TEST REPORT

Applicant Name :	Shenzhen Junge Yunchuang Technology Co., Ltd.
Address :	1204, Unit 3, Building C, Fu Gui Yuan, Fu Gui Road, Fu Hua Community, Xixiang Street, Baoan District, Shenzhen, China
Report Number :	RA230324-14579E-RF-00C
FCC ID:	2A3FP-P11

Test Standard (s)

FCC PART 15.407

Sample Description

Product:	Projector
Tested Model:	PJ-SK500W, F501, F502, F503, F504, F505, F506
Trade Name:	N/A
Date Received:	2023-03-24
Date of Test	2023-04-10 to 2023-05-31
Report Date:	2023-05-31

Test Result:	PASS*

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

Prepared and Checked By:

Bob Liao
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.

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230324-14579E-RF-00C	Original Report	2023-05-31

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Projector		
Tested Model	PJ-SK500W		
Multiple Model	F501, F502, F503, F504, F505, F506		
Model Difference	Please refer to DOS Letter		
Frequency Range	5G Wi-Fi: 5150-5250 MHz (802.11a/ n20/n40)		
Maximum Conducted Output Power	5150-5250 MHz		
	14.13dBm (802.11a),	14.06dBm(802.11n20)	13.77dBm(802.11n40)
Modulation Technique	OFDM		
Antenna Specification*	Band1: 1.88dBi (provided by the applicant)		
Voltage Range	AC 100-240V		
Sample number	RA230324-14579E-RF-S1(CE&RE) RA230324-14579E-RF-S2(RF Conducted Test) (Assigned by ATC, Shenzhen)		
Sample/EUT Status	Good condition		

Objective

This type approval report is in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

Test Methodology

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

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.71dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.74dB
Emissions, Radiated	30MHz - 1GHz	5.08dB
	1GHz - 18GHz	4.96dB
	18GHz - 26.5GHz	5.16dB
	26.5GHz - 40GHz	4.64dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

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

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the Floor 1, KuMaKe Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189.

Accredited by American Association for Laboratory Accreditation (A2LA).The Certificate Number is 4297.01.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 30241.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The device only supports 5G Wi-Fi 802.11a/n20/n40 modes, which was declared by manufacturer.

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

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

For 802.11a, 802.11n20, channel 36, 40, 48 were tested;
For 802.11n40, channel 38, 46 were tested;

Special Accessories

The AC power cable and HDMI Cable with ferrite cord.

EUT Exercise Software

“Serial”* software was used to test and power level as below:

Frequency Range	Mode	Date rate	Power Level*
5150 - 5250 MHz	802.11a	6Mbps	Default
	802.11n20	MCS0	Default
	802.11n40	MCS0	Default

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

Duty cycle

Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

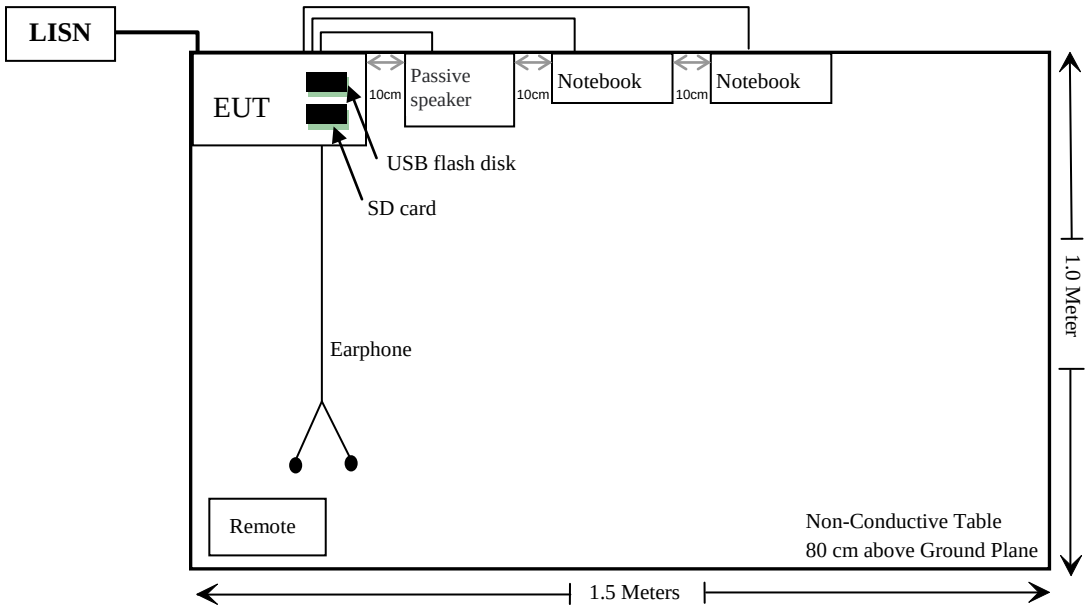
Manufacturer	Description	Model	Serial Number
LENOVO	Notebook	ThinkPad x240	SL10F31638JS
Hasee	Notebook	CV15S01	K6406H01120953
Unknown	Earphone	Unknown	Unknown
Unknown	Passive speaker	Unknown	Unknown
Kingston	USB flash disk	DTKN	Unknown
Unknown	SD Card	Unknown	Unknown

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable AC Cable	1.4	EUT	L.I.S.N
Shielding Detachable HDMI Cable	1.2	EUT	Notebook
Un-shielding Detachable VAG Cable	1.0	EUT	Notebook
Un-shielding Detachable Earphone Cable	1	EUT	Earphone
Un-shielding Detachable Cable	0.9	EUT	Passive speaker

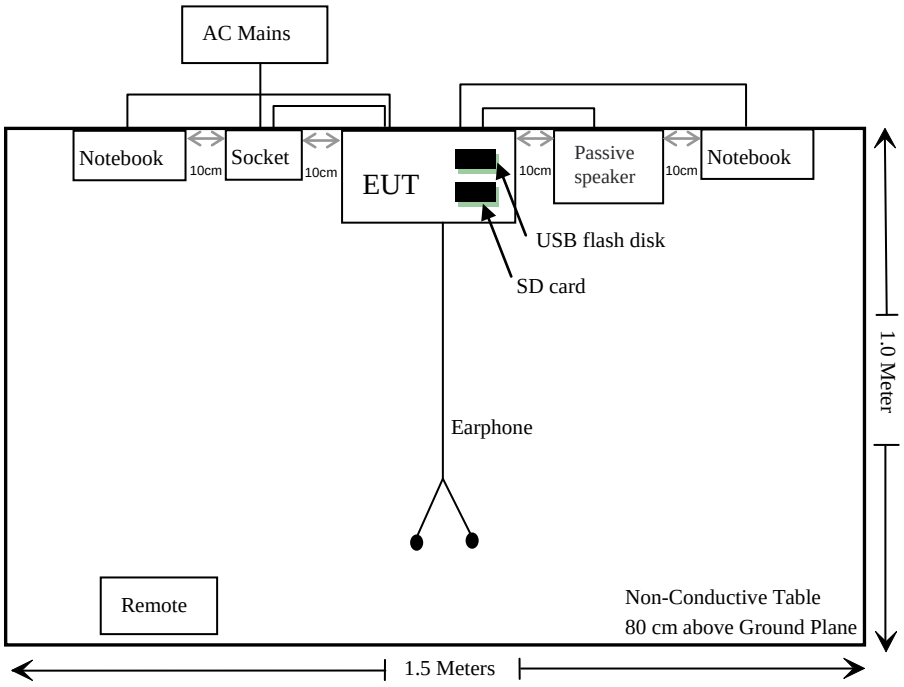
Block Diagram of Test Setup

For Conducted Emission:



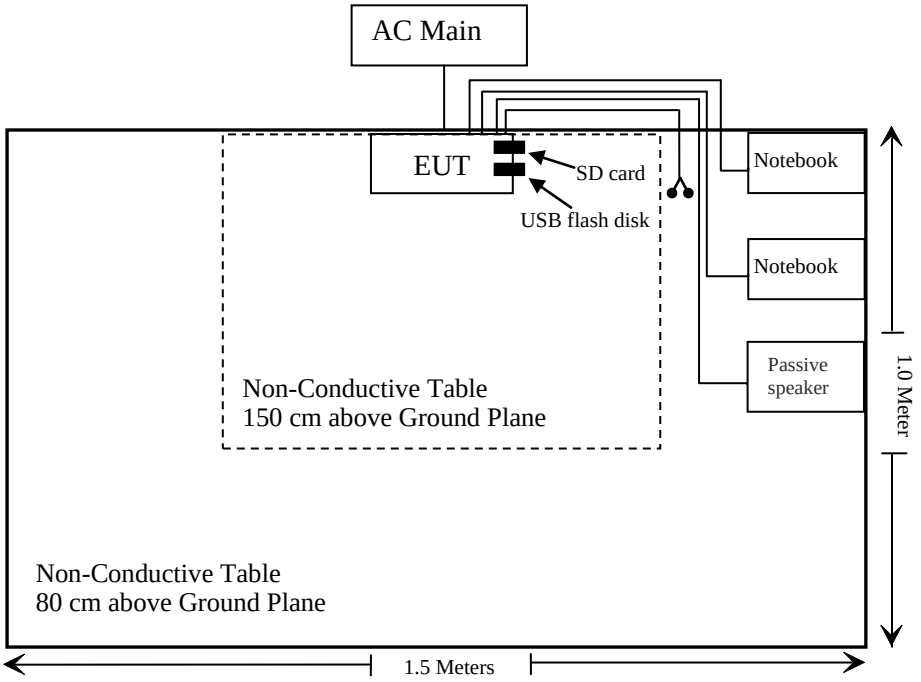
For Radiated Emission:

Below 1G



Note: the support table edge was flush with center of turntable

Above 1G



Note: the support table edge was flush with center of turntable

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b)	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(8) & §15.207(a)	Conducted Emissions	Compliant
§15.205 & §15.209 & §15.407(b) (1), (8), (9), (10)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (12)	Bandwidth	Compliant
§15.407(a) (1)	Conducted Transmitter Output Power	Compliant
§15.407 (a) (1)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100784	2022/11/25	2023/11/24
R & S	L.I.S.N.	ENV216	101314	2022/11/25	2023/11/24
Anritsu Corp	50Ω Coaxial Switch	MP59B	6100237248	2022/12/07	2023/12/06
Unknown	RF Coaxial Cable	No.17	N0350	2022/11/25	2023/11/24
Conducted Emission Test Software: e3 191218 (V9)					
Radiated Emissions Test					
Rohde & Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde & Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2023/02/14	2026/02/13
Schwarzbeck	Horn Antenna	BBHA9120D	837	2023/02/22	2026/02/21
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2022/12/26	2025/12/25
CD	Band Reject Filter	BRM-5.15/5.35g-45	075	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.15	N600	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.16	N650	2022/11/25	2023/11/24
Radiated Emission Test Software:e3 191218 (V9)					
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2022/11/25	2023/11/24
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2022/11/25	2023/11/24
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.32	RF-02	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. 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) – RF EXPOSURE

Applicable Standard

According to FCC §1.1307(b), 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.

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.4 –MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

f = frequency in MHz;
R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

Test result

For worst case:

Mode	Frequency Range (MHz)	Tune-up Output Power		Antenna Gain		ERP		Evaluation Distance (cm)	MPE-Based Exemption Threshold (W)
		(dBm)	(mW)	(dBi)	(dBd)	(dBm)	(W)		
BT	2402-2480	-1	0.79	-0.68	-2.83	-3.83	0.0004	20	0.768
2.4G Wi-Fi	2412-2462	19	79.43	3.35	1.2	20.2	0.1047	20	0.768
5G Wi-Fi	5150-5250	14.5	28.18	1.88	-0.27	14.23	0.0265	20	0.768

Note 1: The tune-up power was declared by the applicant.
Note 2: 0dBd=2.15dBi.
Note 3: The BT function can transmit at the same time with the Wi-Fi function.

Simultaneous transmitting consideration:

The ratio= MPE_{BT}/limit+$MPE_{2.4G\ Wi\text{-}Fi}$/limit=0.0004/0.768+0.1047/0.768=0.137＜1.0

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

Result: Compliant.

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 one antennas arrangement for 5G Wi-Fi, which were permanently attached to the EUT and the antenna gain is 1.88dBi, fulfill the requirement of this section. Please refer to the EUT photos.

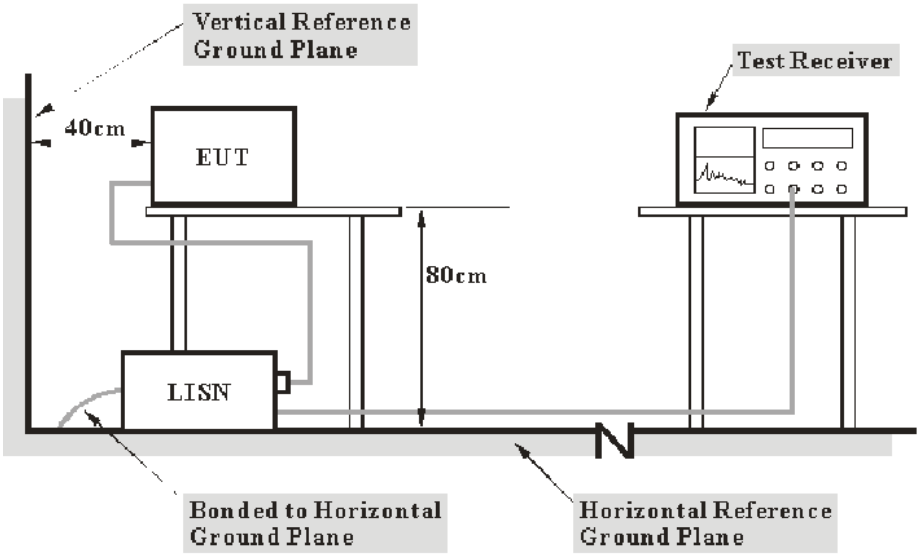
Result: Compliant.

FCC §15.407 (B) (8) §15.207 (A) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (8)

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

Test Data

Environmental Conditions

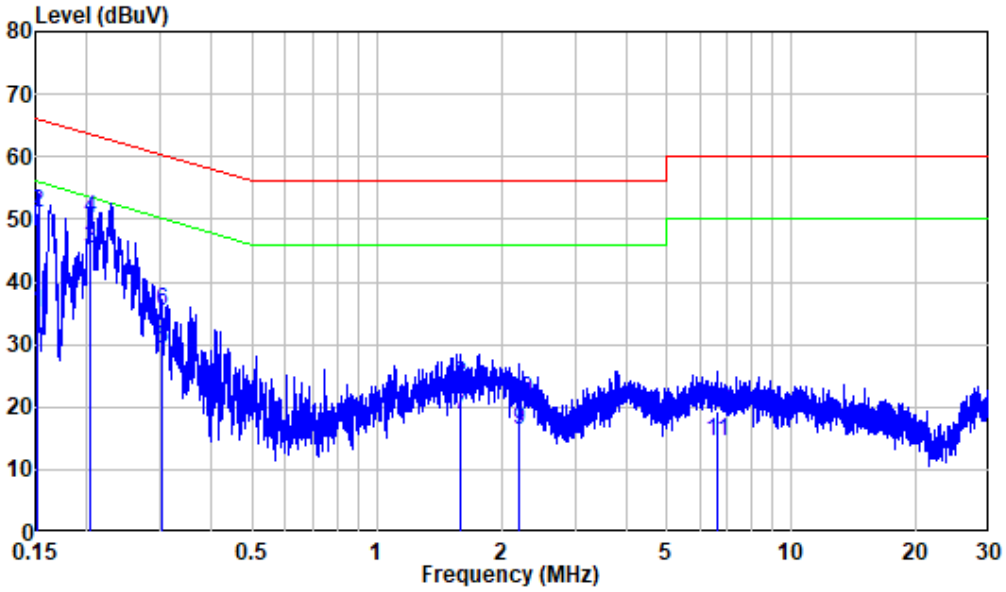
Temperature:	22 ℃
Relative Humidity:	59 %
ATM Pressure:	101.1 kPa

The testing was performed by Jerry Wu on 2023-04-26.

EUT operation mode: Full load + 5G Wi-Fi Transmite (worst case for 802.11a, 5240MHz)

Test Result: Please refer the below plots.

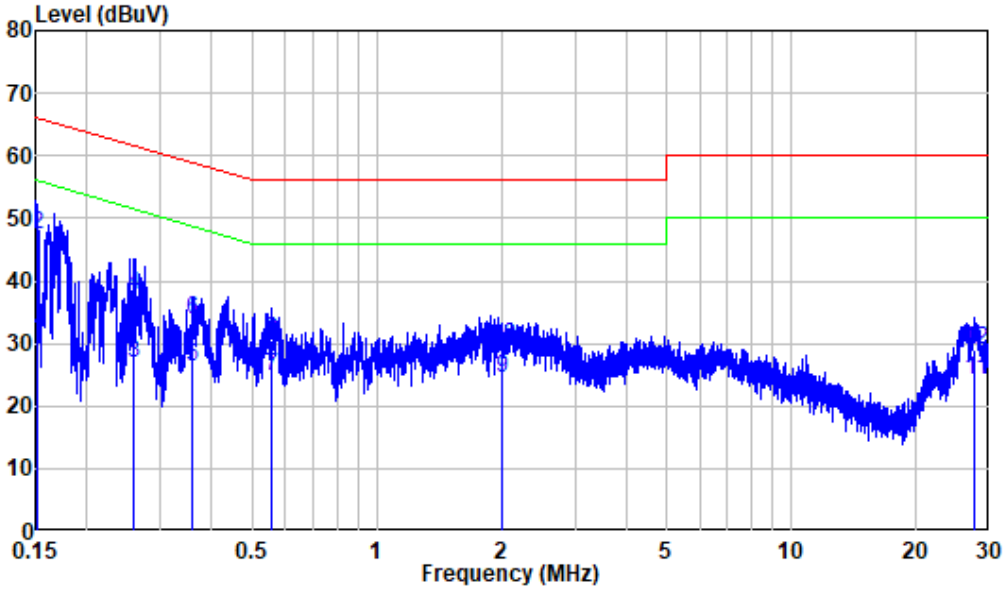
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA230324-14579-RF
Mode : Full load+5Gwifi Transmite
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.152	10.07	24.86	34.93	55.91	-20.98	Average
2	0.152	10.07	41.10	51.17	65.91	-14.74	QP
3	0.204	10.19	34.98	45.17	53.44	-8.27	Average
4	0.204	10.19	39.93	50.12	63.44	-13.32	QP
5	0.302	10.22	18.99	29.21	50.20	-20.99	Average
6	0.302	10.22	25.03	35.25	60.20	-24.95	QP
7	1.589	10.38	8.35	18.73	46.00	-27.27	Average
8	1.589	10.38	13.08	23.46	56.00	-32.54	QP
9	2.203	10.40	5.77	16.17	46.00	-29.83	Average
10	2.203	10.40	10.71	21.11	56.00	-34.89	QP
11	6.623	10.42	4.22	14.64	50.00	-35.36	Average
12	6.623	10.42	9.02	19.44	60.00	-40.56	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : RA230324-14579-RF
Mode : Full load+5Gwifi Transmite
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	9.67	20.69	30.36	55.92	-25.56	Average
2	0.151	9.67	37.59	47.26	65.92	-18.66	QP
3	0.259	9.70	17.07	26.77	51.46	-24.69	Average
4	0.259	9.70	28.13	37.83	61.46	-23.63	QP
5	0.360	9.73	16.53	26.26	48.73	-22.47	Average
6	0.360	9.73	24.05	33.78	58.73	-24.95	QP
7	0.556	9.77	14.86	24.63	46.00	-21.37	Average
8	0.556	9.77	20.70	30.47	56.00	-25.53	QP
9	2.001	9.80	14.77	24.57	46.00	-21.43	Average
10	2.001	9.80	19.76	29.56	56.00	-26.44	QP
11	27.708	10.06	13.97	24.03	50.00	-25.97	Average
12	27.708	10.06	18.90	28.96	60.00	-31.04	QP

FCC §15.205 & §15.209 & §15.407(B) (1), (8), (9), (10) – UNDESIRABLE EMISSION

Applicable Standard

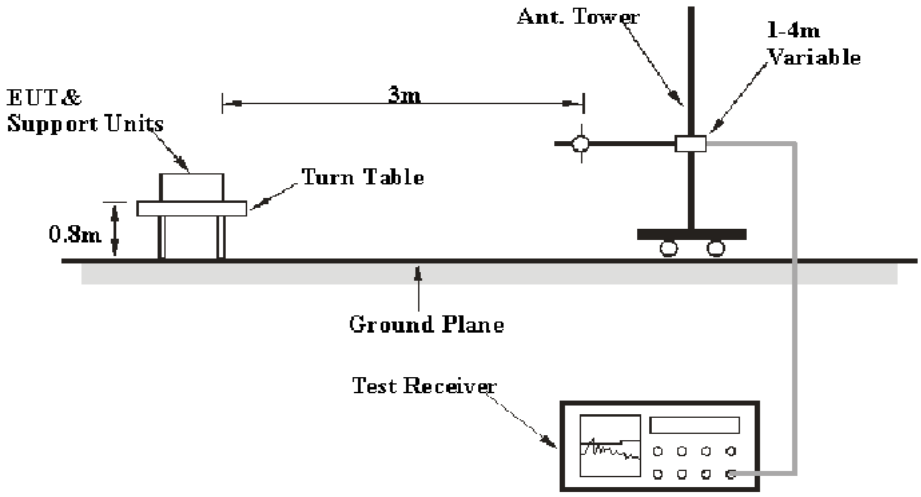
FCC §15.407 (b) (1), (7), (8), (9), (10); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b) (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

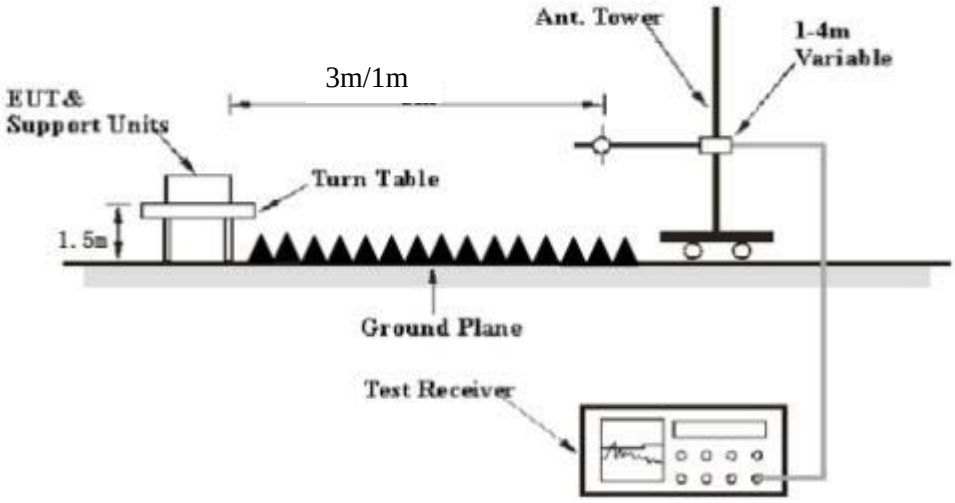
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



Note: 1-18GHz tested @3m, 18-40GHz tested @1m.

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.

EMI Test Receiver & Spectrum Analyzer Setup

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

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

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

If the maximized peak measured value complies with the limit, then it is unnecessary to perform QP/Average measurement.

Test Procedure

Radiated Spurious Emission

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-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

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:	23-24℃
Relative Humidity:	57-58 %
ATM Pressure:	101.0 kPa

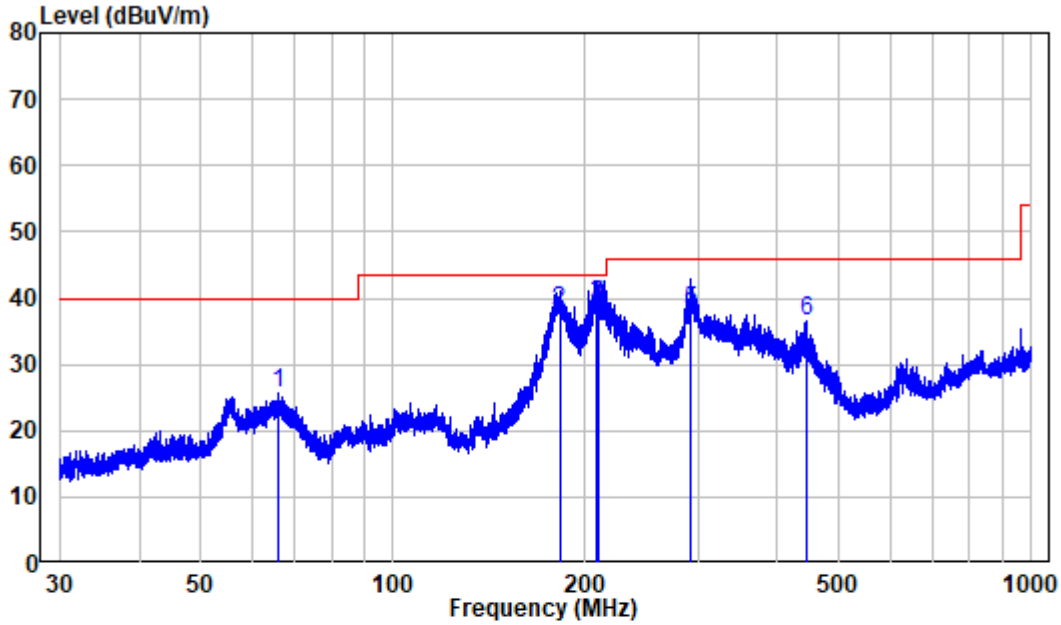
The testing was performed by Jason Liu on 2023-05-10 for below 1GHz and on 2023-04-10 for above 1GHz.

EUT operation mode: Full load + 5G Wi-Fi Transmite or 5G WIFI Transmitting

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

30 MHz~1 GHz: (worst case for 802.11a, 5240MHz)

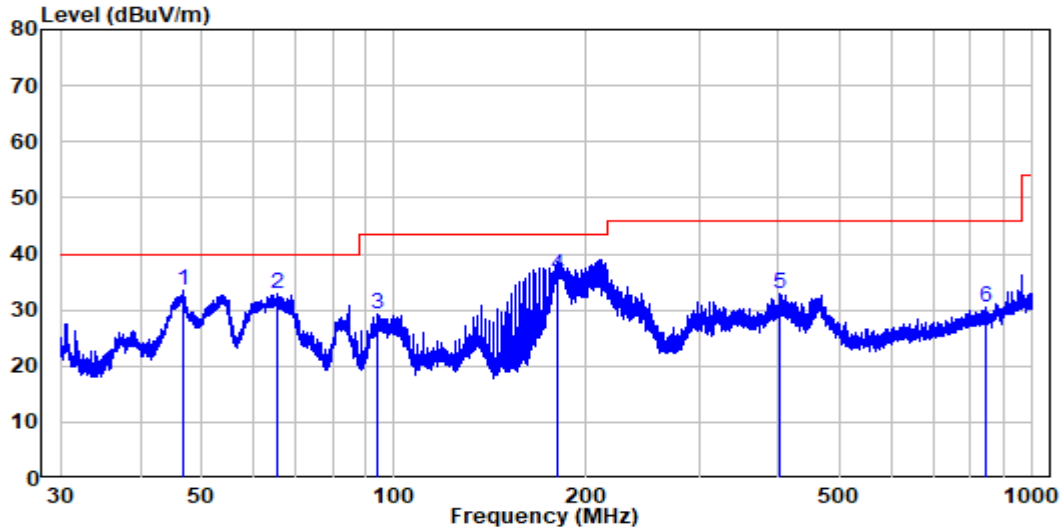
Horizontal:



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230324-14579E-RF
Test Mode: Full load+5Gwifi Transmite

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	66.063	-12.98	38.73	25.75	40.00	-14.25	Peak
2	182.239	-12.43	50.40	37.97	43.50	-5.53	QP
3	207.759	-12.03	51.01	38.98	43.50	-4.52	QP
4	209.956	-12.06	51.11	39.05	43.50	-4.45	QP
5	292.571	-9.23	47.21	37.98	46.00	-8.02	QP
6	443.294	-5.37	41.87	36.50	46.00	-9.50	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA230324-14579E-RF
Test Mode: Full load+5Gwifi Transmite

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	46.830	-10.07	43.45	33.38	40.00	-6.62	Peak
2	65.774	-12.86	45.75	32.89	40.00	-7.11	Peak
3	94.304	-12.72	41.93	29.21	43.50	-14.29	Peak
4	180.649	-12.61	48.71	36.10	43.50	-7.40	QP
5	400.783	-6.33	39.23	32.90	46.00	-13.10	Peak
6	848.056	0.78	29.80	30.58	46.00	-15.42	Peak

5150-5250MHz

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)				
802.11 A, Low Channel									
4500	58.01	PK	334	1.9	H	-6.44	51.57	74	-22.43
4500	58.81	PK	334	1.9	V	-6.44	52.37	74	-21.63
5150	57.39	PK	168	1.9	H	-4.91	52.48	74	-21.52
5150	58.72	PK	156	1.7	V	-4.91	53.81	74	-20.19
10360	46.37	PK	201	1.8	H	5.36	51.73	68.2	-16.47
10360	46.93	PK	269	1.5	V	8.12	55.05	68.2	-13.15
802.11 A, Middle Channel									
10400	46.88	PK	98	1.9	H	5.66	52.54	68.2	-15.66
10400	45.68	PK	338	1.6	V	5.66	51.34	68.2	-16.86
802.11 A, High Channel									
5350	58.32	PK	191	1.3	H	-3.89	54.43	74	-19.57
5350	45.50	AVG	262	1.6	H	-3.89	41.61	54	-12.39
5350	58.38	PK	262	1.6	V	-3.89	54.49	74	-19.51
5350	44.63	AVG	136	1.1	V	-3.89	40.74	54	-13.26
5460	59.03	PK	224	1.1	H	-3.24	55.79	74	-18.21
5460	45.30	AVG	39	1.7	H	-3.24	42.06	54	-11.94
5460	57.83	PK	39	1.7	V	-3.24	54.59	74	-19.41
5460	44.16	AV	217	1.9	V	-3.24	40.92	54	-13.08
10480	46.29	PK	84	1.5	H	5.52	51.81	68.2	-16.39
10480	46.12	PK	72	1.2	V	5.52	51.64	68.2	-16.56
802.11 N20, Low Channel									
4500	57.72	PK	217	1.9	H	-6.44	51.28	74	-22.72
4500	57.20	PK	84	1.5	V	-6.44	50.76	74	-23.24
5150	56.91	PK	72	1.2	H	-4.91	52.00	74	-22.00
5150	56.87	PK	192	1.8	V	-4.91	51.96	74	-22.04
10360	46.19	PK	345	1.1	H	5.36	51.55	68.2	-16.65
10360	47.37	PK	218	1.4	V	5.36	52.73	68.2	-15.47
802.11 N20, Middle Channel									
10400	45.62	PK	7	1.8	H	5.66	51.28	68.2	-16.92
10400	47.03	PK	241	1.9	V	5.66	52.69	68.2	-15.51
802.11 N20, High Channel									
5350	57.74	PK	175	1.7	H	-3.89	53.85	74	-20.15
5350	58.17	PK	288	1.0	V	-3.89	54.28	74	-19.72
5350	45.50	AVG	146	1.0	V	-3.89	41.61	54	-12.39
5460	56.93	PK	42	1.2	H	-3.24	53.69	74	-20.31
5460	58.26	PK	98	2.0	V	-3.24	55.02	74	-18.98
5460	44.30	AVG	346	1.2	V	-3.24	41.06	54	-12.94
10480	45.40	PK	349	1.3	H	5.52	50.92	68.2	-17.28
10480	46.28	PK	250	1.1	V	5.52	51.80	68.2	-16.40

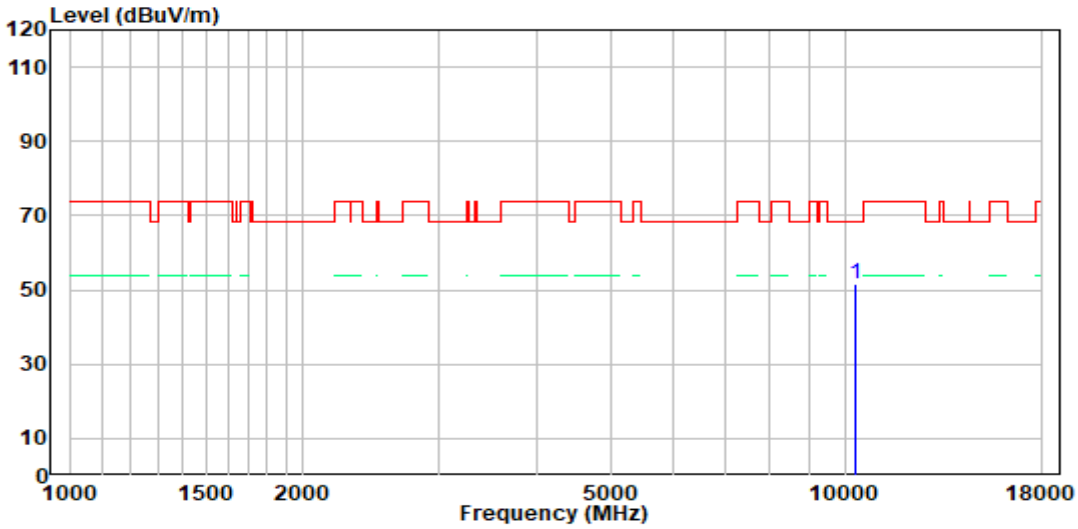
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11N40, Low Channel									
4500	58.23	PK	209	2.2	H	-6.44	51.79	74	-22.21
4500	57.15	PK	214	2.2	V	-6.44	50.71	74	-23.29
5150	59.75	PK	15	1.7	H	-4.91	54.84	74	-19.16
5150	48.60	AV	33	1.2	H	-4.91	43.69	54	-10.31
5150	57.00	PK	292	1.1	V	-4.91	52.09	74	-21.91
10380	45.40	PK	48	1.4	H	5.51	50.91	68.2	-17.29
10380	46.03	PK	5	1.3	V	5.51	51.54	68.2	-16.66
802.11N40, High Channel									
5350	57.88	PK	344	2.1	H	-3.89	53.99	74	-20.01
5350	57.31	PK	279	1.4	V	-3.89	53.42	74	-20.58
5460	57.32	PK	144	1.5	H	-3.24	54.08	74	-19.92
5460	46.30	AV	238	2.0	H	-3.24	43.06	54	-10.94
5460	58.49	PK	137	1.3	V	-3.24	55.25	74	-18.75
5460	45.70	AV	254	1.3	V	-3.24	42.46	54	-11.54
10460	46.40	PK	203	1.1	H	5.51	51.91	68.2	-16.29
10460	45.26	PK	254	1.4	V	5.51	50.77	68.2	-17.43

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.
When the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, just peak value was recorded.

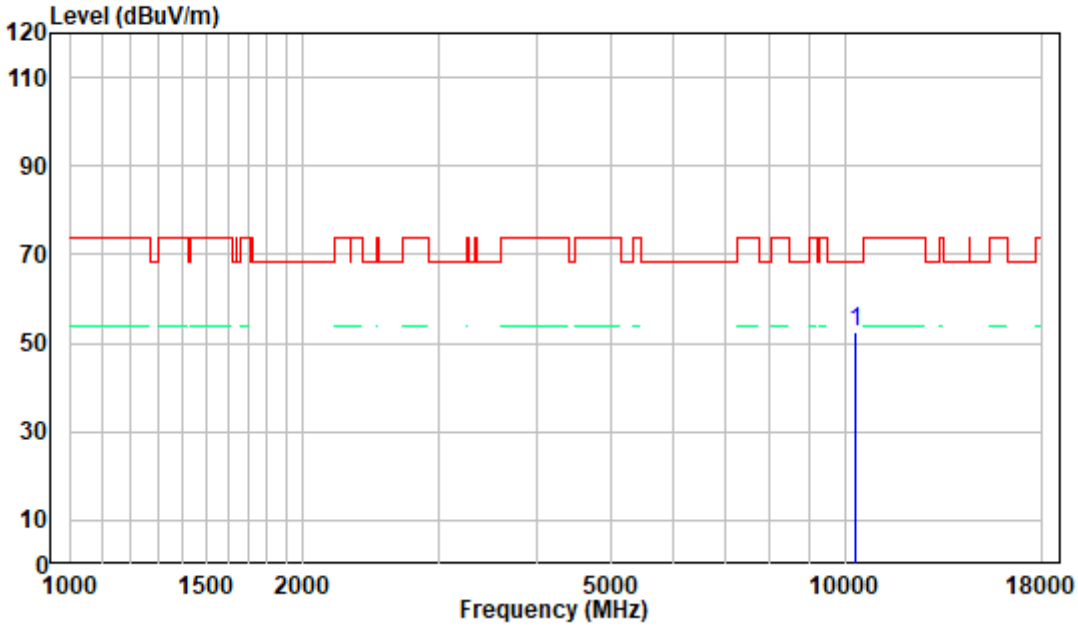
1-18 GHz (Worst case):

Pre-scan plots:

802.11a, 5180MHz
Horizontal



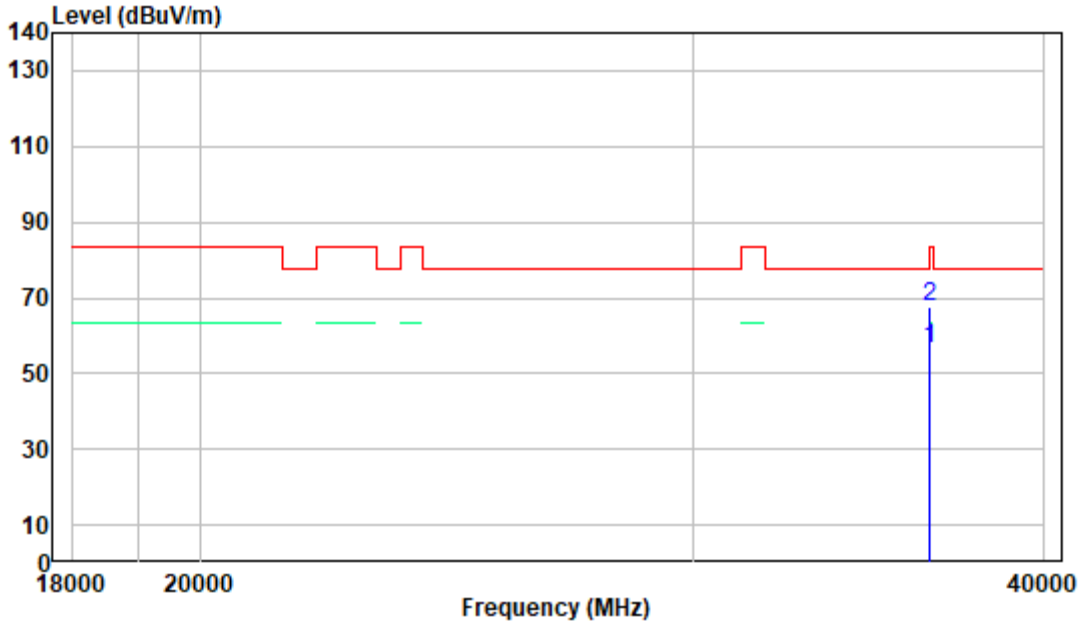
Vertical



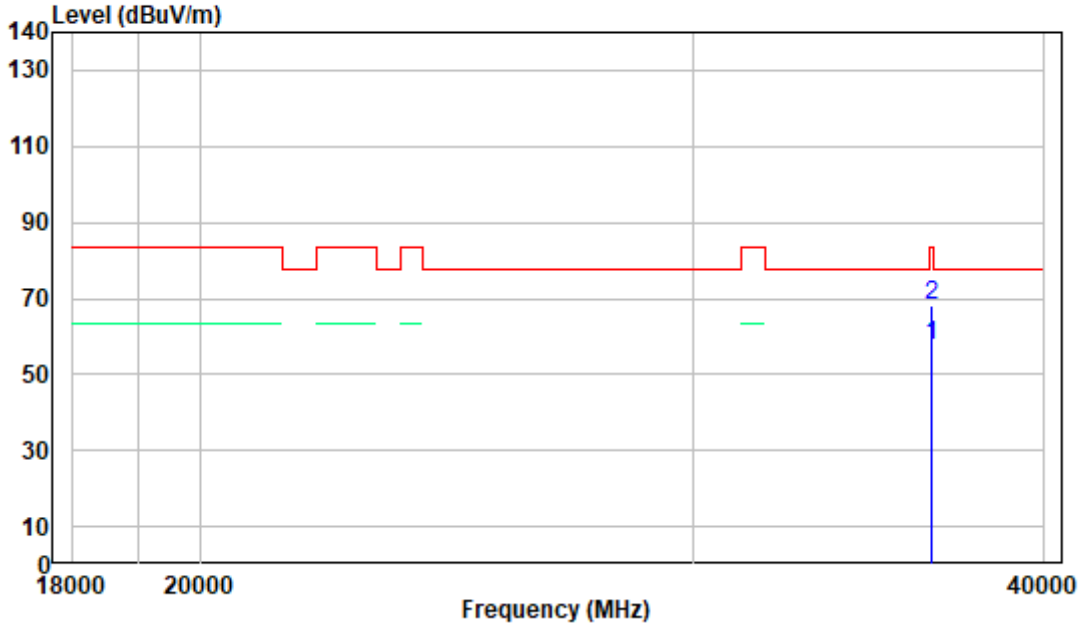
18-40 GHz (Worst case):

Pre-scan plots:

802.11a, 5180MHz
Horizontal



Vertical



FCC §15.407(a) – 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. **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.

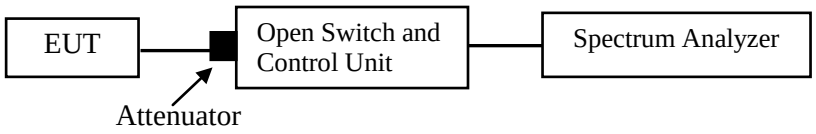
3. **99% Occupied Bandwidth**

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:	24 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Bob Liao on 2023-04-13.

EUT operation mode: Transmitting

Test Result: PASS. Please refer to the Appendix.

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

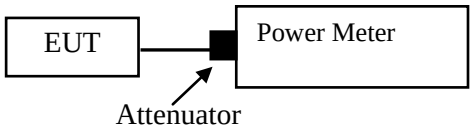
Applicable Standard

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure

According to KDB789033 D02 section II.E.3.b).

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



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Bob Liao on 2023-04-13.

EUT operation mode: Transmitting

Test Result: PASS. Please refer to the Appendix.

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

Applicable Standard

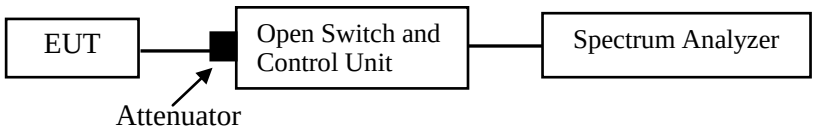
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure

According to KDB789033 D02 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 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:	24 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Bob Liao on 2023-05-31.

EUT operation mode: Transmitting

Test Result: PASS. Please refer to the Appendix.

APPENDIX

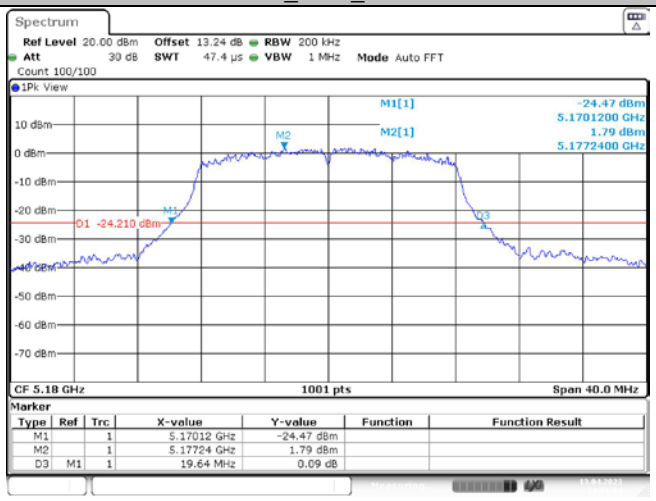
Appendix A1: Emission Bandwidth

Test Result

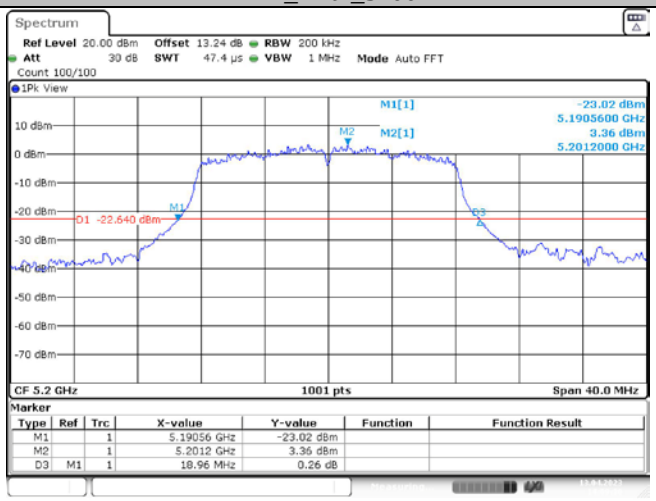
Test Mode	Antenna	Freq(MHz)	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	19.64	5170.12	5189.76	---	PASS
		5200	18.96	5190.56	5209.52	---	PASS
		5240	19.12	5230.40	5249.52	---	PASS
11N20SISO	Ant1	5180	20.32	5169.72	5190.04	---	PASS
		5200	20.16	5190.00	5210.16	---	PASS
		5240	20.00	5229.92	5249.92	---	PASS
11N40SISO	Ant1	5190	38.40	5170.80	5209.20	---	PASS
		5230	38.48	5210.88	5249.36	---	PASS

Test Graphs

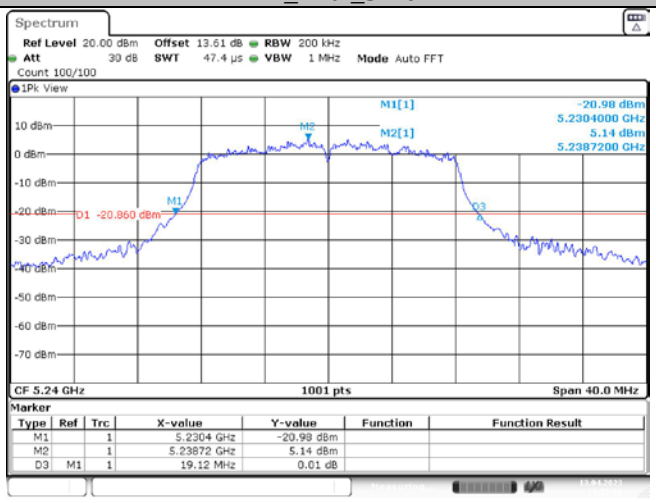
11A_Ant1_5180



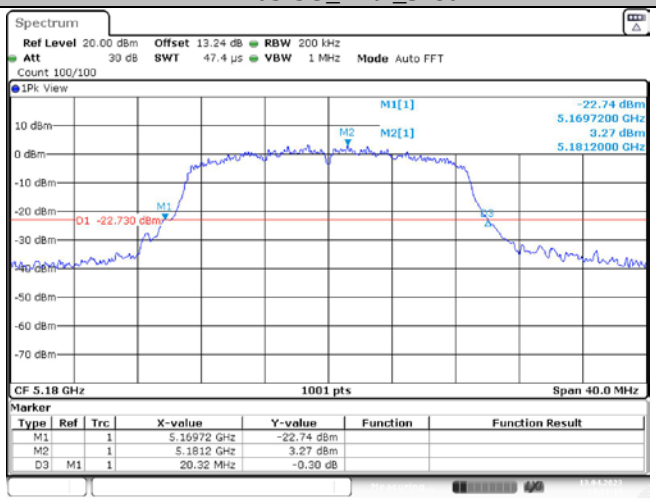
11A_Ant1_5200



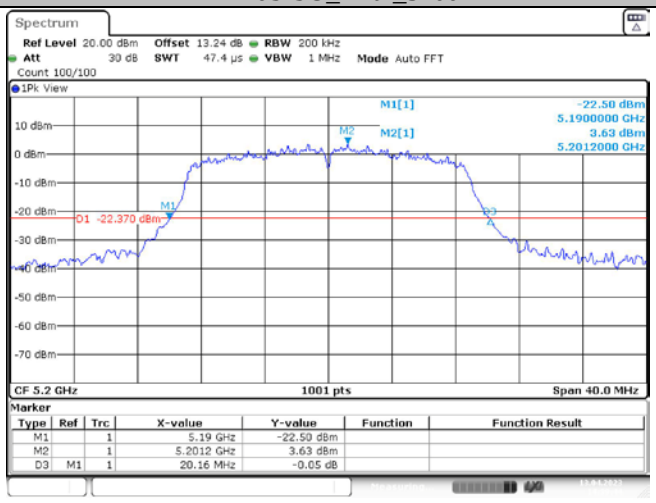
11A_Ant1_5240



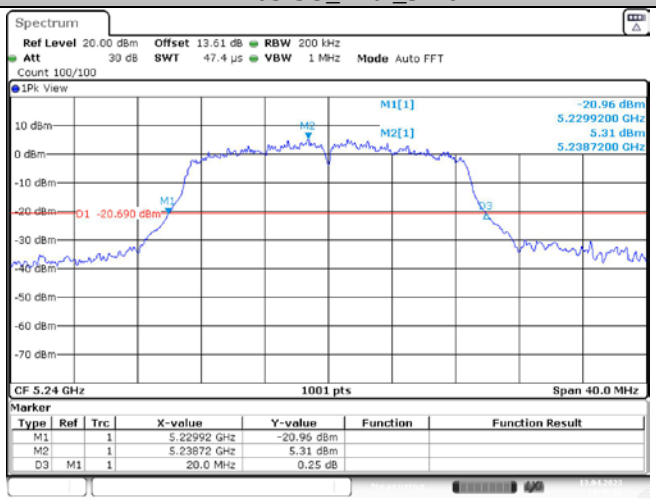
11N20SISO_Ant1_5180



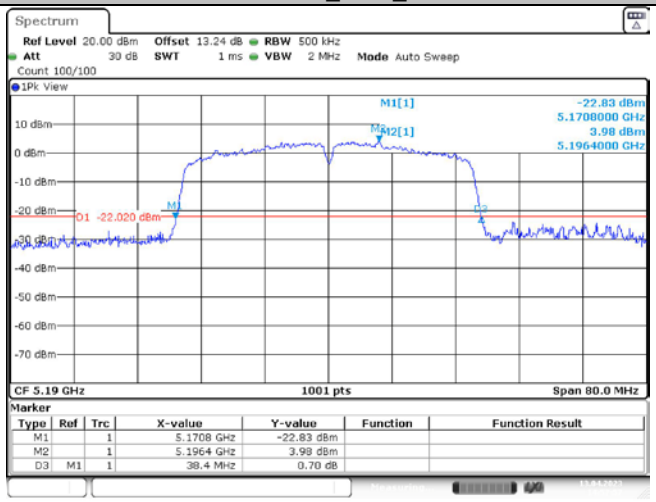
11N20SISO_Ant1_5200



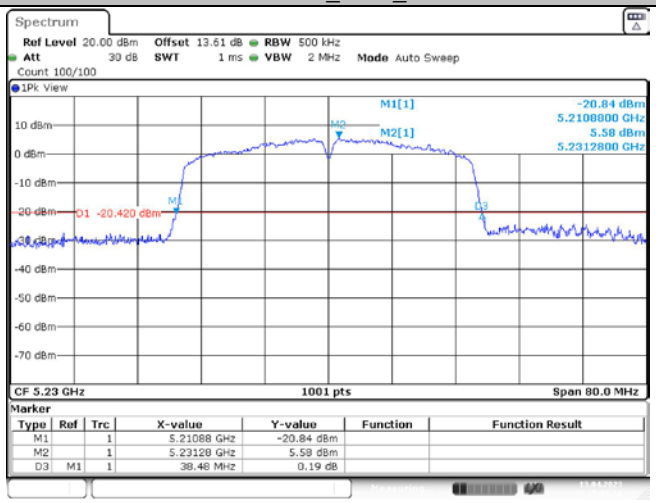
11N20SISO_Ant1_5240



11N40SISO_Ant1_5190



11N40SISO_Ant1_5230



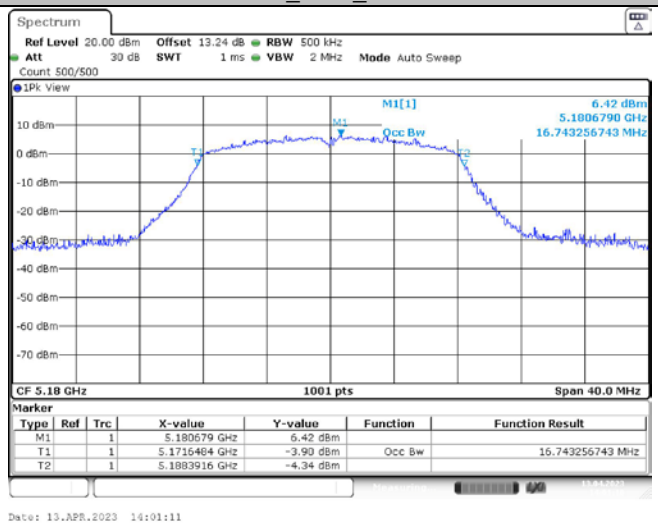
Appendix A2: Occupied Channel Bandwidth

Test Result

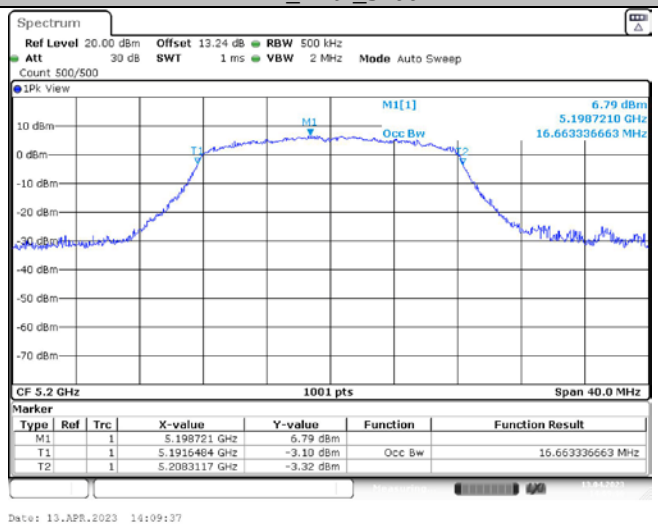
Test Mode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	16.743	5171.6484	5188.3916	No transmitted signal in the 99% bandwidth extends into the U-NII-2A band	PASS
		5200	16.663	5191.6484	5208.3117		PASS
		5240	16.703	5231.6084	5248.3117		PASS
11N20SISO	Ant1	5180	17.822	5171.0889	5188.9111		PASS
		5200	17.742	5191.1688	5208.9111		PASS
		5240	17.742	5231.1289	5248.8711		PASS
11N40SISO	Ant1	5190	35.325	5172.4176	5207.7423		PASS
		5230	35.325	5212.4176	5247.7423		PASS

Test Graphs

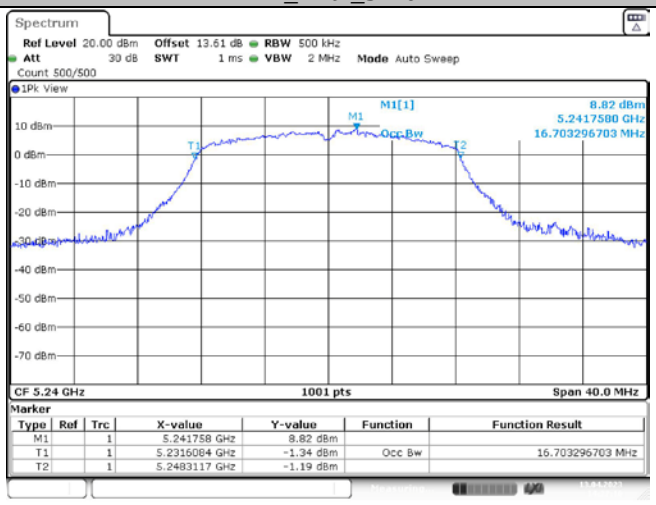
11A_Ant1_5180



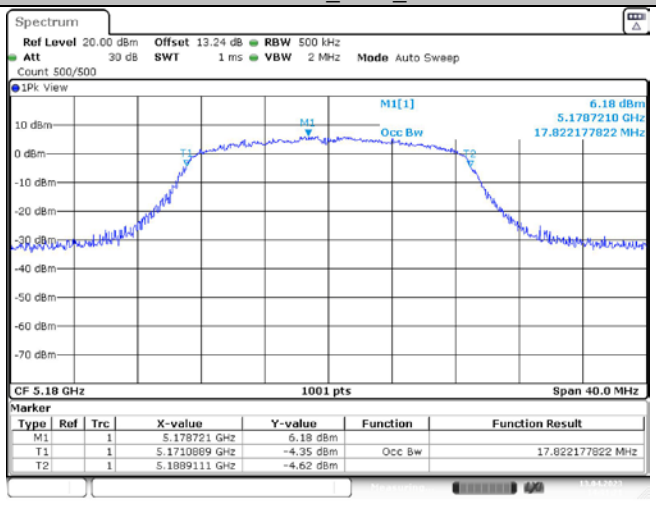
11A_Ant1_5200



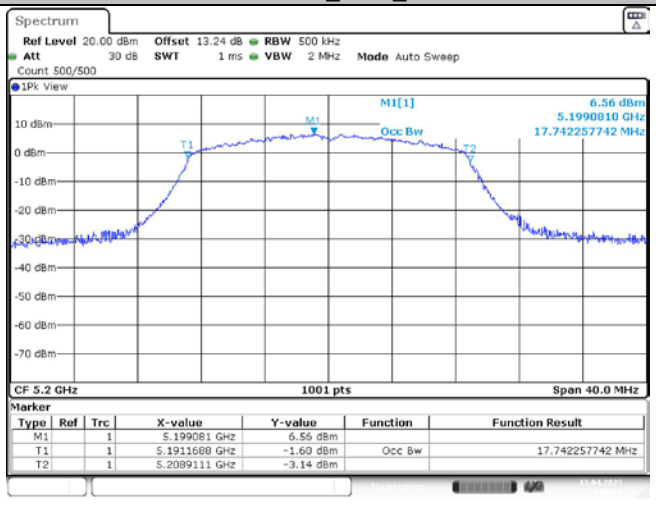
11A_Ant1_5240



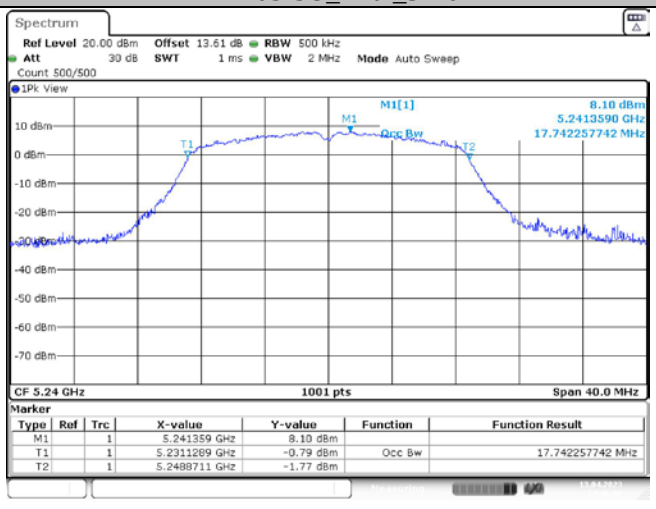
11N20SISO_Ant1_5180



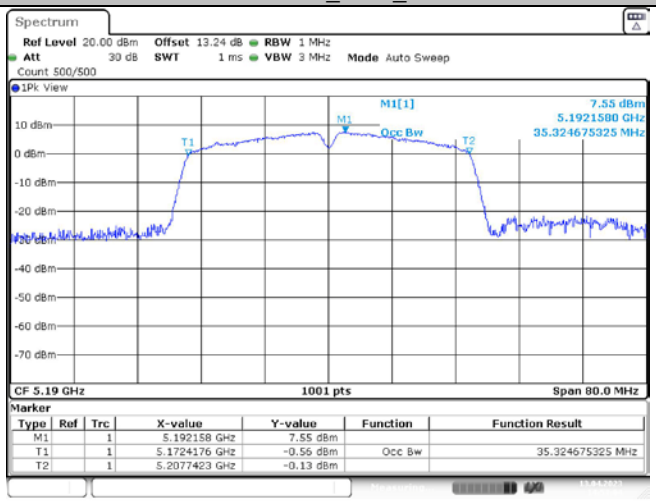
11N20SISO_Ant1_5200



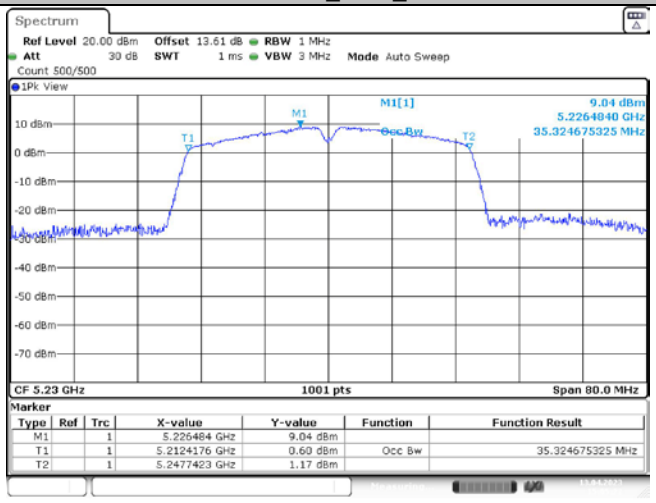
11N20SISO_Ant1_5240



11N40SISO_Ant1_5190



11N40SISO_Ant1_5230



Appendix B: Maximum Conducted Average Output Power

Test Result

Test Mode	Antenna	Channel	Conducted output power [dBm]	Limit[dBm]	Verdict
11A	Ant1	5180	12.25	≤23.98	PASS
		5200	12.55	≤23.98	PASS
		5240	**14.13**	≤23.98	PASS
11N20SISO	Ant1	5180	12.09	≤23.98	PASS
		5200	12.38	≤23.98	PASS
		5240	**14.06**	≤23.98	PASS
11N40SISO	Ant1	5190	12.54	≤23.98	PASS
		5230	**13.77**	≤23.98	PASS

Appendix C: Maximum Power Spectral Density

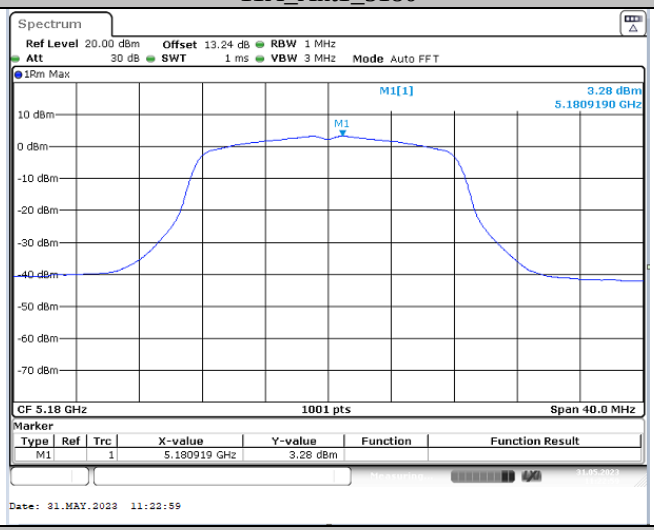
Test Result

Test Mode	Antenna	Freq(MHz)	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	3.28	<=11	PASS
		5200	3.09	<=11	PASS
		5240	4.52	<=11	PASS
11N20SISO	Ant1	5180	3.06	<=11	PASS
		5200	2.91	<=11	PASS
		5240	4.40	<=11	PASS
11N40SISO	Ant1	5190	0.42	<=11	PASS
		5230	1.21	<=11	PASS

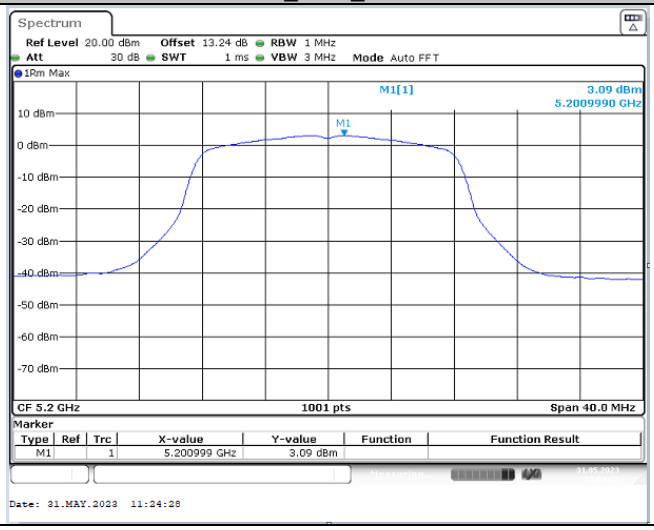
Note: the duty cycle not constant, method SA-3 was used

Test Graphs

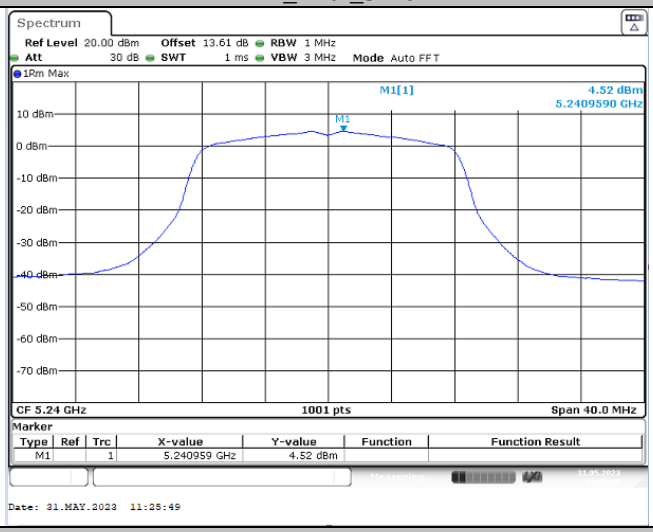
11A_Ant1_5180



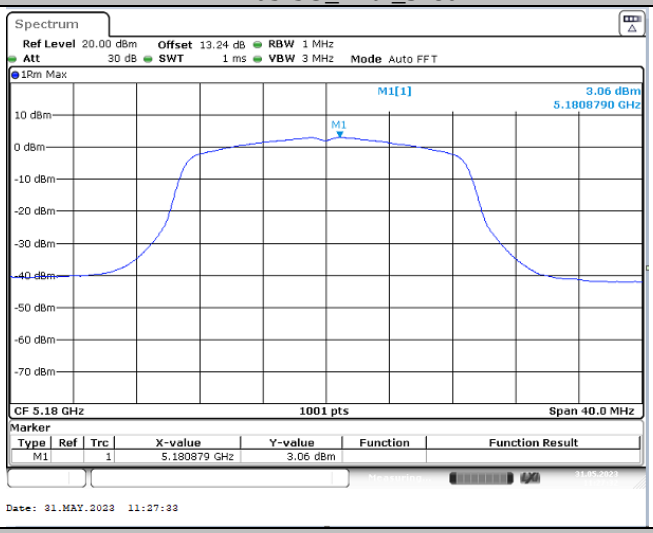
11A_Ant1_5200



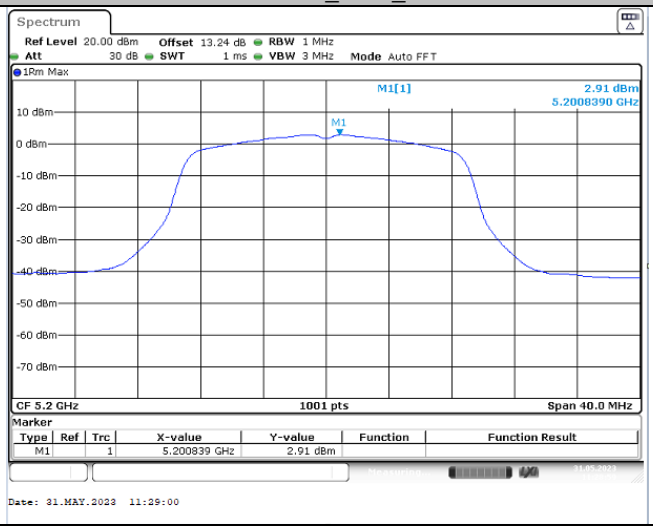
11A_Ant1_5240



11N20SISO_Ant1_5180



11N20SISO_Ant1_5200



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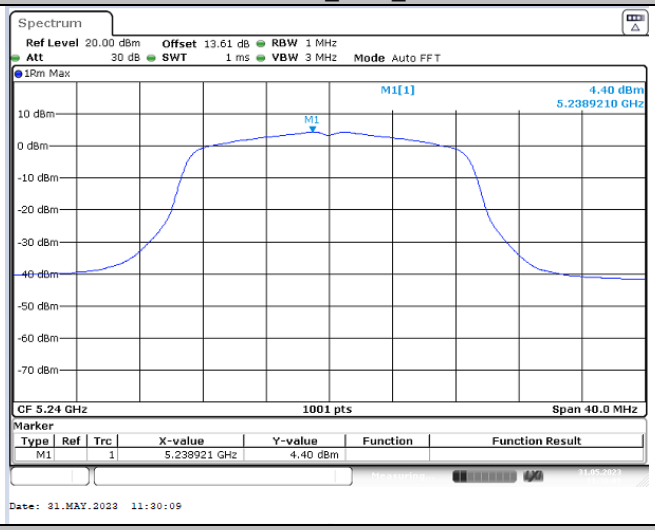
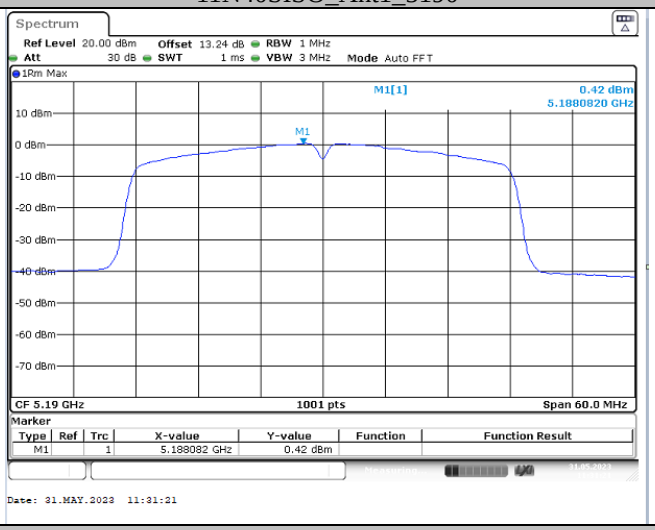
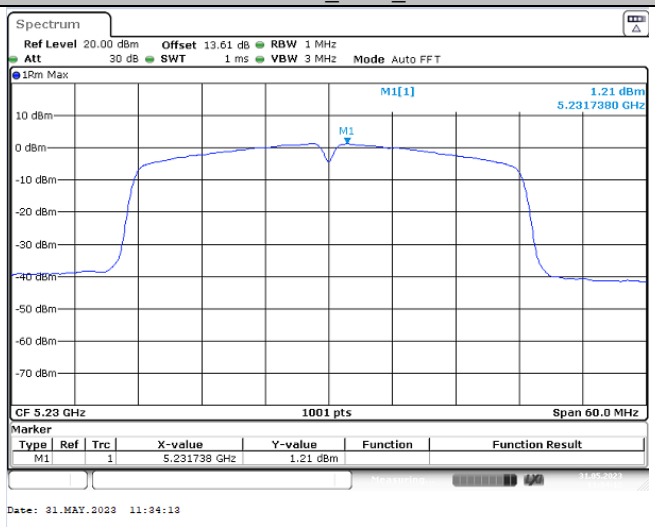


11N40SISO_Ant1_5190



11N40SISO_Ant1_5230



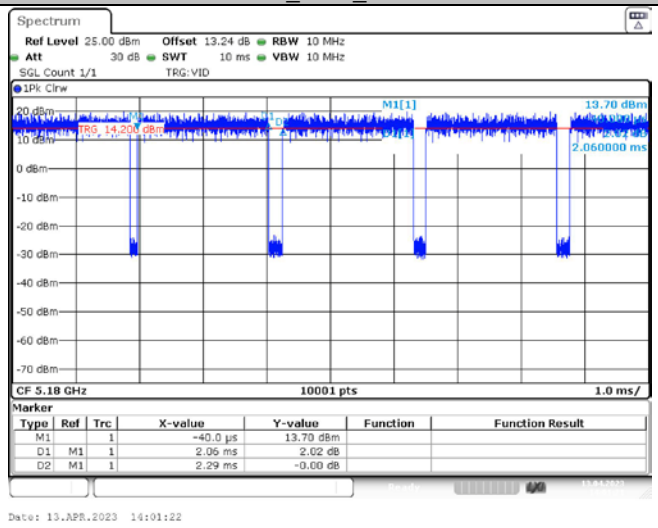
Appendix D: Duty Cycle

Test Result

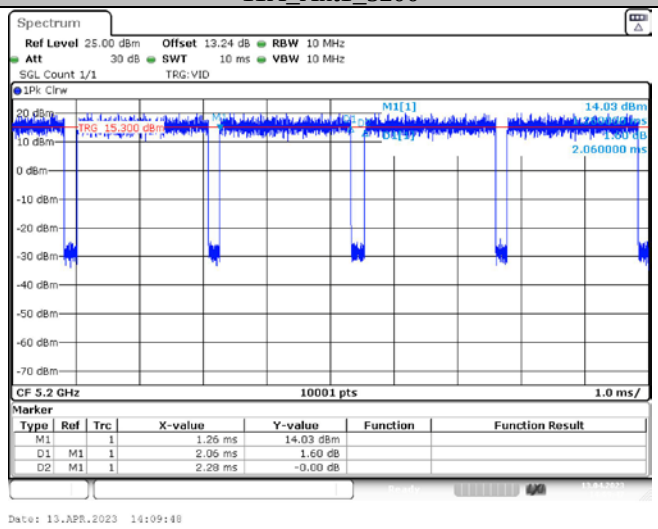
Test Mode	Antenna	Freq(MHz)	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T minimum VBW setting(kHz)
11A	Ant1	5180	2.06	2.29	Not Constant	0.49
		5200	2.06	2.28	Not Constant	0.49
		5240	2.07	2.30	Not Constant	0.48
11N20SISO	Ant1	5180	1.92	2.13	Not Constant	0.52
		5200	1.92	2.10	Not Constant	0.52
		5240	1.92	2.13	Not Constant	0.52
11N40SISO	Ant1	5190	0.95	1.18	Not Constant	1.05
		5230	0.95	1.15	Not Constant	1.05

Test Graphs

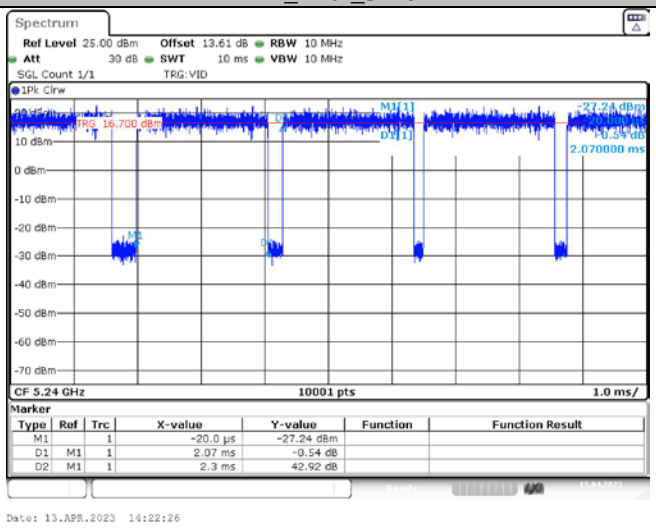
11A_Ant1_5180



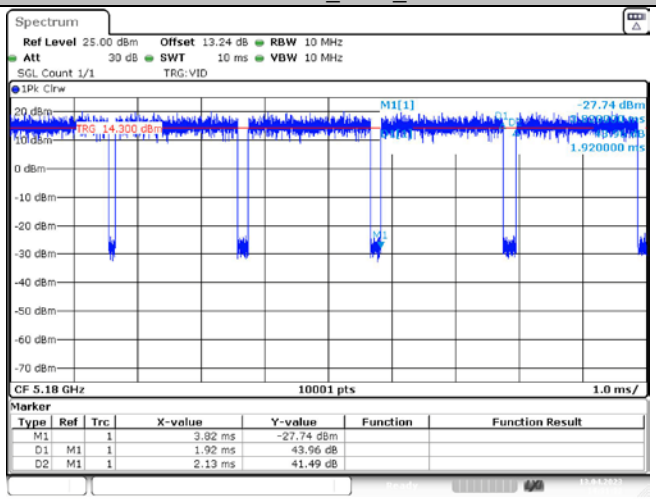
11A_Ant1_5200



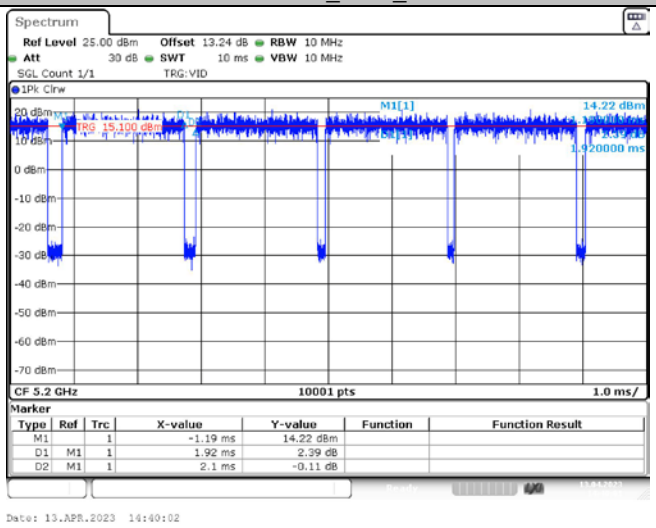
11A_Ant1_5240



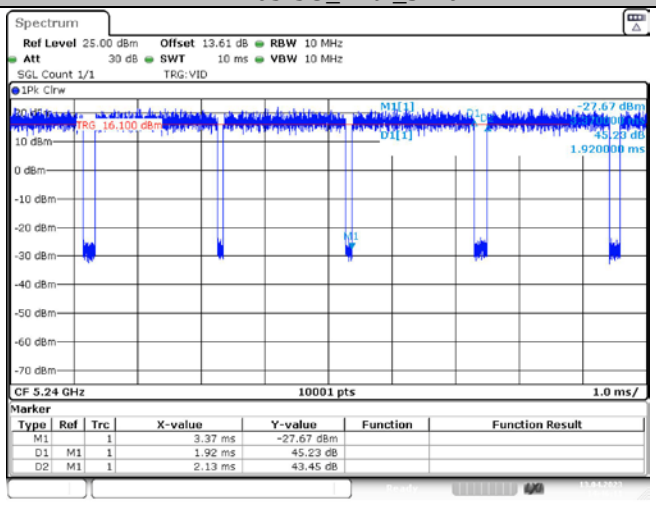
11N20SISO_Ant1_5180



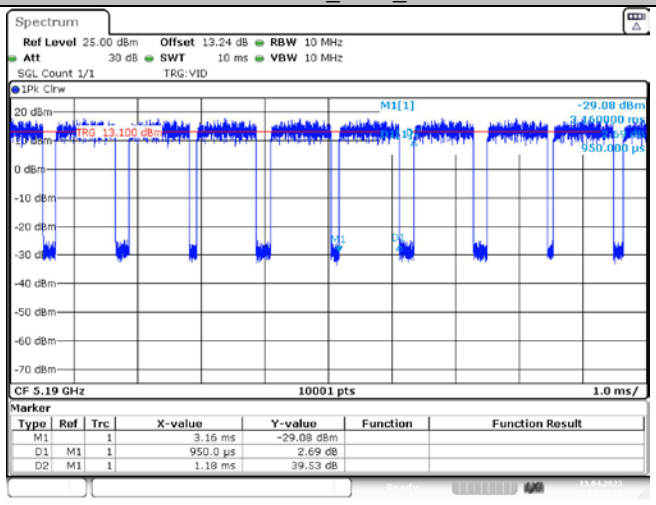
11N20SISO_Ant1_5200



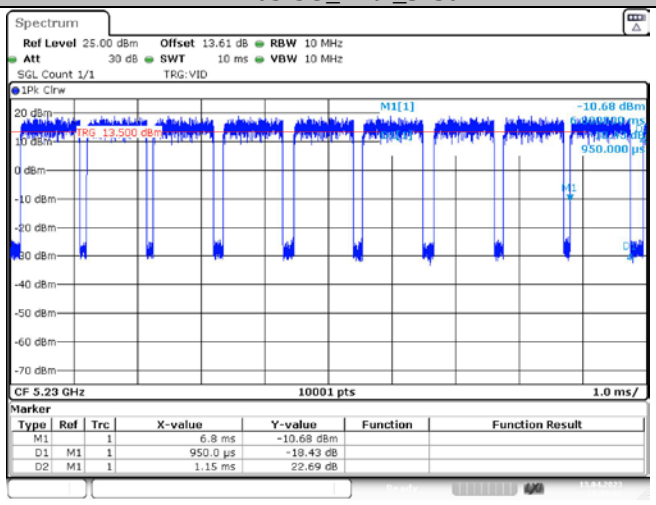
11N20SISO_Ant1_5240



11N40SISO_Ant1_5190



11N40SISO_Ant1_5230



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