

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 1 of 66

Applicant : Sonim Technologies Inc
Address of Applicant : 6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA

Product Name : Rugged Tablet
Model No. : RS80
Sample No. : E20060042-01#01
E20060042-01#07
FCC ID : WYPRS80
ISED Number : 8090A-RS80

Standards : FCC CFR47 Part 15, Subpart C
RSS-Gen (Issue 5, March 2019)
RSS-247 (Issue 2, February 2017)

Date of Receipt : 2020-09-27
Date of Test : 2020-10-14 ~ 2021-01-14
Date of Issue : 2021-01-15

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by: Jennifer Zhou Reviewed by: Oliver Xiang Approved by: Guoyou Chi
(Jennifer Zhou) (Oliver Xiang) (Authorized signatory: Guoyou Chi)

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 2 of 66

Revision Record

Version	Date	Revisions	Revised By
1.0	2019-10-31	Original	--

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 3 of 66

Contents

1	GENERAL INFORMATION	4
1.1	TESTING LABORATORY	4
1.2	DETAILS OF APPLICATION	4
1.3	DETAILS OF EUT	4
1.4	TEST METHODOLOGY	5
2	TEST CONDITION	6
2.1	TEST FACILITY	6
2.2	ENVIRONMENTAL CONDITIONS	6
2.3	EQUIPMENT LIST	6
2.4	MEASUREMENT UNCERTAINTY	6
3	TEST SET-UP AND OPERATION MODES	7
3.1	DETAILS OF TEST MODE	7
3.2	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	8
3.3	SUPPORT SOFTWARE	8
3.4	TEST SETUP DIAGRAM	9
4	TEST RESULTS	11
4.1	TRANSMITTER REQUIREMENT & TEST SUITES	11
4.1.1	<i>Antenna Requirement</i>	11
4.1.2	<i>Peak Output Power and E.I.R.P</i>	12
4.1.3	<i>6dB Bandwidth and 99% Bandwidth</i>	16
4.1.4	<i>Power Spectral Density</i>	29
4.1.5	<i>Conducted Spurious Emission & Authorized-band band-edge</i>	36
4.1.6	<i>Spurious Emission</i>	59
4.1.7	<i>Band Edge (Restricted-band band-edge)</i>	60
4.2	MAINS EMISSIONS	61
4.2.1	<i>Conducted Emission on AC Mains</i>	61
5	APPENDIXES	64
5.1	PHOTOGRAPHS OF THE SAMPLE	64
5.2	SET-UP FOR CONDUCTED EMISSIONS	65
5.3	SET-UP FOR CONDUCTED RF TEST AT ANTENNA PORT	65
5.4	SET-UP FOR SPURIOUS EMISSIONS BELOW 1GHZ	66
5.5	SET-UP FOR SPURIOUS EMISSIONS ABOVE 1GHZ	66

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 4 of 66

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	Sonim Technologies Inc
Address	6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA
Contact Person	Avena.Xu
Telephone	1-650-378-8100
Email	avena.xu@sonimtech.com

1.3 Details of EUT

Product Name	Rugged Tablet
Brand Name	Sonim
Model No.	RS80
FCC ID	WYPRS80
ISED Number	8090A-RS80
Mode of Operation	WLAN 802.11b/g/n(HT20/40)
Frequency Range	2400MHz ~ 2483.5MHz
Channel Separation	5 MHz
Modulation Type	DSSS, OFDM
Antenna Type	Internal Antenna
Antenna Gain	1.71dBi
Extreme Temperature Range	-20°C ~ +55°C
Test Voltage	DC 3.8V
Hardware version	V1.00
Software version	80.0.0-01-10.0.0-00.35.01
Test SW Version	BL410_R;BL410_E
RF power setting in TEST SW	QRCT

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 5 of 66

1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	15.247 Meas Guidance.
KDB Publication 662911 D01 v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)
RSS-Gen (Issue 5, March 2019)	General Requirements for Compliance of Radio Apparatus
RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 6 of 66

2 Test Condition

2.1 Test Facility

2.2 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.3 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-18
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2021-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2021-06-08
Test Software	BL	BL410_E	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A

2.4 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 7 of 66

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

For 802.11b/g/n (HT20)

Channel	Frequency
The lowest channel(CH1)	2412MHz
The middle channel(CH6)	2437MHz
The Highest channel(CH11)	2462MHz

For 802.11n(HT40)

Channel	Frequency
The lowest channel(CH3)	2422MHz
The middle channel(CH6)	2437MHz
The Highest channel(CH9)	2452MHz

Through Pre-scan under all rate at lowest channel, the data rate as below table described is the worst case, so we choose these data rate for test.

Type	Data rate
802.11b	5.5Mbps
802.11g	24Mbps
802.11n(20M)	MCS3
802.11n(40M)	MCS3

The basic operation modes are:

- A. On
 - 1. WLAN mode
 - a. Transmitting
 - i. Low Channel
 - ii. Middle Channel
 - iii. High Channel
 - b. Receiving
- B. Standby
- C. Off

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 8 of 66

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A
Earphone	N/A	N/A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	Qualcomm	QRCT

TEST REPORT

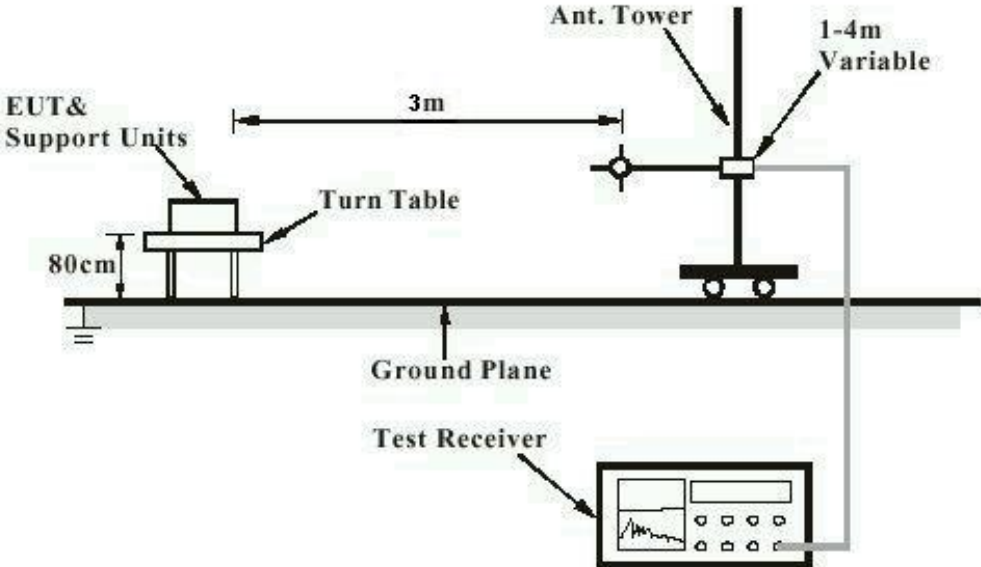
Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 9 of 66

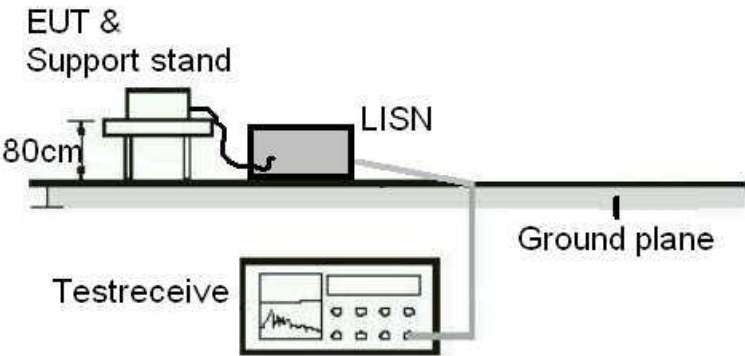
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



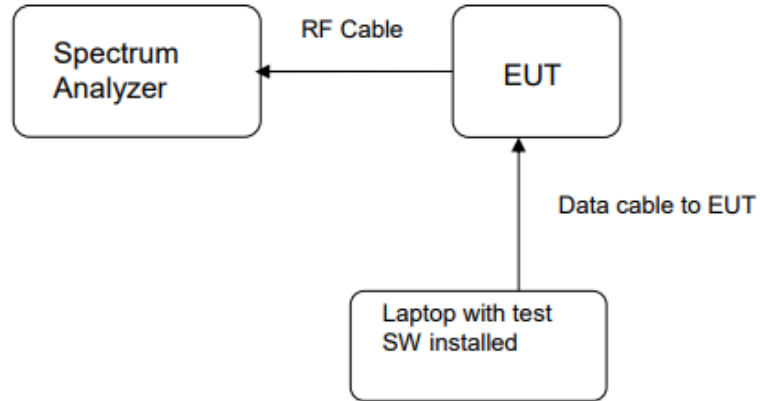
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 10 of 66

Diagram of Measurement Equipment Configuration for Transmitter Measurement



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 11 of 66

4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:

PASS

Test standard : FCC Part 15.247(b)(4), Part 15.203
RSS-247 5.4(6)

Requirement : The use of approved antennas only with directional gains that do not exceed 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 1.71dBi. The antenna is an internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 12 of 66

4.1.2 Peak Output Power and E.I.R.P

RESULT:

PASS

Test standard : FCC Part 15.247(b)(3)
RSS-247 5.4(4)
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 25°C
Relative humidity : 52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power	Peak Output Power		Limit (W)
		(dBm)	(dBm)	(mW)	
802.11b	2412	12.04	12.14	16.37	< 1
	2437	12.51	12.61	18.24	
	2462	12.90	13.00	19.95	
802.11g	2412	11.87	12.38	17.30	< 1
	2437	11.88	12.39	17.34	
	2462	12.30	12.81	19.10	
802.11n(HT20)	2412	11.95	12.47	17.66	< 1
	2437	12.08	12.60	18.20	
	2462	12.73	13.25	21.13	
802.11n(HT40)	2422	11.99	13.01	20.00	< 1
	2437	12.30	13.32	21.48	
	2452	10.89	11.91	15.52	

Notes:

Peak Output Power = Measured Conducted peak power +duty cycle factor

TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

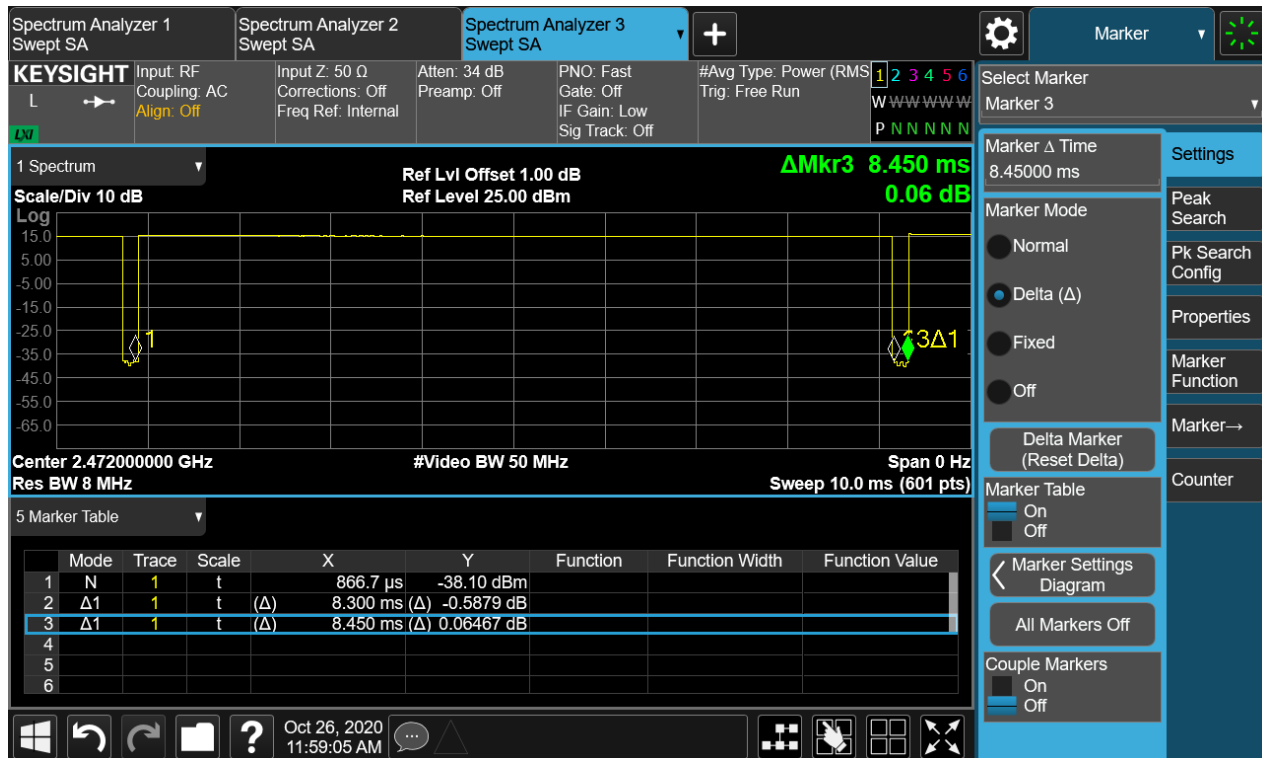
Page 13 of 66

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
802.11b	2412	13.85	24.27	< 4
	2437	14.32	27.04	
	2462	14.71	29.58	
802.11g	2412	14.09	25.64	
	2437	14.10	25.70	
	2462	14.52	28.31	
802.11n(HT20)	2412	14.18	26.18	
	2437	14.31	26.98	
	2462	14.96	31.33	
802.11n(HT40)	2422	14.72	29.65	
	2437	15.03	31.84	
	2452	13.62	23.01	

Duty cycle factor = $10 \cdot \log(1/\text{duty cycle})$

802.11b > 98%



802.11g < 98%

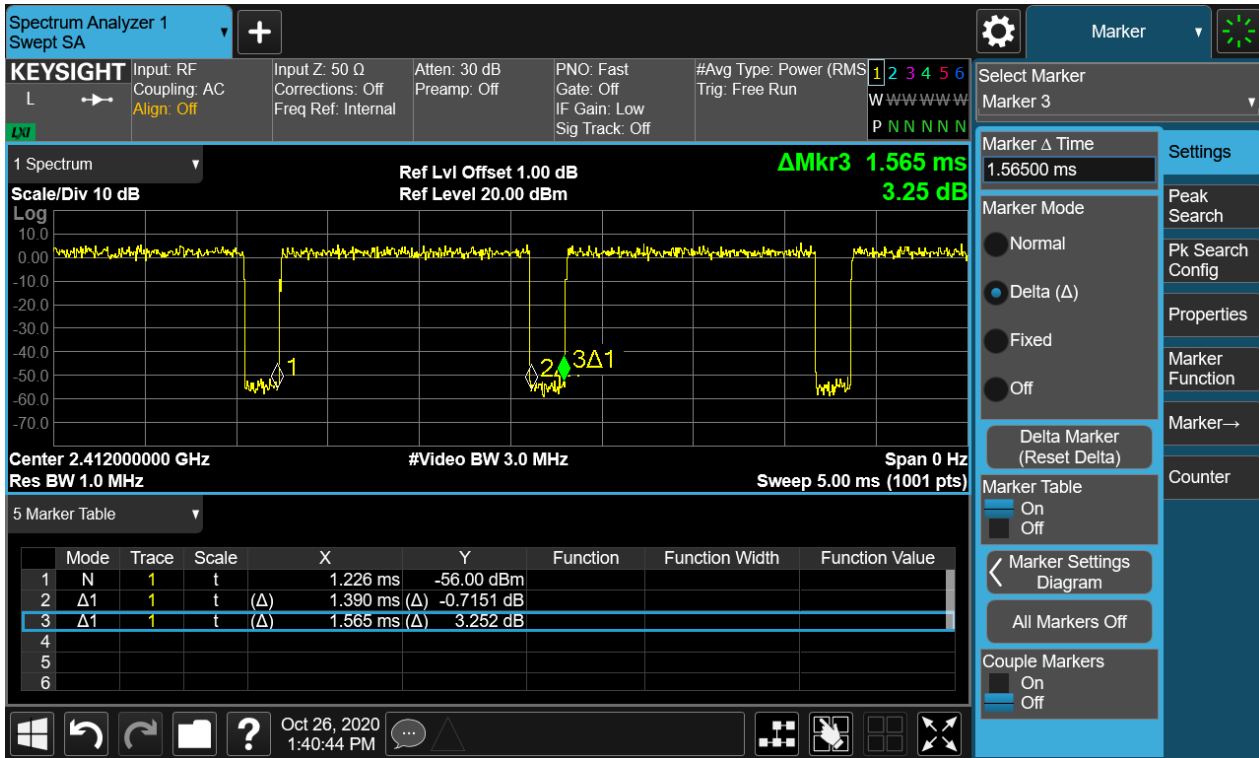
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

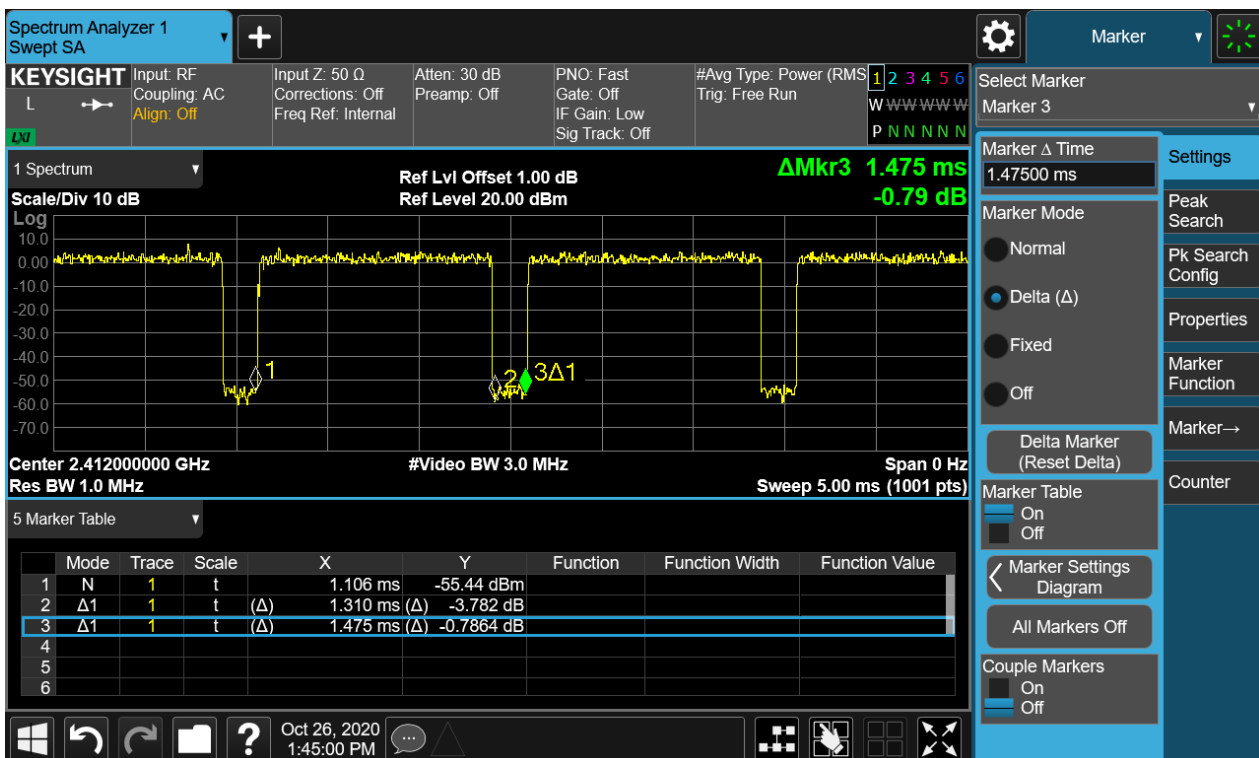
Page 14 of 66

Duty cycle factor = $10 \cdot \log(1/\text{duty cycle}) = 0.51$



802.11n20<98%

Duty cycle factor = $10 \cdot \log(1/\text{duty cycle}) = 0.52$



802.11n40<98%

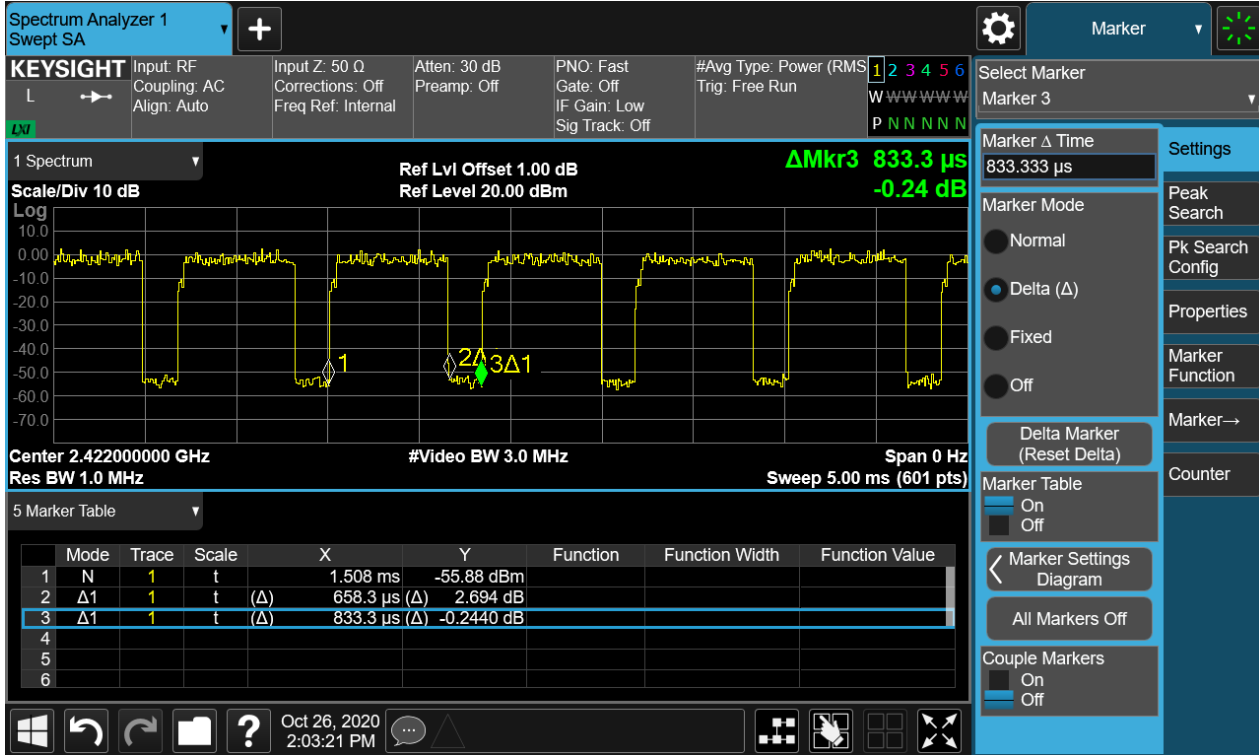
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 15 of 66

Duty cycle factor = $10 \cdot \log(1/\text{duty cycle}) = 1.02$



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 16 of 66

4.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)
 RSS-247 5.2(1)
 RSS-Gen 6.6

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

Table 3: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limit (MHz)
802.11b	2412	7.122	12.228	>0.5
	2437	7.133	11.997	
	2462	7.028	12.080	
802.11g	2412	16.400	17.307	
	2437	16.390	17.363	
	2462	16.410	17.091	
802.11n(HT20)	2412	17.590	18.281	
	2437	17.340	18.159	
	2462	17.630	18.102	
802.11n(HT40)	2422	35.160	36.212	
	2437	35.180	36.137	
	2452	35.070	36.198	

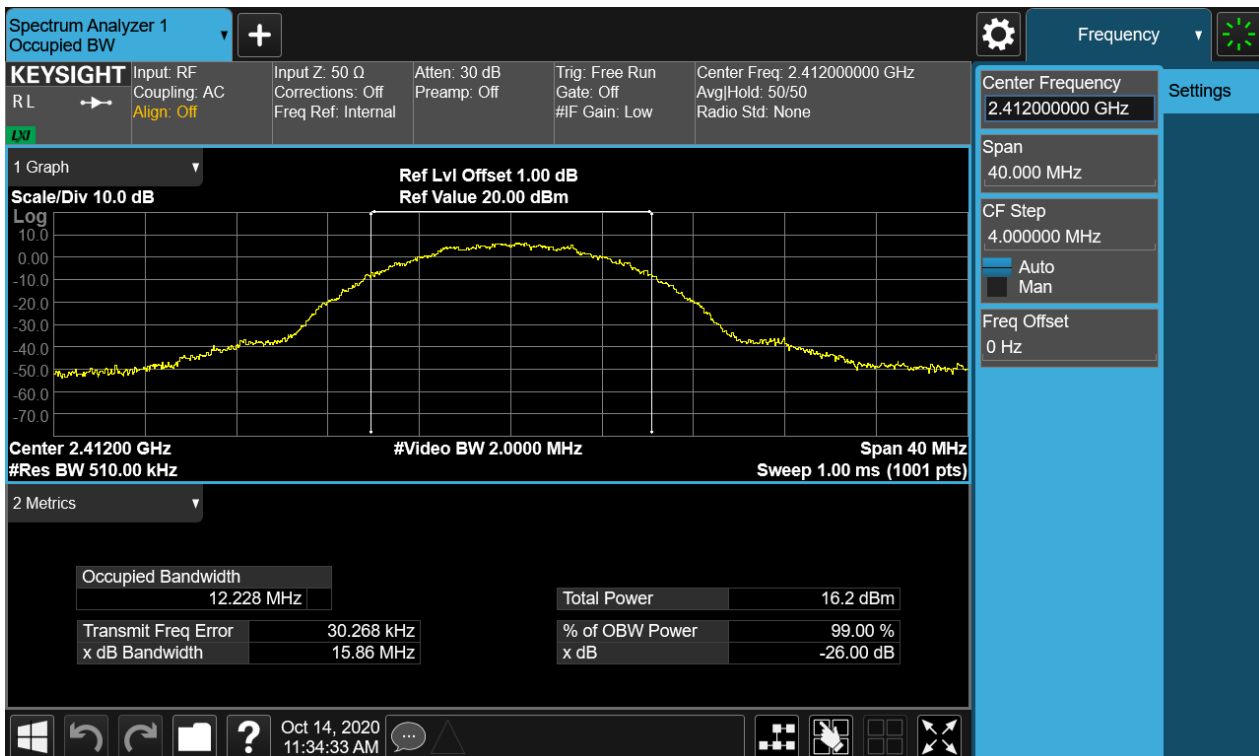
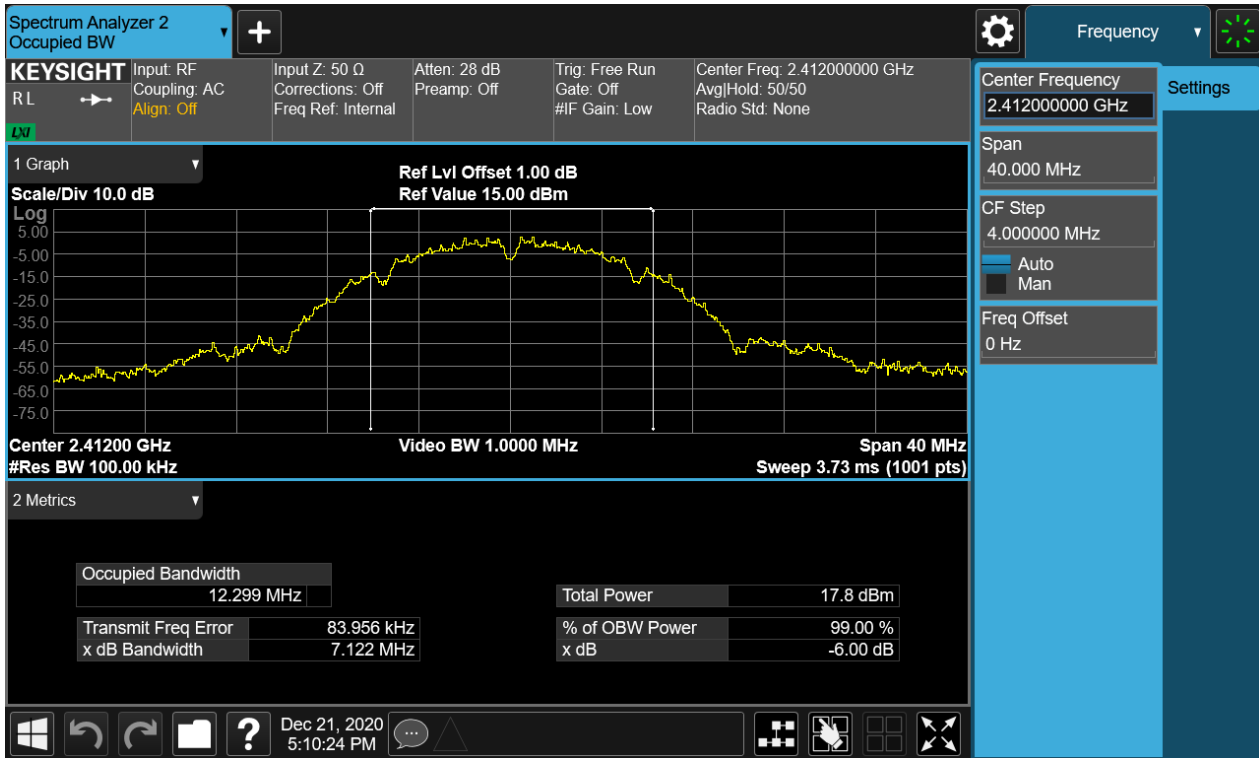
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 17 of 66

Figure 1: 6dB Bandwidth and 99% Bandwidth, 802.11b, 2412MHz



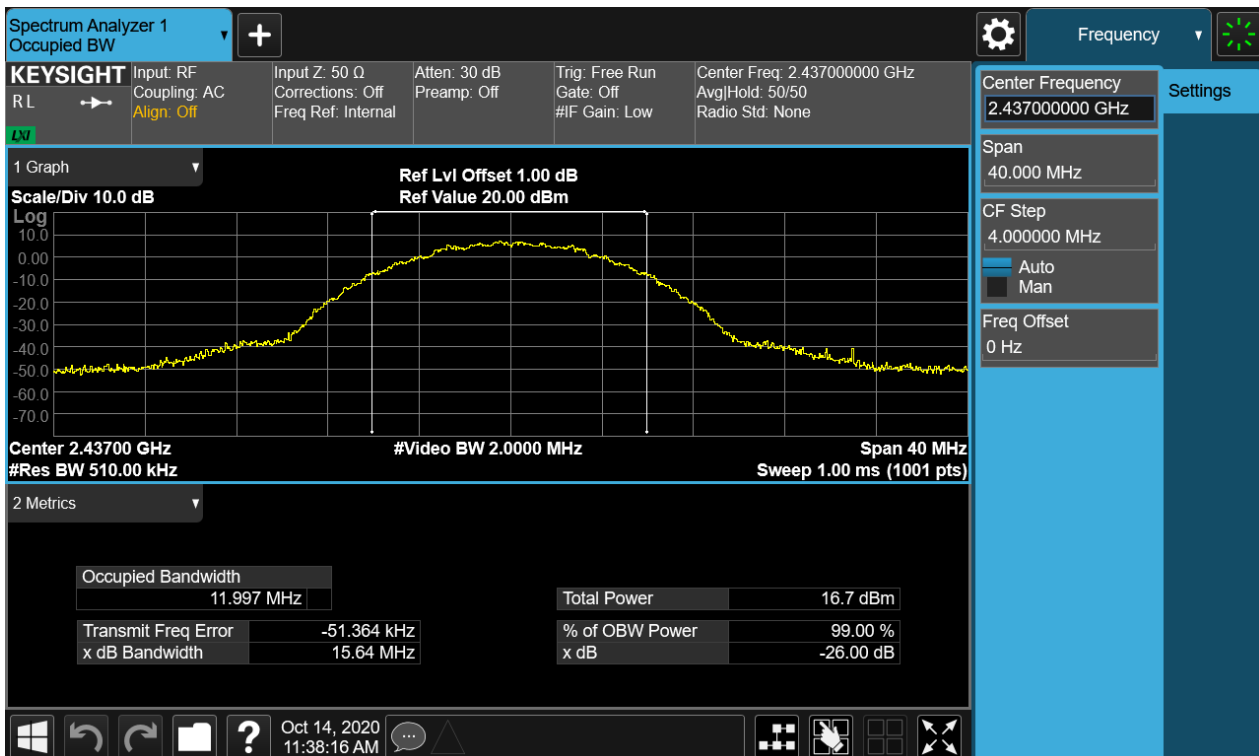
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 18 of 66

Figure 2: 6dB Bandwidth and 99% Bandwidth, 802.11b, 2437MHz



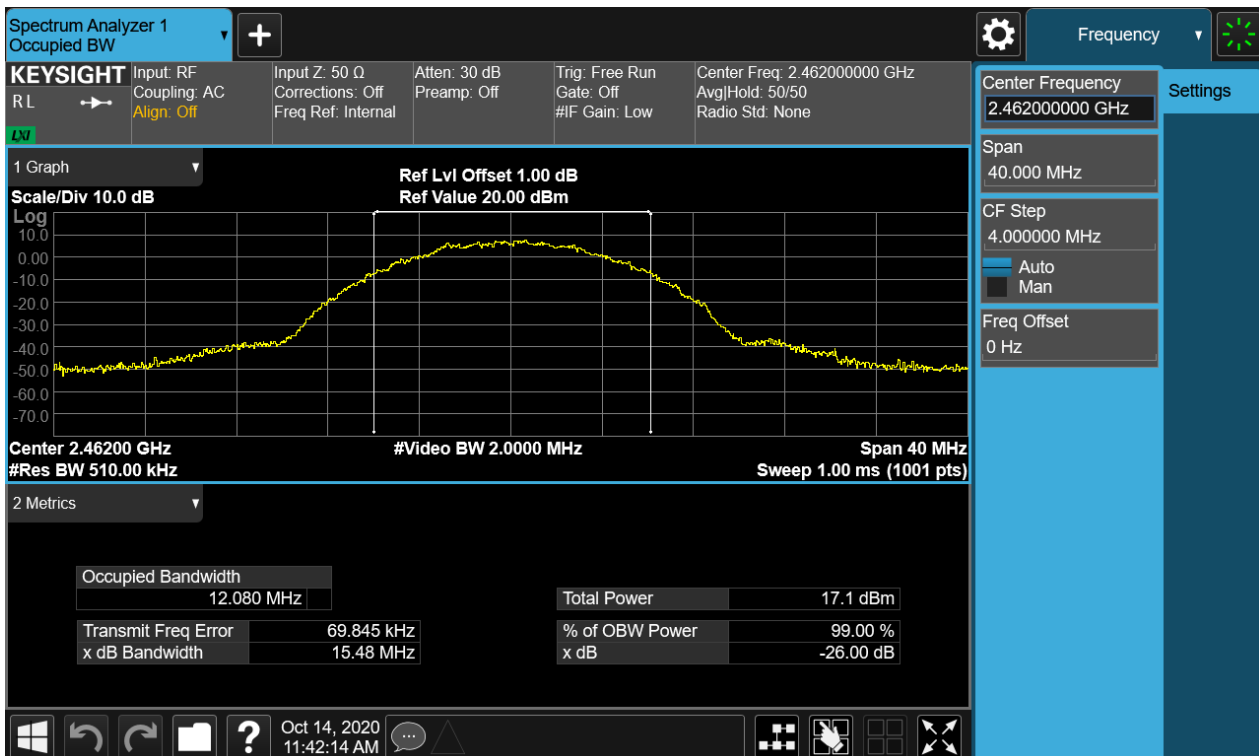
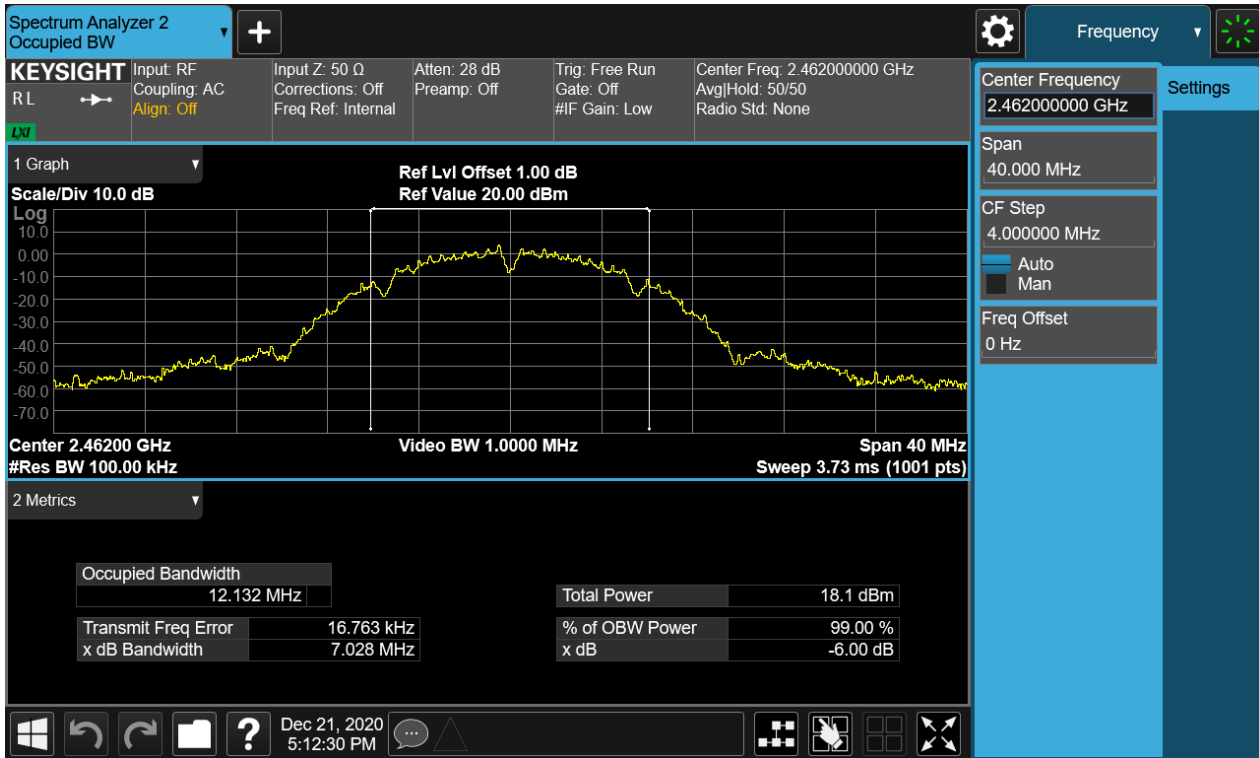
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 19 of 66

Figure 3: 6dB Bandwidth and 99% Bandwidth, 802.11b, 2462MHz



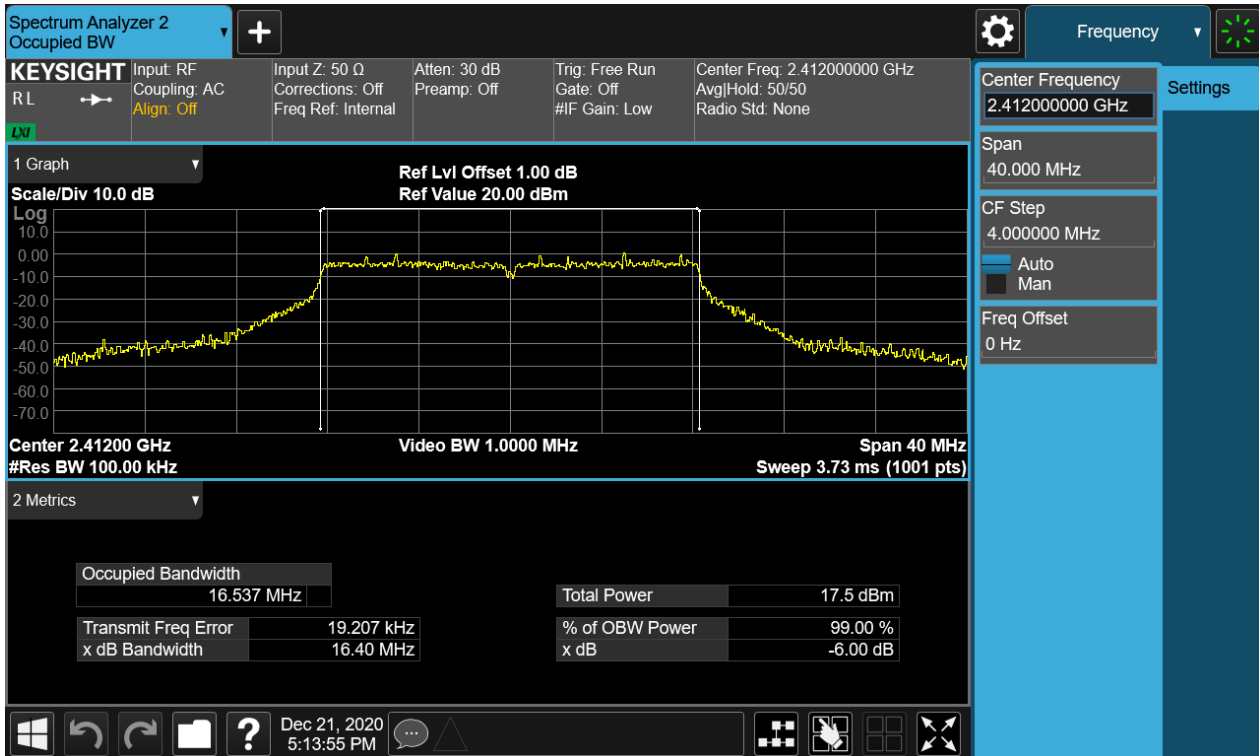
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 20 of 66

Figure 4: 6dB Bandwidth and 99% Bandwidth, 802.11g, 2412MHz



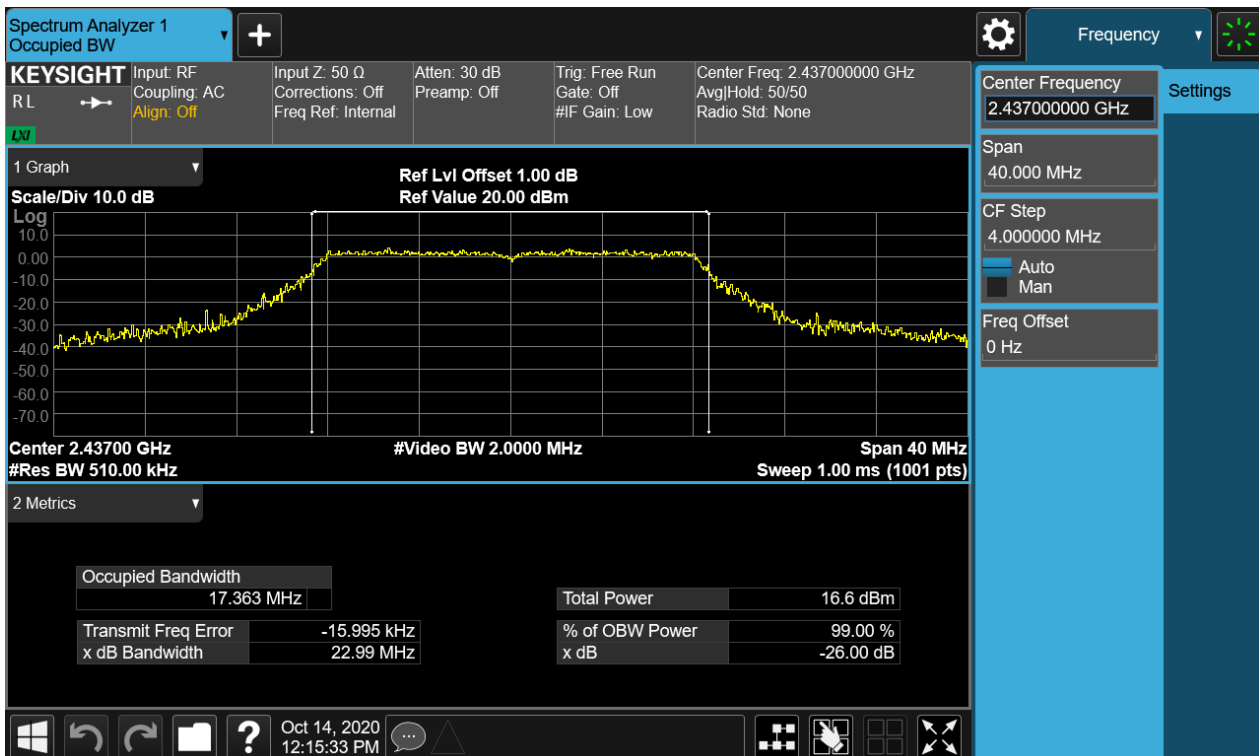
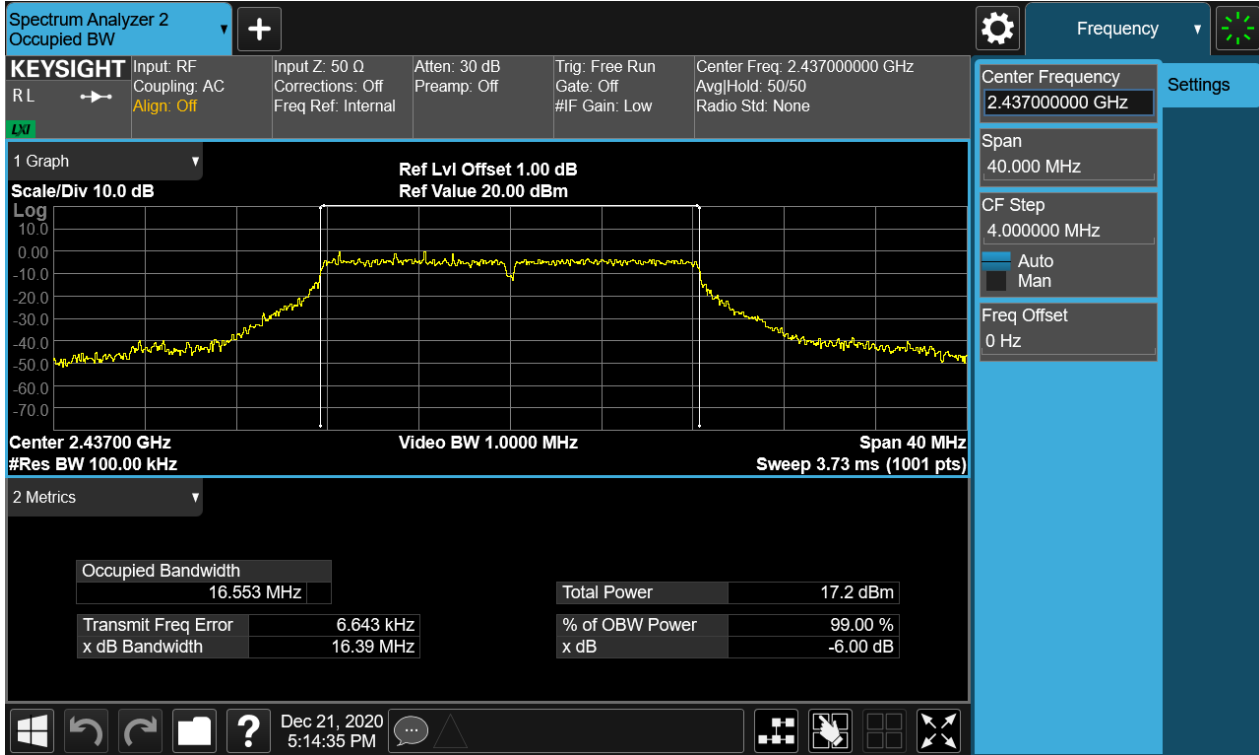
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 21 of 66

Figure 5: 6dB Bandwidth and 99% Bandwidth, 802.11g, 2437MHz



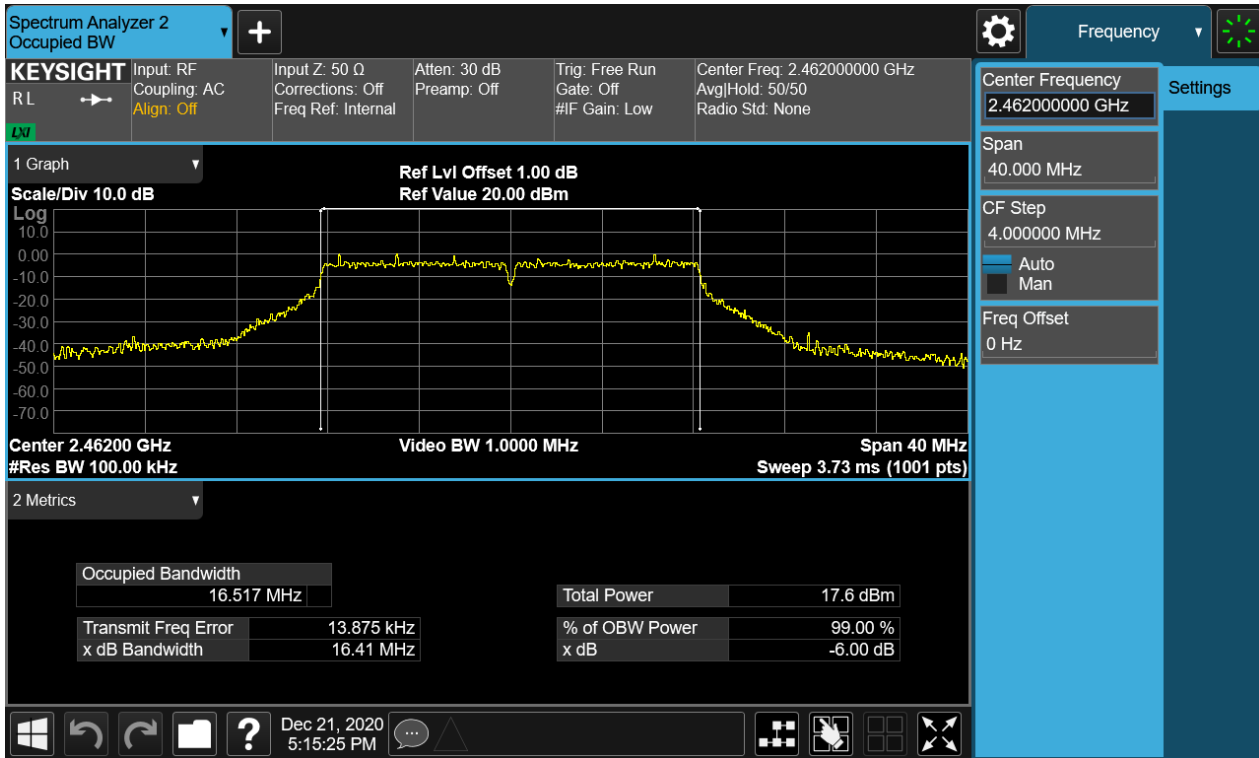
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 22 of 66

Figure 6: 6dB Bandwidth and 99% Bandwidth, 802.11g, 2462MHz



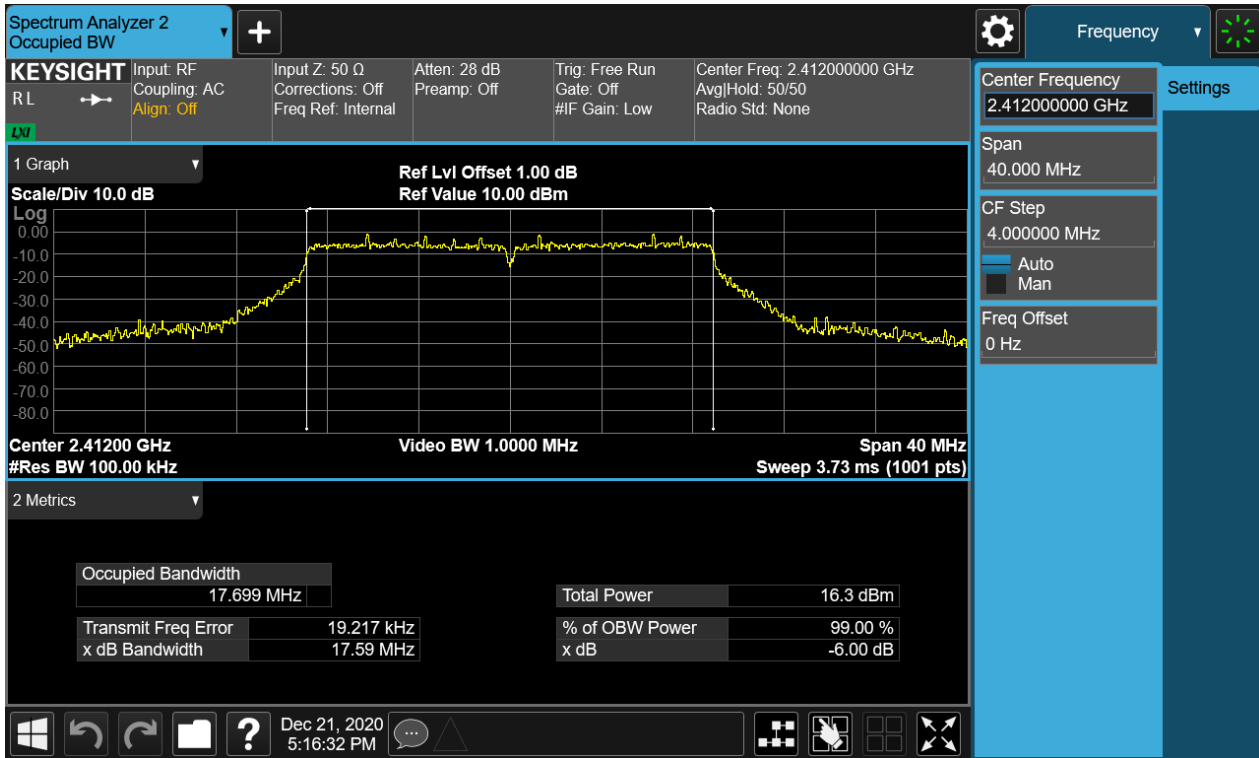
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 23 of 66

Figure 7: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT20), 2412MHz



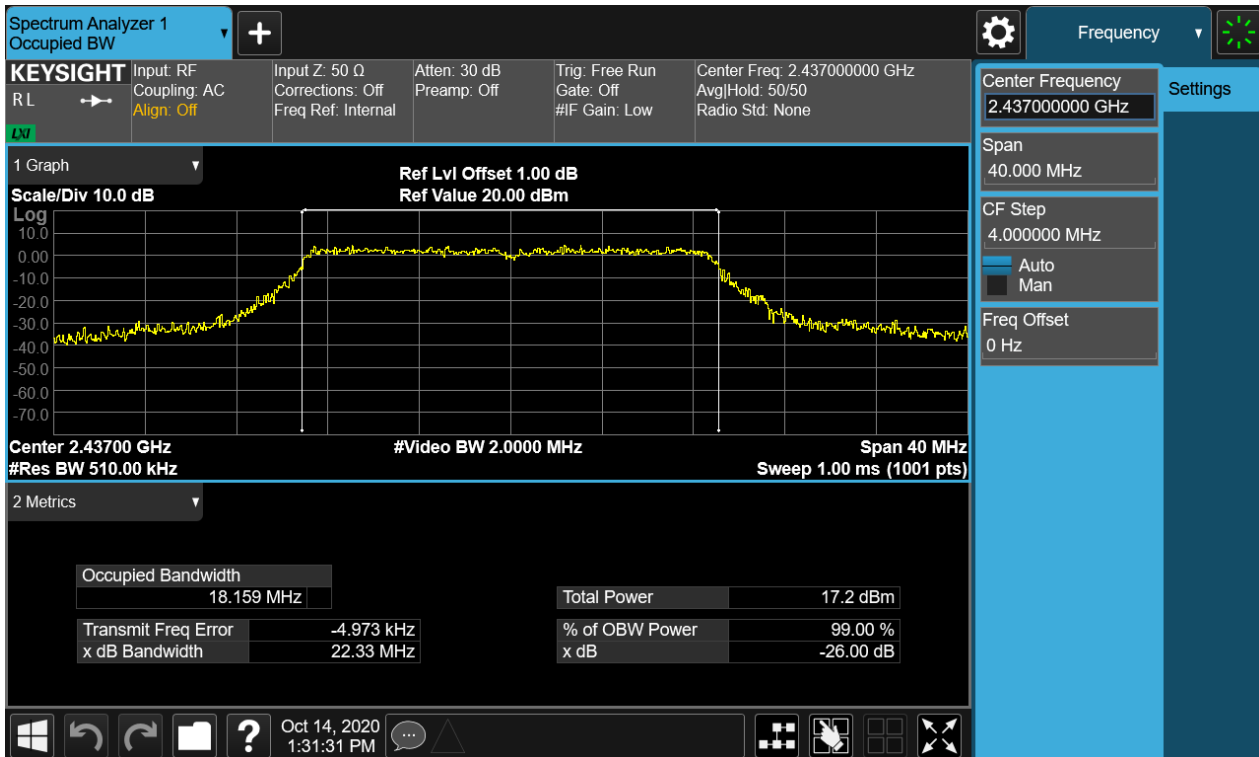
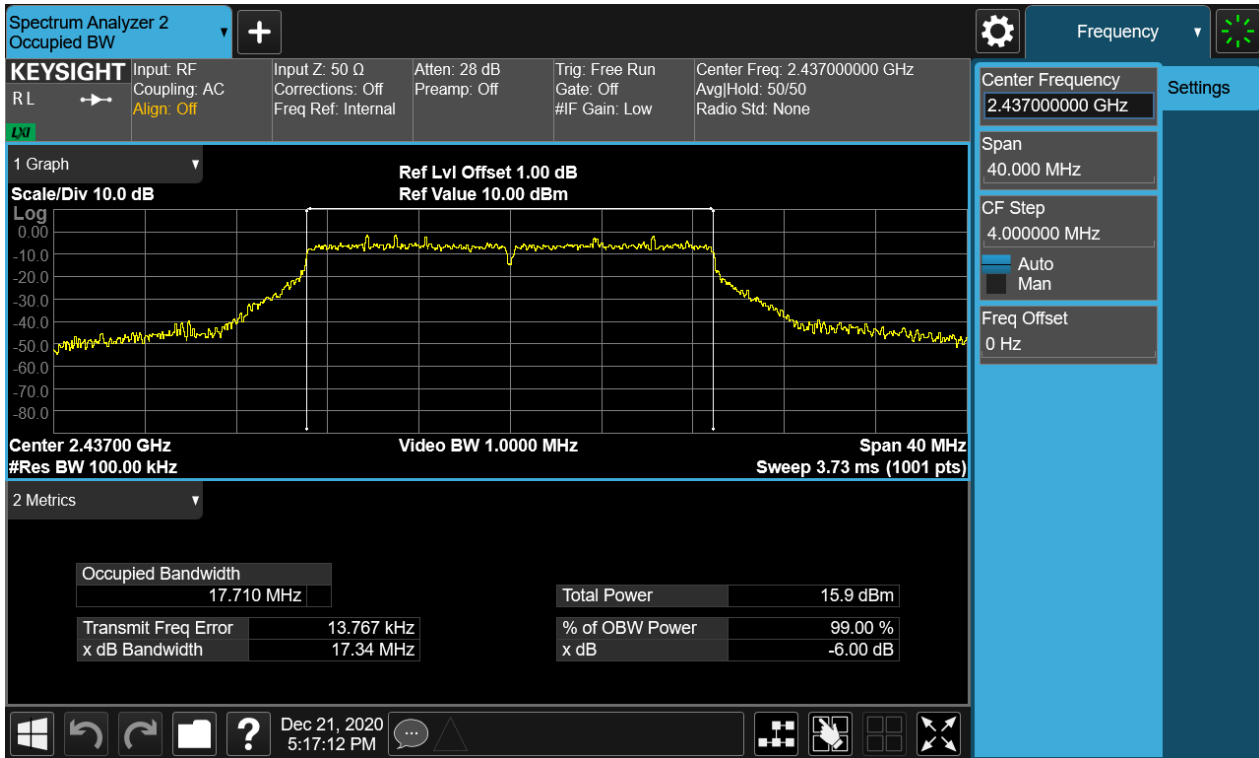
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 24 of 66

Figure 8: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT20), 2437MHz



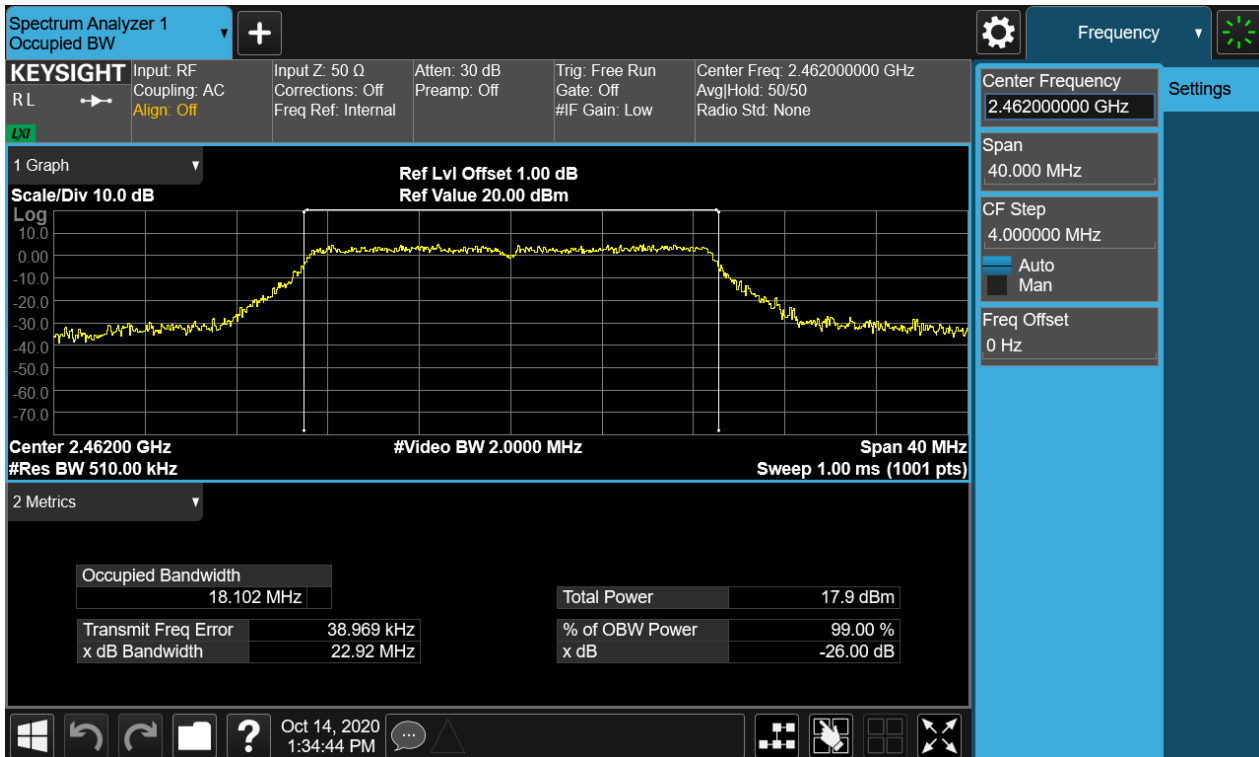
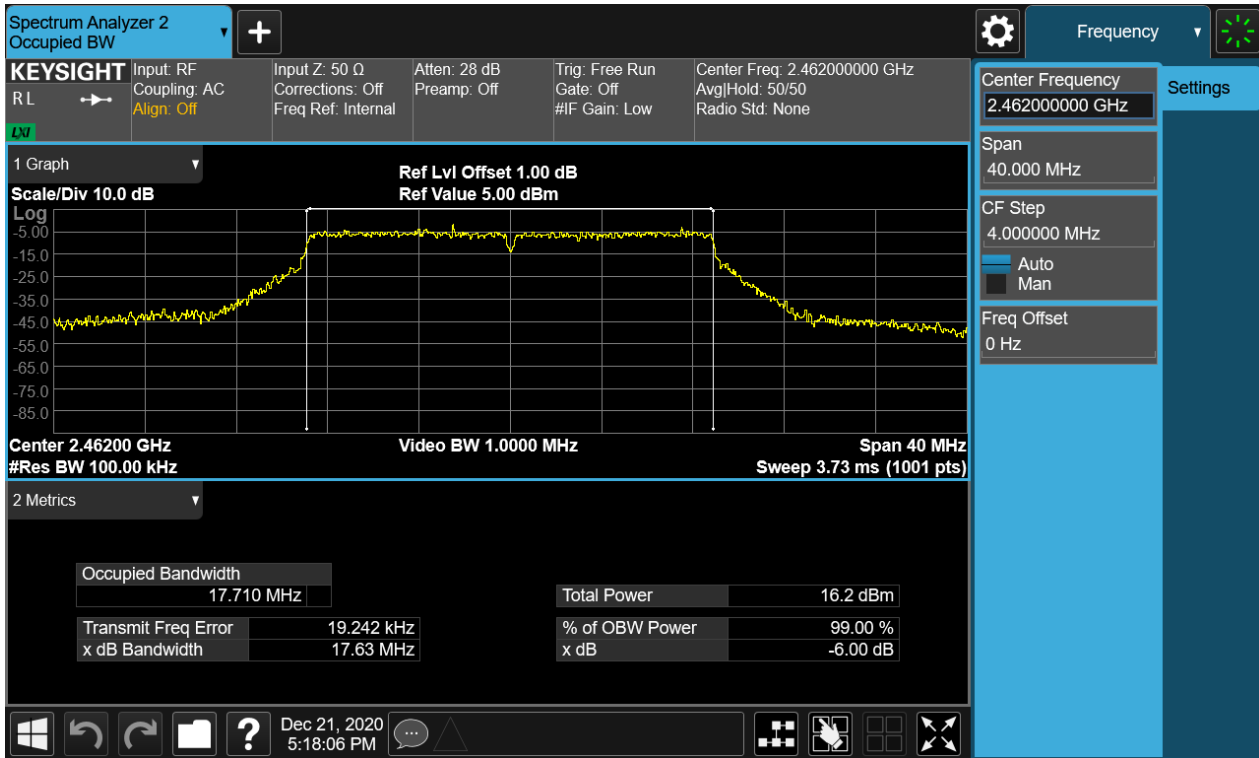
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 25 of 66

Figure 9: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT20), 2462MHz



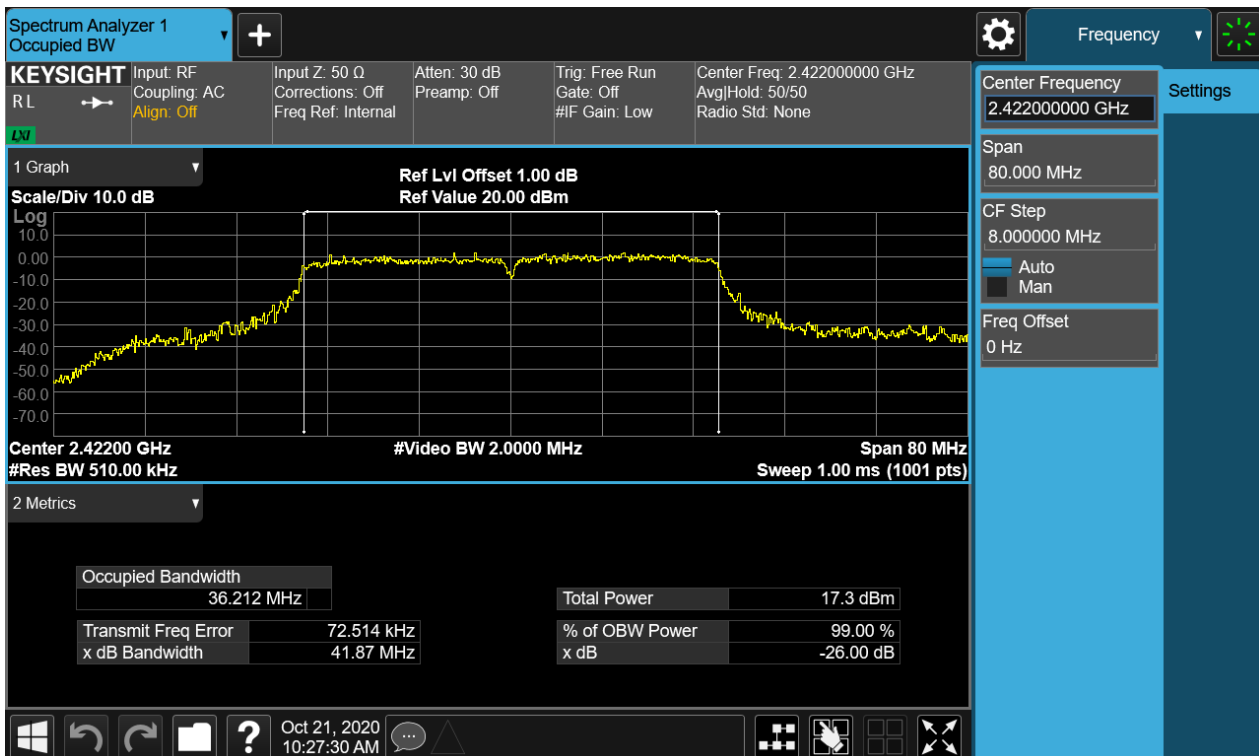
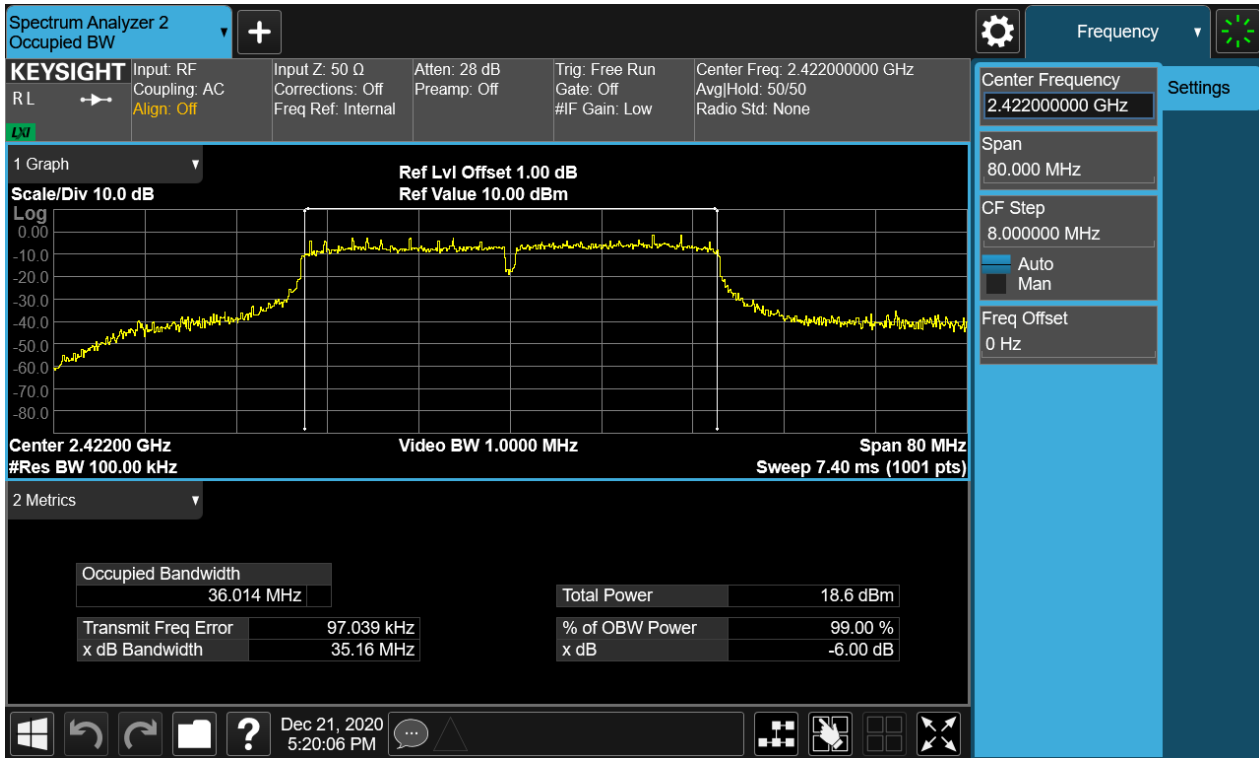
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 26 of 66

Figure 10: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT40), 2422MHz



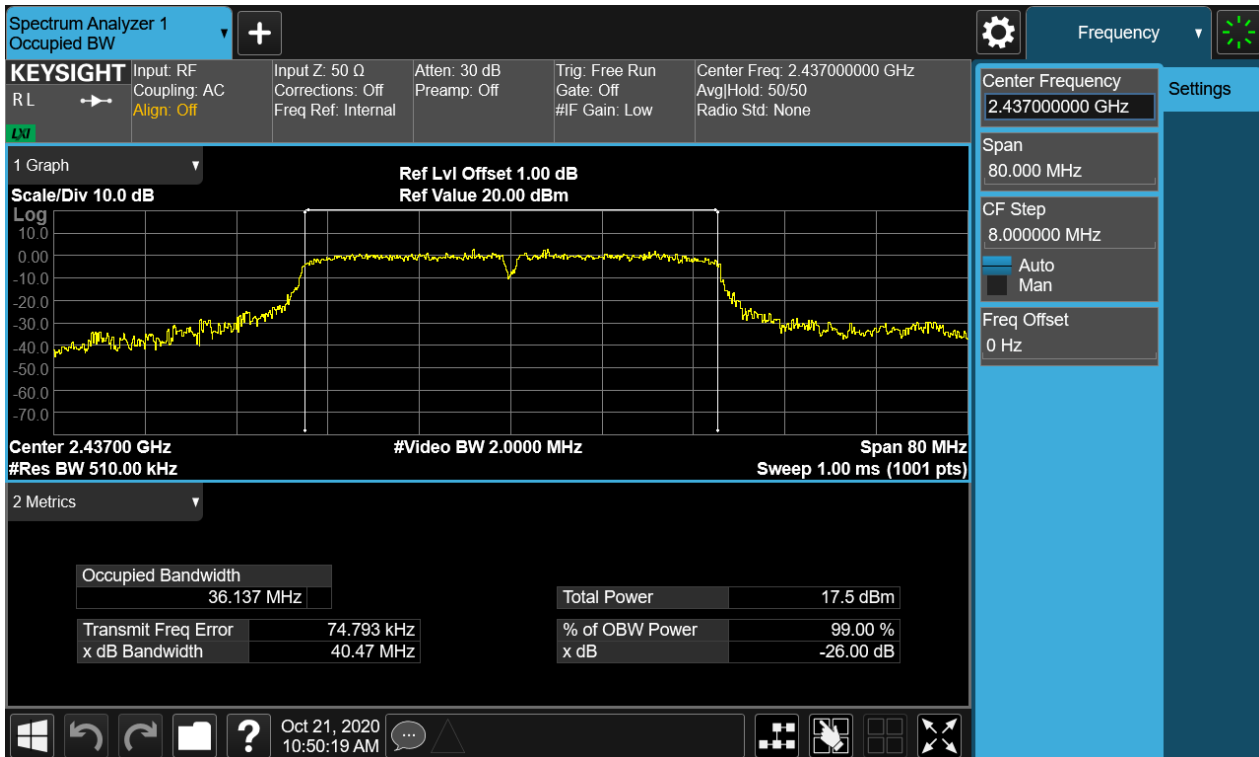
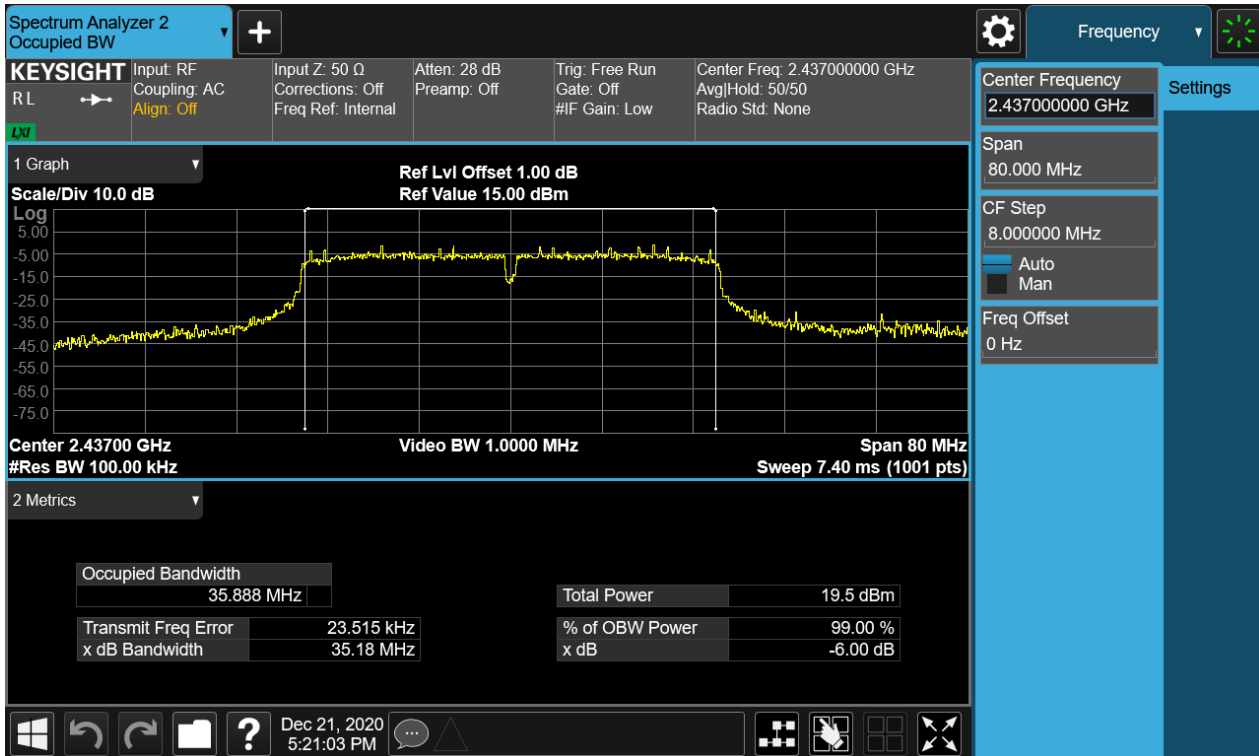
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 27 of 66

Figure 11: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT40), 2437MHz



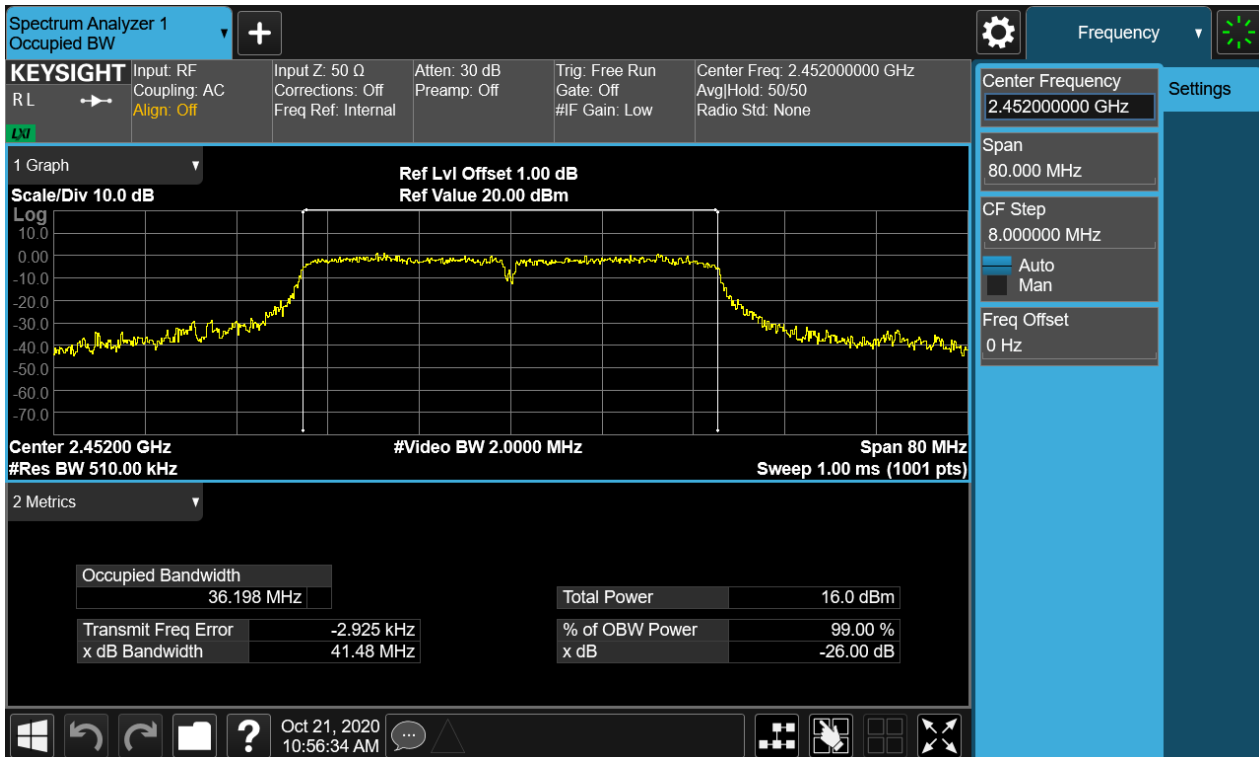
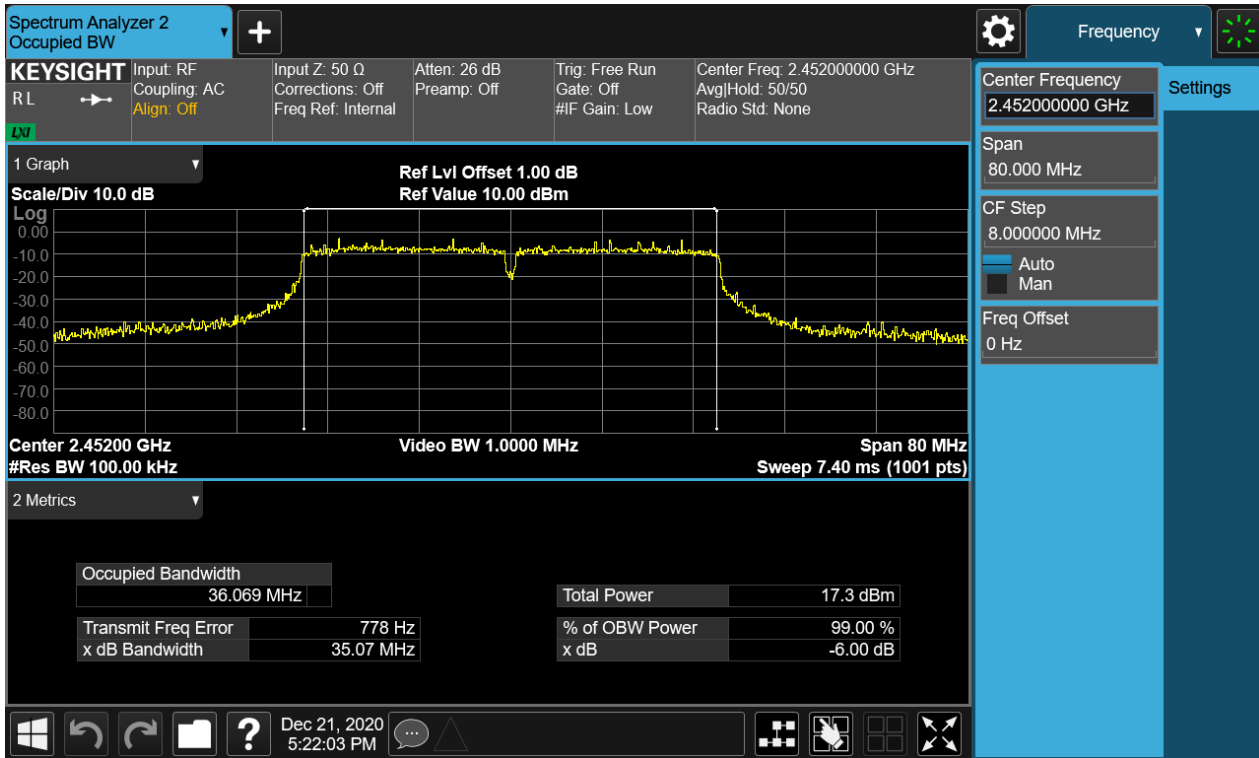
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 28 of 66

Figure 12: 6dB Bandwidth and 99% Bandwidth, 802.11n(HT40), 2452MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 29 of 66

4.1.4 Power Spectral Density

RESULT:

PASS

Test standard : FCC Part 15.247(e)
RSS-247 5.2(2)
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 25°C
Relative humidity : 52%

Table 4: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	2412	-12.21	8
	2437	-11.08	
	2462	-10.46	
802.11g	2412	-15.44	
	2437	-14.41	
	2462	-14.21	
802.11n(HT20)	2412	-14.57	
	2437	-14.97	
	2462	-14.31	
802.11n(HT40)	2422	-17.98	
	2437	-17.92	
	2452	-17.86	

TEST REPORT

Report No.: SHE20060042-02GE

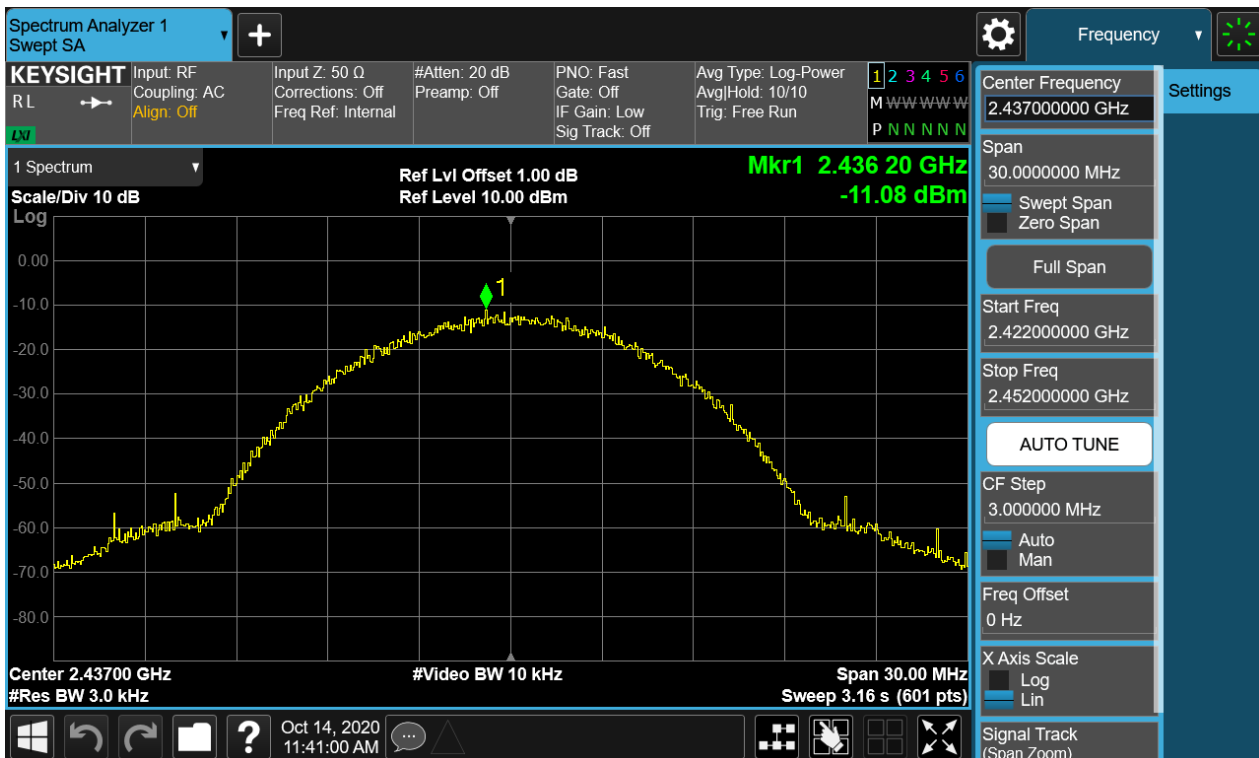
Date: 2021-01-15

Page 30 of 66

Figure 13: Power Spectral Density, 802.11b, 2412MHz



Figure 14: Power Spectral Density, 802.11b, 2437MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 31 of 66

Figure 15: Power Spectral Density, 802.11b, 2462MHz

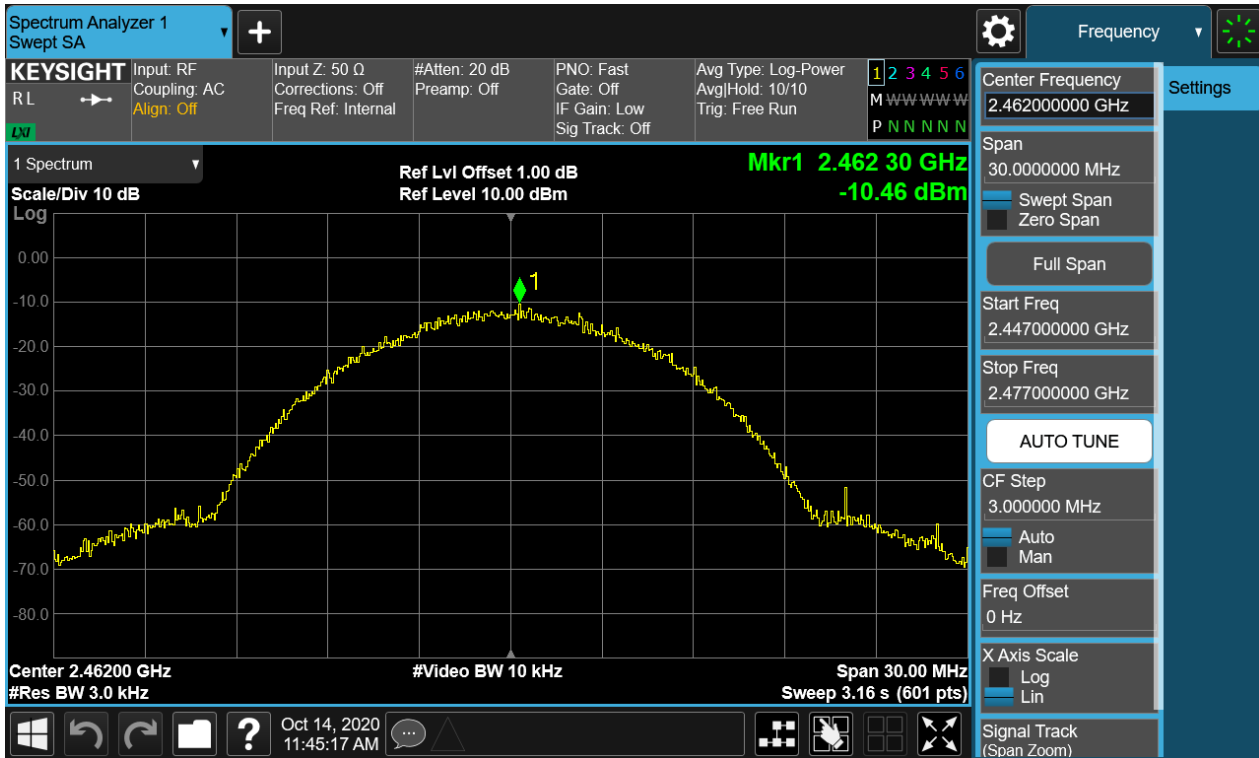
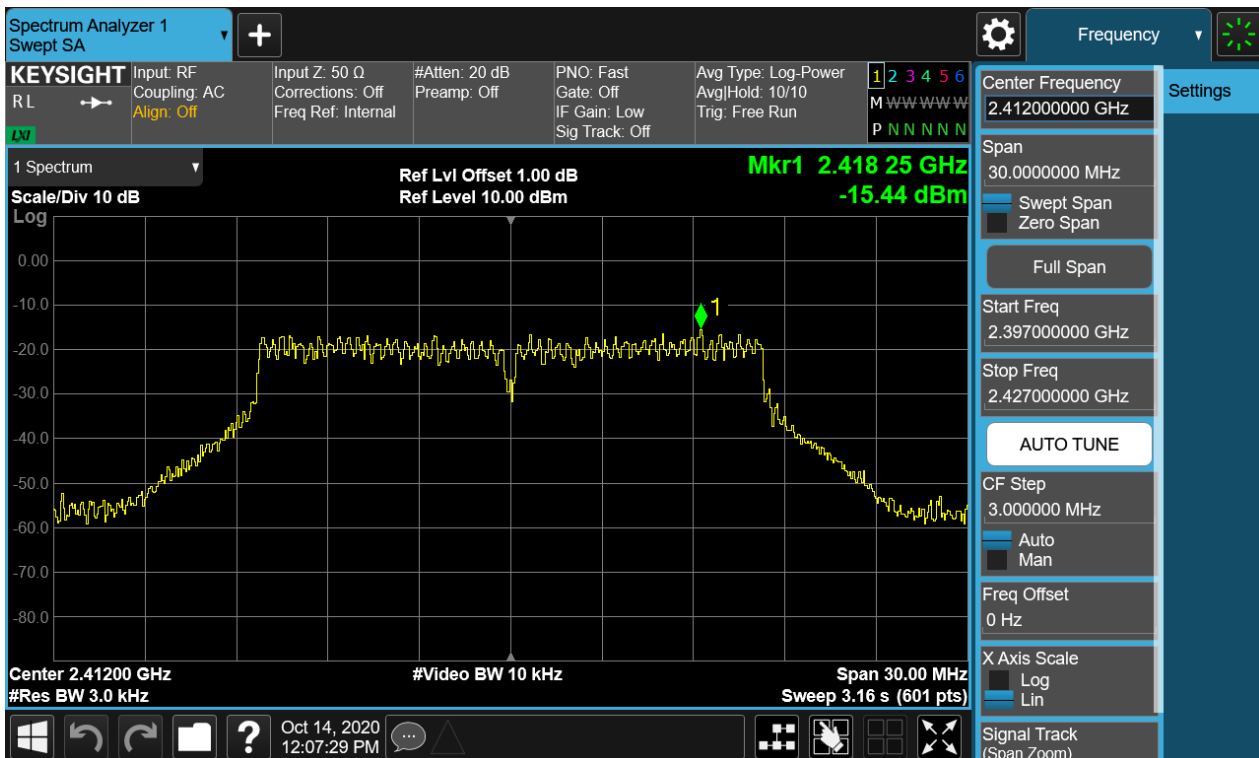


Figure 16: Power Spectral Density, 802.11g, 2412MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 32 of 66

Figure 17: Power Spectral Density, 802.11g, 2437MHz

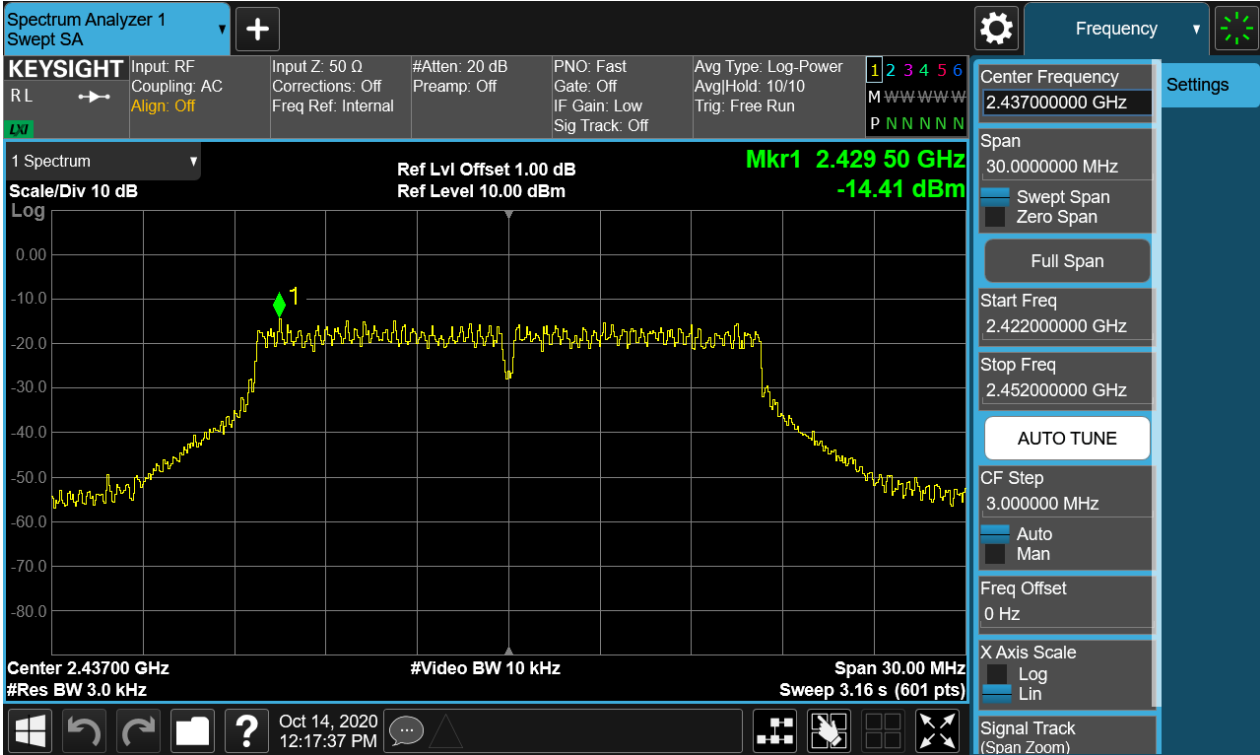
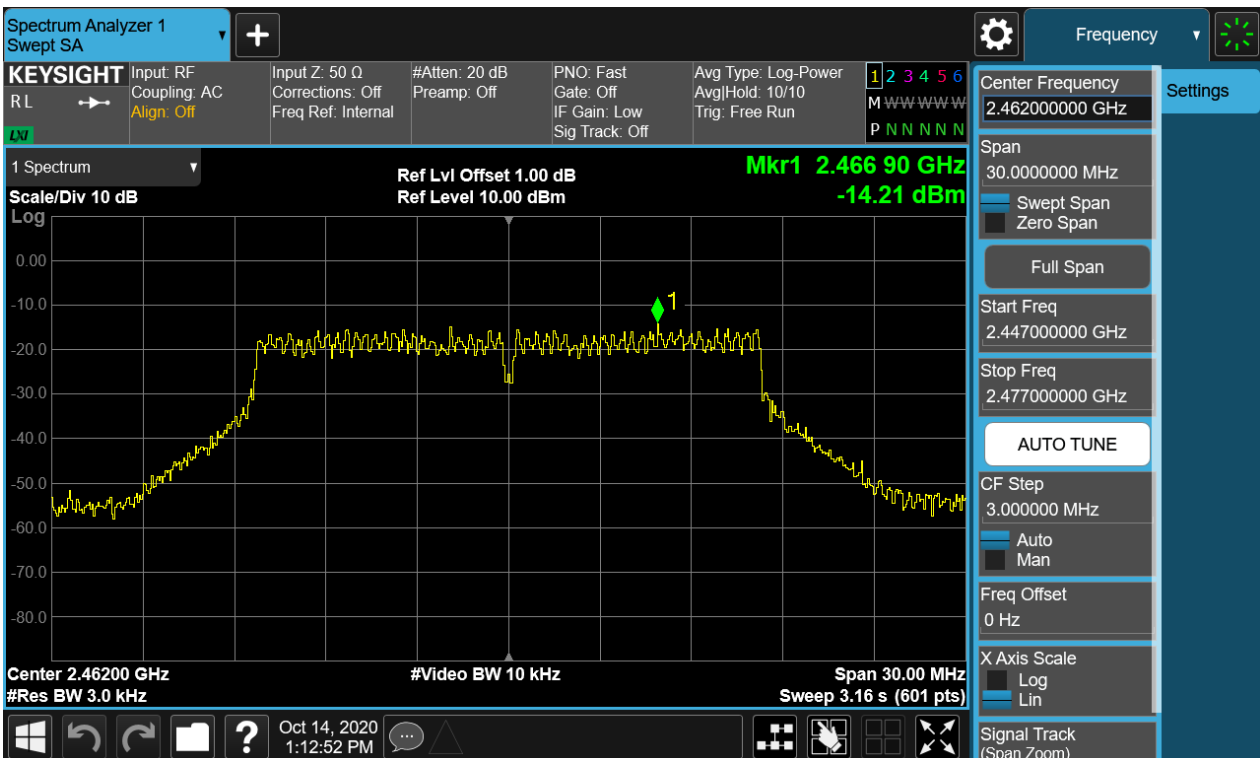


Figure 18: Power Spectral Density, 802.11g, 2462MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 33 of 66

Figure 19: Power Spectral Density, 802.11n(HT20), 2412MHz

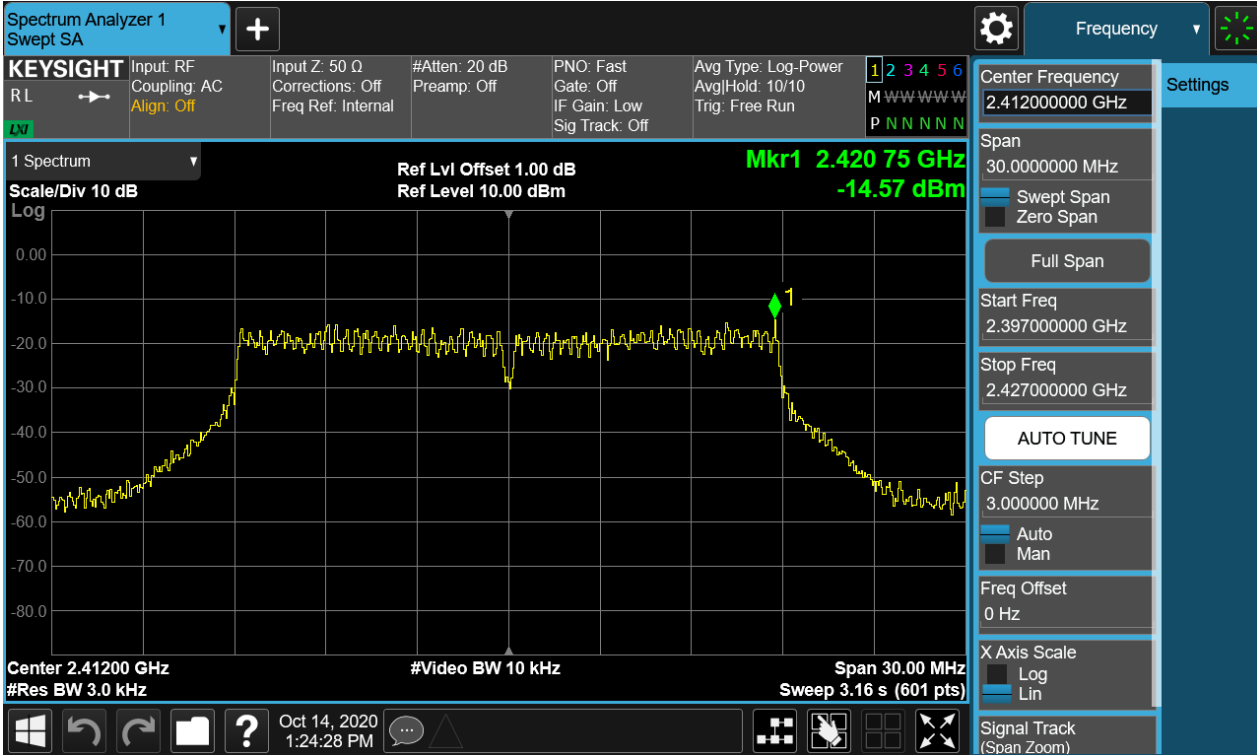
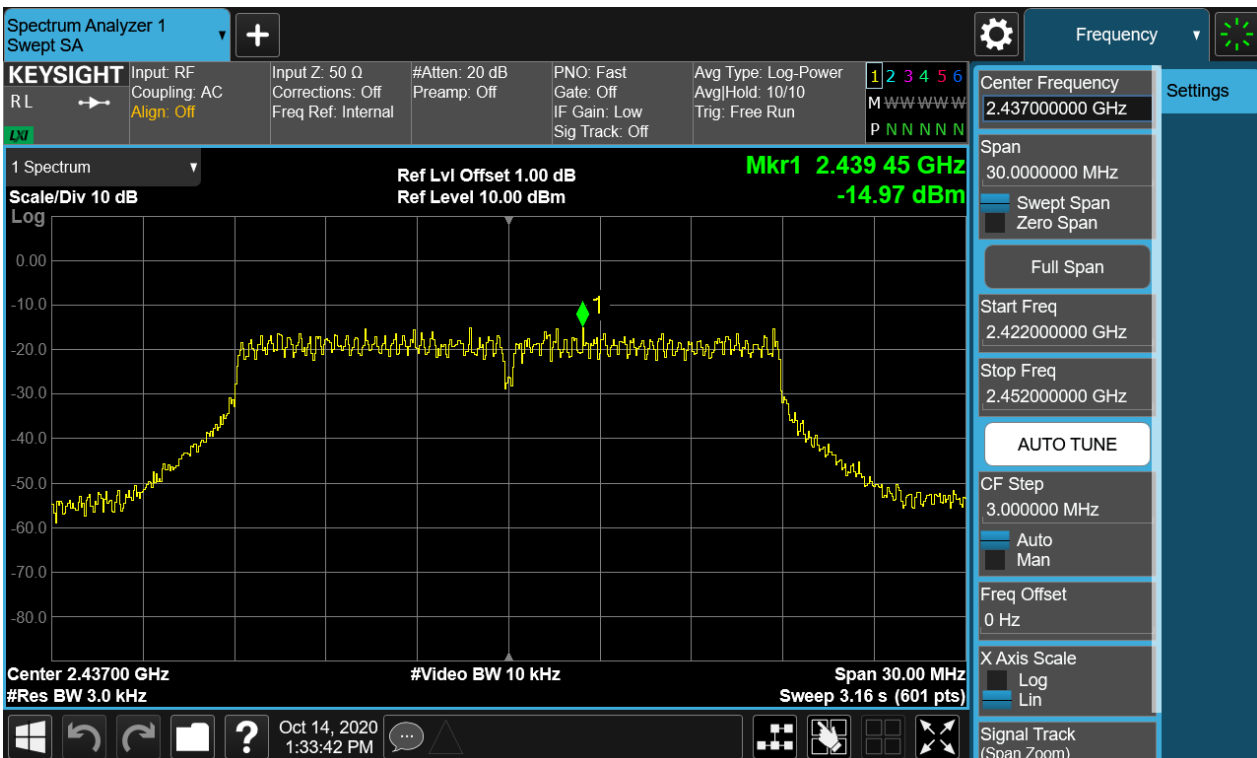


Figure 20: Power Spectral Density, 802.11n(HT20), 2437MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 34 of 66

Figure 21: Power Spectral Density, 802.11n(HT20), 2462MHz

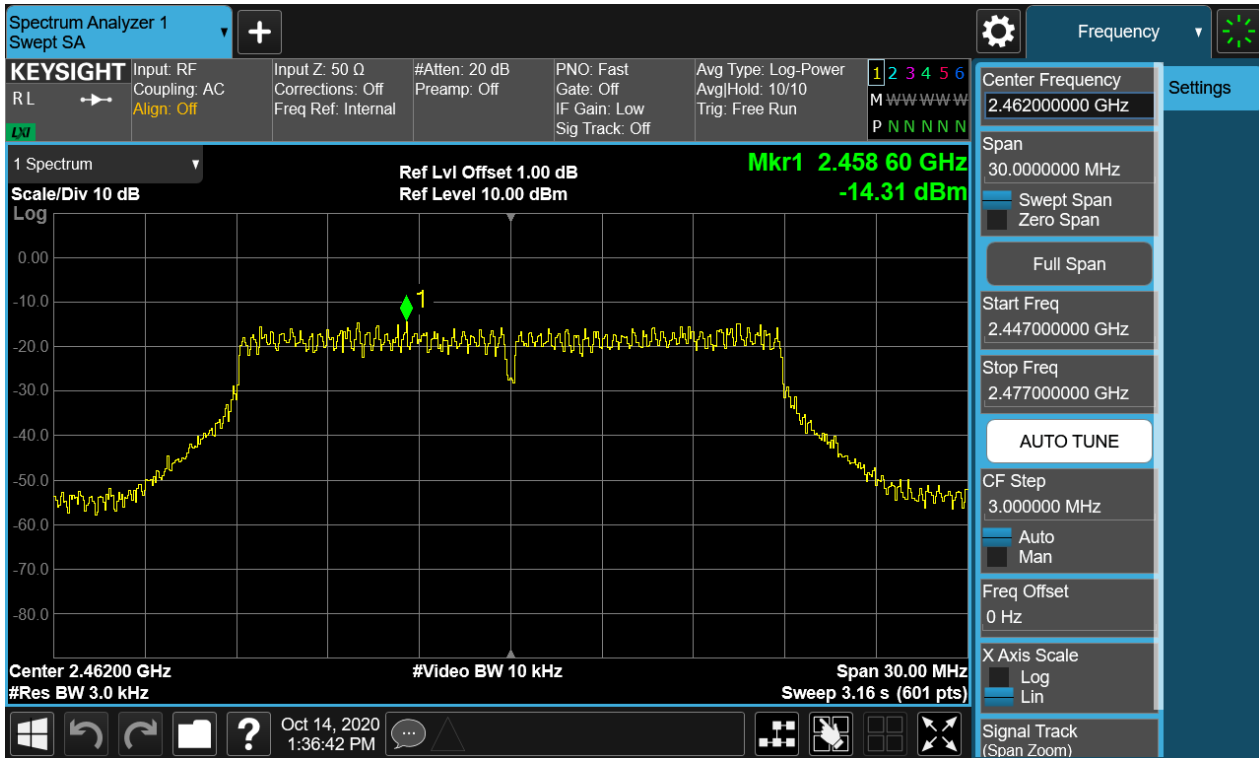
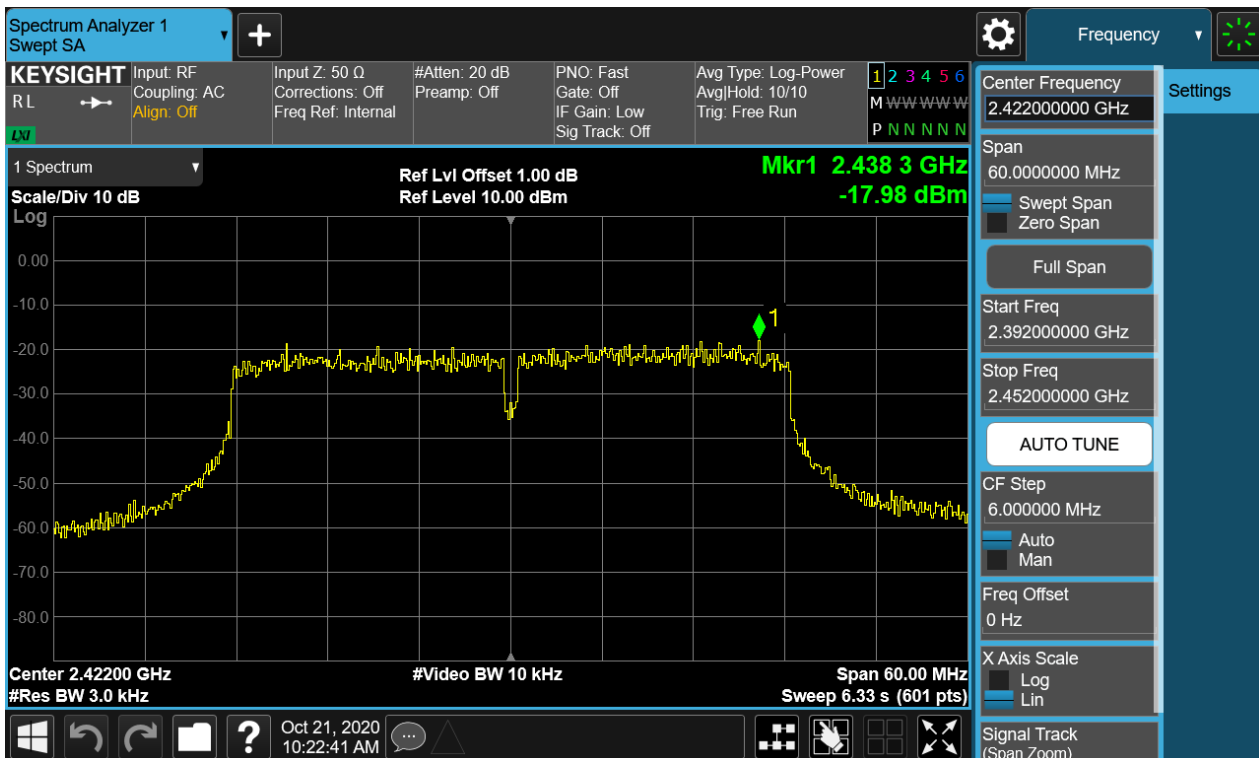


Figure 22: Power Spectral Density, 802.11n(HT40), 2422MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 35 of 66

Figure 23: Power Spectral Density, 802.11n(HT40), 2437MHz

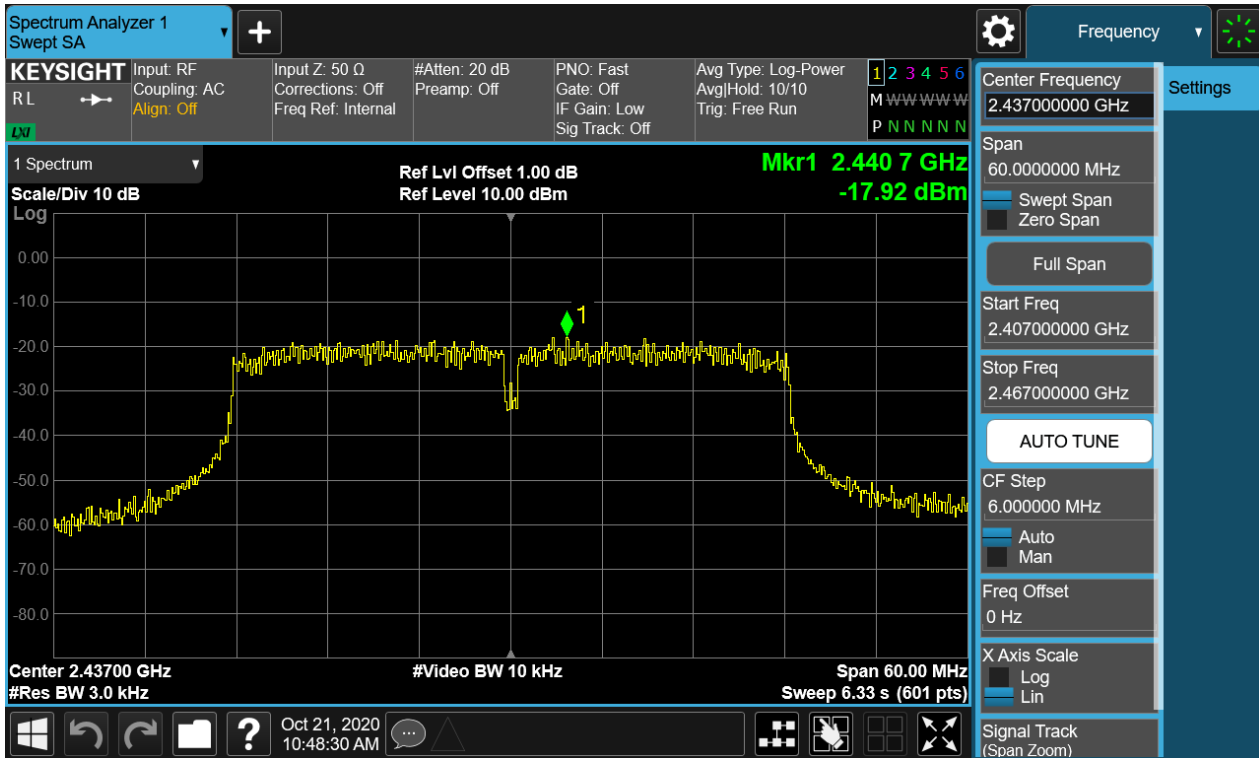
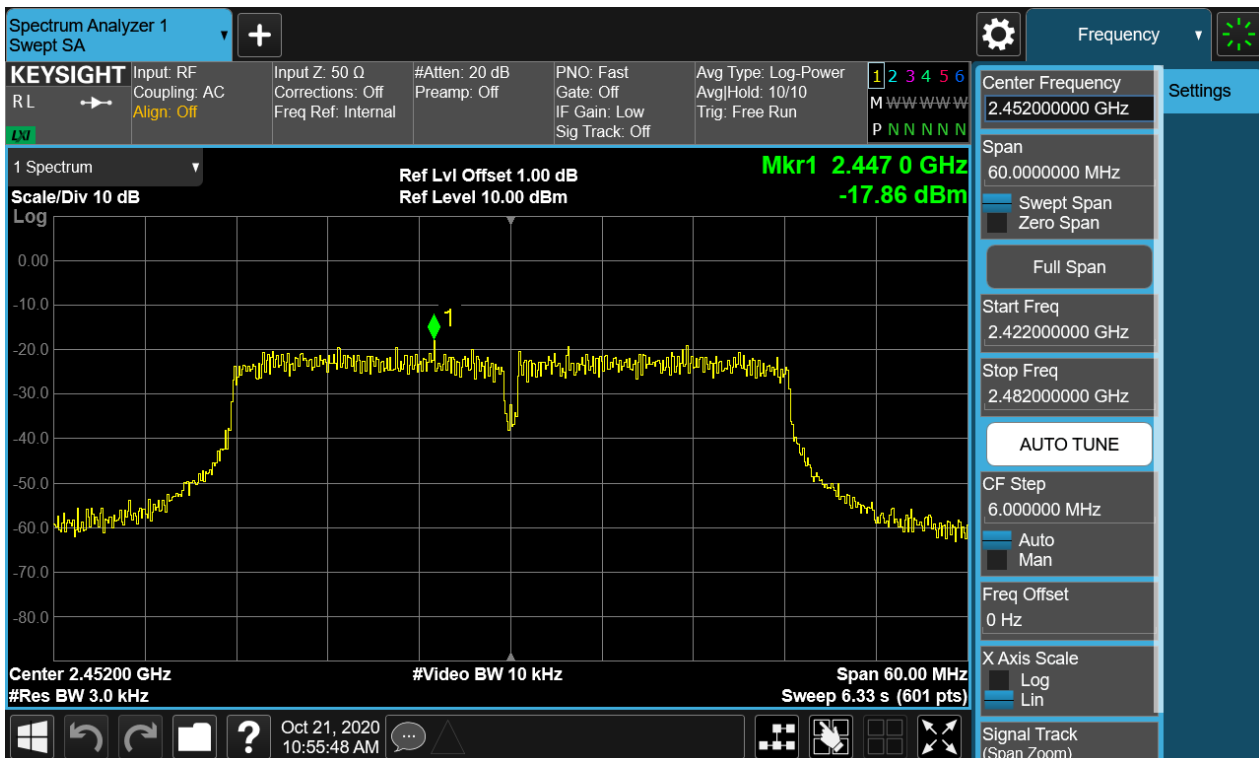


Figure 24: Power Spectral Density, 802.11n(HT40), 2452MHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 36 of 66

4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.209
RSS-247 5.5
RSS-Gen 8.9

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High for spurious, Low/High for Band Edge

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

For details refer to following test plot.

Figure 25: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2412MHz Carrier Level



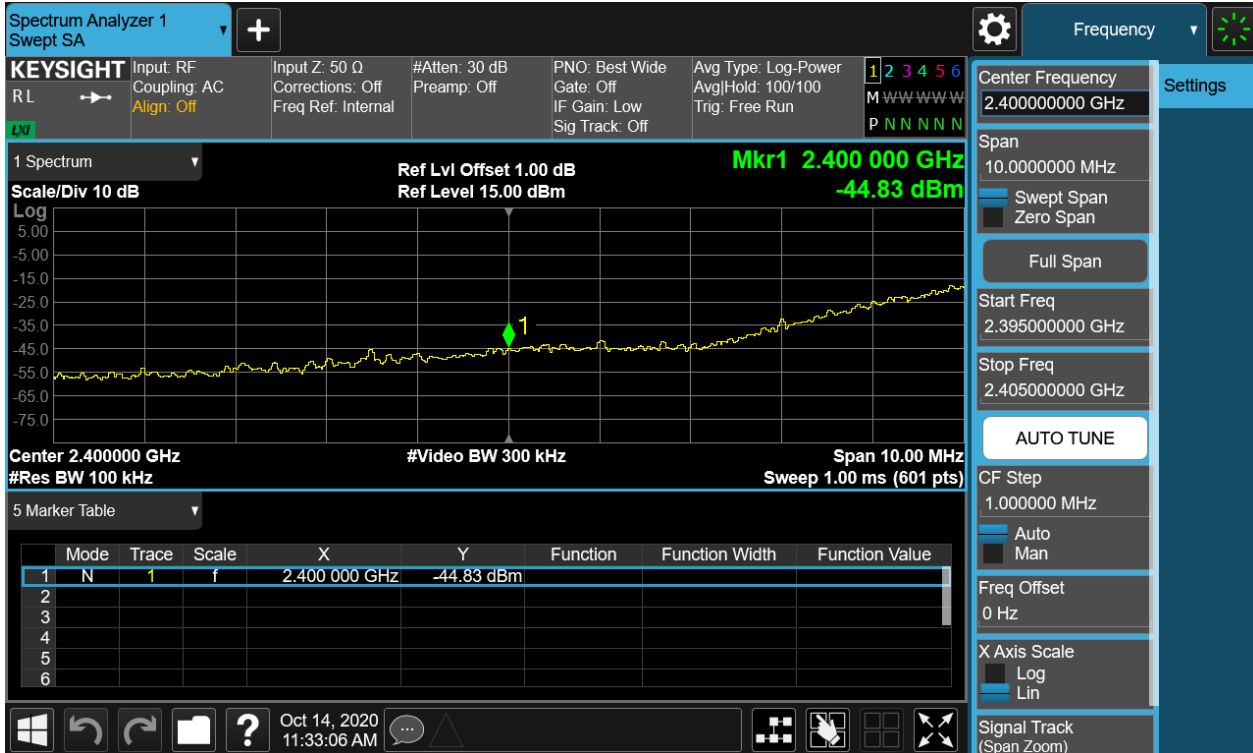
TEST REPORT

Report No.: SHE20060042-02GE

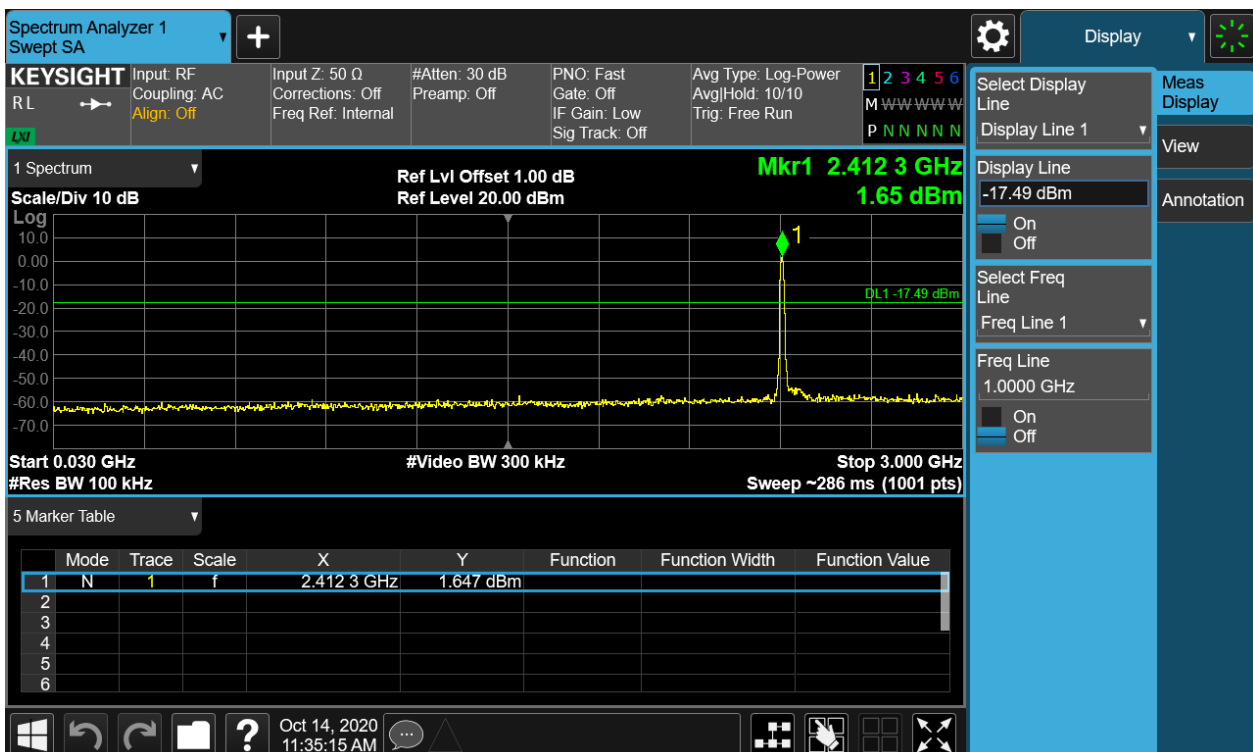
Date: 2021-01-15

Page 37 of 66

Band Edge



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 38 of 66

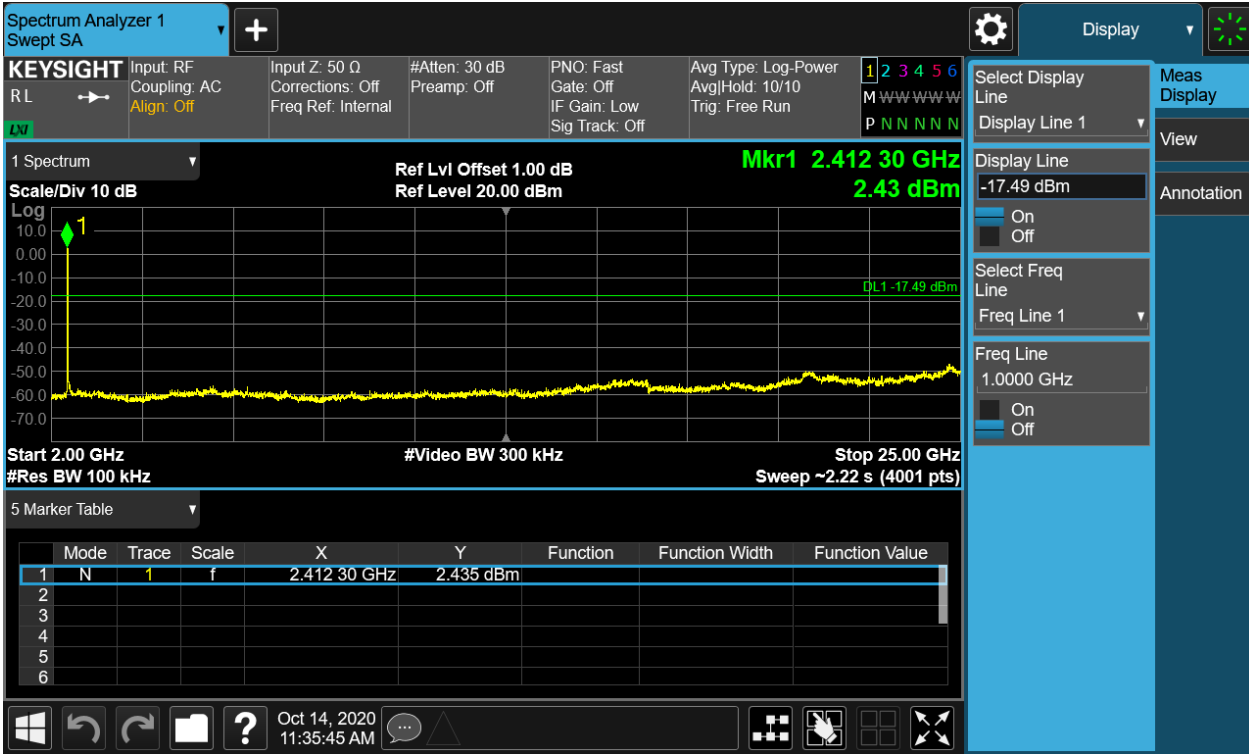
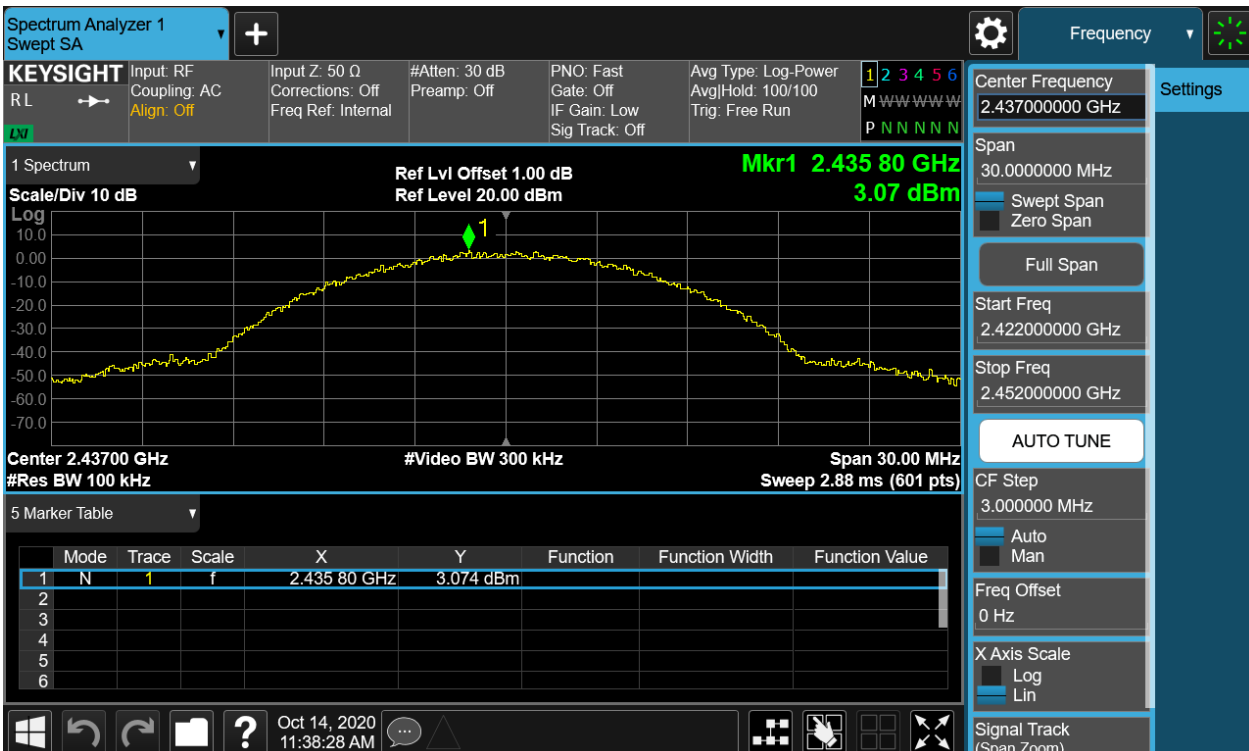


Figure 26: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2437MHz Carrier Level



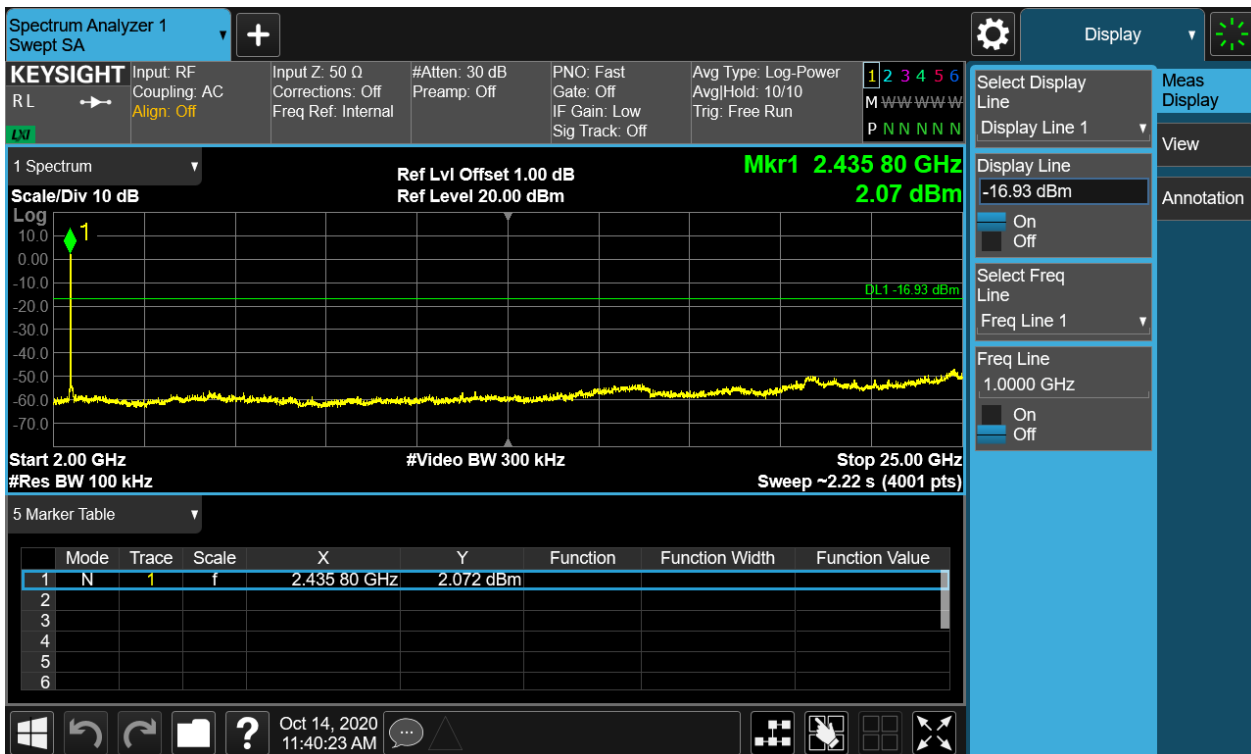
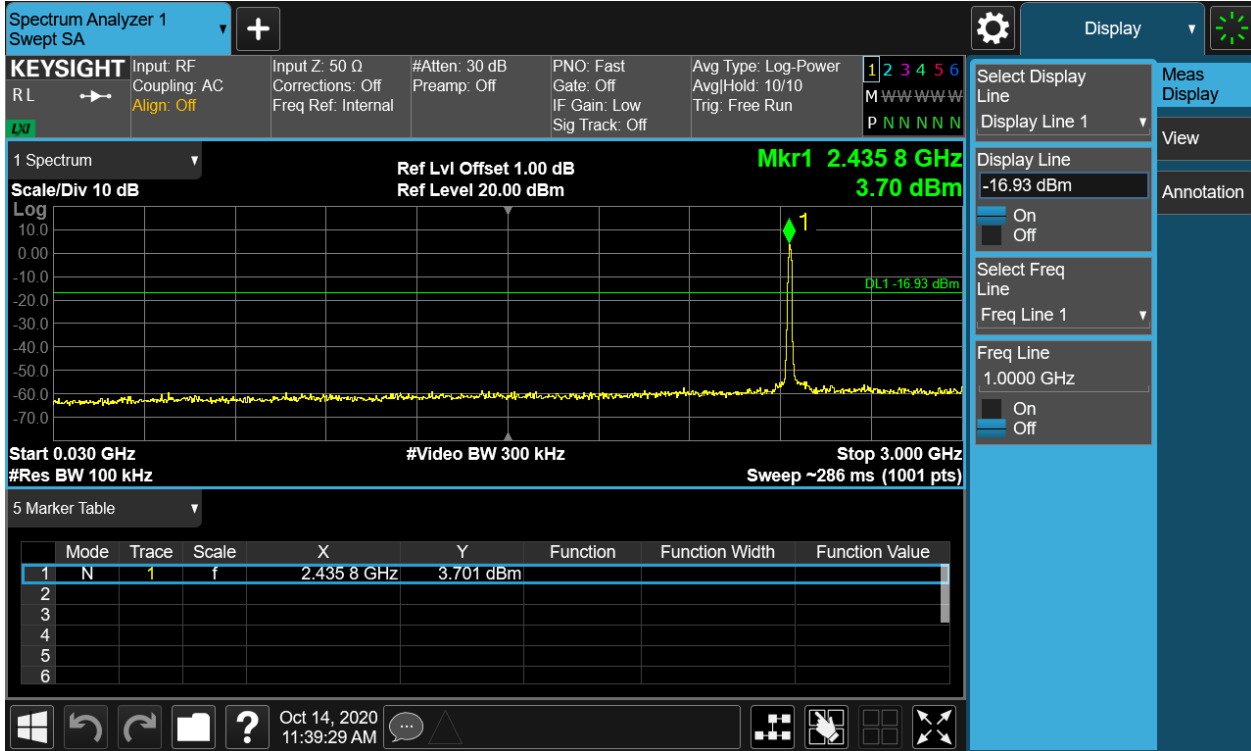
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 39 of 66

Conducted spurious emissions 30MHz-25GHz



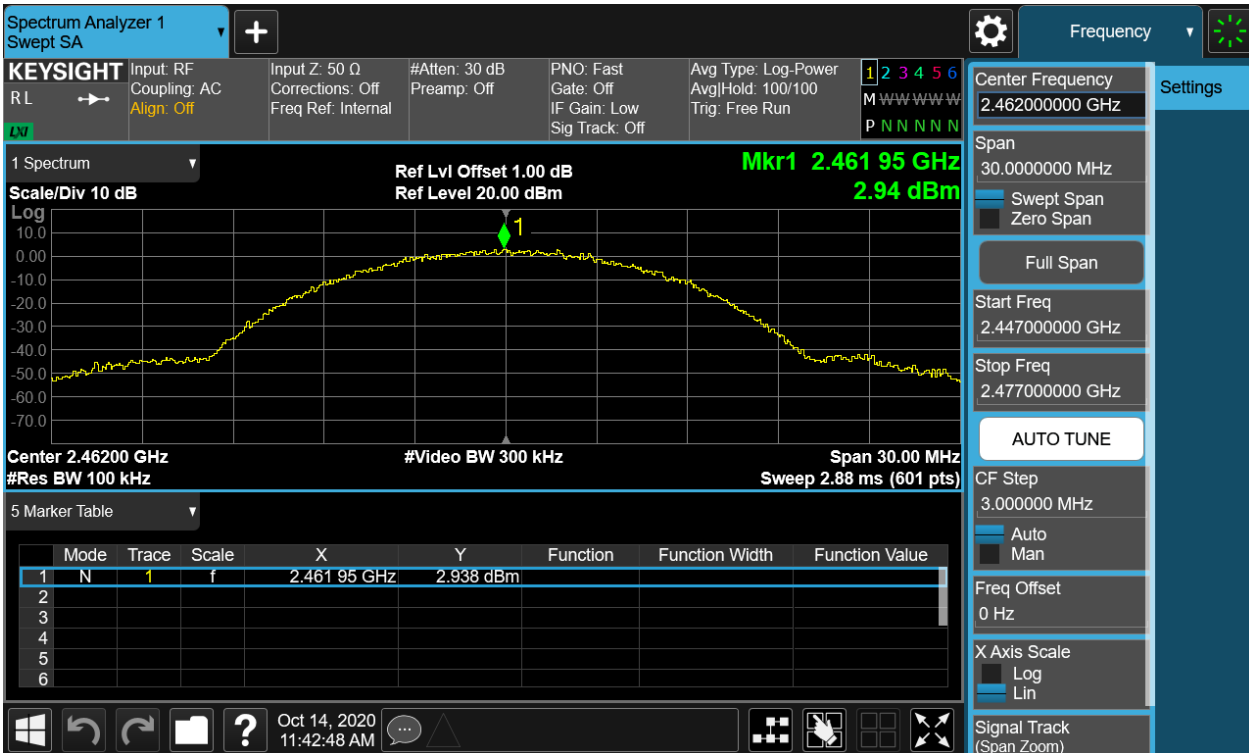
TEST REPORT

Report No.: SHE20060042-02GE

Date: 2021-01-15

Page 40 of 66

Figure 27: Conducted Spurious Emission & Authorized-band band-edge, 802.11b, 2462MHz Carrier Level



Band Edge

