Microtest
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Test Report

Report No.: MTi230612014-02E1

Date of issue: 2023-06-27

Applicant: Kingtec Branch (Vietnam) Technologies Co., Ltd.

Product: Smart outlets

Model(s): CCRCOWF2PK, CURCOWF2PK, RCOWF2PK, SURCOWF2PK, UTRCOWF2PK

FCC ID: 2BBU7-40201

Shenzhen Microtest Co., Ltd.

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Table of contents

1 General Description 5
1.1 Description of the EUT 5
1.2 Description of test modes 6
1.3 Environmental conditions for testing 7
1.4 Description of support units 7
2 Measurement uncertainty 8
3 Summary of Test Result 9
4 Test Laboratory 10
5 Equipment List 11
6 Test Result 12
6.1 Antenna requirement 12
6.2 AC power line conducted emissions 13
6.3 Radiated spurious emission 16
6.4 DTS bandwidth 25
6.5 Maximum conducted output power 26
6.6 Power spectral density 27
6.7 Band edge (Conducted) 28
6.8 Conducted spurious emissions 29
6.9 Duty Cycle 30
Appendix A: DTS Bandwidth 31
Appendix B: Maximum conducted output power 35
Appendix C: Maximum power spectral density 36
Appendix D: Band edge measurements 40
Appendix E: Conducted Spurious Emission 42
Appendix F: Duty Cycle 51
Photographs of the Test Setup 53
Photographs of the EUT 54

Test Result Certification	
Applicant:	**Kingtec Branch (Vietnam) Technologies Co., Ltd.**
Address:	Lot 35, Street 3, Tan Duc Industrial Zone, Duc Hoa Ha Commune, Duc Hoa District, Long An Province, Vietnam
Manufacturer:	**Kingtec Branch (Vietnam) Technologies Co., Ltd.**
Address:	Lot 35, Street 3, Tan Duc Industrial Zone, Duc Hoa Ha Commune, Duc Hoa District, Long An Province, Vietnam
Product description	
Product name:	Smart outlets
Trademark:	prime
Model name:	CCRCOWF2PK
Series Model:	CURCOWF2PK, RCOWF2PK, SURCOWF2PK, UTRCOWF2PK
Standards:	FCC 47 CFR Part 15 Subpart C
Test method:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02
Date of Test	
Date of test:	2022-07-28 ~ 2023-06-27
Test result:	Pass

Test Engineer : Letter. Lan.

(Letter Lan)

Reviewed By: : Leon chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of the EUT

Product name:	Smart outlets
Model name:	CCRCOWF2PK
Series Model:	CURCOWF2PK, RCOWF2PK, SURCOWF2PK, UTRCOWF2PK
Model difference:	All the models are the same circuit and module, except the model name.
Electrical rating:	125VAC 60Hz 15A 1875W Resistive 8A/1000W Tungsten 1/3HP
Hardware version:	1.0
Software version:	1.0
Accessories:	N/A
Test sample(s) number:	MTi230612014-02S1001
RF specification:	
Operation frequency:	802.11b/g/n20:2412~2462 MHz
Modulation type:	IEEE 802.11b: DSSS (DBPSK, DQPSK, CCK) IEEE 802.11g/n (HT20): OFDM (64QAM, 16QAM, QPSK, BPSK)
Date Rate:	802.11b:1/2/5.5/11 Mbit/s 802.11g:6/9/12/18/24/36/48/54 Mbit/s 802.11n(20MHz) use 800 ns GI: 6.5/13/19.5/26/39/52/58.5/65 Mbit/s
Antenna(s) information:	Antenna type: PCB antenna Antenna gain: 0.04dBi
Maximum conducted output power	12.45 dBm

1.2 Description of test modes

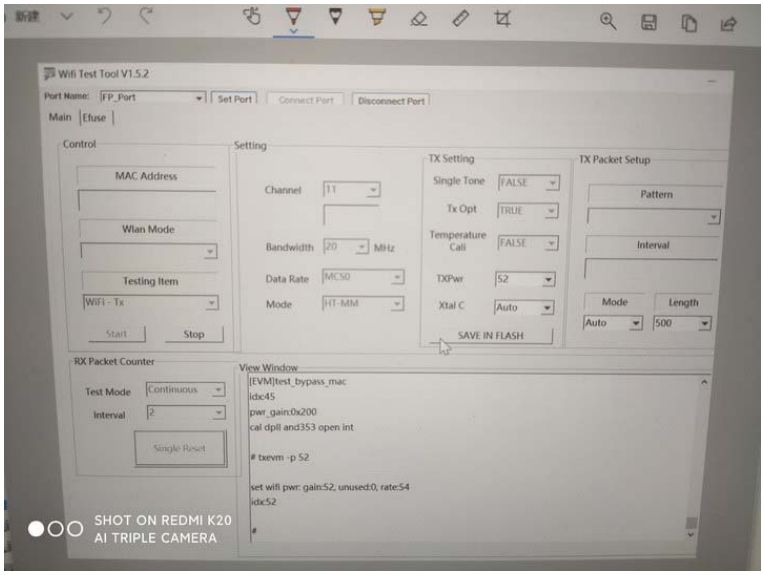
1.2.1 Operation channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	/	

Note: The test software has been used to control EUT for working in engineering mode, that enables selectable channel, and capable of continuous transmitting mode.

Test Software:	WIFI TEST TOOL		
802.11b		**802.11g**	
Channel	Power setting	Channel	Power setting
1	17	1	47
6	19	6	51
11	19	11	51
802.11n (HT20)			
Channel	Power setting		
1	49		
6	52		
11	52		

The test software:



1.3 Environmental conditions for testing

Environment of test site:

Temperature:	15ºC~35ºC
Humidity:	20 % RH ~ 75 % RH

1.4 Description of support units

Support equipment list			
Description	Model	Serial No.	Manufacturer
/	/	/	/
Support cable list			
Description	Length (m)	From	To
/	/	/	/

2 Measurement uncertainty

Parameter	Measurement uncertainty
AC power line conducted emission (9 kHz~30 MHz)	±2.5 dB
Occupied Bandwidth	±3 %
Conducted RF output power	±0.16 dB
Conducted spurious emissions	±0.21 dB
Radiated emission (9 kHz ~ 30 MHz)	±4.0 dB
Radiated emission (30 MHz~1 GHz)	±4.2 dB
Radiated emission (above 1 GHz)	±4.3 dB
Power Spectral Density, conducted	±1 dB

Note: the measurement uncertainty is calculated and correspond to a factor k = 2 (which provide confidence levels of 95.45 %)

3 Summary of Test Result

No.	FCC reference	Description of test	Result
1	§ 15.203	Antenna requirement	Pass
2	§ 15.207	AC power line conducted emissions	Pass
3	§ 15.247(d)	Radiated spurious emissions	Pass
4	15.247(a)(2)	DTS bandwidth	Pass
5	15.247(b)(3)	Maximum conducted output power	Pass
6	15.247(e)	Power Spectral Density	Pass
7	15.247(d)	Band edge (Conducted)	Pass
8	15.247(d)	Conducted spurious emissions	Pass
9	/	Duty Cycle	Pass

Notes:

N/A means not applicable.

4 Test Laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573

5 Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
MTi-E002	EMI Test Receiver	R&S	ESCI3	101368	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E023	Artificial power network	Schwarzbeck	NSLK8127	NSLK8127#841	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E025	Artificial power network	Schwarzbeck	NSLK8127	8127183	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E043	EMI test receiver	R&S	ESCI7	101166	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00044	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E044	Broadband antenna	Schwarzbeck	VULB9163	9163-1338	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E045	Horn antenna	Schwarzbeck	BBHA9120D	9120D-2278	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E047	Pre-amplifier	Hewlett-Packard	8447F	3113A06184	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E048	Pre-amplifier	Agilent	8449B	3008A01120	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E120	Broadband antenna	Schwarzbeck	VULB9163	9163-1419	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E121	Pre-amplifier	Hewlett-Packard	8447D	2944A09365	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E123	Pre-amplifier	Agilent	8449B	3008A04723	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E135	Horn antenna	Schwarzbeck	BBHA 9170	00987	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E136	Pre-amplifier	Space-Dtronics	EWLAN1840 G-G45	210405001	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E067	RF Control Unit	Tonscend	JS0806-1	19D8060152	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E068	RF Control Unit	Tonscend	JS0806-2	19D8060153	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTi-E069	Band Reject Filter Group	Tonscend	JS0806-F	19D8060160	2023/04/26 2022/04/26	2024/04/25 2023/04/25
MTI-E010S	EMI Measurement Software	Farad	EZ-EMC Ver. EMEC-3A1	/	/	/
MTI-E014S	RF Test System	Tonscend	TS®JS1120 V2.6.88.0330	/	/	/

Note: the calibration interval of the test equipment is 12 or 24 months and the calibrations are traceable to international system unit(SI)

6 Test Result

6.1 Antenna requirement

15.203 requirement

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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Description of the antenna of EUT

The antenna of the EUT is permanently attached.

Conclusion:

The EUT complies with the requirement of § 15.203.

6.2 AC power line conducted emissions

6.2.1 Limits

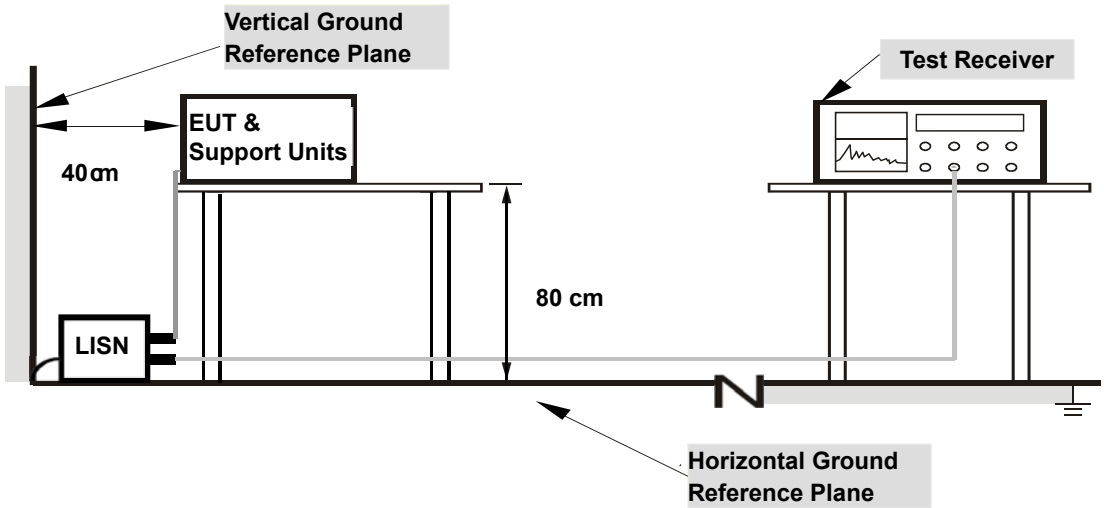
Frequency (MHz)	Detector type / Bandwidth	Limit-Quasi-peak dBμV	Limit-Average dBμV
0.15 -0.5	Average / 9 kHz	66 to 56	56 to 46
0.5 -5		56	46
5 -30		60	50

Note 1: the limit decreases with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz.

6.2.2 Test Procedures

a) Test method: ANSI C63.10-2013 Section 6.2.
b) The EUT is connected to the main power through a line impedance stabilization network (LISN). All support equipment is powered from additional LISN(s).
c) Emissions were measured on each current carrying line of the EUT using an EMI test receiver connected to the LISN powering the EUT.
d) The test receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes described in Item 1.2.
e) The test data of the worst-case condition(s) was recorded.

6.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the test setup.

6.2.4 Test Result

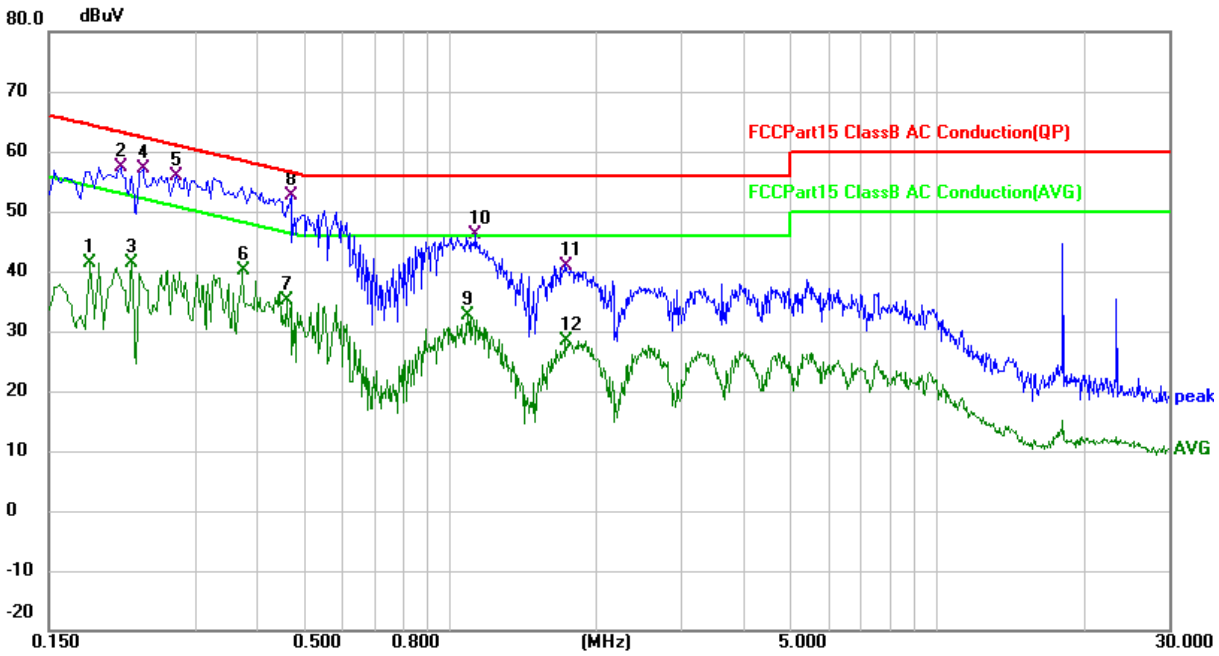
Notes:

All modes of operation of the EUT were investigated, and only the worst-case results are reported.

Calculation formula:

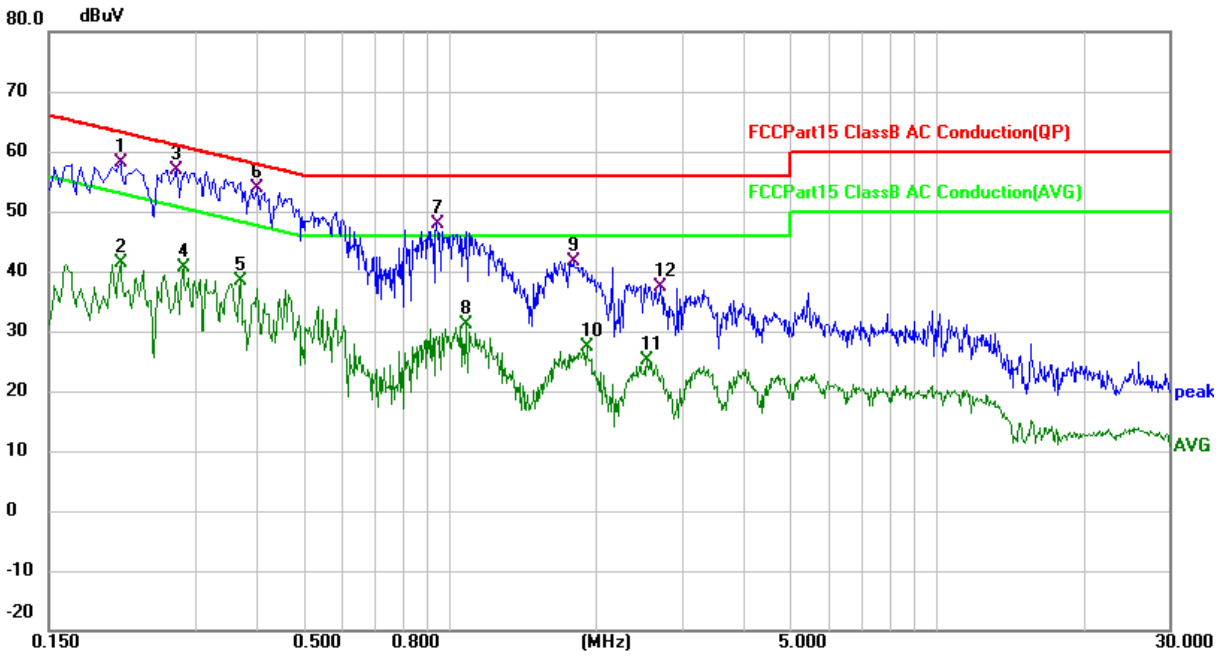
Measurement (dBμV) = Reading Level (dBμV) + Correct Factor (dB)
Over (dB) = Measurement (dBμV) – Limit (dBμV)

Test mode:	TX – 802.11b 2412MHz	Phase:	L
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1819	30.76	10.64	41.40	54.40	-13.00	AVG
2		0.2100	46.71	10.70	57.41	63.21	-5.80	QP
3		0.2220	30.59	10.72	41.31	52.74	-11.43	AVG
4		0.2340	46.32	10.73	57.05	62.31	-5.26	QP
5		0.2740	45.04	10.81	55.85	61.00	-5.15	QP
6		0.3740	29.20	11.03	40.23	48.41	-8.18	AVG
7		0.4620	23.82	11.24	35.06	46.66	-11.60	AVG
8	*	0.4700	41.44	11.26	52.70	56.51	-3.81	QP
9		1.0900	19.97	12.56	32.53	46.00	-13.47	AVG
10		1.1300	33.45	12.61	46.06	56.00	-9.94	QP
11		1.7340	27.43	13.57	41.00	56.00	-15.00	QP
12		1.7340	14.86	13.57	28.43	46.00	-17.57	AVG

Test mode:	TX – 802.11b 2412MHz	Phase:	N
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2100	47.32	10.70	58.02	63.21	-5.19	QP
2		0.2100	30.68	10.70	41.38	53.21	-11.83	AVG
3		0.2740	46.16	10.81	56.97	61.00	-4.03	QP
4		0.2819	29.82	10.83	40.65	50.76	-10.11	AVG
5		0.3700	27.42	11.03	38.45	48.50	-10.05	AVG
6	*	0.4020	42.72	11.10	53.82	57.81	-3.99	QP
7		0.9420	35.67	12.29	47.96	56.00	-8.04	QP
8		1.0780	18.65	12.54	31.19	46.00	-14.81	AVG
9		1.7980	27.97	13.68	41.65	56.00	-14.35	QP
10		1.9180	17.46	10.03	27.49	46.00	-18.51	AVG
11		2.5500	15.08	10.15	25.23	46.00	-20.77	AVG
12		2.7139	27.08	10.20	37.28	56.00	-18.72	QP

6.3 Radiated spurious emission

6.3.1 Limits

§ 15.247 (d) 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)).

§ 15.209 Radiated emission limits at restricted bands:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note 1: the tighter limit applies at the band edges.
Note 2: the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector

§ 15.35 (b) requirements:
When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

According to ANSI C63.10-2013, the tests shall be performed in the frequency range shown in the following table:

Frequency range of measurements for unlicensed wireless device

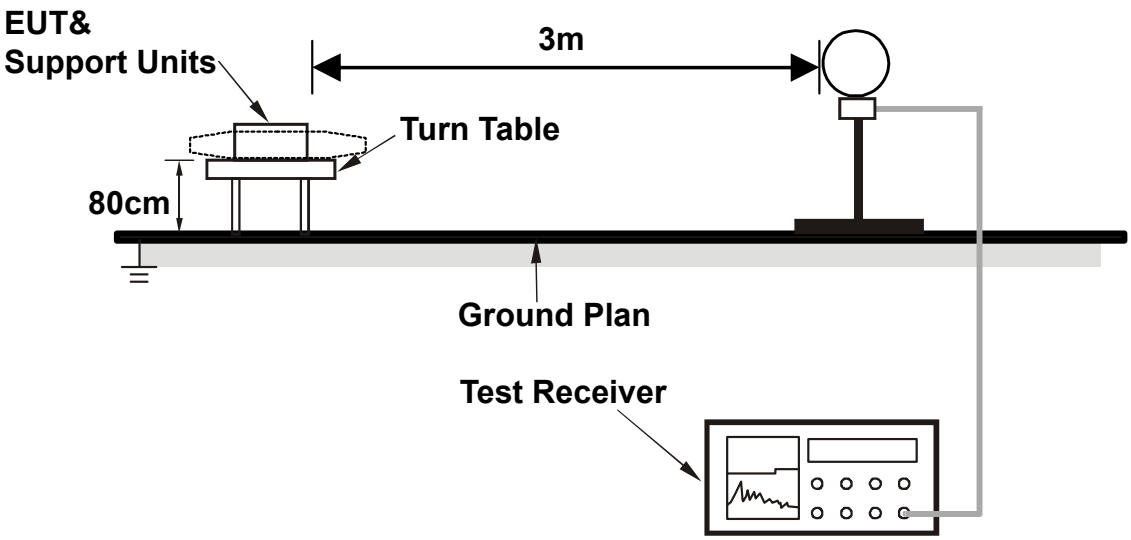
Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

Frequency range of measurements for unlicensed wireless device with digital device

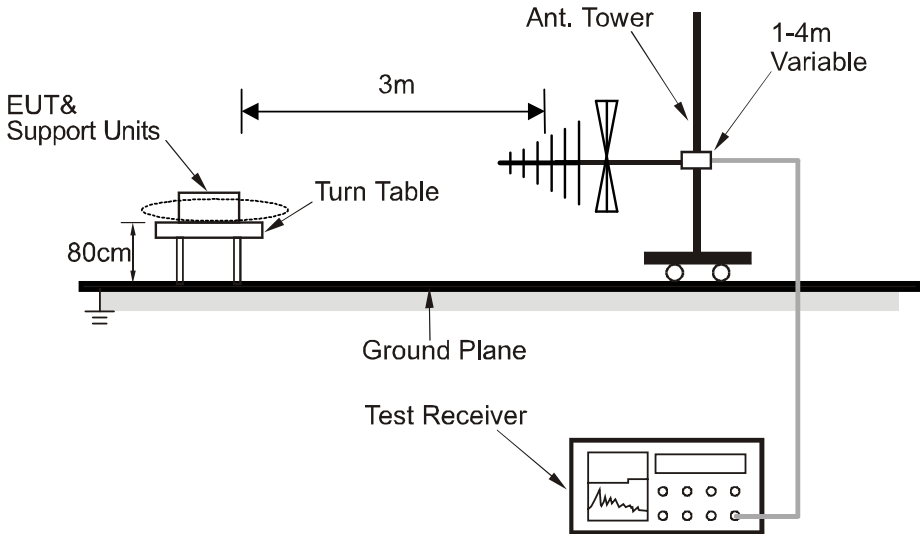
Highest frequency generated or used in the device or on which the device operates or tunes	Upper frequency range of measurement
Below 1.705 MHz	30 MHz
1.705 MHz to 108 MHz	1000 MHz
108 MHz to 500 MHz	2000 MHz
500 MHz to 1000 MHz	5000 MHz
Above 1000 MHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower

6.3.2 Test setup

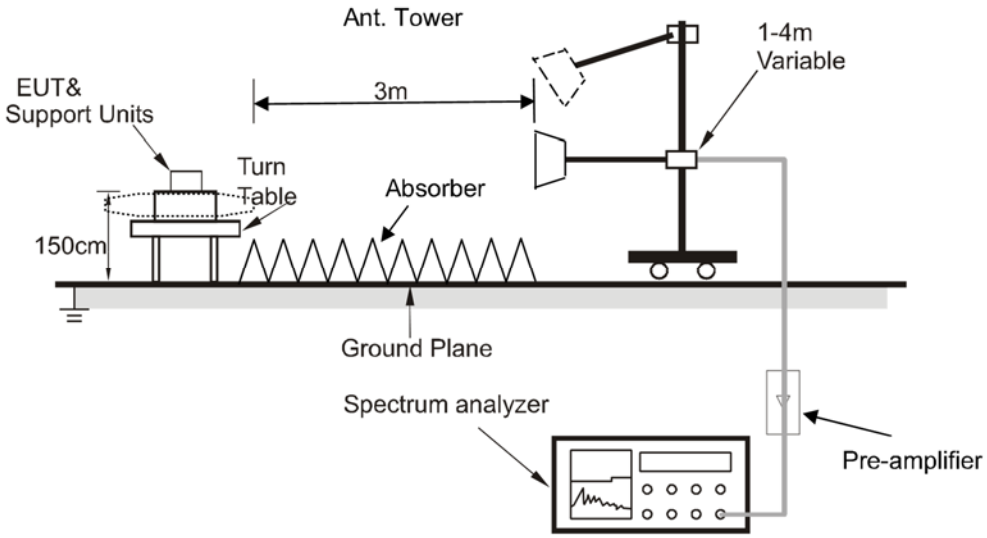
Below 30MHz:



30MHz~1GHz:



Above 1GHz:



For the actual test configuration, please refer to the related item – Photographs of the test setup.

6.3.3 Test procedure

a) Test method: ANSI C63.10-2013 Section 6.3, 6.4, 6.5, 6.6, 11.11, 11.12, 11.13.
b) The EUT is placed on an on-conducting table 0.8 meters above the ground plane for measurement below 1GHz, 1.5 meters above the ground plane for measurement above 1GHz.
c) Emission blew 18 GHz were measured at a 3 meters test distance, above 18 GHz were measured at 1-meter test distance with the application of a distance correction factor
d) The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Test instrument setup

Frequency	Test receiver / Spectrum analyzer setting
9 kHz ~ 150 kHz	Quasi Peak / RBW: 200 Hz
150 kHz ~ 30 MHz	Quasi Peak / RBW: 9 kHz
30 MHz ~ 1 GHz	Quasi Peak / RBW: 120 kHz
Above 1 GHz	Peak / RBW: 1 MHz, VBW: 3MHz, Peak detector AVG / RBW: 1 MHz, VBW: 3MHz, Average detector

6.3.4 Test results

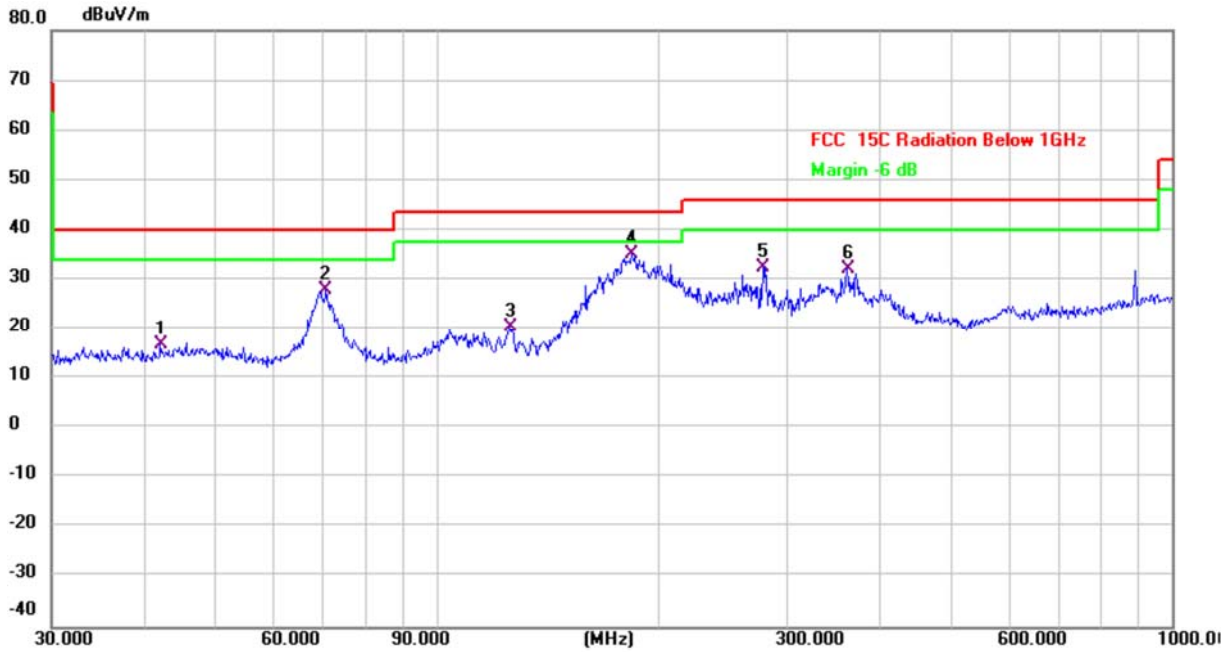
Notes:

The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.
All modes of operation of the EUT were investigated, and only the worst-case results are reported.
There were no emissions found below 30MHz within 20dB of the limit.

Calculation formula:
Measurement (dBμV/m) = Reading Level (dBμV) + Correct Factor (dB/m)
Over (dB) = Measurement (dBμV/m) – Limit (dBμV/m)

Radiated emissions between 30MHz – 1GHz

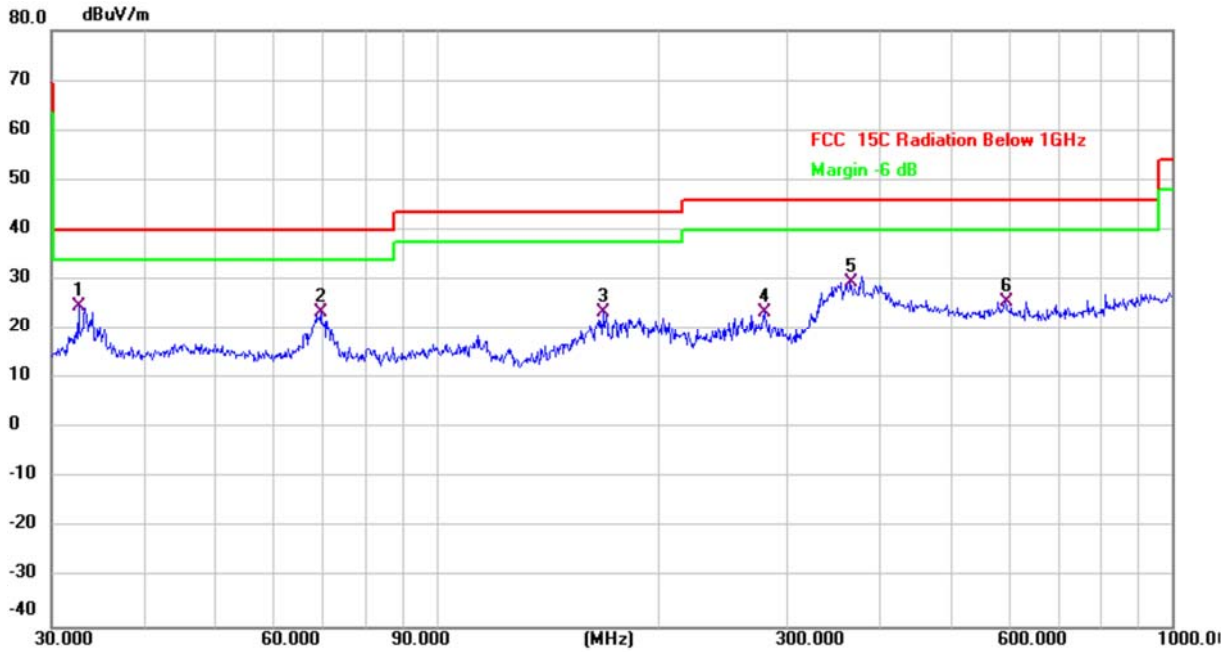
Test mode:	TX –802.11n20 2462MHz	Polarization:	Horizontal
Power supply:	AC 120V/60Hz	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		42.1542	26.35	-9.61	16.74	40.00	-23.26	QP
2		70.8315	39.43	-11.57	27.86	40.00	-12.14	QP
3		125.8864	32.96	-12.52	20.44	43.50	-23.06	QP
4	*	184.4898	45.90	-10.83	35.07	43.50	-8.43	QP
5		278.0668	40.50	-7.96	32.54	46.00	-13.46	QP
6		361.7139	39.33	-7.06	32.27	46.00	-13.73	QP

Radiated emissions between 30MHz – 1GHz

Test mode:	TX –802.11n20 2462MHz	Polarization:	Vertical
Power supply:	AC 120V/60Hz	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	32.6340	34.88	-10.33	24.55	40.00	-15.45	QP
2		69.6005	35.06	-11.54	23.52	40.00	-16.48	QP
3		168.4138	35.24	-11.69	23.55	43.50	-19.95	QP
4		279.0436	31.31	-7.96	23.35	46.00	-22.65	QP
5		365.5391	36.57	-7.04	29.53	46.00	-16.47	QP
6		593.0497	28.39	-2.81	25.58	46.00	-20.42	QP

Radiated emissions 1 GHz ~ 25 GHz

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
TX 802.11n20 2412MHz							
4824	40.49	0.91	41.40	74.00	-32.60	Peak	V
4824	34.33	0.91	35.24	54.00	-18.76	AVG	V
7236	39.79	5.77	45.56	74.00	-28.44	Peak	V
7236	33.56	5.77	39.33	54.00	-14.67	AVG	V
9648	39.96	6.29	46.25	74.00	-27.75	Peak	V
9648	33.88	6.29	40.17	54.00	-13.83	AVG	V
4824	39.26	0.91	40.17	74.00	-33.83	Peak	H
4824	33.27	0.91	34.18	54.00	-19.82	AVG	H
7236	37.66	5.77	43.43	74.00	-30.57	Peak	H
7236	31.48	5.77	37.25	54.00	-16.75	AVG	H
9648	39.10	6.29	45.39	74.00	-28.61	Peak	H
9648	32.93	6.29	39.22	54.00	-14.78	AVG	H
TX 802.11n20 2437MHz							
4874	40.01	1.14	41.15	74.00	-32.85	Peak	V
4874	33.98	1.14	35.12	54.00	-18.88	AVG	V
7311	39.68	5.55	45.23	74.00	-28.77	Peak	V
7311	33.60	5.55	39.15	54.00	-14.85	AVG	V
9748	40.05	6.22	46.27	74.00	-27.73	Peak	V
9748	34.00	6.22	40.22	54.00	-13.78	AVG	V
4874	40.95	1.14	42.09	74.00	-31.91	Peak	H
4874	34.91	1.14	36.05	54.00	-17.95	AVG	H
7311	38.27	5.55	43.82	74.00	-30.18	Peak	H
7311	31.84	5.55	37.39	54.00	-16.61	AVG	H
9748	38.75	6.22	44.97	74.00	-29.03	Peak	H
9748	32.37	6.22	38.59	54.00	-15.41	AVG	H

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
TX 802.11n20 2462MHz							
4924	39.63	1.37	41.00	74.00	-33.00	Peak	V
4924	33.32	1.37	34.69	54.00	-19.31	AVG	V
7386	37.81	5.32	43.13	74.00	-30.87	Peak	V
7386	31.79	5.32	37.11	54.00	-16.89	AVG	V
9848	38.98	6.14	45.12	74.00	-28.88	Peak	V
9848	32.94	6.14	39.08	54.00	-14.92	AVG	V
4924	41.09	1.37	42.46	74.00	-31.54	Peak	H
4924	34.88	1.37	36.25	54.00	-17.75	AVG	H
7386	39.04	5.32	44.36	74.00	-29.64	Peak	H
7386	33.02	5.32	38.34	54.00	-15.66	AVG	H
9848	40.66	6.14	46.80	74.00	-27.20	Peak	H
9848	34.15	6.14	40.29	54.00	-13.71	AVG	H

Radiated emissions at band edge

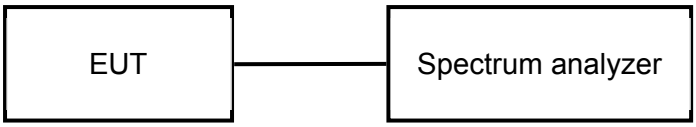
Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
TX 802.11n20 2412MHz							
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
2310	41.89	-8.20	33.69	74.00	-40.31	Peak	V
2310	32.25	-8.20	24.05	54.00	-29.95	AVG	V
2390	41.85	-7.83	34.02	74.00	-39.98	Peak	V
2390	32.32	-7.83	24.49	54.00	-29.51	AVG	V
2310	43.47	-8.20	35.27	74.00	-38.73	Peak	H
2310	32.38	-8.20	24.18	54.00	-29.82	AVG	H
2390	41.99	-7.83	34.16	74.00	-39.84	Peak	H
2390	32.65	-7.83	24.82	54.00	-29.18	AVG	H
TX 802.11n20 2462MHz							
2483.5	48.05	-7.39	40.66	74.00	-33.34	Peak	V
2483.5	37.70	-7.39	30.31	54.00	-23.69	AVG	V
2500	47.79	-7.32	40.47	74.00	-33.53	Peak	V
2500	37.71	-7.32	30.39	54.00	-23.61	AVG	V
2483.5	47.85	-7.39	40.46	74.00	-33.54	Peak	H
2483.5	37.62	-7.39	30.23	54.00	-23.77	AVG	H
2500	47.95	-7.32	40.63	74.00	-33.37	Peak	H
2500	37.75	-7.32	30.43	54.00	-23.57	AVG	H

6.4 DTS bandwidth

6.4.1 Limits

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.

6.4.2 Test setup



6.4.3 Test procedures

Test method: ANSI C63.10-2013 Section 11.8.1

6.4.4 Test results

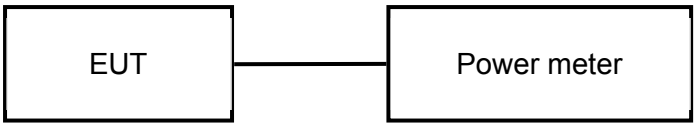
Note: See the appendix A

6.5 Maximum conducted output power

6.5.1 Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

6.5.2 Test setup



6.5.3 Test procedure

Test method for peak power: ANSI C63.10-2013 Section 11.9.1.3 PKPM1 Peak power meter method
Test method for average power: ANSI C63.10-2013 Section 11.9.2.3.1 Method AVGPM

6.5.4 Test results

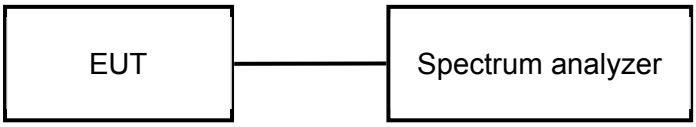
Note: see the appendix B

6.6 Power spectral density

6.6.1 Limit

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.

6.6.2 Test setup



6.6.3 Test Procedure

Test method: ANSI C63.10-2013 Section 11.10.2

6.6.4 Test Results

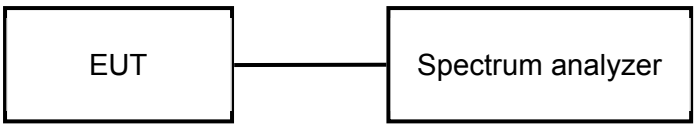
Note: see the appendix C

6.7 Band edge (Conducted)

6.7.1 Limits

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)).

6.7.2 Test setup



6.7.3 Test procedure

Test method: ANSI C63.10-2013 Section 11.13

6.7.4 Test results

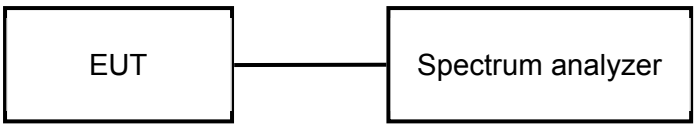
Note: see the appendix D

6.8 Conducted spurious emissions

6.8.1 Limits

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)).

6.8.2 Test setup



6.8.3 Test procedure

Test method: ANSI C63.10-2013 Section 11.13

6.8.4 Test results

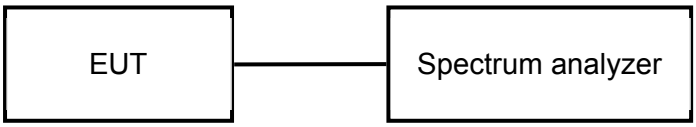
Note: see the appendix E

6.9 Duty Cycle

6.9.1 Limits

None, for reporting purposes only.

6.9.2 Test setup



6.9.3 Test procedure

Test method: KDB 558074 section 6, zero-span spectrum analyzer method.

6.9.4 Test Results

Note: see the appendix F

Appendix A: DTS Bandwidth

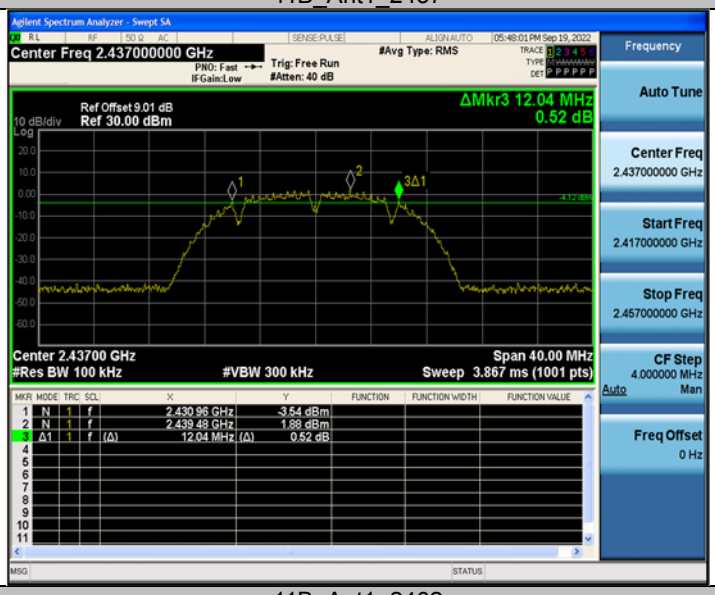
Test Result

Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	11.080	0.5	PASS
		2437	12.040	0.5	PASS
		2462	11.120	0.5	PASS
11G	Ant1	2412	15.400	0.5	PASS
		2437	15.280	0.5	PASS
		2462	15.440	0.5	PASS
11N20SISO	Ant1	2412	15.080	0.5	PASS
		2437	11.320	0.5	PASS
		2462	11.320	0.5	PASS

Test Graphs

11B_Ant1_2412

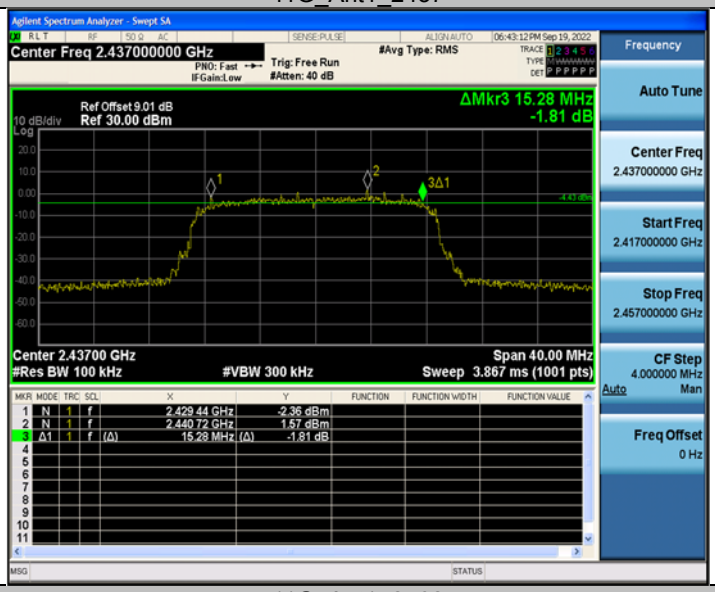
11B_Ant1_2437



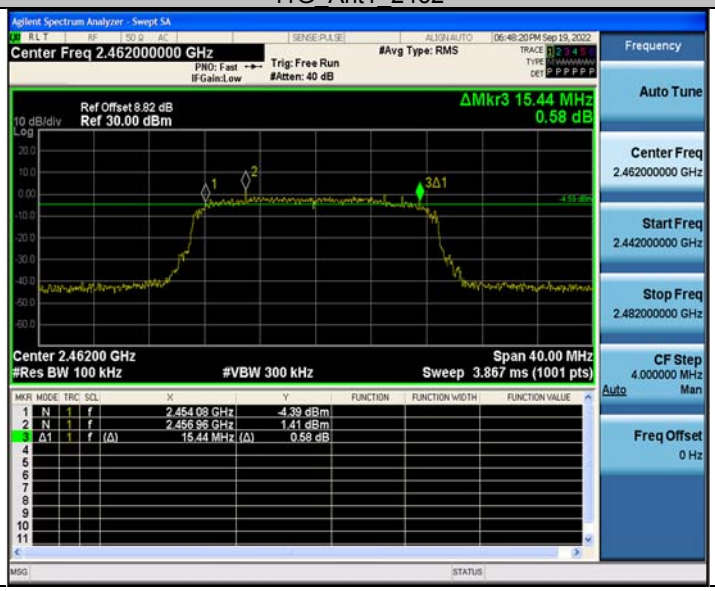
11B_Ant1_2462

11G_Ant1_2412

11G_Ant1_2437

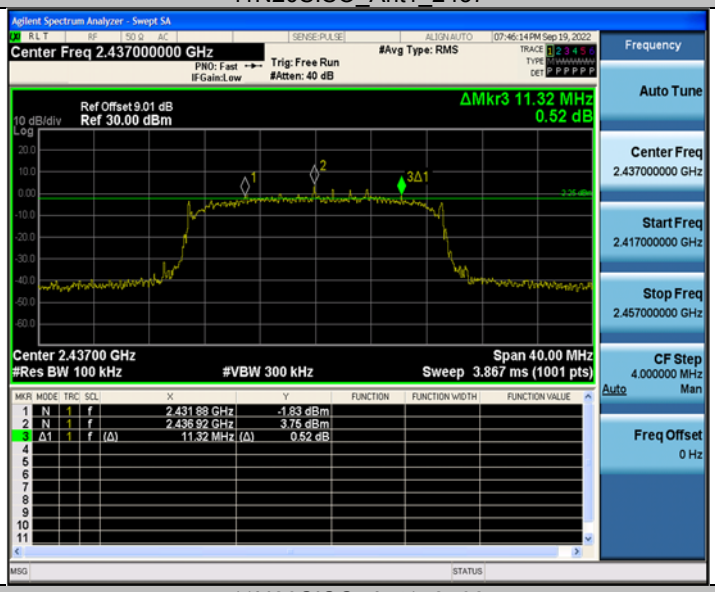


11G_Ant1_2462



11N20SISO_Ant1_2412

11N20SISO_Ant1_2437



11N20SISO_Ant1_2462

Appendix B: Maximum conducted output power

Test Result Peak

Test Mode	Antenna	Frequency [MHz]	Peak Power [dBm]	Conducted Limit [dBm]	Verdict
11B	Ant1	2412	12.03	≤30.00	PASS
		2437	12.08	≤30.00	PASS
		2462	12.38	≤30.00	PASS
11G	Ant1	2412	12.18	≤30.00	PASS
		2437	12.26	≤30.00	PASS
		2462	12.43	≤30.00	PASS
11N20SISO	Ant1	2412	12.44	≤30.00	PASS
		2437	12.00	≤30.00	PASS
		2462	12.45	≤30.00	PASS

Appendix C: Maximum power spectral density

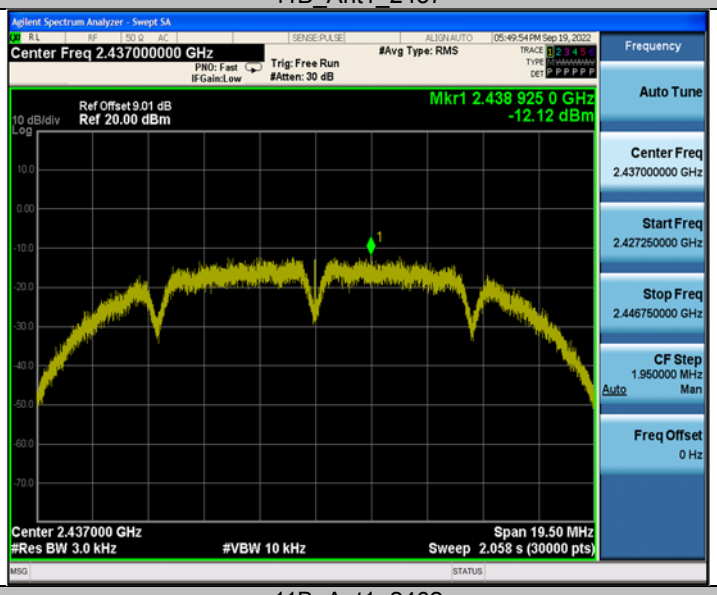
Test Result

Test Mode	Antenna	Frequency [MHz]	Result [dBm/3-100kHz]	Limit [dBm/3kHz]	Verdict
11B	Ant1	2412	-11.8	≤8.00	PASS
		2437	-12.12	≤8.00	PASS
		2462	-12.32	≤8.00	PASS
11G	Ant1	2412	-11.99	≤8.00	PASS
		2437	-11.61	≤8.00	PASS
		2462	-11.85	≤8.00	PASS
11N20SISO	Ant1	2412	-11.38	≤8.00	PASS
		2437	-11.89	≤8.00	PASS
		2462	-11.54	≤8.00	PASS

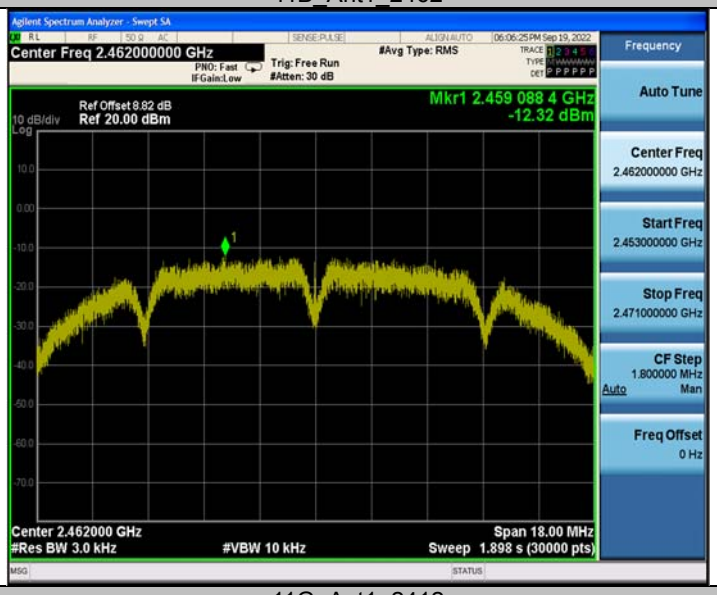
Test Graphs

11B_Ant1_2412

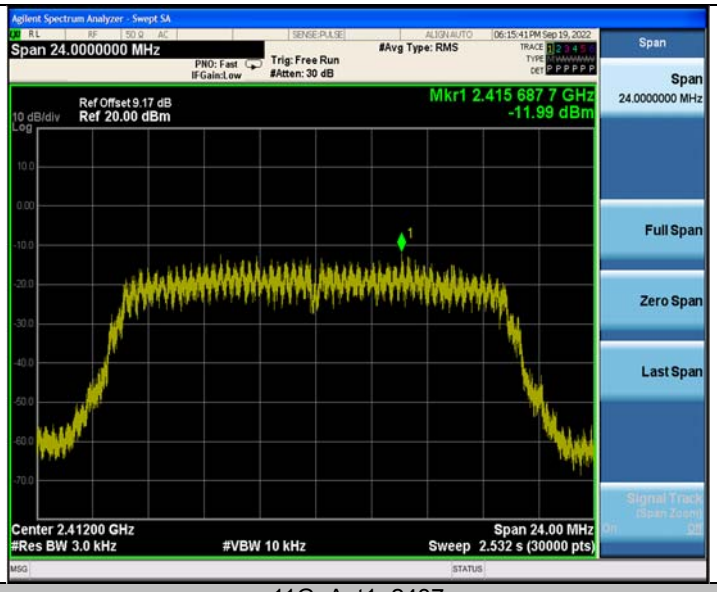
11B_Ant1_2437



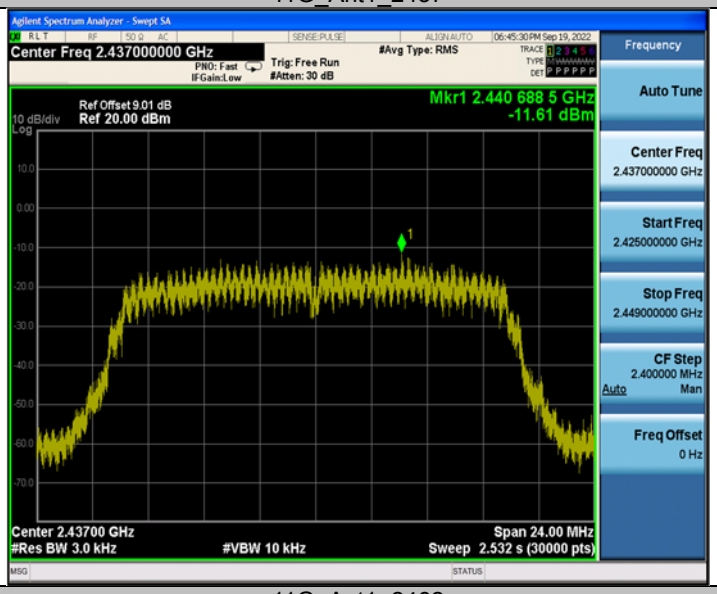
11B_Ant1_2462



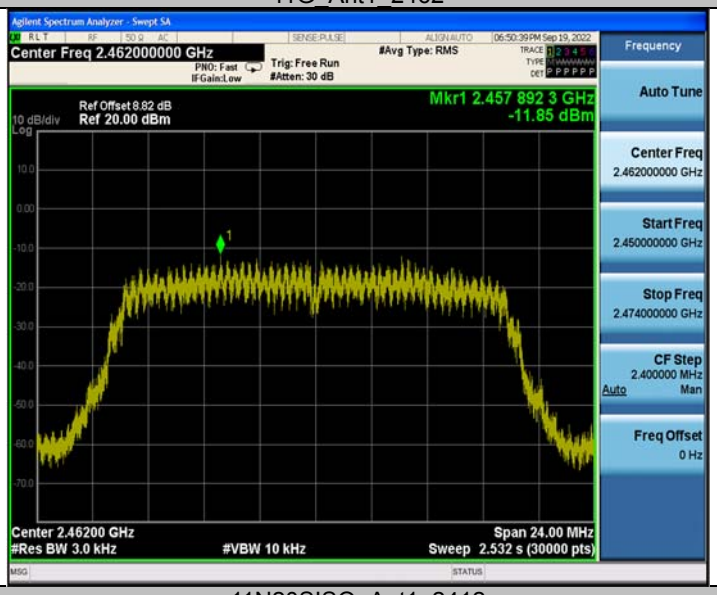
11G_Ant1_2412



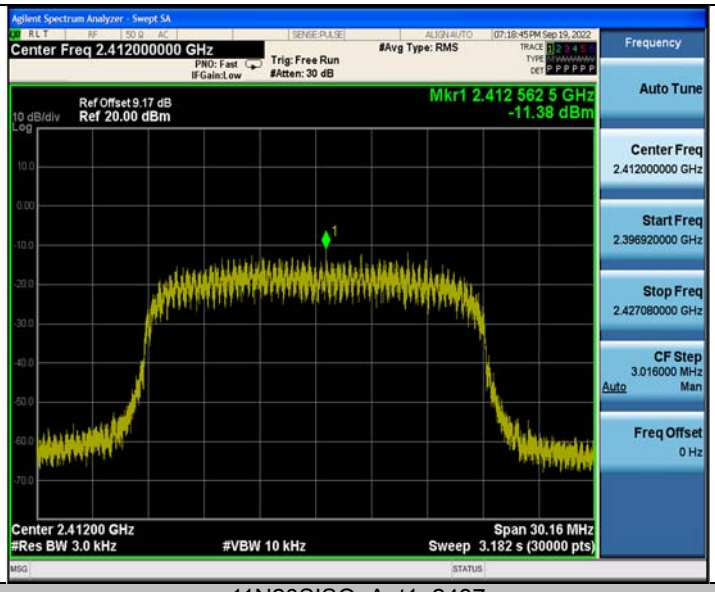
11G_Ant1_2437



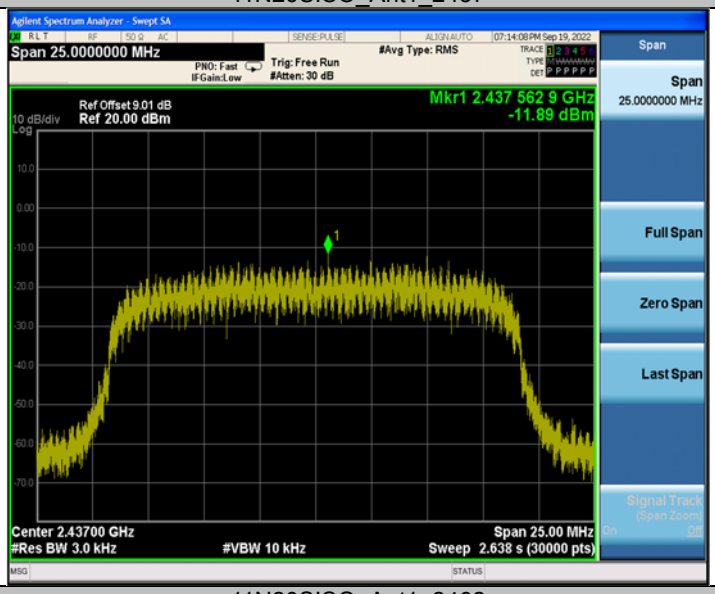
11G_Ant1_2462



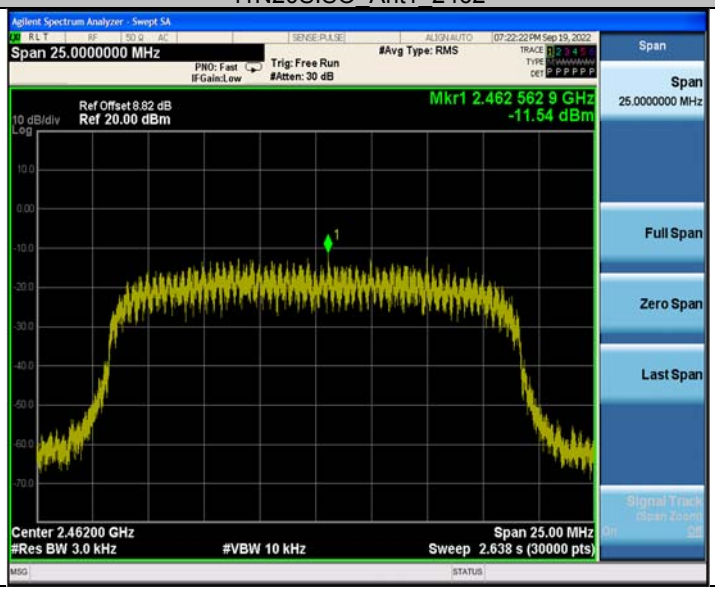
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437

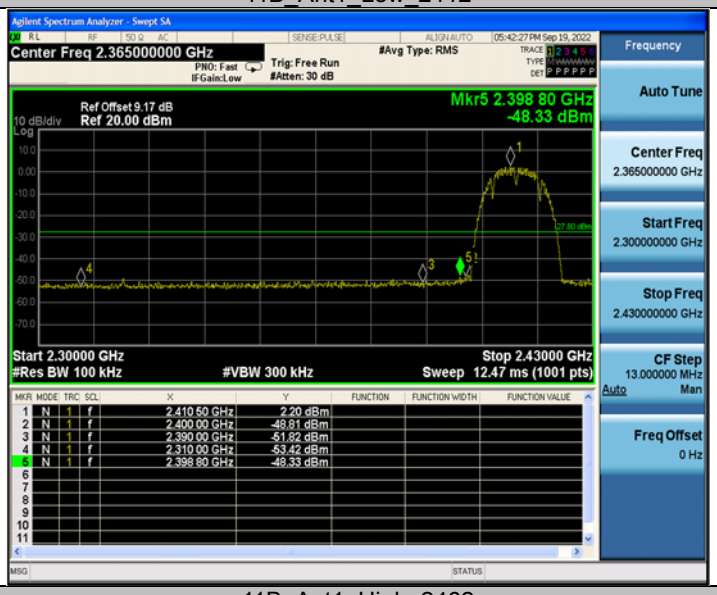


11N20SISO_Ant1_2462

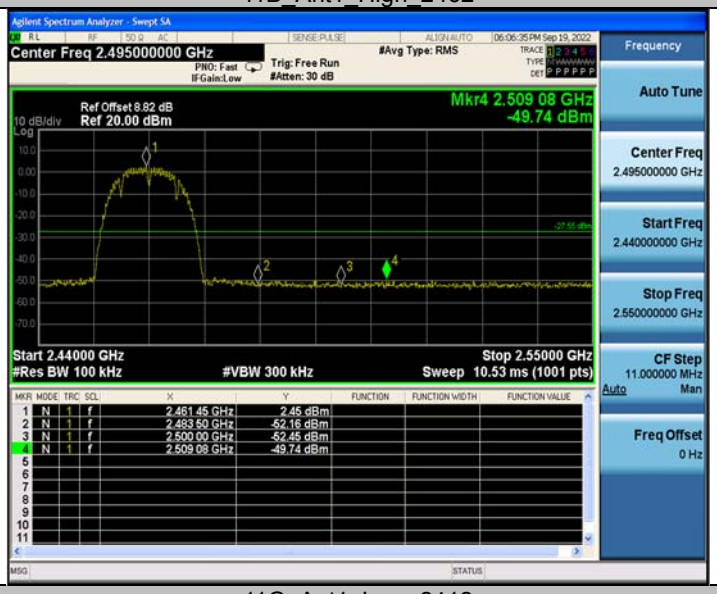


Appendix D: Band edge measurements

11B_Ant1_Low_2412

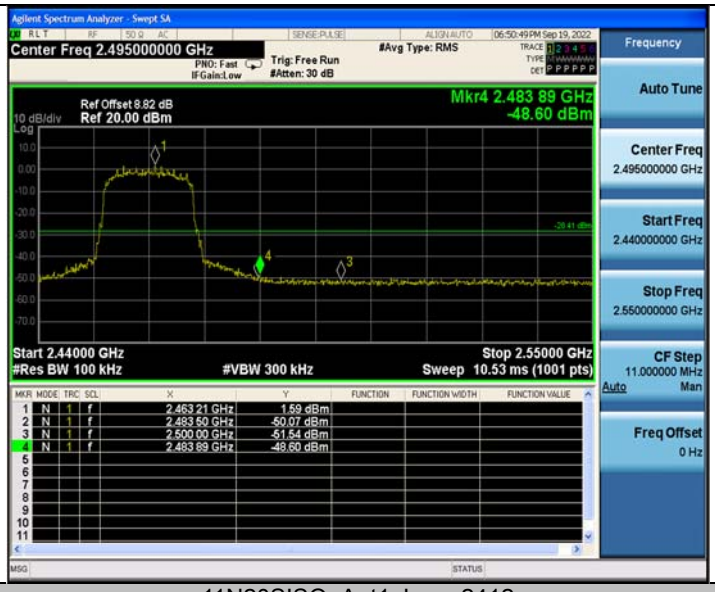


11B_Ant1_High_2462



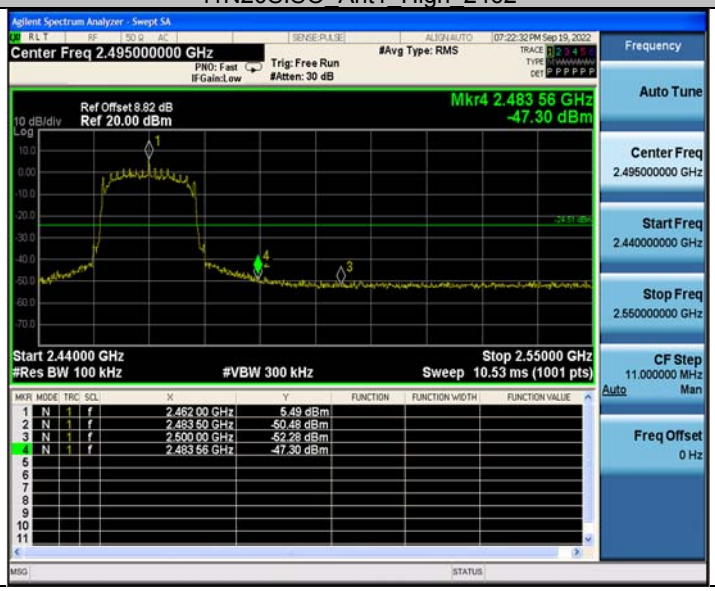
11G_Ant1_Low_2412

11G_Ant1_High_2462



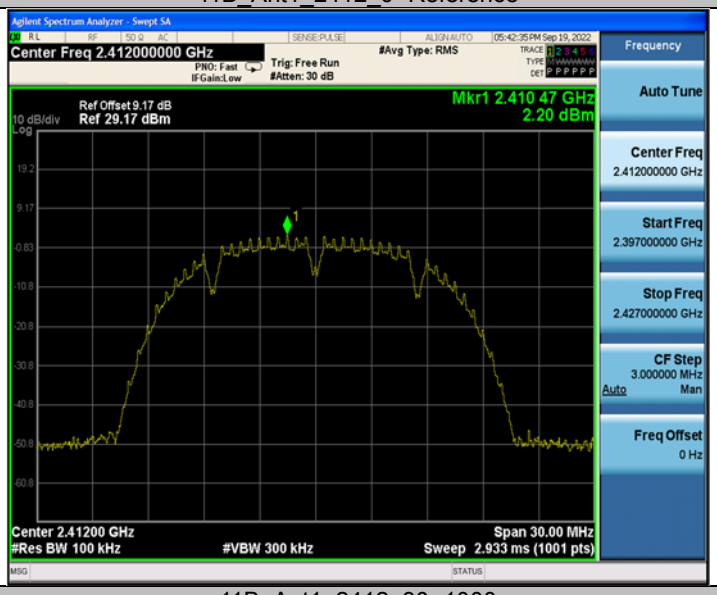
11N20SISO_Ant1_Low_2412

11N20SISO_Ant1_High_2462

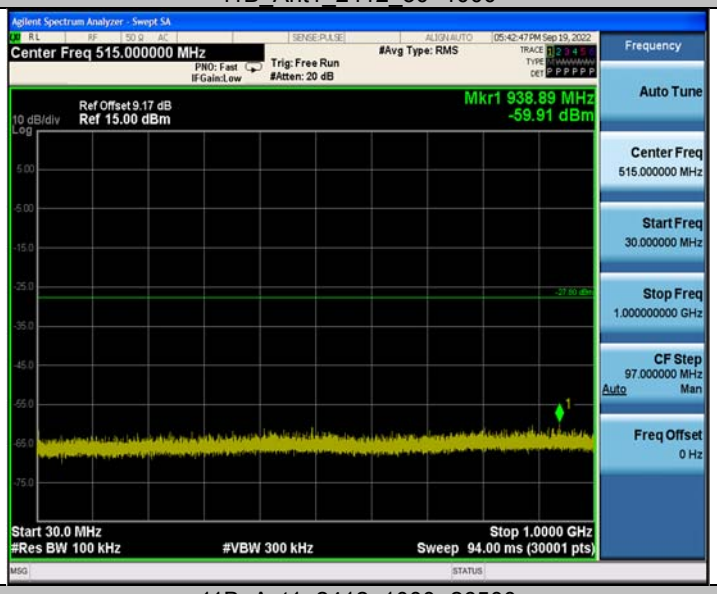


Appendix E: Conducted Spurious Emission

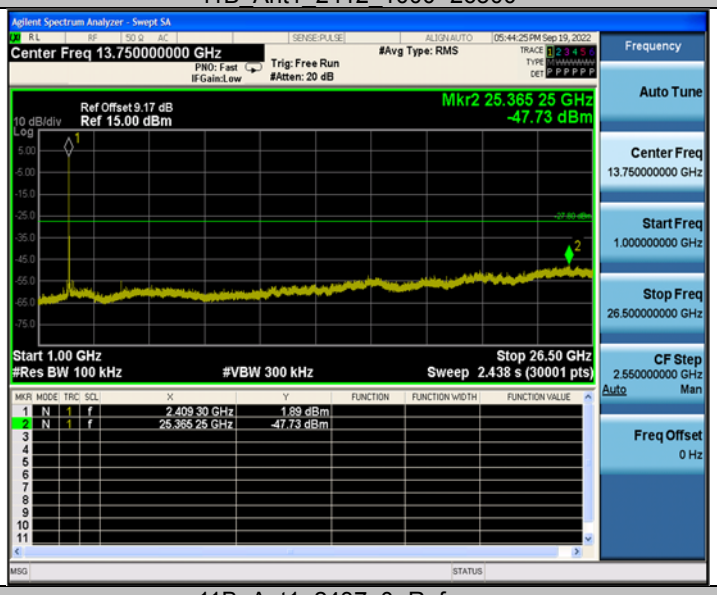
11B_Ant1_2412_0~Reference



11B_Ant1_2412_30~1000

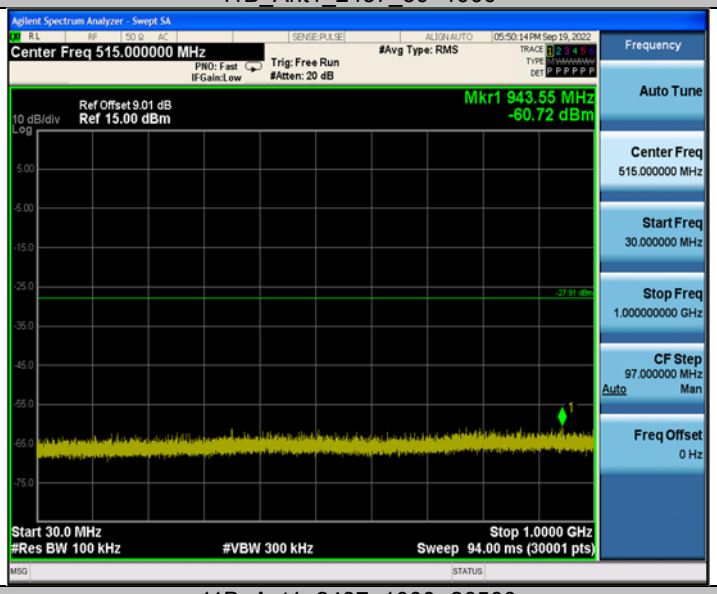


11B_Ant1_2412_1000~26500

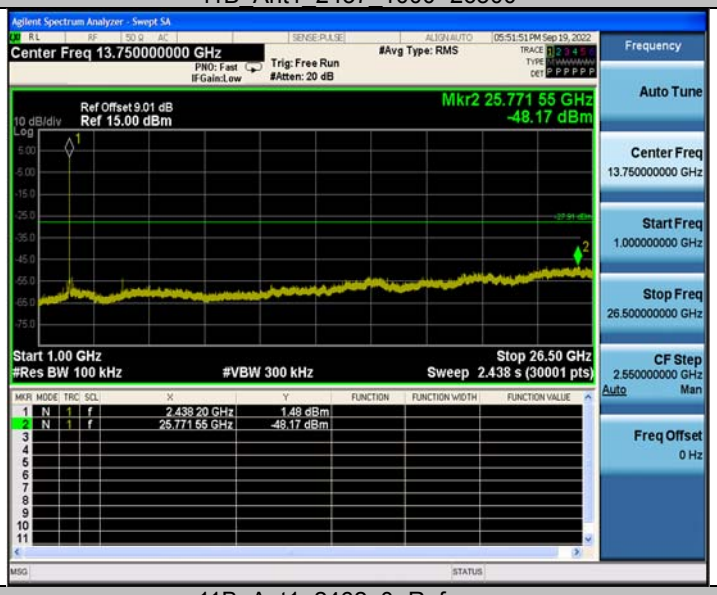


11B_Ant1_2437_0~Reference

11B_Ant1_2437_30~1000

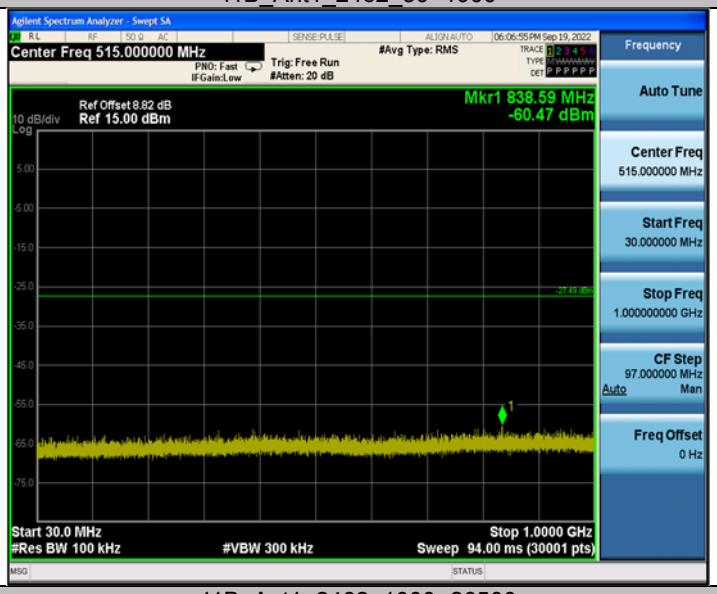


11B_Ant1_2437_1000~26500

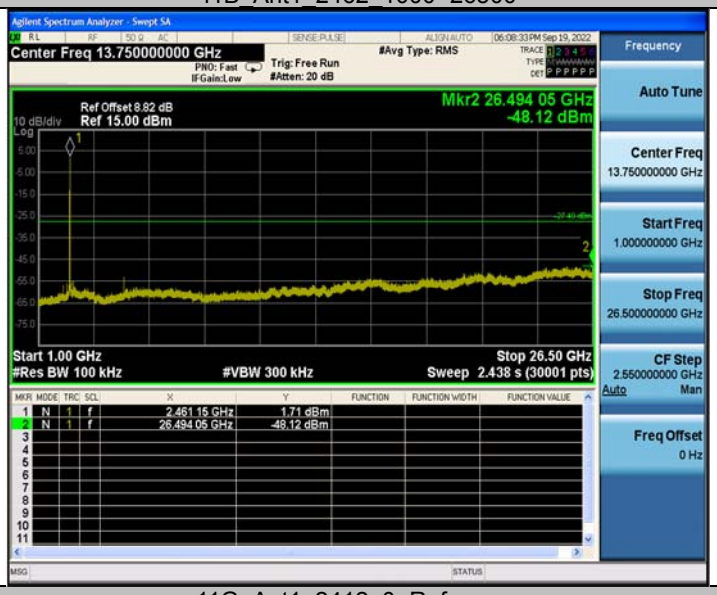


11B_Ant1_2462_0~Reference

11B_Ant1_2462_30~1000

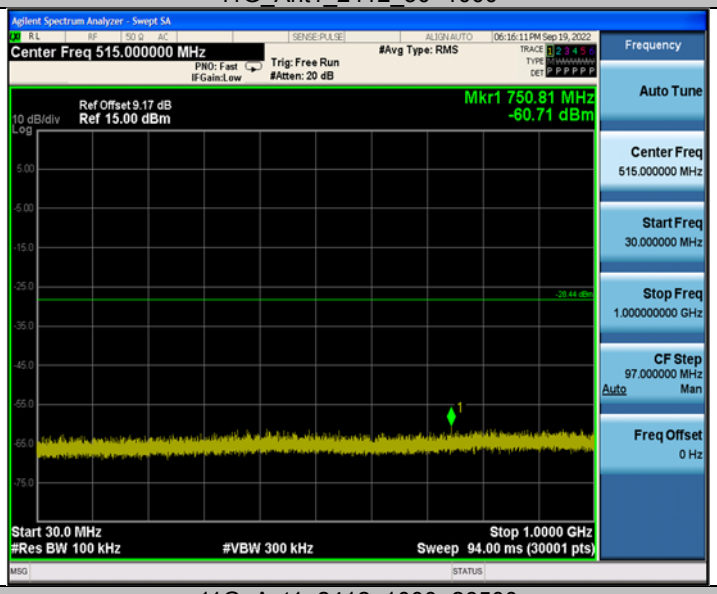


11B_Ant1_2462_1000~26500



11G_Ant1_2412_0~Reference

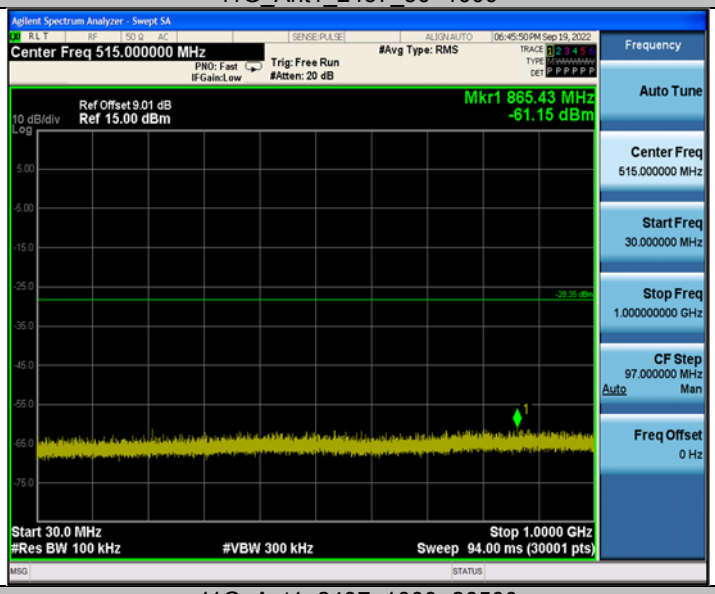
11G_Ant1_2412_30~1000



11G_Ant1_2412_1000~26500

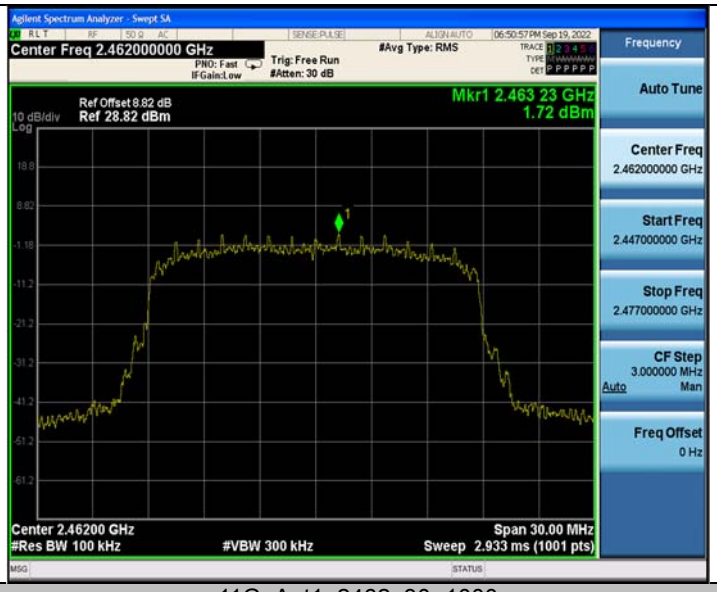
11G_Ant1_2437_0~Reference

11G_Ant1_2437_30~1000



11G_Ant1_2437_1000~26500

11G_Ant1_2462_0~Reference



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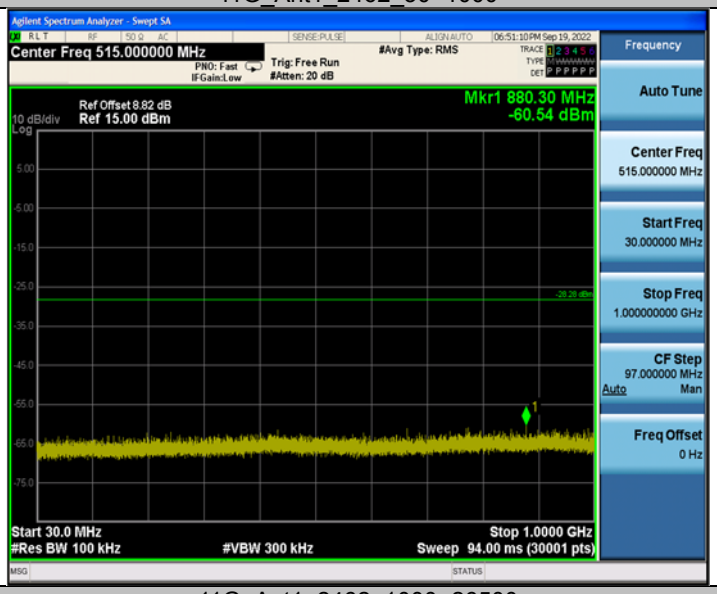
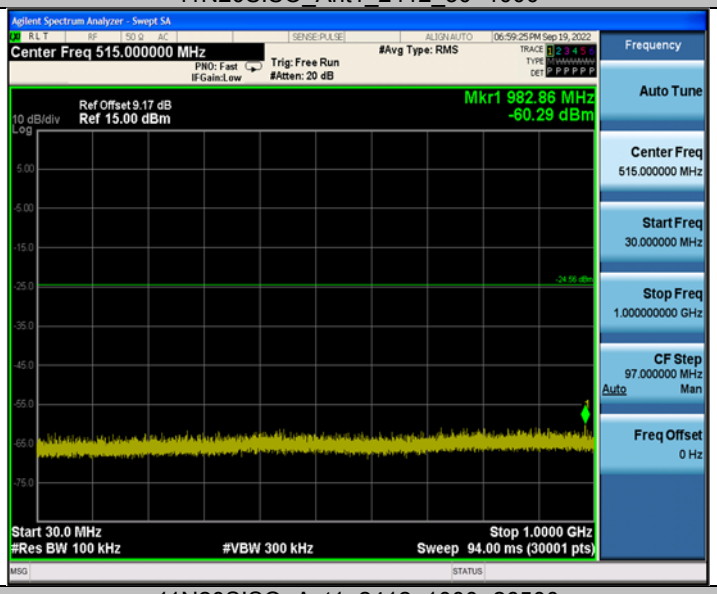


11G_Ant1_2462_1000~26500

11N20SISO_Ant1_2412_0~Reference

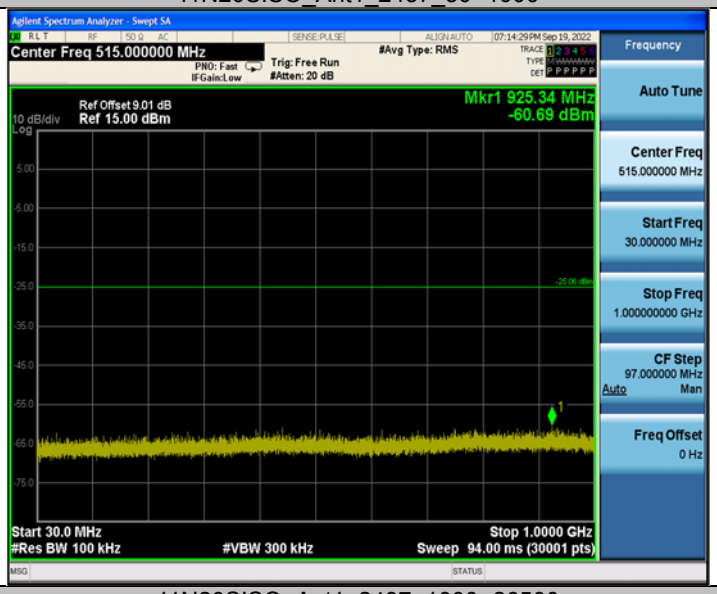
11N20SISO_Ant1_2412_30~1000



11N20SISO_Ant1_2412_1000~26500

11N20SISO_Ant1_2437_0~Reference

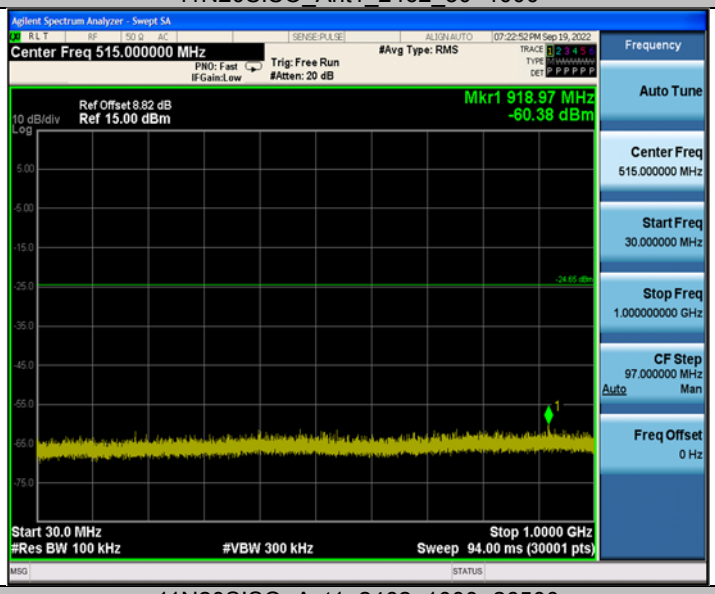
11N20SISO_Ant1_2437_30~1000



11N20SISO_Ant1_2437_1000~26500

11N20SISO_Ant1_2462_0~Reference

11N20SISO_Ant1_2462_30~1000



11N20SISO_Ant1_2462_1000~26500

Appendix F: Duty Cycle

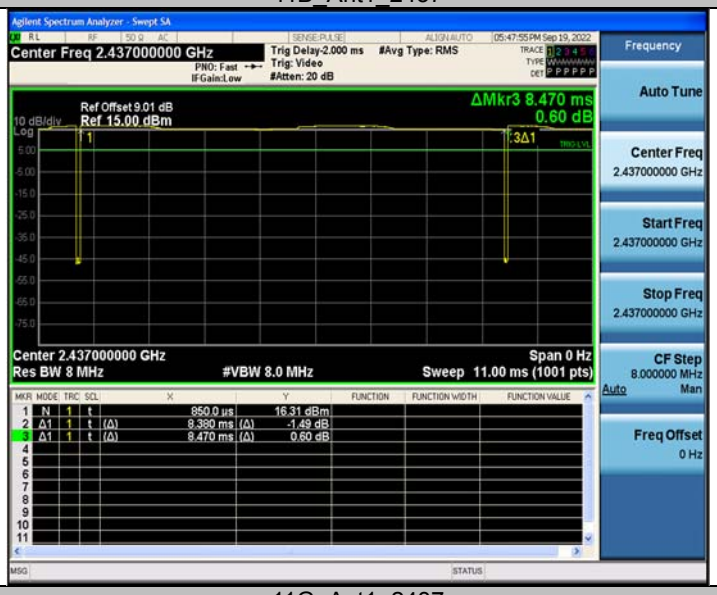
Test Result

Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Factor
11B	Ant1	2437	8.38	8.47	98.94	0.05
11G	Ant1	2437	1.39	1.41	98.58	0.06
11N20SISO	Ant1	2437	1.30	1.31	99.24	0.03

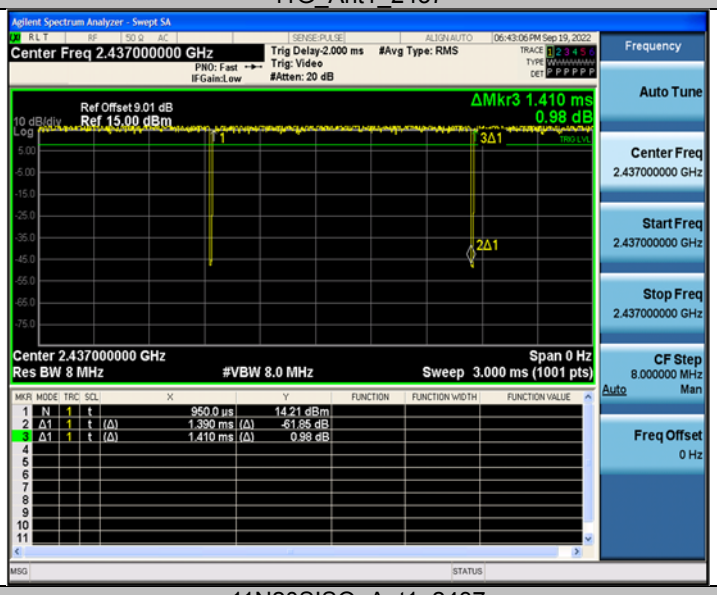
Notes:
Duty Cycle [%] = Transmission Duration [ms] / Transmission Period [ms] * 100
Factor = 10 * log (Duty Cycle)

Test Graphs

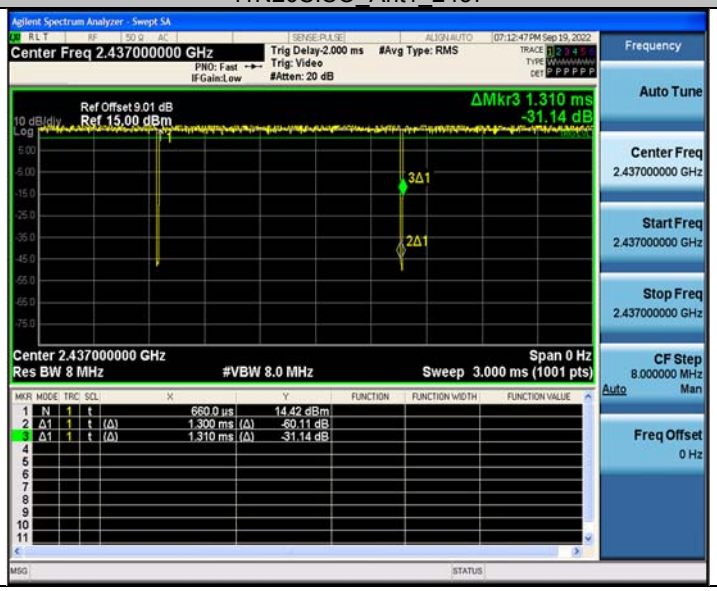
11B_Ant1_2437



11G_Ant1_2437



11N20SISO_Ant1_2437



Photographs of the Test Setup

See the Appendix – Test Setup Photos.

Photographs of the EUT

See the Appendix - EUT Photos.

----End of Report----