TEST REPORT

Applicant Name:	Shenzhen Four Seas Global Link Network Technology Co., Ltd
Address:	Room 607-610, Block B, TAOJINDI Electronic Business Incubation Base, Tenglong Road, Longhua District, Shenzhen China
Report Number:	SZ4240129-06787E-RF-00
FCC ID:	OYR-CF-AC1300

Test Standard (s)

FCC PART 15.407

Sample Description

Product Type:	Wi-Fi Dongle
Model No.:	CF-AC1300
Multiple Model(s) No.:	CF-913AC V2
Trade Mark:	COMFAST
Date Received:	2024/01/29
Issue Date:	2024/04/12

Test Result:	Pass▲

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

Prepared and Checked By:

Black Chen

RF Engineer

Approved By:

Nancy Wang

RF Supervisor

Note: The information marked# is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZ4240129-06787E-RF-00	Original Report	2024/04/12

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Wi-Fi Dongle
Tested Model	CF-AC1300
Multiple Model(s)	CF-913AC V2
Frequency Range	5G Wi-Fi: 5150-5250MHz
Mode	802.11a/n20/n40/ac20/ac40/ac80
Maximum Conducted Average Output Power	5150-5250MHz: 13.10dBm
Modulation Technique	OFDM
Antenna Specification#	2dBi (It is provided by the applicant)
Voltage Range	DC 5V from USB port
Sample serial number	2HBW-2 for Conducted and Radiated Emissions 2HBW-1 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A
Note#: The Multiple models are electrically identical with the test model except for model name. Please refer to the declaration letter# for more detail, which was provided by manufacturer.	

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

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Frequency		213.55 Hz(k=2, 95% level of confidence)
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
Unwanted Emission, conducted		1.75 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz-150kHz	3.94dB(k=2, 95% level of confidence)
	150kHz-30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

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

Test Facility

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

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The system support 802.11a/n ht20/n ht40/ac vht20/ac vht40/ac vht80, the 802.11 n ht20/n ht40 were reduced since the identical parameters with 802.11ac vht20 and vht40.

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.

EUT Exercise Software

"00008186-Win7_MP_Kit_RTL11ac_8822BU_USB_V0.19"[#] software was used and power level as below. The software and power level was provided by the applicant. The device was tested with the worst case was performed as below:

5150-5250 MHz Band:					
Test Modes	Test Channels	Test Frequency	Data rate	Power Level Setting[#]	
				ANT1	ANT2
802.11a	Lowest	5180	6Mbps	15	15
	Middle	5200	6Mbps	15	15
	Highest	5240	6Mbps	15	15
802.11ac vht20	Lowest	5180	MCS0	15	15
	Middle	5200	MCS0	15	15
	Highest	5240	MCS0	15	15
802.11ac vht40	Lowest	5190	MCS0	15	15
	Highest	5230	MCS0	15	15
802.11ac vht80	Middle	5210	MCS0	15	15
1. The above are the worst-case data rates, which are determined for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations. 2. For 802.11 a mode, the device only support SISO mode. 3. For 802.11n/ac modes, the device supports SISO and MIMO in all modes, per pretest, the MIMO mode was the worst mode for all the modes.					

Duty cycle

Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

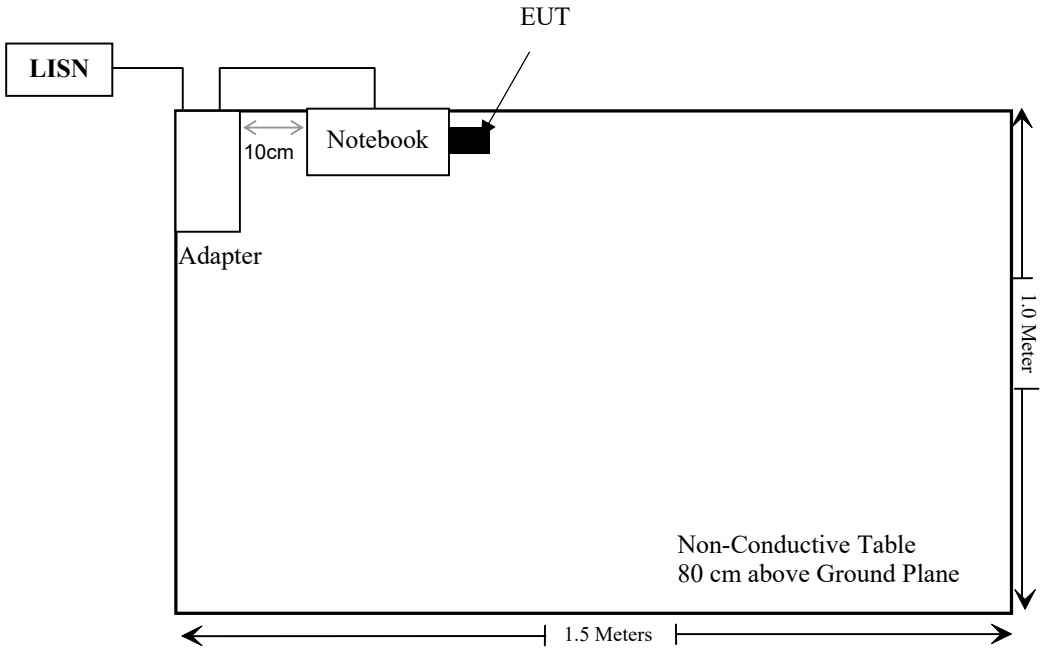
Manufacturer	Description	Model	Serial Number
Dell	Notebook	Inspiron	Unknown
Dell	adapter	DA130PE-00	Unknown

External I/O Cable

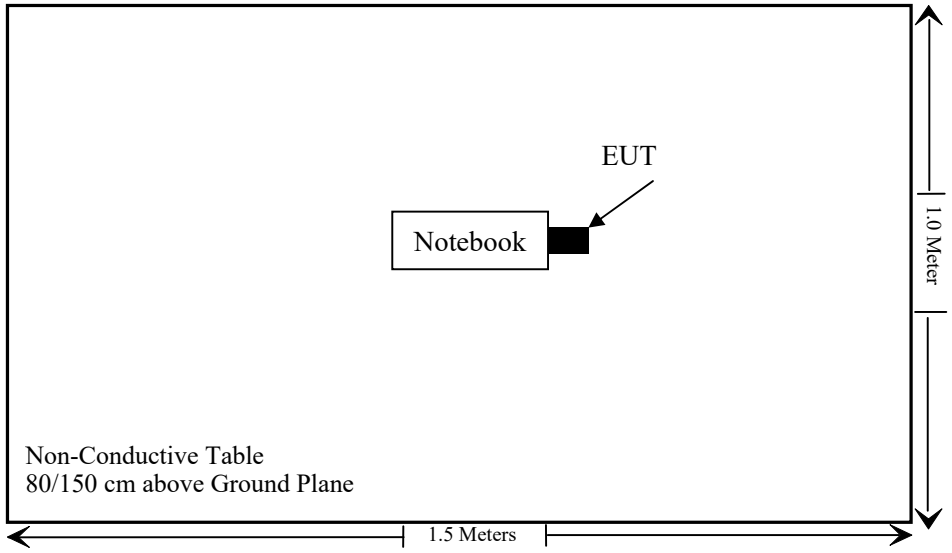
Cable Description	Length (m)	From Port	To
Unshielded Detachable AC cable	1.2	LISN	Adapter
Unshielded Un-detachable DC cable	1.5	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



For radiated emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) &§2.1093	RF Exposure	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)	26 dB Emission Bandwidth	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)	Not Applicable

Not Applicable: the EUT only support the 5150-5250MHz.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/01/16	2025/01/15
Rohde & Schwarz	LISN	ENV216	101613	2024/01/16	2025/01/15
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2023/08/03	2024/08/02
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2023/08/03	2024/08/02
Audix	EMI Test software	E3	191218	NCR	NCR
Radiated Emissions Test					
R&S	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2023/06/08	2024/06/07
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2024/07/19
ETS	Passive Loop Antenna	6512	29604	2023/07/07	2024/07/06
Unknown	Cable	Chamber Cable 1	F-03-EM236	2023/08/03	2024/08/02
Unknown	Cable	Chamber Cable 4	EC-007	2023/08/03	2024/08/02
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2023/04/18	2024/04/17
COM-POWER	Pre-amplifier	PA-122	181919	2023/06/29	2024/06/28
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2024/07/25
Unknown	RF Cable	UFA147	219661	2023/10/08	2024/10/07
Unknown	RF Cable	XH750A-N	J-10M	2023/10/08	2024/10/07
SNSD	5G Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2023/08/03	2024/08/02
A.H.System	Pre-amplifier	PAM-1840VH	190	2023/08/03	2024/08/02
Electro-Mechanics Co	Horn Antenna	3116	2026	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2023/08/03	2024/08/02
Audix	EMI Test software	E3	191218(V9)	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF conducted test					
Tonscend	RF control Unit	JS0806-2	19D8060154	2023/09/06	2024/09/05
ANRITSU	Microwave peak power sensor	MA24418A	12622	2023/08/08	2024/08/07
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2024/01/16	2025/01/15
Narda	20dB Attenuator	99899	0107	2023/07/04	2024/07/03

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

FCC §1.1307 (B) (1) & §2.1093- RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

Result: Compliant.

Please refer to SAR Report Number: SZ4240129-13293E-20A.

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.
c. 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 two internal antennas which was permanently attached, and the maximum antenna gain# is 2dBi, fulfill the requirement of this section. Please refer to the EUT photos.

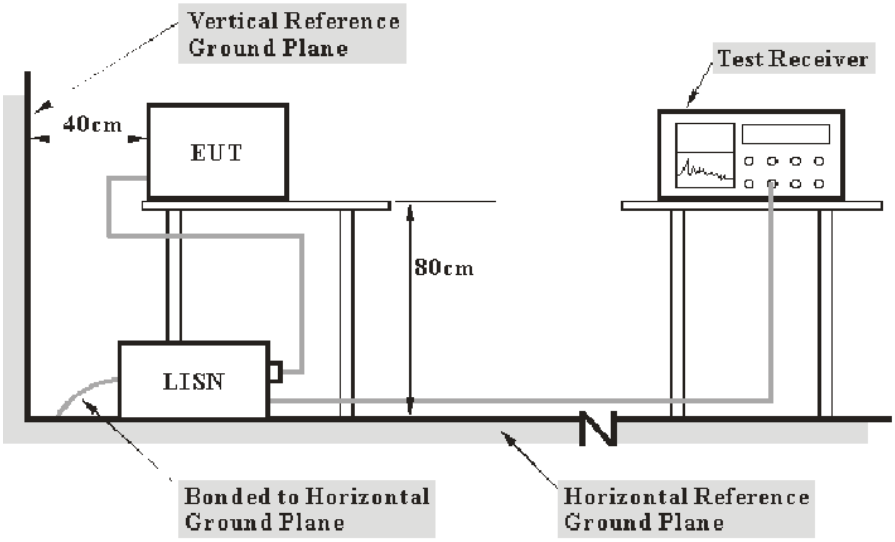
Result: Compliant

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 Average detection mode.

Factor & Over Limit Calculation

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

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

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

Test Data

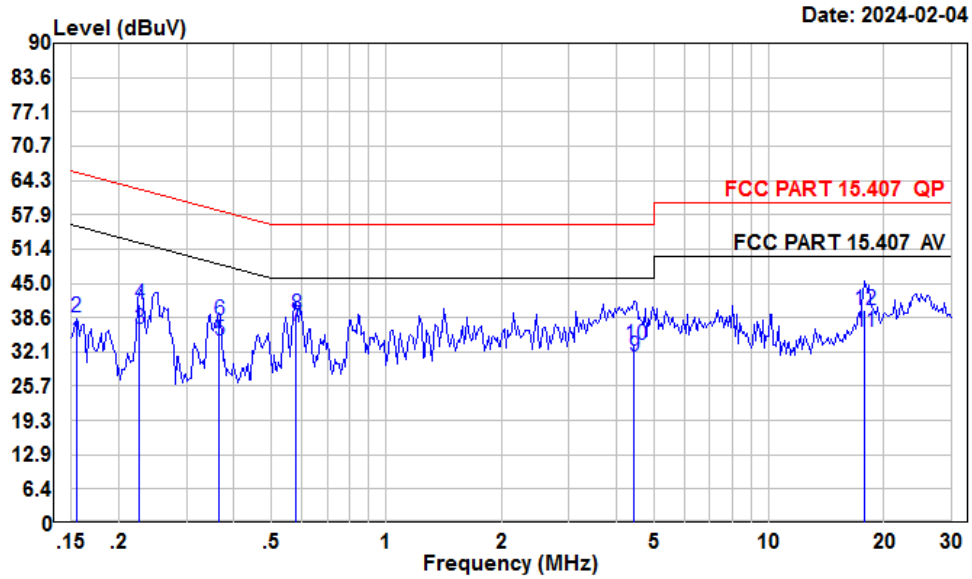
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	64 %
ATM Pressure:	101 kPa

The testing was performed by Macy Shi on 2024-02-04.

EUT operation mode: Transmitting (Maximum output power mode, 802.11 ac 40, 5230MHz)

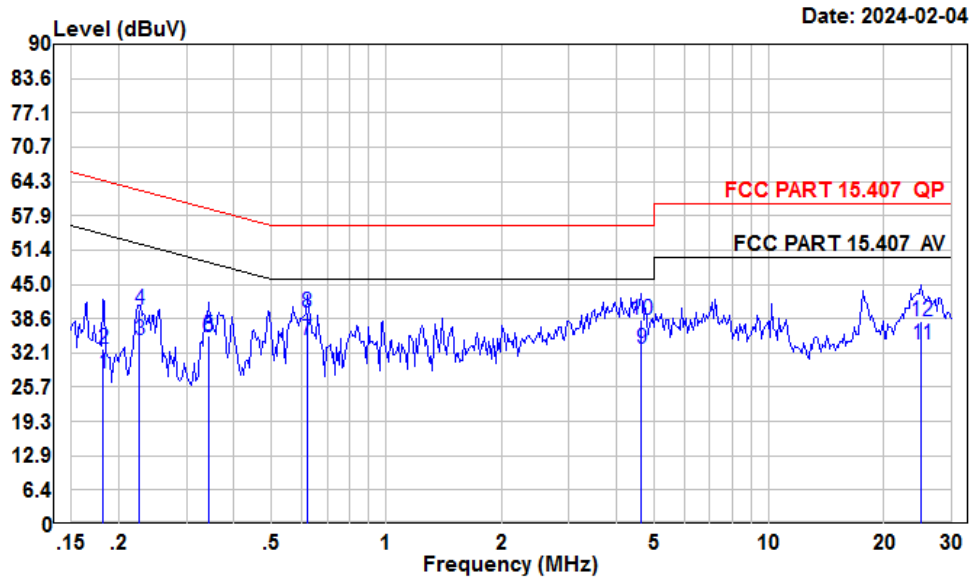
AC 120V/60 Hz, Line



Condition: Line
Project : SZ4240129-06787E-RF
Tester : Macy shi
Note : 5G WIFI

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	13.67	34.22	10.40	10.15	55.74	-21.52	Average
2	0.15	17.96	38.51	10.40	10.15	65.74	-27.23	QP
3	0.23	15.82	36.34	10.37	10.15	52.57	-16.23	Average
4	0.23	20.47	40.99	10.37	10.15	62.57	-21.58	QP
5	0.37	13.94	34.39	10.27	10.18	48.61	-14.22	Average
6	0.37	17.63	38.08	10.27	10.18	58.61	-20.53	QP
7	0.58	16.44	36.94	10.29	10.21	46.00	-9.06	Average
8	0.58	18.69	39.19	10.29	10.21	56.00	-16.81	QP
9	4.45	10.59	31.27	10.44	10.24	46.00	-14.73	Average
10	4.45	12.90	33.58	10.44	10.24	56.00	-22.42	QP
11	17.85	15.32	35.97	10.54	10.11	50.00	-14.03	Average
12	17.85	19.40	40.05	10.54	10.11	60.00	-19.95	QP

AC 120V/60 Hz, Neutral



Condition: Neutral
Project : SZ4240129-06787E-RF
Tester : Macy shi
Note : 5G WIFI

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.18	7.66	28.26	10.47	10.13	54.42	-26.16	Average
2	0.18	12.37	32.97	10.47	10.13	64.42	-31.45	QP
3	0.23	13.75	34.53	10.63	10.15	52.57	-18.04	Average
4	0.23	19.37	40.15	10.63	10.15	62.57	-22.42	QP
5	0.34	14.53	35.40	10.72	10.15	49.13	-13.73	Average
6	0.34	14.11	34.98	10.72	10.15	59.13	-24.15	QP
7	0.62	13.72	34.55	10.61	10.22	46.00	-11.45	Average
8	0.62	18.94	39.77	10.61	10.22	56.00	-16.23	QP
9	4.65	12.19	32.82	10.40	10.23	46.00	-13.18	Average
10	4.65	17.85	38.48	10.40	10.23	56.00	-17.52	QP
11	25.06	13.23	33.73	10.26	10.24	50.00	-16.27	Average
12	25.06	17.49	37.99	10.26	10.24	60.00	-22.01	QP

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

Applicable Standard

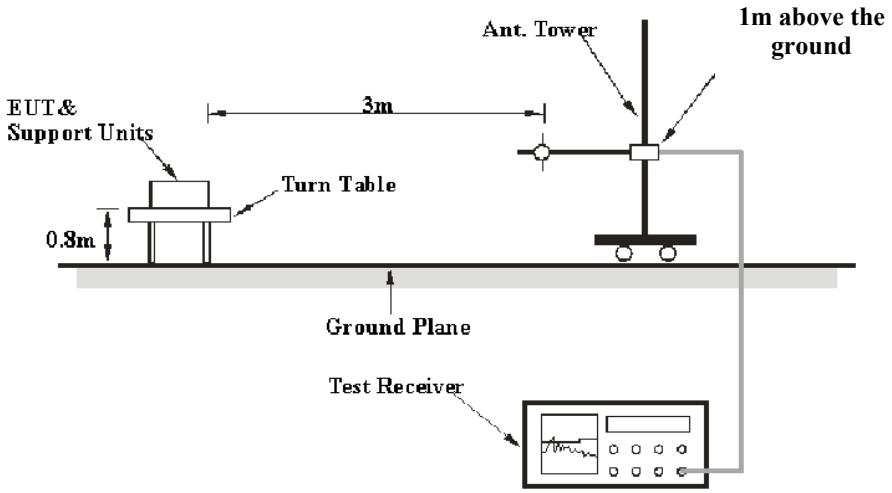
FCC §15.407 (b); §15.209; §15.205;

(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.

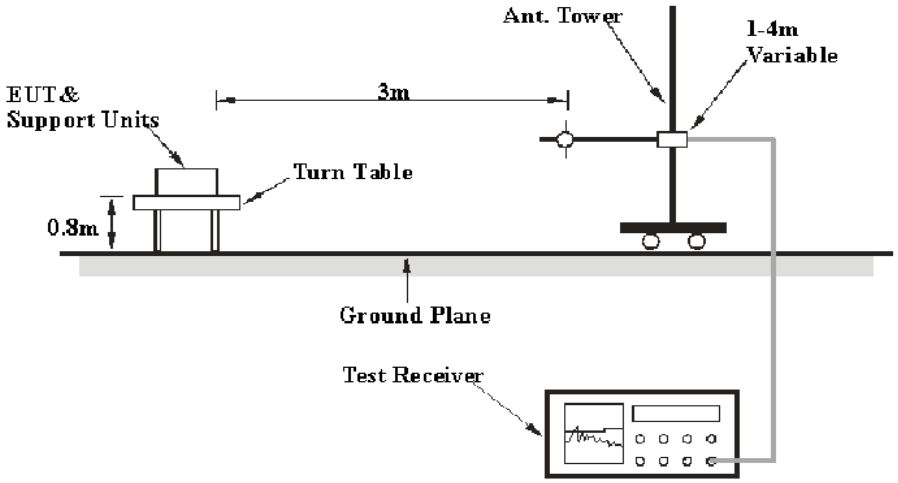
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

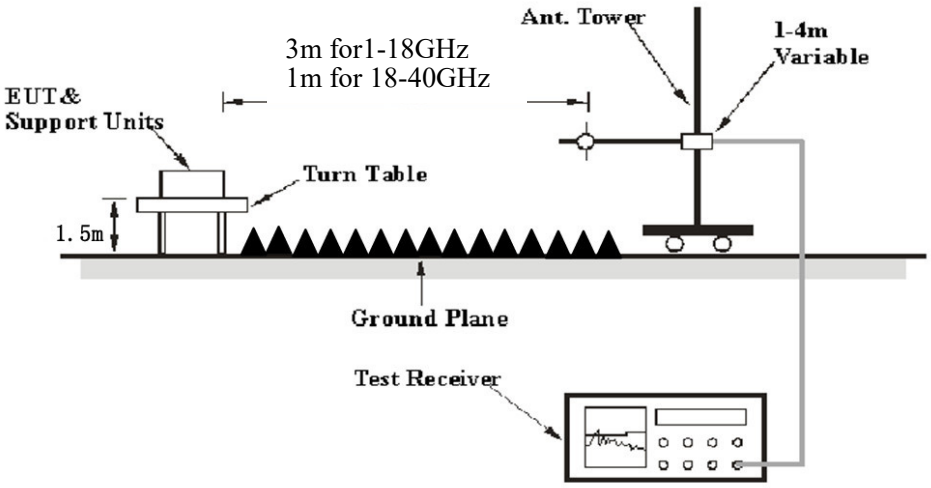
9 kHz-30MHz:



30MHz-1GHz:



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 9 kHz to 40 GHz.

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

9 kHz-1GHz:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK

1-40GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	≥1/T

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

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.

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

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

Test Data

Environmental Conditions

Temperature:	23~24 ℃
Relative Humidity:	55~61 %
ATM Pressure:	101.0~101.2 kPa

The testing was performed by Warren Huang on 2024-02-18 for below 1GHz and Dylan Yang from 2024-03-12 to 2024-04-12 for above 1GHz.

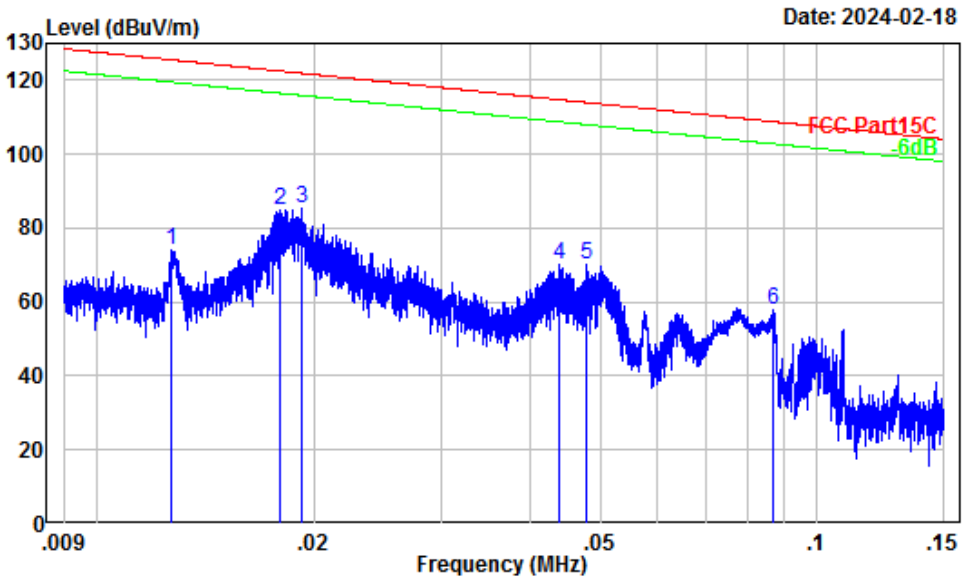
EUT operation mode: Transmitting

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

9 kHz-30MHz: *(Maximum output power mode, 802.11 ac 40, 5230MHz MIMO)*

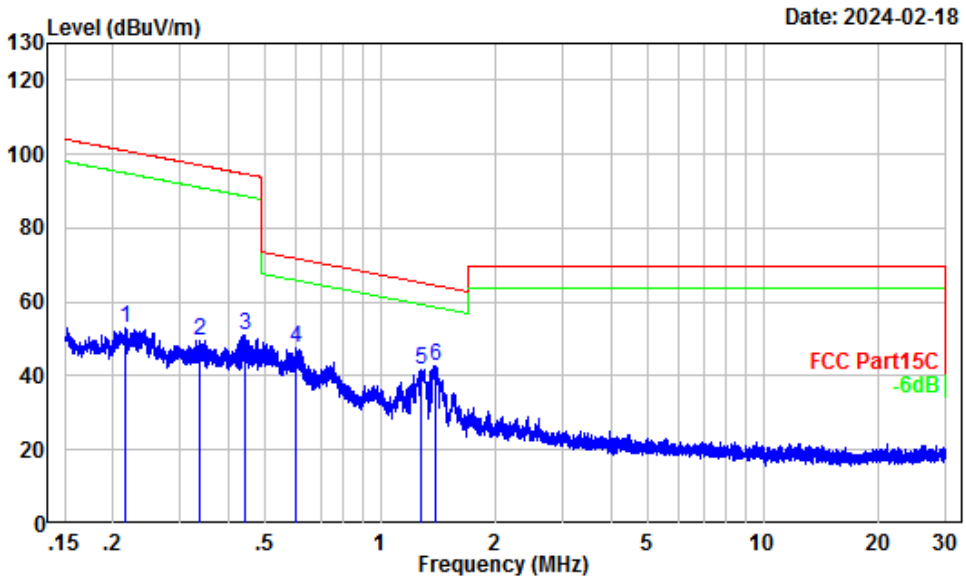
Note: When the test result of peak was less than the limit of QP more than 6dB, just peak value were recorded.

Parallel (worst case)



Site : chamber
Condition : 3m
Project Number: SZ4240129-06787E-RF
Note : 5G WIFI
Tester : Warren Huang

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	52.49	21.50	73.99	125.54	-51.55	Peak
2	0.02	50.86	34.05	84.91	122.52	-37.61	Peak
3	0.02	50.47	34.94	85.41	121.92	-36.51	Peak
4	0.04	42.92	27.22	70.14	114.78	-44.64	Peak
5	0.05	41.70	28.32	70.02	114.03	-44.01	Peak
6	0.09	35.93	21.98	57.91	108.82	-50.91	Peak

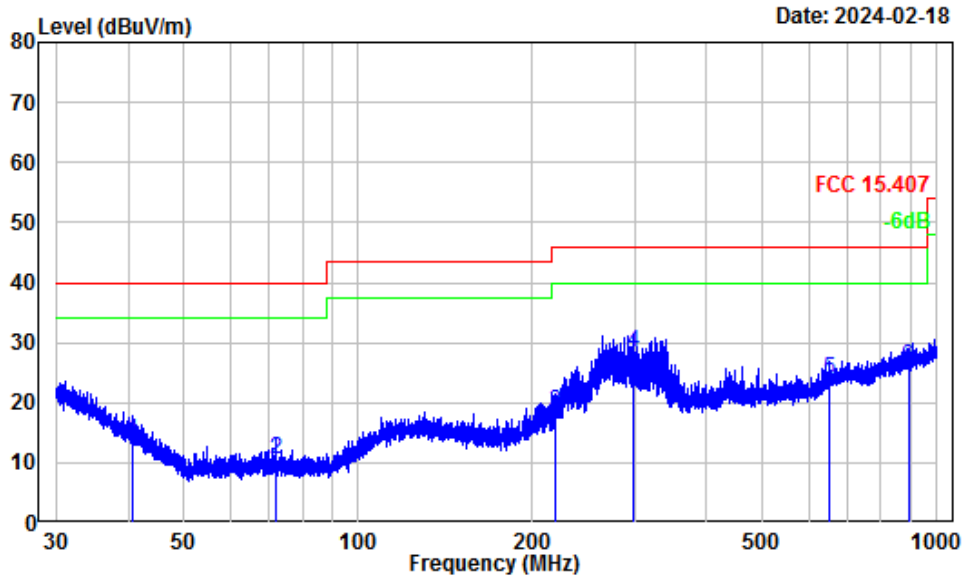


Site : chamber
Condition : 3m
Project Number: SZ4240129-06787E-RF
Note : 5G WIFI
Tester : Warren Huang

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.22	28.39	24.75	53.14	100.89	-47.75	Peak
2	0.34	24.31	25.35	49.66	97.08	-47.42	Peak
3	0.44	21.75	29.37	51.12	94.68	-43.56	Peak
4	0.60	19.66	27.69	47.35	71.98	-24.63	Peak
5	1.27	14.09	27.78	41.87	65.33	-23.46	Peak
6	1.40	13.46	29.40	42.86	64.49	-21.63	Peak

30 MHz–1 GHz: *(Maximum output power mode, 802.11 ac 40, 5230MHz)*

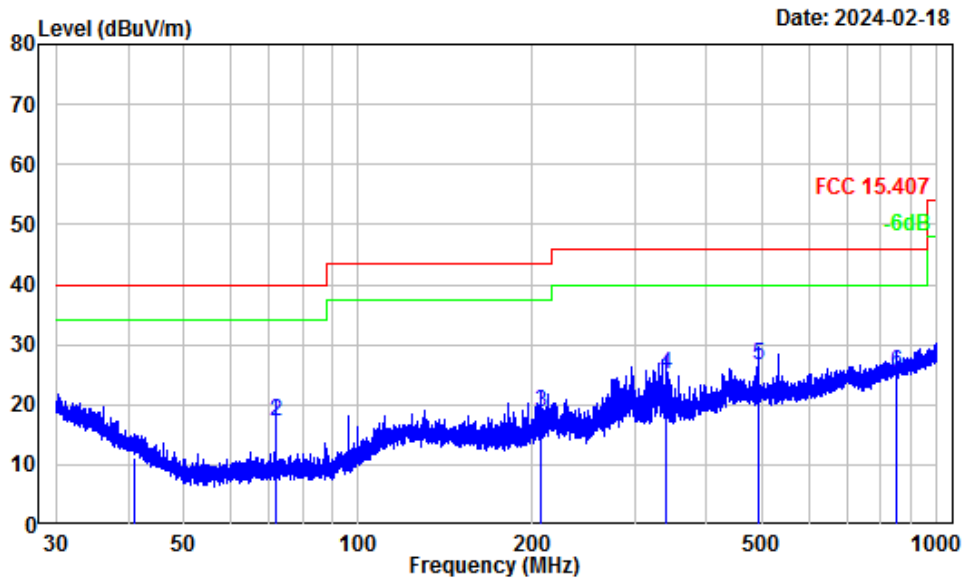
Horizontal



Site : chamber
Condition : 3m Horizontal
Project Number: SZ4240129-06787E-RF
Note : 5G WIFI
Tester : Warren Huang

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.77	-10.89	24.60	13.71	40.00	-26.29	QP
2	72.02	-16.30	26.94	10.64	40.00	-29.36	QP
3	218.98	-11.34	29.69	18.35	46.00	-27.65	QP
4	298.40	-10.02	38.29	28.27	46.00	-17.73	QP
5	650.80	-2.43	26.35	23.92	46.00	-22.08	QP
6	892.29	0.88	25.16	26.04	46.00	-19.96	QP

Vertical



Site : chamber
Condition : 3m Vertical
Project Number: SZ4240129-06787E-RF
Note : 5G WIFI
Tester : Warren Huang

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	41.02	-12.47	23.50	11.03	40.00	-28.97	QP
2	72.02	-17.28	34.40	17.12	40.00	-22.88	QP
3	207.30	-12.23	31.04	18.81	43.50	-24.69	QP
4	339.44	-10.20	35.27	25.07	46.00	-20.93	QP
5	491.39	-5.40	32.10	26.70	46.00	-19.30	QP
6	849.92	-0.11	25.59	25.48	46.00	-20.52	QP

Above 1GHz:

5150-5250 MHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11a (ANT 1)							
5180MHz							
10360.00	45.42	PK	H	13.07	58.49	68.2	-9.71
10360.00	44.49	PK	V	13.07	57.56	68.2	-10.64
5200MHz							
10400.00	44.53	PK	H	13.12	57.65	68.2	-10.55
10400.00	47.66	PK	V	13.12	60.78	68.2	-7.42
5240MHz							
10480.00	45.57	PK	H	13.07	58.64	68.2	-9.56
10480.00	48.34	PK	V	13.07	61.41	68.2	-6.79
802.11a (ANT 2)							
5180MHz							
10360.00	46.21	PK	H	13.07	59.28	68.2	-8.92
10360.00	51.28	PK	V	13.07	64.35	68.2	-3.85
5200MHz							
10400.00	48.11	PK	H	13.12	61.23	68.2	-6.97
10400.00	50.02	PK	V	13.12	63.14	68.2	-5.06
5240MHz							
10480.00	47.59	PK	H	13.07	60.66	68.2	-7.54
10480.00	51.04	PK	V	13.07	64.11	68.2	-4.09
802.11ac20							
5180MHz							
10360.00	47.49	PK	H	13.07	60.56	68.2	-7.64
10360.00	50.75	PK	V	13.07	63.82	68.2	-4.38
5200MHz							
10400.00	48.72	PK	H	13.12	61.84	68.2	-6.36
10400.00	51.23	PK	V	13.12	64.35	68.2	-3.85
5240MHz							
10480.00	49.18	PK	H	13.07	62.25	68.2	-5.95
10480.00	52.02	PK	V	13.07	65.09	68.2	-3.11

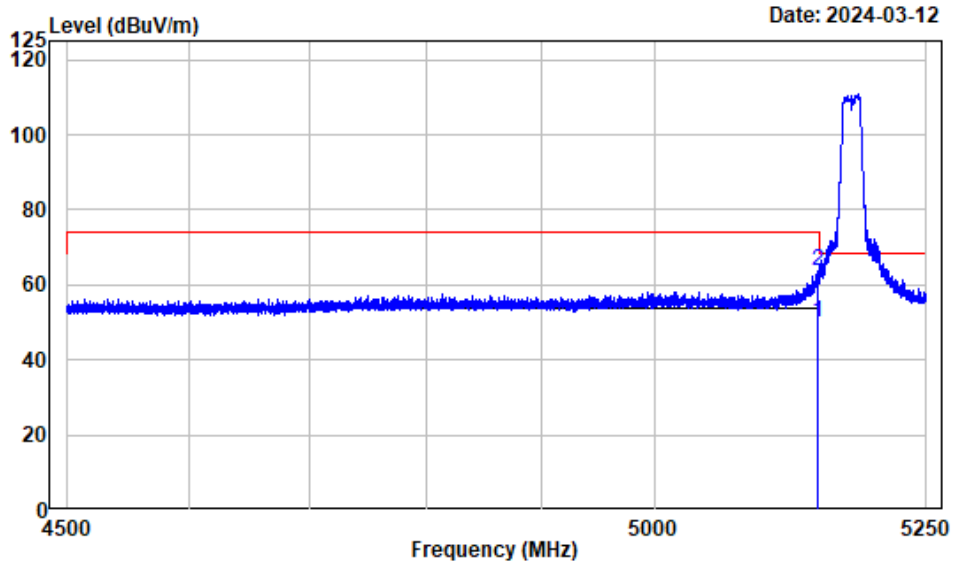
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11ac40							
5190MHz							
10380.00	44.81	PK	H	13.09	57.90	68.2	-10.30
10380.00	46.72	PK	V	13.09	59.81	68.2	-8.39
5230MHz							
10460.00	45.71	PK	H	13.09	58.80	68.2	-9.40
10460.00	47.13	PK	V	13.09	60.22	68.2	-7.98
802.11ac80							
5210MHz							
10420.00	44.94	PK	H	13.12	58.06	68.2	-10.14
10420.00	44.38	PK	V	13.12	57.50	68.2	-10.70

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.

Test plots for Band Edge Measurements (Radiated)

5150-5250MHz:

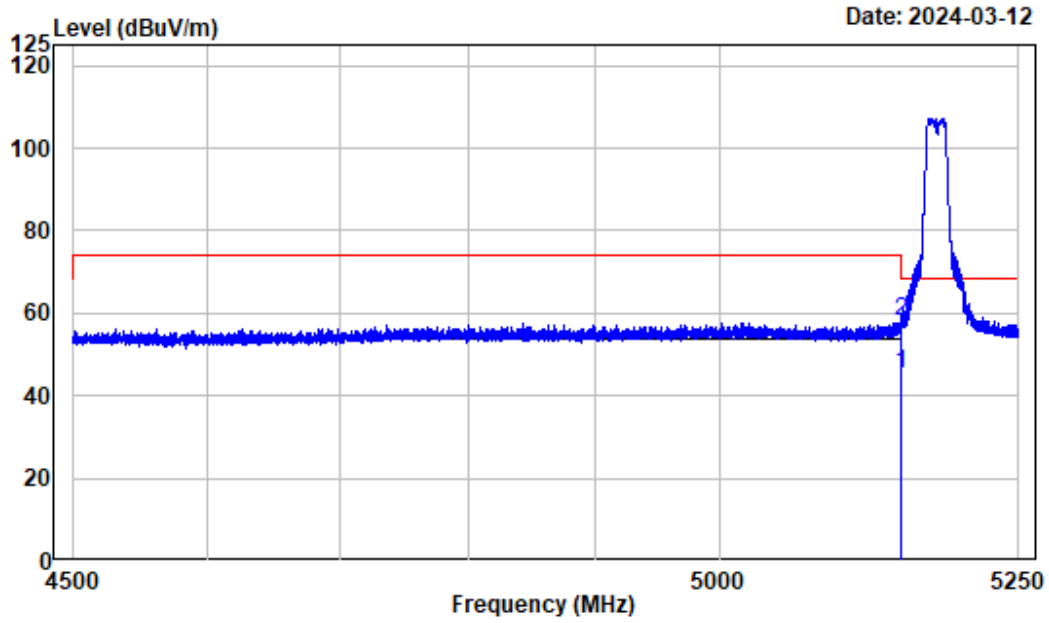
802.11a_ ANT 1			
Test Channel:	**5180MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5180

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5148.094	2.70	47.44	50.14	54.00	-3.86	Average
2	5148.094	2.70	60.93	63.63	74.00	-10.37	peak

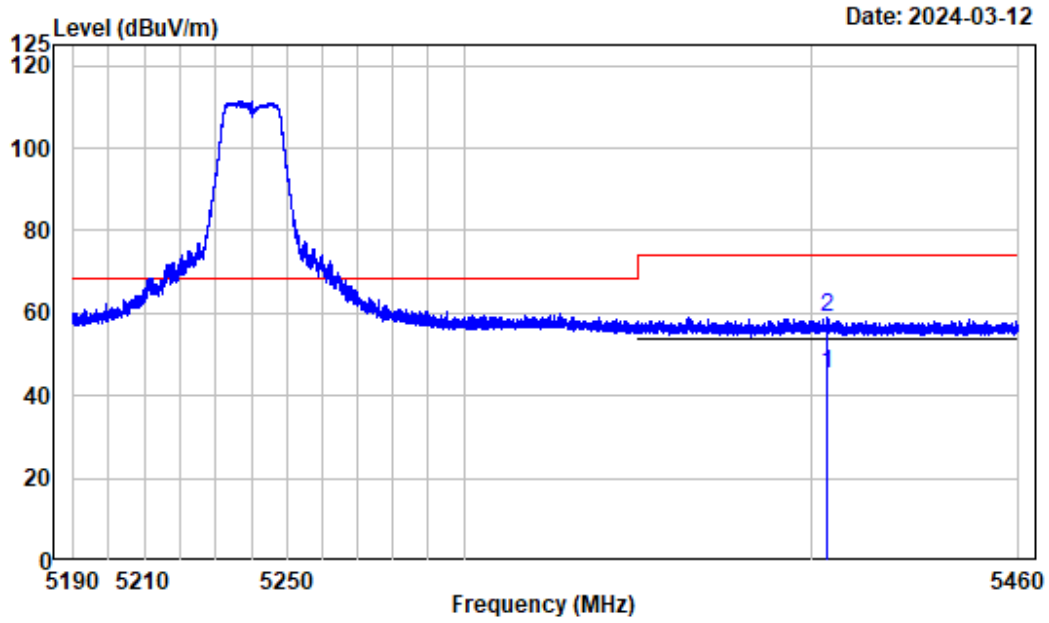
802.11a_ ANT 1			
Test Channel:	**5180MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5180

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5149.875	2.71	42.76	45.47	54.00	-8.53	Average
2	5149.875	2.71	55.51	58.22	74.00	-15.78	peak

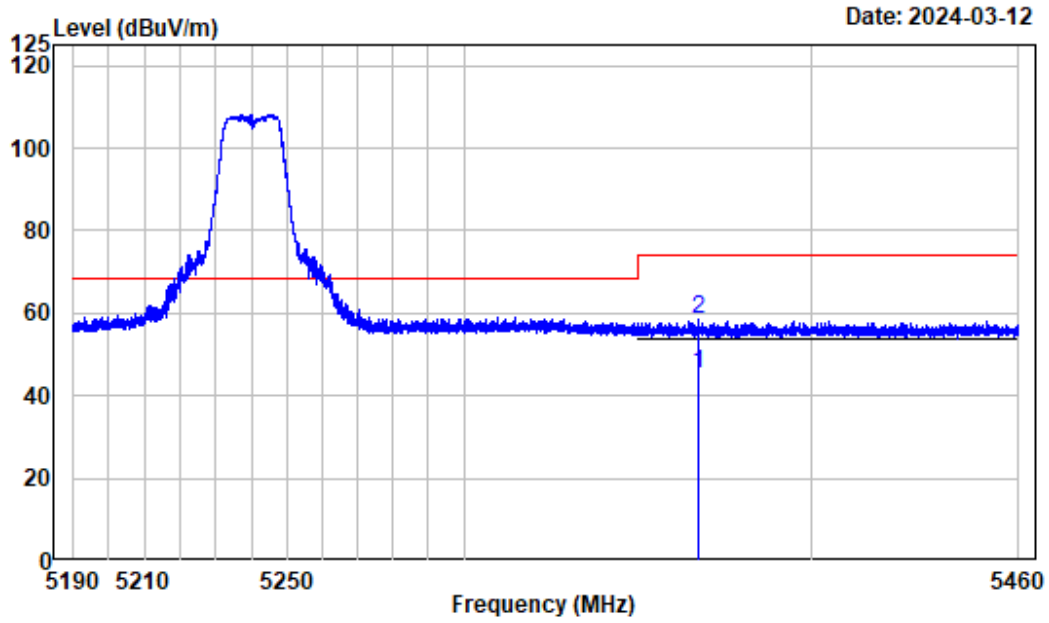
802.11a_ ANT 1			
Test Channel:	**5240MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5404.076	3.00	42.37	45.37	54.00	-8.63	Average
2	5404.076	3.00	55.94	58.94	74.00	-15.06	peak

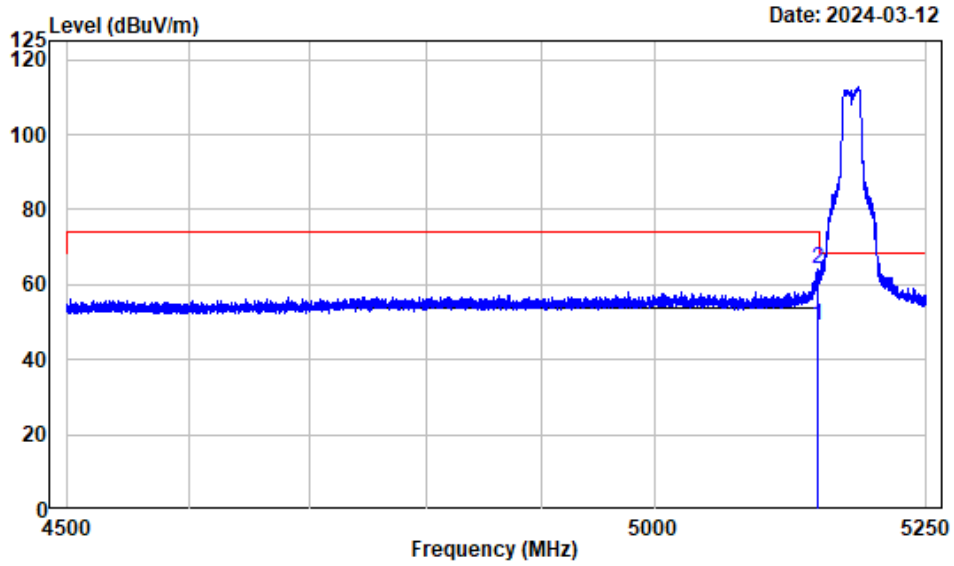
802.11a_ ANT 1			
Test Channel:	**5240MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5367.120	2.93	42.26	45.19	54.00	-8.81	Average
2	5367.120	2.93	55.53	58.46	74.00	-15.54	peak

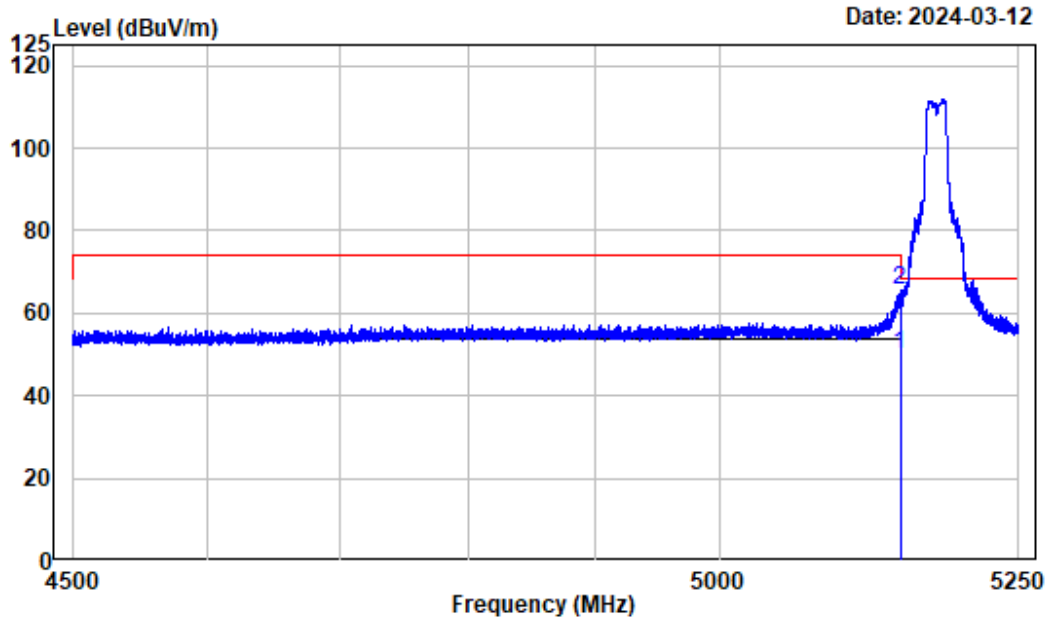
802.11a_ ANT 2			
Test Channel:	**5180MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5180

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5149.500	2.71	46.54	49.25	54.00	-4.75	Average
2	5149.500	2.71	61.24	63.95	74.00	-10.05	peak

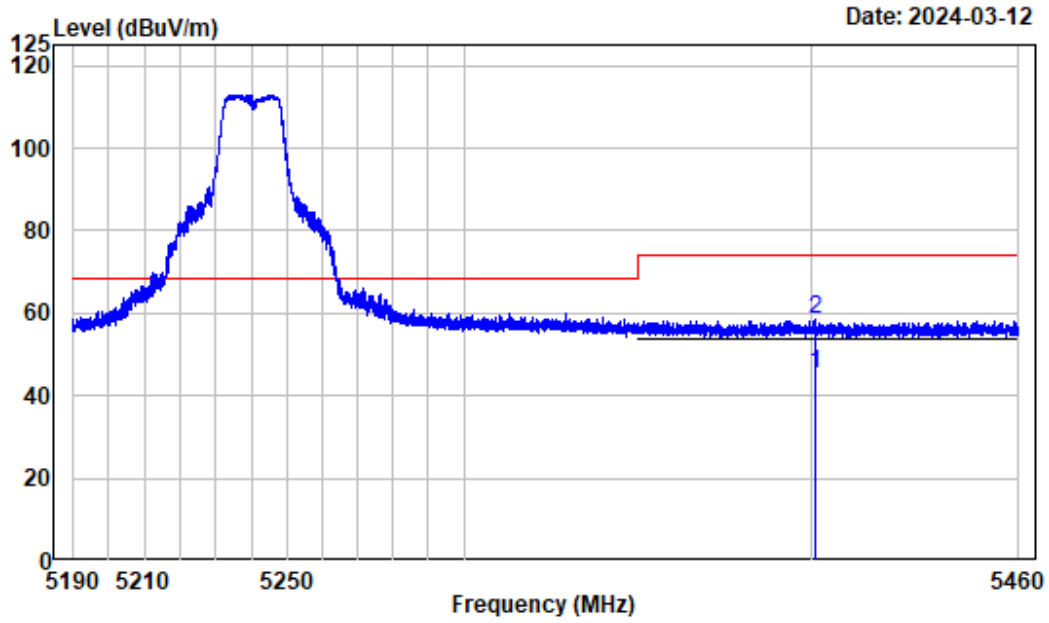
802.11a_ ANT 2			
Test Channel:	**5180MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5180

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5149.688	2.71	47.51	50.22	54.00	-3.78	Average
2	5149.688	2.71	62.93	65.64	74.00	-8.36	peak

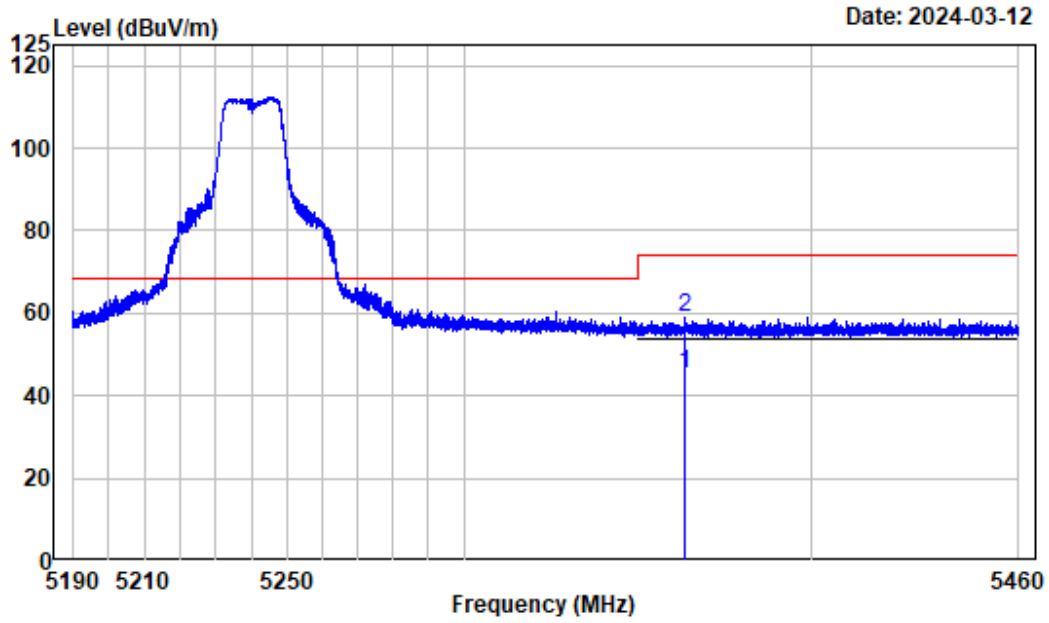
802.11a_ ANT 2			
Test Channel:	**5240MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5400.904	2.99	42.36	45.35	54.00	-8.65	Average
2	5400.904	2.99	55.29	58.28	74.00	-15.72	peak

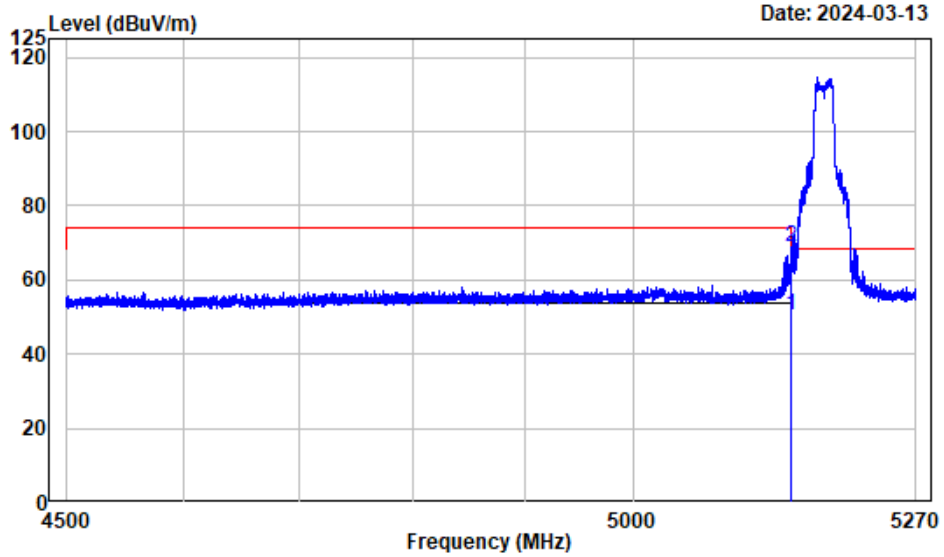
802.11a_ ANT 2			
Test Channel:	**5240MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11A_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5363.340	2.93	42.45	45.38	54.00	-8.62	Average
2	5363.340	2.93	56.14	59.07	74.00	-14.93	peak

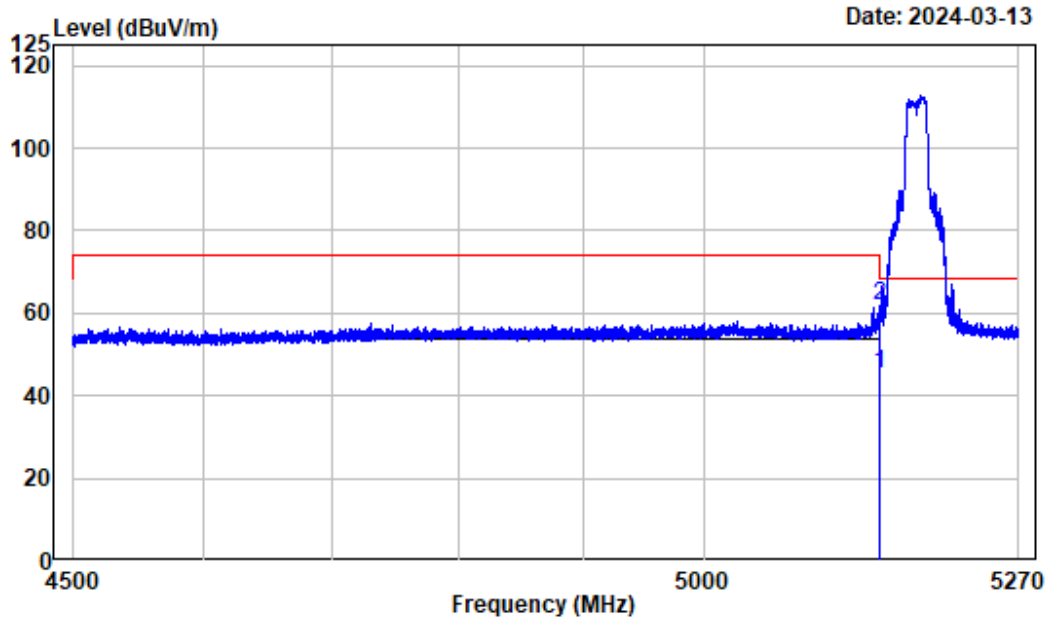
802.11ac20			
Test Channel:	**5180MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC20_5180

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5149.784	2.71	47.64	50.35	54.00	-3.65	Average
2	5149.784	2.71	65.96	68.67	74.00	-5.33	peak

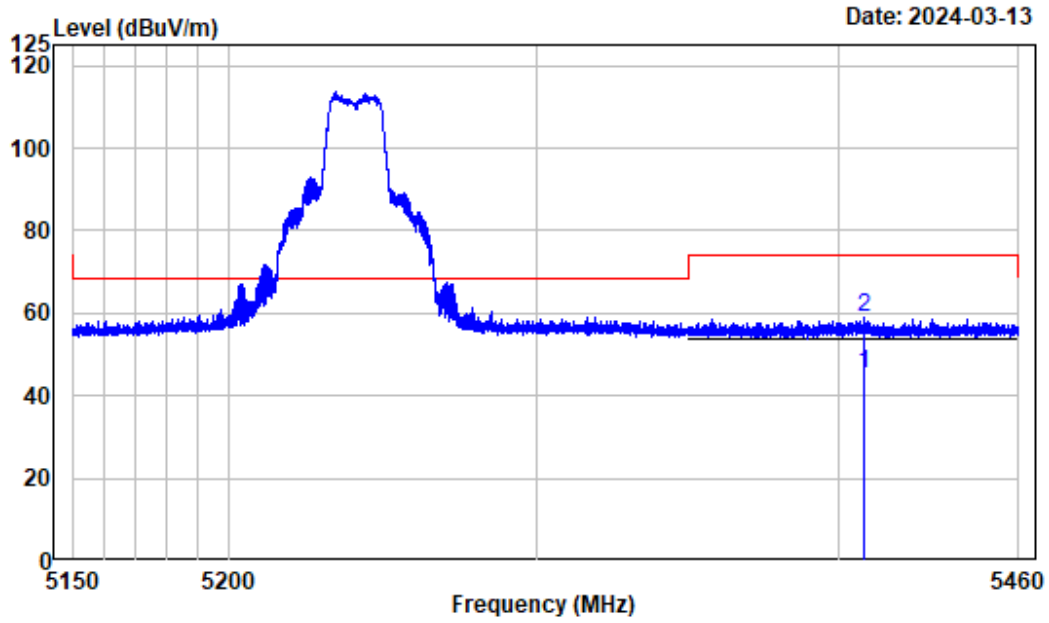
802.11ac20			
Test Channel:	**5180MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC20_5180

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5149.784	2.71	42.65	45.36	54.00	-8.64	Average
2	5149.784	2.71	58.91	61.62	74.00	-12.38	peak

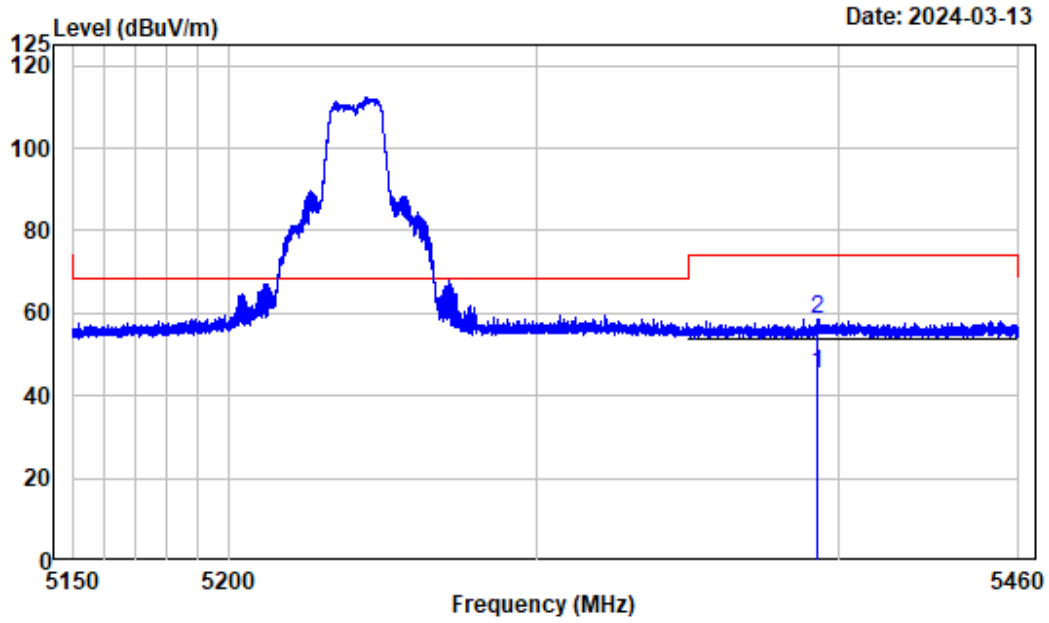
802.11ac20			
Test Channel:	**5240MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC20_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5407.881	3.00	42.32	45.32	54.00	-8.68	Average
2	5407.881	3.00	55.77	58.77	74.00	-15.23	peak

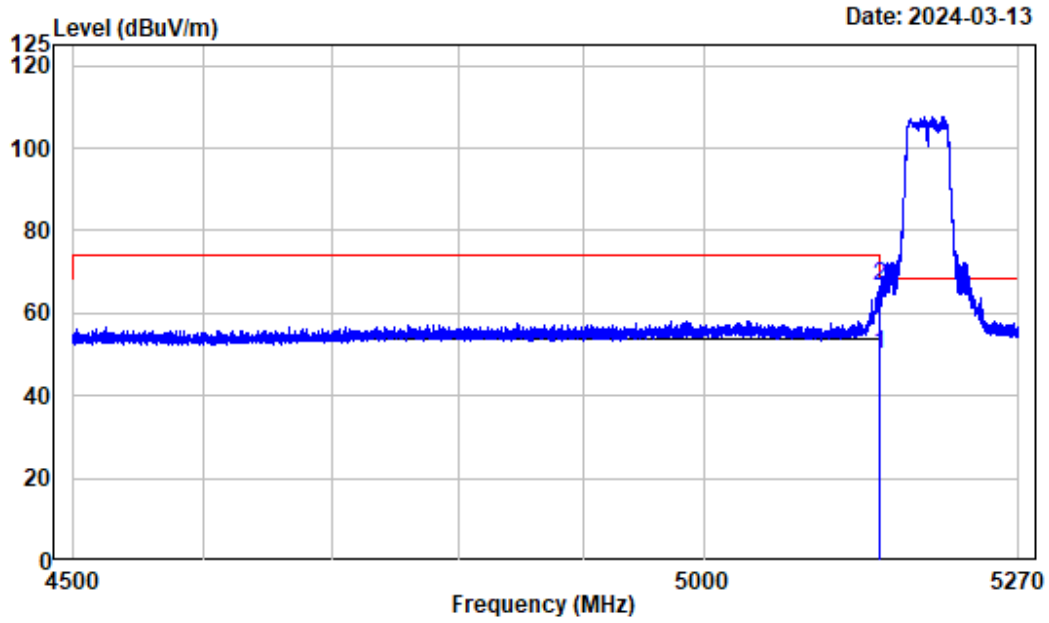
802.11ac20			
Test Channel:	**5240MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC20_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5392.342	2.97	42.25	45.22	54.00	-8.78	Average
2	5392.342	2.97	55.72	58.69	74.00	-15.31	peak

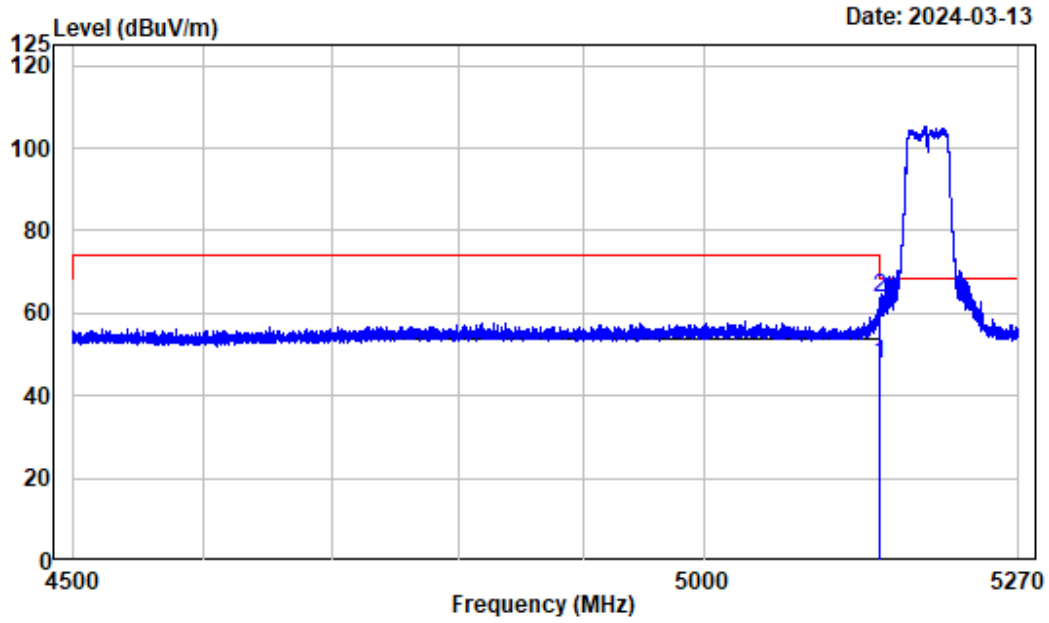
802.11ac40			
Test Channel:	**5190MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC40_5190

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5148.725	2.71	47.51	50.22	54.00	-3.78	Average
2	5148.725	2.71	63.80	66.51	74.00	-7.49	peak

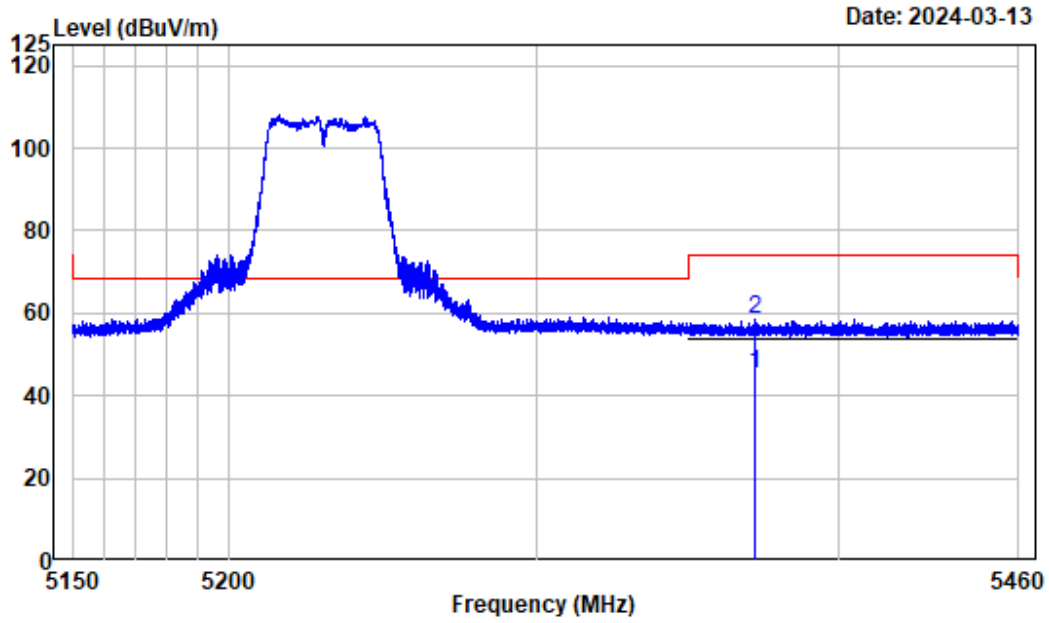
802.11ac40			
Test Channel:	**5190MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC40_5190

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5149.110	2.71	44.77	47.48	54.00	-6.52	Average
2	5149.110	2.71	60.95	63.66	74.00	-10.34	peak

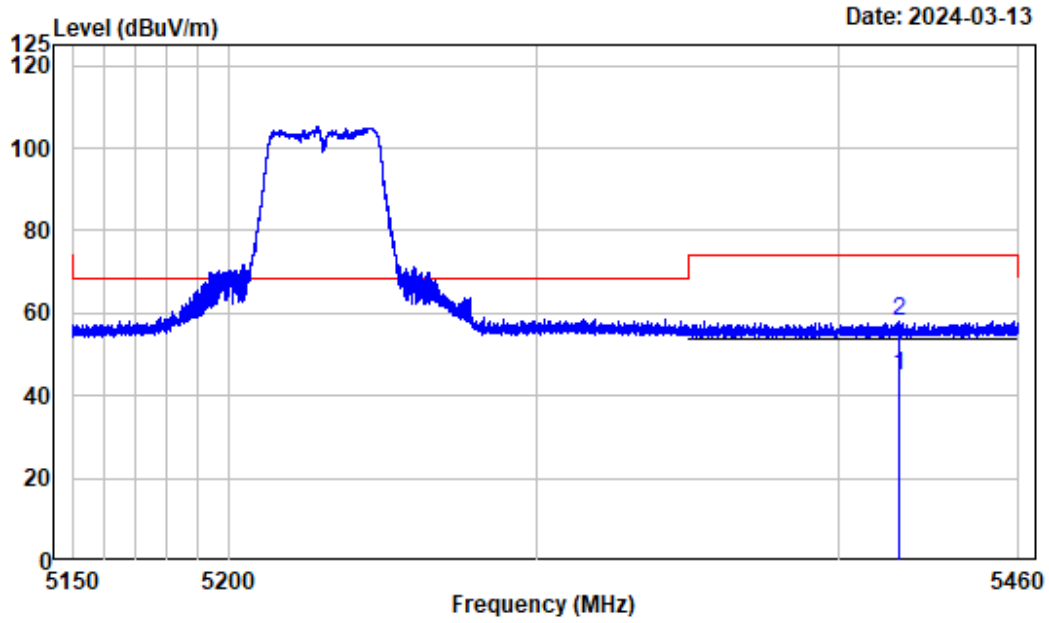
802.11ac40			
Test Channel:	**5230MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC40_5230

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5371.921	2.94	42.21	45.15	54.00	-8.85	Average
2	5371.921	2.94	55.62	58.56	74.00	-15.44	peak

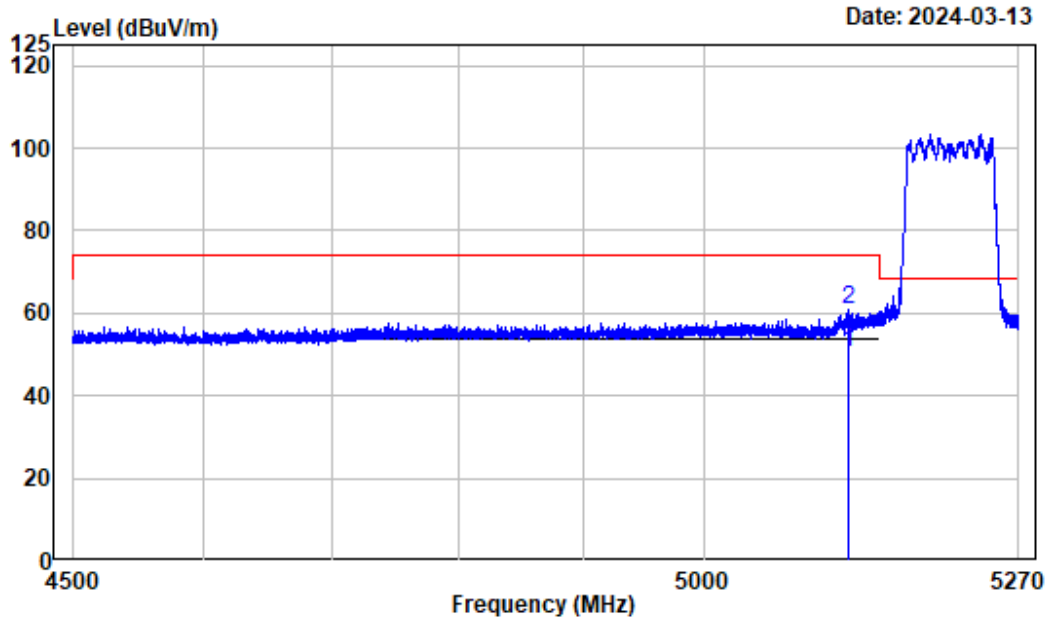
802.11ac40			
Test Channel:	**5230MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC40_5230

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5419.933	3.02	41.88	44.90	54.00	-9.10	Average
2	5419.933	3.02	55.16	58.18	74.00	-15.82	peak

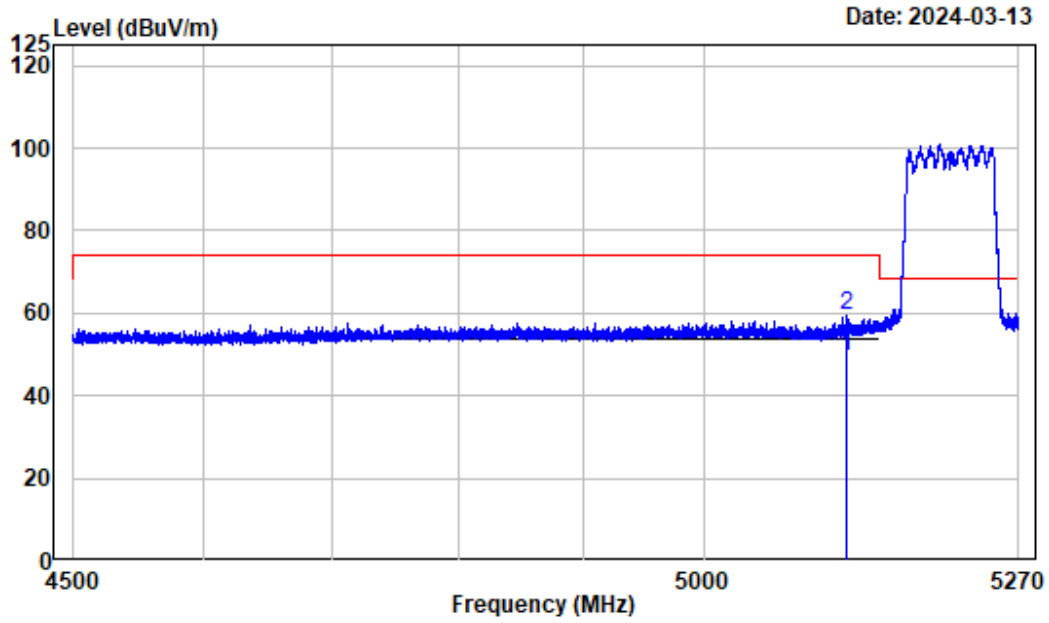
802.11ac80			
Test Channel:	**5210MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC80_5210

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5121.775	2.72	47.65	50.37	54.00	-3.63	Average
2	5121.775	2.72	58.35	61.07	74.00	-12.93	peak

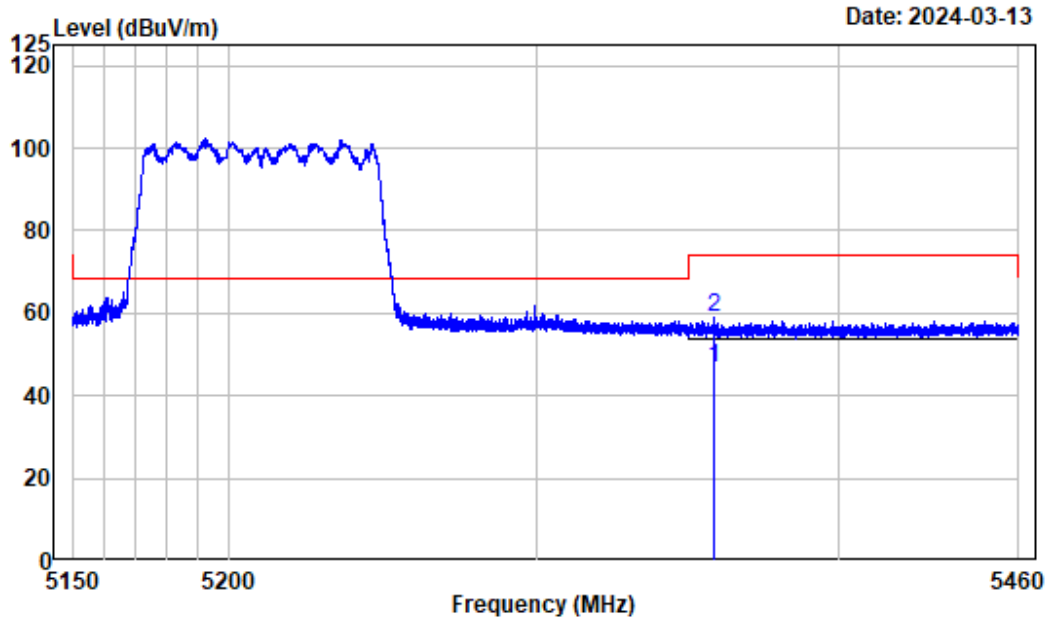
802.11ac80			
Test Channel:	**5210MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC80_5210

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5121.390	2.72	46.71	49.43	54.00	-4.57	Average
2	5121.390	2.72	56.85	59.57	74.00	-14.43	peak

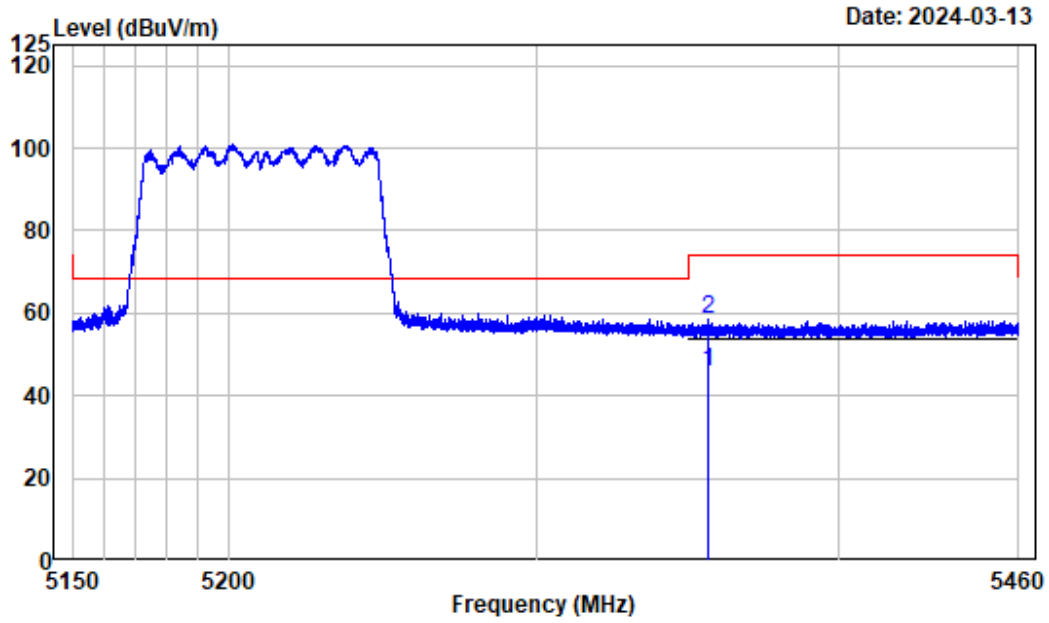
802.11ac80			
Test Channel:	**5210MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC80_5210

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5358.436	2.93	43.61	46.54	54.00	-7.46	Average
2	5358.436	2.93	55.85	58.78	74.00	-15.22	peak

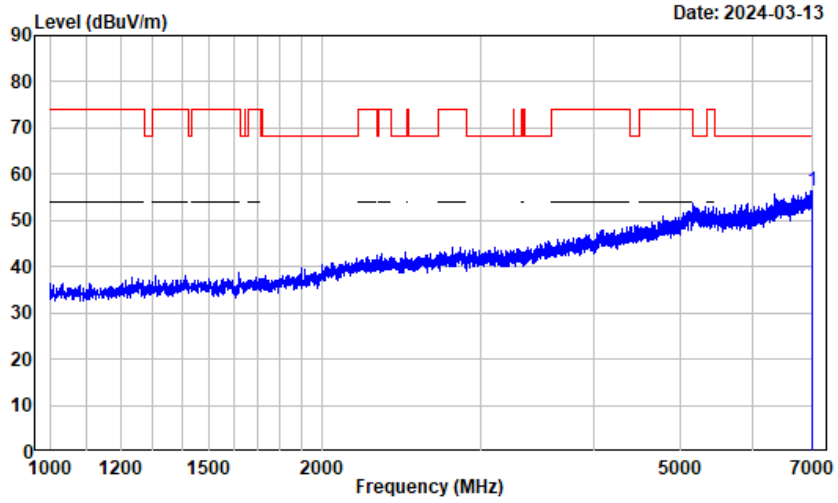
802.11ac80			
Test Channel:	**5210MHz**	**Ant. Polar. :**	**Vertical**



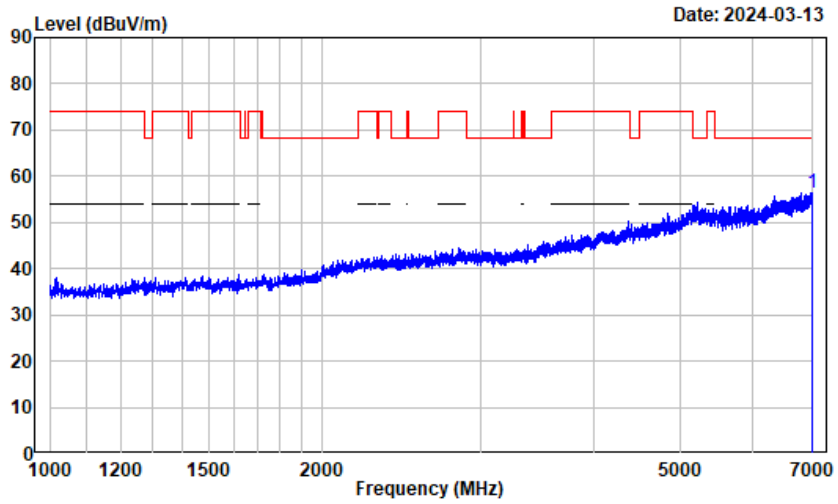
Condition : Vertical
Project No.: SZ4240129-06787E
Tester : Dylan
Note : 802.11AC80_5210

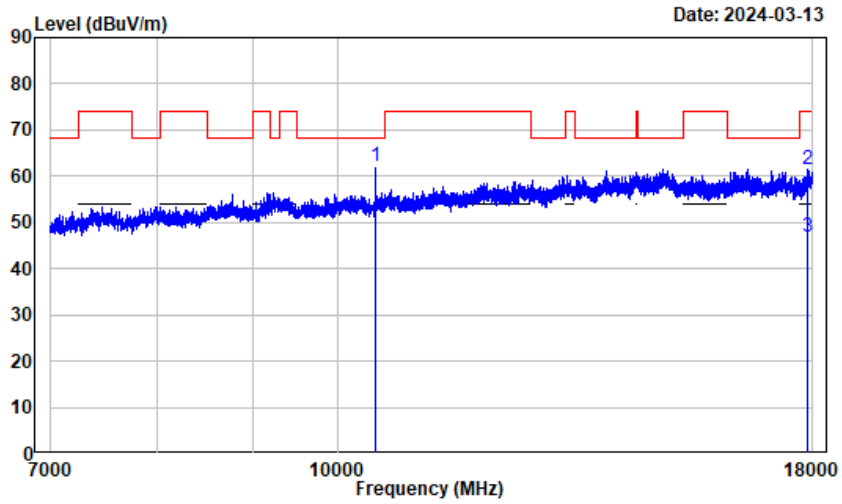
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	5356.615	2.92	43.07	45.99	54.00	-8.01	Average
2	5356.615	2.92	55.74	58.66	74.00	-15.34	peak

Listed with the worst harmonic margin test plot (802.11ac20, 5240MHz)

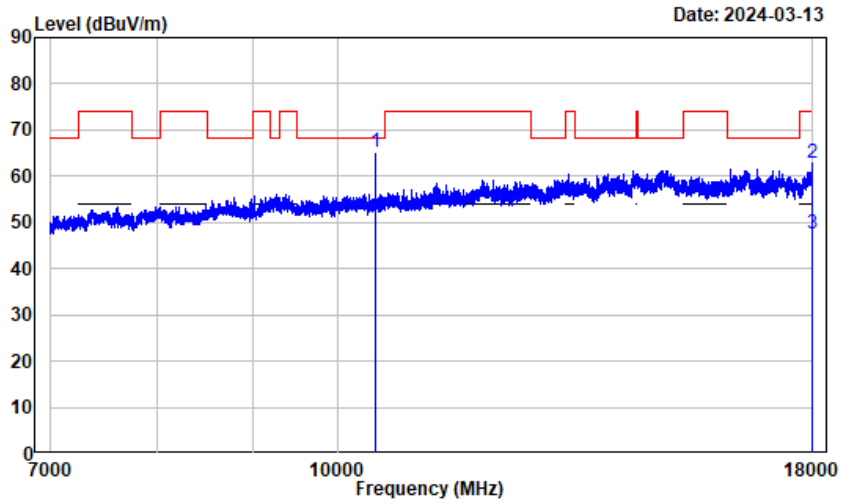
Horizontal	
1-7GHz	 Condition : Horizontal Project No.: SZ4240129-06787E Tester : Dylan Note : 802.11Band1_5240

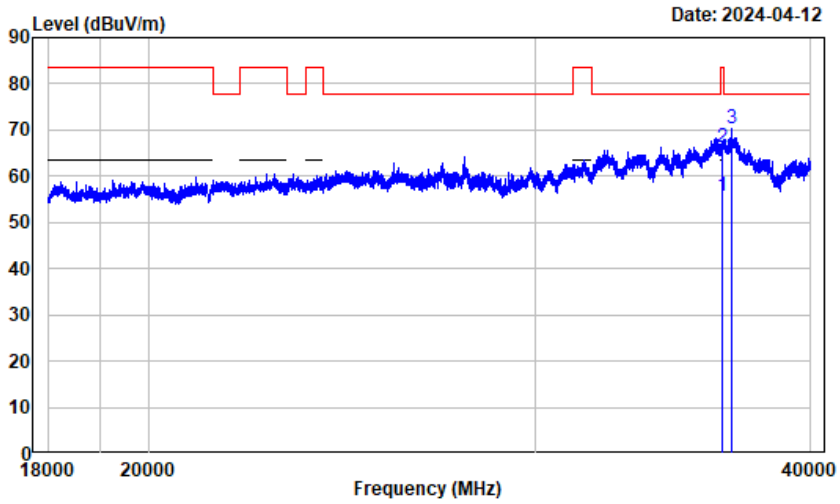
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	6995.500	8.62	47.62	56.24	68.20	-11.96	Peak

Vertical	
1-7GHz	 Condition : Vertical Project No.: SZ4240129-06787E Tester : Dylan Note : 802.11Band1_5240 | | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark | | | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | | | 1 | 6995.500 | 8.62 | 47.62 | 56.24 | 68.20 | -11.96 | Peak |

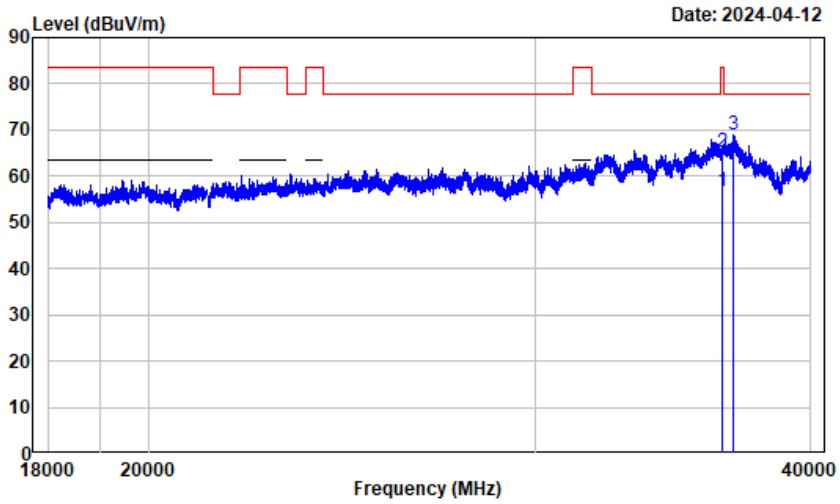
Horizontal	
7-18GHz	 Condition : Horizontal Project No.: SZ4240129-06787E Tester : Dylan Note : 802.11Band1_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	10480.000	13.07	49.18	62.25	68.20	-5.95	Peak
2	17885.880	23.68	37.68	61.36	74.00	-12.64	Peak
3	17885.880	23.68	23.02	46.70	54.00	-7.30	Average

Vertical	
7-18GHz	 Condition : Vertical Project No.: SZ4240129-06787E Tester : Dylan Note : 802.11Band1_5240 | | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark | | | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | | | 1 | 10480.000 | 13.07 | 52.02 | 65.09 | 68.20 | -3.11 | Peak | | 2 | 17990.380 | 24.55 | 38.26 | 62.81 | 74.00 | -11.19 | Peak | | 3 | 17990.380 | 24.55 | 23.09 | 47.64 | 54.00 | -6.36 | Average |

Horizontal	
18-40GHz	 Condition : Horizontal Project No.: SZ4240129-06787E Tester : Dylan Note : 802.11Band1_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	36444.250	25.21	30.44	55.65	63.50	-7.85	Average
2	36444.250	25.21	41.00	66.21	83.50	-17.29	Peak
3	36840.250	25.06	45.09	70.15	77.70	-7.55	Peak

Vertical	
18-40GHz	 Condition : Vertical Project No.: SZ4240129-06787E Tester : Dylan Note : 802.11Band1_5240

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	36449.000	25.22	31.58	56.80	63.50	-6.70	Average
2	36449.000	25.22	40.14	65.36	83.50	-18.14	Peak
3	36884.250	25.01	43.83	68.84	77.70	-8.86	Peak

FCC §15.407(a) – 26 dB EMISSION BANDWIDTH

Applicable Standard

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Test Procedure

According to KDB789033 D02 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%.

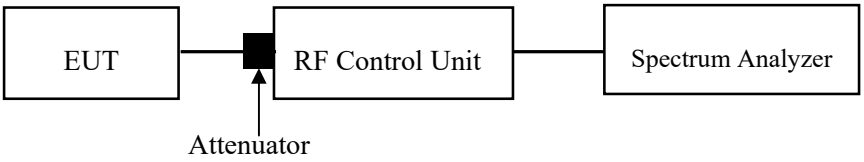
2. 99% Occupied Bandwidth:

According to ANSI C63.10-2013 Section 12.4.2&6.9.3

The 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. The following procedure shall be used for measuring 99% power bandwidth:
a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) 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.
f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. 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% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	49 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-03-19.

EUT operation mode: Transmitting

Test Result: Compliant. 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.

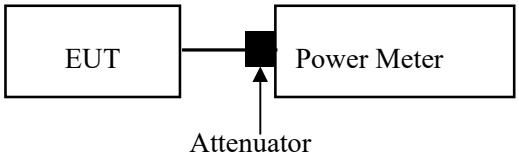
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 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 KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method PM-G should be applied

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.



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	49 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-03-19.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.407(a) - POWER SPECTRAL DENSITY

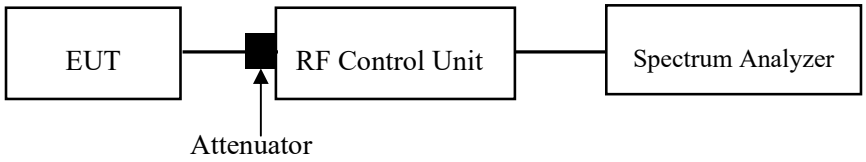
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting 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 KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-2 should be applied
a) Set span to encompass the entire EBW(or, alternatively, the entire 99% occupied



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	49 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-03-19.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

EUT PHOTOGRAPHS

Please refer to the attachment SZ4240129-06787E-RF External photo and SZ4240129-06787E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment SZ4240129-06787E-RFA Test Setup photo.

APPENDIX

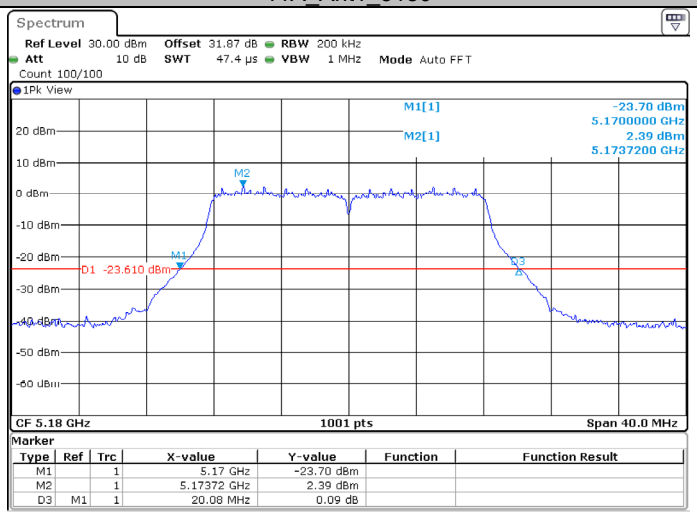
Appendix A1: Emission Bandwidth

Test Result

Test Mode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	20.08	---	---
	Ant1	5200	19.88	---	---
	Ant1	5240	20.40	---	---
11AC20MIMO	Ant1	5180	20.44	---	---
	Ant1	5200	19.80	---	---
	Ant1	5240	20.56	---	---
11AC40MIMO	Ant1	5190	43.52	---	---
	Ant1	5230	43.20	---	---
11AC80MIMO	Ant1	5210	83.04	---	---

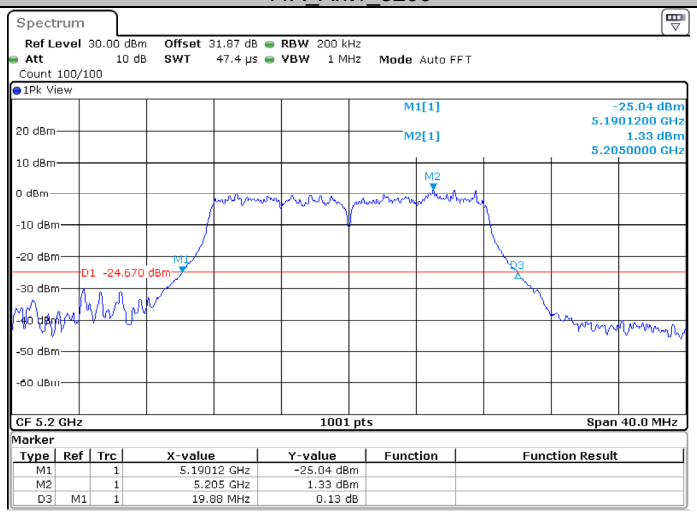
Test Graphs

11A_Ant1_5180



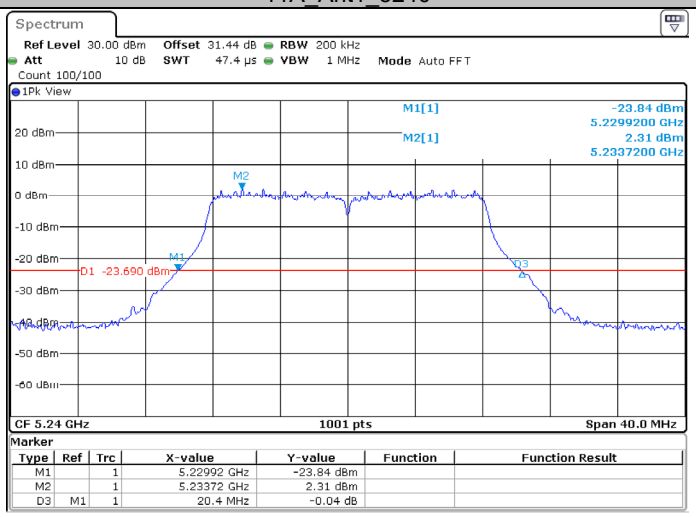
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:43:23

11A_Ant1_5200



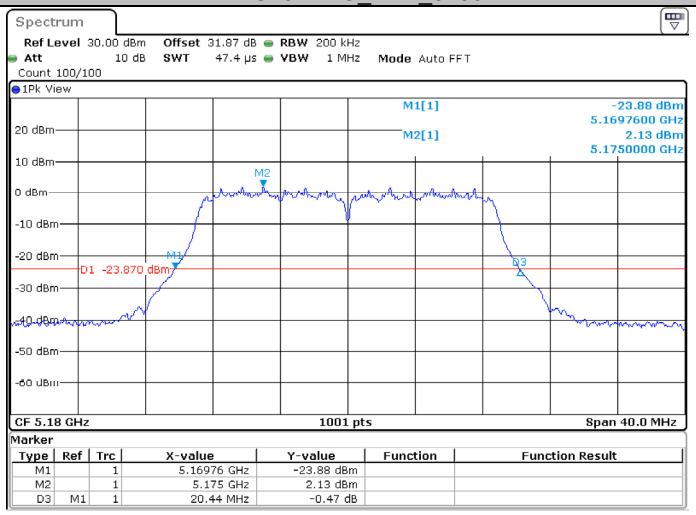
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:46:22

11A_Ant1_5240



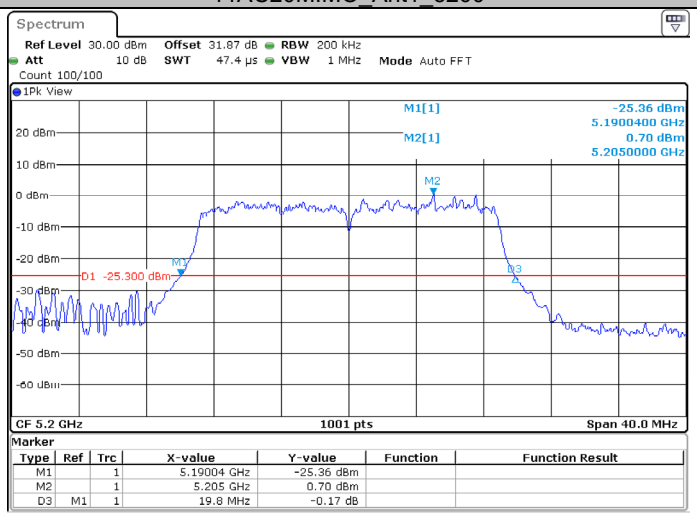
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:47:38

11AC20MIMO_Ant1_5180



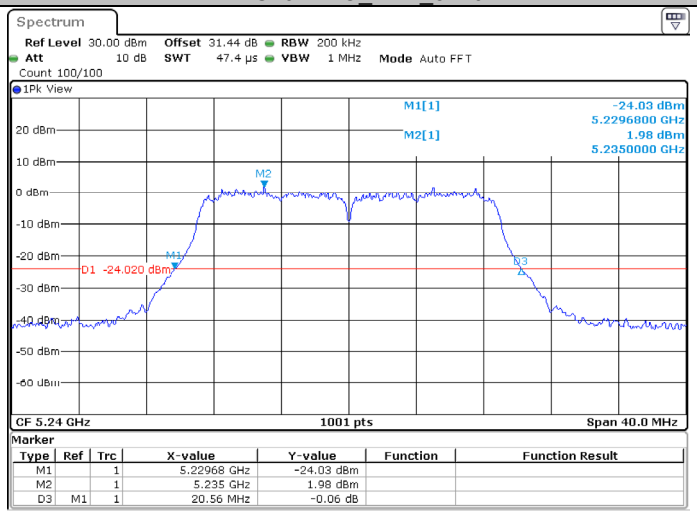
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:54:47

11AC20MIMO_Ant1_5200



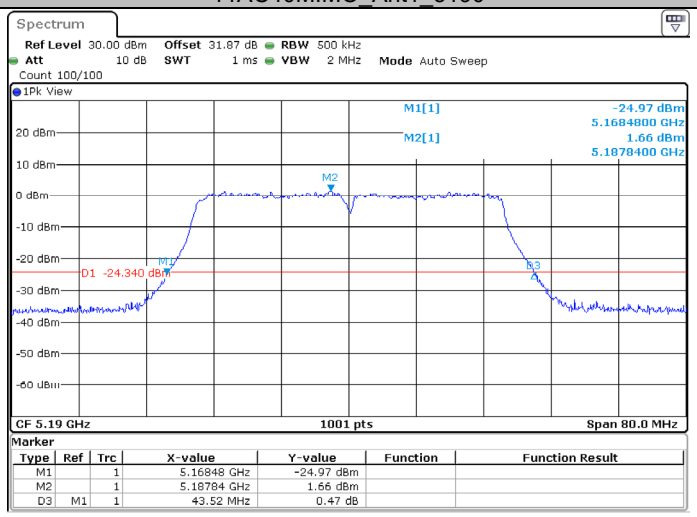
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:00:39

11AC20MIMO_Ant1_5240



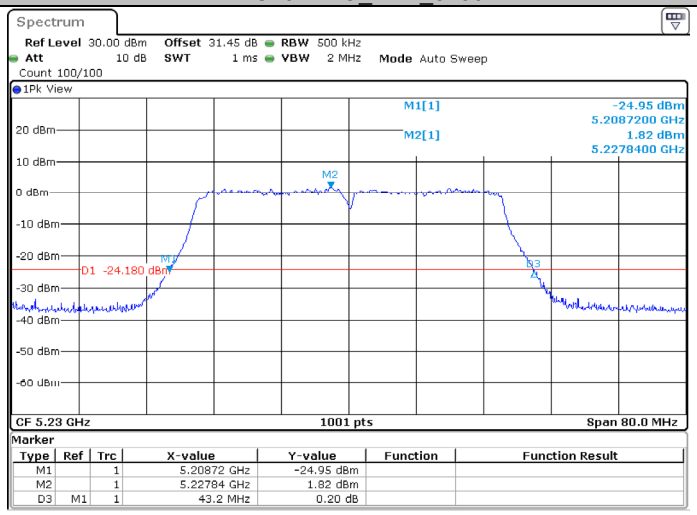
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:03:21

11AC40MIMO_Ant1_5190



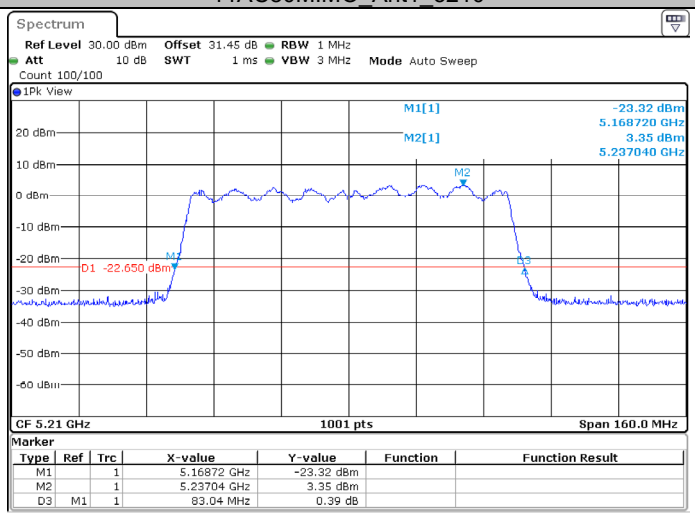
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:06:54

11AC40MIMO_Ant1_5230



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:10:26

11AC80MIMO_Ant1_5210



Appendix A2: Occupied channel bandwidth

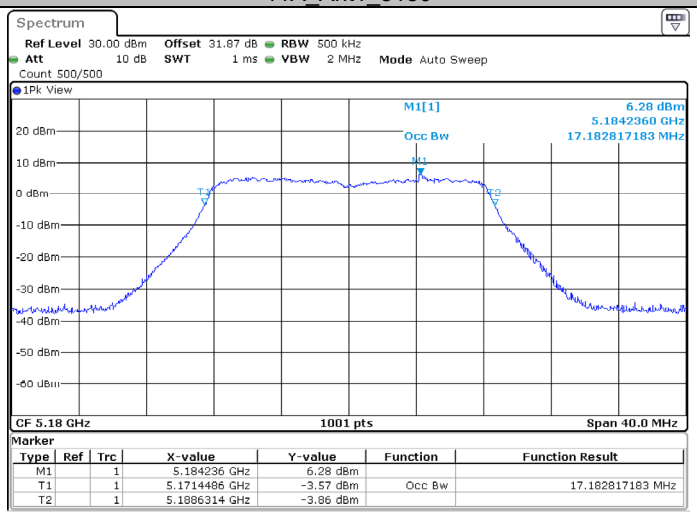
Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.183	---	---
	Ant1	5200	17.303	---	---
	Ant1	5240	17.223	---	---
11AC20MIMO	Ant1	5180	18.062	---	---
	Ant1	5200	18.302	---	---
	Ant1	5240	18.102	---	---
11AC40MIMO	Ant1	5190	37.083	---	---
	Ant1	5230	37.003	---	---
11AC80MIMO	Ant1	5210	76.244	---	---

Note: The 99% Occupied Bandwidth have not fall into the band 5250-5350MHz, please refer to the test plots of 99% Occupied Bandwidth

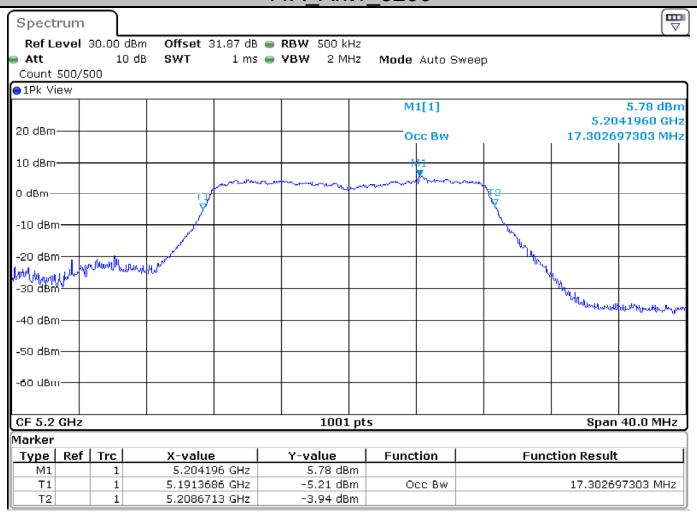
Test Graphs

11A_Ant1_5180



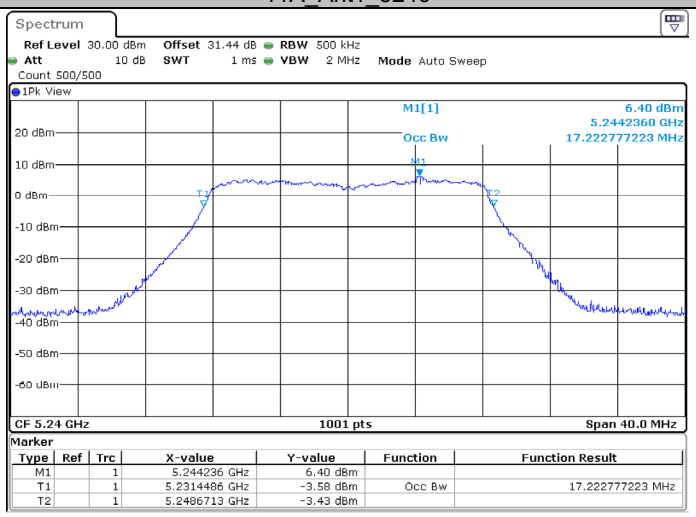
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:43:29

11A_Ant1_5200



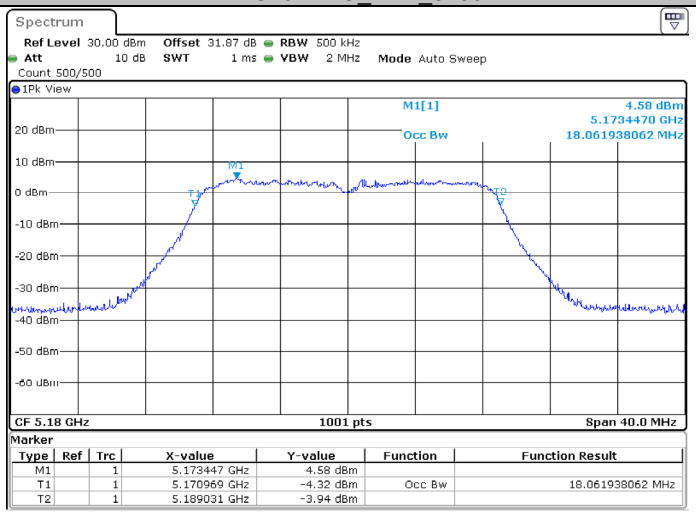
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:46:28

11A_Ant1_5240



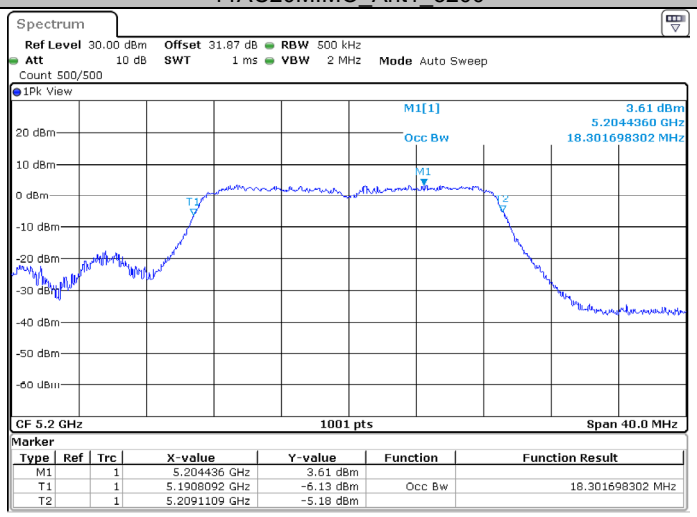
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:47:44

11AC20MIMO_Ant1_5180



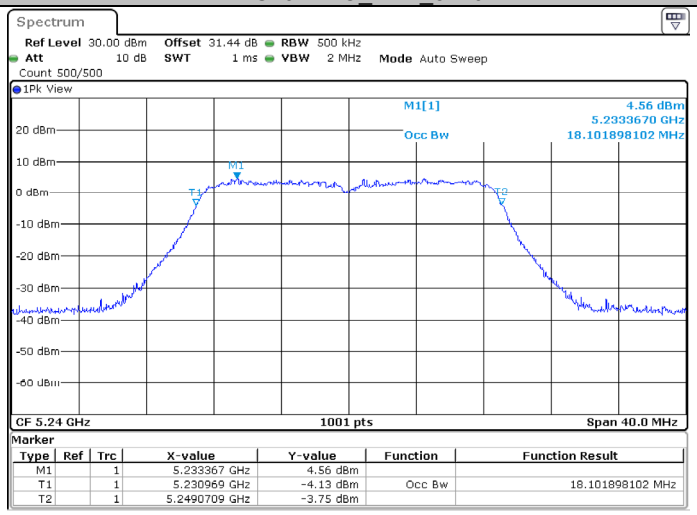
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:54:53

11AC20MIMO_Ant1_5200



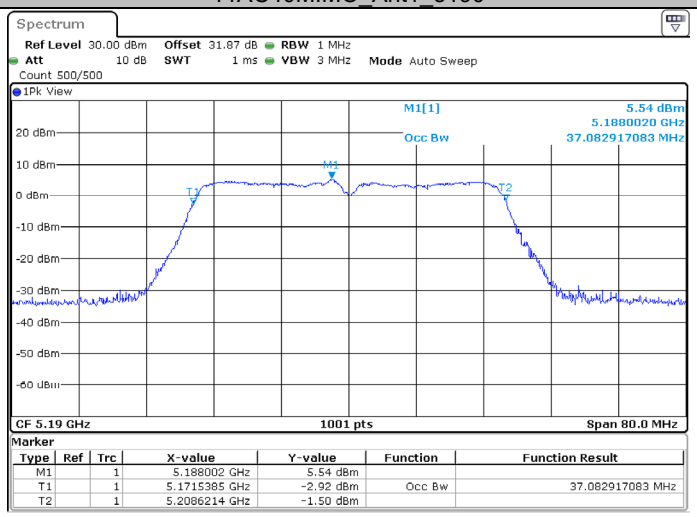
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:00:45

11AC20MIMO_Ant1_5240



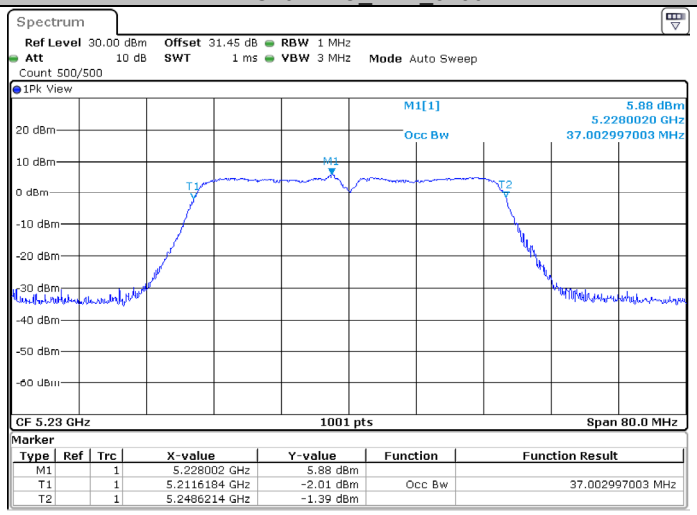
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:03:27

11AC40MIMO_Ant1_5190



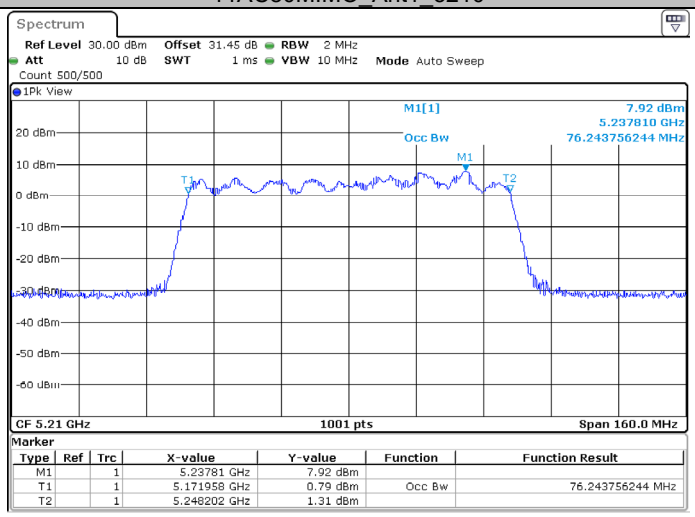
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:07:00

11AC40MIMO_Ant1_5230



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:10:32

11AC80MIMO_Ant1_5210



Appendix B: Maximum conducted output power

Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11A	Ant1	5180	11.89	≤23.98	PASS
	Ant2	5180	12.07	≤23.98	PASS
	Ant1	5200	11.43	≤23.98	PASS
	Ant2	5200	11.67	≤23.98	PASS
	Ant1	5240	11.98	≤23.98	PASS
	Ant2	5240	12.05	≤23.98	PASS
11AC20MIMO	Ant1	5180	9.74	≤23.98	PASS
	Ant2	5180	9.86	≤23.98	PASS
	total	5180	12.81	≤23.98	PASS
	Ant1	5200	9.04	≤23.98	PASS
	Ant2	5200	9.24	≤23.98	PASS
	total	5200	12.15	≤23.98	PASS
	Ant1	5240	9.75	≤23.98	PASS
	Ant2	5240	9.71	≤23.98	PASS
	total	5240	12.74	≤23.98	PASS
11AC40MIMO	Ant1	5190	9.87	≤23.98	PASS
	Ant2	5190	9.80	≤23.98	PASS
	total	5190	12.85	≤23.98	PASS
	Ant1	5230	10.08	≤23.98	PASS
	Ant2	5230	10.09	≤23.98	PASS
	total	5230	13.10	≤23.98	PASS
11AC80MIMO	Ant1	5210	9.79	≤23.98	PASS
	Ant2	5210	9.75	≤23.98	PASS
	total	5210	12.78	≤23.98	PASS

Note:
The device is a client unit.
The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$

Antenna Gain:	2.0	dBi	Directional gain:	2.0	dBi

Appendix C: Maximum power spectral density

Test Result

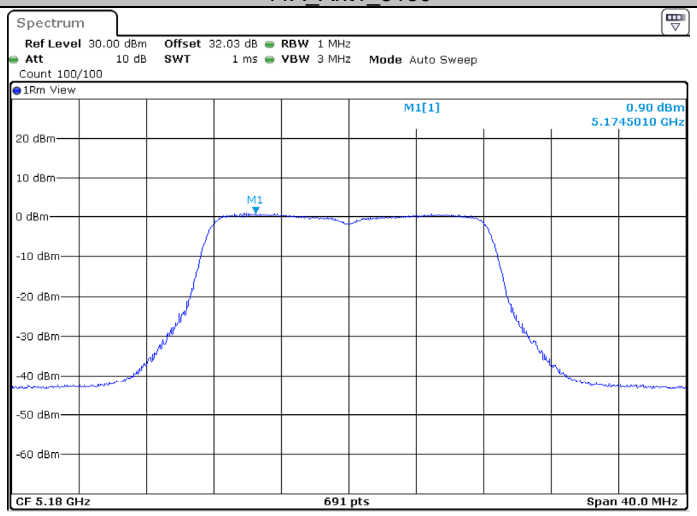
Test Mode	Antenna	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	0.9	≤11.00	PASS
	Ant2	5180	1.03	≤11.00	PASS
	Ant1	5200	0.37	≤11.00	PASS
	Ant2	5200	0.73	≤11.00	PASS
	Ant1	5240	0.84	≤11.00	PASS
	Ant2	5240	0.83	≤11.00	PASS
11AC20MIMO	Ant1	5180	-1.56	≤11.00	PASS
	Ant2	5180	-1.47	≤11.00	PASS
	total	5180	1.50	≤11.00	PASS
	Ant1	5200	-2.32	≤11.00	PASS
	Ant2	5200	-2.11	≤11.00	PASS
	total	5200	0.80	≤11.00	PASS
	Ant1	5240	-1.58	≤11.00	PASS
	Ant2	5240	-1.56	≤11.00	PASS
	total	5240	1.44	≤11.00	PASS
11AC40MIMO	Ant1	5190	-4.64	≤11.00	PASS
	Ant2	5190	-4.41	≤11.00	PASS
	total	5190	-1.51	≤11.00	PASS
	Ant1	5230	-4.11	≤11.00	PASS
	Ant2	5230	-4.3	≤11.00	PASS
	total	5230	-1.19	≤11.00	PASS
11AC80MIMO	Ant1	5210	-6.09	≤11.00	PASS
	Ant2	5210	-6.25	≤11.00	PASS
	total	5210	-3.16	≤11.00	PASS

Note:
The device is a client unit.
Method SA-2 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01was used for PSD test, and the duty cycle factor was added into the result.
The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:
Array Gain = 10 $\log(N_{ANT}/N_{SS})$ dB

Antenna Gain:	2.0	dBi	Directional gain:	5.0	dBi

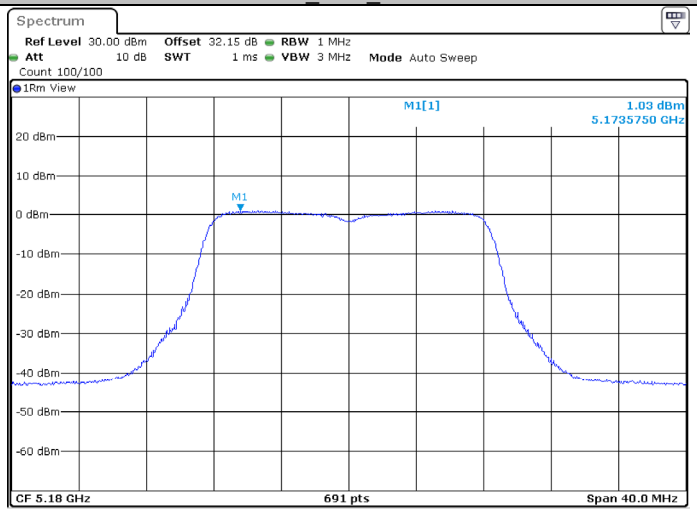
Test Graphs

11A_Ant1_5180



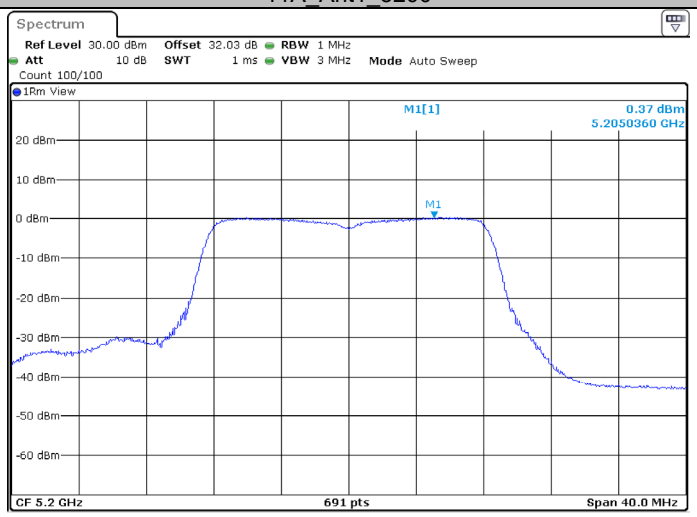
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:44:01

11A_Ant2_5180



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:49:35

11A_Ant1_5200



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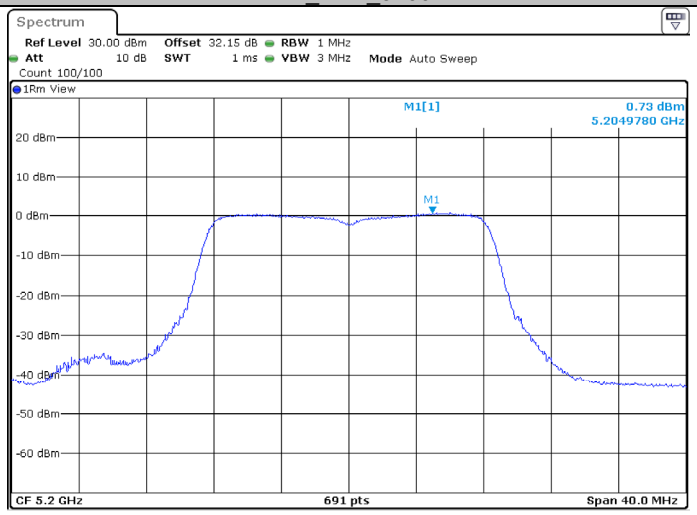
Date: 19.MAR.2024 21:46:57

11A_Ant2_5200



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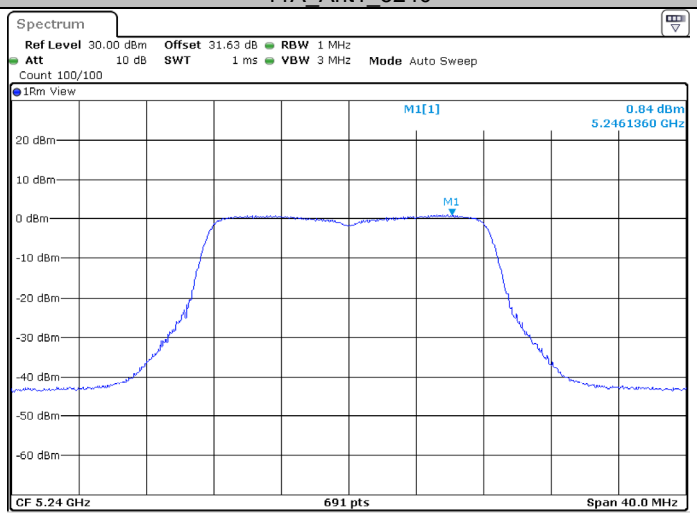
Date: 19.MAR.2024 21:51:51

11A_Ant1_5240


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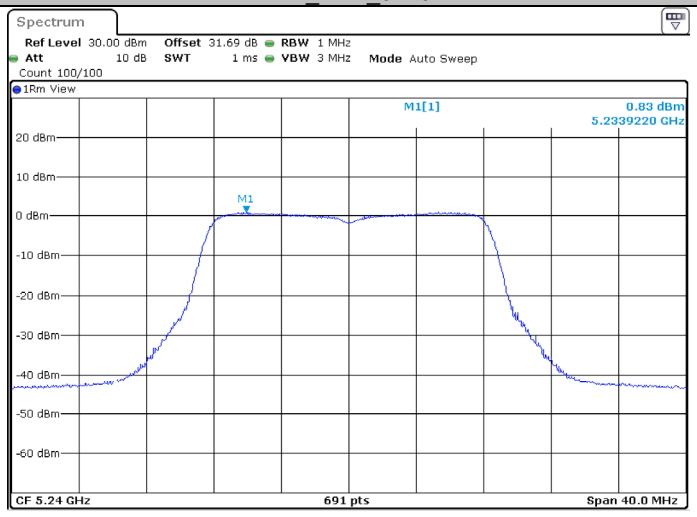
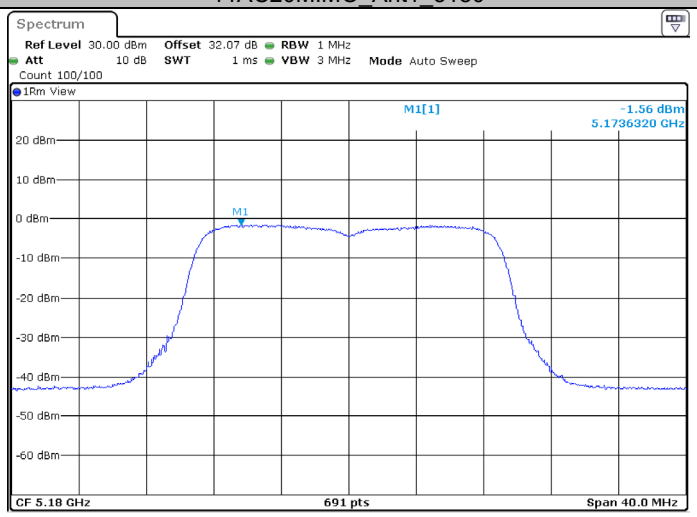
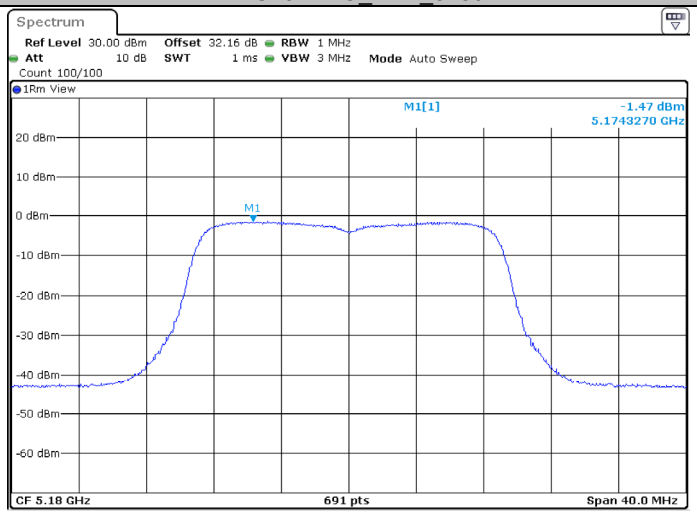


11AC20MIMO_Ant1_5180



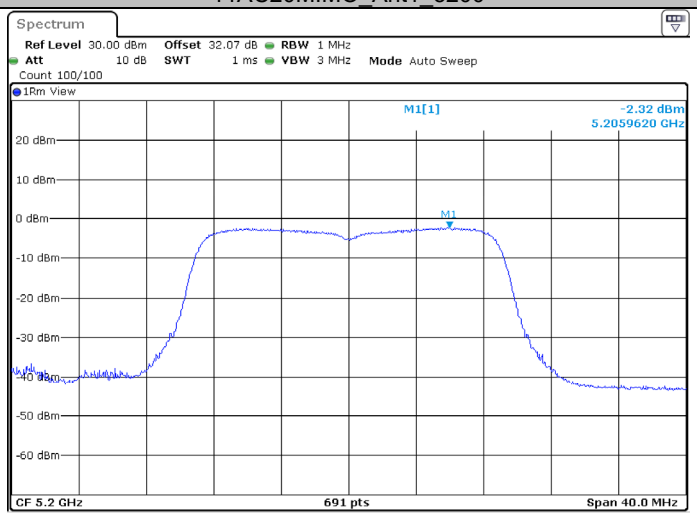
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:55:22

11AC20MIMO_Ant2_5180

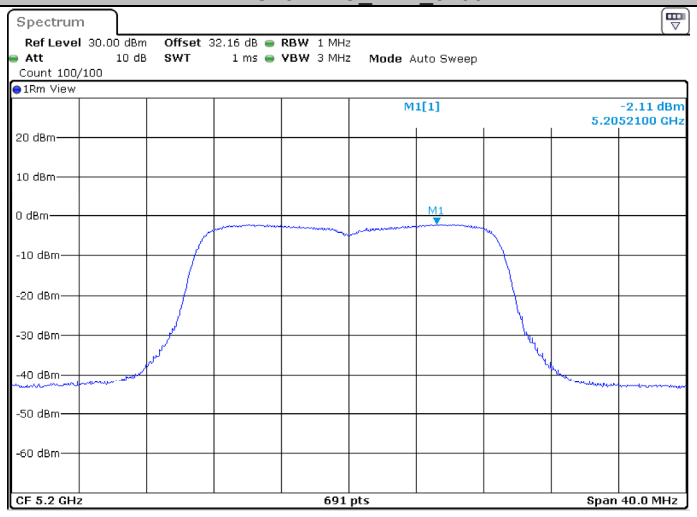


ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:56:12

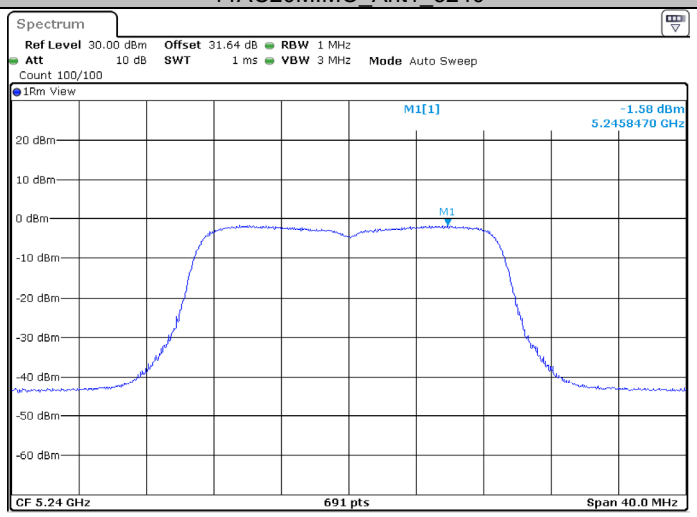
11AC20MIMO_Ant1_5200



11AC20MIMO_Ant2_5200



11AC20MIMO_Ant1_5240



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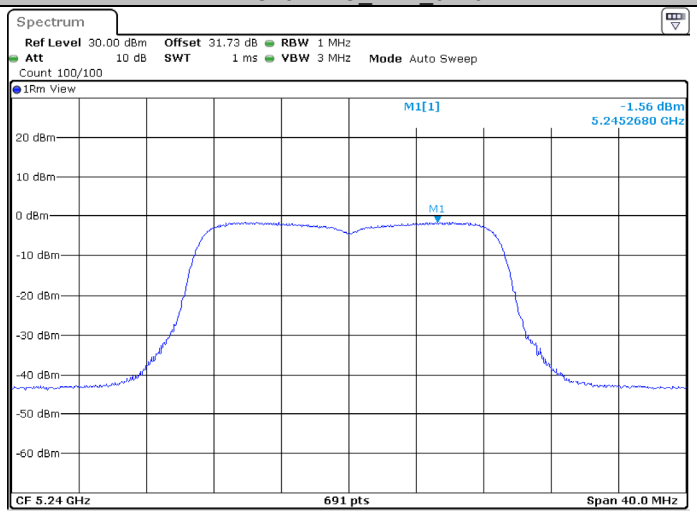
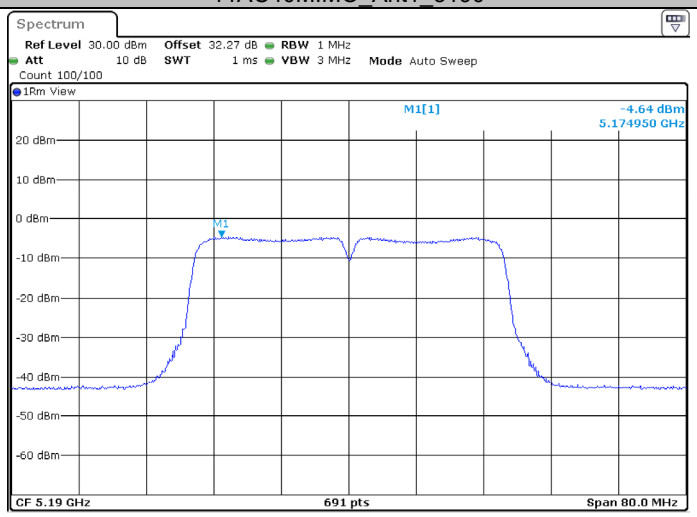
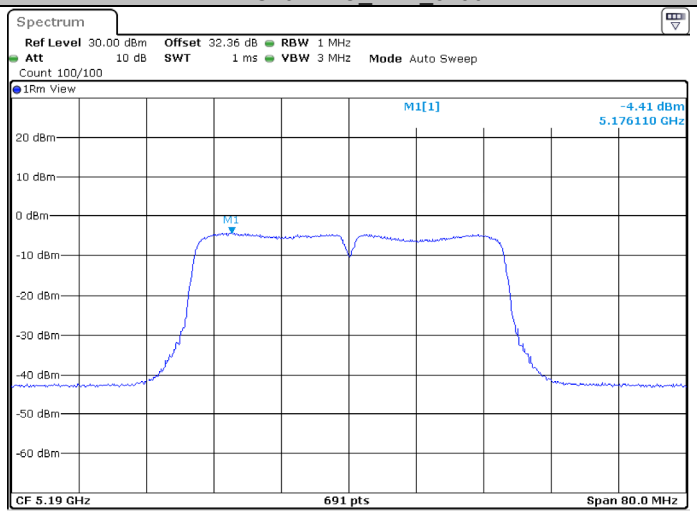


11AC40MIMO_Ant1_5190



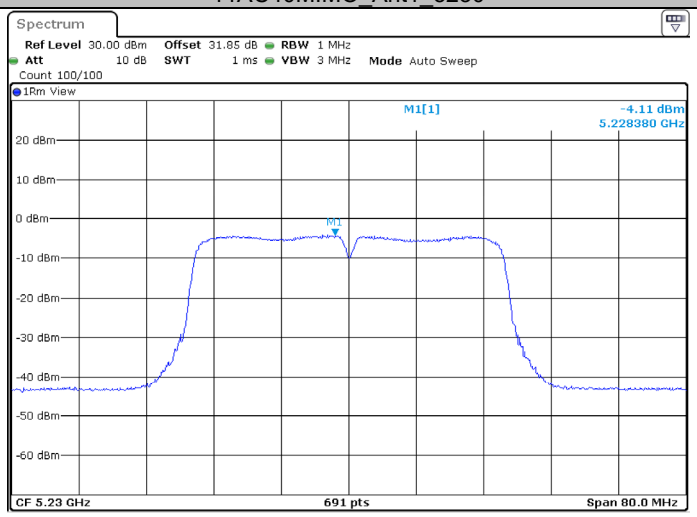
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:07:29

11AC40MIMO_Ant2_5190



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:08:19

11AC40MIMO_Ant1_5230



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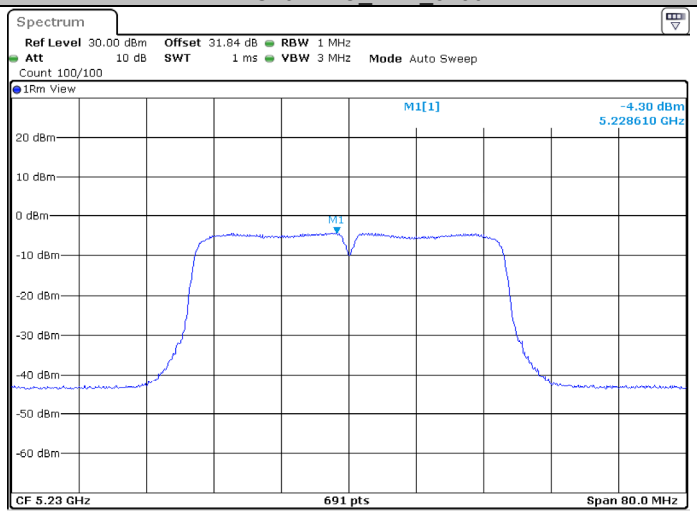
Date: 19.MAR.2024 22:11:02

11AC40MIMO_Ant2_5230



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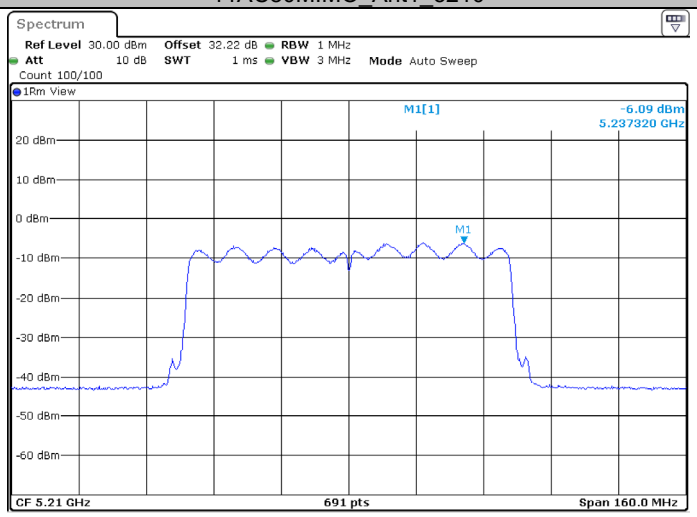
Date: 19.MAR.2024 22:11:53

11AC80MIMO_Ant1_5210



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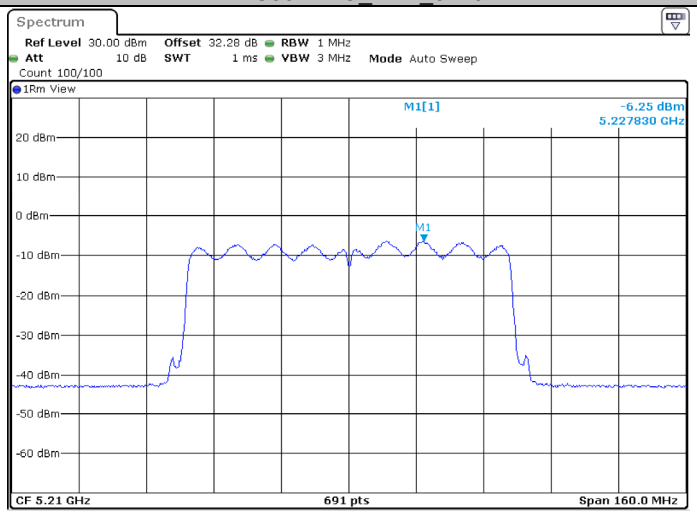
Date: 19.MAR.2024 22:13:54

11AC80MIMO_Ant2_5210



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:14:45

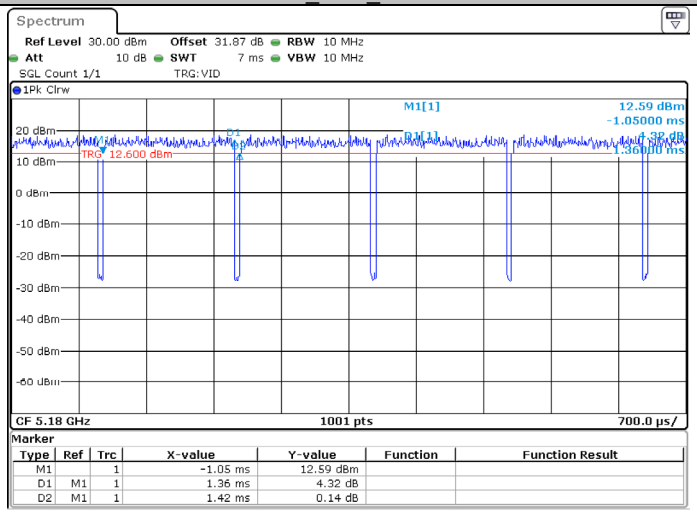
Appendix D: Duty Cycle

Test Result

Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Duty Cycle Factor [dB]	1/T[Hz]	VBW setting [Hz]
11A	Ant1	5180	1.36	1.42	95.77	0.19	735	1000
	Ant2	5180	1.35	1.41	95.74	0.19	741	1000
	Ant1	5200	1.36	1.41	96.45	0.16	735	1000
	Ant2	5200	1.35	1.41	95.74	0.19	741	1000
	Ant1	5240	1.35	1.41	95.74	0.19	741	1000
	Ant2	5240	1.36	1.41	96.45	0.16	735	1000
11AC20MIMO	Ant1	5180	1.26	1.32	95.45	0.20	794	1000
	Ant2	5180	1.27	1.33	95.49	0.20	787	1000
	Ant1	5200	1.27	1.33	95.49	0.20	787	1000
	Ant2	5200	1.26	1.32	95.45	0.20	794	1000
	Ant1	5240	1.26	1.32	95.45	0.20	794	1000
	Ant2	5240	1.26	1.32	95.45	0.20	794	1000
11AC40MIMO	Ant1	5190	0.63	0.69	91.30	0.40	1587	2000
	Ant2	5190	0.63	0.69	91.30	0.40	1587	2000
	Ant1	5230	0.63	0.69	91.30	0.40	1587	2000
	Ant2	5230	0.63	0.68	92.65	0.33	1587	2000
11AC80MIMO	Ant1	5210	0.31	0.37	83.78	0.77	3226	5000
	Ant2	5210	0.31	0.37	83.78	0.77	3226	5000

Test Graphs

11A_Ant1_5180

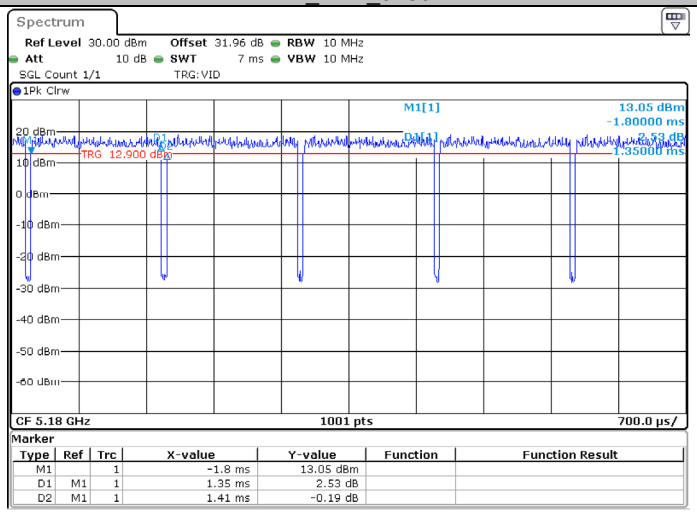


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.05 ms	12.59 dBm		
D1	M1	1	1.36 ms	4.32 dB		
D2	M1	1	1.42 ms	0.14 dB		

ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:44:50

11A_Ant2_5180

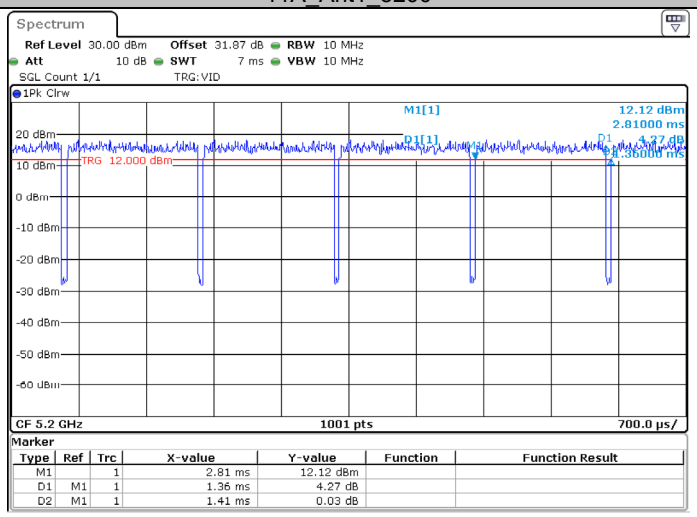


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.8 ms	13.05 dBm		
D1	M1	1	1.35 ms	2.53 dB		
D2	M1	1	1.41 ms	-0.19 dB		

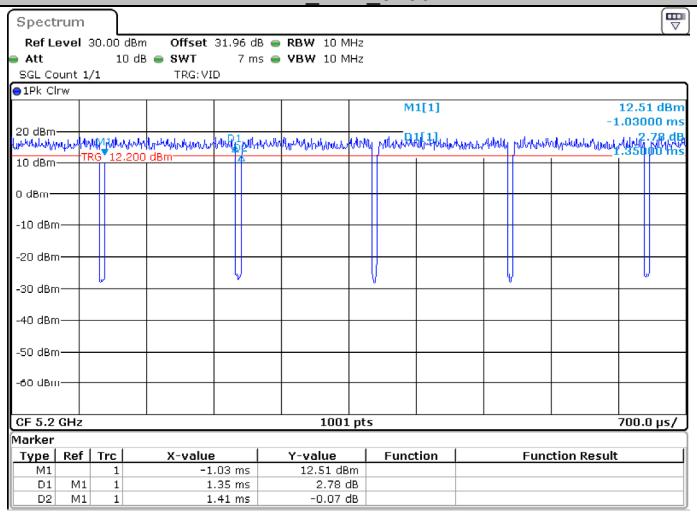
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:49:17

11A_Ant1_5200



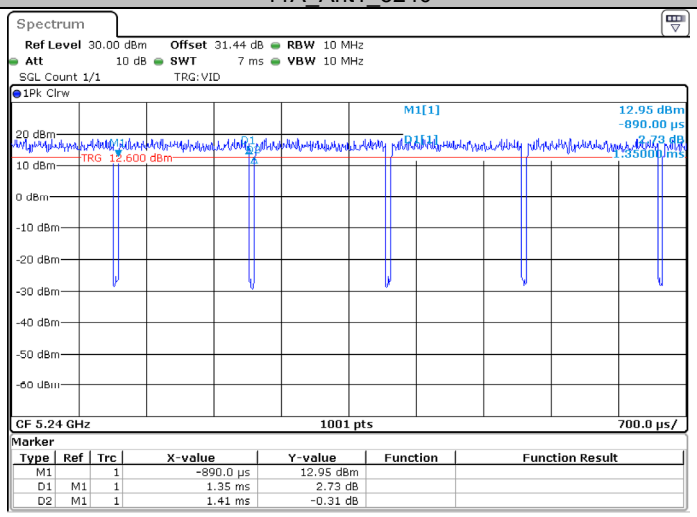
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:46:39

11A_Ant2_5200



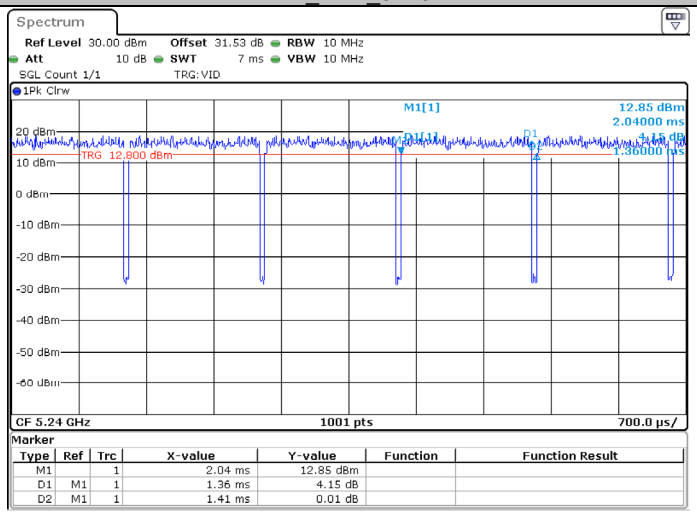
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:51:33

11A_Ant1_5240



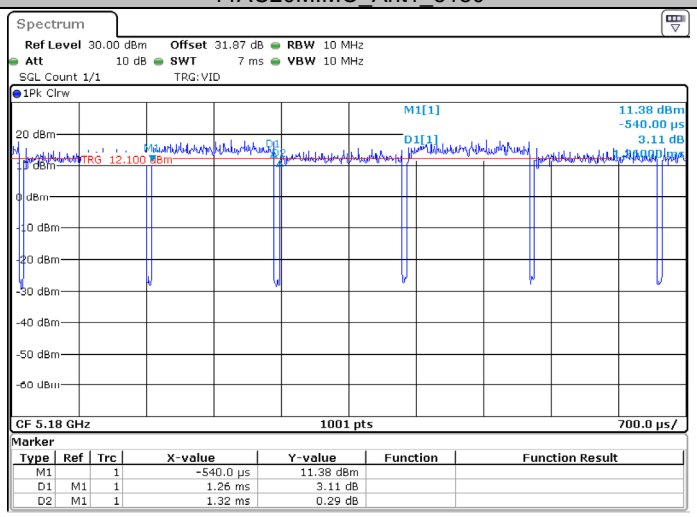
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:47:55

11A_Ant2_5240



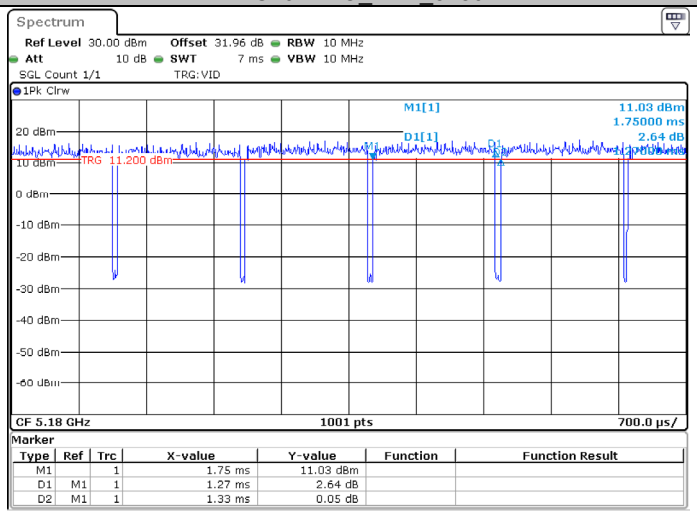
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:52:54

11AC20MIMO_Ant1_5180



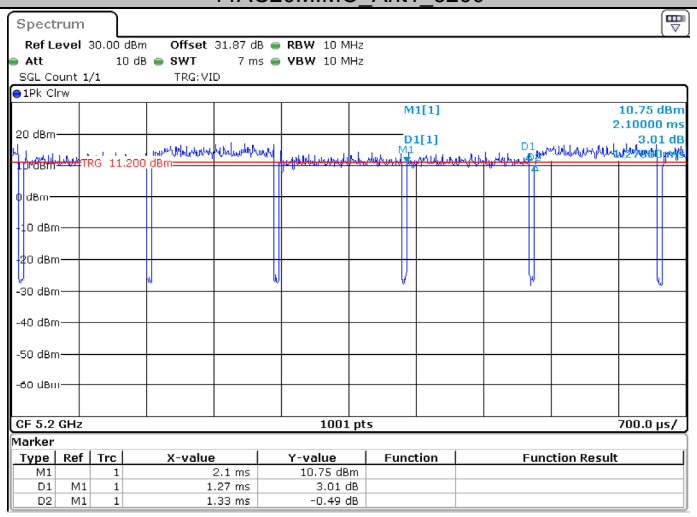
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:55:04

11AC20MIMO_Ant2_5180



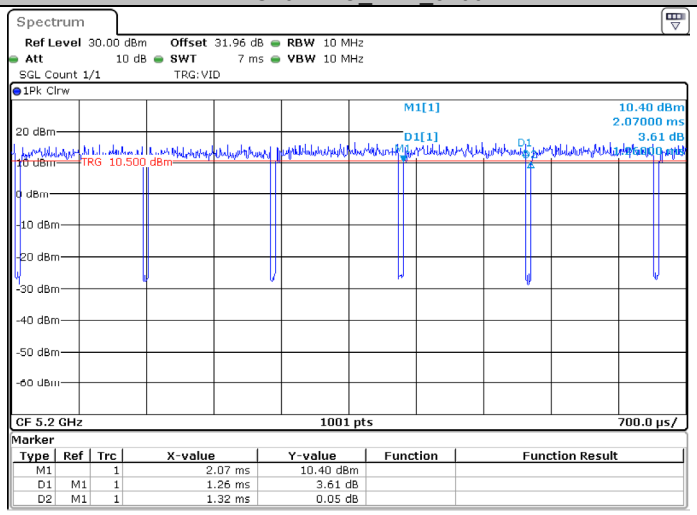
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 21:55:53

11AC20MIMO_Ant1_5200



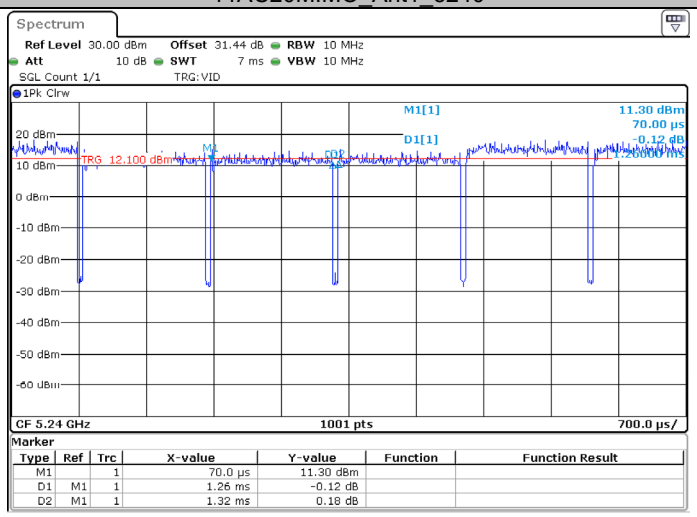
ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:00:56

11AC20MIMO_Ant2_5200



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:01:48

11AC20MIMO_Ant1_5240



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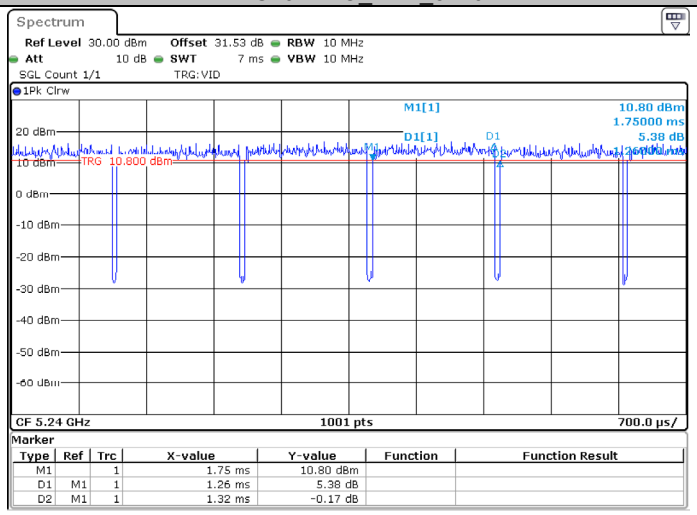
Date: 19.MAR.2024 22:03:38

11AC20MIMO_Ant2_5240



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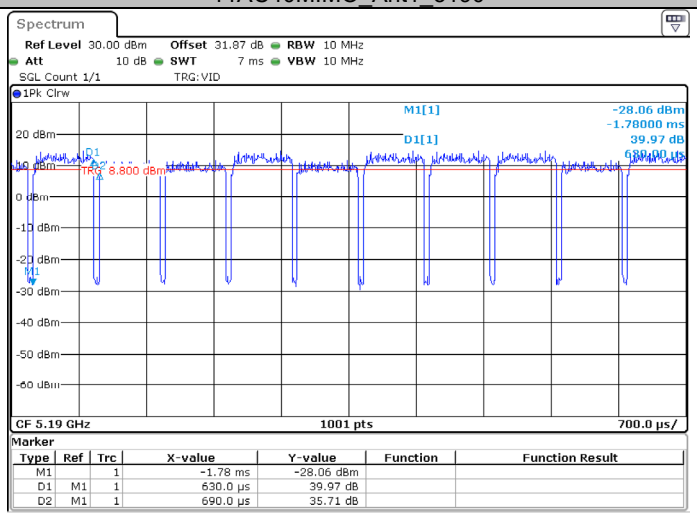
Date: 19.MAR.2024 22:04:28

11AC40MIMO_Ant1_5190



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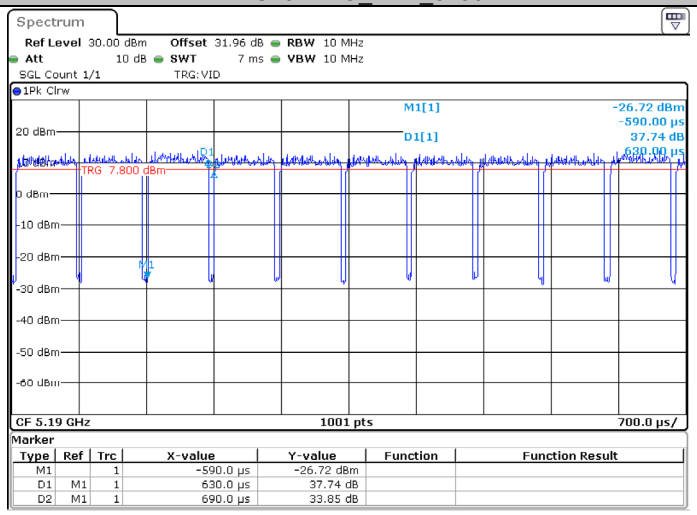
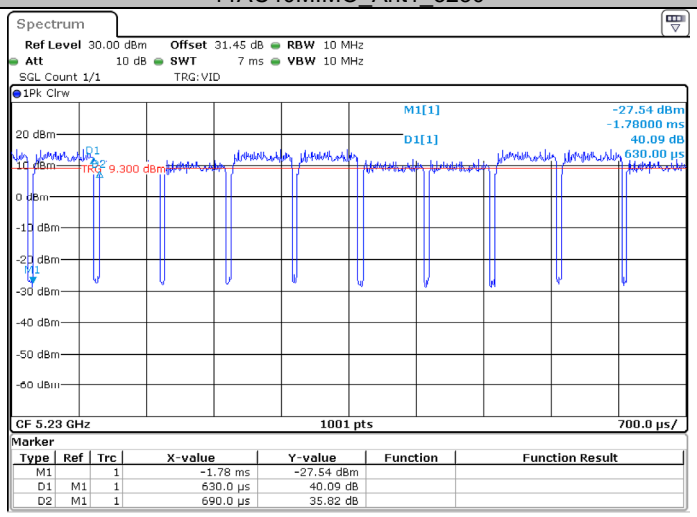
11AC40MIMO_Ant2_5190



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:08:00

11AC40MIMO_Ant1_5230



ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:10:43

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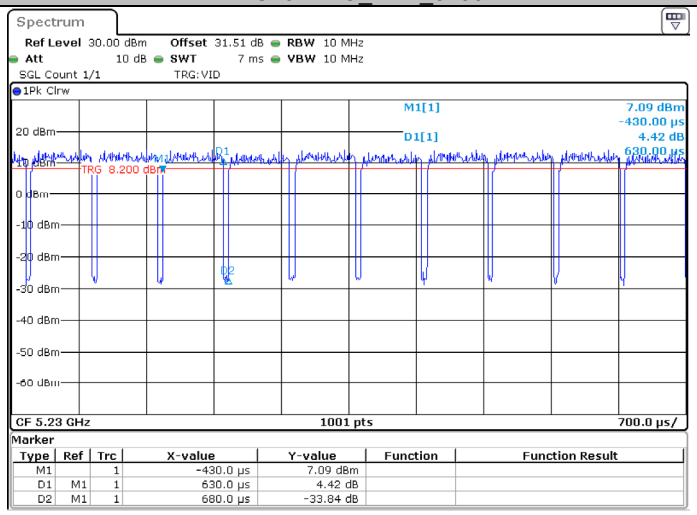

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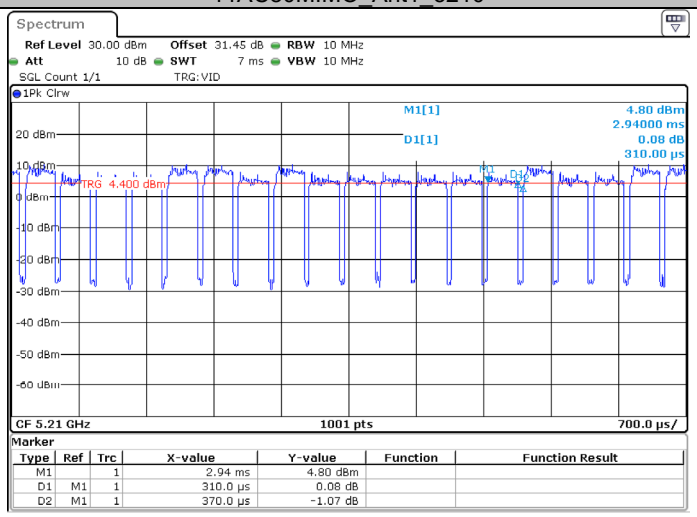

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Date: 19.MAR.2024 22:13:36

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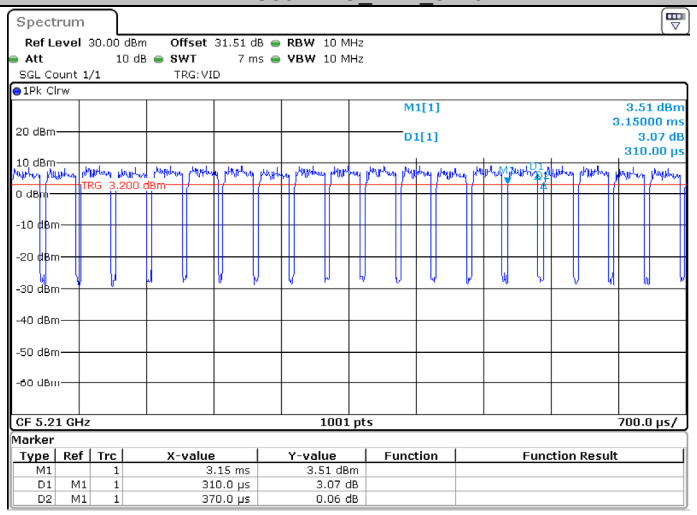

ProjectNo.:SZ4240129-06787E-RF Tester:Tom Tan
Date: 19.MAR.2024 22:14:25

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