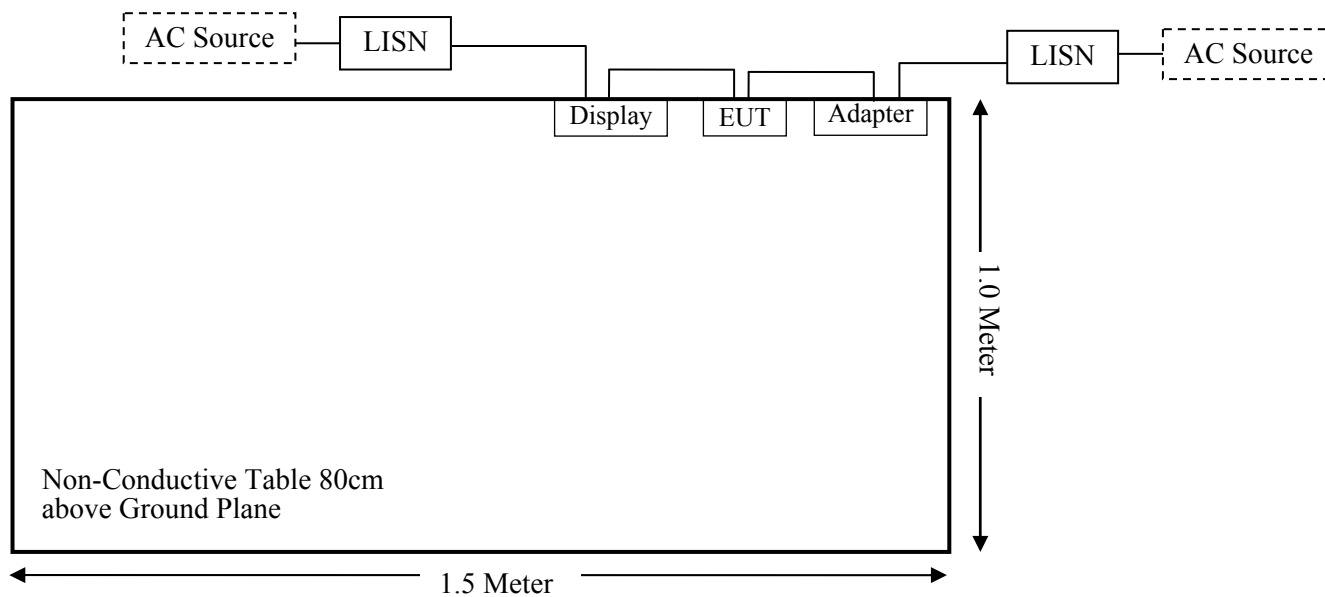
Manufacturer	Description	Model	Serial Number
DELL	Display	U255H	/
SWIT	Adapter	SW-120100	/

External I/O Cable

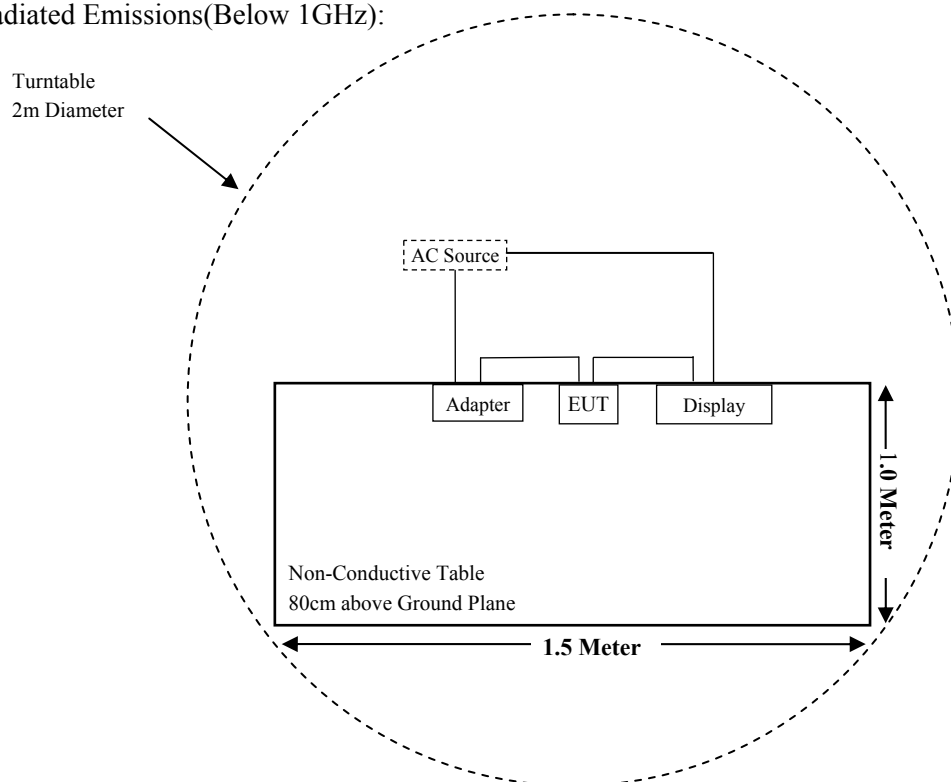
Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	Display
Power Cable	1.0	EUT	Adapter
Power Cable	1.0	Adapter	LISN/AC Source

Block Diagram of Test Setup

For Conducted Emissions:

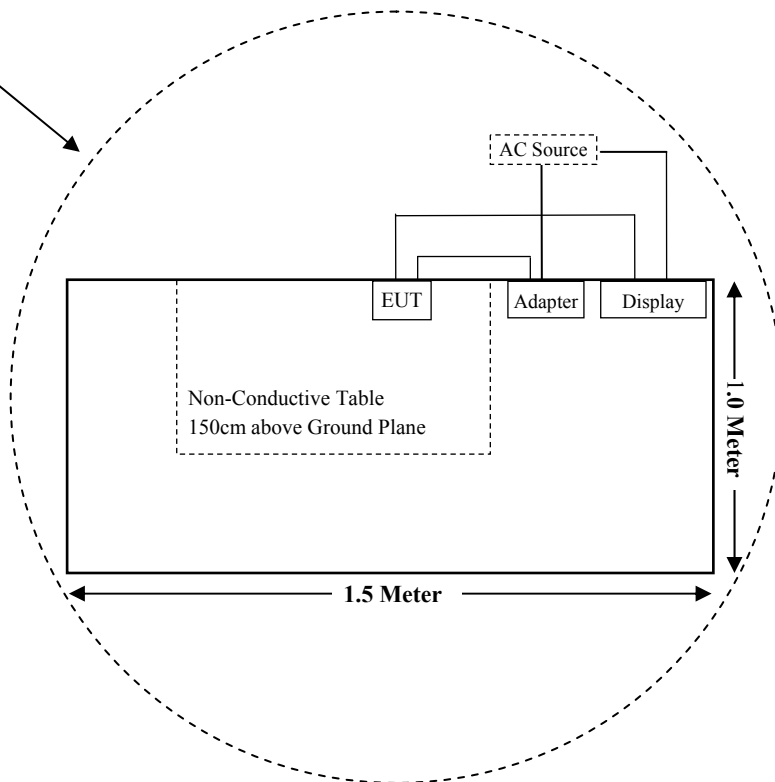


For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):

Turntable
2m Diameter



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 & §15.407(b) (6)	AC Power Line Conducted Emissions	Compliant
§ 15.205 & §15.209 & §15.407(b) (1), (4),(6),(7)	Undesirable Emission & Restricted Bands	Compliant
§§15.407(a) & §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	ESCI	100195	2019-12-14	2020-12-13
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2017-12-26	2020-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
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	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-17	2023-01-16
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
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	2019-11-12	2020-11-11
Agilent	Power Meter	N1912A	MY5000492	2019-11-18	2020-11-17
Agilent	Power Sensor	N1921A	MY54210024	2019-11-18	2020-11-17
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
BACL	Temperature & Humidity Chamber	BTH-150	30023	2019-12-20	2020-12-19
SWIT	RF Cable	SWIT 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	2019-08-05	2020-08-04
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2019-11-30	2020-11-29
Rohde & Schwarz	LISN	ENV216	101115	2019-12-14	2020-12-13
Audix	Test Software	e3	V9	--	--
Rohde & Schwarz	Pulse limiter	ESH3-Z2	357.8810.52	2019-08-10	2020-08-09
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).

FCC §15.247 (I) & §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1310, 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				
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

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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);

Calculated Data (worst case):

Frequency Range (MHz)	Maximum Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
5180~5220	1.0	1.58	17.50	56.23	20	0.0141	1.00
5760~5820	1.0	1.58	19.50	89.13	20	0.0223	1.00

Note:

The Tune-up conducted power was declared by the Manufacturer.

Conclusion: The device meets MPE at distance 20cm.

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 two Omni antennas which the antenna gain are both 1.0 dBi, the antennas must use a unique type of connector to attach to the EUT, fulfill the requirement of this section. Please refer to the EUT photos.

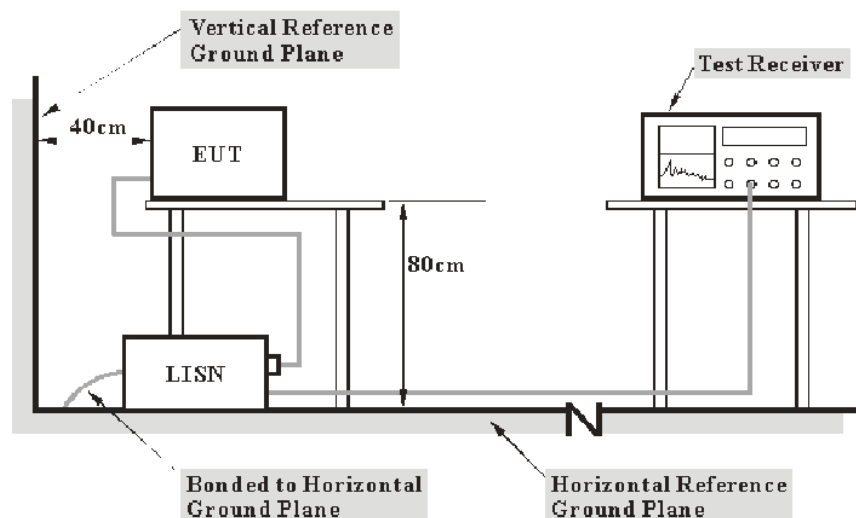
Result: Compliant.

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 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.

Corrected Factor & Over Limit Calculation

The Corrected 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:

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

Test Results Summary

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

Test Data

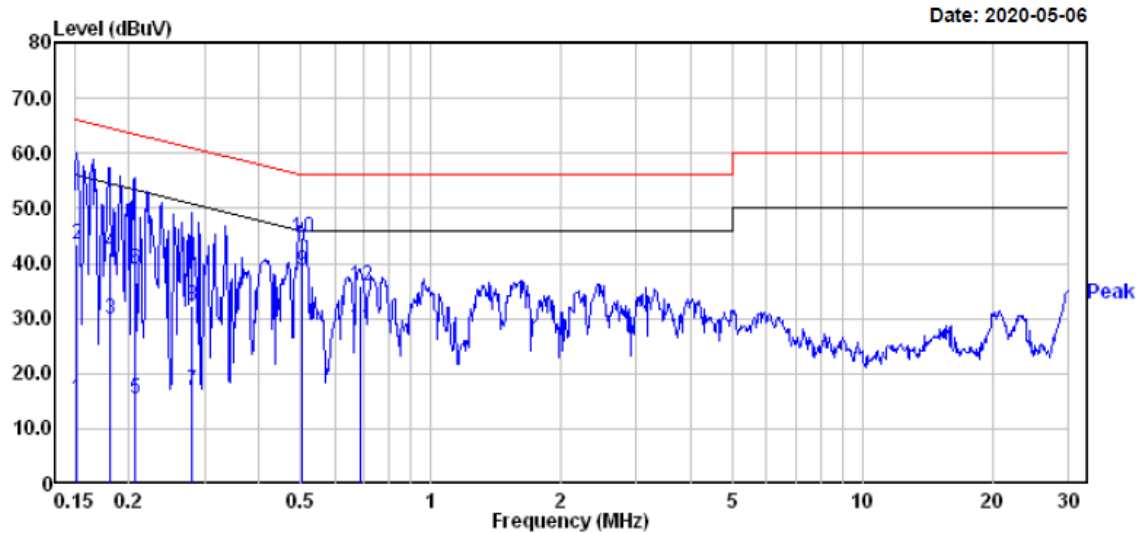
Environmental Conditions

Temperature:	24.7 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Lee Li on 2020-05-06.

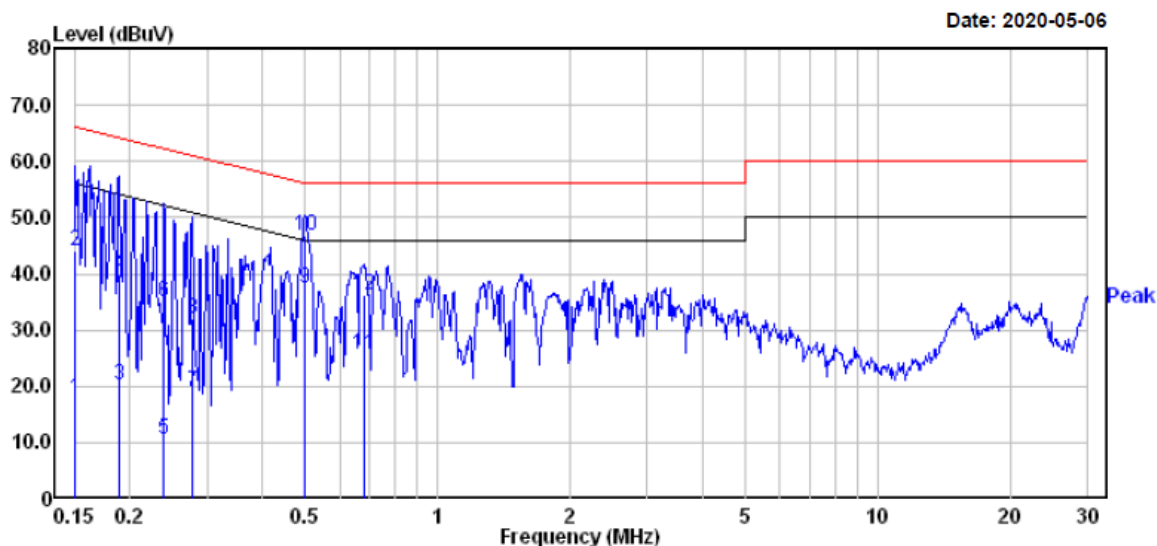
EUT operation mode: Transmitting in middle channel of 5760-5820MHz (worst case)

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	-4.50	19.82	15.32	55.91	-40.59	Average
2	0.152	23.60	19.82	43.42	65.91	-22.49	QP
3	0.181	10.10	19.83	29.93	54.46	-24.53	Average
4	0.181	22.20	19.83	42.03	64.46	-22.43	QP
5	0.206	-4.40	19.82	15.42	53.36	-37.94	Average
6	0.206	19.20	19.82	39.02	63.36	-24.34	QP
7	0.280	-2.90	19.82	16.92	50.81	-33.89	Average
8	0.280	12.50	19.82	32.32	60.81	-28.49	QP
9	0.502	19.00	19.76	38.76	46.00	-7.24	Average
10	0.502	25.00	19.76	44.76	56.00	-11.24	QP
11	0.690	8.50	19.75	28.25	46.00	-17.75	Average
12	0.690	16.20	19.75	35.95	56.00	-20.05	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.150	-2.10	19.82	17.72	56.00	-38.28	Average
2	0.150	24.20	19.82	44.02	66.00	-21.98	QP
3	0.189	0.50	19.82	20.32	54.06	-33.74	Average
4	0.189	20.10	19.82	39.92	64.06	-24.14	QP
5	0.239	-9.20	19.82	10.62	52.13	-41.51	Average
6	0.239	15.20	19.82	35.02	62.13	-27.11	QP
7	0.277	-0.70	19.82	19.12	50.90	-31.78	Average
8	0.277	12.10	19.82	31.92	60.90	-28.98	QP
9	0.499	17.70	19.76	37.46	46.01	-8.55	Average
10	0.499	27.10	19.76	46.86	56.01	-9.15	QP
11	0.679	6.00	19.75	25.75	46.00	-20.25	Average
12	0.679	16.50	19.75	36.25	56.00	-19.75	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), (4),(6),(7) – UNDESIRABLE EMISSION & RESTRICTED BANDS

Applicable Standard

FCC §15.407 (b) (1), (4), (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 e.i.r.p. of -27 dBm/MHz.

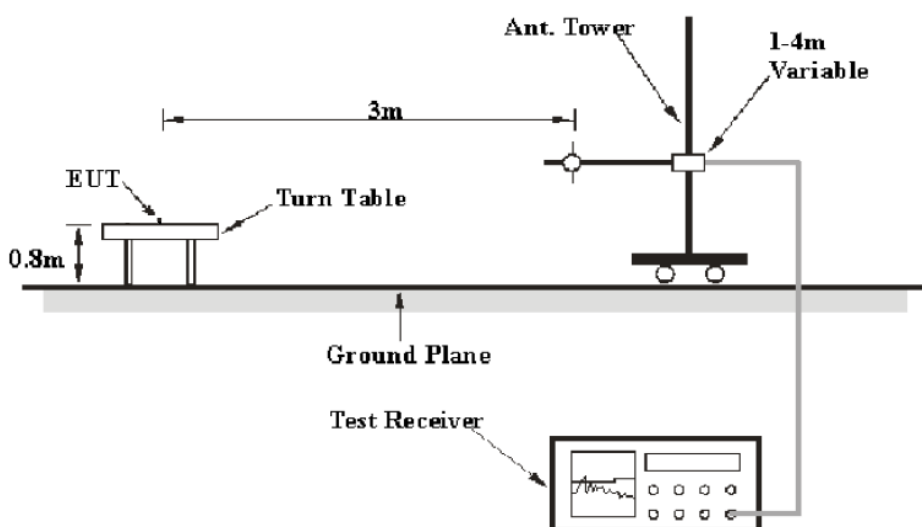
For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to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

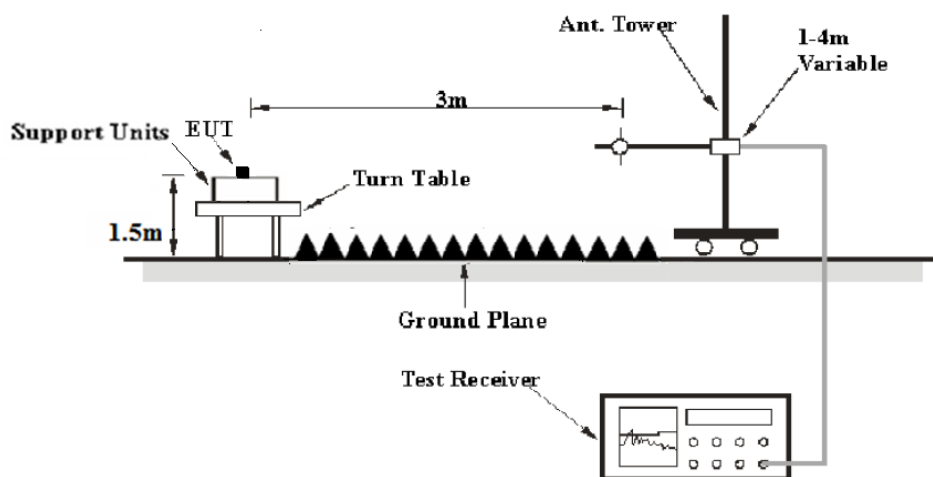
According to 789033 D02 General UNII Test Procedures New Rules v02r01, emission shall be computed as: E [dBμV/m] = EIRP [dBm] + 95.2, for $d = 3$ meters.

EUT Setup

Below 1 GHz:



1 GHz-40GHz:



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 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 Calculation (for Below 1GHz)

The factor is calculated by adding Antenna Factor, Cable Loss and Amplifier Gain. The basic equation is as follows:

$$\text{Factor (dB)} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + \text{Amplifier Gain (dB)}$$

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:

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

Corrected Amplitude & Margin Calculation (for Above 1GHz)

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data**Environmental Conditions**

Temperature:	20.2~23.8 °C
Relative Humidity:	48~51 %
ATM Pressure:	101.1~101.3 kPa

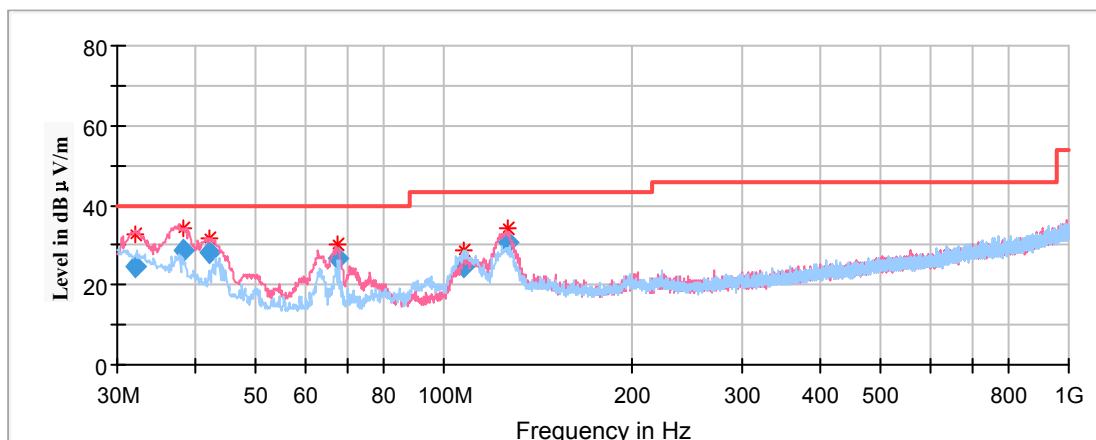
The testing was performed by Lee Li on 2020-05-10 to 2020-05-16.

Test Mode: Transmitting

Spurious Emission Test

30MHz-1GHz(5180-5220MHz):

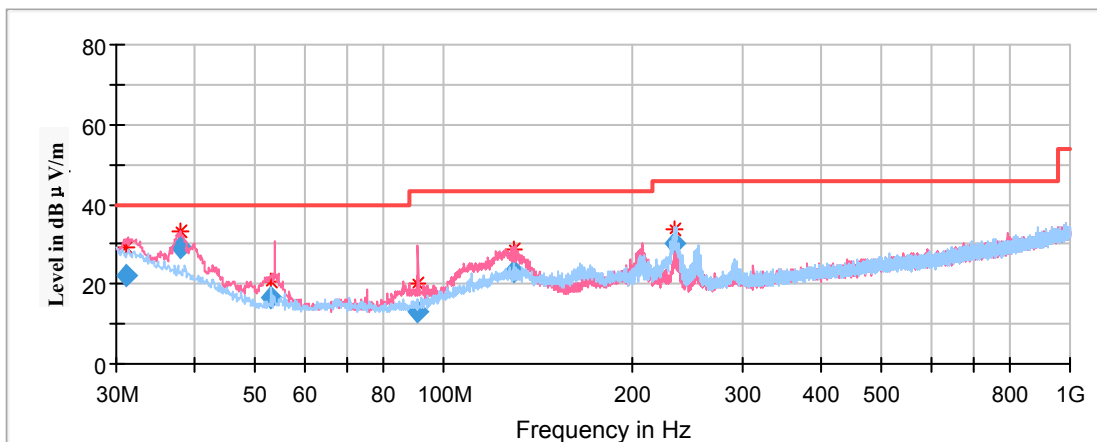
Pre-scan in the X, Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	QuasiPeak (dB μ V/m)	Height (cm)	Polar (H/V)				
32.008000	24.51	100.0	V	162.0	-5.3	40.00	15.49
38.165550	28.73	100.0	V	198.0	-9.5	40.00	11.27
42.137150	28.20	100.0	V	45.0	-12.2	40.00	11.80
67.347000	26.43	100.0	V	254.0	-17.5	40.00	13.57
107.649350	24.61	200.0	H	172.0	-13.5	43.50	18.89
126.566650	30.49	100.0	V	354.0	-11.5	43.50	13.01

30MHz-1GHz((5760-5820MHz)):

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



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	QuasiPeak (dBμV/m)	Height (cm)	Polar (H/V)				
31.159450	22.22	200.0	V	303.0	-4.7	40.00	17.78
37.996500	29.35	100.0	V	179.0	-9.4	40.00	10.65
53.142500	16.76	100.0	V	356.0	-17.6	40.00	23.24
90.851700	12.89	100.0	V	195.0	-17.3	43.50	30.61
129.518650	23.09	100.0	V	211.0	-11.6	43.50	20.41
233.317200	30.17	200.0	H	146.0	-12.2	46.00	15.83

1GHz-18GHz (5180-5220MHz):

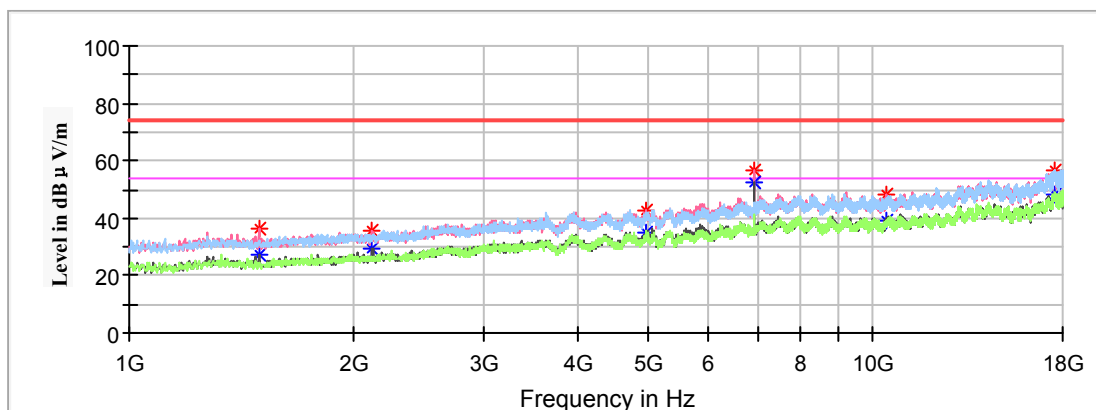
(Pre-scan in the X, Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded.)

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

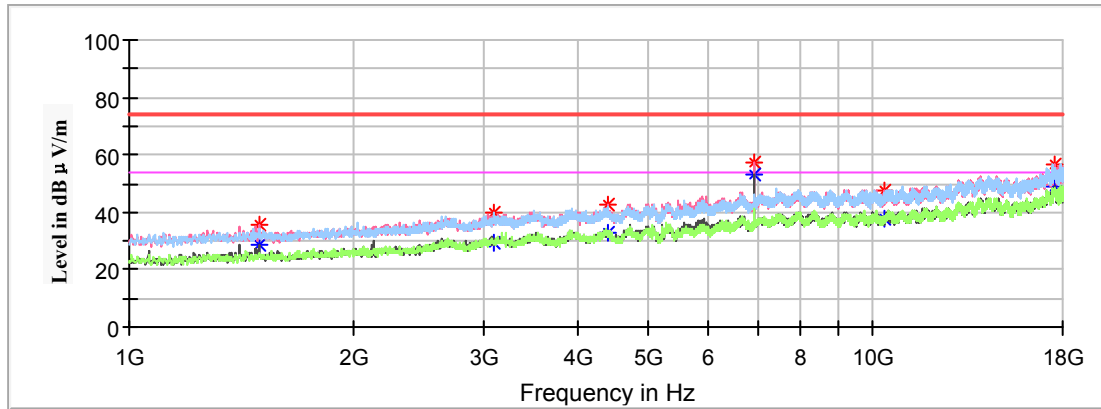
Full Spectrum



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)				
1494.70	36.14	---	200.0	V	186.0	-16.4	74.00	37.86
1494.70	---	27.31	200.0	V	186.0	-16.4	54.00	26.69
2123.70	---	29.66	200.0	V	204.0	-14.0	54.00	24.34
2123.70	35.81	---	200.0	V	204.0	-14.0	74.00	38.19
4957.60	42.80	---	150.0	V	130.0	-5.3	74.00	31.20
4957.60	---	35.06	150.0	V	130.0	-5.3	54.00	18.94
6905.80	56.61	---	200.0	V	341.0	-0.3	74.00	17.39
6905.80	---	52.33	200.0	V	341.0	-0.3	54.00	1.67
10360.00	---	39.24	150.0	V	327.0	2.3	54.00	14.76
10360.00	47.91	---	150.0	V	327.0	2.3	74.00	26.09
17558.00	---	48.18	200.0	H	246.0	8.9	54.00	5.82
17558.00	56.82	---	200.0	H	246.0	8.9	74.00	17.18

Middle Channel: 5200MHz

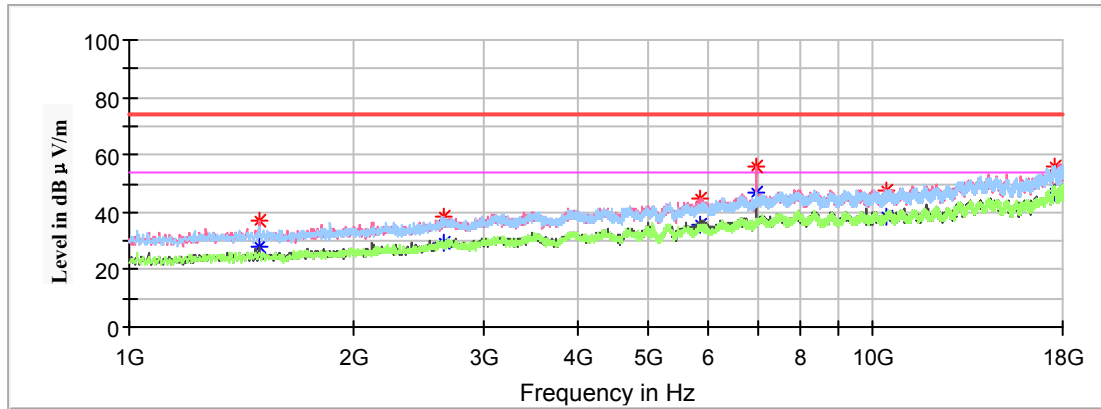
Full Spectrum



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)				
1493.00	---	28.43	150.0	V	79.0	-16.4	54.00	25.57
1493.00	35.40	---	150.0	V	79.0	-16.4	74.00	38.60
3091.00	---	29.48	200.0	H	338.0	-9.9	54.00	24.52
3091.00	40.04	---	200.0	H	338.0	-9.9	74.00	33.96
4403.40	---	33.13	150.0	V	341.0	-6.4	54.00	20.87
4403.40	42.97	---	150.0	V	341.0	-6.4	74.00	31.03
6933.00	---	52.81	150.0	V	94.0	-0.2	54.00	1.19
6933.00	57.44	---	150.0	V	94.0	-0.2	74.00	16.56
10400.00	---	37.70	200.0	V	327.0	2.2	54.00	16.30
10400.00	47.22	---	200.0	V	327.0	2.2	74.00	26.78
17537.60	---	48.72	200.0	V	157.0	8.9	54.00	5.28
17537.60	56.67	---	200.0	V	157.0	8.9	74.00	17.33

High Channel: 5220MHz

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)				
1494.70	---	27.63	200.0	V	235.0	-16.4	54.00	26.37
1494.70	37.22	---	200.0	V	235.0	-16.4	74.00	36.78
2649.00	---	29.41	150.0	V	279.0	-11.7	54.00	24.59
2649.00	38.23	---	150.0	V	279.0	-11.7	74.00	35.77
5850.10	---	35.58	150.0	V	358.0	-3.3	54.00	18.42
5850.10	45.06	---	150.0	V	358.0	-3.3	74.00	28.94
6958.50	---	46.64	200.0	V	100.0	-0.2	54.00	7.36
6958.50	56.15	---	200.0	V	100.0	-0.2	74.00	17.85
10440.00	---	38.38	150.0	V	38.0	2.3	54.00	15.62
10440.00	47.69	---	150.0	V	38.0	2.3	74.00	26.31
17595.40	---	46.90	200.0	V	308.0	8.9	54.00	7.10
17595.40	56.22	---	200.0	V	308.0	8.9	74.00	17.78

5760-5820MHz:

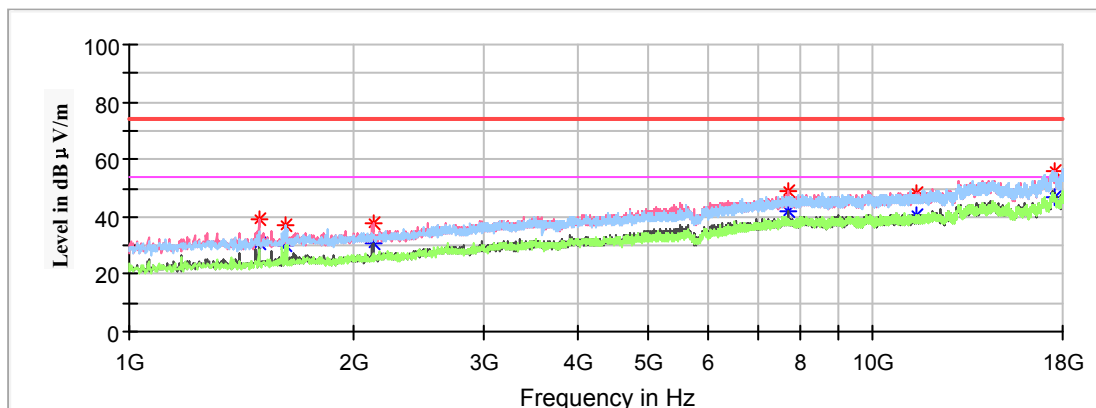
Pre-scan with X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded

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: 5760MHz

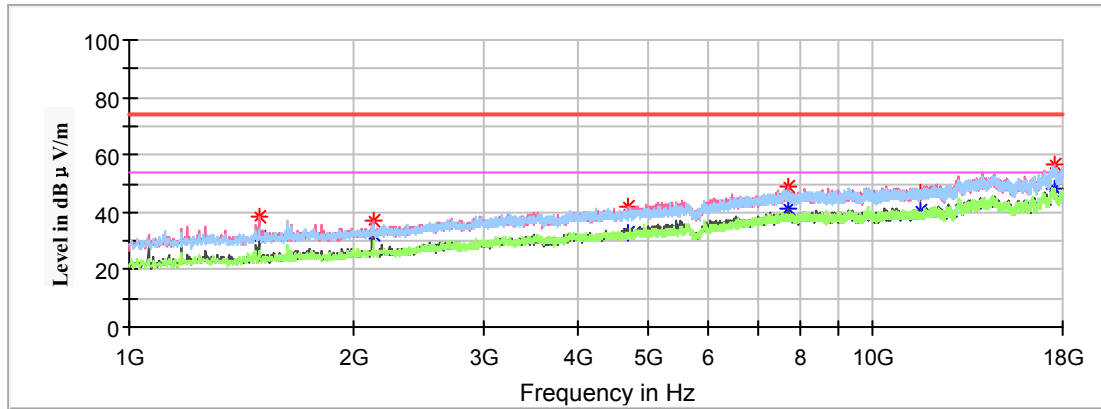
Full Spectrum



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)				
1493.00	---	30.82	150.0	V	173.0	-16.4	54.00	23.18
1493.00	39.49	---	150.0	V	173.0	-16.4	74.00	34.51
1622.20	---	29.73	150.0	H	312.0	-15.9	54.00	24.27
1622.20	37.32	---	150.0	H	312.0	-15.9	74.00	36.68
2127.10	---	30.74	150.0	V	276.0	-13.9	54.00	23.26
2127.10	38.11	---	150.0	V	276.0	-13.9	74.00	35.89
7679.30	---	41.77	200.0	V	320.0	1.3	54.00	12.23
7679.30	48.91	---	200.0	V	320.0	1.3	74.00	25.09
11448.20	---	40.73	200.0	V	263.0	2.8	54.00	13.27
11448.20	48.33	---	200.0	V	263.0	2.8	74.00	25.67
17534.20	---	46.93	150.0	V	350.0	8.9	54.00	7.07
17534.20	55.88	---	150.0	V	350.0	8.9	74.00	18.12

Middle Channel: 5780MHz

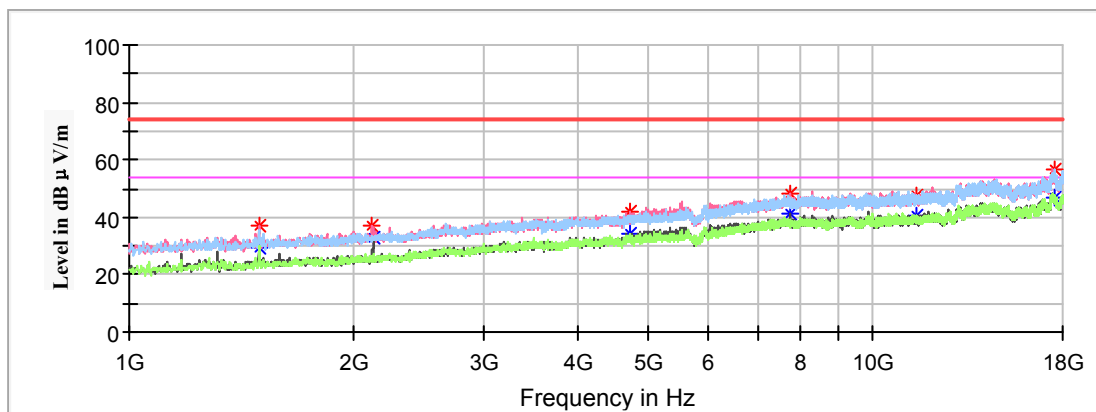
Full Spectrum



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)				
1494.70	---	31.40	150.0	V	157.0	-16.4	54.00	22.60
1494.70	38.49	---	150.0	V	157.0	-16.4	74.00	35.51
2127.10	---	32.02	200.0	V	50.0	-13.9	54.00	21.98
2127.10	37.35	---	200.0	V	50.0	-13.9	74.00	36.65
4677.10	---	33.15	150.0	V	0.0	-5.8	54.00	20.85
4677.10	42.08	---	150.0	V	0.0	-5.8	74.00	31.92
7706.50	---	41.20	200.0	V	248.0	1.4	54.00	12.80
7706.50	48.61	---	200.0	V	248.0	1.4	74.00	25.39
11560.00	46.89	---	150.0	V	96.0	2.9	74.00	27.11
11560.00	---	40.83	150.0	V	96.0	2.9	54.00	13.17
17558.00	---	48.22	200.0	H	21.0	8.9	54.00	5.78
17558.00	56.50	---	200.0	H	21.0	8.9	74.00	17.50

High Channel: 5820MHz

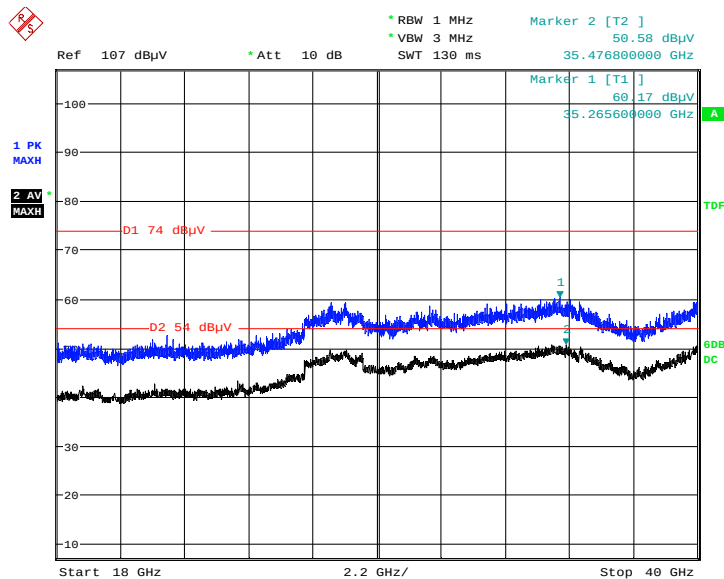
Full Spectrum



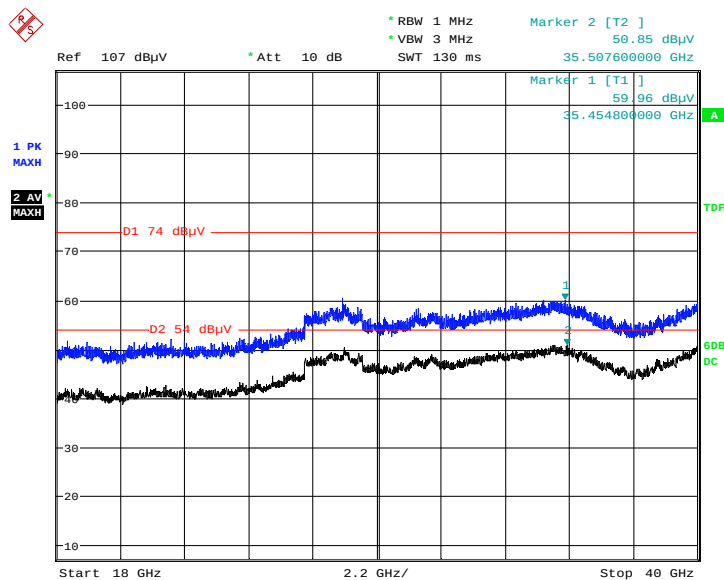
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Correct Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1493.00	---	29.32	200.0	V	358.0	-16.4	54.00	24.68
1493.00	37.31	---	200.0	V	358.0	-16.4	74.00	36.69
2123.70	37.13	---	150.0	V	275.0	-14.0	74.00	36.87
2127.10	---	33.11	150.0	V	275.0	-14.0	54.00	20.89
4700.90	---	34.41	200.0	H	188.0	-5.8	54.00	19.59
4700.90	42.27	---	200.0	H	188.0	-5.8	74.00	31.73
7759.20	---	41.04	150.0	V	304.0	1.4	54.00	12.96
7759.20	48.22	---	150.0	V	304.0	1.4	74.00	25.78
11422.70	47.42	---	150.0	H	145.0	2.8	74.00	26.58
11422.70	---	40.83	150.0	H	145.0	2.8	54.00	13.17
17575.00	---	47.03	200.0	H	152.0	8.9	54.00	6.97
17575.00	56.99	---	200.0	H	152.0	8.9	74.00	17.01

18GHz-40GHz (5180-5220MHz):

(Pre-scan in the X, Y and Z axes of orientation, the worst case 5180MHz in Z-axis of orientation was recorded)

Horizontal

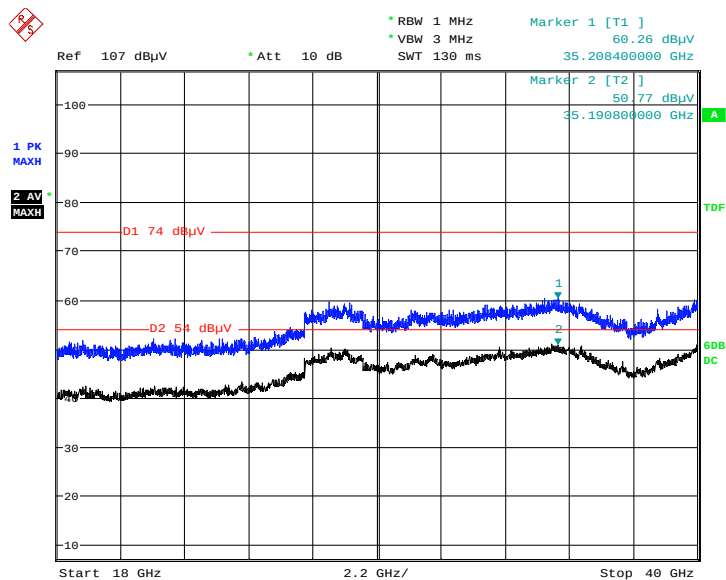
Date: 19.MAY.2020 08:08:52

Vertical

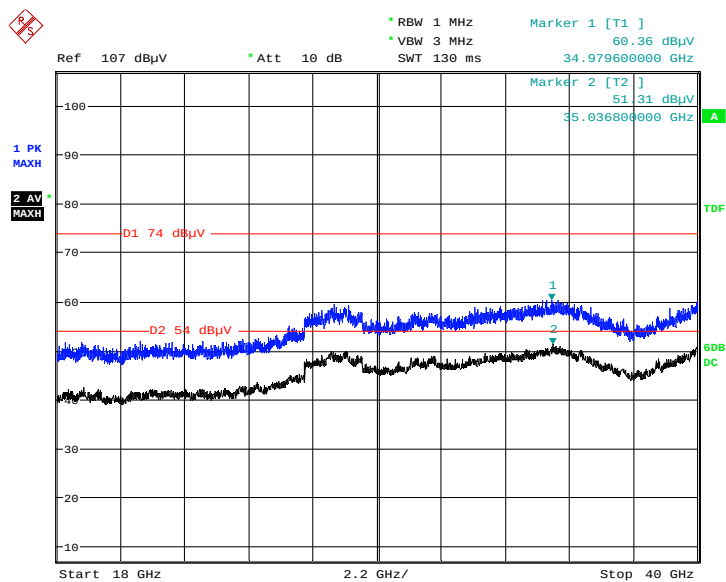
Date: 19.MAY.2020 08:16:51

18GHz-40GHz (5760-5820):

(Pre-scan in the X, Y and Z axes of orientation, the worst case 5780MHz in Z-axis of orientation was recorded)

Horizontal

Date: 19.MAY.2020 08:25:48

Vertical

Date: 19.MAY.2020 08:41:37

Restricted Bands Emissions Test (5180-5220MHz):

Note:

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

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

(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: 5180MHz								
5150.00	54.32	---	150.0	H	272.0	8.2	74.00	19.68
5150.00	---	47.87	150.0	H	272.0	8.2	54.00	6.13
High Channel: 5220MHz								
5350.00	---	45.39	150.0	H	159.0	8.7	54.00	8.61
5350.00	54.65	---	150.0	H	159.0	8.7	74.00	19.35

Restricted Bands Emissions Test (5760-5820MHz):

Note:

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

2. Corrected Amplitude = Corrected Factor + Reading

3. Margin = Limit - Corrected. Amplitude

(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: 5760MHz								
5650.00	53.00	---	200.0	V	284.0	9.5	68.20	15.20
5700.00	54.08	---	200.0	V	284.0	9.5	105.20	51.12
5720.00	54.77	---	150.0	V	273.0	9.5	110.80	56.03
5725.00	53.72	---	150.0	V	273.0	9.5	122.20	68.48
High Channel: 5825MHz								
5850.00	53.54	---	150.0	V	120.0	9.7	122.20	68.66
5855.00	53.88	---	150.0	V	120.0	9.7	110.80	56.92
5875.00	54.15	---	150.0	V	268.0	9.7	105.20	51.05
5925.00	53.62	---	150.0	V	268.0	9.7	67.80	14.18

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 band is 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

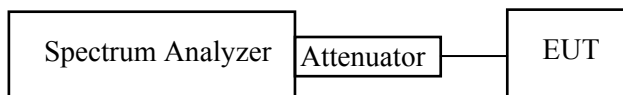
1. Emission Bandwidth (EBW)

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- 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:

- Set RBW = 100 kHz.
 - Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
 - Detector = Peak.
 - Trace mode = max hold.
 - Sweep = auto couple.
 - 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:	24.5 °C
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Lee Li on 2020-04-26.

Test Result: Compliant

5180-5220 MHz:

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	19.960	18.277
Middle	5200	19.800	18.277
High	5220	19.880	18.277

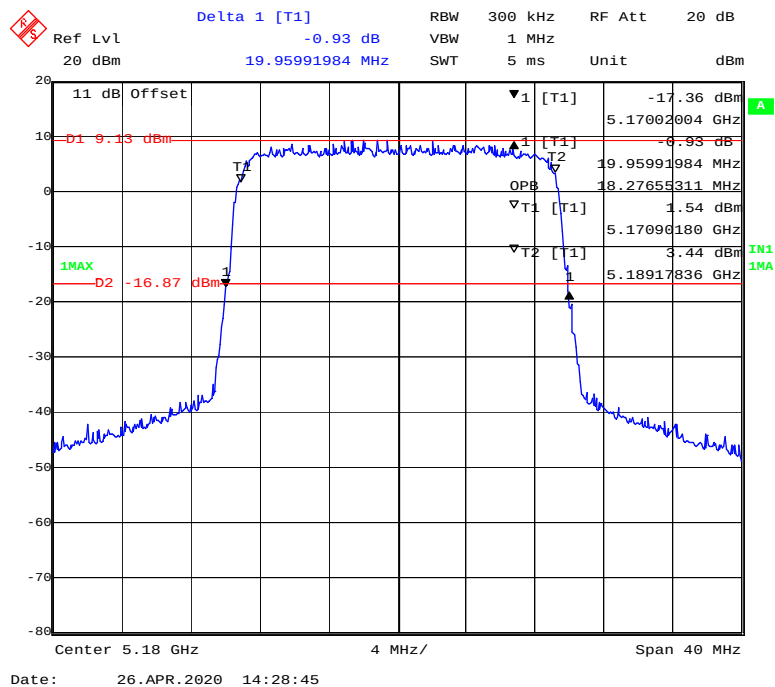
5760-5820MHz:

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5760	17.876	18.277
Middle	5780	17.595	18.277
High	5820	17.956	18.277

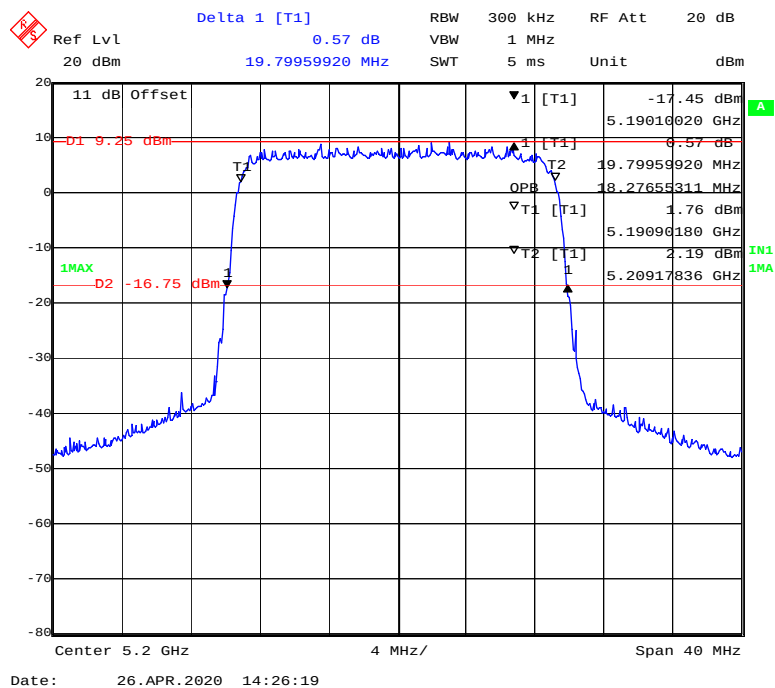
5180-5220 MHz:

26 Bandwidth&99% Occupied Bandwidth

Frequency: 5180MHz



Frequency: 5200MHz



Delta 1 [T1]
 Ref Lvl -0.10 dB
 20 dBm
 19.87975952 MHz
 RBW 300 kHz
 SWT 5 ms
 RF Att 20 dB
 Unit dBm

11 dB Offset
 D1 -0.72 dBm
 1MAX
 D2 -16.28 dBm
 1
 T1
 T2
 OPB
 T1 [T1]
 T2 [T1]
 1
 1

-17.46 dBm
 5.21018020 GHz
 -0.10 dB
 19.87975952 MHz
 18.27655311 MHz
 2.71 dBm
 5.21096180 GHz
 3.00 dBm
 5.22917836 GHz

IN1
 1MA

Center 5.22 GHz
 4 MHz/
 Span 40 MHz

Date: 26. APR. 2020 13:48:16

6 Bandwidth

Delta 1 [T1]

Ref Lvl 0.90 dB

20 dBm 17.87575150 MHz

RBW 100 kHz RF Att 20 dB

VBW 300 kHz

SWT 10 ms Unit dBm

11 dB Offset

D1 8.06 dBm

D2 2.06 dBm

1MAX

IN1 1MA

Center 5.76 GHz

4 MHz/

Span 40 MHz

Date: 26. APR. 2020 16:19:43

Delta 1 [T1] 0.70 dB
 RBW 100 kHz RF Att 20 dB
 Ref Lvl 20 dBm VBW 300 kHz
 20 dBm 17.59519038 MHz SWT 10 ms Unit dBm

11 dB Offset
 D1 7.97 dBm
 D2 1.97 dBm
 1MAX
 1 [T1]
 1.43 dBm
 5.77106212 GHz
 0.70 dB
 17.59519038 MHz
 IN1
 1MA

Center 5.78 GHz 4 MHz/ Span 40 MHz

Date: 26. APR. 2020 16:21:44

Ref Lvl 20 dBm

Marker 1 [T1] 1.03 dBm

RBW 100 kHz

VBW 300 kHz

SWT 10 ms

RF Att 20 dB

Unit dBm

11 dB Offset

D1 7.93 dBm

D2 1.93 dBm

1MAX

▼1 [T1]

△1 [T1]

1.03 dBm

5.81090180 GHz

0.62 dB

17.9559182 MHz

IN1

IMA

Center 5.82 GHz

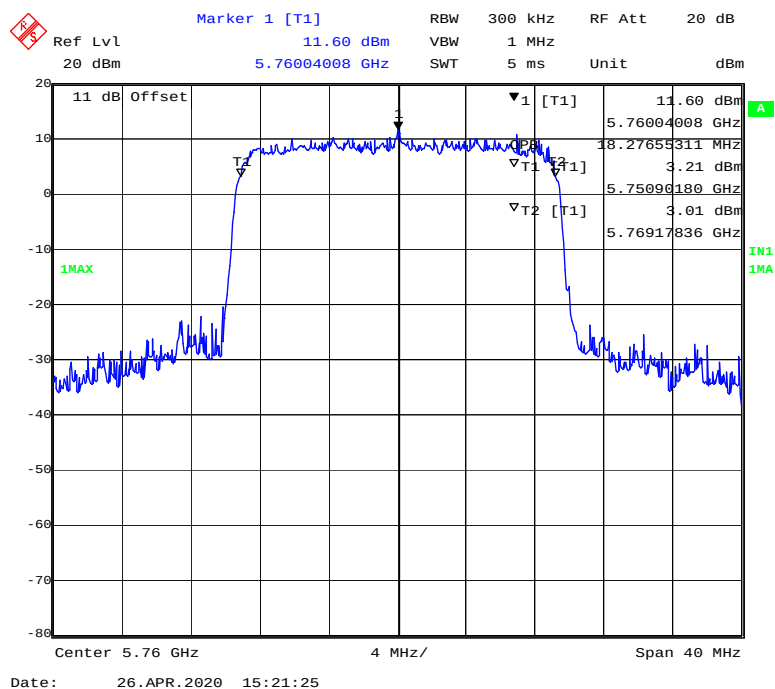
4 MHz/

Span 40 MHz

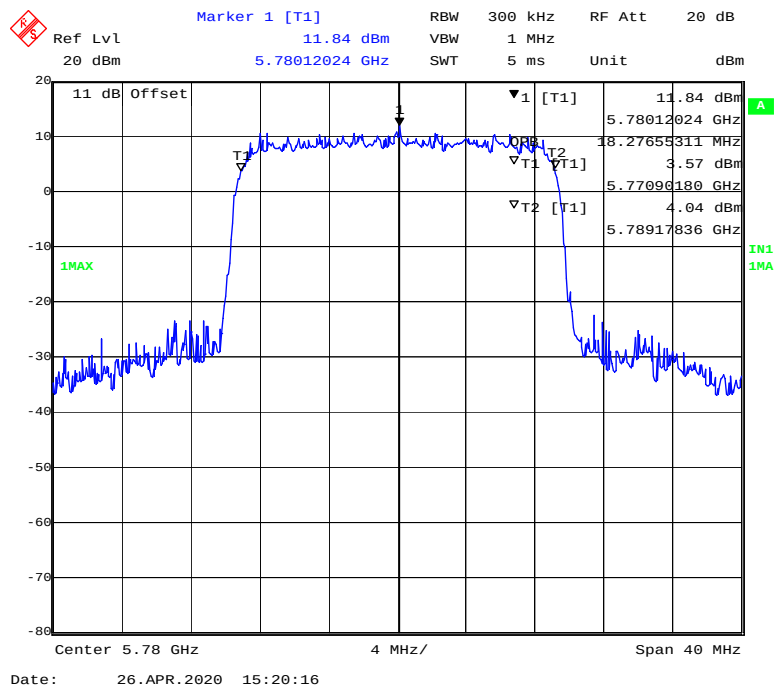
Date: 26. APR. 2020 16:24:09

99% Occupied Bandwidth

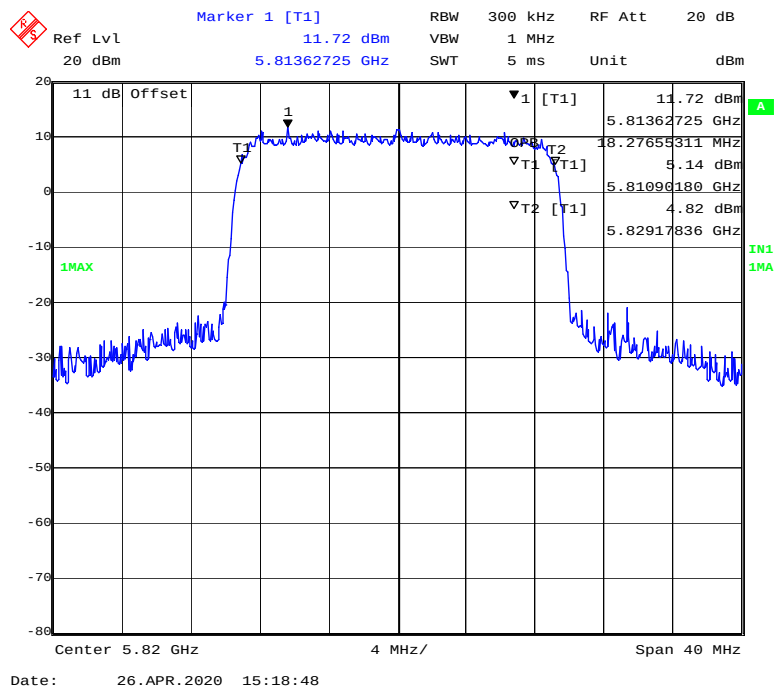
Frequency: 5760MHz



Frequency: 5780MHz



Frequency: 5820MHz



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

Applicable Standard

According to §15.407(a)(1)

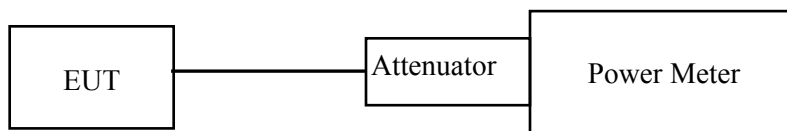
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

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:	24.2 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Lee Li on 2020-04-26.

Test Mode: Transmitting

Frequency Range(MHz)	Frequency (MHz)	Average Conducted Output Power (dBm)	Limit (dBm)	Result
5180-5220 MHz	5180	17.20	30	PASS
	5200	16.78	30	PASS
	5220	17.18	30	PASS
5760-5820 MHz	5760	19.18	30	PASS
	5780	19.36	30	PASS
	5820	19.26	30	PASS

Frequency Range(MHz)	Maximum Conducted Output Power (dBm)	Maximum Antenna gain (dBi)	Maximum e.i.r.p (dBm)	e.i.r.p Limit elevation angle above 30 degrees (dBm)	Result
5180-5220 MHz	17.20	1.0	18.20	21	PASS

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

Applicable Standard

According to §15.407(a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

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 Proceidyres New Rules v02r01: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices section F: Maximum power spectral density (PPSD), Method SA-2 (power averaging (rms) detection with trace averaging) was used.

Test Data

Environmental Conditions

Temperature:	24.5 °C
Relative Humidity:	50%
ATM Pressure:	101.3 kPa

The testing was performed by Lee Li on 2020-07-14.

Test Mode: Transmitting

5180MHz-5220MHz:

Frequency (MHz)	Reading (dBm/300kHz)	Reading (dBm/MHz)	10log(1/X) (dB)	PSD (dBm/MHz)	Limit (dBm/MHz)	Result
5180	-6.55	-1.32	0.27	-1.05	17	PASS
5200	-6.21	-0.98	0.27	-0.71	17	PASS
5220	-6.46	-1.23	0.27	-0.96	17	PASS

5760MHz-5820MHz:

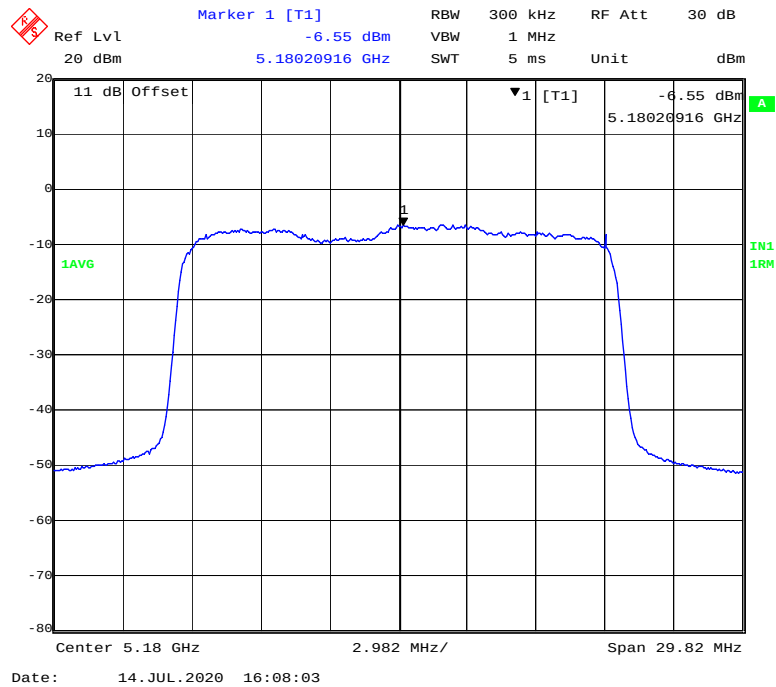
Frequency (MHz)	Reading (dBm/300kHz)	Reading (dBm/500kHz)	10log(1/X) (dB)	PSD (dBm/500kHz)	Limit (dBm/MHz)	Result
5760	-2.50	-0.30	0.24	-0.06	30	PASS
5780	-2.40	-0.20	0.24	0.04	30	PASS
5820	-2.65	-0.45	0.24	-0.21	30	PASS

Note:

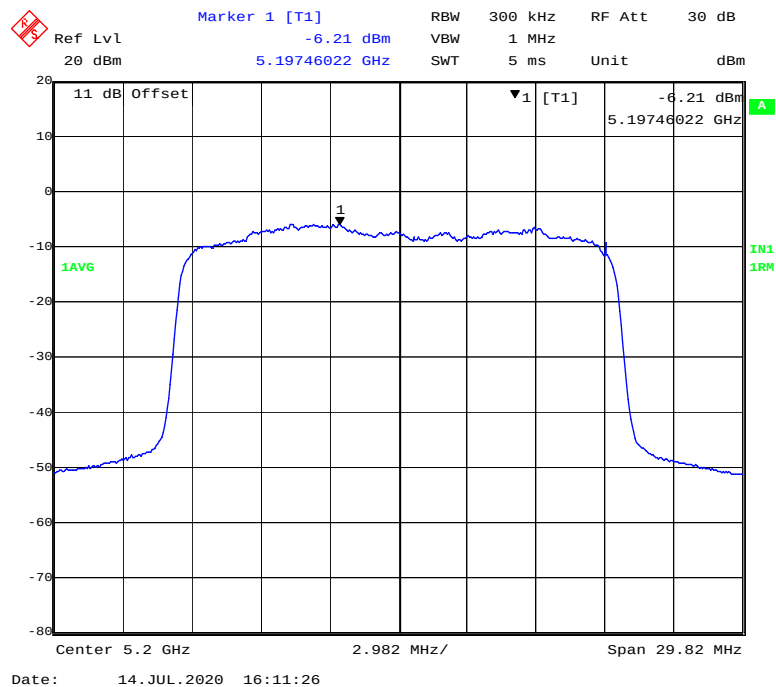
1. “x” means duty cycle.
2. dBm/300kHz conversion to dBm/500kHz need add a factor $10 \cdot \log(500\text{kHz}/300\text{kHz}) = 2.22\text{dB}$

5180MHz-5220MHz:

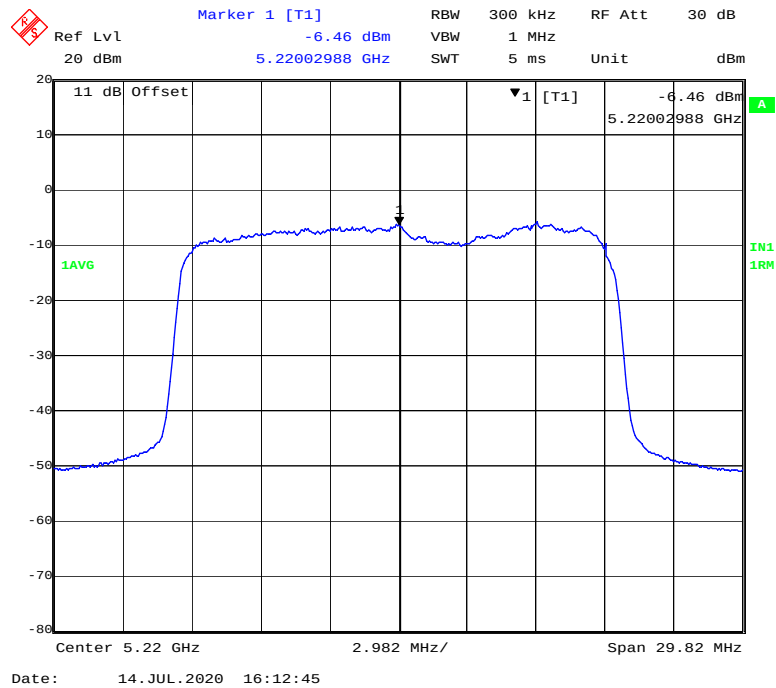
Power spectral density-5180MHz



Power spectral density-5200MHz

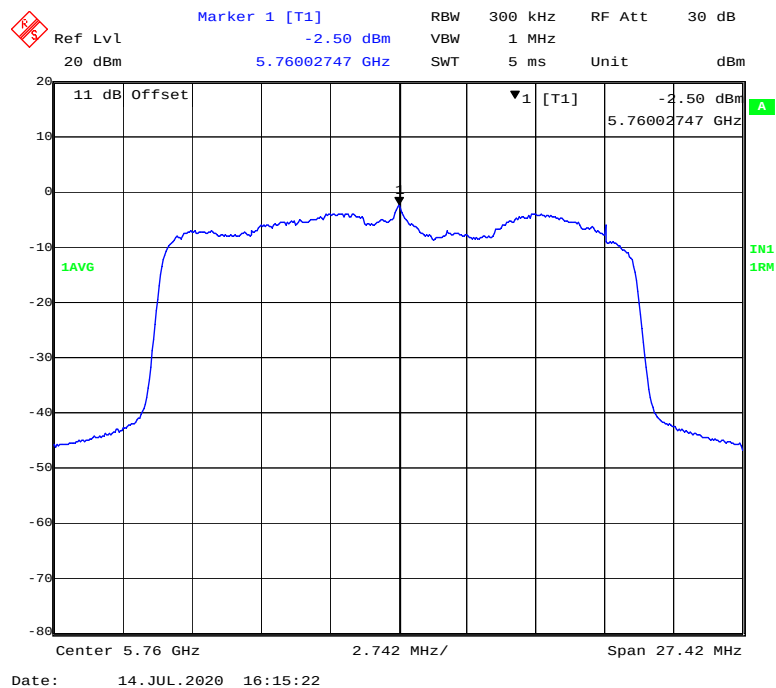


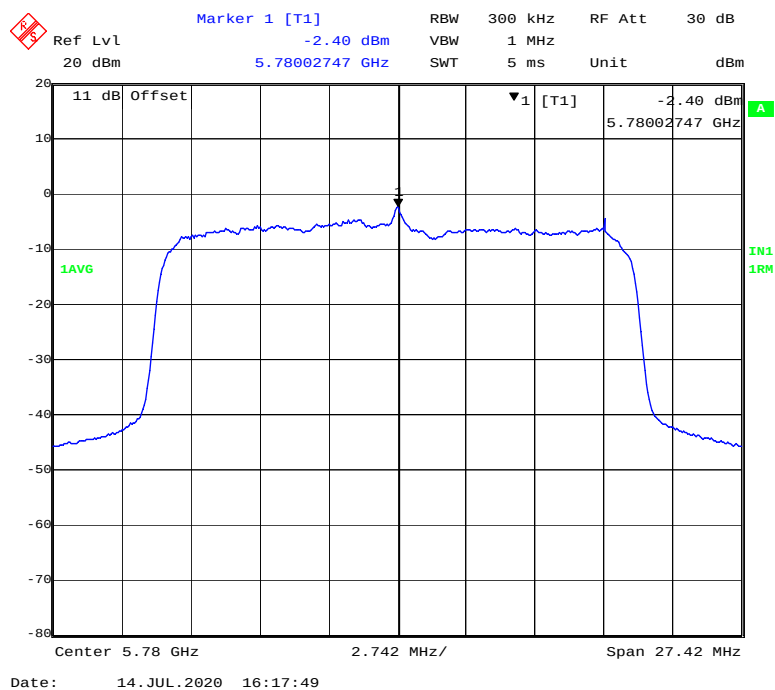
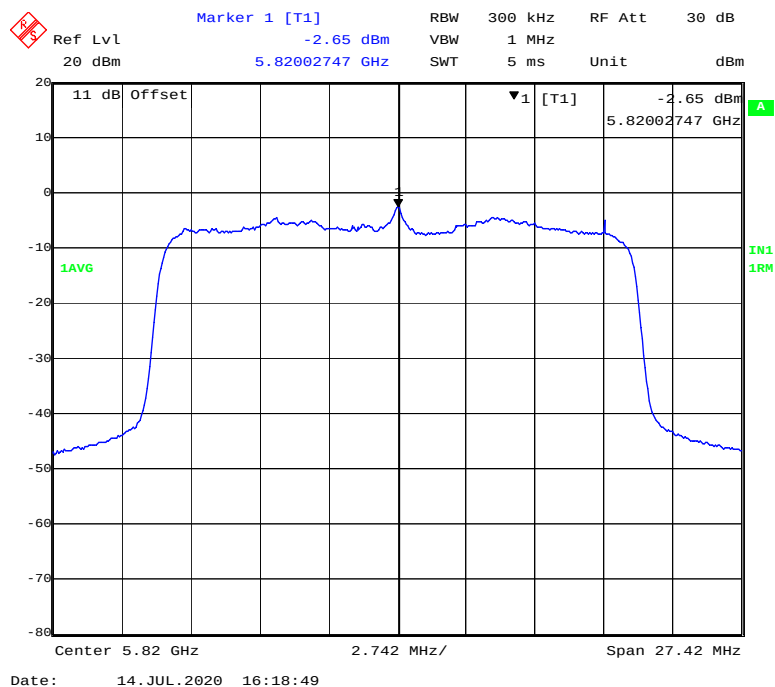
Power spectral density-5220MHz



5760MHz-5820 MHz:

Power spectral density-5760MHz



Power spectral density-5780MHz**Power spectral density-5820MHz********* END OF REPORT *******