TEST REPORT

Applicant Name :	American Tack&Hardware Co., Inc
Address :	250 Boulder DriveSuite 100 Breinigsville, Pennsylvania United States 18031
Report Number :	SZNS211025-54681E-RF-00
FCC ID:	XDE-TAPE10RCWF

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	WIFI ENABLED RGB/CCT LED LIGHT STRIP
Model No.:	TAPE10RCWF-T
Multiple Model(s) No.:	N/A
Date Received:	2021/10/25
Date of Test:	2021/11/05~2021/11/24
Report Date:	2021/11/25

Test Result:	Pass*

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

Prepared and Checked By:

Ting Lv

EMC Engineer

Approved By:

Candy Li

EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★ ".

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	Wi-Fi: 2412-2472MHz
Maximum Conducted Peak Output Power	Wi-Fi: 802.11b: 15.96dBm, 802.11g: 14.77dBm, 802.11n-HT20: 13.51dBm, 802.11n-HT40: 11.54dBm
Modulation Technique	Wi-Fi: DSSS, OFDM
Antenna Specification*	Internal Antenna: 1.3 dBi(provided by the applicant)
Voltage Range	DC 12V from adapter
Sample serial number	SZNS211025-54681E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter Information	Model: CW1202000USG Input: AC100-240V 50/60Hz 0.8A Max Output: DC 12V, 2000mA

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 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 KDB 558074 D01 15.247 Meas Guidance v05r02.

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 Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
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 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 mode, total 13 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

802.11b, 802.11g and 802.11n-HT20 mode was tested with Channel 1, 7 and 13.

802.11n-HT40 mode was tested with Channel 3, 7 and 11.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

"wifi test tool"* Software was used to test and power level as below:

Item	Mode	Data Rate	Power Level*
2.4G Wi-Fi	802.11 b	1Mbps	default
	802.11 g	6 Mbps	default
	802.11 n20	MCS0	default
	802.11 n40	MCS0	default

The sofeware and power level was provided by applicant.

Duty cycle

Test Result: Compliant. Please refer to the Appendix Wi-Fi.

Support Equipment List and Details

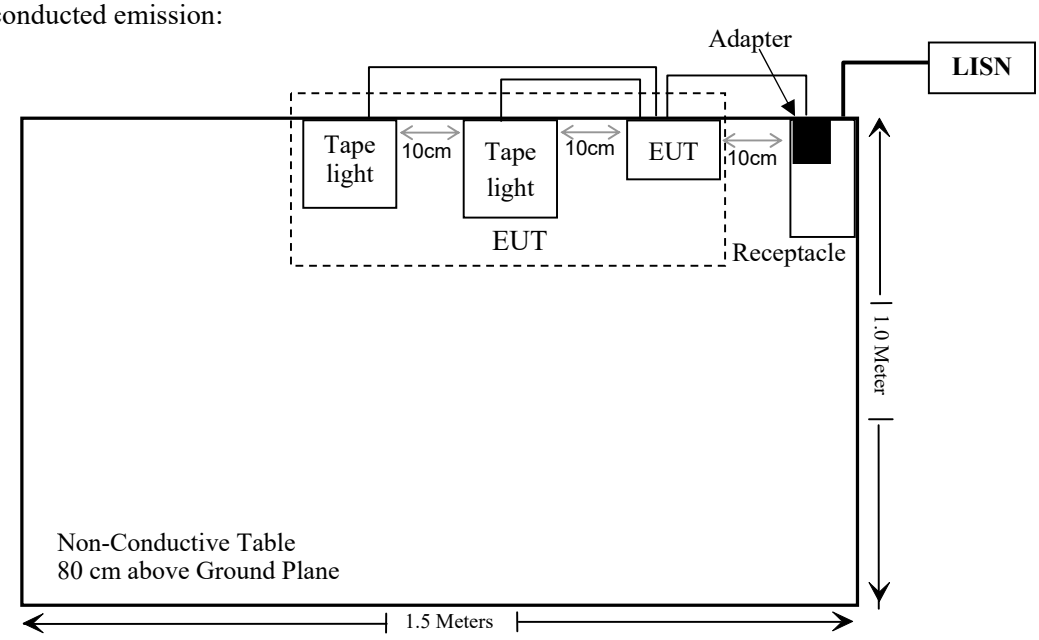
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

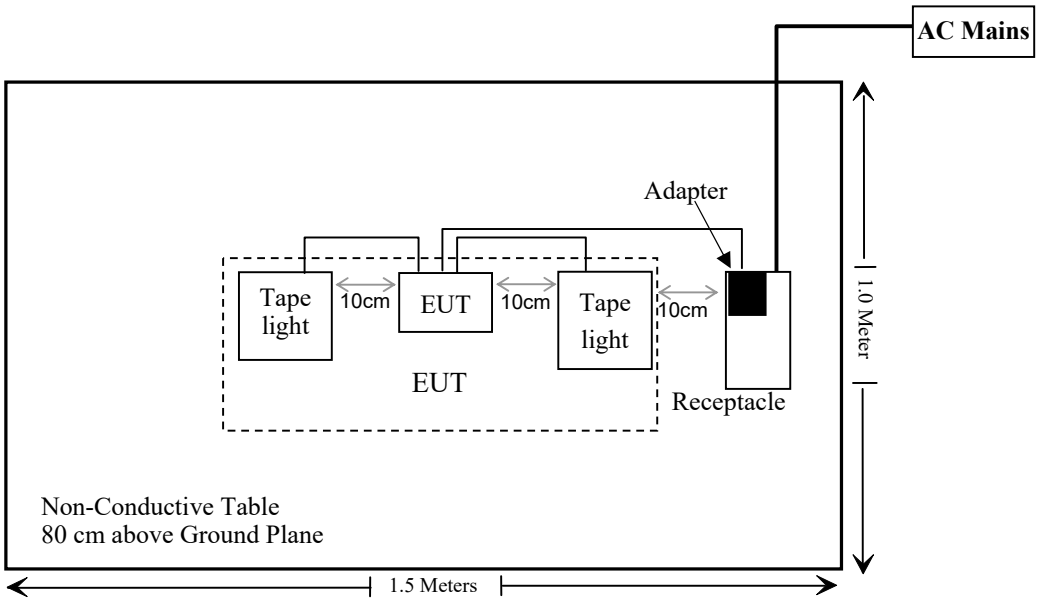
Cable Description	Length (m)	From Port	To
Unshield detachable DC Cable	1.5	Adapter	EUT

Block Diagram of Test Setup

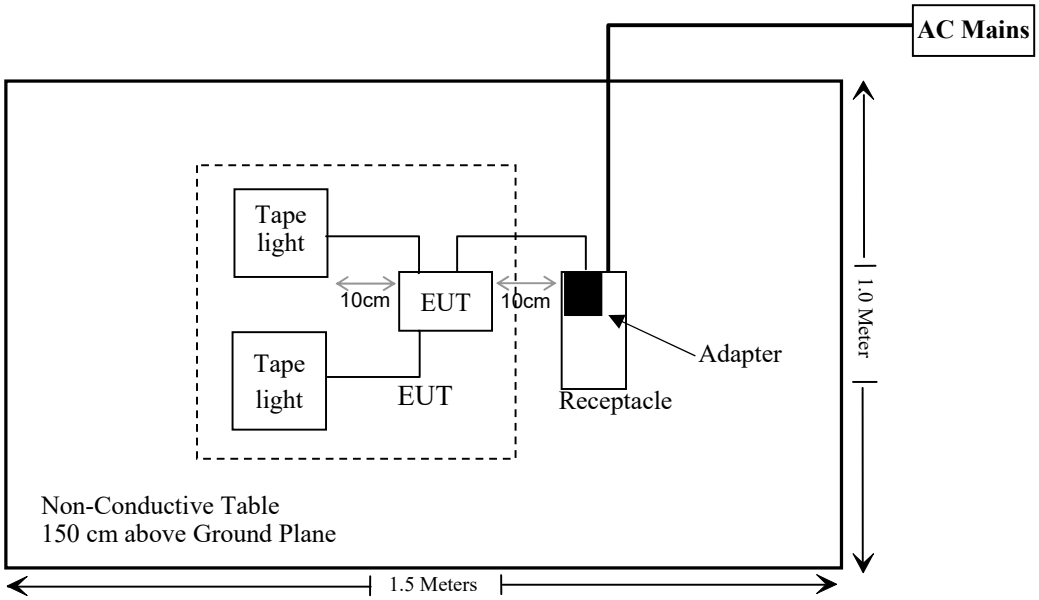
For conducted emission:



For Radiated emission(Below 1GHz):



For Radiated emission(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth & Occupied Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
R & S	L.I.S.N.	ENV216	101314	2020/12/25	2021/12/24
Anritsu Corp	50ΩCoaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-2m	No.2	2020/12/25	2021/12/24
Conducted Emission Test Software: e3 19821G (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2021/07/08	2022/07/07
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/28	2021/11/27
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Radiated Emission Test Software: e3 19821G (V9)					
Unknown	RF Coaxial Cable	N-5m	No.3	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-5m	No.4	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.5	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.6	2020/12/25	2021/12/24
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2020/12/25	2021/12/24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
Tonscend	RF Control Unit	JS0806-2	19G8060182	2021/07/06	2022/07/05

*** 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 §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2472	1.3	1.35	16.5	44.67	20	0.012	1

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.

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 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 1.3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

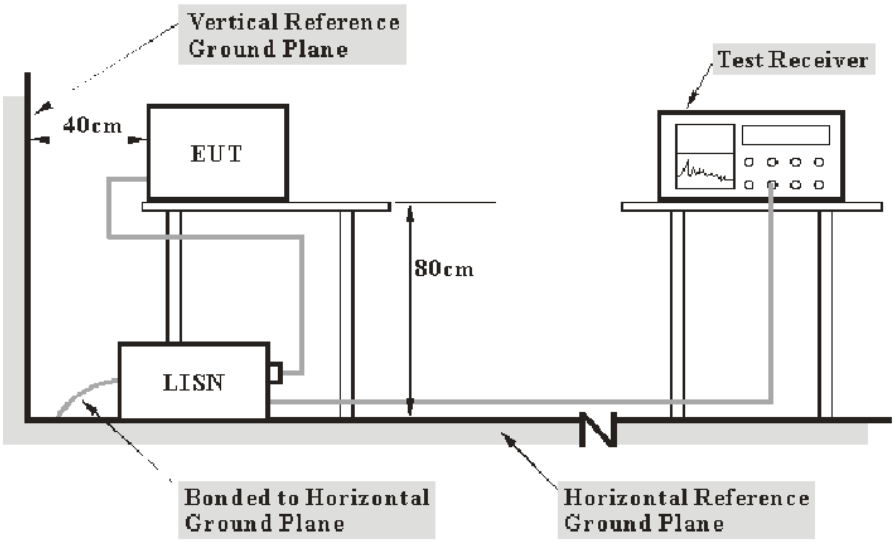
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

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 device was connected to the outlet of the LISN.

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

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

Transd Factor & Margin Calculation

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

Transd Factor = LISN VDF + Cable Loss

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

Over Limit = level – Limit
Level= reading level+ Transd Factor

Test Data

Environmental Conditions

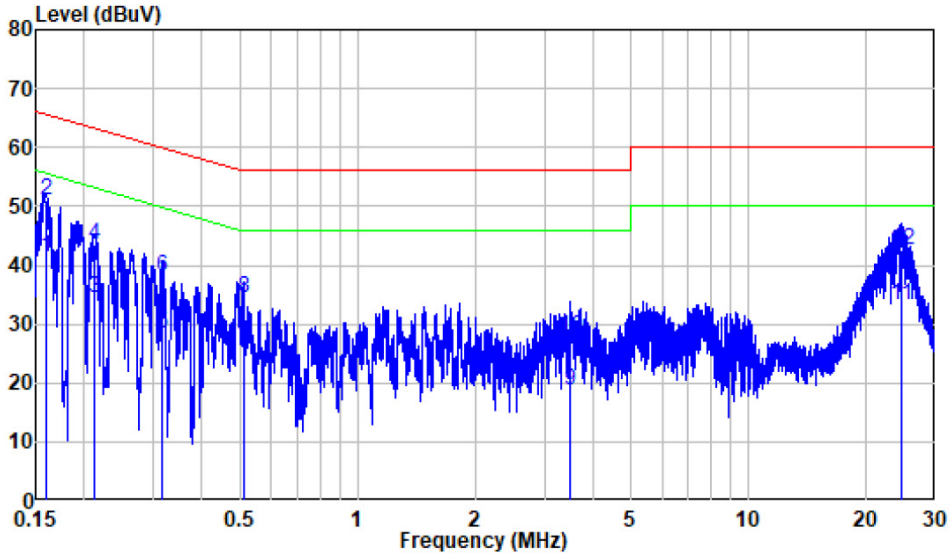
Temperature:	25 ℃
Relative Humidity:	64 %
ATM Pressure:	101.0 kPa

The testing was performed by Bin Duan on 2021-11-05.

EUT operation mode: Transmitting

Wi-Fi: (Worst case is 802.11B mode, low Channel)

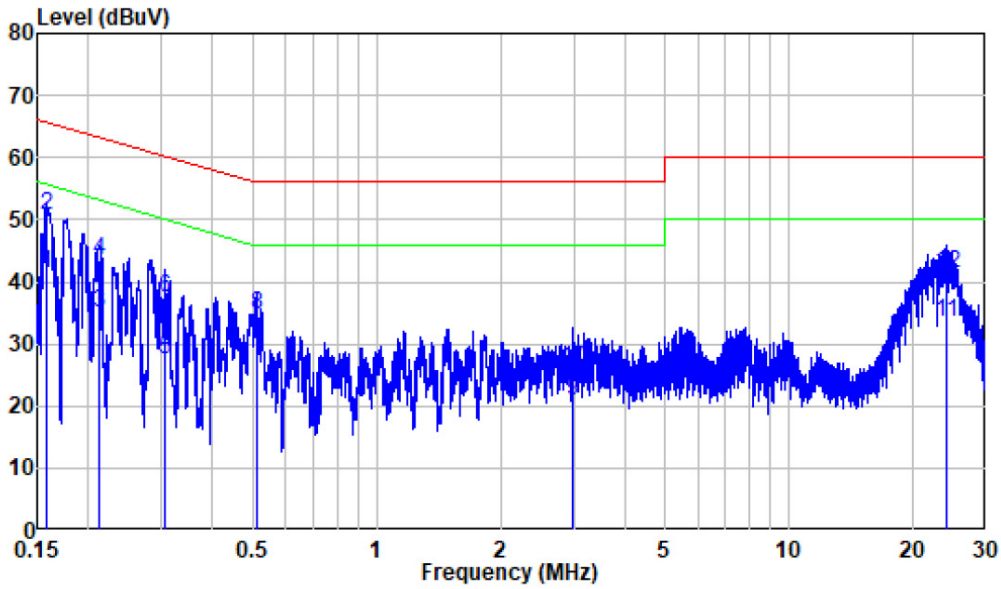
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.159	9.88	31.62	41.50	55.51	-14.01	Average
2	0.159	9.88	41.26	51.14	65.51	-14.37	QP
3	0.212	9.80	24.62	34.42	53.13	-18.71	Average
4	0.212	9.80	33.60	43.40	63.13	-19.73	QP
5	0.316	9.80	18.48	28.28	49.81	-21.53	Average
6	0.316	9.80	28.31	38.11	59.81	-21.70	QP
7	0.511	9.81	15.87	25.68	46.00	-20.32	Average
8	0.511	9.81	24.66	34.47	56.00	-21.53	QP
9	3.498	9.93	8.78	18.71	46.00	-27.29	Average
10	3.498	9.93	17.98	27.91	56.00	-28.09	QP
11	24.594	10.35	22.81	33.16	50.00	-16.84	Average
12	24.594	10.35	32.15	42.50	60.00	-17.50	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.158	9.92	31.38	41.30	55.56	-14.26	Average
2	0.158	9.92	40.87	50.79	65.56	-14.77	QP
3	0.213	9.99	24.91	34.90	53.10	-18.20	Average
4	0.213	9.99	33.60	43.59	63.10	-19.51	QP
5	0.305	9.95	17.56	27.51	50.09	-22.58	Average
6	0.305	9.95	27.61	37.56	60.09	-22.53	QP
7	0.512	9.91	20.03	29.94	46.00	-16.06	Average
8	0.512	9.91	24.81	34.72	56.00	-21.28	QP
9	2.986	9.99	10.91	20.90	46.00	-25.10	Average
10	2.986	9.99	16.09	26.08	56.00	-29.92	QP
11	23.999	10.28	23.26	33.54	50.00	-16.46	Average
12	23.999	10.28	31.20	41.48	60.00	-18.52	QP

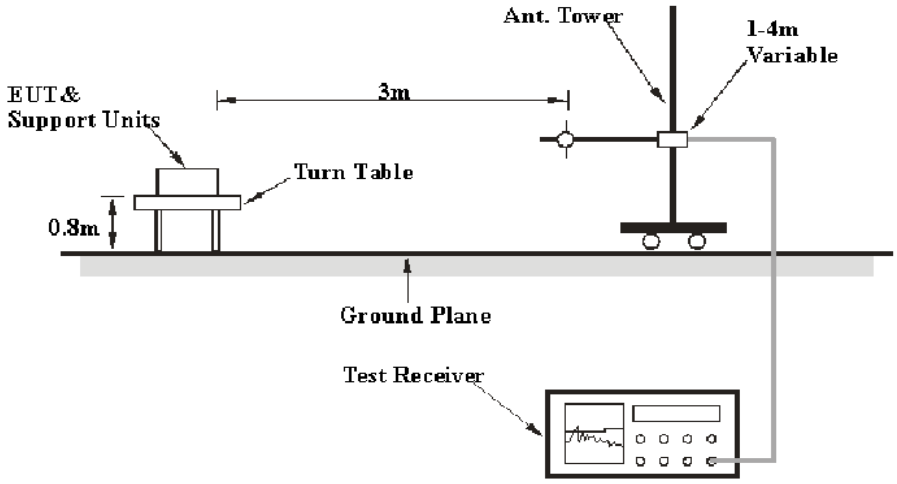
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

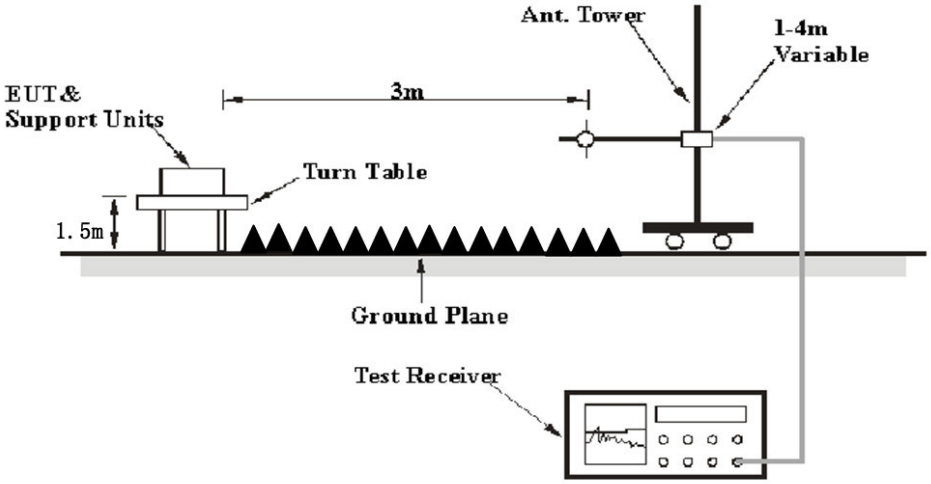
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 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	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

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

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all 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.

Factor & Margin Calculation

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

Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

Over Limit/ Margin = Level / Corrected Amplitude - Limit
Level / Corrected Amplitude = Reading + Corrected Factor

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	64 %
ATM Pressure:	101.0 kPa

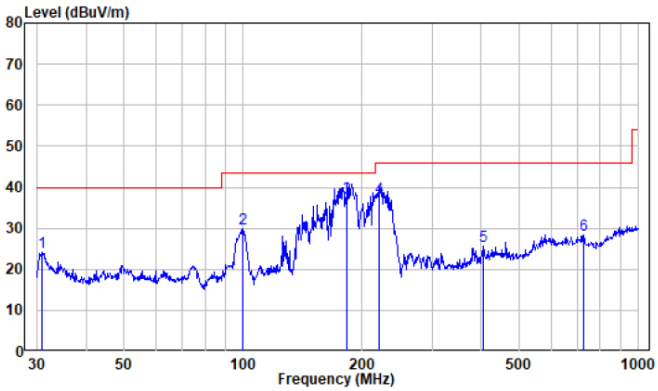
The testing was performed by Chao Mo on 2021-11-05 for below 1GHz and 2021-11-24 for above 1GHz.

EUT operation mode: Transmitting

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

30MHz-1GHz: (Worst case is 802.11B mode, low Channel)

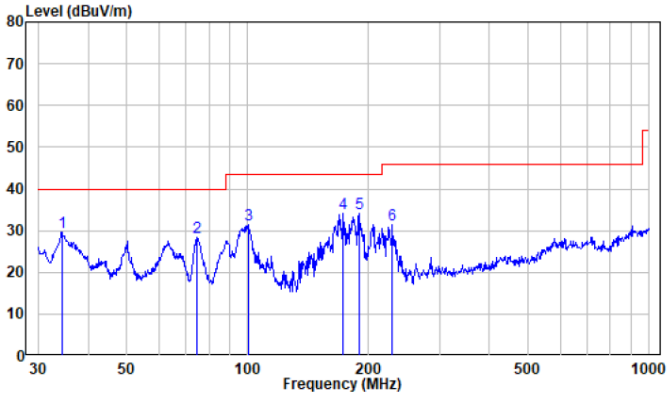
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job NO : SZNS211025-54681E-RF
Mode : TX

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Result
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.85	-20.36	44.57	24.21	40.00	-15.79	
2	99.88	-19.19	49.18	29.99	43.50	-13.51	
3	183.20	-20.98	58.35	37.37	43.50	-6.13	
4	221.39	-18.97	56.38	37.41	46.00	-8.59	
5	404.67	-15.55	41.29	25.74	46.00	-20.26	
6	726.81	-11.33	39.81	28.48	46.00	-17.52	

Vertical



Site : chamber
Condition: 3m VERTICAL
Job NO : SZNS211025-54681E-RF
Mode : TX

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Result
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	34.40	-19.58	49.05	29.47	40.00	-10.53	
2	74.92	-22.27	50.60	28.33	40.00	-11.67	
3	100.23	-19.16	50.57	31.41	43.50	-12.09	
4	172.60	-21.07	55.17	34.10	43.50	-9.40	
5	189.07	-20.27	54.27	34.00	43.50	-9.50	
6	229.29	-18.87	50.22	31.35	46.00	-14.65	

1-25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave		Height (m)	Polar (H/V)				
802.11B, Low Channel									
2310	67.35	PK	159	1.1	H	-7.25	60.1	74	-13.9
2310	53.28	Ave	159	1.1	H	-7.25	46.03	54	-7.97
2310	67.74	PK	207	2.1	V	-7.25	60.49	74	-13.51
2310	53.27	Ave	207	2.1	V	-7.25	46.02	54	-7.98
2390	68.02	PK	280	1.5	H	-7.23	60.79	74	-13.21
2390	54.37	Ave	280	1.5	H	-7.23	47.14	54	-6.86
2390	68.5	PK	304	1.1	V	-7.23	61.27	74	-12.73
2390	54.41	Ave	304	1.1	V	-7.23	47.18	54	-6.82
4824	60.21	PK	338	2.2	H	-3.51	56.7	74	-17.3
4824	46.25	Ave	338	2.2	H	-3.51	42.74	54	-11.26
4824	56.53	PK	261	2.2	V	-3.51	53.02	74	-20.98
4824	41.94	Ave	261	2.2	V	-3.51	38.43	54	-15.57
802.11B, Middle Channel									
4884	61.6	PK	45	2.1	H	-3.28	58.32	74	-15.68
4884	49.86	Ave	45	2.1	H	-3.28	46.58	54	-7.42
4884	59.77	PK	185	1.9	V	-3.28	56.49	74	-17.51
4884	46.21	Ave	185	1.9	V	-3.28	42.93	54	-11.07
802.11B, High Channel									
2483.5	69.94	PK	310	1.1	H	-7.18	62.76	74	-11.24
2483.5	55.27	Ave	310	1.1	H	-7.18	48.09	54	-5.91
2483.5	69.91	PK	306	1.1	V	-7.18	62.73	74	-11.27
2483.5	54.43	Ave	306	1.1	V	-7.18	47.25	54	-6.75
2500	68.47	PK	53	1.8	H	-7.18	61.29	74	-12.71
2500	54.56	Ave	53	1.8	H	-7.18	47.38	54	-6.62
2500	68.62	PK	28	1.3	V	-7.18	61.44	74	-12.56
2500	54.51	Ave	28	1.3	V	-7.18	47.33	54	-6.67
4944	56.4	PK	213	1	H	-3.04	53.36	74	-20.64
4944	56.99	PK	213	1	V	-3.04	53.95	74	-20.05

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave		Height (m)	Polar (H/V)				
802.11G, Low Channel									
2310	67.52	PK	75	1.3	H	-7.25	60.27	74	-13.73
2310	53.8	Ave	75	1.3	H	-7.25	46.55	54	-7.45
2310	67.62	PK	223	1.7	V	-7.25	60.37	74	-13.63
2310	53.75	Ave	223	1.7	V	-7.25	46.5	54	-7.5
2390	68.34	PK	71	1.8	H	-7.23	61.11	74	-12.89
2390	54.92	Ave	71	1.8	H	-7.23	47.69	54	-6.31
2390	68.87	PK	81	1.5	V	-7.23	61.64	74	-12.36
2390	54.84	Ave	81	1.5	V	-7.23	47.61	54	-6.39
4824	56.73	PK	292	1.1	H	-3.51	53.22	74	-20.78
4824	55.55	PK	292	1.1	V	-3.51	52.04	74	-21.96
802.11G, Middle Channel									
4884	57.47	PK	301	1	H	-3.28	54.19	74	-19.81
4884	43.23	Ave	301	1	H	-3.28	39.95	54	-14.05
4884	56.73	PK	7	1.8	V	-3.28	53.45	74	-20.55
4884	42.21	Ave	7	1.8	V	-3.28	38.93	54	-15.07
802.11G, High Channel									
2483.5	70.15	PK	187	2.3	H	-7.18	62.97	74	-11.03
2483.5	56.14	Ave	187	2.3	H	-7.18	48.96	54	-5.04
2483.5	68.94	PK	297	2.4	V	-7.18	61.76	74	-12.24
2483.5	55.47	Ave	297	2.4	V	-7.18	48.29	54	-5.71
2500	67.79	PK	230	1.4	H	-7.18	60.61	74	-13.39
2500	55.12	Ave	230	1.4	H	-7.18	47.94	54	-6.06
2500	68.41	PK	65	1.8	V	-7.18	61.23	74	-12.77
2500	54.76	Ave	65	1.8	V	-7.18	47.58	54	-6.42
4944	54.6	PK	138	1.4	H	-3.04	51.56	74	-22.44
4944	55.55	PK	138	1.4	V	-3.04	52.51	74	-21.49

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave		Height (m)	Polar (H/V)				
802.11N20, Low Channel									
2310	70.04	PK	305	1.1	H	-7.25	62.79	74	-11.21
2310	57.55	Ave	305	1.1	H	-7.25	50.3	54	-3.7
2310	67.68	PK	56	2.4	V	-7.25	60.43	74	-13.57
2310	53.86	Ave	56	2.4	V	-7.25	46.61	54	-7.39
2390	69.29	PK	224	2	H	-7.23	62.06	74	-11.94
2390	55.43	Ave	224	2	H	-7.23	48.2	54	-5.8
2390	68.33	PK	278	1.4	V	-7.23	61.1	74	-12.9
2390	55.04	Ave	278	1.4	V	-7.23	47.81	54	-6.19
4824	59.1	PK	333	1.1	H	-3.51	55.59	74	-18.41
4824	43.89	Ave	333	1.1	H	-3.51	40.38	54	-13.62
4824	54.93	PK	250	1.9	V	-3.51	51.42	74	-22.58
4824	41.38	Ave	250	1.9	V	-3.51	37.87	54	-16.13
802.11N20, Middle Channel									
4884	59.18	PK	148	2.4	H	-3.28	55.9	74	-18.1
4884	43.12	Ave	148	2.4	H	-3.28	39.84	54	-14.16
4884	61.17	PK	249	1.4	V	-3.28	57.89	74	-16.11
4884	45.24	Ave	249	1.4	V	-3.28	41.96	54	-12.04
802.11N20, High Channel									
2483.5	69.41	PK	166	1.9	H	-7.18	62.23	74	-11.77
2483.5	56.08	Ave	166	1.9	H	-7.18	48.9	54	-5.1
2483.5	69.29	PK	5	1	V	-7.18	62.11	74	-11.89
2483.5	55.62	Ave	5	1	V	-7.18	48.44	54	-5.56
2500	68.03	PK	200	1.1	H	-7.18	60.85	74	-13.15
2500	55.09	Ave	200	1.1	H	-7.18	47.91	54	-6.09
2500	68.36	PK	257	1.9	V	-7.18	61.18	74	-12.82
2500	55.04	Ave	257	1.9	V	-7.18	47.86	54	-6.14
4944	57.72	PK	343	1.2	H	-3.04	54.68	74	-19.32
4944	43.68	Ave	343	1.2	H	-3.04	40.64	54	-13.36
4944	58.39	PK	96	1.8	V	-3.04	55.35	74	-18.65
4944	45.2	Ave	96	1.8	V	-3.04	42.16	54	-11.84

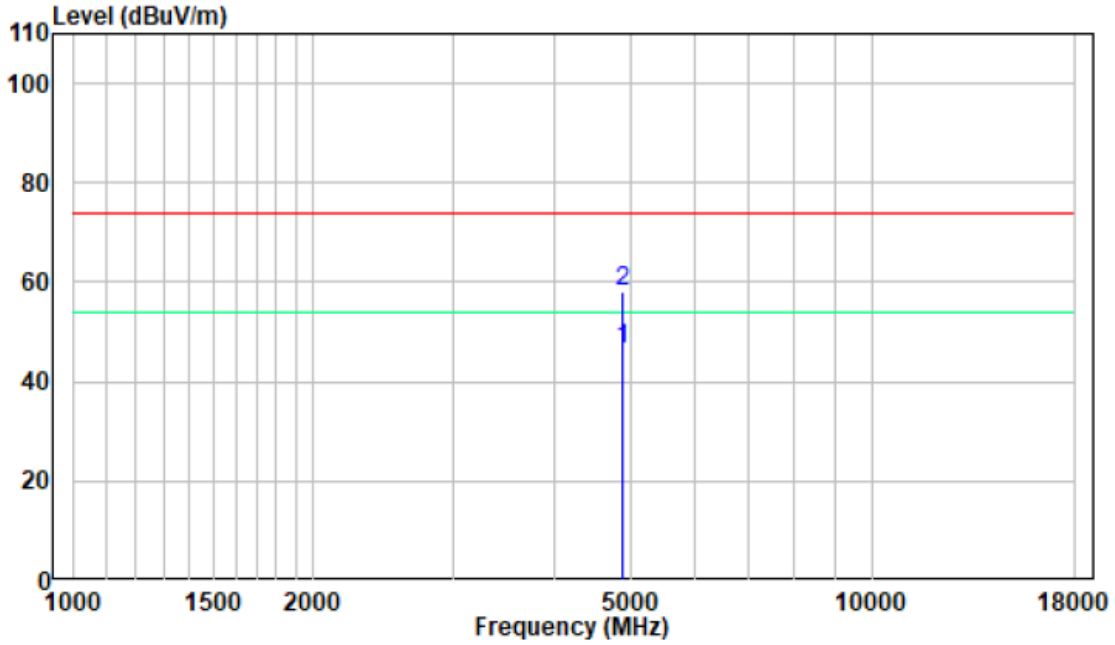
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave		Height (m)	Polar (H/V)				
802.11n40, Low Channel									
2310	68.03	PK	94	2.1	H	-7.25	60.78	74	-13.22
2310	54.43	Ave	94	2.1	H	-7.25	47.18	54	-6.82
2310	68.74	PK	292	2.3	V	-7.25	61.49	74	-12.51
2310	54.58	Ave	292	2.3	V	-7.25	47.33	54	-6.67
2390	68.51	PK	304	2	H	-7.23	61.28	74	-12.72
2390	55.54	Ave	304	2	H	-7.23	48.31	54	-5.69
2390	68.2	PK	63	1.8	V	-7.23	60.97	74	-13.03
2390	55.37	Ave	63	1.8	V	-7.23	48.14	54	-5.86
4844	54.87	PK	38	1.8	H	-3.51	51.36	74	-22.64
4844	55.59	PK	38	1.8	V	-3.51	52.08	74	-21.92
802.11n40, Middle Channel									
4884	54.97	PK	147	1.4	H	-3.28	51.69	74	-22.31
4884	55.49	PK	147	1.4	V	-3.28	52.21	74	-21.79
802.11n40, High Channel									
2483.5	69.06	PK	89	1.3	H	-7.18	61.88	74	-12.12
2483.5	56.28	Ave	89	1.3	H	-7.18	49.1	54	-4.9
2483.5	69.08	PK	30	1.4	V	-7.18	61.9	74	-12.1
2483.5	55.72	Ave	30	1.4	V	-7.18	48.54	54	-5.46
2500	68.29	PK	267	2.4	H	-7.18	61.11	74	-12.89
2500	55.54	Ave	267	2.4	H	-7.18	48.36	54	-5.64
2500	68.44	PK	231	2.4	V	-7.18	61.26	74	-12.74
2500	55.2	Ave	231	2.4	V	-7.18	48.02	54	-5.98
4924	54.14	PK	230	1.2	H	-3.04	51.1	74	-22.9
4924	54.85	PK	230	1.2	V	-3.04	51.81	74	-22.19

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Absolute Level (Corrected Amplitude） = Factor + Reading
Margin = Absolute Level - Limit
The other spurious emission which is 20dB below to the limit was not recorded.
The test result of peak was less than the limit of average, so just peak values were recorded.

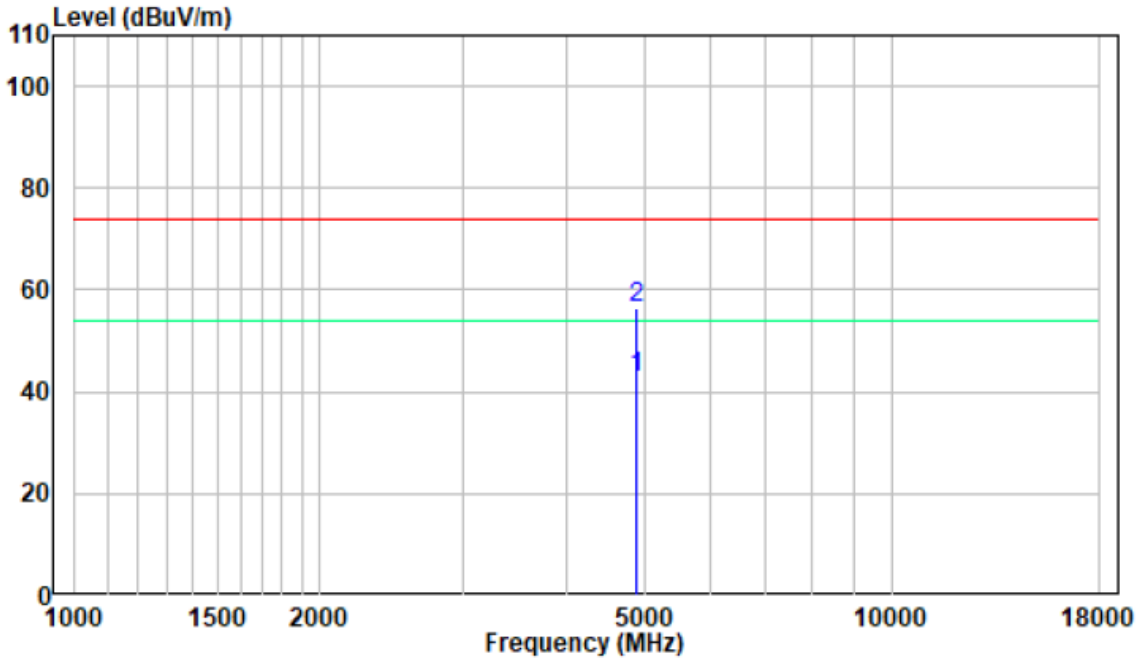
1-18 GHz:

Pre-scan Plots:

802.11 b Middle Channel
Horizontal



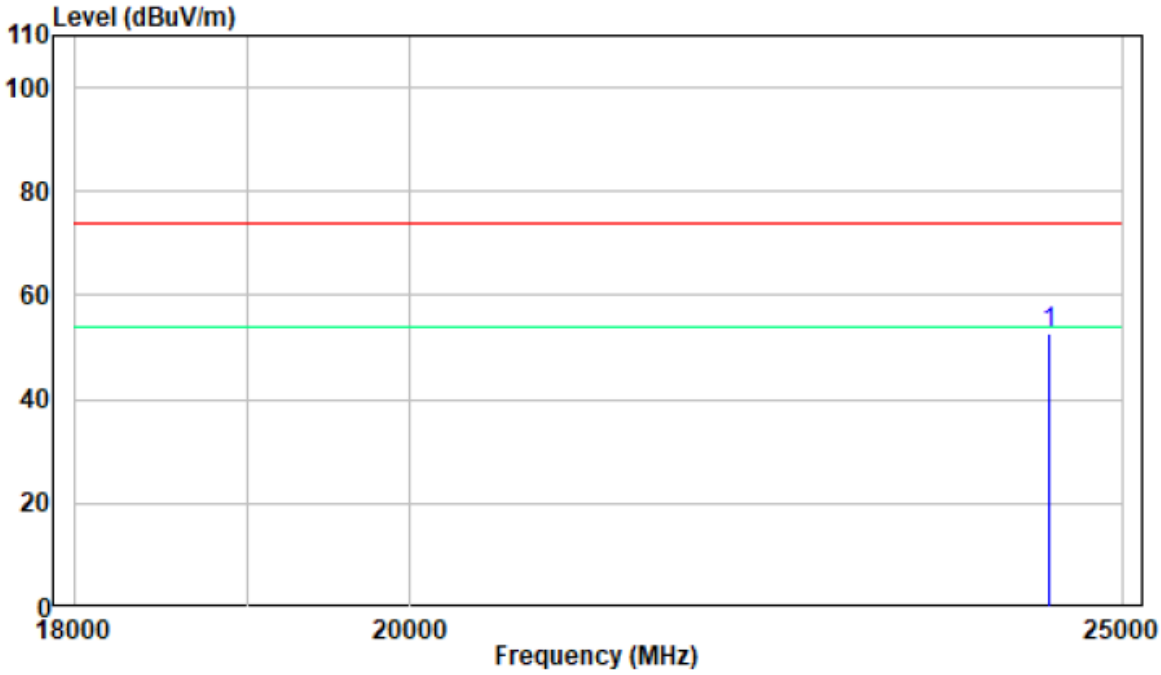
Vertical



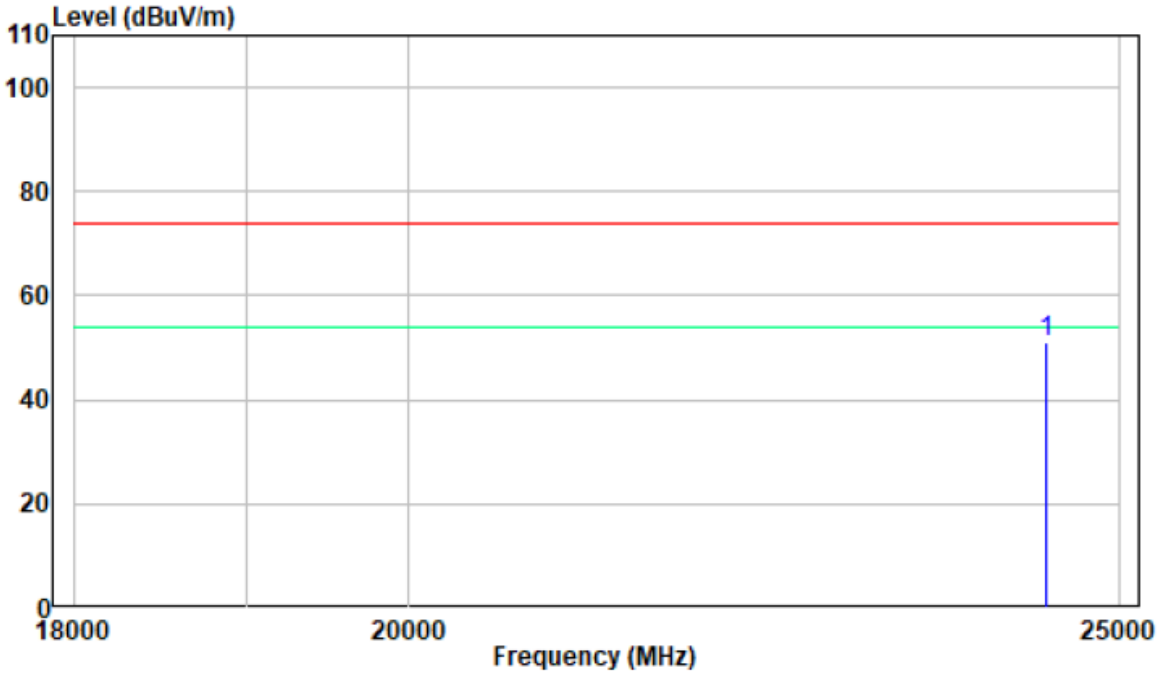
18 -25GHz:

Pre-scan Plots:

802.11 b Middle Channel
Horizontal



Vertical



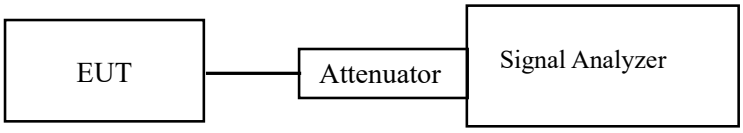
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	57 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul liu on 2021-11-07 and 2021-11-08.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

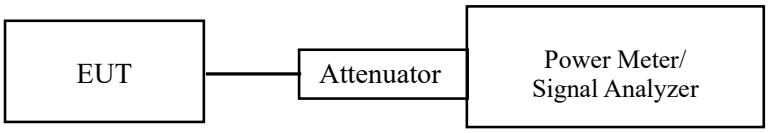
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

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



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	57 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul liu on 2021-11-07 and 2021-11-08.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

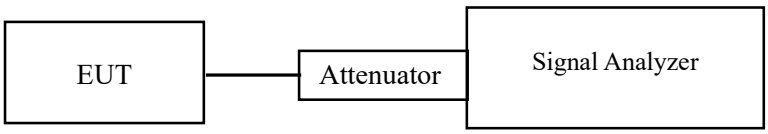
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	57 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul liu on 2021-11-17.

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

Please refer to the Appendix.

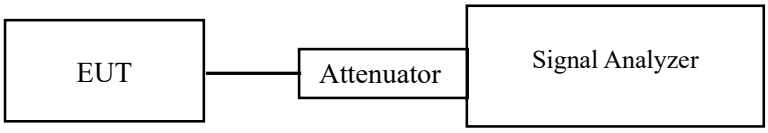
FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	57 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul liu on 2021-11-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

APPENDIX

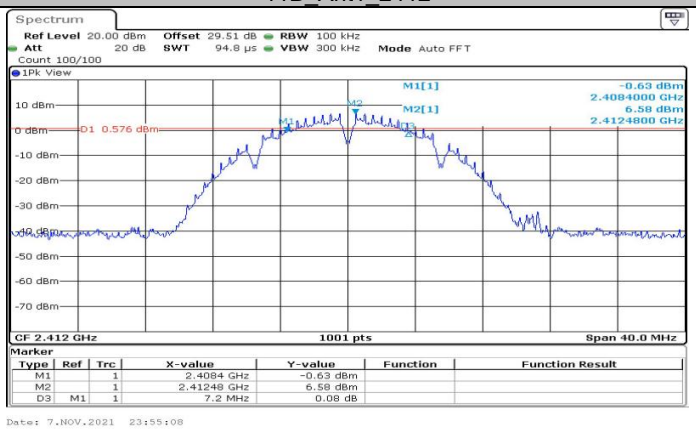
Appendix A: DTS Bandwidth

Test Result

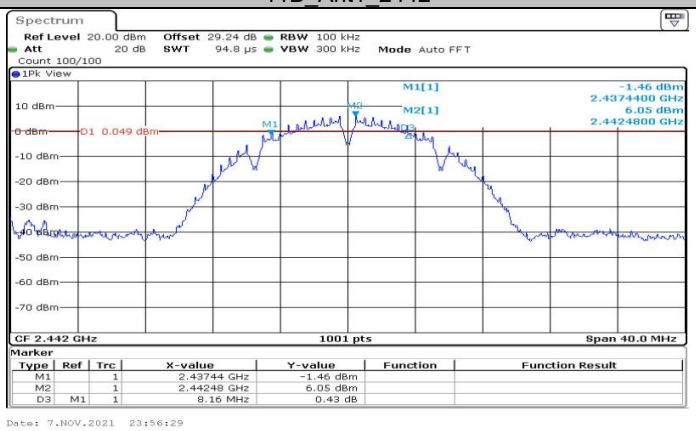
Test Mode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	7.200	0.5	PASS
		2442	8.160	0.5	PASS
		2472	7.200	0.5	PASS
11G	Ant1	2412	16.400	0.5	PASS
		2442	16.400	0.5	PASS
		2472	16.440	0.5	PASS
11N20SISO	Ant1	2412	17.680	0.5	PASS
		2442	17.680	0.5	PASS
		2472	17.680	0.5	PASS
11N40SISO	Ant1	2422	36.480	0.5	PASS
		2442	36.480	0.5	PASS
		2462	36.480	0.5	PASS

Test Graphs

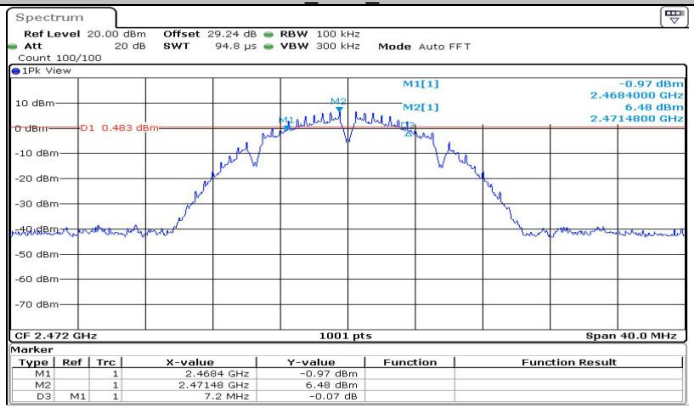
11B_Ant1_2412



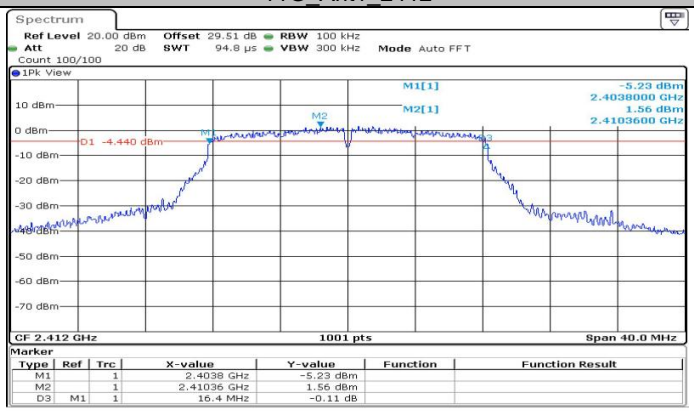
11B_Ant1_2442



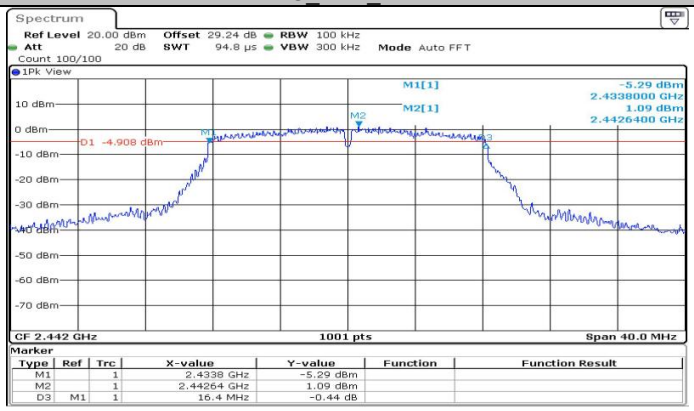
11B_Ant1_2472



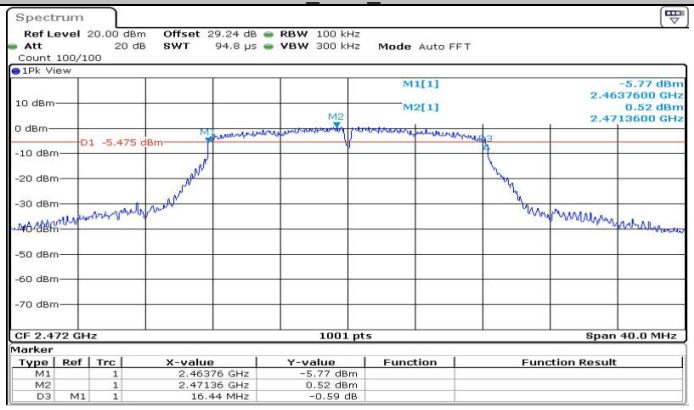
11G_Ant1_2412



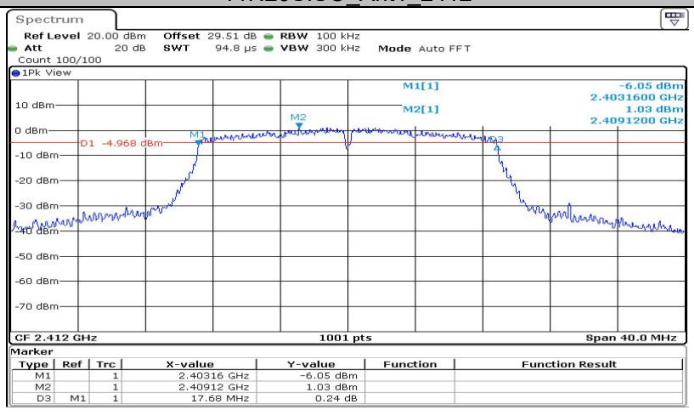
11G_Ant1_2442



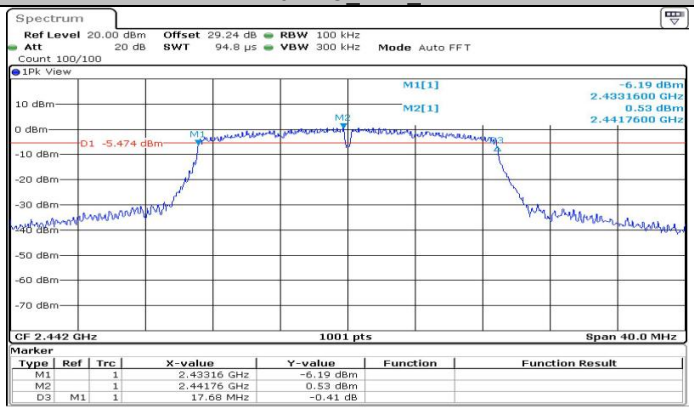
11G_Ant1_2472



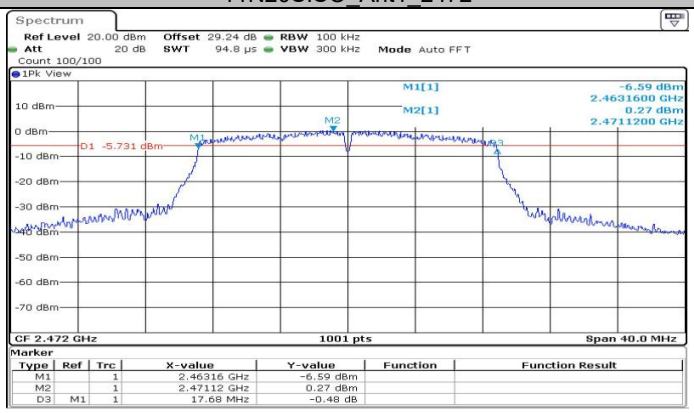
11N20SISO_Ant1_2412



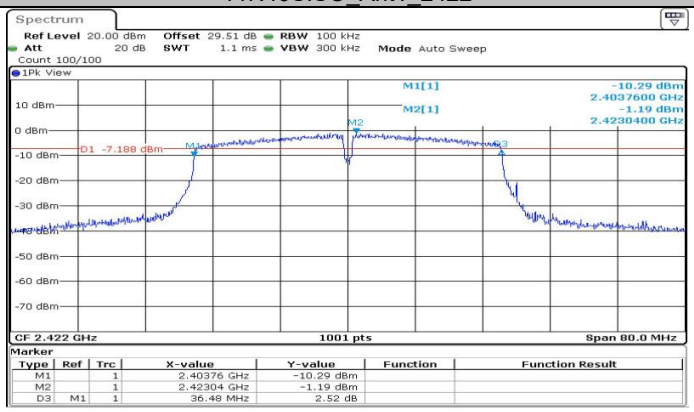
11N20SISO_Ant1_2442



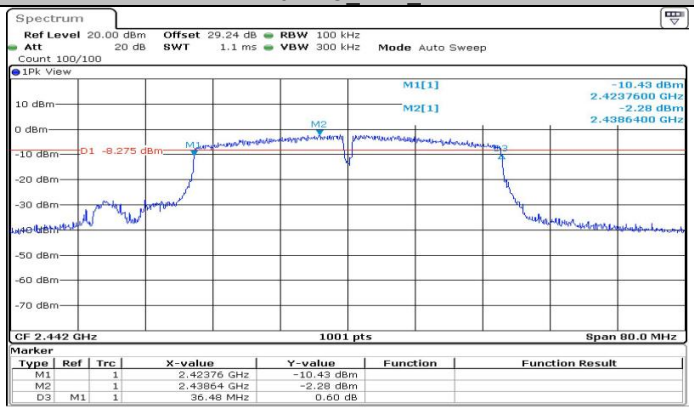
11N20SISO_Ant1_2472



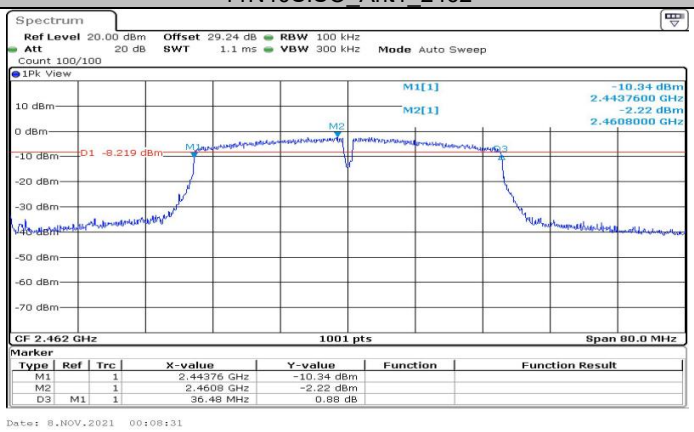
11N40SISO_Ant1_2422



11N40SISO_Ant1_2442



11N40SISO_Ant1_2462



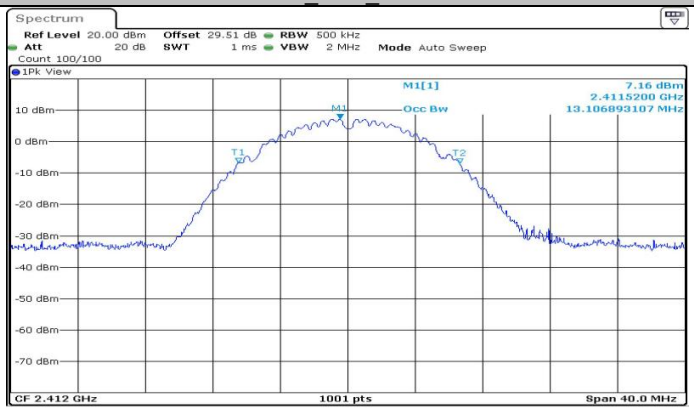
Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.107	---	PASS
		2442	13.027	---	PASS
		2472	13.027	---	PASS
11G	Ant1	2412	17.263	---	PASS
		2442	17.343	---	PASS
		2472	17.303	---	PASS
11N20SISO	Ant1	2412	18.142	---	PASS
		2442	18.182	---	PASS
		2472	18.182	---	PASS
11N40SISO	Ant1	2422	36.603	---	PASS
		2442	36.603	---	PASS
		2462	36.683	---	PASS

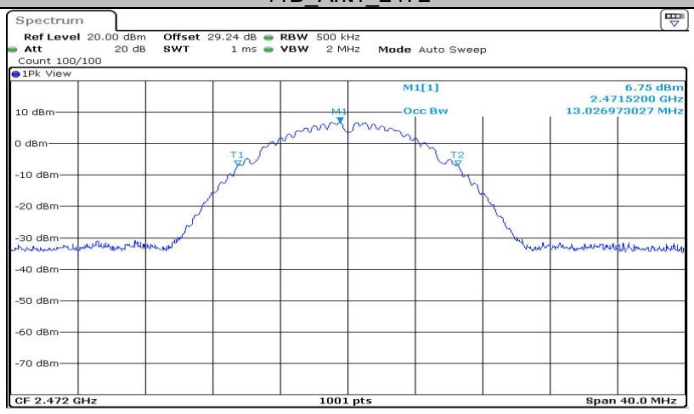
Test Graphs

11B_Ant1_2412



11B_Ant1_2442

11B_Ant1_2472



11G_Ant1_2412

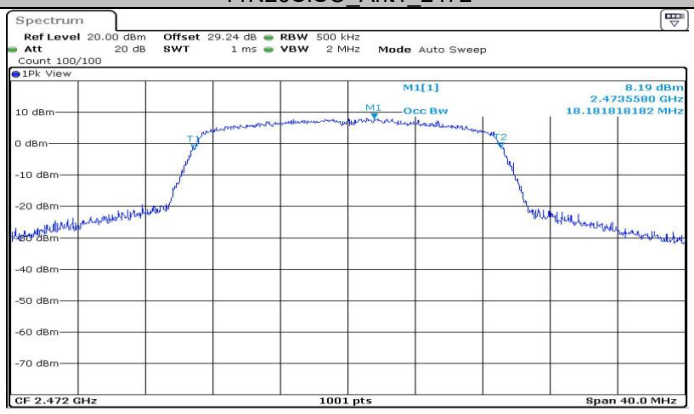
11G_Ant1_2442

11G_Ant1_2472

11N20SISO_Ant1_2412

11N20SISO_Ant1_2442

11N20SISO_Ant1_2472



11N40SISO_Ant1_2422

11N40SISO_Ant1_2442

11N40SISO_Ant1_2462

Appendix C: Maximum conducted Peak output power

Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	15.96	≤30	PASS
		2442	15.74	≤30	PASS
		2472	15.03	≤30	PASS
11G	Ant1	2412	14.77	≤30	PASS
		2442	14.60	≤30	PASS
		2472	13.40	≤30	PASS
11N20SISO	Ant1	2412	12.12	≤30	PASS
		2442	13.51	≤30	PASS
		2472	11.54	≤30	PASS
11N40SISO	Ant1	2422	11.38	≤30	PASS
		2442	11.54	≤30	PASS
		2462	10.30	≤30	PASS

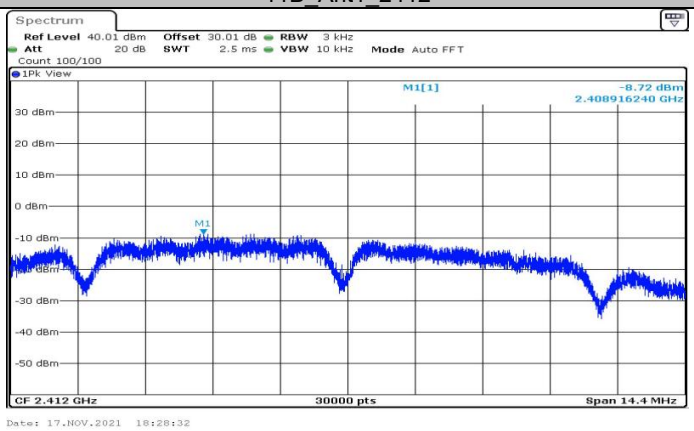
Appendix D: Maximum power spectral density

Test Result

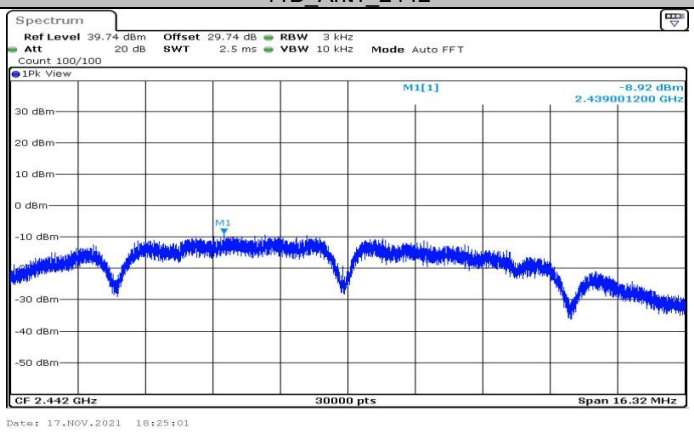
Test Mode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-8.72	≤8	PASS
		2442	-8.92	≤8	PASS
		2472	-10.71	≤8	PASS
11G	Ant1	2412	-14.80	≤8	PASS
		2442	-14.78	≤8	PASS
		2472	-16.09	≤8	PASS
11N20SISO	Ant1	2412	-15.9	≤8	PASS
		2442	-16.63	≤8	PASS
		2472	-18.36	≤8	PASS
11N40SISO	Ant1	2422	-19.50	≤8	PASS
		2442	-19.65	≤8	PASS
		2462	-20.77	≤8	PASS

Test Graphs

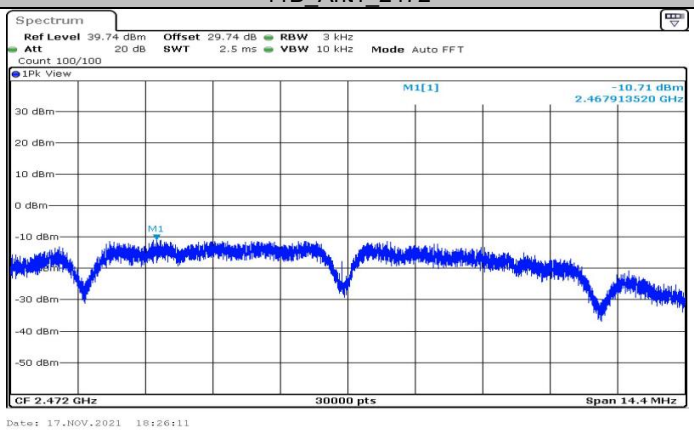
11B_Ant1_2412



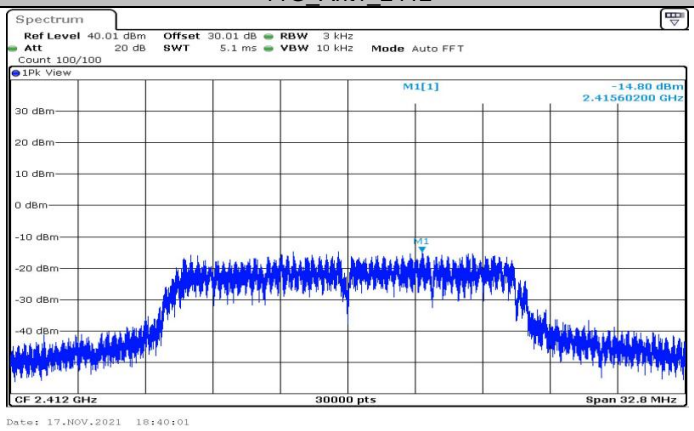
11B_Ant1_2442



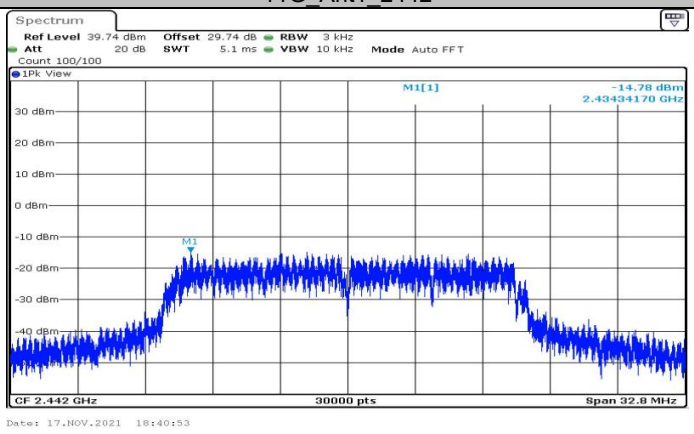
11B_Ant1_2472



11G_Ant1_2412



11G_Ant1_2442



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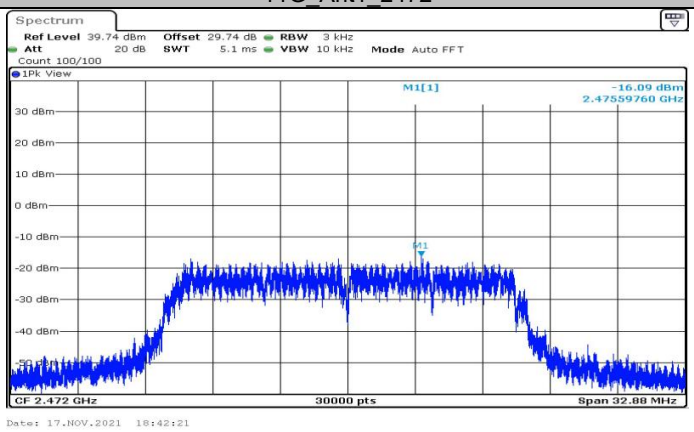

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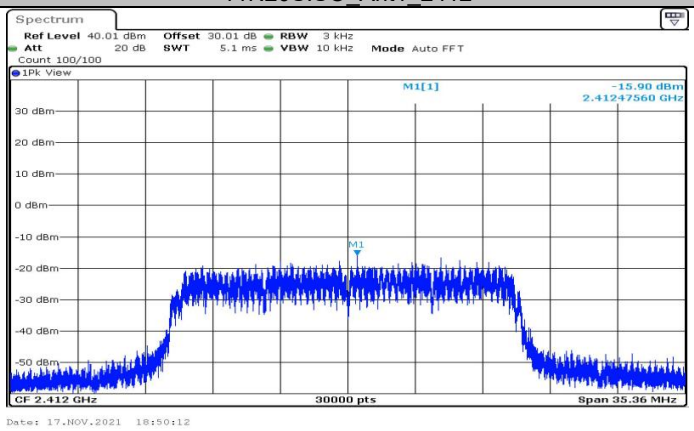

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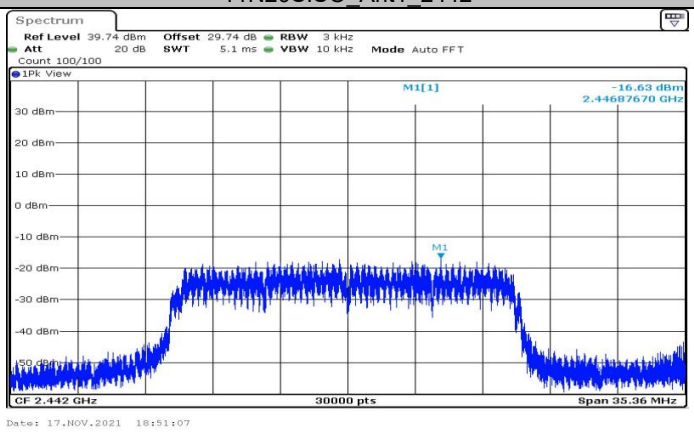

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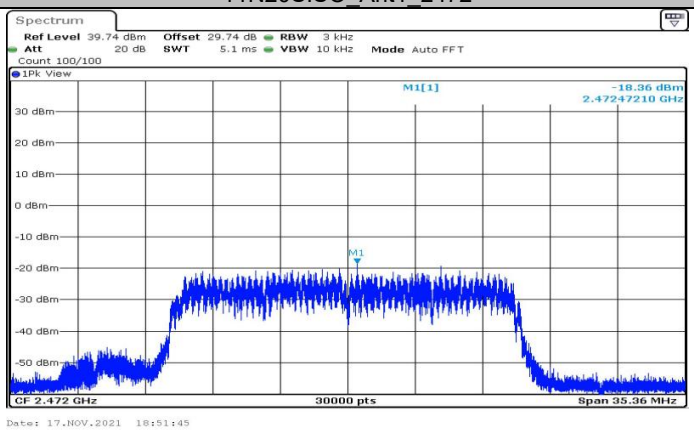
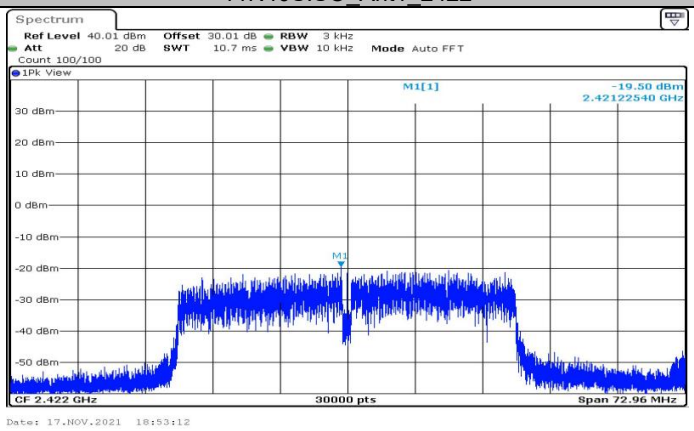
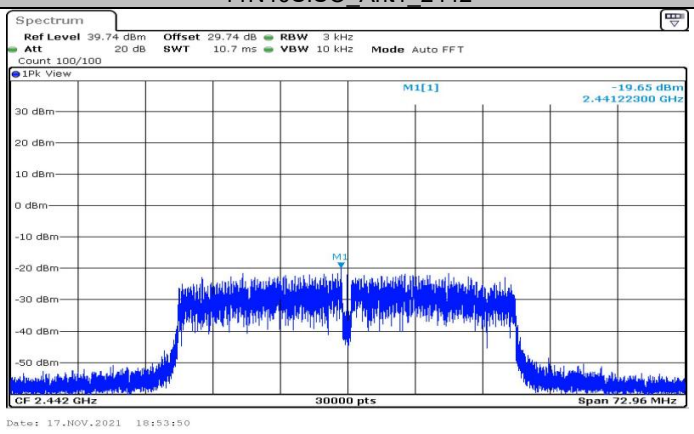
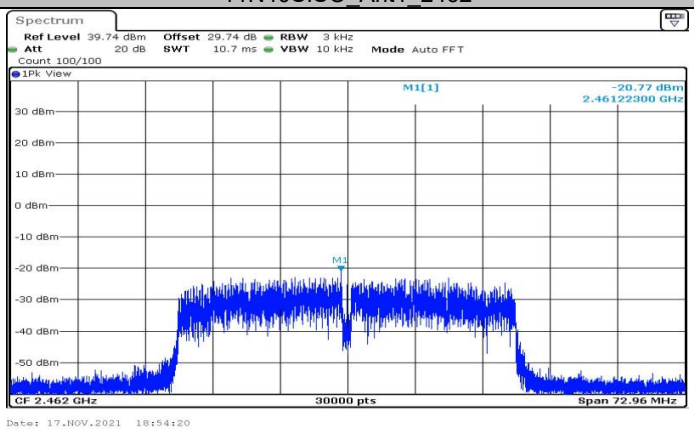


11N40SISO_Ant1_2422



11N40SISO_Ant1_2442

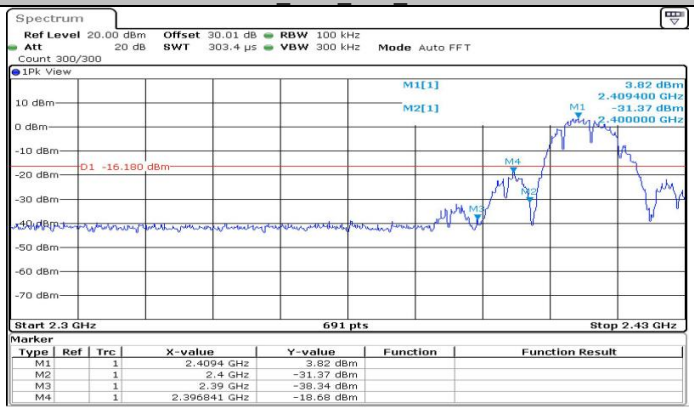


11N40SISO_Ant1_2462


Appendix E: Band edge measurements

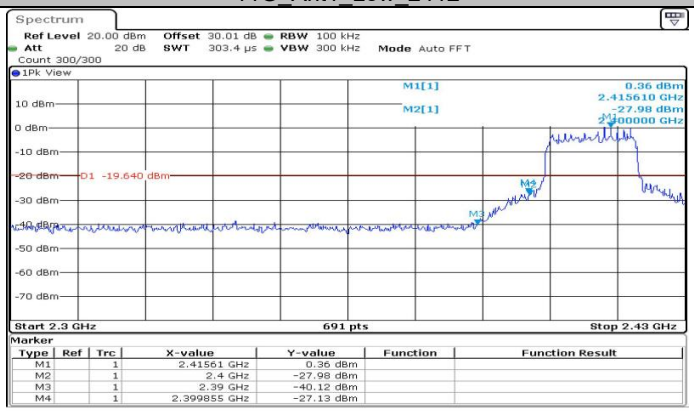
Test Graphs

11B_Ant1_Low_2412

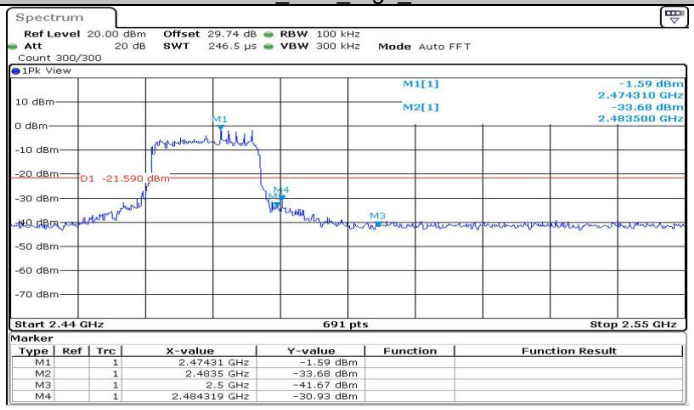


11B_Ant1_High_2472

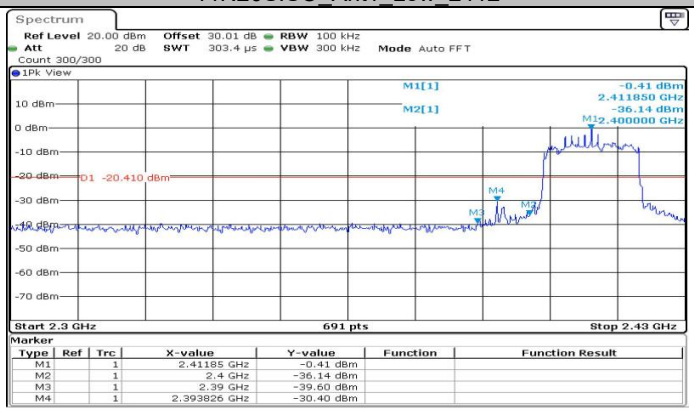
11G_Ant1_Low_2412



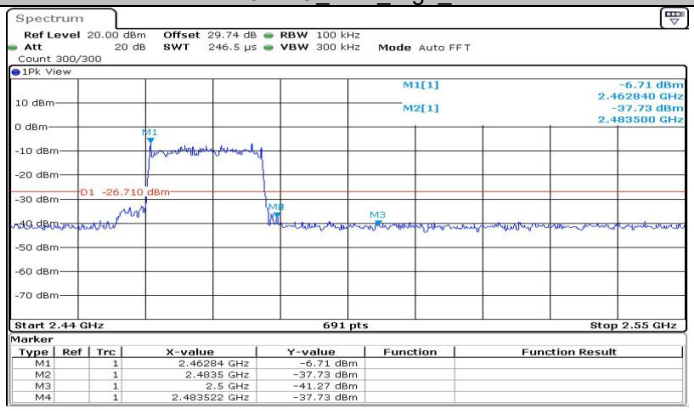
11G_Ant1_High_2472



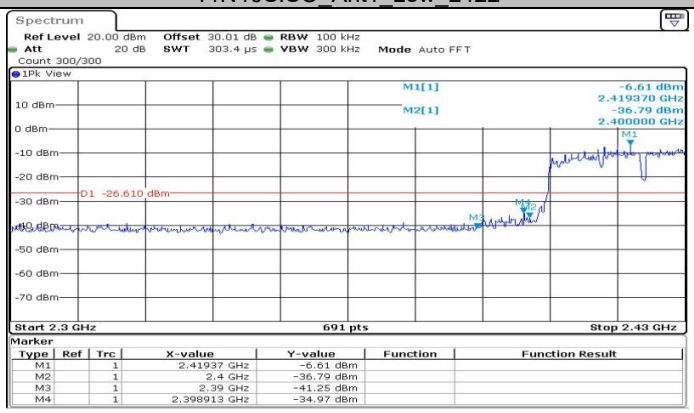
11N20SISO_Ant1_Low_2412



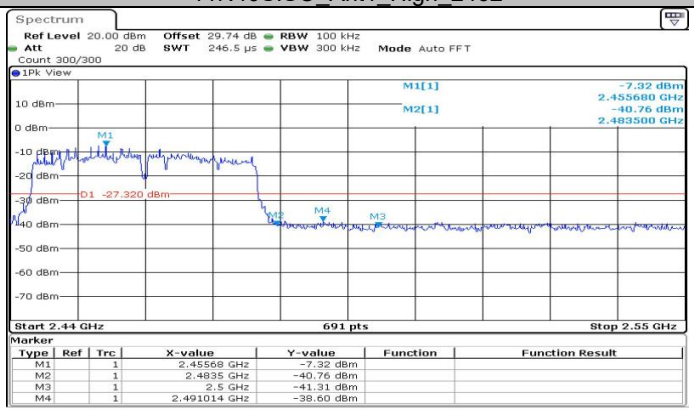
11N20SISO_Ant1_High_2472



11N40SISO_Ant1_Low_2422



11N40SISO_Ant1_High_2462



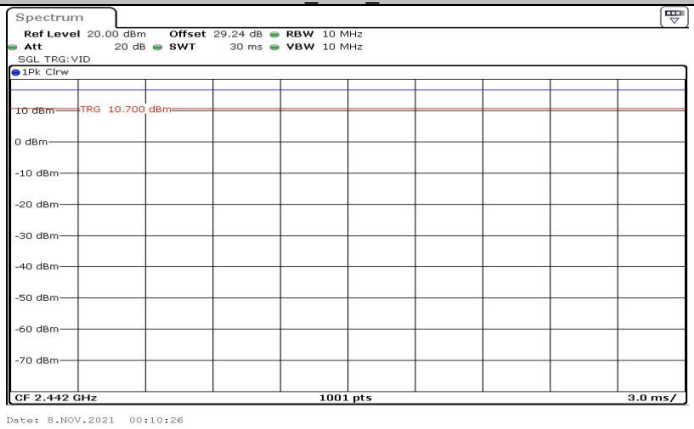
Appendix F: Duty Cycle

Test Result

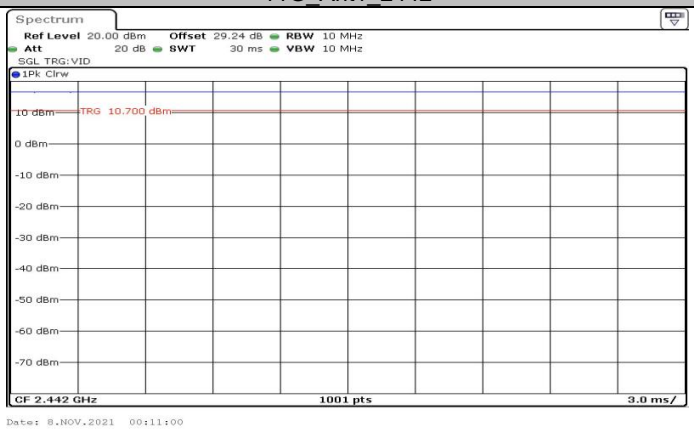
Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2442	30.00	30.00	100.00
11G	Ant1	2442	30.00	30.00	100.00
11N20SISO	Ant1	2442	30.00	30.00	100.00
11N40SISO	Ant1	2442	30.00	30.00	100.00

Test Graphs

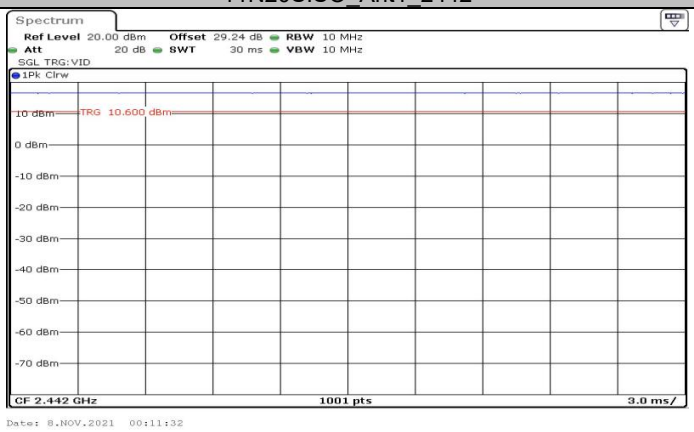
11B_Ant1_2442



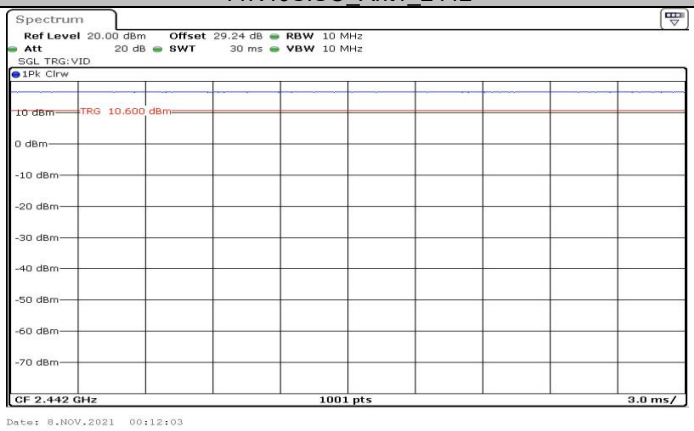
11G_Ant1_2442



11N20SISO_Ant1_2442



11N40SISO_Ant1_2442



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