

Test Report

Report No.: MTi231221009-05E1

Date of issue: 2024-02-01

Applicant: Shenzhen Zhaoyang Tianxia Technology CO., Ltd.

Product: IP Camera

Model(s): HX01, HX02, HX03, HX04, HX05, HX06, HX07, A01, A02, A03, A04, A05, A06, A07, A08

FCC ID: 2AP56-A01HX01

Shenzhen Microtest Co., Ltd.

<http://www.mtitest.com>

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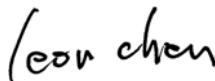
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Table of contents

1	General Description	5
1.1	Description of the EUT	5
1.2	Description of test modes	5
1.3	Environmental Conditions	7
1.4	Description of support units	7
1.5	Measurement uncertainty	7
2	Summary of Test Result	8
3	Test Facilities and accreditations	9
3.1	Test laboratory	9
4	List of test equipment	10
5	Evaluation Results (Evaluation)	11
5.1	Antenna requirement	11
6	Radio Spectrum Matter Test Results (RF)	12
6.1	Conducted Emission at AC power line	12
6.2	Occupied Bandwidth	17
6.3	Maximum Conducted Output Power	18
6.4	Power Spectral Density	19
6.5	RF conducted spurious emissions and band edge measurement	20
6.6	Band edge emissions (Radiated)	21
6.7	Radiated emissions (below 1GHz)	28
6.8	Radiated emissions (above 1GHz)	32
	Photographs of the test setup	36
	Photographs of the EUT	37
	Appendix A: DTS Bandwidth	39
	Appendix B: Maximum conducted output power	43
	Appendix C: Maximum power spectral density	44
	Appendix D: Band edge measurements	48
	Appendix E: Conducted Spurious Emission	50
	Appendix F: Duty Cycle	59

Test Result Certification	
Applicant:	Shenzhen Zhaoyang Tianxia Technology CO., Ltd.
Address:	Room217, Building C1, Bantian International Center, Bantian Street, Longgang District, Shenzhen, China
Manufacturer:	Shenzhen Zhaoyang Shidai Technology Co., Ltd.
Address:	F6, Block F, JIN HENG RUN Industrial Park, Xintang, Fucheng Street, Longhua District, Shenzhen, China
Product description	
Product name:	IP Camera
Trademark:	SV3C
Model name:	HX01
Series Model(s):	HX02, HX03, HX04, HX05, HX06, HX07, A01, A02, A03, A04, A05, A06, A07, A08
Standards:	47 CFR Part 15.247
Test Method:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02
Date of Test	
Date of test:	2024-01-20 to 2024-01-30
Test result:	Pass

Test Engineer	:	
		(Maleah Deng)
Reviewed By	:	
		(Leon Chen)
Approved By	:	
		(Tom Xue)

1 General Description

1.1 Description of the EUT

Product name:	IP Camera
Model name:	HX01
Series Model(s):	HX02, HX03, HX04, HX05, HX06, HX07, A01, A02, A03, A04, A05, A06, A07, A08
Model difference:	All the models are the same circuit and module, except the model name and color.
Electrical rating:	Input: DC 12V 2000mA
Accessories:	Adaptor: Model:LY030SPS-120200U Input: AC 100~240V 50/60HZ 0.8A Output: DC 12V 2A Cable: Lan cable
Hardware version:	SSC338Q+IMX415
Software version:	V22.1.11.25.3-20230616
Test sample(s) number:	MTi231221009-05S1001
RF specification	
Operating frequency range:	802.11b/g/n20: 2412~2462 MHz
Channel number:	11
Modulation type:	IEEE 802.11b: DSSS (DBPSK, DQPSK, CCK) IEEE 802.11g/n (HT20) : OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna(s) type:	SMA black antenna
Antenna(s) gain:	5dBi

1.2 Description of test modes

No.	Emission test modes
Mode1	TX-802.11b
Mode2	TX-802.11g
Mode3	TX-802.11N20

1.2.1 Operation channel list

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

Test Channel List

Bandwidth (MHz)	Lowest Channel (LCH) (MHz)	Middle Channel (MCH) (MHz)	Highest Channel (HCH) (MHz)
20	2412	2437	2462

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

Test Software:

For power setting, refer to below table.

Software:	MPTOOL		
Mode	2412MHz	2437MHz	2462MHz
802.11b	90	90	90
802.11g	90	90	90
802.11n20	90	90	90

1.3 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15°C ~ 35°C
Humidity:	20% RH ~ 75% RH
Atmospheric pressure:	98 kPa ~ 101 kPa

1.4 Description of support units

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

1.5 Measurement uncertainty

Measurement	Uncertainty
Conducted emissions (AMN 150kHz~30MHz)	±3.1dB
Occupied channel bandwidth	±3 %
RF output power, conducted	±1 dB
Power Spectral Density, conducted	±1 dB
Unwanted Emissions, conducted	±1 dB
Radiated spurious emissions (above 1GHz)	±5.3dB
Radiated spurious emissions (9kHz~30MHz)	±4.3dB
Radiated spurious emissions (30MHz~1GHz)	±4.7dB
Temperature	±1 °C
Humidity	± 5 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2 Summary of Test Result

No.	Item	Standard	Requirement	Result
1	Antenna requirement	47 CFR Part 15.247	47 CFR 15.203	Pass
2	Conducted Emission at AC power line	47 CFR Part 15.247	47 CFR 15.207(a)	Pass
3	Occupied Bandwidth	47 CFR Part 15.247	47 CFR 15.247(a)(2)	Pass
4	Maximum Conducted Output Power	47 CFR Part 15.247	47 CFR 15.247(b)(3)	Pass
5	Power Spectral Density	47 CFR Part 15.247	47 CFR 15.247(e)	Pass
6	RF conducted spurious emissions and band edge measurement	47 CFR Part 15.247	47 CFR 15.247(d), 15.209, 15.205	Pass
7	Band edge emissions (Radiated)	47 CFR Part 15.247	47 CFR 15.247(d), 15.209, 15.205	Pass
8	Radiated emissions (below 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d), 15.209, 15.205	Pass
9	Radiated emissions (above 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d), 15.209, 15.205	Pass

3 Test Facilities and accreditations

3.1 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
IC Registration No.:	21760
CABID:	CN0093

4 List of test equipment

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	2023-06-03	2024-06-02
Occupied Bandwidth Maximum Conducted Output Power Power Spectral Density RF conducted spurious emissions and band edge measurement						
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) Radiated emissions (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	2023-06-17	2025-06-16
3	Amplifier	Agilent	8449B	3008A01120	2023-06-26	2024-06-25
4	Multi-device Controller	TuoPu	TPMDC	/	2023-05-04	2024-05-03
5	MXA signal analyzer	Agilent	N9020A	MY54440859	2023-06-01	2024-05-31
Radiated emissions (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	2023-06-11	2025-06-10
3	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00066	2023-06-11	2025-06-10
4	Amplifier	Hewlett-Packard	8447F	3113A06184	2023-04-25	2024-04-24
5	Multi-device Controller	TuoPu	TPMDC	/	2023-05-04	2024-05-03

5 Evaluation Results (Evaluation)

5.1 Antenna requirement

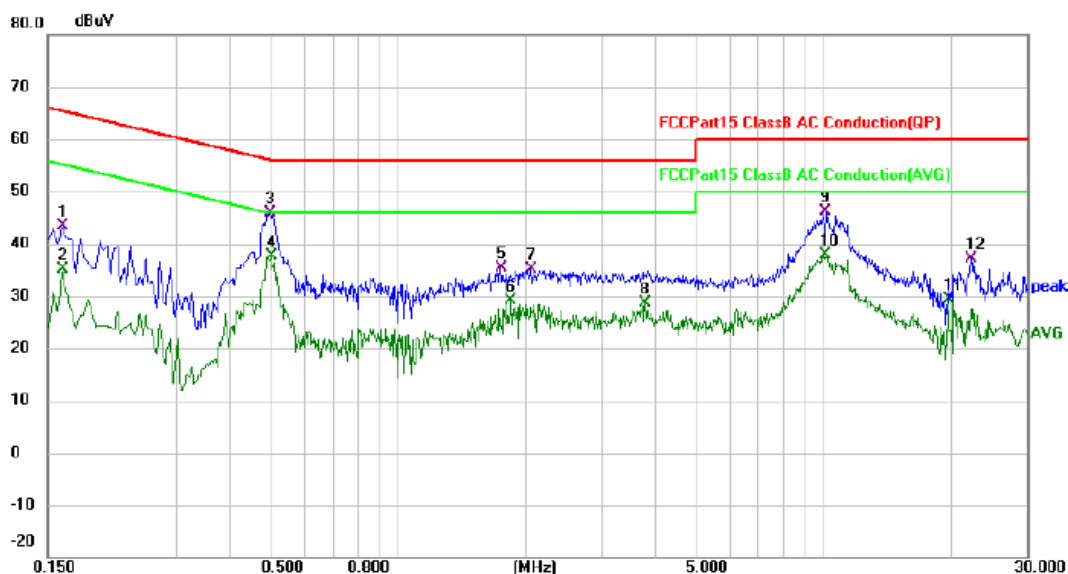
Test Requirement:	Refer to 47 CFR Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.
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5.1.1 Conclusion:

The EUT antenna is External antenna (5dBi)
The EUT complies with the requirement of FCC PART 15.203. In case of replacement of broken antenna the same antenna type must be used.

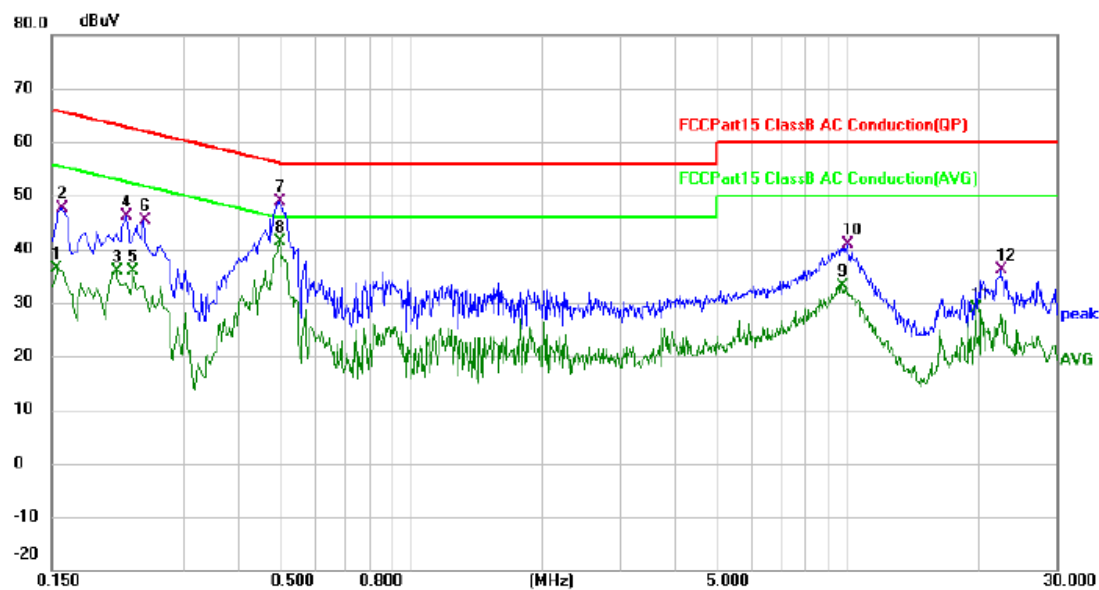
6.1.3 Test Data:

Mode1(AC 120V 60Hz) / Line: Line / BW: 20 / CH: L



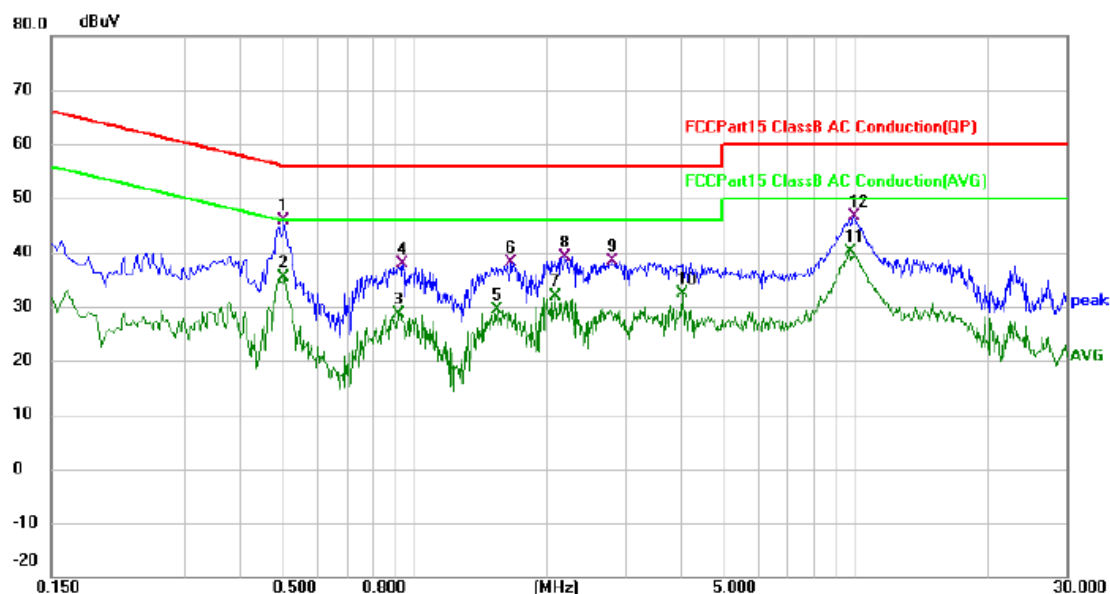
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	33.11	10.38	43.49	65.36	-21.87	QP	
2		0.1620	24.66	10.38	35.04	55.36	-20.32	AVG	
3		0.4980	34.39	11.51	45.90	56.03	-10.13	QP	
4	*	0.5020	26.01	11.51	37.52	46.00	-8.48	AVG	
5		1.7380	21.38	14.11	35.49	56.00	-20.51	QP	
6		1.8420	18.53	10.63	29.16	46.00	-16.84	AVG	
7		2.0460	24.49	10.63	35.12	56.00	-20.88	QP	
8		3.8140	17.96	10.65	28.61	46.00	-17.39	AVG	
9		10.0659	35.39	10.75	46.14	60.00	-13.86	QP	
10		10.0659	27.22	10.75	37.97	50.00	-12.03	AVG	
11		19.7099	18.30	11.15	29.45	50.00	-20.55	AVG	
12		22.2139	26.07	11.12	37.19	60.00	-22.81	QP	

Mode1(AC 120V 60Hz) / Line: Neutral / BW: 20 / CH: L



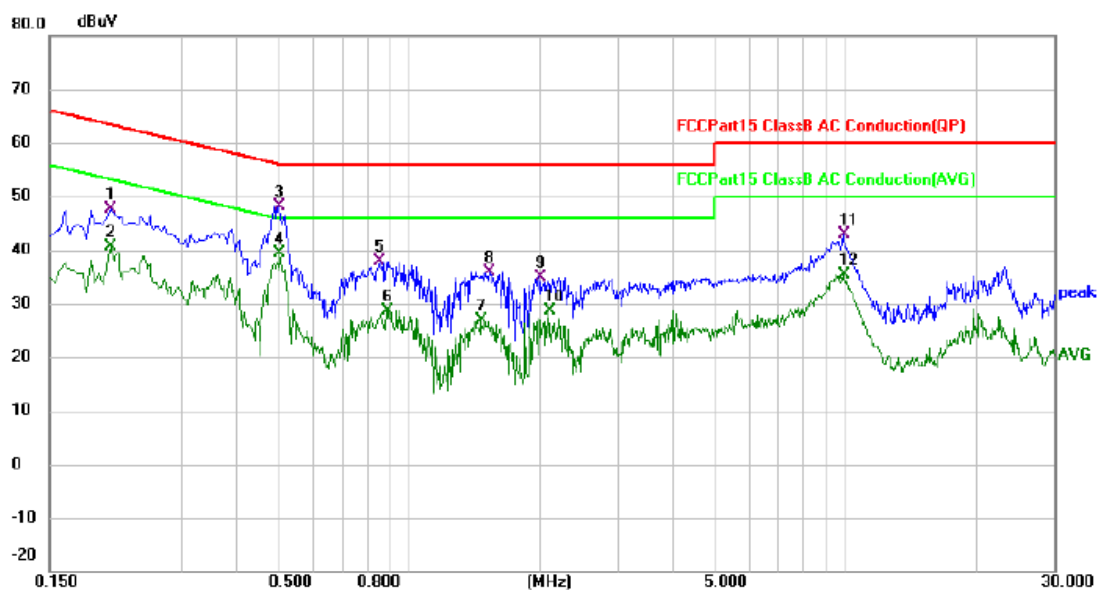
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1539	25.90	10.38	36.28	55.79	-19.51	AVG	
2		0.1580	37.25	10.38	47.63	65.57	-17.94	QP	
3		0.2100	25.06	10.80	35.86	53.21	-17.35	AVG	
4		0.2220	35.21	10.83	46.04	62.74	-16.70	QP	
5		0.2300	24.93	10.85	35.78	52.45	-16.67	AVG	
6		0.2420	34.54	10.88	45.42	62.03	-16.61	QP	
7		0.4980	37.46	11.51	48.97	56.03	-7.06	QP	
8	*	0.4980	29.76	11.51	41.27	46.03	-4.76	AVG	
9		9.6580	22.45	10.74	33.19	50.00	-16.81	AVG	
10		9.9580	30.18	10.75	40.93	60.00	-19.07	QP	
11		19.7099	17.85	11.15	29.00	50.00	-21.00	AVG	
12		22.4580	24.91	11.11	36.02	60.00	-23.98	QP	

Mode1(AC 240V 60Hz) / Line: Line / BW: 20 / CH: L



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.5060	34.34	11.53	45.87	56.00	-10.13	QP	
2		0.5060	23.97	11.53	35.50	46.00	-10.50	AVG	
3		0.9220	16.26	12.44	28.70	46.00	-17.30	AVG	
4		0.9420	25.49	12.49	37.98	56.00	-18.02	QP	
5		1.5420	15.79	13.71	29.50	46.00	-16.50	AVG	
6		1.6620	24.30	13.94	38.24	56.00	-17.76	QP	
7		2.0940	21.19	10.63	31.82	46.00	-14.18	AVG	
8		2.1980	28.52	10.64	39.16	56.00	-16.84	QP	
9		2.8100	27.73	10.64	38.37	56.00	-17.63	QP	
10		4.0700	21.81	10.65	32.46	46.00	-13.54	AVG	
11	*	9.6860	29.33	10.74	40.07	50.00	-9.93	AVG	
12		9.8860	35.78	10.75	46.53	60.00	-13.47	QP	

Mode1(AC 240V 60Hz) / Line: Neutral / BW: 20 / CH: L



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2060	36.82	10.80	47.62	63.37	-15.75	QP	
2		0.2060	29.76	10.80	40.56	53.37	-12.81	AVG	
3		0.5020	36.69	11.51	48.20	56.00	-7.80	QP	
4	*	0.5060	27.86	11.53	39.39	46.00	-6.61	AVG	
5		0.8540	25.63	12.29	37.92	56.00	-18.08	QP	
6		0.8980	16.30	12.40	28.70	46.00	-17.30	AVG	
7		1.4580	13.33	13.54	26.87	46.00	-19.13	AVG	
8		1.5300	22.27	13.69	35.96	56.00	-20.04	QP	
9		1.9860	24.37	10.63	35.00	56.00	-21.00	QP	
10		2.0940	18.03	10.63	28.66	46.00	-17.34	AVG	
11		9.8819	32.04	10.75	42.79	60.00	-17.21	QP	
12		9.8819	24.53	10.75	35.28	50.00	-14.72	AVG	

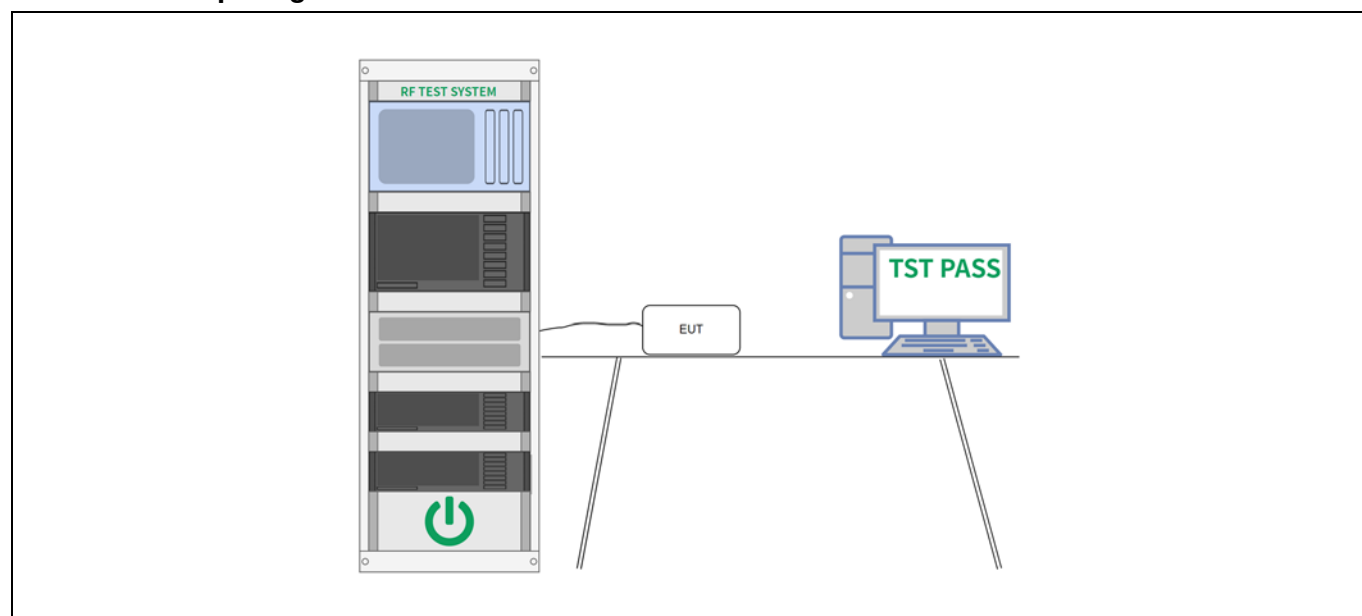
6.2 Occupied Bandwidth

Test Requirement:	47 CFR 15.247(a)(2)
Test Limit:	Refer to 47 CFR 15.247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	ANSI C63.10-2013, section 11.8 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	a) Set RBW = 100 kHz. b) Set the VBW $\geq [3 \times \text{RBW}]$. c) Detector = peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25 °C	Humidity:	56 %	Atmospheric Pressure:	100 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.2.2 Test Setup Diagram:



6.2.3 Test Data:

Please Refer to Appendix for Details.

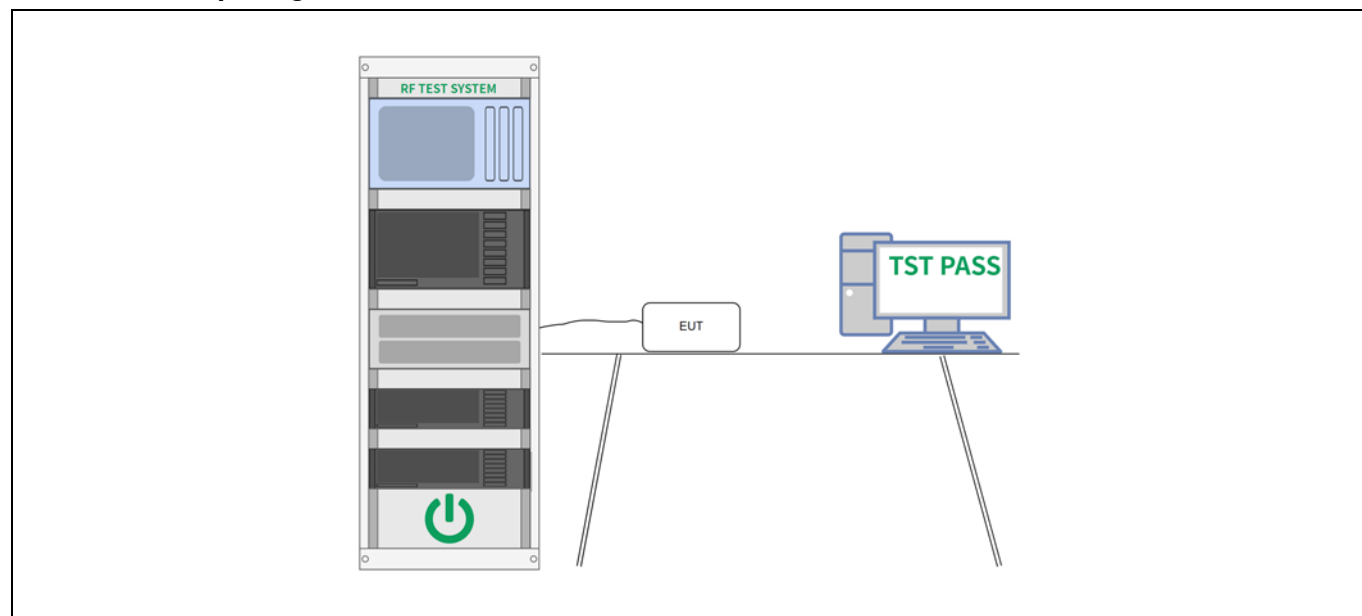
6.3 Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(3)
Test Limit:	Refer to 47 CFR 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method:	ANSI C63.10-2013, section 11.9.1.3 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013, section 11.9.1.3 Maximum peak conducted output power

6.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25 °C	Humidity:	56 %	Atmospheric Pressure:	100 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.3.2 Test Setup Diagram:



6.3.3 Test Data:

Please Refer to Appendix for Details.

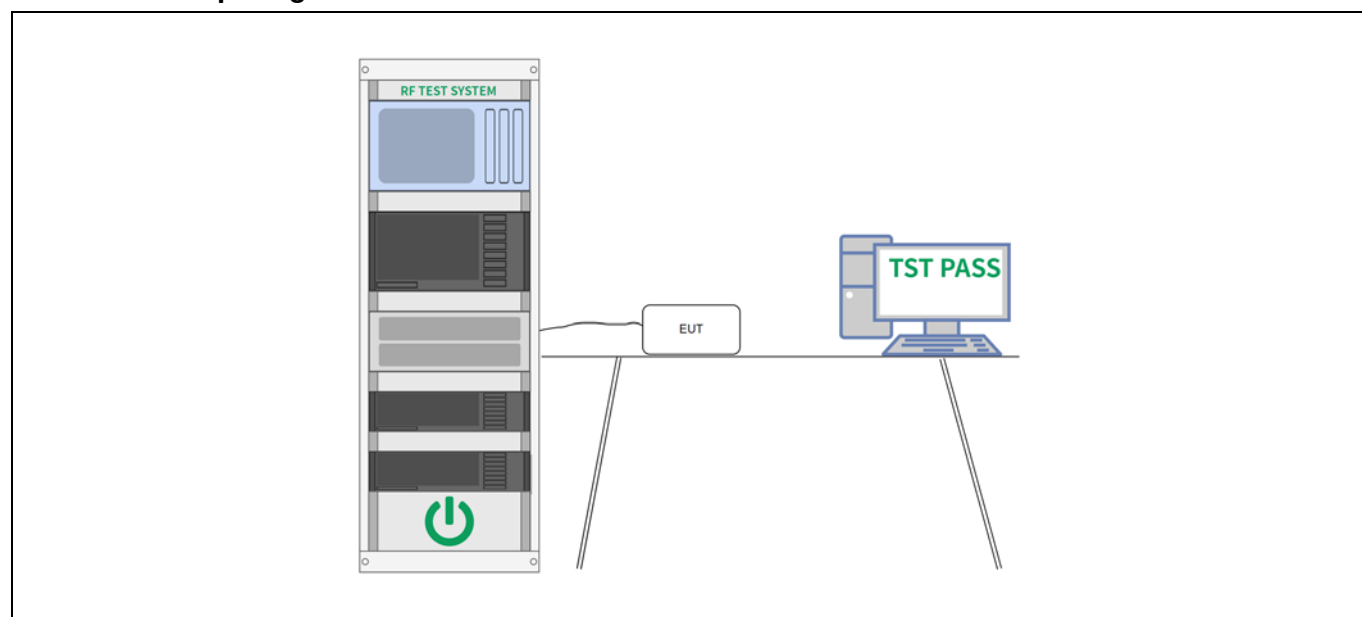
6.4 Power Spectral Density

Test Requirement:	47 CFR 15.247(e)
Test Limit:	Refer to 47 CFR 15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10-2013, section 11.10 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013, section 11.10, Maximum power spectral density level in the fundamental emission

6.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25 °C	Humidity:	56 %	Atmospheric Pressure:	100 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.4.2 Test Setup Diagram:



6.4.3 Test Data:

Please Refer to Appendix for Details.

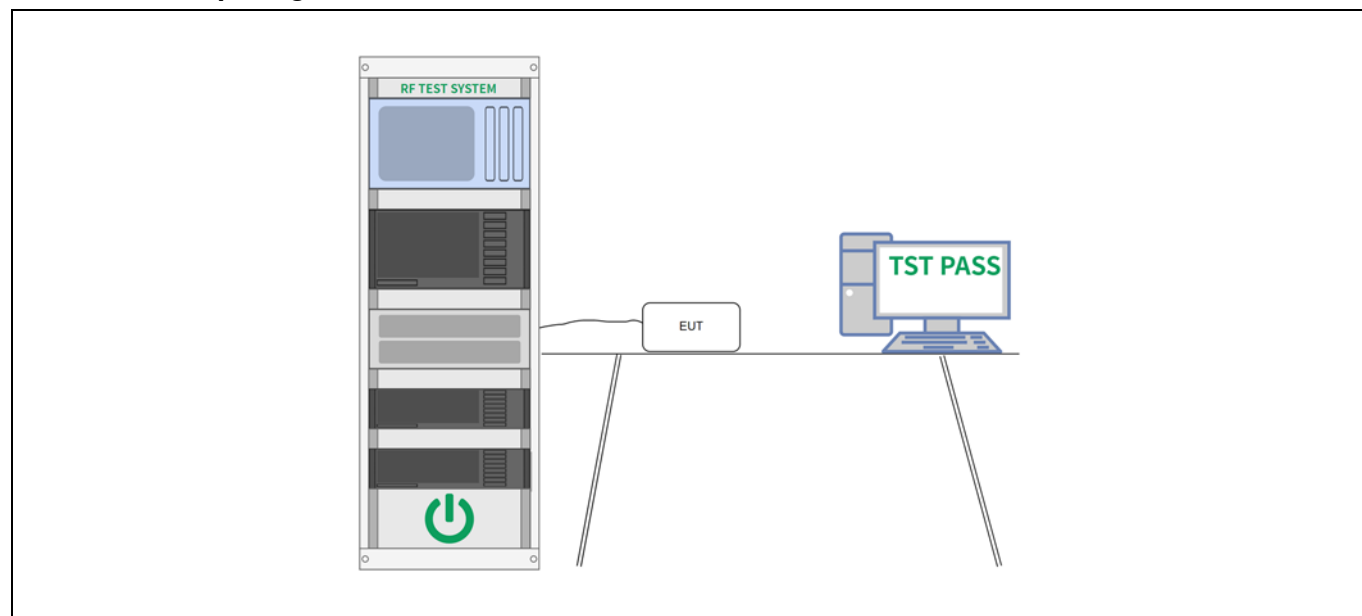
6.5 RF conducted spurious emissions and band edge measurement

Test Requirement:	47 CFR 15.247(d), 15.209, 15.205
Test Limit:	Refer to 47 CFR 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.
Test Method:	ANSI C63.10-2013 section 11.11 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3

6.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25 °C	Humidity:	56 %	Atmospheric Pressure:	100 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.5.2 Test Setup Diagram:



6.5.3 Test Data:

Please Refer to Appendix for Details.

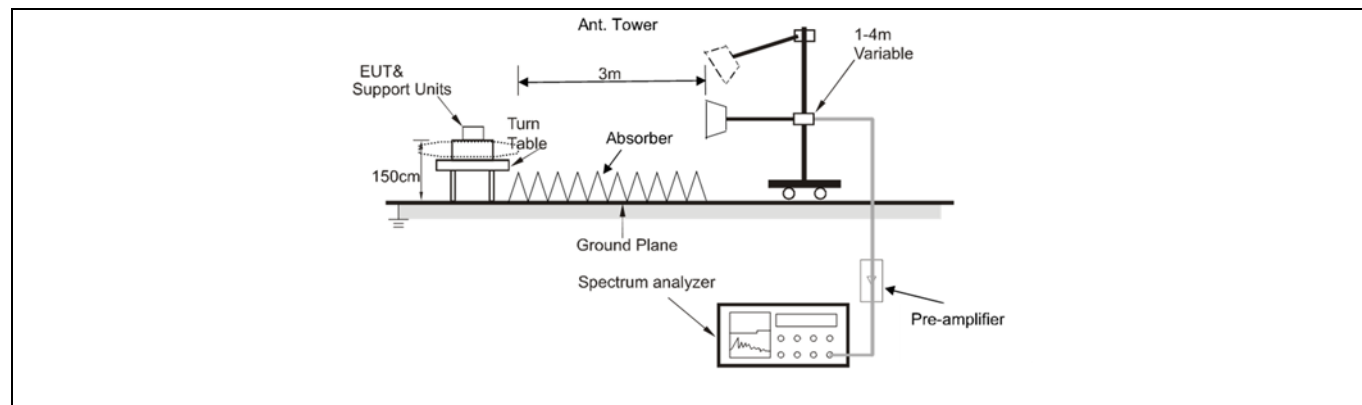
6.6 Band edge emissions (Radiated)

Test Requirement:	Refer to 47 CFR 15.247(d), 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 Limit:	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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. 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.			
Test Method:	ANSI C63.10-2013 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	ANSI C63.10-2013 section 6.10.5.2		

6.6.1 E.U.T. Operation:

Operating Environment:					
Temperature:	26 °C	Humidity:	54 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				
Note: The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.					

6.6.2 Test Setup Diagram:



6.6.3 Test Data:

Mode1 / Polarization: Horizontal / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	51.80	-12.83	38.97	74.00	-35.03	peak
2		2310.000	42.73	-12.83	29.90	54.00	-24.10	AVG
3		2390.000	53.72	-12.42	41.30	74.00	-32.70	peak
4	*	2390.000	43.34	-12.42	30.92	54.00	-23.08	AVG

Mode1 / Polarization: Vertical / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	52.16	-12.83	39.33	74.00	-34.67	peak
2	*	2310.000	42.60	-12.83	29.77	54.00	-24.23	AVG
3		2390.000	51.97	-12.42	39.55	74.00	-34.45	peak
4		2390.000	42.05	-12.42	29.63	54.00	-24.37	AVG

Mode1 / Polarization: Horizontal / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	52.19	-12.44	39.75	74.00	-34.25	peak
2		2483.500	41.74	-12.44	29.30	54.00	-24.70	AVG
3		2500.000	51.65	-12.35	39.30	74.00	-34.70	peak
4	*	2500.000	42.09	-12.35	29.74	54.00	-24.26	AVG

Mode1 / Polarization: Vertical / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	51.63	-12.44	39.19	74.00	-34.81	peak
2		2483.500	41.64	-12.44	29.20	54.00	-24.80	AVG
3		2500.000	50.86	-12.35	38.51	74.00	-35.49	peak
4	*	2500.000	42.06	-12.35	29.71	54.00	-24.29	AVG

Mode2 / Polarization: Horizontal / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	51.73	-12.83	38.90	74.00	-35.10	peak
2		2310.000	42.56	-12.83	29.73	54.00	-24.27	AVG
3		2390.000	71.95	-12.42	59.53	74.00	-14.47	peak
4	*	2390.000	52.91	-12.42	40.49	54.00	-13.51	AVG

Mode2 / Polarization: Vertical / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	52.38	-12.83	39.55	74.00	-34.45	peak
2		2310.000	42.59	-12.83	29.76	54.00	-24.24	AVG
3		2390.000	58.70	-12.42	46.28	74.00	-27.72	peak
4	*	2390.000	44.25	-12.42	31.83	54.00	-22.17	AVG

Mode2 / Polarization: Horizontal / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	52.83	-12.44	40.39	74.00	-33.61	peak
2		2483.500	41.95	-12.44	29.51	54.00	-24.49	AVG
3		2500.000	51.26	-12.35	38.91	74.00	-35.09	peak
4	*	2500.000	42.34	-12.35	29.99	54.00	-24.01	AVG

Mode2 / Polarization: Vertical / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	52.11	-12.44	39.67	74.00	-34.33	peak
2		2483.500	42.53	-12.44	30.09	54.00	-23.91	AVG
3		2500.000	52.27	-12.35	39.92	74.00	-34.08	peak
4	*	2500.000	42.66	-12.35	30.31	54.00	-23.69	AVG

Mode3 / Polarization: Horizontal / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	52.34	-12.83	39.51	74.00	-34.49	peak
2		2310.000	42.13	-12.83	29.30	54.00	-24.70	AVG
3		2390.000	76.24	-12.42	63.82	74.00	-10.18	peak
4	*	2390.000	57.94	-12.42	45.52	54.00	-8.48	AVG

Mode3 / Polarization: Vertical / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	53.04	-12.83	40.21	74.00	-33.79	peak
2		2310.000	42.99	-12.83	30.16	54.00	-23.84	AVG
3		2390.000	64.00	-12.42	51.58	74.00	-22.42	peak
4	*	2390.000	46.59	-12.42	34.17	54.00	-19.83	AVG

Mode3 / Polarization: Horizontal / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	54.77	-12.44	42.33	74.00	-31.67	peak
2	*	2483.500	42.49	-12.44	30.05	54.00	-23.95	AVG
3		2500.000	51.81	-12.35	39.46	74.00	-34.54	peak
4		2500.000	42.12	-12.35	29.77	54.00	-24.23	AVG

Mode3 / Polarization: Vertical / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	51.69	-12.44	39.25	74.00	-34.75	peak
2		2483.500	41.92	-12.44	29.48	54.00	-24.52	AVG
3		2500.000	51.66	-12.35	39.31	74.00	-34.69	peak
4	*	2500.000	42.24	-12.35	29.89	54.00	-24.11	AVG

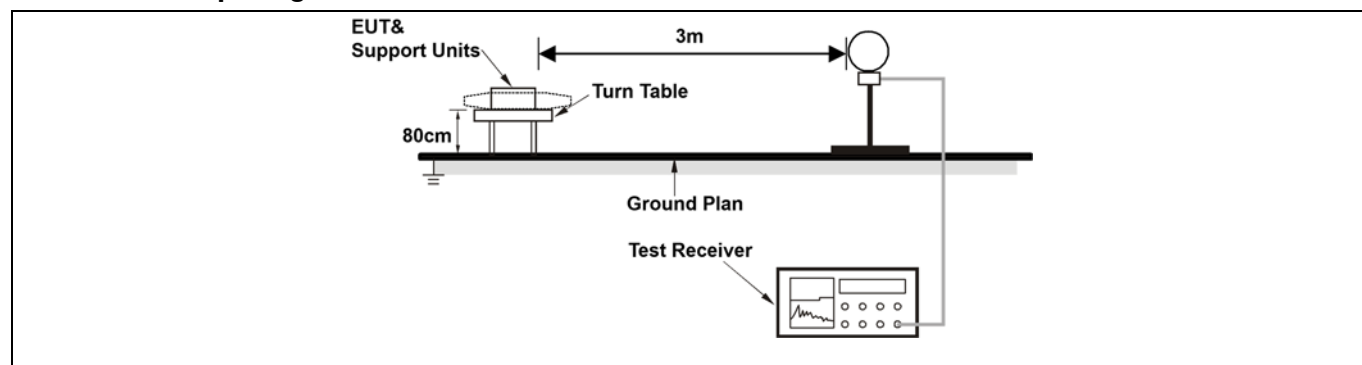
6.7 Radiated emissions (below 1GHz)

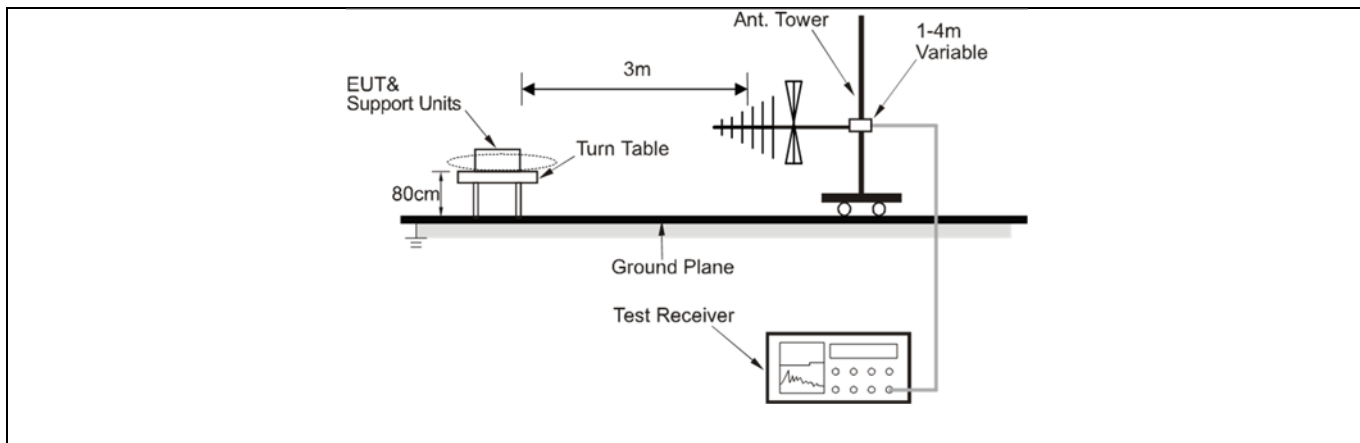
Test Requirement:	Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`		
Test Limit:	Frequency (MHz)	Field strength (microvolts/meter)	Measurement 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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. 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.			
Test Method:	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	ANSI C63.10-2013 section 6.6.4		

6.7.1 E.U.T. Operation:

Operating Environment:						
Temperature:	26 °C		Humidity:	54 %	Atmospheric Pressure:	101 kPa
Pre test mode:		Mode1, Mode2, Mode3				
Final test mode:		All of the listed pre-test mode were tested, only the data of the worst mode (Mode1) is recorded in the report				
Note: 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.						

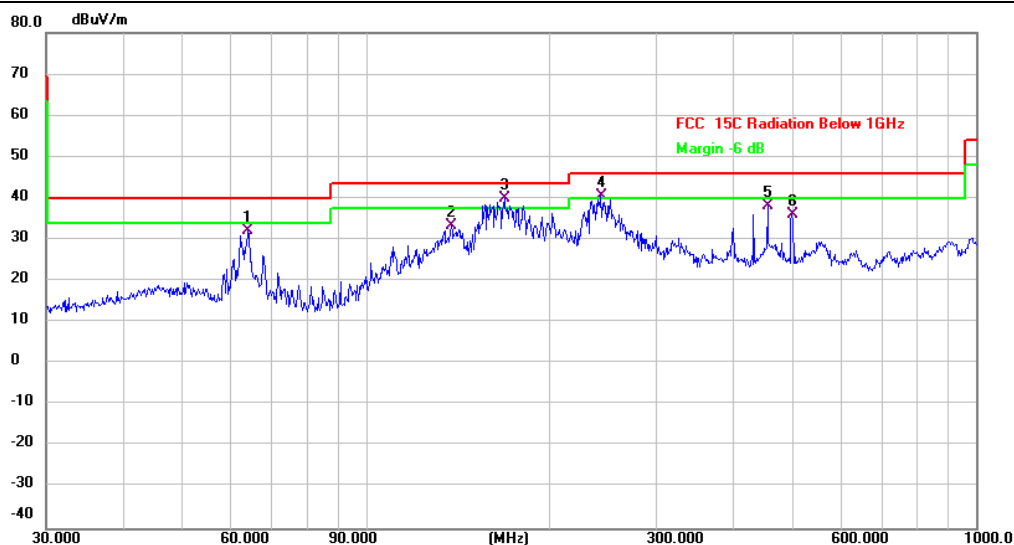
6.7.2 Test Setup Diagram:





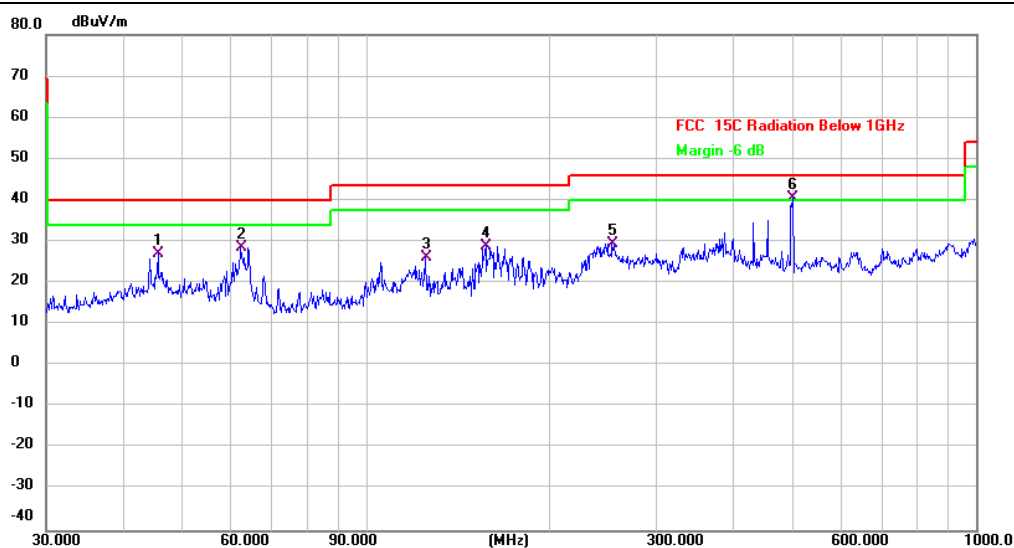
6.7.3 Test Data:

Mode1 / Polarization: Horizontal / BW: 20 / CH: H



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		64.2074	42.34	-10.25	32.09	40.00	-7.91	QP	
2		137.9028	43.82	-10.46	33.36	43.50	-10.14	QP	
3	*	168.4138	50.99	-11.01	39.98	43.50	-3.52	QP	
4	!	243.3772	48.07	-7.48	40.59	46.00	-5.41	QP	
5		455.9058	42.12	-4.07	38.05	46.00	-7.95	QP	
6		499.4247	39.63	-3.47	36.16	46.00	-9.84	QP	

Mode1 / Polarization: Vertical / BW: 20 / CH: H



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	45.6948	34.28	-7.29	26.99	40.00	-13.01	QP	
2	62.4314	38.27	-9.64	28.63	40.00	-11.37	QP	
3	125.0066	38.17	-11.97	26.20	43.50	-17.30	QP	
4	157.0074	39.33	-10.36	28.97	43.50	-14.53	QP	
5	253.8367	37.06	-7.57	29.49	46.00	-16.51	QP	
6 *	501.1790	44.05	-3.42	40.63	46.00	-5.37	QP	

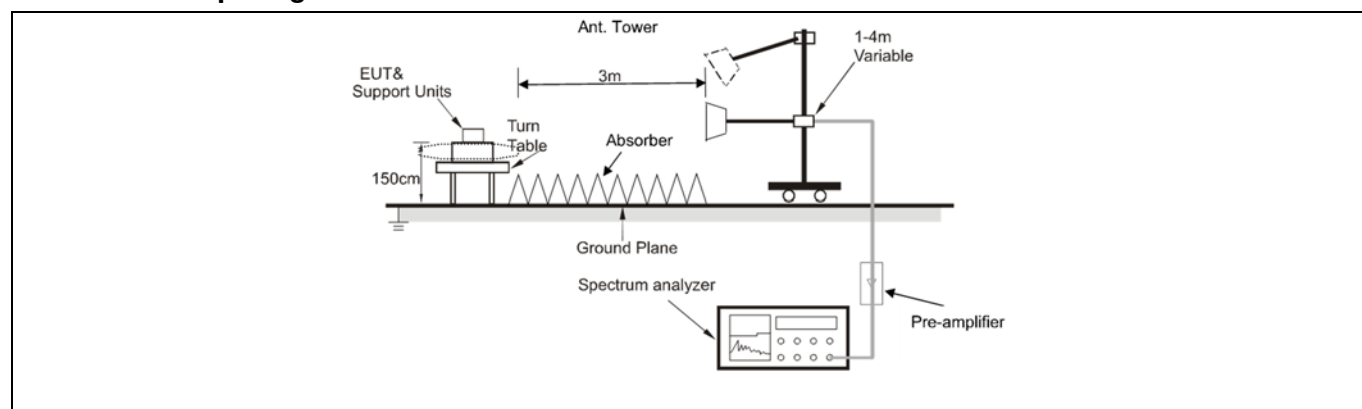
6.8 Radiated emissions (above 1GHz)

Test Requirement:	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 Limit:	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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. 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.			
Test Method:	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	ANSI C63.10-2013 section 6.6.4		

6.8.1 E.U.T. Operation:

Operating Environment:					
Temperature:	26 °C	Humidity:	54 %	Atmospheric Pressure:	101 kPa
Pre test mode:		Mode1, Mode2, Mode3			
Final test mode:		All of the listed pre-test mode were tested, only the data of the worst mode (Mode1) is recorded in the report			
Note: Test frequency are from 1GHz to 25GHz, 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.					

6.8.2 Test Setup Diagram:



6.8.3 Test Data:

Mode1 / Polarization: Horizontal / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4824.000	50.80	-7.42	43.38	74.00	-30.62	peak
2		4824.000	44.66	-7.42	37.24	54.00	-16.76	AVG
3		7236.000	48.18	0.75	48.93	74.00	-25.07	peak
4		7236.000	42.12	0.75	42.87	54.00	-11.13	AVG
5		9648.000	48.47	2.34	50.81	74.00	-23.19	peak
6	*	9648.000	42.31	2.34	44.65	54.00	-9.35	AVG

Mode1 / Polarization: Vertical / BW: 20 / CH: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4824.000	51.01	-7.42	43.59	74.00	-30.41	peak
2		4824.000	44.68	-7.42	37.26	54.00	-16.74	AVG
3		7236.000	48.34	0.75	49.09	74.00	-24.91	peak
4		7236.000	42.46	0.75	43.21	54.00	-10.79	AVG
5		9648.000	49.64	2.34	51.98	74.00	-22.02	peak
6	*	9648.000	43.53	2.34	45.87	54.00	-8.13	AVG

Mode1 / Polarization: Horizontal / BW: 20 / CH: M

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4874.000	51.62	-7.44	44.18	74.00	-29.82	peak
2		4874.000	45.82	-7.44	38.38	54.00	-15.62	AVG
3		7311.000	48.57	0.70	49.27	74.00	-24.73	peak
4		7311.000	42.66	0.70	43.36	54.00	-10.64	AVG
5		9748.000	48.16	3.03	51.19	74.00	-22.81	peak
6	*	9748.000	42.23	3.03	45.26	54.00	-8.74	AVG

Mode1 / Polarization: Vertical / BW: 20 / CH: M

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4874.000	52.01	-7.44	44.57	74.00	-29.43	peak
2		4874.000	45.98	-7.44	38.54	54.00	-15.46	AVG
3		7311.000	47.01	0.70	47.71	74.00	-26.29	peak
4		7311.000	40.98	0.70	41.68	54.00	-12.32	AVG
5		9748.000	48.18	3.03	51.21	74.00	-22.79	peak
6	*	9748.000	41.98	3.03	45.01	54.00	-8.99	AVG

Mode1 / Polarization: Horizontal / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4924.000	51.57	-7.37	44.20	74.00	-29.80	peak
2		4924.000	45.49	-7.37	38.12	54.00	-15.88	AVG
3		7386.000	47.48	1.06	48.54	74.00	-25.46	peak
4		7386.000	41.29	1.06	42.35	54.00	-11.65	AVG
5		9848.000	48.28	2.75	51.03	74.00	-22.97	peak
6	*	9848.000	42.37	2.75	45.12	54.00	-8.88	AVG

Mode1 / Polarization: Vertical / BW: 20 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4924.000	51.98	-7.37	44.61	74.00	-29.39	peak
2		4924.000	45.82	-7.37	38.45	54.00	-15.55	AVG
3		7386.000	48.62	1.06	49.68	74.00	-24.32	peak
4		7386.000	42.17	1.06	43.23	54.00	-10.77	AVG
5		9848.000	48.23	2.75	50.98	74.00	-23.02	peak
6	*	9848.000	41.92	2.75	44.67	54.00	-9.33	AVG

Photographs of the test setup

Refer to Appendix - Test Setup Photos

Photographs of the EUT

Refer to Appendix - EUT Photos

Appendix

Appendix A: DTS Bandwidth

Test Result

Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	9.600	0.5	PASS
		2437	8.600	0.5	PASS
		2462	10.000	0.5	PASS
11G	Ant1	2412	12.520	0.5	PASS
		2437	15.080	0.5	PASS
		2462	15.080	0.5	PASS
11N20SISO	Ant1	2412	12.560	0.5	PASS
		2437	12.880	0.5	PASS
		2462	13.840	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	11.10	≤30.00	PASS
		2437	7.63	≤30.00	PASS
		2462	6.88	≤30.00	PASS
11G	Ant1	2412	13.57	≤30.00	PASS
		2437	9.95	≤30.00	PASS
		2462	7.59	≤30.00	PASS
11N20SISO	Ant1	2412	13.22	≤30.00	PASS
		2437	8.97	≤30.00	PASS
		2462	6.95	≤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	-13.49	≤8.00	PASS
		2437	-16.93	≤8.00	PASS
		2462	-18.68	≤8.00	PASS
11G	Ant1	2412	-16.73	≤8.00	PASS
		2437	-20.27	≤8.00	PASS
		2462	-22.76	≤8.00	PASS
11N20SISO	Ant1	2412	-16.49	≤8.00	PASS
		2437	-19.93	≤8.00	PASS
		2462	-22.07	≤8.00	PASS

Test Graphs

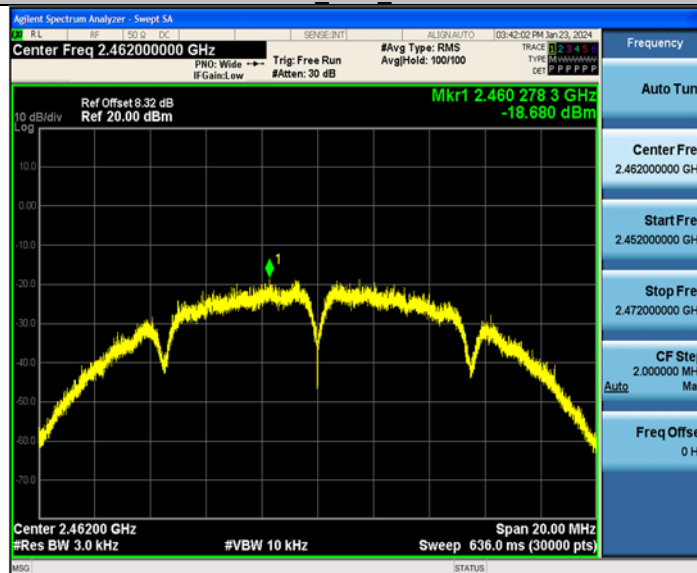
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11B_Ant1_2437



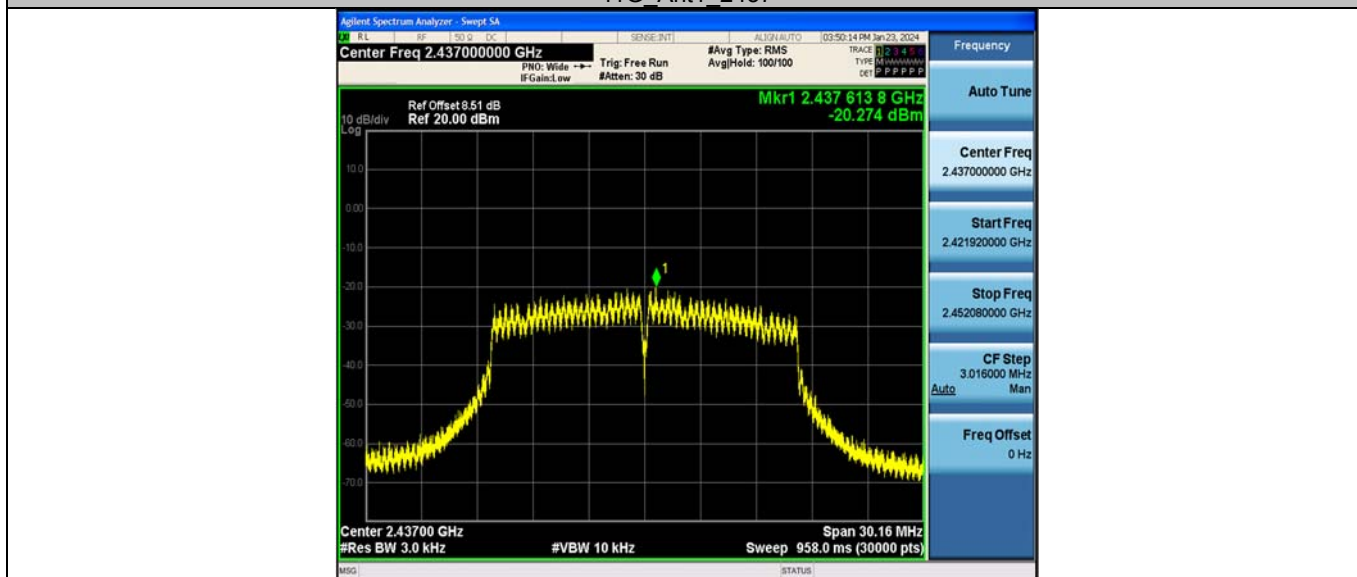
11B_Ant1_2462



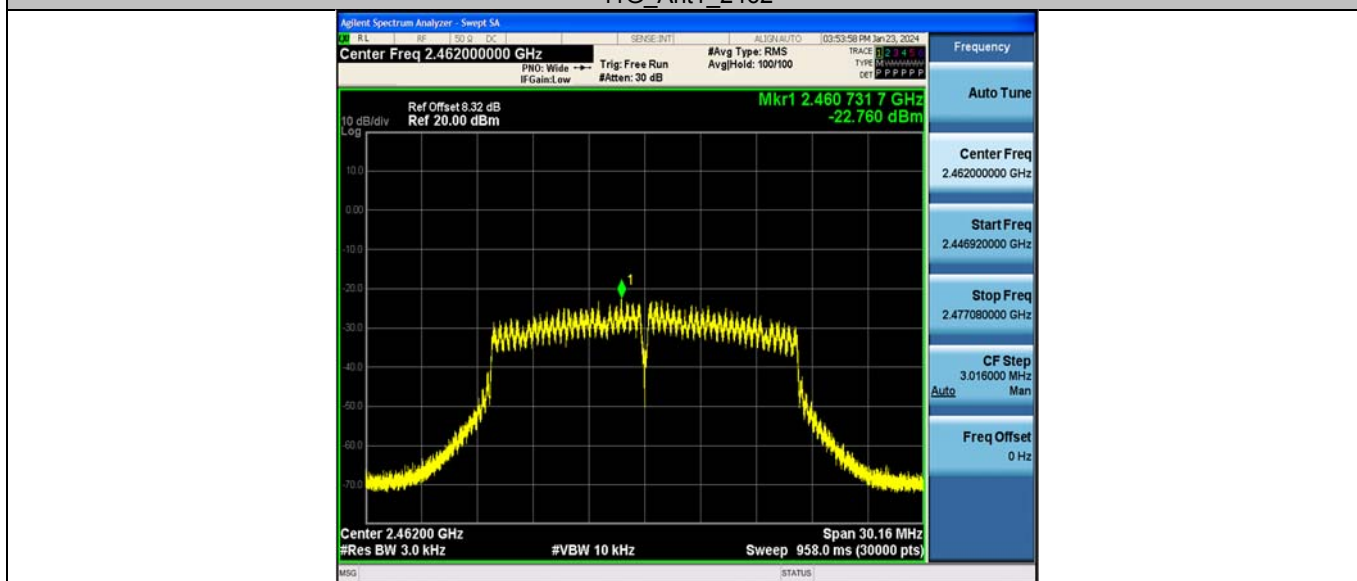
11G_Ant1_2412



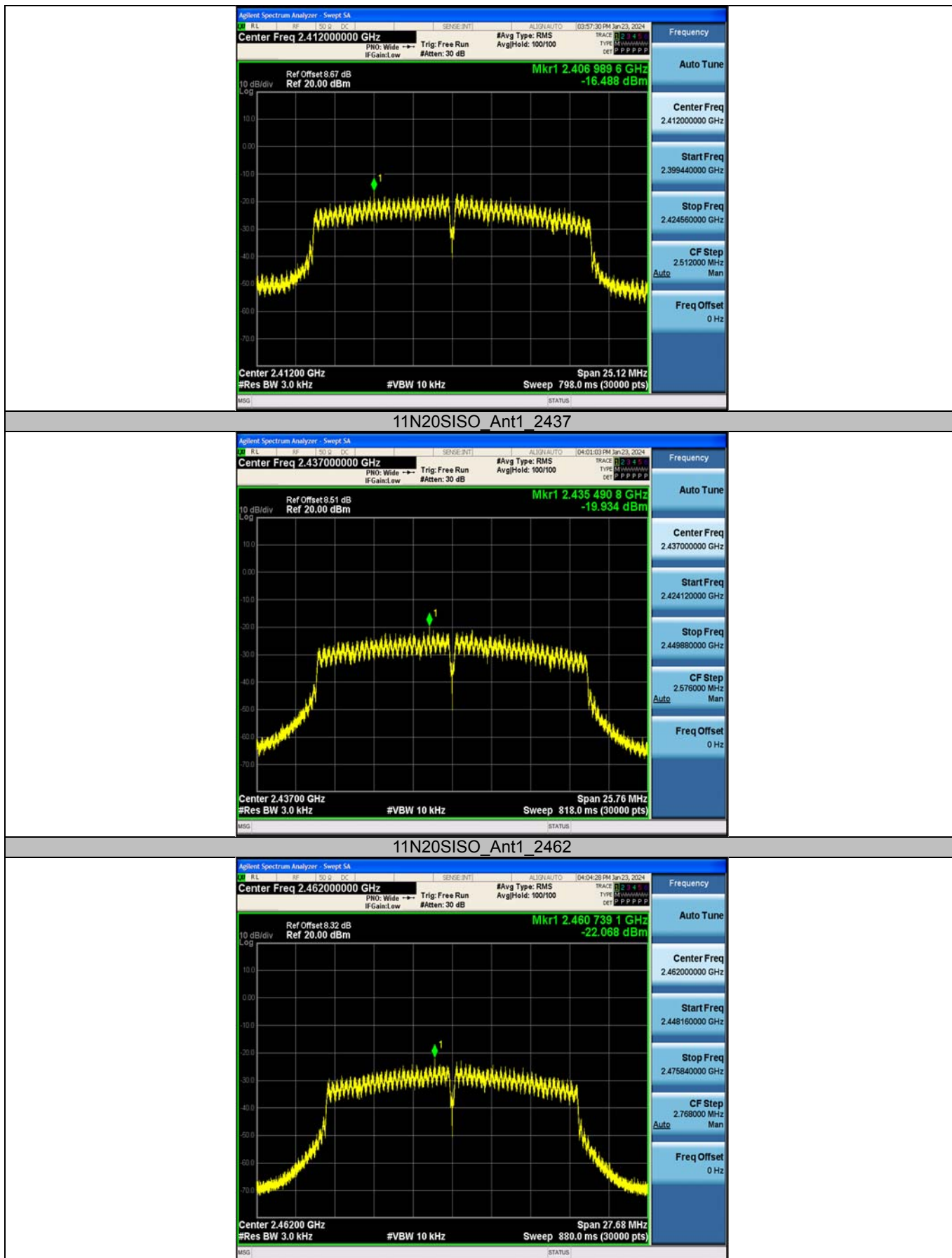
11G_Ant1_2437



11G_Ant1_2462



11N20SISO_Ant1_2412

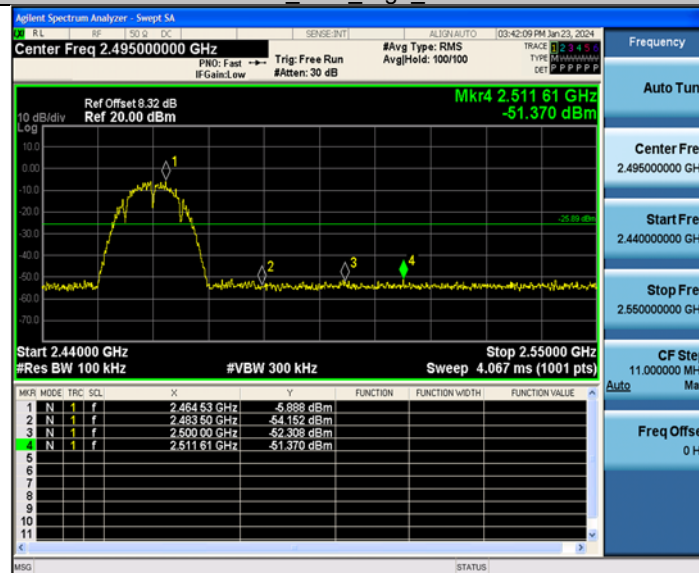


Appendix D: Band edge measurements

11B_Ant1_Low_2412



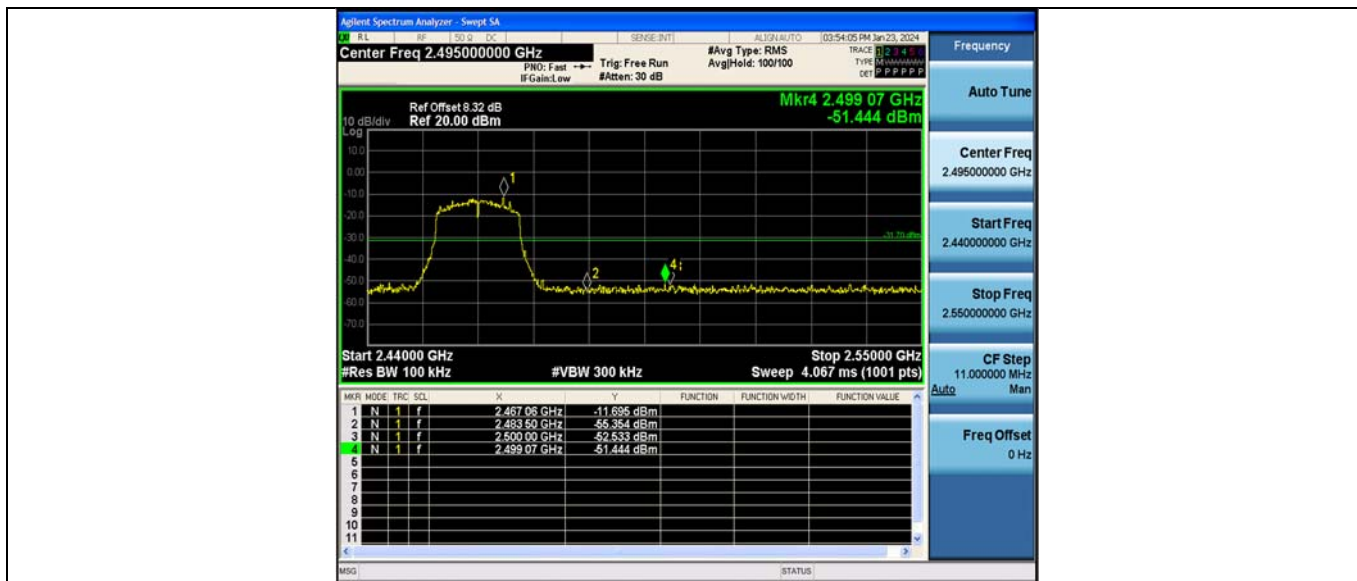
11B_Ant1_High_2462



11G_Ant1_Low_2412



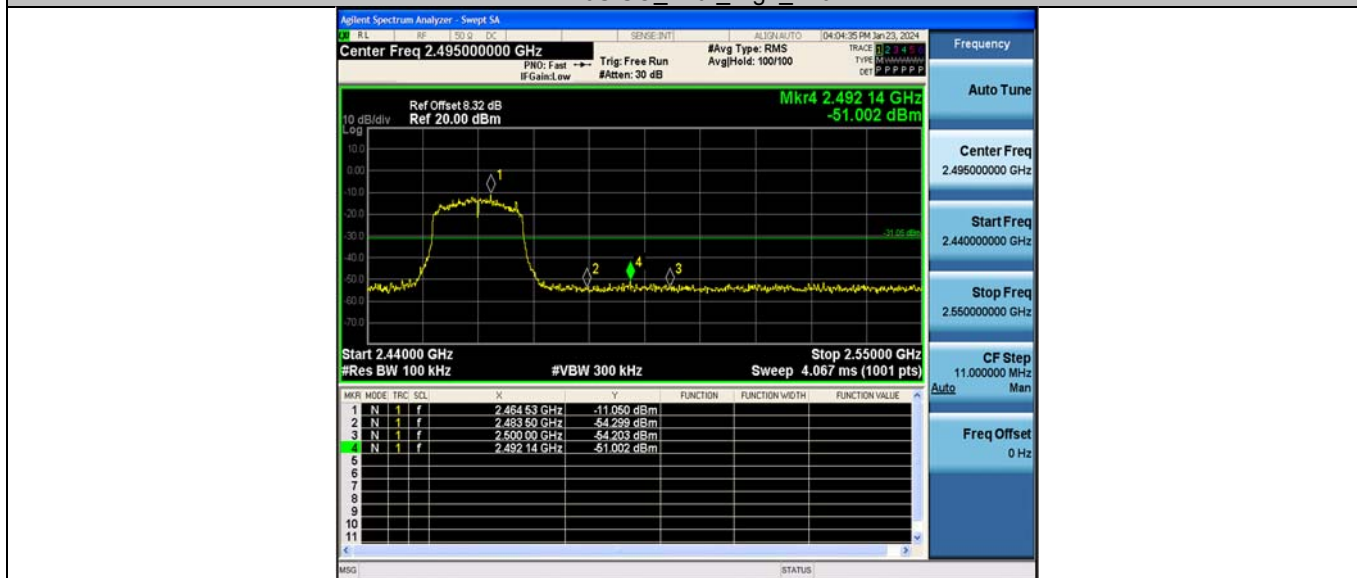
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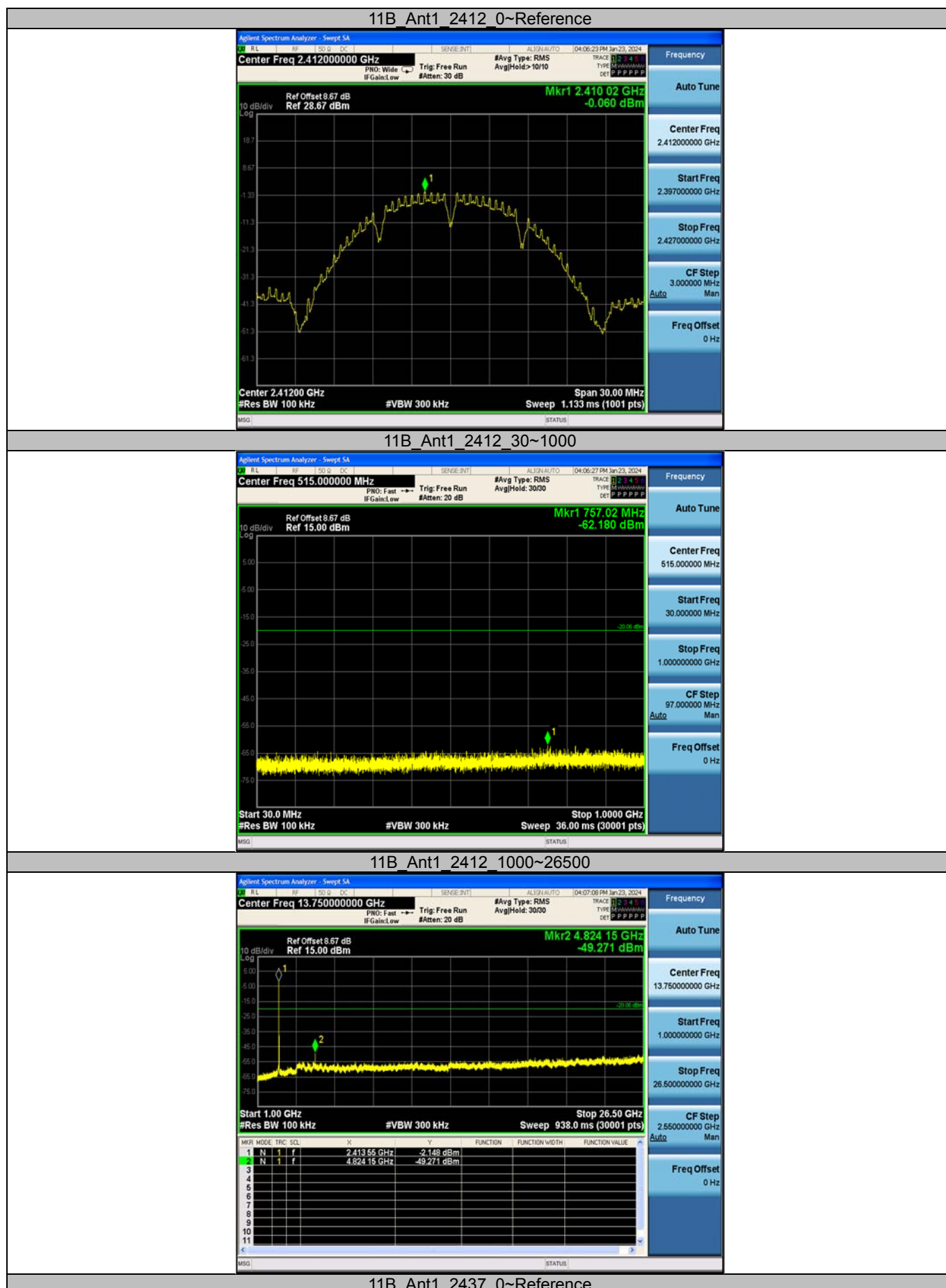
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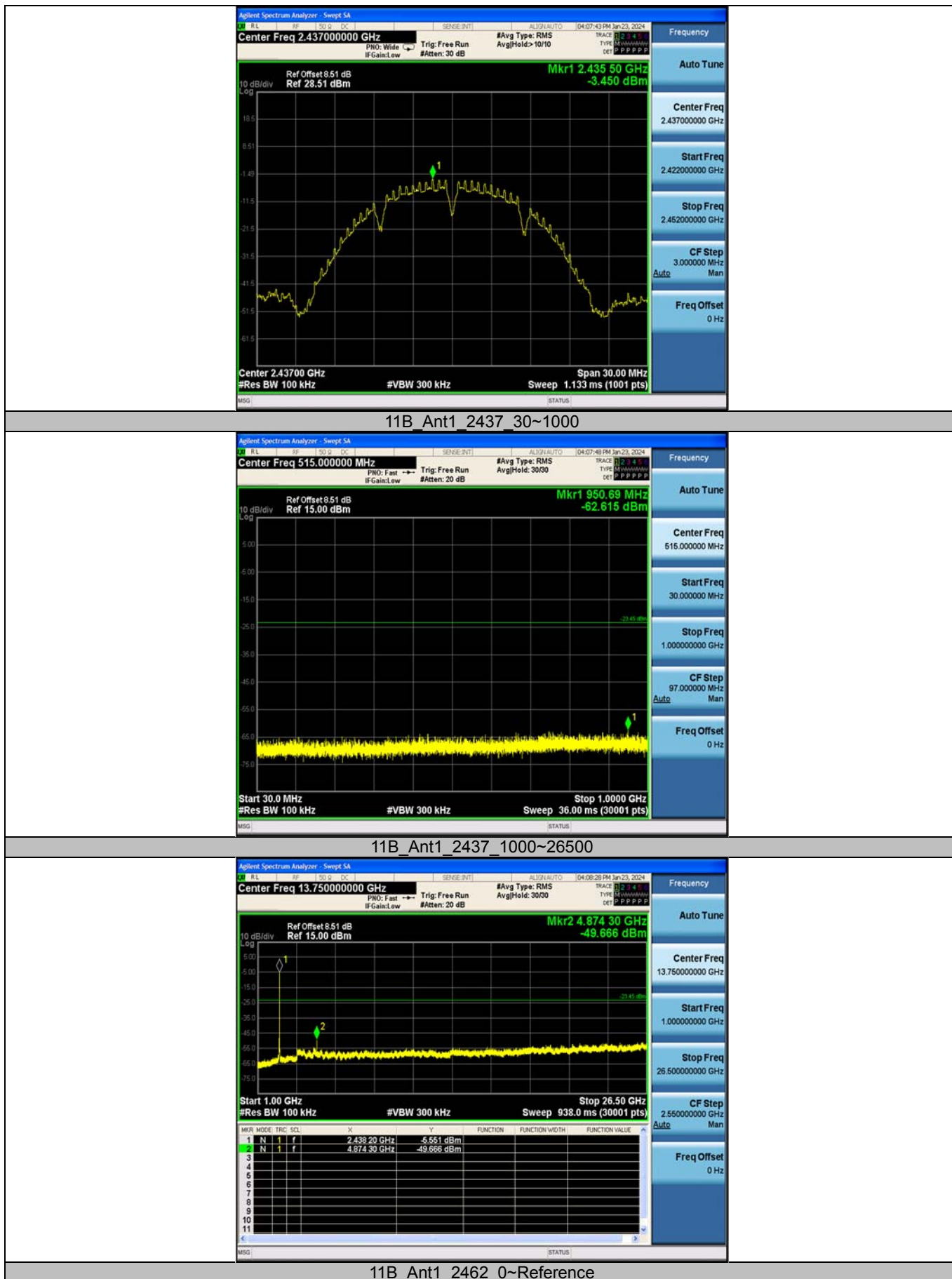


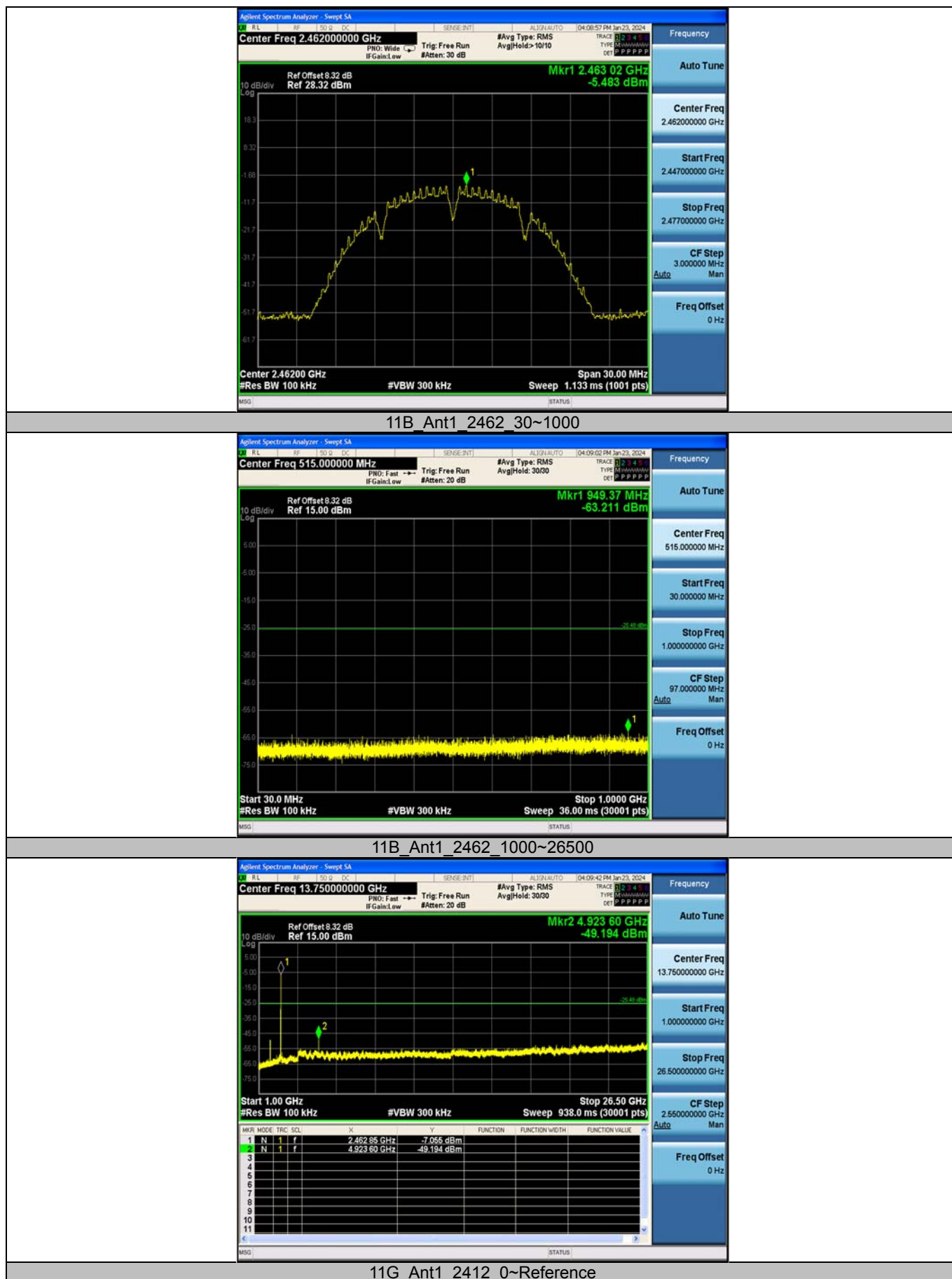
11N20SISO_Ant1_High_2462



Appendix E: Conducted Spurious Emission

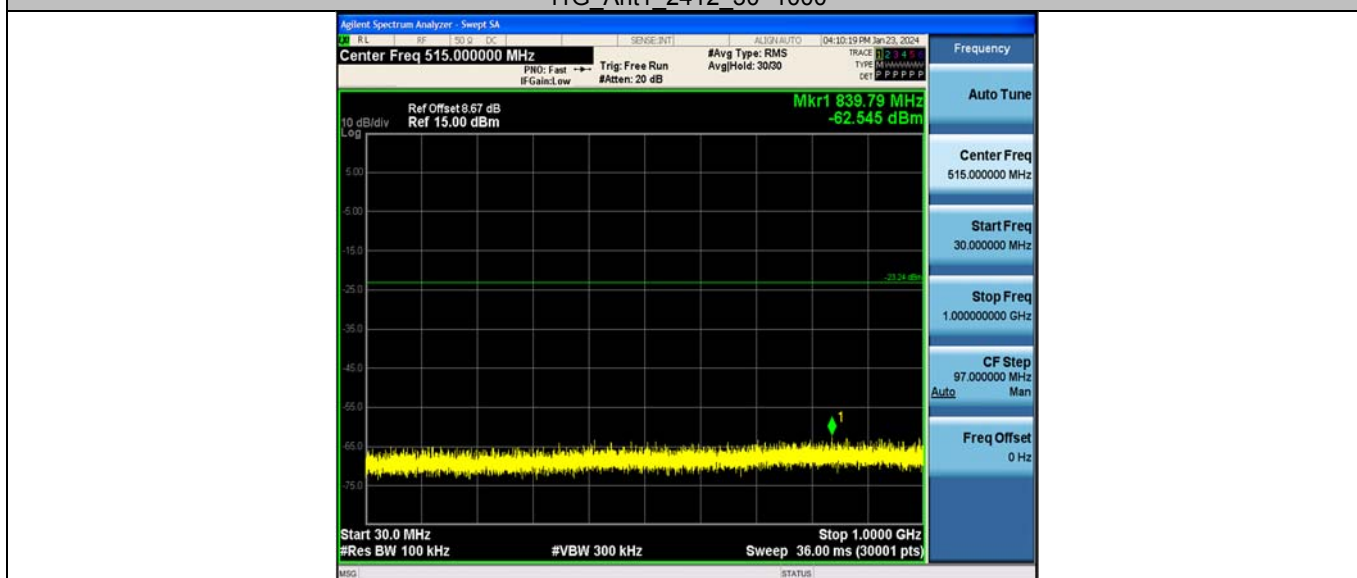




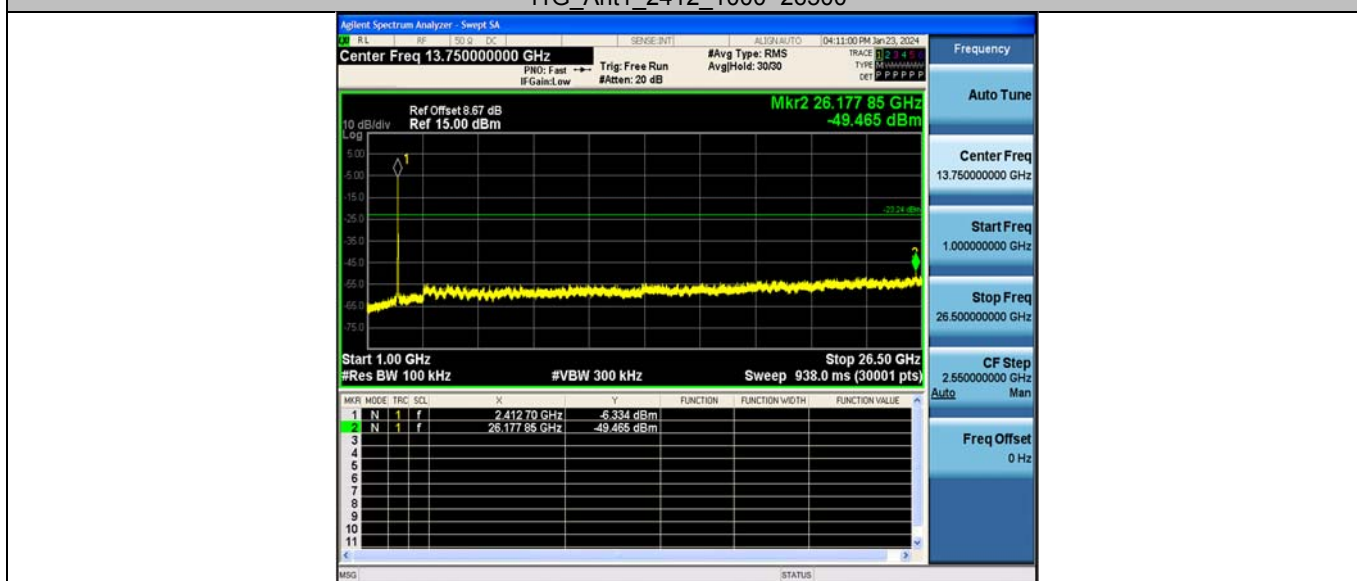




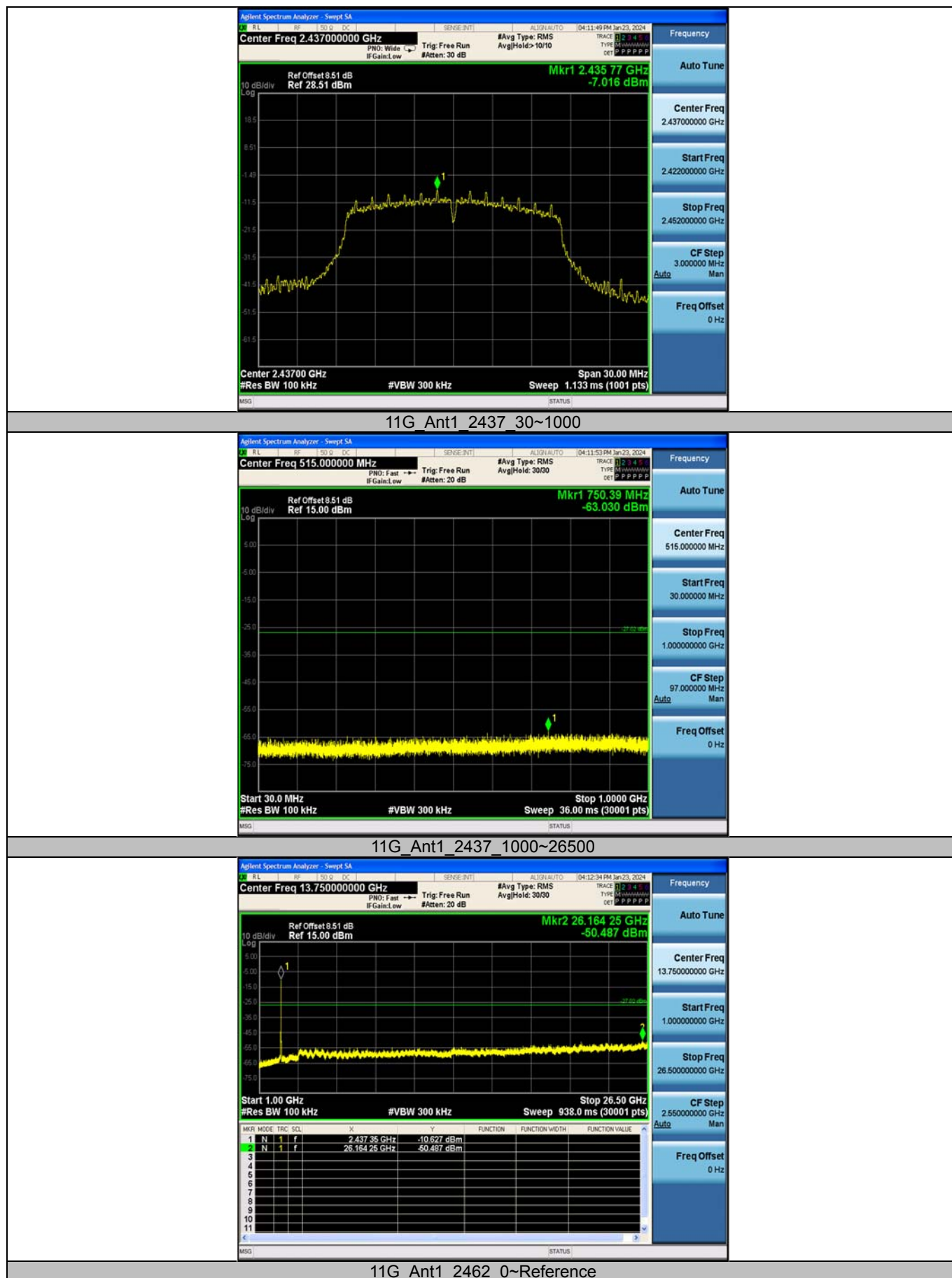
11G_Ant1_2412_30~1000



11G_Ant1_2412_1000~26500

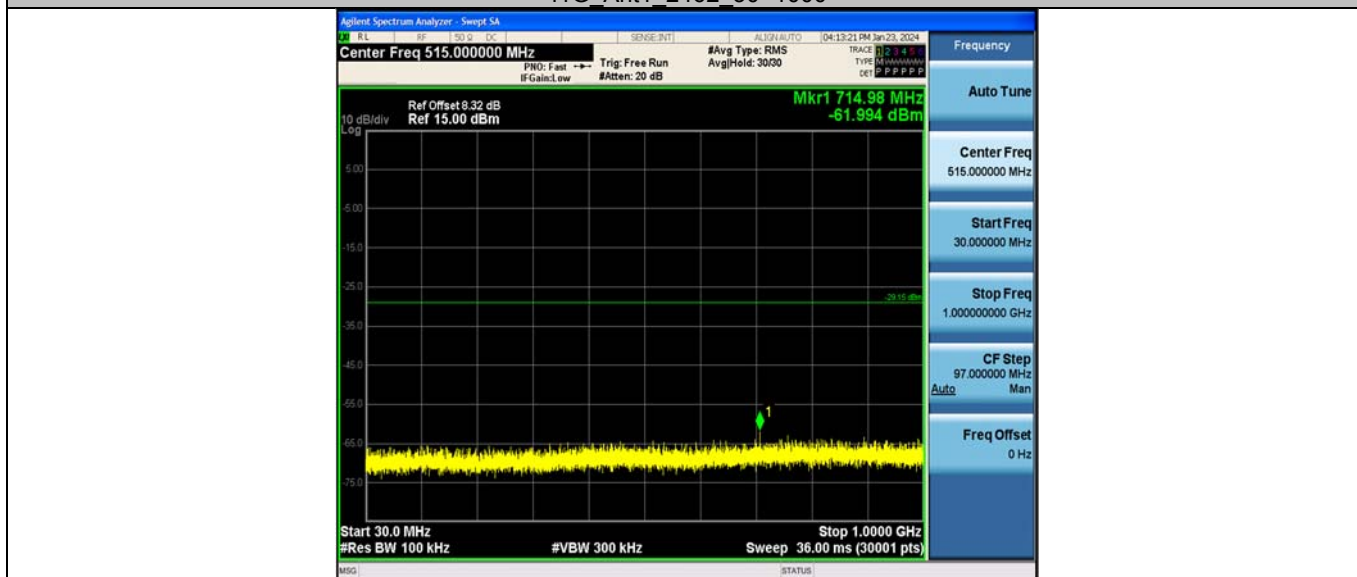


11G_Ant1_2437_0~Reference

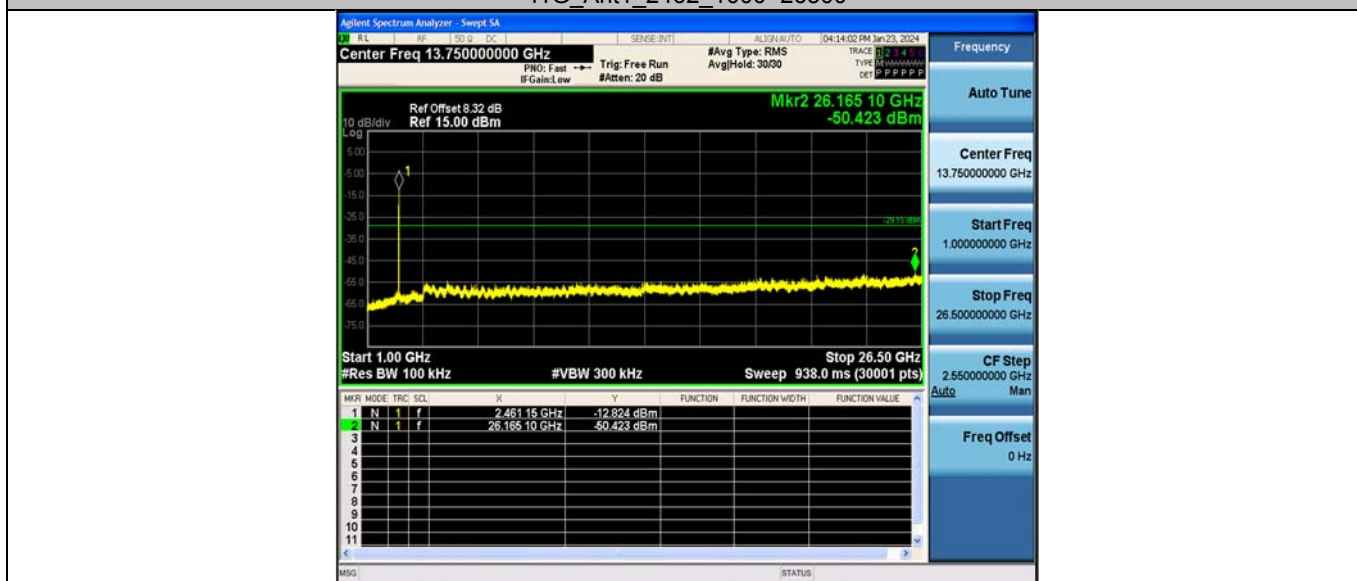




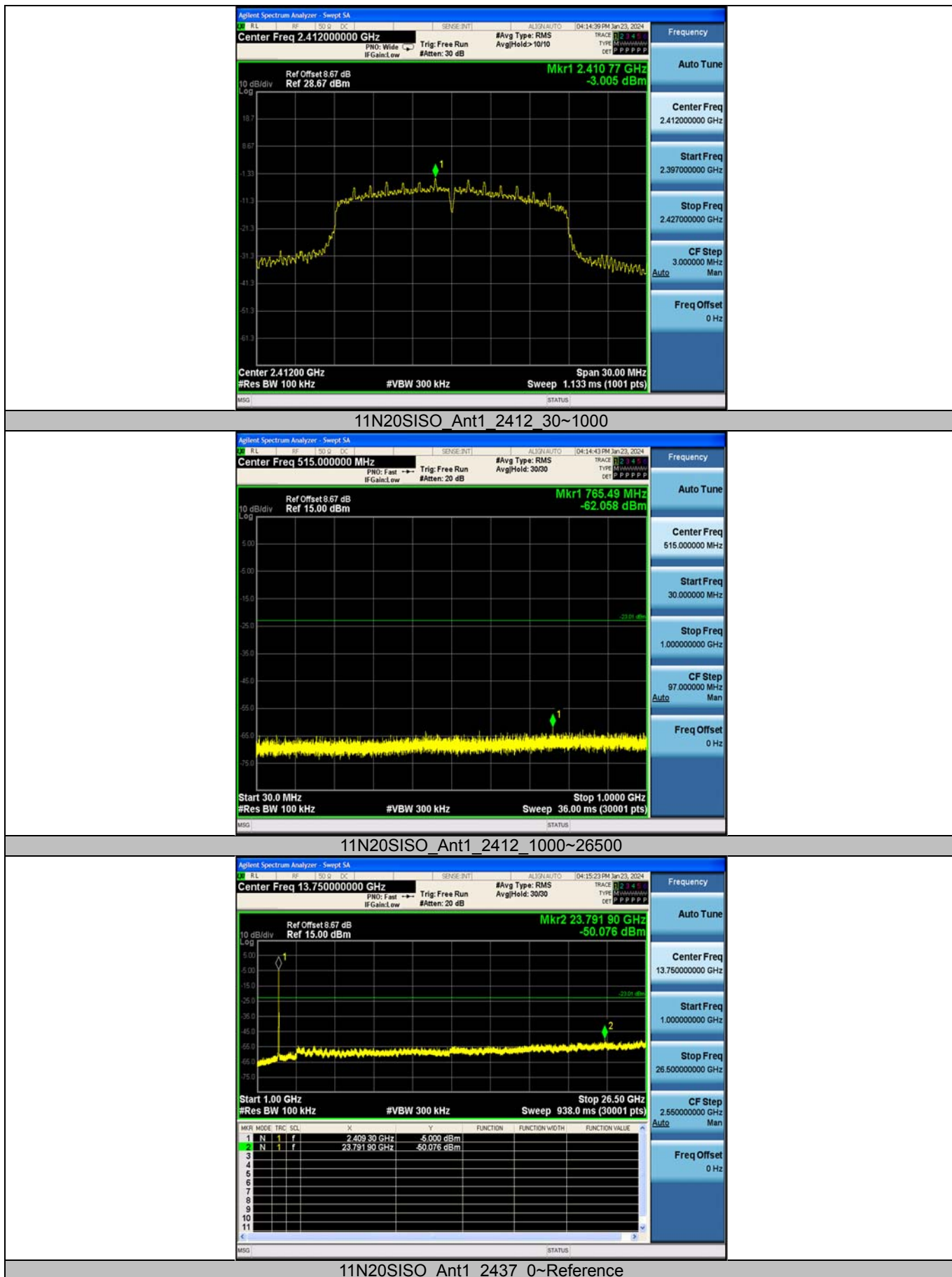
11G_Ant1_2462_30~1000



11G_Ant1_2462_1000~26500

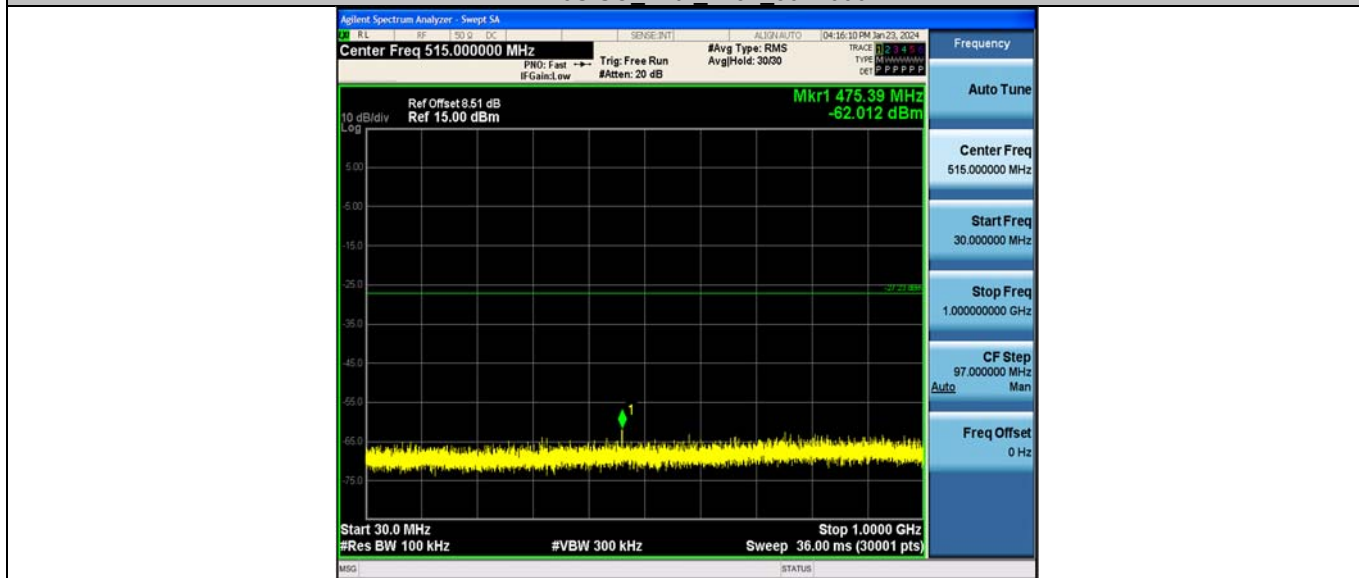


11N20SISO_Ant1_2412_0~Reference

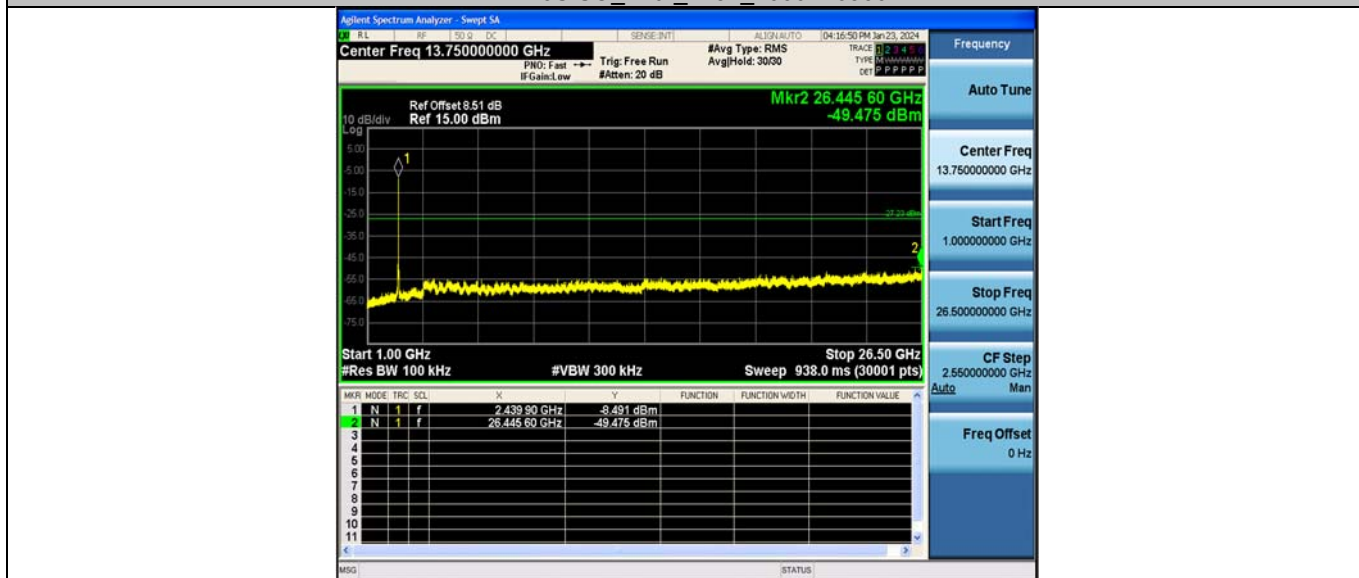




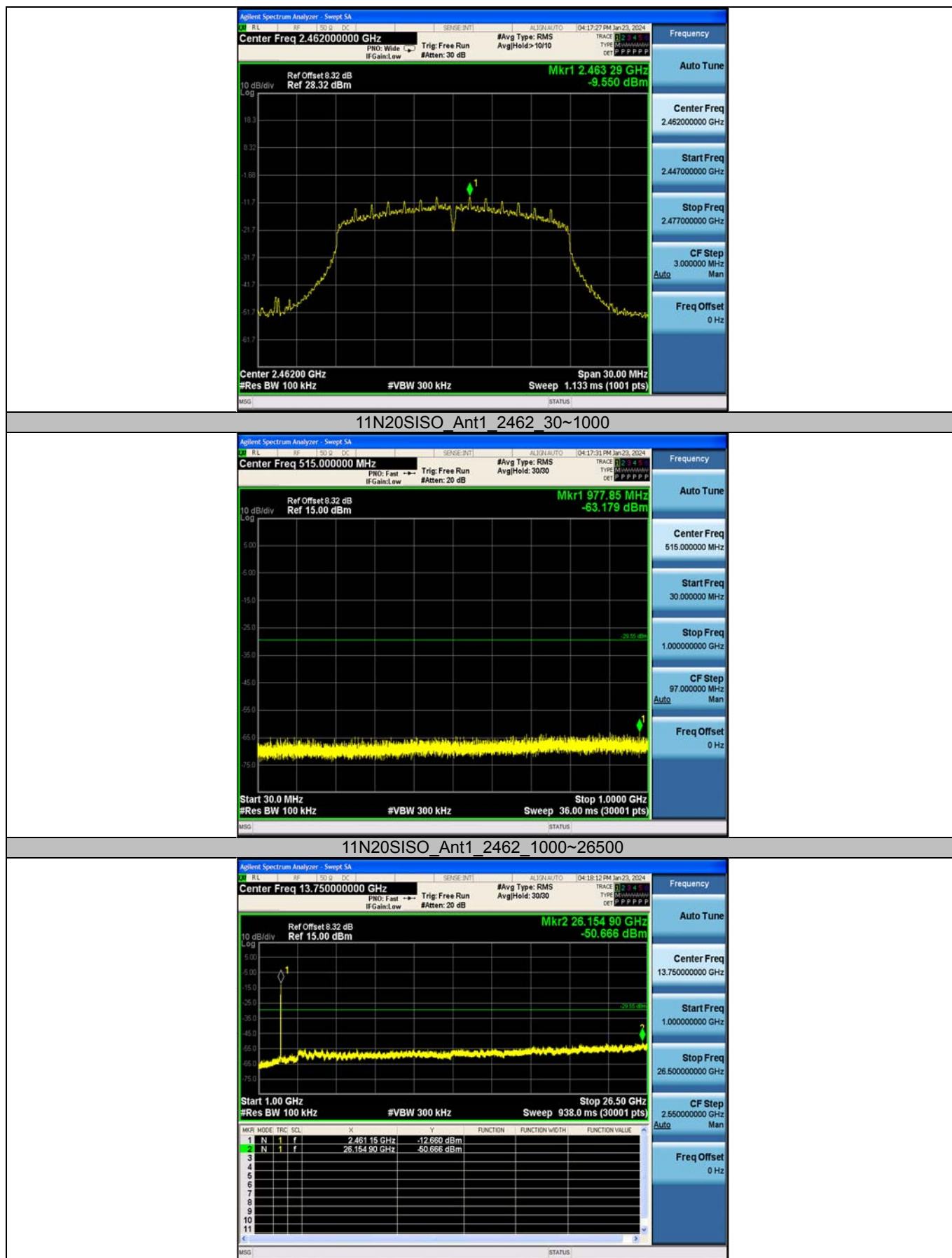
11N20SISO_Ant1_2437_30~1000



11N20SISO_Ant1_2437_1000~26500



11N20SISO_Ant1_2462_0~Reference



Appendix F: Duty Cycle

Test Result

Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Factor
11B	Ant1	2437	8.48	8.83	96.04	0.18
11G	Ant1	2437	1.41	1.61	87.58	0.58
11N20SISO	Ant1	2437	1.32	1.54	85.71	0.67

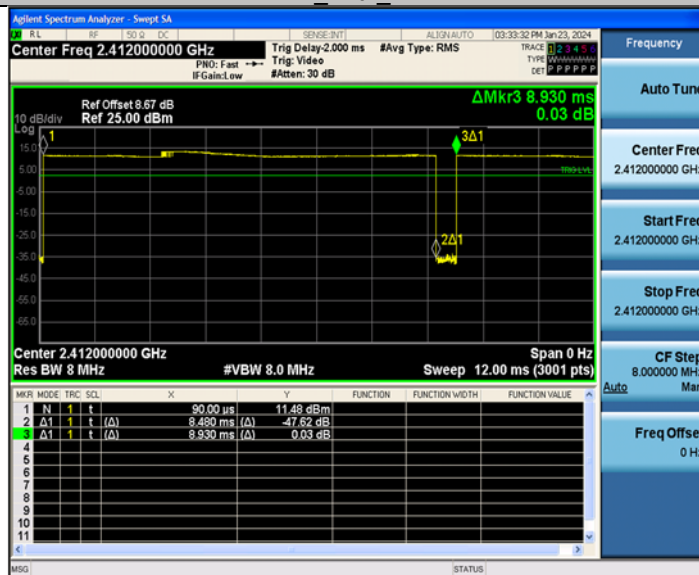
Notes:

Duty Cycle [%] = Transmission Duration [ms] / Transmission Period [ms] * 100

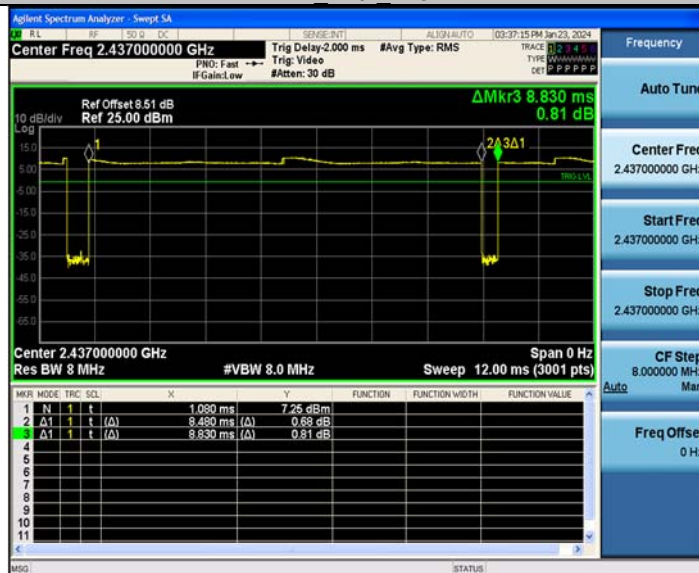
Factor = 10 * log (Duty Cycle)

Test Graphs

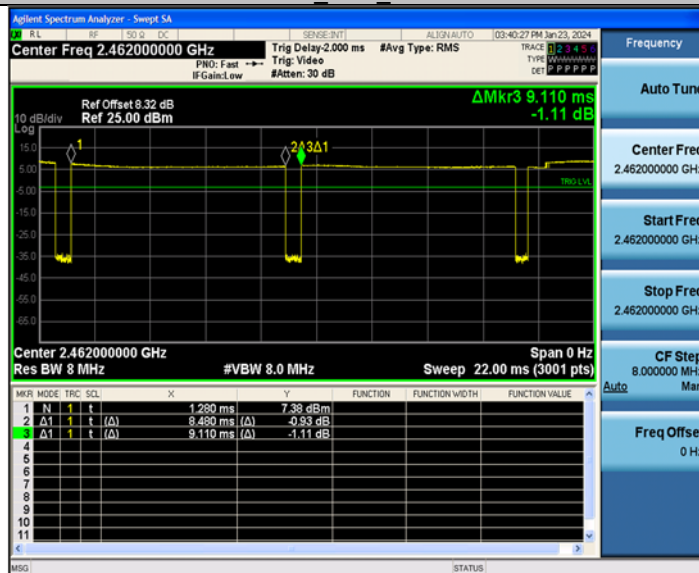
11B_Ant1_2412



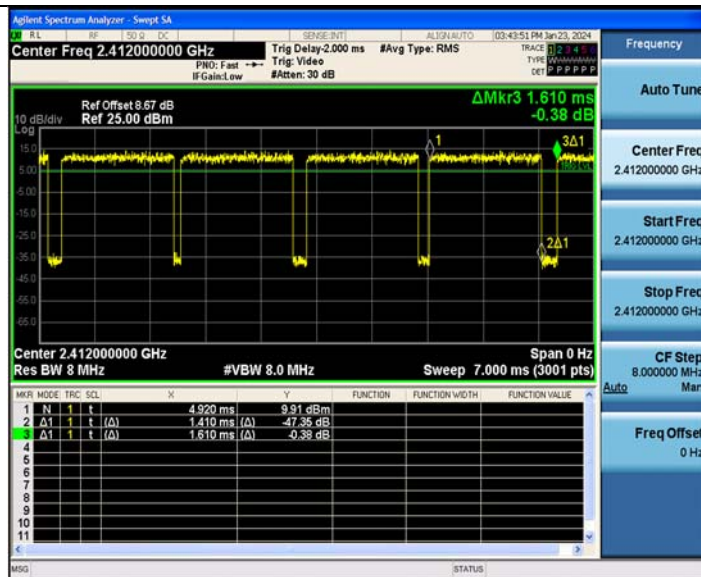
11B_Ant1_2437



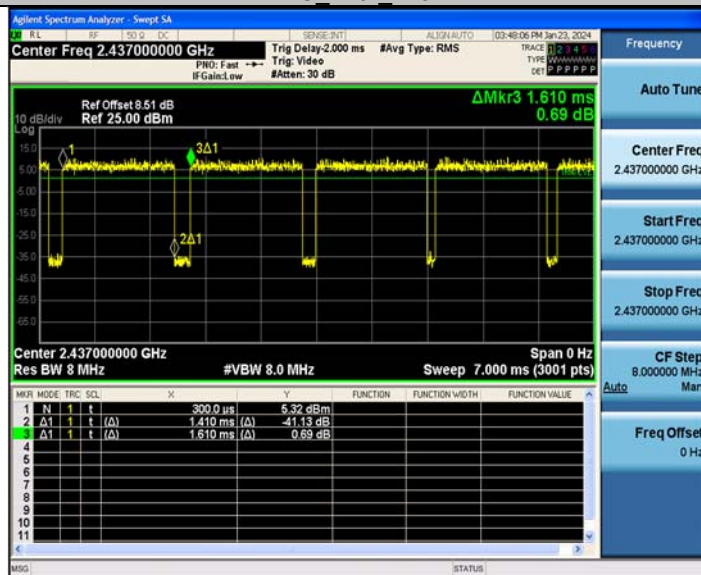
11B_Ant1_2462



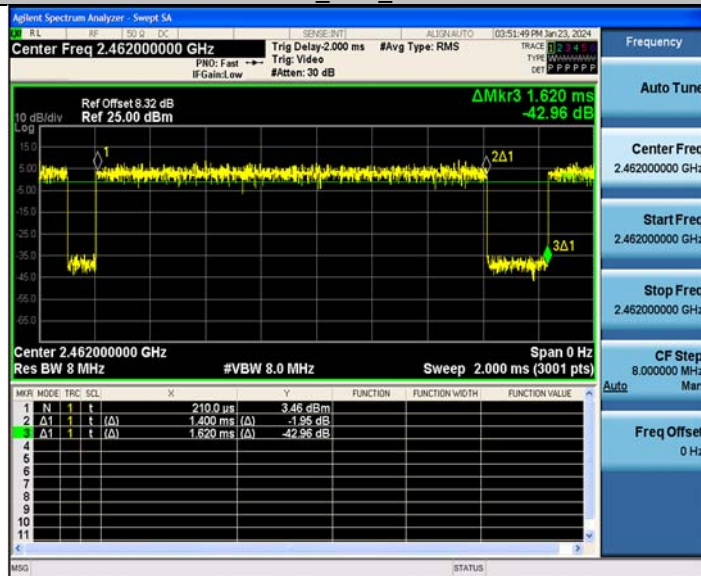
11G_Ant1_2412



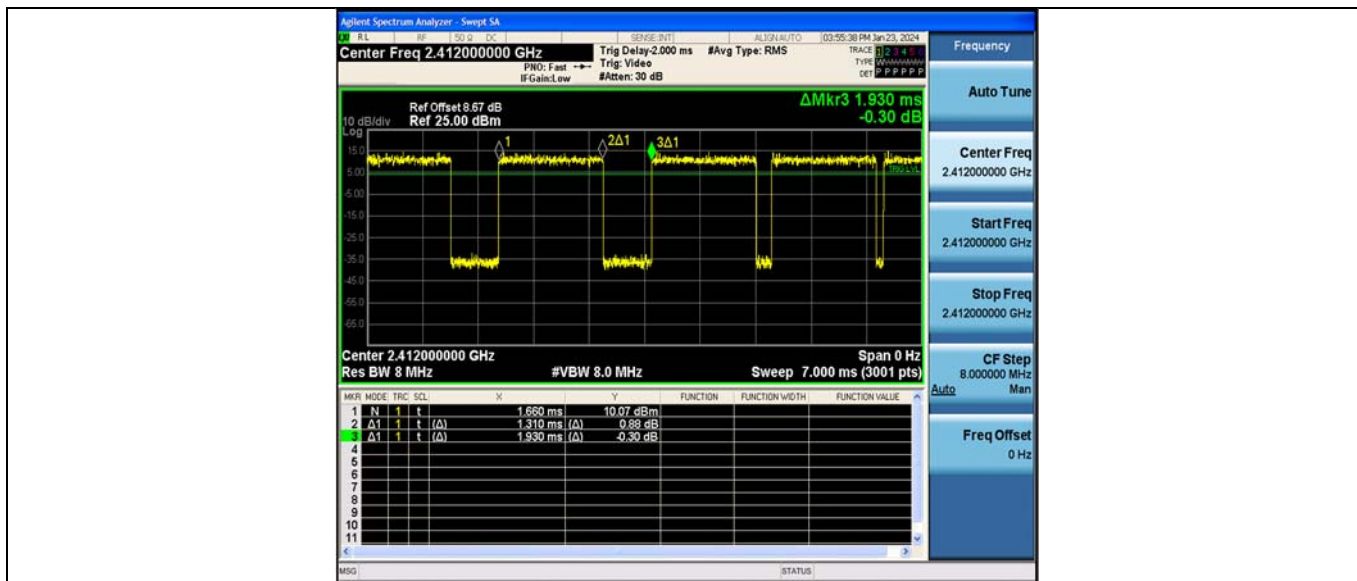
11G_Ant1_2437



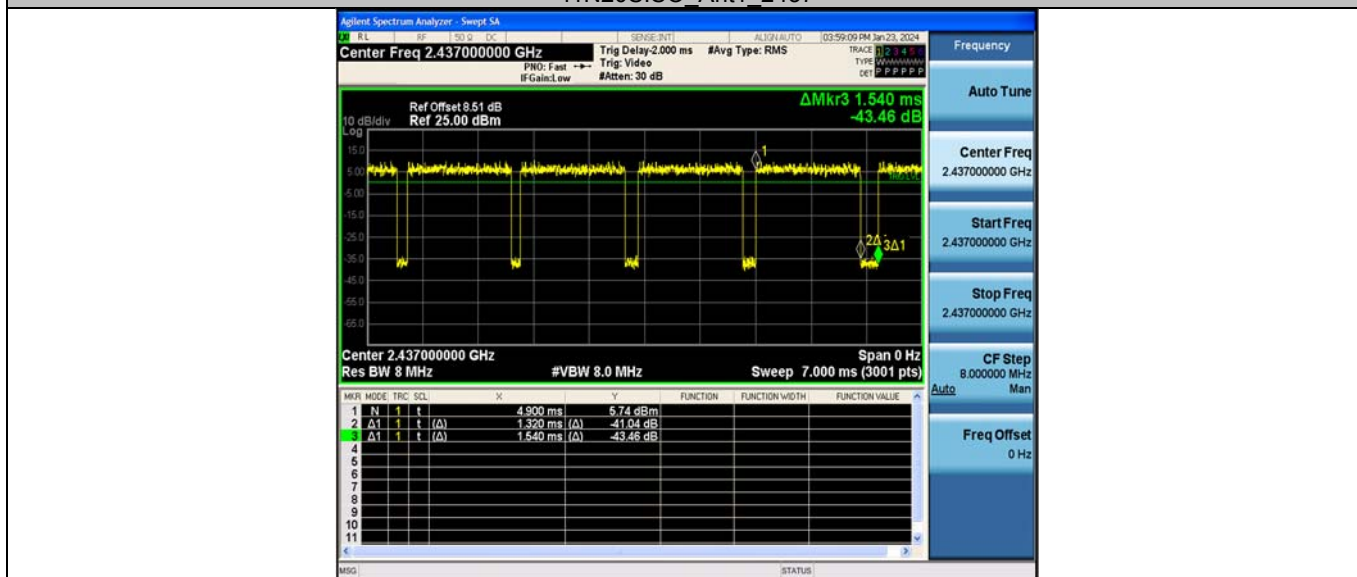
11G_Ant1_2462



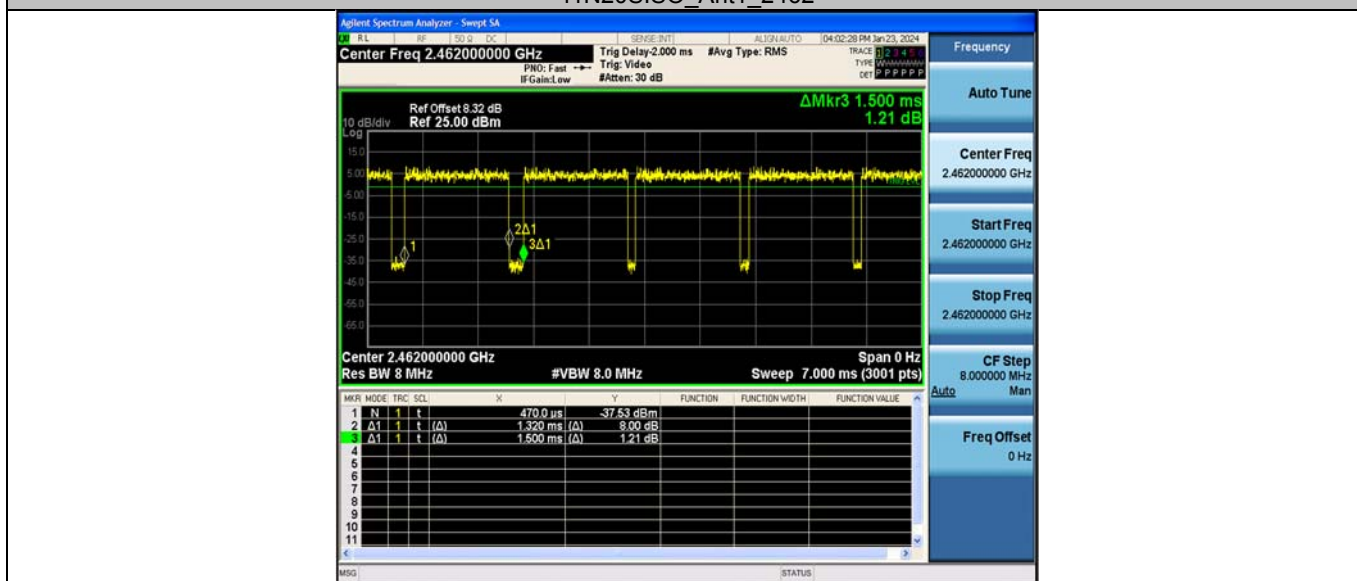
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



----End of Report----