



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

CONSUMER CAMERA

MODEL NUMBER: IPC-A23P

**ADDITIONAL MODEL NUMBER: IPC-A23N-imou; IPC-A23P-imou; IPC-A23N;
IPC-TA23-LC; LC-TA3**

PROJECT NUMBER: 4790015544-3

REPORT NUMBER: 4790015544-3-3

FCC ID: 2AVYF-IPC-AX3

ISSUE DATE: Jul.19, 2021

Prepared for

Hangzhou Huacheng Network Technology Co.,Ltd.

Prepared by

UL-CCIC COMPANY LIMITED

No. 2, Chengwan Road, Suzhou Industrial Park, People's Republic of China

Tel: + 86-512-6808 6400

Fax: + 86-512-6808 4099

Website: www.ul.com



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V0	07/19/2021	Initial Issue	



TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	7
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	7
4.2. <i>MEASUREMENT UNCERTAINTY</i>	7
5. EQUIPMENT UNDER TEST	8
5.1. <i>DESCRIPTION OF EUT</i>	8
5.2. <i>MAXIMUM OUTPUT POWER</i>	9
5.3. <i>CHANNEL LIST</i>	9
5.4. <i>TEST CHANNEL CONFIGURATION</i>	10
5.5. <i>THE WORSE CASE POWER SETTING PARAMETER</i>	10
5.6. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	11
5.7. <i>THE WORSE CASE CONFIGURATIONS</i>	11
5.8. <i>TEST ENVIRONMENT</i>	12
5.9. <i>DESCRIPTION OF TEST SETUP</i>	13
5.10. <i>MEASURING INSTRUMENT AND SOFTWARE USED</i>	14
6. MEASUREMENT METHODS	15
7. ANTENNA PORT TEST RESULTS	16
7.1. <i>ON TIME AND DUTY CYCLE</i>	16
7.2. <i>6 dB BANDWIDTH</i>	19
7.3. <i>CONDUCTED POWER</i>	27
7.4. <i>POWER SPECTRAL DENSITY</i>	29
7.5. <i>CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS</i>	37
7.6. <i>RADIATED TEST RESULTS</i>	68
7.6.1. <i>LIMITS AND PROCEDURE</i>	68
7.6.2. <i>RESTRICTED BANDEDGE</i>	73
7.6.3. <i>SPURIOUS EMISSIONS</i>	90
8. AC POWER LINE CONDUCTED EMISSIONS	147
9. ANTENNA REQUIREMENTS	150



1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Hangzhou Huacheng Network Technology Co., Ltd.
Address: No.2930, Nanhuan Road, Binjiang District, Hangzhou, China

Manufacturer Information

Company Name: Hangzhou Huacheng Network Technology Co., Ltd.
Address: No.2930, Nanhuan Road, Binjiang District, Hangzhou, China

EUT Description

Product Name CONSUMER CAMERA
Model Name IPC-A23P
Additional No. IPC-A23N-imou; IPC-A23P-imou; IPC-A23N; IPC-TA23-LC;
LC-TA3
Sample Number 4060126
Data of Receipt Sample Jul.11,2021
Test Date Jul.11,2021~ Jul.18,2021

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS



Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	6db DTS Bandwidth	FCC 15.247 (a) (2)	PASS
2	Conducted Power	FCC 15.247 (b) (3)	PASS
3	Power Spectral Density	FCC 15.247 (e)	PASS
4	Conducted Band edge And Spurious emission	FCC 15.247 (d)	PASS
5	Radiated Band edges and Spurious emission	FCC 15.247 (d) FCC 15.209 FCC 15.205	PASS
6	Conducted Emission Test For AC Power Port	FCC 15.207	PASS
7	Antenna Requirement	FCC 15.203	PASS
Remark: 1) The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C> when <Accuracy Method> decision rule is applied.			

Prepared By:

Tom Tang

Tom Tang
Project Engineer

Reviewed By:

Leon Wu

Leon Wu
Senior Project Engineer

Authorized By:

Chris Zhong

Chris Zhong
Laboratory Leader



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p>A2LA (Certificate No.: 4829.01) UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA.</p> <p>FCC (FCC Designation No.: CN1247) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.</p> <p>IC (IC Designation No.: 25056) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.</p>
---------------------------	--

Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of China

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY


Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.1dB
Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	3.4dB
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	3.4dB
Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	3.9dB (1GHz-18Gz)
	4.2dB (18GHz-26.5Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Product Name:	CONSUMER CAMERA
Model No.:	IPC-A23P
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
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 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)
Channels Step:	Channels with 5MHz step
Sample Type:	Fixed production
Test software of EUT:	Secure CRT (manufacturer declare)
Antenna Type:	Monopole Antenna
Antenna Gain:	2.4 dBi
	Remark: This data is provided by customer and our lab isn't responsible for this data
Adapter	NAME: AC Adapter MODEL: NBS05B050100VUU INPUT:100-240V,50/60Hz, 0.2A OUTPUT:5.0V  1.0A

Remark:

Model No.:

Number:	Name:	Number:	Name:	Number:	Name:
1	IPC-A23P	2	IPC-A23N-imou	3	IPC-A23P-imou
4	IPC-A23N	5	IPC-TA23-LC	6	LC-TA3

Only the main model **IPC-A23P** was tested and only the data of this model is shown in this test report.

Since Their electrical circuit design, layout, components used and internal wiring are identical, only the name of the models.



5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains (NTX)	IEE Std. 802.11	Channel Number	Max AV Conducted Power (dBm)
1	IEEE 802.11B SISO	1-11[11]	17.43
1	IEEE 802.11G SISO	1-11[11]	15.24
1	IEEE 802.11nHT20	1-11[11]	15.12
1	IEEE 802.11nHT40	3-9[7]	15.25

5.3. CHANNEL LIST

Channel List for 802.11b/g/n (20 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	4	2427	7	2442	10	2457
2	2417	5	2432	8	2447	11	2462
3	2422	6	2437	9	2452		

Channel List for 802.11n (40 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	5	2432	7	2442	9	2452
4	2427	6	2437	8	2447		



5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
WiFi TX(802.11b)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11g)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT20)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT40)	CH 3, CH 6, CH 9	2422MHz, 2437MHz, 2452MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worst Case Power Setting Parameter under 2400 ~ 2483.5MHz Band							
Test Software		EspRFtestTool					
Modulation Mode	Transmit Antenna Number	Test Channel					
		NCB: 20MHz			NCB: 40MHz		
		CH 1	CH 6	CH 11	CH 3	CH 6	CH 9
802.11b	1	N/A	N/A	N/A	/		
802.11g	1	N/A	N/A	N/A			
802.11n HT20	1	N/A	N/A	N/A			
802.11n HT40	1	/			N/A	N/A	N/A



5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	Monopole Antenna	2.4

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	<input checked="" type="checkbox"/> 1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11g	<input checked="" type="checkbox"/> 1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11N (HT20)	<input checked="" type="checkbox"/> 1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11N (HT20)	<input checked="" type="checkbox"/> 1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.

5.7. THE WORSE CASE CONFIGURATIONS

For the product, there two transmission antennas, and pre-testing both of them, only the worse data for the antenna is recorded in the report.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps
802.11b mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0



5.8. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1010Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	AC 120V
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.9. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E550c	N/A
2	Fixed Frequency Board	N/A	N/A	Supply by UL Lab

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	USB	USB-VGA	100cm Length (Supply by UL Lab)	N/A

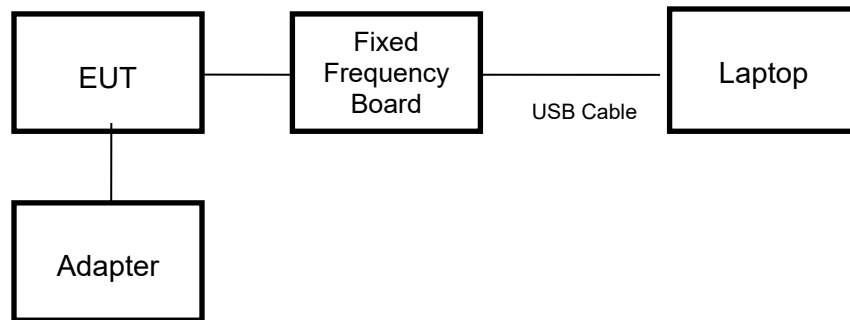
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Micro SD card	Kingston	32GB	Supply by UL lab

TEST SETUP

The EUT can work in an engineer mode with a software through a table PC.

SETUP DIAGRAM FOR TESTS



Remark: The EUT has been built one SD card during the testing



5.10. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions (Instrument)							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	126700	2019-12-12	2020-12-05	2021-12-04
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	126701	2019-12-12	2020-12-05	2021-12-04
<input checked="" type="checkbox"/>	Artificial Mains Networks	R&S	ENY81	126711	2019-12-12	2020-12-05	2021-12-04
Software							
Used	Description		Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance		R&S	EMC32	Ver. 9.25		
Radiated Emissions (Instrument)							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9010B	MY57110128	2020-05-10	2021-05-09	2022-05-08
<input checked="" type="checkbox"/>	EMI test receiver	R&S	ESR26	1267603	2019-12-12	2020-12-05	2021-12-04
<input checked="" type="checkbox"/>	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1513	513-265	2018-06-15	2021-06-03	2022-06-02
<input checked="" type="checkbox"/>	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion	JB1	177821	N/A	2019-01-28	2022-01-27
<input checked="" type="checkbox"/>	Receiver Antenna (1GHz-18GHz)	R&S	HF907	126705	2018-01-29	2019-01-28	2022-01-27
<input checked="" type="checkbox"/>	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170	126706	2019-02-06	2020-12-05	2021-12-04
<input checked="" type="checkbox"/>	Pre-amplification (To 18GHz)	Compliance Direction System Inc.	PAP-1G18-50	14140-13467	2019-03-18	2020-12-05	2021-12-04
<input checked="" type="checkbox"/>	Pre-amplification (To 26.5GHz)	R&S	SCU-26D	134668	2019-02-06	2020-09-27	2021-09-26
<input checked="" type="checkbox"/>	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	1	2020-05-10	2021-05-09	2022-05-08
<input checked="" type="checkbox"/>	Highpass Filter	Wainwright	WHKX10-2700-3000-18000-40SS	2	2020-05-10	2021-05-09	2022-05-08
Software							
Used	Description		Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance		Tonscend	JS32	V1.0		
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9010B	MY57110128	2020-05-10	2021-05-09	2022-05-08
<input checked="" type="checkbox"/>	Power Meter	Keysight	U2021XA	MY57110002	2020-05-10	2021-05-09	2022-05-08



6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r02	8.2
2	Conducted Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.1.3/8.3.2.3
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.5
5	Out-of-band emissions in restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.6
6	Band-edge	KDB 558074 D01 15.247 Meas Guidance v05r02	8.7
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	6.2



7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

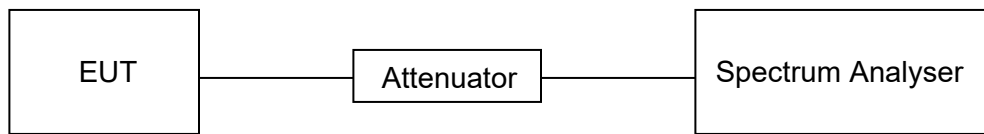
LIMITS

None; for reporting purposes only

PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)	Final Minimum VBW (KHz)
11B	8.381	8.45	0.992	99.2	0.03	0.12	0.01(Note4)
11G	1.392	1.4596	0.954	95.4	0.20	0.72	1
11N HT20	5.081	5.151	0.986	98.6	0.06	0.20	0.01(Note4)
11N HT40	2.467	2.536	0.973	97.3	0.12	0.41	1

Note: 1) Duty Cycle Correction Factor= $10\log(1/x)$.

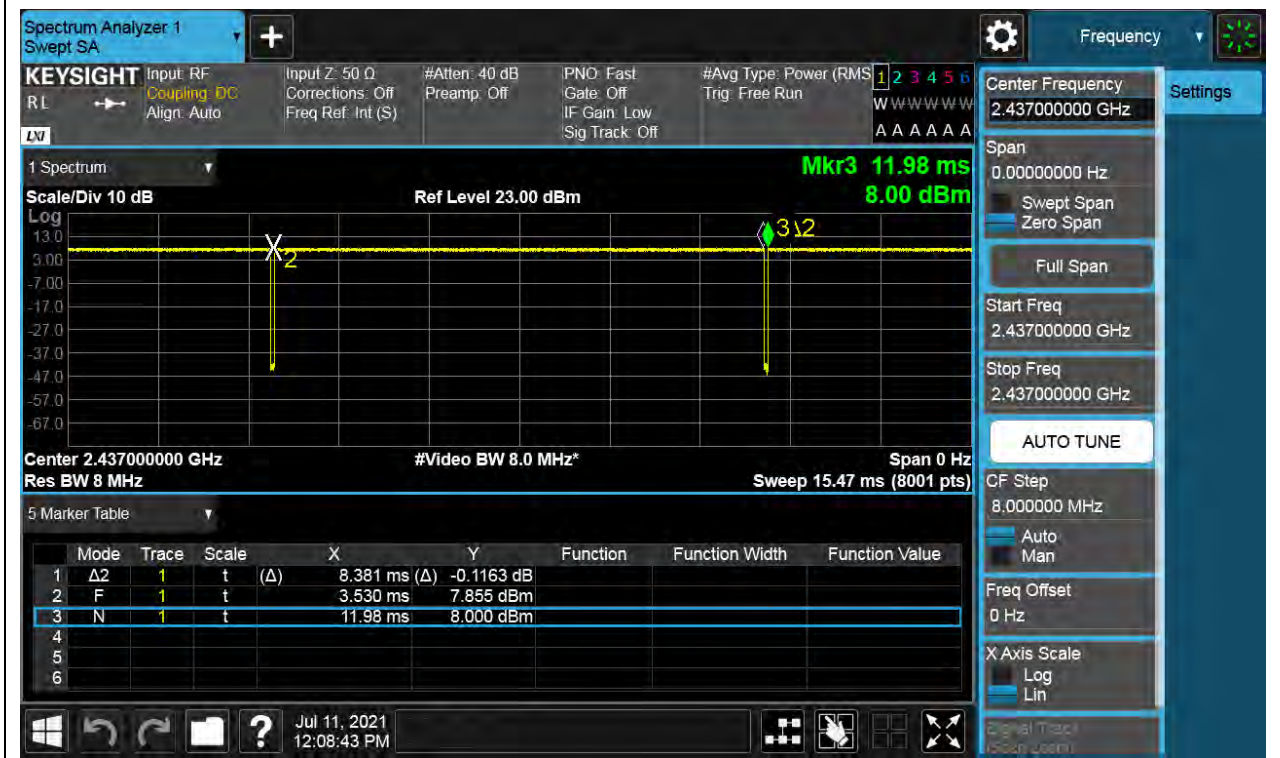
2) Where: x is Duty Cycle(Linear)

3) Where: T is On Time (transmit duration)

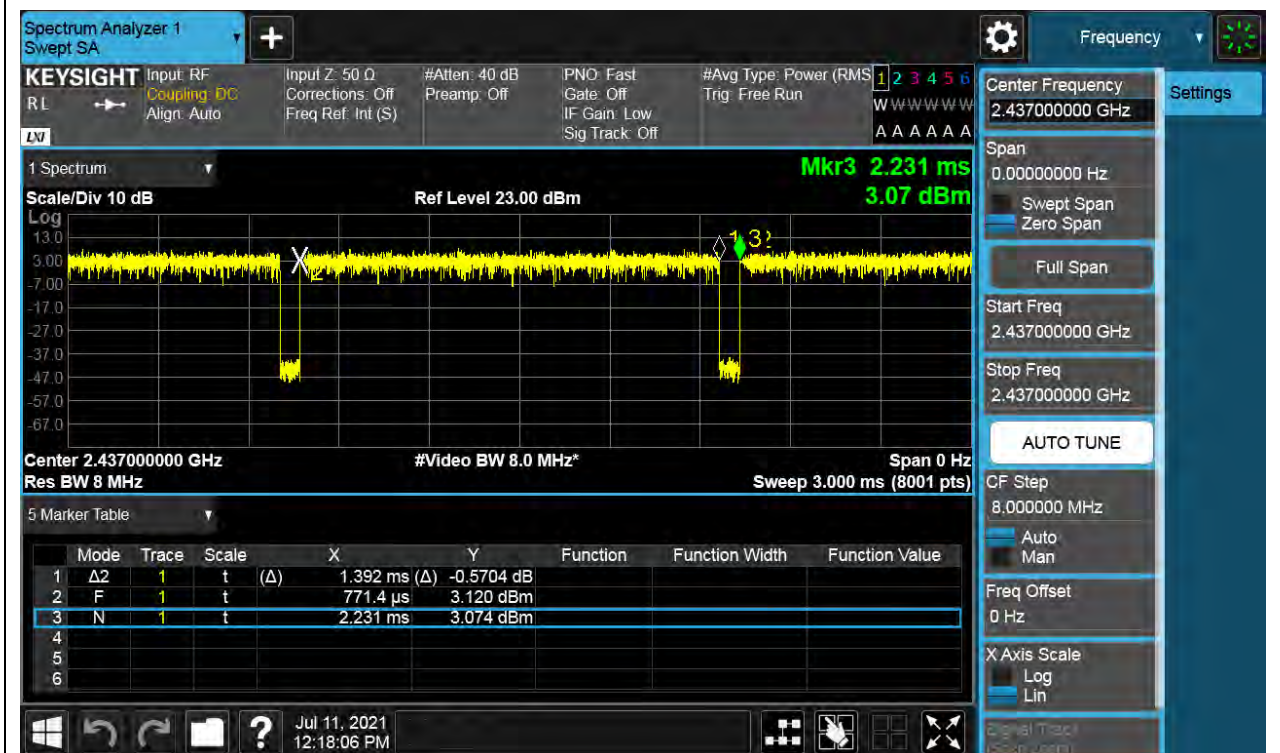
4) The minimum VBW should be 10Hz if the duty cycle is over 98%.



11B ON TIME AND DUTY CYCLE MID CH (WORSE CASE)

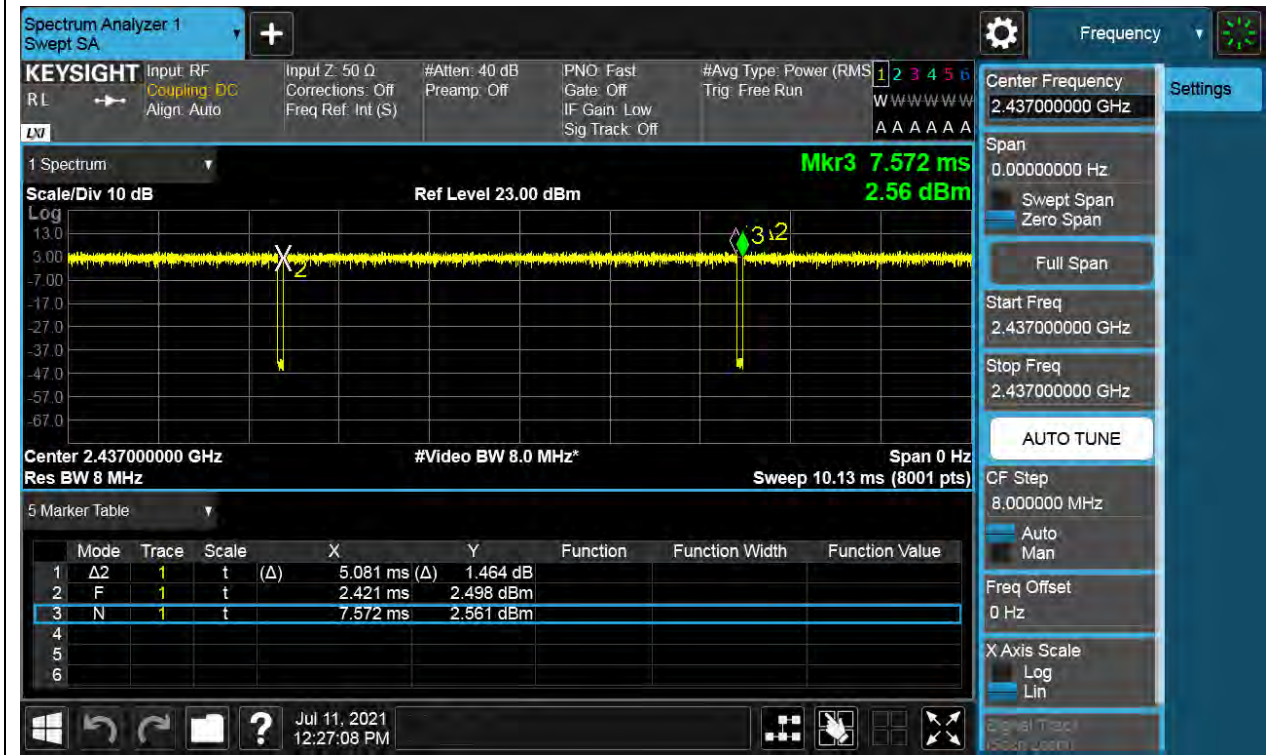


11G ON TIME AND DUTY CYCLE MID CH (WORSE CASE)

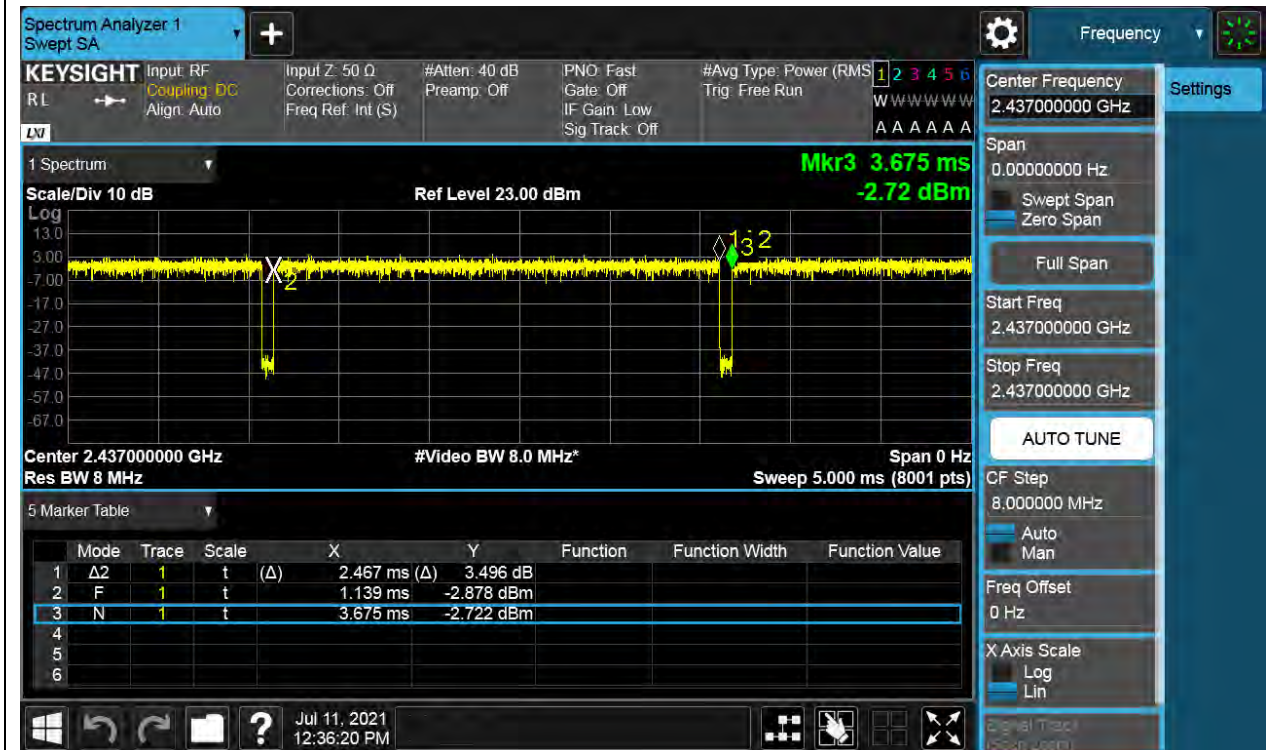




11N HT20 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



11N HT40 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



7.2. 6 dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2)	6dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5

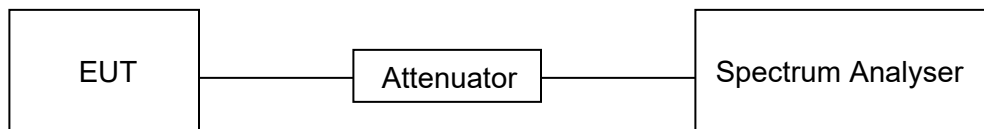
TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth :100K
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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.

TEST SETUP





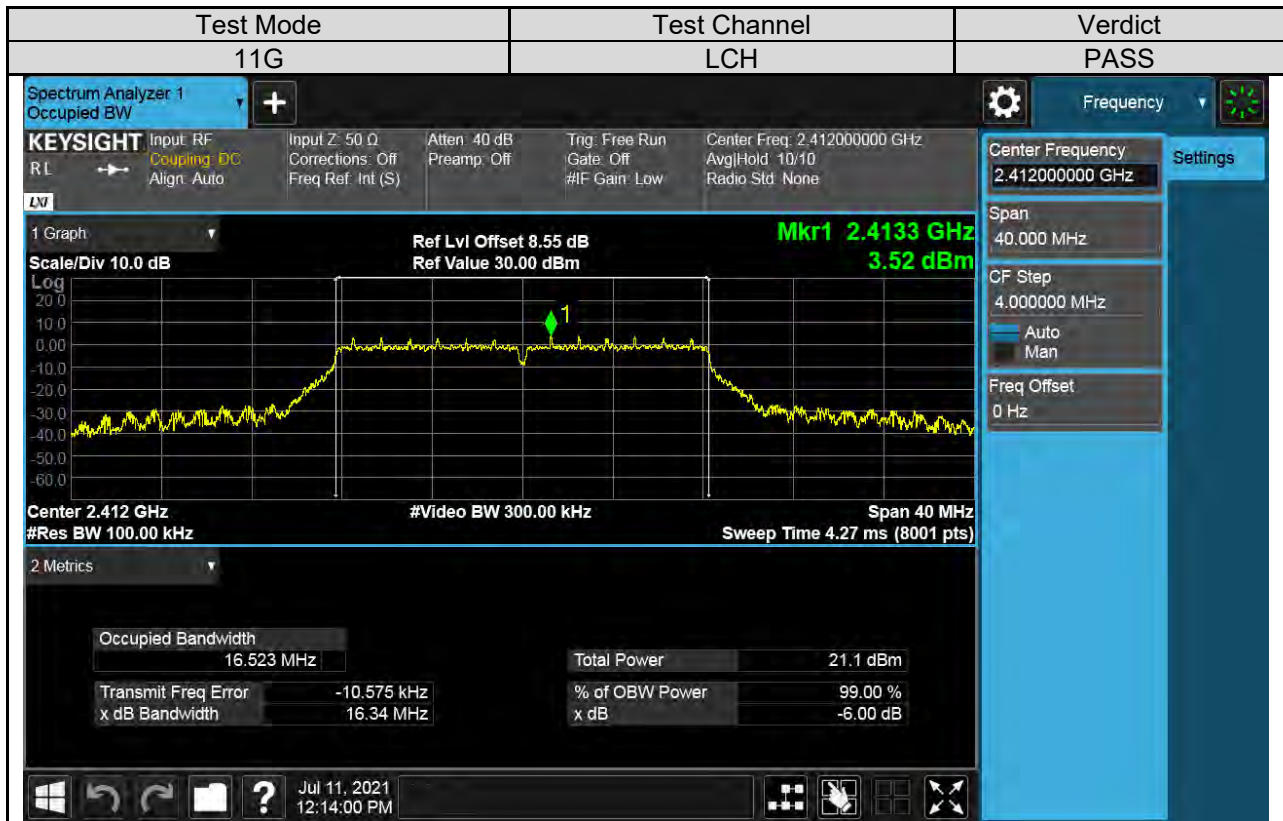
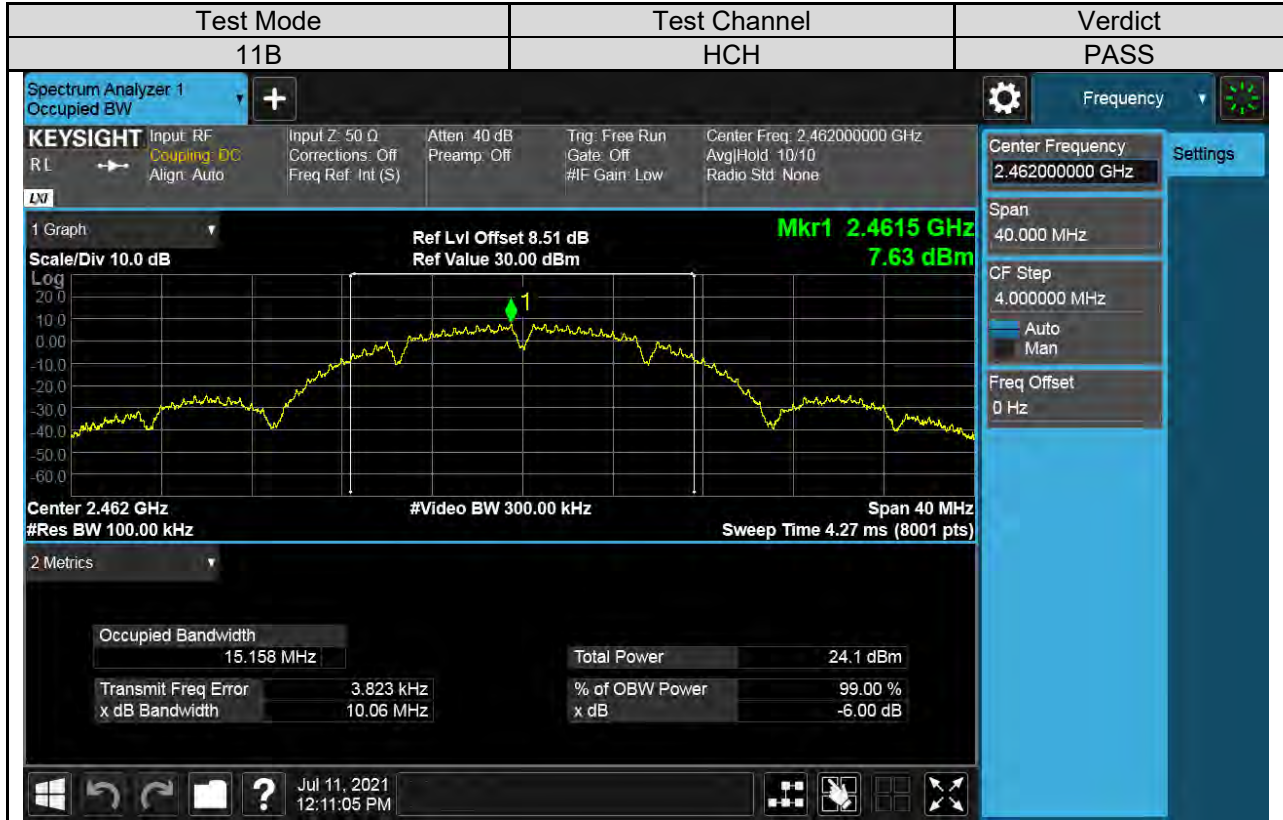
RESULTS

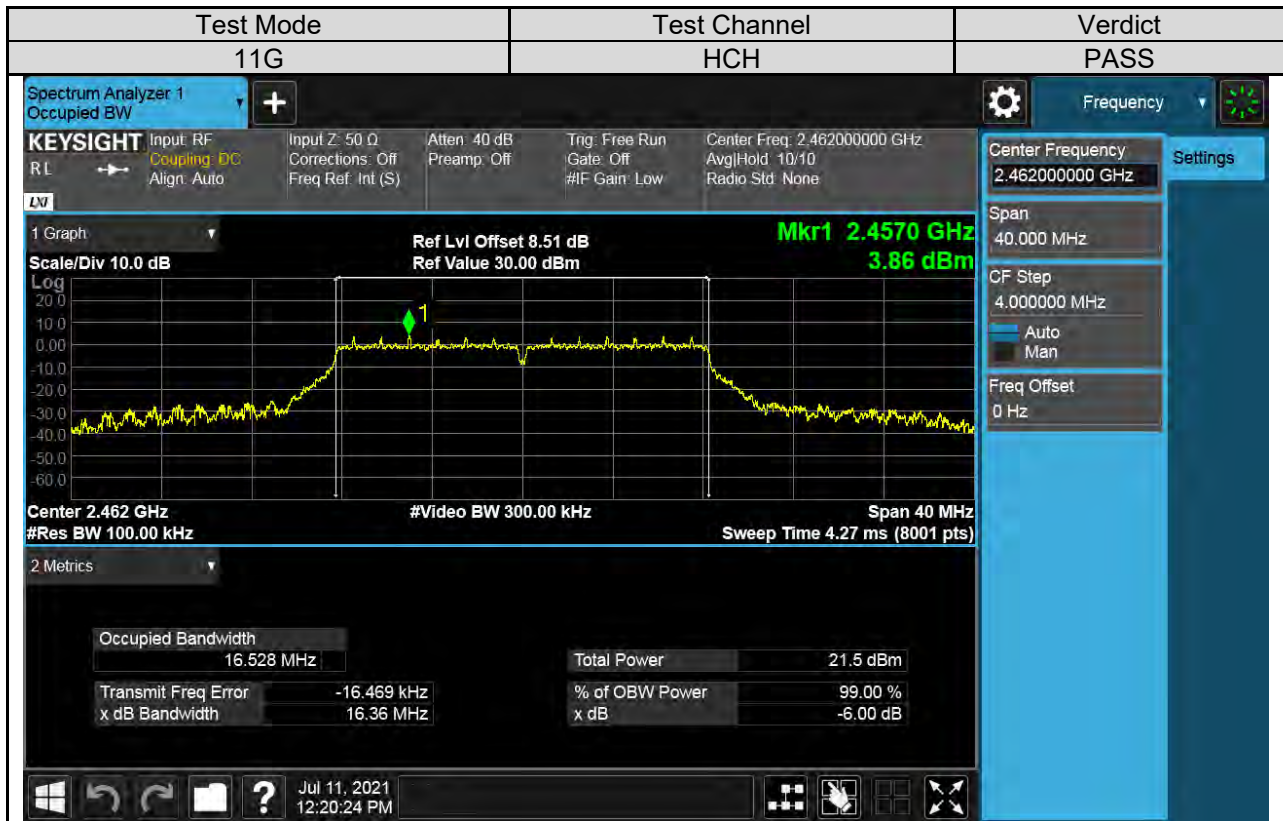
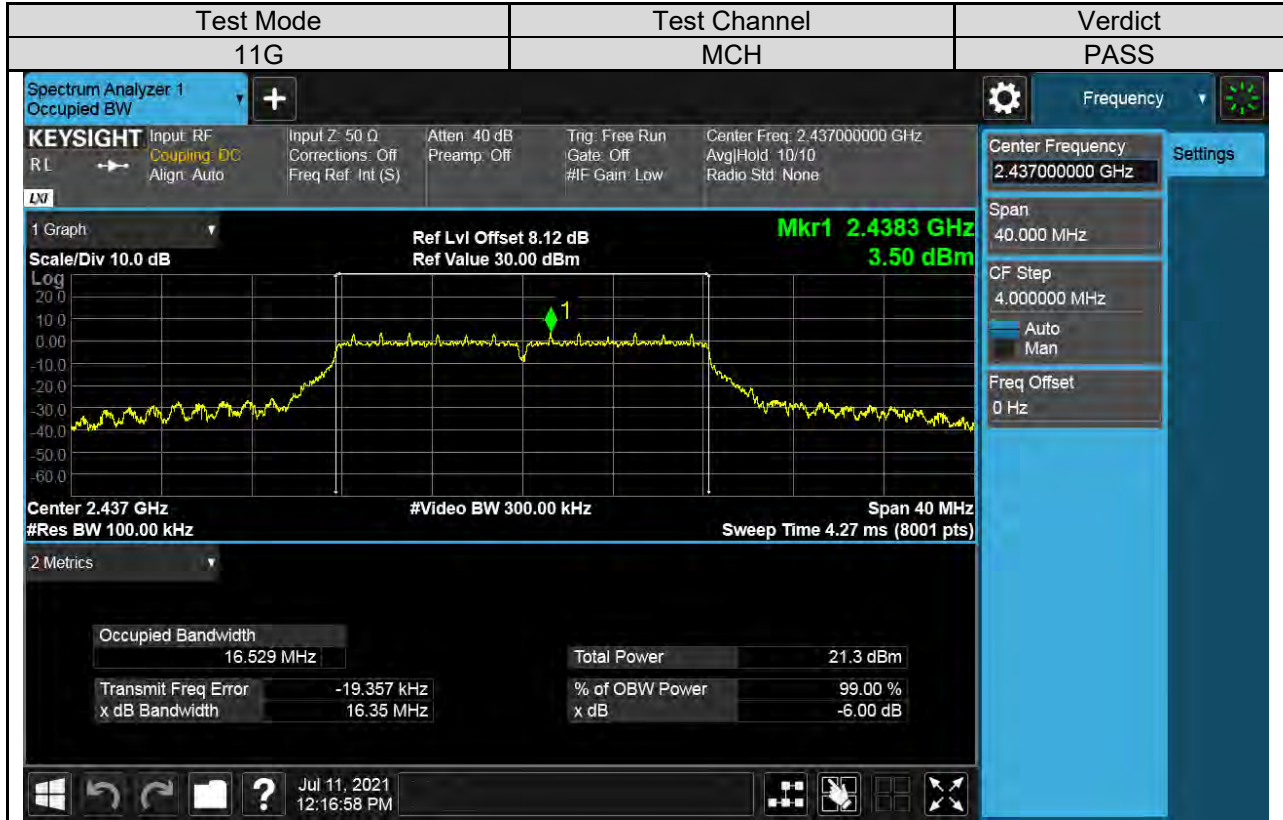
Test Mode	Test Channel	6dB bandwidth (MHz)	Result
11B	LCH	10.06	Pass
	MCH	10.06	Pass
	HCH	10.06	Pass
11G	LCH	16.34	Pass
	MCH	16.35	Pass
	HCH	16.36	Pass
11N HT20	LCH	17.60	Pass
	MCH	17.60	Pass
	HCH	17.61	Pass
11N HT40	LCH	36.30	Pass
	MCH	36.31	Pass
	HCH	36.31	Pass

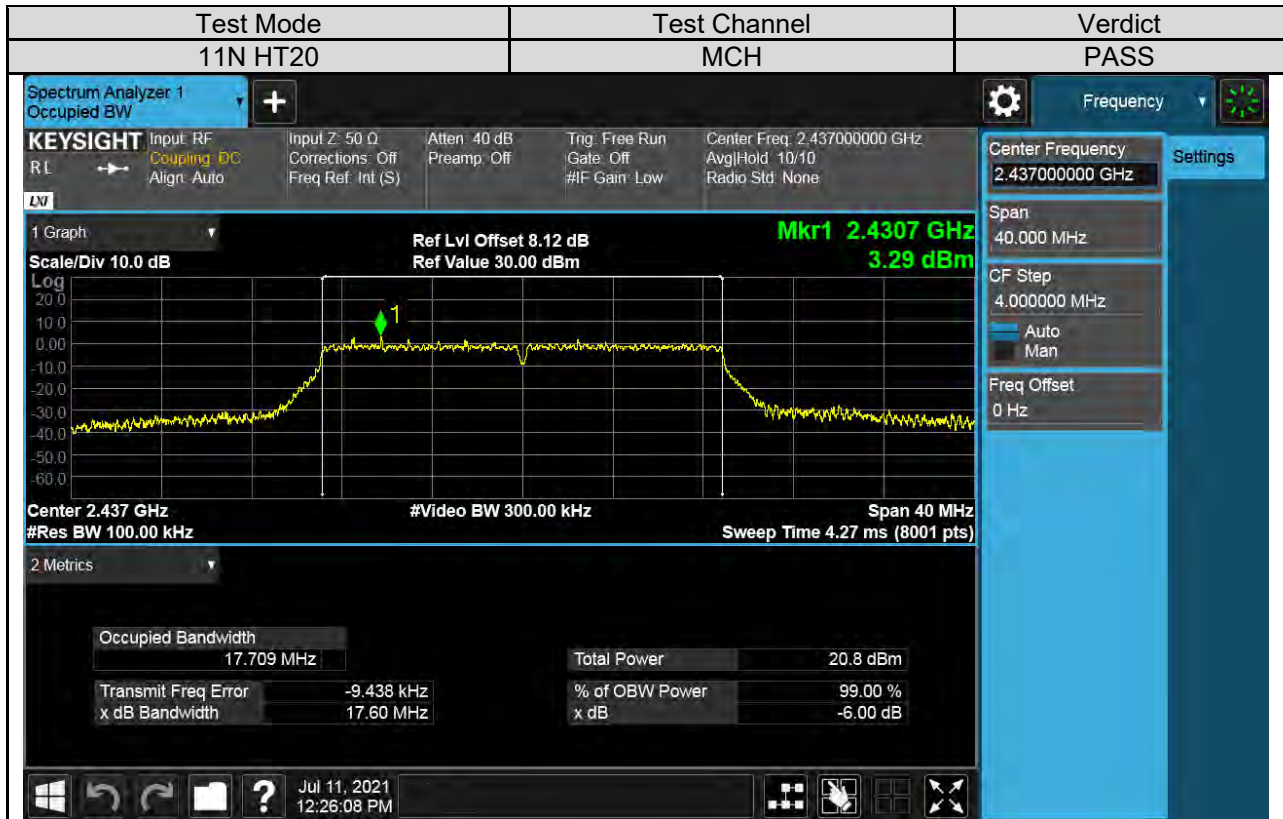
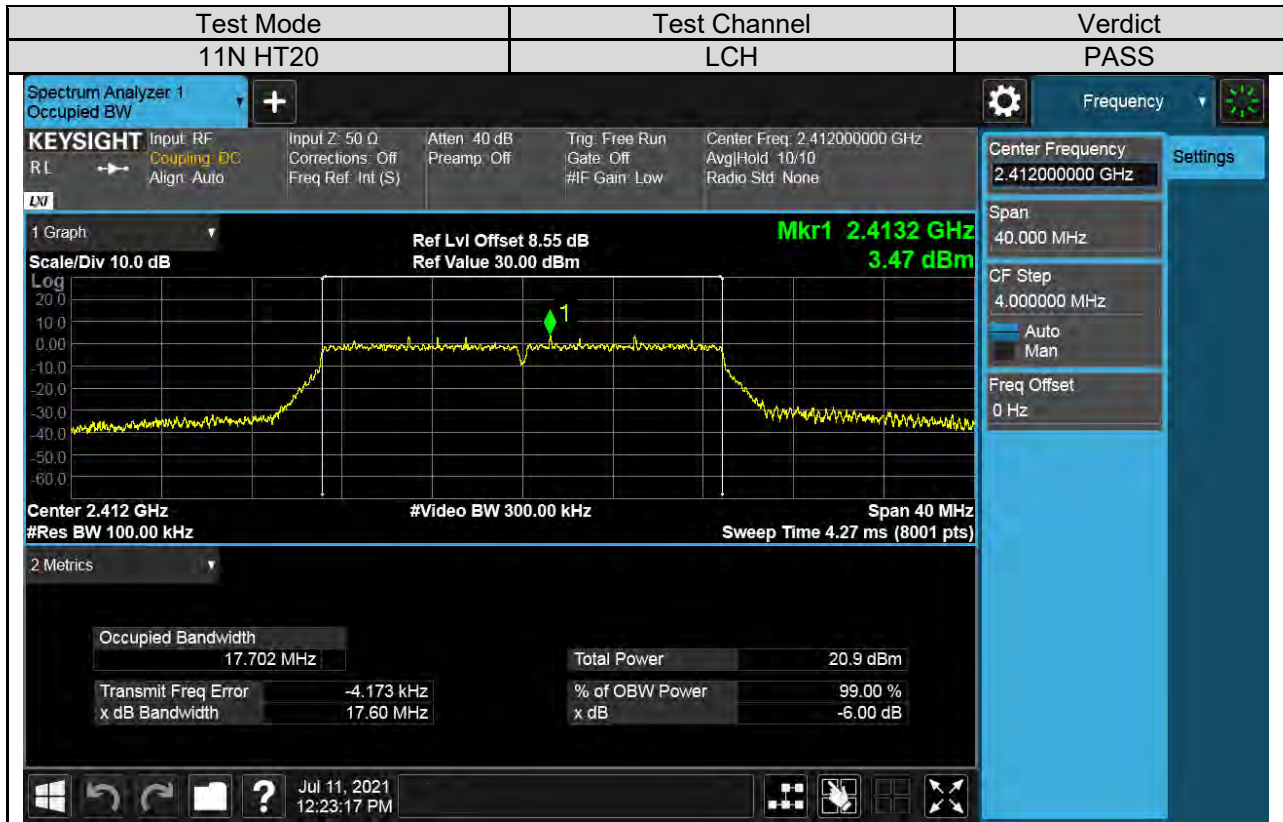


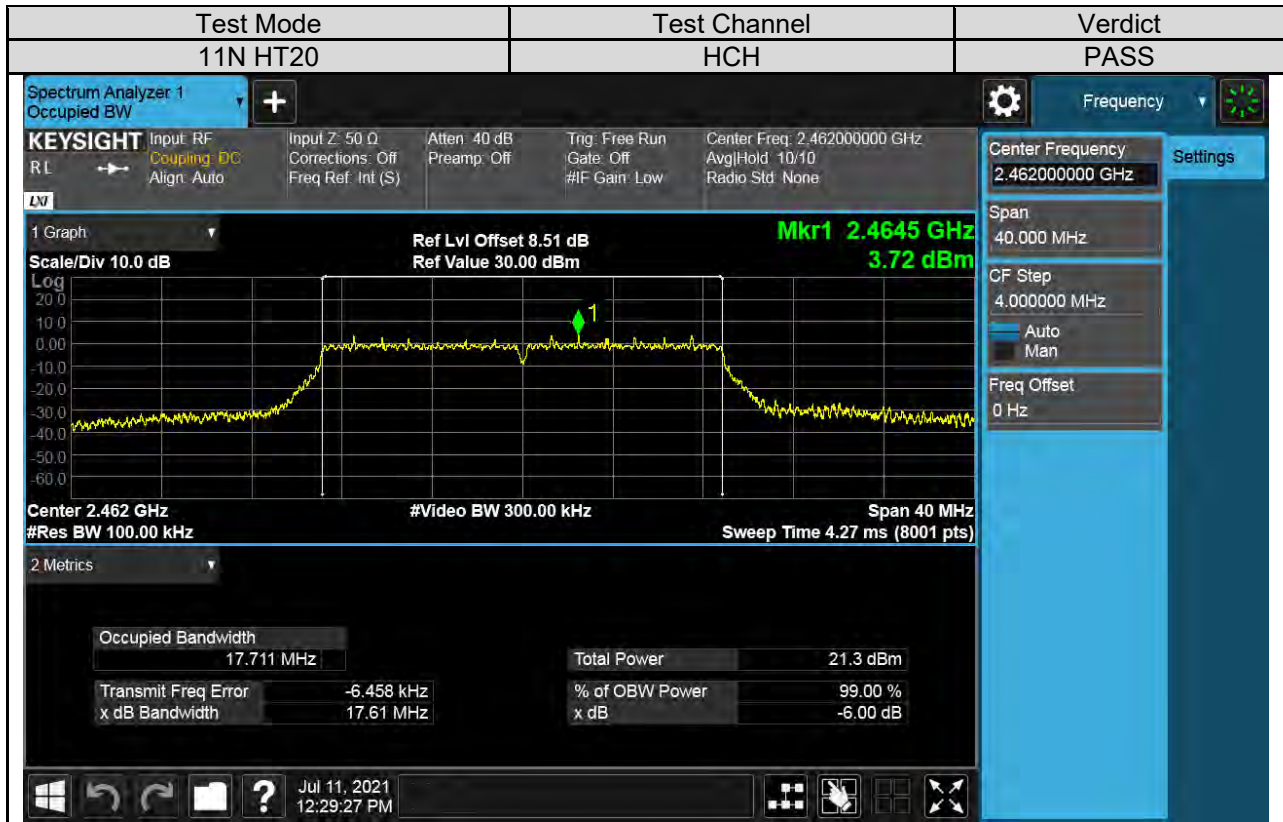
Test Graphs
For 6dB Bandwidth part:

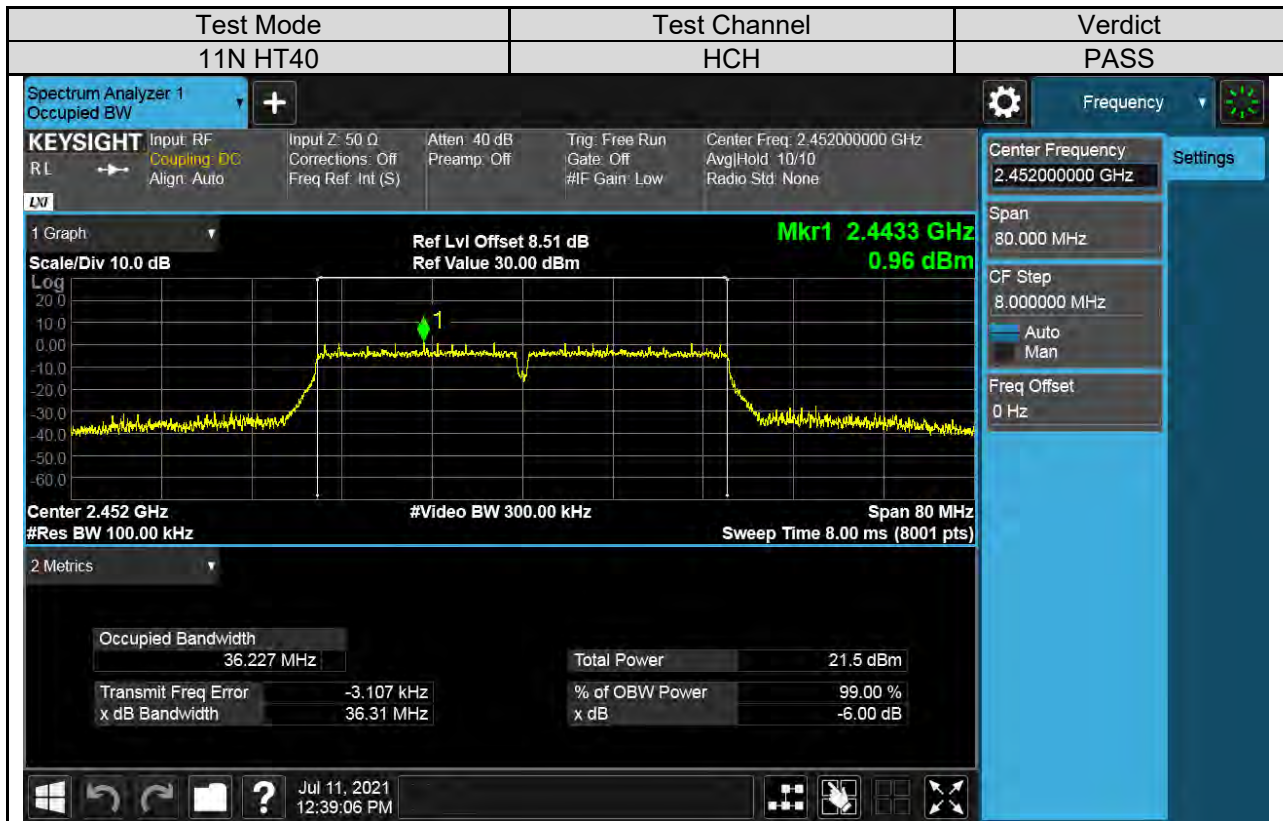












7.3. CONDUCTED POWER

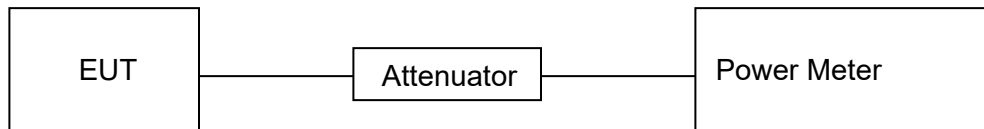
LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3)	Output Power	1 watt or 30dBm	2400-2483.5

TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
Measure the power of each channel.
AVG Detector use for AVG result.

TEST SETUP





RESULTS

Test Mode	Test Channel	Maximum Conducted Output Power (AV)	Result
		dBm	
11B	LCH	17.08	Pass
	MCH	17.02	Pass
	HCH	17.43	Pass
11G	LCH	14.81	Pass
	MCH	14.73	Pass
	HCH	15.24	Pass
11N HT20	LCH	14.76	Pass
	MCH	14.67	Pass
	HCH	15.12	Pass
11N HT40	LCH	14.63	Pass
	MCH	14.76	Pass
	HCH	15.25	Pass

Remark:

- 1) For all the test results has been adjusted the duty cycle factor.
- 2) For Correction Factor is refer to the result in section 7.1

7.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

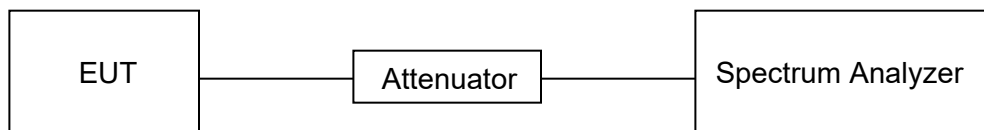
Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



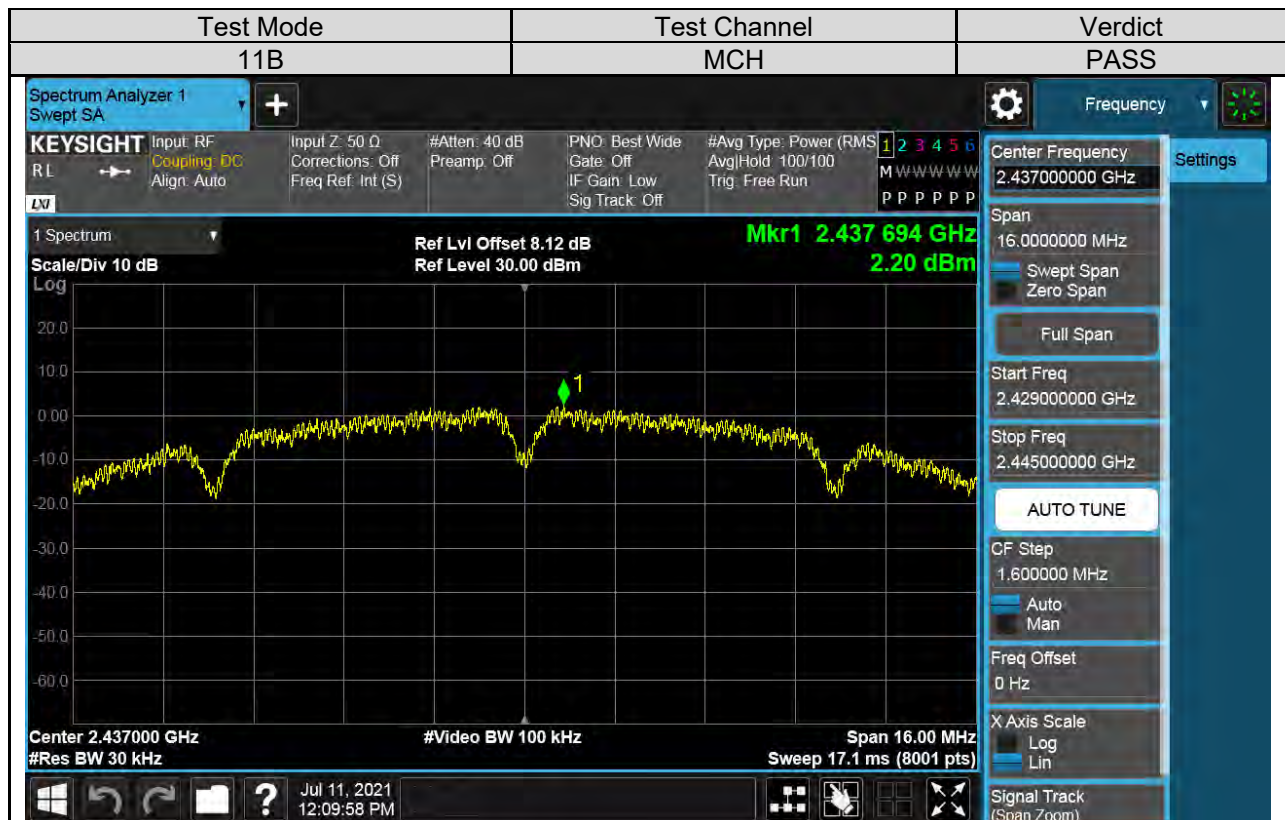


RESULTS

Test Mode	Test Channel	Maximum Peak power spectral density (dBm/30kHz)	Result
11B	LCH	2.27	Pass
	MCH	2.20	Pass
	HCH	2.57	Pass
11G	LCH	-1.26	Pass
	MCH	-0.67	Pass
	HCH	-0.62	Pass
11N HT20	LCH	-2.09	Pass
	MCH	-1.22	Pass
	HCH	-1.98	Pass
11N HT40	LCH	-5.34	Pass
	MCH	-5.05	Pass
	HCH	-4.25	Pass

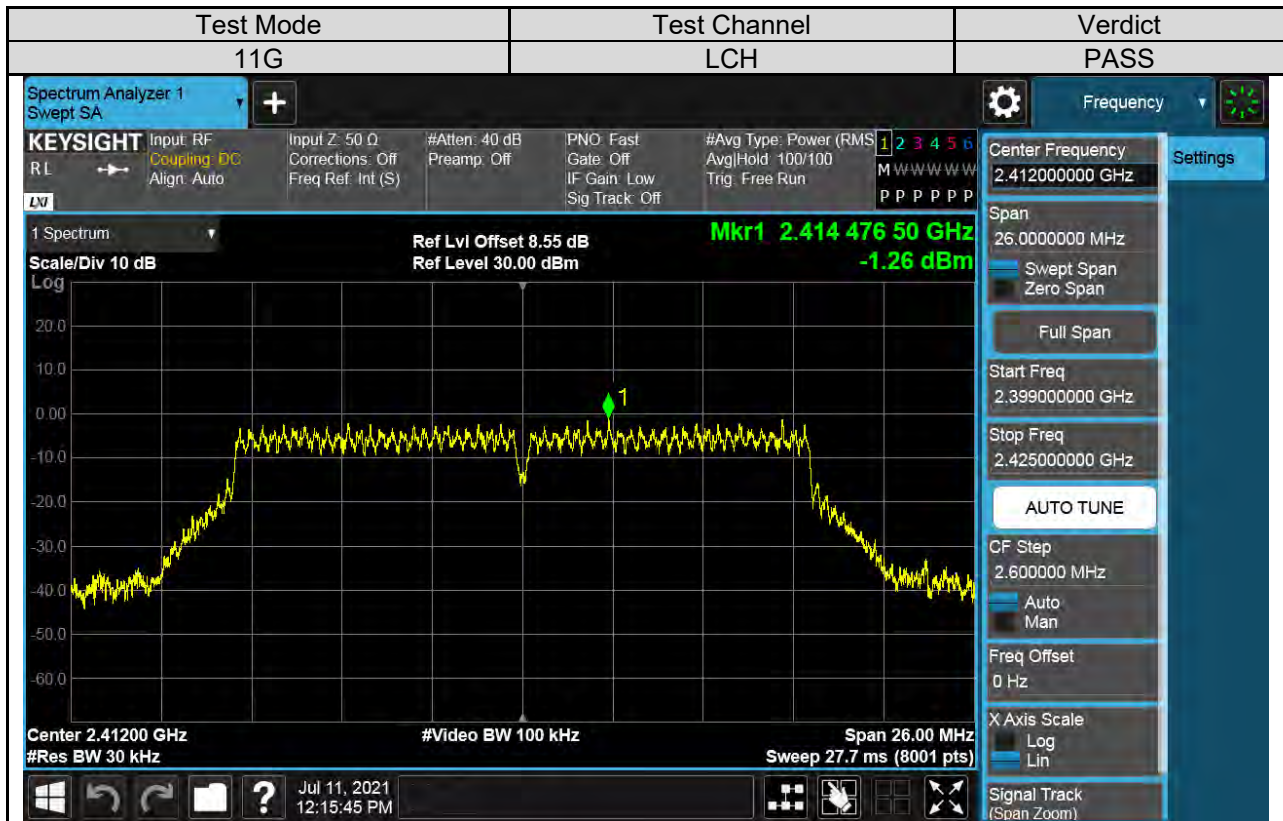


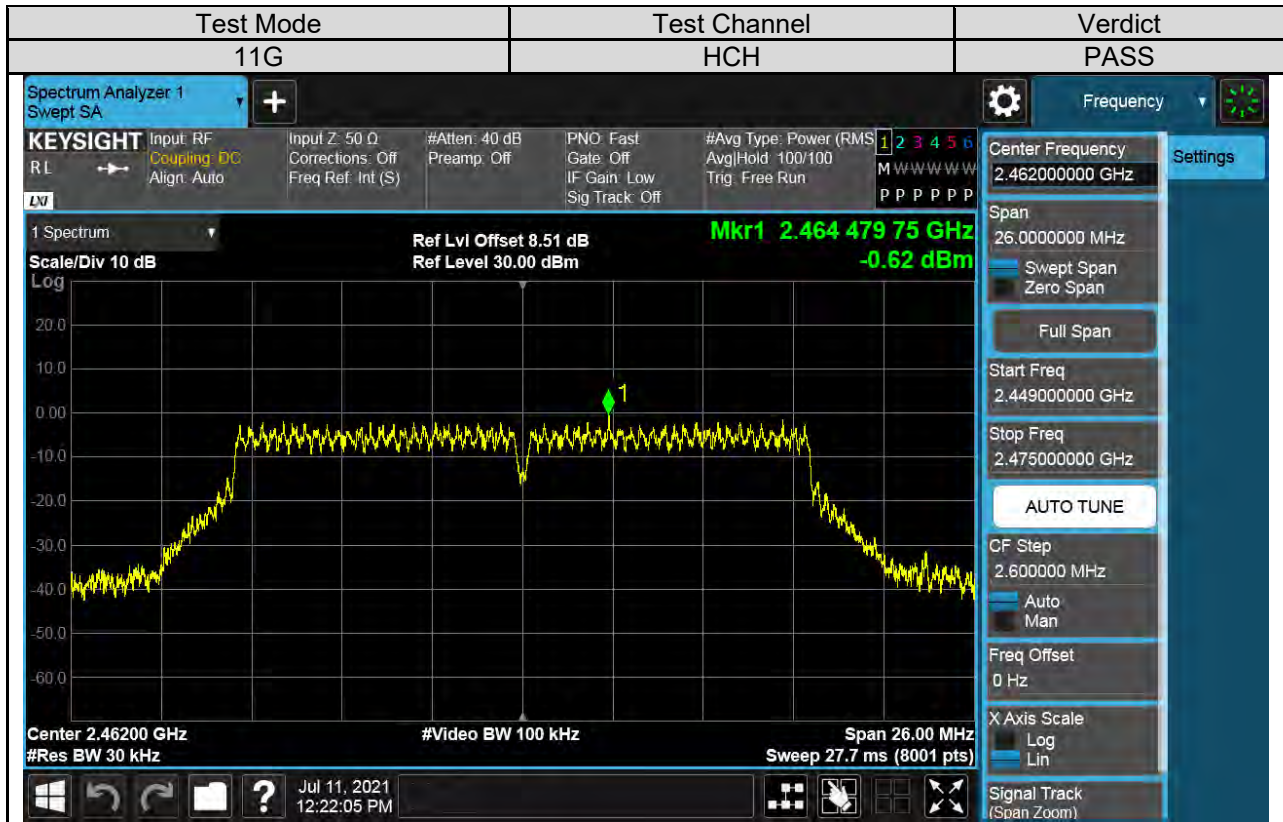
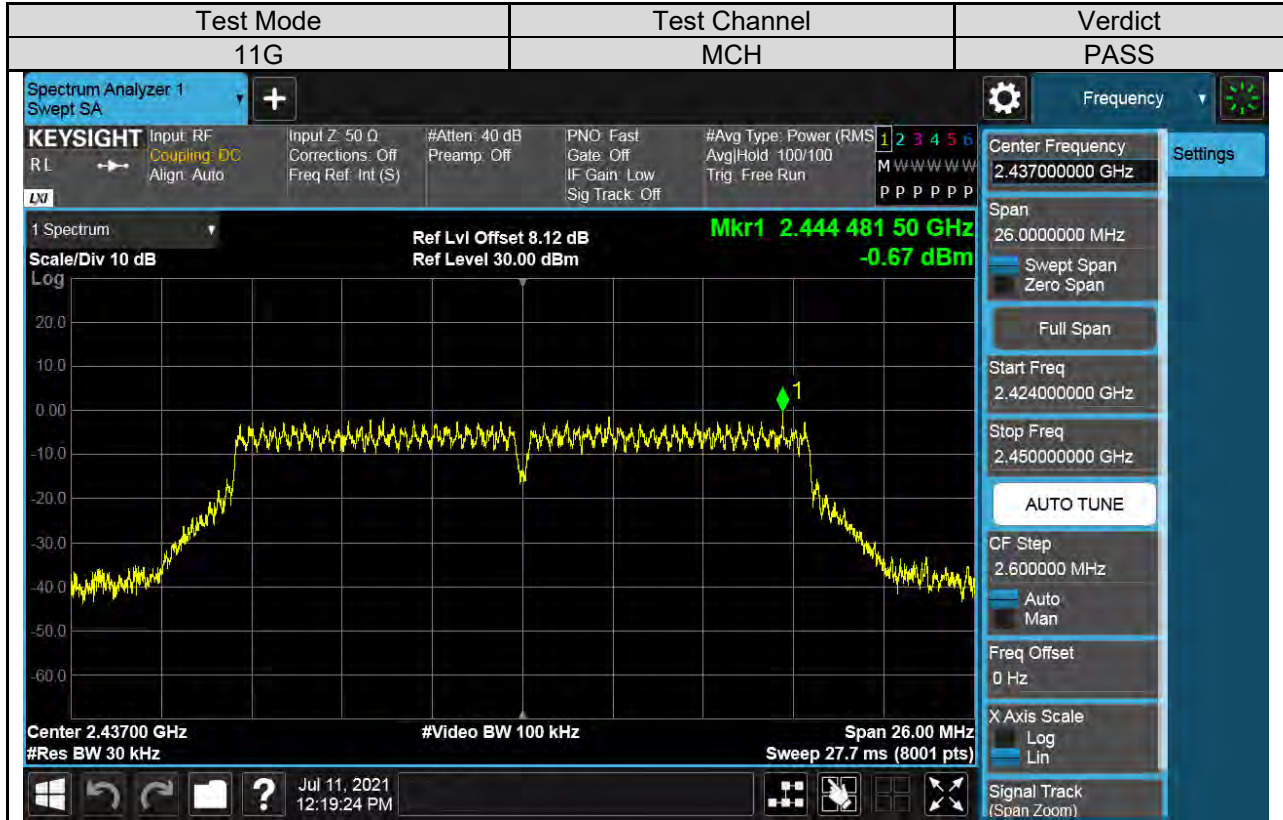
Test Graphs:

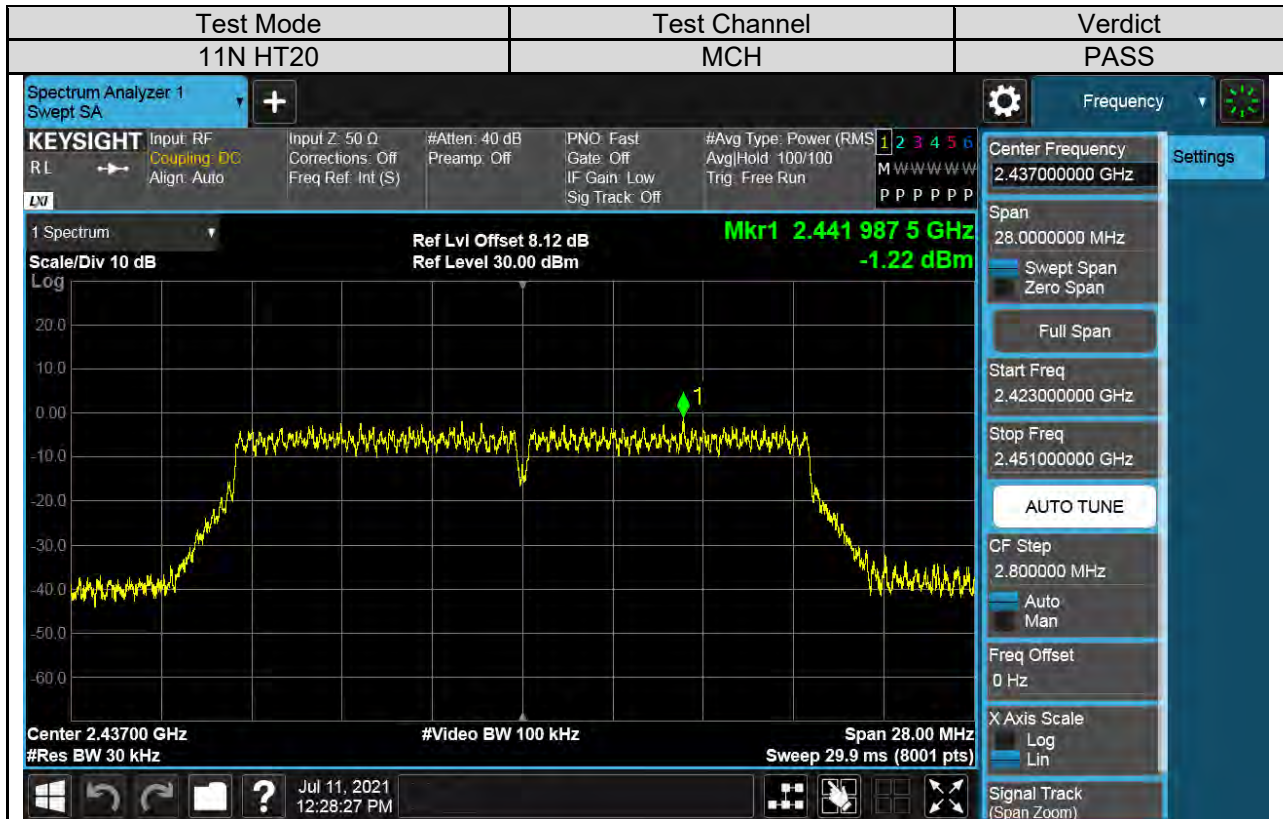
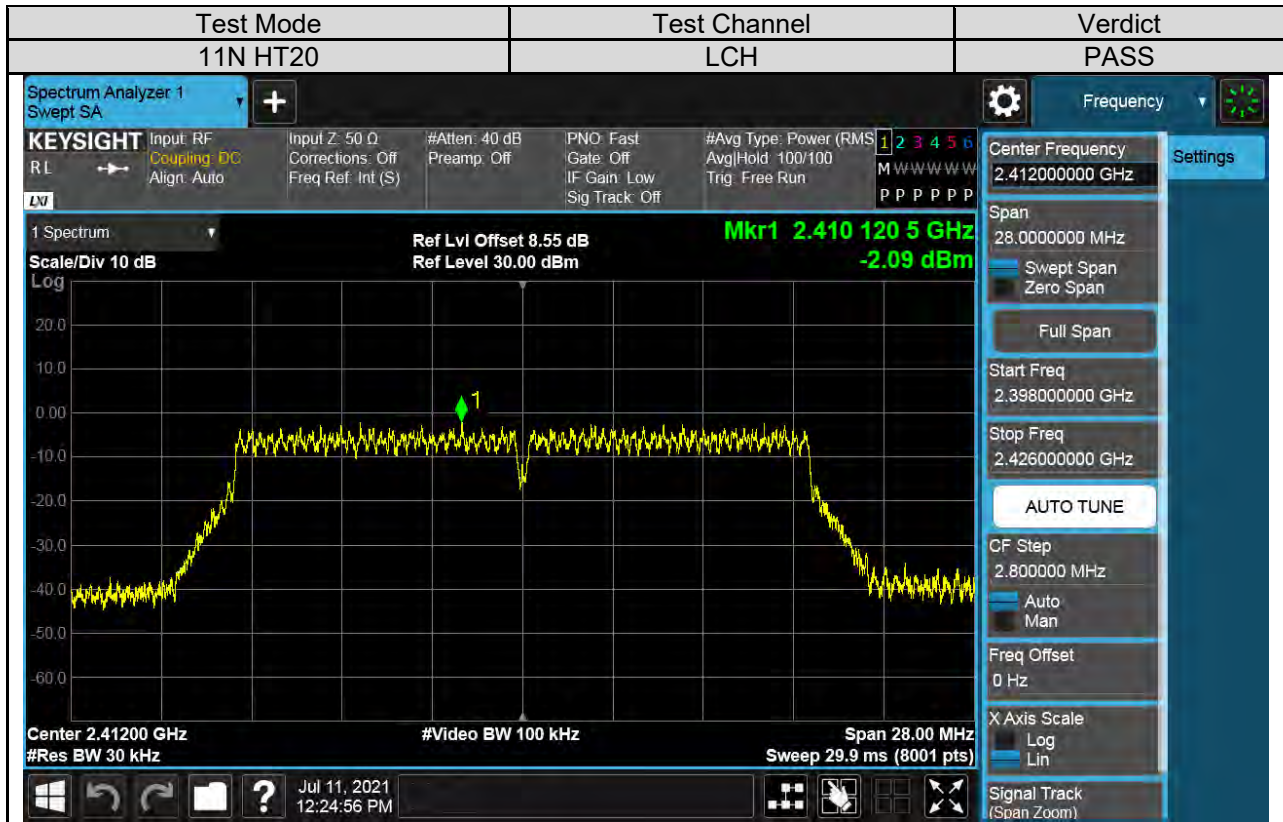


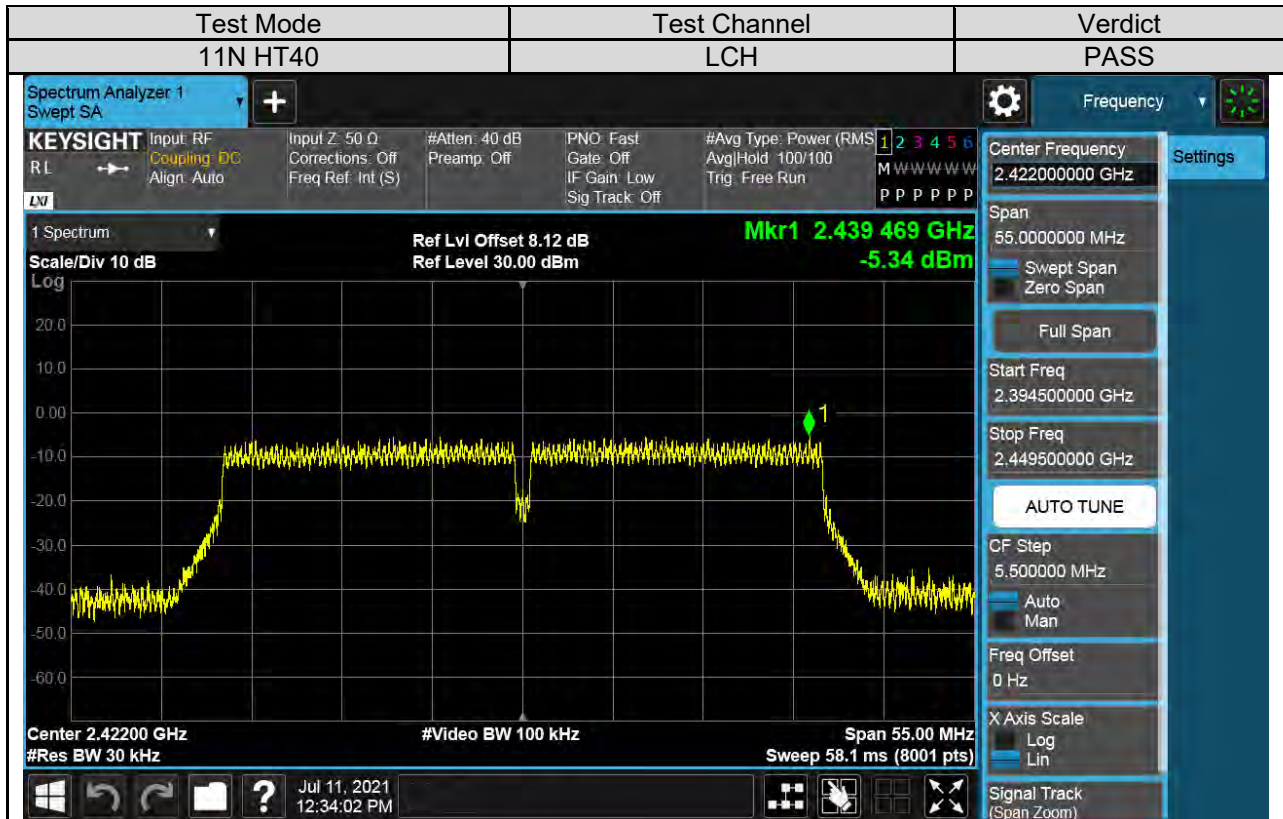
UL-CCIC COMPANY LIMITED

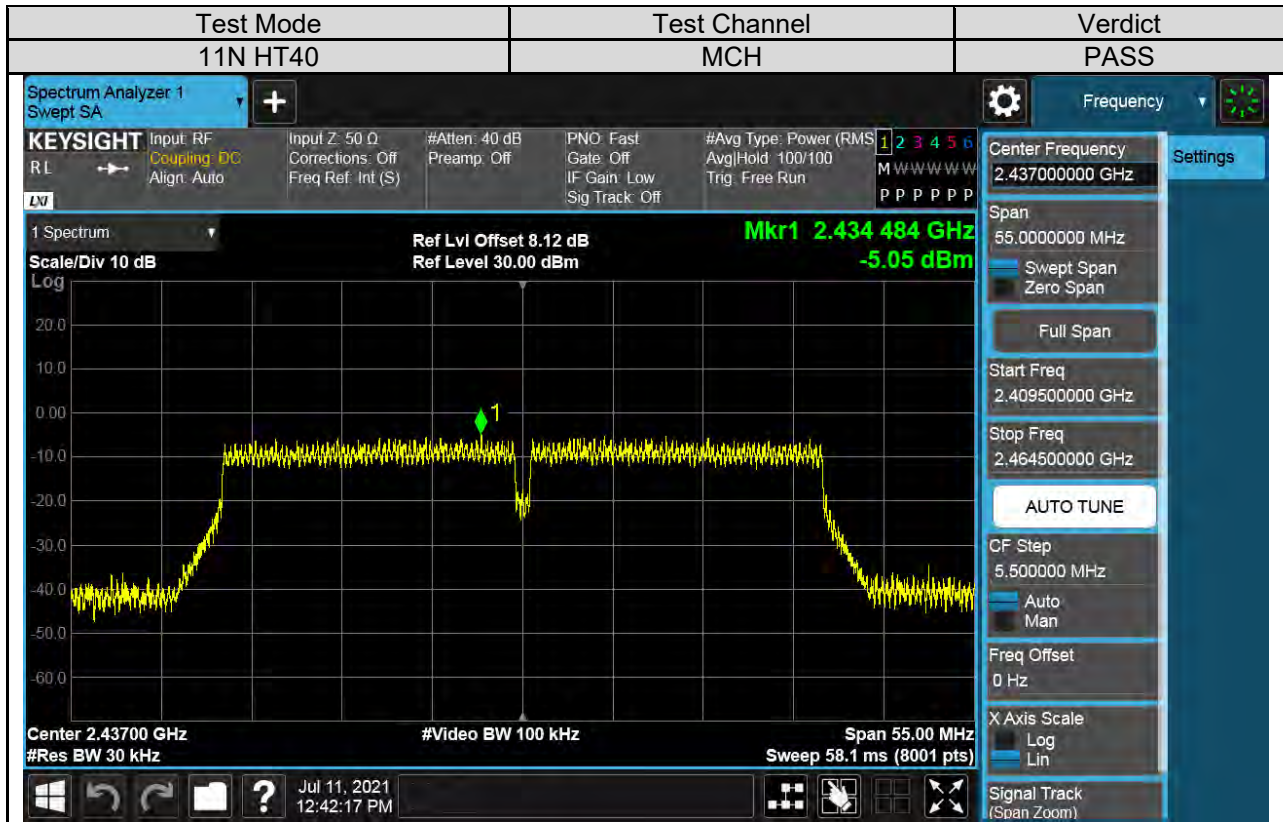
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.











UL-CCIC COMPANY LIMITED

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	At least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

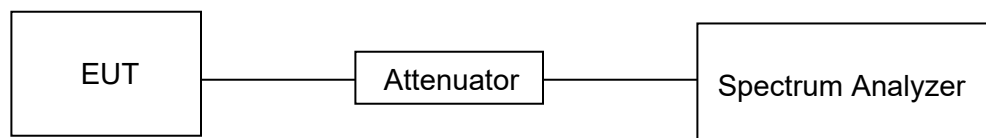
settings:

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

TEST SETUP





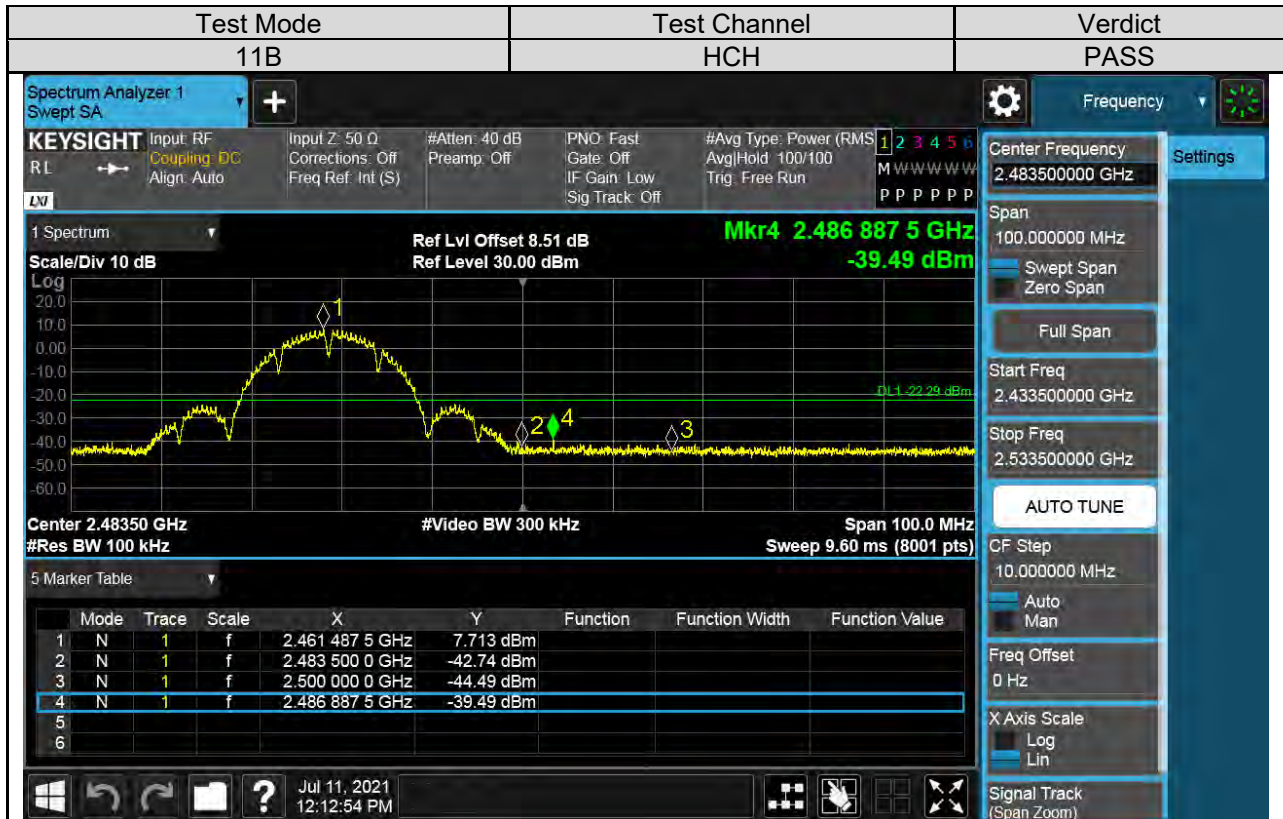
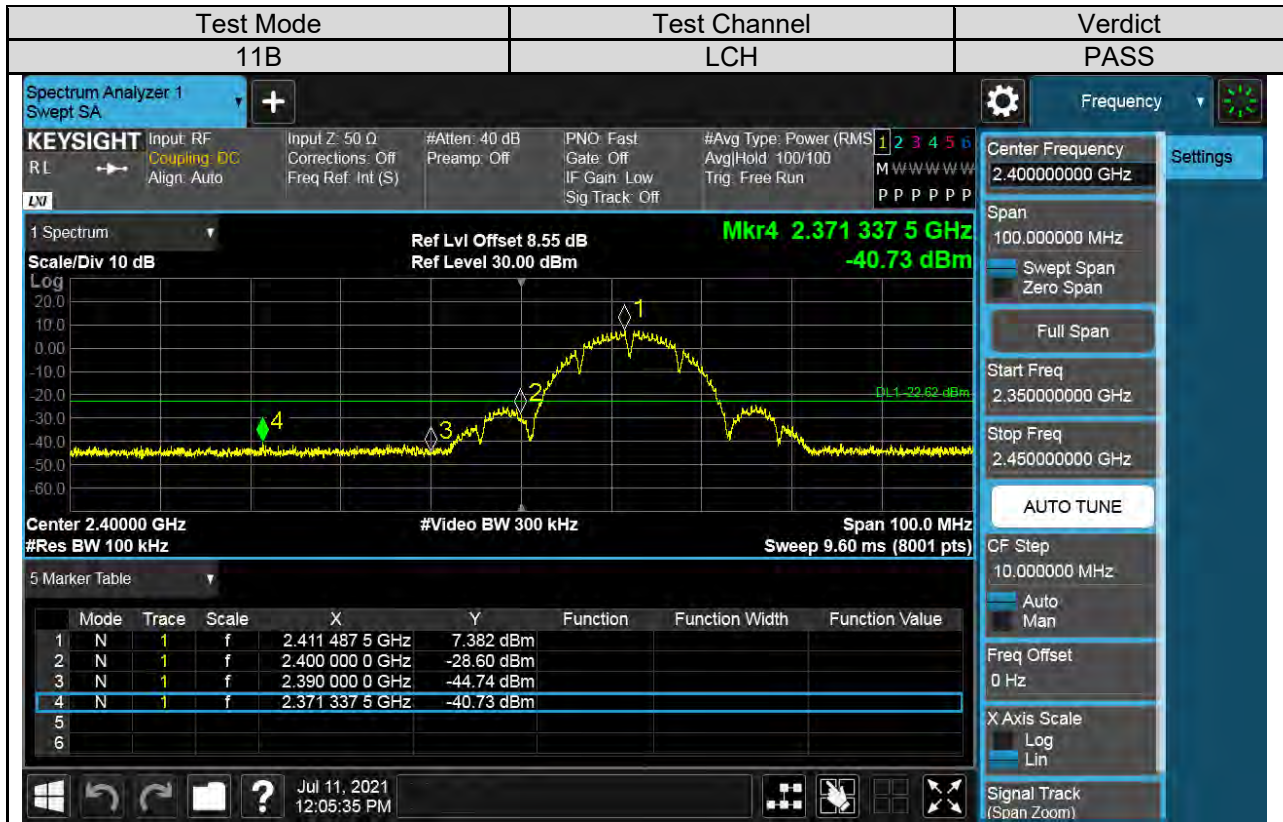
Part I :Conducted Bandedge

RESULTS TABLE

Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	7.382	-40.73	-22.62	PASS
	HCH	7.713	-39.49	-22.29	PASS
11G	LCH	3.700	-40.39	-26.3	PASS
	HCH	4.034	-37.28	-25.97	PASS
11N HT20	LCH	3.472	-39.24	-26.53	PASS
	HCH	3.322	-35.38	-26.68	PASS
11N HT40	LCH	0.450	-31.76	-29.55	PASS
	HCH	0.856	-30.72	-29.14	PASS

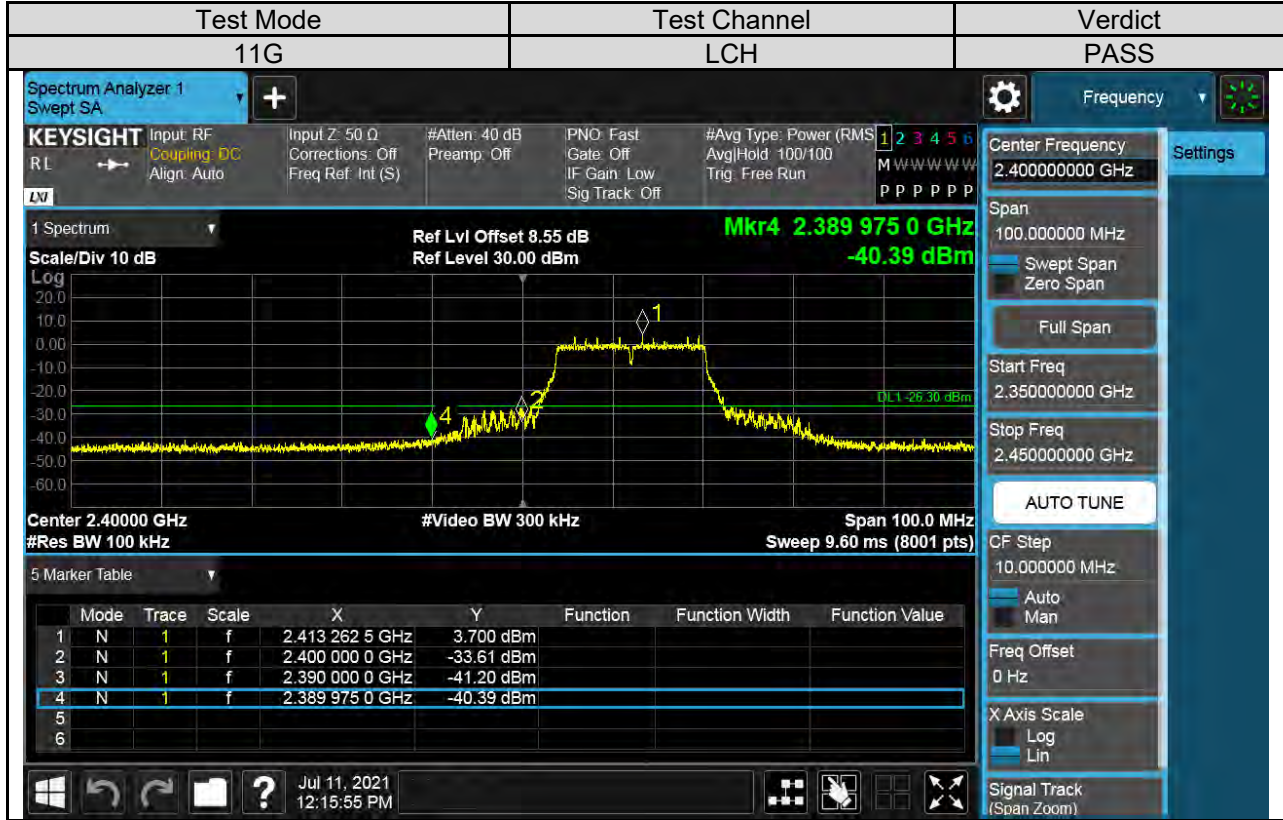


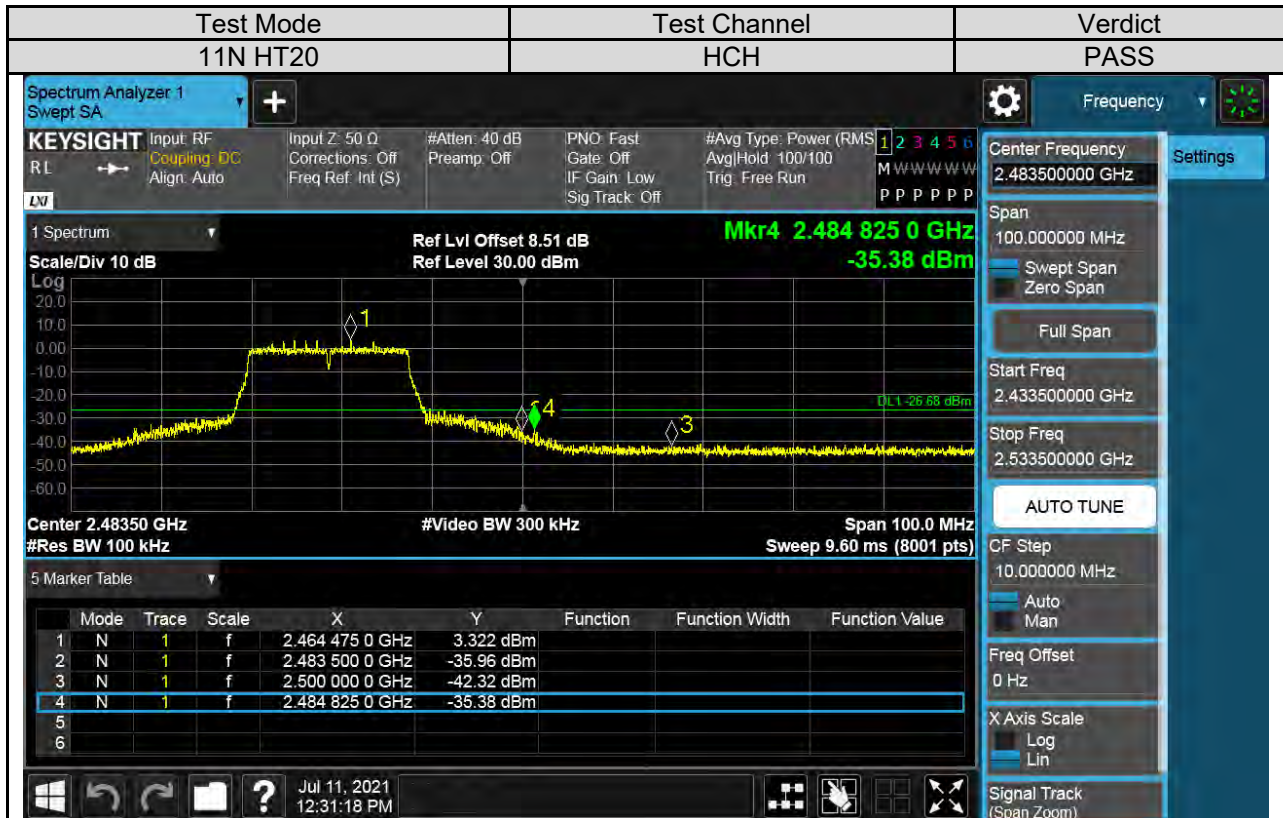
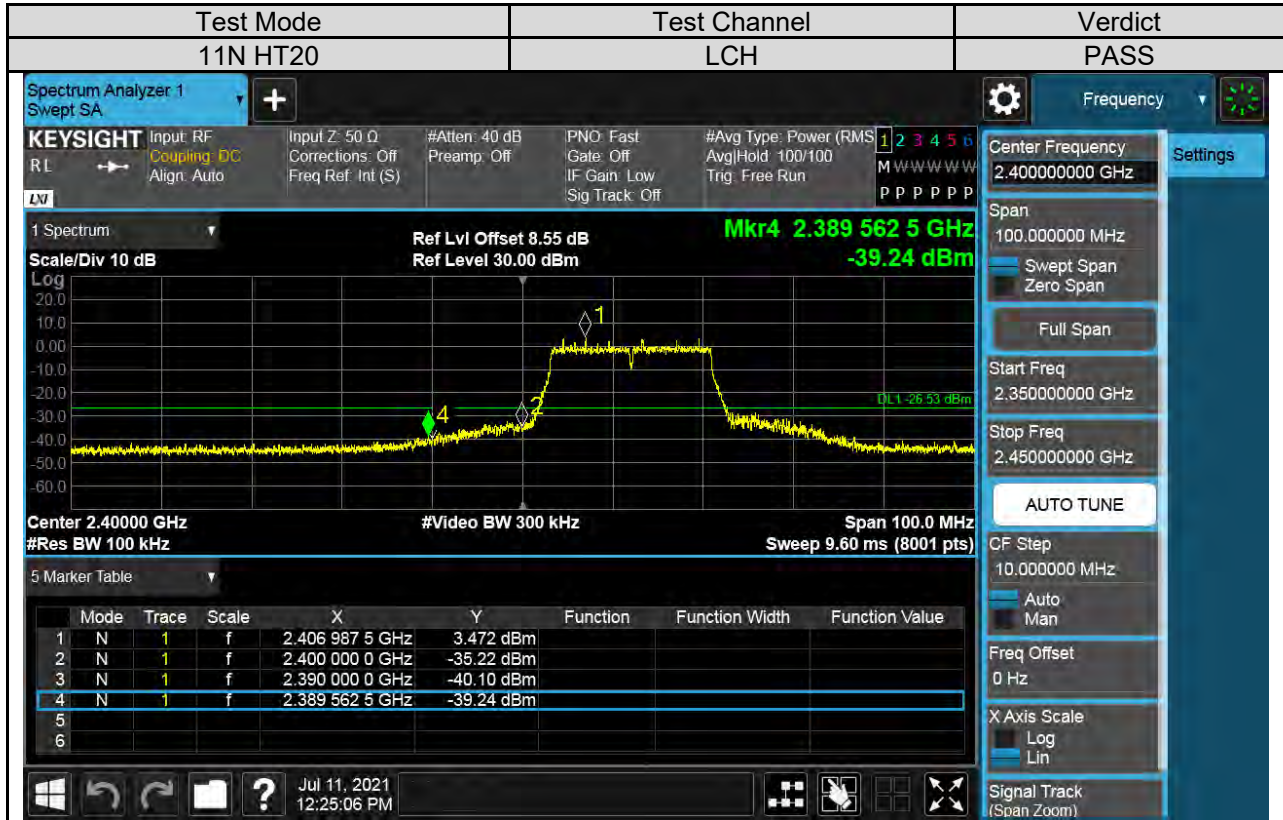
TEST GRAPHS

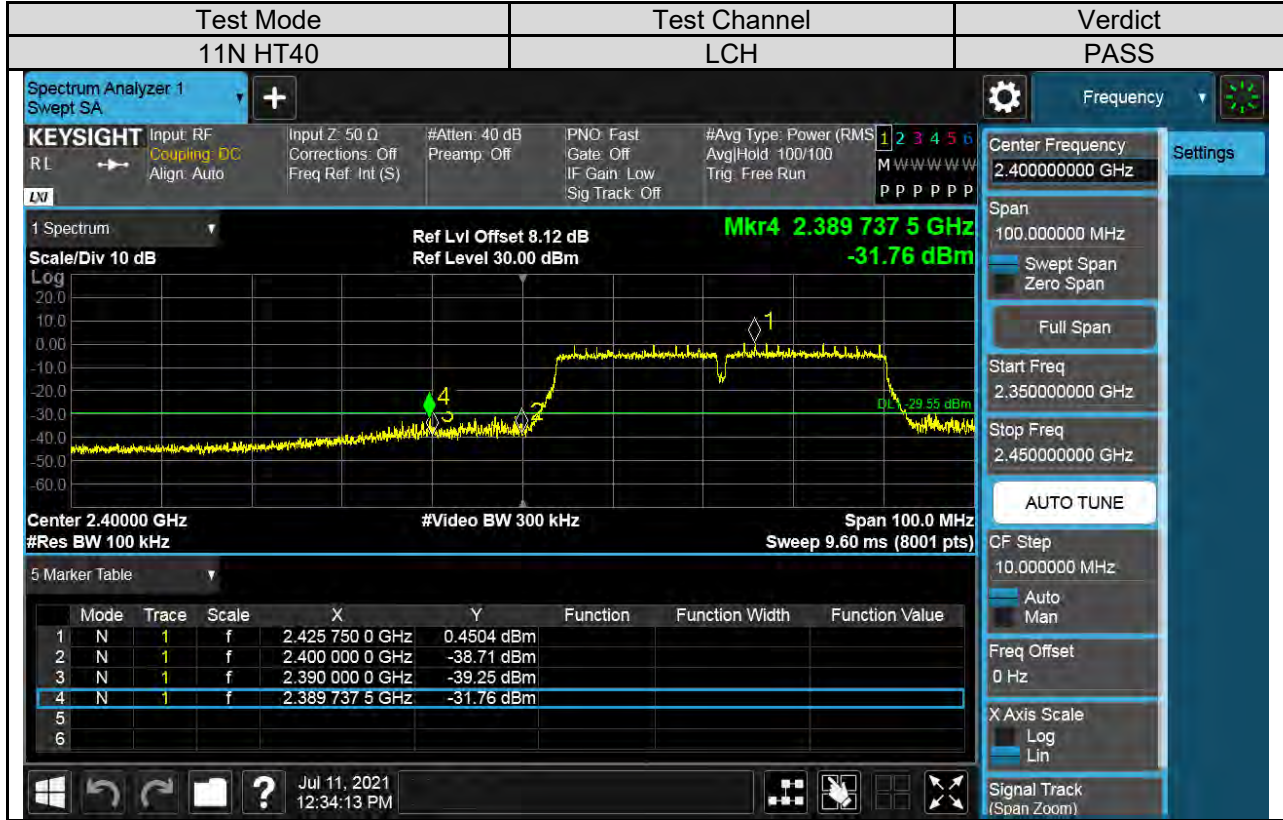


UL-CCIC COMPANY LIMITED

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.









Part II :Conducted Emission

Test Result Table

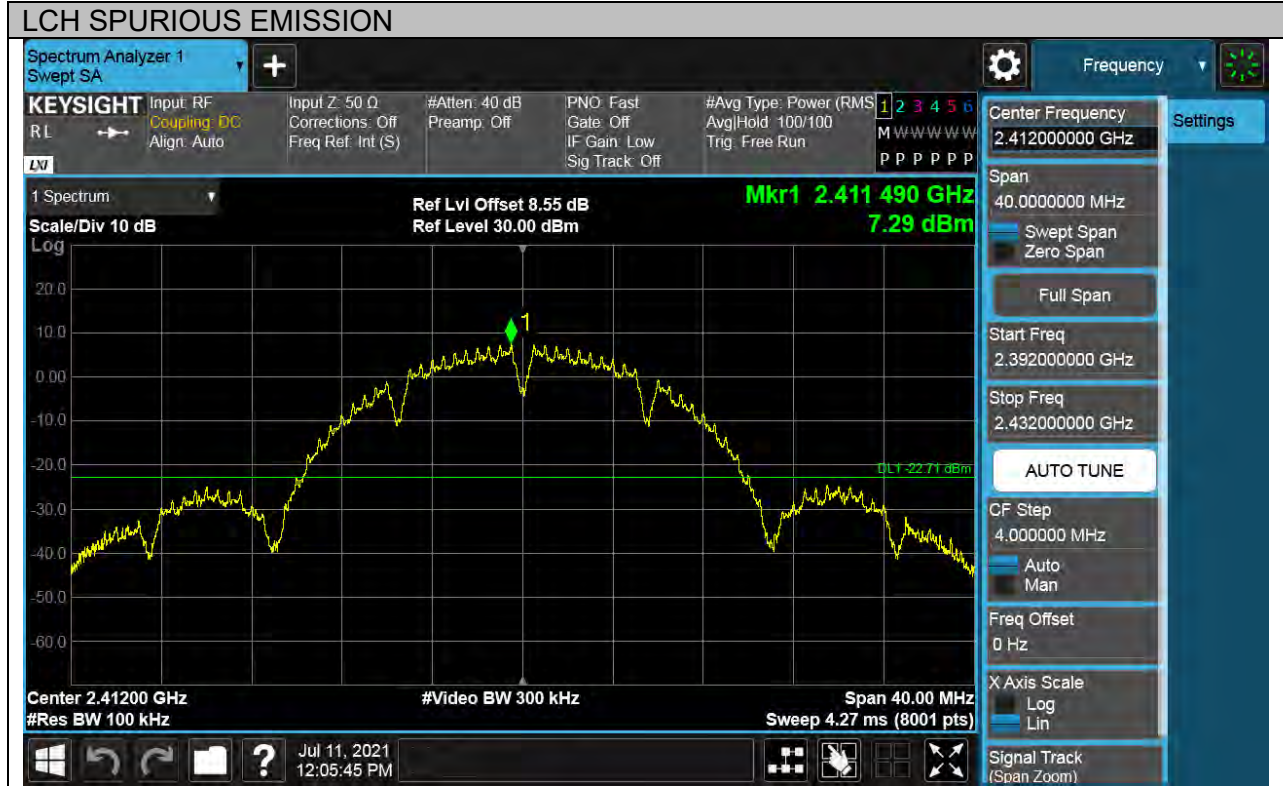
Test Mode	Test Antenna	Channel	Pref(dBm)	Puw(dBm)	Verdict
11B	Antenna 1	LCH	See the test graphs	<Limit	PASS
		MCH	See the test graphs	<Limit	PASS
		HCH	See the test graphs	<Limit	PASS
11G	Antenna 1	LCH	See the test graphs	<Limit	PASS
		MCH	See the test graphs	<Limit	PASS
		HCH	See the test graphs	<Limit	PASS
11N HT20	Antenna 1	LCH	See the test graphs	<Limit	PASS
		MCH	See the test graphs	<Limit	PASS
		HCH	See the test graphs	<Limit	PASS
11N HT40	Antenna 1	LCH	See the test graphs	<Limit	PASS
		MCH	See the test graphs	<Limit	PASS
		HCH	See the test graphs	<Limit	PASS



Test Plots

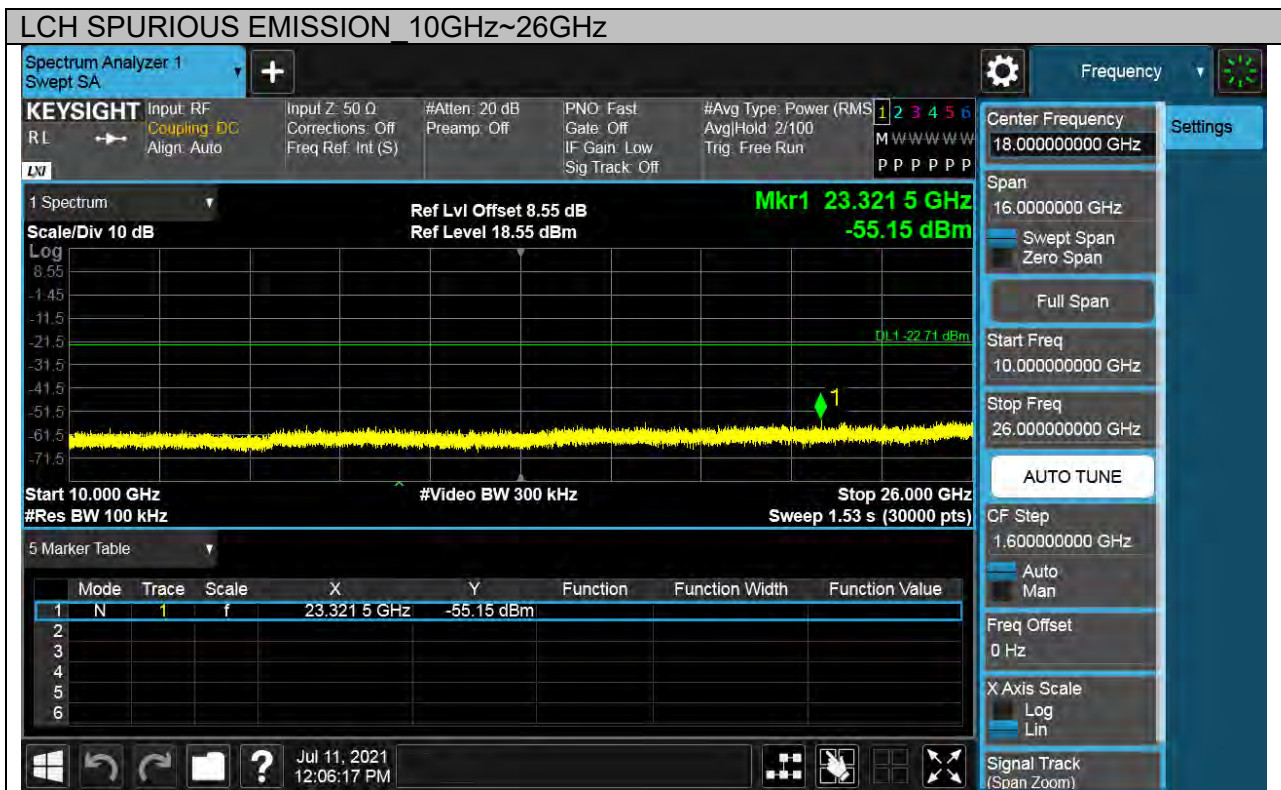
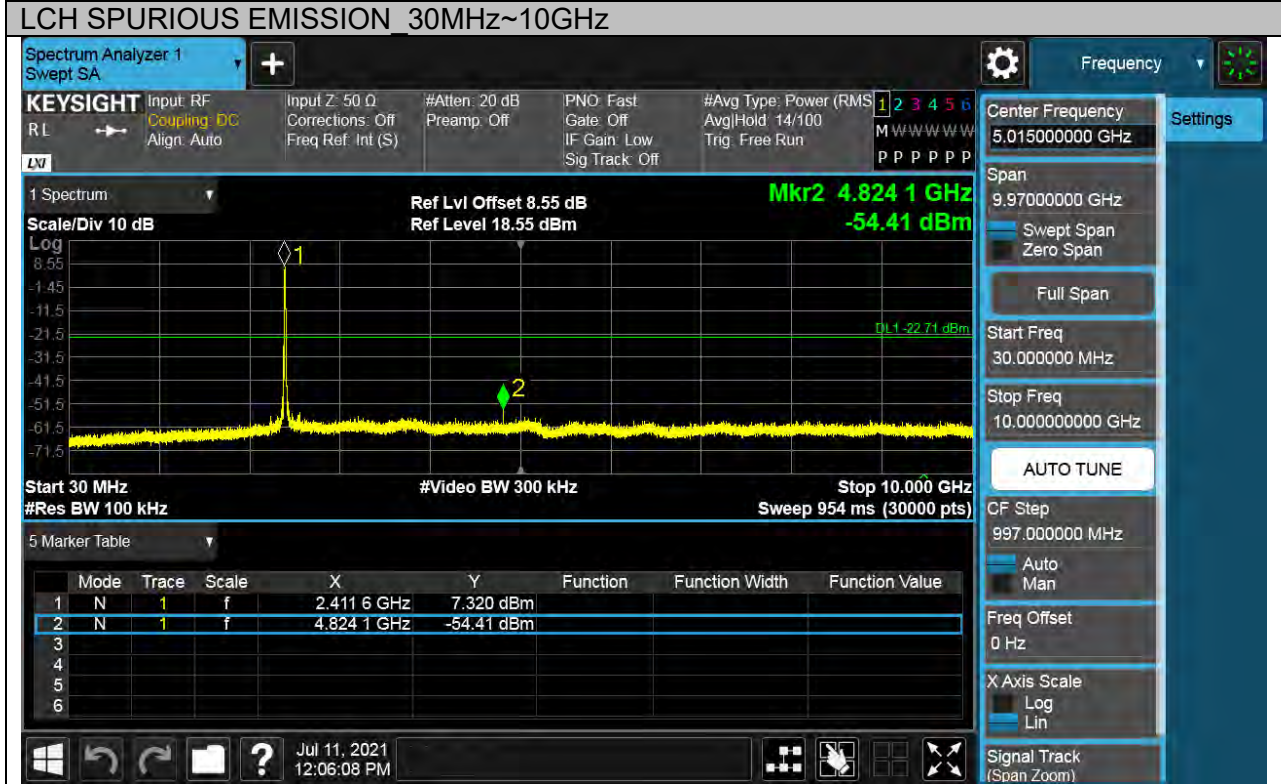
Test Mode	Channel	Verdict
11B	LCH	PASS

Pref test Plot





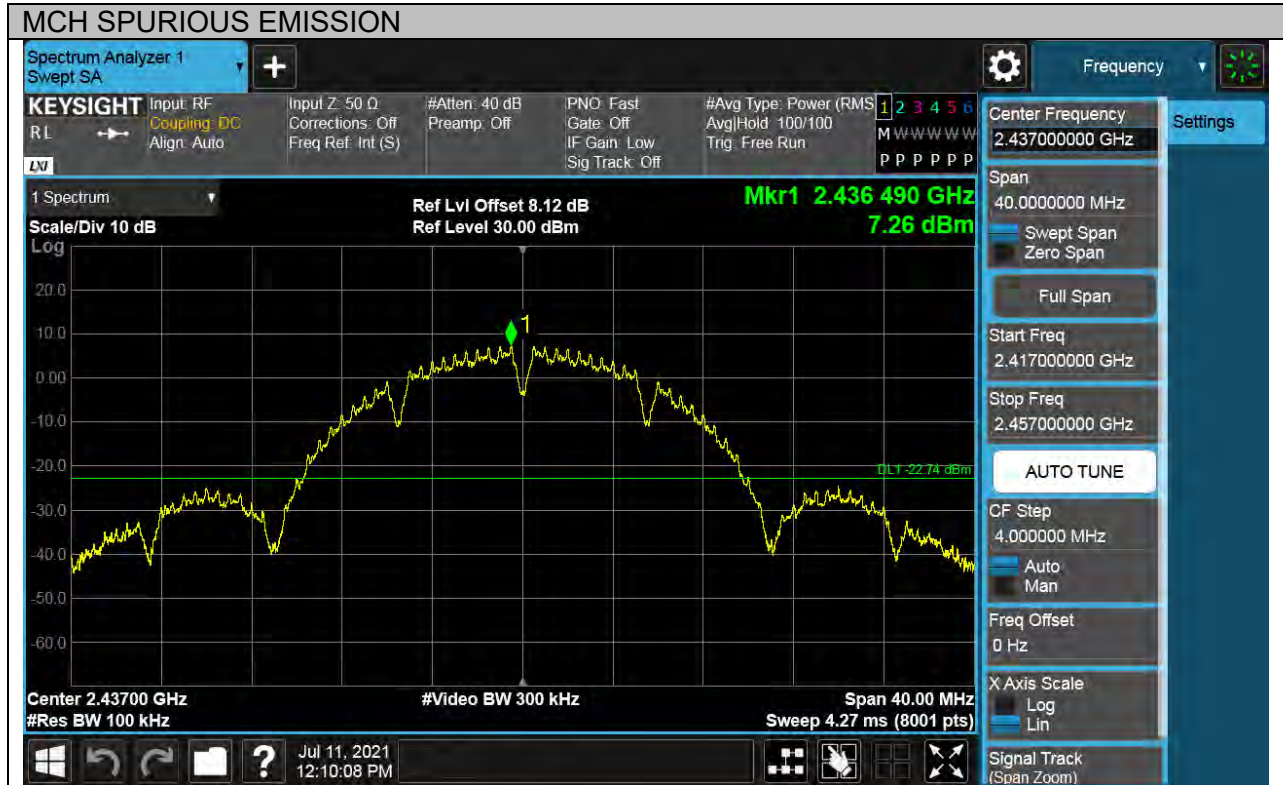
Puw test Plot





Test Mode	Channel	Verdict
11B	MCH	PASS

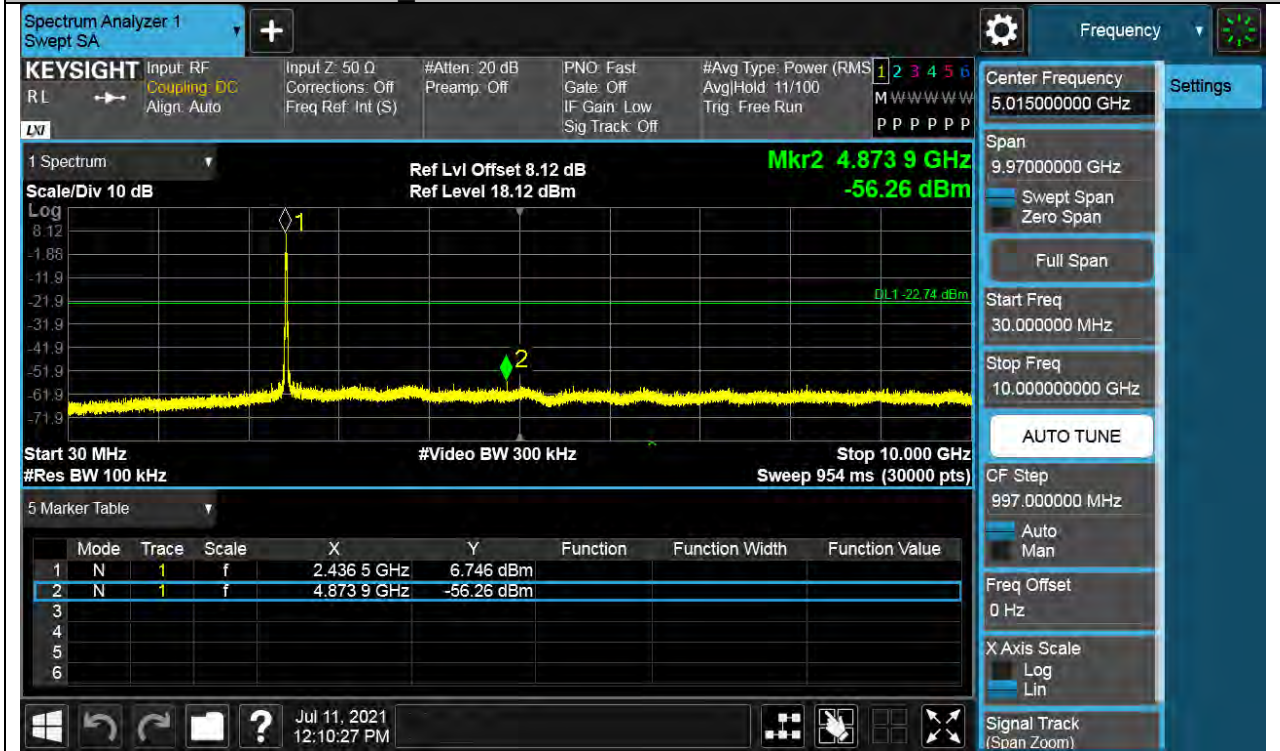
Pref test Plot



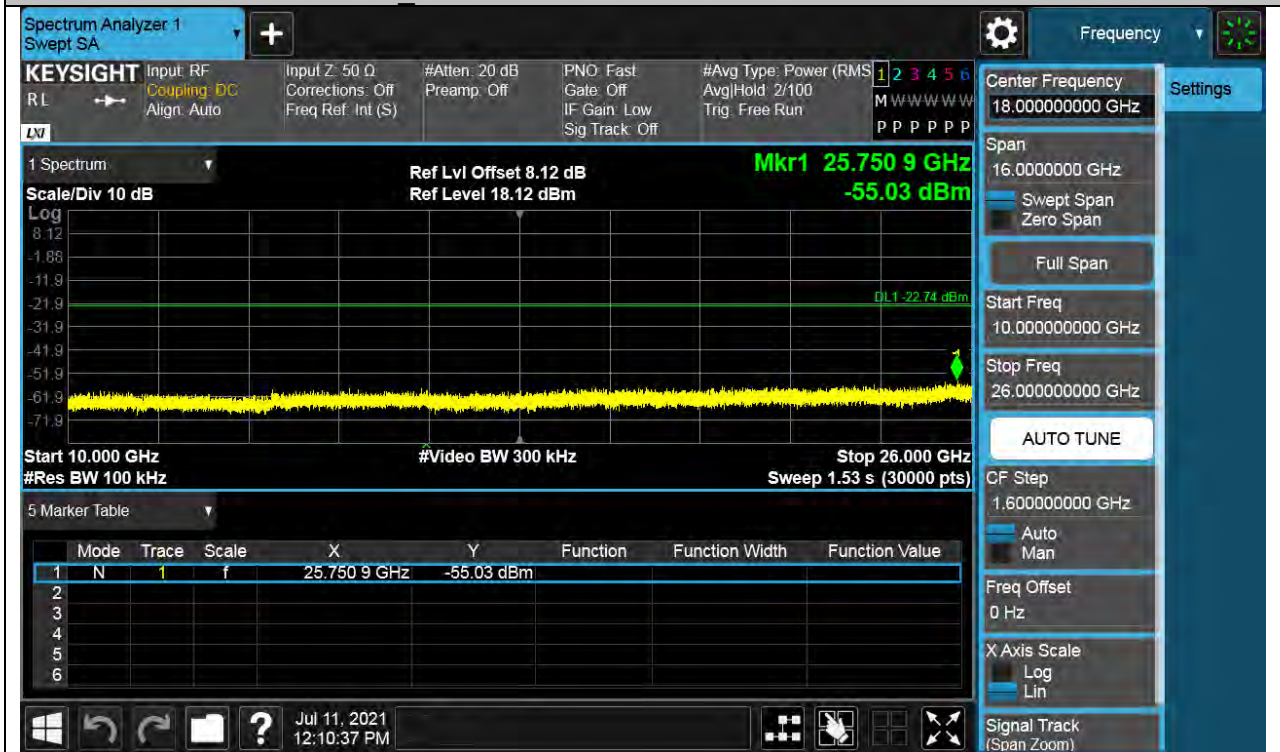


Puw test Plot

MCH SPURIOUS EMISSION 30MHz~10GHz



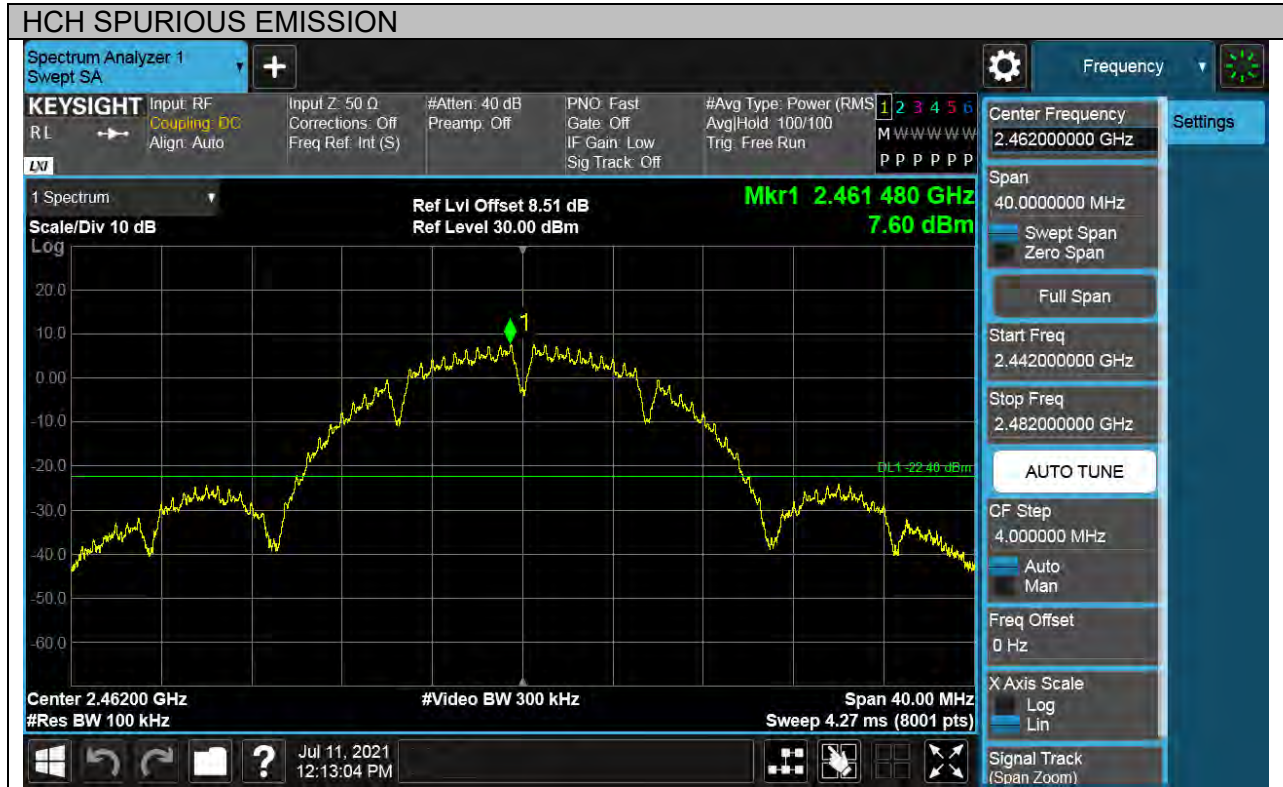
MCH SPURIOUS EMISSION 10GHz~26GHz





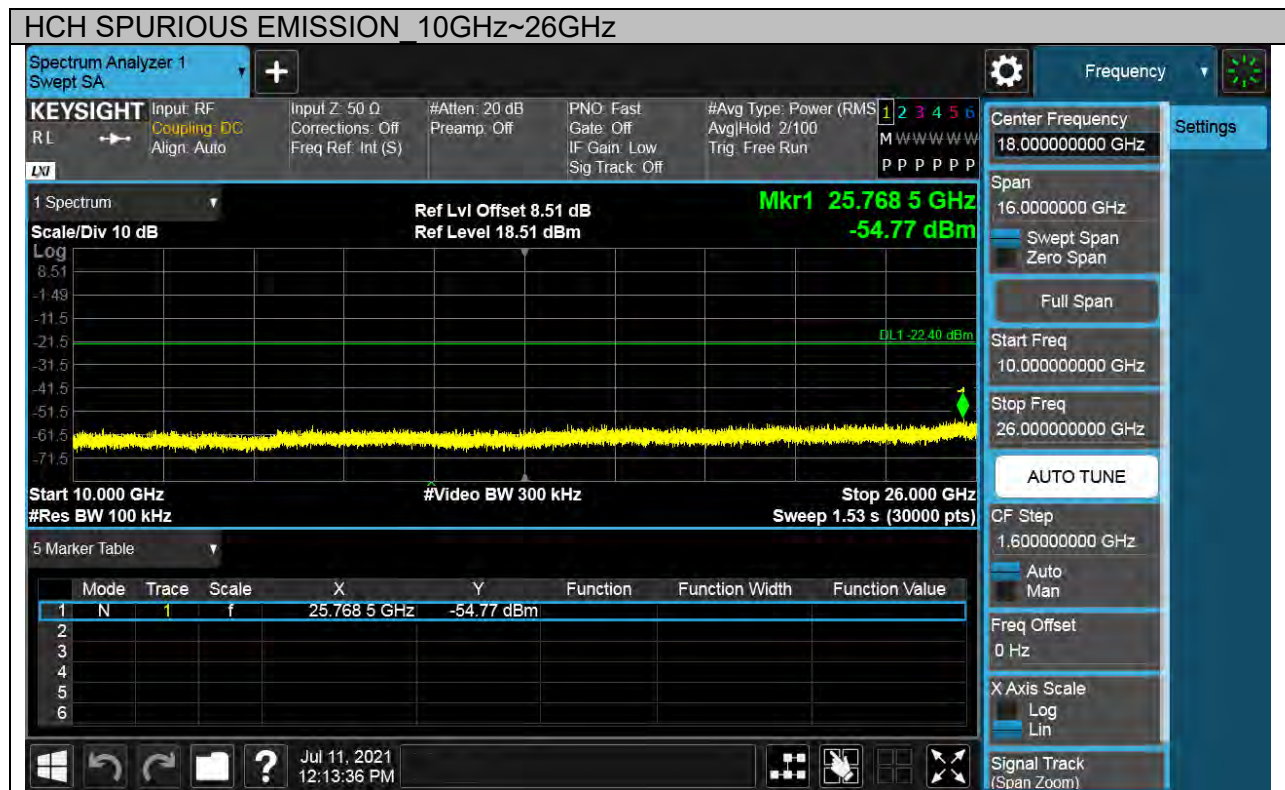
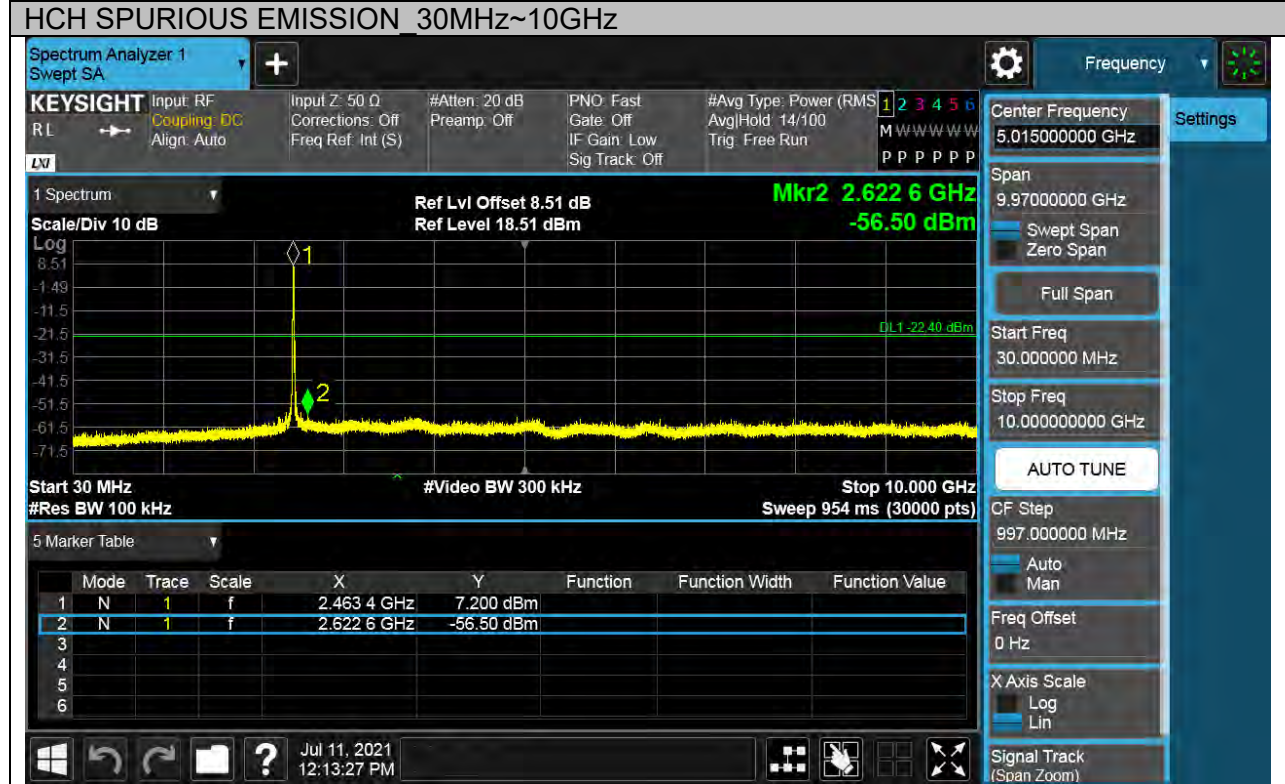
Test Mode	Channel	Verdict
11B	HCH	PASS

Pref test Plot





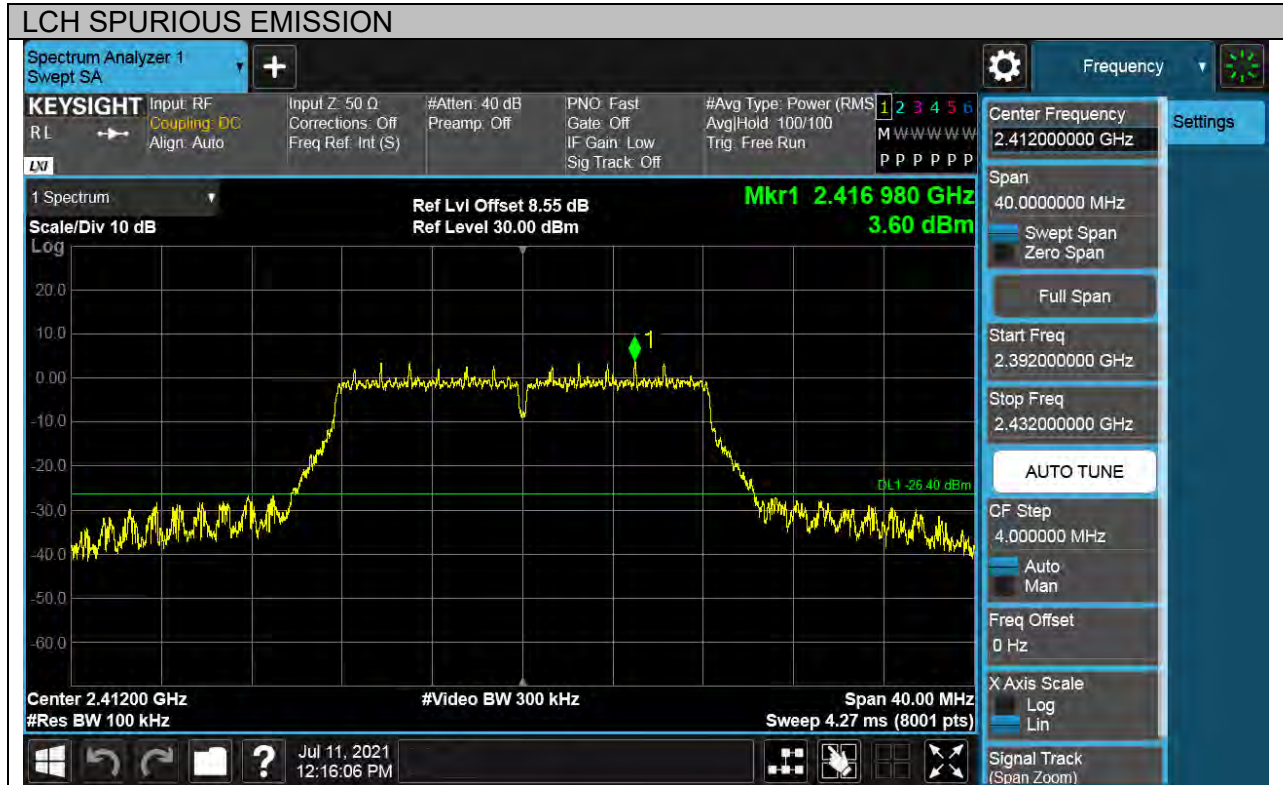
Puw test Plot





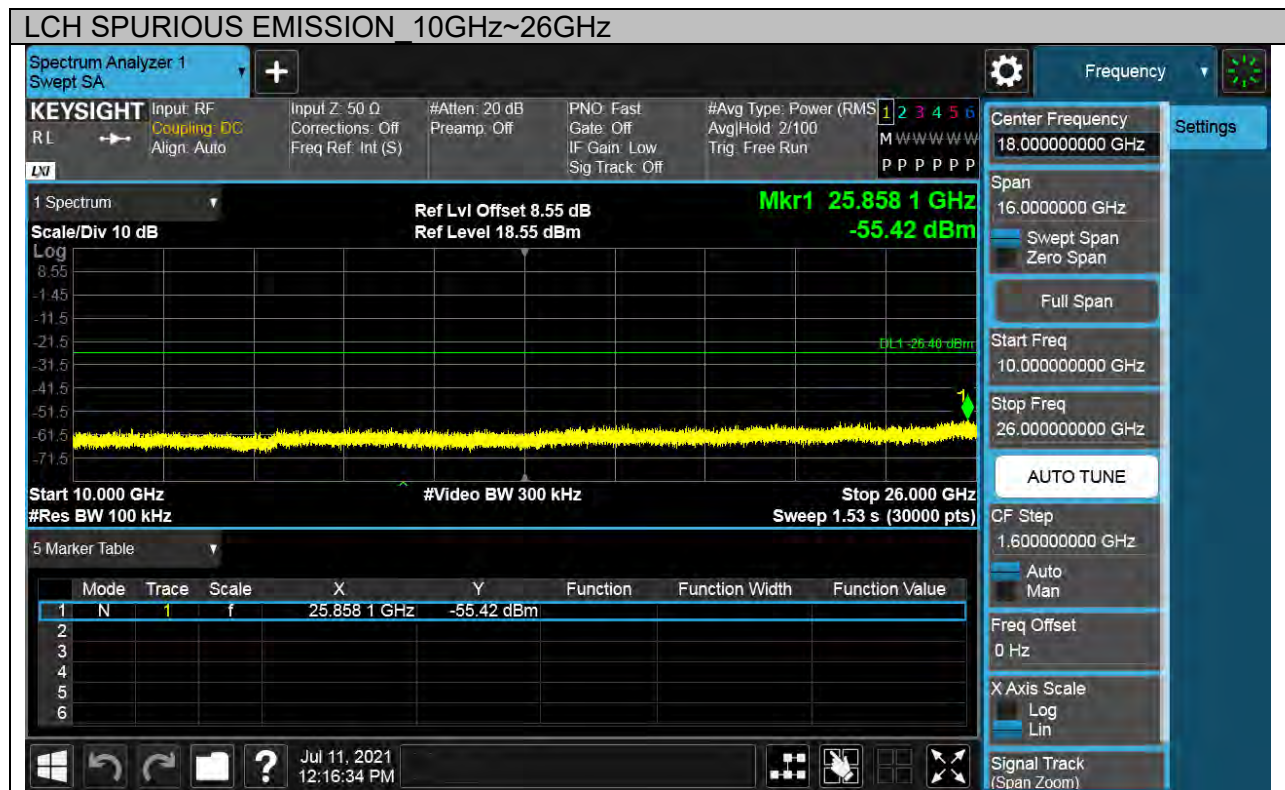
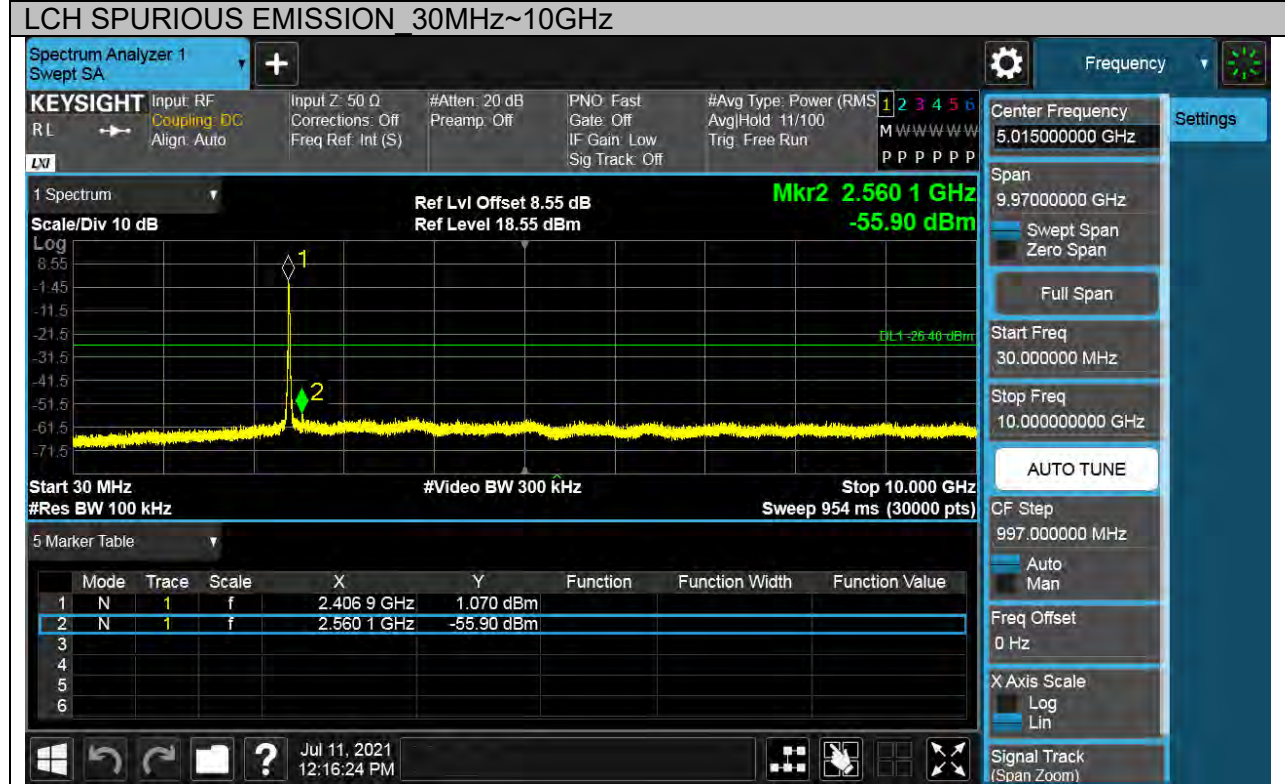
Test Mode	Channel	Verdict
11G	LCH	PASS

Pref test Plot





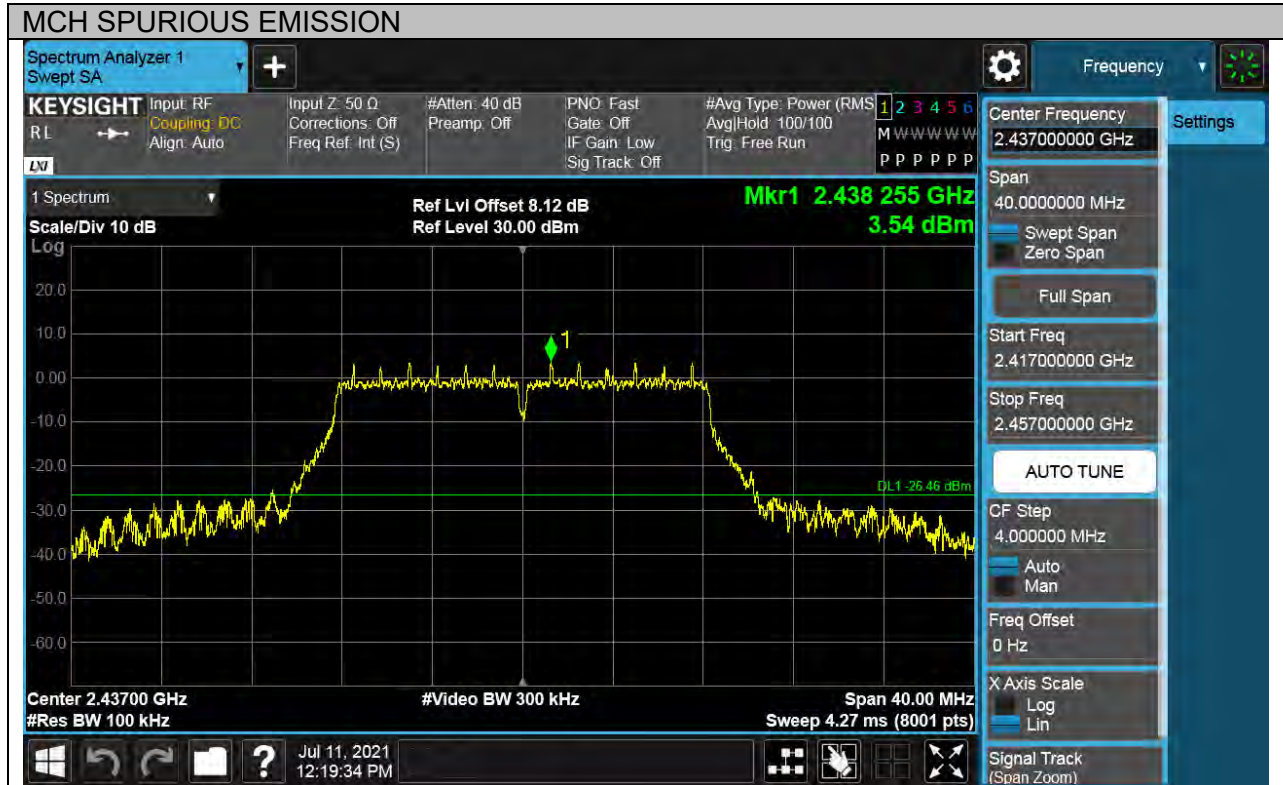
Puw test Plot





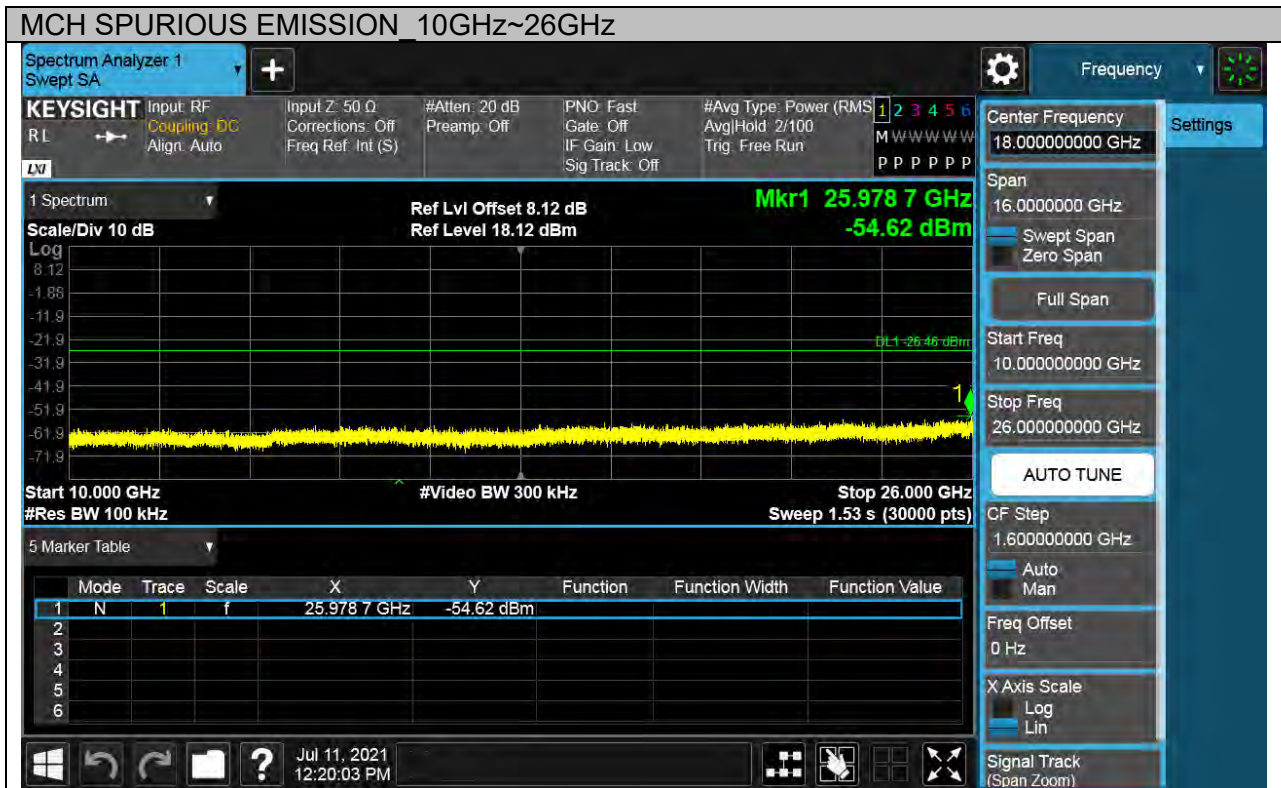
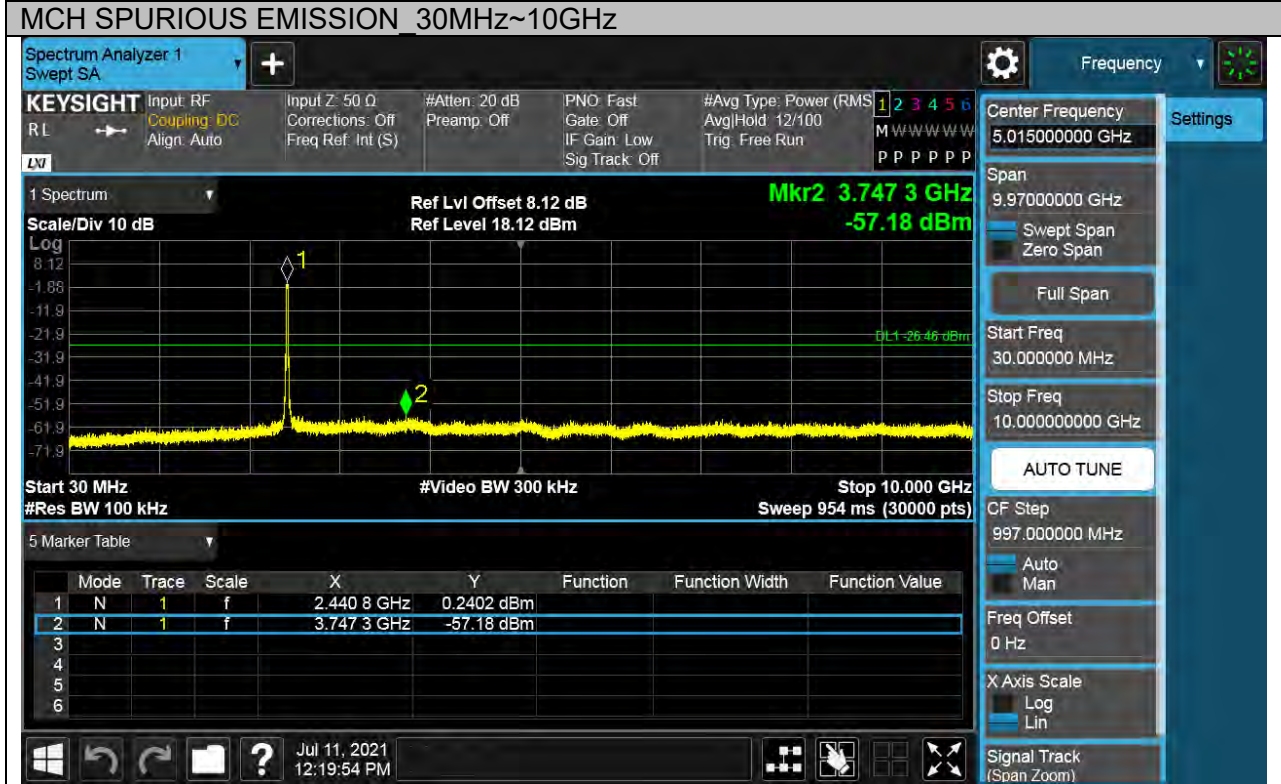
Test Mode	Channel	Verdict
11G	MCH	PASS

Pref test Plot





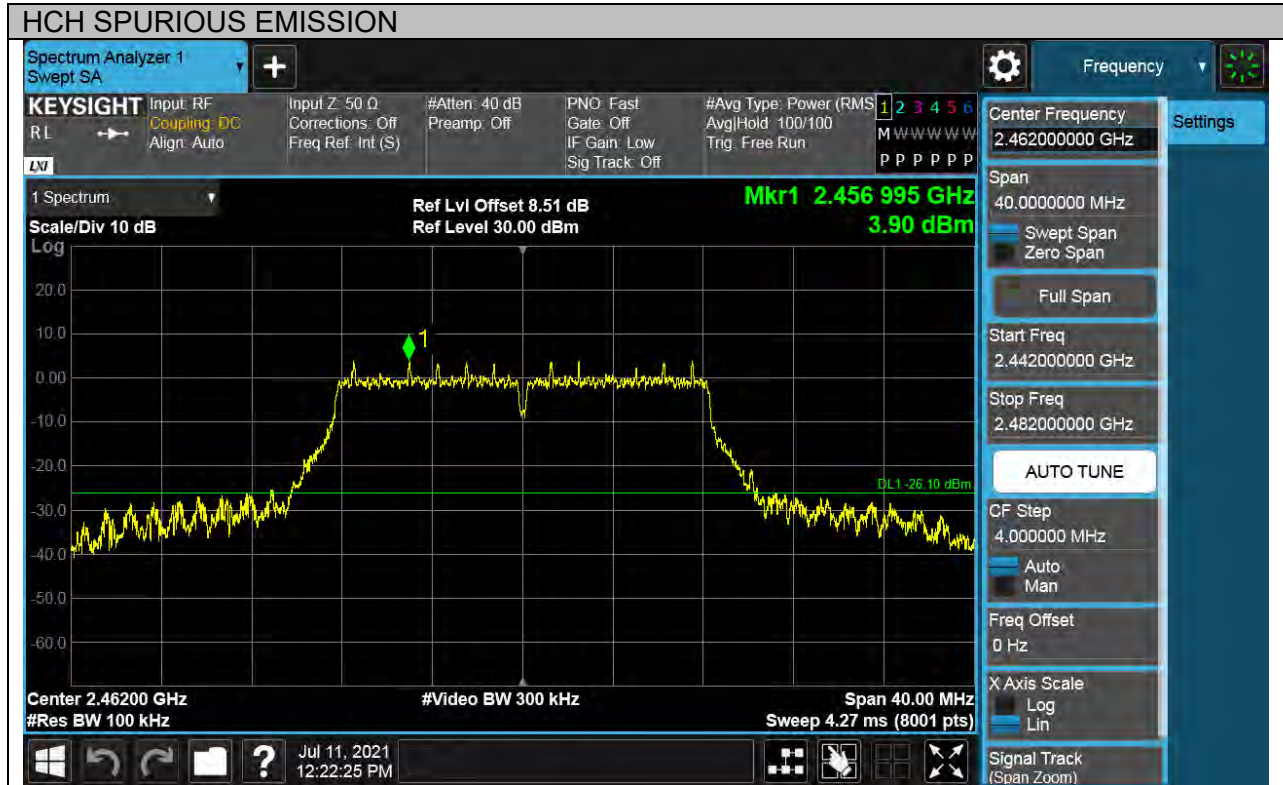
Puw test Plot





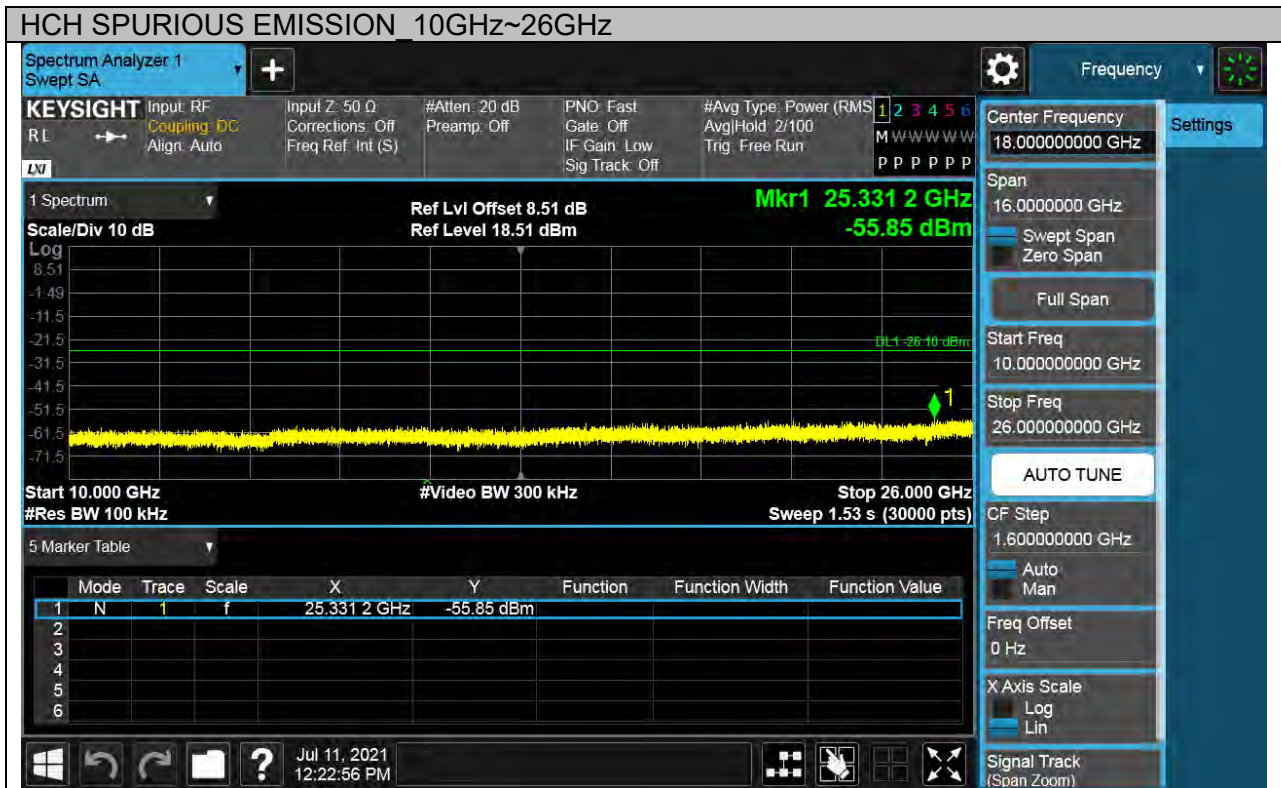
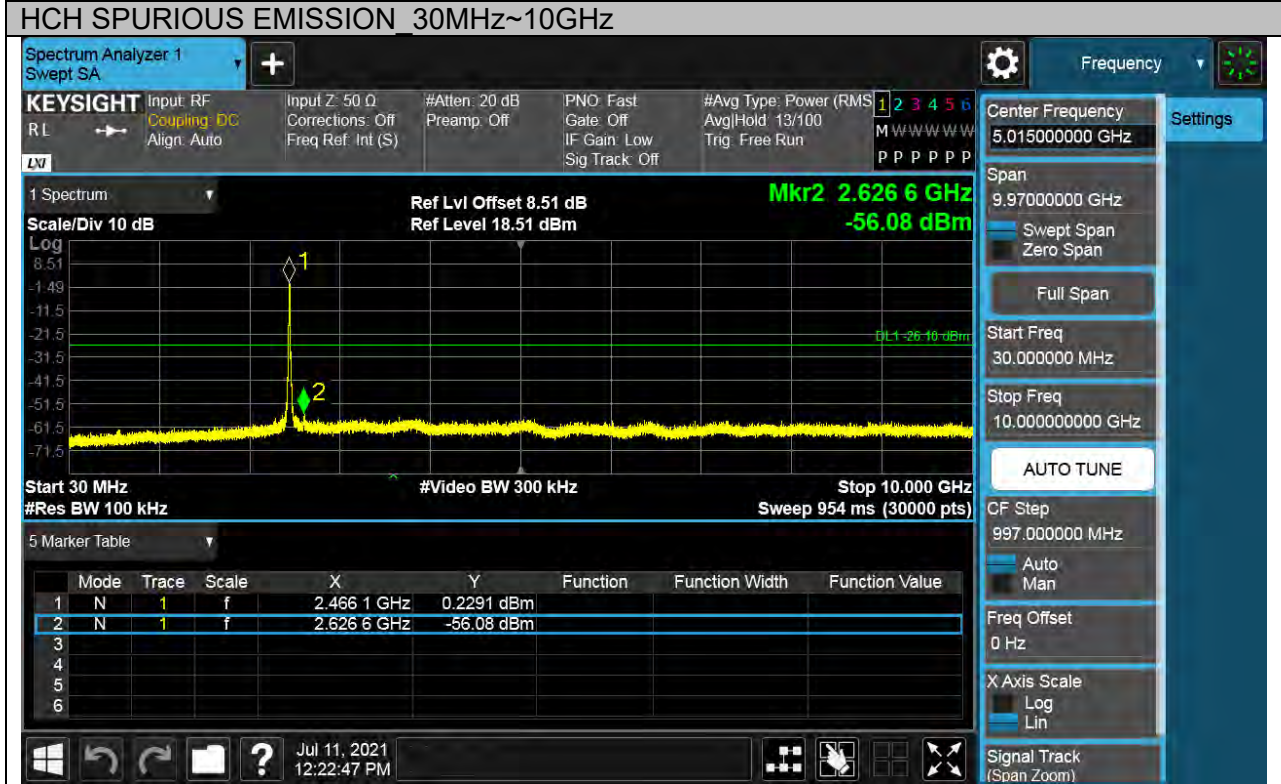
Test Mode	Channel	Verdict
11G	HCH	PASS

Pref test Plot





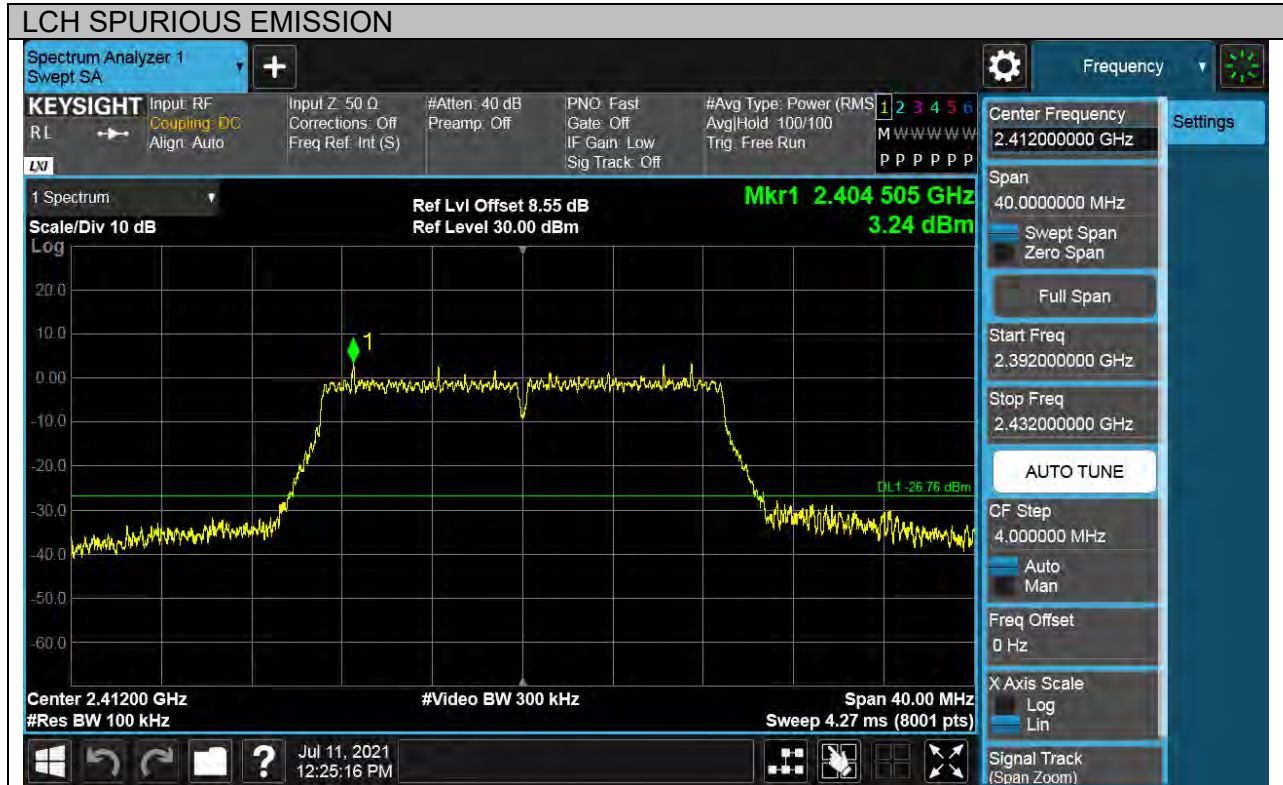
Puw test Plot





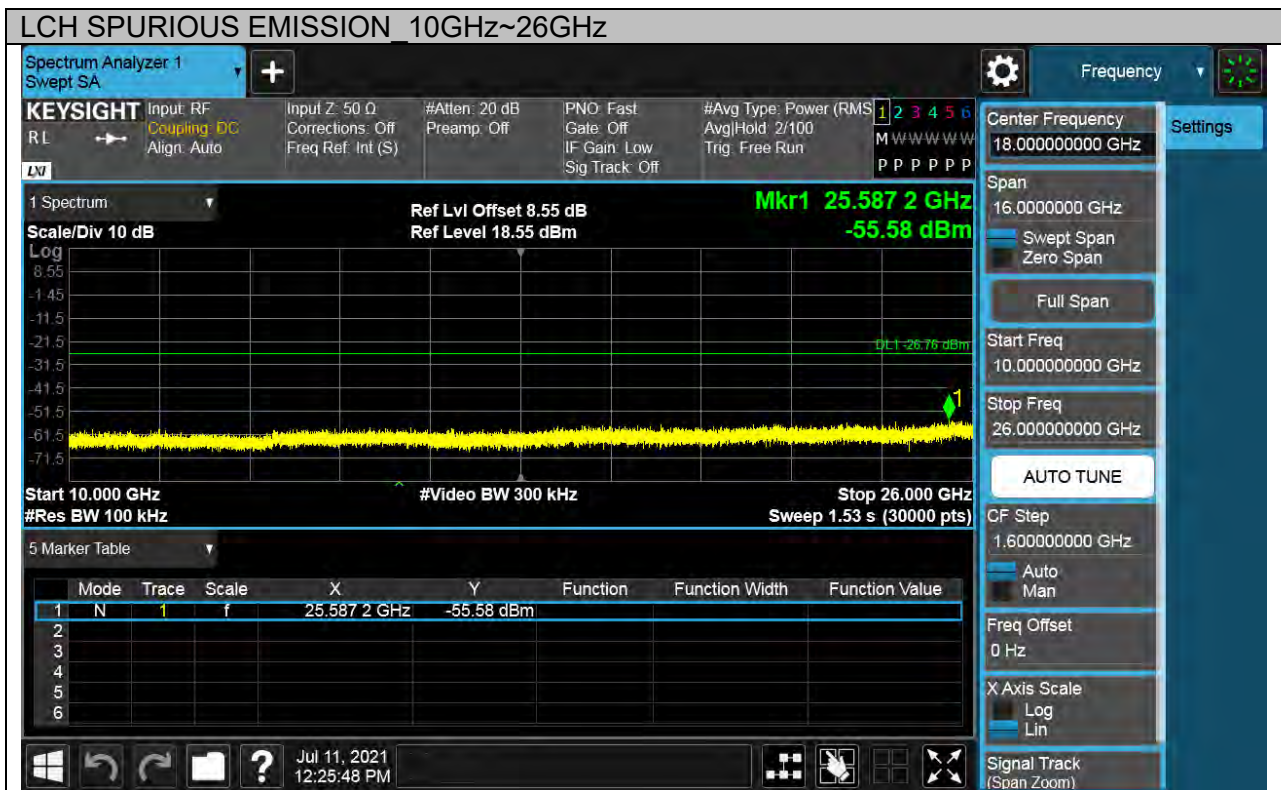
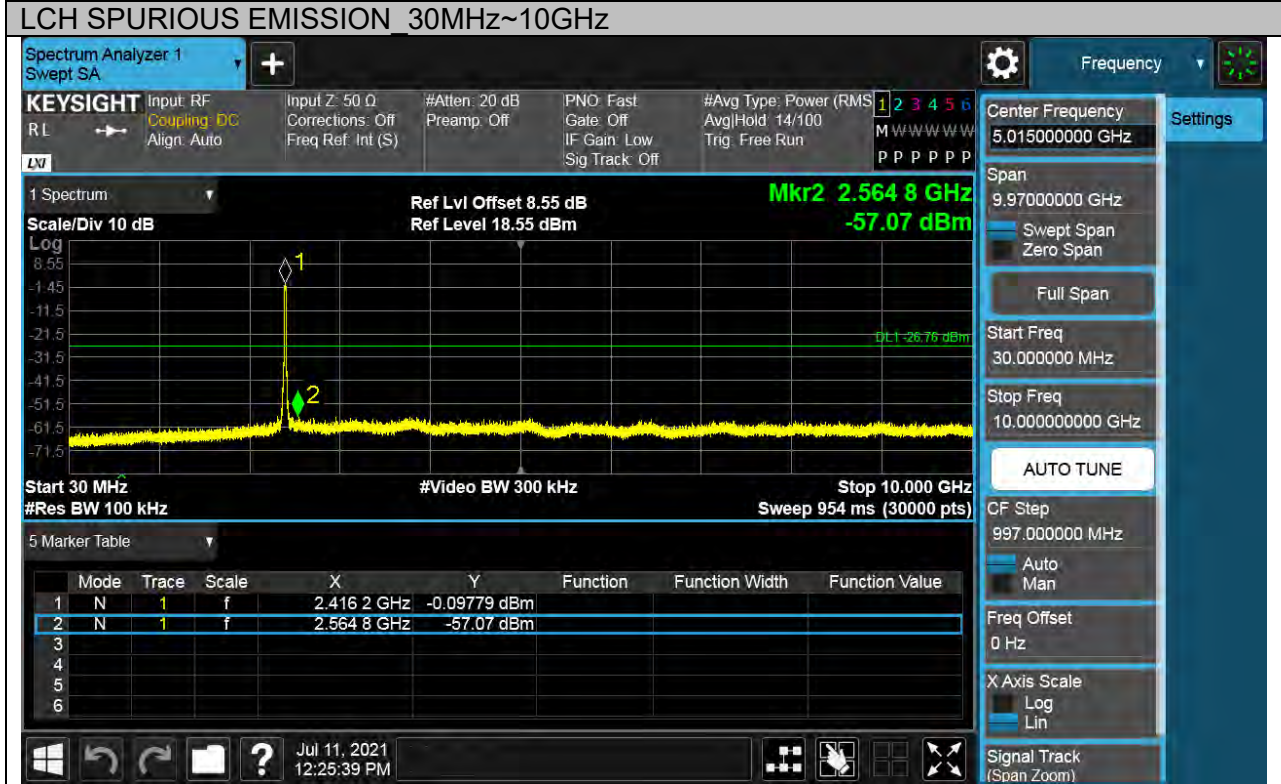
Test Mode	Channel	Verdict
11N HT20	LCH	PASS

Pref test Plot





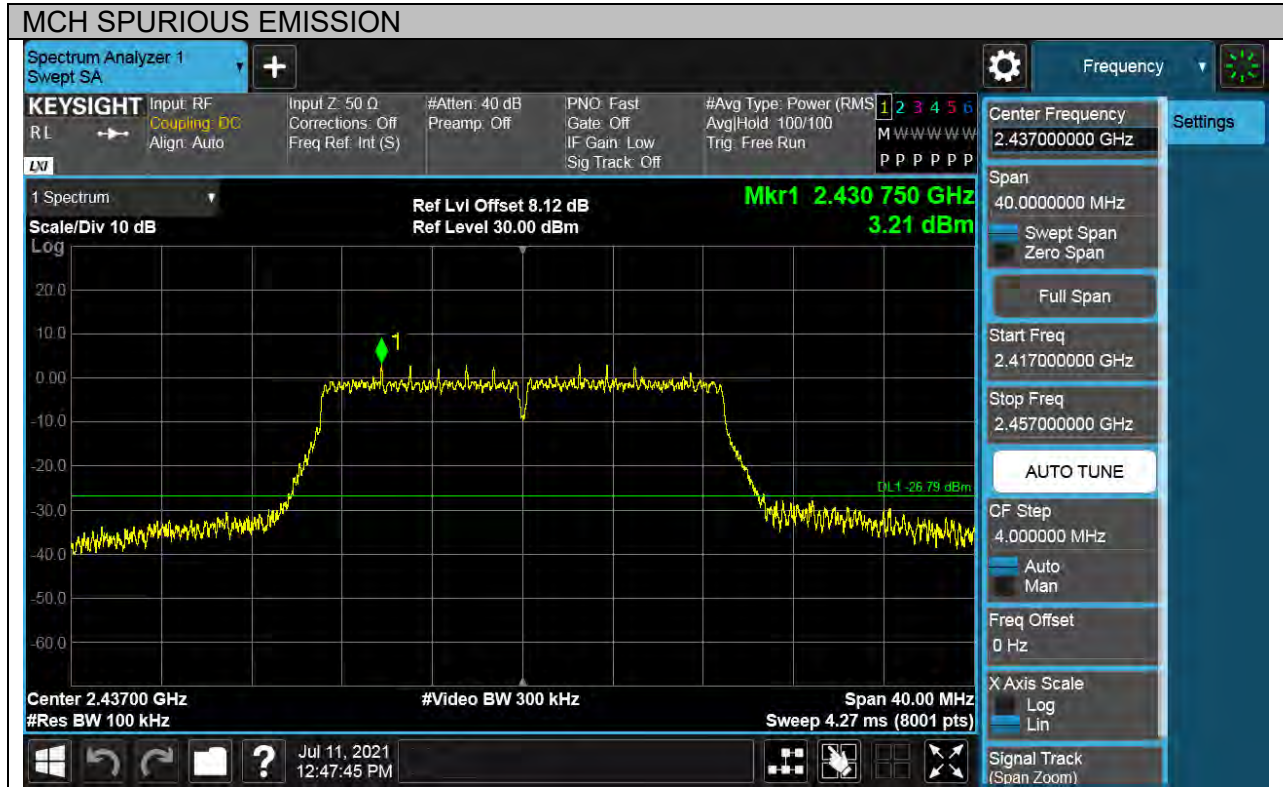
Puw test Plot





Test Mode	Channel	Verdict
11N HT20	MCH	PASS

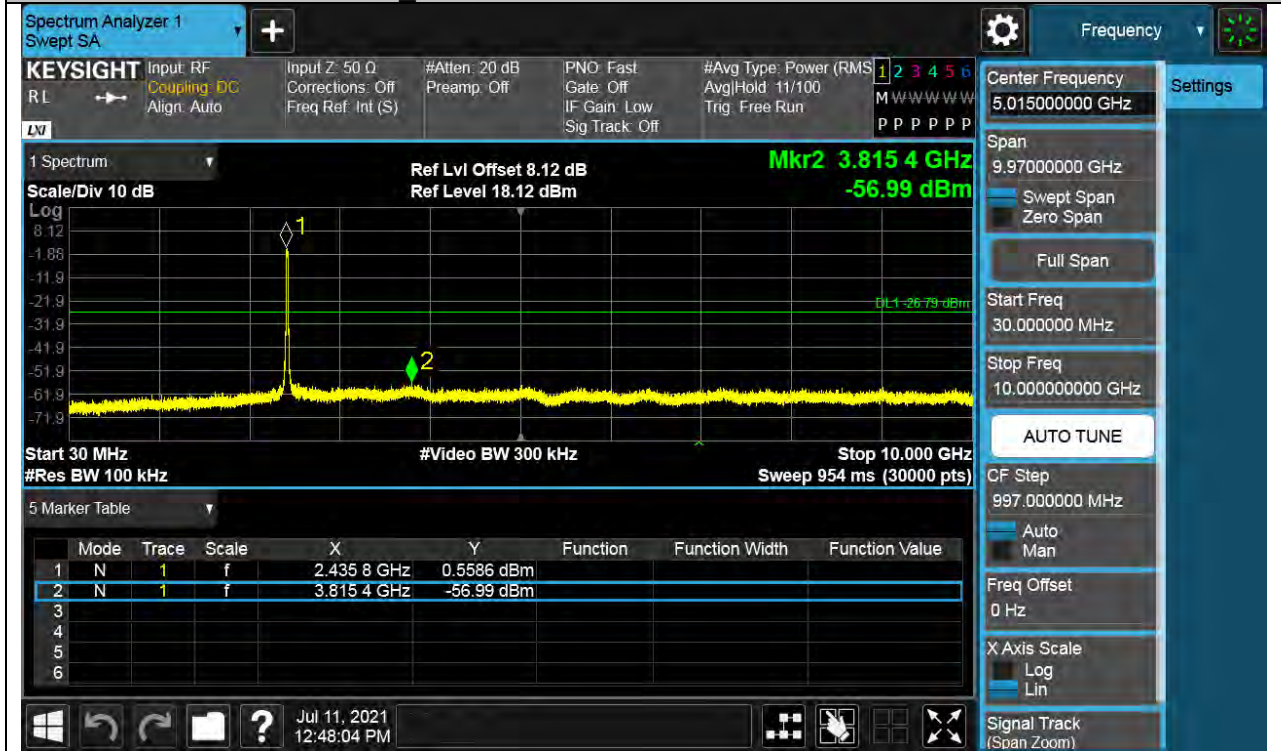
Pref test Plot





Puw test Plot

MCH SPURIOUS EMISSION 30MHz~10GHz



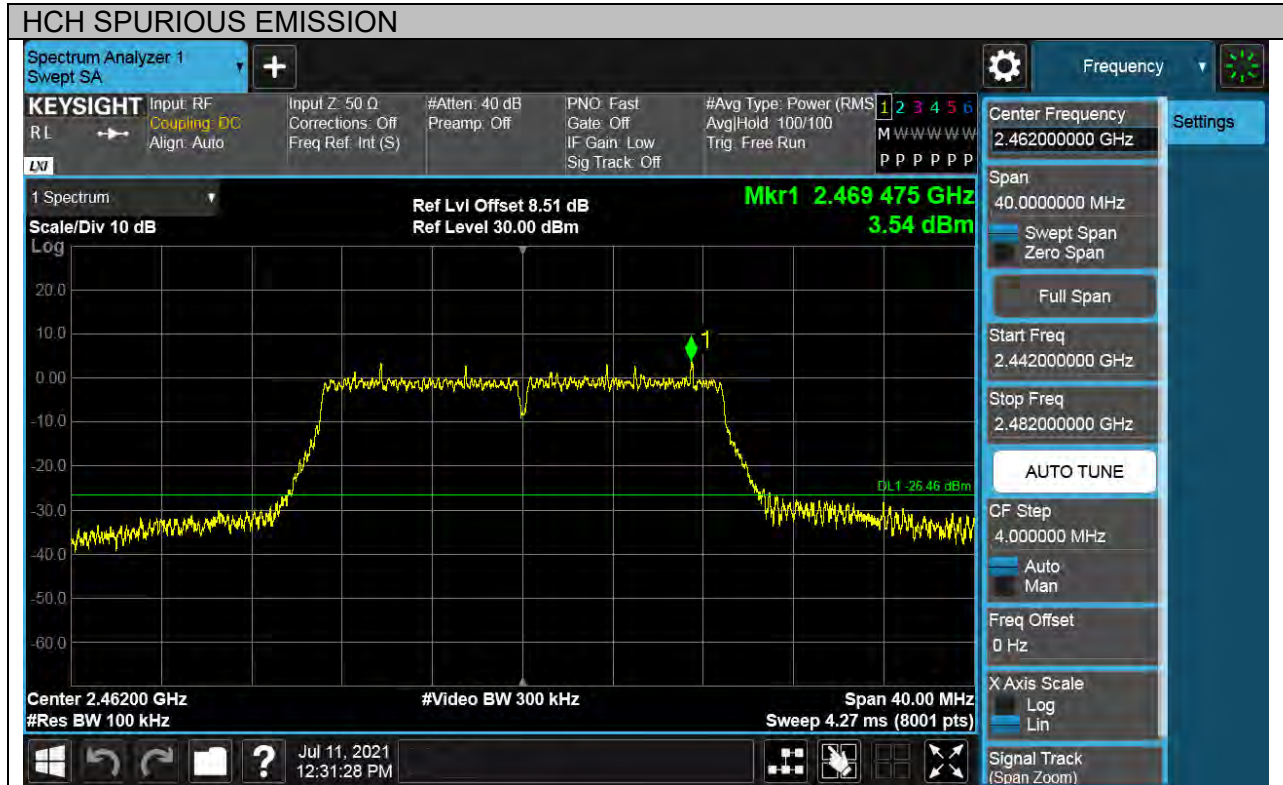
MCH SPURIOUS EMISSION 10GHz~26GHz





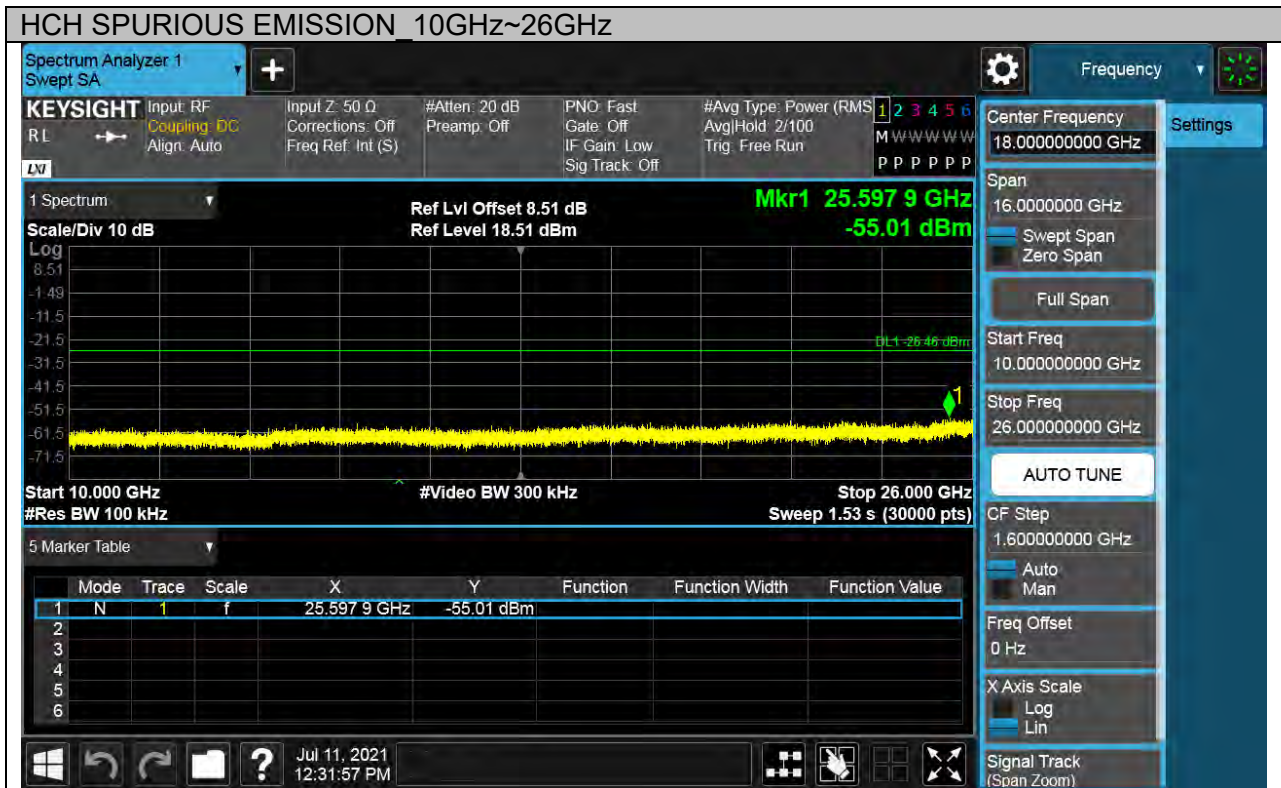
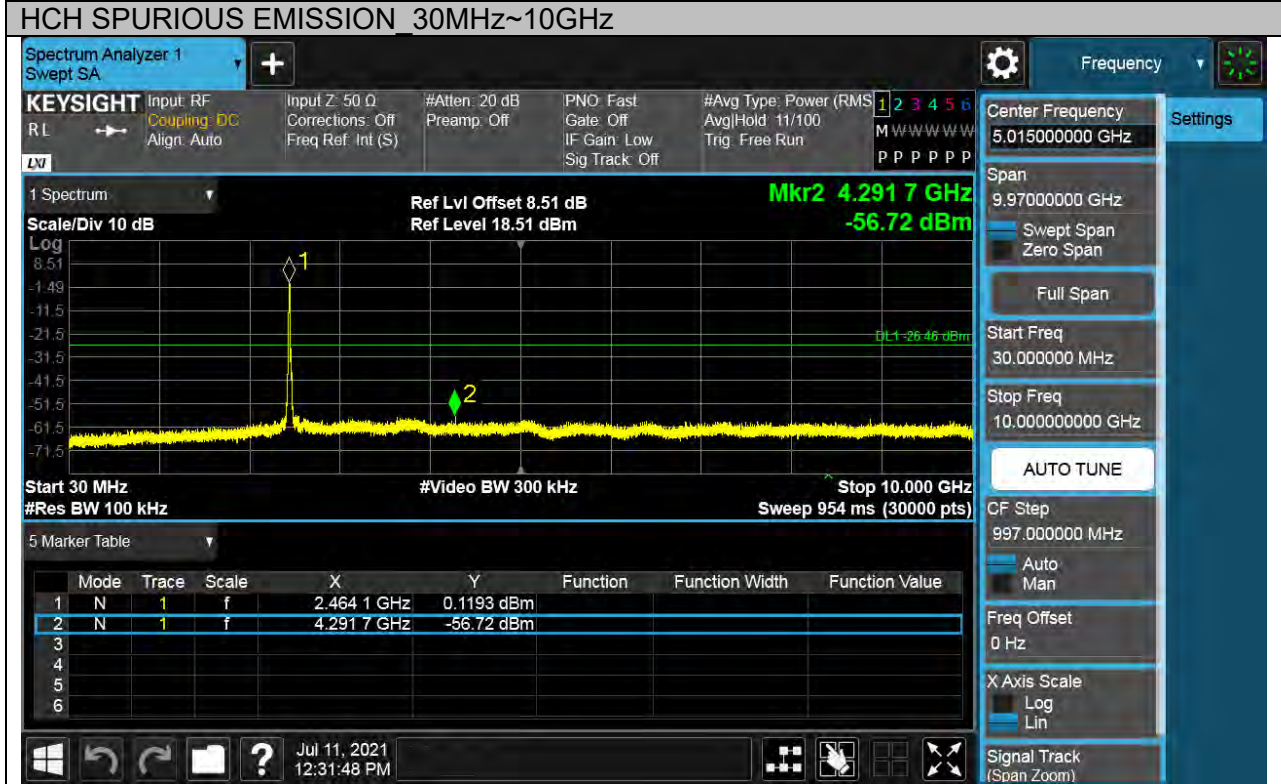
Test Mode	Channel	Verdict
11N HT20	HCH	PASS

Pref test Plot





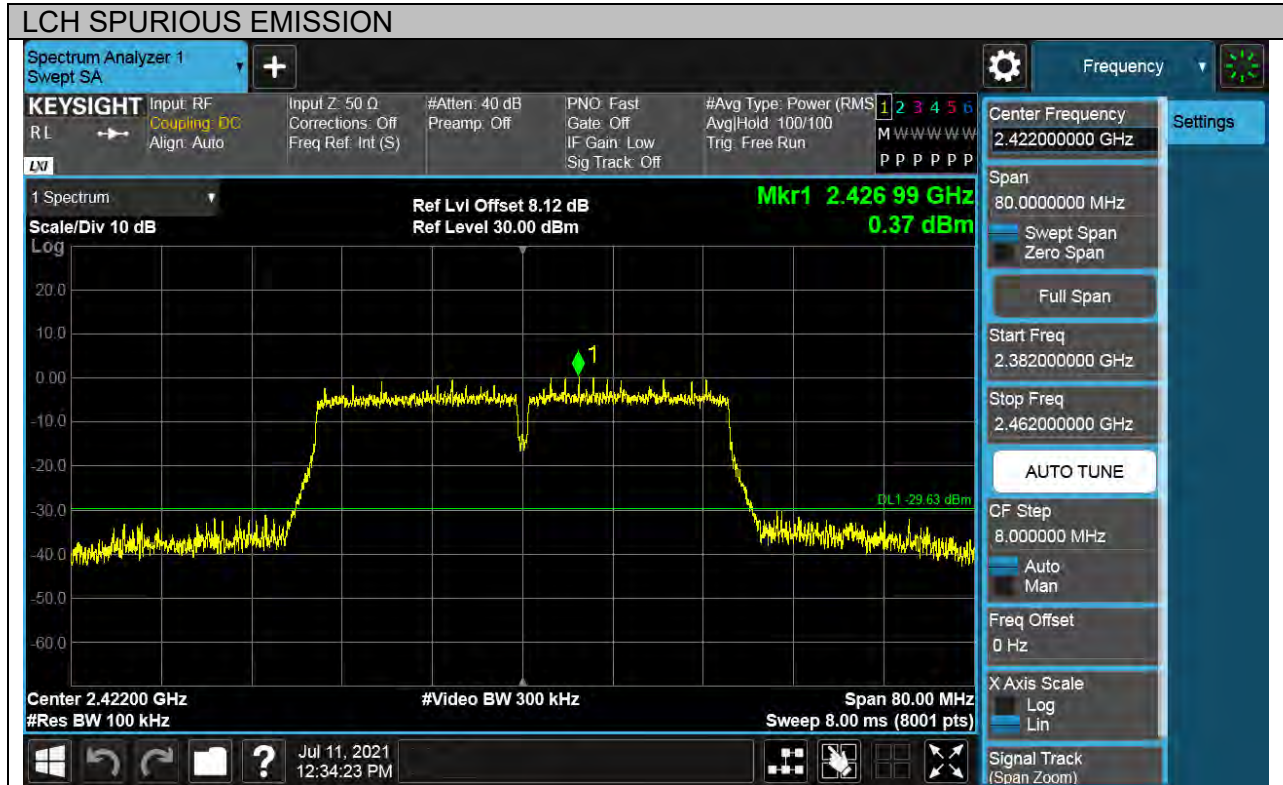
Puw test Plot





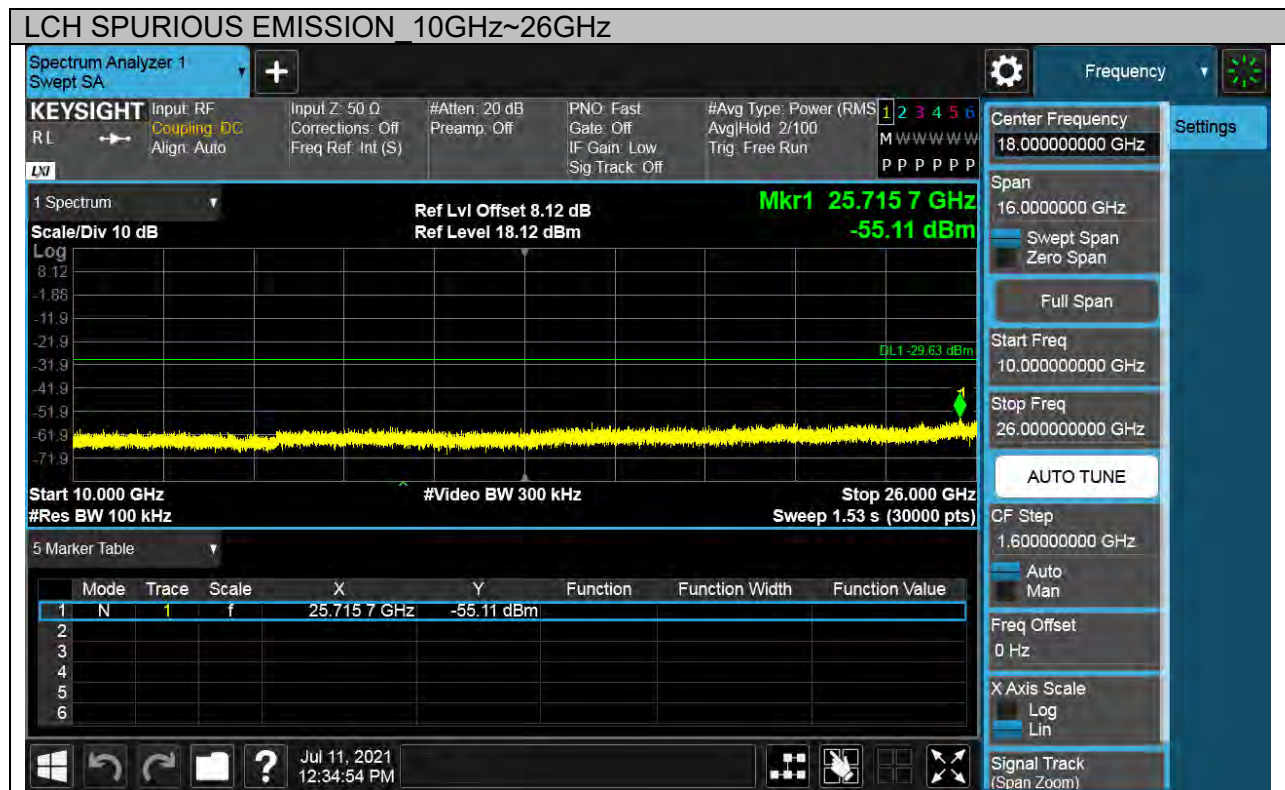
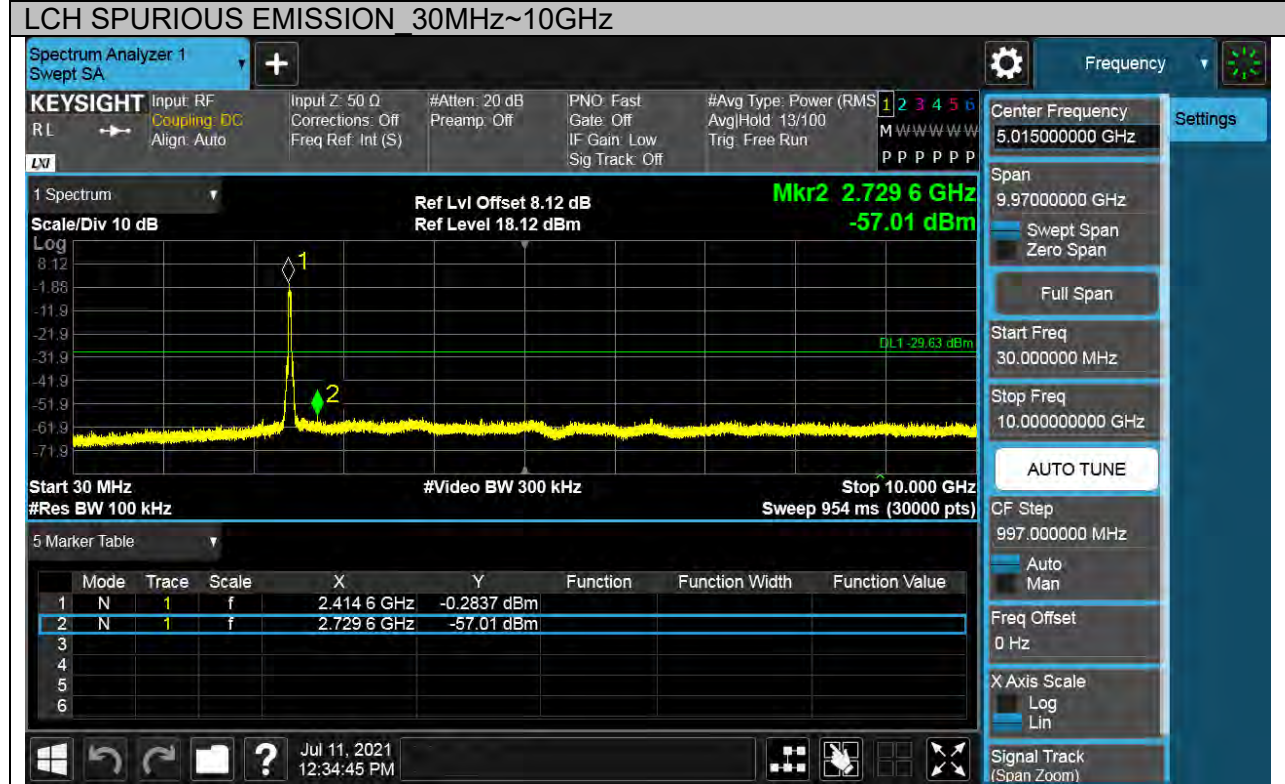
Test Mode	Channel	Verdict
11N HT40	LCH	PASS

Pref test Plot





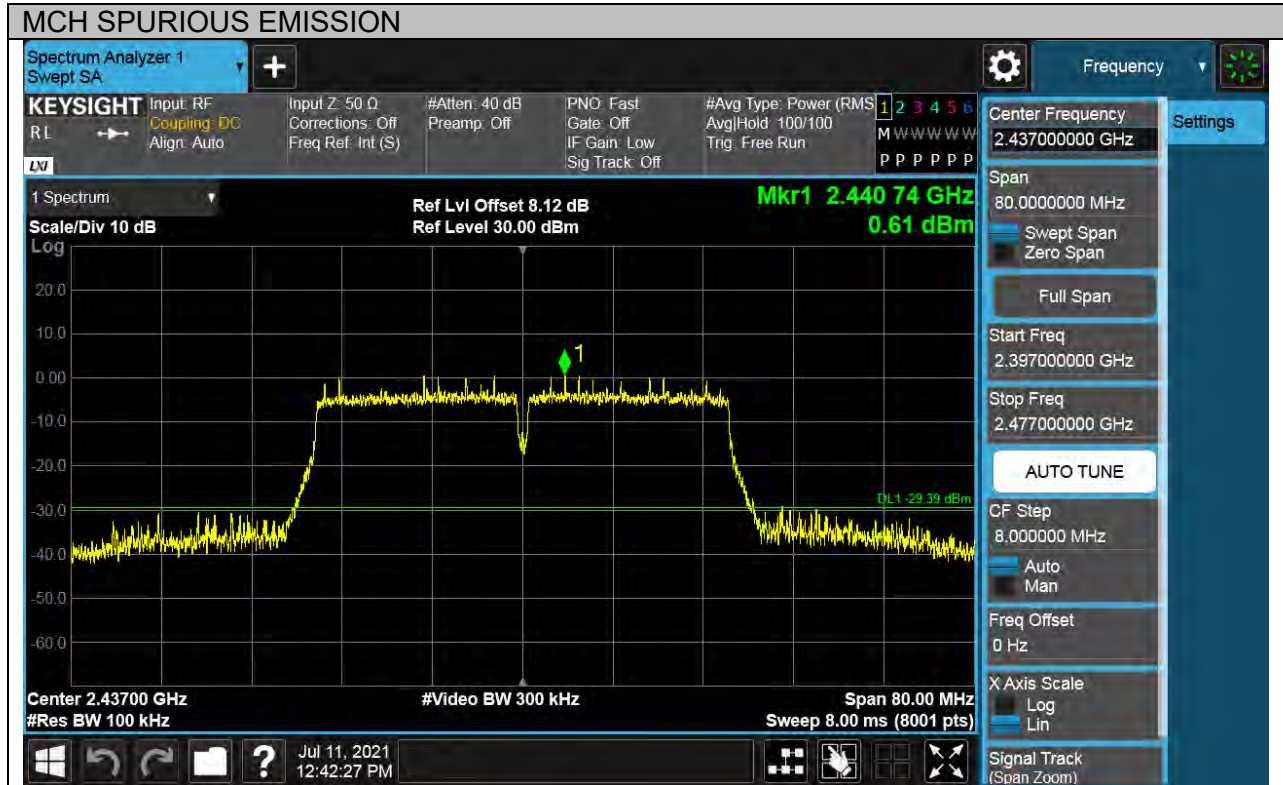
Puw test Plot





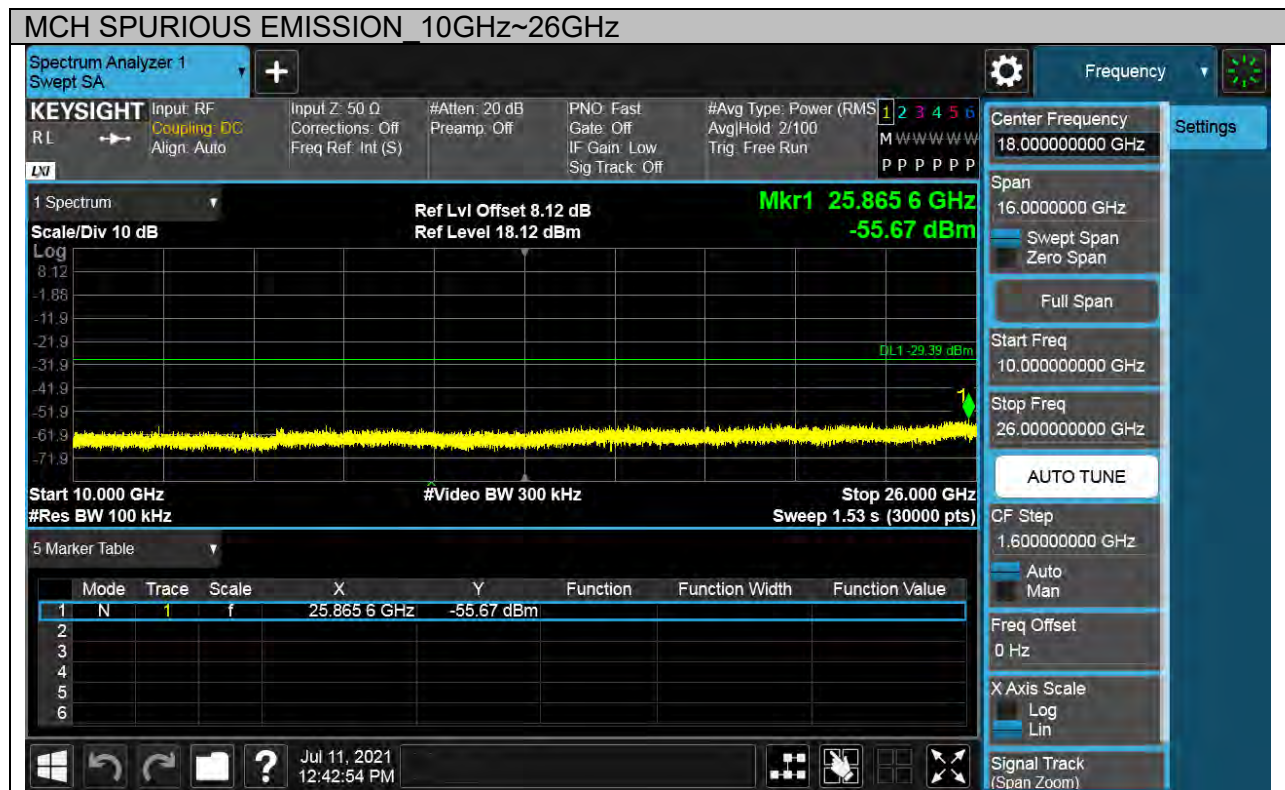
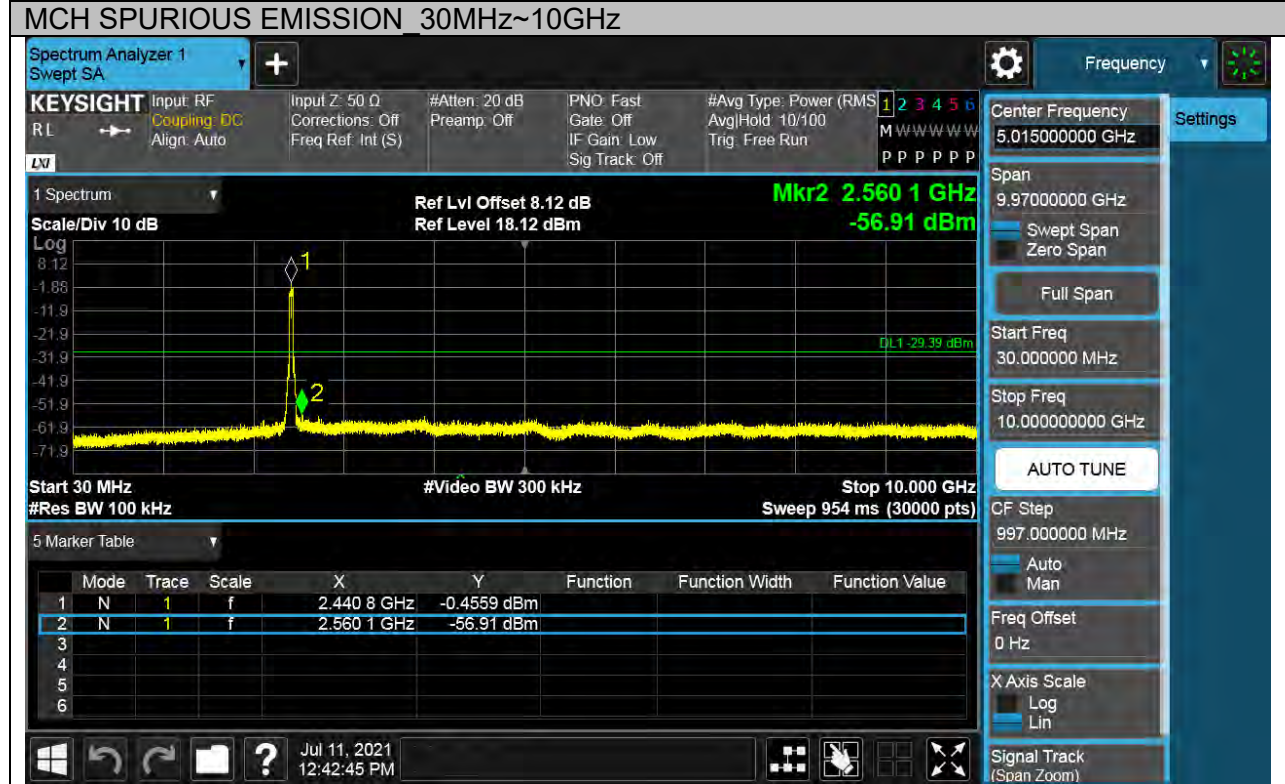
Test Mode	Channel	Verdict
11N HT40	MCH	PASS

Pref test Plot





Puw test Plot





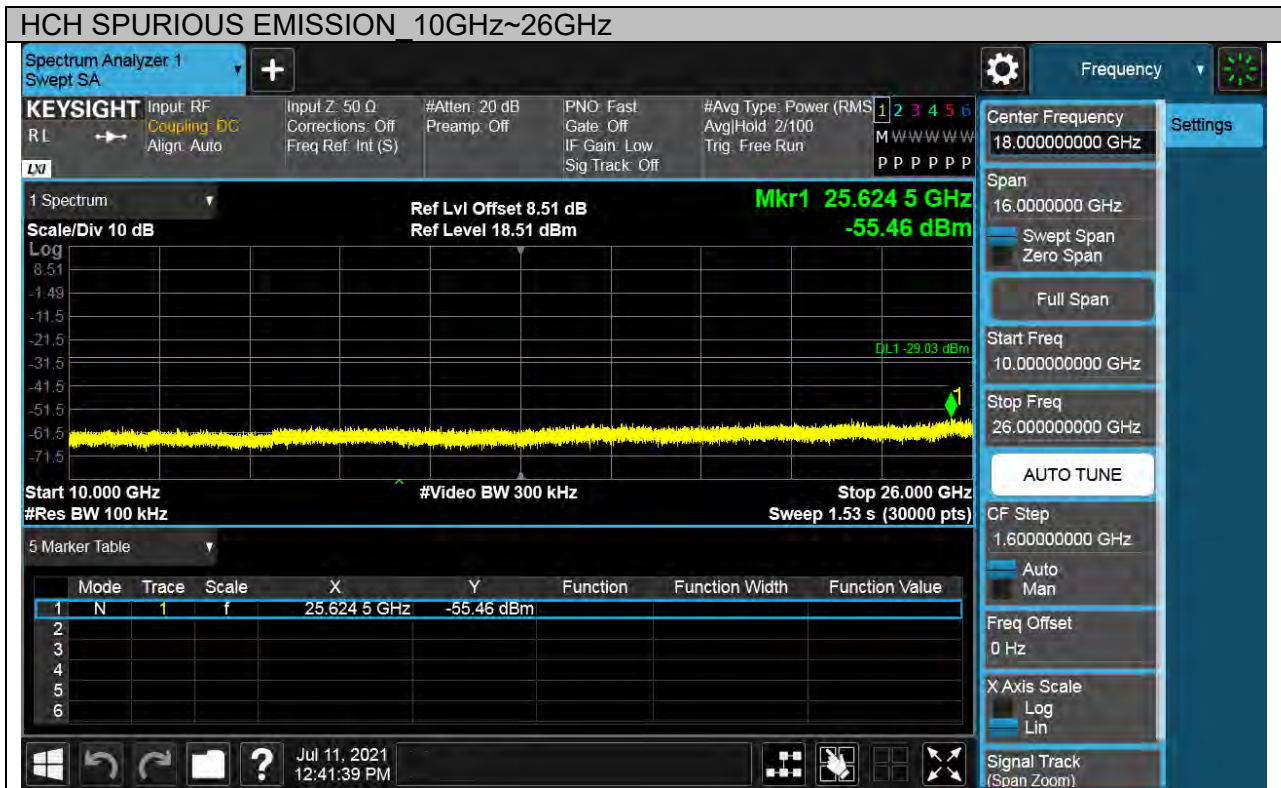
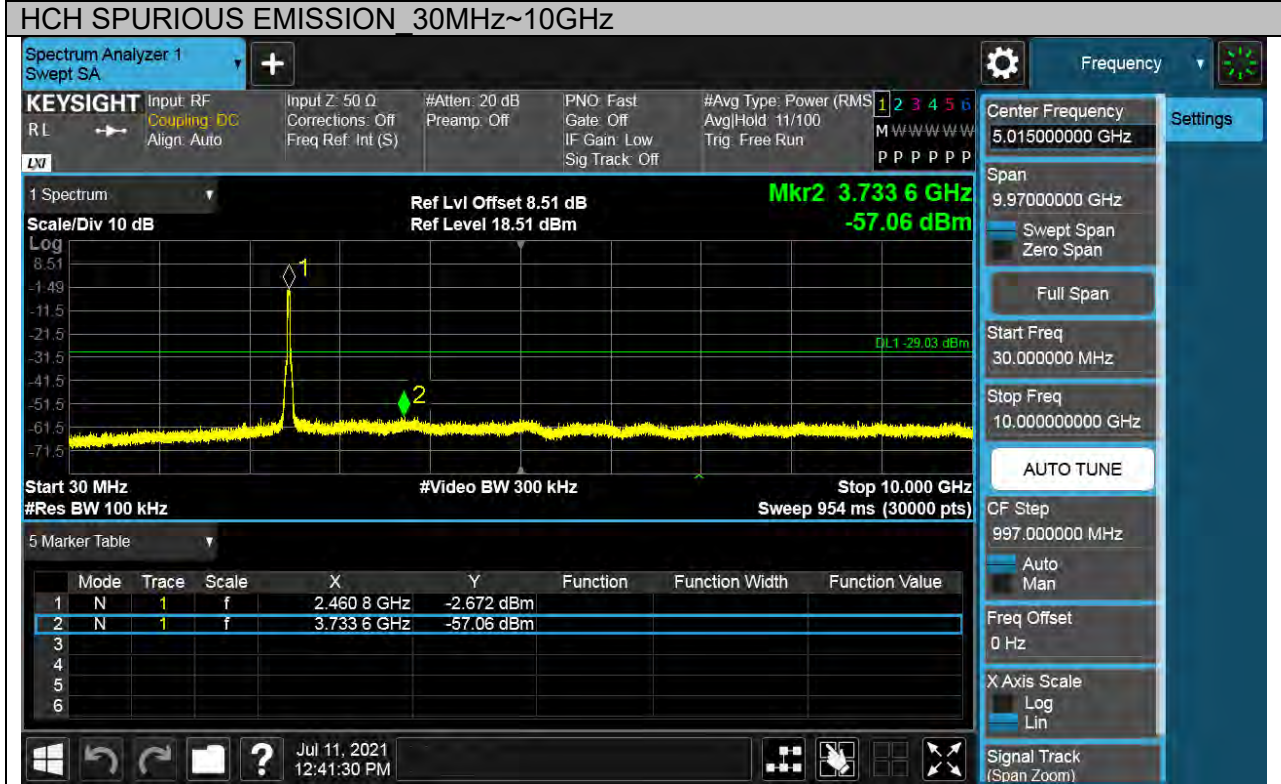
Test Mode	Channel	Verdict
11N HT40	HCH	PASS

Pref test Plot





Puw test Plot





7.6. RADIATED TEST RESULTS

7.6.1. LIMITS AND PROCEDURE

LIMITS

Please refer to FCC §15.205 and §15.209 (Transmitter)

Please refer to FCC KDB 558074

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

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
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.



Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Restricted bands of operation

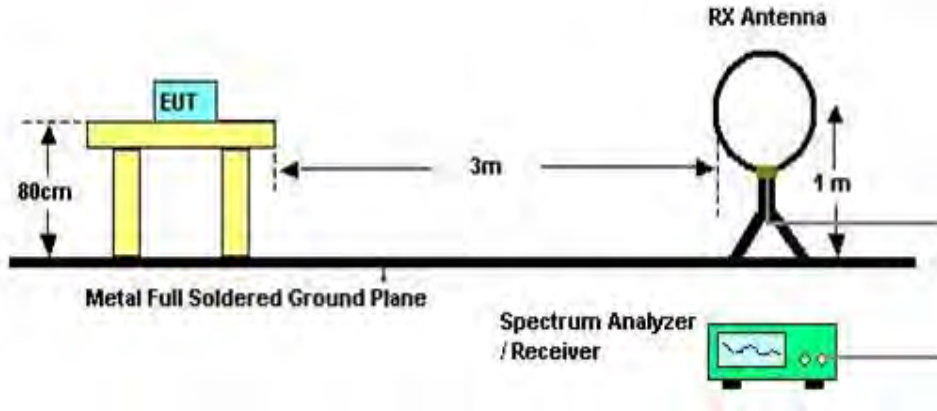
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30MHz

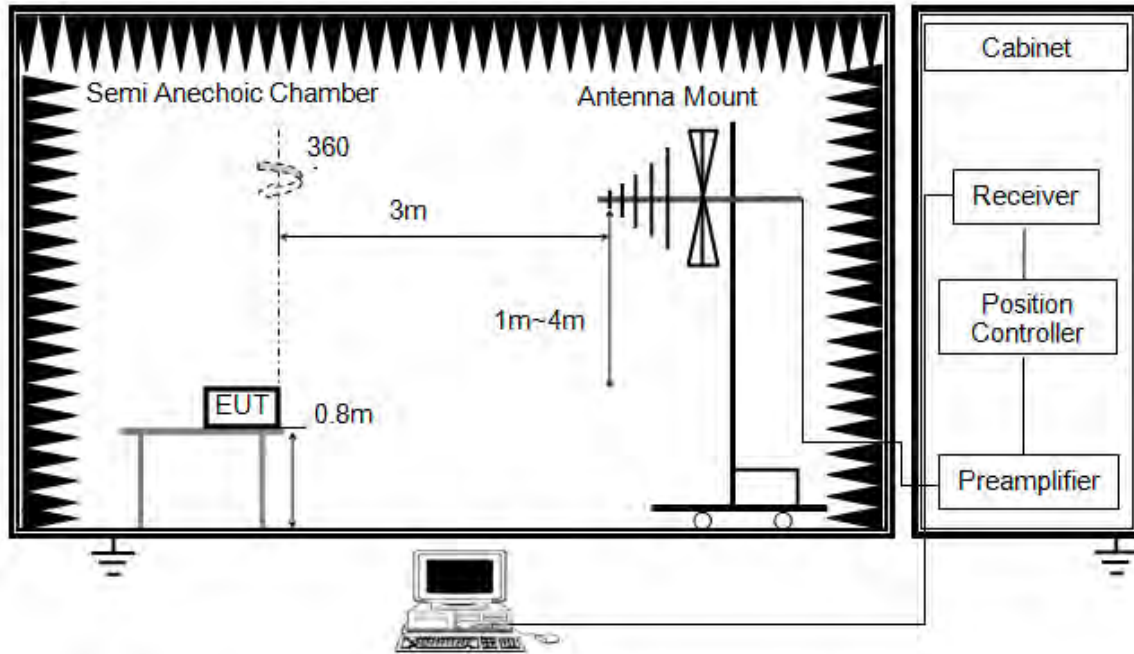


The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1m height antenna tower.
5. The radiated emission limits 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
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Below 1G

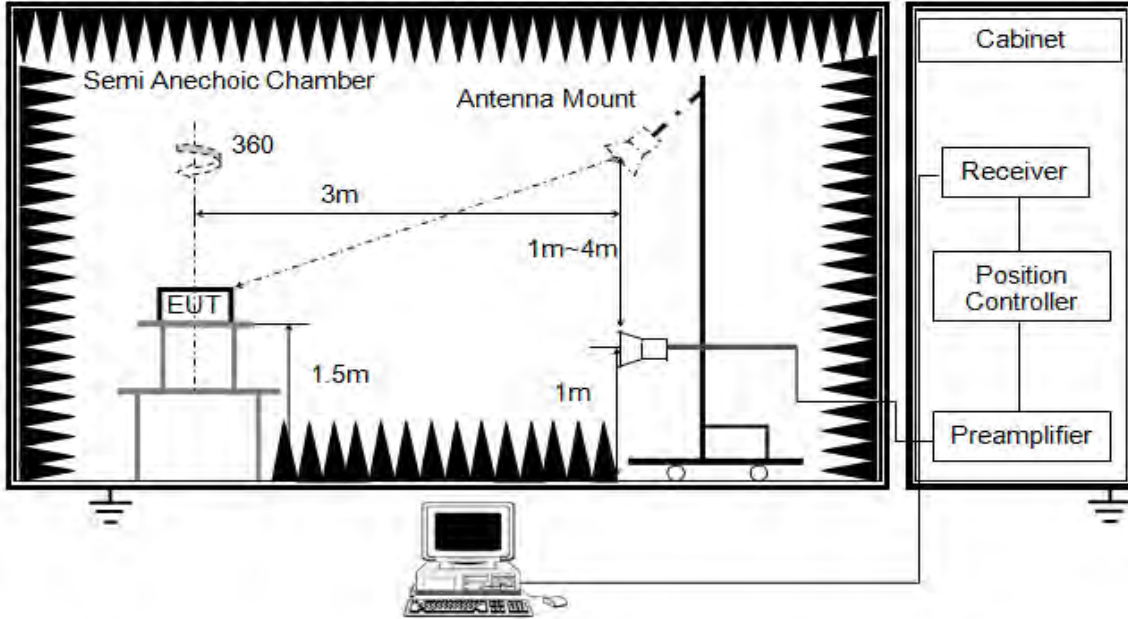


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G

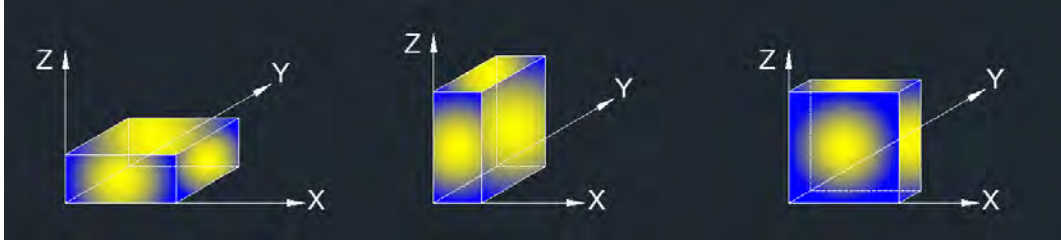


The setting of the spectrum analyser

RBW	1M
VBW	PEAK:3M AVG: See note6
Sweep	Auto
Detector	Peak/Average(10Hz)
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements; and 1 MHz resolution bandwidth with video bandwidth $\geq 1/T$ but not less than the setting list in section 7.1 when use peak detector, max hold to be run for at least $[50 \cdot (1/\text{Duty Cycle})]$ traces for average measurements. For the Duty Cycle need to refer the results in section 7.1.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

X axis, Y axis, Z axis positions:



Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (Z axis) data recorded in the report.

7.6.2.RESTRICTED BANDEDGE

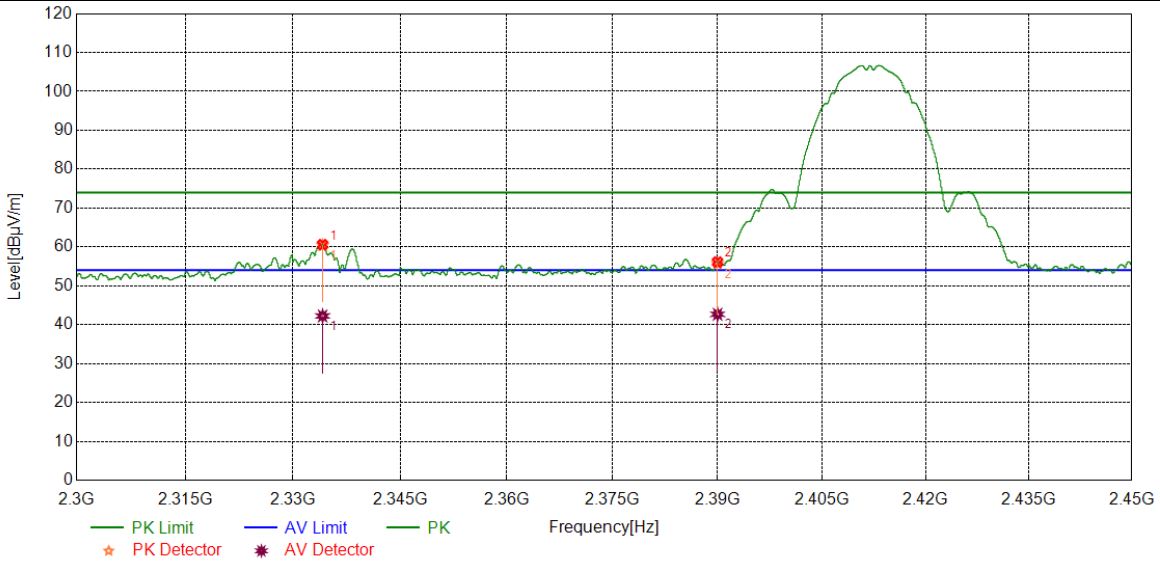
Test Result Table

Test Mode	Channel	Puw(dBm)	Verdict
11B	LCH	<Limit	PASS
	HCH	<Limit	PASS
11G	LCH	<Limit	PASS
	HCH	<Limit	PASS
11N HT20	LCH	<Limit	PASS
	HCH	<Limit	PASS
11N HT40	LCH	<Limit	PASS
	HCH	<Limit	PASS



Test Graphs:

Test Mode	Channel	Polarization	Verdict
11B	LCH	Horizontal	PASS



No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	2334.1293	48.06	12.52	60.58	74.00	-13.42	peak
		29.72	12.52	42.24	54.00	-11.76	average
2	2390.0000	43.04	13.07	56.11	74.00	-17.89	peak
		29.61	13.07	42.68	54.00	-11.32	average

- Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
 2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
 3. Measurement = Reading Level + Correct Factor.
 4. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.