Microtest
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Test Report

Report No.: MTi230519006-01E1

Date of issue: 2023-11-03

Applicant: Shenzhen Smartrol Technology Limited

Product: SMART CAMERA

Model(s): ZX-C23B, ZX-C24

FCC ID: 2AURI-ZX-C23B

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 13
6.1 Antenna requirement 13
6.2 AC power line conducted emissions 14
6.3 Radiated spurious emission 17
6.4 DTS bandwidth 28
6.5 Maximum conducted output power 29
6.6 Power spectral density 30
6.7 Band edge (Conducted) 31
6.8 Conducted spurious emissions 32
6.9 Duty Cycle 33
Appendix A: DTS Bandwidth 34
Appendix B: Maximum conducted output power 39
Appendix C: Maximum power spectral density 40
Appendix D: Band edge measurements 45
Appendix E: Conducted Spurious Emission 48
Appendix F: Duty Cycle 60
Photographs of the Test Setup 65
Photographs of the EUT 66

Test Result Certification	
Applicant:	**Shenzhen Smartrol Technology Limited**
Address:	6F, Leishi Industrial Park, NO.1119, Guanlan Guanguang Road, Longhua District, Shenzhen, China
Manufacturer:	**Shenzhen Smartrol Technology Limited**
Address:	6F, Leishi Industrial Park, NO.1119, Guanlan Guanguang Road, Longhua District, Shenzhen, China
Product description	
Product name:	SMART CAMERA
Trademark:	N/A
Model name:	ZX-C23B
Series Model:	ZX-C24
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:	2023-06-02 ~ 2023-11-03
Test result:	Pass

Test Engineer : Maleah Deng

(Maleah Deng)

Reviewed By: : Leon Chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of the EUT

Product name:	SMART CAMERA
Model name:	ZX-C23B
Series Model:	ZX-C24
Model difference:	All the models are the same circuit and module, except the model name and the shape of the housing at the camera hole.
Electrical rating:	Input: DC 5V
Hardware version:	V1.1
Software version:	V8.29.9
Accessories:	Cable: USB-A to micro cable 1m Adapter: Model: CKX-050100 Input: AC 100-240V 50/60Hz 0.3A Output: DC 5V 1000mA
Test sample(s) number:	MTi230519006-01S1001 MTi230519006-01S1002
RF specification:	
Operation frequency:	802.11b/g/n20:2412~2462 MHz 802.11n40:2422~2452 MHz
Modulation type:	IEEE 802.11b: DSSS (DBPSK, DQPSK, CCK) IEEE 802.11g/n (HT20/HT40): 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 802.11n(40MHz) use 800 ns GI: 13.5/27/40.5/54/81/108/121.5/135 Mbit/s
Antenna(s) information:	Antenna type: FPC antenna Antenna gain: 3.5 dBi
Maximum conducted output power	15.26 dBm

1.2 Description of test modes

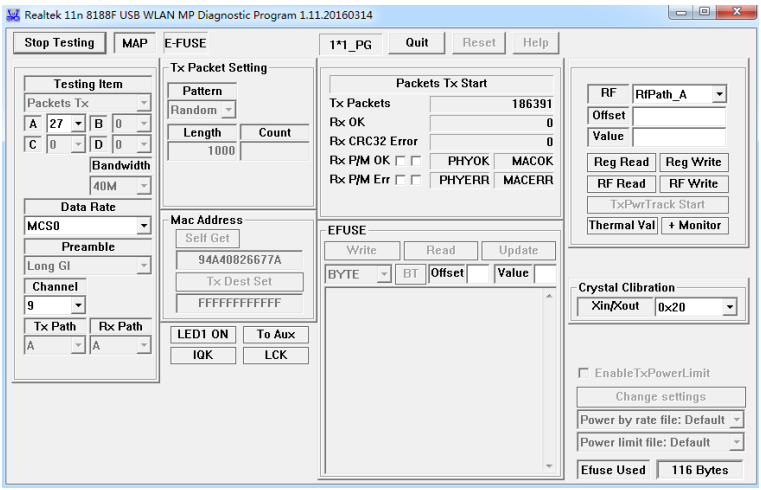
1.2.1 Operation channel list

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:	Realtek 11n 8188F USB WLAN MP Diagnostic Program 1.11.20160314		
802.11b		**802.11g**	
Channel	Power setting	Channel	Power setting
1	27	1	27
6	27	6	27
11	27	11	27
802.11n (HT20)		**802.11n (HT40)**	
Channel	Power setting	Channel	Power setting
1	27	3	27
6	27	6	27
11	27	9	27

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
Mobile phone	S9+	R28C34V79NT	SAMSUNG
Adapter	HW-090200CH0	/	Huizhou BYD Electronics Co., Ltd.
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
Temperature	±1 °C

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
Conducted Emission at AC power line						
1	EMI Test Receiver	Rohde&schwarz	ESCI3	101368	2023-04-26	2024-04-25
2	Artificial mains network	Schwarzbeck	NSLK 8127	183	2023-05-05	2024-05-04
3	Artificial Mains Network	Rohde & Schwarz	ESH2-Z5	100263	2023-06-02	2024-06-03
4	Artificial Mains Network	Rohde & Schwarz	ESH2-Z5	100263	2022-06-03	2023-06-02
Occupied Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in frequency bands						
1	Wideband Radio Communication Tester	Rohde&schwarz	CMW500	149155	2023-04-26	2024-04-25
2	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2023-04-25	2024-04-24
3	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2023-04-25	2024-04-24
4	Synthesized Sweeper	Agilent	83752A	3610A01957	2023-04-25	2024-04-24
5	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2023-04-26	2024-04-25
6	RF Control Unit	Tonscend	JS0806-1	19D8060152	2023-04-26	2024-04-25
7	Band Reject Filter Group	Tonscend	JS0806-F	19D8060160	2023-05-05	2024-05-04
8	ESG Vector Signal Generator	Agilent	N5182A	MY50143762	2023-04-25	2024-04-24
9	DC Power Supply	Agilent	E3632A	MY40027695	2023-05-05	2024-05-04
Band edge emissions (Radiated) Emissions in frequency bands (above 1GHz)						
1	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2023-04-26	2024-04-25
2	Double Ridged Broadband Horn Antenna	schwarabeck	BBHA 9120 D	2278	2023-05-26	2024-05-25
3	Amplifier	Agilent	8449B	3008A01120	2022/05/05	2023/05/04
4	Amplifier	Agilent	8449B	3008A01120	2023-05-04	2024-06-25
5	Multi-device Controller	TuoPu	TPMDC	/	2023-05-04	2024-05-03
6	MXA signal analyzer	Agilent	N9020A	MY54440859	2023-05-05	2024-05-04
Emissions in frequency bands (below 1GHz)						
1	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2023-04-26	2024-04-25
2	TRILOG Broadband Antenna	schwarabeck	VULB 9163	9163-1338	2021/05/30	2024/05/29
3	TRILOG Broadband Antenna	schwarabeck	VULB 9163	9163-1338	2023-05-28	2025-05-29
4	Amplifier	Hewlett-Packard	8447F	3113A06184	2022/05/05	2023/05/04

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
5	Amplifier	Hewlett-Packard	8447F	3113A06184	2023-05-04	2024-05-04
6	Multi-device Controller	TuoPu	TPMDC	/	2023-05-04	2024-05-03
7	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00066	2021-06-10	2023-06-11
8	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00066	2023-06-11	2025-06-10

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

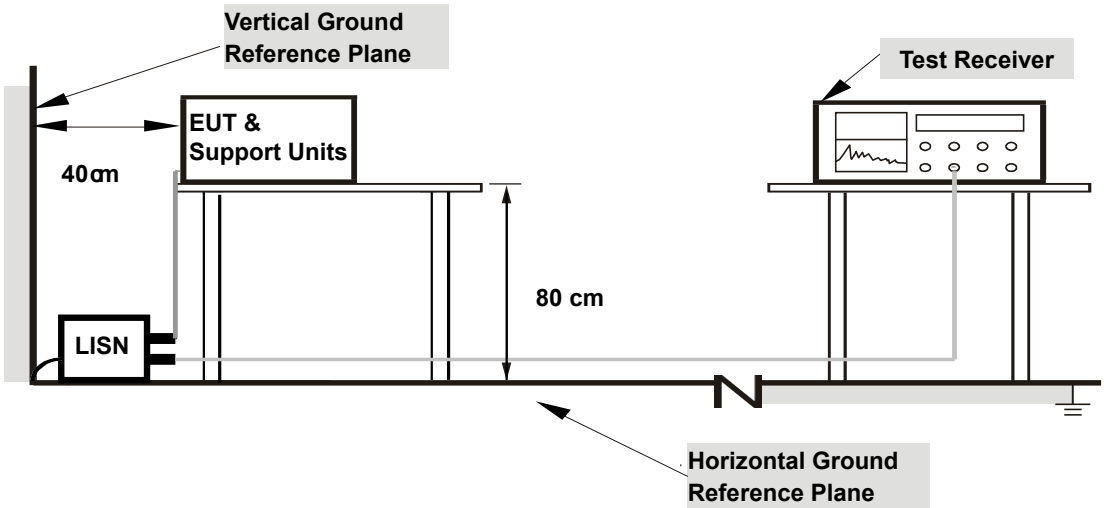
Frequency (MHz)	Detector type / Bandwidth	Limit-Quasi-peak dBμV	Limit-Average dBμV
0.15 -0.5	Average / 9 kHz	66 to 56	56 to 46
0.5 -5		56	46
5 -30		60	50

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

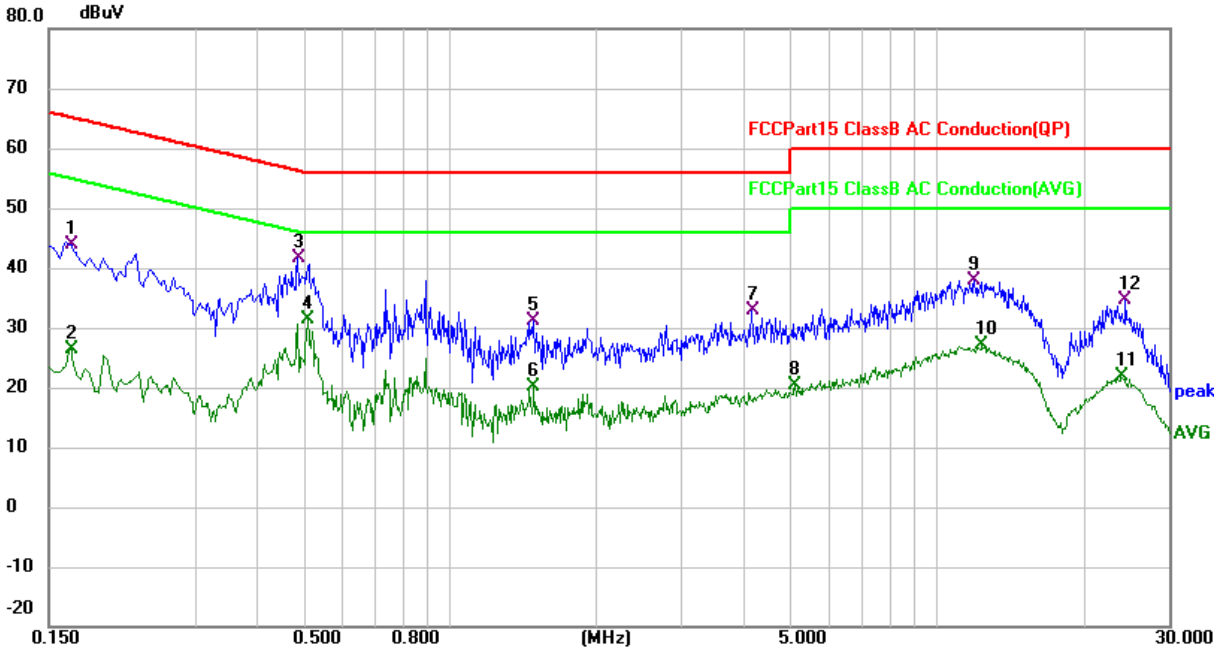
Notes:

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

Calculation formula:

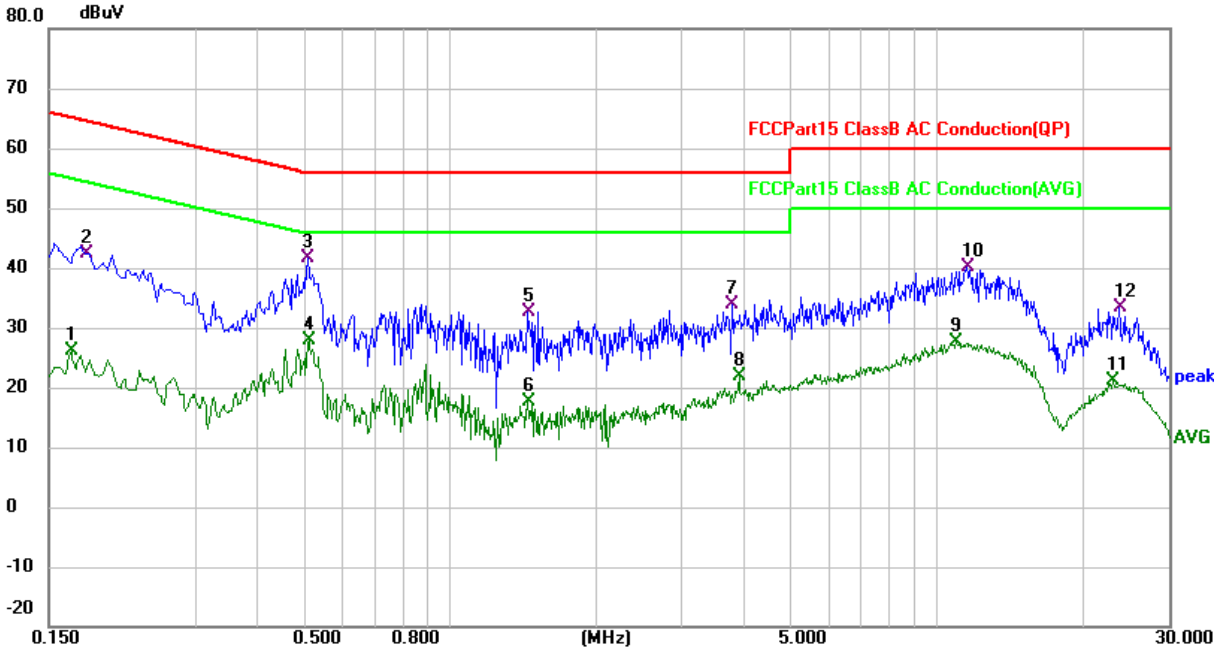
Measurement (dBμV) = Reading Level (dBμV) + Correct Factor (dB)
Over (dB) = Measurement (dBμV) – Limit (dBμV)

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		0.1660	33.54	10.28	43.82	65.16	-21.34	QP
2		0.1660	16.22	10.28	26.50	55.16	-28.66	AVG
3	*	0.4860	30.35	11.30	41.65	56.24	-14.59	QP
4		0.5100	20.02	11.34	31.36	46.00	-14.64	AVG
5		1.4819	17.92	13.17	31.09	56.00	-24.91	QP
6		1.4900	6.99	13.19	20.18	46.00	-25.82	AVG
7		4.1740	22.68	10.26	32.94	56.00	-23.06	QP
8		5.1300	10.17	10.26	20.43	50.00	-29.57	AVG
9		11.9700	27.44	10.45	37.89	60.00	-22.11	QP
10		12.4100	16.57	10.45	27.02	50.00	-22.98	AVG
11		23.9180	11.12	10.75	21.87	50.00	-28.13	AVG
12		24.4100	23.78	10.77	34.55	60.00	-25.45	QP

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		0.1660	15.84	10.26	26.10	55.16	-29.06	AVG
2		0.1796	32.15	10.23	42.38	64.50	-22.12	QP
3	*	0.5100	30.40	11.34	41.74	56.00	-14.26	QP
4		0.5140	16.64	11.34	27.98	46.00	-18.02	AVG
5		1.4460	19.38	13.29	32.67	56.00	-23.33	QP
6		1.4460	4.37	13.29	17.66	46.00	-28.34	AVG
7		3.8060	23.64	10.28	33.92	56.00	-22.08	QP
8		3.9260	11.71	10.28	21.99	46.00	-24.01	AVG
9		10.9900	17.17	10.35	27.52	50.00	-22.48	AVG
10		11.5260	29.70	10.37	40.07	60.00	-19.93	QP
11		23.1380	10.32	10.75	21.07	50.00	-28.93	AVG
12		23.6420	22.60	10.76	33.36	60.00	-26.64	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

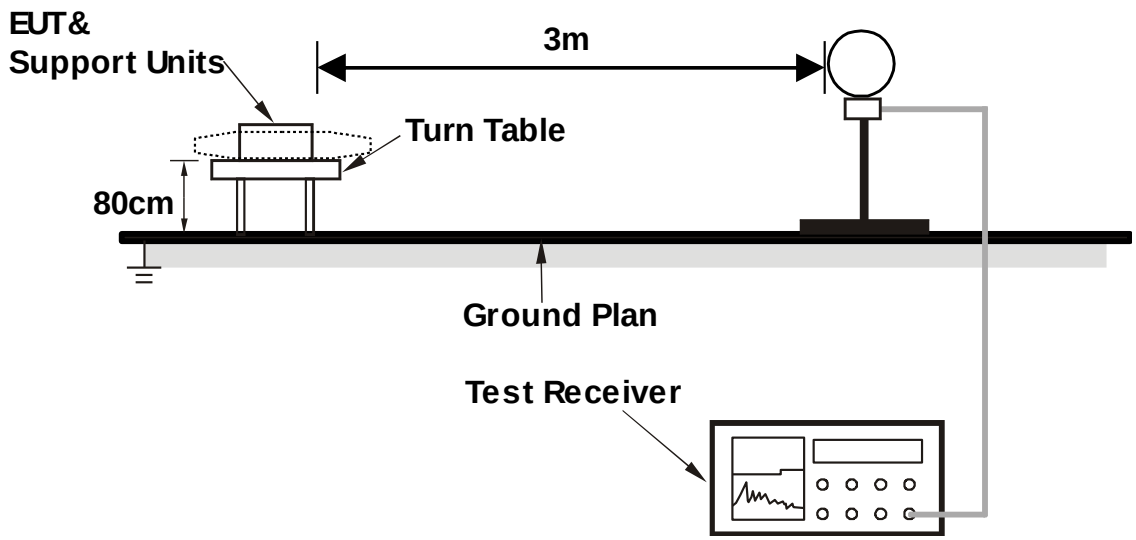
Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or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

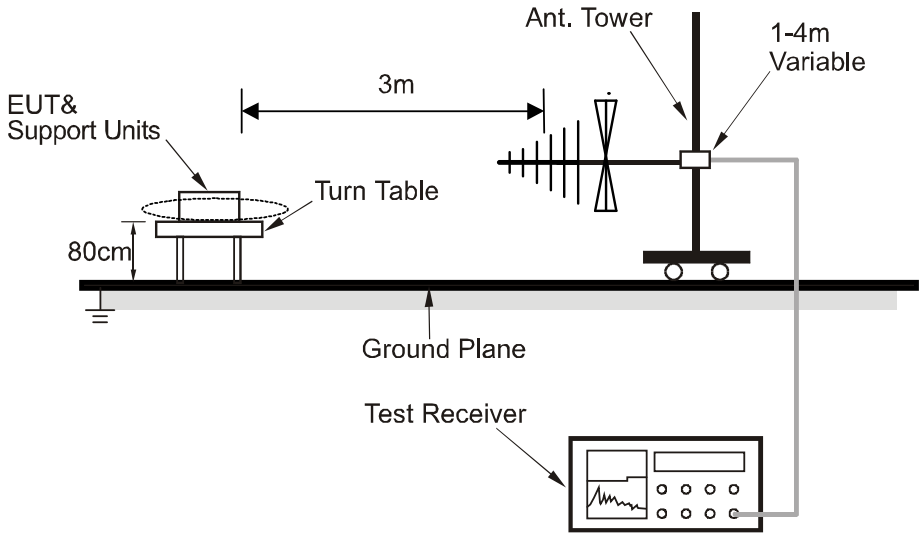
Highest frequency generated or used in the device or on which the device operates or tunes	Upper frequency range of measurement
Below 1.705 MHz	30 MHz
1.705 MHz to 108 MHz	1000 MHz
108 MHz to 500 MHz	2000 MHz
500 MHz to 1000 MHz	5000 MHz
Above 1000 MHz	5th harmonic of the highest frequency or 40 GHz,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

6.3.2 Test setup

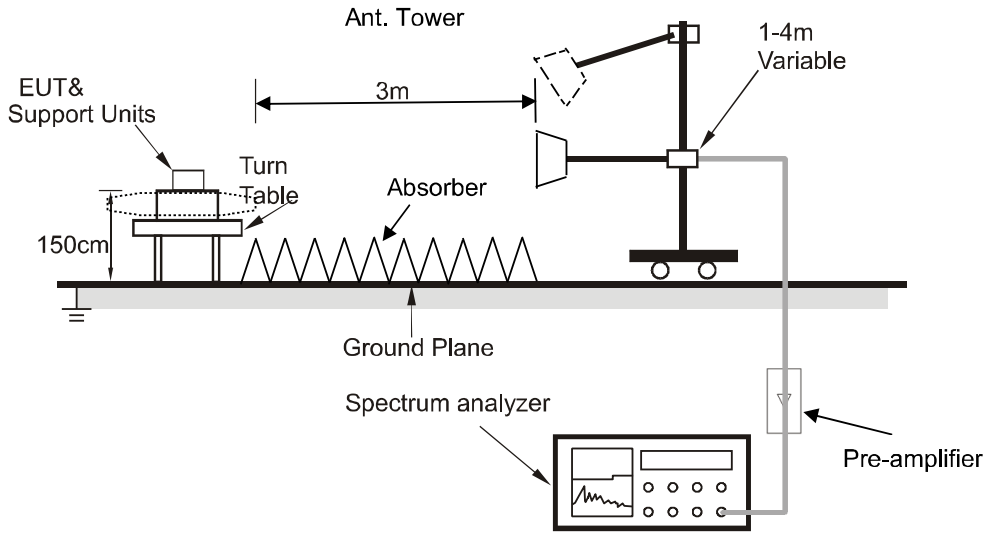
Below 30MHz:



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

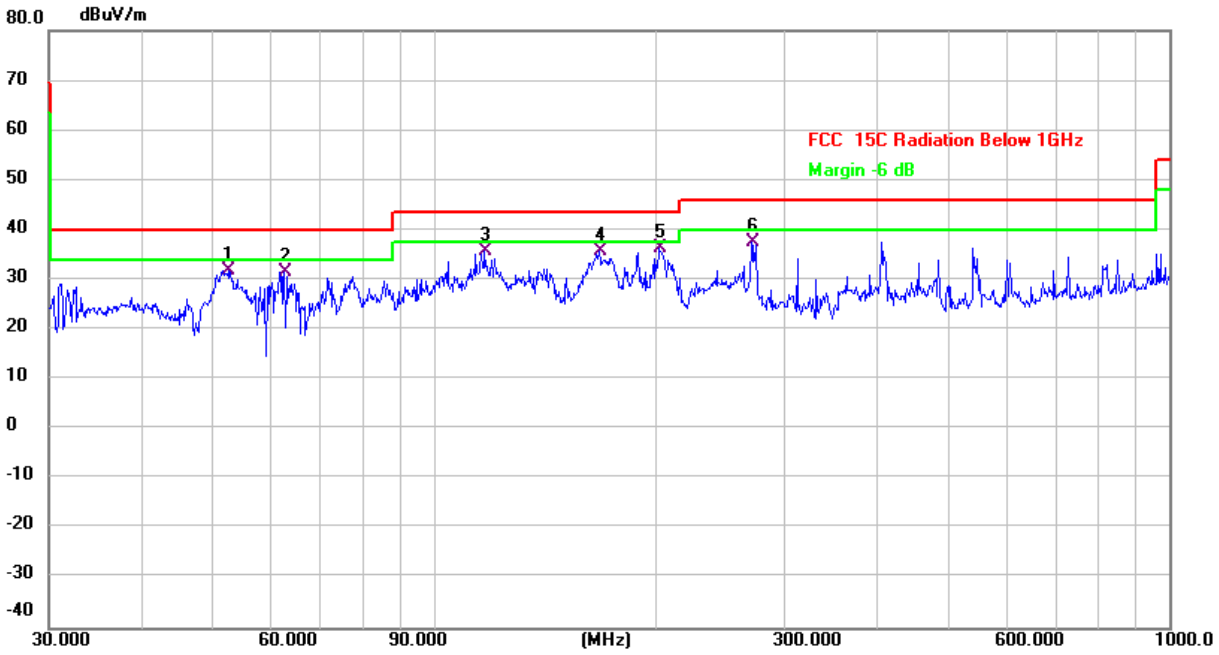
Notes:

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

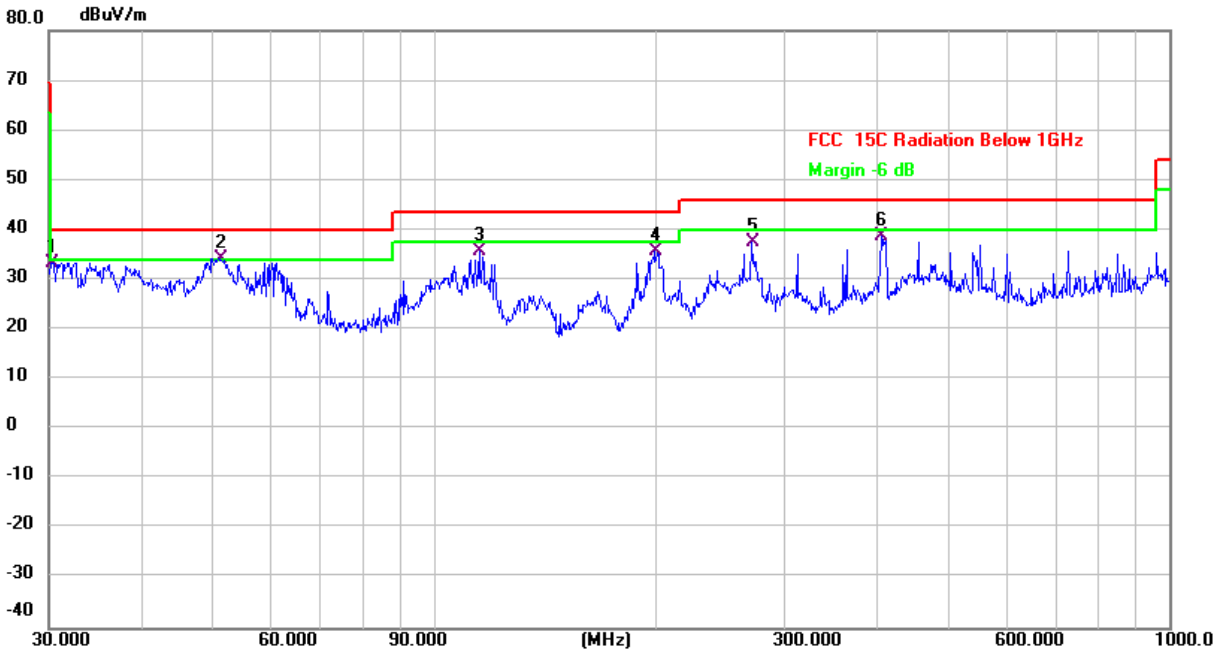
Test mode:	TX – 802.11b 2412MHz(ZX-C23B)	Polarization:	Horizontal
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		52.5753	37.04	-5.17	31.87	40.00	-8.13	QP
2		62.6507	39.22	-7.52	31.70	40.00	-8.30	QP
3		117.3603	45.65	-9.83	35.82	43.50	-7.68	QP
4		167.8243	45.43	-9.77	35.66	43.50	-7.84	QP
5	*	202.8104	44.44	-8.16	36.28	43.50	-7.22	QP
6		270.3748	43.61	-5.94	37.67	46.00	-8.33	QP

Radiated emissions between 30MHz – 1GHz

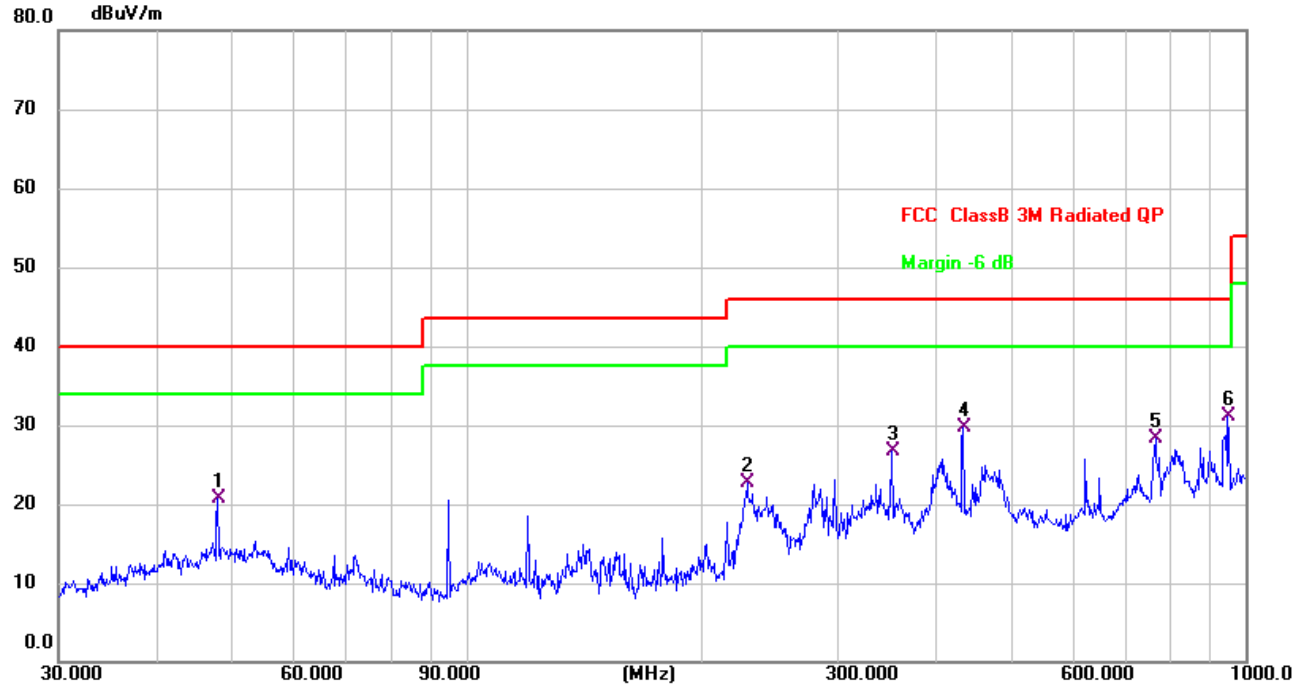
Test mode:	TX – 802.11b 2412MHz(ZX-C23B)	Polarization:	Vertical
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		30.2111	41.82	-8.36	33.46	40.00	-6.54	QP
2	*	51.3005	39.25	-4.90	34.35	40.00	-5.65	QP
3		115.3205	45.30	-9.53	35.77	43.50	-7.73	QP
4		199.9856	43.97	-8.27	35.70	43.50	-7.80	QP
5		270.3748	43.57	-5.94	37.63	46.00	-8.37	QP
6		406.0880	42.59	-3.77	38.82	46.00	-7.18	QP

Radiated emissions between 30MHz – 1GHz

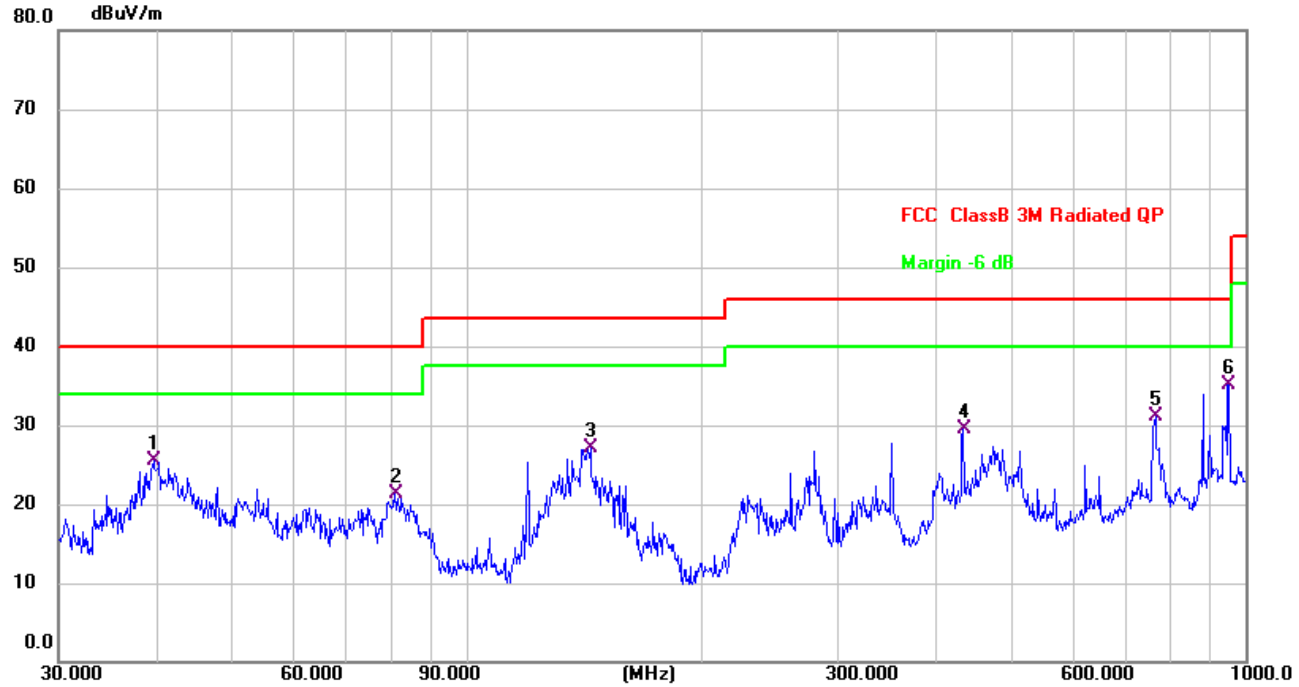
Test mode:	TX – 802.11b 2412MHz(ZX-C24)	Polarization:	Horizontal
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		47.9940	33.61	-12.98	20.63	40.00	-19.37	QP
2		229.2930	36.36	-13.69	22.67	46.00	-23.33	QP
3		351.7079	36.80	-10.18	26.62	46.00	-19.38	QP
4		434.0650	39.03	-9.33	29.70	46.00	-16.30	QP
5		766.0571	32.73	-4.42	28.31	46.00	-17.69	QP
6	*	948.7609	32.62	-1.46	31.16	46.00	-14.84	QP

Radiated emissions between 30MHz – 1GHz

Test mode:	TX – 802.11b 2412MHz(ZX-C24)	Polarization:	Vertical
Power supply:	DC 5V	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		39.7146	39.63	-14.17	25.46	40.00	-14.54	QP
2		80.9275	39.29	-18.00	21.29	40.00	-18.71	QP
3		144.3348	43.33	-16.19	27.14	43.50	-16.36	QP
4		434.0651	38.83	-9.33	29.50	46.00	-16.50	QP
5		766.0571	35.58	-4.42	31.16	46.00	-14.84	QP
6	*	952.0937	36.59	-1.48	35.11	46.00	-10.89	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 802.11b 2412MHz							
4824.000	49.73	0.82	50.55	74.00	-23.45	Peak	V
4824.000	46.99	0.82	47.81	54.00	-6.19	AVG	V
7236.000	40.96	6.00	46.96	74.00	-27.04	Peak	V
7236.000	35.15	6.00	41.15	54.00	-12.85	AVG	V
9648.000	40.73	6.17	46.90	74.00	-27.10	Peak	V
9648.000	34.41	6.17	40.58	54.00	-13.42	AVG	V
4824.000	50.06	0.82	50.88	74.00	-23.12	Peak	H
4824.000	46.39	0.82	47.21	54.00	-6.79	AVG	H
7236.000	40.78	6.00	46.78	74.00	-27.22	Peak	H
7236.000	35.20	6.00	41.20	54.00	-12.80	AVG	H
9648.000	41.32	6.17	47.49	74.00	-26.51	Peak	H
9648.000	36.15	6.17	42.32	54.00	-11.68	AVG	H
TX 802.11b 2437MHz							
4874.000	51.74	1.01	52.75	74.00	-21.25	Peak	V
4874.000	48.50	1.01	49.51	54.00	-4.49	AVG	V
7311.000	40.68	5.94	46.62	74.00	-27.38	Peak	V
7311.000	34.32	5.94	40.26	54.00	-13.74	AVG	V
9748.000	40.20	6.54	46.74	74.00	-27.26	Peak	V
9748.000	34.67	6.54	41.21	54.00	-12.79	AVG	V
4874.000	51.87	1.01	52.88	74.00	-21.12	Peak	H
4874.000	49.10	1.01	50.11	54.00	-3.89	AVG	H
7311.000	39.85	5.94	45.79	74.00	-28.21	Peak	H
7311.000	34.18	5.94	40.12	54.00	-13.88	AVG	H
9748.000	41.53	6.54	48.07	74.00	-25.93	Peak	H
9748.000	34.71	6.54	41.25	54.00	-12.75	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 802.11b 2462MHz							
4924.000	51.11	1.27	52.38	74.00	-21.62	Peak	V
4924.000	48.23	1.27	49.50	54.00	-4.50	AVG	V
7386.000	40.92	5.86	46.78	74.00	-27.22	Peak	V
7386.000	35.38	5.86	41.24	54.00	-12.76	AVG	V
9848.000	41.01	6.31	47.32	74.00	-26.68	Peak	V
9848.000	34.92	6.31	41.23	54.00	-12.77	AVG	V
4924.000	52.68	1.27	53.95	74.00	-20.05	Peak	H
4924.000	49.70	1.27	50.97	54.00	-3.03	AVG	H
7386.000	39.83	5.86	45.69	74.00	-28.31	Peak	H
7386.000	34.40	5.86	40.26	54.00	-13.74	AVG	H
9848.000	41.44	6.31	47.75	74.00	-26.25	Peak	H
9848.000	35.27	6.31	41.58	54.00	-12.42	AVG	H

Radiated emissions at band edge

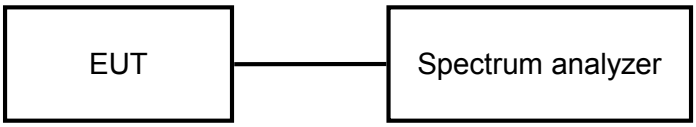
Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
TX 802.11b 2412MHz							
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
2310.000	44.47	-8.08	36.39	74.00	-37.61	Peak	V
2310.000	34.10	-8.08	26.02	54.00	-27.98	AVG	V
2390.000	51.13	-7.71	43.42	74.00	-30.58	Peak	V
2390.000	38.35	-7.71	30.64	54.00	-23.36	AVG	V
2310.000	43.49	-8.08	35.41	74.00	-38.59	Peak	H
2310.000	33.53	-8.08	25.45	54.00	-28.55	AVG	H
2390.000	43.75	-7.71	36.04	74.00	-37.96	Peak	H
2390.000	33.38	-7.71	25.67	54.00	-28.33	AVG	H
TX 802.11b 2462MHz							
2483.500	57.16	-7.24	49.92	74.00	-24.08	Peak	V
2483.500	40.03	-7.24	32.79	54.00	-21.21	AVG	V
2500.000	49.59	-7.17	42.42	74.00	-31.58	Peak	V
2500.000	38.31	-7.17	31.14	54.00	-22.86	AVG	V
2483.500	50.56	-7.24	43.32	74.00	-30.68	Peak	H
2483.500	38.81	-7.24	31.57	54.00	-22.43	AVG	H
2500.000	47.37	-7.17	40.20	74.00	-33.80	Peak	H
2500.000	38.06	-7.17	30.89	54.00	-23.11	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

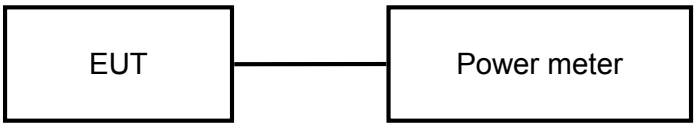
Note: See the appendix A

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

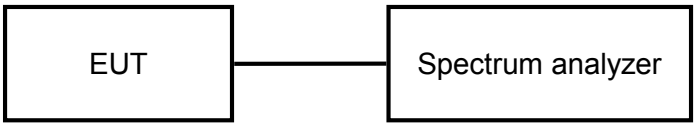
Note: see the appendix B

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

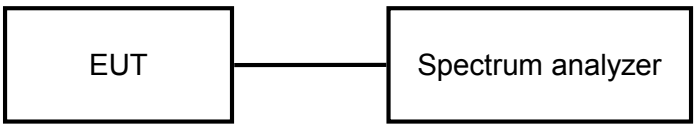
Note: see the appendix C

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

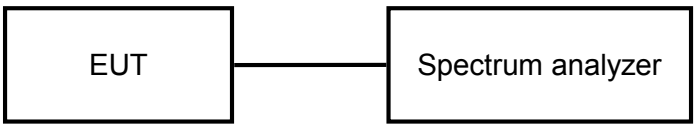
Note: see the appendix D

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

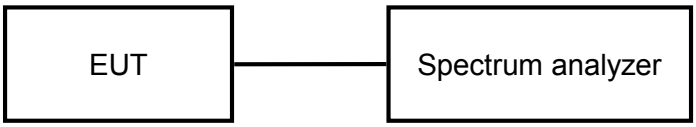
Note: see the appendix E

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

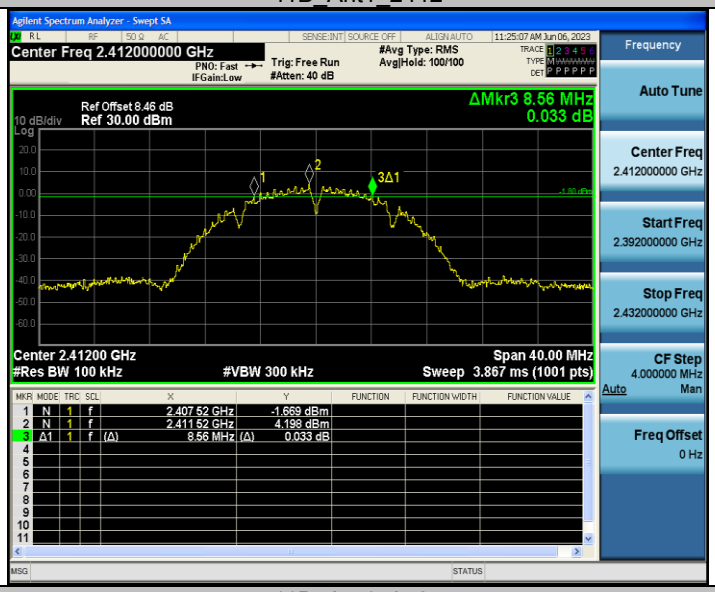
Appendix A: DTS Bandwidth

Test Result

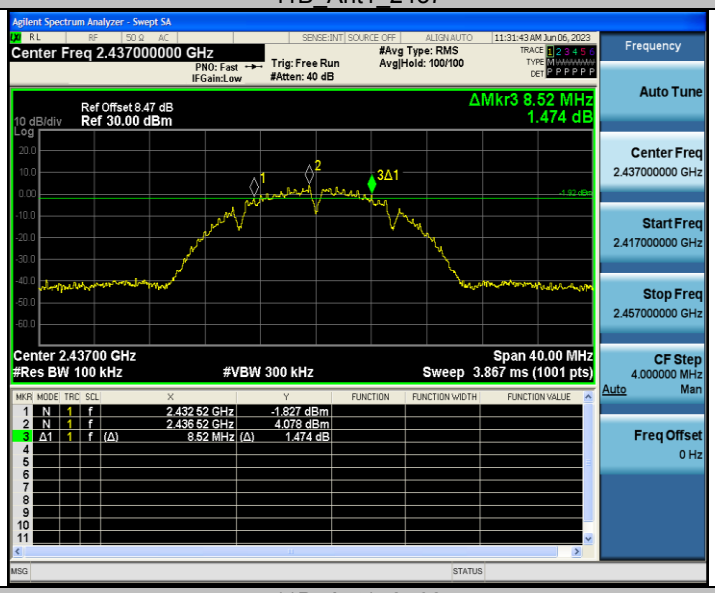
Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	8.560	0.5	PASS
		2437	8.520	0.5	PASS
		2462	8.560	0.5	PASS
11G	Ant1	2412	16.360	0.5	PASS
		2437	16.360	0.5	PASS
		2462	16.320	0.5	PASS
11N20SISO	Ant1	2412	17.560	0.5	PASS
		2437	17.120	0.5	PASS
		2462	17.560	0.5	PASS
11N40SISO	Ant1	2422	36.000	0.5	PASS
		2437	35.760	0.5	PASS
		2452	35.680	0.5	PASS

Test Graphs

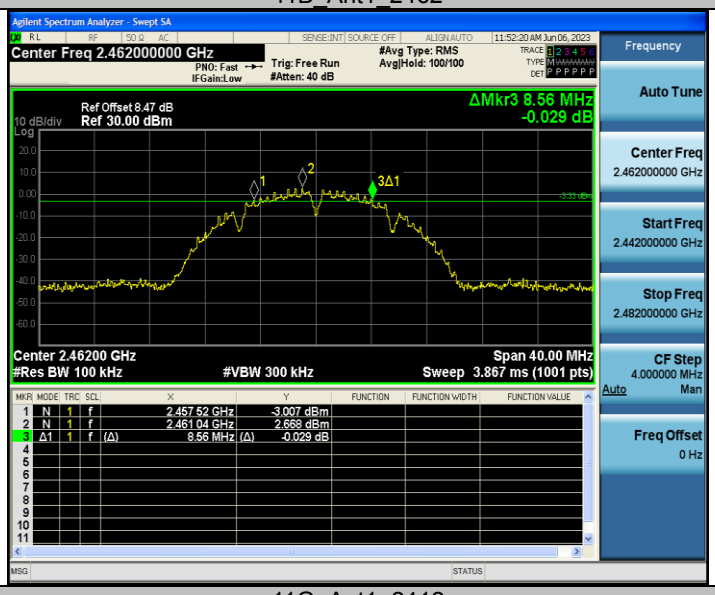
11B_Ant1_2412



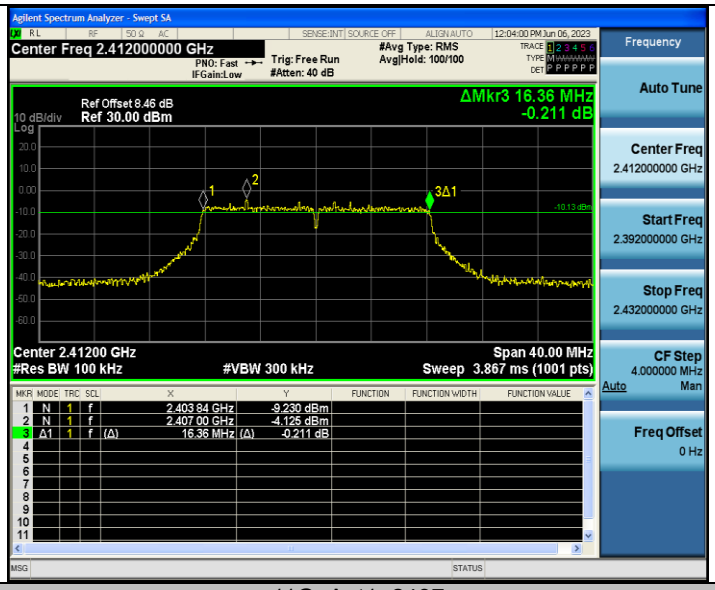
11B_Ant1_2437



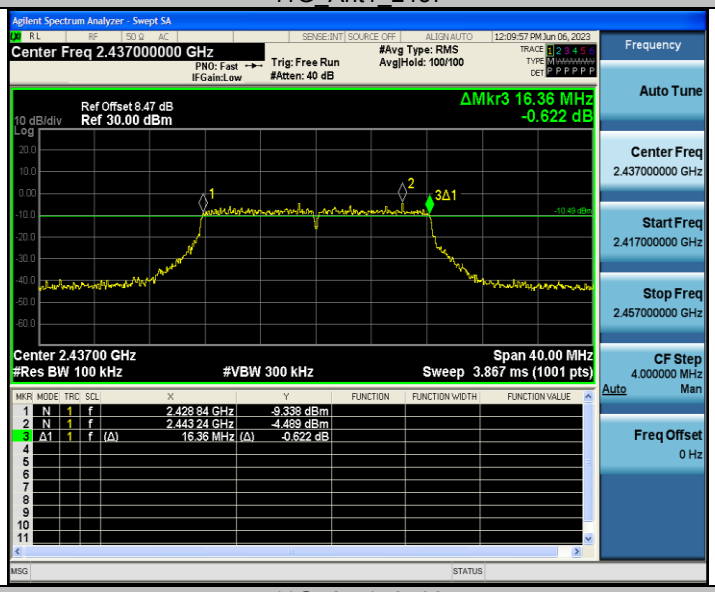
11B_Ant1_2462



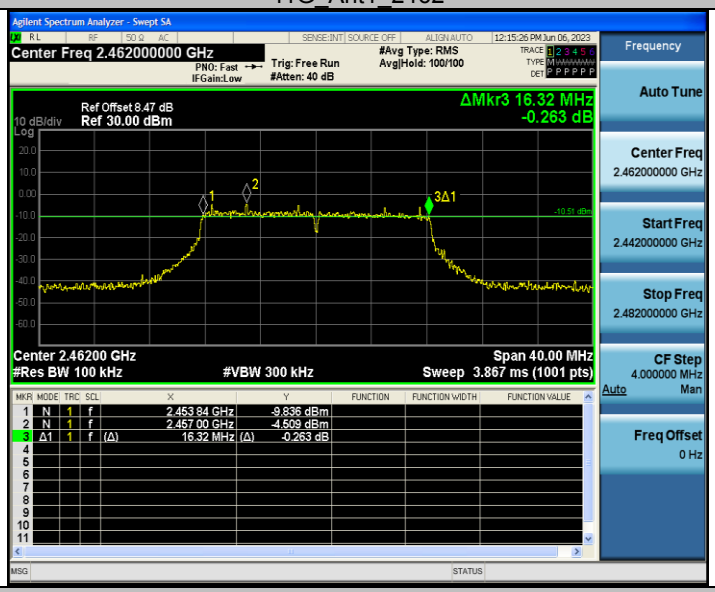
11G_Ant1_2412



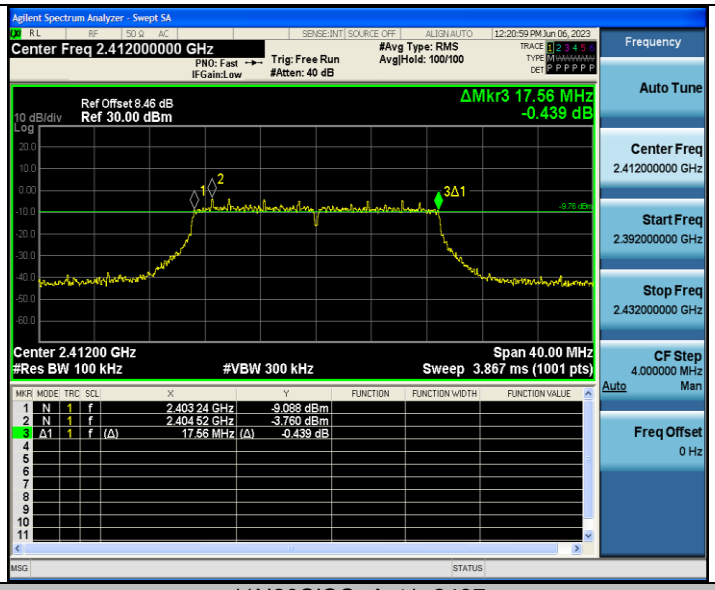
11G_Ant1_2437



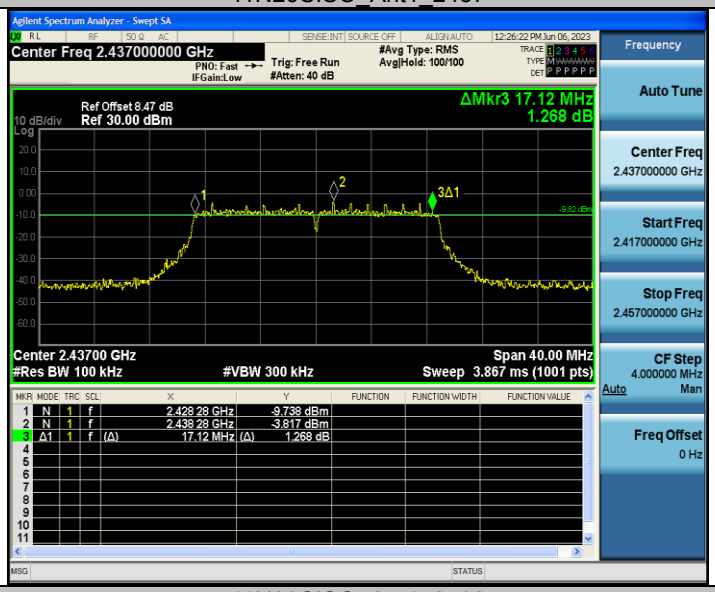
11G_Ant1_2462



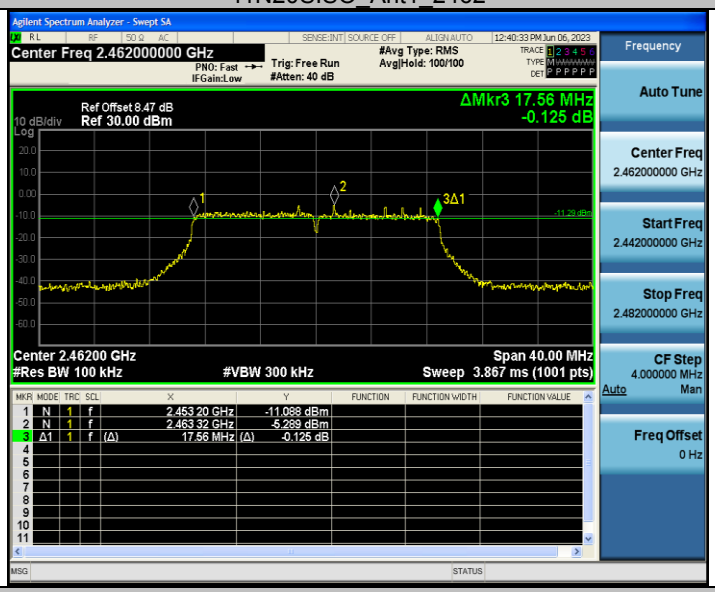
11N20SISO_Ant1_2412



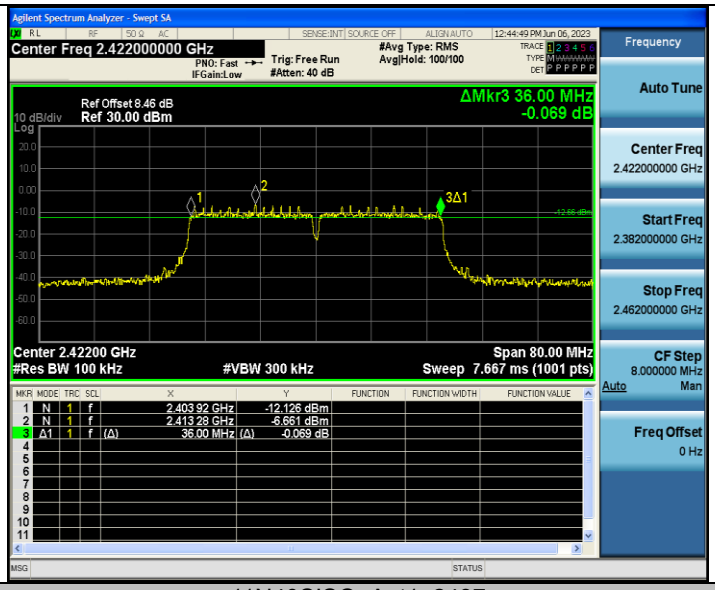
11N20SISO_Ant1_2437



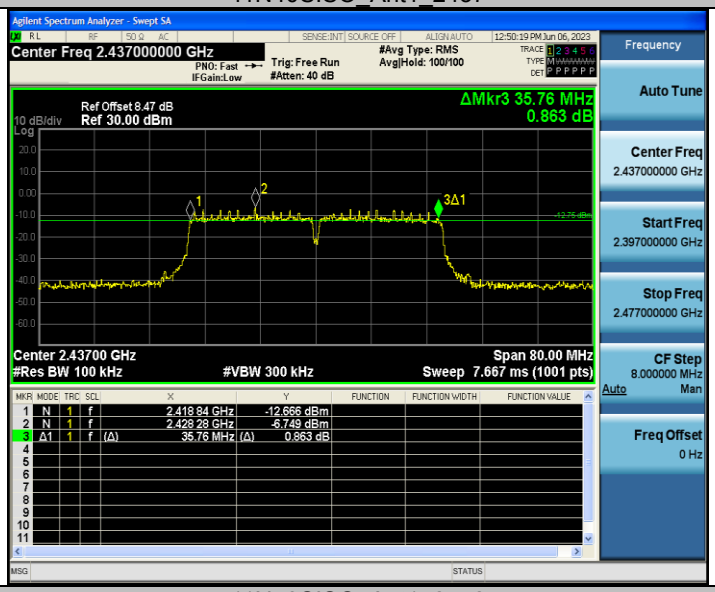
11N20SISO_Ant1_2462



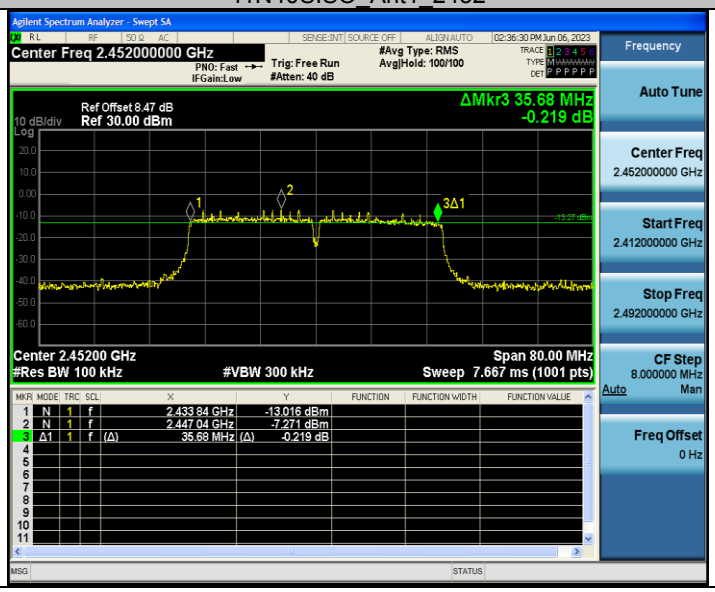
11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



11N40SISO_Ant1_2452



Appendix B: Maximum conducted output power

Test Result Peak

Test Mode	Antenna	Frequency [MHz]	Peak Power [dBm]	Conducted Limit [dBm]	Verdict
11B	Ant1	2412	15.26	≤30.00	PASS
		2437	15.14	≤30.00	PASS
		2462	14.02	≤30.00	PASS
11G	Ant1	2412	14.42	≤30.00	PASS
		2437	14.53	≤30.00	PASS
		2462	13.30	≤30.00	PASS
11N20SISO	Ant1	2412	14.54	≤30.00	PASS
		2437	14.14	≤30.00	PASS
		2462	13.19	≤30.00	PASS
11N40SISO	Ant1	2422	14.56	≤30.00	PASS
		2437	14.19	≤30.00	PASS
		2452	13.88	≤30.00	PASS

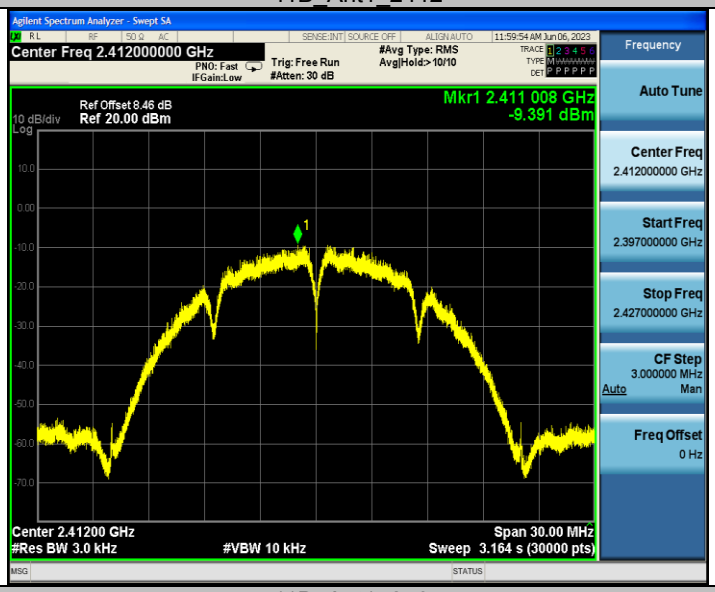
Appendix C: Maximum power spectral density

Test Result

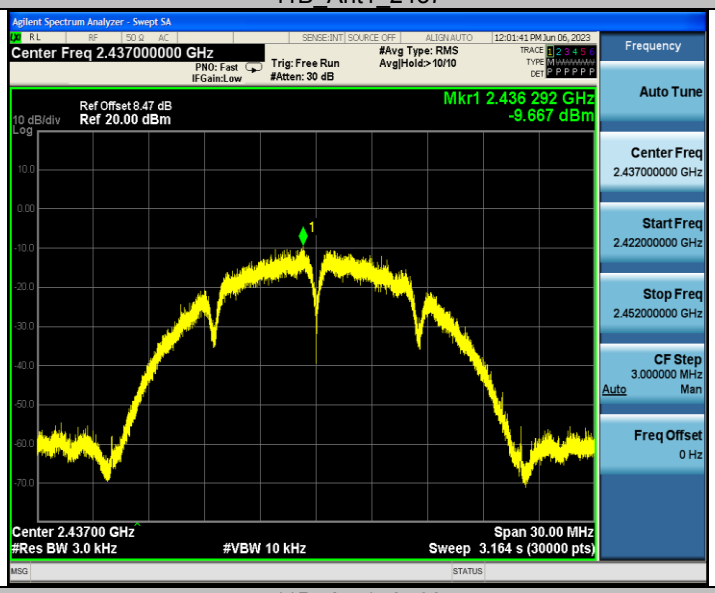
Test Mode	Antenna	Frequency [MHz]	Result [dBm/3-100kHz]	Limit [dBm/3kHz]	Verdict
11B	Ant1	2412	-9.39	≤8.00	PASS
		2437	-9.67	≤8.00	PASS
		2462	-10.83	≤8.00	PASS
11G	Ant1	2412	-17.3	≤8.00	PASS
		2437	-17.36	≤8.00	PASS
		2462	-17.39	≤8.00	PASS
11N20SISO	Ant1	2412	-17.44	≤8.00	PASS
		2437	-16.45	≤8.00	PASS
		2462	-17.58	≤8.00	PASS
11N40SISO	Ant1	2422	-20.39	≤8.00	PASS
		2437	-19.73	≤8.00	PASS
		2452	-20.83	≤8.00	PASS

Test Graphs

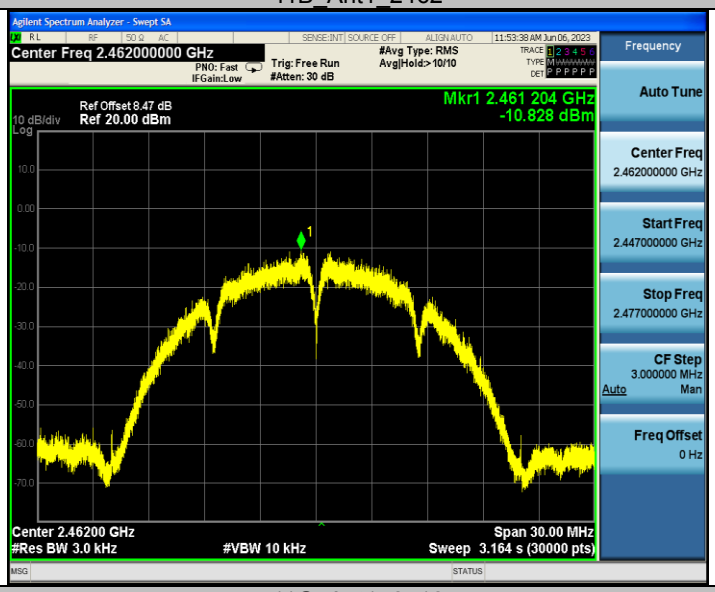
11B_Ant1_2412



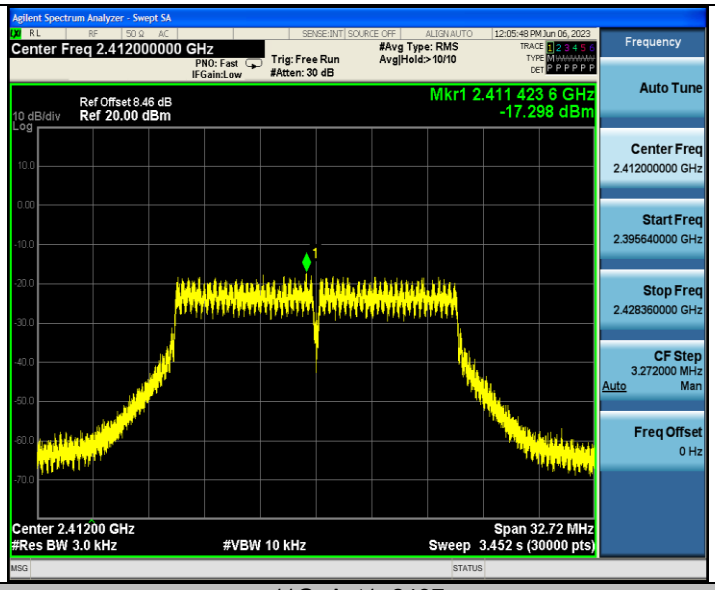
11B_Ant1_2437



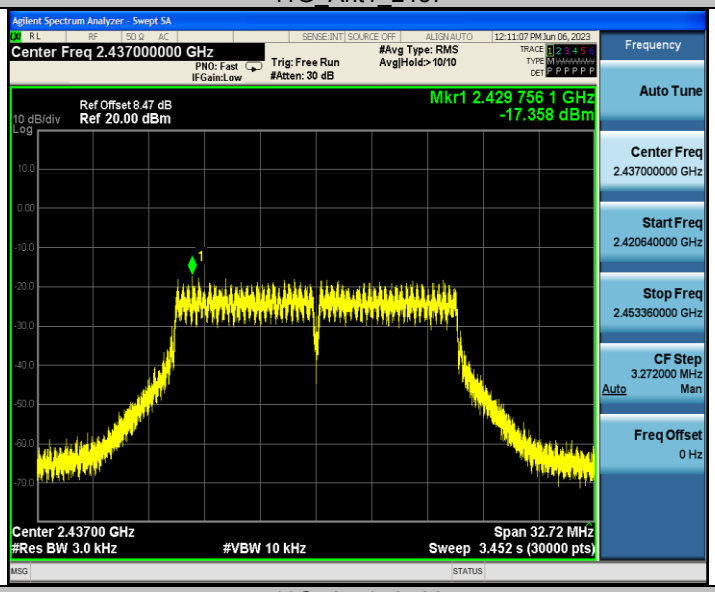
11B_Ant1_2462



11G_Ant1_2412



11G_Ant1_2437



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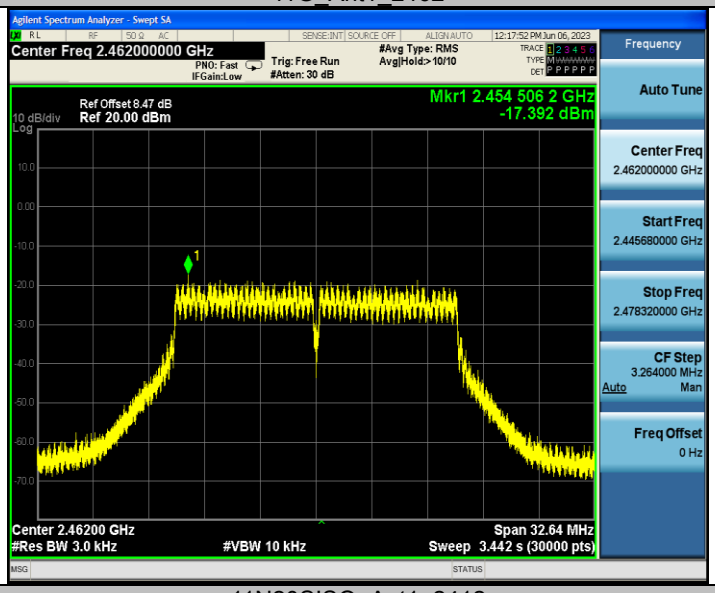
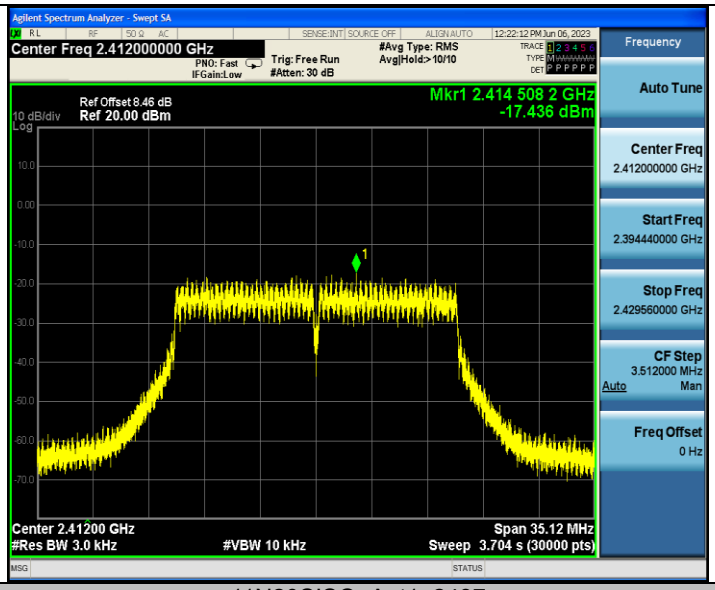


11N20SISO_Ant1_2412



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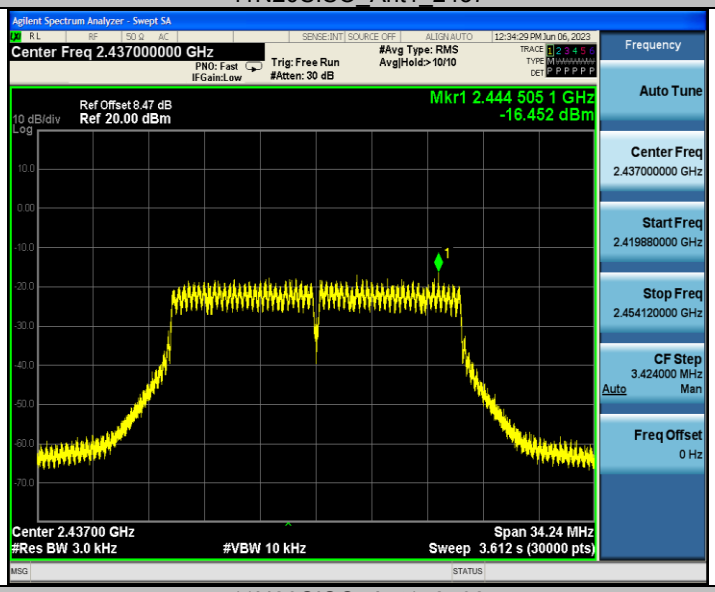

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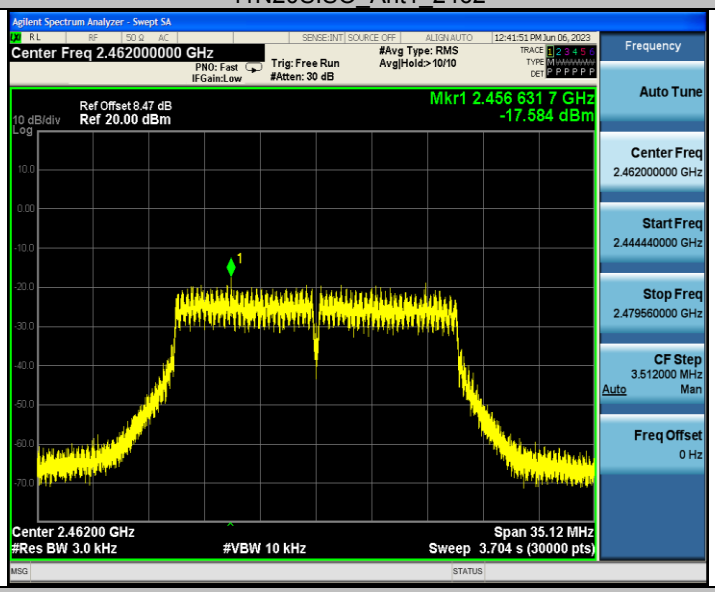

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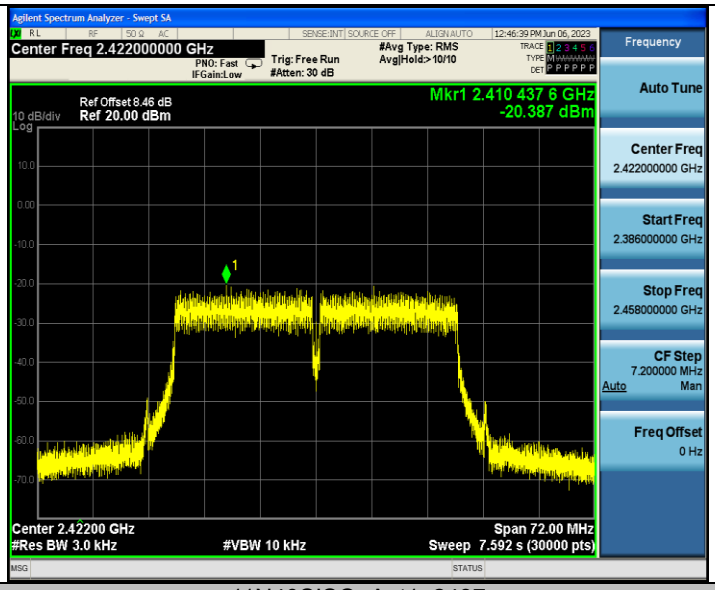

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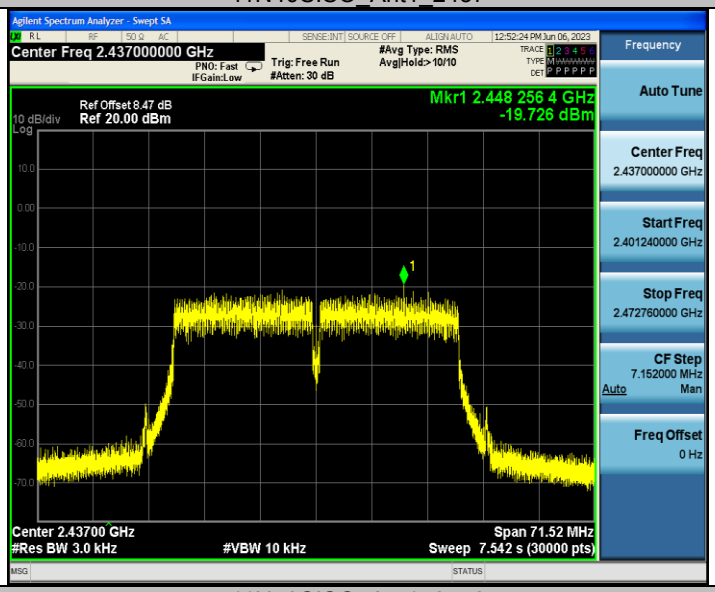

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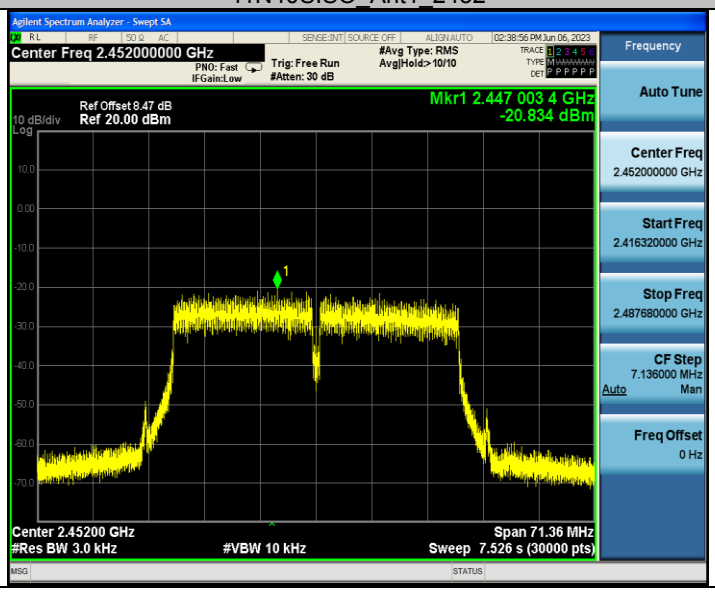
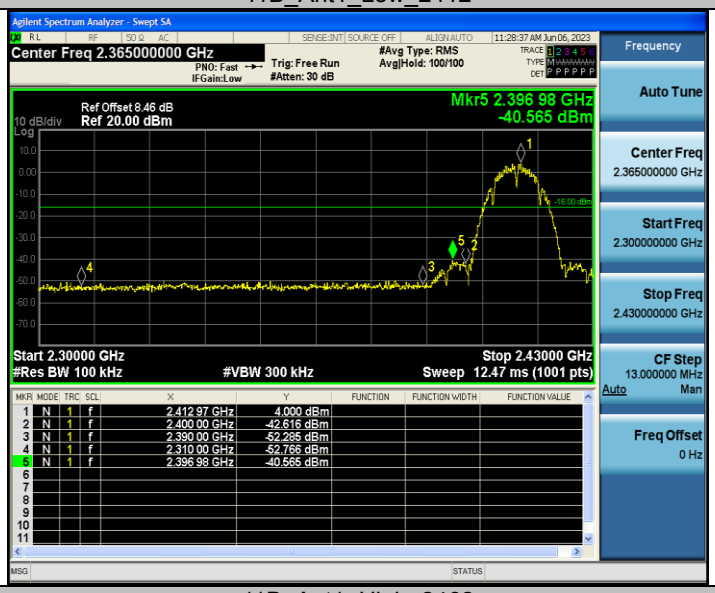
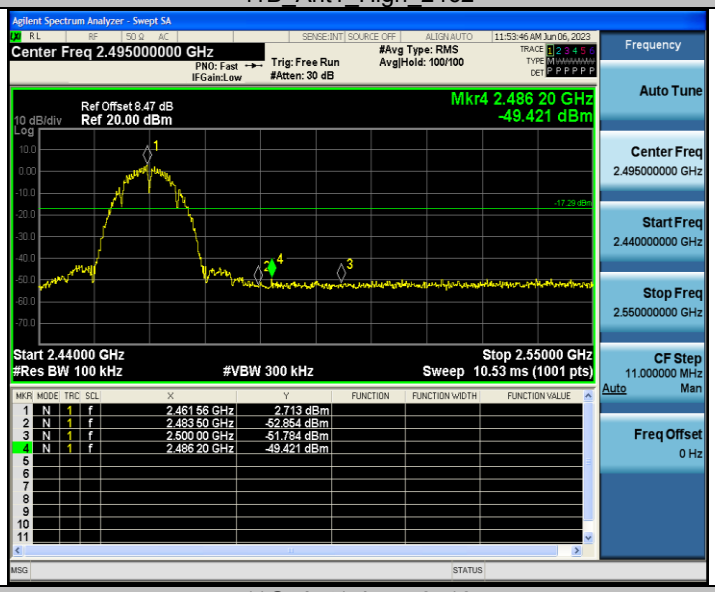


Appendix D: Band edge measurements

11B_Ant1_Low_2412



11B_Ant1_High_2462



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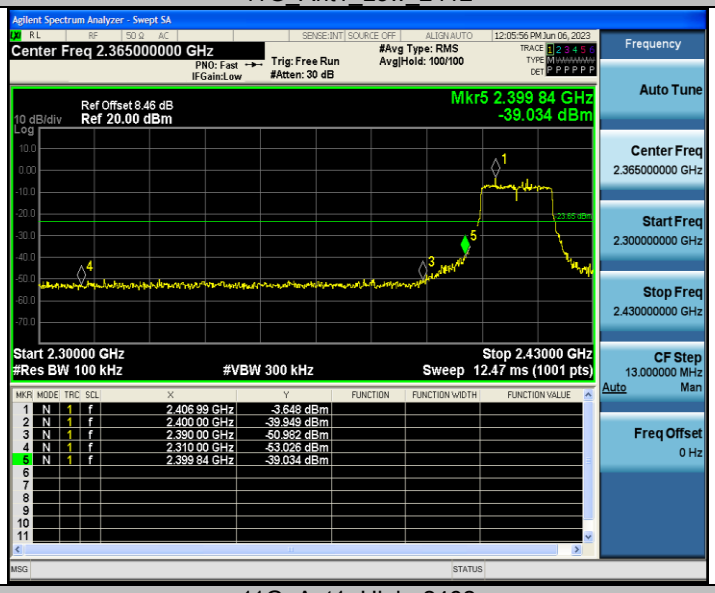

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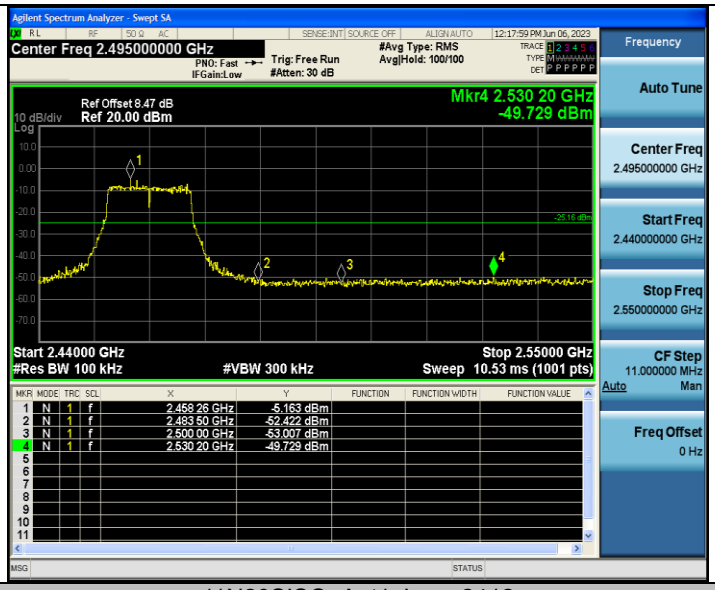
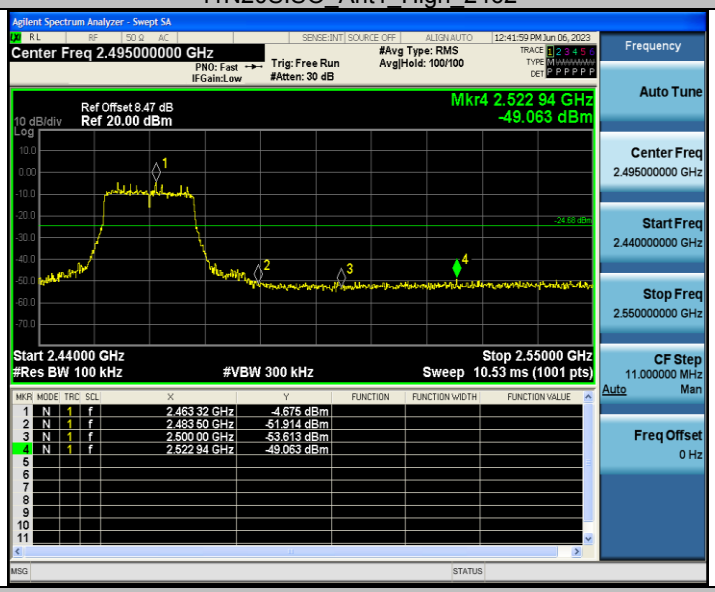


11N20SISO_Ant1_Low_2412

11N20SISO_Ant1_High_2462



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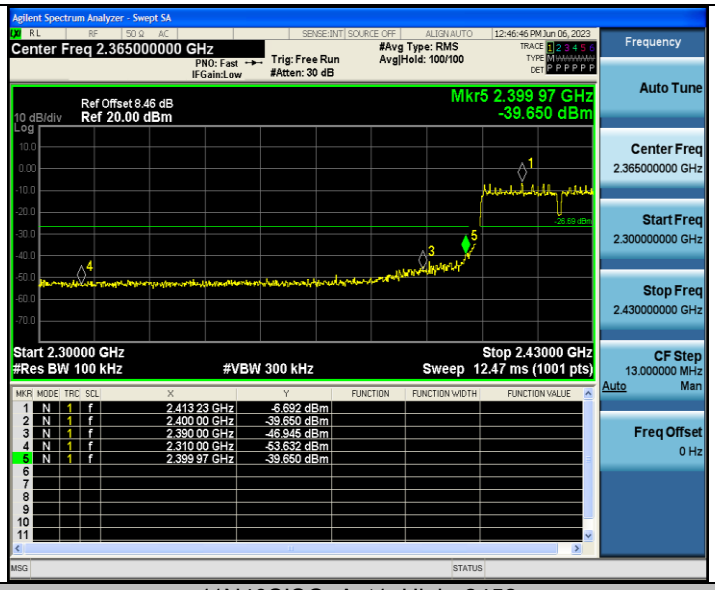
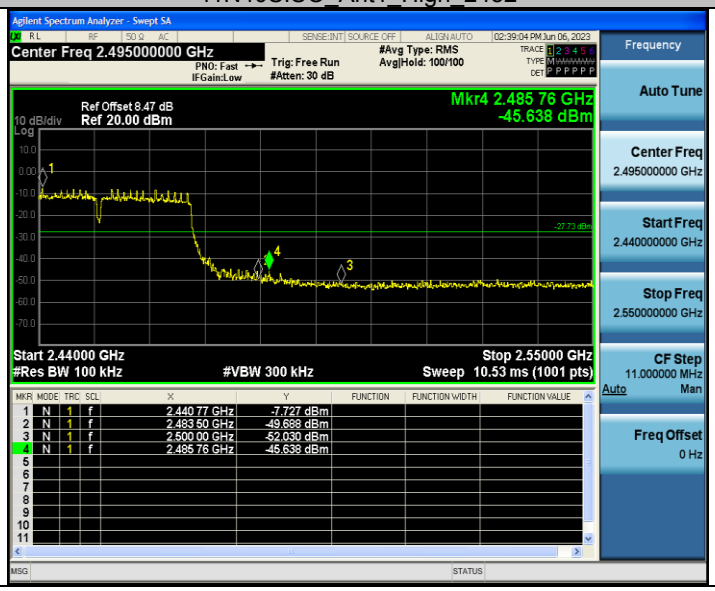
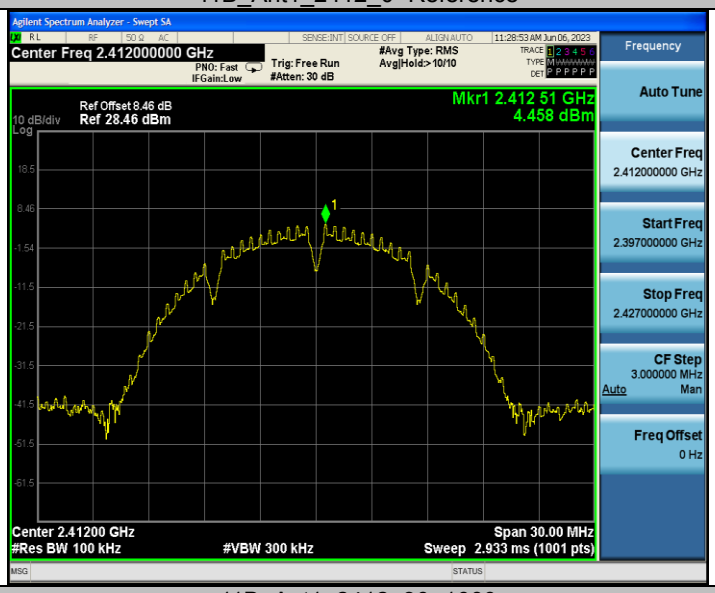


11N40SISO_Ant1_High_2452

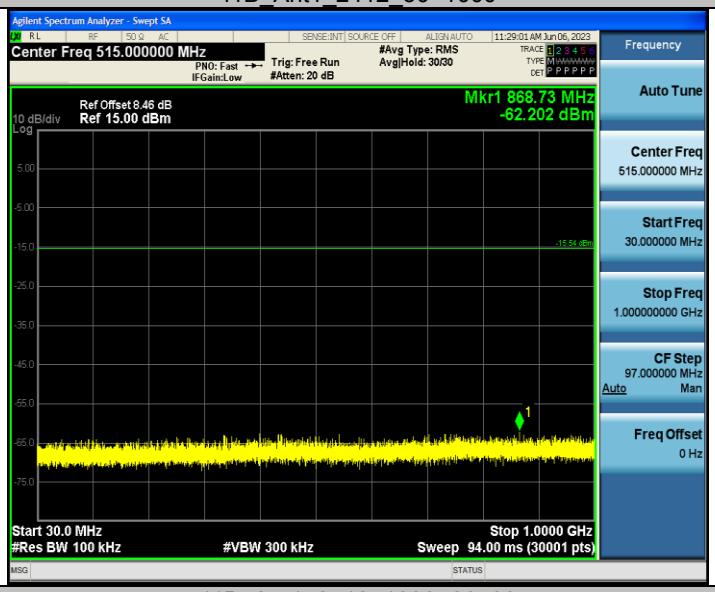


Appendix E: Conducted Spurious Emission

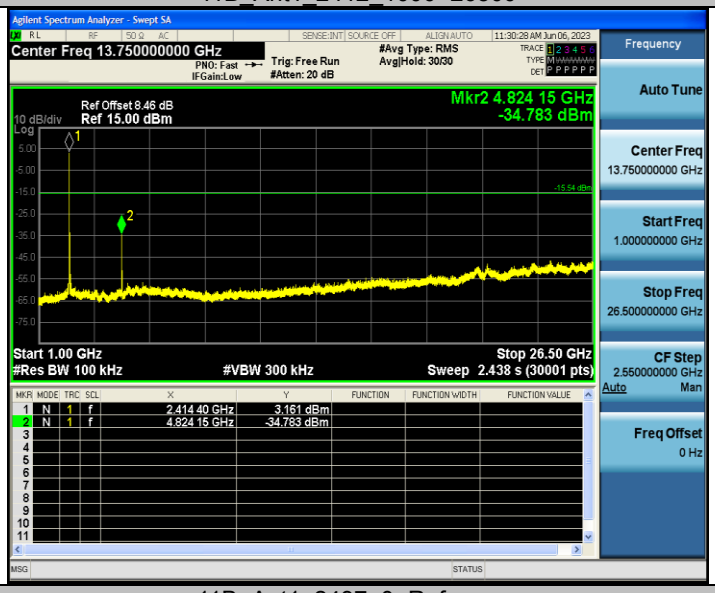
11B_Ant1_2412_0~Reference



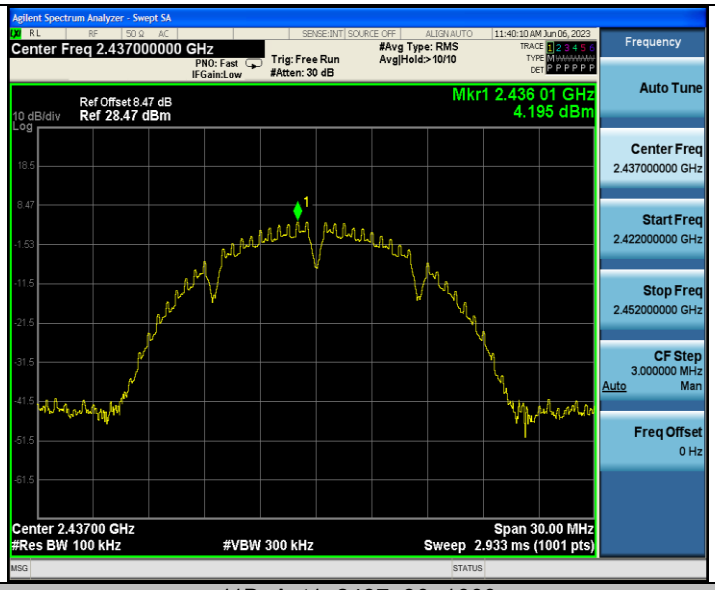
11B_Ant1_2412_30~1000



11B_Ant1_2412_1000~26500



11B_Ant1_2437_0~Reference



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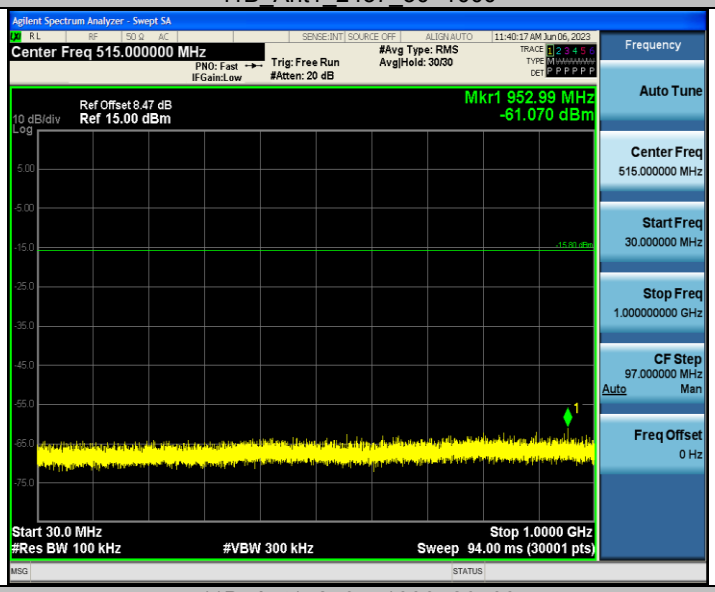

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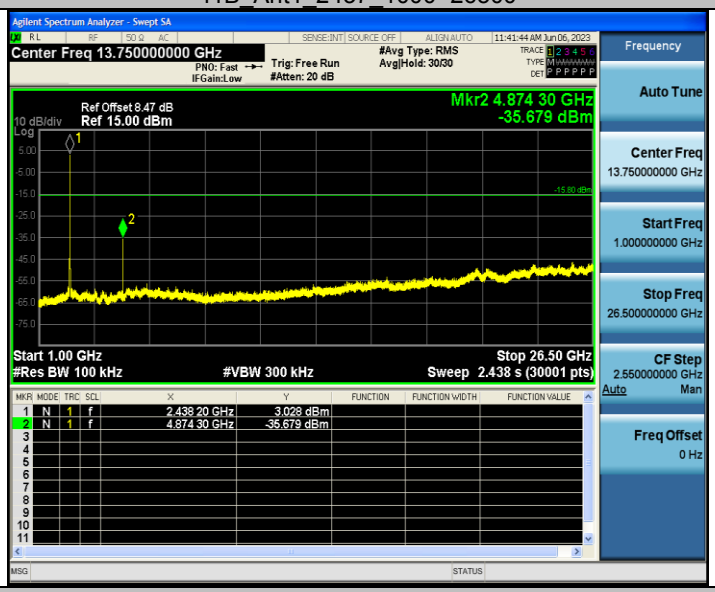

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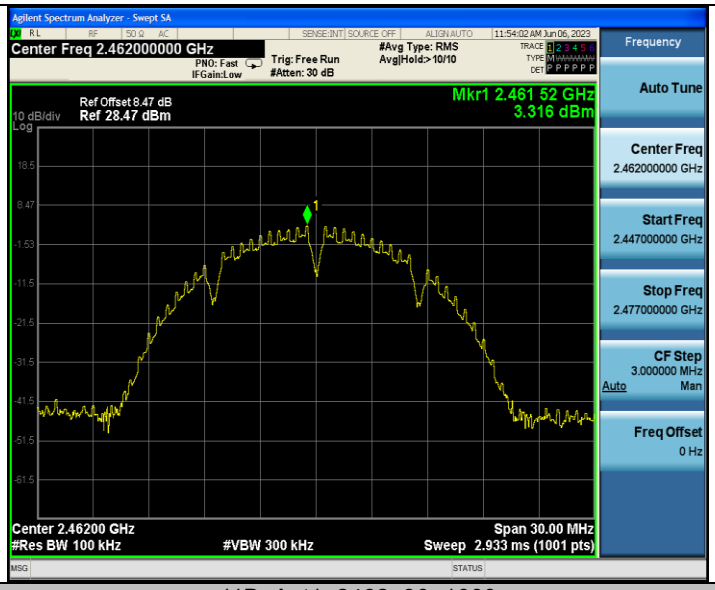

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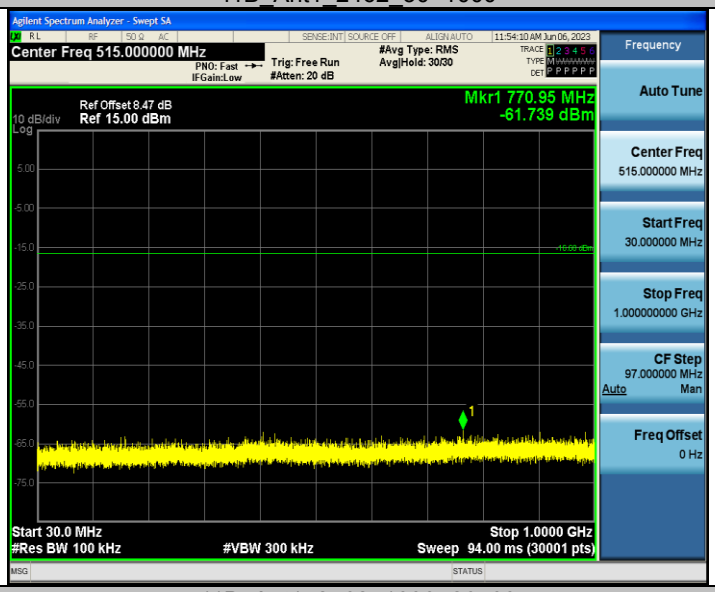

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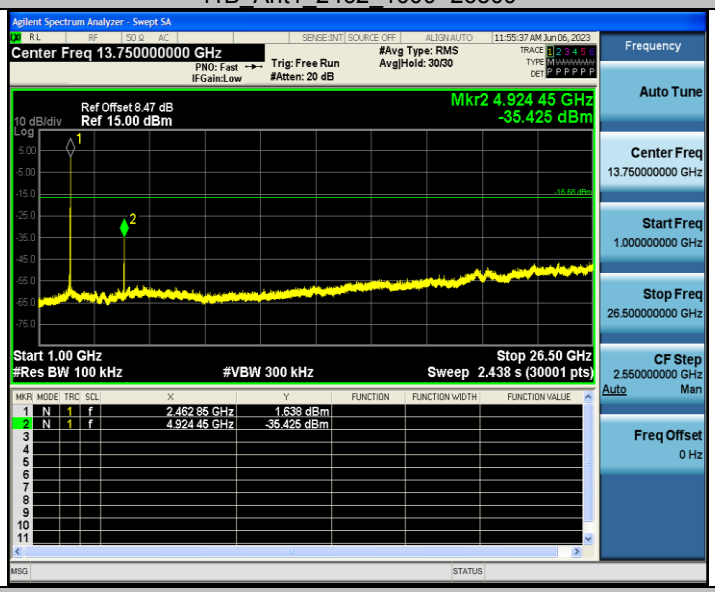

11G_Ant1_2412_0~Reference