TEST REPORT

Applicant Name :	Chillax Care Limited
Address :	Room 118, Flat A, 8/F, William Industrial Building, 23-25 Ng Fong Street, San Po Kong, Kowloon, Hong Kong
Report Number :	RA221213-61312E-RFA
FCC ID:	2AZ8M-BCX620BU
IC:	27169-BCX620BU

Test Standard (s)

FCC PART 15.247; RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2; RSS-247, ISSUE 2, FEBRUARY 2017

Sample Description

Product Type:	Smart Mood Light Soother
Model No.:	DM620BU
Multiple Model(s) No.:	N/A
Trade Mark:	ChillaxBaby
Date Received:	2022/12/13
Report Date:	2023/02/28

Test Result:	Pass*

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

Prepared and Checked By:

Andy Yu
EMC Engineer

Approved By:

Candy Li
EMC Engineer

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

DOCUMENT REVISION HISTORY **4**

GENERAL INFORMATION **5**

PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 5
OBJECTIVE 5
TEST METHODOLOGY 5
MEASUREMENT UNCERTAINTY 6

SYSTEM TEST CONFIGURATION **7**

DESCRIPTION OF TEST CONFIGURATION 7
EQUIPMENT MODIFICATIONS 7
EUT EXERCISE SOFTWARE 7
SUPPORT EQUIPMENT LIST AND DETAILS 7
EXTERNAL I/O CABLE 8
BLOCK DIAGRAM OF TEST SETUP 8

SUMMARY OF TEST RESULTS **9**

TEST EQUIPMENT LIST **10**

FCC §15.247 (I) & §1.1307 (B) (3) & §2.1091- MPE-BASED EXEMPTION **12**

APPLICABLE STANDARD 12
RESULT 12

RSS-102 § 2.5.2 –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION **13**

APPLICABLE STANDARD 13

§15.203 & RSS-GEN §6.8 ANTENNA REQUIREMENT **14**

APPLICABLE STANDARD 14
ANTENNA CONNECTOR CONSTRUCTION 15

§15.207 (A) & RSS-GEN §8.8 AC LINE CONDUCTED EMISSIONS **16**

APPLICABLE STANDARD 16
EUT SETUP 17
EMI TEST RECEIVER SETUP 17
TEST PROCEDURE 17
CORRECTED FACTOR & MARGIN CALCULATION 18
TEST DATA 18

§15.205, §15.209, §15.247(D) & RSS-GEN § 8.10 & RSS-247 § 5.5 SPURIOUS EMISSIONS **23**

APPLICABLE STANDARD 23
EUT SETUP 23
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 24
TEST PROCEDURE 24
CORRECTED AMPLITUDE & MARGIN CALCULATION 25
TEST DATA 25

§15.247 (A)(2) & RSS-GEN§6.7 RSS-247 § 5.2 (A) 99% OCCUPIED BANDWIDTH & 6 DB EMISSION BANDWIDTH **36**

APPLICABLE STANDARD 36
TEST PROCEDURE 36
TEST DATA 37

§15.247(B)(3) & RSS-247 § 5.4(D) MAXIMUM CONDUCTED OUTPUT POWER 38
APPLICABLE STANDARD 38
TEST PROCEDURE 38
TEST DATA 39
§15.247(D) & RSS-247 § 5.5 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE.....40
APPLICABLE STANDARD 40
TEST PROCEDURE 40
TEST DATA 40
§15.247(E) & RSS-247 § 5.2 (B) POWER SPECTRAL DENSITY 41
APPLICABLE STANDARD 41
TEST PROCEDURE 41
TEST DATA 42
APPENDIX 43
APPENDIX A: DTS BANDWIDTH 43
APPENDIX B: OCCUPIED CHANNEL BANDWIDTH 48
APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER 53
APPENDIX D: MAXIMUM POWER SPECTRAL DENSITY.....54
APPENDIX E: BAND EDGE MEASUREMENTS.....59
APPENDIX F: DUTY CYCLE 62

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA221213-61312E-RFA	Original Report	2023-02-28

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	BCX620BU
FVIN	Vl.4.66
Frequency Range	Wi-Fi: 2412-2472MHz
Maximum Conducted Average Output Power	Wi-Fi: 24.32dBm(802.11b), 19.96dBm(802.11g), 19.87dBm(802.11n20) 18.06dBm(802.11n40)
Modulation Technique	Wi-Fi: DSSS, OFDM
Antenna Specification*	0 dBi(It is provided by the applicant)
Voltage Range	DC 3.7V from battery or DC5V from adapter
Sample Number	1XQX-1 for Conducted and Radiation Emissions Test 1XQY-2 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter 1 information	Model: YWK-AD050200-U Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5.0V, 2000 mA
Adapter 2 information	Model: KA12H-0502000US Input: AC 100-240V, 50/60Hz, 0.4A Max Output: DC 5.0V, 2000 mA

Objective

This report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules and RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada 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 RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017.

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.

Each test item follows test standards and with no deviation.

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 Wi-Fi 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	2465
6	2437	13	2472
7	2442	/	/

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

"SecureCRT"* was used for the testing. The software and power level was provided by the applicant.

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

Mode	Data rate	Power level*		
		Low channel	Middle channel	High channel
802.11b	1 Mbps	60	60	60
802.11g	6Mbps	60	60	60
802.11n-HT20	MCS0	60	60	60
802.11n-HT40	MCS0	60	60	60

Support Equipment List and Details

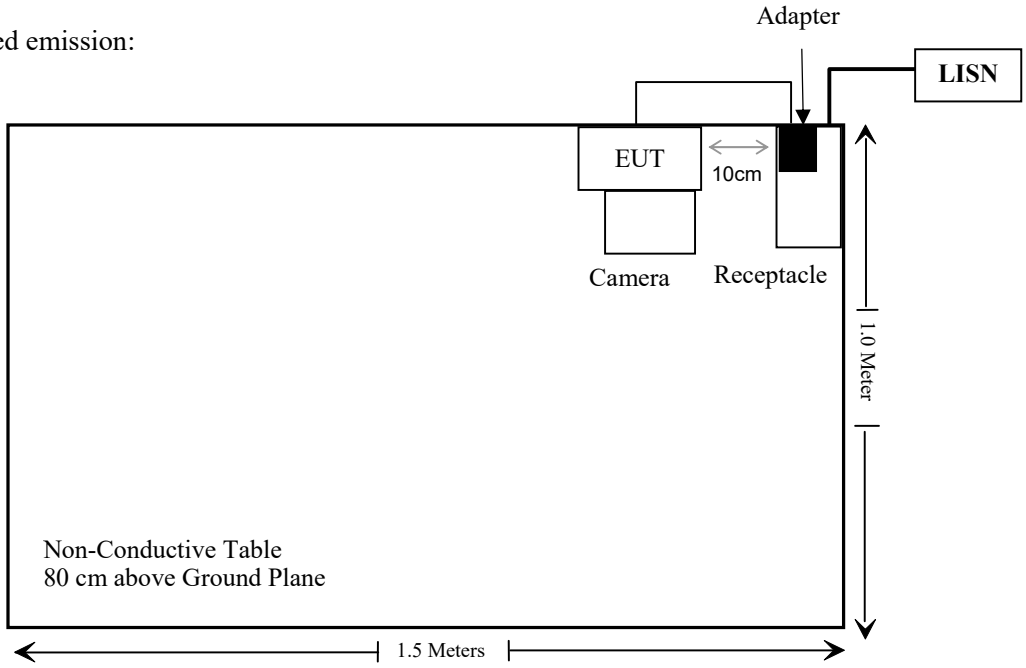
Manufacturer	Description	Model	Serial Number
Chillax Care Limited	Camera	DM680	Unknown

External I/O Cable

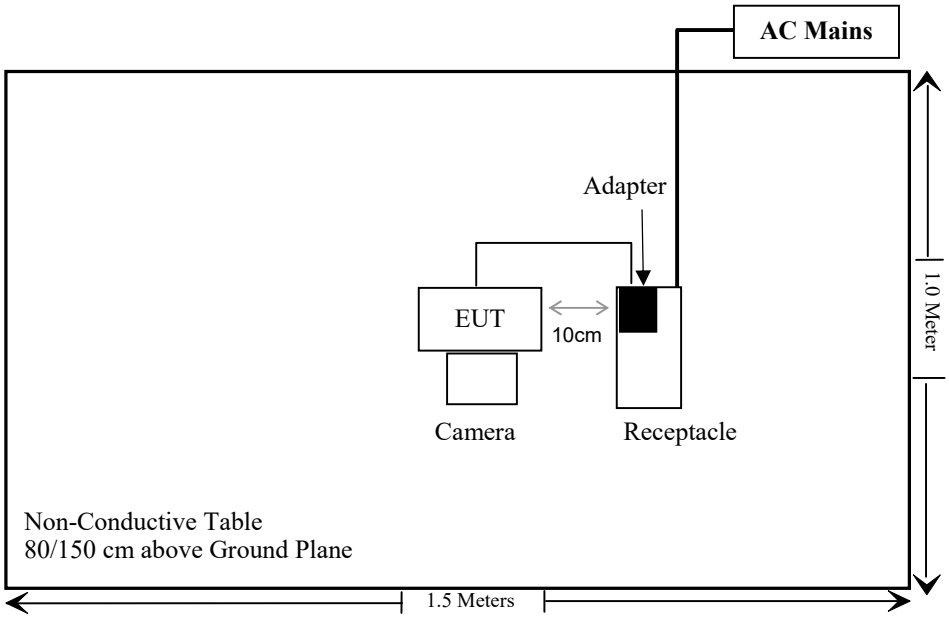
Cable Description	Length (m)	From Port	To
Un-shielding Un-Detachable DC Cable	1.5	EUT	Adapter

Block Diagram of Test Setup

For conducted emission:



For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	RSS-247 & RSS-Gen Rules	Description of Test	Result
15.247 (i) & §1.1307 (b) (3) & §2.1091	RSS-102 § 2.5.2	MPE-Based Exemption & Exemption Limits For Routine Evaluation-RF Exposure Evaluation	Compliant
§15.203	RSS-Gen §6.8	Antenna Requirement	Compliant
§15.207 (a)	RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	RSS-GEN § 8.10 & RSS-247 § 5.5	Spurious Emissions	Compliant
§15.247 (a)(2)	RSS- Gen§6.7 RSS-247 § 5.2 (a)	99% Occupied Bandwidth & 6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	RSS-247 § 5.4(d)	Maximum Conducted Output Power	Compliant
§15.247(d)	RSS-247 § 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	RSS-247 § 5.2 (b)	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
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2022/11/25	2023/11/24
Anritsu Corp	50 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 19821b (V9)					
Radiated Emissions Test (30MHz-1GHZ)					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
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
Radiated Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test (above 1GHz)					
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
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	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	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
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2022/11/25	2023/11/24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/11/25	2023/11/24
Tonscend	RF Control Unit	JS0806-2	19G8060182	2022/10/24	2023/10/23
Agilent	USB wideband power sensor	U2021XA	MY54250003	2022/06/27	2023/06/26
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101948	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	Each time
Unknown	RF Cable	No.01	RF-02	Each time	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 §15.247 (i) & §1.1307 (b) (3) & §2.1091- MPE-Based Exemption

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.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemptionfrom further evaluation from 300 kHz through 100 GHz.

Table 1 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.

Ris the minimum separation distance in meters
f = frequency in MHz

Result

Mode	Frequency (MHz)	Tune up conducted power	Antenna Gain		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
Wi-Fi	2412-2472	24.5	0	-2.15	22.35	171.79	0.2	768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
2. The FHSS and Wi-Fi cannot transmit at same time.

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

Result: Compliant.

RSS-102 § 2.5.2 –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 § (2.5.2):

2.5.2 Exemption Limits for Routine Evaluation — RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Data:

For worst case:

Mode	Frequency (MHz)	Maximum tune-up conducted power	Antenna Gain	Maximum tune-up EIRP		Evaluation Distance (cm)	Limit (W)
		(dBm)	(dBi)	(dBm)	(W)		
Wi-Fi	2412-2472	24.5	0	24.5	0.282	20	2.68

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
2. The FHSS and Wi-Fi cannot transmit at same time.

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

Result: The RF Exposure evaluation can be exempted.

§15.203 & RSS-Gen §6.8 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.

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has an internal antenna arrangement which was permanently attached and the antenna gain is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Type	Antenna Gain	Impedance
Monopole	0dBi	50 Ω

Result: Pass

§ 15.207 (a) & RSS-GEN §8.8 AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207 and RSS-GEN §8.8

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Table 4 - AC Power Lines Conducted Emission Limits		
Frequency range (MHz)	Conducted limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

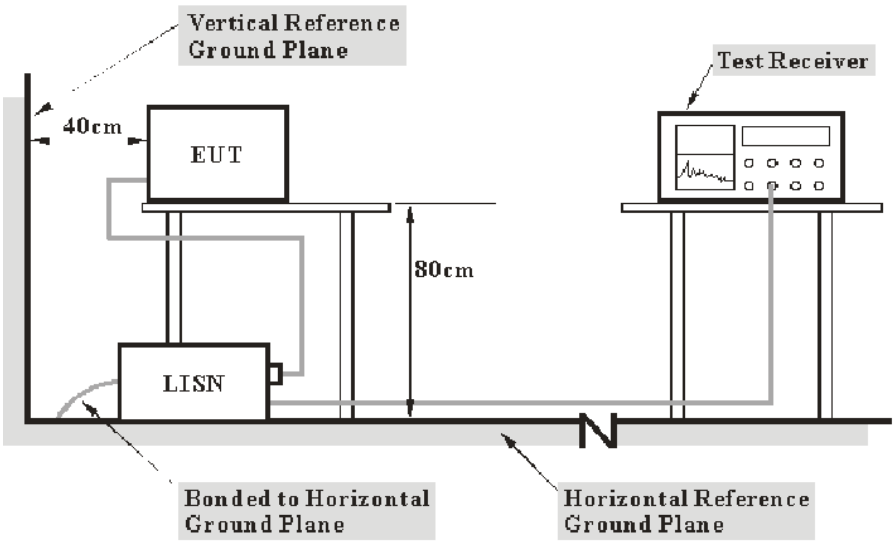
Note 1: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.

(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

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 & RSS-Gen limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver 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 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.

Corrected Factor & Margin Calculation

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

Transd Factor = LISN VDF + Cable Loss

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

Over limit = Level - Limit
Level= Reading level+ Transd Factor

Test Data

Environmental Conditions

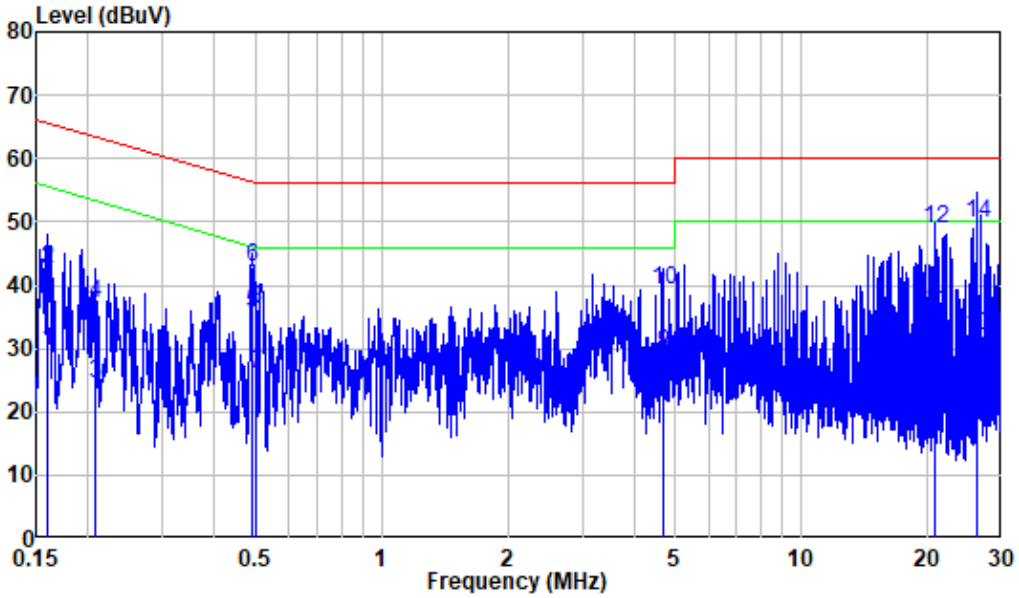
Temperature:	23 ℃
Relative Humidity:	52%
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2023-02-02.

EUT operation mode: Transmitting (worst case is 802.11b, low channel)

Adapter 1(Model: YWK-AD050200-U):

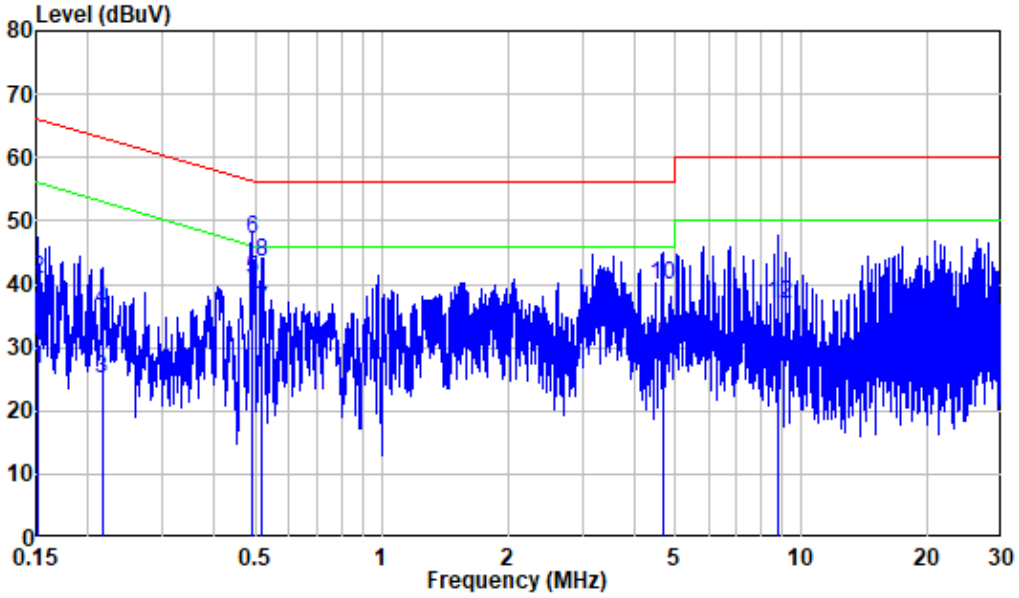
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA221213-61312E-RF
Mode : Charging+2.4G WIFI Transmitting
Note : YWK-AD050200-U

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.160	9.90	19.65	29.55	55.48	-25.93	Average
2	0.160	9.90	32.55	42.45	65.48	-23.03	QP
3	0.207	9.90	14.56	24.46	53.32	-28.86	Average
4	0.207	9.90	27.34	37.24	63.32	-26.08	QP
5	0.492	9.80	25.96	35.76	46.13	-10.37	Average
6	0.492	9.80	33.07	42.87	56.13	-13.26	QP
7	0.500	9.80	16.25	26.05	46.00	-19.95	Average
8	0.500	9.80	26.41	36.21	56.00	-19.79	QP
9	4.690	9.95	19.28	29.23	46.00	-16.77	Average
10	4.690	9.95	29.17	39.12	56.00	-16.88	QP
11	20.814	10.02	25.77	35.79	50.00	-14.21	Average
12	20.814	10.02	38.78	48.80	60.00	-11.20	QP
13	26.278	10.13	21.80	31.93	50.00	-18.07	Average
14	26.278	10.13	39.61	49.74	60.00	-10.26	QP

AC 120V/60 Hz, Neutral

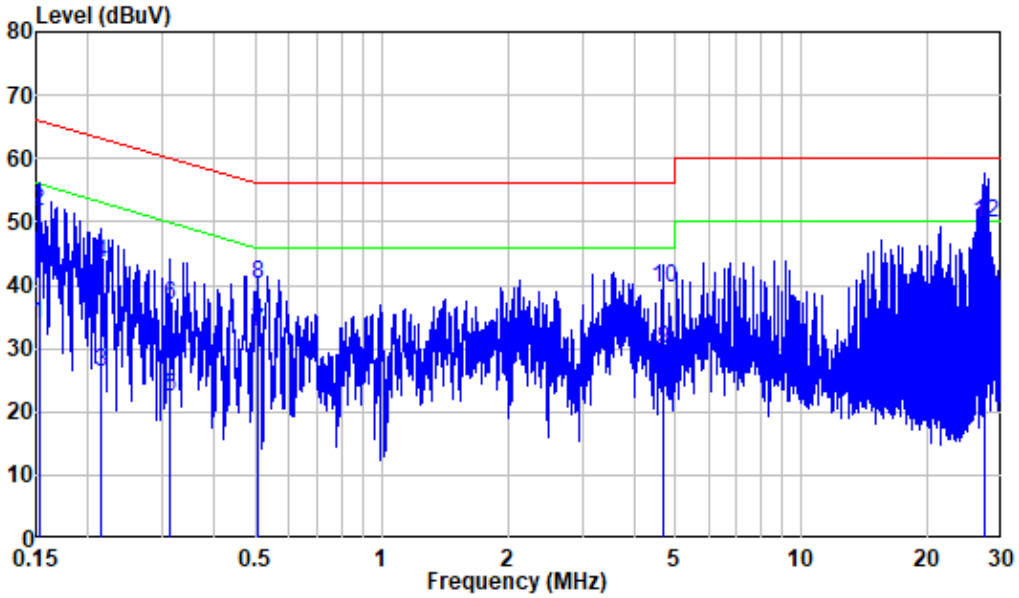


Site : Shielding Room
Condition: Neutral
Job No. : RA221213-61312E-RF
Mode : Charging+2.4G WIFI Transmitting
Note : YWK-AD050200-U

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.152	9.80	16.81	26.61	55.88	-29.27	Average
2	0.152	9.80	30.81	40.61	65.88	-25.27	QP
3	0.215	9.81	15.13	24.94	52.99	-28.05	Average
4	0.215	9.81	26.11	35.92	62.99	-27.07	QP
5	0.492	9.90	30.90	40.80	46.14	-5.34	Average
6	0.492	9.90	37.13	47.03	56.14	-9.11	QP
7	0.518	9.90	26.12	36.02	46.00	-9.98	Average
8	0.518	9.90	33.63	43.53	56.00	-12.47	QP
9	4.662	9.90	20.46	30.36	46.00	-15.64	Average
10	4.662	9.90	29.80	39.70	56.00	-16.30	QP
11	8.764	10.03	17.85	27.88	50.00	-22.12	Average
12	8.764	10.03	26.81	36.84	60.00	-23.16	QP

Adapter 2(Model: KA12H-0502000US):

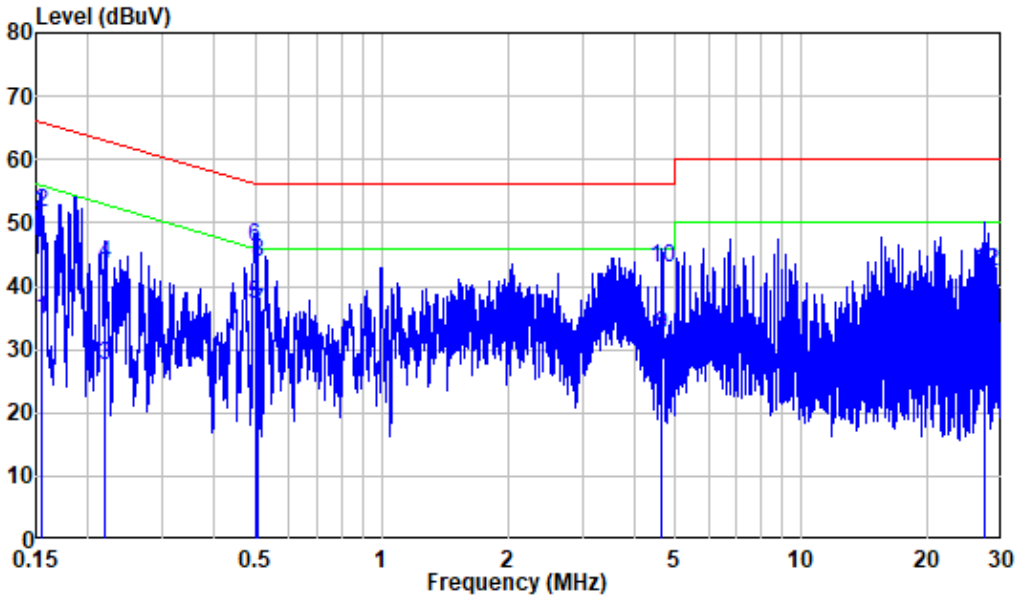
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA221213-61312E-RF
Mode : Charging+2.4G WIFI Transmitting
Note : KA12H-0502000US

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.152	9.90	23.91	33.81	55.87	-22.06	Average
2	0.152	9.90	41.66	51.56	65.87	-14.31	QP
3	0.214	9.89	16.39	26.28	53.05	-26.77	Average
4	0.214	9.89	33.62	43.51	63.05	-19.54	QP
5	0.313	9.85	12.36	22.21	49.89	-27.68	Average
6	0.313	9.85	27.09	36.94	59.89	-22.95	QP
7	0.505	9.80	22.67	32.47	46.00	-13.53	Average
8	0.505	9.80	30.36	40.16	56.00	-15.84	QP
9	4.690	9.95	19.83	29.78	46.00	-16.22	Average
10	4.690	9.95	29.46	39.41	56.00	-16.59	QP
11	27.398	10.15	21.87	32.02	50.00	-17.98	Average
12	27.398	10.15	39.63	49.78	60.00	-10.22	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : RA221213-61312E-RF
Mode : Charging+2.4G WIFI Transmitting
Note : KA12H-0502000US

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.155	9.80	25.04	34.84	55.73	-20.89	Average
2	0.155	9.80	41.88	51.68	65.73	-14.05	QP
3	0.219	9.81	17.69	27.50	52.87	-25.37	Average
4	0.219	9.81	33.74	43.55	62.87	-19.32	QP
5	0.499	9.90	27.24	37.14	46.02	-8.88	Average
6	0.499	9.90	36.37	46.27	56.02	-9.75	QP
7	0.505	9.90	26.11	36.01	46.00	-9.99	Average
8	0.505	9.90	33.72	43.62	56.00	-12.38	QP
9	4.659	9.90	22.41	32.31	46.00	-13.69	Average
10	4.659	9.90	33.07	42.97	56.00	-13.03	QP
11	27.398	10.19	18.53	28.72	50.00	-21.28	Average
12	27.398	10.19	32.20	42.39	60.00	-17.61	QP

§15.205, §15.209, §15.247(d) & RSS-GEN § 8.10 & RSS-247 § 5.5 SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

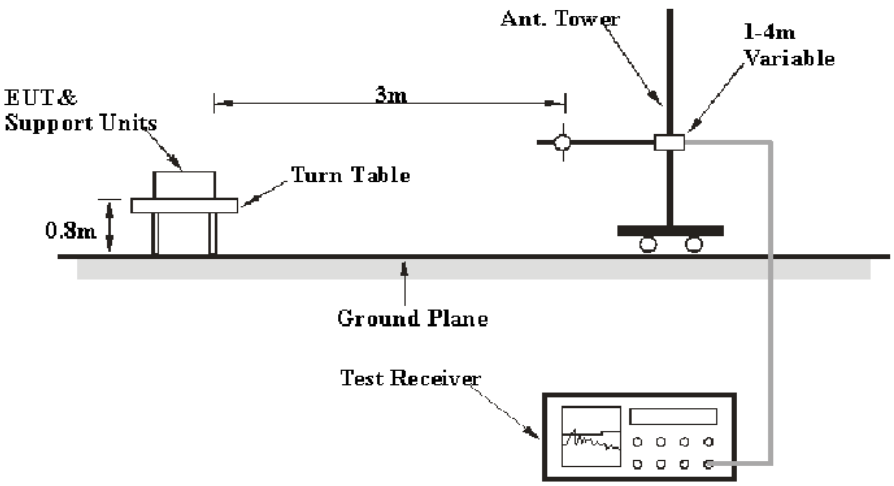
According to RSS-GEN § 8.10 & RSS-247 § 5.5

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

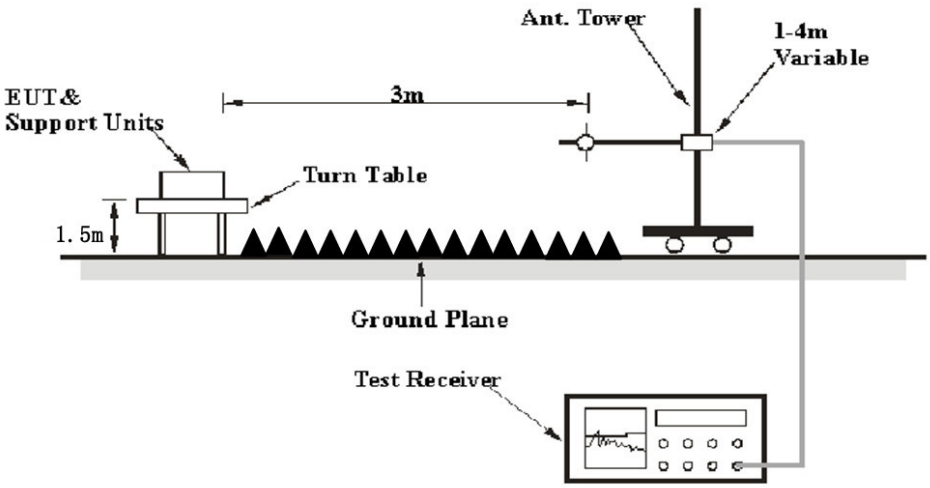
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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 & RSS-Gen. The specification used was the FCC 15.209, and FCC 15.247 & RSS-Gen limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	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.

Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

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.

Repeat above procedures until all measured frequencies were complete.

Corrected Amplitude & Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

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

Test Data

Environmental Conditions

Temperature:	24~24.5℃
Relative Humidity:	50~62%
ATM Pressure:	101.0 kPa

The testing was performed by jimi zheng on 2023-01-16 for below 1GHz, Jaosn Liu on 2022-12-17 for above 1GHz.

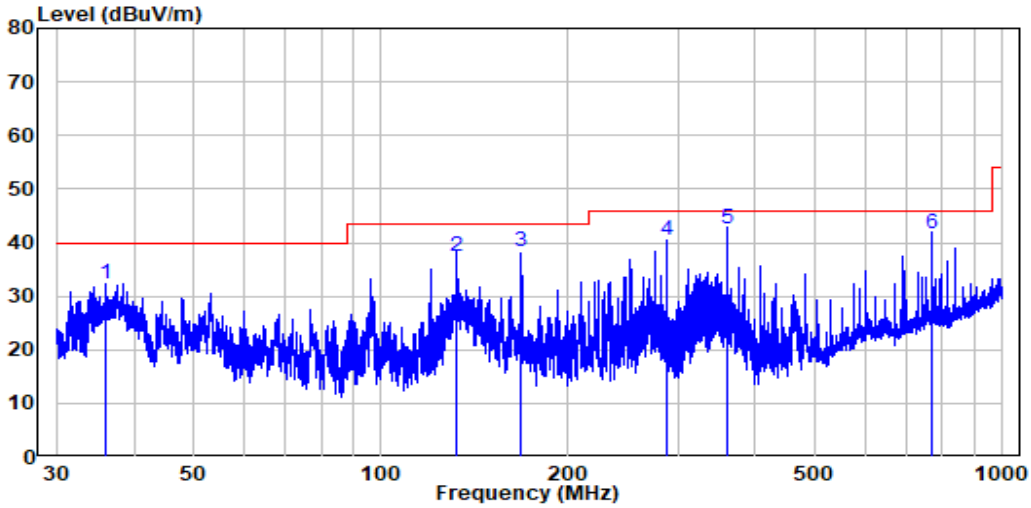
EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

30 MHz~1 GHz: *(worst case at 802.11b mode, low channel)*

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

Adapter 1(Model: YWK-AD050200-U)

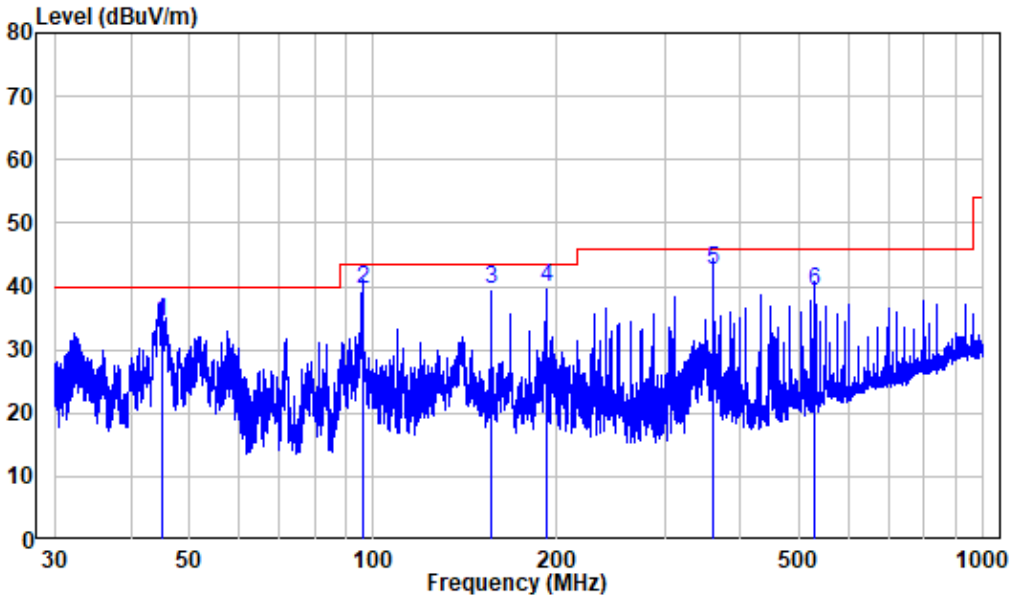
Horizontal




```
Site      : chamber
Condition: 3m HORIZONTAL
Job No.   : RA221213-61312E-RF
Test Mode: Charging+2.4G WIFI Transmitting
Note      : YWK-AD050200-U
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	35.953	-11.21	43.41	32.20	40.00	-7.80	Peak
2	132.395	-14.98	52.30	37.32	43.50	-6.18	QP
3	168.193	-13.76	52.00	38.24	43.50	-5.26	QP
4	287.990	-9.36	49.80	40.44	46.00	-5.56	QP
5	359.974	-7.68	50.20	42.52	46.00	-3.48	QP
6	767.738	-0.29	41.80	41.51	46.00	-4.49	QP

Vertical

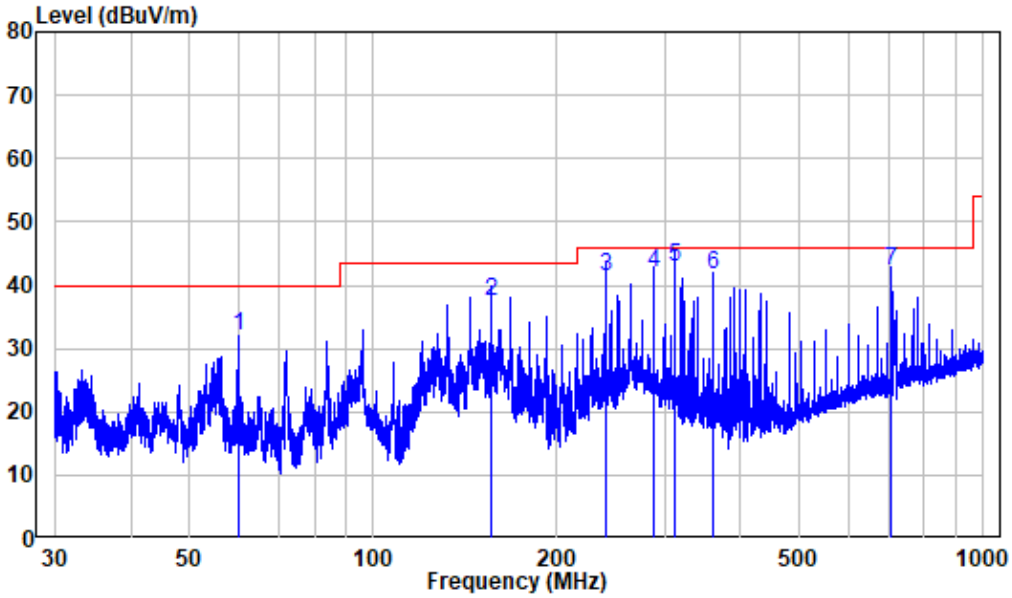


Site : chamber
Condition: 3m VERTICAL
Job No. : RA221213-61312E-RF
Test Mode: Charging+2.4G WIFI Transmitting
Note : YWK-AD050200-U

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	44.920	-9.94	44.30	34.36	40.00	-5.64	QP
2	96.014	-12.30	51.70	39.40	43.50	-4.10	QP
3	156.115	-14.80	54.50	39.70	43.50	-3.80	QP
4	191.913	-11.26	51.10	39.84	43.50	-3.66	QP
5	361.714	-7.64	50.21	42.57	46.00	-3.43	QP
6	528.014	-4.48	43.86	39.38	46.00	-6.62	QP

Adapter 2(Model: KA12H-0502000US)

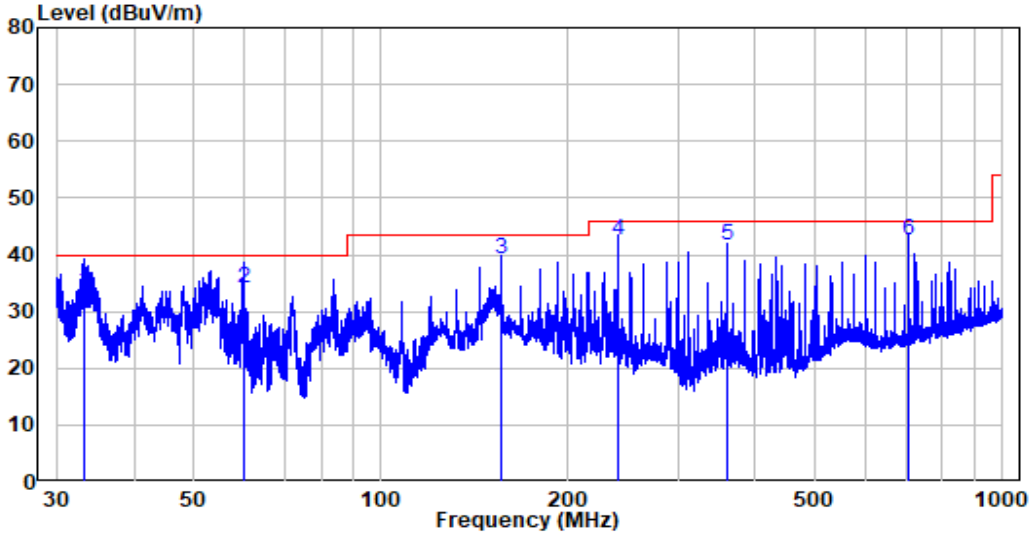
Horizontal:



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA221213-61312E-RF
Test Mode: Charging+2.4G WIFI Transmitting
Note : KA12H-0502000US

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	60.016	-10.63	42.50	31.87	40.00	-8.13	Peak
2	155.979	-14.82	52.30	37.48	43.50	-6.02	QP
3	240.093	-10.90	52.40	41.50	46.00	-4.50	QP
4	288.117	-9.36	51.30	41.94	46.00	-4.06	QP
5	312.179	-8.82	51.60	42.78	46.00	-3.22	QP
6	360.132	-7.68	49.30	41.62	46.00	-4.38	QP
7	705.153	-1.46	43.60	42.14	46.00	-3.86	QP

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA221213-61312E-RF
Test Mode: Charging+2.4G WIFI Transmitting
Note : KA12H-0502000US

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	33.372	-11.95	45.60	33.65	40.00	-6.35	QP
2	59.990	-10.62	44.70	34.08	40.00	-5.92	QP
3	156.047	-14.81	54.00	39.19	43.50	-4.31	QP
4	240.093	-10.90	53.40	42.50	46.00	-3.50	QP
5	360.132	-7.68	49.20	41.52	46.00	-4.48	QP
6	705.462	-1.46	44.10	42.64	46.00	-3.36	QP

1 GHz-25 GHz: Worst case is Adapter 1(Model: YWK-AD050200-U)

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11b									
Low Channel(2412MHz)									
2310	61.80	PK	132	1.7	H	-7.24	54.56	74	-19.44
2310	47.03	AV	132	1.7	H	-7.24	39.79	54	-14.21
2310	61.82	PK	250	1.1	V	-7.24	54.58	74	-19.42
2310	47.29	AV	250	1.1	V	-7.24	40.05	54	-13.95
2390	62.50	PK	15	1.2	H	-7.22	55.28	74	-18.72
2390	48.49	AV	15	1.2	H	-7.22	41.27	54	-12.73
2390	62.67	PK	218	1.9	V	-7.22	55.45	74	-18.55
2390	48.64	AV	218	1.9	V	-7.22	41.42	54	-12.58
4824	57.55	PK	1	2.2	H	-3.52	54.03	74	-19.97
4824	45.64	AV	1	2.2	H	-3.52	42.12	54	-11.88
4824	57.72	PK	208	1.8	V	-3.52	54.20	74	-19.80
4824	45.72	AV	208	1.8	V	-3.52	42.20	54	-11.80
Middle Channel(2442MHz)									
4884	57.41	PK	184	1.5	H	-3.36	54.05	74	-19.95
4884	45.39	AV	184	1.5	H	-3.36	42.03	54	-11.97
4884	57.59	PK	184	1	V	-3.36	54.23	74	-19.77
4884	45.80	AV	184	1	V	-3.36	42.44	54	-11.56
High Channel(2472 MHz)									
2483.5	77.58	PK	204	1.5	H	-7.20	70.38	74	-3.62
2483.5	57.27	AV	204	1.5	H	-7.20	50.07	54	-3.93
2483.5	79.03	PK	109	1.2	V	-7.20	71.83	74	-2.17
2483.5	58.50	AV	109	1.2	V	-7.20	51.30	54	-2.70
2500	63.82	PK	131	1.9	H	-7.18	56.64	74	-17.36
2500	49.34	AV	131	1.9	H	-7.18	42.16	54	-11.84
2500	64.32	PK	338	1.4	V	-7.18	57.14	74	-16.86
2500	50.25	AV	338	1.4	V	-7.18	43.07	54	-10.93
4944	57.18	PK	226	1.6	H	-3.07	54.11	74	-19.89
4944	45.18	AV	226	1.6	H	-3.07	42.11	54	-11.89
4944	57.28	PK	298	1.5	V	-3.07	54.21	74	-19.79
4944	46.37	AV	298	1.5	V	-3.07	43.30	54	-10.70

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11g									
Low Channel(2412MHz)									
2310	61.55	PK	259	1.1	H	-7.24	54.31	74	-19.69
2310	47.94	AV	259	1.1	H	-7.24	40.70	54	-13.30
2310	61.84	PK	284	1	V	-7.24	54.60	74	-19.40
2310	48.12	AV	284	1	V	-7.24	40.88	54	-13.12
2390	62.98	PK	313	2.2	H	-7.22	55.76	74	-18.24
2390	49.46	AV	313	2.2	H	-7.22	42.24	54	-11.76
2390	62.75	PK	358	1.8	V	-7.22	55.53	74	-18.47
2390	49.18	AV	358	1.8	V	-7.22	41.96	54	-12.04
4824	56.60	PK	255	1.7	H	-3.52	53.08	74	-20.92
4824	56.32	PK	157	1.7	V	-3.52	52.80	74	-21.20
Middle Channel(2442MHz)									
4884	56.45	PK	34	1.4	H	-3.36	53.09	74	-20.91
4884	56.69	PK	243	1.4	V	-3.36	53.33	74	-20.67
High Channel(2472 MHz)									
2483.5	79.48	PK	208	2.1	H	-7.20	72.28	74	-1.72
2483.5	57.26	AV	208	2.1	H	-7.20	50.06	54	-3.94
2483.5	80.13	PK	289	2.1	V	-7.20	72.93	74	-1.07
2483.5	58.81	AV	289	2.1	V	-7.20	51.61	54	-2.39
2500	63.27	PK	21	1.4	H	-7.18	56.09	74	-17.91
2500	49.35	AV	21	1.4	H	-7.18	42.17	54	-11.83
2500	63.80	PK	47	1.6	V	-7.18	56.62	74	-17.38
2500	49.81	AV	47	1.6	V	-7.18	42.63	54	-11.37
4944	56.49	PK	103	1.7	H	-3.07	53.42	74	-20.58
4944	56.56	PK	243	1.7	V	-3.07	53.49	74	-20.51

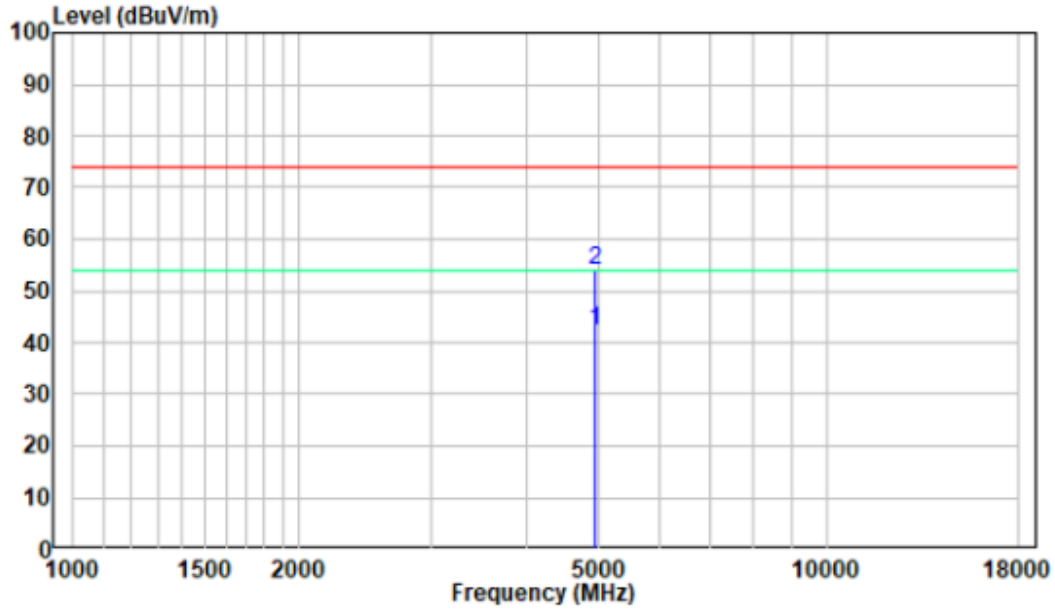
Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11n20									
Low Channel(2412MHz)									
2310	61.56	PK	180	2.1	H	-7.24	54.32	74	-19.68
2310	47.91	AV	180	2.1	H	-7.24	40.67	54	-13.33
2310	61.48	PK	185	2.3	V	-7.24	54.24	74	-19.76
2310	47.74	AV	185	2.3	V	-7.24	40.50	54	-13.50
2390	63.14	PK	66	2.2	H	-7.22	55.92	74	-18.08
2390	49.53	AV	66	2.2	H	-7.22	42.31	54	-11.69
2390	63.00	PK	192	1.2	V	-7.22	55.78	74	-18.22
2390	48.99	AV	192	1.2	V	-7.22	41.77	54	-12.23
4824	57.47	PK	313	1.8	H	-3.52	53.95	74	-20.05
4824	56.90	PK	33	1.8	V	-3.52	53.38	74	-20.62
Middle Channel(2442MHz)									
4884	56.54	PK	165	2.1	H	-3.36	53.18	74	-20.82
4884	56.42	PK	8	2.1	V	-3.36	53.06	74	-20.94
High Channel(2472 MHz)									
2483.5	80.09	PK	45	1.4	H	-7.20	72.89	74	-1.11
2483.5	58.19	AV	45	1.4	H	-7.20	50.99	54	-3.01
2483.5	78.50	PK	174	1.1	V	-7.20	71.3	74	-2.70
2483.5	57.47	AV	174	1.1	V	-7.20	50.27	54	-3.73
2500	63.79	PK	268	2.3	H	-7.18	56.61	74	-17.39
2500	49.71	AV	268	2.3	H	-7.18	42.53	54	-11.47
2500	63.31	PK	172	1.6	V	-7.18	56.13	74	-17.87
2500	49.52	AV	172	1.6	V	-7.18	42.34	54	-11.66
4944	56.44	PK	114	1.2	H	-3.07	53.37	74	-20.63
4944	55.74	PK	182	1.2	V	-3.07	52.67	74	-21.33

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11n40									
Low Channel 2422MHz									
2310	62.05	PK	224	1.8	H	-7.24	54.81	74	-19.19
2310	48.46	AV	224	1.8	H	-7.24	41.22	54	-12.78
2310	61.57	PK	14	1.7	V	-7.24	54.33	74	-19.67
2310	48.22	AV	14	1.7	V	-7.24	40.98	54	-13.02
2390	62.46	PK	278	2.3	H	-7.22	55.24	74	-18.76
2390	49.76	AV	278	2.3	H	-7.22	42.54	54	-11.46
2390	62.55	PK	333	1.7	V	-7.22	55.33	74	-18.67
2390	49.85	AV	333	1.7	V	-7.22	42.63	54	-11.37
4844	56.95	PK	129	1.2	H	-3.54	53.41	74	-20.59
4844	56.64	PK	40	1.2	V	-3.54	53.10	74	-20.90
Middle Channel 2442MHz									
4884	57.33	PK	225	2.4	H	-3.36	53.97	74	-20.03
4884	56.90	PK	43	2.4	V	-3.36	53.54	74	-20.46
High Channel 2462MHz									
2483.5	76.06	PK	108	1.8	H	-7.20	68.86	74	-5.14
2483.5	58.21	AV	108	1.8	H	-7.20	51.01	54	-2.99
2483.5	76.05	PK	322	2.3	V	-7.20	68.85	74	-5.15
2483.5	59.06	AV	322	2.3	V	-7.20	51.86	54	-2.14
2500	65.72	PK	330	1.3	H	-7.18	58.54	74	-15.46
2500	50.64	AV	330	1.3	H	-7.18	43.46	54	-10.54
2500	68.58	PK	71	1.1	V	-7.18	61.4	74	-12.60
2500	52.71	AV	71	1.1	V	-7.18	45.53	54	-8.47
4924	56.56	PK	0	1.8	H	-3.16	53.40	74	-20.60
4924	55.82	PK	97	1.8	V	-3.16	52.66	74	-21.34

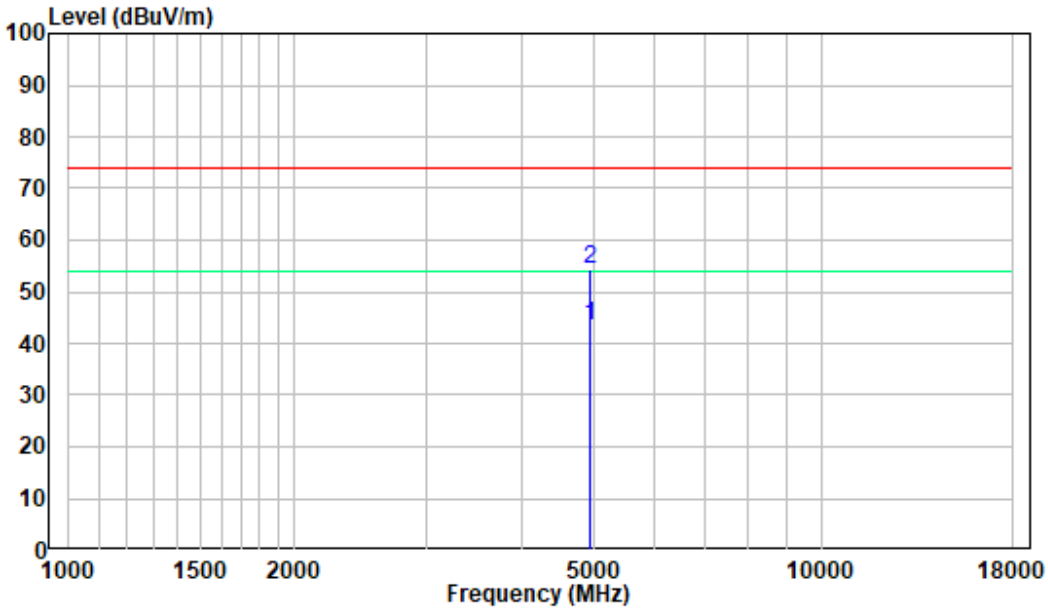
Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Factor + Reading
Margin = Corrected Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was less than the limit of average, so just peak values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

1-18 GHz:

Pre-scan for 802.11 b High Channel
Horizontal

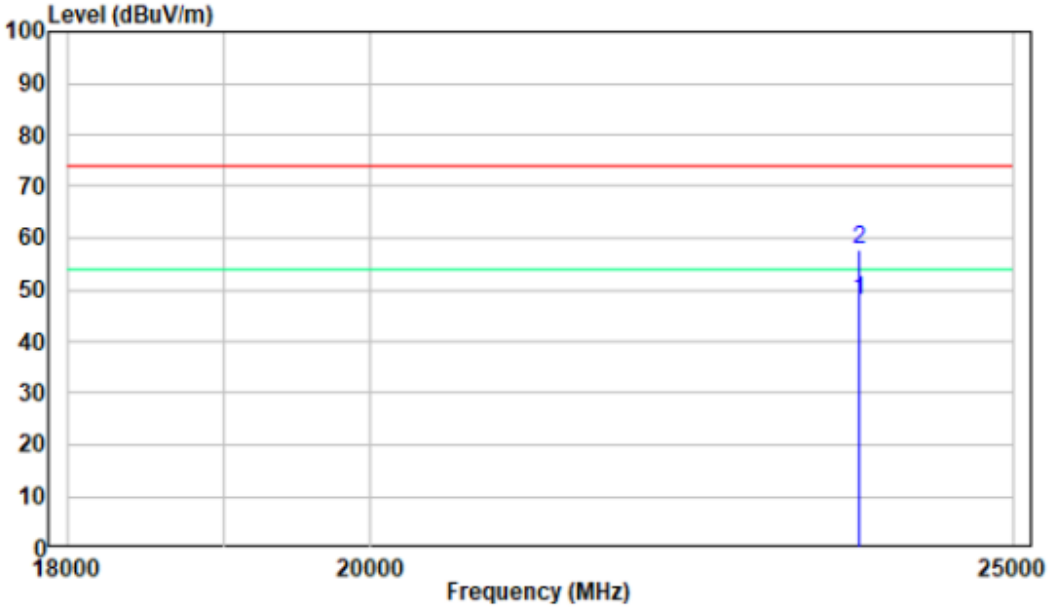


Vertical

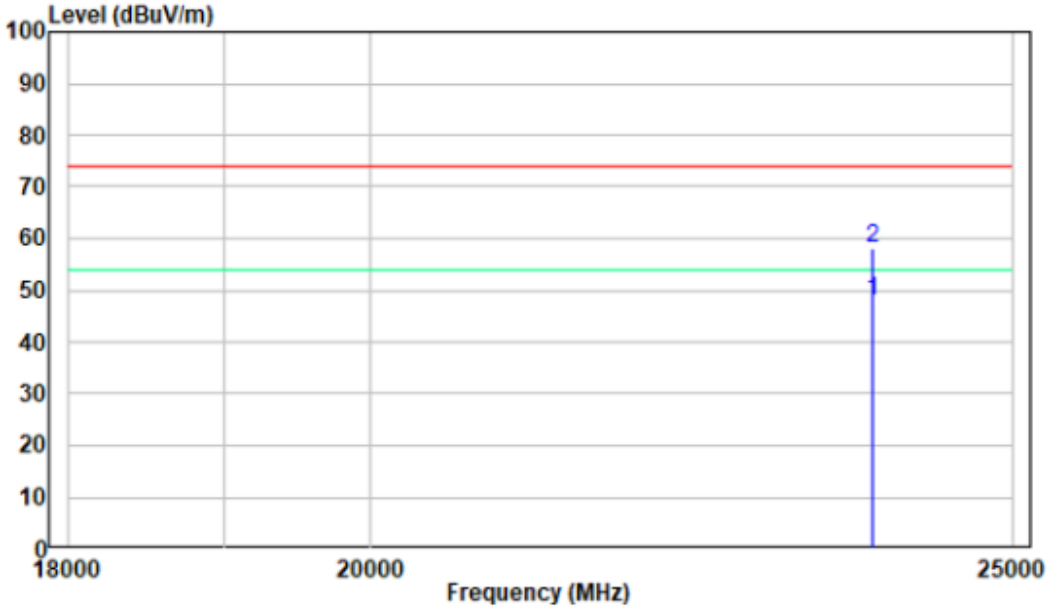


18 -25GHz:

Pre-scan for 802.11 b High Channel
Horizontal



Vertical



§15.247 (a)(2) & RSS-Gen§6.7 RSS-247 § 5.2 (a) 99% OCCUPIED BANDWIDTH & 6 dB EMISSION 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.

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "6 dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated 6 dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.8.1 & Clause 6.9.3

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.

The following conditions shall be observed for measuring the occupied bandwidth and 6 dB bandwidth:
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

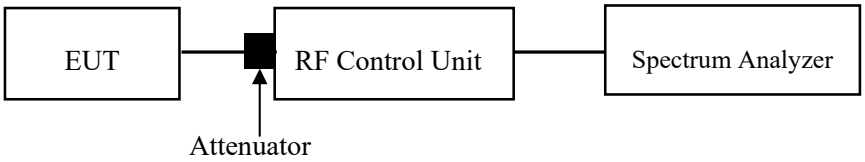
• The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / 6 dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 6 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed

in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-12-27.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

§15.247(b)(3) & RSS-247 § 5.4(d) 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.

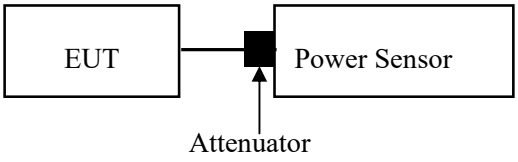
For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling 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 transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.9.1.1

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:	25℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2023-02-28.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

§ 15.247(d) & RSS-247 § 5.5 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

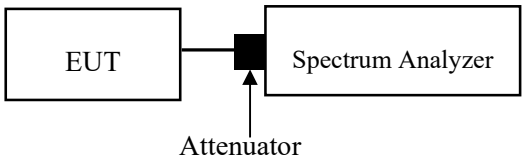
Applicable Standard

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

Test Method: ANSI C63.10-2013 Clause 11.11

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:	25℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2023-02-28.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

§15.247(e) & RSS-247 § 5.2 (b) 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.

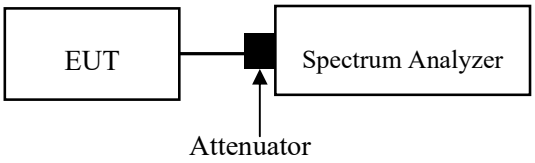
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.10.2

Use this procedure when the maximum average conducted output power in the fundamental emission is used to demonstrate compliance.

1. Measure the duty cycle (*D*) of the transmitter output signal as described in ANSI C63.10-2013 11.6.
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 = Power Averaging (rms).
6. Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
7. Sweep time = auto couple.
8. Trace mode = trace averaging (rms) mode over a minimum of 100 traces.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. When the EUT cannot be configured to transmit continuously (i.e.,D < 98%), when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than ±2%), add [10 log (1 / D)], where D is the duty cycle measured in step 1), to the measured PSD to compute the average PSD during the actual transmission time.
12. When the EUT transmits continuously (or with a $D \geqslant 98\%$), step 11 is not required.
13. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2023-02-28.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

APPENDIX

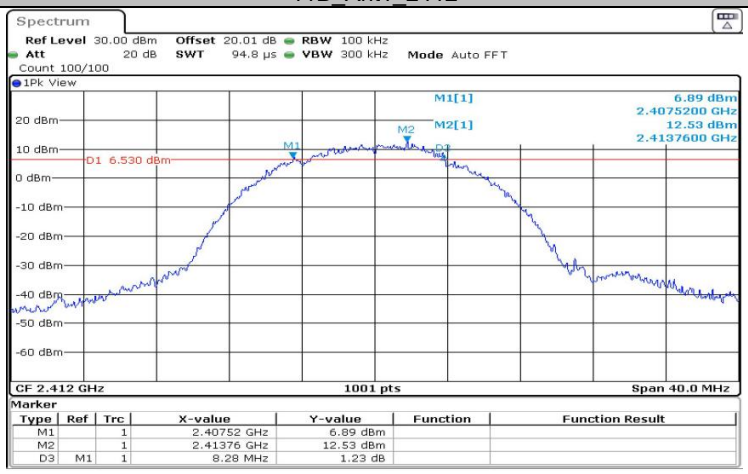
Appendix A: DTS Bandwidth

Test Result

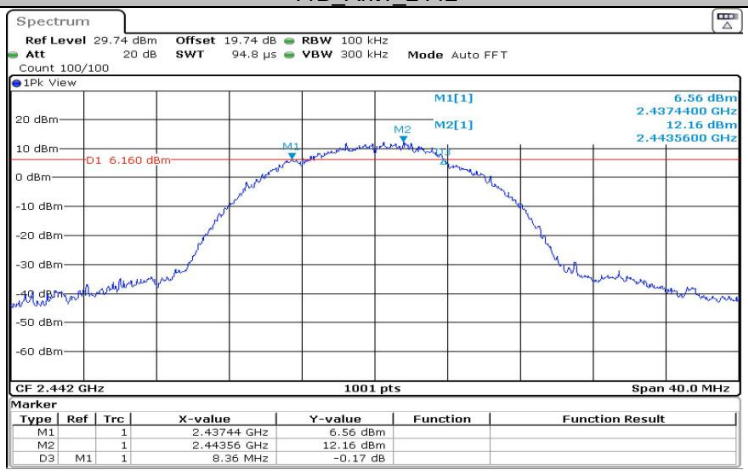
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.28	0.5	PASS
		2442	8.36	0.5	PASS
		2472	8.48	0.5	PASS
11G	Ant1	2412	16.40	0.5	PASS
		2442	16.32	0.5	PASS
		2472	16.32	0.5	PASS
11N20SISO	Ant1	2412	17.60	0.5	PASS
		2442	17.60	0.5	PASS
		2472	17.28	0.5	PASS
11N40SISO	Ant1	2422	36.00	0.5	PASS
		2442	36.40	0.5	PASS
		2462	35.68	0.5	PASS

Test Graphs

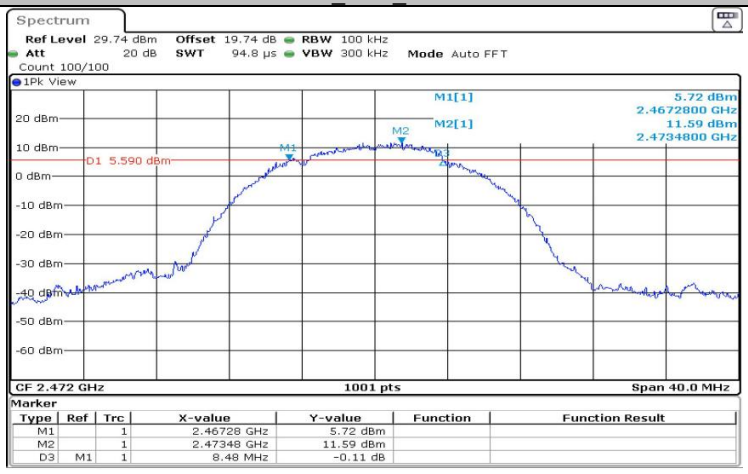
11B_Ant1_2412



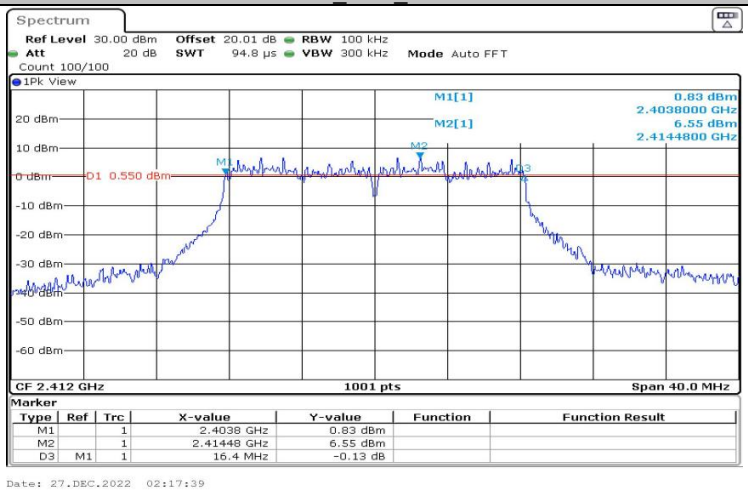
11B_Ant1_2442



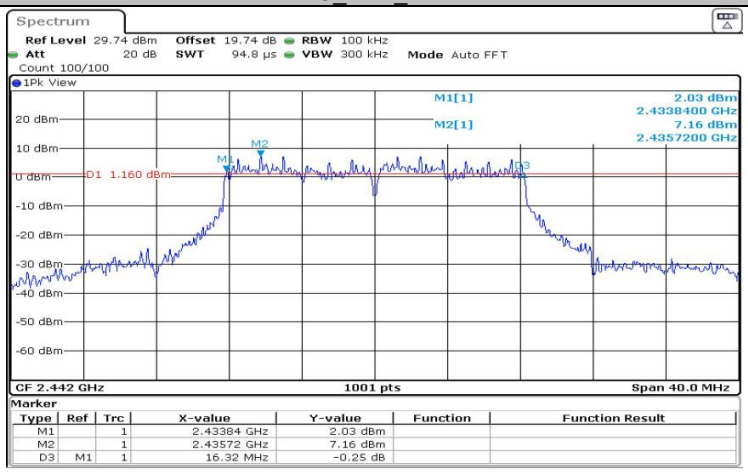
11B_Ant1_2472



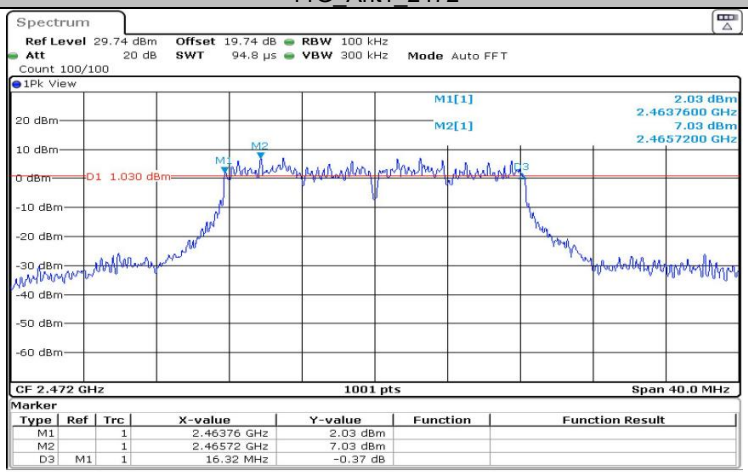
11G_Ant1_2412



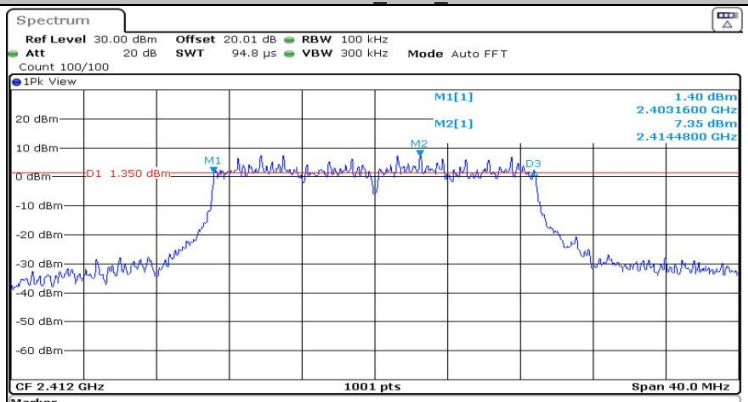
11G_Ant1_2442



11G_Ant1_2472



11N20SISO_Ant1_2412

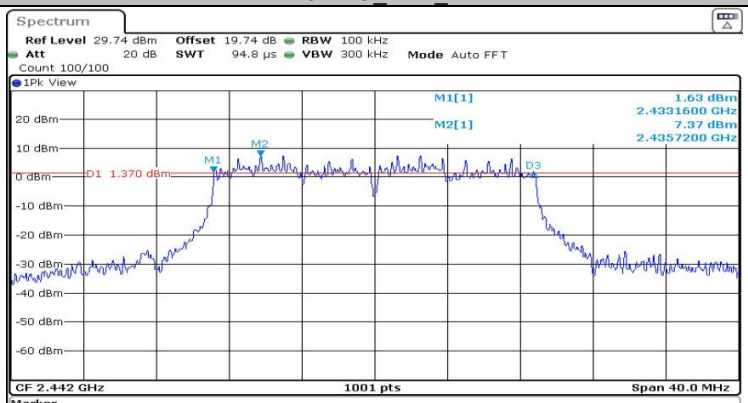


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40316 GHz	1.40 dBm		
M2		1	2.41448 GHz	7.35 dBm		
D3	M1	1	17.6 MHz	0.77 dB		

Date: 27.DEC.2022 02:23:00

11N20SISO_Ant1_2442

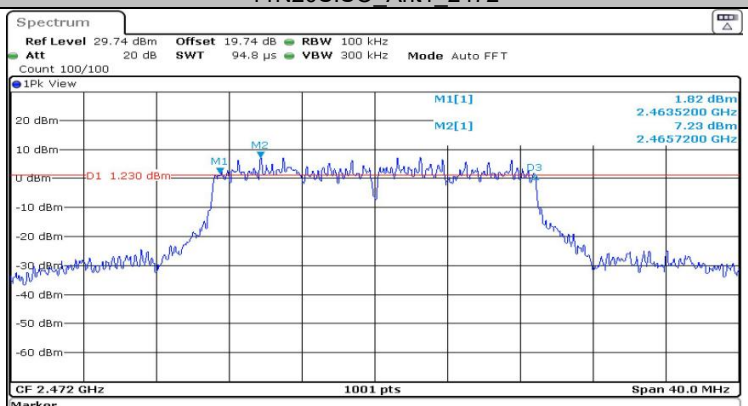


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43316 GHz	1.63 dBm		
M2		1	2.43572 GHz	7.37 dBm		
D3	M1	1	17.6 MHz	-0.00 dB		

Date: 27.DEC.2022 02:25:21

11N20SISO_Ant1_2472

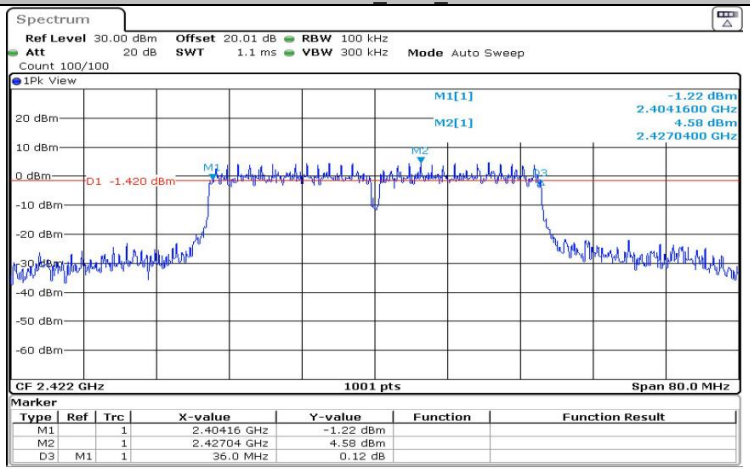


Marker

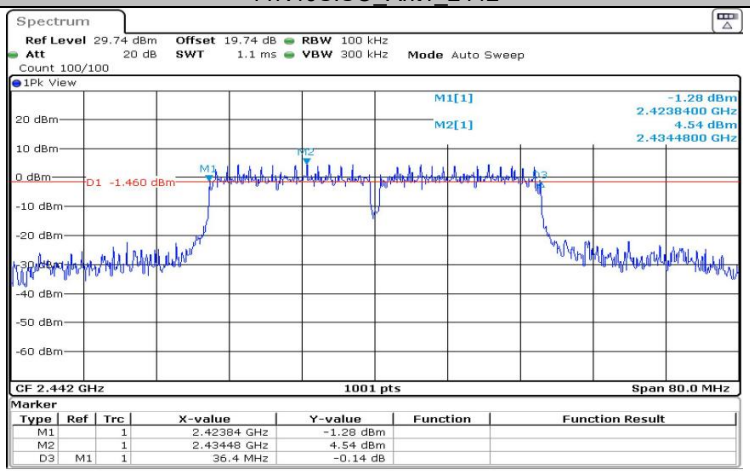
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46352 GHz	1.82 dBm		
M2		1	2.46572 GHz	7.23 dBm		
D3	M1	1	17.28 MHz	-0.42 dB		

Date: 27.DEC.2022 02:26:33

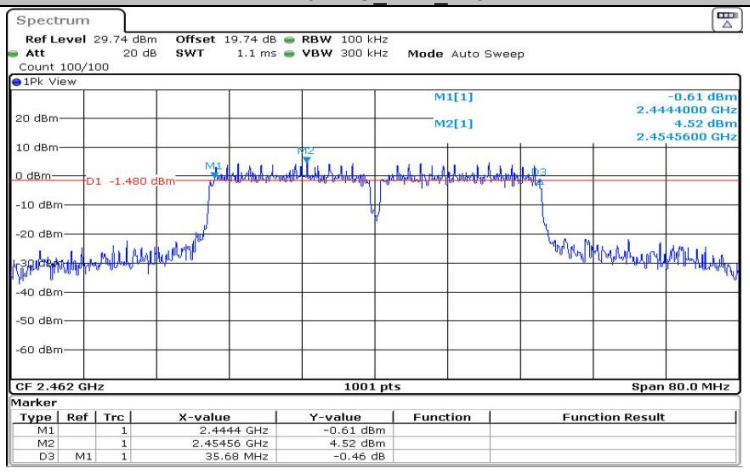
11N40SISO_Ant1_2422



11N40SISO_Ant1_2442



11N40SISO_Ant1_2462



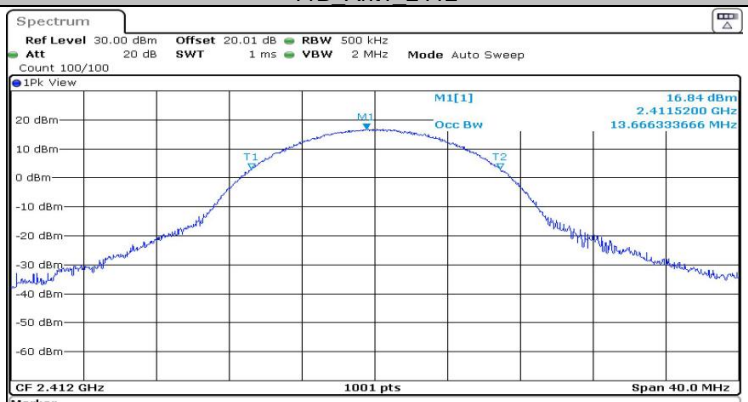
Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel Frequency[MHz]	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.666	---	---
		2442	13.626	---	---
		2472	13.666	---	---
11G	Ant1	2412	17.263	---	---
		2442	17.343	---	---
		2472	17.223	---	---
11N20SISO	Ant1	2412	18.022	---	---
		2442	18.142	---	---
		2472	18.302	---	---
11N40SISO	Ant1	2422	37.403	---	---
		2442	37.003	---	---
		2462	36.923	---	---

Test Graphs

11B_Ant1_2412

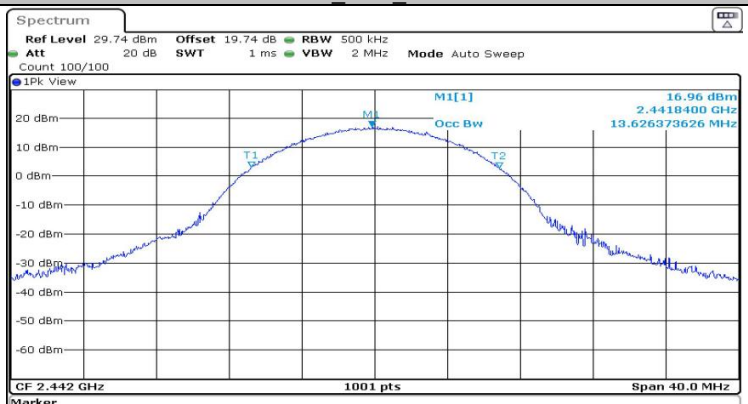


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41152 GHz	16.84 dBm		
T1		1	2.4052068 GHz	3.04 dBm	Occ Bw	13.666333666 MHz
T2		1	2.4188731 GHz	2.90 dBm		

Date: 27.DEC.2022 02:12:35

11B_Ant1_2442

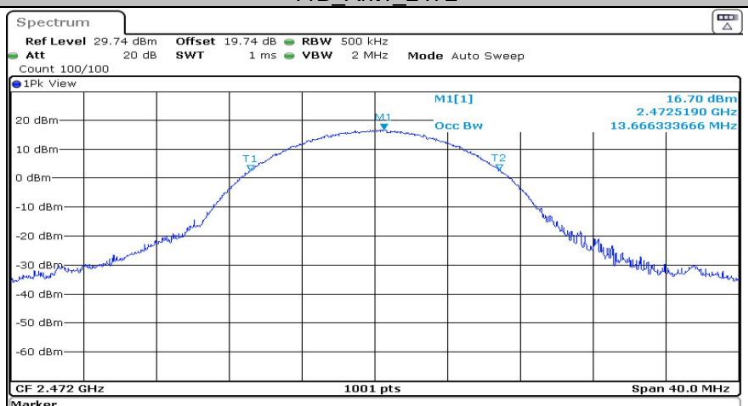


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44184 GHz	16.96 dBm		
T1		1	2.4352068 GHz	2.93 dBm	Occ Bw	13.626373626 MHz
T2		1	2.4488332 GHz	2.83 dBm		

Date: 27.DEC.2022 02:14:12

11B_Ant1_2472

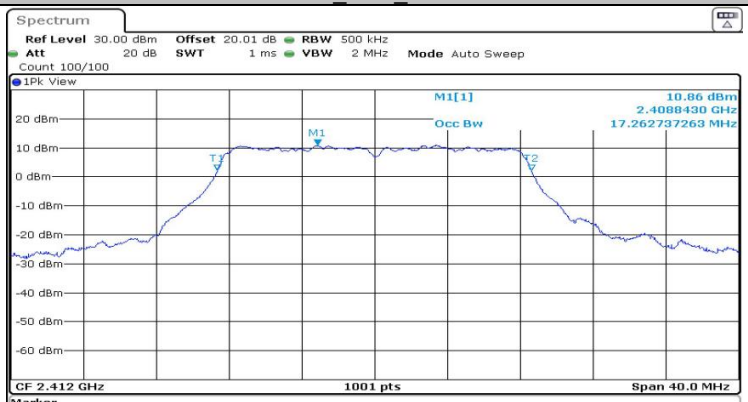


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.472519 GHz	16.70 dBm		
T1		1	2.4651668 GHz	2.57 dBm	Occ Bw	13.666333666 MHz
T2		1	2.4788332 GHz	2.79 dBm		

Date: 27.DEC.2022 02:15:37

11G_Ant1_2412

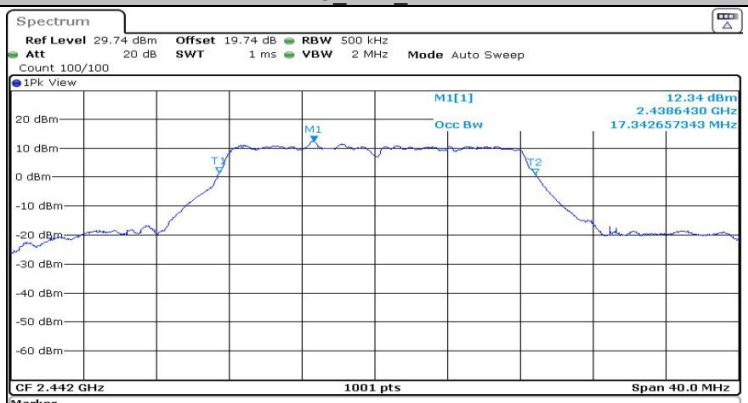


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.408843 GHz	10.86 dBm		
T1		1	2.4033287 GHz	2.10 dBm	Occ Bw	17.262737263 MHz
T2		1	2.4205914 GHz	2.12 dBm		

Date: 27.DEC.2022 02:17:50

11G_Ant1_2442

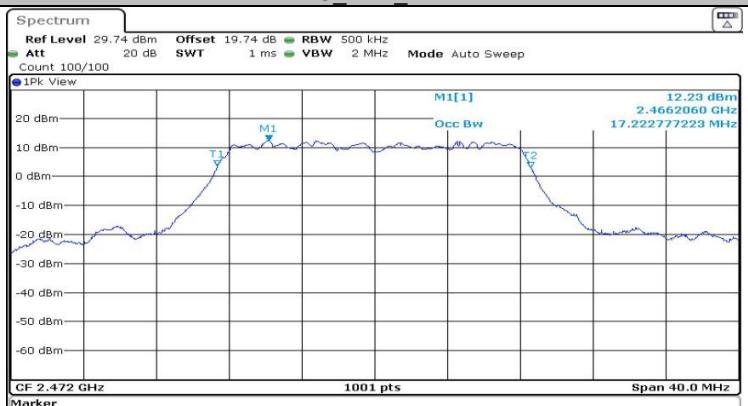


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.438643 GHz	12.34 dBm		
T1		1	2.4334486 GHz	1.51 dBm	Occ Bw	17.342657343 MHz
T2		1	2.4507912 GHz	1.03 dBm		

Date: 27.DEC.2022 02:19:42

11G_Ant1_2472

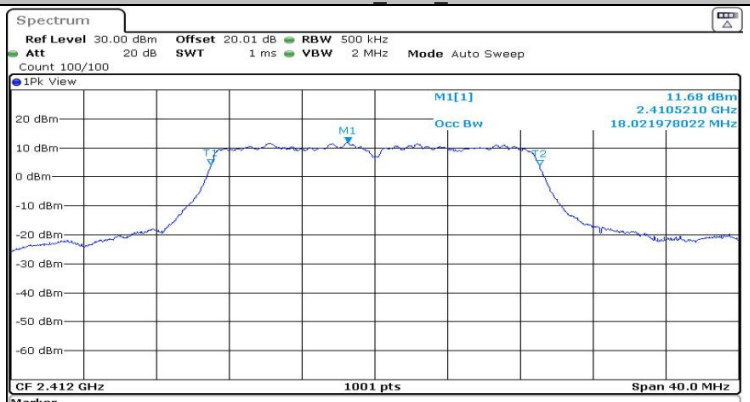


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.466206 GHz	12.23 dBm		
T1		1	2.4633287 GHz	3.45 dBm	Occ Bw	17.222777223 MHz
T2		1	2.4805514 GHz	3.08 dBm		

Date: 27.DEC.2022 02:21:45

11N20SISO_Ant1_2412

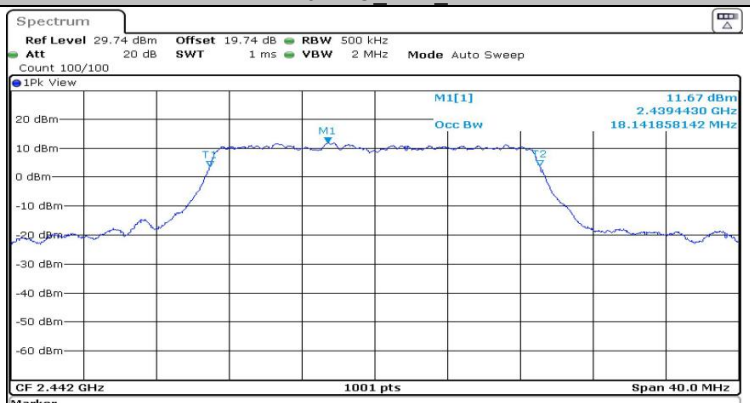


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.410521 GHz	11.68 dBm		
T1		1	2.403009 GHz	4.16 dBm	Occ Bw	18.021978022 MHz
T2		1	2.421031 GHz	3.81 dBm		

Date: 27.DEC.2022 02:23:11

11N20SISO_Ant1_2442

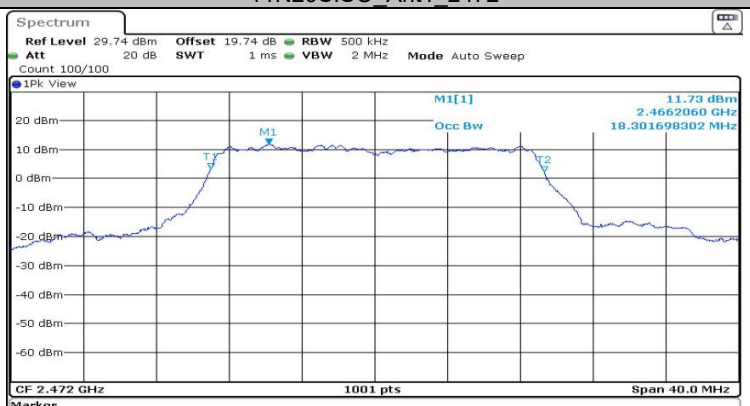


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.439443 GHz	11.67 dBm		
T1		1	2.4329291 GHz	3.65 dBm	Occ Bw	18.141858142 MHz
T2		1	2.4510709 GHz	3.73 dBm		

Date: 27.DEC.2022 02:25:32

11N20SISO_Ant1_2472

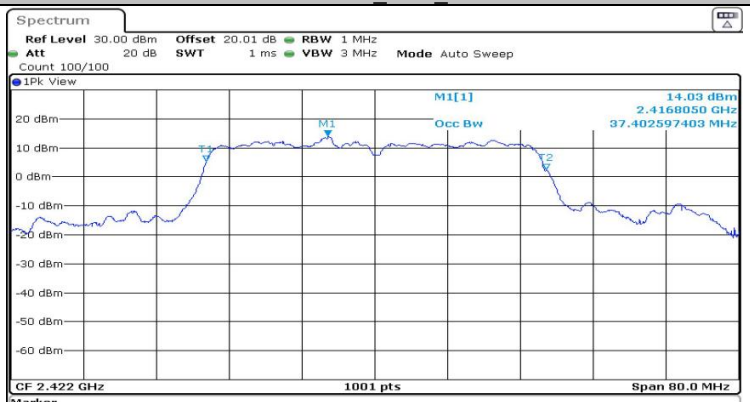


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.466206 GHz	11.73 dBm		
T1		1	2.463009 GHz	3.17 dBm	Occ Bw	18.301698302 MHz
T2		1	2.4813107 GHz	2.11 dBm		

Date: 27.DEC.2022 02:26:43

11N40SISO_Ant1_2422

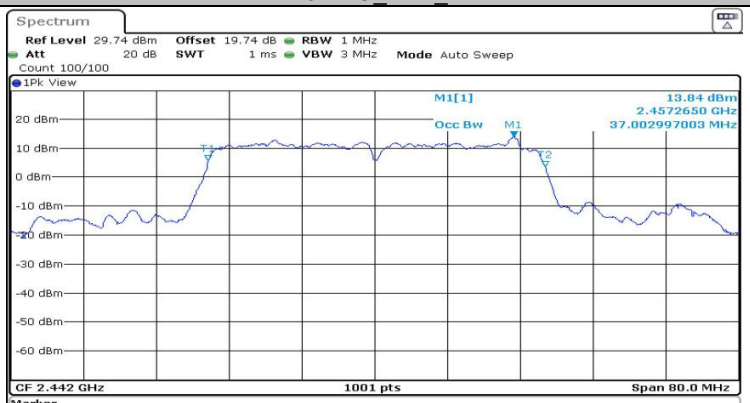


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.416805 GHz	14.03 dBm		
T1		1	2.4034585 GHz	5.28 dBm	Occ Bw	37.402597403 MHz
T2		1	2.4408611 GHz	2.54 dBm		

Date: 27.DEC.2022 02:27:58

11N40SISO_Ant1_2442

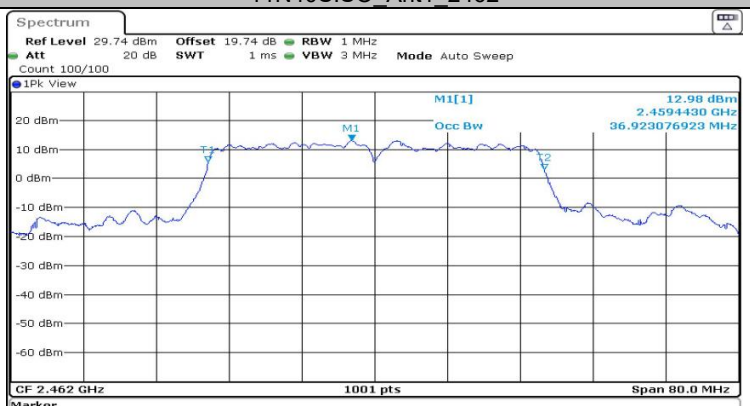


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457265 GHz	13.84 dBm		
T1		1	2.4236983 GHz	5.65 dBm	Occ Bw	37.002997003 MHz
T2		1	2.4607013 GHz	3.65 dBm		

Date: 27.DEC.2022 02:29:20

11N40SISO_Ant1_2462



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.459443 GHz	12.98 dBm		
T1		1	2.4436983 GHz	5.68 dBm	Occ Bw	36.923076923 MHz
T2		1	2.4806214 GHz	3.07 dBm		

Date: 27.DEC.2022 02:30:28

Appendix C: Maximum conducted output power

Test Result

Test Mode	Antenna	Frequency [MHz]	Average Power [dBm]	Conducted Limit[dBm]	EIRP [dBm]	EIRP Limit[dBm]	Verdict
11B	Ant1	2412	24.32	≤30.00	24.32	≤36.00	PASS
		2442	24.03	≤30.00	24.03	≤36.00	PASS
		2472	23.84	≤30.00	23.84	≤36.00	PASS
11G	Ant1	2412	19.37	≤30.00	19.37	≤36.00	PASS
		2442	19.96	≤30.00	19.96	≤36.00	PASS
		2472	19.73	≤30.00	19.73	≤36.00	PASS
11N20SISO	Ant1	2412	19.24	≤30.00	19.24	≤36.00	PASS
		2442	19.87	≤30.00	19.87	≤36.00	PASS
		2472	19.65	≤30.00	19.65	≤36.00	PASS
11N40SISO	Ant1	2422	18.06	≤30.00	18.06	≤36.00	PASS
		2442	18.04	≤30.00	18.04	≤36.00	PASS
		2462	17.99	≤30.00	17.99	≤36.00	PASS

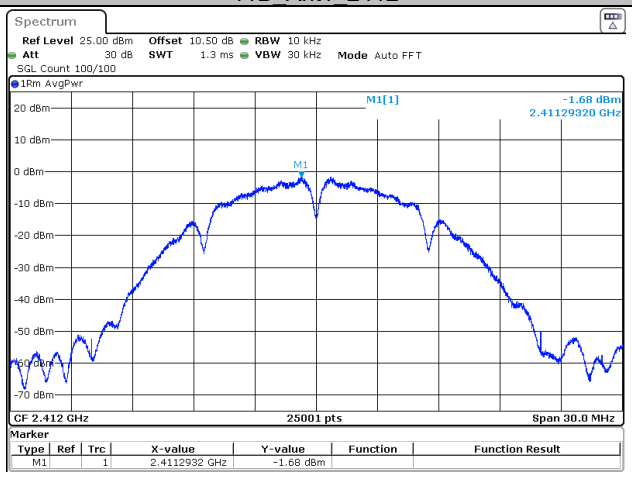
Appendix D: Maximum power spectral density

Test Result

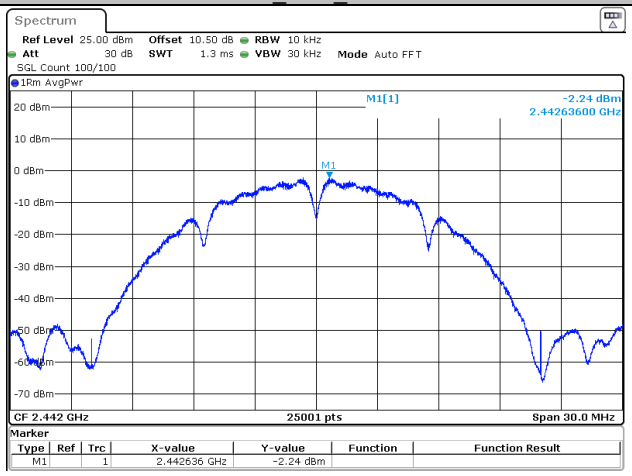
Test Mode	Antenna	Frequency [MHz]	Measured [dBm/10 kHz]	Duty cycle(%)	Result[dBm/10kHz]	Limit[dBm/3kHz]
11B	Ant1	2412	-1.68	100	-1.68	≤8.00
		2442	-2.24	100	-2.24	≤8.00
		2472	-2.27	100	-2.27	≤8.00
11G	Ant1	2412	-8.09	100	-8.09	≤8.00
		2442	-8.86	100	-8.86	≤8.00
		2472	-8.59	100	-8.59	≤8.00
11N20SISO	Ant1	2412	-8.36	100	-8.36	≤8.00
		2442	-8.65	100	-8.65	≤8.00
		2472	-9.13	100	-9.13	≤8.00
11N40SISO	Ant1	2422	-11.91	100	-11.91	≤8.00
		2442	-13.40	100	-13.40	≤8.00
		2462	-12.09	100	-12.09	≤8.00

Test Graphs

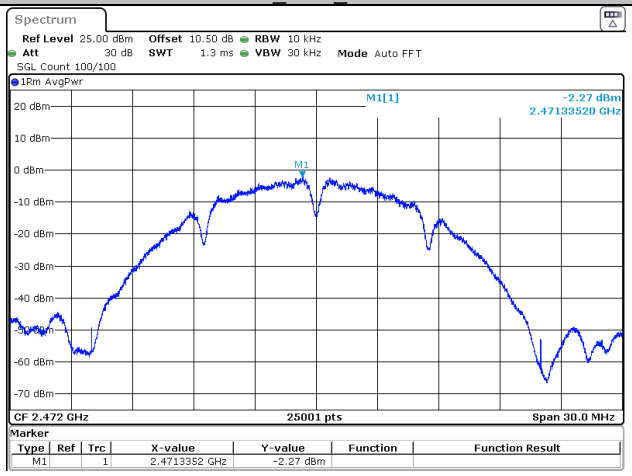
11B_Ant1_2412



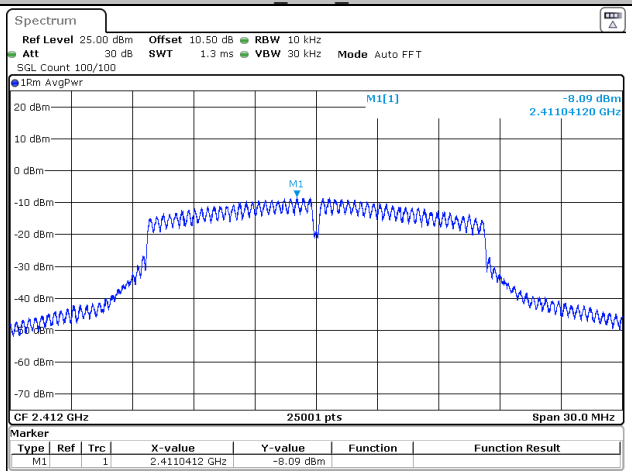
11B_Ant1_2442



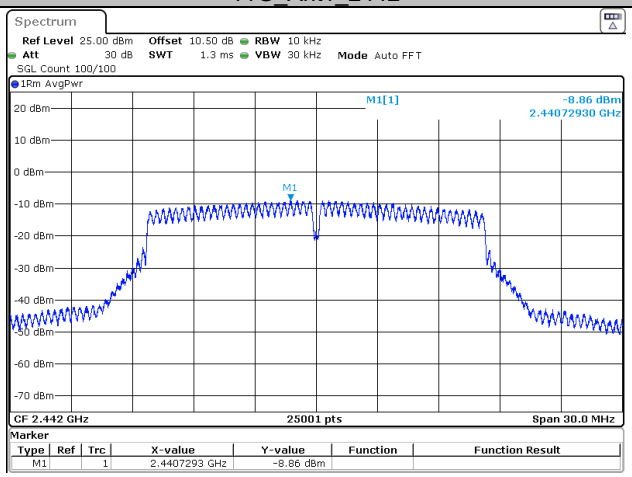
11B_Ant1_2472



11G_Ant1_2412



11G_Ant1_2442



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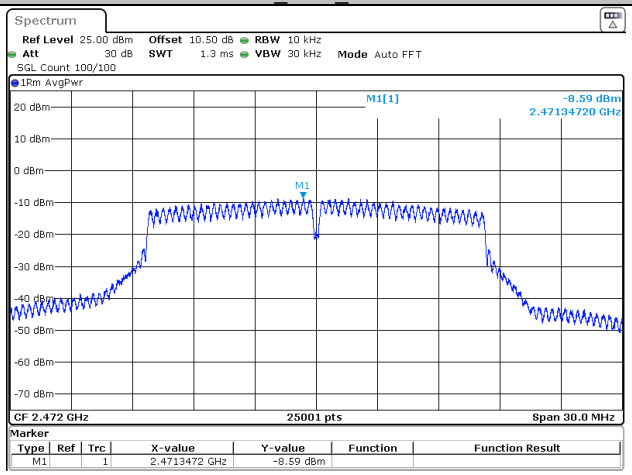
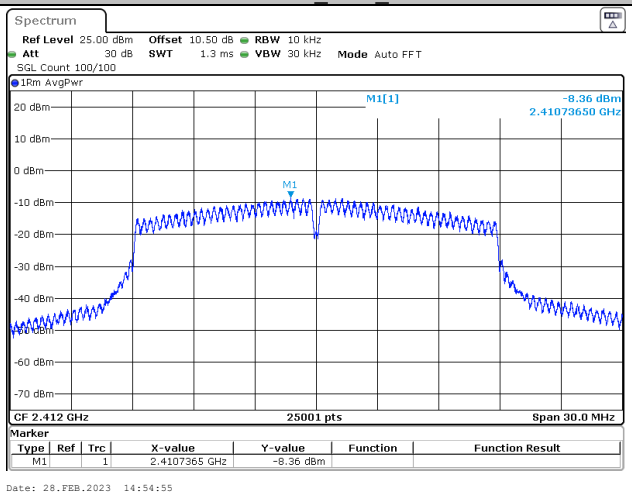


11N20SISO_Ant1_2412



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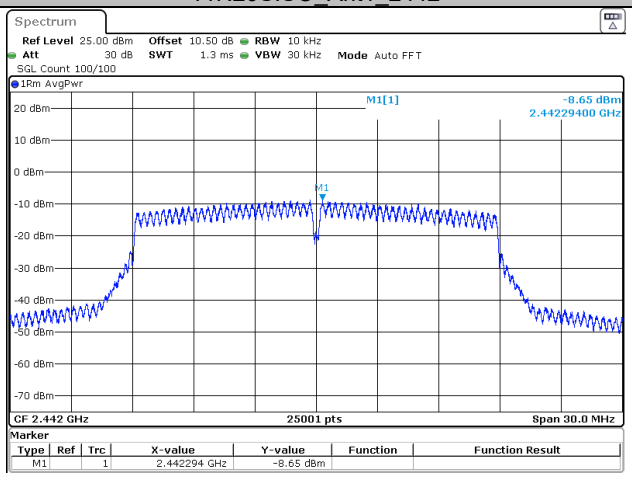

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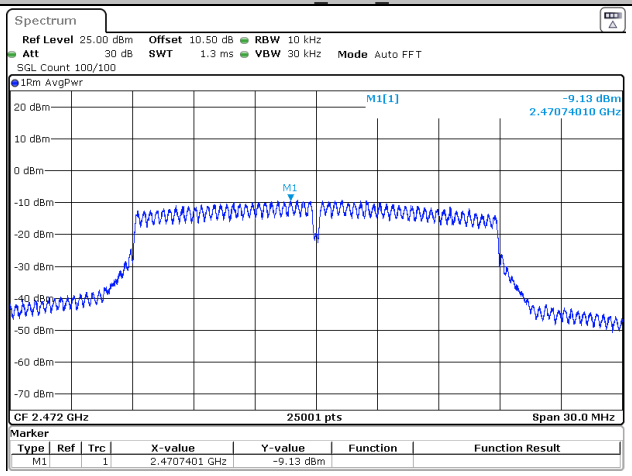
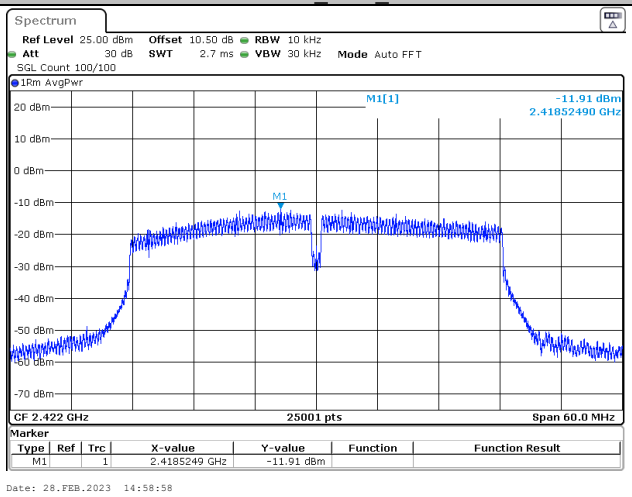
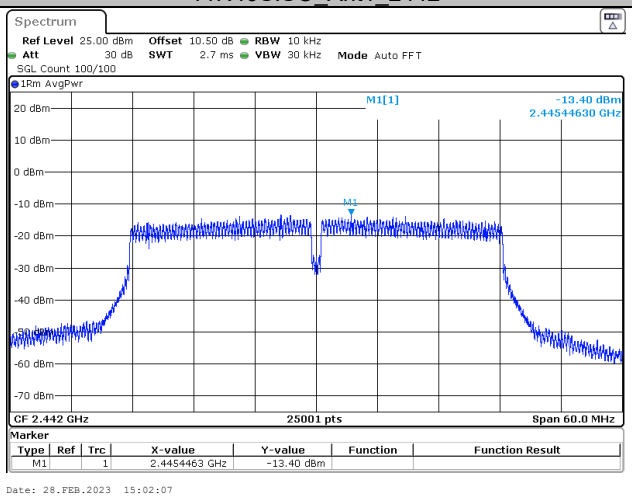


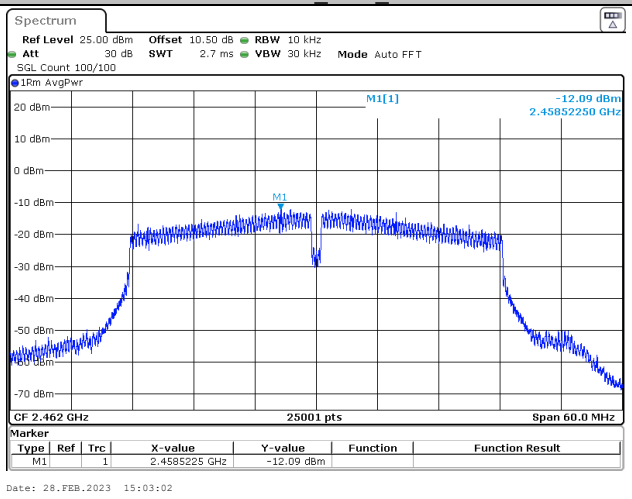
11N40SISO_Ant1_2422



11N40SISO_Ant1_2442



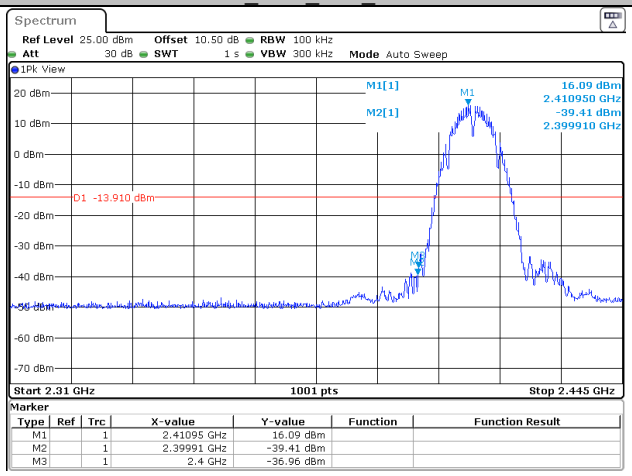
11N40SISO_Ant1_2462



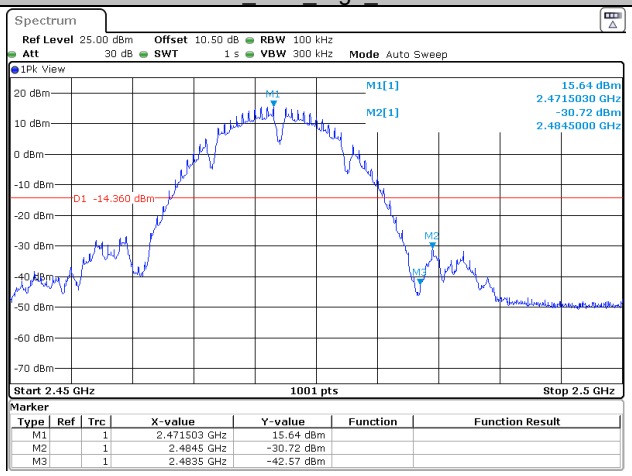
Appendix E: Band edge measurements

Test Graphs

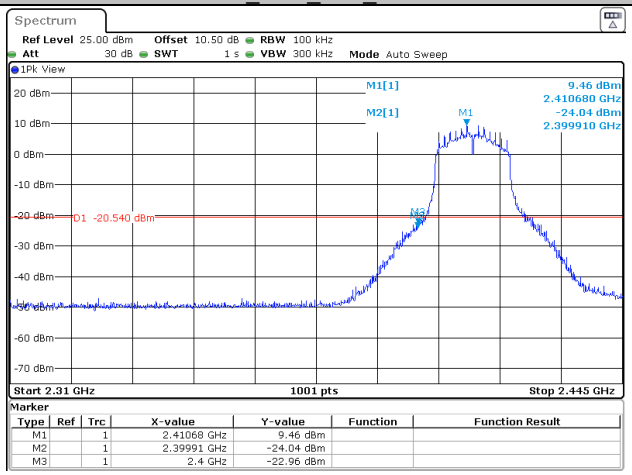
11B_Ant1_Low_2412



11B_Ant1_High_2472



11G_Ant1_Low_2412

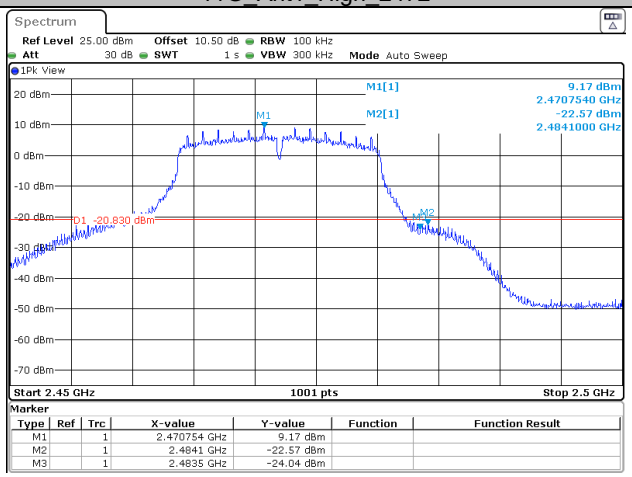


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41068 GHz	9.46 dBm		
M2		1	2.39991 GHz	-24.04 dBm		
M3		1	2.4 GHz	-22.96 dBm		

Date: 28.FEB.2023 14:50:51

11G_Ant1_High_2472

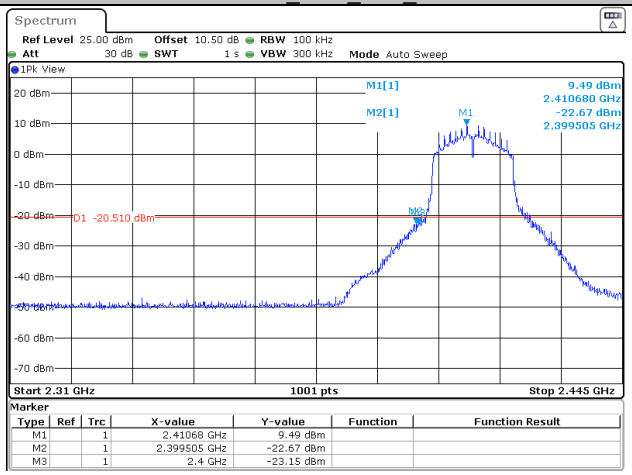


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.470754 GHz	9.17 dBm		
M2		1	2.4841 GHz	-22.57 dBm		
M3		1	2.4835 GHz	-24.04 dBm		

Date: 28.FEB.2023 14:53:47

11N20SISO_Ant1_Low_2412

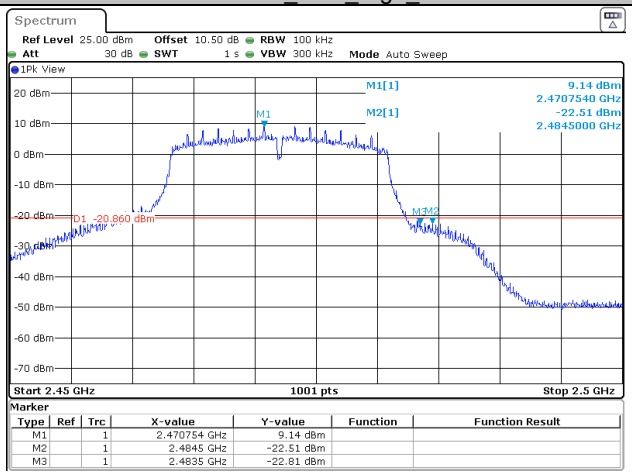


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41068 GHz	9.49 dBm		
M2		1	2.399505 GHz	-22.67 dBm		
M3		1	2.4 GHz	-23.15 dBm		

Date: 28.FEB.2023 14:55:26

11N20SISO_Ant1_High_2472

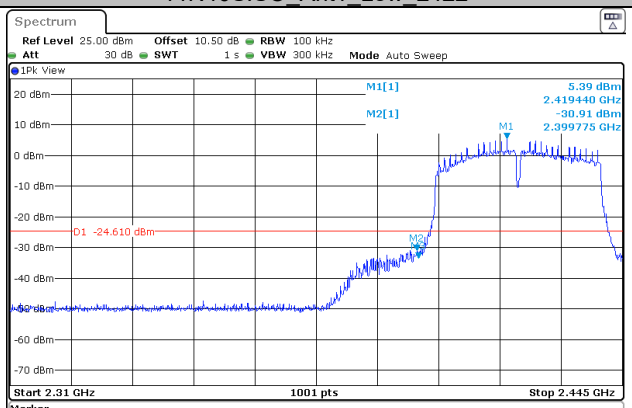


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.470754 GHz	9.14 dBm		
M2		1	2.4845 GHz	-22.51 dBm		
M3		1	2.4835 GHz	-22.81 dBm		

Date: 28.FEB.2023 14:57:56

11N40SISO_Ant1_Low_2422

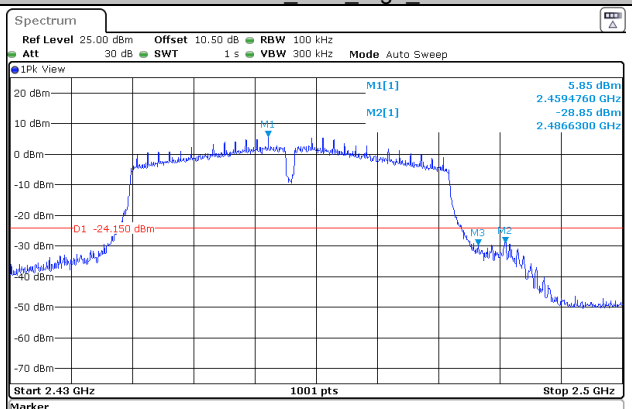


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41944 GHz	5.39 dBm		
M2		1	2.399775 GHz	-30.91 dBm		
M3		1	2.4 GHz	-33.41 dBm		

Date: 28.FEB.2023 14:59:14

11N40SISO_Ant1_High_2462



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.459476 GHz	5.85 dBm		
M2		1	2.48663 GHz	-28.85 dBm		
M3		1	2.4835 GHz	-29.77 dBm		

Date: 28.FEB.2023 15:03:21

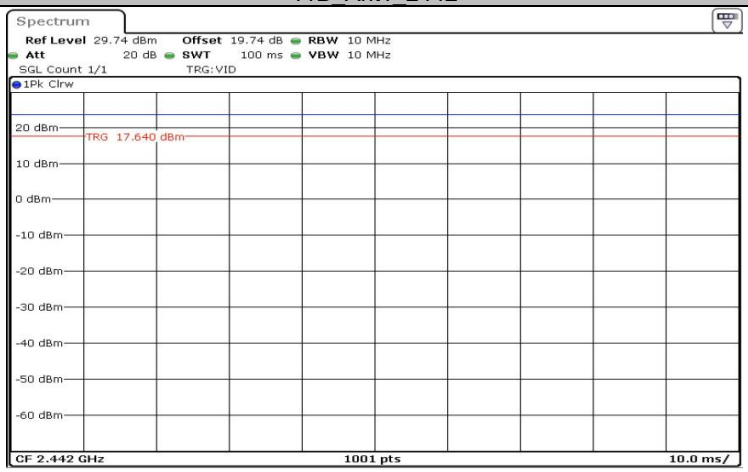
Appendix F: Duty Cycle

Test Result

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

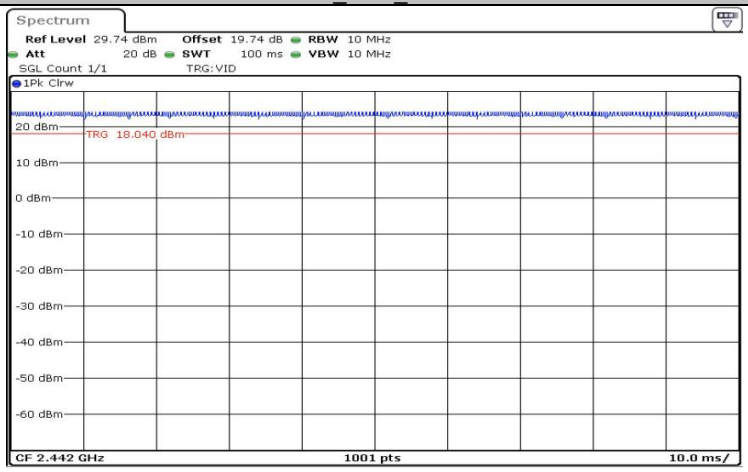
Test Graphs

11B_Ant1_2442



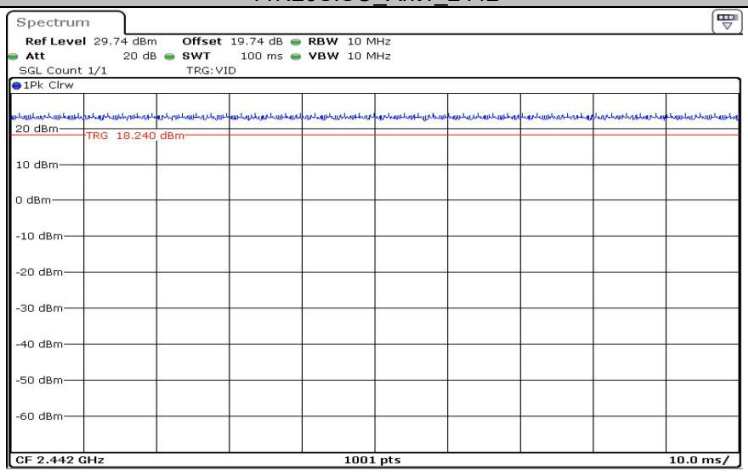
Date: 28.JAN.2023 23:46:32

11G_Ant1_2442



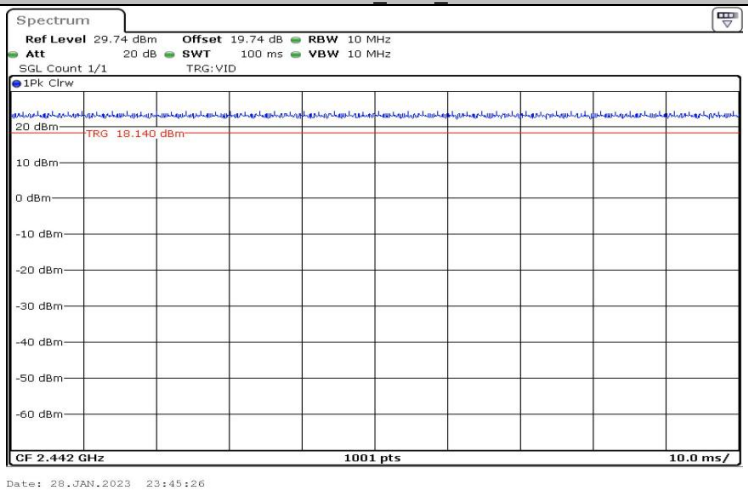
Date: 28.JAN.2023 23:43:58

11N20SISO_Ant1_2442



Date: 28.JAN.2023 23:44:55

11N40SISO_Ant1_2442



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