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Test Report

Report No. : CQASZ20190800042EX-01

Applicant: Wenzhou Morning Electronics Co.,LTD

Address of Applicant: No.231-2, Wei 6 Road, Yueqing Economic Development Zone, Yueqing City, Zhejiang, China 325604

Manufacturer: Wenzhou Morning Electronics Co.,LTD

Address of Manufacturer: No.231-2, Wei 6 Road, Yueqing Economic Development Zone, Yueqing City, Zhejiang, China 325604

Equipment Under Test (EUT):

Product: Smart Switch

All Model No.: MS-101, MS-101R, MS-101WR, MS-102, MS-102B, MS-103, MS-104, MS-104R, MS-104WR, MS-104B-R, MS-104B-WR, MS-104B, MS-105, MS-106, MS-107, MS-108

Test Model No.: MS-101

Brand Name: N/A

FCC ID: 2AT8P-MS10X

Standards: 47 CFR FCC Part 15 Subpart C 15.247

Date of Test: Aug. 05, 2019 to Aug. 12, 2019

Date of Issue: Aug. 12, 2019

Test Result : PASS

Tested By:

Tom Chen

(Tom Chen)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai

(Jack Ai)



* 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
CQASZ20190800042EX-01	Rev.01	Initial report	Aug. 12, 2019

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

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4 General Information

4.1 Client Information

Applicant:	Wenzhou Morning Electronics Co.,LTD
Address of Applicant:	No.231-2, Wei 6 Road, Yueqing Economic Development Zone, Yueqing City, Zhejiang, China 325604
Manufacturer:	Wenzhou Morning Electronics Co.,LTD
Address of Manufacturer:	No.231-2, Wei 6 Road, Yueqing Economic Development Zone, Yueqing City, Zhejiang, China 325604

4.2 General Description of EUT

Product Name:	Smart Switch
Model No.:	MS-101
Trade Mark:	N/A
Hardware version:	V1.0
Software version:	V2.2.3
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
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
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	RF test (manufacturer declare)
Antenna Type	PCB Antenna
Antenna Gain	0dBi
Power Supply:	AC 110V 60Hz

1. All model: MS-101, MS-101R, MS-101WR, MS-102, MS-102B, MS-103, MS-104, MS-104R, MS-104WR, MS-104B-R, MS-104B-WR, MS-104B, MS-105,MS-106, MS-107, MS-108
2. Only the model MS-101 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

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:

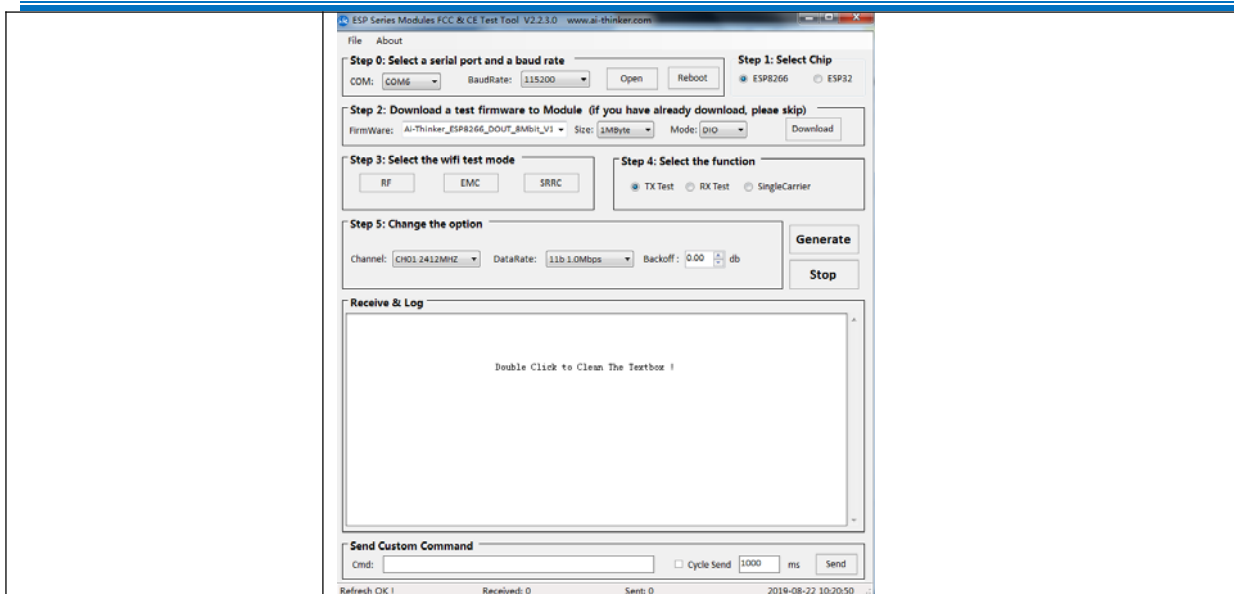
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11b/g/n (HT20):

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

4.3 Test Environment

Operating Environment:	
Radiated Emission	
Temperature:	25.5 °C
Humidity:	52 % RH
Atmospheric Pressure:	992mbar
RF item test (RF test room)	
Temperature:	27.8 °C
Humidity:	56 % RH
Atmospheric Pressure:	992mbar
Conduction emission	
Temperature:	23.0 C
Humidity:	51 % 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
/	/	/	/	/
/	/	/	/	/

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°C	(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	2018/9/26	2019/9/25
Spectrum analyzer	R&S	FSU26	CQA-038	2018/10/28	2019/10/27
Spectrum analyzer	keysight	N9020A	CQA-105	2018/10/28	2019/10/27
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/9/26	2019/9/25
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2018/11/2	2019/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2018/10/28	2020/10/27
Bilog Antenna	R&S	HL562	CQA-011	2018/9/26	2020/9/25
Horn Antenna	R&S	HF906	CQA-012	2018/9/26	2020/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2018/9/26	2020/9/25
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2018/9/26	2019/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2018/9/26	2019/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2018/9/26	2019/9/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2018/9/26	2019/9/25
Power Sensor	KEYSIGHT	U2021XA	CQA-30	2018/9/26	2019/9/25
N1918A Power Analysis Manager Power Panel	Agilent	N1918A	CQA-074	2018/9/26	2019/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2018/9/26	2019/9/25
EMI Test Receiver	R&S	ESPI3	CQA-013	2018/9/26	2019/9/25
LISN	R&S	ENV216	CQA-003	2018/11/5	2019/11/4
Coaxial cable	CQA	N/A	CQA-C009	2018/9/26	2019/9/25

Note:

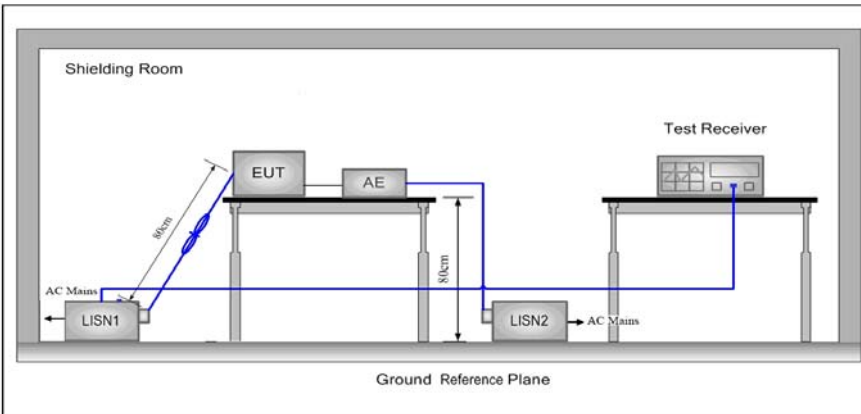
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

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 internal antenna. The best case gain of the antenna is 0dBi.	

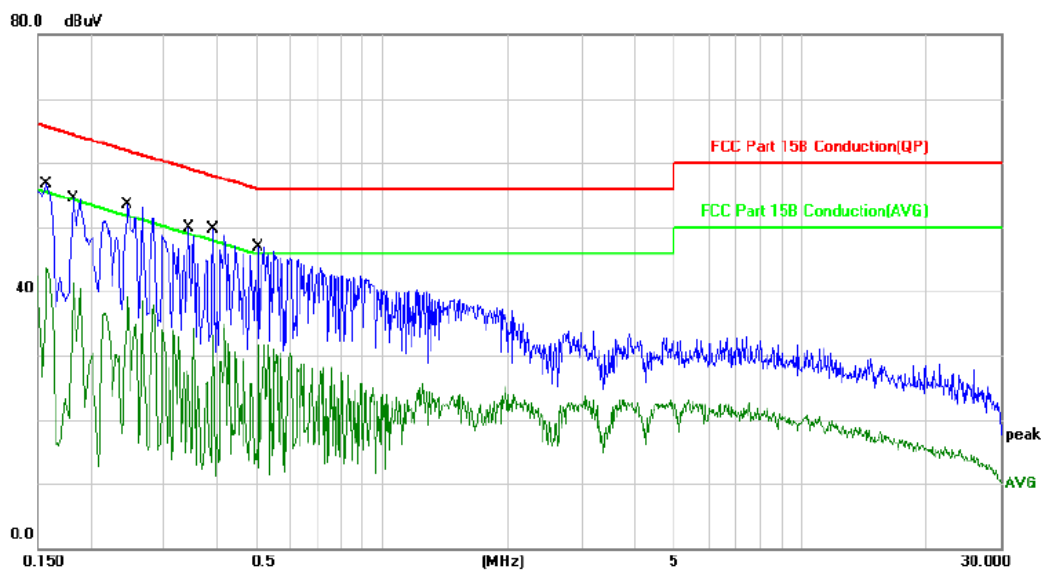
5.2 Conducted Emissions

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:				
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.			
Final Test Mode:	All modes of 802.11b/g/n were tested at Low, Middle, and High channel; only			

	the worst result of 802.11b CH1 was reported as below
Test Voltage:	AC120V/60Hz
Test Results:	Pass

Measurement Data

Live Line:

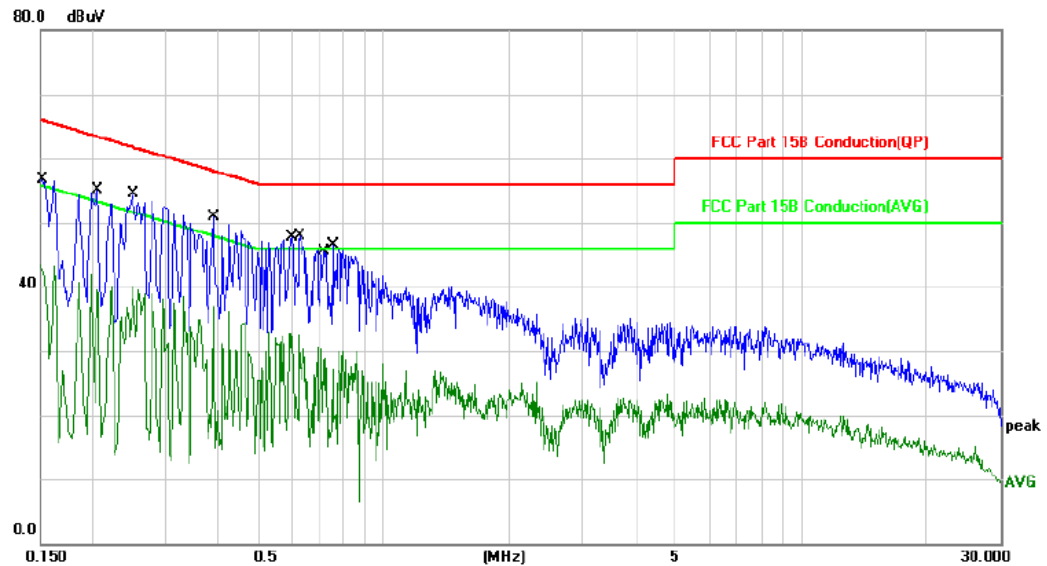


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV	dB	dBuV	dBuV	dB		
1		0.1580	56.85	-0.13	56.72	65.56	-8.84	QP	
2		0.1580	43.78	-0.13	43.65	55.56	-11.91	AVG	
3		0.1819	54.56	-0.13	54.43	64.39	-9.96	QP	
4		0.1819	41.46	-0.13	41.33	54.39	-13.06	AVG	
5		0.2459	53.70	-0.11	53.59	61.89	-8.30	QP	
6		0.2459	39.24	-0.11	39.13	51.89	-12.76	AVG	
7		0.3420	27.58	-0.02	27.56	49.15	-21.59	AVG	
8		0.3459	49.88	-0.02	49.86	59.06	-9.20	QP	
9	*	0.3940	49.77	-0.01	49.76	57.98	-8.22	QP	
10		0.3940	33.05	-0.01	33.04	47.98	-14.94	AVG	
11		0.5060	46.95	-0.03	46.92	56.00	-9.08	QP	
12		0.5060	31.70	-0.03	31.67	46.00	-14.33	AVG	

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:

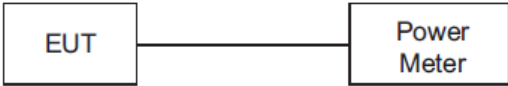


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1499	43.67	-0.13	43.54	56.00	-12.46	AVG	
2	0.1516	56.76	-0.13	56.63	65.91	-9.28	QP	
3	0.2060	55.18	-0.13	55.05	63.36	-8.31	QP	
4	0.2060	39.53	-0.13	39.40	53.36	-13.96	AVG	
5 *	0.2500	54.70	-0.11	54.59	61.75	-7.16	QP	
6	0.2500	40.20	-0.11	40.09	51.75	-11.66	AVG	
7	0.3899	50.90	-0.01	50.89	58.06	-7.17	QP	
8	0.3899	36.97	-0.01	36.96	48.06	-11.10	AVG	
9	0.5940	32.77	-0.04	32.73	46.00	-13.27	AVG	
10	0.6300	47.87	-0.05	47.82	56.00	-8.18	QP	
11	0.7220	28.88	-0.06	28.82	46.00	-17.18	AVG	
12	0.7539	46.52	-0.07	46.45	56.00	-9.55	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

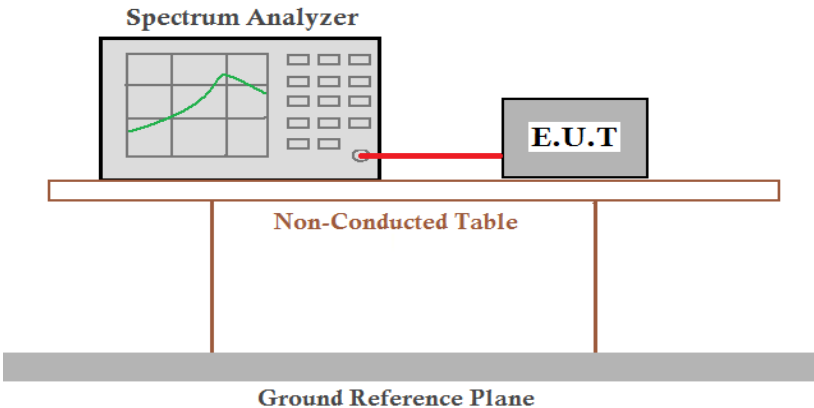
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <pre> graph LR EUT[EUT] --- PM[Power Meter] </pre>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b; 54Mbps of rate is the worst case of 802.11g; 65Mbps of rate is the worst case of 802.11n(HT20); Only the worst case is recorded in the report.
Limit:	30dBm
Test Results:	Pass

WIFI

Type	Test channel	Peak Output Power (dBm)	Average Output Power dBm)	Limit (dBm)	Result
802.11b	Lowest	13.49	7.57	30.00	Pass
	Middle	14.19	7.76		
	Highest	14.46	8.31		
802.11g	Lowest	14.09	4.44	30.00	Pass
	Middle	14.59	5.35		
	Highest	14.91	5.97		
802.11n(HT20)	Lowest	12.83	3.97	30.00	Pass
	Middle	13.29	4.33		
	Highest	13.43	4.68		

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

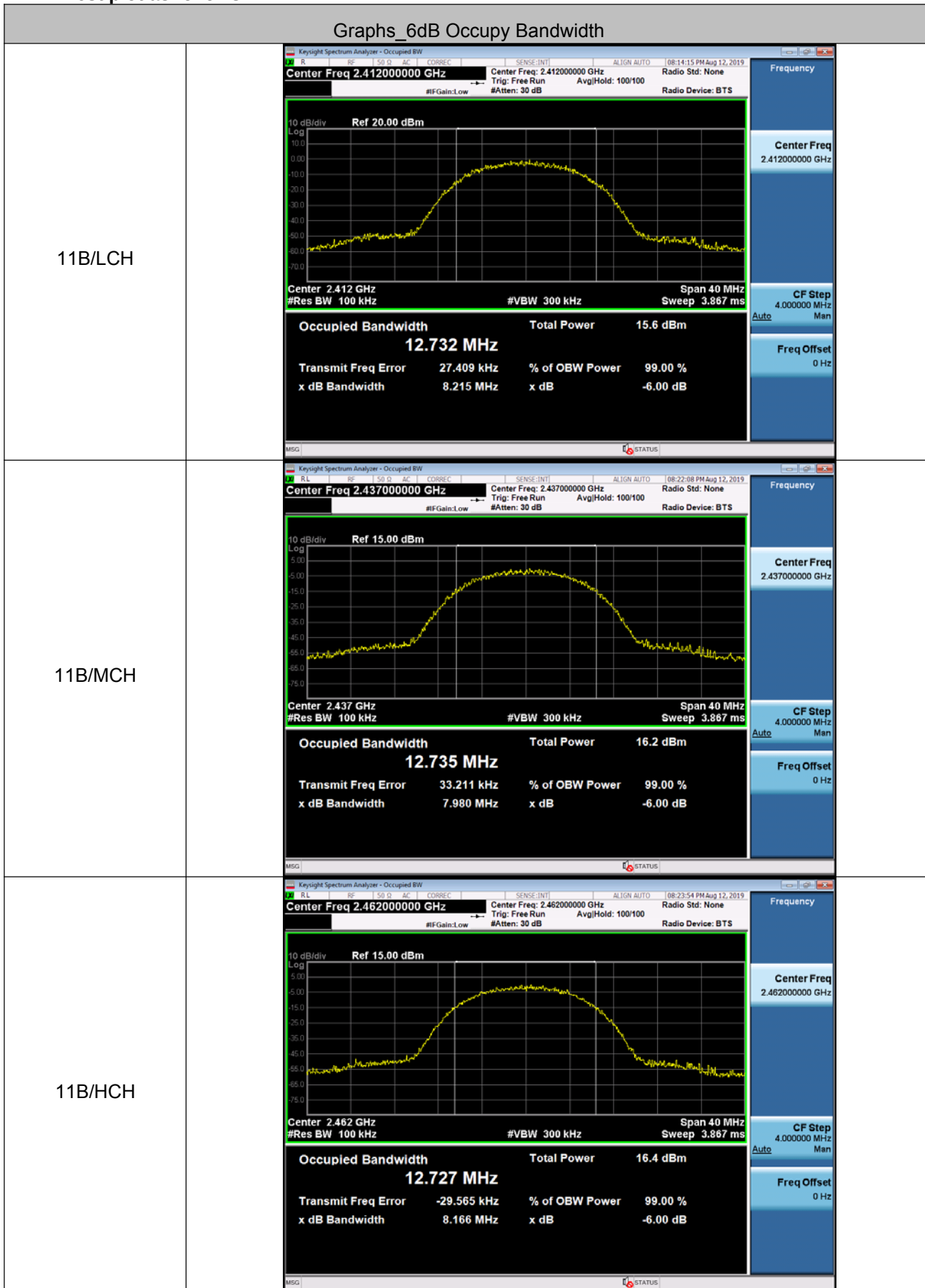
5.4 6dB Occupy Bandwidth

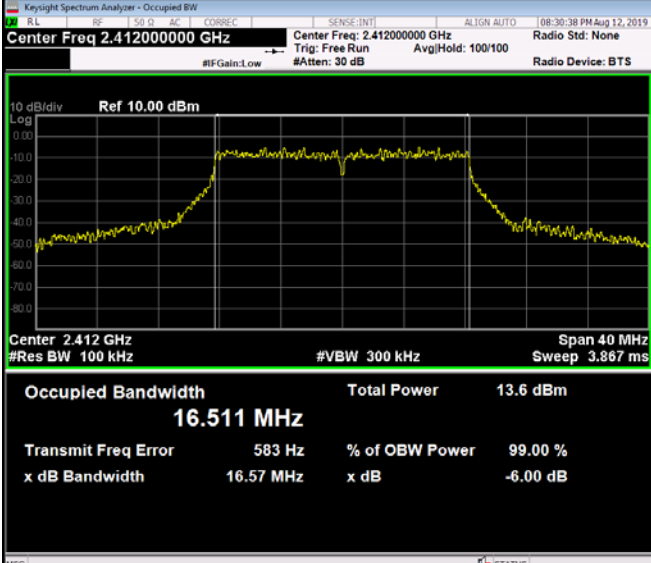
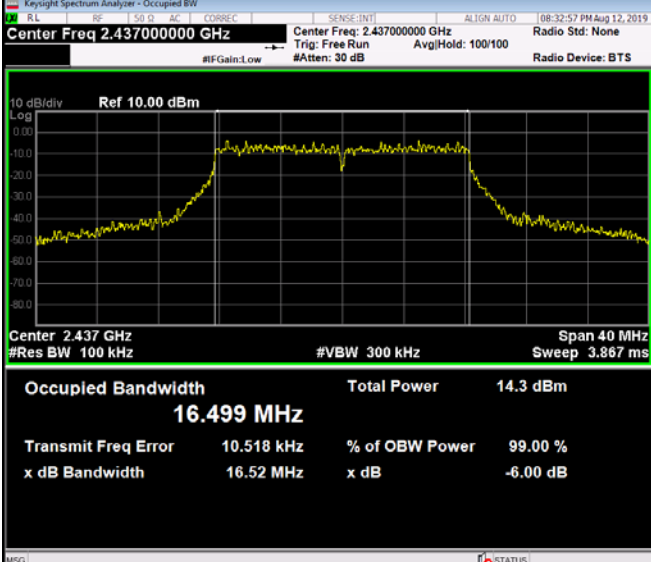
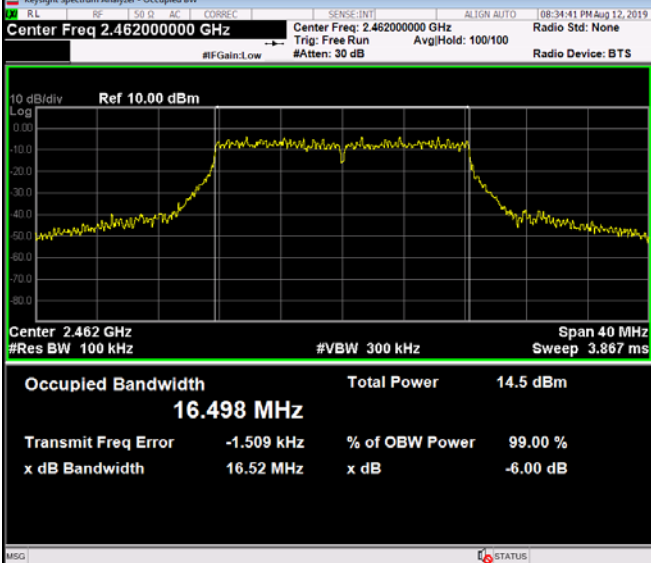
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b; 54Mbps of rate is the worst case of 802.11g; 65Mbps of rate is the worst case of 802.11n(HT20); Only the worst case is recorded in the report.
Limit:	≥ 500 kHz
Test Results:	Pass

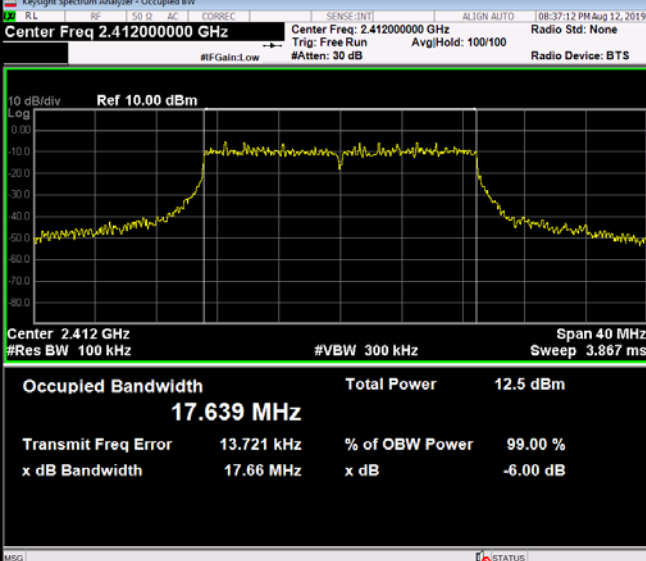
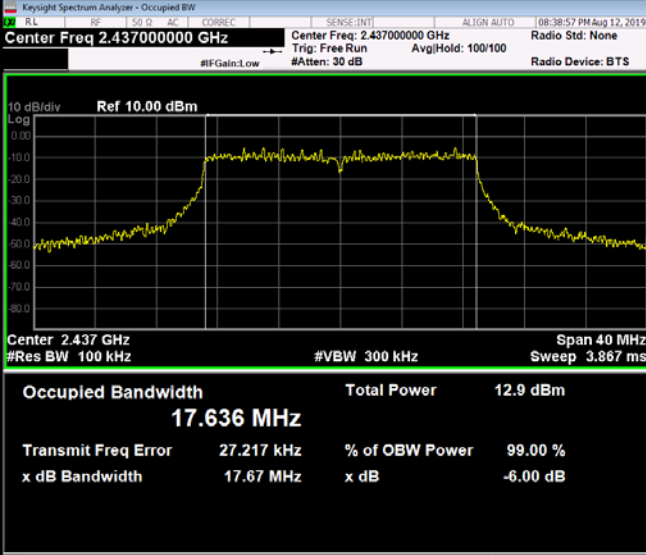
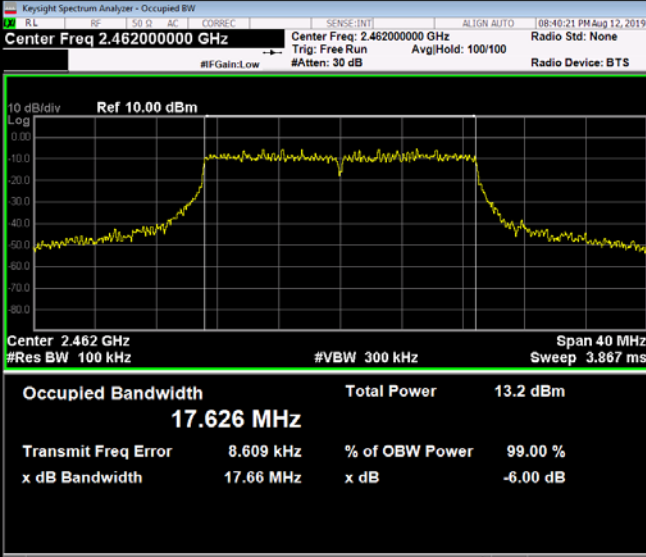
Measurement Data

Type	hannel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11b	Lowest	8.215	≥ 500	Pass
	Middle	7.980		
	Highest	8.166		
802.11g	Lowest	16.568	≥ 500	Pass
	Middle	16.519		
	Highest	16.518		
802.11n(HT20)	Lowest	17.663	≥ 500	Pass
	Middle	17.665		
	Highest	17.656		

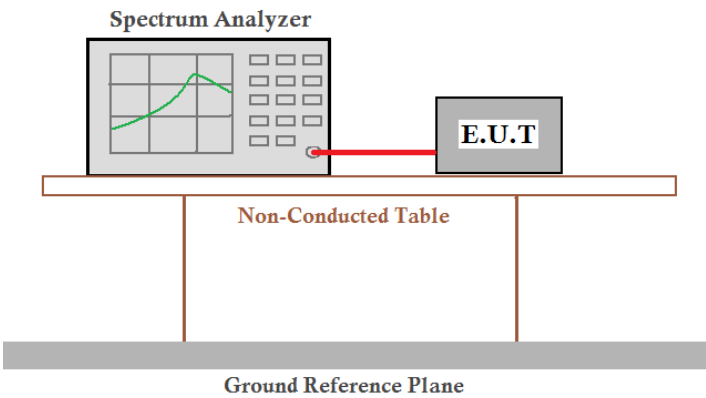
Test plot as follows:



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 Ref 10.00 dBm Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 16.511 MHz Total Power 13.6 dBm Transmit Freq Error 583 Hz % of OBW Power 99.00 % x dB Bandwidth 16.57 MHz x dB -6.00 dB Frequency Center Freq 2.41200000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz
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 Ref 10.00 dBm Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 16.499 MHz Total Power 14.3 dBm Transmit Freq Error 10.518 kHz % of OBW Power 99.00 % x dB Bandwidth 16.52 MHz x dB -6.00 dB Frequency Center Freq 2.43700000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz
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 Ref 10.00 dBm Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 16.498 MHz Total Power 14.5 dBm Transmit Freq Error -1.509 kHz % of OBW Power 99.00 % x dB Bandwidth 16.52 MHz x dB -6.00 dB Frequency Center Freq 2.46200000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz

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 Ref 10.00 dBm Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 17.639 MHz Total Power 12.5 dBm Transmit Freq Error 13.721 kHz % of OBW Power 99.00 % x dB Bandwidth 17.66 MHz x dB -6.00 dB Frequency Center Freq 2.41200000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz
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 Ref 10.00 dBm Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 17.636 MHz Total Power 12.9 dBm Transmit Freq Error 27.217 kHz % of OBW Power 99.00 % x dB Bandwidth 17.67 MHz x dB -6.00 dB Frequency Center Freq 2.43700000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz
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 Ref 10.00 dBm Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 3.867 ms Occupied Bandwidth 17.626 MHz Total Power 13.2 dBm Transmit Freq Error 8.609 kHz % of OBW Power 99.00 % x dB Bandwidth 17.66 MHz x dB -6.00 dB Frequency Center Freq 2.46200000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz

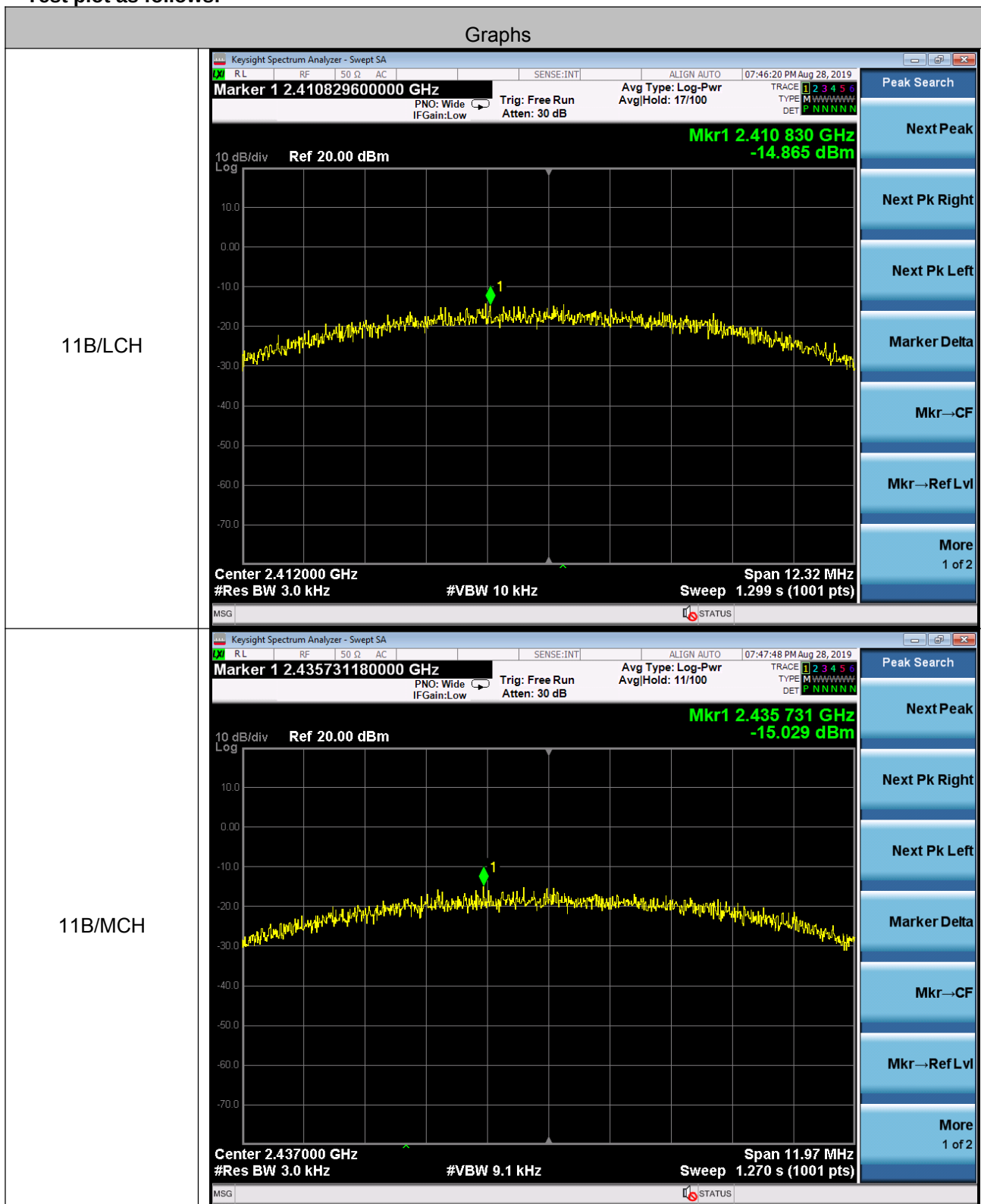
5.5 Power Spectral Density

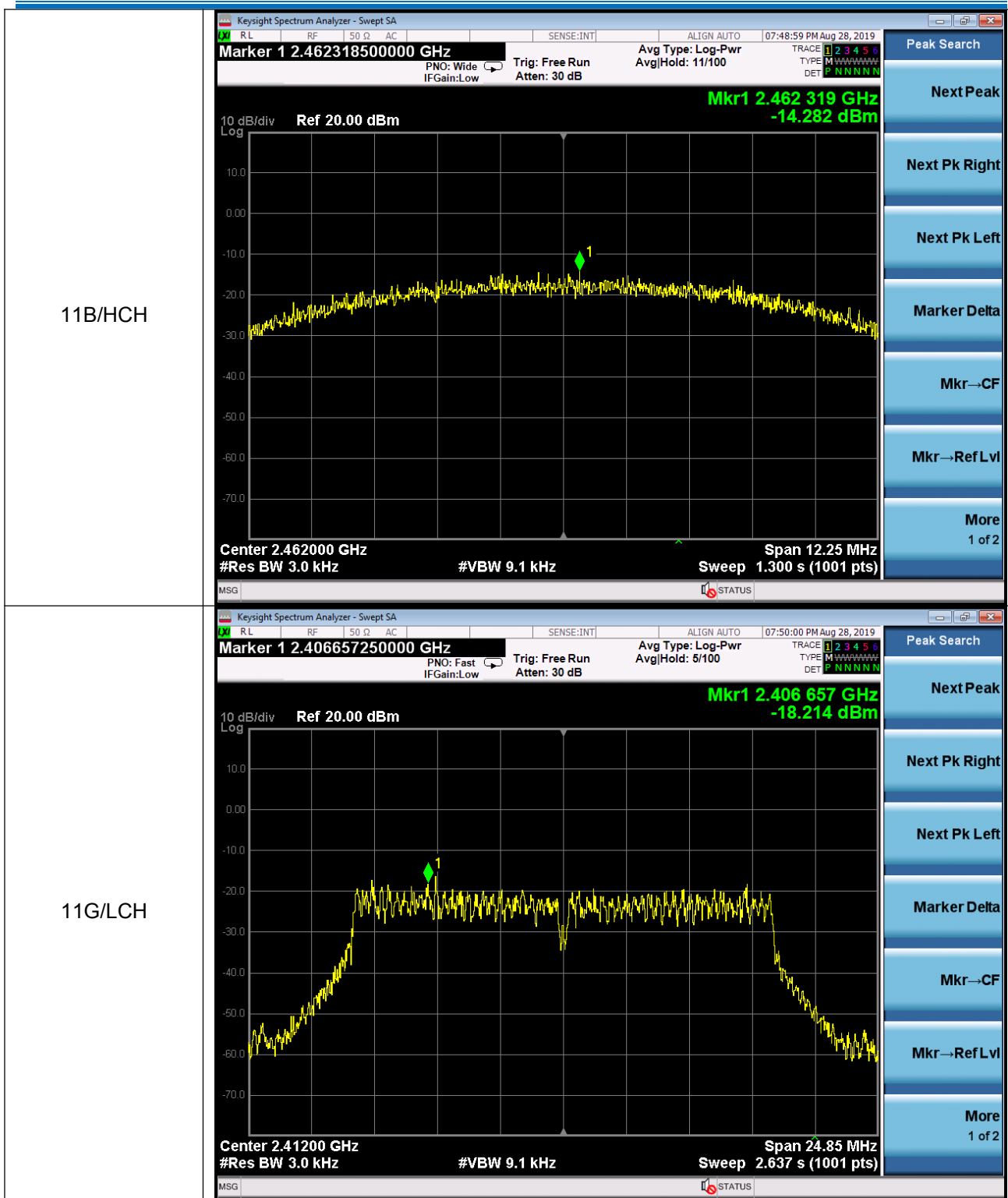
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b; 54Mbps of rate is the worst case of 802.11g; 65Mbps of rate is the worst case of 802.11n(HT20); Only the worst case is recorded in the report.
Limit:	$\leq 8.00\text{dBm}/3\text{kHz}$
Test Results:	Pass

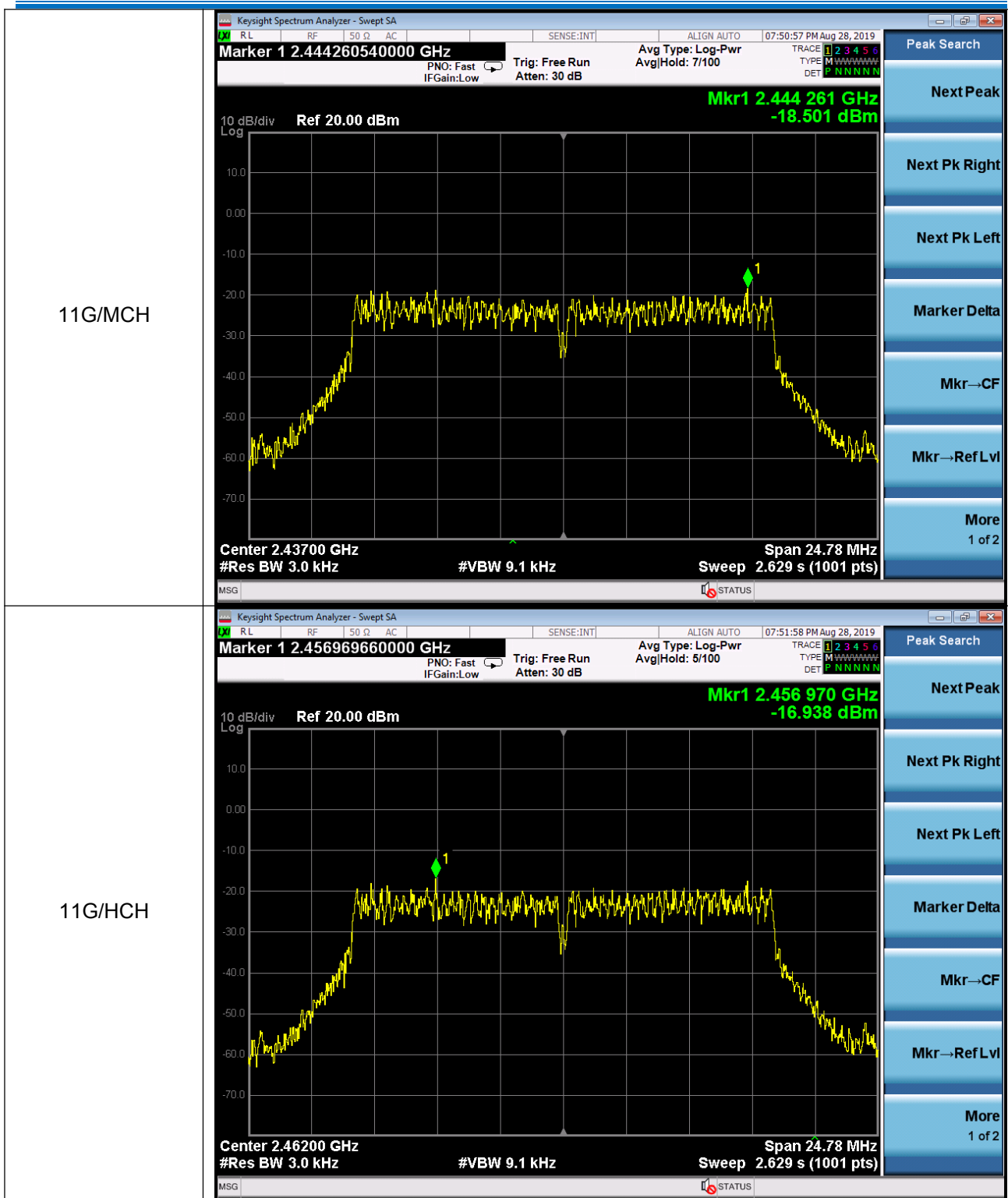
Measurement Data

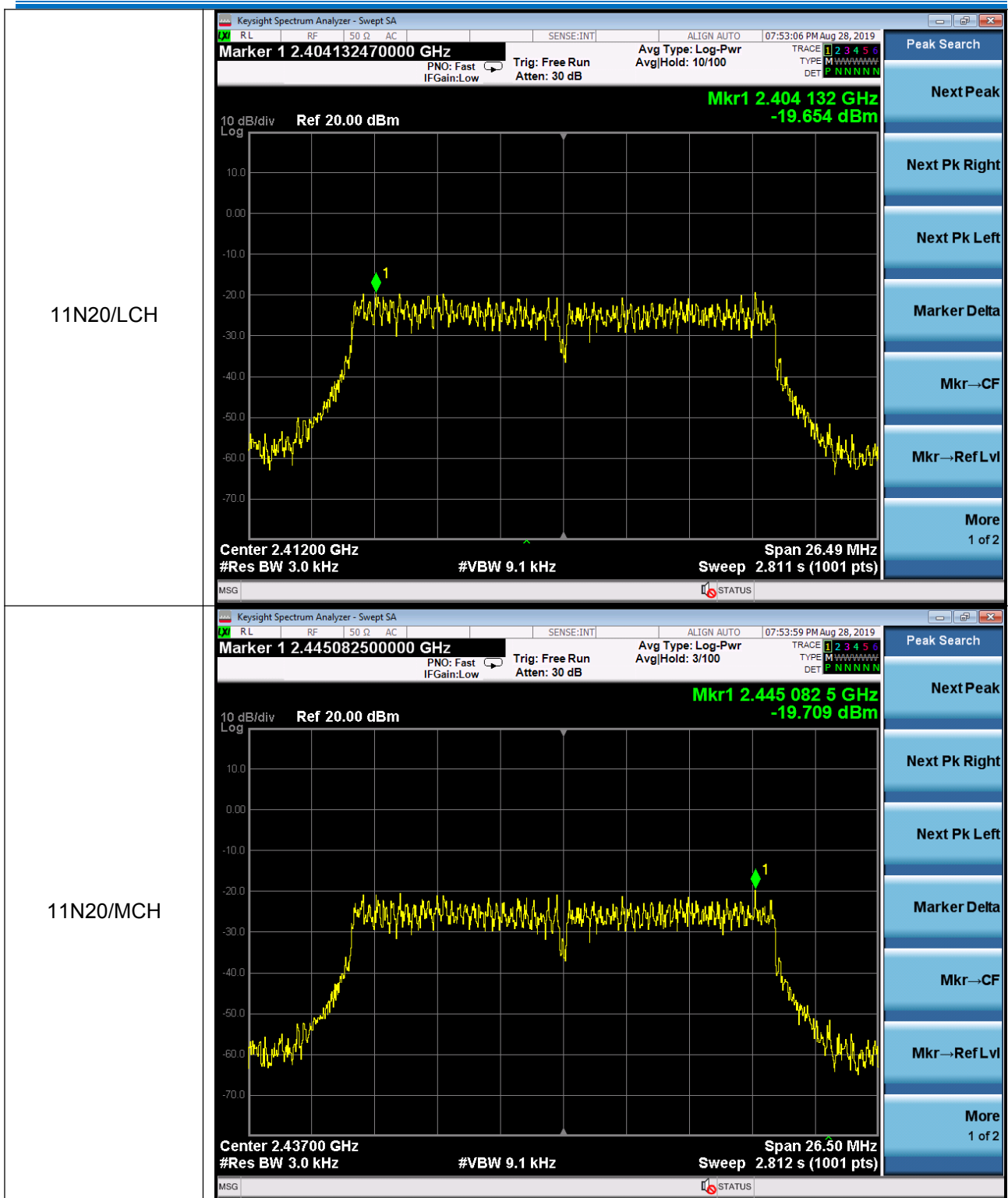
Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	Lowest	-14.865	≤ 8	Pass
	Middle	-15.029		
	Highest	-14.282		
802.11g	Lowest	-18.214	≤ 8	Pass
	Middle	-18.501		
	Highest	-16.938		
802.11n(HT20)	Lowest	-19.654	≤ 8	Pass
	Middle	-19.709		
	Highest	-18.820		

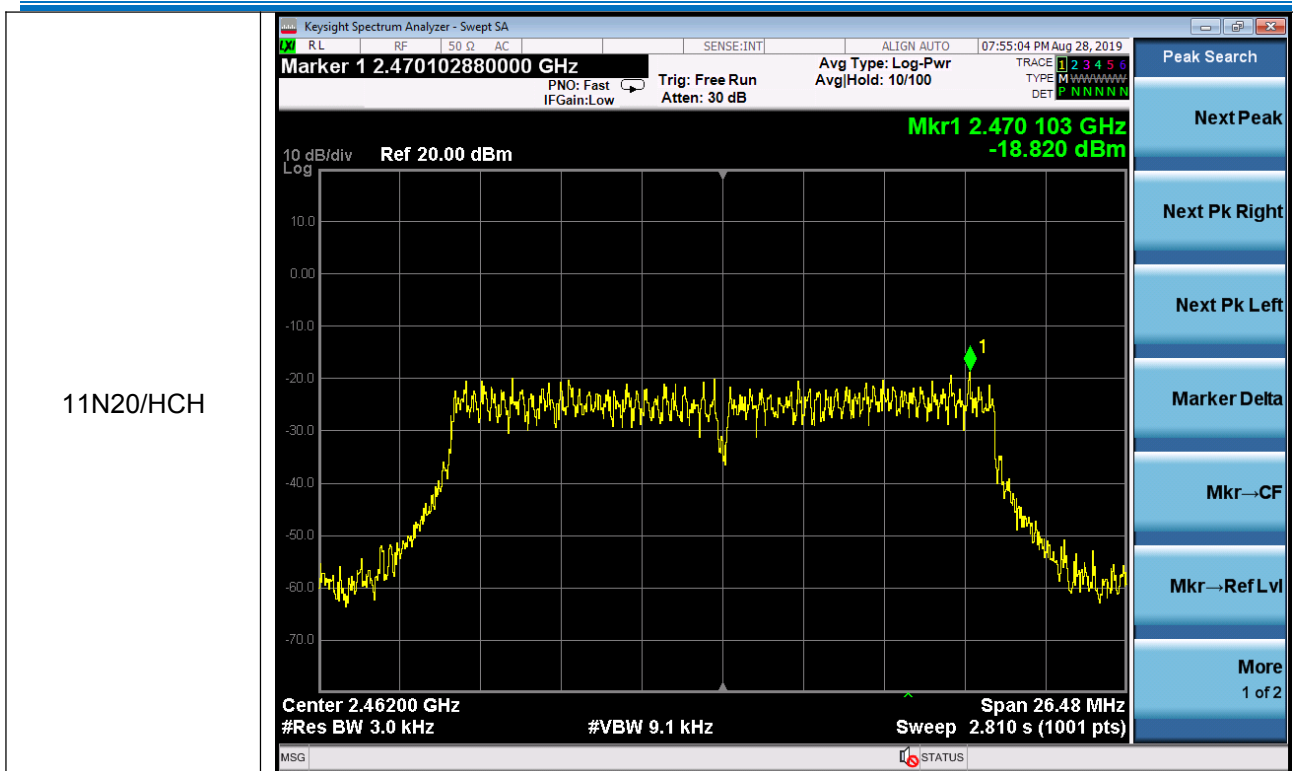
Test plot as follows:



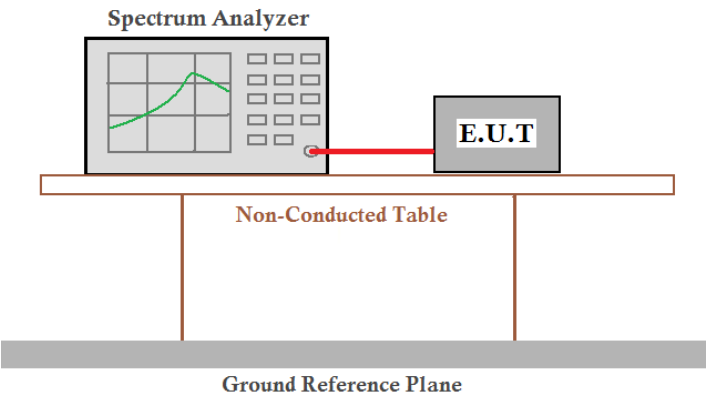




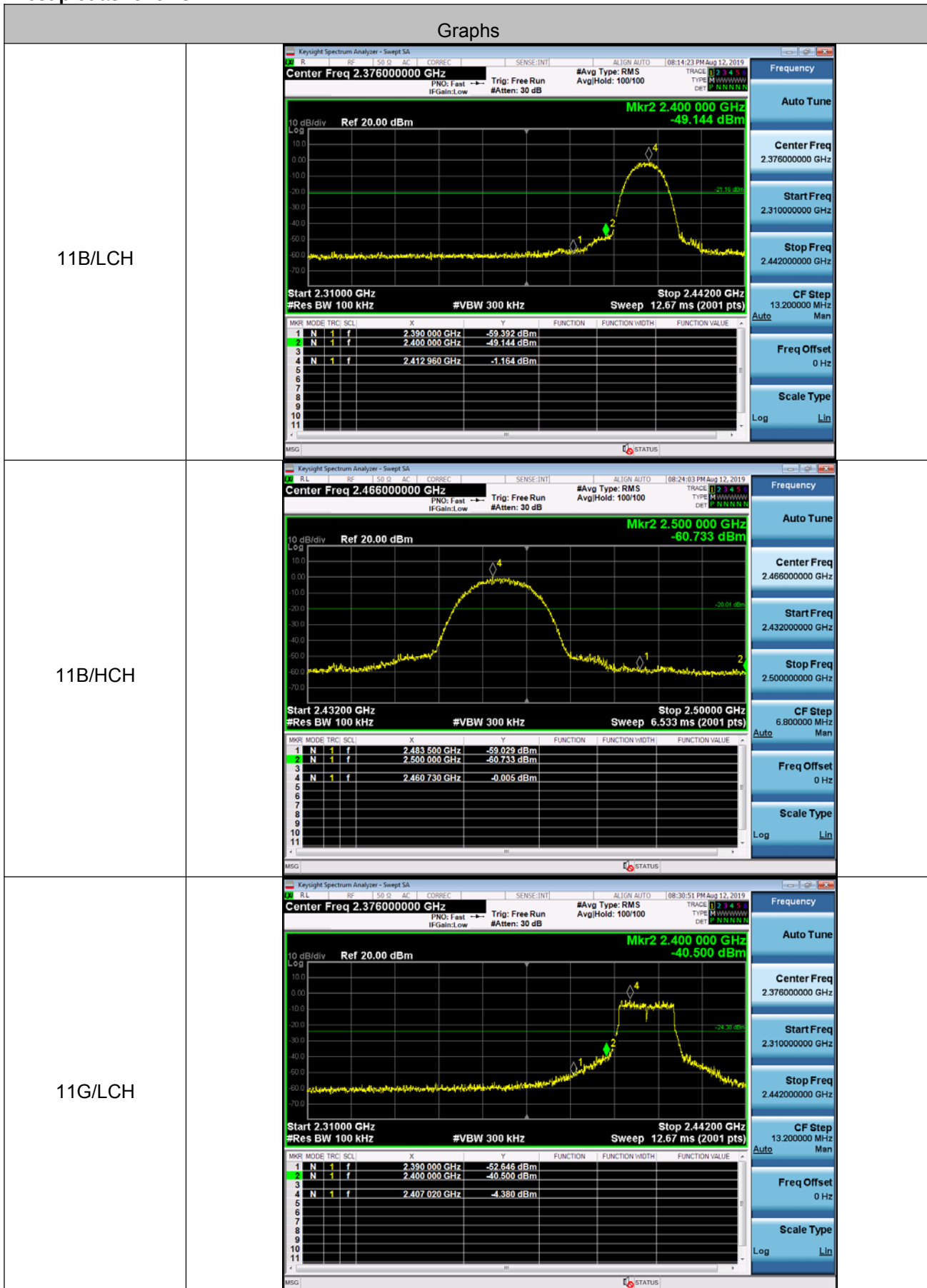




5.6 Band-edge for RF Conducted Emissions

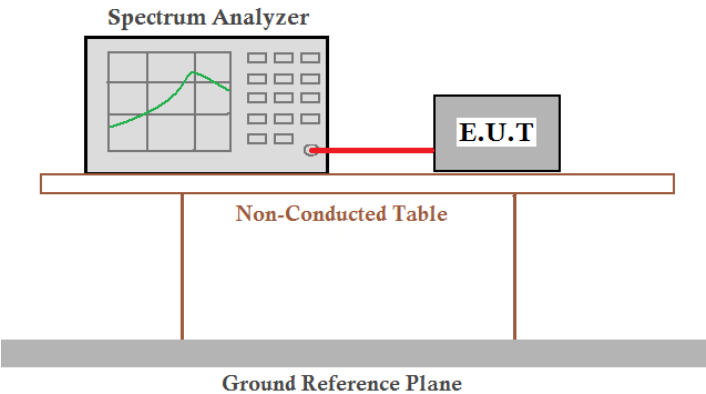
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b; 54Mbps of rate is the worst case of 802.11g; 65Mbps of rate is the worst case of 802.11n(HT20); 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:

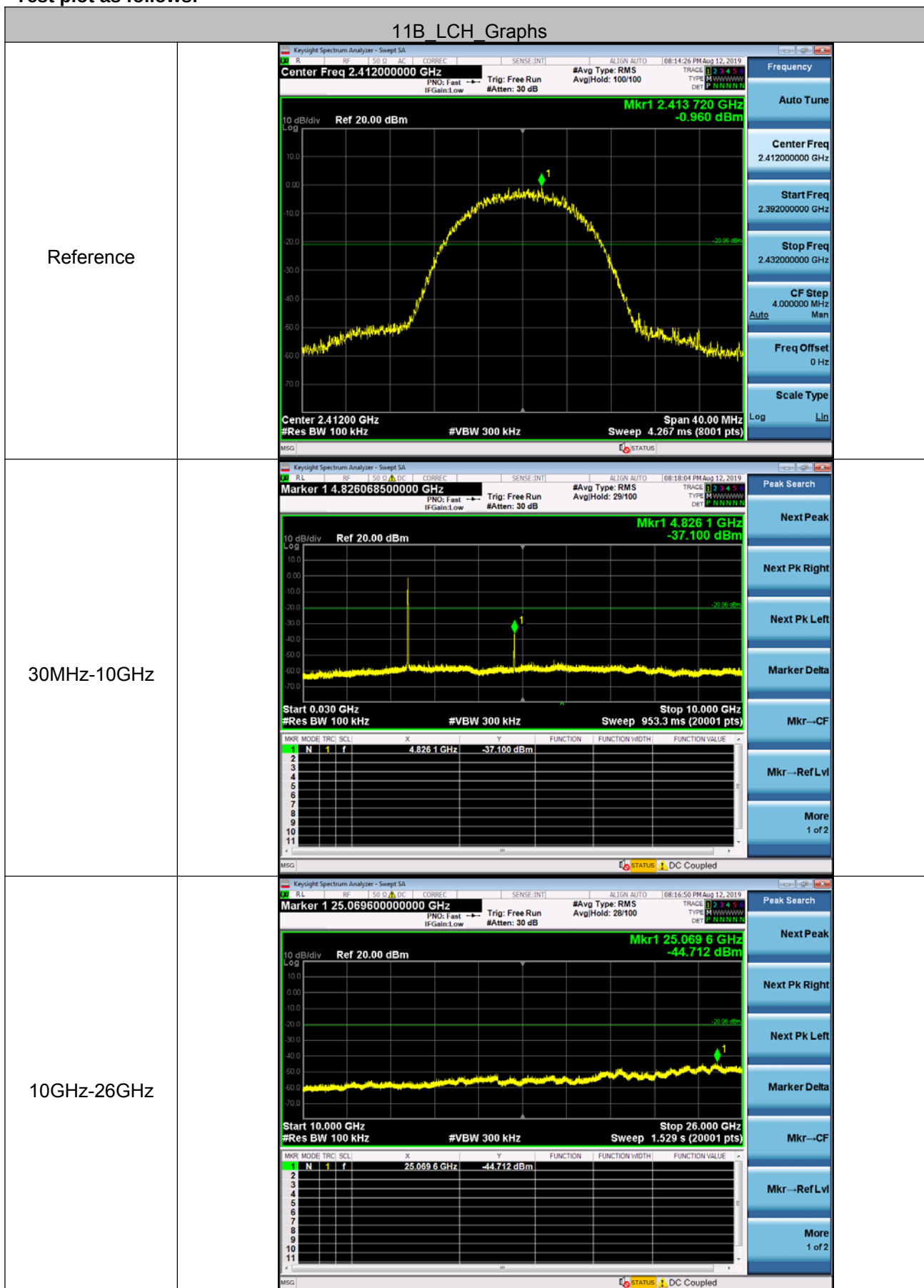


11G/HCH	Keyight Spectrum Analyzer - Sweep SA AL FS AF COBSEC SENSE:INT ALLEN AUTO 68:34:54 PM Aug 12, 2019 Center Freq 2.466000000 GHz PN0: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS Avg/Hold: 100/100 TRACE 1 2 3 4 5 TYPE M W W W W W W DET N B N N N N 10 dB/div Ref 20.00 dBm Mkr2 2.500 000 GHz -59.215 dBm Start 2.43200 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 6.533 ms (2001 pts) <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.483 500 GHz</td><td>-51.438 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.500 000 GHz</td><td>-59.215 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.456 990 GHz</td><td>-3.542 dBm</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> MSG STATUS Frequency Auto Tune Center Freq 2.466000000 GHz Start Freq 2.432000000 GHz Stop Freq 2.500000000 GHz CF Step 6.800000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.483 500 GHz	-51.438 dBm				2	N	1	f	2.500 000 GHz	-59.215 dBm				3									4	N	1	f	2.456 990 GHz	-3.542 dBm				5									6									7									8									9									10									11								
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11N20/LCH	Keyight Spectrum Analyzer - Sweep SA AL FS AF COBSEC SENSE:INT ALLEN AUTO 68:37:26 PM Aug 12, 2019 Center Freq 2.376000000 GHz PN0: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS Avg/Hold: 100/100 TRACE 1 2 3 4 5 TYPE M W W W W W W DET N B N N N N 10 dB/div Ref 20.00 dBm Mkr2 2.400 000 GHz -39.952 dBm Start 2.31000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 12.67 ms (2001 pts) <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.390 000 GHz</td><td>-53.316 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.400 000 GHz</td><td>-39.952 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.404 512 GHz</td><td>-5.450 dBm</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> MSG STATUS Frequency Auto Tune Center Freq 2.376000000 GHz Start Freq 2.310000000 GHz Stop Freq 2.442000000 GHz CF Step 13.200000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.390 000 GHz	-53.316 dBm				2	N	1	f	2.400 000 GHz	-39.952 dBm				3									4	N	1	f	2.404 512 GHz	-5.450 dBm				5									6									7									8									9									10									11								
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11N20/HCH	Keyight Spectrum Analyzer - Sweep SA AL FS AF COBSEC SENSE:INT ALLEN AUTO 68:40:34 PM Aug 12, 2019 Center Freq 2.466000000 GHz PN0: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS Avg/Hold: 100/100 TRACE 1 2 3 4 5 TYPE M W W W W W W DET N B N N N N 10 dB/div Ref 20.00 dBm Mkr2 2.500 000 GHz -60.625 dBm Start 2.43200 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 6.533 ms (2001 pts) <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.483 500 GHz</td><td>-52.054 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.500 000 GHz</td><td>-60.625 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.456 990 GHz</td><td>-4.707 dBm</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> MSG STATUS Frequency Auto Tune Center Freq 2.466000000 GHz Start Freq 2.432000000 GHz Stop Freq 2.500000000 GHz CF Step 6.800000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.483 500 GHz	-52.054 dBm				2	N	1	f	2.500 000 GHz	-60.625 dBm				3									4	N	1	f	2.456 990 GHz	-4.707 dBm				5									6									7									8									9									10									11								
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5.7 RF Conducted Spurious Emissions

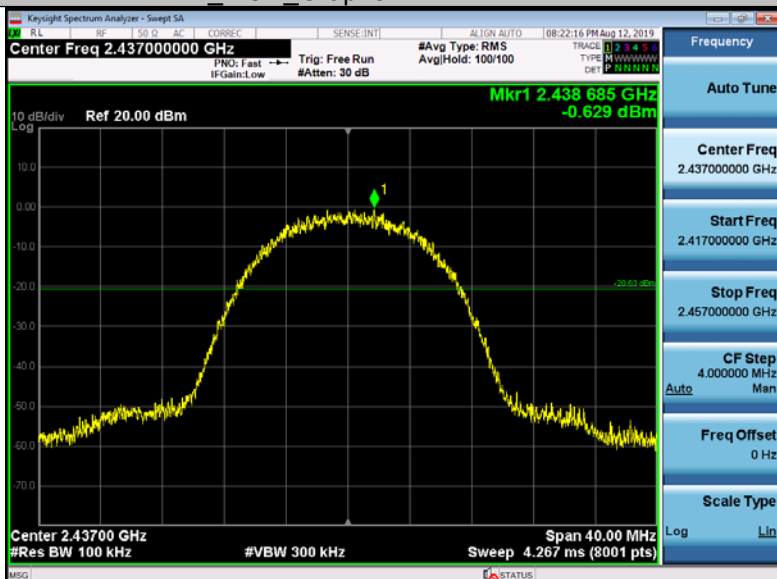
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b; 54Mbps of rate is the worst case of 802.11g; 65Mbps of rate is the worst case of 802.11n(HT20); 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:

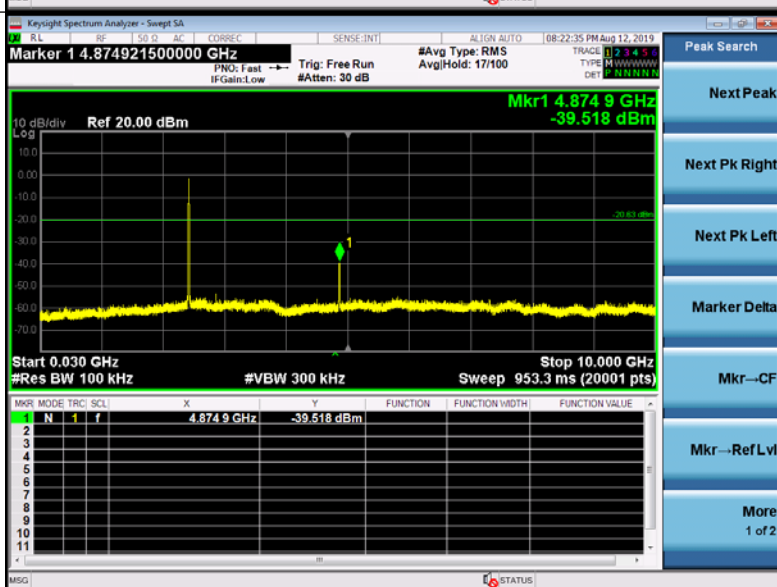


11B_MCH_Graphs

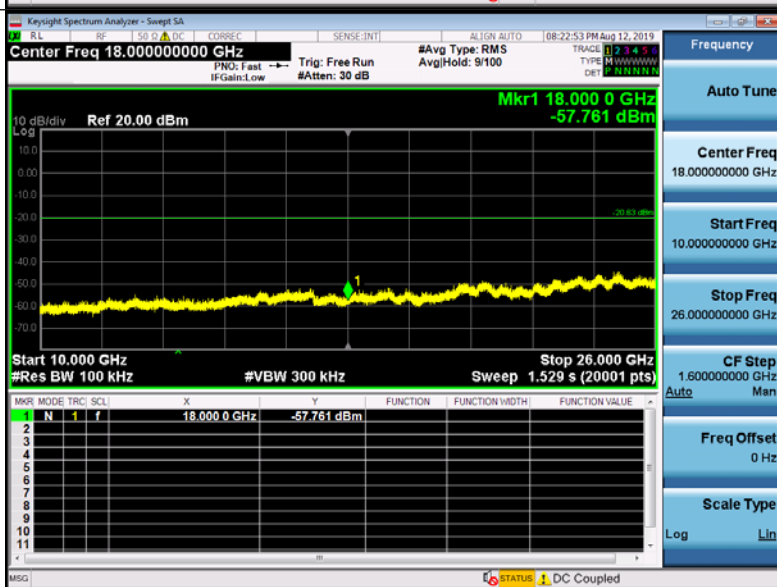
Reference



30MHz-10GHz

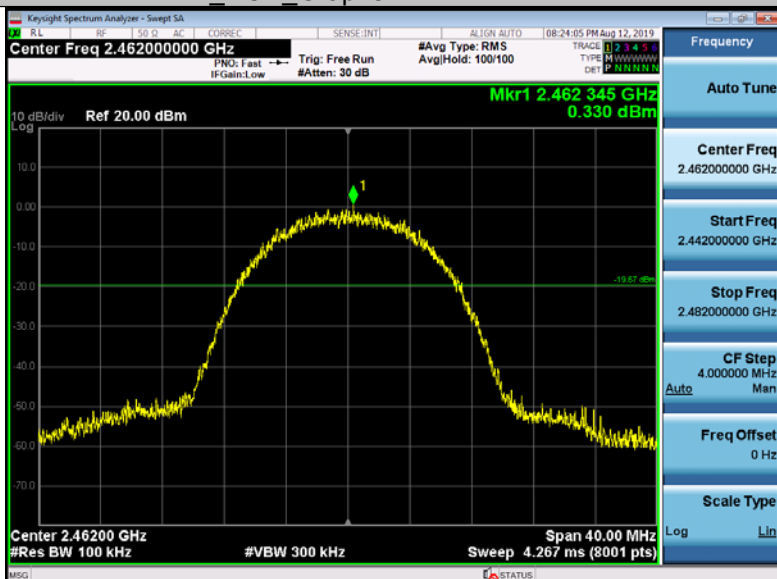


10GHz-26GHz

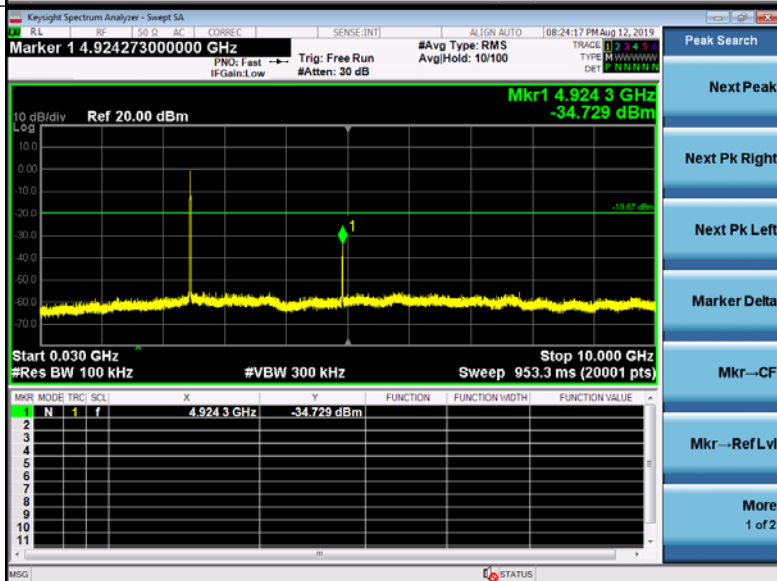


11B_HCH_Graphs

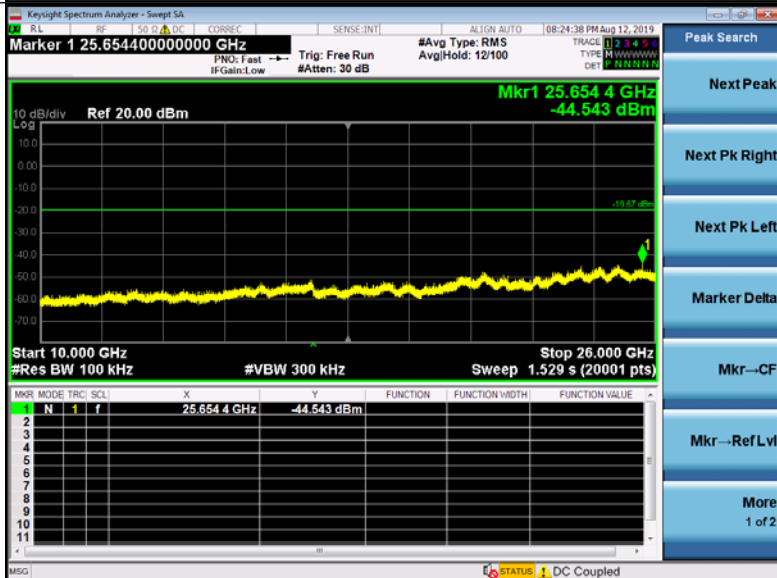
Reference



30MHz-10GHz

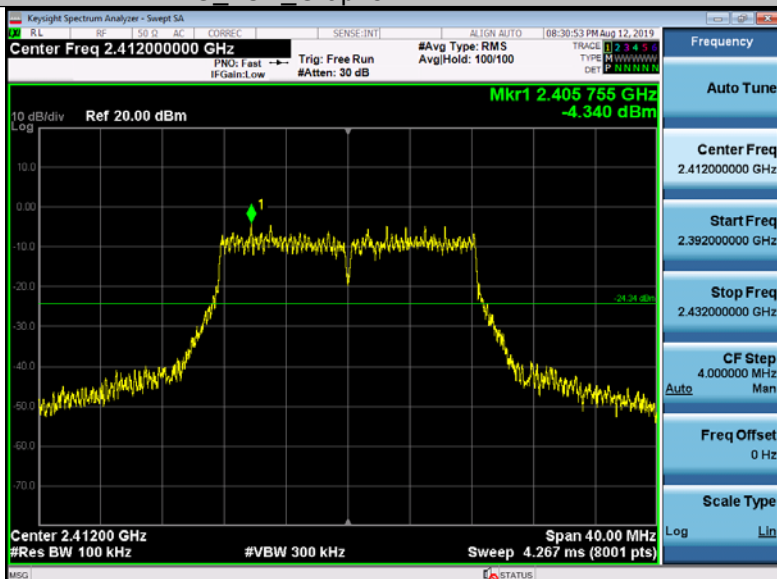


10GHz-26GHz

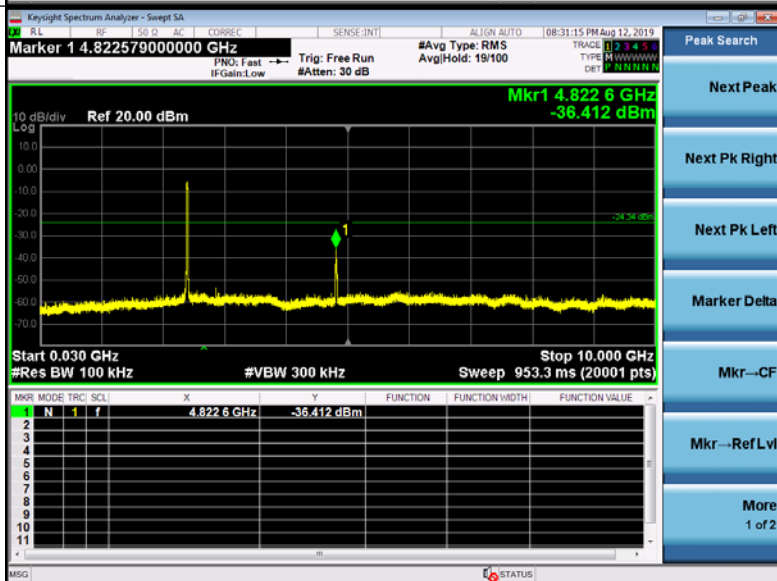


11G_LCH_Graphs

Reference



30MHz-10GHz



10GHz-26GHz

