



# FCC PART 15.407 TEST REPORT

For

## Ultimate Health Plans Corporate

1244 Mariner Boulevard Spring Hill, FL 34609, United States

**FCC ID:2AYLKULT291**

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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	Ultimate
Tested Model	Ultimate FU
Frequency Range	5G Wi-Fi: 5150-5250 MHz
Transmit Power	5150-5250 MHz 14.85dBm (802.11a), 14.31dBm(802.11n20), 14.61dBm(802.11n40), 14.38dBm(802.11ac20), 15.02dBm (802.11ac 40)
Modulation Technique	Wi-Fi: OFDM
Antenna Specification*	0.8dBi(provided by the applicant)
Voltage Range	DC3.85V from battery or DC 5.0V from adapter
Date of Test	2021-01-14 to 2021-01-25
Sample number	RSZ201224003-RF-S1(Assigned by BACL, Shenzhen)
Received date	2020-12-24
Sample/EUT Status	Good condition
Adapter information	Model: HJ-0501000B2-US Input: AC 100-240V, 50/60Hz, 0.15A Output: DC 5V, 1A

### Objective

This type approval 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

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

**Measurement Uncertainty**

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

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

**Test Facility**

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

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

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

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

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

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

For 5150-5250MHz Band, 6 channels are provided to testing:

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

### Equipment Modifications

No modification was made to the EUT tested.

### EUT Exercise Software

The device was tested with the worst case was performed as below:

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power Level*
5150 – 5250MHz	802.11 a	CH36	5180	6	Default
		CH40	5200	6	Default
		CH48	5240	6	Default
	802.11 n20	CH36	5180	MCS0	Default
		CH40	5200	MCS0	Default
		CH48	5240	MCS0	Default
	802.11 ac20	CH36	5180	MCS0	Default
		CH40	5200	MCS0	Default
		CH48	5240	MCS0	Default
	802.11 n40	CH38	5190	MCS0	Default
		CH46	5230	MCS0	Default
	802.11 ac40	CH38	5190	MCS0	Default
		CH46	5230	MCS0	Default

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

The power level was provided by applicant.

Duty cycle:

Test Result: Pass. Please refer to the Appendix.

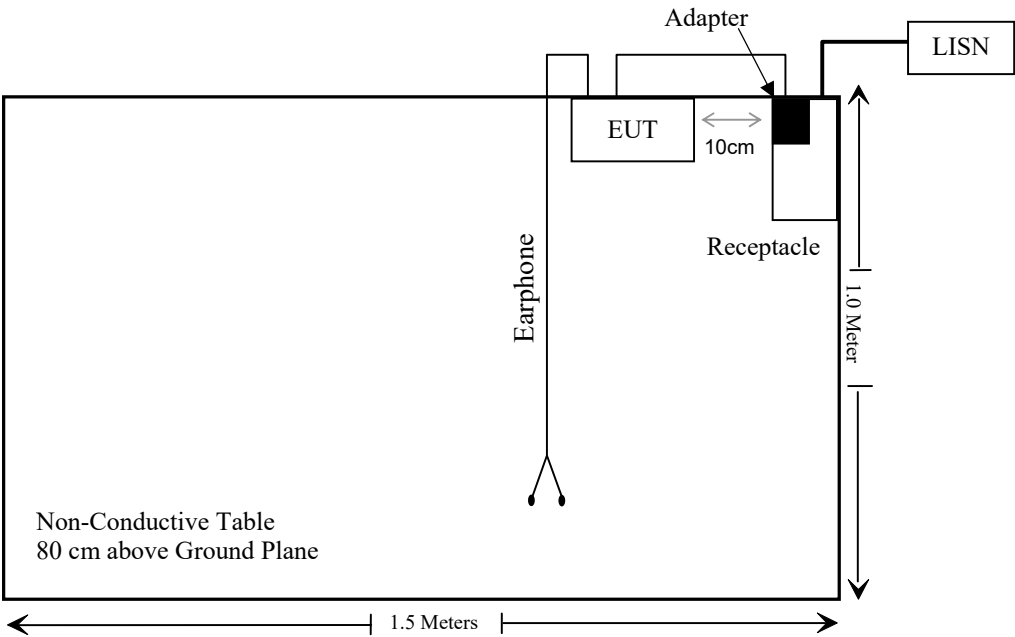
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Unshield Detachable USB Cable	1.0	Adapter	EUT

Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6) & §15.207(a)	Conducted Emissions	Compliance
§15.205 & §15.209 & §15.407(b) (4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a) (3)	Conducted Transmitter Output Power	Compliance
§15.407 (a) (3)	Power Spectral Density	Compliance



**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Conducted Emissions Test</b>					
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 Limitor	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
<b>Radiated Emission Test (30MHz-1GHz)</b>					
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	A040904-1	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
<b>Radiated Emission Test (1GHz-40GHz)</b>					
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	2020/11/29	2021/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2020/12/22	2023/12/21
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
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2020/04/20	2021/04/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-021304	2020/12/06	2023/12/05
Ducommun Technologies	Horn antenna	ARH-2823-02	1007726-011302	2020/12/06	2023/12/05
<b>RF Conducted Test</b>					
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
Unknown	RF Cable	Unknown	2301 276	2020/11/29	2021/11/28

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

## **FCC §1.1310 & §2.1093 - RF EXPOSURE**

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### **Applicable Standard**

FCC§1.1310 and §2.1093.

### **Test Result**

Compliance, please refer to the SAR report: RSZ201224003-SA.

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## **FCC §15.203 – ANTENNA REQUIREMENT**

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### **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 antennas arrangement for Wi-Fi, which were permanently attached and the antenna gain is 0.8 dBi for both Antennas, fulfill the requirement of this section. Please refer to the EUT photos.

**Result: Pass.**

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

### Applicable Standard

FCC §15.207, §15.407(b) (6)

### EUT Setup



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

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

The spacing between the peripherals was 10 cm.

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

### EMI Test Receiver Setup

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

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

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

### Test Procedure

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

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

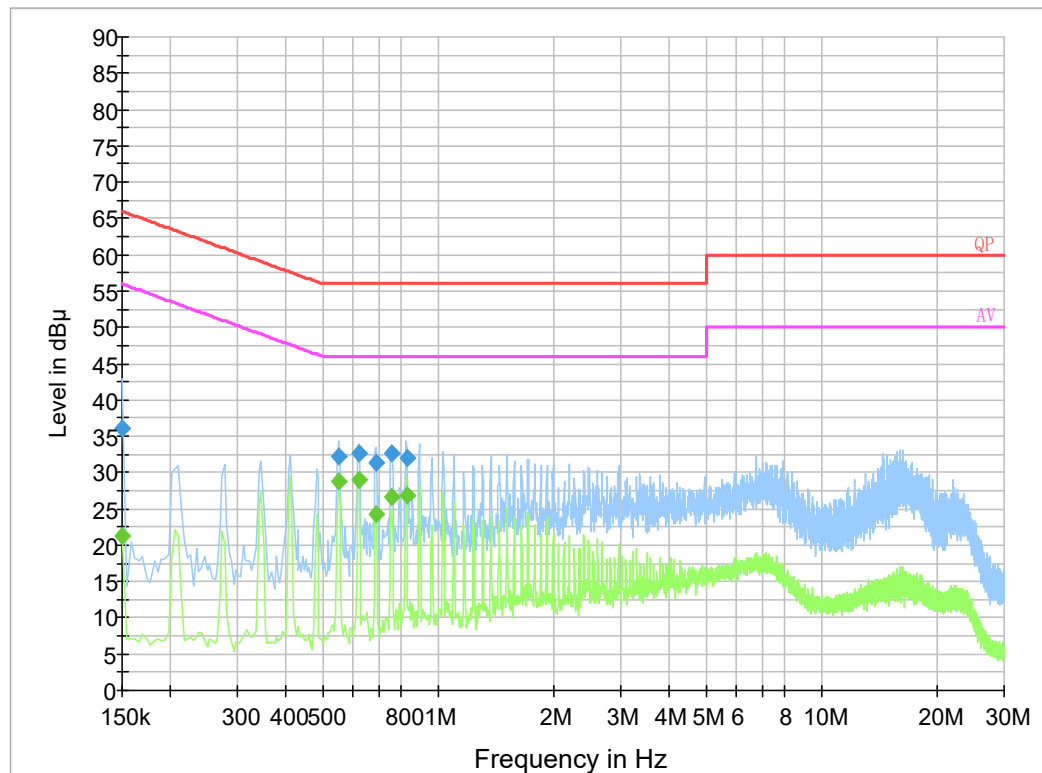
All data was recorded in the Quasi-peak and average detection mode.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	65 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Haiguo Li on 2021-01-16.*

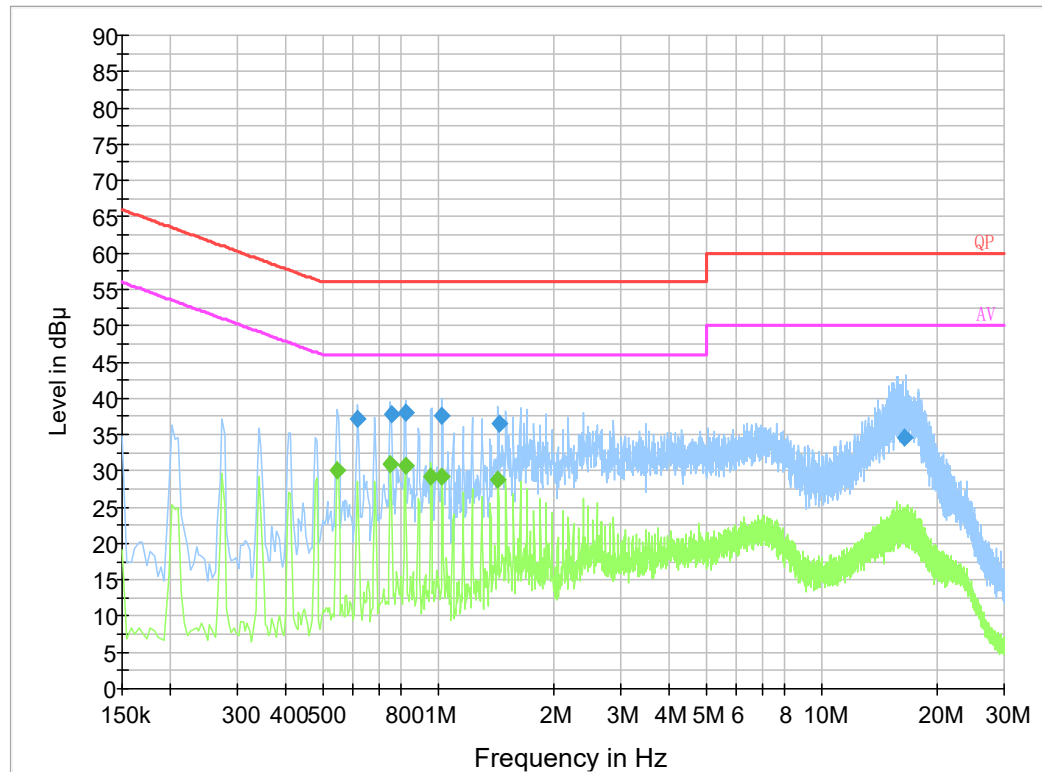
*EUT operation mode: WIFI Transmitting (worst case is 802.11ac40 mode 5230 MHz)*

**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)
0.150000	36.0	0.200	L1	19.8	30.0	66.0
0.549750	32.3	9.000	L1	19.8	23.7	56.0
0.620670	32.7	9.000	L1	19.8	23.3	56.0
0.687650	31.4	9.000	L1	19.8	24.6	56.0
0.758630	32.6	9.000	L1	19.8	23.4	56.0
0.829610	32.0	9.000	L1	19.8	24.0	56.0

**Final Result 2**

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	21.4	9.000	L1	19.8	34.6	56.0
0.549750	28.9	9.000	L1	19.8	17.1	46.0
0.620670	29.0	9.000	L1	19.8	17.0	46.0
0.687650	24.3	9.000	L1	19.8	21.7	46.0
0.758630	26.7	9.000	L1	19.8	19.3	46.0
0.829610	26.9	9.000	L1	19.8	19.1	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)
0.616730	37.2	9.000	N	19.8	18.8	56.0
0.754690	37.8	9.000	N	19.8	18.2	56.0
0.821670	38.1	9.000	N	19.8	17.9	56.0
1.026610	37.6	9.000	N	19.8	18.4	56.0
1.440430	36.6	9.000	N	19.8	19.4	56.0
16.484970	34.6	9.000	N	20.1	25.4	60.0

**Final Result 2**

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.546000	30.0	9.000	N	19.8	16.0	46.0
0.754000	31.0	9.000	N	19.8	15.0	46.0
0.822000	30.6	9.000	N	19.8	15.4	46.0
0.958000	29.2	9.000	N	19.8	16.8	46.0
1.026000	29.1	9.000	N	19.8	16.9	46.0
1.438000	28.8	9.000	N	19.8	17.2	46.0

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

### Applicable Standard

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

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

(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.

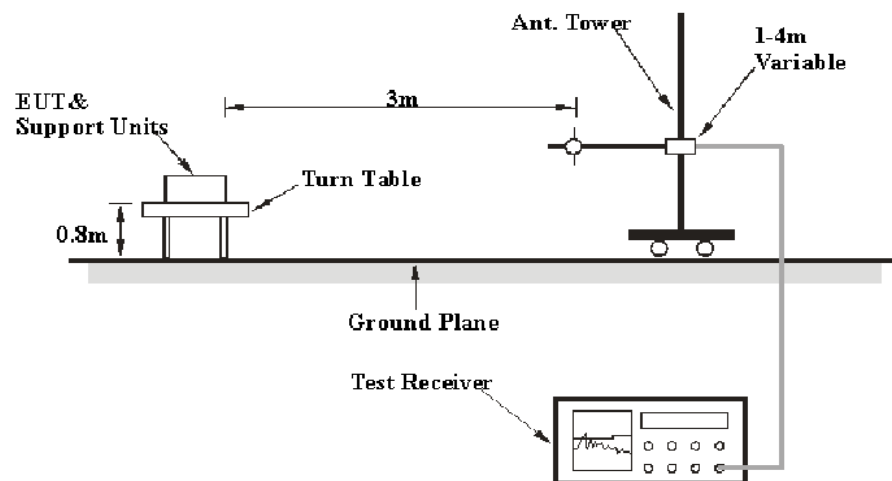
KDB 789033 D02 General UNII Test Procedures New Rules v02r01, clause G),

$E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] - 20 \log(d[\text{m}]) + 104.77$ , where E = field strength and d = distance at which field strength limit is specified.

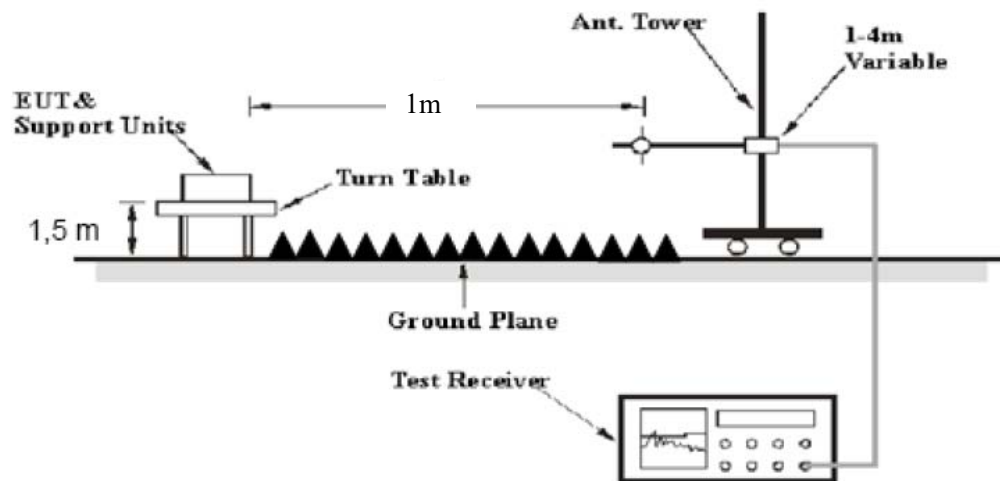
For FCC §15.407 (b) (1), (2), (3), (4),  $d=1\text{m}$ , non-Restricted bands limit  $= -27 - 20 \log(1) + 104.77 = 77.7 \text{ dB}\mu\text{V}/\text{m}$

### 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**

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 <sup>Note 1</sup>	/	Average
	1MHz	> 1/T <sup>Note 2</sup>	/	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: 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 $\mu$ V/m
$E_{\text{Meas}}$	is the field strength of the emission at the measurement distance, in dB $\mu$ V/m
$d_{\text{Meas}}$	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

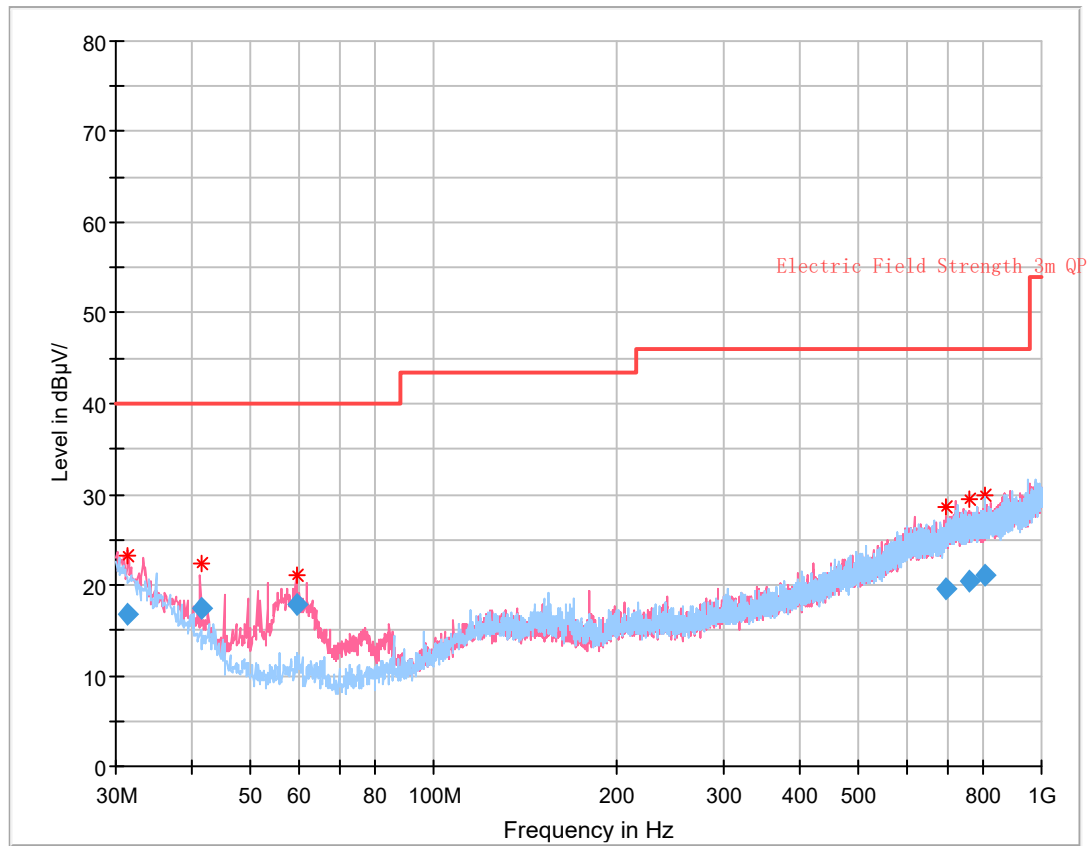
#### Environmental Conditions

<b>Temperature:</b>	20.8~24 °C
<b>Relative Humidity:</b>	41~51 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Holland Yang on 2021-01-18 for below 1GHz and Troy Wang on 2021-01-25 for above 1GHz.*

*EUT operation mode: Transmitting*

**30 MHz – 1 GHz:** (worst case is 802.11ac40 mode 5230 MHz)



## Final Result

Frequency (MHz)	QuasiPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.324750	16.84	40.00	23.16	113.0	V	0.0	-5.3
41.362500	17.42	40.00	22.58	111.0	V	0.0	-11.5
59.543375	17.84	40.00	22.16	104.0	V	180.0	-17.1
698.527250	19.52	46.00	26.48	355.0	V	291.0	-1.2
760.061625	20.50	46.00	25.50	281.0	V	191.0	-0.2
808.407125	20.99	46.00	25.01	250.0	H	0.0	-0.1

**30 MHz ~ 40 GHz:****5150-5250MHz:**

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407	
	Reading (dBμV)	PK/QP/Ave.		Degree	Height (m)			Polar (H / V)	Limit (dBμV/m)
802.11A									
5180 MHz									
5149.53	31.09	PK	123	1.2	V	38.36	69.45	83.5	14.05
5149.53	18.45	Ave.	123	1.2	V	38.36	56.81	63.5	6.69
5355.01	31.04	PK	61	1.7	V	39.09	70.13	83.5	13.37
5355.01	18.11	Ave.	61	1.7	V	39.09	57.20	63.5	6.30
10360.00	51.57	PK	303	2.2	V	17.42	68.99	77.7	8.71
5200 MHz									
10400.00	51.06	PK	233	1.2	V	17.52	68.58	77.7	9.12
5240 MHz									
5145.12	31.08	PK	161	2.5	V	38.36	69.44	83.5	14.06
5145.12	18.17	Ave.	161	2.5	V	38.36	56.53	63.5	6.97
5373.96	32.55	PK	163	2.2	V	39.09	71.64	83.5	11.86
5373.96	18.16	Ave.	163	2.2	V	39.09	57.25	63.5	6.25
10480.00	50.94	PK	150	1.5	V	17.25	68.19	77.7	9.51
802.11N20									
5180MHz									
5142.57	31.52	PK	250	2.1	V	38.36	69.88	83.5	13.62
5142.57	18.34	Ave.	250	2.1	V	38.36	56.70	63.5	6.80
5385.25	32.74	PK	119	1.4	V	39.09	71.83	83.5	11.67
5385.25	18.41	Ave.	119	1.4	V	39.09	57.50	63.5	6.00
10360.00	49.65	PK	33	1.5	V	17.42	67.07	77.7	10.63
5200 MHz									
10400.00	50.82	PK	136	1.4	V	17.52	68.34	77.7	9.36
5240 MHz									
5027.24	31.21	PK	220	1.6	V	38.14	69.35	83.5	14.15
5027.24	18.31	Ave.	220	1.6	V	38.14	56.45	63.5	7.05
5389.41	32.88	PK	314	1.3	V	39.19	72.07	83.5	11.43
5389.41	18.33	Ave.	314	1.3	V	39.19	57.52	63.5	5.98
10480.00	51.01	PK	26	1.7	V	17.25	68.26	77.7	9.44

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11N40									
5190 MHz									
5147.65	36.36	PK	255	2.4	V	38.36	74.72	83.5	8.78
5142.57	23.24	Ave.	255	2.4	V	38.36	61.60	63.5	1.90
5452.28	31.21	PK	21	1.6	V	39.37	70.58	83.5	12.92
5452.28	18.76	Ave.	21	1.6	V	39.37	58.13	63.5	5.37
10380.00	47.39	PK	323	2.5	V	17.42	64.81	77.7	12.89
5230 MHz									
5147.25	33.01	PK	84	2.3	V	38.36	71.37	83.5	12.13
5147.25	18.86	Ave.	84	2.3	V	38.36	57.22	63.5	6.28
5358.71	32.64	PK	241	1.1	V	39.09	71.73	83.5	11.77
5358.71	18.91	Ave.	241	1.1	V	39.09	58.00	63.5	5.50
10460.00	48.31	PK	70	2.5	V	17.15	65.46	77.7	12.24
802.11AC20									
5180 MHz									
5146.37	31.82	PK	54	1.6	V	38.36	70.18	83.5	13.32
5146.37	18.35	Ave.	54	1.6	V	38.36	56.71	63.5	6.79
5356.73	32.05	PK	53	2.4	V	39.09	71.14	83.5	12.36
5356.73	18.41	Ave.	53	2.4	V	39.09	57.50	63.5	6.00
10360.00	50.88	PK	152	1.2	V	17.42	68.30	77.7	9.40
5200 MHz									
10400.00	51.06	PK	246	1.3	V	17.52	68.58	77.7	9.12
5240MHz									
5142.84	32.13	PK	122	2.2	V	38.36	70.49	83.5	13.01
5142.84	18.38	Ave.	122	2.2	V	38.36	56.74	63.5	6.76
5359.17	32.28	PK	355	1.8	V	39.09	71.37	83.5	12.13
5359.17	18.52	Ave.	355	1.8	V	39.09	57.61	63.5	5.89
10480.00	51.54	PK	55	1.3	V	17.25	68.79	77.7	8.91

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11AC40									
5190 MHz									
5148.59	34.81	PK	185	1.1	V	38.36	73.17	83.5	10.33
5142.15	21.53	Ave.	185	1.1	V	38.36	59.89	63.5	3.61
5362.34	31.43	PK	38	1.6	V	39.09	70.52	83.5	12.98
5362.34	18.91	Ave.	38	1.6	V	39.09	58.00	63.5	5.50
10380.00	48.37	PK	281	2.3	V	17.42	65.79	77.7	11.91
5230 MHz									
5148.59	34.81	PK	23	1.6	V	38.36	73.17	83.5	10.33
5142.15	21.53	Ave.	23	1.6	V	38.36	59.89	63.5	3.61
5362.34	31.43	PK	166	2.0	V	39.09	70.52	83.5	12.98
5362.34	18.91	Ave.	166	2.0	V	39.09	58.00	63.5	5.50
10460.00	49.44	PK	331	2.3	V	17.15	66.59	77.7	11.11

**Note:**

Corrected Amplitude = Corrected Factor + Reading

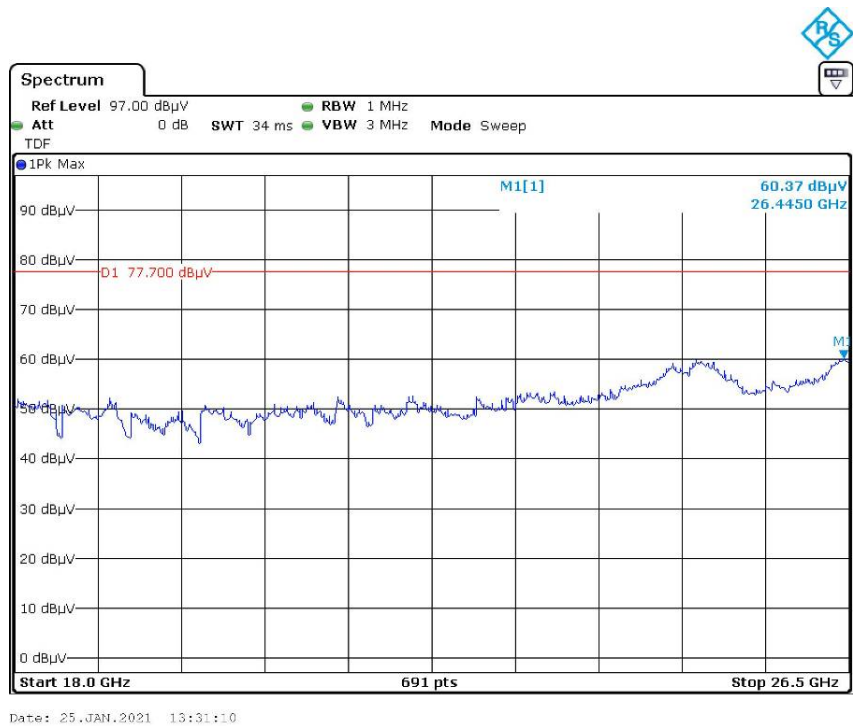
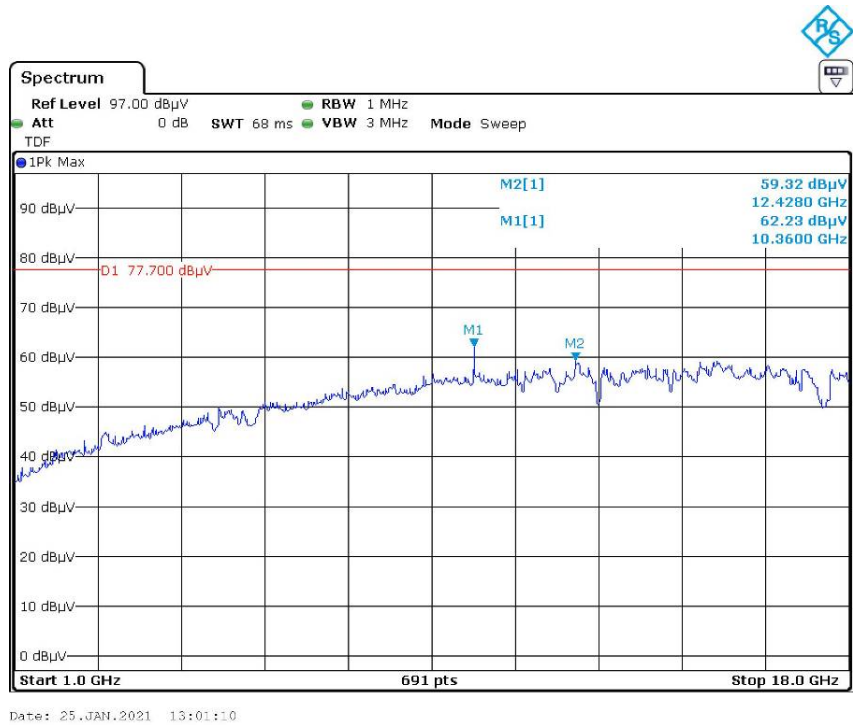
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

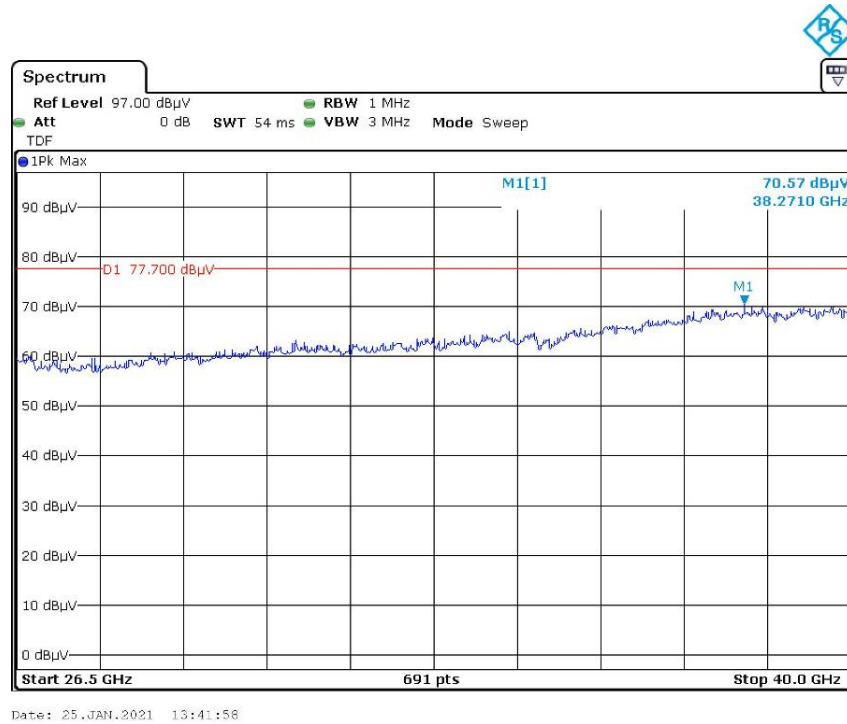
Margin = Limit- Corr. Amplitude

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

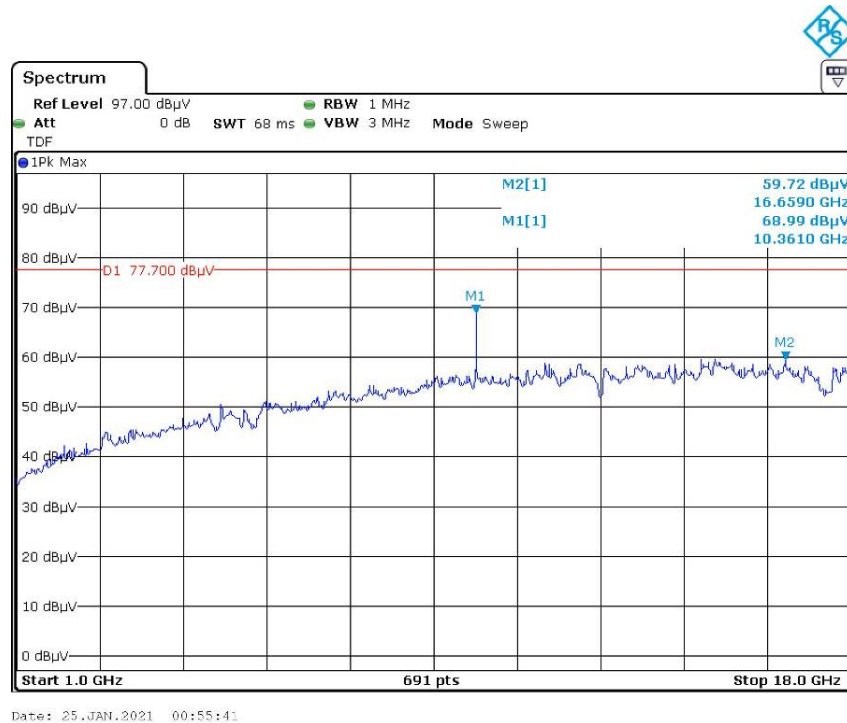
Test at 1m distance for above 1GHz.

Pre-scan with 802.11a 5180MHz  
Horizontal

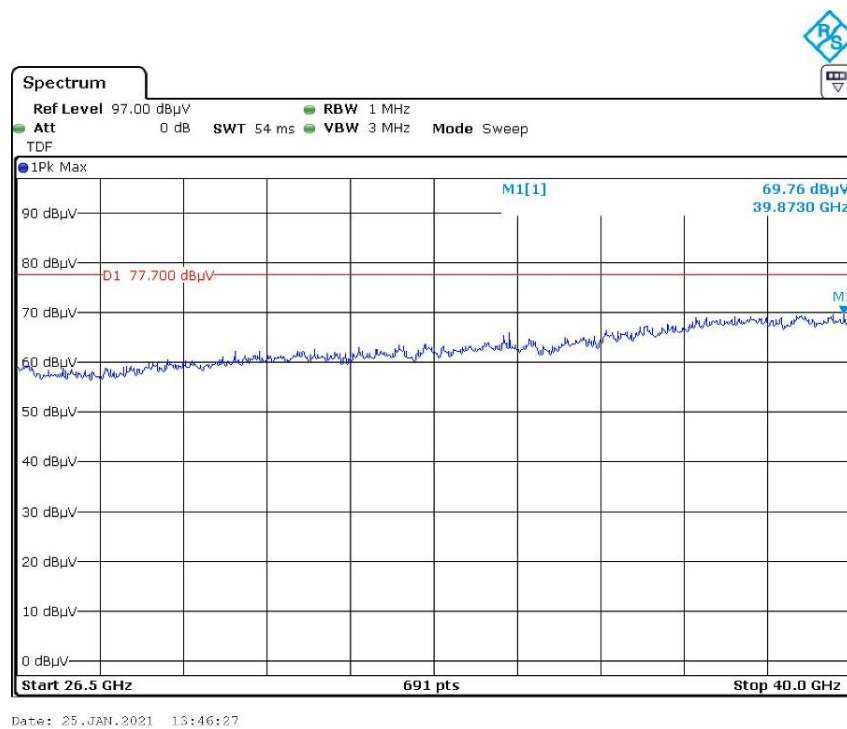
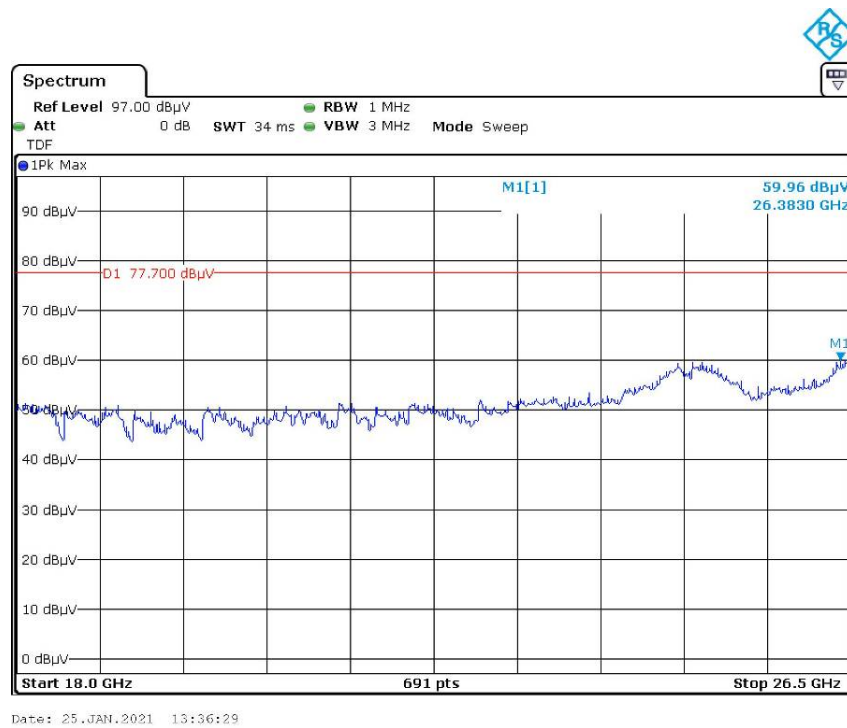




## Vertical







## FCC §15.407(a) (1) (5), (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 Co

mmision 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

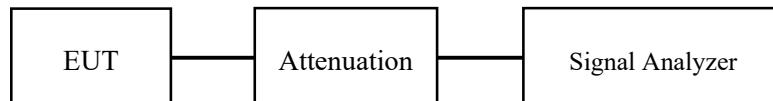
#### 1. Emission Bandwidth (EBW)

- 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 5.715-5.85 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.
- 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**

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Coco Liu on 2021-01-14.*

*EUT operation mode: Transmitting*

**Test Result: Pass.**

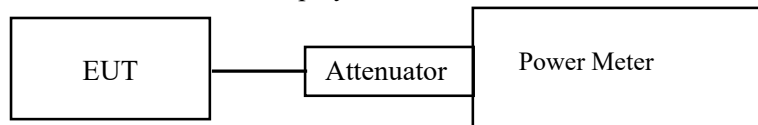
*Please refer to the Appendix*

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

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

**Test Procedure**

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

**Test Data****Environmental Conditions**

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

*The testing was performed by Coco Liu on 2021-01-14.*

*EUT operation mode: Transmitting*

**Test Result: Pass.**

*Please refer to the Appendix*

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

### Applicable Standard

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

### Test Procedure

For devices operating in the bands 5.15-5.25 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 Coco Liu on 2021-01-14.*

*EUT operation mode: Transmitting*

**Test Result: Pass.**

*Please refer to the Appendix*

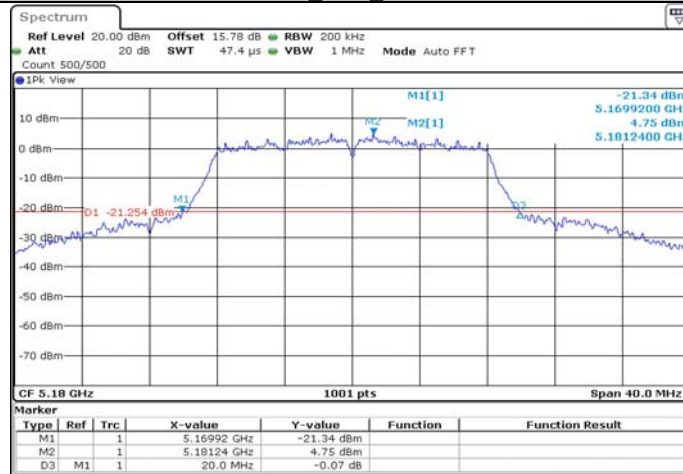
## APPENDIX

### Appendix A1: Emission Bandwidth Test Result

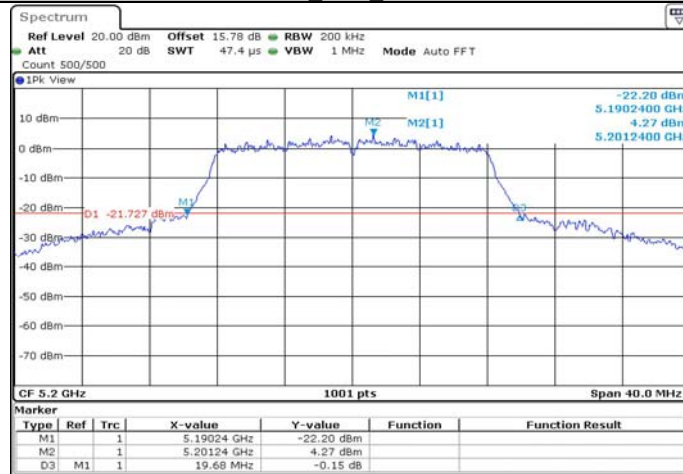
TestMode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	20.000	---	PASS
		5200	19.680	---	PASS
		5240	20.520	---	PASS
11N20SISO	Ant1	5180	24.600	---	PASS
		5200	20.800	---	PASS
		5240	21.520	---	PASS
11N40SISO	Ant1	5190	57.600	---	PASS
		5230	49.280	---	PASS
11AC20SISO	Ant1	5180	23.880	---	PASS
		5200	21.440	---	PASS
		5240	23.600	---	PASS
11AC40SISO	Ant1	5190	60.400	---	PASS
		5230	64.720	---	PASS

## Test Graphs

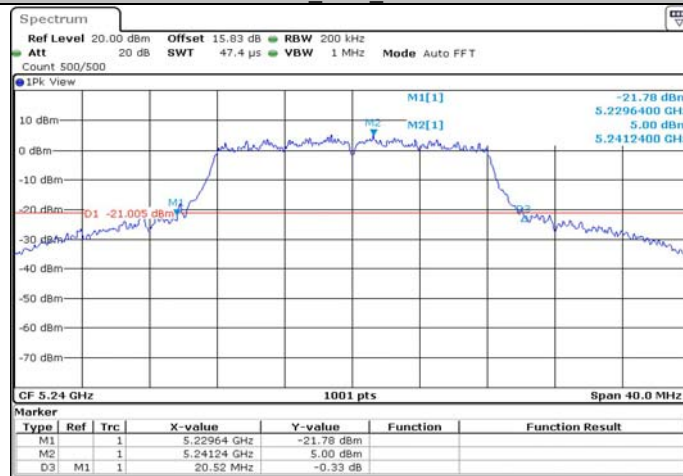
11A\_Ant1\_5180

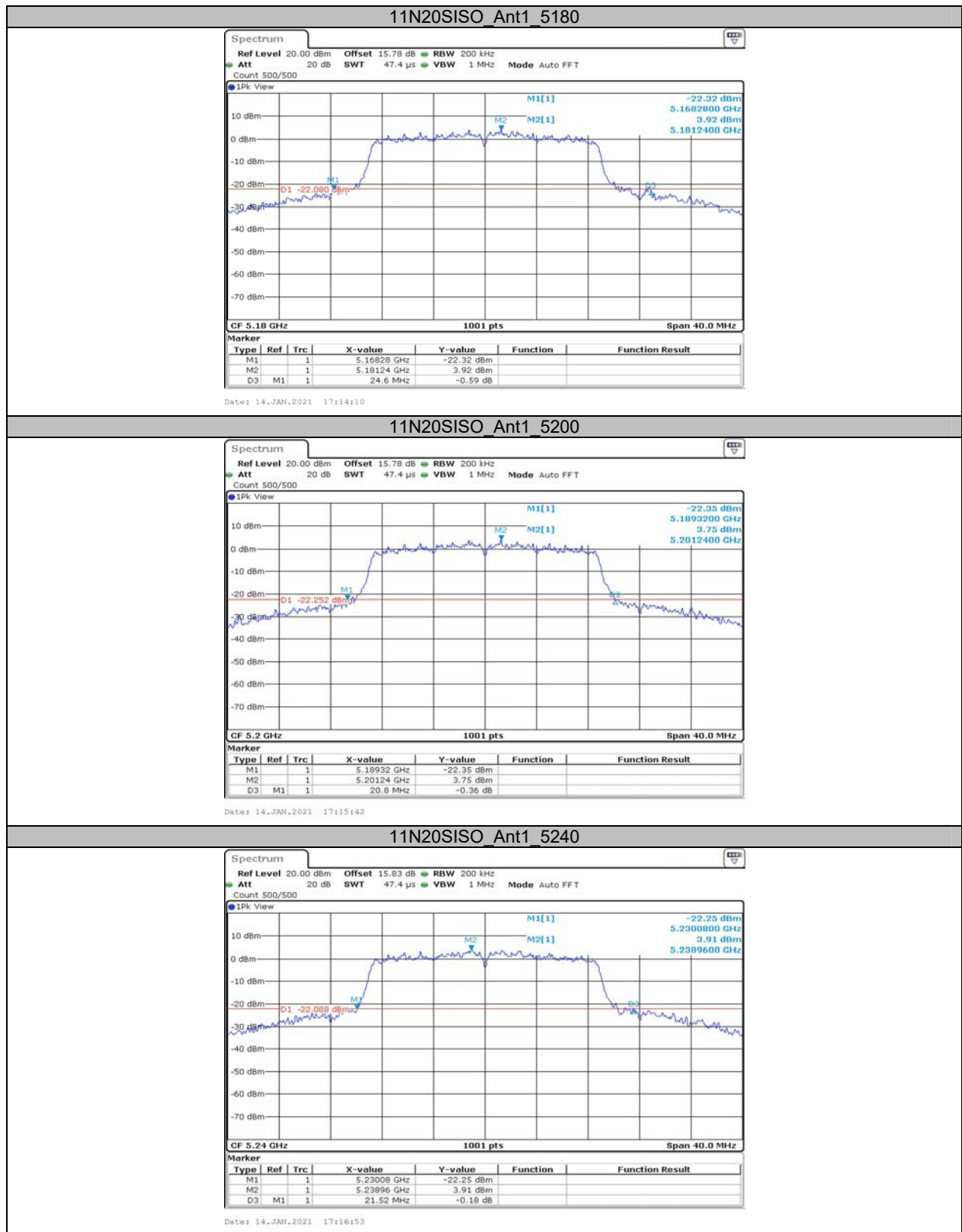


11A\_Ant1\_5200



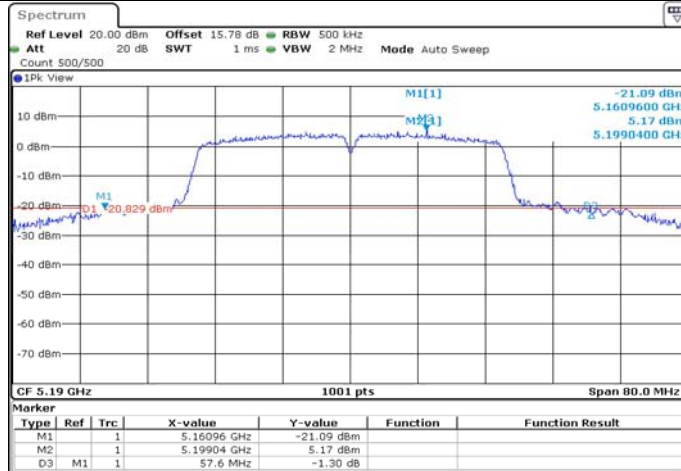
11A\_Ant1\_5240





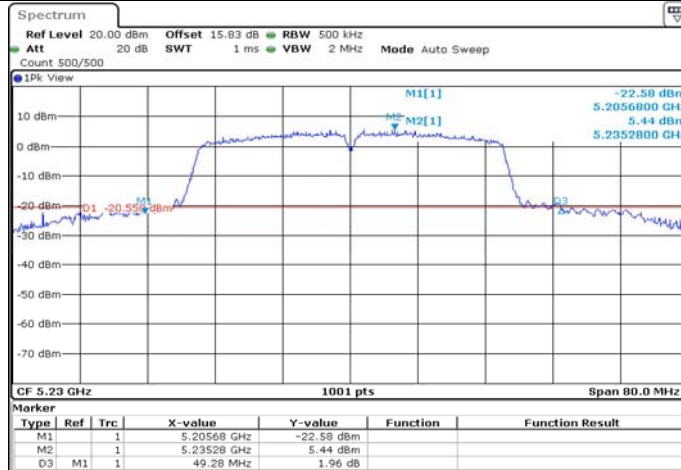


## 11N40SISO\_Ant1\_5190



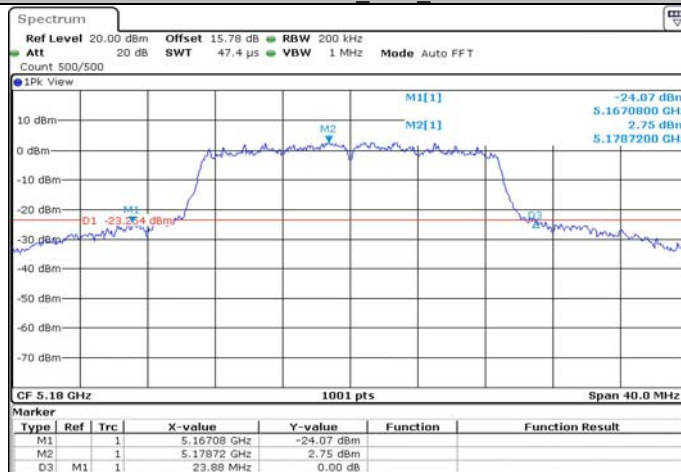
Date: 14.JAN.2021 17:34:14

## 11N40SISO\_Ant1\_5230



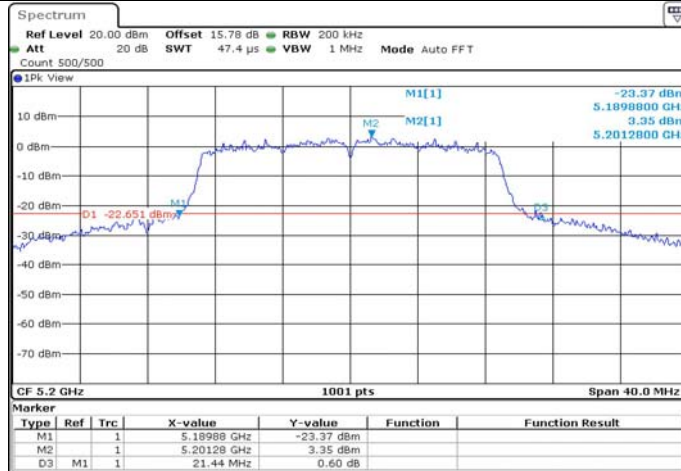
Date: 14.JAN.2021 17:48:21

## 11AC20SISO\_Ant1\_5180



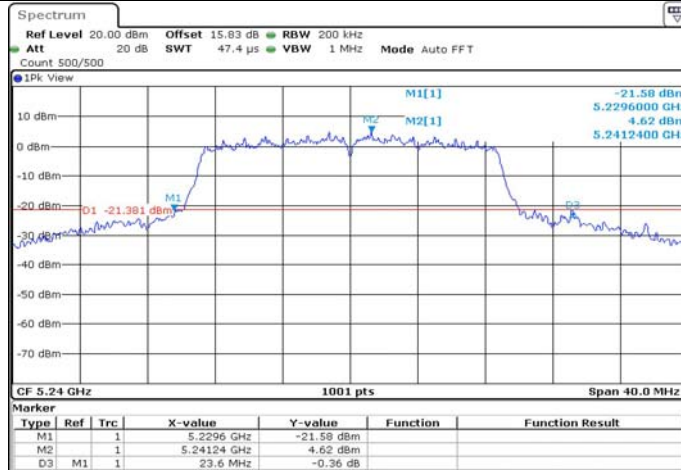
Date: 14.JAN.2021 17:49:43

## 11AC20SISO\_Ant1\_5200



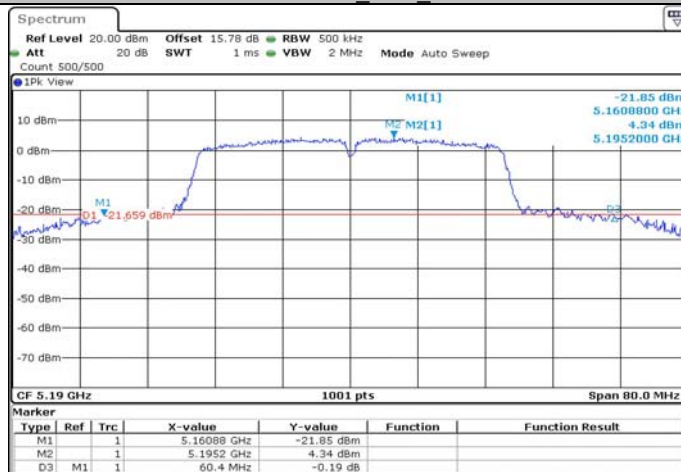
Date: 14.JAN.2021 17:51:04

## 11AC20SISO\_Ant1\_5240

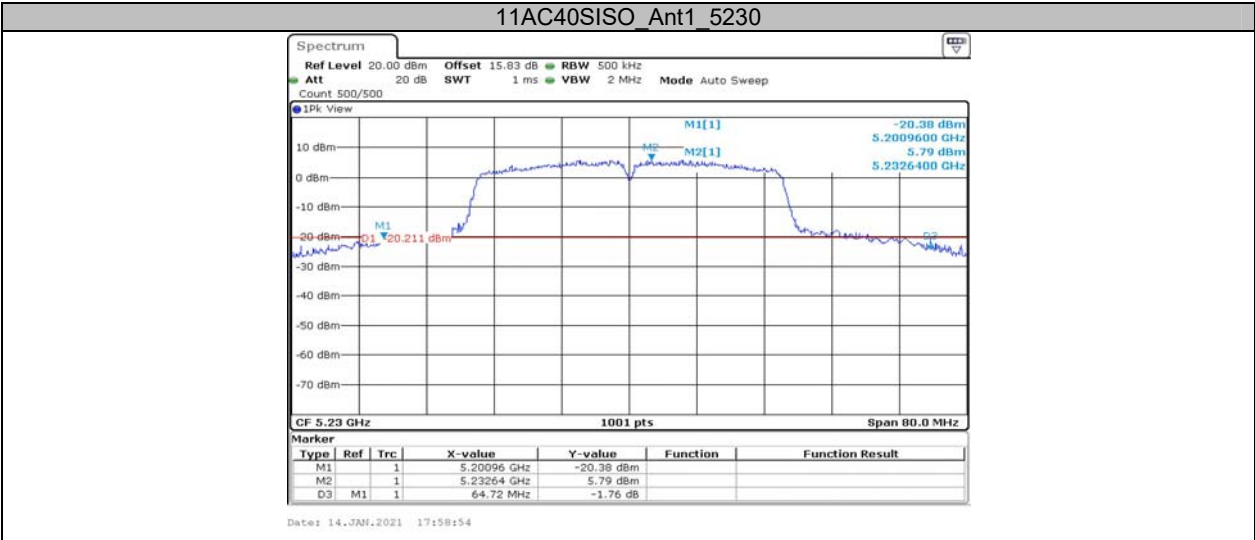


Date: 14.JAN.2021 17:53:07

## 11AC40SISO\_Ant1\_5190



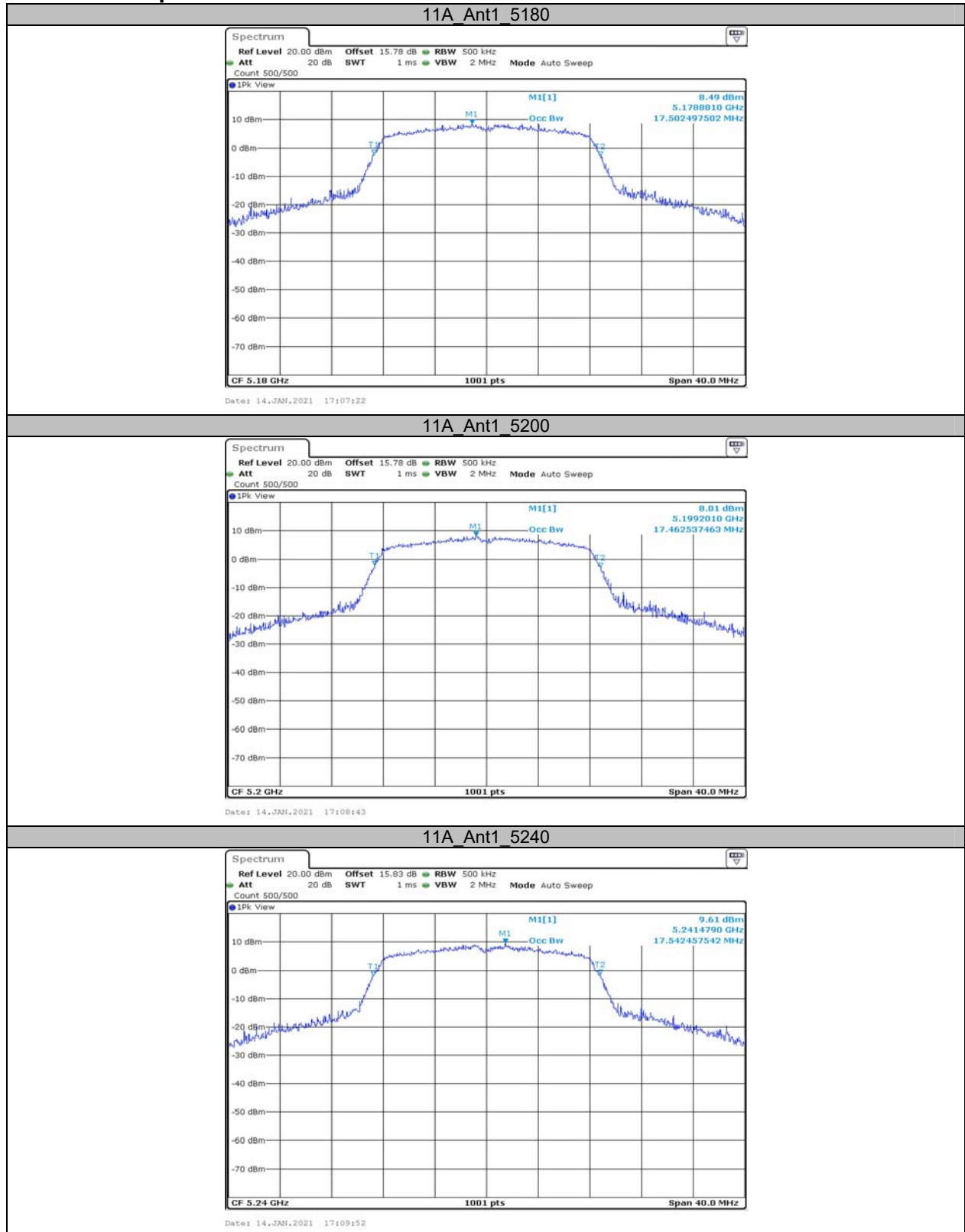
Date: 14.JAN.2021 17:56:36



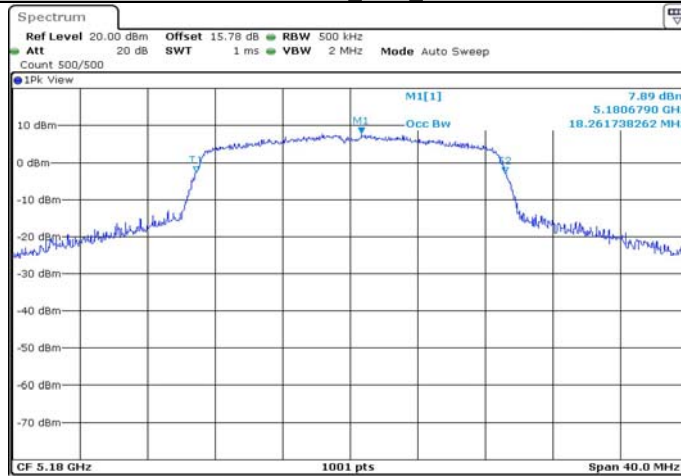
**Appendix A2: Occupied channel bandwidth  
Test Result**

TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.502	---	PASS
		5200	17.463	---	PASS
		5240	17.542	---	PASS
11N20SISO	Ant1	5180	18.262	---	PASS
		5200	18.262	---	PASS
		5240	18.262	---	PASS
11N40SISO	Ant1	5190	37.003	---	PASS
		5230	36.843	---	PASS
11AC20SISO	Ant1	5180	18.222	---	PASS
		5200	18.302	---	PASS
		5240	18.222	---	PASS
11AC40SISO	Ant1	5190	36.923	---	PASS
		5230	36.843	---	PASS

## Test Graphs

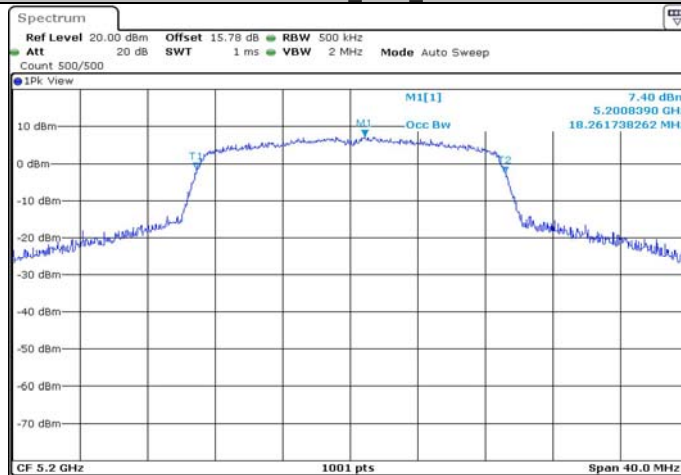


## 11N20SISO\_Ant1\_5180



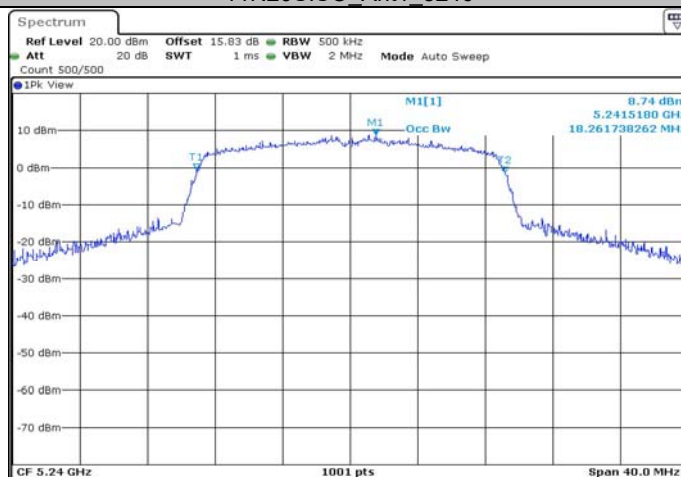
Date: 14, JAN, 2021 17:14:20

## 11N20SISO\_Ant1\_5200

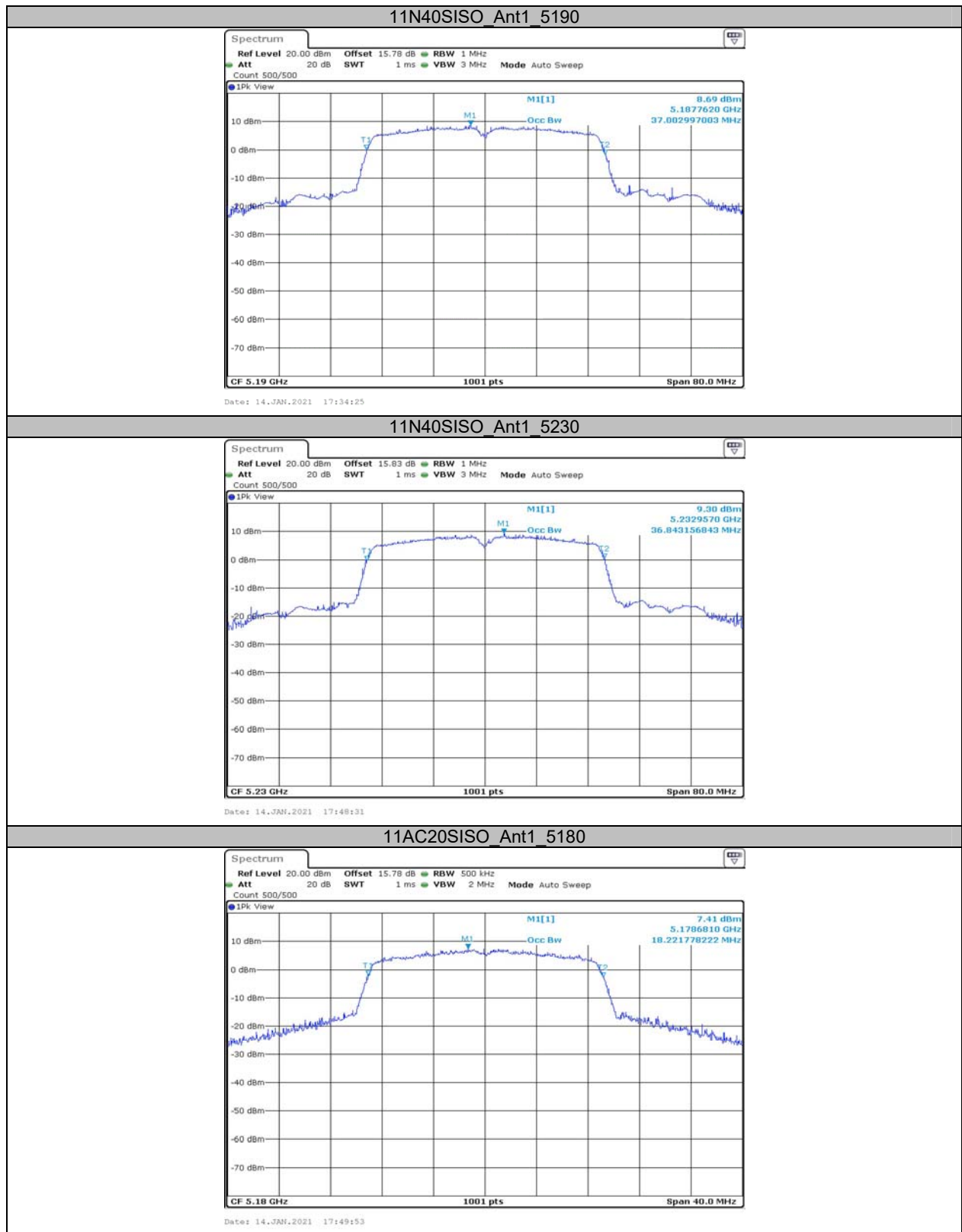


Date: 14, JAN, 2021 17:15:53

## 11N20SISO\_Ant1\_5240



Date: 14, JAN, 2021 17:17:03



## 11AC20SISO\_Ant1\_5200



## 11AC20SISO\_Ant1\_5240



## 11AC40SISO\_Ant1\_5190







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

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11A	Ant1	5180	14.71	<=23.98	PASS
		5200	14.59	<=23.98	PASS
		5240	14.85	<=23.98	PASS
11N20SISO	Ant1	5180	14.04	<=23.98	PASS
		5200	13.99	<=23.98	PASS
		5240	14.31	<=23.98	PASS
11N40SISO	Ant1	5190	14.61	<=23.98	PASS
		5230	14.49	<=23.98	PASS
11AC20SISO	Ant1	5180	13.68	<=23.98	PASS
		5200	13.91	<=23.98	PASS
		5240	14.38	<=23.98	PASS
11AC40SISO	Ant1	5190	14.24	<=23.98	PASS
		5230	15.02	<=23.98	PASS

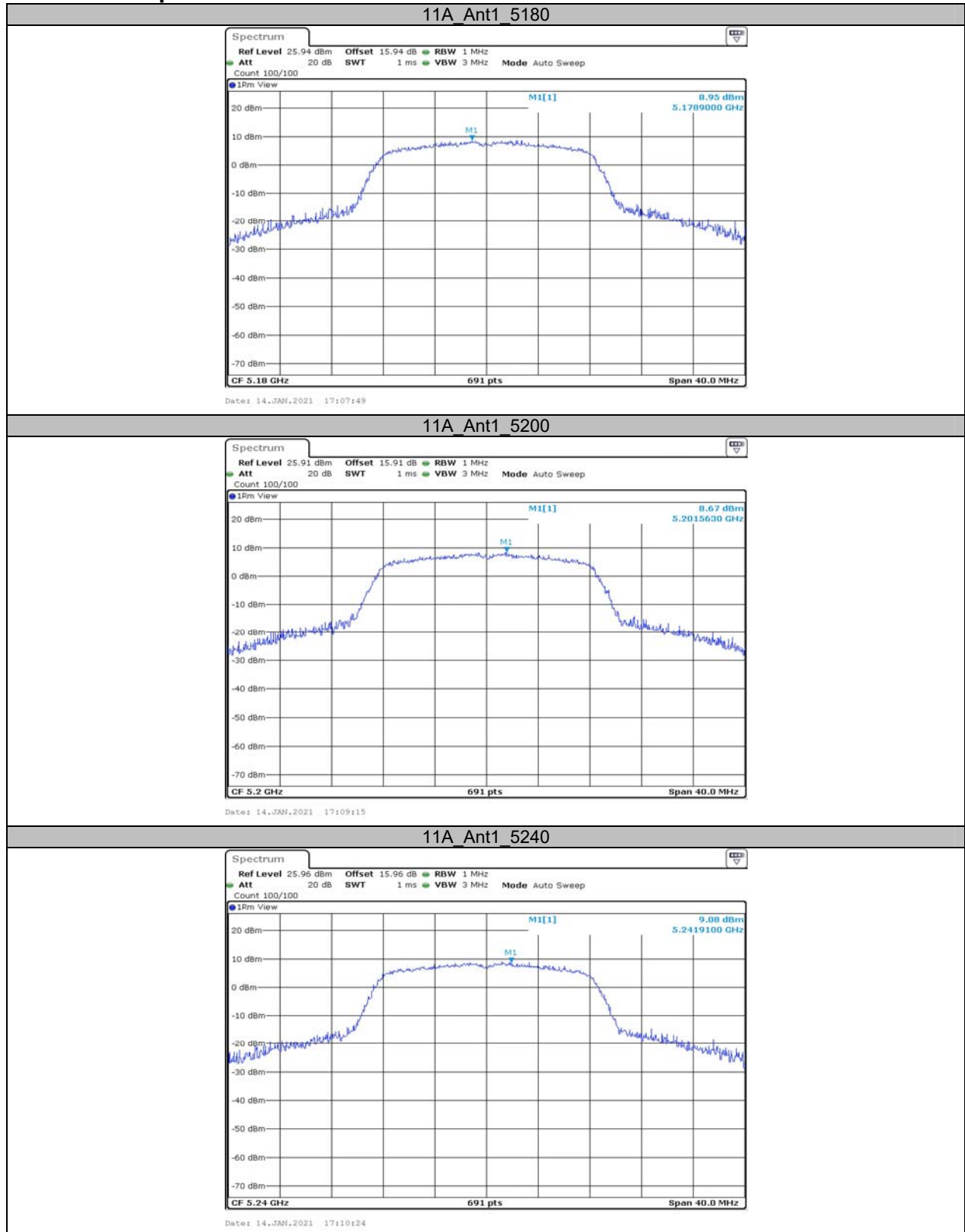
Note: The EUT is client.

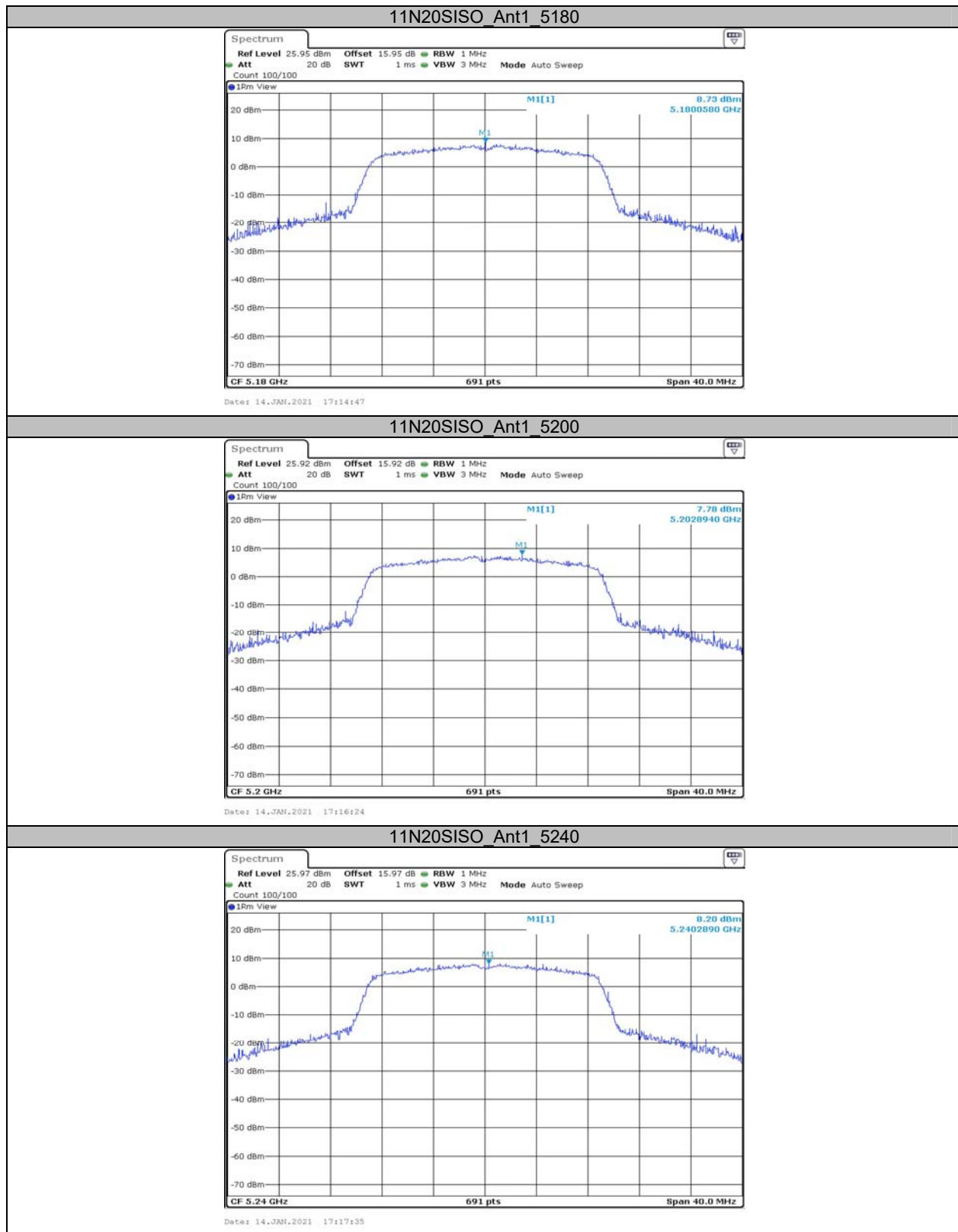
**Appendix C: Maximum power spectral density  
Test Result**

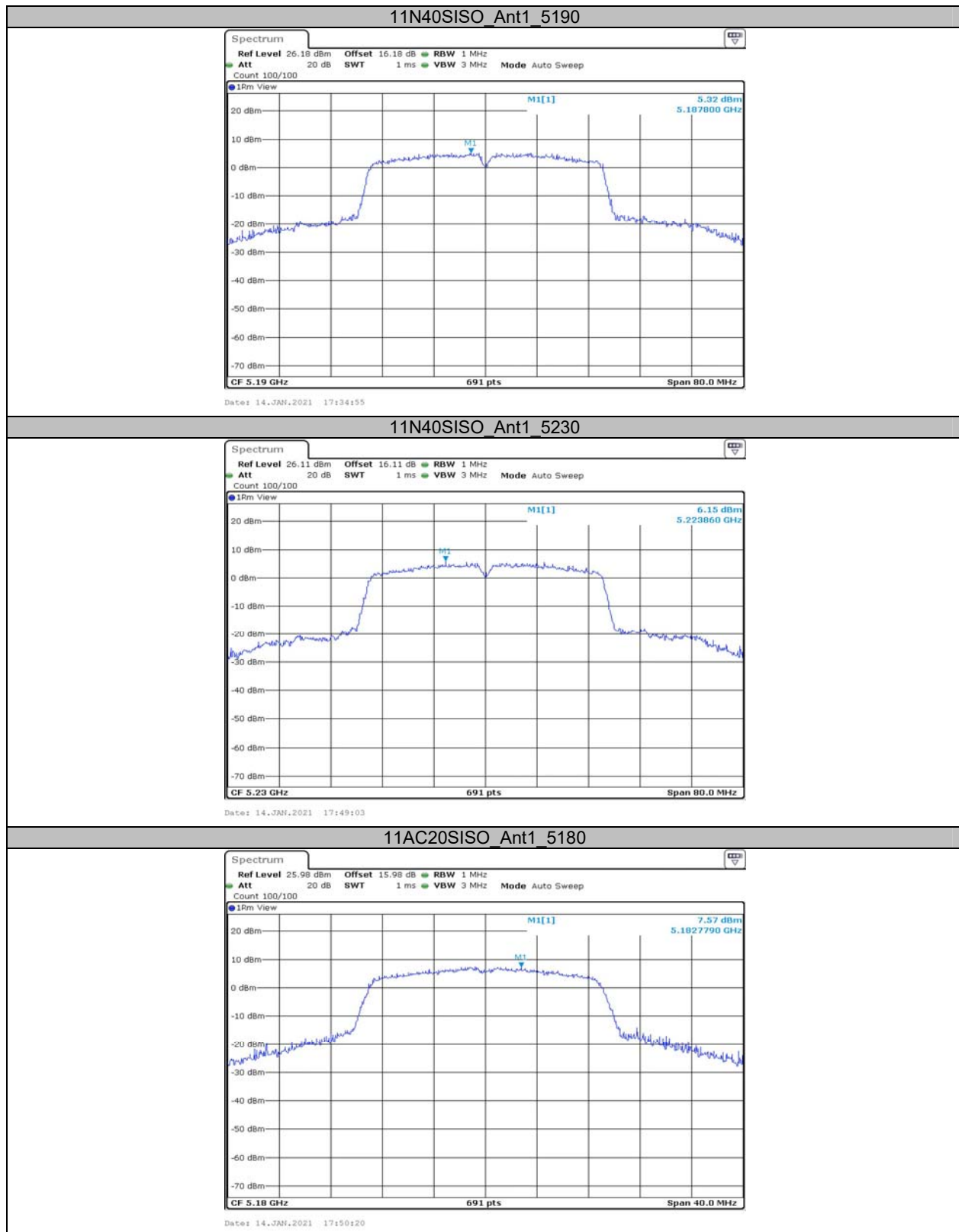
TestMode	Antenna	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	8.95	<=11	PASS
		5200	8.67	<=11	PASS
		5240	9.08	<=11	PASS
11N20SISO	Ant1	5180	8.73	<=11	PASS
		5200	7.78	<=11	PASS
		5240	8.20	<=11	PASS
11N40SISO	Ant1	5190	5.32	<=11	PASS
		5230	6.15	<=11	PASS
11AC20SISO	Ant1	5180	7.57	<=11	PASS
		5200	7.81	<=11	PASS
		5240	8.59	<=11	PASS
11AC40SISO	Ant1	5190	5.50	<=11	PASS
		5230	6.19	<=11	PASS

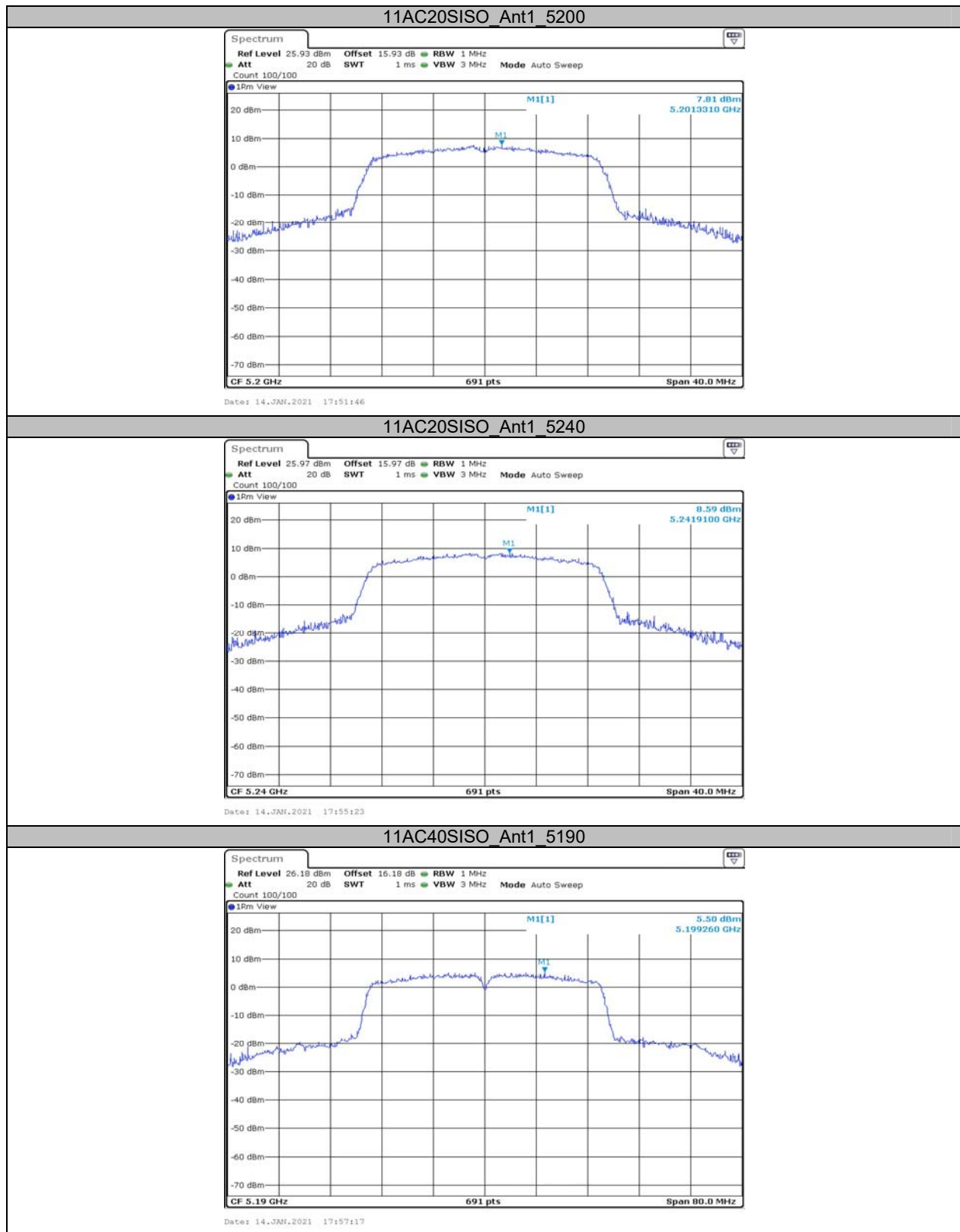
Note: The Duty Cycle Factor is compensated in the graph.

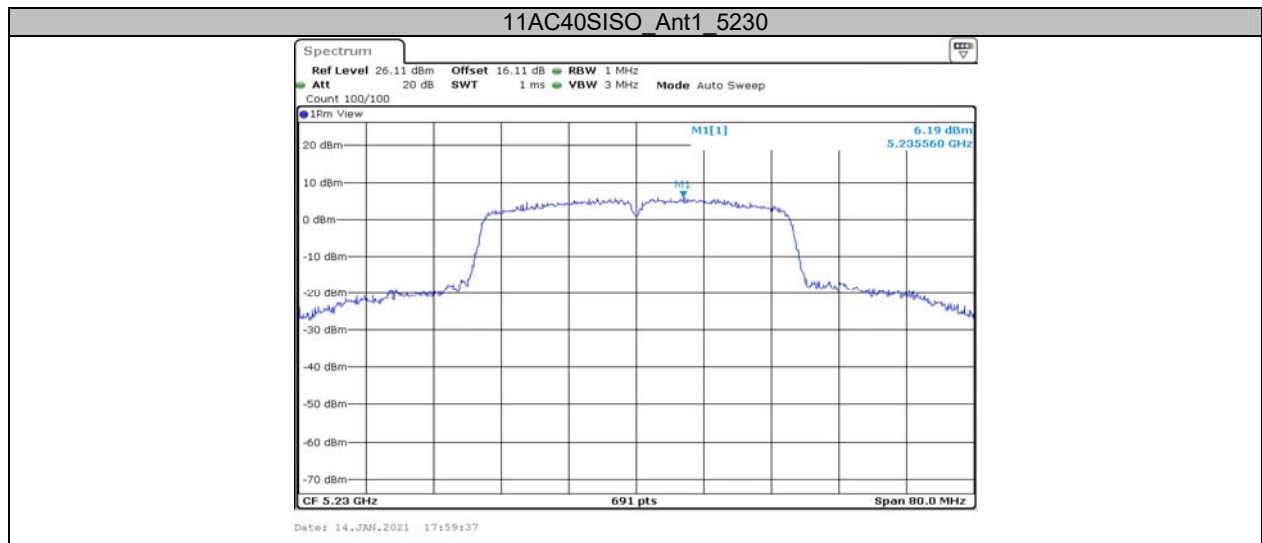
## Test Graphs











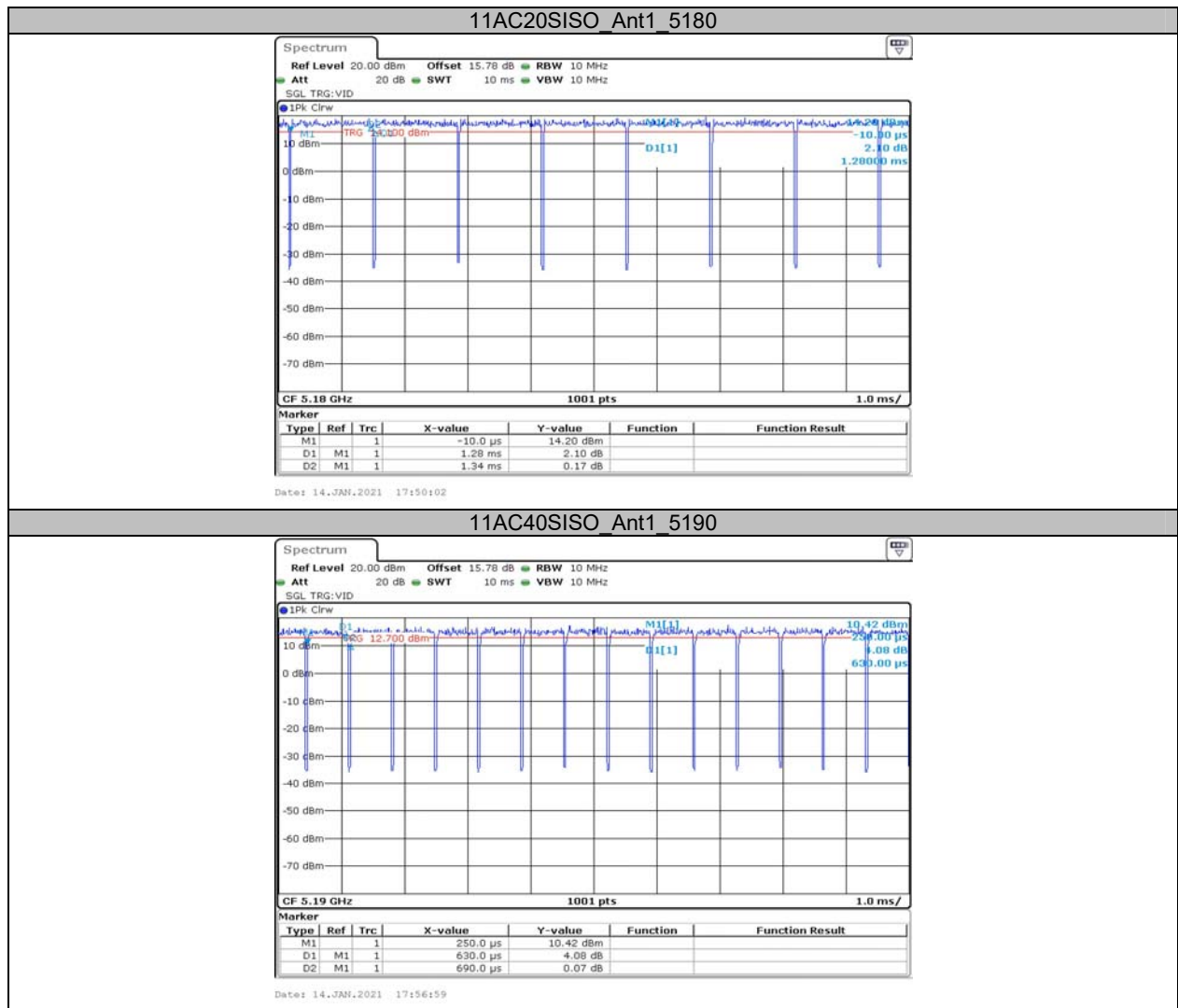


**Appendix D: Duty Cycle  
Test Result**

TestMode	Antenna	Channel	TransmissionDuration [ms]	Transmission Period [ms]	Duty Cycle [%]
11A	Ant1	5180	1.37	1.42	96.48
11N20SISO	Ant1	5180	1.28	1.33	96.24
11N40SISO	Ant1	5190	0.63	0.69	91.30
11AC20SISO	Ant1	5180	1.28	1.34	95.52
11AC40SISO	Ant1	5190	0.63	0.69	91.30

## Test Graphs





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