

TEST REPORT

Product : Smart Helmet
Trade mark : K wearable
Model/Type reference : KC-N901
Serial Number : N/A
Report Number : EED32M00050703
FCC ID : 2AVZ7KC-N901
Date of Issue : Jun. 03, 2020
Test Standards : 47 CFR Part 15 Subpart C
Test result : PASS

Prepared for:

Shenzhen Kuang-Chi Space Technology Co., Ltd
301-B077, Building 2, No.1, Mawu Road,
Baoan Community, Longgang District,
Shenzhen, Guangdong, China

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
Shenzhen, Guangdong, China

TEL: +86-755-3368 3668
FAX: +86-755-3368 3385

Compiled by:

Sunlight Sun

Reviewed by:

Ware Xin

Approved by:

Sunlight Sun

Sam Chuang

Sam Chuang

Date:

Ware Xin

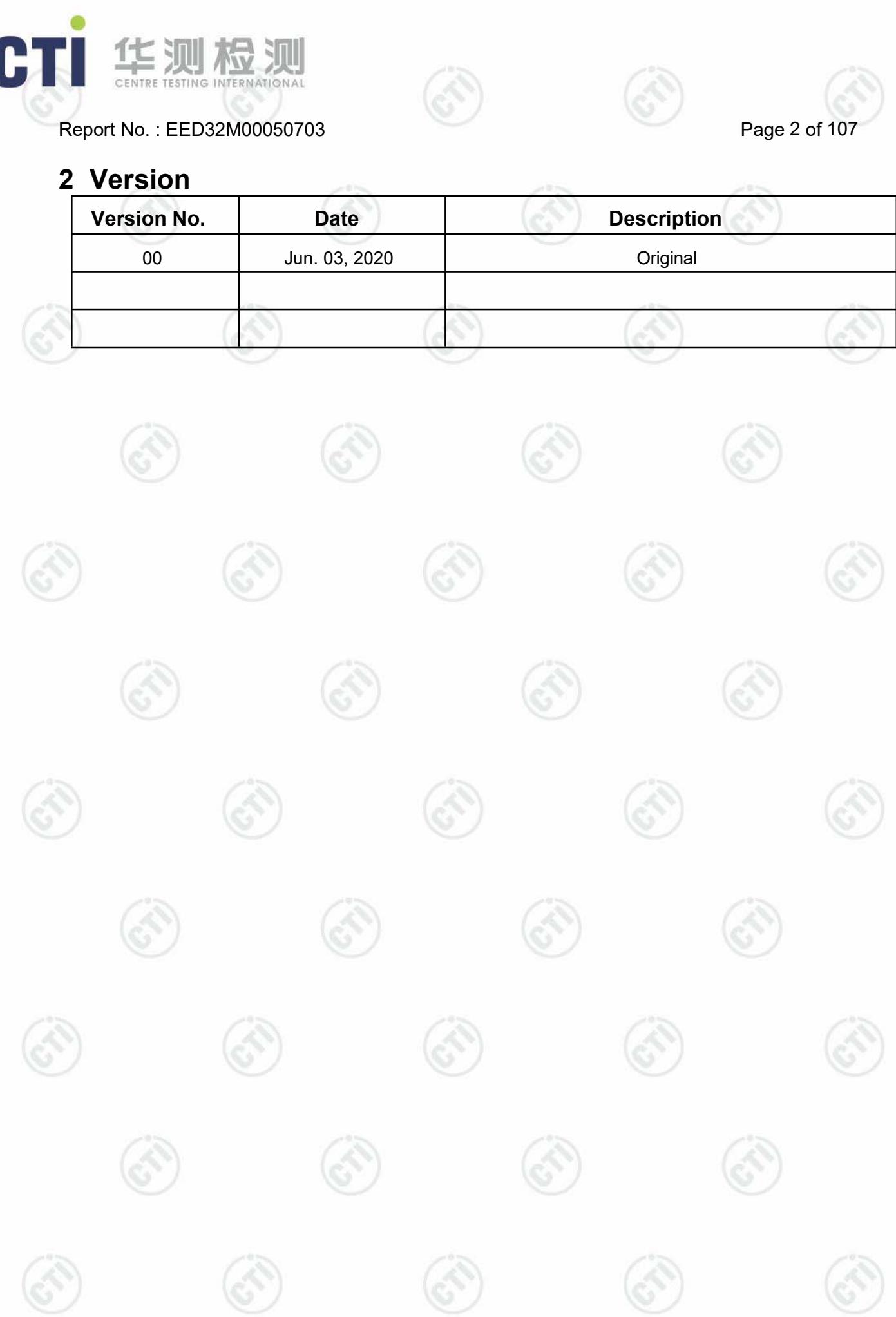
Jun. 03, 2020

Check No.:3096344197



2 Version

Version No.	Date	Description
00	Jun. 03, 2020	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.

The tested sample(s) and the sample information are provided by the client.

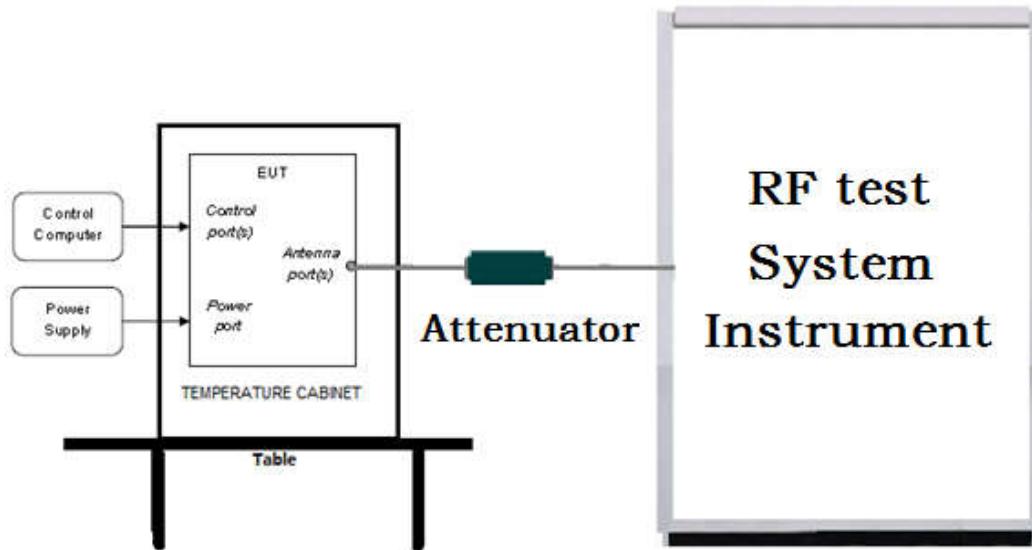
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5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

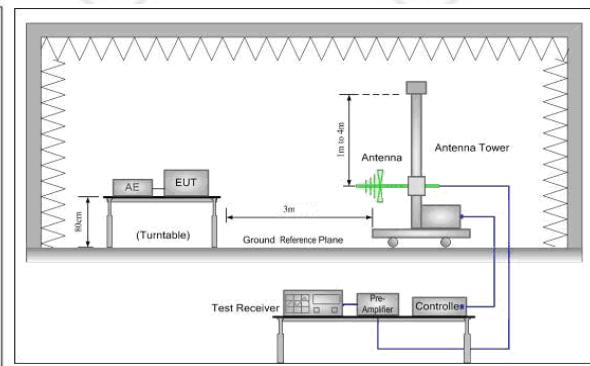
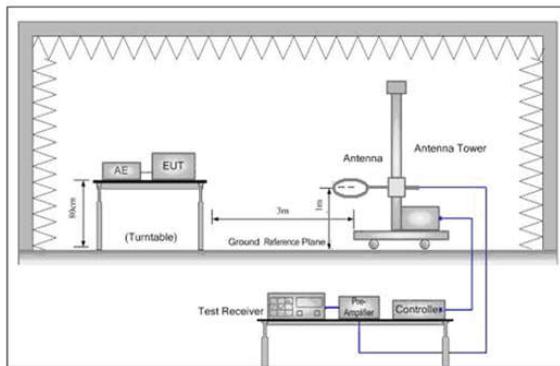


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

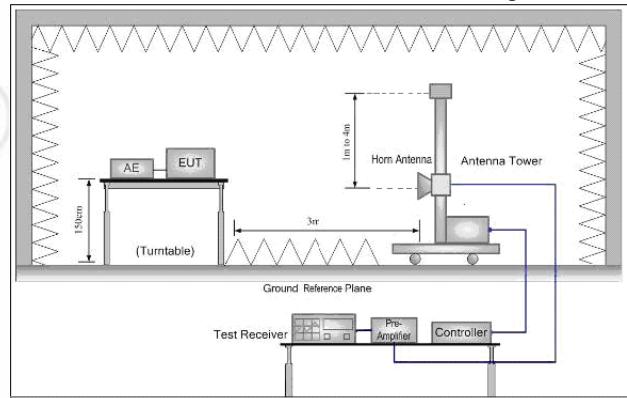
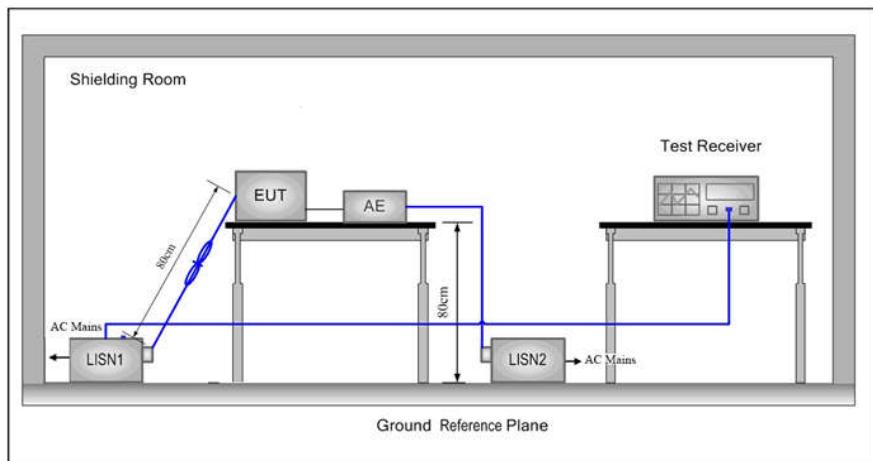


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:

Temperature:	24 °C
Humidity:	53 % 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	Channel 11
		2412MHz	2437MHz	2462MHz
802.11n(HT40)	2422MHz ~2452 MHz	Channel 3	Channel 6	Channel 9
		2422MHz	2437MHz	2452MHz
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.			

Test mode:

Test mode:

Pre-scan under all rate at lowest channel 1

Mode	802.11b								
Data Rate	1Mbps	2Mbps	5.5Mbps	11Mbps					
Power(dBm)	18.01	18.00	17.99	17.95					
Mode	802.11g								
Data Rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
Power(dBm)	17.44	17.40	17.38	17.35	17.30	17.29	17.25	17.20	
Mode	802.11n (HT20)								
Data Rate	6.5Mbps	13Mbps	19.5Mbps	26Mbps	39Mbps	52Mbps	58.5Mbps	65Mbps	
Power(dBm)	16.12	16.10	15.99	15.96	15.93	15.90	15.88	15.85	
Mode	802.11n (HT40)								
Data Rate	13.5Mbps	27Mbps	40.5Mbps	54Mbps	81Mbps	108Mbps	121.5Mbps	135Mbps	
Power(dBm)	15.23	15.20	15.18	15.15	15.12	15.10	15.08	15.05	

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); 13.5Mbps of rate is the worst case of 802.11n(HT40).

6 General Information

6.1 Client Information

Applicant:	Shenzhen Kuang-Chi Space Technology Co., Ltd
Address of Applicant:	301-B077, Building 2, No.1, Mawu Road, Baoan Community, Longgang District, Shenzhen, Guangdong, China
Manufacturer:	Shenzhen Kuang-Chi Space Technology Co., Ltd.
Address of Manufacturer:	301-B077, Building 2, No.1, Mawu Road, Baoan Community, Longgang District, Shenzhen, Guangdong, China
Factory:	Shenzhen Kuang-Chi Space Technology Co., Ltd
Address of Factory:	301-B077, Building 2, No.1, Mawu Road, Baoan Community, Longgang District, Shenzhen, Guangdong, China

6.2 General Description of EUT

Product Name:	Smart Helmet			
Model No.(EUT):	KC-N901			
Trade Mark:	 wearable			
EUT Supports Radios application:	Wi-Fi IEEE 802.11 b/g/n(HT20)(HT40), 2412MHz to 2462MHz			
Power Supply:	LI-ION BATTERY	RATED CAPACITY 5000mAh (19Wh) TYPICAL CAPACITY 5100mAh (19.38Wh) NOMINAL VOLTAGE: 3.8V --- LIMITED CHARGE VOLTAGE: 4.35 --- MODEL: GQ-V496594P		
Sample Received Date:	Mar.18, 2020			
Sample tested Date:	Mar.18, 2020 to May 06, 2020			

6.3 Product Specification subjective to this standard

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
Type of Modulation:	DSSS, OFDM
Test Power Grade:	Refence Table
Test Software of EUT:	Engineering Order *###9646633##*(manufacturer declare)
Antenna Type and Gain:	Type: monopole antenna Gain: 3 dBi
Test Voltage:	BATTERY 3.8V

Operation Frequency each of channel(802.11b/g/n HT20)							
Channel	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		
Operation Frequency each of channel(802.11n HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
3	2422MHz	6	2437MHz	9	2452MHz		
4	2427MHz	7	2442MHz				
5	2432MHz	8	2447MHz				

Table 1:

Mode	Channel	Frequency	Data Rate	Power Setting
b	1	2412	1 Mbps	25
	6	2437		20
	11	2462		20
g	1	2412	6 Mbps	14.5
	6	2437		13.5
	11	2462		14
n20	1	2412	MCS 0	13.5
	6	2437		12.5
	11	2462		13
n40	3	2422	MCS 0	11.5
	6	2437		11.5
	9	2452		11.5

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

Communication RF test system					
Equipment	Manufacturer	Model No.	Serial Number	Cal. Date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Spectrum Analyzer	Agilent	E4440A	MY46185649	11-05-2019	11-04-2020
Communication test set	R&S	CMW200	111935	02-17-2020	02-16-2021
Signal Generator	Keysight	E8257D	MY53401106	02-17-2020	02-16-2021
Communication test set	R&S	CMW500	152394	02-17-2020	02-16-2021
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	---	---
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	---	---
band rejection filter	Sinoscite	FL5CX01CA09C L12-0395-001	---	---	---
band rejection filter	Sinoscite	FL5CX01CA08C L12-0393-001	---	---	---
band rejection filter	Sinoscite	FL5CX02CA04C L12-0396-002	---	---	---
band rejection filter	Sinoscite	FL5CX02CA03C L12-0394-001	---	---	---
DC Power	Keysight	E3642A	MY55156236	02-17-2020	02-16-2021
DC Power	Keysight	E3642A	MY56376035	02-17-2020	02-16-2021
PC-2	Lenovo	R4960d	---	---	---
PC-3	Lenovo	R4960d	---	---	---
RF control unit	JS Tonscend	JS0806-1	158060004	02-17-2020	02-16-2021
DC power Box	JS Tonscend	JS0806-4	158060007	---	---
LTE Automatic test software	JS Tonscend	JS1120-1	---	---	---
WCDMA Automatic test software	JS Tonscend	JS1120-3	---	---	---
GSM Automatic test software	JS Tonscend	JS1120-3	---	---	---
Temperature/ Humidity Indicator	biaozhi	HM10	1804186	07-26-2019	07-25-2020

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	05-20-2019 04-28-2020	05-19-2020 04-27-2021
Temperature/ Humidity Indicator	Defu	TH128	/	06-14-2019	06-13-2020
LISN	R&S	ENV216	100098	03-05-2020	03-04-2021
Barometer	changchun	DYM3	1188	06-20-2019	06-19-2020

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	06-19-2019	06-18-2020
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	980596	05-22-2019	05-21-2020
Communication test set	R&S	CMW500	102898	01-14-2020	01-13-2021
Preamplifier	EMCI	EMC001330	980563	05-08-2019 04-22-2020	05-07-2020 04-21-2021
Preamplifier	JS Tonscend	980380	EMC051845 SE	01-09-2020	01-08-2021
Temperature/ Humidity Indicator	biaozhi	GM1360	EE1186631	04-30-2019 04-27-2020	04-29-2020 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	---	---

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	07-26-2019	07-25-2020
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-21-2019	10-20-2020
Multi device Controller	maturo	NCD/070/107 11112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	07-26-2019	07-25-2020
Communication test set	Agilent	E5515C	GB47050534	03-01-2019	02-28-2022
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	---	---
band rejection filter	Sinoscite	FL5CX01CA0 8CL12-0393-001	---	---	---

8 Radio Technical Requirements Specification

Reference documents for testing:

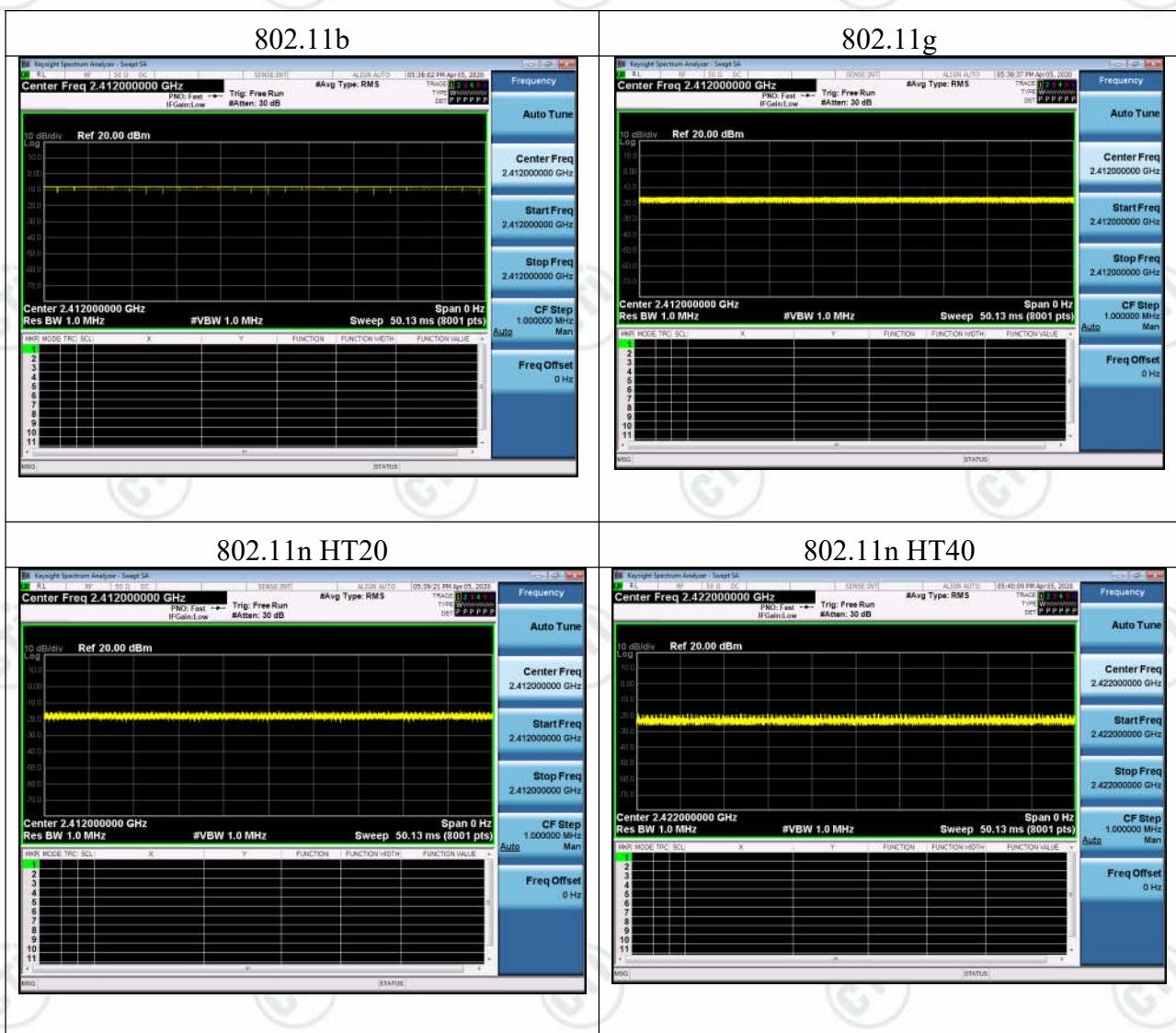
No.	Identity	Document Title
1	FCC Part 15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

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)

Duty Cycle

Duty Cycle			
Configuration	TX ON(ms)	TX ALL(ms)	Duty Cycle(%)
802.11b	1.000	1.000	100.00%
802.11g	1.000	1.000	100.00%
802.11n HT20	1.000	1.000	100.00%
802.11n HT40	1.000	1.000	100.00%



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	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 30dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : [Limit = 30 – (DG – 6)] <input type="checkbox"/> Point-to-point operation :
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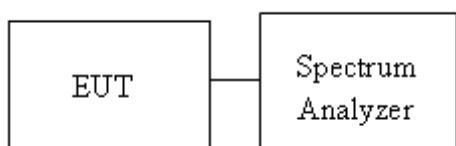
Average output power : For reporting purposes only.

Test Procedure

Test method Refer as KDB 558074 D01.

1. The EUT RF output connected to spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT.
3. Spectrum analyzer settings are as follows:
 - a) Set the RBW = 1 MHz.
 - b) Set the VBW $\geq [3 \times \text{RBW}]$.
 - c) Set the span $\geq [1.5 \times \text{DTS bandwidth}]$.
 - d) Detector = peak.
 - e) Sweep time = auto couple.
 - f) Trace mode = max hold.
 - g) Allow trace to fully stabilize.
4. Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges.
5. Measure and record the result in the test report.

Test Setup

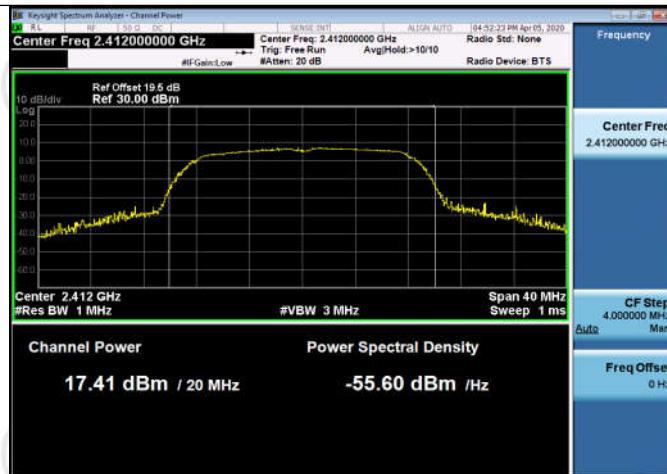
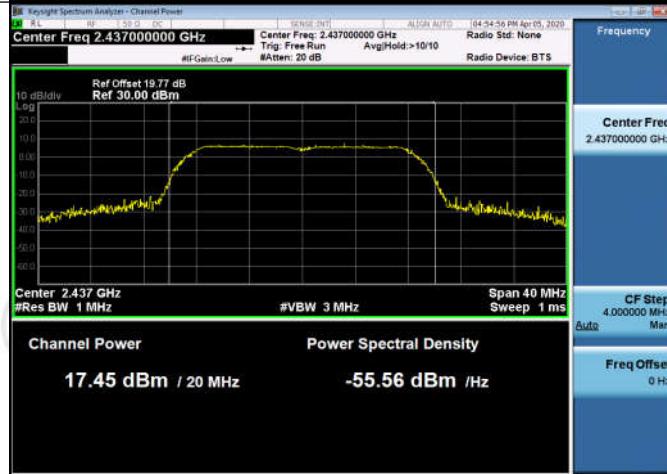
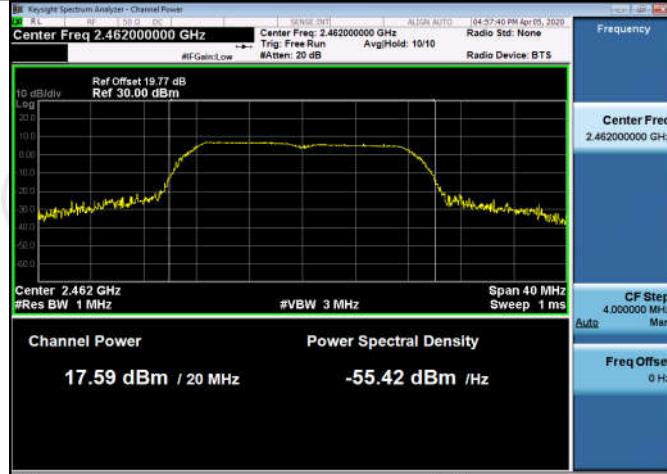


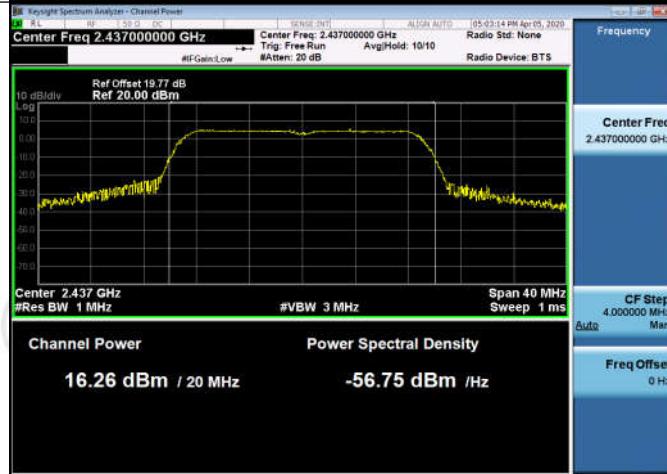
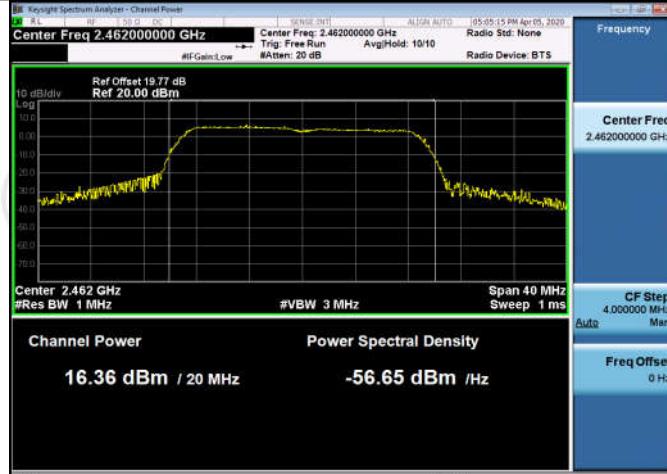
Result Table

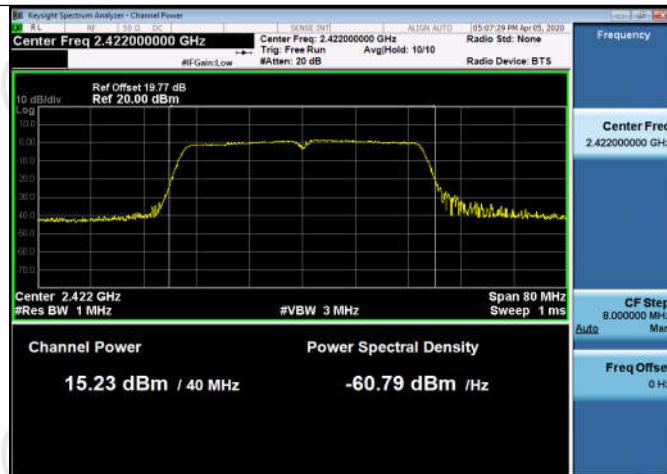
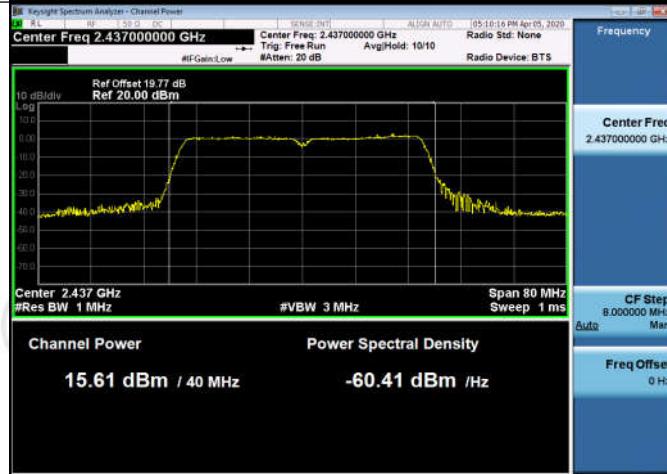
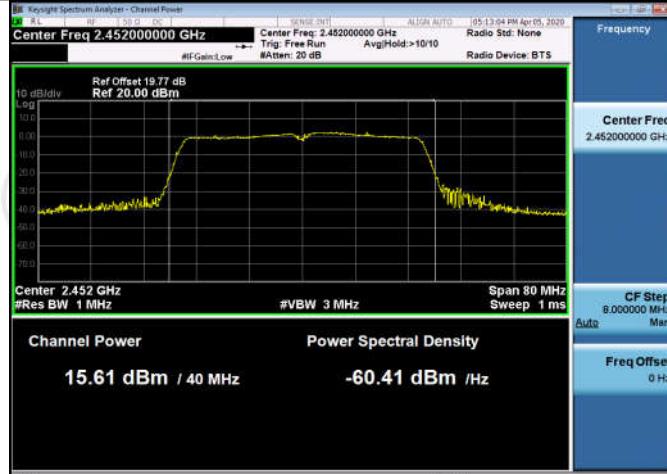
Mode	Channel	Conducted Peak Output Power [dBm]	Verdict
11B	LCH	18.01	PASS
11B	MCH	18.73	PASS
11B	HCH	18.77	PASS
11G	LCH	17.41	PASS
11G	MCH	17.45	PASS
11G	HCH	17.59	PASS
11N20SISO	LCH	16.12	PASS
11N20SISO	MCH	16.26	PASS
11N20SISO	HCH	16.36	PASS
11N40SISO	LCH	15.23	PASS
11N40SISO	MCH	15.61	PASS
11N40SISO	HCH	15.61	PASS

Test Graph



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

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

11N40SISO/LCH	
11N40SISO/MCH	
11N40SISO/HCH	

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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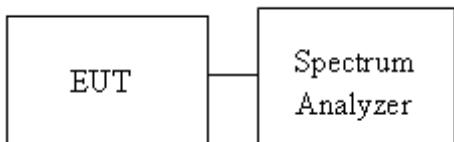
Occupied Bandwidth(99%) : For reporting purposes only.

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



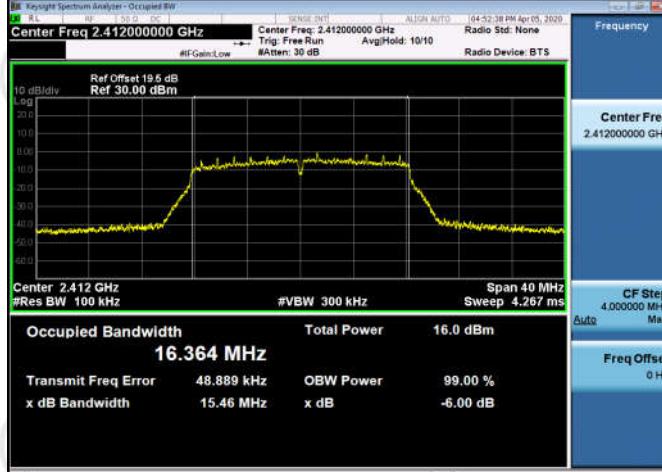
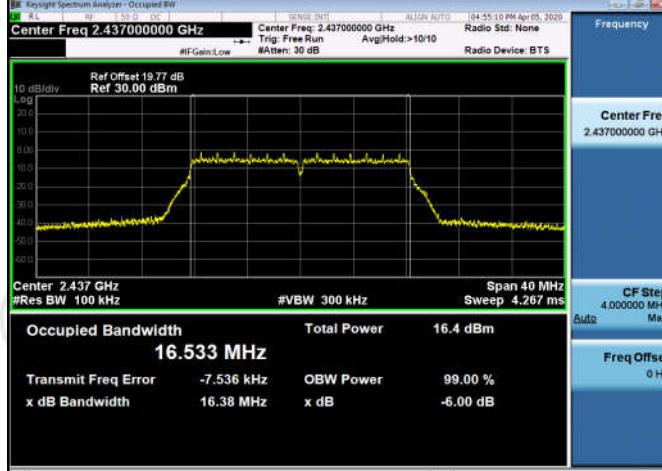
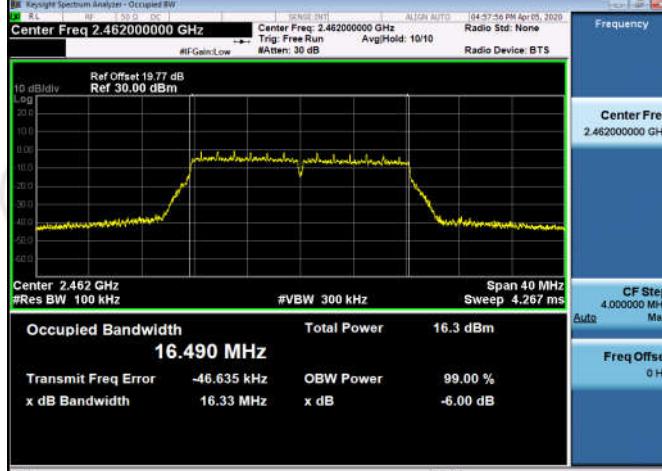
**6dB OBW
Result Table**

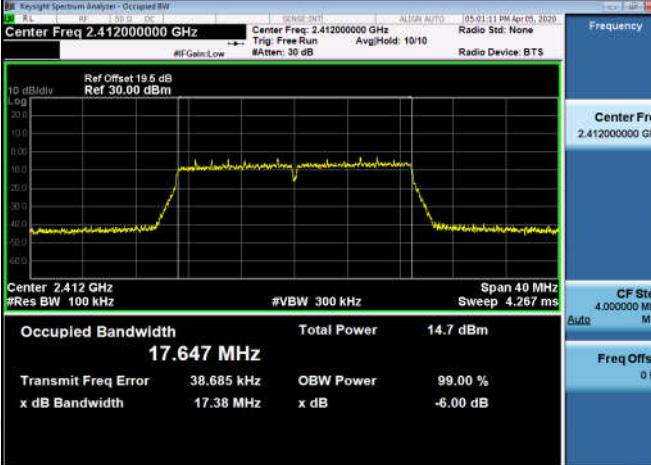
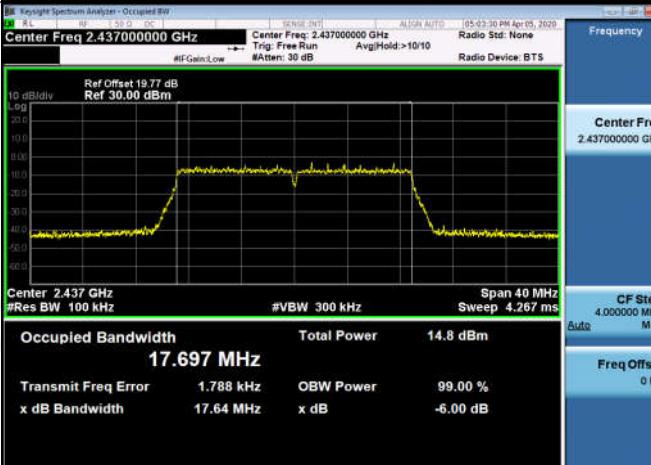
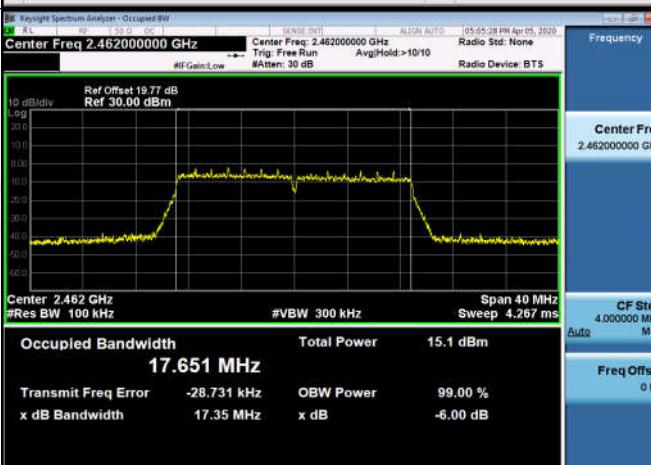
Mode	Channel	6dB Bandwidth [MHz]	Verdict
11B	LCH	9.569	PASS
11B	MCH	10.04	PASS
11B	HCH	9.543	PASS
11G	LCH	15.46	PASS
11G	MCH	16.38	PASS
11G	HCH	16.33	PASS
11N20SISO	LCH	17.38	PASS
11N20SISO	MCH	17.64	PASS
11N20SISO	HCH	17.35	PASS
11N40SISO	LCH	35.47	PASS
11N40SISO	MCH	35.75	PASS
11N40SISO	HCH	35.11	PASS

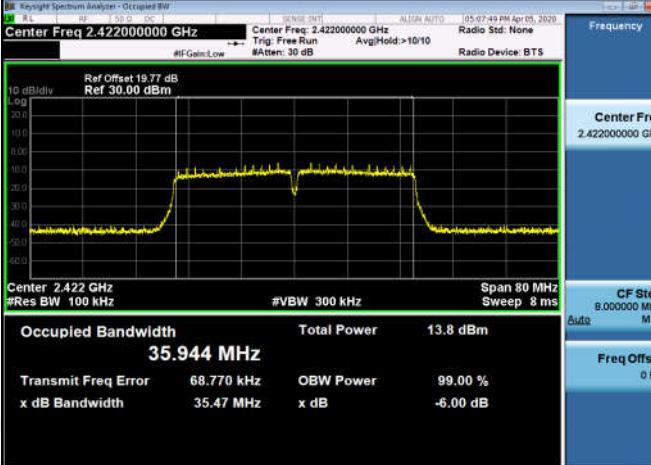
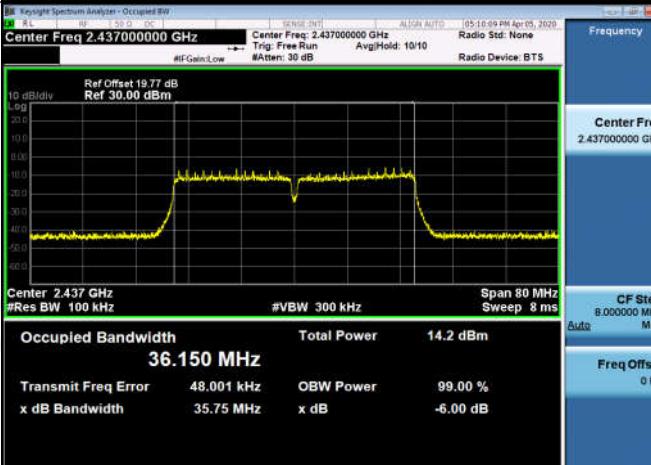
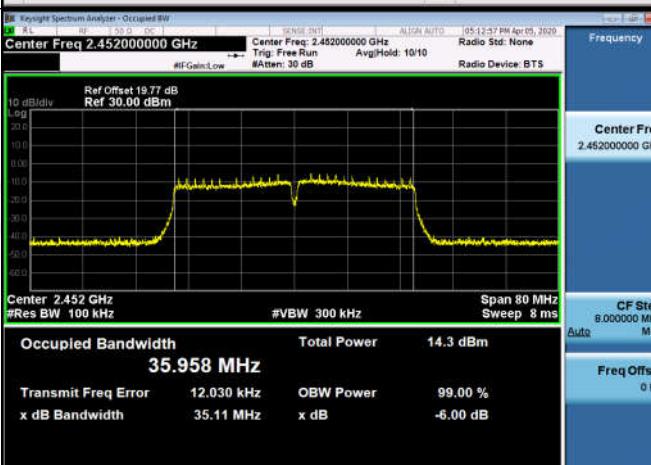
**99% OBW
Result Table**

Mode	Channel	99% OBW [MHz]	Verdict
11B	LCH	12.578	PASS
11B	MCH	12.765	PASS
11B	HCH	12.778	PASS
11G	LCH	16.489	PASS
11G	MCH	16.544	PASS
11G	HCH	16.671	PASS
11N20SISO	LCH	17.707	PASS
11N20SISO	MCH	17.768	PASS
11N20SISO	HCH	17.728	PASS
11N40SISO	LCH	36.049	PASS
11N40SISO	MCH	36.302	PASS
11N40SISO	HCH	36.087	PASS

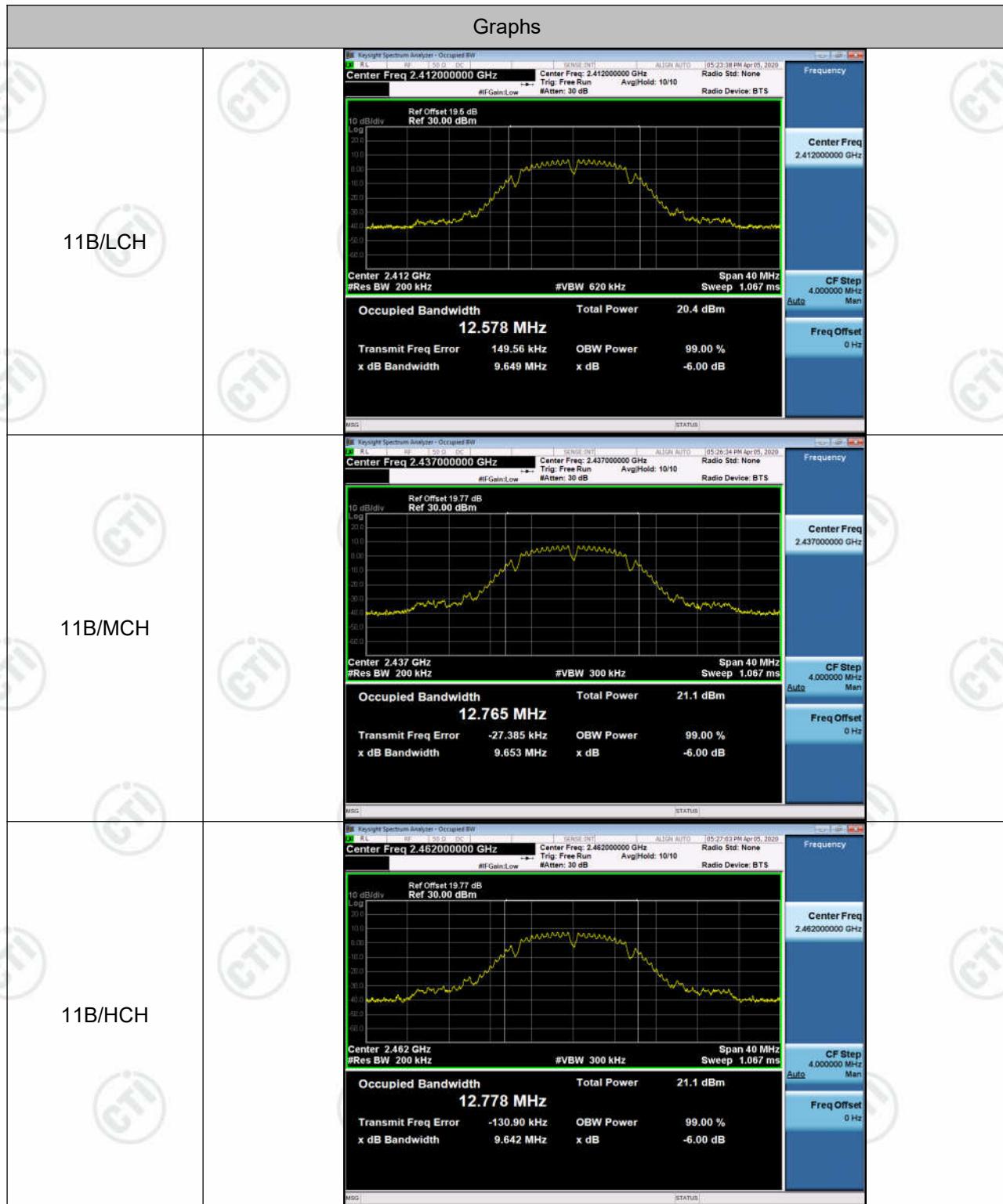
**6dB OBW
Test Graph**

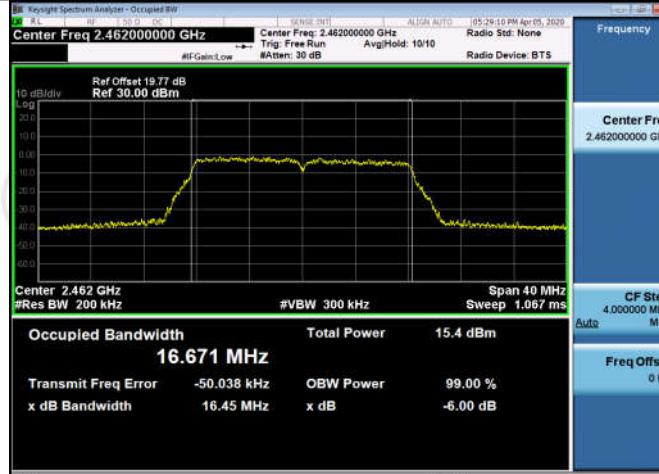

11G/LCH	
11G/MCH	
11G/HCH	

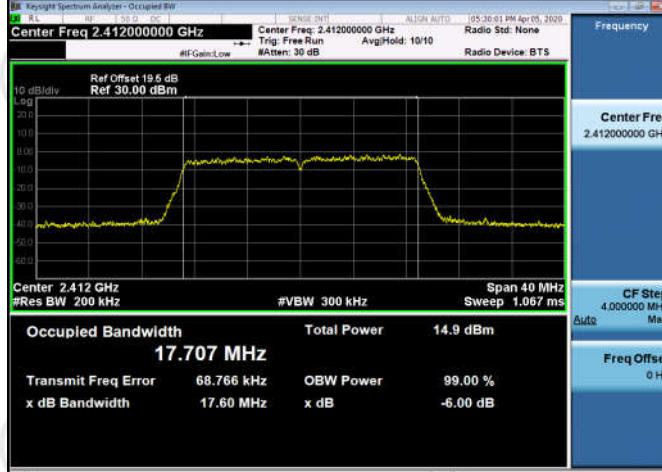
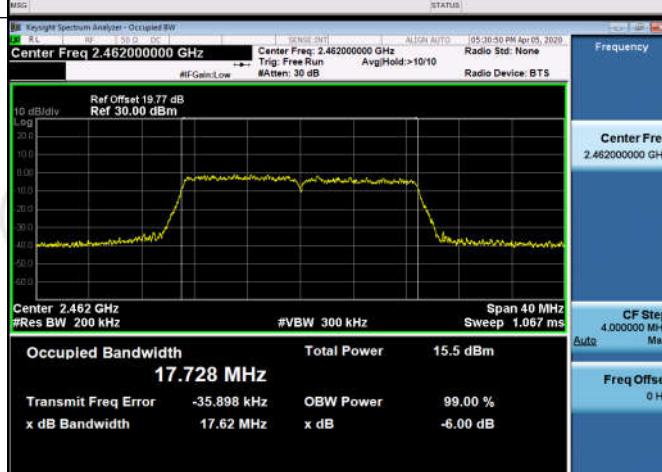
11N20SISO/LCH	 <p>Occupied Bandwidth 17.647 MHz Transmit Freq Error 38.685 kHz x dB Bandwidth 17.38 MHz</p>
11N20SISO/MCH	 <p>Occupied Bandwidth 17.697 MHz Transmit Freq Error 1.788 kHz x dB Bandwidth 17.64 MHz</p>
11N20SISO/HCH	 <p>Occupied Bandwidth 17.651 MHz Transmit Freq Error -28.731 kHz x dB Bandwidth 17.35 MHz</p>

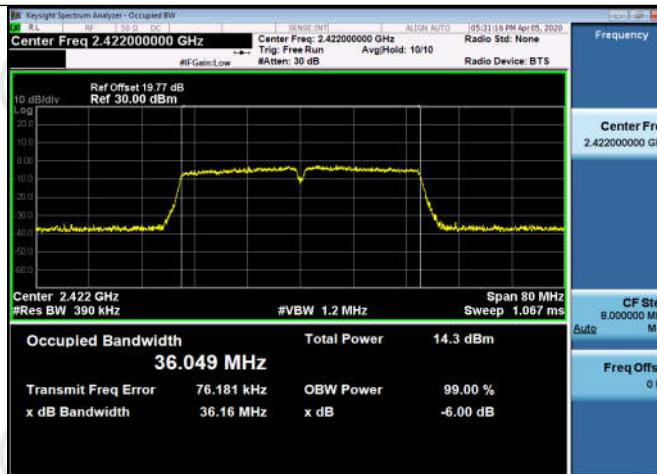
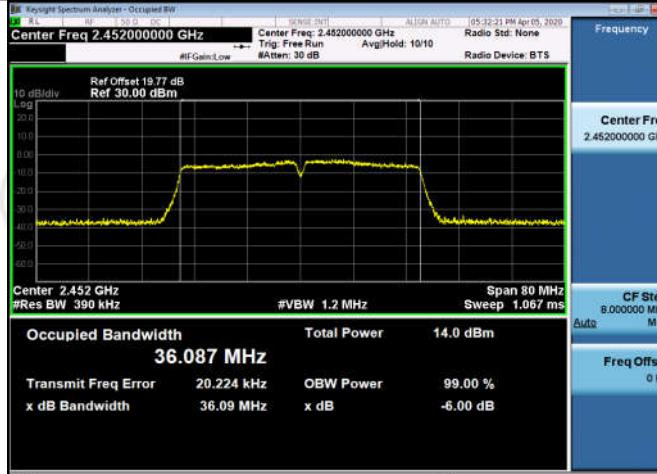
11N40SISO/LCH	
11N40SISO/MCH	
11N40SISO/HCH	

**99% OBW
Test Graph**



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

11N20SISO/LCH	 <p>Occupied Bandwidth 17.707 MHz Transmit Freq Error 68.766 kHz x dB Bandwidth 17.60 MHz</p>
11N20SISO/MCH	 <p>Occupied Bandwidth 17.768 MHz Transmit Freq Error 3.086 kHz x dB Bandwidth 17.76 MHz</p>
11N20SISO/HCH	 <p>Occupied Bandwidth 17.728 MHz Transmit Freq Error -35.898 kHz x dB Bandwidth 17.62 MHz</p>

11N40SISO/LCH	 <p>Occupied Bandwidth 36.049 MHz Transmit Freq Error 76.181 kHz x dB Bandwidth 36.16 MHz</p>
11N40SISO/MCH	 <p>Occupied Bandwidth 36.302 MHz Transmit Freq Error 100.20 kHz x dB Bandwidth 36.32 MHz</p>
11N40SISO/HCH	 <p>Occupied Bandwidth 36.087 MHz Transmit Freq Error 20.224 kHz x dB Bandwidth 36.09 MHz</p>

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,

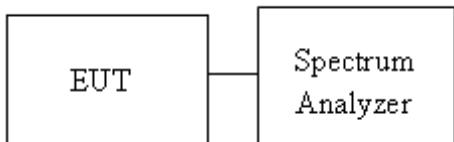
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

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.

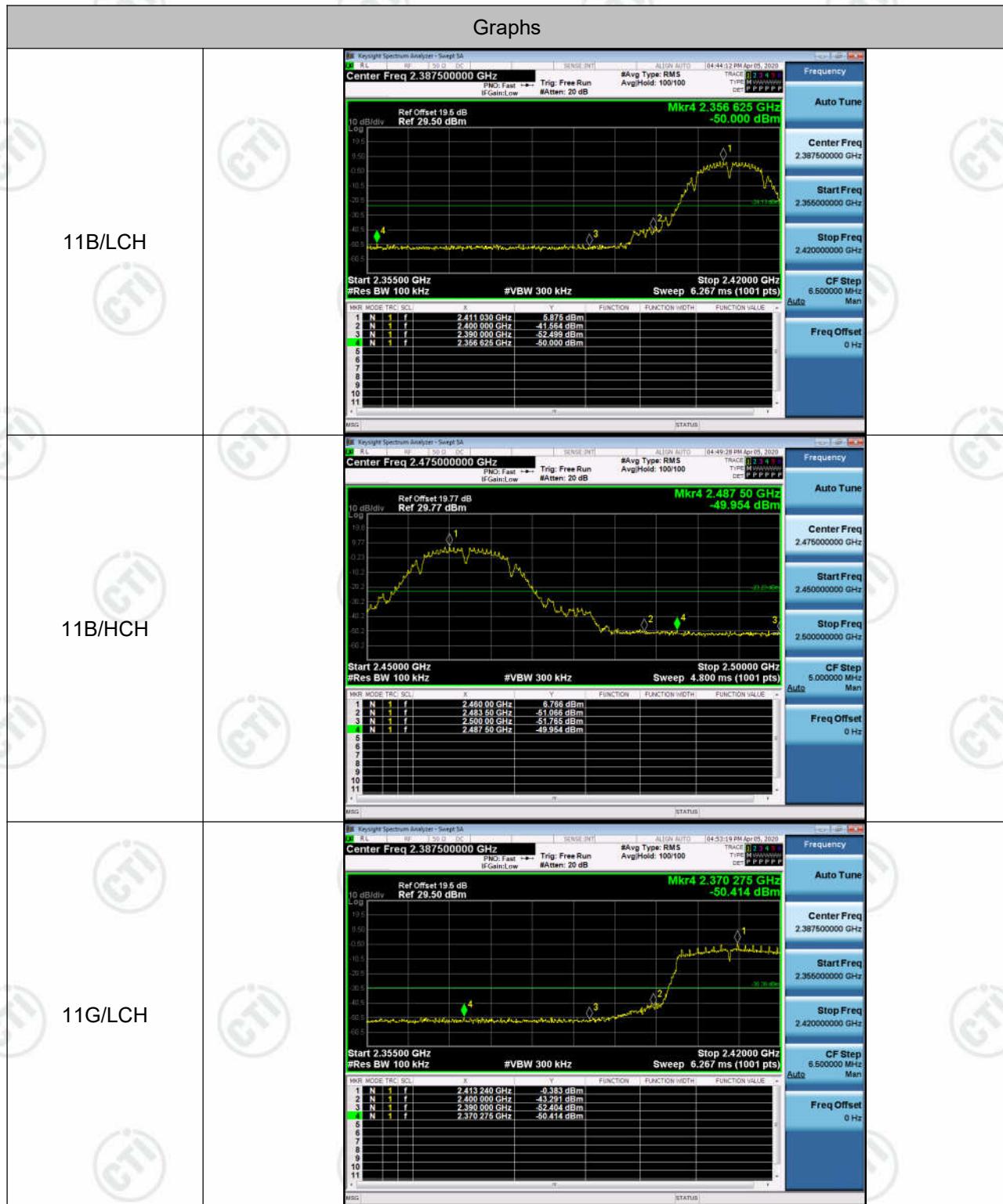
Test Setup



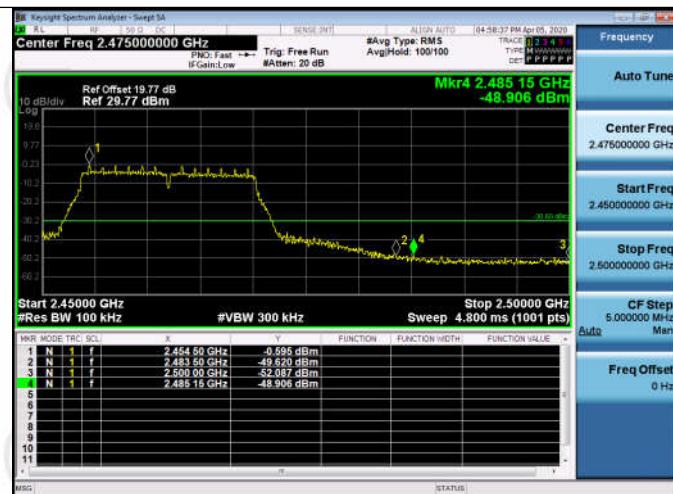
Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	5.875	-50.000	-24.13	PASS
11B	HCH	6.766	-49.954	-23.23	PASS
11G	LCH	-0.383	-50.414	-30.38	PASS
11G	HCH	-0.595	-48.906	-30.6	PASS
11N20SISO	LCH	-2.371	-50.304	-32.37	PASS
11N20SISO	HCH	-2.159	-48.366	-32.16	PASS
11N40SISO	LCH	-6.749	-50.406	-36.75	PASS
11N40SISO	HCH	-5.329	-49.131	-35.33	PASS

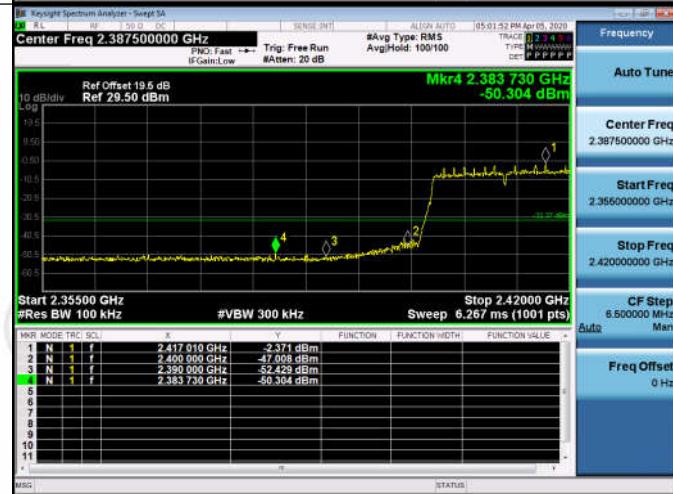
Test Graph



11G/HCH

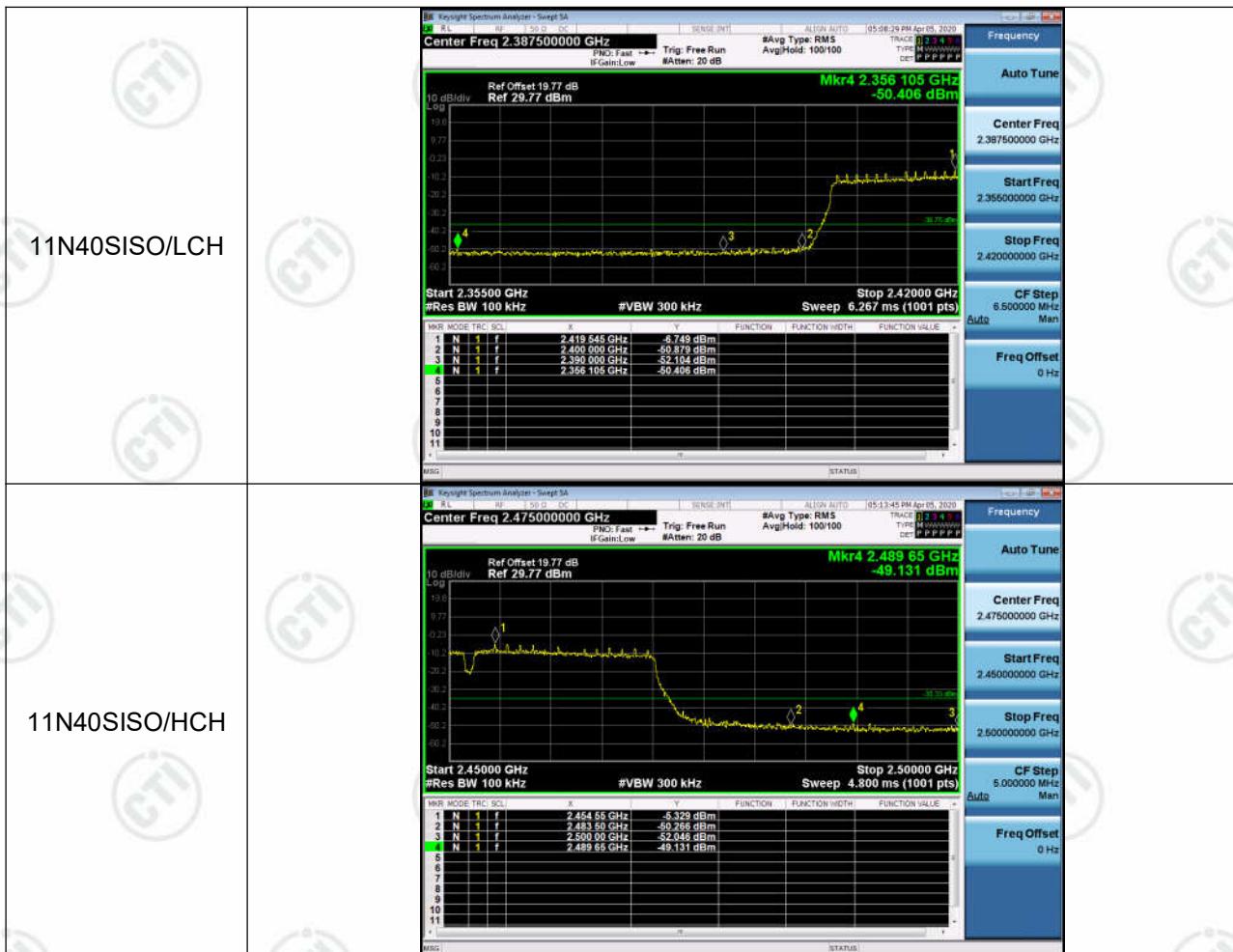


11N20SISO/LCH



11N20SISO/HCH





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.

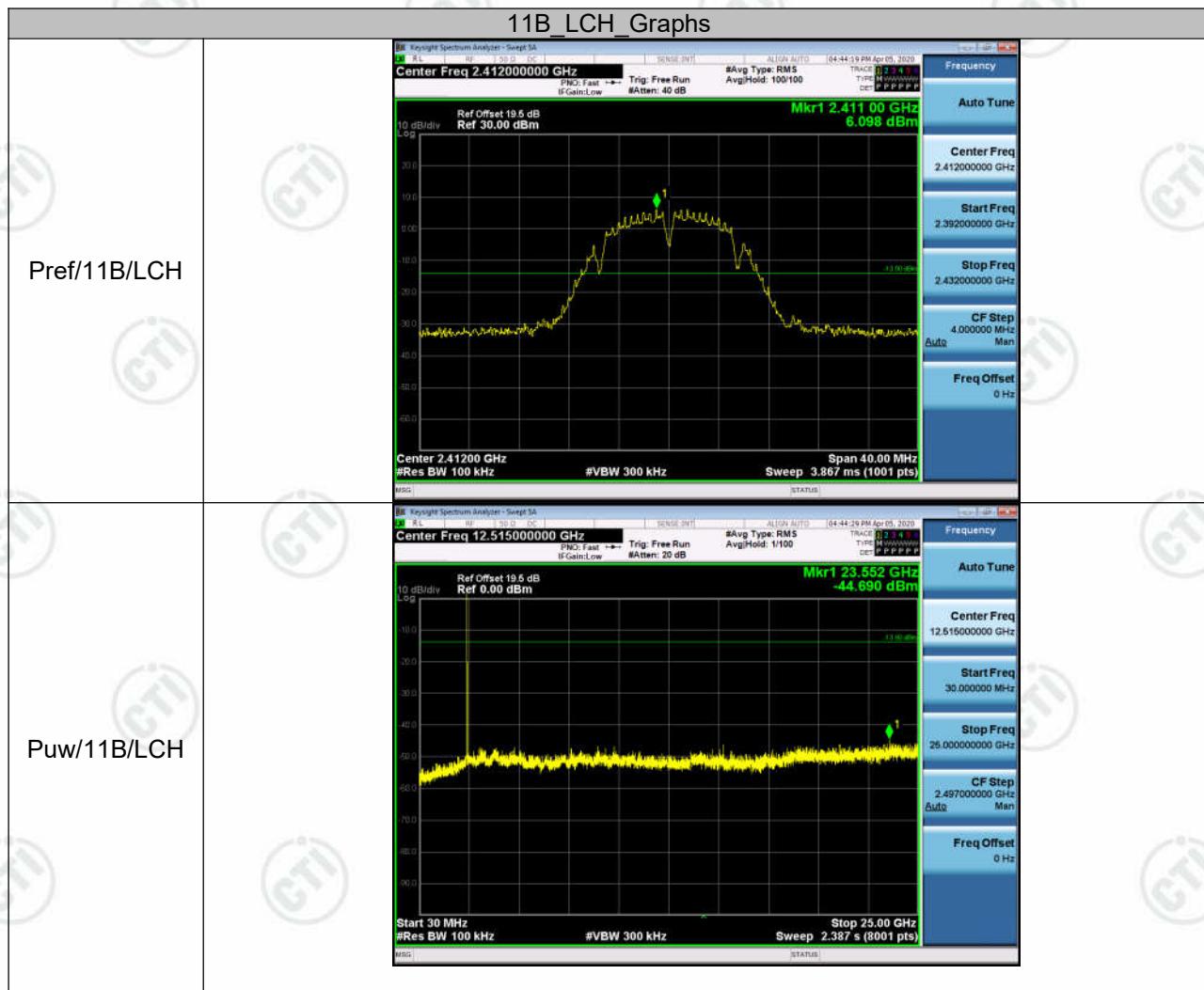
Test Setup

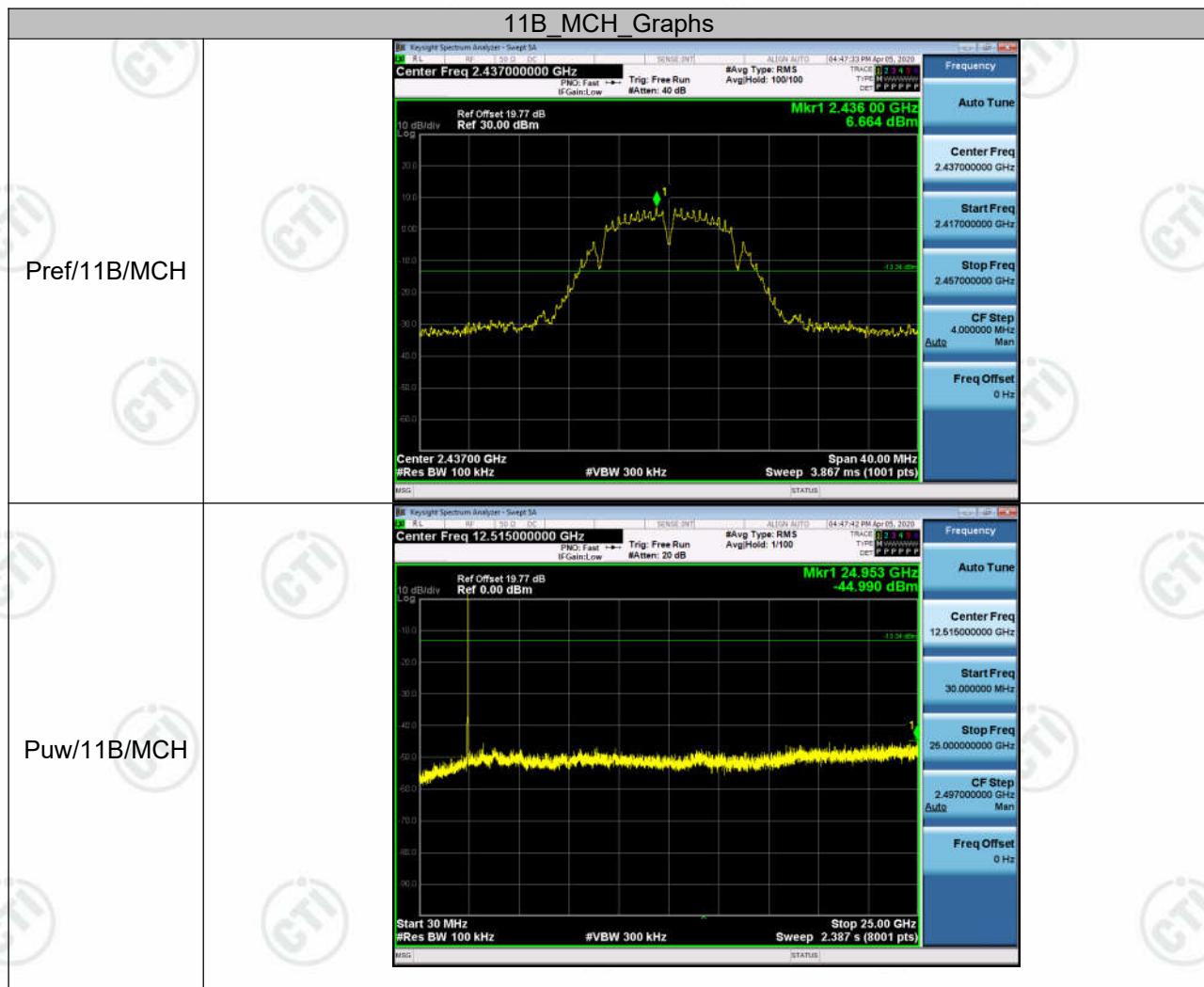


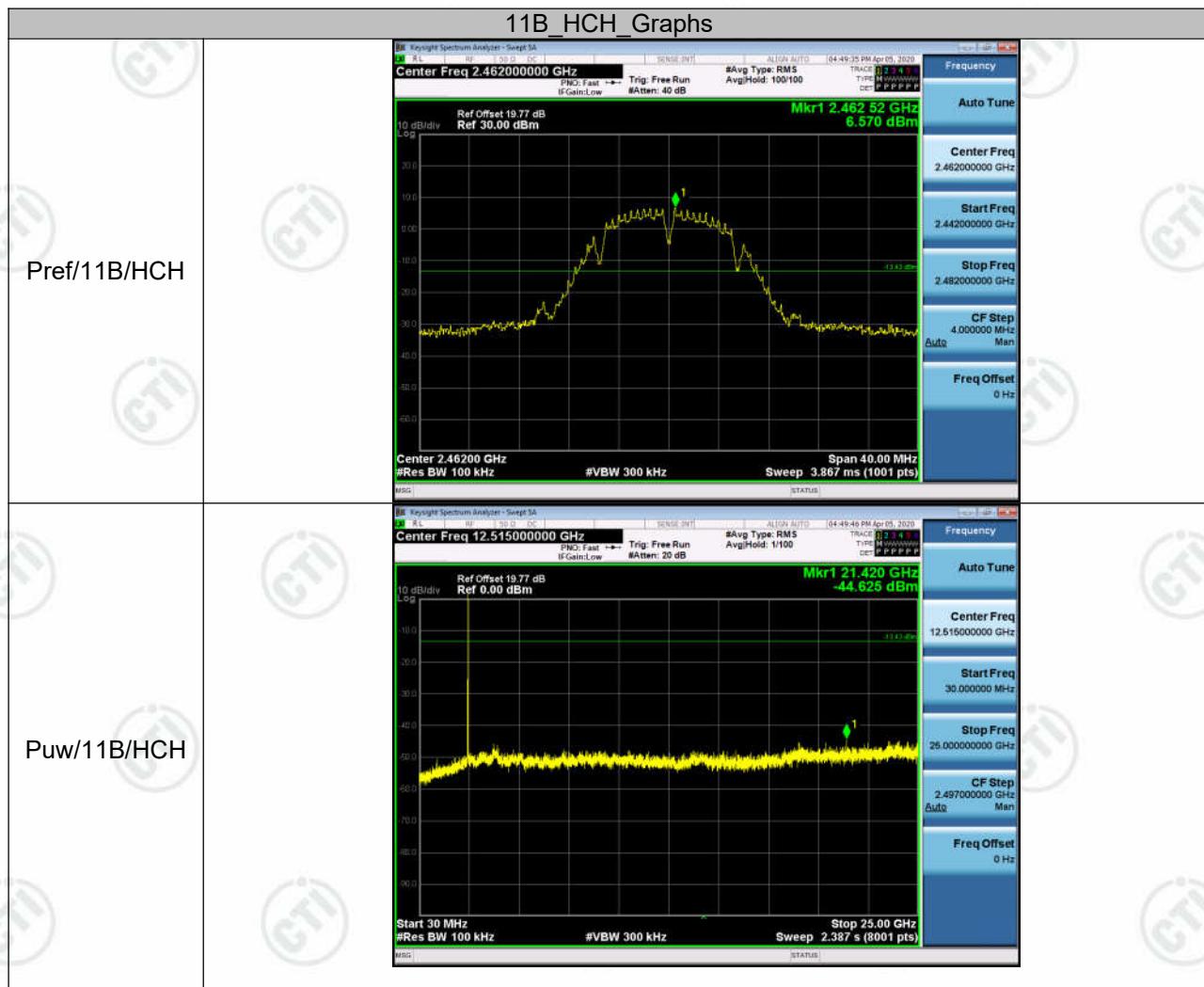
Result Table

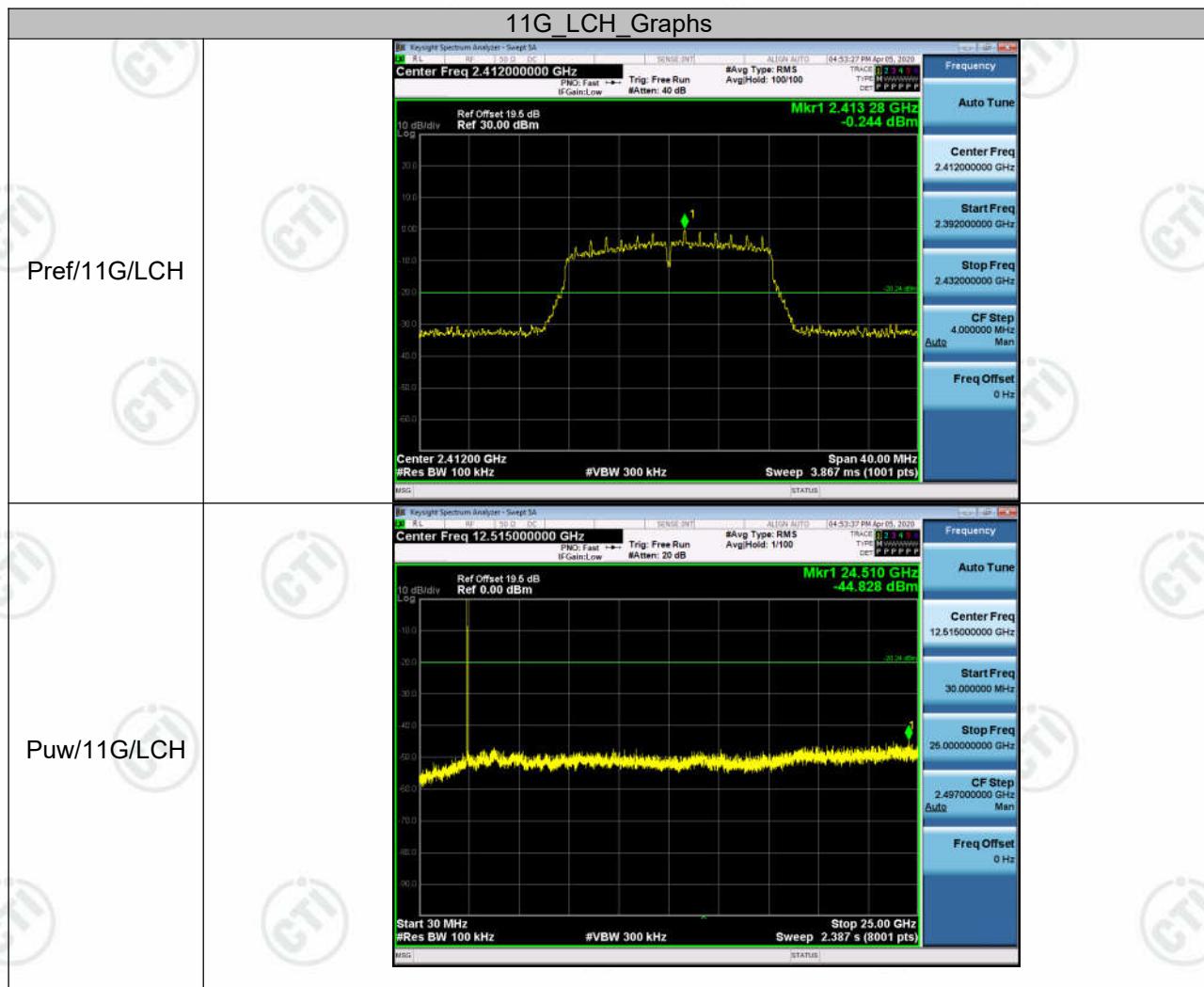
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
11B	LCH	6.098	<Limit	PASS
11B	MCH	6.664	<Limit	PASS
11B	HCH	6.57	<Limit	PASS
11G	LCH	-0.244	<Limit	PASS
11G	MCH	-1.107	<Limit	PASS
11G	HCH	-0.451	<Limit	PASS
11N20SISO	LCH	-2.554	<Limit	PASS
11N20SISO	MCH	-3.155	<Limit	PASS
11N20SISO	HCH	-2.003	<Limit	PASS
11N40SISO	LCH	-6.015	<Limit	PASS
11N40SISO	MCH	-5.498	<Limit	PASS
11N40SISO	HCH	-5.683	<Limit	PASS

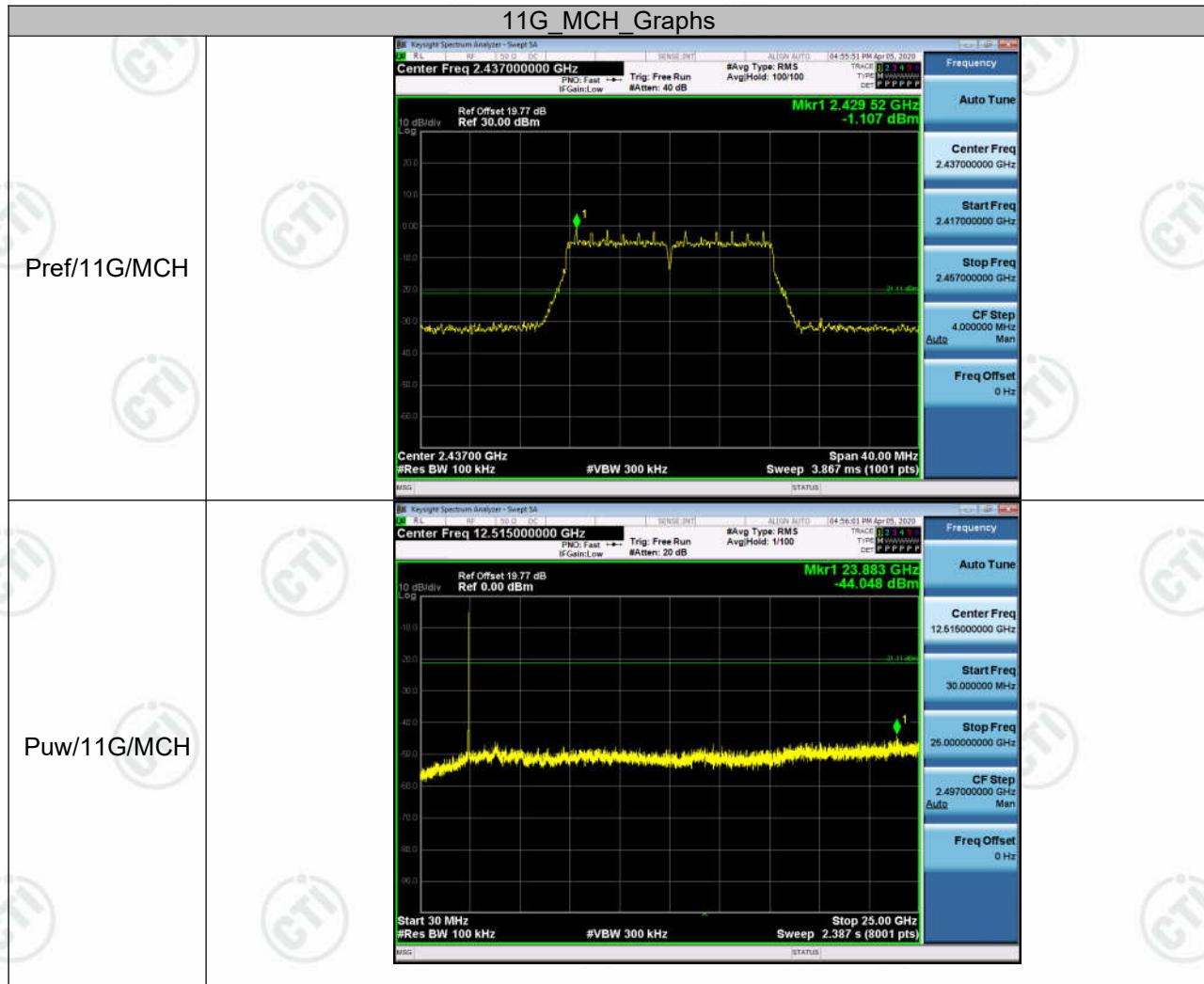
Test Graph

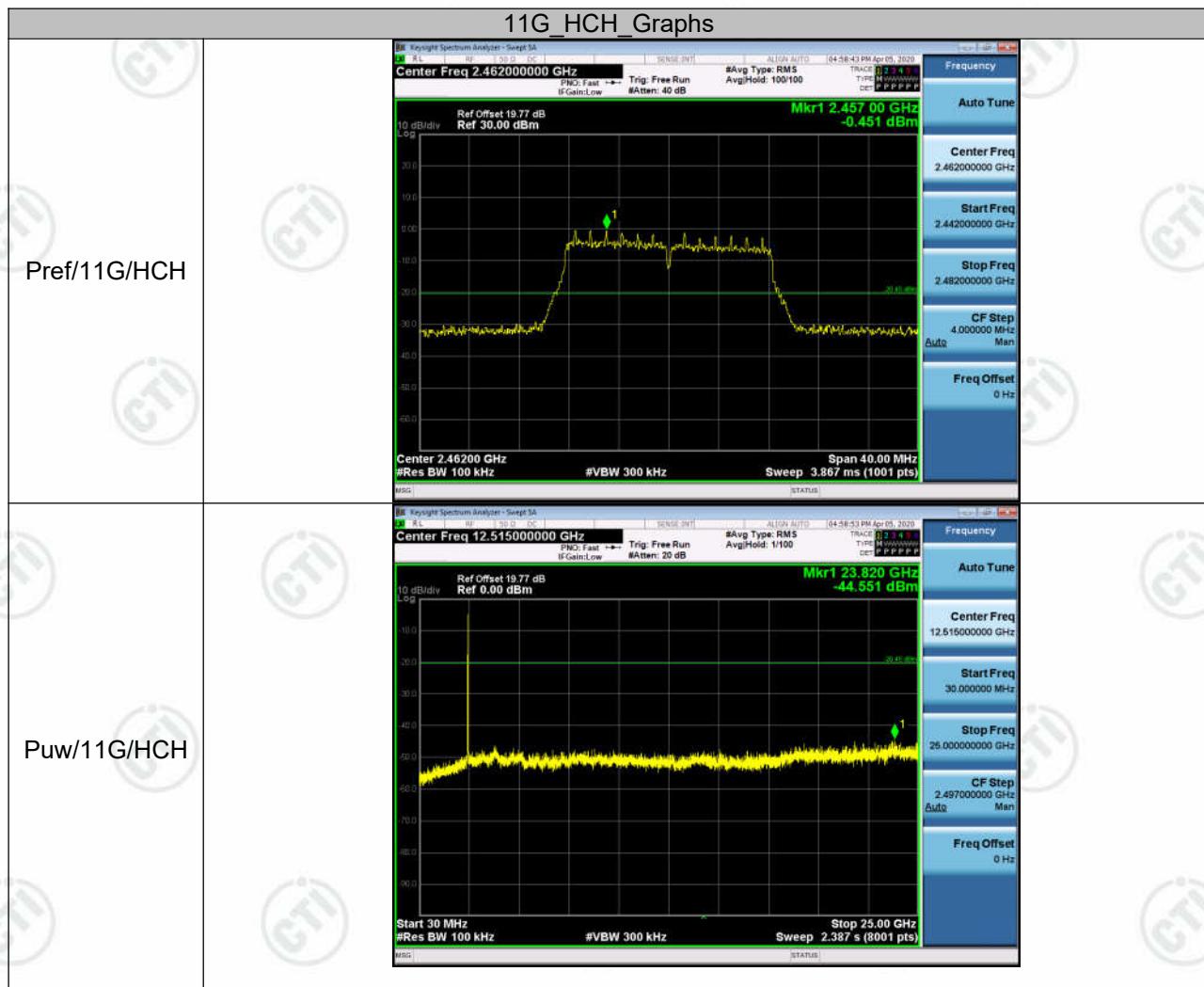


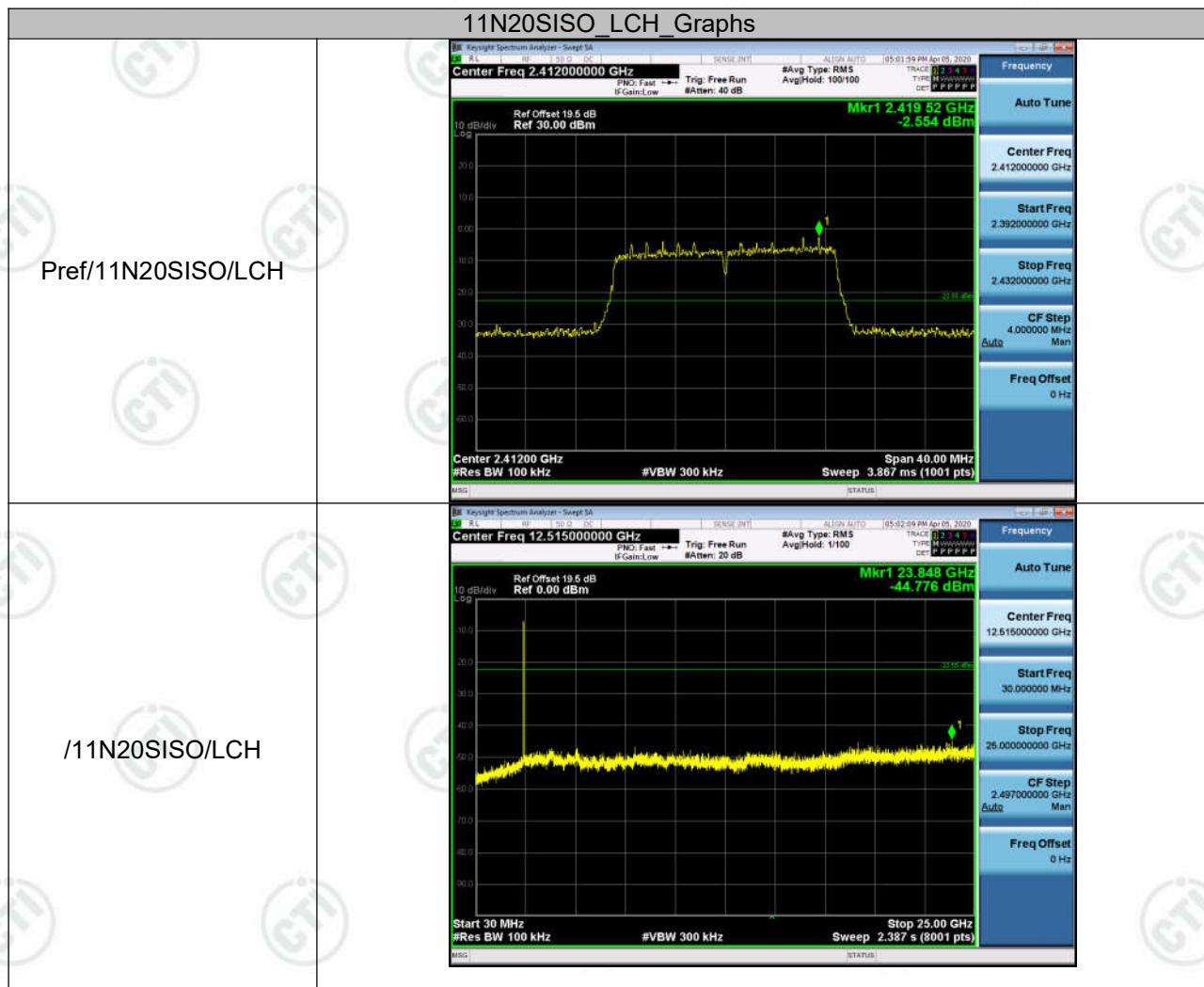


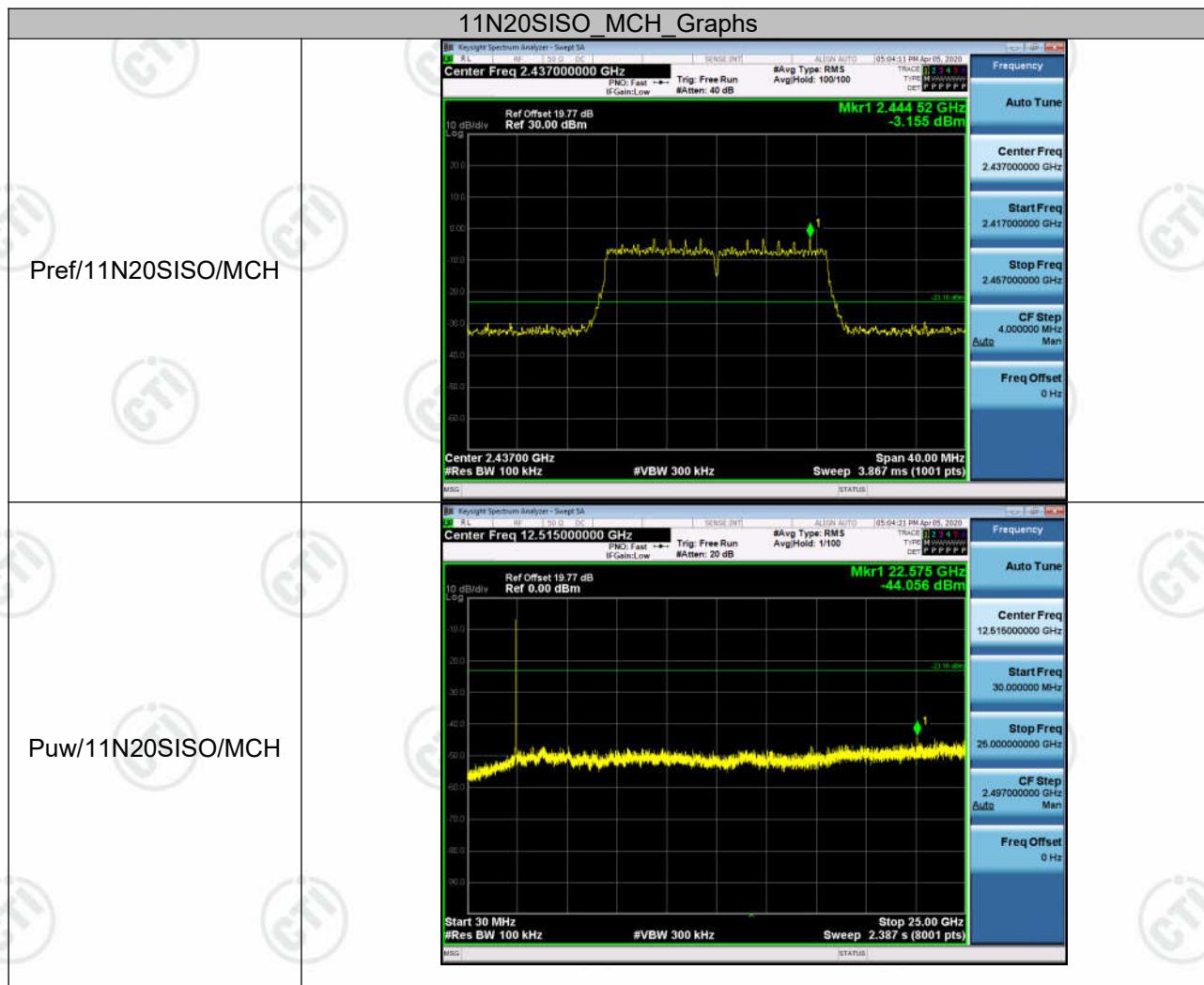


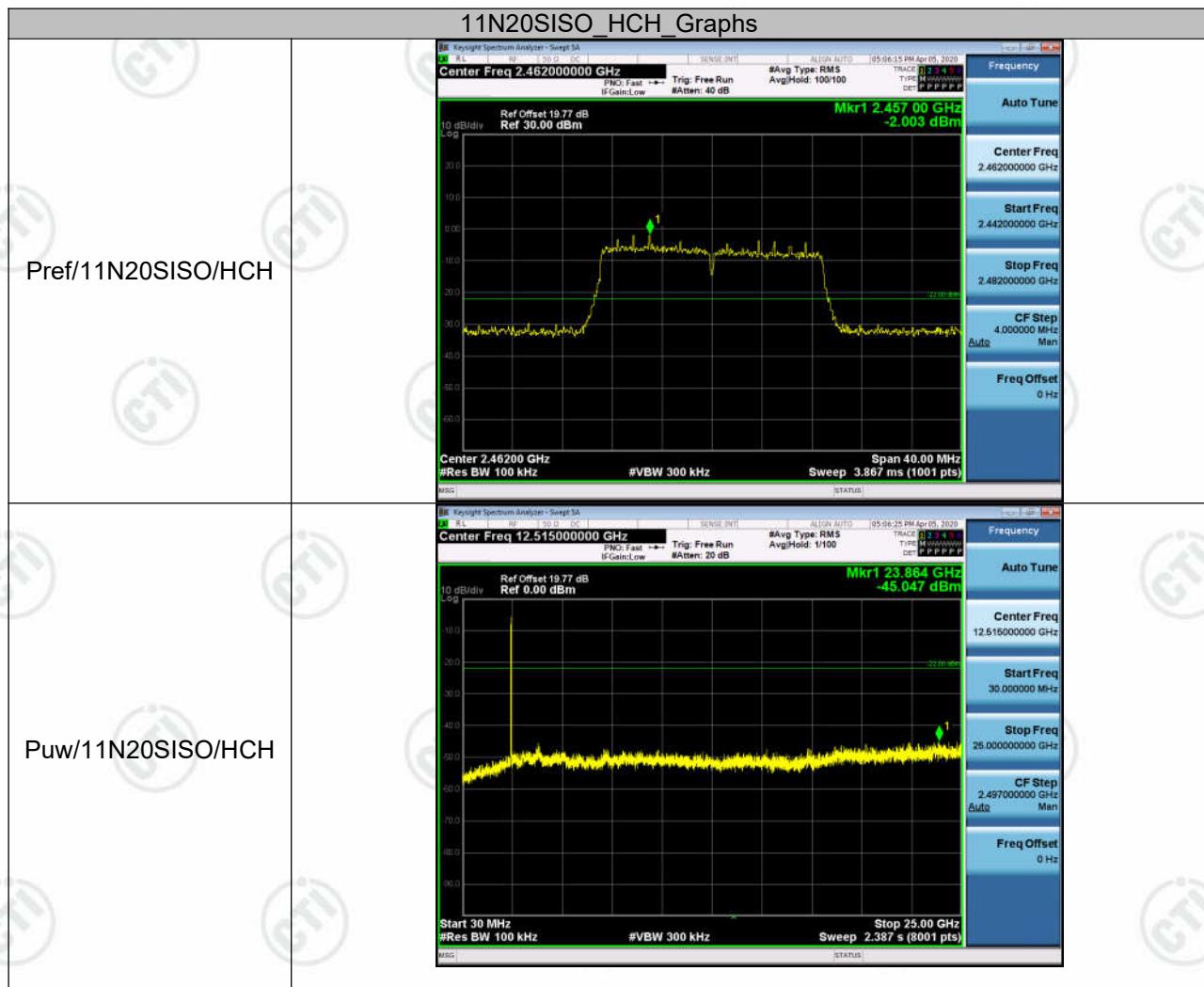


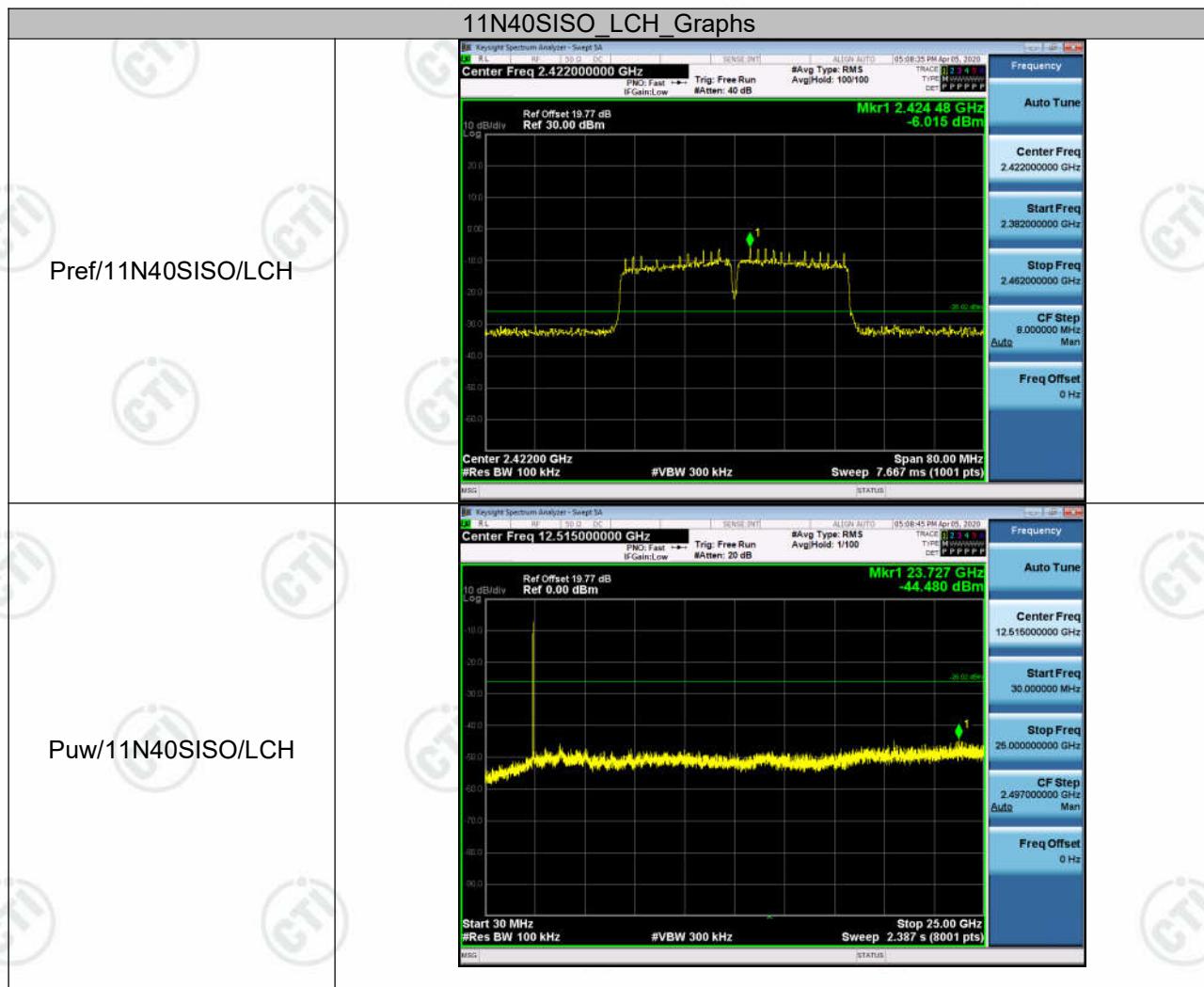


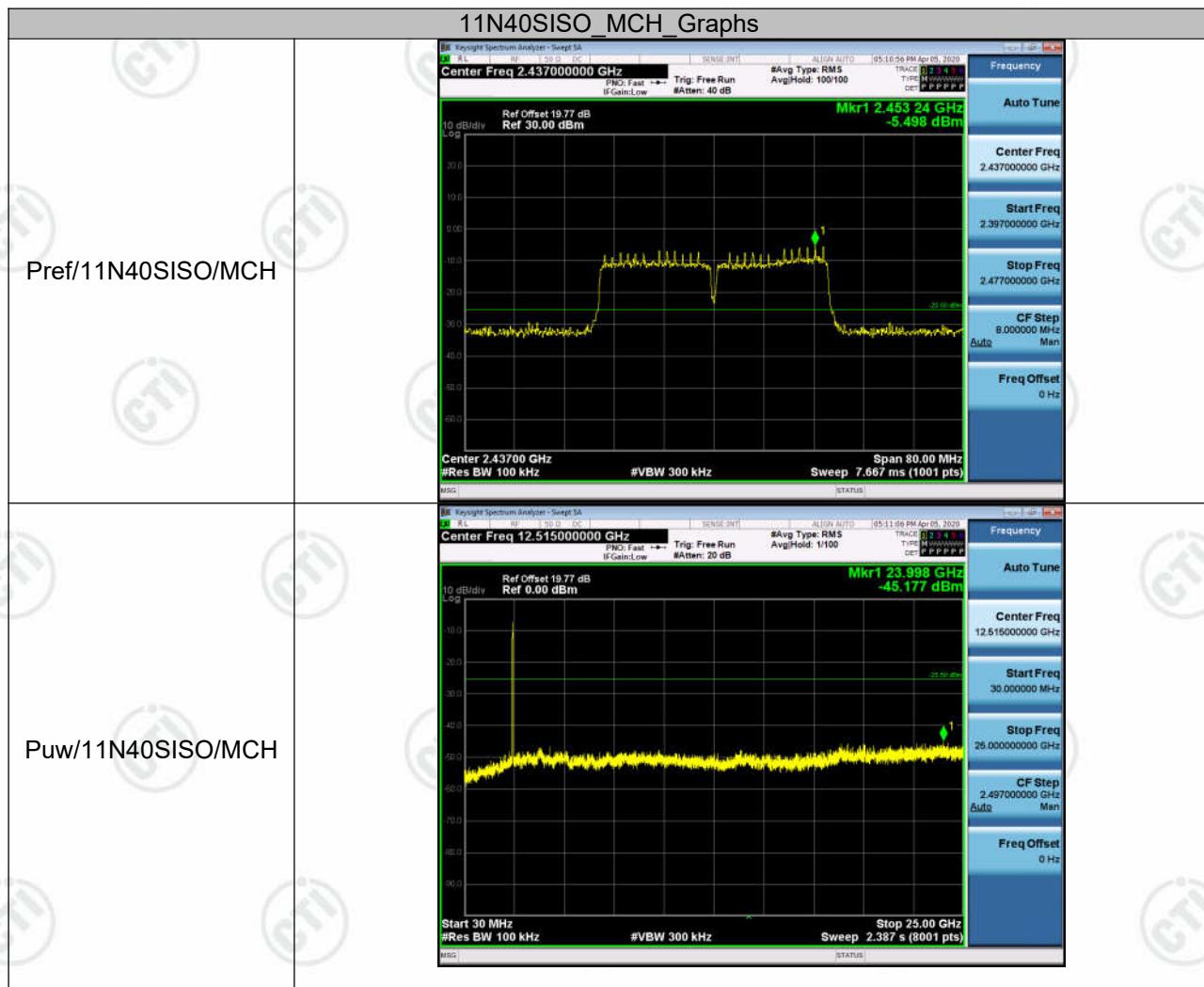


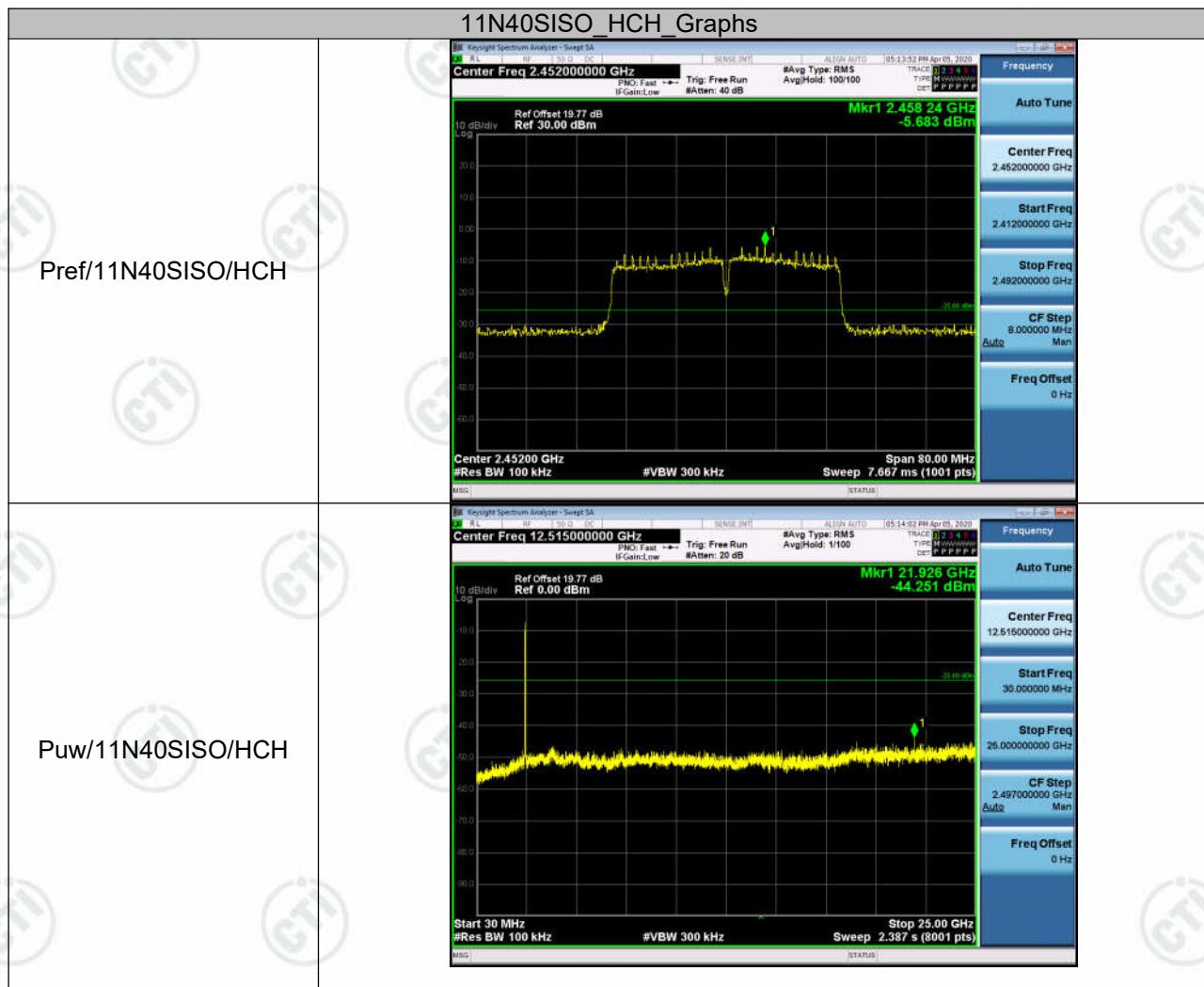












Appendix E): Power Spectral Density

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.

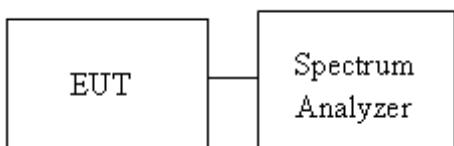
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 8dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : [Limit = 8 – (DG – 6)] <input type="checkbox"/> Point-to-point operation :
-------	---

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 = 10kHz, 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

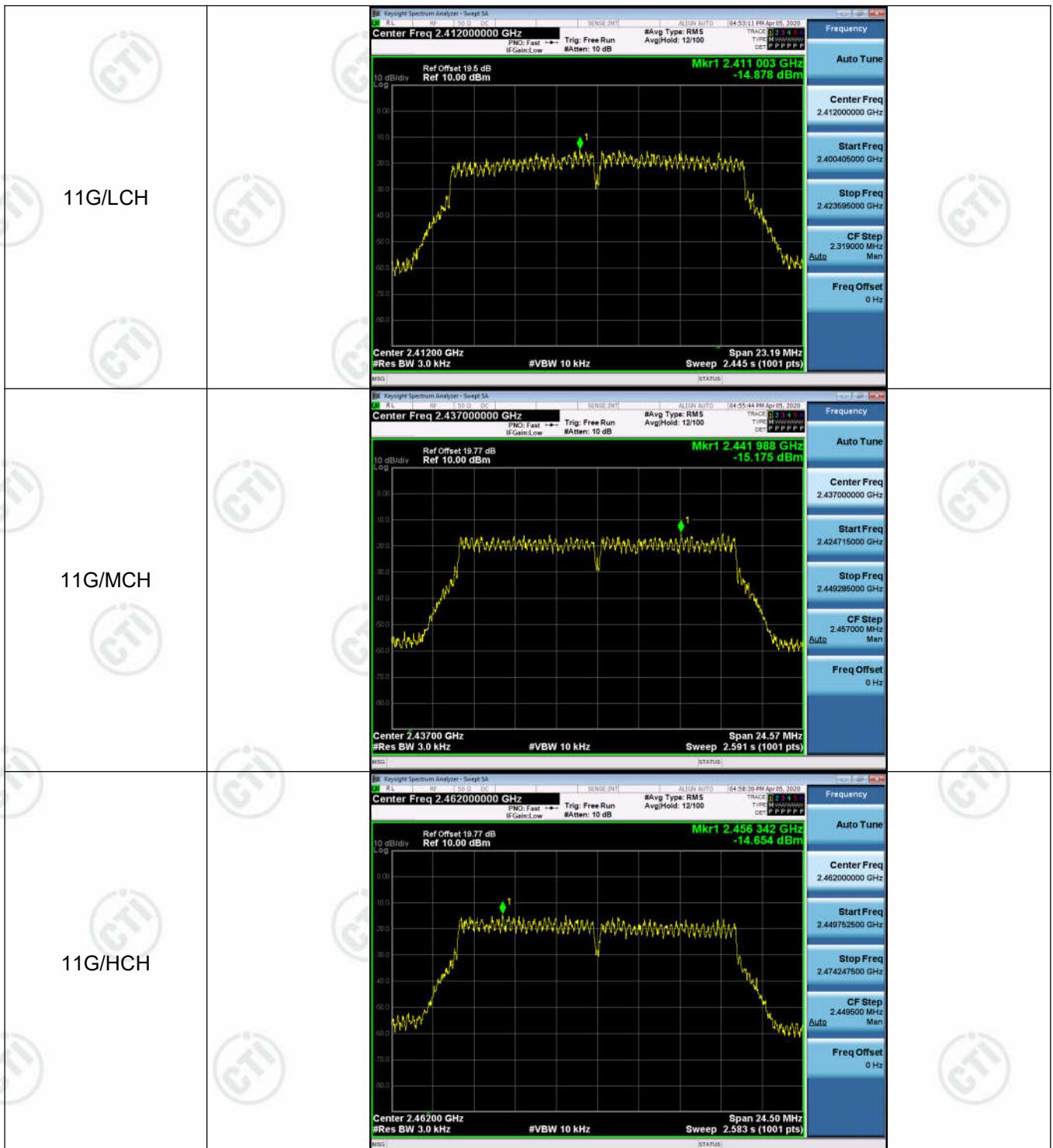


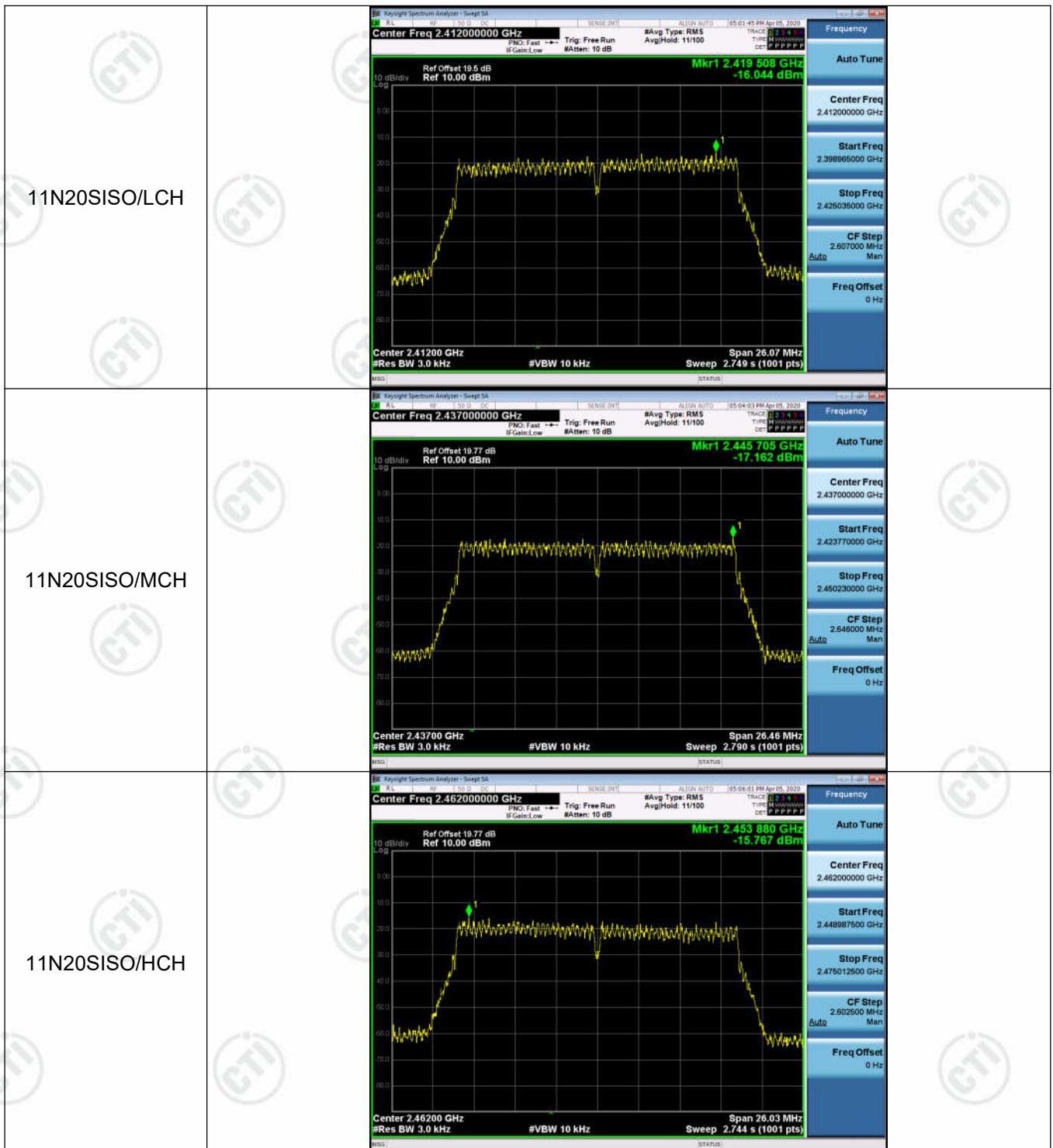
Result Table

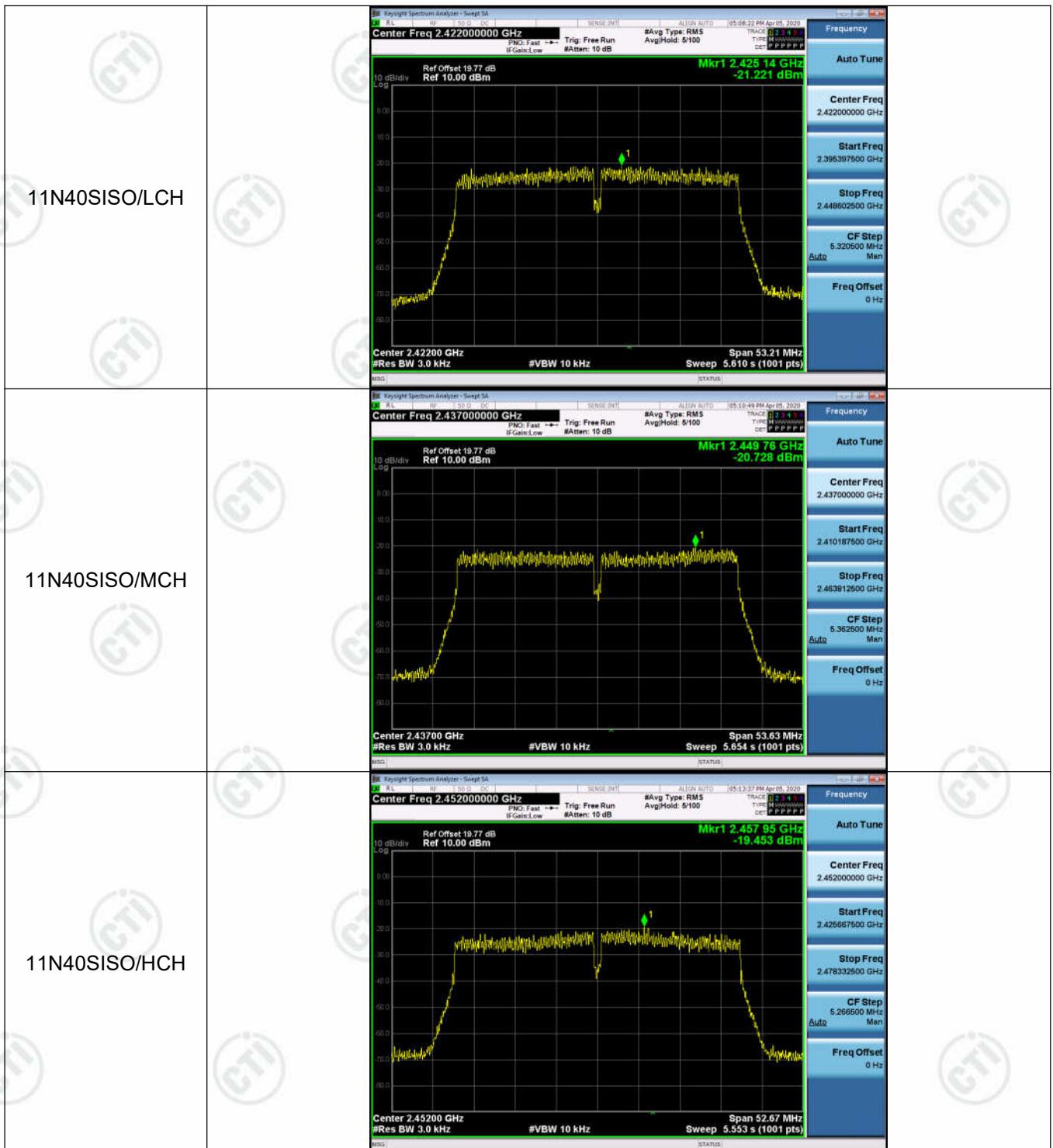
Mode	Channel	Power Spectral Density [dBm]	Verdict
11B	LCH	-8.183	PASS
11B	MCH	-8.069	PASS
11B	HCH	-7.472	PASS
11G	LCH	-14.878	PASS
11G	MCH	-15.175	PASS
11G	HCH	-14.654	PASS
11N20SISO	LCH	-16.044	PASS
11N20SISO	MCH	-17.162	PASS
11N20SISO	HCH	-15.767	PASS
11N40SISO	LCH	-21.221	PASS
11N40SISO	MCH	-20.728	PASS
11N40SISO	HCH	-19.453	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 integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3 dBi

Appendix G): AC Power Line Conducted Emission

Test Procedure:	<p>Test frequency range :150KHz-30MHz</p> <p>1)The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>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.</p> <p>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,</p> <p>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.</p> <p>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.</p>														
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> <p>* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.</p> <p>NOTE : The lower limit is applicable at the transition frequency</p>	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.

Product : Smart Helmet

Model/Type reference

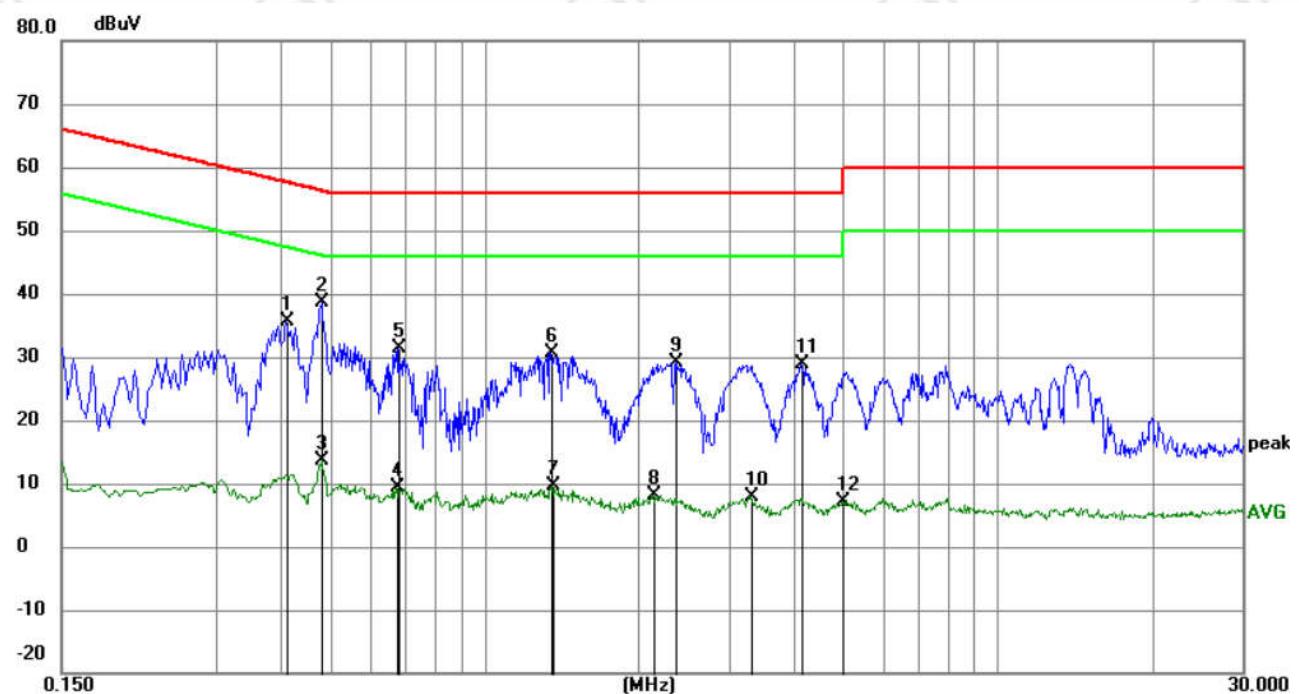
: KC-N901

Temperature : 23°C

Humidity

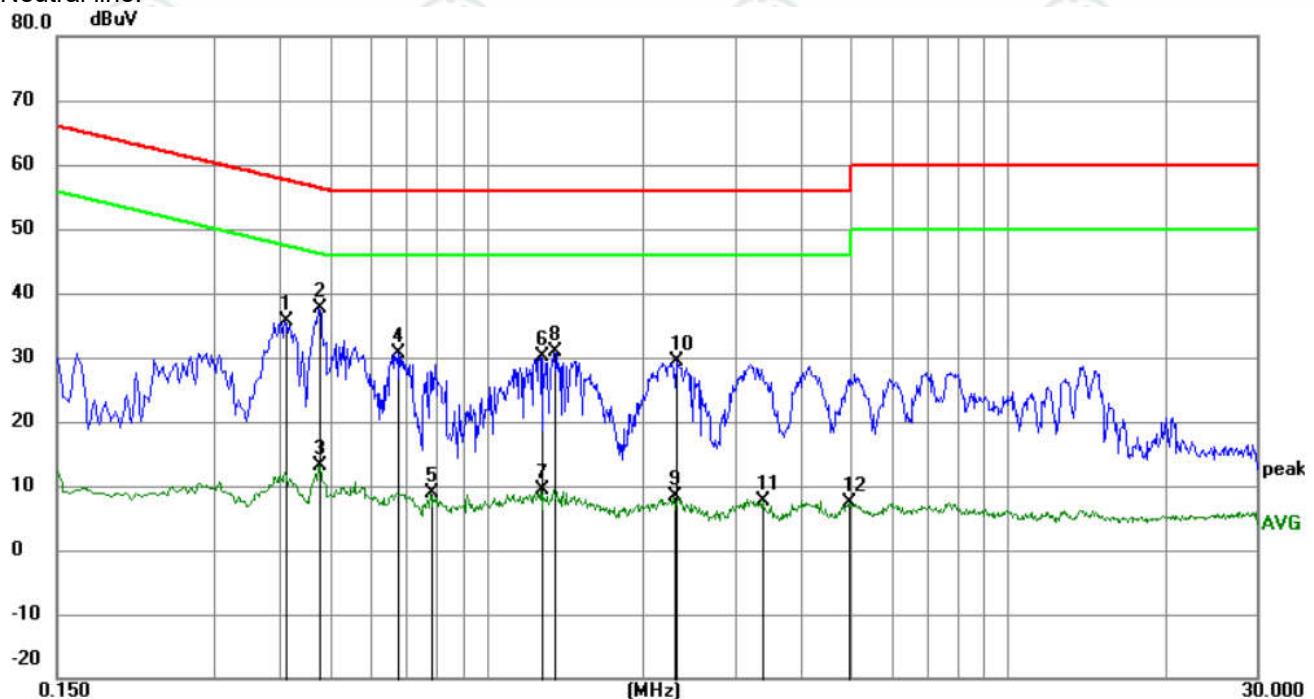
: 54%

Live line:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.4110	25.69	10.00	35.69	57.63	-21.94	QP
2	*	0.4830	28.72	10.00	38.72	56.29	-17.57	QP
3		0.4830	3.52	10.00	13.52	46.29	-32.77	AVG
4		0.6720	-0.50	9.77	9.27	46.00	-36.73	AVG
5		0.6809	21.58	9.73	31.31	56.00	-24.69	QP
6		1.3515	20.76	9.88	30.64	56.00	-25.36	QP
7		1.3560	-0.31	9.88	9.57	46.00	-36.43	AVG
8		2.1390	-1.64	9.83	8.19	46.00	-37.81	AVG
9		2.3640	19.32	9.83	29.15	56.00	-26.85	QP
10		3.2955	-1.87	9.83	7.96	46.00	-38.04	AVG
11		4.1415	19.13	9.83	28.96	56.00	-27.04	QP
12		4.9785	-2.75	9.83	7.08	46.00	-38.92	AVG

Neutral line:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.4110	25.71	10.00	35.71	57.63	-21.92	QP	
2	*	0.4785	27.55	10.00	37.55	56.37	-18.82	QP	
3		0.4785	3.22	10.00	13.22	46.37	-33.15	AVG	
4		0.6765	20.79	9.75	30.54	56.00	-25.46	QP	
5		0.7799	-0.88	9.86	8.98	46.00	-37.02	AVG	
6		1.2750	20.34	9.89	30.23	56.00	-25.77	QP	
7		1.2750	-0.50	9.89	9.39	46.00	-36.61	AVG	
8		1.3515	21.11	9.88	30.99	56.00	-25.01	QP	
9		2.2920	-1.54	9.83	8.29	46.00	-37.71	AVG	
10		2.3190	19.46	9.83	29.29	56.00	-26.71	QP	
11		3.3855	-2.08	9.83	7.75	46.00	-38.25	AVG	
12		4.9740	-2.40	9.83	7.43	46.00	-38.57	AVG	

Notes:

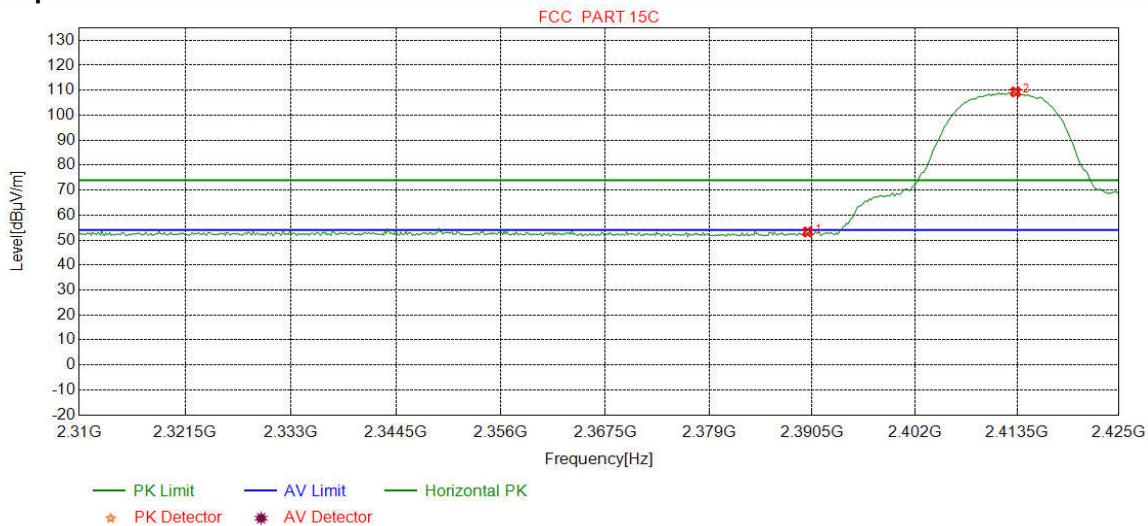
1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

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: <ul style="list-style-type: none"> a. 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. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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: <ul style="list-style-type: none"> g. 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). h. Test the EUT in the lowest channel , the Highest channel i. 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. j. Repeat above procedures until all frequencies measured was complete. 																								
Limit:	<table border="1"> <thead> <tr> <th>Frequency</th><th>Limit (dBμV/m @3m)</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr> <tr> <td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr> <tr> <td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr> <tr> <td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr> <tr> <td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr> <tr> <td>74.0</td><td>Peak Value</td></tr> </tbody> </table>					Frequency	Limit (dB μ V/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
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Test plot as follows:

Mode:	802.11 b(1Mbps) Transmitting	Channel:	2412
Remark:	PK		

Test Graph

NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	50.73	53.23	74.00	20.77	Pass	Horizontal
2	2413.3417	32.28	13.36	-43.12	106.78	109.30	74.00	-35.30	Pass	Horizontal