

TEST REPORT

Product : Digital Night Vision
Trade mark : Sytong
Model/Type reference : HT60
Serial Number : N/A
Report Number : EED32M80106501
FCC ID : 2AYFSHT60202012
Date of Issue : Jan. 06, 2021
Test Standards : 47 CFR Part 15Subpart C
Test result : PASS

Prepared for:

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Date:

Jan. 06, 2021

Check No:4059031220

2 Version

Version No.	Date	Description
00	Jan. 06, 2021	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15 Subpart C Section 15.247 (e)	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
Radiated Spurious Emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

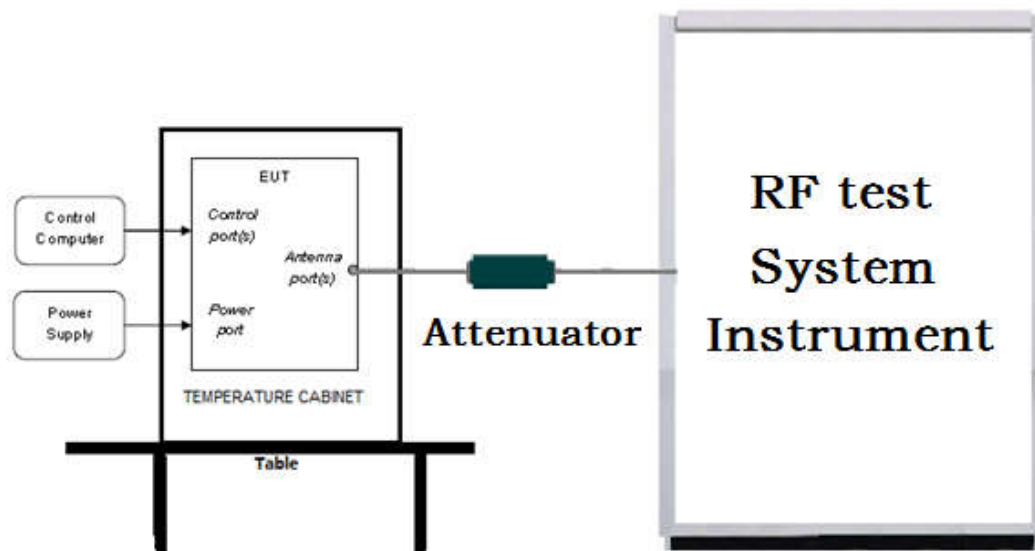
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5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

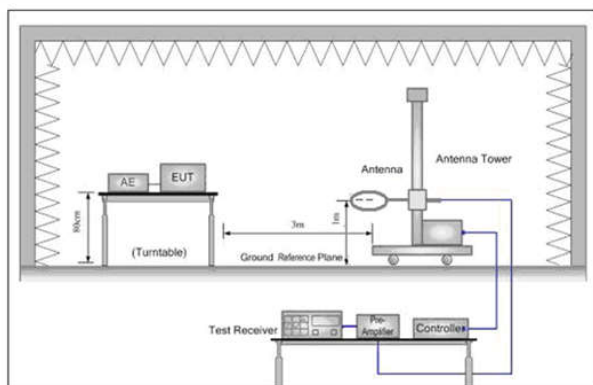


Figure 1. Below 30MHz

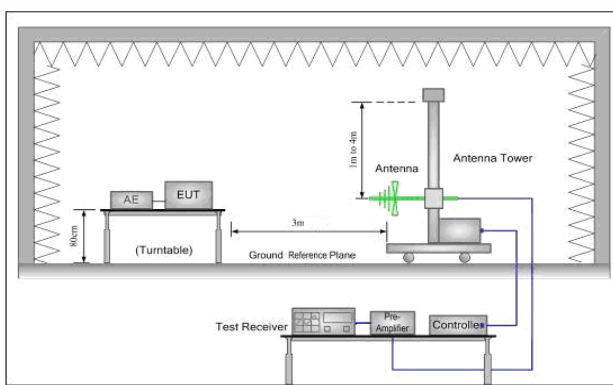


Figure 2. 30MHz to 1GHz

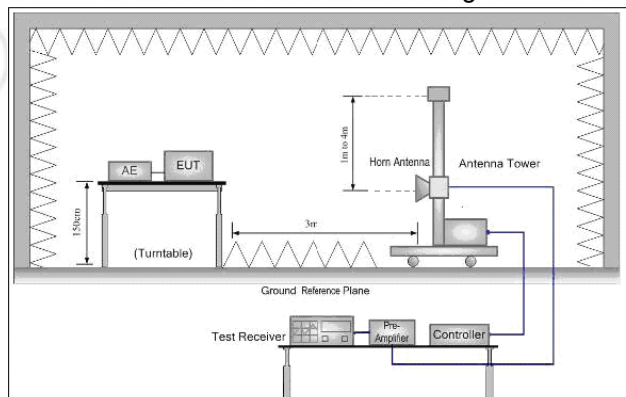
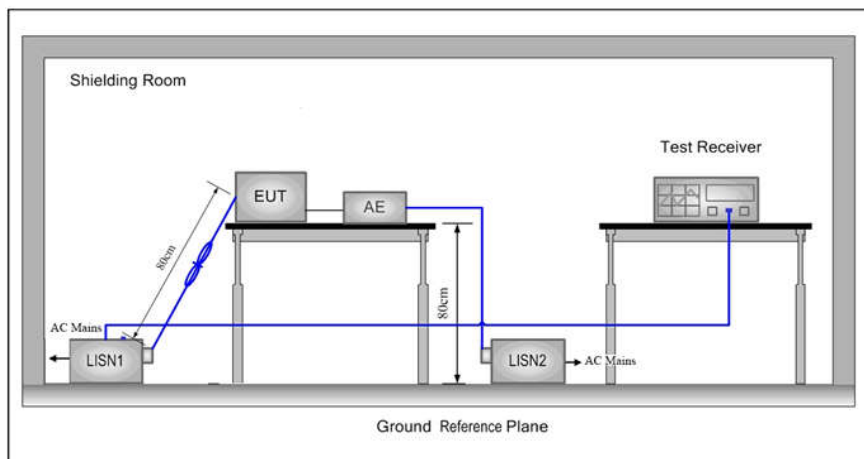


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	23.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11b/g/n(HT20)	2412MHz ~2462 MHz	Channel 1	Channel 6	Channel11
		2412MHz	2437MHz	2462MHz
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.			

Test mode:

Pre-scan under all rate at lowest channel 1

Through Pre-scan, 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20).

6 General Information

6.1 Client Information

Applicant:	Shenzhen Shi Yutong Technology Co. LTD
Address of Applicant:	Lianjian Science and Technology Industrial Park, Dalang Street, Longhua District, Shenzhen city , China
Manufacturer:	Shenzhen Shi Yutong Technology Co. LTD
Address of Manufacturer:	Lianjian Science and Technology Industrial Park, Dalang Street, Longhua District, Shenzhen city , China
Factory:	Shenzhen Shi Hui Tong Technology Co. LTD
Address of Factory:	Lianjian Science and Technology Industrial Park, Dalang Street, Longhua District, Shenzhen city , China

6.2 General Description of EUT

Product Name:	Digital Night Vision
Model No.(EUT):	HT60
Trade mark:	Sytong
EUT Supports Radios application:	IEEE 802.11 b/g/n(HT20): 2412MHz to 2462MHz
Power Supply:	DC 5V
Sample Received Date:	Dec. 04, 2020
Sample tested Date:	Dec. 04, 2020 to Dec. 18, 2020

6.3 Product Specification subjective to this standard

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz						
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels						
Channel Separation:	5MHz						
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g :OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM,QPSK,BPSK)						
Test Power Grade:	Reference Table						
Test Software of EUT:	SecureCRT						
Antenna Type and Gain:	Type: PCB Antenna Gain:0 dBi						
Test Voltage:	DC 5V						
Operation Frequency each of channel(802.11b/g/n HT20)							
Chann el	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

6.4 Description of Support Units

The EUT has been tested with associated equipment below.

Associated equipment name		Manufacture	model	S/N serial number	Supplied by	Certification
AE1	Notebook	DELL	DELL 3490	D245DX2	DELL	CE&FCC

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

6.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

7 Equipment List

RF test system					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. Date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Spectrum Analyzer	Keysight	N9010A	MY54510339	02-17-2020	02-16-2021
Signal Generator	Keysight	N5182B	MY53051549	02-17-2020	02-16-2021
Temperature/ Humidity Indicator	biaozhi	HM10	1804186	06-29-2020	06-28-2021
High-pass filter	Sinoscite	FL3CX03WG18N M12-0398-002	---	---	---
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	---	---
DC Power	Keysight	E3642A	MY56376072	02-17-2020	02-16-2021
PC-1	Lenovo	R4960d	---	---	---
BT&WI-FI Automatic control	R&S	OSP120	101374	02-17-2020	02-16-2021
RF control unit	JS Tonscend	JS0806-2	158060006	02-17-2020	02-16-2021
BT&WI-FI Automatic test software	JS Tonscend	JS1120-3	---	---	---

Conducted disturbance Test					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Receiver	R&S	ESCI	100435	04-28-2020	04-27-2021
Temperature/ Humidity Indicator	Defu	TH128	/	---	---
LISN	R&S	ENV216	100098	03-05-2020	03-04-2021
Barometer	changchun	DYM3	1188	---	---

3M Semi/full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	05-16-2020	05-15-2021
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-16-2020	10-15-2021
Multi device Controller	maturo	NCD/070/107 11112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	06-29-2020	06-28-2021
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---

3M full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	---	---
Receiver	Keysight	N9038A	MY57290136	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9020B	MY57111112	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9030B	MY57140871	03-05-2020	03-04-2021
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-25-2018	04-24-2021
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-25-2018	04-24-2021
Horn Antenna	ETS-LINDGREN	3117	00057407	07-10-2018	07-09-2021
Preamplifier	EMCI	EMC184055SE	980597	05-20-2020	05-19-2021
Preamplifier	EMCI	EMC001330	980563	04-22-2020	04-21-2021
Preamplifier	JS Tonscend	980380	EMC051845 SE	01-09-2020	01-08-2021
Temperature/Humidity Indicator	biaozhi	GM1360	EE1186631	04-27-2020	04-26-2021
Fully Anechoic Chamber	TDK	FAC-3	---	01-17-2018	01-16-2021
Filter bank	JS Tonscend	JS0806-F	188060094	04-10-2018	04-09-2021
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix A)
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix H)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix I)

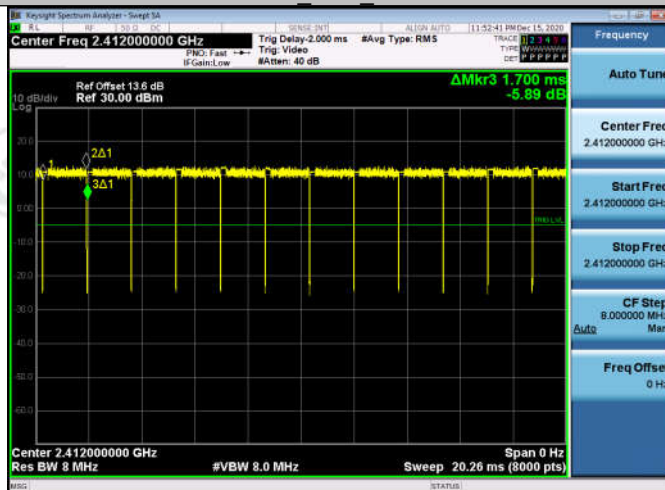
EUT DUTY CYCLE

Result Table

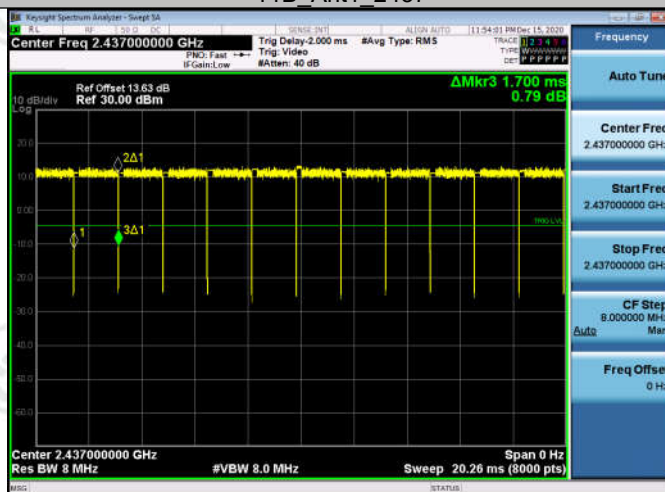
Test Mode	Antenna	Channel	Duty Cycle [%]	Limit	Verdict
11B	Ant1	2412	97.91	---	PASS
	Ant1	2437	97.91	---	PASS
	Ant1	2462	97.91	---	PASS
11G	Ant1	2412	89.16	---	PASS
	Ant1	2437	89.16	---	PASS
	Ant1	2462	89.51	---	PASS
11N20SISO	Ant1	2412	87.98	---	PASS
	Ant1	2437	87.98	---	PASS
	Ant1	2462	87.60	---	PASS

Test Graph

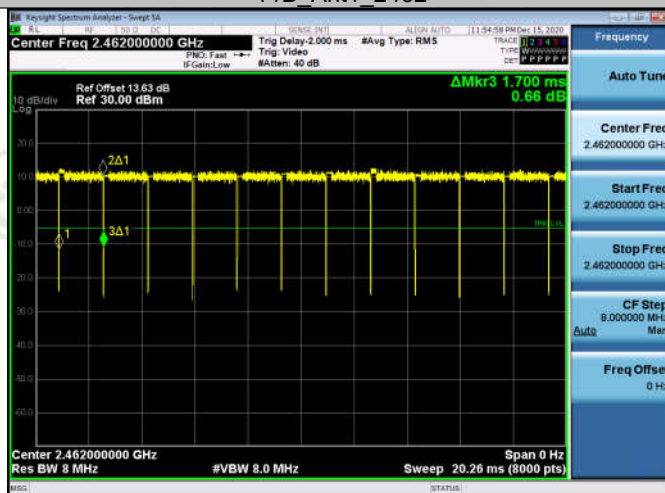
11B_Ant1_2412



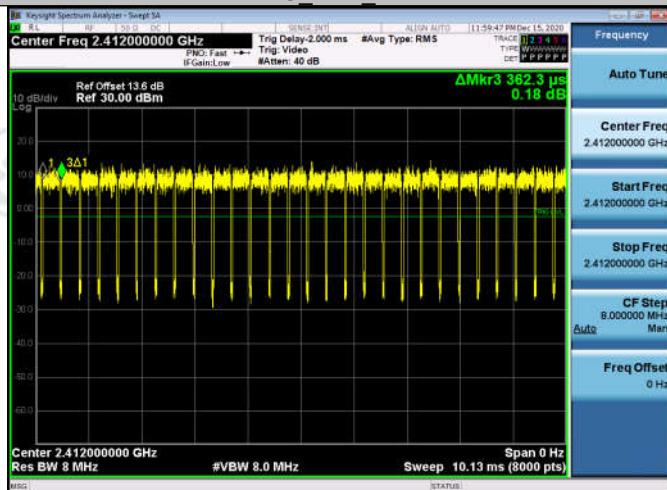
11B_Ant1_2437



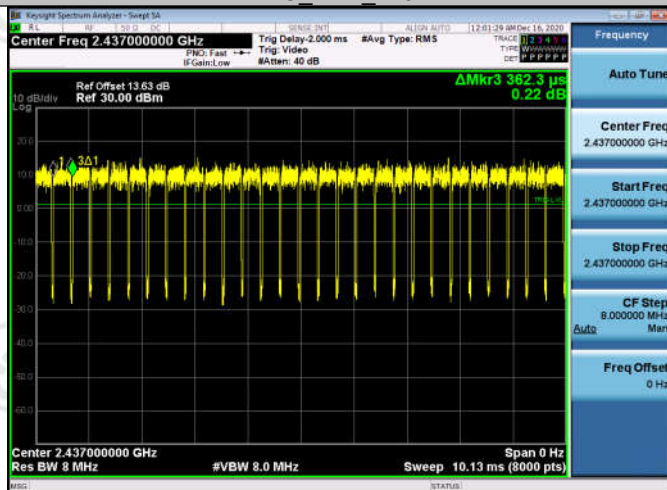
11B_Ant1_2462



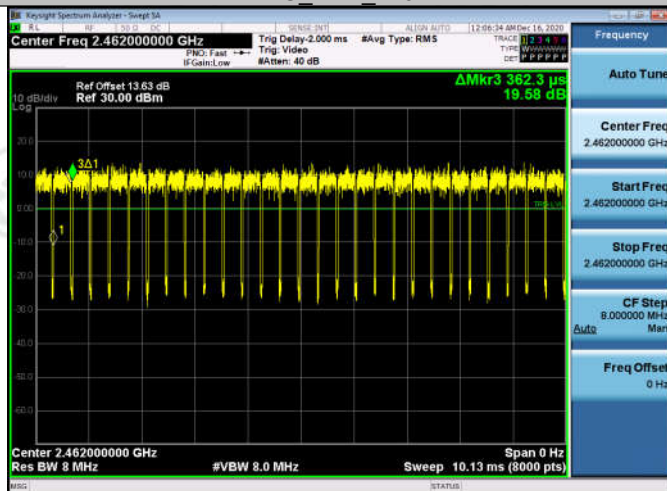
11G_Ant1_2412



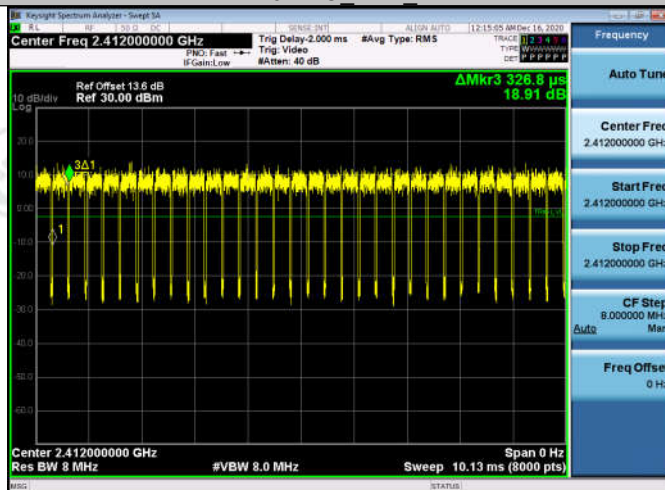
11G_Ant1_2437



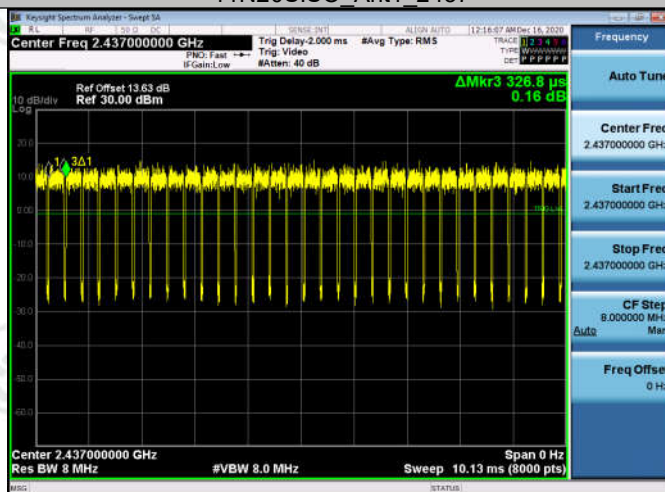
11G_Ant1_2462



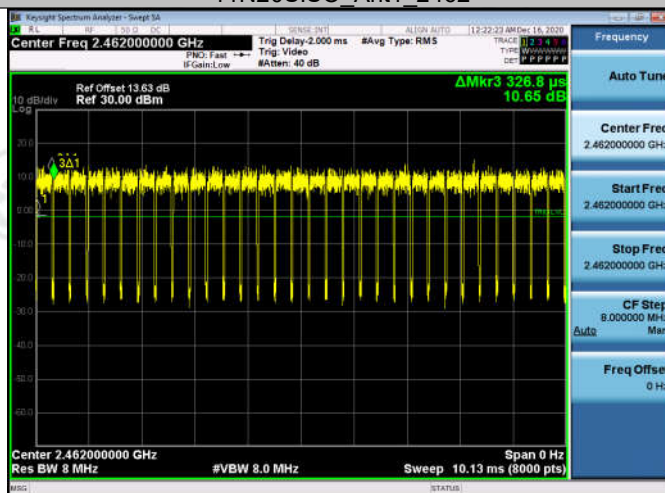
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462



Appendix A): Conducted Peak Output Power

Test Limit

According to §15.247(b)(3),

Peak output power:

For systems using digital modulation in the 2400-2483.5 MHz: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi. If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Limit	☒ Antenna not exceed 6 dBi: 30dBm ☐ Antenna with DG greater than 6 dBi: [Limit = 30 – (DG – 6)] ☐ Point-to-point operation:
-------	--

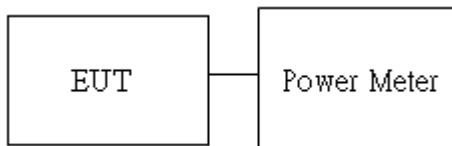
Average output power: For reporting purposes only.

Test Procedure

Test method Refer as KDB 558074 D01.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

Test Setup



Test Result

Mode	Channel	Conducted Peak Output Power [dBm]	Verdict
11B	LCH	7.37	PASS
11B	MCH	7.89	PASS
11B	HCH	6.95	PASS
11G	LCH	6.90	PASS
11G	MCH	7.97	PASS
11G	HCH	6.72	PASS
11N20SISO	LCH	6.76	PASS
11N20SISO	MCH	8.15	PASS
11N20SISO	HCH	7.46	PASS

Appendix B): 6dB Occupied Bandwidth

Test Limit

According to §15.247(a)(2),

6 dB Bandwidth :

Limit	Shall be at least 500kHz
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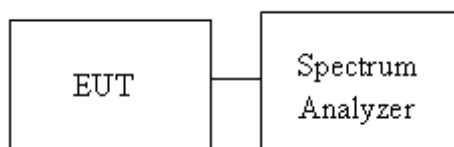
Occupied Bandwidth(99%) : For reporting purposes only.

Test Procedure

Test method Refer as KDB 558074 D01 and ANSI C63.10: 2013 clause 6.9.2,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW =100KHz , VBW = 300KHz and Detector = Peak, to measurement 6dB Bandwidth
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

Test Setup

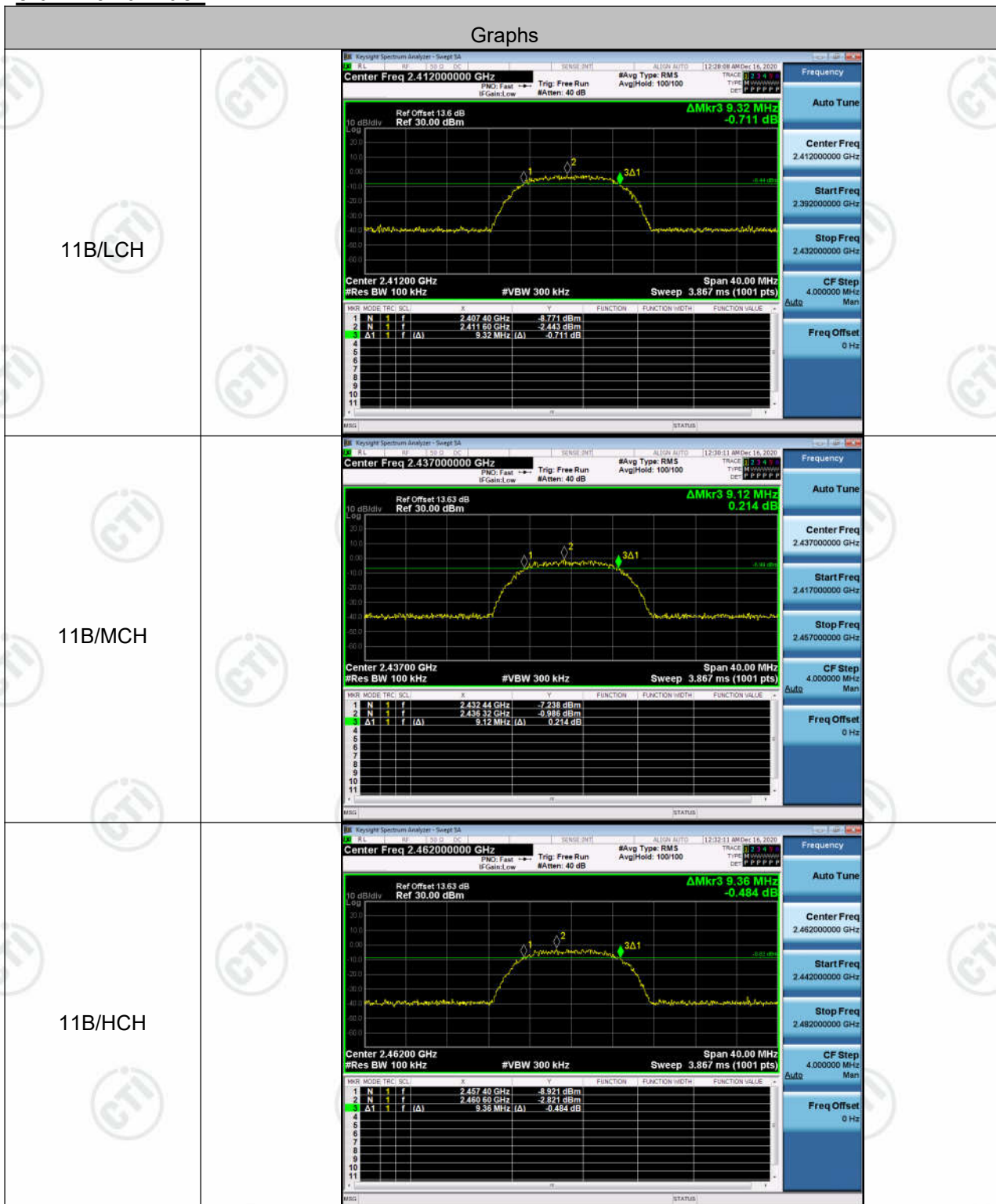


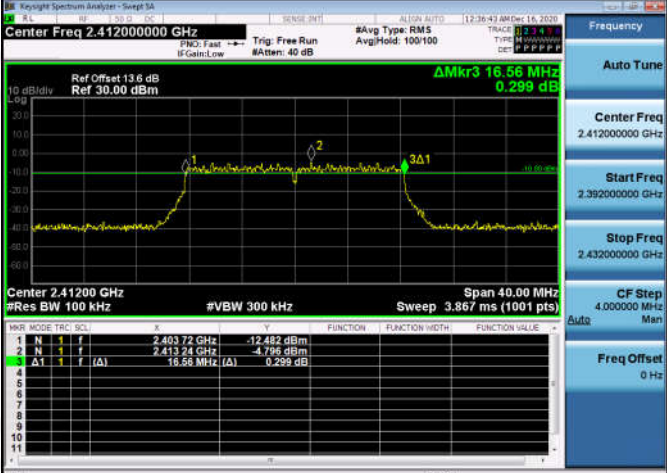
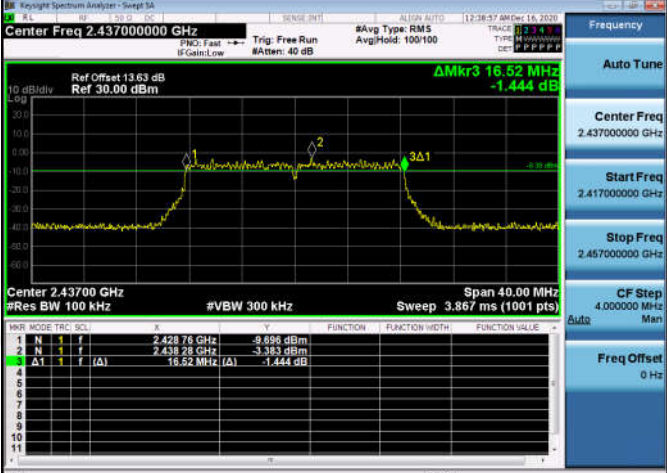
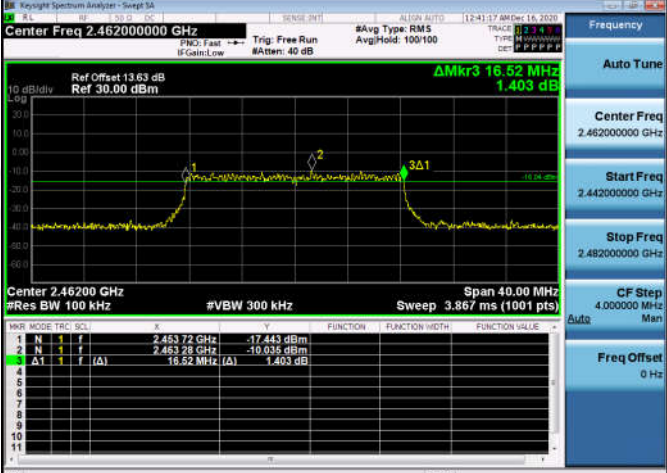
Test Result

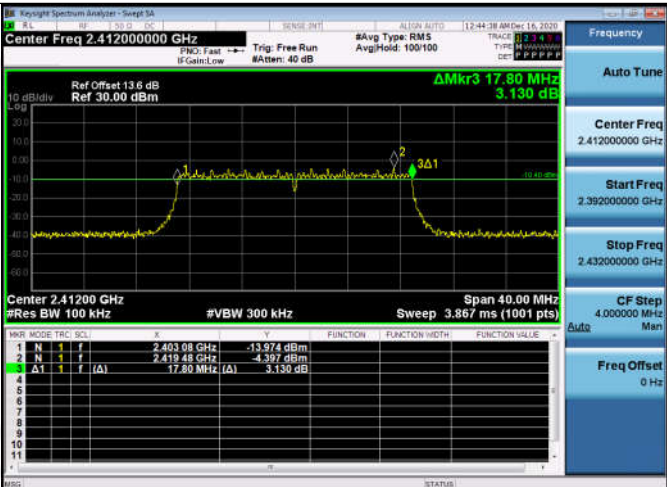
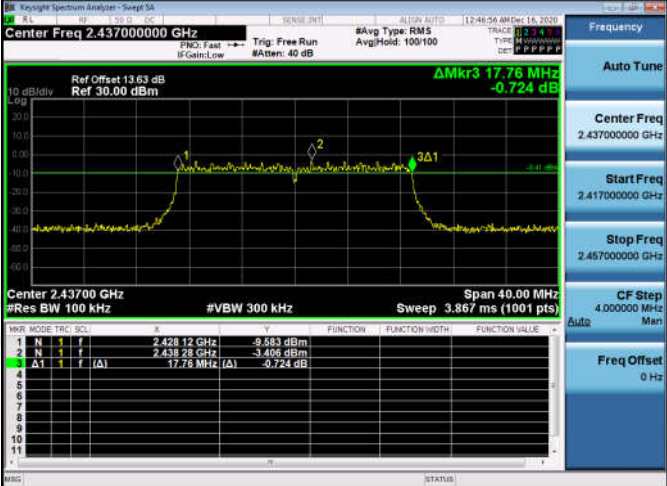
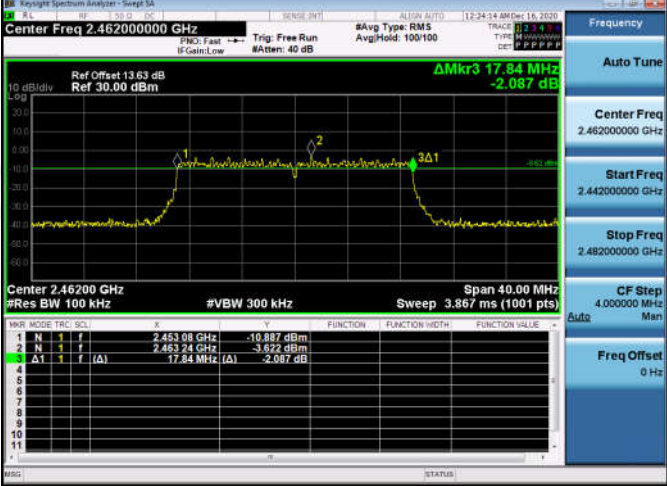
Mode	Channel	6dB Bandwidth [MHz]	99% OBW [MHz]	Verdict
11B	LCH	9.320	11.541	PASS
11B	MCH	9.120	11.565	PASS
11B	HCH	9.360	11.561	PASS
11G	LCH	16.560	16.746	PASS
11G	MCH	16.520	16.765	PASS
11G	HCH	16.520	16.817	PASS
11N20SISO	LCH	17.800	17.821	PASS
11N20SISO	MCH	17.760	17.845	PASS
11N20SISO	HCH	17.840	17.808	PASS

Test Graph

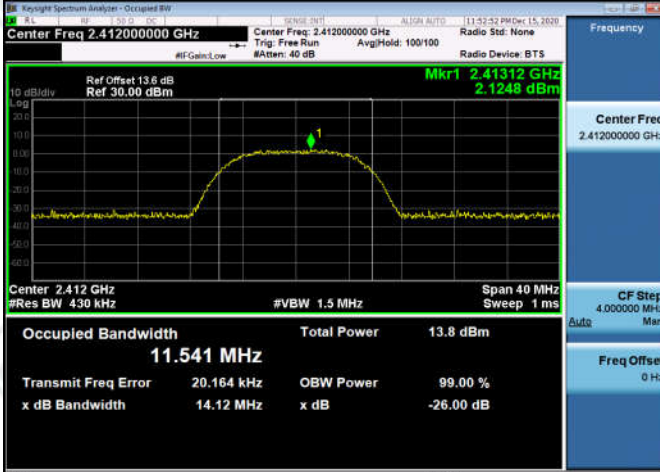
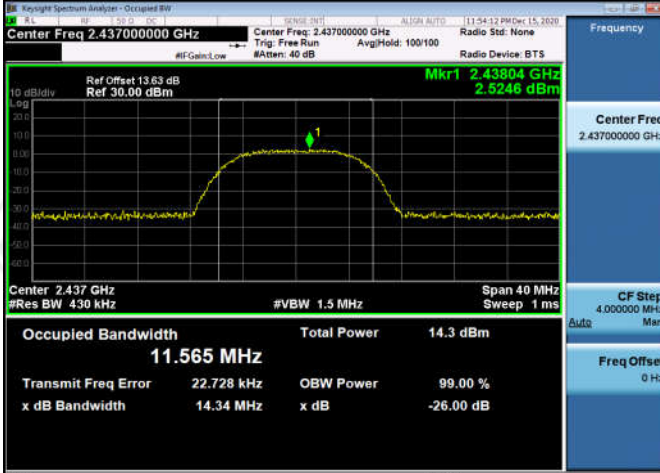
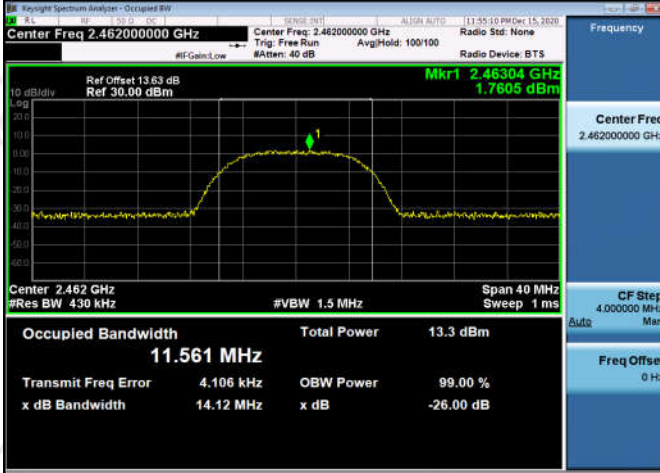
6 dB Bandwidth

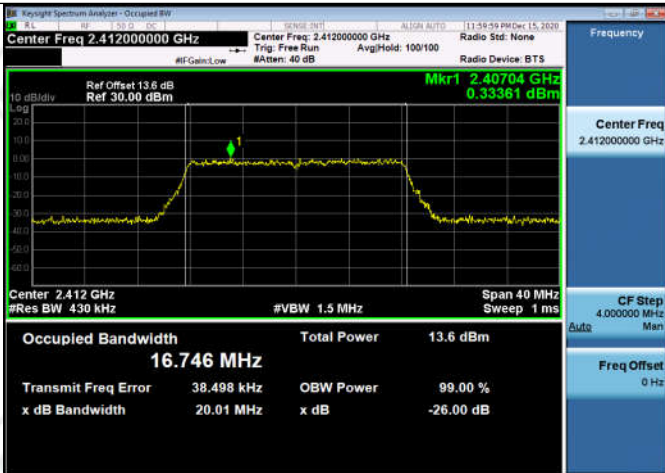
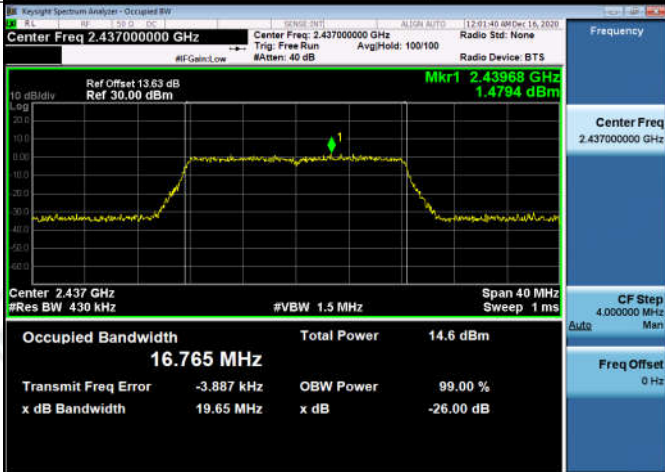
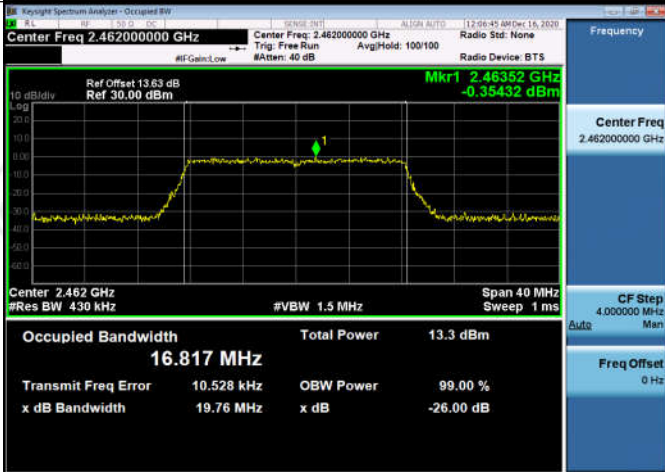


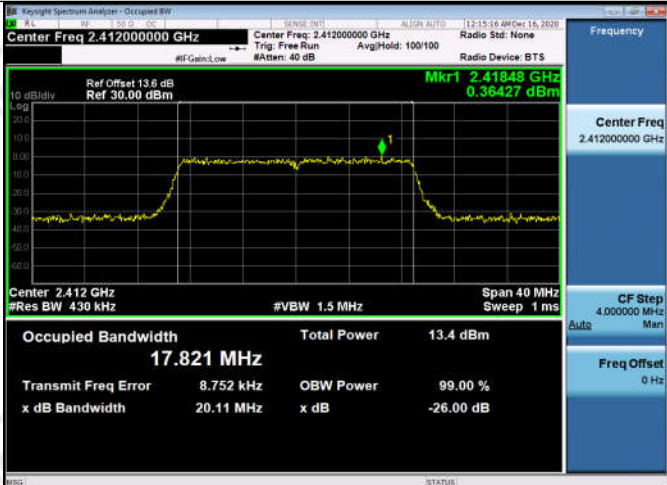
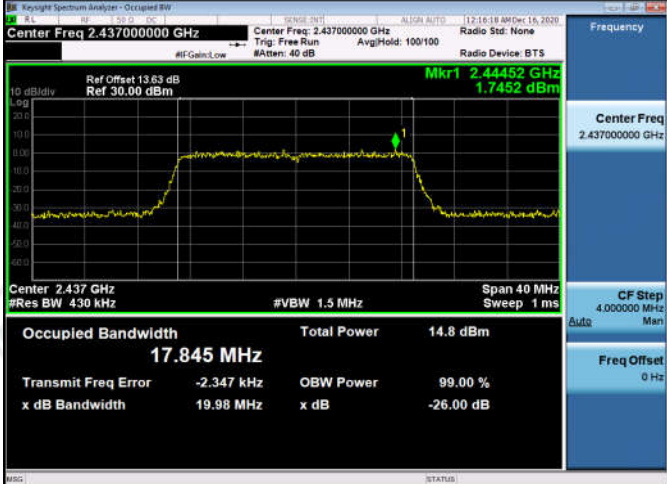
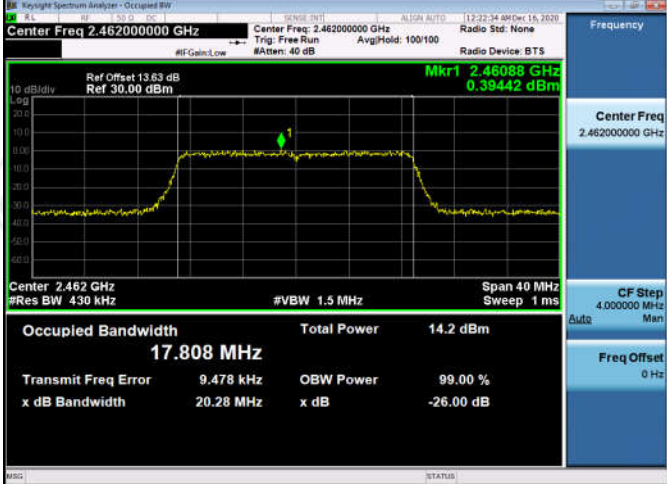
11G/LCH	
11G/MCH	
11G/HCH	

11N20SISO/LCH	
11N20SISO/MCH	
11N20SISO/HCH	

Occupied Bandwidth(99%)

Graphs	
11B/LCH	 Keygraph Spectrum Analyzer - Occupied BW Center Freq 2.412000000 GHz Ref Offset 13.6 dB Ref 30.00 dBm Mkr1 2.41312 GHz 2.1248 dBm Center 2.412 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 11.541 MHz Total Power 13.8 dBm Transmit Freq Error 20.164 kHz OBW Power 99.00 % x dB Bandwidth 14.12 MHz x dB -26.00 dB
11B/MCH	 Keygraph Spectrum Analyzer - Occupied BW Center Freq 2.437000000 GHz Ref Offset 13.63 dB Ref 30.00 dBm Mkr1 2.43804 GHz 2.5246 dBm Center 2.437 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 11.565 MHz Total Power 14.3 dBm Transmit Freq Error 22.728 kHz OBW Power 99.00 % x dB Bandwidth 14.34 MHz x dB -26.00 dB
11B/HCH	 Keygraph Spectrum Analyzer - Occupied BW Center Freq 2.462000000 GHz Ref Offset 13.63 dB Ref 30.00 dBm Mkr1 2.46304 GHz 1.7605 dBm Center 2.462 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 11.561 MHz Total Power 13.3 dBm Transmit Freq Error 4.106 kHz OBW Power 99.00 % x dB Bandwidth 14.12 MHz x dB -26.00 dB

11G/LCH	 Keyight Spectrum Analyzer - Occupied BW Center Freq 2.412000000 GHz Ref Offset 13.8 dB Ref 30.00 dBm Mkr1 2.40704 GHz 0.33361 dBm Center 2.412 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 16.746 MHz Total Power 13.6 dBm Transmit Freq Error 38.498 kHz OBW Power 99.00 % x dB Bandwidth 20.01 MHz x dB -26.00 dB
11G/MCH	 Keyight Spectrum Analyzer - Occupied BW Center Freq 2.437000000 GHz Ref Offset 13.63 dB Ref 30.00 dBm Mkr1 2.43968 GHz 1.4794 dBm Center 2.437 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 16.765 MHz Total Power 14.6 dBm Transmit Freq Error -3.887 kHz OBW Power 99.00 % x dB Bandwidth 19.65 MHz x dB -26.00 dB
11G/HCH	 Keyight Spectrum Analyzer - Occupied BW Center Freq 2.462000000 GHz Ref Offset 13.63 dB Ref 30.00 dBm Mkr1 2.46352 GHz -0.35432 dBm Center 2.462 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 16.817 MHz Total Power 13.3 dBm Transmit Freq Error 10.528 kHz OBW Power 99.00 % x dB Bandwidth 19.76 MHz x dB -26.00 dB

11N20SISO/LCH	 Keyight Spectrum Analyzer - Occupied BW Center Freq 2.412000000 GHz Ref Offset 13.8 dB Ref 30.00 dBm Mkr1 2.41848 GHz 0.36427 dBm Center 2.412 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 17.821 MHz Total Power 13.4 dBm Transmit Freq Error 8.752 kHz OBW Power 99.00 % x dB Bandwidth 20.11 MHz x dB -26.00 dB
11N20SISO/MCH	 Keyight Spectrum Analyzer - Occupied BW Center Freq 2.437000000 GHz Ref Offset 13.63 dB Ref 30.00 dBm Mkr1 2.44452 GHz 1.7452 dBm Center 2.437 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 17.845 MHz Total Power 14.8 dBm Transmit Freq Error -2.347 kHz OBW Power 99.00 % x dB Bandwidth 19.98 MHz x dB -26.00 dB
11N20SISO/HCH	 Keyight Spectrum Analyzer - Occupied BW Center Freq 2.462000000 GHz Ref Offset 13.63 dB Ref 30.00 dBm Mkr1 2.46088 GHz 0.39442 dBm Center 2.462 GHz #Res BW 430 kHz #VBW 1.5 MHz Span 40 MHz Sweep 1 ms Occupied Bandwidth 17.808 MHz Total Power 14.2 dBm Transmit Freq Error 9.478 kHz OBW Power 99.00 % x dB Bandwidth 20.28 MHz x dB -26.00 dB

Appendix C): Band-edge for RF Conducted Emissions

Test Limit

According to §15.247(d),

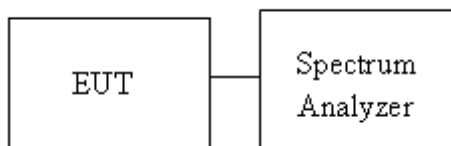
In any 100 kHz bandwidth outside the authorized frequency band,
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Test Procedure

Test method Refer as KDB 558074 D01.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

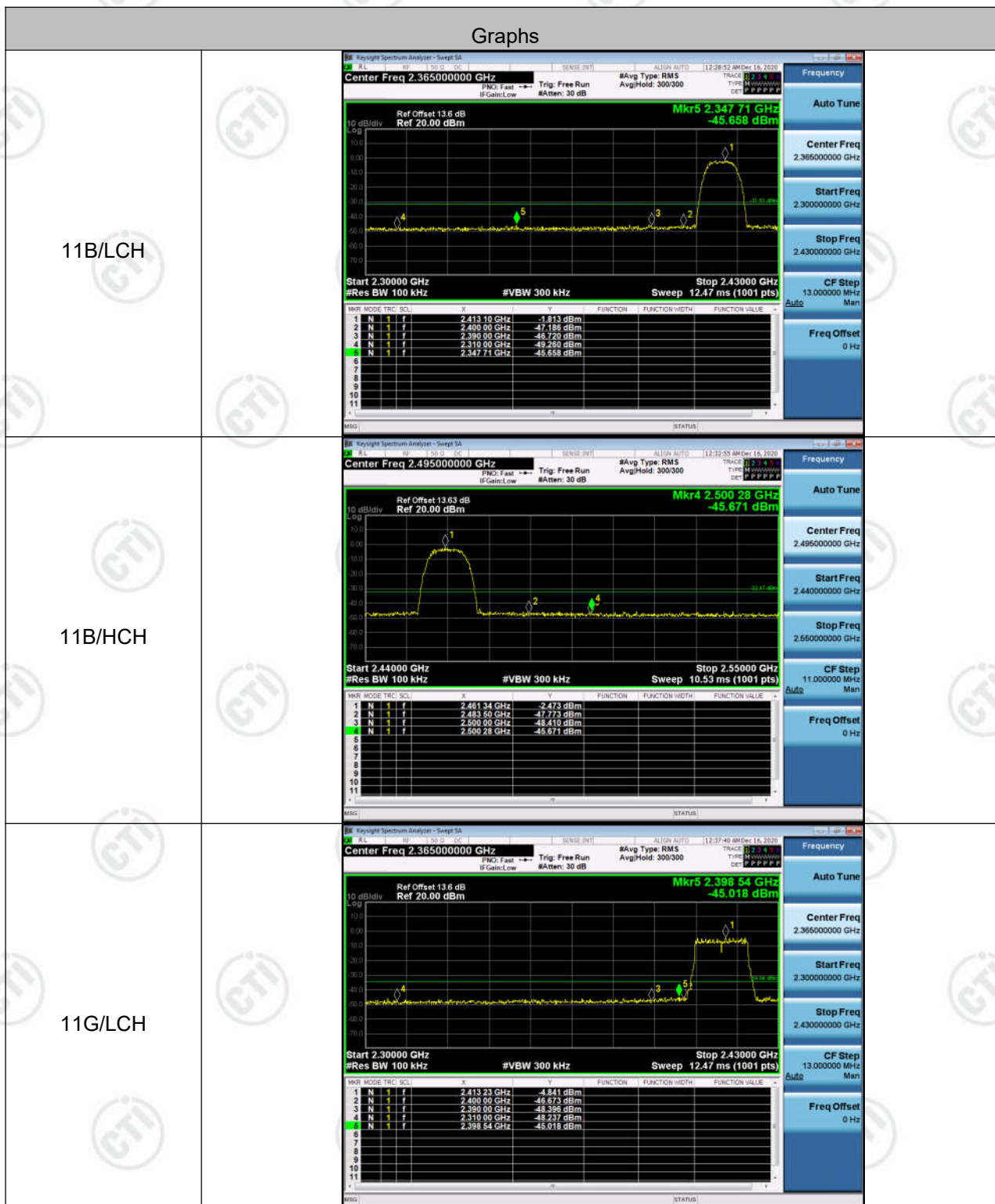
Test Setup



Result Table

Test Mode	Antenna	Ch Name	Channel	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	Low	2412	-1.81	-45.66	<=-31.81	PASS
		High	2462	-2.47	-45.67	<=-32.47	PASS
11G	Ant1	Low	2412	-4.84	-45.02	<=-34.84	PASS
		High	2462	-9.90	-45.13	<=-39.9	PASS
11N20SISO	Ant1	Low	2412	-4.40	-43.01	<=-34.4	PASS
		High	2462	-3.64	-45.75	<=-33.64	PASS

Test Graph



11G/HCH	Keylight Spectrum Analyzer - Swept SA 11G/HCH Center Freq 2.495000000 GHz Ref Offset 13.63 dB Ref 20.00 dBm 10 dB/div Log Mkr4 2.542 74 GHz -45.130 dBm Start 2.440000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.550000 GHz Sweep 10.53 ms (1001 pts) <table><thead><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SOL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.454 62 GHz</td><td>-9.896 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.483 50 GHz</td><td>-47.661 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.500 00 GHz</td><td>-47.402 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.542 74 GHz</td><td>-45.130 dBm</td><td></td><td></td><td></td></tr></tbody></table> Frequency Auto Tune Center Freq 2.495000000 GHz Start Freq 2.440000000 GHz Stop Freq 2.550000000 GHz CF Step 11.000000 MHz Man Freq Offset 0 Hz	MNR	MODE	TRC	SOL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.454 62 GHz	-9.896 dBm				2	N	1	f	2.483 50 GHz	-47.661 dBm				3	N	1	f	2.500 00 GHz	-47.402 dBm				4	N	1	f	2.542 74 GHz	-45.130 dBm												
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11N20SISO/LCH	Keylight Spectrum Analyzer - Swept SA 11N20SISO/LCH Center Freq 2.365000000 GHz Ref Offset 13.6 dB Ref 20.00 dBm 10 dB/div Log Mkr5 2.398 02 GHz -43.013 dBm Start 2.300000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.430000 GHz Sweep 12.47 ms (1001 pts) <table><thead><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SOL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.413 23 GHz</td><td>-4.396 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.460 00 GHz</td><td>-46.091 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.380 00 GHz</td><td>-47.685 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.310 00 GHz</td><td>-48.185 dBm</td><td></td><td></td><td></td></tr><tr><td>5</td><td>N</td><td>1</td><td>f</td><td>2.398 02 GHz</td><td>-43.013 dBm</td><td></td><td></td><td></td></tr></tbody></table> Frequency Auto Tune Center Freq 2.365000000 GHz Start Freq 2.300000000 GHz Stop Freq 2.430000000 GHz CF Step 13.000000 MHz Man Freq Offset 0 Hz	MNR	MODE	TRC	SOL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.413 23 GHz	-4.396 dBm				2	N	1	f	2.460 00 GHz	-46.091 dBm				3	N	1	f	2.380 00 GHz	-47.685 dBm				4	N	1	f	2.310 00 GHz	-48.185 dBm				5	N	1	f	2.398 02 GHz	-43.013 dBm			
MNR	MODE	TRC	SOL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																															
1	N	1	f	2.413 23 GHz	-4.396 dBm																																																		
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5	N	1	f	2.398 02 GHz	-43.013 dBm																																																		
11N20SISO/HCH	Keylight Spectrum Analyzer - Swept SA 11N20SISO/HCH Center Freq 2.495000000 GHz Ref Offset 13.63 dB Ref 20.00 dBm 10 dB/div Log Mkr4 2.488 40 GHz -45.747 dBm Start 2.440000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.550000 GHz Sweep 10.53 ms (1001 pts) <table><thead><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SOL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.463 21 GHz</td><td>-3.636 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.483 60 GHz</td><td>-47.306 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.500 00 GHz</td><td>-48.475 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.488 40 GHz</td><td>-45.747 dBm</td><td></td><td></td><td></td></tr></tbody></table> Frequency Auto Tune Center Freq 2.495000000 GHz Start Freq 2.440000000 GHz Stop Freq 2.550000000 GHz CF Step 11.000000 MHz Man Freq Offset 0 Hz	MNR	MODE	TRC	SOL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.463 21 GHz	-3.636 dBm				2	N	1	f	2.483 60 GHz	-47.306 dBm				3	N	1	f	2.500 00 GHz	-48.475 dBm				4	N	1	f	2.488 40 GHz	-45.747 dBm												
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3	N	1	f	2.500 00 GHz	-48.475 dBm																																																		
4	N	1	f	2.488 40 GHz	-45.747 dBm																																																		

Appendix D): RF Conducted Spurious Emissions

Test Limit

According to §15.247(d),

In any 100 kHz bandwidth outside the authorized frequency band,

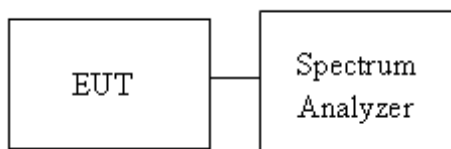
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Test Procedure

Test method Refer as KDB 558074 D01.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

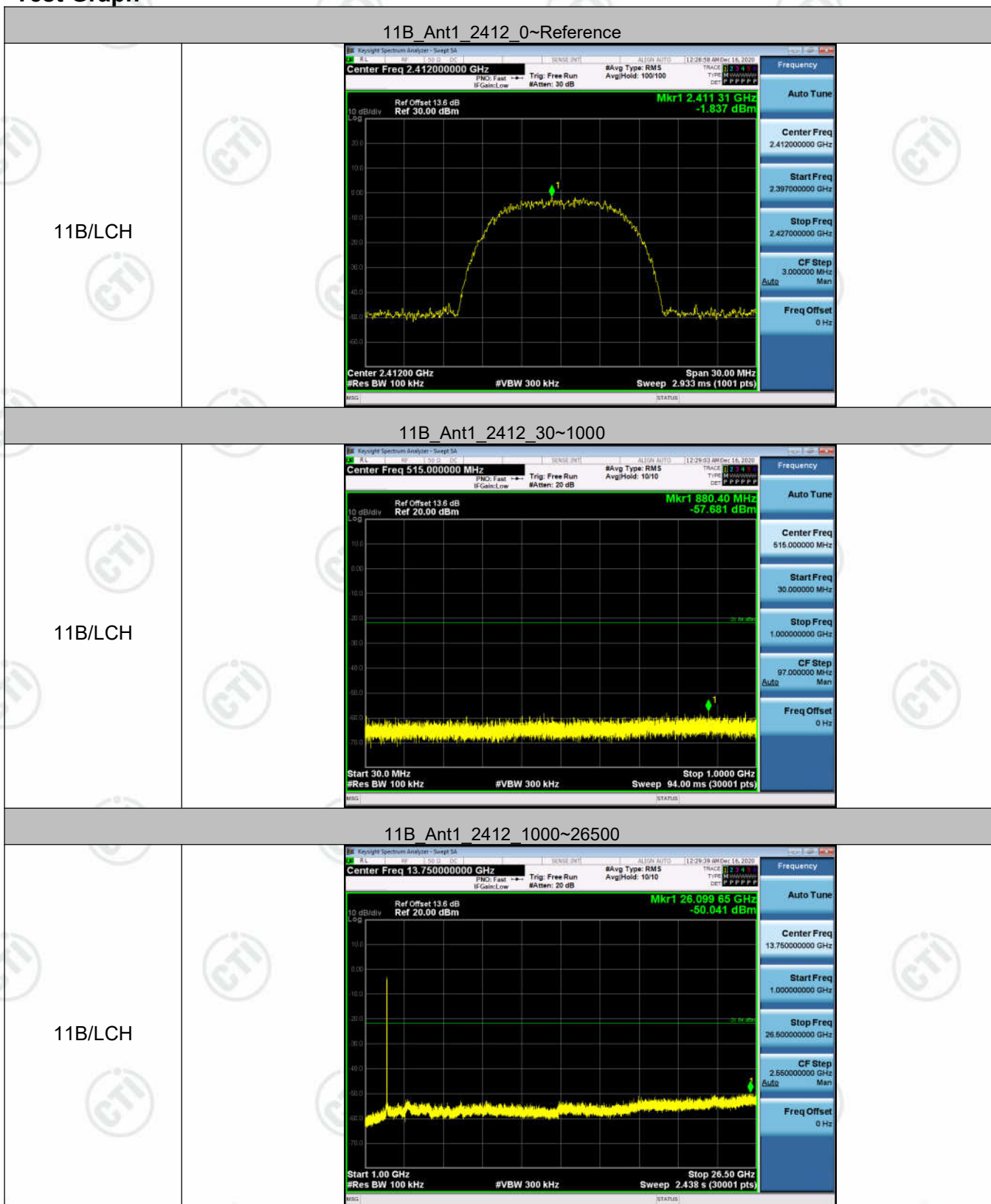
Test Setup

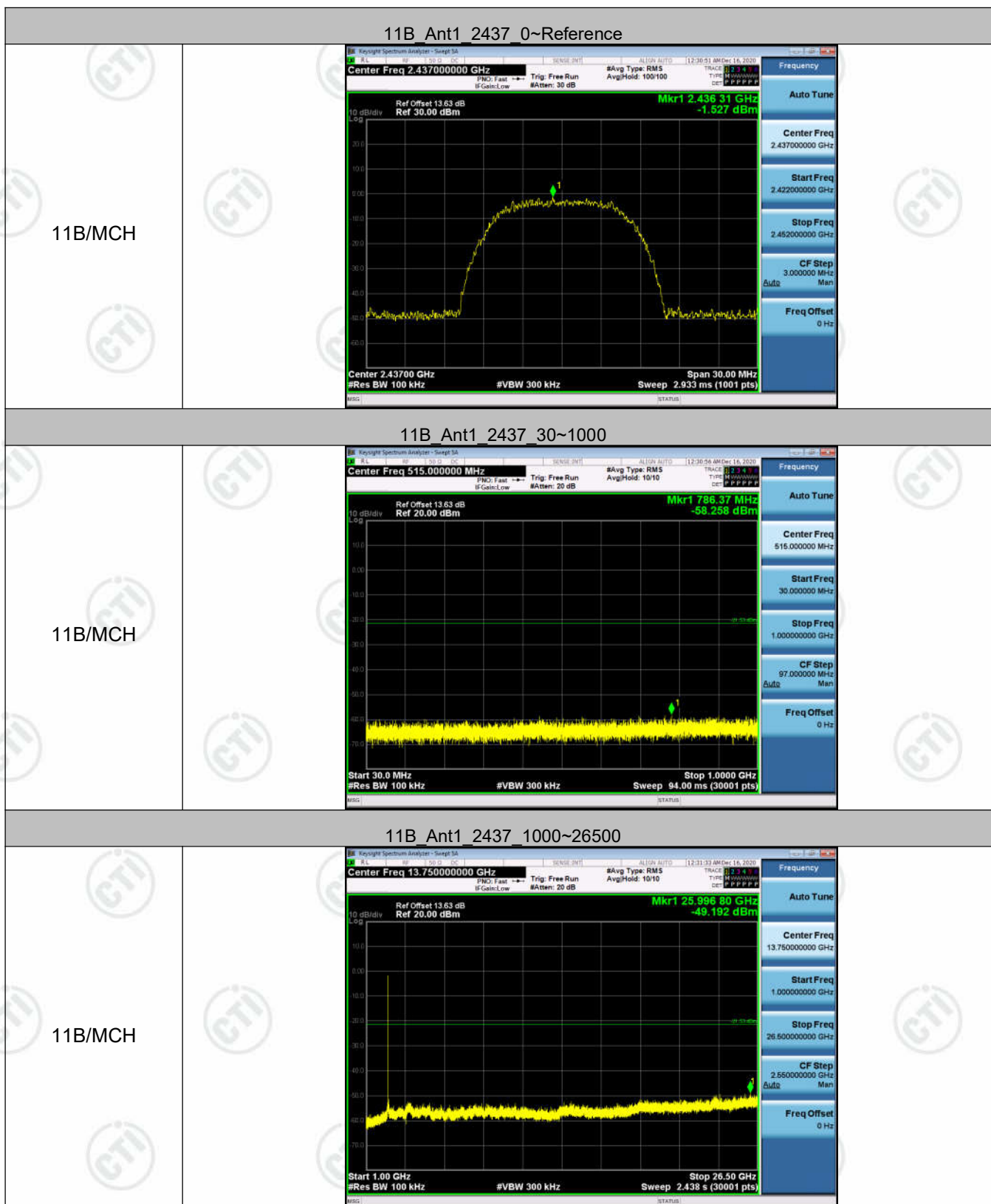


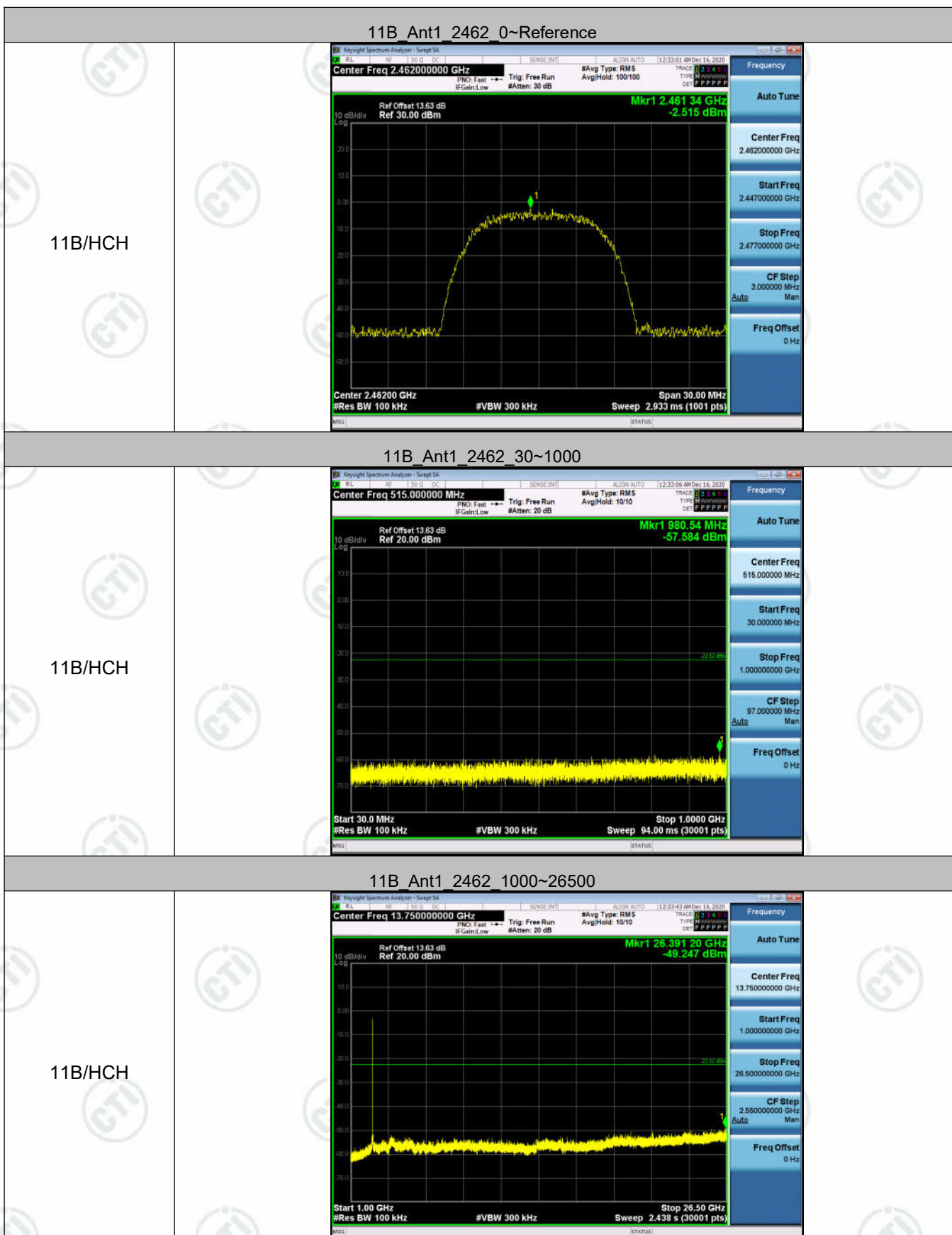
Result Table

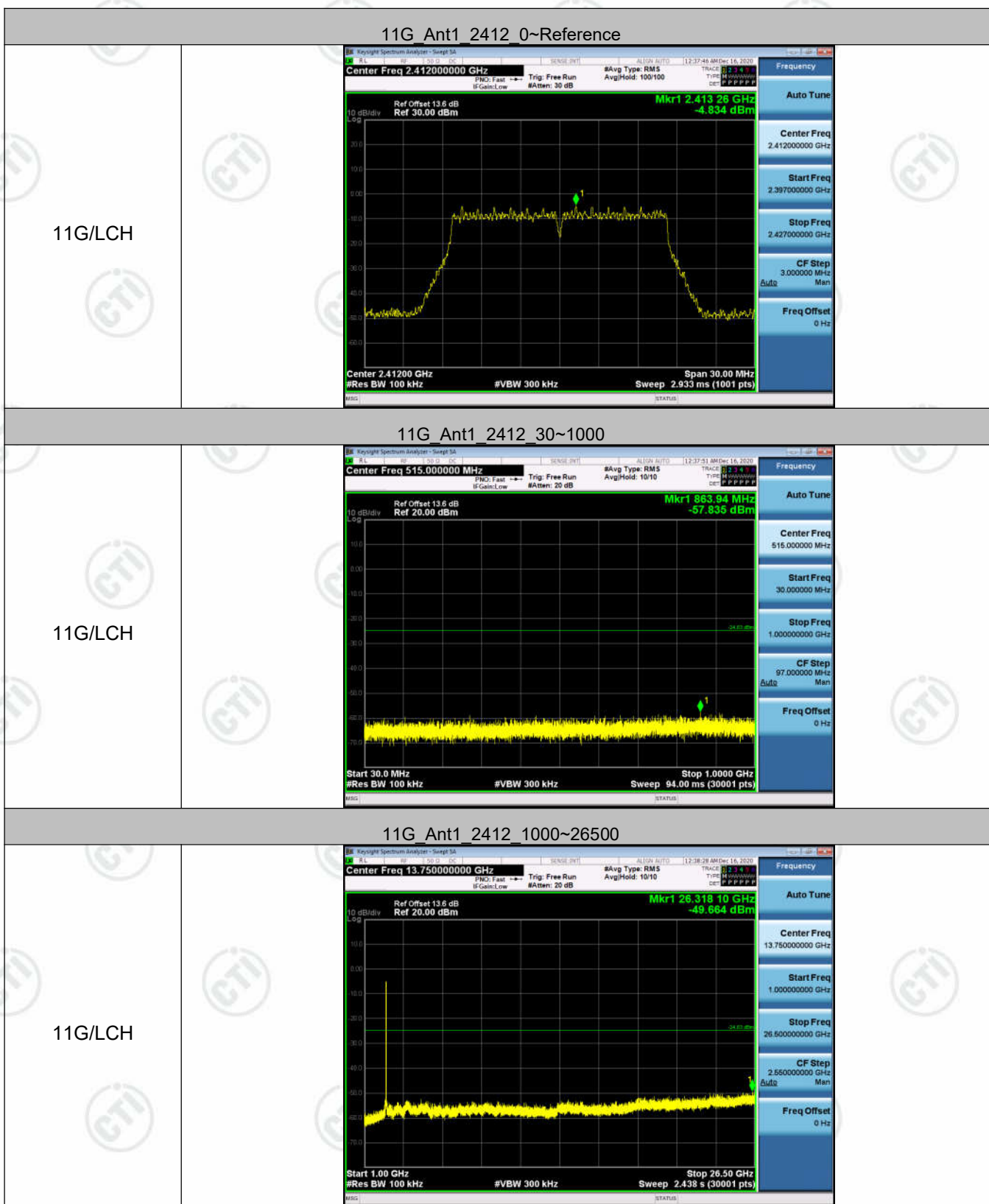
Test Mode	Antenna	Channel	Freq Range [Mhz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	-1.84	-1.84	---	PASS
			30~1000	30~1000	-57.681	<=-21.837	PASS
			1000~26500	1000~26500	-50.041	<=-21.837	PASS
		2437	Reference	-1.53	-1.53	---	PASS
			30~1000	30~1000	-58.258	<=-21.527	PASS
			1000~26500	1000~26500	-49.192	<=-21.527	PASS
		2462	Reference	-2.52	-2.52	---	PASS
			30~1000	30~1000	-57.584	<=-22.515	PASS
			1000~26500	1000~26500	-49.247	<=-22.515	PASS
11G	Ant1	2412	Reference	-4.83	-4.83	---	PASS
			30~1000	30~1000	-57.835	<=-24.834	PASS
			1000~26500	1000~26500	-49.664	<=-24.834	PASS
		2437	Reference	-3.39	-3.39	---	PASS
			30~1000	30~1000	-58.279	<=-23.388	PASS
			1000~26500	1000~26500	-49.707	<=-23.388	PASS
		2462	Reference	-9.94	-9.94	---	PASS
			30~1000	30~1000	-57.652	<=-29.935	PASS
			1000~26500	1000~26500	-48.854	<=-29.935	PASS
11N20SISO	Ant1	2412	Reference	-4.42	-4.42	---	PASS
			30~1000	30~1000	-57.241	<=-24.417	PASS
			1000~26500	1000~26500	-49.704	<=-24.417	PASS
		2437	Reference	-3.61	-3.61	---	PASS
			30~1000	30~1000	-57.126	<=-23.607	PASS
			1000~26500	1000~26500	-49.084	<=-23.607	PASS
		2462	Reference	-3.64	-3.64	---	PASS
			30~1000	30~1000	-57.545	<=-23.644	PASS
			1000~26500	1000~26500	-49.592	<=-23.644	PASS

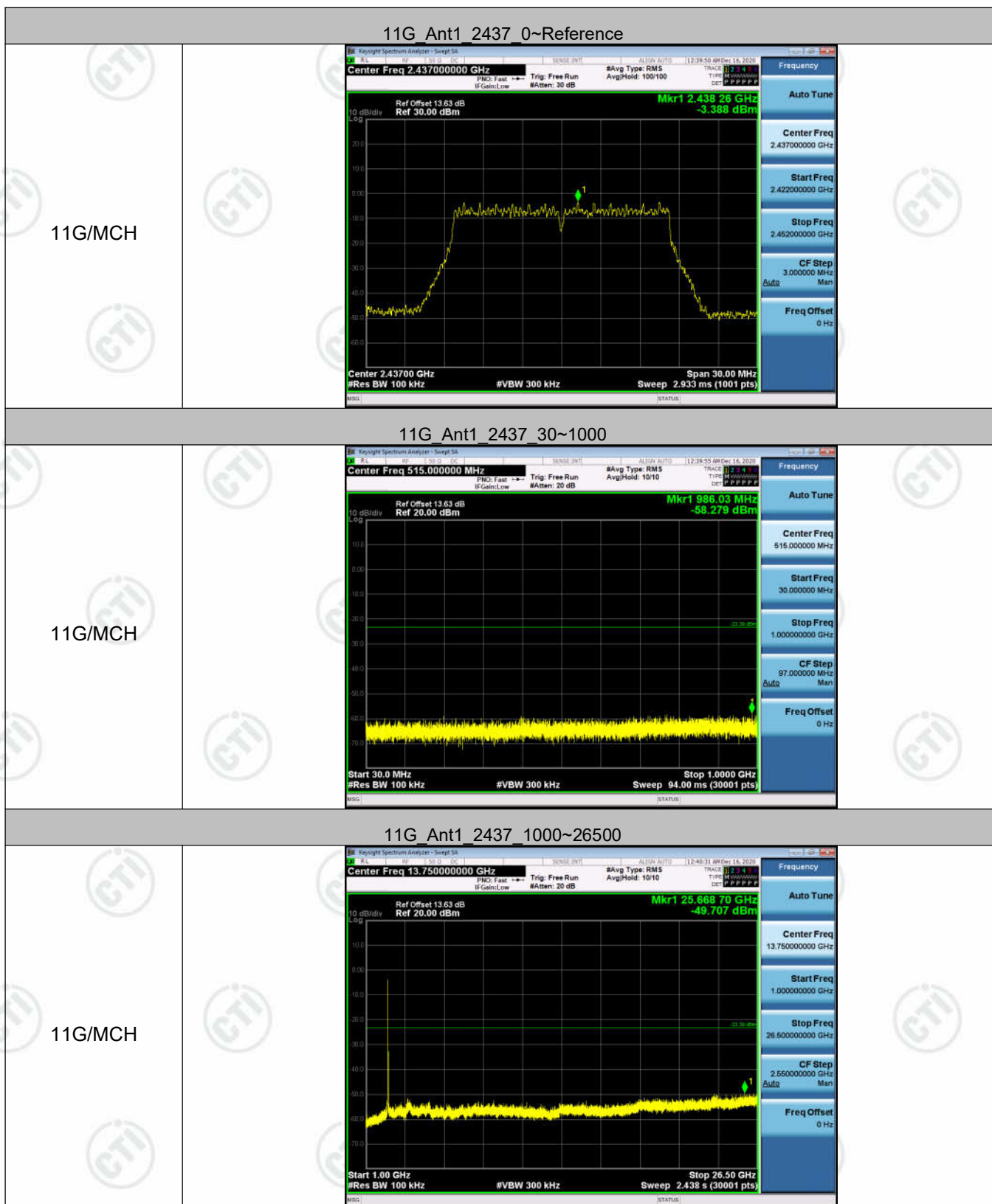
Test Graph

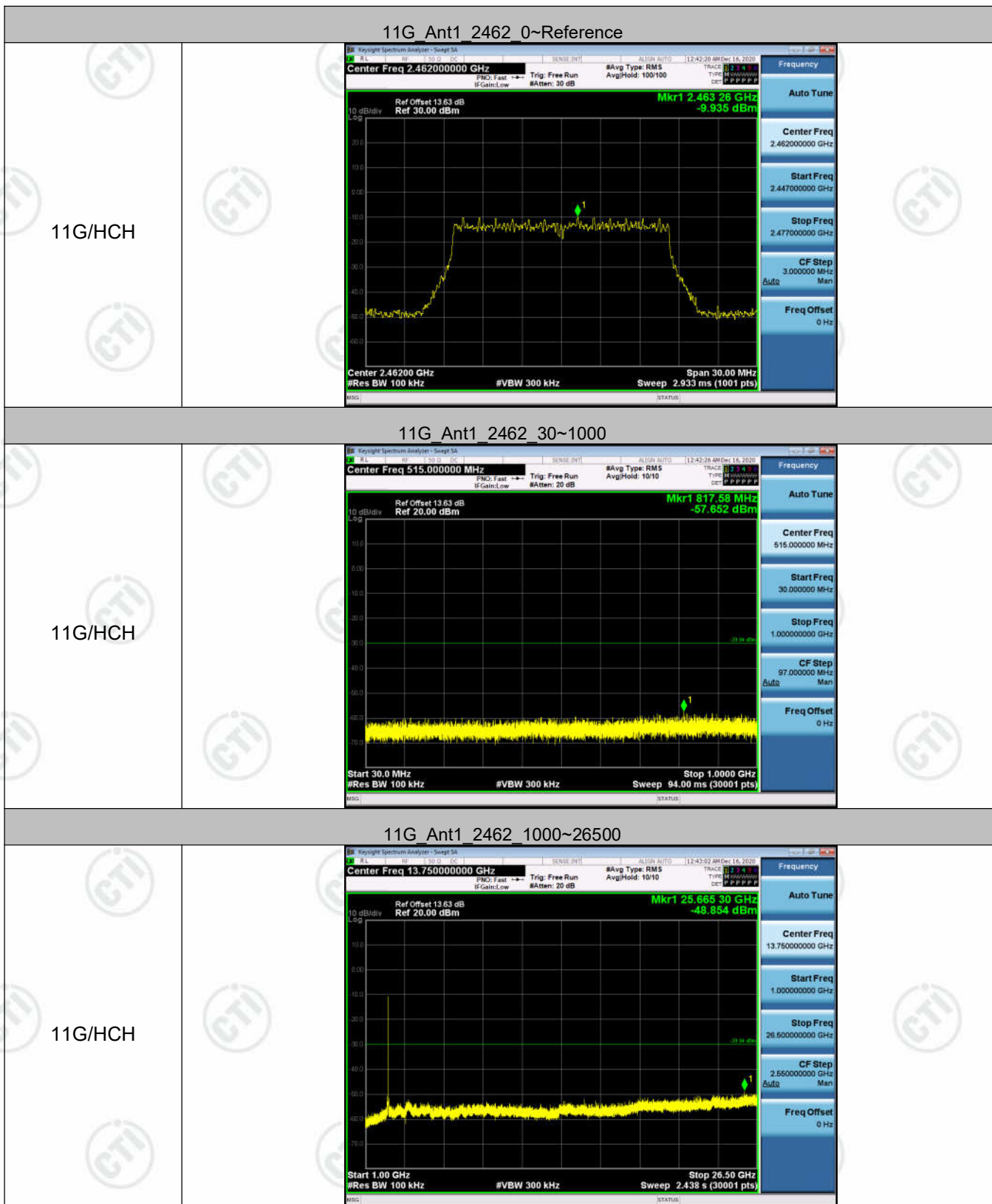


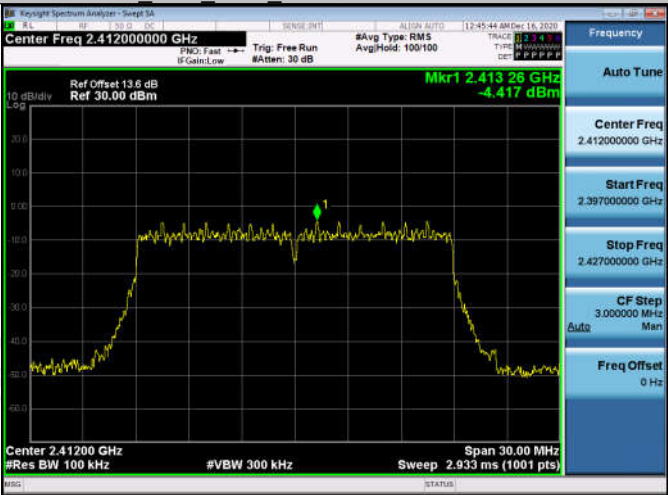
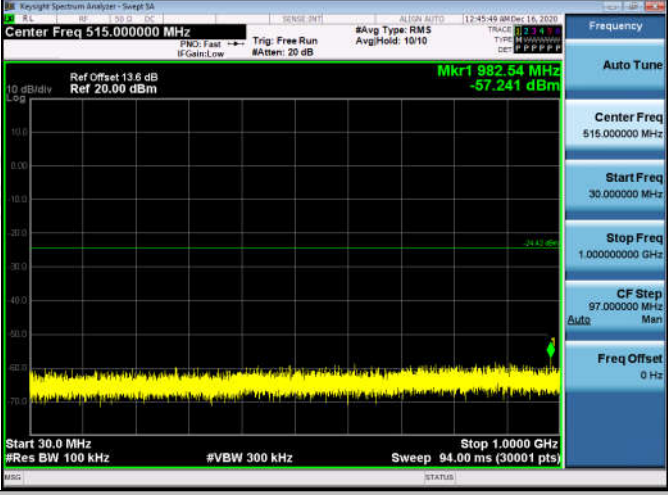
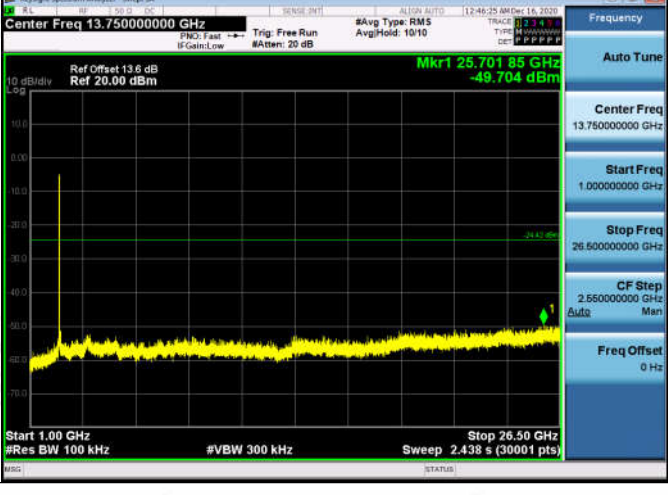




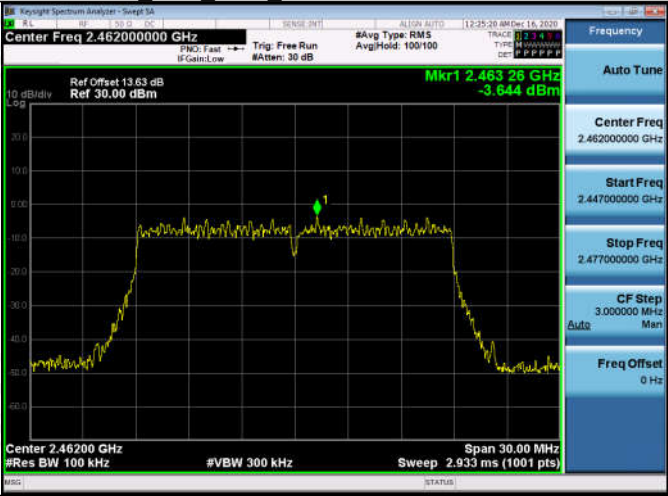
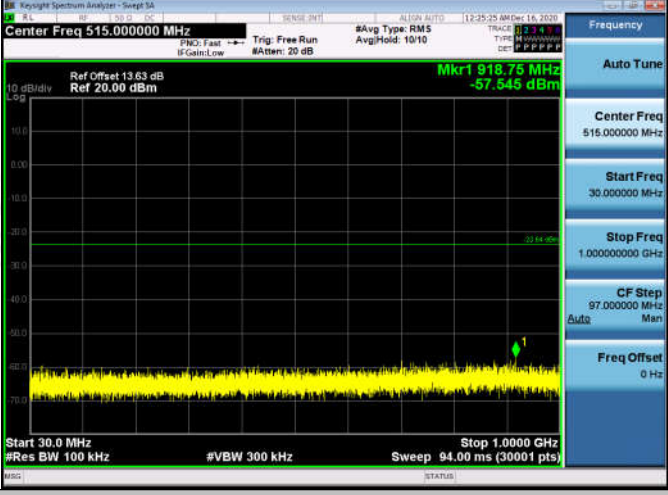
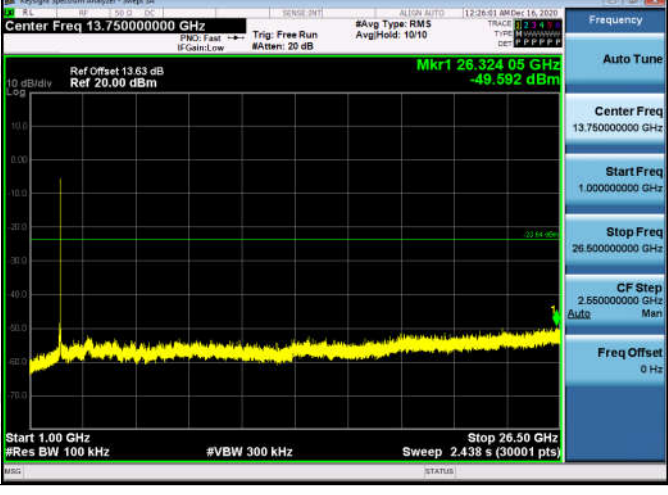






11N20SISO Ant1 2412 0~Reference	
11N20SISO/LCH	 Key parameters from screenshot: - Center Freq: 2.412000000 GHz - Ref Offset: 13.6 dB - Ref: 30.00 dBm - Mkr1: 2.41326 GHz, -4.417 dBm - Span: 30.00 MHz #Res BW: 100 kHz #VBW: 300 kHz - Sweep: 2.933 ms (1001 pts)
11N20SISO Ant1 2412 30~1000	
11N20SISO/LCH	 Key parameters from screenshot: - Center Freq: 515.0000000 MHz - Ref Offset: 13.6 dB - Ref: 20.00 dBm - Mkr1: 982.54 MHz, -57.241 dBm - Start: 30.0 MHz - Stop: 1.0000 GHz #Res BW: 100 kHz #VBW: 300 kHz - Sweep: 94.00 ms (30001 pts)
11N20SISO Ant1 2412 1000~26500	
11N20SISO/LCH	 Key parameters from screenshot: - Center Freq: 13.750000000 GHz - Ref Offset: 13.6 dB - Ref: 20.00 dBm - Mkr1: 25.70185 GHz, -49.704 dBm - Start: 1.00 GHz - Stop: 26.50 GHz #Res BW: 100 kHz #VBW: 300 kHz - Sweep: 2.438 s (30001 pts)

11N20SISO Ant1 2437 0~Reference	
11N20SISO/MCH	
11N20SISO Ant1 2437 30~1000	
11N20SISO/MCH	
11N20SISO Ant1 2437 1000~26500	
11N20SISO/MCH	

11N20SISO Ant1 2462 0~Reference	
11N20SISO/HCH	
11N20SISO Ant1 2462 30~1000	
11N20SISO/HCH	
11N20SISO Ant1 2462 1000~26500	
11N20SISO/HCH	

Appendix E): Power Spectral Density

Test Limit

According to §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.

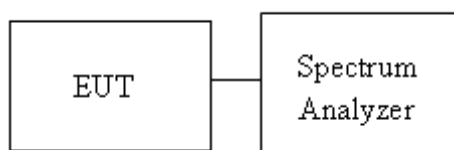
Limit	☒ Antenna not exceed 6 dBi: 8dBm ☐ Antenna with DG greater than 6 dBi: [Limit = 8 – (DG – 6)] ☐ Point-to-point operation:
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Test Procedure

Test method Refer as KDB 558074 D01.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss was compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

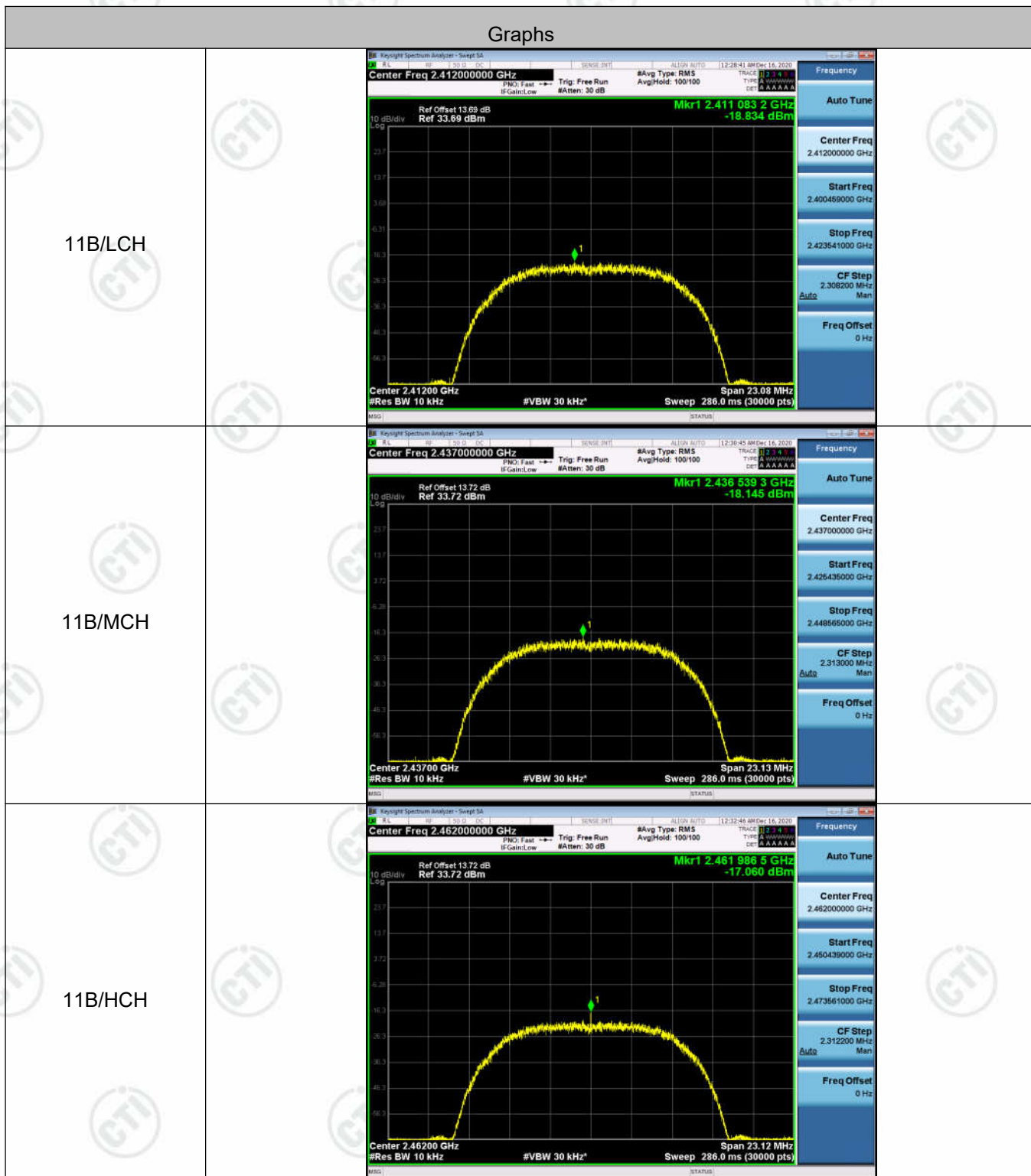
Test Setup

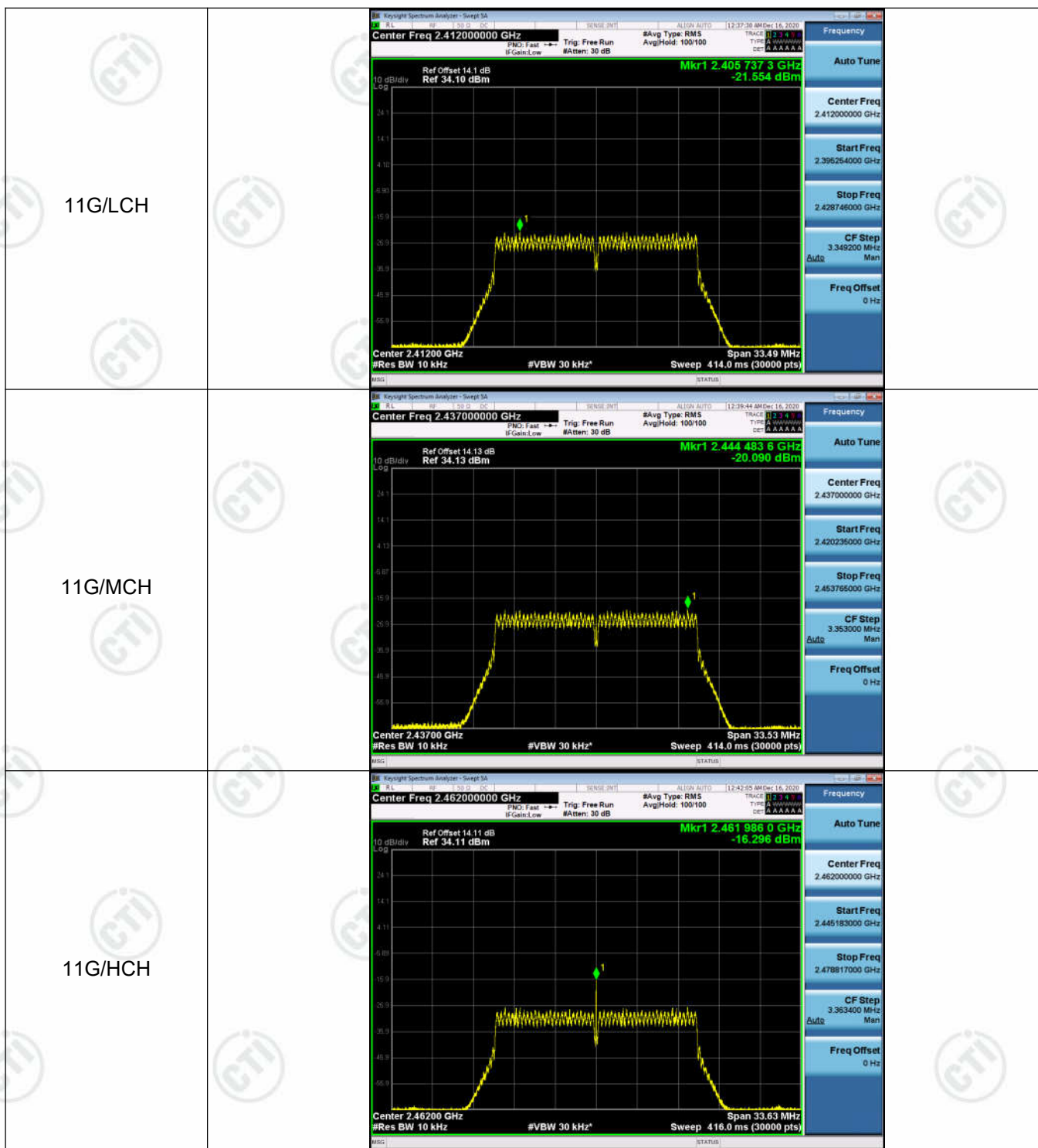


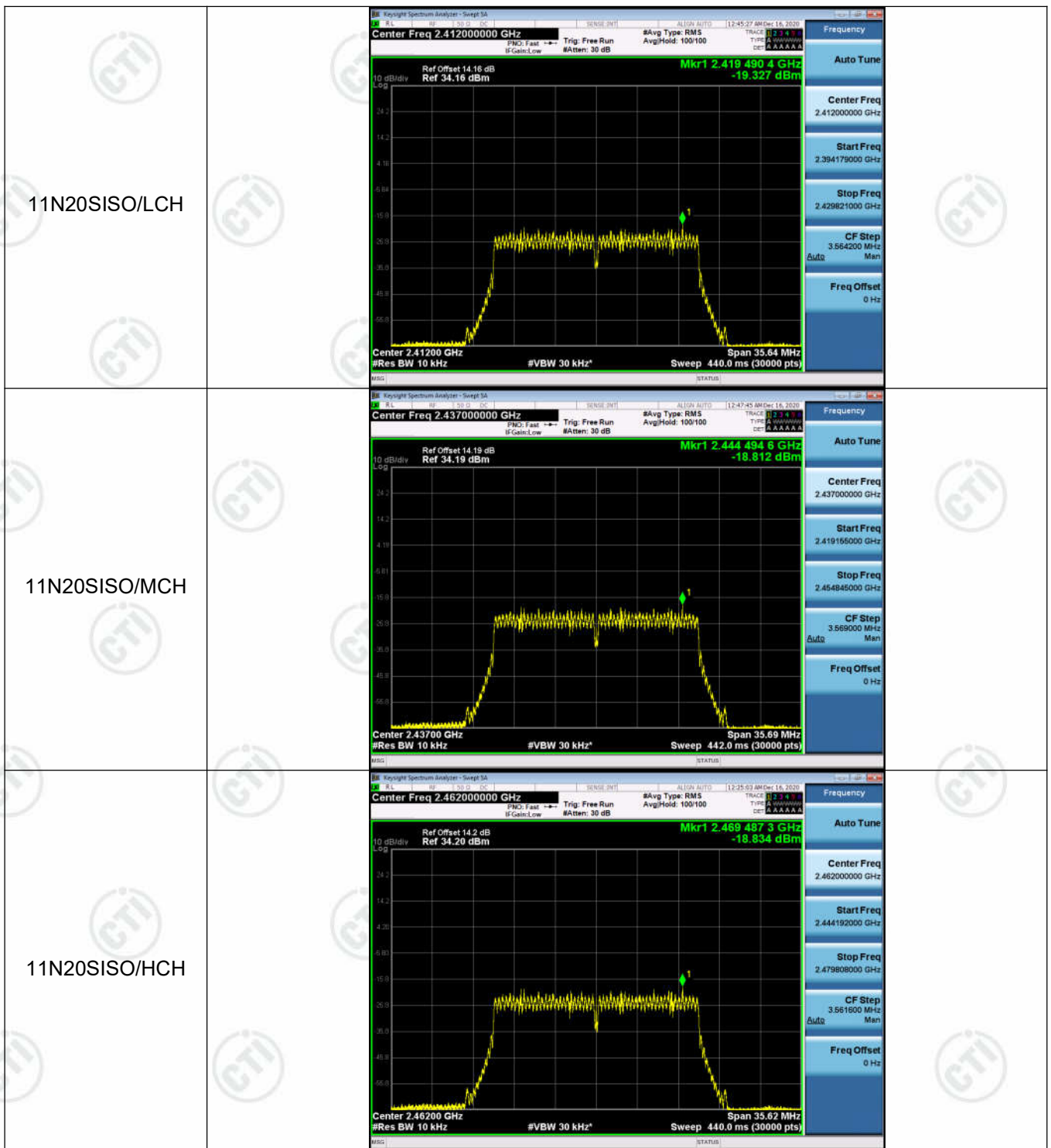
Result Table

Mode	Channel	Power Spectral Density [dBm]	Verdict
11B	LCH	-18.83	PASS
11B	MCH	-18.15	PASS
11B	HCH	-17.06	PASS
11G	LCH	-21.55	PASS
11G	MCH	-20.09	PASS
11G	HCH	-16.3	PASS
11N20SISO	LCH	-19.33	PASS
11N20SISO	MCH	-18.81	PASS
11N20SISO	HCH	-18.83	PASS

Test Graph







Appendix F): Antenna Requirement

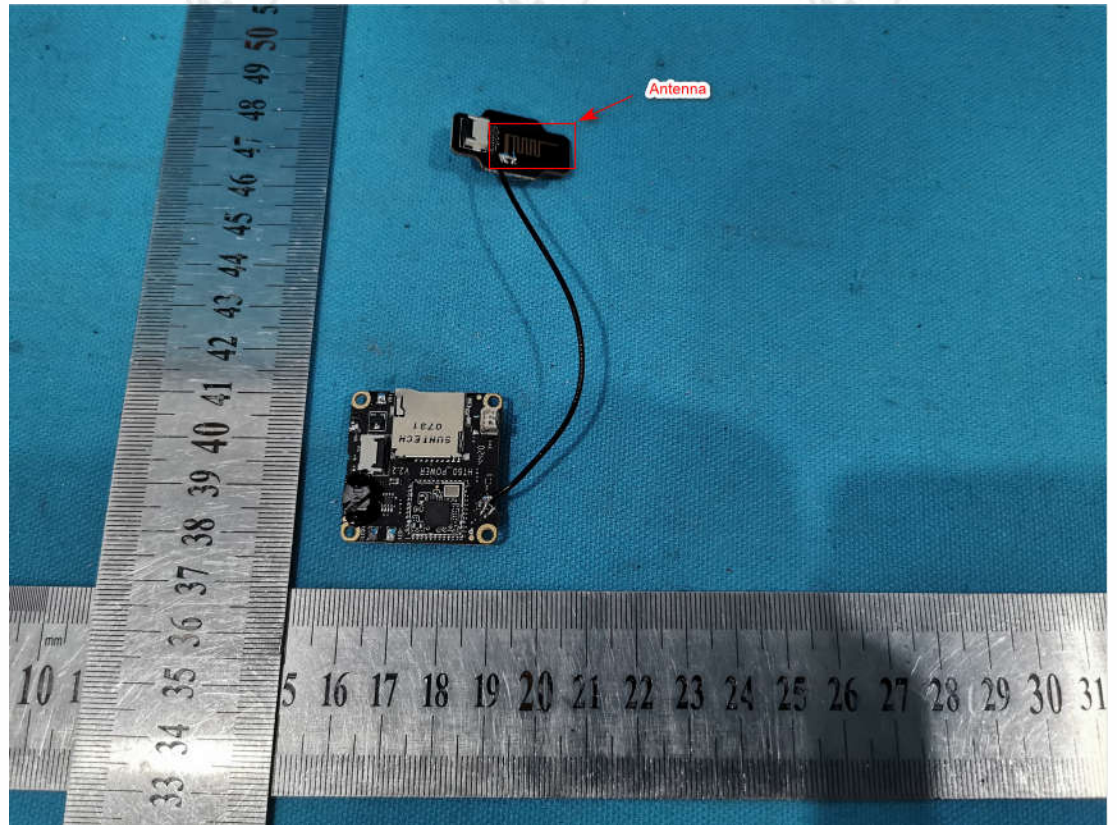
15.203 requirement:

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, 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:



The antenna is PCB Antenna . The best case gain of the antenna is 0 dBi.

Appendix G): AC Power Line Conducted Emission

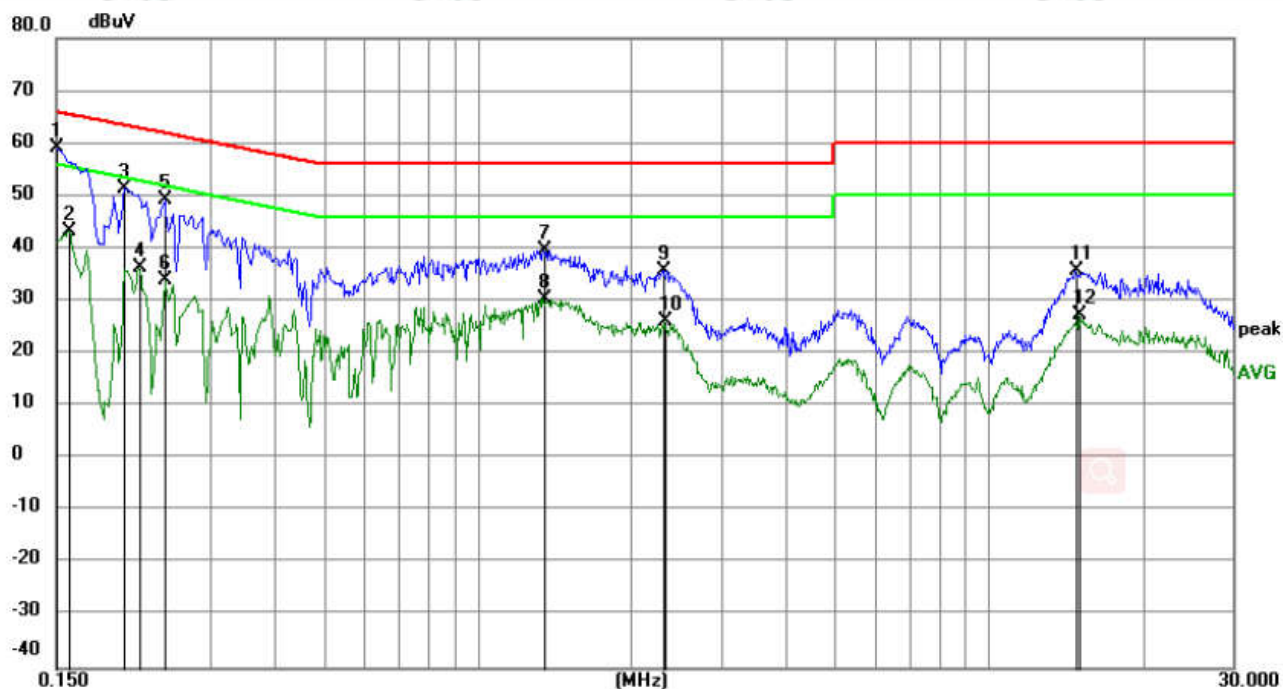
Test Procedure:	Test frequency range :150KHz-30MHz 1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.															
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBμV)</th></tr> <tr> <th>Quasi-peak</th><th>Average</th></tr> </thead> <tbody> <tr> <td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr> <tr> <td>0.5-5</td><td>56</td><td>46</td></tr> <tr> <td>5-30</td><td>60</td><td>50</td></tr> </tbody> </table> * The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. NOTE : The lower limit is applicable at the transition frequency		Frequency range (MHz)	Limit (dB μ V)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dB μ V)															
	Quasi-peak	Average														
0.15-0.5	66 to 56*	56 to 46*														
0.5-5	56	46														
5-30	60	50														

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

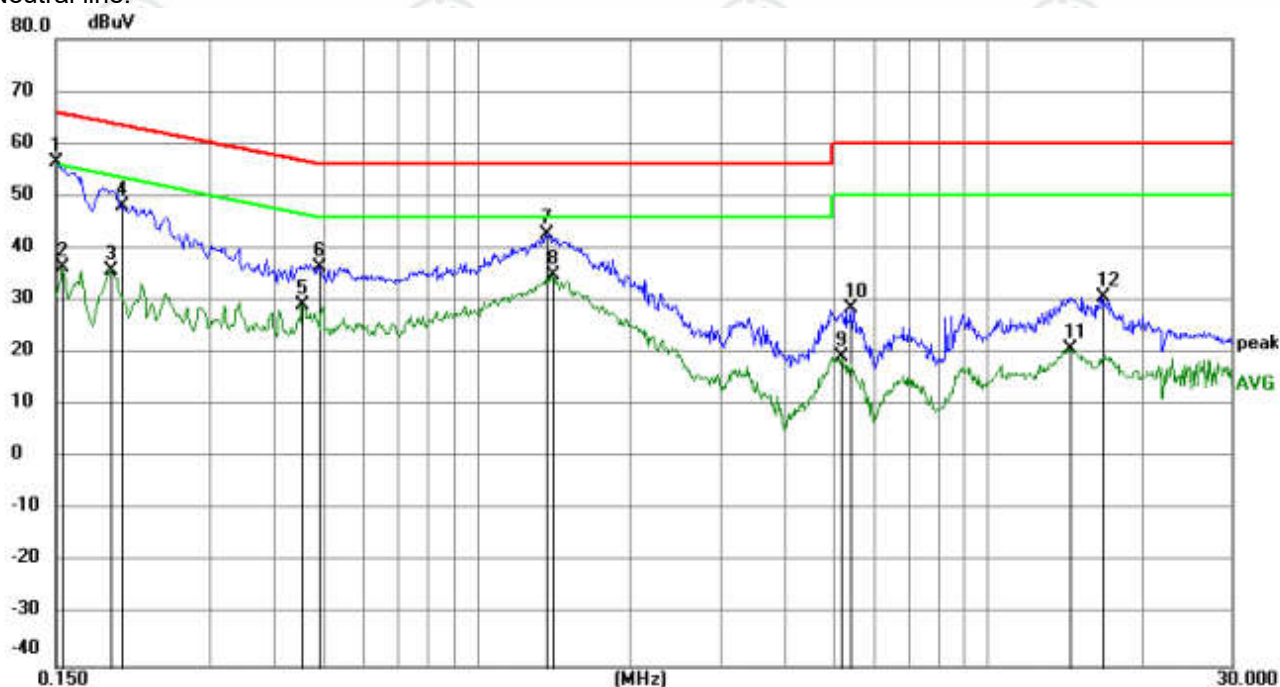
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1500	49.29	9.87	59.16	66.00	-6.84	peak	
2		0.1590	33.40	9.87	43.27	55.52	-12.25	AVG	
3		0.2038	41.41	9.88	51.29	63.45	-12.16	peak	
4		0.2174	26.58	9.90	36.48	52.92	-16.44	AVG	
5		0.2444	39.21	9.96	49.17	61.95	-12.78	peak	
6		0.2444	24.11	9.96	34.07	51.95	-17.88	AVG	
7		1.3467	29.84	9.82	39.66	56.00	-16.34	peak	
8		1.3467	20.48	9.82	30.30	46.00	-15.70	AVG	
9		2.3054	26.07	9.79	35.86	56.00	-20.14	peak	
10		2.3233	16.43	9.79	26.22	46.00	-19.78	AVG	
11		14.7568	25.78	9.92	35.70	60.00	-24.30	peak	
12		15.0630	17.47	9.93	27.40	50.00	-22.60	AVG	

Neutral line:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1500	46.46	9.87	56.33	66.00	-9.67	peak	
2		0.1544	26.35	9.87	36.22	55.76	-19.54	AVG	
3		0.1923	25.92	9.87	35.79	53.94	-18.15	AVG	
4		0.2017	38.22	9.87	48.09	63.54	-15.45	peak	
5		0.4560	19.28	9.96	29.24	46.77	-17.53	AVG	
6		0.4919	26.27	9.95	36.22	56.14	-19.92	peak	
7		1.3693	32.92	9.82	42.74	56.00	-13.26	peak	
8		1.4053	25.00	9.81	34.81	46.00	-11.19	AVG	
9		5.1764	9.57	9.78	19.35	50.00	-30.65	AVG	
10		5.3925	18.71	9.78	28.49	60.00	-31.51	peak	
11		14.4644	10.93	9.91	20.84	50.00	-29.16	AVG	
12		16.8270	20.63	9.94	30.57	60.00	-29.43	peak	

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

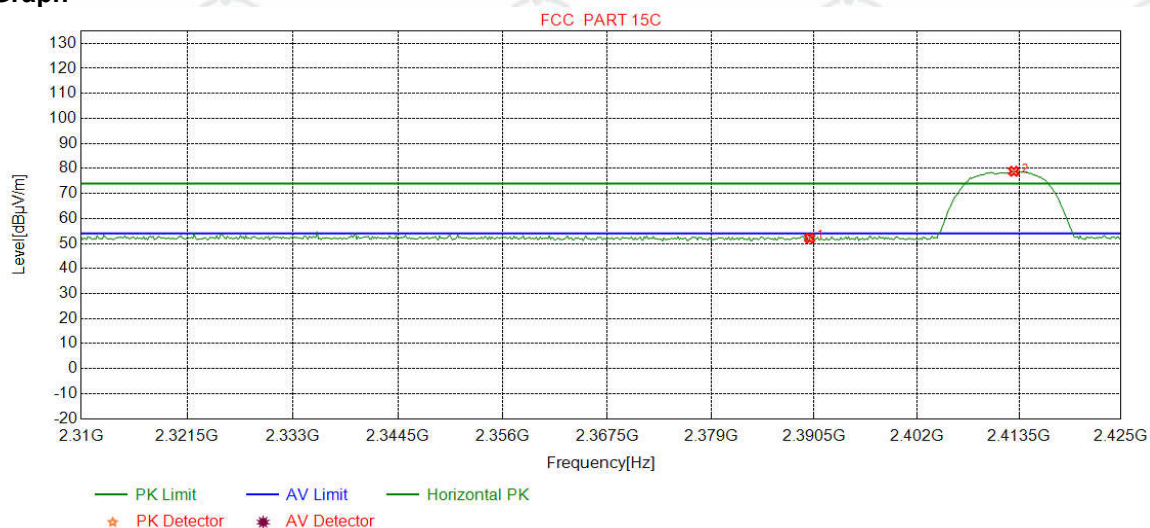
Appendix H): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Test Procedure:	Below 1GHz test procedure as below: Test method Refer as KDB 558074 D01 - The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. - The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. - The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. - For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. - The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. - Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel Above 1GHz test procedure as below: - Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter). - Test the EUT in the lowest channel , the Highest channel - The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. - Repeat above procedures until all frequencies measured was complete.				
Limit:	Frequency	Limit (dBμV/m @3m)	Remark		
	30MHz-88MHz	40.0	Quasi-peak Value		
	88MHz-216MHz	43.5	Quasi-peak Value		
	216MHz-960MHz	46.0	Quasi-peak Value		
	960MHz-1GHz	54.0	Quasi-peak Value		
	Above 1GHz	54.0	Average Value		
		74.0	Peak Value		

Test plot as follows:

Mode:	802.11 b Transmitting	Channel:	2412
Remark:	PK		

Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	49.63	52.13	74.00	21.87	Pass	Horizontal
2	2412.9099	32.28	13.36	-43.12	76.33	78.85	74.00	-4.85	Pass	Horizontal