



Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640

Fax: +86-755-26648637

Website: www.cqa-cert.com

Report Template Version: V03

Report Template Revision Date: Mar.1st, 2017

Test Report

Report No. : CQASZ20210100002EX-01

Applicant: SHENZHEN AMEDIATECH TECHNOLOGY CO.,LTD

Address of Applicant: No.01, 2/F, A Plant, Block B, Minsheng Industrial Park, Longmei Road, Gaofeng community, Dalang office, Longhua District, Shenzhen, China

Manufacturer: SHENZHEN AMEDIATECH TECHNOLOGY CO.,LTD

Address of Manufacturer: No.01, 2/F, A Plant, Block B, Minsheng Industrial Park, Longmei Road, Gaofeng community, Dalang office, Longhua District, Shenzhen, China

Equipment Under Test (EUT):

Product: Set Top Box

All Model No.: X96 mini+

Test Model No.: X96 mini+

Brand Name: N/A

FCC ID: 2A16D-X96MINI

Standards: 47 CFR FCC Part 15 Subpart C 15.247

Date of Test: Jan. 04, 2021 – Jan. 31, 2021

Date of Issue: Jan. 31, 2021

Test Result : PASS

Tested By:

Jun Li

(Jun Li)

Reviewed By:

Ares Liu

(Ares Liu)

Approved By:

Sheek Luo

(Sheek Luo)



* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 .Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20210100002EX-01	Rev.01	Initial report	Jan. 31, 2021

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
Conducted Peak & Average Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10 2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10 2013	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10 2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

3 Contents

	Page
1 .VERSION.....	2
2 TEST SUMMARY	3
3 CONTENTS	4
4 GENERAL INFORMATION	5
4.1 CLIENT INFORMATION	5
4.2 GENERAL DESCRIPTION OF EUT	5
4.3 TEST ENVIRONMENT	6
4.4 DESCRIPTION OF SUPPORT UNITS	7
4.5 TEST LOCATION	7
4.6 TEST FACILITY.....	7
4.7 STATEMENT OF THE MEASUREMENT UNCERTAINTY	8
4.8 DEVIATION FROM STANDARDS.....	8
4.9 ABNORMALITIES FROM STANDARD CONDITIONS.....	8
4.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	8
4.11 EQUIPMENT LIST	9
5 TEST RESULTS AND MEASUREMENT DATA	10
5.1 ANTENNA REQUIREMENT.....	10
5.2 CONDUCTED EMISSIONS.....	11
5.3 CONDUCTED PEAK & AVERAGE OUTPUT POWER.....	14
5.4 6dB OCCUPY BANDWIDTH.....	15
5.5 POWER SPECTRAL DENSITY.....	20
5.6 BAND-EDGE FOR RF CONDUCTED EMISSIONS	26
5.7 RF CONDUCTED SPURIOUS EMISSIONS	30
5.8 RADIATED SPURIOUS EMISSIONS.....	44
5.8.1 Radiated emission below 1GHz	47
5.8.2 Transmitter emission above 1GHz.....	49
5.9 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY.....	54
6 PHOTOGRAPHS - EUT TEST SETUP.....	60
PLEASE REFER TO TEST SETUP FILE	60
7 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS	62

4 General Information

4.1 Client Information

Applicant:	SHENZHEN AMEDIATECH TECHNOLOGY CO.,LTD
Address of Applicant:	No.01, 2/F, A Plant, Block B, Minsheng Industrial Park, Longmei Road, Gaofeng community, Dalang office, Longhua District, Shenzhen, China
Manufacturer:	SHENZHEN AMEDIATECH TECHNOLOGY CO.,LTD
Address of Manufacturer:	No.01, 2/F, A Plant, Block B, Minsheng Industrial Park, Longmei Road, Gaofeng community, Dalang office, Longhua District, Shenzhen, China

4.2 General Description of EUT

Product Name:	Set Top Box
Test Model No.:	X96 mini+
Trade Mark:	/
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(H40): 2422MHz~2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM IEEE for 802.11n(HT20): OFDM IEEE for 802.11n(HT40): OFDM
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Antenna Type	IPEX Antenna
Antenna Gain	0dBi
Power Supply:	DC 5V from adapter
Adapter Information:	AC/DC ADAPTER MODEL:TSL-1681 INPUT:110-240V AC 50/60Hz 0.3A OUTPUT: DC 5V 2A

Note: 1. This report is only for 2.4GHz WiFi.

2. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Operation Frequency each of channel(802.11b/g/n HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11b/g/n (HT20):

Channel	Frequency
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz

For 802.11n (HT40):

Channel	Frequency
The Lowest channel	2422MHz
The Middle channel	2437MHz
The Highest channel	2452MHz

Note: Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.3 Test Environment

Operating Environment:	
Conduction emission	
Temperature:	23 °C
Humidity:	51 % RH
Atmospheric Pressure:	992mbar
Radiated Emission (Normal Conditions)	
Temperature:	25.1 °C~25.5 °C
Humidity:	51 % RH~55 % RH
Atmospheric Pressure:	992mbar
RF item test (RF test room Normal Conditions)	
Temperature:	26 °C~27.3 °C
Humidity:	58 % RH~59 % RH
Atmospheric Pressure:	992mbar
Transmitting mode:	Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT. Note: In the process of transmitting of EUT, the duty cycle > 98%.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
AC/DC ADAPTER	/	MODEL:TSL-1681 INPUT:110-240V AC 50/60Hz 0.3A OUTPUT: DC 5v 2A	Provide by applicant	SDOC
/	/	/	/	/

4.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **ISED Registration No.: 22984-1**

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

• **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequency Error	5.5 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

4.10 Other Information Requested by the Customer

None.

4.11 Equipment List

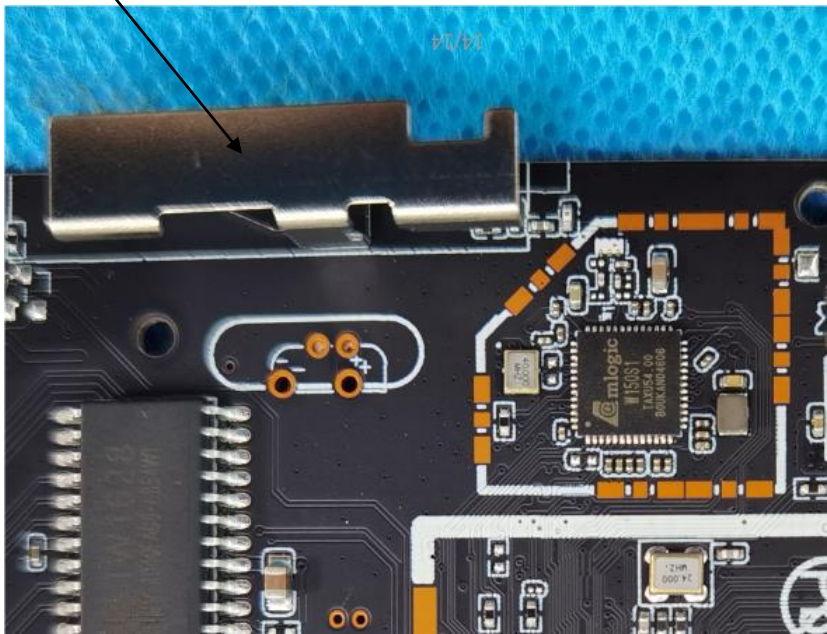
Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2020/9/22	2021/9/21
Spectrum analyzer	R&S	FSU26	CQA-038	2020/10/24	2021/10/23
Spectrum analyzer	keysight	N9020A	CQA-105	2020/10/24	2021/10/23
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2020/9/22	2021/9/21
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2020/11/2	2021/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2020/10/28	2021/10/27
Bilog Antenna	R&S	HL562	CQA-011	2020/9/22	2021/9/21
Horn Antenna	R&S	HF906	CQA-012	2020/9/22	2021/9/21
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2020/9/22	2021/9/21
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2020/9/22	2021/9/21
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2020/9/22	2021/9/21
Antenna Connector	CQA	RFC-01	CQA-080	2020/9/22	2021/9/21
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2020/9/22	2021/9/21
Power Sensor	KEYSIGHT	U2021XA	CQA-30	2020/9/22	2021/9/21
N1918A Power Analysis Manager Power Panel	Agilent	N1918A	CQA-074	2020/9/22	2021/9/21
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2020/9/22	2021/9/21
EMI Test Receiver	R&S	ESPI3	CQA-013	2020/9/22	2021/9/21
LISN	R&S	ENV216	CQA-003	2021/11/1	2021/10/30
Coaxial cable	CQA	N/A	CQA-C009	2020/9/22	2021/9/21

Note:

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	Antenna 
The antenna is IFIA Antenna. The best case gain of the antenna is 0dBi.	

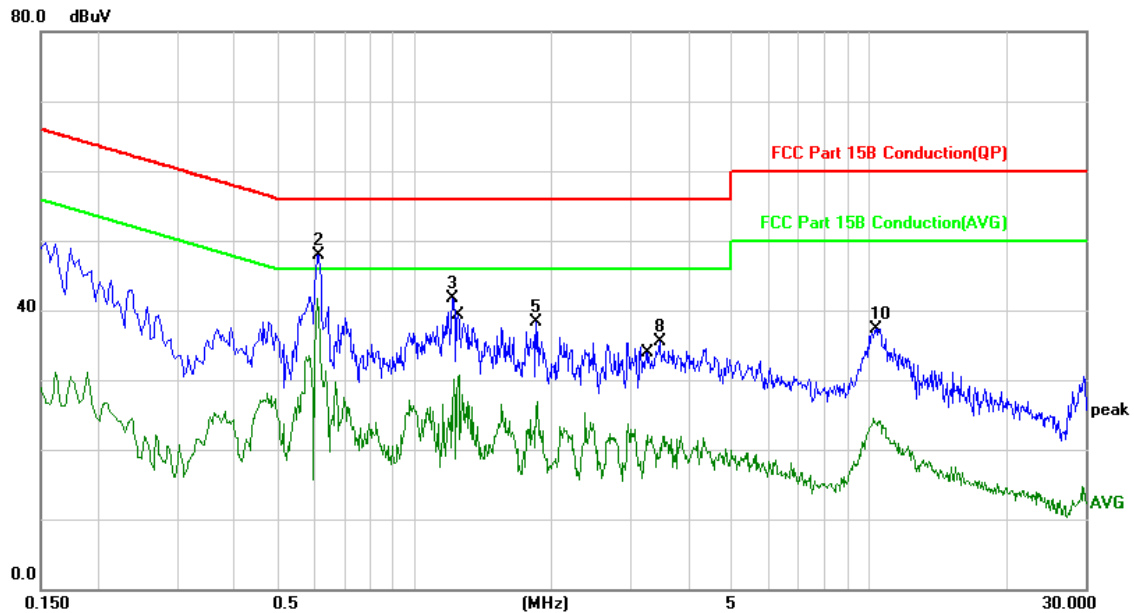
5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207			
Test Method:	ANSI C63.10: 2013			
Test Frequency Range:	150kHz to 30MHz			
Limit:	Frequency range (MHz)	Limit (dBuV)		
		Quasi-peak	Average	
		0.15-0.5	66 to 56*	56 to 46*
		0.5-5	56	46
		5-30	60	50
* Decreases with the logarithm of the frequency.				
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.			
Test Setup:	Shielding Room AC Mains LISN1 EUT AE LISN2 AC Mains Test Receiver 80cm 80cm Ground Reference Plane			
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.			
Final Test Mode:	All wifi modes of 5.2G/5.8G were tested at Low, Middle, and High channel.			

	only the worst result of 802.11b CH11 was reported as below
Test Voltage:	AC110V/60Hz
Test Results:	Pass

Measurement Data

Live Line:

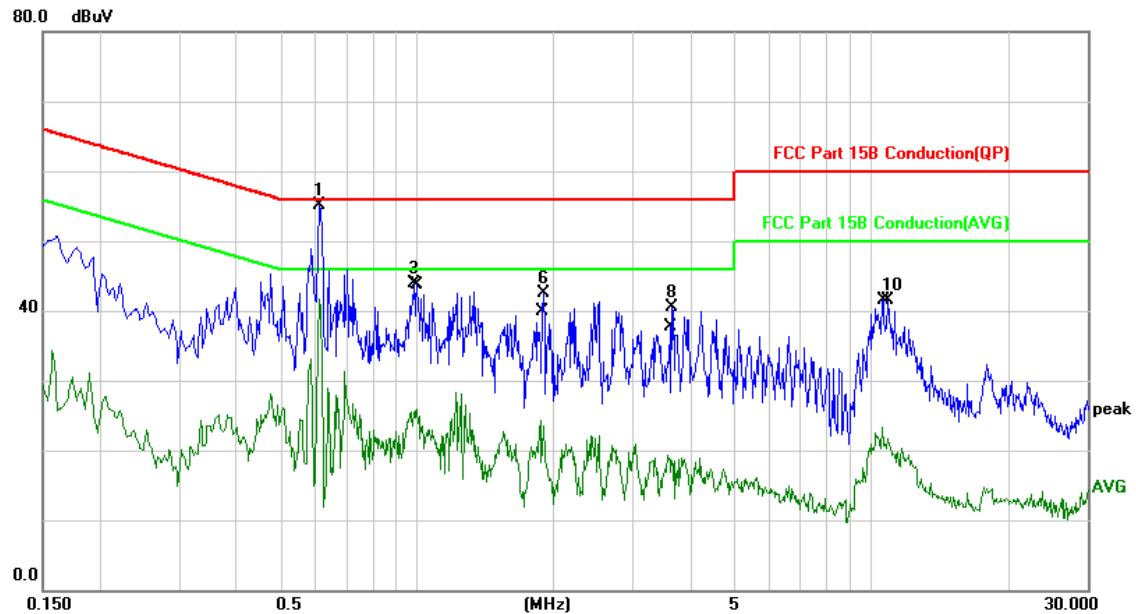


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.6100	41.73	-0.04	41.69	46.00	-4.31	AVG	
2		0.6140	48.01	-0.04	47.97	56.00	-8.03	QP	
3		1.2140	41.89	-0.15	41.74	56.00	-14.26	QP	
4		1.2500	30.80	-0.16	30.64	46.00	-15.36	AVG	
5		1.8580	38.48	-0.22	38.26	56.00	-17.74	QP	
6		1.8620	27.16	-0.22	26.94	46.00	-19.06	AVG	
7		3.2540	22.28	-0.19	22.09	46.00	-23.91	AVG	
8		3.4660	35.77	-0.19	35.58	56.00	-20.42	QP	
9		10.2779	24.60	-0.11	24.49	50.00	-25.51	AVG	
10		10.3939	37.48	-0.11	37.37	60.00	-22.63	QP	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral Line:

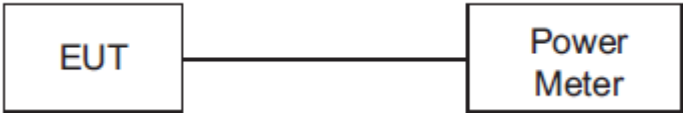


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.6100	54.83	0.33	55.16	56.00	-0.84	QP	
2		0.6100	41.34	0.33	41.67	46.00	-4.33	AVG	
3		0.9860	43.60	0.29	43.89	56.00	-12.11	QP	
4		1.0020	25.65	0.29	25.94	46.00	-20.06	AVG	
5		1.8700	24.16	0.18	24.34	46.00	-21.66	AVG	
6		1.9020	42.42	0.17	42.59	56.00	-13.41	QP	
7		3.5700	19.39	-0.05	19.34	46.00	-26.66	AVG	
8		3.6460	40.58	-0.05	40.53	56.00	-15.47	QP	
9		10.5778	23.25	0.11	23.36	50.00	-26.64	AVG	
10		10.9619	41.42	0.10	41.52	60.00	-18.48	QP	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

5.3 Conducted Peak & Average Output Power

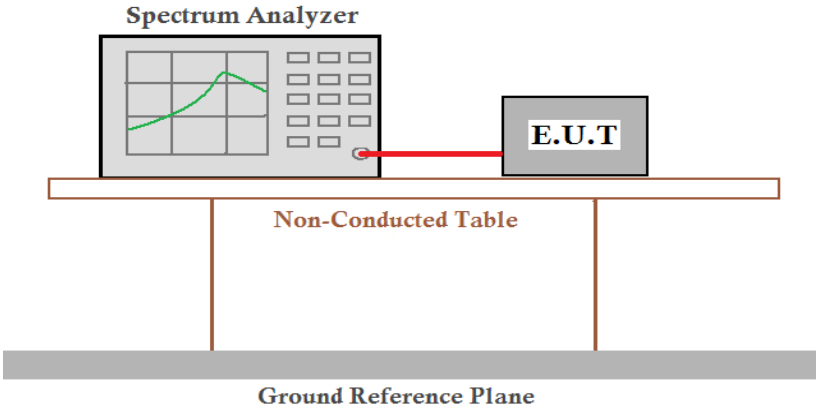
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); Only the worst case is recorded in the report.
Limit:	30dBm
Test Results:	Pass

WIFI(2.4G)

Type	Test channel	Peak Output Power (dBm)	AVG Output Power (dBm)	Limit (dBm)	Result
802.11b	Lowest	15.49	11.67	30.00	Pass
	Middle	16.67	9.63		
	Highest	15.45	10.75		
802.11g	Lowest	13.69	8.07	30.00	Pass
	Middle	13.26	7.95		
	Highest	13.33	8.75		
802.11n(HT20)	Lowest	12.84	6.67	30.00	Pass
	Middle	12.55	6.71		
	Highest	13.43	6.53		
802.11n(HT40)	Lowest	11.36	5.97	30.00	Pass
	Middle	11.95	5.13		
	Highest	11.36	5.28		

Note: 1.The test results including the cable lose.

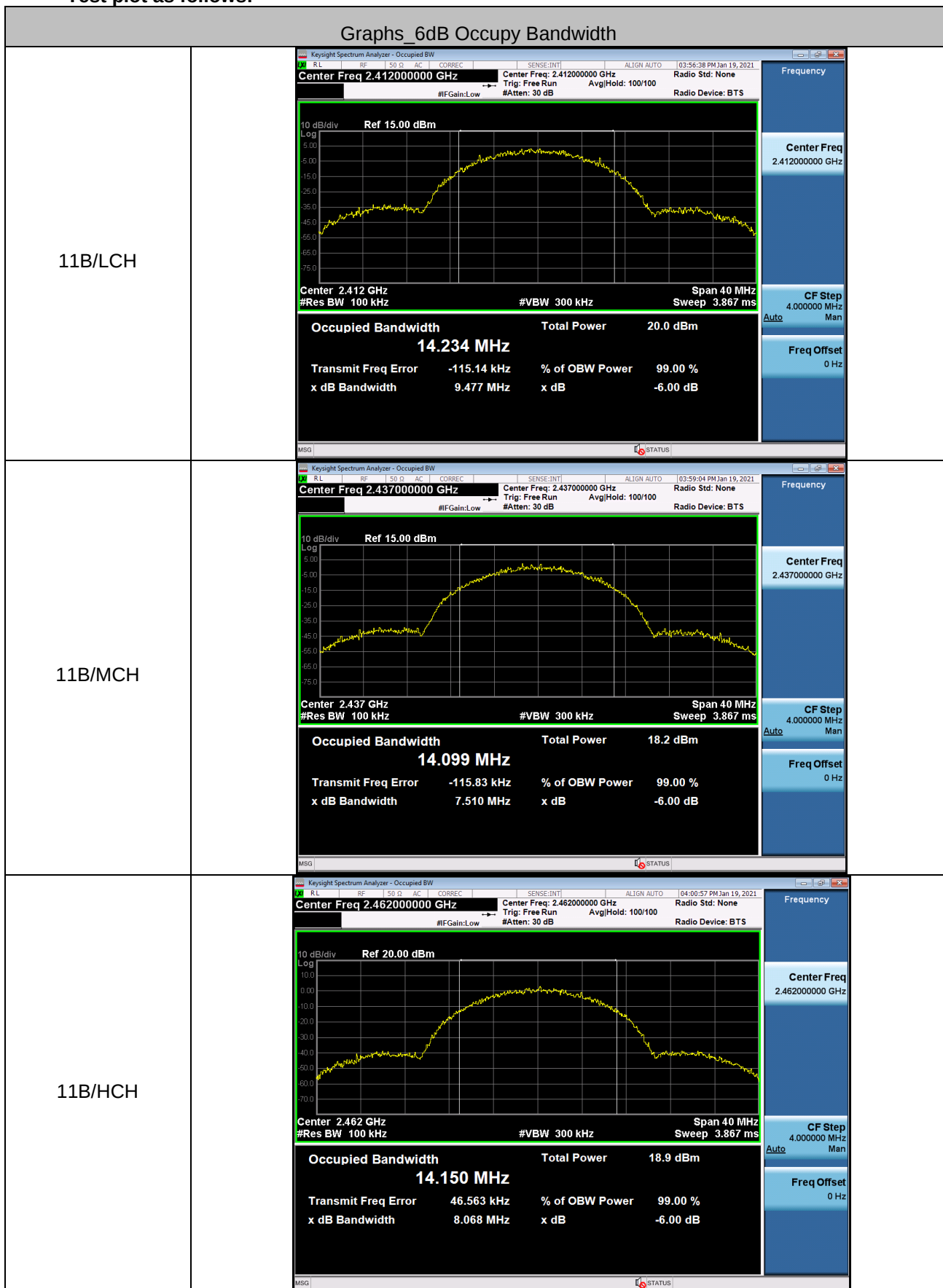
5.4 6dB Occupy Bandwidth

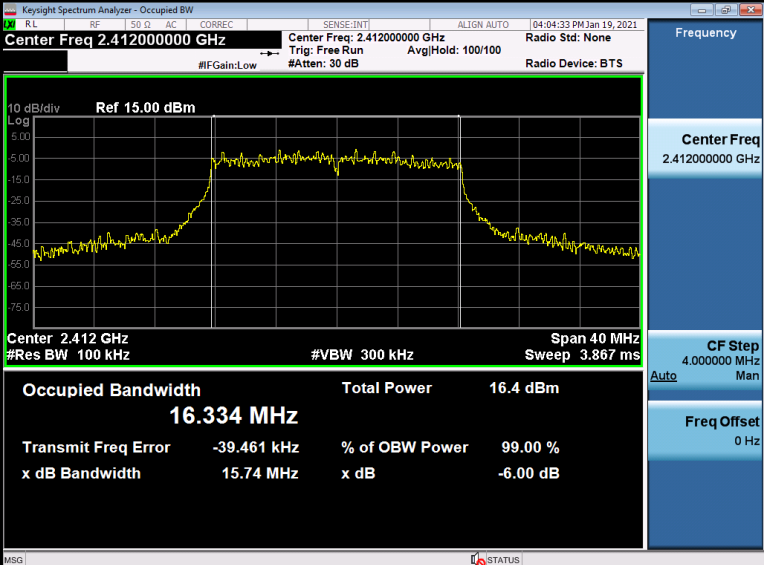
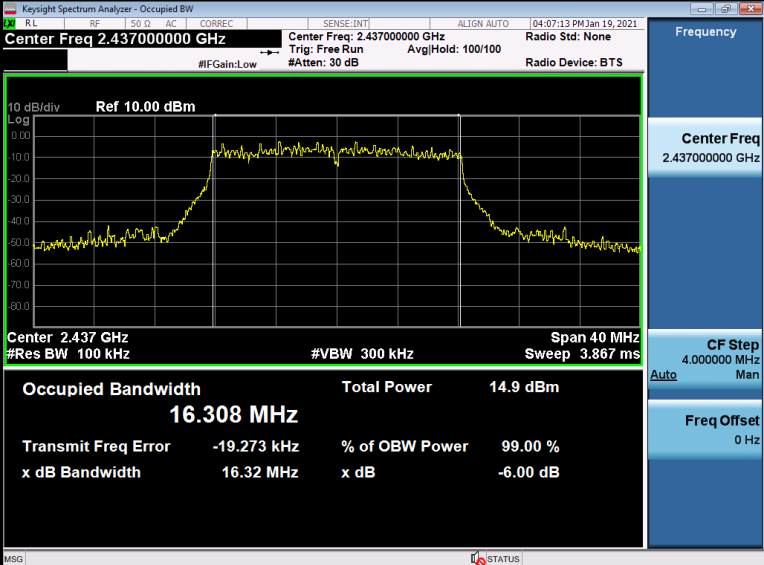
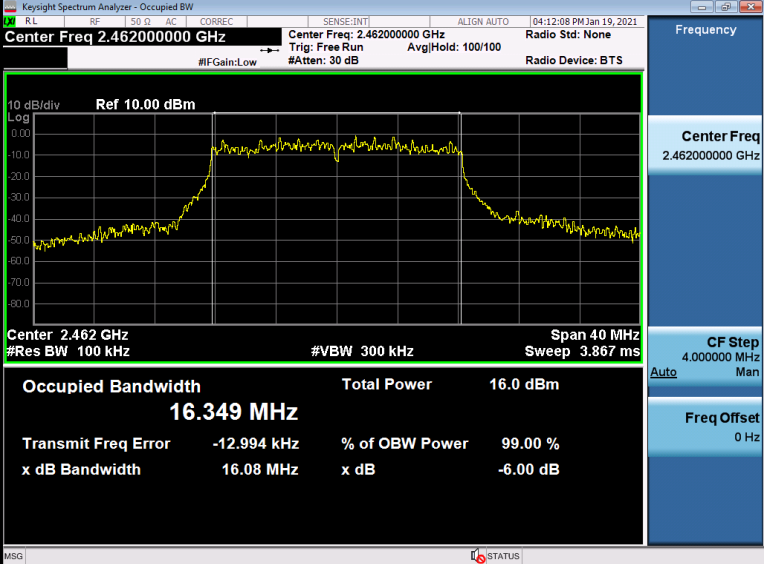
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); Only the worst case is recorded in the report.
Limit:	≥ 500 kHz
Test Results:	Pass

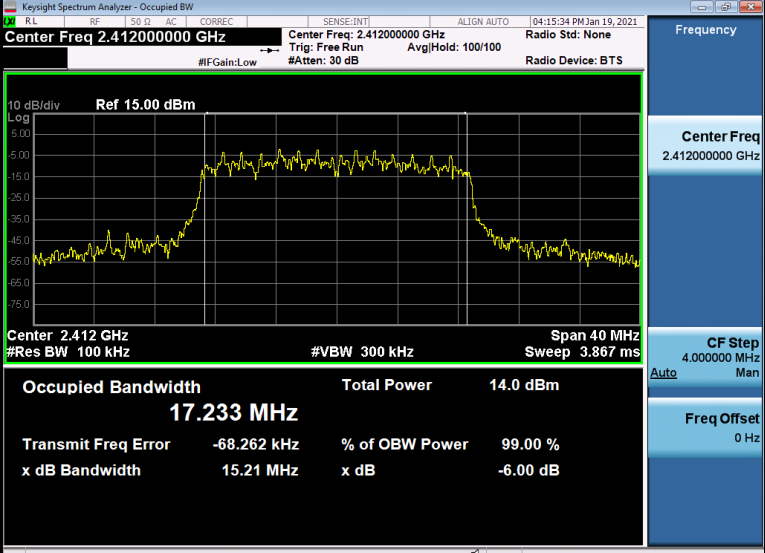
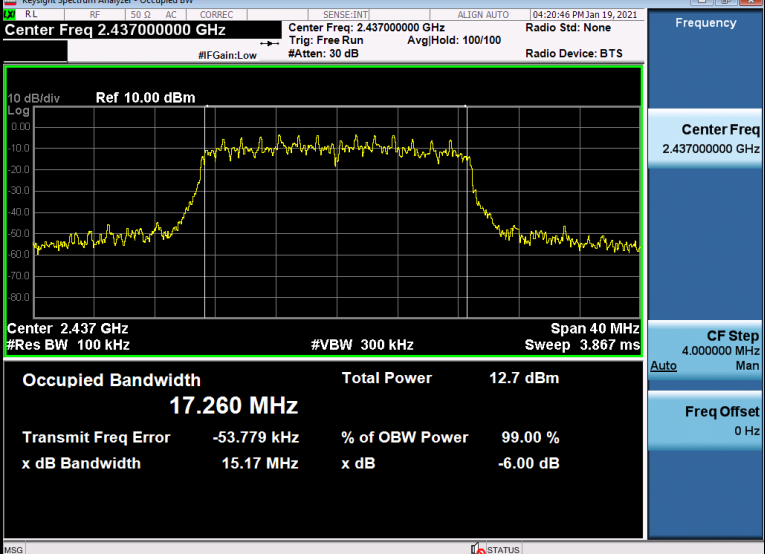
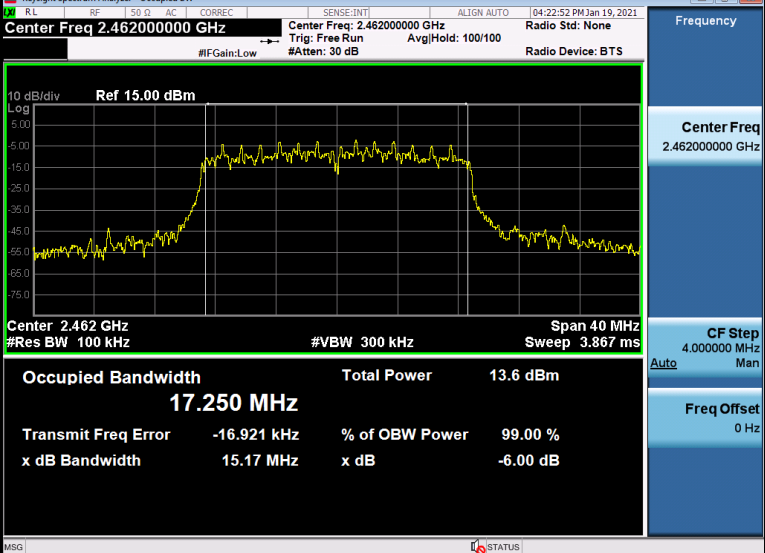
Measurement Data

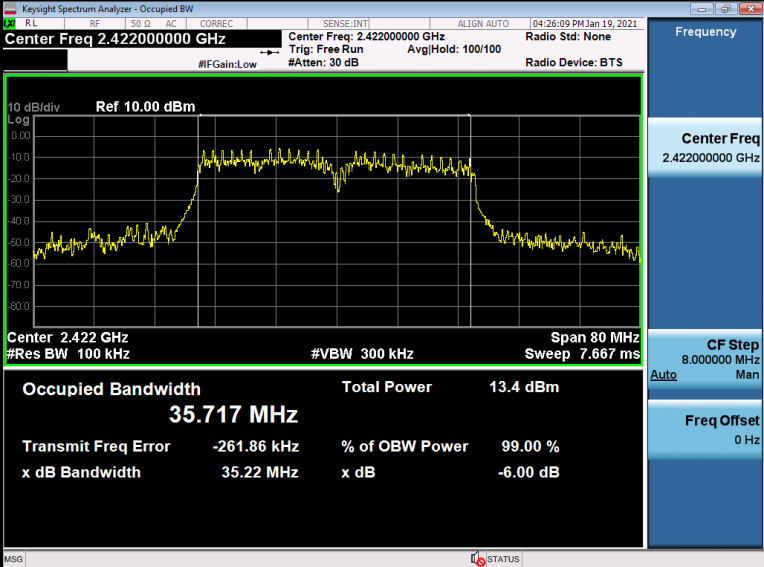
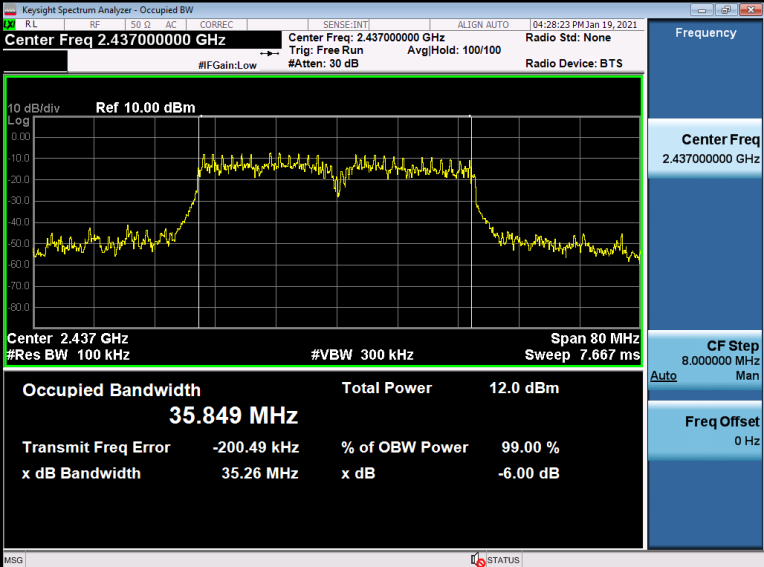
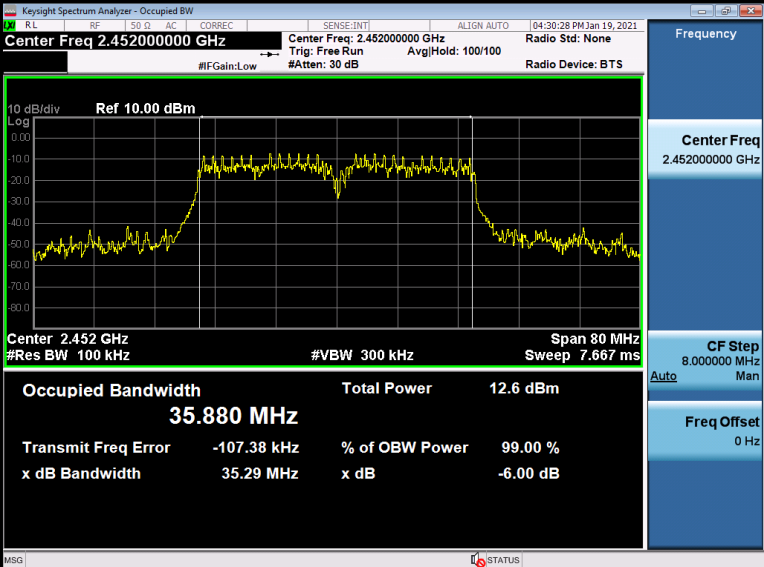
Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11b	Lowest	9.477	≥500	Pass
	Middle	7.51		
	Highest	8.068		
802.11g	Lowest	15.74	≥500	Pass
	Middle	16.32		
	Highest	16.08		
802.11n(HT20)	Lowest	15.21	≥500	Pass
	Middle	15.17		
	Highest	15.17		
802.11n(HT40)	Lowest	35.22	≥500	Pass
	Middle	35.26		
	Highest	35.29		

Test plot as follows:

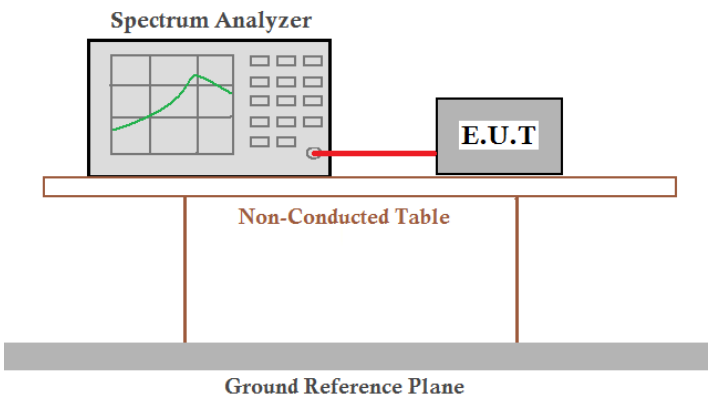


11G/LCH	 Keysight Spectrum Analyzer - Occupied BW Center Freq 2.41200000 GHz Center Freq: 2.41200000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS 10 dB/div Ref 15.00 dBm Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 16.334 MHz Total Power 16.4 dBm Transmit Freq Error -39.461 kHz % of OBW Power 99.00 % x dB Bandwidth 15.74 MHz x dB -6.00 dB Frequency Center Freq 2.41200000 GHz CF Step 4.000000 MHz Man Freq Offset 0 Hz Auto MSG STATUS
11G/MCH	 Keysight Spectrum Analyzer - Occupied BW Center Freq 2.43700000 GHz Center Freq: 2.43700000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS 10 dB/div Ref 10.00 dBm Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 16.308 MHz Total Power 14.9 dBm Transmit Freq Error -19.273 kHz % of OBW Power 99.00 % x dB Bandwidth 16.32 MHz x dB -6.00 dB Frequency Center Freq 2.43700000 GHz CF Step 4.000000 MHz Man Freq Offset 0 Hz Auto MSG STATUS
11G/HCH	 Keysight Spectrum Analyzer - Occupied BW Center Freq 2.46200000 GHz Center Freq: 2.46200000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS 10 dB/div Ref 10.00 dBm Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 16.349 MHz Total Power 16.0 dBm Transmit Freq Error -12.994 kHz % of OBW Power 99.00 % x dB Bandwidth 16.08 MHz x dB -6.00 dB Frequency Center Freq 2.46200000 GHz CF Step 4.000000 MHz Man Freq Offset 0 Hz Auto MSG STATUS

11N20/LCH	 KeySight Spectrum Analyzer - Occupied BW Center Freq 2.41200000 GHz Center Freq: 2.41200000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS 10 dB/div Ref 15.00 dBm Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 17.233 MHz Total Power 14.0 dBm Transmit Freq Error -68.262 kHz % of OBW Power 99.00 % x dB Bandwidth 15.21 MHz x dB -6.00 dB MSG STATUS
11N20/MCH	 KeySight Spectrum Analyzer - Occupied BW Center Freq 2.43700000 GHz Center Freq: 2.43700000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS 10 dB/div Ref 10.00 dBm Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 17.260 MHz Total Power 12.7 dBm Transmit Freq Error -53.779 kHz % of OBW Power 99.00 % x dB Bandwidth 15.17 MHz x dB -6.00 dB MSG STATUS
11N20/HCH	 KeySight Spectrum Analyzer - Occupied BW Center Freq 2.46200000 GHz Center Freq: 2.46200000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS 10 dB/div Ref 15.00 dBm Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 17.250 MHz Total Power 13.6 dBm Transmit Freq Error -16.921 kHz % of OBW Power 99.00 % x dB Bandwidth 15.17 MHz x dB -6.00 dB MSG STATUS

11N40/LCH	 Keysight Spectrum Analyzer - Occupied BW Center Freq: 2.42200000 GHz Occupied Bandwidth: 35.717 MHz Total Power: 13.4 dBm Transmit Freq Error: -261.86 kHz x dB Bandwidth: 35.22 MHz Freq Offset: 0 Hz
11N40/MCH	 Keysight Spectrum Analyzer - Occupied BW Center Freq: 2.43700000 GHz Occupied Bandwidth: 35.849 MHz Total Power: 12.0 dBm Transmit Freq Error: -200.49 kHz x dB Bandwidth: 35.26 MHz Freq Offset: 0 Hz
11N40/HCH	 Keysight Spectrum Analyzer - Occupied BW Center Freq: 2.45200000 GHz Occupied Bandwidth: 35.880 MHz Total Power: 12.6 dBm Transmit Freq Error: -107.38 kHz x dB Bandwidth: 35.29 MHz Freq Offset: 0 Hz

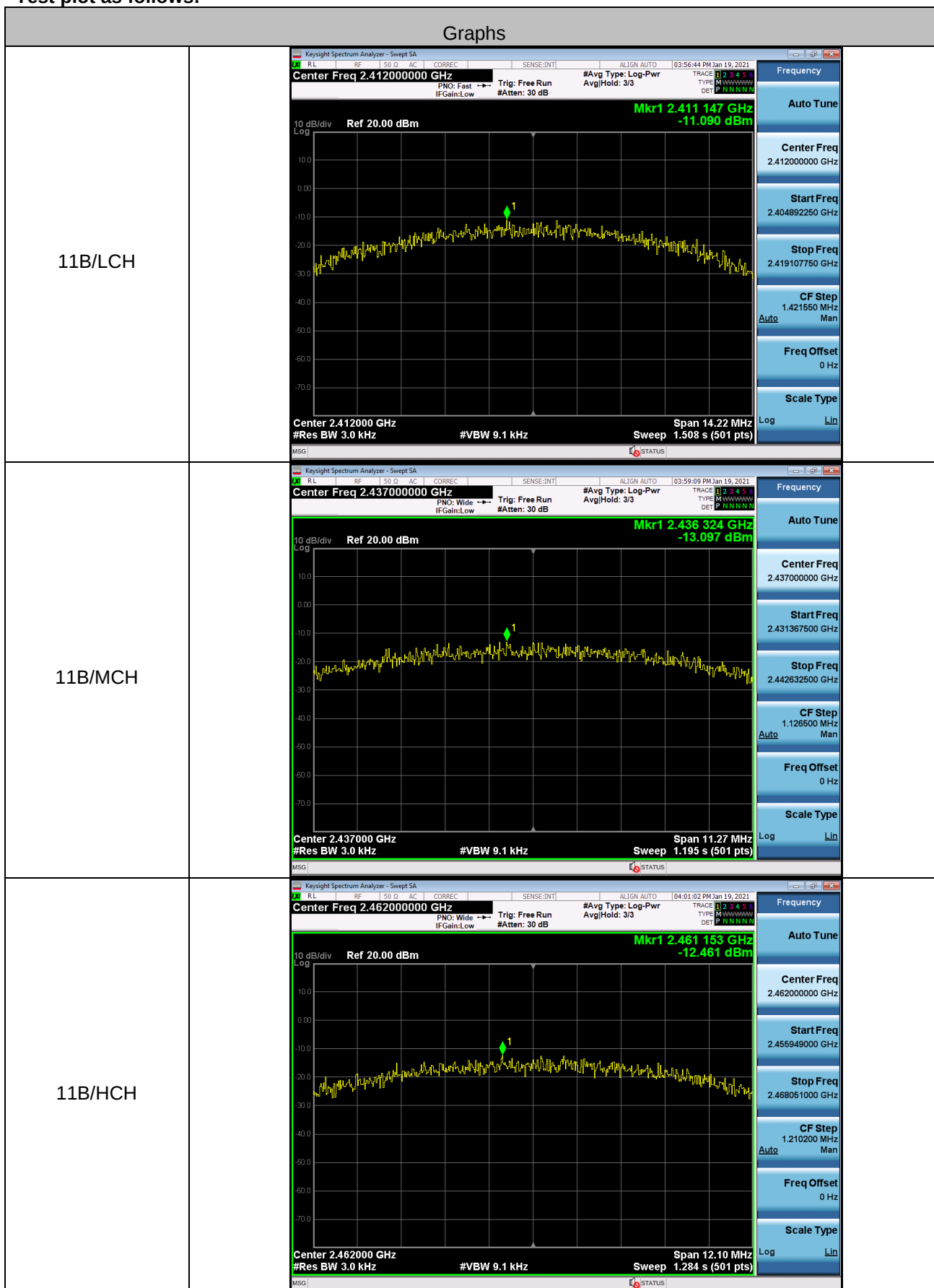
5.5 Power Spectral Density

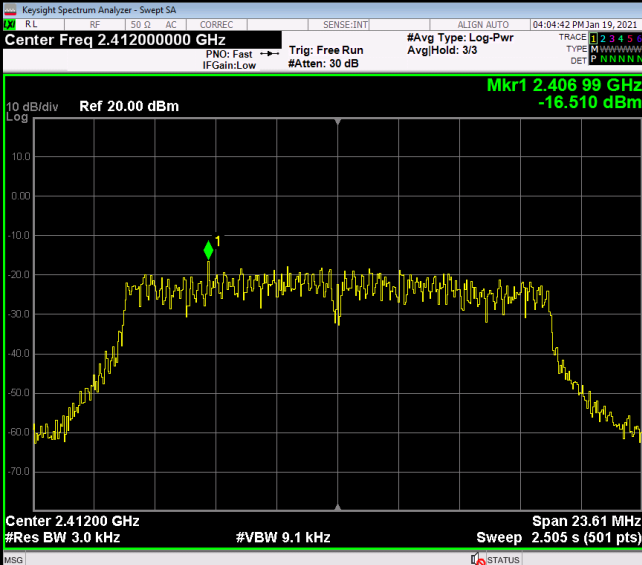
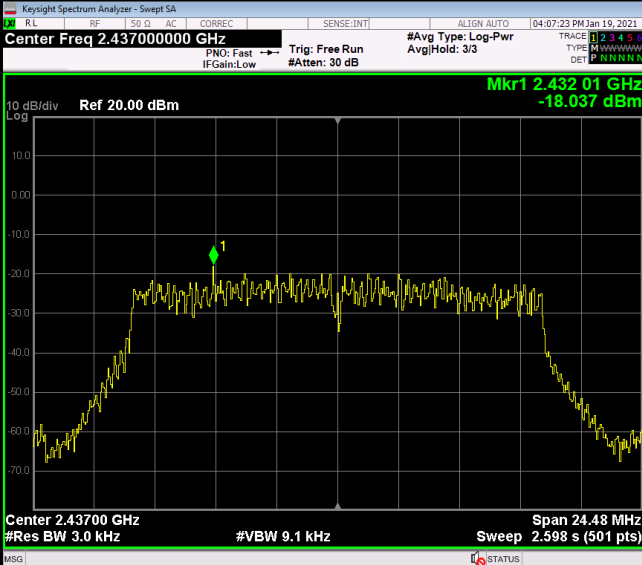
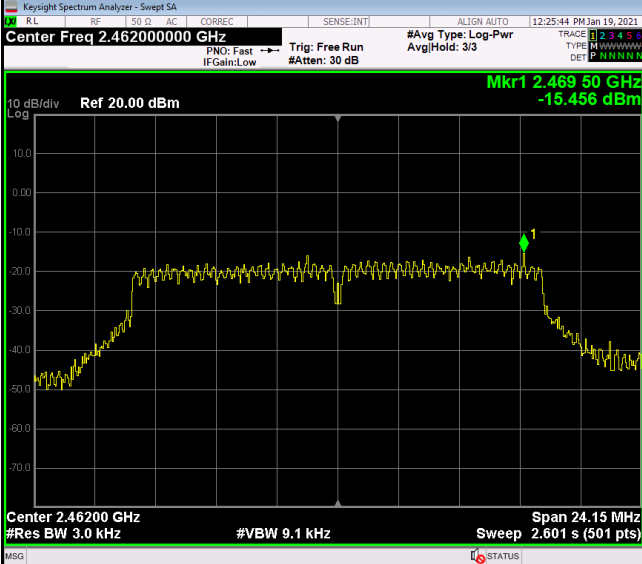
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); Only the worst case is recorded in the report.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

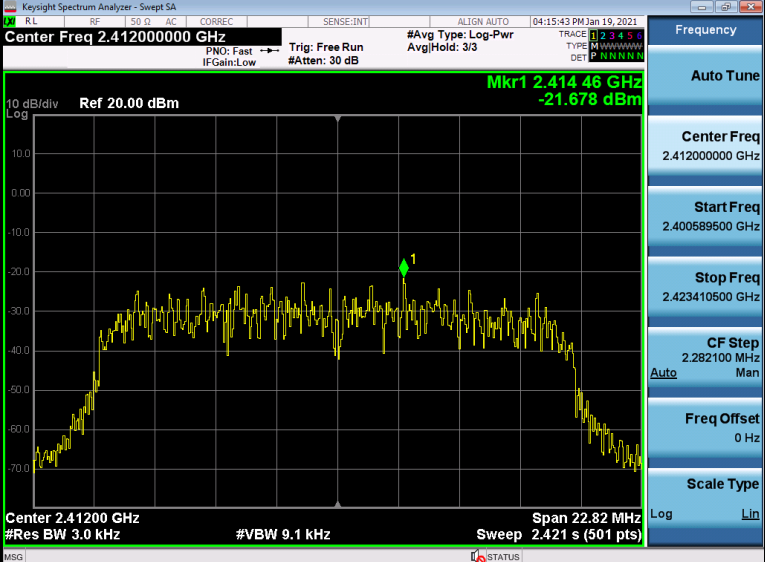
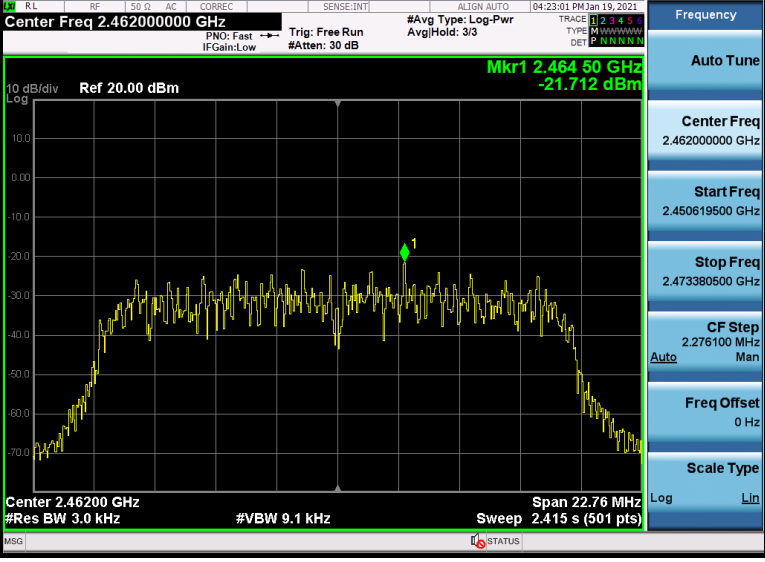
Measurement Data

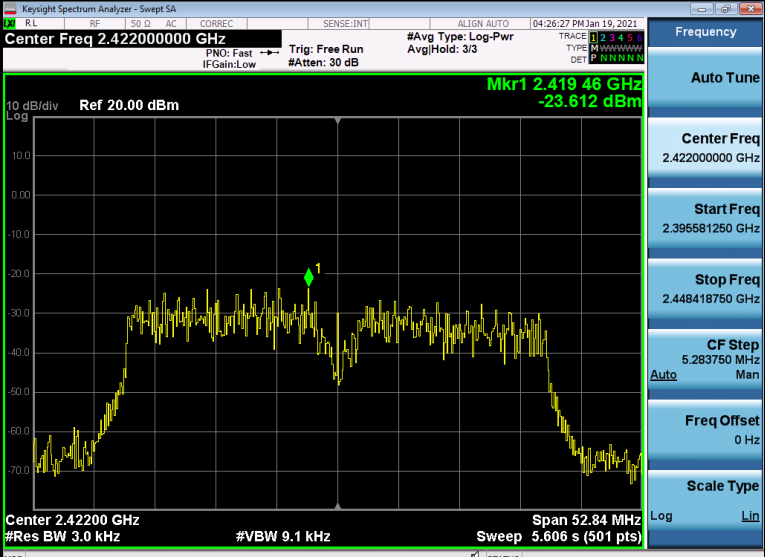
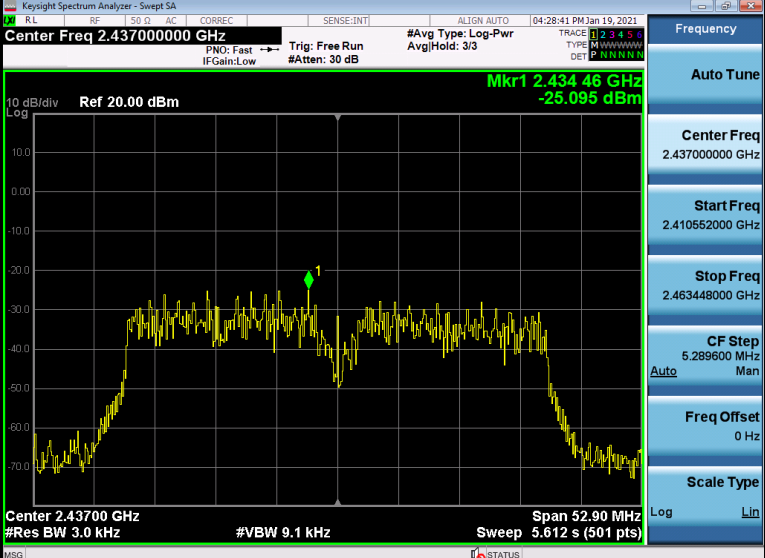
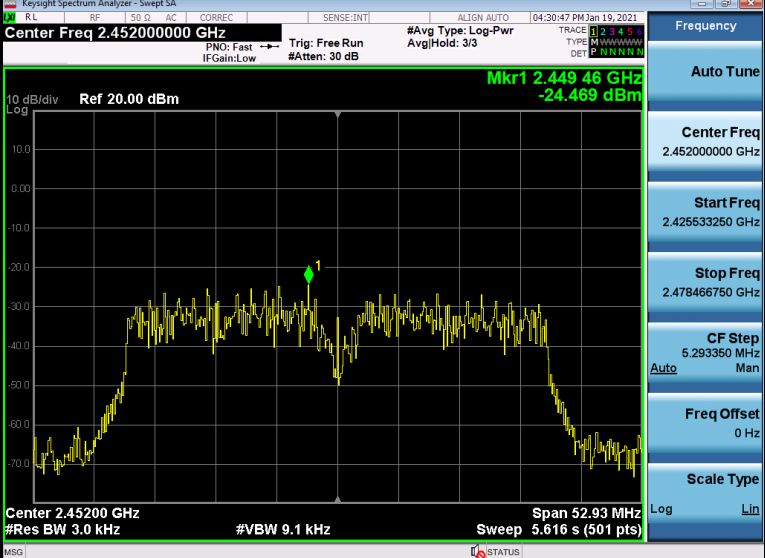
Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11 b	Lowes	-11.09	8	Pass
	Middle	-13.097		
	Highest	-12.461		
802.11g	Lowest	-16.51	8	Pass
	Middle	-18.037		
	Highest	-15.456		
802.11n(HT20)	Lowest	-21.678	8	Pass
	Middle	-23.117		
	Highest	-21.712		
802.11n(HT40)	Lowest	-23.612	8	Pass
	Middle	-25.095		
	Highest	-24.469		

Test plot as follows:

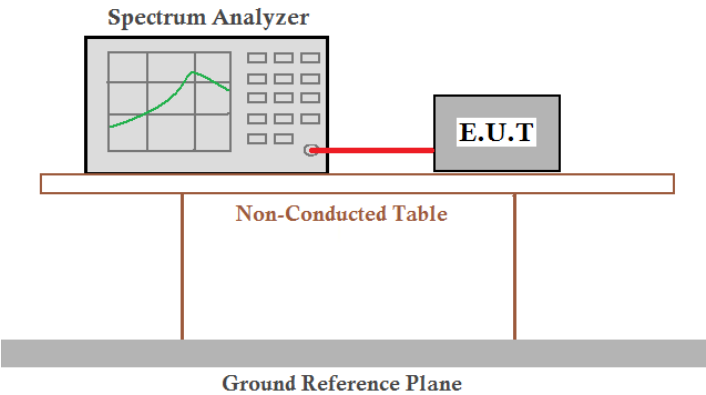


11G/LCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.41200000 GHz RF 150 Ω AC CORREC SENSE:INT ALIGN AUTO 04:04:42 PM Jan 19, 2021 TRAC 1 2 3 4 5 6 TYPE M W W W W W W W DEF P M M M M M M M PNO: Fast Trig: Free Run #Avg Type: Log-Pwr IF Gain: Low #Atten: 30 dB Avg Hold: 3/3 10 dB/div Ref 20.00 dBm Mkr1 2.406 99 GHz -16.510 dBm Center 2.41200 GHz Span 23.61 MHz #Res BW 3.0 kHz #VBW 9.1 kHz Sweep 2.505 s (501 pts) MSG STATUS Frequency Auto Tune Center Freq 2.41200000 GHz Start Freq 2.400193500 GHz Stop Freq 2.423806500 GHz CF Step 2.361300 MHz Man Freq Offset 0 Hz Scale Type Log Lin
11G/MCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.43700000 GHz RF 150 Ω AC CORREC SENSE:INT ALIGN AUTO 04:07:23 PM Jan 19, 2021 TRAC 1 2 3 4 5 6 TYPE M W W W W W W W DEF P M M M M M M M PNO: Fast Trig: Free Run #Avg Type: Log-Pwr IF Gain: Low #Atten: 30 dB Avg Hold: 3/3 10 dB/div Ref 20.00 dBm Mkr1 2.432 01 GHz -18.037 dBm Center 2.43700 GHz Span 24.48 MHz #Res BW 3.0 kHz #VBW 9.1 kHz Sweep 2.598 s (501 pts) MSG STATUS Frequency Auto Tune Center Freq 2.43700000 GHz Start Freq 2.424758500 GHz Stop Freq 2.449241500 GHz CF Step 2.448300 MHz Man Freq Offset 0 Hz Scale Type Log Lin
11G/HCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.46200000 GHz RF 150 Ω AC CORREC SENSE:INT ALIGN AUTO 12:25:44 PM Jan 19, 2021 TRAC 1 2 3 4 5 6 TYPE M W W W W W W W DEF P M M M M M M M PNO: Fast Trig: Free Run #Avg Type: Log-Pwr IF Gain: Low #Atten: 30 dB Avg Hold: 3/3 10 dB/div Ref 20.00 dBm Mkr1 2.469 50 GHz -15.456 dBm Center 2.46200 GHz Span 24.15 MHz #Res BW 3.0 kHz #VBW 9.1 kHz Sweep 2.601 s (501 pts) MSG STATUS Frequency Auto Tune Center Freq 2.46200000 GHz Start Freq 2.449744250 GHz Stop Freq 2.474255750 GHz CF Step 2.451150 MHz Man Freq Offset 0 Hz Scale Type Log Lin

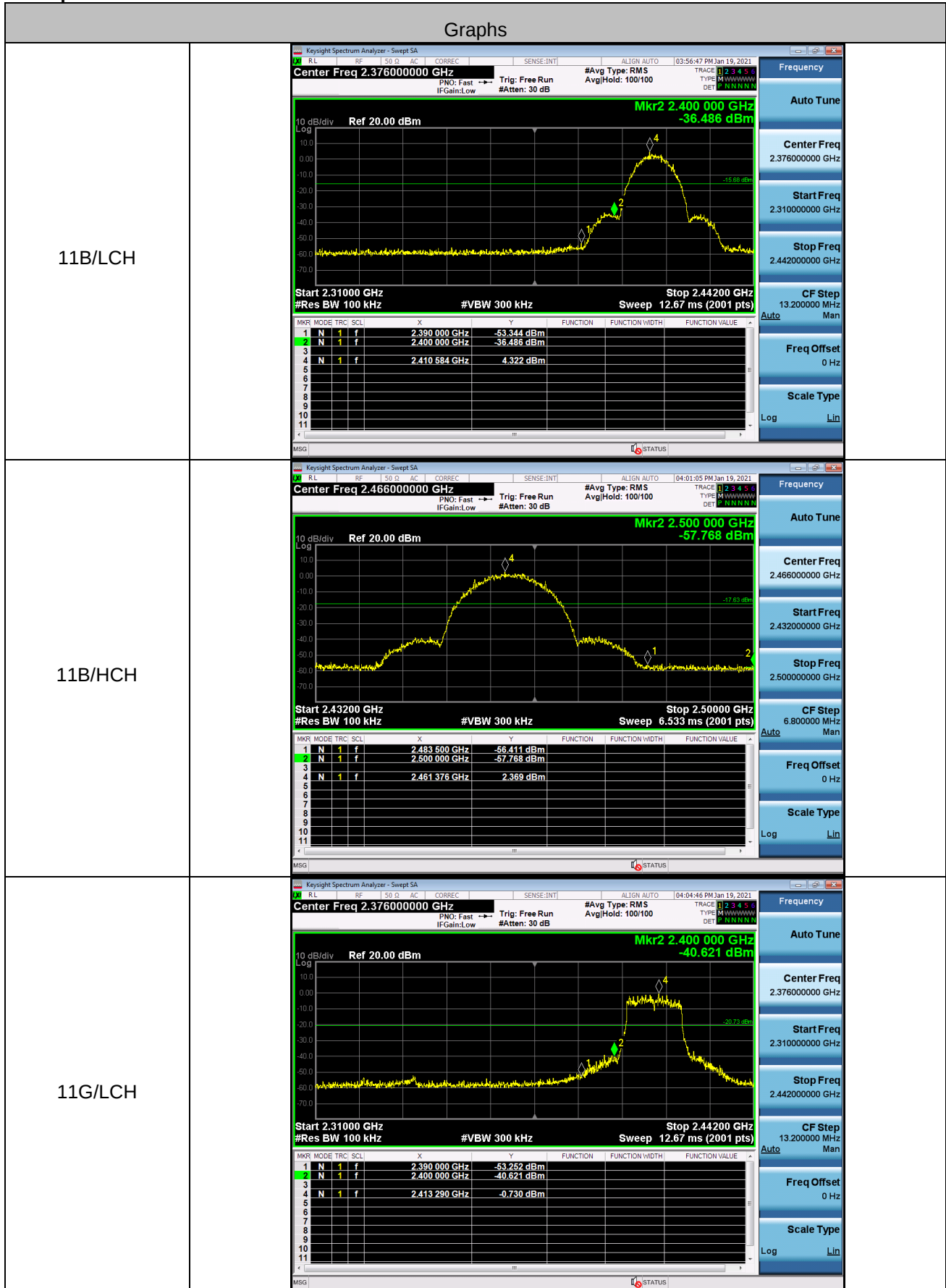
11N20/LCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.41200000 GHz Mkr1 2.41446 GHz -21.678 dBm 10 dB/div Ref 20.00 dBm Center 2.41200 GHz #Res BW 3.0 kHz #VBW 9.1 kHz Span 22.82 MHz Sweep 2.421 s (501 pts) Frequency Auto Tune Center Freq 2.41200000 GHz Start Freq 2.400589500 GHz Stop Freq 2.423410500 GHz CF Step 2.282100 MHz Man Freq Offset 0 Hz Scale Type Log Lin
11N20/MCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.43700000 GHz Mkr1 2.43950 GHz -23.117 dBm 10 dB/div Ref 20.00 dBm Center 2.43700 GHz #Res BW 3.0 kHz #VBW 9.1 kHz Span 22.76 MHz Sweep 2.414 s (501 pts) Frequency Auto Tune Center Freq 2.43700000 GHz Start Freq 2.425622500 GHz Stop Freq 2.448377500 GHz CF Step 2.275500 MHz Man Freq Offset 0 Hz Scale Type Log Lin
11N20/HCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.46200000 GHz Mkr1 2.46450 GHz -21.712 dBm 10 dB/div Ref 20.00 dBm Center 2.46200 GHz #Res BW 3.0 kHz #VBW 9.1 kHz Span 22.76 MHz Sweep 2.415 s (501 pts) Frequency Auto Tune Center Freq 2.46200000 GHz Start Freq 2.450619500 GHz Stop Freq 2.473380500 GHz CF Step 2.276100 MHz Man Freq Offset 0 Hz Scale Type Log Lin

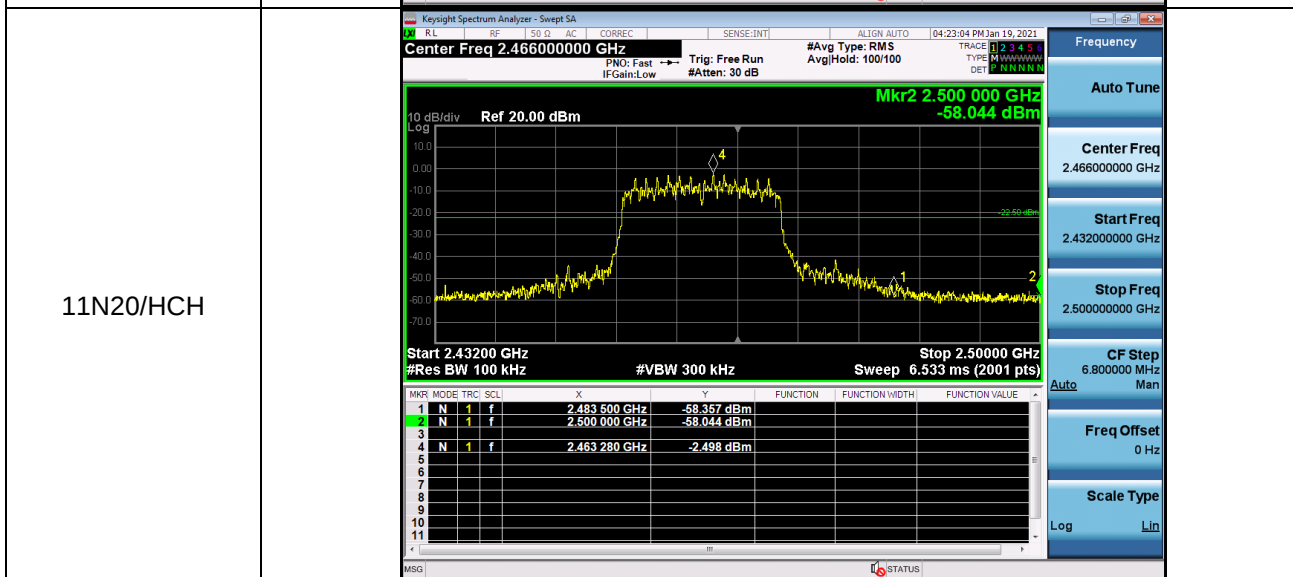
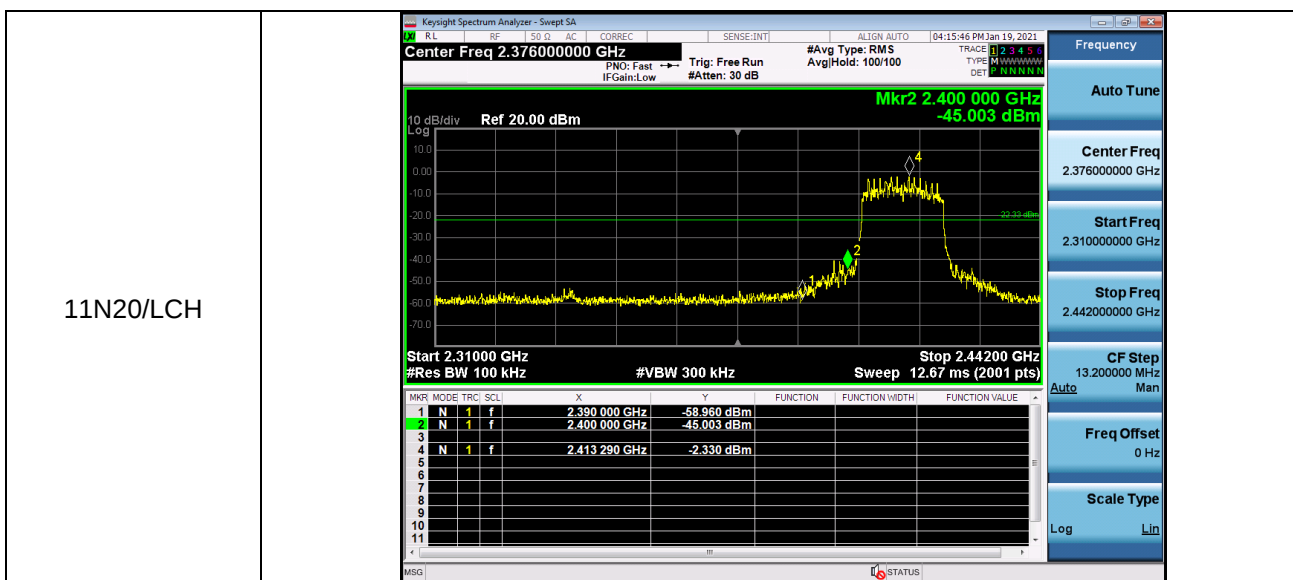
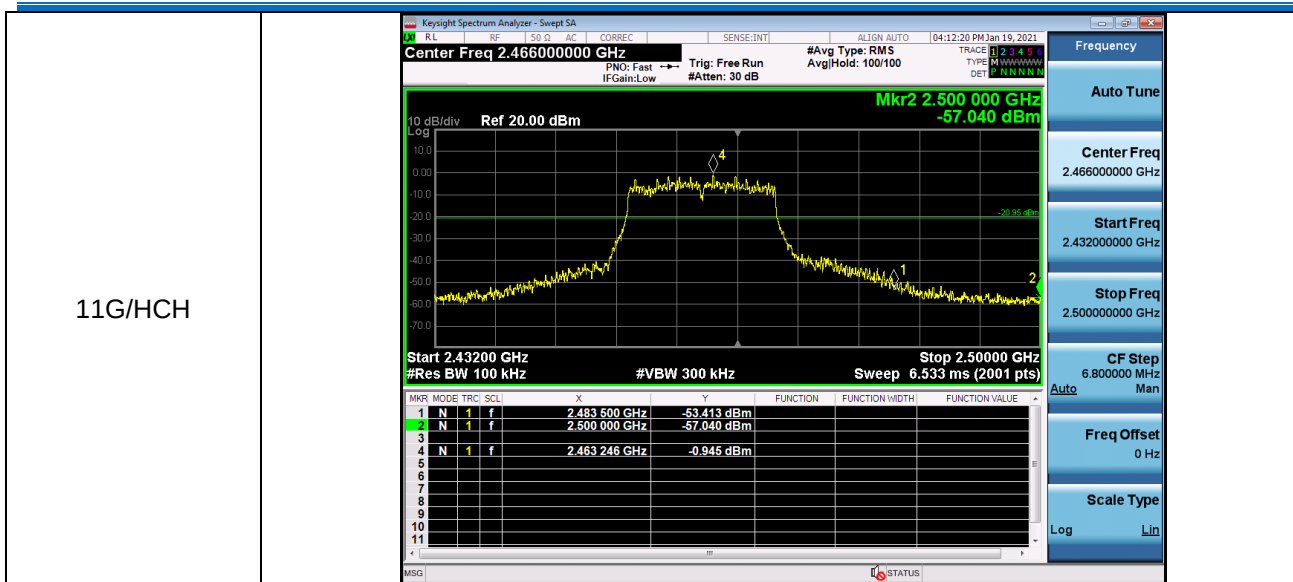
11N40/LCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.42200000 GHz Mkr1 2.41946 GHz -23.612 dBm Center 2.42200 GHz #Res BW 3.0 kHz #VBW 9.1 kHz Span 52.84 MHz Sweep 5.606 s (501 pts)	
11N40/MCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.43700000 GHz Mkr1 2.43446 GHz -25.095 dBm Center 2.43700 GHz #Res BW 3.0 kHz #VBW 9.1 kHz Span 52.90 MHz Sweep 5.612 s (501 pts)	
11N40/HCH	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.45200000 GHz Mkr1 2.44946 GHz -24.469 dBm Center 2.45200 GHz #Res BW 3.0 kHz #VBW 9.1 kHz Span 52.93 MHz Sweep 5.616 s (501 pts)	

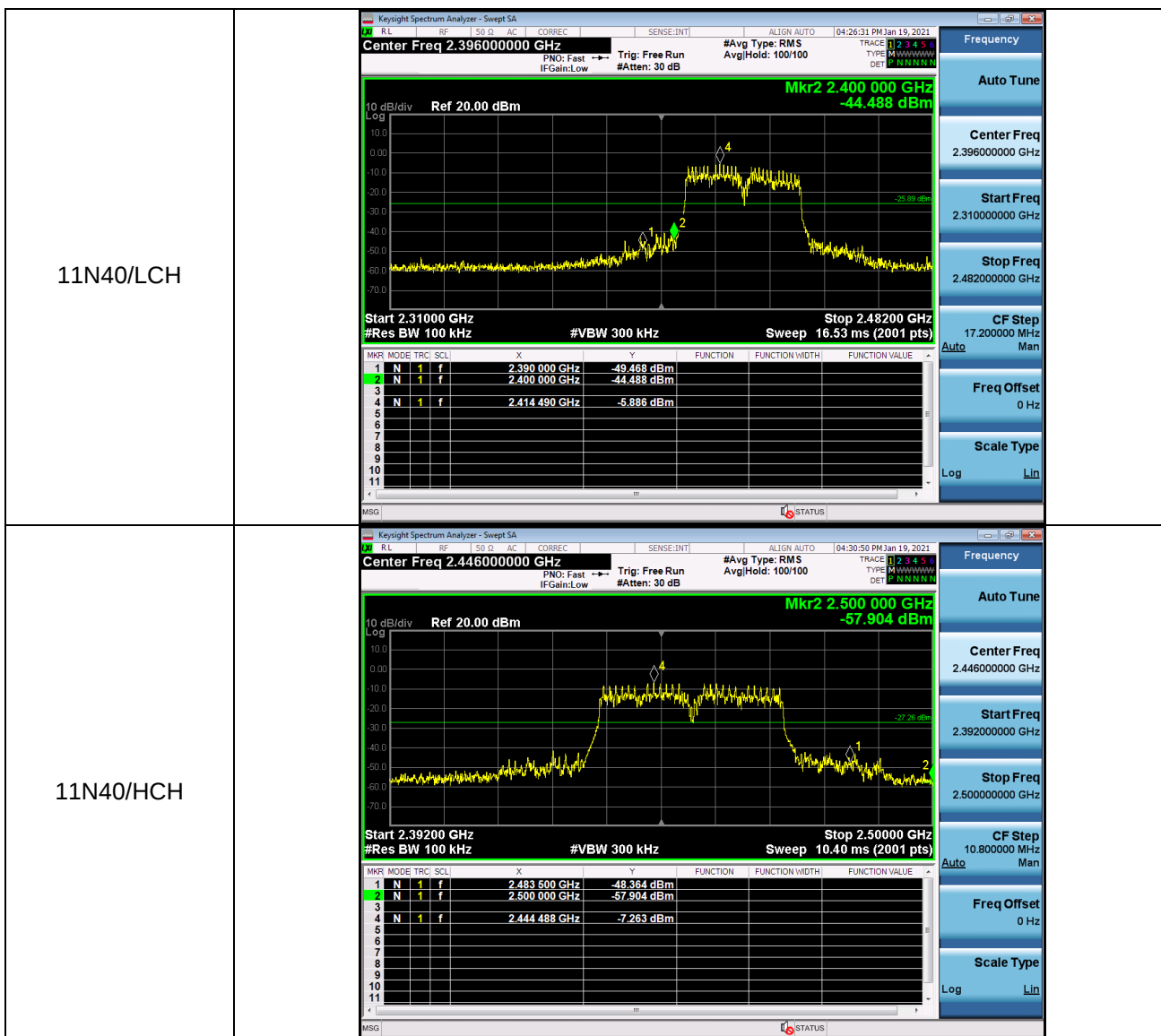
5.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40); Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass

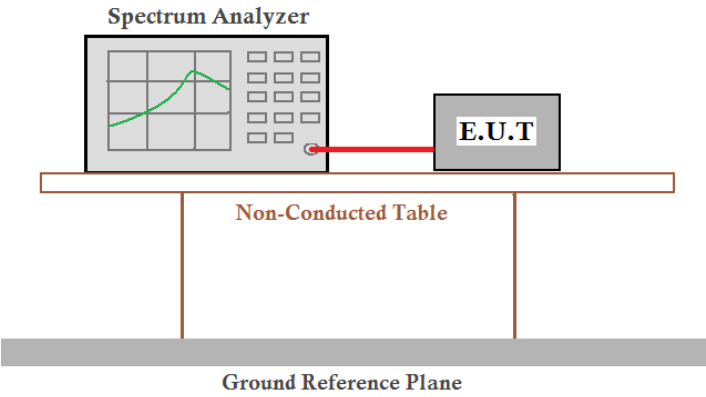
Test plot as follows:



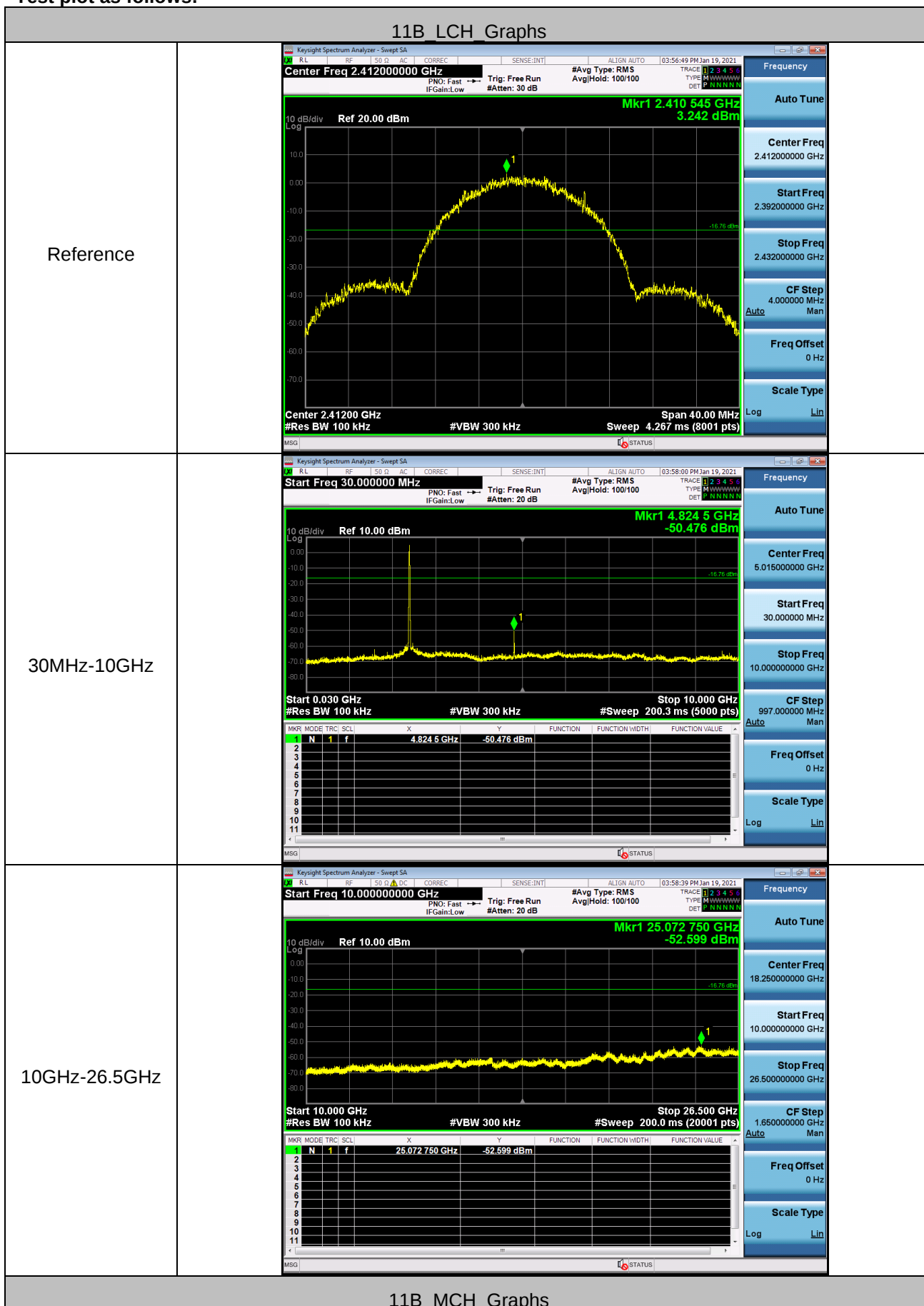




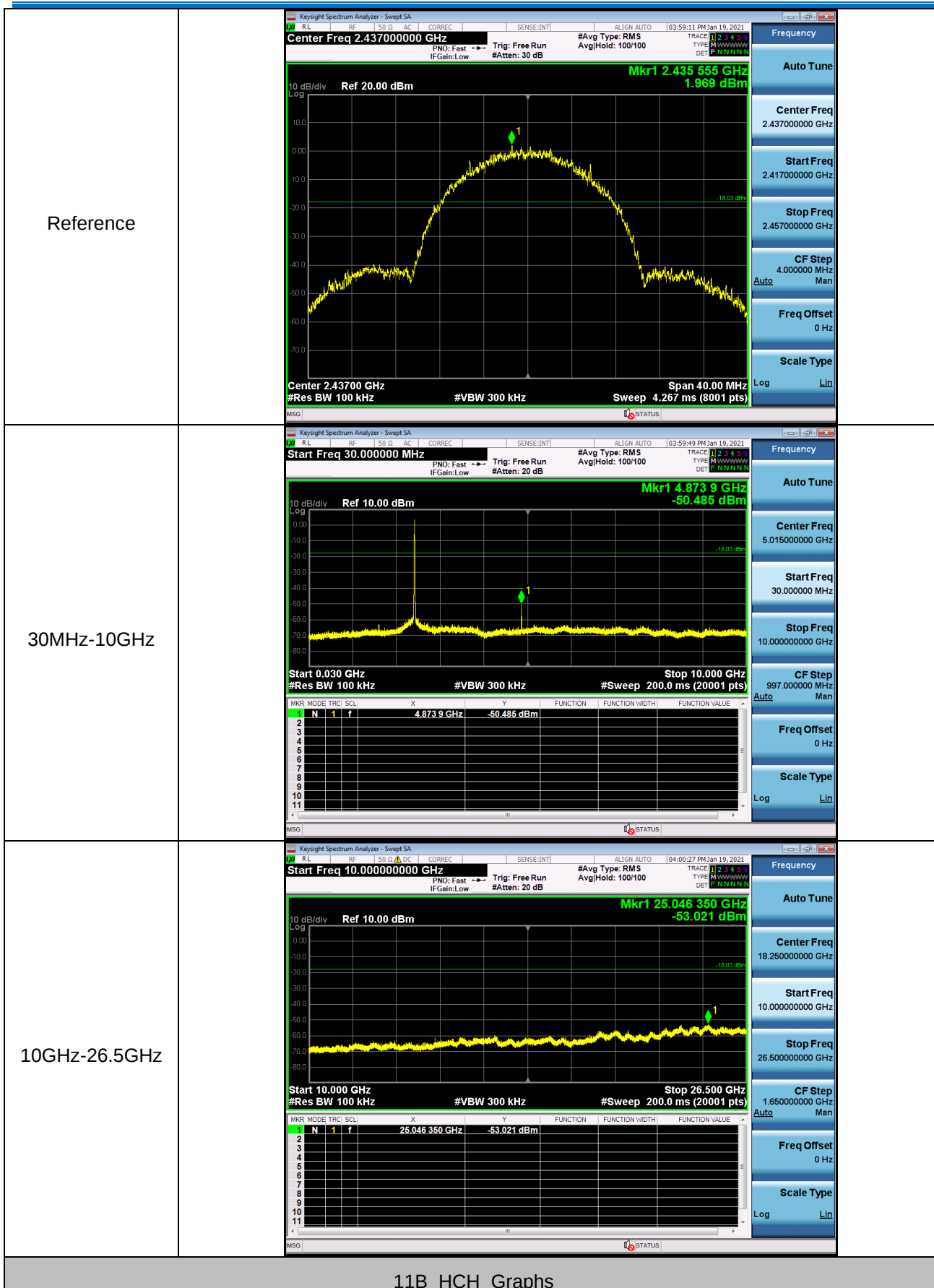
5.7 RF Conducted Spurious Emissions

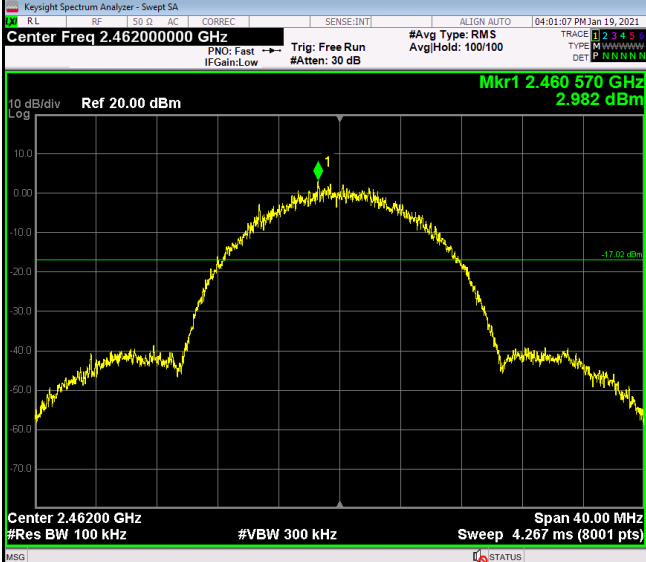
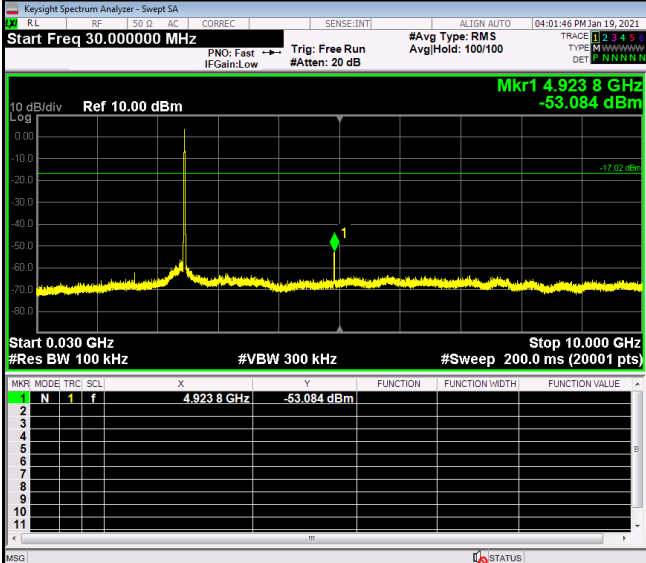
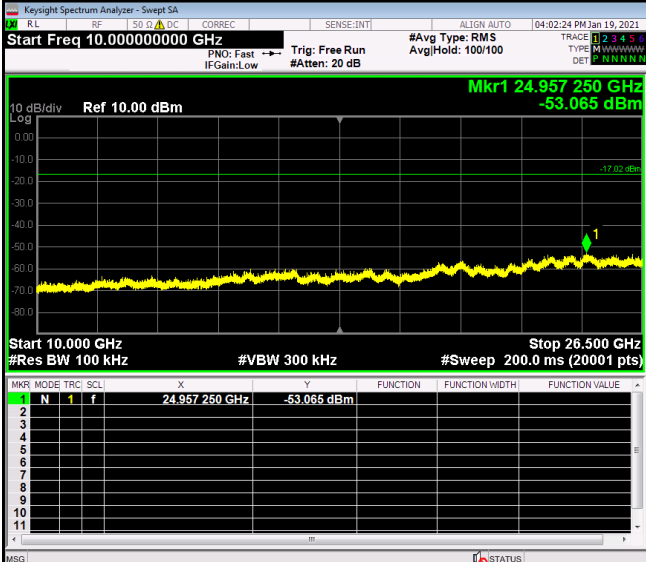
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass

Test plot as follows:

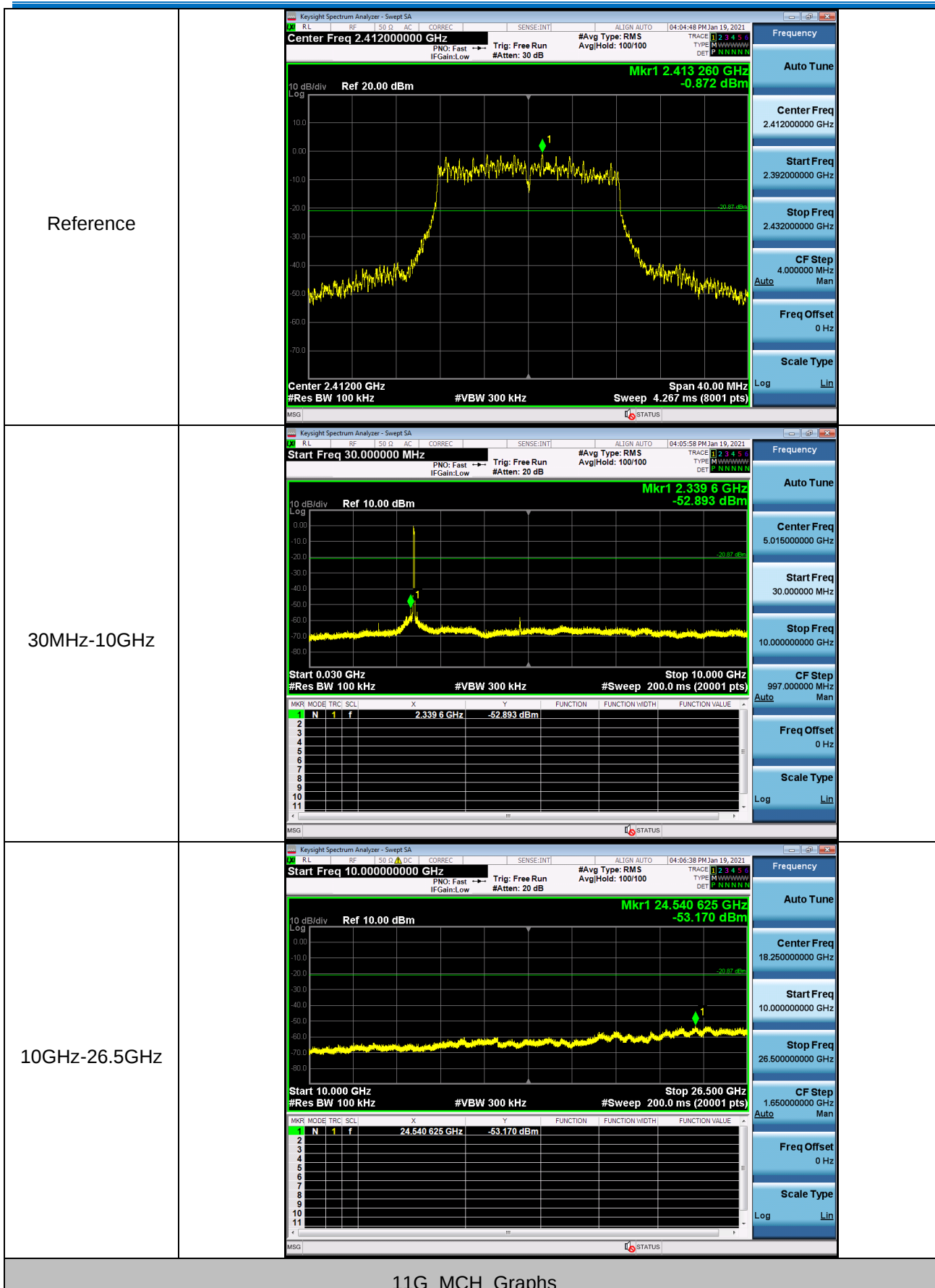


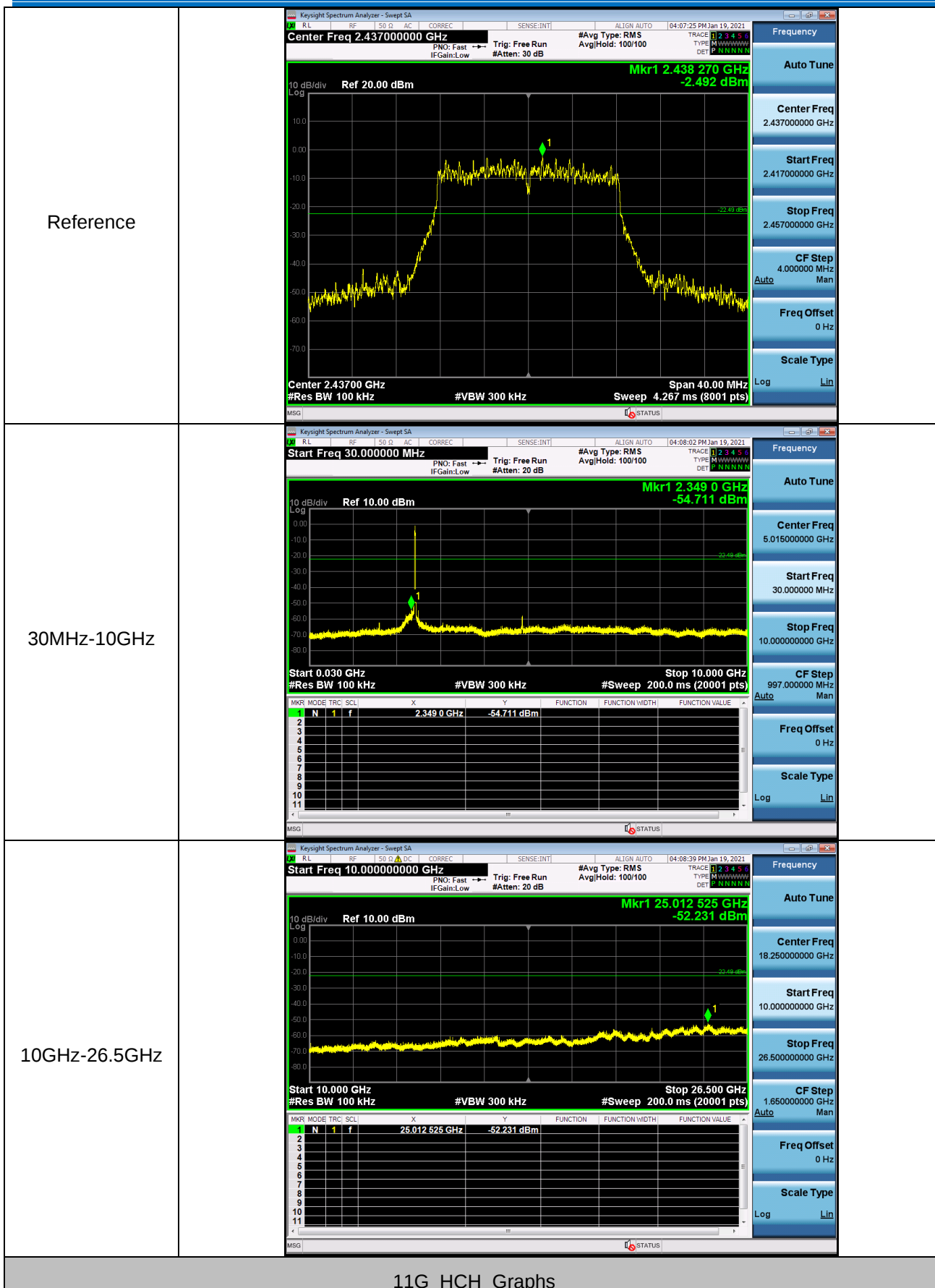
11B MCH Graphs

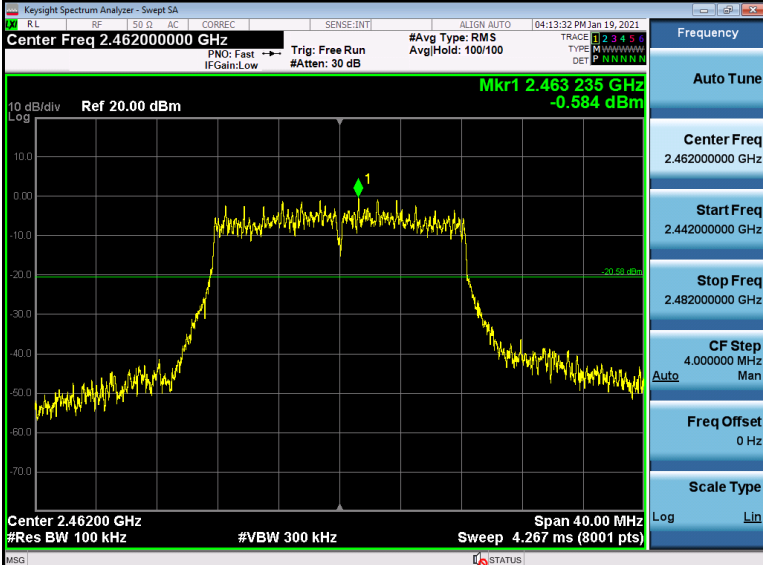
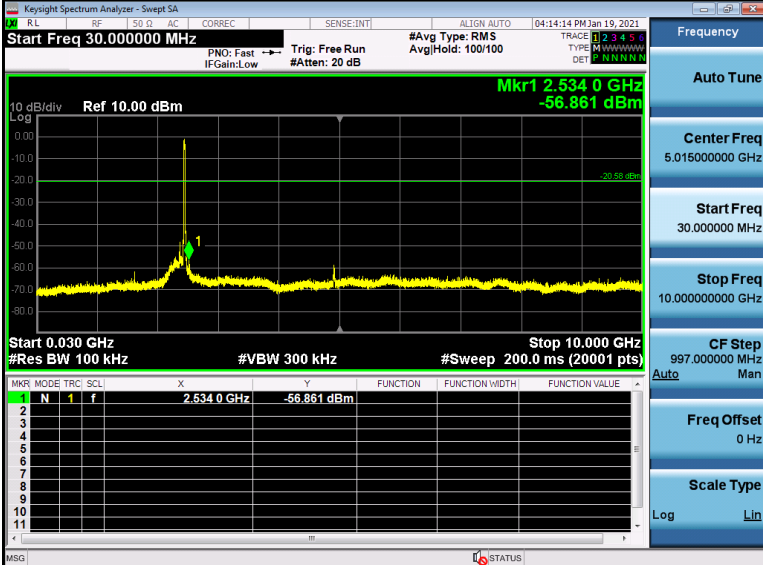
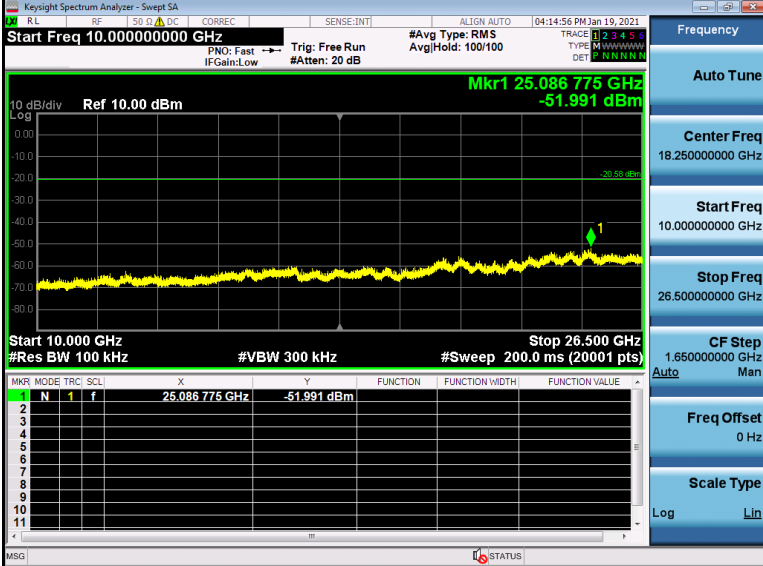


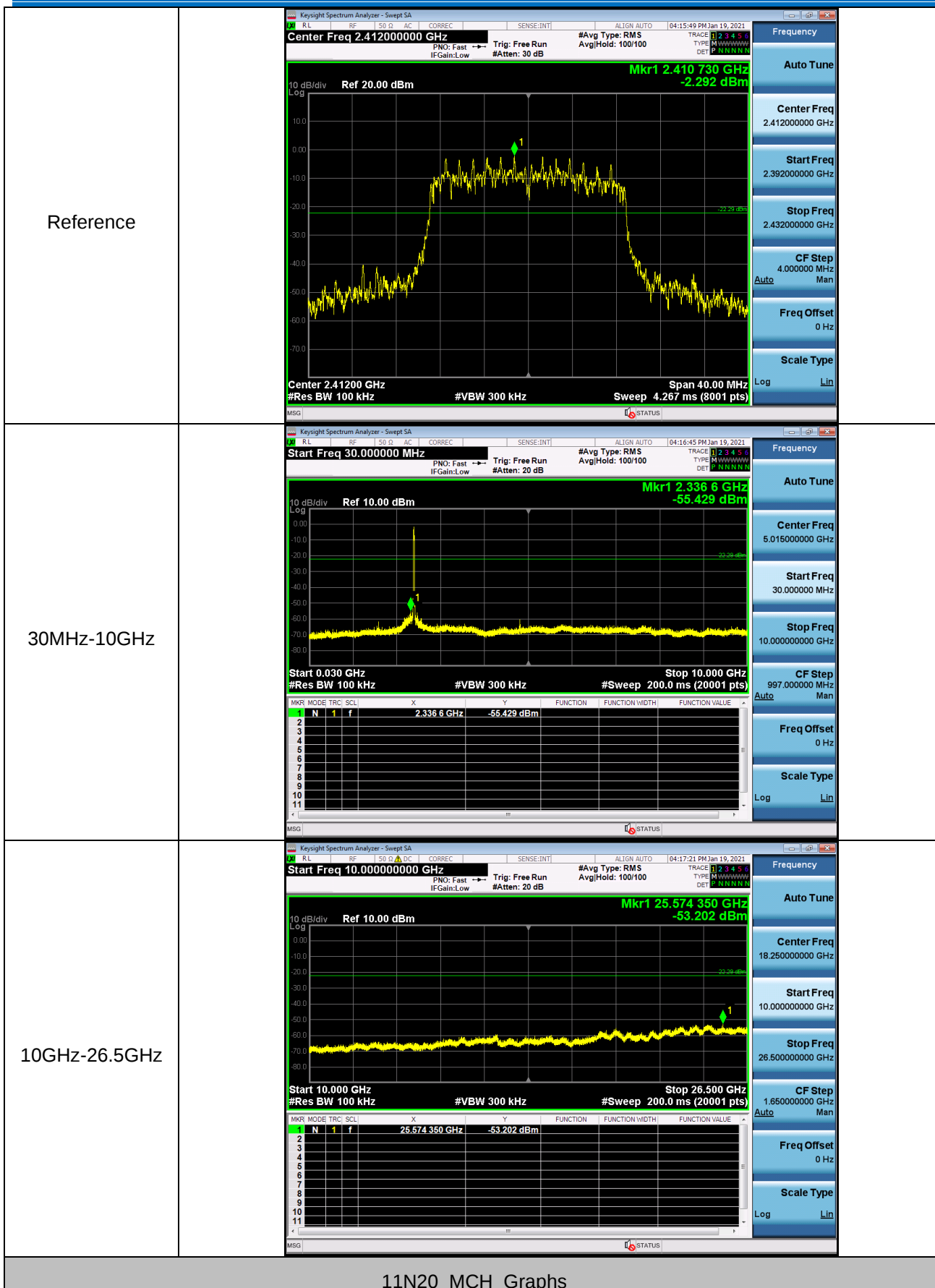
Reference	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.46200000 GHz Mkr1 2.460570 GHz -2.982 dBm Ref 20.00 dBm 10 dB/div Center 2.46200 GHz #Res BW 100 kHz #VBW 300 kHz Span 40.00 MHz Sweep 4.267 ms (8001 pts) Frequency Auto Tune Center Freq 2.46200000 GHz Start Freq 2.442000000 GHz Stop Freq 2.482000000 GHz CF Step 4.000000 MHz Freq Offset 0 Hz Scale Type Log	
30MHz-10GHz	 Keysight Spectrum Analyzer - Swept SA Start Freq 30.000000 MHz Mkr1 4.9238 GHz -53.084 dBm Ref 10.00 dBm 10 dB/div Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz Stop 10.000 GHz #Sweep 200.0 ms (20001 pts) Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq 30.0000000 MHz Stop Freq 10.000000000 GHz CF Step 997.000000 MHz Freq Offset 0 Hz Scale Type Log	
10GHz-26.5GHz	 Keysight Spectrum Analyzer - Swept SA Start Freq 10.000000000 GHz Mkr1 24.957250 GHz -53.065 dBm Ref 10.00 dBm 10 dB/div Start 10.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 26.500 GHz #Sweep 200.0 ms (20001 pts) Frequency Auto Tune Center Freq 18.250000000 GHz Start Freq 10.000000000 GHz Stop Freq 26.500000000 GHz CF Step 1.650000000 GHz Freq Offset 0 Hz Scale Type Log	

11G_LCH Graphs

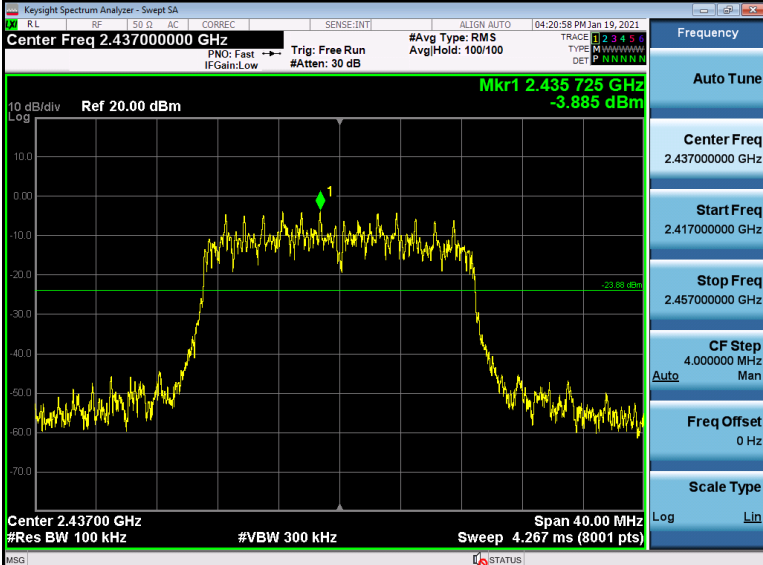
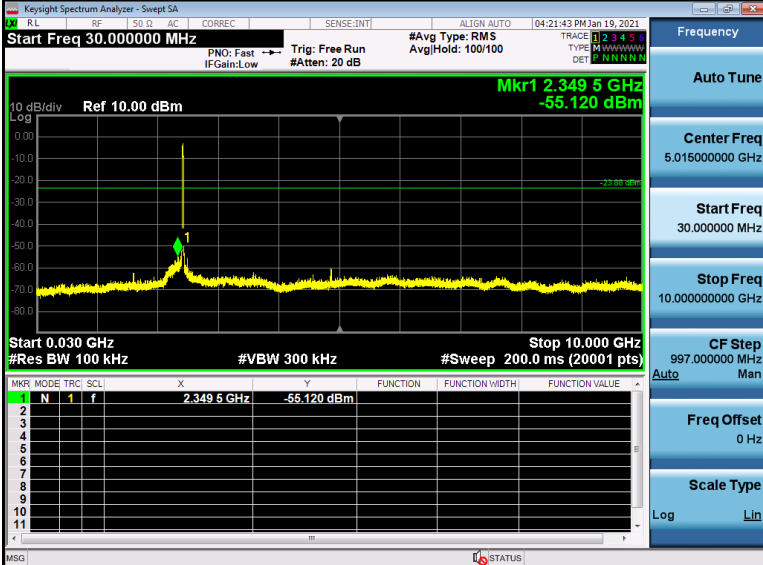
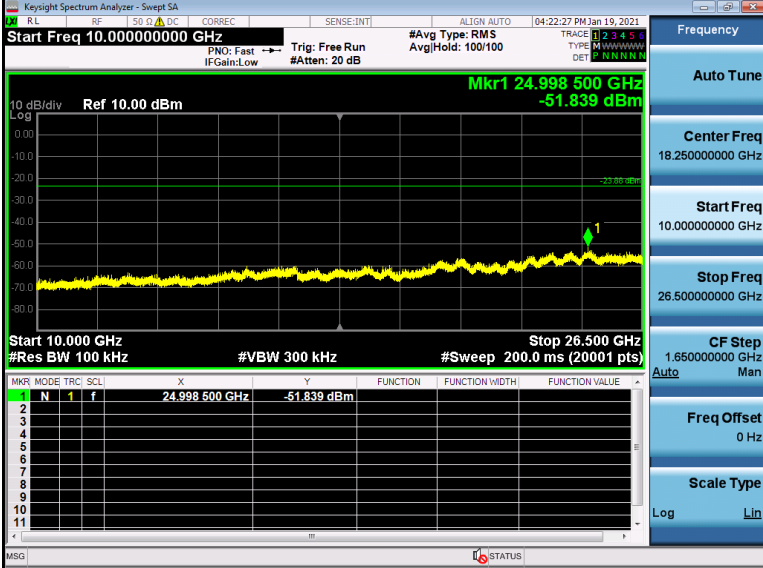




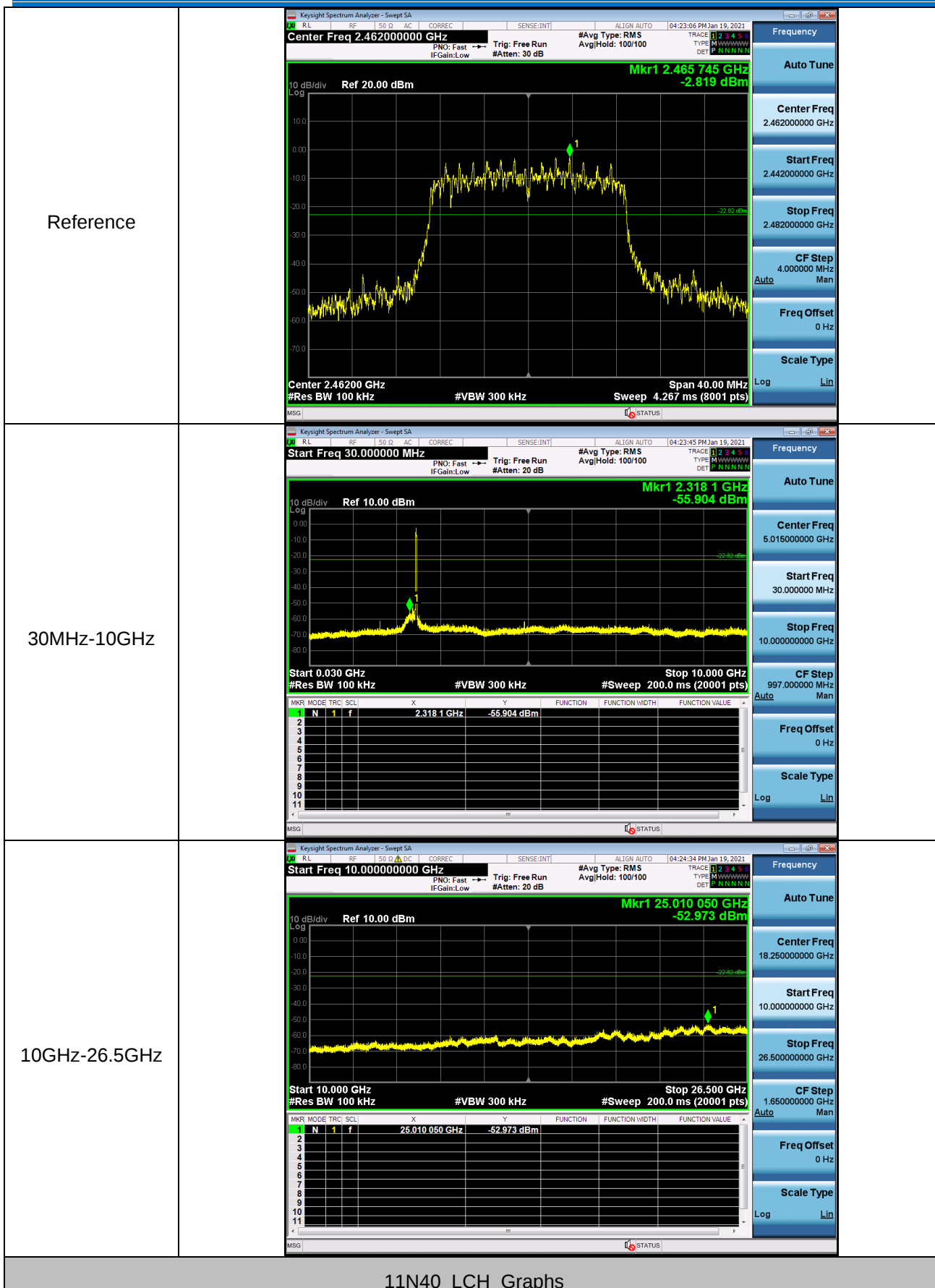
Reference	 KeySight Spectrum Analyzer - Swept SA Center Freq 2.46200000 GHz Ref 20.00 dBm Mkr1 2.463 235 GHz -0.584 dBm Center 2.46200 GHz #Res BW 100 kHz #VBW 300 kHz Span 40.00 MHz Sweep 4.267 ms (8001 pts) Frequency Auto Tune Center Freq 2.46200000 GHz Start Freq 2.442000000 GHz Stop Freq 2.482000000 GHz CF Step 4.000000 MHz Auto Freq Offset 0 Hz Scale Type Log
30MHz-10GHz	 KeySight Spectrum Analyzer - Swept SA Start Freq 30.000000 MHz Ref 10.00 dBm Mkr1 2.534 0 GHz -56.861 dBm Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz Stop 10.000 GHz #Sweep 200.0 ms (20001 pts) Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq 30.0000000 MHz Stop Freq 10.000000000 GHz CF Step 997.000000 MHz Auto Freq Offset 0 Hz Scale Type Log
10GHz-26.5GHz	 KeySight Spectrum Analyzer - Swept SA Start Freq 10.000000000 GHz Ref 10.00 dBm Mkr1 25.086 775 GHz -51.991 dBm Start 10.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 26.500 GHz #Sweep 200.0 ms (20001 pts) Frequency Auto Tune Center Freq 18.250000000 GHz Start Freq 10.000000000 GHz Stop Freq 26.500000000 GHz CF Step 1.650000000 GHz Auto Freq Offset 0 Hz Scale Type Log



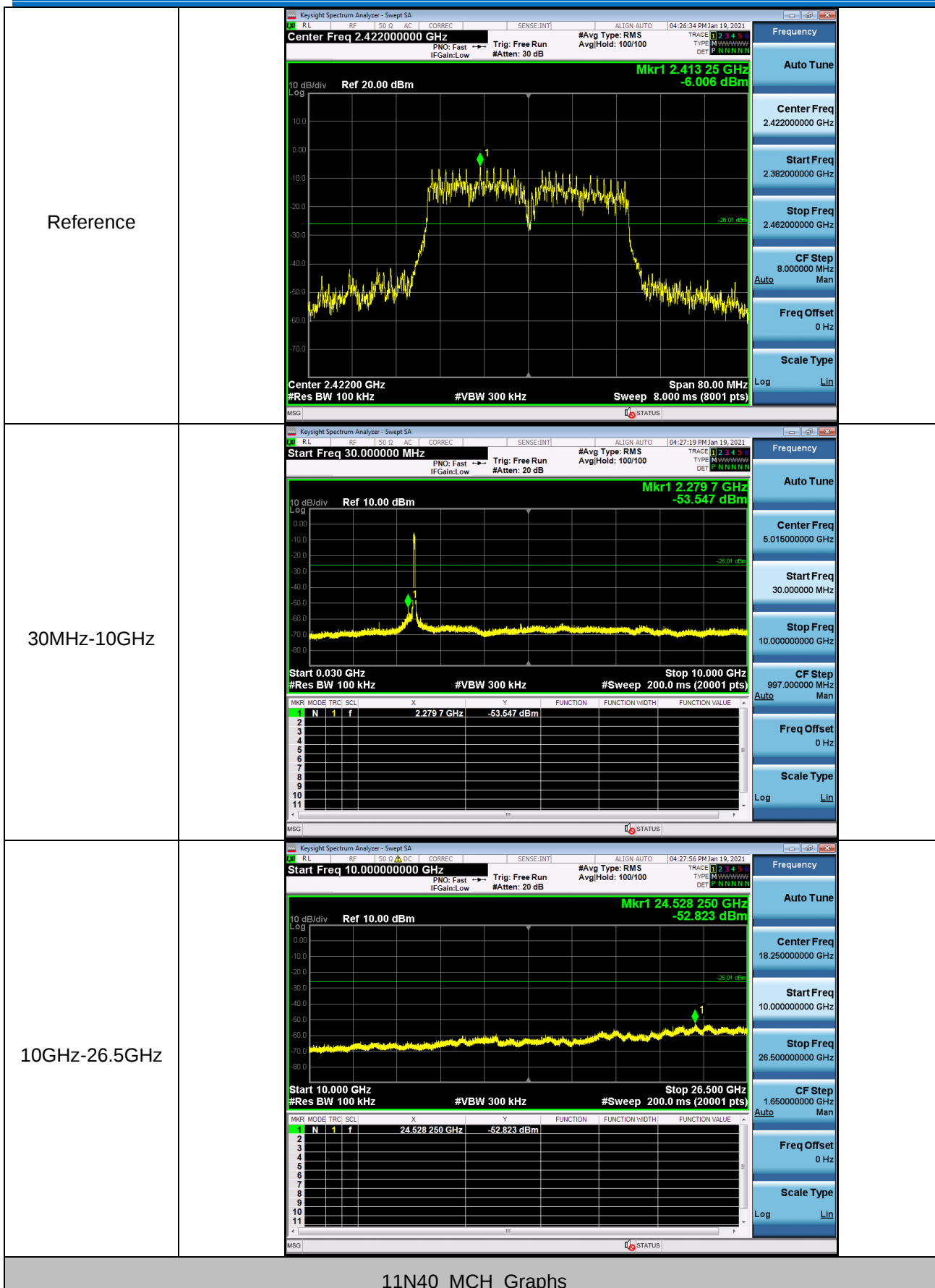
11N20 MCH Graphs

Reference	 Keysight Spectrum Analyzer - Swept SA Center Freq 2.437000000 GHz Mkr1 2.435 725 GHz -3.885 dBm Start Freq 2.417000000 GHz Stop Freq 2.457000000 GHz CF Step 4.000000 MHz Freq Offset 0 Hz Scale Type Log Center 2.43700 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 4.267 ms (8001 pts)
30MHz-10GHz	 Keysight Spectrum Analyzer - Swept SA Start Freq 30.000000 MHz Mkr1 2.349 5 GHz -55.120 dBm Stop 10.000 GHz CF Step 997.000000 MHz Freq Offset 0 Hz Scale Type Log Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz #Sweep 200.0 ms (20001 pts)
10GHz-26.5GHz	 Keysight Spectrum Analyzer - Swept SA Start Freq 10.000000000 GHz Mkr1 24.998 500 GHz -51.839 dBm Stop 26.500 GHz CF Step 1.650000000 GHz Freq Offset 0 Hz Scale Type Log Start 10.000 GHz #Res BW 100 kHz #VBW 300 kHz #Sweep 200.0 ms (20001 pts)

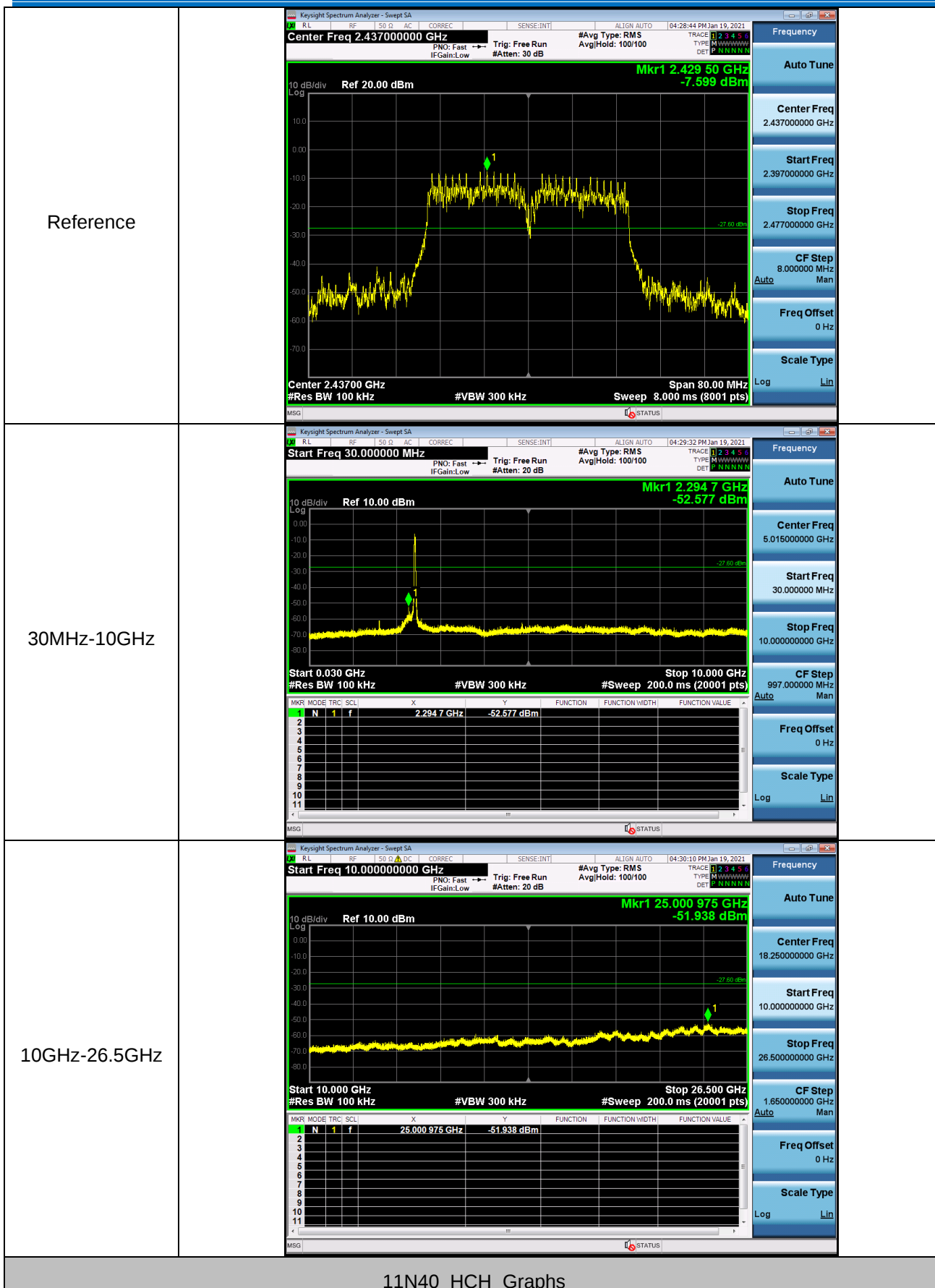
11N20_HCH_Graphs



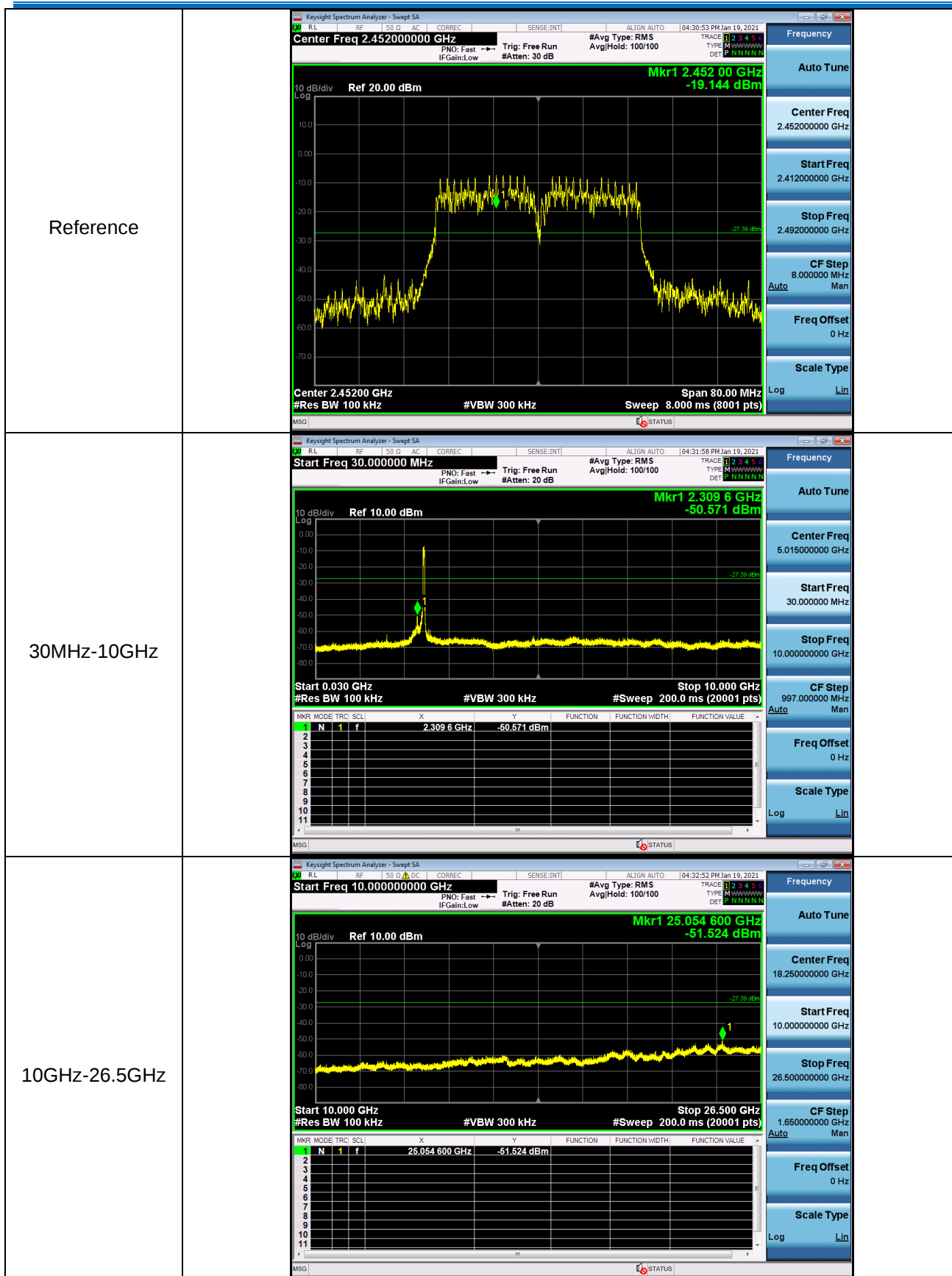
11N40_LCH Graphs



11N40 MCH Graphs



11N40_HCH_Graphs



Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

5.8 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 2013				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Setup:

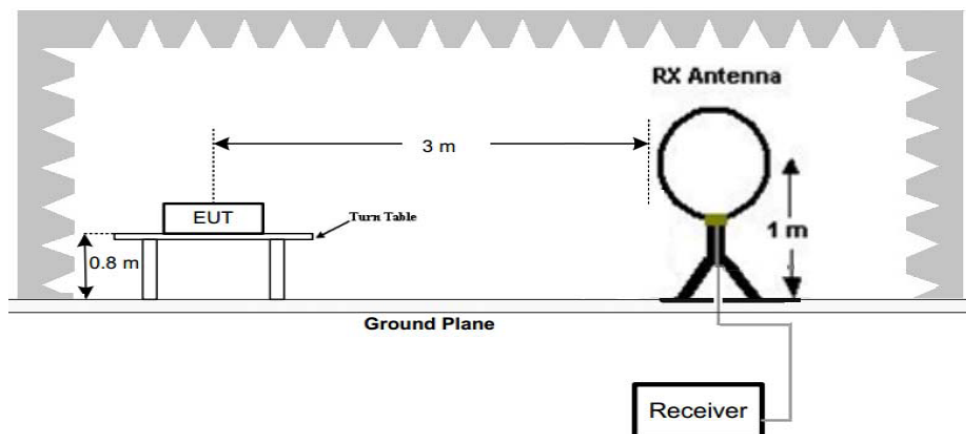


Figure 1. Below 30MHz

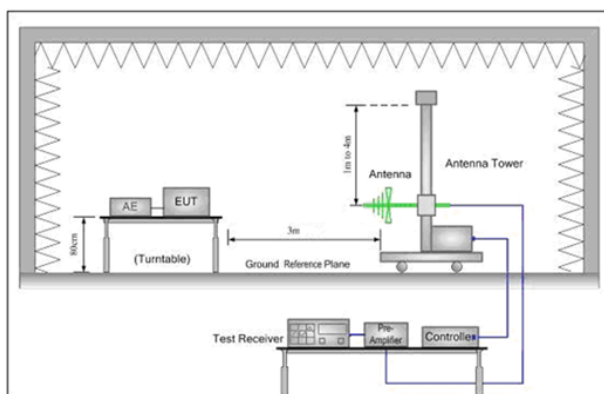


Figure 2. 30MHz to 1GHz

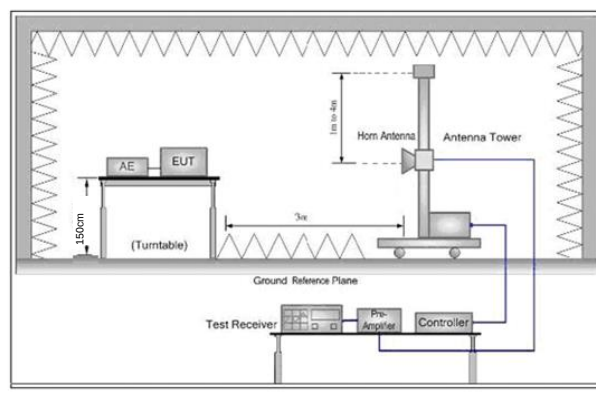


Figure 3. Above 1 GHz

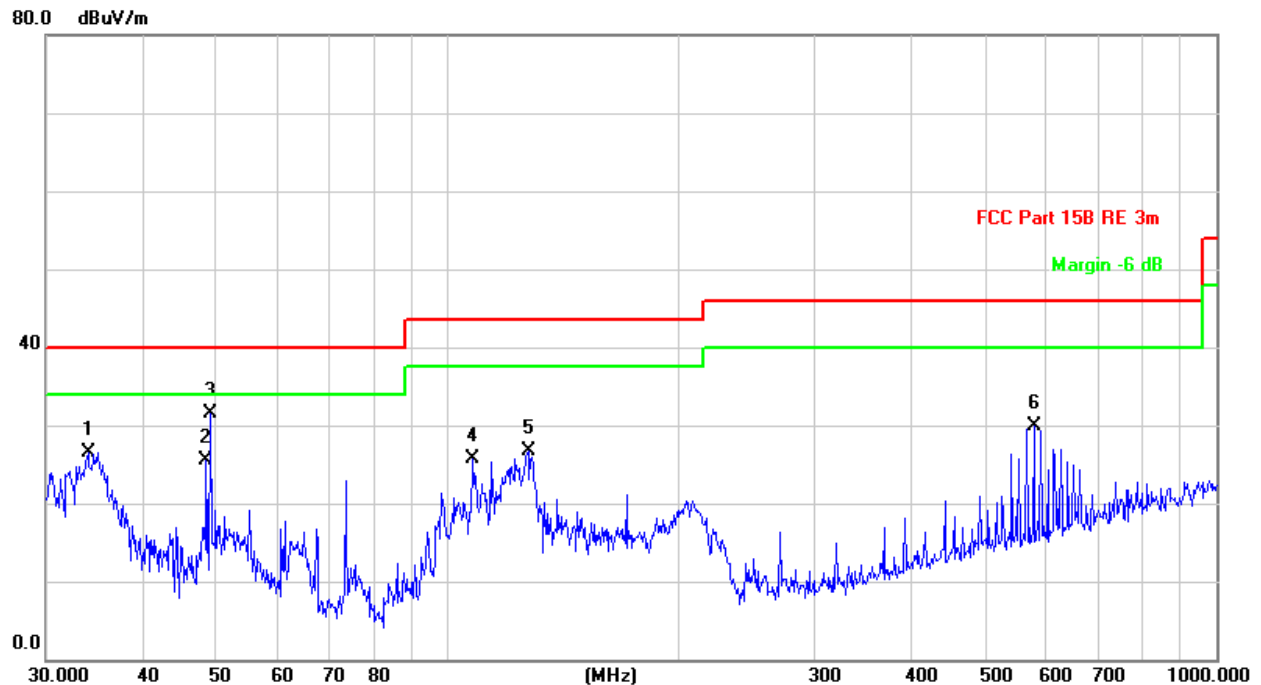
Test Procedure:

- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

	d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode,
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11b at lowest channel is the worst case.
Test Results:	Pass

5.8.1 Radiated emission below 1GHz

30MHz~1GHz		
Test mode:	Transmitting	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		34.0365	34.76	-8.27	26.49	40.00	-13.51	QP		
2		48.5016	43.37	-17.83	25.54	40.00	-14.46	QP		
3	*	49.1865	49.63	-18.13	31.50	40.00	-8.50	QP		
4		107.8877	39.39	-13.65	25.74	43.50	-17.76	QP		
5		127.2176	39.08	-12.35	26.73	43.50	-16.77	QP		
6		578.6699	35.20	-5.32	29.88	46.00	-16.12	QP		

Remark:

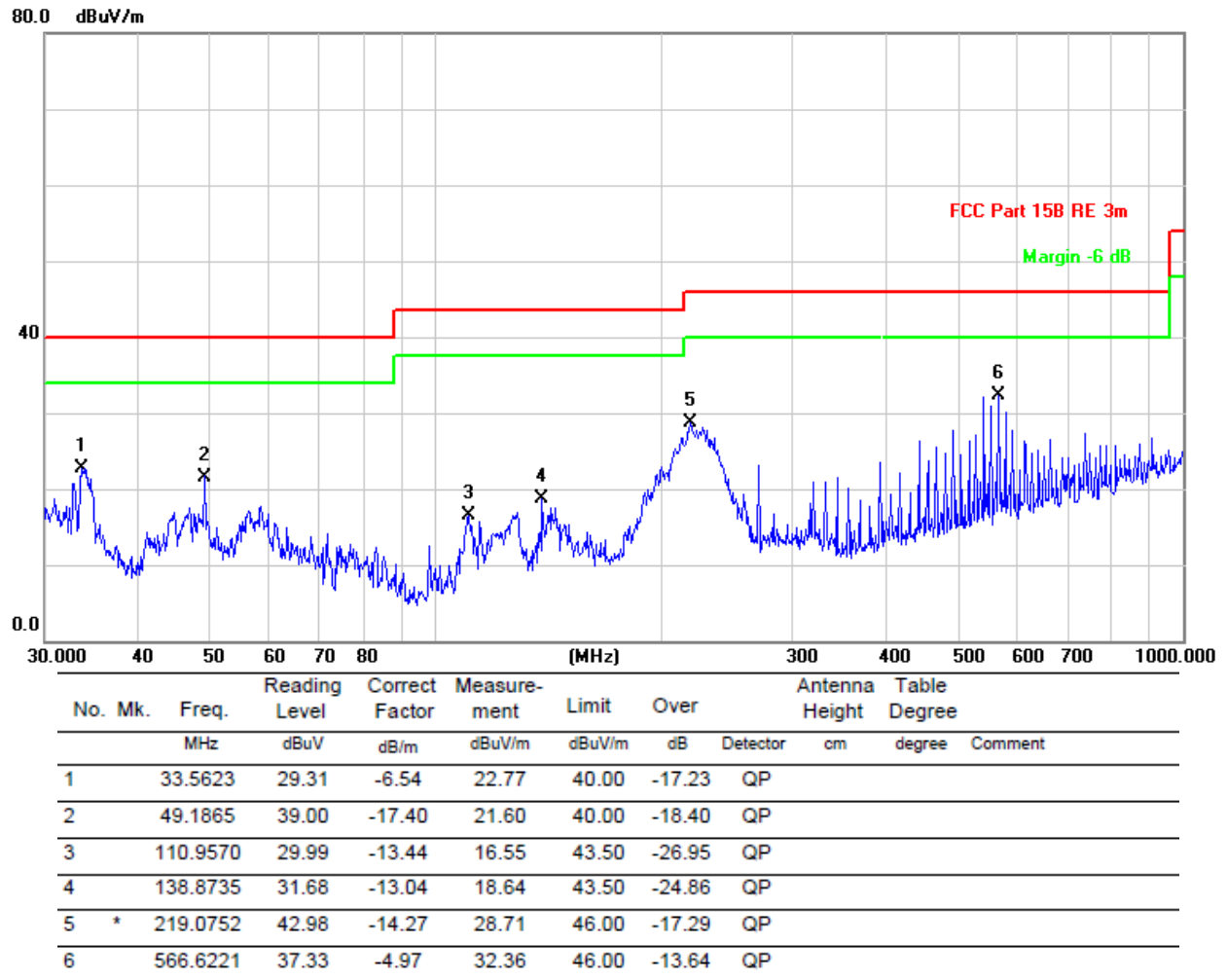
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Test mode:	Transmitting	Horizontal
------------	--------------	------------



Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.