TEST REPORT

Applicant Name :	Invengo Information Technology Co., Ltd.
Address :	27th and 28th Floor,Hi-Tech Zone Union Tower, NO.63, Gaoxin South 10th Road, Nanshan District，Shenzhen,China
Report Number :	SZNS1220914-41680E-RF-00D
FCC ID:	TQ4-XC2908

Test Standard (s)

FCC PART 15.407

Sample Description

Product Type:	Portable reader
Model No.:	XC2908
Multiple Model(s) No.:	XC2908-A,XC2908-B,XC2908-C,XC2908-D,XC2908-E, XC2908-F,XC2908-G,XC2908-H,XC2908-I,XC2908-J, XC2908-K,XC2908-L,XC2908-M,XC2908-N,XC2908-BM, XC-BM500,XC-RH500,AT908, XC2002,XC2005,XC9915
Trade Mark:	N/A
Date Received:	2022/09/14
Report Date:	2022/11/15

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Andy Yu
EMC Engineer

Approved By:

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★ ".
Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZNS1220914-41680E-RF-00D	Original Report	2022/11/15

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Portable reader
Tested Model	XC2908
Multiple Models	XC2908-A,XC2908-B,XC2908-C,XC2908-D,XC2908-E, XC2908-F,XC2908-G,XC2908-H,XC2908-I,XC2908-J, XC2908-K,XC2908-L,XC2908-M,XC2908-N,XC2908-BM, XC-BM500,XC-RH500,AT908, XC2002,XC2005,XC9915 (model difference see product declaration letter of similarity)
Frequency Range	5G Wi-Fi: 5150-5350MHz; 5725-5850MHz
Mode	802.11a/n20/n40/ac20/ac40/ac80
Maximum Conducted Average Output Power	5150-5250MHz: 14.87dBm 5250-5350MHz: 14.96dBm 5725-5850MHz:14.82dBm
Modulation Technique	OFDM
Antenna Specification*	1.29dBi (It is provided by the applicant)
Voltage Range	3.7V from battery or DC 5V from adapter
Test Sample serial number	SZNS1220914-41680E-RF-S1 for Conducted and Radiated Emissions SZNS1220914-41680E-RF-S2 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter information	Model: ICP20-050-3000B Input: AC 100-240V, 50/60Hz, 0.6A Output: DC 5.0V, 3.0A ,15.0W
Note: the series models are electrical identical, they may have slight difference in appearance, detail please refer to the DOS letter and External photo, the model XC2908 was selected to test.	

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

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. 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
AC Line Conducted emission		2.72dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB

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 Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. 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.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The EUT support 802.11a/n20/n40/ac20/ac40/ac80 mode, the n20/n40 mode is identical parameter to ac20/ac40 mode, so test was only made on ac20/ac40 mode for reduce test.

For 5150-5250MHz Band, 7 channels are provided to testing:

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

For 802.11a/ ac20 mode: channel 36, 40, 48 were tested;
For 802.11ac40 mode: channel 38, 46 were tested;
For 802.11ac80 mode, channel 42 was tested.

For 5250-5350MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300
54	5270	62	5310
56	5280	64	5320
58	5290	/	/

For 802.11a/ ac20 mode: channel 52, 56, 64were tested;
For 802.11ac40 mode: channel 54, 62 were tested;
For 802.11ac80 mode, channel 58 was tested.

For 5725-5850MHz Band, 8 channels are provided to testing:

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

For 802.11a/ac20 mode: channel 149, 157, 165 were tested;
For 802.11ac40 mode: channel 151, 159 were tested;
For 802.11ac80 mode, channel 155 was tested.

EUT Exercise Software

EUT was testing in an engineering mode and Power level which was provided by applicant is as below:

Frequency Band (MHz)	Mode	Data rate	Power Level*		
			Low channel	Middle channel	High channel
5150-5250	a	6Mbps	Default	Default	Default
	ac20	MCS0	Default	Default	Default
	ac40	MCS0	Default	/	Default
	ac80	MCS0	/	Default	/
5250-5350	a	6Mbps	Default	Default	Default
	ac20	MCS0	Default	Default	Default
	ac40	MCS0	Default	/	Default
	ac80	MCS0	/	Default	/
5725-5850	a	6Mbps	Default	Default	Default
	ac20	MCS0	Default	Default	Default
	ac40	MCS0	Default	/	Default
	ac80	MCS0	/	Default	/

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

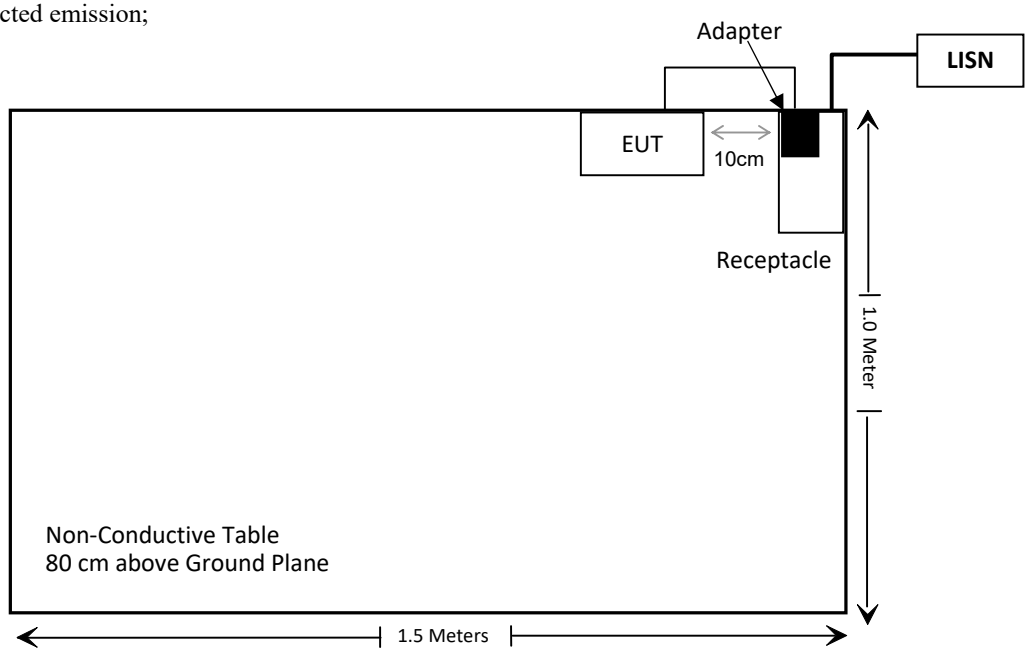
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

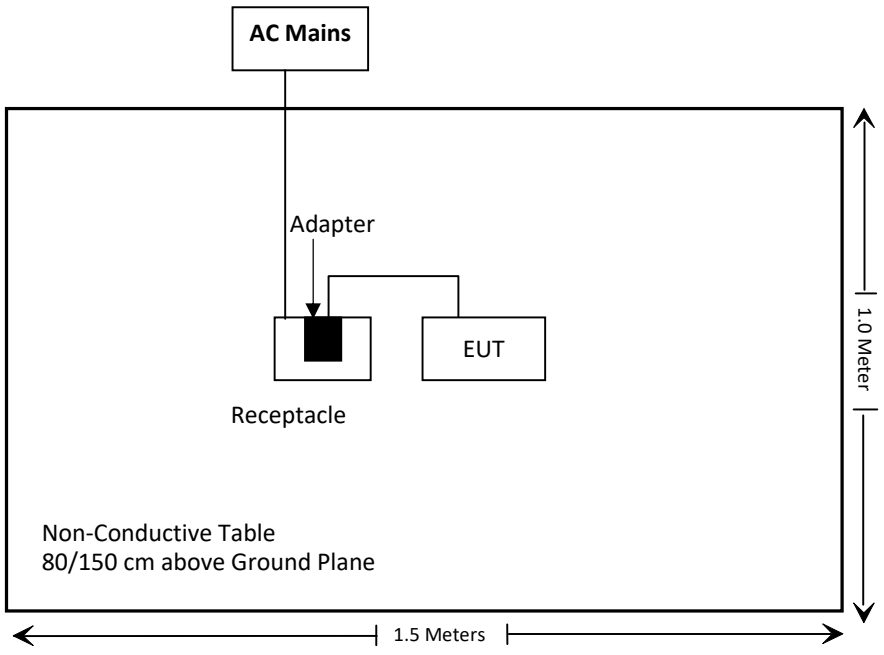
Cable Description	Length (m)	From Port	To
Un-shielded detachable USB cable	1.0	adapter	EUT

Block Diagram of Test Setup

For conducted emission;



For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 ,§2.1093	RF Exposure (SAR)	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(9)& §15.207(a)	Conducted Emissions	Compliant
§15.205& §15.209 &§15.407(b)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (e)	Bandwidth measurement	Compliant
§15.407(a)	Conducted Transmitter Output Power	Compliant
§15.407 (a)	Power Spectral Density	Compliant
§15.407 (h)	Transmit Power Control (TPC)	Not Applicable
§15.407 (h)	Dynamic Frequency Selection (DFS)	Compliant*

Compliant*: Please refer to the DFS report: SZNS1220914-41680E-RF-00E.
Not Applicable: the device not support TPC function.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12
Rohde & Schwarz	L.I.S.N.	ESH3-Z5	100305	2021/12/13	2022/12/12
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2021/11/11	2022/11/10
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
CD	Band Reject Filter	BRM-5.15/5.35g-45	075	2021/12/14	2022/12/13
CD	Band Reject Filter	BRM-5.725/5.875G-45	065	2021/12/14	2022/12/13

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/01/19	2023/01/18
Tonscend	RF Control Unit	JS0806-2	19G8060182	2021/10/26	2022/10/25
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Unknown	RF Cable	Unknown	1	Each time	/

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations hAve.e been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307(b)&§2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report: SZNS1220914-41680E-SA.

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 were permanently attached. Please refer to the EUT photos.

Type	Antenna Gain	Impedance	Frequency Range
PIFA	1.29dBi	50 Ω	5150-5850MHz

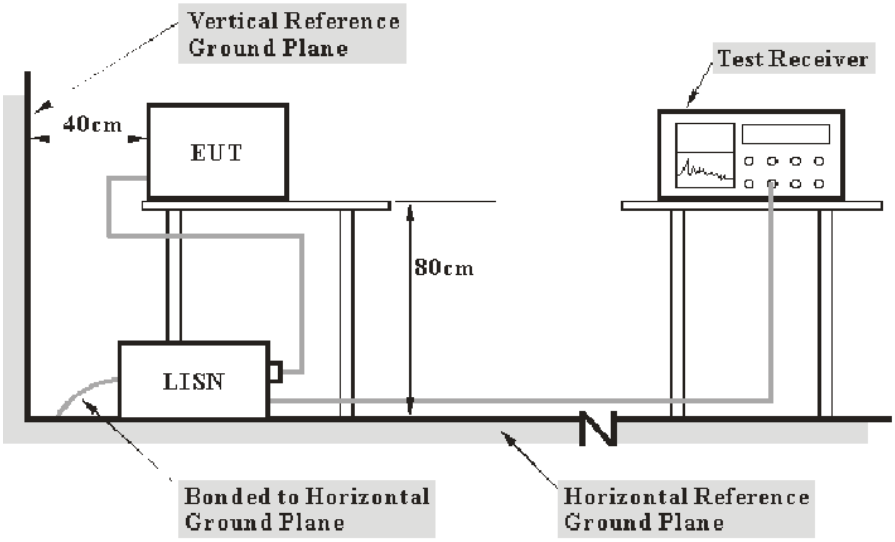
Result: Compliant.

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.

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 Ave.erage detection mode.

Corrected Factor & Margin Calculation

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

Transd Factor = LISN VDF + Cable Loss

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

Over Limit = Level – Limit
Level = Read Level + Factor

Test Data

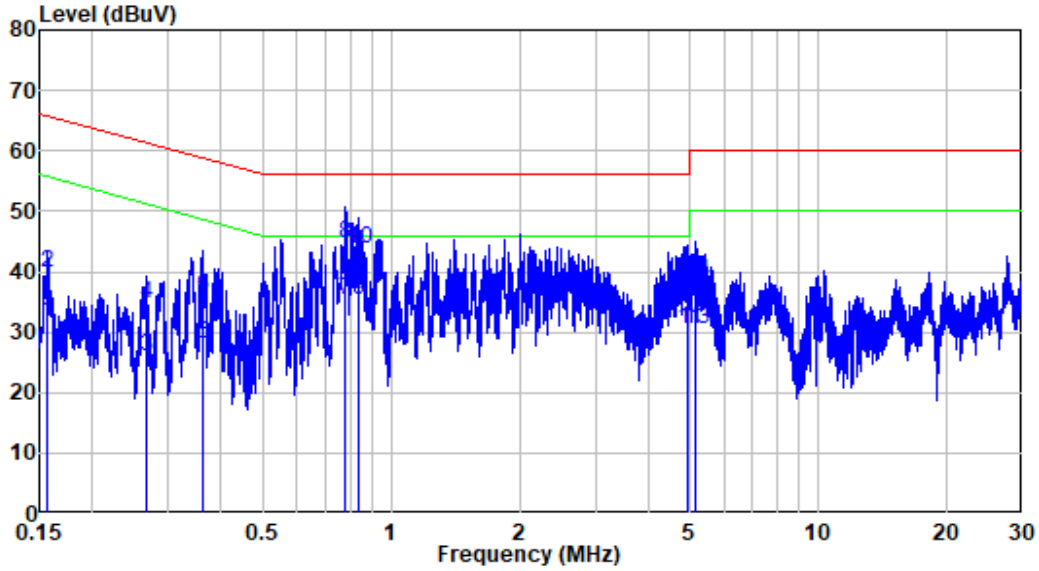
Environmental Conditions

Temperature:	23 °C
Relative Humidity:	40%
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2022-10-21.

EUT operation mode: Transmitting (worst case is 802.11ac80, 5290MHz)

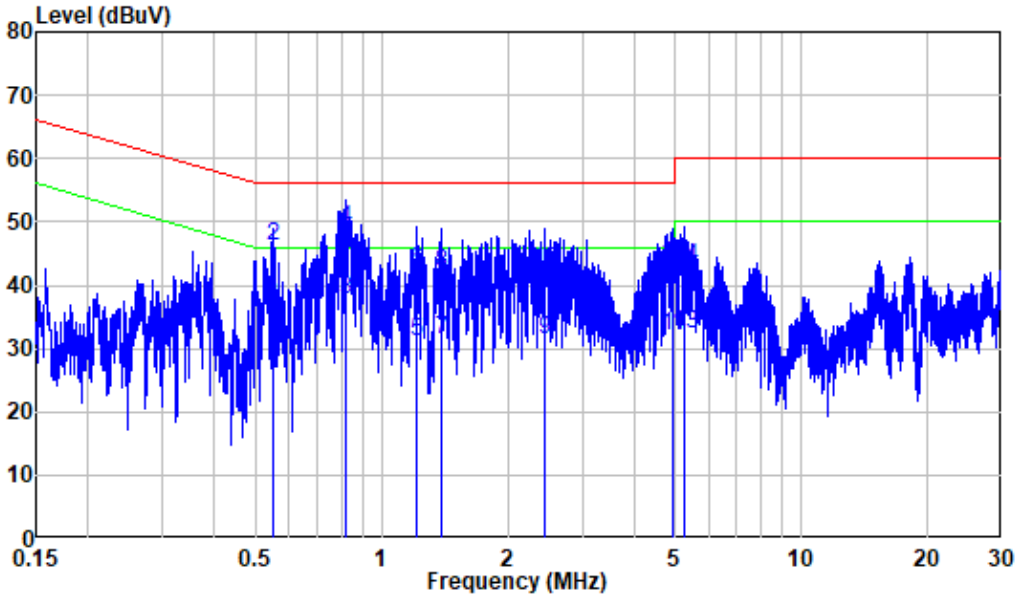
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : SZNS1220914-41680E-RF
Mode : 5G WIFI
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.157	9.80	21.87	31.67	55.64	-23.97	Average
2	0.157	9.80	30.09	39.89	65.64	-25.75	QP
3	0.267	9.80	16.13	25.93	51.21	-25.28	Average
4	0.267	9.80	25.03	34.83	61.21	-26.38	QP
5	0.361	9.80	18.16	27.96	48.71	-20.75	Average
6	0.361	9.80	26.22	36.02	58.71	-22.69	QP
7	0.780	9.81	25.57	35.38	46.00	-10.62	Average
8	0.780	9.81	34.95	44.76	56.00	-11.24	QP
9	0.838	9.81	25.48	35.29	46.00	-10.71	Average
10	0.838	9.81	33.87	43.68	56.00	-12.32	QP
11	4.955	9.85	20.70	30.55	46.00	-15.45	Average
12	4.955	9.85	28.66	38.51	56.00	-17.49	QP
13	5.163	9.85	20.62	30.47	50.00	-19.53	Average
14	5.163	9.85	28.44	38.29	60.00	-21.71	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : SZNS1220914-41680E-RF
Mode : 5G WIFI
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.552	9.81	26.75	36.56	46.00	-9.44	Average
2	0.552	9.81	36.42	46.23	56.00	-9.77	QP
3	0.821	9.81	28.00	37.81	46.00	-8.19	Average
4	0.821	9.81	39.00	48.81	56.00	-7.19	QP
5	1.210	9.81	21.33	31.14	46.00	-14.86	Average
6	1.210	9.81	32.35	42.16	56.00	-13.84	QP
7	1.387	9.81	21.65	31.46	46.00	-14.54	Average
8	1.387	9.81	32.27	42.08	56.00	-13.92	QP
9	2.441	9.82	21.70	31.52	46.00	-14.48	Average
10	2.441	9.82	32.51	42.33	56.00	-13.67	QP
11	4.916	9.89	22.18	32.07	46.00	-13.93	Average
12	4.916	9.89	33.20	43.09	56.00	-12.91	QP
13	5.263	9.90	22.42	32.32	50.00	-17.68	Average
14	5.263	9.90	32.82	42.72	60.00	-17.28	QP

§15.205 & §15.209 & §15.407(B)– UNDESIRABLE EMISSION

Applicable Standard

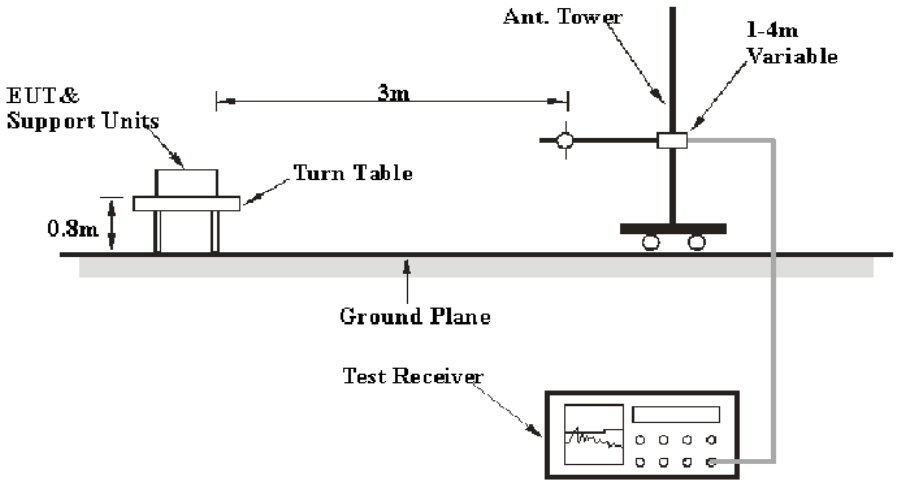
FCC §15.407 (b); §15.209; §15.205;

(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.
(2) For transmitters operating in the 5.25-5.35 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.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 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.

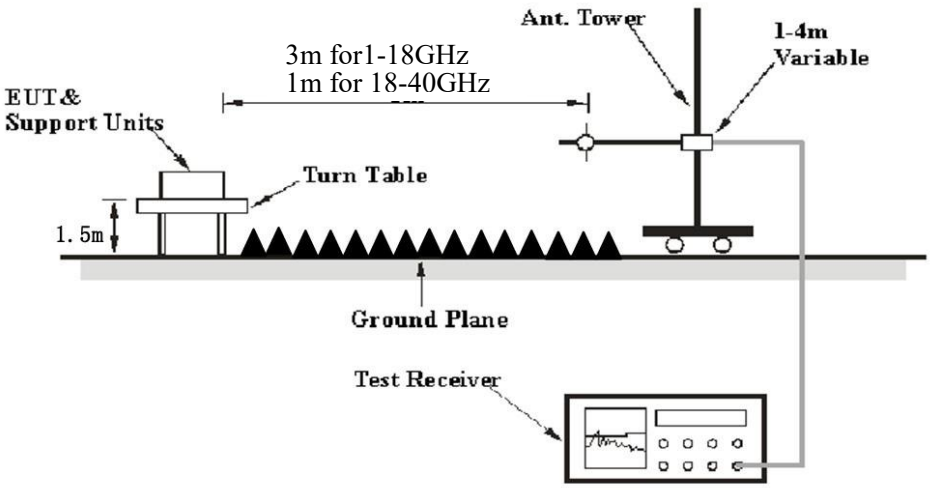
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

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	/	Ave.erage
	1MHz	＞1/T Note 2	/	Ave.erage

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 Ave.erage 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;

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

where

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

So the extrapolation factor of 1m is 20*log(1/3)= -9.5 dB, for 18-40GHz range, the limit of 1m distance was added by 9.5dB from limit of 3m to compared with the result measurement at 1m distance.

Factor & Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	58%
ATM Pressure:	101.2 kPa

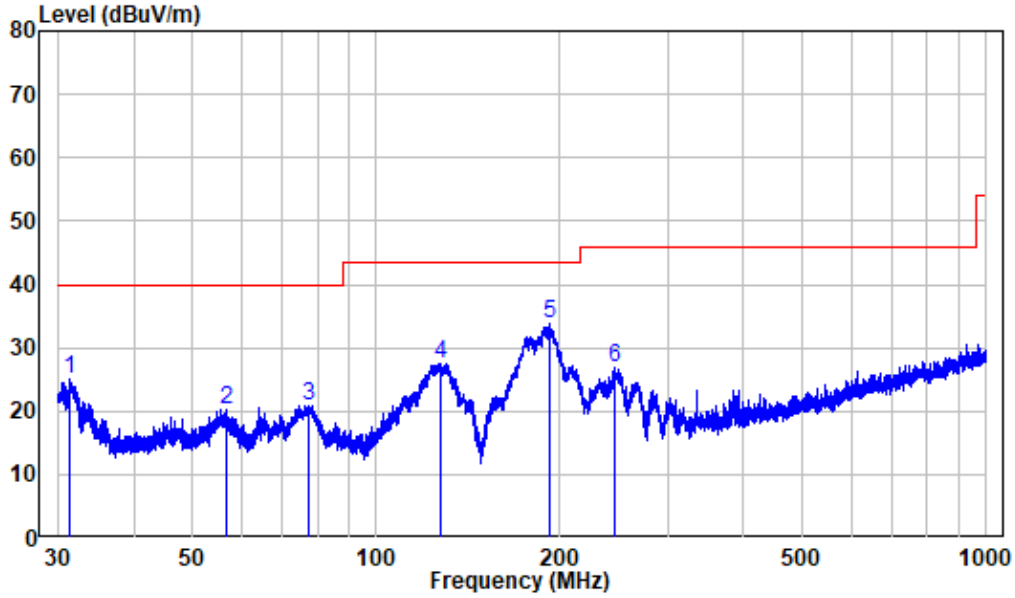
The testing was performed by Level Li on 2022-10-22 .

EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axes of orientation was recorded)

30 MHz – 1 GHz: *(worst case is 802.11ac80, 5290MHz)*

Note: When the result of Peak less than the limit of QP by more than 6dB, just the peak value was recorded.

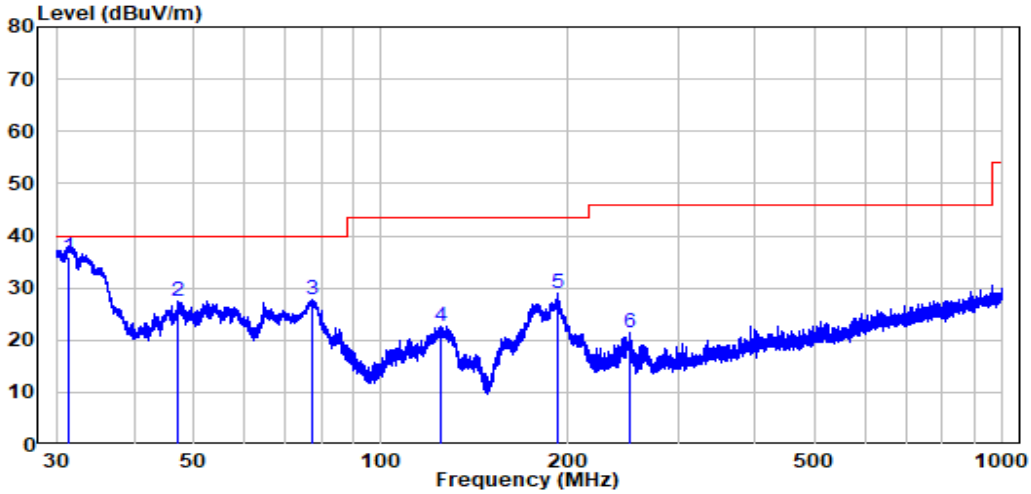
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS1220914-41680E-RF
Test Mode: 5G WIFI Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.427	-12.24	37.33	25.09	40.00	-14.91	Peak
2	56.916	-10.06	30.23	20.17	40.00	-19.83	Peak
3	77.491	-16.56	37.53	20.97	40.00	-19.03	Peak
4	127.329	-14.60	42.19	27.59	43.50	-15.91	Peak
5	192.166	-11.26	45.12	33.86	43.50	-9.64	Peak
6	245.198	-10.58	37.55	26.97	46.00	-19.03	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : SZNS1220914-41680E-RF
Test Mode: 5G WIFI Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.496	-12.23	48.12	35.89	40.00	-4.11	QP
2	47.057	-10.00	37.48	27.48	40.00	-12.52	Peak
3	77.457	-16.56	44.39	27.83	40.00	-12.17	Peak
4	124.624	-14.27	36.87	22.60	43.50	-20.90	Peak
5	191.997	-11.25	40.32	29.07	43.50	-14.43	Peak
6	251.511	-10.71	32.25	21.54	46.00	-24.46	Peak

Above 1GHz:

5150-5250 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11A, Low Channel									
4500	44.69	PK	147	1.8	H	-4.72	39.97	74	-34.03
4500	44.74	PK	165	2.0	V	-4.72	40.02	74	-33.98
5150	49.26	PK	226	1.7	H	-2.73	46.53	74	-27.47
5150	46.09	PK	51	2.0	V	-2.73	43.36	74	-30.64
10360	43.10	PK	138	1.1	H	8.12	51.22	68.2	-16.98
10360	43.15	PK	158	1.1	V	8.12	51.27	68.2	-16.93
802.11A, Middle Channel									
10400	43.14	PK	94	1.9	H	8.24	51.38	68.2	-16.82
10400	43.04	PK	164	2.2	V	8.24	51.28	68.2	-16.92
802.11A, High Channel									
5350	46.00	PK	235	1.3	H	-2.33	43.67	74	-30.33
5350	45.89	PK	102	1.9	V	-2.33	43.56	74	-30.44
5460	46.42	PK	8	1.2	H	-2.26	44.16	74	-29.84
5460	46.01	PK	43	2.0	V	-2.26	43.75	74	-30.25
10480	41.85	PK	255	1.2	H	8.57	50.42	68.2	-17.78
10480	42.48	PK	21	1.5	V	8.57	51.05	68.2	-17.15
802.11AC20, Low Channel									
4500	44.40	PK	165	1.9	H	-4.72	39.68	74	-34.32
4500	44.61	PK	43	2.0	V	-4.72	39.89	74	-34.11
5150	48.14	PK	64	1.2	H	-2.73	45.41	74	-28.59
5150	45.80	PK	21	1.5	V	-2.73	43.07	74	-30.93
10360	42.36	PK	278	1.1	H	8.12	50.48	68.2	-17.72
10360	43.21	PK	135	1.6	V	8.12	51.33	68.2	-16.87
802.11AC20, Middle Channel									
10400	43.54	PK	248	1.4	H	8.24	51.78	68.2	-16.42
10400	42.85	PK	282	1.3	V	8.24	51.09	68.2	-17.11
802.11AC20, High Channel									
5350	45.89	PK	41	1.4	H	-2.33	43.56	74	-30.44
5350	45.80	PK	30	1.4	V	-2.33	43.47	74	-30.53
5460	46.69	PK	17	1.1	H	-2.26	44.43	74	-29.57
5460	46.21	PK	274	1.1	V	-2.26	43.95	74	-30.05
10480	42.65	PK	261	1.7	H	8.57	51.22	68.2	-16.98
10480	43.45	PK	325	1.1	V	8.57	52.02	68.2	-16.18

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11AC40, Low Channel									
4500	45.05	PK	331	2.2	H	-4.72	40.33	74	-33.67
4500	43.98	PK	274	1.1	V	-4.72	39.26	74	-34.74
5150	53.61	PK	184	1.9	H	-2.73	50.88	74	-23.12
5150	47.08	PK	325	1.1	V	-2.73	44.35	74	-29.65
10380	43.16	PK	336	1.8	H	8.19	51.35	68.2	-16.85
10380	42.99	PK	126	1.4	V	8.19	51.18	68.2	-17.02
802.11AC40, High Channel									
5350	45.94	PK	46	2.0	H	-2.33	43.61	74	-30.39
5350	45.76	PK	326	1.8	V	-2.33	43.43	74	-30.57
5460	46.51	PK	350	1.3	H	-2.26	44.25	74	-29.75
5460	45.61	PK	235	1.2	V	-2.26	43.35	74	-30.65
10460	41.77	PK	306	1.5	H	8.48	50.25	68.2	-17.95
10460	43.57	PK	215	1.9	V	8.48	52.05	68.2	-16.15
802.11AC80									
4500	44.44	PK	306	1.5	H	-4.72	39.72	74	-34.28
4500	44.99	PK	215	1.9	V	-4.72	40.27	74	-33.73
5150	55.87	PK	313	1.2	H	-2.73	53.14	74	-20.86
5150	52.22	PK	125	2.1	V	-2.73	49.49	74	-24.51
5350	46.98	PK	315	1.0	H	-2.33	44.65	74	-29.35
5350	45.95	PK	0	1.9	V	-2.33	43.62	74	-30.38
5460	45.82	PK	299	1.8	H	-2.26	43.56	74	-30.44
5460	45.85	PK	293	1.8	V	-2.26	43.59	74	-30.41
10420	42.87	PK	57	1.7	H	8.31	51.18	68.2	-17.02
10420	42.78	PK	343	2.2	V	8.31	51.09	68.2	-17.11

5250-5350 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11A, Low Channel									
4500	44.42	PK	27	2.4	H	-4.72	39.70	74	-34.3
4500	45.62	PK	301	2.1	V	-4.72	40.90	74	-33.1
5150	46.13	PK	118	1.1	H	-2.73	43.40	74	-30.6
5150	44.70	PK	173	1.7	V	-2.73	41.97	74	-32.03
10520	42.83	PK	265	2.4	H	8.65	51.48	68.2	-16.72
10520	41.38	PK	17	1.8	V	8.65	50.03	68.2	-18.17
802.11A, Middle Channel									
10560	44.02	PK	198	2.2	H	8.65	52.67	68.2	-15.53
10560	42.56	PK	348	2.5	V	8.65	51.21	68.2	-16.99
802.11A, High Channel									
5350	51.98	PK	138	1.8	H	-2.33	49.65	74	-24.35
5350	51.98	PK	318	2.2	V	-2.33	49.65	74	-24.35
5460	46.44	PK	339	1.4	H	-2.26	44.18	74	-29.82
5460	46.87	PK	30	2.3	V	-2.26	44.61	74	-29.39
10640	44.13	PK	339	1.4	H	8.9	53.03	74	-20.97
10640	43.99	PK	30	2.3	V	8.9	52.89	74	-21.11
802.11AC20, Low Channel									
4500	44.88	PK	299	2.3	H	-4.72	40.16	74	-33.84
4500	44.52	PK	66	1.9	V	-4.72	39.80	74	-34.2
5150	45.82	PK	343	1.1	H	-2.73	43.09	74	-30.91
5150	45.08	PK	228	2	V	-2.73	42.35	74	-31.65
10520	43.35	PK	339	1.4	H	8.65	52.00	68.2	-16.2
10520	43.29	PK	250	2.3	V	8.65	51.94	68.2	-16.26
802.11AC20, Middle Channel									
10560	43.00	PK	184	1.1	H	8.65	51.65	68.2	-16.55
10560	43.88	PK	210	1.9	V	8.65	52.53	68.2	-15.67
802.11AC20, High Channel									
5350	51.50	PK	311	2	H	-2.33	49.17	74	-24.83
5350	55.28	PK	272	1.4	V	-2.33	52.95	74	-21.05
5460	46.61	PK	338	2.4	H	-2.26	44.35	74	-29.65
5460	46.95	PK	76	1.6	V	-2.26	44.69	74	-29.31
10640	44.78	PK	67	2.2	H	8.9	53.68	74	-20.32
10640	43.50	PK	146	1.1	V	8.9	52.40	74	-21.6

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11AC40, Low Channel									
4500	45.94	PK	192	1.5	H	-4.72	41.22	74	-32.78
4500	44.34	PK	278	2.3	V	-4.72	39.62	74	-34.38
5150	45.12	PK	248	1.5	H	-2.73	42.39	74	-31.61
5150	46.09	PK	145	2	V	-2.73	43.36	74	-30.64
10540	43.62	PK	138	1.8	H	8.65	52.27	68.2	-15.93
10540	41.71	PK	41	1.6	V	8.65	50.36	68.2	-17.84
802.11AC40, Channel									
5350	49.11	PK	114	1.4	H	-2.33	46.78	74	-27.22
5350	55.06	PK	294	1.5	V	-2.33	52.73	74	-21.27
5460	46.12	PK	249	1.8	H	-2.26	43.86	74	-30.14
5460	47.53	PK	88	1.8	V	-2.26	45.27	74	-28.73
10620	41.94	PK	16	2.2	H	8.8	50.74	74	-23.26
10620	42.68	PK	125	1.4	V	8.8	51.48	74	-22.52
802.11AC80									
4500	44.81	PK	27	1.6	H	-4.72	40.09	74	-33.91
4500	45.08	PK	193	1.1	V	-4.72	40.36	74	-33.64
5150	45.80	PK	35	2	H	-2.73	43.07	74	-30.93
5150	46.08	PK	135	1.6	V	-2.73	43.35	74	-30.65
5350	54.65	PK	329	2	H	-2.33	52.32	74	-21.68
5350	53.34	PK	3	1.9	V	-2.33	51.01	74	-22.99
5460	46.27	PK	312	1.9	H	-2.26	44.01	74	-29.99
5460	46.14	PK	86	2.5	V	-2.26	43.88	74	-30.12
10580	43.17	PK	315	1.6	H	8.7	51.87	68.2	-16.33
10580	42.96	PK	36	1.8	V	8.7	51.66	68.2	-16.54

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit	Margin
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)			(dBμV/m)	(dB)
802.11A, Low Channel									
5650	48.81	PK	358	1.9	H	-1.95	46.86	68.2	-21.34
5650	48.00	PK	49	1.8	V	-1.95	46.05	68.2	-22.15
5700	49.56	PK	262	1.3	H	-2.02	47.54	105.2	-57.66
5700	49.39	PK	95	1.5	V	-2.02	47.37	105.2	-57.83
5720	58.89	PK	351	1.1	H	-1.96	56.93	110.8	-53.87
5720	63.20	PK	320	1.0	V	-1.96	61.24	110.8	-49.56
5725	66.38	PK	320	1.0	H	-1.96	64.42	122.2	-57.78
5725	62.67	PK	205	1.5	V	-1.96	60.71	122.2	-61.49
11490	44.12	PK	291	1.6	H	6.63	50.75	74	-23.25
11490	43.79	PK	71	1.1	V	6.63	50.42	74	-23.58
802.11A, Middle Channel									
11570	43.84	PK	29	2.2	H	6.59	50.43	74	-23.57
11570	45.65	PK	76	1.0	V	6.59	52.24	74	-21.76
802.11A, High Channel									
5850	56.73	PK	328	2.0	H	-1.81	54.92	122.2	-67.28
5850	54.22	PK	67	1.9	V	-1.81	52.41	122.2	-69.79
5855	51.66	PK	185	1.9	H	-1.82	49.84	110.8	-60.96
5855	56.22	PK	283	1.2	V	-1.82	54.40	110.8	-56.4
5875	47.66	PK	327	1.3	H	-1.84	45.82	105.2	-59.38
5875	47.34	PK	225	2.1	V	-1.84	45.50	105.2	-59.7
5925	47.13	PK	197	1.9	H	-1.83	45.30	68.2	-22.9
5925	47.69	PK	331	1.5	V	-1.83	45.86	68.2	-22.34
11650	44.94	PK	275	1.2	H	6.77	51.71	74	-22.29
11650	44.50	PK	58	1.3	V	6.77	51.27	74	-22.73

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit	Margin
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)			(dBμV/m)	(dB)
802.11AC20, Low Channel									
5650	48.87	PK	198	2.1	H	-1.95	46.92	68.2	-21.28
5650	47.37	PK	298	1.6	V	-1.95	45.42	68.2	-22.78
5700	49.52	PK	198	2.1	H	-2.02	47.50	105.2	-57.7
5700	49.06	PK	298	1.6	V	-2.02	47.04	105.2	-58.16
5720	57.50	PK	198	2.1	H	-1.96	55.54	110.8	-55.26
5720	57.24	PK	298	1.6	V	-1.96	55.28	110.8	-55.52
5725	61.11	PK	85	1.5	H	-1.96	59.15	122.2	-63.05
5725	62.44	PK	81	1.9	V	-1.96	60.48	122.2	-61.72
11490	44.01	PK	168	1.3	H	6.63	50.64	74	-23.36
11490	43.94	PK	268	1.1	V	6.63	50.57	74	-23.43
802.11AC20, Middle Channel									
11570	44.18	PK	0	1.1	H	6.59	50.77	74	-23.23
11570	43.64	PK	306	1.9	V	6.59	50.23	74	-23.77
802.11AC20, High Channel									
5850	56.32	PK	28	1.2	H	-1.81	54.51	122.2	-67.69
5850	57.73	PK	172	1.7	V	-1.81	55.92	122.2	-66.28
5855	53.68	PK	44	1.6	H	-1.82	51.86	110.8	-58.94
5855	55.19	PK	193	1.5	V	-1.82	53.37	110.8	-57.43
5875	48.87	PK	10	1.6	H	-1.84	47.03	105.2	-58.17
5875	47.02	PK	225	1.1	V	-1.84	45.18	105.2	-60.02
5925	47.61	PK	318	1.2	H	-1.83	45.78	68.2	-22.42
5925	46.65	PK	126	1.3	V	-1.83	44.82	68.2	-23.38
11650	44.82	PK	191	1.6	H	6.77	51.59	74	-22.41
11650	44.60	PK	41	1.3	V	6.77	51.37	74	-22.63

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit	Margin
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)			(dBμV/m)	(dB)
802.11AC40, Low Channel									
5650	47.07	PK	41	1.3	H	-1.95	45.12	68.2	-23.08
5650	47.60	PK	10	1.8	V	-1.95	45.65	68.2	-22.55
5700	50.12	PK	10	1.8	H	-2.02	48.10	105.2	-57.1
5700	49.89	PK	17	1.7	V	-2.02	47.87	105.2	-57.33
5720	56.86	PK	265	1.7	H	-1.96	54.90	110.8	-55.9
5720	60.01	PK	148	1.0	V	-1.96	58.05	110.8	-52.75
5725	68.33	PK	101	1.4	H	-1.96	66.37	122.2	-55.83
5725	61.06	PK	112	2.0	V	-1.96	59.10	122.2	-63.1
11510	44.00	PK	51	2.1	H	6.59	50.59	74	-23.41
11510	43.28	PK	102	1.7	V	6.59	49.87	74	-24.13
802.11AC40, High Channel									
5850	47.47	PK	358	2.1	H	-1.81	45.66	122.2	-76.54
5850	46.09	PK	45	1.3	V	-1.81	44.28	122.2	-77.92
5855	48.70	PK	9	1.7	H	-1.82	46.88	110.8	-63.92
5855	48.67	PK	255	1.2	V	-1.82	46.85	110.8	-63.95
5875	47.40	PK	239	1.5	H	-1.84	45.56	105.2	-59.64
5875	47.40	PK	84	2.1	V	-1.84	45.56	105.2	-59.64
5925	47.47	PK	114	1.9	H	-1.83	45.64	68.2	-22.56
5925	46.65	PK	206	2.1	V	-1.83	44.82	68.2	-23.38
11590	44.77	PK	76	1.0	H	6.57	51.34	74	-22.66
11590	44.87	PK	58	2.0	V	6.57	51.44	74	-22.56

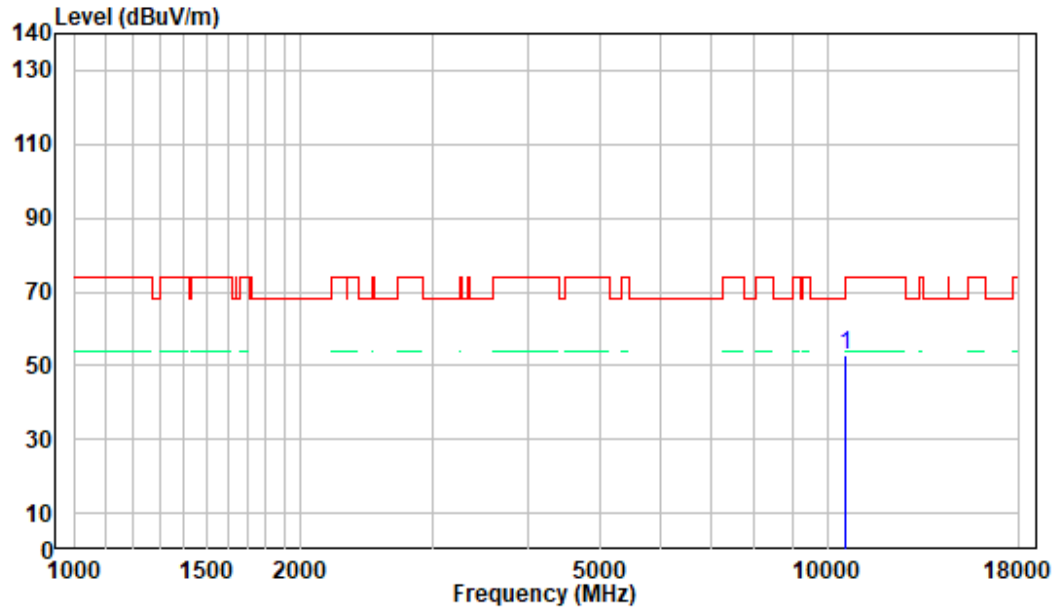
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit	Margin
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)			(dBμV/m)	(dB)
802.11AC80									
5650	48.47	PK	46	1.5	H	-1.95	46.52	68.2	-21.68
5650	46.76	PK	103	2.0	V	-1.95	44.81	68.2	-23.39
5700	56.10	PK	222	2.2	H	-2.02	54.08	105.2	-51.12
5700	54.88	PK	46	1.0	V	-2.02	52.86	105.2	-52.34
5720	59.91	PK	224	1.8	H	-1.96	57.95	110.8	-52.85
5720	65.76	PK	214	1.7	V	-1.96	63.80	110.8	-47
5725	60.19	PK	158	1.4	H	-1.96	58.23	122.2	-63.97
5725	54.92	PK	259	1.8	V	-1.96	52.96	122.2	-69.24
5850	53.50	PK	158	1.4	H	-1.81	51.69	122.2	-70.51
5850	52.76	PK	259	1.8	V	-1.81	50.95	122.2	-71.25
5855	54.83	PK	141	2.1	H	-1.82	53.01	110.8	-57.79
5855	51.60	PK	164	2.1	V	-1.82	49.78	110.8	-61.02
5875	50.93	PK	58	1.8	H	-1.84	49.09	105.2	-56.11
5875	48.71	PK	356	1.9	V	-1.84	46.87	105.2	-58.33
5925	46.56	PK	66	1.9	H	-1.83	44.73	68.2	-23.47
5925	45.93	PK	69	1.9	V	-1.83	44.10	68.2	-24.1
11550	43.35	PK	118	2.1	H	6.61	49.96	74	-24.04
11550	43.21	PK	273	1.7	V	6.61	49.82	74	-24.18

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was less than the limit of average, so just peak value were recorded.

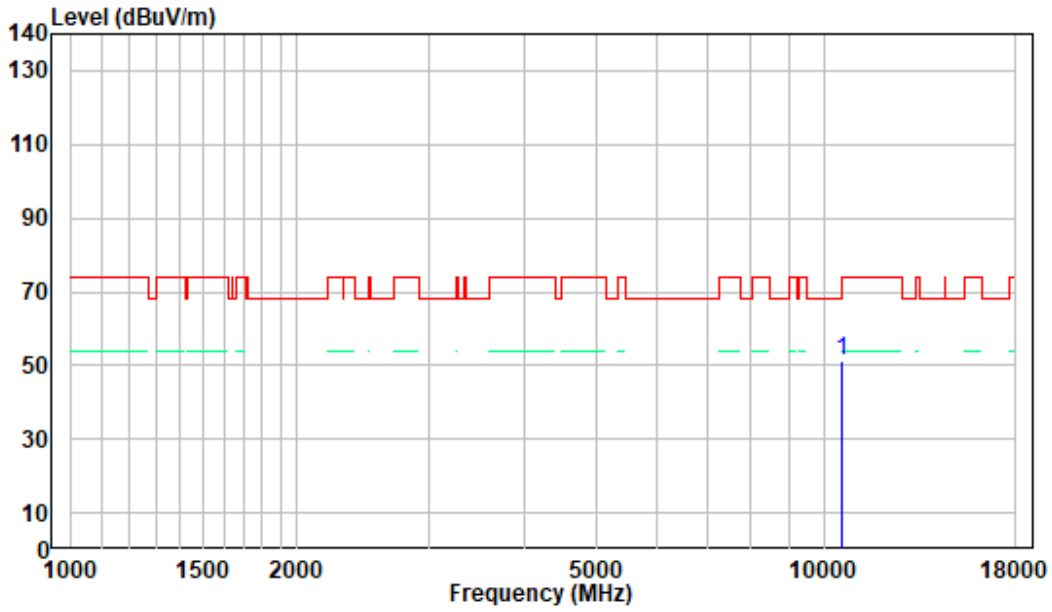
1 GHz - 18 GHz: (Pre-Scan plots)

802.11a, 5280MHz

Horizontal



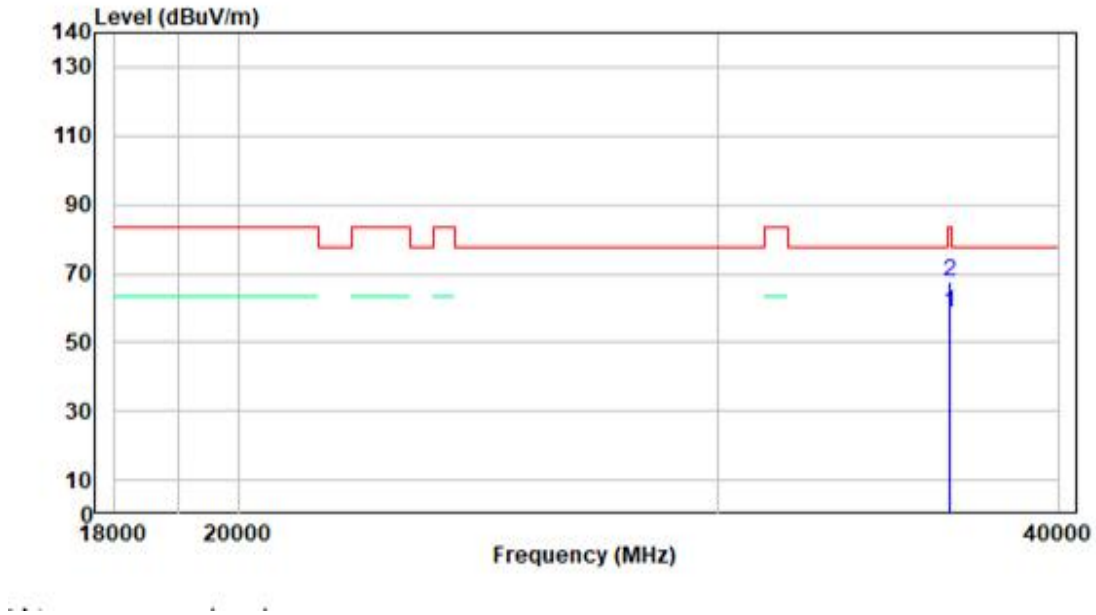
Vertical



18-40GHz: (Pre-Scan plots)

802.11a, 5280MHz

Horizontal



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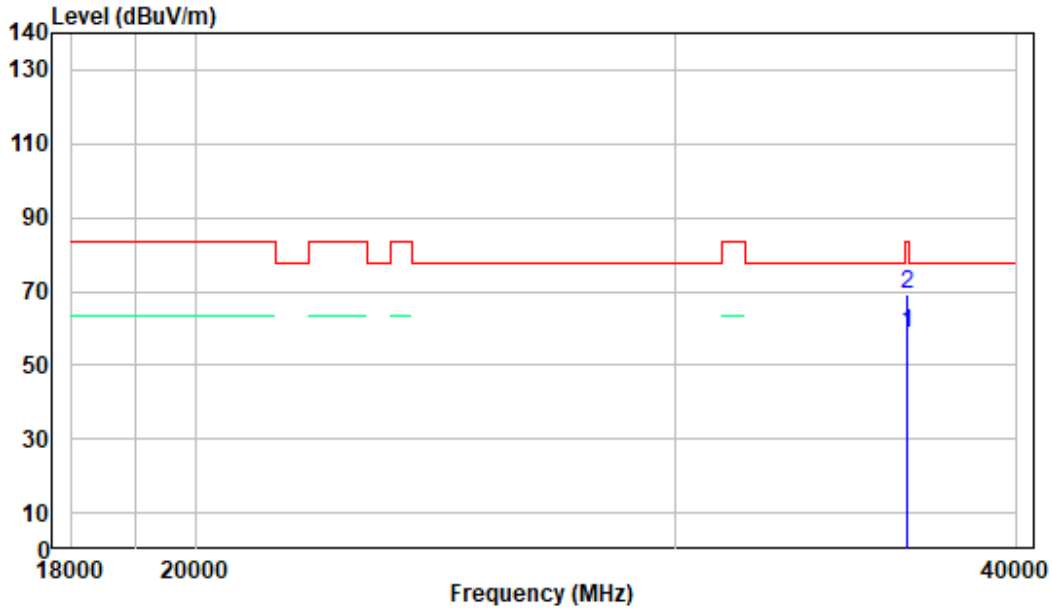


FCC §15.407(a),(e) – BANDWIDTH MEASUREMENT

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

According to KDB789033 section II.C. and section II.D.

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

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

3. **99% Occupied Bandwidth**
The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is required only as a condition for using the optional bandedge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with Section 15.407(a)

The following procedure shall be used for measuring (99%) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1% to 5% of the OBW
4. Set VBW ≥ 3 × RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99% power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies

Note: For devices that use channel aggregation refer to III.A and III.C for determining 99% bandwidth.

Test Data

Environmental Conditions

Temperature:	27.5℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-13.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

FCC §15.407(a) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

For an indoor 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.

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 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

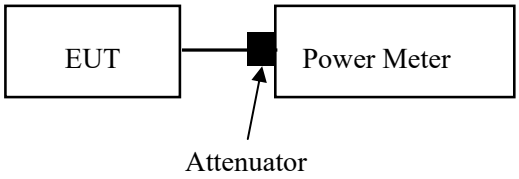
Test Procedure

According to KDB789033 section II.E.3. a).

a. Place the EUT on a bench and set it in transmitting mode.

b. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.

c. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	27.5℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-13.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

FCC §15.407(a) - POWER SPECTRAL DENSITY

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 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

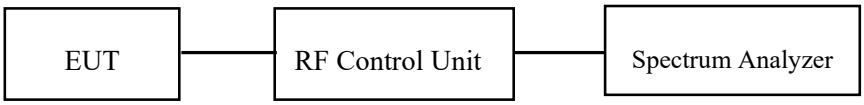
For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum 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

According to KDB789033 section II.F..

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.e 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

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



Test Data

Environmental Conditions

Temperature:	27.5℃
Relative Humidity:	62 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-13.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

APPENDIX

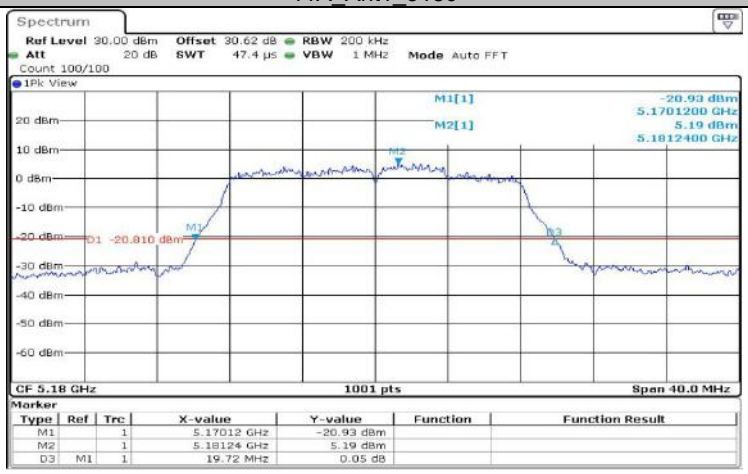
Appendix A1: Emission Bandwidth

Test Result

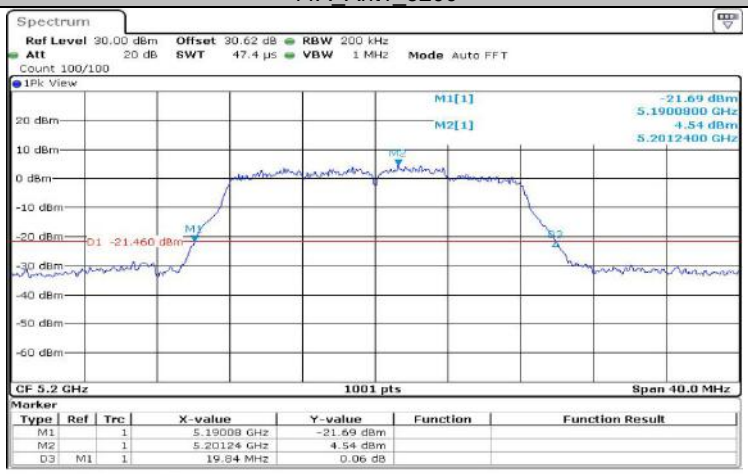
Test Mode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	19.72	---	---
		5200	19.84	---	---
		5240	19.88	---	---
		5260	19.84	---	---
		5280	20.04	---	---
		5320	19.76	---	---
11AC20SISO	Ant1	5180	20.20	---	---
		5200	20.28	---	---
		5240	20.44	---	---
		5260	20.16	---	---
		5280	20.16	---	---
		5320	20.08	---	---
11AC40SISO	Ant1	5190	41.28	---	---
		5230	41.12	---	---
		5270	41.12	---	---
		5310	41.12	---	---
11AC80SISO	Ant1	5210	82.08	---	---
		5290	81.44	---	---

Test Graphs

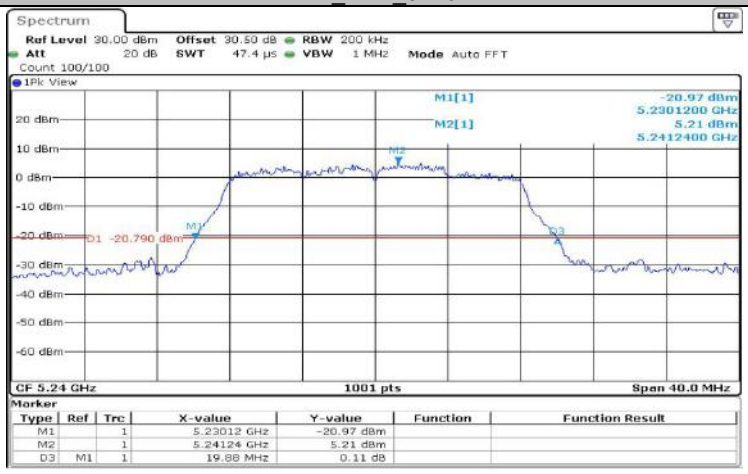
11A_Ant1_5180



11A_Ant1_5200



11A_Ant1_5240



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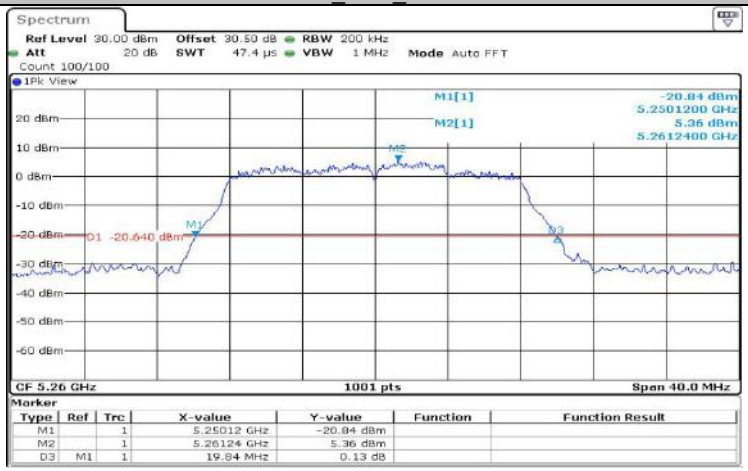
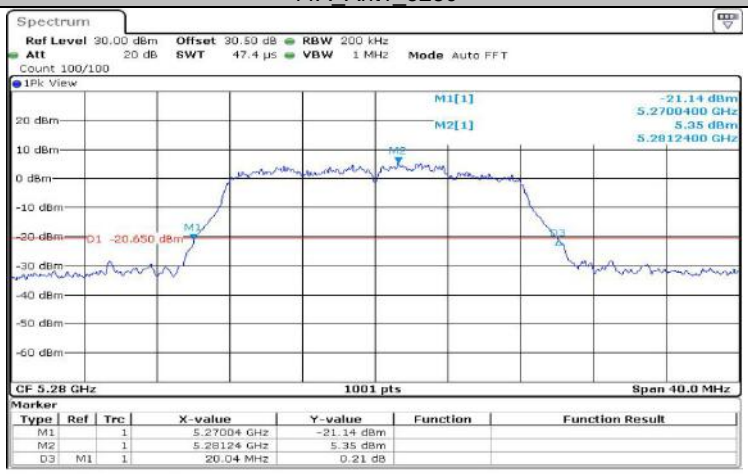
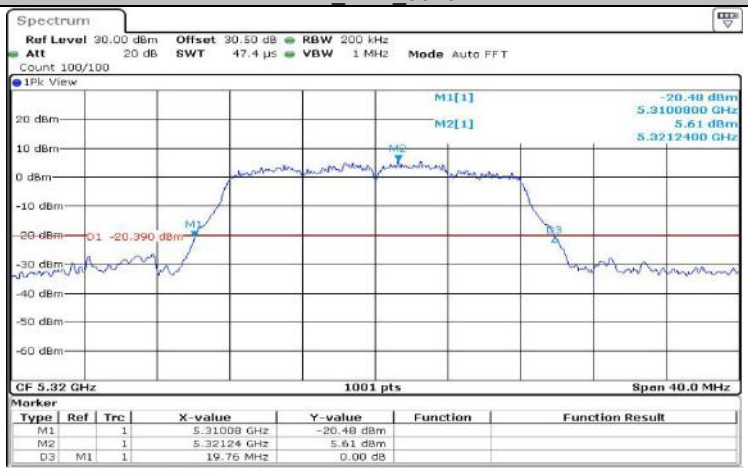


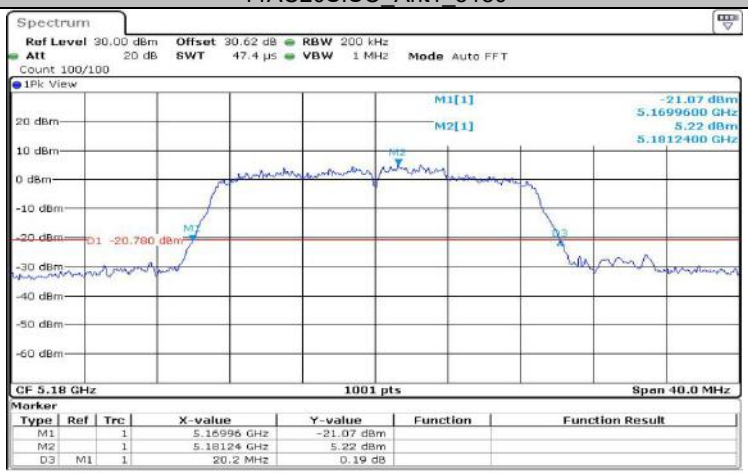
11A_Ant1_5280



11A_Ant1_5320



11AC20SISO_Ant1_5180



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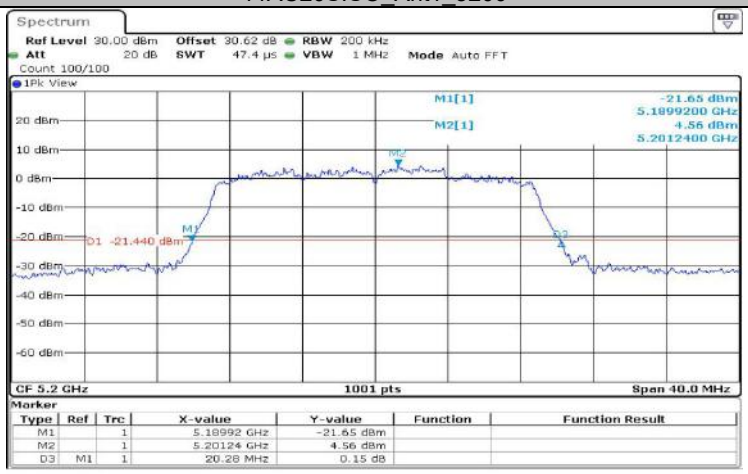

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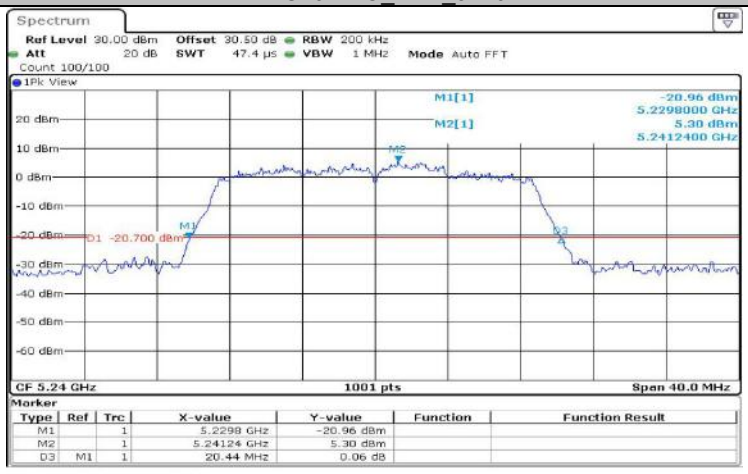

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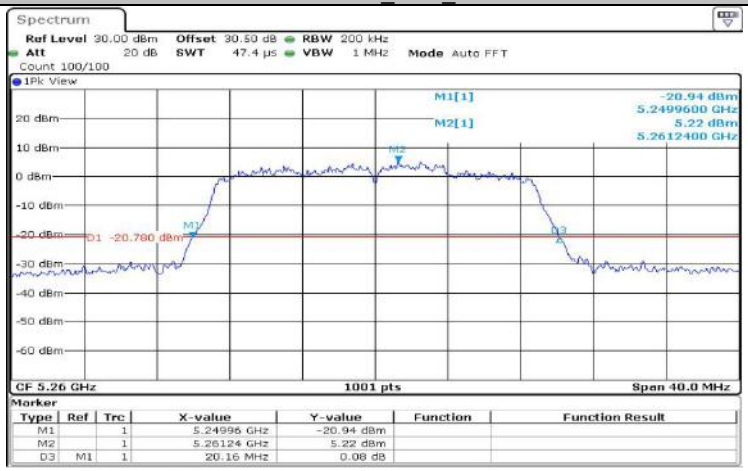

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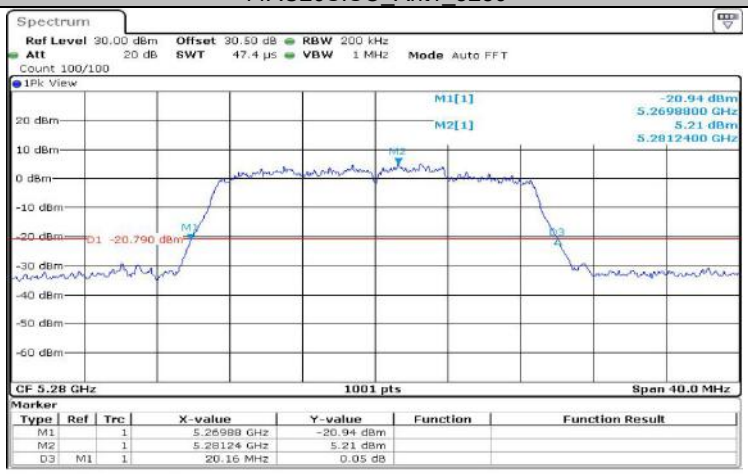

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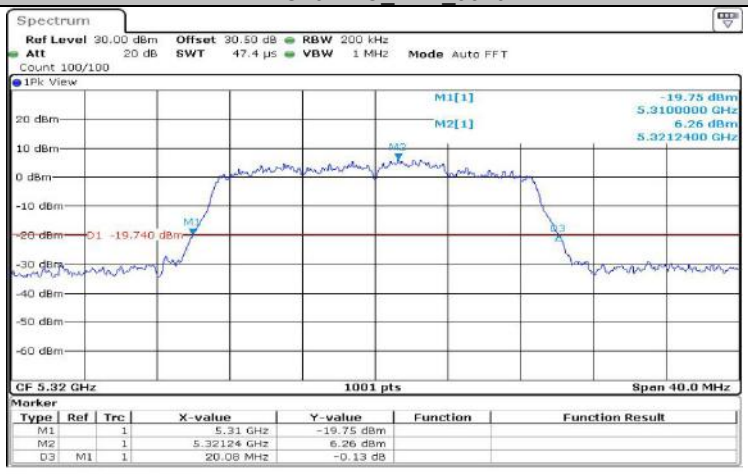
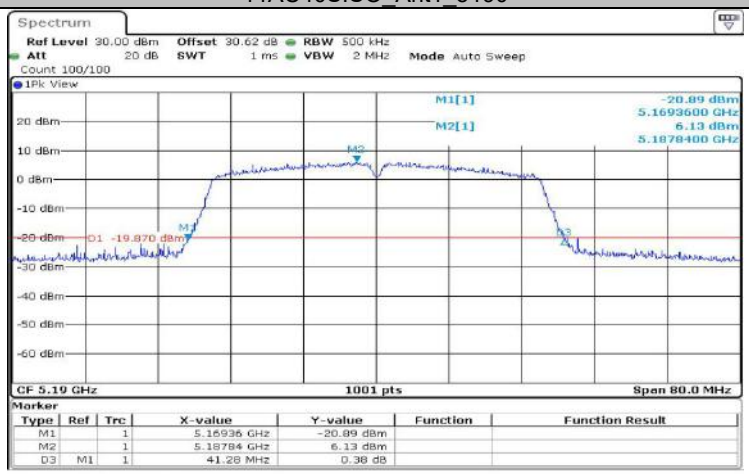
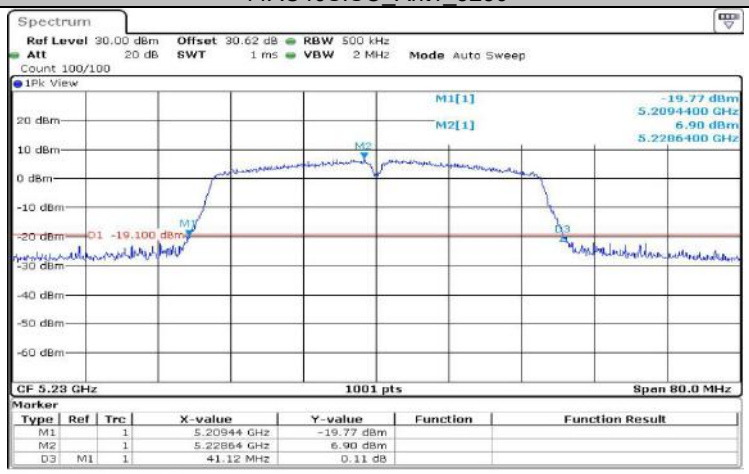


11AC40SISO_Ant1_5190



11AC40SISO_Ant1_5230



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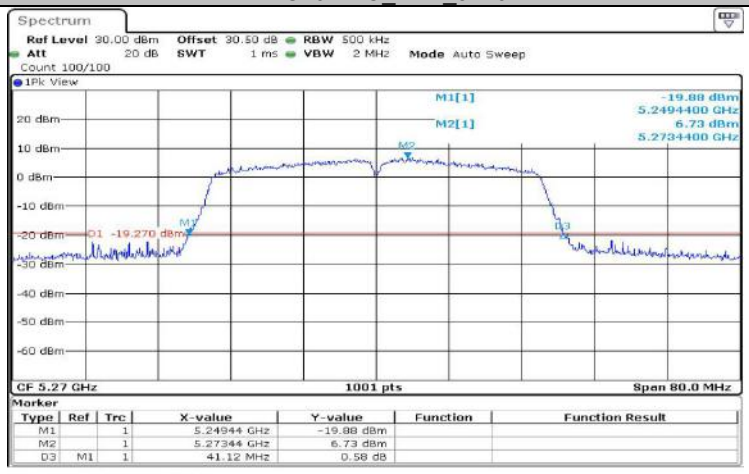
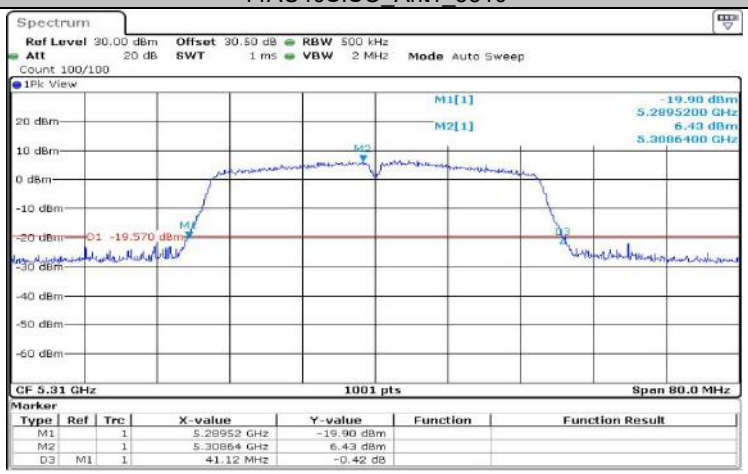
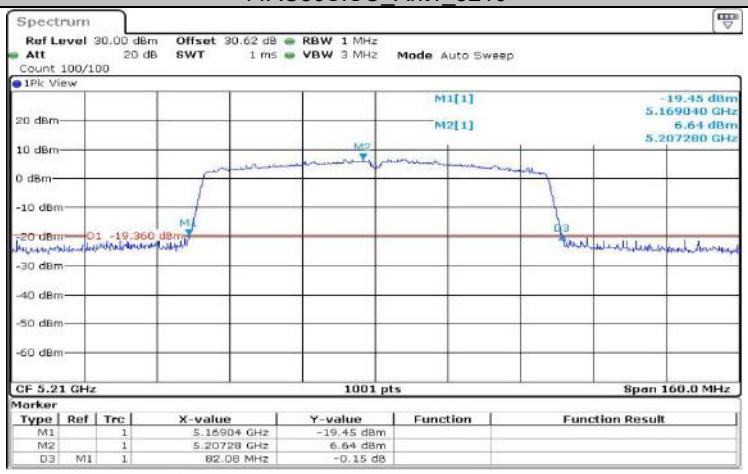


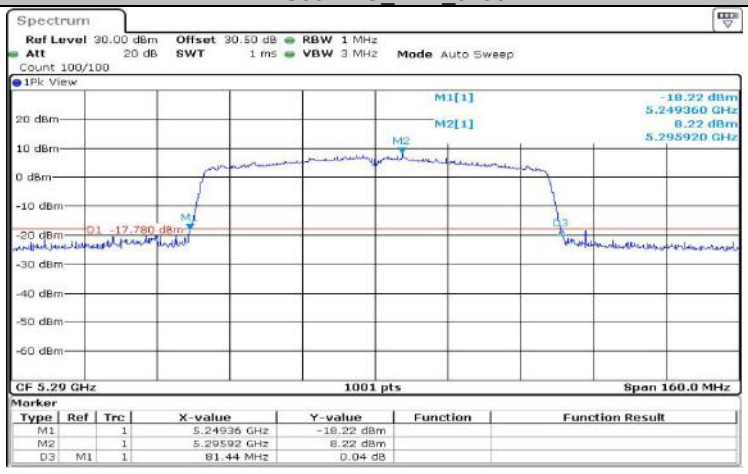
11AC40SISO_Ant1_5310



11AC80SISO_Ant1_5210



11AC80SISO_Ant1_5290



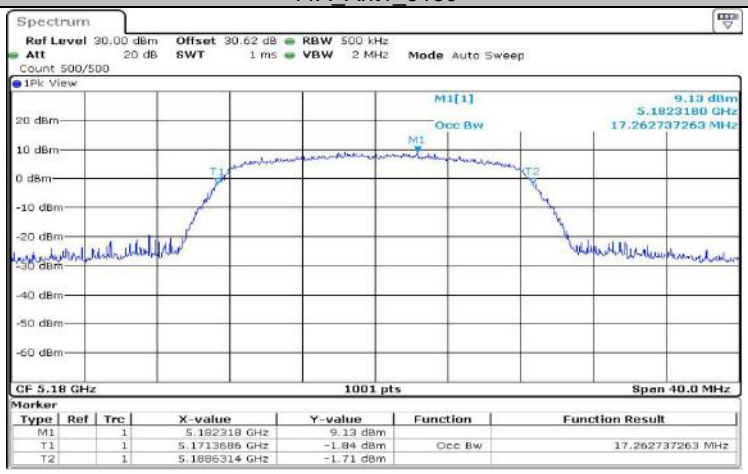
Appendix A2: Occupied channel bandwidth

Test Result

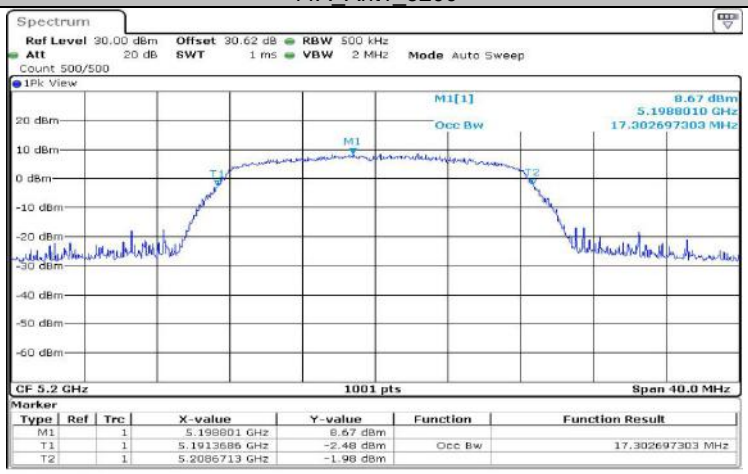
Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.263	---	---
		5200	17.303	---	---
		5240	17.263	---	---
		5260	17.303	---	---
		5280	17.303	---	---
		5320	17.223	---	---
		5745	17.343	---	---
		5785	17.303	---	---
		5825	17.343	---	---
11AC20SISO	Ant1	5180	18.142	---	---
		5200	18.182	---	---
		5240	18.142	---	---
		5260	18.102	---	---
		5280	18.102	---	---
		5320	18.102	---	---
		5745	18.142	---	---
		5785	18.142	---	---
		5825	18.182	---	---
11AC40SISO	Ant1	5190	36.603	---	---
		5230	36.603	---	---
		5270	36.603	---	---
		5310	36.683	---	---
		5755	36.603	---	---
		5795	36.683	---	---
11AC80SISO	Ant1	5210	75.445	---	---
		5290	75.285	---	---
		5775	75.445	---	---

Test Graphs

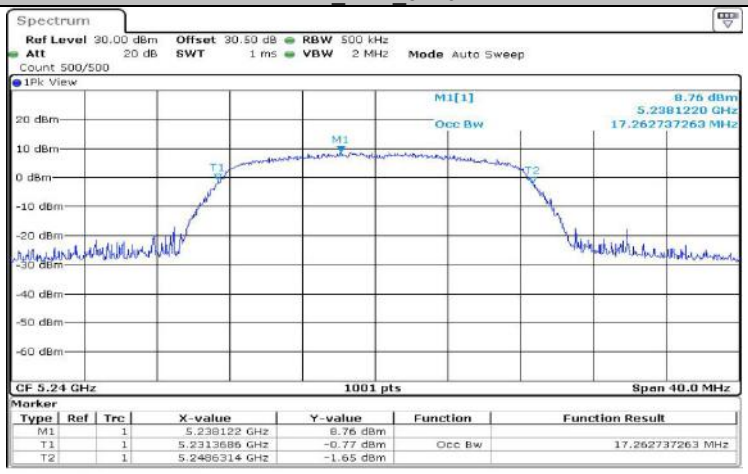
11A_Ant1_5180



11A_Ant1_5200



11A_Ant1_5240



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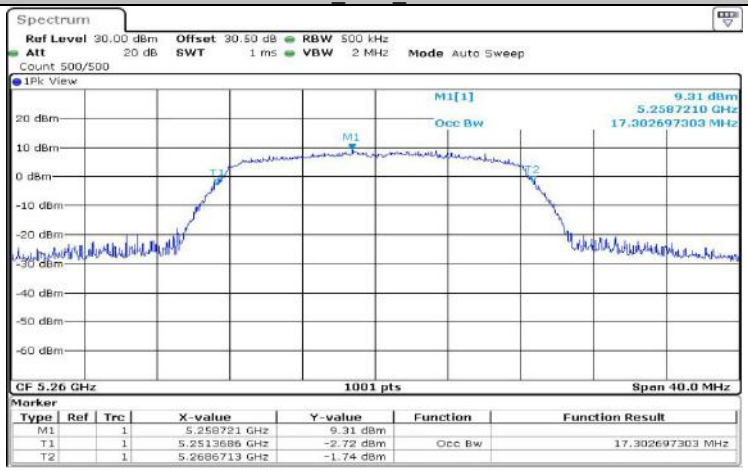

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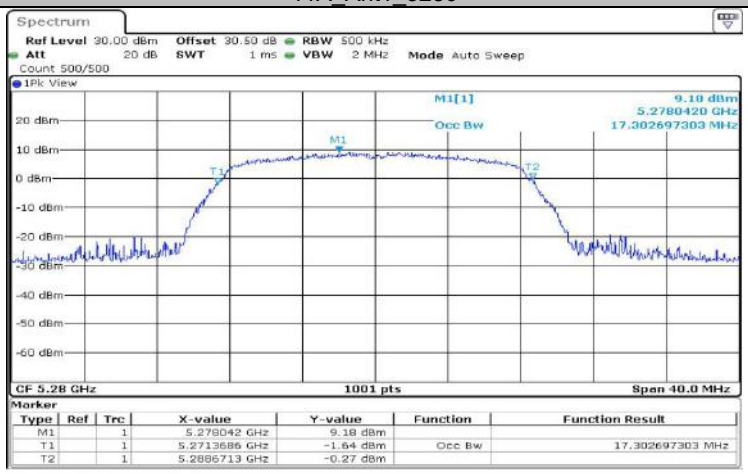

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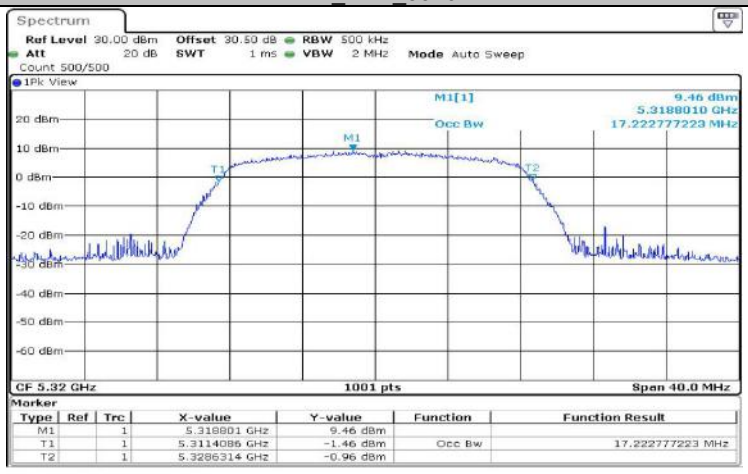
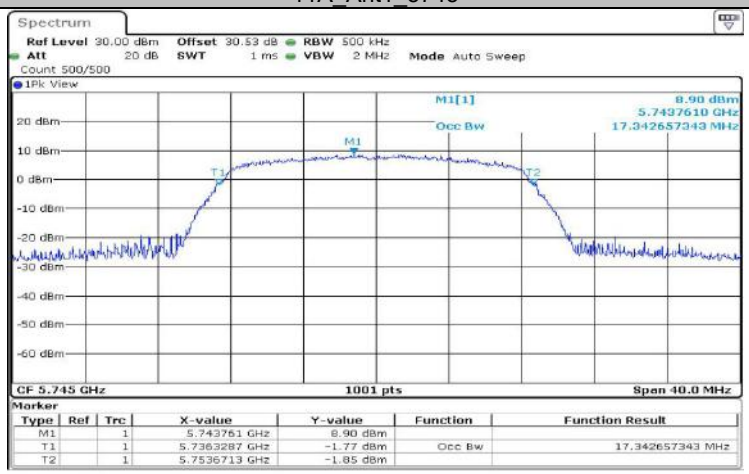
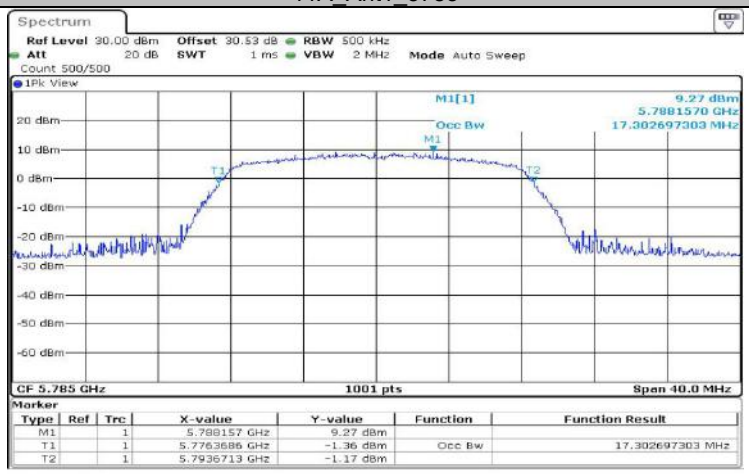


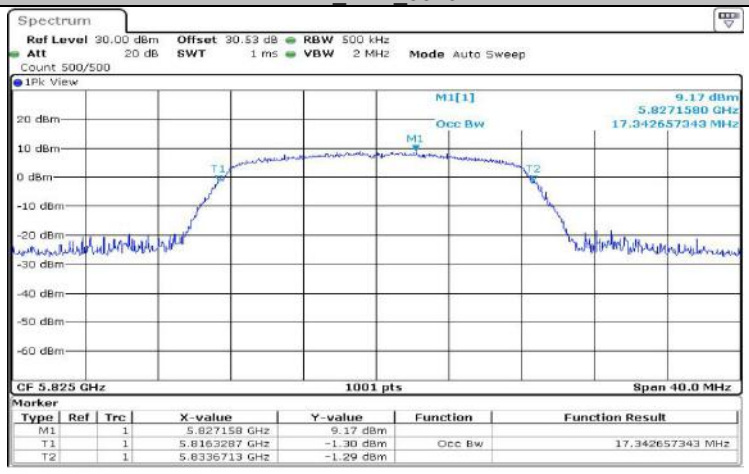
11A_Ant1_5745



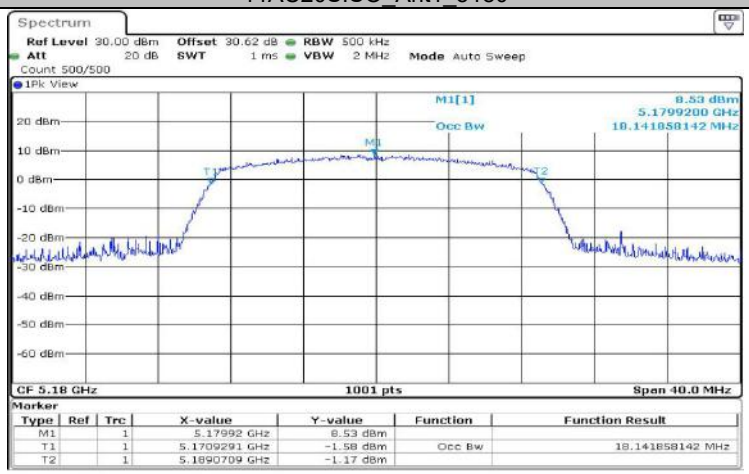
11A_Ant1_5785



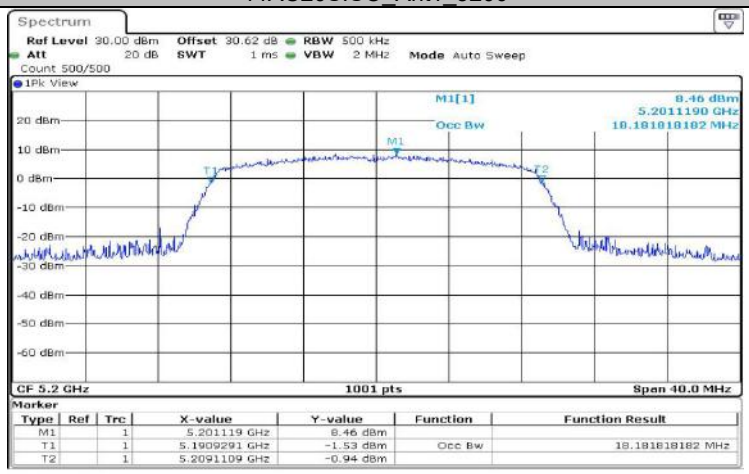
11A_Ant1_5825



11AC20SISO_Ant1_5180



11AC20SISO_Ant1_5200



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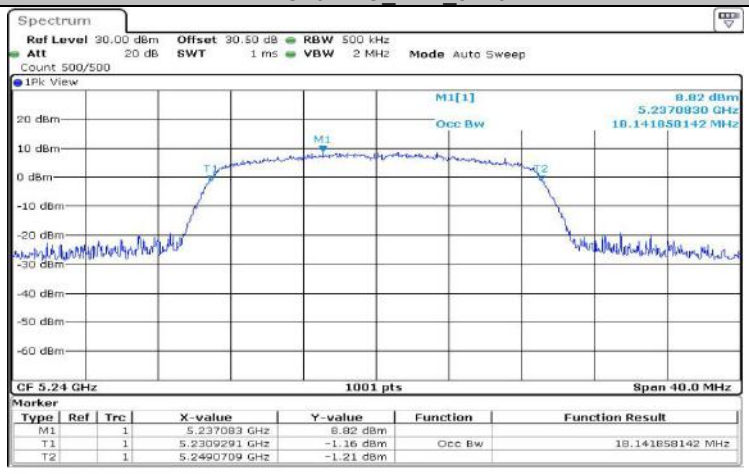
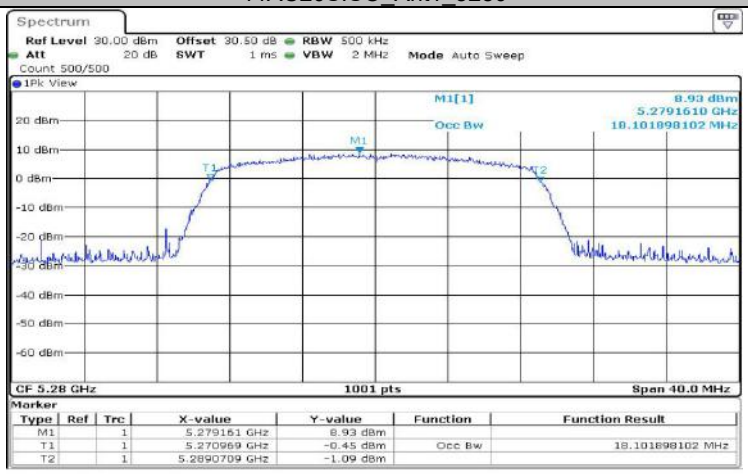


11AC20SISO_Ant1_5260

11AC20SISO_Ant1_5280



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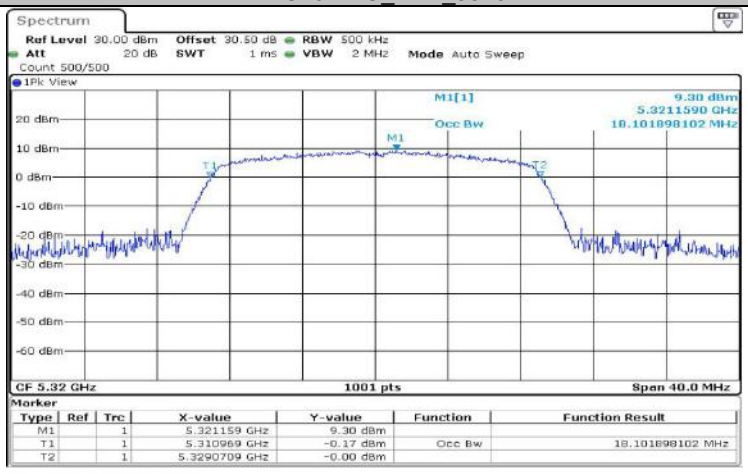
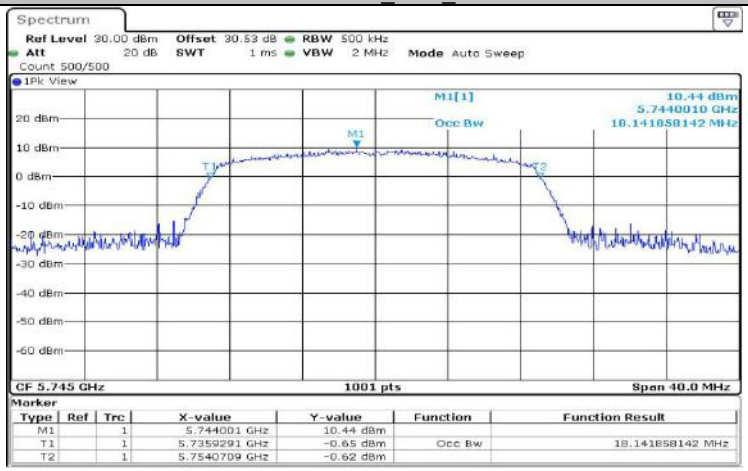
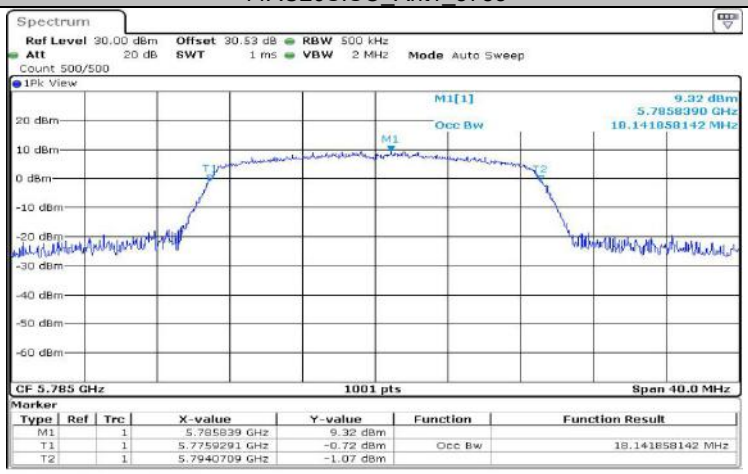


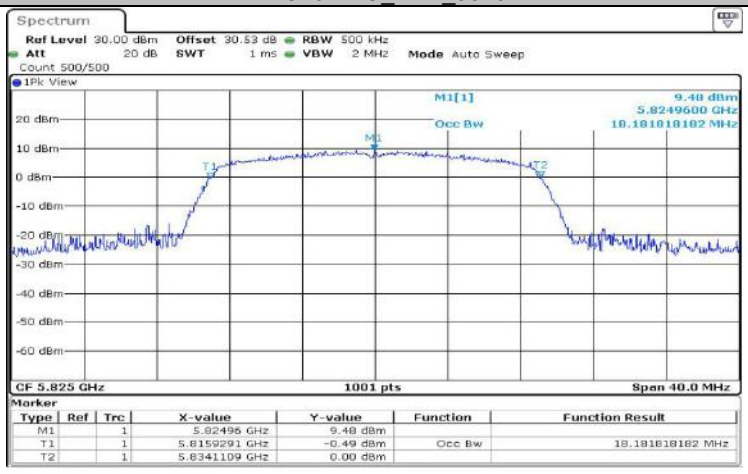
11AC20SISO_Ant1_5745



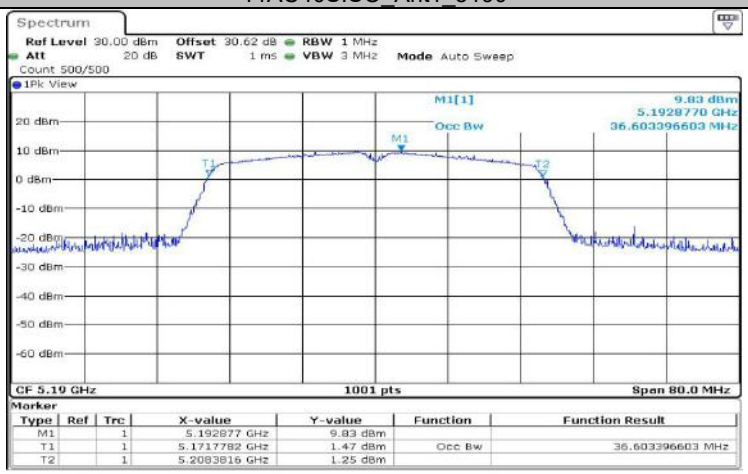
11AC20SISO_Ant1_5785



11AC20SISO_Ant1_5825



11AC40SISO_Ant1_5190



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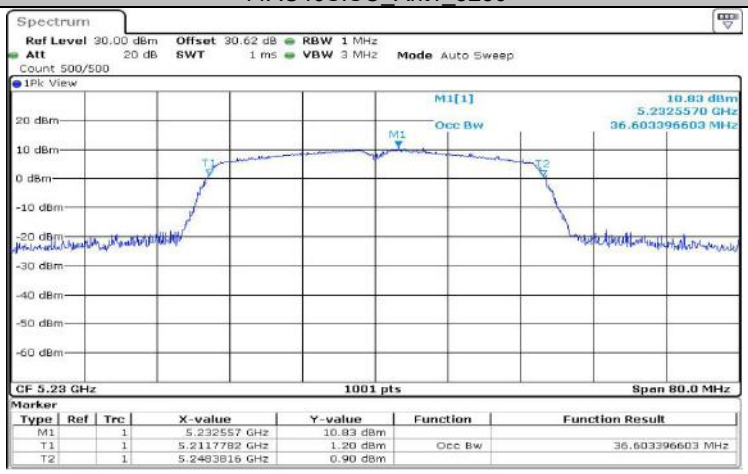

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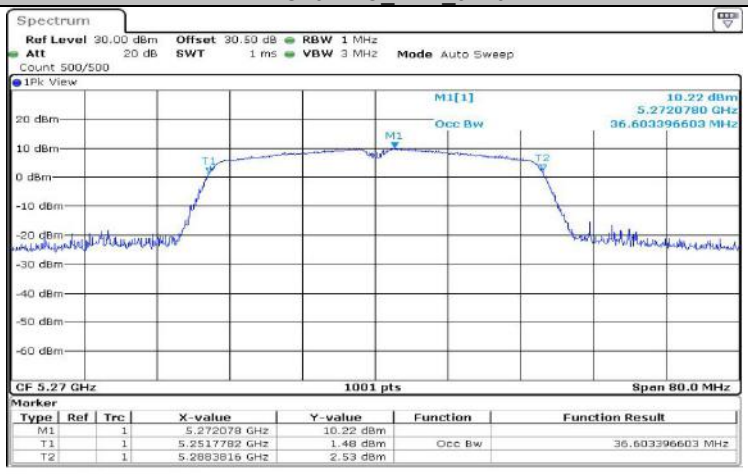

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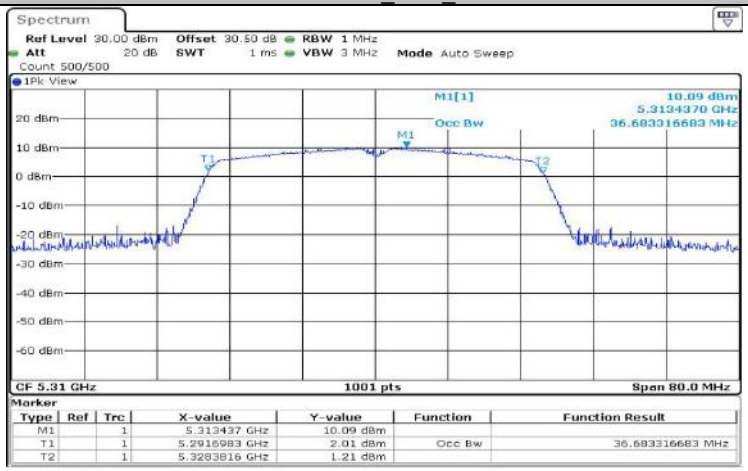

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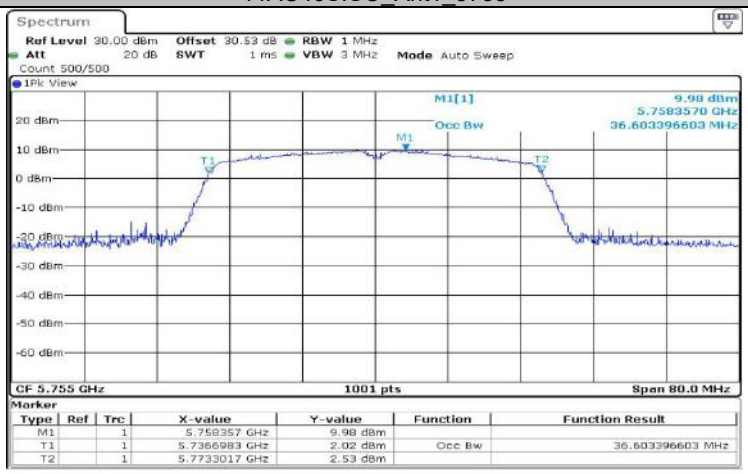
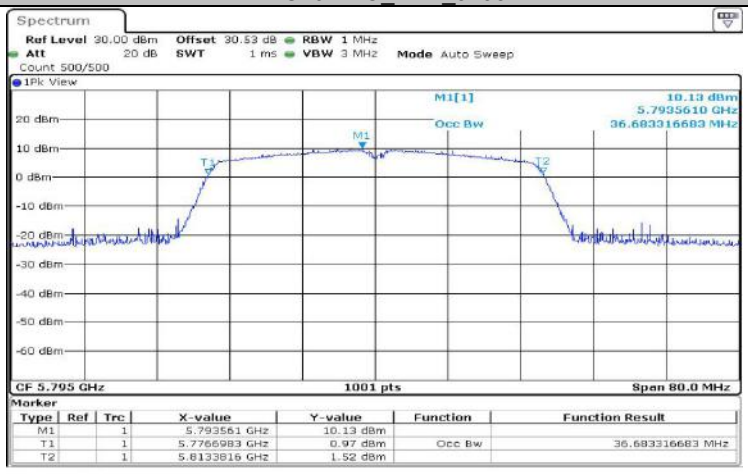
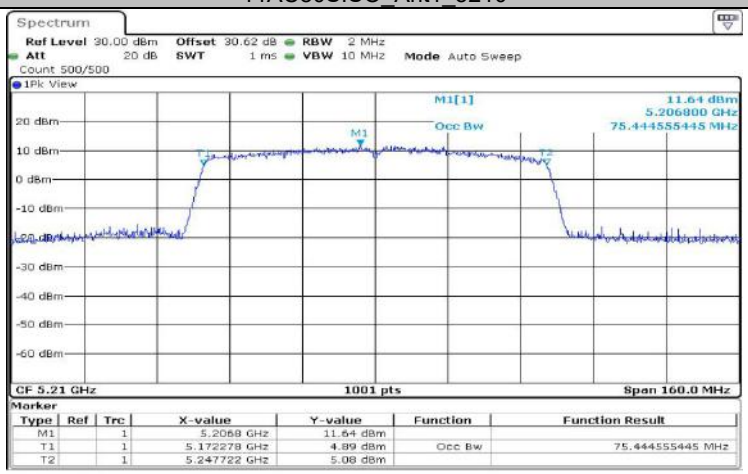


11AC40SISO_Ant1_5795



11AC80SISO_Ant1_5210



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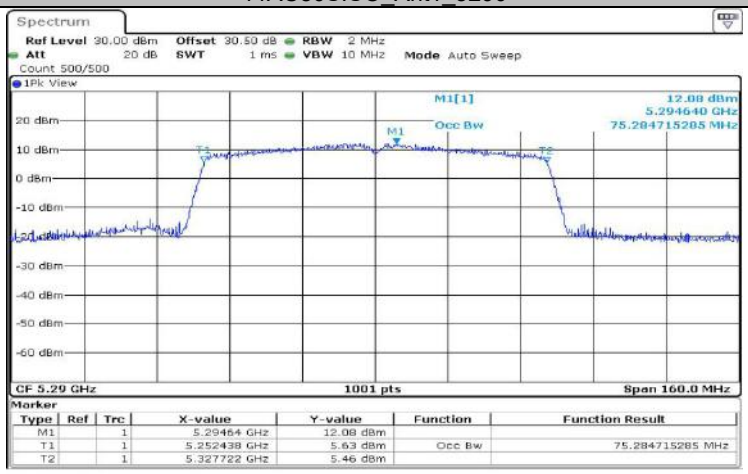
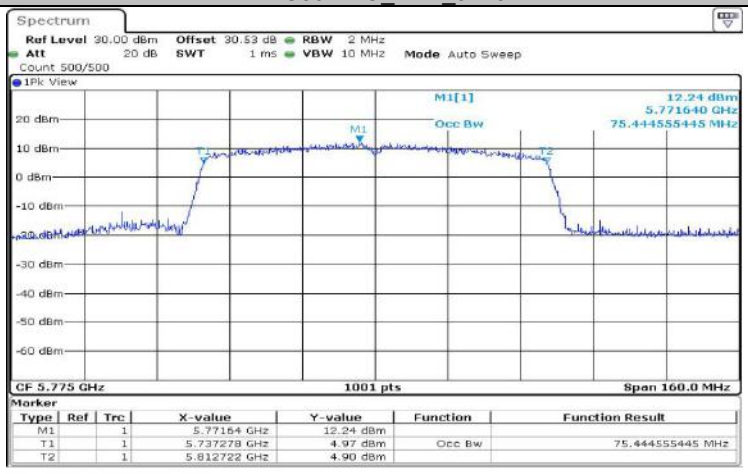


11AC80SISO_Ant1_5775



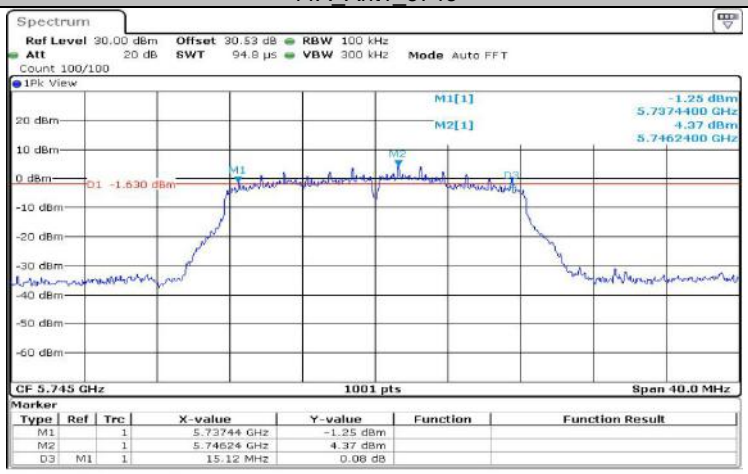
Appendix A3: Min emission bandwidth

Test Result

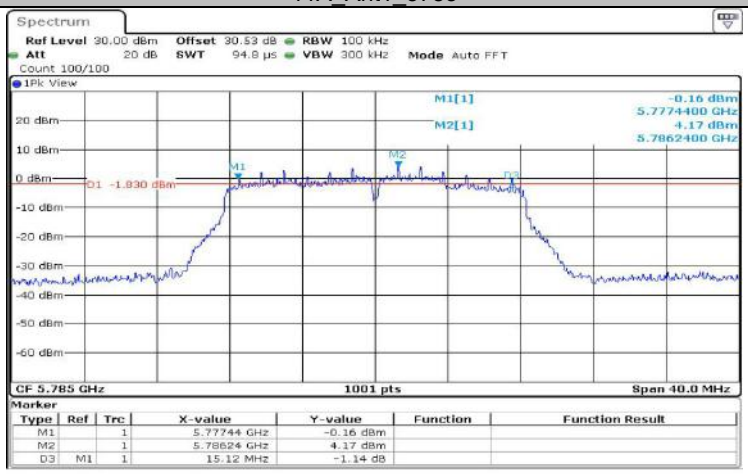
Test Mode	Antenna	Channel	6db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	15.12	0.5	PASS
		5785	15.12	0.5	PASS
		5825	15.12	0.5	PASS
11AC20SISO	Ant1	5745	15.12	0.5	PASS
		5785	15.08	0.5	PASS
		5825	15.08	0.5	PASS
11AC40SISO	Ant1	5755	35.12	0.5	PASS
		5795	35.12	0.5	PASS
11AC80SISO	Ant1	5775	75.20	0.5	PASS

Test Graphs

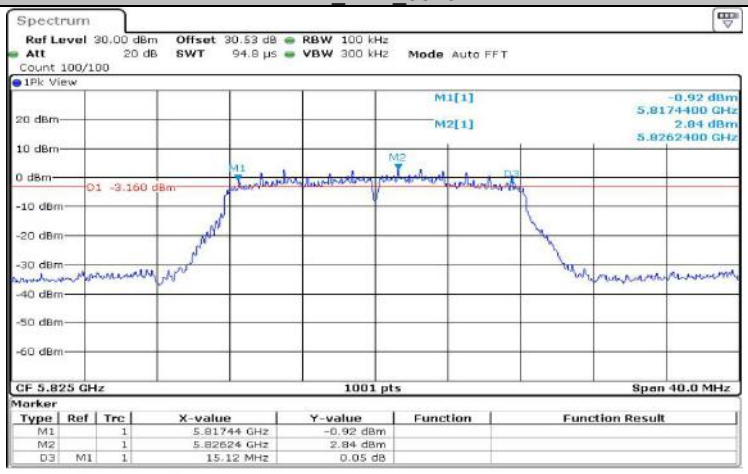
11A_Ant1_5745



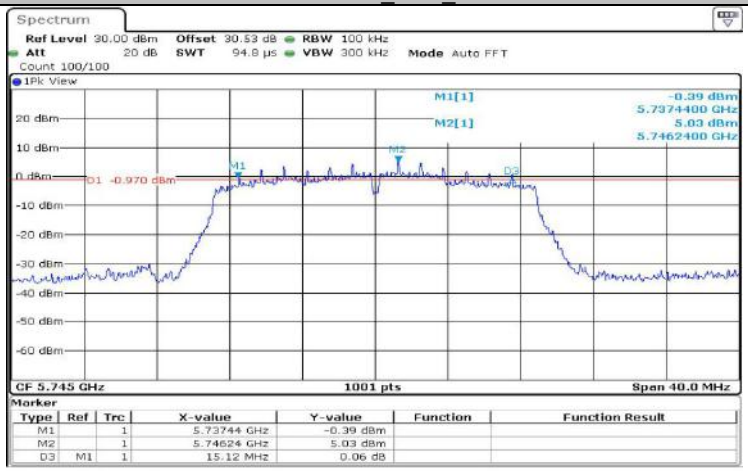
11A_Ant1_5785



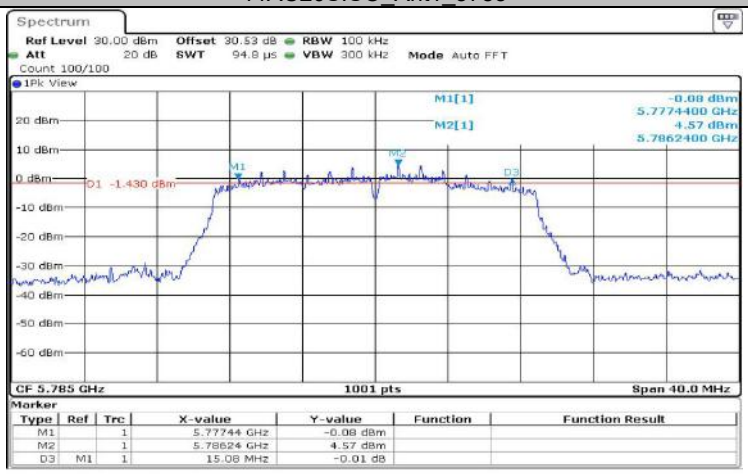
11A_Ant1_5825



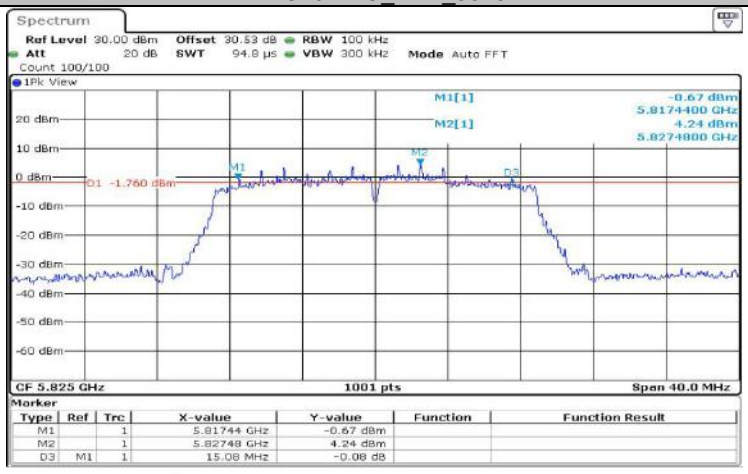
11AC20SISO_Ant1_5745



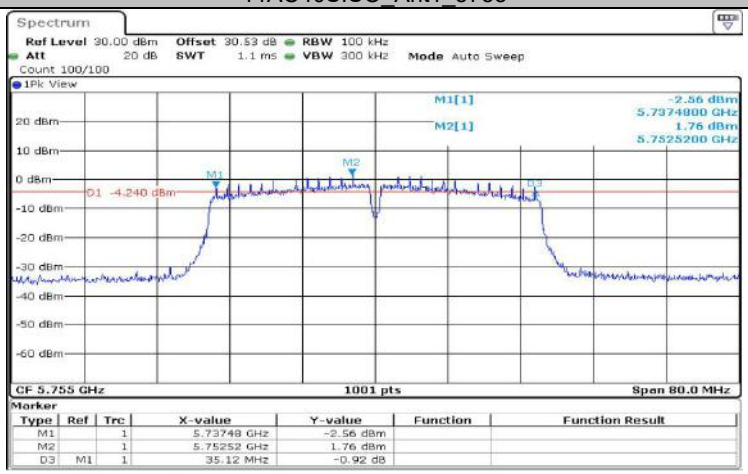
11AC20SISO_Ant1_5785



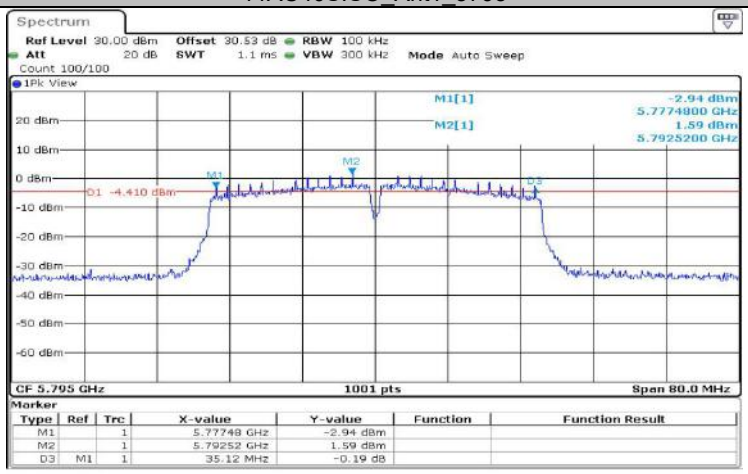
11AC20SISO_Ant1_5825



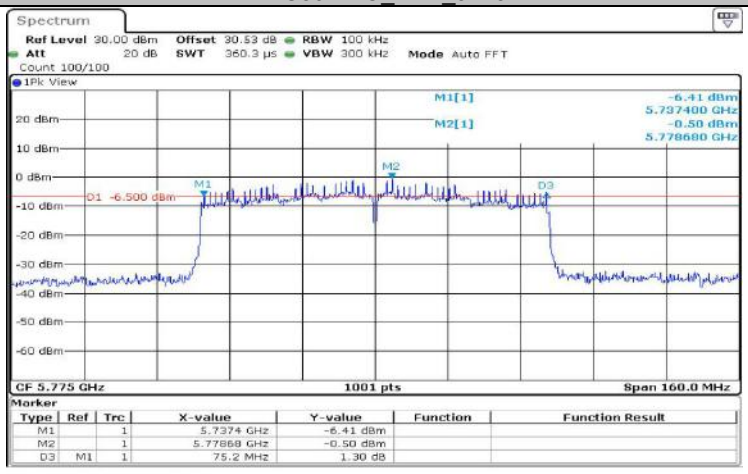
11AC40SISO_Ant1_5755



11AC40SISO_Ant1_5795



11AC80SISO_Ant1_5775



Appendix B: Maximum conducted output power

Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11A	Ant1	5180	14.22	≤23.98	PASS
		5200	13.86	≤23.98	PASS
		5240	14.09	≤23.98	PASS
		5260	14.26	≤23.98	PASS
		5280	14.55	≤23.98	PASS
		5320	14.45	≤23.98	PASS
		5745	14.26	≤30.00	PASS
		5785	14.31	≤30.00	PASS
		5825	14.30	≤30.00	PASS
11AC20SISO	Ant1	5180	14.13	≤23.98	PASS
		5200	13.83	≤23.98	PASS
		5240	14.12	≤23.98	PASS
		5260	14.04	≤23.98	PASS
		5280	14.28	≤23.98	PASS
		5320	14.96	≤23.98	PASS
		5745	14.82	≤30.00	PASS
		5785	14.76	≤30.00	PASS
		5825	14.76	≤30.00	PASS
11AC40SISO	Ant1	5190	14.48	≤23.98	PASS
		5230	14.87	≤23.98	PASS
		5270	14.85	≤23.98	PASS
		5310	14.86	≤23.98	PASS
		5755	14.74	≤30.00	PASS
		5795	14.56	≤30.00	PASS
11AC80SISO	Ant1	5210	14.64	≤23.98	PASS
		5290	14.96	≤23.98	PASS
		5775	14.77	≤30.00	PASS

Note: the duty cycle factor has added into result.

Appendix C: Maximum power spectral density

Test Result

Test Mode	Antenna	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	3.87	≤11.00	PASS
		5200	3.50	≤11.00	PASS
		5240	3.78	≤11.00	PASS
		5260	4.02	≤11.00	PASS
		5280	4.24	≤11.00	PASS
		5320	4.19	≤11.00	PASS
		5745	1.03	≤30.00	PASS
		5785	1.08	≤30.00	PASS
		5825	1.07	≤30.00	PASS
11AC20SISO	Ant1	5180	3.60	≤11.00	PASS
		5200	3.26	≤11.00	PASS
		5240	3.66	≤11.00	PASS
		5260	3.65	≤11.00	PASS
		5280	3.81	≤11.00	PASS
		5320	4.67	≤11.00	PASS
		5745	1.24	≤30.00	PASS
		5785	1.39	≤30.00	PASS
		5825	1.39	≤30.00	PASS
11AC40SISO	Ant1	5190	1.09	≤11.00	PASS
		5230	1.66	≤11.00	PASS
		5270	1.54	≤11.00	PASS
		5310	1.46	≤11.00	PASS
		5755	-1.65	≤30.00	PASS
		5795	-2.01	≤30.00	PASS
11AC80SISO	Ant1	5210	-1.78	≤11.00	PASS
		5290	-1.45	≤11.00	PASS
		5775	-4.56	≤30.00	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

11A_Ant1_5180

11A_Ant1_5200

11A_Ant1_5240

11A_Ant1_5260

11A_Ant1_5280

11A_Ant1_5320

11A_Ant1_5745

11A_Ant1_5785

11A_Ant1_5825

11AC20SISO_Ant1_5180

11AC20SISO_Ant1_5200

11AC20SISO_Ant1_5240

11AC20SISO_Ant1_5260

11AC20SISO_Ant1_5280

11AC20SISO_Ant1_5320

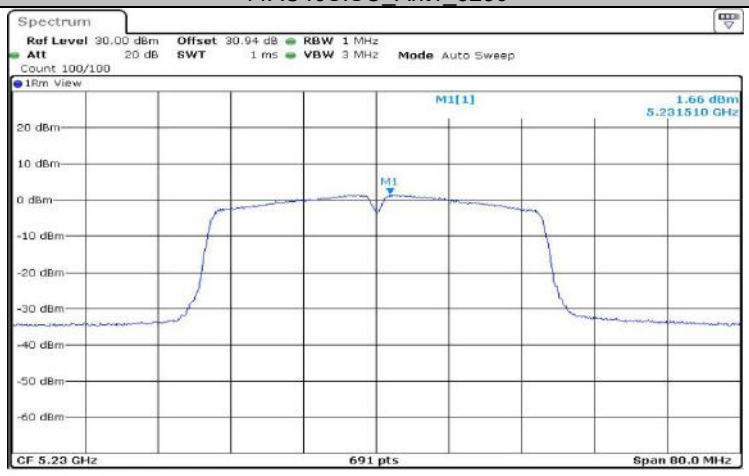
11AC20SISO_Ant1_5745

11AC20SISO_Ant1_5785

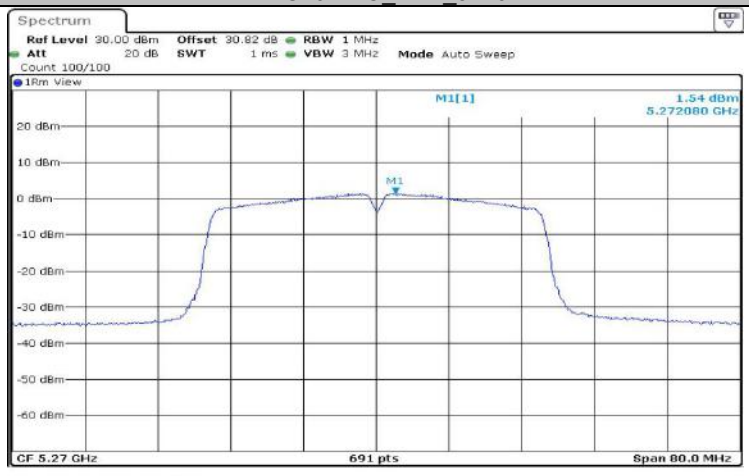
11AC20SISO_Ant1_5825

11AC40SISO_Ant1_5190

11AC40SISO_Ant1_5230



11AC40SISO_Ant1_5270



11AC40SISO_Ant1_5310

11AC40SISO_Ant1_5755

11AC40SISO_Ant1_5795

11AC80SISO_Ant1_5210

11AC80SISO_Ant1_5290

11AC80SISO_Ant1_5775

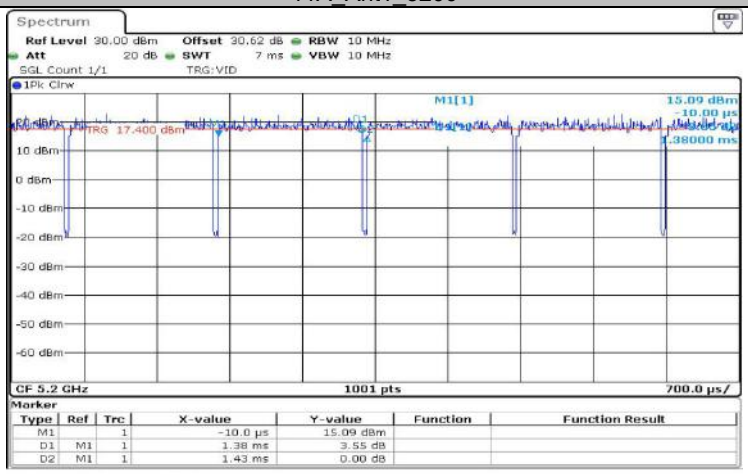
Appendix D: Duty Cycle

Test Result

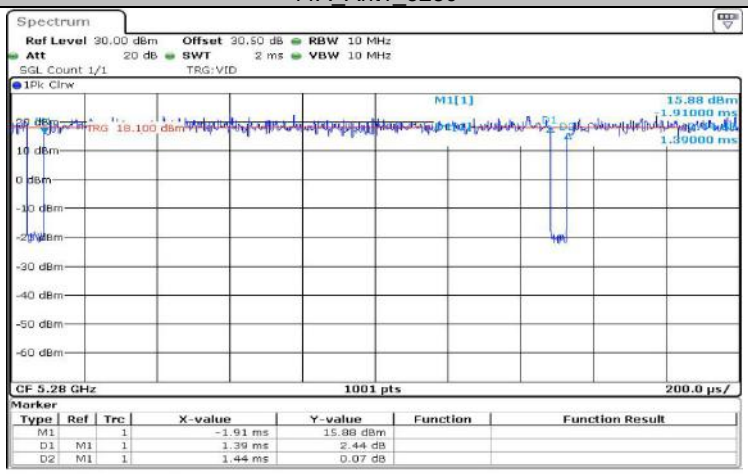
Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11A	Ant1	5200	1.38	1.43	96.50
		5280	1.39	1.44	96.53
		5785	1.39	1.44	96.53
11AC20SISO	Ant1	5200	1.31	1.36	96.32
		5280	1.31	1.36	96.32
		5785	1.31	1.36	96.32
11AC40SISO	Ant1	5190	0.65	0.70	92.86
		5270	0.65	0.70	92.86
		5755	0.65	0.70	92.86
11AC80SISO	Ant1	5210	0.32	0.37	86.49
		5290	0.32	0.37	86.49
		5775	0.32	0.37	86.49

Test Graphs

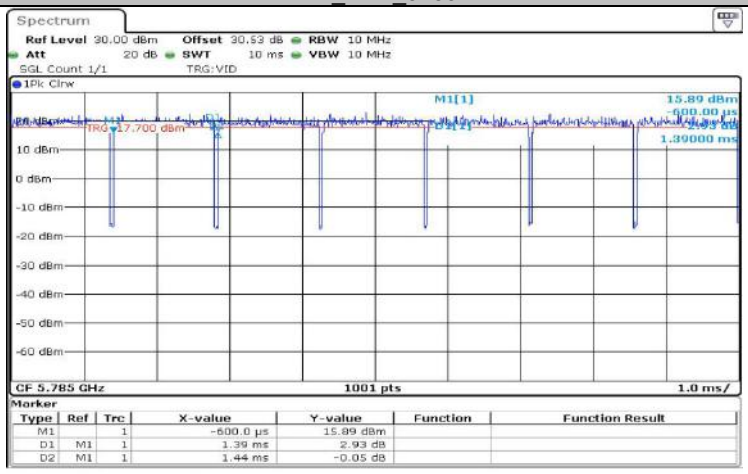
11A_Ant1_5200



11A_Ant1_5280



11A_Ant1_5785



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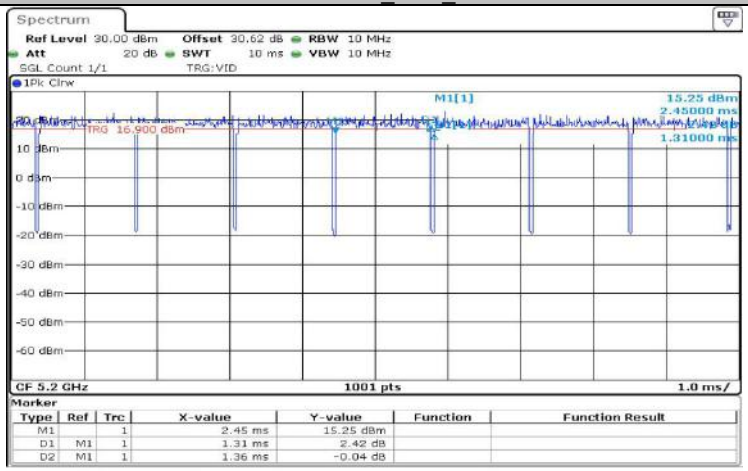
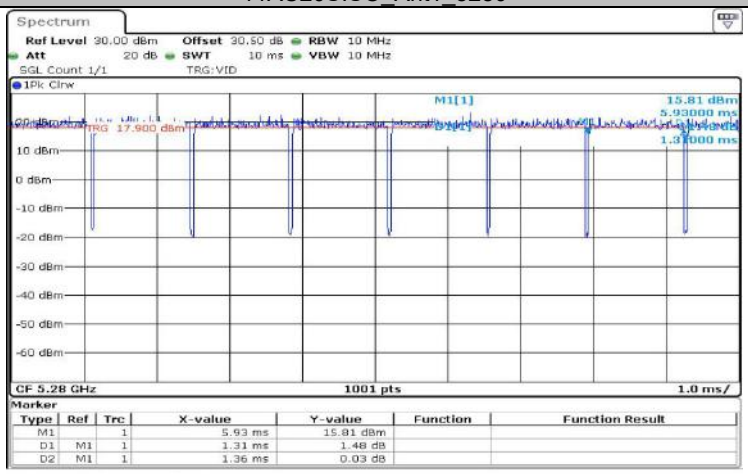


11AC20SISO_Ant1_5280



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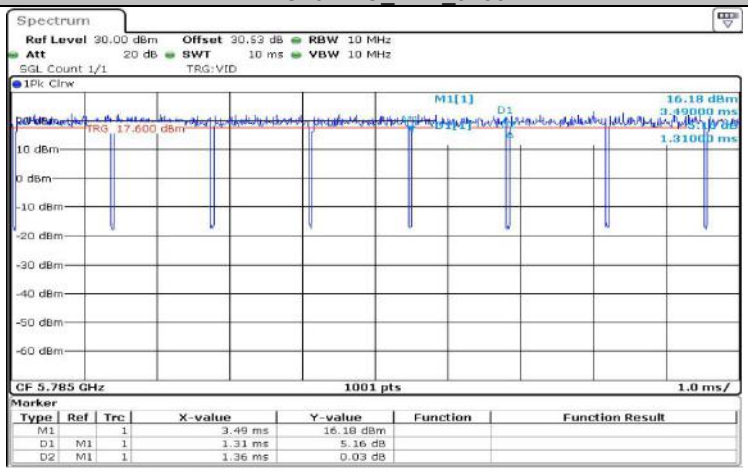

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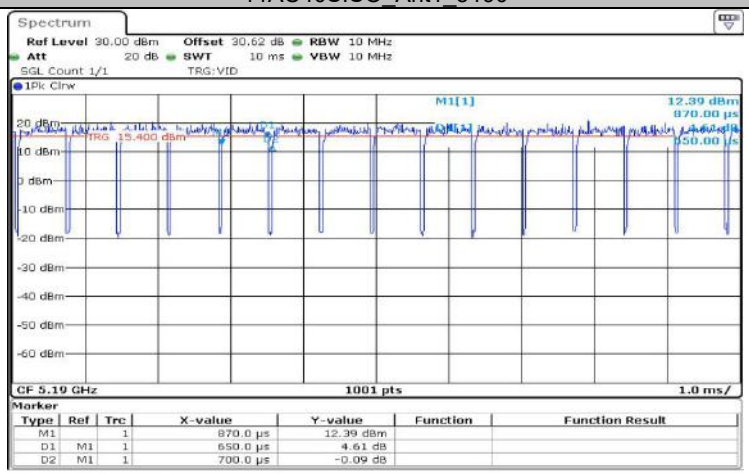
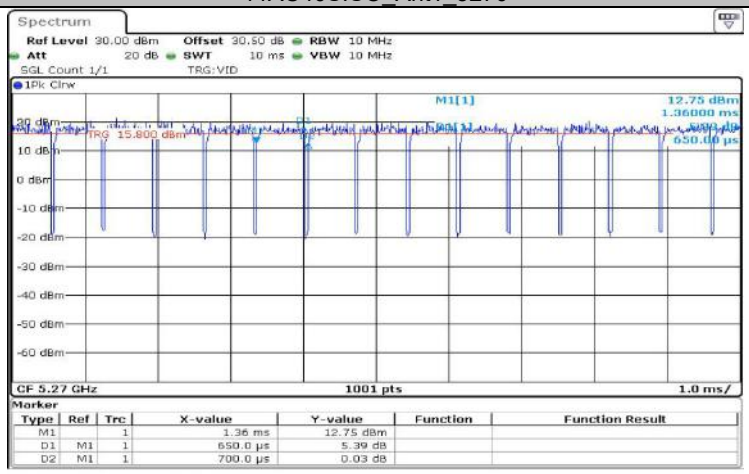
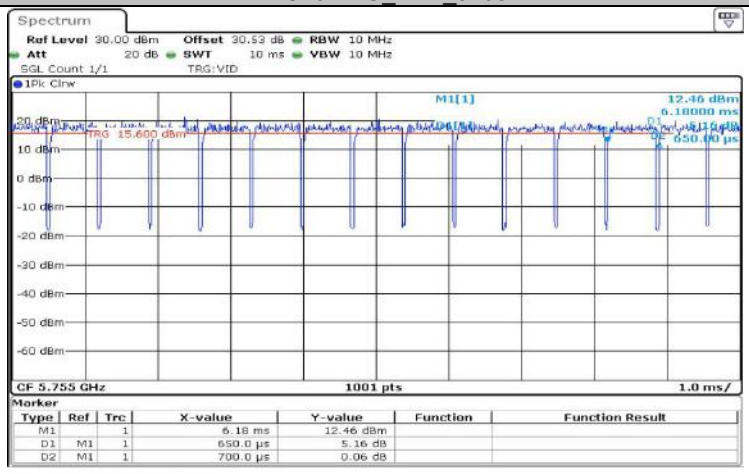


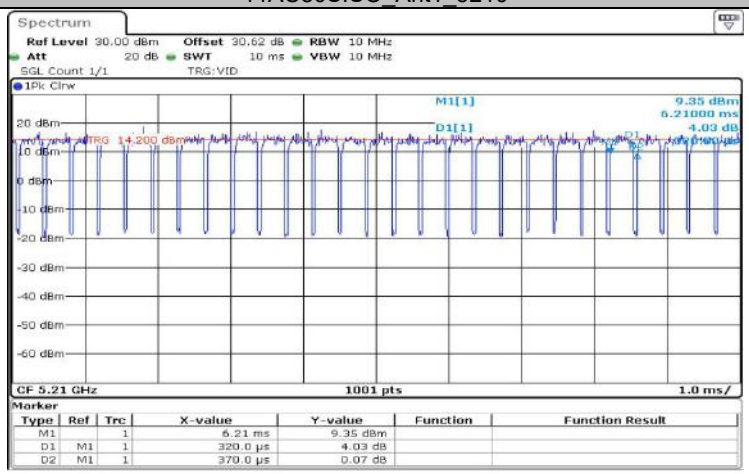
11AC40SISO_Ant1_5270



11AC40SISO_Ant1_5755



11AC80SISO_Ant1_5210



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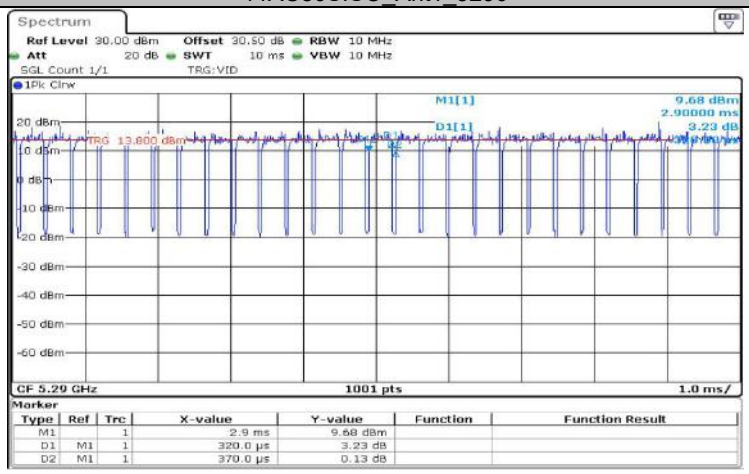
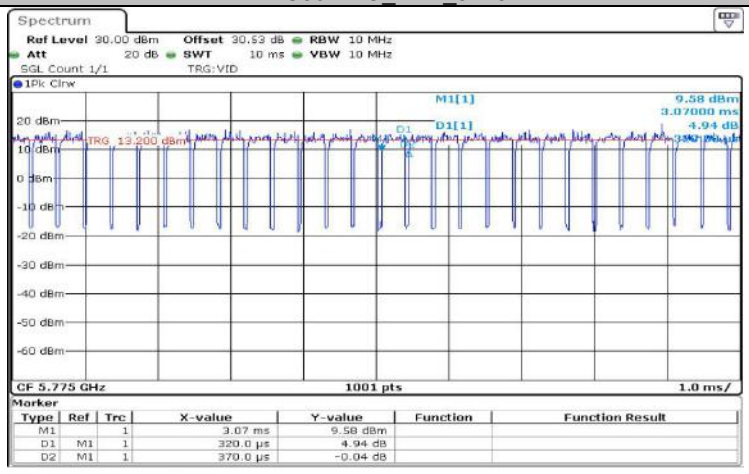


11AC80SISO_Ant1_5775



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