



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

Wireless Moudle

MODEL NUMBER: VS0B9MW3565UE

PROJECT NUMBER: 4790751248

REPORT NUMBER: 4790751248-6

FCC ID: 2AL8S-0211C5L1

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Prepared for

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	04/12/2023	Initial Issue	

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: ZHEJIANG UNIVIEW TECHNOLOGIES CO., LTD
Address: 88 JIANGLING RD BINJIANG DISTRICT HANGZHOU ZHEJIANG
310051 CHINA

Manufacturer Information

Company Name: ZHEJIANG UNIVIEW TECHNOLOGIES CO., LTD
Address: 88 JIANGLING RD BINJIANG DISTRICT HANGZHOU ZHEJIANG
310051 CHINA

EUT Description

Product Name: Wireless Moudle
Model Name: VS0B9MW3565UE
Sample Number: 5811281
Data of Receipt Sample: Feb. 21, 2023
Test Date: Feb. 23, 2023~ Apr. 11, 2023

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 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	N/A(Note2)
7	Antenna Requirement	FCC 15.203	PASS
<p>Note:</p> <p>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.</p> <p>2)This product is power supply by DC.</p>			

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2. TEST METHODOLOGY

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

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; CAB No.: CN0073) 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>
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Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, 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)	3.5dB (1GHz-18Gz)
	3.9dB (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:	Wireless Moudle
Model No.:	VS0B9MW3565UE
Operating Frequency:	IEEE 802.11b/g/n/ax(HT20): 2412MHz to 2462MHz IEEE 802.11n/ax(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) IEEE for 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Channels Step:	Channels with 5MHz step
Test software of EUT:	QATool_Dbg
Antenna Type:	PIFA antenna
Antenna Gain:	Antenna1:2.49 dBi
	Antenna2:3.52 dBi
	Remark: This data is provided by customer and our lab isn't responsible for this data
Test Voltage	DC5V

5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains (NTX)	IEE Std. 802.11	Channel Number	Max AVG Conducted Power (dBm)
1/2	IEEE 802.11B	1-11[11]	13.60
1/2	IEEE 802.11G	1-11[11]	13.79
1/2	IEEE 802.11N HT20	1-11[11]	12.60
1/2	IEEE 802.11N HT40	3-9[7]	10.84
1/2	IEEE 802.11AX20	1-11[11]	12.67
1/2	IEEE 802.11AX40	3-9[7]	12.96

Remark: For this product, it has five antennas, only three antennas for WF-M921U RF module, but only two antennas for WIFI function. For this WF-M921U RF module WIFI function, only the 802.11N HT20, 802.11N HT40, 802.11 AX20 and 802.11 AX40 modes can support both the SISO and MIMO technical. For the modes of 11B&11G only support SISO mode.

5.3. CHANNEL LIST

Channel List for 802.11B/G/N/AX(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/AX(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 (MHz)
IEEE 802.11B	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11G	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11N HT20	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11N HT40	LCH: CH03 2422
	MCH: CH06 2437
	HCH: CH09 2452
IEEE 802.11AX20	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11AX40	LCH: CH03 2422
	MCH: CH06 2437
	HCH: CH09 2452

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worst Case Power Setting Parameter under 2400 ~ 2483.5MHz Band							
Test Software		QATool_Dbg					
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	1/2	14/14	14/14	14/14	/		
802.11G	1/2	14/14	14/14	14/14			
802.11N HT20	1/2	10/10	10/10	10/10			
802.11N HT40	1/2	/			10/10	10/10	10/10
802.11AX20	1/2	10/10	10/10	10/10	/		
802.11AX40	1/2	/					

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)	Directional gain(dBi)
1	2400-2483.5	PIFA antenna	2.49	6.05
2	2400-2483.5	PIFA antenna	3.52	

Note:

- 1) Directional gain= $10\log [(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}] = 6.05$ dBi
- 2) N_{ANT} : the number of Antenna
- 3) For this product, it has five antennas, but only three antennas for WF-M921U RF module, but only two antennas for WIFI function. For this WF-M921U RF module WIFI function, only the 802.11N HT20, 802.11N HT40, 802.11 AX20 and 802.11 AX40 modes can support both the SISO and MIMO technical. For the modes of 11B&11G only support SISO mode.

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11B	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.
IEEE 802.11G	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.
IEEE 802.11N HT20	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.
IEEE 802.11N HT40	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.
IEEE 802.11AX20	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.
IEEE 802.11AX40	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.

5.7. THE WORSE CASE CONFIGURATIONS

For WIFI module, the worst-case data rates as provided by the client were:

- 802.11B mode: 1 Mbps
- 802.11G mode: 6 Mbps
- 802.11N HT20 mode: MCS0
- 802.11N HT40 mode: MCS0
- 802.11AX20 mode: MCS0
- 802.11AX40 mode: MCS0

Remark:

- 1) The EUT support Cyclic Shift Diversity (CDD), Space Time Coding (STBC), Spatial Division Multiplexing (SDM) modes. They use the same conducted power per chain in any given mode, CDD mode have the maximum power setting, so we only chose the worst case mode CDD for final testing.
- 2) For 802.11AX mode only support full RU mode.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E590	N/A

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	USB	USB	100cm Length	N/A

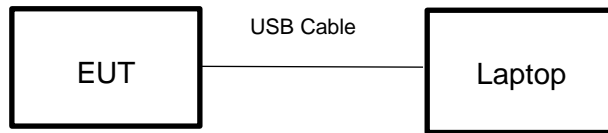
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



5.9. MEASURING INSTRUMENT AND SOFTWARE USED

Radiated 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	ESR7	222993	/	2022-05-20	2023-05-19
<input checked="" type="checkbox"/>	EMI test receiver	R&S	ESR26	126703	2021-12-04	2022-12-03	2023-12-02
<input checked="" type="checkbox"/>	Spectrum Analyzer	R&S	FSV3044	222992	2022-05-27	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1513	155456	2018-06-15	2021-06-03	2024-06-02
<input checked="" type="checkbox"/>	Receiver Antenna (30MHz-1GHz)	Schwarzbeck	VULB 9163	126704	2019-01-28	2022-01-18	2025-01-17
<input checked="" type="checkbox"/>	Receiver Antenna (1GHz-18GHz)	R&S	HF907	126705	2018-01-29	2022-02-28	2025-02-27
<input checked="" type="checkbox"/>	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170	126706	2019-01-05	2021-07-15	2024-07-14
<input checked="" type="checkbox"/>	Pre-amplification (To 18GHz)	Tonscnd	TAP01018050	224539	/	2022-10-20	2023-10-19
<input checked="" type="checkbox"/>	Pre-amplification (To 18GHz)	R&S	SCU-18D	134667	2021-12-05	2022-12-04	2023-12-03
<input checked="" type="checkbox"/>	Pre-amplification (To 26.5GHz)	R&S	SCU-26D	135391	2021-12-05	2022-12-04	2023-12-03
<input checked="" type="checkbox"/>	Band Reject Filter	Wainwright	WRCGV12-2375-2400-2485-2510-40SS	1	2021-12-05	2022-12-04	2023-12-03
<input checked="" type="checkbox"/>	High Pass Filter	COM-MW	ZBF13-3-18G-01	2	2021-12-05	2022-12-04	2023-12-03
<input checked="" type="checkbox"/>	Chamber A	Albatross	9*6*6	126721	2019-05-31	2022-05-30	2025-05-29
<input checked="" type="checkbox"/>	Chamber B	SAEMC	9*6*6	220350	/	2022-07-03	2025-06-01
<input checked="" type="checkbox"/>	Temperature and Humidity Datalogger	Omega Engineering Inc.	iTHX-SD-5	183135	/	2022-07-20	2023-07-19
Software							
Used	Description	Manufacturer	Name	Version			
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance	JSTONSCEND	JS32-RE	Ver. 4.0.0.1			
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance	Chinese-EMC	RE_RSE	Ver. 3.03			
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9010B	155368	2022-04-09	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	Power Meter	MWT	MW100-RFCB	221694	2022-04-09	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	Attenuator	PASTERNAK	PE7087-6	1624	2022-04-09	2023-04-08	2024-04-07

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	8.3.2.2 (Method AVGSA-2)
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4 (Method PKPSD)
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

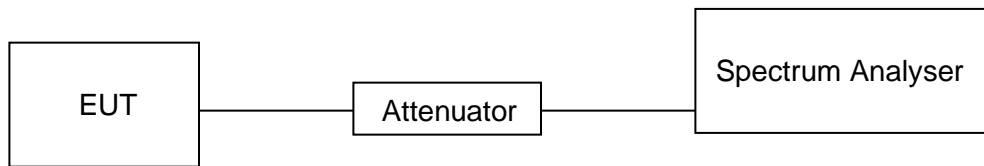
LIMITS

None; for reporting purposes only

PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	24.2°C	Relative Humidity	52.5%
Atmosphere Pressure	102.1kpa	Test Voltage	DC5V

TEST RESULTS TABLE

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (kHz)	Final VBW (kHz)
11B	2.24	2.59	0.865	86.5	0.63	0.45	1
11G	0.36	0.72	0.500	50.0	3.01	2.78	3
802.11N HT20	1.30	1.68	0.774	77.4	1.11	0.77	1
802.11N HT40	0.63	1.04	60.58	60.6	2.18	1.59	2
802.11AX20	0.20	0.55	0.364	36.4	4.39	5	5
802.11AX40	0.19	0.58	0.328	32.8	4.84	5.26	6

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

2) Where: x is Duty Cycle (Linear)

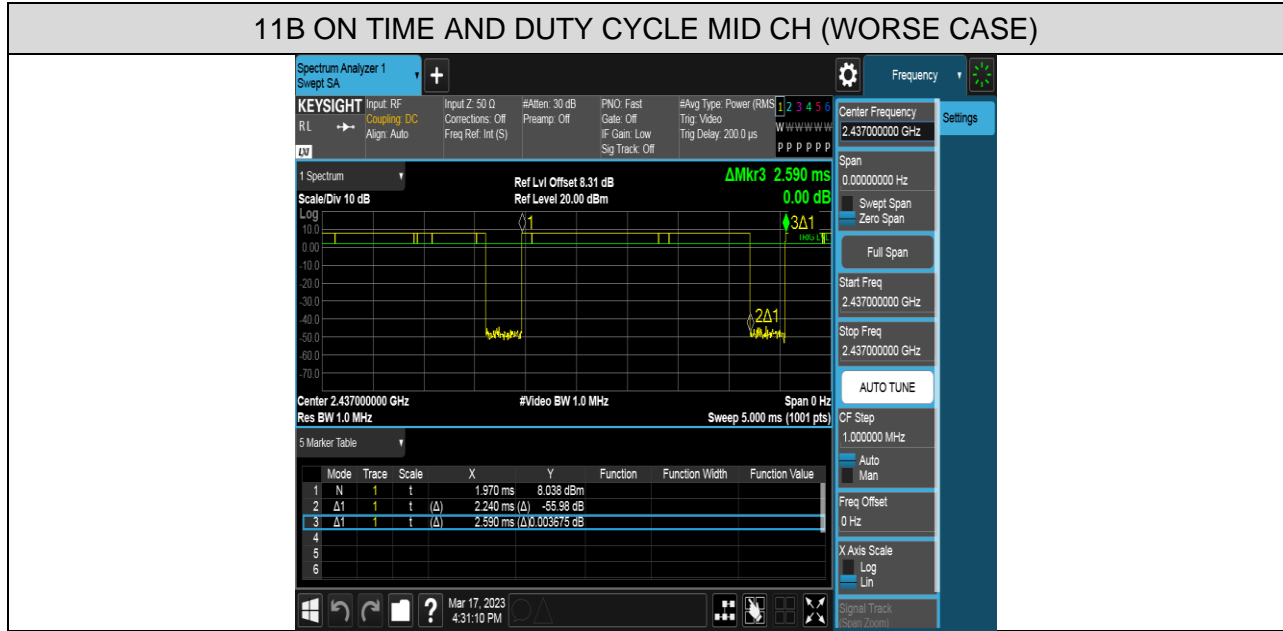
3) Where: T is On Time (transmit duration)

4) If the duty cycle is above 98%, the Final VBW is 10Hz.

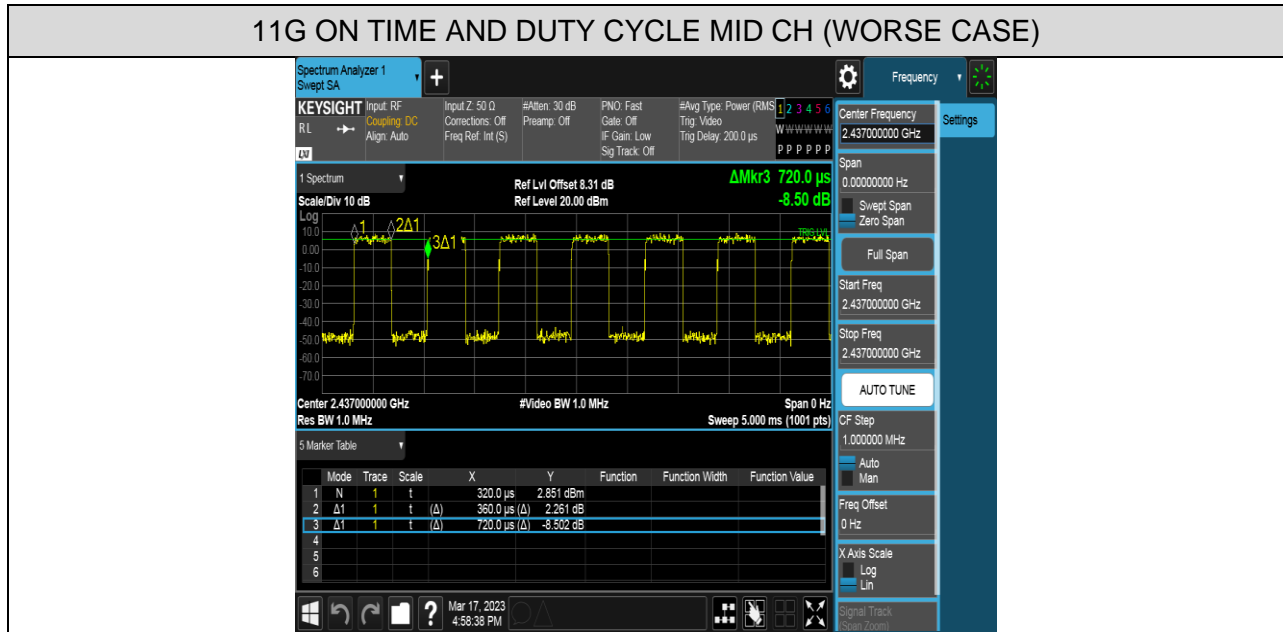
5) Antenna1 and Antenna2 can be used as transmitting/receiving antenna independently, and the duty cycle results are the same, so only the data of worse case is included in this report.

TEST GRAPHS_Antenna 2

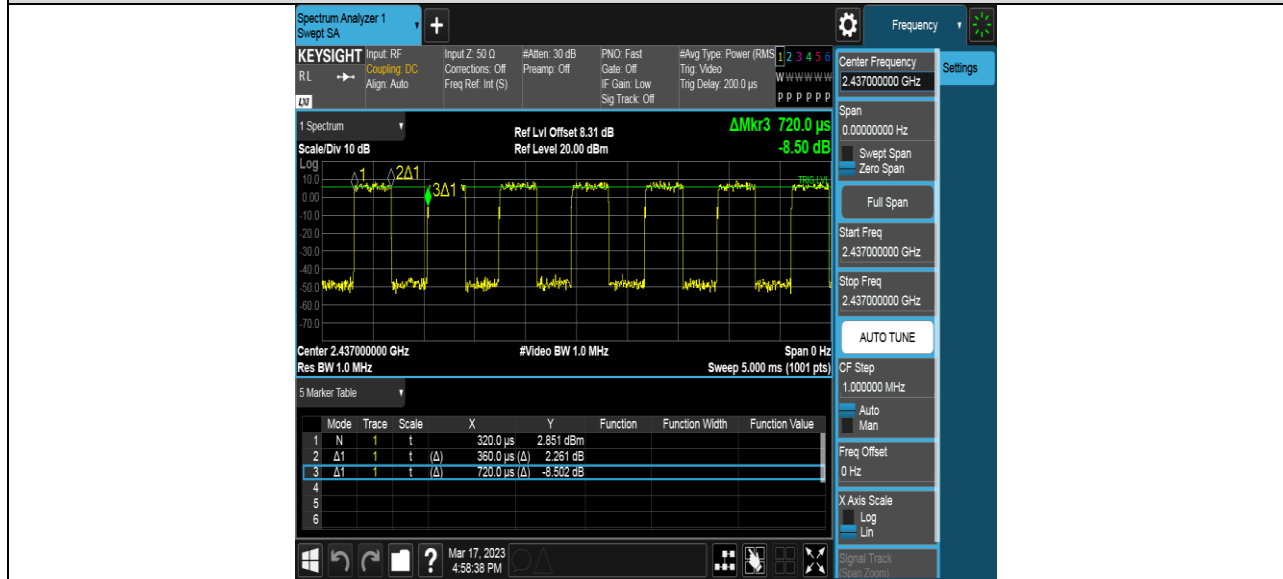
11B ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



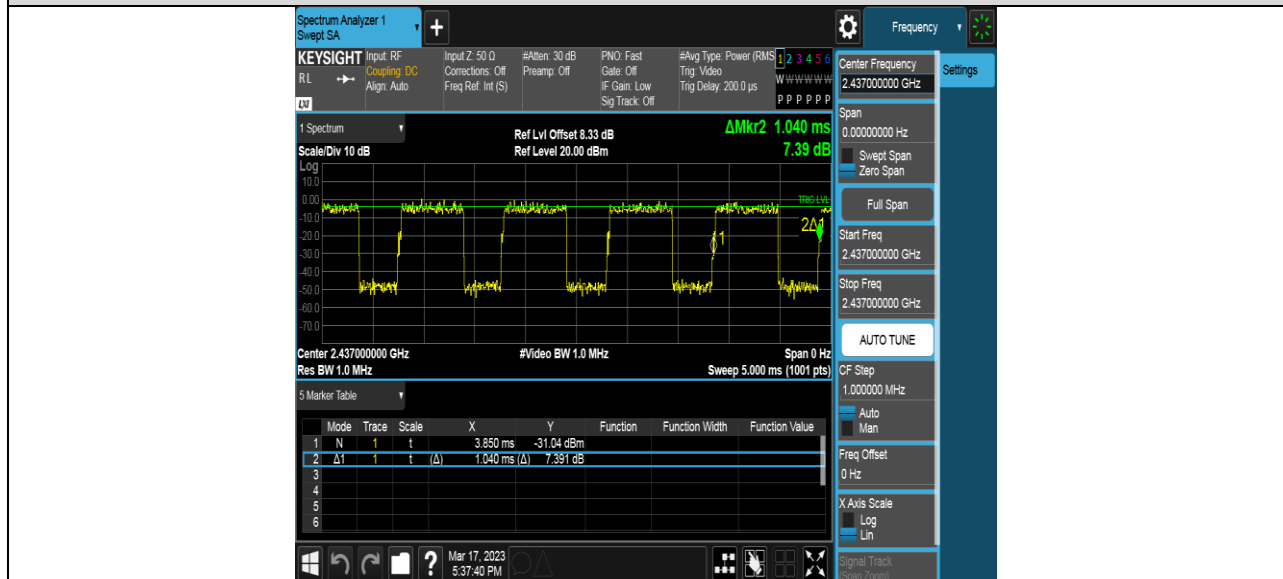
11G ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



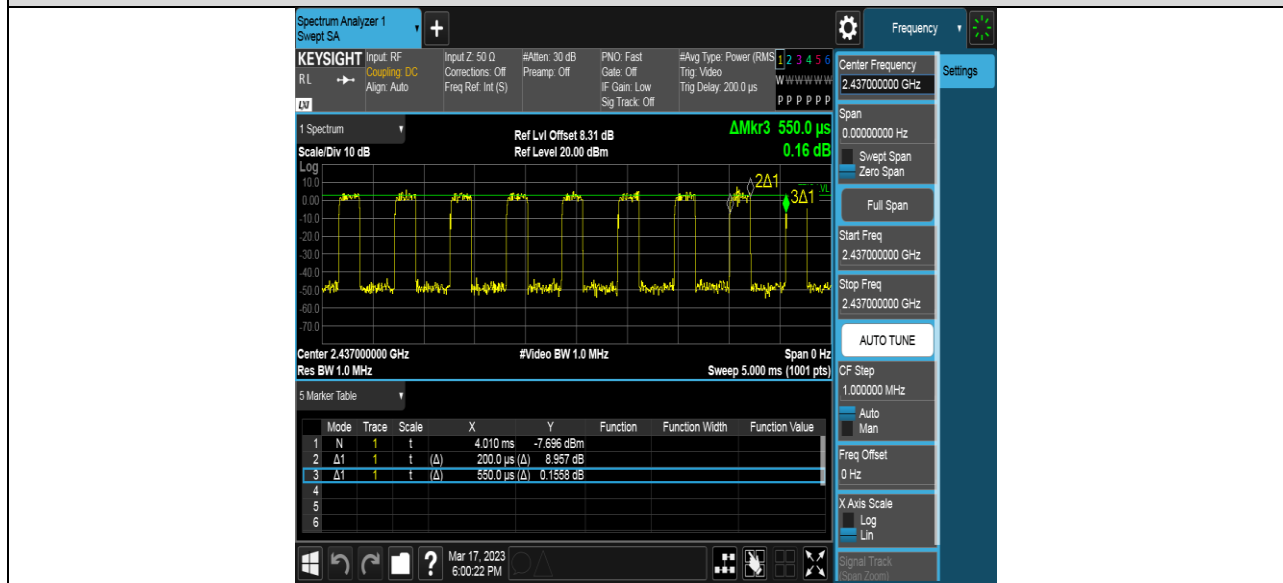
11N HT20 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



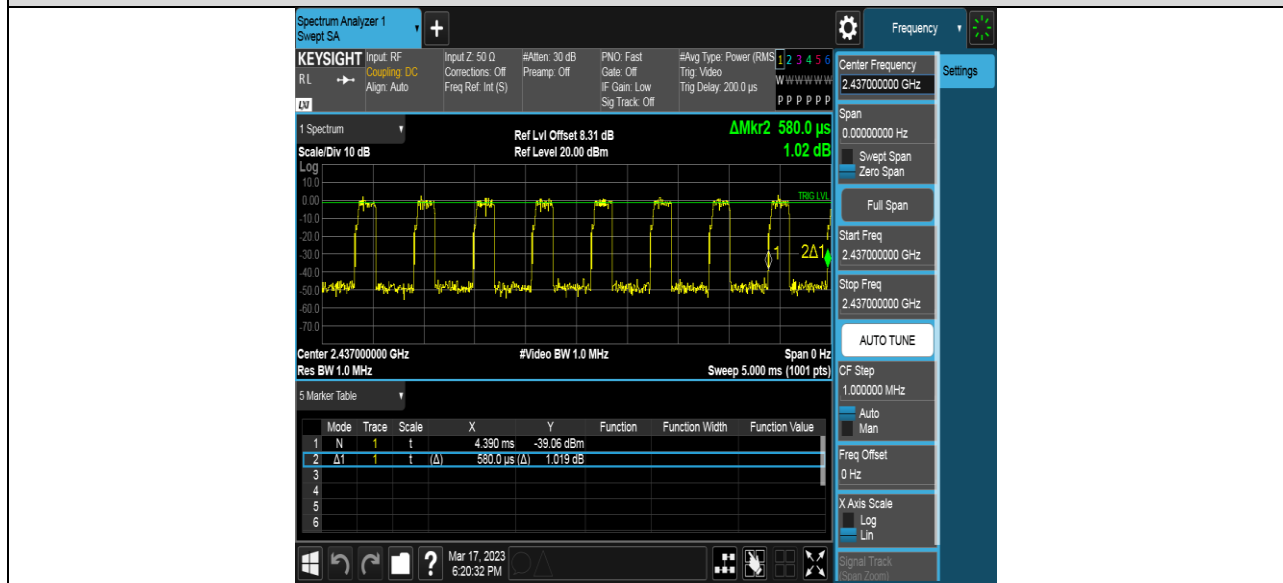
11N HT40 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



11AX20 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



11AX40 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)
CFR 47 FCC 15.247(a)(2)	6dB Bandwidth	$\geq 500\text{kHz}$	2400-2483.5
	99 % Occupied Bandwidth	For reporting purposes only	2400-2483.5

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.8 for DTS bandwidth and clause 6.9 for Occupied Bandwidth.

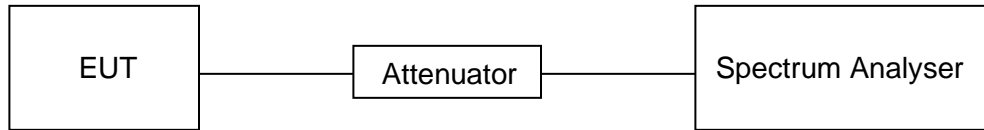
Connect the EUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth: 100 kHz For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 6 dB Bandwidth: $\geq 3 \times \text{RBW}$ For 99 % Occupied Bandwidth: $\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

a) Use the 99 % power bandwidth function of the instrument, allow the trace to stabilize and report the measured bandwidth.

b) 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



TEST ENVIRONMENT

Temperature	24.2°C	Relative Humidity	52.5%
Atmosphere Pressure	102.1kpa	Test Voltage	DC5V

TEST RESULTS TABLE

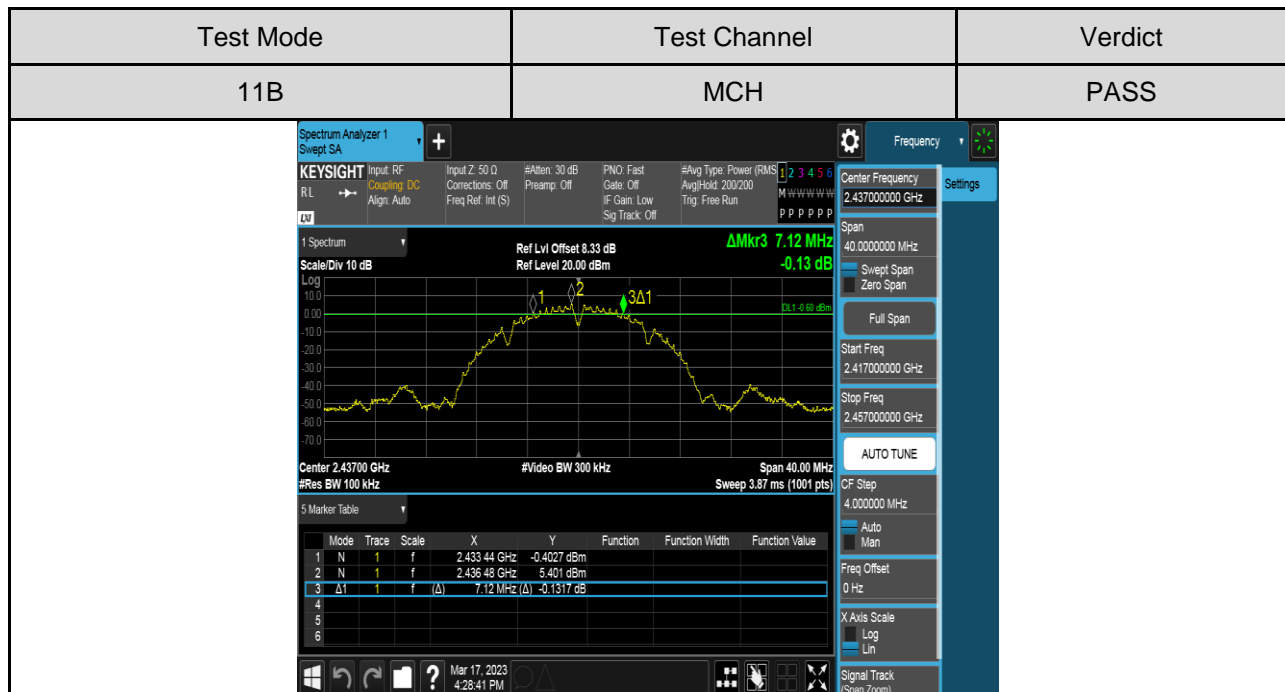
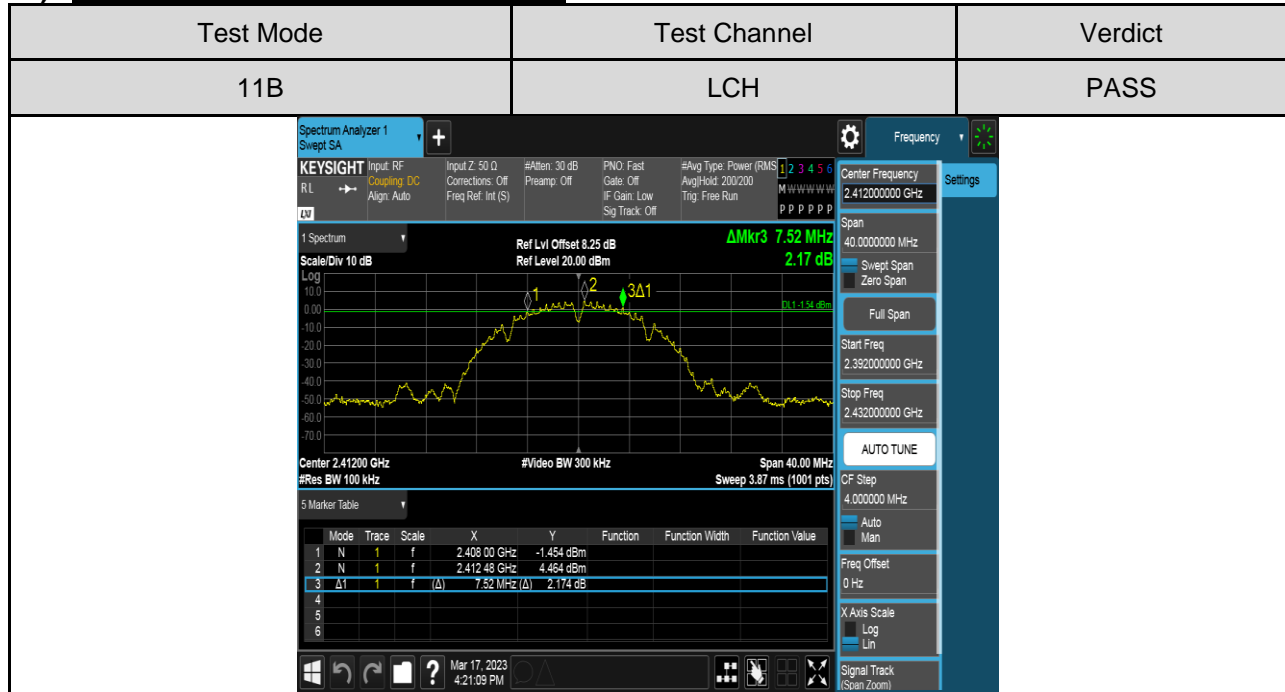
Test Mode	Antenna	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
11B	Ant1	LCH	7.520	12.275	PASS
	Ant2	LCH	7.080	12.398	PASS
	Ant1	MCH	7.120	12.300	PASS
	Ant2	MCH	8.040	12.396	PASS
	Ant1	HCH	8.040	12.315	PASS
	Ant2	HCH	7.560	12.392	PASS
11G	Ant1	LCH	15.080	16.533	PASS
	Ant2	LCH	15.000	16.584	PASS
	Ant1	MCH	15.480	17.135	PASS
	Ant2	MCH	15.160	17.339	PASS
	Ant1	HCH	15.280	17.179	PASS
	Ant2	HCH	15.120	17.486	PASS
11N20MIMO	Ant1	LCH	15.080	17.631	PASS
	Ant2	LCH	14.960	17.729	PASS
	Ant1	MCH	17.560	18.188	PASS
	Ant2	MCH	15.400	18.455	PASS
	Ant1	HCH	16.040	18.280	PASS
	Ant2	HCH	15.600	18.605	PASS
11N40MIMO	Ant1	LCH	35.040	36.005	PASS
	Ant2	LCH	34.960	36.062	PASS
	Ant1	MCH	35.040	35.953	PASS
	Ant2	MCH	35.040	35.977	PASS
	Ant1	HCH	35.120	36.038	PASS
	Ant2	HCH	35.120	36.088	PASS
11AX20MIMO	Ant1	LCH	15.120	18.821	PASS
	Ant2	LCH	17.080	18.812	PASS
	Ant1	MCH	16.600	19.039	PASS
	Ant2	MCH	17.720	19.061	PASS
	Ant1	HCH	16.440	19.076	PASS
	Ant2	HCH	15.160	18.977	PASS
11AX40MIMO	Ant1	LCH	36.400	37.629	PASS
	Ant2	LCH	35.840	37.608	PASS
	Ant1	MCH	36.400	37.669	PASS
	Ant2	MCH	35.920	37.580	PASS
	Ant1	HCH	36.400	37.742	PASS
	Ant2	HCH	36.320	37.794	PASS

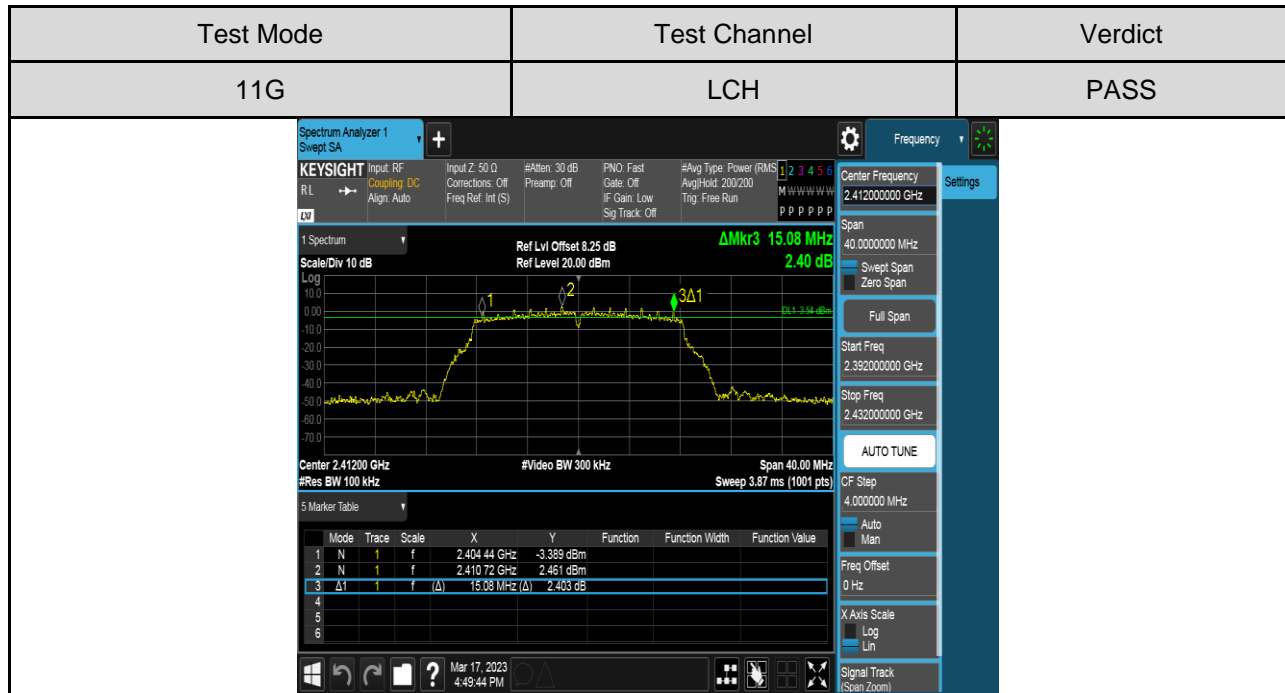
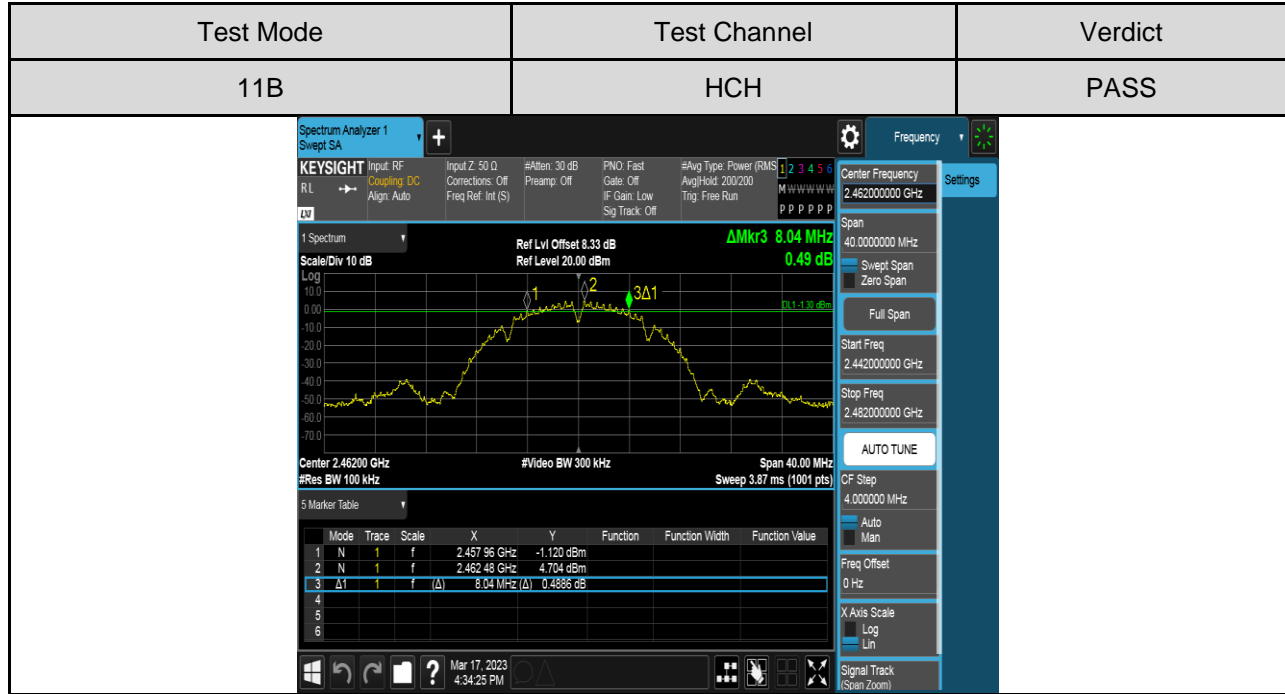
Remark:

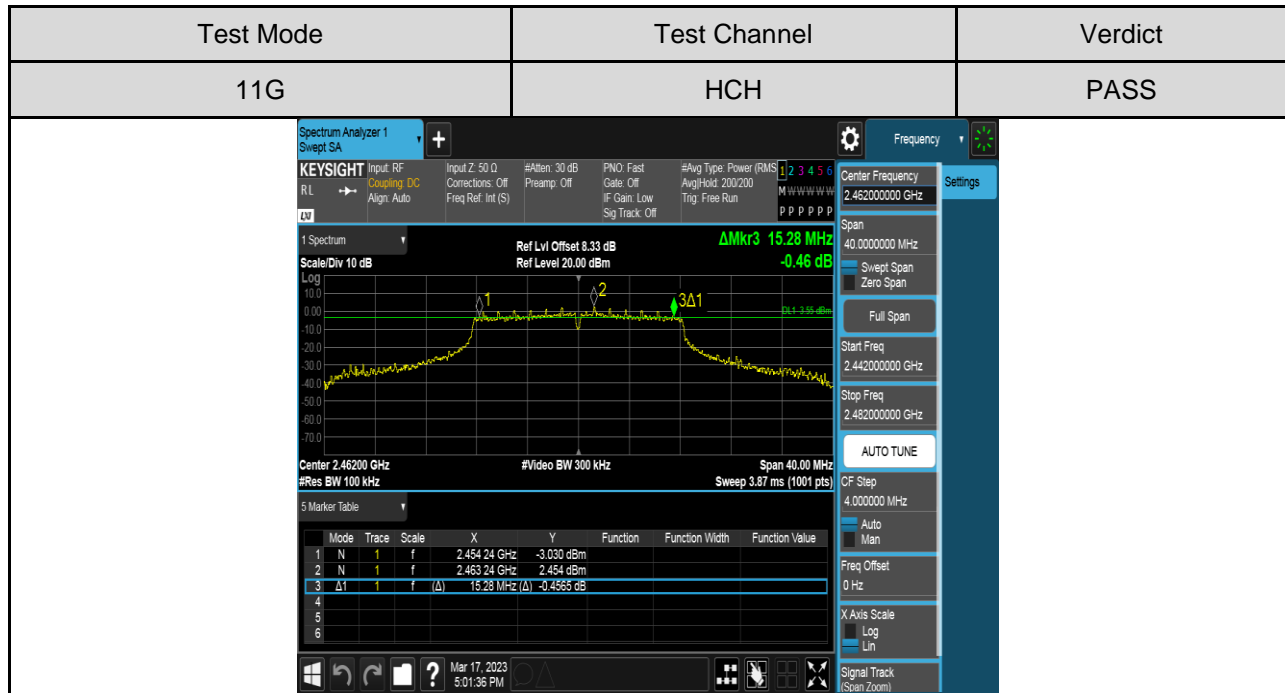
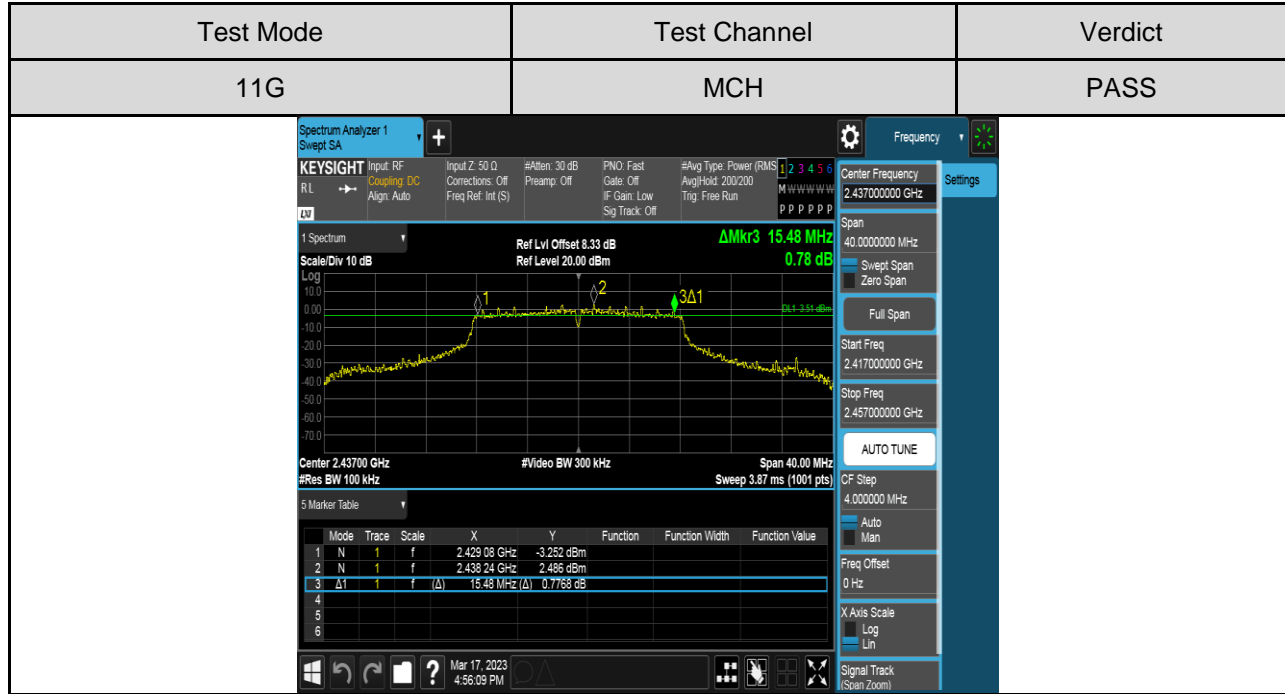
- 1) For this product, it has five antennas, but only three antennas for WF-M921U RF module, but only two antennas for WIFI function. For this WF-M921U RF module WIFI function, only the 802.11N HT20, 802.11N HT40, 802.11 AX20 and 802.11 AX40 modes can support both the SISO and MIMO technical. For the modes of 11B&11G only support SISO mode.
- 2) Through pre-testing all the test modes of 11N 20 and 11N40, including SISO and MIMO, but only the data if worse case is included in this test report.

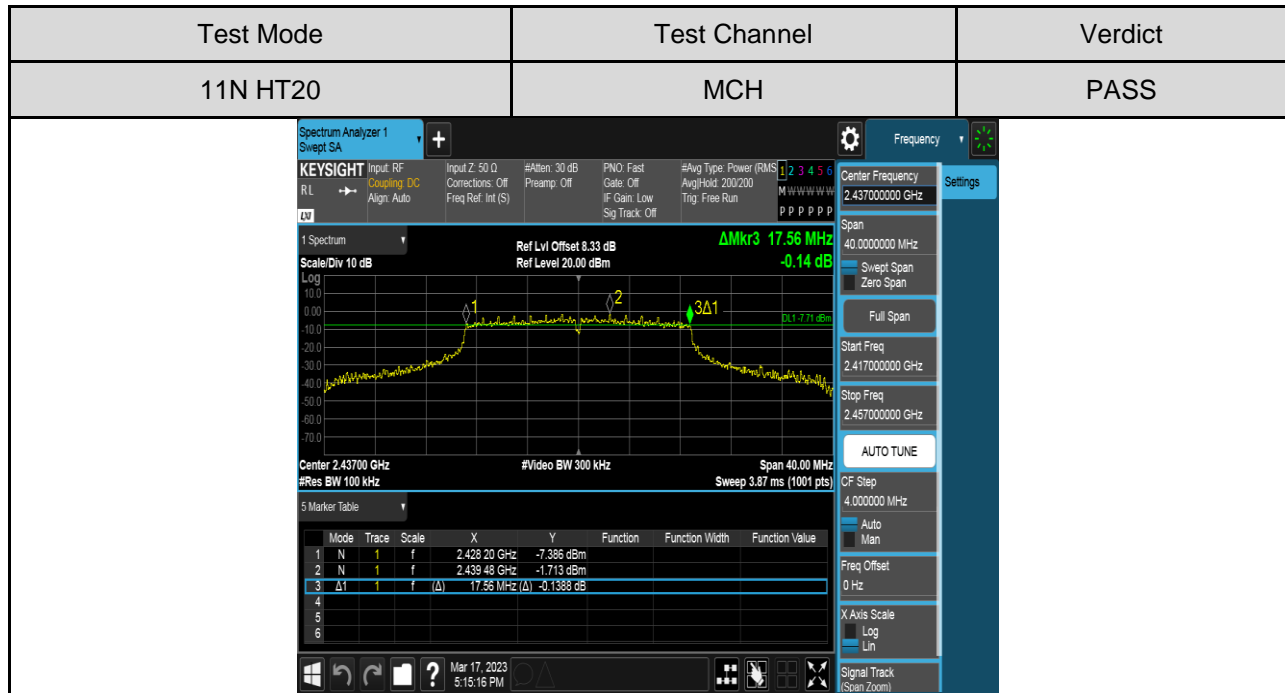
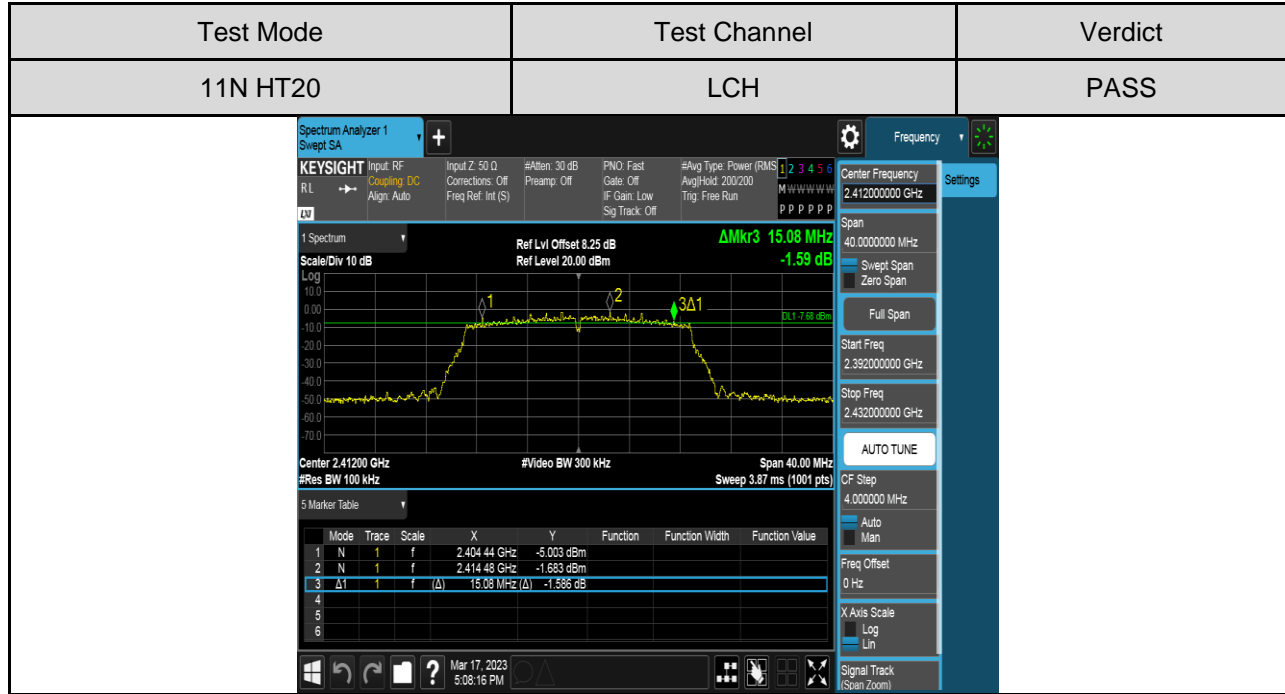
TEST GRAPHS

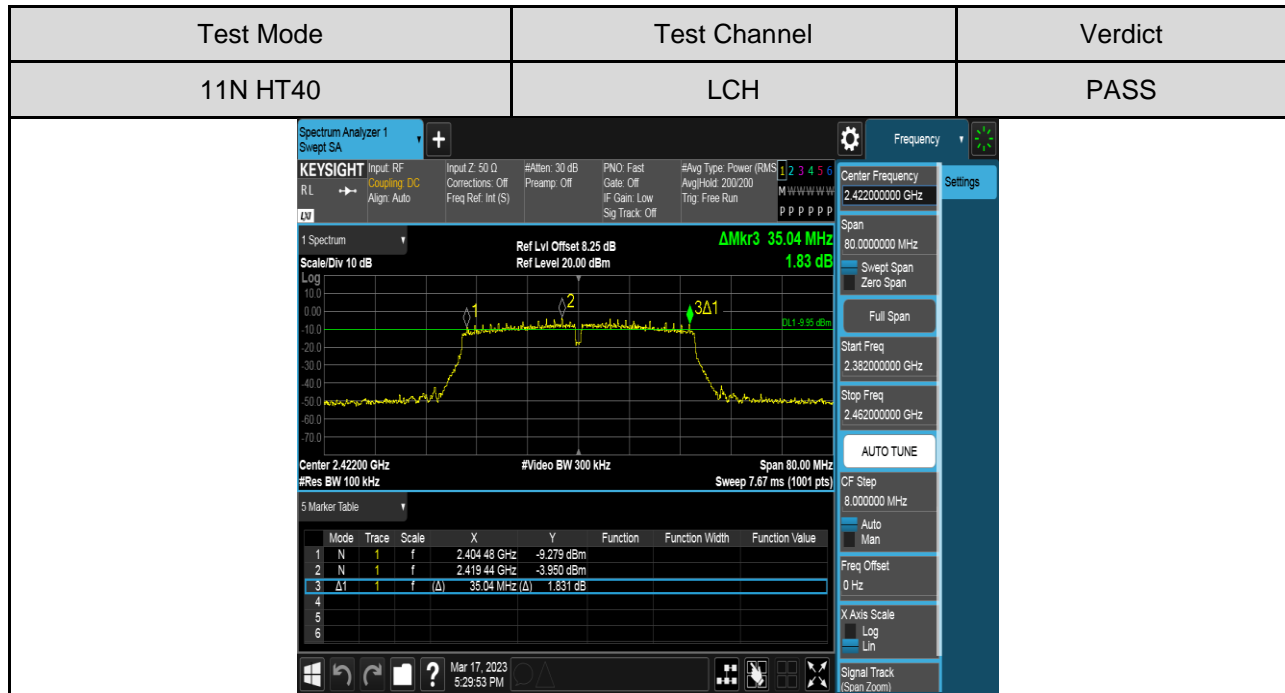
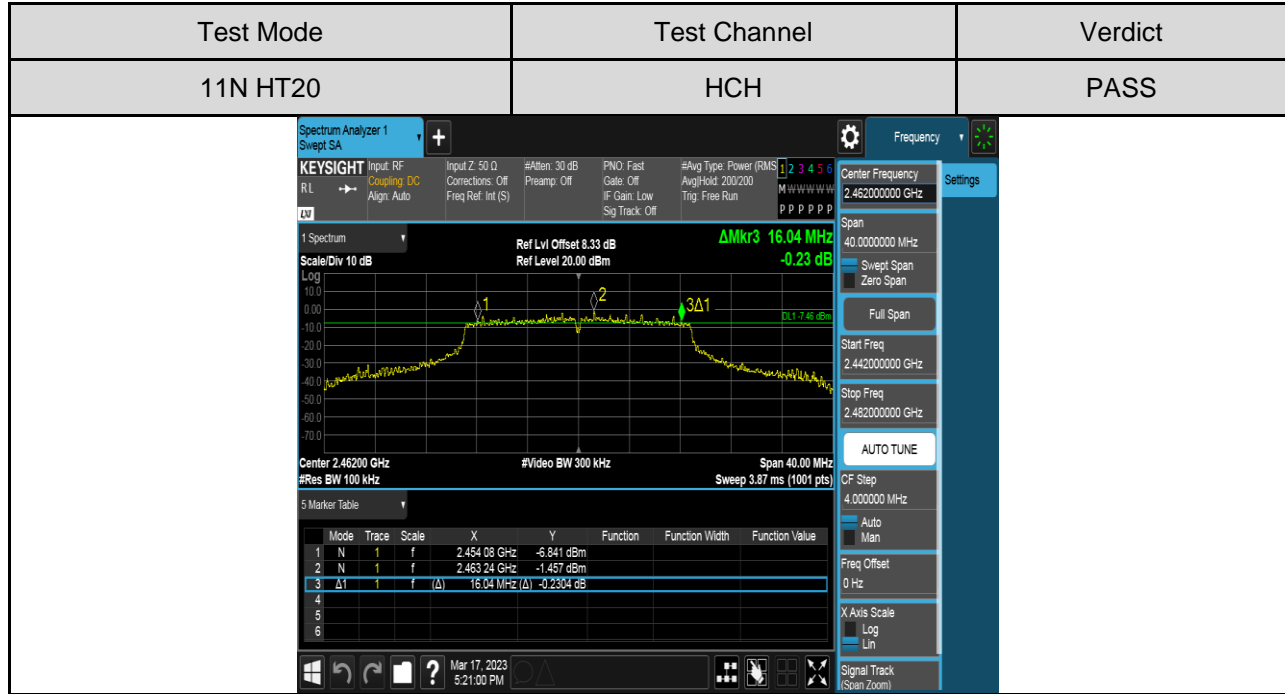
1) For 6dB Bandwidth Antenna 1 Part:







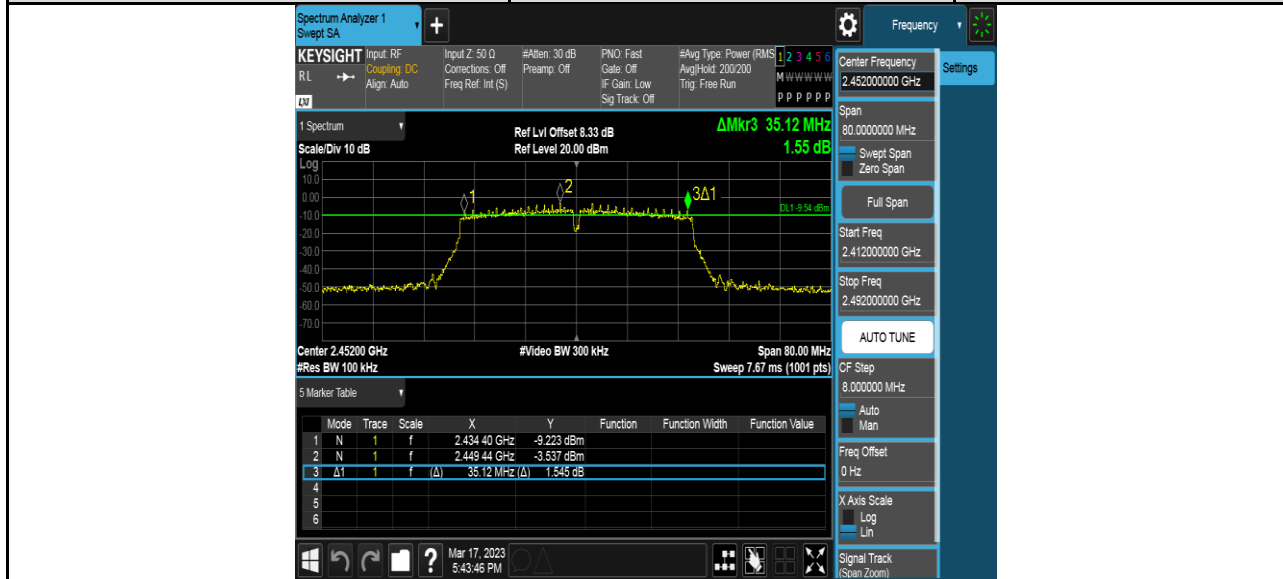


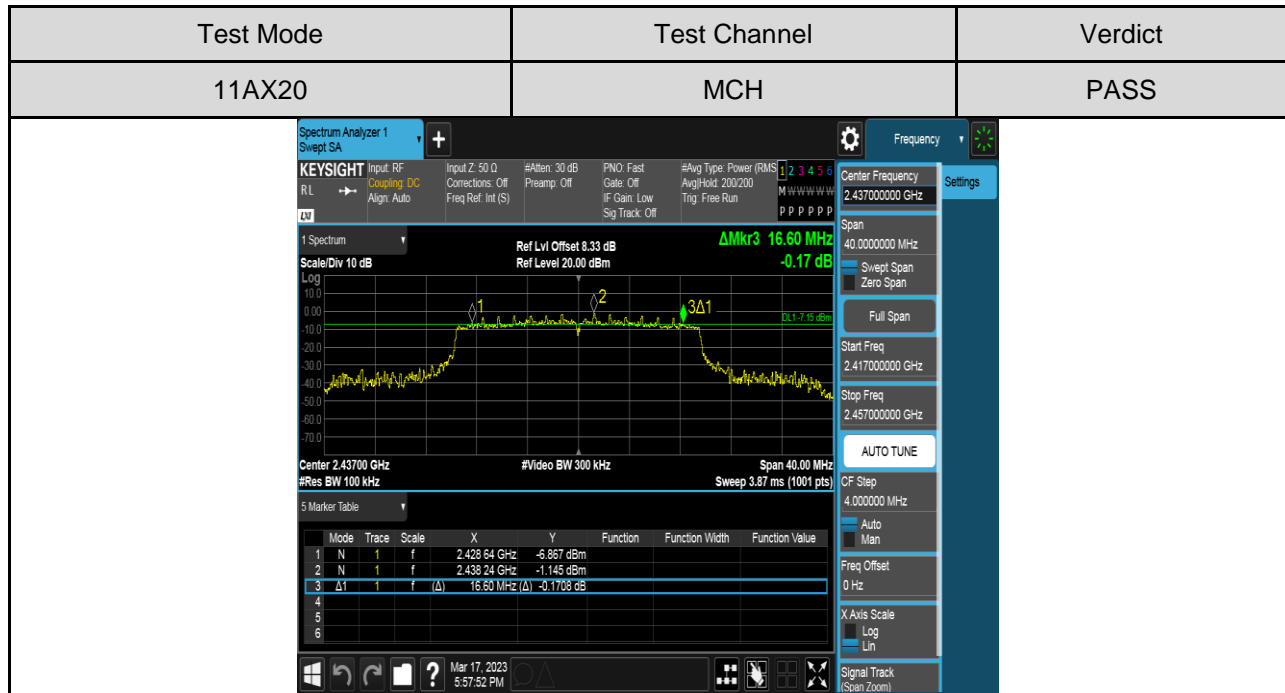
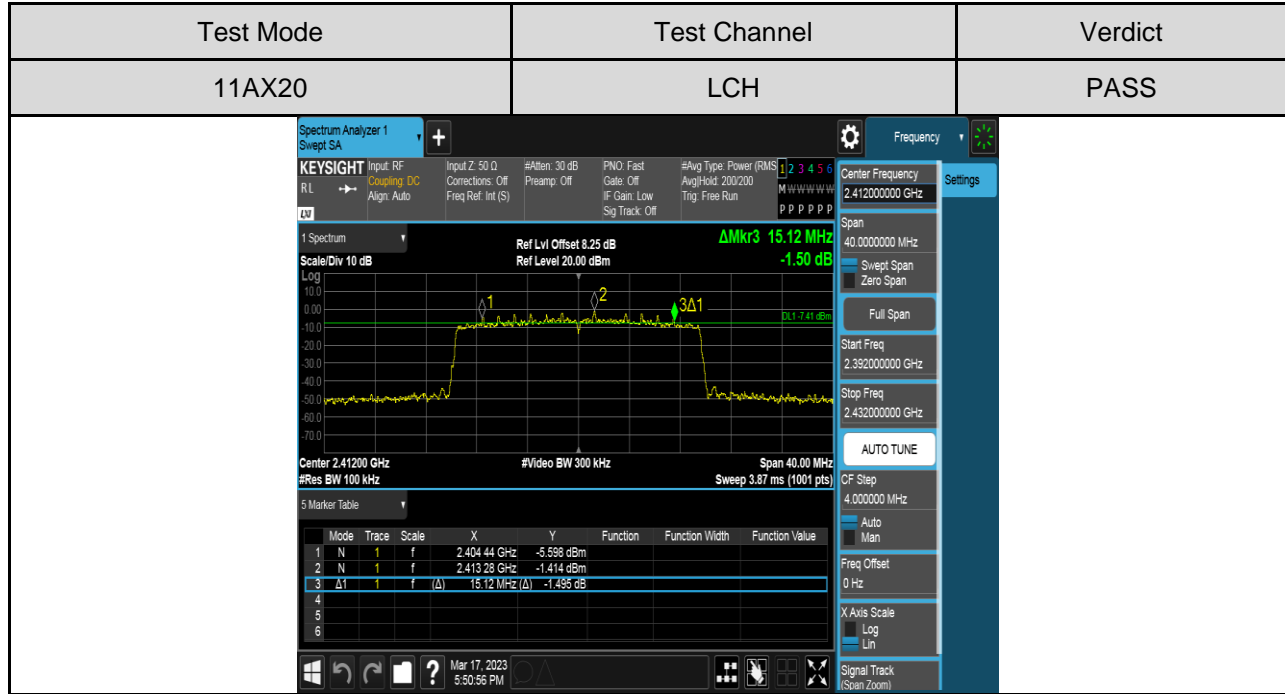


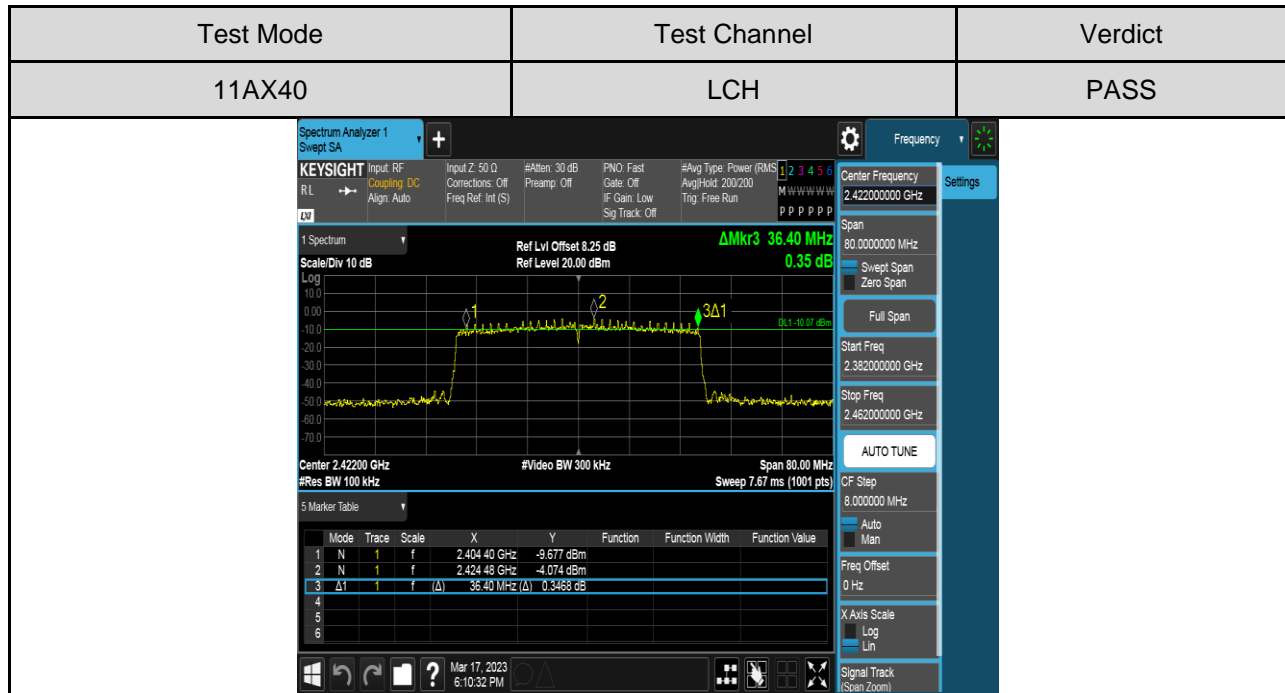
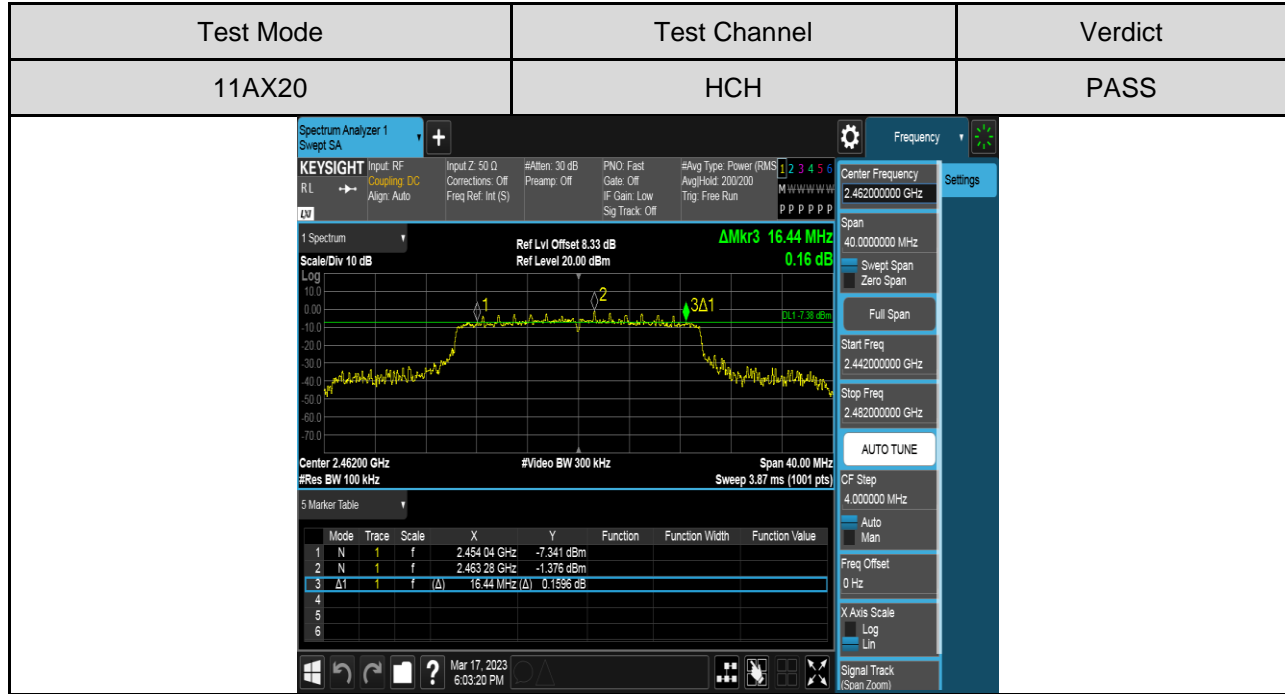
Test Mode	Test Channel	Verdict
11N HT40	MCH	PASS

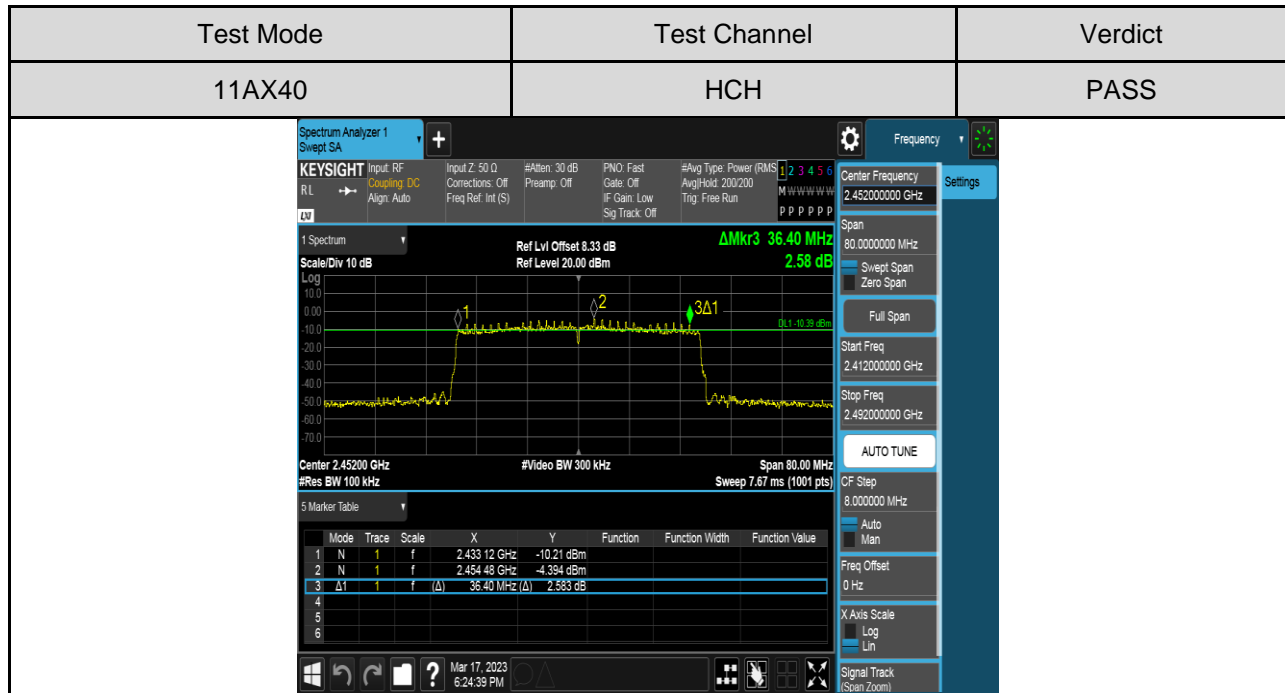
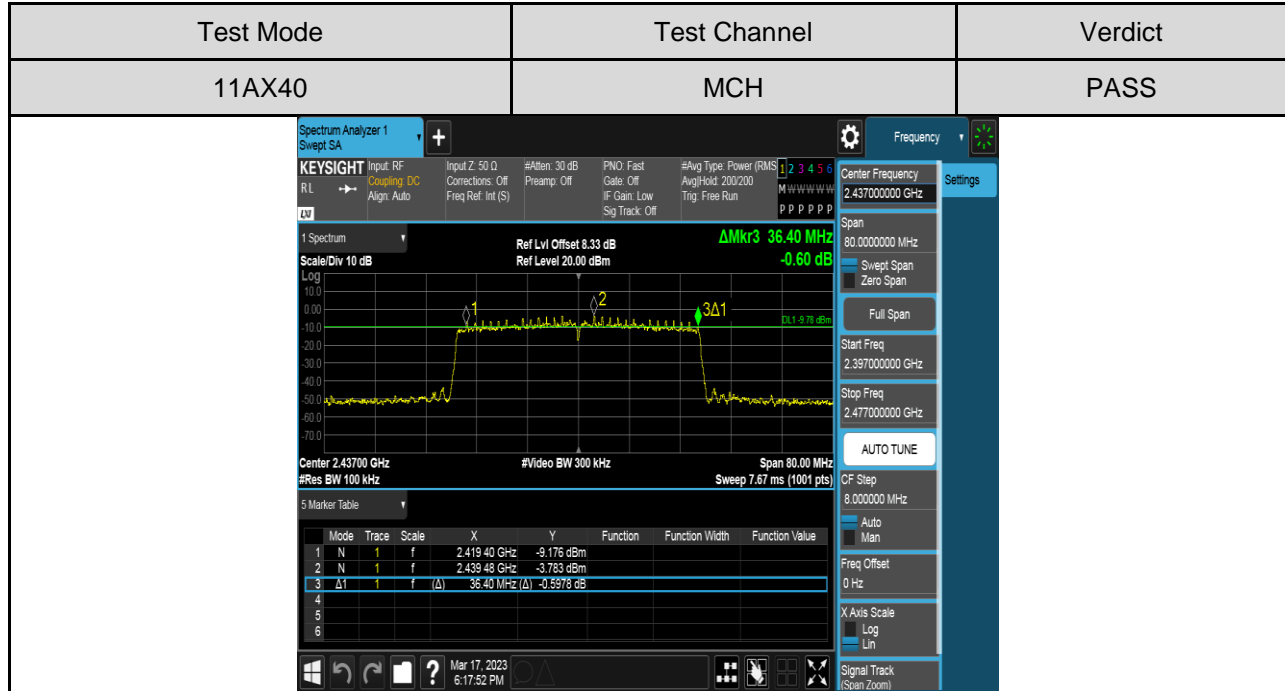


Test Mode	Test Channel	Verdict
11N HT40	HCH	PASS

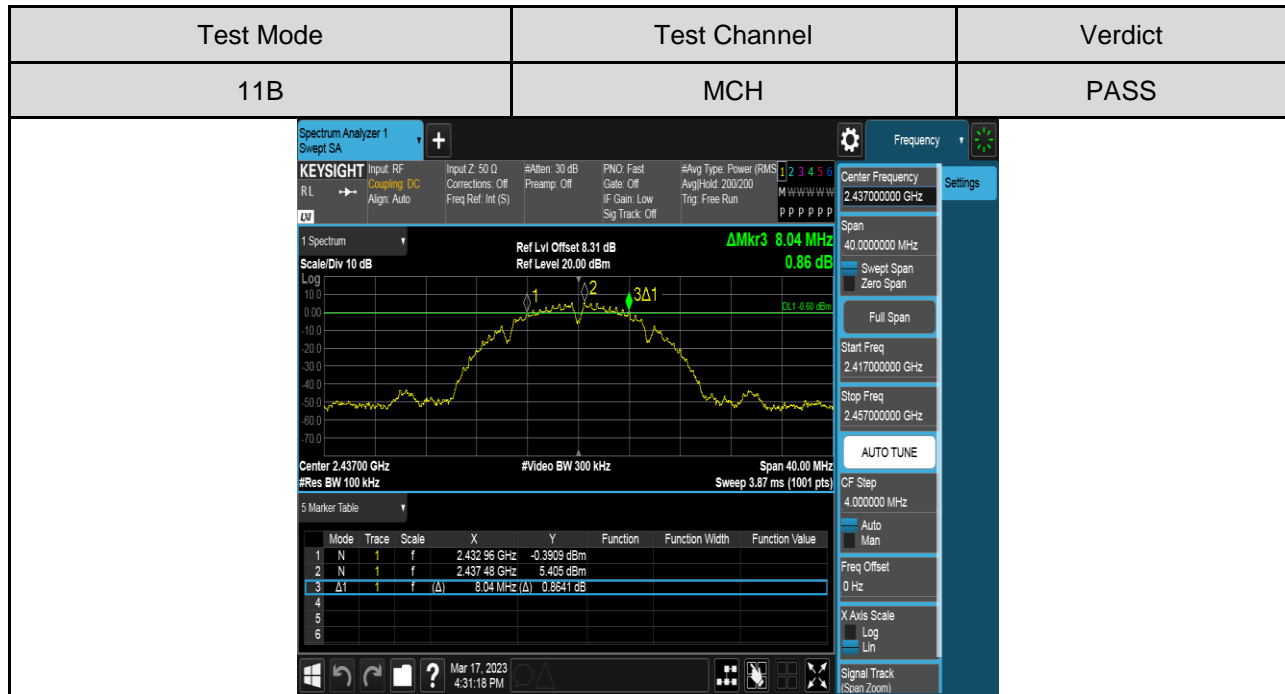
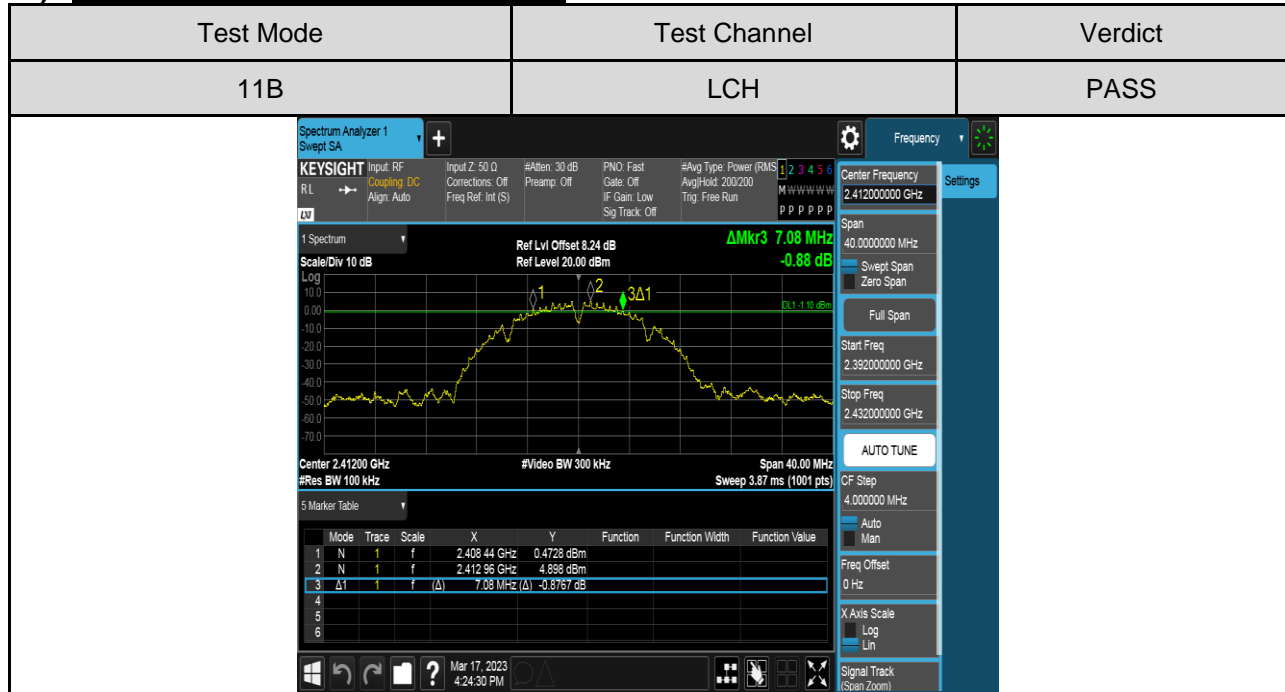


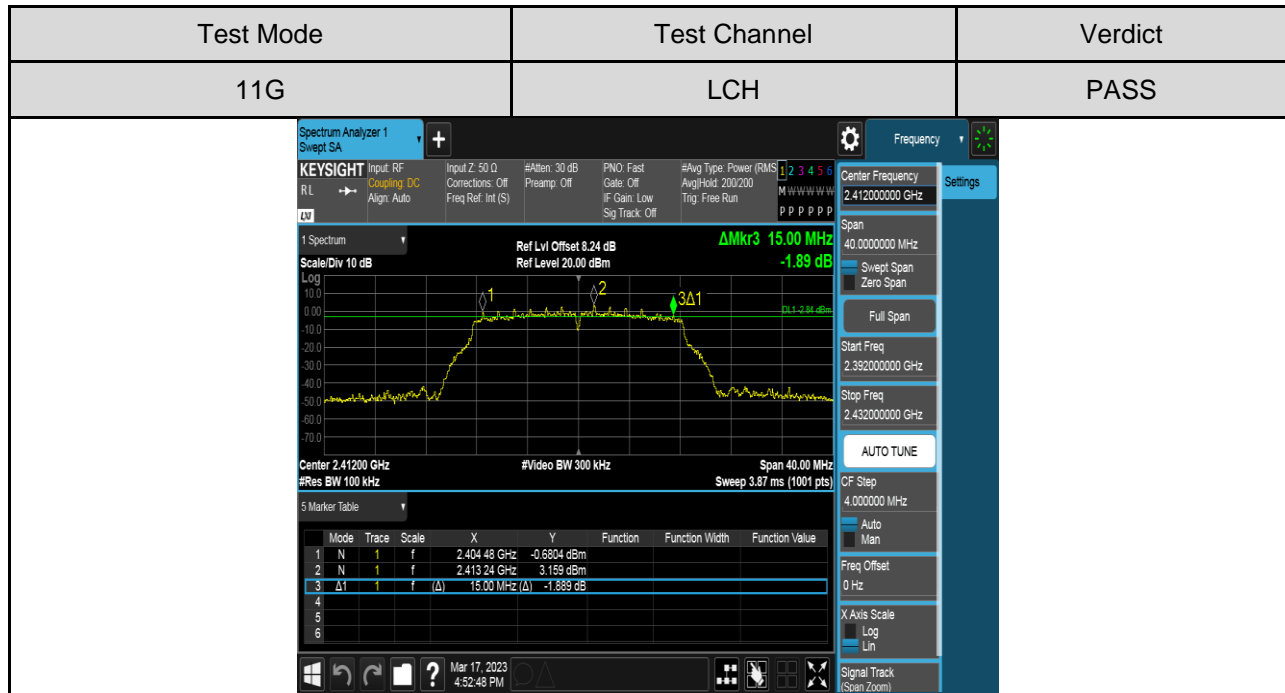
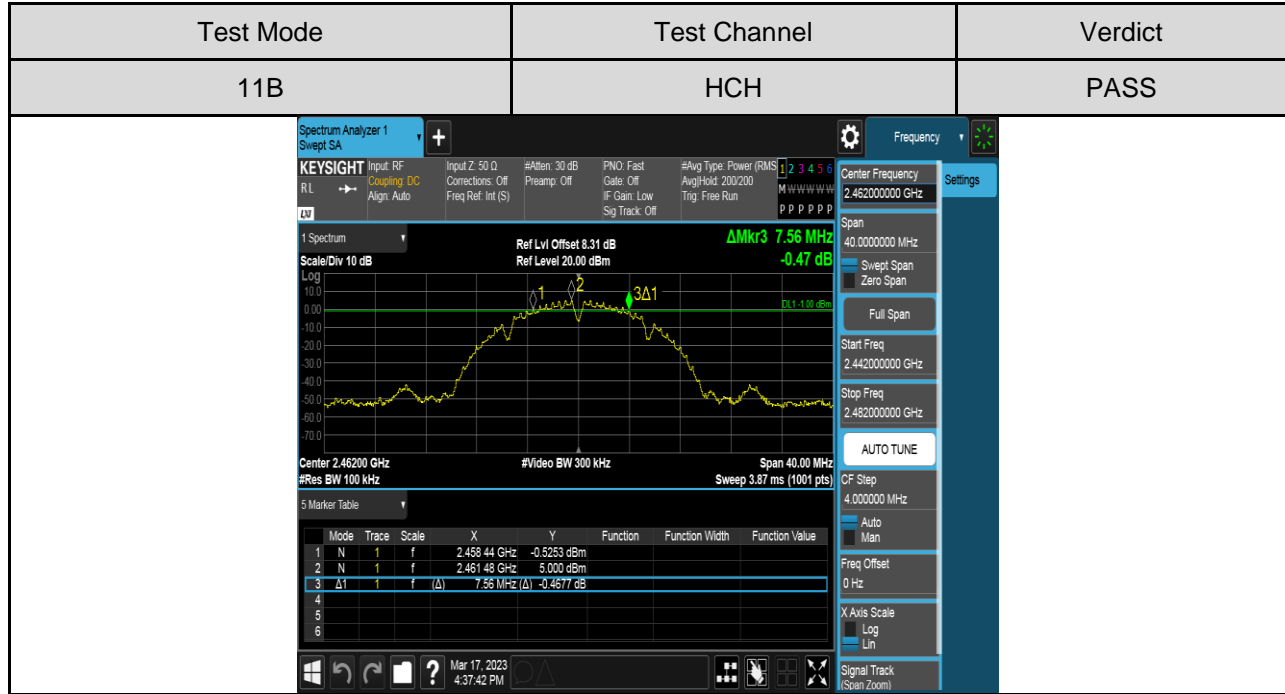


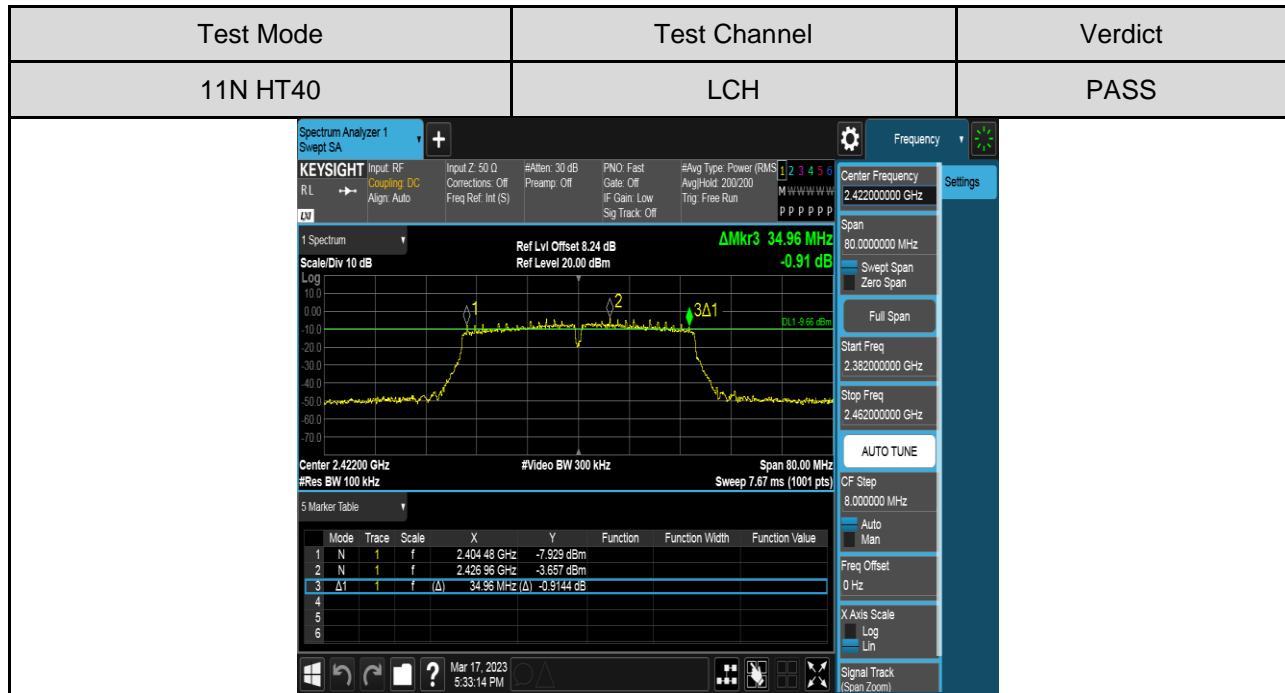
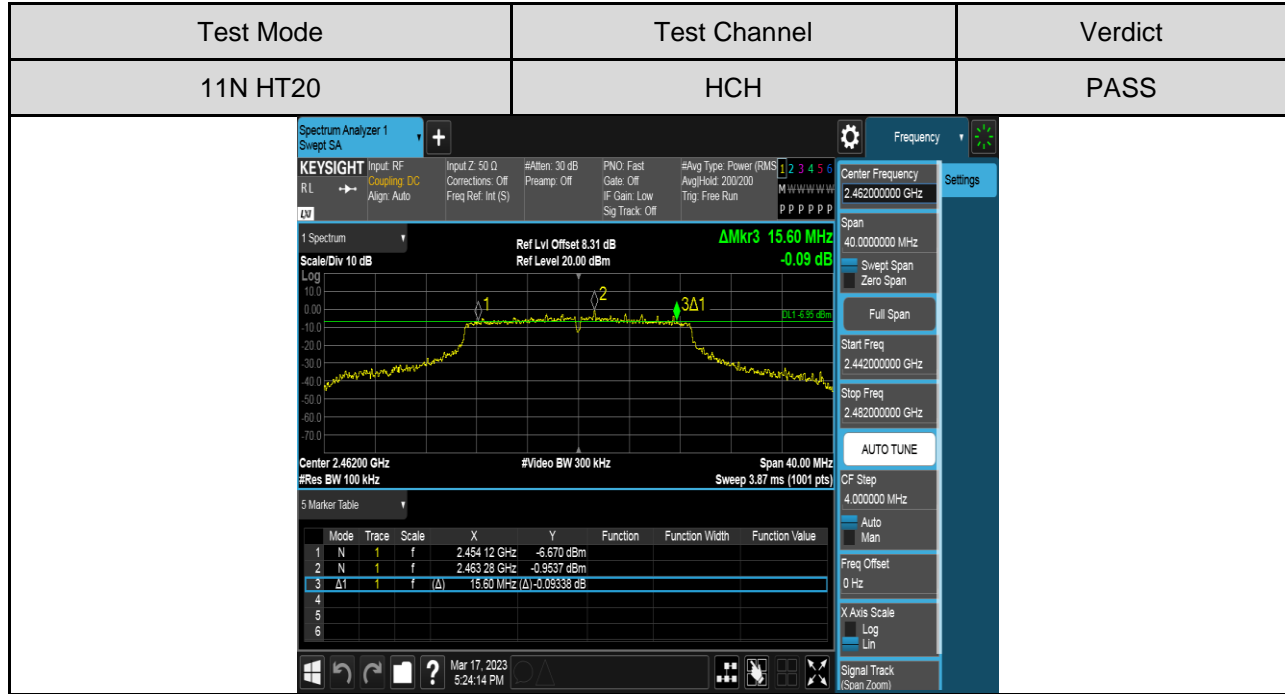


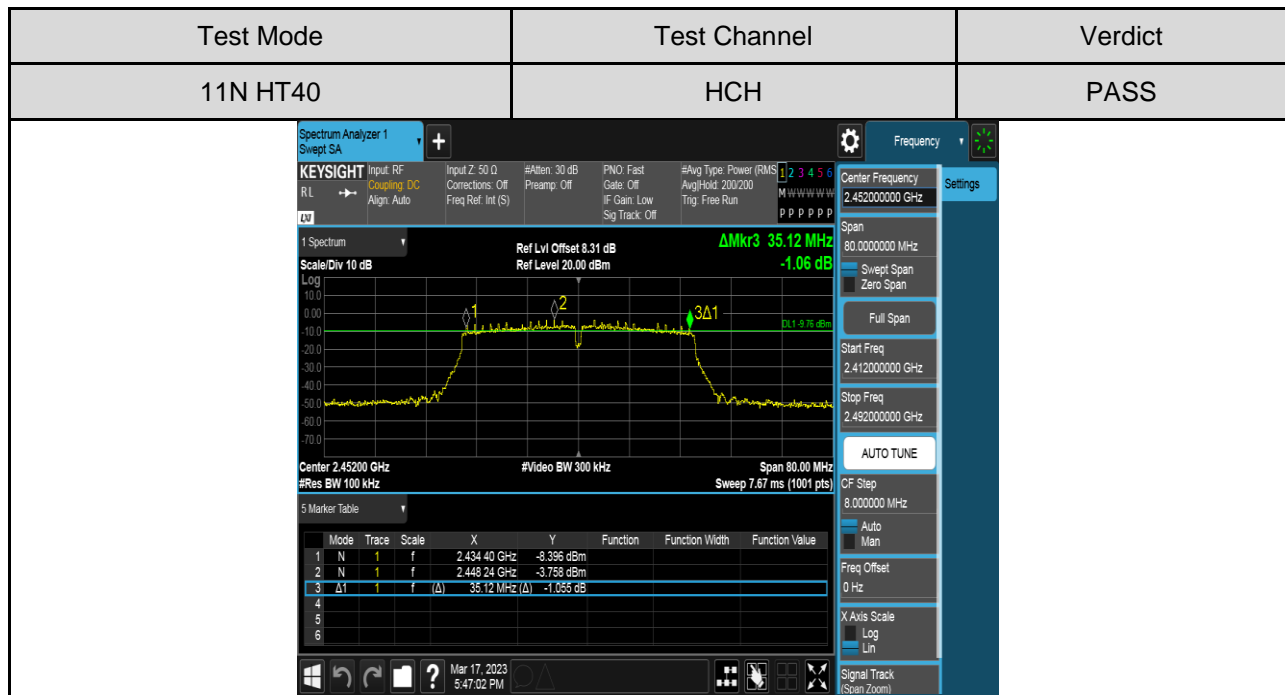
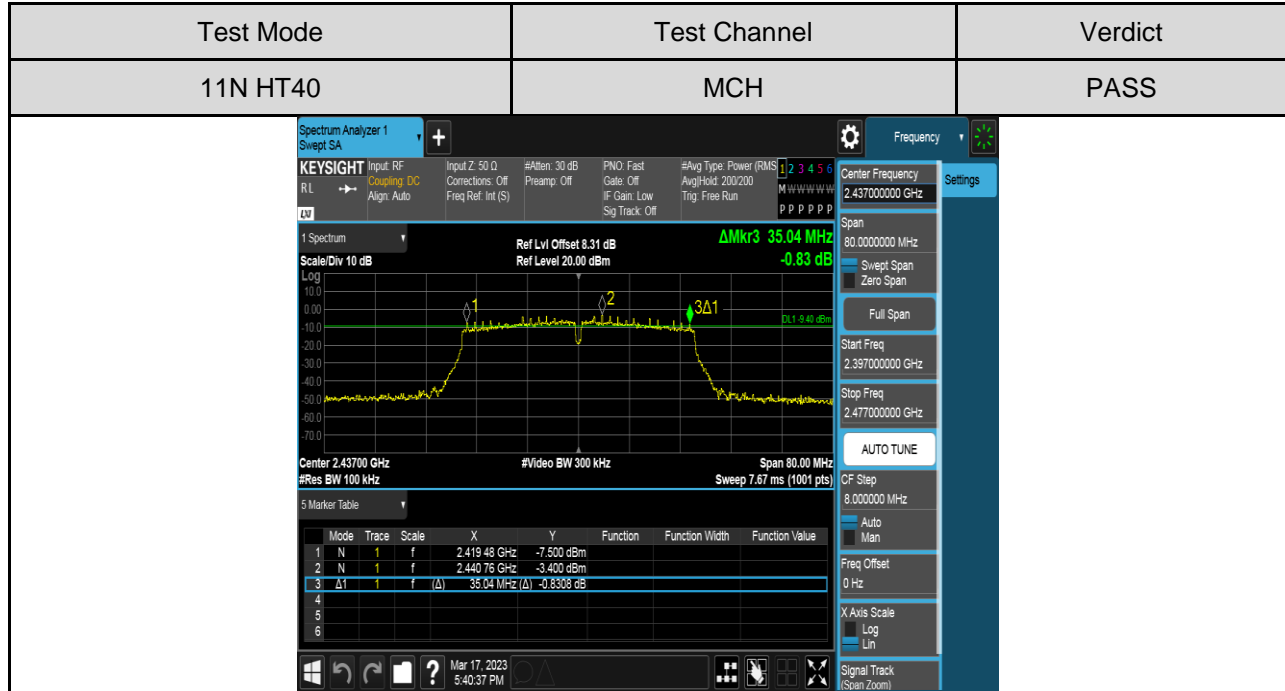


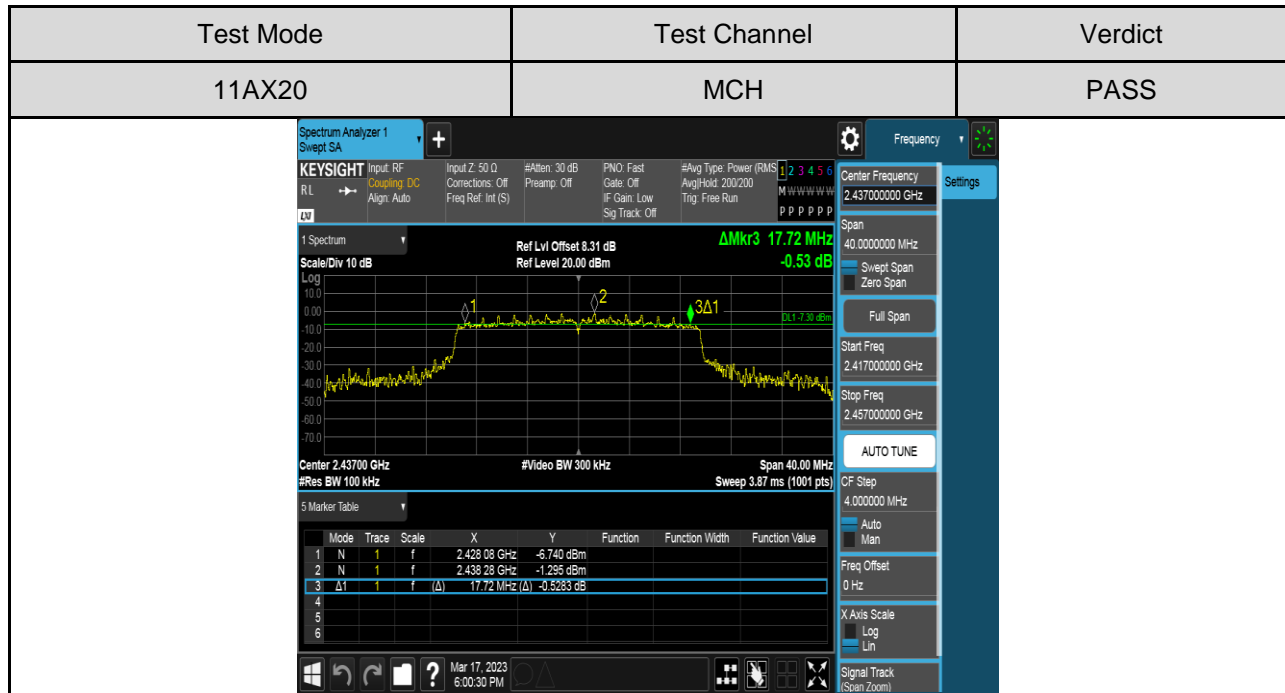
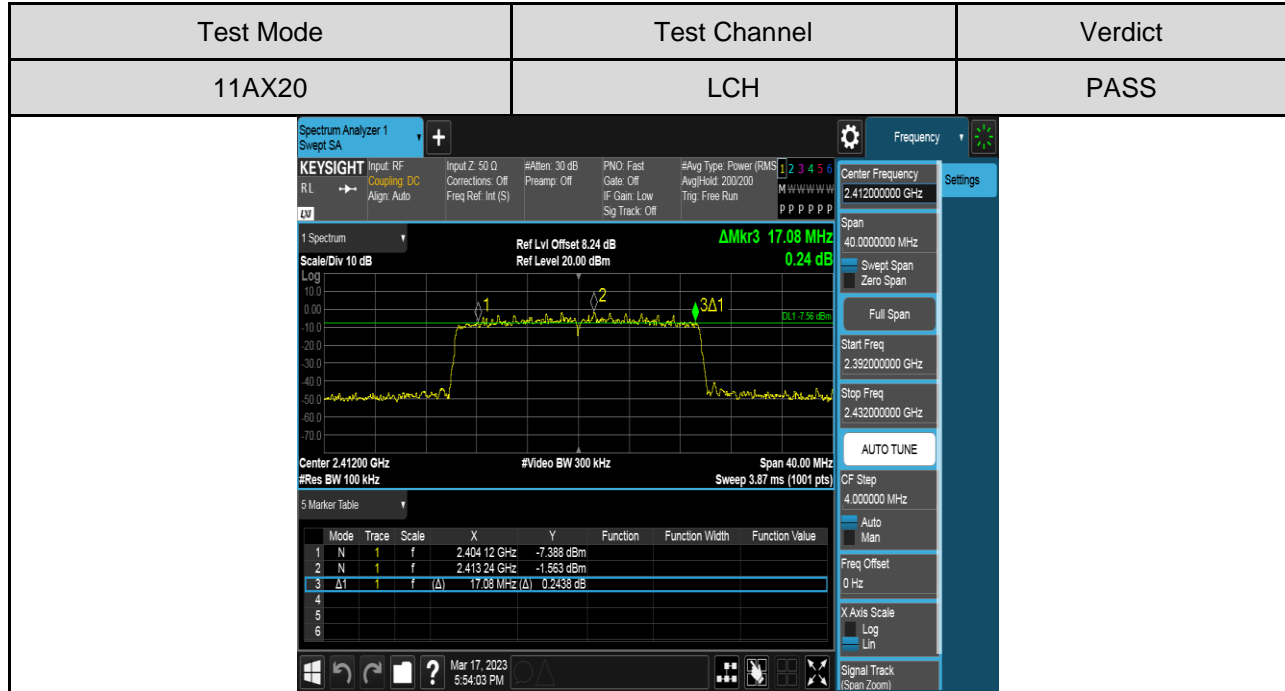
2) For 6dB Bandwidth Antenna 2 Part:

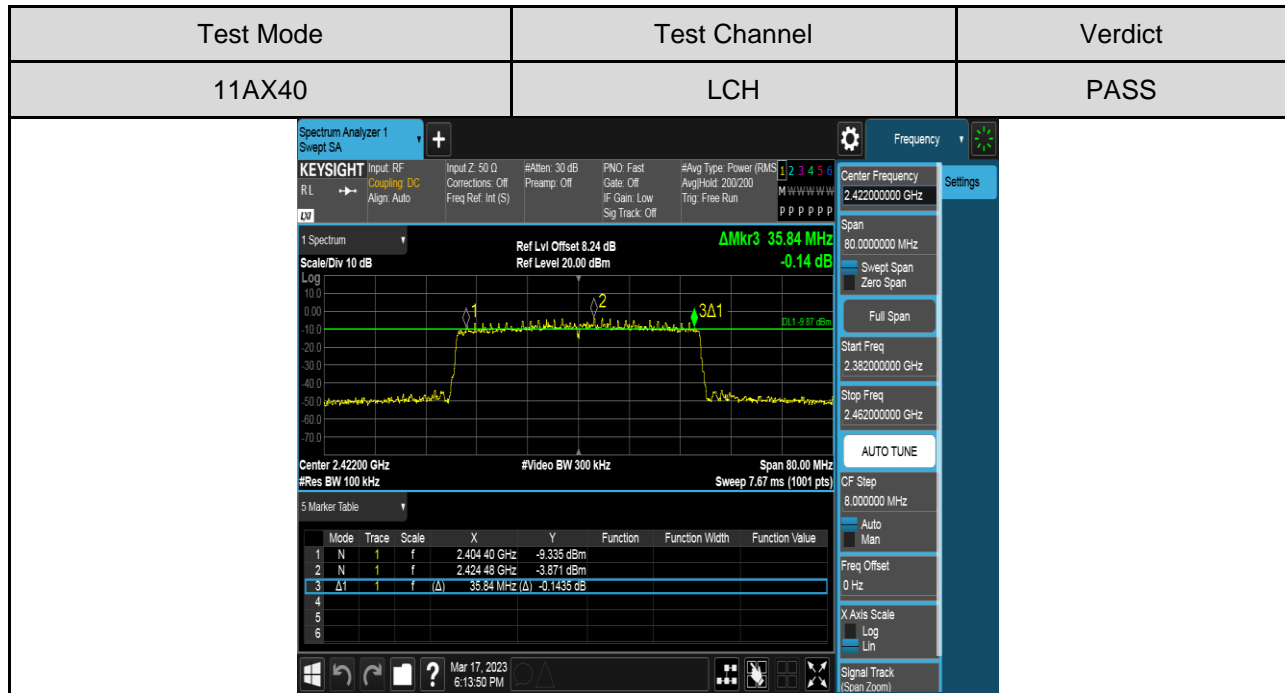
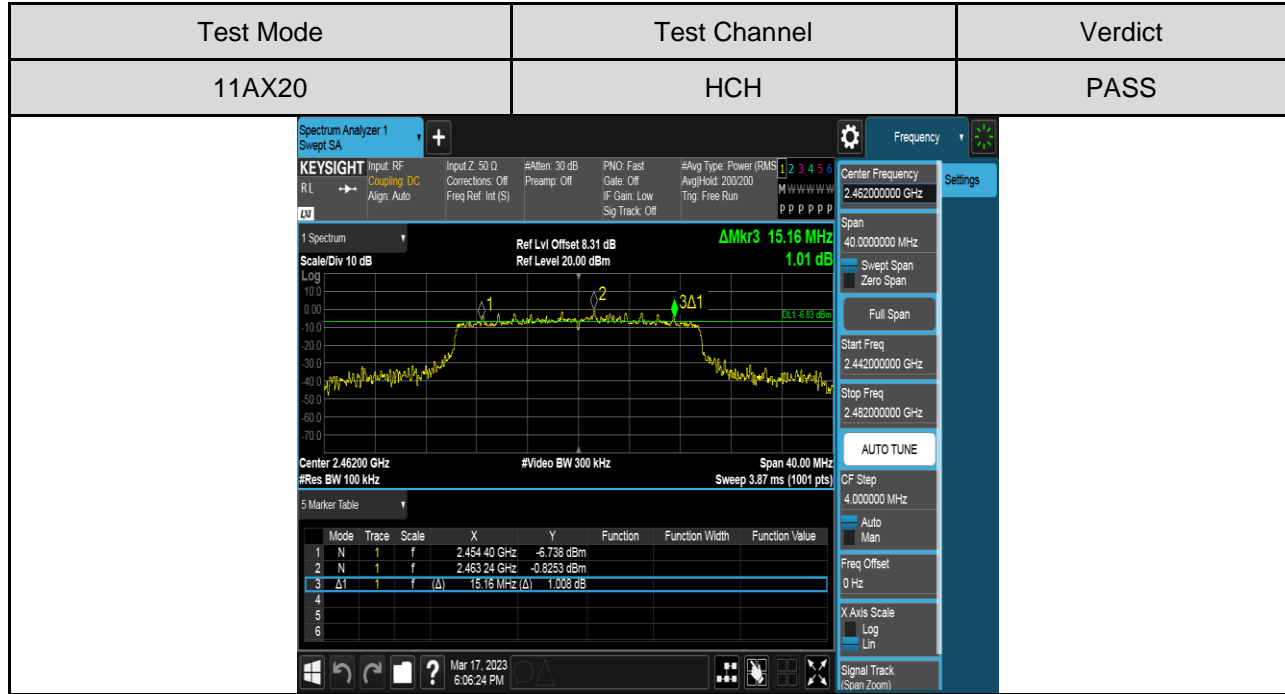


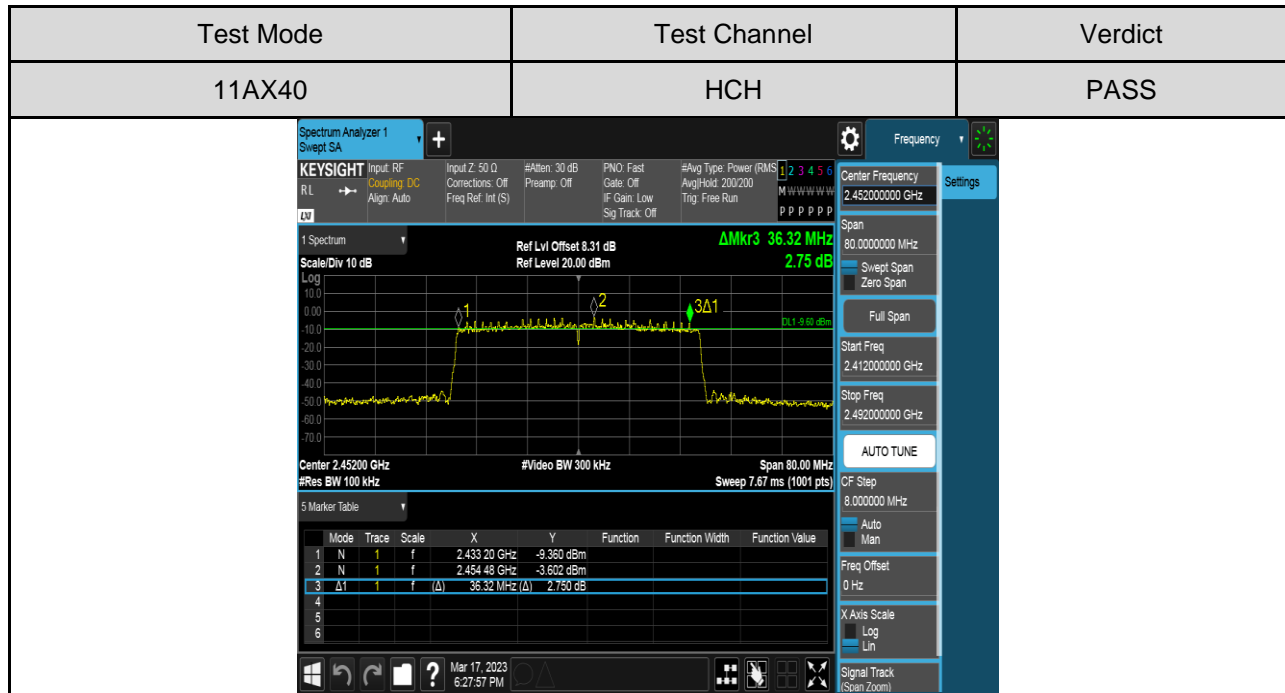
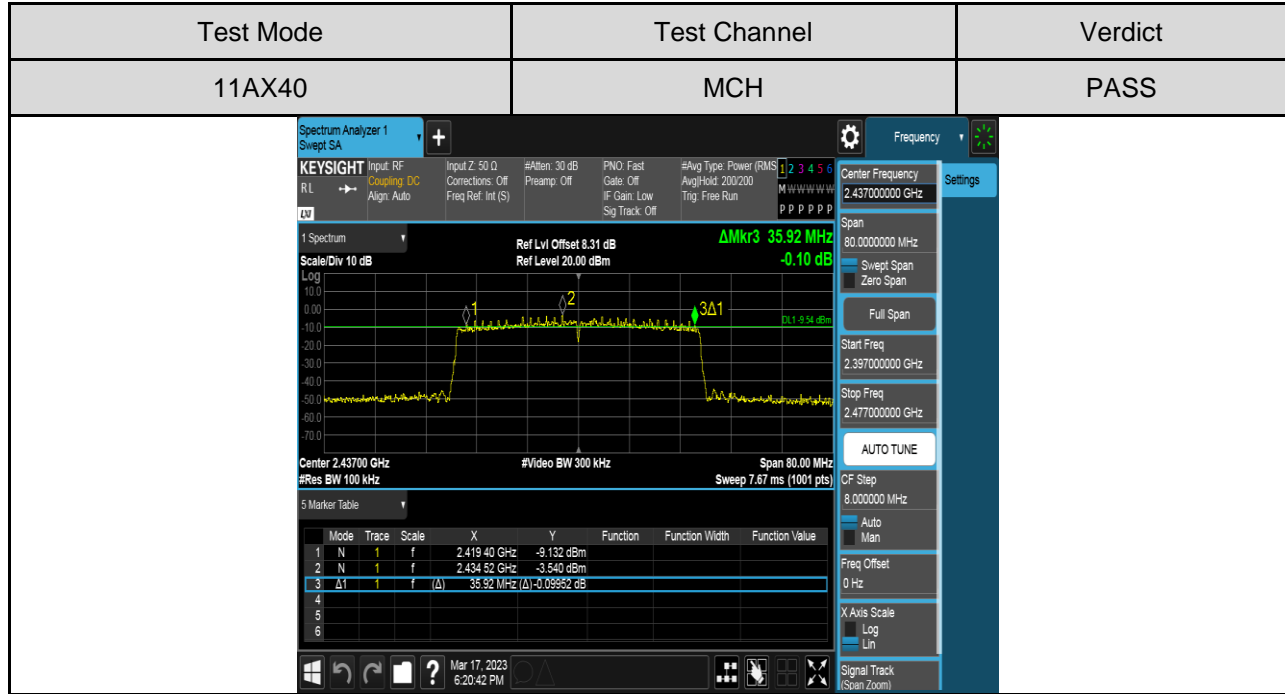




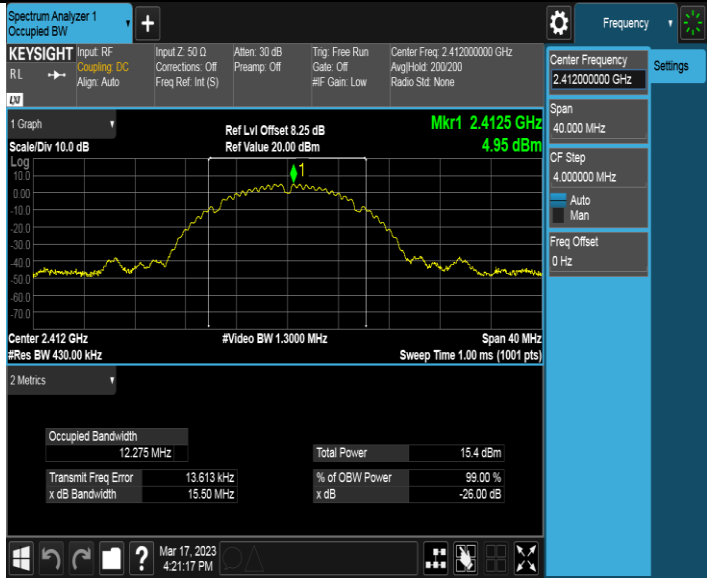








3) For 99% Bandwidth Antenna 1 Part:

Test Mode	Test Channel	Verdict
11B	LCH	PASS
		

Test Mode	Test Channel	Verdict
11B	MCH	PASS
		