

RF TEST REPORT



Report No.: JP_SL18040201-RIO-002 -WLAN

Supersede Report No.:

Applicant	Resin.io
Product Name	Raspberry Compute Module 3 Lite
Model No.	Balena Fin
Test Standard	Article 2 Section 1 No.19 Article 2 Section 1 No.19-3 Article 2 Section 1 No.19-3-2
Test Method	Notification No.88 of MIC, 2004 , Table No 43 Notification No.88 of MIC, 2004 , Table No 45
Date of test	05/09/201 to 06/22/2018
Issue Date	06/22/2018
Test Result	Pass Fail
Equipment complied with the specification <input checked="" type="checkbox"/>	
Equipment did not comply with the specification <input type="checkbox"/>	
 	
Benjamin Jing	Chen Ge
Test Engineer	Engineer Reviewer
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only	

Issued By:
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Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom

Hong Kong	OFTA (US002)	RF, Telecom
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CONTENTS

1 REPORT REVISION HISTORY	4
2 EXECUTIVE SUMMARY.....	5
3 CUSTOMER INFORMATION	5
4 TEST SITE INFORMATION	5
5 MODIFICATION.....	5
6 EUT INFORMATION	6
6.1 EUT Description.....	6
6.2 Radio Description.....	6
6.3 EUT test modes/configuration Description	8
6.4 EUT Photos.....	9
7 SUPPORTING EQUIPMENT/SOFTWARE AND CABLING DESCRIPTION.....	10
7.1 Supporting Equipment.....	10
7.2 Cabling Description	10
7.3 Test Software Description	10
8 TEST SUMMARY.....	11
9 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	12
9.1 Frequency.....	12
9.2 Occupied Bandwidth (99%).....	14
9.3 Spread Bandwidth (90%)	39
9.4 Spurious emission Intensity.....	47
9.5 Antenna Power	108
9.6 Secondary Spurious Emissions	135
9.7 Adjacent Channel Power	140
9.8 Transmitter Burst Length	158
9.9 Carrier Sense Function.....	160
9.10 Dynamic Frequency Selection (DFS)	162
ANNEX A. TEST INSTRUMENT.....	166
ANNEX B. SIEMIC ACCREDITATION	167

1 Report Revision History

Report No.	Report Version	Description	Issue Date
JP_SL18040201-RIO-002-WLAN	NONE	Original	06/22/2018

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Resin.io
Product: Raspberry Compute Module 3 Lite
Model: Balena Fin

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Resin.io .
Applicant Address	7 Winkley Street, London E2 6PY, UK
Manufacturer Name	Resin.io.
Manufacturer Address	7 Winkley Street, London E2 6PY, UK

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	Raspberry Compute Module 3 Lite
Model No.	Balena Fin
Trade Name	Resin.in
Serial No.	N/A
Host Model No.	N/A
Input Power	100-240VAC 50/60Hz
Power Adapter Manu/Model	VEL36US120-US-JA
Power Adapter SN	E317867
Date of EUT received	04/15/2018
Equipment Class/ Category	Wideband transmit system
Port/Connectors	1 X RJ45, 2 X USB, 1 X mini USB, 1 X HDMI

6.2 Radio Description

Radio Type	802.11b	802.11g	802.11a	802.11n-HT20	802.11n-HT40	802.11ac
Operating Frequency	2412-2472MHz	2412-2472MHz	5180-5320MHz 5500-5720MHz	2412-2472MHz 5180-5320MHz 5500-5720MHz	2422-2452MHz 5190-5310MHz 5510-5710MHz	5210MHz, 5290MHz 5530MHz, 5690MHz,
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	5MHz	5MHz	20MHz	5MHz(2.4GHz), 20MHz (5GHz)	40MHz	80MHz
Number of Channels	13	13	15	13(2.4GHz) 15 (5GHz)	9(2.4GHz) 8(5GHz)	4
Antenna Type	Internal dipole array					
Antenna Gain (Peak)	2.4G: Highest Gain 6dBi 5G: Highest Gain 8dBi					
Antenna Connector Type	U.FL					
Note	N/A					

EUT Power level setting

W24:

Mode	Frequency (MHz)	Power setting
802.11-b	2412	12
802.11-b	2442	12
802.11-b	2472	12
802.11-g	2412	10
802.11-g	2442	10
802.11-g	2472	10
802.11-n-20	2412	10
802.11-n-20	2442	10
802.11-n-20	2472	10
802.11-n-40	2422	11
802.11-n-40	2442	11
802.11-n-40	2462	11

W52:

Mode	Frequency	Power Setting
802.11-a	5180	10
802.11-a	5200	10
802.11-a	5240	10
802.11-n-20	5180	10
802.11-n-20	5200	10
802.11-n-20	5240	11
802.11-n-40	5190	11
802.11-n-40	5230	11
802.11-ac-80	5210	11

W53:

Mode	Frequency	Power Setting
802.11-a	5260	11
802.11-a	5280	11
802.11-a	5320	11
802.11-n-20	5260	12
802.11-n-20	5280	12
802.11-n-20	5320	12
802.11-n-40	5270	12
802.11-n-40	5310	12
802.11-ac-80	5290	12

W56:

Mode	Frequency	Power Setting
802.11-a	5500	11
802.11-a	5580	13
802.11-a	5700	13
802.11-n-20	5500	14
802.11-n-20	5580	14
802.11-n-20	5700	14
802.11-n-40	5510	14
802.11-n-40	5590	14
802.11-n-40	5670	14
802.11-ac-80	5530	14
802.11-ac-80	5610	14

6.3 EUT test modes/configuration Description

802.11b/g/n-2.4GHz

Test Item	Operating mode	Tested antenna port	Test frequencies
Frequency	Carrier frequency mode	TX port	Low, Mid, High
Occupied Bandwidth (99%)	Cont-TX, 11b (1M), 11g(6M), 11n(MCS0)	TX port	Low, Mid, High
Spread spectrum Bandwidth (90%)	Cont-TX, 11b (1M), 11g(6M), 11n(MCS0)	TX port	Low, Mid, High
Spurious emission Intensity	Cont-TX, 11b (11M), 11g(54M), 11n(MCS8)	TX port	Low, Mid, High
Antenna Power	Cont-TX, 11b (11M), 11g(54M), 11n(MCS15)	TX port	Low, Mid, High
Secondary Radiated Emissions	RX mode	TX/RX port	Low, Mid, High
Carrier sense	Regular mode	TX portA	Mid

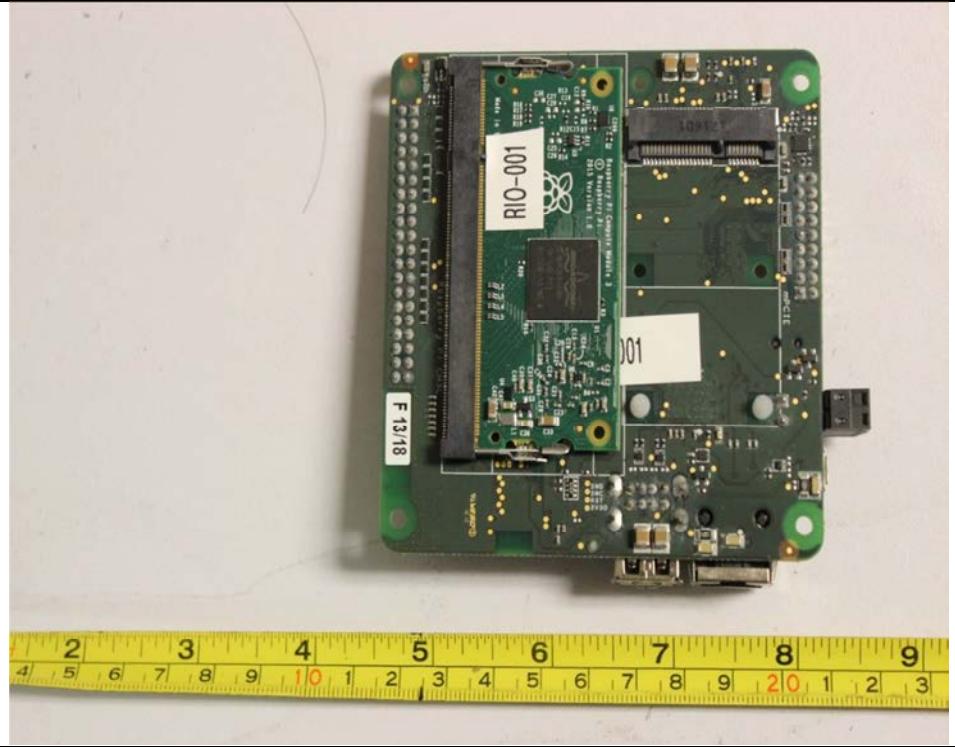
802.11a/n-5GHz

Test Item	Operating mode	Tested antenna port	Test frequencies
Frequency	Carrier frequency mode	TX port	Low, Mid, High
Occupied Bandwidth (99%)	Cont-TX, 11a (6M), 11n(MCS0)	TX port	Low, Mid, High
Spread spectrum Bandwidth (90%)	Cont-TX, 11a (6M), 11n(MCS0)	TX port	Low, Mid, High
Spurious emission Intensity	Cont-TX, 11a (54M), 11n(MCS8, MCS15)	TX port	Low, Mid, High
Antenna Power	Cont-TX, 11a (54M), 11n(MCS15)	TX port	Low, Mid, High
Secondary Radiated Emissions	RX mode	TX/RX port	Low, Mid, High
Carrier sense	Regular mode	TX port	Mid
Transmitter burst length	Cont-TX, 11a (6M), 11n(MCS8)	TX port	Mid
Adjacent Channel Power	Cont-TX, 11a (54M), 11n(MCS15)	TX port	Low, Mid, High

6.4 EUT Photos



Top View



Bottom View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Index	Supporting Equipment Description	Model	Serial No.	Manu	Note
1	Laptop	LATITUDE 3550	N/A	Dell	-
2	Router	WNR2000	N/A	Netgear	

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
Ethernet	RJ-45	EUT	RJ-45	Laptop	Ethernet 1 m	no	Unshielded

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Dut Labtool	Set the EUT to transmit continuously in different test mode

8 Test Summary

Article 2 paragraph 1 item (19)

Test Item	Test standard	Test Method/Procedure	Pass / Fail
Frequency	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Occupied Bandwidth (99%)	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Spread spectrum Bandwidth (90%)	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Spurious emission Intensity	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Antenna Power	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Secondary Spurious Emissions	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Adjacent Channel Power	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Out-Band Leakage Power	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Transmitter Burst Length	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Carrier Sensing	Article 2-1 Item 19-3	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Frequency	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Occupied Bandwidth (99%)	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Spread spectrum Bandwidth (90%)	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Spurious emission Intensity	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Antenna Power	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Secondary Spurious Emissions	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Adjacent Channel Power	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Out-Band Leakage Power	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Transmitter Burst Length	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Carrier Sensing	Article 2-1 Item 19-3-2	Notification No.88 of MIC, 2004 , Table No 45	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
Remark	NONE		

9 Measurements, examination and derived results

9.1 Frequency

Requirement(s):

Spec	Item	Requirement	Applicable
Article 2-1	19	Tolerance of frequency: $+/- 50 \times 10^{-6}$ or less	<input checked="" type="checkbox"/>
Article 2-1	19-3	Tolerance of frequency: $+/- 20 \times 10^{-6}$ or less	<input checked="" type="checkbox"/>
Article 2-1	19-3-2	Tolerance of frequency: $+/- 20 \times 10^{-6}$ or less	<input checked="" type="checkbox"/>
Article 2-1	19-3-3	Tolerance of frequency: $+/- 20 \times 10^{-6}$ or less	<input type="checkbox"/>
Test Setup		 <p>Spectrum Analyzer</p>	
Test Procedure		<u>Frequency measurement procedure</u> <ul style="list-style-type: none"> - CW Tx - Allow the trace to stabilize. - Use the frequency counter to measure the Frequency. - Repeat above steps for different test channel 	
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature 22°C Relative Humidity 45% Atmospheric Pressure 1018mbar
Remark	NONE		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

Test Plot Yes N/A

Test was done by Benjamin Jing at RF Test Site.

Frequency measurement result per Article 2 paragraph 1 item (19)

Type	Frequency (MHz)	CH	Result (MHz)	Error (PPM)	Tolerance Limit (ppm)	Result
WLAN	2412	Low	2411.997	-0.83	≤50	Pass
	2442	Mid	2441.988	-5.32	≤50	Pass
	2472	High	2471.987	-4.85	≤50	Pass

Frequency measurement result per Article 2 paragraph 1 item (19)-3

Type	Frequency (MHz)	CH	Result (MHz)	Error (PPM)	Tolerance Limit (ppm)	Result
WLAN	5180	Low	5179.996	-0.97	≤20	Pass
	5200	Mid	5199.993	-1.15	≤20	Pass
	5240	High	5239.991	-1.72	≤20	Pass
	5260	Low	5259.986	-2.66	≤20	Pass
	5280	Mid	5279.989	-2.08	≤20	Pass
	5320	High	5319.997	-0.56	≤20	Pass
	5190	Low	5189.997	-0.39	≤20	Pass
	5230	High	5229.988	-2.29	≤20	Pass
	5270	Low	5269.994	-1.14	≤20	Pass
	5310	High	5309.995	-0.75	≤20	Pass

Frequency measurement result per Article 2 paragraph 1 item (19)-3-2

Type	Frequency (MHz)	CH	Result (MHz)	Error (PPM)	Tolerance Limit (ppm)	Result
WLAN	5500	Low	5499.994	-1.27	≤20	Pass
	5580	Mid	5579.997	-0.54	≤20	Pass
	5700	High	5699.998	-0.53	≤20	Pass
	5510	Low	5509.994	-1.09	≤20	Pass
	5550	Mid	5549.989	-1.98	≤20	Pass
	5670	High	5669.987	-2.29	≤20	Pass

9.2 Occupied Bandwidth (99%)

Requirement(s):

Spec	Item	Requirement	Applicable
Article 2-1	19	FH	<input type="checkbox"/>
		FH + DS	<input type="checkbox"/>
		FH + OFDM	<input type="checkbox"/>
		OFDM	<input checked="" type="checkbox"/>
		Others	<input type="checkbox"/>
Article 2-1	19-3	OFDM	<input checked="" type="checkbox"/>
		OFDM	<input checked="" type="checkbox"/>
		OFDM	<input checked="" type="checkbox"/>
Article 2-1	19-3-2	OFDM	<input checked="" type="checkbox"/>
		OFDM	<input checked="" type="checkbox"/>
		OFDM	<input checked="" type="checkbox"/>
Article 2-1	19-3-3	OFDM	<input type="checkbox"/>
Test Setup	 Spectrum Analyzer —————— EUT		
Test Procedure	<u>Occupied bandwidth measurement procedure</u> <ul style="list-style-type: none"> - Modulation Tx - Allow the trace to stabilize. - Use the spectrum analyser built-in measurement function to determine the Frequency. - Capture the plot. - Repeat above steps for different test channel and other modulation type. 		
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature 23oC Relative Humidity 46% Atmospheric Pressure 1019mbar
Remark	NONE		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test was done by Benjamin Jing at RF Test Site.

Occupied Bandwidth (99%) measurement result per Article 2 paragraph 1 item (19)

W24:

Type	Frequency (MHz)	Test mode	CH	Result (MHz)	Limit (MHz)	Result
WLAN	2412	802.11b	Low	13.18	≤ 26	Pass
	2442		Mid	13.20	≤ 26	Pass
	2472		High	13.17	≤ 26	Pass
	2412	802.11g	Low	16.61	≤ 26	Pass
	2442		Mid	17.43	≤ 26	Pass
	2472		High	16.60	≤ 26	Pass
	2412	802.11n-HT20	Low	16.64	≤ 26	Pass
	2442		Mid	17.48	≤ 26	Pass
	2472		High	16.60	≤ 26	Pass
	2422	802.11n-HT40	Low	36.09	≤ 38	Pass
	2442		Mid	36.09	≤ 38	Pass
	2462		High	36.06	≤ 38	Pass

Occupied Bandwidth (99%) measurement result per Article 2 paragraph 1 item (19)-3

W52:

Type	Frequency (MHz)	Test mode	CH	Result (MHz)	Limit (MHz)	Result
WLAN	5180	802.11a	Low	17.71	≤ 19	Pass
	5200		Mid	17.70	≤ 19	Pass
	5240		High	17.74	≤ 19	Pass
	5180	802.11n-HT20	Low	17.67	≤ 19	Pass
	5200		Mid	17.69	≤ 19	Pass
	5240		High	17.76	≤ 19	Pass
	5190	802.11n-HT40	Low	35.92	≤ 38	Pass
	5230		High	36.13	≤ 38	Pass
	5210	802.11ac-VHT80	Low	75.99	≤ 78	Pass

W53:

Type	Frequency (MHz)	Test mode	CH	Result (MHz)	Limit (MHz)	Result
WLAN	5260	802.11a	Low	17.62	≤19	Pass
	5280		Mid	17.71	≤19	Pass
	5320		High	17.68	≤19	Pass
	5260	802.11n-HT20	Low	17.91	≤19	Pass
	5280		Mid	17.72	≤19	Pass
	5320		High	17.71	≤19	Pass
	5270	802.11n-HT40	Low	35.95	≤38	Pass
	5310		High	36.06	≤38	Pass
	5290	802.11ac-VHT80	Low	76.03	≤78	Pass

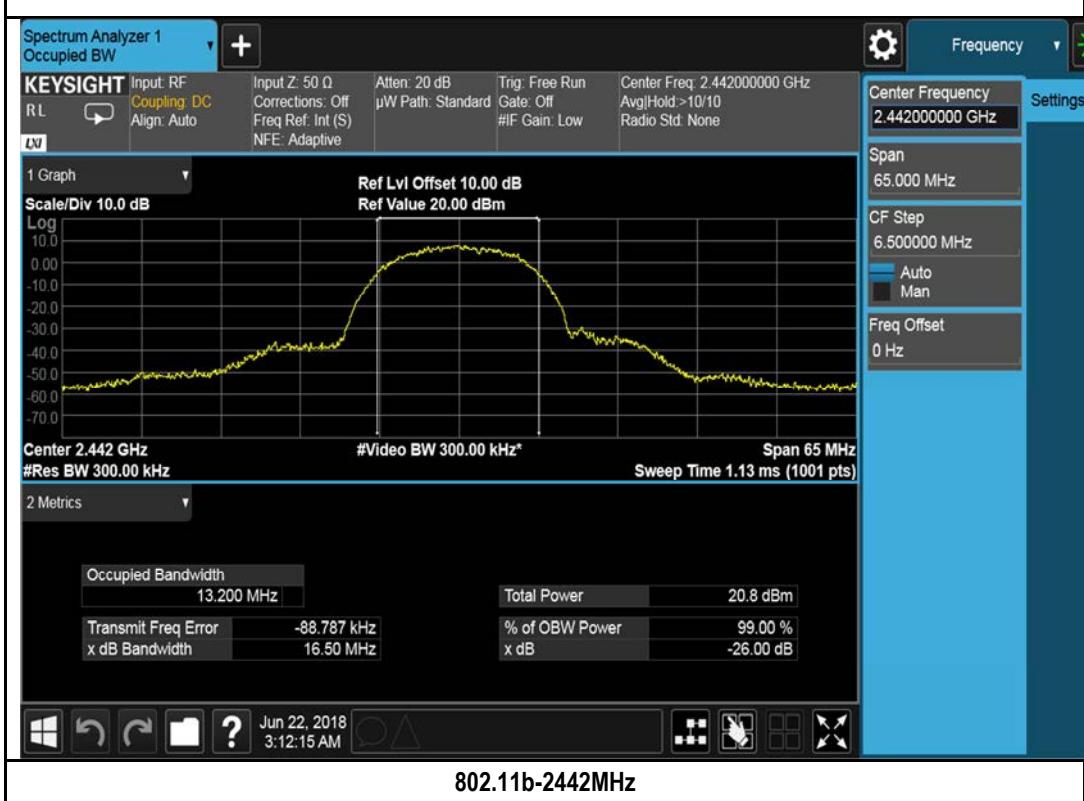
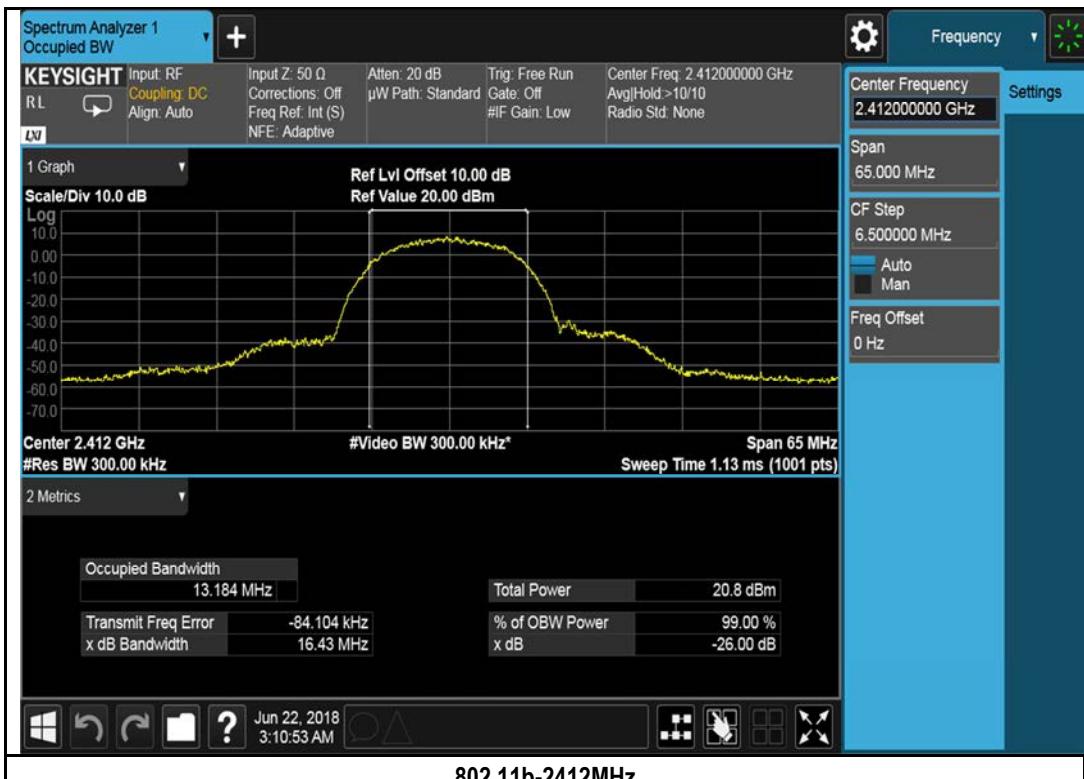
Occupied Bandwidth (99%) measurement result per Article 2 paragraph 1 item (19)-3-2

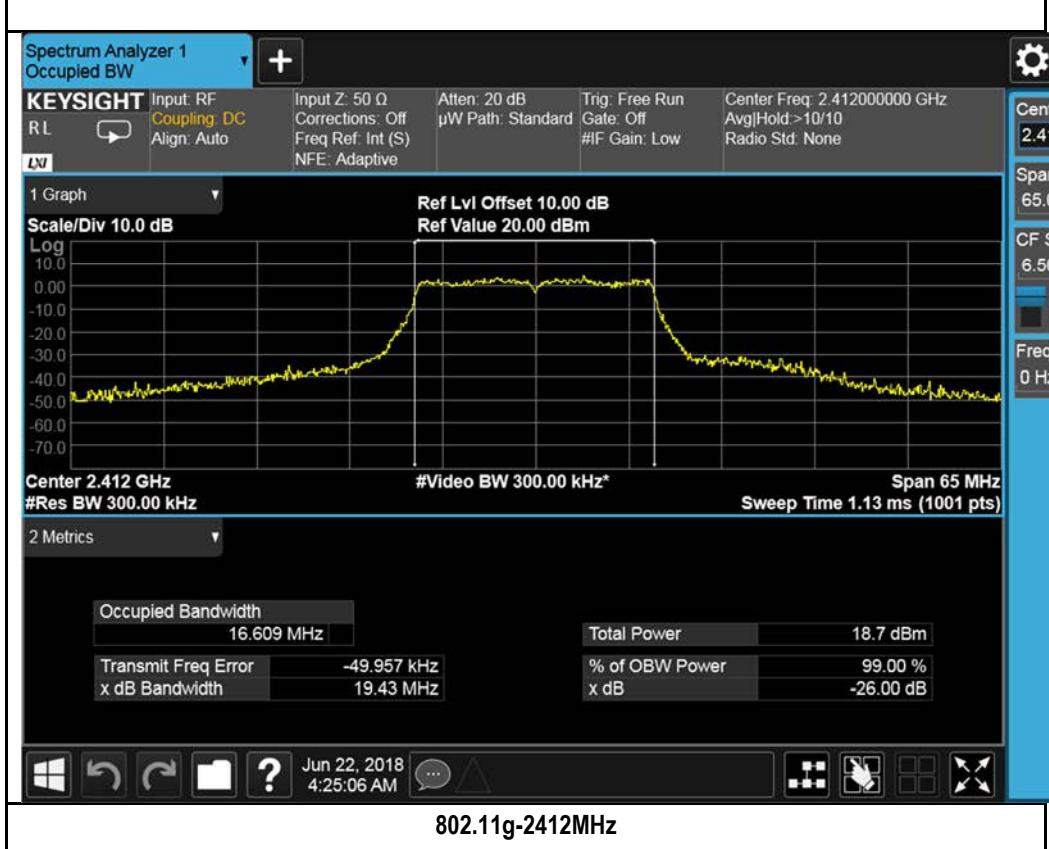
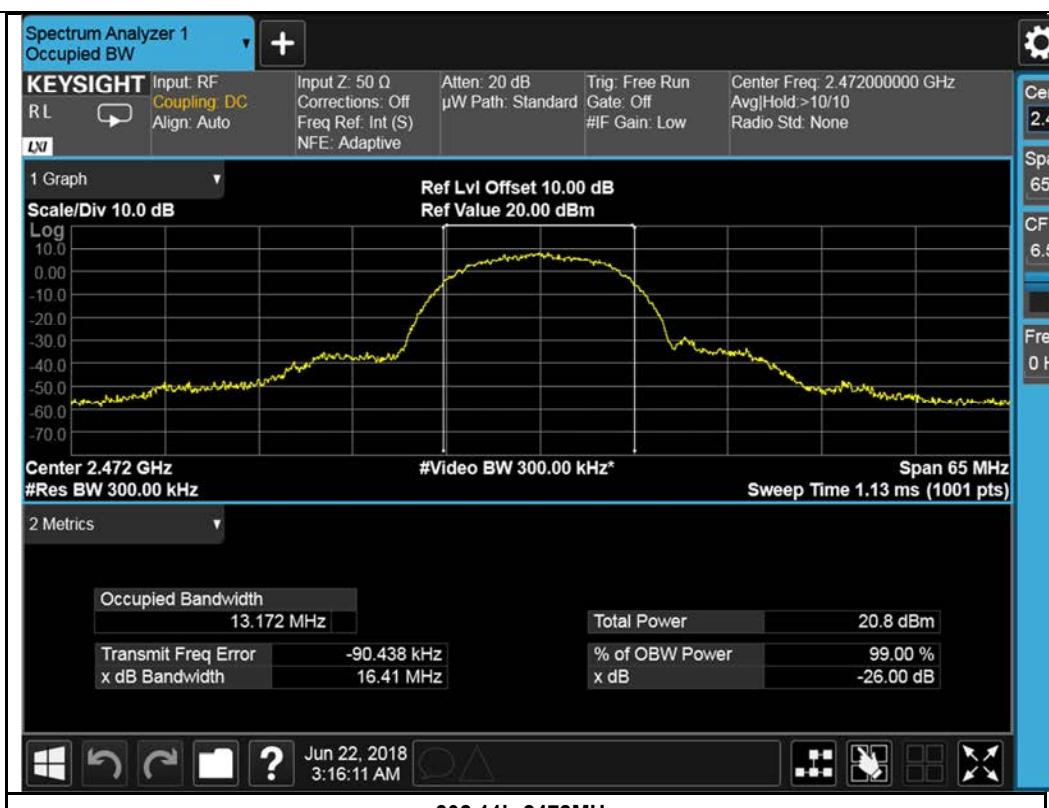
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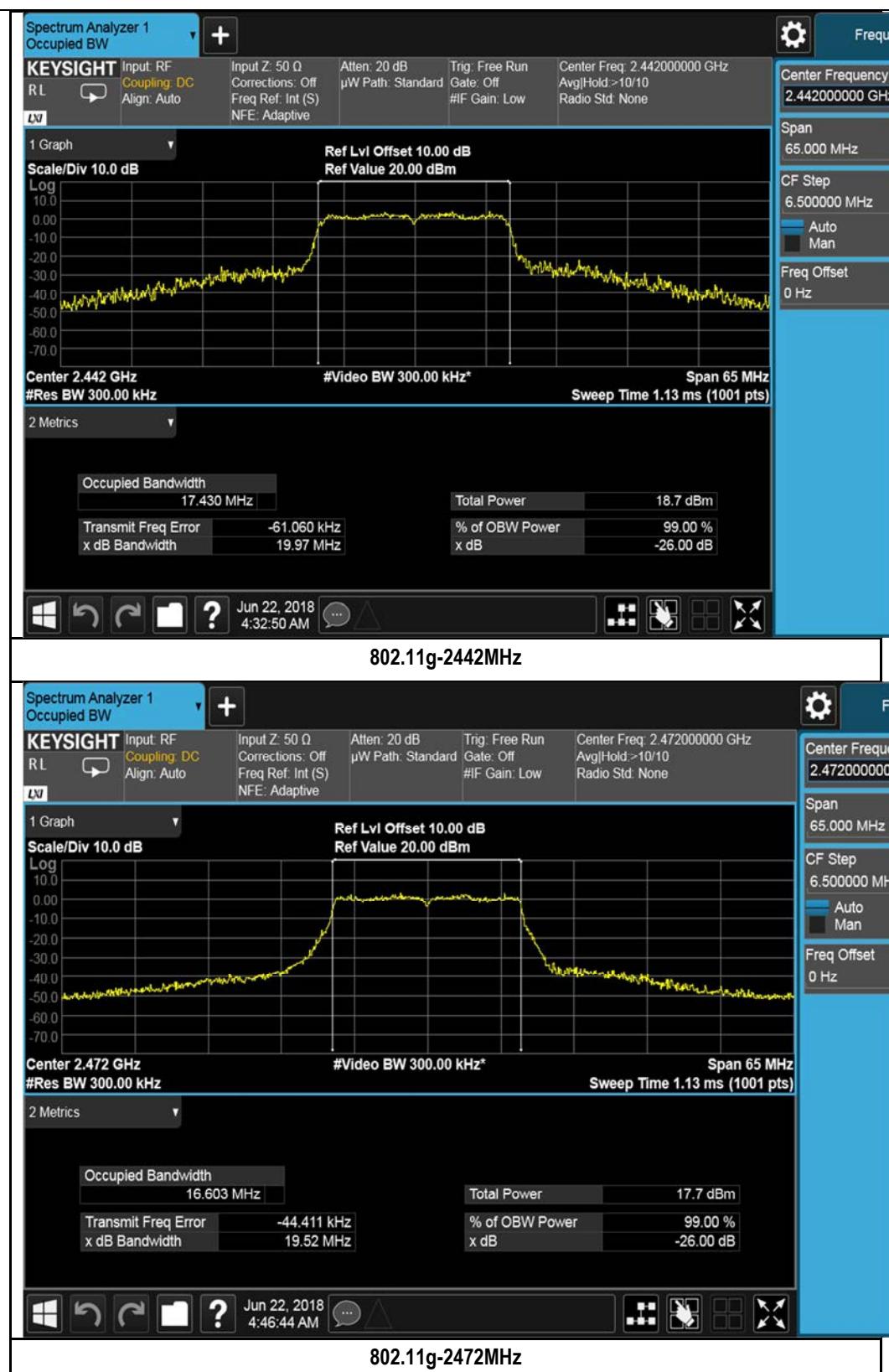
Type	Frequency (MHz)	Test mode	CH	Result (MHz)	Limit (MHz)	Result
WLAN	5500	802.11a	Low	17.59	≤19.7	Pass
	5600		Mid	17.59	≤19.7	Pass
	5700		High	17.68	≤19.7	Pass
	5500	802.11n-HT20	Low	17.65	≤19.7	Pass
	5600		Mid	17.63	≤19.7	Pass
	5700		High	17.69	≤19.7	Pass
	5510	802.11n-HT40	Low	36.02	≤38	Pass
	5550		Mid	36.20	≤38	Pass
	5670		High	36.14	≤38	Pass
	5530	802.11ac-VHT80	Low	75.99	≤78	Pass
	5610		High	76.00	≤78	Pass

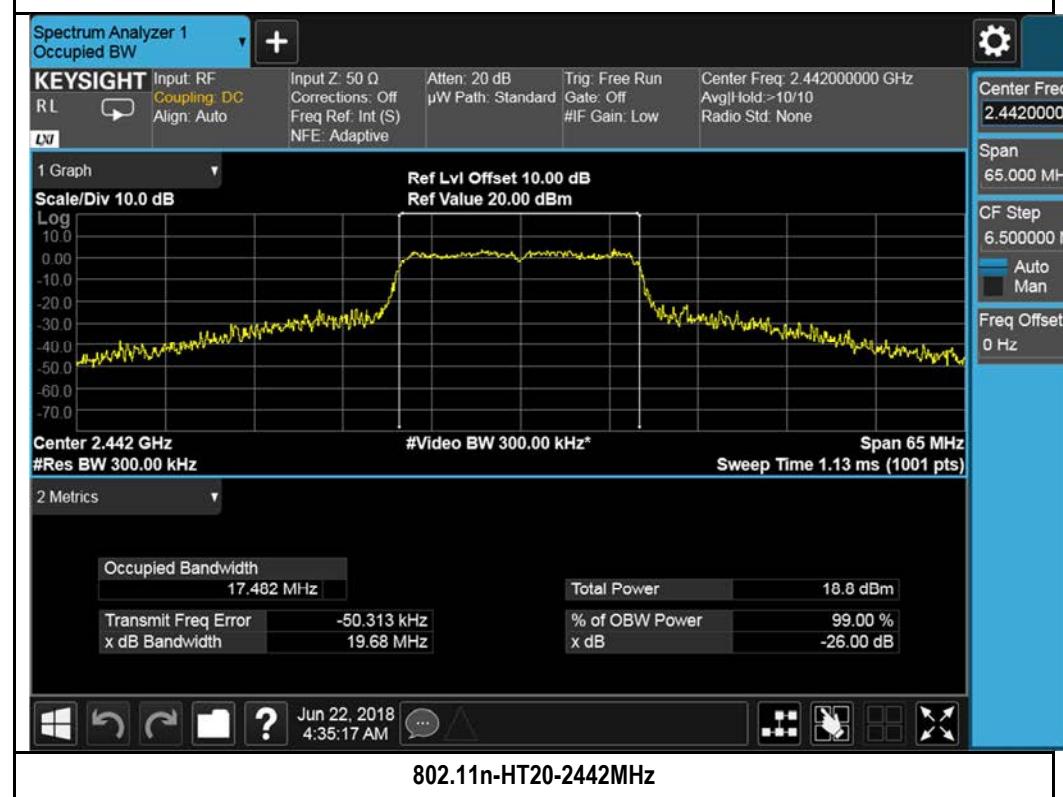
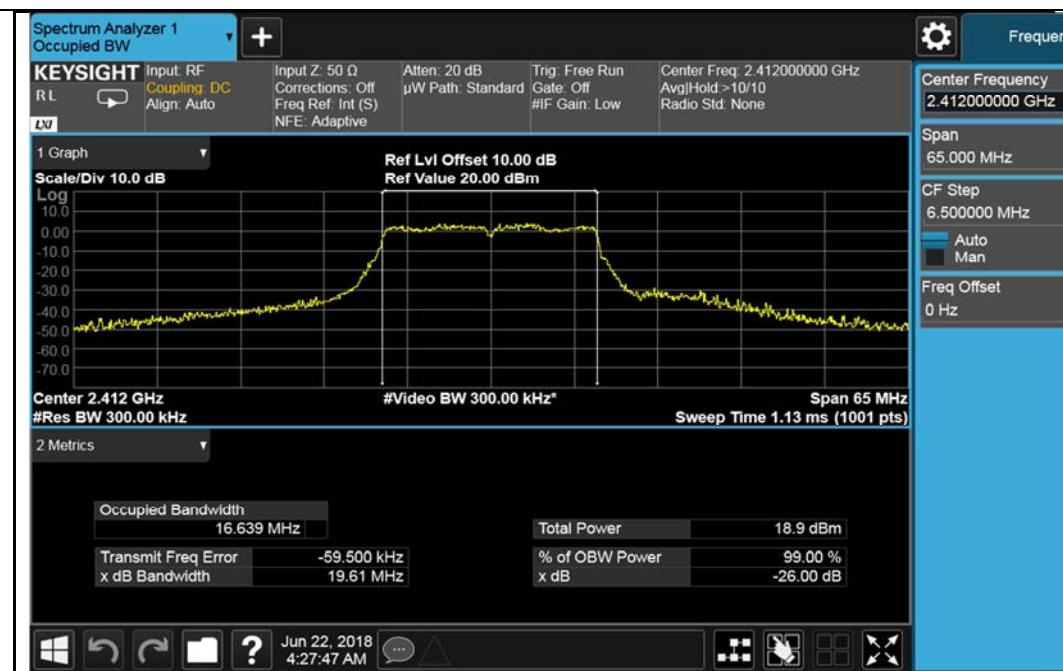
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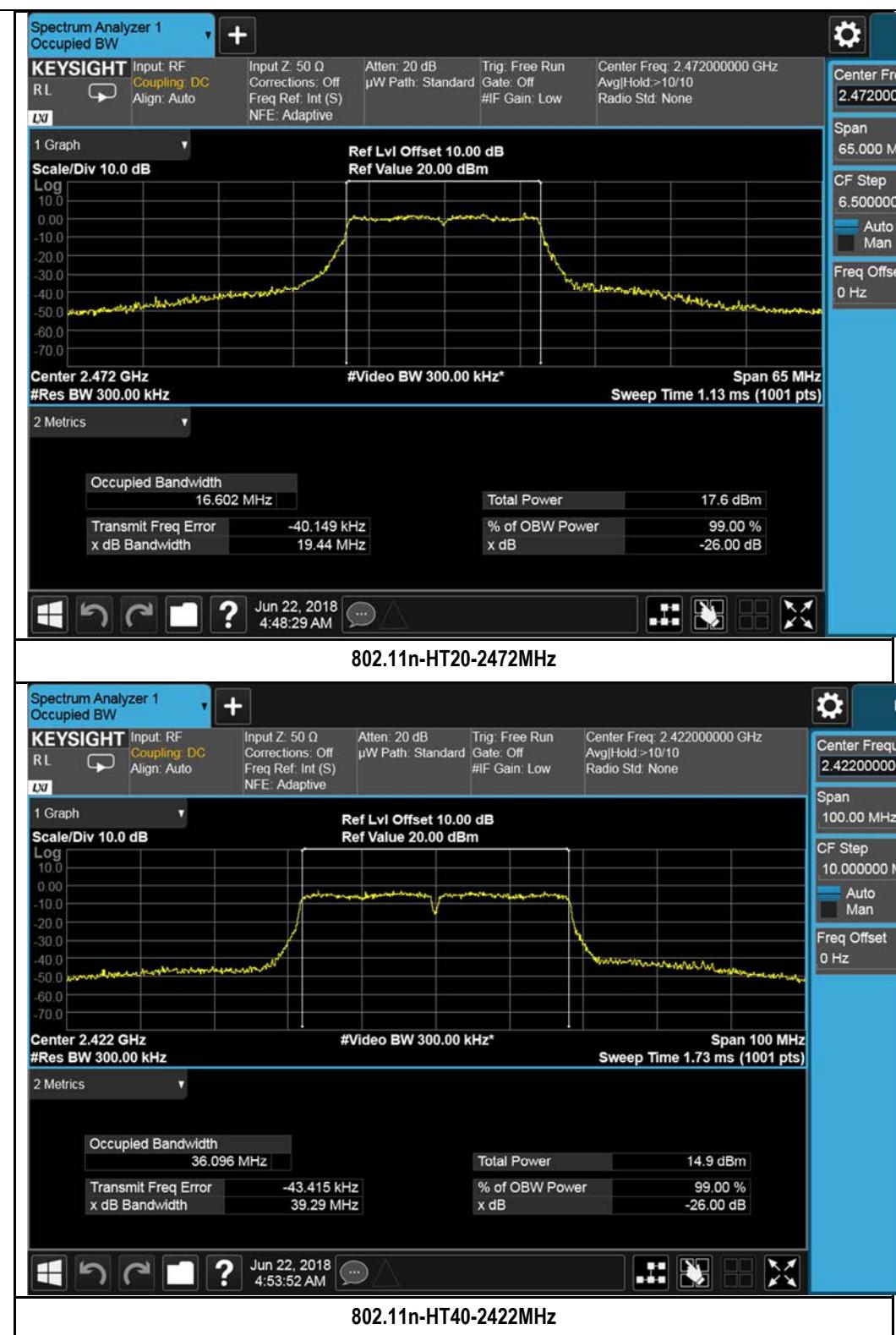
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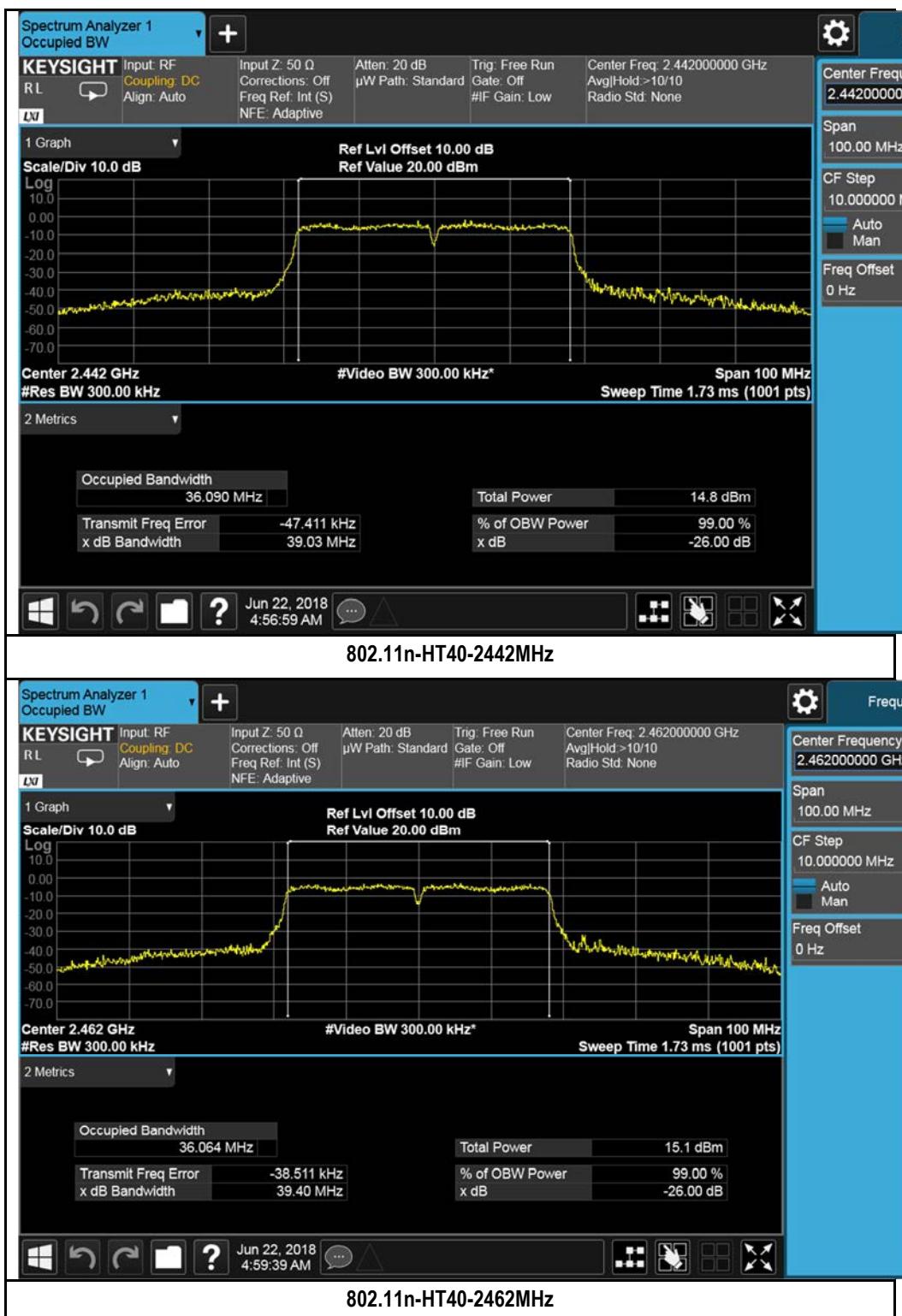




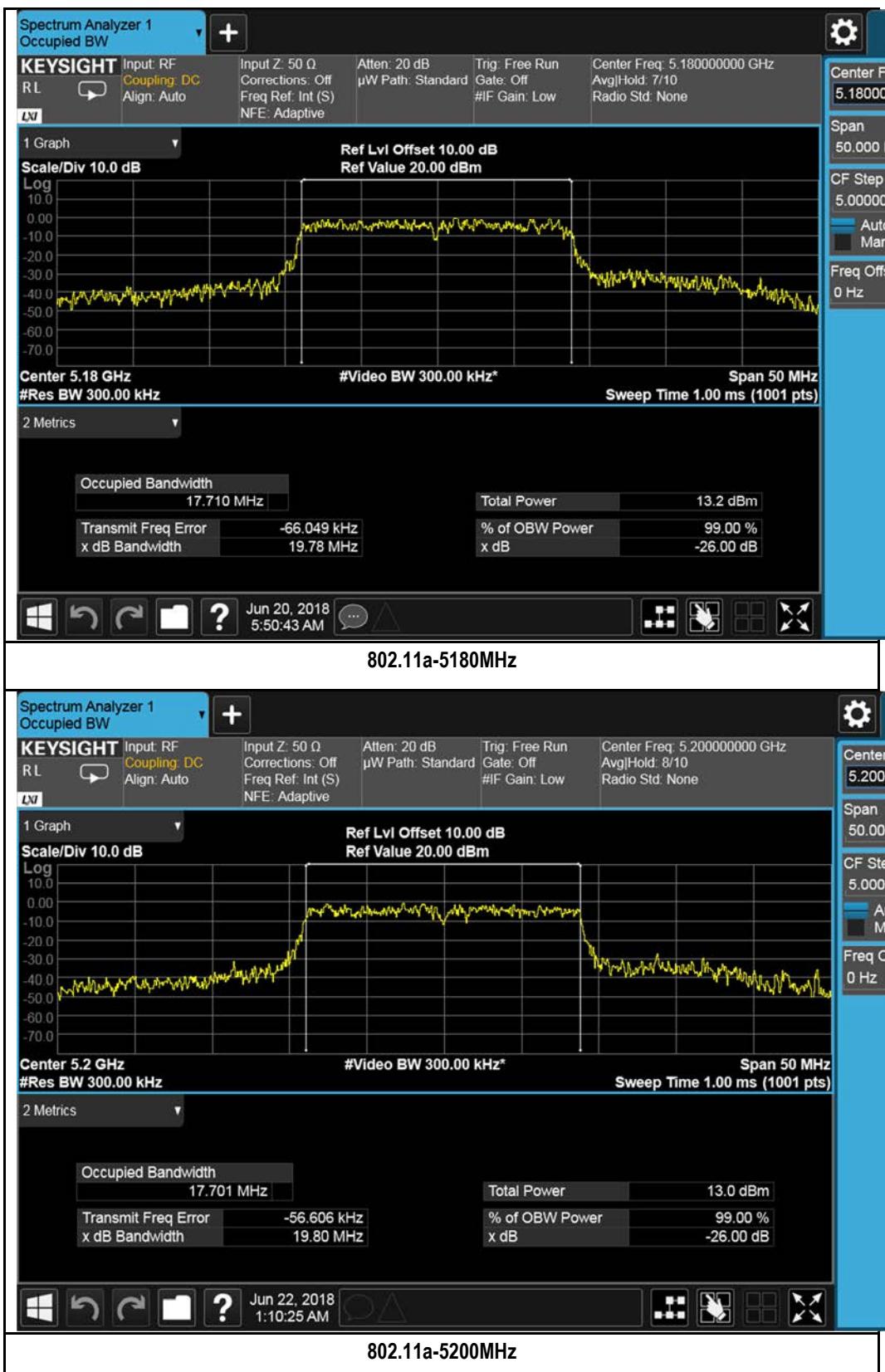


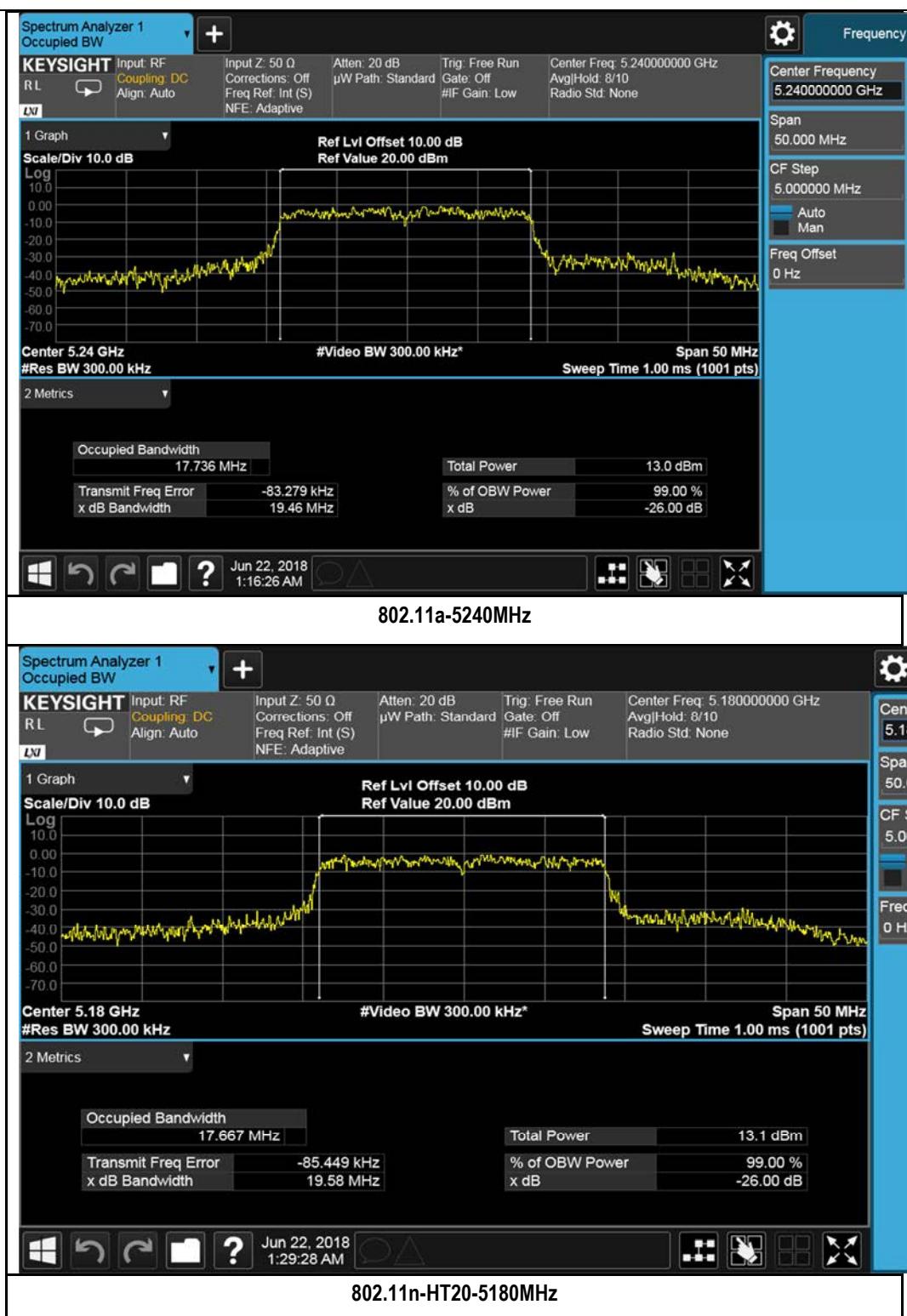


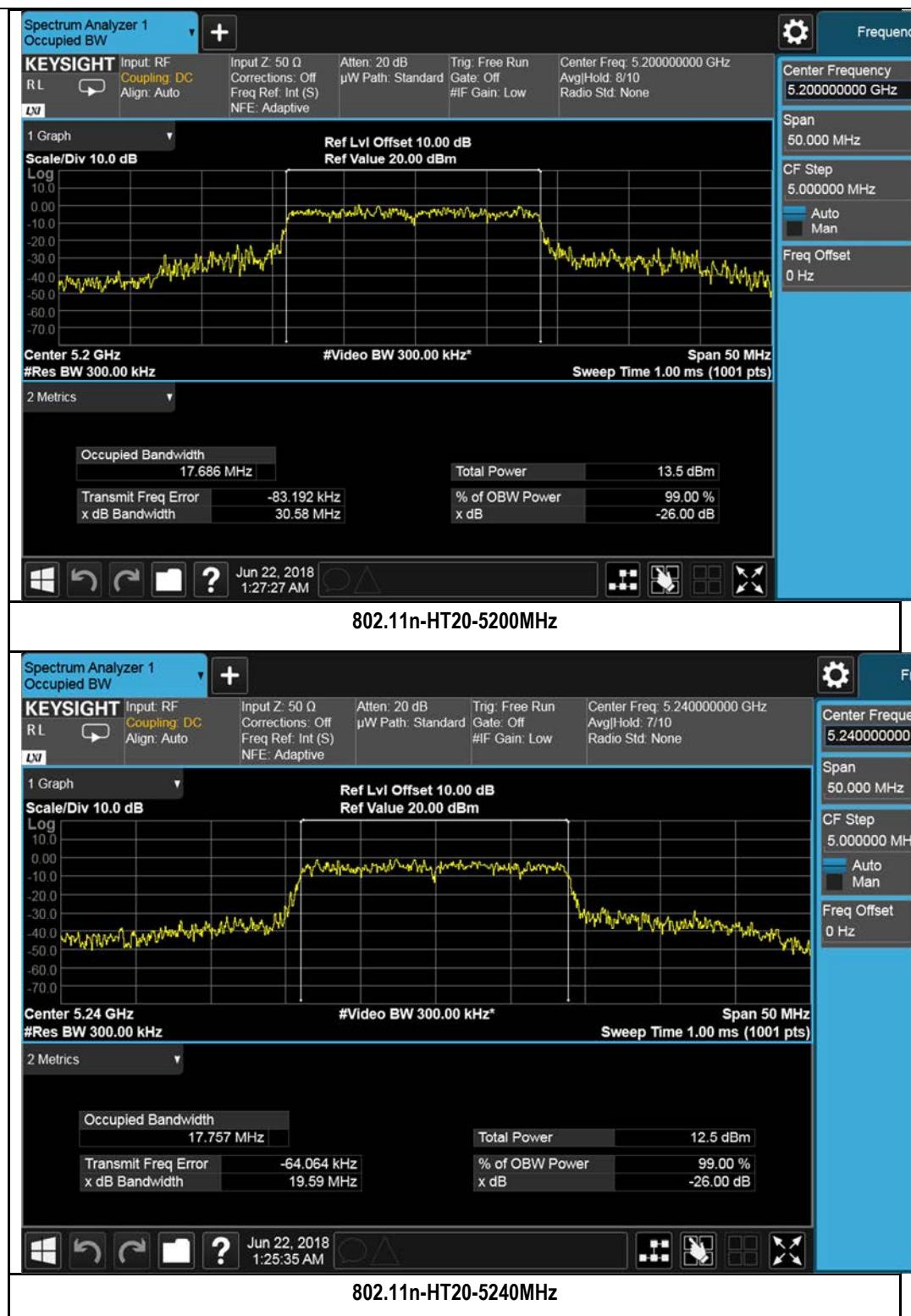




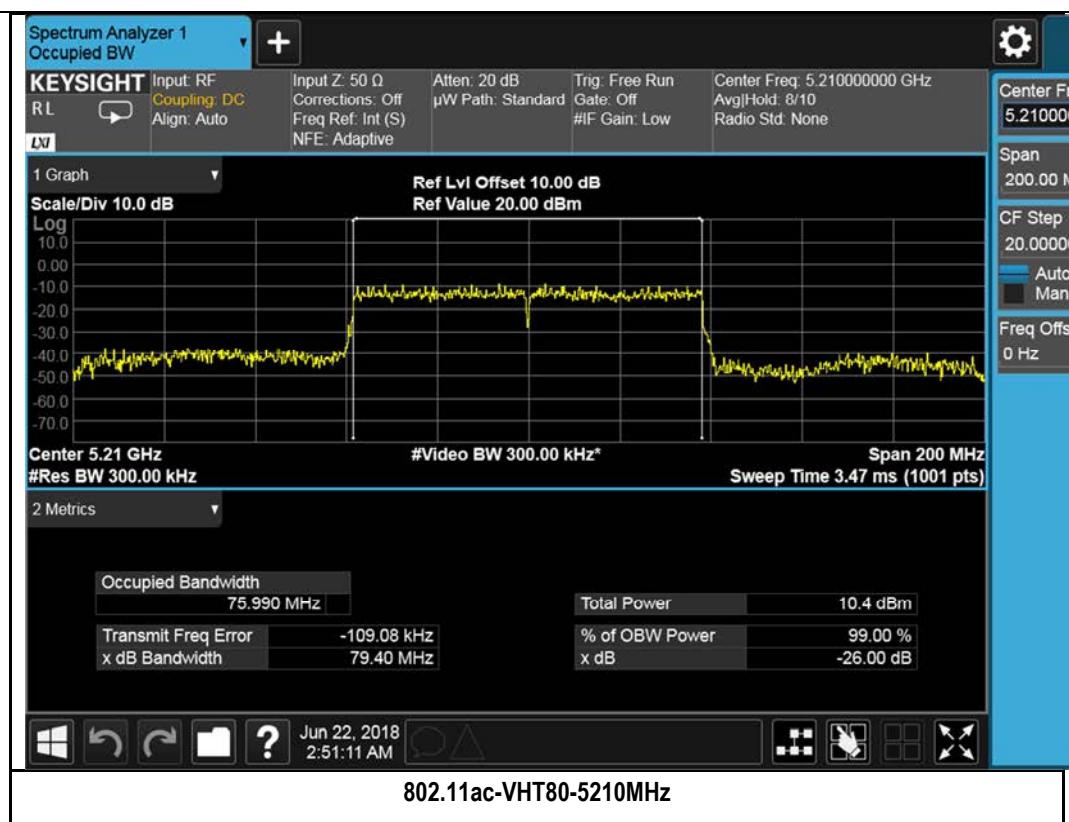
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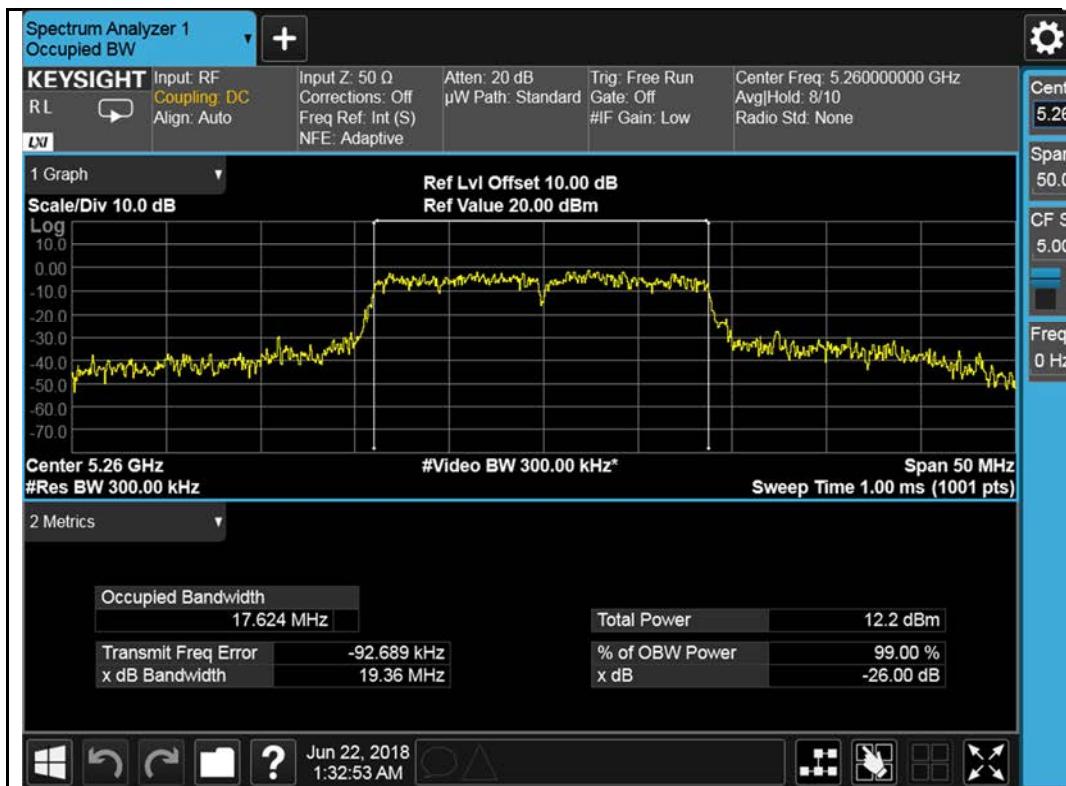








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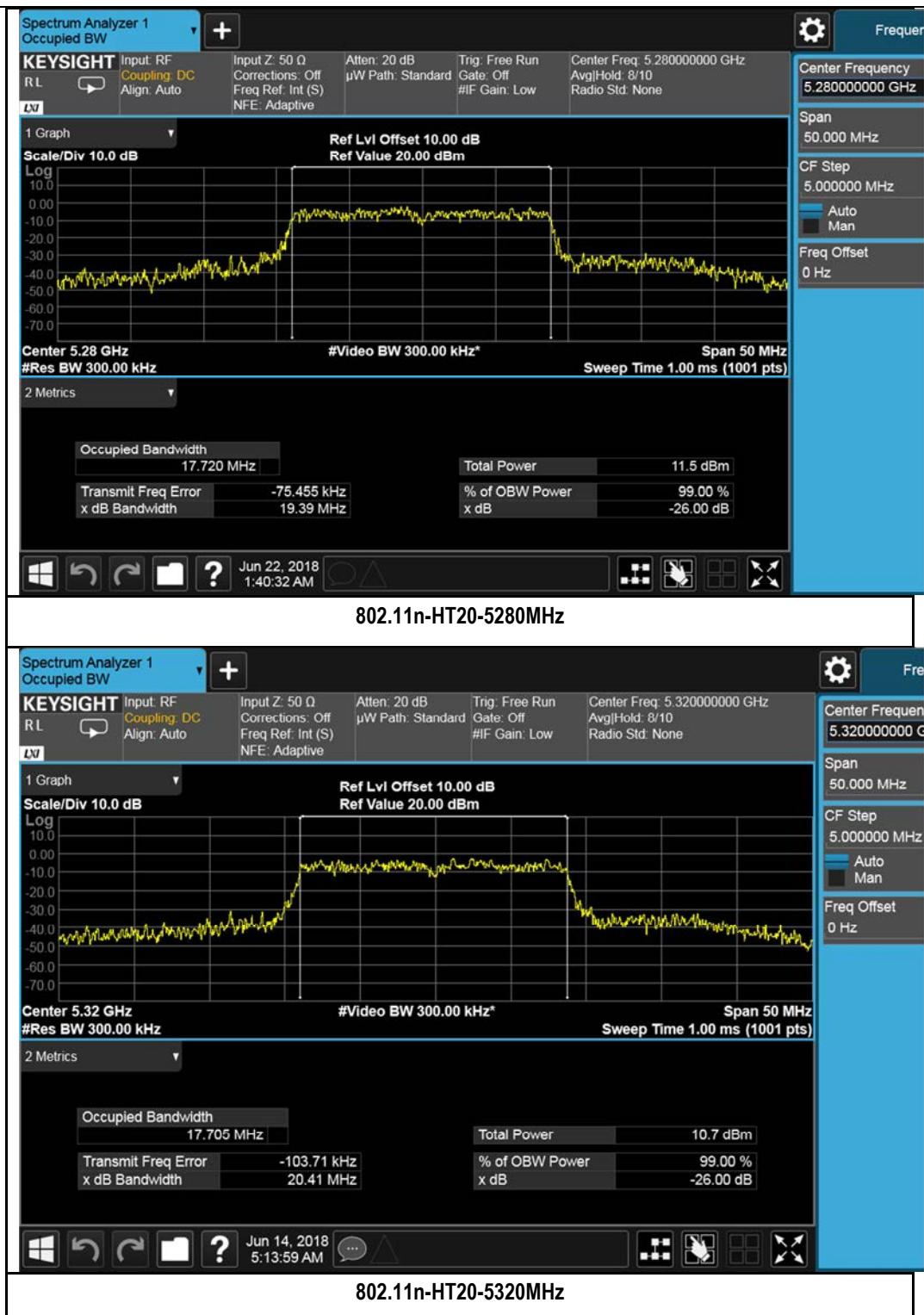


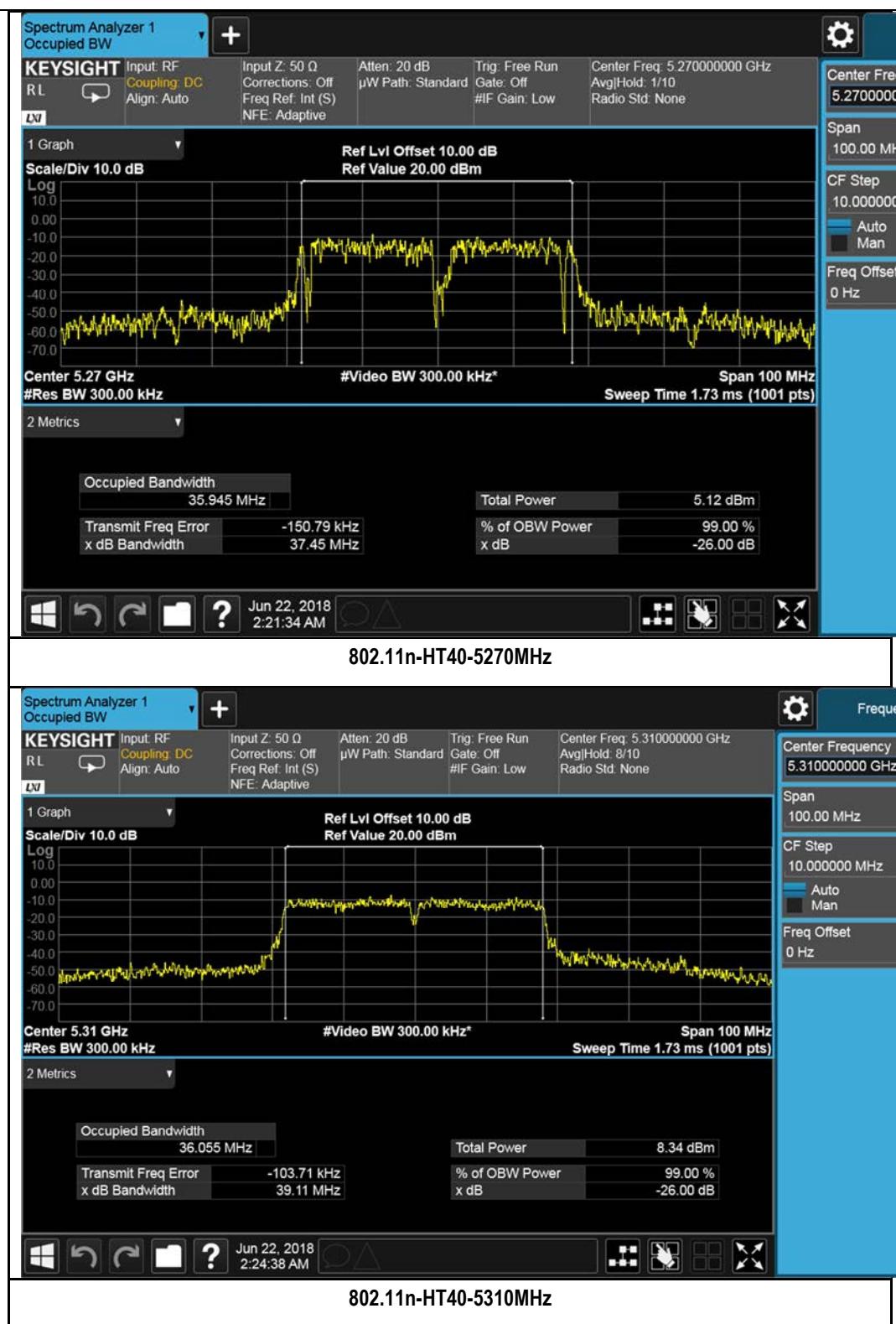
802.11a-5260MHz

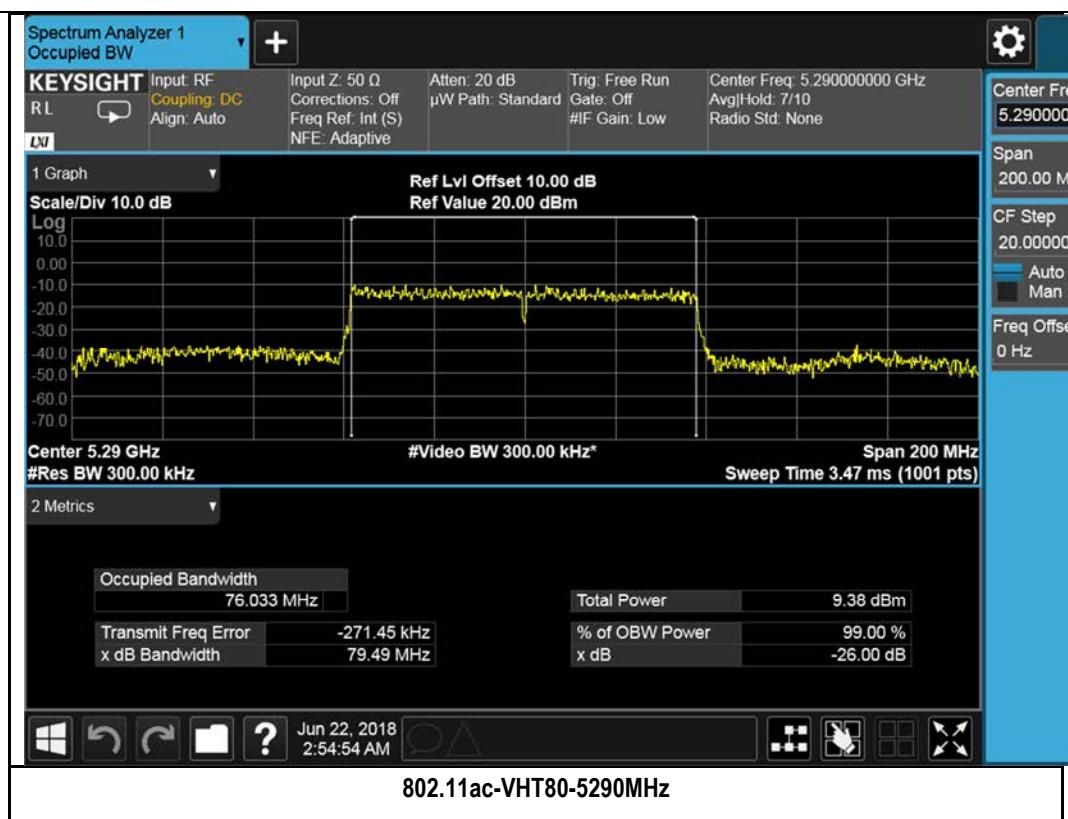


802.11a-5280MHz

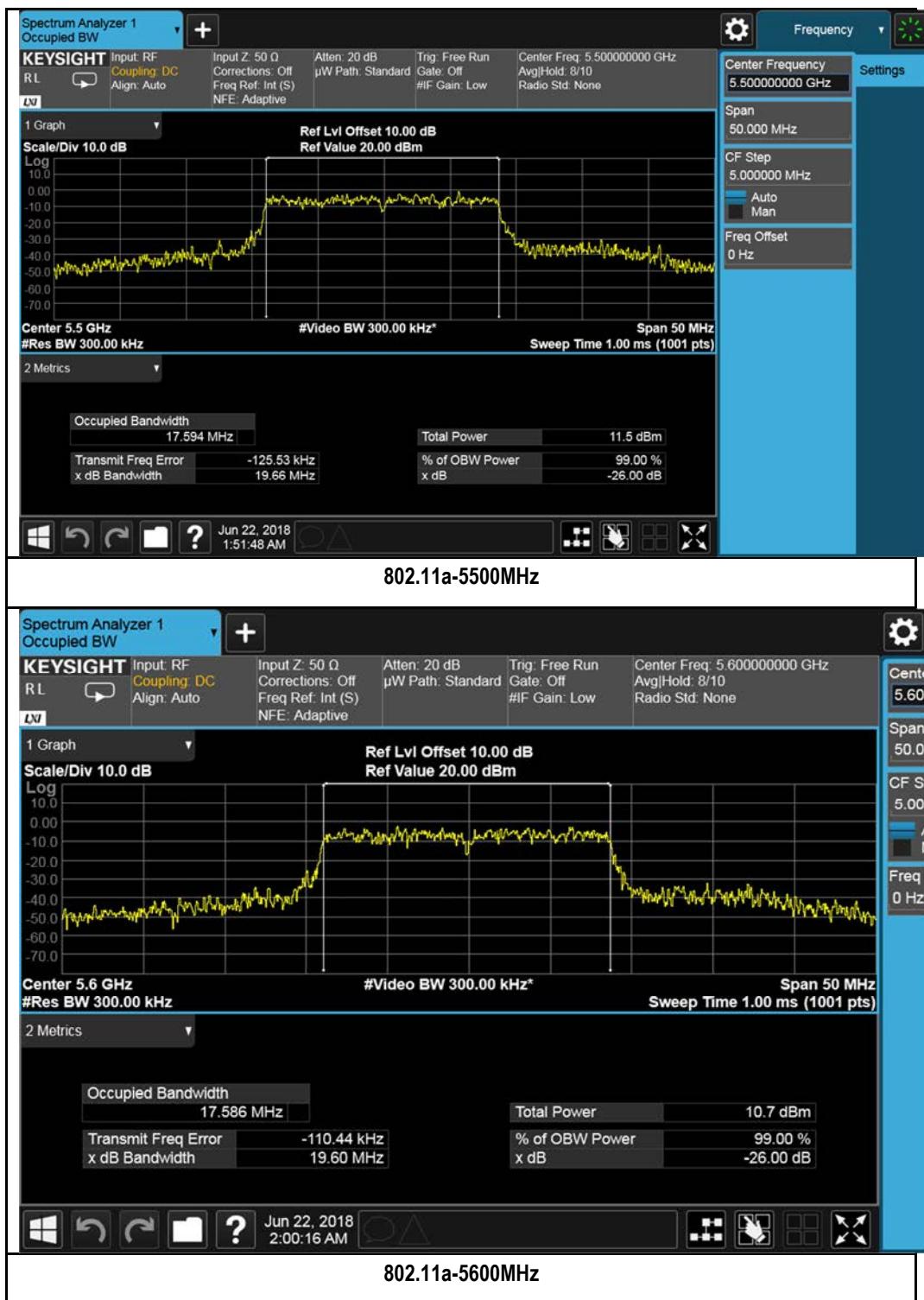


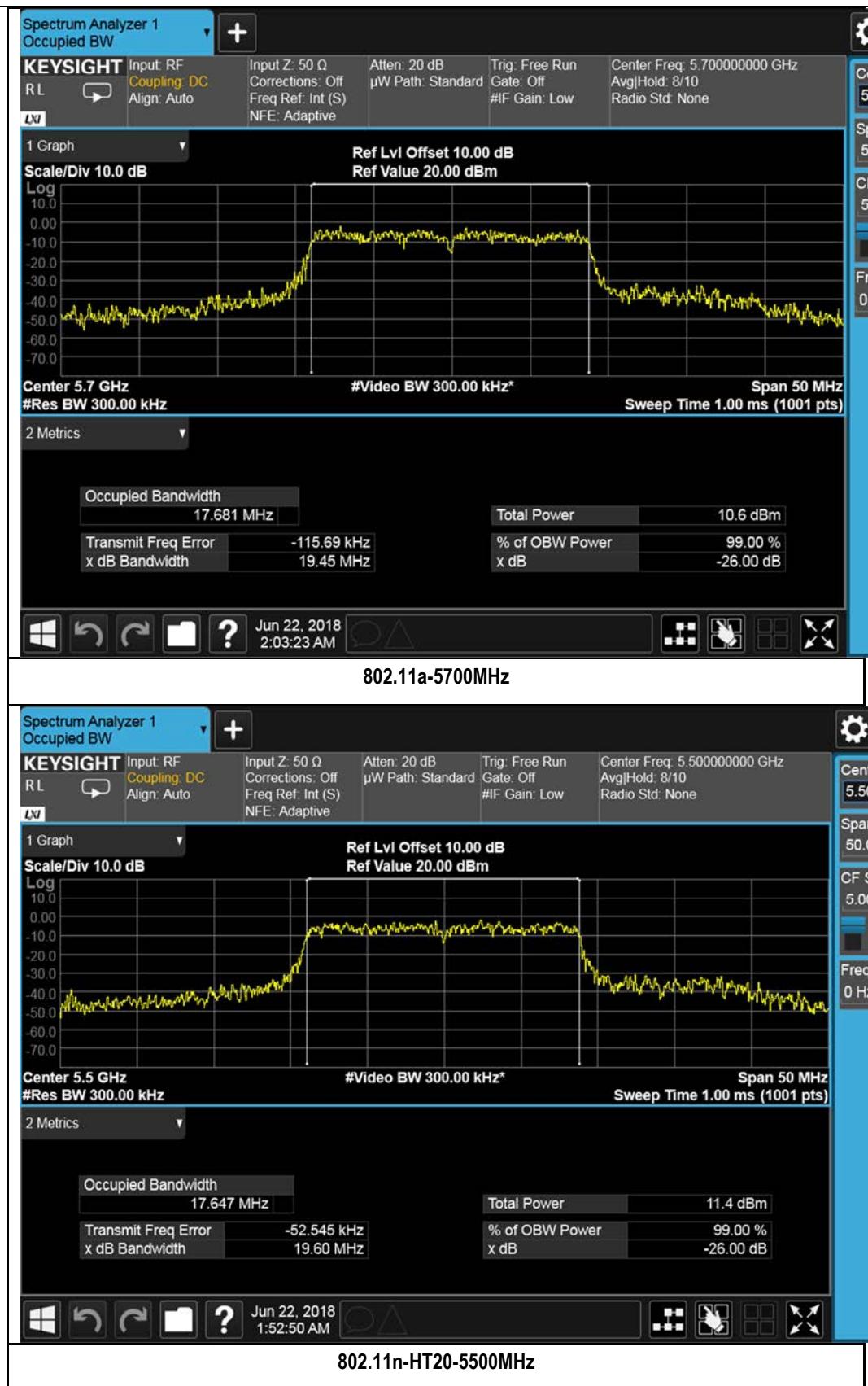


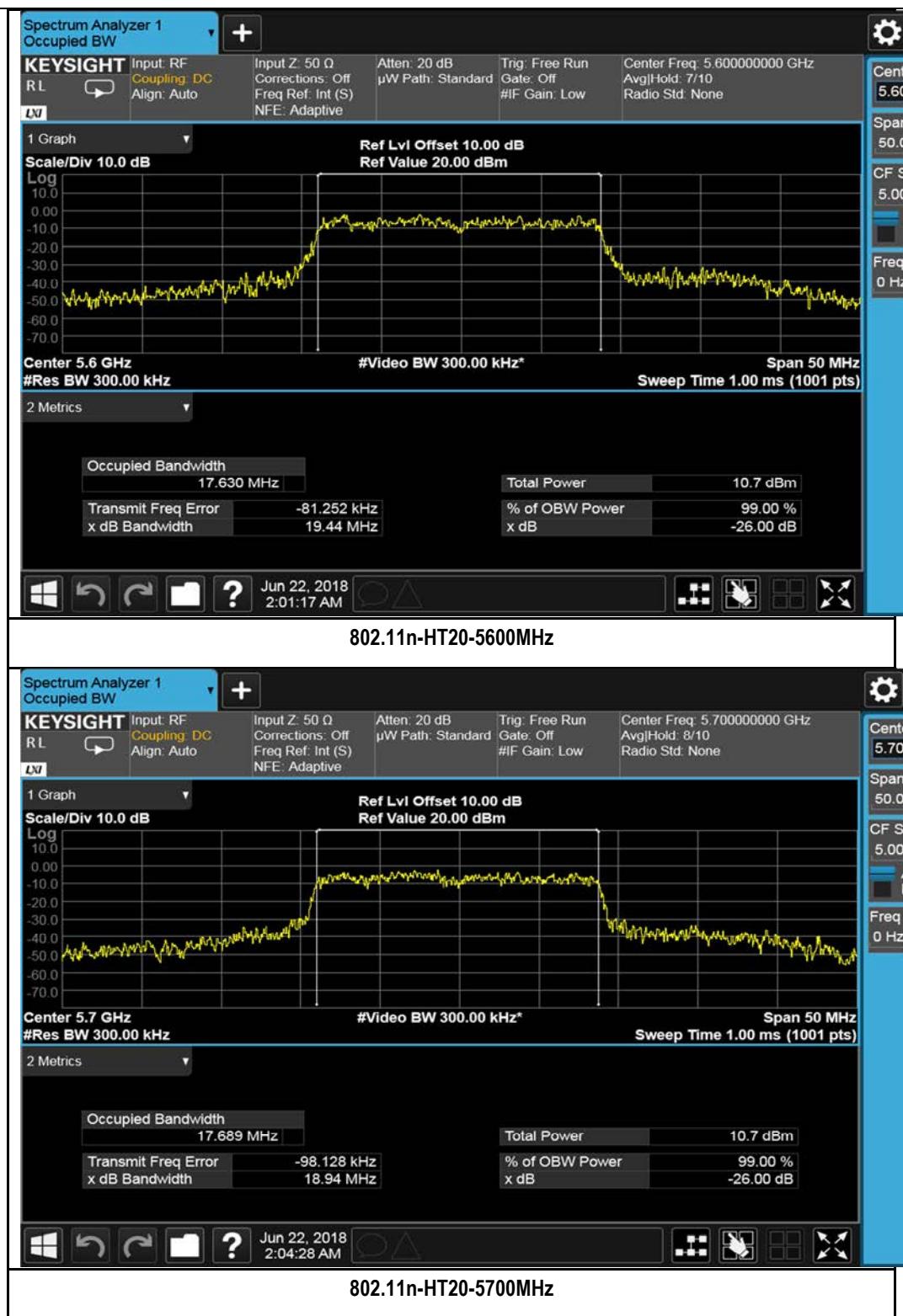




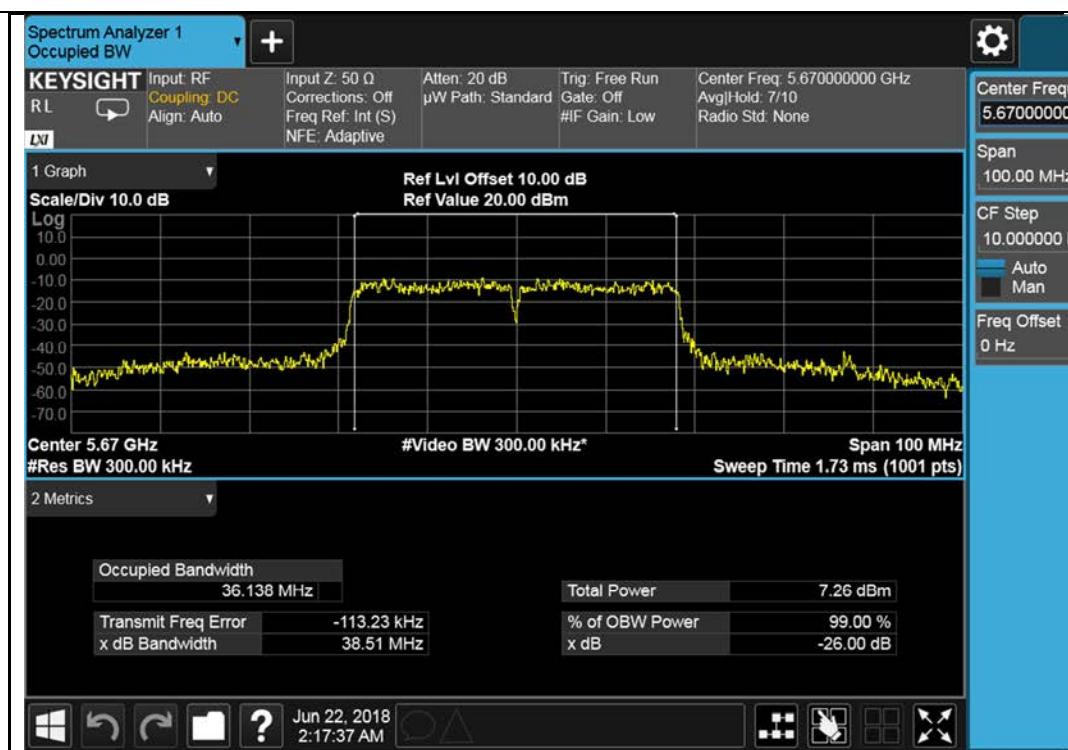
W56:



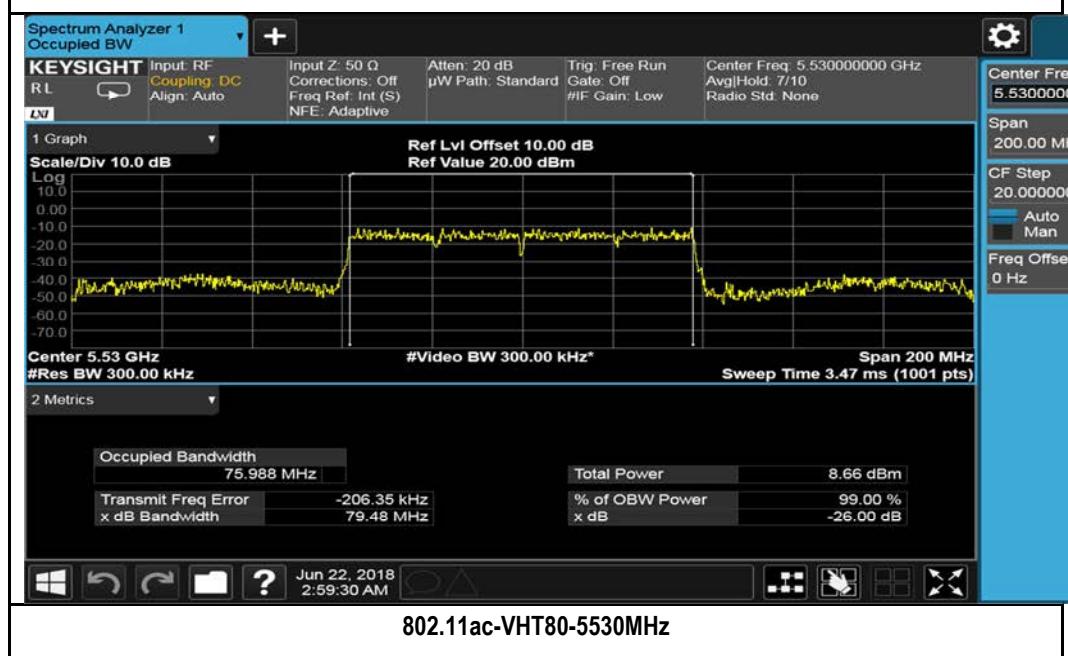




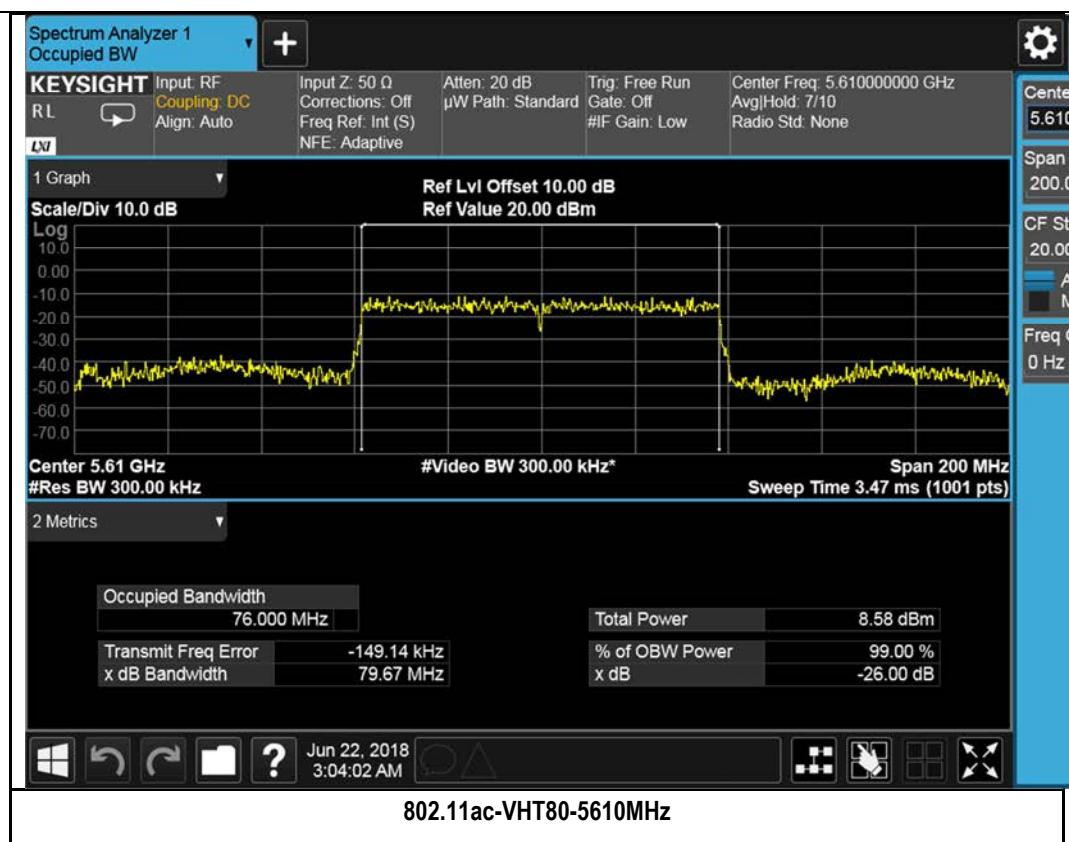




802.11n-HT40-5670MHz

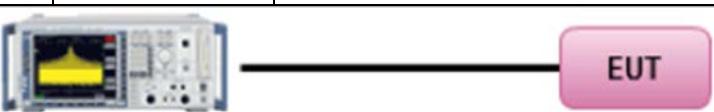


802.11ac-VHT80-5530MHz



9.3 Spread Bandwidth (90%)

Requirement(s):

Spec	Item	Requirement	Applicable
Article 2-1	19	FH FH + DS FH + OFDM OFDM Others	500 kHz or more
Article 2-1	19-3	OFDM	500 kHz or more
Article 2-1	19-3-2	OFDM	500 kHz or more
Test Setup	 <p>Spectrum Analyzer ————— EUT</p>		
Test Procedure	<u>Occupied bandwidth measurement procedure</u> <ul style="list-style-type: none"> - Modulation Tx - Allow the trace to stabilize. - Capture the plot. - Repeat above steps for different test channel and other modulation type. 		
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature 23oC Relative Humidity 46% Atmospheric Pressure 1019mbar
Remark	NONE		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

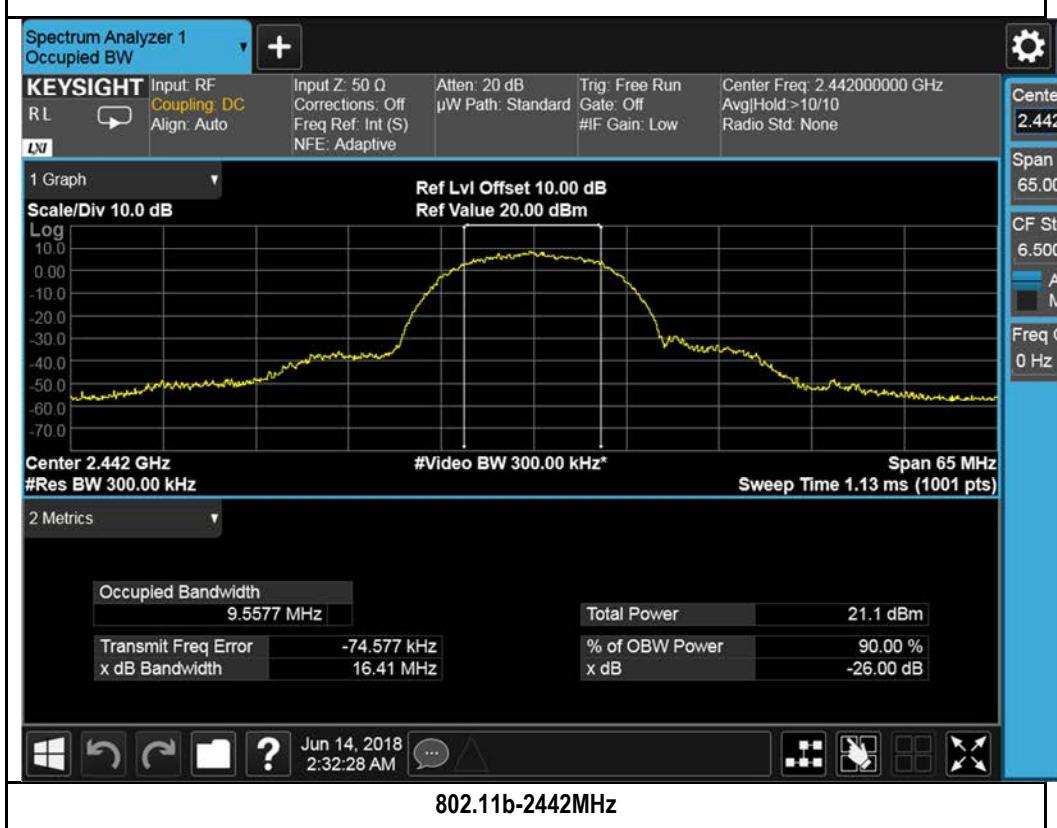
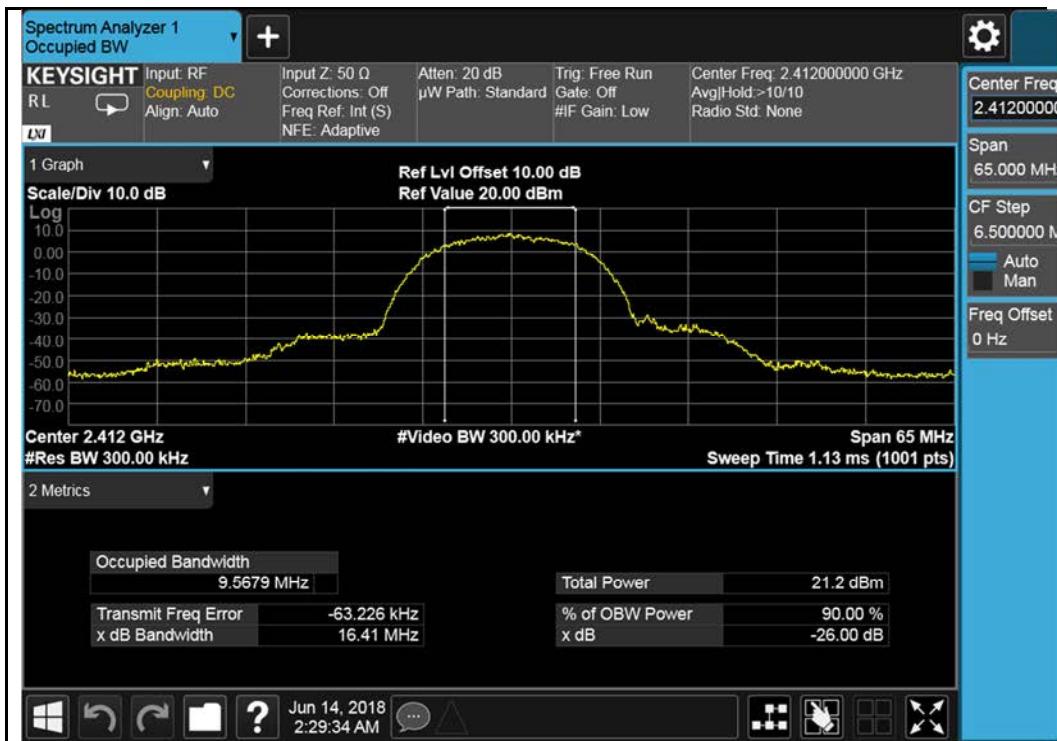
Test Plot Yes (See below) N/A

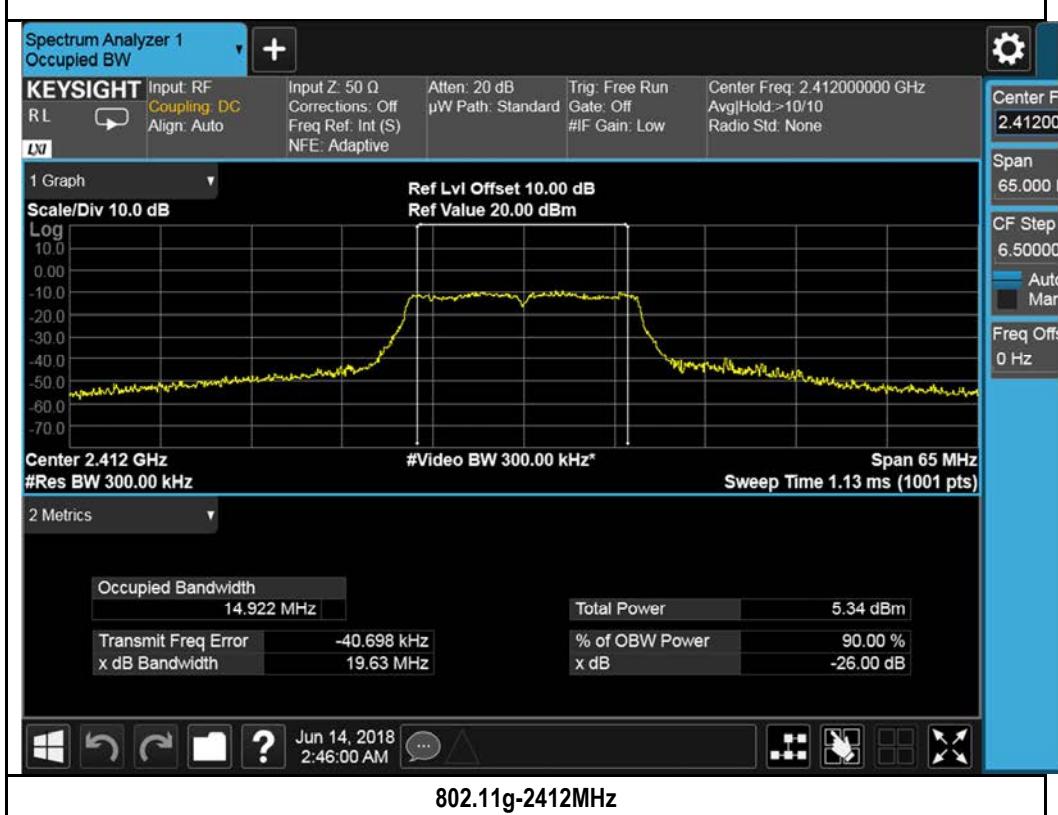
Test was done by Benjamin Jing at RF Test Site.

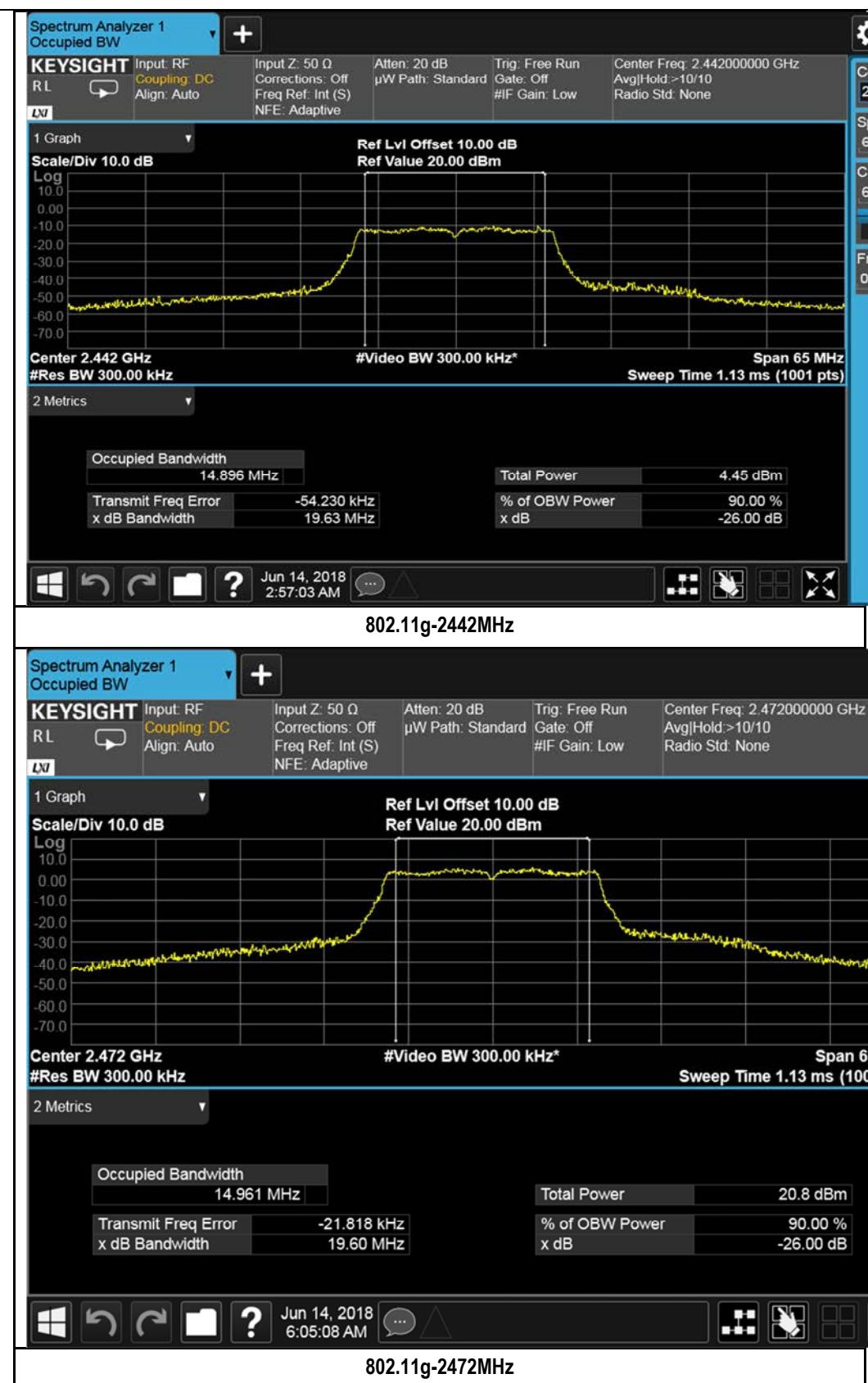
Spread Bandwidth (90%) measurement result per Article 2 paragraph 1 item (19)

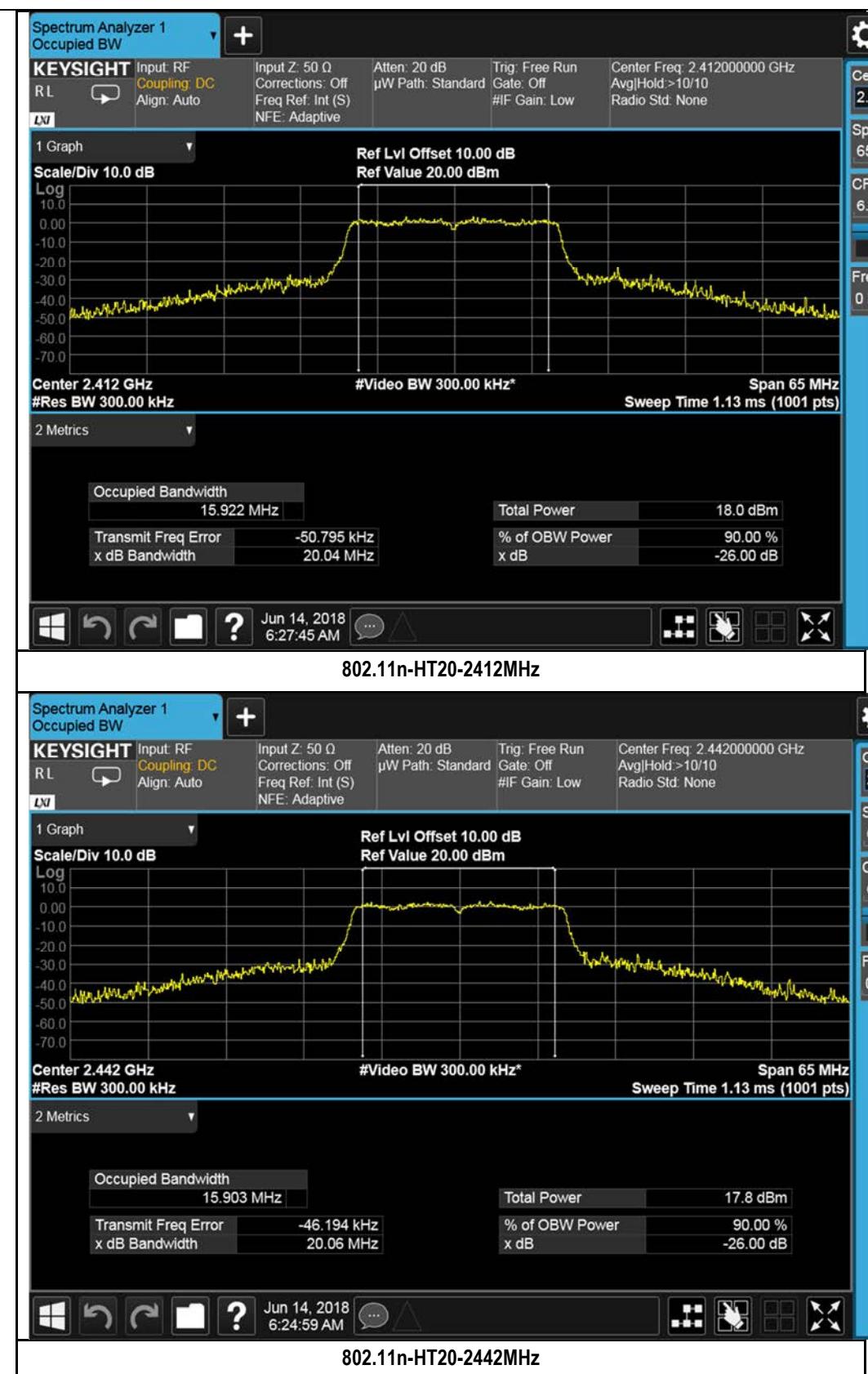
Type	Frequency (MHz)	Test mode	CH	Result (MHz)	Limit (MHz)	Result
WLAN	2412	802.11b	Low	9.57	≥ 0.5	Pass
	2442		Mid	9.57	≥ 0.5	Pass
	2472		High	9.57	≥ 0.5	Pass
	2412	802.11g	Low	14.92	≥ 0.5	Pass
	2442		Mid	14.89	≥ 0.5	Pass
	2472		High	14.96	≥ 0.5	Pass
	2412	802.11n-HT20	Low	15.92	≥ 0.5	Pass
	2442		Mid	15.90	≥ 0.5	Pass
	2472		High	14.98	≥ 0.5	Pass
	2422	802.11n-HT40	Low	32.50	≥ 0.5	Pass
	2442		Mid	32.35	≥ 0.5	Pass
	2462		High	32.44	≥ 0.5	Pass

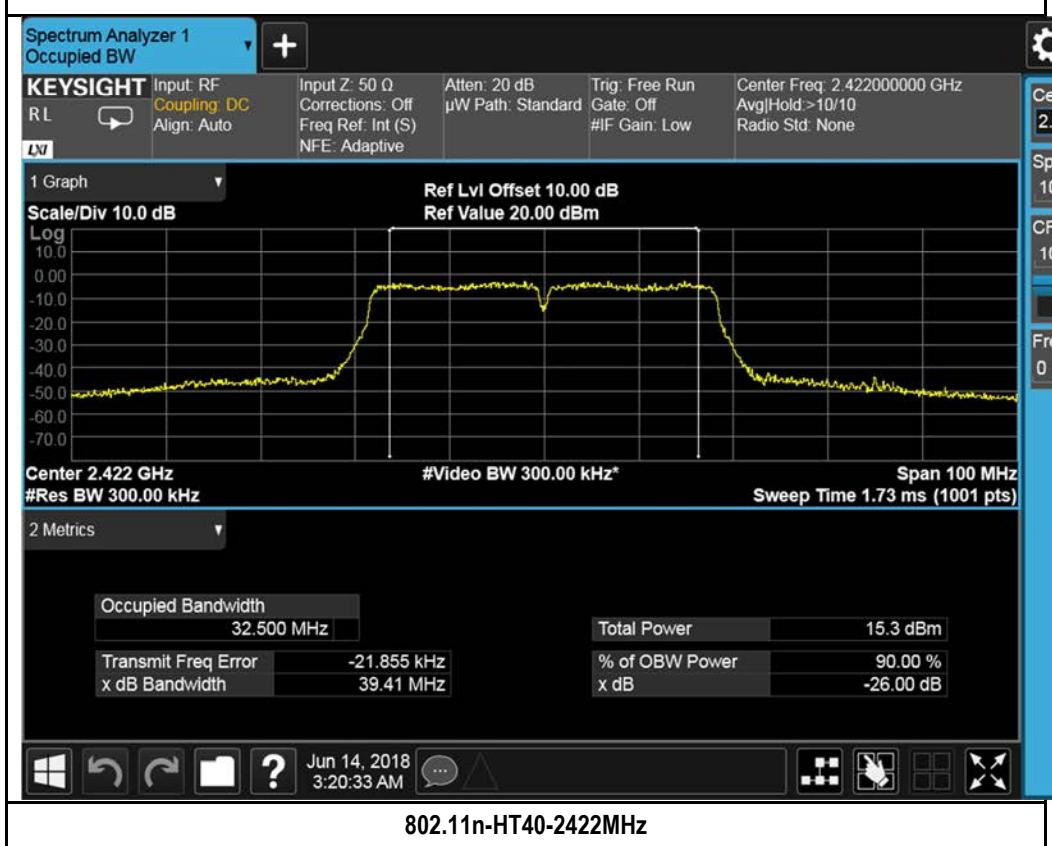
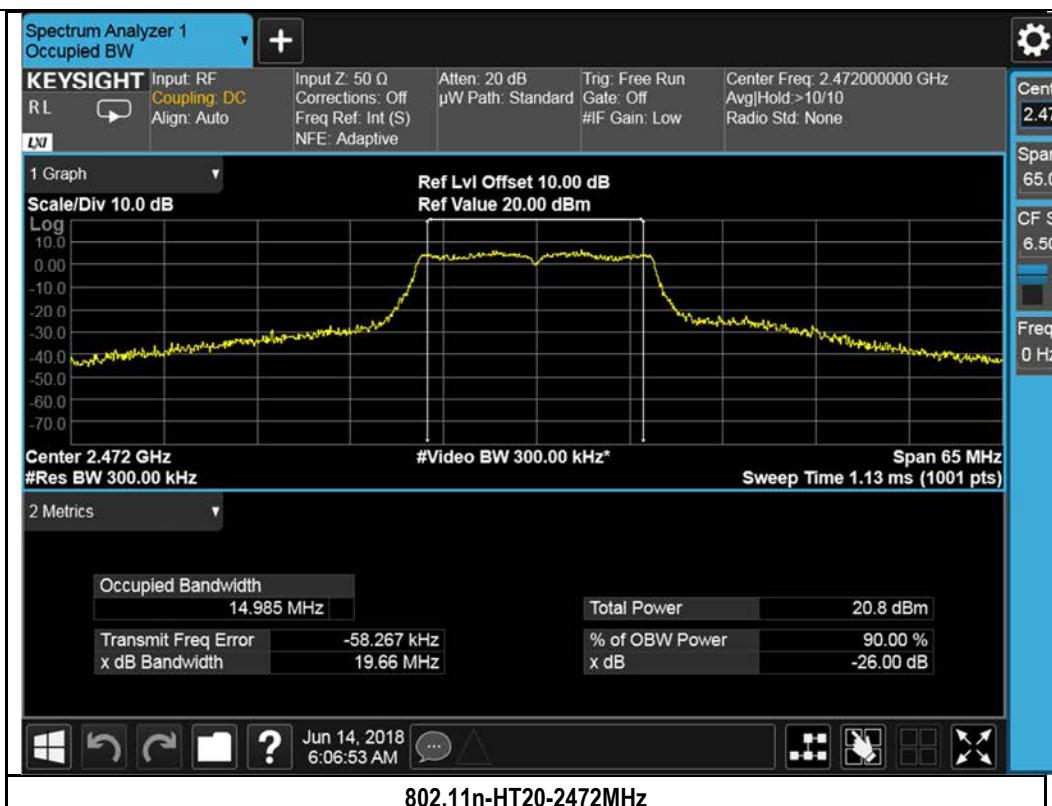
Test Plots

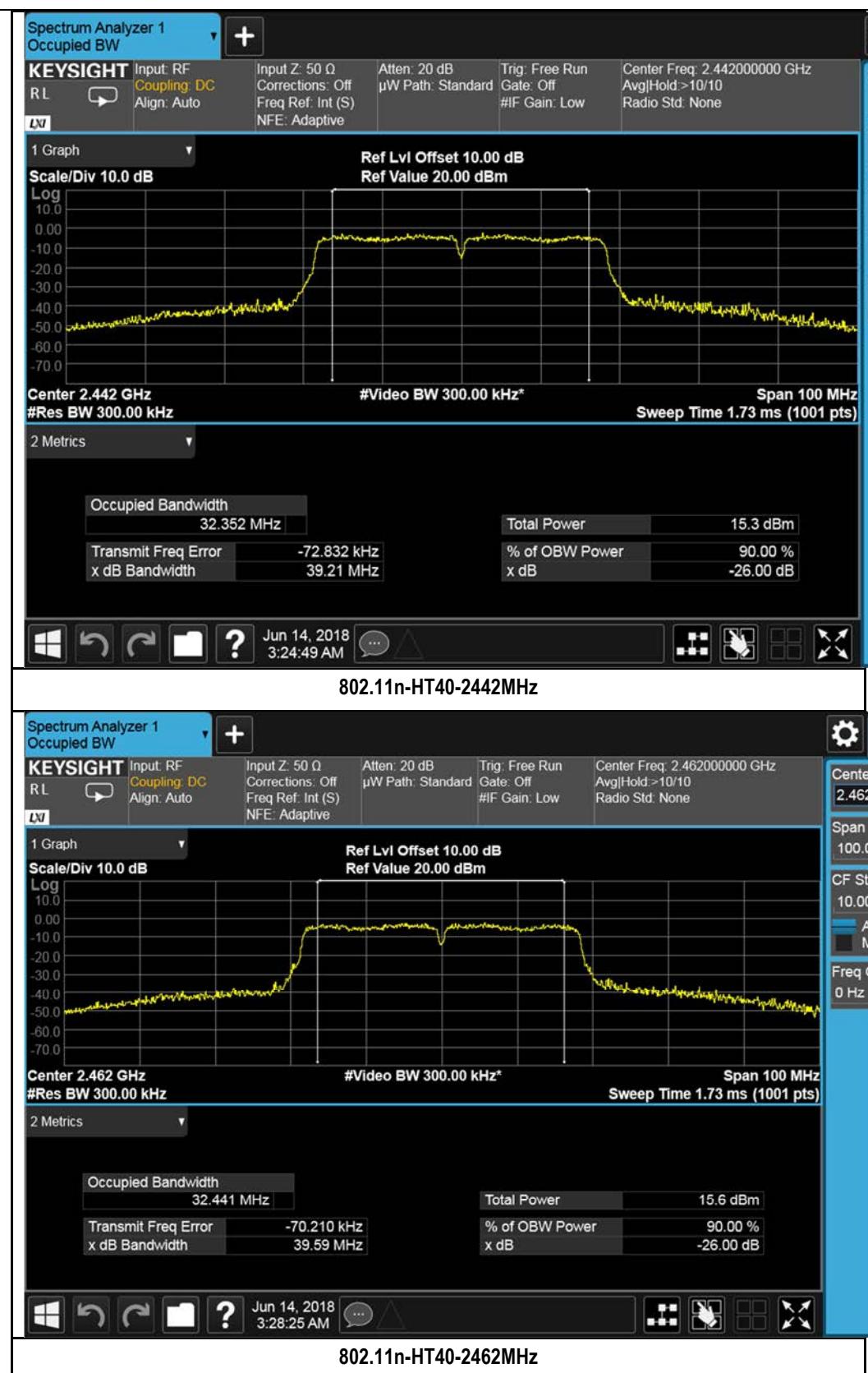










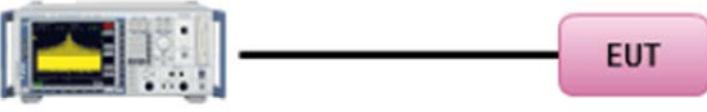


9.4 Spurious emission Intensity

Requirement(s):

Unwanted Emission Strength			
Spec	Item	Requirement (Spurious emission)	Applicable
Article 2-1	19	(1) Below 2387 MHz	Less -26dBm
		(2) 2387 to 2400 MHz	Less -16dBm
		(3) 2483.5 to 2496.5 MHz	Less -16dBm
		(4) Over 2496.5 MHz	Less -26dBm
Article 2-1	19-3	OFDM, 19MHz BW	<input checked="" type="checkbox"/>
		(1) Below 5135 MHz	Less -26dBm
	OFDM, 38MHz BW	(2) 5365 to 26GHz	Less -26dBm
		(1) Below 5100 MHz	Less -26dBm
	OFDM, 78MHz BW	(2) 5400 to 26GHz	Less -26dBm
		(1) Below 5020 MHz	Less -26dBm
Article 2-1	19-3-2	OFDM, 19.7MHz BW	<input checked="" type="checkbox"/>
		(2) 5745 to 26000 MHz	Less -26dBm
		OFDM, 38MHz BW	<input checked="" type="checkbox"/>
	OFDM, 78MHz BW	(1) Below 5420 MHz	Less -26dBm
		(2) 5760 to 26000 MHz	Less -26dBm
		(1) Below 5340 MHz	Less -26dBm
Article 2-1	19-3-3	OFDM-5.21G,5.29G	<input type="checkbox"/>
		(2) 5480 to 26000 MHz	Less -26dBm
	OFDM-5.53G,5.61G	(1) Below 5340 MHz	Less -26dBm
		(2) 5800 to 26000 MHz	Less -26dBm

Out-Band Leakage power			
Spec	Item	Requirement (Out-Band Leakage)	Applicable
Article 2-1	19-3	5135 - 5142 MHz	-26 dBm
		5142 - 5150 MHz	-18 dBm
		5250 - 5251 MHz	10 x (1-(f-5240-9)) dBm
		5251 - 5260 MHz	10 x ((-1-(8/90)(f-5240-11))) dBm
		5260 - 5266.7 MHz	10 x (-1.8-(6/50)(f-5240-20)) dBm
		5266.7 - 5365 MHz	-26 dBm
	W52,40MHz BW	5100 - 5141.6 MHz	-26 dBm
		5141.6 - 5150 MHz	-18 dBm
		5250 - 5251 MHz	10x(-(f-5230-20)+log(1/2)) dBm
		5251 - 5270 MHz	10x(-(8/190)(f-5230-21)-1+log(1/2)) dBm
		5270 - 5278.4 MHz	10x(-(3/50)(f-5230-40)-1.8+log(1/2)) dBm
	W52,80MHz BW	5278.4 - 5400 MHz	-26 dBm
		5020 - 5123.2 MHz	-26 dBm
		5123.2 - 5150 MHz	-18.24 dBm
		5250 - 5251 MHz	10x(-(f-5210-40)+log(1/4)) dBm
		5251 - 5290 MHz	10x(-(8/390)(f-5210-41)-1+log(1/4)) dBm
		5290 - 5296.7 MHz	10x(-(3/100)(f-5210-80)-1.8+log(1/4)) dBm
	W53,18-19MHz BW	5296.7 - 5480 MHz	-26 dBm
		5135 - 5233.3 MHz	-26 dBm
		5233.3 - 5240 MHz	10x(-1.8-(6/50)(f-5260-20)) dBm
		5240 - 5249 MHz	10x(-1-(8/90)(f-5260-11)) dBm
		5249 - 5250 MHz	10x(1-(f-5260-9)) dBm
	W53,40MHz BW	5350 - 5365 MHz	-26 dBm
		5100 - 5210 MHz	-26 dBm
		5210 - 5221.6 MHz	-26 dBm
		5221.6 - 5230 MHz	10x(-(3/50)(f-5270-40)-1.8+log(1/2)) dBm
		5230 - 5249 MHz	10x(-(8/190)(f-5270-21)-1+log(1/2)) dBm
		5249 - 5250 MHz	10x(-(f-5270-20)+log(1/2)) dBm
	W53,80MHz BW	5350 - 5358.4 MHz	-18 dBm
		5358.4 - 5400 MHz	-26 dBm
		5020 - 5203.3 MHz	-26 dBm
		5203.3 - 5210 MHz	10x(-(3/100)(f-5290-80)-1.8+log(1/4)) dBm
		5210 - 5249 MHz	10x(-(8/390)(f-5290-41)-1+log(1/4)) dBm
		5249 - 5250 MHz	10x(-(f-5290-40)+log(1/4)) dBm
Article 2-1	19-3-2	5350 - 5376.8 MHz	-18.24 dBm
		5376.8 - 5480 MHz	-26 dBm
		5455 - 5460 MHz	-26 dBm
		5460 - 5470 MHz	-19 dBm
	OFDM, 20 MHz BW	5725 - 5740 MHz	-19 dBm
		5740 - 5745 MHz	-26 dBm
		5420 - 5460 MHz	-19 dBm
	OFDM, 40 MHz BW	5460 - 5470 MHz	-13 dBm
		5725 - 5760 MHz	-19 dBm
		5340 - 5460 MHz	-19 dBm
		5460 - 5469.5 MHz	-13 dBm
	OFDM, 80 MHz BW	5469.5 - 5470 MHz	-12.91 dBm
		5725 - 5800 MHz	-19 dBm

Article 2-1	19-3-3	OFDM, 80 MHz BW 5.21GHz & (5.53GHz or 5.61GHz)	5020 – 5134.8 MHz	-26 dBm	<input type="checkbox"/>
			5134.8 – 5150 MHz	-19 dBm	
			5250 – 5251 MHz	$10x(-(f-5210-40)+\log(1/8))$ dBm	
			5251 – 5285.2 MHz	$10x(-(8/390)(f-5210-41)-1+\log(1/8))$ dBm	
			5285.2 – 5370 MHz	-26 dBm	
			5370 – 5454.8 MHz	-26 dBm	
			5454.8 – 5470 MHz	-18 dBm	
			5725 – 5800 MHz	-18 dBm	
Article 2-1	19-3-3	OFDM, 80 MHz BW 5.29GHz & (5.53GHz or 5.61GHz)	5020 – 5214.8 MHz	-26 dBm	<input type="checkbox"/>
			5214.8 – 5249 MHz	$10x(-(8/390)(f-5290-41)-1+\log(1/8))$ dBm	
			5249 – 5250 MHz	$10x(-(f-5290-40)+\log(1/8))$ dBm	
			5350 – 5365.2 MHz	-18 dBm	
			5365.2 – 5410 MHz	-26 dBm	
			5410 – 5454.8 MHz	-26 dBm	
			5454.8 – 5470 MHz	-18 dBm	
			5725 – 5800 MHz	-18 dBm	
Test Setup	 <p>Spectrum Analyzer</p>				
Test Procedure	<p><u>measurement procedure</u></p> <p>Step1</p> <ul style="list-style-type: none"> - For 2.4GHz band, all spurious are measured from 30MHz to 13GHz by peak mode; for 5GHz band, all spurious are measured from 30MHz to 26GHz by peak mode - Measure on Wide Range and Outband (near the band) with different SA setting. - In other case, measure only Wide Range. <p>Step2</p> <ul style="list-style-type: none"> - If the value measured by Step1 is bigger than (limit -3dB), measure in burst average mode. 				
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22oC 47% 1019mbar	
Remark	N/A.				
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail				

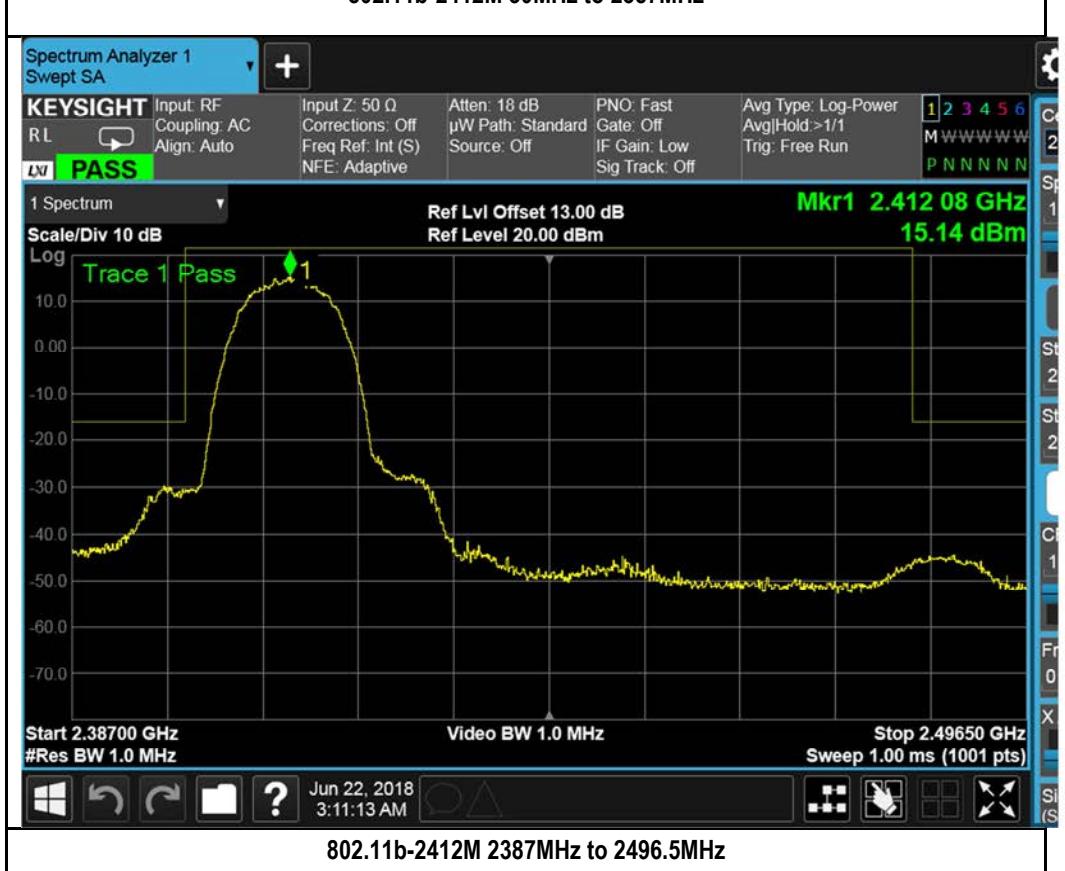
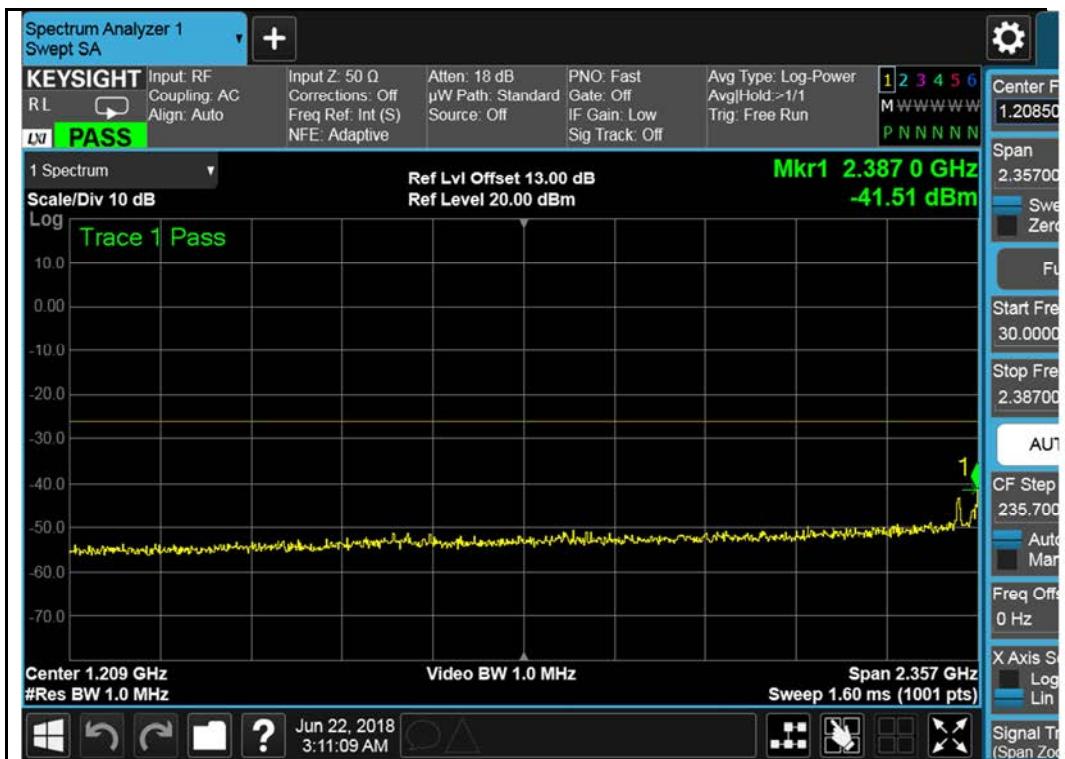
Test Data Yes N/A

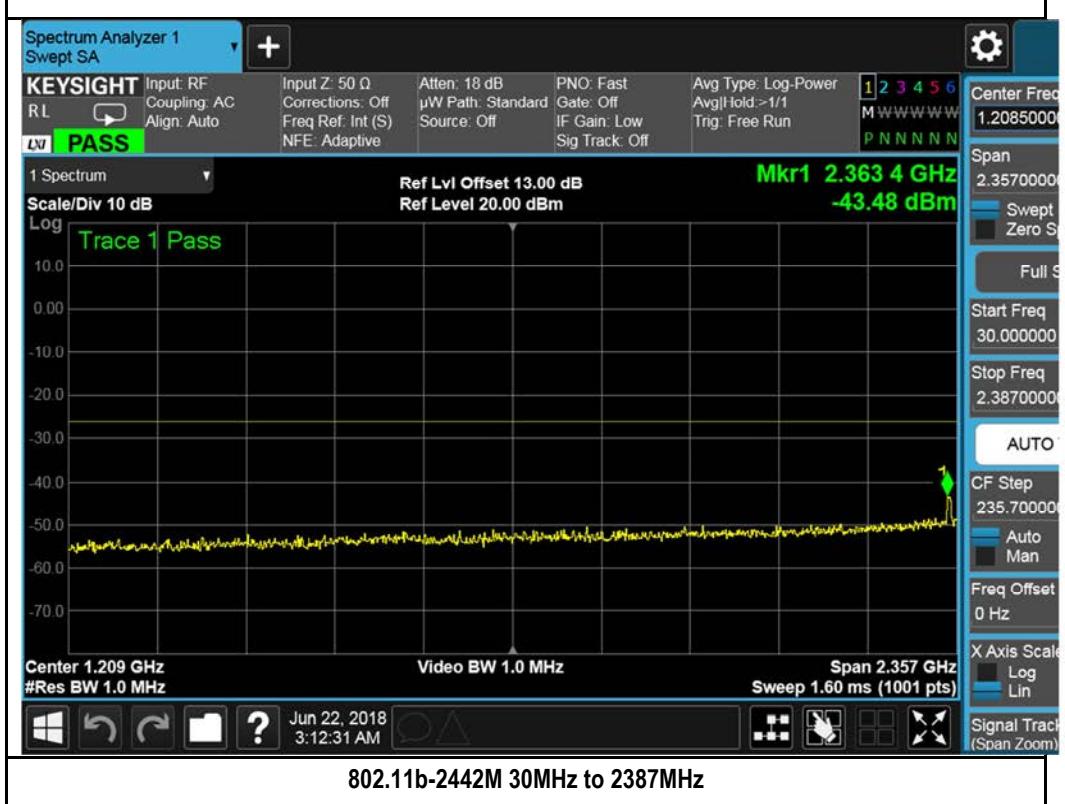
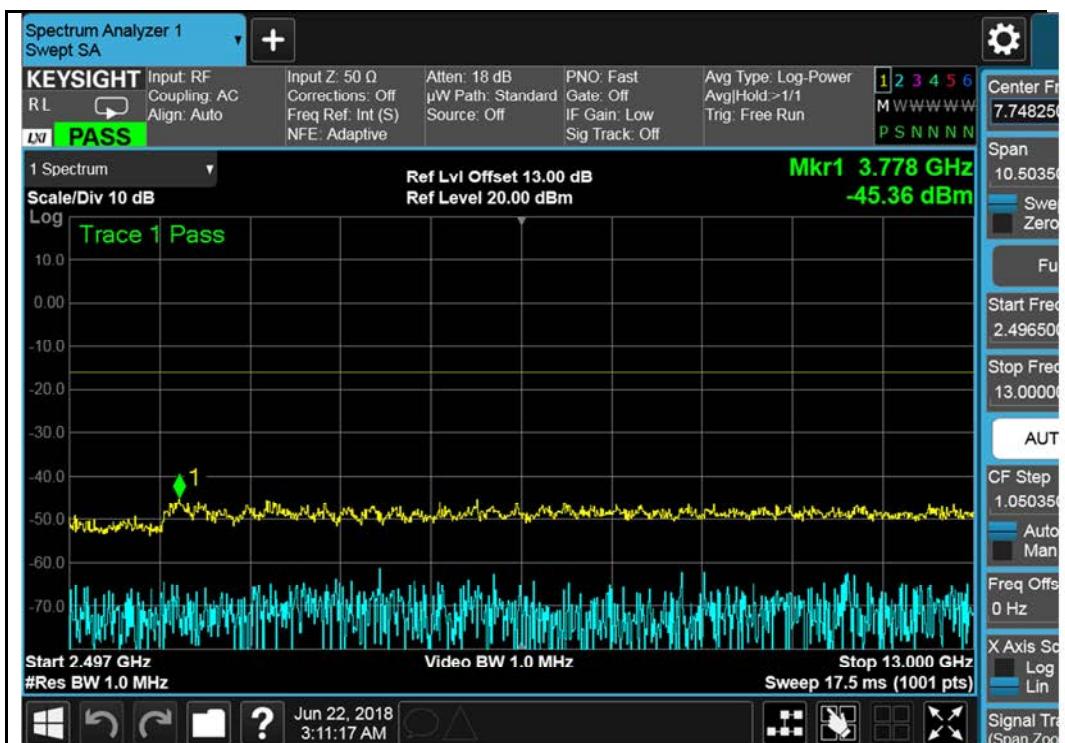
Test Plot Yes N/A

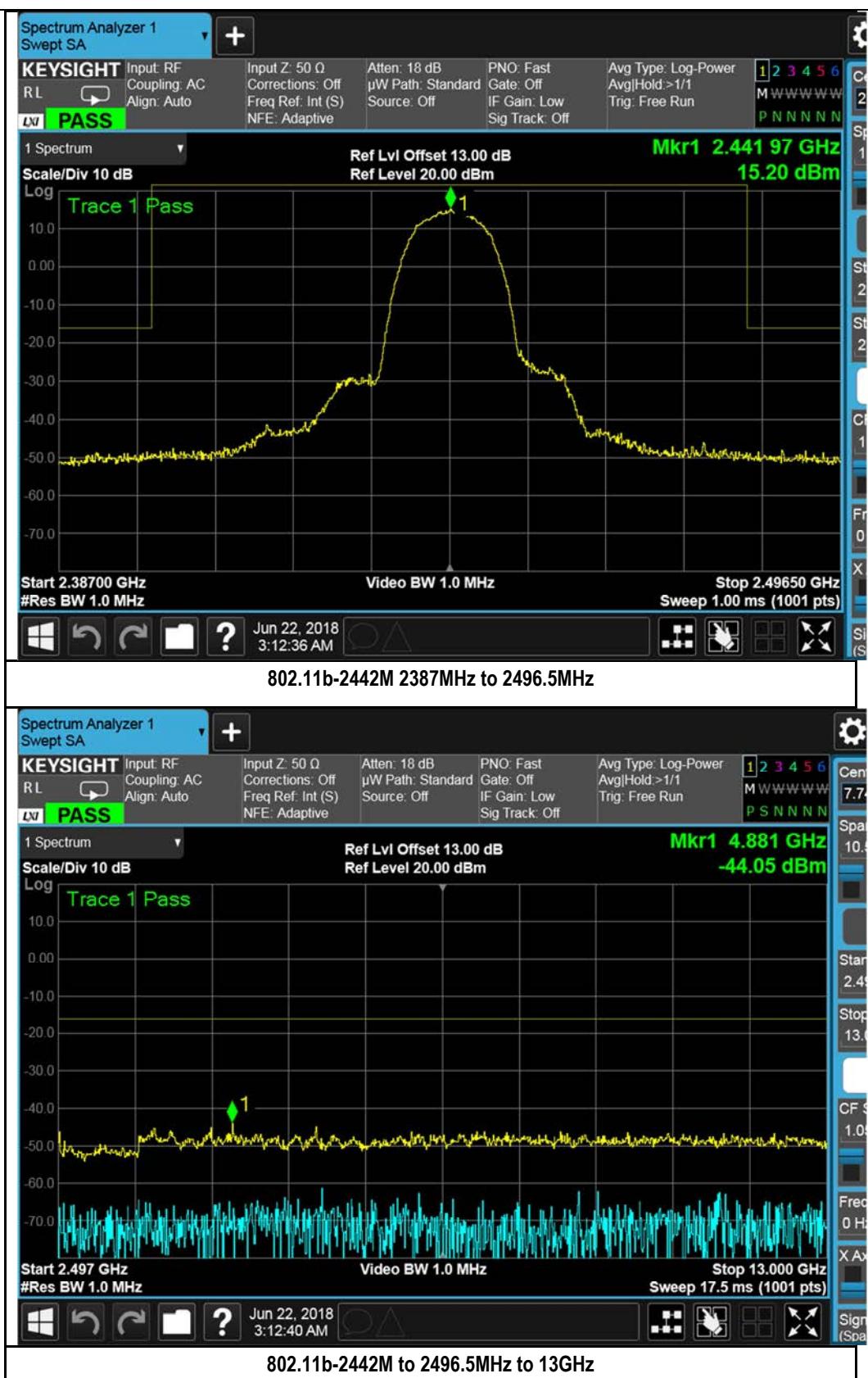
Test was done by Benjamin Jing at RF Test Site.

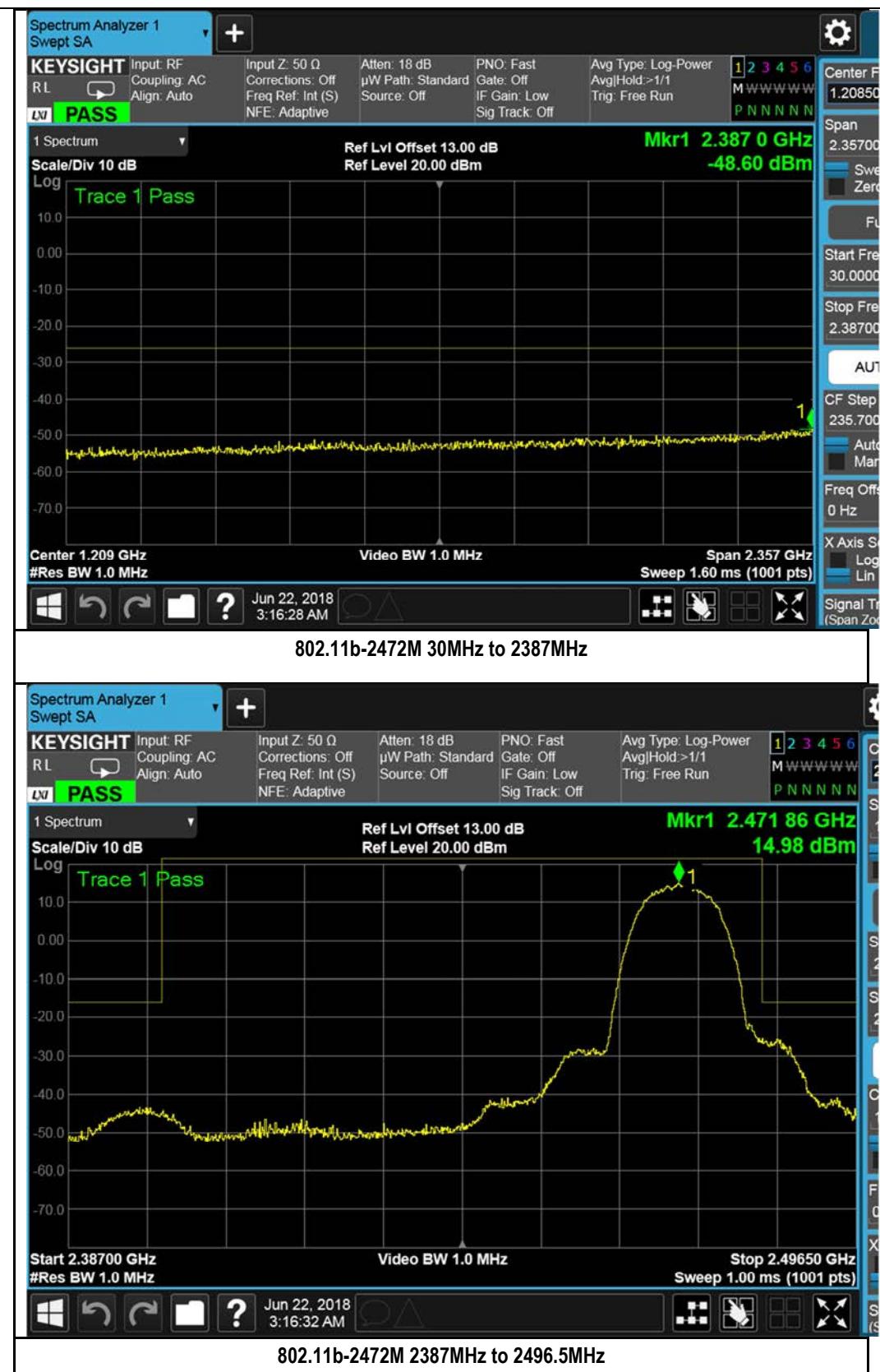
Note: Only worst case of two chains is presented.

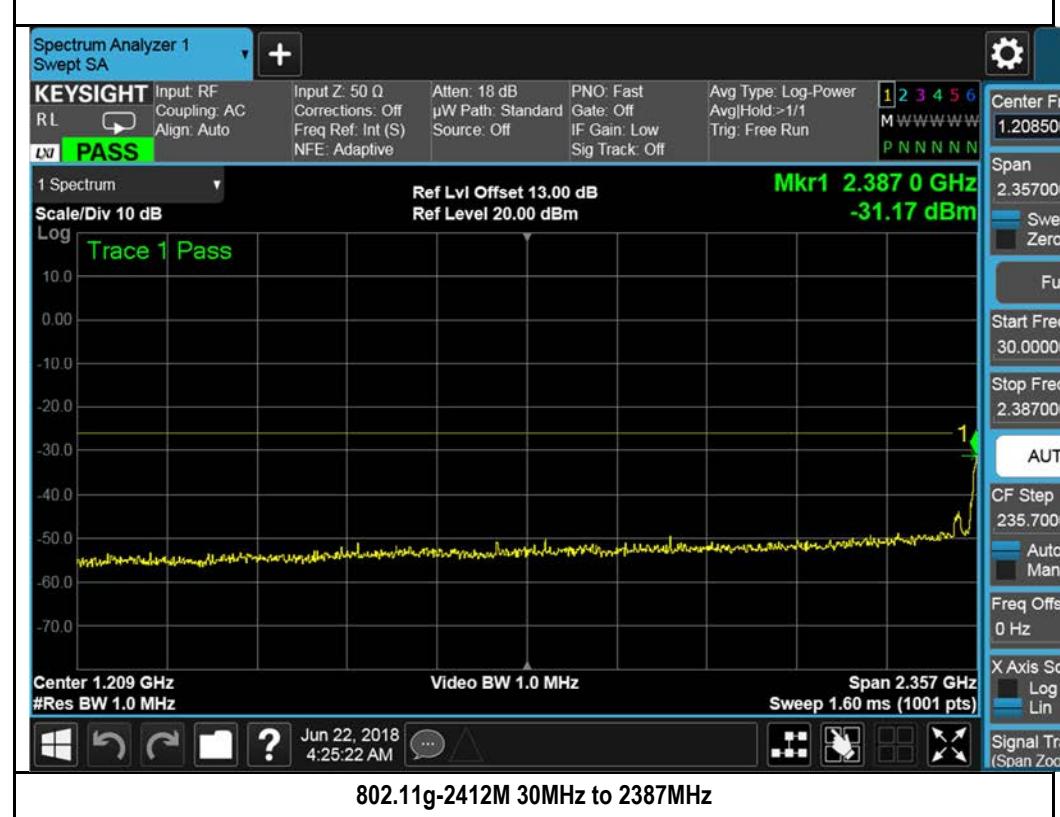
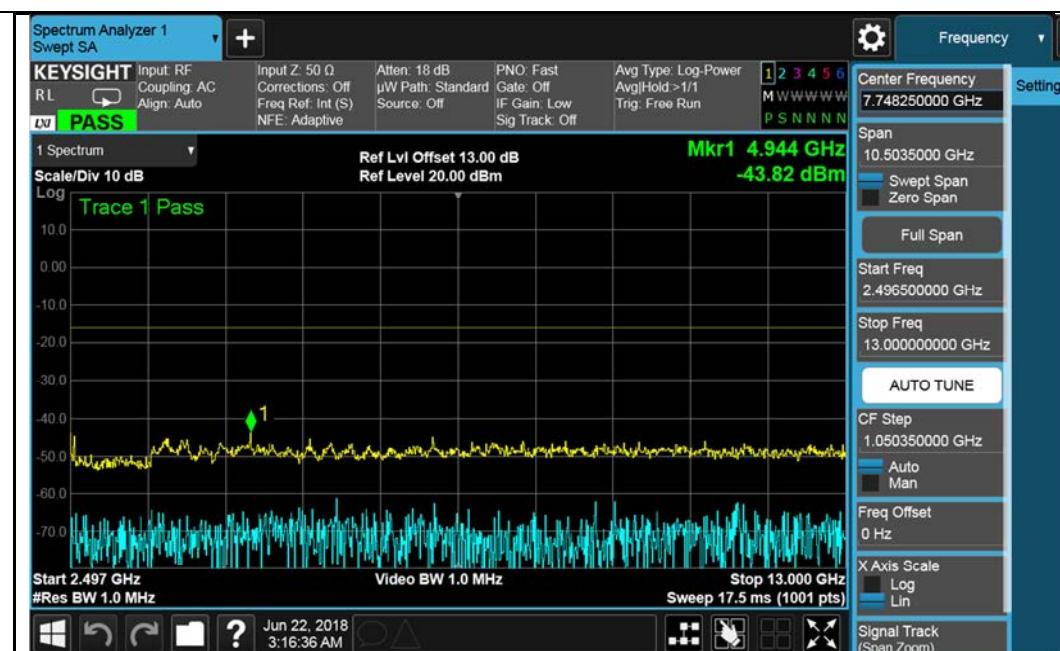
Test Plots

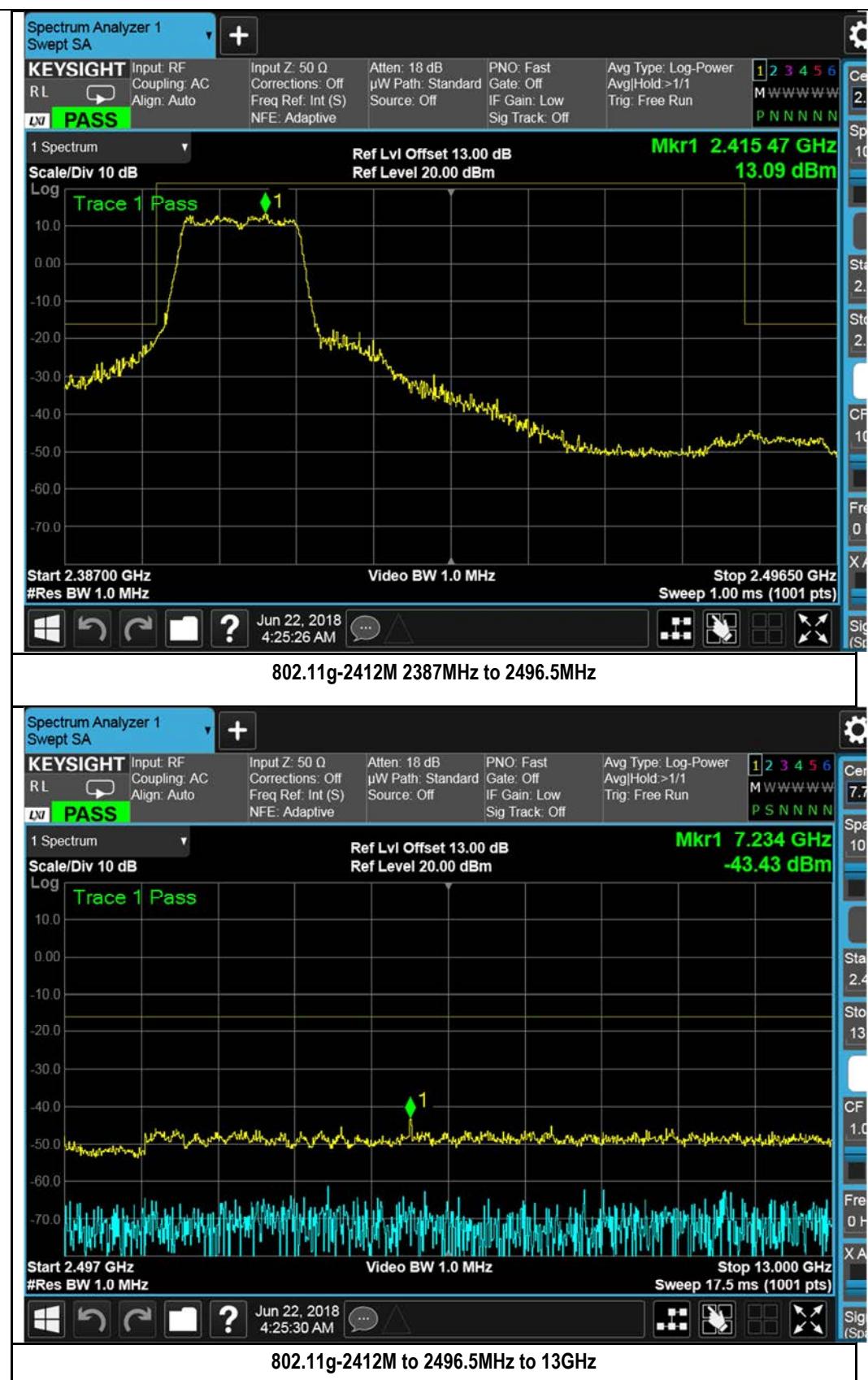


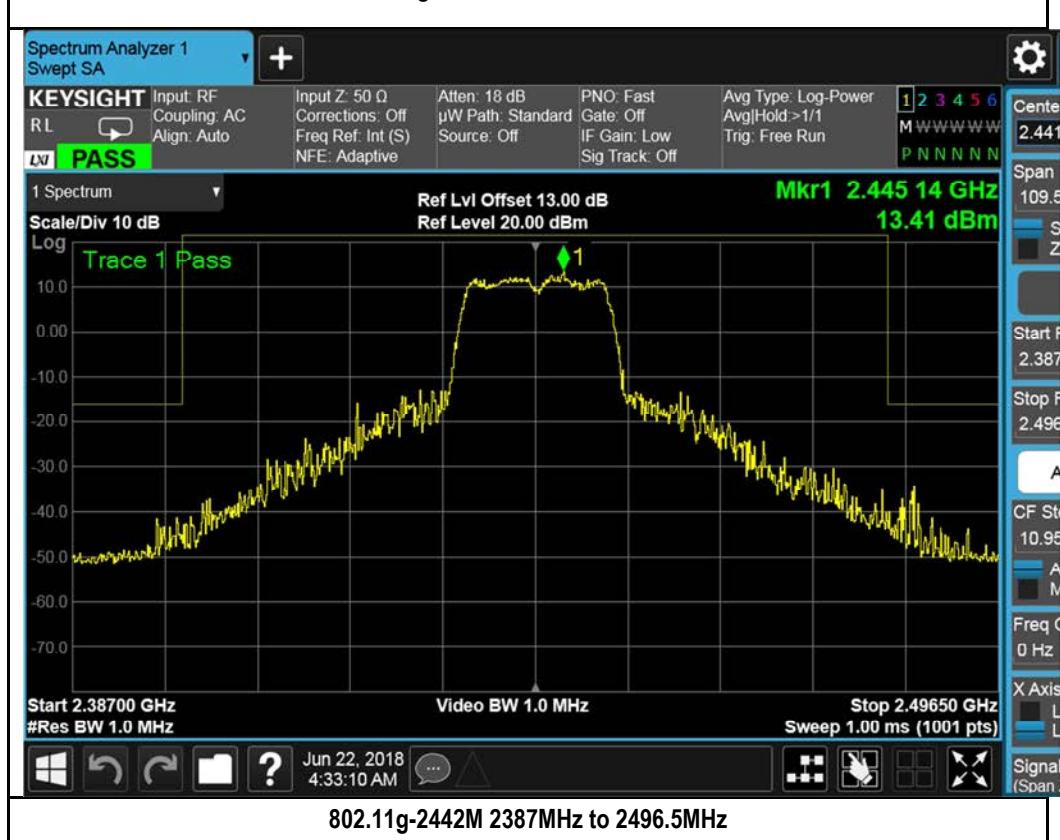
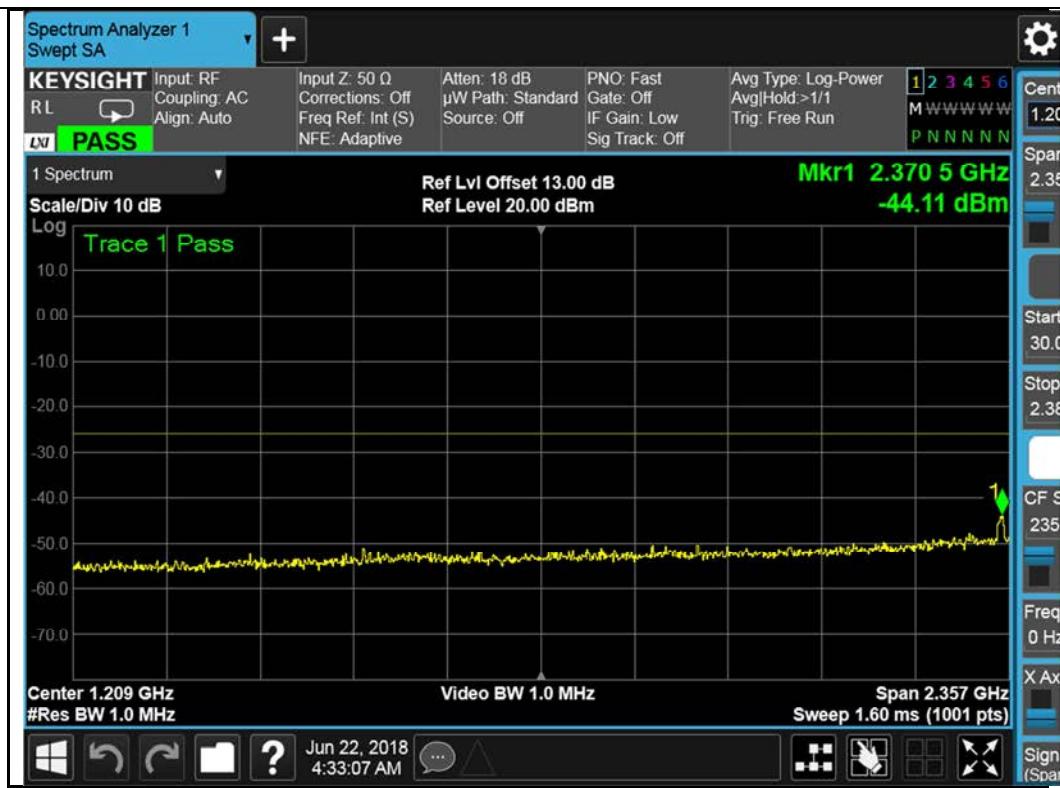


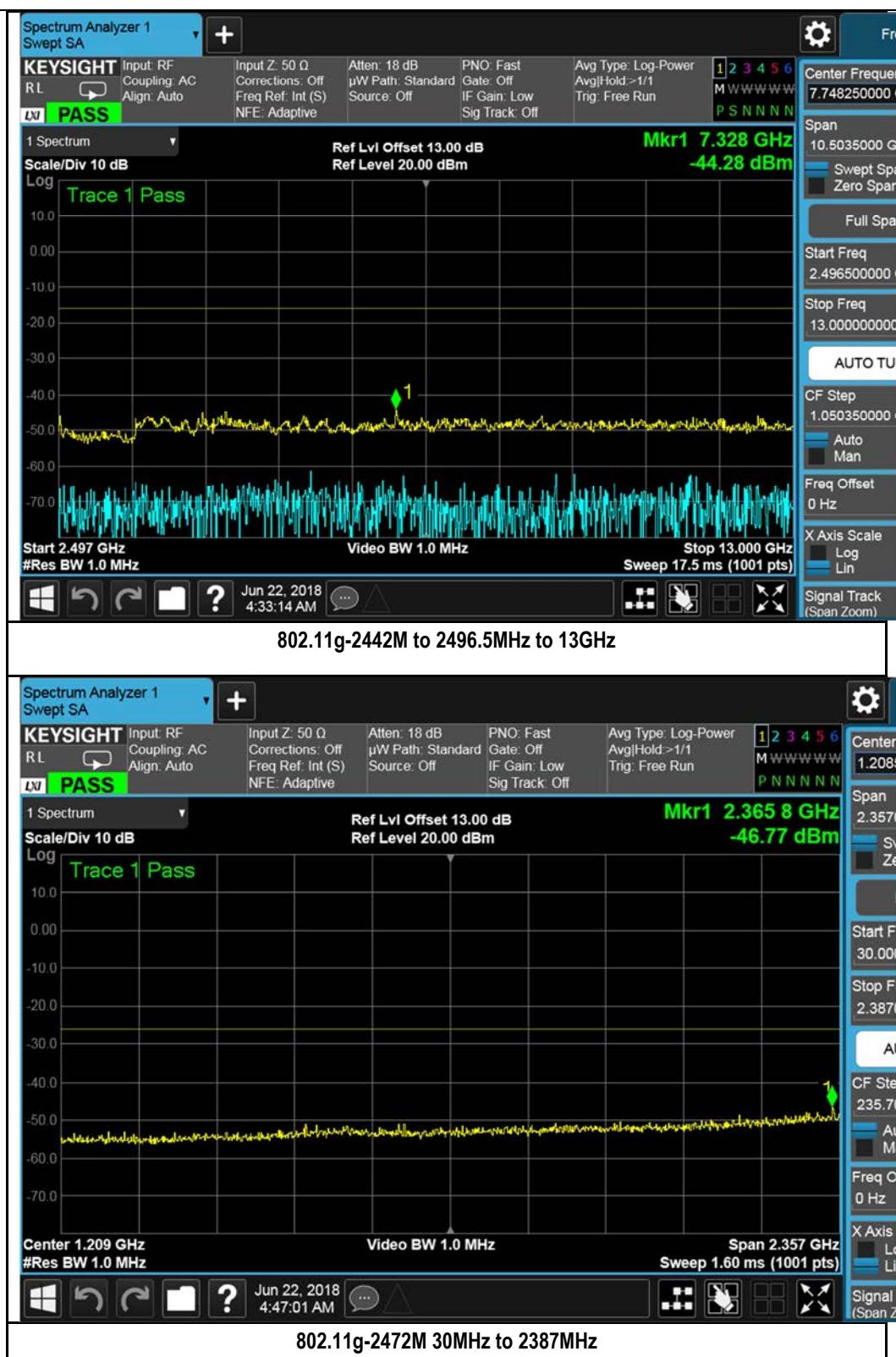




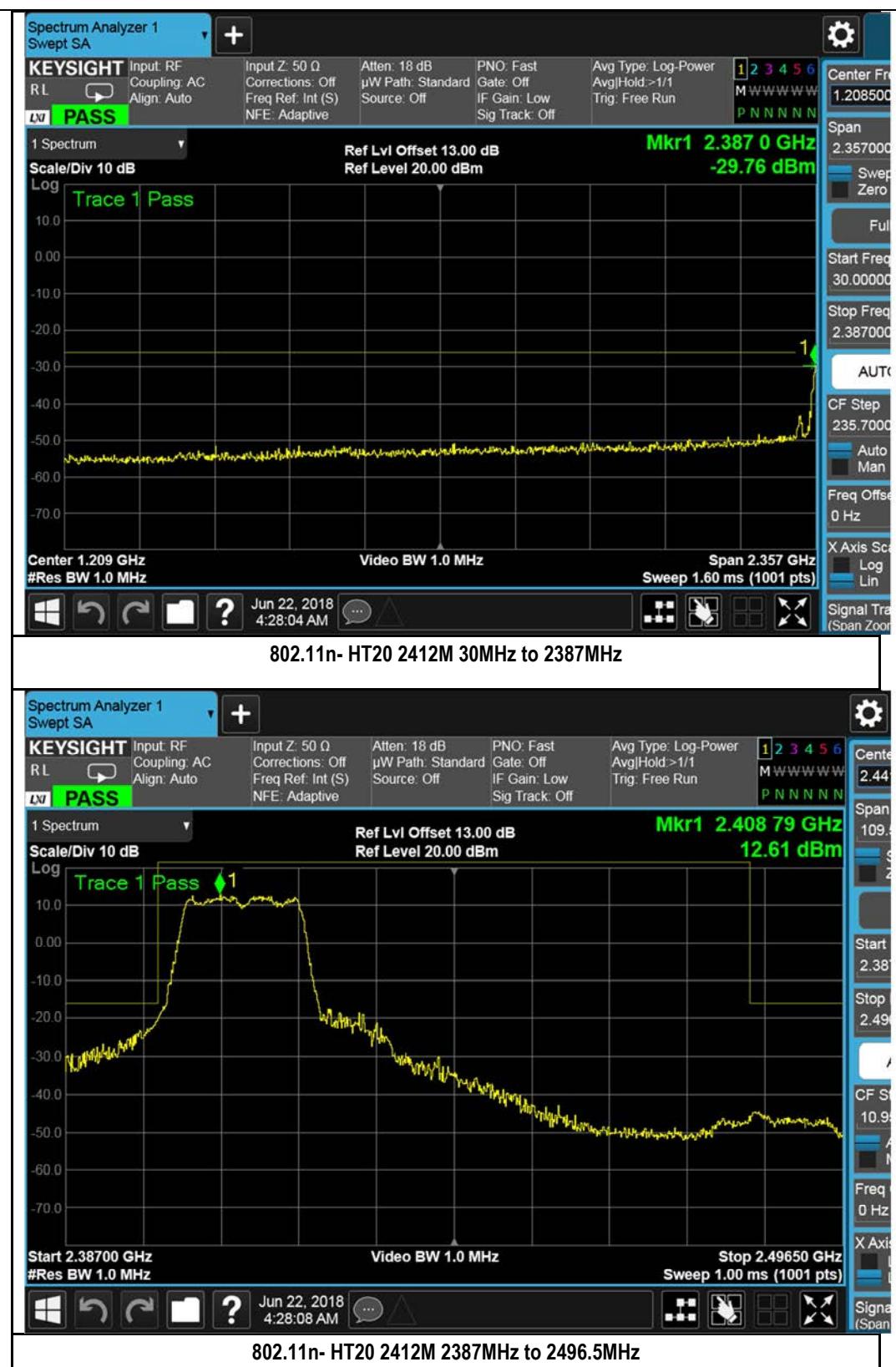


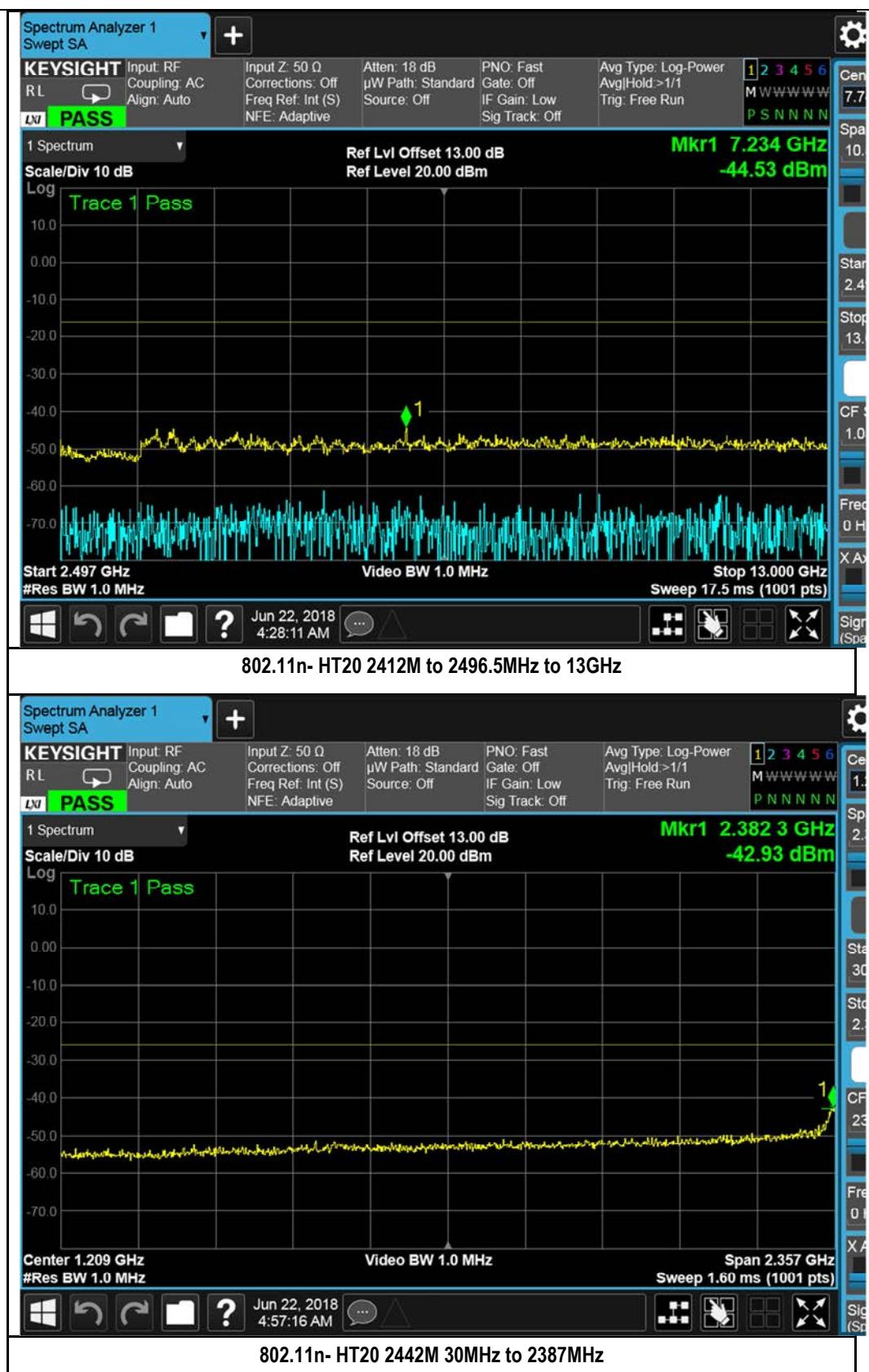


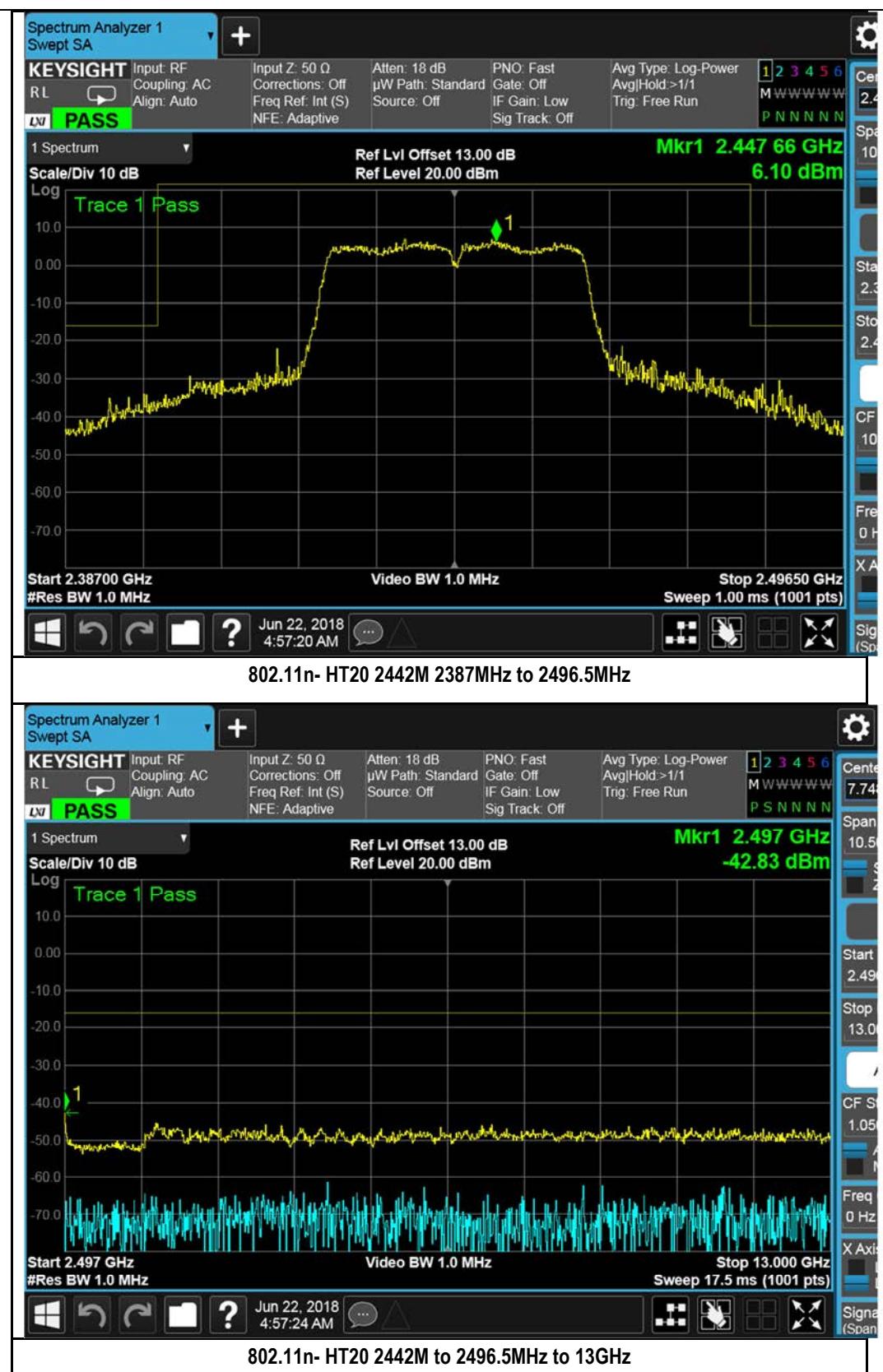


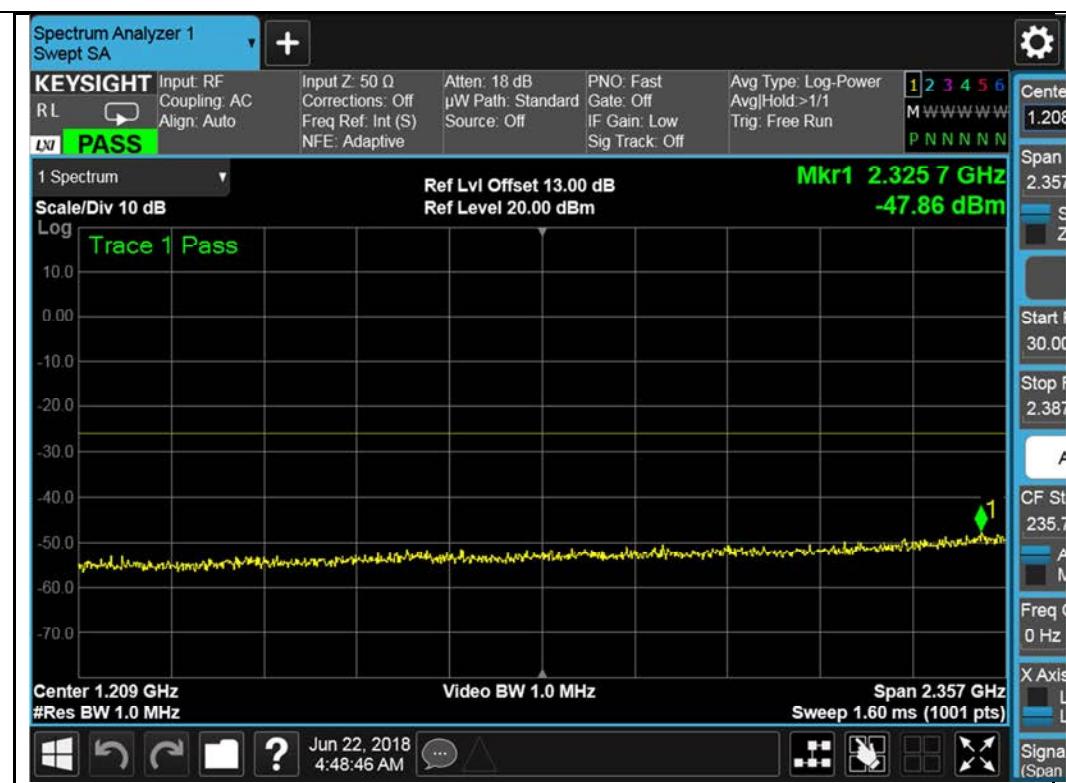








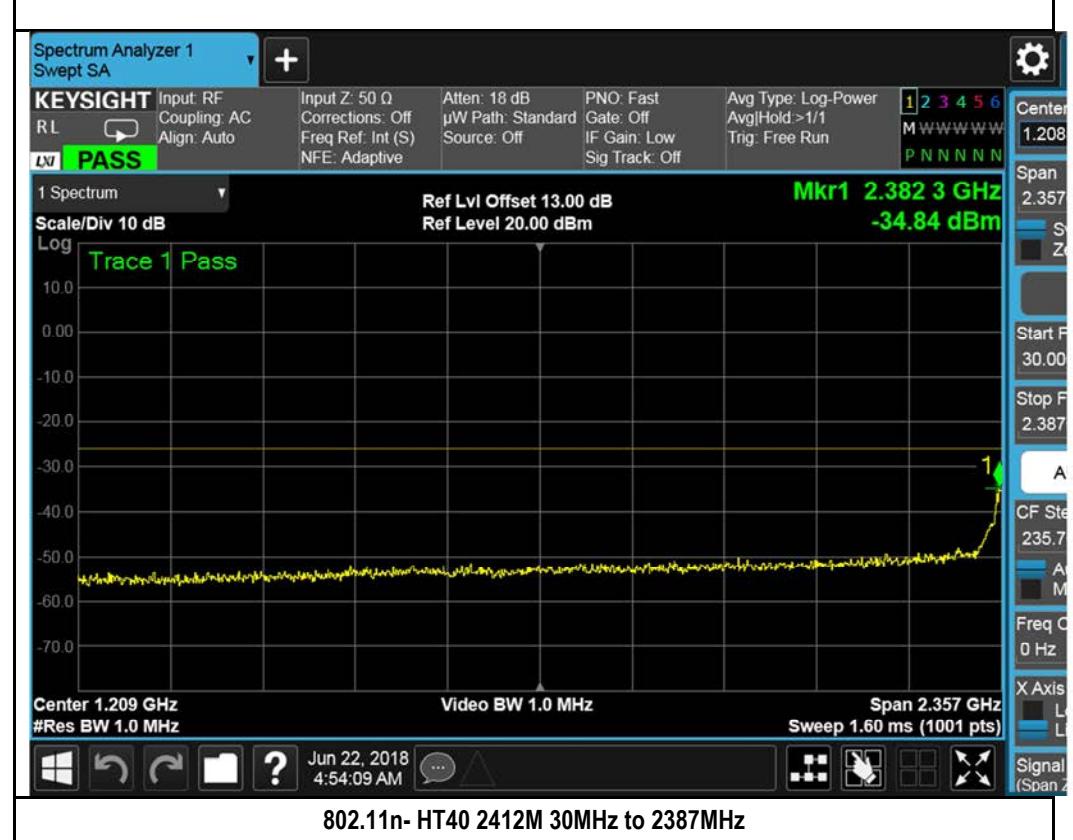
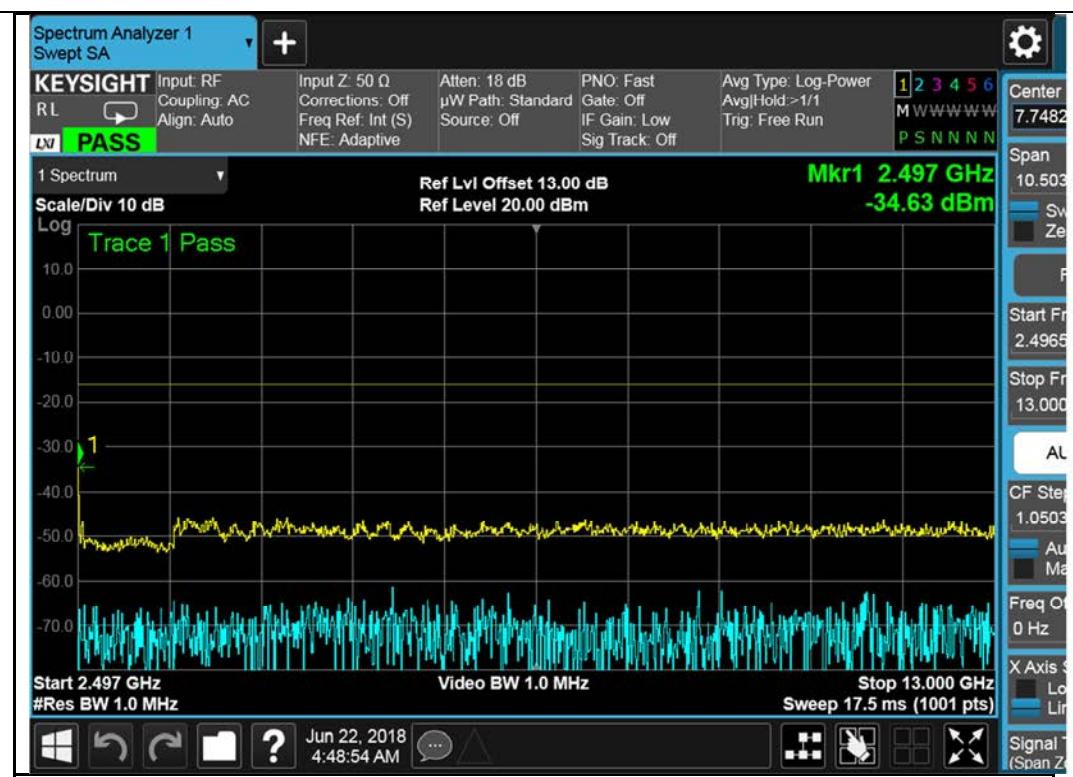




802.11n- HT20 2472M 30MHz to 2387MHz

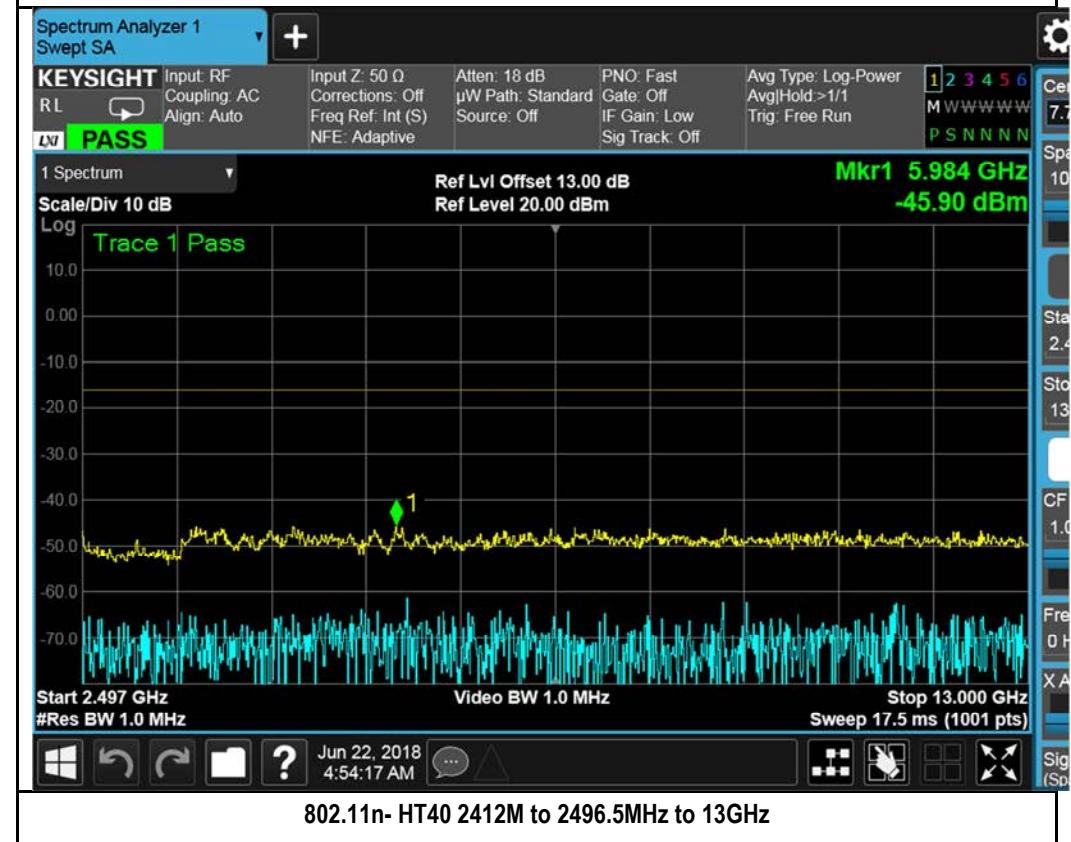


802.11n- HT20 2472M 2387MHz to 2496.5MHz

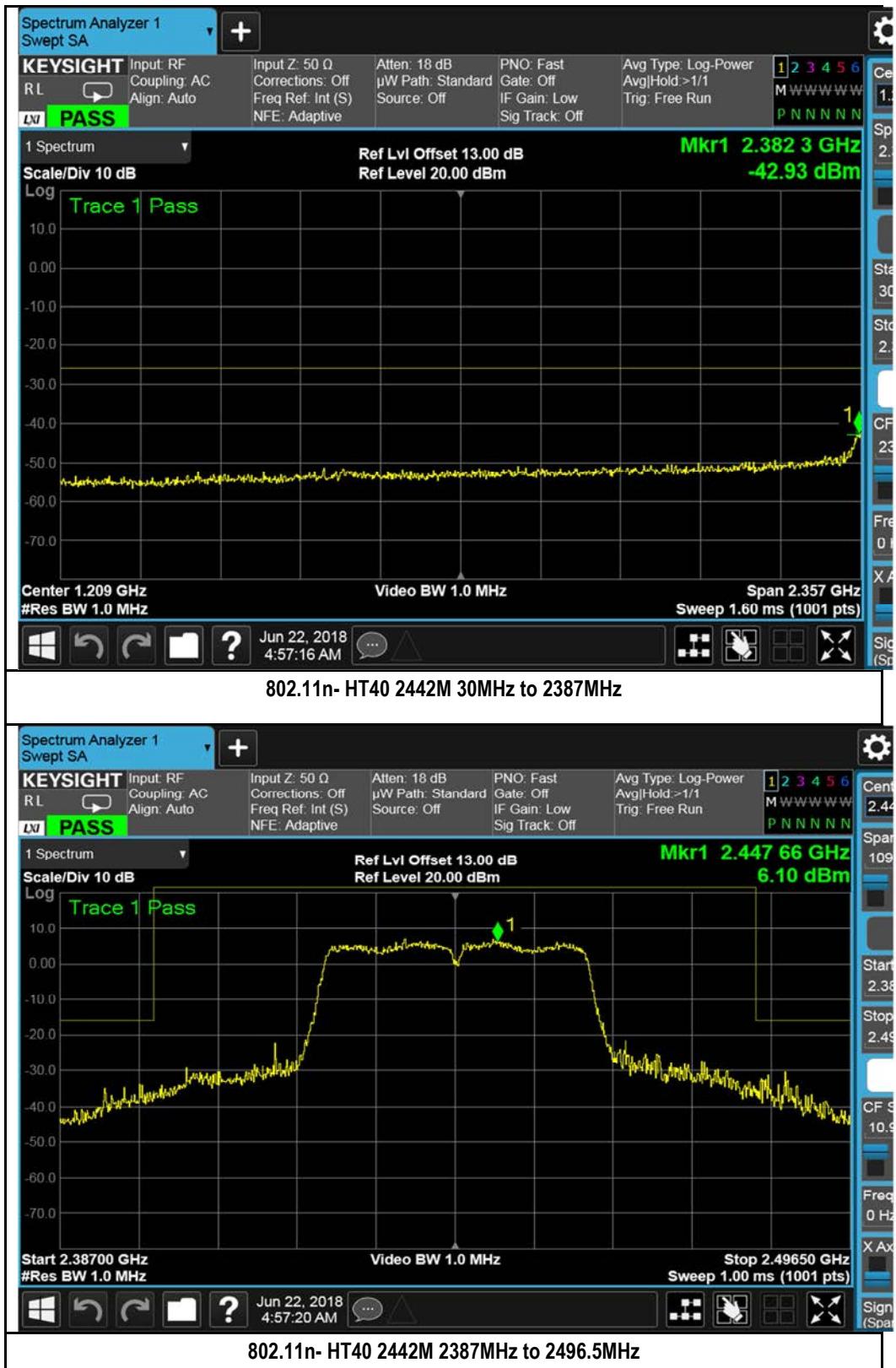


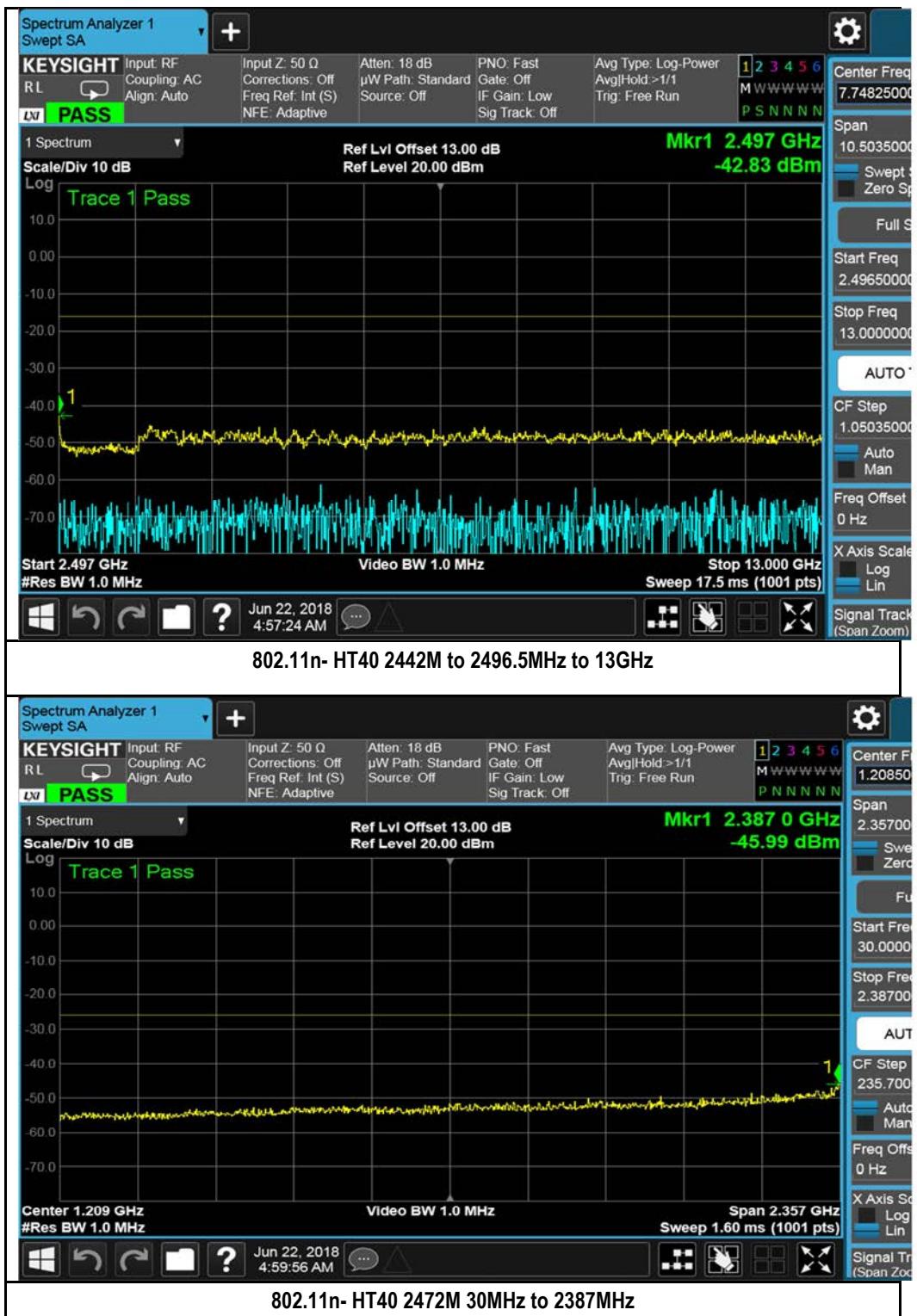


802.11n- HT40 2412M 2387MHz to 2496.5MHz

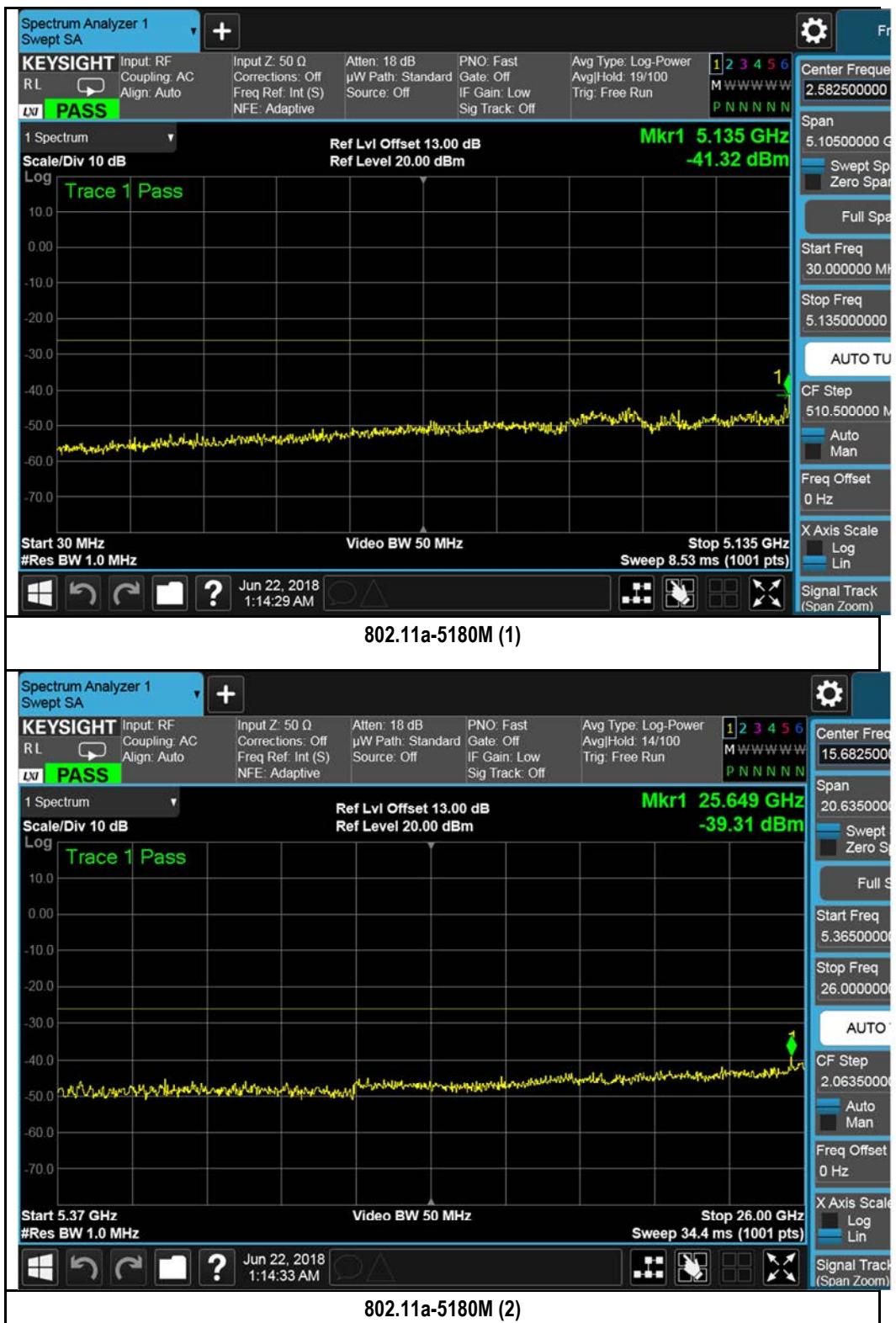


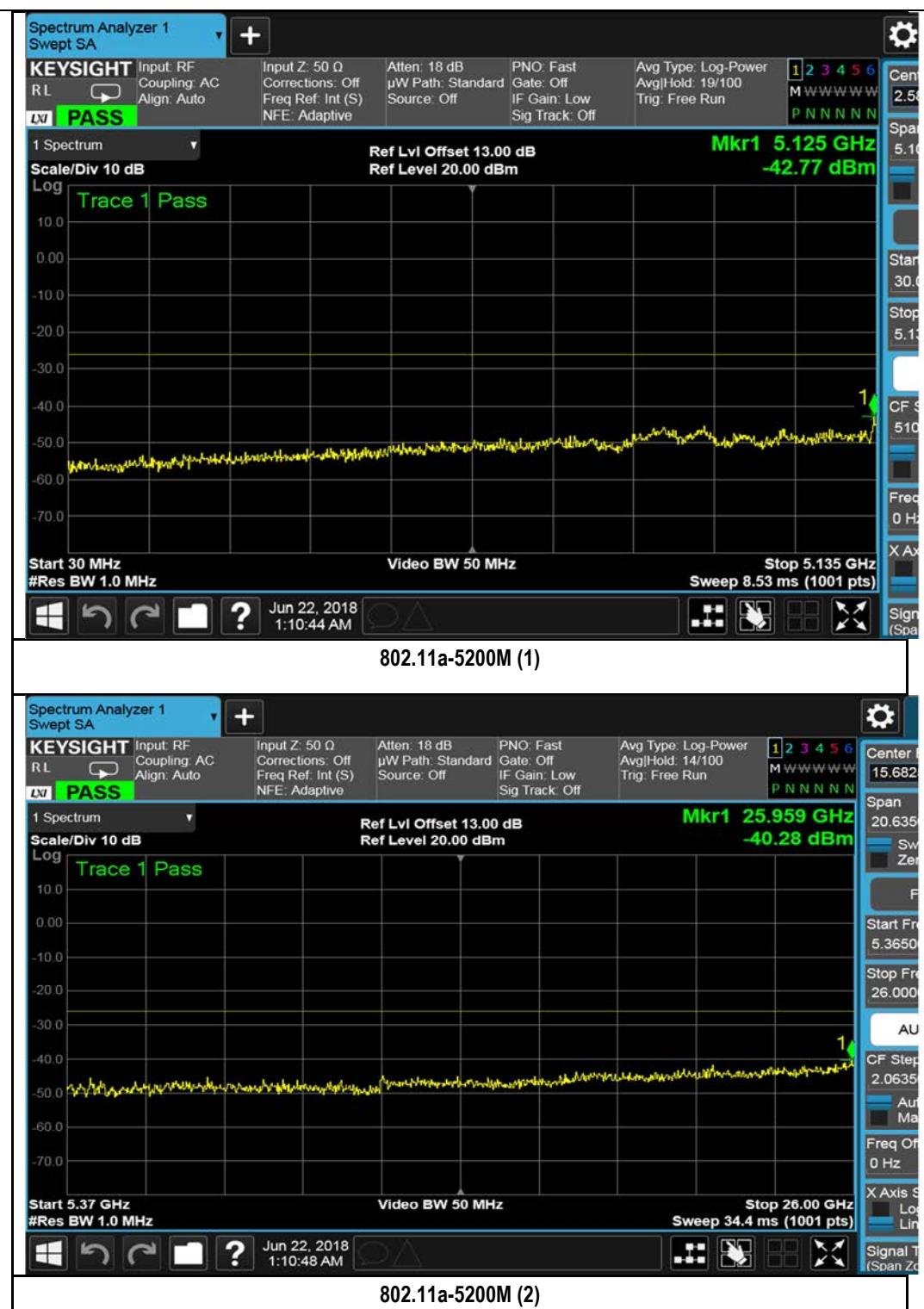
802.11n- HT40 2412M to 2496.5MHz to 13GHz

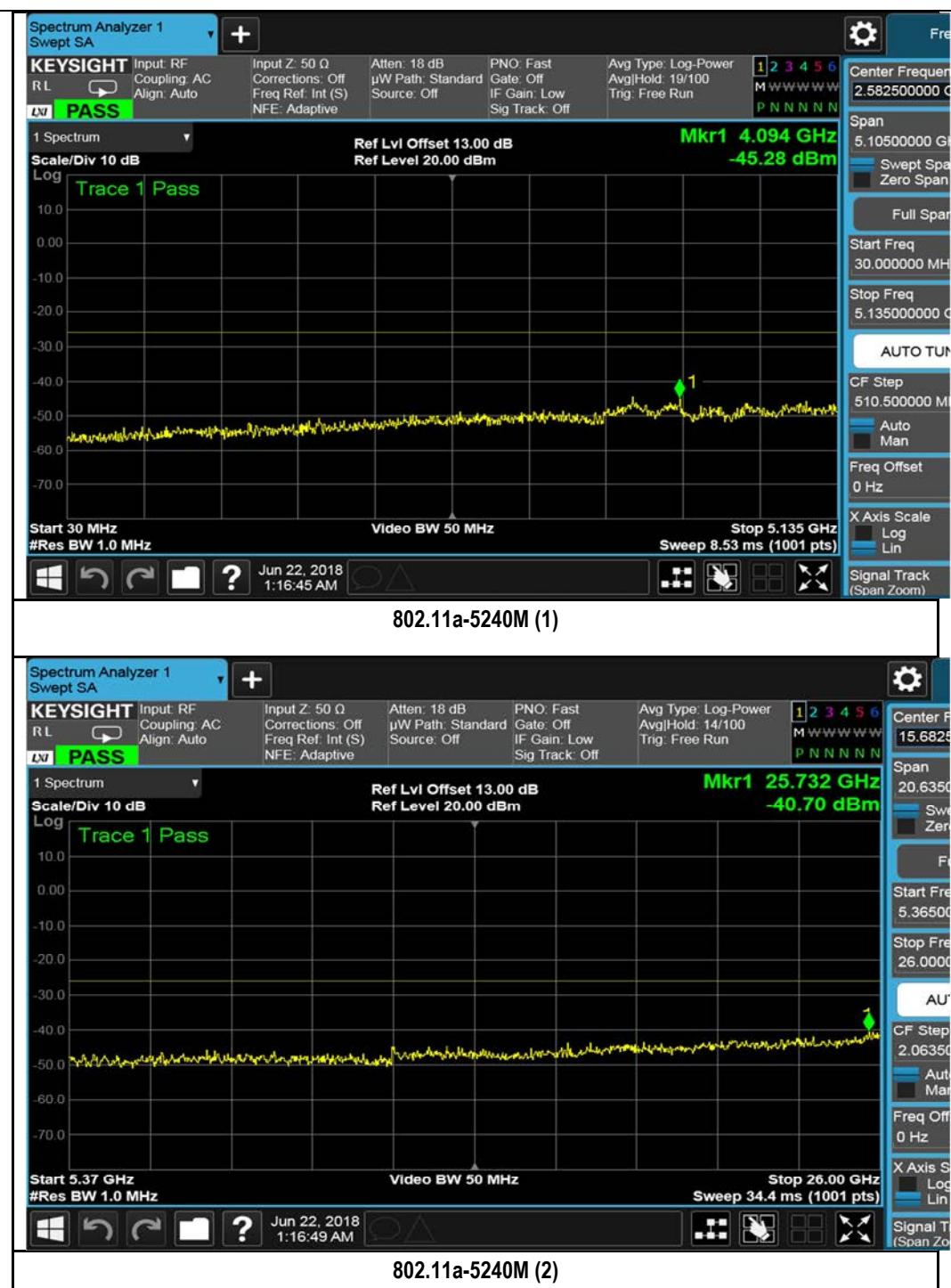


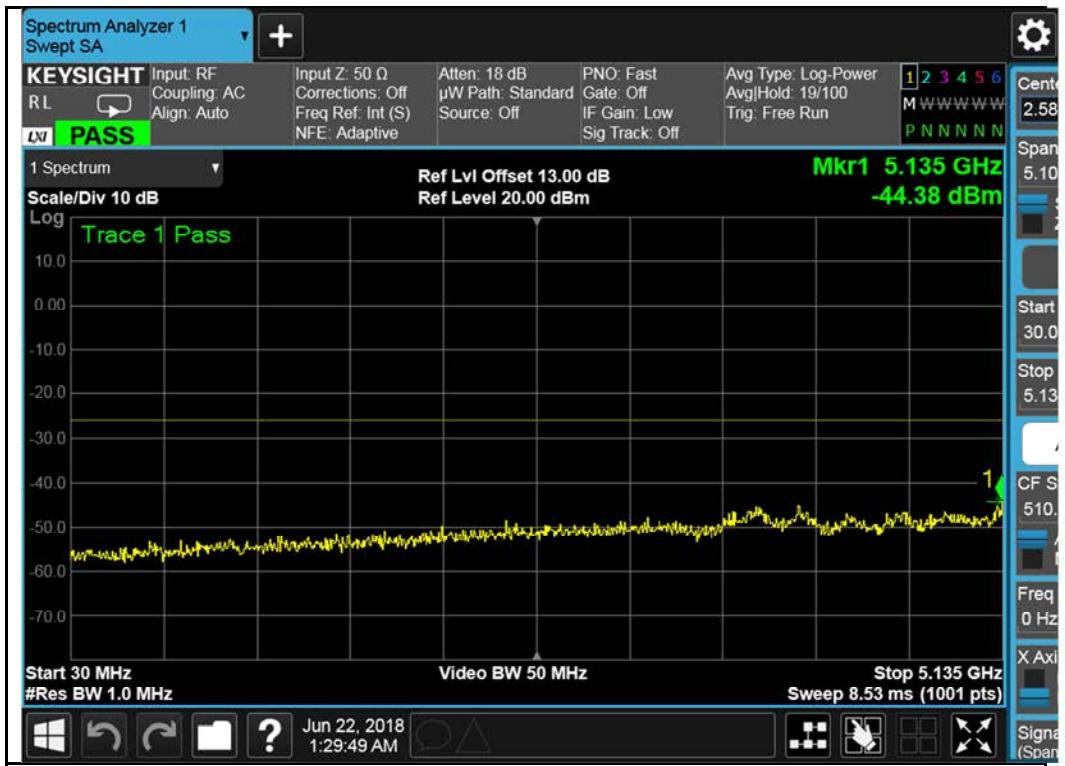
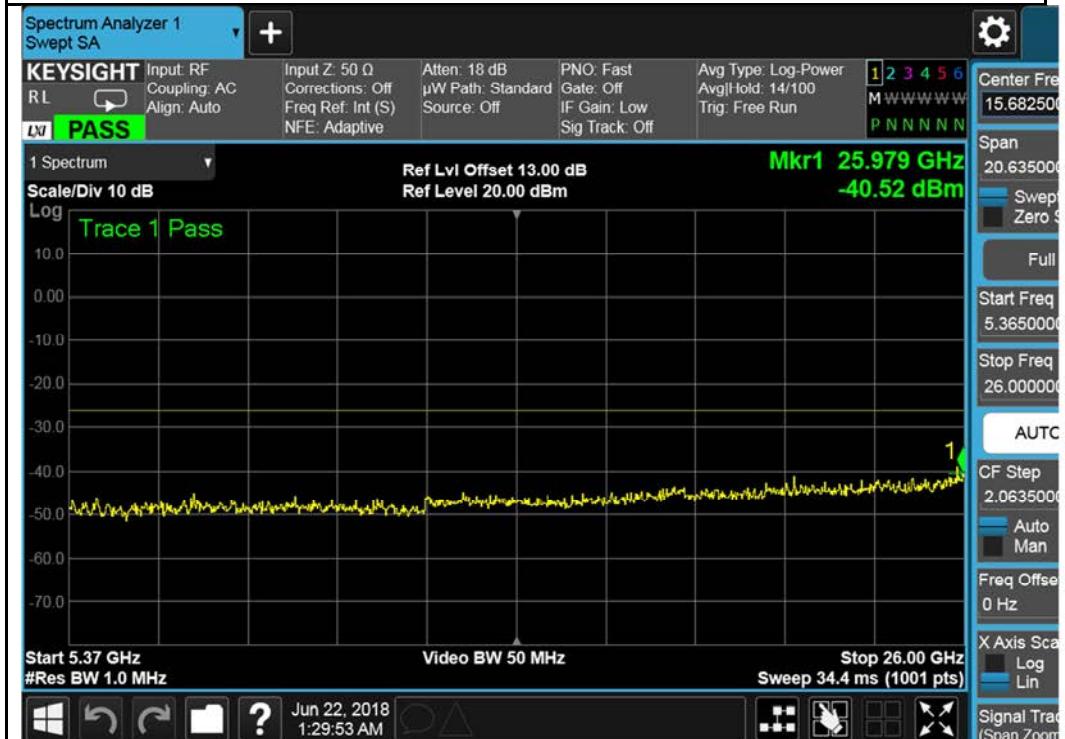


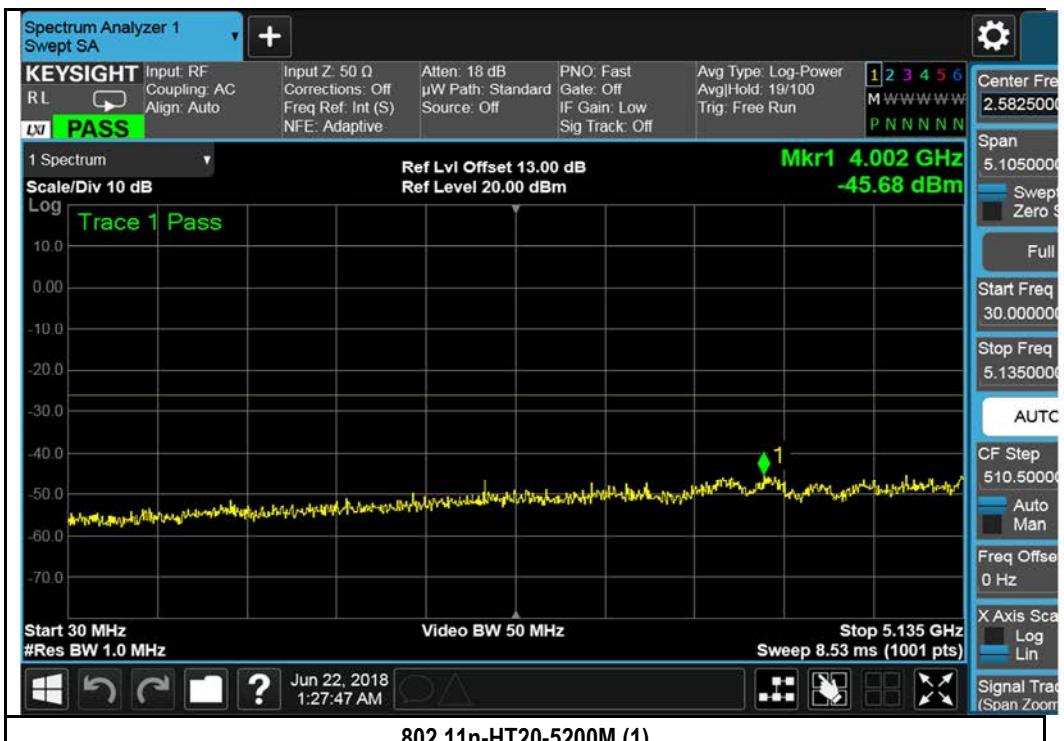




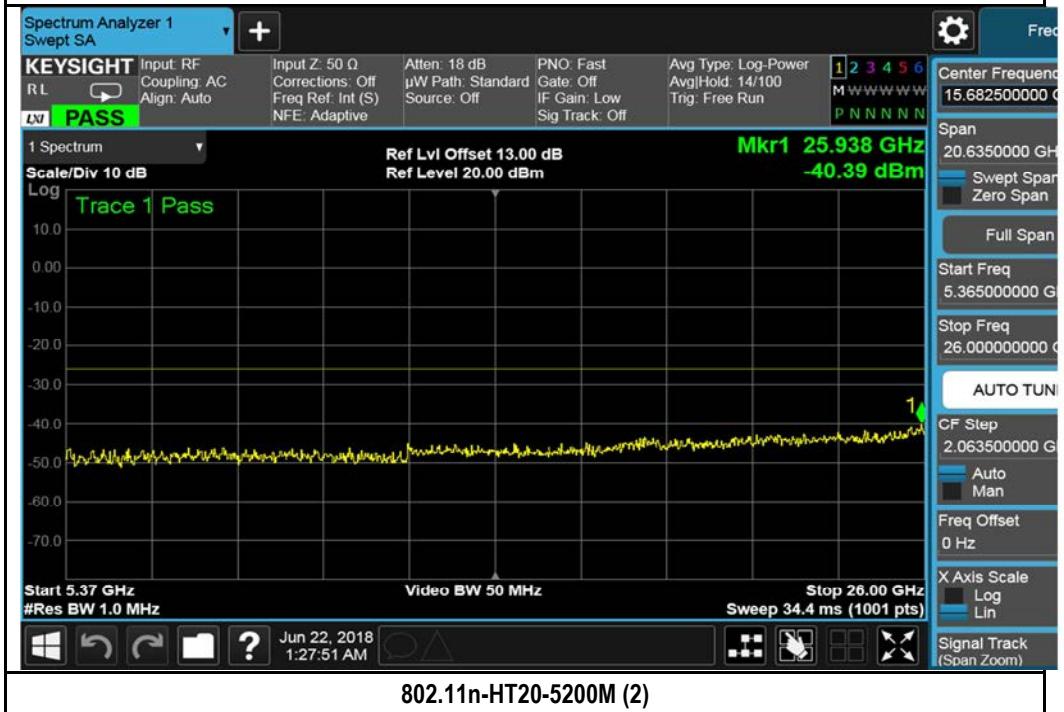




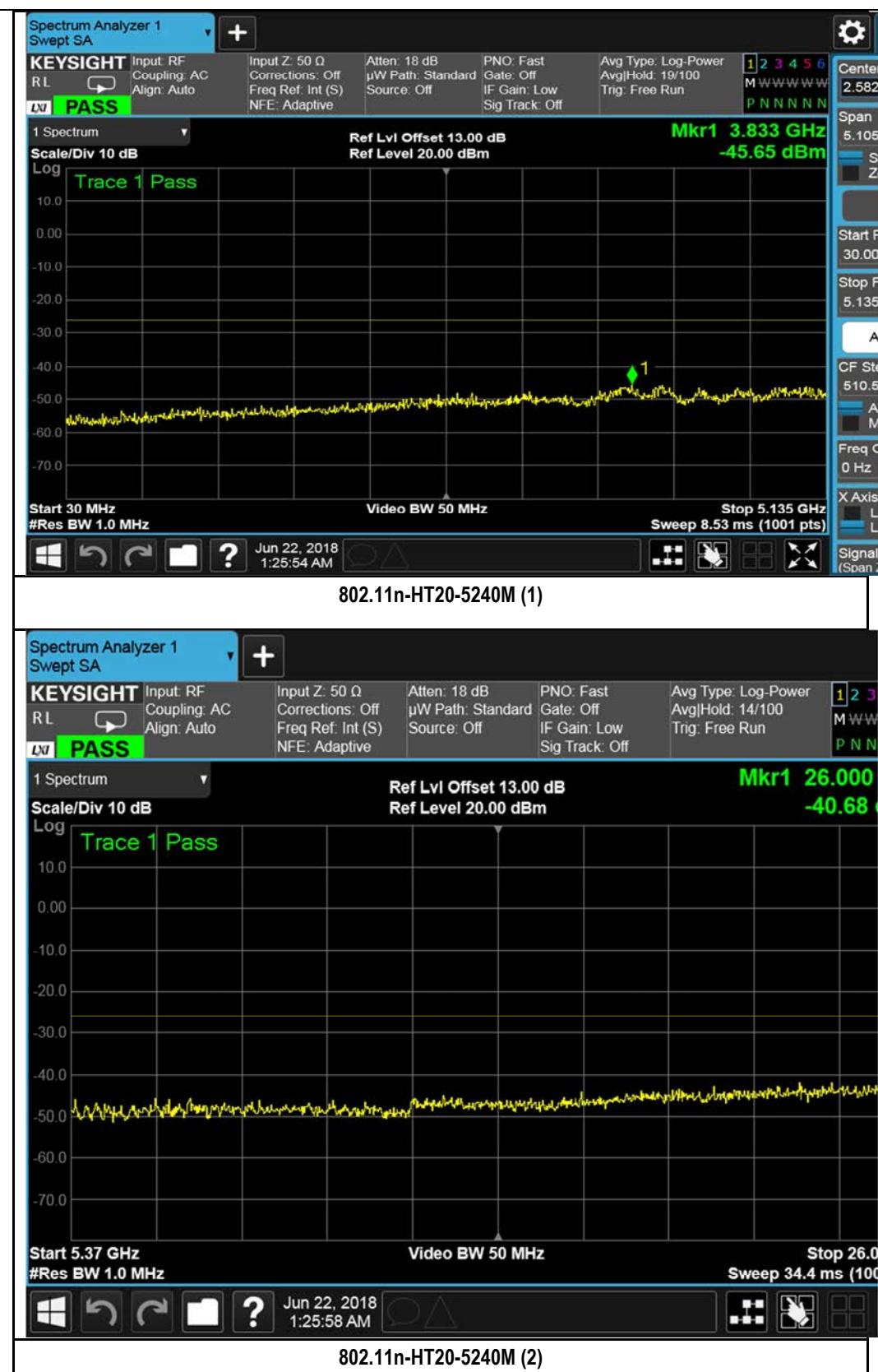

802.11n-HT20-5180M (1)

802.11n-HT20-5180M (2)

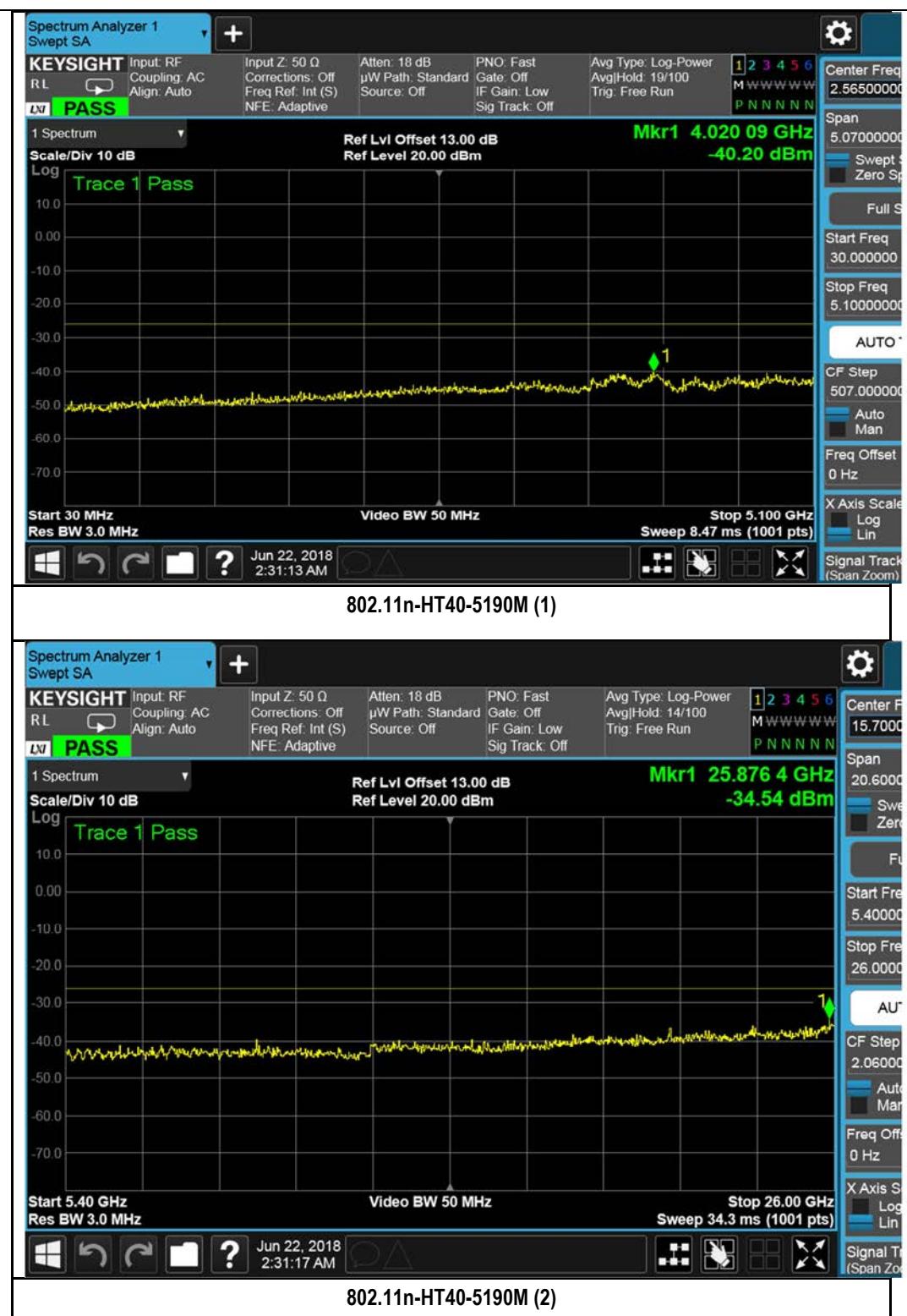


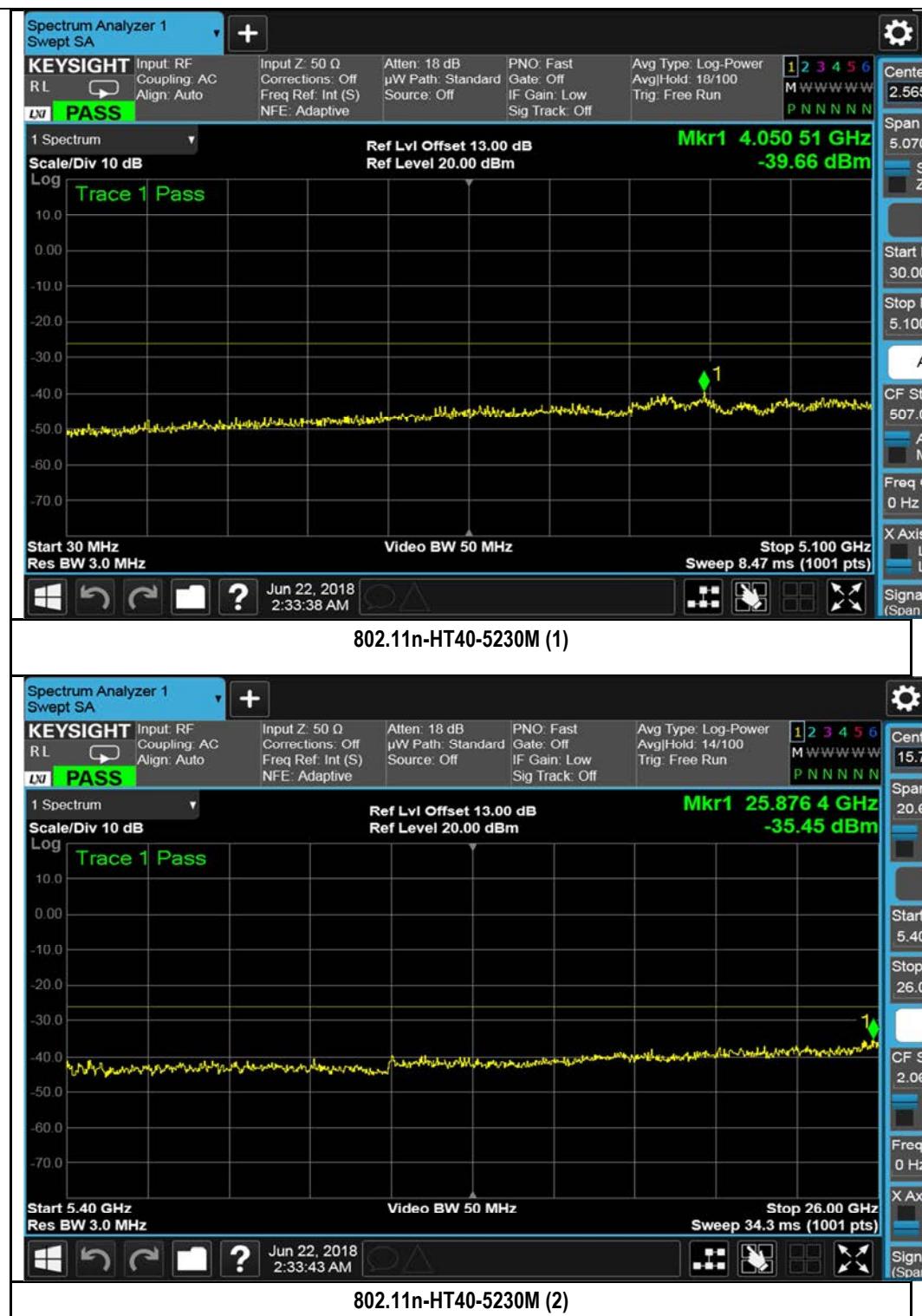
802.11n-HT20-5200M (1)



802.11n-HT20-5200M (2)

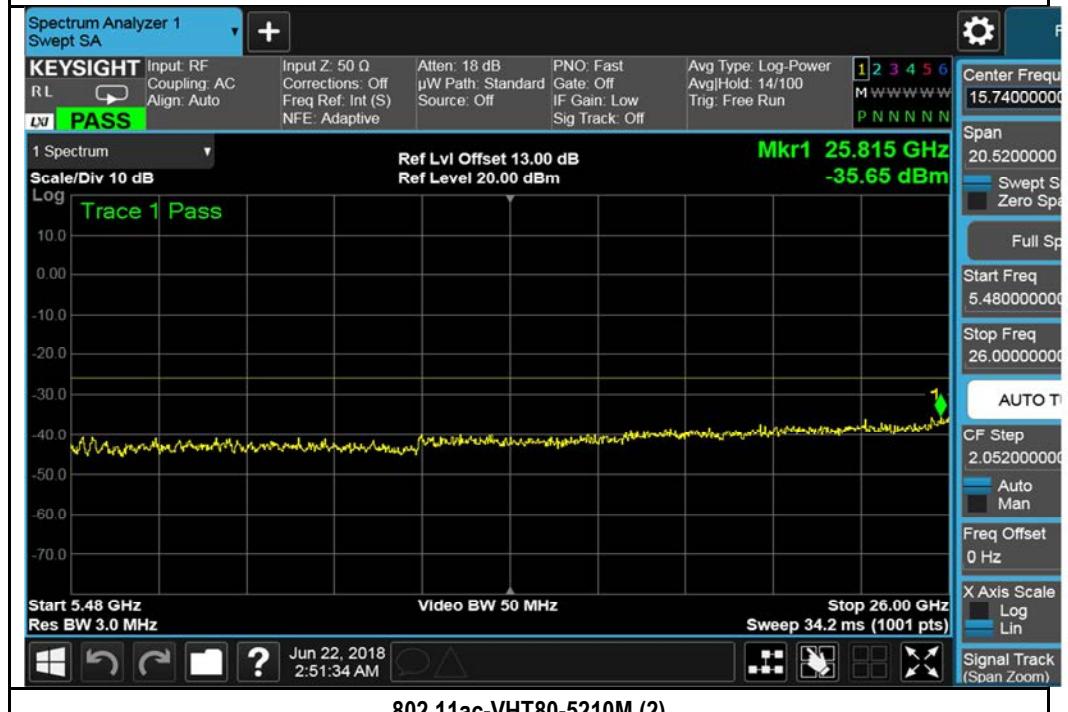




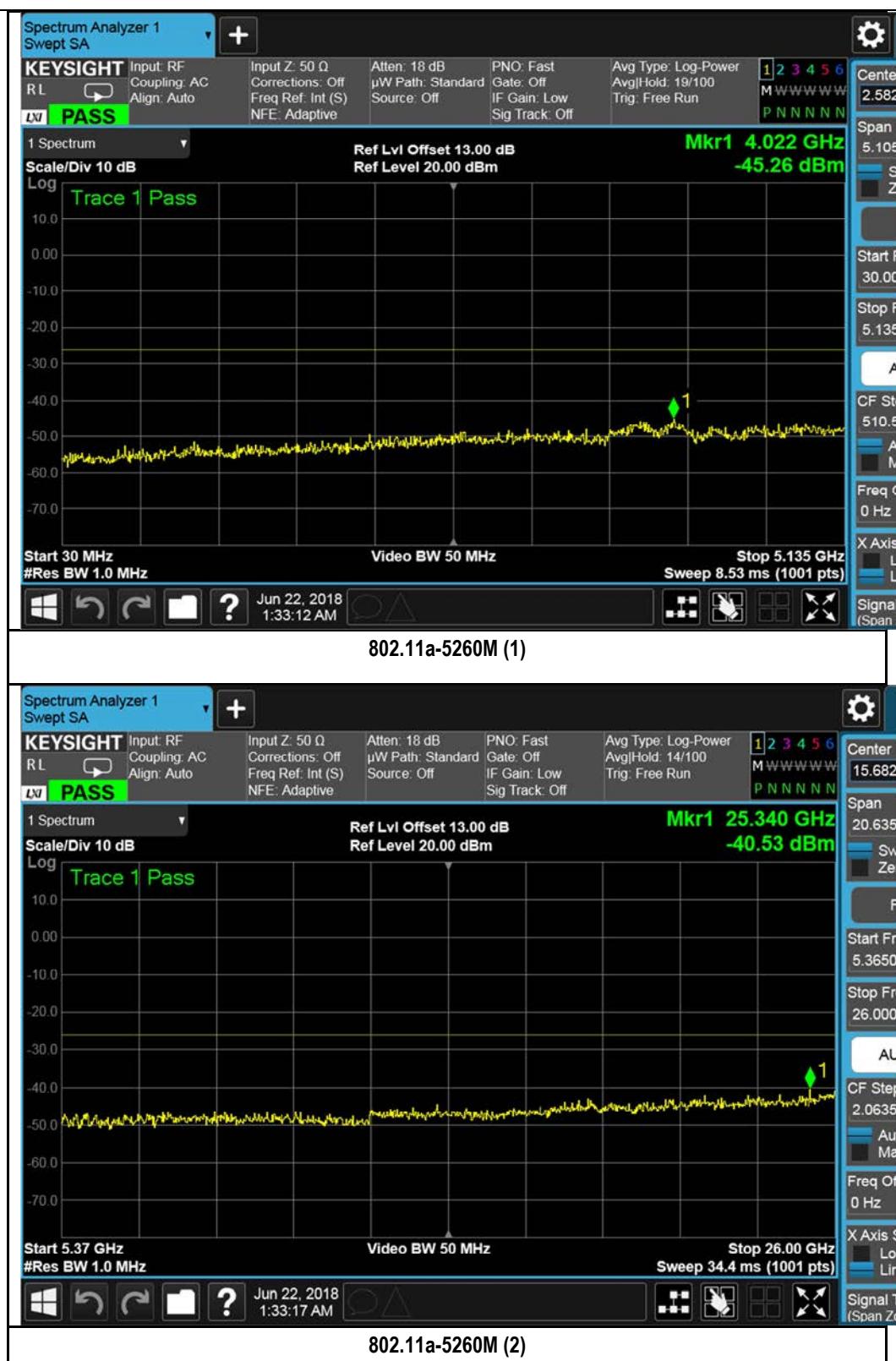


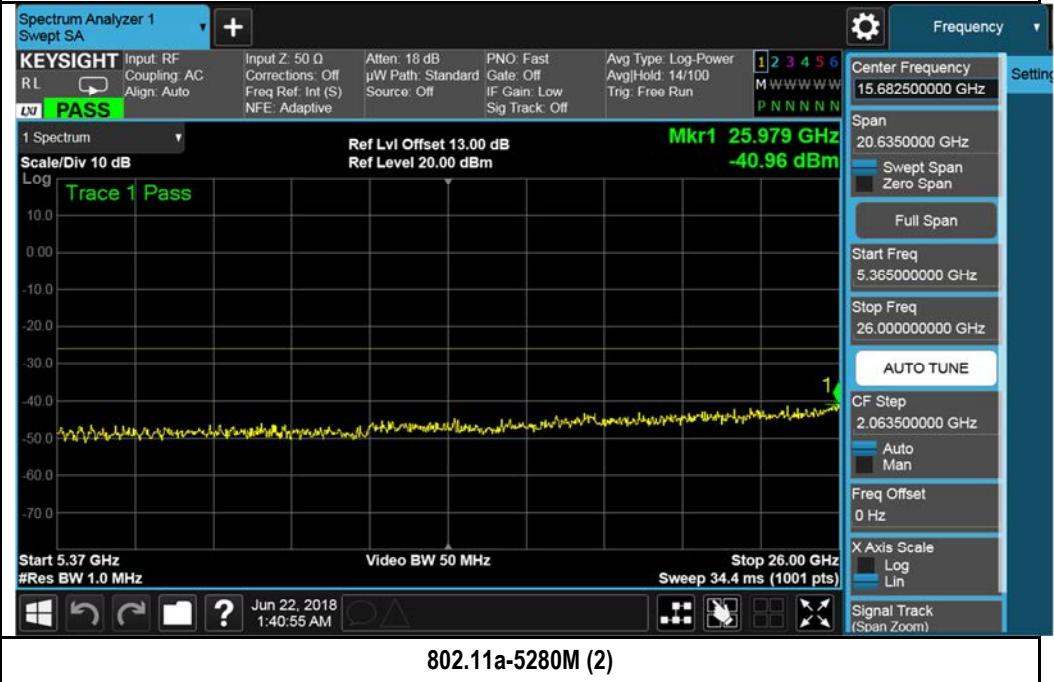
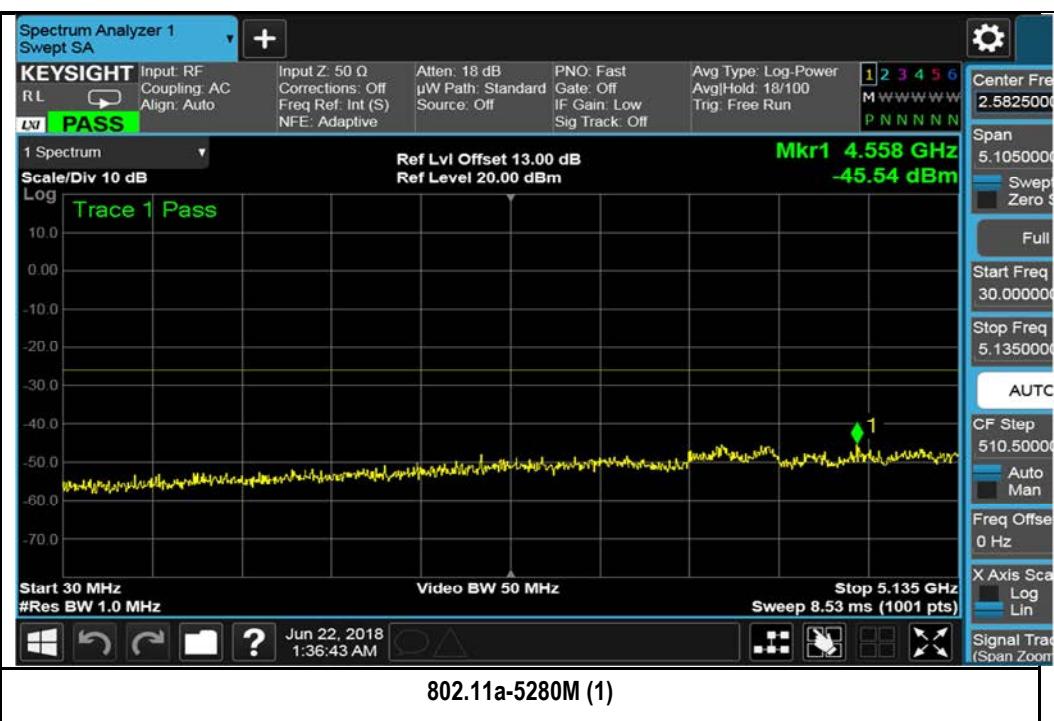


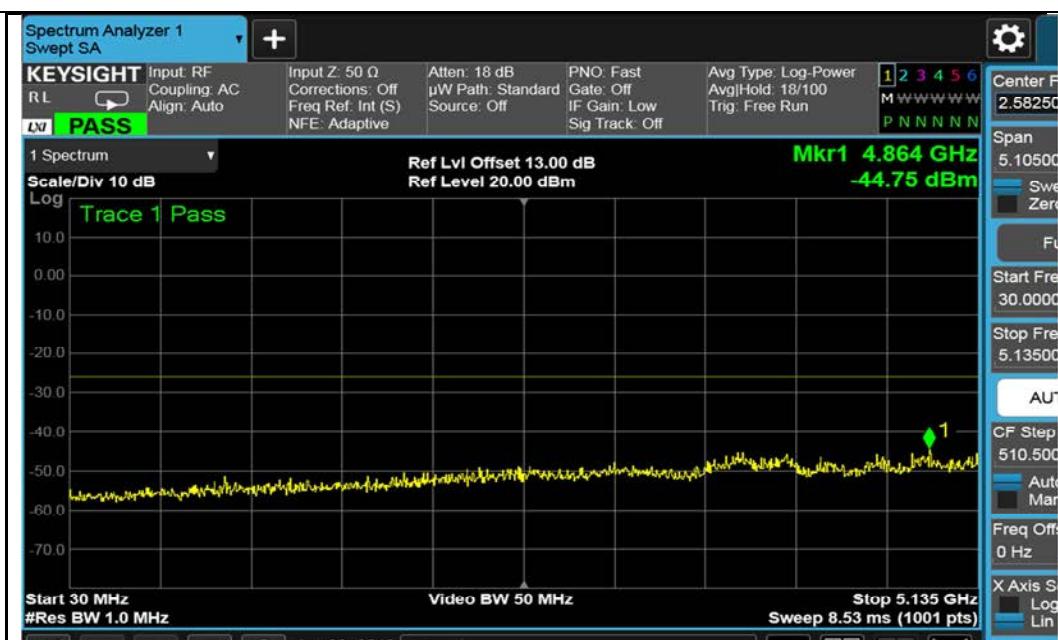
802.11ac-VHT80-5210M (1)



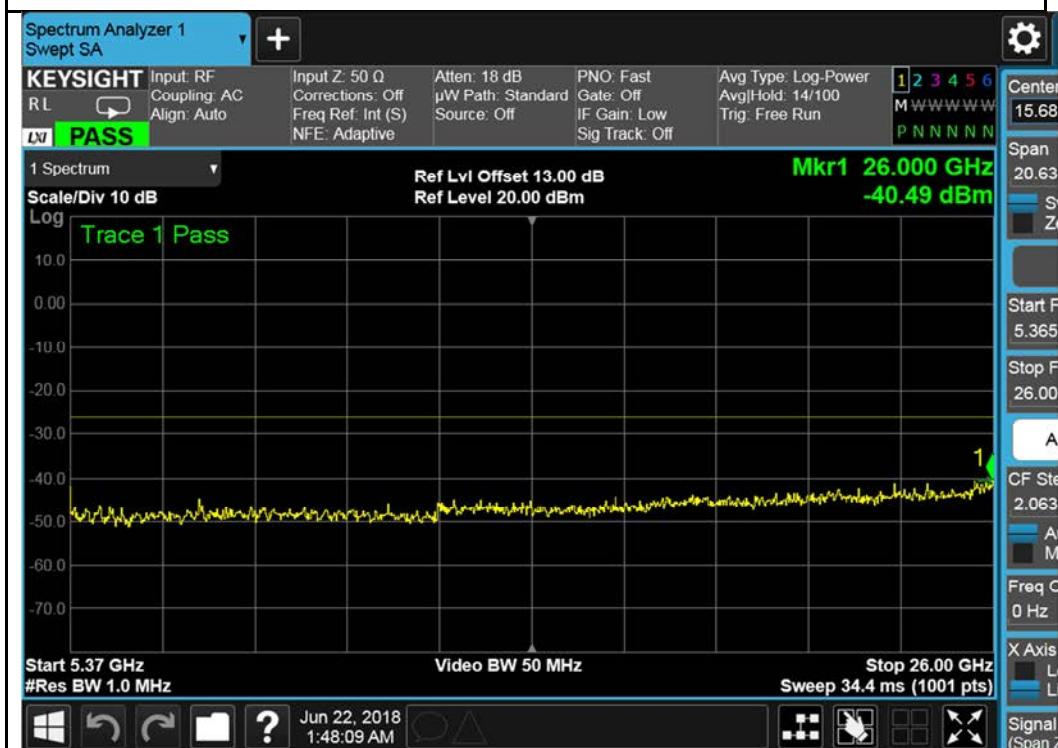
802.11ac-VHT80-5210M (2)



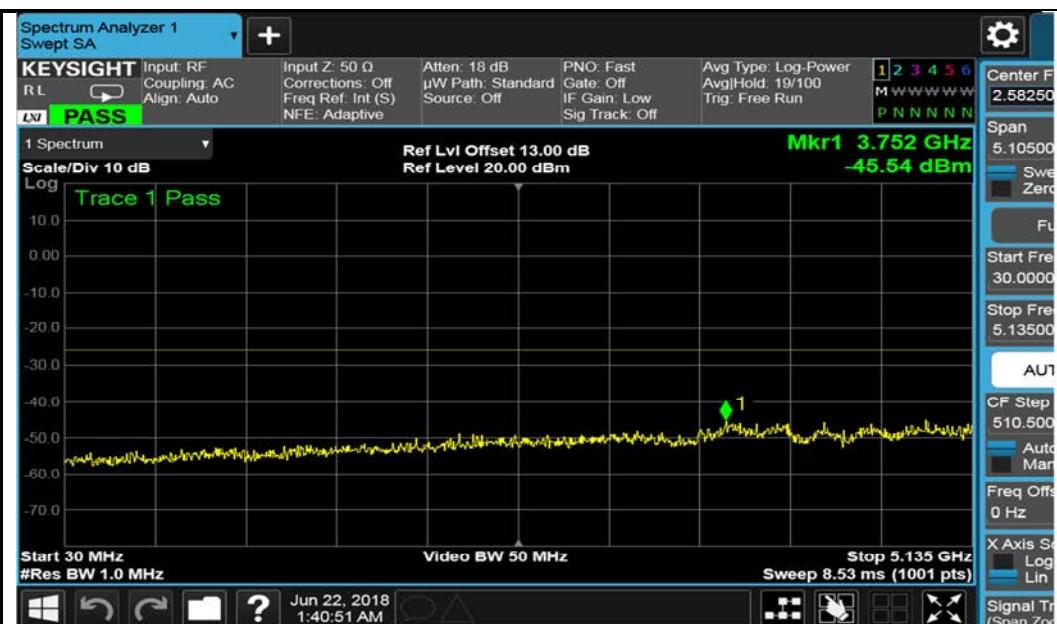
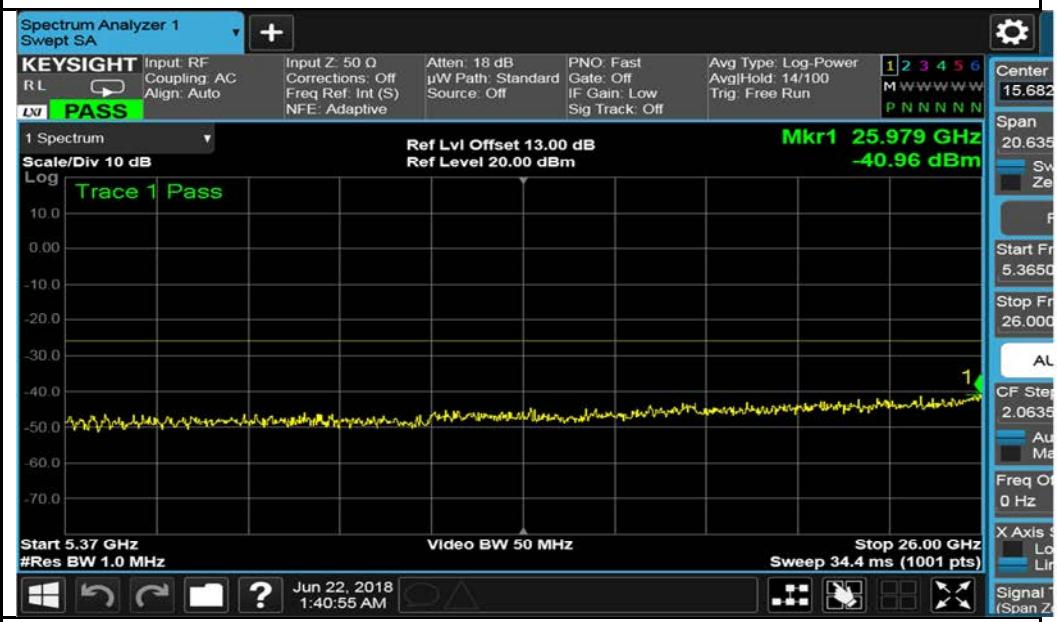


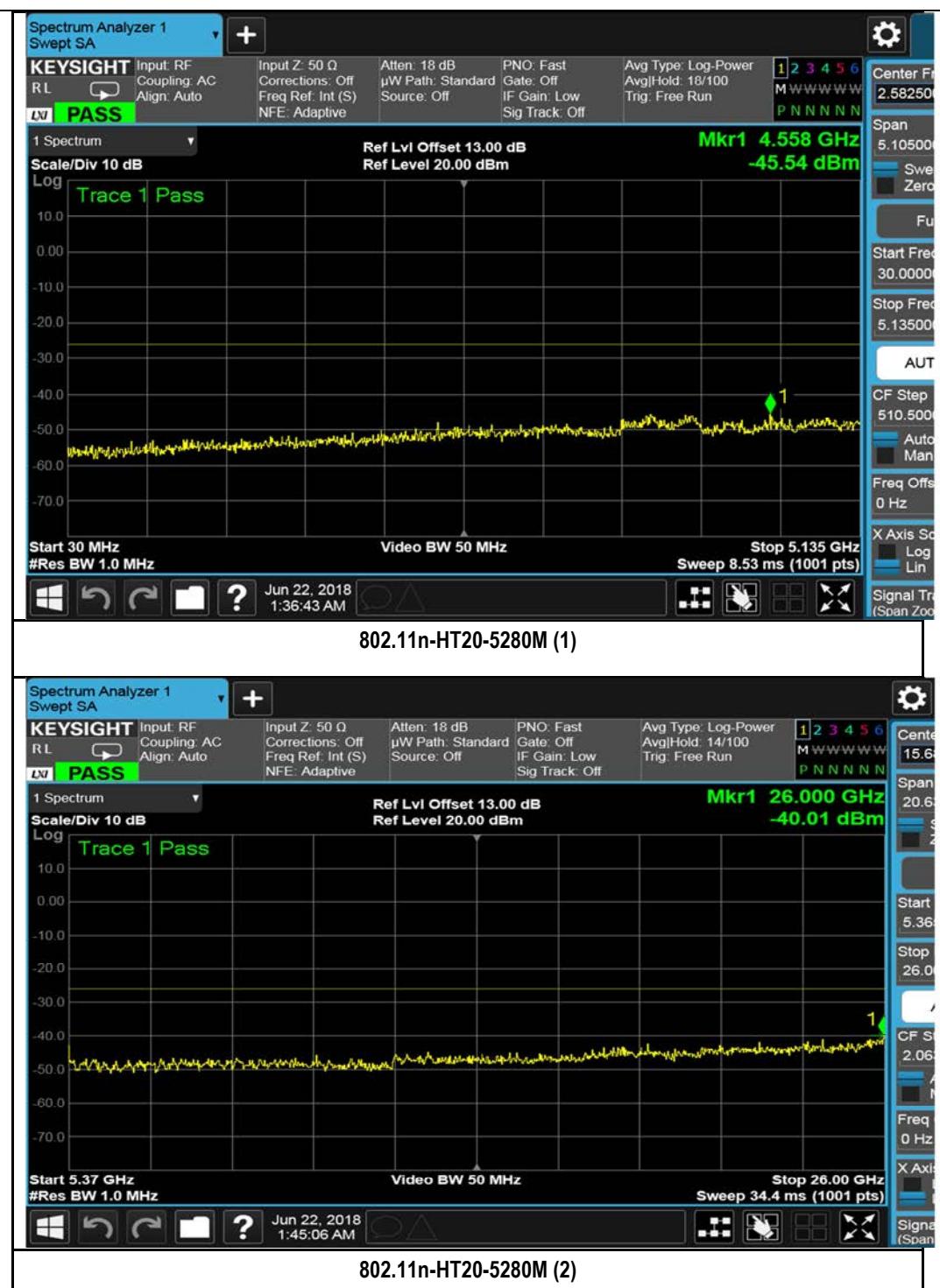


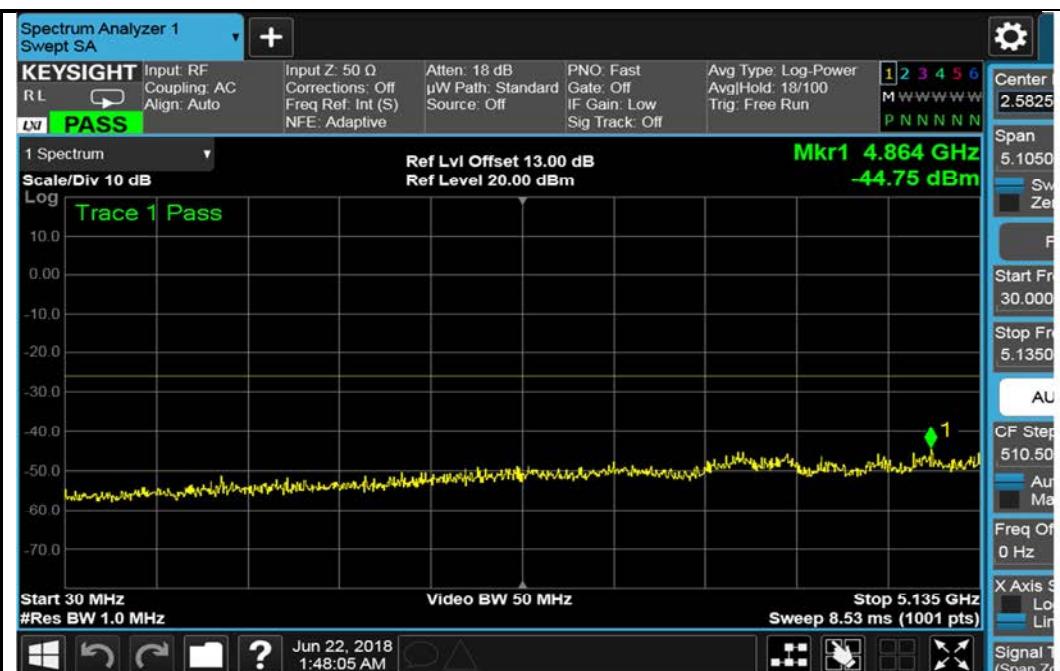
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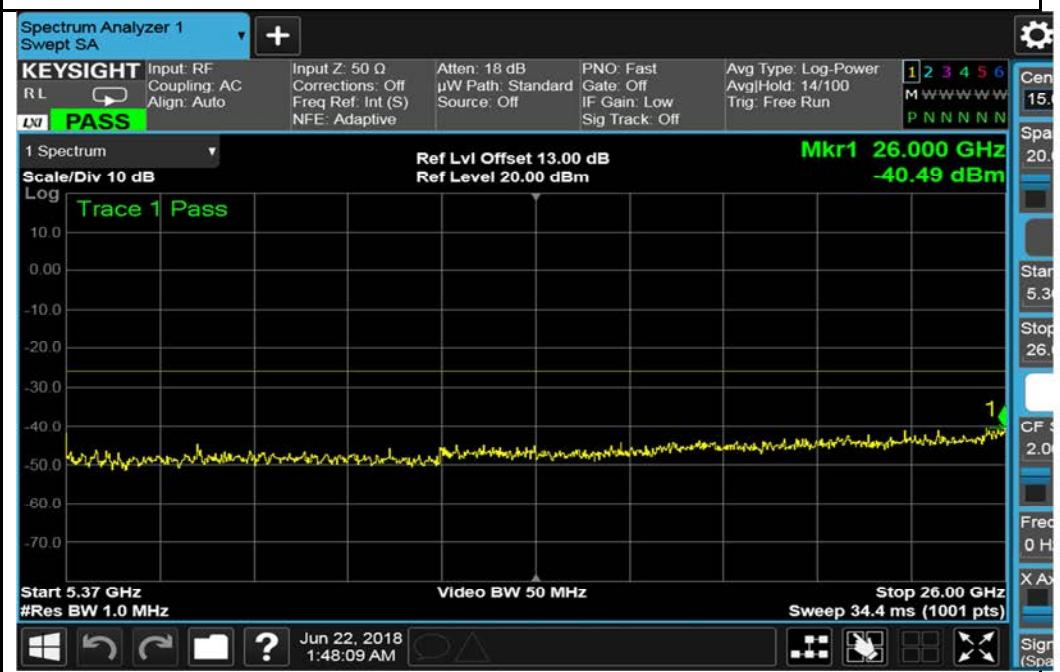
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802.11n-HT20-5260M (1)

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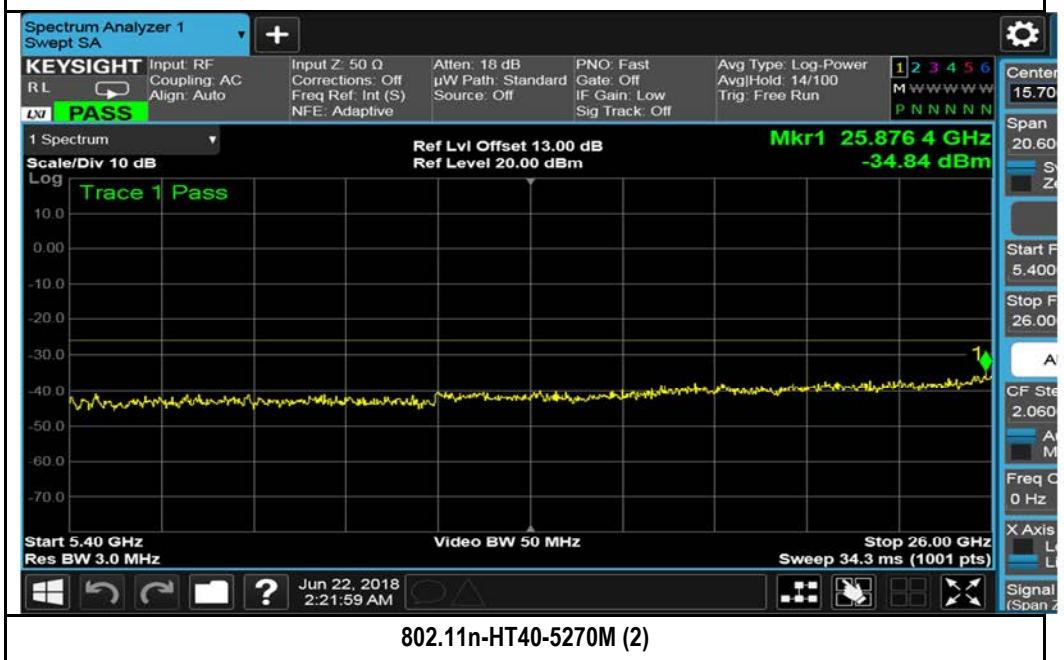
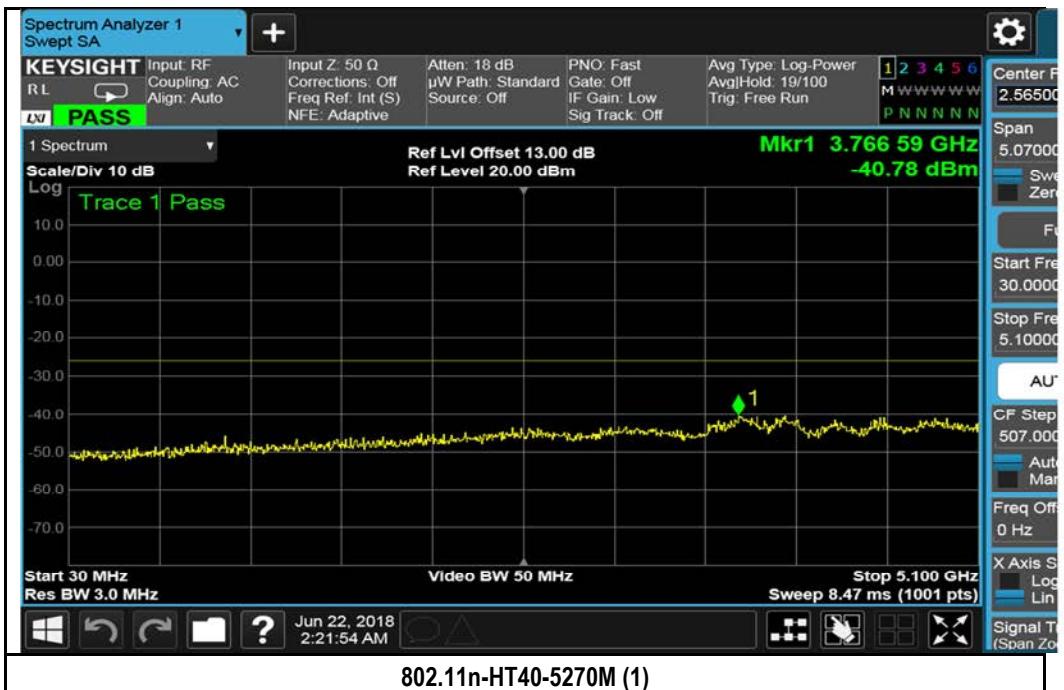


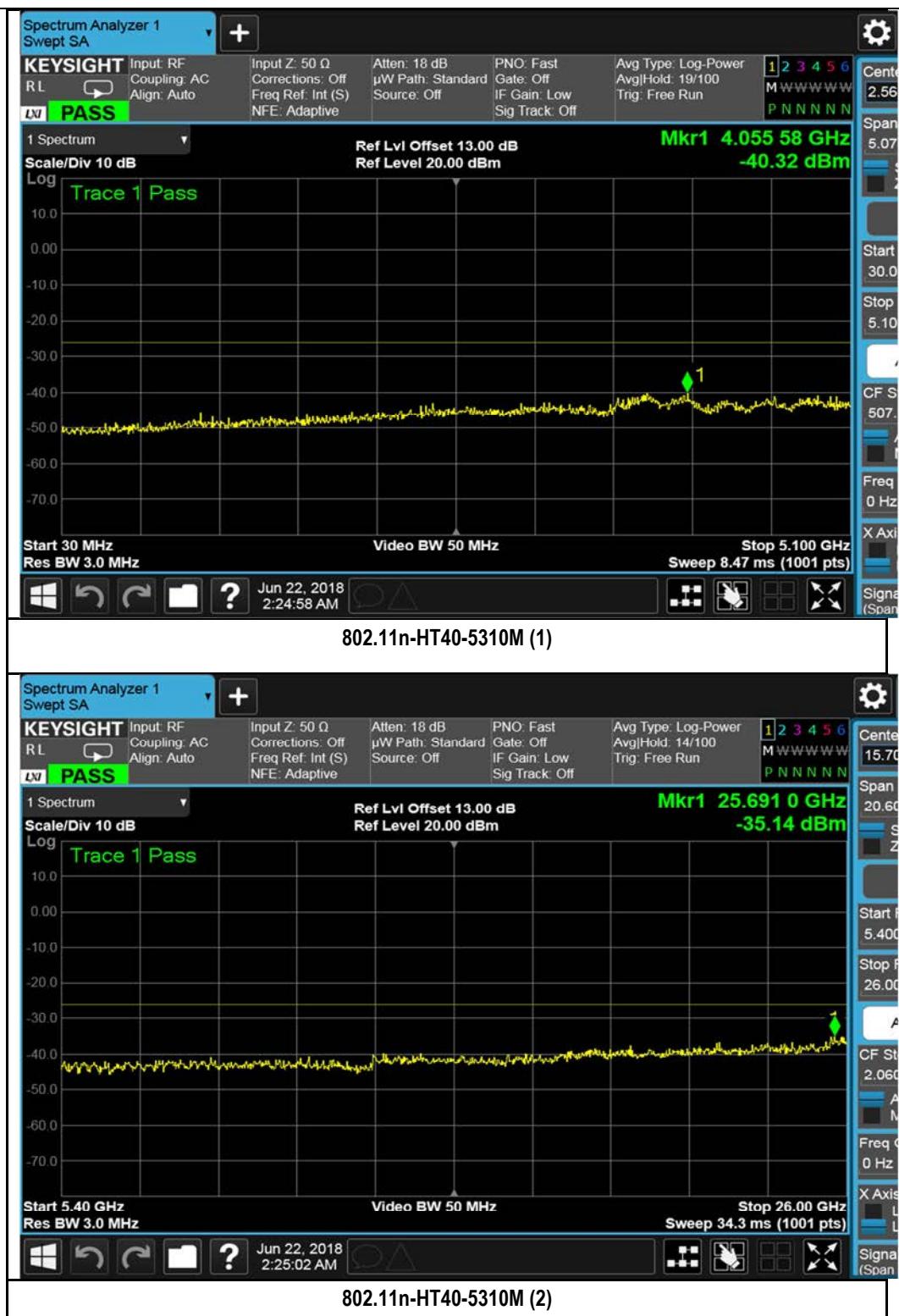


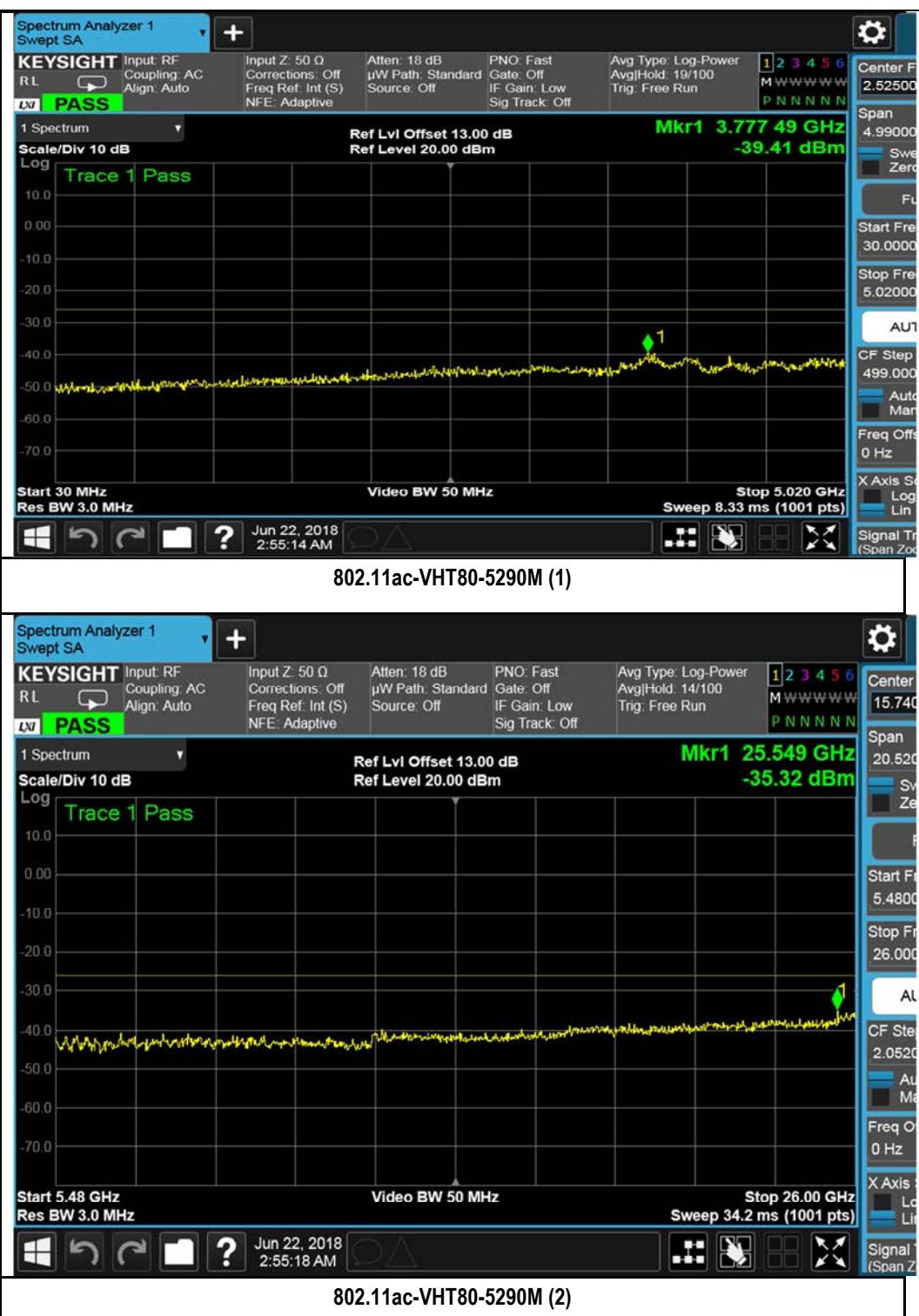
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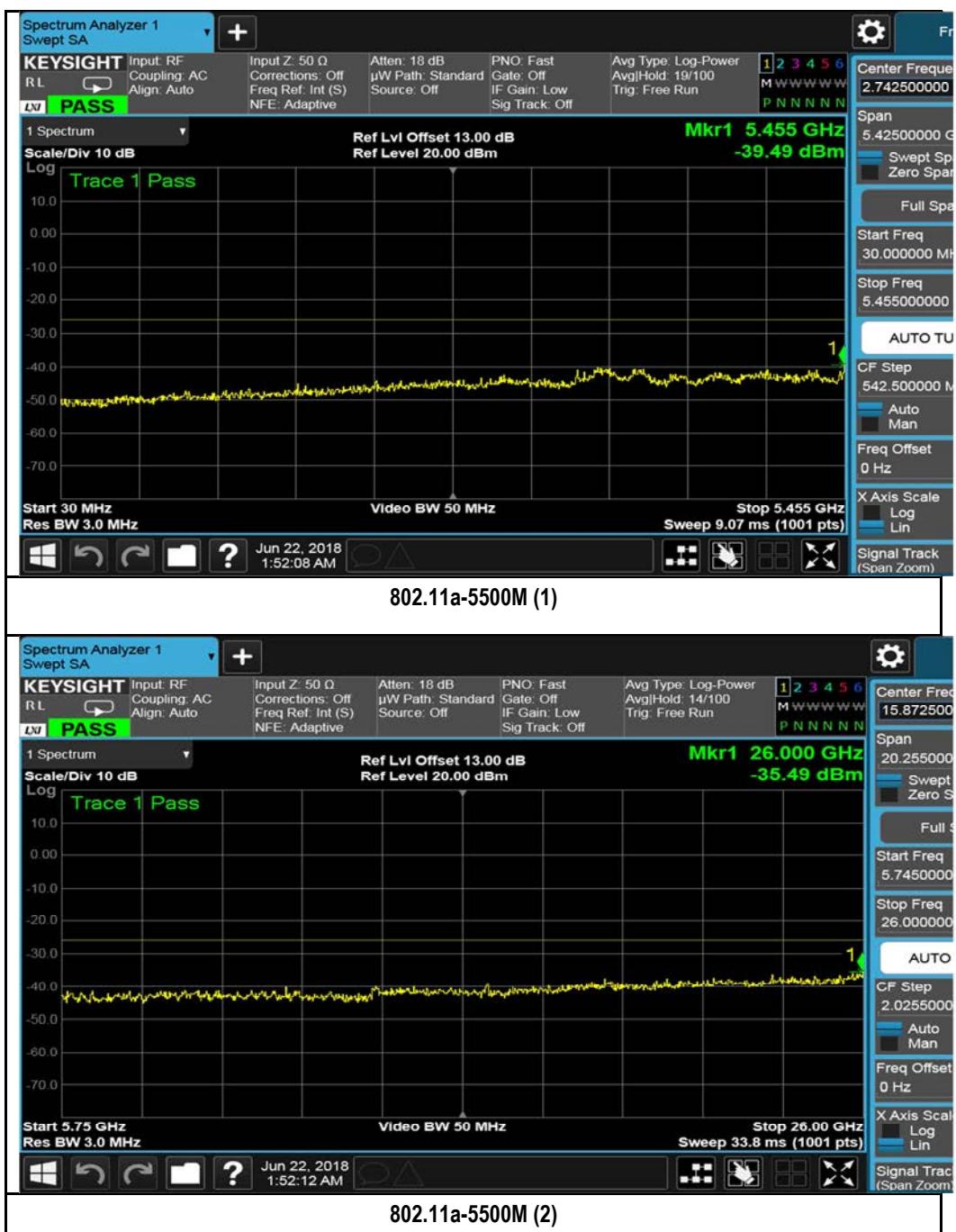
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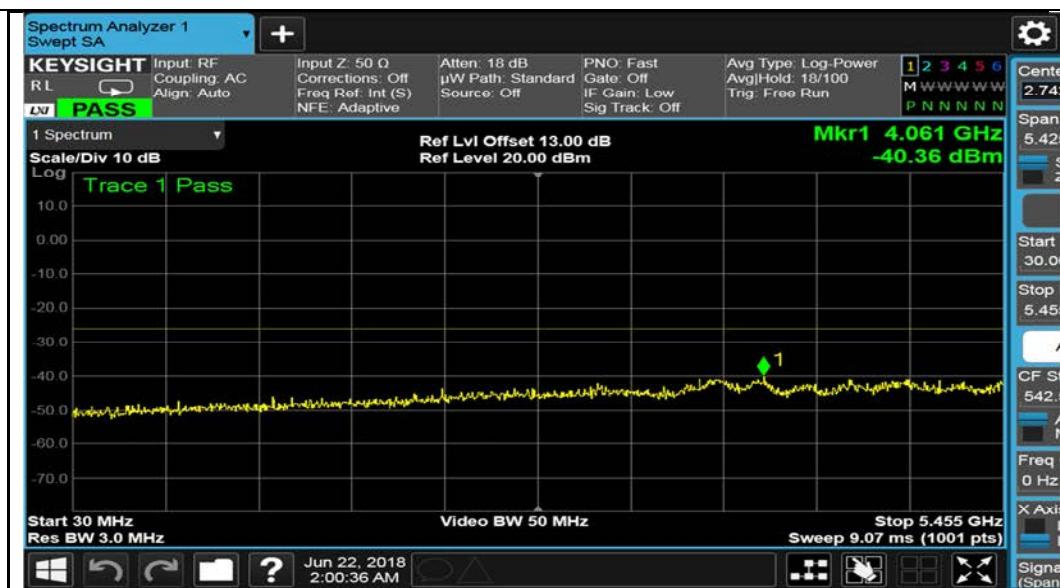




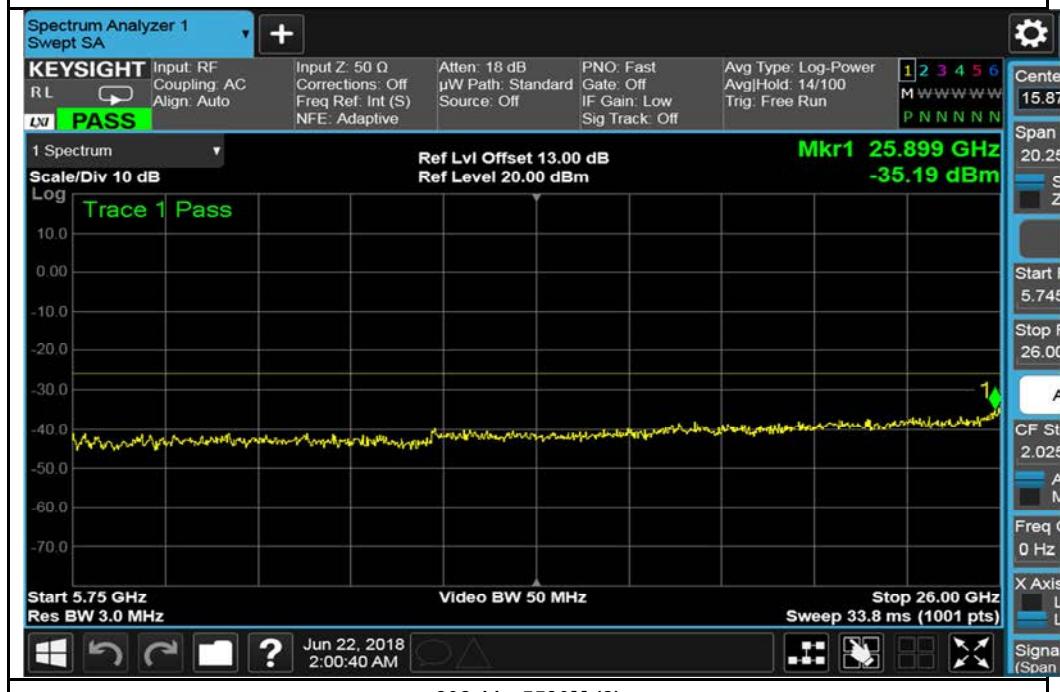


W56:

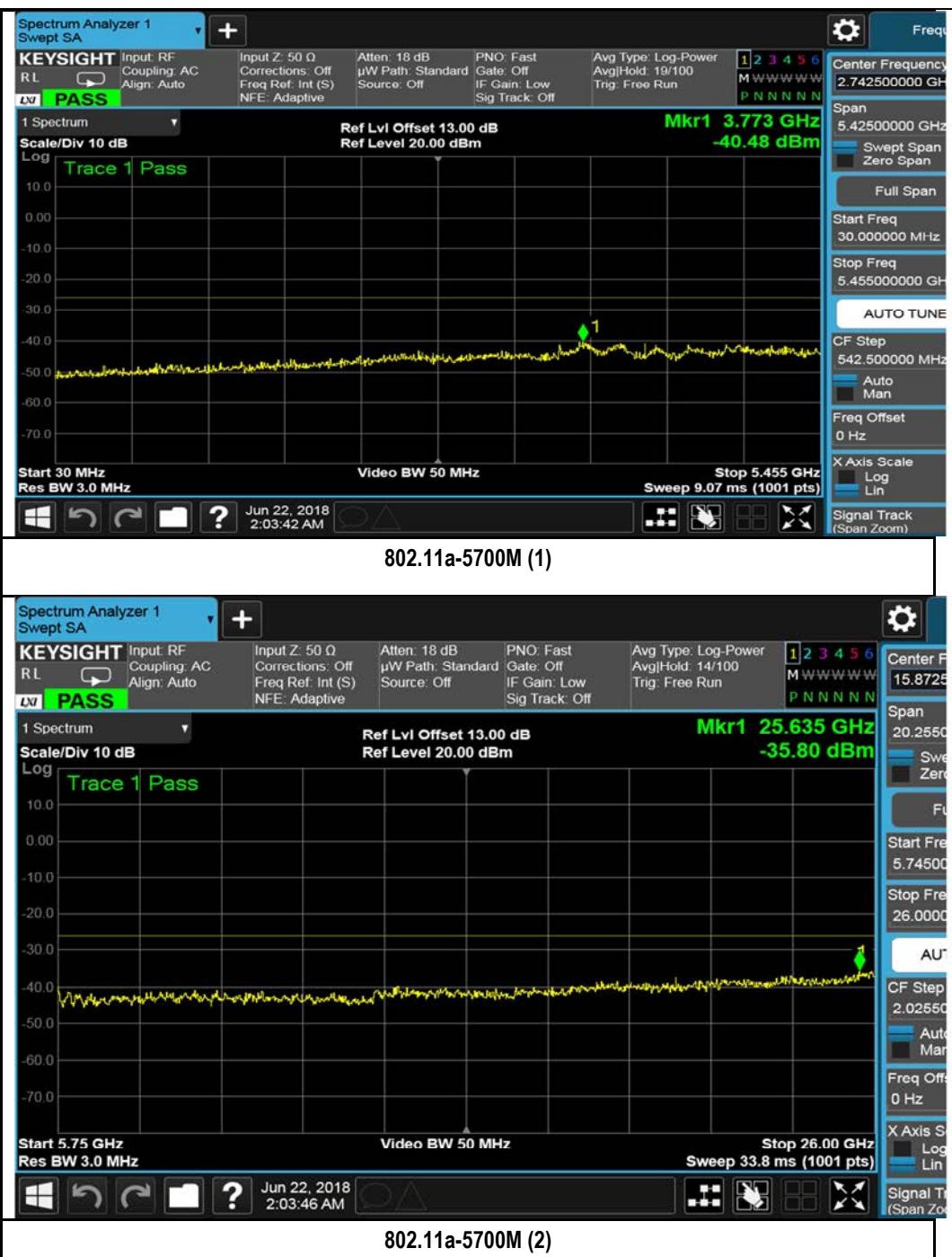


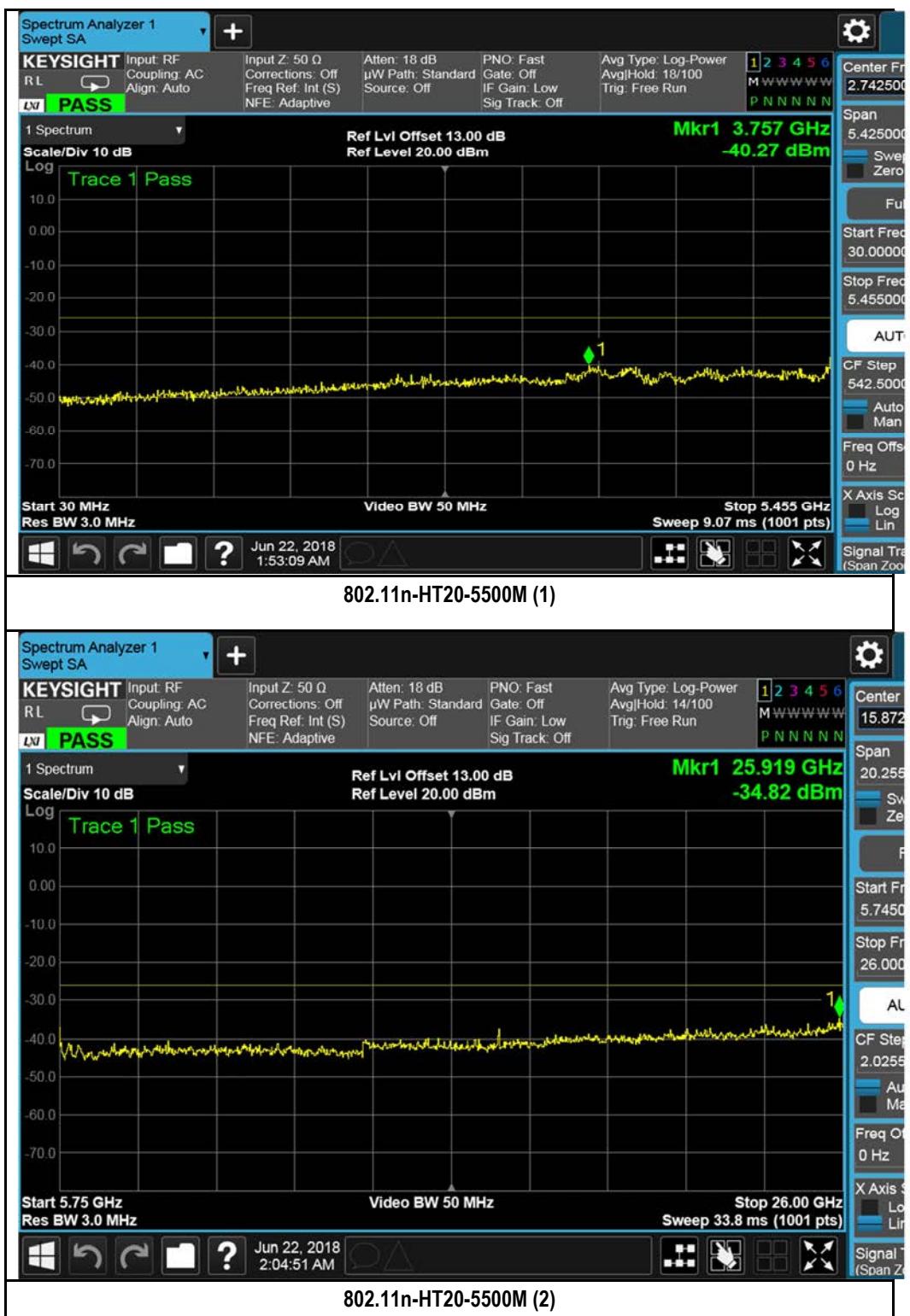


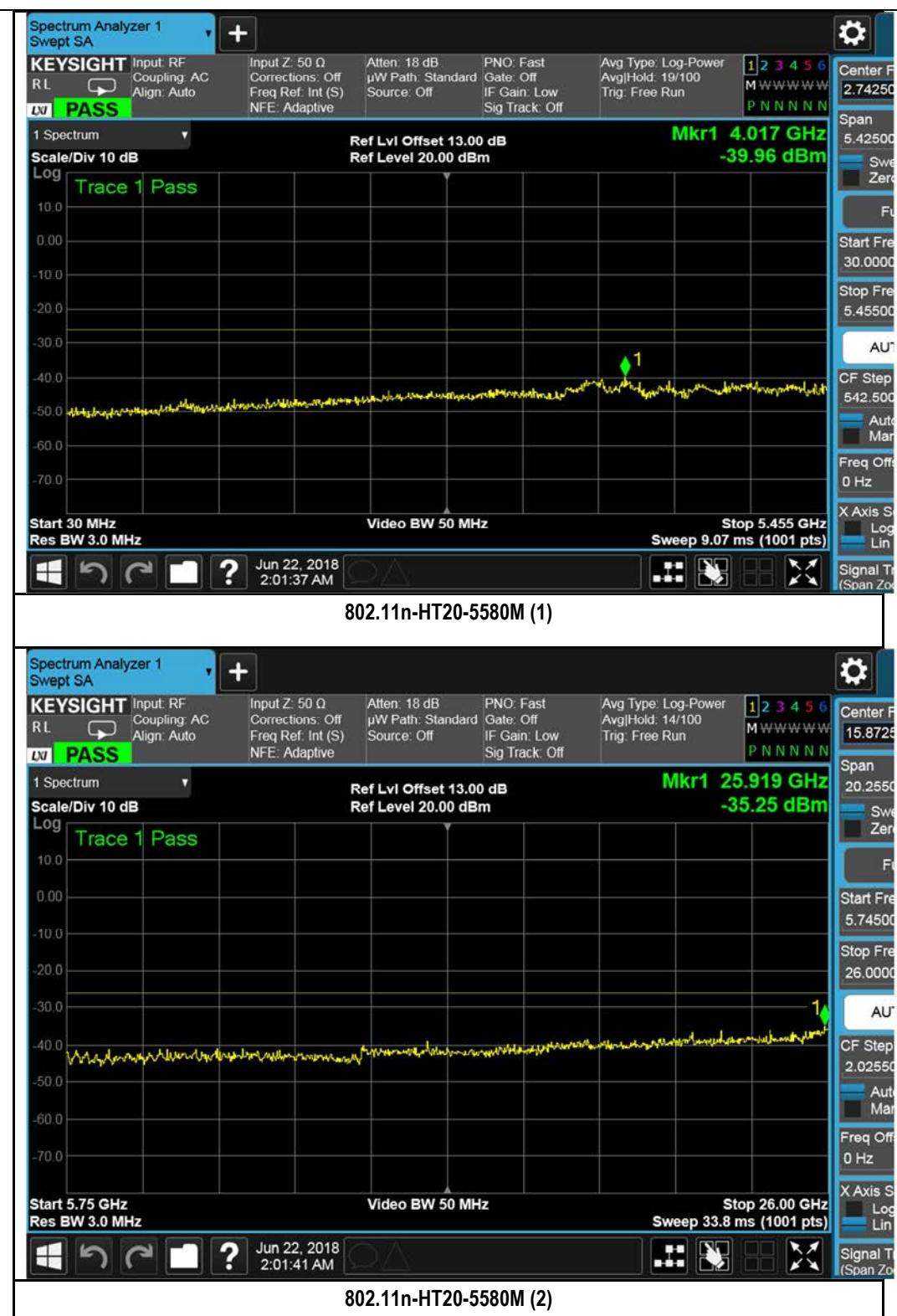
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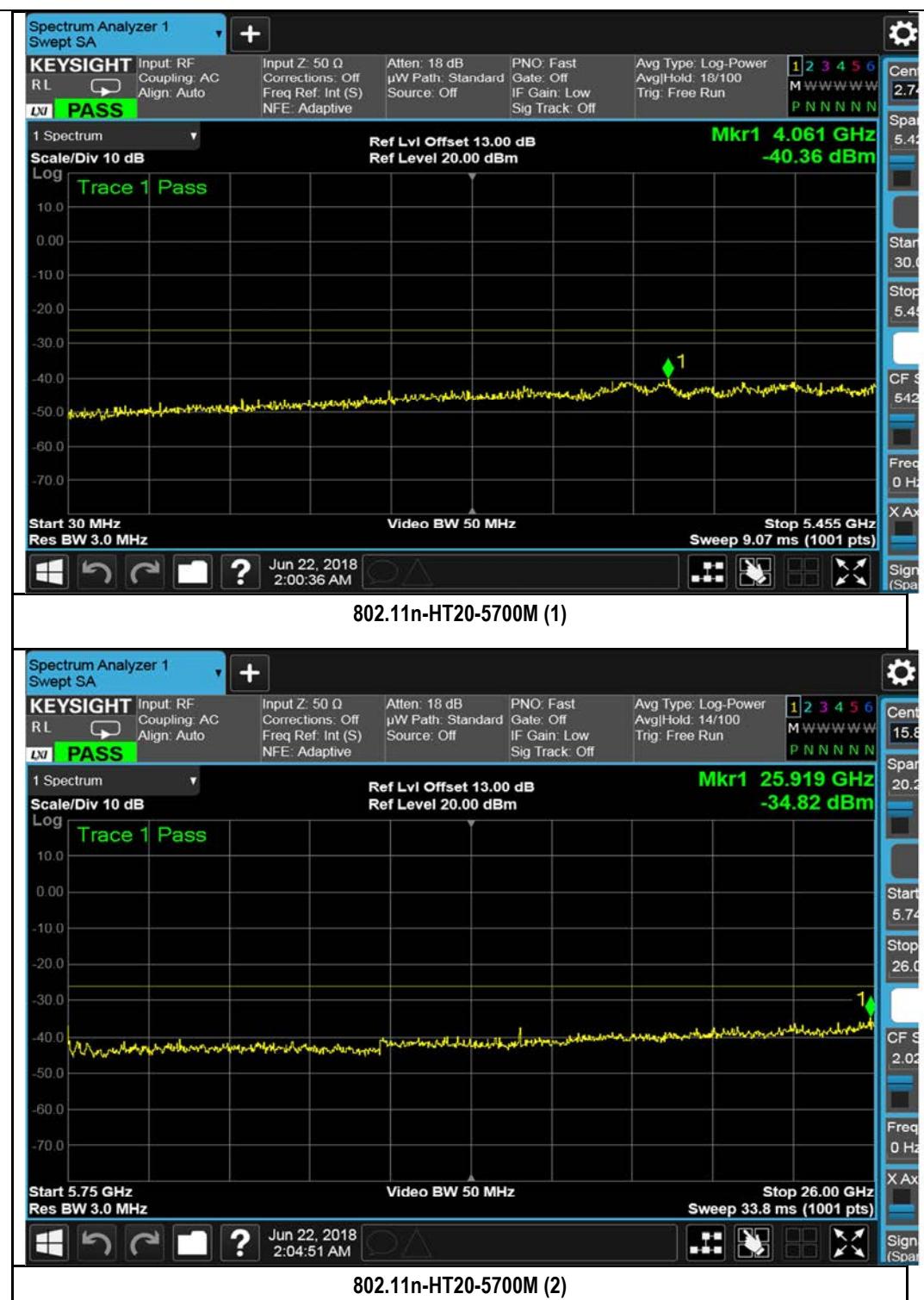


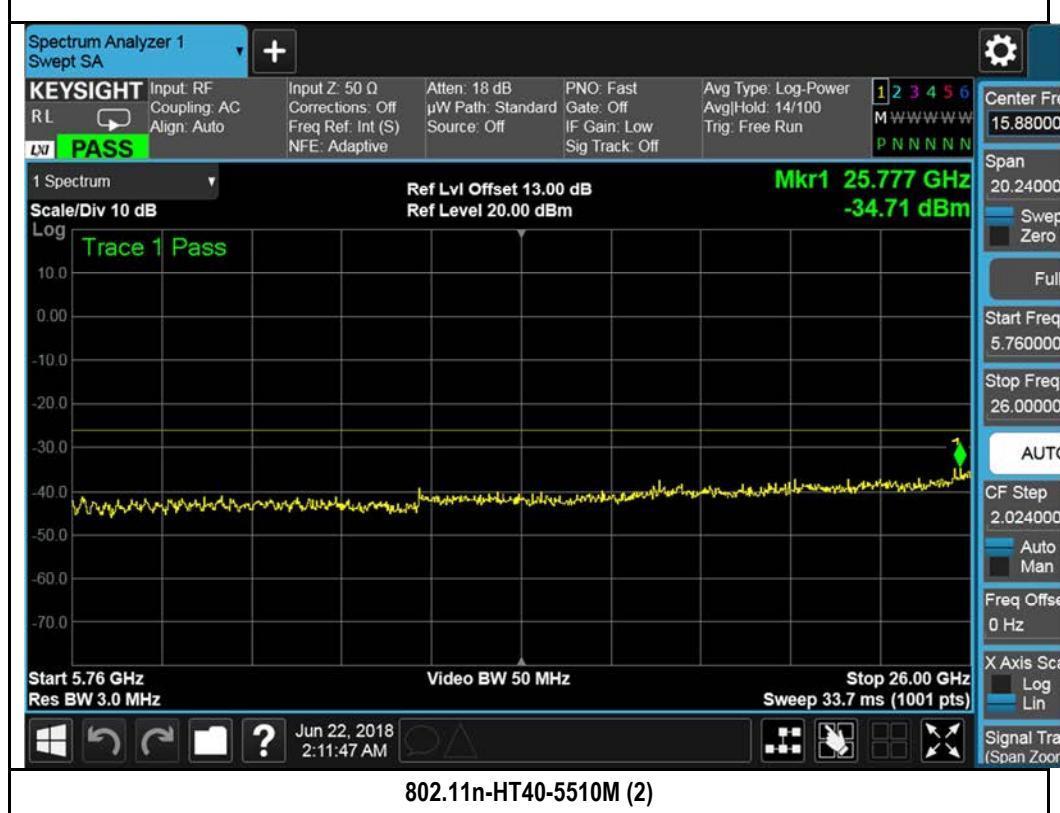
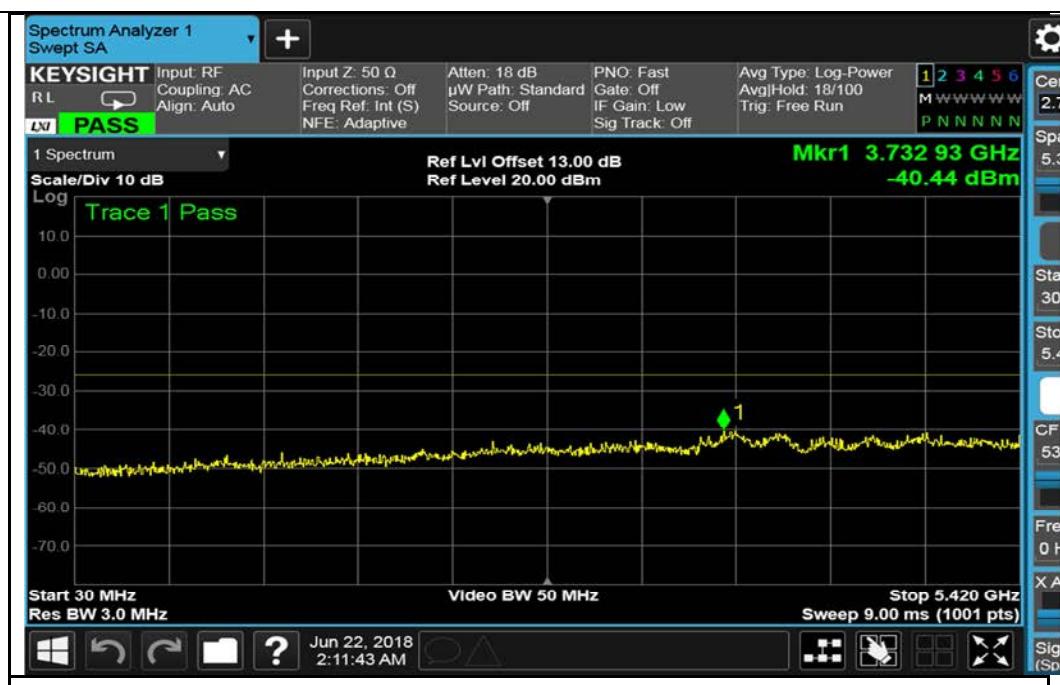
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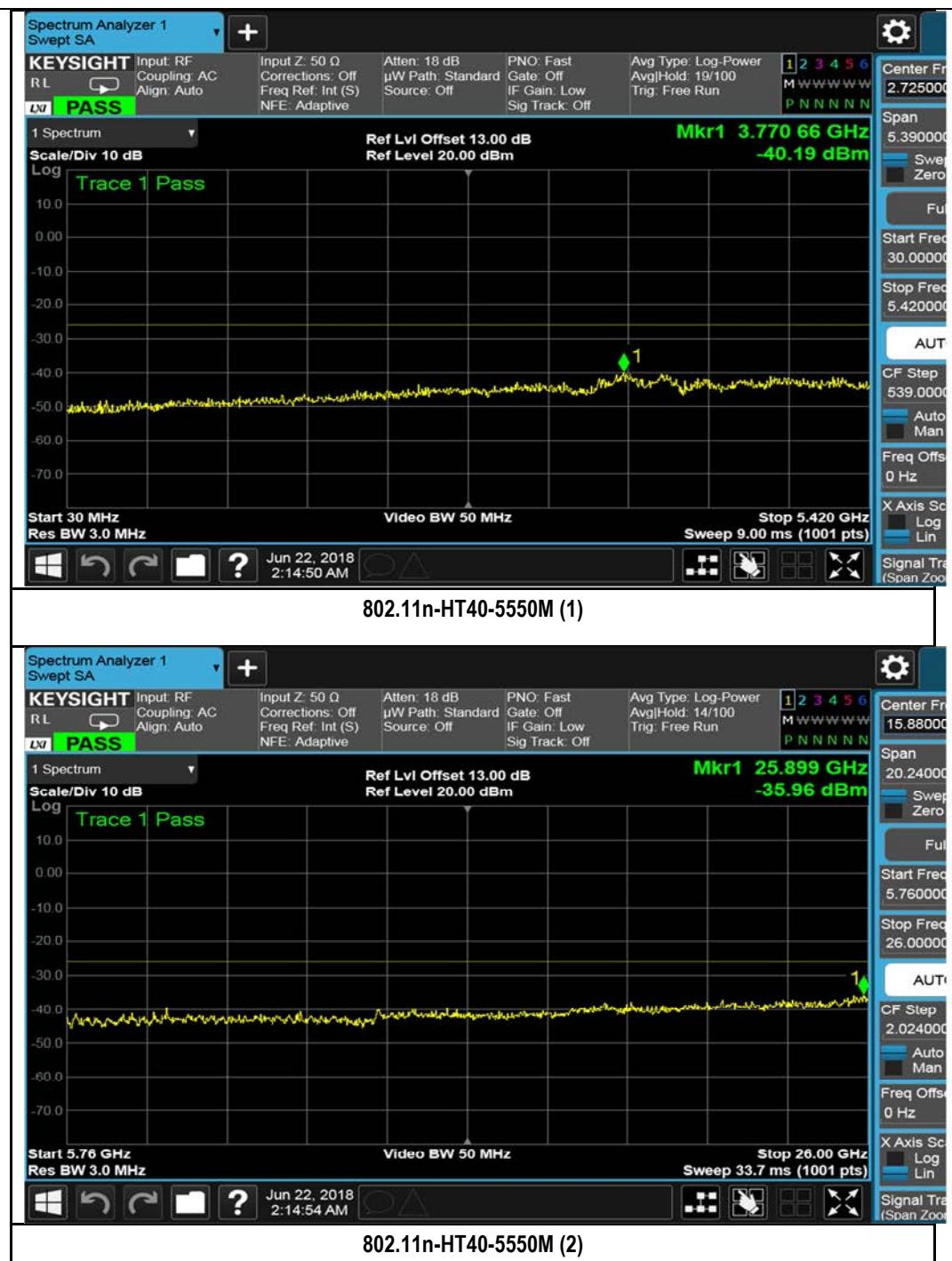


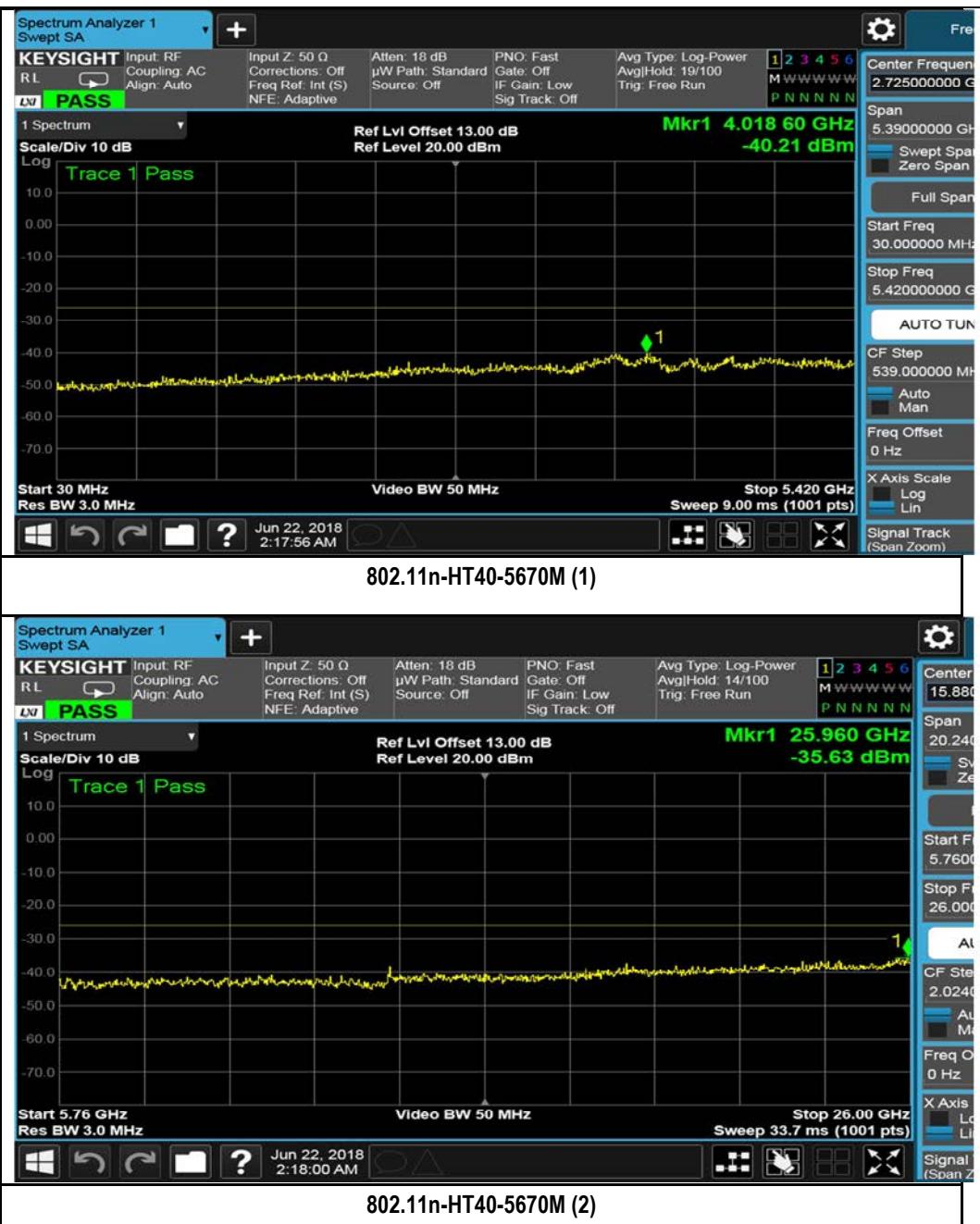


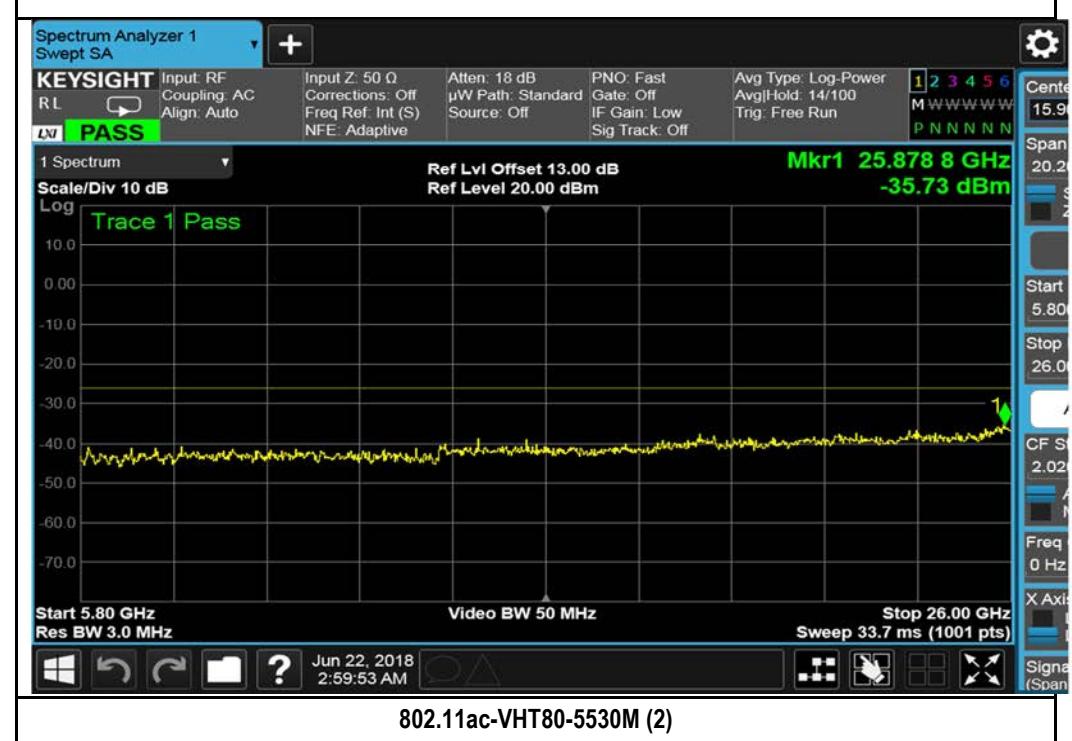
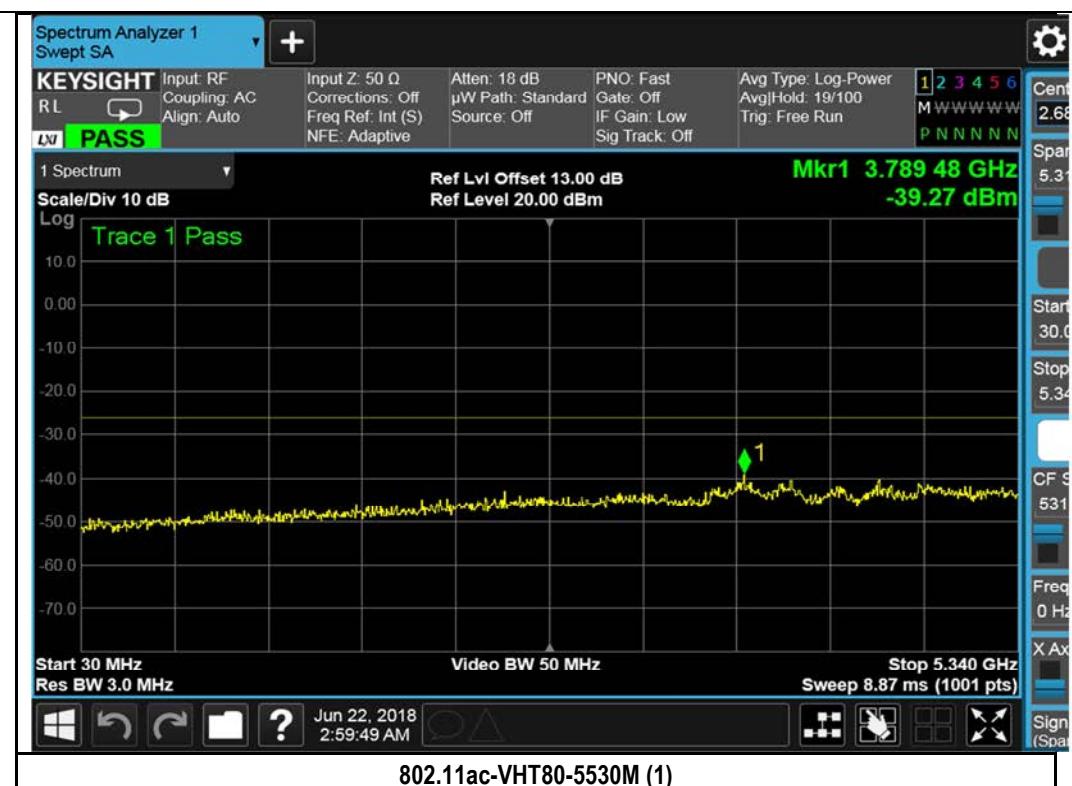


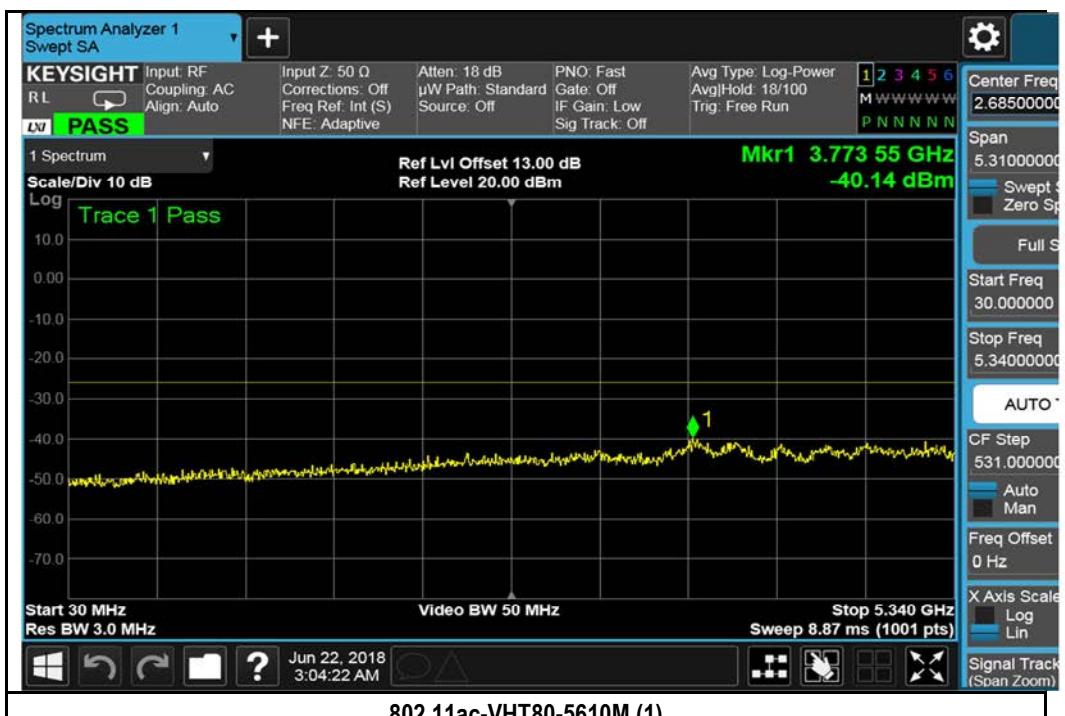






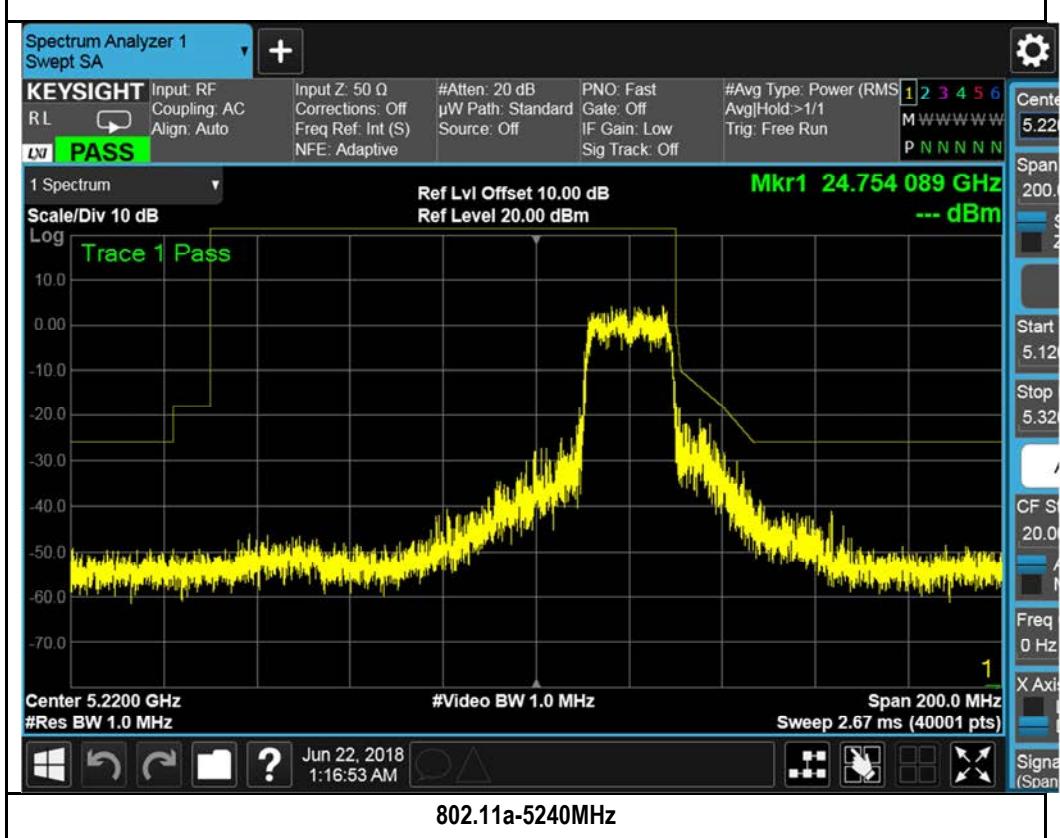
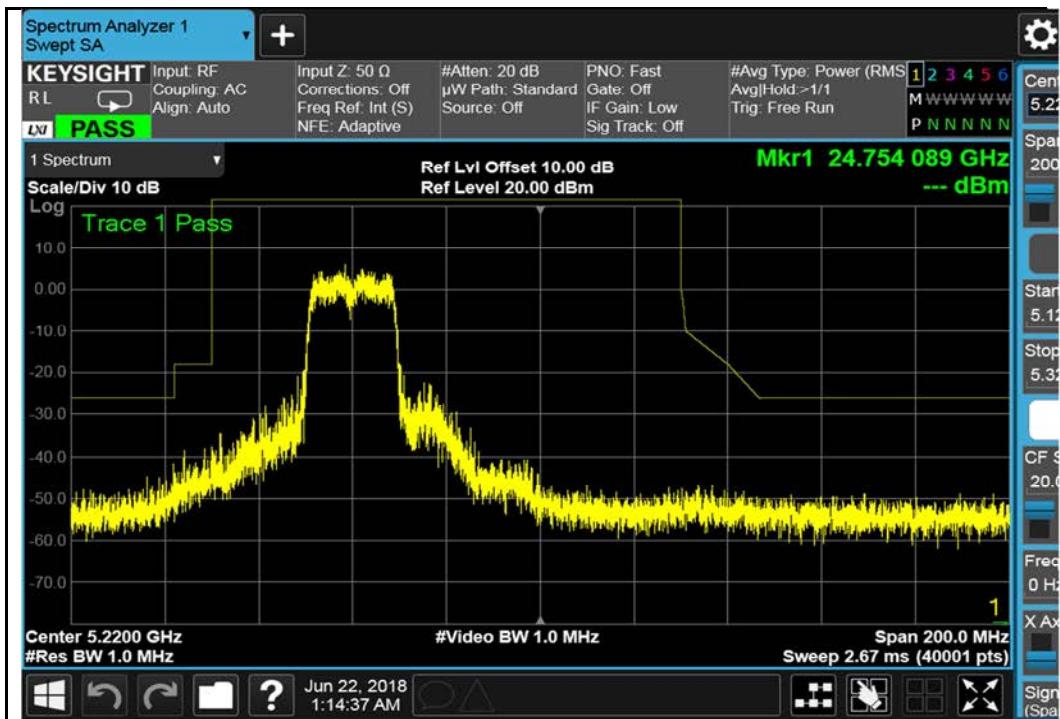


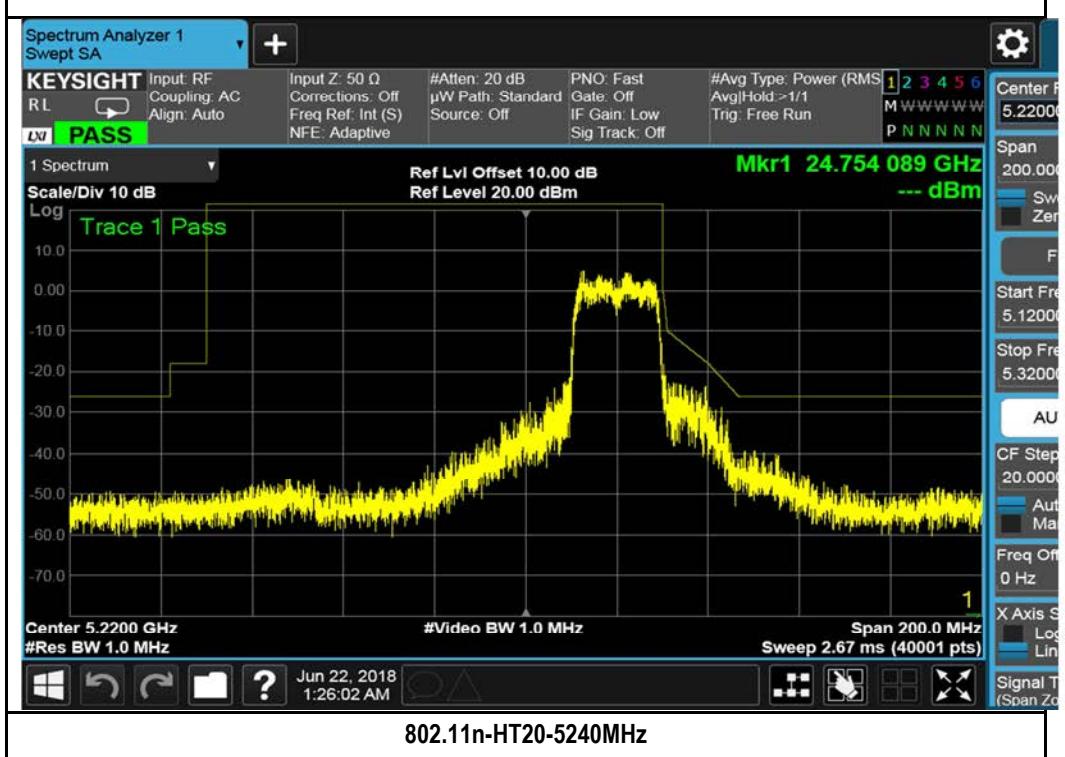
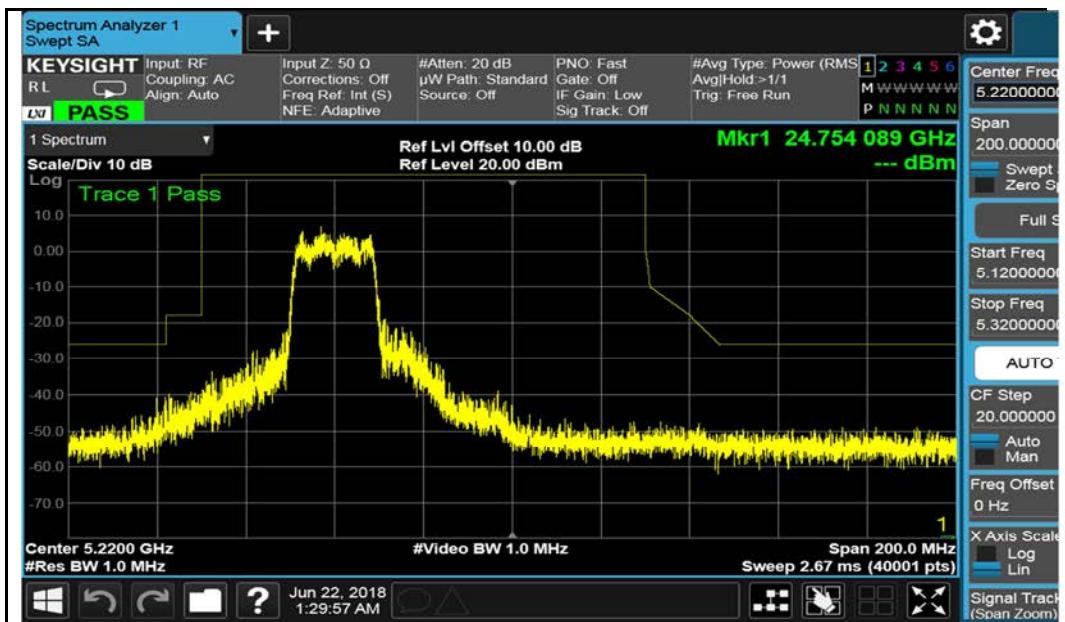


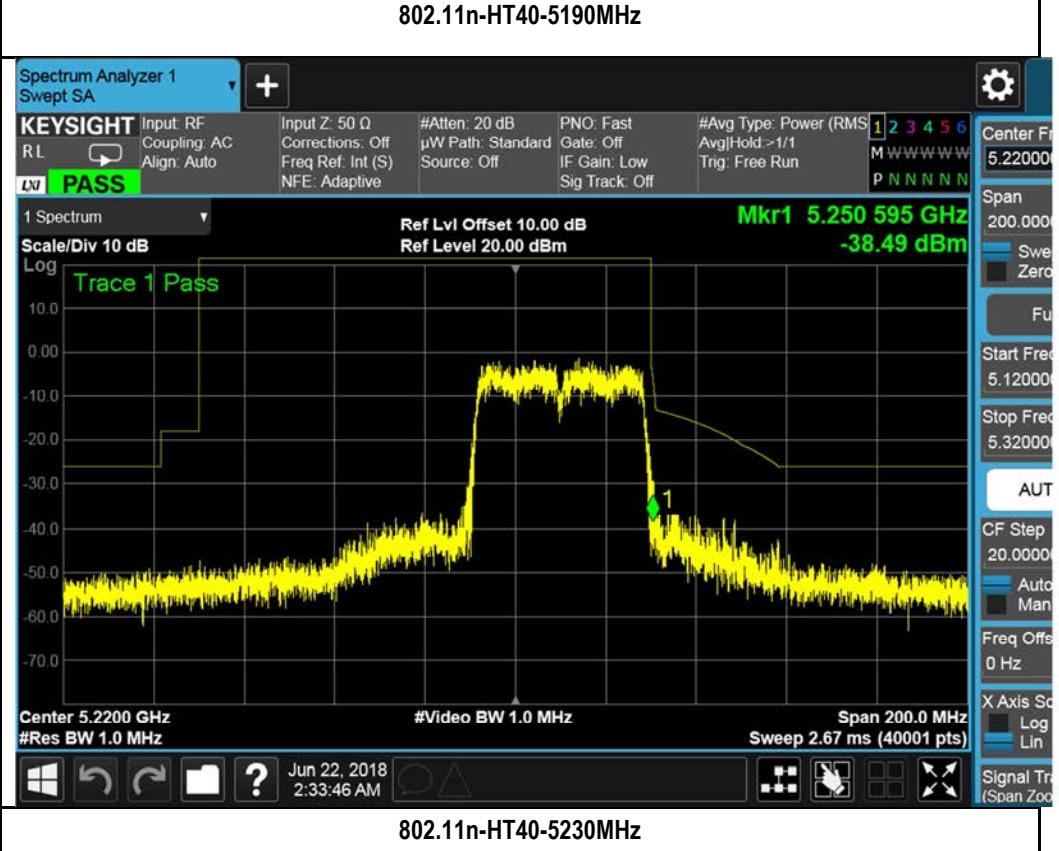
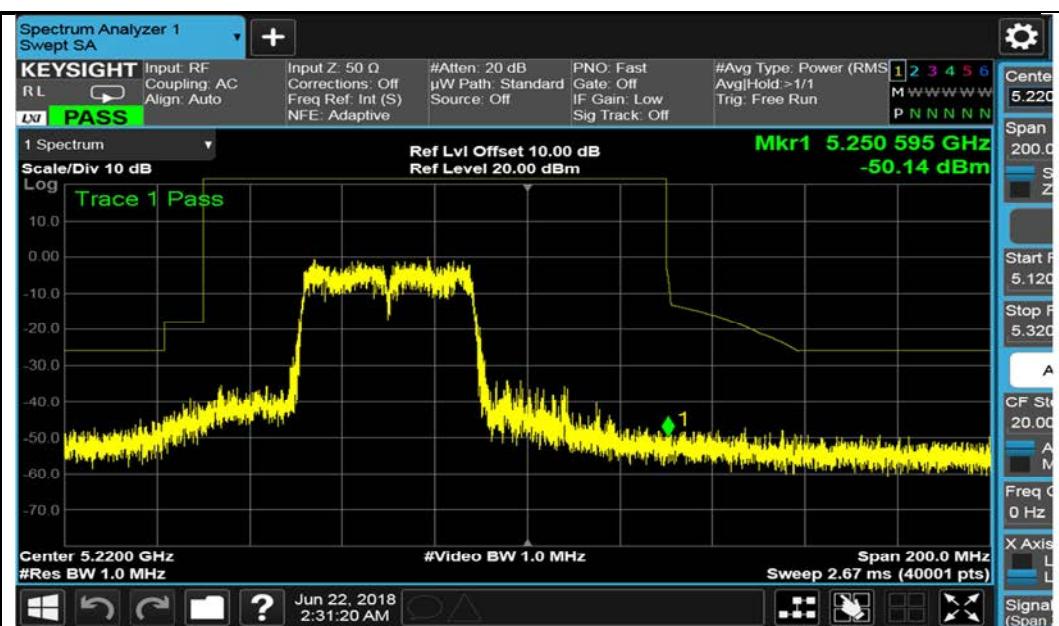


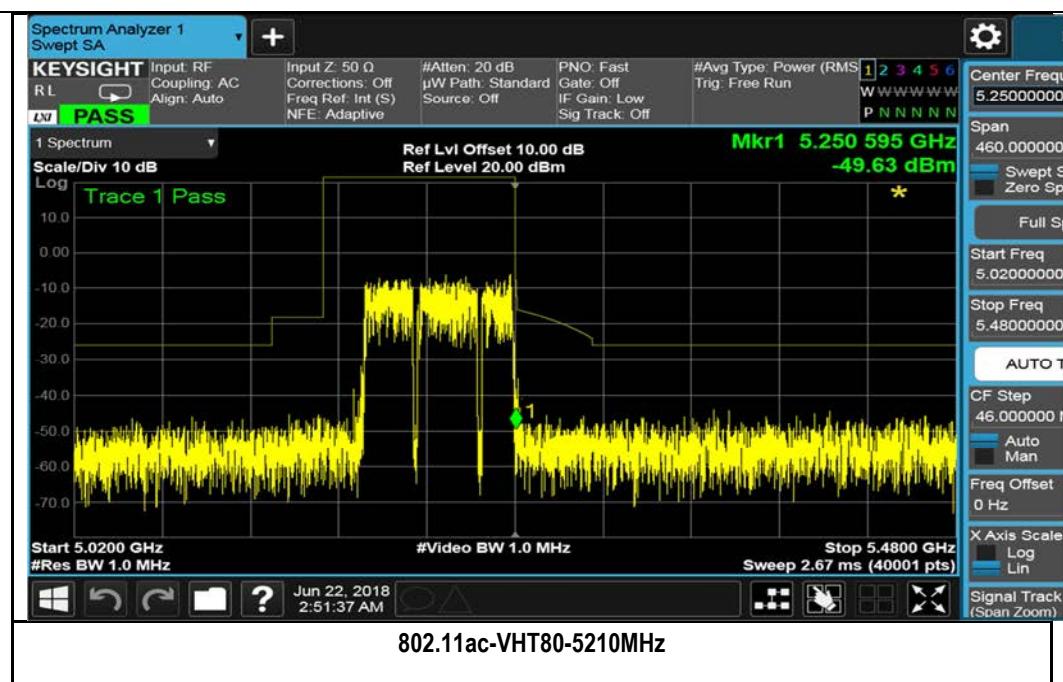
WLAN Out-Band Leakage Power

W52:

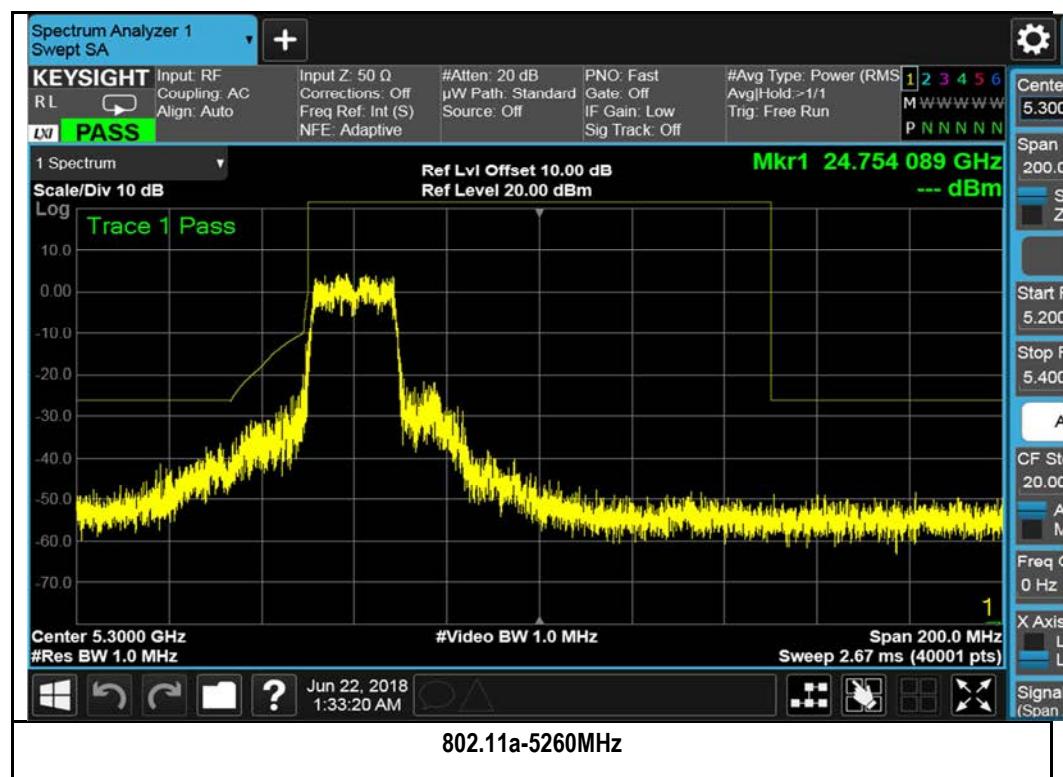


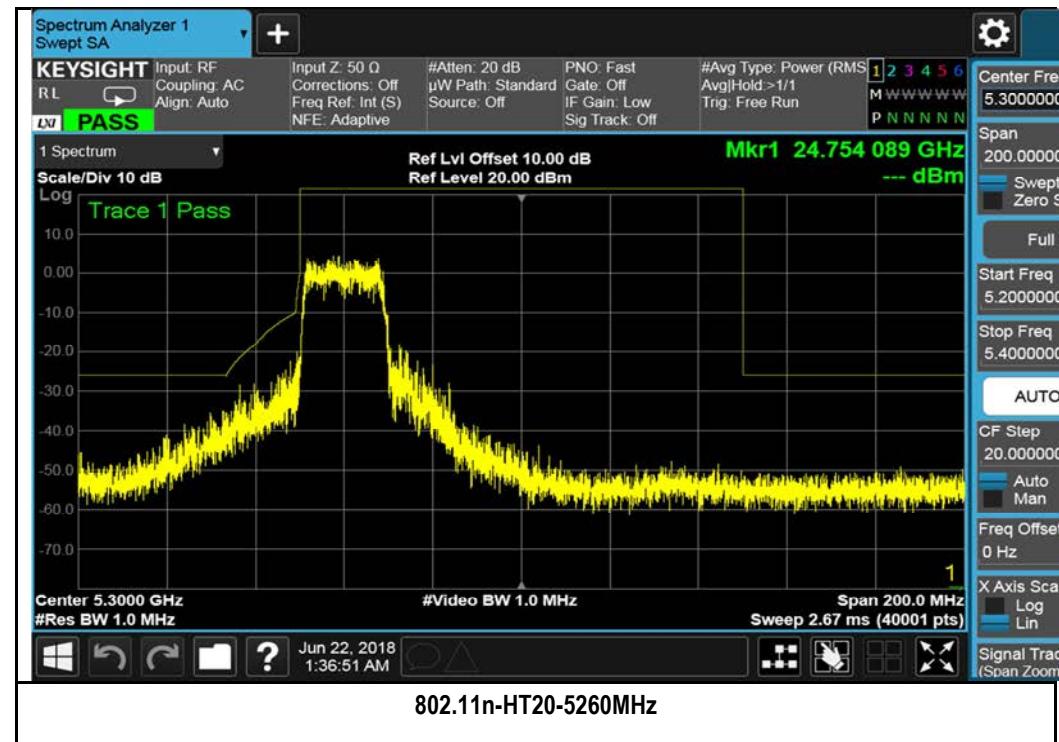
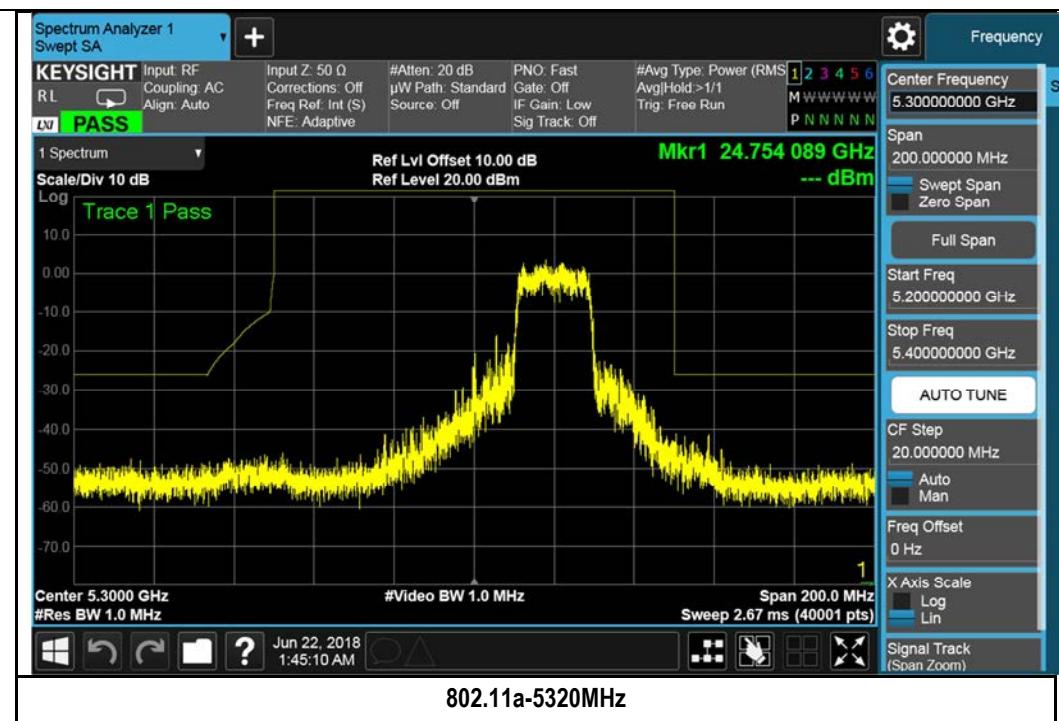


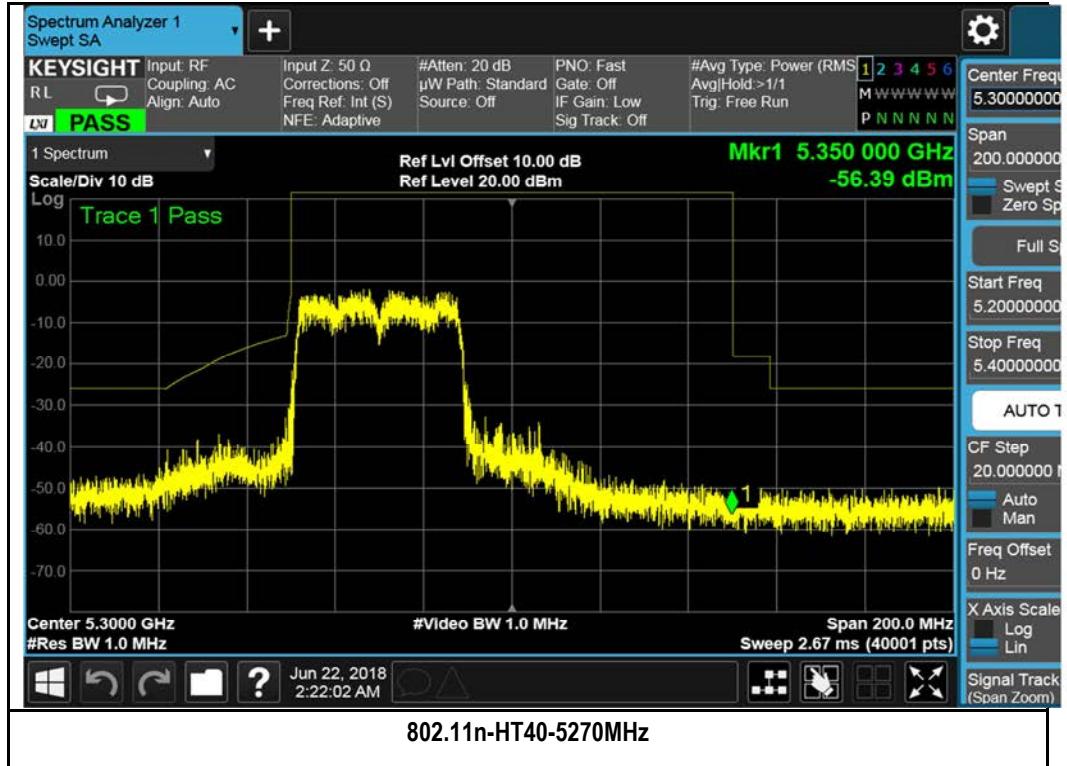
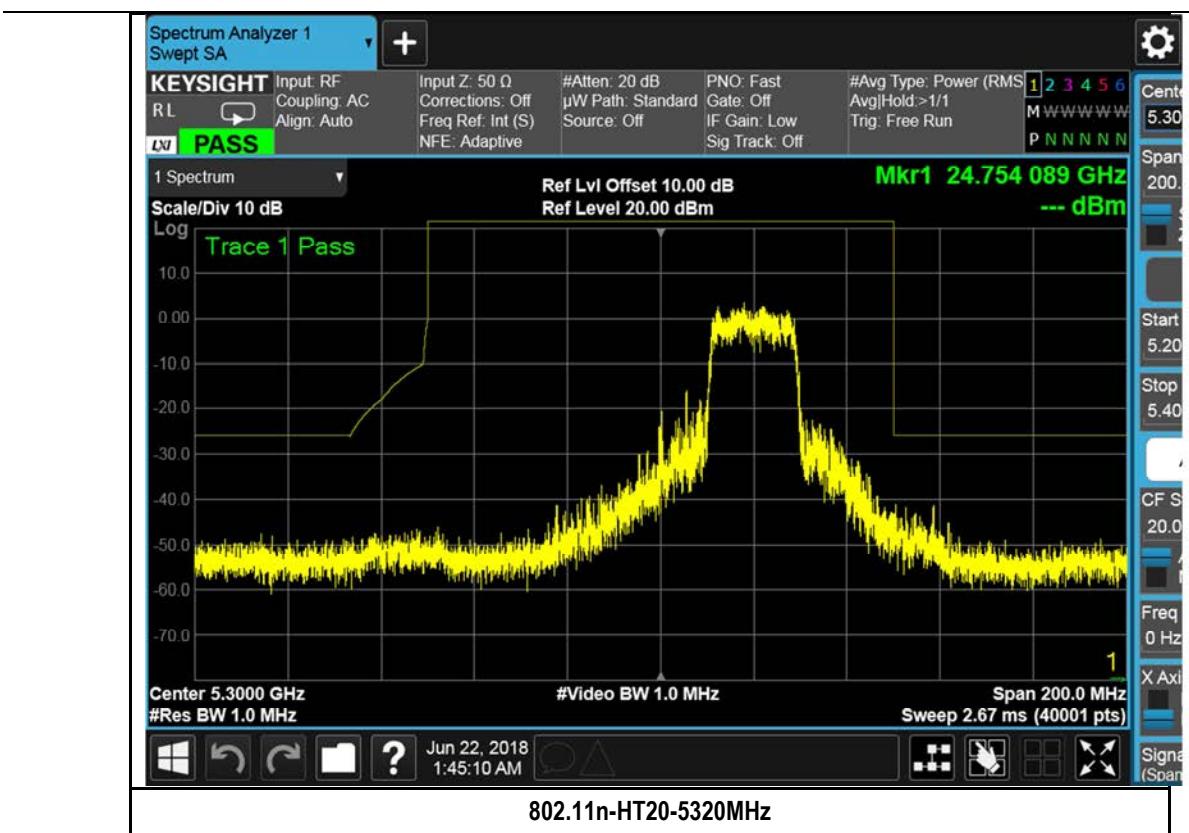


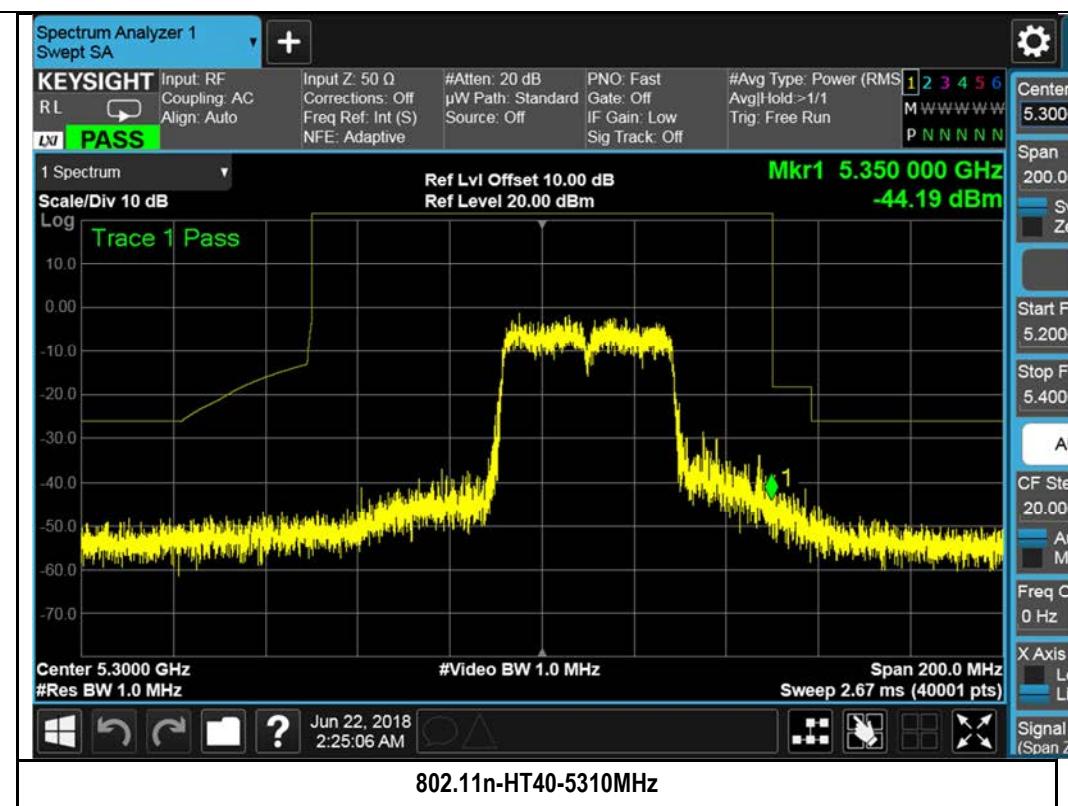


53:

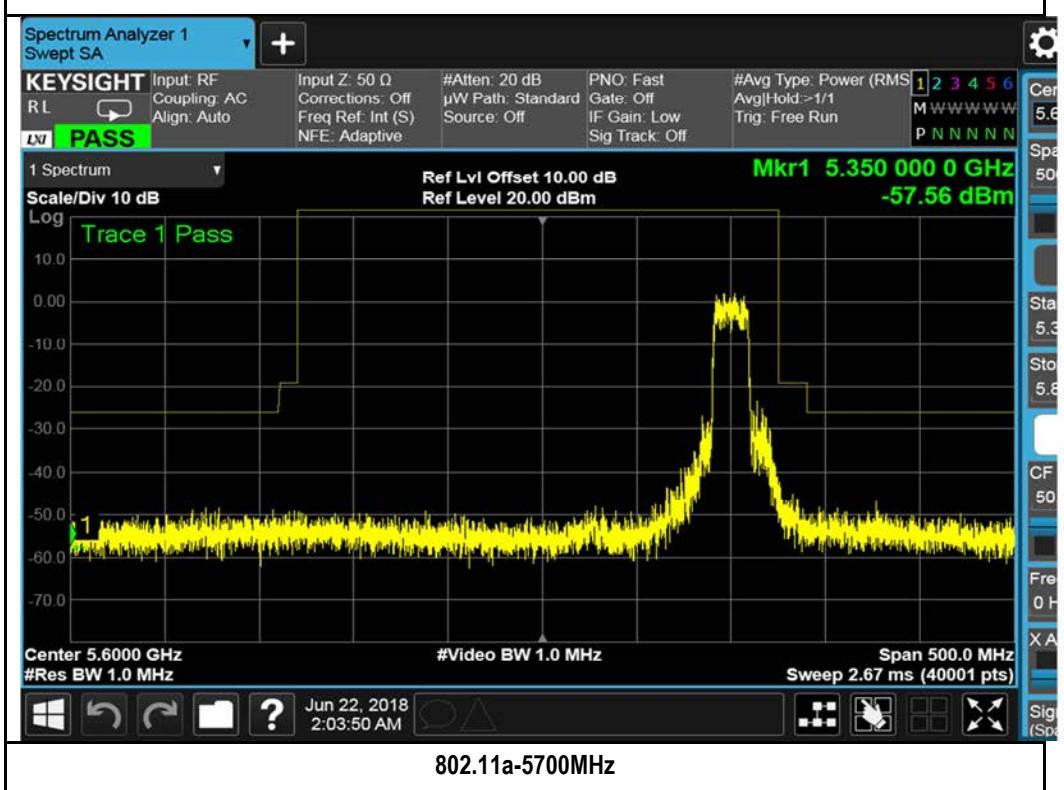
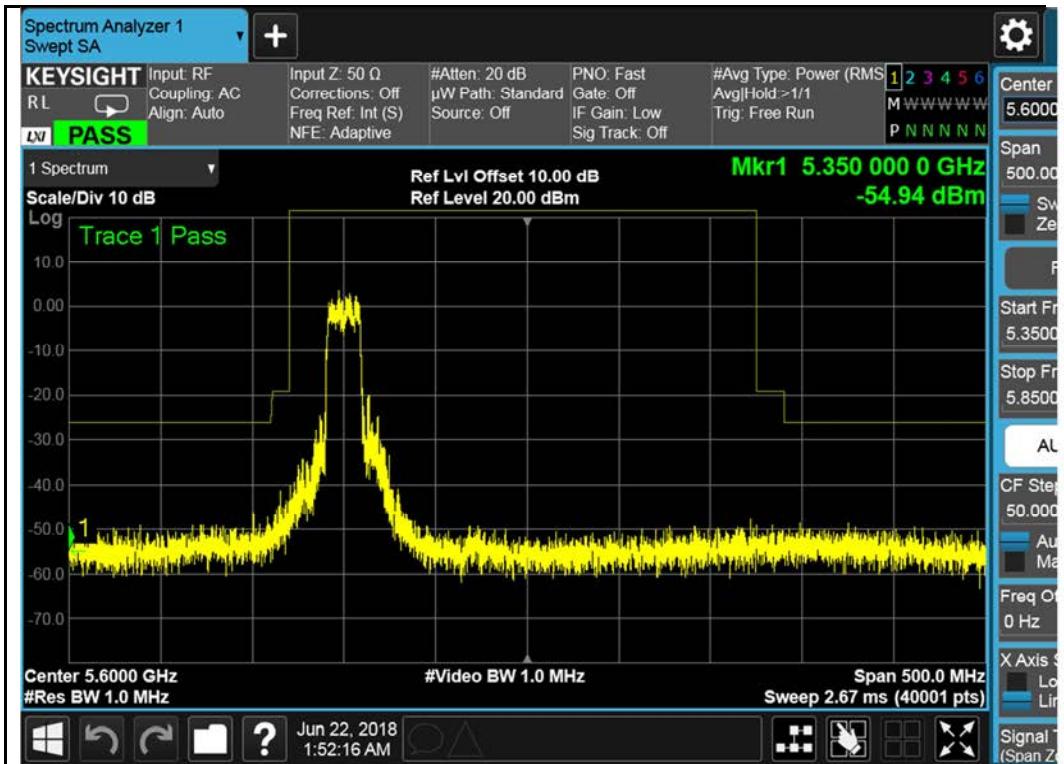


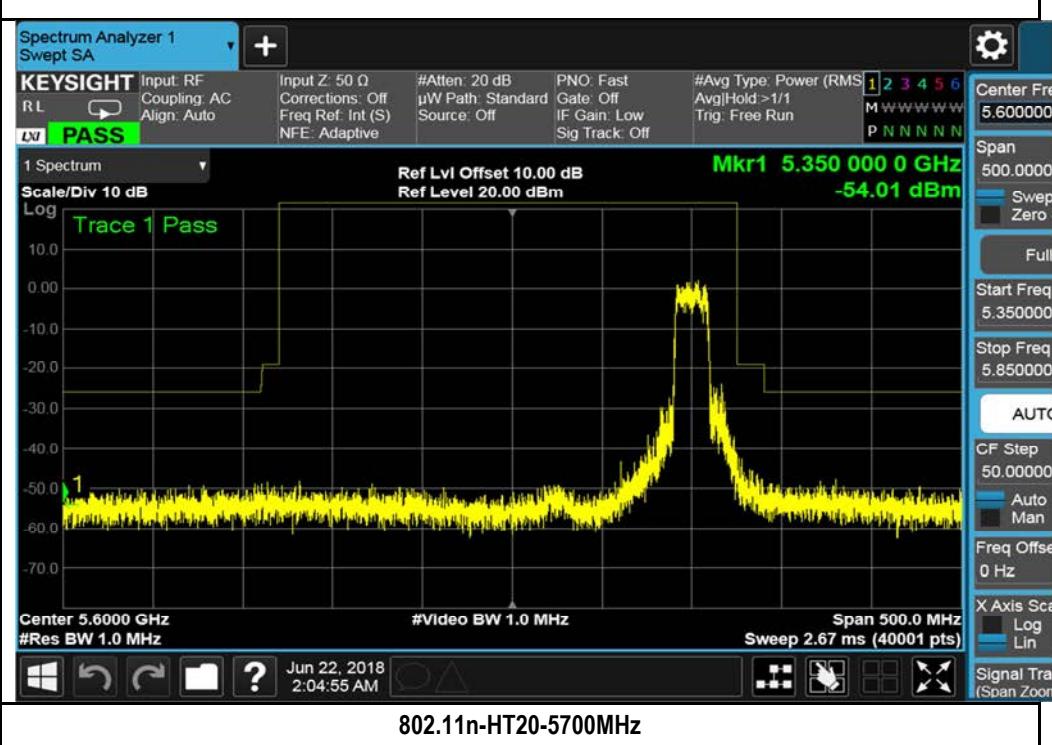
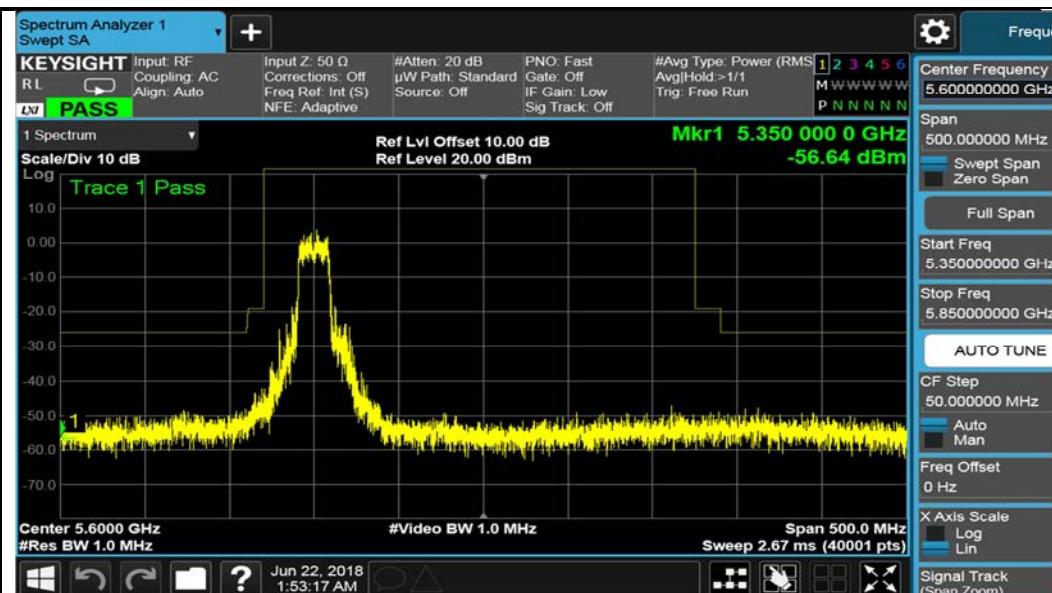


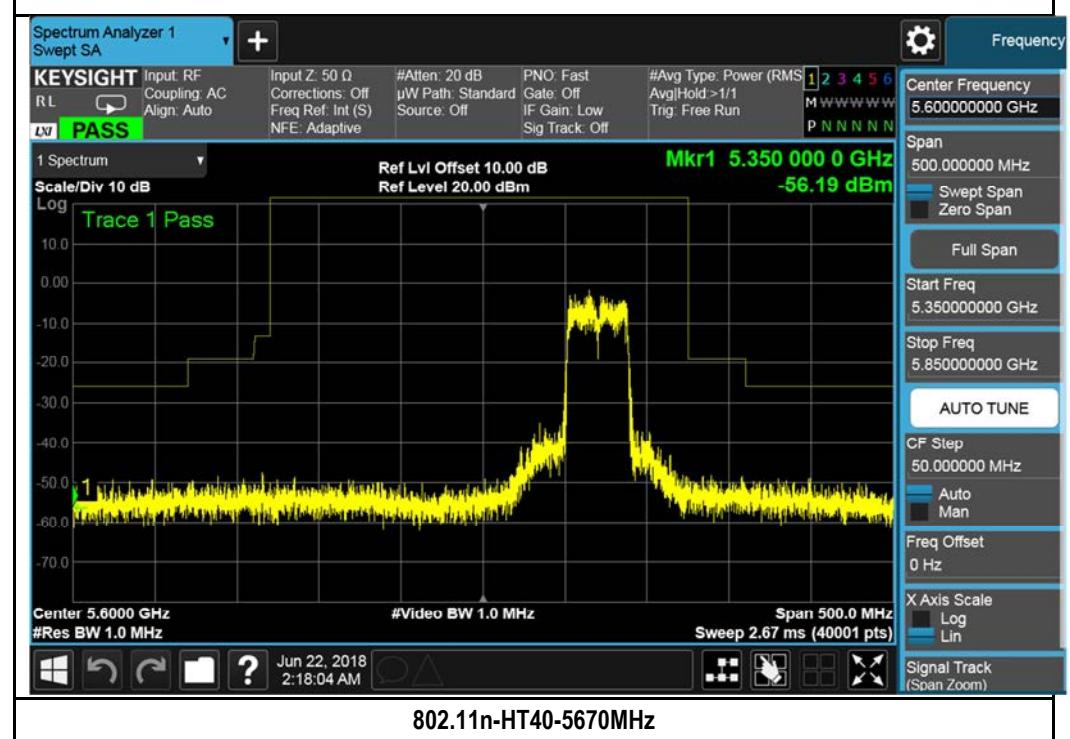
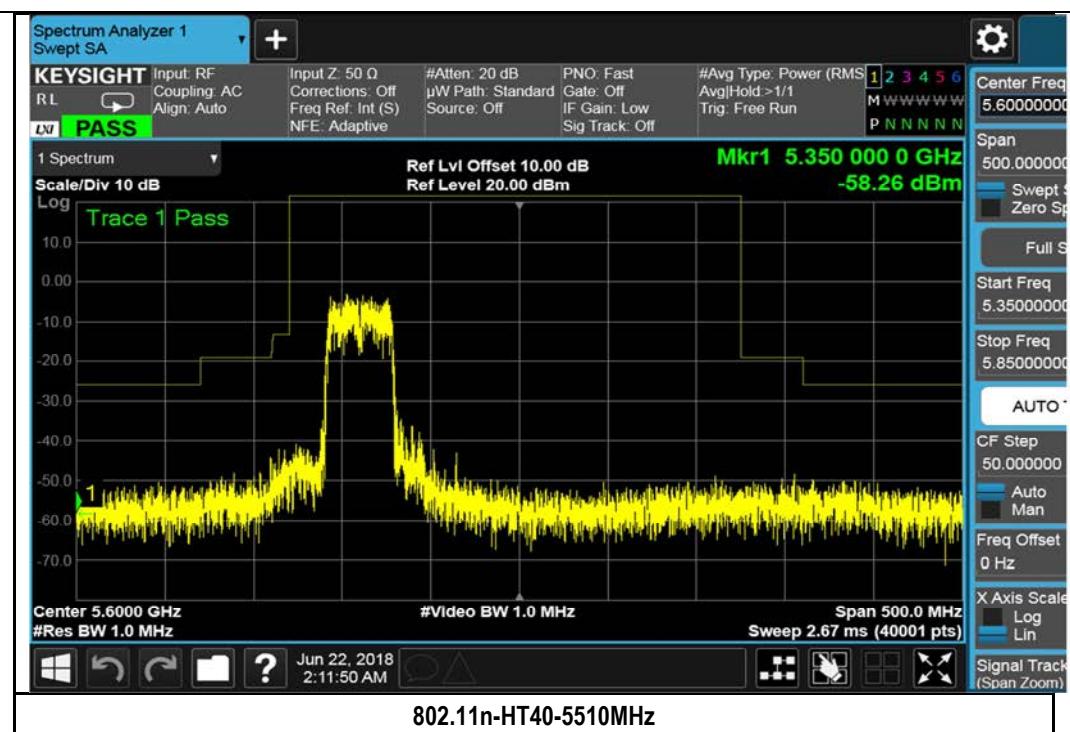


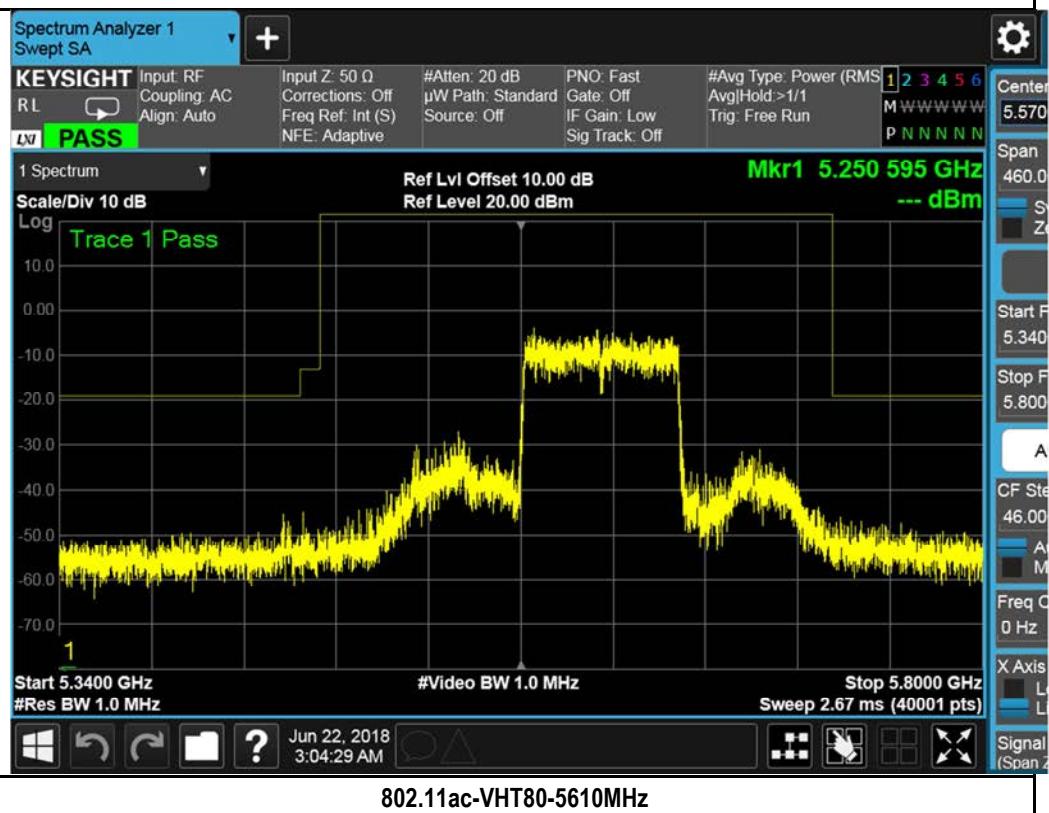
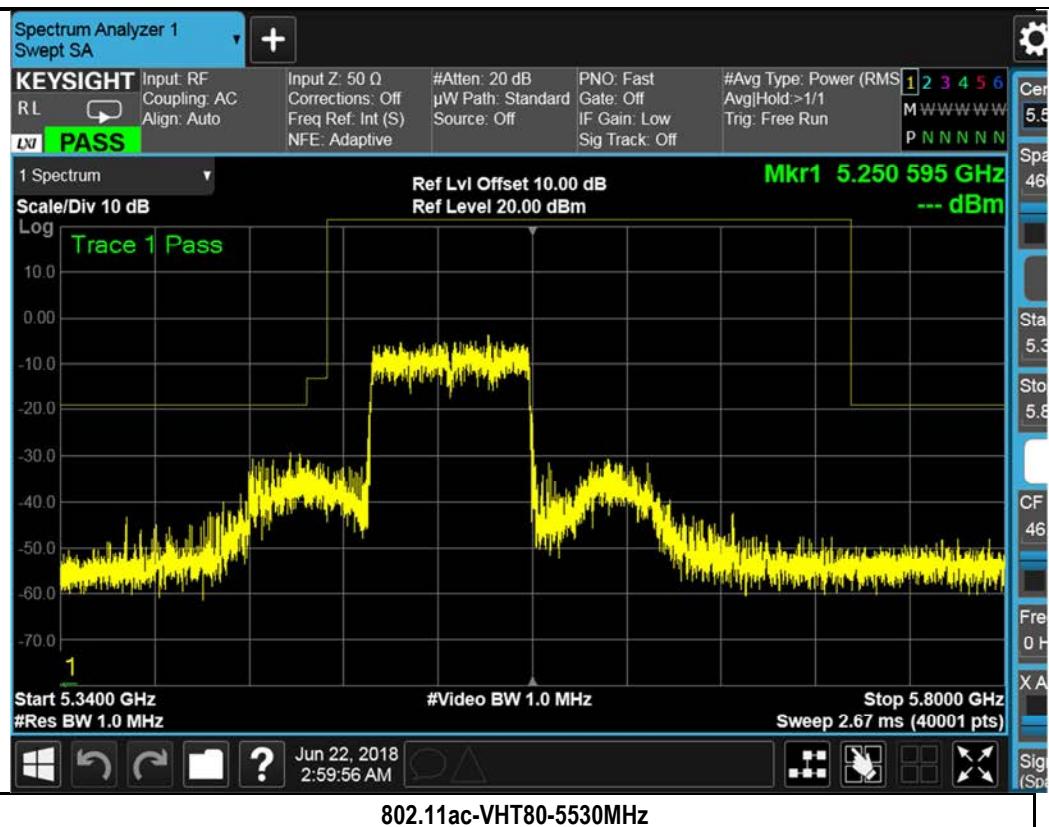


W56:









9.5 Antenna Power

Requirement(s):

Spec	Item	Requirement			Applicable	
Article 2-1	19	(1) FH, FH+DS, FH+OFDM	3mW/MHz (EIRP 6.91 – 16.91 dBm/MHz)	<input type="checkbox"/>		
		(2) OFDM (BW ≤ 26 MHz)	10mW/MHz (EIRP 12.14 – 22.14 dBm/MHz)	<input checked="" type="checkbox"/>		
		(2) OFDM (BW ≤ 38 MHz)	5mW/MHz (EIRP 9.13 – 19.13 dBm/MHz)	<input checked="" type="checkbox"/>		
		(3) Other than (1) & (2) (BW ≤ 26 MHz)	10mW	<input type="checkbox"/>		
Article 2-1	19-3	Band W52 - OFDM (BW ≤ 19 MHz)	-	10mW/MHz (EIRP 10 mW/MHz)	<input checked="" type="checkbox"/>	
		Band W53 - OFDM (BW ≤ 19 MHz)	TPC	10mW/MHz (EIRP 10 mW/MHz)	<input checked="" type="checkbox"/>	
		Band W52 - OFDM (BW ≤ 38 MHz)	Non-TPC	10mW/MHz (EIRP 5 mW/MHz)	<input type="checkbox"/>	
		Band W53 - OFDM (BW ≤ 38 MHz)	-	5mW/MHz (EIRP 5 mW/MHz)	<input checked="" type="checkbox"/>	
		Band W52 - OFDM (BW ≤ 78 MHz)	TPC	5mW/MHz (EIRP 5 mW/MHz)	<input checked="" type="checkbox"/>	
		Band W53 - OFDM (BW ≤ 78 MHz)	Non-TPC	5mW/MHz (EIRP 2.5 mW/MHz)	<input type="checkbox"/>	
		Band W52 - OFDM (BW ≤ 78 MHz)	TPC	2.5mW/MHz (EIRP 2.5 mW/MHz)	<input checked="" type="checkbox"/>	
Article 2-1	19-3-2	OFDM (BW ≤ 19 MHz)	TPC	10mW/MHz (EIRP 50 mW/MHz)	<input checked="" type="checkbox"/>	
		OFDM (BW ≤ 19 MHz)	Non-TPC	10mW/MHz (EIRP 25 mW/MHz)	<input type="checkbox"/>	
		OFDM (BW ≤ 38 MHz)	TPC	5mW/MHz (EIRP 25 mW/MHz)	<input checked="" type="checkbox"/>	
		OFDM (BW ≤ 38 MHz)	Non-TPC	5mW/MHz (EIRP 12.5 mW/MHz)	<input type="checkbox"/>	
		OFDM (BW ≤ 78 MHz)	TPC	2.5mW/MHz (EIRP 12.5 mW/MHz)	<input checked="" type="checkbox"/>	
Article 2-1	19-3-3	OFDM (38 ≤ BW ≤ 78 MHz) - 5.21GHz	-	1.25mW/MHz (EIRP 1.25 mW/MHz)	<input type="checkbox"/>	
		OFDM (38 ≤ BW ≤ 78 MHz) 5.29GHz, 5.53GHz, 5.61GHz	TPC	1.25mW/MHz (EIRP 1.25 mW/MHz)	<input type="checkbox"/>	
		OFDM (38 ≤ BW ≤ 78 MHz) 5.29GHz, 5.53GHz, 5.61GHz	Non-TPC	1.25mW/MHz (EIRP 0.625 mW/MHz)	<input type="checkbox"/>	
Test Setup		 ————— 	Spectrum Analyzer	EUT		
Test Procedure		<ul style="list-style-type: none"> - Modulation, Tx - For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal. - Antenna Power = Peak amplitude on spectrum. 				
Test Date	05/09/2018 - 06/25/2018	Environmental condition		Temperature Relative Humidity Atmospheric Pressure	23oC 47% 1019mbar	
Remark	NA					
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail					

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test was done by Benjamin Jing at RF Test Site.

Antenna information:

Frequency Band	Peak Gain (dBi)
2400 to 2483.5MHz	2
5.15 to 5.25GHz	2
5.25 to 5.35GHz	2
5.47 to 5.725GHz	2

Antenna Power measurement result per Article 2 paragraph 1 item (19)
W24

Type	Test mode	Frequency. Range (MHz)	Antenna Power (mW/MHz)	Declared (mW/MHz)	Limit (mW/MHz) +20%,-80%
WLAN	802.11b	Low-2412M	4.842	5	1 ~ 6
		Mid-2442M	4.686	5	1 ~ 6
		High-2472M	5.131	5	1 ~ 6
	802.11g	Low-2412M	3.397	5	1 ~ 6
		Mid-2442M	4.157	5	1 ~ 6
		High-2472M	3.662	5	1 ~ 6
	802.11n-HT20	Low-2412M	2.681	5	1 ~ 6
		Mid-2442M	4.197	5	1 ~ 6
		High-2472M	3.956	5	1 ~ 6
	802.11n-HT40	Low-2422M	1.605	3	0.6 ~ 3.6
		Mid-2442M	1.439	3	0.6 ~ 3.6
		High-2462M	2.080	3	0.6 ~ 3.6

EIRP

Type	Test mode	Freq. Range (MHz)	Highest Power (mW/MHz)	Absolute Power Limit (mW/MHz)	EIRP (mW/MHz)	EIRP Limit (mW/MHz)	Result
WLAN	802.11b	Low-2412M	4.842	10	7.652	16.368	Pass
		Mid-2442M	4.686	10	7.427	16.368	Pass
		High-2472M	5.131	10	8.132	16.368	Pass
	802.11g	Low-2412M	3.397	10	5.384	16.368	Pass
		Mid-2442M	4.157	10	6.618	16.368	Pass
		High-2472M	3.662	10	5.804	16.368	Pass
	802.11n-HT20	Low-2412M	2.681	10	4.249	16.368	Pass
		Mid-2442M	4.197	10	6.651	16.368	Pass
		High-2472M	3.956	10	6.270	16.368	Pass
	802.11n-HT40	Low-2422M	1.605	5	2.544	8.184	Pass
		Mid-2442M	1.439	5	2.281	8.184	Pass
		High-2462M	2.080	5	3.297	8.184	Pass

Note:

EIRP limit depends on HPBA, where $HPBA = 360 / A$, and $A = E.I.R.P \text{ limit} / (2.14 \text{ dBi} + \text{output power limit in dBm})$ ($1 \leq A \leq 10$)

Antenna Power (mW/MHz) measurement result per Article 2 paragraph 1 item (19)-3
W52:

Test mode	Frequency Range (MHz)	Antenna Power (mW/MHz)	Declared (mW/MHz)	Limit (mW/MHz) +20%, -80%
802.11a	Low-5180M	2.289	3	0.6 ~ 3.6
	Mid-5200M	2.362	3	0.6 ~ 3.6
	High-5240M	3.095	3	0.6 ~ 3.6
802.11n-HT20	Low-5180M	2.604	3	0.6 ~ 3.6
	Mid-5200M	2.820	3	0.6 ~ 3.6
	High-5240M	2.805	3	0.6 ~ 3.6
802.11n-HT40	Low-5190M	0.699	1	0.2 ~ 1.2
	High-5230M	0.538	1	0.2 ~ 1.2
802.11ac-VHT80	High-5210M	0.362	0.5	0.1 ~ 0.6

Test mode	Frequency Range (MHz)	Antenna Power (mW/MHz)	Absolute Power Limit (mW/MHz)	Result
802.11a	Low-5180M	2.289	10	Pass
	Mid-5200M	2.362	10	Pass
	High-5240M	3.095	10	Pass
802.11n-HT20	Low-5180M	2.604	10	Pass
	Mid-5200M	2.820	10	Pass
	High-5240M	2.805	10	Pass
802.11n-HT40	Low-5190M	0.699	5	Pass
	High-5230M	0.538	5	Pass
802.11ac-VHT80	High-5210M	0.362	2.5	Pass

EIRP (Worst case)

Test mode	Frequency Range (MHz)	Power (mW/MHz)	Antenna Gain (dBi)	EIRP (mW/MHz)	EIRP Limit (mW/MHz)	Result
802.11a	Low-5180M	2.289	2	3.627	10	Pass
	Mid-5200M	2.362	2	3.744	10	Pass
	High-5240M	3.095	2	4.906	10	Pass
802.11n-HT20	Low-5180M	2.604	2	4.127	10	Pass
	Low-5200M	2.820	2	4.469	10	Pass
	Low-5240M	2.805	2	4.445	10	Pass
802.11n-HT40	Low-5190M	0.699	2	1.108	5	Pass
	High-5230M	0.538	2	0.853	5	Pass
802.11ac-VHT80	Low-5210M	0.362	2	0.574	2.5	Pass

W53

Test mode	Frequency Range (MHz)	Antenna Power (mW/MHz)	Declared (mW/MHz)	Limit (mW/MHz) +20%,-80%
802.11a	Low-5260M	2.566	3	0.6 ~ 3.6
	Mid-5280M	2.268	3	0.6 ~ 3.6
	High-5320M	2.075	3	0.6 ~ 3.6
802.11n-HT20	Low-5260M	2.582	3	0.6 ~ 3.6
	Mid-5280M	2.022	3	0.6 ~ 3.6
	High-5320M	2.002	3	0.6 ~ 3.6
802.11n-HT40	Low-5270M	0.572	1	0.2 ~ 1.2
	High-5310M	0.564	1	0.2 ~ 1.2
802.11ac-VHT80	High-5290M	0.317	0.5	0.1 ~ 0.6

Test mode	Frequency Range (MHz)	Antenna Power (mW/MHz)	Absolute Power Limit (mW/MHz)	Result
802.11a	Low-5260M	2.566	10	Pass
	Mid-5280M	2.268	10	Pass
	High-5320M	2.075	10	Pass
802.11n-HT20	Low-5260M	2.582	10	Pass
	Mid-5280M	2.022	10	Pass
	High-5320M	2.002	10	Pass
802.11n-HT40	Low-5270M	0.572	5	Pass
	High-5310M	0.564	5	Pass
802.11ac-VHT80	High-5290M	0.317	2.5	Pass

EIRP (Worst case)

Test mode	Frequency Range (MHz)	Power (mW/MHz)	Antenna Gain (dBi)	EIRP (mW/MHz)	EIRP Limit (mW/MHz)	Result
802.11a	Low-5260M	2.566	2	4.067	10	Pass
	Mid-5280M	2.268	2	3.594	10	Pass
	High-5320M	2.075	2	3.289	10	Pass
802.11n-HT20	Low-5260M	2.582	2	4.902	10	Pass
	Low-5280M	2.022	2	3.205	10	Pass
	Low-5320M	2.002	2	3.173	10	Pass
802.11n-HT40	Low-5270M	0.572	2	0.907	5	Pass
	High-5310M	0.564	2	0.894	5	Pass
802.11ac-VHT80	High-5290M	0.317	2	0.502	2.5	Pass

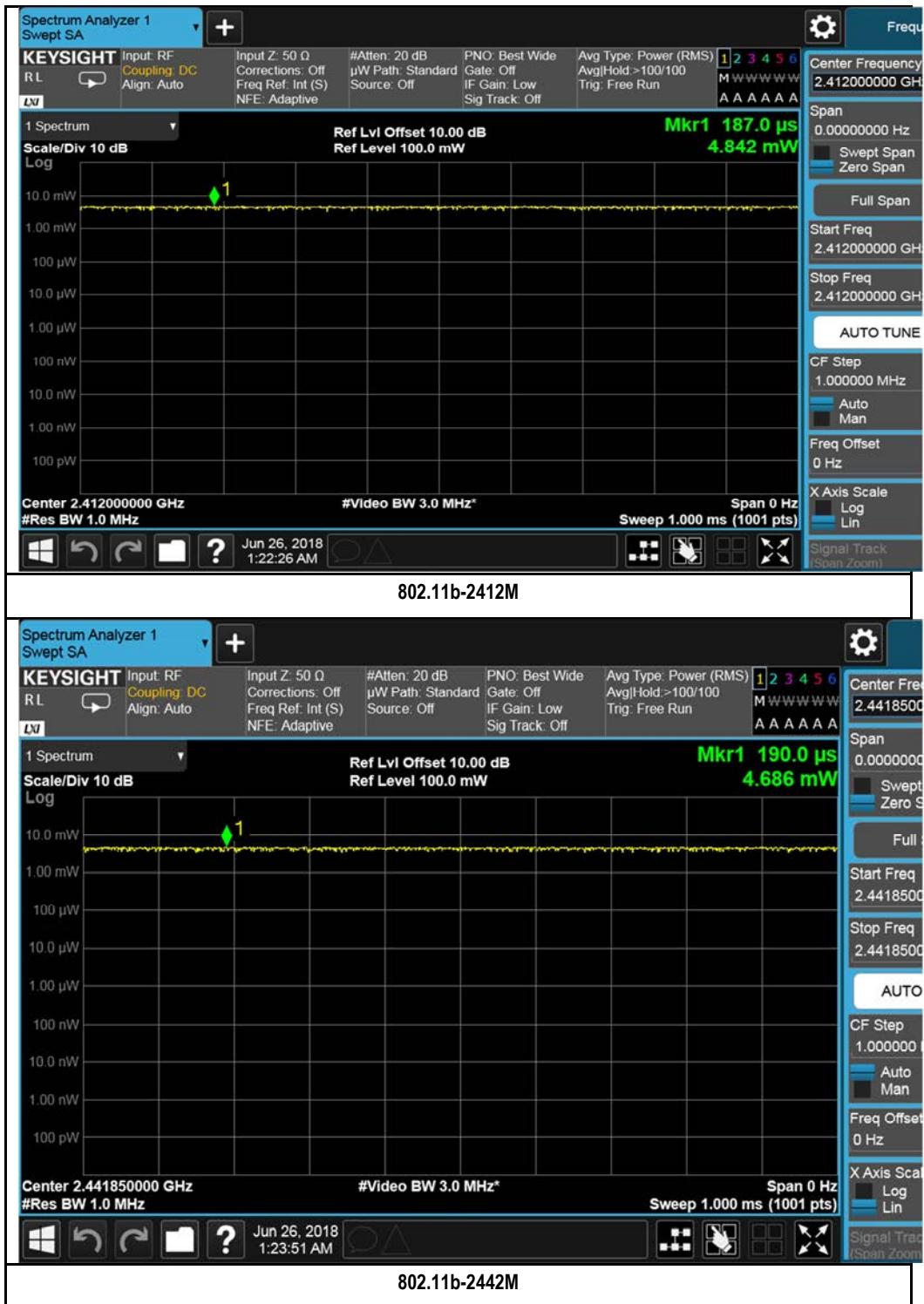
Antenna Power measurement result per Article 2 paragraph 1 item (19)-3-2

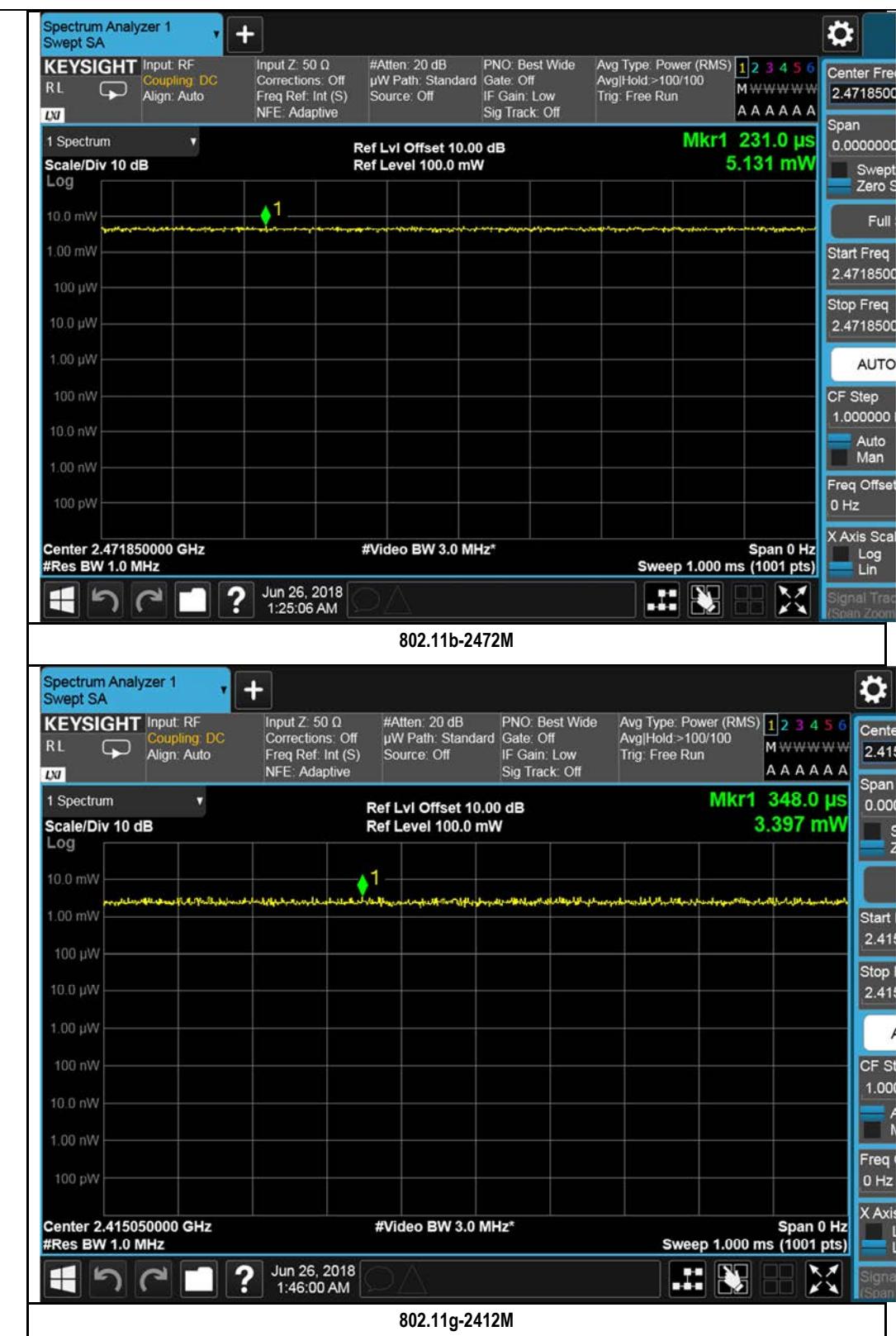
W56

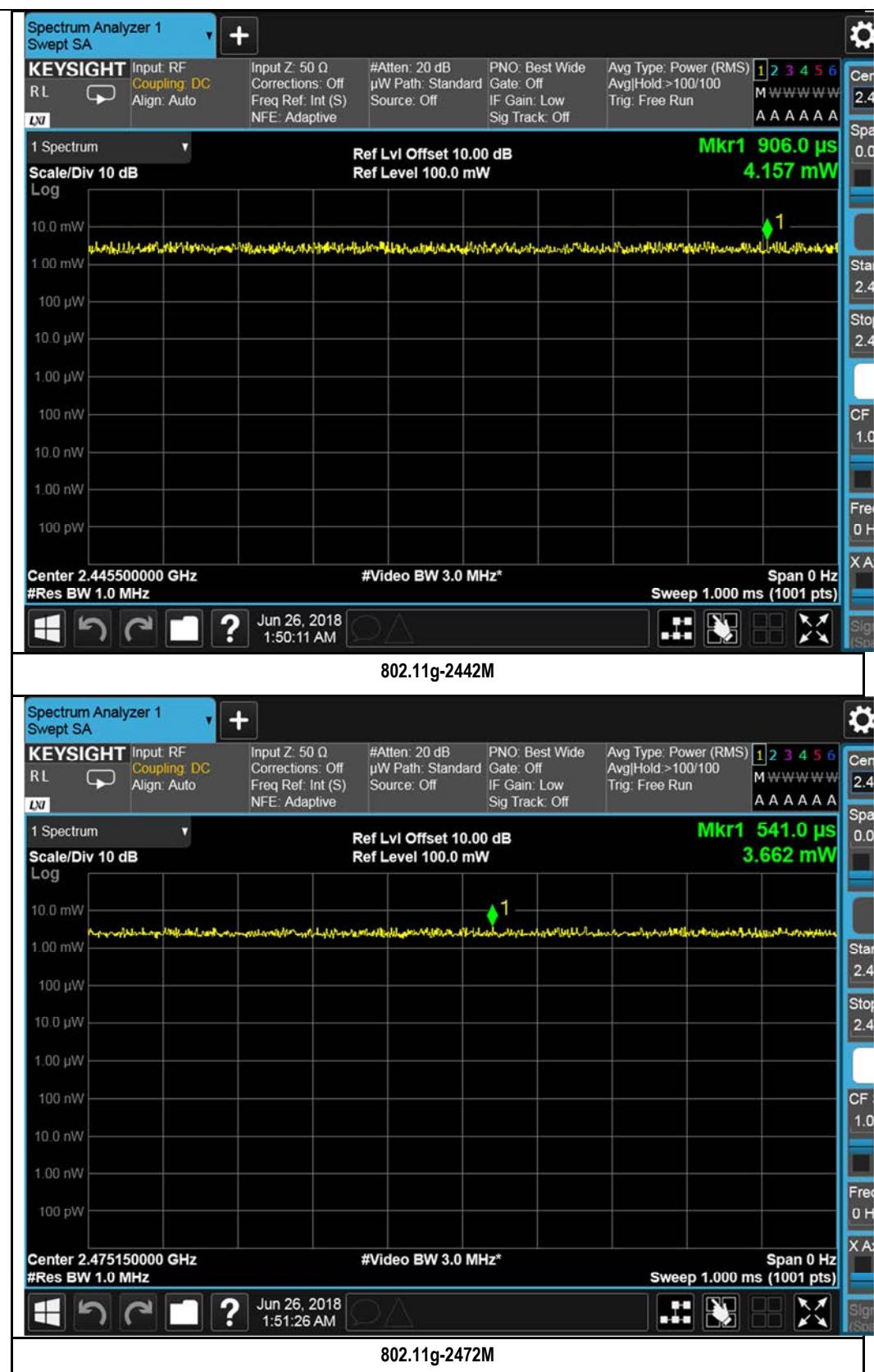
Test mode	Frequency Range (MHz)	Antenna Power (mW/MHz)	Declared (mW/MHz)	Limit (mW/MHz) +20%, -80%
802.11a	Low-5500M	2.205	3	0.6 ~ 3.6
	Mid-5600M	2.326	3	0.6 ~ 3.6
	High-5700M	1.401	3	0.6 ~ 3.6
802.11n-HT20	Low-5500M	2.057	3	0.6 ~ 3.6
	Low-5600M	2.407	3	0.6 ~ 3.6
	Low-5700M	1.846	3	0.6 ~ 3.6
802.11n-HT40	Low-5510M	0.476	1	0.2 ~ 1.2
	Mid-5550M	0.447	1	0.2 ~ 1.2
	High-5670M	0.441	1	0.2 ~ 1.2
802.11ac-VHT80	Low-5530M	0.327	0.5	0.1 ~ 0.6
	High-5610M	0.290	0.5	0.1 ~ 0.6

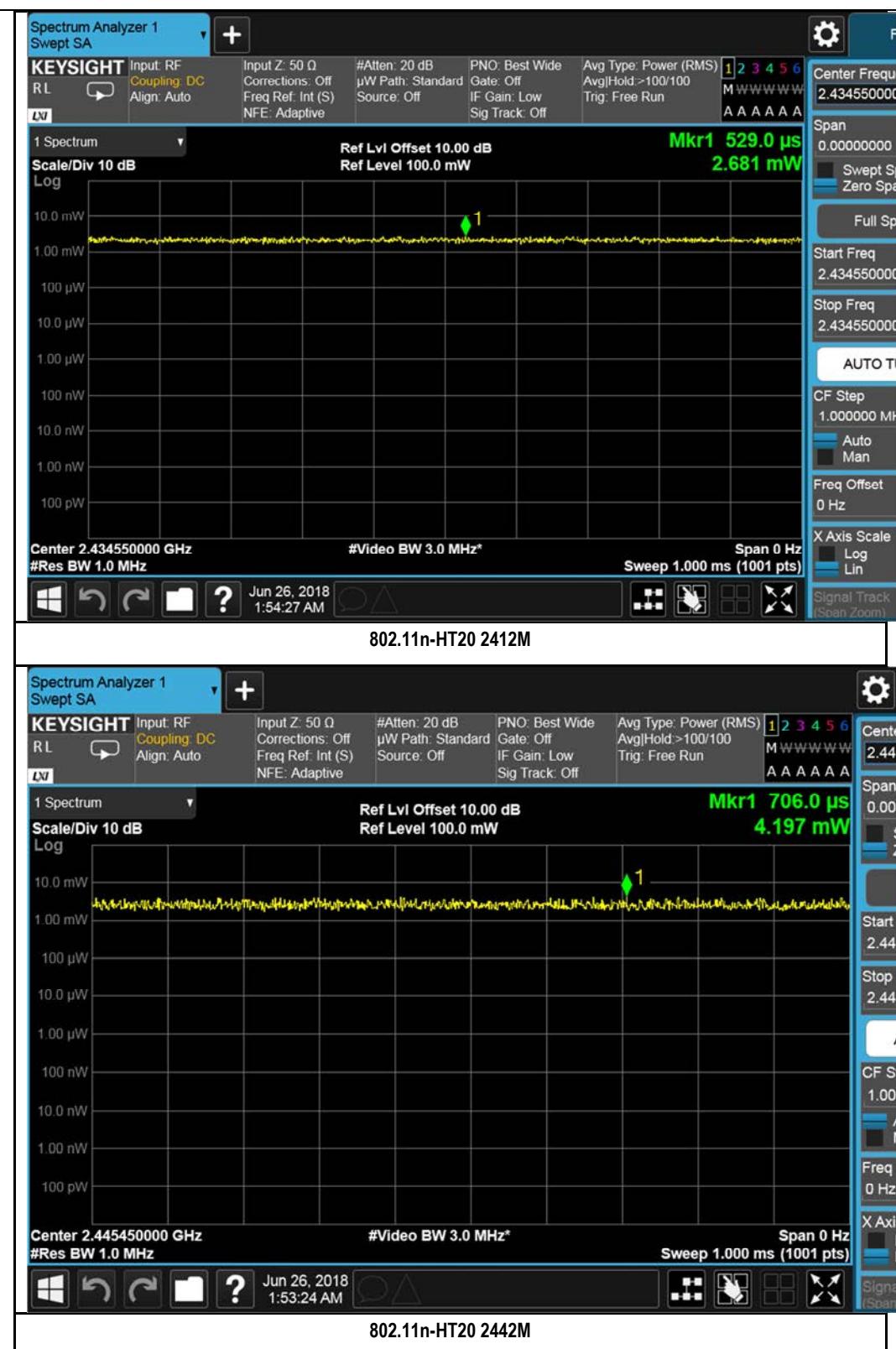
EIRP

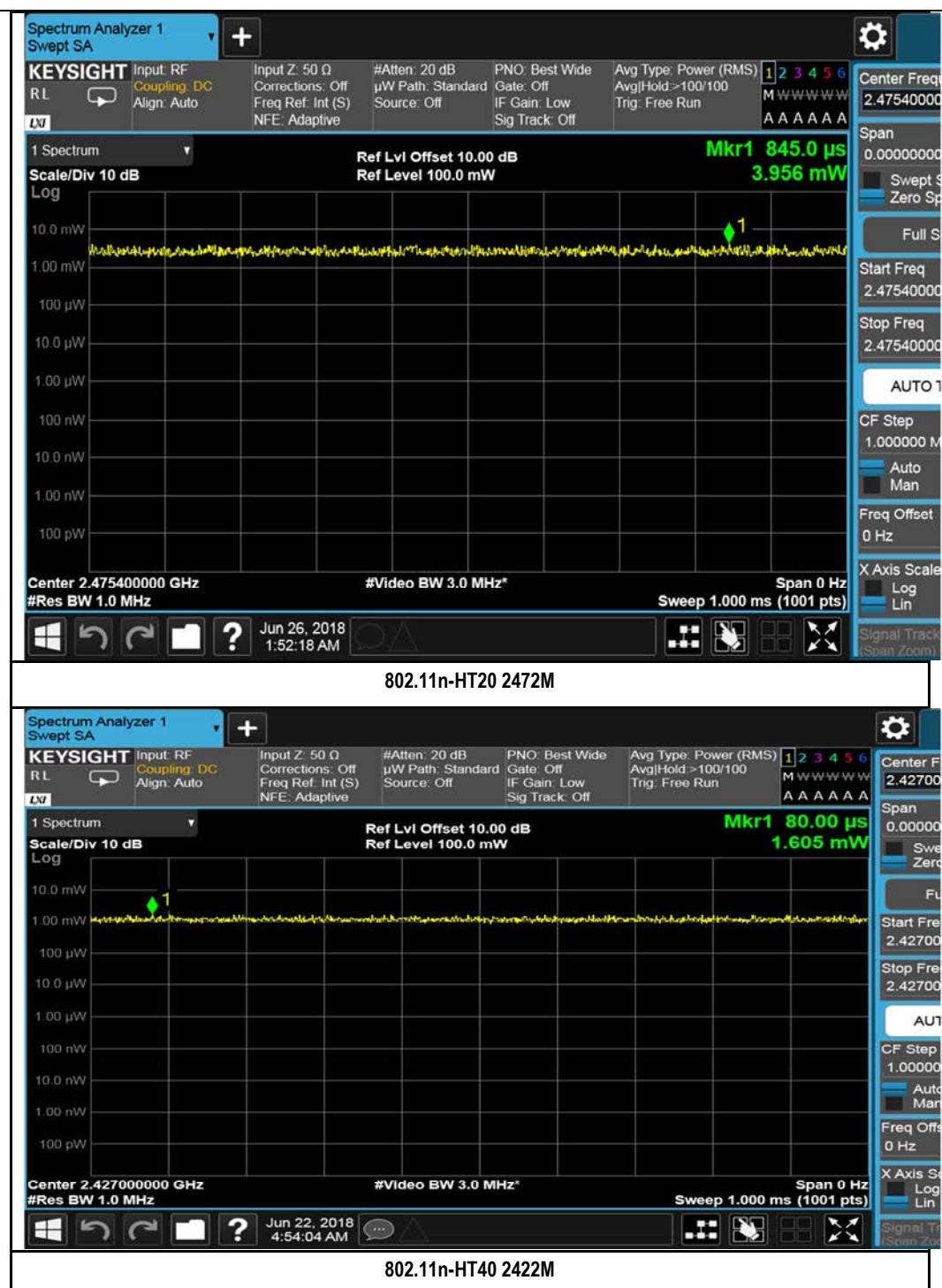
Test mode	Frequency Range (MHz)	Power (mW/MHz)	Antenna Gain (dBi)	EIRP (mW/MHz)	EIRP Limit (mW/MHz)	RESULT
802.11a	Low-5500M	2.205	2	3.495	50	Pass
	Mid-5600M	2.326	2	3.686	50	Pass
	High-5700M	1.401	2	2.220	50	Pass
802.11n-HT20	Low-5500M	2.057	2	3.260	50	Pass
	Low-5600M	2.407	2	3.815	50	Pass
	Low-5700M	1.846	2	2.925	50	Pass
802.11n-HT40	Low-5510M	0.476	2	0.754	25	Pass
	Mid-5550M	0.447	2	0.708	25	Pass
	High-5670M	0.441	2	0.699	25	Pass
802.11ac-VHT80	Low-5530M	0.327	2	0.518	12.5	Pass
	High-5610M	0.290	2	0.460	12.5	Pass

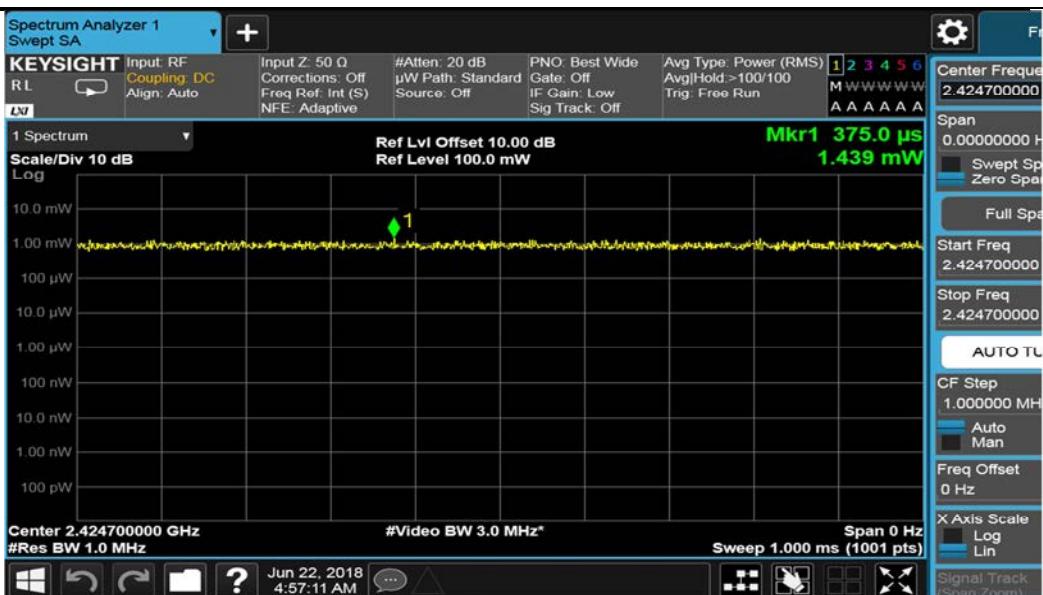
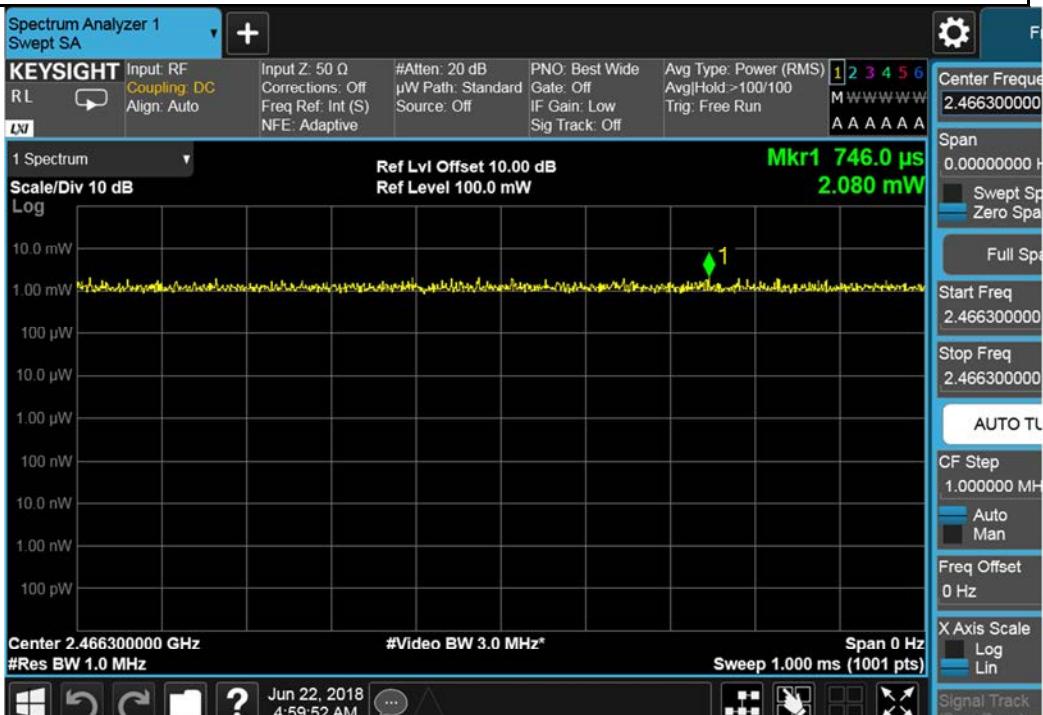
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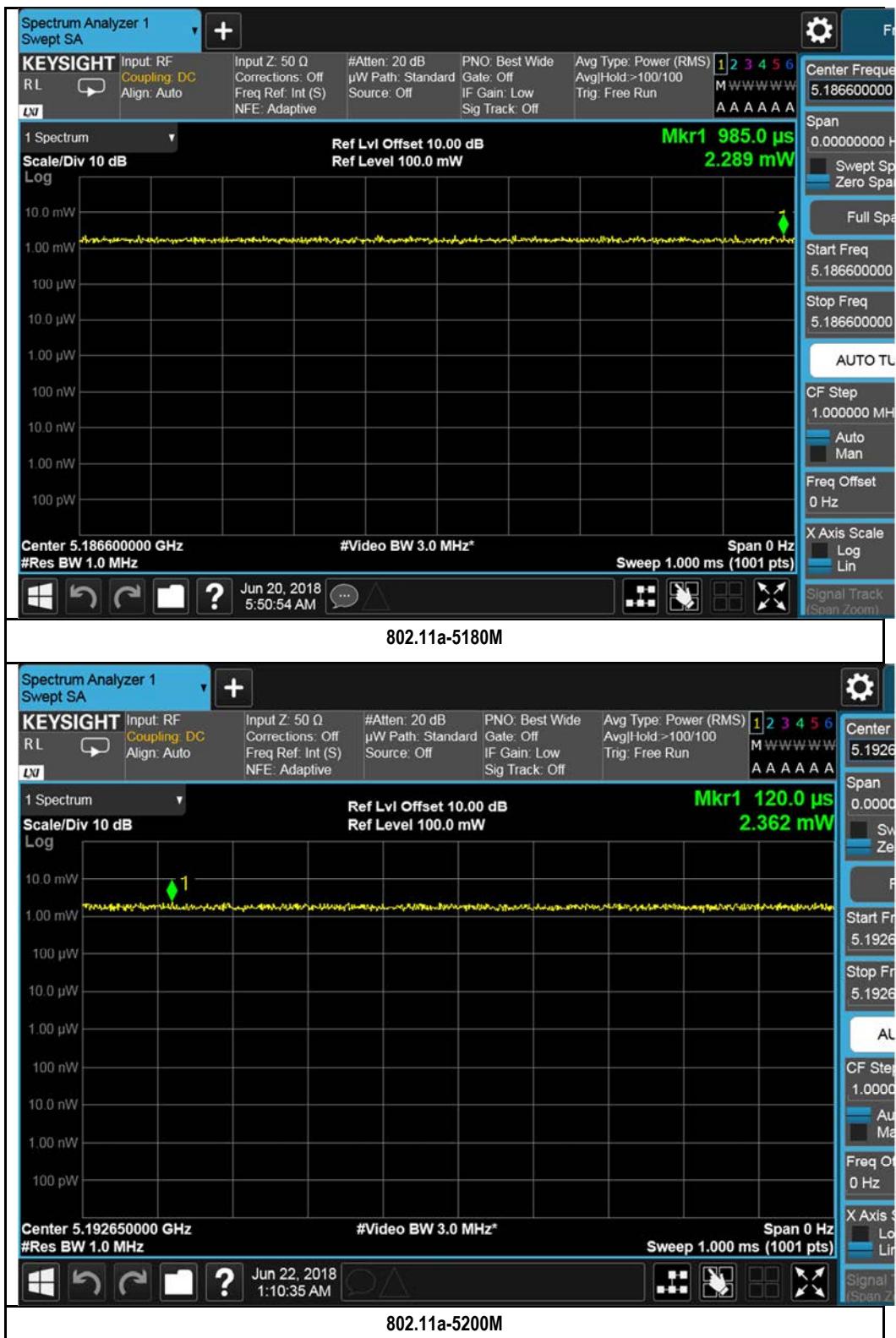


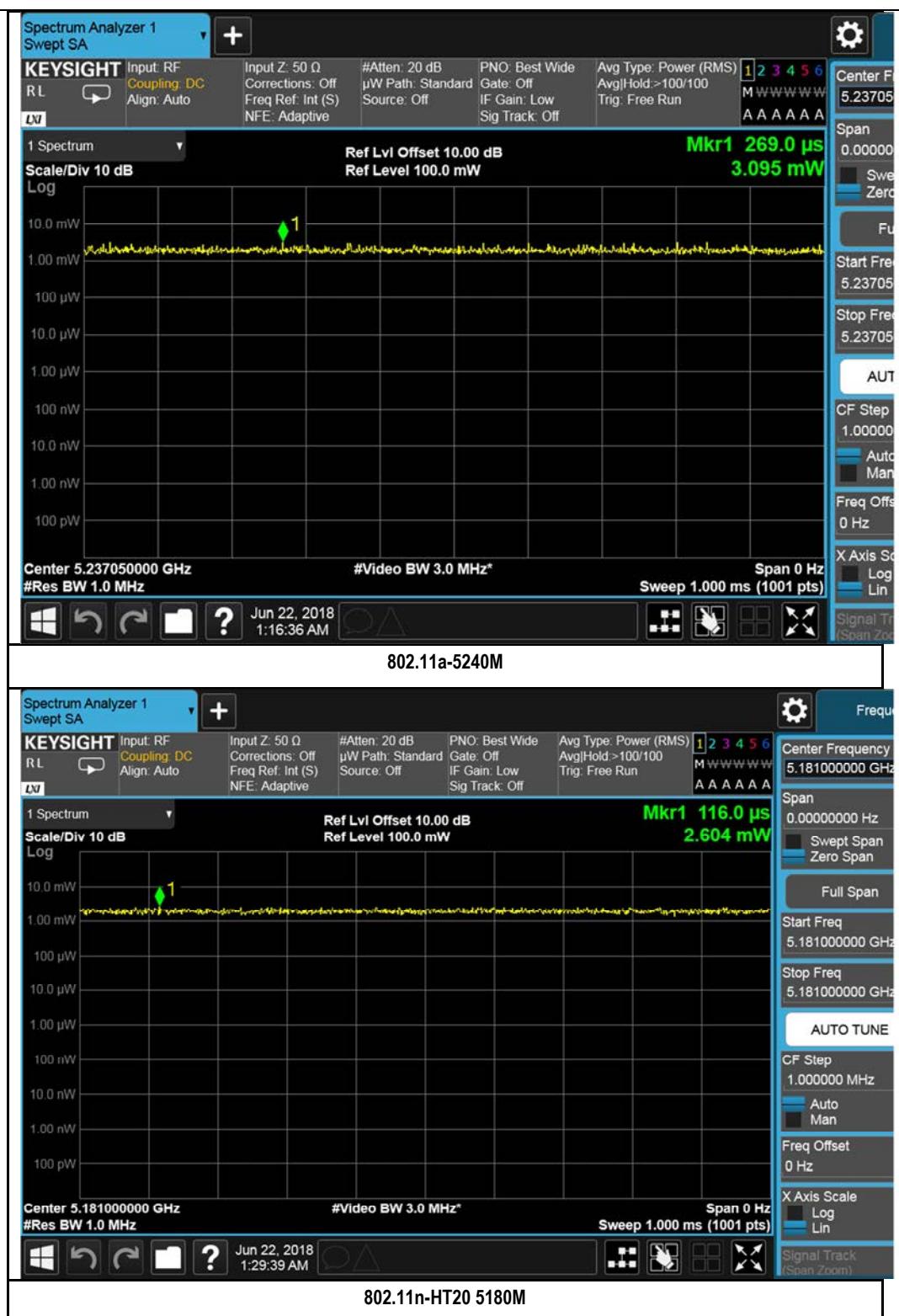


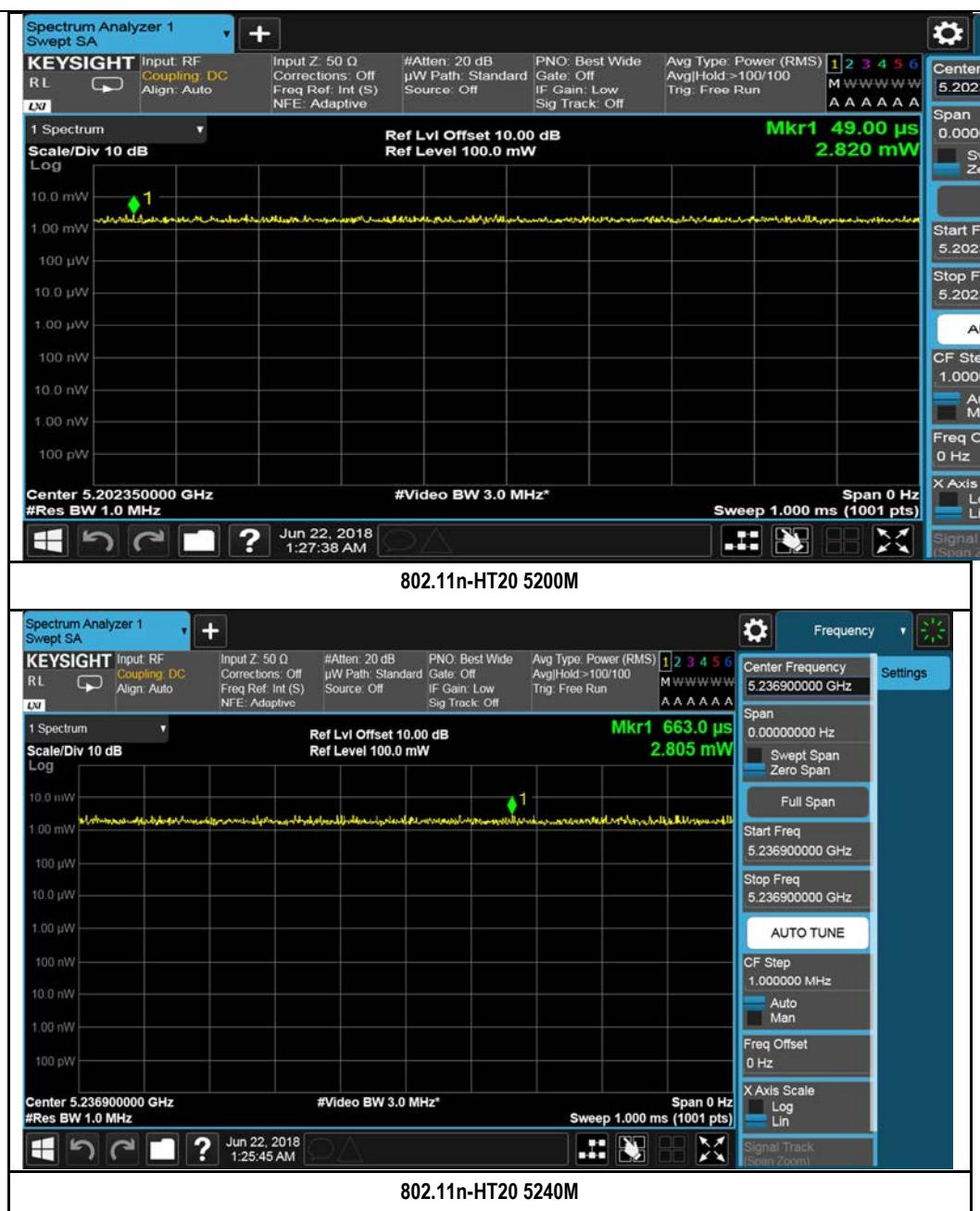


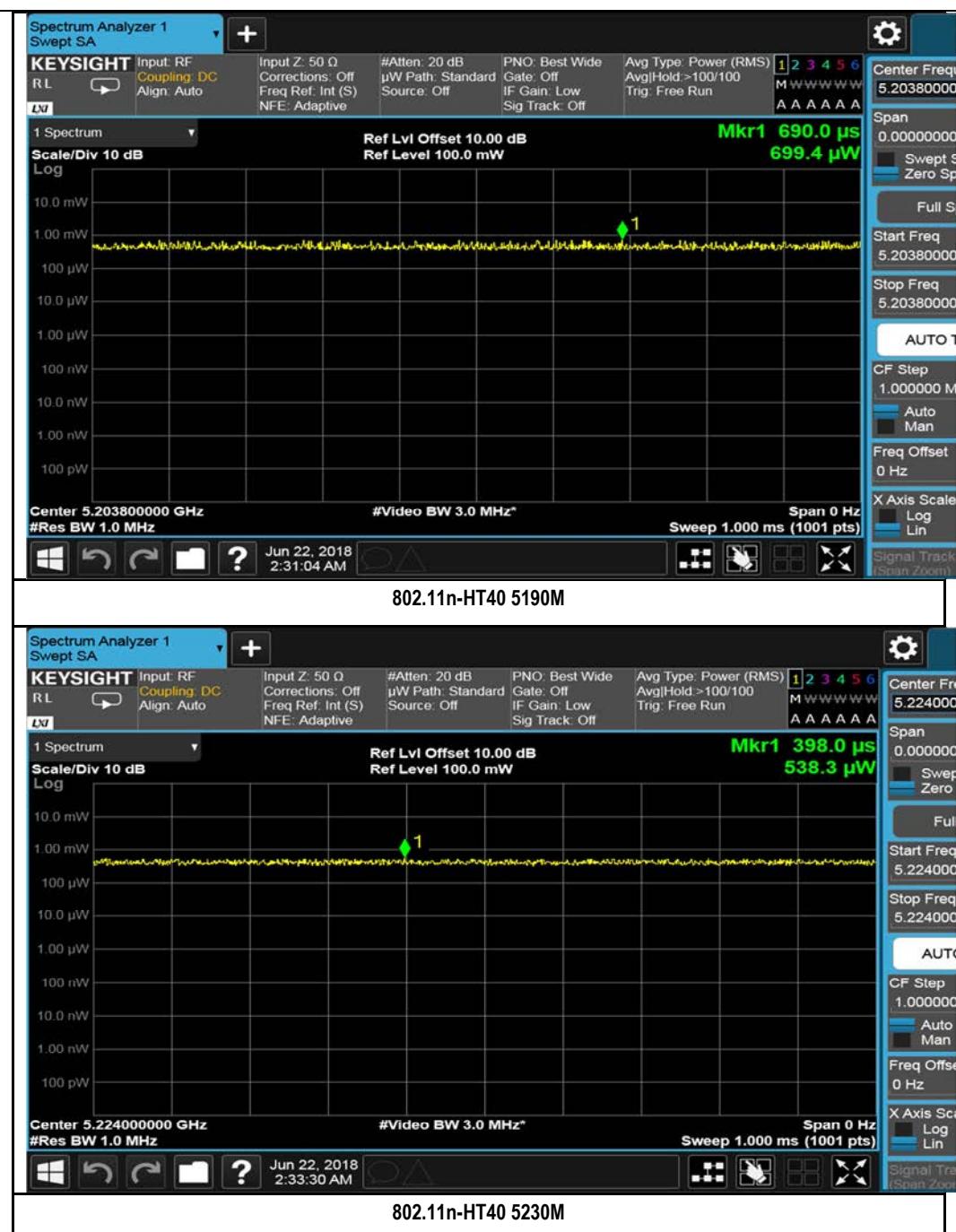

802.11n-HT40 2442M

802.11n-HT40 2462M

W52:



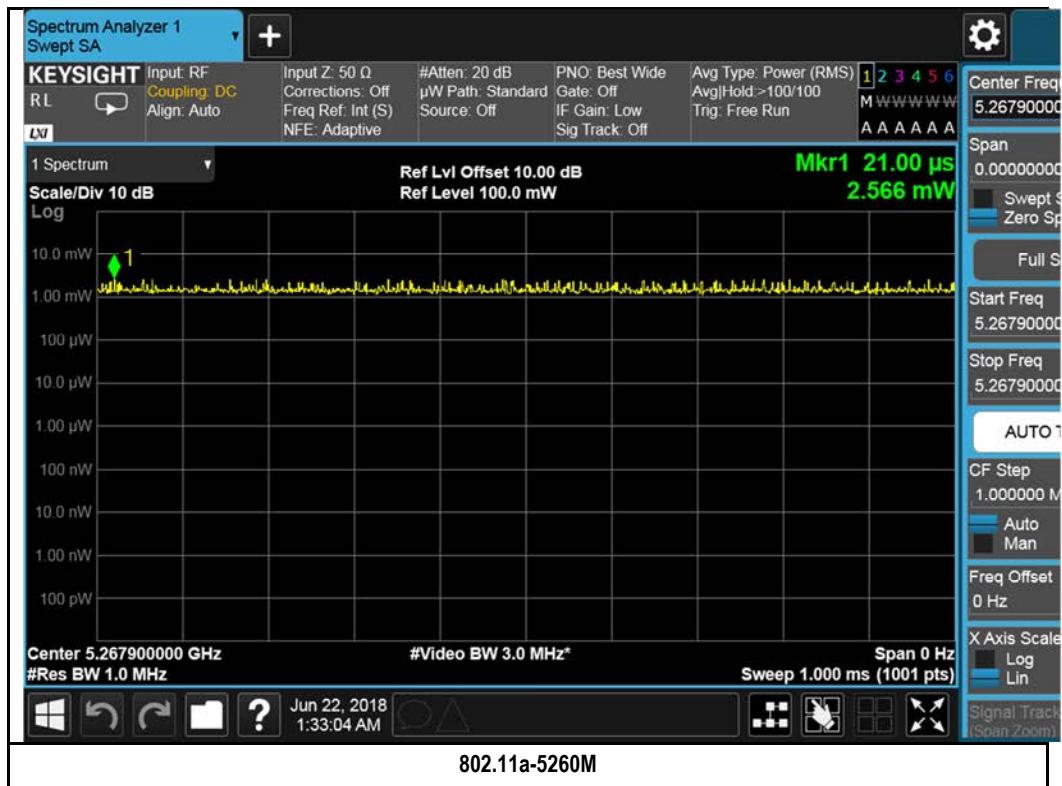


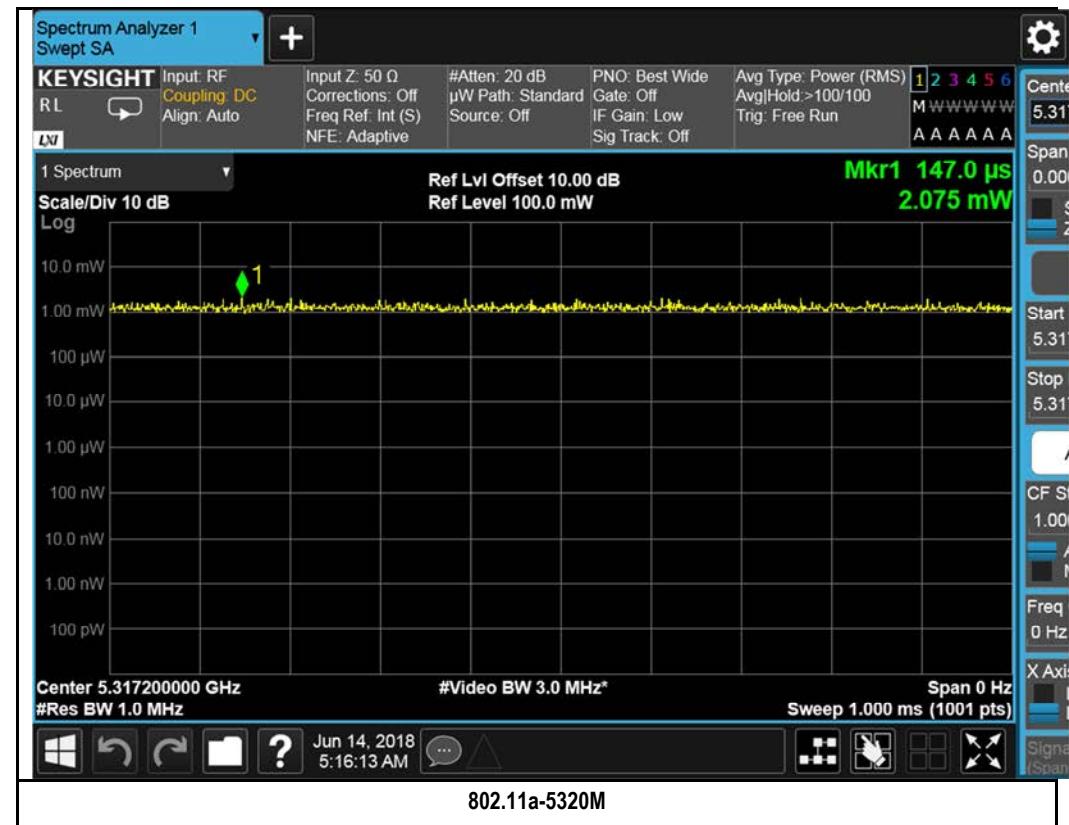
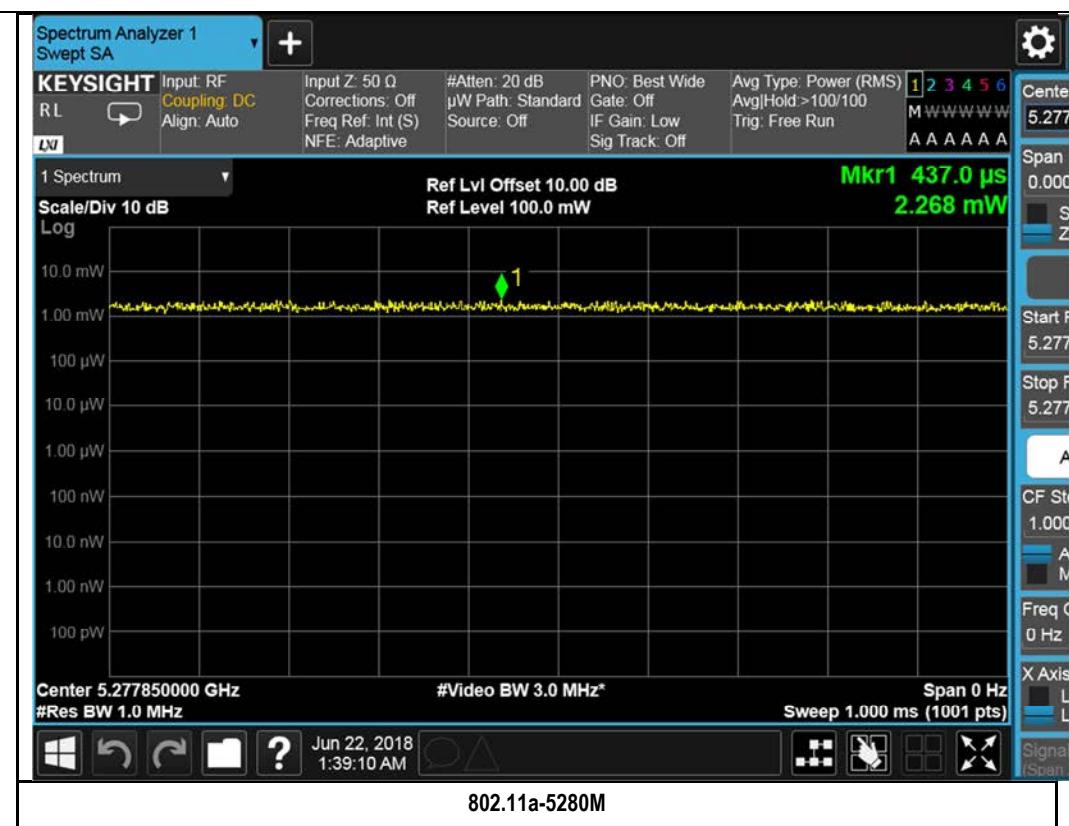


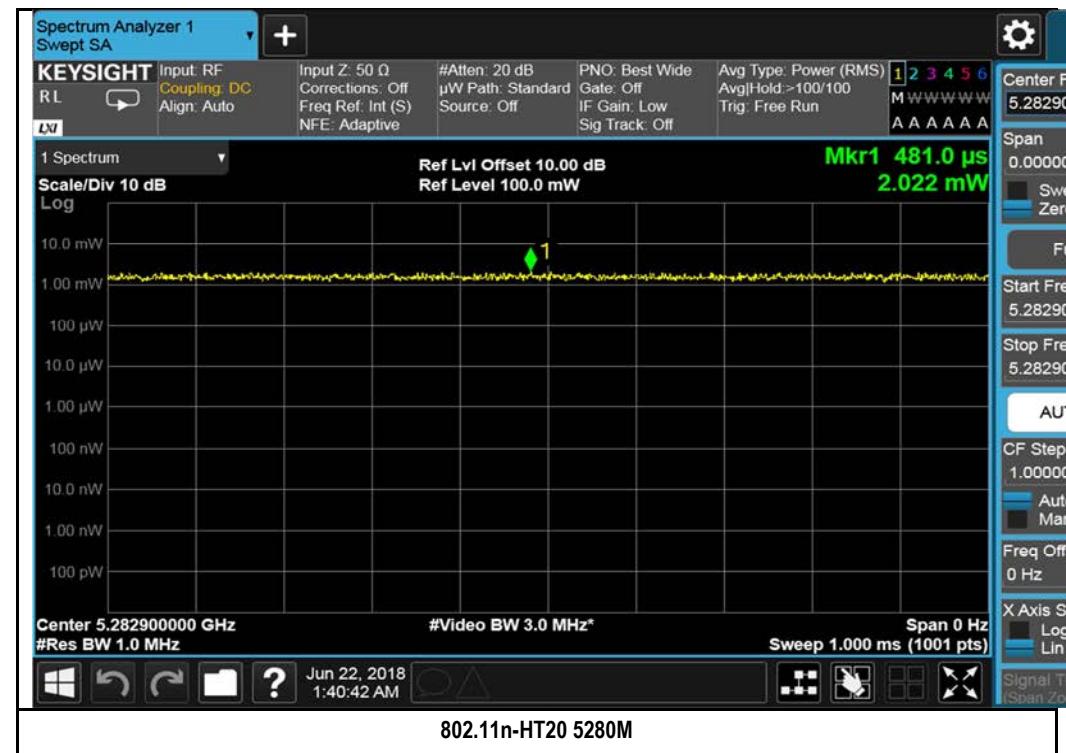
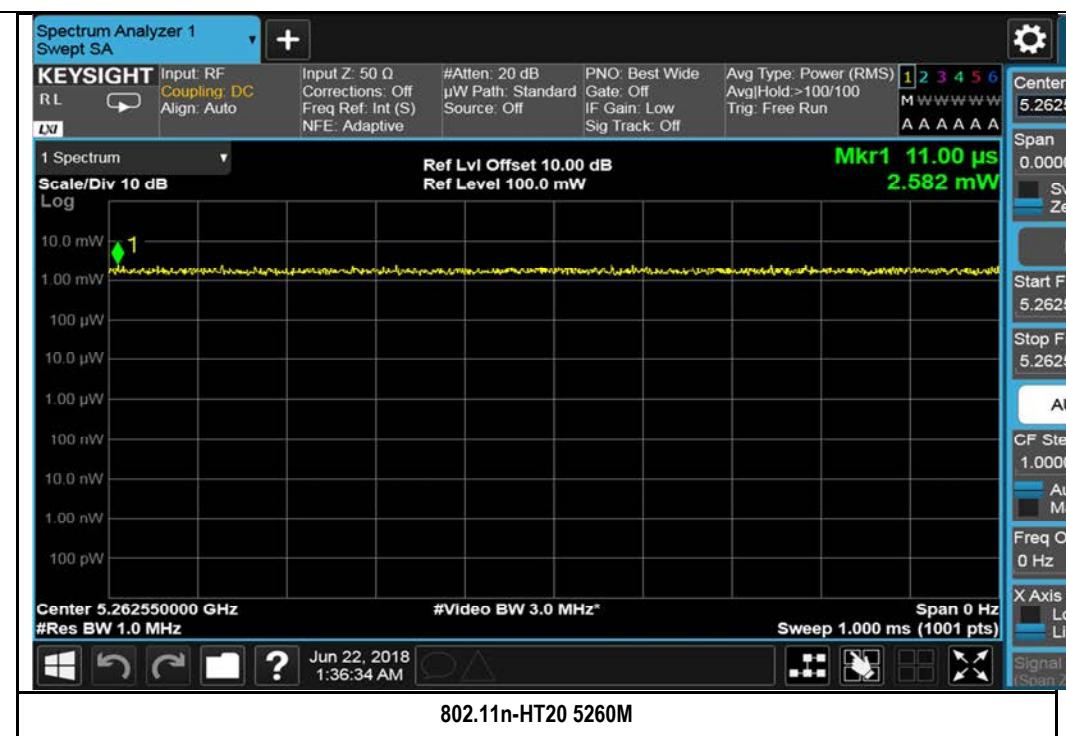


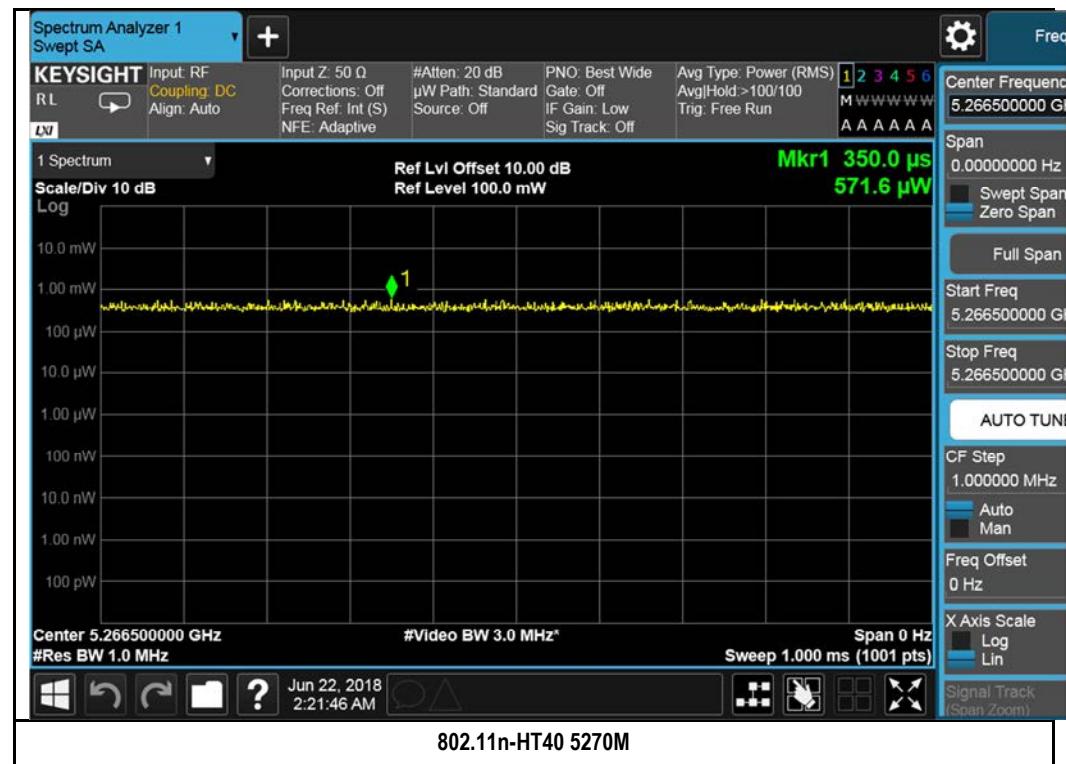
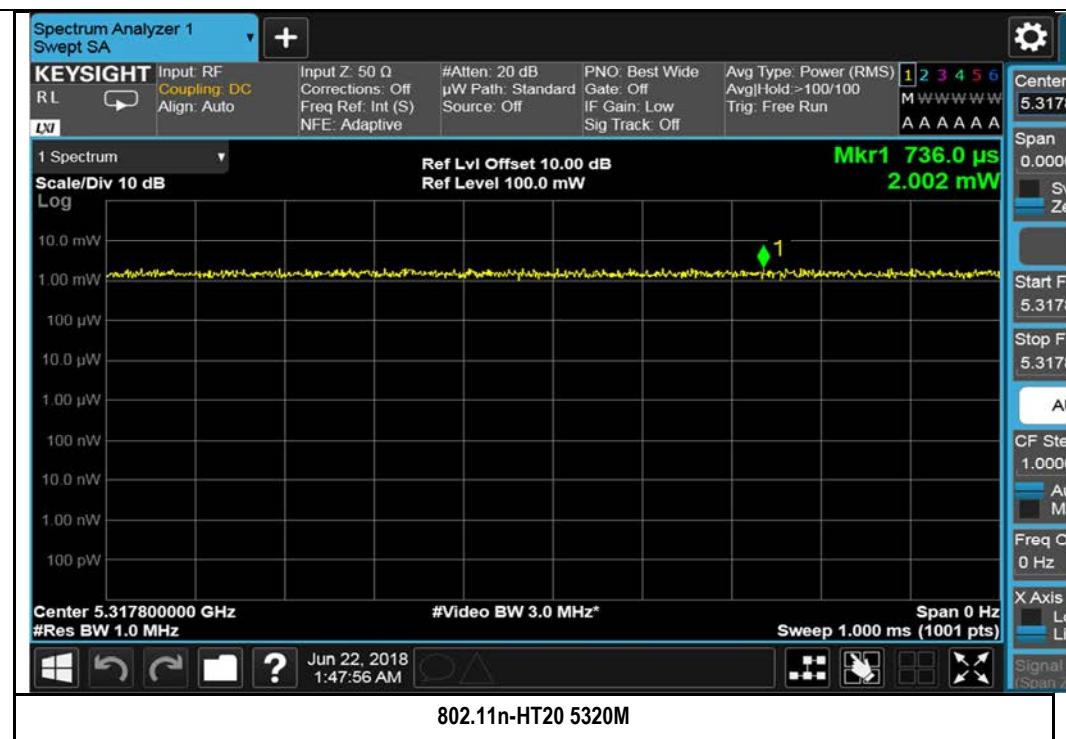


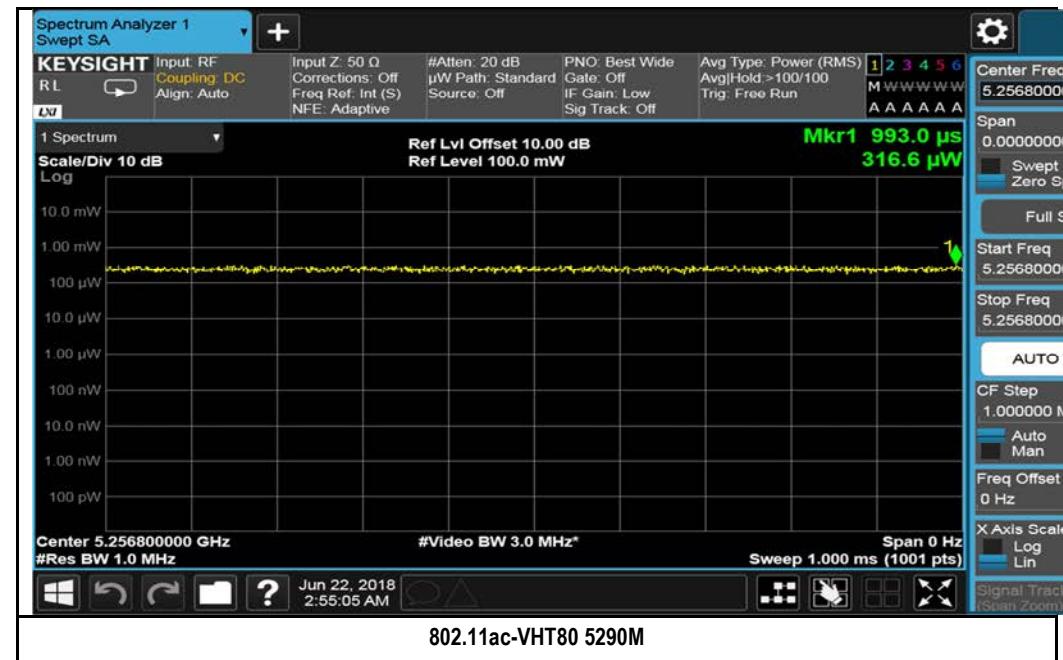
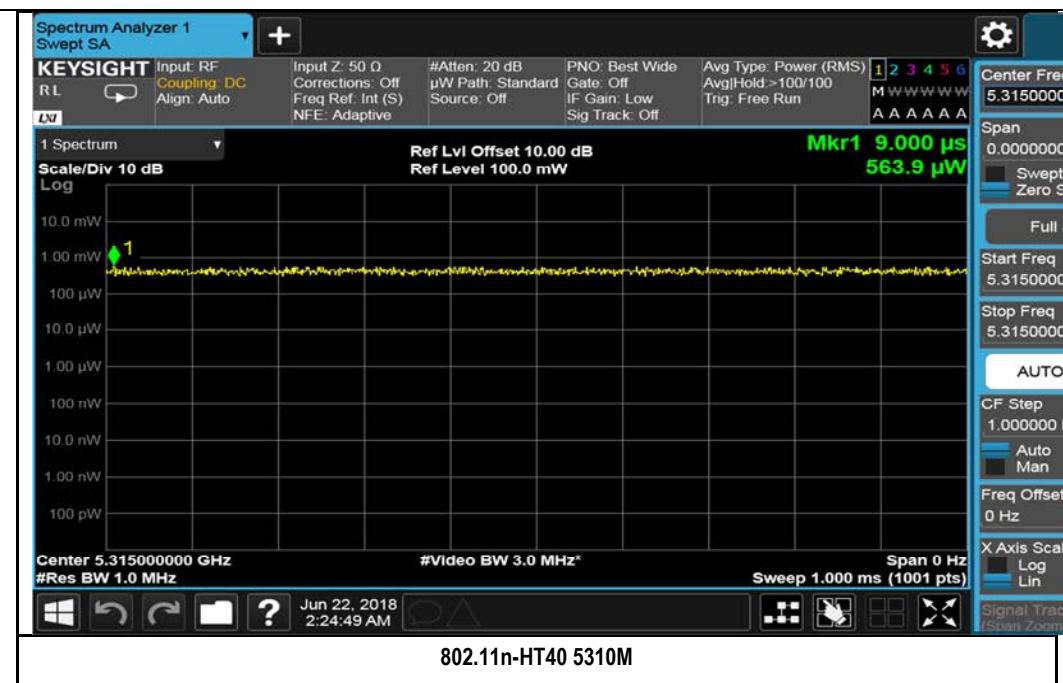
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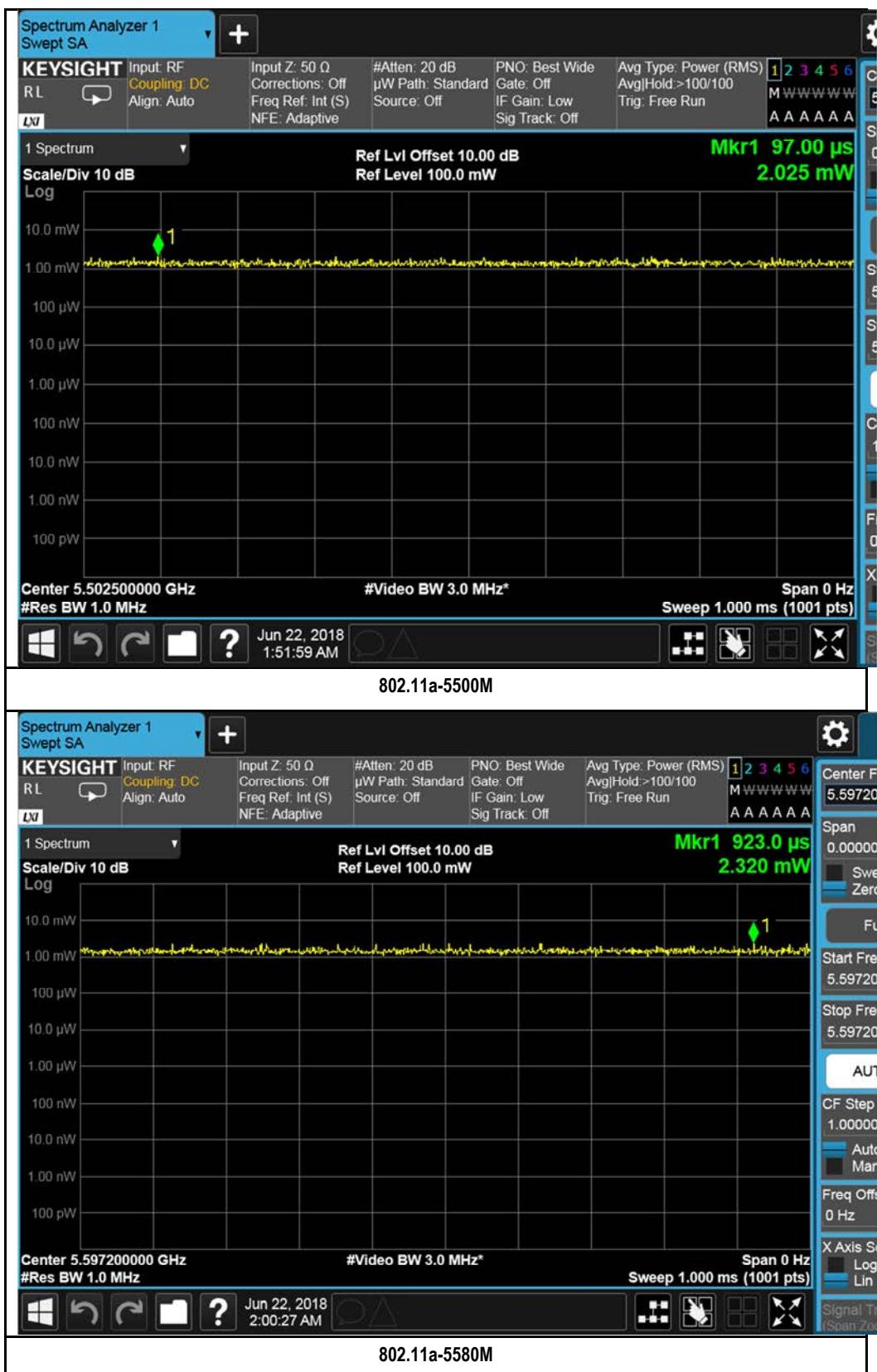


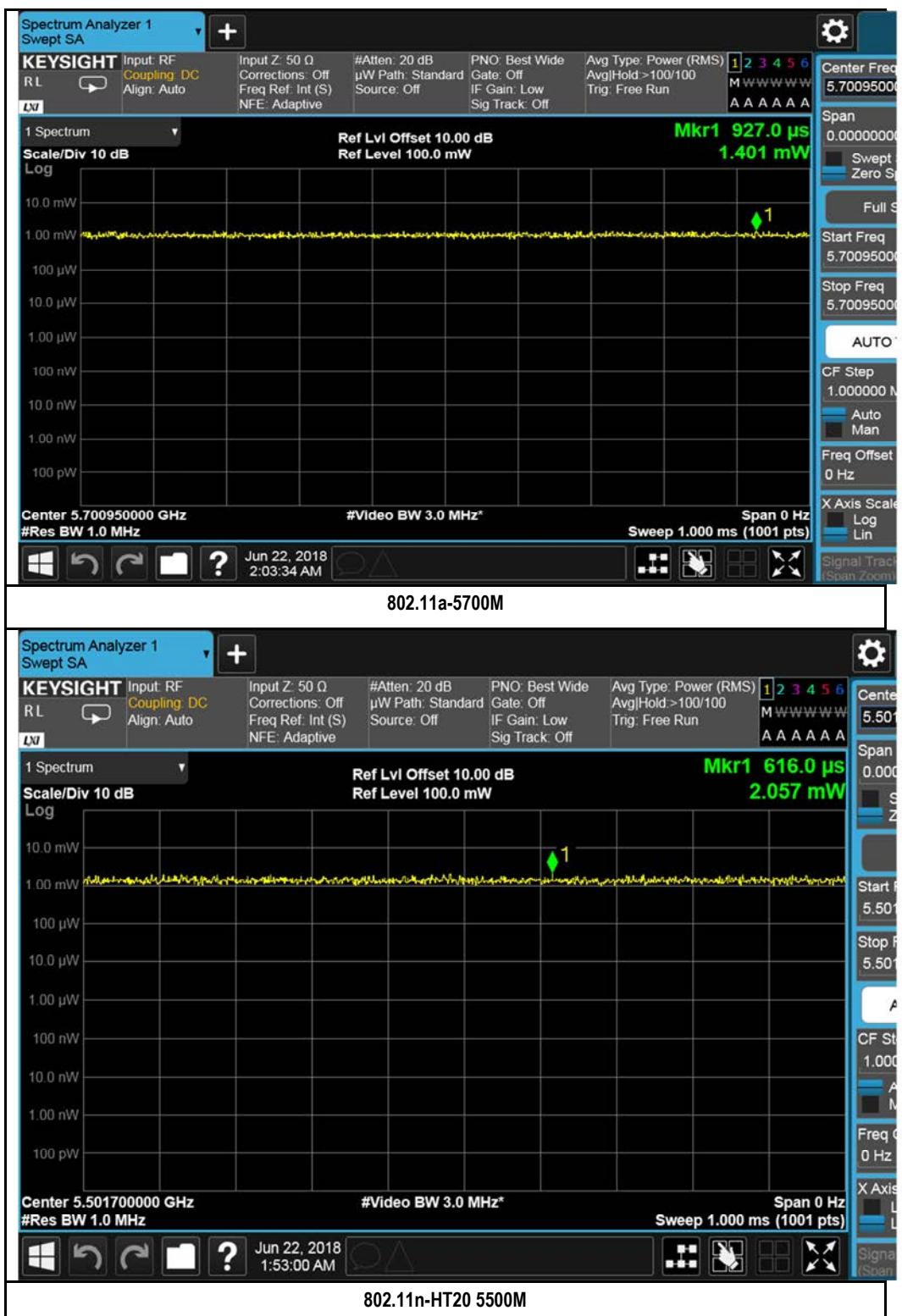


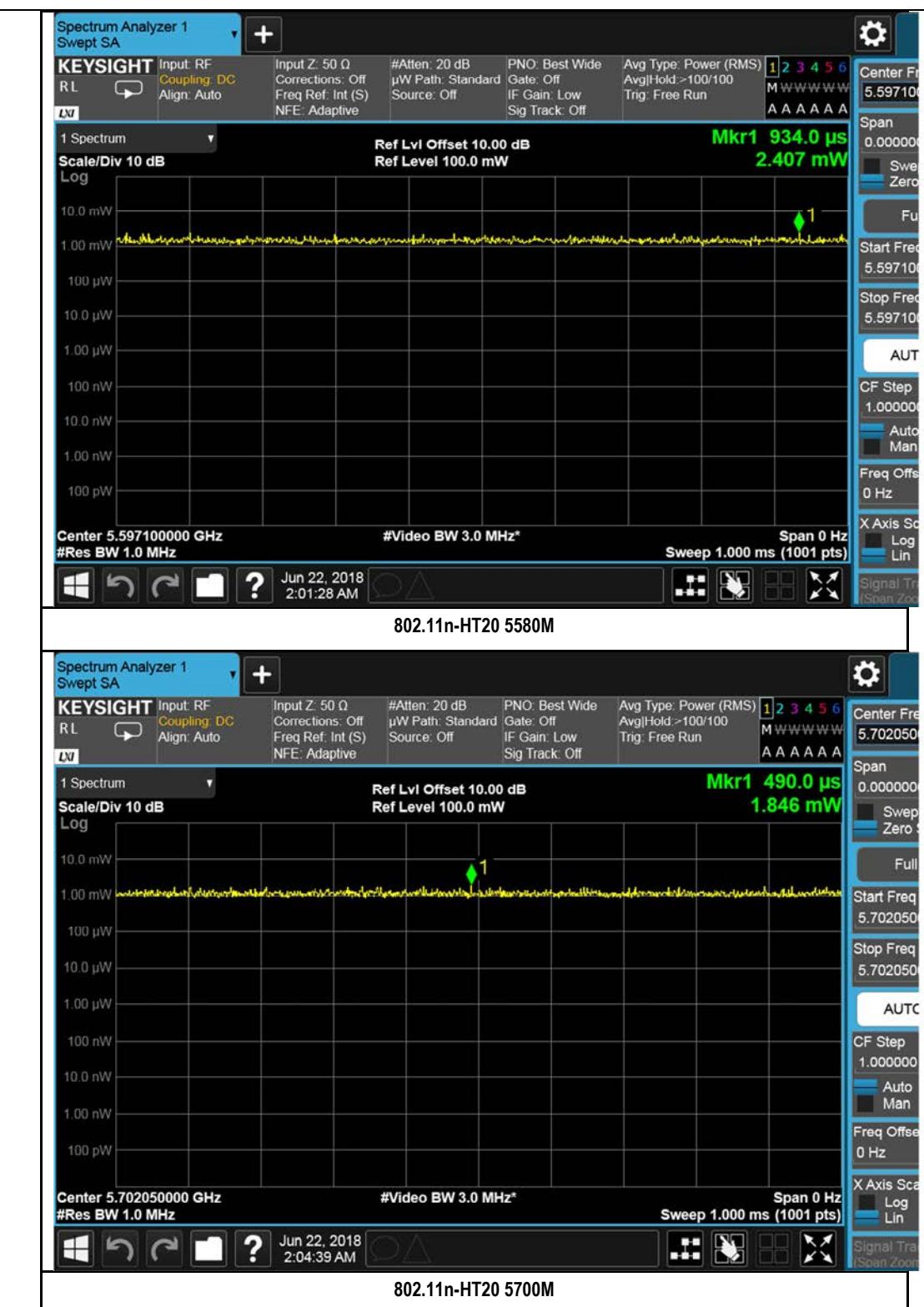


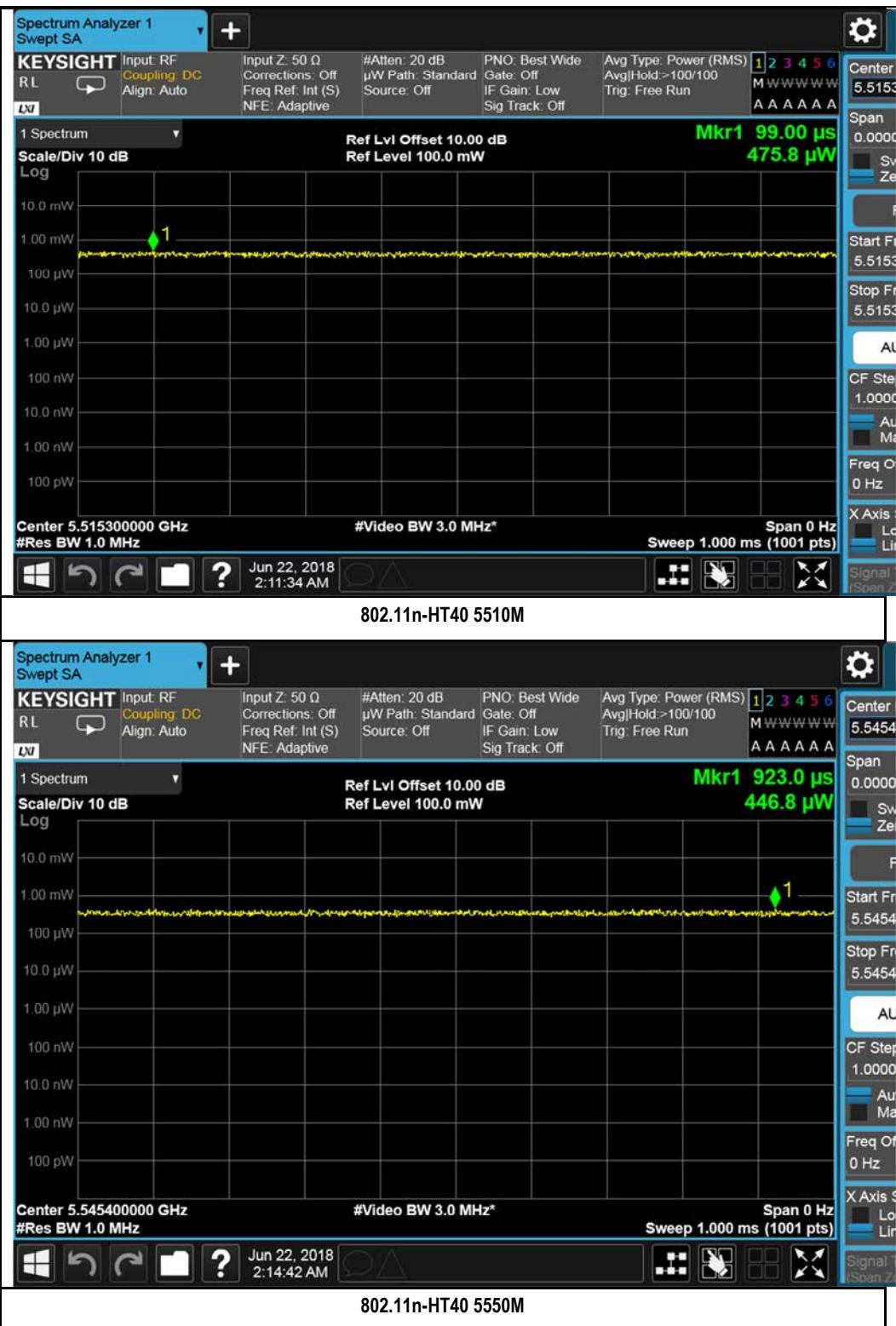


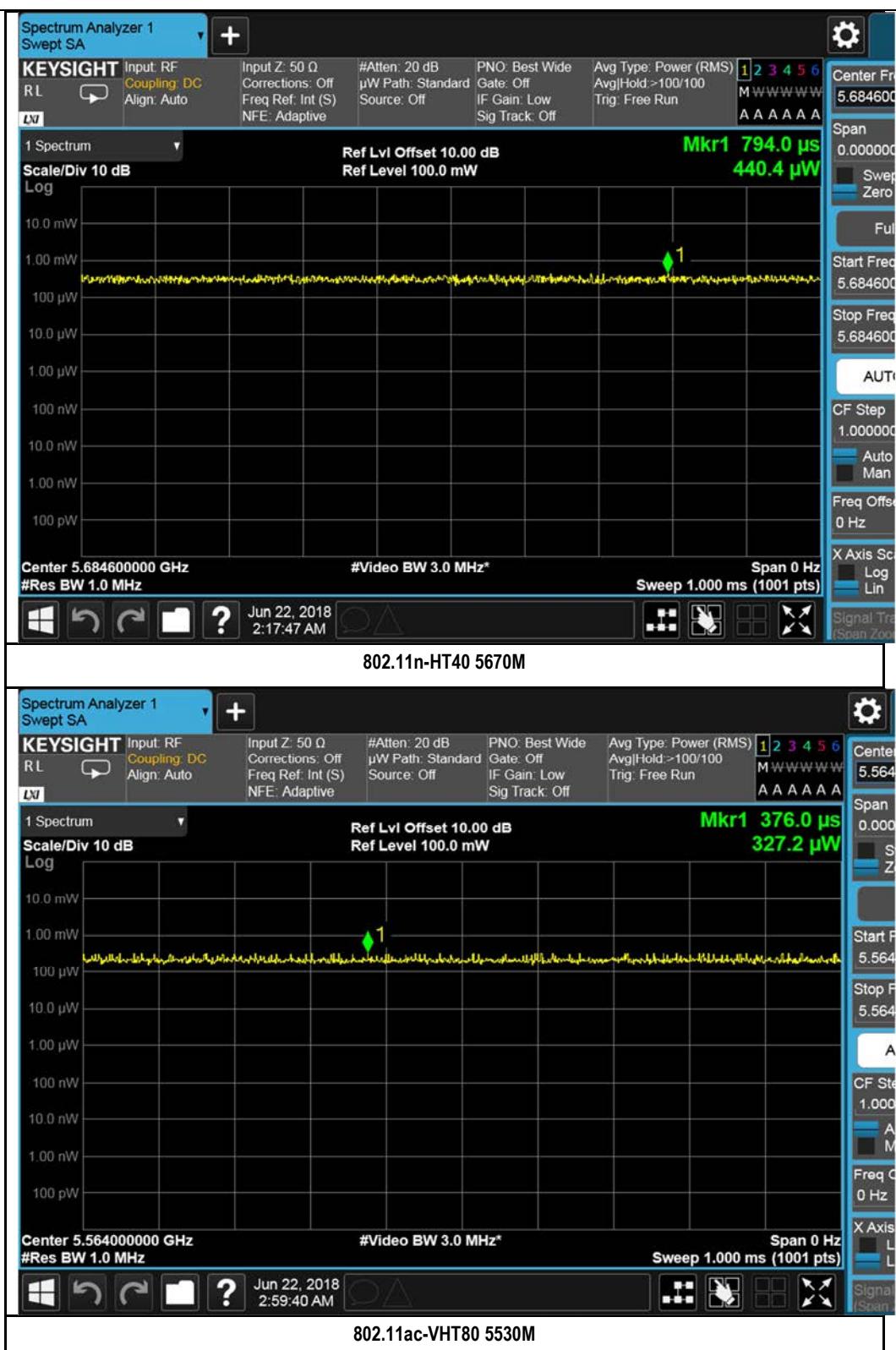
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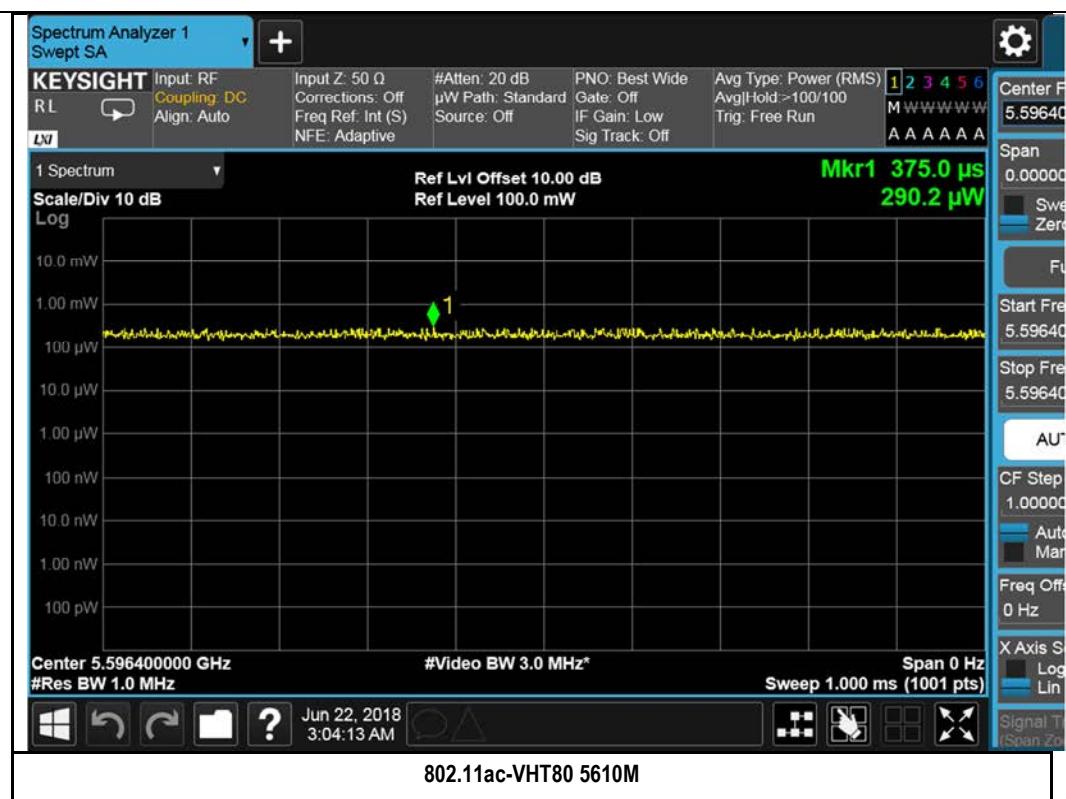






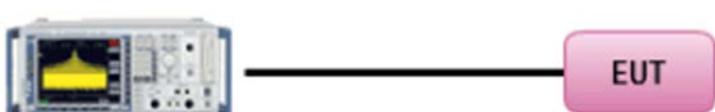






9.6 Secondary Spurious Emissions

Requirement(s):

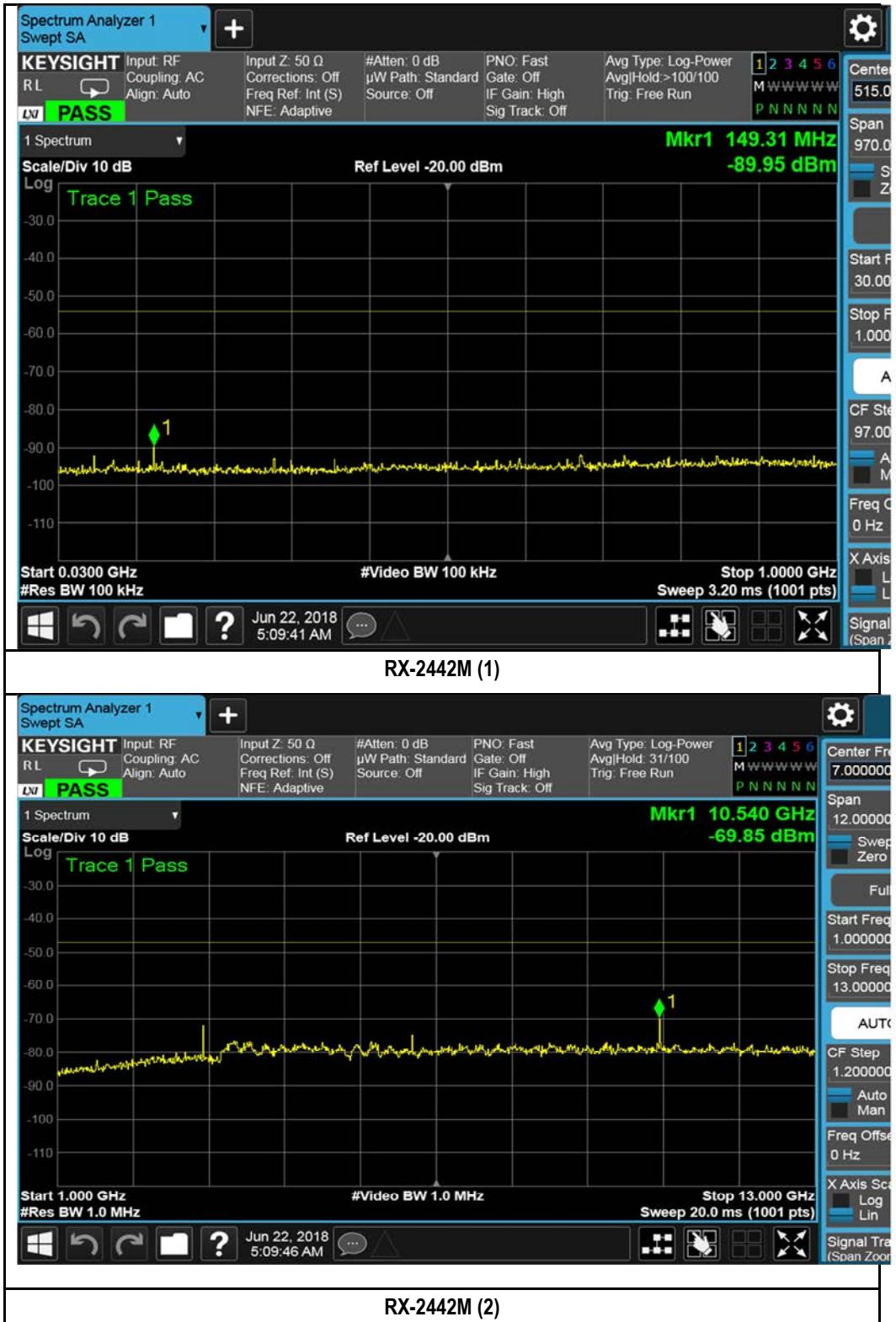
Spec	Item	Requirement	Applicable
Article 2-1	19	(1) Below 1 GHz	4 nW or less -54 dBm
		(2) 1 GHz and above	20 nW or less -47 dBm
Article 2-1	19-3	(1) Below 1 GHz	4 nW or less -54 dBm
		(2) 1 GHz and above	20 nW or less -47 dBm
Article 2-1	19-3-2	(1) Below 1 GHz	4 nW or less -54 dBm
		(2) 1 GHz and above	20 nW or less -47 dBm
Article 2-1	19-3-3	(1) Below 1 GHz	4 nW or less -54 dBm
		(2) 1 GHz and above	20 nW or less -47 dBm
Test Setup		 <p>Spectrum Analyzer</p>	EUT
Test Procedure		<p><u>measurement procedure</u></p> <p>Step1</p> <ul style="list-style-type: none"> - For 2.4GHz, all emissions are measured from 30MHz to 13GHz by using spectrum analyser's internal spurious measurement function. - For 5GHz, all emissions are measured from 30MHz to 26GHz by using spectrum analyser's internal spurious measurement function. <p>Step2</p> <ul style="list-style-type: none"> - It measures the point by average mode value of 3dB or less to the limit. 	
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature 22oC Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	N/A		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

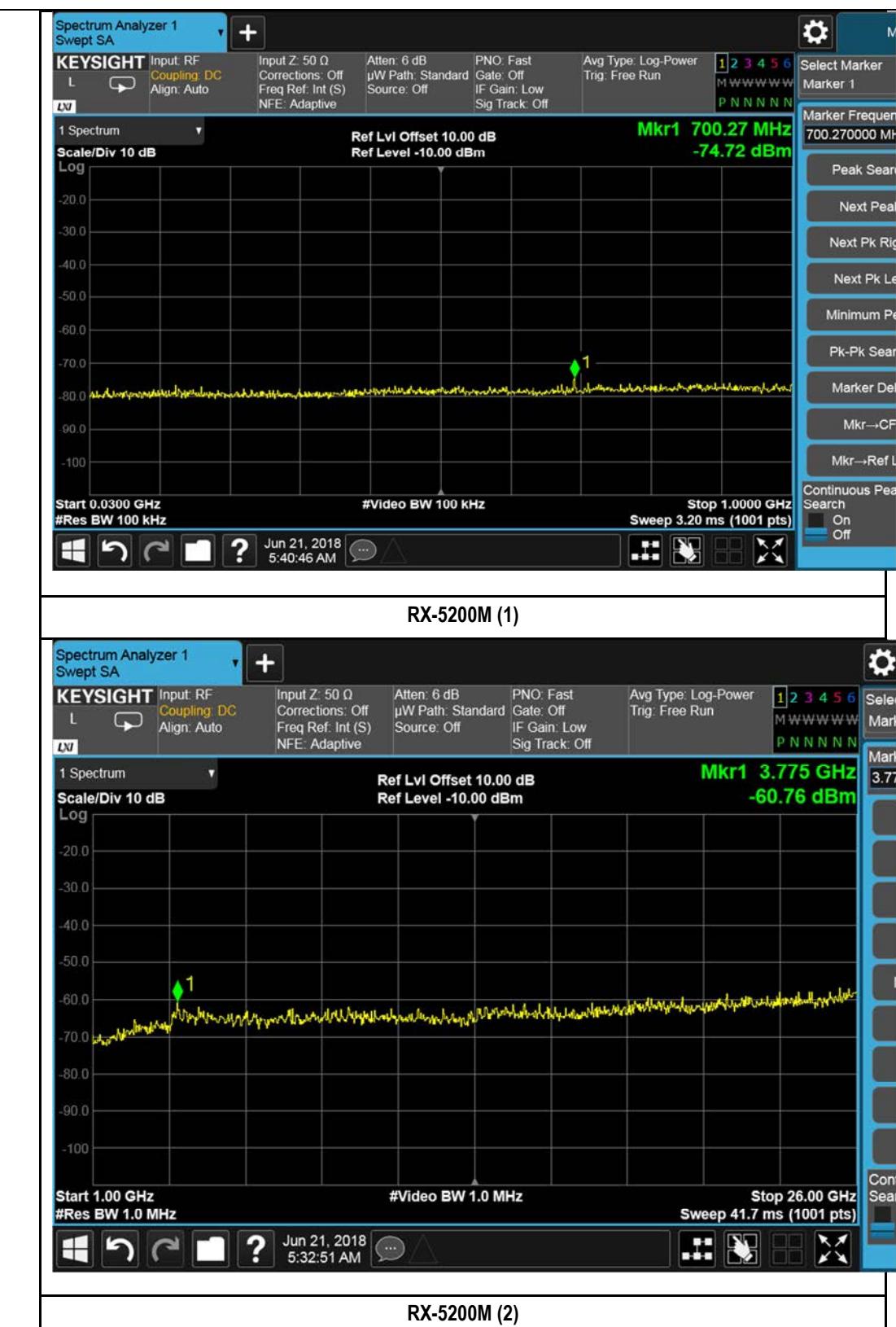
Test Data Yes N/A

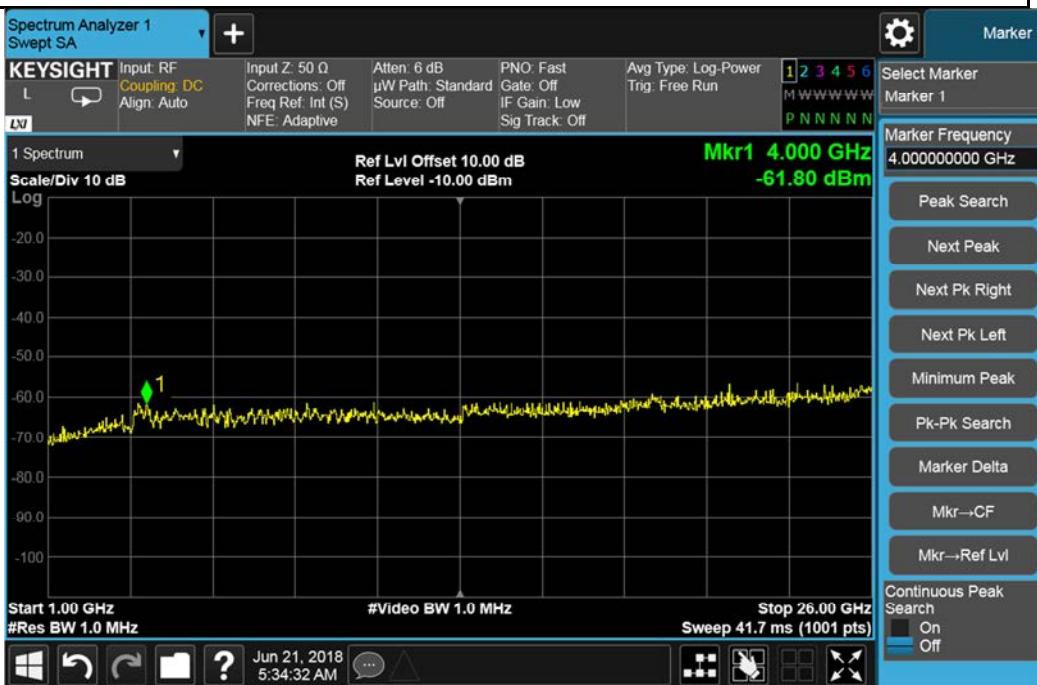
Test Plot Yes (See below) N/A

Test was done by Benjamin Jing at RF Test Site.

Test Plots






RX-5280M (1)

RX-5280M (2)



9.7 Adjacent Channel Power

Requirement(s):

Spec	Item	Requirement			Applicable	
Article 2-1	19-3	BW ≤ 19 MHz	fo+/ -20MHz	25dBc or less	<input checked="" type="checkbox"/>	
			fo+/ -40MHz	40dBc or less	<input checked="" type="checkbox"/>	
		BW ≤ 38 MHz	fo+/ -40MHz	25dBc or less	<input checked="" type="checkbox"/>	
	19-3-2		fo+/ -80MHz	40dBc or less	<input checked="" type="checkbox"/>	
		BW ≤ 78 MHz	fo+/ -80MHz	25dBc or less	<input type="checkbox"/>	
		BW ≤ 19 MHz	fo+/ -20MHz	25dBc or less	<input checked="" type="checkbox"/>	
			fo+/ -40MHz	40dBc or less	<input checked="" type="checkbox"/>	
		BW ≤ 38 MHz	fo+/ -40MHz	25dBc or less	<input checked="" type="checkbox"/>	
			fo+/ -80MHz	40dBc or less	<input checked="" type="checkbox"/>	
	19-3-3	BW ≤ 78 MHz	fo+/ -80MHz	25dBc or less	<input type="checkbox"/>	
Test Setup	 Spectrum Analyzer ————— EUT					
Test Procedure	<ul style="list-style-type: none"> - Set the equipment to the test frequency, and modulate with standard coding test signal. - Put the equipment into a continuously transmitting status or a sequentially (constant period, constant burst length) burst transmitting status. - Use spectrum analyzer's internal measurement function to make measurement - Capture the plot and record the test data 					
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature 23°C Relative Humidity 47% Atmospheric Pressure 1019mbar			
Remark	NONE					
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail				

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test was done by Benjamin Jing at RF Test Site.

Adjacent Channel Power measurement result per Article 2 paragraph 1 item (19)-3

Test mode	Frequency Range (MHz)	Result		Limit (dBc)	Result
		±20M(dBc)	±40M(dBc)		
802.11a	Low-5180M	-45.207	-47.890	-25/-40	Pass
	Mid-5200M	-45.561	-48.102	-25/-40	Pass
	High-5240M	-45.864	-48.871	-25/-40	Pass
802.11n-HT20	Low-5180M	-44.098	-48.448	-25/-40	Pass
	Mid-5200M	-44.182	-48.652	-25/-40	Pass
	High-5240M	-44.422	-49.288	-25/-40	Pass
802.11n-HT40	Low-5190M	-45.549	-45.952	-25/-40	Pass
	High-5230M	-40.774	-40.774	-25/-40	Pass

Test mode	Frequency Range (MHz)	Result		Limit (dBc)	Result
		±20M(dBc)	±40M(dBc)		
802.11a	Low-5260M	-47.593	-54.916	-25/-40	Pass
	Mid-5280M	-48.046	-55.081	-25/-40	Pass
	High-5320M	-47.746	-54.875	-25/-40	Pass
802.11n-HT20	Low-5260M	-45.435	-54.832	-25/-40	Pass
	Mid-5280M	-45.403	-55.289	-25/-40	Pass
	High-5320M	-45.503	-55.215	-25/-40	Pass
802.11n-HT40	Low-5270M	-49.937	-52.070	-25/-40	Pass
	High-5310M	-42.944	-43.102	-25/-40	Pass

Test mode	Frequency Range (MHz)	Result		Limit (dBc)	Result
		±40M(dBc)			
802.11ac-VHT80	Low-5210M	-40.774		-40	Pass
802.11ac-VHT80	High-5290M	-42.944		-40	Pass

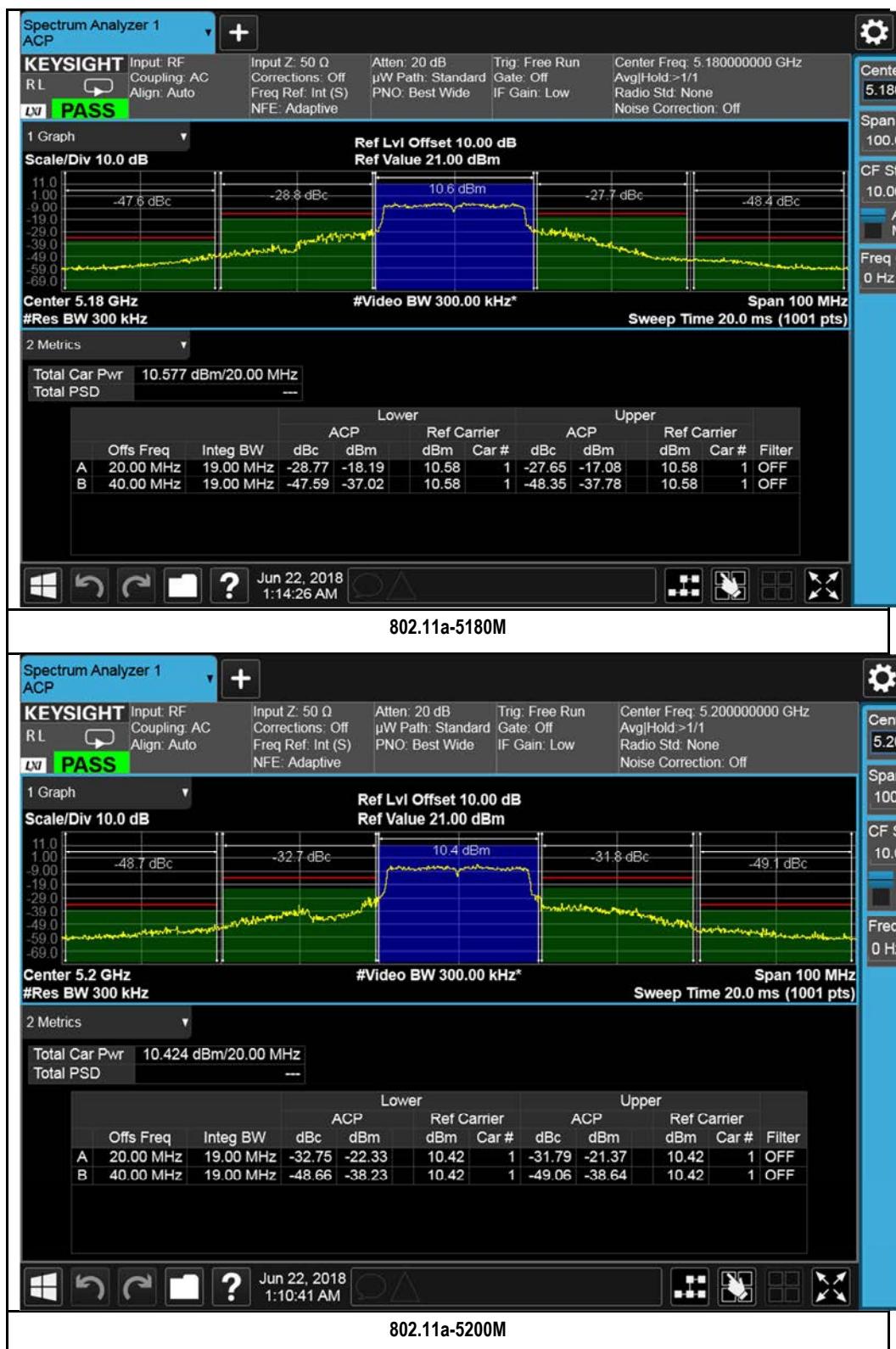
Adjacent Channel Power measurement result per Article 2 paragraph 1 item (19)-3-2

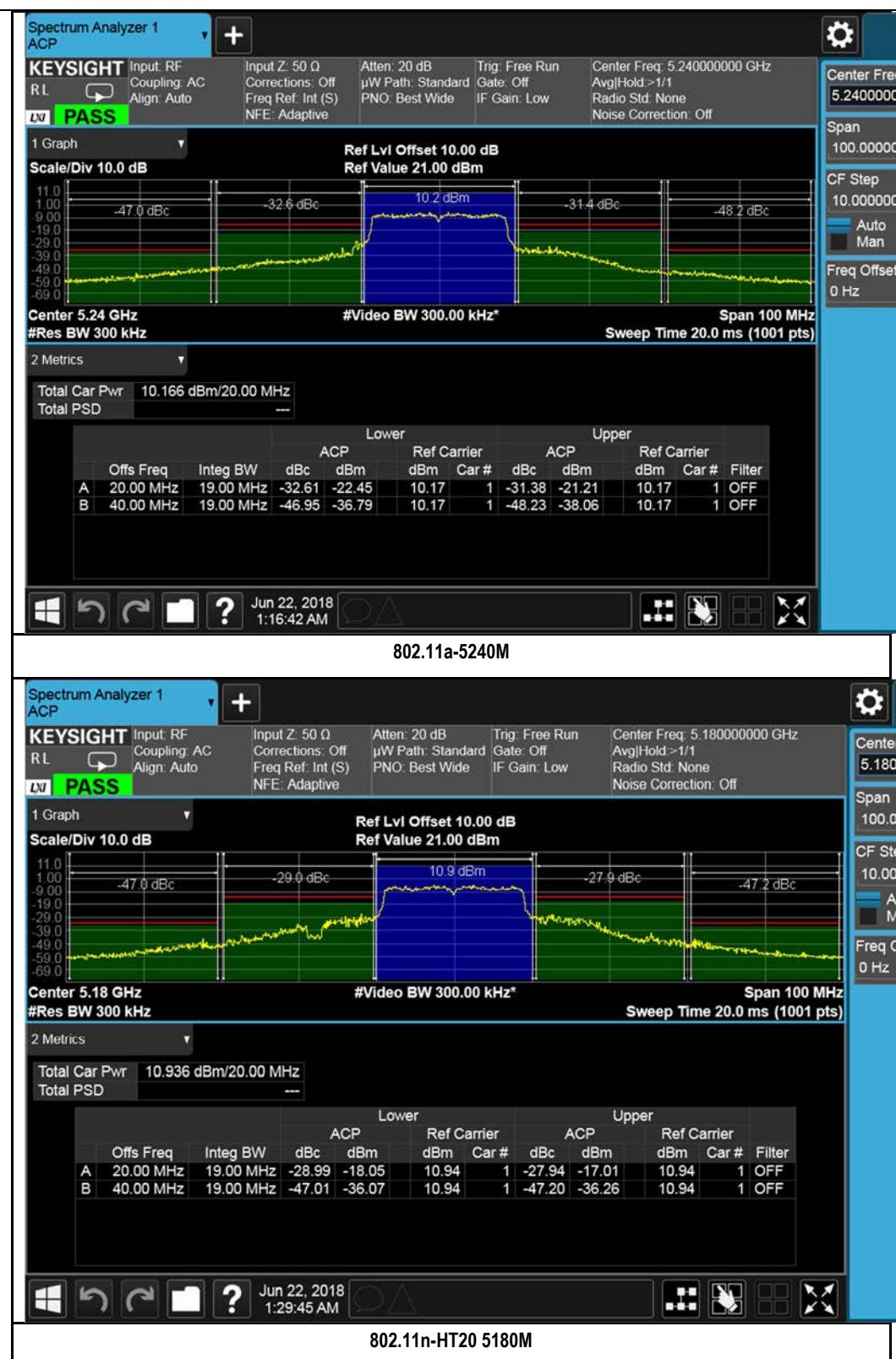
Test mode	Frequency Range (MHz)	Result		Limit (dBc)	Result
		±20M(dBc)	±40M(dBc)		
802.11a	Low-5500M	-47.797	-54.157	-25/-40	Pass
	Mid-5580M	-47.252	-53.446	-25/-40	Pass
	High-5700M	-47.656	-54.363	-25/-40	Pass
802.11n-HT20	Low-5500M	-45.030	-52.658	-25/-40	Pass
	Mid-5580M	-45.331	-53.820	-25/-40	Pass
	High-5700M	-45.400	-54.900	-25/-40	Pass
802.11n-HT40	Low-5510M	-47.772	-49.558	-25/-40	Pass
	Mid-5550M	-47.656	-49.516	-25/-40	Pass
	High-5670M	-48.485	-51.137	-25/-40	Pass

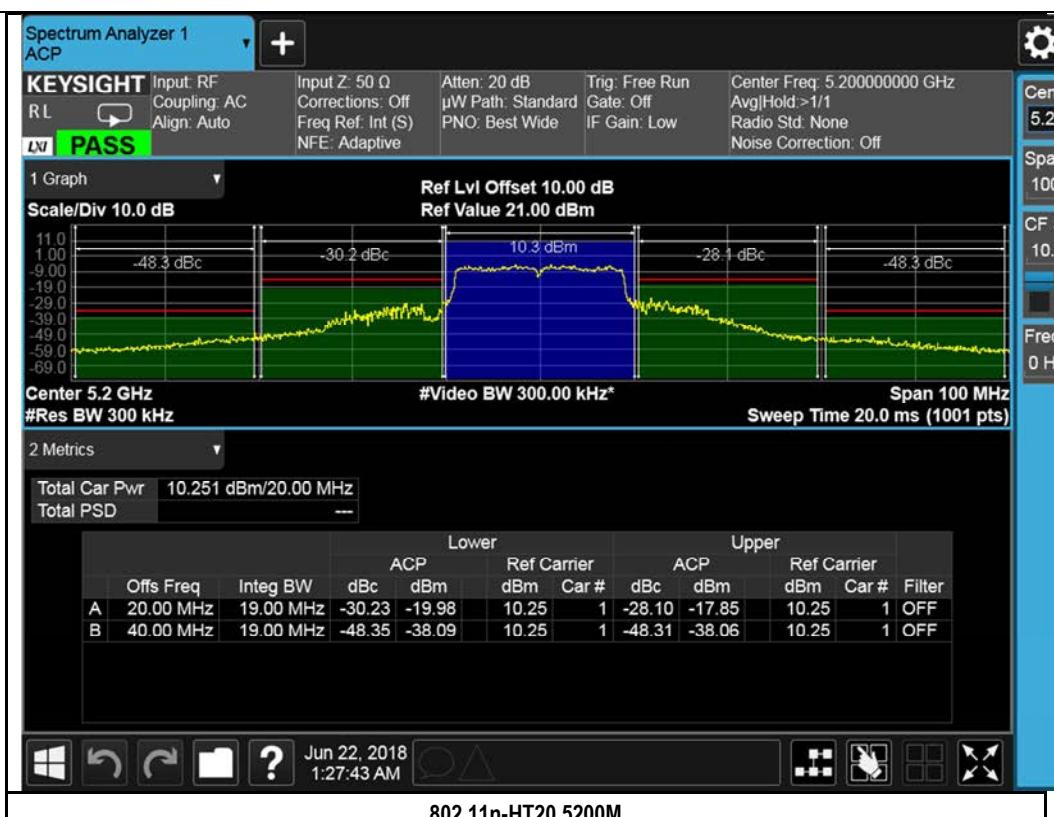
Test mode	Frequency Range (MHz)	Result		Limit (dBc)	Result
		±40M(dBc)			
802.11ac-VHT80	Low-5530M	-41.165		-40	Pass
802.11ac-VHT80	High-5610M	-41.959		-40	Pass

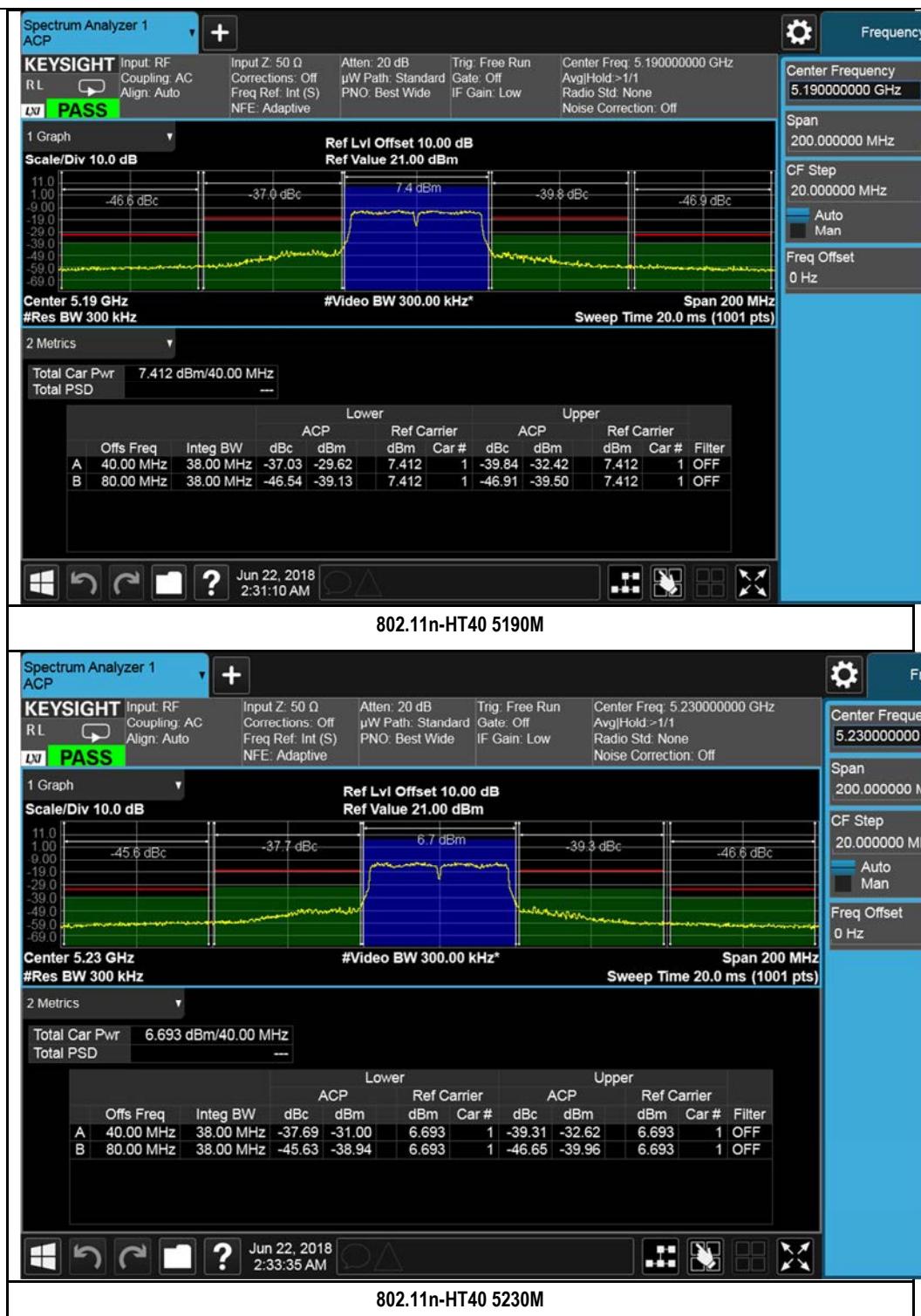
Test Plots

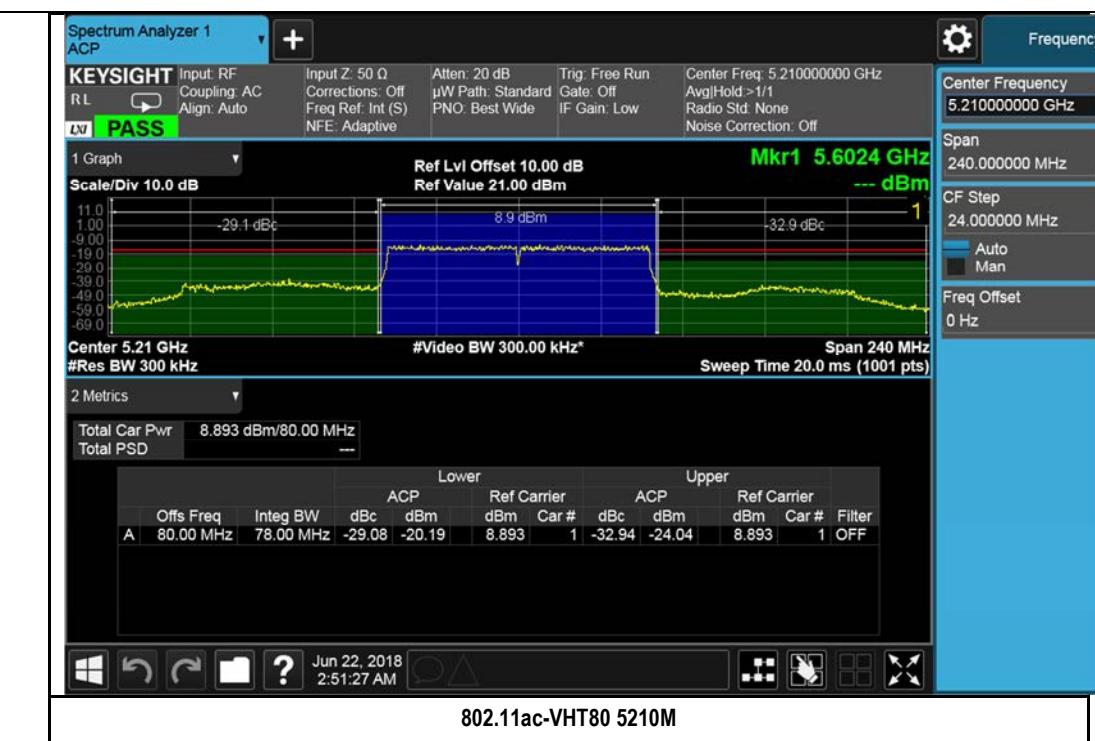
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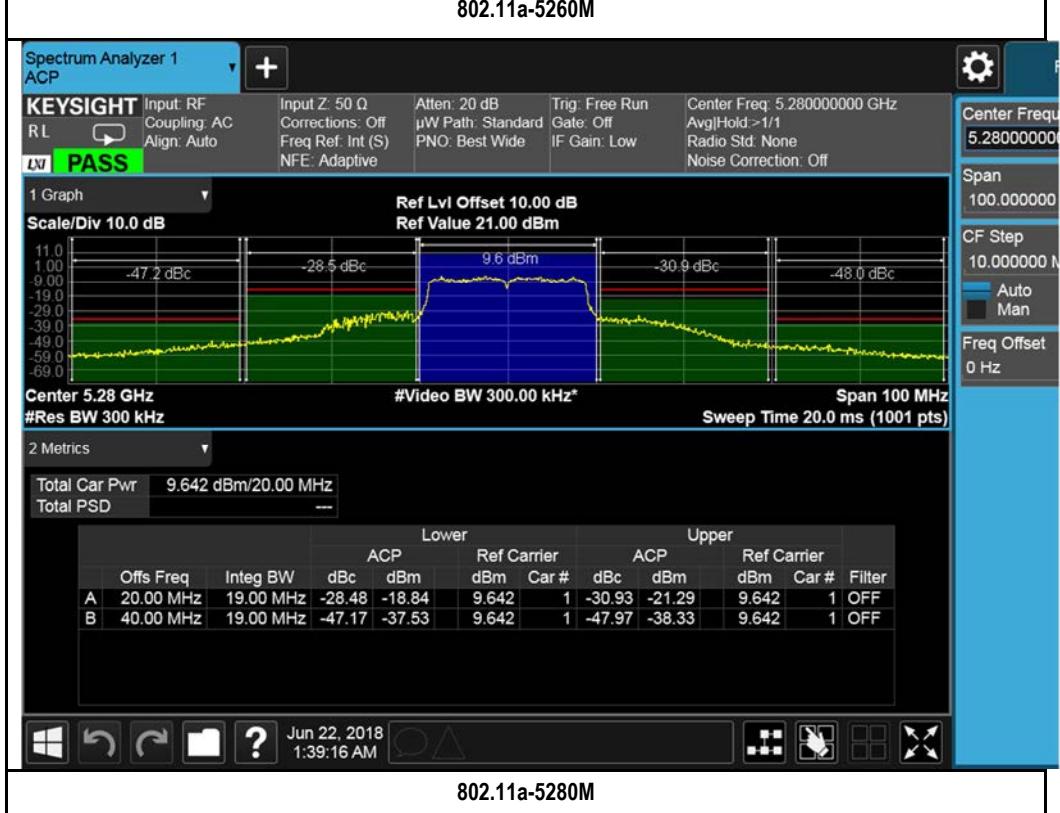
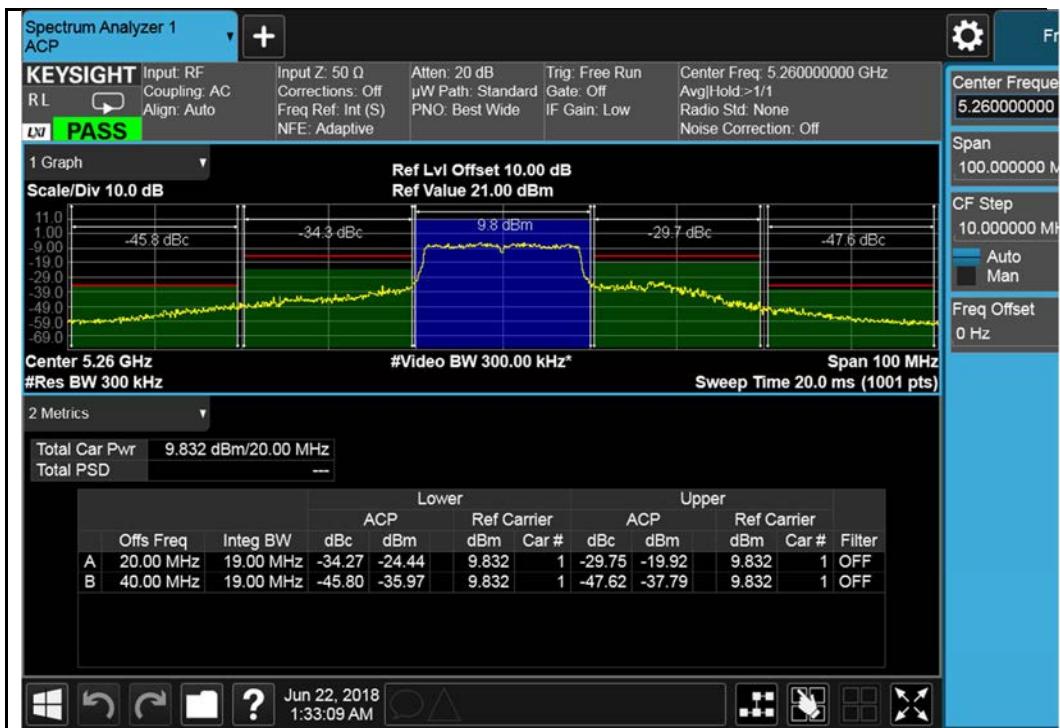


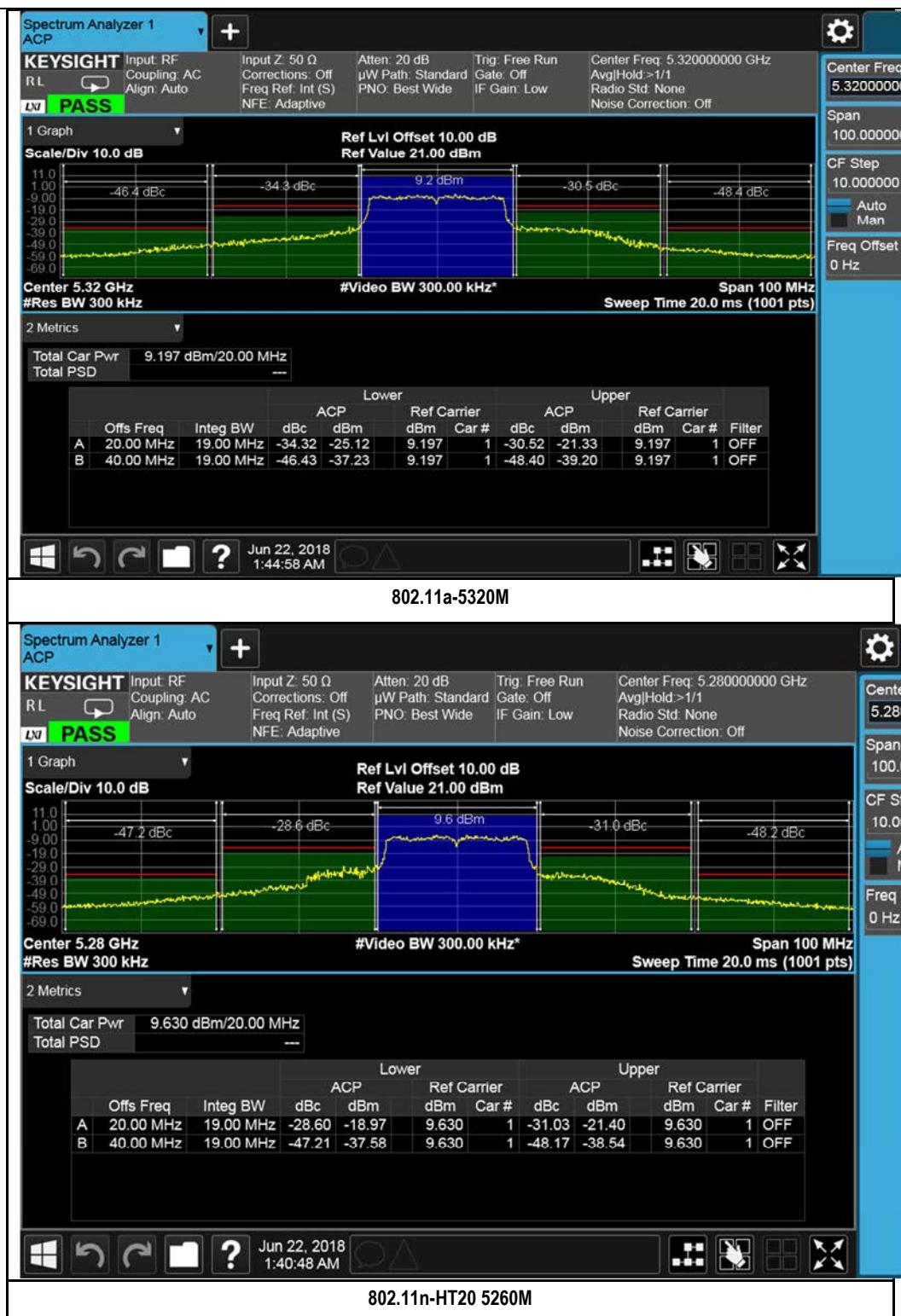




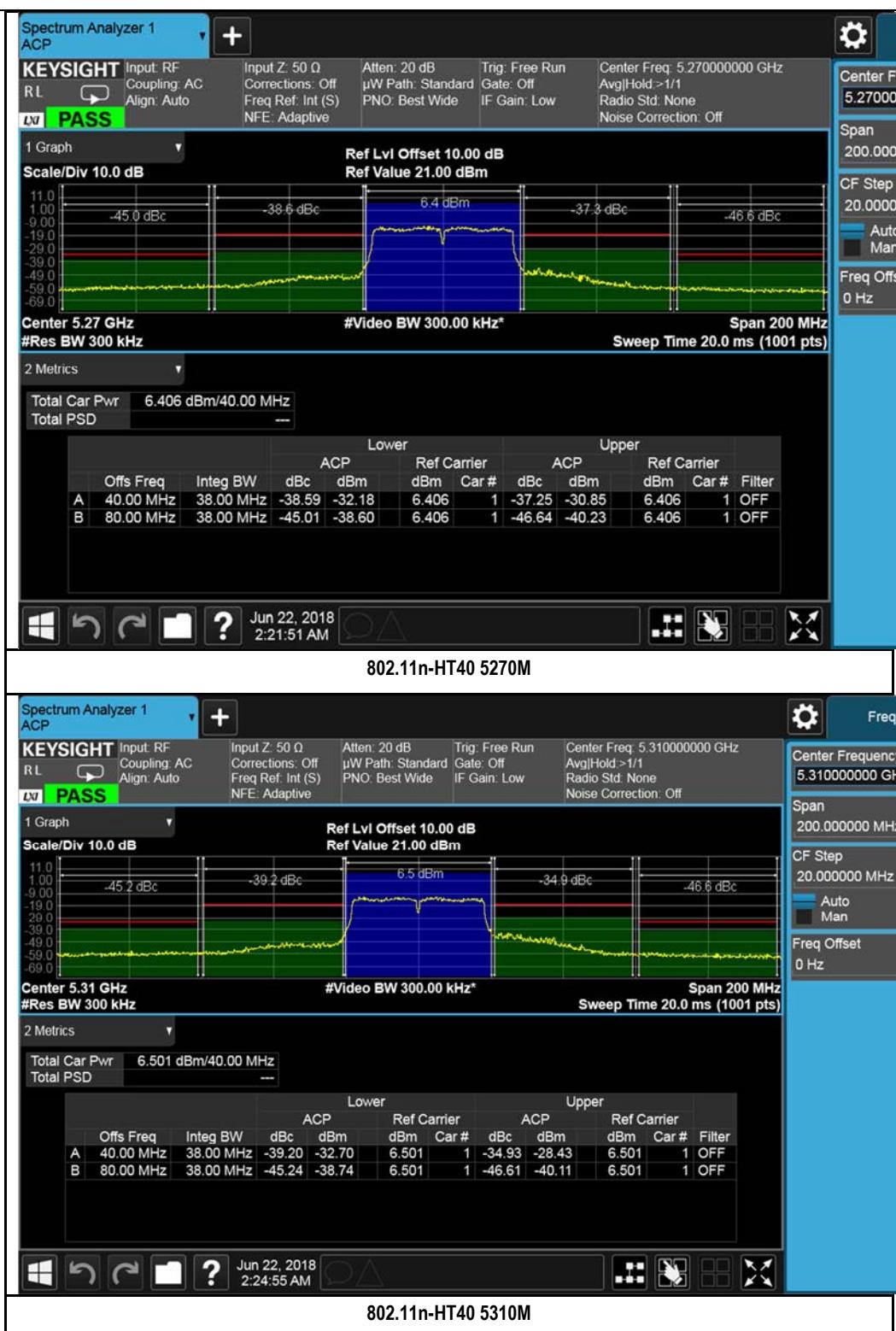


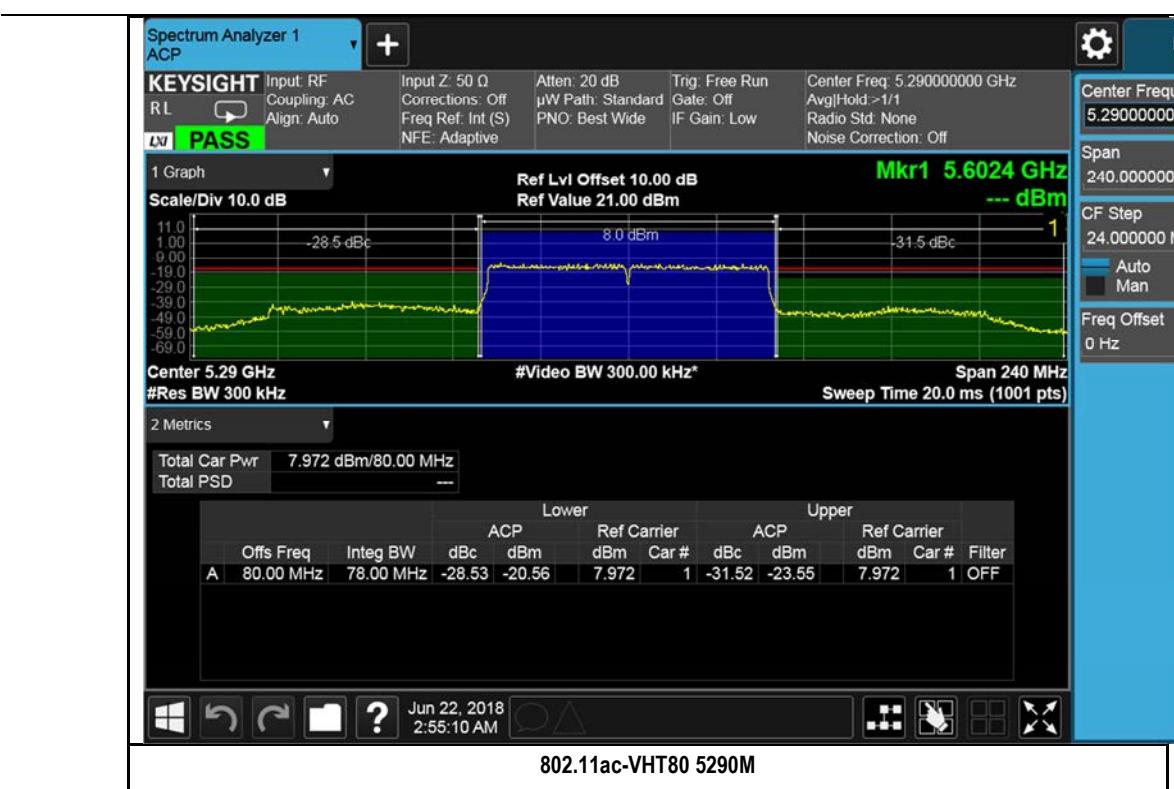
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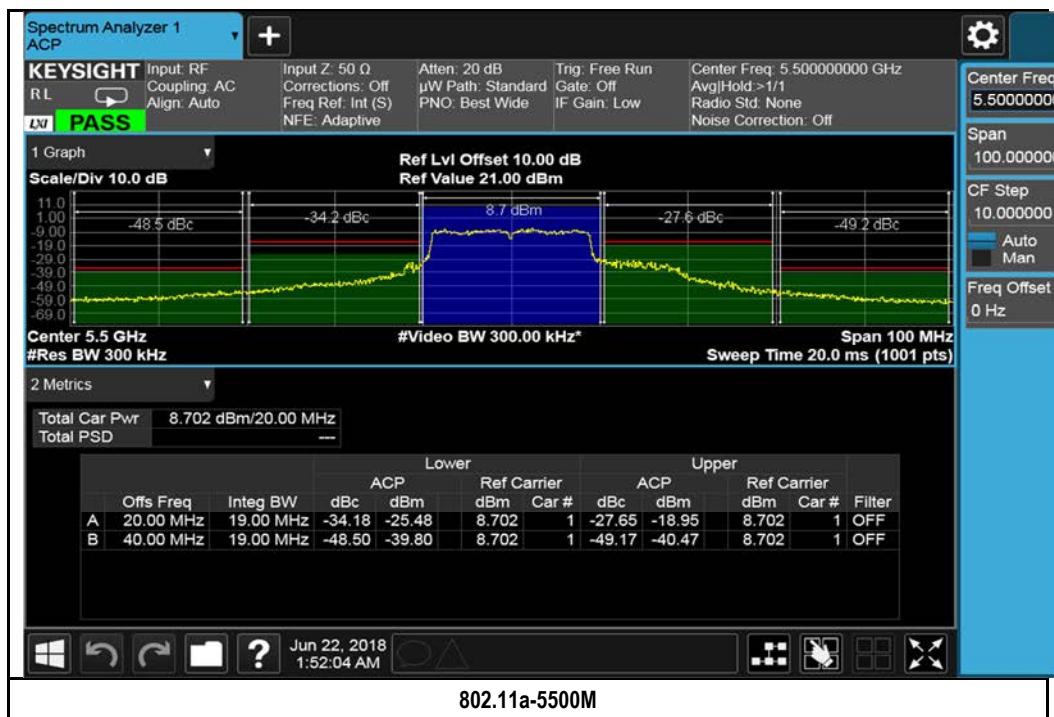


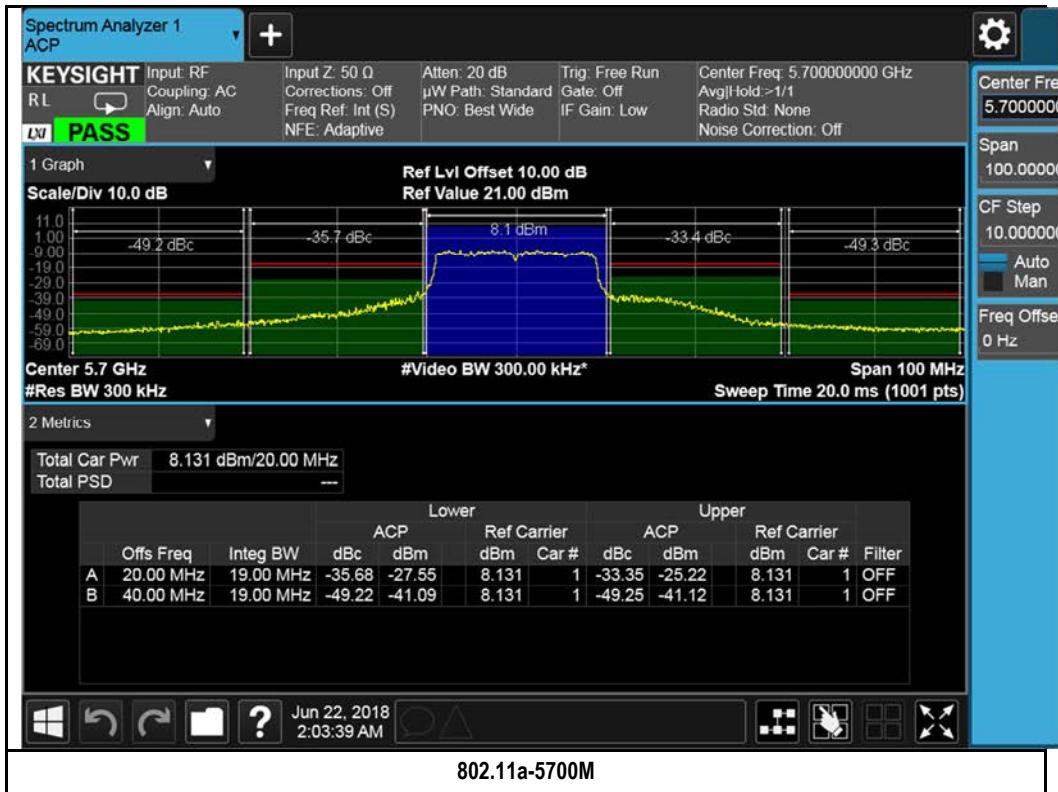
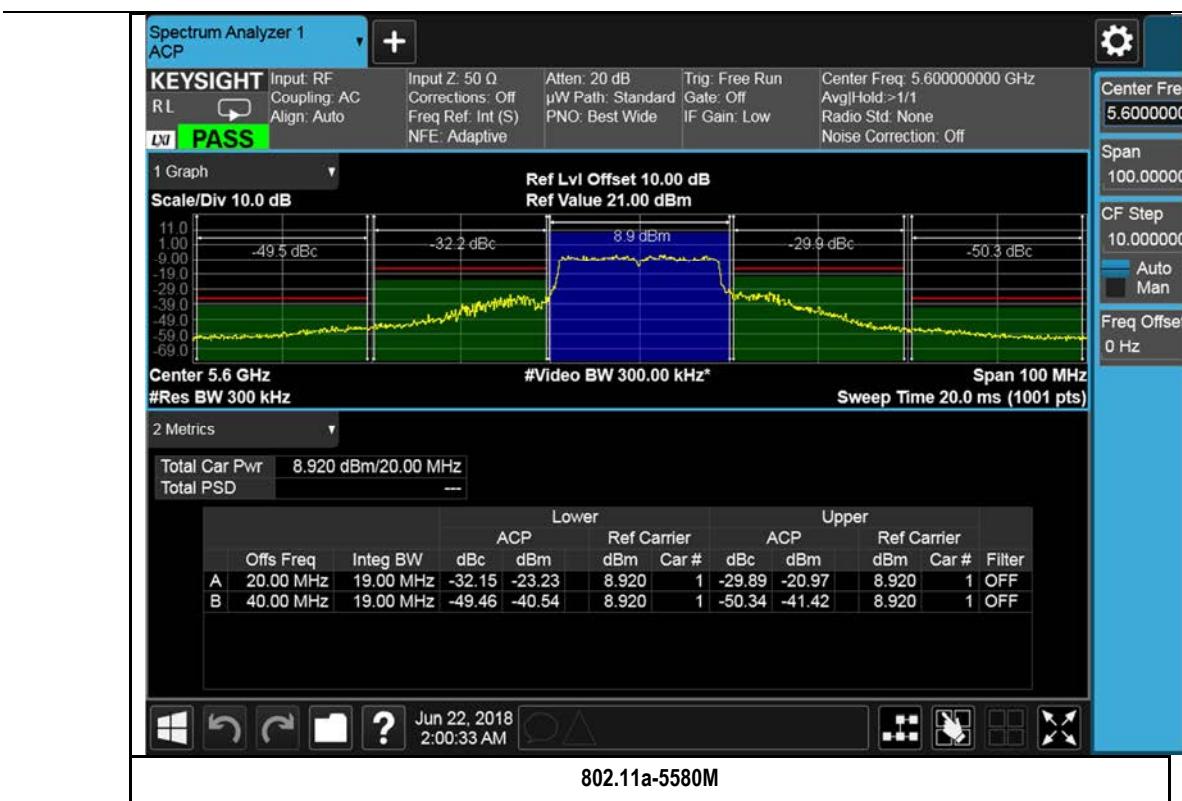


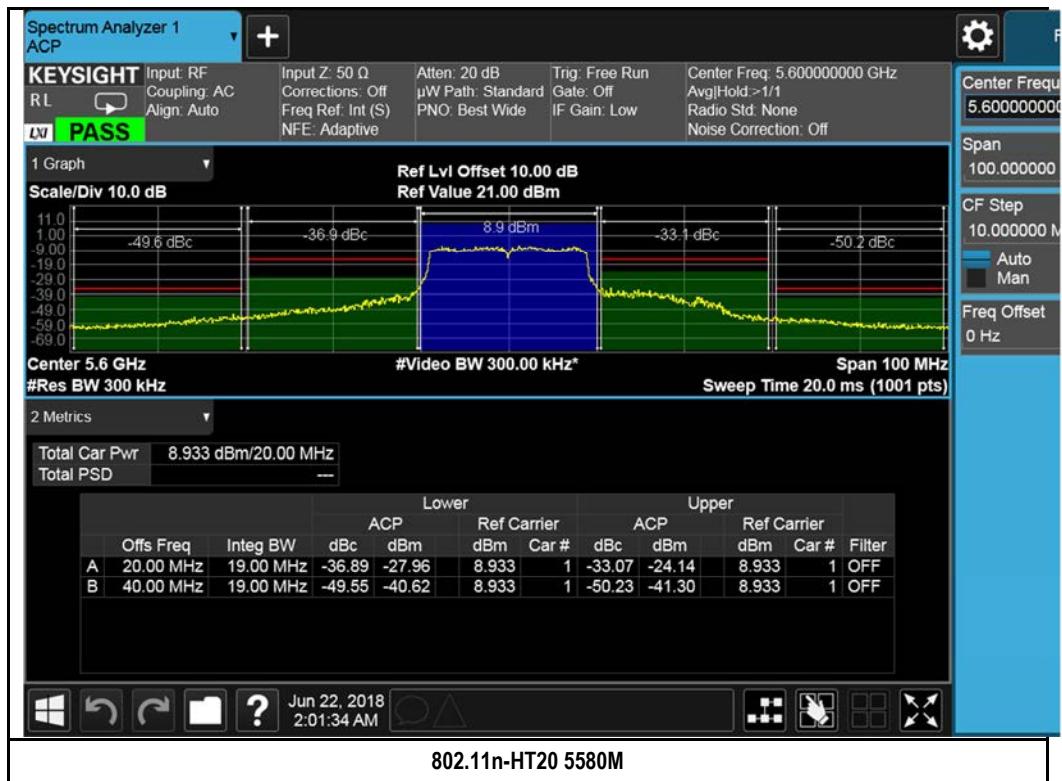
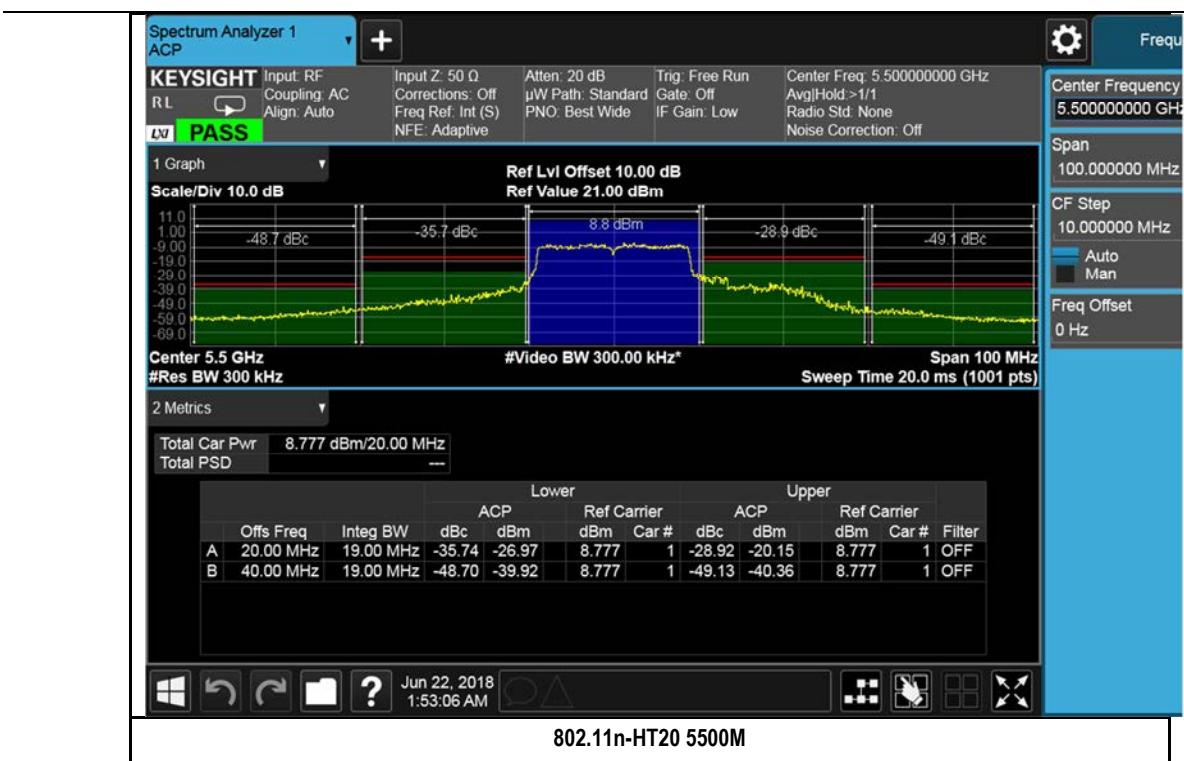


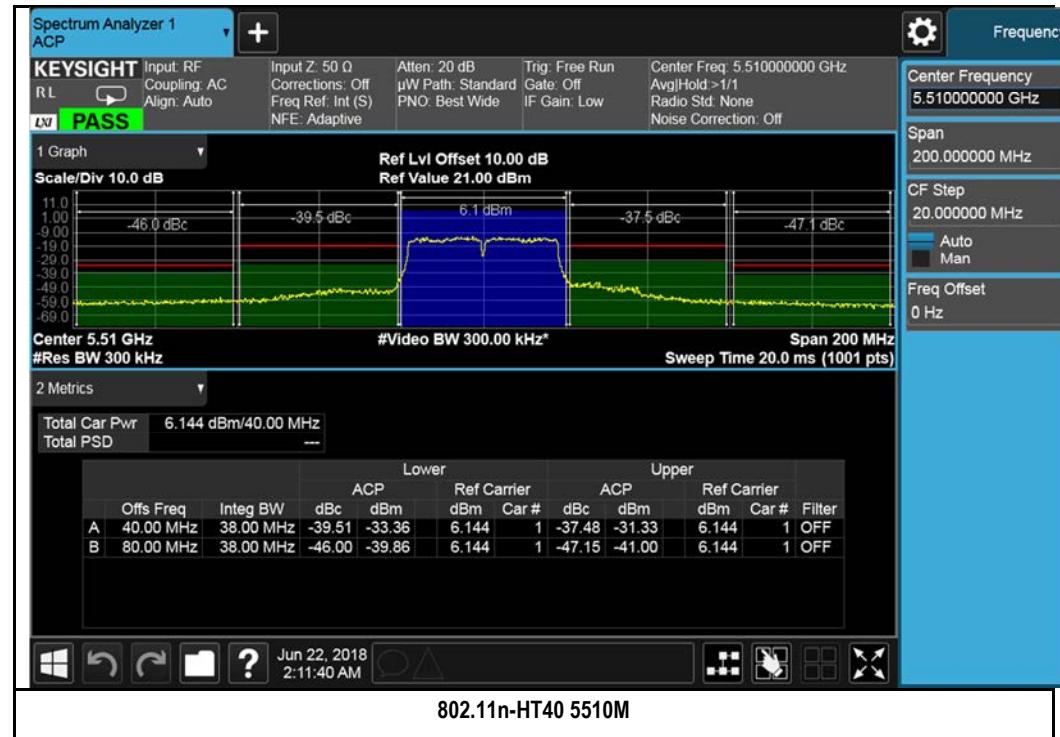
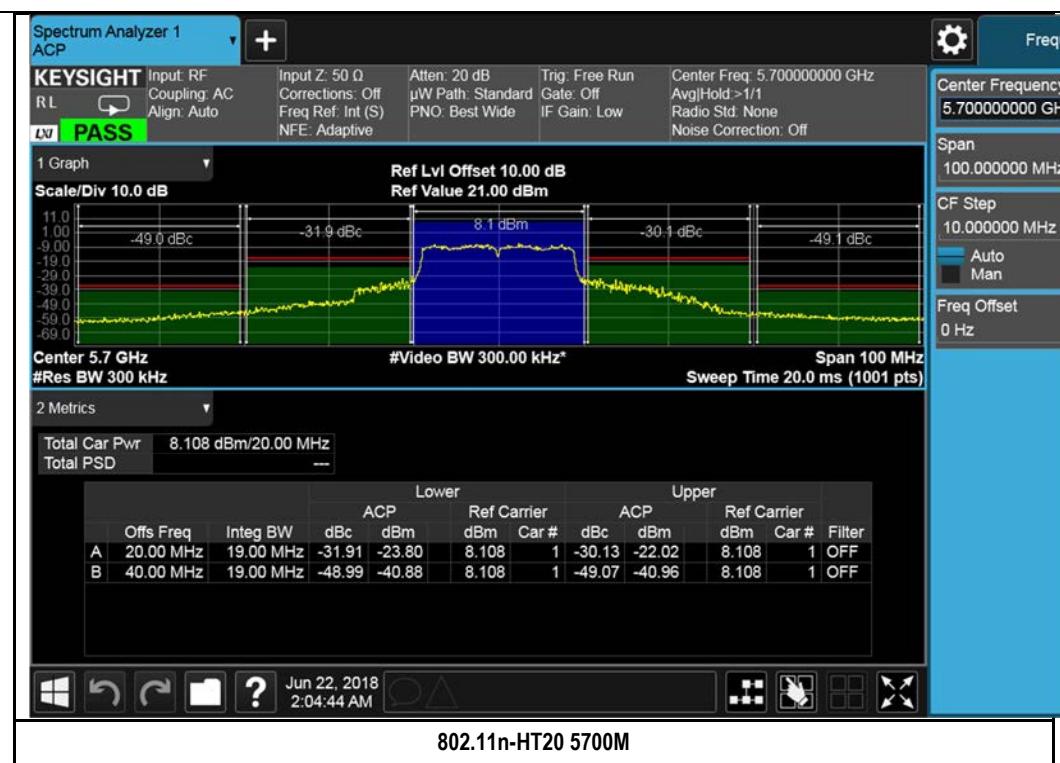


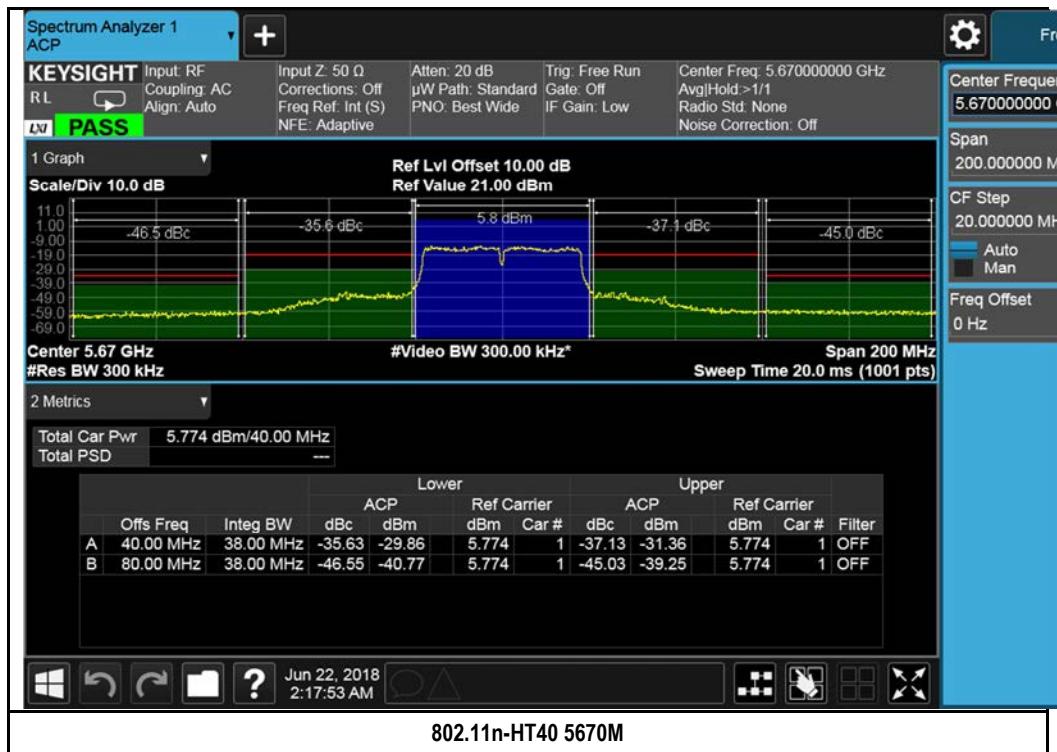
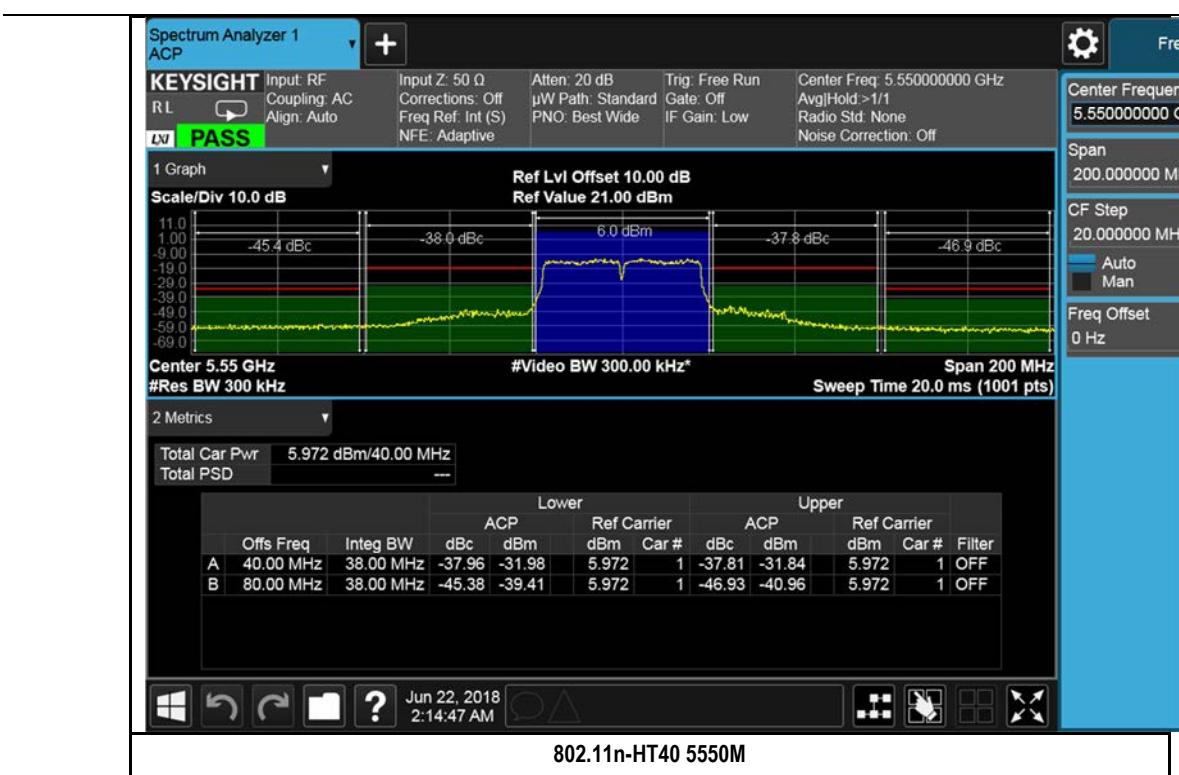
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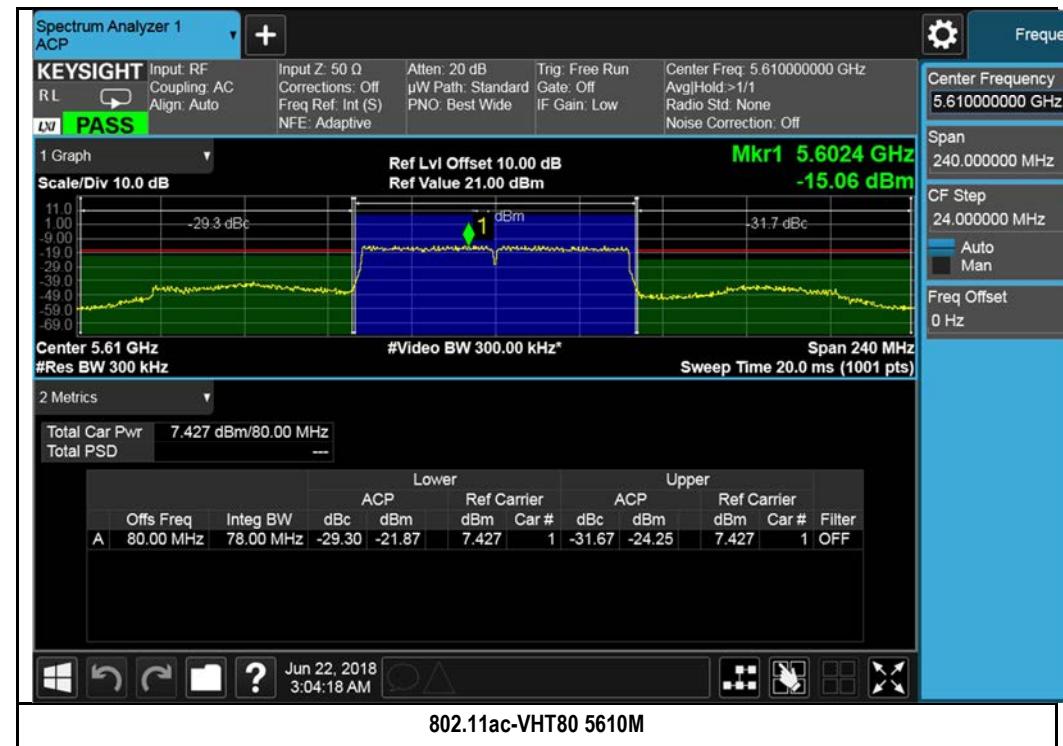
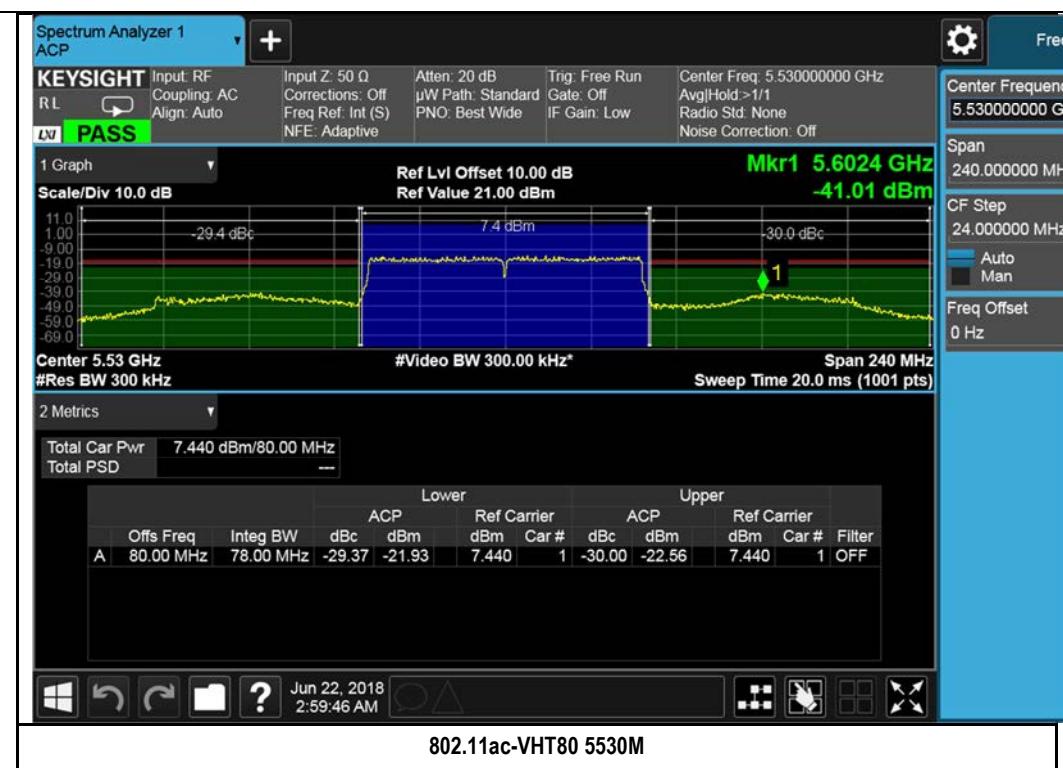












9.8 Transmitter Burst Length

Requirement(s):

Spec	Item	Requirement	Applicable
Article 2-1	19-3	4msec or less	<input checked="" type="checkbox"/>
Article 2-1	19-3-2	4msec or less	<input checked="" type="checkbox"/>
Article 2-1	19-3-3	4msec or less	<input type="checkbox"/>
Test Setup	 <p>Spectrum Analyzer ————— EUT</p>		
Test Procedure	<u>measurement procedure</u> <ul style="list-style-type: none"> - Set EUT to transmit continuously at test frequency - Set SPAN to be 0 - Measures the Sending time of 1 burst (sec) - Record the data 		
Test Date	05/09/2018 - 06/21/2018	Environmental condition	Temperature 23oC Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	NONE		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

Test Data Yes N/A

Test Plot Yes N/A

Test was done by Benjamin Jing at RF Test Site.

Transmitter burst length measurement result per Article 2 paragraph 1 item (19)-3

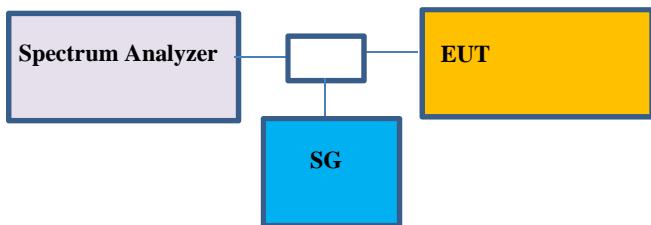
Test Mode	Channel/Modulation	Measured burst length (mS)	Limit (mS)	Result
802.11a	Mid-5200M	2.294	≤4	Pass
	Mid-5280M	2.363	≤4	Pass
802.11n-HT20	Mid-5200M	2.132	≤4	Pass
	Mid-5280M	2.128	≤4	Pass
802.11n-HT40	Low-5190M	1.126	≤4	Pass
	High-5310M	1.132	≤4	Pass
802.11ac-VHT80	Low-5210M	0.645	≤4	Pass
	High-5290M	0.643	≤4	Pass

Transmitter burst length measurement result per Article 2 paragraph 1 item (19)-3-2

Test Mode	Channel/Modulation	Measured burst length (mS)	Limit (mS)	Result
802.11a	Mid-5580M	2.291	≤4	Pass
802.11n-HT20	Mid-5580M	2.149	≤4	Pass
802.11n-HT40	Mid-5550M	0.998	≤4	Pass
802.11ac-VHT80	High-5530M	0.643	≤4	Pass

9.9 Carrier Sense Function

Requirement(s):

Spec	Item	Requirement	Applicable
Article 2-1	19	EUT shall stop transmission automatically if receiving a signal with field strength level above 100mV/m.	<input checked="" type="checkbox"/>
Article 2-1	19-3	EUT shall stop transmission automatically if receiving a signal with field strength level above 100mV/m.	<input checked="" type="checkbox"/>
Article 2-1	19-3-2	EUT shall stop transmission automatically if receiving a signal with field strength level above 100mV/m.	<input checked="" type="checkbox"/>
Article 2-1	19-3-3	EUT shall stop transmission automatically if receiving a signal with field strength level above 100mV/m.	<input type="checkbox"/>
Test Setup			
Test Procedure		<ul style="list-style-type: none"> - Modulation, Tx - For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal. 	
Test Date	05/09/2018 - 06/22/2018	Environmental condition	Temperature 22°C Relative Humidity 48% Atmospheric Pressure 1019mbar
Remark	NONE		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

Test Data Yes N/A

Test Plot Yes N/A

Test was done by Benjamin Jing at RF Test Site.

Carrier Sense measurement result per Article 2 paragraph 1 item (19)

Test Mode	Channel	Antenna Port	Field Strength Level (mV/m)	Result
802.11n-HT40	2442MHz	TX/RX port	100mV/m	Pass

Carrier Sense measurement result per Article 2 paragraph 1 item (19)-3

Test Mode	Channel	Antenna Port	Field Strength Level (mV/m)	Result
802.11a	Mid-5200M	TX/RX port	100mV/m	Pass
	Mid-5280M	TX/RX port	100mV/m	Pass
802.11n-HT20	Mid-5200M	TX/RX port	100mV/m	Pass
	Mid-5280M	TX/RX port	100mV/m	Pass
802.11n-HT40	Low-5190M	TX/RX port	100mV/m	Pass
	High-5310M	TX/RX port	100mV/m	Pass
802.11ac-VHT80	Low-5210M	TX/RX port	100mV/m	Pass
	High-5290M	TX/RX port	100mV/m	Pass

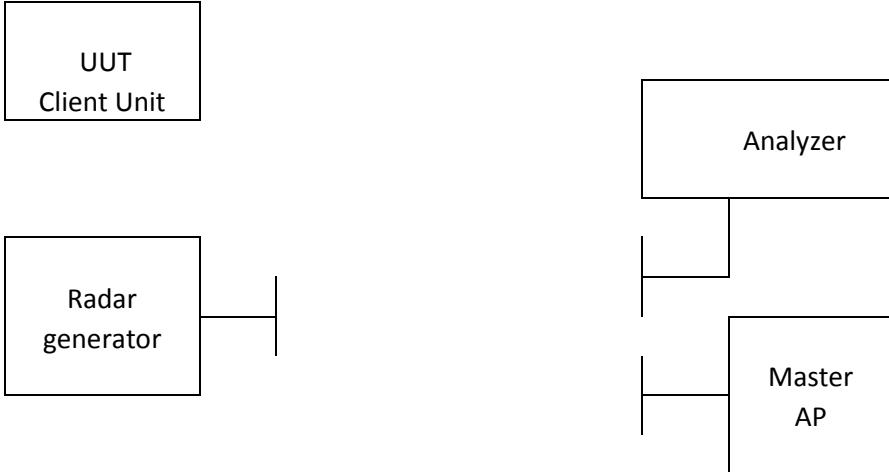
Carrier Sense measurement result per Article 2 paragraph 1 item (19)-3-2

Test Mode	Channel/Modulation	Antenna Port	Field Strength Level (mV/m)	Result
802.11a	Mid-5580M	TX/RX port	100mV/m	Pass
802.11n-HT20	Mid-5580M	TX/RX port	100mV/m	Pass
802.11n-HT40	Mid-5550M	TX/RX port	100mV/m	Pass
802.11ac-VHT80	Low-5530M	TX/RX port	100mV/m	Pass

9.10 Dynamic Frequency Selection (DFS)

Requirement(s):

Spec	Item	Requirement			Applicable
Article 2-1	19-3	Radar Threshold	E.I.R.P < 0.2W	Threshold = -62 dBm	<input type="checkbox"/>
			E.I.R.P ≥ 0.2W	Threshold = -64 dBm	<input type="checkbox"/>
		Radar Type	-	J1-1, J1-2	<input type="checkbox"/>
		Test Items	Closing time	≤260ms	<input checked="" type="checkbox"/>
			Non-Occupancy Period	≥30 Minutes	<input checked="" type="checkbox"/>
			CAC-Time	≥60 seconds	<input type="checkbox"/>
			Channel Move time	≤10sec	<input checked="" type="checkbox"/>
			Detection Probability	Radar type J1-1 ≥ 60% Radar type J1-2 ≥ 60%	<input type="checkbox"/>
		Radar Threshold	E.I.R.P < 0.2W	Threshold = -62 dBm	<input type="checkbox"/>
			E.I.R.P ≥ 0.2W	Threshold = -64 dBm	<input type="checkbox"/>
Article 2-1	19-3-2	Radar Type	-	J2-1, J2-3, DFS-US-1, DFS-US-2, DFS-US-3, DFS-US-4, DFS-US-5, DFS-US-6	<input type="checkbox"/>
		Test Items	Closing time	≤260ms	<input checked="" type="checkbox"/>
			Non-Occupancy Period	≥30 Minutes	<input checked="" type="checkbox"/>
			CAC-Time	≥60 seconds	<input type="checkbox"/>
			Channel Move time	≤10sec	<input checked="" type="checkbox"/>
		Detection Probability	Radar type J2-1, J2-3, DFS-US-1, DFS-US-2, DFS-US-3, DFS-US-4 ≥ 60%, Radar type DFS-US-5 ≥ 80% Radar type DFS-US-6 ≥ 70%		
Article 2-1	19-3-3 5.21GHz, 5.29GHz	Radar Threshold	E.I.R.P < 0.2W	Threshold = -62 dBm	<input type="checkbox"/>
			E.I.R.P ≥ 0.2W	Threshold = -64 dBm	<input type="checkbox"/>
		Radar Type	-	J1-1, J1-2	<input type="checkbox"/>
		Test Items	Closing time	≤260ms	<input type="checkbox"/>
			Non-Occupancy Period	≥30 Minutes	<input type="checkbox"/>
			CAC-Time	≥60 seconds	<input type="checkbox"/>
			Channel Move time	≤10sec	<input type="checkbox"/>
			Detection Probability	Radar type J1-1 ≥ 60% Radar type J1-2 ≥ 60%	<input type="checkbox"/>
Article 2-1	19-3-3 5.53GHz, 5.61GHz	Radar Threshold	E.I.R.P < 0.2W	Threshold = -62 dBm	<input type="checkbox"/>
			E.I.R.P ≥ 0.2W	Threshold = -64 dBm	<input type="checkbox"/>
		Radar Type	-	J2-1, J2-3, DFS-US-1, DFS-US-2, DFS-US-3, DFS-US-4, DFS-US-5, DFS-US-6	<input type="checkbox"/>
		Test Items	Closing time	≤260ms	<input type="checkbox"/>
			Non-Occupancy Period	≥30 Minutes	<input type="checkbox"/>
			CAC-Time	≥60 seconds	<input type="checkbox"/>
			Channel Move time	≤10sec	<input type="checkbox"/>
			Detection Probability	Radar type J2-1, J2-3, DFS-US-1, DFS-US-2, DFS-US-3, DFS-US-4 ≥ 60%, Radar type DFS-US-5 ≥ 80% Radar type DFS-US-6 ≥ 70%	<input type="checkbox"/>

Test Setup	
	 <pre> graph LR UUT[UUT Client Unit] --- > Radar[Radar generator] Radar --- > Master[Master AP] Master --- > Analyzer[Analyzer] </pre>
<u>Channel availability check</u>	
Test Procedure	<ol style="list-style-type: none"> 1. The standard signal generator shall be set to non-transmitting mode 2. Initialize the EUT, channel availability check, or verify external test equipment is not transmitting by using spectrum analyzer. 3. Check out the channel availability time, selected randomly in time, by using standard signal generator generates the pseudo radar pulses with the input level specified. 4. Using a spectrum analyzer to verify that no transmit signal when a pseudo radar pulse is applied to EUT. 5. The test shall be repeated four times, number of EUT fail and successfully detect the radar shall be recorded. <u>Channel monitoring during operation</u> <ol style="list-style-type: none"> 1. The standard signal generator shall be set to non-transmitting mode 2. Initialize the EUT and channel status monitoring during operation, and set the transmit frequency. 3. Communication load condition of the EUT and external test equipment communication link is set to 50% of maximum transmission signal speed of radio equipment at the signaling rate which does not include the error correction or control signal. 4. By using standard signal generator generate the pseudo radar pulses with the input level specified. 5. Using a spectrum analyzer to verify that the radio will stop transmission when the simulated radar pulse is applied to EUT. 6. The test shall be repeated for 20 times, number of successful radar detection trail shall be recorded. EUT shall at least successfully detect 15 times. 7. In power, for more than 11 times less than 14 times the number of simulated radar pulse detection is repeated 20 times until the option from the software to record the existence of the launch of radio wave pulse is fired when no pseudo-radar detected. 8. For detection rate, more than 11 times less than 14 times out of 20 trial, number of successful trail and unsuccessful trails shall be recorded.
Test Date	06/02/2018
	Environmental condition
	Temperature 22oC
	Relative Humidity 48%
	Atmospheric Pressure 1019mbar
Remark	The EUT is operated as a Client station with no radar detect function.
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data Yes N/A

Test Plot Yes N/A

Test was done by Benjamin Jing t DFS Test Site.

Non-Occupancy Period, Channel Move Time, and Channel Closing Transmission Time

The UUT operating as a Client Device will associate with a UNII master device at Mid Channel. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

At time T0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at -64dBm.

Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results to the limits defined in the DFS Response requirement values table.

DFS Test Result



Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated DFS Measurement						
Keysight Signal Analyzer	N9010A	MY51440112	8/20/2017	1 Year	08/20/2018	<input checked="" type="checkbox"/>
Splitter/Combiner (Mini-Circuit)	ZFSC-2-9G+	S F030000719	N/A	1 Year	N/A	<input checked="" type="checkbox"/>
Splitter/Combiner (Mini-Circuit)	ZFSC-2-9G+	S F030000718	N/A	1 Year	N/A	<input checked="" type="checkbox"/>
Agilent Signal Generator	MXG N5182A	MY47071065	04/12/2018	1 Year	04/12/2019	<input checked="" type="checkbox"/>

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		Radio & Telecommunications Terminal Equipment: EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)	 	Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
HongKong OFCA		(Phase II) OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		Radio: Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		Radio : A1. Terminal equipment for purpose of calling Telecom : B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		EMI : KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI EMS : KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
Taiwan NCC CAB Recognition		Radio : RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68 Telecom : President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measuremet
Australia CAB Regocnition		EMC : AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4 Radiocommunications : AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771 Telecommunications : AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2