




FCC PART 15.407 TEST REPORT

For

Trans Electric Co., Ltd.

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FCC ID: BY4WTR6000TX

Report Type: Original Report	Product Type: HD Wireless Conference System
Report Number:	SZ4210526-19650E-00
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	HD Wireless Conference System
Tested Model	WTR-6000
Multiple Model	WTR-6100, WTR-6200, WTR-6300, WTR-6500
Model Differences	Refer to the DoS letter
Frequency Range	5G Wi-Fi: 5150-5250MHz; 5725-5850 MHz
Maximum conducted average output power	5150-5250 MHz: 11.24dBm 5725-5850 MHz: 11.43dBm
Modulation Technique	OFDM
Antenna Specification*	0 dBi (It is provided by the applicant)
Voltage Range	DC5V
Date of Test	2021-06-24 to 2021-07-07
Sample number	SZ4210526-19650E-RF-S1(Assigned by BACL, Shenzhen)
Received date	2021-05-26
Sample/EUT Status	Good condition
Adapter information	N/A

Objective

This test report is 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.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB789033D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters. Each test item follows test standards and with no deviation.

Measurement Uncertainty

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

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

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West), 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The EUT operate in 802.11ac40 mode.

For 5150-5250MHz Band, 2 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

Channel 38, 46 were tested.

For 5725-5850MHz Band, 2 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

Channel 151, 159 were tested.

EUT Exercise Software

“REALTEK 11ac 8821CU USB WLAN NIC Massproduction Kit.exe*” software was used.

Test frequencies and power level were configured as below:

U-NII	Mode	Frequency (MHz)	Rate (Mbps)	Power Level*
5150-5250MHz	802.11 ac40	5190	MCS0	40
		5230	MCS0	40
5725-5850MHz	802.11 ac40	5755	MCS0	38
		5795	MCS0	40

Note 1: The worse-case data rates are determined to be as above table for each mode based upon investigations by measuring the output power and PSD across all data rated, and modulations.

Note 2: The power level was provided by the applicant.

Duty cycle

Test Result: Pass. Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

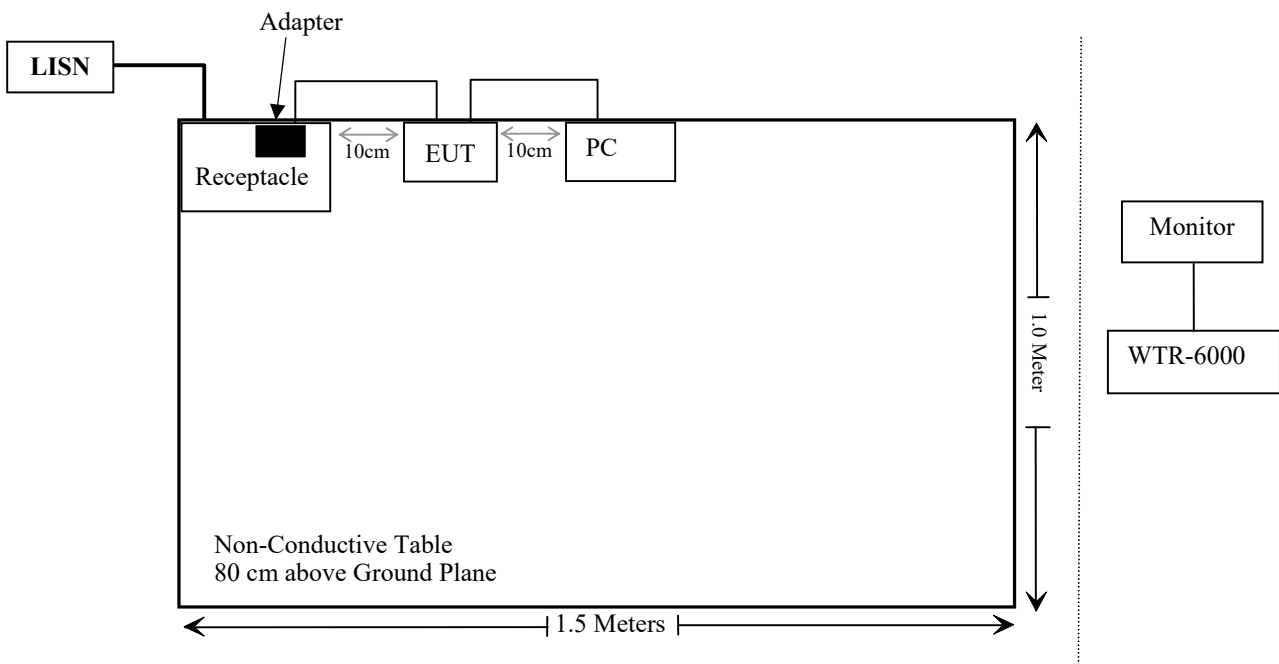
Manufacturer	Description	Model	Serial Number
RETCVIS	Adapter	DSA-5PF07-05 FUS	Unknown
SAMSUNG	Monitor	S24E390HL	ZZFRH4ZN303357K
DELL	PC	Latitude E5430	590NLV1
Trans Electric Co., Ltd	Receiver	WTR-6000	Unknown

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielded detachable HDMI cable	0.2	WTR-6000	PC

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(9)& §15.207(a)	Conducted Emissions	Compliant
§15.205& §15.209 &§15.407(b) (1), (4),(9),(10)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (12),(e)	26 dB Emission Bandwidth & 6dB 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
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test (Below 1G)					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2020/12/22	2023/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Radiated Emission Test (Above 1G)					
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2021/11/28
Sunol Sciences	Horn Antenna	3115	9107-3694	2021/01/15	2024/01/14
Insulated Wire Inc.	RF Cable	SPS-2503-3150	02222010	2020/11/29	2021/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2020/11/29	2021/11/28
Unknown	Signal Cable	RG-214	2	2020/11/29	2021/11/28
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2021/04/20	2022/04/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-021304	2020/12/06	2023/12/05
Ducommun Technologies	Horn antenna	ARH-2823-02	1007726-021302	2020/12/06	2023/12/05

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2020/08/04	2021/08/03
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2020/08/04	2021/08/03

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

§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For worst case:

Frequency (MHz)	Antenna Gain		Conducted Tune up Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
5150-5250	0	1.0	12.0	15.85	20	0.0032	1.0
5725-5850	0	1.0	12.0	15.85	20	0.0032	1.0

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

Result: Compliance

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

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

- a. Antenna must be permanently attached to the unit.
 - b. Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

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

Antenna Connector Construction

The EUT has one internal antenna arrangement for 5G Wi-Fi, which was permanently attached and the antenna gain is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

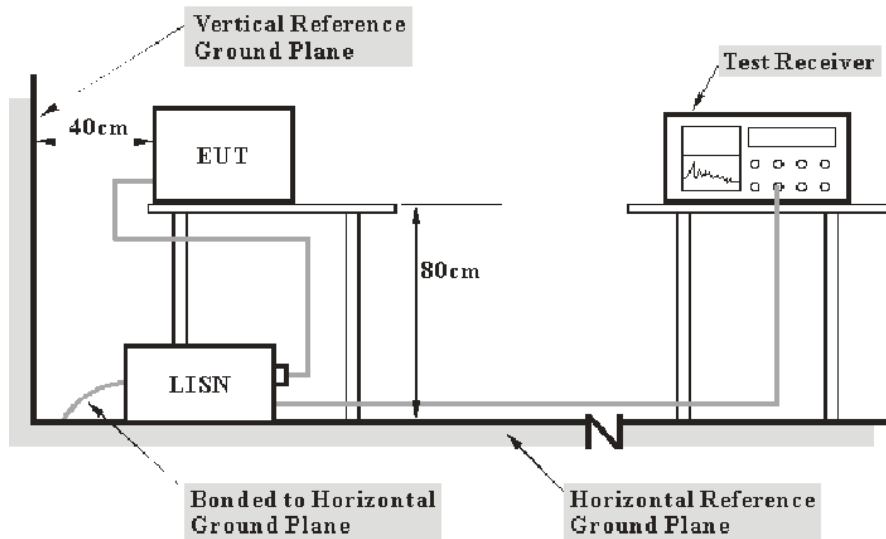
Result: Pass

FCC §15.407 (b) (9) §15.207 (a) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (9)

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.

Test Data

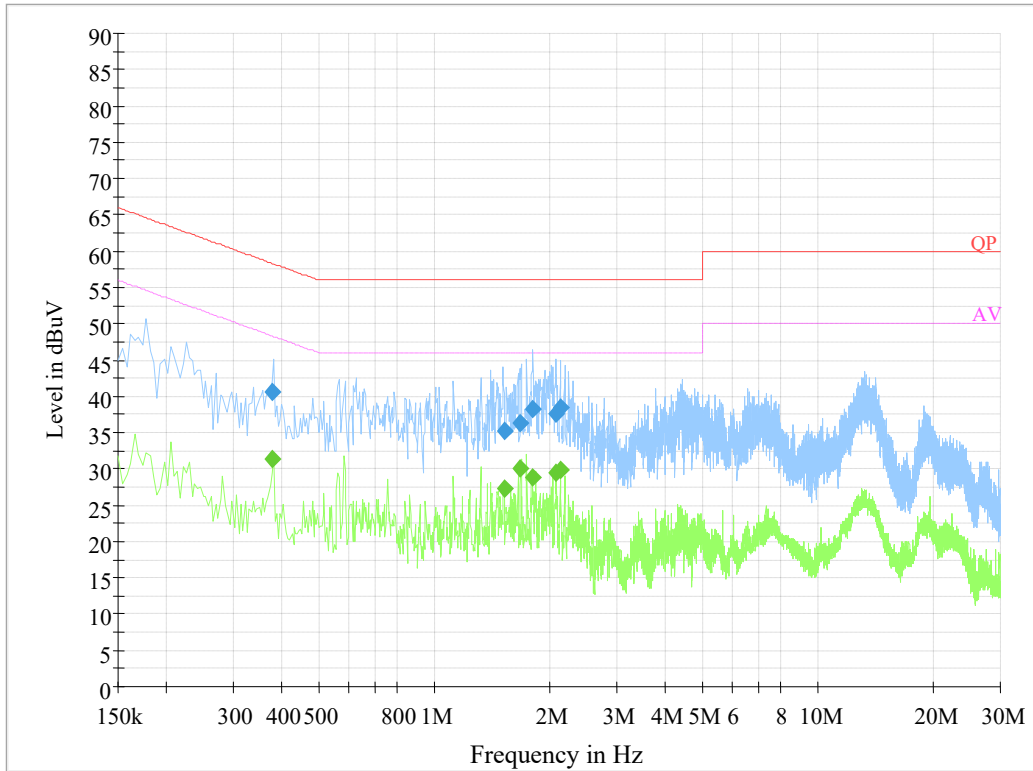
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	70 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2021-06-26.

EUT operation mode: Transmitting

AC 120V/60 Hz, Line:



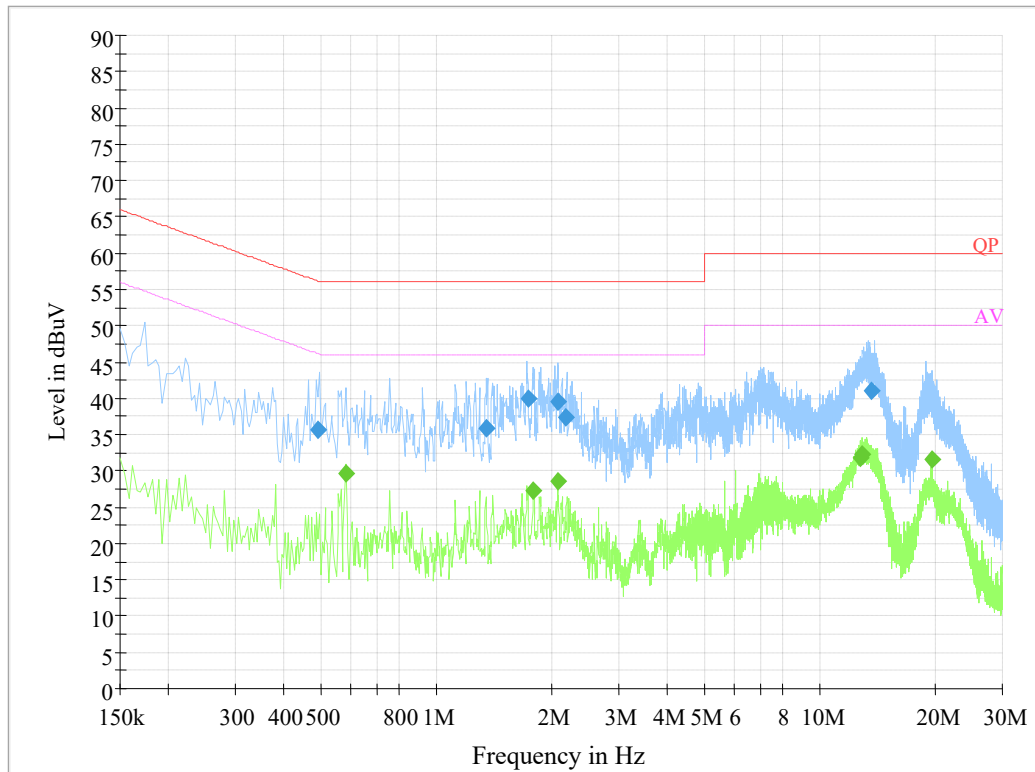
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.380270	40.6	9.000	L1	19.9	17.7	58.3
1.523290	35.2	9.000	L1	19.8	20.8	56.0
1.680650	36.3	9.000	L1	19.9	19.7	56.0
1.814790	38.3	9.000	L1	19.9	17.7	56.0
2.074770	37.5	9.000	L1	19.9	18.5	56.0
2.141870	38.5	9.000	L1	19.9	17.5	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.380270	31.4	9.000	L1	19.9	16.9	48.3
1.523290	27.4	9.000	L1	19.8	18.6	46.0
1.680650	30.4	9.000	L1	19.9	18.6	46.0
1.814790	28.4	9.000	L1	19.9	21.6	46.0
2.074770	29.2	9.000	L1	19.9	16.8	46.0
2.141870	29.8	9.000	L1	19.9	16.2	46.0

AC120V, 60 Hz, Neutral:



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.490530	35.7	9.000	N	19.8	20.5	56.2
1.349570	35.9	9.000	N	19.8	20.1	56.0
1.736110	39.8	9.000	N	19.8	16.2	56.0
2.086890	39.5	9.000	N	19.9	16.5	56.0
2.181090	37.5	9.000	N	19.8	18.5	56.0
13.648070	41.1	9.000	N	19.9	18.9	60.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.582000	29.6	9.000	N	19.8	16.4	46.0
1.794000	27.2	9.000	N	19.8	18.8	46.0
2.074000	28.6	9.000	N	19.9	17.4	46.0
12.810000	32.3	9.000	N	19.9	17.7	50.0
12.910000	32.4	9.000	N	19.9	17.6	50.0
19.710000	31.5	9.000	N	20.4	18.5	50.0

§15.205 & §15.209 & §15.407(B) (1), (4), (9), (10) – UNDESIRABLE EMISSION

Applicable Standard

FCC §15.407 (b) (1), (4), (9), (10); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

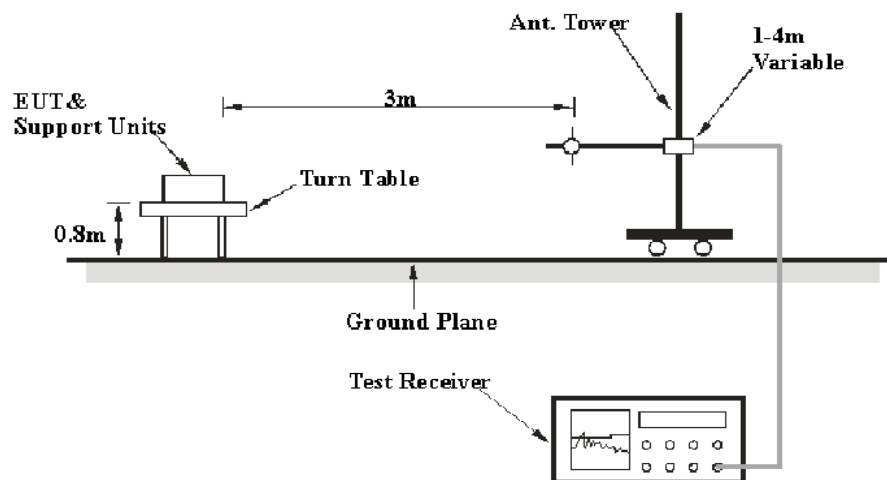
(4) For transmitters operating in the 5.725-5.85 GHz band:

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

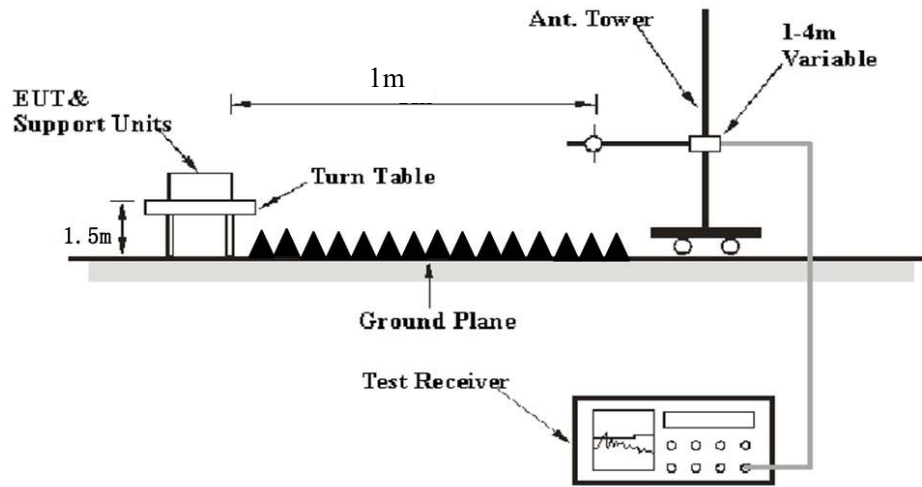
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



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

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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

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

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

Note 2: when duty cycle is less than 98%

Test Procedure

Radiated Spurious Emission

During the radiated emission test, the adapter was connected to the AC floor outlet. Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

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

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified, extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\text{SpecLimit}} = E_{\text{Meas}} + 20 \log \left(\frac{d_{\text{Meas}}}{d_{\text{SpecLimit}}} \right)$$

where

$E_{\text{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dB μ V/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dB μ V/m
d_{Meas}	is the measurement distance, in m
$d_{\text{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is $20 \cdot \log(1/3) = -9.5$ dB

Corrected Amplitude & Margin Calculation

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

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

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

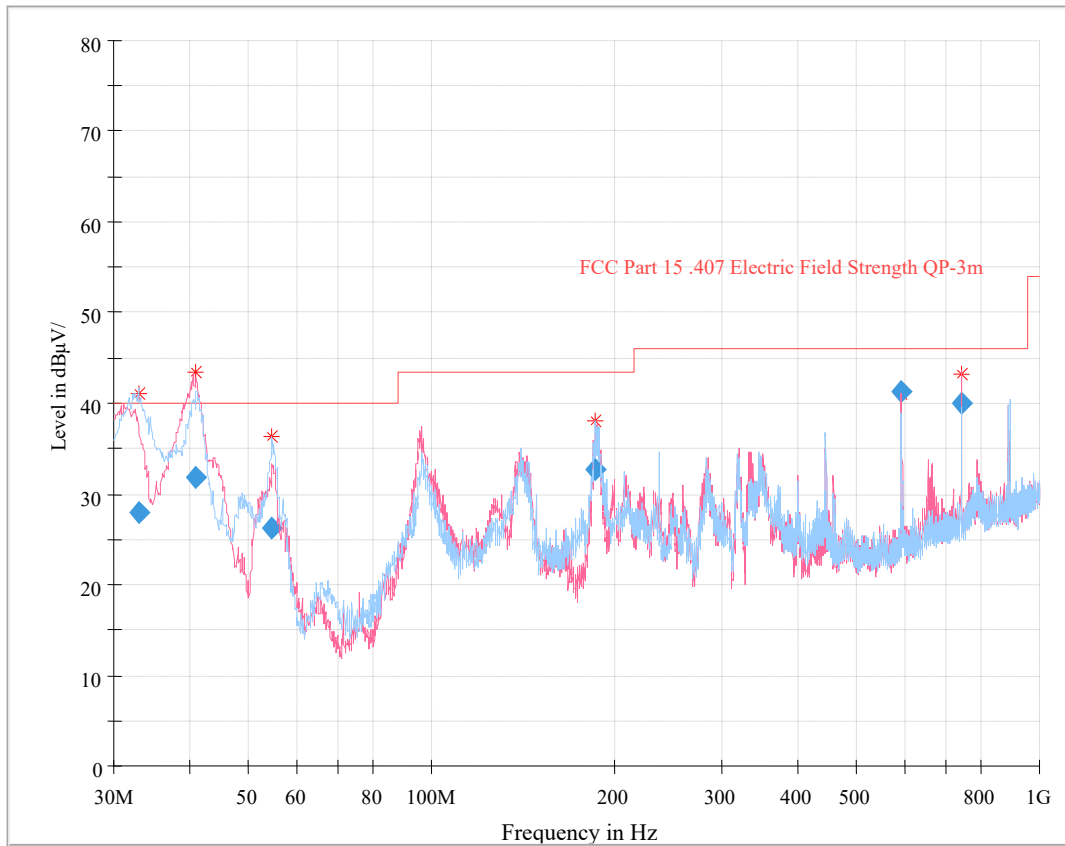
Environmental Conditions

Temperature:	28~28.6 °C
Relative Humidity:	52~ 60 %
ATM Pressure:	101.0~101.1 kPa

The testing was performed by Cloud Qiu on 2021-06-29 for below 1GHz and Bruce Lin on 2021-06-27 for above 1GHz.

EUT operation mode: Transmitting

30 MHz~1 GHz: (the worst case is 802.11ac40 Mode, 5755MHz)



Final Result

Frequency (MHz)	QuasiPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.913125	27.99	40.00	12.01	125.0	H	150.0	-5.8
41.011375	31.74	40.00	8.26	381.0	V	171.0	-11.1
54.735000	26.33	40.00	13.67	200.0	H	306.0	-16.6
186.291250	32.68	43.50	10.82	278.0	H	190.0	-12.3
593.994375	41.21	46.00	4.79	111.0	V	204.0	-4.5
742.438750	40.01	46.00	5.99	102.0	V	185.0	-1.6

1 ~ 40 GHz:

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

5150-5350MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac40									
5190 MHz									
5149.27	31.37	PK	356	1.4	H	38.36	69.73	83.5	13.77
5149.27	18.57	Ave.	356	1.4	H	38.36	56.93	63.5	6.57
5350.31	31.51	PK	311	1.6	H	39.09	70.60	83.5	12.90
5350.31	18.24	Ave.	311	1.6	H	39.09	57.33	63.5	6.17
10380.00	42.96	PK	74	1.7	H	17.42	60.38	77.7	17.32
5230 MHz									
5149.32	31.51	PK	294	2.4	H	38.36	69.87	83.5	13.63
5149.32	18.68	Ave.	294	2.4	H	38.36	57.04	63.5	6.46
5350.84	31.21	PK	266	1.1	H	39.09	70.30	83.5	13.20
5350.84	18.66	Ave.	266	1.1	H	39.09	57.75	63.5	5.75
10460.00	42.02	PK	338	1.0	H	17.15	59.17	77.7	18.53

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part15.407	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
802.11ac40									
5755 MHz									
5646.49	31.61	PK	80	1.1	H	39.46	71.07	77.7	6.63
5698.99	32.45	PK	170	1.5	H	39.49	71.94	113.96	42.02
5716.80	34.71	PK	93	2.0	H	39.49	74.20	119.4	45.20
5722.24	33.78	PK	121	1.1	H	39.49	73.27	125.41	52.14
11510.00	42.83	PK	234	1.5	H	17.47	60.30	83.5	23.20
11510.00	28.25	Ave.	234	1.5	H	17.47	45.72	63.5	17.78
5795 MHz									
5854.01	33.42	PK	260	1.9	H	39.87	73.29	122.56	49.27
5856.88	34.25	PK	62	2.3	H	39.87	74.12	119.77	45.65
5878.32	34.17	PK	70	1.3	H	39.87	74.04	112.24	38.20
5936.24	33.56	PK	302	2.3	H	39.97	73.53	77.7	4.17
11590.00	42.91	PK	323	1.7	H	17.51	60.42	83.5	23.08
11590.00	28.35	Ave.	323	1.7	H	17.51	45.86	63.5	17.64

Note:

Corrected Amplitude = Corrected Factor + Reading

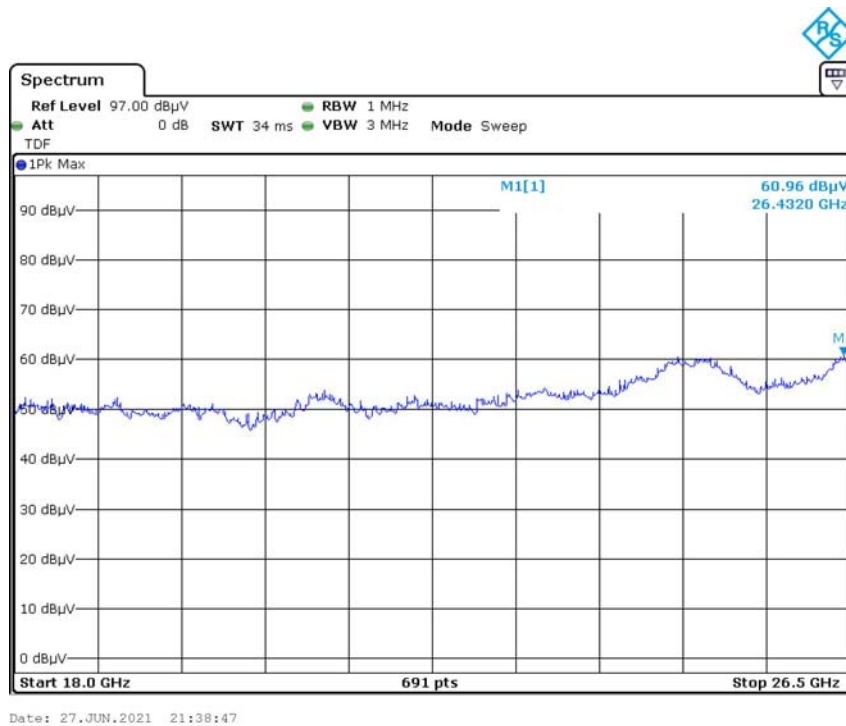
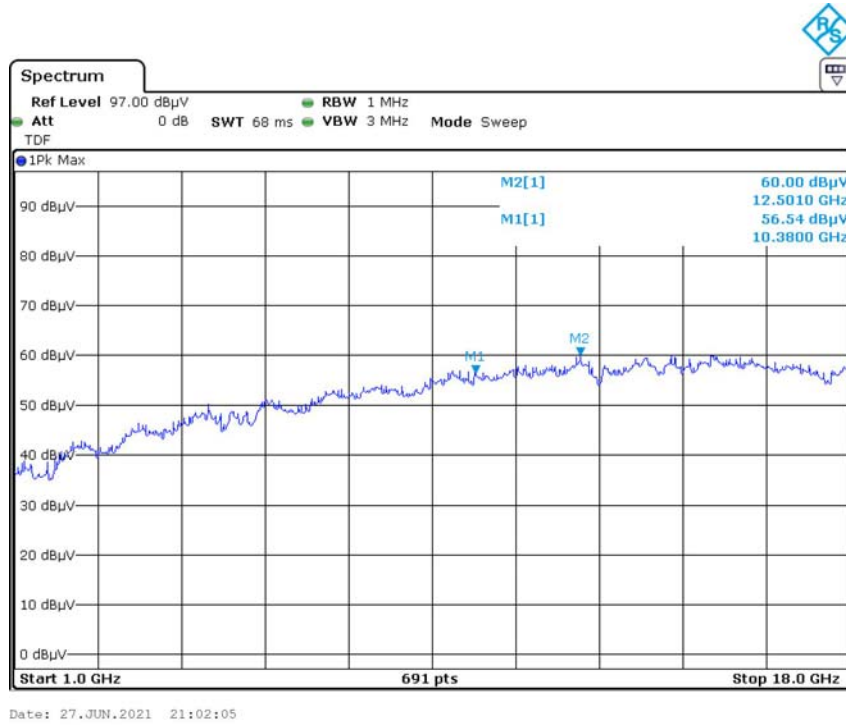
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

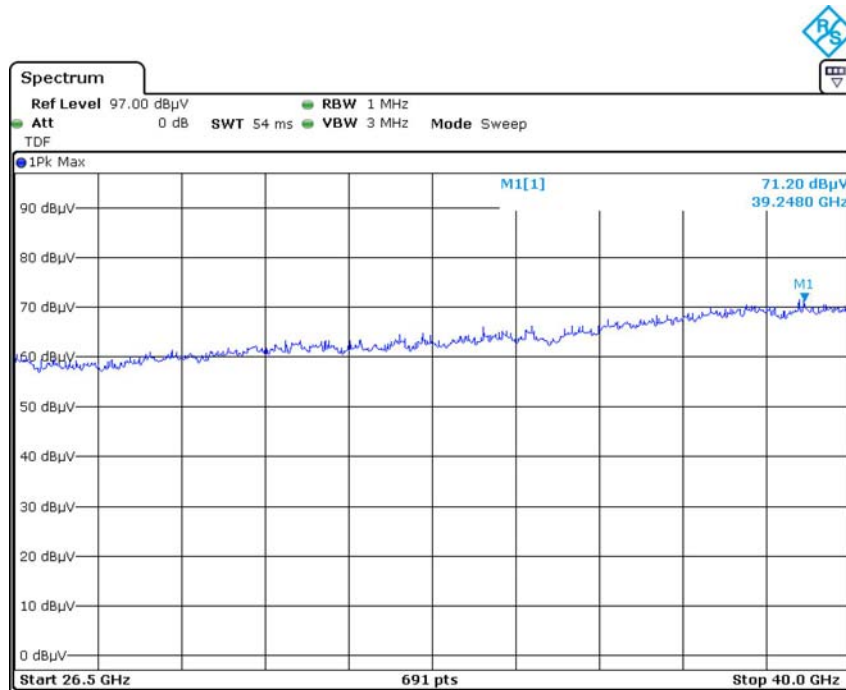
Margin = Limit- Corr. Amplitude

All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

Peak

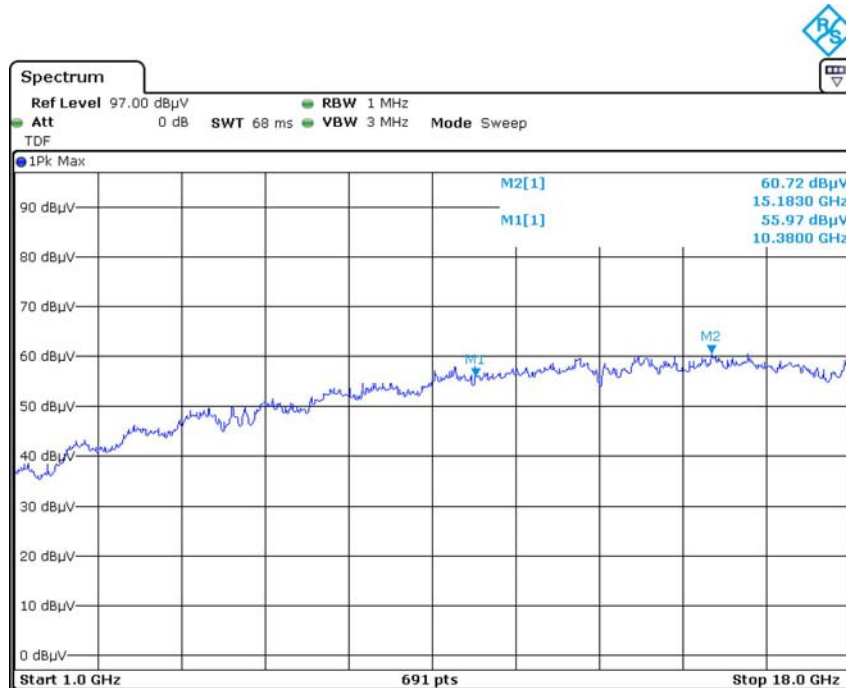
Pre-scan with 802.11ac40 mode 5190MHz
Horizontal



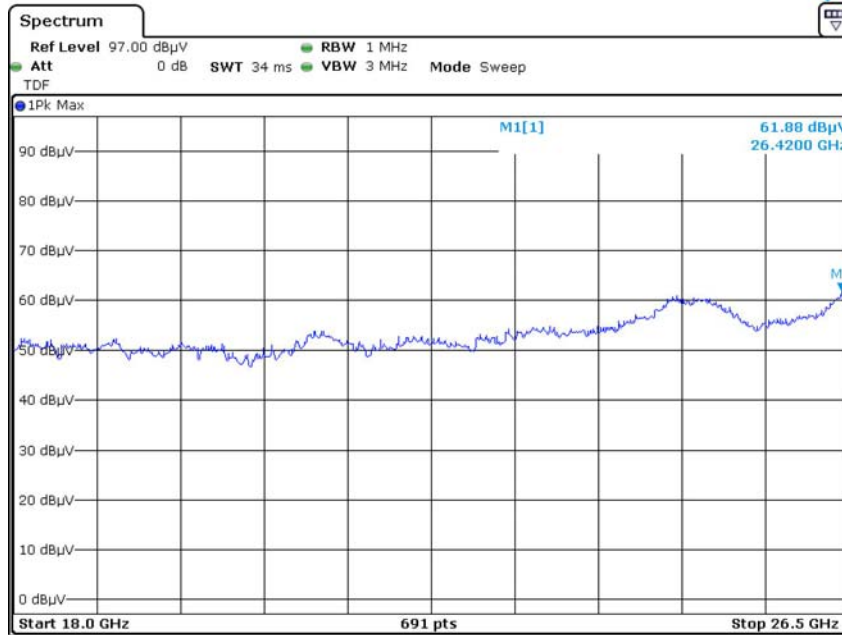


Date: 27.JUN.2021 21:47:29

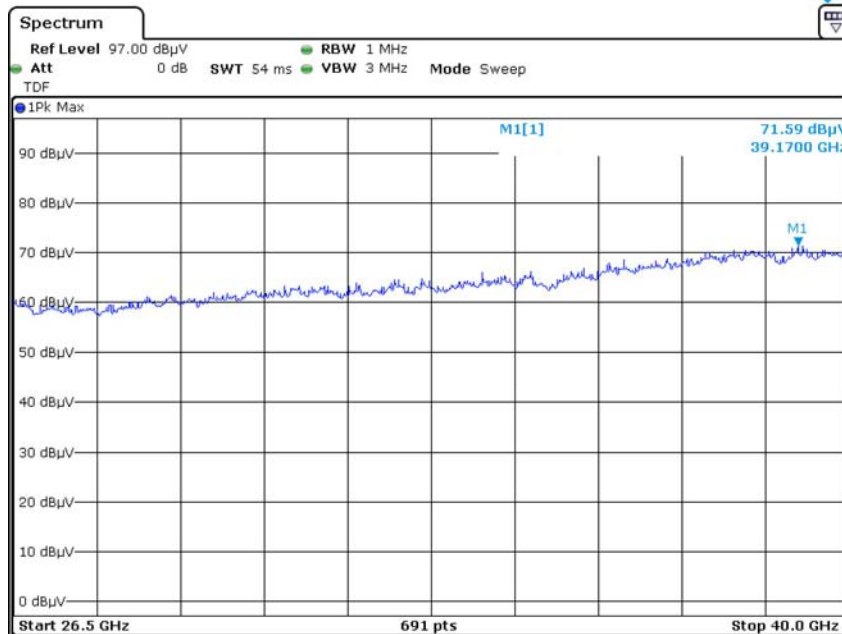
Vertical



Date: 27.JUN.2021 21:08:09



Date: 27.JUN.2021 21:42:16



Date: 27.JUN.2021 21:52:43

FCC §15.407(a) (12) (e)– 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands 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

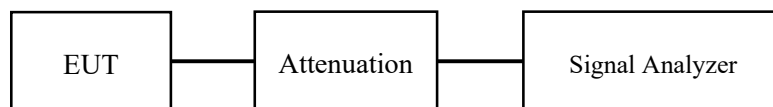
1. Emission Bandwidth (EBW)

- 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 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ 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:	24 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bravos Zhao on 2021-06-24.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix

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

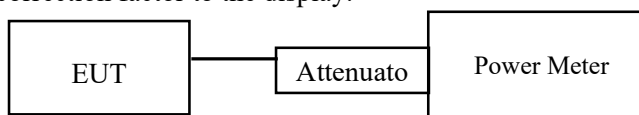
Applicable Standard

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.

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 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bravos Zhao on 2021-06-24.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix

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

Applicable Standard

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.

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

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

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

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bravos Zhao on 2021-06-24.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix

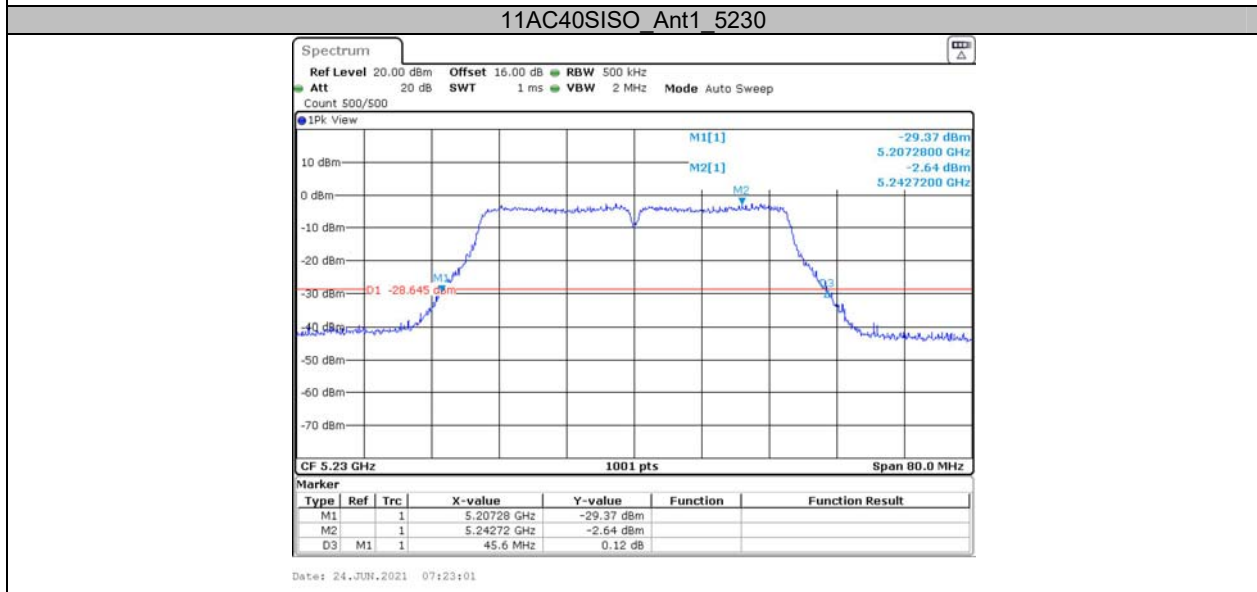
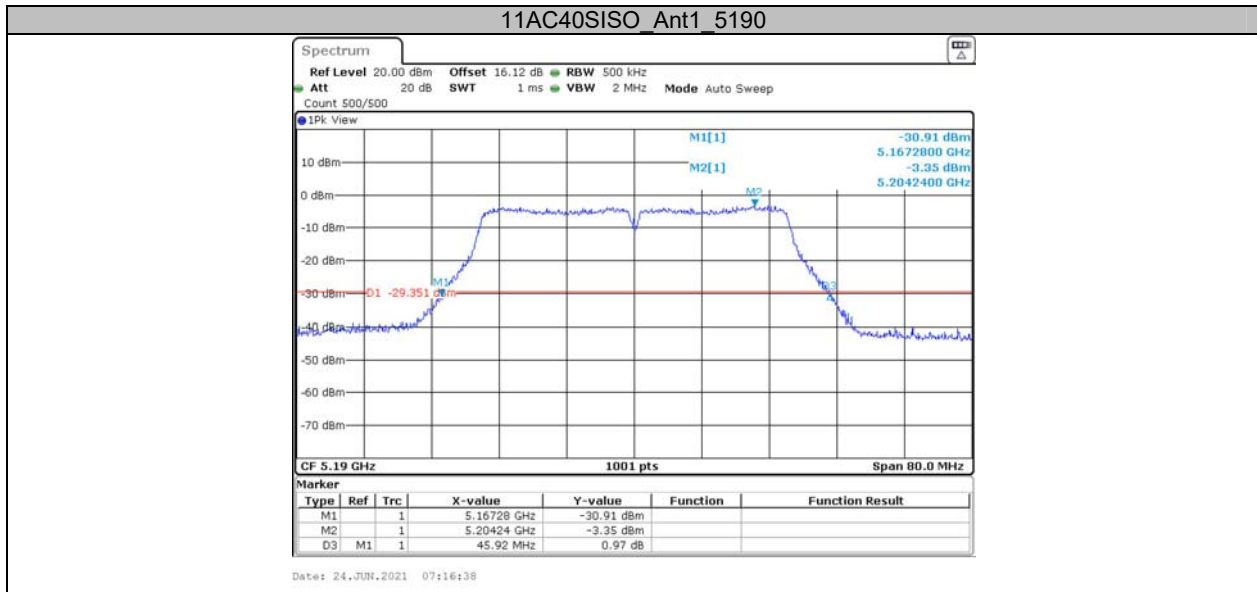
APPENDIX

Appendix A1: Emission Bandwidth

Test Result

TestMode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11AC40SISO	Ant1	5190	45.920	---	PASS
		5230	45.600	---	PASS

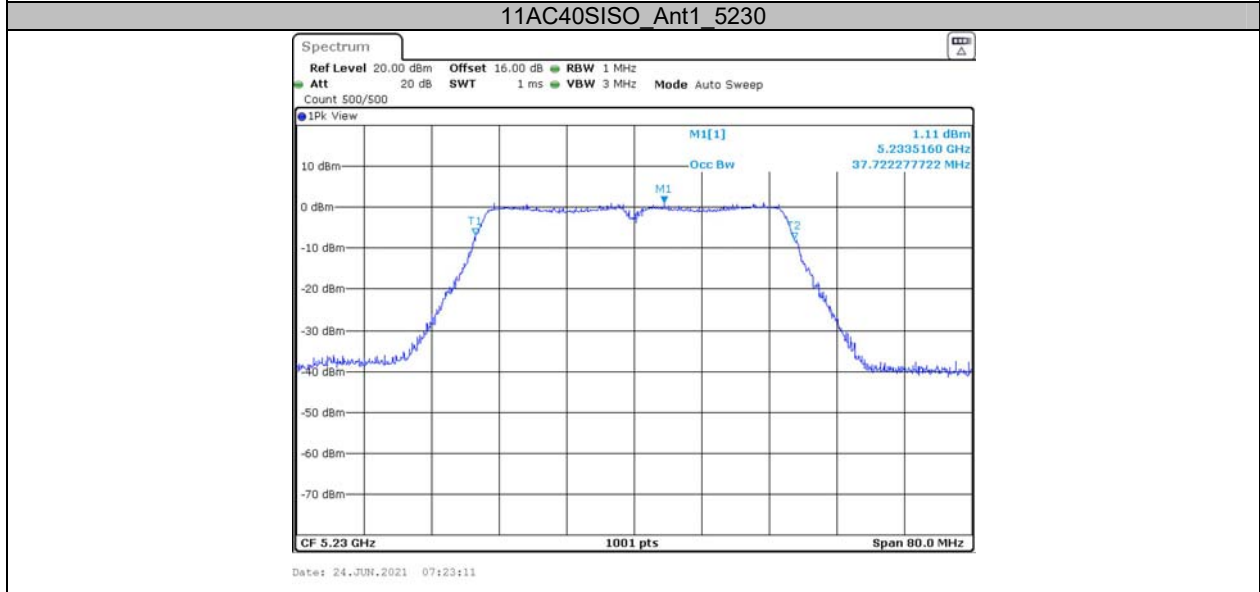
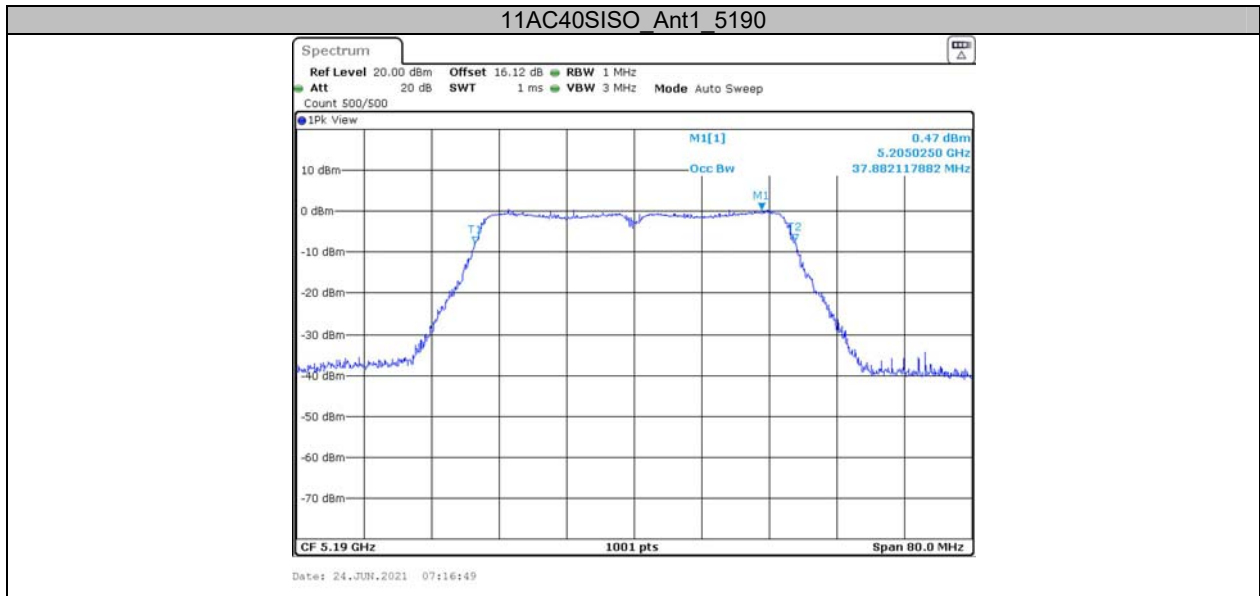
Test Graphs

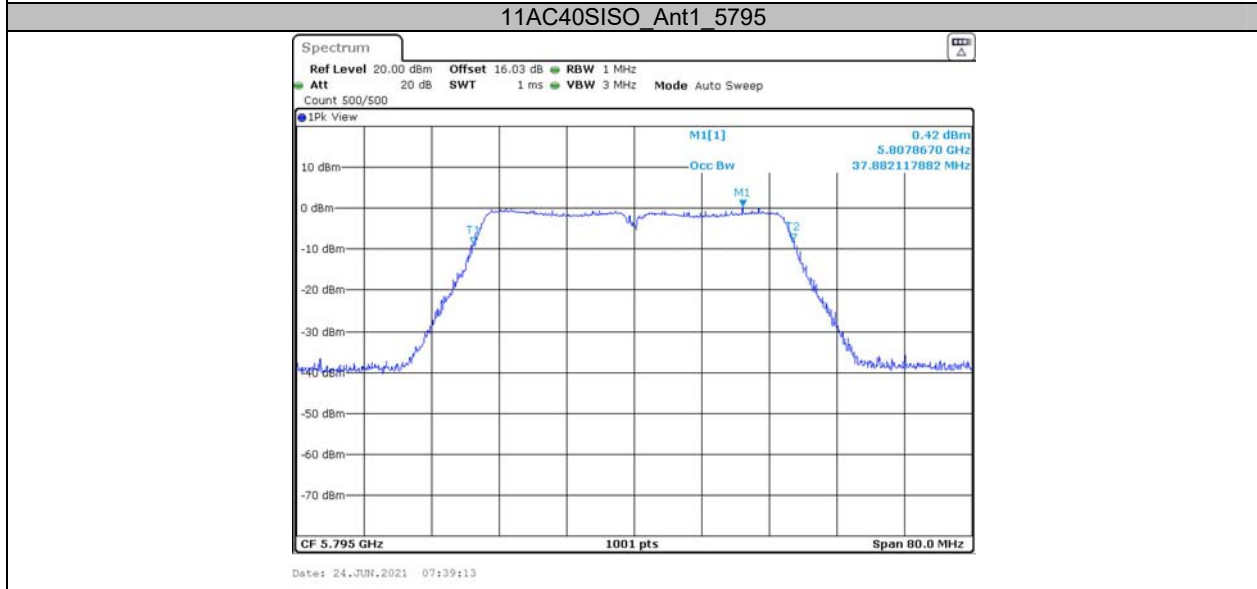
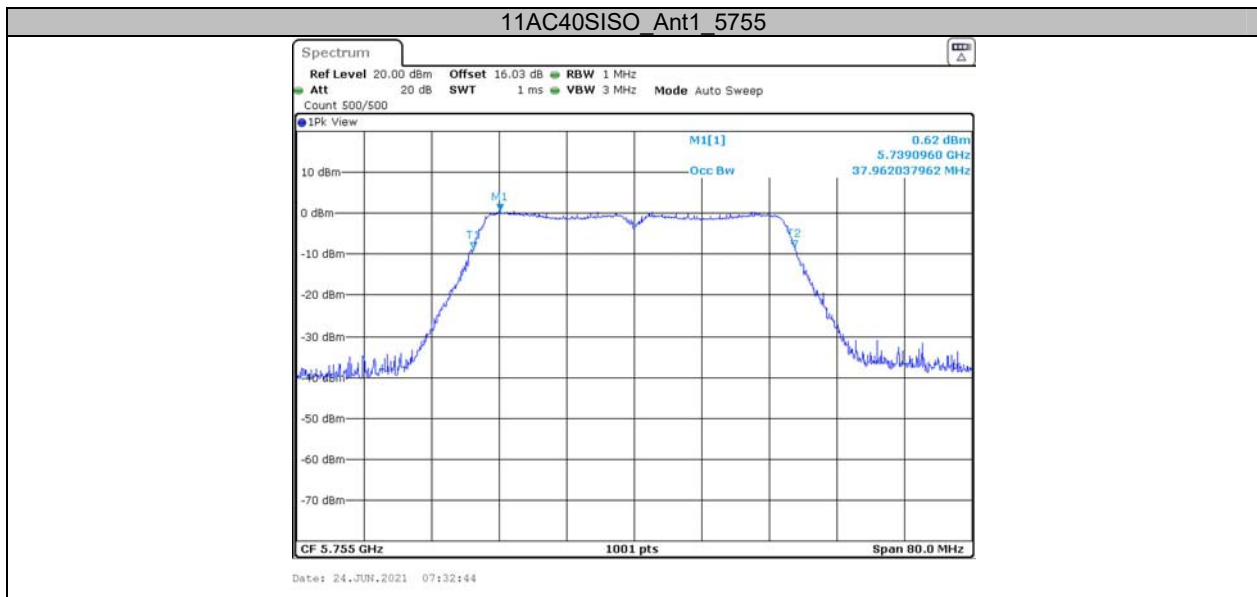


Appendix A2: Occupied channel bandwidth**Test Result**

TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11AC40SISO	Ant1	5190	37.882	---	PASS
		5230	37.722	---	PASS
		5755	37.962	---	PASS
		5795	37.882	---	PASS

Test Graphs



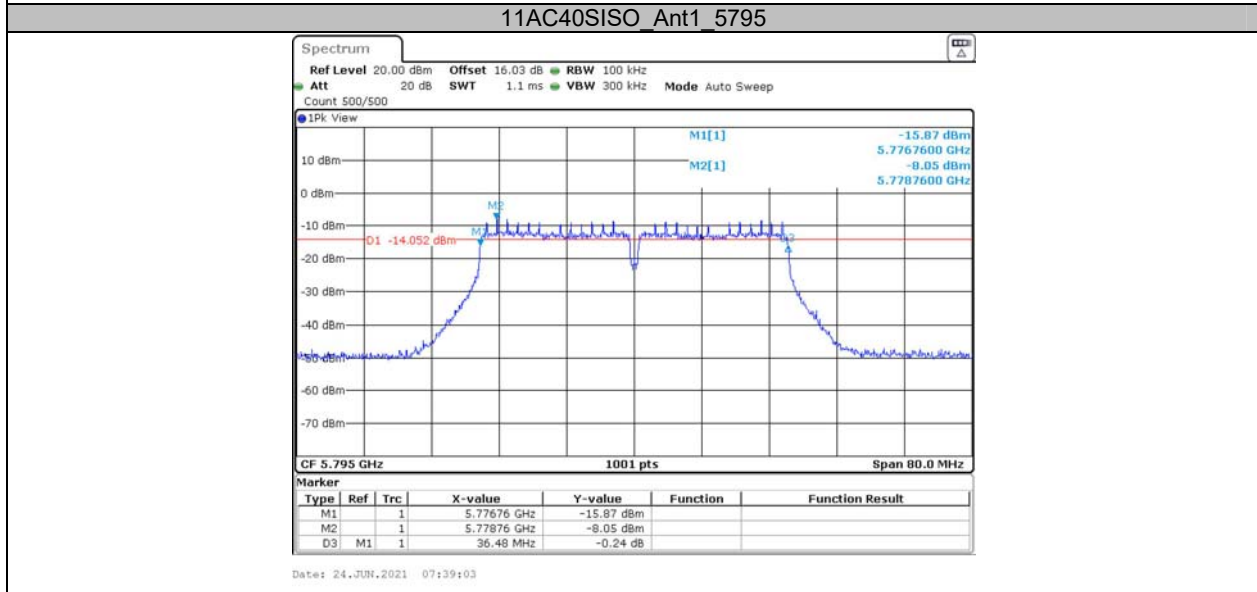
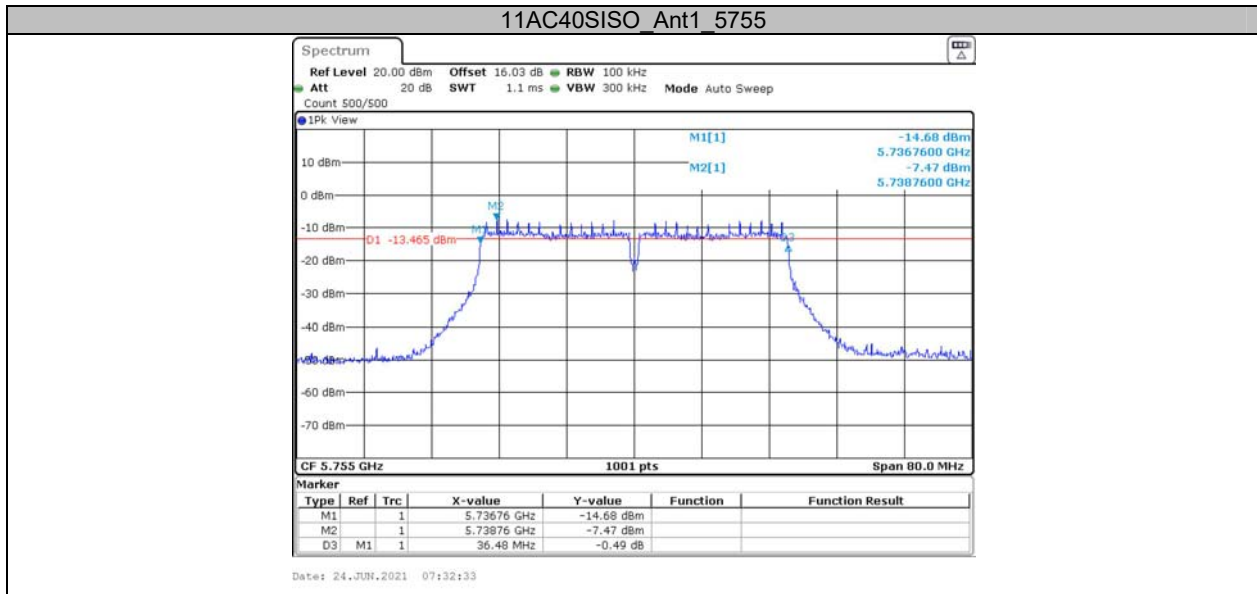


Appendix A3: Min emission bandwidth

Test Result

TestMode	Antenna	Channel	6db EBW [MHz]	Limit[MHz]	Verdict
11AC40SISO	Ant1	5755	36.480	0.5	PASS
		5795	36.480	0.5	PASS

Test Graphs



Appendix B: Maximum conducted average output power**Test Result**

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11AC40SISO	Ant1	5190	10.88	≤23.98	PASS
		5230	11.24	≤23.98	PASS
		5755	11.43	≤30	PASS
		5795	9.70	≤30	PASS

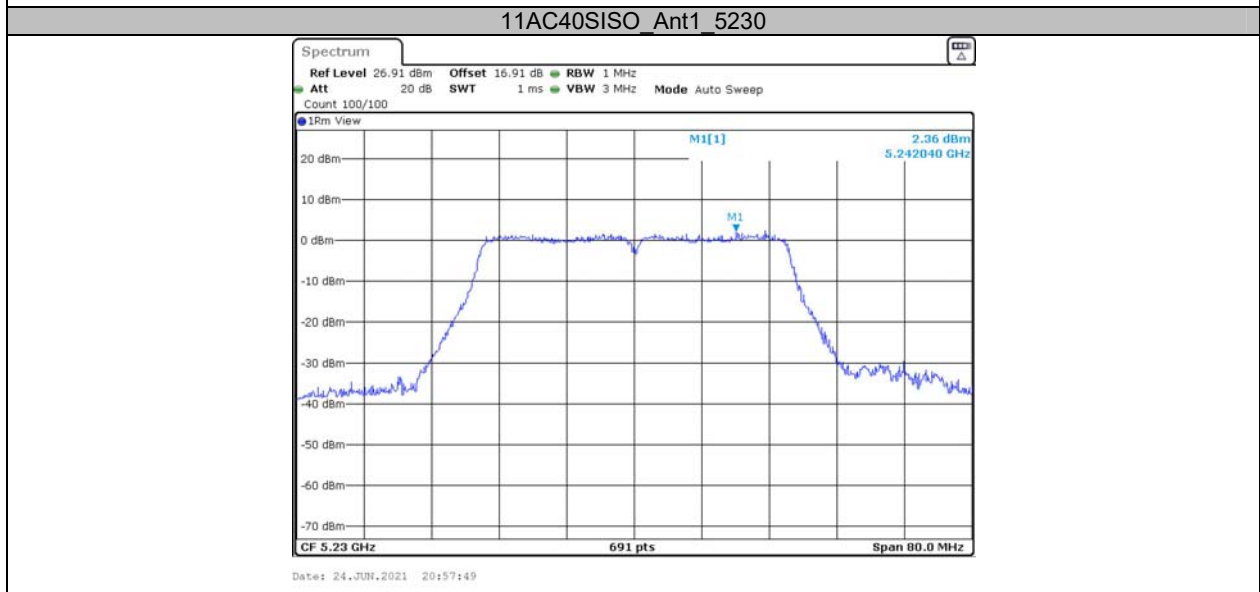
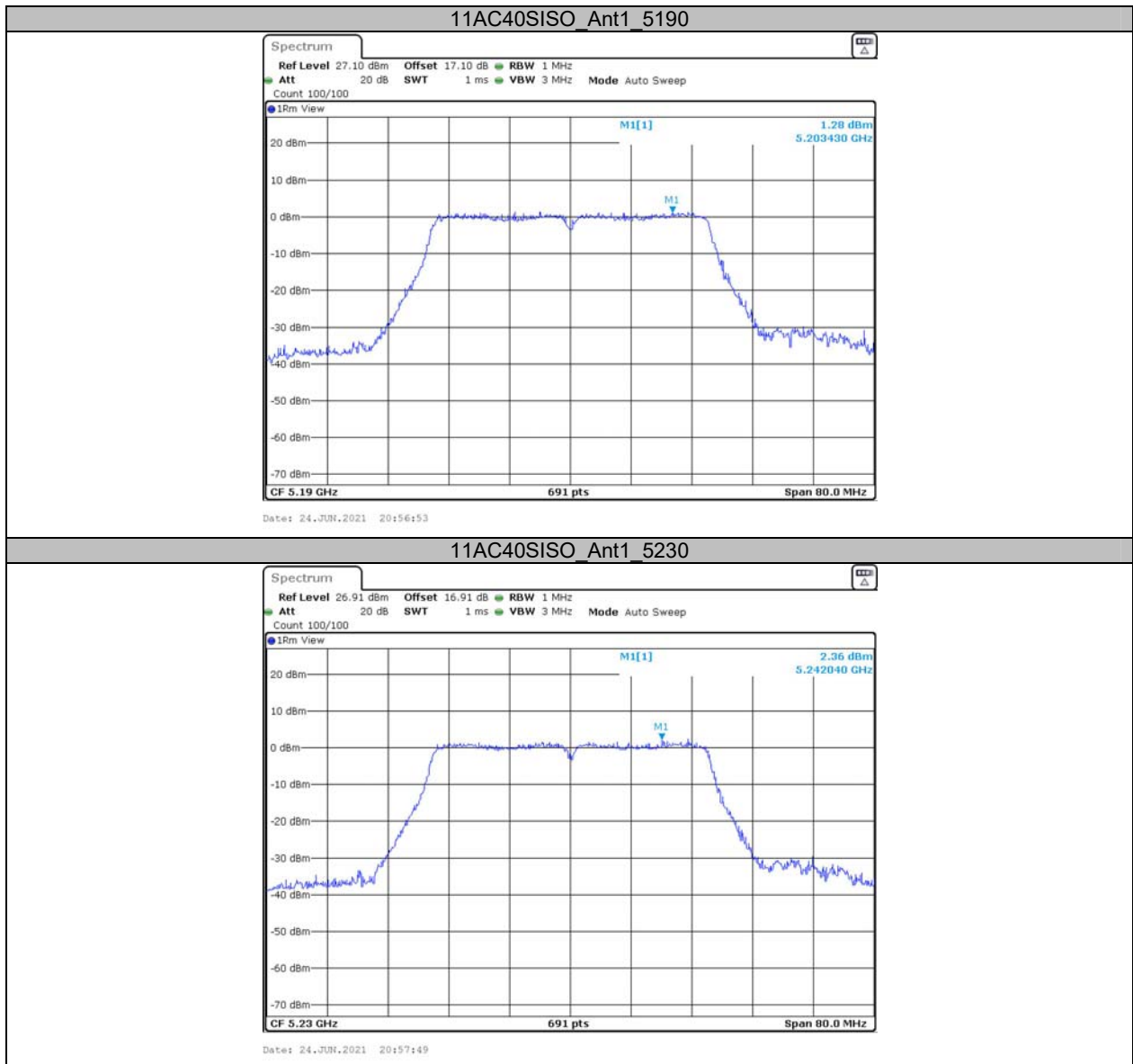
Note: 1. The duty cycle factor has been added into result.
2. EUT is client.

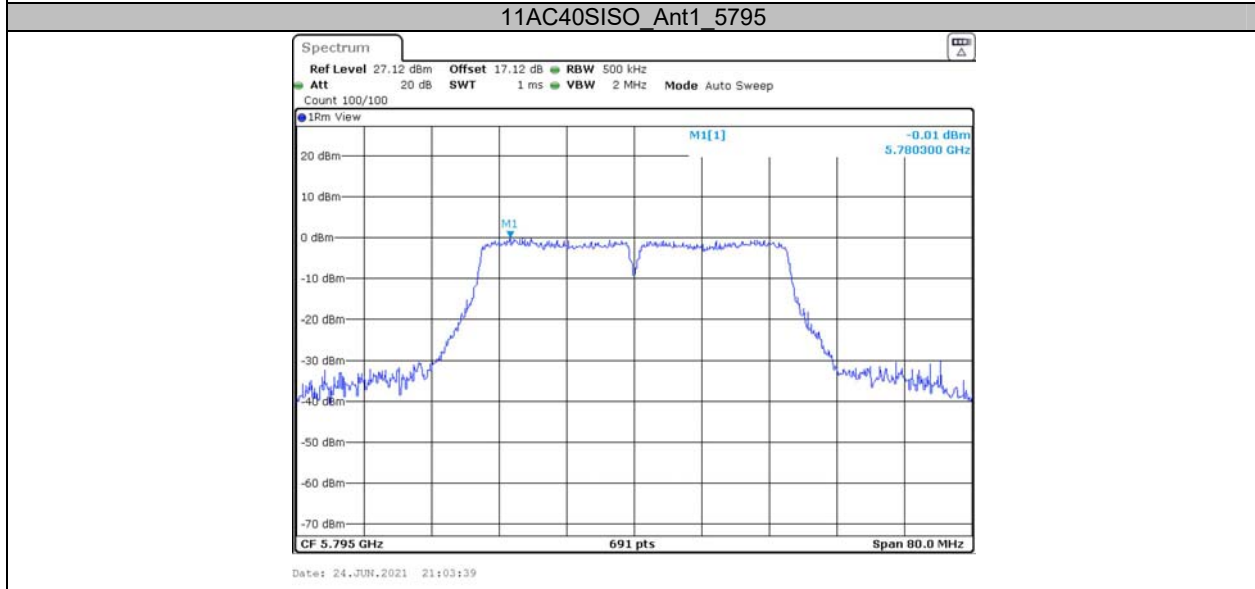
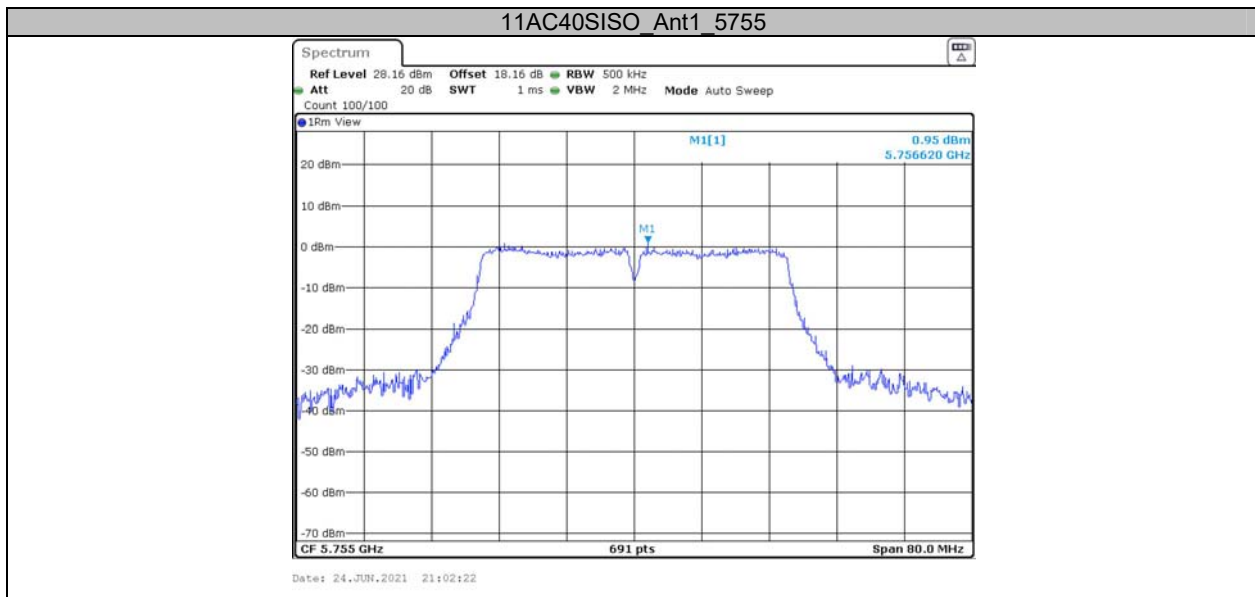
Appendix C: Maximum power spectral density**Test Result**

TestMode	Antenna	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11AC40SISO	Ant1	5190	1.28	≤ 11	PASS
		5230	2.36	≤ 11	PASS
		5755	0.95	≤ 30	PASS
		5795	-0.01	≤ 30	PASS

Note: 1. The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.
2. The Duty Cycle Factor is compensated in the graph.

Test Graphs

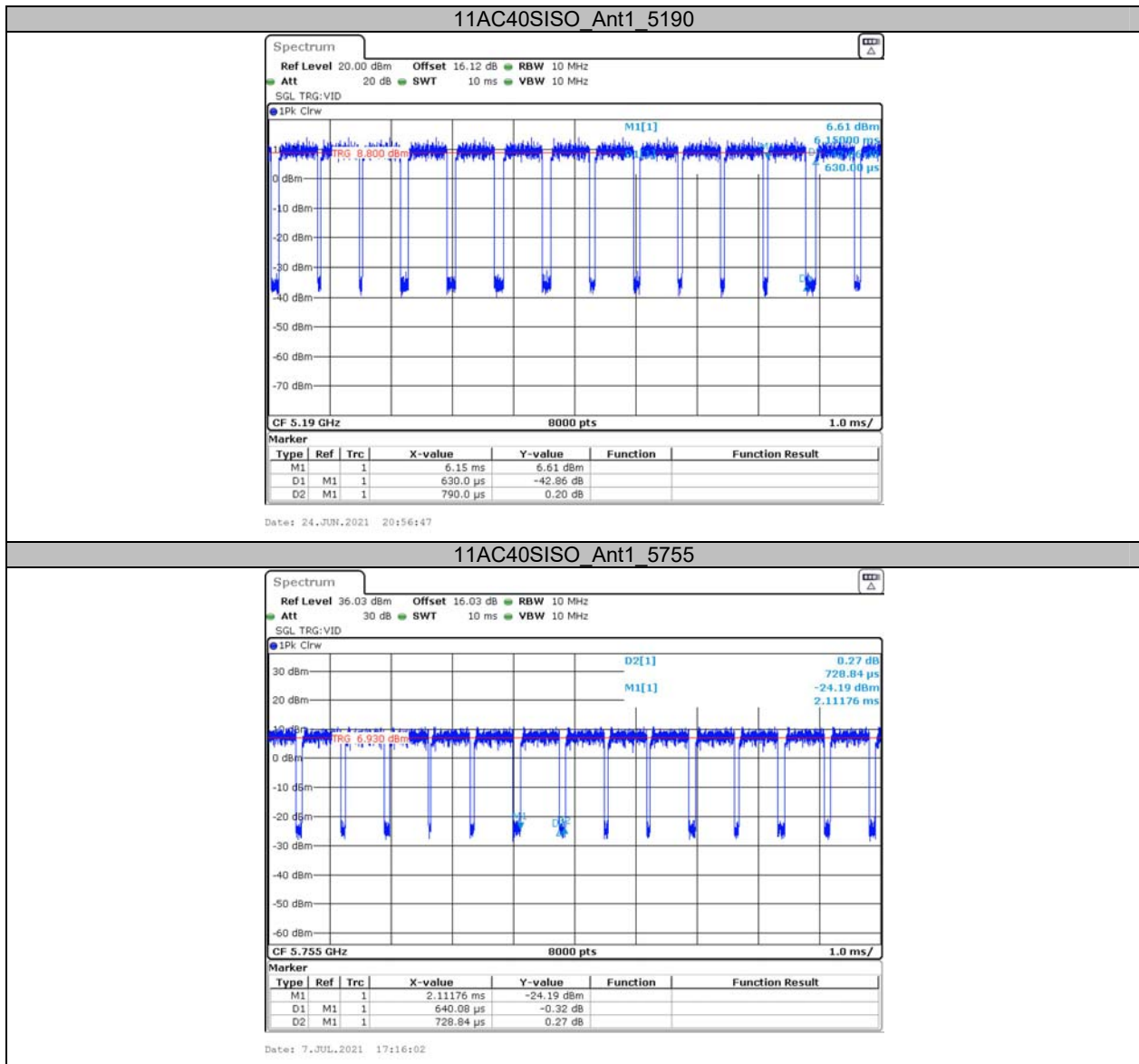




Appendix D: DutyCycle**Test Result**

TestMode	Antenna	Channel	TransmissionDuration [ms]	Transmission Period [ms]	Duty Cycle [%]
11AC40SISO	Ant1	5190	0.63	0.79	79.75
		5755	0.64	0.73	87.67

Test Graphs



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