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Report Template Version: V03

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# Test Report

**Report No. :** CQASZ20190500013EX-01

**Applicant:** SHENZHEN SHINYLOAM ELECTRONICS CO.,LTD

**Address of Applicant:** No.22, Kukeng Dafu industry zone, Kukeng Community, Guanlan Street, Longhua, Shenzhen, China

**Manufacturer:** SHENZHEN SHINYLOAM ELECTRONICS CO.,LTD

**Address of Manufacturer:** No.22, Kukeng Dafu industry zone, Kukeng Community, Guanlan Street, Longhua, Shenzhen, China

**Equipment Under Test (EUT):**

**Product:** Panoramic wireless IP camera

**All Model No.:** SYL-P2, SYL-P1, SYL-D1, SYL-P2, SYL-P3, SYL-P6, SYL-P8, SYL-P9

**Test Model No.:** SYL-P2

**Brand Name:** SHINYLOAM

**FCC ID:** 2ASVY-SYLP2

**Standards:** 47 CFR Part 15, Subpart C

**Date of Test:** 2019-03-19 to 2019-05-29

**Date of Issue:** 2019-05-29

**Test Result :** PASS

**Tested By:**

*Daisy Qin*

(Daisy Qin)

**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.

## 2 Version

### Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20190500013EX-01	Rev.01	Initial report	2019-05-29

### 3 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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## 5 General Information

### 5.1 Client Information

Applicant:	SHENZHEN SHINYLOAM ELECTRONICS CO.,LTD
Address of Applicant:	No.22, Kukeng Dafu industry zone, Kukeng Community, Guanlan Street, Longhua, Shenzhen, China
Manufacturer:	SHENZHEN SHINYLOAM ELECTRONICS CO.,LTD
Address of Manufacturer:	No.22, Kukeng Dafu industry zone, Kukeng Community, Guanlan Street, Longhua, Shenzhen, China

### 5.2 General Description of EUT

Product Name:	Panoramic wireless IP camera
All Model No.:	SYL-P2, SYL-P1, SYL-D1, SYL-P2, SYL-P3, SYL-P6, SYL-P8, SYL-P9
Test Model No.:	SYL-P2
Trade Mark:	SHINYLOAM
Hardware version:	V1.1
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:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Test Software of EUT:	RF test (manufacturer declare )
Antenna Type	IPEX Antenna
Antenna Gain	2.0dBi
Power Supply:	DC 5V from adapter
Adapter Information:	Model: HP-050100A1-3C Input: 100-240V 50/60Hz 0.3A Output: 5V 1000mA

Note:1. Please refer to the instruction manual for details.

2. All model: SYL-P2, SYL-P1, SYL-D1, SYL-P2, SYL-P3, SYL-P6, SYL-P8, SYL-P9, 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, the model SYL-P2 was the worst case model,

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	/	/

Operation Frequency each of channel(802.11n HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
/	/	4	2427MHz	7	2442MHz	/	/
/	/	5	2432MHz	8	2447MHz	/	/
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.

### 5.3 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
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%.

### 5.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
Adapter	/	HP-050100A1-3C	AC/DC	FCC SDOC

### 5.5 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

### 5.6 Test Facility

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

• **CNAS (No. CNAS L5785)**

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of 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

## 5.7 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	$3 \times 10^{-8}$	(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	time	0.6 %.	(1)
14	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.

## 5.8 Deviation from Standards

None.

## 5.9 Abnormalities from Standard Conditions

None.

## 5.10 Other Information Requested by the Customer

None.

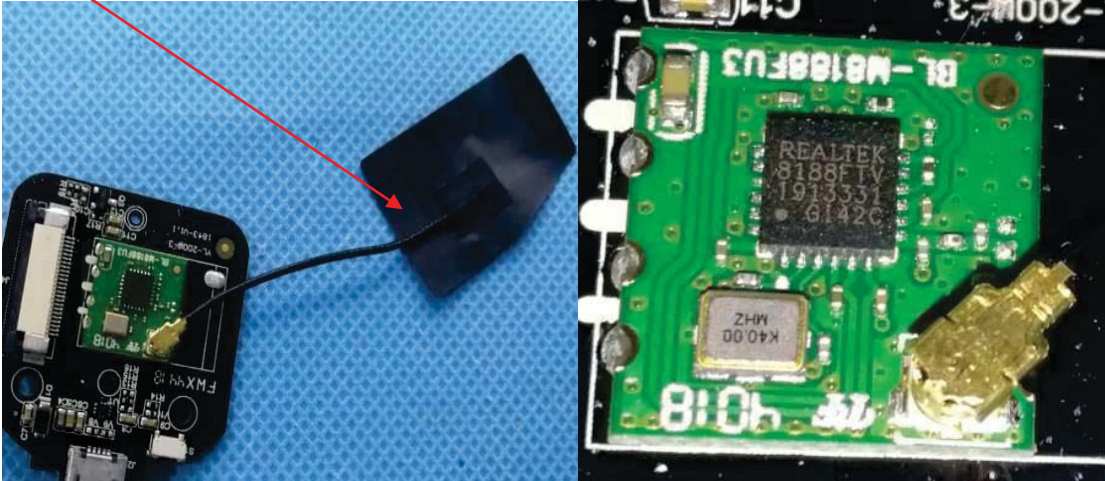


## 5.11 Equipment List

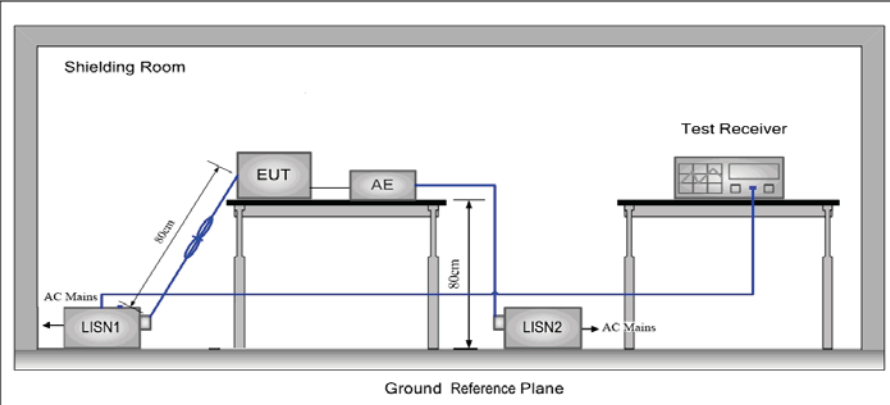
Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2018/9/26	2019/9/25
Spectrum analyzer	R&S	FSU26	CQA-038	2018/10/28	2018/10/27
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/9/26	2019/9/25
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	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
Spectrum analyzer	Agilent	E4440A	CQA-103	2018/10/28	2019/10/27
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

## 6 Test results and Measurement Data

### 6.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
<p>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.</p> <p>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.</p>	
EUT Antenna:	<p>ipex Antenna</p> 
The antenna is ipex antenna. The best case gain of the antenna is 2.0dBi.	

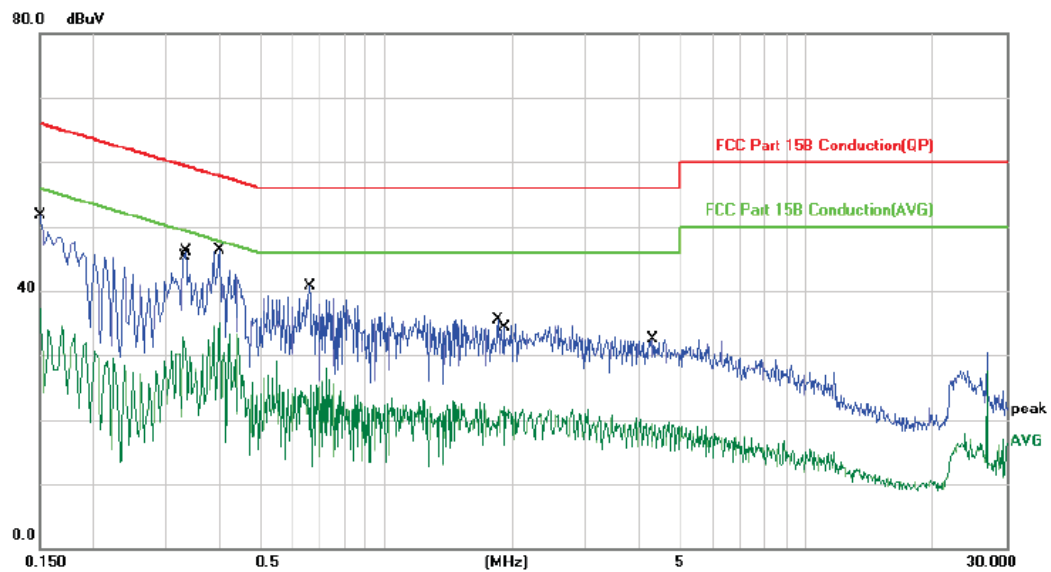
## 6.2 Conducted Emissions

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:	<ol style="list-style-type: none"> <li>1) The mains terminal disturbance voltage test was conducted in a shielded room.</li> <li>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a <math>50\Omega/50\mu\text{H} + 5\Omega</math> 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.</li> <li>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,</li> <li>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.</li> <li>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.</li> </ol>		
Test Setup:			
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.		

Final Test Mode:	Through Pre-scan, find the 6Mbps of rate of 802.11g at highest channel is the worst case. Only the worst case is recorded in the report.
Test Voltage:	AC120V/60Hz
Test Results:	Pass

## Measurement Data

Live Line:

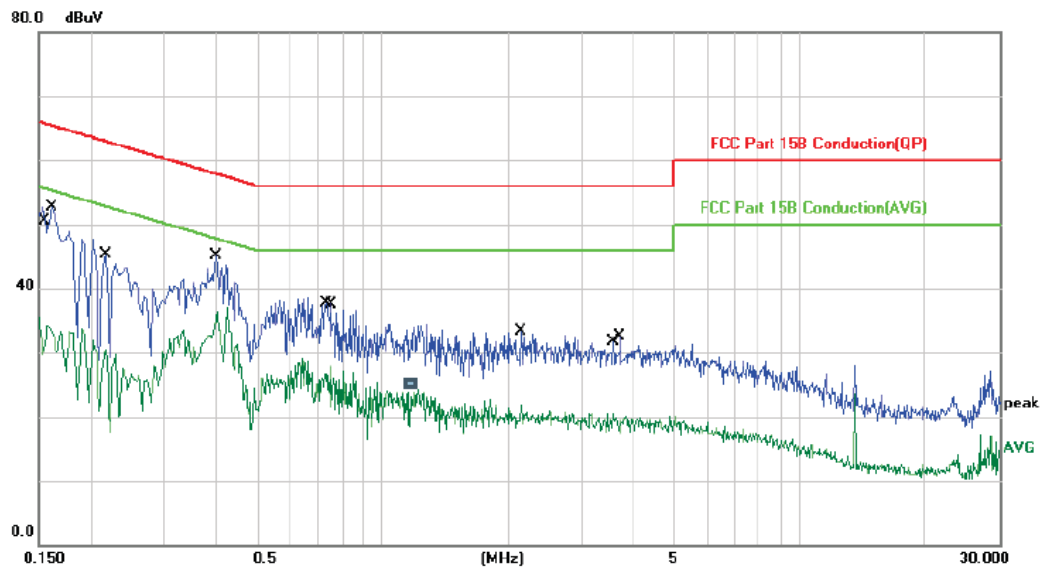


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	51.62	0.17	51.79	65.99	-14.20	QP	
2		0.1500	37.23	0.17	37.40	55.99	-18.59	AVG	
3		0.3300	32.61	0.32	32.93	49.45	-16.52	AVG	
4		0.3339	45.81	0.32	46.13	59.35	-13.22	QP	
5	*	0.4020	46.03	0.32	46.35	57.81	-11.46	QP	
6		0.4020	34.85	0.32	35.17	47.81	-12.64	AVG	
7		0.6580	40.44	0.33	40.77	56.00	-15.23	QP	
8		0.6620	24.99	0.33	25.32	46.00	-20.68	AVG	
9		1.8580	35.37	0.18	35.55	56.00	-20.45	QP	
10		1.8820	21.28	0.17	21.45	46.00	-24.55	AVG	
11		4.2780	19.36	-0.03	19.33	46.00	-26.67	AVG	
12		4.3340	32.56	-0.02	32.54	56.00	-23.46	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:

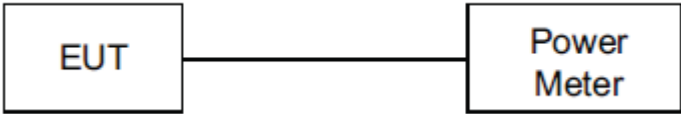


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1580	33.97	0.18	34.15	55.56	-21.41	AVG	
2	0.1620	52.51	0.18	52.69	65.36	-12.67	QP	
3	0.2180	45.17	0.20	45.37	62.89	-17.52	QP	
4	0.2180	30.30	0.20	30.50	52.89	-22.39	AVG	
5	0.3980	44.83	0.32	45.15	57.89	-12.74	QP	
6 *	0.4020	36.06	0.32	36.38	47.81	-11.43	AVG	
7	0.7340	37.34	0.33	37.67	56.00	-18.33	QP	
8	0.7539	27.61	0.32	27.93	46.00	-18.07	AVG	
9	2.1540	33.16	0.15	33.31	56.00	-22.69	QP	
10	2.1540	21.84	0.15	21.99	46.00	-24.01	AVG	
11	3.5780	20.50	-0.05	20.45	46.00	-25.55	AVG	
12	3.7020	32.53	-0.06	32.47	56.00	-23.53	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.

### 6.3 Conducted Peak & Average Output Power

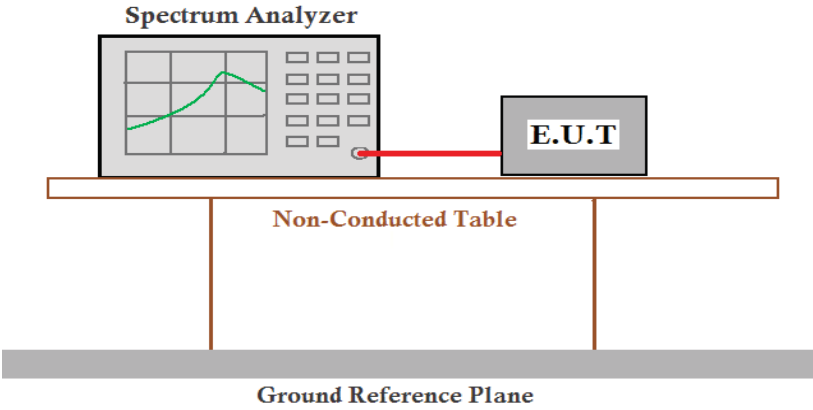
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 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

Type	Test channel	Peak Output Power (dBm)	Average Output Power dBm)	Limit (dBm)	Result
802.11b	Lowest	15.514	12.501	30.00	Pass
	Middle	15.425	12.407		
	Highest	15.987	12.698		
802.11g	Lowest	16.466	9.039	30.00	Pass
	Middle	16.173	8.799		
	Highest	16.625	9.249		
802.11n(HT20)	Lowest	15.903	8.552	30.00	Pass
	Middle	15.172	7.948		
	Highest	14.993	7.782		
802.11n(HT40)	Lowest	15.379	8.010	30.00	Pass
	Middle	15.410	8.050		
	Highest	15.052	7.725		

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

## 6.4 6dB Occupy Bandwidth

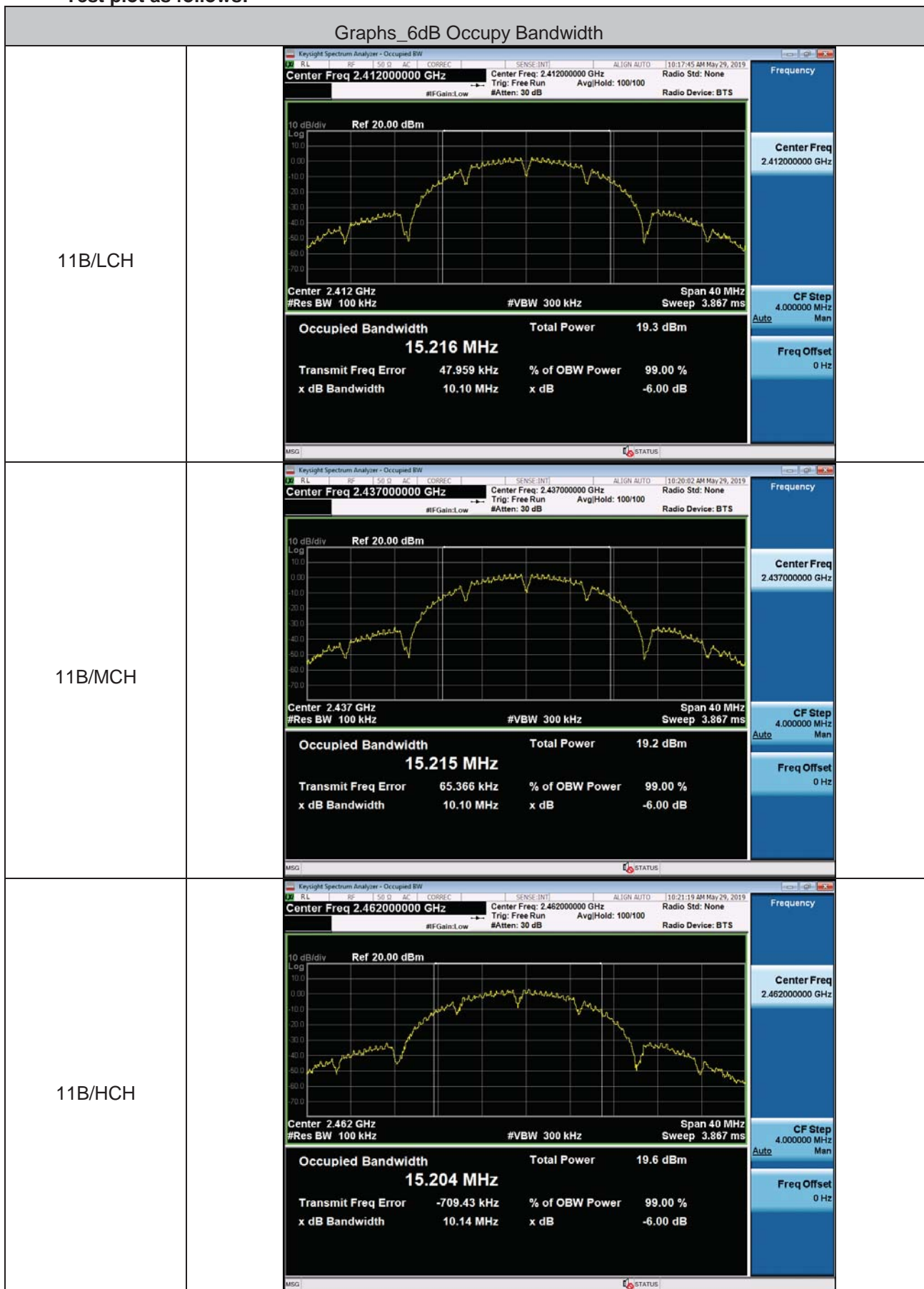
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p>Offset=cable loss+ attenuation factor</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 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:	$\geq 500$ kHz
Test Results:	Pass

### Measurement Data

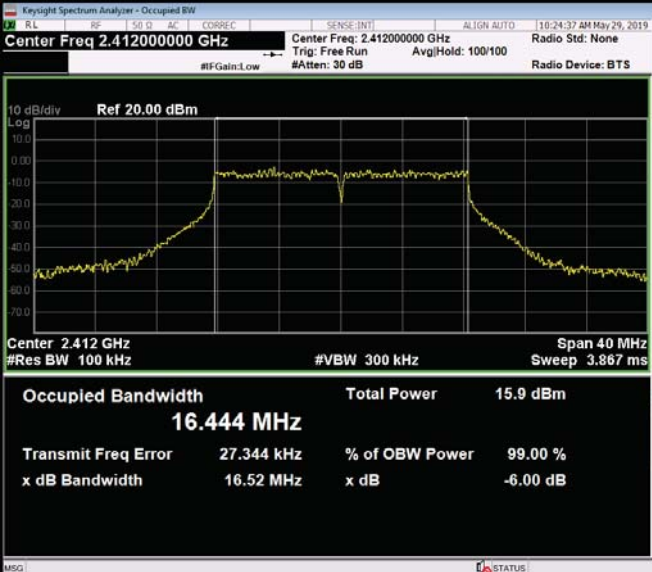
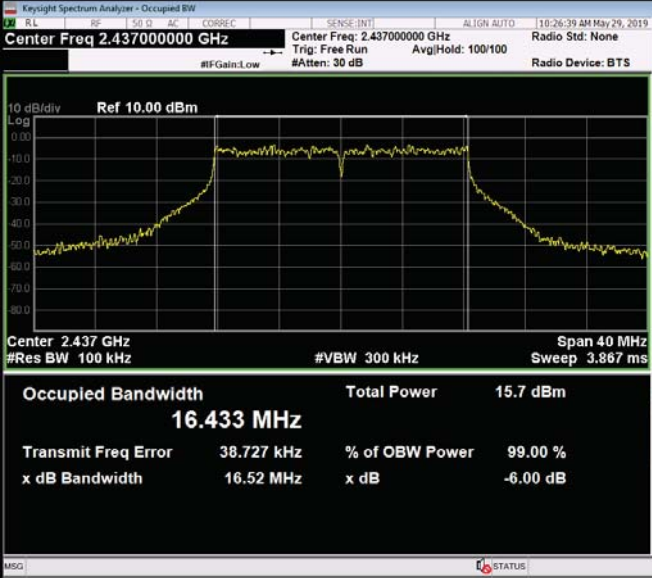
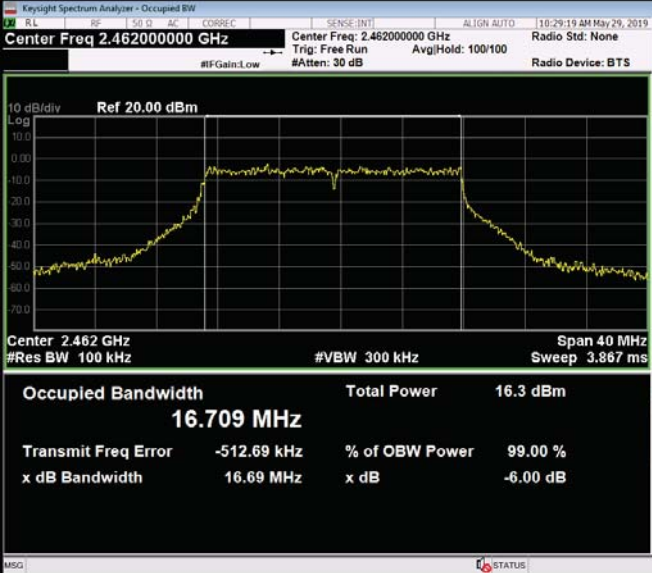
Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11b	Lowest	10.103	$\geq 500$	Pass
	Middle	10.100		
	Highest	10.137		
802.11g	Lowest	16.515	$\geq 500$	Pass
	Middle	16.520		
	Highest	14.813		
802.11n(HT20)	Lowest	16.69	$\geq 500$	Pass
	Middle	17.817		
	Highest	17.843		
802.11n(HT40)	Lowest	17.827	$\geq 500$	Pass
	Middle	36.494		
	Highest	36.501		

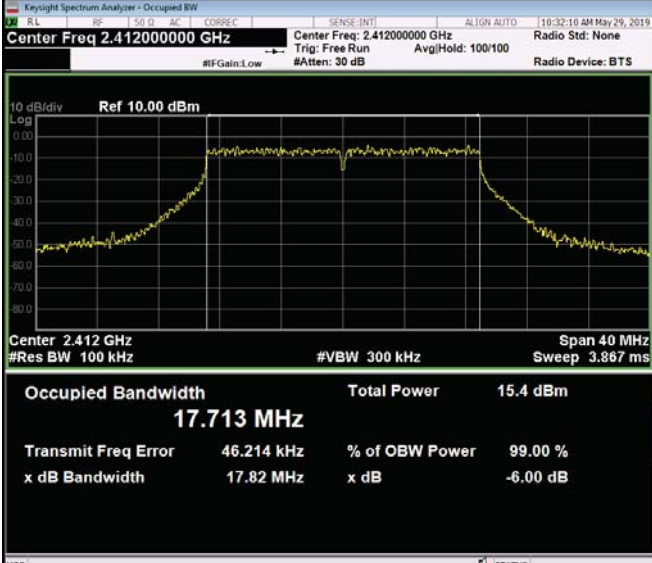
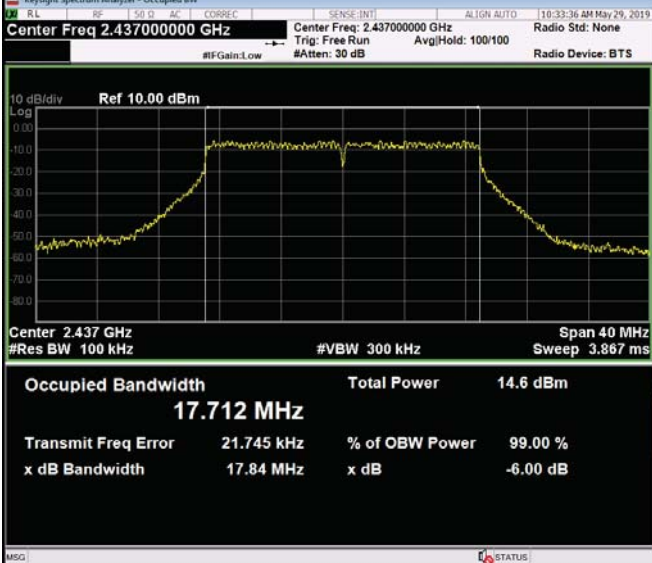
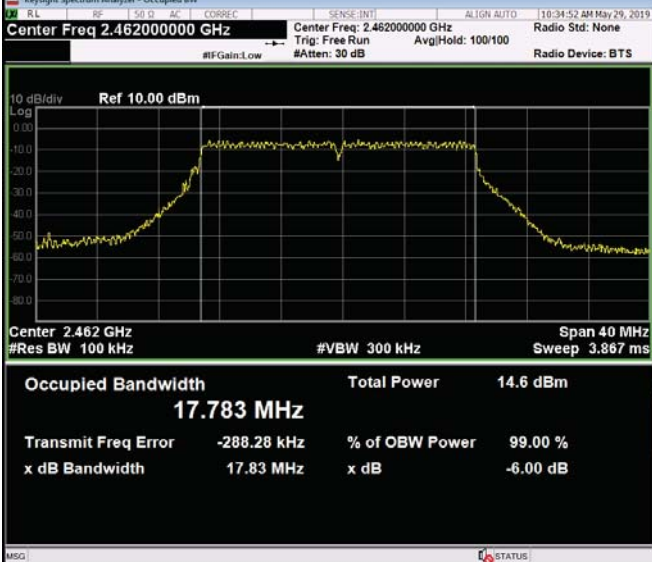


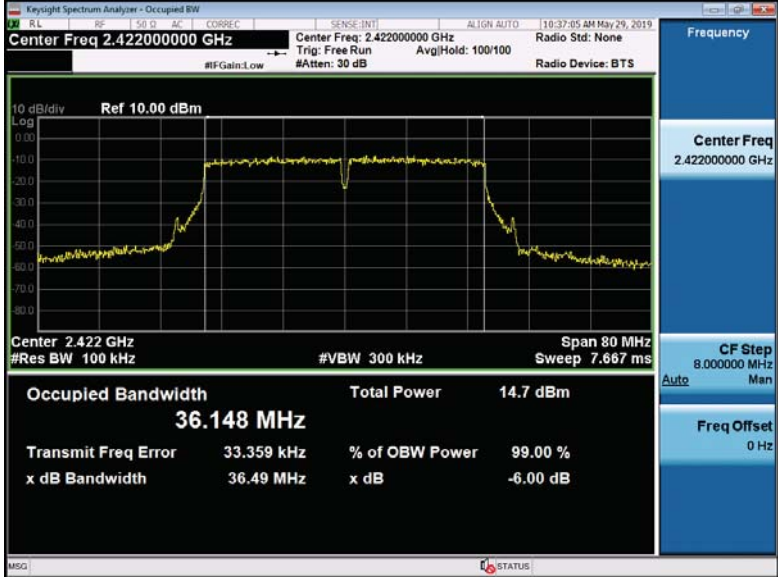
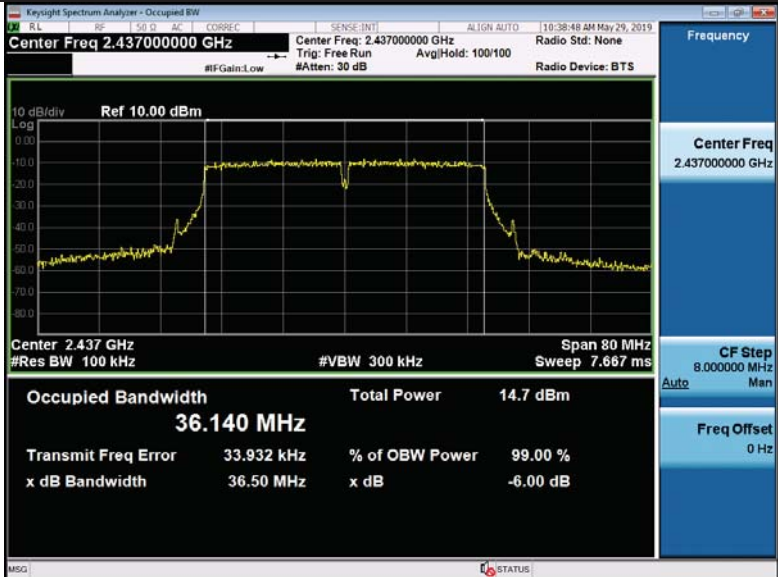
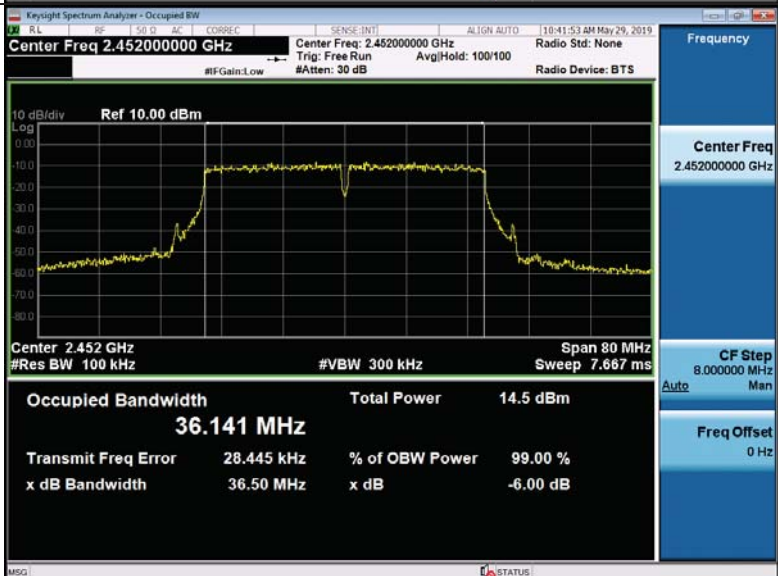
Test plot as follows:



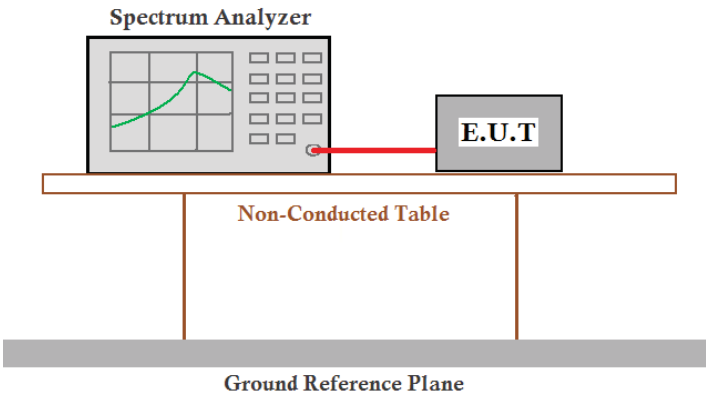


11G/LCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.412000000 GHz</p> <p>Center Freq: 2.412000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div</p> <p>Ref 20.00 dBm</p> <p>Center 2.412 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 3.867 ms</p> <p>Occupied Bandwidth 16.444 MHz</p> <p>Total Power 15.9 dBm</p> <p>Transmit Freq Error 27.344 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 16.52 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.412000000 GHz</p> <p>CF Step 4.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>
11G/MCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.437000000 GHz</p> <p>Center Freq: 2.437000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div</p> <p>Ref 10.00 dBm</p> <p>Center 2.437 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 3.867 ms</p> <p>Occupied Bandwidth 16.433 MHz</p> <p>Total Power 15.7 dBm</p> <p>Transmit Freq Error 38.727 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 16.52 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.437000000 GHz</p> <p>CF Step 4.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>
11G/HCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.462000000 GHz</p> <p>Center Freq: 2.462000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div</p> <p>Ref 20.00 dBm</p> <p>Center 2.462 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 3.867 ms</p> <p>Occupied Bandwidth 16.709 MHz</p> <p>Total Power 16.3 dBm</p> <p>Transmit Freq Error -512.69 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 16.69 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.462000000 GHz</p> <p>CF Step 4.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>

11N20/LCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.412000000 GHz</p> <p>Center Freq: 2.412000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div</p> <p>Ref 10.00 dBm</p> <p>Center 2.412 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 3.867 ms</p> <p>Occupied Bandwidth 17.713 MHz</p> <p>Total Power 15.4 dBm</p> <p>Transmit Freq Error 46.214 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 17.82 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.412000000 GHz</p> <p>CF Step 4.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>
11N20/MCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.437000000 GHz</p> <p>Center Freq: 2.437000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div</p> <p>Ref 10.00 dBm</p> <p>Center 2.437 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 3.867 ms</p> <p>Occupied Bandwidth 17.712 MHz</p> <p>Total Power 14.6 dBm</p> <p>Transmit Freq Error 21.745 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 17.84 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.437000000 GHz</p> <p>CF Step 4.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>
11N20/HCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.462000000 GHz</p> <p>Center Freq: 2.462000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>10 dB/div</p> <p>Ref 10.00 dBm</p> <p>Center 2.462 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 3.867 ms</p> <p>Occupied Bandwidth 17.783 MHz</p> <p>Total Power 14.6 dBm</p> <p>Transmit Freq Error -288.28 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 17.83 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.462000000 GHz</p> <p>CF Step 4.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>

11N40/LCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.42200000 GHz</p> <p>Center Freq: 2.42200000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref 10.00 dBm</p> <p>Center 2.422 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 80 MHz</p> <p>Sweep 7.667 ms</p> <p>Occupied Bandwidth 36.148 MHz</p> <p>Total Power 14.7 dBm</p> <p>Transmit Freq Error 33.359 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 36.49 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.42200000 GHz</p> <p>CF Step 8.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>
11N40/MCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.43700000 GHz</p> <p>Center Freq: 2.43700000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref 10.00 dBm</p> <p>Center 2.437 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 80 MHz</p> <p>Sweep 7.667 ms</p> <p>Occupied Bandwidth 36.140 MHz</p> <p>Total Power 14.7 dBm</p> <p>Transmit Freq Error 33.932 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 36.50 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.43700000 GHz</p> <p>CF Step 8.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>
11N40/HCH	 <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.45200000 GHz</p> <p>Center Freq: 2.45200000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref 10.00 dBm</p> <p>Center 2.452 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 80 MHz</p> <p>Sweep 7.667 ms</p> <p>Occupied Bandwidth 36.141 MHz</p> <p>Total Power 14.5 dBm</p> <p>Transmit Freq Error 28.445 kHz</p> <p>% of OBW Power 99.00 %</p> <p>x dB Bandwidth 36.50 MHz</p> <p>x dB -6.00 dB</p> <p>Frequency</p> <p>Center Freq 2.45200000 GHz</p> <p>CF Step 8.000000 MHz</p> <p>Auto Man</p> <p>Freq Offset 0 Hz</p>

## 6.5 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p>Offset=cable loss+ attenuation factor</p>
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
02.11	Lowest	-17.712	8	Pass
	Middle	-17.711		
	Highest	-12.614		
802.11 g	Lowest	-18.225	8	Pass
	Middle	-18.333		
	Highest	-16.722		
802.11n(HT20)	Lowest	-17.194	8	Pass
	Middle	-18.968		
	Highest	-17.887		
802.11n(HT40)	Lowest	-21.312	8	Pass
	Middle	-21.034		
	Highest	-21.512		

Test plot as follows:



Graphs

11B/LCH

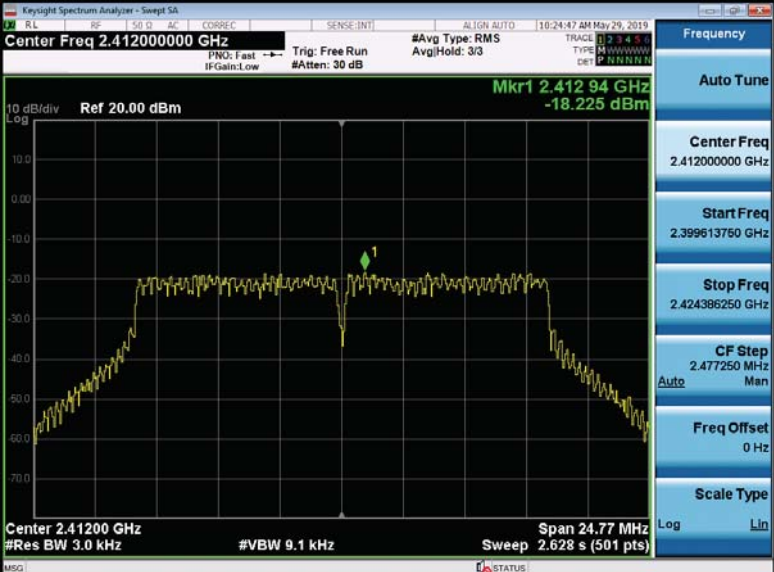
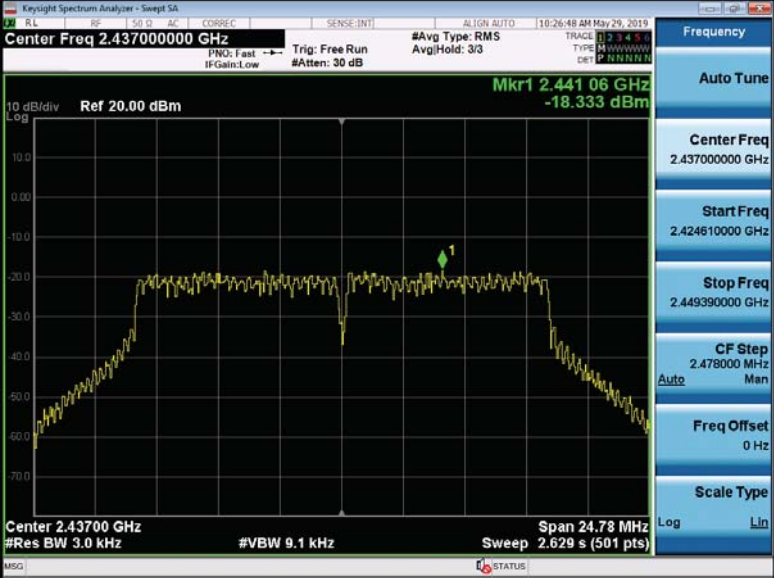



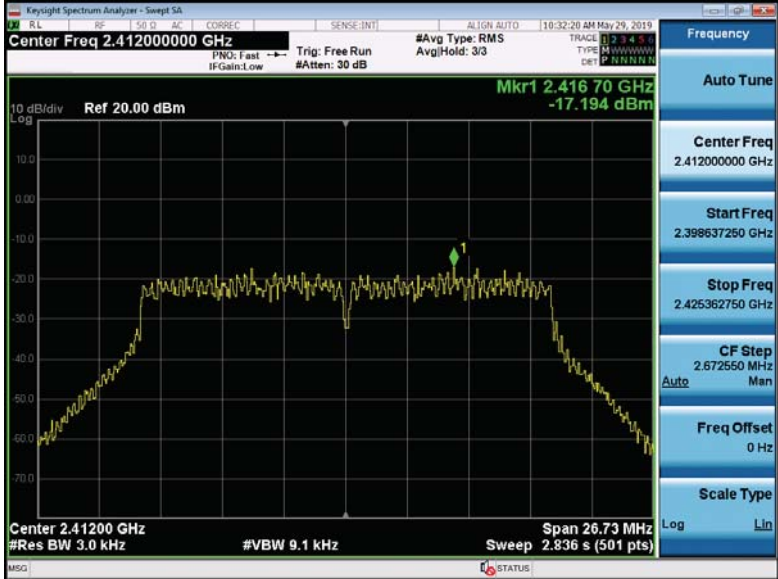
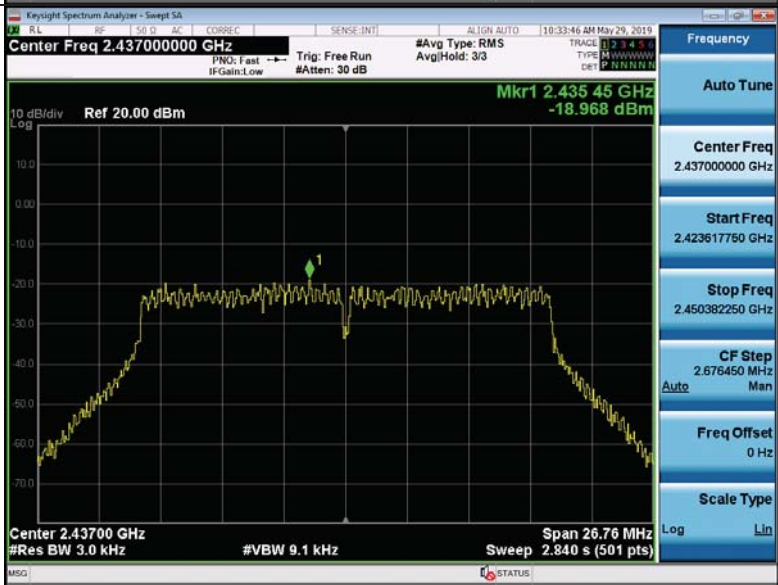
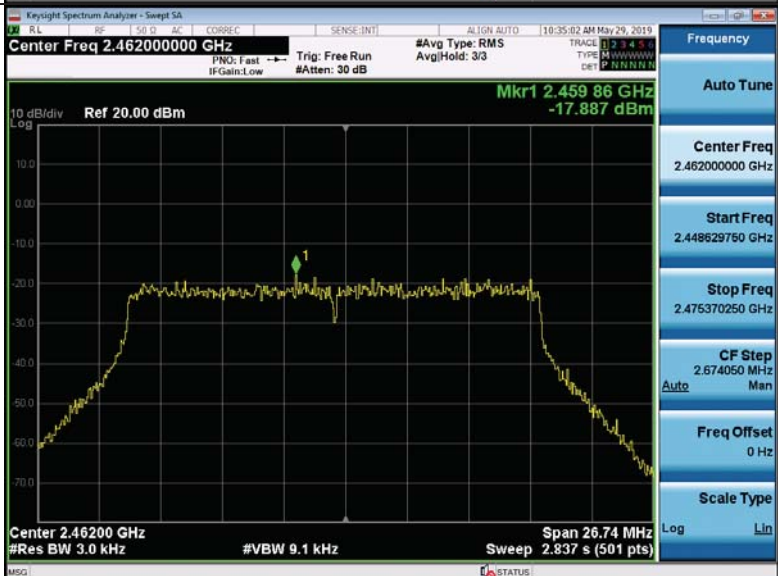
11B/MCH


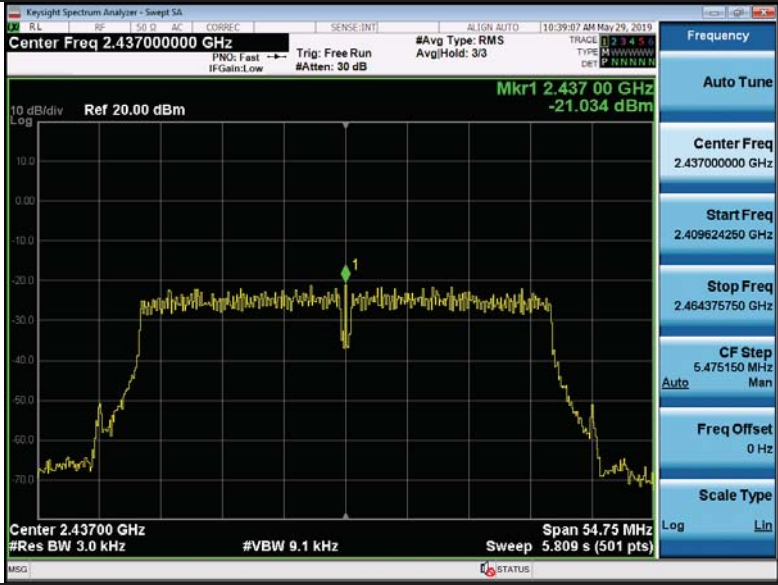



11B/HCH



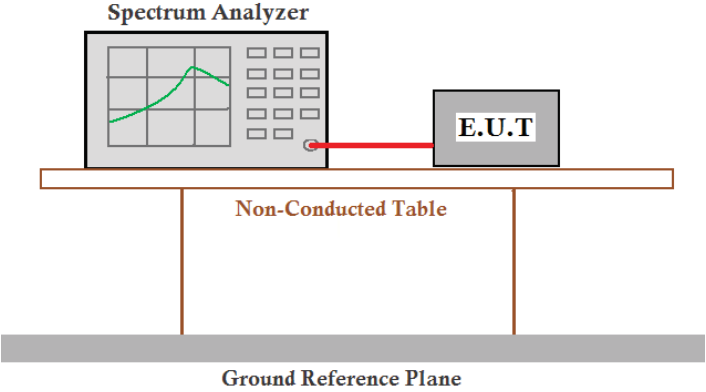
11G/LCH	 <p>KeySight Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.41200000 GHz</p> <p>Mkr1 2.412 94 GHz -18.225 dBm</p> <p>Center 2.41200 GHz</p> <p>#Res BW 9.1 kHz</p> <p>Span 24.77 MHz</p> <p>Sweep 2.628 s (501 pts)</p>
11G/MCH	 <p>KeySight Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.43700000 GHz</p> <p>Mkr1 2.441 06 GHz -18.333 dBm</p> <p>Center 2.43700 GHz</p> <p>#Res BW 9.1 kHz</p> <p>Span 24.78 MHz</p> <p>Sweep 2.629 s (501 pts)</p>
11G/HCH	 <p>KeySight Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.46200000 GHz</p> <p>Mkr1 2.464 75 GHz -16.722 dBm</p> <p>Center 2.46200 GHz</p> <p>#Res BW 9.1 kHz</p> <p>Span 25.04 MHz</p> <p>Sweep 2.656 s (501 pts)</p>

11N20/LCH	 <p>Key parameters for 11N20/LCH:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.41200000 GHz</li> <li>Start Freq: 2.398637250 GHz</li> <li>Stop Freq: 2.426362750 GHz</li> <li>CF Step: 2.672550 MHz</li> <li>Freq Offset: 0 Hz</li> <li>Scale Type: Log</li> <li>Center Freq (Marker): 2.41670 GHz</li> <li>Power (Marker): -17.194 dBm</li> <li>Span: 26.73 MHz</li> <li>Res BW: 3.0 kHz</li> <li>VBW: 9.1 kHz</li> <li>Sweep: 2.836 s (501 pts)</li> </ul>
11N20/MCH	 <p>Key parameters for 11N20/MCH:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.43700000 GHz</li> <li>Start Freq: 2.423617750 GHz</li> <li>Stop Freq: 2.450382250 GHz</li> <li>CF Step: 2.676450 MHz</li> <li>Freq Offset: 0 Hz</li> <li>Scale Type: Log</li> <li>Center Freq (Marker): 2.43545 GHz</li> <li>Power (Marker): -18.968 dBm</li> <li>Span: 26.76 MHz</li> <li>Res BW: 3.0 kHz</li> <li>VBW: 9.1 kHz</li> <li>Sweep: 2.840 s (501 pts)</li> </ul>
11N20/HCH	 <p>Key parameters for 11N20/HCH:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.46200000 GHz</li> <li>Start Freq: 2.448629750 GHz</li> <li>Stop Freq: 2.475370250 GHz</li> <li>CF Step: 2.674050 MHz</li> <li>Freq Offset: 0 Hz</li> <li>Scale Type: Log</li> <li>Center Freq (Marker): 2.45986 GHz</li> <li>Power (Marker): -17.887 dBm</li> <li>Span: 26.74 MHz</li> <li>Res BW: 3.0 kHz</li> <li>VBW: 9.1 kHz</li> <li>Sweep: 2.837 s (501 pts)</li> </ul>

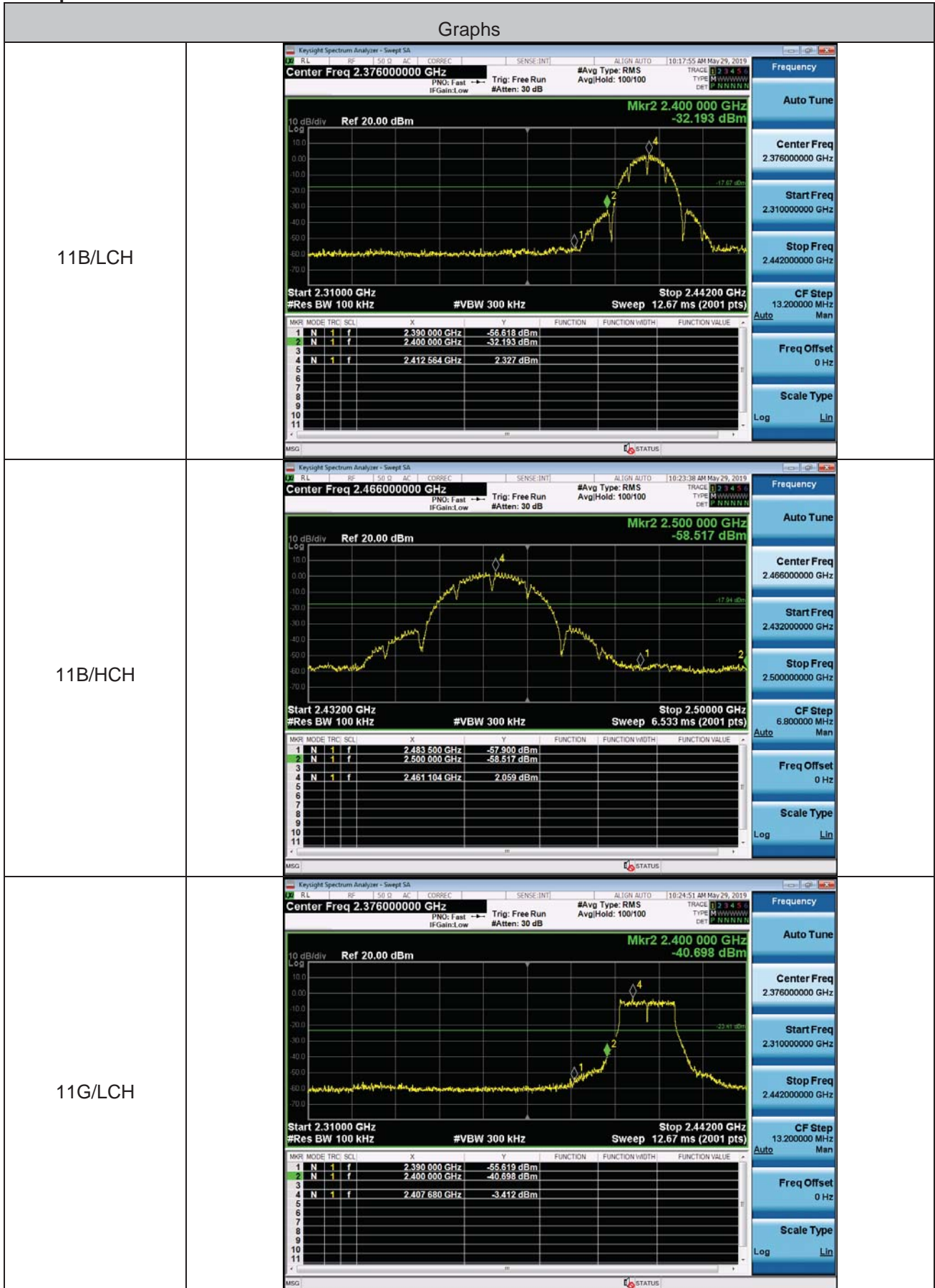
11N40/LCH	 <p>KeySight Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.42200000 GHz</p> <p>Mkr1 2.418 93 GHz -21.312 dBm</p> <p>Center 2.42200 GHz</p> <p>#Res BW 3.0 kHz</p> <p>#VBW 9.1 kHz</p> <p>Span 54.74 MHz</p> <p>Sweep 5.808 s (501 pts)</p>
11N40/MCH	 <p>KeySight Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.43700000 GHz</p> <p>Mkr1 2.437 00 GHz -21.034 dBm</p> <p>Center 2.43700 GHz</p> <p>#Res BW 3.0 kHz</p> <p>#VBW 9.1 kHz</p> <p>Span 54.75 MHz</p> <p>Sweep 5.809 s (501 pts)</p>
11N40/HCH	 <p>KeySight Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.45200000 GHz</p> <p>Mkr1 2.455 18 GHz -21.512 dBm</p> <p>Center 2.45200 GHz</p> <p>#Res BW 3.0 kHz</p> <p>#VBW 9.1 kHz</p> <p>Span 54.76 MHz</p> <p>Sweep 5.810 s (501 pts)</p>



## 6.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p>Offset=cable loss+ attenuation factor</p>
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

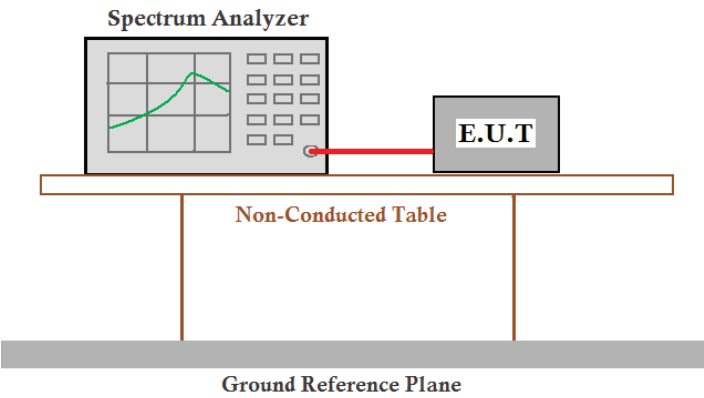
Test plot as follows:



11G/HCH	<div><div><div>Keysight Spectrum Analyzer - Sweep SA</div><div>Center Freq 2.466000000 GHz</div><div>Ref 20.00 dBm</div><div>10 dB/div</div><div>LOG</div><div>Mkr2 2.500 000 GHz -60.490 dBm</div><div>Start 2.43200 GHz #Res BW 100 kHz</div><div>Stop 2.50000 GHz #VBW 300 kHz Sweep 6.533 ms (2001 pts)</div><div><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>-57.448 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>-60.490 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>2.462 906 GHz</td><td>-3.299 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></div><div><div>Frequency</div><div>Auto Tune</div><div>Center Freq 2.466000000 GHz</div><div>Start Freq 2.432000000 GHz</div><div>Stop Freq 2.500000000 GHz</div><div>CF Step 6.8000000 MHz Man</div><div>Auto</div><div>Freq Offset 0 Hz</div><div>Scale Type Log Lin</div></div></div></div>	Mkr	Mode	Trc	Scl	X	Y	Function	Function Width	Function Value	1	N	1	f	2.483 500 GHz	-57.448 dBm				2	N	1	f	2.500 000 GHz	-60.490 dBm				3									4	N	1	f	2.462 906 GHz	-3.299 dBm				5									6									7									8									9									10									11								
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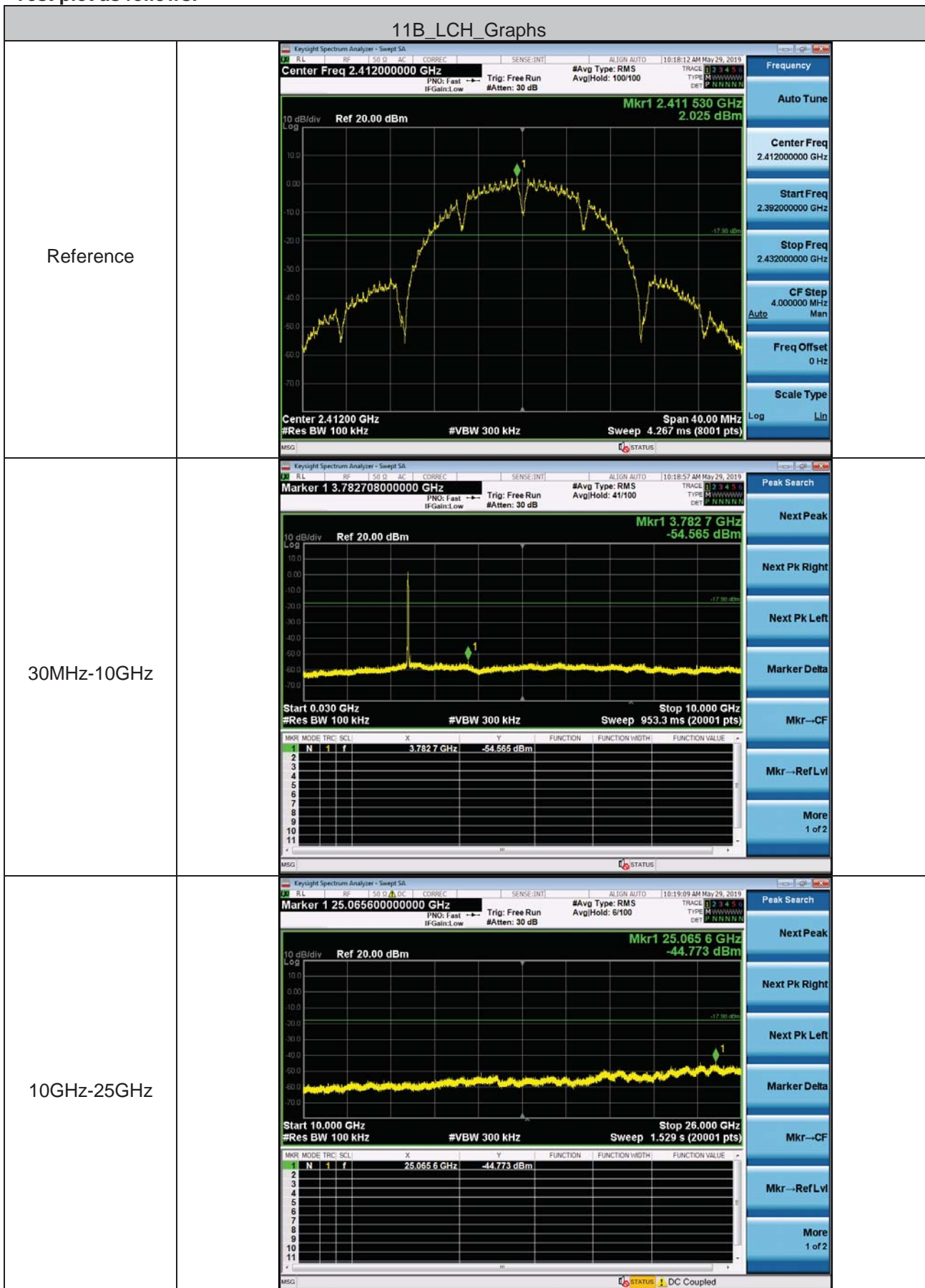


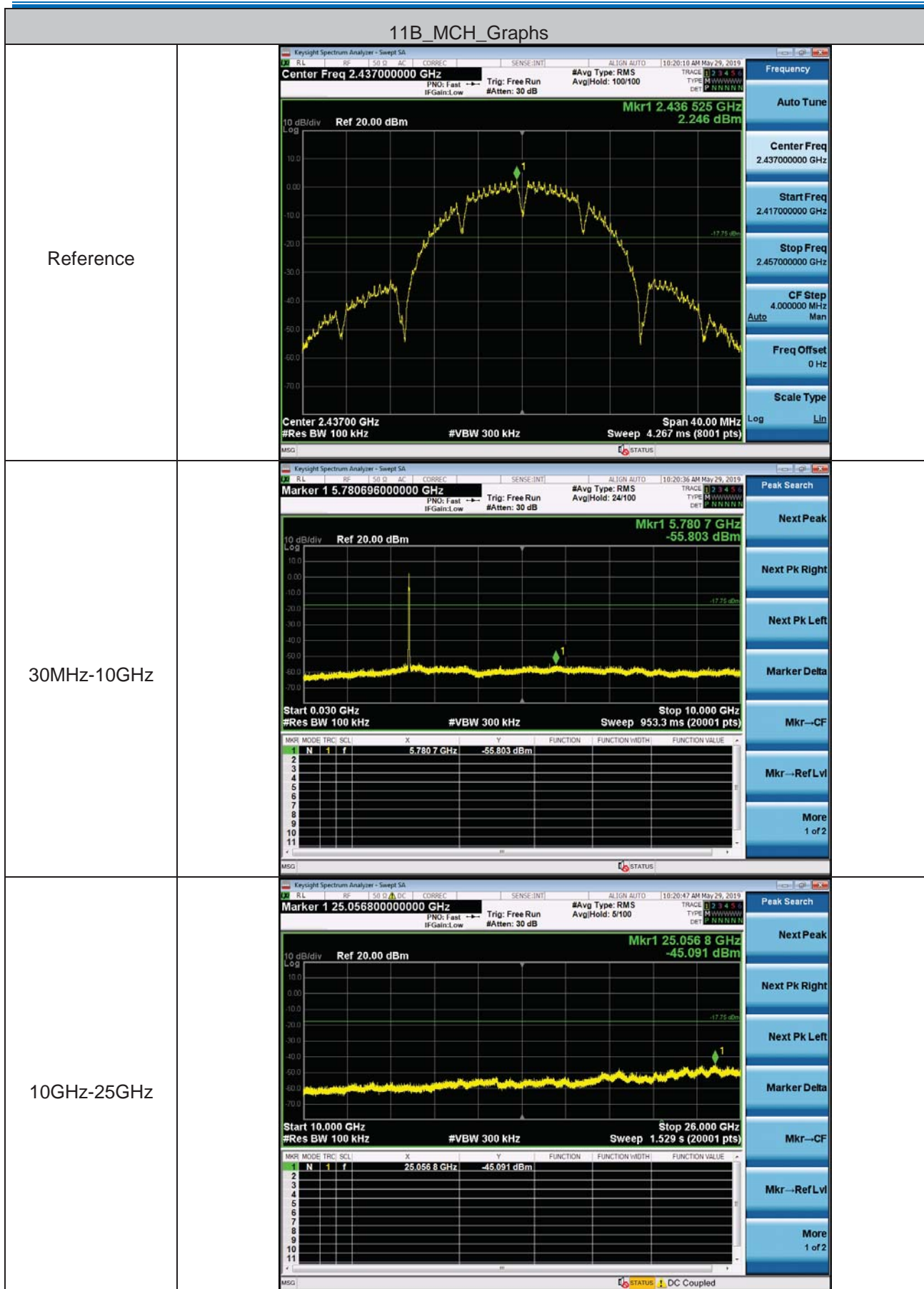
## 6.7 RF Conducted Spurious Emissions

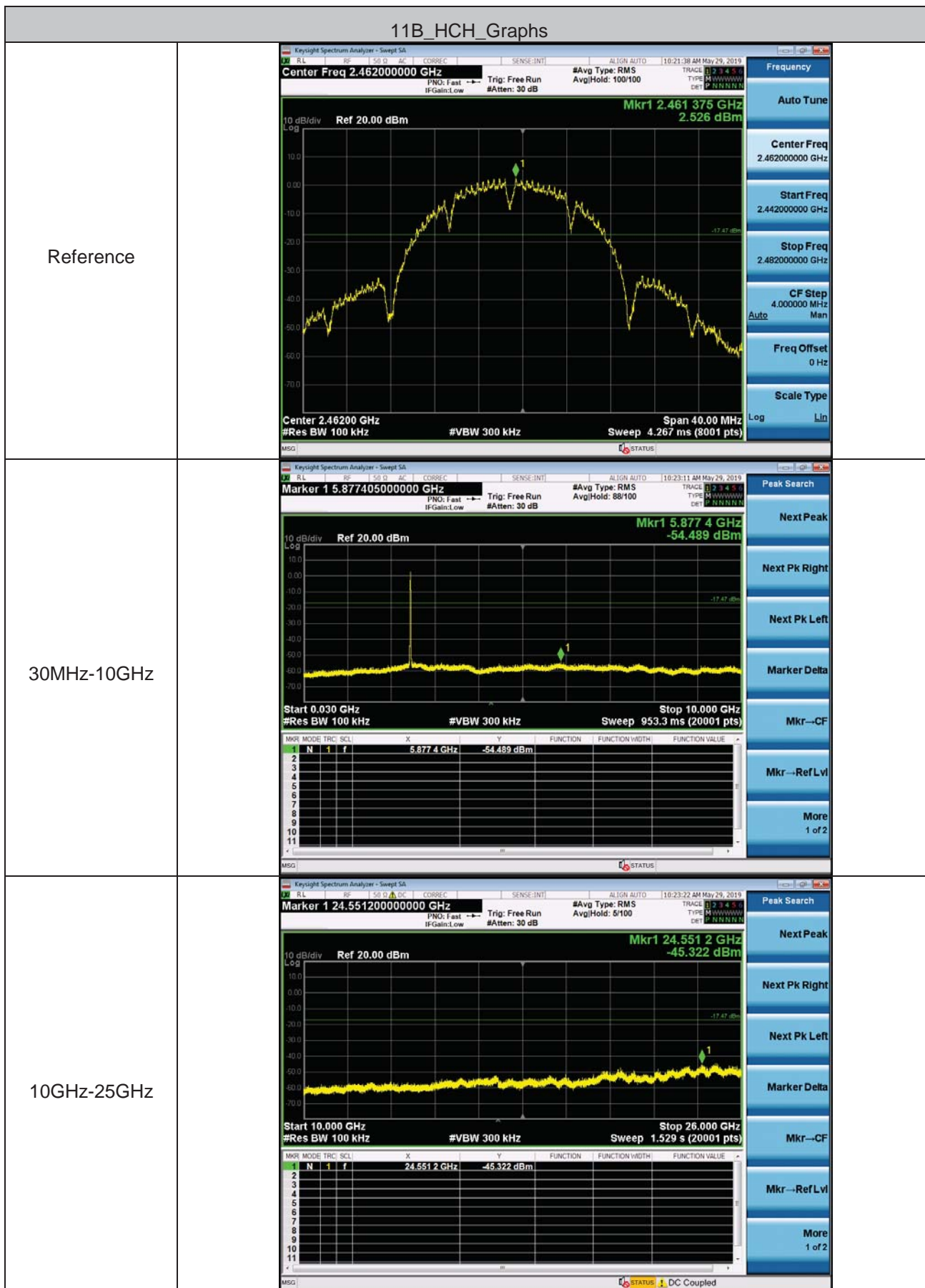
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p>Offset=cable loss+ attenuation factor</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 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



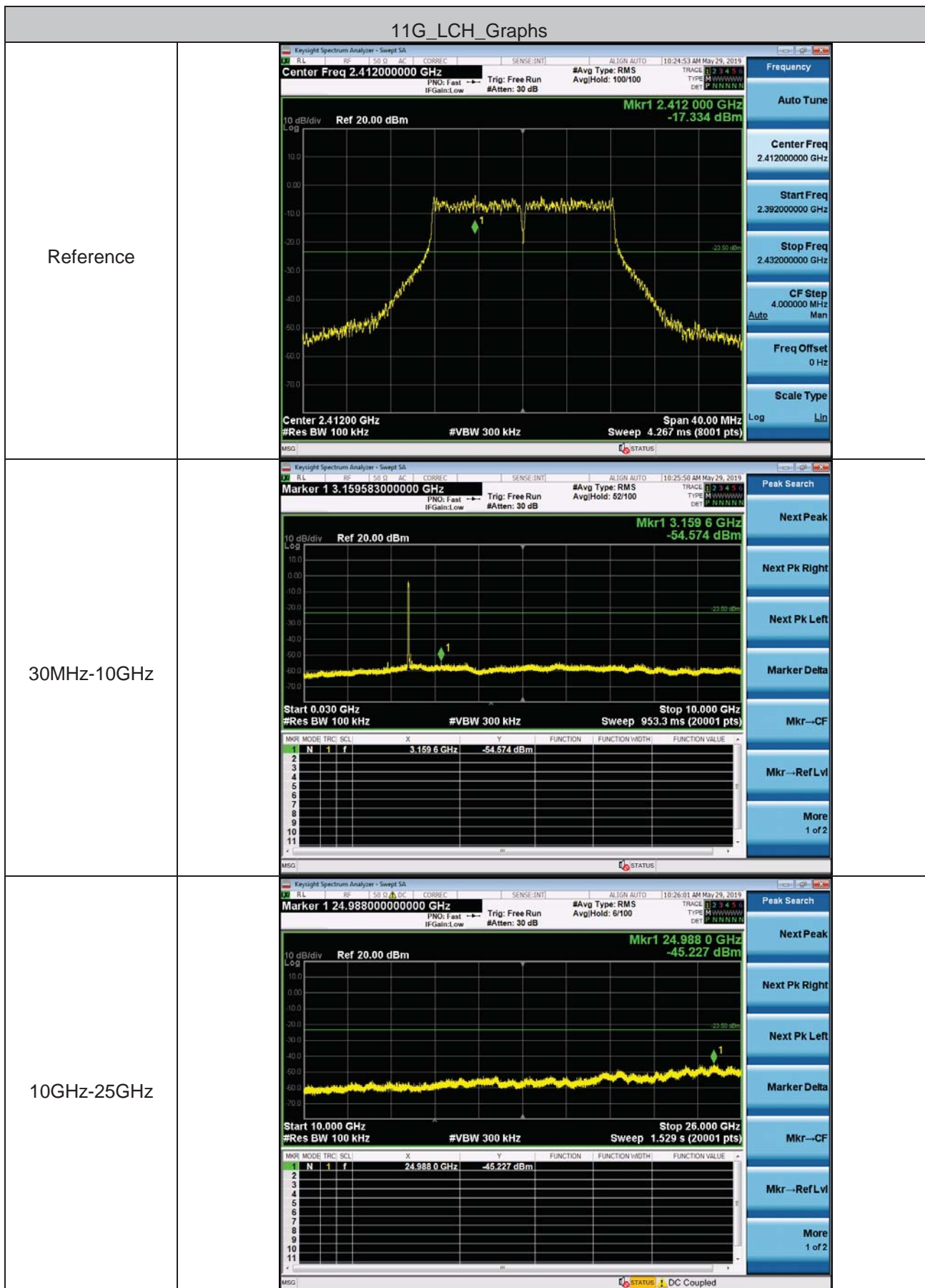
Test plot as follows:

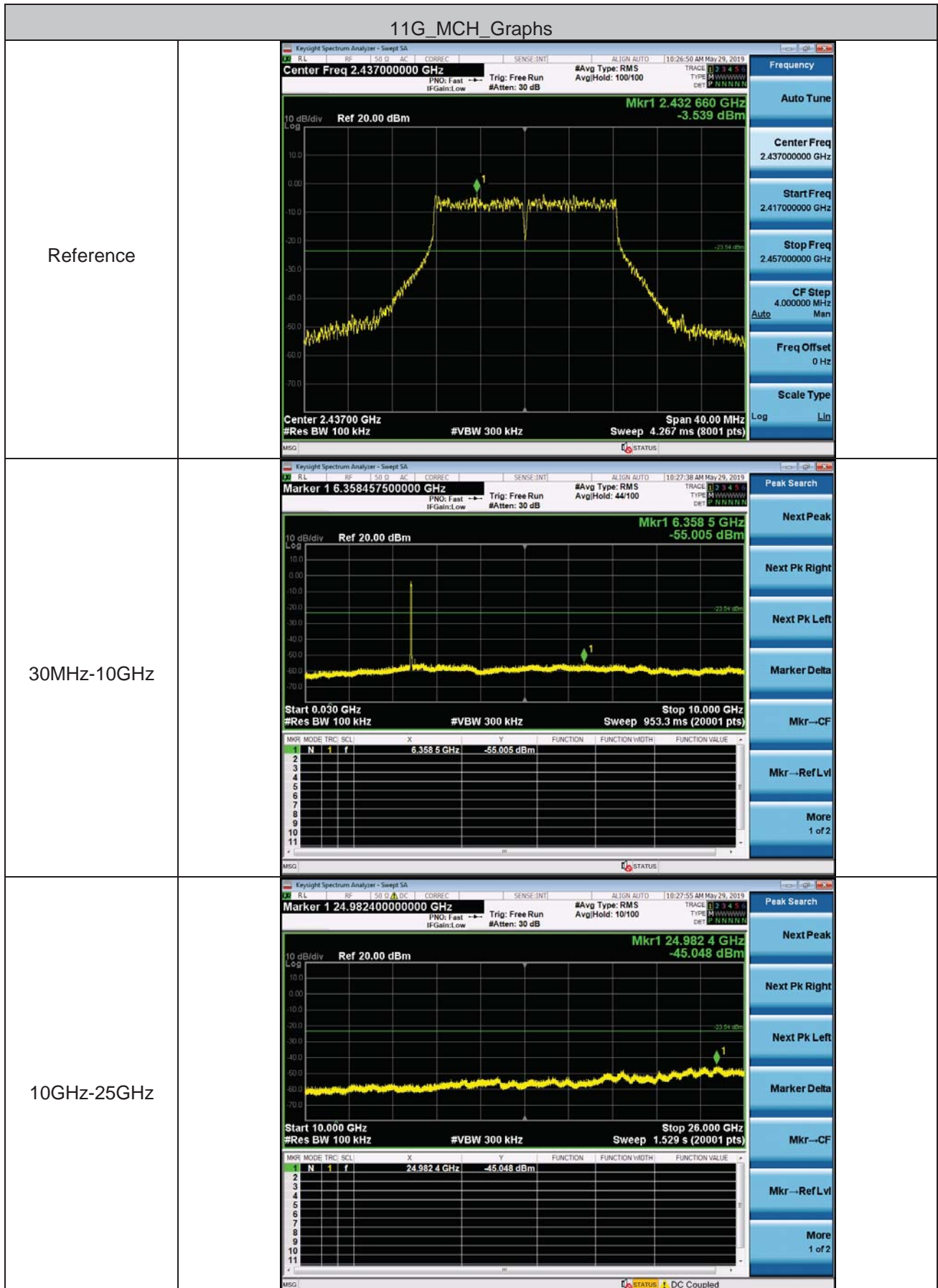


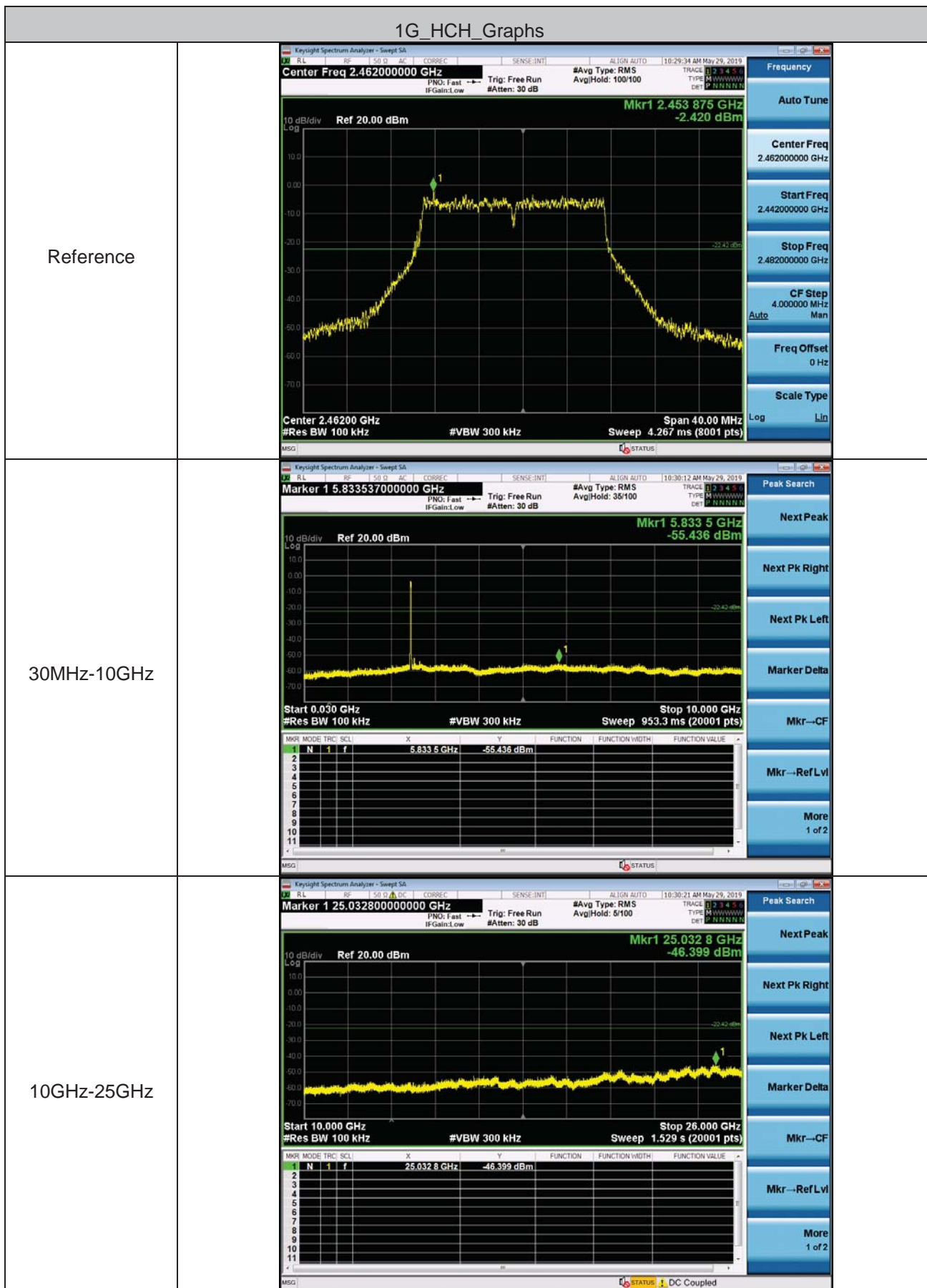




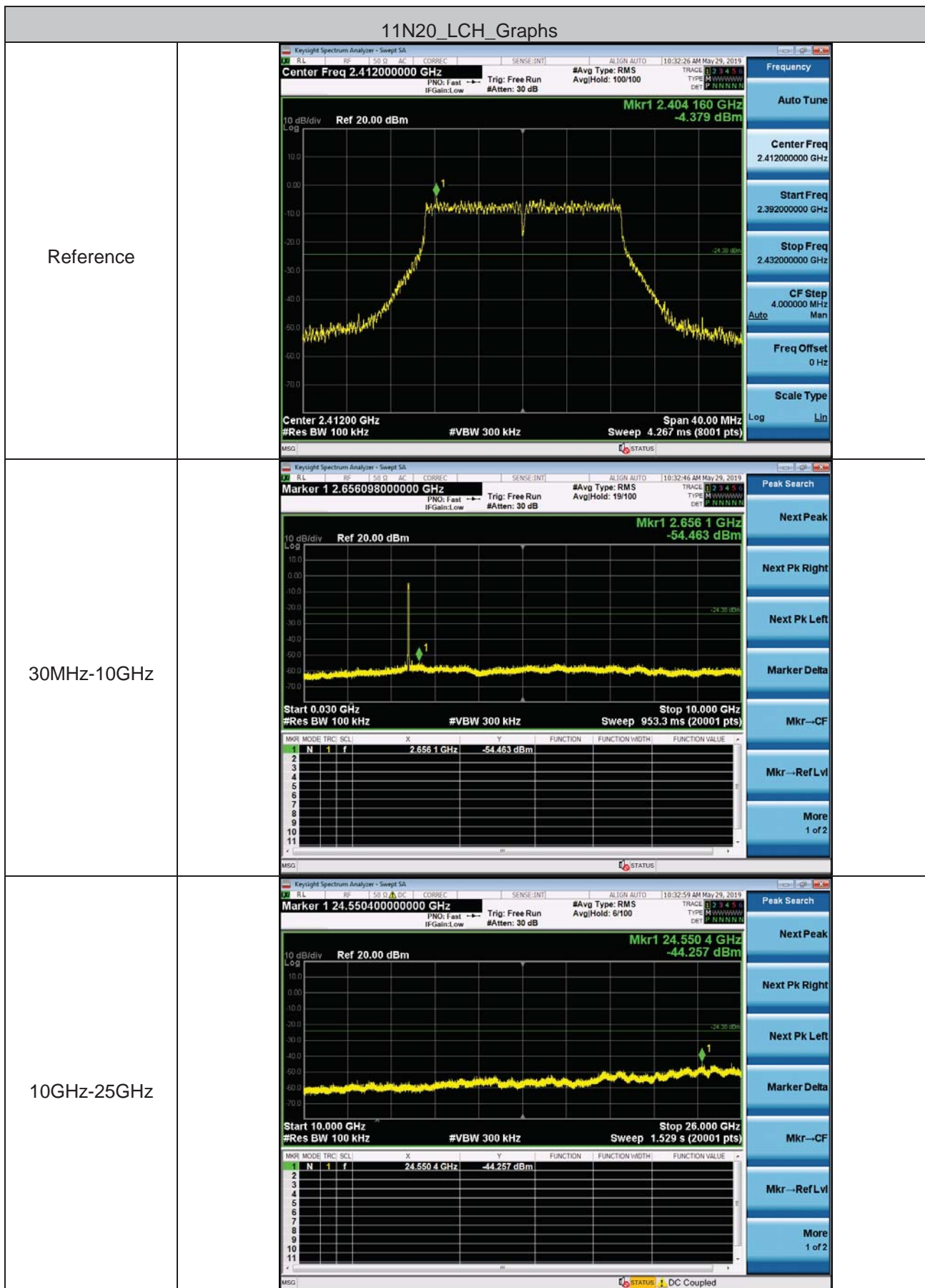


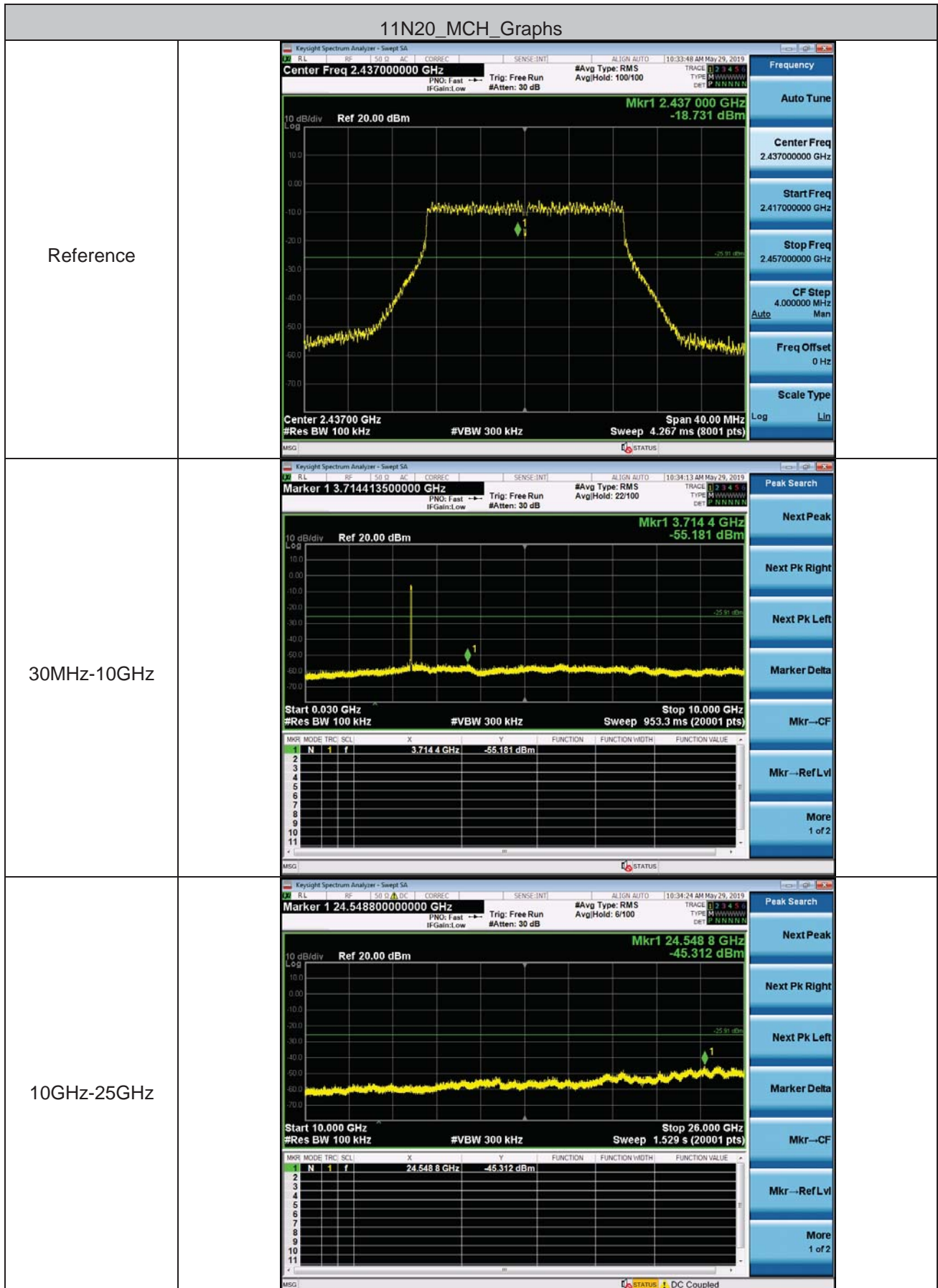


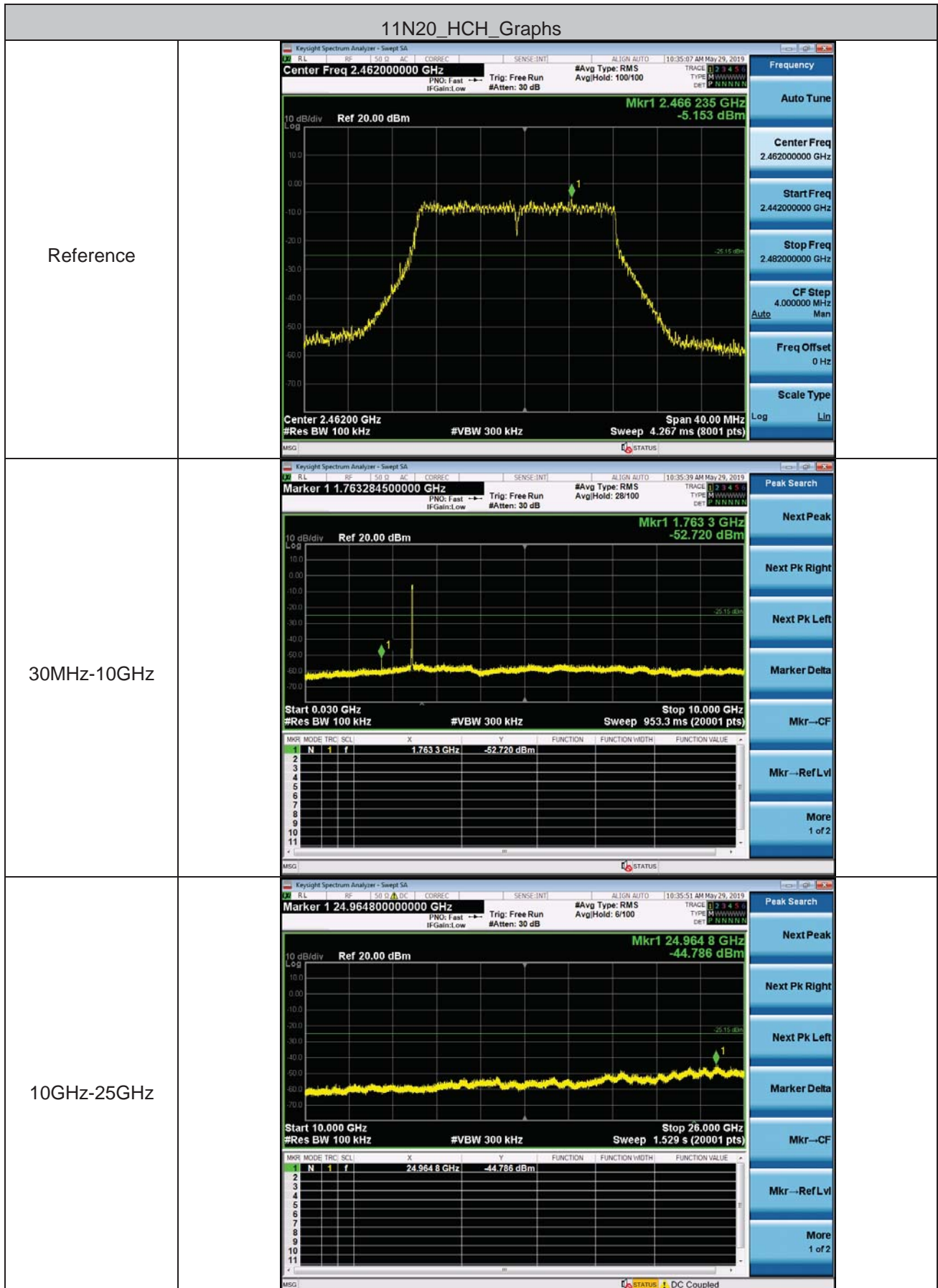




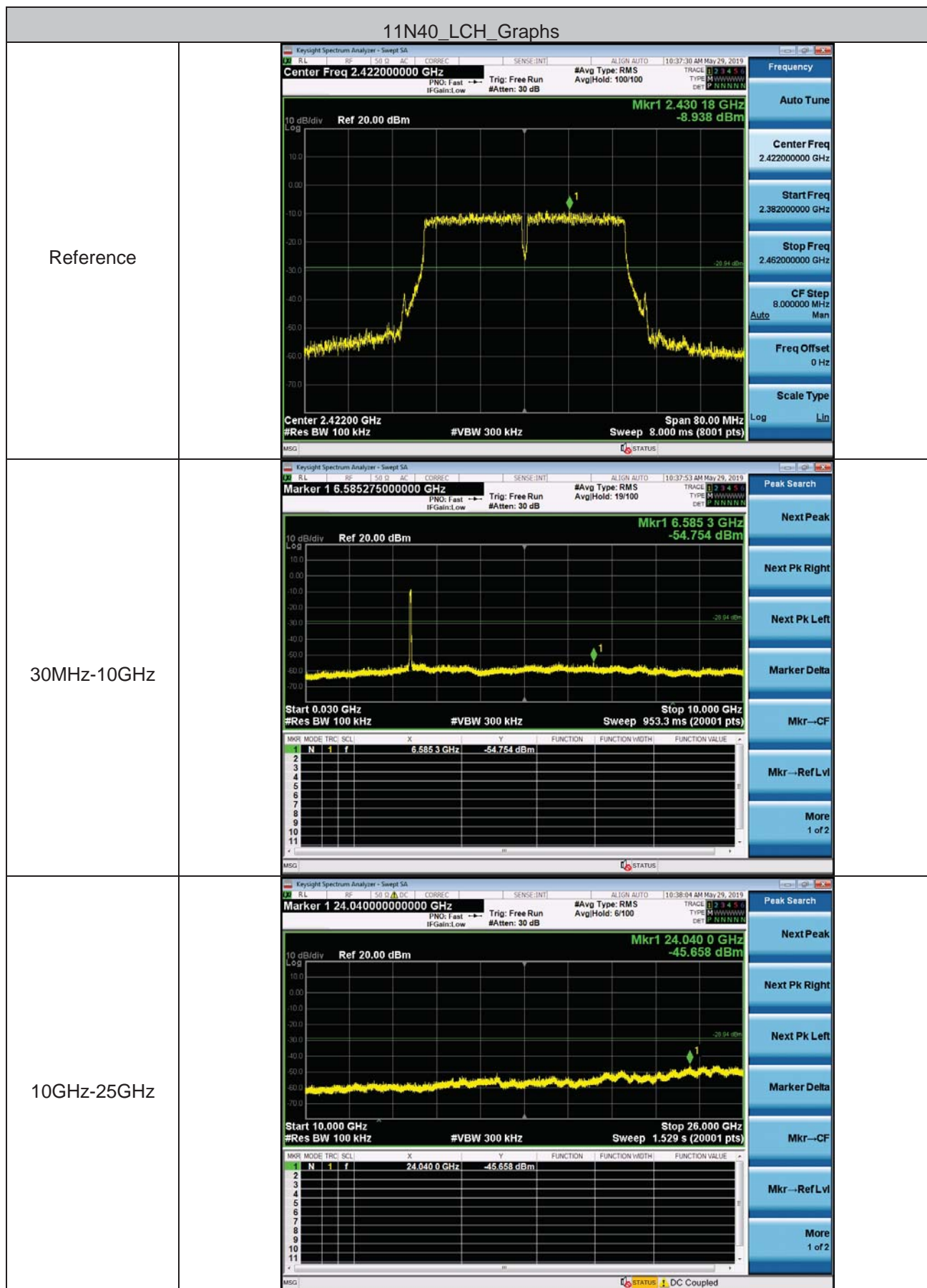


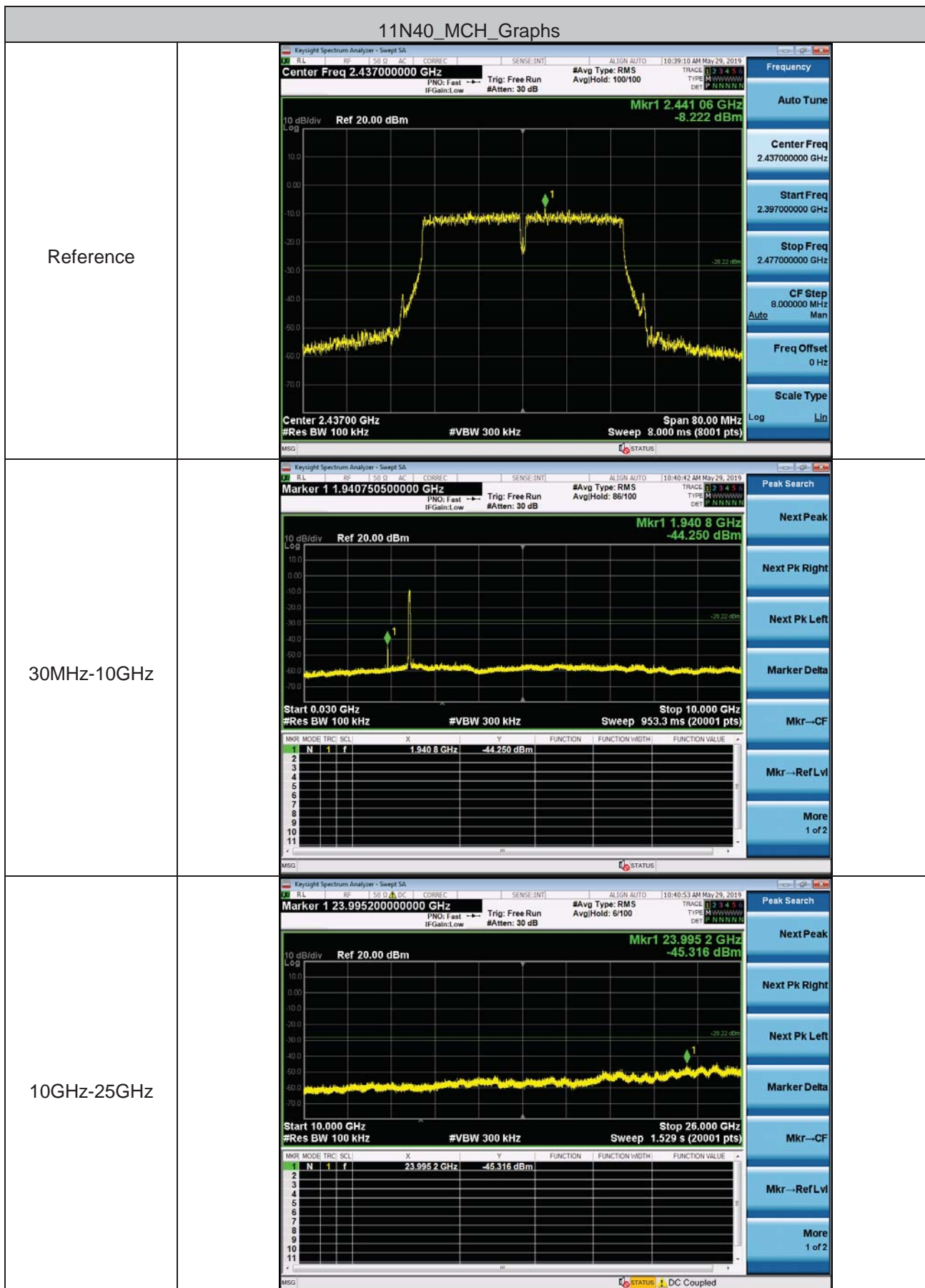




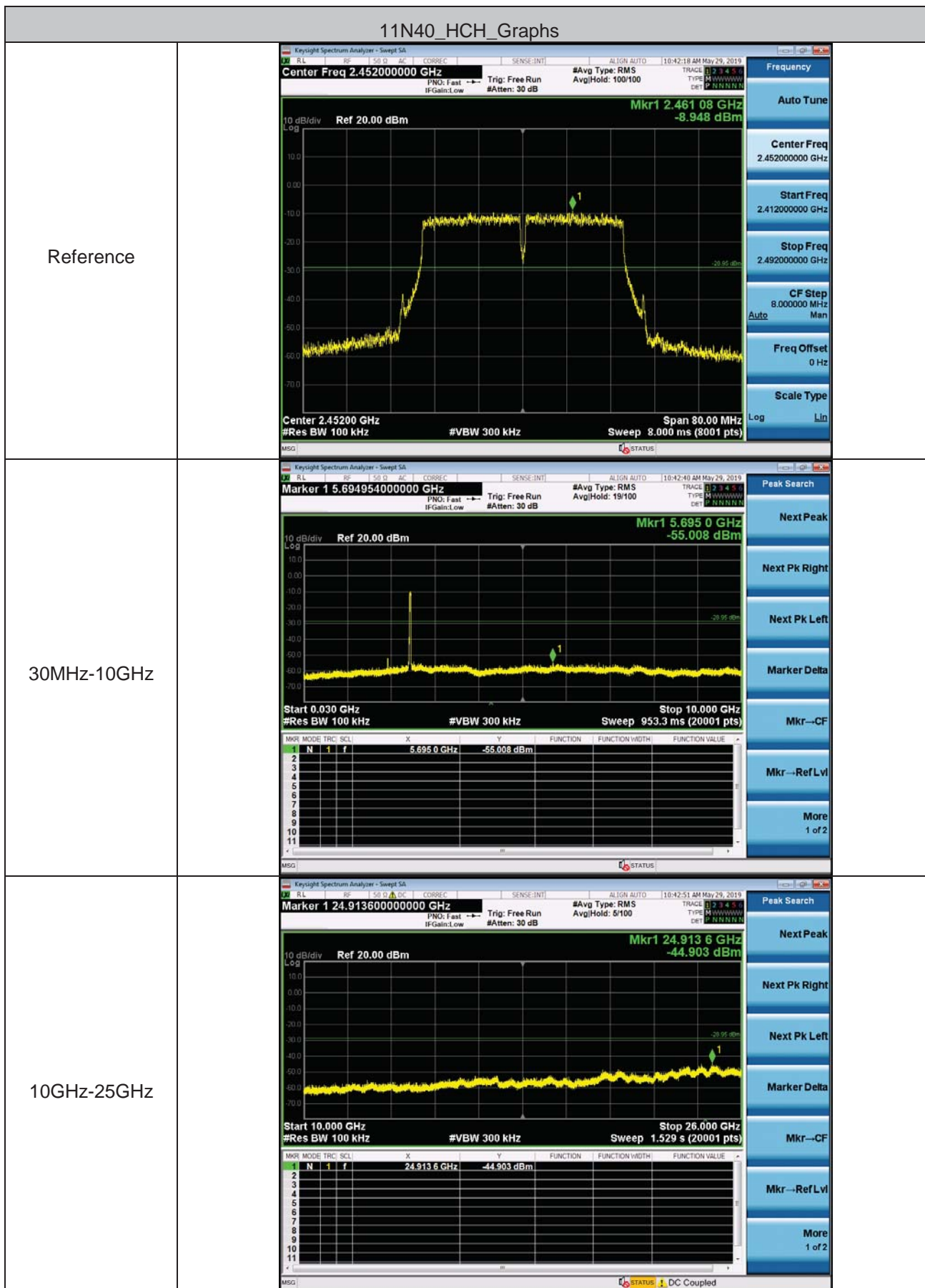












Remark:

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.

## 6.8 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:

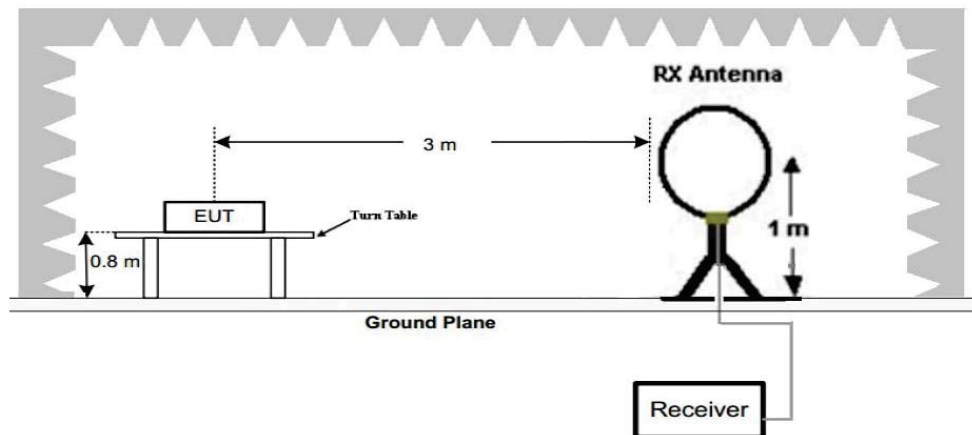


Figure 1. Below 30MHz

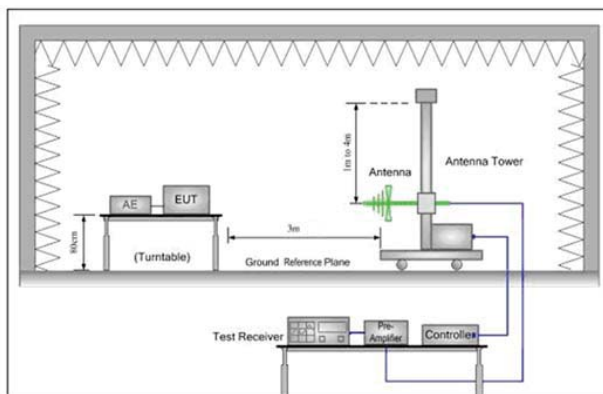


Figure 2. 30MHz to 1GHz

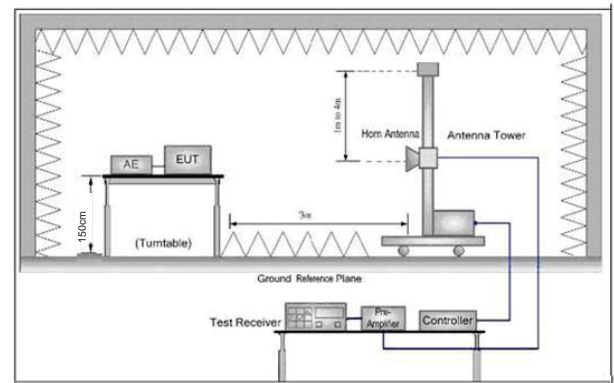


Figure 3. Above 1 GHz

Test Procedure:

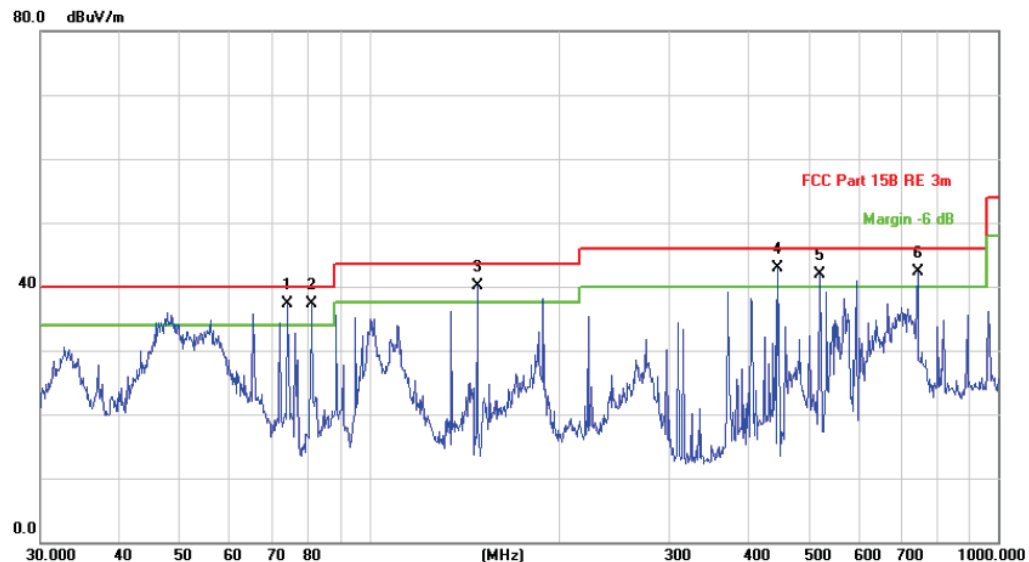
- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
  - 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above 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

	<p>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.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p> <p>g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel</p> <p>h. Repeat above procedures until all frequencies measured was complete.</p>
Exploratory Test Mode:	<p>Transmitting with all kind of modulations, data rates.</p> <p>Transmitting mode</p>
Final Test Mode:	<p>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)</p> <p>For below 1GHz, through Pre-scan, find the 6Mbps of rate of 802.11g at highest channel is the worst case.</p> <p>Only the worst case is recorded in the report.</p>
Test Results:	Pass



### 6.8.1 Radiated emission below 1GHz

30MHz~1GHz		
Test mode:	Transmitting	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	74.1350	54.55	-18.21	36.34	40.00	-3.66	QP
2	!	80.9274	54.73	-18.43	36.30	40.00	-3.70	QP
3	!	148.4410	52.38	-13.28	39.10	43.50	-4.40	QP
4	!	446.4141	48.93	-7.09	41.84	46.00	-4.16	QP
5	!	520.8881	46.89	-6.00	40.89	46.00	-5.11	QP
6	!	744.8660	43.10	-1.74	41.36	46.00	-4.64	QP

Remark:

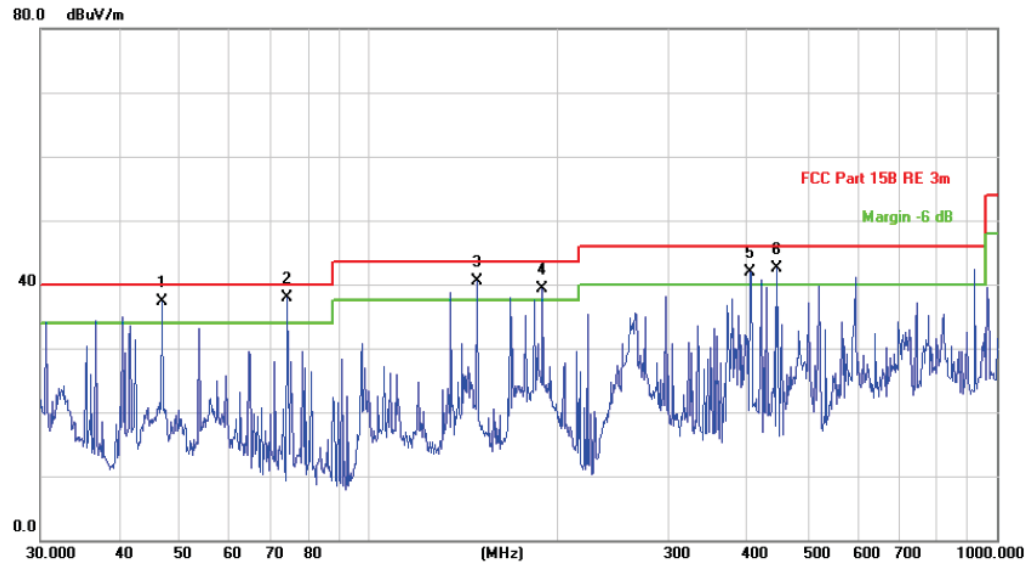
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Test mode:	Transmitting	Horizontal
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	!	46.8303	52.90	-16.55	36.35	40.00	-3.65	QP
2	*	74.1350	54.76	-17.92	36.84	40.00	-3.16	QP
3	!	148.4410	52.83	-13.32	39.51	43.50	-3.99	QP
4	!	189.0742	52.71	-14.39	38.32	43.50	-5.18	QP
5	!	404.6664	49.58	-8.60	40.98	46.00	-5.02	QP
6	!	446.4141	49.00	-7.47	41.53	46.00	-4.47	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.

## 6.8.2 Transmitter emission above 1GHz

Test mode:		802.11g(6Mbps)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4824.000	60.05	-4.26	55.79	74	-18.21	PK	H
4824.000	46.32	-4.26	42.06	54	-11.94	AV	H
7236.000	60.93	1.18	62.11	74	-11.89	PK	H
7236.000	42.80	1.18	43.98	54	-10.02	AV	H
4824.000	60.46	-4.26	56.20	74	-17.80	PK	V
4824.000	47.41	-4.26	43.15	54	-10.85	AV	V
7236.000	60.74	1.18	61.92	74	-12.08	PK	V
7236.000	42.58	1.18	43.76	54	-10.24	AV	V

Test mode:		802.11g(6Mbps)		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4874.000	63.85	-4.12	59.73	74	-14.27	PK	H
4874.000	46.16	-4.12	42.04	54	-11.96	AV	H
7311.000	60.46	1.46	61.92	74	-12.08	PK	H
7311.000	42.68	1.46	44.14	54	-9.86	AV	H
4874.000	62.38	-4.12	58.26	74	-15.74	PK	V
4874.000	46.90	-4.12	42.78	54	-11.22	AV	V
7311.000	60.20	1.46	61.66	74	-12.34	PK	V
7311.000	42.77	1.46	44.23	54	-9.77	AV	V

Test mode:		802.11g(6Mbps)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4924.000	62.32	-4.03	58.29	74	-15.71	PK	H
4924.000	46.90	-4.03	42.87	54	-11.13	AV	H
7386.000	60.89	1.66	62.55	74	-11.45	PK	H
7386.000	41.31	1.66	42.97	54	-11.03	AV	H
4924.000	62.84	-4.03	58.81	74	-15.19	PK	V
4924.000	47.94	-4.03	43.91	54	-10.09	AV	V
7386.000	59.92	1.66	61.58	74	-12.42	PK	V
7386.000	42.07	1.66	43.73	54	-10.27	AV	V

Remark:

- 1) The 6Mbps of rate of 802.11g is the worst case.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$
- 3) Scan from 9kHz to 25GHz, The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

## 6.9 Restricted bands around fundamental frequency

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)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value

Test Setup:	
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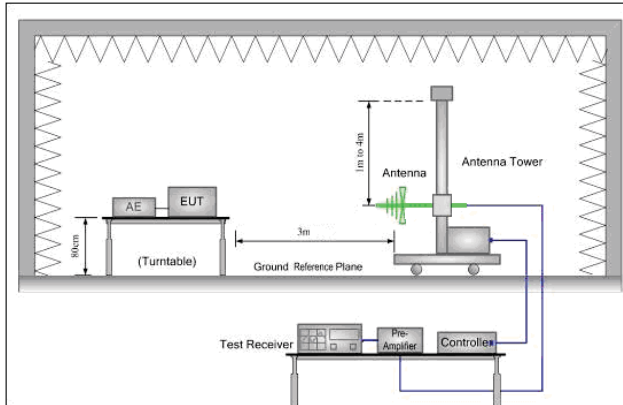


Figure 1. 30MHz to 1GHz

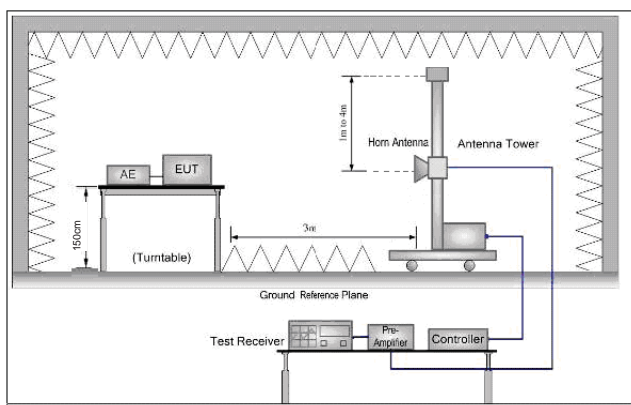


Figure 2. Above 1 GHz

Test Procedure:	<p>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.</p> <p>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.</p> <p>Note: For the radiated emission test above 1GHz:</p> <p>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.</p> <p>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.</p> <p>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.</p>
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	<p>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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel</p> <p>g. Test the EUT in the lowest channel , the Highest channel</p> <p>h. Repeat above procedures until all frequencies measured was complete.</p>
Exploratory Test Mode:	<p>Transmitting with all kind of modulations, data rates.</p> <p>Transmitting mode.</p>
Final Test Mode:	<p>Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case</p> <p>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)</p> <p>Only the worst case is recorded in the report.</p>
Test Results:	Pass

**Test data:**

Worse case mode:		802.11b(1Mbps)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390.000	62.30	-9.2	53.10	74	-20.90	PK	H
2390.000	46.22	-9.2	37.02	54	-16.98	AV	H
2400.000	60.11	-9.39	50.72	74	-23.28	PK	H
2400.000	42.75	-9.39	33.36	54	-20.64	AV	H
2390.000	60.95	-9.2	51.75	74	-22.25	PK	V
2390.000	47.12	-9.2	37.92	54	-16.08	AV	V
2400.000	60.56	-9.39	51.17	74	-22.83	PK	V
2400.000	42.91	-9.39	33.52	54	-20.48	AV	V

Worse case mode:		802.11b(1Mbps)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.500	61.85	-9.29	52.56	74	-21.44	PK	H
2483.500	46.05	-9.29	36.76	54	-17.24	AV	H
2483.500	59.36	-9.29	50.07	74	-23.93	PK	V
2483.500	42.91	-9.29	33.62	54	-20.38	AV	V

Worse case mode:		802.11g(6Mbps)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390.000	62.40	-9.2	53.20	74	-20.80	PK	H
2390.000	47.61	-9.2	38.41	54	-15.59	AV	H
2400.000	60.12	-9.39	50.73	74	-23.27	PK	H
2400.000	42.61	-9.39	33.22	54	-20.78	AV	H
2390.000	60.84	-9.2	51.64	74	-22.36	PK	V
2390.000	47.92	-9.2	38.72	54	-15.28	AV	V
2400.000	59.40	-9.39	50.01	74	-23.99	PK	V
2400.000	42.81	-9.39	33.42	54	-20.58	AV	V

Worse case mode:		802.11g(6Mbps)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.500	61.90	-9.29	52.61	74	-21.39	PK	H
2483.500	46.75	-9.29	37.46	54	-16.54	AV	H
2483.500	59.18	-9.29	49.89	74	-24.11	PK	V
2483.500	42.52	-9.29	33.23	54	-20.77	AV	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390.000	62.07	-9.29	52.78	74	-21.22	PK	H
2390.000	46.06	-9.29	36.77	54	-17.23	AV	H
2400.000	60.30	-9.29	51.01	74	-22.99	PK	H
2400.000	41.39	-9.29	32.10	54	-21.90	AV	H
2390.000	63.63	-9.29	54.34	74	-19.66	PK	V
2390.000	46.99	-9.29	37.70	54	-16.30	AV	V
2400.000	60.02	-9.29	50.73	74	-23.27	PK	V
2400.000	41.33	-9.29	32.04	54	-21.96	AV	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.500	61.33	-9.29	52.04	74	-21.96	PK	H
2483.500	47.80	-9.29	38.51	54	-15.49	AV	H
2483.500	59.10	-9.29	49.81	74	-24.19	PK	V
2483.500	42.31	-9.29	33.02	54	-20.98	AV	V

Worse case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390.000	61.71	-9.2	52.51	74	-21.49	PK	H
2390.000	45.99	-9.2	36.79	54	-17.21	AV	H
2400.000	60.34	-9.39	50.95	74	-23.05	PK	H
2400.000	41.92	-9.39	32.53	54	-21.47	AV	H
2390.000	61.67	-9.2	52.47	74	-21.53	PK	V
2390.000	46.21	-9.2	37.01	54	-16.99	AV	V
2400.000	60.07	-9.39	50.68	74	-23.32	PK	V
2400.000	41.21	-9.39	31.82	54	-22.18	AV	V

Worse case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.500	60.51	-9.2	51.31	74	-22.69	PK	H
2483.500	46.87	-9.2	37.67	54	-16.33	AV	H
2483.500	60.43	-9.29	51.14	74	-22.86	PK	V
2483.500	41.14	-9.29	31.85	54	-22.15	AV	V

**Note:**

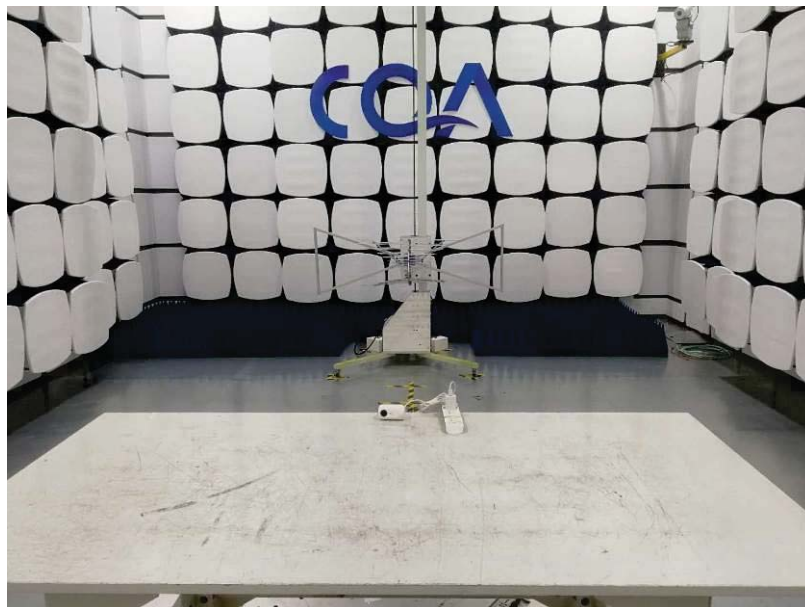
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

*Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor*



## 7 Photographs - EUT Test Setup

### 7.1 Radiated Spurious Emission



## 7.2 Conducted Emission



## 8 Photographs - EUT Constructional Details

### External Photos





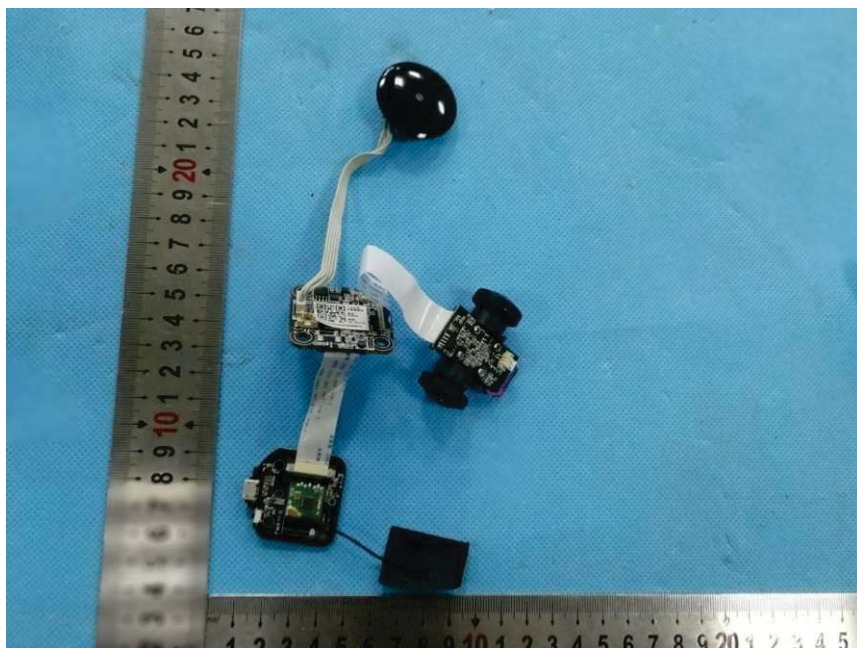


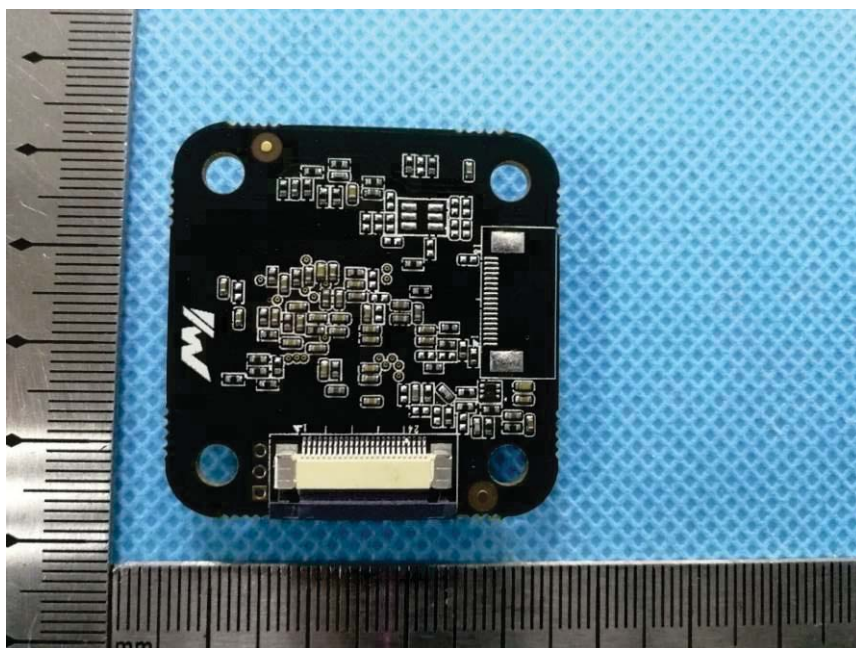
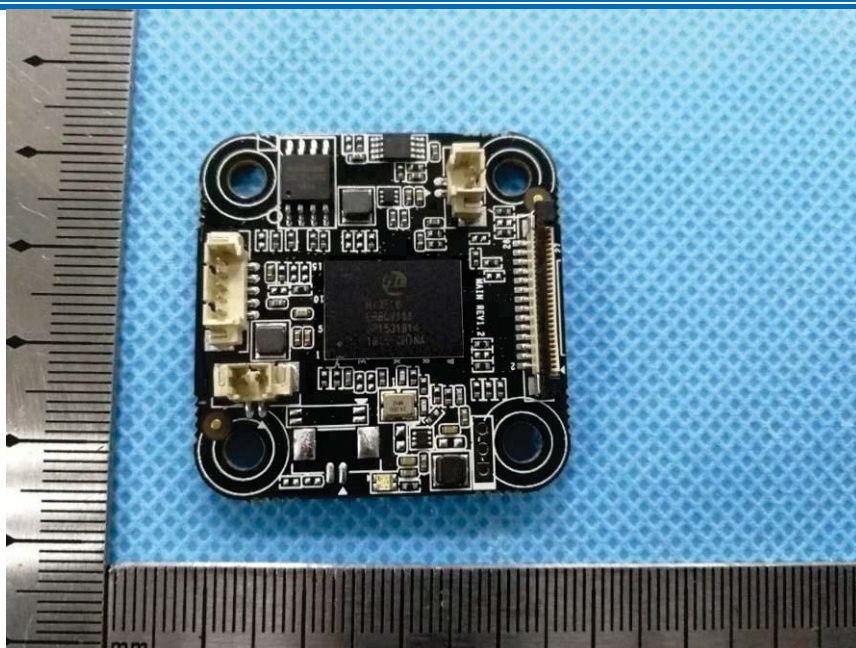




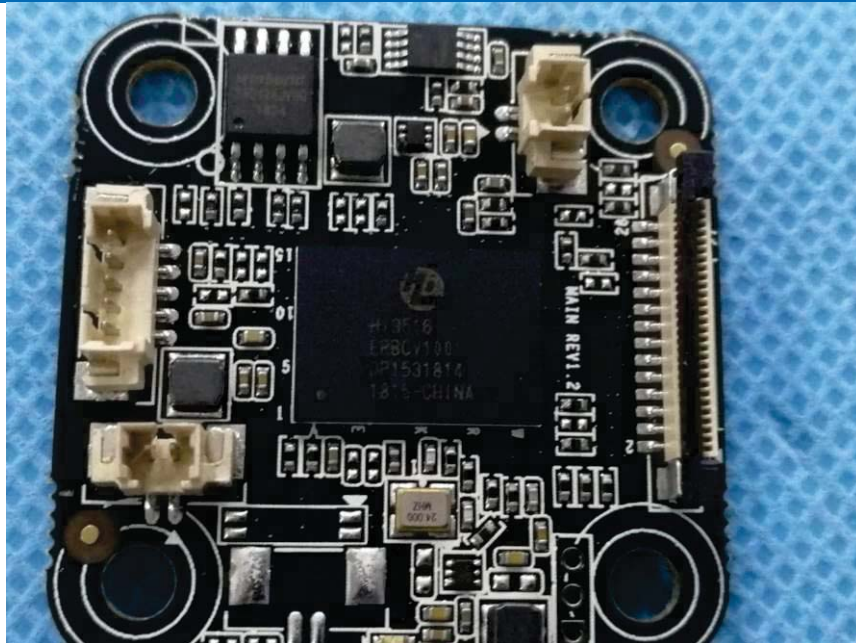


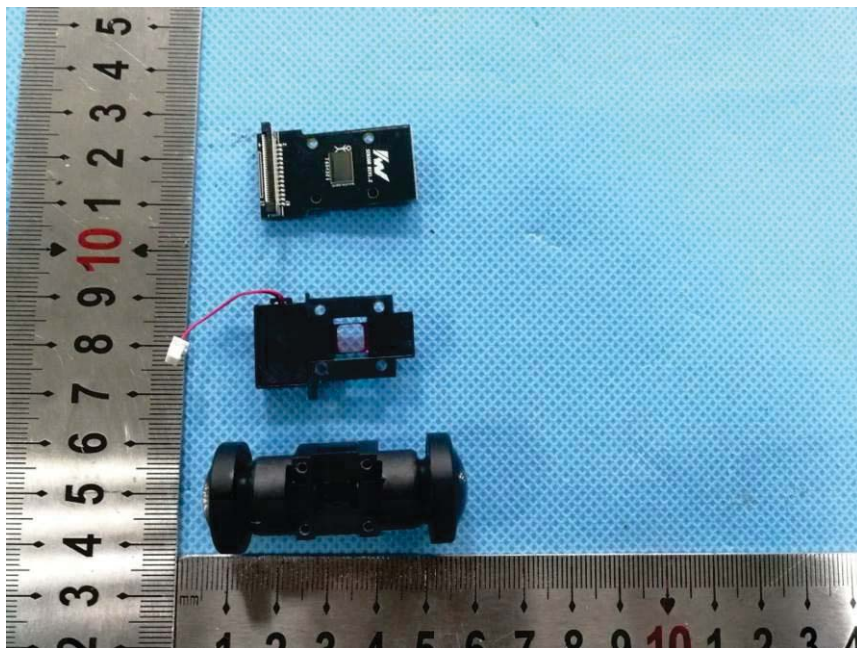
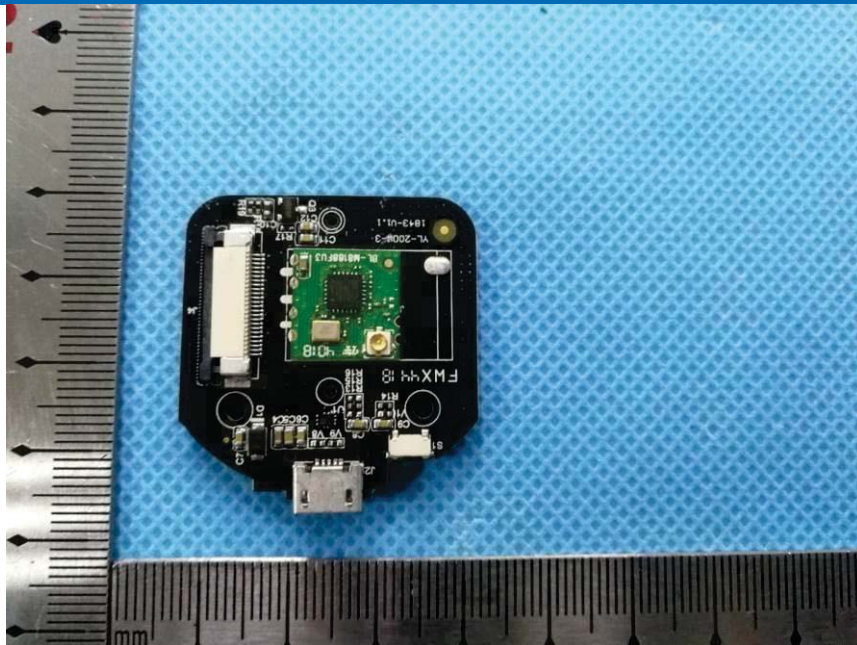
**Internal Photos**



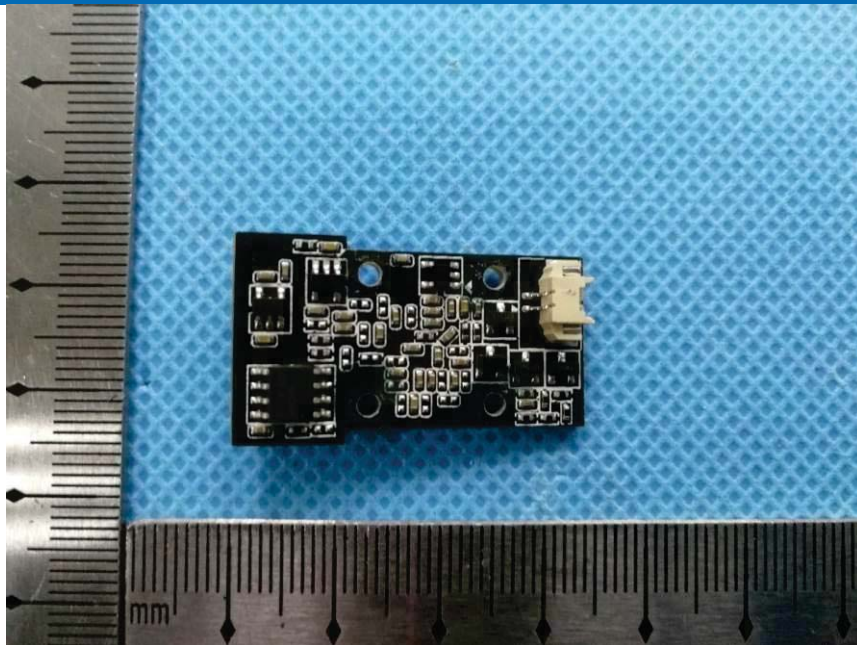


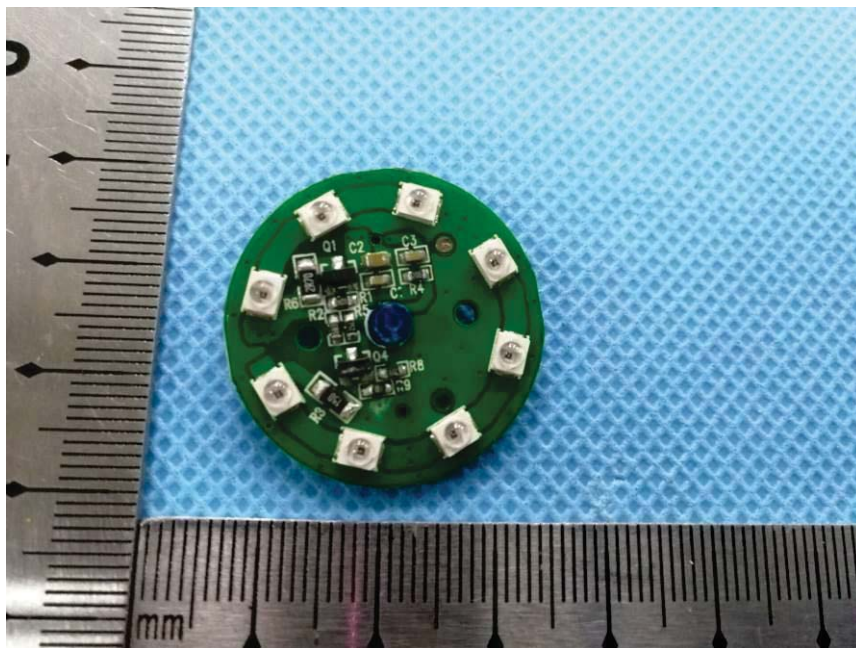
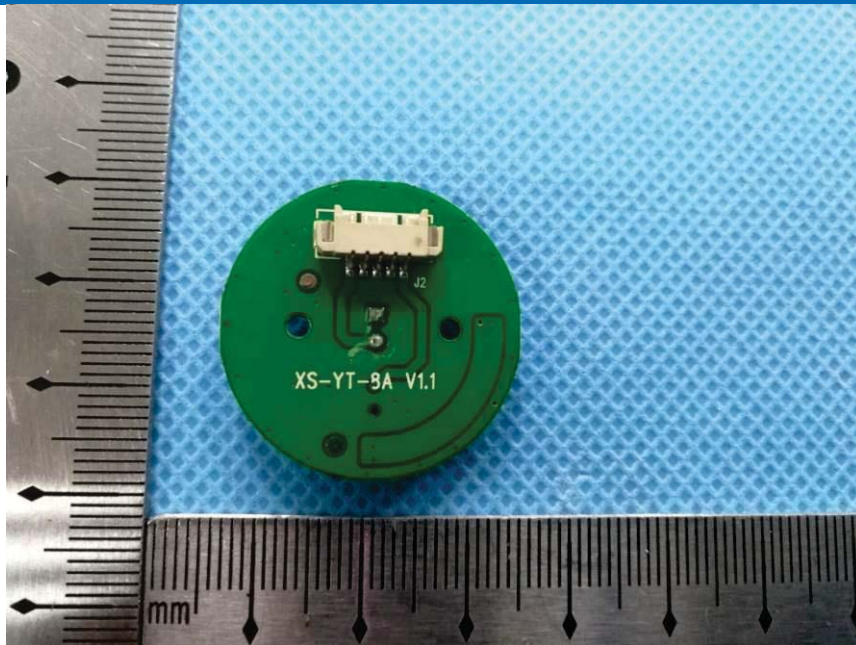


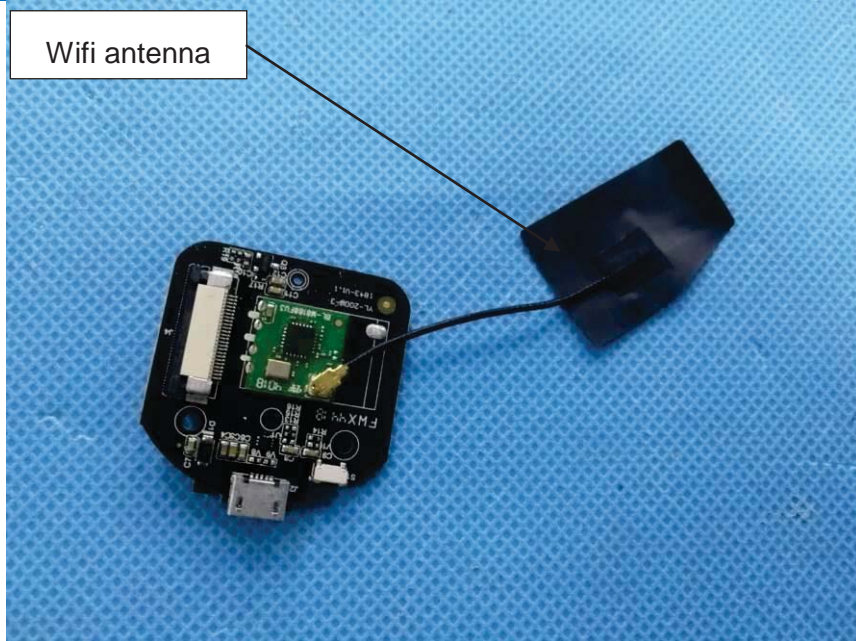












**THE END**